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Report On

Limited EN 60945 and IEC 61097-2 Testing of the
McMurdo Limited
G5 Smartfind Plus (a) & (m)

COMMERCIAL-IN-CONFIDENCE

Document 75911555 Report 01 Issue 2

February 2011



Product Service

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COMMERCIAL-IN-CONFIDENCE

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McMurdo Limited
G5 Smartfind Plus (a) & (m)

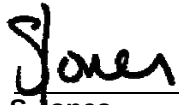
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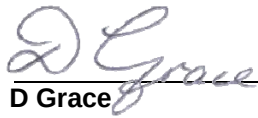
PREPARED FOR

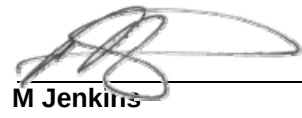
McMurdo Limited
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PO3 5PB

PREPARED BY


S Jones
Project Manager

APPROVED BY


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Authorised Signatory


M Jenkins
Authorised Signatory

DATED

28 February 2011

22 February 2011

This report has been up-issued to Issue 2 to include additional test results.





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SECTION 1

REPORT SUMMARY

Limited EN 60945 and IEC 61097-2 Testing of the
McMurdo Limited
G5 Smartfind Plus (a) & (m)



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the McMurdo Limited G5 Smartfind Plus (a) & (m) to the requirements of EN 60945 and IEC 61097-2.

Objective	To perform Limited EN 60945 and IEC 61097-2 testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	McMurdo Limited
Model Number(s)	G5 Smartfind Plus (a) & (m)
Serial Number(s)	Sample 75911555-TSR0003 (mech unit) Sample 75911555-TSR0002 (radio unit)
Equipment Category	Portable
Software / Hardware Version	Refer to Declaration of Build Form (Section 1.1.6)
Number of Samples Tested	Three (two radiated samples and one conducted)
Test Specification/Issue/Date	EN 60945: 2002 IEC 61097-2: 2008
Order Number	PC0004329
Date	29 October 2010
Start of Test	22 November 2010
Finish of Test	23 February 2011
Name of Engineer(s)	P Clark M P Hardy R Bennett R Harris N Williams
Related Document(s)	EN 60068 Series



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out to EN 60945 and IEC 61097-2 of the McMurdo Limited, G5 Smartfind Plus (a) & (m) is shown below.

Environmental Tests

Section	Spec	Spec Clause	Test Description	Result	Comment
2.1	EN 60945 / IEC 61097-2	8.6 / 15.17.5	Drop (onto hard surface)	Satisfactory	-
2.2	EN 60945 / IEC 61097-2	8.7 / 15.17.6	Vibration	Satisfactory	-
2.3	IEC 61097-2	5.17.7	Ruggedness	Satisfactory	-

Radio Tests

Section	Spec	Spec Clause	Test Description	Result	Comment
3.1	IEC 61097-2	5.19	Spurious Emissions	Pass	-
3.2	IEC 61097-2	D.4.3	Off Ground Plane Radiated Power Test	Pass	-

Other Tests

Section	Spec	Spec Clause	Test Description	Result	Comment
4.1	IEC61097-2	5.3.3.3	Effective Luminous Intensity of the Low Duty Light	Satisfactory	Refer to customer report



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1.3 APPLICATION FORM

1.1.1 Beacon Manufacturer and Beacon Model

Beacon Manufacturer	McMurdo Ltd
Beacon Model	G5 Smartfind Plus (a) & (m)
Other Model Names	SGE406II (a) & (m), EG50:AUTO & EG50:MAN, Kannad Marine Sport+, McMurdo Smartfind A5G

1.1.2 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)		☐

1.1.3 Beacon Characteristics

Characteristic	Specification
Operating frequency	406.040 MHz
Operating temperature range	Tmin = -20 °C Tmax = +55 °C
Operating lifetime	48 hours
Battery chemistry	Lithium Manganese Dioxide
Battery cell model name, size and number of cells	CR 2/3AH (3x3) or CR123A (3x3)
Battery cell manufacturer	Varta/Panasonic
Battery pack manufacturer and part number	Varta/Panasonic 82-939D
Battery pack replacement period	8 years



Characteristic	Specification
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon
Oscillator part name and number	E5344LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integral
Antenna manufacturer	Doig/Pressco
Antenna part name and number	82-909
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	NEO-6M
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS, Galileo
For External Navigation Devices	
- Data protocol for GNSS receiver to beacon interface	
- Physical interface for beacon to navigation device	
- Electrical interface for beacon to navigation device	
- Part number of the external navigation interface device (if applicable)	
- 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	406.040MHz/ 121.5MHz Power, PLL Lock, GPS module	GPS Position fix
- Self-test transmission burst duration (440 or 520 ms)	520 ms	520 ms
- Self-test format bit ("0" or "1")	1	1
- Maximum duration of Self Test / GNSS Self-test	9	15mins +/- 10seconds
- Maximum number of GNSS Self Tests (beacons with internal navigation devices only)	N/A	10
- Self-test results in transmission of a single burst, irrespectively of the test result (Yes or No)	N/A	No
- Maximum number of self-tests during battery pack replacement period	96	N/A



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 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



Characteristic	Specification
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121.5 MHz
-Homer Transmit Power	17 dBm
-Homer Duty Cycle	Continuous %
-Duty Cycle of Homer Swept Tone	36 %
Beacon includes a strobe light (Yes or No)	Yes
- Strobe light intensity	>0.75cd
- Strobe light flash rate	21
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)	Yes
Other ancillary devices (e.g. voice transceiver, remote control, external audio and light indicators, external activation device). List details on a separate sheet if insufficient space to describe.	N/A
Beacon includes automatic activation mechanism (Yes or No) Specify type of automatic beacon activation mechanism	Yes. Sea water switch contacts
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



