



Product Service

**Choose certainty.
Add value.**

Report On

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

COMMERCIAL-IN-CONFIDENCE

Document 75900217 Report 01 Issue 3

February 2008



Product Service

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

COMMERCIAL-IN-CONFIDENCE

REPORT ON

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

Document 75900217 Report 01 Issue 3

February 2008

PREPARED FOR

Jotron AS
Østbyveien 1
PO. BOX 54
3280 Tjodalyng
Norway

PREPARED BY

A handwritten signature in black ink, appearing to read 'R Hampton', written over a horizontal line.

R Hampton
Test Engineer

APPROVED BY

A handwritten signature in black ink, appearing to read 'M Jenkins', written over a horizontal line.

M Jenkins
Authorised Signatory

DATED

05 February 2008

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



CONTENTS

| Section | Page No |
|----------------|---|
| 1 | REPORT SUMMARY 4 |
| 1.1 | Introduction 5 |
| 1.2 | Application Form 9 |
| 1.3 | Product Information 14 |
| 1.4 | Deviations from the Standard 16 |
| 1.5 | Modification Record 16 |
| 1.6 | Alternative Test Site 16 |
| 2 | TEST DETAILS 17 |
| 2.1 | Message Format And Homing Devices 24 |
| 2.2 | Dry Heat Test (Combined Storage And Operational) 25 |
| 2.3 | Damp Heat Test 32 |
| 2.4 | Vibration Test 36 |
| 2.5 | Ruggedness Test 42 |
| 2.6 | Corrosion Test 45 |
| 2.7 | Drop Test (On Hard Surface) 49 |
| 2.8 | Drop Test (In Water) 51 |
| 2.9 | Thermal Shock Test 58 |
| 2.10 | Immersion Test 62 |
| 2.11 | Spurious Emissions Test 63 |
| 2.12 | Conducted Interference test 66 |
| 2.13 | Signal Light Test 67 |
| 2.14 | Battery Capacity At Low Temperature Test 68 |
| 2.15 | Cospas-Sarsat Type Approval 77 |
| 2.16 | Compulsory Sequence Of Tests 78 |
| 2.17 | Inadvertent Activation Test 80 |
| 2.18 | Self-test 81 |
| 2.19 | Automatic Release Mechanism And Automatic Activation Tests 83 |
| 2.20 | Stability And Buoyancy Test 84 |
| 2.21 | Safety Inspection 87 |
| 2.22 | Compass Safe Distance Test 88 |
| 2.23 | Solar Radiation 90 |
| 2.24 | Oil Resistance 91 |
| 2.25 | Conducted Emissions 92 |
| 2.26 | Radiated Emissions Test (Electric Field) 93 |
| 2.27 | Radiated Emissions Test (Magnetic Field) 106 |
| 2.28 | Immunity To Conducted Radio Frequency Disturbance 111 |
| 2.29 | Immunity To Radiated Radio frequencies 112 |
| 2.30 | Immunity To Fast Transients 114 |
| 2.31 | Immunity To Surges 115 |
| 2.32 | Immunity To Power Supply Short-term Variation 116 |
| 2.33 | Immunity To Power Supply Failure 117 |
| 2.34 | Immunity To Electrostatic Discharge 118 |
| 2.35 | 121.5MHz Homing Device (Carrier Frequency Test) 121 |
| 2.36 | 121.5MHz Homing Device (Peak Effective Radiated Power) 122 |
| 2.37 | 121.5MHz Homing Device (Modulation Characteristics - Transmitter Duty cycle) 123 |
| 2.38 | 121.5MHz Homing Device (Modulation Characteristics - Modulation Frequency And Sweep Repetition Rate, Modulation Duty Cycle) 126 |
| 2.39 | 121.5MHz Homing Device (Modulation Characteristics - Modulation Factor) 127 |
| 3 | TEST EQUIPMENT USED 130 |



Product Service

| | | |
|----------------|---|------------|
| 3.1 | Test Equipment Used | 131 |
| 4 | PHOTOGRAPHS..... | 141 |
| 4.1 | Photographs of Equipment Under Test (EUT) | 142 |
| 5 | DISCLAIMERS AND COPYRIGHT | 144 |
| 5.1 | Disclaimers and Copyright..... | 145 |
| ANNEX A | Customer Supplied Information | A.2 |



Product Service

SECTION 1

REPORT SUMMARY

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



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the MED Testing of the Jotron AS Tron 40GPS MkII and Tron 40S MkII to the requirements of IEC 60945: 2002 and IEC 61097-2: 2002.

| | |
|-------------------------------|---|
| Objective | To perform MED Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out. |
| Manufacturer | Jotron AS |
| Model Number(s) | Tron 40GPS MkII |
| Serial Number(s) | 001 (Modified sample to incorporate 50Ω output) 002 003 (Tron 40S MkII, non-GPS variant) |
| Number of Samples Tested | Three |
| Customer Declared Variant(s) | Tron 40S MkII (Non-GPS Variant) |
| Test Specification/Issue/Date | IEC 60945: 2002 IEC 61097-2 Second edition 2002-09 (Herein referred to as IEC 61097-2: 2002) |
| Incoming Release Date | Application Form 02 May 2007 |
| Order Number Date | PO0637001 02 October 2007 |
| Start of Test | 12 March 2007 |
| Finish of Test | 21 December 2007 |
| Name of Engineer(s) | R Hampton C Hedley C Bowles A Castle K Adsetts C Lewis A Guy D Day |



Related Document(s)

The following referenced documents are indispensable for the application of EN 60945:2002.

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*
Amendment 1 (1997)
Amendment 2 (1998)

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Tests A: Cold*
Amendment 1 (1993)
Amendment 2 (1994)

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Tests B: Dry heat*
Amendment 1 (1993)
Amendment 2 (1994)

IEC 60068-2-5:1975, *Environmental testing – Part 2: Test Sa: Simulated solar radiation at ground level.*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Test Fc: Vibration (sinusoidal)*
Corrigendum 1 (1995)

IEC 60068-2-9:1975, *Environmental testing – Part 2: Guidance for solar radiation testing*
Amendment 1 (1984) Corrigendum 1 (1989)

IEC 60068-2-30:1980, *Environmental testing – Part 2: Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*
Amendment 1 (1985)

IEC 60068-2-48:1982, *Environmental testing – Part 2: Guidance on the application of the tests of IEC 60068 to simulate the effects of storage*

IEC 60068-2-52:1996, *Environmental testing – Part 2: Test Kb: Salt mist, cyclic (sodium chloride solution)*
Corrigendum 1 (1996)

IEC 60071-2:1996, *Insulation co-ordination – Part 2: Application guide*

IEC 60092-101:1994, *Electrical installations in ships – Part 101: Definitions and general requirements*
Amendment 1 (1995)
Corrigendum 1 (1996)



Product Service

IEC 60417(all parts), *Graphical symbols for use on equipment*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*
Amendment 1 (1999)

IEC 60533:1999, *Electrical and electronic installations in ships – Electromagnetic Compatibility*

IEC 60651:1979, *Sound level meters*
Amendment 1 (1993)

The following referenced documents are indispensable for the application of IEC 61097-2:2002. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60945, *Marine navigation and radiocommunication equipment and systems – General Requirements – Methods of testing and required test results*

IMO Resolution A.658(16):1989, *Use and fitting of retro-reflective materials on life-saving appliances*

IMO Resolution A.662(16):1989, *Performance standards for float-free release and activation arrangements for emergency radio equipments*

IMO Resolution A.689(17):1991, *Testing of life-saving appliances*

IMO Resolution A.694(17):1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO Resolution A.696(17):1991, *Type approval of satellite emergency position-indicating radio beacons (EPIRBs) operating in the COSPAS-SARSAT system*

IMO Resolution A.702(17):1991, *Radio maintenance guidelines for the global maritime distress and safety system (GMDSS) related to sea areas A3 and A4*

IMO Resolution A.810(19):1995, *Performance standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz*

ITU-R Recommendation M.585 as amended, *Assignment and use of maritime mobile service identities*



Product Service

ITU-R Recommendation M.633, Transmission characteristics of a satellite emergency position-indicating radio beacon (satellite EPIRB) system operating through a low polarorbiting satellite system in the 406 MHz band

ITU-R Recommendation M.690-1, Technical characteristics of emergency position indicating radio beacons (EPIRBs) operating on the carrier frequencies of 121,5 MHz and 243 MHz

COSPAS-SARSAT

C/S T.001, as amended, Specification for COSPAS-SARSAT 406 MHz distress beacons and C/S T.007, as amended, COSPAS-SARSAT 406 MHz distress beacon type approval standard (as applicable to EPIRBs).

IMO Safety of Life at Sea (SOLAS) Convention 1974, as amended. (GMDSS)



Product Service

1.2 APPLICATION FORM

1.2.1 Beacon Manufacturer and Beacon Model

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

1.2.2 Beacon Type and Operational Configurations

| Beacon Type | Beacon used while: | Tick where appropriate |
|----------------------------|---|-------------------------------------|
| EPIRB | Floating in water or on deck or in a safety raft | <input checked="" type="checkbox"/> |
| PLB | On ground and above ground | <input type="checkbox"/> |
| | On ground and above ground and floating in water | <input type="checkbox"/> |
| ELT Survival | On ground and above ground | <input type="checkbox"/> |
| | On ground and above ground and floating in water | <input type="checkbox"/> |
| ELT Auto Fixed | Fixed ELT with aircraft external antenna | <input type="checkbox"/> |
| ELT Auto Portable | In aircraft with an external antenna | <input type="checkbox"/> |
| | On ground, above ground, or in a safety raft with an integrated antenna | <input type="checkbox"/> |
| ELT Auto Deployable | Deployable ELT with attached antenna | <input type="checkbox"/> |
| Other (specify) | | <input type="checkbox"/> |

1.2.3 Beacon Characteristics

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



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



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



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

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: October 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: M Jenkins

Position Held: Authorised Signatory

Date: 05 February 2008



Product Service

1.2.5 Applicant Details

| | | | |
|-----------------------|---|-----------------------------------|--------------|
| Company Name | Jotron AS | | |
| Address | Østbyveien 1 PO Box 54 3280 Tjodalyng Norway | | |
| Category of Applicant | <input checked="" type="checkbox"/> Manufacturer | <input type="checkbox"/> Importer | |
| | <input type="checkbox"/> Distributor | <input type="checkbox"/> Agent | |
| Contact Name | Eirik Storjordet | Telephone | +47 33139714 |
| Email | eirik.storjordet@jotron.com | Facsimile | +47 33126780 |

1.2.6 Manufacturer Details

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

1.2.7 Declaration of Build Status

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

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: 27.04.2007



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

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



Equipment Under Test, Sample Serial Number 001



1.3.2 Test Configuration

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

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

The EUT was powered by its internal battery.

1.3.3 Modes of Operation

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

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

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

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

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

1.3.4 Monitoring of Performance

Performance check comprises successful self-test of beacon into a beacon tester and confirmation strobe flashes on EUT. Please note that Beacon Test Reports are provided to show successful transmission of the digital message only. All other values and measurements shown are for informative purposes only and are not traceable (calibrated) results.

1.3.5 Performance Criterion

EUT must successfully complete the performance check or performance test if required.

1.3.6 Additional Variants

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

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



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 | Software update to version 1.01 to fix Repetition Rate problem | TÜV Product Service Ltd (SW Supplied by Jotron AS) | 08 March 2007 |
| 2 | Software update to version 1.02 to fix 121MHz Spurious Emissions problem | TÜV Product Service Ltd (SW Supplied by Jotron AS) | 20 March 2007 |
| 3 | Software update to version 1.03 to fix Encoded position drop problem | TÜV Product Service Ltd (SW Supplied by Jotron AS) | 25 May 2007 |
| 4 | Software update to version 1.04 to fix modulation problem on last bit | TÜV Product Service Ltd (SW Supplied by Jotron AS) | 05 June 2007 |
| 5 | Software update to version 1.05 to fix problems encountered during Cospas-Sarsat testing | TÜV Product Service Ltd (SW Supplied by Jotron AS) | 20 June 2007 |
| 6 | Software update to version 1.06 to fix coarse position and delta offset problem | TÜV Product Service Ltd (SW Supplied by Jotron AS) | 09 August 2007 |
| 7 | Hardware change to fix self-test fault measuring 121.5MHz power | Jotron AS | 11 September 2007 |

1.6 ALTERNATIVE TEST SITE

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

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

2.36 Peak Equivalent Radiated Power



Product Service

SECTION 2

TEST DETAILS

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



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. Message Format and Homing Devices | | | | | | Section 2.1 Result: Pass |
| Test Protocol Utilised | Utilised | ✓ | | Y | | Tron 40GPS MkII, Serial Number 001 Tron 40GPS MkII, Serial Number 002 |
| Evidence of compliance provided | Provided | ✓ | | Y | | |
| 50Ω connection provided | Provided | ✓ | | Y | | |
| Homing frequency | ≠ 121.5 | MHz | | 122.55 | | |
| 2. Dry Heat Test – Combined Storage and Operational | | | | | | Section 2.2 Result: Pass |
| Electrical And Functional Tests At Constant Temperature | Successful completion | ✓ | | | ✓ | Doubles as "Post Storage Performance Check" |
| Performance Check (during 2 hour period) | Successful self-test | ✓ | | | ✓ | |
| Performance Check (at end of 2 hour period) | Successful self-test | ✓ | | | ✓ | |
| 3. Damp Heat Test | | | | | | Section 2.3 Result: Pass |
| Performance Test | Successful completion | ✓ | | | ✓ | |
| Performance Check (during 2 hour period) | Successful self-test | ✓ | | | ✓ | |
| 4. Vibration Test | | | | | | Section 2.4 Result: Pass |
| Performance Check (post test) | Successful self-test | ✓ | | ✓ | | |
| 5. Ruggedness Test | | | | | | Section 2.5 Result: Pass |
| Performance Check (post test) | Successful self-test | ✓ | | ✓ | | |
| 6. Corrosion Test | | | | | | Section 2.6 Result: Pass |
| Exterior Mechanical Inspection | No damage | ✓ | | ✓ | | |
| Performance Check | Successful self-test | ✓ | | ✓ | | |



| Parameter To Be Measured | Range Of Specification | Units | Test Results | | | Comments |
|---------------------------------|------------------------------------|-------|--------------------------|------------------|--------------------------|---|
| | | | T _{min} (-20°C) | T _{amb} | T _{max} (+55°C) | |
| 7. Drop Test 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. |
| Performance Check | Successful self-test | ✓ | | ✓ | | |
| 8. Drop Test In Water | | | | | | Section 2.8 Result: Pass |
| Exterior Mechanical Inspection | No damage | ✓ | | ✓ | | |
| Performance Check | Successful self-test | ✓ | | ✓ | | |
| 9. Thermal Shock | | | | | | Section 2.9 Result: Pass |
| Performance Check | Successful self-test | ✓ | | ✓ | | The EUT was soaked at the maximum stowage temperature (+70°C) prior to the immersion. |
| Interior Inspection | No water ingress | ✓ | | ✓ | | |
| 10. Immersion Test | | | | | | Section 2.10 Result: Pass |
| Performance Check | Successful self-test | ✓ | | ✓ | | |
| Exterior Mechanical Inspection | No damage | ✓ | | ✓ | | |
| Interior Inspection | No water ingress | ✓ | | ✓ | | |
| 11. Spurious Emissions Test | | | | | | Section 2.11 Result: Pass |
| 156 - 174 MHz Band | Peak emission < 25mW | ✓ | | ✓ | | |
| 1525 - 1545 MHz Band | Peak emission < 25mW | ✓ | | ✓ | | |
| 12. Conducted Interference Test | | | | | | Section 2.12 Result: N/A |
| Applicability | EUT Connects to ships power system | Y / N | | N | | Test not applicable |
| 13. Signal Light Test | | | | | | Section 2.13 Result: Completed |
| Test | Completed | Y / N | Y* | Y* | Y* | * As per customer supplied information, see Annex A |



| Parameter To Be Measured | Range Of Specification | Units | Test Results | | | Comments |
|--|-----------------------------|--------|--------------------------|------------------|--------------------------|---|
| | | | T _{min} (-20°C) | T _{amb} | T _{max} (+55°C) | |
| 14. Battery Capacity At Low Temperature Test | | | | | | Section 2.14 Result: Pass |
| Operational duration | ≥48 | Hours | 54.1 | | | Minimum and maximum values stated are up to 54.1 hours |
| Transmit frequency: | | | Minimum | | Maximum | |
| Nominal value | C/S T.001 | MHz | 406.036935 | | 406.036939 | |
| Short-term stability | ≤2x10 ⁻⁹ | /100ms | 9.456x10 ⁻¹¹ | | 2.997x10 ⁻¹⁰ | |
| Medium-term stability – slope | (-1 to +1)x10 ⁻⁹ | /min | -6.762x10 ⁻¹¹ | | 7.794x10 ⁻¹¹ | |
| Medium-term stability – residual frequency variation | ≤3x10 ⁻⁹ | | 9.684x10 ⁻¹¹ | | 3.295x10 ⁻¹⁰ | |
| Transmitter power output | 35 - 39 | dBm | 36.08 | | 36.66 | |
| Digital message | Correct | ✓ | ✓ | | | |
| 15. Cospas-Sarsat Type Approval | | | | | | Section 2.15 |
| Cospas-Sarsat Certificate | Provided | Y / N | Pending | | | |
| 16. Compulsory Sequence of Tests | | | | | | Section 2.16 |
| All Tests | Completed | Y / N | Y | | | |
| Sequence | Maintained | Y / N | Y | | | "Environmental" Sample (Serial number 002, not modified to provide 50Ω output) |
| 17. Inadvertent Activation Test | | | | | | Section 2.17 Result: Completed |
| Test | Completed | Y / N | | Y* | | * As per customer supplied information, see Annex A |
| 18. Self-test | | | | | | Section 2.18 Result: Pass |
| RF pulse duration | 440 or 520* | ms | | 520 | | * Range Of Specification dependant on message length. EUT coded with long message, hence limit is 520ms |
| Frame synchronisation pattern | 0 1101 0000 | ✓ | | ✓ | | |



| Parameter To Be Measured | Range Of Specification | Units | Test Results | | | Comments |
|--|------------------------------------|-------|--------------------------|------------------|--------------------------|---|
| | | | T _{min} (-20°C) | T _{amb} | T _{max} (+55°C) | |
| 19. Automatic Release Mechanism Test | | | | | | Section 2.19 Result: Completed |
| Test | Completed | Y / N | | Y* | | * As per customer supplied information, see Annex A |
| 20. Stability and Buoyancy Test | | | | | | Section 2.20 Result: Pass |
| Time to upright | < 2 seconds | Y / N | | Y | | |
| Reserve buoyancy | > 1.05 | Y / N | | Y | | |
| Float upright; Antenna base | > 40 mm | Y / N | | Y | | |
| 21. Safety Inspection | | | | | | Section 2.21 Result: Pass |
| Compliance with relevant clauses of the specification | Complies | Y / N | | Y | | |
| 22. Compass Safe Distance Test | | | | | | Section 2.22 Result: Pass |
| Safe distance for standard compass | Record | mm | | 700 | | |
| Safe distance for Steering, Standby Steering and Emergency Compass | Record | mm | | 500 | | |
| 23. Solar Radiation | | | | | | Section 2.23 Result: N/A |
| Test | Completed | Y / N | | | N | Waiver requested, see Annex A |
| 24. Oil Resistance | | | | | | Section 2.24 Result: N/A |
| Test | Completed | Y / N | | N | | Waiver requested, see Annex A |
| 25. Conducted Emissions | | | | | | Section 2.25 Result: N/A |
| Applicability of test | EUT Connects to ships power system | Y / N | | N | | Test not applicable |



| Parameter To Be Measured | Range Of Specification | Units | Test Results | | | Comments |
|---|------------------------------------|-------|--------------------------|------------------|--------------------------|---------------------------|
| | | | T _{min} (-20°C) | T _{amb} | T _{max} (+55°C) | |
| 26. Radiated Emissions Test (Electric Field) | | | | | | Section 2.26 Result: Pass |
| Limiting Values For Radiated Emissions From Enclosure Ports | Below limits | Y / N | | Y | | |
| 27. Radiated Emissions Test (Magnetic Field) | | | | | | Section 2.27 Result: Pass |
| Limiting Values For Radiated Emissions From Enclosure Ports | Below limits | Y / N | | Y | | |
| 28. Immunity To Conducted Radio Frequency Disturbance | | | | | | Section 2.28 Result: N/A |
| Applicability of test | EUT Connects to ships power system | Y / N | | N | | Test not applicable |
| 29. Immunity To Radiated Radiofrequencies | | | | | | Section 2.29 Result: Pass |
| Complies With The Performance Criterion | Complies | Y / N | | Y | | |
| 30. Immunity To Fast Transients | | | | | | Section 2.30 Result: N/A |
| Applicability of test | EUT Connects to ships power system | Y / N | | N | | Test not applicable |
| 31. Immunity To Surges | | | | | | Section 2.31 Result: N/A |
| Applicability of test | EUT Connects to ships power system | Y / N | | N | | Test not applicable |
| 32. Immunity To Power Supply Short-term Variation | | | | | | Section 2.32 Result: N/A |
| Applicability of test | EUT Connects to ships power system | Y / N | | N | | Test not applicable |
| 33. Immunity To Power Supply Failure | | | | | | Section 2.33 Result: N/A |
| Applicability of test | EUT Connects to ships power system | Y / N | | N | | Test not applicable |
| 34. Immunity To Electrostatic Discharge | | | | | | Section 2.34 Result: Pass |
| Complies With The Performance Criterion | Complies | Y / N | | Y | | |



| Parameter To Be Measured | Range Of Specification | Units | Test Results | | | Comments |
|----------------------------------|--|-------------------|--------------------------|------------------|--------------------------|--------------|
| | | | T _{min} (-20°C) | T _{amb} | T _{max} (+55°C) | |
| 34. 121.5MHz Homing Device Tests | | | | | | Result: Pass |
| Carrier frequency | 121.5 ± 50ppm | MHz | 121.4997666 | | 121.4997202 | Section 2.35 |
| PERP | +17 ± 3dB | dBm | | 18.99 | | Section 2.36 |
| • Pattern | Omnidirectional | ✓ | | ✓ | | |
| • Polarisation | Vertical | ✓ | | ✓ | | |
| Transmitter Duty cycle | Transmitter interruption to be less than 2 seconds | ✓ | ✓ | | ✓ | Section 2.37 |
| Modulation: | | | | | | |
| • Frequency | 700 Hz within the range of 300 - 1600 Hz | ✓ | ✓ | | ✓ | Section 2.38 |
| – Range | ≥ 700 | Hz | 944.3 | | 945.75 | |
| – Minimum | ≥ 300 | Hz | 387.3 | | 385.36 | |
| – Maximum | ≤ 1600 | Hz | 1331.6 | | 1331.1 | |
| • Direction | Upward or Downward | Upward / Downward | Downward | | Downward | |
| • Duty cycle | 33 - 55 | % | 33.61 | | 35.73 | |
| • Sweep repetition rate | 2 - 4 | Hz | 2.61 | | 2.70 | |
| • Factor | 0.85 - 1.0 | | 87.3 | | 93.7 | Section 2.39 |



Product Service

2.1 MESSAGE FORMAT AND HOMING DEVICES

2.1.1 Specification Reference

IEC 61097-2:2002, Clause A.1.1 (5.1.7)

2.1.2 Equipment Under Test

Tron 40GPS MkII, Serial Numbers 001 and 002

2.1.3 Test Results

EUT and manufacturers data checked against requirements of the clause before the commencement of testing. No discrepancies were found. Detailed results can be found in the Table of Test Results, starting on page 18



Product Service

2.2 DRY HEAT TEST (COMBINED STORAGE AND OPERATIONAL)

2.2.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.2 (5.13.1)
IEC 60945: 2002, Clause 8.2

2.2.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.2.3 Date of Test and Modification State

12 to 13 March 2007 - Modification State 1

2.2.4 Test Equipment Used

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

2.2.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Operating as per "Test Results", below.

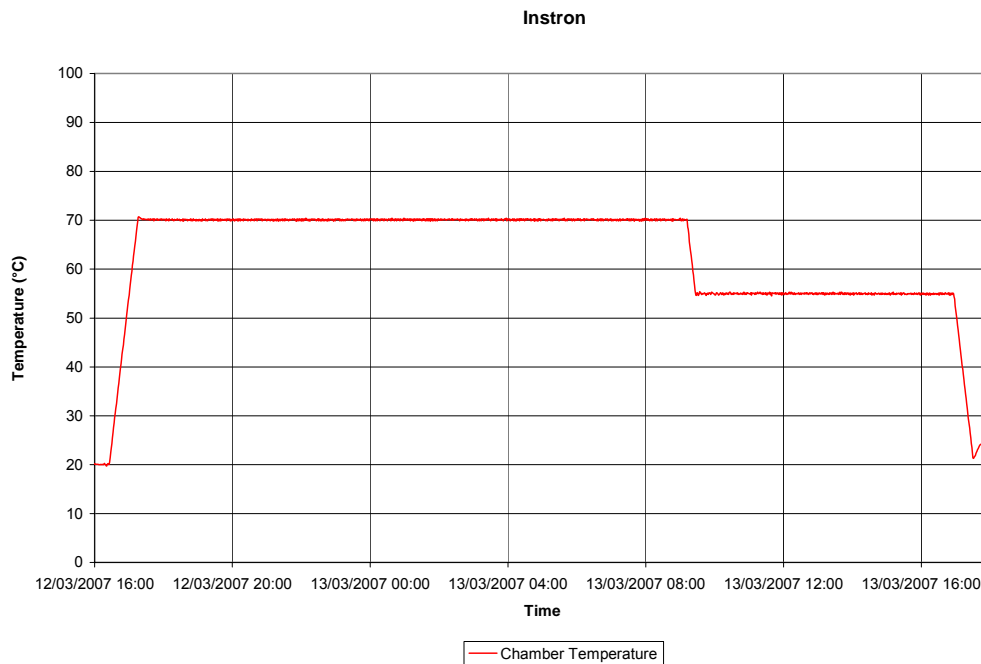


Test Set-up



2.2.6 Environmental Conditions

Dry Heat Cycle Temperature Plot



2.2.7 Test Results

The test was performed “combined”, i.e. rather than returning to ambient between the two tests the operational test immediately followed the storage period.

Test Procedure

EUT was placed in the Instron (Climatic) chamber. With EUT switched off, the chamber temperature was ramped to and held at +70°C for 16 hours. The chamber was then ramped to then held at +55°C and the EUT switched on and function tested, see results below.

Chamber temperature ramped to lab ambient. Upon reaching lab ambient the chamber was deactivated.

Performance Check (During Dwell)

A Performance Check was conducted during +55°C temperature dwell, see Beacon Test Report below.



Product Service

Beacon Test Report (Performance Check, During Test)

Beacon Test Report

A03D3CF400001

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

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

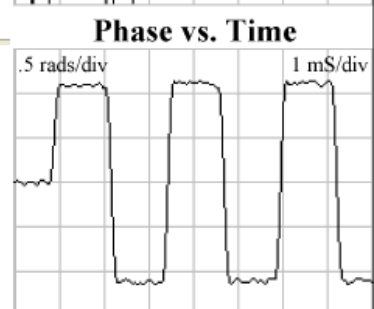
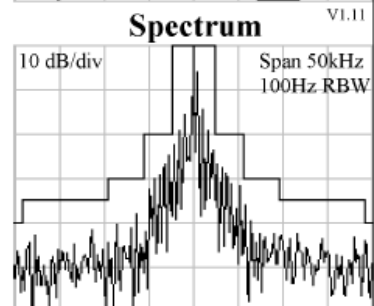
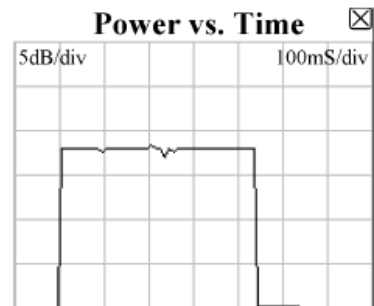
Notes: Add text comments here.

15 Hex ID: A03D3CF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

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

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



Note: The date shown on the beacon tester is incorrect and should read 13-Mar-07.



Electrical And Functional Tests At Constant Temperature

| Parameter | Limit | Units | Result |
|---------------------------------------|--------------------------------|-----------|---------|
| Power Output | | | |
| Transmitter power output | 35 - 39 | dBm | 36.13 |
| Power output rise time | < 5 | ms | 0 |
| Digital Message Coding | | | |
| Bit Sync | 15 bits "1" | P / F | P |
| Frame sync | "000101111" | P / F | P |
| Format flag | 1 bit | bit value | 0 |
| Protocol flag | 1 bit | bit value | 1 |
| ID / position data | 59 bits | P / F | P |
| BCH code | 21 bits | P / F | P |
| Emerg. Code/nat. use/supplem. Data | 6 bits | bit value | 110110 |
| Additional data / BCH (if applicable) | 32 bits | P / F | N/A |
| Position Error | < 5 | km | N/A |
| Digital Message Generator | | | |
| Repetition rate T_R : | | | |
| Average T_R | $48.5 \leq T_{Ravg} \leq 51.5$ | seconds | 50.541 |
| Minimum T_R | $47.5 \leq T_{Rmin} \leq 48.0$ | seconds | 47.79 |
| Maximum T_R | $52.0 \leq T_{Rmax} \leq 52.5$ | seconds | 52.35 |
| Standard deviation | 0.5 - 2.0 | seconds | 1.704 |
| Bit rate | | | |
| Minimum fb | ≥ 396 | bits/sec | 399.622 |
| Maximum fb | ≤ 404 | bits/sec | 399.831 |
| Total transmission time | | | |
| Short message | 435.6 - 444.4 | ms | 440.136 |
| Long message | 514.8 - 525.2 | ms | N/A |
| Unmodulated carrier | | | |
| Minimum T1 | ≥ 158.4 | ms | 160.401 |
| Maximum T1 | ≤ 161.6 | ms | 160.501 |
| First burst delay | ≥ 47.5 | seconds | 54 |
| Modulation | | | |
| Biphase-L | P / F | P / F | P |
| Rise time | 50 - 250 | μ s | 134.24 |
| Fall time | 50 - 250 | μ s | 131.78 |
| Phase deviation: positive | +(1.0 to 1.2) | radians | 1.06 |
| Phase deviation: negative | -(1.0 to 1.2) | radians | -1.15 |
| Symmetry measurement | ≤ 0.05 | | 0.0081 |

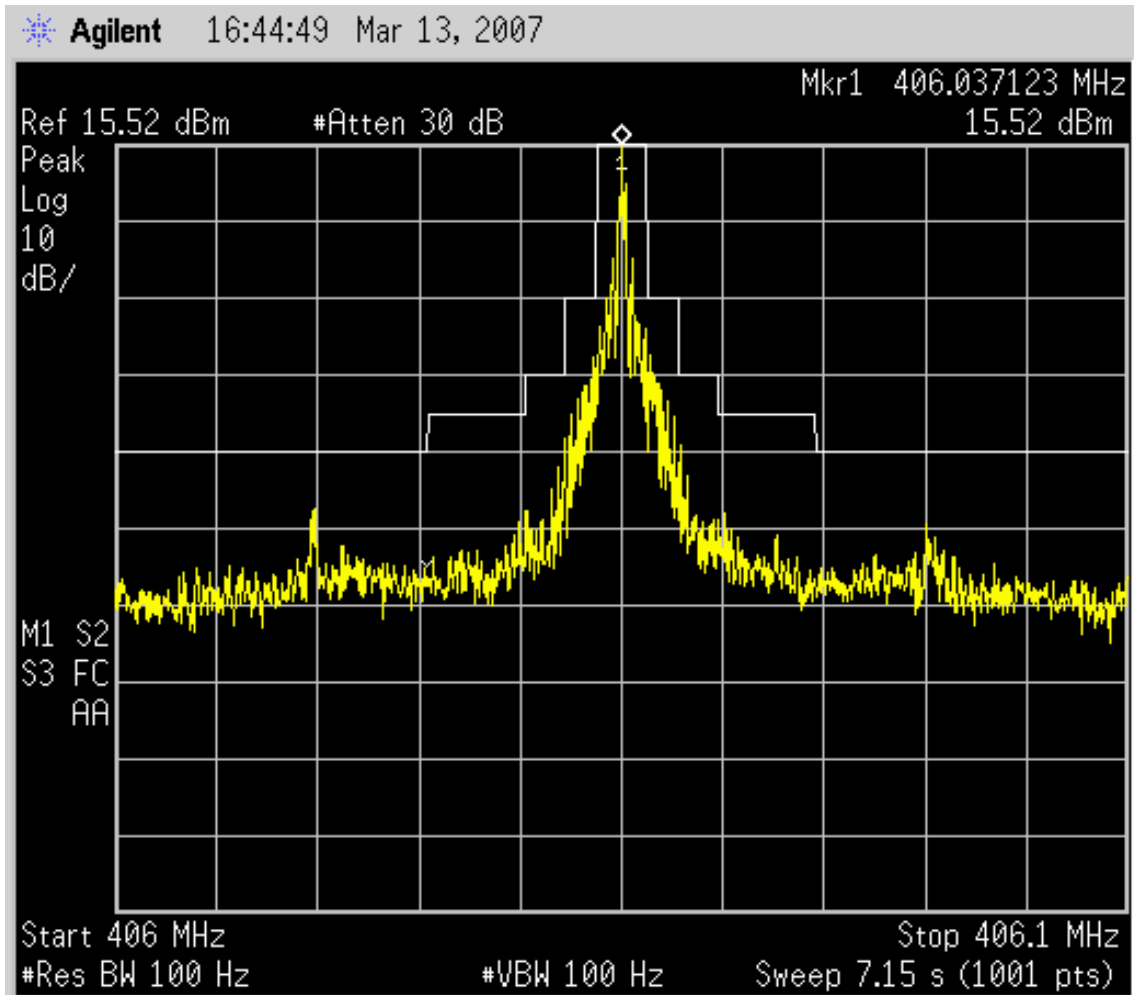


| Parameter | Limit | Units | Result |
|--|--------------------------------------|-----------|--------------------------|
| 406 MHz Transmitted Frequency | | | |
| Nominal Value | C/S T.001 | MHz | 406.036997 |
| Short-term stability | $\leq 2 \times 10^{-9}$ | /100ms | 3.97×10^{-10} |
| Medium-term stability – Slope | $(-1 \text{ to } +1) \times 10^{-9}$ | /minutes | -5.681×10^{-11} |
| Medium-term stability – Residual frequency variation | $\leq 3 \times 10^{-9}$ | | 2.54×10^{-10} |
| Spurious Emissions into 50ohms | | | |
| In band (406.0 - 406.1 MHz) | C/S T.001 mask | P / F | See plot, below |
| 406 MHz VSWR Check | | | |
| Nominal transmitted frequency | C/S T.001 | MHz | 406.036996 |
| Modulation | | | |
| Rise time | 50-250 | μ s | 142.22 |
| Fall time | 50-250 | μ s | 129.78 |
| Phase deviation: positive | + (1.0 to 1.2) | radians | 1.07 |
| Phase deviation: negative | - (1.0 to 1.2) | radians | -1.15 |
| Symmetry measurement | ≤ 0.05 | | 0.0073 |
| Digital Message | correct | P / F | P |
| Self Test Mode | | | |
| Frame sync | 011010000 | P / F | P |
| Format flag | 1 / 0 | bit value | 0 |
| Single radiated burst | $\leq 440 / 520 (\pm 1\%)$ | ms | 440.5 |
| Default position data (if applicable) | correct | P / F | N/A |
| Single burst verification | one burst | P / F | P |
| Provides for 15 Hex ID | correct | P / F | P |



Product Service

Spurious Emissions Plot





Product Service

Performance Check (During Dwell)

A Performance Check was conducted during +55°C temperature dwell, see Beacon Test Report below.

