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Report On

Cospas-Sarsat T.007 Testing of the
McMurdo A Division of Signature Industries Ltd
Fastfind PLB 210

Document 75904389 Report 01 Issue 3 January 2009

Product Service

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REPORT ON

Cospas-Sarsat T.007 Testing of the
McMurdo A Division of Signature Industries Ltd
Fastfind PLB 210

Document 75904389 Report 01 Issue 3

January 2009

PREPARED FOR

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PREPARED BY

R Hampton
Test Engineer

APPROVED BY

N Forsyth
Authorised Signatory

DATED 30 January 2009

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Section **Page No**

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SECTION 1

REPORT SUMMARY

Cospas-Sarsat T.007 Testing of the
McMurdo A Division of Signature Industries Ltd
Fastfind PLB 210

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Cospas-Sarsat T.007 Testing of the McMurdo A Division of Signature Industries Ltd Fastfind PLB 210 to the requirements of T.007 Issue 4 – Rev 2 November 2007.

Objective	To perform Cospas-Sarsat T.007 Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	McMurdo A Division of Signature Industries Ltd
Model Number(s)	Fastfind PLB 210
Serial Number(s)	75904389_01 Fastfind PLB 210, S/N: TUV 1
Number of Samples Tested	One
Test Specification/Issue/Date	Cospas-Sarsat T.007 Issue 4 – Rev 2 November 2007
Incoming Release Date	Application Form 06 August 2008
Date of Receipt of Test Samples	26 August 2008
Order Number Date	PC0003427 24 July 2008
Start of Test	16 September 2008
Finish of Test	05 January 2009
Name of Engineer(s)	R Hampton R Bennett

1.2 APPLICATION FORM

1.2.1 Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Signature Industries
Beacon Model	McMurdo Fastfind PLB 210
Other Model Names	McMurdo Fastfind PLB 211

1.2.2 Beacon Type and Operational Configurations

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

1.2.3 Beacon Characteristics

Characteristic	**Specification**
Operating temperature range	Tmin = -20°C Tmax = +55°C
Operating lifetime	24 hours
Battery chemistry	Lithium Manganese Dioxide
Battery cell size and number of cells	CR 2/3 AH x4 cells Alt Batt: CR123 x4 cells
Battery cell manufacturer	Varta Microbattery Alt Batt: Panasonic
Battery pack manufacturer and part number	Varta Microbattery Alt Batt: Panasonic /91-156D
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon
Oscillator part name and number	E4892LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes

Characteristic	Specification
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integrated
Antenna manufacturer	Doig
Antenna part name and number	91-206
Navigation device type (Internal, External or None)	Internal
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	Yes
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes
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	uBlox
- Navigation device model name and part Number	LEA 5A
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS, Galileo
For External Navigation Devices	N/A
- Data protocol for GNSS receiver to beacon interface	
- Physical interface for beacon to navigation device	
- Electrical interface for beacon to navigation device	
- Navigation device model and manufacturer (if beacon designed to use specific devices)	

Characteristic	Specification	
Self-Test Mode Characteristics	Self-Test Mode	Optional GNSS Self-Test Mode
- Self-test has separate switch position (Yes or No)	Yes	Yes
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes	Yes
- Self-test activation can cause an operational mode transmission (Yes or No)	No	No
- Self-test causes a single beacon self-test message burst only regardless of how long the self-test activation mechanism applied (Yes or No)	Yes	Yes
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	Pass/ Fail LED	Pass / Fail LED
- Self-test can be activated from beacon remote activation points (Yes or No)	No	No
- Self-test performs an internal check and indicates that RF power emitted at 406 MHz and 121.5 MHz if beacon includes a 121.5 MHz homer (Yes or No)	Yes	No
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	Yes 121.5MHz	No
- Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
- List of Items checked by self-test	406.037/ 121.5MHz Power, PLL lock, GPS Module	GPS position fix
- Self-test transmission burst duration (440 or 520 ms)	440 ms	520 ms
- Self-test format bit (“0” or “1”)	1	
- Maximum duration of GNSS Self Test	N/A	5 mins ±10 secs
- Maximum number of GNSS Self Tests (beacons with internal navigation devices only)	N/A	10
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121.5MHz	
-Homer Transmit Power	16.5dBm	
-Homer Duty Cycle	99.13%	
-Duty Cycle of Homer Swept Tone	35%	

Characteristic	Specification
Beacon includes a strobe light (Yes or No)	No
- Strobe light intensity	
- Strobe light flash rate	
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) Specify type of automatic beacon activation mechanism	No
Beacon includes software or hardware features and functions not listed above and non-related to 406 MHz (Yes or No) List features and use a separate sheet if insufficient space	No

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

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: 28 August 2008

Applicable C/S Standards:

Document	Issue	Revision	Date
C/S T.001	3	8	Nov-07
C/S T.007	4	2	Nov-07

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

Signed: 

Name: N Forsyth

Position Held: Authorised Signatory

Date: 30 January 2009

1.2.5 Applicant Details

Company Name	Signature Industries		
Address	Silver Point, Airport Service Road, Portsmouth, P03 5PB		
Category of Applicant	☒ Manufacturer	☐ Importer	
	☐ Distributor	☐ Agent	
Contact Name	Neil Jordan	Telephone	02392 623934
Email	neiljordan@mcmurdo.co.uk	Facsimile	02392 623997

1.2.6 Manufacturer Details

Company Name	Same as above		
Address			
Contact Name		Telephone	
Email		Facsimile	

1.2.7 Declaration of Build Status

Hardware Version	
- PCB Revision	1
- Battery Model	Varta CR 2/3 AH / Panasonic CR123A
Software Version	N/A
Firmware Version	1.1.165
Other (Specify)	

1.2.8 Applicant's Declaration

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

Signed: _____

Name: Neil Jordan

Position Held: Engineering Manager

Date: 25-11-08

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a McMurdo A Division of Signature Industries Ltd Fastfind PLB 210 as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test

1.3.2 Physical Test Configuration

The Main Equipment Under Test (EUT), S/N TUV 1 was operated using its own power source (internal VARTA batteries, note that the alternative Panasonic batteries are the subject of a separate document). The EUT was configurable so that it could be either connected to the 50Ω test system using a coaxial cable or so that it radiated through its normal antenna as per normal operational configuration. In the 50Ω-conducted mode, the 406MHz and 121MHz transmissions came from separate ports.

The test configuration for all tests was the 50Ω-conducted configuration with the exception of Antenna Characteristics, Satellite Qualitative and Position Accuracy Time and Position Accuracy. The radiated configuration was used for these tests.

1.3.3 Modes of Operation

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

Standby Mode:

- No apparent EUT activity
- No ancillary devices were declared

Self-test:

- “TEST” button depressed until White LED light indicated Self-test operation
- List of features tested as per Application Form

(Long/GPS Self-test):

- “TEST” button depressed until White LED light indicated GNSS Self-test operation, note that the normal Self-test routine is completed in the interim
- List of features tested as per Application Form

Operating:

- 121 MHz homer active and offset to 121.65 MHz
- 243 MHz homer not declared
- GPS active and in search mode (no signals supplied) unless otherwise declared
- Physical configuration as above

1.4 MODIFICATIONS

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	EUT Firmware upgraded to correct Last Valid Position retention error. Modification fitted to main sample S/N TUV 1.	McMurdo, A Division of Signature Industries Ltd	13 November 2008
2*	EUT not passing Self-test routine indicating a fault. One FET was replaced and some solder joints were "reflowed". The part was replaced with an identical component.	McMurdo, A Division of Signature Industries Ltd	20 November 2008

* Note that this EUT state was identified as Modification State 2 for information only, being only a repair it is not technically deemed to be a modification.

1.5 REPORT MODIFICATION RECORD

Issue 1 – First Issue

Issue 2 – Modifications made in line with Cospas-Sarsat document "Worksheet-2_2008-27_McMurdo Fastfind PLB 200-210_18 DEC 08". Changes include:

- Customer supplied information: Application Form (Section 1.2)
- Test Name "Digital Message Coding" changed to "Digital Message"
- Satellite Qualitative Test results altered (Section 2.9), note added
- Alternative Antenna Characteristics added to Annex A
- Operational Lifetime Test (Battery Pre-test Discharge Calculations) GPS Self-test data now excludes 'Normal' Self-test data. Final result: pre-test discharge now 6 minutes shorter
- Comment about max/min temperature added to Test Results Table, Section 8a
- Test data added to Section 2.5: Maximum number of GNSS Self-tests checked (Test Results Table, Section 8b, also updated)
- Modulus of all CTA values now replace original data for Satellite Qualitative Tests (Section 2.9)
- Alternative Antenna Characteristics results added to Annex A and a comment in the Test Results Table, Section 15

Issue 3 – Modifications made in line with Cospas-Sarsat document "Worksheet-1_2008-27_McMurdo Fastfind PLB 200-210_29 JAN 09". Changes include:

- Customer supplied information: Application Form (Section 1.2)
- Operational Lifetime Test (Battery Pre-test Discharge Calculations)

SECTION 2

TEST DETAILS

Cospas-Sarsat T.007 Testing of the
McMurdo A Division of Signature Industries Ltd
Fastfind PLB 210

TEST RESULTS TABLE

Parameter		Limits	Units	Test Results T_{min} (-20°C)	Test Results T_{amb} (22.4°C)	Test Results T_{max} (+55°C)	Comments
1. Power Output							Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Transmitter power output		35 - 39	dBm	35.69	36.51	36.84	
Power output rise time		< 5	ms	2.296	2.268	2.198	
Power output 1ms before burst		< -10	dBm	-16.98	-17.61	-19.40	
2. Digital Message		Bit Numbers					Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Bit Sync	1 - 15	15 bits "1"	P / F	P	P	P	Decoded Message: Page 22
Frame sync	16 - 24	"000101111"	P / F	P	P	P	
Format flag	25	1 bit	bit value	1	1	1	
Protocol flag	26	1 bit	bit value	0	0	0	
Identification / position data	27 - 85	59 bits	P / F	P	P	P	
BCH code	86 -106	21 bits	P / F	P	P	P	
Emerg. Code/nat. use/supplem. Data	107 - 112	6 bits	bit value	110111	110111	110111	
Additional data / BCH (if applicable)	112 - 144	32 bits	P / F	P	P	P	
Position Error (if applicable)		< 5	km	N/A	N/A	N/A	
3. Digital Message Generator							Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Repetition rate, T_R:							
Average T_R		48.5 ≤ T_{Ravg} ≤ 51.5	seconds	49.979	49.974	49.937	
Minimum T_R		47.5 ≤ T_{Rmin} ≤ 48.0	seconds	47.734	47.765	47.672	
Maximum T_R		52.0 ≤ T_{Rmax} ≤ 52.5	seconds	52.266	52.063	52.078	
Standard deviation		0.5 - 2.0	seconds	1.368	1.318	1.340	
Bit rate							
Minimum fb		≥ 396	bits/sec	399.904	400.050	400.196	
Maximum fb		≤ 404	bits/sec	399.944	400.085	400.211	
Total transmission time							
Short message		435.6 - 444.4	ms	N/A	N/A	N/A	
Long message		514.8 - 525.2	ms	519.920	520.009	519.962	
Unmodulated carrier							
Minimum T1		≥ 158.4	ms	158.999	159.037	159.203	
Maximum T1		≤ 161.6	ms	159.199	159.295	159.227	
First burst delay		≥ 47.5	seconds	50	51	51	

Parameter	Limits	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb} (22.4°C)	T_{max} (+55°C)	
4. Modulation						Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Biphase-L	P / F	P / F	P	P	P	
Rise time	50 - 250	µs	163.3	174.4	165.3	
Fall time	50 - 250	µs	161.7	180.6	169.7	
Phase deviation: positive	+(1.0 to 1.2)	radians	1.0824	1.1287	1.1032	
Phase deviation: negative	-(1.0 to 1.2)	radians	-1.0723	-1.1164	-1.1071	
Symmetry measurement	≤ 0.05		0.0159	0.0199	0.0167	
5. 406 MHz Transmitted Frequency						Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Nominal Value	C/S T.001	MHz	406.0371202	406.0370720	406.0370623	
Short-term stability	≤ $2x10^{-9}$	/100ms	$7.819x10^{-11}$	$1.265x10^{-10}$	$8.203x10^{-11}$	
Medium-term stability – Slope	(-1 to +1)$x10^{-9}$	/minutes	$1.384x10^{-10}$	$-4.005x10^{-11}$	$-9.558x10^{-11}$	
Medium-term stability – Residual frequency variation	≤ $3x10^{-9}$		$3.498x10^{-10}$	$2.299x10^{-10}$	$1.889x10^{-10}$	
6. Spurious Emissions into 50ohms						Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
In band (406.0 – 406.1 MHz)	C/S T.001 mask	P / F	P	P	P	Spectrum plots: Page 25
7. 406 MHz VSWR Check						Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Nominal transmitted frequency	C/S T.001	MHz	406.0371238	406.0370694	406.0370620	
Modulation						
Rise time	50-250	µs	163.3	171.3	169.3	
Fall time	50-250	µs	162.7	175.7	164.7	
Phase deviation: positive	+ (1.0 to 1.2)	radians	1.0866	1.1287	1.0966	
Phase deviation: negative	- (1.0 to 1.2)	radians	-1.0741	-1.1168	-1.1101	
Symmetry measurement	≤ 0.05		0.0167	0.0183	0.0171	
Digital Message	correct	P / F	P	P	P	Decoded Message: Page 26

Parameter	Limits	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb} (22.4°C)	T_{max} (+55°C)	
8 (a). Self-test Mode						Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Frame sync	011010000	P / F	P	P	P	Decoded Message: Page 27
Format flag	1 / 0	bit value	1	1	1	Note: min and max temperature results are for information only
Single radiated burst	≤440 / 520 (±1%)	ms	442.7932	442.8769	441.3585	
Default position data (if applicable)	correct	P / F	P	P	P	
Description	provided	Y / N		Y		
Design data on protection against repetitive self-test mode transmissions	provided	Y / N		Y		Applicant's data: See Annex A
Single burst verification	one burst	P / F	P	P	P	
Provides for 15 Hex ID	correct	P / F	P	P	P	
121.5 MHz RF power (if applicable)	self-test checks that RF power emitted	Y / N		Y		
406 MHz power	self-test checks that RF power emitted	Y / N		Y		Applicant's data: See Annex A
8 (b). GNSS Self-test Mode						Test Sample: 75904389_01 Mod State: 2 **Result: Pass**
Frame sync	011010000	P / F	P	P	P	Detailed test Data: Page 28
Format flag	1 / 0	bit value	1	1	1	Note: min and max temperature results are for information only
Single radiated burst	514.8 - 525.2	ms	519.920	520.520	522.035	
Position data (if applicable)	must be within 500m of the actual position	P / F	P	P	P	Note: Limit is 5.25km for User Location Protocol
Design data showing how GNSS Self-test is limited in number of transmissions and duration	provided	Y / N		N		Applicant's data: To be provided as part of the Application
Single burst verification	one burst	P / F	P	P	P	Note: GNSS Self-test routine activation described at Annex A, in the section entitled "GNSS Self-test"
121.5 MHz RF power (if applicable) checked by Self-test		Y / N		Y		Applicant's data: See Section 1.2 Application Form
406 MHz power checked by Self-test		Y / N		Y		
Maximum duration of GNSS Self-test	5 minutes 10 seconds	P / F	N/T	P	N/T	N/T = Not Tested. Measured value at Ambient: 5 minutes 4 seconds
Actual duration of Self-test with encoded location	≤ 5 minutes 10 seconds	min	0.6	0.6	0.4	
Maximum number of GNSS Self-tests (only beacons with internal navigation devices)	10	P / F	N/T	P	N/T	Number of GNSS Self-tests: 10

Parameter	Limits	Units	Test Results		Comments
9. Thermal Shock					Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Soak Temperature	30°C difference	°C	23		
Measurement Temperature		°C	55		Test Data: Page 30
Transmitted Frequency			Min	Max	
Nominal value	C/S T.001	MHz	406037062.5	406037064.2	
Short-term stability	≤ $2x10^{-9}$	/100ms	$9.57x10^{-11}$	$1.906x10^{-10}$	
Medium-term stability – Slope	(-2 to +2)$x10^{-9}$	/min	$-1.607x10^{-10}$	$8.281x10^{-11}$	
Medium-term stability – Residual frequency variation	≤ $3x10^{-9}$		$1.062x10^{-10}$	$9.027x10^{-10}$	
Transmitter power output	35 - 39	dBm	36.78	36.86	
Digital message	correct	P/F	P		Decoded Message: Page 35
10 Operating Lifetime at Minimum Temperature					Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Pre-test battery discharge duration (operating) required		Hours	5.12		Test Data: Page 36
Pre-test battery discharge duration (operating)		Hours	5.21		Over-tested by 6 minutes
duration	>24	hours	37.0 Hours at Tmin = -20 °C		The Pre-test battery discharge was performed prior to the start of the Operating Lifetime at Minimum Temperature.
Transmitted Frequency			Min	Max	
Nominal value	C/S T.001	MHz	406037124.9	406037126.7	Values shown are the min/max to 24 hours
Short-term stability	≤ $2x10^{-9}$	/100ms	3.699E-11	1.186E-10	
Medium-term stability – Slope	(-1 to +1)$x10^{-9}$	/min	-9.88E-11	1.342E-10	
Medium-term stability – Residual frequency variation	≤ $3x10^{-9}$		5.195E-11	5.083E-10	
Transmitter power output	35 - 39	dBm	36.08	36.17	First failure on transmitter power output at 37.0 hours
Digital message	correct	P/F	P		Decoded Message: Page 41
11. Temperature Gradient (5°C/hr)					Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Transmitted Frequency			Min	Max	Test Data: Page 48
Nominal value	C/S T.007	MHz	406.0370551	406.0371217	
Short-term stability	≤ $2x10^{-9}$	/100ms	$4.543x10^{-11}$	$1.455x10^{-10}$	
Medium-term stability – Slope	(-1 to +1)$x10^{-9}$	/min	$-5.15x10^{-11}$	$1.63x10^{-10}$	Data for points A to B, C+15 min to D and E+15 min to F
Medium-term stability – Slope	(-2 to +2)$x10^{-9}$	/min	$-3.89x10^{-10}$	$3.86x10^{-10}$	Data for points B to C+15 min and D to E+15 min
Medium-term stability – Residual frequency variation	≤ $3x10^{-9}$		$5.032x10^{-11}$	$5.21x10^{-10}$	
Transmitter power output	35 – 39	dBm	35.71	36.64	
Digital message	correct	P/F	P		Decoded Message: Page 53

