
REPORT ON

Limited FCC CFR 47: Parts 15 B Testing in support of an
Application for Grant of Equipment Authorisation
of a Raymarine RAY218 Fixed Mount VHF (with Class D DSC)

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Report No OR615608/01 Issue 2

March 2007



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DATED

6th March 2007

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: Parts 15 B. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

G Lawler





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SECTION 1

REPORT SUMMARY

Limited FCC CFR 47: Parts 15 B Testing in support of an
Application for Grant of Equipment Authorisation
of a Raymarine RAY218 Fixed Mount VHF (with Class D DSC)



1.1 STATUS

Equipment Under Test	Fixed Mount VHF (with Class D DSC)
Objective	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
Name and Address of Client	Raymarine Anchorage Park Portsmouth Hampshire PO3 5TD United Kingdom
Model Number	RAY218
Product Code	E43032
Serial Number	No.02
Hardware Version	1.00
Firmware Issue	1.00
Declared Variants	None
Test Specification/Issue/Date	FCC CFR 47: Part 15, Subpart B, October 2006
Number of Items Tested	One
Security Classification of EUT	Commercial-In-Confidence
Incoming Release Date	Declaration of Build Status 8 th November 2006
Disposal Reference Number Date	Held pending disposal Not Applicable Not Applicable
Order Number Date	112818-2 2 nd October 2006
Start of Test	19 th February 2007
Finish of Test	19 th February 2007
Related Documents	ANSI C63.4: 2001 FCC: DA 00-705



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1.2 INTRODUCTION

The information contained within this report is intended to show limited verification of compliance of the Raymarine RAY218 Fixed Mount VHF (with Class D DSC) to the requirements of FCC Specification Parts 15 B.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Raymarine.



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1.3 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out is shown below.

Section	Spec Clause	Test Description	Result	Levels/Comments
2.1	15.109	Spurious Radiated Emissions	Pass	
-	15.205	Measurement at the Band Edge (Marker Delta Method)	N/A	
-	15.207	Conducted Emissions on Power Ports	N/A	
-	15.247(b)(3)	Maximum Peak Output Power	N/A	

N/A – Not Applicable



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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Raymarine RAY218 Fixed Mount VHF (with Class D DSC) Marine Radio.

1.4.2 Modes of Operation

The EUT was set to Receive mode on middle channel. All signal and control cables were attached (R/C extension (worst case), NMEA, speaker and hailer). The appropriate termination details were supplied by Raymarine.

1.4.3 Test Configuration

As supplied by Raymarine:

Transmitter frequency bands : 156.025MHz to 157.425MHz

Receiver frequency channels : 156.025MHz to 163.275MHz

For the testing the EUT was set to receive on Channel 16.

The following cables were terminated as described:

NMEA in & out loaded by 100R resistor

Hailer loaded by 4R resistor

Speaker Loaded by 4R resistor



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1.5 TEST CONDITIONS

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site under FCC Registration Number: 90987 and tested in accordance with the applicable specification.

For all tests, the Raymarine RAY218 Fixed Mount VHF (with Class D DSC) was powered by a 12 V DC supply.

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards were made.

1.7 MODIFICATION RECORD

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

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied	N/A	
1	For Hailer PCB Add R501,R502 / 100 ohm Add CP501,CP502 / 0.01uF	Raymarine plc	Prior to testing
	For Raymic PCB Add RP001 / 100ohm Add CP002,CP004 / 0.01uF Add CP003 / 1000pF Added dual shield to the PCB as per photo A. Ferrite bead was added into the SPK output wire		

All testing was conducted at Modification State 1



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SECTION 2

TEST DETAILS

Limited FCC CFR 47: Parts 15 B Testing in support of an
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2.1 SPURIOUS RADIATED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47: Part 15 Subpart B, Section 15.109

2.1.2 Equipment Under Test

RAY218 Fixed Mount VHF (with Class D DSC)

2.1.3 Date of Test

19th February 2007

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.

A preliminary profile of the Spurious Radiated Emissions was 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 Measurement Antenna in both Horizontal and Vertical Polarisation. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

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

2.1.6 Environmental Conditions

Ambient Temperature	19.3°C
Relative Humidity	44%
Atmospheric Pressure	1002mbar



2.1 SPURIOUS RADIATED EMISSIONS

2.1.7 Test Results

The EUT met the requirements of FCC CFR 47: Part 15 Subpart B, Section 15.109 for Spurious Radiated Emissions (30MHz – 1GHz).

