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Report On

EMC Testing of the
McMurdo
Fastfind Plus

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Document 75901815 Report 04 Issue 1

November 2007



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

EMC Testing of the
McMurdo
Fastfind Plus


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16th November 2007





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SECTION 1

REPORT SUMMARY

EMC Testing of the
McMurdo
Fastfind Plus



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the EMC Testing of the McMurdo Fastfind Plus to the requirements of IEC 60945: 2002.

Objective	To perform Electromagnetic Compatibility (EMC) Qualification Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	McMurdo
Model Number(s)	Fastfind/Fastfind Plus
Serial Number(s)	_01
Software Version	N/A
Hardware Version	85-800N
Number of Samples Tested	One
Test Specification/Issue/Date	IEC 60945: 2002
Incoming Release Date	Not Formally Released 20 th August 2007
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Start of Test	16 th September 2007
Finish of Test	30 th October 2007
Name of Engineer(s)	G Lawler
Related Document(s)	CISPR 16-1 1999 IEC 61000-4-3 2002 IEC 61000-4-2 1995



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with IEC 60945: 2002, is shown below.

Configuration 1 - As supplied				
Section	Spec Clause	Test Description	Result	Base Standard
	Table 5, 9.2	Conducted Emissions (DC Power Port)	N/A	CISPR 16-1
	Table 5, 9.2	Conducted Emissions (AC Power Port)	N/A	CISPR 16-1
	Table 5, 9.3	Enclosure Port Magnetic Emissions - Field Strength	N/A	CISPR 16-1
2.1	Table 5, 9.3	Radiated Emissions Electric Field (Enclosure Port)	Pass	CISPR 16-1
2.2	Table 5, 9.3	Radiated Emissions Magnetic Field (Enclosure Port)	Pass	CISPR 16-1
	Table 6, 10.3	Immunity to Radio Frequency Common Mode (AC Power Port)	N/A	IEC 61000-4-6
	Table 6, 10.3	Immunity to Radio Frequency Common Mode (DC Power Port)	N/A	IEC 61000-4-6
	Table 6, 10.3	Immunity to Radio Frequency Common Mode (Signal, Control and Telecommunications Port)	N/A	IEC 61000-4-6
2.3	Table 6, 10.4	Immunity to Radio Frequency Electromagnetic Field (Enclosure Port)	Pass	IEC 61000-4-3
	Table 6, 10.5	Immunity to Fast Transient Bursts Common Mode (AC Power Port)	N/A	IEC 61000-4-4
	Table 6, 10.5	Immunity to Fast Transient Bursts Common Mode (Signal, Control and Telecommunications Port)	N/A	IEC 61000-4-4
	Table 6, 10.6	Immunity to Surges (AC Power Port)	N/A	IEC 61000-4-5
	Table 6, 10.7	Immunity to Power Supply Short Term Variation (AC Power Ports)	N/A	IEC 61000-4-11
	Table 6, 10.8	Immunity to Interruptions (AC Power Port)	N/A	IEC 61000-4-11
	Table 6, 10.8	Immunity to Interruptions (DC Power Port)	N/A	IEC 61000-4-11
2.4	Table 6, 10.9	Immunity to Electrostatic Discharge (Enclosure Port)	Pass	IEC 61000-4-2
	Table 6, 11.2	Immunity to Compass Safe Distance (Enclosure Port)	N/A	EN 60945

N/A – Not Applicable



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1.3 DECLARATION OF BUILD STATUS

Manufacturer	<u>McMurdo</u>
Country of origin	<u>United Kingdom</u>
UK Agent	<u>N/A</u>
Technical Description	<u>Personal Locator Beacon</u>
Model No	<u>Fastfind Plus</u>
Part No	<u>85-881-001</u>
Serial No	<u>N/A</u>
Drawing Number	<u>85-800</u>
Build Status	<u>Issue B</u>
Software Issue	<u>1.1.70</u>
FCC ID	<u>To be assigned</u>

Signature _____**Date** _____**D of B S Serial No** _____

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by BABT/TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.



1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a McMurdo Limited Fastfind Plus as shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



1.4.2 Test Configuration

Configuration: As supplied

The EUT was configured in accordance with IEC 60945: 2002.

1.4.3 Modes of Operation

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

Mode 1 - Idle.

