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Report On

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Class A AIS Transceiver

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FCC ID: UYW-405-0002
IC ID: 7075A

Document 75907909 Report 04 Issue 1

March 2010



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

COMMERCIAL-IN-CONFIDENCE

REPORT ON

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SRT Marine Technology Ltd
Class A AIS Transceiver

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PREPARED FOR

SRT Marine Technology Ltd
Wireless House
Westfield Industrial Estate
Midsomer Norton
Bath
BA3 4BS

PREPARED BY


N Bennett
Senior Administrator

APPROVED BY


M Jenkins
Authorised Signatory

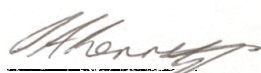
DATED

19 March 2010

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 80 and RSS-182. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);


S Bennett


R Henley





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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Class A AIS Transceiver



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the SRT Marine Technology Ltd Class A AIS Transceiver to the requirements of FCC CFR 47 Part 80 and RSS-182.

Objective	To perform FCC and Industry Canada 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(s)	POSIEDON
Serial Number(s)	Not Serialised (TUV_0003) Not Serialised (TUV_0021)
Software Version	V33
Hardware Version	V2
Number of Samples Tested	Two
Test Specification/Issue/Date	FCC CFR 47 Part 80: 2008 RSS-182 Issue 4: 2003
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	900
Date	18 October 2009
Start of Test	15 February 2010
Finish of Test	5 March 2010
Name of Engineer(s)	S Bennett R Henley
Related Document(s)	ANSI 63.4: 2003



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 80 and RSS-182, is shown below.

Section	Spec Clause		Test Description	Mod State	Result	EUT Reference
	FCC	IC				
2.1	80.211(f)(3)	4.4 and 6.3	Radiated Emissions (Enclosure Port)	2	Pass	TUV_0021
2.2	80.209(a)	3.9, 4.2 and 6.1	Frequency Stability Under Voltage Variations	1	Pass	TUV_0003
2.3	80.209(a)	3.9, 4.2 and 6.1	Frequency Stability Under Temperature Variations	1	Pass	TUV_0003
2.4	80.211(f)(1)(2)	6.3.1 and 6.6	Emission Limitations (Emission Mask)	1	Pass	TUV_0003
2.5	80.205(a)	3.4(d) and (e) and 3.9	Occupied Bandwidth	1	Pass	TUV_0003
2.6	80.211(f)(3)	4.4 and 6.3	Emission Limitations (Conducted Transmitter Spurious)	1	Pass	TUV_0003
2.7	2.1047(a), 80.213	-	Modulation Characteristics	1	Pass	TUV_0003
2.8	80.215	3.7, 3.9, 4.3 and 6.2	Transmitter Power	1	Pass	TUV_0003
2.9	80.217 (b)	-	Suppression of Interference Aboard Ships	1	Pass	TUV_0003
2.10	80.215 (e)(g)(1)(2)(3)	3.7	Transmitter Carrier Power Reduction	1	Pass	TUV_0003
2.11	80.213 (a)(2)	3.4(b)	Transmitter Frequency Deviation	1	Pass	TUV_0003

N/A – Not Applicable



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1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Class A AIS Transceiver
MANUFACTURER	SRT Marine Technology Ltd
TYPE	Marine Radio Equipment
PART NUMBER	405-0002
SERIAL NUMBER	405-0002-TLA3 & 405-0002-TLA3
HARDWARE VERSION	V2
SOFTWARE VERSION	V33
TRANSMITTER OPERATING RANGE	VHF = 156.025-162.025MHz
RECEIVER OPERATING RANGE	VHF = 156.025-162.025MHz, GPS = 1575.42MHz
COUNTRY OF ORIGIN	United Kingdom
INTERMEDIATE FREQUENCIES	12.8MHz, 19.655MHz, 26.055MHz, 36.5MHz, 51.655MHz
ITU DESIGNATION OF EMISSION	9K65G3E
HIGHEST INTERNALLY GENERATED FREQUENCY	213.68MHz
OUTPUT POWER (W or dBm)	12.5W, 33dBm
FCC ID	UYW-405-0002
INDUSTRY CANADA ID	7075A
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Marine AIS SOTDMA Class A Transceiver to IEC61993-2
BATTERY/POWER SUPPLY	
MANUFACTURING DESCRIPTION	Switch mode power supply
MANUFACTURER	SRT Marine Technology Ltd
TYPE	Switch mode power supply
PART NUMBER	N/A as internal
VOLTAGE	12 to 24V DC, -10% to +30% (10.8 to 31.2V DC)
COUNTRY OF ORIGIN	United Kingdom

Signature Held on file at TÜV Product Service

Date 12 March 2010

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 Product Service as to the accuracy of the information declared in this document by the manufacturer.



1.4 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	POSEIDON
Part Number	405-0002
Technical Description (Please provide a brief description of the intended use of the equipment)	Marine AIS SOTDMA Class A Transceiver to IEC61993-2

TYPE OF EQUIPMENT	
☐ Base Station	(Equipment fitted with an antenna socket for use with an external antenna, and intended for use in a fixed location).
☒ Mobile Station	(Mobile equipment fitted with an antenna socket, for use with an external antenna, normally used in a vehicle or as a transportable station).
☐ Hand Portable	(fitted with an antenna socket)
☐ Hand Portable	(without an external antenna socket integral antenna equipment, but fitted with a permanent internal or a temporary internal 50 ohm R.F. connector which allows access to the transmitter output and the receiver input)
☐ Other	

TYPE OF EQUIPMENT					
Base Station	☐	Mobile Station	☒	Hand Portable	☐
☐ Transmitter		☐ Simplex			
☐ Receiver		☒ Duplex			
☒ Transceiver		☐ Communal Site use (70dB limit)			

TRANSMITTER TECHNICAL CHARACTERISTICS		
FREQUENCY CHARACTERISTICS		
Transmitter channel switching frequency range:	156.025 to 162.025	MHz (MHz Range)
Transmitter frequency alignment range:	156.0 to 162.0	MHz (MHz Range)



TRANSMITTER POWER CHARACTERISTICS			
Is transmitter intended for :			
Continuous duty	☐	Yes	☒ No
Intermittent duty only	☒	Yes	☐ No
If intermittent duty state DUTY CYCLE			
Transmitter ON	0.0267	Seconds	Transmitter OFF 5 Seconds
Is transmitter output power variable?	☒	Yes	☐ No
If yes			
RF output power (watts)	12.5	Maximum	1 Minimum
Is the RF power			
continuously variable	☐	Yes	☒ No
Or			
stepped	☐	Yes	☒ No
If stepped			dB per step

TRANSMITTER - MODULATION			
Amplitude	☐	Other	☐
Frequency	☐	Details :	
Phase	☒		
Can the transmitter be operated without modulation (See Note 1)			☒ Yes ☐ No

RECEIVER TECHNICAL CHARACTERISTICS		
Intermediate Frequencies		
☒ 1 st	☒ 2 nd	
☐ 3 rd		
Is local oscillator injection frequency higher or lower than the receiver nominal frequency?		
☐ Higher	☒ Lower	
RECEIVER CHANNEL SWITCHING FREQUENCY RANGE	156.025 to 162.025	MHz (MHz Range)
RECEIVER FREQUENCY ALIGNMENT RANGE	156.0 to 162.0	MHz (MHz Range)



RECEIVER AUDIO (AF) CHARACTERISTICS			
MAXIMUM RATED AUDIO (AF) FREQUENCY OUTPUT POWER			
Into Loudspeaker	N/A	Watts	
Into Line	N/A	Watts	
Into Earpiece	N/A	Watts	
Balanced			☐ Yes ☐ No
Unbalanced			☐ Yes ☐ No
Does connection carry DC voltage?			☐ Yes ☐ No
If Yes, please state value:	N/A		
Normal Audio load impedance:			
At Loudspeaker	N/A	Ohms	
At Line	N/A	Ohms	
At Earpiece	N/A	Ohms	
At audio accessory connection or facility socket (if fitted):			
Output	N/A	Watts	
Impedance	N/A	Ohms	
Max input level at audio accessory socket:			
Output	N/A	mV	
Impedance	N/A	Ohms	

TRANSMITTER AND RECEIVER CHARACTERISTICS		
Channel Separation:	25	kHz
State the maximum number of channels over which the equipment can operate	240	

EXTREME TEMPERATURE RANGE over which equipment is to be type tested	
☐	-25°C to +55°C
☒	-15°C to +55°C
☐	-10°C to +55°C



POWER SOURCE			
☐	AC mains	State voltage	
	AC supply frequency (Hz)		
	VAC		
	Max Current		
	Hz		
☐	Single phase	☐	Three phase
And / Or			
☒	External DC supply		
	Nominal voltage	12V V	Max Current 6 A
	Extreme upper voltage	31.2 V	
	Extreme lower voltage	10.8 V	
Battery			
☐	Nickel Cadmium	☐	Lead acid (Vehicle regulated)
☐	Alkaline	☐	Leclanche
☐	Lithium	☐	Other Details :
	Volts nominal.		
	End point voltage as quoted by equipment manufacturer	V	