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1.1.4 Applicant Details

Company Name	McMurdo Ltd		
Address	Silver Point Airport Service Road Portsmouth Hampshire, PO3 5PB		
Category of Applicant	☒ Manufacturer	☐ Importer	
	☐ Distributor	☐ Agent	
Contact Name	Neil Jordan	Telephone	+44(0)2392623934
Email	neiljordan@mcmurdo.co.uk	Facsimile	+44(0)2392623997

1.1.5 Manufacturer Details

Company Name	Same as above		
Address			
Contact Name		Telephone	
Email		Facsimile	

1.1.6 Declaration of Build Status

Hardware Version	
- PCB Revision	Issue 1
- Battery Model	Varta CR 2/3AH /Panasonic CR123A
Software Version	N/A
Firmware Version	1.3.220
Other (Specify)	

1.1.7 Applicant's Declaration

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

Signed: 

Name: Neil Jordan

Position Held: Engineering Manager

Date: 15th November 2010



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a McMurdo Limited, G5 Smartfind Plus (a) & (m) as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test



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1.5 DEVIATIONS FROM THE STANDARD

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

1.6 MODIFICATION RECORD

No modifications were made to the EUT during testing.



Product Service

SECTION 2

ENVIRONMENTAL TEST DETAILS

Limited EN 60945 and IEC 61097-2 Testing of the
McMurdo Limited
G5 Smartfind Plus (a) & (m)



2.1 DROP (ONTO HARD SURFACE)

2.1.1 Specification Reference

EN 60945 Clause 8.6
IEC 61097-2 Clause 5.17.5.1

2.1.2 Equipment Under Test

G5 Smartfind Plus (a) & (m): Mech Unit 1, TUV Reference: 0003

2.1.3 Date of Test and Modification State

24 November 2010 - Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 5.1.

2.1.5 Test Method

The test was performed with the EUT in the following mode(s): Idle. The EUT was not fixed to the mounting bracket.



Test Set-up – Drop Test



Product Service

Procedure

The EUT was dropped from a height of 1m onto a piece of solid hardwood as described in EN 60945. The EUT was dropped 6 times, one on each face. The performance check was carried out following the drop test.

2.1.6 Test Results

Performance Check

The performance check was carried out on completion of the test as required by IEC 61097-2. The readings can be shown below:

Post Drop Test			
Sample	Functional Check	Self Test	Active
Three / TUV0004	Frequency (MHz)	406.0404	406.0404
	Digital Message	✓	✓
	Presence of Homing Signal	✓	✓



2.2 VIBRATION

2.2.1 Specification Reference

EN 60945 Clause 8.7
IEC 61097-2 Clause 5.17.6

2.2.2 Equipment Under Test

G5 Smartfind Plus (a) & (m): Mech Unit 1, TUV Reference: 0003

2.2.3 Date of Test and Modification State

22 to 23 November 2010 - Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 5.1.

2.2.5 Test Method

The test was performed with the EUT in the following mode(s): Idle. The EUT was positioned on the vibration table in accordance with EN 60945. The EUT was mounted via the mounting bracket provided by McMurdo.



Test Set-up – Vibration



Product Service

Procedure

The EUT was fixed to the vibration table via a clamping arrangement. The system was subject to the following vibration profile:

Resonance search:

- 5 Hz and up to 13.2 Hz with an excursion of $\pm 1 \text{ mm} \pm 10 \%$ (7 m/s^2 maximum acceleration at 13.2 Hz);
- above 13.2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s^2 .

For each axis a resonance search was conducted, see Control Channel (input) and Response Channel (output/EUT response) plots.

Endurance run:

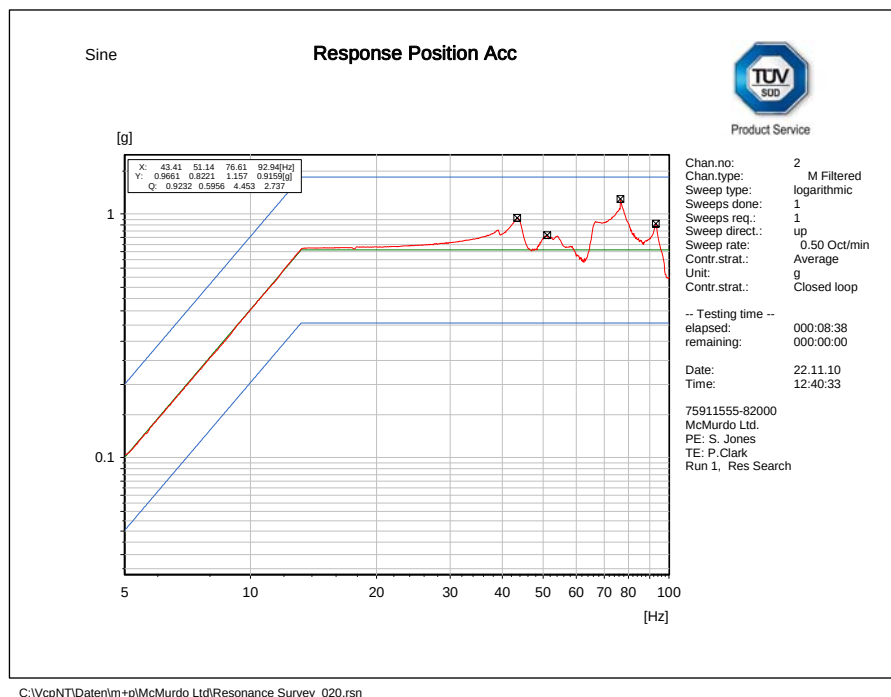
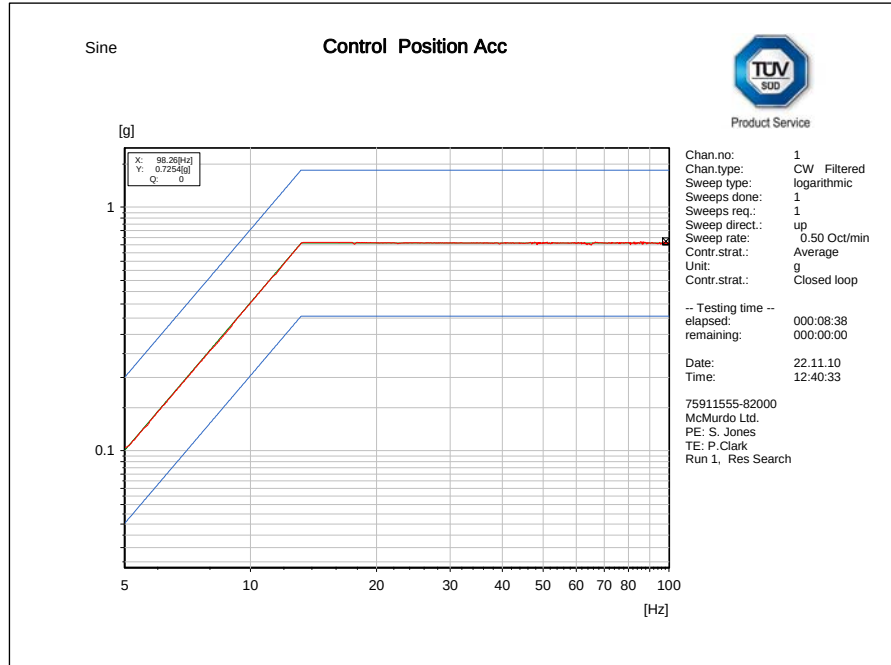
Where no resonances were found the endurance run was performed at 30 Hz for a period of 2 hours, see following Control Channel and Response Channel plots.