Mode 2 - Active.

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.4.4 Monitoring of Performance

The EUT was monitored for transmit status using a spectrum analyser. The EUT was additionally monitored for operation of LEDs using a CCTV camera.

1.4.5 Performance Criteria

Idle Mode

The EUT should not accidentally transmit. EUTs must not indicate it has changed from idle to operating mode.

Active Mode

The EUT should continue to transmit at it's expected interval. The EUTs visible indication of operation state must continue to operate as expected.



1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from an internal battery supply.

Test Results

EN60945, Clause 5.3 states:

The measured test results shall be compared with the corresponding acceptable performance limits and the EUT shall pass the test only if the measured performance margin is favourable and greater than the measurement uncertainty. The test report shall show, for each test measurement, the test results, its associated measurement uncertainty, and the acceptable performance limits, and the acceptable performance margin, as applicable.

1.6 DEVIATIONS FROM THE STANDARD

Section 2.1: Both the Idle and Active modes were tested. However the test specification states that for Radiated emissions tests, equipment including a radio transmitter operating within the measurement bands shall be in the operational state but not the transmitting state.

1.7 MODIFICATION RECORD

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

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	N/A	N/A
1	Firmware update to update interval (prior to C/S testing).	McMurdo	03/09/2007
2	Firmware update to correct Morse P signal (RTCM).	McMurdo	23/10/2007
3	Like for like replacement of: RES 8MHz resonator R55 330R 0603 resistor	McMurdo	25/10/2007



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SECTION 2

TEST DETAILS

EMC Testing of the
McMurdo Limited
Fastfind Plus



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2.1 RADIATED EMISSIONS ELECTRIC FIELD (ENCLOSURE PORT)**2.1.1 Specification Reference**

IEC 60945: 2002, Table 5, 9.3

2.1.2 Equipment Under Test

Fastfind Plus, _01

2.1.3 Date of Test and Modification State

17th October 2007 - Modification State 1

2.1.4 Test Equipment Used

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

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of CISPR 16-1.

The test was performed with the EUT in the following configurations and modes of operation:

- Configuration As supplied - Mode Idle
- Mode Active

2.1.6 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	56%
Atmospheric Pressure	1017mbar



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2.1.7 Test Results

For the period of test the EUT met the requirements of IEC 60945 for Radiated Emissions (Enclosure Port).

The test results are shown below.

Configuration 1 - Mode Idle

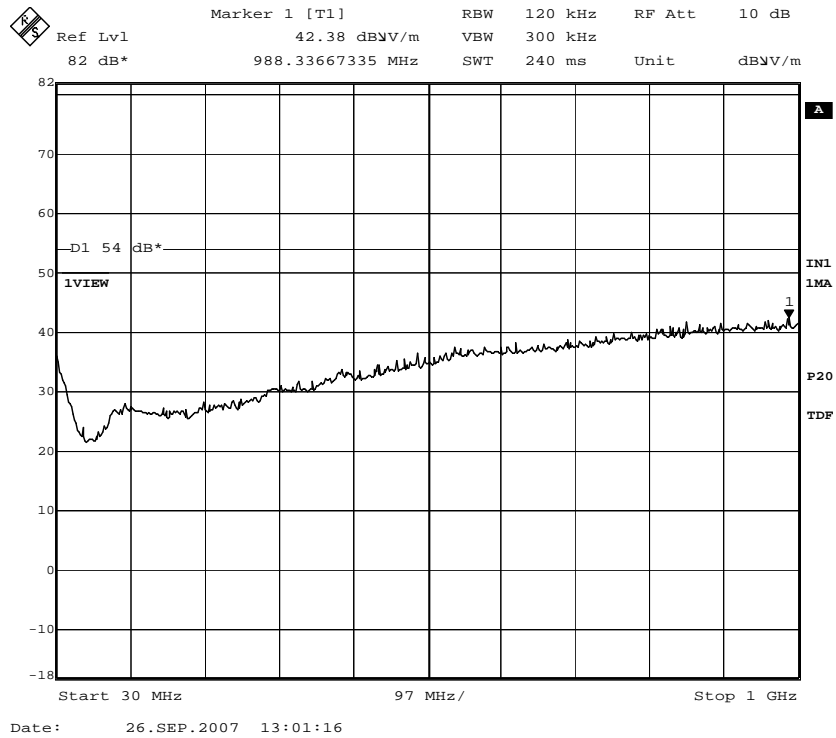
No emissions were detected within 20dB of the specification limit.