Beacon Test Report (Performance Check, End Of Test)

Beacon Test Report

A03D3CFCF400001

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

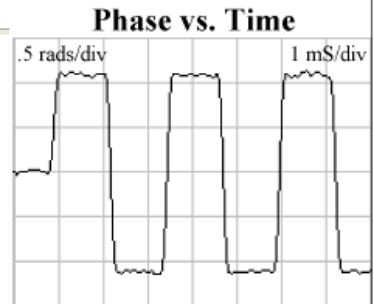
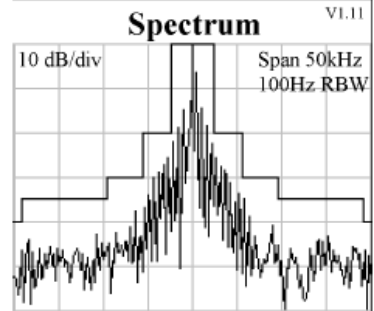
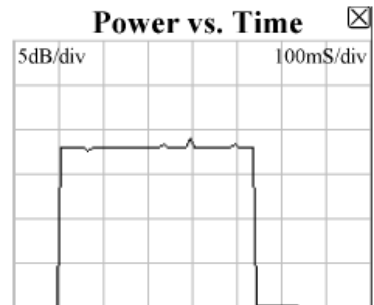
PASS
 FAIL
 INITIALS: _____

Notes: Add text comments here.

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

Emergency type: Non-Maritime
Activation type: Auto

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



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

Note: The date shown on the beacon tester is incorrect and should read 13-Mar-07.



Product Service

2.3 DAMP HEAT TEST

2.3.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.3 (5.13.2)
IEC 60945: 2002, Clause 8.3

2.3.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.3.3 Date of Test and Modification State

15 to 16 February 2007 - Modification State 0

2.3.4 Test Equipment Used

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

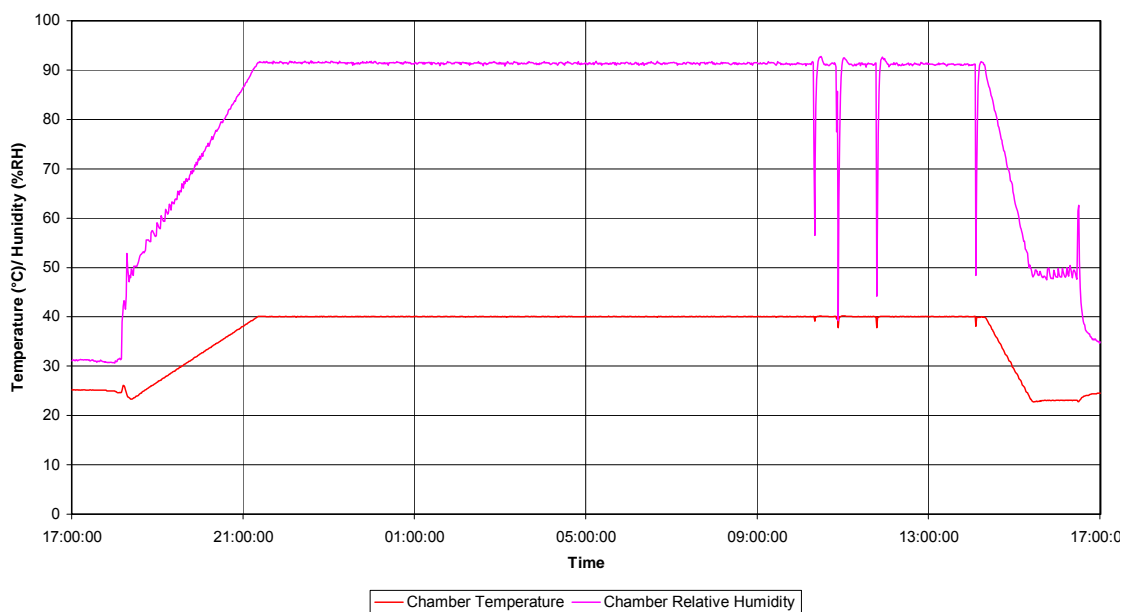
2.3.5 Test Set-up and Operating Modes

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

2.3.6 Environmental Conditions

Damp Heat Cycle Temperature Plot (Climatec 3 Chamber)

75900217 15-02-07 to 16-02-07





2.3.7 Test Results

Performance Test Results

| Parameter | Limit | Units | Result |
|--|--------------------------------------|-----------|--------------------------|
| Power Output | | | |
| Transmitter power output | 35 - 39 | dBm | 36.36 |
| Power output rise time | < 5 | ms | 0 |
| Digital Message Coding | | | |
| Bit Sync | 15 bits "1" | P / F | P |
| Frame sync | "000101111" | P / F | P |
| Format flag | 1 bit | bit value | 0 |
| Protocol flag | 1 bit | bit value | 1 |
| ID / position data | 59 bits | P / F | P |
| BCH code | 21 bits | P / F | P |
| Emerg. Code/nat. use/supplem. Data | 6 bits | bit value | 110110 |
| Additional data / BCH (if applicable) | 32 bits | P / F | N/A |
| Position Error | < 5 | km | N/A |
| 406 MHz Transmitted Frequency | | | |
| Nominal Value | C/S T.001 | MHz | 406.036988 |
| Short-term stability | $\leq 2 \times 10^{-9}$ | /100ms | 4.062×10^{-10} |
| Medium-term stability – Slope | $(-1 \text{ to } +1) \times 10^{-9}$ | /minutes | -3.019×10^{-11} |
| Medium-term stability – Residual frequency variation | $\leq 3 \times 10^{-9}$ | | 2.466×10^{-10} |

Summary of Performance Check results

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



Product Service

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

Beacon Test Report

A03D3CFCF400001

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

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

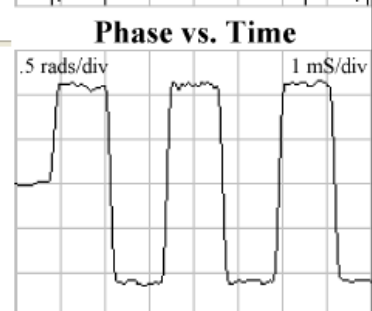
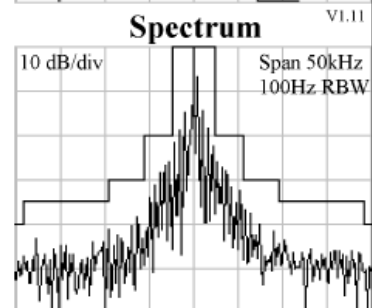
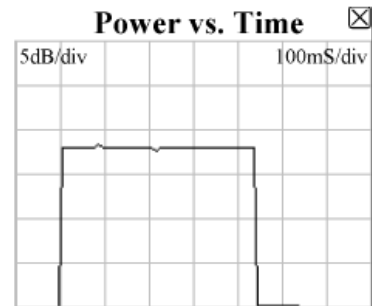
Notes: Add text comments here.

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

Emergency type: Non-Maritime
Activation type: Auto

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

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





Product Service

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

Beacon Test Report

A03D3CFCF400001

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

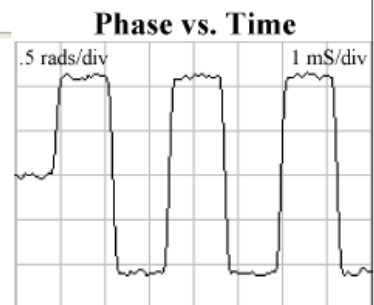
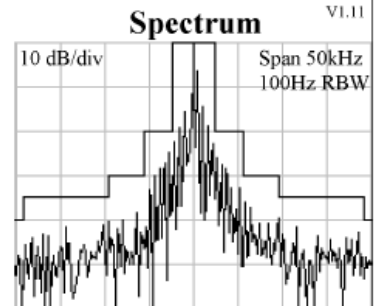
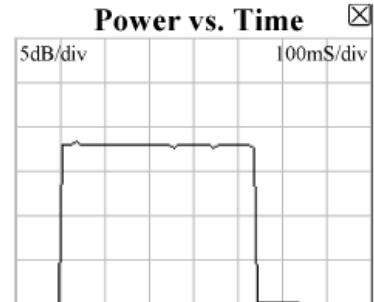
PASS
 FAIL
 INITIALS: _____

Notes: Add text comments here.

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

Emergency type: Non-Maritime
Activation type: Auto

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



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



Product Service

2.4 VIBRATION TEST

2.4.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.4 (5.13.6)
IEC 60945: 2002, Clause 8.7

2.4.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.4.3 Date of Test and Modification State

28 February and 01 March 2007 - Modification State 1

2.4.4 Test Equipment Used

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

2.4.5 Test Set-up and Operating Modes

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



Test Set-up



Product Service

2.4.6 Test Results

Test Procedure

EUT interfaced to tall bulkhead fixture.
Control accelerometer fitted adjacent to interface point.

Vertical axis, Swept sine resonance search: Peak resonance @ 88.20Hz

Vertical axis, fixed frequency endurance for two hours @ 88.2Hz

Lateral axis, Swept sine resonance search: Peak resonance @ 59.55Hz

Lateral axis, fixed frequency endurance for two hours @ 59.55Hz

Longitudinal axis, Swept sine resonance search: Peak resonance @ 84.88Hz

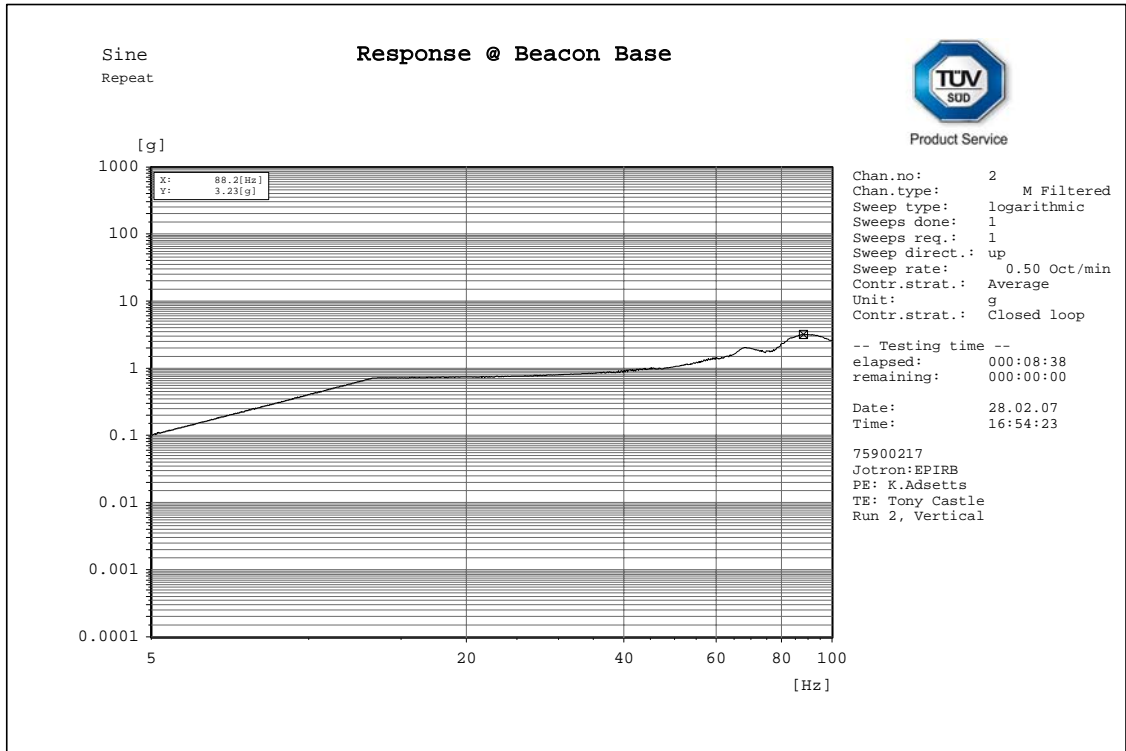
Longitudinal axis, fixed frequency endurance for two hours @ 84.88Hz

After testing was complete, a performance check was carried out, see beacon test report below.



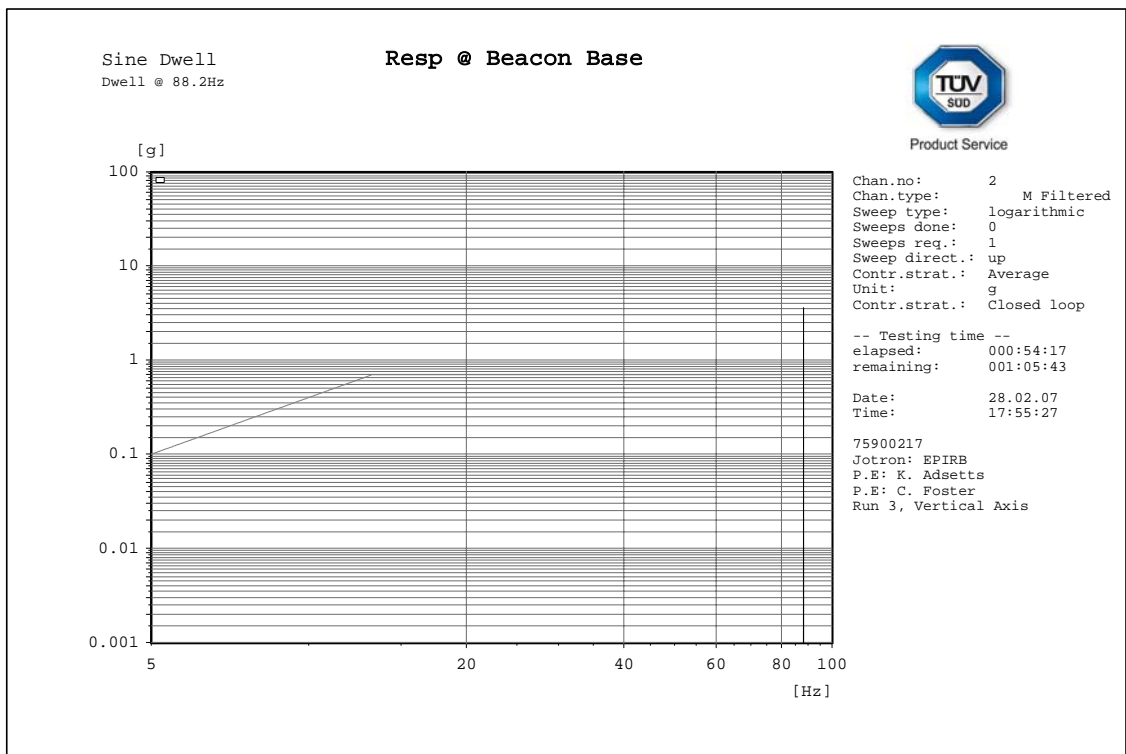
Product Service

Vertical axis, Resonance Search (EUT Response)



C:\VcpNT\Daten\m+p\Jotron\Res Search 005.rsn

Vertical axis, Resonance Dwell

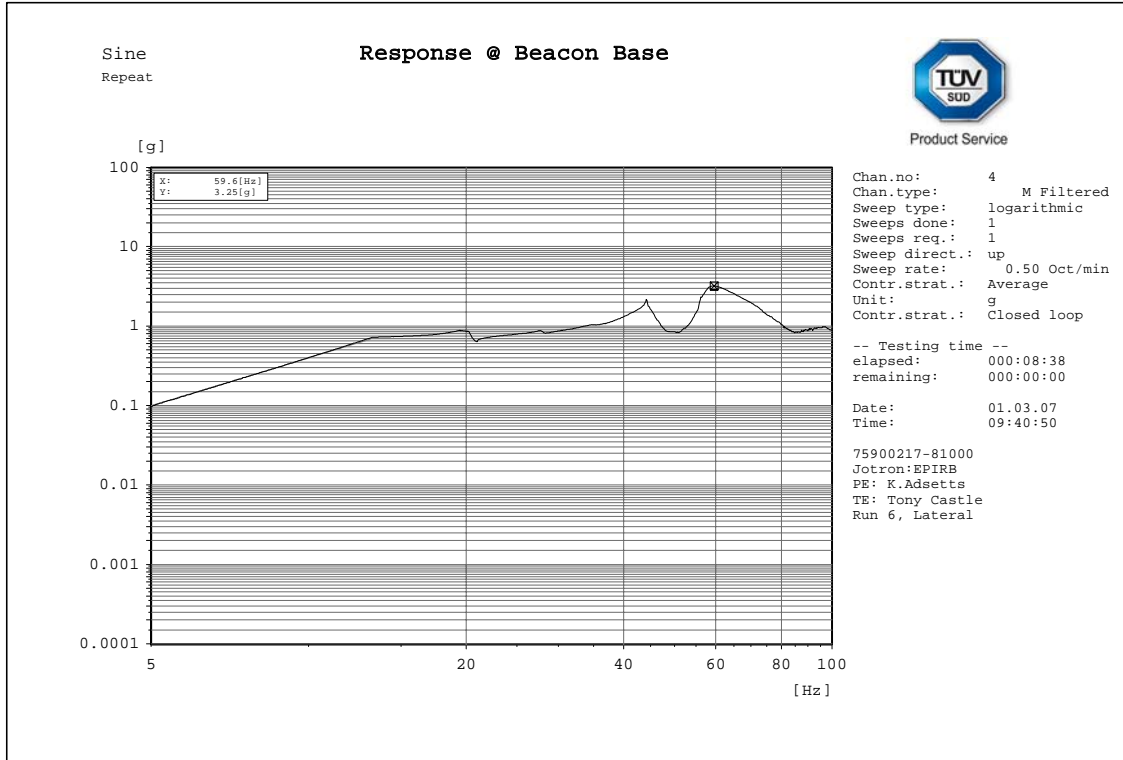


C:\VcpNT\Daten\m+p\Jotron\Dwells 006.rsd



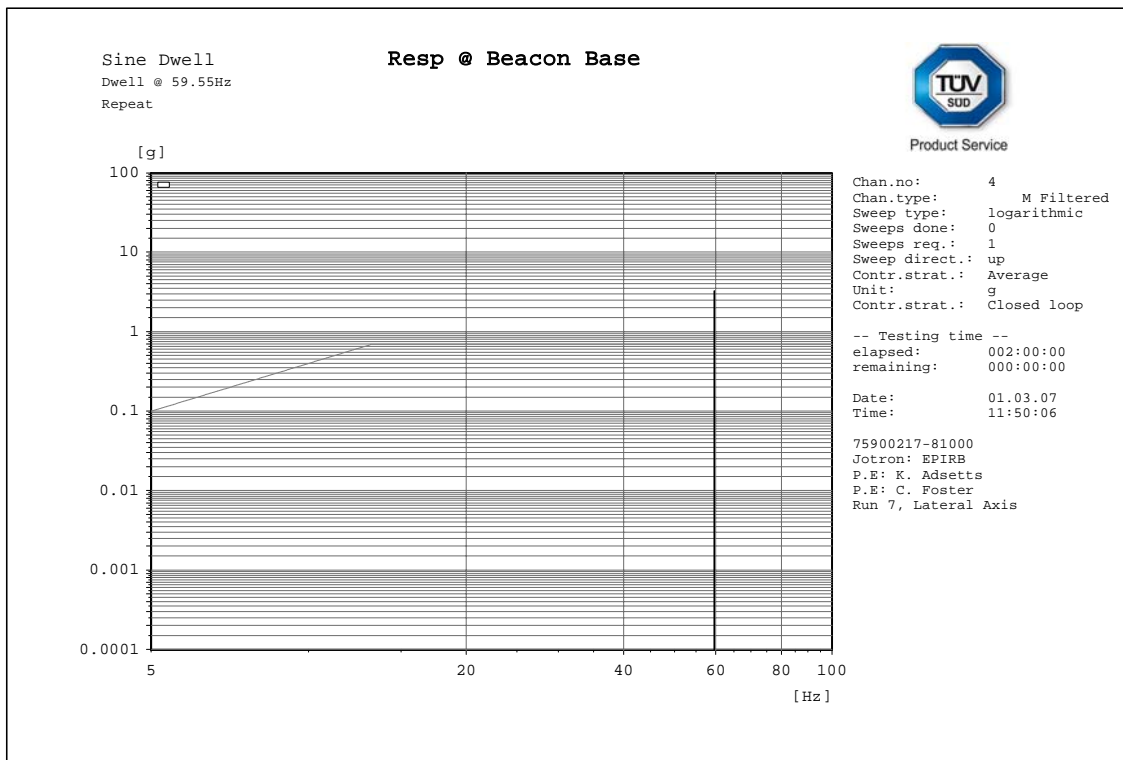
Product Service

Lateral axis, Resonance Search (EUT Response)



C:\VcpNT\Daten\m+p\Jotron\Res Search 1 003.rsn

Lateral axis, Resonance Dwell

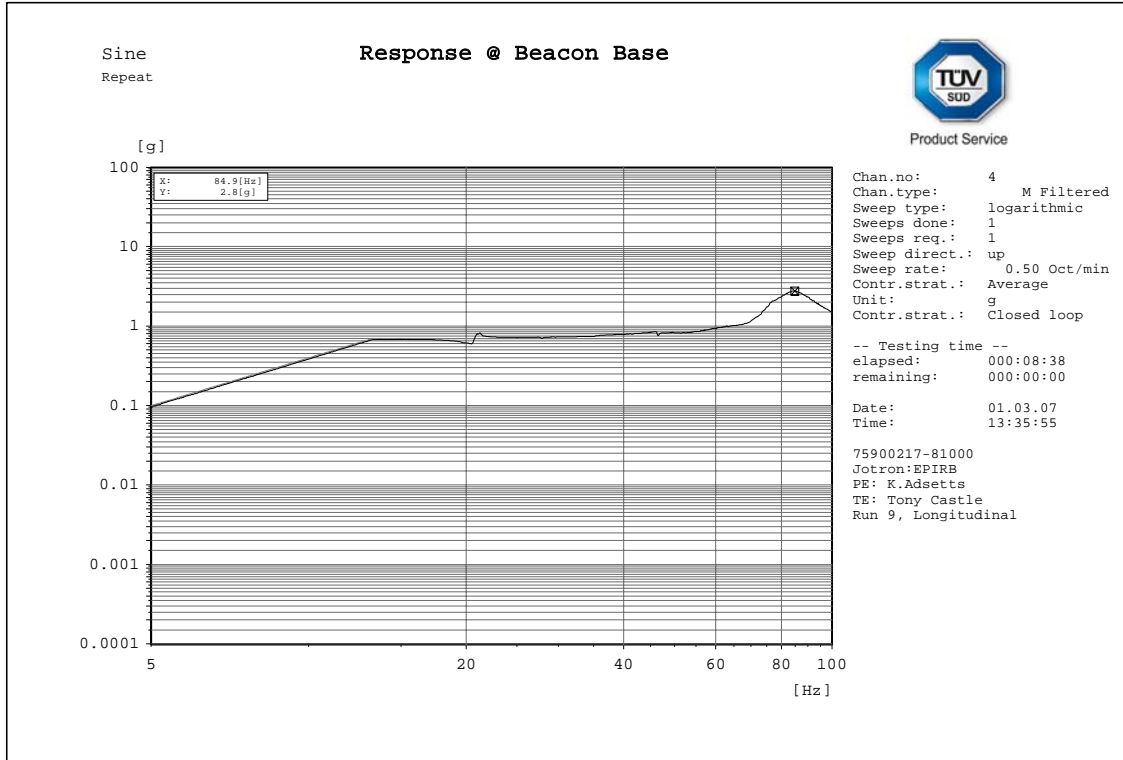


C:\VcpNT\Daten\m+p\Jotron\Dwells 1 001.rsd



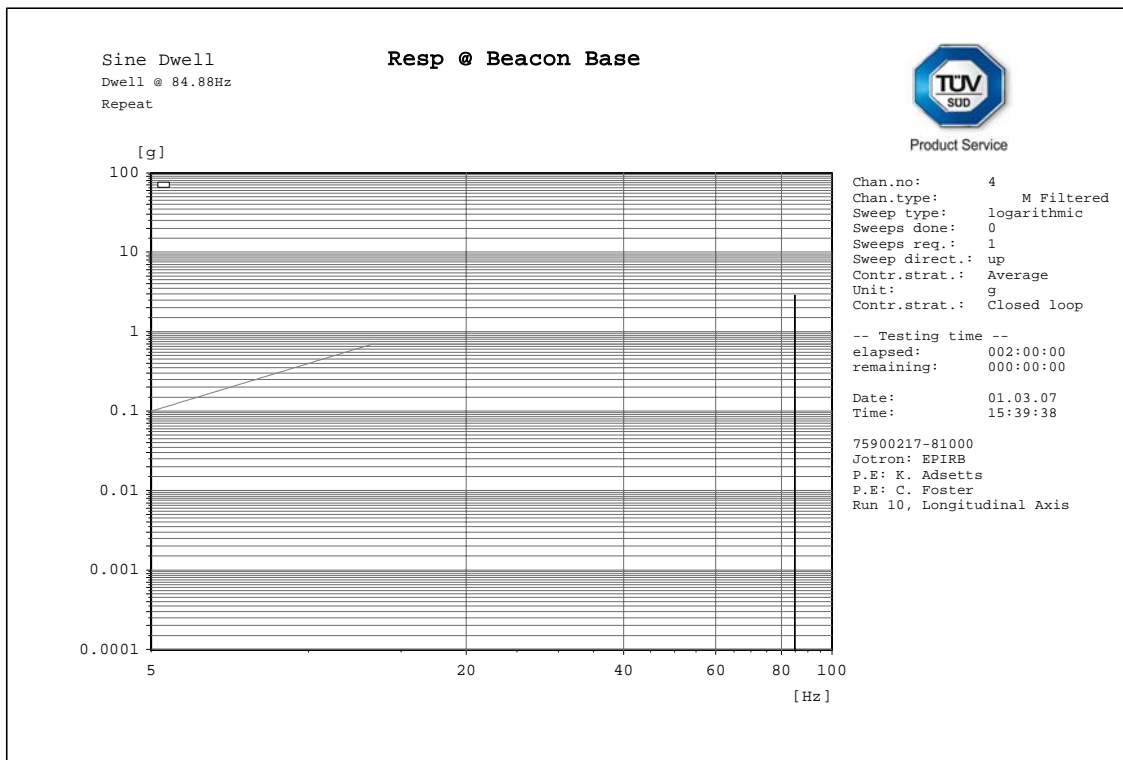
Product Service

Longitudinal axis, Resonance Search (EUT Response)



C:\VcpNT\Daten\m+p\Jotron\Res Search 1 004.rsn

Longitudinal axis, Resonance Dwell



C:\VcpNT\Daten\m+p\Jotron\Dwells 1 003.rsd



Product Service

Beacon Test Report (Post Test Performance Check)

Beacon Test Report

203DE7E7A0FFBFF

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

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

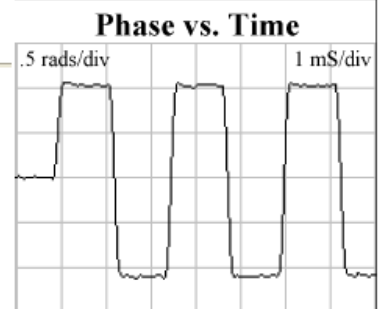
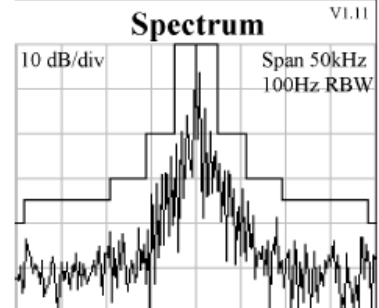
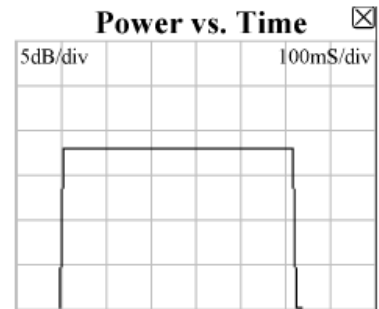
Notes: Add text comments here.

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

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

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

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





Product Service

2.5 RUGGEDNESS TEST

2.5.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.5 (5.13.7)

2.5.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.5.3 Date of Test and Modification State

01 March 2007 - Modification State 1

2.5.4 Test Equipment Used

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

2.5.5 Test Set-up and Operating Modes

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

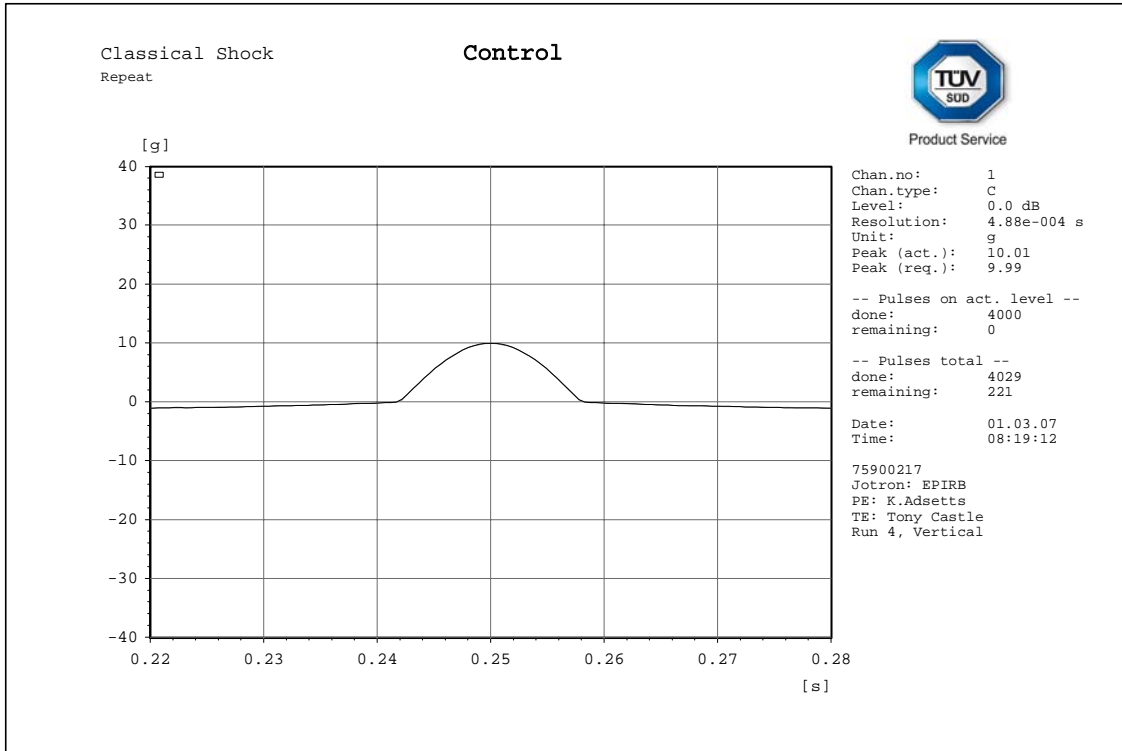
Physical test configuration: as per Vibration Test, above.



Product Service

2.5.6 Test Results

Vertical axis, 4000 Bumps





Product Service

Beacon Test Report (Post Test Performance Check)

Beacon Test Report

203DE7E7A0FFBFF

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

PASS
 FAIL
 INITIALS: _____

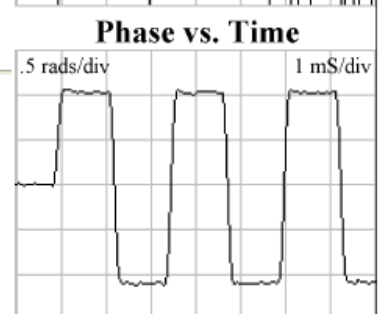
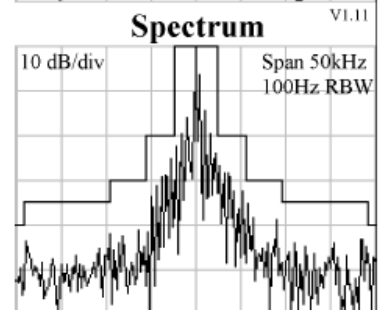
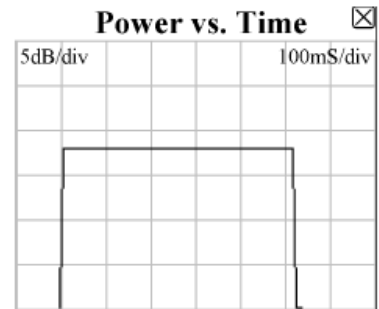
Notes: Add text comments here.

