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# Report On

FCC and Industry Canada Testing of the  
SRT Marine  
Raymarine AIS500

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FCC ID: PJ5-AIS500  
IC ID: 4069B-AIS500 B

Document 75905837 Report 02 Issue 1

April 2009



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**REPORT ON**

FCC and Industry Canada Testing of the  
SRT Marine  
Raymarine AIS500

Document 75905837 Report 02 Issue 1

April 2009

**PREPARED FOR**

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Authorised Signatory

**DATED**

06 April 2009

**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, Industry Canada RSS-182 and RSS-Gen. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

  
**S C Hartley**  
**B Airs**



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## **SECTION 1**

### **REPORT SUMMARY**

FCC and Industry Canada Testing of the  
SRT Marine  
Raymarine AIS500



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the SRT Marine Raymarine AIS500 to the requirements of FCC CFR 47: Part 80, RSS-182 and RSS-Gen.

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	Raymarine PLC
Model Number(s)	AIS500
Serial Number(s)	EP2-03 AE622350290011
Software Version	V10.5 / V10.6.8.16
Hardware Version	V5
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47: Part 80: 2006 RSS-182: Issue 4: 2003 RSS-Gen: Issue 2: 2007
Incoming Release Date	Declaration of Build Status and Application Form 13 February 2009
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	639 12 March 2009
Start of Test	11 March 2009
Finish of Test	20 March 2009
Name of Engineer(s)	S C Hartley B Airs
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, RSS-182 and RSS-Gen, is shown below.

Configuration 1 - Normal							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Base Standard
	FCC	IC					
2.1	80.211(f)(3)	4.4 / 6.3	Radiated Emissions (Enclosure Port)	Transmit	0	Pass	-
2.2	80.209(a)	4.2 / 6.1	Frequency Stability Under Voltage Variations	Transmit	0	Pass	-
2.3	80.209(a)	4.2 / 6.1	Frequency Stability Under Temperature Variations	Transmit	0	Pass	-
2.4	80.211(f)(1)(2)	6.3.1	Emission Limitations (Emission Mask)	Transmit	0	Pass	-
2.5	80.205(a)	2.10	Occupied Bandwidth	Transmit	0	Pass	ANSI 63.4: 2003
2.6	80.211(c)(f)(3)	4.4 / 6.3.1	Emission Limitations (Conducted Transmitter Spurious)	Transmit	0	Pass	-
2.7	-	4.5(b) / 6.7	Receiver Spurious Emissions (Conducted)	Receive	0	Pass	-
2.8	80.213(d)	-	Modulation Characteristics	Transmit	0	Pass	-
2.9	80.215	4.3 / 6.2	Transmitter Power	Transmit	0	Pass	-
2.10	80.217(b)	-	Suppression of Interference Aboard Ships	Receive	0	Pass	-



1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	AIS500 Class B AIS Transceiver
MANUFACTURER	Raymarine PLC
TYPE	AIS500
PART NUMBER	
SERIAL NUMBER	EP2-22
HARDWARE VERSION	V5
SOFTWARE VERSION	V10.5 / V10.6.8.16
TRANSMITTER OPERATING RANGE	156.025 to 162.025 MHz
RECEIVER OPERATING RANGE	156.025 to 162.025 MHz
COUNTRY OF ORIGIN	UK
INTERMEDIATE FREQUENCIES	1 <sup>st</sup> IF RX1 117.170 to 123.170MHz 1 <sup>st</sup> IF RX2 129.970 to 135.970MHz 2 <sup>nd</sup> IF RX1 38.855MHz 2 <sup>nd</sup> IF RX2 26.055MHz
ITU DESIGNATION OF EMISSION	15K4G1DXT
HIGHEST INTERNALLY GENERATED FREQUENCY	Radio : 162.025MHz DSP internal clock: 196.608MHz
OUTPUT POWER (W or dBm)	2W
FCC ID	TBD
INDUSTRY CANADA ID	TBD
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Class B Marine AIS Transceiver to IEC62287-1
BATTERY/POWER SUPPLY	
MANUFACTURING DESCRIPTION	NA – External 12V or 24V DC supply required
MANUFACTURER	
TYPE	
PART NUMBER	
VOLTAGE	
COUNTRY OF ORIGIN	
MODULES (if applicable)	
MANUFACTURING DESCRIPTION	
MANUFACTURER	
TYPE	
POWER	
FCC ID	
COUNTRY OF ORIGIN	
INDUSTRY CANADA ID	
EMISSION DESIGNATOR	
DHSS/FHSS/COMBINED OR OTHER	
ANCILLARIES (if applicable)	
MANUFACTURING DESCRIPTION	
MANUFACTURER	
TYPE	
PART NUMBER	
SERIAL NUMBER	
COUNTRY OF ORIGIN	

Signature 

Date 13/02/09  
Declaration of Build Status Serial Number EP2-22

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

<b>APPLICANT'S DETAILS</b>	
CATEGORY OF APPLICANT (please tick relevant box opposite)	(a) <input type="checkbox"/> MANUFACTURER
	(b) <input type="checkbox"/> IMPORTER
If box (b), (c) or (d) is ticked complete details in box below with respect to the manufacturer	(c) <input checked="" type="checkbox"/> DISTRIBUTOR
	(d) <input type="checkbox"/> AGENT
COMPANY NAME :	Raymarine PLC
ADDRESS :	Anchorage Park, Robinson Way, Portsmouth, Hampshire, PO3 5TD
NAME FOR CONTACT PURPOSES :	Andy Little
TELEPHONE NO : 023 9269 3611	FAX NO :
	E-MAIL :

<b>MANUFACTURER'S DETAILS</b>	
COMPANY NAME :	SRT Marine Technology Ltd
ADDRESS :	Wireless House, Westfield Industrial Estate, Midsomer Norton, Bath, BA3 4BS
NAME FOR CONTACT PURPOSES :	Matt Clarke
TELEPHONE NO : 01761 409547	FAX NO :
	E-MAIL : matt.clarke@srt-marine.com







<b>TYPE OF EQUIPMENT</b>	
<input type="checkbox"/> <u>Base Station</u>	(Equipment fitted with an antenna socket for use with an external antenna, and intended for use in a fixed location).
<input checked="" type="checkbox"/> <u>Mobile Station</u>	(Mobile equipment fitted with an antenna socket, for use with an external antenna, normally used in a vehicle or as a transportable station).
<input type="checkbox"/> <u>Handportable</u>	(fitted with an antenna socket)
<input type="checkbox"/>	(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)
<input type="checkbox"/> <u>Other</u>	

<b>BASE STATION</b>	
<input type="checkbox"/> Transmitter	<input type="checkbox"/> Simplex
<input type="checkbox"/> Receiver	<input type="checkbox"/> Duplex
<input type="checkbox"/> Transceiver	<input type="checkbox"/> Communal Site Use (70 dB limit)
<b>MOBILE STATION</b>	
<input type="checkbox"/> Transmitter	
<input type="checkbox"/> Receiver	
<input checked="" type="checkbox"/> Transceiver	
<input type="checkbox"/> Remote Control Head	
<b>HANDPORTABLE</b>	
<input type="checkbox"/> Transmitter	<input type="checkbox"/> Simplex
<input type="checkbox"/> Receiver	<input type="checkbox"/> Duplex
<input type="checkbox"/> Transceiver	



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<b>TRANSMITTER TECHNICAL CHARACTERISTICS</b>	
TRANSMITTER FREQUENCY	
Method of frequency generation	
<input type="checkbox"/>	CRYSTAL
<input checked="" type="checkbox"/>	SYNTHESIZER
<input type="checkbox"/>	OTHER
TRANSMITTER CHANNEL SWITCHING FREQUENCY RANGE	
	156.25MHz - 162.025MHz ( MHz Range)
TRANSMITTER FREQUENCY ALIGNMENT RANGE (6)	
	156.025MHz - 162.025MHz ( MHz Range)





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TRANSMITTER MODULATION INPUT CHARACTERISTICS		
Modulation input signal level for 60% of maximum deviation at at		
Microphone socket	mV	Impedance Ohms
Accessory socket	mV	Impedance Ohms
Other (4)	mV	Impedance Ohms
Lowest audio modulation frequency transmitted by the equipment		
Hz		

(4) For use where direct connection is provided for test purposes.