For the vertical axis a resonance was found at 76.61 Hz and therefore the 2 hour endurance run was carried out at 76.61 Hz.

The performance check was carried out on completion of the test.

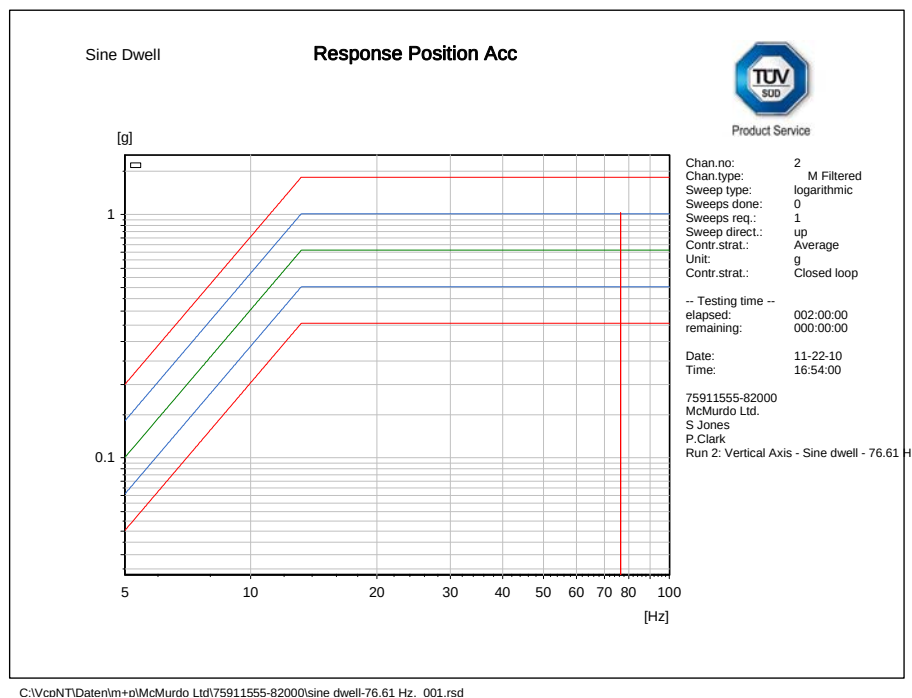
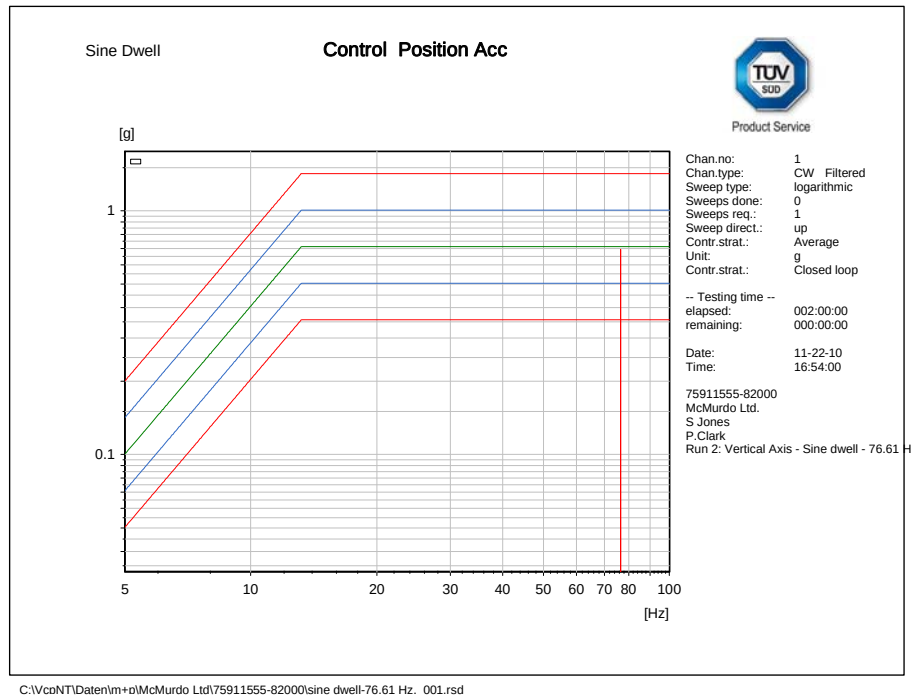


