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Report On

Limited EMC Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit

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Document 75912008 Report 01 Issue 1

February 2011



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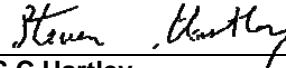
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Product Service

SECTION 1

REPORT SUMMARY

Limited EMC Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the SRT Marine Technology Ltd, Cobalt: Class B AIS Unit to the requirements of IEC 60945.

Objective	To perform Limited 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	SRT Marine Technology Ltd
Model Number	011-0014
Serial Number(s)	12 10
Software Version	1271_17DEC2010 1285_06JAN2011
Hardware Version	N/A
Number of Samples Tested	2
Test Specification/Date	IEC 60945: 2002
Incoming Release Date	Declaration of Build Status 14 February 2011
Disposal Reference Number	Held Pending Disposal
Date	Not Applicable
Order Number	Not Applicable
Date	POR001777 06 January 2011
Start of Test	14 December 2010
Finish of Test	10 February 2011
Name of Engineer(s)	PJ Harrison J Holcombe A R Hubbard D Howard
Related Document(s)	CISPR 16-1-1: 2006 CISPR 16-1-2: 2006 IEC 61000-4-2: 2001 IEC 61000-4-3: 2006 IEC 61000-4-4: 2004 IEC 61000-4-6: 2006 IEC 61000-4-11: 2004



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with IEC 60945 is shown below

Configuration 1						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.1	Table 5, 9.2	Conducted Emissions (DC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	0	Pass	CISPR 16-1-1
			No GPS signal; not transmitting.	0	Pass	
2.2	Table 5, 9.3	Conducted Emissions (AC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	CISPR 16-1-1
			No GPS signal; not transmitting.	N/A	N/A	
2.3	Table 5, 9.3	Radiated Emissions (Enclosure Port)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	CISPR 16-1-2
			No GPS signal; not transmitting.	0	Pass	
2.4	Table 6, 10.3	Immunity to Radio Frequency Common Mode (AC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	IEC 61000-4-6
			No GPS signal; not transmitting.	N/A	N/A	
2.5	Table 6, 10.3	Immunity to Radio Frequency Common Mode (DC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	0	Pass	IEC 61000-4-6
			No GPS signal; not transmitting.	N/A	N/A	
2.6	Table 6, 10.4	Immunity to Radio Frequency Electromagnetic Field (Enclosure Port)	Receiving GPS and transmitting position (at standard transmit interval).	0	Pass	IEC 61000-4-3
			No GPS signal; not transmitting.	N/A	N/A	
2.7	Table 6, 10.5	Immunity to Fast Transient Bursts Common Mode (AC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	IEC 61000-4-4
			No GPS signal; not transmitting.	N/A	N/A	
2.8	Table 6, 10.6	Immunity to Surges (AC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	IEC 61000-4-5
			No GPS signal; not transmitting.	N/A	N/A	
2.9	Table 6, 10.7	Immunity to Power Supply Short Term Variation (AC Power Ports)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	IEC 61000-4-11
			No GPS signal; not transmitting.	N/A	N/A	
2.10	Table 6, 10.8	Immunity to Interruptions (AC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	N/A	N/A	IEC 61000-4-11
			No GPS signal; not transmitting.	N/A	N/A	
2.11	Table 6, 11.2	Immunity to Interruptions (DC Power Port)	Receiving GPS and transmitting position (at standard transmit interval).	0	Pass	IEC 61000-4-2
			No GPS signal; not transmitting.	N/A	N/A	
2.12	Table 6, 10.9	Immunity to Electrostatic Discharge (Enclosure Port)	Receiving GPS and transmitting position (at standard transmit interval).	0	Pass	EN 60945
			No GPS signal; not transmitting.	N/A	N/A	

N/A – Not Applicable

1.3 DECLARATION OF BUILD STATUS

Manufacturer	<u>SRT Marine Technology Ltd</u>
Country of origin	<u>England</u>
UK Agent	<u>SRT Marine Technology Ltd</u>
Technical Description	<u>Class B CSTDMA AIS Transponder OEM Module</u>
Model No	<u>COBALT</u>
Part No	<u>011-0014</u>
Serial No	<u>10, 11 and 12</u>
Drawing Number	<u>LD3566 – P200 Schematic</u>
Build Status	<u>Mod 0 Mod 1 – RX1 Tuning Range Extended (C261 Fitted)</u>
Software Issue	<u>1271_17DEC2010 1285_06JAN2011</u>

Signature


Date 15 February 2011

D of B S Serial No 75912008/01

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 TÜV SÜD Product Service Ltd 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 an SRT Marine Technology Cobalt Class B AIS Unit. A full technical description can be found in the manufacturer's documentation.

1.4.2 Test Configuration

The EUT was a marine transponder module. It was set up with the main board header connected to a test cable. This test cable had an RS-232 9-pin D-type connector for serial communication, twisted-pair power cables, and breakout board for NMEA and other signals.

Configuration 1

The EUT was configured in accordance with IEC 60945.

1.4.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
Serial Port	<1M	DC Power NMEA 0183 Port 1 NMEA 0183 Port 2 NMEA 2000 USB SPI USER I/O	Multicore	No
VHF	<1M	AIS and DSC communications	Co-Axial	Yes
GPS	<1M	GPS Data	Co-Axial	Yes

1.4.4 Modes of Operation

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

Mode 1 – Receiving GPS and transmitting position (at standard transmit interval)

Mode 2 – No GPS signal; not transmitting

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

1.4.5 Monitoring of Performance

IEC 60945

The EUT was monitored via a second AIS transponder. This checked GPS positional data, and the regular transmit function. Since the EUT did not transmit continuously it was additionally monitored via RS-232 to ensure the EUT was still working correctly between transmissions, and that no other errors occurred.

1.4.6 Performance Criteria

IEC 60945

The EUT must continue to send its correct position to the second AIS transponder. The EUT must show no internal errors via the RS-232 link.

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 a 12V DC supply.

Test Results

IEC 60945, 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 result, its associated measurement uncertainty, the acceptable performance limits, and the acceptable performance margin, as applicable.

The tests detailed in this report met the above test requirements; the test levels and limits shown in the test report have been enhanced to meet the Measurement Uncertainties specified in Table 3.2.

1.6 DEVIATIONS FROM THE STANDARD

Immunity to Electrostatic Discharge (Section 2.10)

Only limited testing was performed due to the EUT normally being housed within a plastic enclosure.