TRANSMITTER MODULATION INPUT CHARACTERISTICS (ETS 300 113 Only)						
Modulation bit rate	bit/s					
Type of modulation:						
SUBCARRIER:				DIRECT:		
MSK	YES	[ ]	NO	[ ]	Direct FSK	YES [ ] NO [ ]
FFSK	YES	[ ]	NO	[ ]	GMSK	YES [ ] NO [ ]
					Generalised	
					Tamed FM	YES [ ] NO [ ]
					Multilevel	
					State FM	YES [ ] NO [ ]
					PLL-4PSK	YES [ ] NO [ ]
					8 PSK	YES [ ] NO [ ]
					Other	



<b>INTERFACE FOR DATA TRANSMISSION (ETS 300 113 only)</b>
<p>SIGNAL LEVEL</p> <p style="margin-left: 40px;"><input type="checkbox"/> V28</p> <p style="margin-left: 40px;"><input type="checkbox"/> Other    Details:</p>
<p>DEFINITION OF SIGNALS</p> <p style="margin-left: 40px;"><input type="checkbox"/> V24</p> <p style="margin-left: 40px;"><input type="checkbox"/> Other</p> <p>Details:</p>
<b>NORMAL TEST SIGNAL</b>
<p>Can the equipment transmit continuous bit streams    <input type="checkbox"/> Yes</p> <p style="margin-left: 100px;"><input type="checkbox"/> No</p> <p>If NO, give details of the format and information agreed with the National Regulatory Authority (subclause 6.3 of ETS 300 113 refers).</p> <p>NOTE : It is recommended that details of the agreed format are stated on the page of the type test report titled "Additional information supplementary to the test report".</p>
<p>TYPE OF CONNECTOR</p> <p style="margin-left: 40px;"><input type="checkbox"/> 25 Pin (RS232)</p> <p style="margin-left: 40px;"><input type="checkbox"/> 9 Pin (RS232)</p> <p style="margin-left: 40px;"><input type="checkbox"/> Male</p> <p style="margin-left: 40px;"><input type="checkbox"/> Female</p> <p style="margin-left: 40px;"><input type="checkbox"/> Other</p>



<b>RECEIVER TECHNICAL CHARACTERISTICS</b>	
RECEIVER - FREQUENCY	
METHOD OF FREQUENCY GENERATION	
<input type="checkbox"/>	CRYSTAL
<input checked="" type="checkbox"/>	SYNTHESIZER
<input type="checkbox"/>	OTHER
INTERMEDIATE FREQUENCIES	
<input checked="" type="checkbox"/>	[ RX1 38.855MHz, RX2 26.055MHz]                      1st
<input type="checkbox"/>	[ 455KHz ] 2nd
<input type="checkbox"/>	3rd
Is local oscillator injection frequency higher or lower than the receiver nominal frequency?	
<input type="checkbox"/>	Higher
<input checked="" type="checkbox"/>	Lower
RECEIVER CHANNEL SWITCHING FREQUENCY RANGE	
	156.025MHz – 162.025MHz ( MHz Range)
RECEIVER FREQUENCY ALIGNMENT RANGE	
	156.025MHz - 162.025MHz ( MHz Range)



<b>RECEIVER AUDIO (AF) CHARACTERISTICS</b>	
<b>MAXIMUM RATED AUDIO (AF) FREQUENCY OUTPUT POWER</b>	
INTO LOUDSPEAKER	Watts
TO LINE	Watts
INTO EARPIECE	Watts
BALANCED	<input type="checkbox"/> YES <input type="checkbox"/> NO
UNBALANCED	<input type="checkbox"/> YES <input type="checkbox"/> NO
Does connection carry DC voltage?	
	<input type="checkbox"/> YES <input type="checkbox"/> NO
If yes, state value	
<b>Normal Audio load impedance</b>	
AT LOUDSPEAKER	ohms
AT EARPIECE	ohms
AT LINE OUTPUT	ohms
<b>At audio accessory connection or facility socket (if fitted)</b>	
Output	Watts
Impedance	ohms
Max input level at audio accessory socket	
	mV
Impedance	ohms





<b>TRANSMITTER AND RECEIVER CHARACTERISTICS</b>	
ITU DESIGNATION OR CLASS OF EMISSION	
CHANNEL SEPARATION	25kHz
State the maximum number of channels over which the equipment can operate	240

<b>EXTREME TEMPERATURE RANGE</b> over which equipment is to be type tested	
<input type="checkbox"/> ]	-25°C to +55°C
<input checked="" type="checkbox"/> ]	-15°C to +55°C
<input type="checkbox"/> ]	-10°C to +55°C

<b>CONSTRUCTION OF EQUIPMENT</b>	
<input checked="" type="checkbox"/> ]	Single unit (5)
<input type="checkbox"/> ]	Multiple units
If multiple units describe each one clearly	

(5) Unit means a physically separate item of the equipment.

<b>AUTOMATIC EQUIPMENT SWITCH OFF</b>	
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.	
<input checked="" type="checkbox"/> ]	Applies 15.6Vmax Cut-off voltage, 9.6V min cut off voltage
<input type="checkbox"/> ]	Does not apply



<b>POWER SOURCE</b>	
<input type="checkbox"/> AC MAINS State voltage	<input type="checkbox"/> Single phase
AC MAINS FREQUENCY (Hz)	<input type="checkbox"/> Three phase
DC Voltage (V)	
DC Maximum Current (A)	
<input type="checkbox"/> Other	
<b>BATTERY</b>	
<input type="checkbox"/> Nickel Cadmium	
<input type="checkbox"/> Mercury	
<input type="checkbox"/> Alkaline	
<input checked="" type="checkbox"/> Lead acid (Vehicle regulated)	
<input type="checkbox"/> Leclanche	
<input type="checkbox"/> Lithium	
<input type="checkbox"/> Other	
..... volts nominal. End point voltage as quoted by equipment manufacturer ..... V	

<b>SIGNALLING (See note (c)) (I-ETS 300 219 only)</b>	
Is selective signalling fitted	<input type="checkbox"/> Yes
	<input type="checkbox"/> No
Is selective signalling	
Analogue	<input type="checkbox"/>
Digital	<input type="checkbox"/>
If analogue, state format	
Tone Frequencies	
If digital, state modulation method	
	bit rate (b/s)



<b>DUPLEX OPERATION (BASE STATION ONLY)</b>
<p>Is the equipment intended for</p> <p style="padding-left: 40px;">Duplex operation    <input type="checkbox"/>    Yes</p> <p style="padding-left: 80px;">                                  <input type="checkbox"/>    No</p>
<p>Is the equipment fitted with separate transmitter and receiver antenna sockets</p> <p style="padding-left: 40px;">                                  <input type="checkbox"/>    Yes</p> <p style="padding-left: 80px;">                                  <input type="checkbox"/>    No</p>
<p>Is the equipment fitted with a duplex filter as an integral part of the equipment with a single antenna connection socket</p> <p style="padding-left: 40px;">                                  <input type="checkbox"/>    Yes</p> <p style="padding-left: 80px;">                                  <input type="checkbox"/>    No</p>
<p>Is the duplex filter externally fitted and connected to the main equipment by co-axial cable(s)</p> <p style="padding-left: 40px;">                                  <input type="checkbox"/>    Yes</p> <p style="padding-left: 80px;">                                  <input type="checkbox"/>    No</p>
<p>Type and make of duplex filter</p> <p>.....</p>

<b>COMMUNAL SITE OPERATION (1)</b>
<p>Is the equipment fitted with circulators/isolators, internally or externally, as part of the equipment, to achieve the 70 dB limit for communal site operations?</p> <p style="padding-left: 40px;">                                  <input type="checkbox"/>    Yes</p> <p style="padding-left: 80px;">                                  <input type="checkbox"/>    No</p>
<p>If YES, what is the value of attenuation of the circulator/isolator?</p> <p style="padding-left: 40px;">.....    dB</p>



<b>ALIGNMENT RANGE</b>	
<p>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.</p>	
3.1.5	One sample single channel equipment of category AR1 <span style="float: right;">[ ]</span>
or 3.1.6	Three samples of single channel equipments of category AR2 <span style="float: right;">[ ]</span>
or 3.1.7	One sample two channel equipment of category AR1 <span style="float: right;">[ ]</span>
or 3.1.8	Three samples of two channel equipment of category AR2 <span style="float: right;">[ ]</span>
or 3.1.9	One sample multichannel equipment of category AR1 <span style="float: right;">[ ]</span>
or 3.1.10	Three samples of multichannel equipment of category AR2 <span style="float: right;">[ ]</span>
or 3.1.11	One sample of multichannel equipment of category AR2 where the switching range equals the alignment range <span style="float: right;">[ ]</span>
<p>If more than one option of the equipment is being submitted with different Type Designations, one or three samples, as appropriate, of each version shall be submitted.</p>	

<b>CHANNEL IDENTIFICATION</b>			
<p>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.</p>			
Equipment Identification eg Serial Number	Channel No.	Transmit Nominal Freq MHz	Receive Nominal Freq MHz



<b>OTHER ITEMS SUPPLIED</b>		
Spare batteries	<input type="checkbox"/>	Yes
e.g. (portable equipment)	<input type="checkbox"/>	No
Battery charging device	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Special tools for dismantling equipment		
	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Encoder	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Test interface box (if applicable) or where appropriate the RF test fixture	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Full documentation on equipment (Handbook and circuit diagrams)	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Others	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If Yes, please specify :		



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<b>DECLARATION</b>		
Are the equipments submitted representative production models?	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If not are the equipments pre-production models?	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If pre-production equipments are submitted will the final production equipments be identical in <u>all</u> respects with the equipment tested	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If no supply full details		
Will labelling of the equipment comply with the Requirements of appropriate standards ?	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If no supply full details		

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

Signature :

Name : Matthew Clarke

Position held : Product Manager

Date : 13 February 2009

TÜV Product Service Ltd formally certifies that the manufacturer's declaration as typed out in this report, is a true and accurate record of the original received from the applicant.



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## 1.5 PRODUCT INFORMATION

### 1.5.1 Technical Description

The Equipment Under Test (EUT) was a SRT Marine Raymarine AIS500 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

#### Configuration 1: Normal

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

### 1.5.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
DC Power	1.5m or <3m	Power Lead	2 core	No
Signal	1.5m or <3m	Data	Multicore	No
Signal	5.0m	GPS Antenna	Coax	Yes
Signal	5.0m	VHF Antenna	Coax	Yes

### 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.





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## 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.

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

No modifications were made to the EUT during testing.



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## **SECTION 2**

### **TEST DETAILS**

FCC and Industry Canada Testing of the  
SRT Marine  
Raymarine AIS500



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## **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 / 6.3

### **2.1.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.1.3 Date of Test and Modification State**

17 March 2009 - 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 FCC CFR 47 Part 80.

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

Configuration 1 - Mode 1

### **2.1.6 Environmental Conditions**

17 March 2009

Ambient Temperature 25°C

Relative Humidity 25%

Atmospheric Pressure 1030mbar



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### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 80 and RSS-182 for Radiated Emissions (Enclosure Port).

