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# Report On

EMC Testing of the  
Raymarine Ltd  
AIS500 Class B AIS Transponder Unit

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Document 75904957 Report 02 Issue 2

January 2009



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**REPORT ON**

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**J Adams**  
Authorised Signatory

**DATED**

07 January 2009

**This report has been up-issued to Issue 2 to correct typographical errors.**





## CONTENTS

<b>Section</b>		<b>Page No</b>
<b>1</b>	<b>REPORT SUMMARY .....</b>	<b>3</b>
1.1	Introduction .....	4
1.2	Brief Summary of Results .....	5
1.3	Declaration of Build Status .....	6
1.4	Product Information .....	7
1.5	Test Conditions .....	9
1.6	Deviations From the Standard .....	9
1.7	Modification Record .....	9
<b>2</b>	<b>TEST DETAILS .....</b>	<b>10</b>
2.1	Compass Safe Distance (Enclosure Port) .....	11
<b>3</b>	<b>TEST EQUIPMENT USED .....</b>	<b>13</b>
3.1	Test Equipment Used .....	14
3.2	Measurement Uncertainty .....	15
<b>4</b>	<b>PHOTOGRAPHS.....</b>	<b>16</b>
4.1	Photographs of Equipment Under Test (EUT) .....	17
4.2	Test Set Up Photographs .....	18
<b>5</b>	<b>ACCREDITATION, DISCLAIMERS AND COPYRIGHT .....</b>	<b>19</b>
5.1	Accreditation, Disclaimers and Copyright.....	20



## **SECTION 1**

### **REPORT SUMMARY**

EMC Testing of the  
Raymarine Ltd  
AIS500 Class B AIS Transponder Unit



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Raymarine Ltd AIS500 Class B AIS Transponder Unit to the requirements of EN 60945: 2002.

Objective	To perform Electromagnetic Compatibility (EMC) Qualification Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Raymarine Limited
Model Number(s)	Class B AIS Transponder
Serial Number(s)	Xenon EP2-03, Motherboard EP2-0022, Sirius 322083918
Software Version	EP2-03
Hardware Version	Mod State 4
Application Software Version	Sirius3_10.6.8.14
ARM Microcontroller Software Version	1.2
Number of Samples Tested	1
Test Specification/Issue/Date	EN 60945: 2002
Incoming Release Date	Declaration of Build Status 03 November 2008
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	513 20 October 2008
Start of Test	25 November 2008
Finish of Test	25 November 2008
Name of Engineer(s)	J Holcombe
Related Document(s)	Not Applicable



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**1.2 BRIEF SUMMARY OF RESULTS**

A brief summary of results in accordance with EN 60945, is shown below.

Configuration 1 - Normal						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.1	1	Compass Safe Distance (Enclosure Port)	As Supplied	0	Pass	EN 60945: 2002

N/A – Not Applicable



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1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
<b>MANUFACTURING DESCRIPTION</b>	Raymarine AIS500 Class B AIS Transponder
<b>MANUFACTURER</b>	SRT Marine Technology Ltd.
<b>TYPE</b>	Class B AIS Transponder
<b>PART NUMBER</b>	401-0001
<b>SERIAL NUMBER</b>	EP2-01
<b>HARDWARE VERSION</b>	Mod State 4
<b>SOFTWARE VERSION</b>	EP2-03
<b>TRANSMITTER OPERATING RANGE</b>	156.025MHz to 162.025MHz
<b>RECEIVER OPERATING RANGE</b>	156.025MHz to 162.025MHz
<b>INTERMEDIATE FREQUENCIES</b>	38.855MHz
<b>HIGHEST INTERNALLY GENERATED FREQUENCY</b>	196.608MHz
<b>HIGHEST INTERNALLY GENERATED FREQUENCY IN RECEIVE IDLE MODE</b>	196.608MHz
<b>OUTPUT POWER (W or dBm)</b>	2W (33dBm)
<b>TECHNICAL DESCRIPTION (a brief description of the intended use and operation)</b>	Marine Class B AIS Transponder to IEC62287-1
<b>If unit is SRD being tested to ETS 301 489-3 please state Class of Equipment as defined in Section 6.1</b>	
BATTERY/POWER SUPPLY	
	NA – uses 12V DC supply
<b>MANUFACTURING DESCRIPTION</b>	
<b>MANUFACTURER</b>	
<b>TYPE</b>	
<b>PART NUMBER</b>	
<b>VOLTAGE</b>	
<b>SERIAL NUMBER</b>	
ANCILLARIES (if applicable)	
<b>MANUFACTURING DESCRIPTION</b>	NA
<b>MANUFACTURER</b>	
<b>TYPE</b>	
<b>PART NUMBER</b>	
<b>SERIAL NUMBER</b>	