AUTOMATIC EQUIPMENT SWITCH OFF	
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.	
☐	Applies V cut-off voltage
☒	Does not apply

ALIGNMENT RANGE		
The definition of the alignment range AR1 and AR2 are given in Sub Clauses 3.1.2 and 3.1.3 of the Standard. The applicant should ensure that the sample equipment(s) submitted are operational on the appropriate channel(s) as given in Sub Clauses 3.1.5 through to 3.1.11 and tick the appropriate box.		
	3.1.5 One sample single channel equipment of category AR1	☐
Or	3.1.6 Three samples of single channel equipments of category AR2	☐
Or	3.1.7 One sample two channel equipment of category AR1	☐
Or	3.1.8 Three samples of two channel equipment of category AR2	☐
Or	3.1.9 One sample multichannel equipment of category AR1	☐
Or	3.1.10 Three samples of multichannel equipment of category AR2	☐
Or	3.1.11 One sample of multichannel equipment of category AR2 where the switching range equals the alignment range	☐



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CHANNEL IDENTIFICATION			
Each equipment, whether one or more submitted for tests shall carry clear identification (such as a serial number), together with the frequencies associated with the channel identification displayed on the equipment.			
Equipment Identification eg Serial Number	Channel Number	Transmit Nominal Freq MHz	Receive Nominal Freq MHz
TLA3-RF11-BB12-UI13	AIS 1 and AIS	161.975MHz and 162.025MHz	161.975MHz and 162.025MHz
TLA16-RF29-BB25-UI2	AIS 1 and AIS	161.975MHz and 162.025MHz	161.975MHz and 162.025MHz

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

Signature: Held on file at TÜV Product Service

Name: Nathan Emery

Position held: Test and Quality Manger

Date: 12 March 2010



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1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) was an SRT Marine Technology Ltd Class A AIS Transceiver as shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



1.5.2 Test Configuration

The EUT was configured in accordance with FCC CFR 47 Part 80 and RSS-182.

1.5.3 EUT Cable / Port Identification

Port Type	Identification / Type	No. Off	Max Cable Length
Serial Communications	NMEA2000	1	1M
Serial Communications	RS-232	1	1M
Power	DC Power	1	1M
Serial Communications	Pilot	1	1M
RF Communications	VHF	1	>1M
RF Communications	GPS	1	>1M
Serial Communications	50-Way D-Type	1	1M

1.5.4 Modes of Operation

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

Mode 1 - Transmit

Mode 2 - Receive

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



1.6 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 unless otherwise stated.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.7 DEVIATIONS FROM THE STANDARD

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

1.8 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.

Not Serialised (TUV_0003)

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable
1	Environmental protection seals installed	SRT Marine Limited	07 January 2010

Not Serialised (TUV_0021)

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable
1	Not used for testing associated with this report	Not Applicable	Not Applicable
2	EMC suppression filter incorporated in the power lead	SRT Marine Limited	22 January 2010



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SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Class A AIS Transceiver



Product Service

2.1 RADIATED EMISSIONS (ENCLOSURE PORT)

2.1.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.211(f)(3)
RSS-182, Clause 4.4 and 6.3

2.1.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0021)

2.1.3 Date of Test and Modification State

05 March 2010 - Modification State 2

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 Procedure

Test performed in accordance with ANSI C63.4, FCC Part 80 and RSS-182.

A preliminary profile of the Spurious Radiated Emissions were obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the measuring antenna in both horizontal and vertical polarisations. The profiling produced a list of the worse case emissions from the EUT.

Using the information from the preliminary profiling of the EUT, the list of emissions were then confirmed or updated under the alternative open site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions recorded in the procedure described above over the range 30 MHz to 2 GHz were then formally measured using a peak detector. This was deemed the worst case and where emissions exceeded the limit, the measurement procedure was carried out in accordance with ANSI C63.4.

< 1 GHz – Quazi Peak Detector
> 1 GHz – Average

The EUT was operated at its maximum power level on the bottom and top channels with PRBS modulation.

The measurements were performed at a 3m distance unless otherwise stated.

2.1.6 Environmental Conditions

	05 March 2010
Ambient Temperature	21.9°C
Relative Humidity	22%



2.1.7 Test Results

Frequency of Channel	Emission Frequency (MHz)	Polarisation	Height (cm)	Azimuth (degree)	Emission Level (dBm) Peak
156.025 MHz	312.045	Vertical	100	190	-22.73
	468.071	Horizontal	100	160	-24.72
	624.107	Horizontal	100	30	-20.87
	936.149	Vertical	115	350	-20.45
	1248.205	Horizontal	100	265	-23.80
	1404.263	Horizontal	100	280	-22.67
	1872.260	Horizontal	100	20	-32.43
162.025 MHz	324.035	Horizontal	125	150	-15.36
	486.081	Horizontal	100	50	-32.69
	648.112	Vertical	160	195	-23.79
	972.147	Vertical	100	40	-22.97
	1296.154	Vertical	100	175	-30.07
	1458.317	Vertical	100	30	-33.85

Limit:

Industry Canada Clause 4.4 and 6.3 and FCC Clause 80.211 (f)(3)

Frequency	Limit
30 MHz to 2 GHz	-13 dBm



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2.2 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.2.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.209(a)
RSS-182, Clause 3.9, 4.2 and 6.1

2.2.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.2.3 Date of Test and Modification State

18 February 2010 - 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 Procedure

The EUT was connected to a spectrum analyser via a 30dB attenuator with an external high stability frequency reference connected. The EUT was transmitted unmodulated and the trace set to max hold with a 100Hz RBW. The marker was then used to measure the peak response and the result recorded in the table on the following page.

2.2.6 Environmental Conditions

	18 February 2010
Ambient Temperature	23°C
Relative Humidity	30%



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2.2.7 Test Results

Test Conditions		Frequency Error (kHz)	
		156.025 MHz	162.025 MHz
T _{nom} (23°C)	V _{min} (10.8V) ¹	-0.121	-0.121
	V _{min} (10.2V) ²	-0.121	-0.121
	V _{nom} (12.0V)	-0.121	-0.121
	V _{max} (13.2V) ¹	-0.121	-0.121
	V _{max} (13.8V) ²	-0.121	-0.121
Maximum Frequency Error (Hz)		-0.121	-0.121
Measurement Uncertainty (Hz)		± 11	

Note¹ V_{min} and V_{max} is V_{nom} ± 10% for RSS-182

Note² V_{min} and V_{max} is V_{nom} ± 15% for FCC Part 80

Limit:

Industry Canada Clause 6.1 and FCC Clause 80.209(a)

±1.56025 kHz / ± 1.62025 kHz or 10ppm



Product Service

2.3 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.3.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.209(a)
RSS-182, Clause 3.9, 4.2, and 6.1

2.3.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.3.3 Date of Test and Modification State

18 February 2010 - Modification State 1

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 Procedure

The EUT was connected to a spectrum analyser via a 30dB attenuator with an external high stability frequency reference connected. The EUT was transmitted unmodulated and the trace set to max hold with a 100Hz RBW. The marker was then used to measure the peak response and the result recorded in the table on the following page.

Frequency measurements were made over a temperature range of -20°C to +55° C at 10°C intervals. The EUT was allowed to stabilize at each temperature prior to measurement.

2.3.6 Environmental Conditions

	18 February 2010
Ambient Temperature	23°C
Relative Humidity	30%



Product Service

2.3.7 Test Results

Transmitting at 25W

Channel: 16 Frequency: 156.800 MHz

Temperature Interval °C	Frequency Error (kHz)					
	156.025 MHz			162.025 MHz		
	10.8 V	12.0 V	13.2 V	10.8 V	12.0 V	13.2 V
-20	-0.241	-0.241	-0.241	-0.241	-0.241	-0.241
-15	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
-10	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
0	-0.097	-0.097	-0.097	-0.097	-0.097	-0.097
+10	-0.073	-0.073	-0.064	-0.049	-0.049	-0.048
+20	-0.121	-0.121	-0.121	-0.121	-0.121	-0.121
+30	-0.145	-0.145	-0.145	-0.145	-0.145	-0.145
+40	-0.097	-0.097	-0.097	-0.097	-0.097	-0.097
+50	-0.025	-0.041	-0.041	-0.025	-0.025	-0.025
+55	-0.024	-0.024	-0.008	-0.008	-0.008	-0.008
Measurement Uncertainty (Hz)	± 11					

Limit:

Industry Canada Clause 6.1 and FCC Clause 80.209(a)

±1.56025 kHz / ± 1.62025 kHz or 10ppm



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2.4 EMISSION LIMITATIONS (EMISSION MASK)

2.4.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.211(f)(1)(2)
RSS-182, Clause 6.3.1 and 6.6

2.4.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.4.3 Date of Test and Modification State

16 February 2010 - Modification State 1

2.4.4 Test Equipment Used

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

2.4.5 Test Procedure

The EUT was connected to a spectrum analyser via a 30dB attenuator. The RBW was set to 300Hz and VBW to 1kHz. The EUT was configured to transmit three different packet data loads, (11110000, 10101010 and PRBS). The reference level was set to the power measured in section 2.8 of this report; 80.215 (FCC) and 6.2 (IC). The traces were recorded and are shown on the following pages.