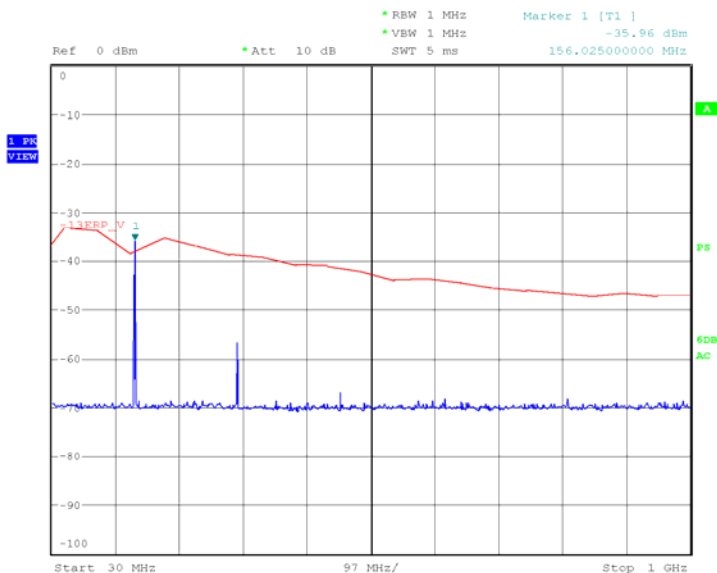
The test results are shown below.

Configuration 1 - Mode 1

Bottom Channel (156.025 MHz)

30MHz to 1GHz

No EUT emissions were detected within 18dB of the specification limit.

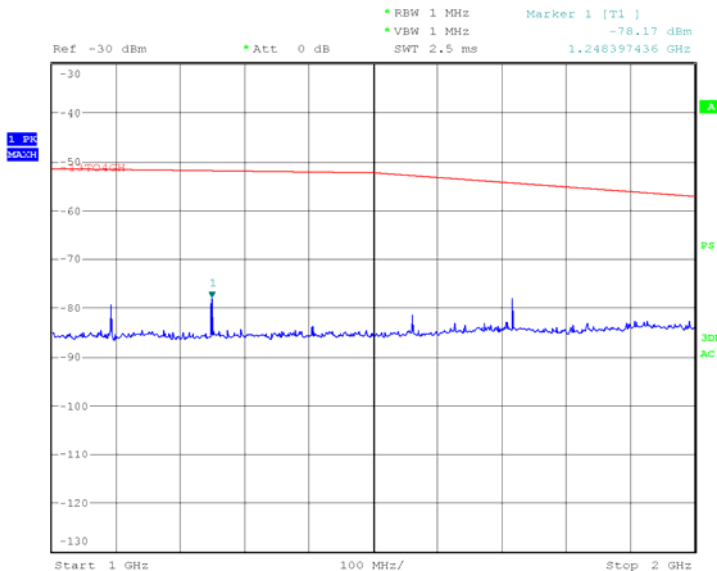


Date: 17.MAR.2009 16:17:04



1GHz to 2GHz

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

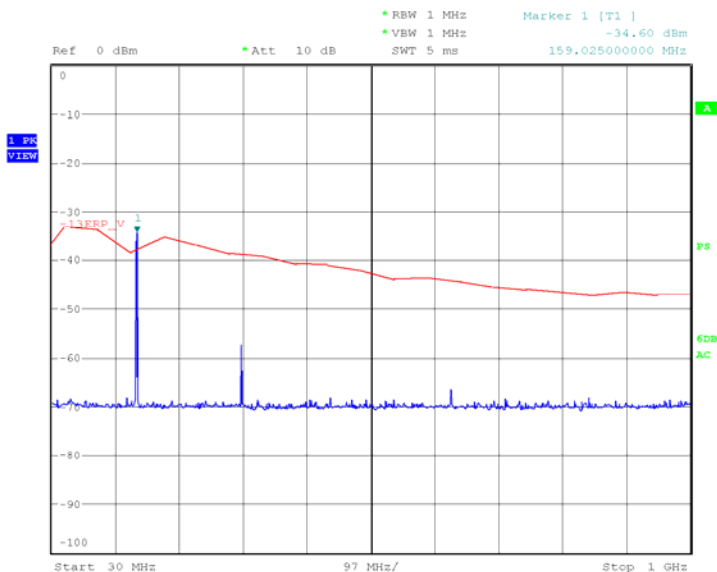


Date: 17.MAR.2009 18:34:44

Middle Channel (159.025 MHz)

30MHz to 1GHz

No EUT emissions (other than the Transmit Carrier) were detected within 18dB of the specification limit.

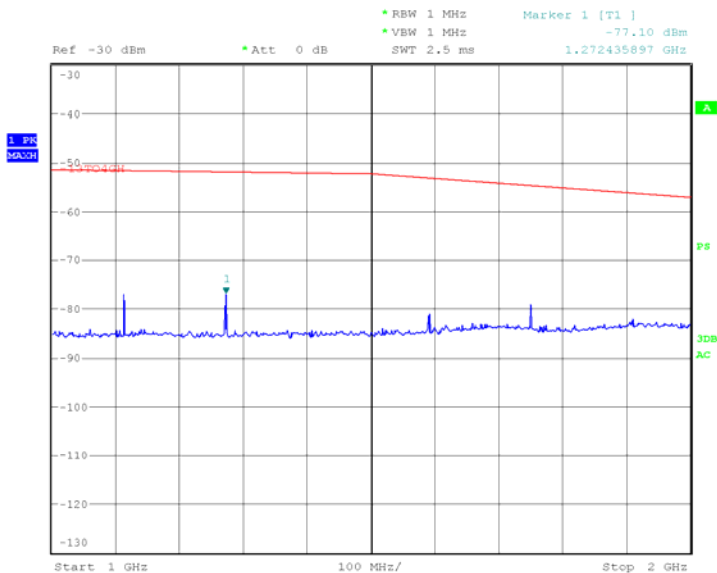


Date: 17.MAR.2009 16:30:53



1GHz to 2GHz

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

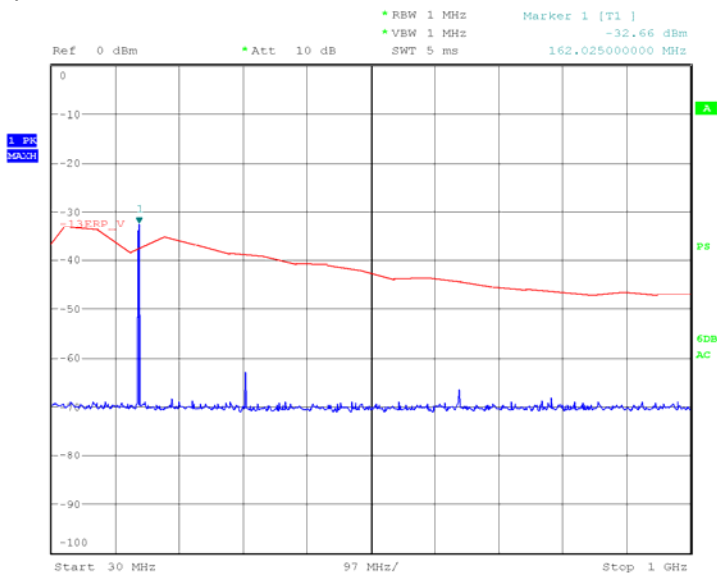


Date: 17.MAR.2009 18:28:27

Top Channel (162.025 MHz)

30MHz to 1GHz

No EUT emissions (other than the Transmit Carrier) were detected within 18dB of the specification limit.

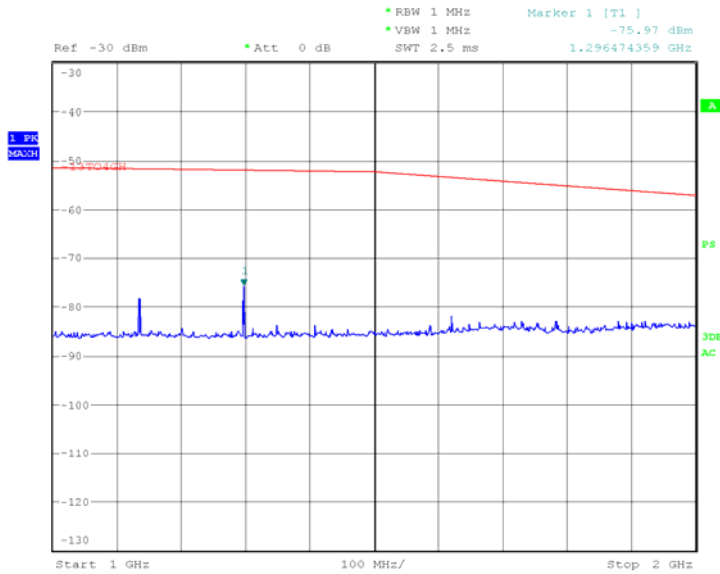


Date: 17.MAR.2009 17:38:18



1GHz to 2GHz

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



Date: 17.MAR.2009 18:09:04



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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 4.2, and 6.1

### **2.2.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.2.3 Date of Test and Modification State**

11 March 2009 - 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 Procedure**

The EUT was set to transmit on maximum power with no modulation. A Spectrum Analyser was used to measure the frequency error. The results were recorded at each voltage interval on the top, middle and bottom channels