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

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

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

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





Product Service

2.6 CORROSION TEST

2.6.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.6 (5.13.9)
IEC 60945: 2002, Clause 8.7

2.6.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

Note: Non-GPS variant sample used as external physical characteristics (size, shape, materials, etc...) declared identical to GPS sample by customer.

2.6.3 Date of Test and Modification State

09 March to 06 April 2007 - Modification State 1

2.6.4 Test Equipment Used

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

2.6.5 Test Set-up and Operating Modes

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

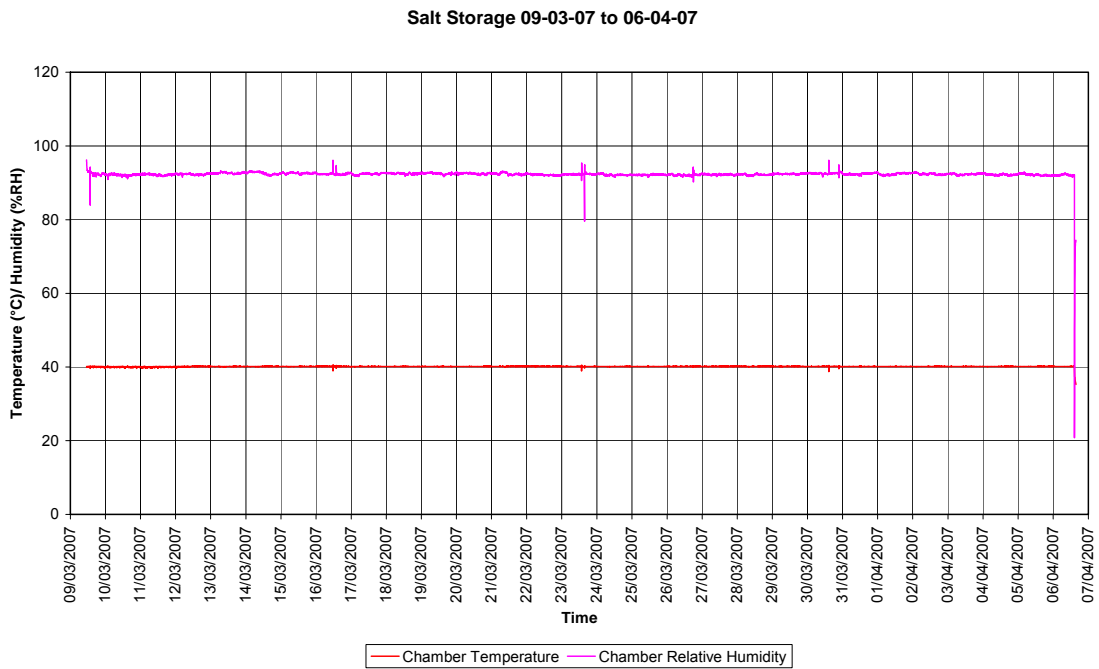


Test Set-up



2.6.6 Environmental Conditions

Storage Temperature Plot



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

2.6.7 Test Results

Before the test the EUT was visually inspected for any signs of deterioration, none was found. The EUT was also Performance Checked, see Beacon Test Report below.

Post test the EUT was inspected, no undue deterioration or corrosion of metal parts was noted. A performance check was completed satisfactorily, see Beacon Test Report below



Product Service

Beacon Test Report (Performance Check, Pre-test)

Beacon Test Report

203DE7E7A0FFBFF

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

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

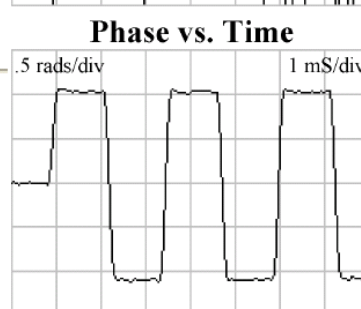
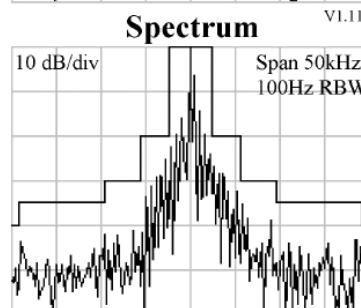
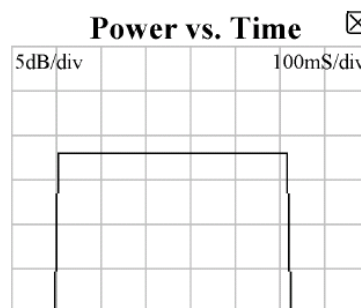
Notes: Add text comments here.

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

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

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

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





Product Service

Beacon Test Report (Performance Check, Post-test)

Beacon Test Report

A03D3CF400001

Organization:

Tested By:

Date: 21-Dec-07 4:14:53 PM

Tester Model/Serial No./File Name: BT100S/1025/00217-60945Tshock-SN003-2

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 22°C



PASS



FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: A03D3CF400001

Full Hex: FFFED0501E9E7E7A00000D504837

Burst Mode: Self Test Mode (Short)

Protocol: Test User Protocol

Country 257: Norway

National Use: 21783256236033

Emergency type: Non-Maritime

Activation type: Auto

406 MHz Measurements

406 Frequency (INT REF): 406.0372 MHz

406 Power (INT ANT): 84%

Power Rise Time: < 5 ms

Phase Deviation: -1.1 +1.14 radians

Modulation Rise Time: 153 uS

Modulation Fall Time: 165 uS

Modulation Symmetry: 0.4%

Modulation Bit Rate: 399.7 bps

CW Preamble: 159.8 ms

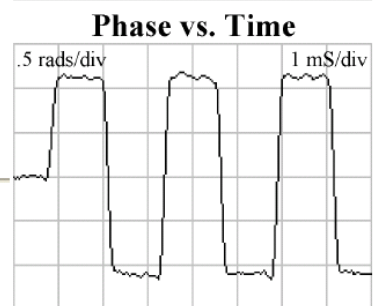
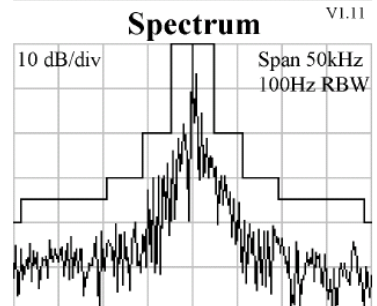
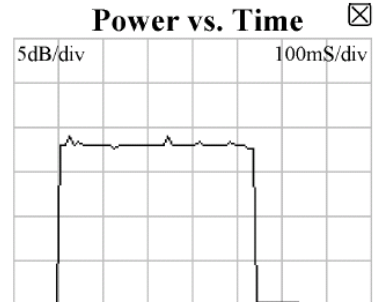
121.5 MHz Measurements

121 Frequency (INT REF): Detected.

121 Power (INT ANT): 37%

Signal was unmodulated.

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.





Product Service

2.7 DROP TEST (ON HARD SURFACE)

2.7.1 Specification Reference

IEC 60945: 2002, Clause 8.6.1

2.7.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.7.3 Date of Test and Modification State

19 April 2007 - Modification State 2

2.7.4 Test Equipment Used

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

2.7.5 Test Set-up and Operating Modes

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



Test Set-up



Product Service

2.7.6 Test Results

The test piece was located into test chamber and the chamber was set to -30°C. Once at -30°C, the chamber was dwelled for 2 hours 21 minutes.

The test piece was removed and 1 drop from a height of 1 metre onto the test surface was performed.

Upon completion of the drop test the EUT was subjected to a performance check; it continued to operate correctly.



Product Service

2.8 DROP TEST (IN WATER)

2.8.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.7 (5.13.5)
IEC 60945: 2002, Clause 8.6.2

2.8.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.8.3 Date of Test and Modification State

26 June 2007 - Modification State 5

2.8.4 Test Equipment Used

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

2.8.5 Test Set-up and Operating Modes

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

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

2.8.6 Test Results

Method

EUT was dropped from a height of 20 meters into sea water three times. Each time the EUT was performance checked before and after the test and each time the EUT was released from a different orientation; upright, horizontal and inverted (with respect to the main antenna/normal orientation). An exterior mechanical inspection was conducted after each drop – no damage was found. Note: After the first drop the labelling partially lifted. By the final drop most of the labelling was so loose that it was removed to avoid loss.

Summary of Performance Check 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 |

Note: Due to a programming error, the EUT was transmitting (during normal operational mode) a message with a self-test frame sync. After the test the EUT was reprogrammed and found to be capable of normal messages. Therefore, the following messages continue to demonstrate that the EUT functioned correctly even though the message output was technically incorrect.



Product Service

Beacon Test Report (Performance Check, Pre-Upright Test)

Beacon Test Report

203DE7E7A0FFBFF

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

PASS
 FAIL
 INITIALS: _____

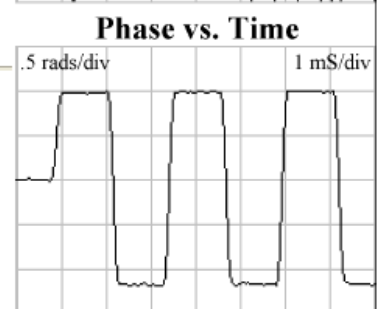
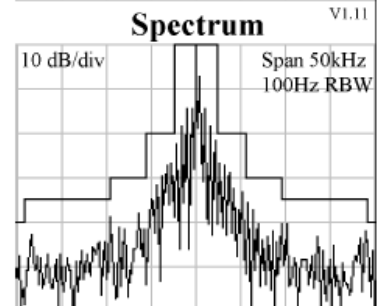
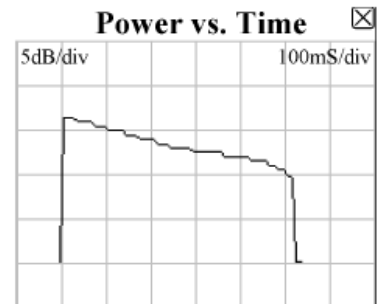
Notes: Add text comments here.

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

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

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

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



Note: Because the EUT was a radiated sample and some external factor has reduced the power towards the final part of the message this Beacon Test Report (BTR) shows a short message. However, the power vs. time graph shows that a full 520ms burst **was** received hence the short message displayed is only part of the full message. This was attributed to the beacon tester receiving insufficient power to decode/display the remainder of the message.



Product Service

Beacon Test Report (Performance Check, Post-Upright Test)

Beacon Test Report

203DE7E7A0FFBFF

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

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

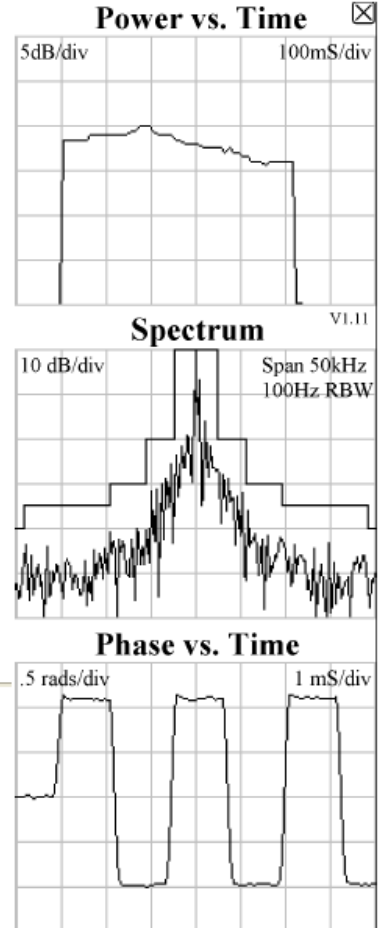
Notes: Add text comments here.

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

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

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

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



Note: Because the EUT was a radiated sample and some external factor has reduced the power towards the final part of the message this Beacon Test Report (BTR) shows a short message. However, the power vs. time graph shows that a full 520ms burst **was** received hence the short message displayed is only part of the full message. This was attributed to the beacon tester receiving insufficient power to decode/display the remainder of the message.



Product Service

Beacon Test Report (Performance Check, Pre-Inverted Test)

Beacon Test Report

203DE7E7A0FFBFF

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

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

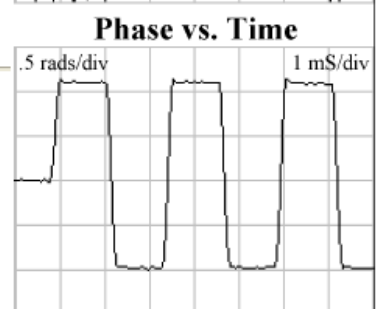
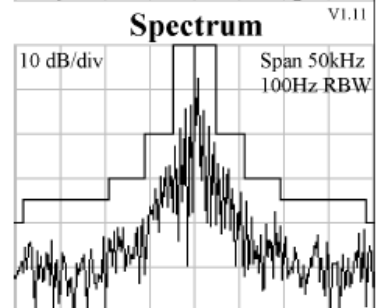
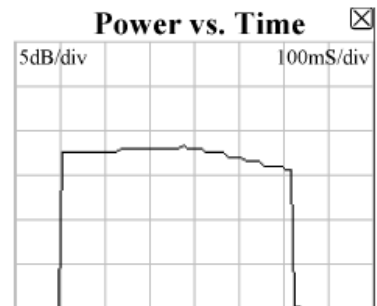
Notes: Add text comments here.

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

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

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

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.





Product Service

Beacon Test Report (Performance Check, Post-Inverted Test)

Beacon Test Report

203DE7E7A0FFBFF

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

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

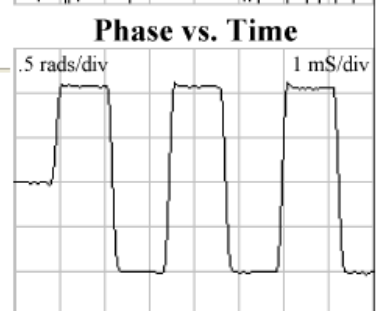
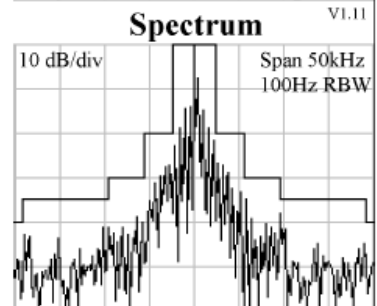
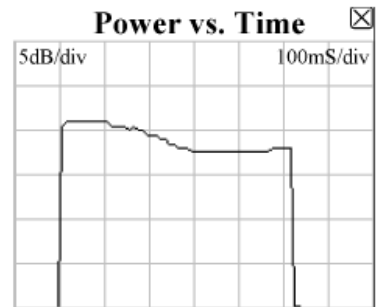
Notes: Add text comments here.

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

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

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

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.





Product Service

Beacon Test Report (Performance Check, Pre-Horizontal Test)

Beacon Test Report

203DE7E7A0FFBFF

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

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

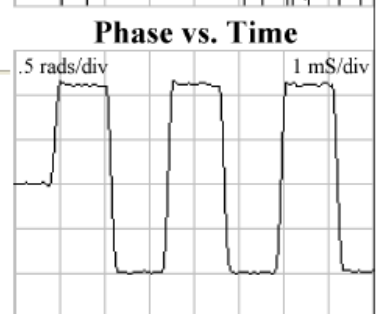
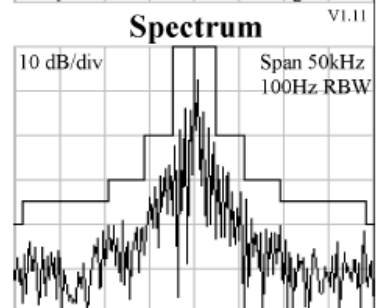
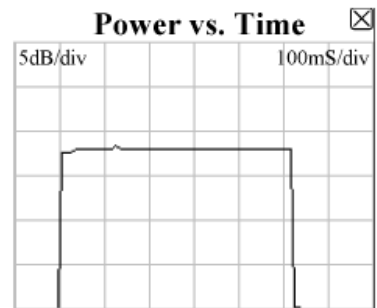
Notes: Add text comments here.

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

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

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

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.





Product Service

Beacon Test Report (Performance Check, Post-Horizontal Test)

Beacon Test Report
203DE7E7A0FFBFF

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

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

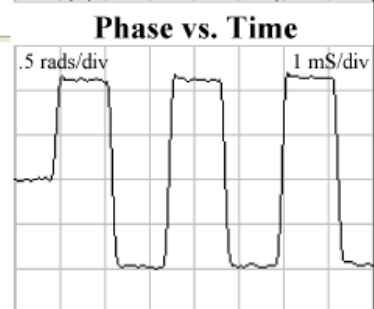
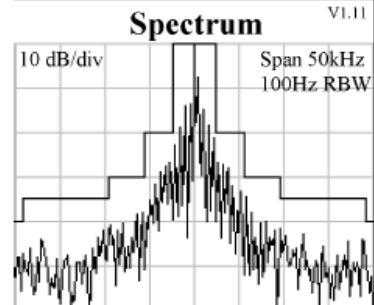
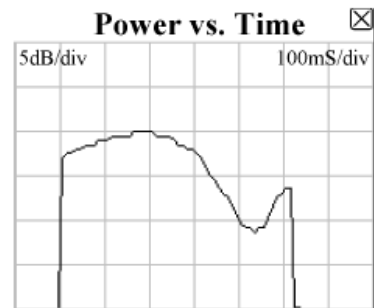
Notes: Add text comments here.

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

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

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

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



Note: Because the EUT was a radiated sample and some external factor has reduced the power towards the final part of the message this Beacon Test Report (BTR) shows a short message. However, the power vs. time graph shows that a full 520ms burst **was** received hence the short message displayed is only part of the full message. This was attributed to the beacon tester receiving insufficient power to decode/display the remainder of the message.



2.9 THERMAL SHOCK TEST

2.9.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.8 (5.13.4)
IEC 60945: 2002, Clause 8.5

2.9.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.9.3 Date of Test and Modification State

21 December 2007 - Modification State 7

2.9.4 Test Equipment Used

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

2.9.5 Test Set-up and Operating Modes

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

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



Test Set-up



Product Service

2.9.6 Environmental Conditions

| | |
|---------------------|--------------|
| Storage Temperature | 70°C |
| Storage Duration | 1:04 (hh:mm) |
| Water Temperature | 26.8°C |
| Immersion Duration | 1:00 (hh:mm) |

2.9.7 Test Results

Prior to the commencement of the testing the EUT was subjected to a performance check and weighed:

- The test item operated correctly, see pre-test performance check, below
- Dry weight = 1.888 kg

The EUT was located in an environmental chamber and stabilised at 70°C for 1 hour 4 minutes.

The EUT was removed from the chamber and immersed within 5 seconds in a vessel filled with water at a temperature of 26.8°C. The uppermost part of the EUT was 100mm from the surface of the water. The unit activated upon immersion. The unit was prevented from floating to the surface and left for one hour.

The EUT was removed from the vessel, dried externally, its weight was recorded and checks were made for signs of ingress:

- The test item operated correctly, see pre-test performance check, below
- Unit weight (post-test): 1.894 kg
- No signs of ingress were noted

Note: EUT deactivated immediately upon removal from the water.

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 outer portion of the seal and switch assembly.



Product Service

Beacon Test Report (Performance Check, Pre-test)

Beacon Test Report

A03D3CF400001

Organization:

Tested By:

Date: 21-Dec-07 4:14:53 PM

Tester Model/Serial No./File Name: BT100S/1025/00217-60945Tshock-SN003-2

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 22°C



PASS



FAIL

INITIALS: _____

Notes: Add text comments here.

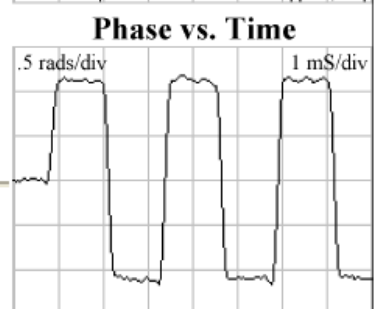
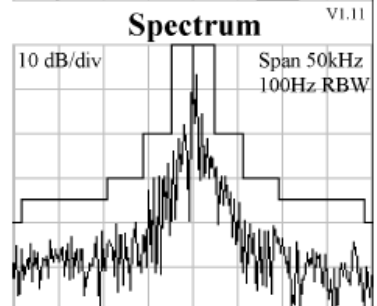
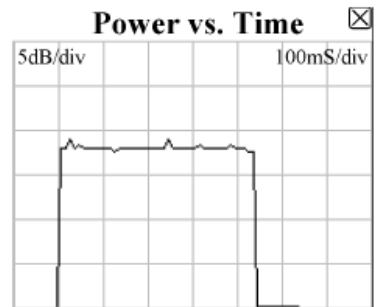
15 Hex ID: A03D3CF400001
Full Hex: FFFED0501E9E7E7A00000D504837
Burst Mode: Self Test Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

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

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

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.





Product Service

Beacon Test Report (Performance Check, Post-test)

Beacon Test Report
A03D3CFCF400001

Organization:
Tested By:
Date: 21-Dec-07 6:46:50 PM
Tester Model/Serial No./File Name: BT100S/1025/00217-60945Tshock-SN003-post-3
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 26°C

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

Notes: Add text comments here.

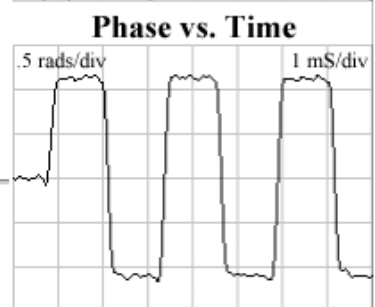
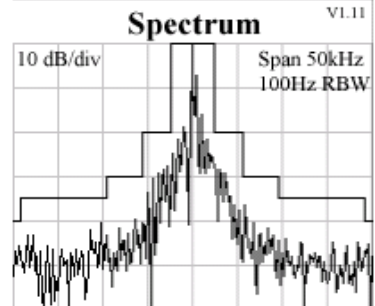
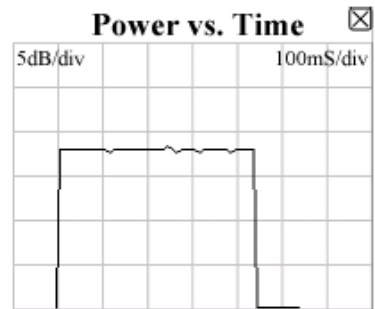
15 Hex ID: A03D3CFCF400001
Full Hex: FFFED0501E9E7E7A00000D504837
Burst Mode: Self Test Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0373 MHz
406 Power (INT ANT): 92%
Power Rise Time: < 5 ms
Phase Deviation: -1.1 +1.13 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.8 ms

121.5 MHz Measurements
121 Frequency (INT REF): Detected.
121 Power (INT ANT): 26%
Signal was unmodulated.

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.





Product Service

2.10 IMMERSION TEST

2.10.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.9 (5.13.8)
IEC 60945: 2002, Clause 8.9

2.10.2 Test Results

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



Product Service

2.11 SPURIOUS EMISSIONS TEST**2.11.1 Specification Reference**

IEC 61097-2: 2002, Clause A.1.10 (5.15)

2.11.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.11.3 Date of Test and Modification State

15 March 2007 - Modification State 1

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): Operating

2.11.6 Environmental Conditions

| | |
|----------------------|----------|
| Ambient Temperature | 23.1°C |
| Atmospheric Pressure | 1023mbar |

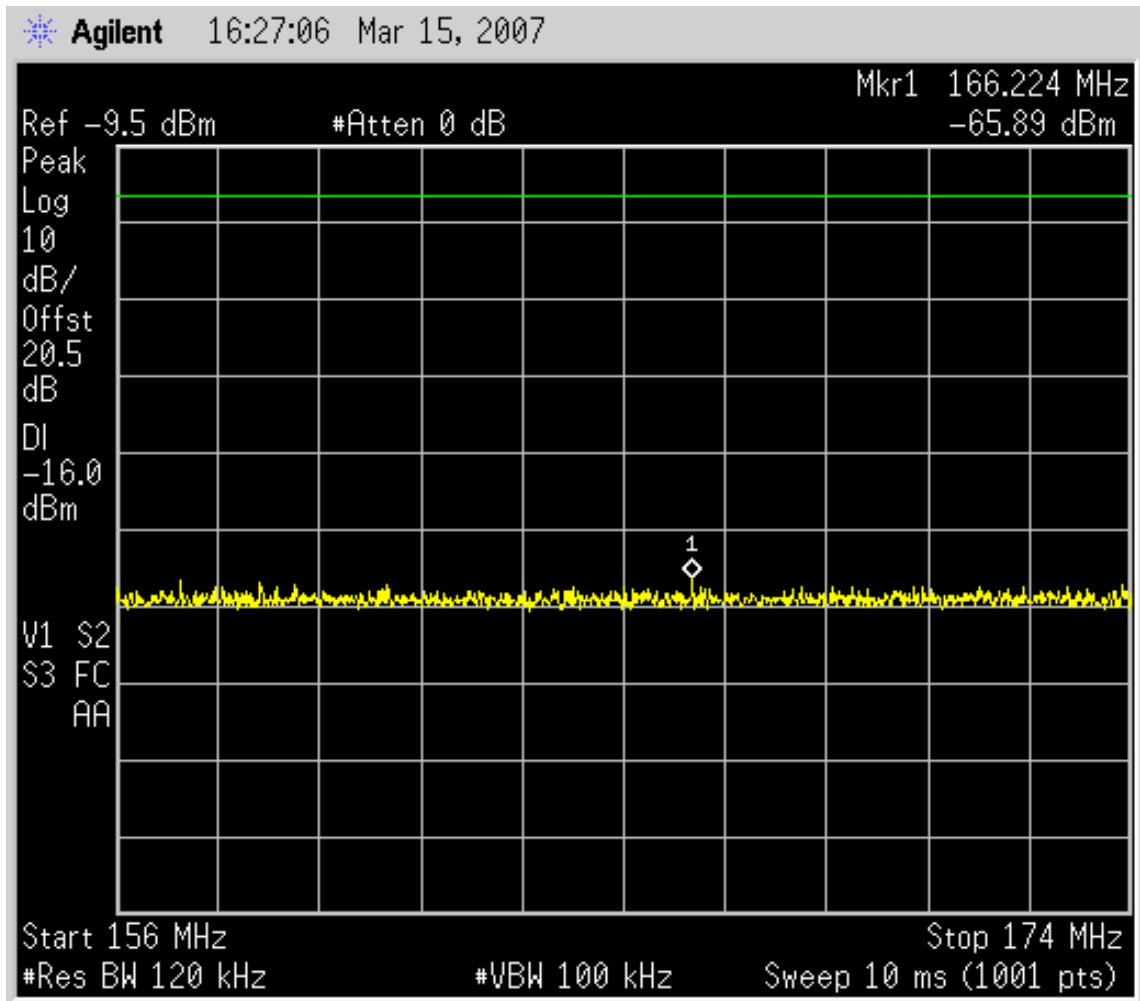


Product Service

2.11.7 Test Results

EUT connected to 50Ω spectrum analyser (in peak hold mode) via 20.5dB of attenuation. The following plots were obtained.

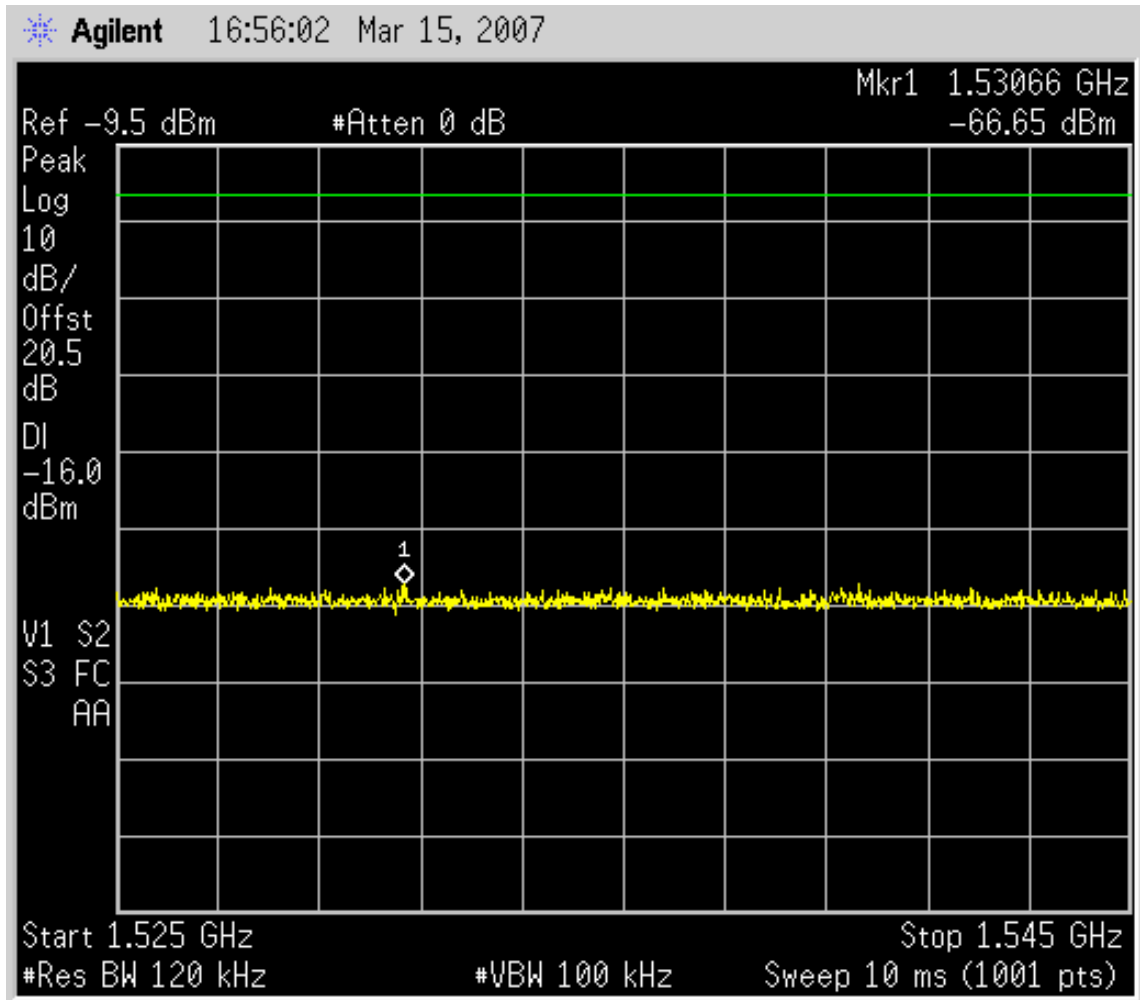
Spurious Emissions, Band 1





Product Service

Spurious Emissions, Band 2



Peak Values

| Frequency Band (MHz) | Measured power (dBm) | Measured power (μ W) | Limit (μ W) |
|----------------------|----------------------|---------------------------|------------------|
| 1. 156 - 174 | -65.89 | 258×10^{-6} | 25 |
| 2. 1525 - 1545 | -66.65 | 216×10^{-6} | 25 |



Product Service

2.12 CONDUCTED INTERFERENCE TEST

2.12.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.11 (5.17)

IEC 60945: 2002, Clause 10.3, 10.5, 10.6, 10.7 and 10.8

2.12.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Hence, test is not applicable.



Product Service

2.13 SIGNAL LIGHT TEST

2.13.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.12 (5.3.3.3)

2.13.2 Test Results

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



Product Service

2.14 BATTERY CAPACITY AT LOW TEMPERATURE TEST

2.14.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.13 (5.12.1)
IEC 60945:2002, Clause 8.4

2.14.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.14.3 Date of Test and Modification State

12 to 14 November 2007 - Modification State 7

2.14.4 Test Equipment Used

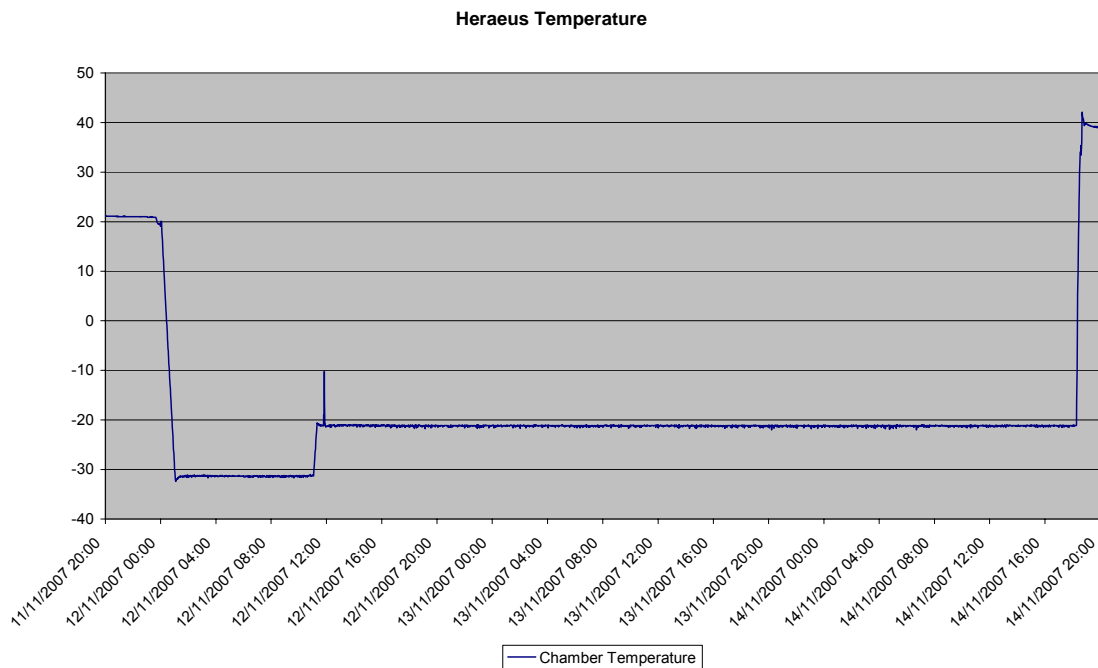
The major items of test equipment used for the above tests are identified in Section 3.1.