Parameter	Limits	Units	Test Results		Comments
12. Oscillator Aging					
Data	provided	Y / N	N		Applicant's data: to be provided as part of the application
13. Protection Against Continuous Transmission					
Description	provided	Y / N	Y		Applicant's data: See Annex A
14. Satellite Qualitative Tests					Test Sample: 75904389_01 Mod State: * **Result: Pass**
Test Configuration	As per C/S T.007		Config 7	Config 8	*Config 7 performed at Mod State 2 Config 8 performed at Mod State 1
15 Hex ID Decoded by LUT	correct	P / F	P	P	Test Data: Page 54
Doppler Location results with error ≤5km	≥80	%	92.9	100	
15. Antenna Characteristics					Test Sample: 75904389_01 Mod State: 0 **Result: Pass**
Test Configuration	C/S T.007		Config 3	Config 4	
Polarisation	linear or RHCP		Linear	linear	Test Data: Page 56
VSWR	≤1.5		N/A		Detachable Antennas Only
$EIRP_{LOSS}$		dB	0.43		
$EIRP_{maxEOL}$	≤43	dBm	42.2	40.3	Note: Alternative final values can be found at Annex A, section entitled "Alternative Antenna Characteristics" along with an explanation as to their origin
$EIRP_{minEOL}$	≥32	dBm	33.3	30.4	
16. Beacon Coding Software					
Sample message for each coding option of the applicable coding types	correct	P / F	N/A		Applicant's data: See Annex A
Sample self-test message for each coding option of the applicable coding types	correct	P / F	N/A		

Parameter	Limits	Units	Test Results			Comments
17. Navigation System						Test Sample: 75904389_01 Mod State: 0 **Result: Pass*** * Except Position Data Encoding, see below
Location protocol	C/S T.001		National	Standard	User	
Position data default values	correct	P / F	P	P	P	Test Data: Page 59
Position acquisition time	<10/1	min	<2	<3	<1	Times stated are the maximum values for all configurations, detailed values can be found at page 59
Configuration 7:						
A.3.8.2.1 Position accuracy	C/S T.001	m	103	151	51	
A.3.8.2.1 Encoded position data update interval	>20	sec	32.8	32.8	1545.2	
A.3.8.2.2 Position accuracy	C/S T.001	m	51	103	51	
A.3.8.2.2 Encoded position data update interval	>20	sec	49.5	50.1	3372.8	
Configuration 8:						
A.3.8.2.1 Position accuracy	C/S T.001	m	51	51	51	
A.3.8.2.1 Encoded position data update interval	>20	sec	32.8	32.8	1545.2	
A.3.8.2.2 Position accuracy	C/S T.001	m	51	51	51	
A.3.8.2.2 Encoded position data update interval	>20	sec	49.5	50.1	3372.8	
Position clearance after deactivation	cleared	P / F	P	P	P	
Position data input update interval (as applicable)	20/1	Min	N/A	N/A	N/A	Not Applicable – EUT support of external navigation data input not declared
Position data encoding	correct	P / F	N/T	N/T	N/T	Position data encoding Not Tested – Applicant's Data: Annex A
Retained last valid position after navigation input lost	240(±5)	Min	240	239	240	
Default position data transmitted after 240(±5) minutes without valid position data	cleared	P / F	P	P	P	
Information on protection against beacon degradation due to navigation device, interface or signal failure or malfunction	provided	Y / N		Y		Applicant's data: Annex A

2.1 DIGITAL MESSAGE

2.1.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.1.2 Date of Test and Modification State

23, 24, 27 and 29 October 2008 - Modification State 0

2.1.3 Test Equipment Used

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

2.1.4 Test Results

Ambient Temperature

```
36 Hex Code:                FFFE2F8C9EF9C0637FDFF83D15B783E0F66C


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                               0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                   110
Fixed Bit         110               1                                         1
Encode Pos Device 111               1 Internal                                1
121.5 Homing      112               1 YES                                     1
Position Change   113-132           DEFAULT              1000 0011 1110 0000 1111
Resultant Position                --> Not Defined
BCH Encoded       133-144           Errors=0                        0110 0110 1100
BCH Generated     133-144                                           0110 0110 1100
```

Minimum Temperature

```
36 Hex Code:                FFFE2F8C9EF9C0637FDFF83D15B783E0F66C


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                              0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                 1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                  110
Fixed Bit         110            1                                           1
Encode Pos Device 111            1 Internal                                  1
121.5 Homing      112            1 YES                                       1
Position Change   113-132         DEFAULT              1000 0011 1110 0000 1111
Resultant Position              --> Not Defined
BCH Encoded       133-144         Errors=0                       0110 0110 1100
BCH Generated     133-144                                        0110 0110 1100
```

Maximum Temperature

```
36 Hex Code:                FFFE2F8C9EF9C0637FDFF83D15B783E0F66C


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                               0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                  110
Fixed Bit         110            1                                           1
Encode Pos Device 111            1 Internal                                  1
121.5 Homing      112            1 YES                                       1
Position Change   113-132         DEFAULT              1000 0011 1110 0000 1111
Resultant Position               --> Not Defined
BCH Encoded       133-144         Errors=0                       0110 0110 1100
BCH Generated     133-144                                        0110 0110 1100
```

2.2 SPURIOUS EMISSIONS

2.2.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.2.2 Date of Test and Modification State

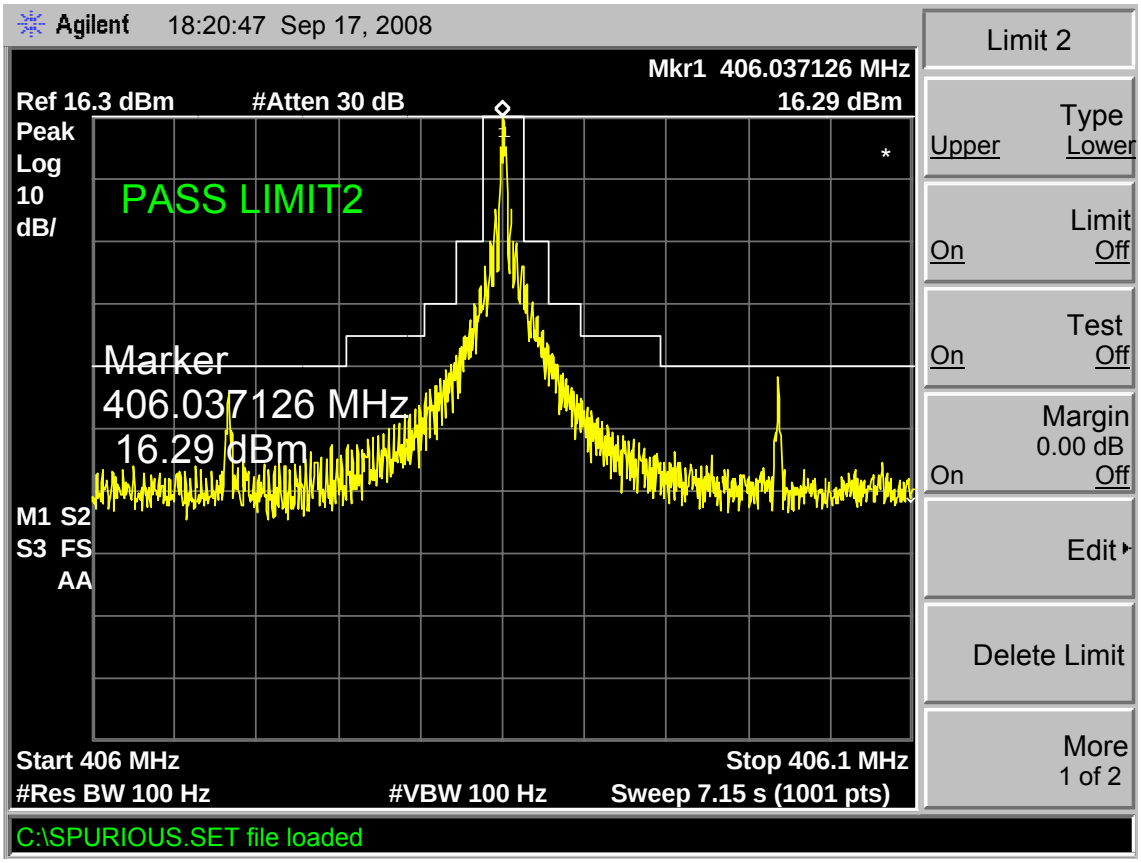
16 and 17 September 2008 - Modification State 0

2.2.3 Test Equipment Used

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

2.2.4 Test Results

Combined Plot over Ambient Temperature, +55°C and -20°C



2.3 406 MHZ VSWR CHECK – DECODED MESSAGE

2.3.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.3.2 Date of Test and Modification State

24, 27 and 29 October 2008 - Modification State 0

2.3.3 Test Equipment Used

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

2.3.4 Test Results

Digital Message

```
36 Hex Code:      FFFE2F8C9EF9C0637FDFF83D15B783E0F66C


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                              0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                   110
Fixed Bit         110               1                                         1
Encode Pos Device 111               1 Internal                                1
121.5 Homing      112               1 YES                                     1
Position Change   113-132           DEFAULT              1000 0011 1110 0000 1111
Resultant Position                --> Not Defined
BCH Encoded       133-144           Errors=0                        0110 0110 1100
BCH Generated     133-144                                           0110 0110 1100
```

Note: The digital message for VSWR was identical at all three test temperatures.

2.4 SELF-TEST MODE – DECODED MESSAGE

2.4.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.4.2 Date of Test and Modification State

24, 27 and 29 October 2008 - Modification State 0

2.4.3 Test Equipment Used

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

2.4.4 Test Results

Digital Message

```
36 Hex Code:      FFFED08C9EF9C0637FDFF83D15B7


Beacon Id Format......... 22 Hex Id, Short Message, Bits 25-112
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B700000000

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1110 0000 0000 0000 0000 0000 0000 0000 000
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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: bcn entered Short Non-Spec    1
Protocol Flag      26            0 Location NEW                                0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Fixed Bits        107-109                                                   110
Fixed Bit          110             1                                          1
Encode Pos Device  111             1 Internal                                 1
121.5 Homing       112             1 YES                                      1
Resultant Position                --> Not Defined
```

Note 1: Short message produced despite Long Message Format Flag is allowed by the standard; however the software used to decode the message does not take the self-test frame sync into account and hence produces an error message.

Note 2: The digital message for Self-test was identical at all three test temperatures.

2.5 GNSS SELF-TEST MODE

2.5.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.5.2 Date of Test and Modification State

21 November 2008 - Modification State 2

2.5.3 Test Equipment Used

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

2.5.4 Test Results

Digital Message Decode

```
36 Hex Code:                FFFED08C9F0018CCD701C85E1A37920C0AB2


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193E003199AE039              193E0031BF81FE0 Default_Id
 30 Hex (Bits 25-144) = 8C9F0018CCD701C85E1A37920C0AB2

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1110 0000 0000 0011 0001 1001 1001 1010 1110 0000 0011 1001
   0000 1011 1100 0011 0100 0110 1111 0010 0100 0001 1000 0001 0101 0110 010
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                               0
MID                 27- 36      201 ALBANIA                          0011 0010 01
Protocol Code       37- 40       15 Test (National)                        1111
Serial Number       41- 58       99                          0000 0000 0001 1000 11
Medium Position     59- 85          Data Present
Latitude Flag       59            0 North:                                     0
Latitude Degrees    60- 66       51  51 deg                            0110 011
Lat. Minutes /2     67- 71       11  22 min                              0101 1
Longitude Flag      72            1 West:                                      1
Long. Degrees       73- 80        1   1 deg                           0000 0001
Long. Minutes /2    81- 85       25  50 min                              1100 1
BCH Encoded         86-106          Errors=0           0000 1011 1100 0011 0100 0
BCH Generated       86-106                             0000 1011 1100 0011 0100 0
Long Message       107-144          Data Present
Fixed Bits         107-109                                                  110
More Data Flag     110           1 Position Data in bits 113-132             1
Encode Pos Device  111           1 Internal                                  1
121.5 Homing       112           1 YES                                       1
Position Change    113-126         Data Present
Lat. Change Sign   113           1 Plus:                                     1
Lat. Chg. Minutes  114-115       0  0 min                                   00
Lat. Chg. Secs /4  116-119       9 36 sec                                 1001
Long Change Sign   120           0 Minus:                                    0
Long Chg. Minutes  121-122       0  0 min                                   00
Long Chg. Secs /4  123-126       3 12 sec                                 0011
```

Decode continued on next page…

```
Resultant Position             -->  51.37667 LAT,   -1.83000 LONG
                   51 deg 22 min 36 sec N,    1 deg 49 min 48 sec W
National Use      127-132        0 Default                                0000 00
BCH Encoded       133-144          Errors=0                     1010 1011 0010
BCH Generated     133-144                                       1010 1011 0010
```

Note: The digital message for GNSS Self-test was identical at all three test temperatures.

Position Error

Position	Latitude	Longitude
Input ①	N 51° 22' 35"	W 001° 49' 50"
Output (as decoded message above)	N 51° 22' 36"	W 001° 49' 48"
Error	49.5 m	

Positional accuracy was estimated using the Haversine Formula, Earth's radius taken as 6367km.

① Input from GPS simulator.

Maximum GNSS Self-test Duration

EUT was placed in the GNSS Self-test mode with no GPS signals applied, current draw from the battery was monitored and the "Power up" and "Power down" times noted.

The interval was 5 minutes and 4 seconds.

Maximum Number of GNSS Self-tests

The EUT operational counters were reset and GNSS Self-tests were conducted repeatedly until the EUT indicated that no more were possible. The number of tests was noted.

The maximum number of GNSS Self-tests allowed by the EUT was 10.

2.6 THERMAL SHOCK

2.6.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.6.2 Date of Test and Modification State

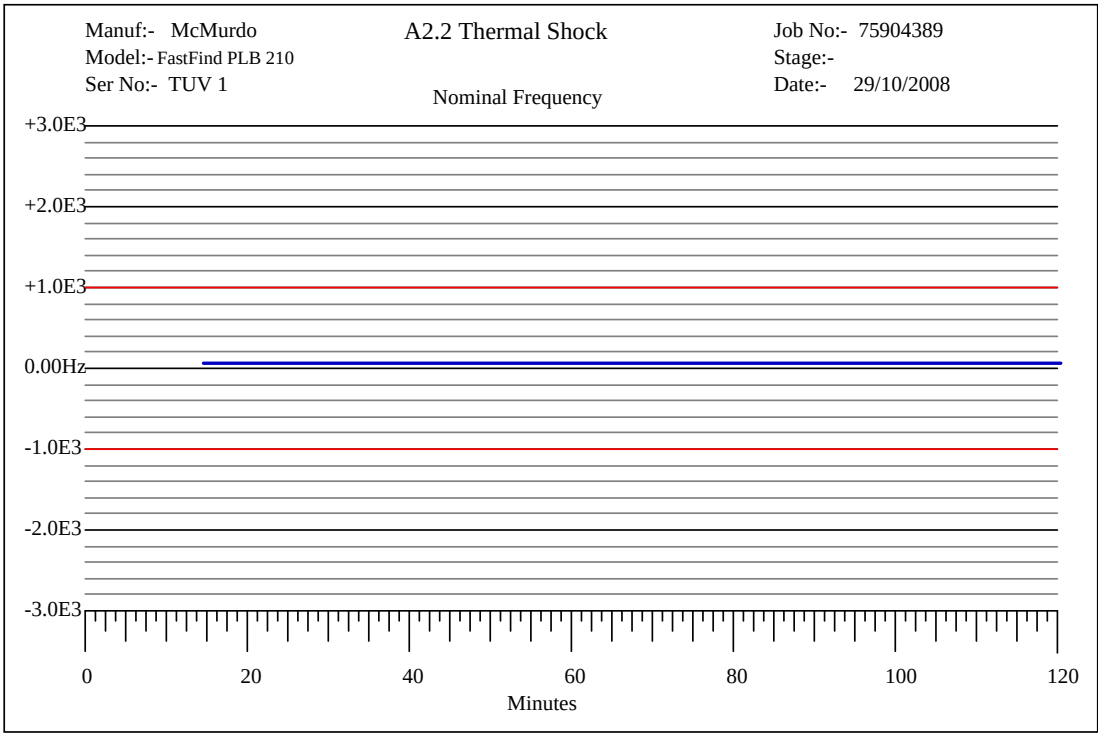
29 October 2008 - Modification State 0

2.6.3 Test Equipment Used

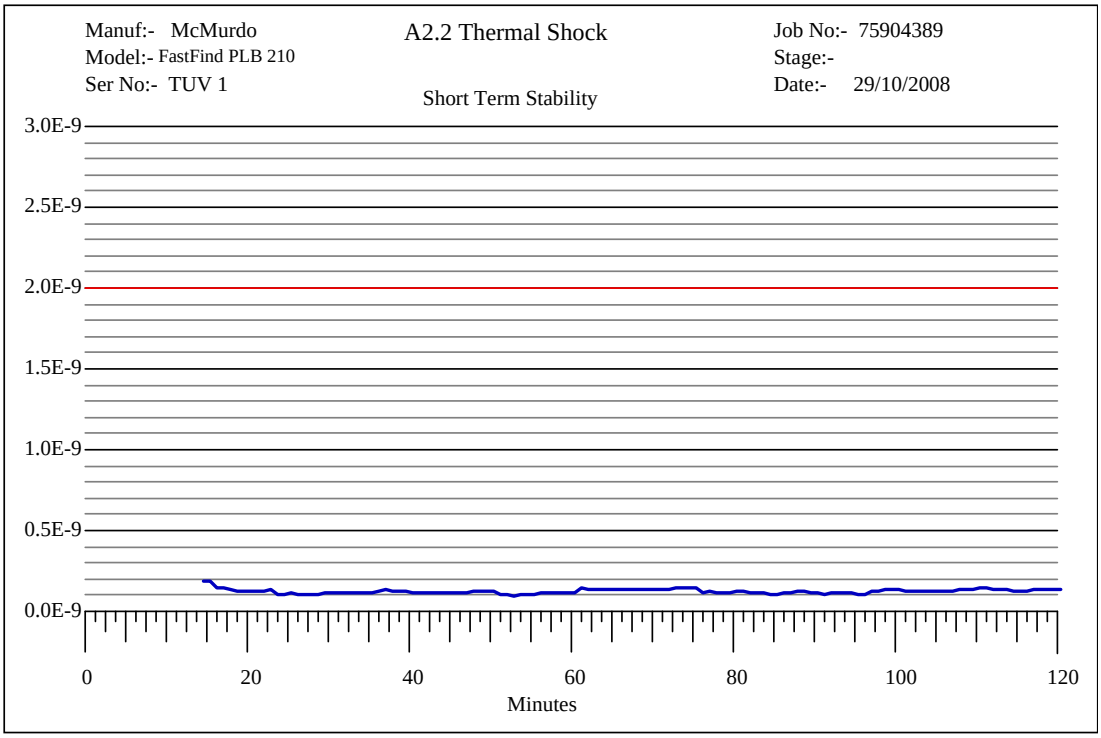
The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.4 Test Results