2.4.6 Environmental Conditions

	16 February 2010
Ambient Temperature	28°C
Relative Humidity	21%

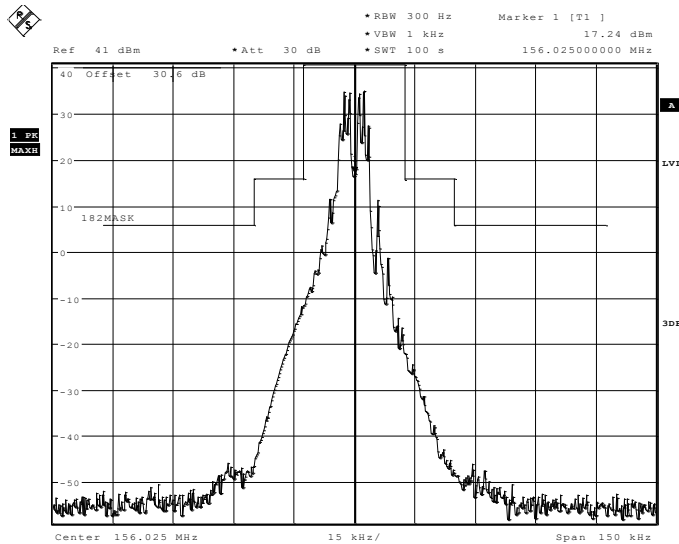


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2.4.7 Test Results

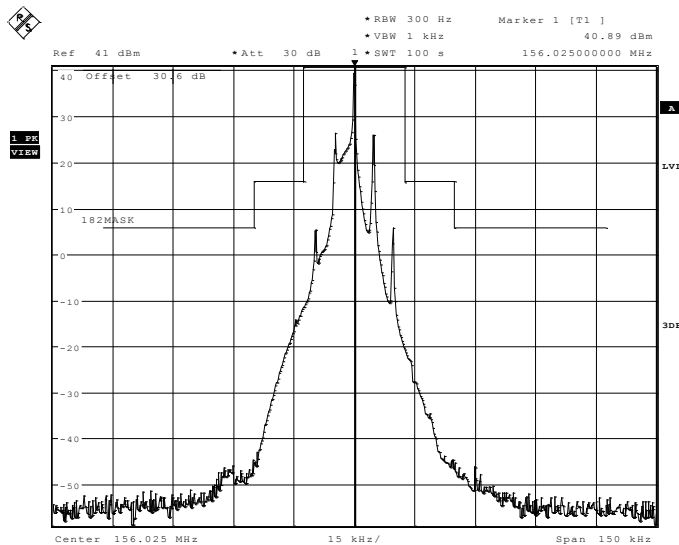
Frequency 156.025 MHz

11110000



OBW1
 Date: 16.FEB.2010 09:21:51

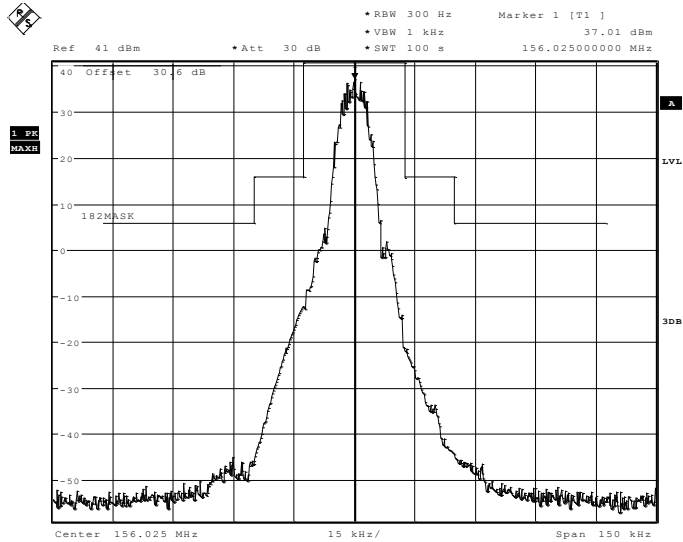
10101010



OBW1
 Date: 16.FEB.2010 09:11:20

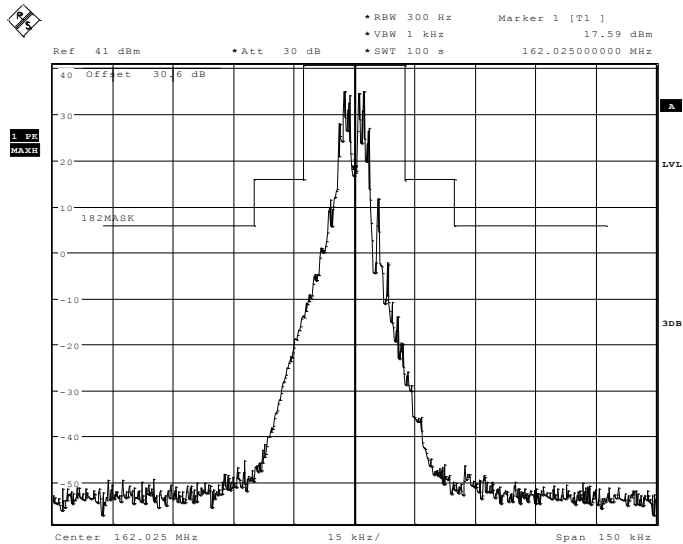


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PRBS

OBW1

Date: 16.FEB.2010 09:36:27

Frequency 162.025 MHz11110000

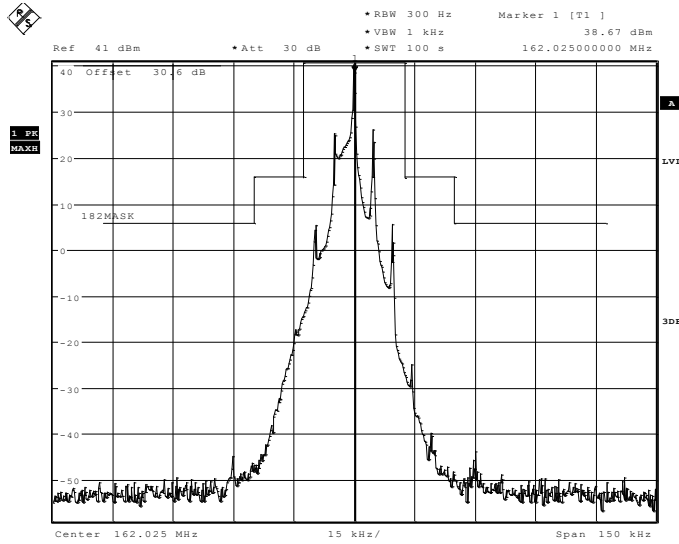
OBW1

Date: 16.FEB.2010 10:30:26



Product Service

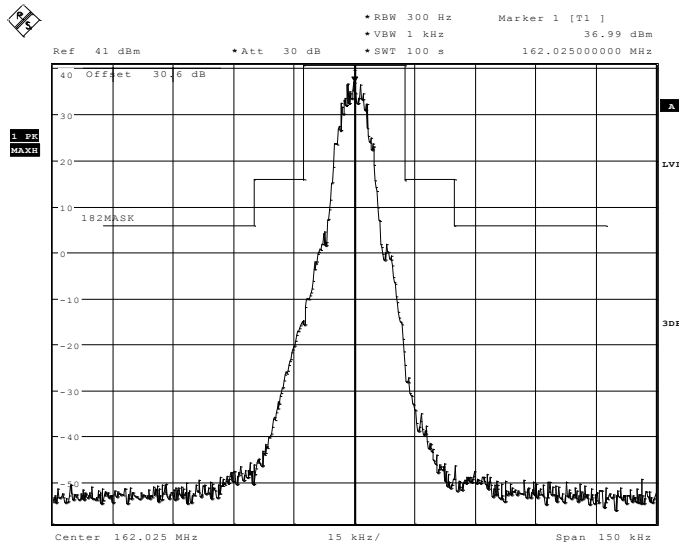
10101010



OBW1

Date: 16.FEB.2010 09:47:29

PRBS



OBW1

Date: 16.FEB.2010 10:10:39



Product Service

2.5 OCCUPIED BANDWIDTH

2.5.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.205(a)
RSS-182, Clause 3.4(d) and (e) and 3.9

2.5.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.5.3 Date of Test and Modification State

15 February 2010 - Modification State 1

2.5.4 Test Equipment Used

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

2.5.5 Test Procedure

The EUT was connected to a spectrum analyser via a cable and a 30dB attenuator. The EUT was set to transmit a maximum power at three different types of test signals. The trace was set to max hold until a sufficient number of sweeps were observed. The 99% occupied bandwidth function was selected on the spectrum analyser and the result was recorded.