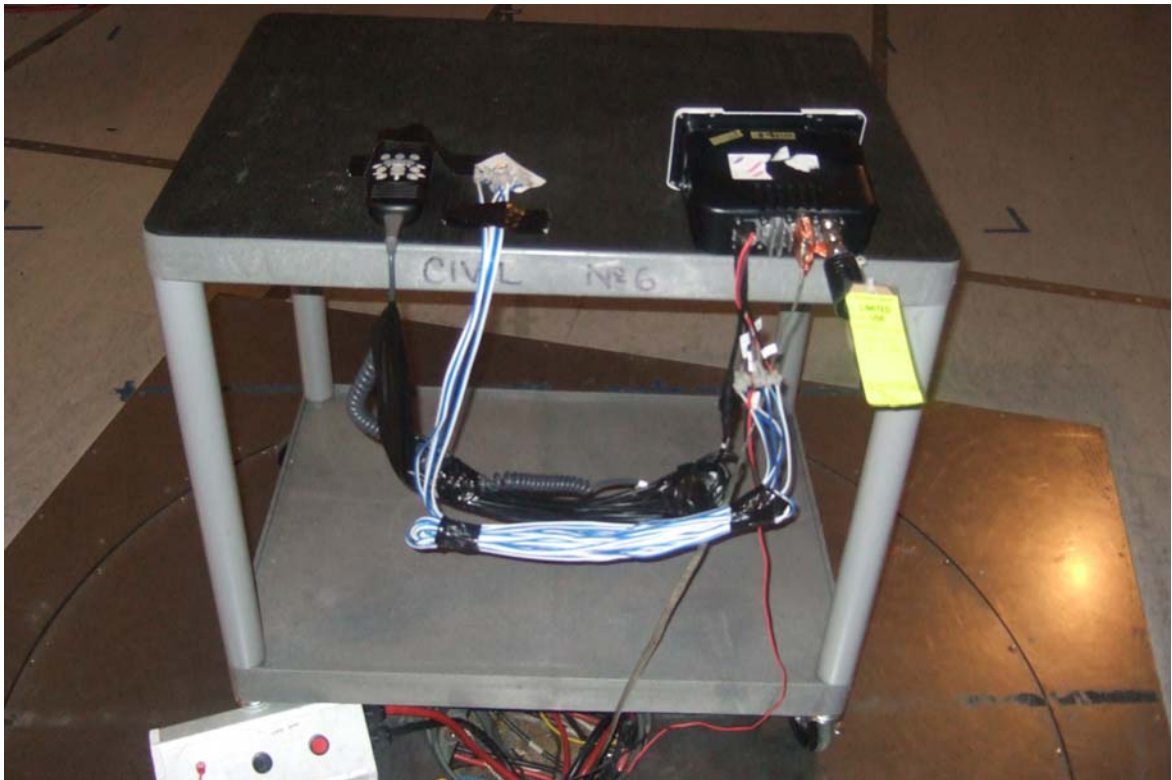
The levels of the six highest emissions measured in accordance with the specification are presented below: -

Frequency MHz	Polarisation	Height cm	Azimuth degree	Field Strength		Limit	
				dB μ V/m	μ V/m	dB μ V/m	μ V/m
30.81	Vertical	100	87	22.3	13.0	40.0	100.0
34.52	Vertical	100	0	16.9	7.0	40.0	100.0
135.20	Vertical	100	95	22.0	12.6	43.5	100.0
499.60	Vertical	100	0	16.8	6.9	46.0	100.0
811.20	Vertical	100	173	34.4	52.5	46.0	100.0
994.90	Vertical	100	0	23.2	14.5	54.0	100.0



2.1 SPURIOUS RADIATED EMISSIONS

2.1.7 Set up Photograph



Set Up Photograph



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SECTION 3

TEST EQUIPMENT



3.1 TEST EQUIPMENT

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

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.1 EMC - Radiated Emissions				
Spectrum Analyser	Hewlett Packard	8542E	18	09/02/2008
Screened Room (5)	Rainford	Rainford	1545	01/03/2008
Mast Controller	Inn-Co GmbH	CO 1000	1606	TU
Turntable/Mast Controller	EMCO	2090	1607	TU
DC Power Supply Unit	Hewlett Packard	6267B	1901	TU
Multimeter	Iso-tech	Iso Tech IDM101	2417	08/08/2007
Bilog Antenna	Chase	CBL6143	2904	10/11/2007
Comb Generator	Schaffner	RSG1000	3034	TU

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*

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

* In accordance with CISPR 16-4



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SECTION 4

PHOTOGRAPHS



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Front View of RAY218



Rear View of RAY218



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4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Label for RAY218



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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.

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