2.14.5 Test Set-up and Operating Modes

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

2.14.6 Environmental Conditions

Temperature Plot





2.14.7 Pre-Test Results

Battery Discharge Current

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

Beacon in the Off or Standby State, "Standby Current"

Beacon performing a Self-test, "Self-test Current"

Beacon activated and transmitting, "Operating Current"

The individual tests were conducted for the following durations:

Standby Current : 30 minutes (1799920 ms)

Self-test Current : 7.92 seconds (7920 ms)

Operating Current : 30 minutes (1799920 ms)

Assumptions / Supplied Data

Battery Replacement Interval : 5 years

Battery Capacity : 7.2 Ah

Battery Self Drain : 3.00 % per year

Self-test Interval : 12 tests per year

Test Results

Mode Current = Accumulated Charge / Time

Standby Current = $1.196 \times 10^9 \text{ pC} / 1799920 \text{ ms} = 664.24 \text{ nA}$

Self-test Current = $905591.2 \text{ uC} / 7920 \text{ ms} = 114.34 \text{ mA}$

Operating Current = $121755156 \text{ uC} / 1799920 \text{ ms} = 67.64 \text{ mA}$

Battery Preconditioning / Discharge Time Calculations

Battery Self Drain = Capacity - [(100% - Self Drain/Year%)^{Replacement Interval} x Capacity]
 = $7.2 - ((1 - 0.0300)^5 \times 7.2) = 1.0171 \text{ Ah}$

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

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

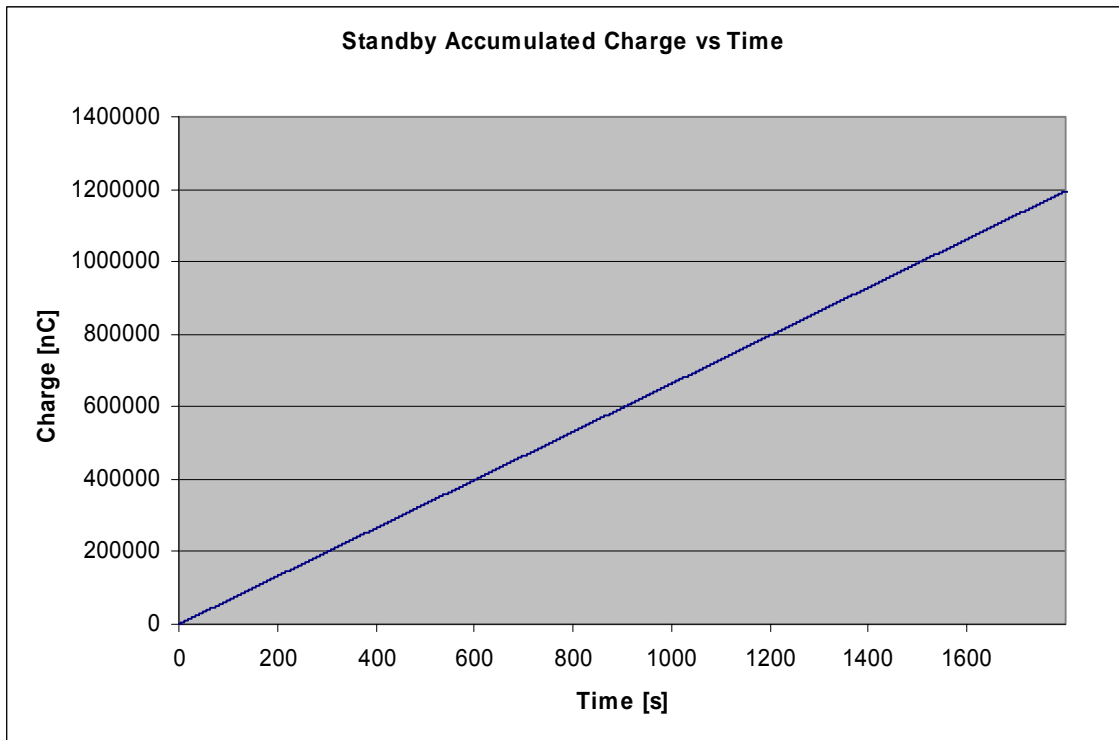
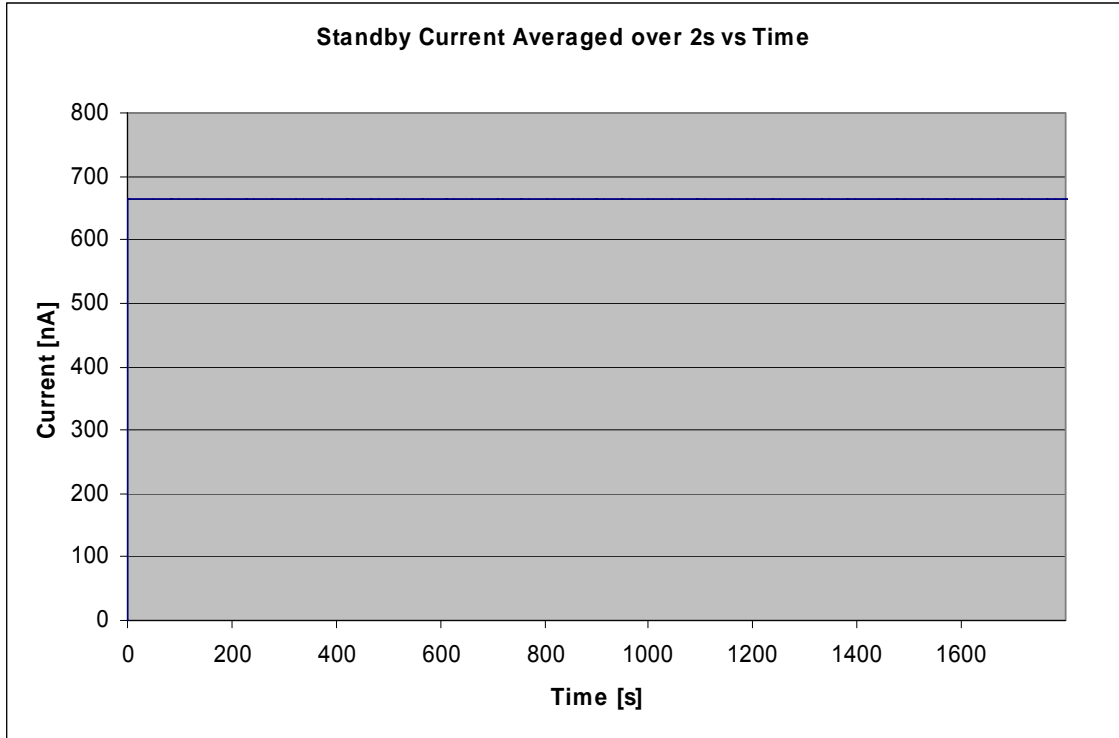
Total Drain = Self Drain + Standby Drain (Worst Case) + Self-test Drain (Worst Case)
 = $1.0171 + 0.0291 + 0.0151 = 1.0613 \text{ Ah}$

Battery Preconditioning / Discharge Time = Worst Case drain / Operational Current
 = $1.0613 / (67.64 \times 10^{-3})$
 = 15.69 hours

The battery was discharged by operating the EUT into a 50Ω load at ambient temperature for 15 hours and 42 minutes.

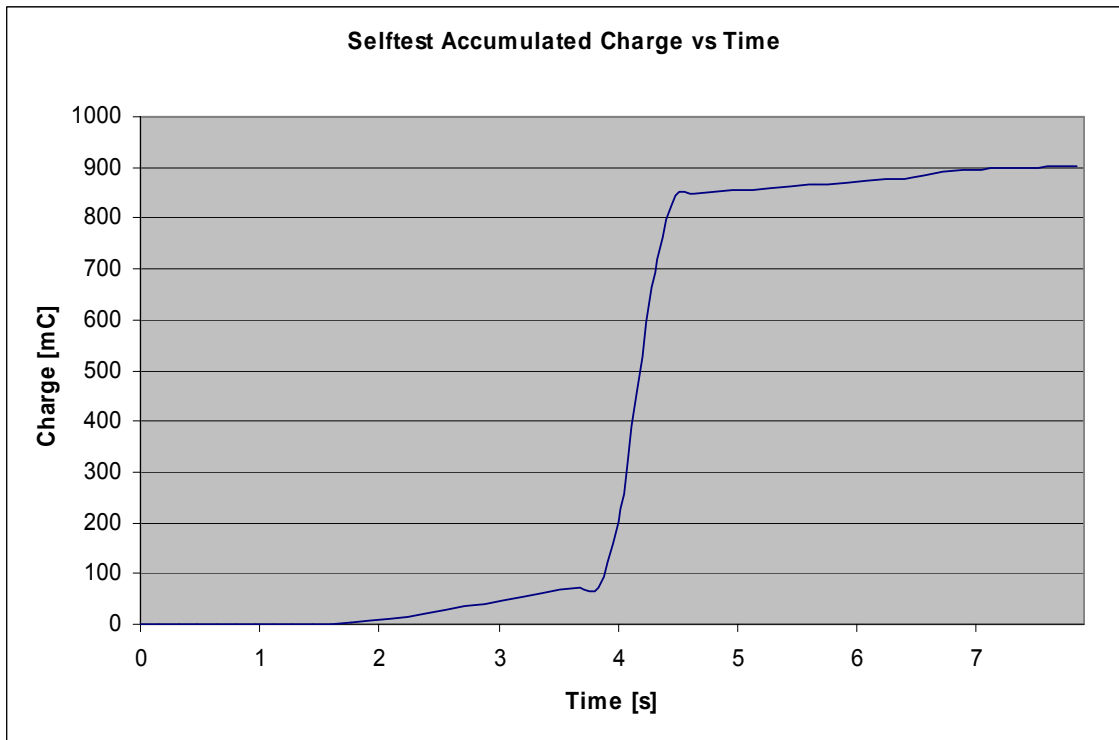
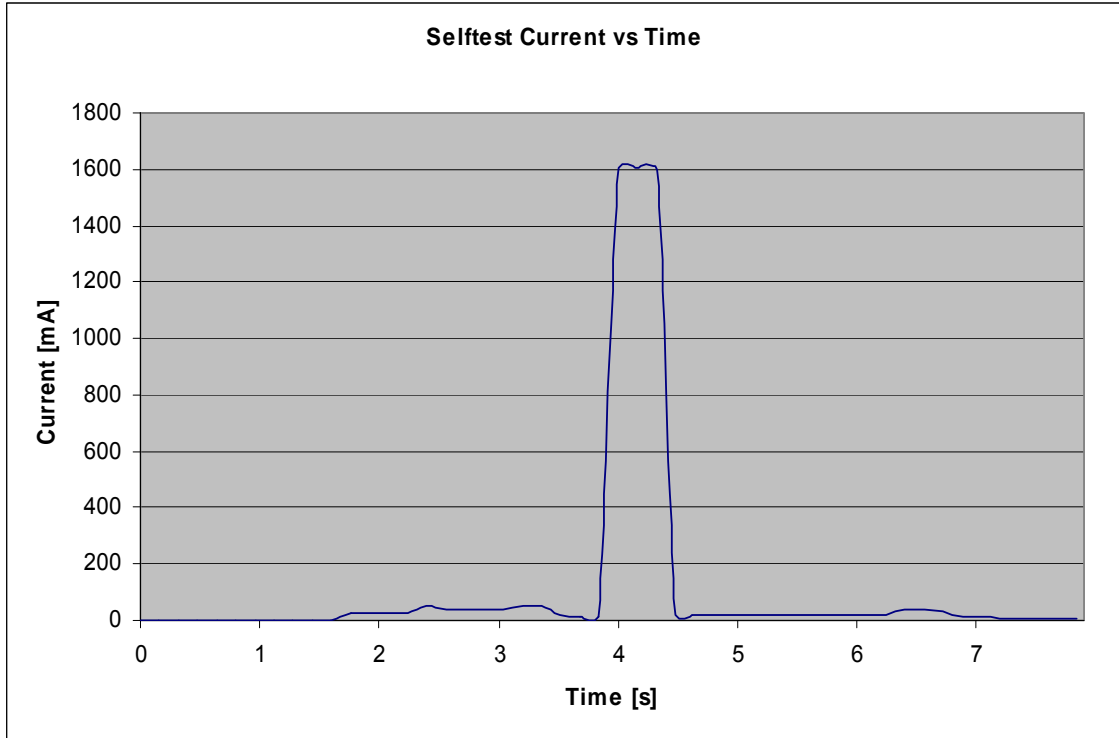


Battery Current Measurement Results (continued) - Standby Mode



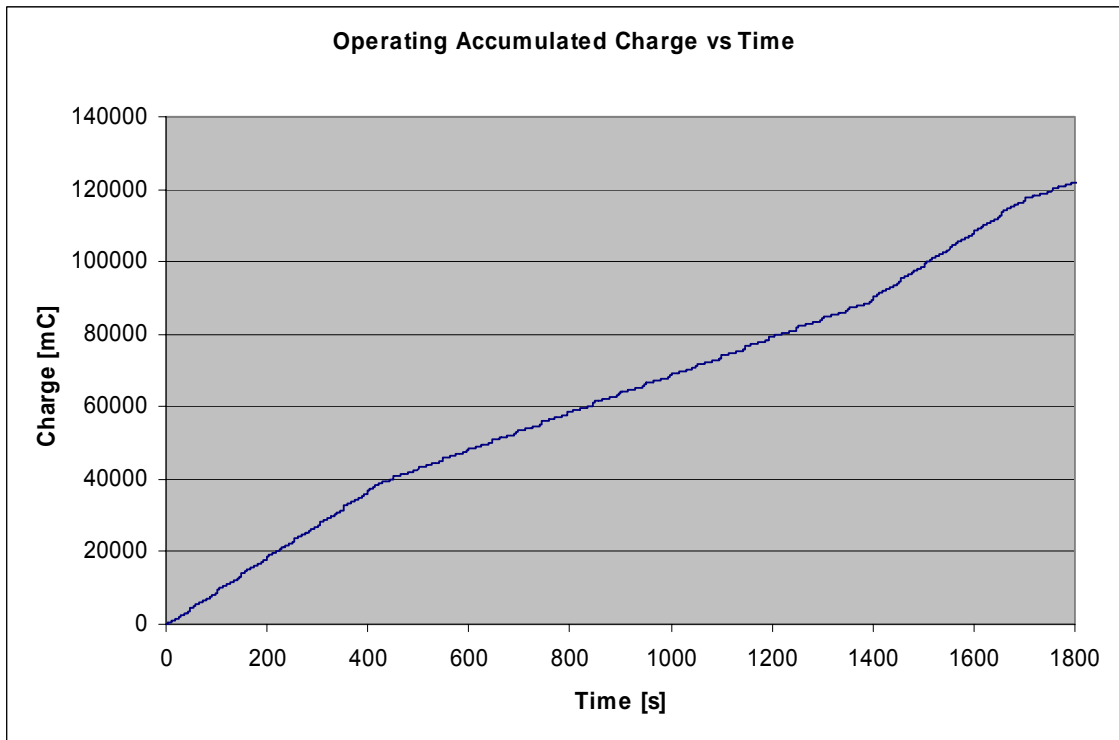
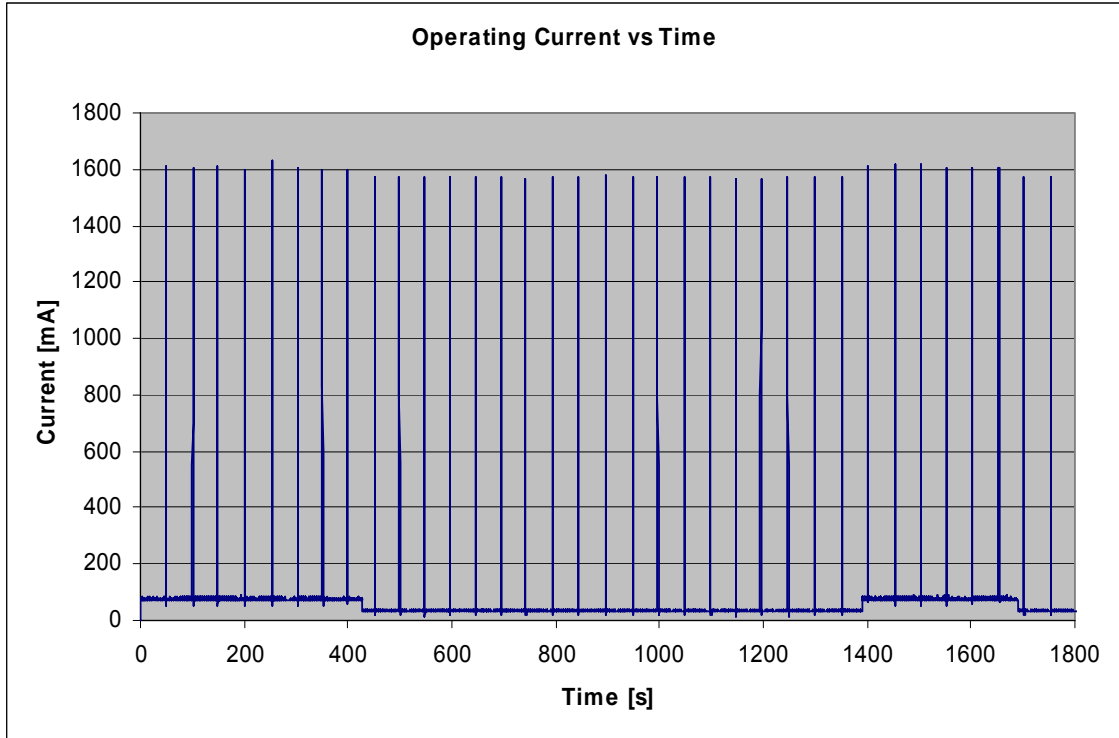


Battery Current Measurement Results (continued) - Self-test Mode





Battery Current Measurement Results (continued) - Operational Mode





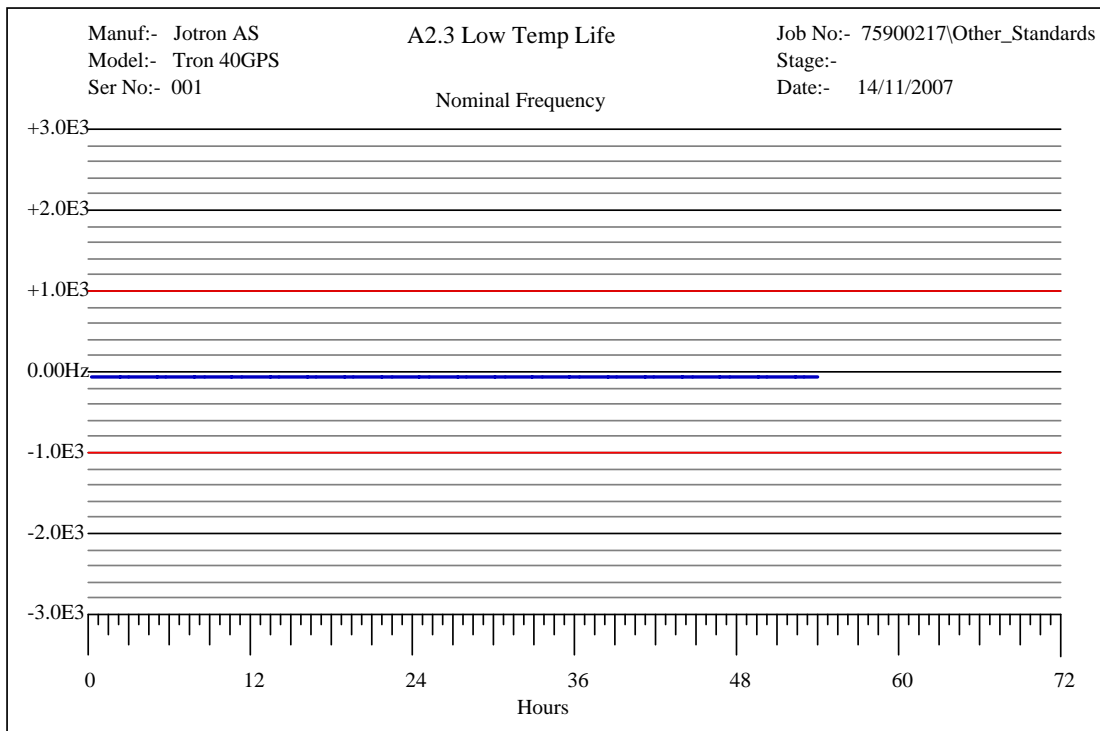
Product Service

2.14.8 Test Results

Note: This test approximates the two tests outlined in IEC 60945:2002, Clauses 8.4.1 and 8.4.2 (Storage and Functional Tests respectively) to an equal or more severe degree. This is based on the longer operational duration, shorter 'warm-up' time and that the operational portion is performed at a time when the EUT internal temperature is most likely still well below the chamber temperature of -20°C having stabilised at -30°C for 10 to 16 hours.

Summary of results can be found in the Test Results Table, starting on page 18.

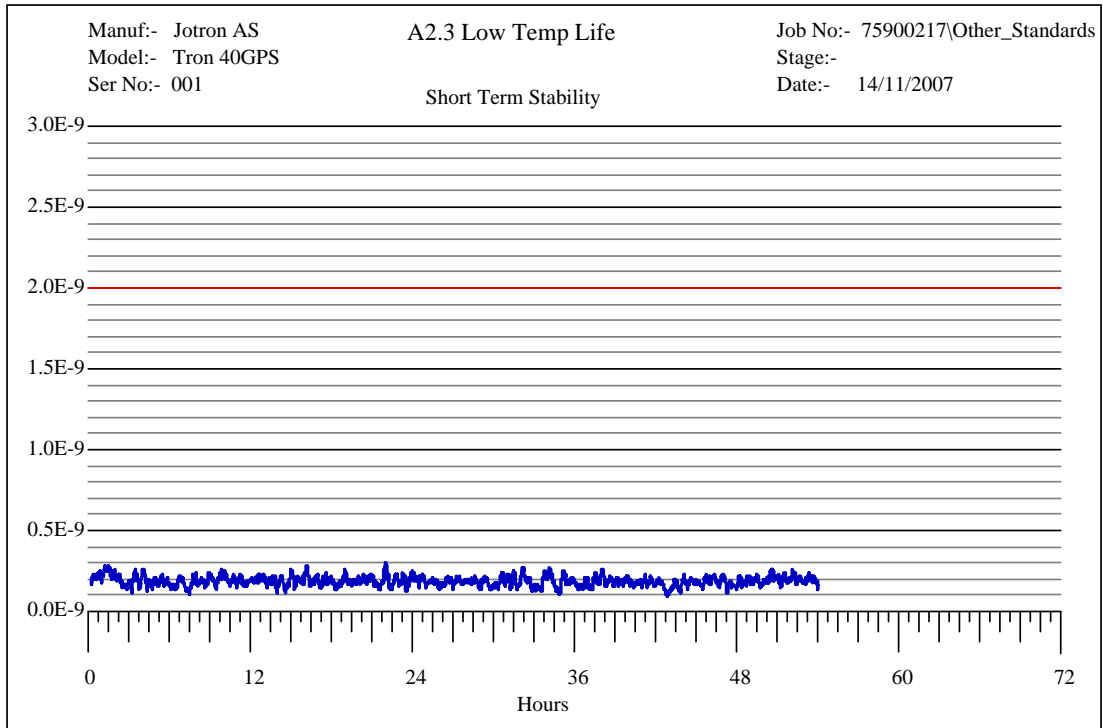
406 MHz Test Result Graphs



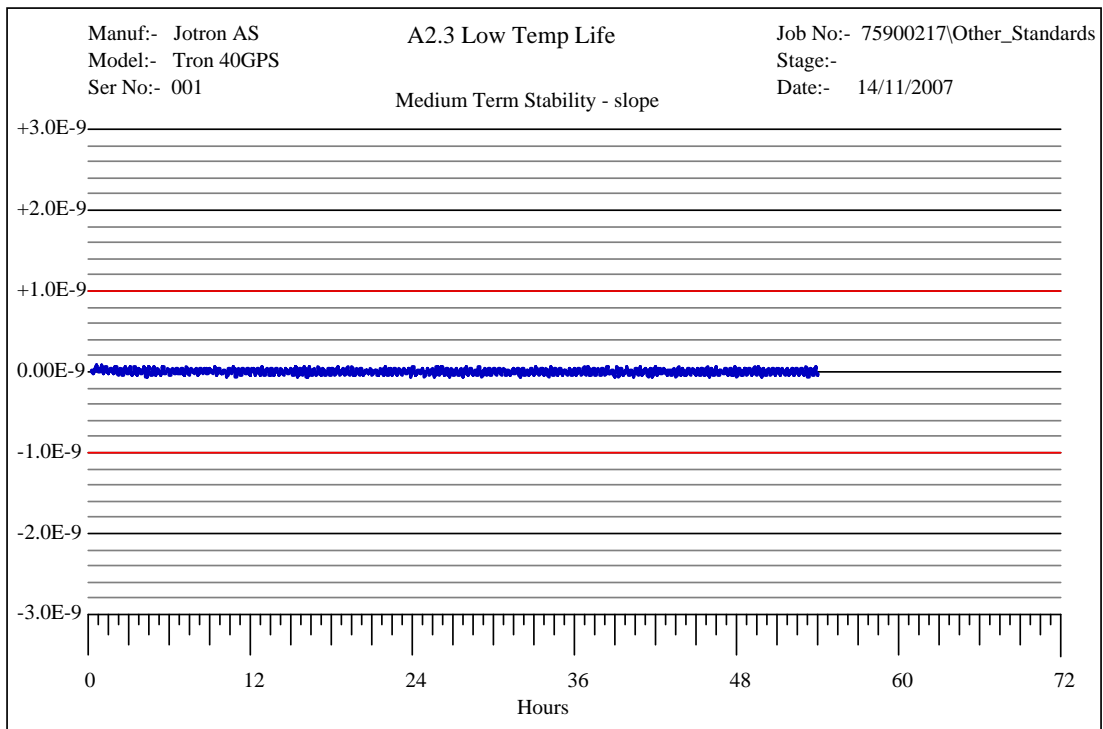
Nominal Frequency Offset



Product Service



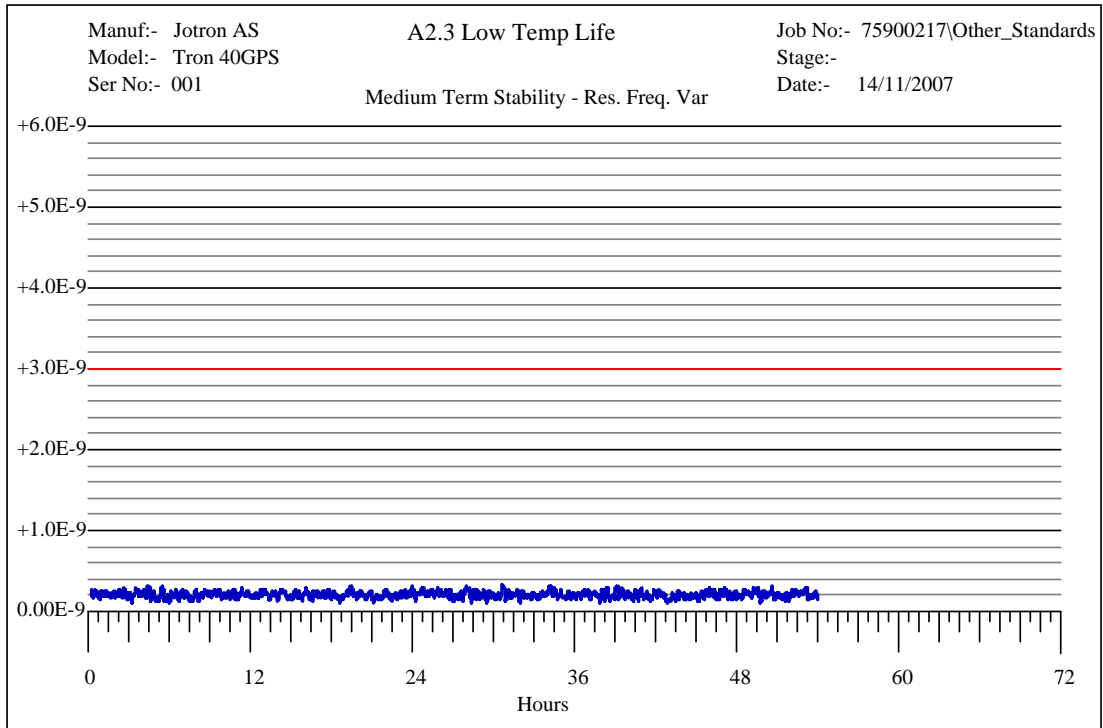
Short Term Stability



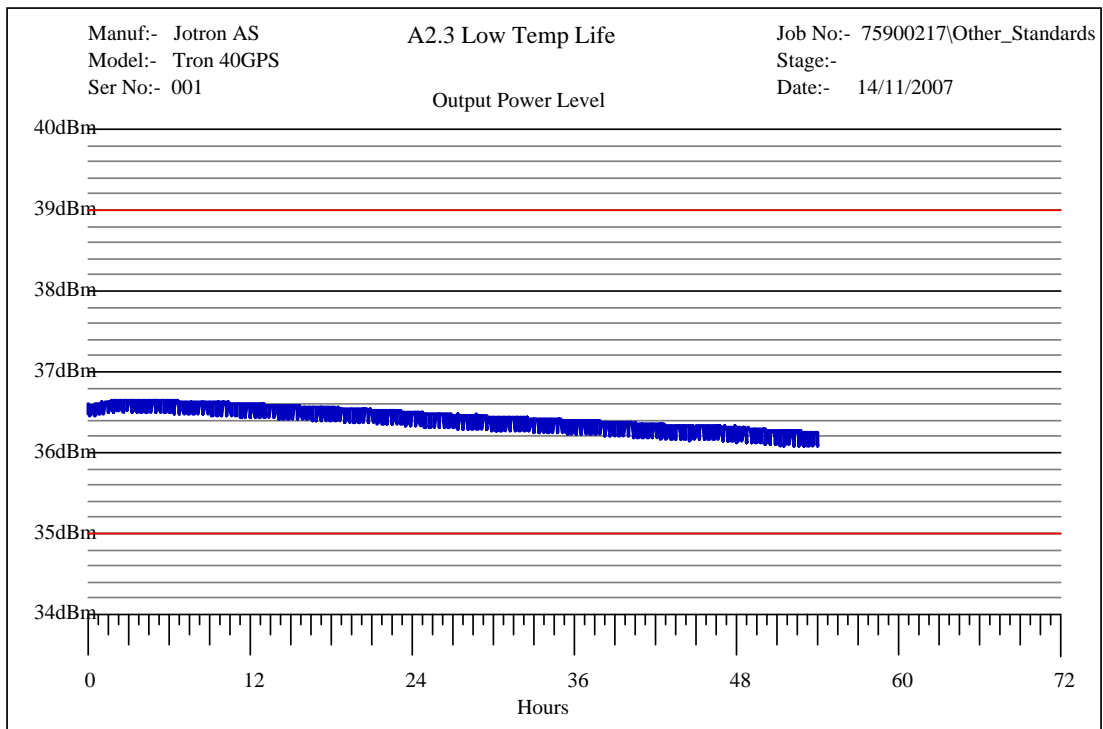
Medium Term Stability – Slope



Product Service



Medium Term Stability – Residual Frequency Variation



Output Power



Operating Lifetime at Minimum Temperature – Digital Message

Message Content

Expected Message FFFE2FCC96A000C6000F4B89E66FE0FF0146
 Actual Message FFFE2FCC96A000C6000F4B89E66FE0FF0146
 Message Error Count 00

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 992D40018C001E9 992D40018C001E9 Default_Id
 30 Hex (Bits 25-144) = CC96A000C6000F4B89E66FE0FF0146

```

    26 30 34 38 42 46 50 54 58 62 66 70 74 78 82
    |  |  |  |  |  |  |  |  |  |  |  |  |  |
1 1001 1001 0010 1101 0100 0000 0000 0001 1000 1100 0000 0000 0001 1110 1001
    0111 0001 0011 1100 1100 1101 1111 1100 0001 1111 1110 0000 0010 1000 110
    |  |  |  |  |  |  |  |  |  |  |  |  |  |
    86 90 94 98 102 106 110 114 118 122 126 130 134 138 142
    
```

| Field Name | Bit Pos | Value Decode | Bits |
|--------------------|---------|--------------------|---------------------------------|
| Format Flag | 25 | 1 Long Message | 1 |
| Protocol Flag | 26 | 1 User | 1 |
| MID | 27- 36 | 201 ALBANIA | 0011 0010 01 |
| User Protocol | 37- 39 | 3 Serialized | 011 |
| Beacon type | 40- 42 | 2 Float Free EPIRB | 010 |
| Certification type | 43 | 1 Cospas-Sarsat | 1 |
| Serial Number | 44- 63 | 99 | 0000 0000 0000 0110 0011 |
| Cosp-Sar Spare | 64- 73 | 0 | 0000 0000 00 |
| Cosp-Sar Cert # | 74- 83 | 122 | 0001 1110 10 |
| Homing | 84- 85 | 1 121.5 | 01 |
| BCH Encoded | 86-106 | Errors=0 | 0111 0001 0011 1100 1100 1 |
| BCH Generated | 86-106 | | 0111 0001 0011 1100 1100 1 |
| Long Message | 107-144 | Data Present | |
| Encode Pos Device | 107 | 1 Internal | 1 |
| Encoded Position | 108-132 | DEFAULT | 0111 1111 0000 0111 1111 1000 0 |
| BCH Encoded | 133-144 | Errors=0 | 0001 0100 0110 |
| BCH Generated | 133-144 | | 0001 0100 0110 |



Product Service

2.15 COSPAS-SARSAT TYPE APPROVAL

2.15.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.14

2.15.2 Test Results

Cospas-Sarsat Type Approval Tests completed outside the scope of this report and submission to Cospas-Sarsat made. Application pending approval at the time of issue of this report.