Configuration 1 - Mode Active

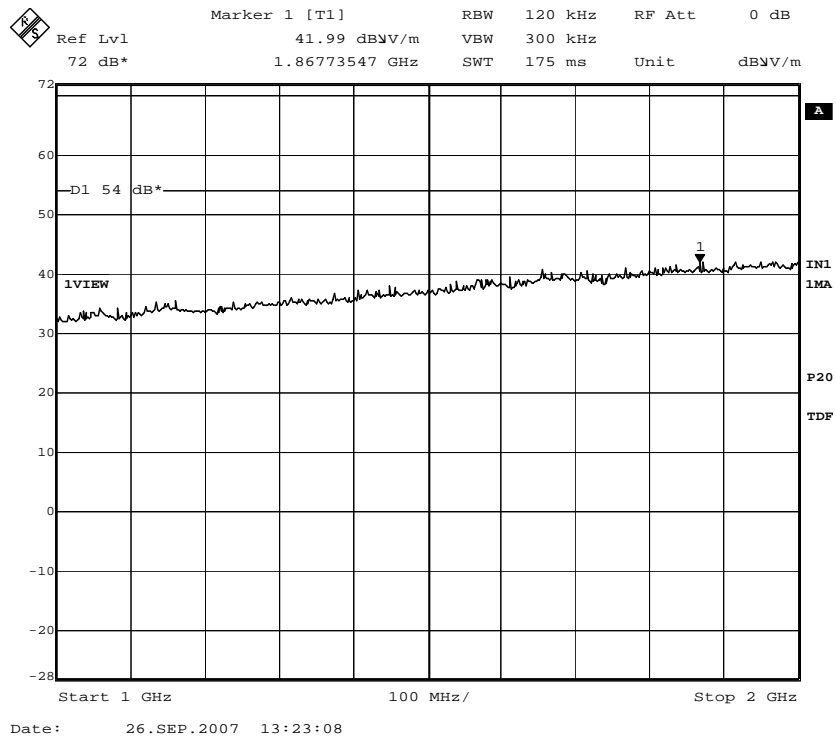
No emissions, other than the transmit or harmonic of the transmit frequency, were detected within 20dB of the specification limit.