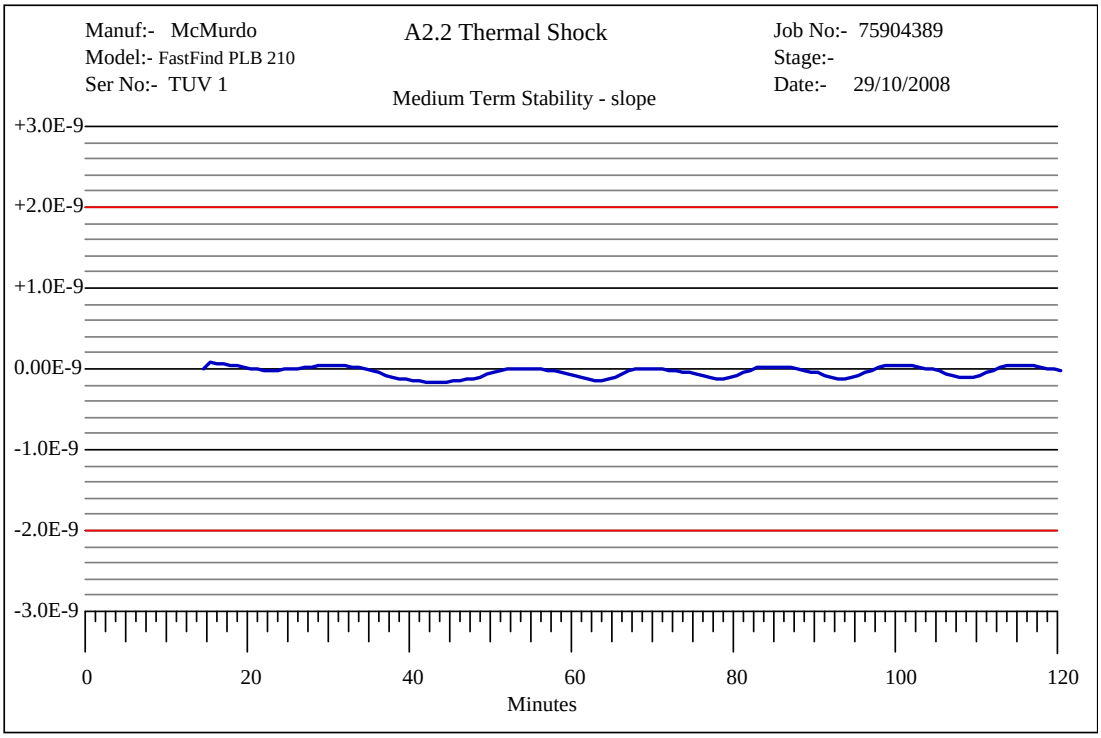
Nominal Frequency



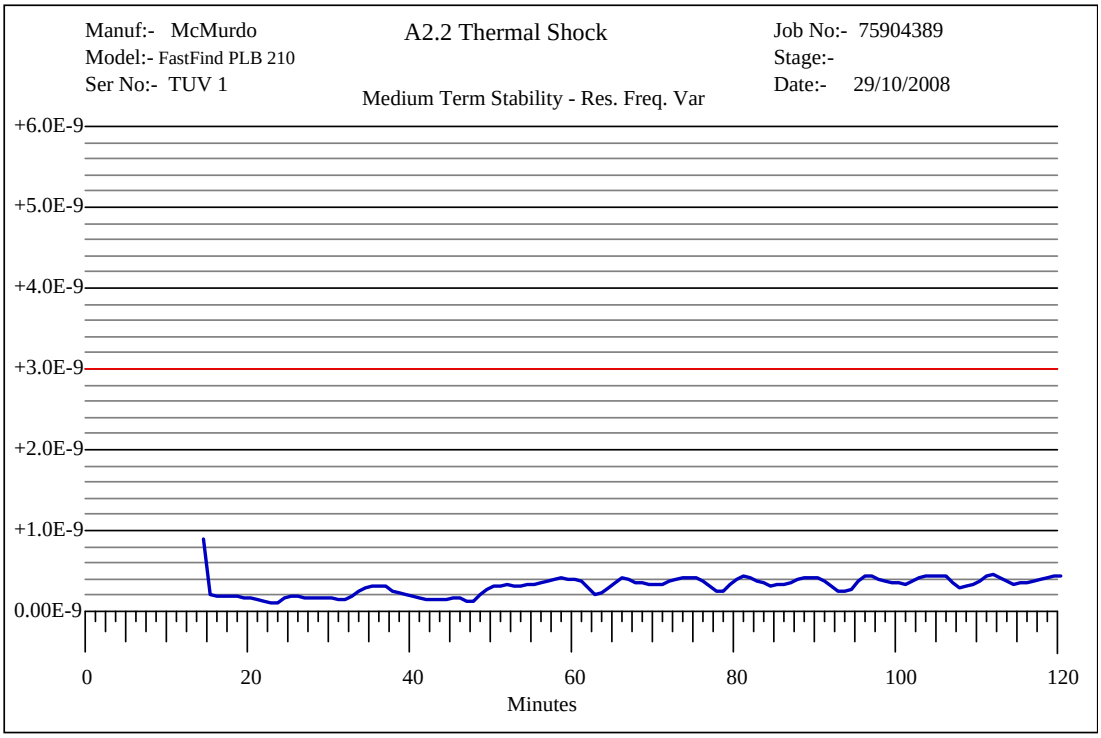
Short Term Stability



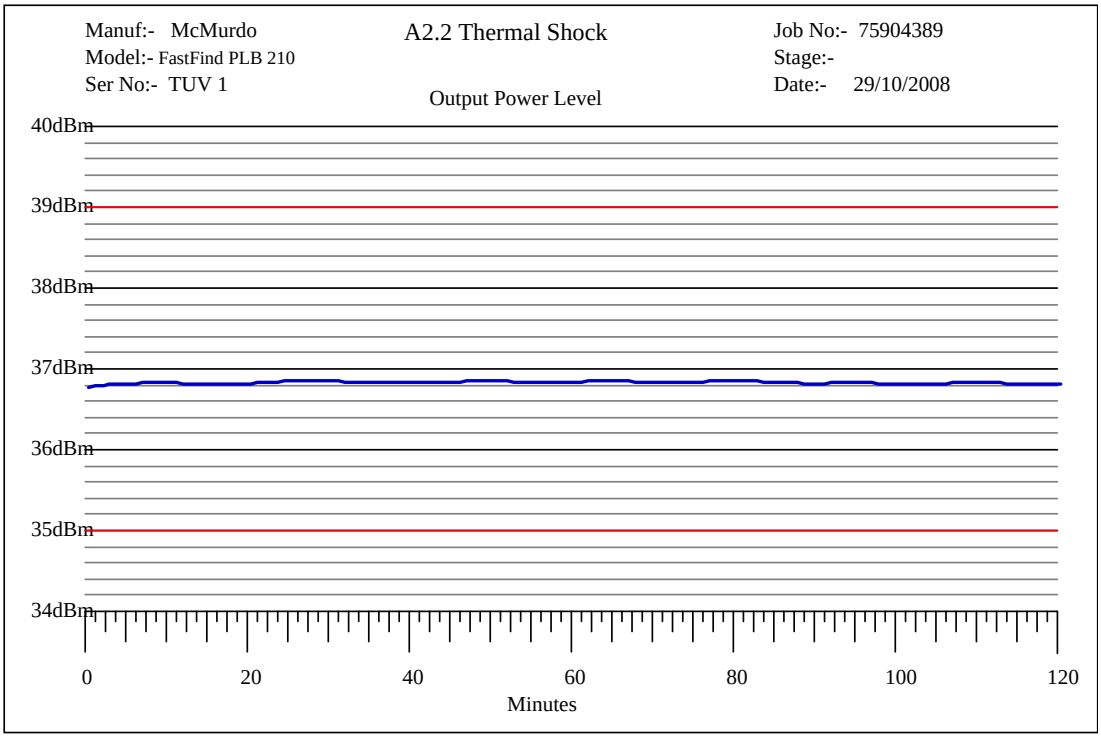
Medium Term Stability, Mean Slope



Medium Term Stability, Residual Frequency Variation



Output Power



Digital Message

```
Message Content
     Expected Message       FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
     Actual Message         FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
     Message Error Count    00


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                              0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                   110
Fixed Bit         110               1                                         1
Encode Pos Device 111               1 Internal                                1
121.5 Homing      112               1 YES                                     1
Position Change   113-132           DEFAULT              1000 0011 1110 0000 1111
Resultant Position                 --> Not Defined
BCH Encoded       133-144          Errors=0                        0110 0110 1100
BCH Generated     133-144                                          0110 0110 1100
```

2.7 OPERATING LIFETIME AT MINIMUM TEMPERATURE

2.7.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.7.2 Date of Test and Modification State

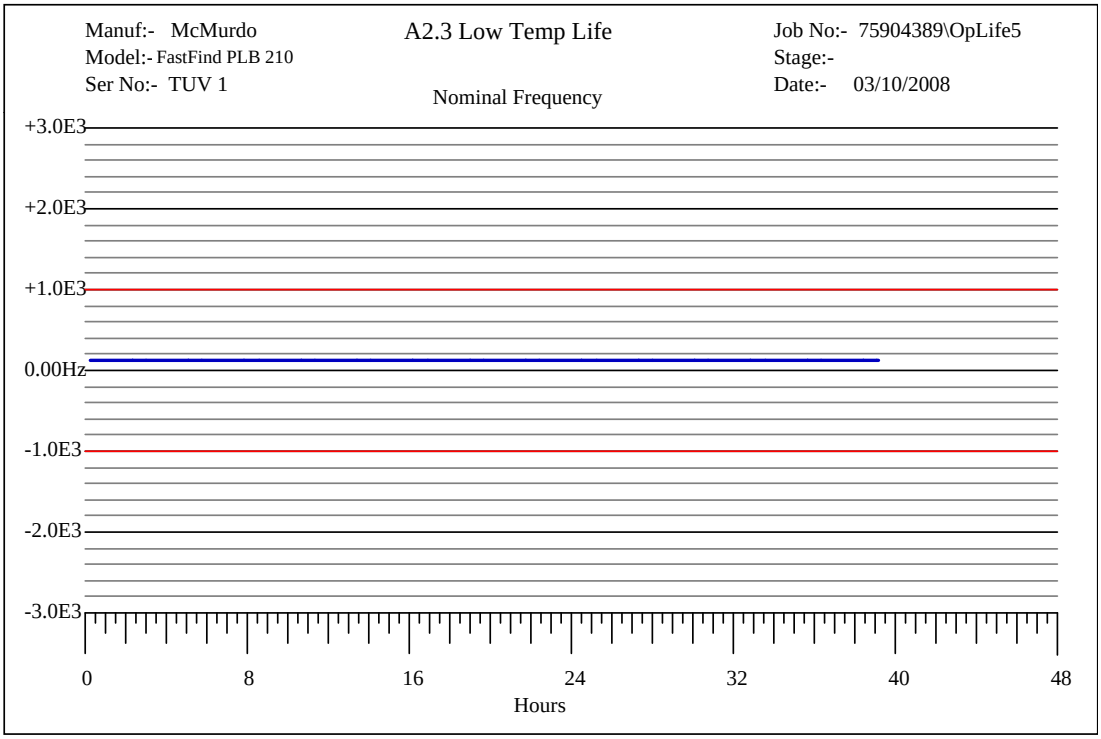
01 to 03 October - Modification State 0

2.7.3 Test Equipment Used

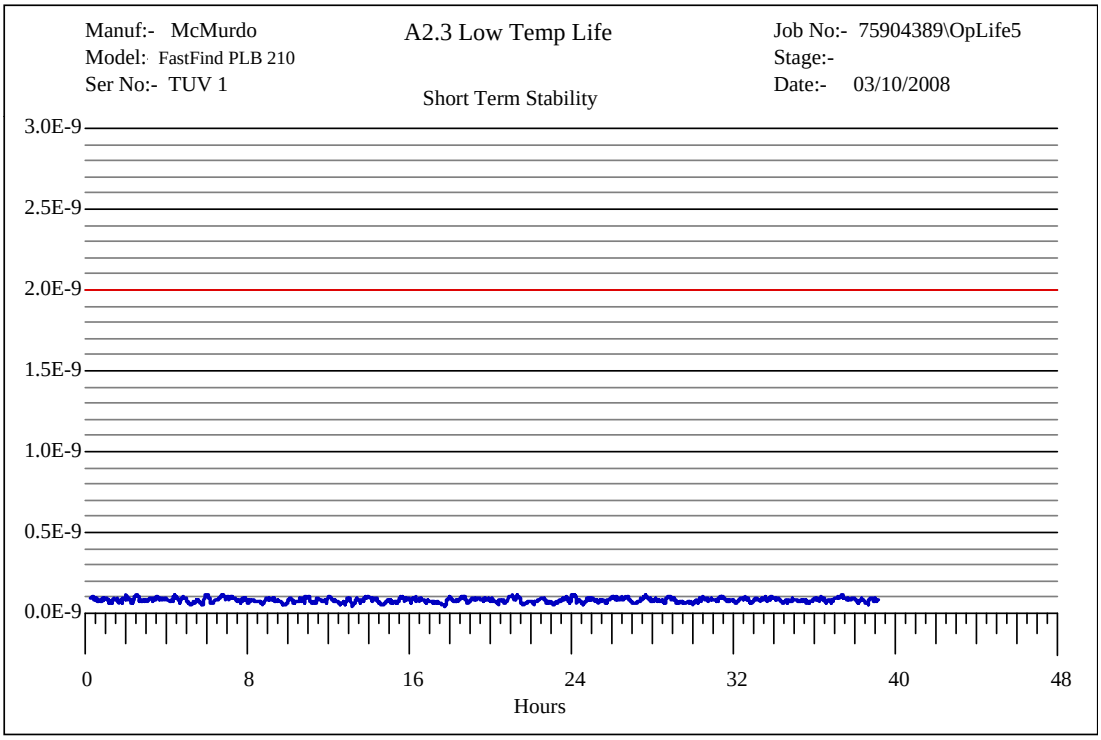
The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.4 Test Results