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Vertical Axis – Resonance Search

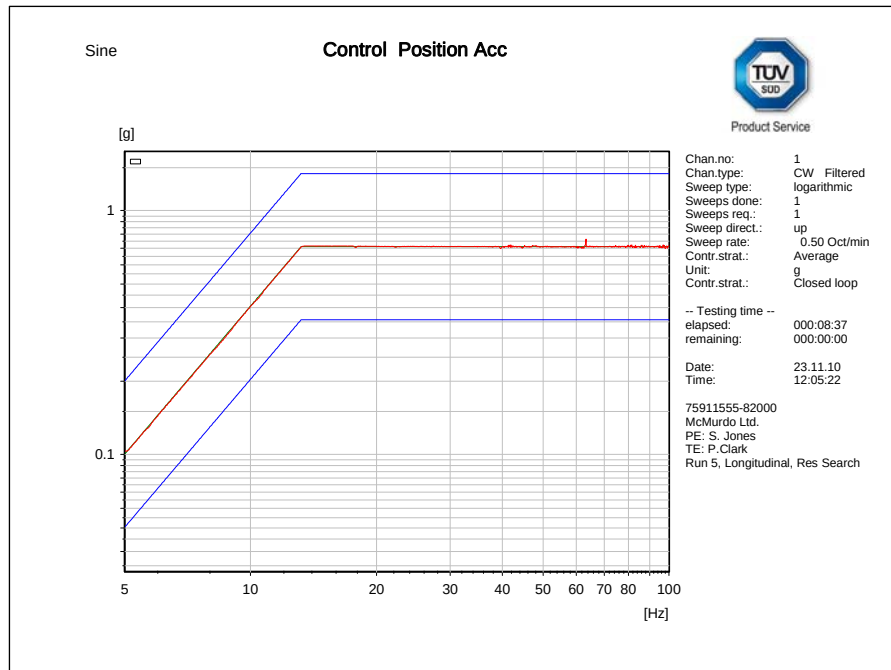


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Vertical Axis – Endurance Run



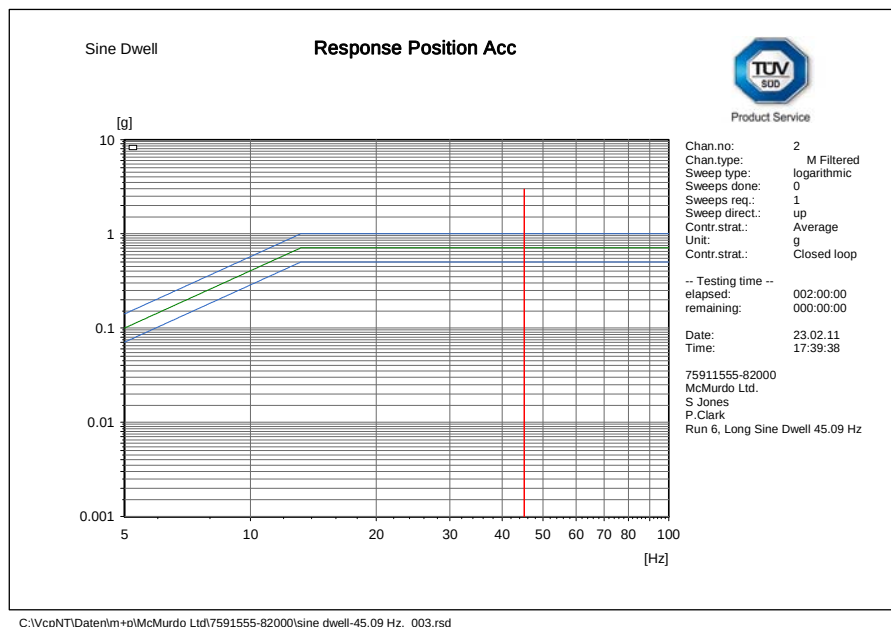
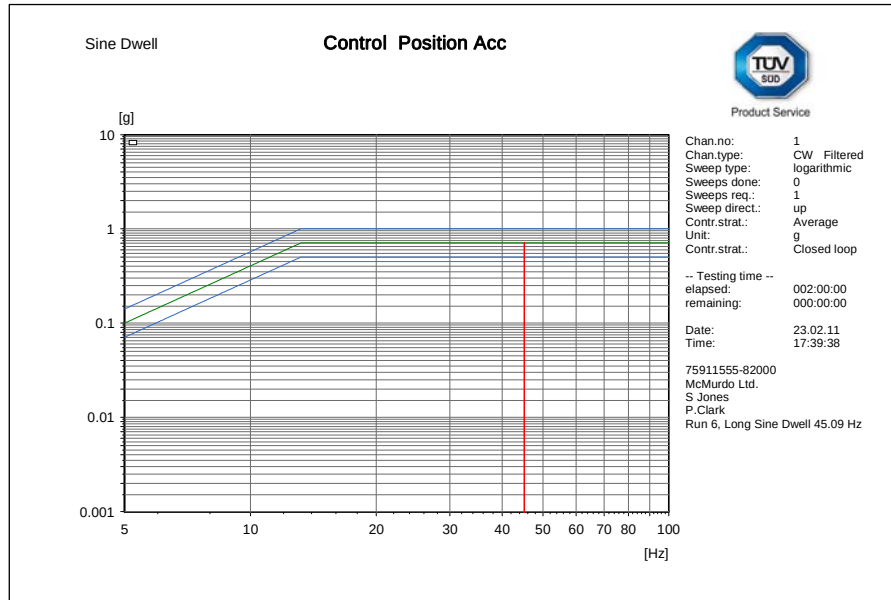
Product Service