Product Service



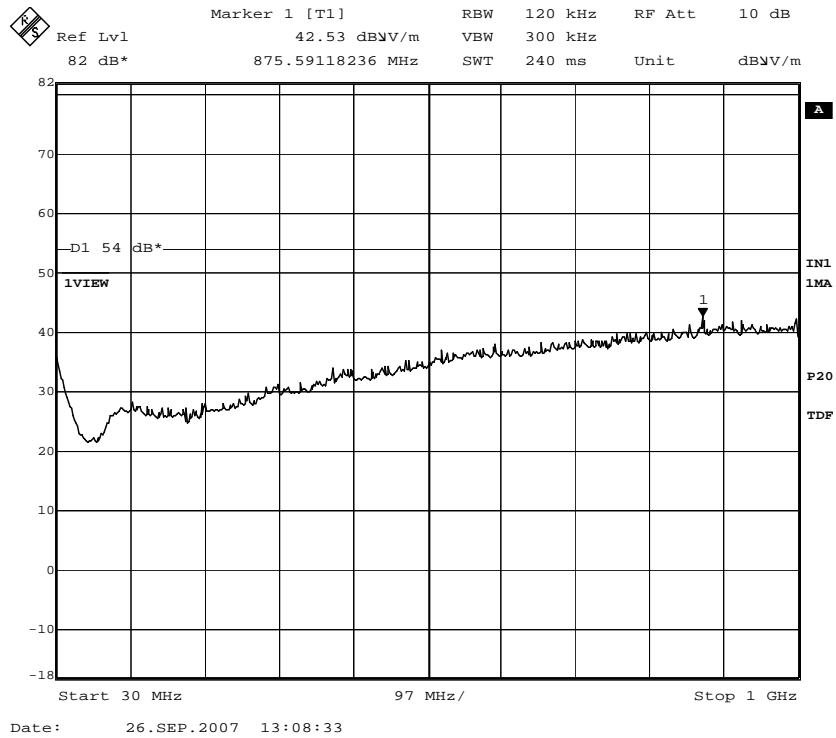
Idle Mode 30MHz to 1GHz



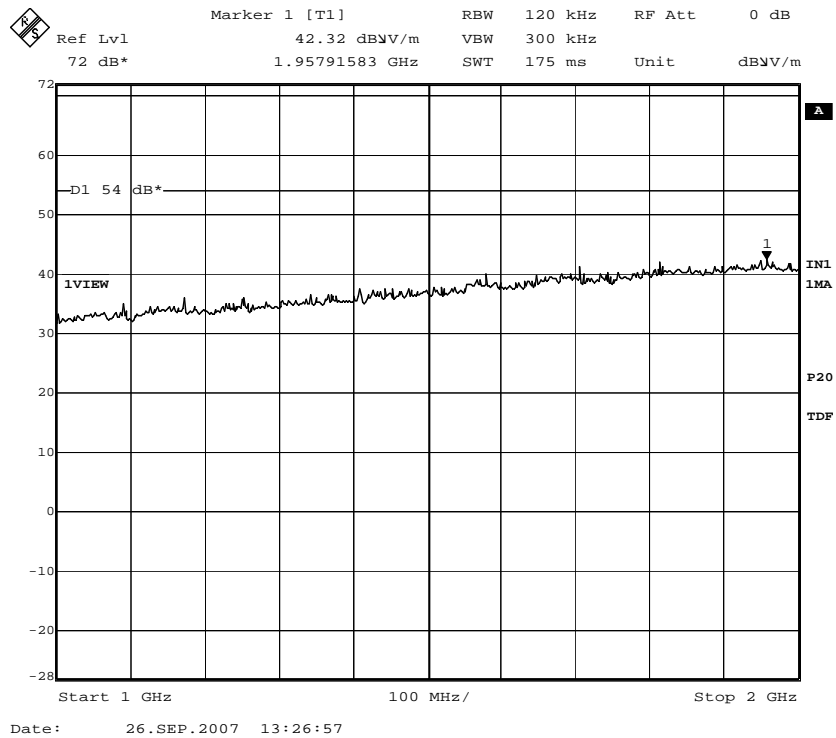
Idle Mode 1GHz to 2GHz



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Active Mode 30MHz to 1GHz



Active Mode 1GHz to 2GHz



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2.2 RADIATED EMISSIONS MAGNETIC FIELD (ENCLOSURE PORT)

2.2.1 Specification Reference

IEC 60945: 2002 Table 5, 9.3

2.2.2 Equipment Under Test

Fastfind Plus, _01

2.2.3 Date of Test and Modification State

20th October 2007 - Modification State 1

2.2.4 Test Equipment Used

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

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of CISPR 16-1.

The test was performed with the EUT in the following configuration and mode of operation:

- Configuration As supplied - Mode Idle
- Mode Active

2.2.6 Environmental Conditions

Ambient Temperature	18.4°C
Relative Humidity	56%
Atmospheric Pressure	1017mbar



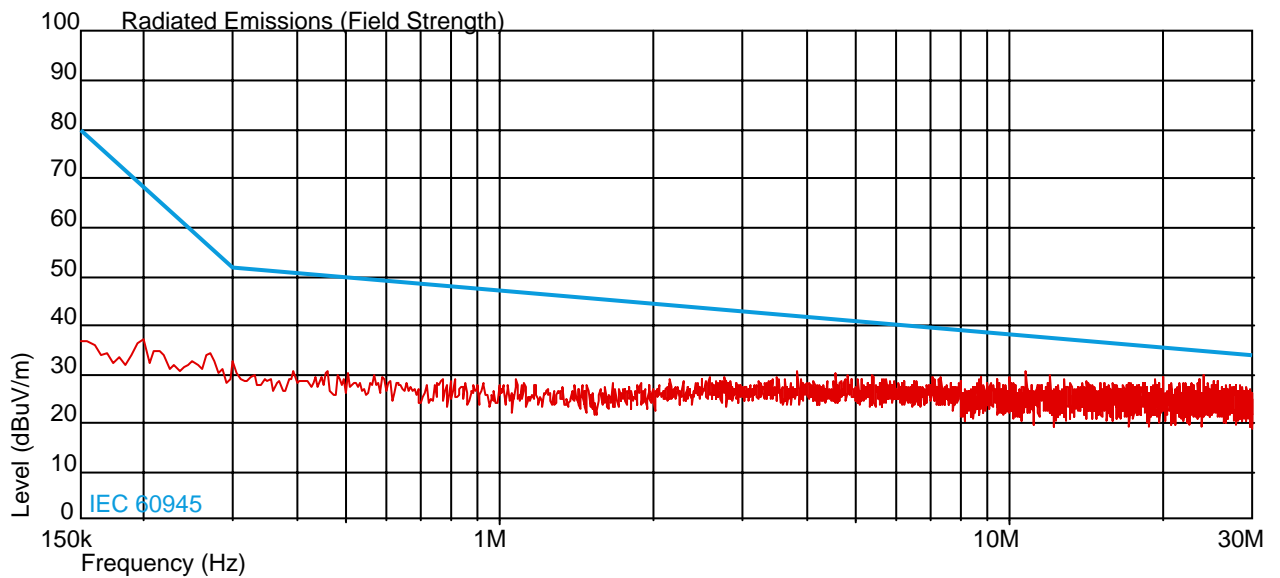
2.2.7 Test Results

For the period of test the EUT met the requirements of IEC 60945 for Radiated Magnetic Emissions (Enclosure Port).

The test results are shown below.

Configuration 1 - Mode Idle

No emissions were detected within 10dB of the specification limit.





2.3 IMMUNITY TO RADIO FREQUENCY ELECTROMAGNETIC FIELD (ENCLOSURE PORT)

2.3.1 Specification Reference

IEC 60945: 2002 Table 5, 9.2

2.3.2 Equipment Under Test

Fastfind Plus, _01

2.3.3 Date of Test and Modification State

26th September 2007 - Modification State 1 (Active Mode and Idle Mode below 1GHz Orientations 1,2,5 and 6)

28th September 2007 – Modification State 1 (Idle Mode Below 1GHz Orientations 3 and 4)

17th October 2007 – Modification State 1 (Idle mode Above 1GHz all Orientations)

2.3.4 Test Equipment Used

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

2.3.5 Test Method and Operating Modes

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

The test was performed with the EUT in the following configurations and modes of operation:

- Configuration As supplied - Mode Idle
- Mode Active

2.3.6 Environmental Conditions

	26 th September	28 th September	17 th October
Ambient Temperature	21.3°C	19.5°C	19.5°C
Relative Humidity	37%	39%	39%
Atmospheric Pressure	1016mbar	1009mbar	1014mbar



2.3.7 Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of IEC 60945 for Immunity to Radio Frequency Electromagnetic Field (Enclosure Port).

The applied test levels are shown below.

Configuration As supplied - Mode Idle

Orientation of EUT		1	2	3	4	5	6
Field Strength (V/m)		12	12	12	12	12	12
Frequency Range (MHz)		80 - 2000	80 - 2000	80 - 2000	80 - 2000	80 - 2000	80 - 2000
AM Modulation	Frequency	1kHz					
	Depth	80%					
Stepped Frequency Increments		1% Logarithmic With Respect To Last Momentary Frequency					
Dwell Time		3 Sec < 1GHz 9 Sec >1GHz					

Configuration As supplied - Mode Active

Orientation of EUT		1	2	3	4	5	6
Field Strength (V/m)		12	12	12	12	12	12
Frequency Range (MHz)		80 - 2000	80 - 2000	80 - 2000	80 - 2000	80 - 2000	80 - 2000
AM Modulation	Frequency	1kHz					
	Depth	80%					
Stepped Frequency Increments		1% Logarithmic With Respect To Last Momentary Frequency					
Dwell Time		3 Sec < 1GHz 9 Sec >1GHz					



Product Service

2.4 IMMUNITY TO ELECTROSTATIC DISCHARGE (ENCLOSURE PORT)

2.4.1 Specification Reference

IEC 60945: 2002 Table 5, 9.2

2.4.2 Equipment Under Test

Fastfind Plus, _01

2.4.3 Date of Test and Modification State

30th October 2007 - Modification State 3

2.4.4 Test Equipment Used

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

2.4.5 Test Method and Operating Modes

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

The test was performed with the EUT in the following configurations and modes of operation:

- Configuration As supplied
 - Mode Idle
 - Mode Active

2.4.6 Environmental Conditions

Ambient Temperature	17.4°C
Relative Humidity	44%
Atmospheric Pressure	1021mbar



2.4.7 Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of IEC 60945 for Immunity to Electrostatic Discharge (Enclosure Port).