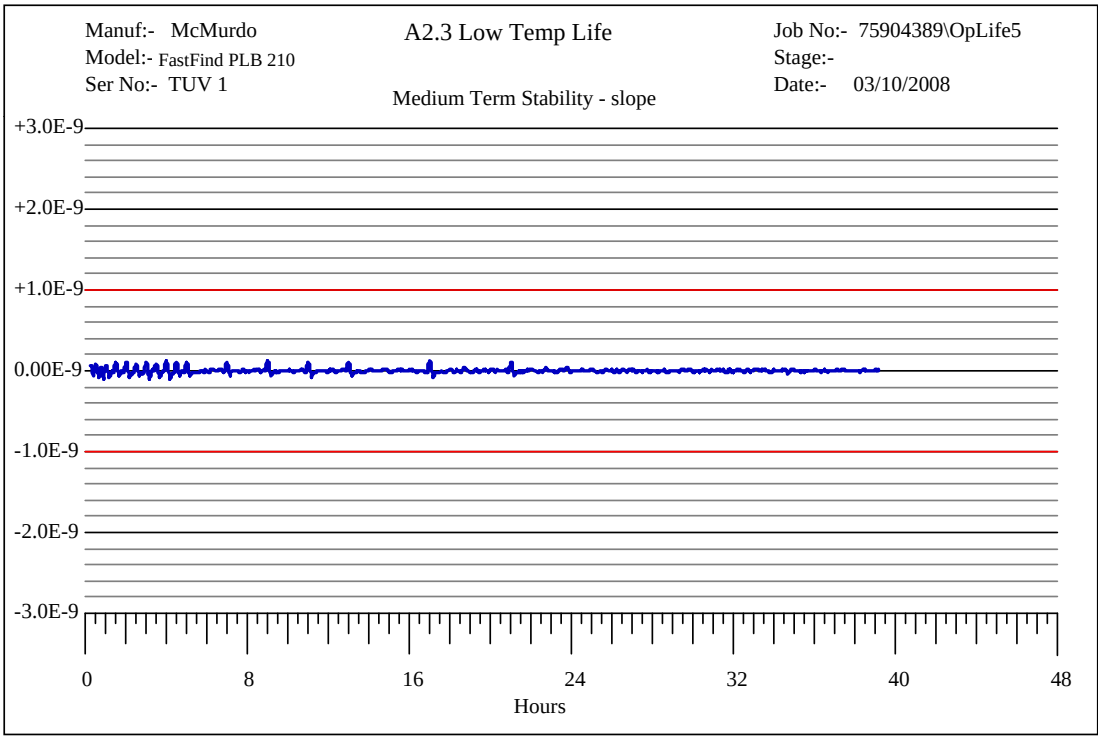
Nominal Frequency



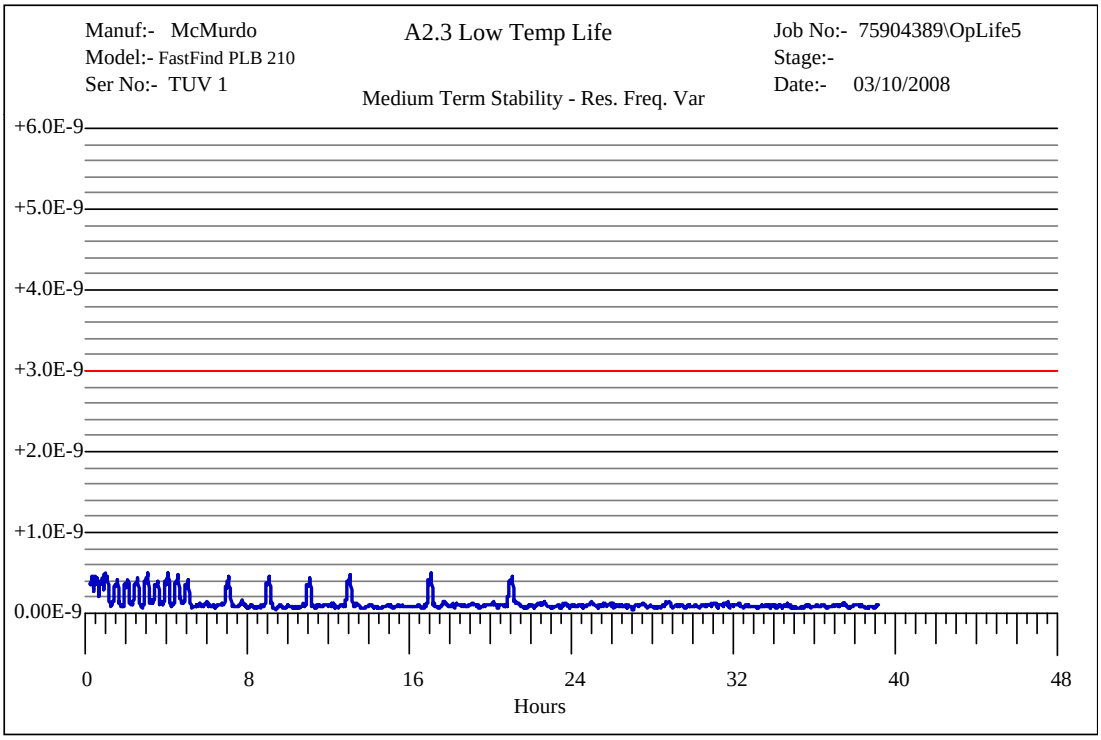
Short Term Stability



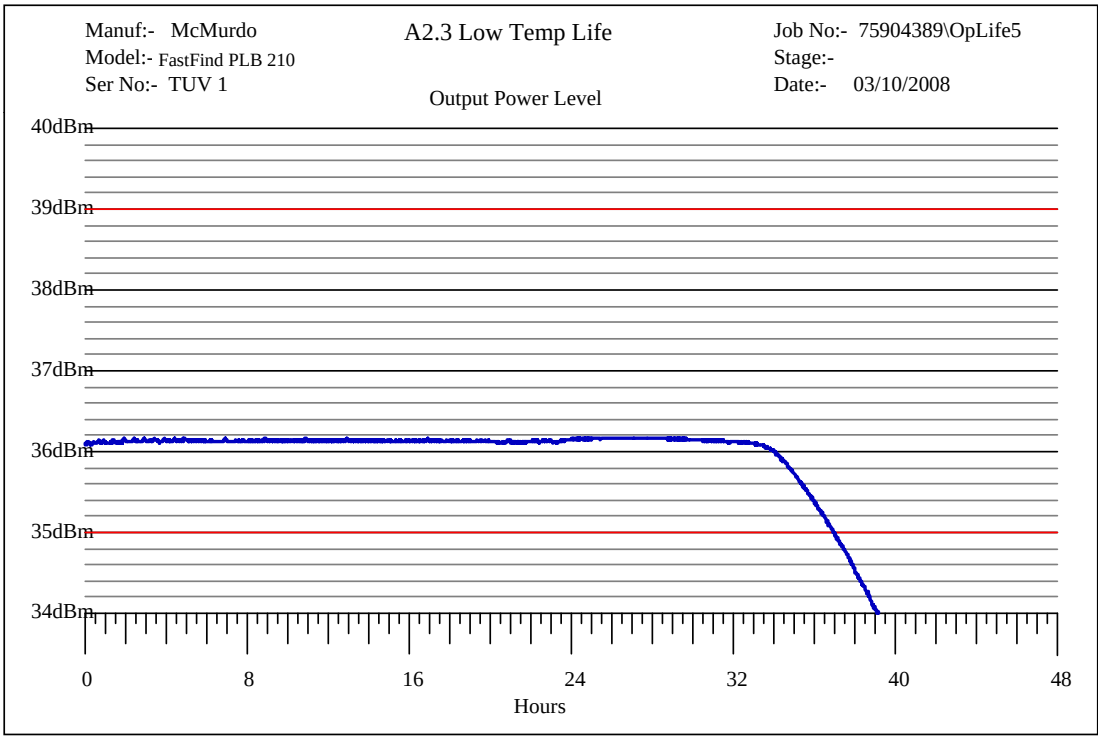
Medium Term Stability, Mean Slope



Medium Term Stability, Residual Frequency Variation



Output Power



Digital Message

```
Message Content
     Expected Message       FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
     Actual Message         FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
     Message Error Count    00


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                               0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                   110
Fixed Bit         110               1                                         1
Encode Pos Device 111               1 Internal                                1
121.5 Homing      112               1 YES                                     1
Position Change   113-132           DEFAULT              1000 0011 1110 0000 1111
Resultant Position                 --> Not Defined
BCH Encoded       133-144          Errors=0                        0110 0110 1100
BCH Generated     133-144                                          0110 0110 1100
```

Battery Current Measurement Results

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	:	20 minutes	(1199920 ms)
Self-test Current	:	11.6 seconds	(11588 ms)
GPS Test Current	:	5.12 minutes	(307443 ms)
Operating Current	:	5 minutes	(299840 ms)

Assumptions / Supplied Data

Battery Replacement Interval	: 6 years
Battery Capacity	: 1.55 Ah
Battery Self Drain	: 1.00 % per year
Self-test Interval	: 12 tests per year
GPS Tests	: 10 tests per life of beacon (limited)

Test Results

Mode Current	=	Accumulated Charge	/	Time		
Standby Current	=	65295829.74 pC	/	1199920 ms	=	54.42 nA
Self-test Current	=	413152 uC	/	11588 ms	=	35.65 mA
GPS Test Current	=	9867346 uC	/	307443 ms	=	32.09 mA
Operating Current	=	9040723.02 uC	/	299840 ms	=	30.15 mA

Product Service

Battery Preconditioning / Discharge Time Calculations

Battery Self Drain = Capacity - [(100% - Self Drain/Year%)$^{\text{Replacement Interval}}$ x Capacity]
= 1.55- ((1- 0.0100)^{6} x 1.55) = 0.0907 Ah

Standby Drain = Hours per year x Battery Replacement Interval x Standby Current
= 365 x 24 x 6 x 54.42 x 10^{-9} = 0.0029 Ah
Worst Case = 1.65 0.0029 Ah = 0.0047 Ah

Self-test Drain = Self-tests per battery x Self-test Current x Self-test duration (in hours)
= (12 x 6 + 10) x 35.65 x 10^{-3} x (12 / 3600) = 0.0094 Ah
Worst Case = 1.65 0.0094 Ah = 0.0155 Ah

GPS Test Drain = Self-tests per beacon x Self-test Current x Self-test duration (in hours)
= 10 x 32.09 x 10^{-3} x (5.1 / 60) + 10 x (0.4A * 0.52 / 3600) = 0.0280 Ah
Worst Case = 1.65 x 0.0280 Ah = 0.0462 Ah

Total Drain = Self Drain + Standby Drain (Worst Case) + Self-test Drain (Worst Case)
= 0.0907 + 0.0047 + 0.0155 + 0.0462 = 0.1571 Ah

Battery Preconditioning / Discharge Time = Worst Case drain / Operational Current
= 0.1571 / (30.15 x 10^{-3})
= 5.21 hours

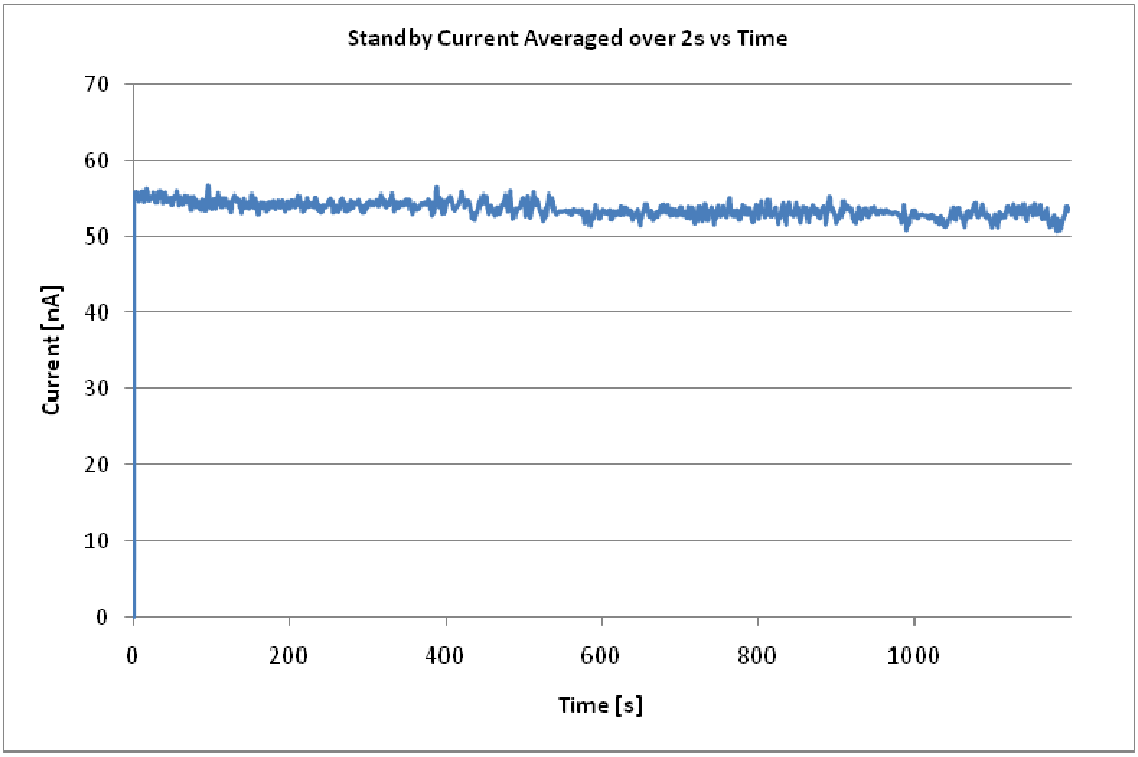
5.21 hours = 5 hours and 13 minutes. EUT Battery was discharged by operating the beacon into a 50Ω load (the same configuration in which the operating current was measured).

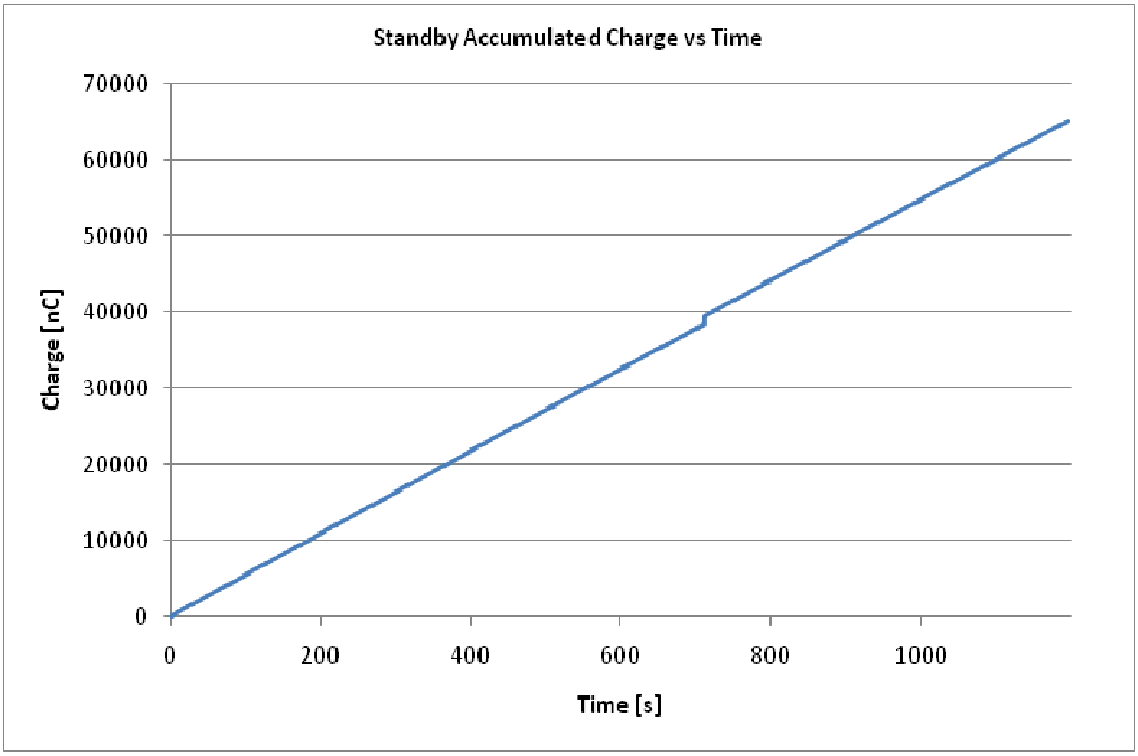
Note: Measurements were all conducted in the 50Ω-conducted configuration with the exception of the Self-test current. This was to enable accurate “real life” equivalent measurements as, in the conducted configuration; the EUT would not pass its Self-test routine and produce the three confirmation flashes of the White LED light.

In this configuration the peak current is less than in the operating mode, this is apparently due to antenna mismatch as, with the antenna extended; the peak current was similar to that of the operating mode. Since the normal Self-test physical configuration would be with the ‘safely cap’ on, the measurements shown and used in the calculations are that with the antenna folded in that position.

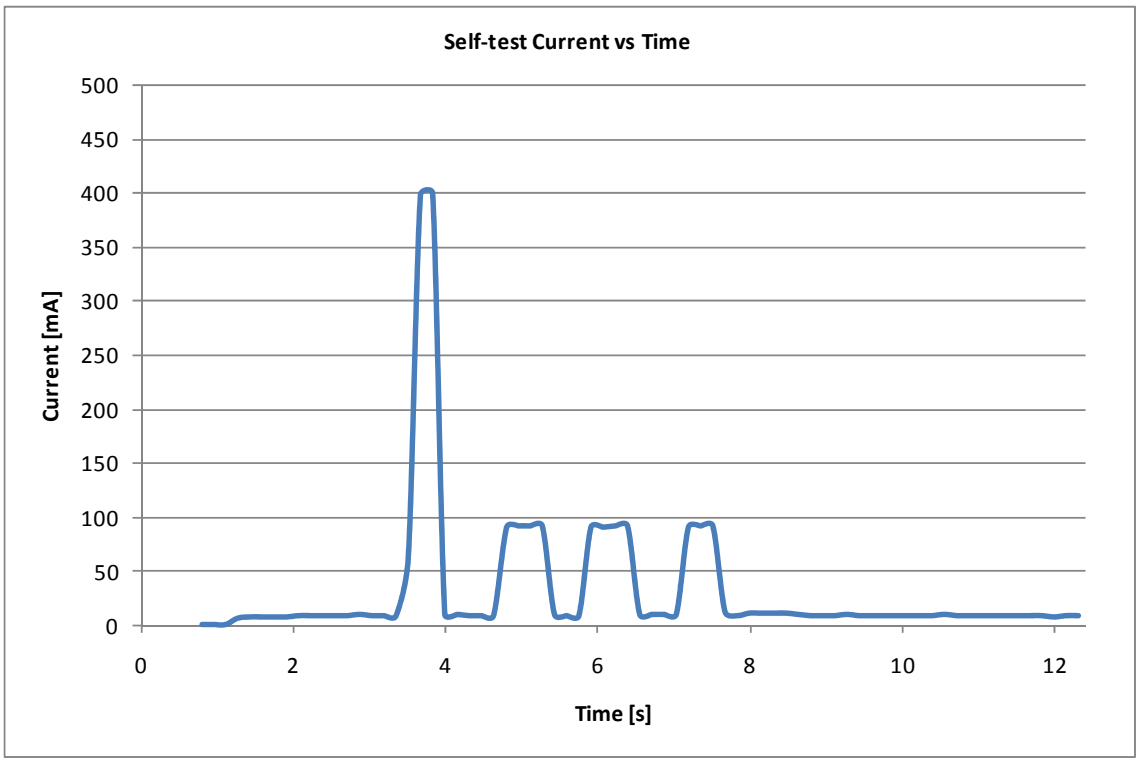
10 406 bursts were added to the GNSS self test. Since the normal Self-test physical configuration would be with the ‘safely cap’ on, the measurements shown and used in the calculations are that with the antenna folded in that position.

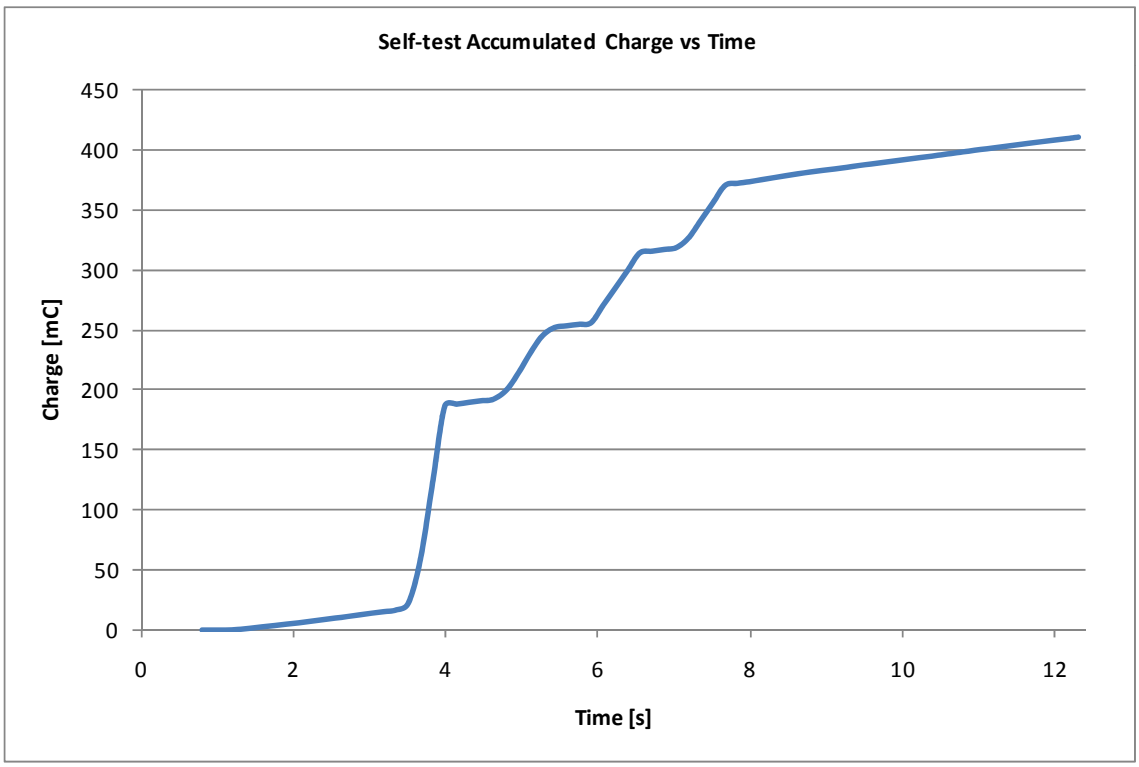
Battery Current Measurement Results (Standby Mode Graphs)