2.5.6 Environmental Conditions

	15 February 2010
Ambient Temperature	26.7°C
Relative Humidity	20.9%



Product Service

2.5.7 Test Results

Frequency	Modulation	Result (kHz)	Authorised Bandwidth (kHz)
156.025MHz	10101010	10.497	20
	11110000	8.573	
	PRBS	9.375	
162.025MHz	10101010	10.657	20
	11110000	8.654	
	PRBS	9.535	

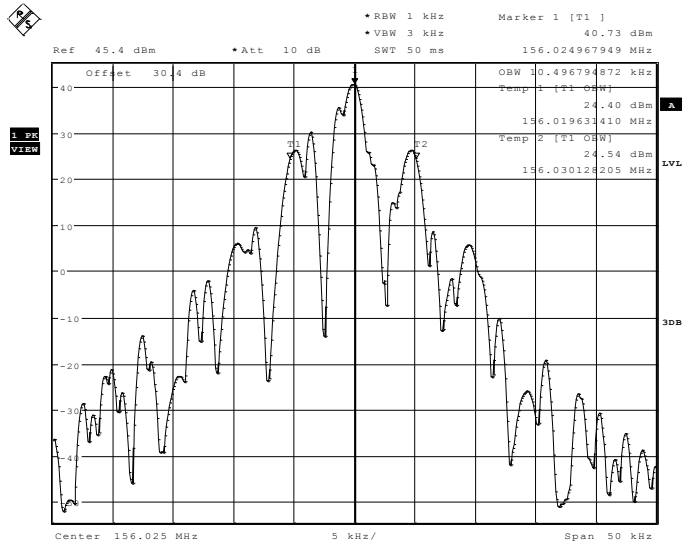
Limit:

Industry Canada Clause 3.4(d)(e) and FCC Clause 80.205(a)

(d) The nominal authorised channel bandwidth for voice is 16kHz (e) For data modulation, an authorised bandwidth of 20 kHz is permitted.

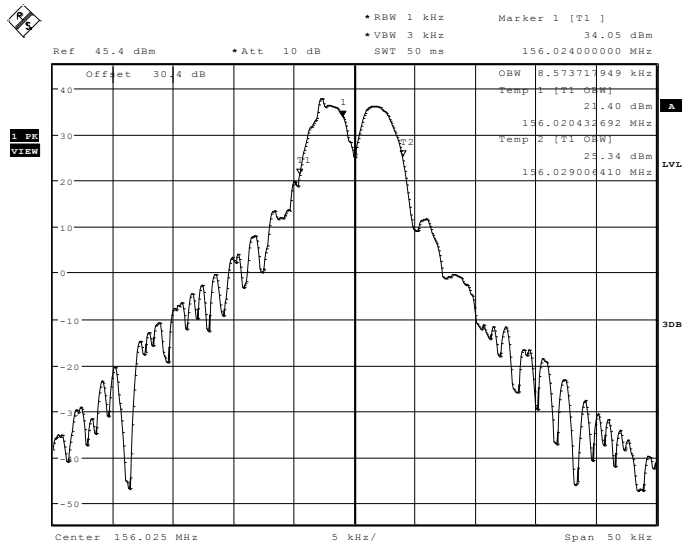


Product Service

Frequency 156.025 MHz10101010

OBW1

Date: 15.FEB.2010 14:30:35

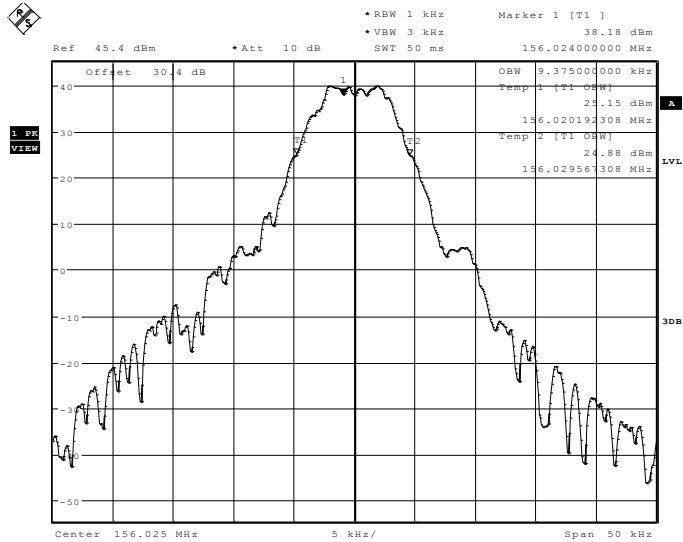
11110000

OBW1

Date: 15.FEB.2010 14:40:41

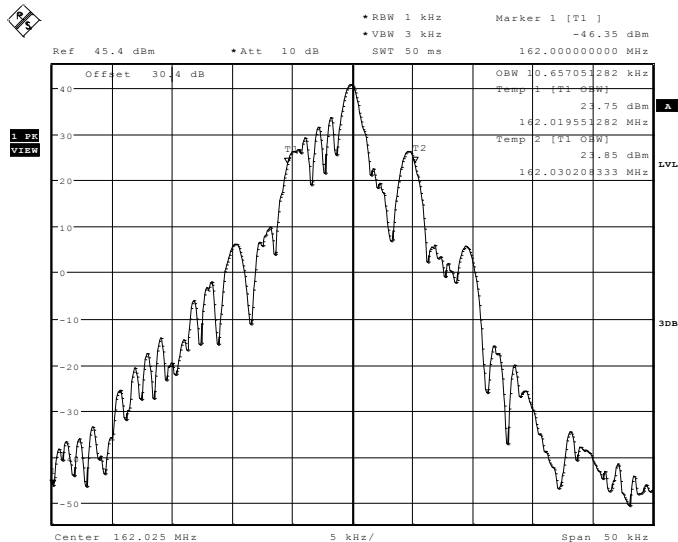


Product Service

PRBS

OBW1

Date: 15.FEB.2010 14:44:02

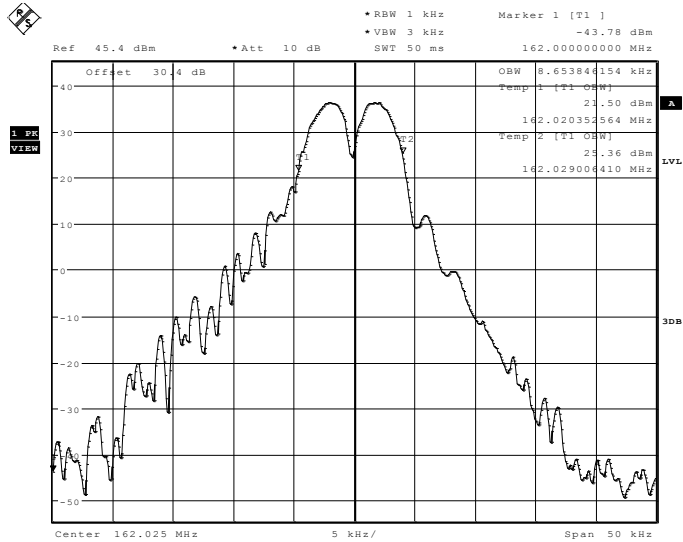
Frequency 162.025 MHz10101010

OBW1

Date: 15.FEB.2010 14:47:22

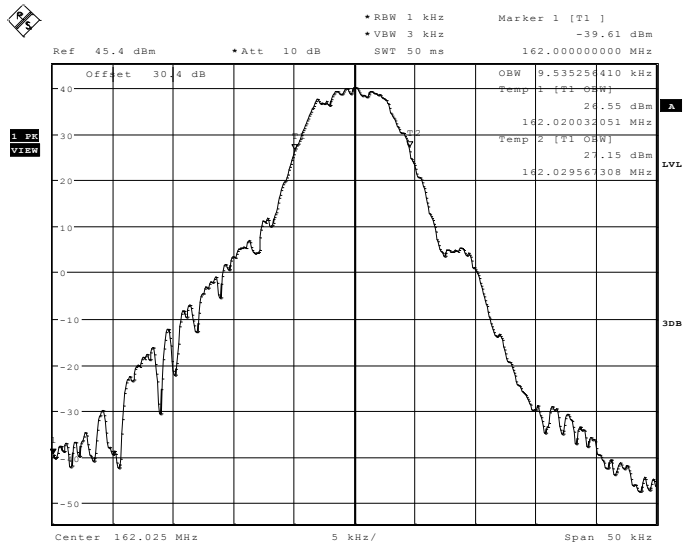


Product Service

11110000

OBW1

Date: 15.FEB.2010 14:49:04

PRBS

OBW1

Date: 15.FEB.2010 14:50:39



Product Service

2.6 EMISSION LIMITATIONS (CONDUCTED TRANSMITTER SPURIOUS)**2.6.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.211(f)(3)
RSS-182, Clause 4.4 and 6.3

2.6.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.6.3 Date of Test and Modification State

16 February 2010 - Modification State 1

2.6.4 Test Equipment Used

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

2.6.5 Test Procedure

Using a spectrum analyser, the emissions were measured between the range 9kHz and 2GHz. The path loss between the EUT and spectrum analyser was measured and the highest value of attenuation across the range was entered as a reference level offset. The RBS was set to 30kHz and the VBW to 100kHz. Due to the burst nature of the signal, the spectrum analyser was set to measure only during the burst. The trace was set to max hold and a peak detector used (worst case). The plots are shown on the following pages.