The applied test levels are shown below.

Configuration As supplied - Mode Idle

		Contact Discharges								Air Discharge							
		2		4		6		8		2		4		8		15	
Test Points		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Horizontal Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A	Antenna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	1	1	1	1	N/A	N/A
B	Blue Seam in Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
C	Keypad	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
D	Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
E	Threaded Insert	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Seam in Back of Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
G	Screw in Rear	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
H	Bar	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Key to Results

- ✓ The EUT's performance was not impaired at this test point when the ESD pulse was applied.
- 1 Partial discharges occur to these points, the EUT's performance was not impaired at this test point when the ESD pulse was applied.
- ✓* No discharge occurred at this test point when the ESD pulse was applied.
- N/A Test not applicable as defined in the specification.

Configuration As supplied - Mode Active

		Contact Discharges								Air Discharge							
		2		4		6		8		2		4		8		15	
Test Points		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Horizontal Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A	Antenna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	1	1	1	1	N/A	N/A
B	Blue Seam in Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
C	Keypad	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
D	Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
E	Threaded Insert	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Seam in Back of Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
G	Screw in Rear	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
H	Bar	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

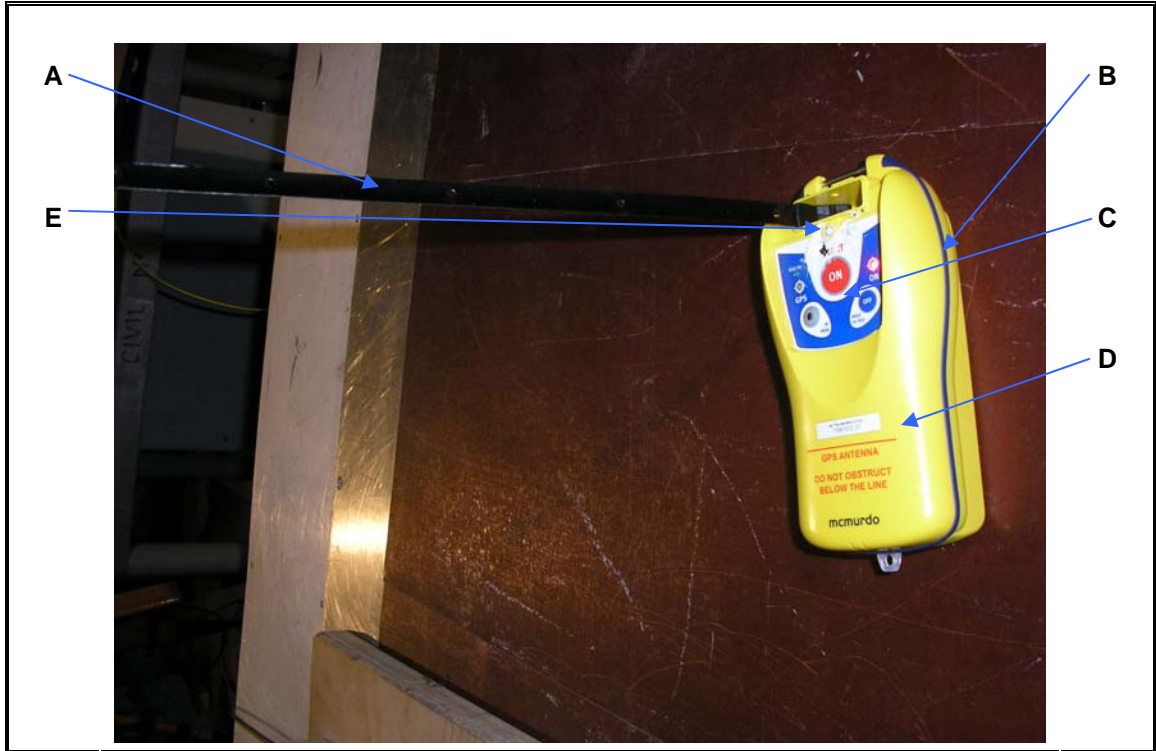
Key to Results

- ✓ The EUT's performance was not impaired at this test point when the ESD pulse was applied.
- 1 Partial discharges occur to these points, the EUT's performance was not impaired at this test point when the ESD pulse was applied.
- ✓* No discharge occurred at this test point when the ESD pulse was applied.
- N/A Test not applicable as defined in the specification.