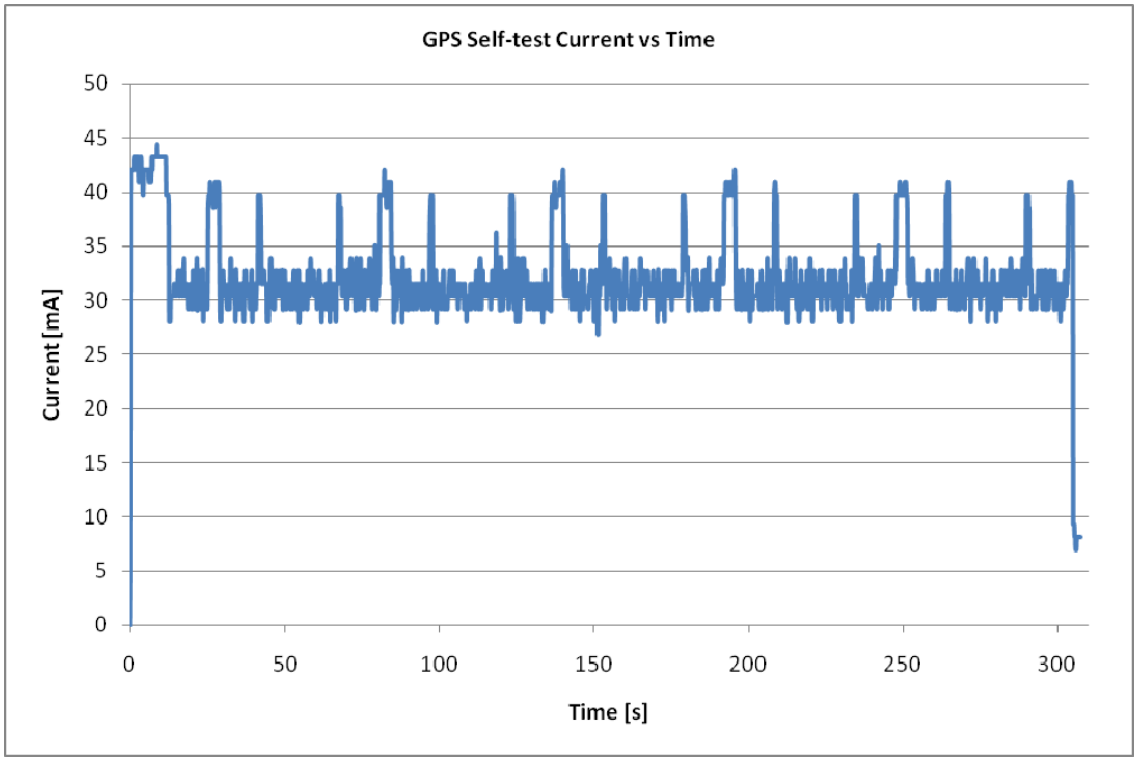


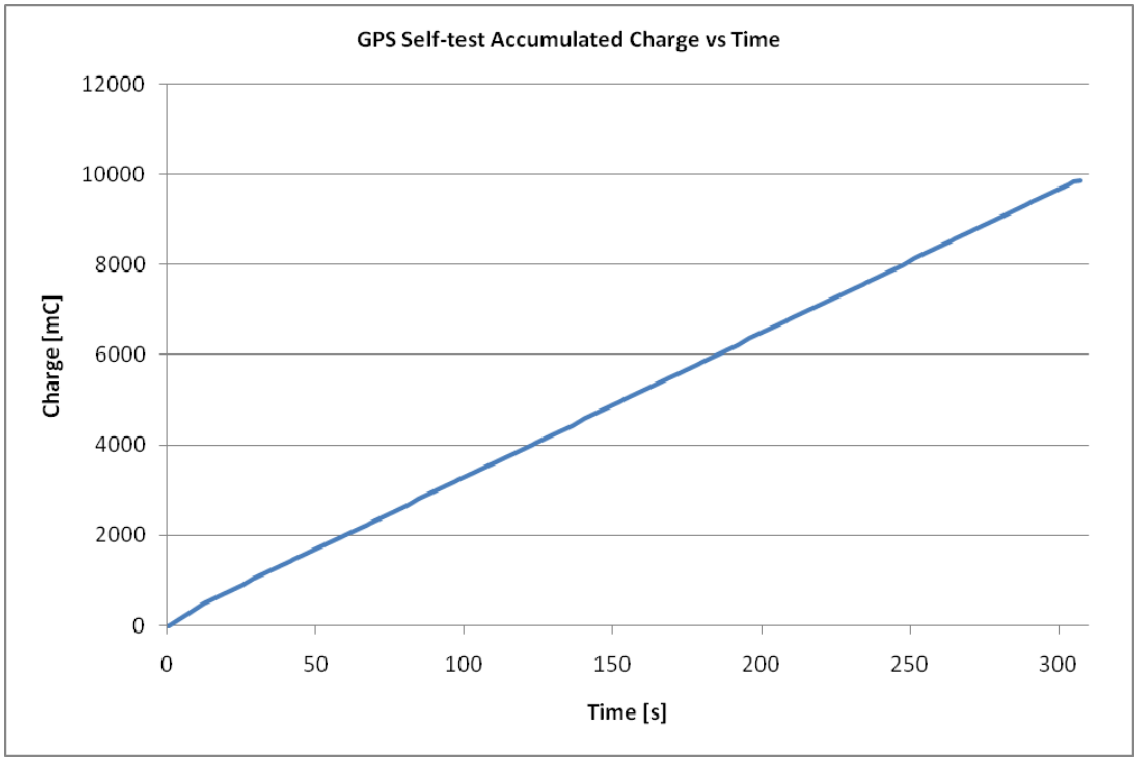
Battery Current Measurement Results (Self-test Mode Graphs)



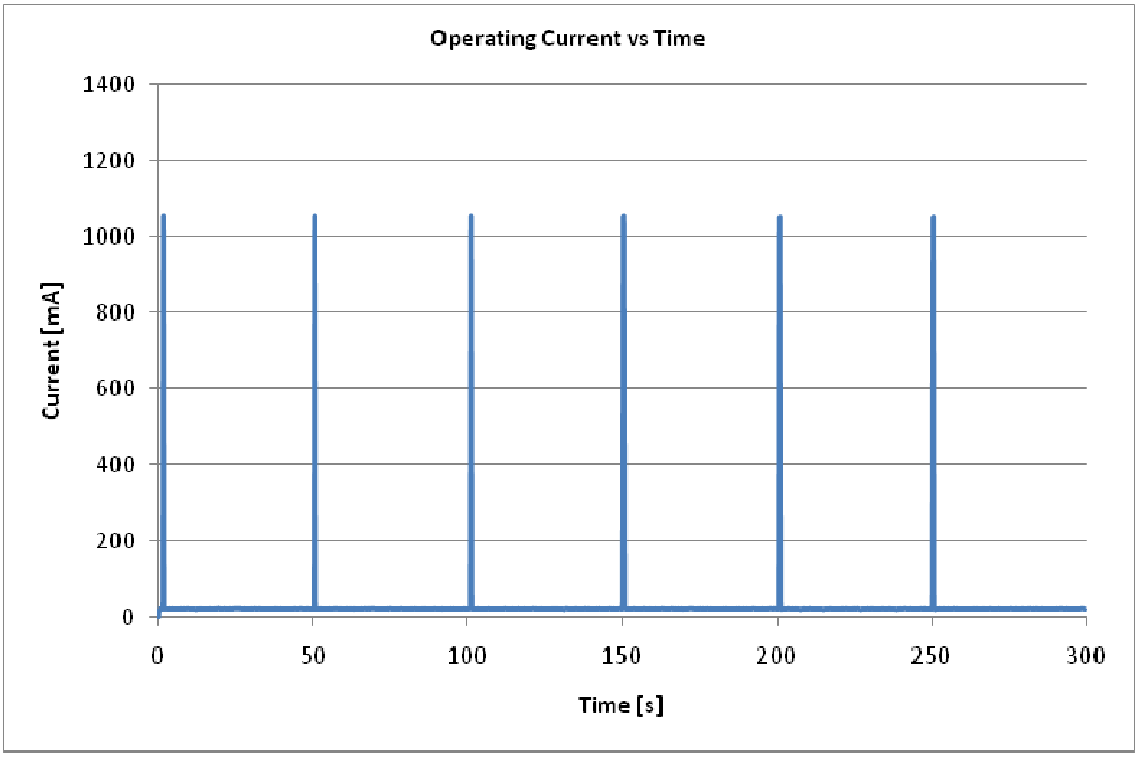


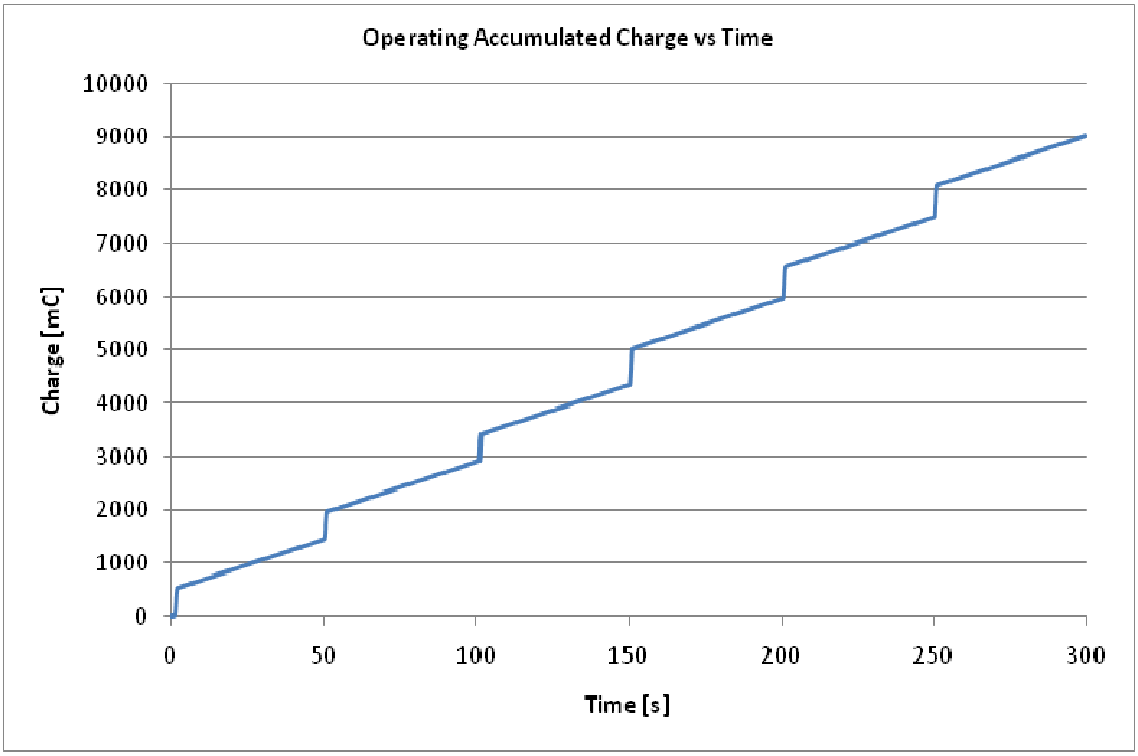
Battery Current Measurement Results (GPS Self-test Mode Graphs)





Battery Current Measurement Results (Standby Mode Graphs)





2.8 FREQUENCY STABILITY WITH TEMPERATURE GRADIENT

2.8.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.8.2 Date of Test and Modification State

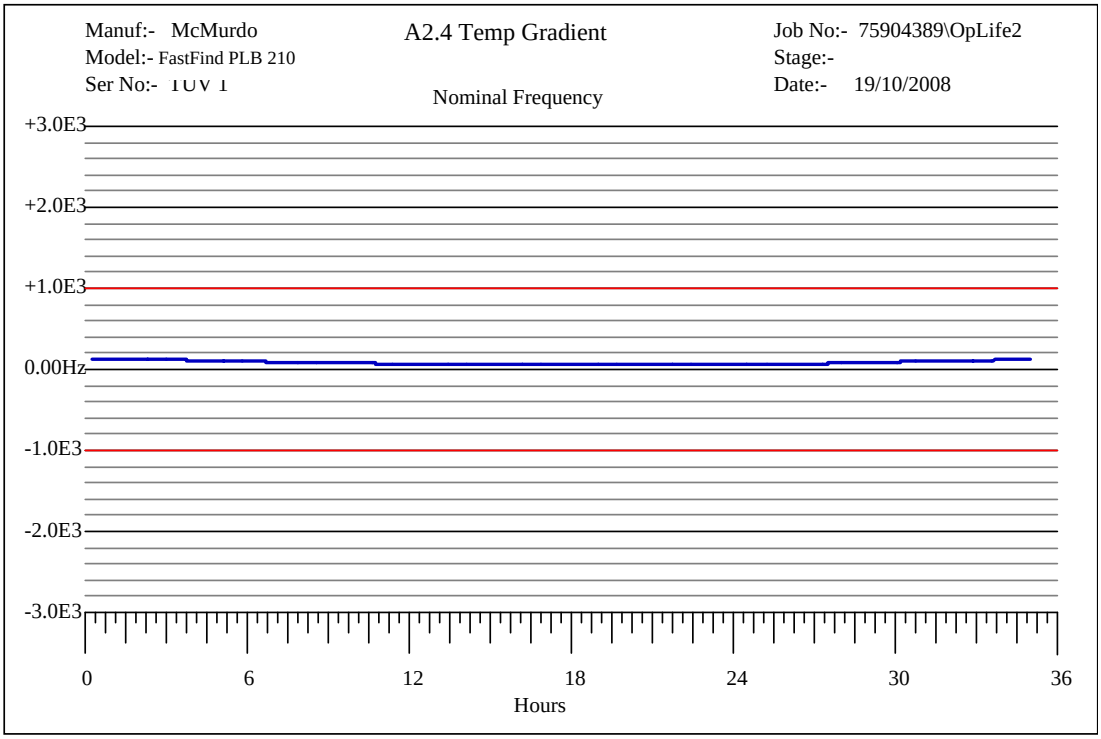
17 to 20 October 2008 - Modification State 0

2.8.3 Test Equipment Used

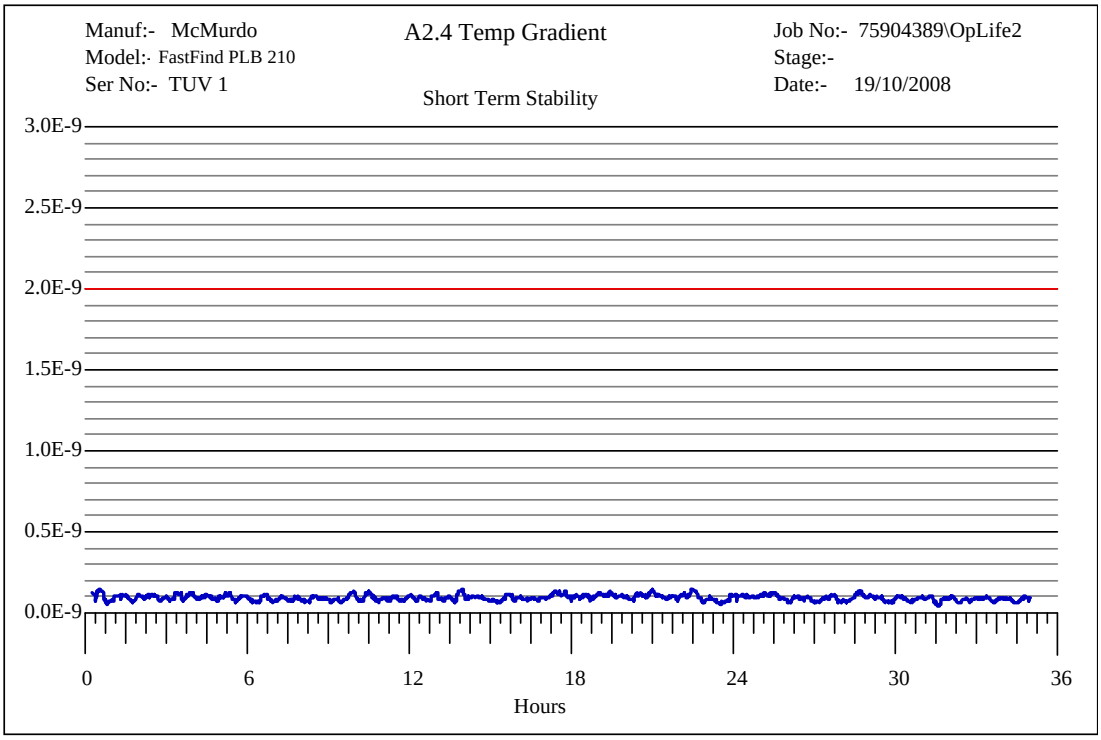
The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.4 Test Results

