TIMCO ENGINEERING, Inc.

An IIA Company

Test Report – C2PC-FCC Part 80 (Radar)
Applicant: Wartsila Guidance Marine Ltd

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager

Date of Signature 8/8/2023

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1. Applicant Information

Applicant: Wartsila Guidance Marine Ltd
Address: 5 Tiber Way
Meridian Business Park
Leicester, LE19 1QP, United Kingdom

1.1 Part 80 Test Result Summary

The following test procedure and guidance were used for measuring FCC PART 80 (STATIONS IN THE MARITIME SERVICES) known as Licensed Maritime Radiotelephone; ANSI C63.26-2015. Full test results are available in this report.

Applicable Clauses from Part 2		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
2.202	Bandwidth & Emission	Pass
2.1033 (c)(8)	Power at the Final Amplifier	N/A
2.1046 (a)	RF Output Power	Pass
2.1047	Modulation characteristics	N/A
2.1049	Occupied Bandwidth	Pass
2.1051	Spurious emissions at antenna terminals	Pass
2.1053	Field strength of spurious radiation	N/A
2.1055	Frequency stability	N/A

Applicable Clauses from Part 80		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
80.205 (a), (d)	Bandwidths & Emission designator	Reported
80.209 (c)	Transmitter Frequency Tolerance	N/A
80.211 (f)	Emission Limitations, In-band	Pass
80.211 (f)	Emission Limitations, Out-of-band	Pass
80.213 (g)	Modulation Requirements	N/A
80.215 (a) (3), (n) (3)	Transmitter Power	Pass

No additions to the test methods were needed. There were no deviations, or exclusions from the test methods. No test results are from external providers or from the customer. The test results relate only to the items tested. Timco does not offer opinions and interpretations, only a pass/fail statement.

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2. Location of Testing

2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA").
Testing was performed at Timco's permanent laboratory located at 849 NW State Road 45, Newberry, Florida 32669

FCC test firm # 578780
FCC Designation # US1070
FCC site registration is under A2LA certificate # 0955.01
ISED Canada test site registration # 2056A
EU Notified Body # 1177
For all designations see A2LA scope # 0955.01

2.2 Testing was performed, reviewed by

Dates of Testing: 5/17/2023

Sr. EMC Engineer
EMC-003838-NE

Signature: _____

Name & Title: Tim Royer, EMC Engineer

Date of Signature 8/8/2023

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3. Test Sample(s) (EUT/DUT)

The test sample was received: 5/2/2023

3.1 Description of the EUT

A description as well as unambiguous identification of the EUT(s) tested. Where more than one sample is required for technical reasons (such as the use of connected units for the purpose of conducted output power testing where the product units will have integral antennas), each specific test shall identify which unit was tested.

Identification	
FCC ID:	VYMARTEMIS
Brief Description	Marine Direction Finding X-Band Radar
Model(s) #	Mk6C
Firmware version	1.0
Software version	7.6.3
Serial Number	2304040

Technical Characteristics	
Frequency Range	9200 MHz- 9300 MHz
RF O/P Power (Max.)	10.60 dBm/ 0.0115 W
Modulation	N/A
Bandwidth & Emission Class	913KP0N
Number of Channels	N/A
Duty Cycle	100%
Antenna Connector	SMA
Voltage Rating (AC or Batt.)	240 VAC

Antenna Characteristics			
Antenna	Frequency Range	Mode / BW	Antenna Gain
1	n/a	n/a	28 dBi

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3.2 Configuration of EUT

Test Modes				
Mode (#)	Mode (Type)	Test Frequencies (MHz)	BW (nominal) (MHz)	Emission Designator
1	Transmit	9270 MHz	200 MHz	KP0N

Operating conditions during Testing:

The device was operated without the provided antenna(s).

No other modifications of the device under test (including firmware, specific software settings, and input/output signal levels to the EUT) were made.

Peripherals used during Testing:

No peripherals used.

3.3 Test Setup of EUT

Equipment, antenna, and cable arrangement. The setup of the equipment and cable or wire placement on the test site that produces the highest radiated and the highest ac power line conducted emissions shall be shown clearly and described. Information on the orientation of portable equipment during testing shall be included. Drawings or photographs may be used for this purpose.

Test Setups are included in the test report.