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

Configuration 1 - Mode 1

### **2.2.6 Environmental Conditions**

	11 March 2009
Ambient Temperature	22°C
Relative Humidity	37%





Product Service

**2.2.7 Test Results**

Configuration 1 - Mode 1

Bottom Channel (156.025 MHz)

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)	ppm
9.6	156.024984	-0.016	±1.56025	±10
12.0	156.025000	0.000	±1.56025	±10
31.2	156.024984	-0.016	±1.56025	±10

Middle Channel (162.025 MHz)

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)	ppm
9.6	159.025008	-0.032	± 1.590250	±10
12.0	159.025008	-0.032	± 1.590250	±10
31.2	159.024984	-0.032	± 1.590250	±10

Top Channel (162.025 MHz)

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)	ppm
9.6	162.024968	-0.032	± 1.620250	±10
12.0	162.024968	-0.032	± 1.620250	±10
31.2	162.024968	-0.032	± 1.620250	±10

Limit:  
 Industry Canada Clause 6.1  
 FCC Clause 80.209(a)

±1.56025 kHz / ± 1.57425 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 4.2, 6.1

### **2.3.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03 and AE622350290011

### **2.3.3 Date of Test and Modification State**

13 and 18 March 2009 - 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 Procedure**

The EUT was set to transmit on maximum power with no modulation. A Spectrum Analyser was used to measure the frequency error. The results were recorded at each temperature and voltage interval on the top, middle and bottom channels.

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

Configuration 1 - Mode 1

### **2.3.6 Environmental Conditions**

	13 March 2009	18 March 2009
Ambient Temperature	22°C	25°C
Relative Humidity	37%	40%



**2.3.7 Test Results**

Configuration 1 – Mode 1

Transmitting at 2W

Bottom Channel (156.025 MHz)

Temperature Interval °C	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-25	9.6	156.025200	+200	1.28
	12.0	156.025200	+200	1.28
	31.2	156.025200	+200	1.28
-20	9.6	156.025160	+160	1.03
	12.0	156.025144	+144	0.92
	31.2	156.025144	+144	0.92
-10	9.6	156.025064	+64	0.41
	12.0	156.025104	+104	0.67
	31.2	156.025104	+104	0.67
0	9.6	156.025000	0	0.00
	12.0	156.025000	0	0.00
	31.2	156.025000	0	0.00
+10	9.6	156.024968	-32	0.205
	12.0	156.024936	-64	0.410
	31.2	156.024968	-32	0.205
+20	9.6	156.024984	-16	0.103
	12.0	156.025000	0	0.000
	31.2	156.024984	-16	0.103
+30	9.6	156.024952	-48	0.310
	12.0	156.024968	-32	0.210
	31.2	156.025016	+16	0.100
+40	9.6	156.024972	-28	0.180
	12.0	156.024968	-32	0.205
	31.2	156.024984	-16	0.103
+50	9.6	156.024892	-108	0.692
	12.0	156.024902	-98	0.628
	31.2	156.024892	-108	0.692
+55	9.6	156.024936	-64	0.410
	12.0	156.024936	-64	0.410
	31.2	156.024924	-76	0.487



Middle Channel (159.025 MHz)

Temperature Interval °C	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-25	9.6	159.025208	+208	1.31
	12.0	159.025200	+200	1.26
	31.2	159.025200	+200	1.26
-20	9.6	159.025144	+144	0.91
	12.0	159.025144	+144	0.91
	31.2	159.025152	+152	0.96
-10	9.6	159.025108	+108	0.68
	12.0	159.025112	+112	0.70
	31.2	159.025120	+120	0.75
0	9.6	159.025032	+32	0.20
	12.0	159.025032	+32	0.20
	31.2	159.025032	+32	0.20
+10	9.6	159.024968	-32	0.20
	12.0	159.024968	-32	0.20
	31.2	159.024968	-32	0.20
+20	9.6	159.025008	+8	0.05
	12.0	159.025008	+8	0.05
	31.2	159.024984	-16	0.10
+30	9.6	159.024952	-48	0.30
	12.0	159.024968	-32	0.20
	31.2	159.025008	+08	0.05
+40	9.6	159.024968	-32	0.20
	12.0	159.024968	-32	0.20
	31.2	159.024984	-16	0.10
+50	9.6	159.024880	-120	0.755
	12.0	159.024880	-120	0.755
	31.2	159.024892	-108	0.679
+55	9.6	159.024936	-64	0.403
	12.0	159.024936	-64	0.403
	31.2	159.024924	-76	0.478



Product Service

Top Channel (162.025 MHz)

Temperature Interval °C	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-25	9.6	162.025200	+200	1.23
	12.0	162.025200	+200	1.23
	31.2	162.025200	+200	1.23
-20	9.6	162.025152	+152	0.94
	12.0	162.025144	+144	0.89
	31.2	162.025144	+144	0.89
-10	9.6	162.025016	+16	0.10
	12.0	162.025108	+108	0.67
	31.2	162.025112	+112	0.69
0	9.6	162.020000	0	0.00
	12.0	162.020000	0	0.00
	31.2	162.020000	0	0.00
+10	9.6	162.024968	-32	0.20
	12.0	162.024968	-32	0.20
	31.2	162.024968	-32	0.20
+20	9.6	162.024968	-32	0.20
	12.0	162.024968	-32	0.20
	31.2	162.024968	-32	0.20
+30	9.6	162.024960	-40	0.25
	12.0	162.024968	-32	0.20
	31.2	162.025000	0	0.00
+40	9.6	162.024960	-40	0.247
	12.0	162.024968	-32	0.198
	31.2	162.024976	-24	0.148
+50	9.6	162.024880	-120	0.741
	12.0	162.024880	-120	0.741
	31.2	162.024892	-108	0.667
+55	9.6	162.024936	-64	0.40
	12.0	162.024932	-68	0.42
	31.2	162.024920	-80	0.49

Limit:  
 Industry Canada Clause 4.2 and 6.1  
 FCC Clause 80.209(a)

± 1.56025kHz / ± 1.57425kHz or 10ppm
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Product Service

## **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

### **2.4.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.4.3 Date of Test and Modification State**

11 March 2009 - 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 Procedure**

The EUT was connected to a Spectrum Analyser via a 30dB attenuator. The path loss between the Spectrum Analyser and the EUT was established within the measurement range and inserted into the Spectrum Analyser as a reference level offset. The emission mask, as defined in the test clauses above, was set and displayed on the Spectrum Analyser. The reference point of the emission mask, 0dB was achieved with the carrier unmodulated. The EUT was then modulated in accordance with 2.1049(c)(1), (Occupied Bandwidth). The measurement detector was set to max hold and the results established.