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

SECTION 2

TEST DETAILS

Limited EMC Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit

2.1 CONDUCTED EMISSIONS (DC POWER PORT)

2.1.1 Specification Reference

IEC 60945: Table 5, Clause 9.2 and 5.3

2.1.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 12

2.1.3 Date of Test and Modification State

10 January 2011 - Modification State 0

2.1.4 Test Equipment Used

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

2.1.5 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 1 - Mode 1

Configuration 1 - Mode 2

2.1.6 Environmental Conditions

10 January 2011

Ambient Temperature 21.7°C

Relative Humidity 25%

Atmospheric Pressure 1011mbar

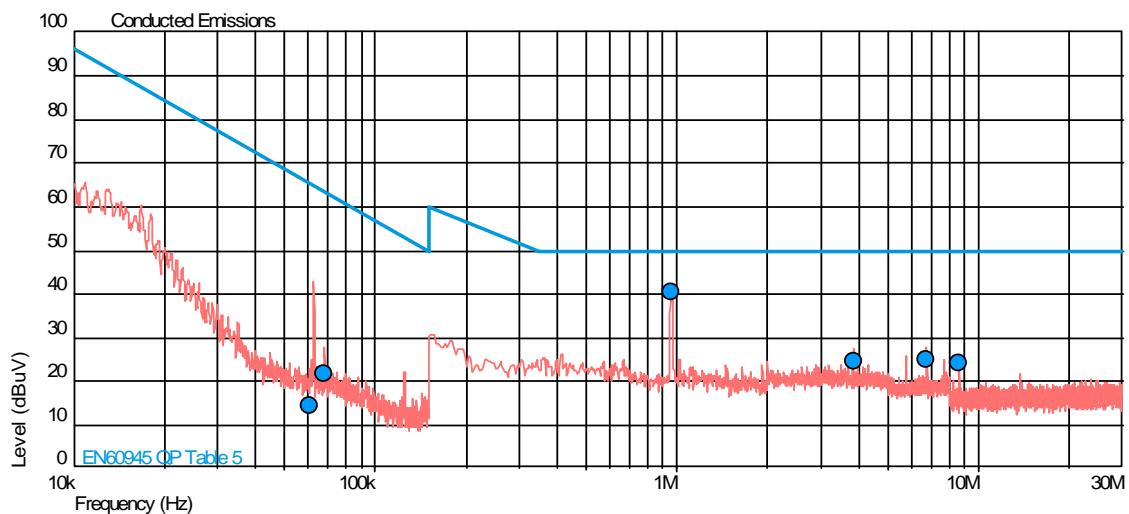
2.1.7 Test Results

For the period of test the EUT met the requirements of IEC 60945 for Conducted Emissions (DC Power Port).

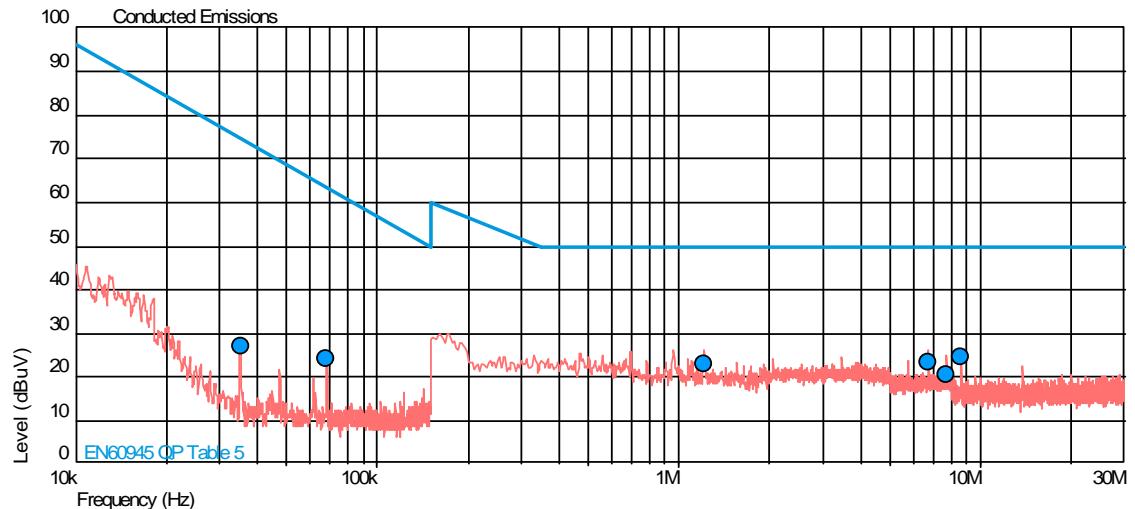
The test results are shown below.