Product Service

2.16 COMPULSORY SEQUENCE OF TESTS

2.16.1 Specification Reference

IEC 61097-2: 2002, Clause A.1

2.16.2 Test Results

In order to comply with the above-mentioned clause the sequence of tests was checked, see below.



Compulsory Sequence of Tests

| Clause | Test | Date(s) | EUT Serial Number | Comments |
|--------|---|--|--------------------------|---|
| A.1.1 | Message format and homing devices | Before testing | 001 & 002 | Sequence OK |
| A.1.2 | Dry heat test | 12 - 13 March 2007 | 001 | May be performed out of sequence Test was performed out of sequence and for the purposes of conducting the Performance Test sample serial number 001 was used (sample fitted with 50ohm interface) |
| A.1.3 | Damp heat test | 15 - 16 February 2007 | 001 | Test performed on sample serial number 001 for the purposes of conducting the Performance Test (sample fitted with 50ohm interface) |
| A.1.4 | Vibration test | 28 February - 01 March 2007 | 002 | Sequence OK |
| A.1.5 | Ruggedness test | 01 March 2007 | 002 | Sequence OK |
| A.1.6 | Corrosion test | 09 March to 06 April 2007 | 003 | Test performed on sample serial number 003 scheduling purposes (long test duration) |
| A.1.7 | Drop test into water | 26 June 2007 | 002 | Sequence OK |
| A.1.8 | Thermal shock test | 21 December 2007 | 003 | Test performed on sample serial number 003 |
| A.1.9 | Immersion test | N/T | N/T | N/T = Not Tested by TÜV Product Service Ltd |
| A.1.10 | Spurious emission | 15 March 2007 | 001 | May be performed out of sequence Test was performed out of sequence and for practical reasons sample with serial number 001 was used (sample fitted with 50ohm interface) |
| A.1.11 | Conducted interference test (if applicable) | N/A | N/A | N/A = Not Applicable |
| A.1.12 | Signal light test | N/T | N/T | N/T = Not Tested by TÜV Product Service Ltd |
| A.1.13 | Battery capacity and low-temperature test | 12 - 14 November 2007 | 001 | Test performed on sample serial number 001 for the purposes of conducting the required measurements (sample fitted with 50ohm interface) |
| A.1.14 | COSPAS-SARSAT type-approval test procedure | 10 July 2007 - 29 November 2007 ① 29 November 2007 - 13 December 2007 ② | 001 002 003 101 | See TÜV Documents: 75900217 Report 02 ① and 75900217 Report 03 ② |

① Tron 40GPS MkII

② Tron 40S MkII (non-GPS variant)



Product Service

2.17 INADVERTENT ACTIVATION TEST

2.17.1 Specification Reference

IEC 61097-2: 2002, Clause A.2.1 (5.3.1 referring to 5.5.1.1)

2.17.2 Test Results

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



Product Service

2.18 SELF-TEST

2.18.1 Specification Reference

IEC 61097-2: 2002, Clause A.2.1 (5.3.4)

2.18.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.18.3 Date of Test and Modification State

30 August 2007 - Modification State 6

2.18.4 Test Equipment Used

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

2.18.5 Test Set-up and Operating Modes

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

2.18.6 Environmental Conditions

Ambient Temperature 21.6°C
 Atmospheric Pressure 1014mbar

2.18.7 Test Results

| Parameter | Result |
|------------------------|--------------------------------------|
| 36 Hex Code | FFFED0CC96A000C6000F4B89E66FE0FF0146 |
| 15 Hex Code | 992D40018C001E9 |
| Decoded Bit Sync | 1111111111111111 |
| Expected Bit Sync | 1111111111111111 |
| Decoded Frame Sync | 011010000 |
| Expected Frame Sync | 011010000 |
| Emer. code / Nat. use | 101111 |
| Self-Test Burst Length | 520.2706ms |



Self-test Message Decode

| | | |
|---|---------|-----------------------|
| Message format: long format | 25 | 1 |
| Protocol: User | 26 | 1 |
| Country code: 201 | 27-36 | 0011001001 |
| User type: Serial User | 37-39 | 011 |
| Serial Type: Float Free EPIRB with Serial Identification Number | 40-42 | 010 |
| Cospas-Sarsat Certificate Number in bits 74-83: Yes | 43 | 1 |
| Serial Number: 99 | 44-63 | 0000000000001100011 |
| All 0s or National Use | 64-73 | 0000000000 |
| C/S Number or National Use (bit 43 refers): 122 | 74-83 | 0001111010 |
| Aux radio device: 121.5 MHz | 84-85 | 01 |
| Encoded BCH 1: | 86-106 | 011100010011110011001 |
| Calculated BCH 1: | N/A | 011100010011110011001 |
| Encoded Position Data Source From Internal Navigation Device | 107 | 1 |
| default | 108 | 0 |
| Latitude (degrees): default | 109-115 | 1111111 |
| Latitude (minutes): default | 116-119 | 0000 |
| default | 120 | 0 |
| Longitude (degrees): default | 121-128 | 11111111 |
| Longitude (minutes): default | 129-132 | 0000 |
| Encoded BCH 2: | 133-144 | 000101000110 |
| Calculated BCH 2: | N/A | 000101000110 |
| 15 Hex ID: | N/A | 992D40018C001E9 |



Product Service

2.19 AUTOMATIC RELEASE MECHANISM AND AUTOMATIC ACTIVATION TESTS

2.19.1 Specification Reference

IEC 61097-2: 2002, Clause A.2.2 (5.2.1)

2.19.2 Test Results

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



Product Service

2.20 STABILITY AND BUOYANCY TEST

2.20.1 Specification Reference

IEC 61097-2: 2002, Clause A.2.3 (5.3.2.2)

2.20.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.20.3 Date of Test and Modification State

16 February 2007- Modification State 1

2.20.4 Test Equipment Used

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

2.20.5 Test Set-up and Operating Modes

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

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



Test Set-up



Product Service

2.20.6 Environmental Conditions

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

2.20.7 Test Procedure

Buoyancy

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

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

Stability

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

Antenna Height

Determined by examining the EUT in the float-free state as per the end of the Stability procedure.

2.20.8 Test Results

Buoyancy

| | |
|--|-----------|
| EUT Mass, m | = 1.994Kg |
| EUT Weight, F_{EUT} (m x Acceleration Due to Gravity, g) | = 19.56N |

Due to unstable reading from the force gauge caused by operator influence and water movement a total of five buoyant force readings were taken, the average (mean) was calculated.

Mean Buoyant Force, $F_{Bmean} = 9.66N$

$$\begin{aligned}
 \text{Reserve Buoyancy, } B_R &= \text{Buoyant Force} + \text{EUT Weight} / \text{EUT Weight} \\
 &= F_{Bmean} + F_{EUT} / F_{EUT} \\
 &= 9.66 + 19.56 / 19.56 \\
 &= 1.49
 \end{aligned}$$

Limit is ≥ 1.05 hence, test result is a pass.



Stability

EUT passed upright position within 2 seconds, hence, test result is a pass.

Antenna Height

EUT floating freely in fresh water:





Product Service

2.21 SAFETY INSPECTION

2.21.1 Specification Reference

IEC 61097-2: 2002, Clause A.2.5 (5.8)
IEC 60945: 2002, Clause 12.1

2.21.2 Date of Verdict

14 December 2007

2.21.3 Inspection Results

An evaluation and assessment of the supporting documentation for the EUT was conducted, see comments below.

- IEC/EN 60945:2002 Clause 12.1 Protection against accidental access to dangerous voltages
 - Sub-clause 4.6.1 states as far as practicable, accidental access to dangerous voltages shall be prevented.
 - Maximum combined peak voltage is considered to be < 50V throughout the equipment after assessment of circuit diagrams and available documentation.

- IEC/EN 60945:2002 Clause 12.1.3 Required result
 - Although access to the main PCB and batteries was possible without the use of a tool, adequate clearance was found between the test probe and any potential hazardous parts.

- IEC/EN 60529:2001 Degrees of protection provided by enclosures
 - Clause 4 Designations
 - From the information detailed above the equipment is considered to provide IP2X against access to Hazardous parts with 12mm jointed test finger when applied as detailed in test procedure of Sub-clause 12.2 with a maximum 30N force.

The unit under test was considered to PASS all applicable criteria regarding electrical safety precautions.



Product Service

2.22 COMPASS SAFE DISTANCE TEST

2.22.1 Specification Reference

IEC 61097-2: 2002, Clause A.2.6 (5.16)
IEC 60945: 2002, Clause 11.2

2.22.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.22.3 Date of Test and Modification State

23 November 2007 - Modification State 7

2.22.4 Test Equipment Used

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

2.22.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle (secured in float-free bracket) and Operating (separated from bracket)

2.22.6 Test Procedure

A wooden table aligned E-W was used with the compass set in the centre of the table and aligned to read zero. The table was marked to give a graduated scale of distance. The EUT was gradually moved towards the compass until a standard deviation of 0.3° was obtained. Each orientation of the EUT was tested in this manner with the measurement distance between the compass centre and the EUT being noted.

The test was repeated but with readings being taken when the compass gave a steering deviation of 1°

The local area Magnetic Flux density (H) at the site of testing was 18.48uT.

The above testing was performed twice with the EUT as follows:

- a. In the magnetic condition in which it is received with the EUT in Idle mode.
- b. After normalising with the EUT in Idle mode.
- c. In Operational mode.

Prior to performing the tests in accordance with parts a and b above, the EUT was normalised by placing it into Helmholtz Coil Assembly and subjecting it to a magnetic field of 79A/m.



Product Service

2.22.7 Test Results

Summary of Distances

| Orientation of the EUT | Un-powered State | | Normalised | | Powered Up | |
|------------------------|---|---|---|---|---|---|
| | Distance From Compass (cm) at 0.3° deflection | Distance From Compass (cm) at 1° deflection | Distance From Compass (cm) at 0.3° deflection | Distance From Compass (cm) at 1° deflection | Distance From Compass (cm) at 0.3° deflection | Distance From Compass (cm) at 1° deflection |
| Front | 32.5 | 45 | 31 | 42 | 29 | 37.5 |
| Top | 29.5 | 44 | 28 | 42 | 30 | 42 |
| Left Hand Side | 32 | 45 | 30 | 40 | 27 | 42 |
| Right Hand Side | 31 | 45 | 30 | 40 | 30.5 | 42 |
| Underside | 17 | 33 | 19 | 40 | 22 | 34 |
| Rear | 44 | 55.5 | 46 | 67 | 39 | 56 |

Outcome

Safe distance for standard compass = 700mm

Safe distance for Steering, Standby Steering and Emergency Compass = 500mm



Product Service

2.23 SOLAR RADIATION

2.23.1 Specification Reference

IEC 60945: 2002, Clause 8.10

2.23.2 Test Results

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



Product Service

2.24 OIL RESISTANCE

2.24.1 Specification Reference

IEC 61097-2: 2002, Clause A.1.12 (5.3.3.3)

2.24.2 Test Results

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



Product Service

2.25 CONDUCTED EMISSIONS

2.25.1 Specification Reference

IEC 60945: 2002, Clause 9.2

2.25.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Hence, test is not applicable.



Product Service

2.26 RADIATED EMISSIONS TEST (ELECTRIC FIELD)

2.26.1 Specification Reference

IEC 60945: 2002, Clause 9.3

2.26.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.26.3 Date of Test and Modification State

07 November 2007 - Modification State 2

2.26.4 Test Equipment Used

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

2.26.5 Test Set-up and Operating Modes

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

2.26.6 Environmental Conditions

| | |
|----------------------|----------|
| Ambient Temperature | 17.3°C |
| Relative Humidity | 48% |
| Atmospheric Pressure | 1025mbar |

2.26.7 Test Procedure

The EUT was set up on a remotely controlled turntable within a semi-anechoic Alternative Open Area Test Site [AOATS], powered up and correct operation verified.

Measurements were made over the frequency range 30MHz to 2GHz at a distance of 3m.

A preliminary profile of the EUT's emissions was made, the profiling yielding a list of worst case emission frequencies together with the EUT azimuth and antenna polarisation.

Utilising the data gathered during the preliminary profiling, the emissions detected were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emission levels were then formally measured with a CISPR Quasi-Peak detector function and the measured levels recorded.

Emission levels, in the frequency band 156MHz to 165MHz were formally measured with a Peak detector function and the measured levels recorded.

The levels of emissions generated by the EUT were then compared with the test specification limits to determine EUT compliance.



Product Service

2.26.8 Test Results

Idle Mode

No Emissions were detected above the test system noise floor, see plots below, hence no emissions were maximised and/or recorded.

Note: System Noise Floor >15dB below limit.

Radiated Emissions Plot 1 (156MHz – 165MHz Marine Distress Band)

Yellow Trace:

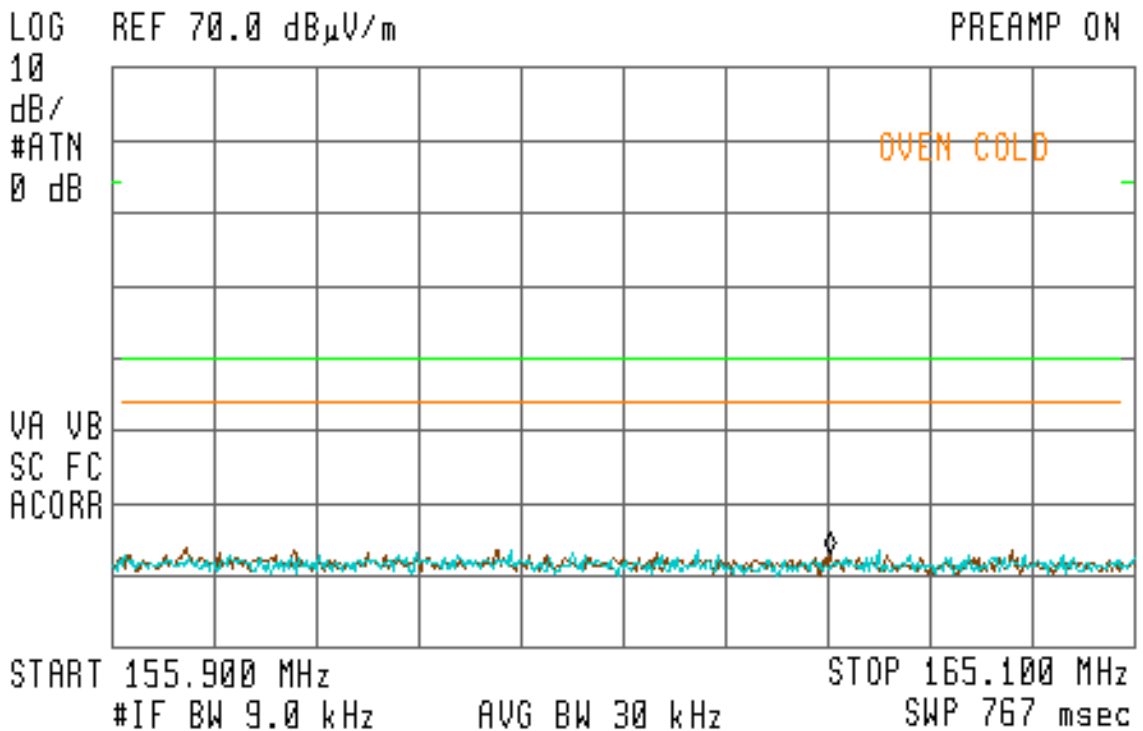
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

12:56:44 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 162.363 MHz
2.93 dB μ V/m





Product Service


Radiated Emissions Plot 2 (30MHz – 500MHz)

Yellow Trace:

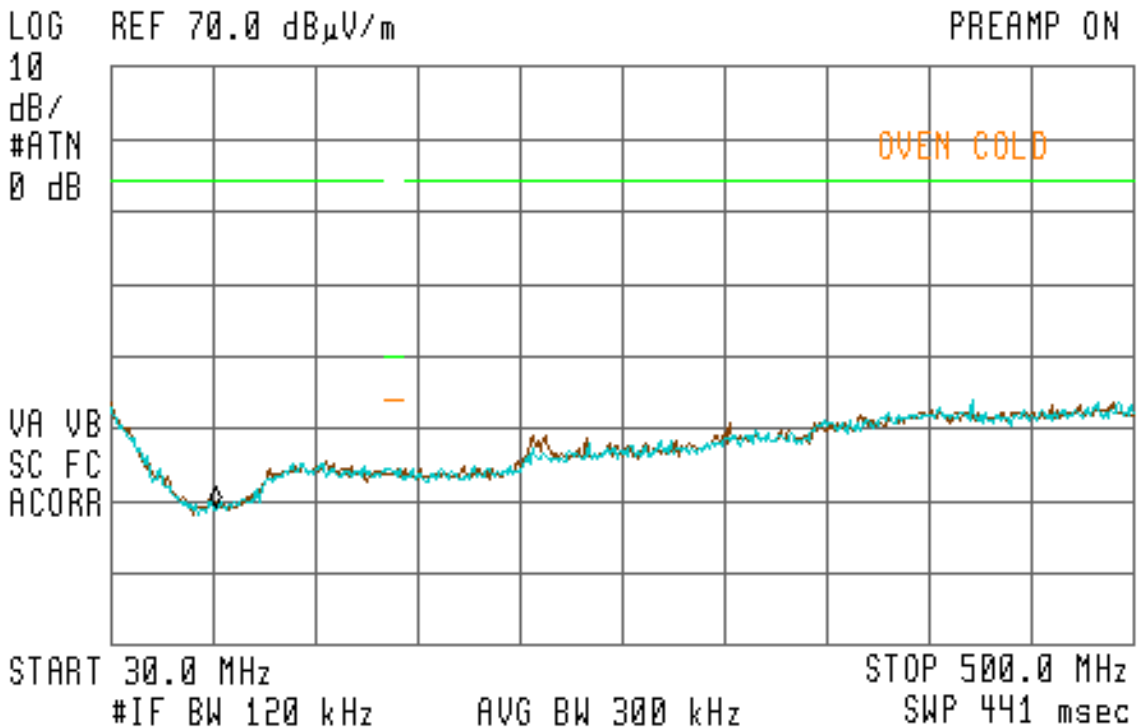
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 12:42:25 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 78.2 MHz
9.17 dB μ V/m





Product Service


Radiated Emissions Plot 3 (500MHz – 1GHz)

Yellow Trace:

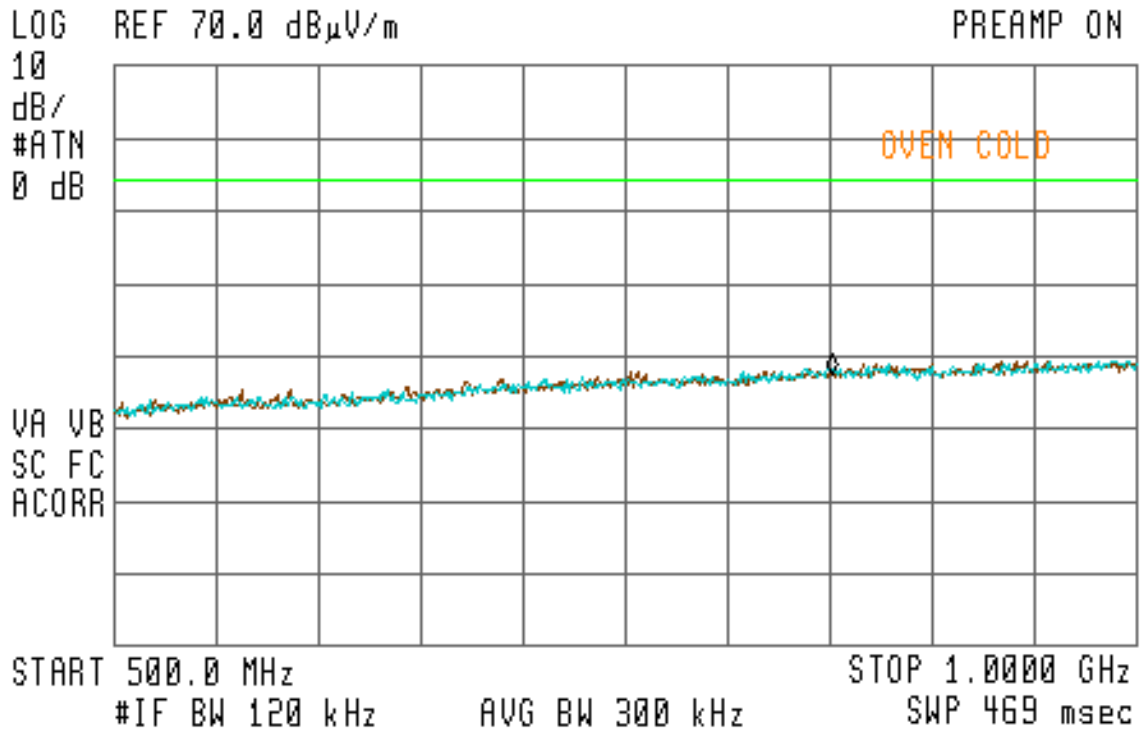
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 13:10:40 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKA 851.3 MHz
27.53 dB μ V/m





Product Service


Radiated Emissions Plot 4 (1GHz – 2GHz)

Yellow Trace:

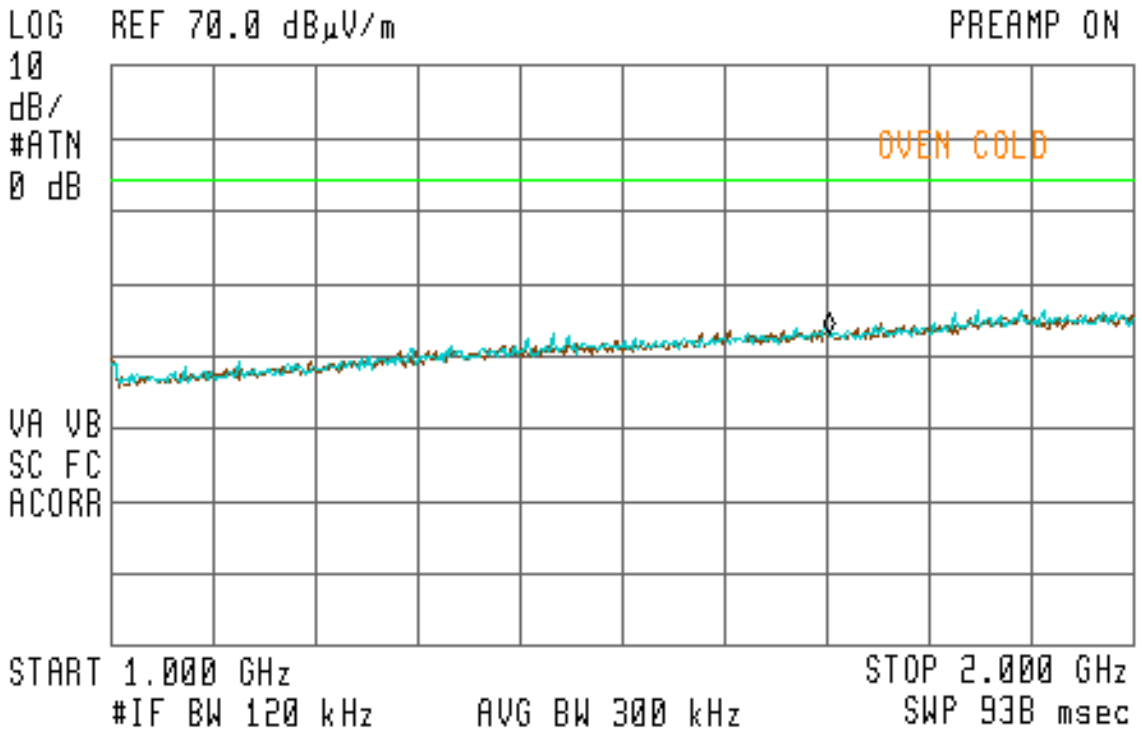
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 13:24:12 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 1.703 GHz
32.90 dB μ V/m





Product Service

Operational Mode

Table 1 shows the final (maximised) results, plots 5 through 11 show the preliminary scans.

Table 1 (Operational Mode Final (Maximised) Results)

| Frequency MHz | Polarity | Height cm | Azimuth degree | Field Strength at 10m dB μ V/m | Specification Limit dB μ V/m |
|---------------|----------|-----------|----------------|------------------------------------|----------------------------------|
| 243.00 | H | 100 | 0 | 33.6 | 54.0 |
| 364.50 | H | 100 | 0 | 45.7 | 54.0 |
| 486.00 | V | 100 | 0 | 45.0 | 54.0 |
| 607.50 | V | 100 | 0 | 37.9 | 54.0 |
| 812.07 | H | 100 | 0 | 62.2* | 54.0 |
| 1218.24 | V | 100 | 0 | 52.7* | 54.0 |
| 1624.53 | V | 100 | 0 | 59.9* | 54.0 |

* Note: 812.07MHz, 1218.24MHz and 1624.53MHz are harmonics of the EUT transmit frequency. These emissions were only detected every 50 seconds (synchronised with the transmitter). As per IEC 60945:2002, Clause 9.1 ("*equipment including a radio transmitter operating within the measurement bands shall be in the operational state but not the transmitting state*"), these were omitted. I.e. Emissions found were not valid radiated emissions because they were noted during the EUT transmit period and were, in fact, harmonics of the transmitter. Due to the random transmission repetition interval it was not practicable to synchronise measurements to only occur in the transmitter off periods, hence they are included here for information only and are omitted from the final results.



Product Service


Radiated Emissions Plot 5 (156MHz – 165MHz Marine Distress Band)

Yellow Trace:

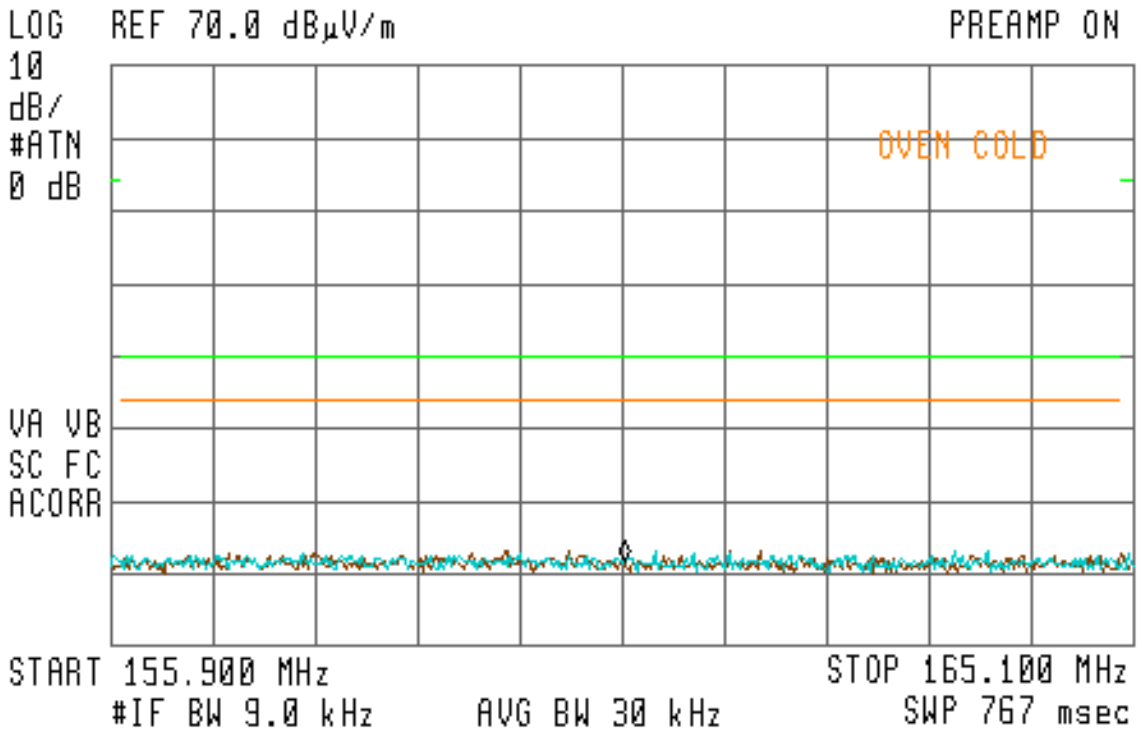
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 14:06:11 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 160.523 MHz
1.64 dB μ V/m





Product Service


Radiated Emissions Plot 6 (30MHz – 300MHz)

Yellow Trace:

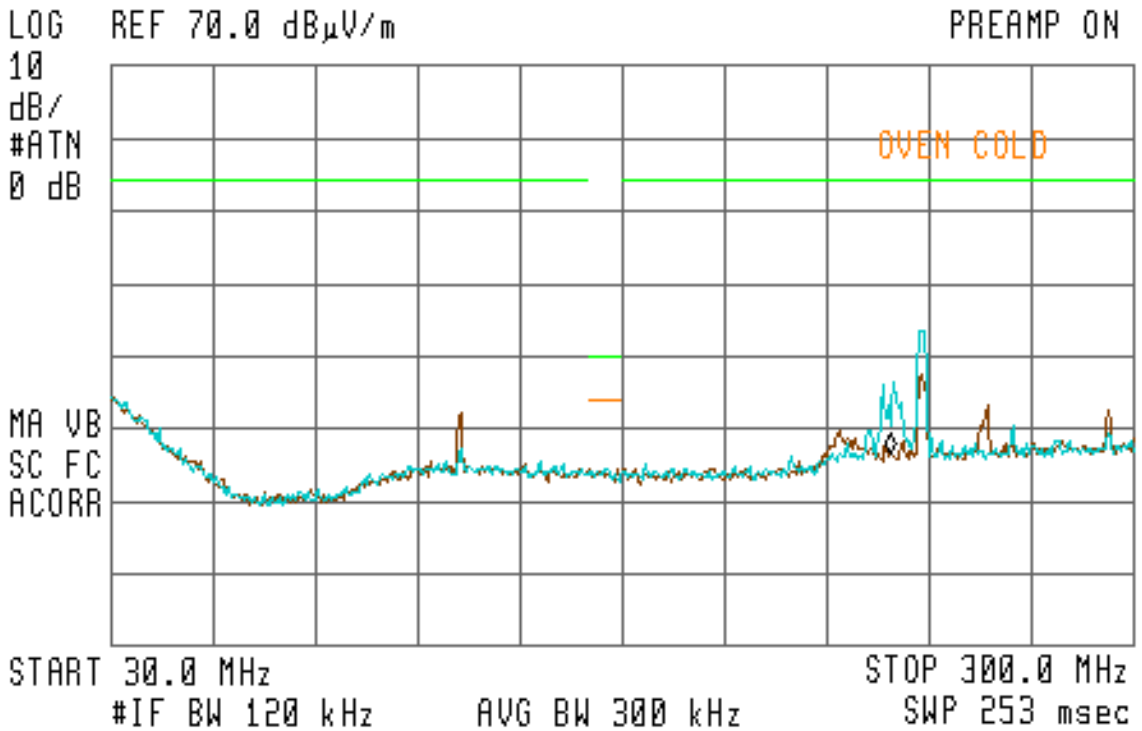
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 14:35:49 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKA 235.9 MHz
16.36 dB μ V/m





Product Service


Radiated Emissions Plot 7 (300MHz – 500MHz)

Yellow Trace:

Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

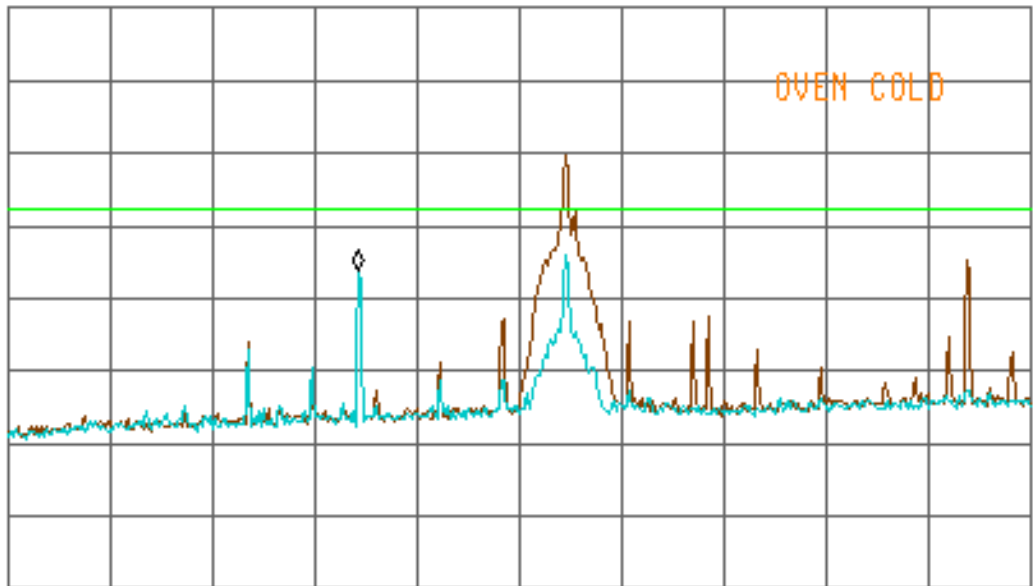
 15:58:10 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKA 365.2 MHz
45.6B dB μ V/m

LOG REF B2.0 dB μ V/m

10
dB/
#ATM
0 dB

VA VB
SC FC
ACORR



START 295.0 MHz STOP 500.0 MHz
#IF BW 120 kHz AVG BW 300 kHz SWP 192 msec



Product Service


Radiated Emissions Plot 8 (500MHz – 800MHz)

Yellow Trace:

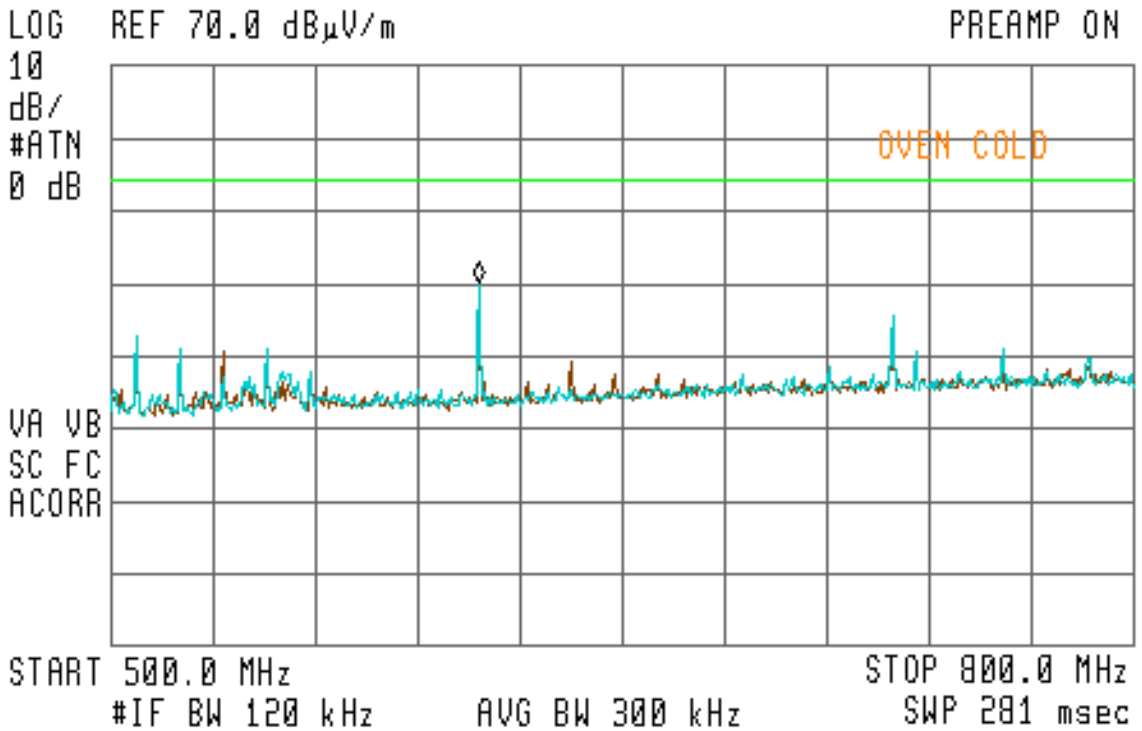
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 16:31:05 07 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 600.0 MHz
40.04 dB μ V/m





Product Service


Radiated Emissions Plot 9 (800MHz – 1.2GHz)

Yellow Trace:

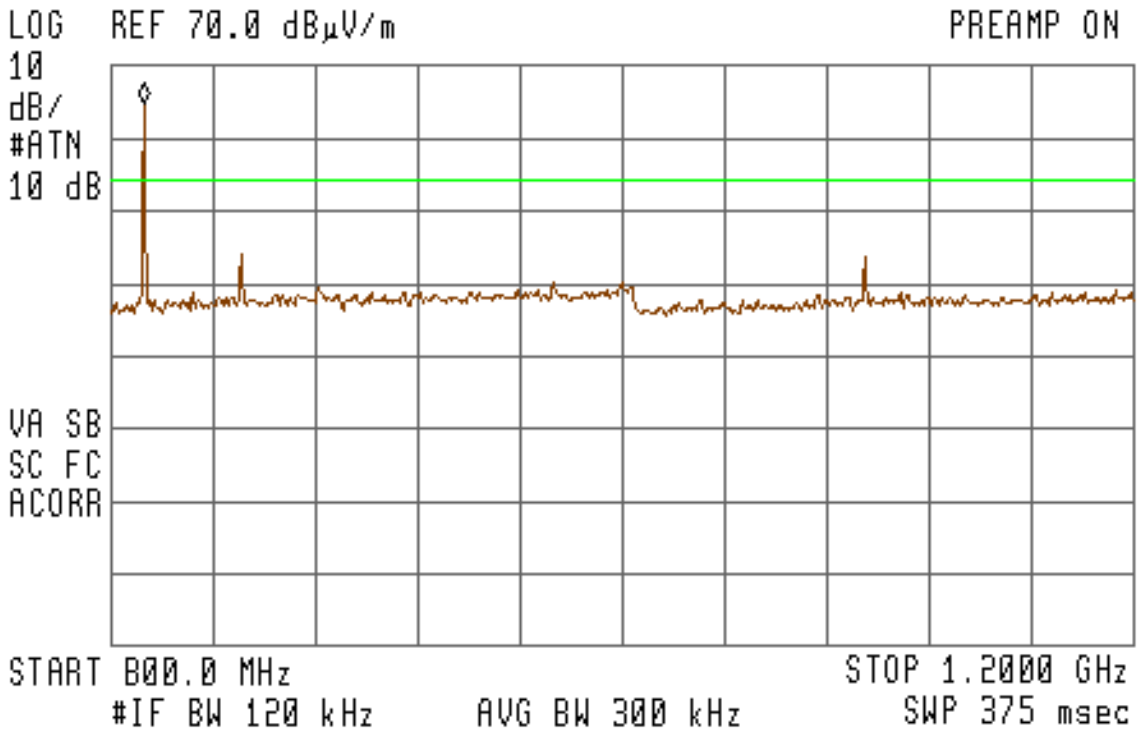
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 18:30:05 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKA 813.0 MHz
64.88 dB μ V/m





Product Service


Radiated Emissions Plot 10 (1.2GHz – 1.6GHz)

Yellow Trace:

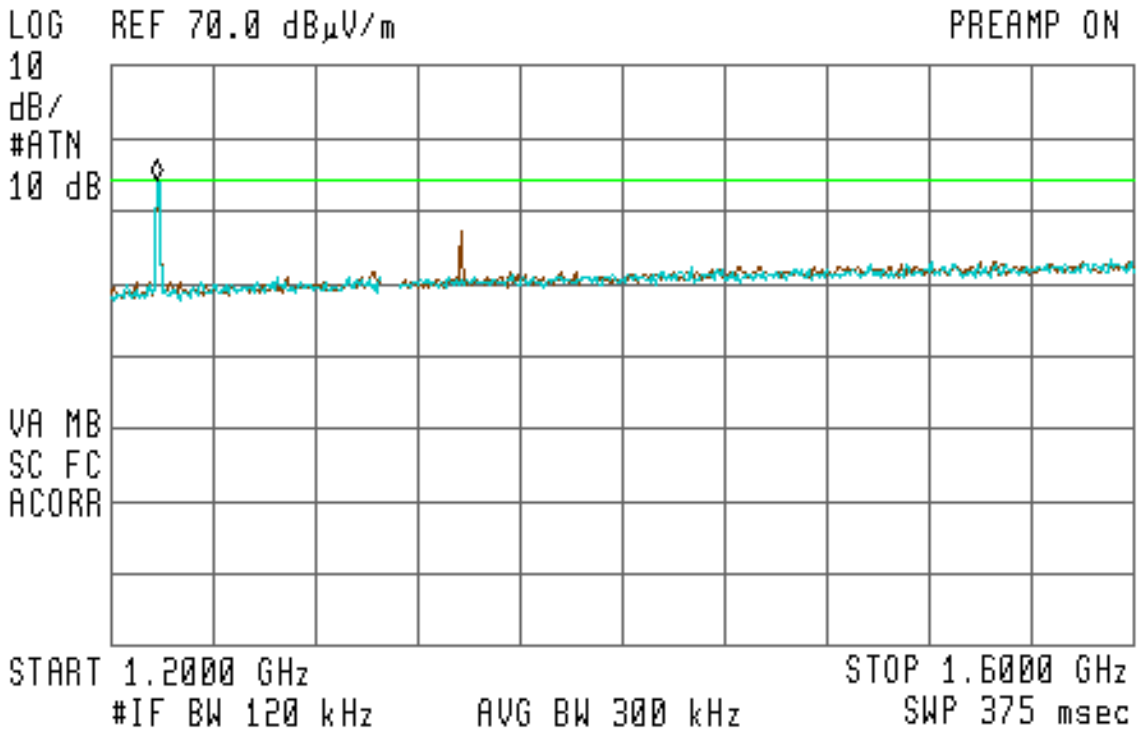
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 18:57:26 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 1.2100 GHz
54.17 dB μ V/m





Product Service


Radiated Emissions Plot 11 (1.6GHz – 2GHz)

Yellow Trace:

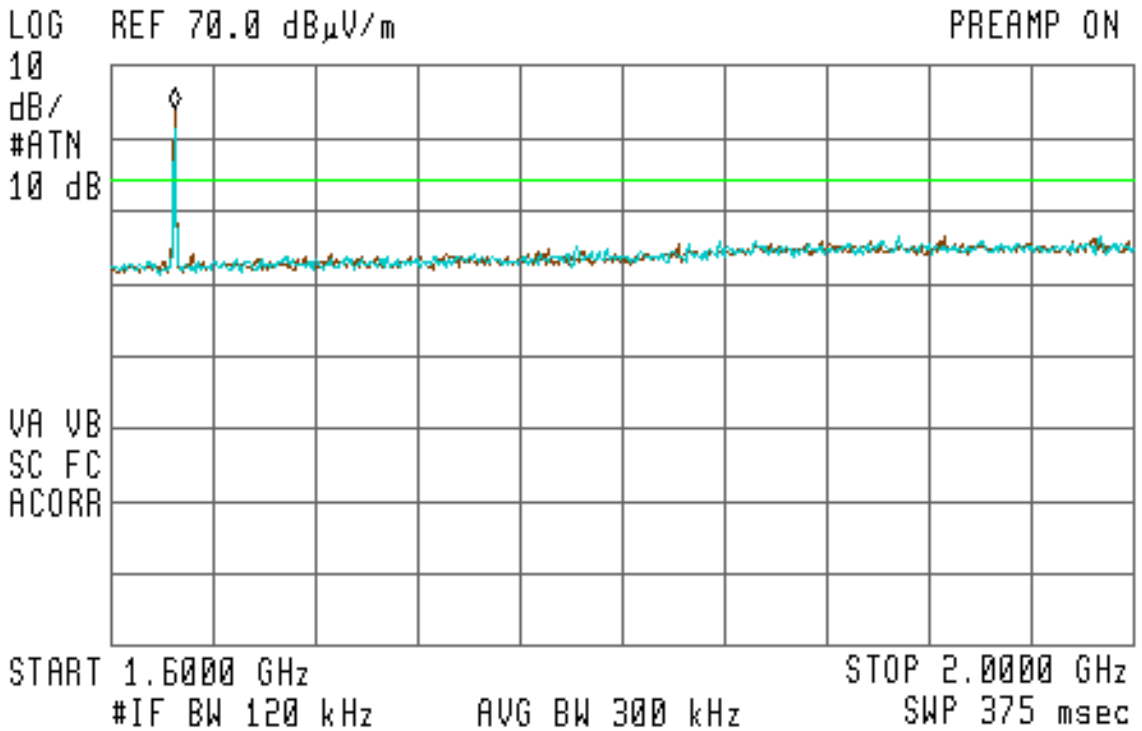
Vertical Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

Blue Trace:

Horizontal Polarity (Antenna at 100cm fixed Height, EUT spun from 0° - 360° trace, Max hold)

 19:15:54 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 1.6250 GHz
64.02 dB μ V/m





Product Service

2.27 RADIATED EMISSIONS TEST (MAGNETIC FIELD)

2.27.1 Specification Reference

IEC 60945: 2002, Clause 9.3

2.27.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.27.3 Date of Test and Modification State

08 November 2007 - Modification State 2

2.27.4 Test Equipment Used

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

2.27.5 Test Set-up and Operating Modes

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

2.27.6 Environmental Conditions

| | |
|----------------------|----------|
| Ambient Temperature | 17°C |
| Relative Humidity | 43% |
| Atmospheric Pressure | 1016mbar |

2.27.7 Test Procedure

The EUT was set up within a shielded enclosure, powered up and correct operation verified.

Measurements were made over the frequency range 150kHz to 30MHz at a distance of 3m.

Measurements of emissions from the EUT were obtained with the Measurement Antenna (Magnetic Loop) configured to be Face On and then Edge On, in relation to the EUT, at a set height of 1.5 metres.

A preliminary profile of the EUT's emissions was made, the profiling yielding a list of worst case emission frequencies together with the EUT azimuth and antenna polarisation.

Utilising the data gathered during the preliminary profiling, the emissions detected were maximised by adjusting the antenna polarisation and turntable azimuth.

Emission levels were then formally measured with a CISPR Quasi-Peak detector function and the measured levels recorded.

The levels of emissions generated by the EUT were then compared with the test specification limits to determine EUT compliance.




Product Service

2.27.8 Test Results

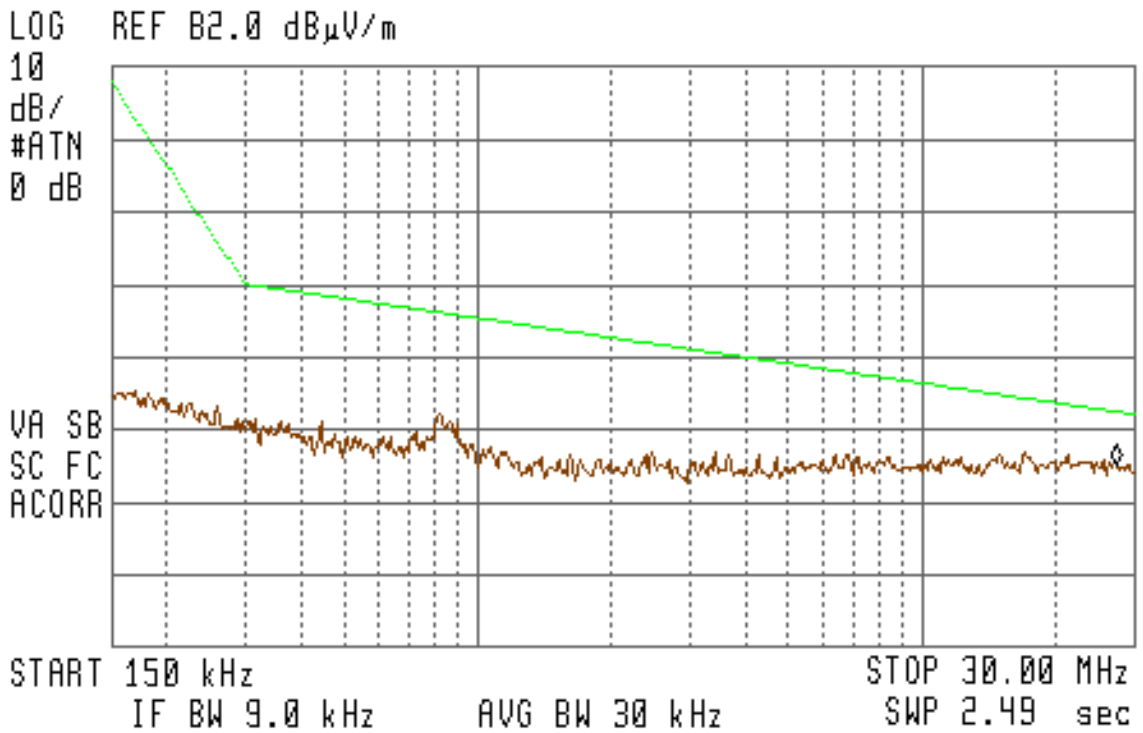
Idle Mode

No Emissions were detected above the test system's noise floor, see plots below, hence no emissions were maximised and/or recorded.

Radiated Magnetic Emissions Plot 1 (Side On)

 21:46:20 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 27.05 MHz
27.03 dB μ V/m





Product Service

Radiated Magnetic Emissions Plot 2 (Edge On)

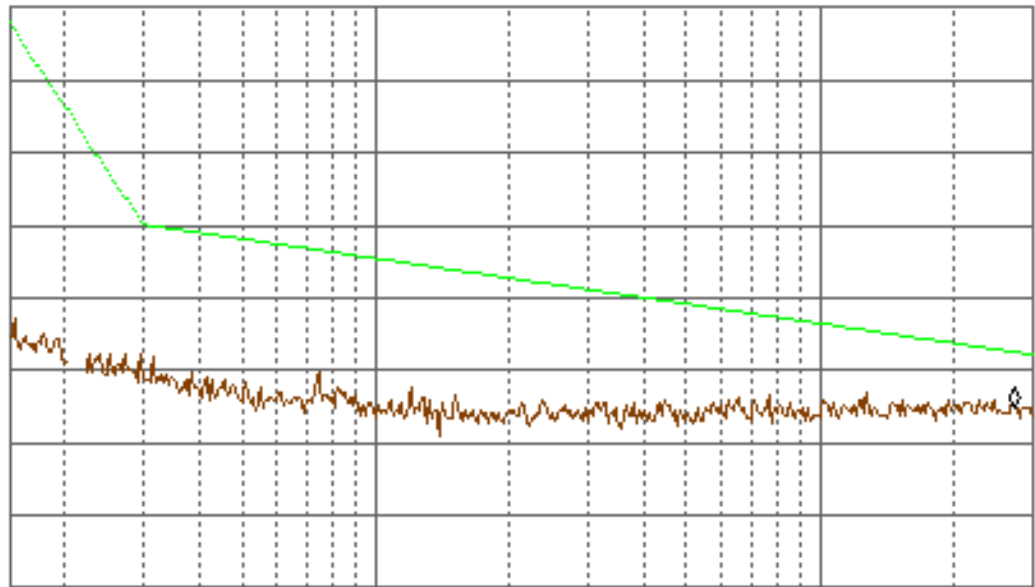
21:54:30 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 27.05 MHz
26.71 dB μ V/m

LOG REF B2.0 dB μ V/m

10
dB/
#ATN
0 dB

MA SB
SC FC
ACORR



START 150 kHz STOP 30.00 MHz
IF BW 9.0 kHz AVG BW 30 kHz SWP 2.49 sec




Product Service

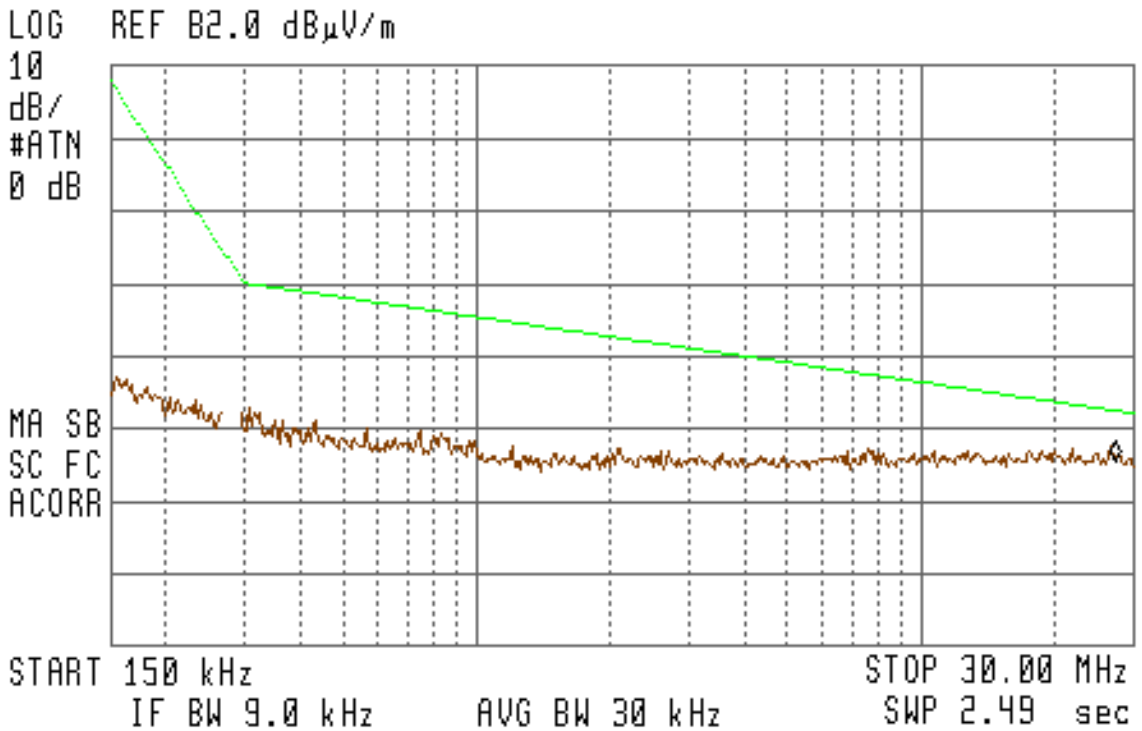
Operational Mode

No Emissions were detected above the test system noise floor, see plots below, hence no emissions were maximised and/or recorded.

Radiated Magnetic Emissions Plot 3 (Side On)

 22:01:13 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 27.05 MHz
27.54 dB μ V/m





Product Service

Radiated Magnetic Emissions Plot 4 (Edge On)

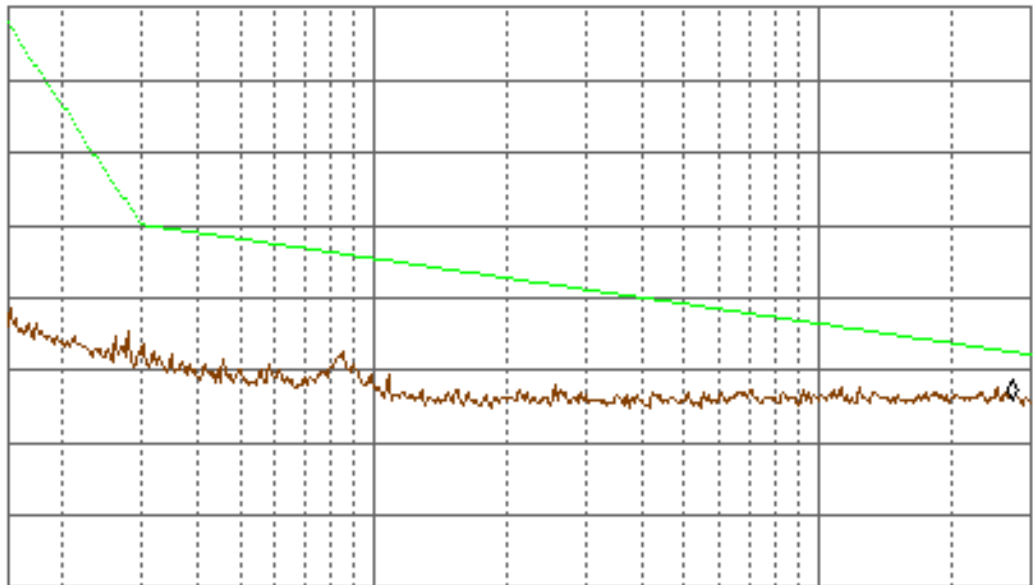
22:12:42 08 NOV 2007

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 27.05 MHz
27.65 dB μ V/m

LOG REF B2.0 dB μ V/m

10
dB/
#ATN
0 dB

MA SB
SC FC
ACORR



START 150 kHz IF BW 9.0 kHz AVG BW 30 kHz STOP 30.00 MHz SWP 2.49 sec



Product Service

2.28 IMMUNITY TO CONDUCTED RADIO FREQUENCY DISTURBANCE

2.28.1 Specification Reference

IEC 60945: 2002, Clause 10.3

2.28.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Hence, test is not applicable.



2.29 IMMUNITY TO RADIATED RADIO FREQUENCIES

2.29.1 Specification Reference

IEC 60945: 2002, Clause 10.4

2.29.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.29.3 Date of Test and Modification State

15 November 2007 - Modification State 7

2.29.4 Test Equipment Used

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

2.29.5 Test Set-up and Operating Modes

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



Test Set-up (Operating Mode)



Test Set-up (Idle Mode)

2.29.6 Environmental Conditions

| | |
|----------------------|----------|
| Ambient Temperature | 19.8°C |
| Relative Humidity | 24% |
| Atmospheric Pressure | 1023mbar |

2.29.7 Test Procedure

The test was applied in accordance with the test method requirements of EN 61000-4-3.

The EUT was set up within a screened enclosure, aligned with the uniform field calibration plane, powered up and correct operation verified.

The test was applied in the frequency range 80MHz to 2GHz to the front, rear, left hand and right hand sides of the EUT.

The performance of the EUT was monitored throughout the period of test and any anomalies/observations were recorded.

| | |
|-------------|-------------------------|
| Test Level | 12V/m |
| Modulation | 80% amplitude at 400Hz |
| Dwell Times | 3 seconds for each step |

2.29.8 Test Results

The EUT met the requirements of EN 60945 for Immunity to Radiated Disturbance.



Product Service

2.30 IMMUNITY TO FAST TRANSIENTS

2.30.1 Specification Reference

IEC 60945: 2002, Clause 10.5

2.30.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Furthermore, EUT has no signal or control lines which connect to the ship's systems. Hence, test is not applicable.



Product Service

2.31 IMMUNITY TO SURGES

2.31.1 Specification Reference

IEC 60945: 2002, Clause 10.6

2.31.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Hence, test is not applicable.



Product Service

2.32 IMMUNITY TO POWER SUPPLY SHORT-TERM VARIATION

2.32.1 Specification Reference

IEC 60945: 2002, Clause 10.7

2.32.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Furthermore EUT is d.c. powered. Hence, test is not applicable.



Product Service

2.33 IMMUNITY TO POWER SUPPLY FAILURE

2.33.1 Specification Reference

IEC 60945: 2002, Clause 10.8

2.33.2 Test Results

EUT does not connect to the ships power system and runs 'stand-alone' from its own internal battery pack. Hence, test is not applicable.



Product Service

2.34 IMMUNITY TO ELECTROSTATIC DISCHARGE

2.34.1 Specification Reference

IEC 60945: 2002, Clause 10.9

2.34.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.34.3 Date of Test and Modification State

23 November 2007 - Modification State 7

2.34.4 Test Equipment Used

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

2.34.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle (secured in float-free bracket) and Operating (separated from bracket)

2.34.6 Environmental Conditions

| | |
|----------------------|----------|
| Ambient Temperature | 21°C |
| Relative Humidity | 30% |
| Atmospheric Pressure | 1021mbar |

2.34.7 Test Procedure

The test was applied in accordance with the test method requirements of EN 61000-4-2.

The EUT was set up on insulators 0.5mm above a Horizontal Coupling Plane within a test area, powered up and correct operation verified.

The test was applied with a proprietary ESD Simulator.

Air Discharge

At each applicable test point 10 positive and 10 negative Air Discharges were applied at each of 2kV and 4kV potentials. The interval between discharges was a minimum of 1 second.



Product Service

Contact Discharge

At each applicable test point 10 positive and 10 negative Contact Discharges were applied at each of 2kV, 4kV and 6kV potentials. The interval between discharges was a minimum of 1 second

Each vertical sides of the EUT was subjected to Vertical Coupled Plane (VCP) discharges of 2kV, 4kV and 6kV, 10 positive and 10 negative polarity.

The base of the EUT was subjected to Horizontal Coupled Plane (HCP) discharges of 2kV and 4kV, 10 positive and 10 negative polarity.

The performance of the EUT was monitored throughout the period of test and any anomalies/observations were recorded.

2.34.8 Test Results

Idle Mode

The EUT met the requirements of EN 60945 for Immunity to Electrostatic Discharges.

Details of the points tested and the results are presented in the following tables.

| Test Point | Contact Discharge | | | | | | Air Discharge | | | | | |
|---------------------------|-------------------|-----|-----|-----|-----|-----|---------------|-----|-----|-----|-----|-----|
| | 2kV | | 4kV | | 6kV | | 2kV | | 4kV | | 8kV | |
| | + | - | + | - | + | - | + | - | + | - | + | - |
| Horizontal Coupling Plane | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | N/A | N/A | N/A | N/A | N/A | N/A |
| Vertical Coupling Plane | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | N/A | N/A | N/A | N/A | N/A | N/A |
| Fixing Bushes | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Retaining Strap Bolts | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Manual Release Pin | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Lanyard Fixing Pin | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Interlock Pin | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Case Screws | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Water Activation Contact | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Float Free Bracket | N/A | N/A | N/A | N/A | N/A | N/A | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Case | N/A | N/A | N/A | N/A | N/A | N/A | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |

Key to Results:

- ✓ The EUT's performance was not impaired at test point when ESD pulse applied.
- ✓* No discharge occurred at test point when ESD pulse applied.
- N/A Test not applicable as defined in the specification.



Product Service

Operating Mode

The EUT met the requirements of EN 60945 for Immunity to Electrostatic Discharges.

Details of the points tested and the results are presented in the following tables.

| Test Point | Contact Discharge | | | | | | Air Discharge | | | | | |
|---------------------------|-------------------|-----|-----|-----|-----|-----|---------------|-----|-----|-----|-----|-----|
| | 2kV | | 4kV | | 6kV | | 2kV | | 4kV | | 8kV | |
| | + | - | + | - | + | - | + | - | + | - | + | - |
| Horizontal Coupling Plane | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | N/A | N/A | N/A | N/A | N/A | N/A |
| Vertical Coupling Plane | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | N/A | N/A | N/A | N/A | N/A | N/A |
| Lanyard fixing pin | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Case Screws | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Water activation contact | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |
| Case | N/A | N/A | N/A | N/A | N/A | N/A | ✓* | ✓* | ✓* | ✓* | ✓* | ✓* |

Key to Results:

- ✓ The EUT's performance was not impaired at test point when ESD pulse applied.
- ✓* No discharge occurred at test point when ESD pulse applied.
- N/A Test not applicable as defined in the specification.



Product Service

2.35 121.5MHZ HOMING DEVICE (CARRIER FREQUENCY TEST)**2.35.1 Specification Reference**

IEC 61097-2: 2002, Clause D.4.1

2.35.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.35.3 Date of Test and Modification State

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

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

2.35.4 Test Equipment Used

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

2.35.5 Test Set-up and Operating Modes

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

2.35.6 Test Results

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



Product Service

2.36 121.5MHZ HOMING DEVICE (PEAK EFFECTIVE RADIATED POWER)

2.36.1 Specification Reference

IEC 61097-2: 2002, Clause D.4.2

2.36.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.36.3 Date of Test and Modification State

25 October 2007 - Modification State 7

2.36.4 Test Equipment Used

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

2.36.5 Test Set-up and Operating Modes

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

2.36.6 Test Results

Note: EUT battery used for test had been operational in the same beacon for a duration of »44hours.

Measurements were made (in dBm) at an arbitrarily chosen azimuth angle across a range of elevation angles. Upon finding the maximum, the elevation was fixed and 12 measurements made at 30° azimuth increments.

These results (from the vertically polarised dipole) were converted to PERP in mW. See the following table.

| Elevation (°) | Azimuth (°) | | | | | | | | | | | |
|---------------|-------------|------|------|------|------|------|------|------|------|------|------|------|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 |
| 5 | 57.3 | - | - | - | - | - | - | - | - | - | - | - |
| 10 | 82.9 | - | - | - | - | - | - | - | - | - | - | - |
| 15 | 88.2 | 86.2 | 76.8 | 71.7 | 68.4 | 75.0 | 84.2 | 90.2 | 82.3 | 80.4 | 76.8 | 80.4 |
| 20 | 74.0 | - | - | - | - | - | - | - | - | - | - | - |

The median result was calculated to be 79.3mW, or 18.99dBm.