**Signature** \_\_\_\_\_ Held on File  
**Date** \_\_\_\_\_ 03/11/08  
**D of B S Serial No** \_\_\_\_\_ EP2-01

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

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



## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a Raymarine Ltd AIS500 Class B AIS Transponder Unit as shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test





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#### **1.4.2 Test Configuration**

##### Configuration 1: Normal

The EUT was configured in accordance with EN 60945.

#### **1.4.3 Modes of Operation**

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

Mode 1 – Consist of three states.

- Un-powered State
- Normalised
- Powered Up

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



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## **1.5 TEST CONDITIONS**

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

The EUT was powered from a 12V DC supply.

## **1.6 DEVIATIONS FROM THE STANDARD**

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

## **1.7 MODIFICATION RECORD**

No modifications were made to the EUT during testing.



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## **SECTION 2**

### **TEST DETAILS**

EMC Testing of the  
Raymarine Ltd  
AIS500 Class B AIS Transponder Unit



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## **2.1 COMPASS SAFE DISTANCE (ENCLOSURE PORT)**

### **2.1.1 Specification Reference**

EN 60945, Clause 11.2

### **2.1.2 Equipment Under Test**

AIS500 Class B AIS Transponder Unit, S/N: Xenon EP2-03, Motherboard EP2-0022, Sirius 322083918

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

25 November 2008 - 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 EN 60945.

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

Configuration 1 - Mode 1

### **2.1.6 Environmental Conditions**

25 November 2008

Ambient Temperature 19°C

Relative Humidity 39%

Atmospheric Pressure 993mbar



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**2.1.7 Test Results**

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

The test results are shown below.

Configuration 1 - Mode 1

Orientation of the EUT	Un-powered State		Normalised		Powered Up	
	Distance From Compass (cm) at A° deflection	Distance From Compass (cm) at B° deflection	Distance From Compass (cm) at A° deflection	Distance From Compass (cm) at B° deflection	Distance From Compass (cm) at A° deflection	Distance From Compass (cm) at B° deflection
Front	17	17	17	17	22	17
Top	17	17	17	17	22	17
Left Hand Side	17	17	17	17	22	17
Right Hand Side	17	17	17	17	22	17
Underside	17	17	22	17	22	17
Rear	17	17	22	17	22	17

Standard Compass safe distance (cm)	25
Emergency Compass safe distance (cm)	20



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### **SECTION 3**

#### **TEST EQUIPMENT USED**



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### 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 - Compass Safe Distance</b>					
Sussex Helmholtz Coil	Various	88771	327	-	TU
Magnetometer	Bartington	MAG01	671	36	3-Sep-2011
Multimeter	Iso-tech	IDM101	2417	12	2-Sep-2009
Marine Binacle Compass with Azimuth Circle	Cassens & Plath	Type 11	3331	24	1-Jun-2009
Compass Verification Unit	TUV	CVU	3579	-	TU

TU – Traceability Unscheduled



### 3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
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





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## **SECTION 4**

### **PHOTOGRAPHS**



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Top View



Bottom View



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4.2 TEST SET UP PHOTOGRAPHS



Compass Safe Distance (Enclosure Port)



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## **SECTION 5**

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



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## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA  
(Not UKAS Accredited).

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