2.6.6 Environmental Conditions

	16 February 2010
Ambient Temperature	29°C
Relative Humidity	21%



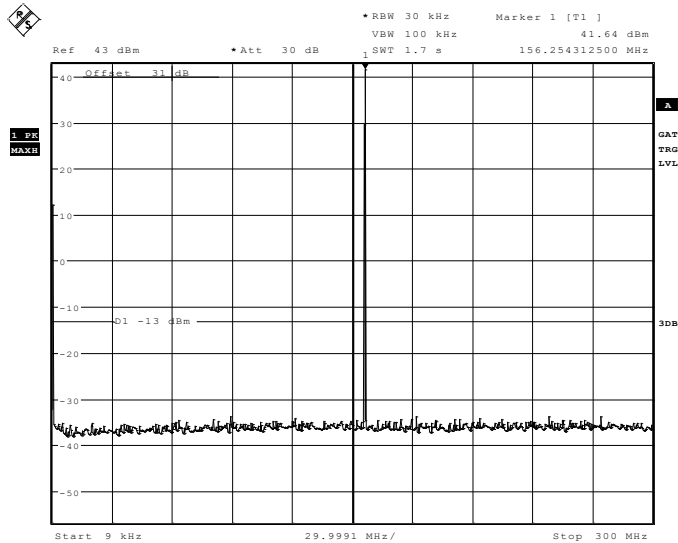
Product Service

2.6.7 Test Results

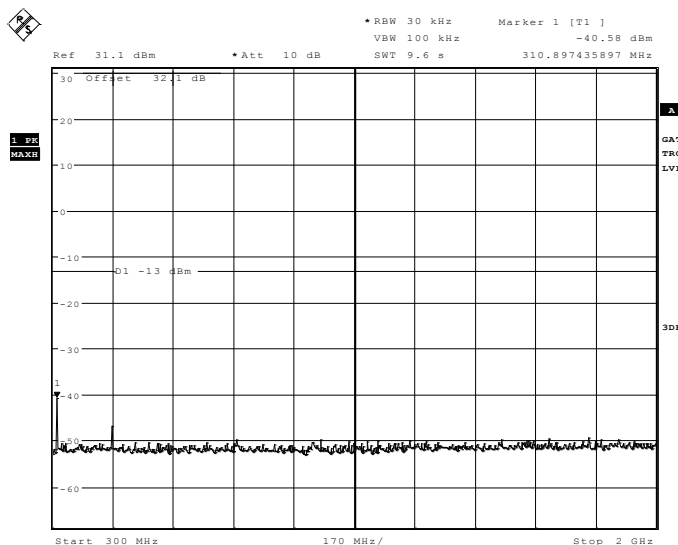
The test result plots are presented below.

Frequency 156.025 MHz

9 kHz to 300MHz



300 MHz to 2 GHz

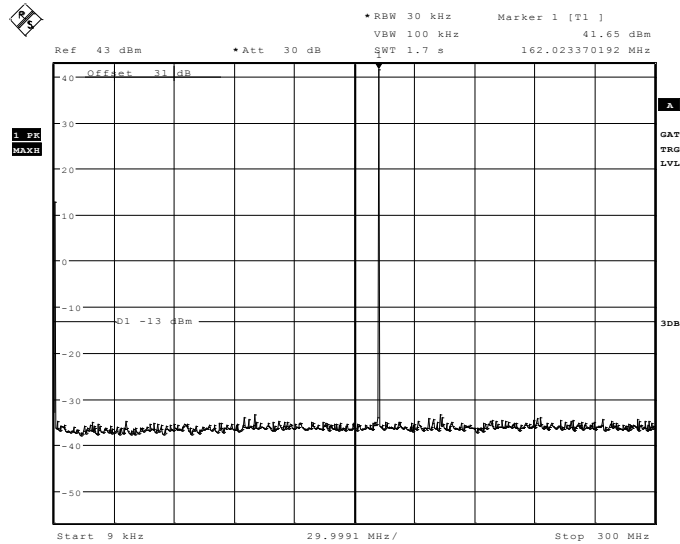




Product Service

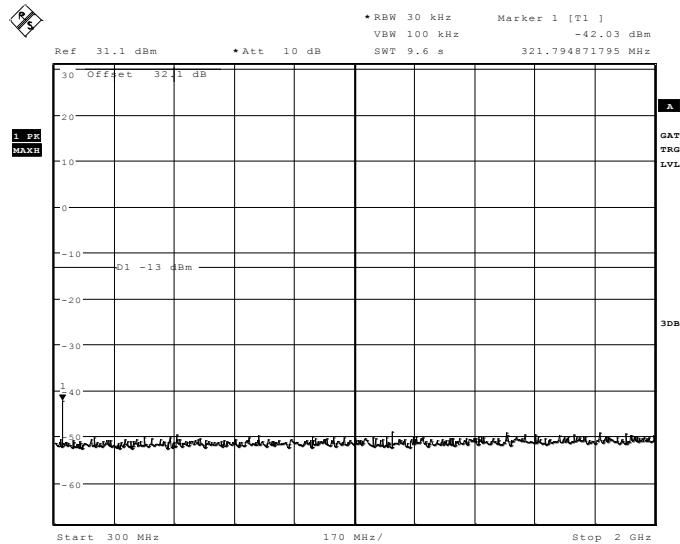
Frequency 162.025 MHz

9 kHz to 300 MHz



OBW1
Date: 16.FEB.2010 11:56:28

300 MHz to 2 GHz



OBW1
Date: 16.FEB.2010 12:12:55

Limit:

Industry Canada Clause 6.3.1 and FCC Clause 80.211(f)(3)

>250% of authorised bandwidth	43+10 Log P
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Product Service

2.7 MODULATION CHARACTERISTICS**2.7.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.213

2.7.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.7.3 Date of Test and Modification State

16 February 2010 - Modification State 1

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 Procedure

The EUT was set to transmit with three different data loads – 10101010, 11110000 and PRBS. The plots are on the following pages.

2.7.6 Environmental Conditions

	16 February 2010
Ambient Temperature	29°C
Relative Humidity	21%

2.7.7 Test Results

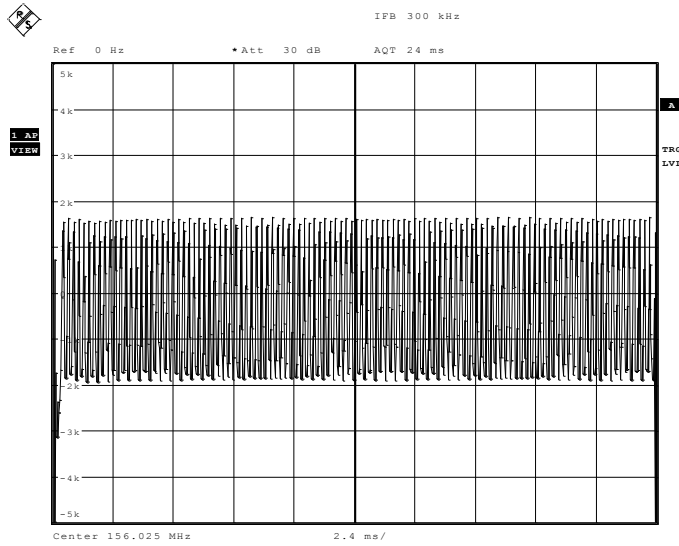
SRT Marine declare that the modulation is GMSK.