Longitudinal Axis – Resonance Search



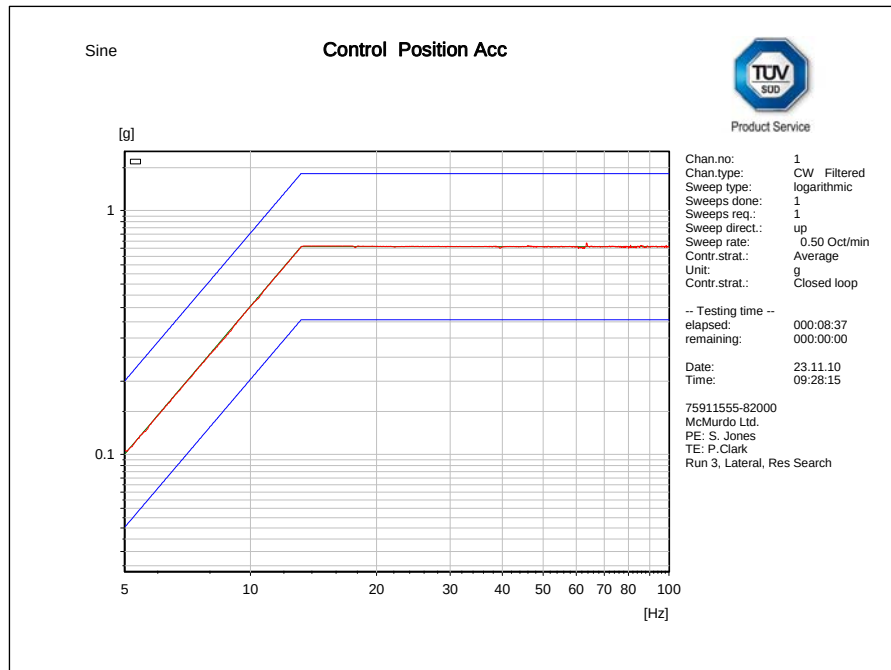
Product Service

Longitudinal Axis – Endurance Run



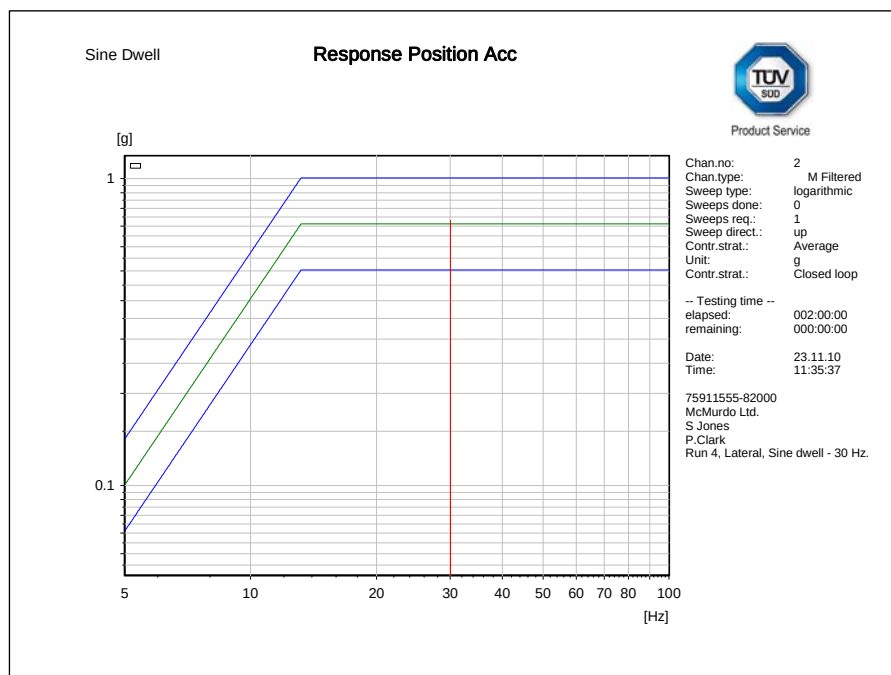
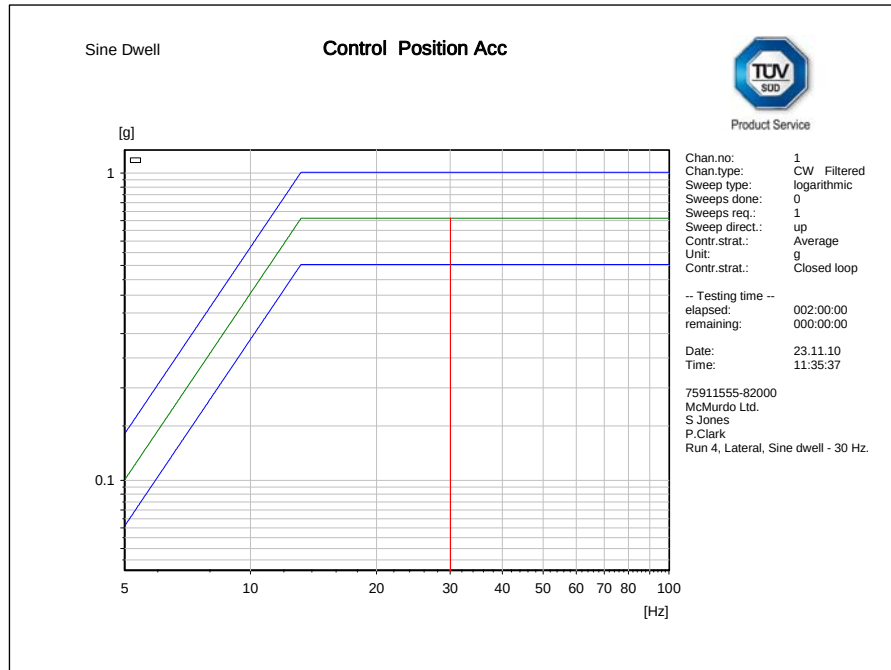