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4. Test methods & Applicable Regulatory Limits

4.1 Test methods/Standards/Guidance:

Test procedures and guidance for measuring Licensed Part 80, 87, & 90 Licensed device:

1) ANSI C63.26-2015
2) ITU-R M.1177-3 (per 80.273 (a) (6))

4.2 Applied Limits and Regulatory Limits:

1) FCC CFR 47 Part 80

5. Measurement Uncertainty

Parameter	Uncertainty (dB)
Conducted Emissions	± 3.14 dB
Radiated Emissions (9kHz – 30 MHz)	± 3.08 dB
Radiated Emissions (30 – 200 MHz)	± 2.16 dB
Radiated Emissions (200 – 1000 MHz)	± 2.15 dB
Radiated Emissions (1 GHz – 18 GHz)	± 2.14 dB
Radiated Emissions (18 GHz – 40 GHz)	± 2.31 dB
Note: The uncertainties provided in this table represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of K=2.	

6. Environmental Conditions

6.1 Temperature & Humidity

Measurements performed at the test site did not exceed the following:

Parameter	Measurement
Temperature	23 C +/- 5%
Humidity	55% +/- 5%
Barometric Pressure	30.05 in Hg
Note: Specific environmental conditions that are applicable to a specific test are available in the test result section.	

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7. List of Test Equipment and Test Facility

The test equipment used identified by type, manufacturer, serial number, or other identification and the date on which the next calibration or service check is due.

Description of the firmware or software used to operate EUT for testing purposes.

A complete list of all test equipment used shall be included with the test report. The manufacturer's model and serial numbers, and date of last calibration, and calibration interval shall be included. Measurement cable loss, measuring instrument bandwidth and detector function, video bandwidth, if appropriate, and antenna factors shall also be included where applicable.

7.1 List of Test Equipment

Test Equipment						
Type	Device	Manufacturer	Model	SN#	Current Cal	Cal Due
Receiver	EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	5/27/21	5/26/2024
Function Generator	Function Generator	Standford	DS340	25200	1/13/21	1/13/2024

Software			
Software	Author	Version	Validation on
ESU Firmware	Rohde & Schwarz	4.43 SP3; BIOS v5.1-24-3	2018
RSCommander	Rohde & Schwarz	1.6.4	2014
ScopeExplorer	LeCroy	v2.25.0.0	2009
Field Strength	Timco	v4.10.7.0	2016

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8. Test Results

The results of the test are usually indicated in the form of tables, spectrum analyzer plots, charts, sample calculations, as appropriate for each test procedure.

A description and/or a block diagram of the test setup is usually provided.

The measurement results, along with the appropriate limits for comparison, may be presented in tabular or graphical form. In addition, any variation in the measurement environment may be reported if applicable (e.g., a significant change of temperature that could affect the cable loss and amplifier response).

Unless noted otherwise in the referenced standard, the measurements of ac power-line conducted emissions and conducted power output will be reported in units of dBµV. Unless noted otherwise in the referenced standard, the measurements of radiated emissions will be reported in units of decibels, referenced to one microvolt per meter (dBµV/m) for electric fields, or to one ampere per meter (dBA/m) for magnetic fields, at the distance specified in the appropriate standards or requirements. The measurements of antenna-conducted power for receivers may be reported in units of dBµV if the impedance of the measuring instrument is also reported. Otherwise, antenna-conducted power will be reported in units of decibels referenced to one milliwatt (dBm). All formulas for data conversions and conversion factors, if used, will be included in this measurement report.

Example:

Freq (MHz)	Meter Reading	+ ACF	+CL	= FS
33	20 dBµV	+ 10.36 dB/m	+0.40 dB	=30.36 dBµV/m @ 3m

EIRP = Pcond (dBm) + dBi

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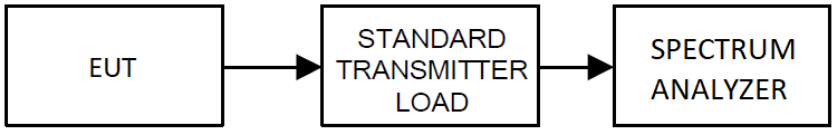
8.1 RF Output Power

Limits from FCC Parts 2.1046(a), 80.215 (a) (3), (n) (3), 87.131 footnote 4, and 90.205 (r); and test procedure from ANSI C63.26-2015.