Configuration 1 - Mode 1

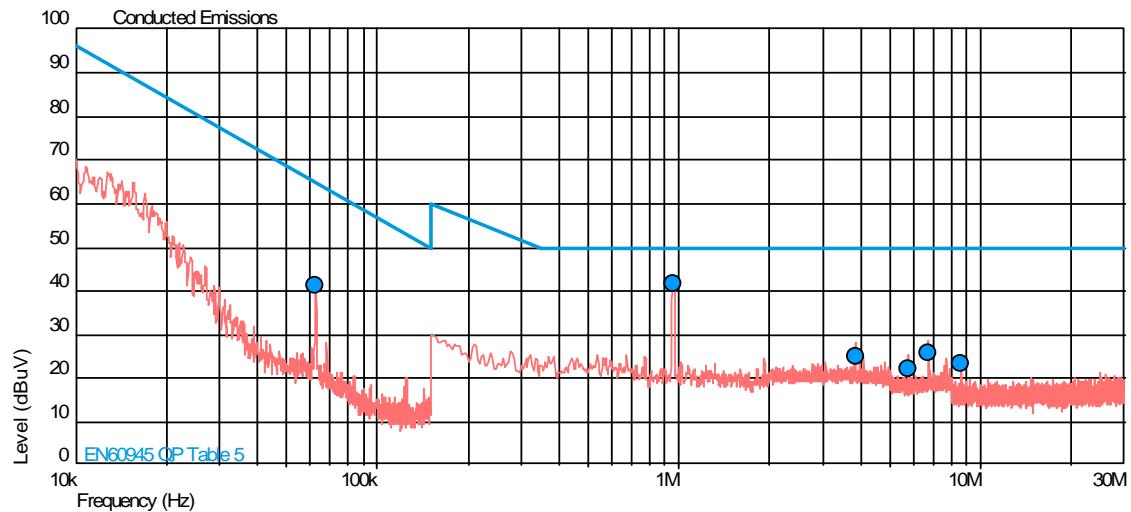
Positive Line



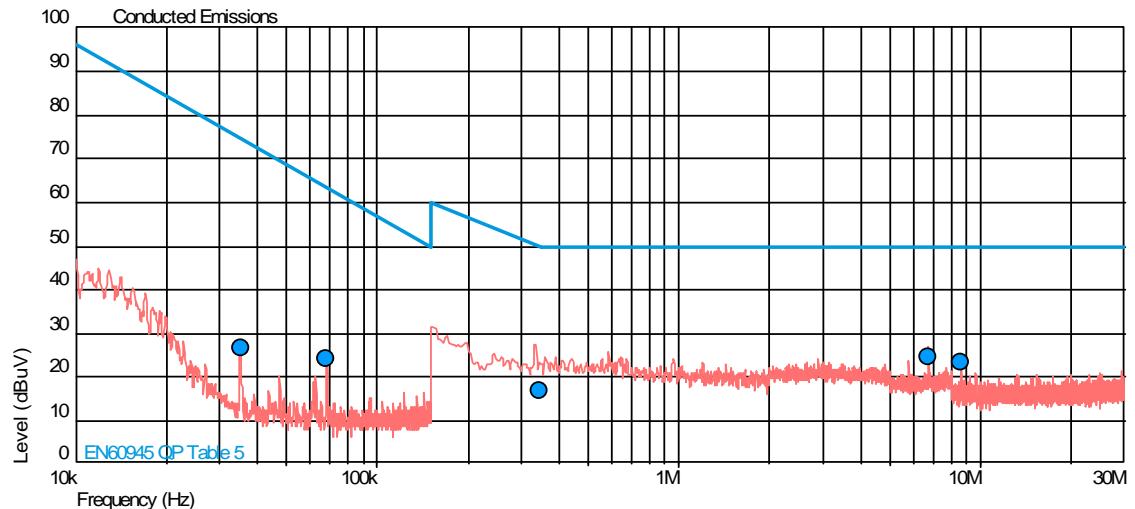
Frequency (MHz)	QP Level (dB μ V)	QP Limit (dB μ V)	QP Margin (dB μ V)
0.061	14.5	65.3	-50.8
0.068	21.9	63.5	-41.6
0.960	40.6	50.0	-9.4
3.840	24.5	50.0	-25.5
6.720	25.2	50.0	-24.8
8.641	24.1	50.0	-25.9

Negative Line

Frequency (MHz)	QP Level (dB μ V)	QP Limit (dB μ V)	QP Margin (dB μ V)
0.035	26.9	74.6	-47.7
0.068	24.2	63.5	-39.3
1.214	22.9	50.0	-27.1
6.720	23.5	50.0	-26.5
7.679	20.4	50.0	-29.6
8.640	24.6	50.0	-25.4

Configuration 1 - Mode 2Positive Line

Frequency (MHz)	QP Level (dB μ V)	QP Limit (dB μ V)	QP Margin (dB μ V)
0.063	41.2	64.9	-23.6
0.959	41.8	50.0	-8.2
3.840	25.1	50.0	-24.9
5.760	22.2	50.0	-27.8
6.721	25.8	50.0	-24.2
8.640	23.4	50.0	-26.6

Negative Line

Frequency (MHz)	QP Level (dB μ V)	QP Limit (dB μ V)	QP Margin (dB μ V)
0.035	26.8	74.6	-47.8
0.068	24.1	63.5	-39.3
0.346	16.7	50.2	-33.4
6.720	24.5	50.0	-25.5
8.640	23.5	50.0	-26.5

2.2 ENCLOSURE PORT MAGNETIC EMISSIONS - FIELD STRENGTH

2.2.1 Specification Reference

IEC 60945: Table 5, Clause 9.3 and 5.3

2.2.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.2.3 Date of Test and Modification State

14 December 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 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 configurations and modes of operation:

Configuration 1 - Mode 2

2.2.6 Environmental Conditions

14 December 2010

Ambient Temperature 21°C

Relative Humidity 31%

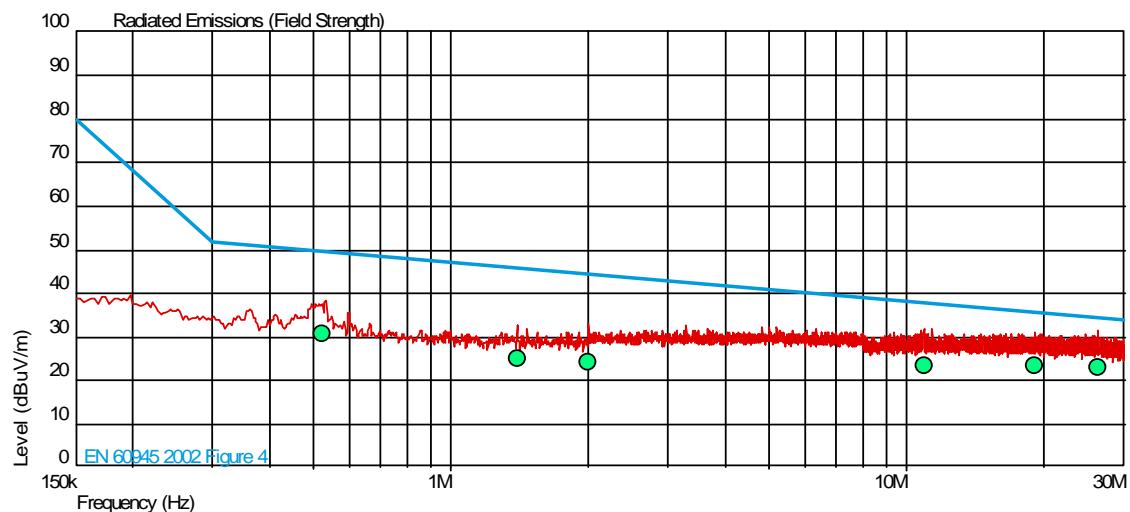
Atmospheric Pressure 1002mbar

2.2.7 Test Results

For the period of test the EUT met the requirements of IEC 60945 for Enclosure Port Magnetic Emissions - Field Strength.

The test results are shown below.