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

Configuration 1 - Mode 1

### **2.4.6 Environmental Conditions**

	11 March 2009
Ambient Temperature	22°C
Relative Humidity	37%

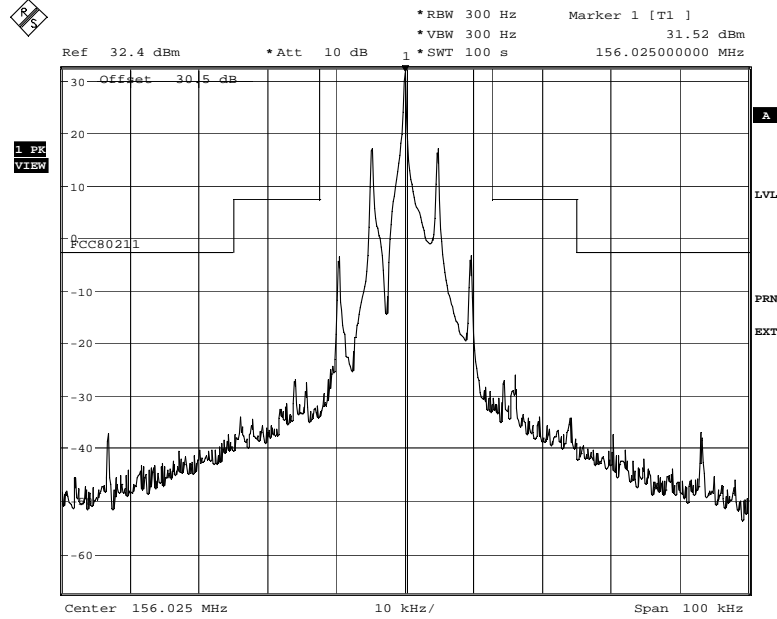


### 2.4.7 Test Results

#### Configuration 1 – Mode 1

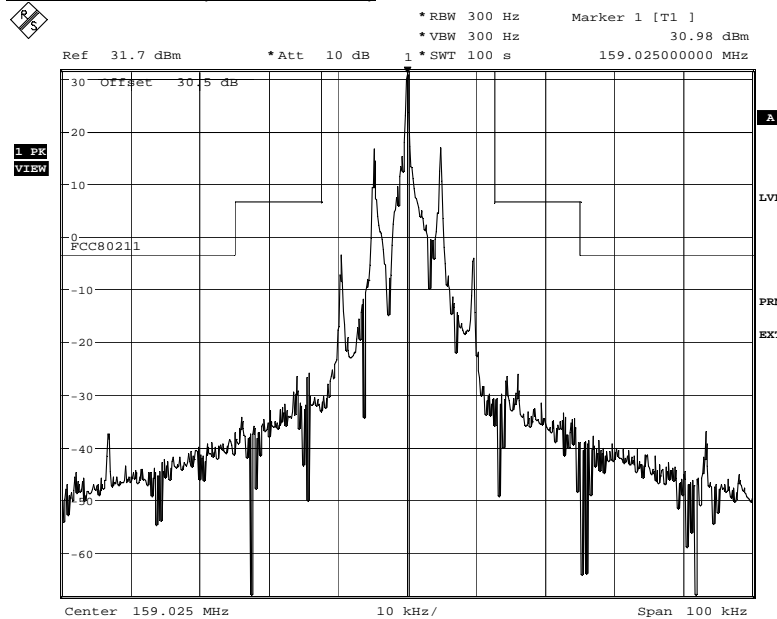
Transmitting at 25W

#### Bottom Channel (156.025 MHz)



Date: 11.MAR.2009 17:08:33

#### Middle Channel (159.025 MHz)

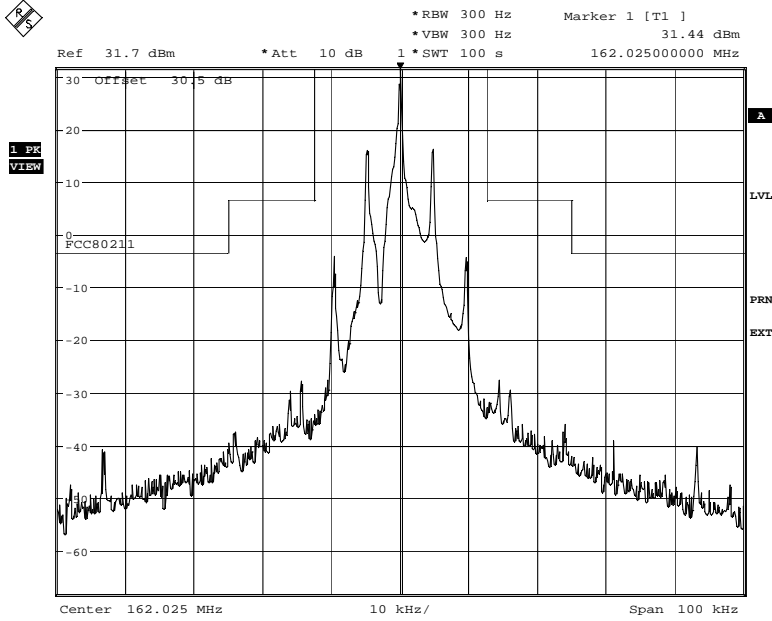


Date: 12.MAR.2009 16:56:42



Product Service

Top Channel (162.025 MHz)



Date: 11.MAR.2009 18:01:13





Product Service

## **2.5 OCCUPIED BANDWIDTH**

### **2.5.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.205(a)  
RSS-182, Clause 2.10

### **2.5.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.5.3 Date of Test and Modification State**

12 March 2009 - 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 Procedure**

Test performed in accordance with ANSI C63.4.

The EUT was connected via a 30dB attenuator to a Spectrum Analyser. The AIS transponder (EUT) output is a fixed digital signal and therefore cannot be adjusted in level or frequency. Therefore the EUT was transmitting a modulated signal. The Occupied Bandwidth was measured and plots taken.

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

Configuration 1 - Mode 1

### **2.5.6 Environmental Conditions**

	12 March 2009
Ambient Temperature	22°C
Relative Humidity	41%



Product Service

**2.5.7 Test Results**

Configuration 1 - Mode 1

Channel Number/Frequency	Power Level (W)	Result (kHz)	Authorised Bandwidth (kHz)
01 / 156.050MHz	2	9.551	20
16 / 156.800MHz	2	9.647	20
88 / 157.425MHz	2	9.519	20

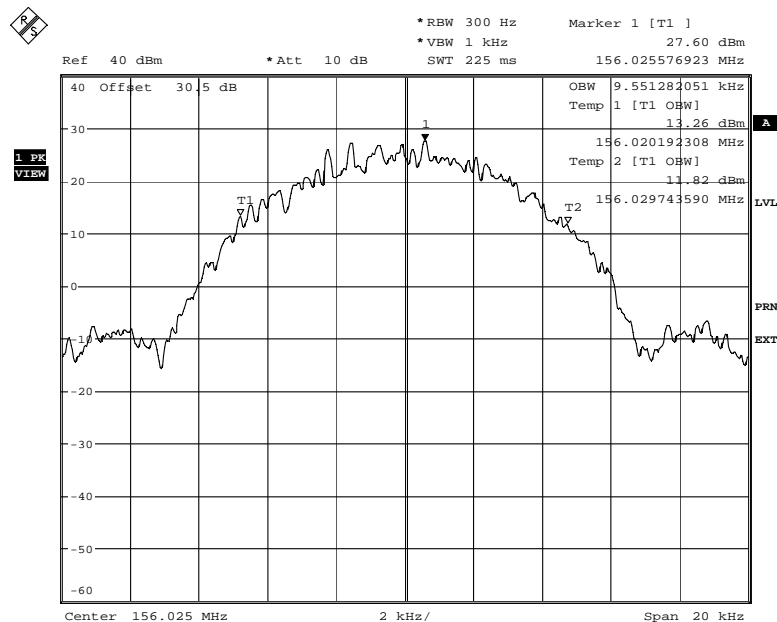
Limit:  
 Industry Canada Clause 3.4(d)(e)  
 FCC Clause 80.205(d)

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

The test result plots are presented below.

Transmitting at 2W

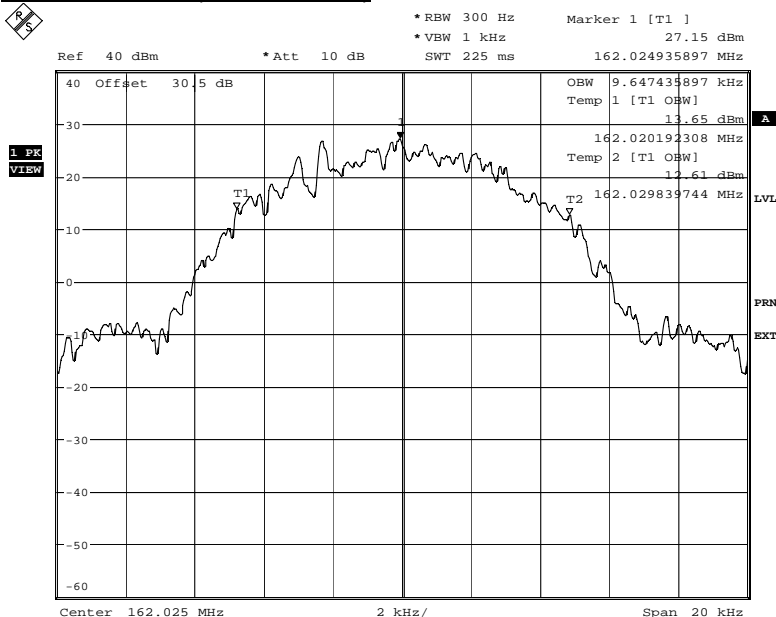
Bottom Channel (156.025 MHz)



Date: 12.MAR.2009 11:31:31

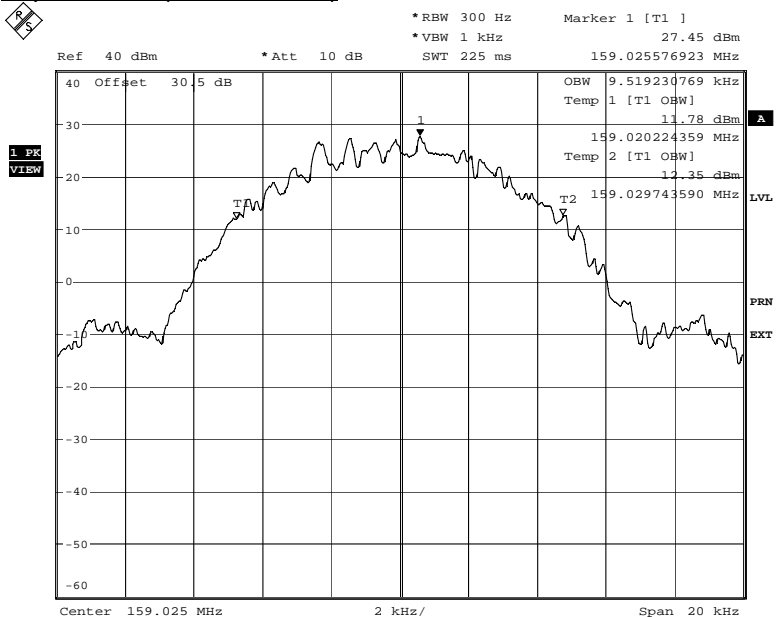


Middle Channel (159.025 MHz)



Date: 12.MAR.2009 11:35:02

Top Channel (162.025 MHz)



Date: 12.MAR.2009 15:18:36



Product Service

## **2.6 EMISSION LIMITATIONS (CONDUCTED TRANSMITTER SPURIOUS)**

### **2.6.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.211(c)(f)(3)  
RSS-182, Clause 4.4 and 6.3.1

### **2.6.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.6.3 Date of Test and Modification State**

12 March 2009 - 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 Procedure**

The EUT was connected to a Spectrum Analyser via a 30dB attenuator for one test range, and a 10dB attenuator and High Pass Filter for the other. The path loss between the Spectrum Analyser and the EUT was established for both set-ups over the measurement ranges and inserted into the Spectrum Analyser as a reference level offset. Using a RBW of 30kHz and a VBW of 30kHz the emissions were measured over the frequency ranges 9kHz to 300MHz and 300Mhz to 2GHz as defined in 2.1057(a)(1). Having entered the reference level offset, the limit line was displayed showing the -13dB,  $43 + 10\log P$ , limit.