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ESD Test Points





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SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.4 EMC - Electrostatic Discharges				
Spectrum Analyser	Hewlett Packard	8590B	772	TU
Conducted Immunity Test System	Schaffner	BEST EMC	1935	21-Sep-2008
ESD Simulator	Schaffner	BEST ESD	2942	22-Aug-2008
Section 2.2 EMC - Magnetic Emissions				
Spectrum Analyser	Hewlett Packard	8542E	18	9-Feb-2008
Antenna (Active Loop, 9kHz-30MHz)	Rohde & Schwarz	HFH2-Z2	333	22-Jun-2008
Mast Controller	Inn-Co GmbH	CO 1000	1606	TU
Section 2.1 EMC - Radiated Emissions				
Spectrum Analyser	Hewlett Packard	8542E	18	9-Feb-2008
Screened Room (5)	Rainford	Rainford	1545	1-Mar-2008
Mast Controller	Inn-Co GmbH	CO 1000	1606	TU
Turntable/Mast Controller	EMCO	2090	1607	TU
Antenna (Bilog)	Chase	CBL6143	2904	10-Nov-2007
Section 2.3 EMC - Radiated Immunity				
Spectrum Analyser	Hewlett Packard	8562A	14	9-Jun-2008
Signal Generator 10kHz to 2.7GHz	Marconi	2031	19	3-Jan-2008
Load (50ohm/15W)	Diamond Antenna	DL-30N	219	5-Sep-2008
Load	Diamond Antenna	DL-30N	220	5-Sep-2008
Multimeter	Rohde & Schwarz	URV-5	261	TU
Signal Generator	Marconi	2031	262	28-Aug-2008
Sensor (10V)	Rohde & Schwarz	URV5-Z2	274	TU
Load (50ohm, 30W)	Weinschel	50T-054	275	TU
Load (50ohm, 30W)	Weinschel	50T-054	276	TU
Millivoltmeter	Rohde & Schwarz	URV-5	281	TU
Sensor (10V)	Rohde & Schwarz	URV-Z2	282	TU
Directional Coupler	Amp Research	DC6180	283	TU
Antenna (Bilog)	Schaffner	CBL 6143	316	TU
Colour TV Monitor	Panasonic	WV-CP220-B	318	TU
Colour TV Monitor	Panasonic	WV-CP220-B	320	TU
Antenna	Schaffner	CLB 6143	322	TU
Spectrum Analyser	Hewlett Packard	8590B	772	TU
Screened Room (1)	Rainford	Rainford	1541	TU
Screened Room (2)	Rainford	Rainford	1542	TU
Signal Generator	Marconi	2031	1845	3-Oct-2007
CW TWT (1-2.5GHz)	Thorn	PTC6341	2069	TU
TV Monitor	Panasonic	TC14S1-M	2108	TU
Laser Powered Electric Field Sensor	Dare Development	RadiSense IV	2148	29-Nov-2007
Directional Coupler	Amp Research	DC6180	2763	TU
RF Power Amplifier	Amp Research	250W1000A	2844	27-Oct-2007
Amplifier (250W, 80MHz - 1GHz)	Amp Research	250W1000A	3029	27-Oct-2008
Laser Powered Electric Field Sensor	Dare Development	RadiSense IV - CTR1001A	3209	29-Jun-2008

TU – Traceability Unscheduled



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Radiated E-Field Susceptibility	26MHz to 2.5GHz Test Amplitude	1.4dB†
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—

Worst case error for both Time and Frequency measurement 12 parts in 10^6 .