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Lateral Axis – Resonance Search



Product Service

Lateral Axis – Endurance Run



Product Service

2.2.6 Test Results

Test Observations

No resonant frequencies were detected in the lateral axis and hence the EUT was subject to the 2 hour endurance run at a frequency of 30 Hz for this axis. A resonance was detected in the vertical and longitudinal axes and therefore the 2 hour endurance run was carried out at 76.61 Hz and 45.09 Hz respectively.

Performance Check

The performance check was carried out on completion of the test as required by IEC 61097-2. The readings can be shown below:

Post Vibration Performance Check			
Sample	Functional Check	Self Test	Active
Mech Unit / TUV0003	Frequency (MHz)	406.0401	406.0401
	Digital Message	✓	✓
	Presence of Homing Signal	✓	✓



2.3 RUGGEDNESS AND BUMP

2.3.1 Specification Reference

IEC 61097-2 Clause 5.17.7

2.3.2 Equipment Under Test

G5 Smartfind Plus (a) & (m): Mech Unit 1, TUV Reference: 0003

2.3.3 Date of Test and Modification State

23 November 2010 - Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 5.1.

2.3.5 Test Method

The test was performed with the EUT in the following mode(s): Idle. The EUT was mounted via the mounting bracket provided by McMurdo.



Test Set-up – Ruggedness



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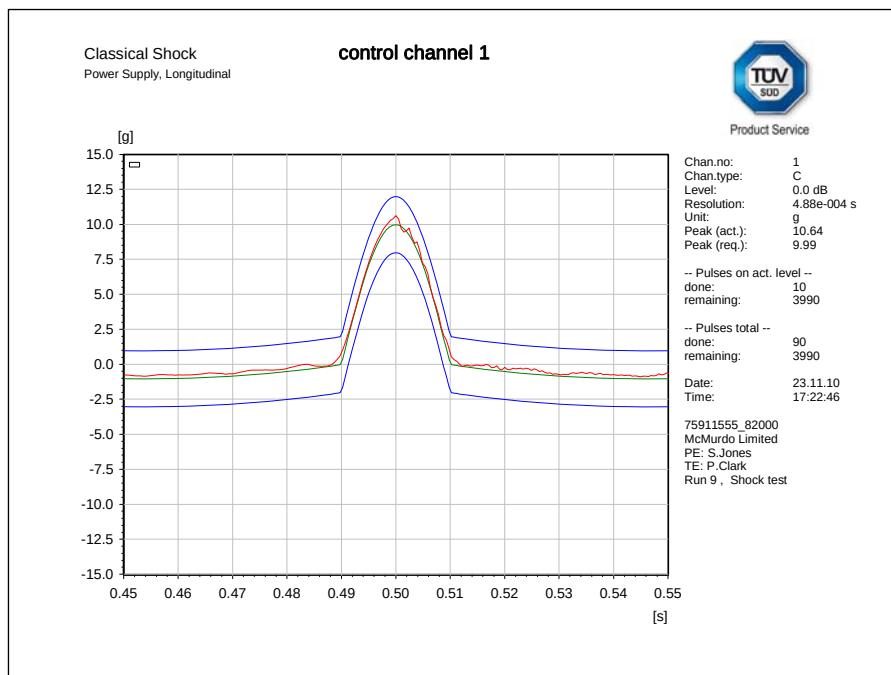
Procedure

The EUT was secured to the test table via the mounting bracket supplied by McMurdo. The EUT was then subject to the ruggedness test in accordance with the following profile (see also plot below):

Peak acceleration: $98 \text{ m/s}^2 \pm 10 \%$
 Pulse duration: $20 \text{ ms} \pm 10 \%$
 Wave shape: Half-cycle sinewave
 Test axis: Vertical
 Number of bumps: 4 000

After completion of the ruggedness test a performance check was carried out.

2.3.6 Test Results



Performance Check

The performance check was carried out on completion of the test as required by IEC 61097-2. The readings can be shown below:

Post Ruggedness Test			
Sample	Functional Check	Self Test	Active
Three / TUV0004	Frequency (MHz)	406.0404	406.0404
	Digital Message	✓	✓
	Presence of Homing Signal	✓	✓



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SECTION 3

RADIO TEST DETAILS

Limited IEC 61097-2 Testing of the
McMurdo Limited
G5 Smartfind Plus (a) & (m)



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3.1 SPURIOUS EMISSIONS

3.1.1 Specification Reference

IEC 61097-2 Clause 5.19

3.1.2 Equipment Under Test

G5 Smartfind Plus, TUV Reference: 0002

3.1.3 Date of Test and Modification State

21 January 2011 - Modification State 0

3.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 5.1.