Configuration 1 - Mode 2



Frequency (MHz)	QP Level (dB μ V/m)	QP Limit (dB μ V/m)	QP Margin (dB μ V/m)	Angle(Deg)	Height(m)	Polarity
0.524	30.6	49.8	-19.2	199	1.50	Vertical
1.398	24.9	46.0	-21.1	0	1.50	Vertical
2.004	24.4	44.6	-20.2	360	1.50	Vertical
10.884	23.2	38.0	-14.8	318	1.50	Vertical
19.173	23.2	35.7	-12.5	72	1.50	Vertical
26.212	23.1	34.5	-11.5	360	1.50	Vertical

2.3 RADIATED EMISSIONS (ENCLOSURE PORT)

2.3.1 Specification Reference

IEC 60945: Table 5, Clause 9.3 and 5.3

2.3.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.3.3 Date of Test and Modification State

14 December 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 3.1.

2.3.5 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 1 - Mode 2

2.3.6 Environmental Conditions

14 December 2010

Ambient Temperature 21°C

Relative Humidity 31%

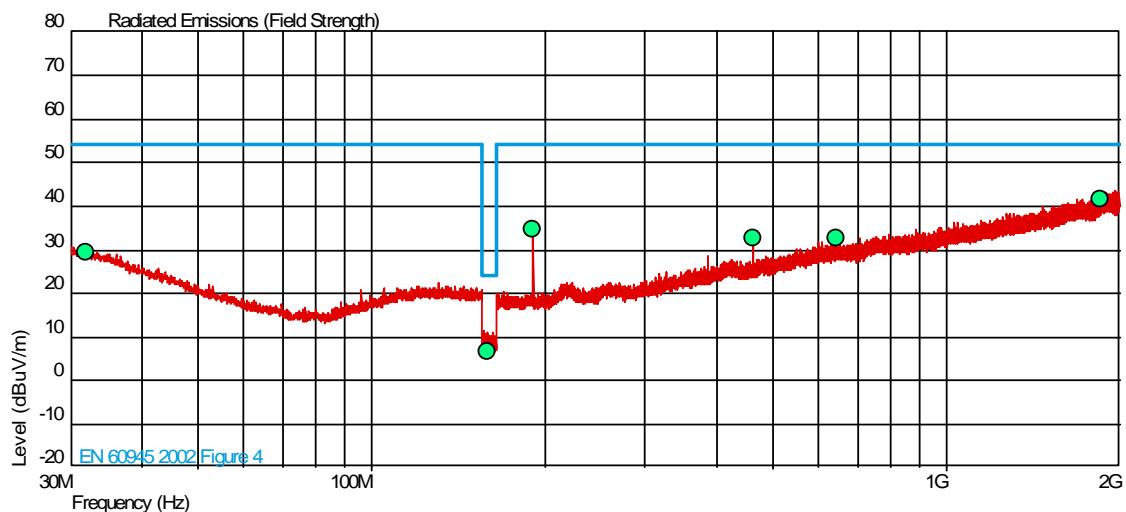
Atmospheric Pressure 1002mbar

2.3.7 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 2



Frequency (MHz)	QP Level (dB μ V/m)	QP Limit (dB μ V/m)	QP Margin (dB μ V/m)	Angle(Deg)	Height(m)	Polarity
31.918	29.2	54.0	-24.8	360	1.00	Vertical
159.353	6.6	24.0	-17.4	214	3.46	Vertical
191.278	34.8	54.0	-19.2	100	1.71	Horizontal
460.637	32.7	54.0	-21.3	158	1.00	Horizontal
643.190	32.6	54.0	-21.4	132	1.00	Horizontal
1854.325	41.5	54.0	-12.5	360	1.00	Vertical

2.4 IMMUNITY TO RADIO FREQUENCY COMMON MODE (DC POWER PORT)

2.4.1 Specification Reference

IEC 60945: Table 6, Clause 10.3 and 5.3

2.4.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.4.3 Date of Test and Modification State

21 January 2011 - Modification State 0

2.4.4 Test Equipment Used

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

2.4.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of IEC 61000-4-6.

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

Configuration 1 - Mode 1

2.4.6 Environmental Conditions

21 January 2011

Ambient Temperature 18.3°C

Relative Humidity 23%

Atmospheric Pressure 1032mbar

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 Radio Frequency Common Mode (DC Power Port).

The applied test levels are shown below.

Configuration 1 - Mode 1

Port Under Test	Test Level (Vrms)	Freq. Range	Modulation/ Freq Depth	Step Size	Dwell Time	Coupling Method	Interference Return Path	Result
DC Input	3V	150kHz to 80MHz	AM, 400Hz, 80%	1%	3 s	M2 CDN	M2 CDN, AE	Pass
DC Input	10V	Spot Frequencies	AM, 400Hz, 80%	N/A	10 s	M2 CDN	M2 CDN, AE	Pass

2.5 IMMUNITY TO RADIO FREQUENCY COMMON MODE (SIGNAL, CONTROL AND TELECOMMUNICATIONS PORT)

2.5.1 Specification Reference

IEC 60945: Table 6, Clause 10.3

2.5.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.5.3 Date of Test and Modification State

21 January 2011 - Modification State 0

2.5.4 Test Equipment Used

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

2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of IEC 61000-4-6.

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

Configuration 1 - Mode 1

2.5.6 Environmental Conditions

21 January 2011

Ambient Temperature 18.3°C

Relative Humidity 23%

Atmospheric Pressure 1032mbar

2.5.7 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 Common Mode (Signal, Control and Telecommunications Port).

The applied test levels are shown below.

Configuration 1 - Mode 1

Port Under Test	Test Level (Vrms)	Freq. Range	Modulation/Freq Depth	Step Size	Dwell Time	Coupling Method	Interference Return Path	Result
Serial Comms	3V	150kHz to 80MHz	AM, 400Hz, 80%	1%	3 s	EM Clamp	M2 CDN, DC Supply	Pass
Serial Comms	10V	Spot Frequencies	AM, 400Hz, 80%	N/A	10 s	EM Clamp	M2 CDN, DC Supply	Pass
NMEA	3V	150kHz to 80MHz	AM, 400Hz, 80%	1%	3 s	Current Injection Probe	M2 CDN, DC Supply	Pass
NMEA	10V	Spot Frequencies	AM, 400Hz, 80%	N/A	10 s	Current Injection Probe	M2 CDN, DC Supply	Pass

2.6 IMMUNITY TO RADIO FREQUENCY ELECTROMAGNETIC FIELD (ENCLOSURE PORT)**2.6.1 Specification Reference**

IEC 60945: Table 6, Clause 10.4

2.6.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.6.3 Date of Test and Modification State