The measurements were performed on the bottom, middle and top channels at a declared power level of 2W.

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

Configuration 1 - Mode 1

### **2.6.6 Environmental Conditions**

	12 March 2009
Ambient Temperature	22°C
Relative Humidity	39%



Product Service

### 2.6.7 Test Results

Limit:  
Industry Canada Clause 6.3.1  
FCC Clause 80.211(c)(f)(3)

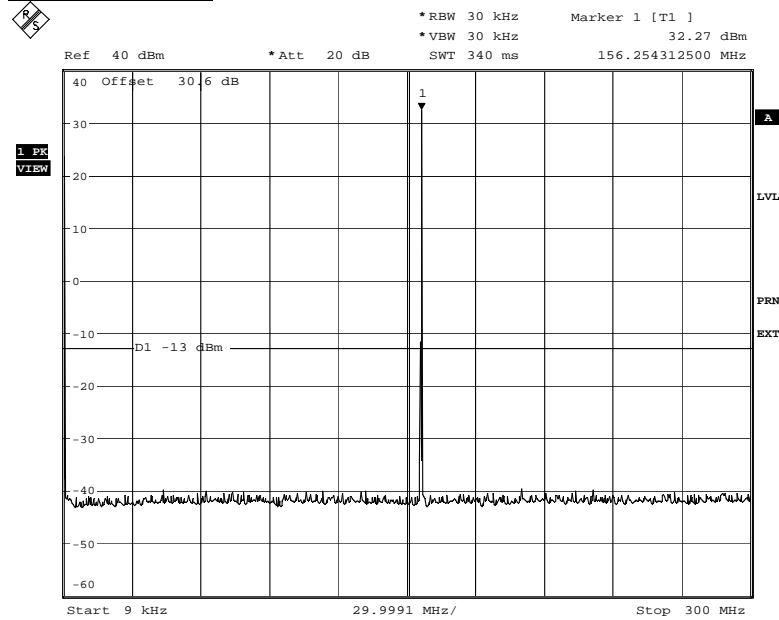
>250% of authorised bandwidth	43+10 Log P
-------------------------------	-------------

The test result plots are presented below.

#### Transmitting at 2W

#### Bottom Channel (156.025 MHz)

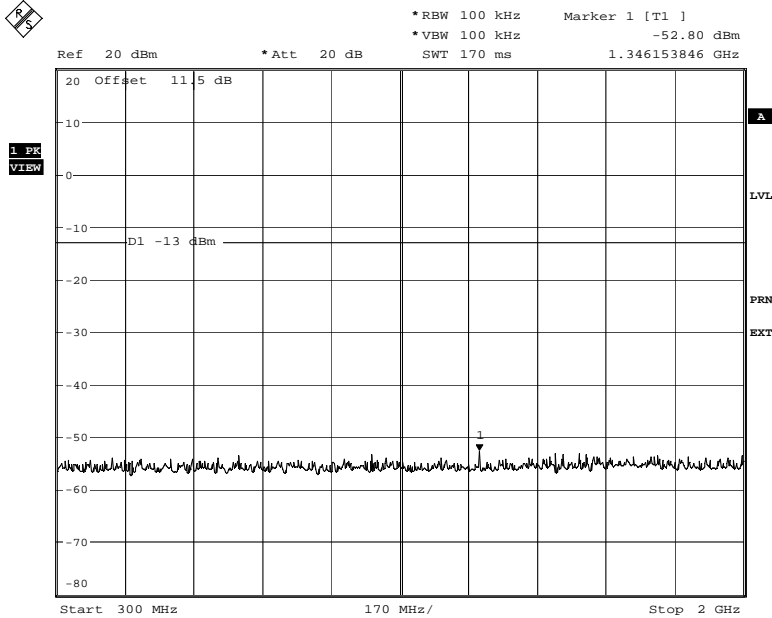
#### 9 kHz to 300MHz



Date: 12.MAR.2009 17:25:13



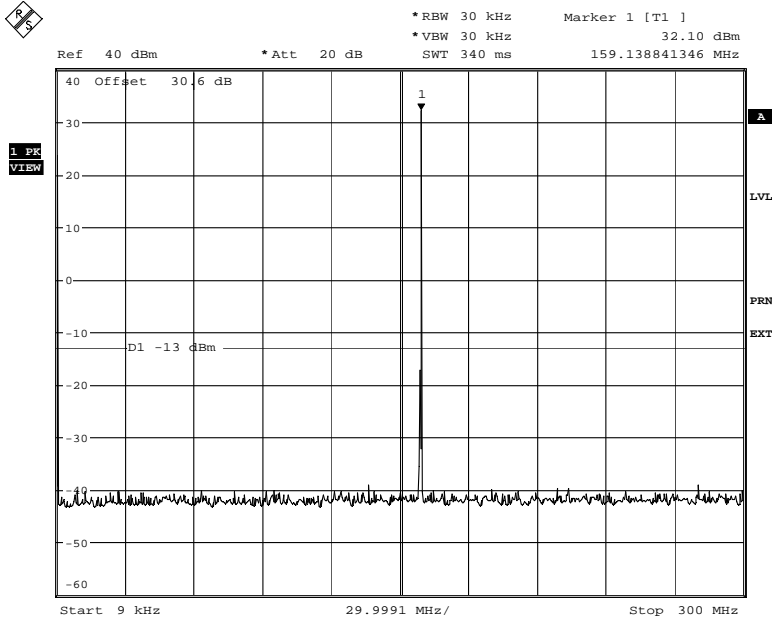
300 MHz to 2GHz



Date: 12.MAR.2009 17:44:09

Middle Channel (159.025 MHz)

9 kHz to 300 MHz

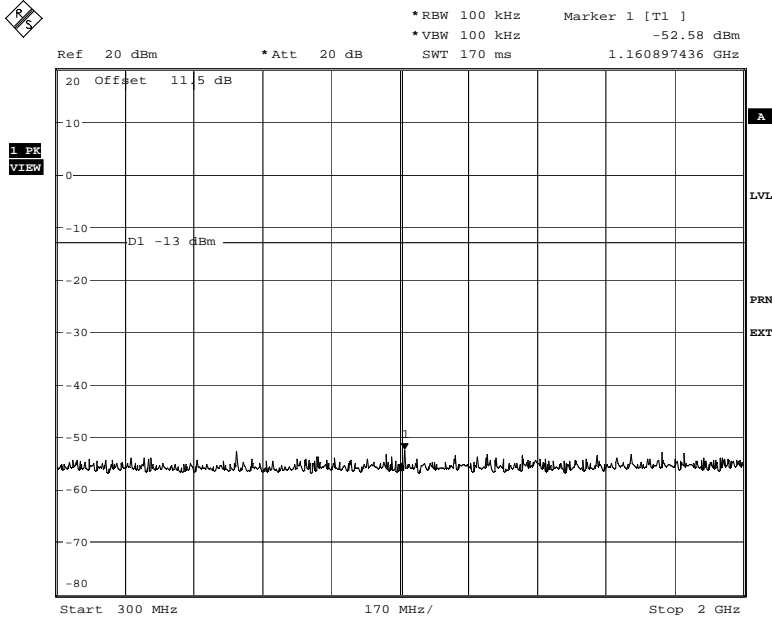


Date: 12.MAR.2009 17:23:53



Product Service

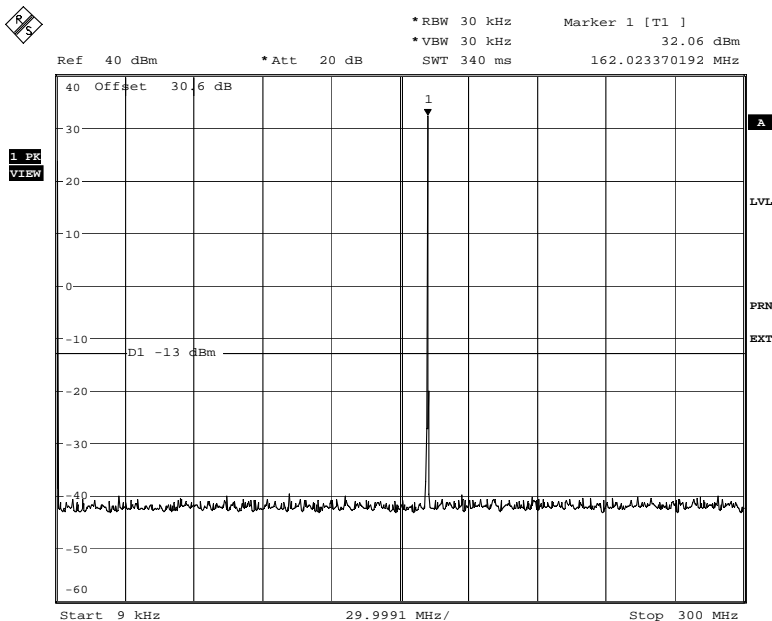
300 MHz to 2GHz



Date: 12.MAR.2009 17:45:17

Top Channel (162.025 MHz)