3.1.5 Test Method

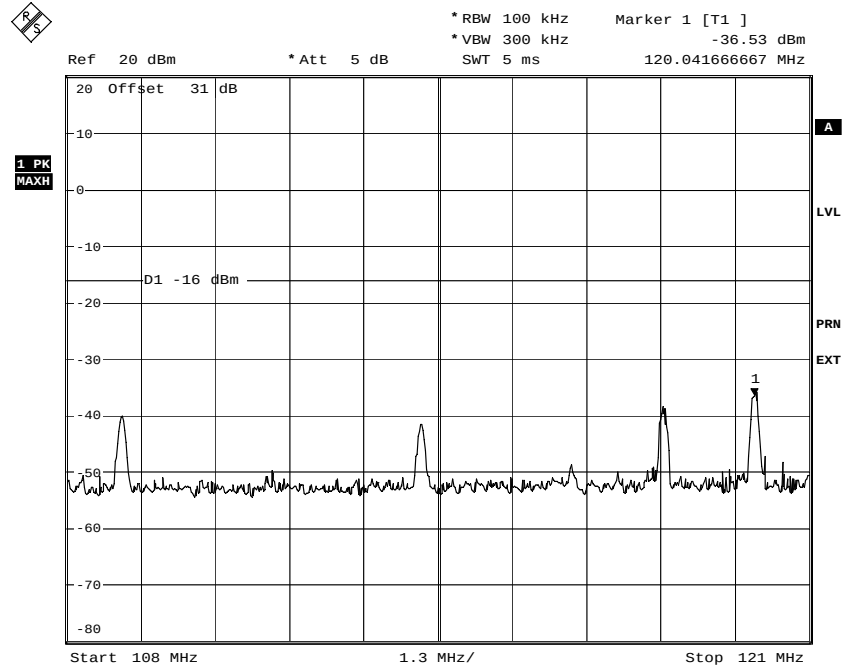
The test was performed with the EUT in the following mode(s): Activated. Measurements were made on a Spectrum Analyser. A 30dB attenuator and filter were used between the EUT 50ohm antenna connector and the measuring equipment. The path loss was pre-calibrated and applied to all measurements as a reference level offset.



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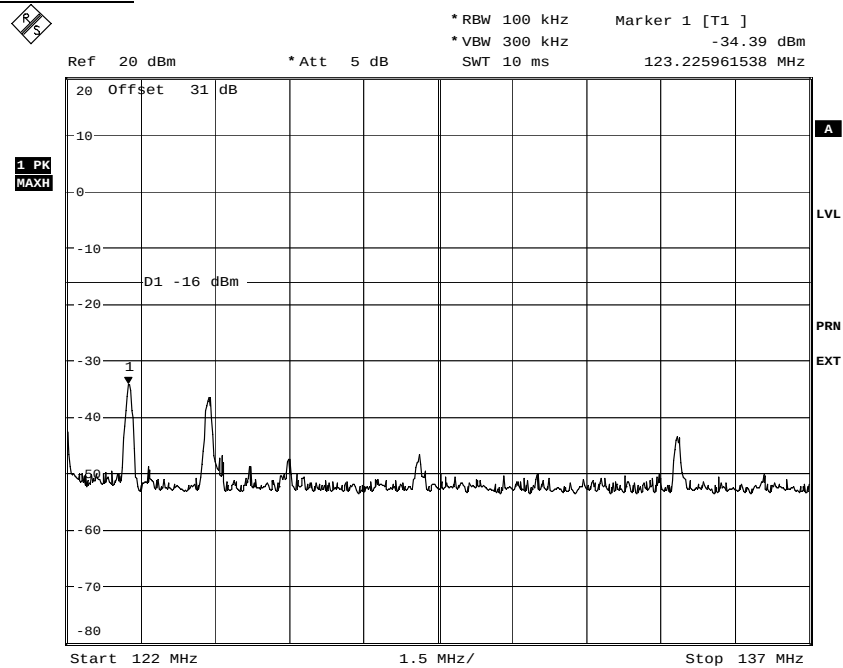
3.1.6 Test Results