20 January 2011 - Modification State 0

2.6.4 Test Equipment Used

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

2.6.5 Test 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 1 - Mode 1

2.6.6 Environmental Conditions

20 January 2011

Ambient Temperature 18.4°C

Relative Humidity 24%

Atmospheric Pressure 1030mbar

2.6.7 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 1 - Mode 1

Amplitude Modulation	Frequency	400Hz								
	Depth	80%								
Stepped Frequency Increments		1% with respect to last momentary frequency								
Dwell Times		80MHz - 1 GHz: 3 Seconds & 1GHz – 2GHz: 9 Seconds								
Field Strength (V/m)*	10	10	10	10	10	10	10			
Frequency Range (GHz)	0.08 – 2.0	0.08 – 2.0	0.08 – 2.0	0.08 – 2.0	0.08 – 2.0	0.08 – 2.0	0.08 – 2.0			
Field Strength (V/m)*	10	10	10	10	10	10	10			
Orientation of EUT	Front	Right Side	Rear (inc cables)	Left Side	Top	Bottom				
Antenna Polarisation (V – Vertical, H – Horizontal)	V	H	V	H	V	H	V	H	V	H
Result (P – Pass, F - Fail)	P	P	P	P	P	P	P	P	P	P

2.7 IMMUNITY TO FAST TRANSIENT BURSTS COMMON MODE (SIGNAL, CONTROL AND TELECOMMUNICATIONS PORT)

2.7.1 Specification Reference

IEC 60945: Table 6, Clause 10.5

2.7.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.7.3 Date of Test and Modification State

21 January 2011 - Modification State 0

2.7.4 Test Equipment Used

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

2.7.5 Test Method and Operating Modes

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

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

Configuration 1 - Mode 1

2.7.6 Environmental Conditions

21 January 2011

Ambient Temperature 18.3°C

Relative Humidity 23%

Atmospheric Pressure 1032mbar

2.7.7 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 Fast Transient Bursts Common Mode (Signal, Control and Telecommunications Port).

The applied test levels are shown below.

Cables Under Test	Test Level (±kV)	Repetition Rate (kHz)	Test Duration (minutes)	Test Method	Result
COM Port	0.5	5	60 each polarity	Clamp	Pass
COM Port	1.0	5	60 each polarity	Clamp	Pass
NMEA Port	0.5	5	60 each polarity	Clamp	Pass
NMEA Port	1.0	5	60 each polarity	Clamp	Pass

2.8 IMMUNITY TO INTERRUPTIONS (DC POWER PORT)

2.8.1 Specification Reference

IEC 60945: Table 6, Clause 10.8

2.8.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.8.3 Date of Test and Modification State

10 February 2011 - Modification State 0

2.8.4 Test Equipment Used

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

2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of IEC 61000-4-11.

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

Configuration 1 - Mode 1

2.8.6 Environmental Conditions

10 February 2011

Ambient Temperature 22.2°C

Relative Humidity 39.7%

Atmospheric Pressure 1007mbar

2.8.7 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 Interruptions (DC Power Port).

The applied test levels are shown below.

Configuration 1 - Mode 1

Description of Test	Result
DC Power Port Immunity to Voltage Interruptions - 0%V _{nom} for 60 s repeated 3 times at 10 second intervals	Pass

2.9 COMPASS SAFE DISTANCE (ENCLOSURE PORT)

2.9.1 Specification Reference

IEC 60945: Table 6, Clause 11.2

2.9.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.9.3 Date of Test and Modification State

26 January 2011 - Modification State 0

2.9.4 Test Equipment Used

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

2.9.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of EN 60945.

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

Configuration 1 - Mode 1

2.9.6 Environmental Conditions

26 January 2011

Ambient Temperature 16°C

Relative Humidity 40%

Atmospheric Pressure 989mbar

2.9.7 Test Results

For the period of test the EUT met the requirements of IEC 60945 for Compass Safe Distance (Enclosure Port).

The test results are shown below.

Configuration 1

Horizontal maximum flux density, Magnetic North (H)	H=	18
Standard compass deviation limit (degrees)	5.4/H	A
Emergency compass deviation limit (degrees)	18/H	B

Orientation of the EUT	Un-powered State		Normalised		Powered Up	
	Distance From Compass (cm) at A° deflection	Distance From Compass (cm) at B° deflection	Distance From Compass (cm) at A° deflection	Distance From Compass (cm) at B° deflection	Distance From Compass (cm) at A° deflection	Distance From Compass (cm) at B° deflection
Front	17	17	17	17	17	17
Top	17	17	17	17	17	17
Left Hand Side	17	17	17	17	17	17
Right Hand Side	17	17	17	17	17	17
Underside	17	17	17	17	17	17
Rear	17	17	17	17	17	17

Standard Compass safe distance	20cm
Emergency Compass safe distance	20cm

2.10 IMMUNITY TO ELECTROSTATIC DISCHARGE (ENCLOSURE PORT)**2.10.1 Specification Reference**

IEC 60945: Table 6, Clause 10.9

2.10.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.10.3 Date of Test and Modification State

10 February 2011 - Modification State 0

2.10.4 Test Equipment Used

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

2.10.5 Test Method and Operating Modes

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

Deviation from the Standard

Only Limited testing was performed due to the EUT normally being housed within a Plastic Enclosure.

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

Configuration 1 - Mode 1

2.10.6 Environmental Conditions

10 February 2011

Ambient Temperature 22.2°C

Relative Humidity 39.7%

Atmospheric Pressure 1007mbar

2.10.7 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.