Product Service

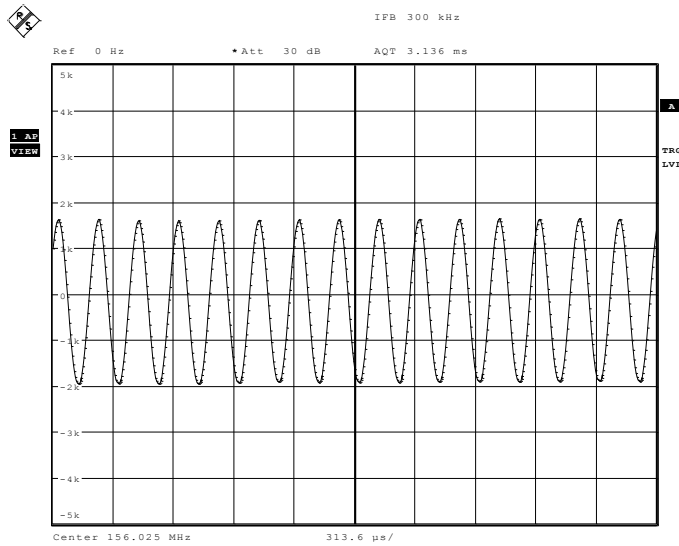
156.025 MHz

10101010



OBW1

Date: 16.FEB.2010 10:43:17



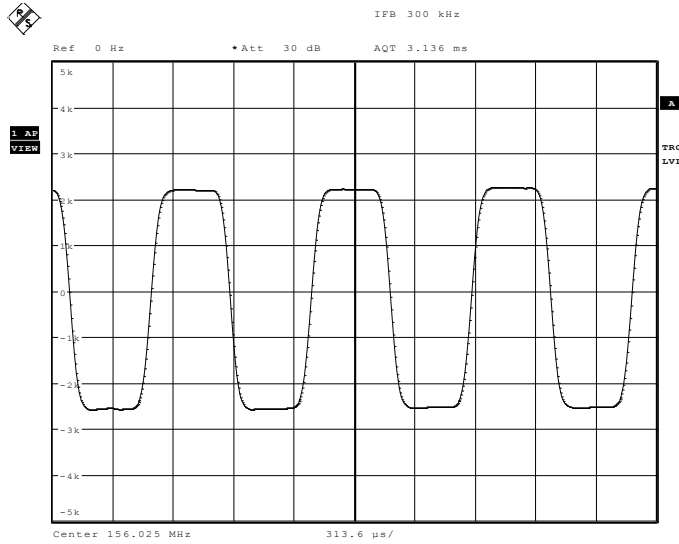
OBW1

Date: 16.FEB.2010 10:47:59

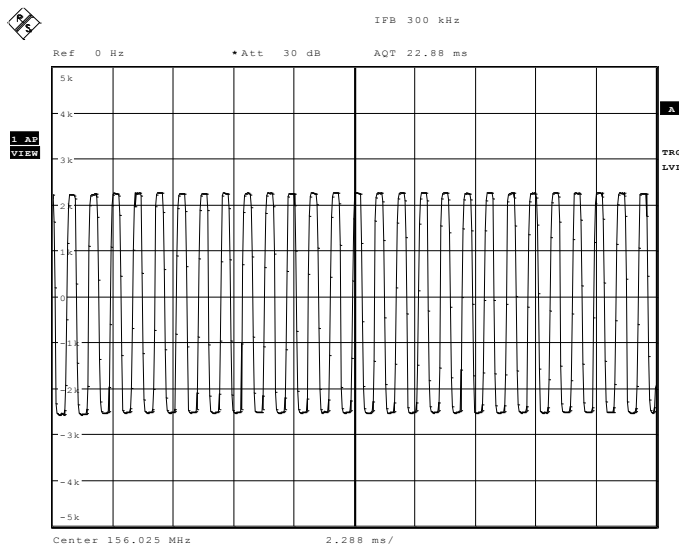


Product Service

11110000



OBW1
Date: 16.FEB.2010 10:49:37

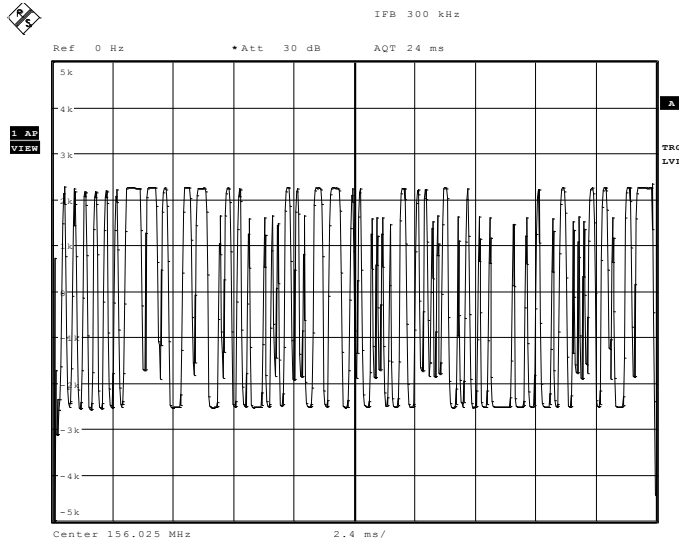


OBW1
Date: 16.FEB.2010 10:52:16



Product Service

PRBS



OBW1

Date: 16.FEB.2010 10:41:12



Product Service

2.8 TRANSMITTER POWER**2.8.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.215
RSS-182, Clause 3.7, 3.9, 4.3 and 6.2

2.8.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.8.3 Date of Test and Modification State

15 February 2010 - Modification State 1

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 Procedure

The EUT was connected to a spectrum analyser via a cable and a 30dB attenuator. The EUT was set to transmit at maximum with a modulated and unmodulated carrier. A resolution bandwidth of 1MHz and a video bandwidth of 10MHz were used using an RMS detector and average trace. The result was recorded in the table on the following page.

2.8.6 Environmental Conditions

	15 February 2010
Ambient Temperature	18°C
Relative Humidity	26%



Product Service

2.8.7 Test Results

Frequency (MHz)		Result (dBm) Unmodulated	Result (W) Unmodulated	Result (dBm) Modulated	Result (W) Modulated
156.025	12.0 V DC	40.97	12.50	40.97	12.50
156.025	13.7 V DC	41.21	13.21	41.22	13.24
162.025	12.0 V DC	41.04	12.71	41.05	12.74
162.025	13.7 V DC	41.22	13.24	41.21	13.24

Limit:

FCC Clause 80.215(g)

< 25 W

Industry Canada

40.97dBm ± 1dB



Product Service

2.9 SUPPRESSION OF INTERFERENCE ABOARD SHIPS

2.9.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.217 (b)

2.9.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.9.3 Date of Test and Modification State

18 February 2010 - Modification State 1

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 Procedure

The EUT was connected to a Spectrum Analyser via a 10dB attenuator. The spectrum was measured between 9kHz and 2GHz. A RBW of 100kHz was used for measurements below 1GHz and a 1MHz RBW for measurements over 1GHz. The plots are shown on the following pages.

Frequency of Interfering Emissions (MHz)	Power to Artificial Antenna (μ W)	Power to Artificial Antenna (dBm)
9kHz to 30 MHz	400	-3.98
30 MHz to 100 MHz	4000	+6.0
100 MHz to 300 MHz	40000	+16.0
300 MHz to 2000 MHz	400000	+26.0

No antenna gain has been applied to the test results.