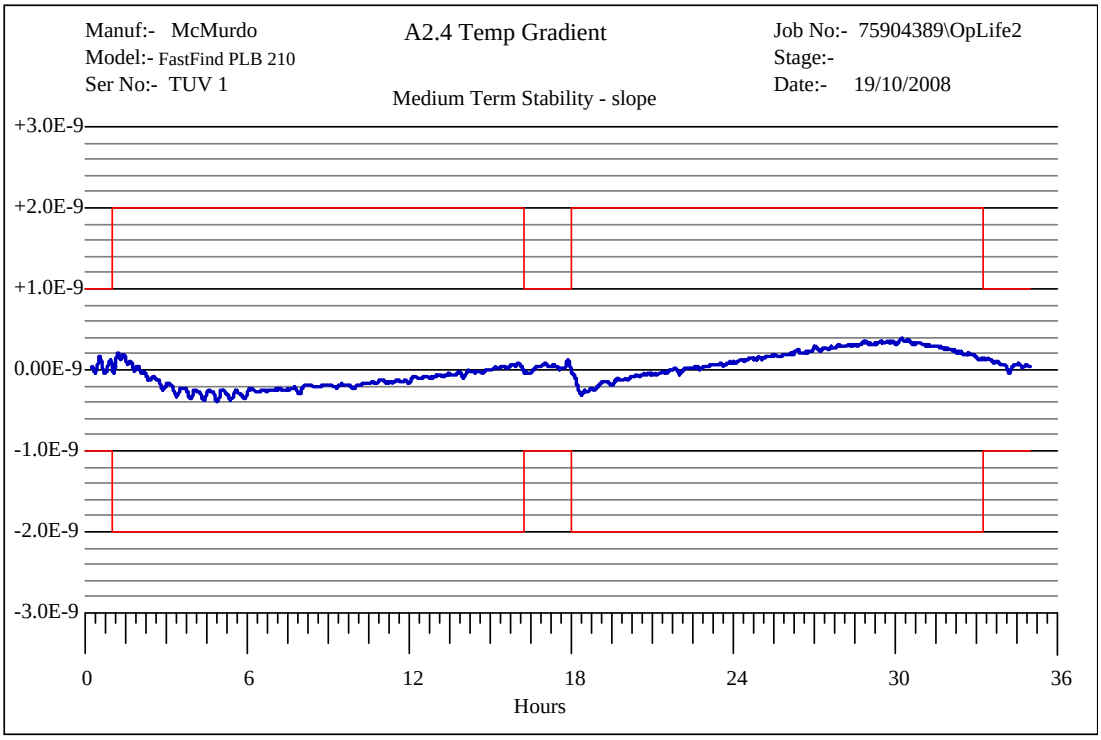
Nominal Frequency



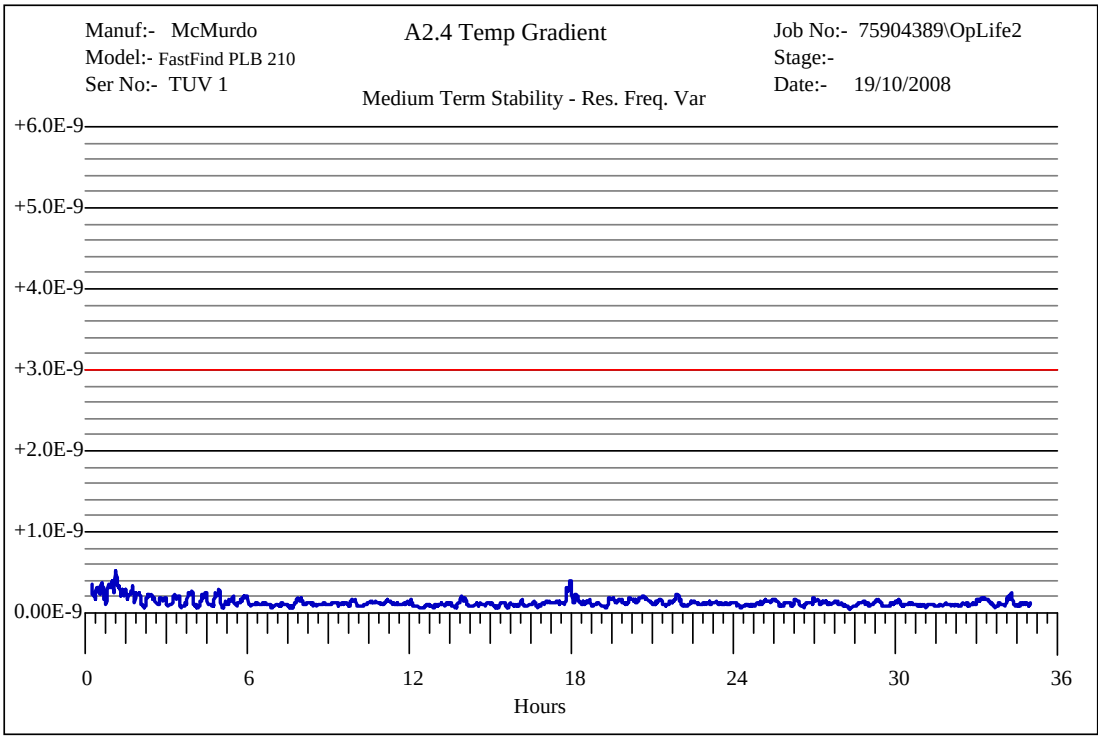
Short Term Stability



Medium Term Stability, Mean Slope

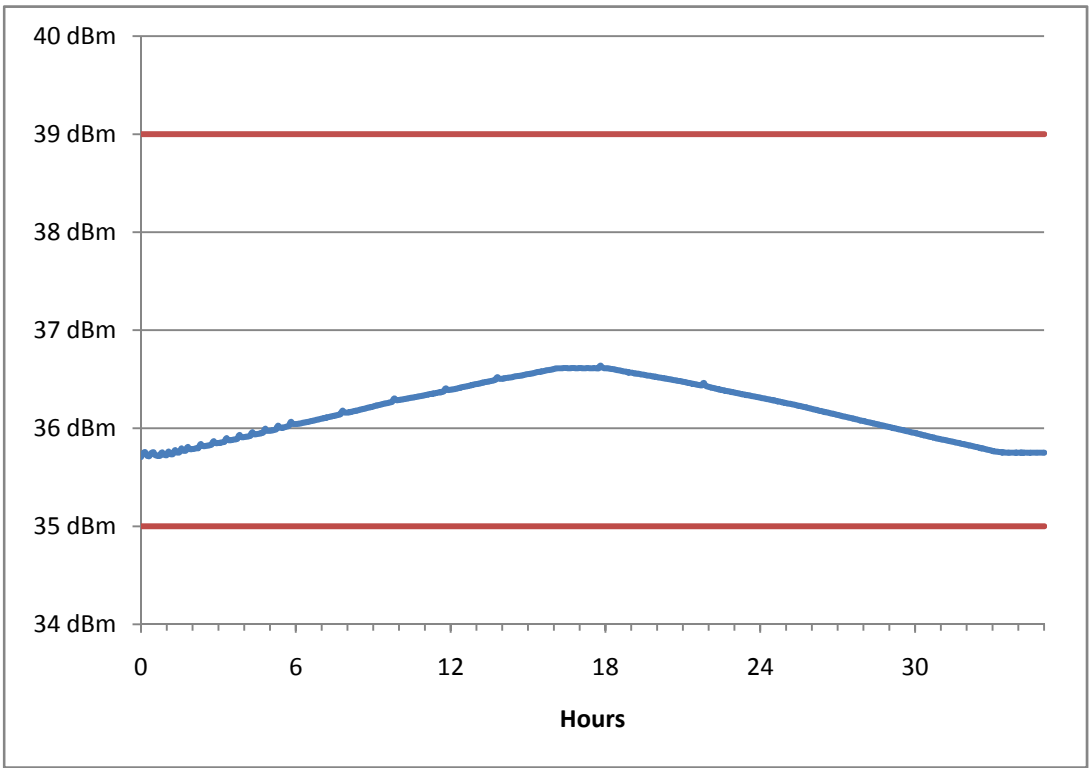


Medium Term Stability, Residual Frequency Variation



Output Power

Manuf:- McMurdo Model:- FastFind PLB 210 Ser No:- TUV 1	A2.4 Temp Gradient Output Power Level	Job No:- 75904389\OpLife2 Stage:- Date:- 19/10/2008



Digital Message

```
Message Content
     Expected Message       FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
     Actual Message         FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
     Message Error Count    00


Beacon Id Format......... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 193DF380C6FFBFF              193DF380C6FFBFF Default_Id
 30 Hex (Bits 25-144) = 8C9EF9C0637FDFF83D15B783E0F66C

   26   30   34   38   42   46   50   54   58   62   66   70   74   78   82
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1 0001 1001 0011 1101 1111 0011 1000 0000 1100 0110 1111 1111 1011 1111 1111
   0000 0111 1010 0010 1011 0110 1111 0000 0111 1100 0001 1110 1100 1101 100
   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
   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            0 Location NEW                               0
MID                27- 36      201 ALBANIA                          0011 0010 01
Protocol Code      37- 40       14 Test Serial (Standard)                  1110
Spare              41- 64                          1111 1001 1100 0000 0110 0011
Coarse Position    65- 85          DEFAULT            0111 1111 1101 1111 1111 1
BCH Encoded        86-106          Errors=0           0000 0111 1010 0010 1011 0
BCH Generated      86-106                             0000 0111 1010 0010 1011 0
Long Message      107-144          Data Present
Fixed Bits        107-109                                                   110
Fixed Bit         110               1                                         1
Encode Pos Device 111               1 Internal                                1
121.5 Homing      112               1 YES                                     1
Position Change   113-132           DEFAULT              1000 0011 1110 0000 1111
Resultant Position                 --> Not Defined
BCH Encoded       133-144          Errors=0                        0110 0110 1100
BCH Generated     133-144                                          0110 0110 1100
```

2.9 SATELLITE QUALITATIVE TESTS

2.9.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.9.2 Date of Test and Modification State

Config' 7 – 20 November 2008 at 20:00 to 21 November 2008 at 10:00 - Modification State 2
Config' 8 – 19 November 2008 at 20:00 to 20 November 2008 at 10:00 - Modification State 1

2.9.3 Test Equipment Used

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

2.9.4 Test Results

Note: For both the following configurations the modulus of the CTA (Cross Track Angle) has been taken of the original results (some were supplied as negative numbers).

Configuration 7

Beacon 15 Hex ID: 193DF 380C6 FFBFF
Actual location of the test beacon: Latitude: 052° 14.447'N
Longitude: 001° 43.970'W

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	Mean Rx Power (dBm)	TCA	CTA (deg)	Location Error (km)
S9	33317	193E0 031BF 81FE0	50.81642	-1.20054	-123.69	09:36:28	8.256	0.273
S11	10848	193E0 031BF 81FE0	50.81862	-1.19806	-126.13	08:23:25	18.182	0.051
S7	54718	193E0 031BF 81FE0	50.76291	-1.41870	-129.40	08:12:30	20.620	16.687
S7	54717	193E0 031BF 81FE0	50.82194	-1.19413	-118.15	06:33:59	7.856	0.492
S8	42094	193E0 031BF 81FE0	50.81753	-1.19439	-123.24	06:36:05	4.894	0.252
S8	42093	193E0 031BF 81FE0	50.81835	-1.19935	-120.01	04:55:09	10.740	0.108
S7	54716	193E0 031BF 81FE0	50.84405	-1.22076	-123.54	04:54:07	7.448	3.294
S10	18061	193E0 031BF 81FE0	50.82261	-1.19479	-127.64	04:39:26	18.371	0.536
S10	18060	193E0 031BF 81FE0	50.81850	-1.19584	-122.96	02:59:47	4.853	0.144
S10	18059	193E0 031BF 81FE0	50.81703	-1.20067	-125.00	01:18:43	10.831	0.237
S9	33311	193E0 031BF 81FE0	50.81592	-1.19352	-128.72	23:06:54	19.190	0.394
S11	10842	193E0 031BF 81FE0	50.82139	-1.19349	-120.17	21:52:38	9.399	0.469
S11	10841	193E0 031BF 81FE0	50.82205	-1.19918	-113.28	20:12:23	6.081	0.440
S9	33310	193E0 031BF 81FE0	50.82047	-1.19120	-123.31	21:25:54	3.252	0.531

$$\text{Ratio of successful solutions} = \frac{\text{number of Doppler solution within 5km with } 1° < CTA < 21°}{\text{number of satellite passes over test duration with } 1° < CTA < 21°}$$

$$= \frac{13}{14} = 92.9\%$$

Product Service

Configuration 8

Beacon 15 Hex ID: 193DF 380C6 FFBFF
Actual location of the test beacon: Latitude: 052° 14.447'N
Longitude: 001° 43.970'W

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	Mean Rx Power (dBm)	TCA	CTA (deg)	Location Error (km)
S10	18045	993F4 0018C 00F9D	50.81702	-1.20167	-131.77	01:29:20	9.148	0.299
S11	10828	993F4 0018C 00F9D	50.82224	-1.19266	-124.41	22:13:33	12.716	0.579
S9	33296	993F4 0018C 00F9D	50.82301	-1.19636	-126.35	21:49:12	6.904	0.546
S11	10827	993F4 0018C 00F9D	50.82440	-1.20191	-123.30	20:33:00	3.004	0.748
S9	33295	993F4 0018C 00F9D	50.82526	-1.21014	-126.42	20:09:20	8.351	1.168

$$\text{Ratio of successful solutions} = \frac{\text{number of Doppler solution within 5km with } 1° < \text{CTA} < 21°}{\text{number of satellite passes over test duration with } 1° < \text{CTA} < 21°}$$

$$= \frac{5}{5} = 100\%$$

2.10 ANTENNA CHARACTERISTICS

2.10.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.10.2 Date of Test and Modification State

09 October 2008 - Modification State 0

2.10.3 Test Equipment Used

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

2.10.4 Test Results

Configuration 4 (Figure B.5)

	Elevation Angle (degrees)									
	10		20		30		40		50	
Azimuth Angle (degrees)	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	39.3	2.15	39.7	2.51	36.5	-0.67	33.6	-3.58	30.8	-6.42
90	39.5	2.28	39.9	2.72	36.9	-0.32	35.4	-1.79	33.9	-3.30
180	39.7	2.47	40.2	2.95	36.9	-0.34	35.2	-2.02	34.2	-3.04
270	39.8	2.58	40.3	3.07	36.8	-0.44	33.0	-4.19	~~30.1~~	-7.14

$EIRP_{LOSS}$ = Pt_{amb} - Pt_{EOL} = (36.51 - 36.08) = 0.43dB

$EIRP_{maxEOL}$ = MAX [$EIRP_{max}$, ($EIRP_{max}$ - $EIRP_{LOSS}$)] = MAX (40.3, 39.8) = 40.3dBm

$EIRP_{minEOL}$ = MIN [$EIRP_{min}$, ($EIRP_{min}$ - $EIRP_{LOSS}$)] = MIN (30.8, 30.4) = 30.4dBm

Pt_{amb} is the power at ambient from the summary table
Pt_{EOL} is the power at the end of Operating Life at Minimum Temperature
$EIRP_{max}$ is the maximum EIRP from the antenna characteristics spreadsheet
$EIRP_{min}$ is the minimum EIRP from the antenna characteristics spreadsheet

Product Service

Configuration 3: (Figure B.2)

	Elevation Angle (degrees)									
	10		20		30		40		50	
Azimuth Angle (degrees)	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	38.6	1.35	42.0	4.82	41.8	4.63	37.3	0.08	34.8	-2.35
30	38.8	1.56	42.0	4.83	41.6	4.41	37.1	-0.07	35.7	-1.50
60	38.7	1.53	41.9	4.72	41.3	4.08	37.0	-0.22	36.2	-1.01
90	38.7	1.52	42.0	4.75	41.5	4.28	36.9	-0.29	36.1	-1.14
120	38.6	1.41	41.7	4.47	41.2	3.97	36.7	-0.49	36.1	-1.07
150	38.5	1.31	42.0	4.79	41.4	4.19	36.8	-0.42	36.0	-1.25
180	38.4	1.21	41.9	4.71	41.4	4.18	36.6	-0.60	35.5	-1.71
210	38.5	1.30	42.2	4.99	41.8	4.55	36.8	-0.42	34.9	-2.33
240	38.5	1.31	42.1	4.90	42.0	4.76	37.1	-0.13	34.3	-2.90
270	38.7	1.51	42.1	4.85	42.0	4.85	37.1	-0.06	34.0	-3.18
300	38.7	1.53	42.1	4.94	42.1	4.89	37.3	0.10	33.7	-3.47
330	38.7	1.54	41.9	4.72	41.9	4.71	37.3	0.13	34.3	-2.91

	Elevation Angle (degrees)									
	10		20		30		40		50	
Azimuth Angle (degrees)	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh
0	110.00	90.50	113.10	86.70	112.10	96.00	106.20	96.00	102.50	87.60
30	110.20	91.20	113.10	89.30	111.90	95.20	106.10	95.20	103.40	86.70
60	110.20	87.30	113.00	87.30	111.60	93.30	106.10	92.80	103.90	86.40
90	110.20	86.70	113.00	92.50	111.80	92.90	106.20	84.20	103.80	84.10
120	110.10	81.60	112.70	93.80	111.50	92.20	106.00	83.50	103.70	90.80
150	110.00	75.80	113.00	95.70	111.70	93.50	106.00	89.20	103.30	93.60
180	109.90	78.00	112.90	96.30	111.70	93.40	105.70	92.80	102.60	94.90
210	110.00	65.60	113.20	95.60	112.10	90.90	106.00	89.20	101.90	94.70
240	110.00	83.90	113.10	96.30	112.30	91.70	106.30	89.10	101.60	92.40
270	110.20	83.40	113.10	92.80	112.40	90.50	106.40	87.30	101.50	90.20
300	110.20	87.20	113.20	91.20	112.40	94.30	106.50	90.70	101.40	85.80
330	110.20	89.90	113.00	87.70	112.20	95.40	106.40	94.10	102.00	84.70
Min (Vv-Vh)	19.00		16.60		16.10		10.20		7.20*	

*Four out of 60 points is 6.67%, the maximum limit is 20%

$EIRP_{LOSS}$ = Pt_{amb} - Pt_{EOL} = (36.51 - 36.08) = 0.43dB

$EIRP_{maxEOL}$ = MAX [$EIRP_{max}$, ($EIRP_{max}$ - $EIRP_{LOSS}$)] = MAX (42.2, 41.8) = 42.2dBm

$EIRP_{minEOL}$ = MIN [$EIRP_{min}$, ($EIRP_{min}$ - $EIRP_{LOSS}$)] = MIN (33.7, 33.3) = 33.3dBm

Pt_{amb} is the power at ambient from the summary table
Pt_{EOL} is the power at the end of Operating Life at Minimum Temperature
$EIRP_{max}$ is the maximum EIRP from the antenna characteristics spreadsheet
$EIRP_{min}$ is the minimum EIRP from the antenna characteristics spreadsheet

2.11 BEACON CODING SOFTWARE

2.11.1 Test Results

Test completed by customer, results submitted to TÜV Product Service Ltd can be found at Annex A

2.12 NAVIGATION SYSTEM – USER LOCATION PROTOCOL

2.12.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.12.2 Date of Test and Modification State

Position Acquisition Time and Position Accuracy: 21 November 2008 - Modification State 2
All other tests: 19 November 2008 - Modification State 1

2.12.3 Test Equipment Used

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

2.12.4 Test Results

Position Data Default Values

The beacon was activated without receiving GPS signals and operated for 30 minutes. Message content was checked for all bursts during this period.

36 Hex Message	Message Count
FFFE2FCC9FA000C6007CE991E56FE0FF0146	37

Position Acquisition Time and Position Accuracy

A3.8.2.1: Location 50° 52.131'N, 001° 14.694'W ①
A3.8.2.2: Location 51° 22.583'N, 001° 49.833'W ②

Operation Configuration	C/S T.007 Section A3.8.2.1		C/S T.007 Section A3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Water ground plane	N/A	N/A	N/A	N/A
Antenna fixed to ground plane	N/A	N/A	N/A	N/A
Beacon on ground plane	51	1545.2	51	3372.8
Beacon above ground plane	51	1545.2	51	3372.8
Other (specify)	N/A	N/A	N/A	N/A

Positional accuracy was estimated using the Haversine Formula, Earth's radius taken as 6367km.

① GPS Site Survey – Live Location
② Input from GPS simulator.

Encoded Position Data Update Interval

Location: N 1° 3.500' W 1° 2.500' ②		
Time from activation to 1st message	51s	
First Message Acquired at	10:54:35	FFFE2FCC9FA000C6007CE991E560230110F4
Data Acquired at	10:54:35	FFFE2FCC9FA000C6007CE991E560230110F4
Location: N 3° 23.500' W 5° 6.250' ②		
First Message Acquired at	10:56:15	FFFE2FCC9FA000C6007CE991E560230110F4
Data Updated at	11:18:44	FFFE2FCC9FA000C6007CE991E5606D0520AF
Data Update Interval	22 minutes 29 seconds	

Position Clearance After Deactivation

Following the Encoded Position Data Update Interval test, the beacon was deactivated and reactivated without providing navigation data.

Deactivated at	11:19:00	
Time from re-activation to 1st message	51s	
Default data present	11:20:43	FFFE2FCC9FA000C6007CE991E56FE0FF0146

Position Data Input Update Interval

Test not applicable.

Last Valid Position

Location: N 51° 22.583' W 1° 49.833' ②		
Time from activation to 1st message	51s	
First Message Acquired at	18:26:04	FFFE2FCC9FA000C6007CE991E56FE0FF0146
Data Acquired at	18:26:56	FFFE2FCC9FA000C6007CE991E5666D01C026
GPS Signal Navigation Data Removed	18:27:06	
Last Message with Positional Data	22:25:49	FFFE2FCC9FA000C6007CE991E5666D01C026
First Message with Default Data	22:26:41	FFFE2FCC9FA000C6007CE991E56FE0FF0146
Last Valid Position Held	239 minutes 55 seconds	

② Input from GPS simulator.

Coarse Position and Delta Offset

Test data supplied by applicant, see Annex A.