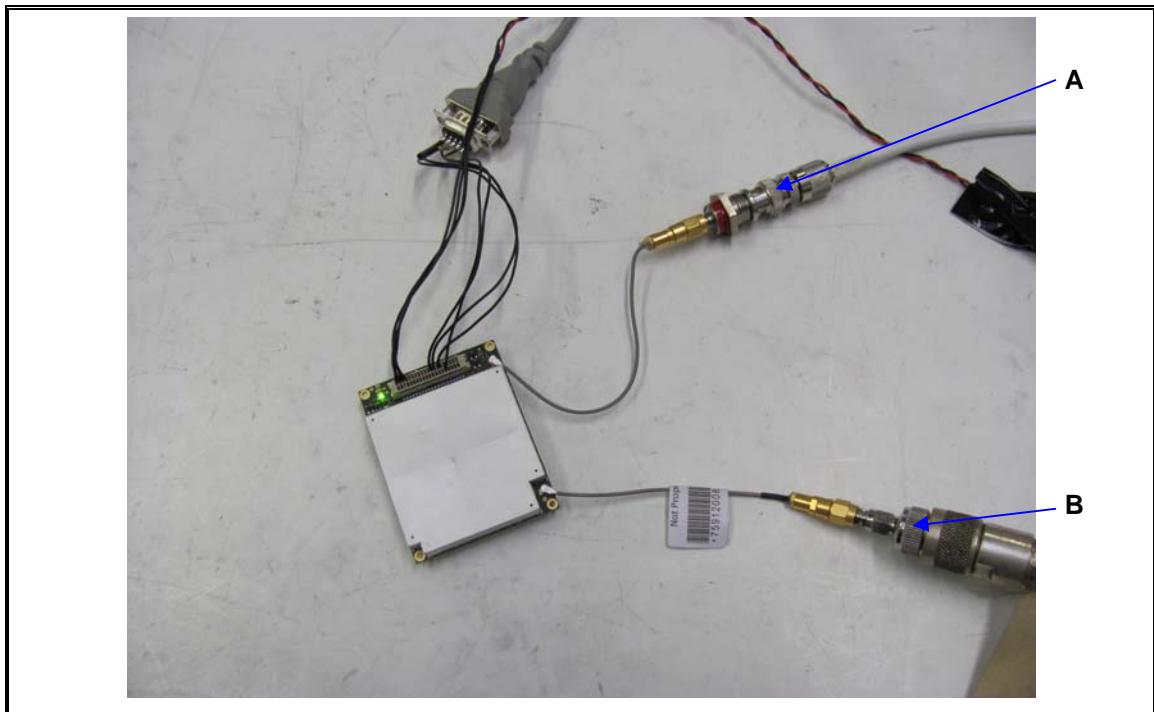
Configuration 1 - Mode 1

		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	GPS Antenna Connector Shell	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	VHF Antenna Connector Shell	✓	✓	✓	✓	✓	✓	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.
- N/A Test not applicable as defined in the specification.

ESD TEST POINTS – CONFIGURATION 1



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 No.	Calibration Period (months)	Calibration Due
Section 2.1 EMC - Conducted Emissions					
LISN	Rohde & Schwarz	ESH2-Z5	17	12	14-Jun-2011
Transient Limiter	Hewlett Packard	11947A	1032	12	22-Jun-2011
Screened Room (5)	Rainford	Rainford	1545	24	11-Feb-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
Section 2.2 EMC - Magnetic Emissions					
Antenna (Active Loop, 9kHz-30MHz)	Rohde & Schwarz	HFH2-Z2	333	24	20-Sep-2012
Screened Room (5)	Rainford	Rainford	1545	24	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
Section 2.3 EMC - Radiated Emissions					
Screened Room (5)	Rainford	Rainford	1545	24	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	4-Dec-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
Sections 2.4 & 2.5 EMC - Conducted Immunity					
Coupling Network	MEB Messelektronik	M2-801-CDN (150kHz to 80MHz)	204	12	6-Sep-2011
Termination	MEB Messelektronik	TRA150	209	-	TU
CDN Jig	MEB Messelektronik	M2-801	213	-	TU
Load (50ohm)	Diamond Antenna	DL-30N	217	12	14-May-2011
8dB Attenuator (2 x 4dB)	Schaffner	INA 2070-1	221	12	12-Jul-2011
RF Generator + Attenuator	Schaffner	NSG2070-400	222	12	29-Nov-2011
Current Injection Probe	Chase	CIP 9136	225	-	TU
Coupling Clamp	MEB Messelektronik	KEMZ-801	228	-	TU
Calibration Fixture (x2)	MEB Messelektronik	KEMZ-801	229	-	TU
Load (50ohm, 30W)	JFW	50T-054	348	12	21-Sep-2011
100ohm Feedthrough	ASL (TUV)	MC002	1408	12	18-Nov-2011
BCI Load (150ohm)	ASL (TUV)	EJ1	1409	12	18-Nov-2011
Attenuator 6dB	Advance	10023-6/MF	1539	12	21-Oct-2011
Attenuator (10dB, 250W)	Weinschel	58-10-34	3591	12	26-Oct-2011

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 EMC - Radiated Immunity					
Directional Coupler	Amp Research	DC6180	283	-	TU
Antenna	Schaffner	CBL6143	322	-	TU
Power Meter	Rohde & Schwarz	NRVD	748	-	TU
Dummy Load (50ohm)	Diamond Antenna	DL-30N	1396	12	TU
Screened Room (2)	Rainford	Rainford	1542	-	TU
CW TWT (1-2.5GHz)	Thorn	PTC6341	2069	-	TU
Amplifier (250W, 80MHz - 1GHz)	Amp Research	250W1000A	3029	24	TU
Signal Generator, 9kHz to 6GHz	Rohde & Schwarz	SMB 100A	3500	12	1-Jun-2011
Power Sensor: 100kHz - 6GHz/100pW - 20mW	Rohde & Schwarz	NRV-Z4	3816	-	TU
Section 2.7 EMC - Fast Transient Bursts					
Immunity Test Set	Schaffner	BEST EMC V2.7	295	12	1-Sep-2011
Capacitive Coupling Clamp	Omiran	EFTC 105	298	-	TU
Section 2.8 EMC - Voltage Dips, Interruptions and Variations					
Power Supply	Farnell	LT30/2	3422	-	TU
Section 2.9 EMC - Compass Safe Distance					
Sussex Helmholtz Coil	Various	88771	327	-	TU
Magnetometer	Bartington	MAG01	671	36	3-Sep-2011
Power Supply	Farnell	LT30-2	2047	-	TU
Multimeter	Iso-tech	IDM101	2418	12	20-Sep-2011
Compass Verification Unit	TUV	CVU	3579	-	TU
Marine Binacle Compass with Repeater Display	Cassens & Plath	Compass: Type 11	3834	-	TU
Section 2.10 EMC - Electrostatic Discharges					
ESD Simulator	Schaffner	NSG 435+SL 171-504	552	12	9-Jul-2011
Multimeter	Iso-tech	IDM101	2423	12	9-Sep-2011

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	5.2dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Conducted Emissions, LISN	150kHz to 30MHz Amplitude	3.2dB*
Conducted Emissions, ISN	150kHz to 30MHz Amplitude	2.1dB
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB
Discontinuous Interference	150kHz to 30MHz Amplitude	3.0dB*
Interference Power	30MHz to 300MHz Amplitude	3.0dB*
Radiated E-Field Susceptibility	10MHz to 6GHz Test Amplitude	2.0dB†/**
Conducted Susceptibility RF	50kHz to 1000MHz Amplitude	3.1dB•/**
	EM Clamp Method of Test	1.2dB•/**
	CDN Method of Test	1.1dB•
	BCI Clamp Method of Test	1.2dB•
	Direct Injection Method of Test	1.1dB**
	Current Injection Probe Method of Test	
Conducted Susceptibility LF	DC to 150kHz	1.0%†
Power Frequency Magnetic Field	50Hz/60Hz Amplitude	0.45%
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Magnetic Field/Flux iaw EN 50366	10Hz to 400kHz	2.64%
Harmonics and Flicker	The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3	—
Mains Voltage Variations and Interrupts	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11	—
Fast Transient Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4	—
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5	—
Vehicle Transients	The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2	—
Compass Safe Distance	Azimuth Accuracy	0.10°

