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FCC PART 80 AND ISED RSS-238 C2PC TEST REPORT

APPLICANT	RAYMARINE UK LTD.
	MARINE HOUSE, CARTWRIGHT DRIVE SEGENSWORTH FAREHAM, HAMPSHIRE PO15 5RJ UNITED KINGDOM
FCC ID	PJ5-QUANTUM
IC	4069B-QUANTUM
MODEL NUMBER	QUANTUM
PRODUCT DESCRIPTION	LIGHT MARINE NAVIGATIONAL RADAR WITH WLAN
DATE SAMPLE RECEIVED	2/22/2018
DATE TESTED	3/12/2018
TESTED BY	Tim Royer
APPROVED BY	Franklin Rose
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Version Number	Description	Issue Date
281UT18TestReport	Rev1	Initial Report	03/20/2018

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

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GENERAL REMARKS

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Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ Not fulfill the general approval requirements as identified in this test report.

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669



Sr. EMC Engineer
EMC-003838-NE



Tested by: Tim Royer, Project Manager/Testing Engineer

Date: 03/19/2018



Reviewed and approved by: Franklin Rose, Project Manager/EMC Testing Technician

Date: 03/20/2018

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EUT SPECIFICATION

EUT Description	LIGHT MARINE NAVIGATIONAL RADAR WITH WLAN
FCC ID	PJ5-QUANTUM
IC	4069B-QUANTUM
Model Number	QUANTUM
Serial Number	E70498
Operating Frequency	9300-9500 MHz
Modulation	Digital
EUT Power Source	<input type="checkbox"/> 110–120Vac/50– 60Hz – Shipboard only
	<input checked="" type="checkbox"/> DC Power (12 V)
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
Type of Equipment	<input type="checkbox"/> Fixed
	<input checked="" type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
Antenna Gain	0 dBi

TEST SETUP INFORMATION

Test facility	Timco Engineering, Inc. 849 NW State Road 45 Newberry, FL 32669 Designation #: US1070
Test Condition	Temperature: 26°C Relative humidity: 50%. Barometer: 1012.5mb
Modifications	None
Test Exercise	The EUT was placed in continuous transmit mode of operation
Applicable Standards	ANSI/TIA 603-E: 2016, FCC CFR 47 Part 80, Part 90, ISSED RSS-238, RSS-GEN

TEST RESULTS SUMMARY

Test	Regulatory Body	Rule	Result
Field Strength of Spurious Emissions	FCC	Part 80.211(f)	Pass
	ISED	RSS 238 4.3	Pass

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FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: FCC Part 2.1053, Part 80.211(f), RSS-238 4.3

Requirements:

Part 80.211(f): $43 + 10\log$ (mean power in watts)

RSS 238 4.3: The unwanted emission power in any 1 MHz bandwidth shall be attenuated below the transmitter peak power by at least 20 dB per decade from the edge of the 40 dB bandwidth and beyond. The unwanted emissions power shall not need to be attenuated more than 60 dB below the transmitter peak power.

METHOD OF MEASUREMENT: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental or 40 GHz. This test was conducted per the standard listed above using the substitution method.

Test Data:

Power Output			Limit	
dBm	Watts		dBc	dBm
39.82	9.59		52.82	-13.00
Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	ERP (dBm)	Margin (dB)
187.5	26.1	V	-56.085	43.08
179.6	26.1	H	-55.609	42.61
57.0	27.0	H	-60.814	47.81
260.3	28.1	H	-54.526	41.53
201.2	26.8	V	-57.756	44.76
8800.0	32.2	V	-18.087	5.09
8800.0	31.4	H	-18.817	5.82
28200.0	7.8	H	-46.217	33.22
28200.0	6.8	V	-47.207	34.21
37600.0	16.3	V	-33.907	20.91
37600.0	16.2	H	-34.067	21.07

Results Meet Requirements

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STATE OF THE MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: “Uncertainty in EMC Measurements” and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	$\pm 49.5 \text{ Hz}$	(1)
RF Conducted Power	$\pm 0.93 \text{ dB}$	(1)
Conducted spurious emission of transmitter valid up to 40GHz	$\pm 1.86 \text{ dB}$	
Occupied Bandwidth	$\pm 2.65\%$	
Audio Frequency Response	$\pm 1.86 \text{ dB}$	
Modulation limiting	$\pm 1.88\%$	
Radiated RF Power	$\pm 1.4 \text{ dB}$	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq.	$\pm 1.88\%$	
Within 6kHz and 25kHz of audio Freq.	$\pm 2.04\%$	
Rad Emissions Sub Meth up to 26.5GHz	$\pm 2.14 \text{ dB}$	
Rad Emissions Sub Meth up to 18-40 GHz	$\pm 2.04\%$	
Adjacent channel power	$\pm 1.47 \text{ dB}$	(1)
Transient Frequency Response	$\pm 1.88\%$	
Temperature	$\pm 1.0^\circ \text{C}$	(1)
Humidity	$\pm 5.0\%$	

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
24 Volt Power Supply	Astron	VLS-25M	9510040	N/A	N/A
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
USB Peak Power Sensor 50 MHz to 18 GHz	Boonton	55318	9224	09/13/16	09/13/18
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
LPA	Electro-Metrics	LPA-25	1122	07/26/2017	07/26/2019
Double Ridged Horn 2	ETS- Lindgren	3117	00041534	03/01/2017	03/01/2019
DOUBLE-RIDGE HORN ANTENNA	EMCO	3116	9011-2145	12/08/2017	12/08/2019
Active Loop	ETS – LINDGREN	6502	00062529	12/11/2017	12/11/2019

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

END OF REPORT