* In accordance with CISPR 16-4

† In accordance with UKAS Lab 34



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SECTION 4

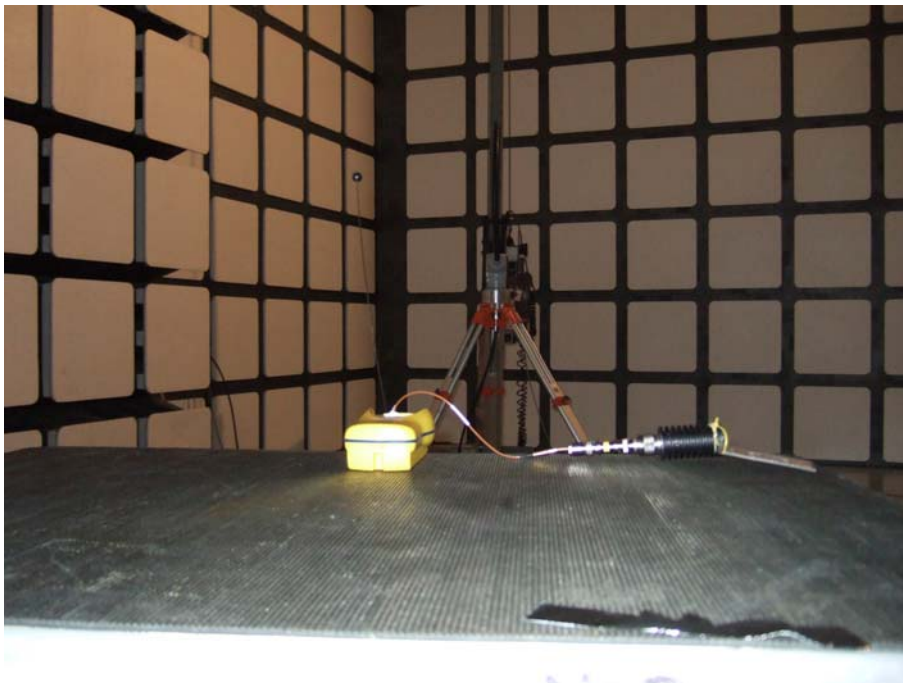
PHOTOGRAPHS



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Radiated emissions



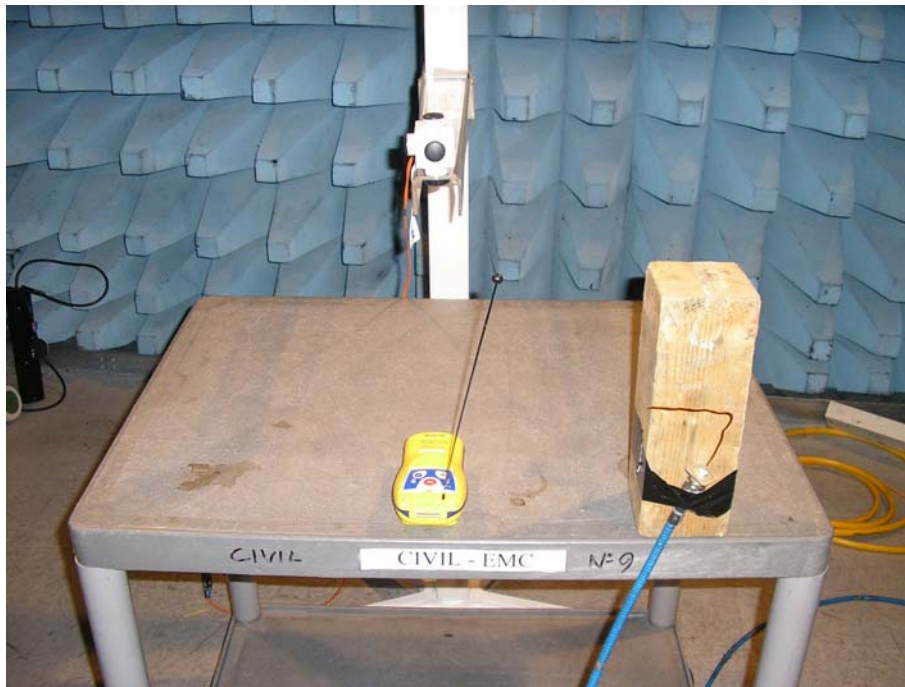
Magnetic Emissions Active



Radiated Immunity Test Setup Orientation 1



Radiated Immunity Test Setup Orientation 2



Radiated Immunity Test Setup Orientation 3



Radiated Immunity Test Setup Orientation 4



Radiated Immunity Test Setup Orientation 5



Radiated Immunity Test Setup Orientation 6



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SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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