The ratio between the maximum and minimum of the highest 11 values was calculated to be 1.26 (showing the antenna to be radiating almost equally in all directions, hence, omnidirectional)



Product Service

2.37 121.5MHZ HOMING DEVICE (MODULATION CHARACTERISTICS - TRANSMITTER DUTY CYCLE)

2.37.1 Specification Reference

IEC 61097-2: 2002, Clause D.4.3

2.37.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.37.3 Date of Test and Modification State

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

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

2.37.4 Test Equipment Used

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

2.37.5 Test Set-up and Operating Modes

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

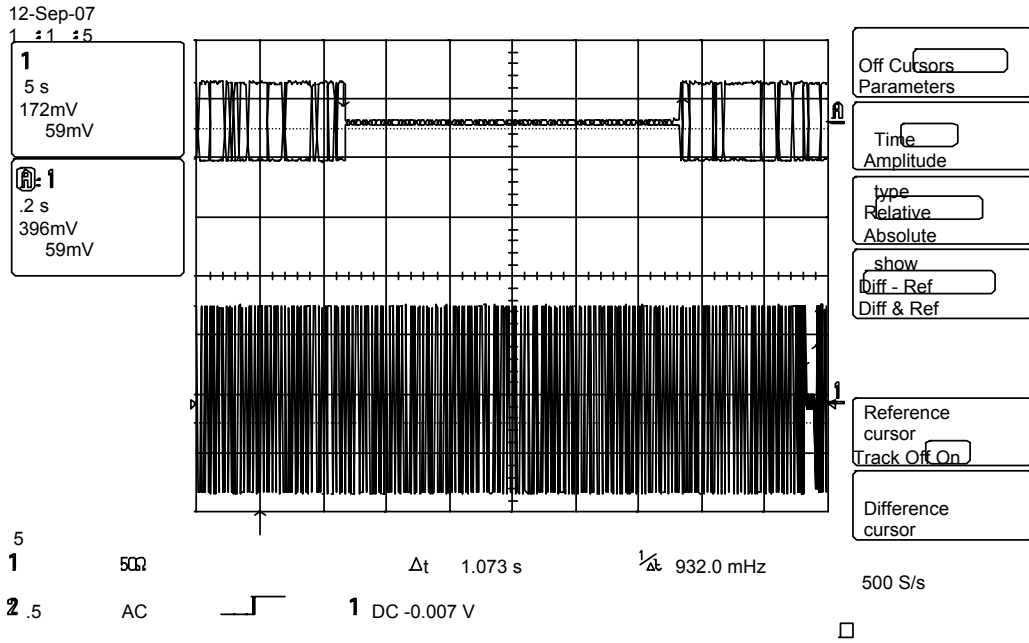
2.37.6 Test Results

| Parameter | Units | Test Results | |
|--|---------|--------------------------|--------------------------|
| | | T _{min} (-20°C) | T _{max} (+55°C) |
| 121.5 MHz transmission interruption duration | seconds | 1.073 | 1.064 |
| 121.5 MHz transmission interruption interval (informative) | seconds | 50.9810 | 46.953 |
| Transmitter Duty Cycle (informative) | % | 97.9 | 97.8 |

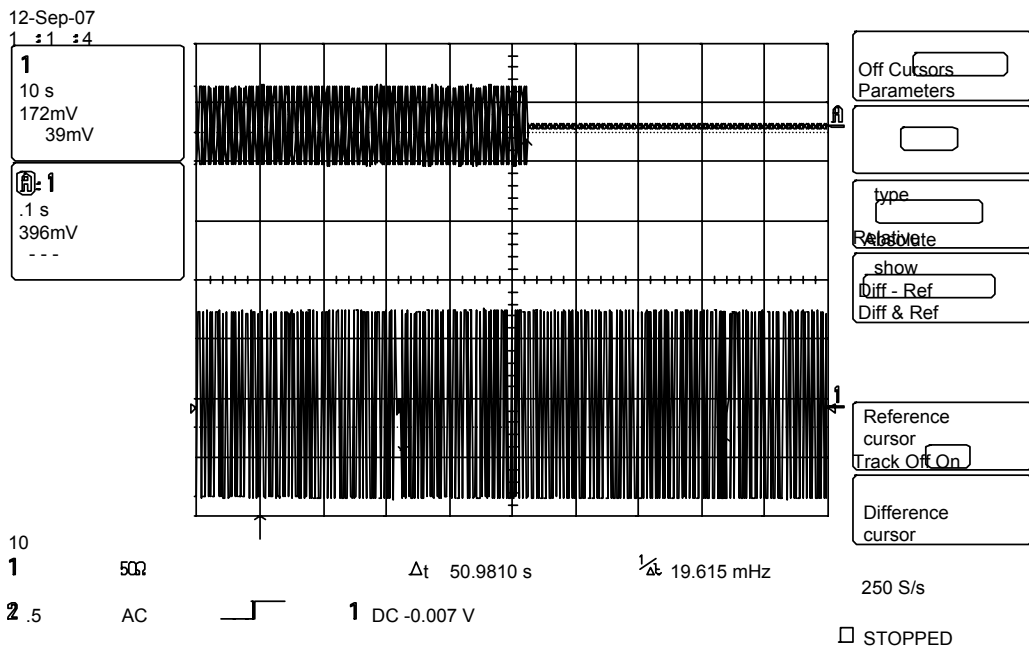
Note: Transmitter Duty Cycle = Transmitter On Time / (Transmitter On Time + Transmitter Off Time)



Product Service



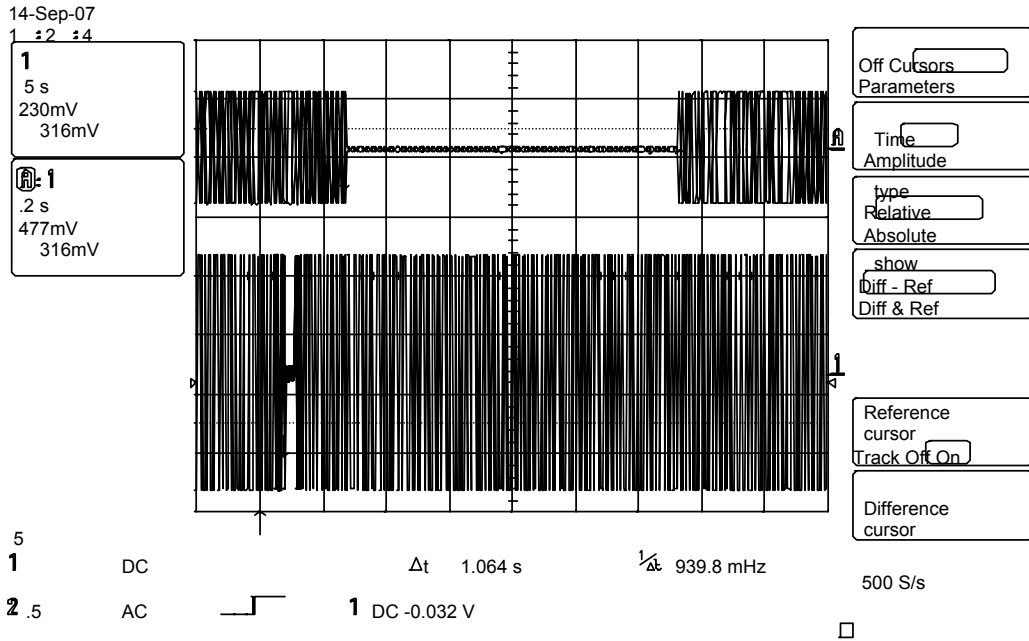
Plot showing 121.5MHz interruption duration (Low Temperature, -20°C)



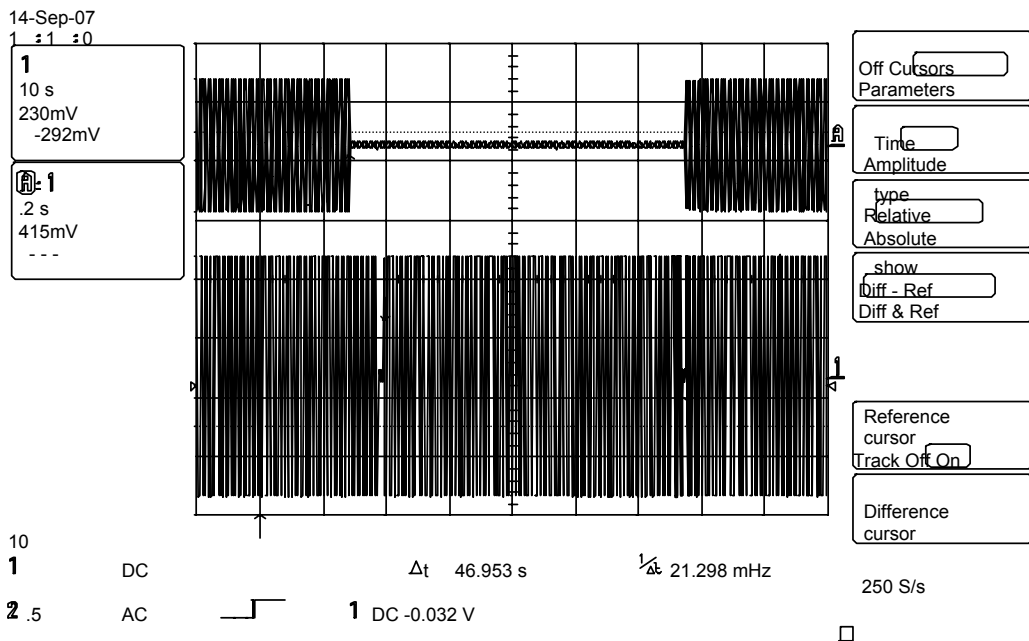
Plot showing 121.5MHz interruption interval (Low Temperature, -20°C)



Product Service



Plot showing 121.5MHz interruption duration (High Temperature, +55°C)



Plot showing 121.5MHz interruption interval (High Temperature, +55°C)



Product Service

2.38 121.5MHZ HOMING DEVICE (MODULATION CHARACTERISTICS - MODULATION FREQUENCY AND SWEEP REPETITION RATE, MODULATION DUTY CYCLE)

2.38.1 Specification Reference

IEC 61097-2: 2002, Clauses D.4.4.1 and D.4.4.2

2.38.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.38.3 Date of Test and Modification State

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

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

2.38.4 Test Equipment Used

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

2.38.5 Test Set-up and Operating Modes

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

2.38.6 Test Results

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

| Parameter | Units | Test Results | |
|-----------------------|-------------------|--------------------------|--------------------------|
| | | T _{min} (-20°C) | T _{max} (+55°C) |
| Frequency Range | Hz | 944.3 | 945.75 |
| Minimum Frequency | Hz | 387.3 | 385.36 |
| Maximum Frequency | Hz | 1331.6 | 1331.1 |
| Sweep Direction | Upward / Downward | Downward | Downward |
| Modulation Duty Cycle | % | 33.61 | 35.73 |
| Sweep repetition rate | sweeps per second | 2.61 | 2.70 |



Product Service

2.39 121.5MHZ HOMING DEVICE (MODULATION CHARACTERISTICS - MODULATION FACTOR)

2.39.1 Specification Reference

IEC 61097-2: 2002, Clauses D.4.4.3

2.39.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.39.3 Date of Test and Modification State

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

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

2.39.4 Test Equipment Used

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

2.39.5 Test Set-up and Operating Modes

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

2.39.6 Test Results

| Parameter | Units | Test Results | |
|-----------------------|-------|--------------------------|--------------------------|
| | | T _{min} (-20°C) | T _{max} (+55°C) |
| A | mv | 456 | 959 |
| B | mv | 31 | 31 |
| Modulation Duty Cycle | % | 87.3 | 93.7 |

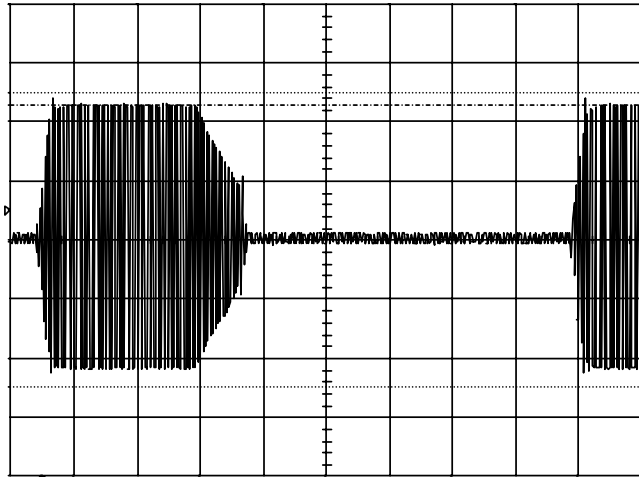
Note: Modulation Factor = (A - B) / (A + B)



13-Sep-07

1 :3 :3

1
.2
200mV
456mV



.2 ms

1 .2 DC

2 .5 AC



1 DC 0.100 V

10 MS/s

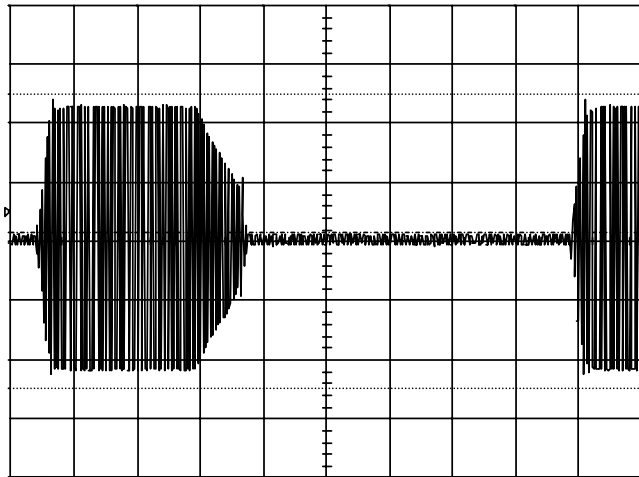


Plot showing "A" (Low Temperature, -20°C)

13-Sep-07

1 :3 :3

1
.2
200mV
31mV



.2 ms

1 .2 DC

2 .5 AC



1 DC 0.100 V

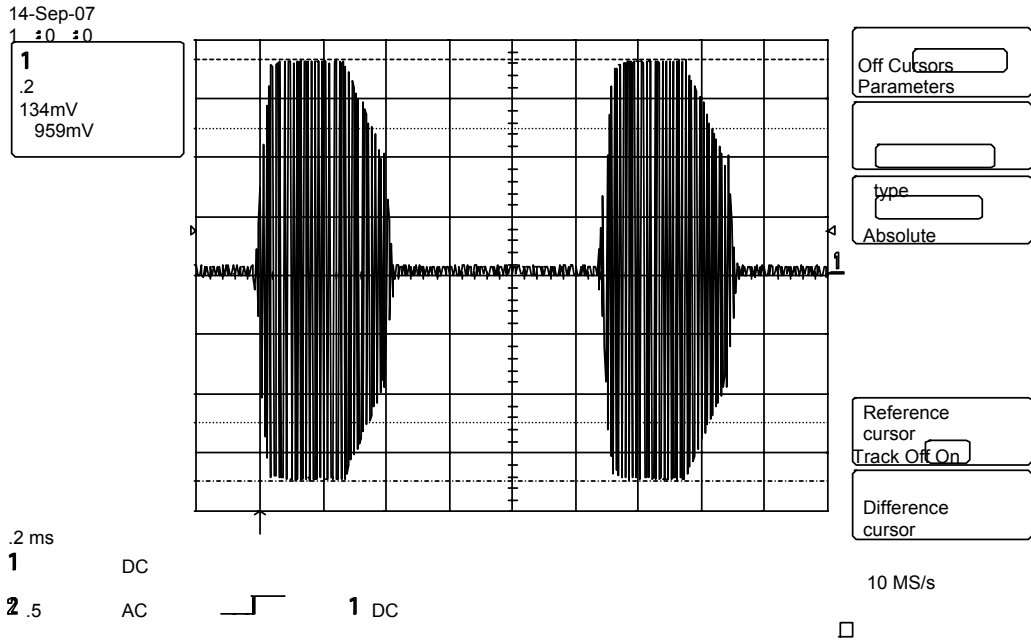
10 MS/s



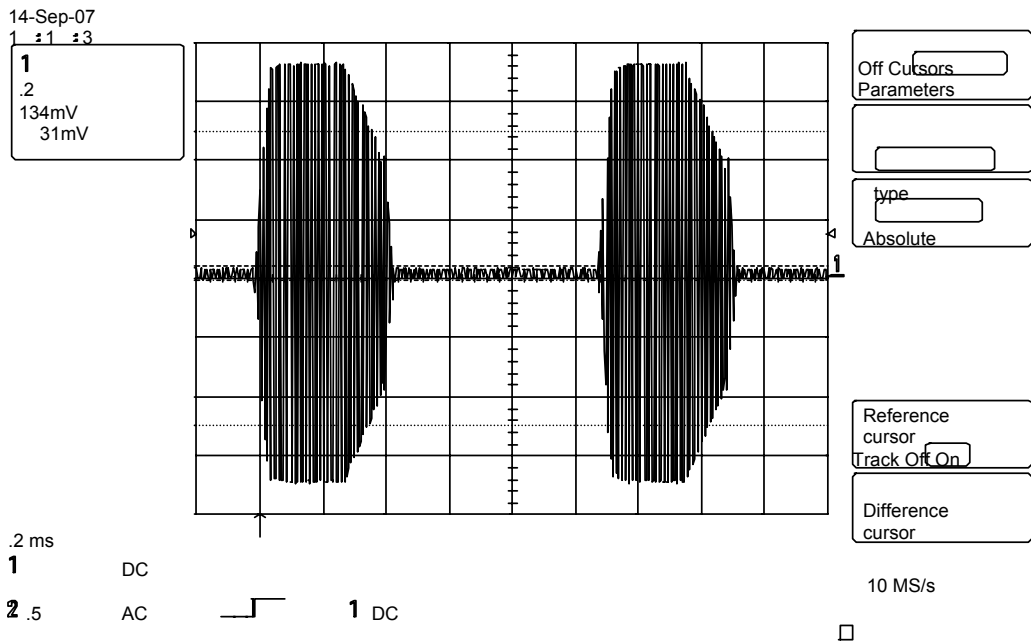
Plot Showing "B" (Low Temperature, -20°C)



Product Service



Plot showing "A" (Low Temperature, +55°C)



Plot Showing "B" (Low Temperature, +55°C)



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|--|----------------------|-------------------|-----------|-----------------|
| Section 2.35 and 2.38, Carrier Frequency and Modulation Characteristics | | | | |
| Climatic Chamber | Heraeus Votsch | VM 04/100 | 85 | O/P Mon |
| Rubidium Frequency Standard | Quartzlock | A10-B | 92 | 22-Dec-2007 |
| Signal Generator | Hewlett Packard | 8644A | 96 | 11-Jan-2008 |
| Beacon RF Unit | TUV | N/A | 97 | TU |
| Attenuator 10dB 25W | Weinschel | 46-10-43 | 400 | 13-Apr-2008 |
| Attenuator (10dB, 10W) | Weinschel | 23-10-34 | 470 | 19-Jun-2008 |
| Attenuator (10dB) | Weinschel | 47-10-34 | 481 | 26-Feb-2008 |
| Load (50ohm, 15W) | Diamond Antenna | DL-30N | 822 | 5-Sep-2008 |
| Climatic Chamber | Unitemp | MINISTRAT | 2129 | 18-Sep-2007 |
| Distress Beacon RF Unit | TUV | | 2445 | TU |
| Beacon RF Unit | TUV | N/A | 3066 | TU |
| Hygrometer | Rotronic | I-1000 | 3068 | 25-Apr-2008 |
| Termination (50ohm, 6W) | Micronde | R404613 | 3074 | 24-Feb-2008 |
| Termination (50ohm, 1W) | Suhner | | 3080 | 24-Feb-2008 |
| Termination (50ohm, 2W) | Omni-Spectra | 3001-6100 | 3081 | 24-Feb-2008 |
| Termination (50ohm, 15W) | Diamond Antenna | DL-30N | 3096 | 16-Mar-2008 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3162 | 19-Jun-2008 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3163 | 30-May-2008 |
| Thermocouple Thermometer | Fluke | 51 | 3172 | 18-Jun-2008 |
| Time Interval Analyser | Yokogawa | TA720 704510 | 3253 | 4-Oct-2007 |
| Scope Corder | Yokogawa | DL750 701210 | 3254 | 9-Oct-2007 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3353 | 18-Apr-2008 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3354 | 18-Apr-2008 |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|--|-----------------|-------------------|-----------|-----------------|
| Section 2.35 and 2.38, Carrier Frequency and Modulation Characteristics (Continued) | | | | |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3356 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3357 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3358 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3359 | 18-Apr-2008 |
| Cable (3m, N-type) | Rhophase | NPS-1601-3000-NPS | 3360 | 18-Apr-2008 |
| Cable (3m, N-type) | Rhophase | NPS-1601-3000-NPS | 3361 | 18-Apr-2008 |
| Section 2.37 and 2.39, Transmitter Duty Cycle and Modulation Factor | | | | |
| Attenuator 10dB 25W | Weinschel | 46-10-43 | 400 | 13-Apr-2008 |
| Attenuator (10dB) | Weinschel | 47-10-34 | 481 | 26-Feb-2008 |
| Sensor Module | Hewlett Packard | 11722A | 1333 | 21-Nov-2007 |
| Climatic Chamber | Unitemp | MINISTRAT | 2129 | 18-Sep-2007 |
| Oscilloscope | Lecroy | 9370 | 2832 | 21-Sep-2007 |
| Hygrometer | Rotronic | I-1000 | 3068 | 25-Apr-2008 |
| Modulation Analyser | Hewlett Packard | 8901B | 3292 | 20-Nov-2007 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3351 | 18-Apr-2008 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3353 | 18-Apr-2008 |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|---|-----------------|-----------------|-----------|-----------------|
| Section 2.14, Battery Capacity At Low Temperature Test | | | | |
| Climatic Chamber | Heraeus Votsch | VMT 04/30 | 40 | O/P Mon |
| Signal Generator | Rohde & Schwarz | SMX | 43 | 10-May-2008 |
| Power Meter | Hewlett Packard | 436A | 47 | 9-Jul-2008 |
| Power Meter | Hewlett Packard | 436A | 83 | 11-Aug-2008 |
| Climatic Chamber | Heraeus Votsch | VM 04/100 | 85 | O/P Mon |
| Rubidium Frequency Standard | Quartzlock | A10-B | 92 | 22-Dec-2007 |
| Signal Generator | Hewlett Packard | 8644A | 96 | 11-Jan-2008 |
| Time Interval Analyser | Yokogawa | TA720 | 181 | 21-Feb-2008 |
| Termination | Diamond Antenna | DL-30N | 187 | 28-Nov-2007 |
| Signal Generator | Hewlett Packard | 8644A | 199 | 11-Jan-2008 |
| Attenuator 10dB 25W | Weinschel | 46-10-43 | 400 | 13-Apr-2008 |
| Attenuator: 10dB/20W | Narda | 766-10 | 480 | 13-Jul-2007 |
| Power Meter | Hewlett Packard | 436A | 751 | 12-Sep-2007 |
| Spectrum Analyser | Hewlett Packard | E4407B | 1154 | 19-Jul-2008 |
| Signal Generator | Hewlett Packard | 3336C | 1185 | 17-Jul-2007 |
| Signal Generator | Hewlett Packard | 3336C | 1189 | 19-Jul-2008 |
| Filter, Broadband | Texscan | 8BC-134-67-3-BB | 1241 | TU |
| Power Sensor | Hewlett Packard | 8482A | 1341 | 4-Oct-2007 |
| Distress Beacon RF Unit | TUV | | 2445 | TU |
| Multimeter | Hewlett Packard | 3478A | 2758 | 21-Jul-2007 |
| Beacon RF Unit | TUV | N/A | 3066 | TU |
| Hygrometer | Rotronic | I-1000 | 3068 | 25-Apr-2008 |
| Termination (50ohm, 6W) | Micronde | R404613 | 3074 | 24-Feb-2008 |
| Termination (50ohm, 1W) | Suhner | | 3080 | 24-Feb-2008 |
| Termination (50ohm, 2W) | Omni-Spectra | 3001-6100 | 3081 | 24-Feb-2008 |
| Termination (50ohm, 15W) | Diamond Antenna | DL-30N | 3097 | 16-Mar-2008 |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|---|----------------------|---|-----------|-----------------|
| Section 2.14, Battery Capacity At Low Temperature Test (Continued) | | | | |
| Termination (50ohm, 15W) | Diamond Antenna | DL-30N | 3098 | 16-Mar-2008 |
| Attenuator (20dB, 10W) | Aeroflex / Weinschel | 23-20-34 | 3158 | 1-Jun-2007 |
| Attenuator (20dB, 10W) | Aeroflex / Weinschel | 23-20-34 | 3159 | 30-May-2008 |
| Attenuator (20dB, 10W) | Aeroflex / Weinschel | 23-20-34 | 3160 | 30-May-2008 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3161 | 30-May-2008 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3162 | 19-Jun-2008 |
| Thermocouple Thermometer | Fluke | 51 | 3172 | 18-Jun-2008 |
| Bandpass Filter | Trilithic | 5BE406/35-1-AA | 3205 | 28-Jul-2008 |
| Bandpass Filter | Trilithic | 5BE406/35-1-AA | 3207 | O/P Mon |
| Time Interval Analyser | Yokogawa | TA720 704510 | 3253 | 6-Nov-2008 |
| Scope Corder | Yokogawa | DL750 701210 | 3254 | 6-Nov-2008 |
| 8 Channel Datalogger + Terminal Board | Pico Technology Ltd | ADC-16 | 3287 | 13-Nov-2007 |
| Power Sensor | Agilent | 8482A | 3290 | 14-Nov-2007 |
| Resistor (Nominal 0.25ohm) | TUV | 2x RS Components 188-071, R5/100W Resistors | 3343 | TU |
| ESA-E Series Spectrum Analyser | Agilent | E4402B | 3348 | 16-Apr-2008 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3351 | 18-Apr-2008 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3353 | 18-Apr-2008 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3354 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3356 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3358 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3359 | 18-Apr-2008 |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|---|----------------------|-------------------|-----------|-----------------|
| Section 2.14, Battery Capacity At Low Temperature Test (Continued) | | | | |
| Cable (3m, N-type) | Rhophase | NPS-1601-3000-NPS | 3360 | 18-Apr-2008 |
| Cable (3m, N-type) | Rhophase | NPS-1601-3000-NPS | 3361 | 18-Apr-2008 |
| Section 2.18, Self Test | | | | |
| Climatic Chamber | Heraeus Votsch | VMT 04/30 | 40 | O/P Mon |
| Beacon Tester | WS Technologies | BT 100S | 87 | TU |
| Rubidium Frequency Standard | Quartzlock | A10-B | 92 | 22-Dec-2007 |
| Signal Generator | Hewlett Packard | 8644A | 96 | 11-Jan-2008 |
| Climatic Chamber | Unitemp | MINISTRAT | 2129 | 18-Sep-2007 |
| Stop Clock | R.S Components | RS328 061 | 2674 | TU |
| Beacon RF Unit | TUV | N/A | 3066 | TU |
| Hygrometer | Rotronic | I-1000 | 3068 | 25-Apr-2008 |
| Termination (50ohm, 6W) | Micronde | R404613 | 3074 | 24-Feb-2008 |
| Attenuator (20dB, 75W) | Bird | 8308-200 | 3076 | 26-Feb-2008 |
| Attenuator (20dB, 10W) | Aeroflex / Weinschel | 23-20-34 | 3160 | 30-May-2008 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3162 | 19-Jun-2008 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3163 | 30-May-2008 |
| Thermocouple Thermometer | Fluke | 51 | 3172 | 18-Jun-2008 |
| Bandpass filter | Trilithic | 5BE406/35-1-AA | 3206 | 28-Jul-2008 |
| Bandpass Filter | Trilithic | 5BE406/35-1-AA | 3207 | O/P Mon |
| Time Interval Analyser | Yokogawa | TA720 704510 | 3253 | 4-Oct-2007 |
| Scope Corder | Yokogawa | DL750 701210 | 3254 | 9-Oct-2007 |
| Cable (1m, N Type) | Rhophase | NPS-1601-1000-NPS | 3354 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3355 | 18-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3359 | 18-Apr-2008 |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|--|----------------------|-------------------|-----------|-----------------|
| Section 2.11, Spurious Emissions | | | | |
| Climatic Chamber | Heraeus Votsch | VM 04/100 | 85 | O/P Mon |
| Spectrum Analyser | Hewlett Packard | E4407B | 1154 | 31-May-2007 |
| Attenuator (20dB, 10W) | Aeroflex / Weinschel | 23-20-34 | 3158 | 30-May-2008 |
| Attenuator (20dB, 10W) | Aeroflex / Weinschel | 23-20-34 | 3159 | 1-Jun-2007 |
| Attenuator (3dB, 20W) | Aeroflex / Weinschel | 23-3-34 | 3163 | 1-Jun-2007 |
| Thermocouple Thermometer | Fluke | 51 | 3172 | 18-Jun-2008 |
| Bandpass Filter | Trilithic | 5BE406/35-1-AA | 3207 | O/P Mon |
| ESA-E Series Spectrum Analyser | Agilent | E4402B | 3348 | 16-Apr-2008 |
| Cable (2m, N Type) | Rhophase | NPS-1601-2000-NPS | 3356 | 18-Apr-2008 |
| Section 2.7, Drop (On Hard Surface) | | | | |
| Climatic Chamber | Unitemp | MINISTRAT | 2129 | 18-Sep-2007 |
| Tape Measure | Stanley | | 2276 | TU |
| Hardwood Block | Unknown | ELM | 2650 | TU |
| Section 2.9, Thermal Shock | | | | |
| Climatic Chamber | Heraeus Votsch | VM 04/100 | 85 | O/P Mon |
| Thermocouple Thermometer | Fluke | 51 | 3172 | 18-Jun-2008 |
| Timer | Radio Spares | 427-590 | 3281 | TU |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|---|----------------------|------------|-----------|-----------------|
| Section 2.4, Vibration - Sine | | | | |
| Charge Amplifier | Endevco | 133 | 2506 | 28-Sep-2007 |
| Vibration Controller | Hewlett Packard | E1434A | 2507 | 2-Mar-2007 |
| Vibration System | Ling Dynamic Systems | LAS V964 | 2515 | 1-May-2007 |
| Charge Amplifier | Endevco | 133 | 2725 | 6-Jul-2007 |
| Isotron Accelerometer | Endevco | 256-10 | 3111 | 05-Sep-2007 |
| Isotron Accelerometer | Endevco | 256-10 | 3113 | 06-Sep-2007 |
| Isotron Accelerometer | Endevco | 256-10 | 3114 | 05-Sep-2007 |
| Isotron Accelerometer | Endevco | 256-10 | 3119 | 15-Feb-2008 |
| Section 2.36, 121.5MHz Homing Device (Peak Effective Radiated Power) | | | | |
| Antenna, (Tuned Dipole Set) | Roberts Antenna | A-100 | 569 | TU |
| Spectrum Analyser | Hewlett Packard | 8568B | 571 | 4-Jan-2008 |
| Signal Generator | Rohde & Schwarz | SMS-2/28 | 1431 | 2-May-2008 |
| Antenna Mast | EMCO | 1050 | 1707 | TU |
| Turntable Controller | Various | RH253 | 1708 | TU |
| Open Area Site 2 | TUV | OATS2 | 1850 | 3-Oct-2008 |
| Antenna Tower 6M | EMCO | 1050 | 1859 | TU |
| Roberts Antenna 406MHz | Compliance Design | - | 1860 | 29-Jun-2009 |
| Roberts Antenna 406MHz | Compliance Design | - | 1861 | 12-Sep-2007 |
| Test Receiver | Rohde & Schwarz | ESIB40 | 2941 | 19-Oct-2008 |
| Section 2.2, Dry Heat Test | | | | |
| Temperature Chamber | Instron | 906 | 2128 | 7-Dec-2007 |
| Section 2.3, Damp Heat Test | | | | |
| Climatic Chamber | Climatec | CLIMATEC 3 | 2846 | 18-Apr-2007 |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|---|-----------------|-----------------|-----------|-----------------|
| Section 2.20, Stability And Buoyancy | | | | |
| Beacon Tester | WS Technologies | BT 100S | 87 | TU |
| Digital Force Gauge (500N) | TWL | AFG4 | 2971 | 16-Nov-2007 |
| ESA-E Series Spectrum Analyser | Agilent | E4402B | 3348 | 16-Apr-2008 |
| Section 2.22, Compass Safe Distance | | | | |
| Sussex Helmholtz Coil | Various | 88771 | 327 | TU |
| Power Supply Unit | Hewlett Packard | 6253A | 614 | TU |
| Magnetometer | Bartington | MAG01 | 671 | 4-Jul-2008 |
| Multimeter | Fluke | 87 | 1427 | 12-Mar-2008 |
| Marine Binacle Compass with Azimuth Circle | Cassens & Plath | Type 11 | 3331 | 1-Jun-2009 |
| Section 2.34, Electrostatic Discharges | | | | |
| Spectrum Analyser | Hewlett Packard | 8562A | 14 | 9-Jun-2008 |
| Beacon Tester | WS Technologies | BT 100S | 87 | TU |
| Conducted Immunity Test System | Schaffner | BEST EMC | 1935 | 21-Sep-2008 |
| Multimeter | Iso-tech | Iso Tech IDM101 | 2423 | 13-Aug-2008 |
| ESD Simulator | Schaffner | BEST ESD | 2942 | 22-Aug-2008 |
| Section 2.8, Drop (In Water) | | | | |
| Beacon Tester | WS Technologies | BT 100S | 87 | TU |
| Tape Measure | Stanley | DYNAGRIP 5M/16 | 2741 | TU |
| Section 2.27, Magnetic Emissions | | | | |
| Spectrum Analyser | Hewlett Packard | 8542E | 18 | 9-Feb-2008 |
| Antenna (Active Loop, 9kHz-30MHz) | Rohde & Schwarz | HFH2-Z2 | 333 | 22-Jun-2008 |
| Mast Controller | Inn-Co GmbH | CO 1000 | 1606 | TU |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|---|-----------------|-------------------------------------|-----------|-----------------|
| Section 2.26, Radiated Emissions | | | | |
| Spectrum Analyser | Hewlett Packard | 8542E | 18 | 9-Feb-2008 |
| Antenna (Bilog) | Schaffner | CBL6143 | 287 | 13-Jan-2008 |
| Screened Room (5) | Rainford | Rainford | 1545 | 1-Mar-2008 |
| Mast Controller | Inn-Co GmbH | CO 1000 | 1606 | TU |
| Turntable/Mast Controller | EMCO | 2090 | 1607 | TU |
| Signal Generator | Marconi | 2031 | 1845 | 16-Oct-2008 |
| Filter (Hi Pass) | Mini-Circuits | NHP-800 | 2842 | 31-Oct-2008 |
| Antenna (Bilog) | Chase | CBL6143 | 2904 | 24-Nov-2007 |
| Antenna (Biconnical) | Schaffner | VBA6106A | 3106 | 3-Apr-2008 |
| Tunable Notch Filter | Wainwright | WRCD 400.0/500.0- 0.1/50-6EEK | 3427 | TU |
| Section 2.29, Radiated Immunity | | | | |
| Signal Generator 10kHz to 2.7GHz | Marconi | 2031 | 19 | 3-Jan-2008 |
| Beacon Tester | WS Technologies | BT 100S | 87 | TU |
| Load (50ohm/15W) | Diamond Antenna | DL-30N | 219 | 5-Sep-2008 |
| Load | Diamond Antenna | DL-30N | 220 | 5-Sep-2008 |
| Amplifier (0.8GHz-2.2GHz) | MILMEGA | ASO822-30L | 258 | 27-Oct-2008 |
| Isotropic Field Monitor | Amp Research | FM1000 | 260 | TU |
| Multimeter | Rohde & Schwarz | URV-5 | 261 | TU |
| Signal Generator | Marconi | 2031 | 262 | 28-Aug-2008 |
| Sensor (10V) | Rohde & Schwarz | URV5-Z2 | 274 | TU |
| Load (50ohm, 30W) | Weinschel | 50T-054 | 275 | TU |
| Load (50ohm, 30W) | Weinschel | 50T-054 | 276 | TU |
| Millivoltmeter | Rohde & Schwarz | URV-5 | 281 | TU |
| Sensor (10V) | Rohde & Schwarz | URV-Z2 | 282 | TU |
| Directional Coupler | Amp Research | DC6180 | 283 | TU |



| Instrument | Manufacturer | Type No | TE Number | Calibration Due |
|--|------------------|--------------|-----------|---|
| Section 2.29, Radiated Immunity (Continued) | | | | |
| Antenna | Schaffner | CLB 6143 | 322 | TU |
| Spectrum Analyser | Hewlett Packard | 8590B | 772 | TU |
| CW TWT (1-2.5GHz) | Thorn | PTC6341 | 2069 | TU |
| Laser Powered Electric Field Sensor | Dare Development | RadiSense IV | 2148 | 29-Nov-2007 |
| Directional Coupler | Amp Research | DC6180 | 2763 | TU |
| RF Power Amplifier | Amp Research | 250W1000A | 2844 | 27-Oct-2008 |
| Amplifier (250W, 80MHz - 1GHz) | Amp Research | 250W1000A | 3029 | 27-Oct-2008 |
| Section 2.6 Climatic - Corrosion | | | | |
| WEISS TECHNIK (T) | Weiss Technik | SALT MIST | 2121 | OP MON |
| Balance | Geniweigher | GM-11K | 2334 | 15/03/2007 (Used at the beginning of the test when still calibrated) |
| PM METER | Unknown | | 2335 | TU |
| Thermometer | Digitron | 2098T | 2347 | 27/09/2007 |
| Balance | Sartorius | HK160 | 2678 | 15/03/2007 (Used at the beginning of the test when still calibrated) |
| Measuring cylinder | Unknown | 50mL | 3136 | TU |

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment



Product Service

SECTION 4

PHOTOGRAPHS



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Equipment Under Test, Sample Serial Number 003



View of EUT (Serial Number 003) in release mechanism



Product Service

SECTION 5

DISCLAIMERS AND COPYRIGHT



Product Service

5.1 DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

This report must not be reproduced, except in its entirety, without the written permission of
TÜV Product Service Limited

© 2008 TÜV Product Service Limited



Product Service

ANNEX A

CUSTOMER SUPPLIED INFORMATION



Product Service

Similarity of Variants

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



TUV Product Service Ltd
Octagon House, Concorde Way, Segensworth
North, Fareham, Hampshire
PO15 5RL
United Kingdom

Tjodalyng: 07.01.2008

Tron 40S MkII and Tron 40GPS MkII

The Tron 40S MkII and Tron 40GPS MkII use the same housing, battery pack, boards, software, brackets and technical manual.