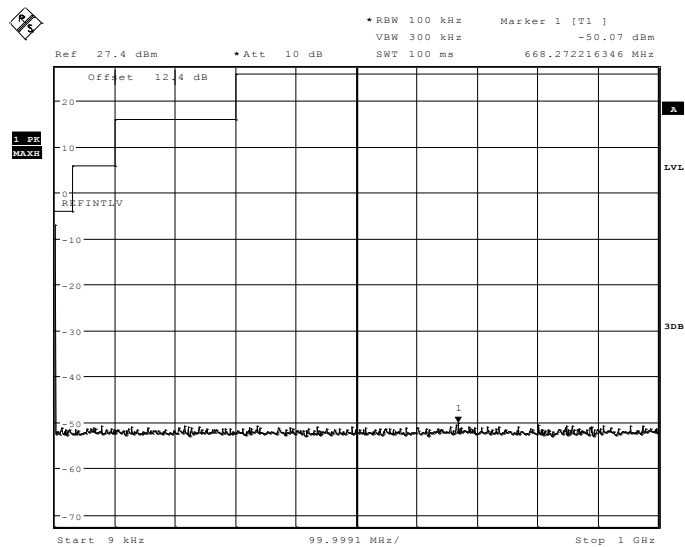
2.9.6 Environmental Conditions

	18 February 2010
Ambient Temperature	23°C
Relative Humidity	29%

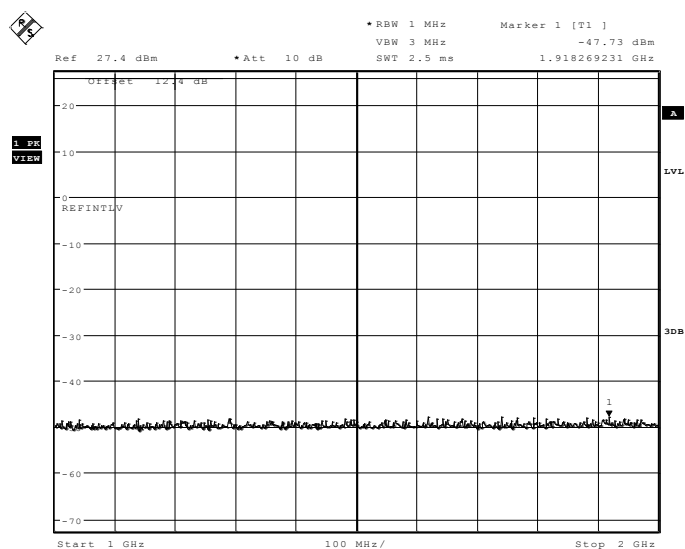


Product Service

2.9.7 Test Results

156.025 MHz9kHz – 1GHz

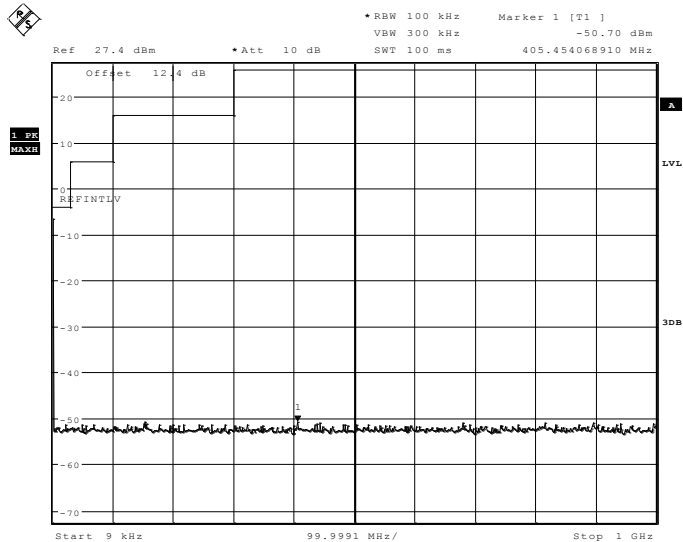
OBW1
Date: 18.FEB.2010 10:34:55

1GHz – 2GHz

OBW1
Date: 18.FEB.2010 10:36:04

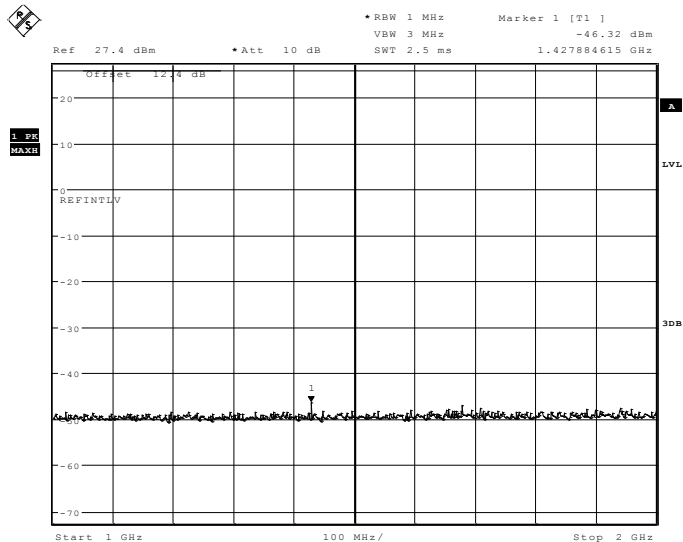


Product Service

162.025 MHz9kHz – 1GHz

OBW1

Date: 18.FEB.2010 10:39:57

1GHz – 2GHz

OBW1

Date: 18.FEB.2010 10:44:25



Product Service

2.10 TRANSMITTER CARRIER POWER REDUCTION

2.10.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.215 (e)(g)(1)(2)(3)
RSS-182, Clause 3.7

2.10.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.10.3 Date of Test and Modification State

18 February 2010 - Modification State 1

2.10.4 Test Procedure

The EUT will never be used on channels, 156.375, 156.650, 156.775 or 156.825MHz, as declared by the manufacturer.



Product Service

2.11 TRANSMITTER FREQUENCY DEVIATION**2.11.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.213 (a)(2)
RSS-182, Clause 3.4(b)

2.11.2 Equipment Under Test

Class A AIS Transceiver, S/N: Not Serialised (TUV_0003)

2.11.3 Date of Test and Modification State

15 February 2010 - Modification State 1

2.11.4 Test Equipment Used

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

2.11.5 Test Procedure

The EUT was set to transmit at maximum power with three different test signals (see table on the following page). The maximum deviation was recorded using the modulation analysis function on the spectrum analyser.

2.11.6 Environmental Conditions

15 February 2010
Ambient Temperature 25°C
Relative Humidity 23%

2.11.7 Test Results

Modulation	Maximum Deviation (kHz)	
	156.025 MHz	162.025 MHz
10101010	2.447	2.351
11110000	2.545	2.600
PRBS	2.527	2.594

Limit

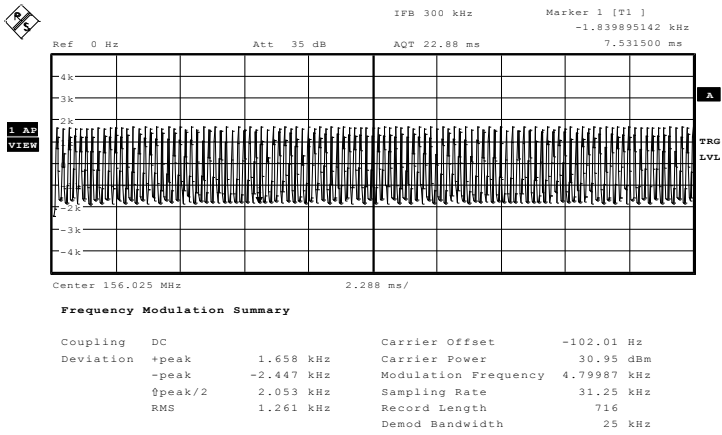
Maximum Permissible Deviation	± 5 KHz
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Product Service