108MHz to 121MHz



Date: 21.JAN.2011 13:20:51

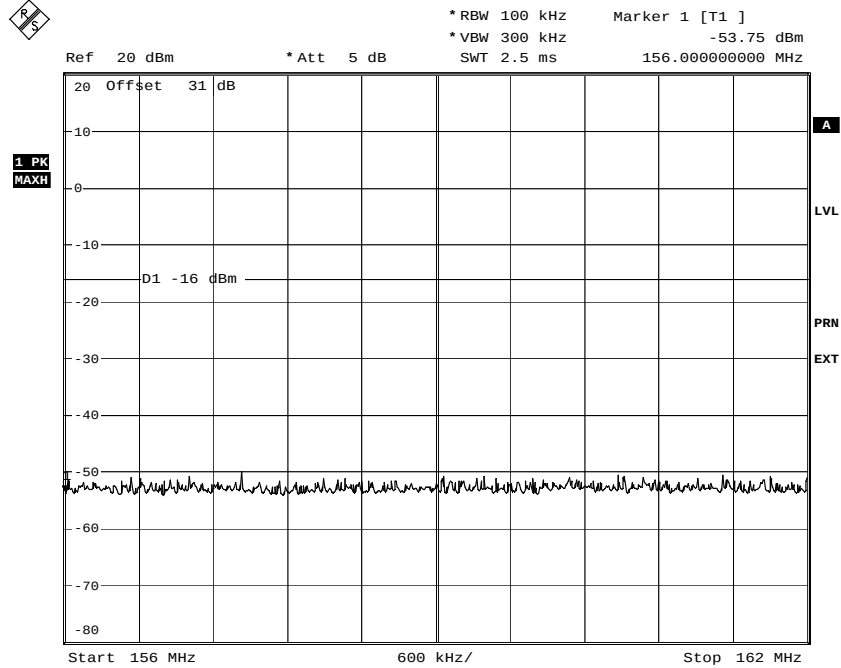
122MHz to 137MHz



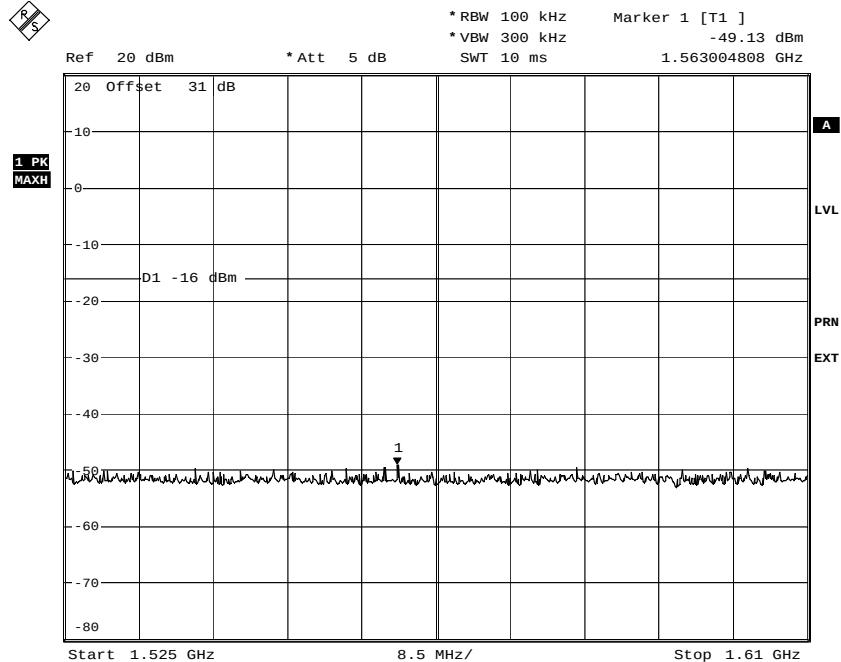
Date: 21.JAN.2011 13:19:45



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156MHz to 162MHz

Date: 21. JAN. 2011 13:21:47

1525MHz to 1610MHz

Date: 21. JAN. 2011 13:25:22



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3.2 OFF GROUND PLANE RADIATED POWER TEST

3.2.1 Specification Reference

IEC 61097-2 Clause D.4.3

3.2.2 Equipment Under Test

G5 Smartfind Plus, TUV Reference: 0001

3.2.3 Date of Test and Modification State

23 November 2010 - Modification State 0

3.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 5.1.

3.2.5 Test Method

Test conducted in accordance with the specification.

3.2.6 Test Results

Measurements were made (in dBm) at the elevation/azimuth combinations as per the following table and converted into PERP (in mW)

PLB-350A (Floatation), S/N #20

Elevation (°)	Azimuth (°)			
	0	90	180	270
5	17.79	17.62	16.91	17.30
10	14.52	14.49	14.52	14.73
15	10.28	9.86	10.40	10.42
20	2.15	2.21	2.27	2.24

The four values used for determination of the PERP are those at the elevation angle which exhibits the maximum antenna gain, in this case 5°. The final PERP value is the minimum of these four values; 16.91 mW.

Note: for the off-ground-plane radiated power test the PERP value shall be greater than or equal to 2 mW.



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SECTION 4

OTHER TEST DETAILS

Limited IEC 61097-2 Testing of the
McMurdo Limited
G5 Smartfind Plus (a) & (m)



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4.1 LOW DUTY CYCLE LIGHT**4.1.1 Specification Reference**

IEC 61097-2, Clause 5.3.3.3

4.1.2 Equipment Under Test

G5 Smartfind Plus

4.1.3 Date of Test and Modification State

23 November 2010 - Modification State 0

4.1.4 Test Equipment Used

Testing carried out at an offsite location with a TUV SUD USCG representative. Refer to customer report number 010-10

4.1.5 Test Results

Measured temperature	-20°C	Ambient	+55°C
Flash rate per minute	23.01	23.03	23.03
Mean effective luminous intensity (Candela)	1.69	1.61	1.53
Minimum effective luminous intensity (Candela)	0.33	0.31	0.30



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SECTION 5

TEST EQUIPMENT USED



5.1 TEST EQUIPMENT USED

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

Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
Section 3.1 – Spurious Emissions					
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2011
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jun-2011
Low Pass Filter	Mini-Circuits	NLP-300	1636	12	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Filter (Hi Pass)	Mini-Circuits	NHP-600	2834	12	TU
Hygrometer	Rotronic	I-1000	3068	12	10-Jul-2011
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	10-Jun-2011
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3352	12	20-Apr-2011
Rubidium Frequency Standard	Symmetrcom	8040C	3490	12	4-Mar-2011
Section 2.2 and 2.3 - Vibration and Ruggedness Test					
Vibration Table	Ling Dynamic Systems	875	3170	6	10-May-2011
Isotron Accelerometer	Endevco	256-10	3390	6	15-May-2011
Accelerometer	Endevco	256-10	3469	6	15-May-2011
Vibration Controller	Muller & Partner	Vibpilot 8	3771	6	3-Feb-2011
Section 2.1 - Drop Test					
Hardwood Block	Unknown	ELM	2650	-	TU
5 m tape measure	Stanley	5 m / 16 ft	3624	-	TU
Section 3.2 Beacons – Off Ground Plane Radiated Power Test					
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
Bilog Antenna	Schaffner	CBL6143	1858	24	9-Aug-2012
Antenna Tower 6M	EMCO	1050	1859	-	TU
EMI Test Receiver	Rohde & Schwarz	ESIB26	2028	12	17-Sep-2011

TU – Traceability Unscheduled



Product Service

SECTION 4

PHOTOGRAPHS



Product Service

6.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Equipment Under Test - Front



Equipment Under Test – Rear View



Product Service



Equipment Under Test – In Mounting Bracket



Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

7.1 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
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