The difference between the Tron 40S MkII and the Tron 40GPS MkII is the GPS module, the GPS patch antenna and the Users manual.

The GPS module and the GPS patch antenna are mounted on each side of the Main Board for the Tron 40GPS MkII.

Eirik Storjordet
Certification Manager

DNB Nor Bank ASA | 0021 Oslo | Norway | Bank account: 24400508514 | IBAN: NO6624400508514 | BIC: DNBNOKK | Reg.no.: NO917713324 MVA
QA Certificate: NS-EN ISO 9001:2000

www.jotron.com

Jotron AS
P.O. Box 54 | NO-3280 Tjodalyng | Norway

Tel: +47 33 13 97 00
Fax: +47 33 12 67 80



Hardware Modification Information

| | | |
|--|----------|-----------|
| | Selftest | Number |
| | 40S MkII | Page 1(1) |

Problem:

The beacon failed with error message "low power 121.5" in selftest at -20°C. Det beacon had no error message at selftest in 20°C.

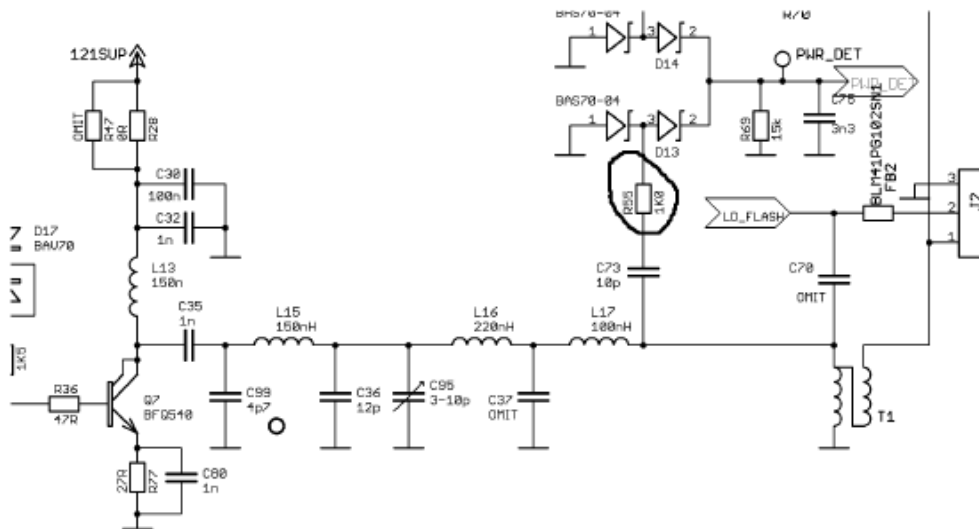
Reason:

The 121.5 MHz signal is rectified through a resistor R55. The rectified signal was too low/ or on edge, to be detected as a "OK" in selftest.

Change:

At the visit at TUV 11. Sept 07, this resistor R55 was changed from 1K5 to 1K0 to increase the rectified signal. This change does not affect other parameters in the beacon.

Figure 1 – Shows the 121.5 outputstage with the rectifier for the power detect:



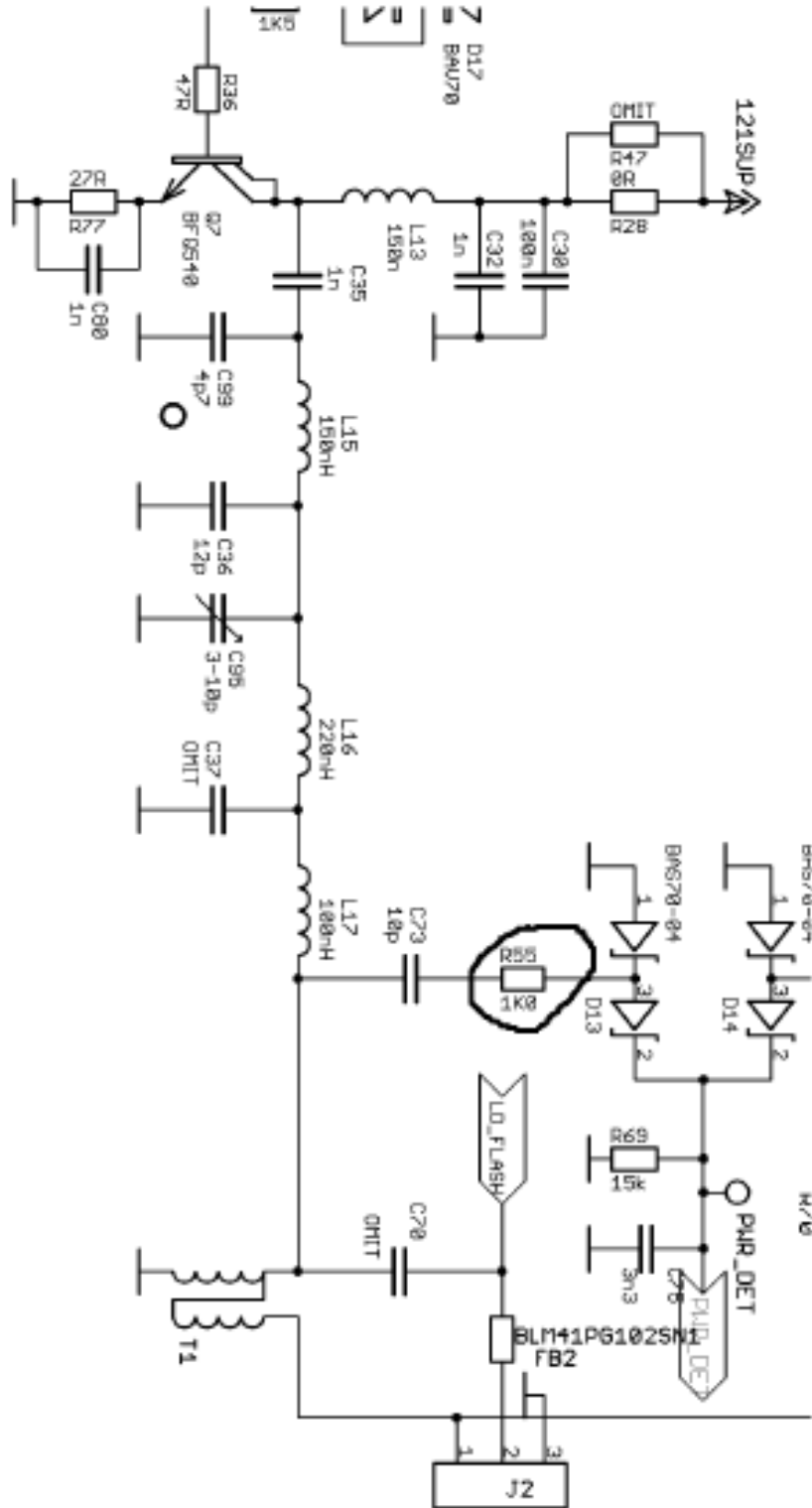
Author: Arne Fredriksen

3707

13. Sept 07




Modification Information (Detail of Schematic, Above)





Information On Previous Testing (Immersion Test)

| | | |
|---|--------------------|---------------|
|  | Test Report | Version A |
| 15.11.05 | Tron S-VDR CAPSULE | Page 23 of 39 |

3.8 Leakage And Immersion test

3.8.1 Test specifications and sequence

IEC 61097-2 ed.2 Section A1.7 (5.13.8)

3.8.2 Test program

A hydraulic pressure of 100kPa (1 bar) shall be applied to the EUT for a period of 5 min. At the end of the test the EUT shall be subjected to a performance check, and shall then be examined for damage and for unwanted ingress of water. The findings shall be noted in the test report. Following examination, the EUT shall be resealed in accordance with the manufacturer's instructions. Alternatively, if there are no external signs of unwanted ingress of water, an internal examination, which involves disturbance to seals, may be carried out after all environmental tests have been completed. (Section 8.9.2 of EN 60945 ed.4).

3.8.3 Equipment under test

Name : Tron S-VDR CAPSULE
Ser. Nr: 100AA102

3.8.4 Test site

Sandefjord, Torøya

3.8.5 Test Equipment

Tron Dec, Cospas Sarsat test unit
15 meters of rope
5 kg. weight



3.8.6 Test result

Passed

3.8.7 Description of the test

To achieve a pressure of 1 bar, we lowered the EUT down to 10-meter depth using a rope and a 4 kg. weight. The EUT stayed at 10m for 5 minutes.

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



Product Service

| | | |
|---|--------------------------|---------------------|
| | <p>Test Report</p> | <p>Version D</p> |
| <p>M:\03_Development\Project_Design\ TRON_40SMKII&60S_200503\Admin \Approval\Jotron Tests</p> | <p>Tron 40S/GPS MkII</p> | <p>Page 2 of 10</p> |

LIST OF CONTENTS

1. Strobe Light tests 3

 1.1 Test specifications and sequence 3

 1.2 Test program 3

 1.3 Equipment under test 3

 1.4 Test site 3

 1.5 Test Equipment 4

 1.6 Description of light test 4

 1.6.1 Conclusion 4

 1.7 Test Jig drawings 5

 1.8 Test Jig pictures 6

 1.9 Calibration certificate 7

 1.10 Light test 9

 1.10.1 Flash rate 9

 1.10.2 Test results 9

 1.11 Test summary 10



Product Service

| | | |
|---|--|---|
| | <h1 style="text-align: center;">Test Report</h1> | <h2 style="text-align: center;">Version D</h2> |
| <small>M:\03_Development\Project_Design\ TRON_40SMkII&60S_200503\Admin \Approval\Jotron Tests</small> | <h3 style="text-align: center;">Tron 40S/GPS MkII</h3> | <h3 style="text-align: center;">Page 3 of 10</h3> |

1. STROBE LIGHT TESTS

1.1 Test specifications and sequence

The effective luminous intensity shall be at least an arithmetic mean of 0.5 cd over the entire upper hemisphere as determined below. The flash rate shall be 20 to 30 times per minute. The flash duration shall be between 10^{-6} s and 10^{-1} s.

The effective luminous intensity shall be measured at 49 points over the upper hemisphere of the satellite EPIRB. The satellite EPIRB shall be floated in a container of fresh water to determine its waterline, which shall then be marked on the body of the satellite EPIRB and used as the baseline for the following tests. The effective luminous intensity shall be measured in accordance with the following table. The arithmetic mean effective luminous intensity of all 49 points shall be at least 0,50 cd. No points shall have an effective luminous intensity of less than 0.2cd.

1.2 Test program

The effective luminous intensity, flash duration and flash rate shall be checked at the normal temperature and at the extreme temperatures. The effective luminous intensity shall be defined by the following formula as indicated in IMO Resolution MSC.81(70) – Testing of life-saving appliances, 10.4.9:

$$\frac{\int_{t_1}^{t_2} i \cdot dt}{0,2 + (t_2 - t_1)}$$

For 50msec pulse (t2-t1)=0,05

where

i is the instantaneous intensity;

0,2 is the Blondel-Rey constant;

$t_2 - t_1$ are the time limits of integration in seconds at which the intensity is i or greater.

$$\frac{\int_{t_1}^{t_2} i \cdot dt}{0,25} = 4 \int_{t_1}^{t_2} i \cdot dt$$

1.3 Equipment under test

Name : Tron 40GPS MkII

Ser. Nr: 001

1.4 Test site

Jotron AS, New lab.



Product Service

| | | |
|---|--------------------------|---------------------|
| | <p>Test Report</p> | <p>Version D</p> |
| <p>M:\03_Development\Project_Design\TRON_40SMkII&60S_200503\Admin\Approval\Jotron Tests</p> | <p>Tron 40S/GPS MkII</p> | <p>Page 4 of 10</p> |

1.5 Test Equipment

IL 1700 Light measuring equipment with calibration certificates.
 SED033 sensor with type Y filter and type L30 lens.

1.6 Description of light test

The test site was covered inside with black textiles and the light measure equipment was mounted. The calibration factor for lux measurement was installed in the IL 1700.

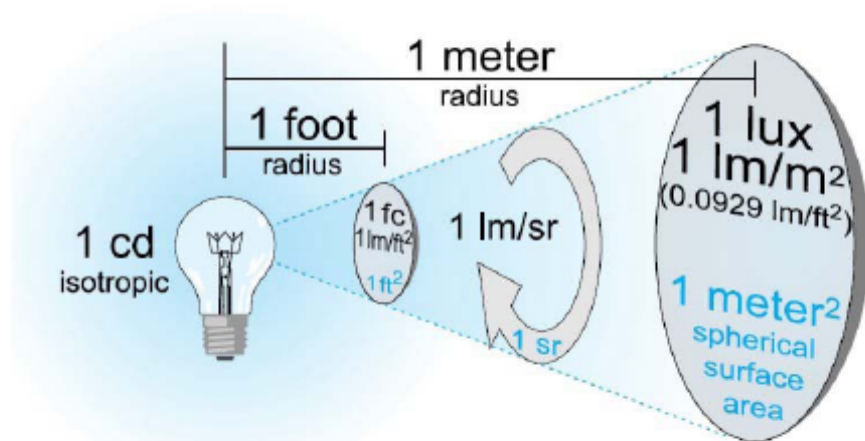


Figure 1.6 The relation between the units

From this relation we can conclude that if we use a distance of 1 meter between the sensor and the light source, 1 lux is equivalent to 1 candela. The pulse width is 50ms.

1.6.1 Conclusion

The light source of the EUT is to be placed 1 meter from the sensor. The IL 1700 is set to zero point the background lightning and to measure integrated light. The integrated light can then be measured during 4 pulses, and the final value will be directly in candela.

The Tron 40S MkII and Tron 40GPS MkII are 100% identical related to this test, so the test results are valid for both units.

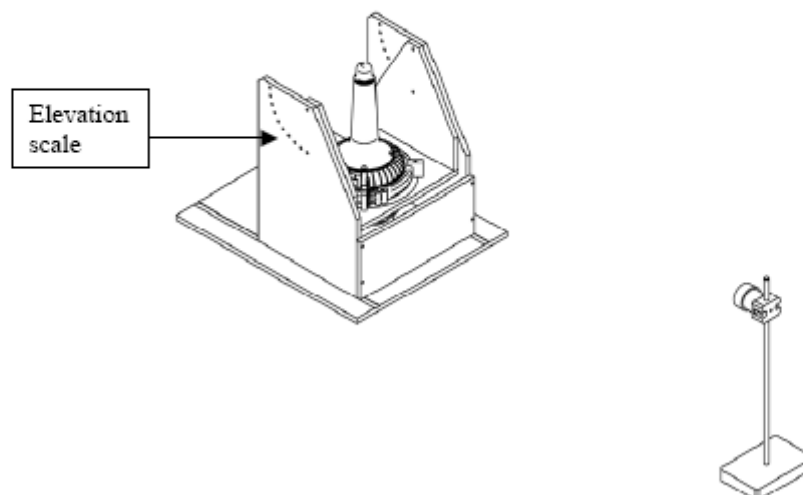
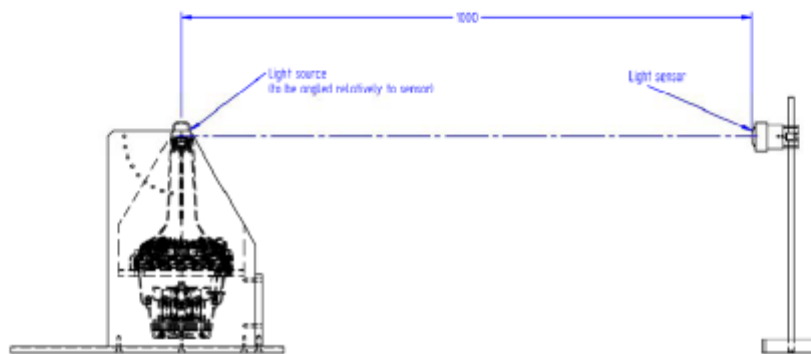


Product Service

| | | |
|---|--------------------------|---------------------|
| | <p>Test Report</p> | <p>Version D</p> |
| <p>M:\03_Development\Project_Design\ TRON_40SMKII&60S_200503\Admin \Approval\Jotron Tests</p> | <p>Tron 40S/GPS MkII</p> | <p>Page 5 of 10</p> |

1.7 Test Jig drawings

The EPIRB can be set to the right elevation and rotated to the right azimuth.





Product Service

| | | |
|---|--------------------------|---------------------|
| | <p>Test Report</p> | <p>Version D</p> |
| <p>M:\03_Development\Project_Design\ TRON_40SMKII&60S_200503\Admin \Approval\Jotron Tests</p> | <p>Tron 40S/GPS MkII</p> | <p>Page 6 of 10</p> |

1.8 Test Jig pictures

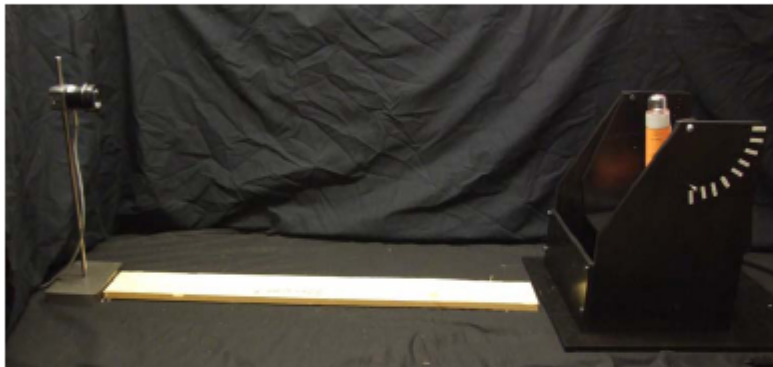


Figure 1.8a Showing test jig and light sensor with lens and a measure stick



Figure 1.8b Front of IL 1700

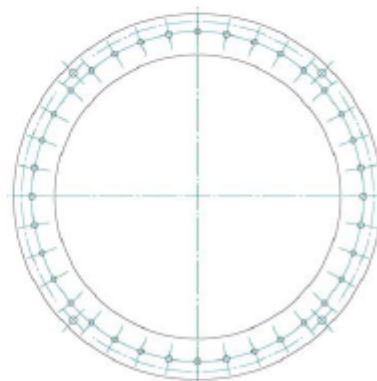


Figure 1.8c Azimuth scale



Product Service

| | | |
|---|--------------------|------------------|
| | Test Report | Version D |
| M:\03_Development\Project_Design\TRON_40SMKI&60S_200503\Admin\Approval\Jotron Tests | Tron 40S/GPS MkII | Page 7 of 10 |

1.9 Calibration certificate

Kalibreringsbevis
Certificate of calibration



| | | | | |
|---|--|---|--|-----------------------------|
| Oppdragsgiver / Client Jotron AS KIRKESTIEN 1 3280 TJODALYNG | | Utførende enhet/lab. / Department / laboratory responsible Teknologisk Institutt as Postboks 1019 3601 KONGSBERG | | |
| Bevisnr. / Certificate no. 07-047546 | Kalibreringsdato / Date of calibration 21.11.07 | Utskriftsdato / Date of print 22.11.2007 | Sider / Antall sider / Page no. / No. of pages 1 av 2 | |
| Kalibrert utstyr / Calibrated equipment • Tils objektID / T's obj. ID 423565 • Kundens ID / Clients ID JE-41.5 • Serienr. / Serial no. 4651 • Objekt / Object Radiometer • Fabrikat / Manufacturer InternationalLight • Modell / Model IL1700 | | Kalibrert av / Calibrated by Arne Figenschou <i>Arne Figenschou</i> | | |
| Kalibreringsprosedyre / Calibration procedure • Status / Status • Temperatur og fuktighet / Temperature and humidity • Anbefalt ny kalibrering / Recommended new calibr. | | LP 4007 Kal. uten justering / Cal. without adjustments 23°C±3°, <70% RH 22.11.08 | | |
| Kalibreringsnormer / Calibration standards | | | | |
| Objekt ID / Object ID | Objekt / Object | Fabrikkat / Manufacturer | Objekttype / Object type | Neste kalib. / Next calibr. |
| 406067 | Research Radiometer | International Light | IL1700 | 06.2008 |
| 406069 | Detector / Filter | International Light | SED033/Y/W | 06.2008 |
| Merknader / Comments Kalibrering er utført som kompareringsmåling mot identisk primær referanse og vil ikke erstatte InternationalLight kalibrering av Radiometeret. | | | | |

Instrumentet er kalibrert i henhold til dokumentert prosedyre som kan forevises på forespørsel, og mot måleenheter som er spesifisert til nasjonale eller internasjonale normer.

This instrument is calibrated according to documented procedure which will be explained upon request, and against measuring norms traceable to national or international standards.

Teknologisk Institutt as

| | | | | | | |
|---|---|--|--|---|--|---|
| Korsettsveien 2HC Pb 2008 SL, Hordaland, NO-0131 Oslo Tlf +47 32 86 50 00 Faks +47 32 33 16 01 | Kongsberg Hveringspark Pb 1070, NO-3601 Kongsberg Tlf +47 32 24 87 00 Faks +47 32 24 87 37 | Hillevikveien 19 NO-4014 Stavanger Tlf +47 51 60 02 16 Faks +47 51 60 02 18 | Fysloben Apsalon Pb 23, NO-5046 Jægersås Tlf +47 56 22 78 40 Faks +47 56 31 22 51 | Tranemoen 1 Pb 44, NO-8411 Ledingen Tlf +47 99 22 79 00 Faks +47 75 91 93 94 | Karlsen Industripark Pb 163, NO-3821 Raufoss Tlf +47 81 15 44 29 Faks +47 81 15 36 35 | Firmaportal@teknologisk.no www.teknologisk.no Org. nr. NO 140 680 |
|---|---|--|--|---|--|---|



Product Service

| | | |
|--|-------------------|--------------|
| | Test Report | Version D |
| M:\03_Development\Project_Design\TRON_40SMKII&60S_200503\Admin\Approval\Jotron Tests | Tron 40S/GPS MkII | Page 8 of 10 |

Kalibreringsbevis

Certificate of calibration

Bevisnr. Certificate no.
07-047546
Side Page 2 av of 2.
Date Date 22.11.2007



Måleprotokoll fra kalibrering

Kalibrering av: Radiometer
 TT's objekt ID: 423565
 Fabrikat: InternationalLight
 Modell: IL1700 Research Radiometer
 Serie nr.: 4651
 Detector: SED033 #8237
 Filter: Y #28008
 Input Optic: L30 #293

Utførelse:

Kompareringsmåling mot TT's referans Radiometer
 Primer standard Radiometer benyttet ved komparering er identisk med InternationalLight IL1700

Radiometerets detektor er kalibrert mot hvittlysreferanse ved rett lysinnfall.
 Til kalibrering benyttes Tungsten Halogen glødelampe med fargetemperatur 3000K ±3%
 Referansedetektor er cosinus korrigeret for rett lysinnfall med størst spektral følsomhet
 ved 555 nm i henhold til CIE V λ Photopic Standard.

Radiometer er avlest i lux med innstillinger likt iht InternationalLight kalibreringssertifikat pr. 22-Jun-05.
 (YIS) Photopic illuminance response sensitivity factor: 1.342E-07 (A) (lux-1)
 IL1700 +5V Bias: Off

Måleresultat ved komparering:

| Nominell måleverdi Illuminans lux | Avlest Radiometer lux | Målt differanse | |
|--------------------------------------|--------------------------|-----------------|---|
| | | lux | % |
| 280 | 280 | 0 | 0 |
| 410 | 420 | 10 | 2 |
| 780 | 820 | 40 | 5 |
| 1130 | 1200 | 70 | 6 |
| 2000 | 2100 | 100 | 5 |
| 3000 | 3000 | 0 | 0 |

Status

Radiometer viser god overenstemmelse ved komparering mot tilsvarende instrument.

Beregnet måleusikkerhet:

≤ ± 6% ved dekningsfaktor k=2

Måleusikkerhet er utvidet da Input Optic Lens L30 #293 er en High Gain Lens med ±8 grader synsfelt og referanse detektor det kompareres mot er av type Wide Eye Diffuser med relativ spasiel rominnsyn respons på ±30 grader.

Sporbarhet:

NIST, U.S. National Institute of Standards and Technology



Product Service

| | | |
|---|--------------------|------------------|
| | Test Report | Version D |
| M:\03_Development\Project_Design\ TRON_40SMKII&60S_200503\Admin Approval\Jotron Tests | Tron 40S/GPS MkII | Page 9 of 10 |

1.10 Light test

The flash rate of the light to be controlled.

1.10.1 Flash rateThe flash rate was: **21****1.10.2 Test results****Test No.1: Effective luminous intensity at minus 20 degrees**

| Azimuth (in Degrees) | Elevation (in Degrees) | | | | | | | | |
|-------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 0 | 2,7 | 2,3 | 1,6 | 1,5 | 1,6 | 0,8 | 0,9 | 2,4 | 1,5 |

Table 1.10a Effective luminous intensity at minus 20 degrees**Test No.2: Effective luminous intensity at normal temperature**

| Azimuth (in Degrees) | Elevation (in Degrees) | | | | | | | | |
|-------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 0 | 3,4 | 2,4 | 1,6 | 1,4 | 1,5 | 0,8 | 0,8 | 2,3 | 1,5 |
| 45 | 3,8 | 2,5 | 1,6 | 1,5 | | | | | |
| 90 | 3,4 | 2,4 | 1,7 | 1,6 | 1,5 | 0,8 | 0,9 | 2,8 | |
| 135 | 3,8 | 2,6 | 1,4 | 1,4 | | | | | |
| 180 | 3,4 | 2,4 | 1,6 | 1,4 | 1,3 | 0,6 | 0,9 | 2,4 | |
| 225 | 3,8 | 2,6 | 1,7 | 1,4 | | | | | |
| 270 | 3,5 | 2,3 | 1,7 | 1,5 | 1,5 | 0,8 | 0,8 | 2,1 | |
| 315 | 3,6 | 2,5 | 1,6 | 1,4 | | | | | |

Table 1.10b Effective luminous intensity at normal temperature**Test No.3: Effective luminous intensity at plus 55 degrees**

| Azimuth (in Degrees) | Elevation (in Degrees) | | | | | | | | |
|-------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 180 | 2,6 | 1,8 | 1,1 | 1,1 | 1,0 | 0,4 | 0,6 | 1,4 | 1,2 |

Table 1.10c Effective luminous intensity at plus 55 degrees



Product Service

| | | |
|---|--------------------------|----------------------|
| | <p>Test Report</p> | <p>Version D</p> |
| <p>M:\03_Development\Project_Design\TRON_40SMKII&603_200503\Admin\Approval\Jotron Tests</p> | <p>Tron 40S/GPS MkII</p> | <p>Page 10 of 10</p> |

1.11 Test summary

| Test No. | Test | IEC 61097-2 Ed.3 CDV | Result (Pass/Fail) | Date | Witness | Notified Body Number |
|----------|-----------------------|----------------------|--------------------|----------|--------------------|----------------------|
| 1 | At minus 20 degrees | 5.3.3.3* | P | 30.11.07 | <i>[Signature]</i> | 0470 |
| 2 | At normal temperature | 5.3.3.3 | P | 30.11.07 | <i>[Signature]</i> | 0470 |
| 3 | At plus 55 degrees | 5.3.3.3* | P | 30.11.07 | <i>[Signature]</i> | 0470 |

* Limited measurements agreed with Mrs. Doreen Thoma, BSH, 29.11.2007

Authorized By:

Bjørn Rishovd
QA Manager
Jotron AS

Supervised by:

Ole A. Lynum
Technical Examination Officer
Nemko AS



Product Service

Information On Previous Testing (Inadvertent Activation Test)

DET NORSKE VERITAS

Report No: 2003-3162, rev. 01

TECHNICAL REPORT



7.2.3 Hose stream

Test specifications: IEC 60945, 8.8
ETSI EN 300 066, 6.9

Test characteristics:

| Parameters | Severity levels |
|--------------------------------------|--|
| Flow | 2300 l/min |
| Hose inner diameter | 63,5 mm |
| Distance between end of hose and EUT | 3,5 m (1,5 m above EUT) |
| Directions of flow | All directions in an arc of 180° perpendicular to normal mounting position |
| Period of testing | 5 min |

The EUT was fixed to a wooden plat during testing.

Result: With the modification described in Ch. 5.2, EUT passed the test



Product Service

DET NORSKE VERITAS



Report No: 2003-3162, rev. 01

TECHNICAL REPORT

5 EQUIPMENT UNDER TEST

5.1 Equipment submitted for tests

Overall designation of product:

| Description | Make | Type | S/N | Remarks |
|---------------------------------|--------|------|-----|-----------|
| EPIR float free release bracket | Jotron | FB-5 | NA | Prototype |

The above will be referred from now as **EUT** (Equipment Under Test).

5.2 Modifications during testing

In order to pass the various tests, the EUT was modified as follows:

| Test | Modifications |
|-------------------|--|
| Release Mechanism | An extra weight was added to the outer shell to make the weight asymmetrical. |
| Vibration/Bump | A new design of the FB-5 bracket is being produced in the nearest future. To upgrade the unit used for testing to the right shape, tape was used on the inner side of the capsule. |
| Hose stream | Fixing of the label tag was moved from the release pin to a separate screw. |



Product Service

Information On Previous Testing (Automatic Release Mechanism And Automatic Activation Tests)

DET NORSKE VERITAS

Report No: 2003-3162, rev. 01

TECHNICAL REPORT



7 TESTS

Wherever several test specifications cover the same issue, the most severe requirement was used as basis for the testing.

7.1 Functional tests

7.1.1 Release mechanism

Test specifications: ETSI EN 300 066, 12

Test characteristics:

| Parameters | Severity levels |
|---------------|--|
| Release depth | Before 4,0m |
| Orientations | Normal mounting pos. Rolling 90° both sides Pitching 90° both sides Upside-down |

The EUT was mounted on a rod and slowly submerged into water¹, until the release mechanism was activated. The depth at time of activation was observed.

Result: In one of the orientations, the EPIRB floated up successfully, but did not release itself from the outer shell of the EUT even after reaching the surface. The EUT was therefore slightly modified (see Ch. 5.2). Repeated tests after the modification were successful. The EPIRB released itself well before 4 meter and the EUT passed the test.



Product Service

DET NORSKE VERITAS



Report No: 2003-3162, rev. 01

TECHNICAL REPORT

5 EQUIPMENT UNDER TEST

5.1 Equipment submitted for tests

Overall designation of product:

| Description | Make | Type | S/N | Remarks |
|---------------------------------|--------|------|-----|-----------|
| EPIR float free release bracket | Jotron | FB-5 | NA | Prototype |

The above will be referred from now as **EUT** (Equipment Under Test).

5.2 Modifications during testing

In order to pass the various tests, the EUT was modified as follows:

| Test | Modifications |
|-------------------|--|
| Release Mechanism | An extra weight was added to the outer shell to make the weight asymmetrical. |
| Vibration/Bump | A new design of the FB-5 bracket is being produced in the nearest future. To upgrade the unit used for testing to the right shape, tape was used on the inner side of the capsule. |
| Hose stream | Fixing of the label tag was moved from the release pin to a separate screw. |



Product Service

Information On Previous Testing (Solar Radiation and Oil Resistance)

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



Tjodalyng: 19.01.2007

To whom it may concern

Ref. type approval of Tron 40S/GPS MkII.

This letter is to advise that our above mentioned EPIRB and mounting bracket uses exactly the same stainless steel metal parts, UV and mould resistant labels, and heavy duty polycarbonate case as our Tron40S, approved first time in 1997.

This equipment has proven itself most capable of withstanding subjection to a severe maritime environment over a long period of time, and we have so far delivered more than 20000 units to the market.

Based on use of the same material combination above and manufacturer documentation supplied we request acceptance, by way of waiver, to tests laid out within EN60945 clauses 8.10 and 8.11, covering resistance to solar radiation and oil resistance.

For and behalf of
Jotron AS

A handwritten signature in black ink, appearing to read 'Bjørn Allum'.

Bjørn Allum
Technical Manager

Jotron AS
P.O. Box 54 | NO-3280 Tjodalyng | Norway

Tel: +47 33 13 97 00
Fax: +47 33 12 67 80

www.jotron.com