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

* In accordance with CISPR 16-4-2

** In accordance with IEC 60945, Clause 5.3

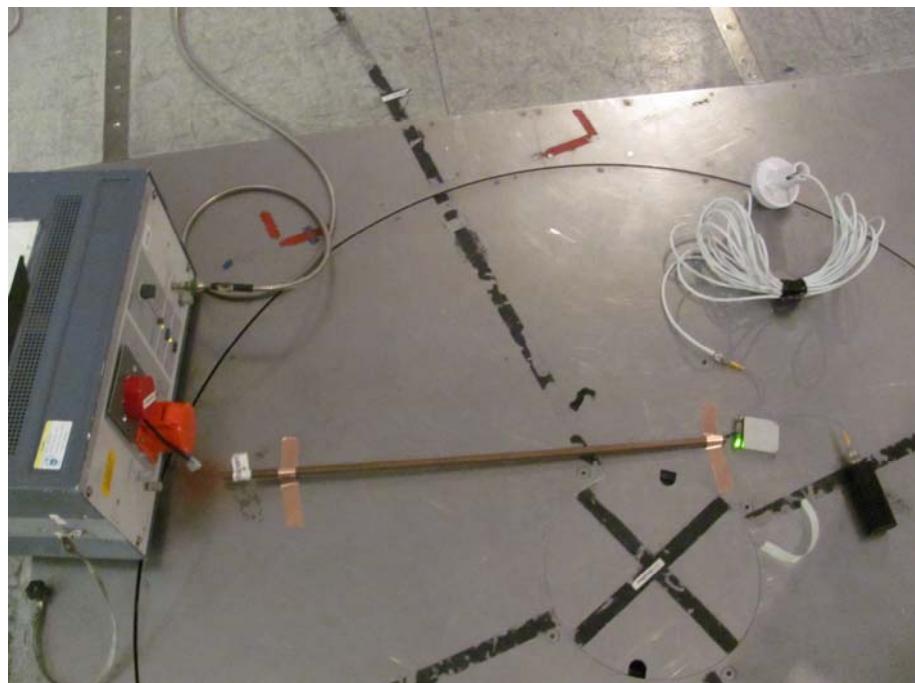
† In accordance with UKAS Lab 34

• In accordance with EN61000-4-6

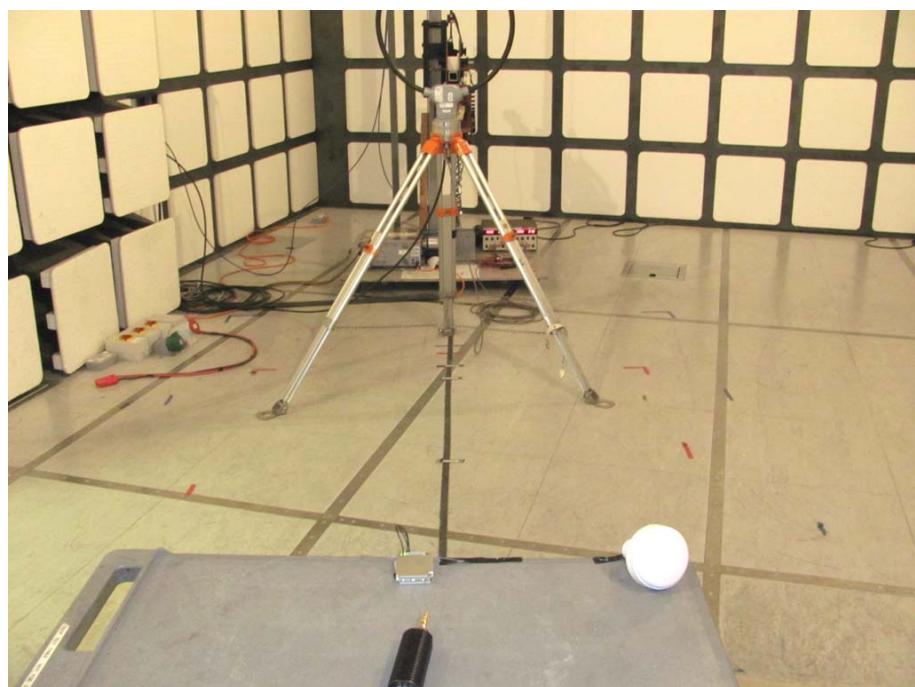
SECTION 4

PHOTOGRAPHS

4.1 TEST SET UP PHOTOGRAPHS



Conducted Emissions (DC Power Port)



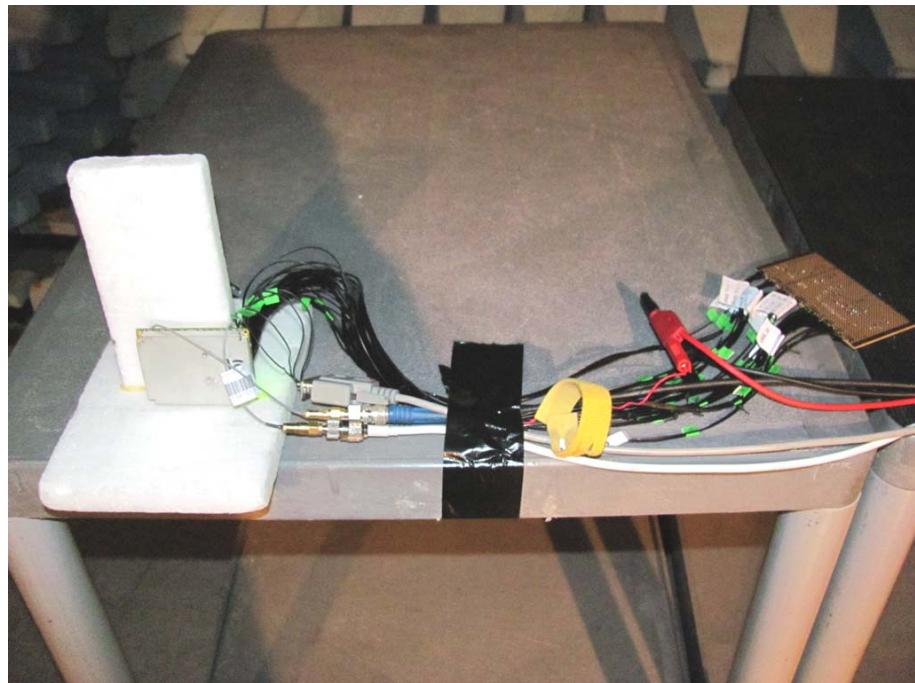
Enclosure Port Magnetic Emissions - Field Strength