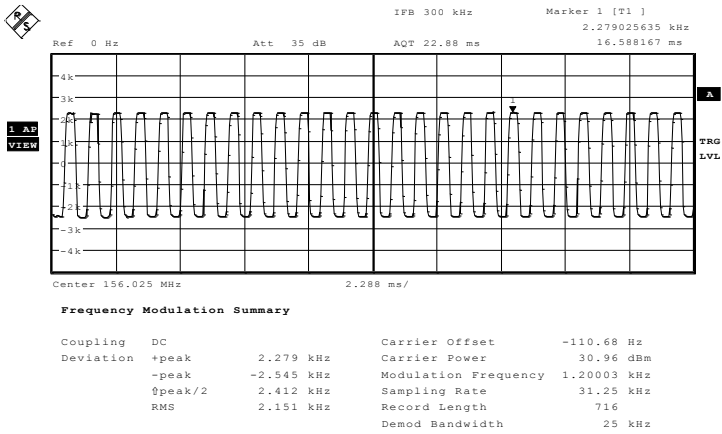
156.025 MHz

10101010



Date: 15.FEB.2010 11:45:57

11110000

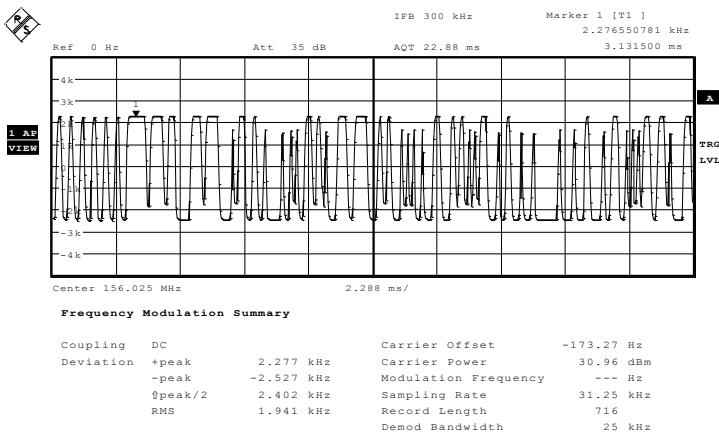


Date: 15.FEB.2010 11:47:09



Product Service

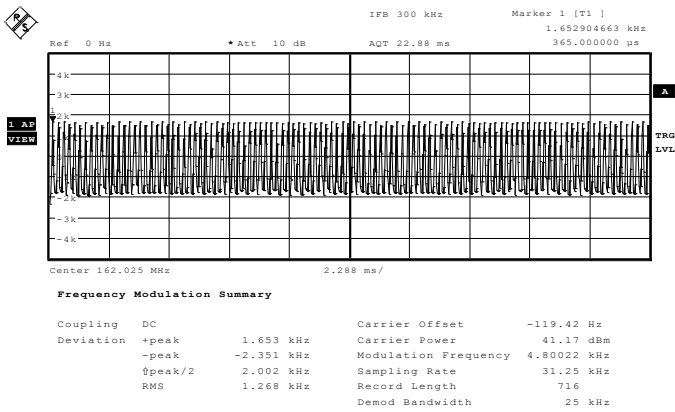
PRBS



Date: 15.FEB.2010 11:48:12

162.025 MHz

10101010



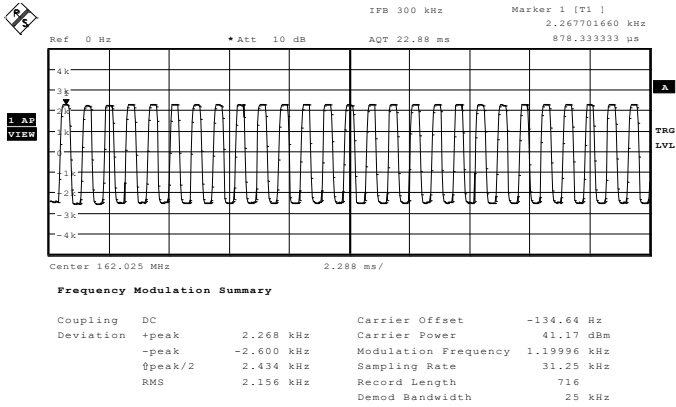
OBW1

Date: 15.FEB.2010 16:18:48



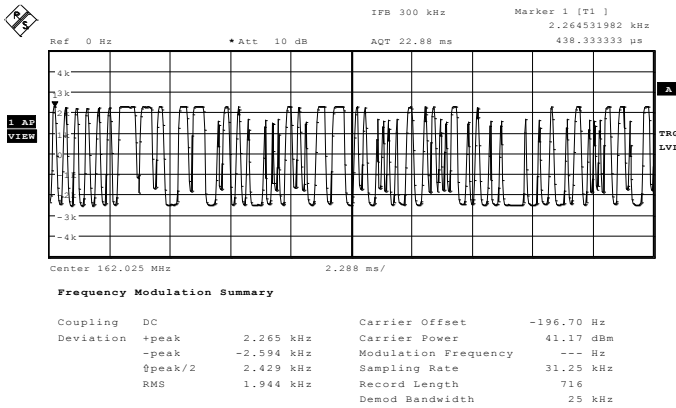
Product Service

11110000



OBW1
Date: 15.FEB.2010 16:17:43

PRBS



OBW1
Date: 15.FEB.2010 16:19:56



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 EMC - Radiated Emissions					
Antenna (Bilog)	Schaffner	CBL6143	287	24	19-Jan-2012
Hygrometer	Rotronic	A1	465	12	21-Dec-2010
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1610	-	TU
Power Supply	Hewlett Packard	6269B	2099	-	TU
Cable (2m, SMA(m) - SMA(m))	Reynolds	262-0248-2000	2401	12	TU
Bandpass Filter	Unknown	925-960	2442	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	4-Dec-2011
Multimeter	Fluke	77 Series II	3067	12	24-Jun-2010
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	4-Aug-2010
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	1-Sep-2010
Section 2.2 and 2.3 - Frequency Stability Under Voltage Variations and Frequency Stability Under Temperature Variations					
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	-	O/P Mon
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Temperature Chamber	Montford	2F3	467	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
Digital Temperature Indicator	Fluke	51	1385	12	7-Sep-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Digital Temperature Indicator	Fluke	51	2267	12	23-Jun-2010
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Thermocouple Thermometer	Fluke	51	3174	12	3-Jul-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010
Section 2.4 - Emission Limitations (Emission Mask)					
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Crystal Detector (Pos O/P)	ASL (TUV)	RAB1	479	-	TU
Power Splitter	Weinschel	1506A	606	12	28-Nov-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Occupied Bandwidth					
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010
Section 2.6 - Emission Limitations (Conducted Transmitter Spurious)					
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
High Pass Filter	Mini-Circuits	NHP-300	1640	12	11-Aug-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (10dB, 150W)	Narda	769-10	3368	12	19-May-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Tunable Notch Filter	Wainwright	WRCD 130.0/170.0-0.05/50-5EEK	3412	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
Signal Generator, 9kHz to 3GHz	Rohde & Schwarz	SMA 100A	3494	12	15-Jan-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010
Section 2.7 Radio (Tx) - Modulation Characteristics					
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010
Section 2.8 - Transmitter Power					
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	-	O/P Mon
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Temperature Chamber	Montford	2F3	467	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
Digital Temperature Indicator	Fluke	51	1385	12	7-Sep-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Digital Temperature Indicator	Fluke	51	2267	12	23-Jun-2010
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	4-Aug-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.9 - Suppression of Interference Aboard Ships					
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Attenuator: 6dB/10W	Trilithic	HFP-50N	476	12	22-Jul-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	4-Jun-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (10dB, 150W)	Narda	769-10	3368	12	19-May-2010
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
Signal Generator, 9kHz to 3GHz	Rohde & Schwarz	SMA 100A	3494	12	15-Jan-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010
Section 2.11 Radio (Tx) - Frequency Deviation					
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	4-Mar-2010
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2010
Hygrometer	Rotronic	I-1000	3220	12	17-Apr-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010

TU – Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment.



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*
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	26MHz to 2.5GHz Test Amplitude	1.4dB†
Conducted Susceptibility	100kHz to 250MHz Amplitude	1.8dB†
DC Input Ripple Immunity	Current Voltage	0.45% 0.91%
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 10⁶.

* In accordance with CISPR 16-4

† In accordance with UKAS Lab 34



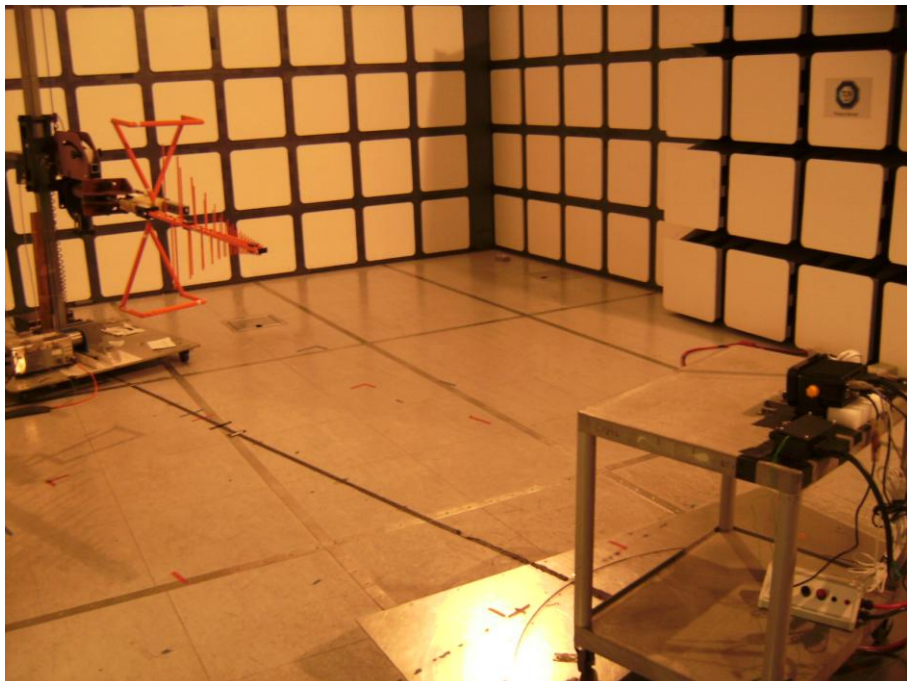
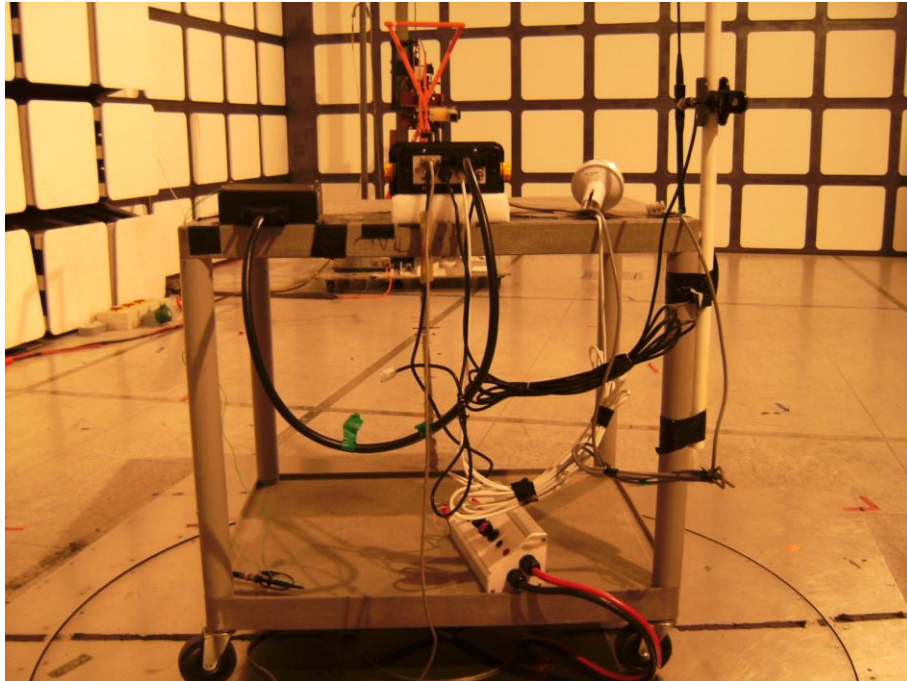
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SECTION 4

PHOTOGRAPHS



4.1 TEST SET UP PHOTOGRAPHS



Radiated Emissions (Enclosure Port)



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SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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