IEC 62238
TEST REPORT

For

Raymarine UK Ltd.

Marine House, Cartwright Drive Segensworth, Fareham, Hampshire, PO15 5RJ, United Kingdom

Tested Model: R70625
Multiple Model: R70624

Report Type:	**Product Type:**
Original Report	RAY 91 VHF BLACK BOX WITH AIS RX

Report Number:	RDG171114005-01B
Report Date:	2017-12-29
Reviewed By:	Candy Li RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen).

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Raymarine UK Ltd.*'s product, model number: *R70625* or the "EUT" in this report was a *RAY 91 VHF BLACK BOX WITH AIS RX*, which was measured approximately: 21.0 cm (L) x 16.0 cm (W) x 6.0 cm(H) for base, 6.5 cm (L) x 14.9 cm (W) x 3.2 cm(H) for handset, rated with input voltage: DC 12.0V.

Notes: This series products model: R70625 and R70624 are identical; they have the identical PCB,Material, only model name, product name and AIS module differently. Model R70625 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

** All measurement and test data in this report was gathered from production sample serial number: 171114005 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-11-14.*

Objective

This test report is prepared on behalf of *Raymarine UK Ltd.* in accordance with IEC 62238.

Related Submittal(s)/Grant(s)

No related submittal(s)

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the IEC 62238 First edition 2003-03, Maritime navigation and radiocommunication equipment and systems-VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC)-Methods of testing and required test results.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a DSC mode in accordance with IEC 62238.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Everfine	DC power supply	WY5015	1109009

SUMMARY OF TEST RESULTS

IEC 62238 Rules	Description of Test	Results
§7.4	Vibration Test	Compliance
§7.5	Temperature Tests	Compliance
§8.14	Test of Gennerated Call Sequences	Compliance
§9.13	Multiple Watch Characteristics	Compliance
§10.3	DSC Receiver Adjacent Channel Selectivity	Compliance
§10.5	DSC Receiver Intermodulation Response	Compliance
§10.8	Verification of Correct Decoding of Various Types of DSC Calls	Compliance
§10.9	Reaction to VTS and AIS Channel Management DSC Transmissions	Compliance
§10.10	Simultaneous Reception	Compliance

Note 1: a brief summary of the tests carried out in accordance with IEC 62238 standards.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
CMI	Vibration Tester	ACT2000-S06L	N/A	2017-06-03	2018-06-03
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2017-11-22	2018-11-22
Hewlett-Packard	Signal Generator	8657A	3217A04699	2017-12-18	2018-12-17
Agilent Technologies	Signal Generator	E4422B	T-08-RM137	2017-01-21	2018-01-20
H&P	Modulation Analyzer	8901B	3438A05208	2017-06-03	2018-06-03
Agilent	RF Communication test set	8920A	3325U00859	2017-06-03	2018-06-03
Agilent	Universal Frequency Center	53220A	N/A	2017-10-09	2018-10-08
Aeroflex	Digital Radio Test Set	3920	1000003253	2017-09-06	2018-09-05
Hyetra	DSC Decoder/Encoder	N/A	N/A	NCR	NCR

§7.4 VIBRATION TEST

Applicable Standard

The vibration test shall be performed as in IEC 62238, Clause 7.4

Limit:

The requirement of the performance check shall be met.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Levels:

- 2Hz to 5Hz and up to 13.2Hz with and excursion of ±1.43mm ± 10% (9.8m/s^2 maximum acceleration at 13.2Hz)
- Above 13.2Hz and up to 600Hz with a constant acceleration of 1g
- Nominal test voltage = +12Vdc

Endurance Test for 2 hour sat each resonant frequency or frequency with a g level ≥ 5 times the drive g level. If no resonant frequencies or frequency with a g level ≥ 5 times the drive g levelare found endurance test shall be performed at 30Hz.

Test Result: Compliance.

§7.5 TEMPERATURE TEST

Applicable Standard

The dry heat cycle shall be performed as in IEC 60945. Tests and performance chechs at extreme power supply conditions shall be performed under the environmental conditions as follow:

Environment	Normal power supply	Extreme power supply
Dry heat	Performance test	Performance check

Limit:

The requirement of the performance check shall be met.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

Environmental Conditions		Temperature	Voltage (V_{DC})	Test Period(Hour)	Results
Dry Heat	Storage Test	70±1℃	-	15	Compliance
	Functional Test	55±1℃	15.6	15	Compliance
			12.0	15	Compliance
			10.8	15	Compliance

§8.14 TEST OF GENNERATED CALL SEQUENCES

Applicable Standard

According to IEC 62238, Clause 8.14

Limit:

The requirement of ITU-R Recoomendation M.493-10/M.493-13/ M.493-14 regarding message composition and content shell be met.