2.13 NAVIGATION SYSTEM – STANDARD LOCATION PROTOCOL

2.13.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.13.2 Date of Test and Modification State

Position Acquisition Time and Position Accuracy:	21 November 2008 - Modification State 2
All other tests:	14 and 17 November 2008 - Modification State 1

2.13.3 Test Equipment Used

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

2.13.4 Test Results

Position Data Default Values

The beacon was activated without receiving GPS signals and operated for 30 minutes. Message content was checked for all bursts during this period.

36 Hex Message	Message Count
FFFE2F8C9EF9C0637FDFF83D15B783E0F66C	37

Position Acquisition Time and Position Accuracy

A3.8.2.1: Location 50° 52.131'N, 001° 14.694'W ①
A3.8.2.2: Location 51° 22.583'N, 001° 49.833'W ②

Operation Configuration	C/S T.007 Section A3.8.2.1		C/S T.007 Section A3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Water ground plane	N/A	N/A	N/A	N/A
Antenna fixed to ground plane	N/A	N/A	N/A	N/A
Beacon on ground plane	151	32.8	103	50.1
Beacon above ground plane	51	32.8	51	50.1
Other (specify)	N/A	N/A	N/A	N/A

Positional accuracy was estimated using the Haversine Formula, Earth's radius taken as 6367km.

① GPS Site Survey – Live Location
② Input from GPS simulator.

Product Service

Encoded Position Data Update Interval

Location: N 51° 22.583' W 1° 49.833' ①		
Time from activation to 1st message	51s	
First Message Acquired at	11:23:38	FFFE2F8C9EF9C06333A03ECA66771DA4D4D0
Data Acquired at	11:23:38	FFFE2F8C9EF9C06333A03ECA66771DA4D4D0
Location: N 50° 48.683' W 1° 37.417' ①		
First Message Acquired at	11:46:57	FFFE2F8C9EF9C06333A03ECA66771DA4D4D0
Data Updated at	11:47:48	FFFE2F8C9EF9C06332E038A8BFB78E8792E8
Data Update Interval	24 minutes 10 seconds	

Position Clearance After Deactivation

Following the Encoded Position Data Update Interval test, the beacon was deactivated and reactivated without providing navigation data.

Deactivated at	12:49:39	
Time from re-activation to 1st message	51s	
Default data present	12:55:01	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C

Position Data Input Update Interval

Test not applicable.

Last Valid Position

Location: N 50° 52.121' W 1° 14.685' ①		
Time from activation to 1st message	51s	
First Message Acquired at	09:38:41	FFFE2F8C9EF9C06332E02BC44E379C8051C4
Data Acquired at	09:38:41	FFFE2F8C9EF9C06332E02BC44E379C8051C4
GPS Signal Navigation Data Removed		
Last Message with Positional Data	13:37:38	FFFE2F8C9EF9C06332E02BC44E379C8051C4
First Message with Default Data	13:38:28	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
Last Valid Position Held	238 minutes 57 seconds	

① GPS Site Survey – Live Location

Coarse Position and Delta Offset

Test data supplied by applicant, see Annex A.

2.14 NAVIGATION SYSTEM – NATIONAL LOCATION PROTOCOL

2.14.1 Equipment Under Test

Fastfind PLB 210, Serial Number: TUV 1

2.14.2 Date of Test and Modification State

Position Acquisition Time and Position Accuracy: 21 November 2008 - Modification State 2
All other tests: 18 November 2008 - Modification State 1

2.14.3 Test Equipment Used

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

2.14.4 Test Results

Position Data Default Values

The beacon was activated without receiving GPS signals and operated for 30 minutes. Message content was checked for all bursts during this period.

36 Hex Message	Message Count
FFFE2F8C9F0018DFC0FF04F9E4379F3C0010	37

Position Acquisition Time and Position Accuracy

A3.8.2.1: Location 50° 52.131'N, 001° 14.694'W ①
A3.8.2.2: Location 51° 22.583'N, 001° 49.833'W ②

Operation Configuration	C/S T.007 Section A3.8.2.1		C/S T.007 Section A3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Water ground plane	N/A	N/A	N/A	N/A
Antenna fixed to ground plane	N/A	N/A	N/A	N/A
Beacon on ground plane	103	32.8	51	49.5
Beacon above ground plane	51	32.8	51	49.5
Other (specify)	N/A	N/A	N/A	N/A

Positional accuracy was estimated using the Haversine Formula, Earth's radius taken as 6367km.

① GPS Site Survey – Live Location
② Input from GPS simulator.

Product Service

Encoded Position Data Update Interval

Location: N 51° 22.583' W 1° 49.833' ②		
Time from activation to 1st message	51s	
First Message Acquired at	17:25:56	FFFE2F8C9F0018DFC0FF04F9E4379F3C0010
Data Acquired at	17:26:48	FFFE2F8C9F0018CCD701C85E1A37920C0AB2
Location: N 50° 48.683' W 1° 37.417' ②		
First Message Acquired at	17:27:36	FFFE2F8C9F0018CCD701C85E1A37920C0AB2
Data Updated at	17:50:06	FFFE2F8C9F0018CCB1019D9B45F794240FCD
Data Update Interval	23 minutes 18 seconds	

Position Clearance After Deactivation

Following the Encoded Position Data Update Interval test, the beacon was deactivated and reactivated without providing navigation data.

Deactivated at	18:15:51	
Time from re-activation to 1st message	51s	
Default data present	18:18:18	FFFE2F8C9F0018DFC0FF04F9E4379F3C0010

Position Data Input Update Interval

Test not applicable.

Last Valid Position

Location: N 51° 22.583' W 1° 49.833' ②		
Time from activation to 1st message	51s	
First Message Acquired at	09:14:08	FFFE2F8C9F0018CCD701C85E1A37920C0AB2
Data Acquired at	09:14:08	FFFE2F8C9F0018CCD701C85E1A37920C0AB2
GPS Signal Navigation Data Removed	09:14:25	
Last Message with Positional Data	13:13:05	FFFE2F8C9F0018CCD701C85E1A37920C0AB2
First Message with Default Data	13:13:55	FFFE2F8C9F0018DFC0FF04F9E4379F3C0010
Last Valid Position Held	239 minutes and 47 seconds	

②Input from GPS simulator.

Coarse Position and Delta Offset

Test data supplied by applicant, see Annex A.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT

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

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Sections 2.1, 2.3, 2.4 and 2.5 Beacons - Constant Temperature Tests					
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	-	O/P Mon
Power Meter	Hewlett Packard	436A	47	12	8-Jul-2009
Power Meter	Hewlett Packard	436A	83	12	13-Aug-2009
Climatic Chamber	Heraeus Votsch	VM 04/100	85	-	O/P Mon
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	2-Jan-2009
Signal Generator	Hewlett Packard	8644A	96	12	17-Apr-2009
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Time Interval Analyser	Yokogawa	TA720	181	12	27-Feb-2009
High Resolution Oscilloscope	Gould	840	182	12	6-Mar-2009
Signal Generator	Hewlett Packard	8644A	199	12	29-Jul-2009
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	12	22-Jul-2009
Attenuator: 6dB/10W	Trilithic	HFP-50N	476	12	22-Jul-2009
Attenuator: 10dB/20W	Narda	766-10	480	12	22-Jul-2009
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	13-Feb-2009
Termination (50ohm, 15W)	Radio Spares	612-192	2416	12	1-Sep-2009
Distress Beacon RF Unit	TUV	-	2445	-	TU
Stop Clock	R.S Components	RS328 061	2674	-	TU
Beacon RF Unit	TUV	N/A	3066	-	TU
Hygrometer	Rotronic	I-1000	3068	12	26-Jun-2009
Termination (50ohm, 2W)	Omni-Spectra	3001-6100	3081	12	15-Mar-2009
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3096	12	15-Mar-2009
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3097	12	15-Mar-2009
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	18-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3161	12	2-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3162	12	18-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3163	12	2-Jun-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Thermocouple Thermometer	Fluke	51	3174	12	26-Jun-2009
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	1-Aug-2009
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	12	1-Aug-2009
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	6-Nov-2008
ScopeCorder	Yokogawa	DL750 701210	3254	12	6-Nov-2008
Short Circuit	TUV	Short Cicuit	3272	-	TU
Power Sensor	Agilent	8482A	3290	12	26-Nov-2008

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Sections 2.1, 2.3, 2.4 and 2.5 Beacons - Constant Temperature Tests (continued)					
Cable (1m, N type)	Rhophase	NPS-1601-1000-NPS	3350	12	22-Apr-2009
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3358	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	12	22-Apr-2009
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3360	12	22-Apr-2009
Timer ('Electronic Clock Timer')	R.S Components	870A	3558	-	TU
Sections 2.12, 2.13 and 2.14 Beacons - Navigation System					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Load (50ohm, 15W)	Diamond Antenna	DL-30N	337	12	1-Sep-2009
Stop Clock	R.S Components	RS328 061	2674	-	TU
GPS/SBAS Simulator	Spirent	STR4500	3056	-	TU
Timer ('Electronic Clock Timer')	R.S Components	870A	3558	-	TU
Copper GRP	TÜV	27cm Diameter	3538	-	TU
Section 2.9 Beacons – Satellite Qualitative					
Copper GRP	TÜV	27cm Diameter	3538	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.7 Beacons - Operating Lifetime					
Power Meter	Hewlett Packard	436A	47	12	8-Jul-2009
Power Meter	Hewlett Packard	436A	83	12	13-Aug-2009
Climatic Chamber	Heraeus Votsch	VM 04/100	85	-	O/P Mon
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	2-Jan-2009
Signal Generator	Hewlett Packard	8644A	96	12	17-Apr-2009
Load (50ohm, 15W)	Diamond Antenna	DL-30N	337	12	1-Sep-2009
Attenuator: 10dB/20W	Narda	766-10	480	12	22-Jul-2009
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	13-Feb-2009
Stop Clock	R.S Components	RS328 061	2674	-	TU
Beacon RF Unit	TUV	N/A	3066	-	TU
Termination (50ohm, 2W)	Omni-Spectra	3001-6100	3081	12	15-Mar-2009
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3096	12	15-Mar-2009
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	18-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3162	12	18-Jun-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	1-Aug-2009
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	6-Nov-2008
ScopeCorder	Yokogawa	DL750 701210	3254	12	6-Nov-2008
Timer	Radio Spares	427-590	3282	-	TU
Power Sensor	Agilent	8482A	3290	12	26-Nov-2008
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	21-Apr-2009
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	12	22-Apr-2009
1m RF Cable sma(m)-sma(m)	Reynolds	262-0248-1000	3453	12	OP MON
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	16-Apr-2009

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.2 Beacons - Spurious Emissions					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	12	22-Jul-2009
Attenuator: 10dB/20W	Narda	766-10	480	12	22-Jul-2009
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	9-Jun-2009
Hygrometer	Rotronic	I-1000	3068	12	26-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3163	12	2-Jun-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	12	1-Aug-2009
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3352	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	12	22-Apr-2009
Section 2.8 Beacons - Temperature Gradient					
Power Meter	Hewlett Packard	436A	83	12	13-Aug-2009
Climatic Chamber	Heraeus Votsch	VM 04/100	85	-	O/P Mon
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	2-Jan-2009
Signal Generator	Hewlett Packard	8644A	96	12	17-Apr-2009
Attenuator: 10dB/20W	Narda	766-10	480	12	22-Jul-2009
Beacon RF Unit	TUV	N/A	3066	-	TU
Termination (50ohm, 2W)	Omni-Spectra	3001-6100	3081	12	15-Mar-2009
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3096	12	15-Mar-2009
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	18-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3162	12	18-Jun-2009
Thermocouple Thermometer	Fluke	51	3174	12	26-Jun-2009
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	1-Aug-2009
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	6-Nov-2008
ScopeCorder	Yokogawa	DL750 701210	3254	12	6-Nov-2008
Power Sensor	Agilent	8482A	3290	12	26-Nov-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	12	22-Apr-2009
Timer ('Electronic Clock Timer')	R.S Components	870A	3558	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 Beacons - Thermal Shock					
Power Meter	Hewlett Packard	436A	47	12	8-Jul-2009
Power Meter	Hewlett Packard	436A	83	12	13-Aug-2009
Climatic Chamber	Heraeus Votsch	VM 04/100	85	-	O/P Mon
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	2-Jan-2009
Signal Generator	Hewlett Packard	8644A	96	12	17-Apr-2009
Attenuator 10dB 25W	Weinschel	46-10-43	400	12	6-May-2009
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	12	22-Jul-2009
Attenuator (10dB, 75W)	Bird	8308-100	469	12	29-Nov-2008
Attenuator: 6dB/10W	Trilithic	HFP-50N	476	12	22-Jul-2009
Attenuator: 10dB/20W	Narda	766-10	480	12	22-Jul-2009
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	13-Feb-2009
Stop Clock	R.S Components	RS328 061	2674	-	TU
Beacon RF Unit	TUV	N/A	3066	-	TU
Hygrometer	Rotronic	I-1000	3068	12	26-Jun-2009
Termination (50ohm, 2W)	Omni-Spectra	3001-6100	3081	12	15-Mar-2009
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3096	12	15-Mar-2009
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	18-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3161	12	2-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3162	12	18-Jun-2009
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3163	12	2-Jun-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Thermocouple Thermometer	Fluke	51	3174	12	26-Jun-2009
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	1-Aug-2009
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	12	1-Aug-2009
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	6-Nov-2008
ScopeCorder	Yokogawa	DL750 701210	3254	12	6-Nov-2008
Power Sensor	Agilent	8482A	3290	12	26-Nov-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	12	22-Apr-2009
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	12	22-Apr-2009
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3360	12	22-Apr-2009

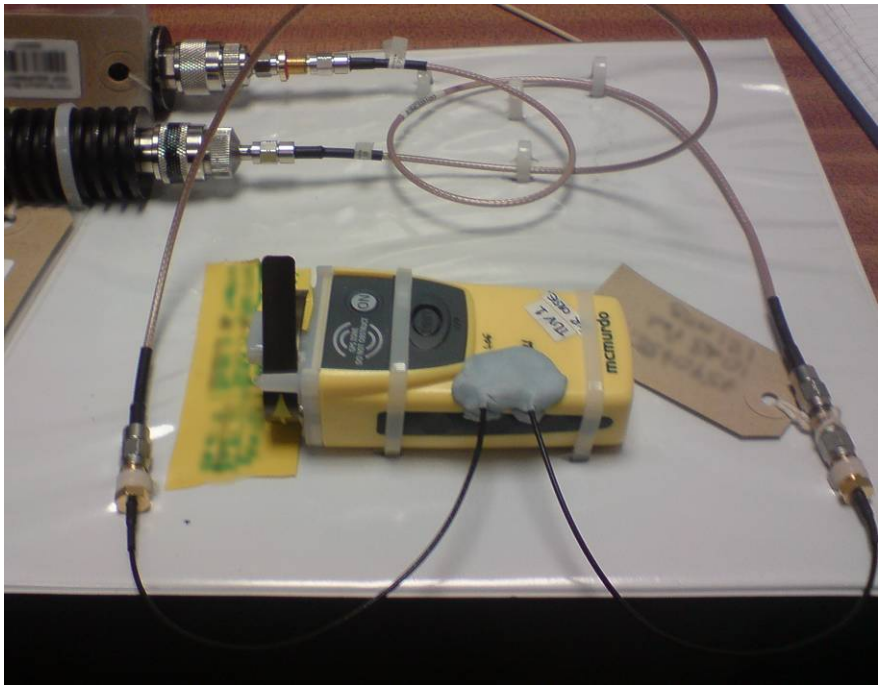
Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.10 - Antenna Characteristics					
Set)	Roberts Antenna	A-100	569	-	TU
Spectrum Analyser	Hewlett Packard	8568B	571	12	1-Feb-2009
Test Receiver	Rohde & Schwarz	ESVP	1669	12	6-Nov-2008
Antenna Mast	EMCO	1050	1707	-	TU
Turntable Controller	Various	RH253	1708	-	TU
Open Area Site 2	TUV	OATS2	1850	36	11-Sep-2011
Turntable Interface	Various	RH-253.6	1855	-	TU
Antenna Tower 6M	EMCO	1050	1859	-	TU
Roberts Antenna 406MHz	Compliance Design	-	1861	24	7-Sep-2009

TU – Traceability Unscheduled
OP MON – Output Monitored with Calibrated Equipment

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



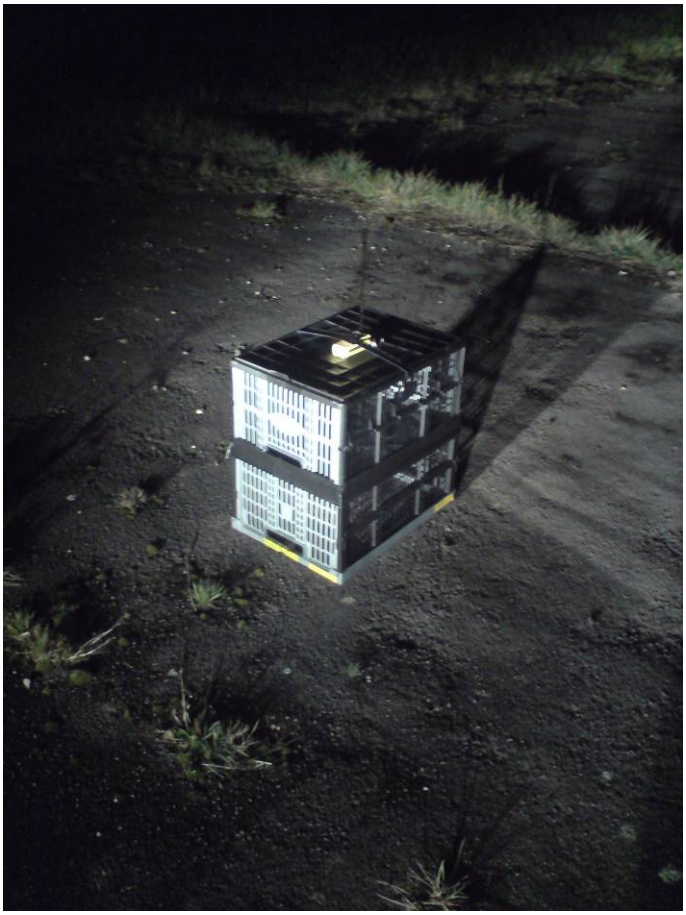
EUT View 1 (Conducted Mode)

EUT View 2 (Radiated Mode)

Configuration 7 (Position Acquisition Time and Position Accuracy Test)

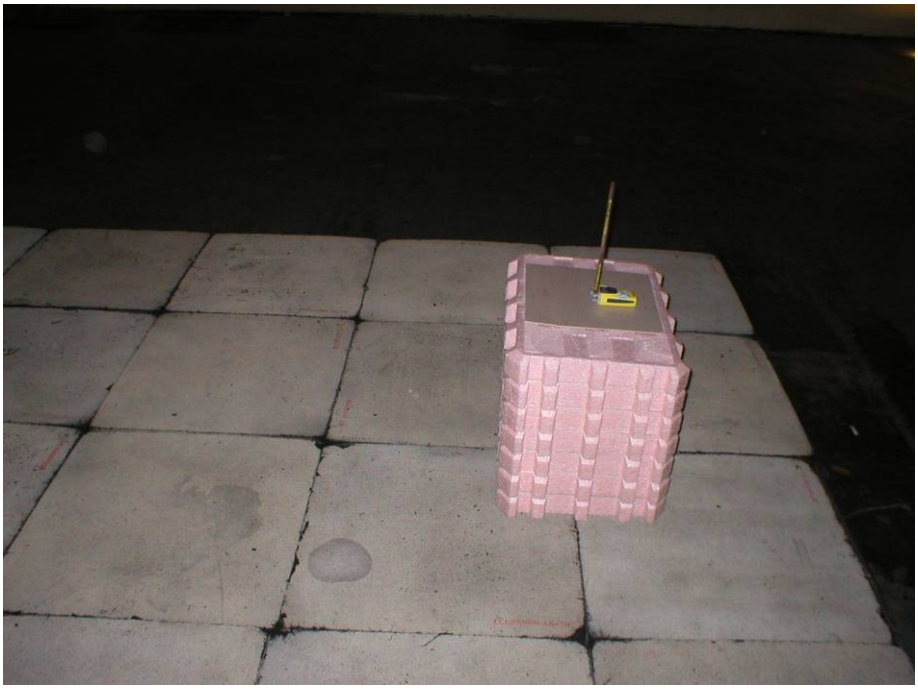
Configuration 8 (Position Acquisition Time and Position Accuracy Test)

Configuration 7 (Satellite Qualitative Test)



Configuration 8 (Satellite Qualitative Test)

Configuration 3 (Antenna Characteristics)



Configuration 4 (Antenna Characteristics)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

ANNEX A

CUSTOMER SUPPLIED INFORMATION

COMMERCIAL IN CONFIDENCE mcmurdo

Fastfind PLB 200/210
Statement on protection from repetitive self-test mode transmissions and self-test routine

Self-test routine

The Fastfind PLB is a 406.037MHz PLB operating with the Cospas-Sarsat satellite system.