9 kHz to 300 MHz

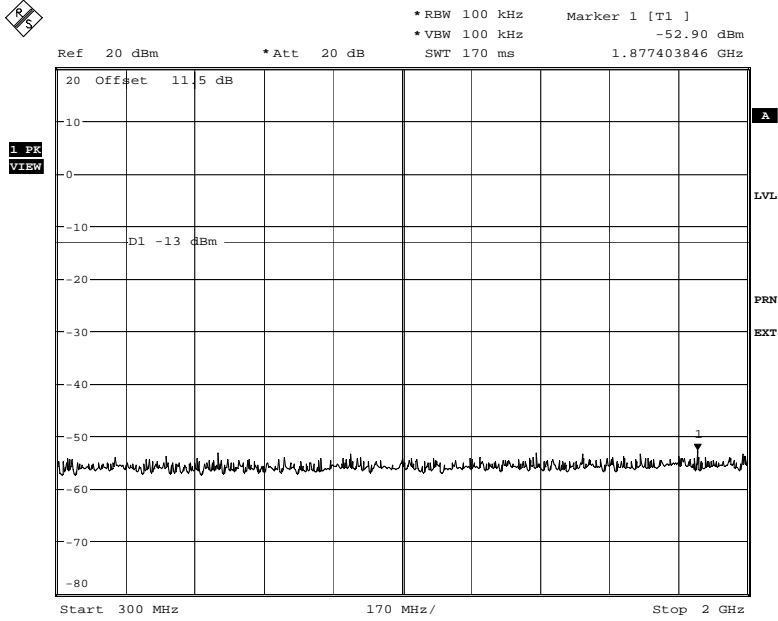


Date: 12.MAR.2009 17:26:40



Product Service

300 MHz to 2 GHz



Date: 12.MAR.2009 17:46:18





Product Service

## **2.7 RECEIVER SPURIOUS EMISSIONS (CONDUCTED)**

### **2.7.1 Specification Reference**

RSS-182, Clause 4.5(b) / 6.7

### **2.7.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.7.3 Date of Test and Modification State**

13 March 2009 - 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 Procedure**

The EUT was connected to a Spectrum Analyser via a cable. The path loss between the Spectrum Analyser and the EUT was established within the measurement range and inserted into the Spectrum Analyser as a reference offset level. The limit line as defined in the test clauses above was set and displayed on the Spectrum Analyser. The measurement detector was set to Max Hold.

The measurements were performed on the middle channel.

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

Configuration 1 - Mode 2

### **2.7.6 Environmental Conditions**

	13 March 2009
Ambient Temperature	22°C
Relative Humidity	43%



Product Service

2.7.7 Test Results

Limit:  
Industry Canada Clause 4.5(b) and 6.7

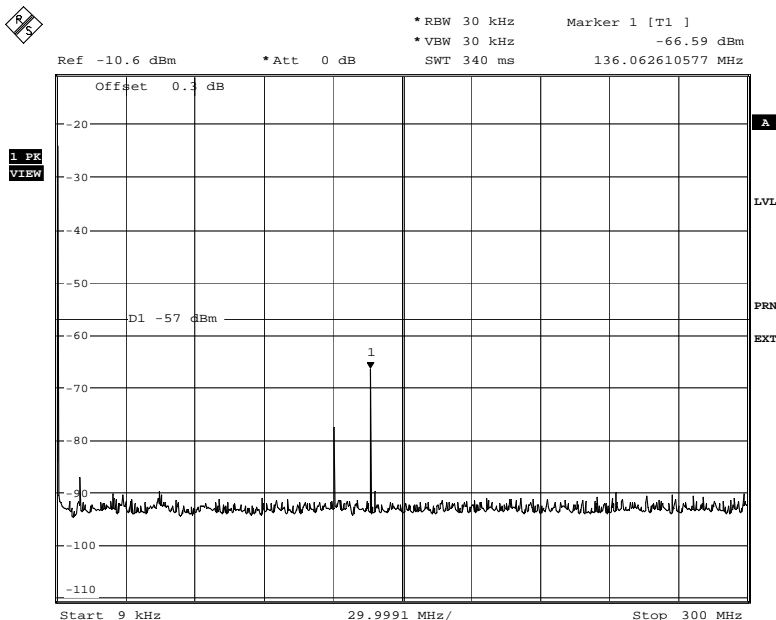
>250% of authorised bandwidth	43+10 Log P
-------------------------------	-------------

The test result plots are presented below.

Transmitting at 2W

Middle Channel (159.025 MHz)

9 kHz to 300 MHz

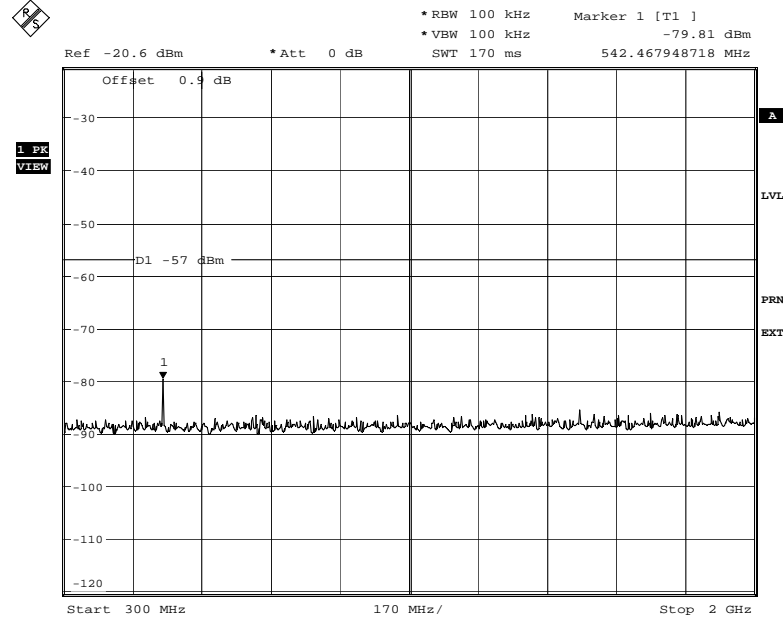


Date: 13.MAR.2009 11:09:35



Product Service

30 MHz to 2 GHz



Date: 13.MAR.2009 11:05:21



Product Service

## **2.8 MODULATION CHARACTERISTICS**

### **2.8.1 Specification Reference**

FCC CFR 47 Part 80, Clause 80.213(d)  
FCC CFR 47 Part 2, Clause 2.1055(a)

### **2.8.2 Equipment Under Test**

Raymarine AIS500, S/N: AE622350290011

### **2.8.3 Date of Test and Modification State**

20 March 2009 - 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 Procedure**

The EUT was connected to a Spectrum Analyser via a 30dB attenuator. Using the FM demodulation function various test signals were analysed and the peak deviation recorded.

Testing was performed on the bottom channel.

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

Configuration 1 - Mode 1

### **2.8.6 Environmental Conditions**

	20 March 2009
Ambient Temperature	22°C
Relative Humidity	29%



**2.8.7 Test Results**

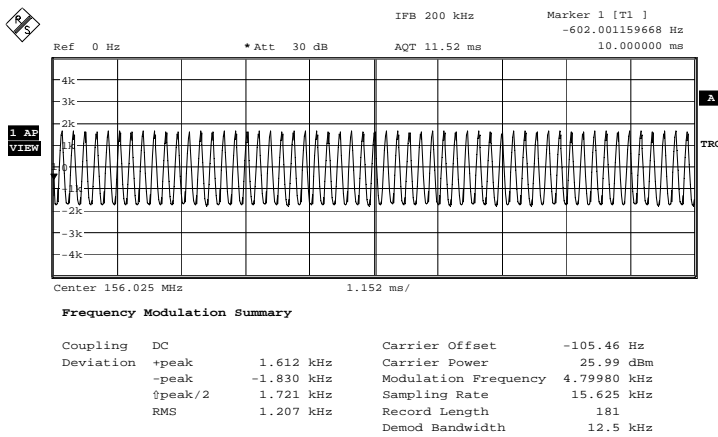
Configuration 1 – Mode 1

Test Signal	Peak Frequency (kHz)
	Bottom Channel (156.025 MHz)
10101010	1.830
11110000	2.631
Pseudo Random	2.645

**Limit**

< 5kHz
--------

10101010

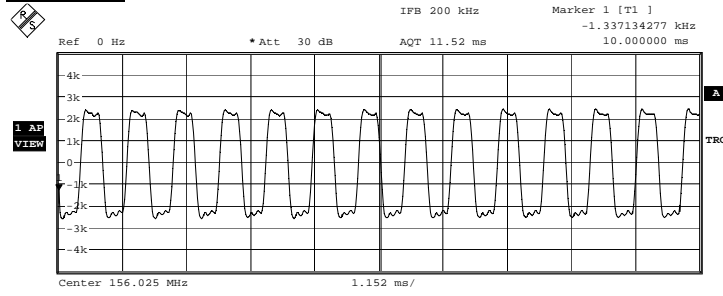


Date: 20.MAR.2009 11:55:24



Product Service

11110000

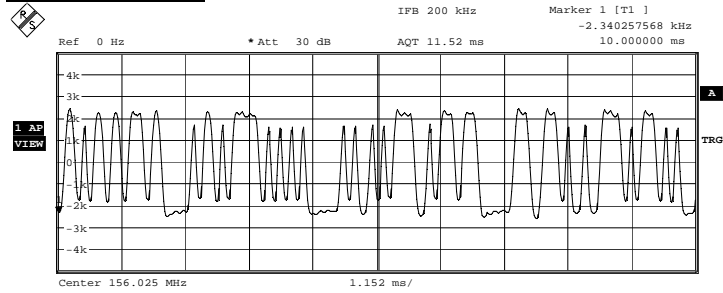


Frequency Modulation Summary

Coupling	DC	Carrier Offset	-107.59 Hz
Deviation	+peak 2.395 kHz	Carrier Power	26.00 dBm
	-peak -2.631 kHz	Modulation Frequency	1.20006 kHz
	†peak/2 2.513 kHz	Sampling Rate	15.625 kHz
	RMS 2.075 kHz	Record Length	181
		Demod Bandwidth	12.5 kHz

Date: 20.MAR.2009 11:57:53

Psuedo Random



Frequency Modulation Summary

Coupling	DC	Carrier Offset	-144.57 Hz
Deviation	+peak 2.407 kHz	Carrier Power	26.00 dBm
	-peak -2.645 kHz	Modulation Frequency	-- Hz
	†peak/2 2.526 kHz	Sampling Rate	15.625 kHz
	RMS 1.748 kHz	Record Length	181
		Demod Bandwidth	12.5 kHz

Date: 20.MAR.2009 12:01:19



Product Service

## **2.9 TRANSMITTER POWER**

### **2.9.1 Specification Reference**

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

### **2.9.2 Equipment Under Test**

Raymarine AIS500, S/N: EP2-03

### **2.9.3 Date of Test and Modification State**

27 March 2009 - 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 Procedure**

The EUT was connected via 10dB and 20dB attenuators to a power meter and sensor. The path loss between the EUT and the power sensor was measured and recorded. The power meter reading was adjusted by the path loss value.