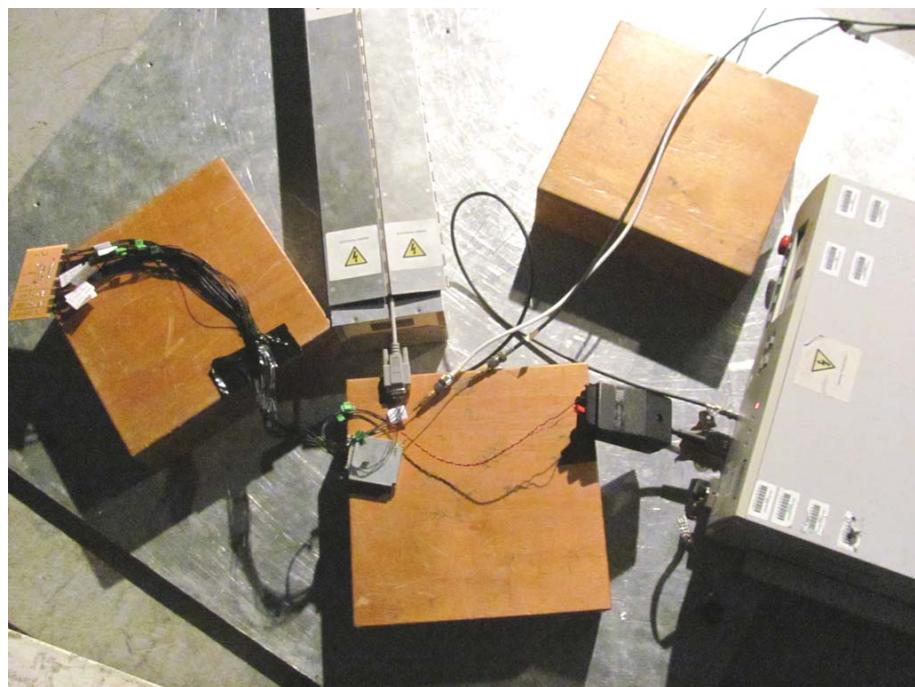
Radiated Emissions (Enclosure Port)



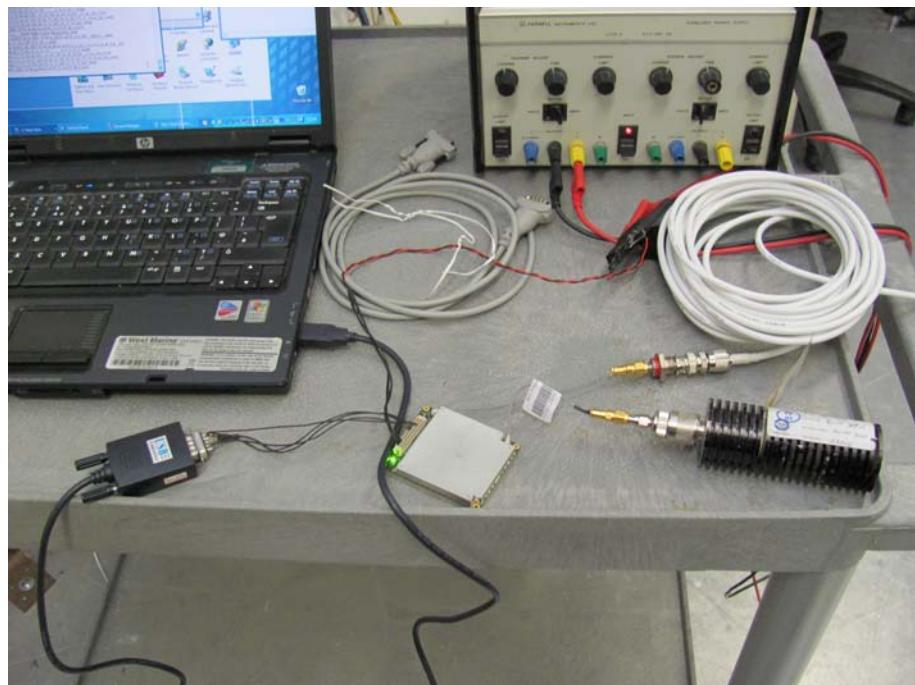
Immunity to RF Common Mode (DC Power & Signal, Control and Telecommunications Port)



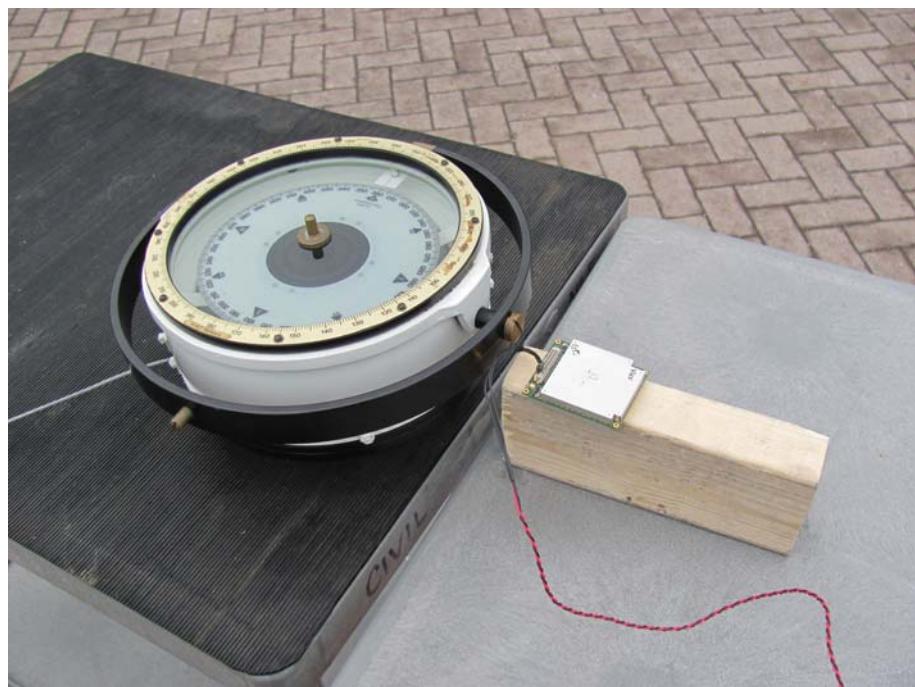
Immunity to Radio Frequency Electromagnetic Field (Enclosure Port)



Immunity to Fast Transient Bursts Common Mode (Signal, Control and Telecommunications Port)



Immunity to Interruptions (DC Power Port)



Compass Safe Distance (Enclosure Port)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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