The generated call shall be anlaysed with the calibrated apparatus for correct configuration of the signal format, including time diversity.

It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to the original channel. However, in the case of a distress call, the transmitter shall tune to channel 16 and automatically select the maximum power.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

Format specifier	Category	1st telecommand (symbol No.)	2st telecommand (symbol No.)
Distress	-	112	132
All Ships	Urgency	112	132
All Ships	Safety	112	132
Individual	Routine	112	132
Group	Routine	112	132

§9.13 MULTIPLE WATCH CHARACTERISTICS

Applicable Standard

According to IEC 62238, Clause 9.13

Limit:

Test Project	Requirement
Scanning Period	⩽2s
Dwell Time (Priority Channel)	⩽150ms
Dwell Time (Additional Channel)	Betweeen 850 ms and 2s

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

Test Conditions		Scanning Tine(s)	Dwell on Priority (ms)	Dwell on Additional (s)
Temperature(°C)	Voltage (V_{DC})			
-15	16.0	1.72	133	1.74
-15	12.0	1.75	132	1.73
-15	10.2	1.74	132	1.72
+25	12.0	1.75	133	1.73
+55	16.0	1.74	134	1.73
+55	12.0	1.77	138	1.73
+55	10.2	1.76	138	1.73

§10.3 DSC RECEIVER ADJACENT CHANNEL SELECTIVITY

Applicable Standard

According to IEC 62238, Clause 10.3

Limit:

The bit error ratio shall be less than 10^{-2}

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

Test Conditions		Bit Error Ratio	
		156.525MHz	
Temperature(°C)	Voltage (V_{DC})	+25 kHz	-25 kHz
-15	16.0	≤0.005	≤0.005
-15	12.0		
-15	10.2		
+25	12.0		
+55	16.0		
+55	12.0		
+55	10.2		

§10.5 DSC RECEIVER INTERMODULATION RESPONSE

Applicable Standard

According to IEC 62238, Clause 10.5

Limit:

The BER shall not exceed 10^{-2}

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

Frequency Increments of Unwanted Signals	**Bit Error Rate**
	156.525 MHz
+50/100 kHz	≤0.005
-50/100 kHz	≤0.005

§10.8 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS

Applicable Standard

According to IEC 62238, Clause 10.8

Limit:

The requirement of ITU-R Recoomendation M.493-10/M.493-13/ M.493-14 regarding message composition and content shall be met.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following tables.

Format specifier	Category	1st telecommand (symbol No.)	2st telecommand (symbol No.)
Distress	-	112	126
Individual Distress Relay	-	115	132
All ships Distress Relay	-	115	132
All Ships	Urgency	116	134
All Ships	Safety	110	130
Individual	Routine	122	132
Individual	Safety	120	131
Individual	Urgency	124	131
Group	Routine	118	128

	Confirm (Y or N)
Confirm that the decoded call sequences at the output of the receiver have been examined for correct technical format, including error check characteristics:	Y
Error found:	N
Confirm that the checks have been made to ensure accordance between printer output and display:	Y
Error found:	N
It has beenverified that the equipment is capable of switching to a channel identified in the DSC call:	Y

§10.9 REACTION TO VTS AND AIS CHANNEL MANAGEMENT DSC TRANSMISSIONS

Applicable Standard

According to IEC 62238, Clause 10.8

Limit:

The equipment shall not sound an alarm, display a message (an accurate, informative display is permissible but not required), transmit a message a reponse or suggest a transmitted response, lock up, or require operator intervention.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

	Confirm (Y or N)
Not sound an alarm	Y
Not display a message (An accurate informative display is permissible but not required)	Y
Not transmit a response	Y
Not suggest a transmitted response	Y
Not lock up	Y
Not require operator intervention	Y

§10.10 SIMULTANEOUS RECEPTION

Applicable Standard

According to IEC 62238, Clause 10.8

Limit:

Test Project	Requirement
SINAD Ratio (dB)	≥20 dB in presence of DSC Signal
Bit Error Rate	$\leqslant 10^{-2}$

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2017-12-22.

Test Result: Compliance. Please refer to following table.

SINAD (dB) No DSC Signal	SINAD (dB) DSC Signal Applied	Bit Error Rate
35.3	34.5	Less than 10^{-2}

******* END OF REPORT *******