The emissions designator for the EUT is declared as G3E. The measurement of G3E designations is defined as being Carrier Power. The Carrier Power was measured in a modulated state for FCC and Unmodulated for IC. DSC power was measured for B, Y and dotting modulations.

The carrier power was measured on the top, middle and bottom channels of the operating frequency band and channel 70 at maximum and minimum power levels.

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

Configuration 1 - Mode 1

### **2.9.6 Environmental Conditions**

	27 March 2009
Ambient Temperature	28°C
Relative Humidity	41%



Product Service

**2.9.7 Test Results**

Configuration 1 – Mode 1

Maximum Power - 2W

Frequency (MHz)	Output Power (uncorrected) (dBm)	Path Loss (dB)	Result (dBm) Unmodulated	Result (W)
156.025	+1.77	30.5	32.27	1.687
159.025	+1.58	30.5	32.08	1.614
162.025	+1.54	30.5	33.04	1.600

Limit:  
FCC Clause 80.215(g)

≥ 8 and 25 W
--------------

Industry Canada

43.98dBm ± 1dB (≤1W) and 6W to 25W
------------------------------------





Product Service

## 2.10 SUPPRESSION OF INTERFERENCE ABOARD SHIPS

### 2.10.1 Specification Reference

FCC CFR 47 Part 80, Clause 80.217 (b)

### 2.10.2 Equipment Under Test

Raymarine AIS500, S/N: EP2-03

### 2.10.3 Date of Test and Modification State

13 March 2009 - 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 Procedure

The EUT was connected to a spectrum Analyser via an RF cable. No external attenuation was inserted as there is no carrier present in this mode of operation. The EUT was set to its receive mode. The emissions were measured over the frequency range .9kHz to 2GHz

The manufacturer declares a maximum gain of the antenna to be 3dBi. Thus in accordance with 80.217(b), the 3dBi gain has been accounted for in the limit line and the deviation of the limits are shown in the table below.

Frequency of Interfering Emissions (MHz)	Power to Artificial Antenna ( $\mu$ W)	Power to Artificial Antenna (dBm)	Power to Artificial Antenna including Maximum Declared Antenna Gain (dB)
<30	400	-4	-7
30 – 100	4000	6	3
100 – 300	40000	16	13
300 - 2000	400000	26	23

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

Configuration 1 - Mode 2

### 2.10.6 Environmental Conditions

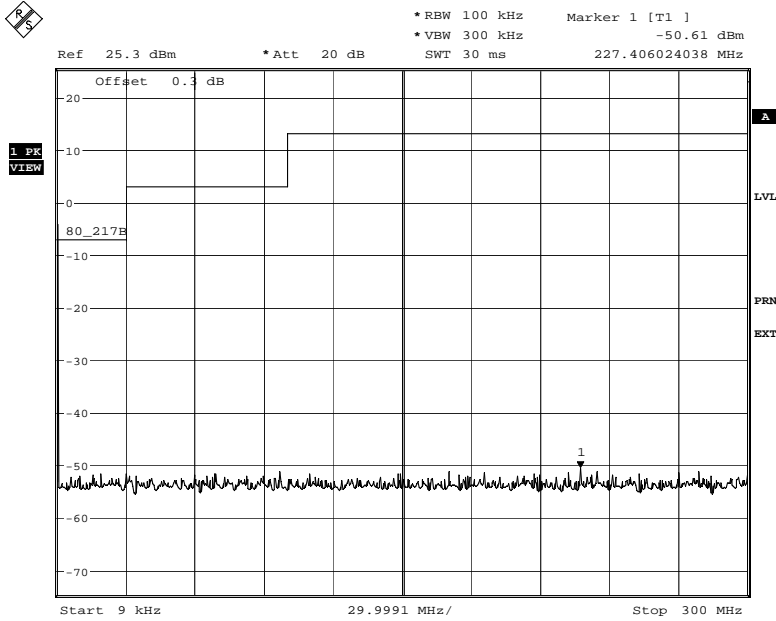
	13 March 2009
Ambient Temperature	22°C
Relative Humidity	43%



### 2.10.7 Test Results

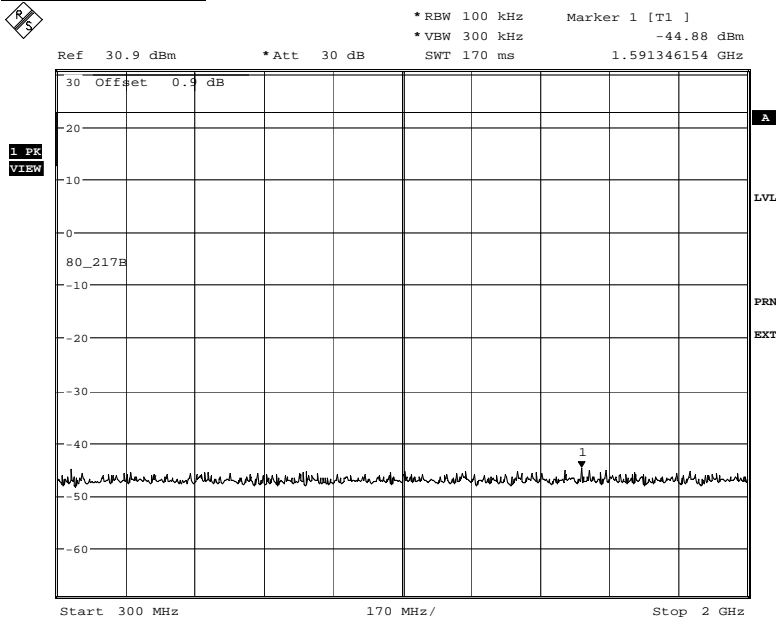
#### Configuration 1 – Mode 1

##### 9kHz to 300MHz



Date: 13.MAR.2009 12:55:30

##### 300MHz to 2GHz



Date: 13.MAR.2009 12:59:23



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
<b>Section 2.1 EMC - Radiated Emissions</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	6-Sep-2009
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	11-Sep-2009
Attenuator 20dB 5W	Marconi	56534-904H	377	12	29-Apr-2009
Pre-Amplifier	Phase One	PS04-0085	1532	12	15-Sep-2009
Pre-Amplifier	Phase One	PS04-0086	1533	12	15-Sep-2009
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Signal Generator	Rohde & Schwarz	SMR40	1589	12	30-Oct-2009
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	28-Nov-2009
Cable (1m, sma Type)	Reynolds	262-0248-1000	3221	12	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	20-Aug-2009
<b>Section 2.2 and 2.3 Radio (Tx) - Frequency Characteristics</b>					
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Thermocouple Thermometer	Fluke	51	3174	12	26-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (30dB, 150W)	Narda	769-30	3369	12	9-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
<b>Section 2.4 Radio (Tx) - Emission Mask</b>					
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (30dB, 150W)	Narda	769-30	3369	12	9-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
<b>Section 2.5 Radio (Tx) - Occupied Bandwidth</b>					
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (30dB, 150W)	Narda	769-30	3369	12	9-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.6 Radio (Tx) - Conducted Spurious Emissions</b>					
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
High Pass Filter	Mini-Circuits	NHP-300	1640	12	12-Aug-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (10dB, 150W)	Narda	769-10	3368	12	9-May-2009
Attenuator (30dB, 150W)	Narda	769-30	3369	12	9-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
<b>Section 2.7 Radio (Rx) - Conducted Emissions</b>					
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
<b>Section 2.8 Radio (Tx) - Modulation Characteristics</b>					
Signal Generator	Rohde & Schwarz	SMG	42	12	17-Jun-2009
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Crystal detector	Hewlett Packard	8470B	1320	12	9-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Attenuator (dc - 18GHz)	Suhner	6810.17.B	2966	12	20-Mar-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (30dB, 150W)	Narda	769-30	3369	12	9-May-2009
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon
Spectrum Analyser	Rohde & Schwarz	200704	N/A	N/A	N/A
<b>Section 2.9 Radio (Tx) - Power Characteristics</b>					
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (30dB, 150W)	Narda	769-30	3369	12	9-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
<b>Section 2.10 Radio (Rx) - Suppression of Interference Aboard Ships</b>					
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010

TU – Traceability Unscheduled

OP MON – Output Monitored with 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 10<sup>6</sup>.

\* In accordance with CISPR 16-4

† In accordance with UKAS Lab 34



Product Service

## **SECTION 4**

### **PHOTOGRAPHS**



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Front View



Rear View





Product Service

## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



Product Service

## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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