The PLB has a press and release self-test facility, which operates as follows.

a) Power up the micro-controller, the CMAC oscillator and the GPS module.
b) Generate a burst at 121.5MHz, check the antenna RF level is above threshold.
c) Activate the 406.037MHz PLL and check that it is locked.
d) Generate an inverted frame 406.037MHz transmission. Check the antenna RF level is above threshold. (This also confirms the battery is capable of high current loads).
e) Confirm the GPS receiver has output normal NMEA sentences. (do not wait for a fix).

The self-test completes within 5s. If all of the above checks prove true then the white LED will flash three times.

Protection from repetitive self-test mode transmissions

Once the self-test sequence is complete the hardware is powered off, preventing repetitive self-test transmissions.

Self-test may only be re-initiated by deliberate intervention on the part of the user.

Neil Jordan
Engineering Manager
8-8-08

Product Service

GNSS Self-test

Customer email pertaining to GNSS Self-test routine:

"From: Neil Jordan [neiljordan@mcmurdo.co.uk]
Sent: 23 December 2008 10:39
To: Hampton, Robert
Cc: Plummer, Julie
Subject: Changes to Report 01

Importance: High

[…]

The GNSS self-test and can only be accessed after the completion of the normal PLB self-test routine.

Push and hold the SELF TEST button for a minimum of 2 seconds, the indicator light will flash once to indicate the start of the normal Self-Test sequence. Release the Self-Test button. After a few seconds, a good self-test will result in the indicator light flashing a number of times in quick succession depending on past battery usage.

Immediately after the indicator light stops flashing; push and continue to hold down the TEST button for 30 seconds to move onto a full GNSS Self-Test (position acquisition test). Throughout the period of GNSS testing the indicator light will continue to flash slowly for up to 5 minutes. A successful GNSS position acquisition test will result in the indicator light flashing a number of times in quick succession and one self-test burst.

Kind regards
Neil Jordan
Engineering Manager
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email : neiljordan@mcmurdo.co.uk

McMurdo, A division of Signature Industries Ltd. Silver Point, Airport Service Road, Portsmouth, Hampshire, PO3 5PB, UK.
Phone: +44 (0) 23 9262 3900 Fax : +44 (0) 23 9262 3998.
Registered in England No. 2800561 Registered Office: Tom Cribb Road, Thamesmead, London, SE28 0BH VAT NO GB 626 3127 57"

Alternative Antenna Characteristics

TÜV Document 75904389 Report 03 Issue 2 contains the following values:

Pt_{amb}: 37.00
Pt_{EOL}: 35.98

This would give a $EIRP_{LOSS}$ of 1.02dB (37.00 - 35.98).

The measurements of this report found the $EIRP_{LOSS}$ to be 0.43dB, if the 1.02dB value is used the results of the test within this report would have been as follows:

Configuration 4 (Figure B.5)

	Elevation Angle (degrees)									
	10		20		30		40		50	
Azimuth Angle (degrees)	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	39.3	2.15	39.7	2.51	36.5	-0.67	33.6	-3.58	~~30.8~~*	-6.42
90	39.5	2.28	39.9	2.72	36.9	-0.32	35.4	-1.79	33.9	-3.30
180	39.7	2.47	40.2	2.95	36.9	-0.34	35.2	-2.02	34.2	-3.04
270	39.8	2.58	40.3	3.07	36.8	-0.44	33.0	-4.19	~~30.1~~	-7.14

*Not previously stricken out.

$EIRP_{LOSS}$ = Pt_{amb} - Pt_{EOL} = (37.00 - 35.98) = 1.02dB

$EIRP_{maxEOL}$ = MAX [$EIRP_{max}$, ($EIRP_{max}$ - $EIRP_{LOSS}$)] = MAX (40.3, 39.3) = 40.3dBm (No change)

$EIRP_{minEOL}$ = MIN [$EIRP_{min}$, ($EIRP_{min}$ - $EIRP_{LOSS}$)] = MIN (33.0, 32.0) = 32.0dBm (greater pass margin)

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Configuration 3: (Figure B.2)

	Elevation Angle (degrees)									
	10		20		30		40		50	
Azimuth Angle (degrees)	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	38.6	1.35	42.0	4.82	41.8	4.63	37.3	0.08	34.8	-2.35
30	38.8	1.56	42.0	4.83	41.6	4.41	37.1	-0.07	35.7	-1.50
60	38.7	1.53	41.9	4.72	41.3	4.08	37.0	-0.22	36.2	-1.01
90	38.7	1.52	42.0	4.75	41.5	4.28	36.9	-0.29	36.1	-1.14
120	38.6	1.41	41.7	4.47	41.2	3.97	36.7	-0.49	36.1	-1.07
150	38.5	1.31	42.0	4.79	41.4	4.19	36.8	-0.42	36.0	-1.25
180	38.4	1.21	41.9	4.71	41.4	4.18	36.6	-0.60	35.5	-1.71
210	38.5	1.30	42.2	4.99	41.8	4.55	36.8	-0.42	34.9	-2.33
240	38.5	1.31	42.1	4.90	42.0	4.76	37.1	-0.13	34.3	-2.90
270	38.7	1.51	42.1	4.85	42.0	4.85	37.1	-0.06	34.0	-3.18
300	38.7	1.53	42.1	4.94	42.1	4.89	37.3	0.10	~~33.7~~*	-3.47
330	38.7	1.54	41.9	4.72	41.9	4.71	37.3	0.13	34.3	-2.91

*Not previously stricken out.

[Polarisation table omitted, no change]

$EIRP_{LOSS}$ = Pt_{amb} - Pt_{EOL} = (37.00 - 35.98) = 1.02dB

$EIRP_{maxEOL}$ = MAX [$EIRP_{max}$, ($EIRP_{max}$ - $EIRP_{LOSS}$)] = MAX (42.2, 41.3) = 42.2dBm (No change)

$EIRP_{minEOL}$ = MIN [$EIRP_{min}$, ($EIRP_{min}$ - $EIRP_{LOSS}$)] = MIN (34.0, 33.0) = 33.0dBm (lesser pass margin)

Beacon Coding Software

Note that Table F-D.1 applies to the Non-GPS equipped variant which is the subject of a separate document.

Beacon Coding Software Results
91-115Z Firmware Version 1.1.165

CS T.007 ISSUE 4 REVISION 2 APPENDIX D TO ANNEX F
BEACON CODING SOFTWARE RESULTS

Table F-D.1: User Protocol Beacon Messages

Protocol	Operational Message	Self-Test Message
Maritime User Protocol with MMSI	FFFE2F4C9418618618668A26F180	FFFED04C9418618618668A26F180
Maritime User Protocol with Radio Call Sign	FFFE2F4C9526F6F06B268C679100	FFFED04C9526F6F06B268C679100
Radio Call Sign User Protocol	FFFE2F4C9DBDBC1A55468D215500	FFFED04C9DBDBC1A55468D215500
Serial User : Non Float-Free EPIRB with Serial Number	FFFE2F4C972000C6007CE8871240	FFFED04C972000C6007CE8871240
Serial User : PLB with Serial Number	FFFE2F4C97A000C6007CEBC6BCC0	FFFED04C97A000C6007CEBC6BCC0

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BEACON CODING SOFTWARE RESULTS

Table F-D.2: Location Protocol Beacon Messages

Protocol	Operational Message		Self-Test Message	GNSS Self-Test Message
	Location 'A' [1]	Location 'B' [2,3]	(Truncated to 112 Bits)	Location 'A'
Standard Location EPIRB with MMSI	FFFE2F8C92F423F032E02164D37792E36051	FFFE2F8C92F423F032E02164D3779362B4F5	FFFED08C92F423F07FDFFB2BF037	FFFED08C92F423F032E02164D37792E36051
Standard Location EPIRB with Serial Number	FFFE2F8C96F9C06332E023DDCC7792E36051	FFFE2F8C96F9C06332E023DDCC779362B4F5	FFFED08C96F9C0637FDFF992EF37	FFFED08C96F9C06332E023DDCC7792E36051
Standard Location PLB with Serial Number	FFFE2F8C97F9C06332E0255E917792E36051	FFFE2F8C97F9C06332E0255E91779362B4F5	FFFED08C97F9C0637FDFFF11B237	FFFED08C97F9C06332E0255E917792E36051
National Location EPIRB	FFFE2F8C9A0018CCB301157676F70824003F	FFFE2F8C9A0018CCB3010FACFFB7072C03CA	FFFED08C9A0018DFC0FF02AD4477	FFFED08C9A0018CCB301157676F70824003F
National Location PLB	FFFE2F8C9B0018CCB30113F52BF70824003F	FFFE2F8C9B0018CCB301092FA2B7072C03CA	FFFED08C9B0018DFC0FF042E1977	FFFED08C9B0018CCB30113F52BF70824003F
User Location PLB	FFFE2FCC97A000C6007CE83E1FE6590115C5	FFFE2FCC97A000C6007CE83E1FE659013FB7	FFFED0CC97A000C6007CE83E1FEF	FFFED0CC97A000C6007CE83E1FE6590115C5

[1] Location 'A', all protocols : N50°49'43" W1°3'24"
[2] Location 'B', Standard Location & National Location protocols : N50°49'50" W1°2'45"
[3] Location 'B', User Location protocol : N50°49'18" W1°12'41"

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BEACON CODING SOFTWARE RESULTS

Table F-D.2: Supplemental F-D.1 User Location Protocol Messages

Protocol	Operational Message Location 'A' [4]	Self-Test Message (Truncated to 112 Bits)
Maritime User Protocol with MMSI	FFFE2FCC9418618618668 9DE52A6590115C5	FFFED0CC9418618618668 9DE52AF
Maritime User Protocol with Radio Call Sign	FFFE2FCC9526F6F06B268F9F3226590115C5	FFFED0CC9526F6F06B268F9F322F
Radio Call Sign User Protocol	FFFE2FCC9D8DBC1A55468ED9F626590115C5	FFFED0CC9D8DBC1A55468ED9F62F
Serial User : Non Float-Free EPIRB with Serial Number	FFFE2FCC972000C6007CEB7FB166590115C5	FFFED0CC972000C6007CEB7FB16F
Serial User : PLB with Serial Number	FFFE2FCC97A000C6007CE83E1FE6590115C5	FFFED0CC97A000C6007CE83E1FEF

[4] Location 'A', all protocols : N50°49'43" W1°3'24"

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Statement on protection against beacon degradation due to internal navigation device failure

The internal GPS navigation device is a LEA 5A 16-channel module made by uBlox in Switzerland.

Software protection:

The positional data is sent from the GPS module in serial NMEA format. This data is checked for validity by examining the message field quality bit and calculated HDOP (Horizontal dilution of precision) figure. The quality bit is calculated by the GPS module to determine the quality of the position fix and requires three or more satellites with good signal to noise ratios. The HDOP figure is calculated from the relative geometry of the satellites used to determine the position fix. The smaller the figure the better the positional accuracy. The software rejects position fixes with a HDOP figure greater than 25.

With these checks in place it is considered unlikely that false position data could be encoded in the 406MHz message.

If no valid GPS data is available, the beacon will revert to transmitting default position data.

Hardware protection:

The serial NMEA data is input to the micro-controller, this input is only connected to the GPS module. If the uBlox GPS module fails in such a way as to output incorrect logic levels, then this input is protected by diodes from any excessive voltage.

The GPS module is not continuously powered in order to comply with the maximum positional update rate defined in C/S T.001. Hence in any one hour, at least 40 406MHz transmissions are made with the GPS module in-active.

The GPS module is supplied by P-channel logic level FET, which is enabled or disabled by a discrete control line from the microprocessor.

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Engineering Manager
8-8-08

Product Service

Position Data Encoding

Note: Applicant re-supplied this data at Modification State 1.

Navigation System Test Script Results
91-115 Firmware Version 1.1.166

CS T.007 ISSUE 4 REVISION 2 APPENDIX C TO ANNEX F
NAVIGATION SYSTEM TEST RESULTS

USER LOCATION PROTOCOL

Script Reference (Table D.1)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (✓)
1	Bits 108-132 = **FE0FF0**	✓
2	Bits 108-132 = **23011** Number of seconds after providing navigation data that beacon transmitted the above encoded location information : **52.2 seconds**	✓
3	Bits 108-132 = **6D052**	✓

STANDARD LOCATION PROTOCOL

Script Reference (Table D.2)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (✓)
1	Bits 65-85 = **FFBFF** Bits 113-132 – **83E0F**	✓ ✓
2	Bits 65-85 = **2404** Bits 113-132 = **8E227** Number of seconds after providing navigation data that beacon transmitted the above encoded location information : **52.3 seconds**	✓ ✓
3	Bits 65-85 = **2402** Bits 113-132 = **F8227**	✓ ✓
4	Bits 65-85 = **3404** Bits 113-132 = **88227**	✓ ✓
5	Bits 65-85 = **3404** Bits 113-132 = **74627**	✓ ✓
6	Bits 65-85 = **2404** Bits 113-132 = **8227**	✓ ✓
7	Bits 65-85 = **2404** Bits 113-132 = **83D7**	✓ ✓
8	Bits 65-85 = **2406** Bits 113-132 = **8227**	✓ ✓
9	Bits 65-85 = **2406** Bits 113-132 = **81B8**	✓ ✓
10	Bits 65-85 = **2402** Bits 113-132 = **8206**	✓ ✓

NATIONAL LOCATION PROTOCOL

Script Reference (Table D.3)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (✓)
1	Bits 59-85 = **3F81FE0** Bits 113-126 = **27CF**	✓ ✓
2	Bits 59-85 = **A8A0C2** Bits 113-126 = **2489** Number of seconds after providing navigation data that beacon transmitted the above encoded location information : **52.3 seconds**	✓ ✓
3	Bits 59-85 = **A8A0C2** Bits 113-126 = **3F09**	✓ ✓
4	Bits 59-85 = **D8A0C2** Bits 113-126 = **2189**	✓ ✓
5	Bits 59-85 = **D8A0C2** Bits 113-126 = **B09**	✓ ✓
6	Bits 59-85 = **C8B67D** Bits 113-126 = **749**	✓ ✓
7	Bits 59-85 = **C8B67D** Bits 113-126 = **77E**	✓ ✓
8	Bits 59-85 = **C8967C** Bits 113-126 = **702**	✓ ✓
9	Bits 59-85 = **C8967C** Bits 113-126 = **77E**	✓ ✓
10	Bits 59-85 = **C8B67D** Bits 113-126 = **749**	✓ ✓

Protection Against Continuous Transmission

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Protection against continuous transmission

The McMurdo Fastfind PLB 200/210 is designed to limit any inadvertent 406.037MHz transmission to a maximum of 2 seconds under the worst case conditions.

Figure 1 is an extract from the Fastfind PLB circuit diagram 91-150C issue 1. The PA_ON line provides DC bias via the resistive network R24 and R54, to energise the transistor Q7; the transistor Q7 then enables the PA regulator Q6. The PA regulator supplies power to the FET power amplifier Q2.

The PA_ON line also supplies voltage to the gate of Q8 via the time constant R25 and C8. If the 406 PA is on for longer than 2 seconds sufficient voltage will be developed across C8 to switch Q8 on. This will result in all the PA_ON voltage being dropped across R24, R54 and therefore removing the DC gate bias to Q7 and therefore shutting down the PA regulator Q6; preventing continuous transmission.

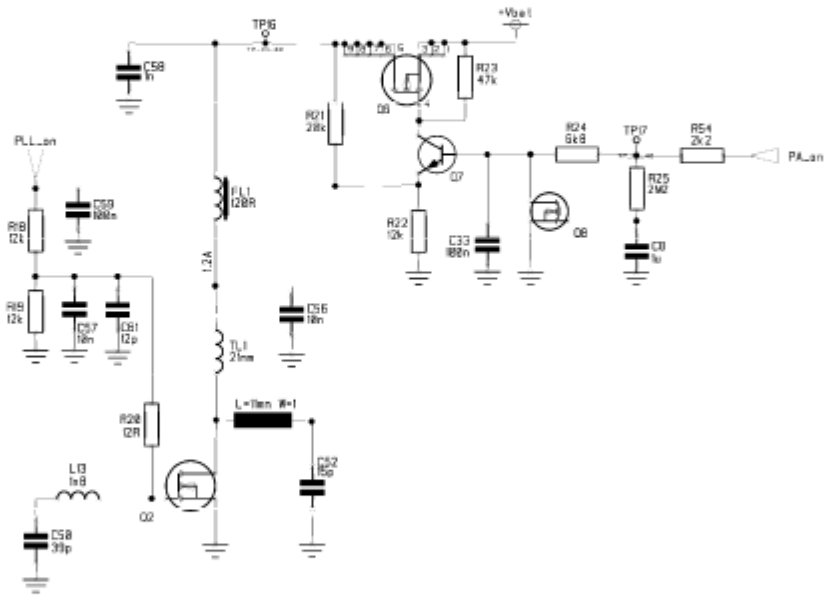

Figure 1

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16-9-08