Test Setup


Test Results				
Mode	Tuned Frequency (MHz)	Method	Measured Peak Power Output (dBm)	Measured Peak Power Output (W)
1	9270 MHz	Conducted	10.60	0.0115 W

Maximum Peak Power: 10.60dBm/ 0.0155 W

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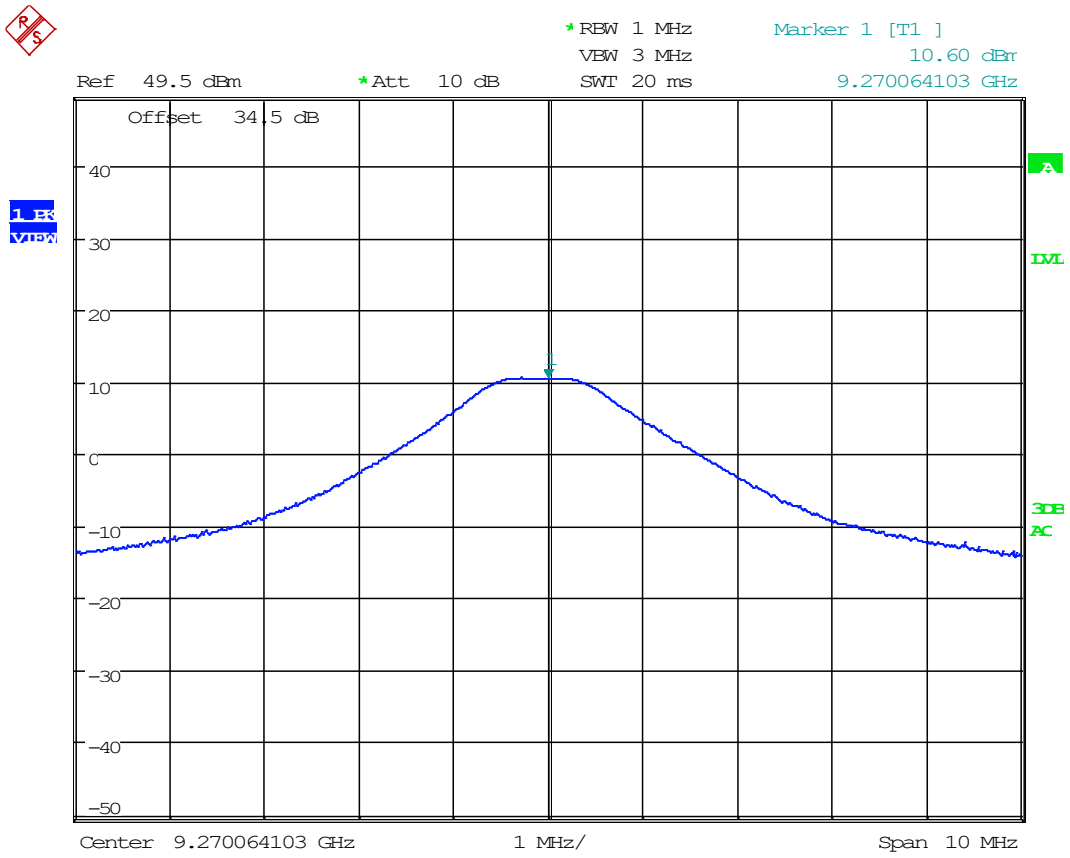
8.1.1 RF Power Output Plot, 9270 MHz



Date: 17.MAY.2023 11:42:39

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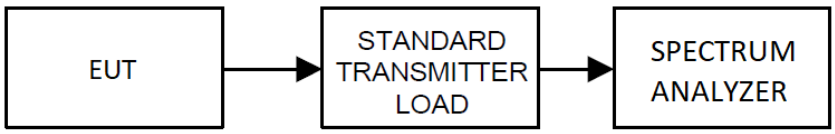
8.2 Bandwidth & Emission

Limits from FCC Parts 2.1049, 80.205 (a) and test procedure from ANSI C63.26-2015.

Test Setup


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Test Results, Authorized Bandwidth		
Rule Part	Operating Range	Authorized Bandwidth
Part 80	9.2 – 9.3 GHz	200 MHz

Test Results, Occupied Bandwidth		
Tuned Frequency (MHz)	Occupied Bandwidth (MHz)	Bandwidth Type
9270 MHz	1.23 MHz	99% Power

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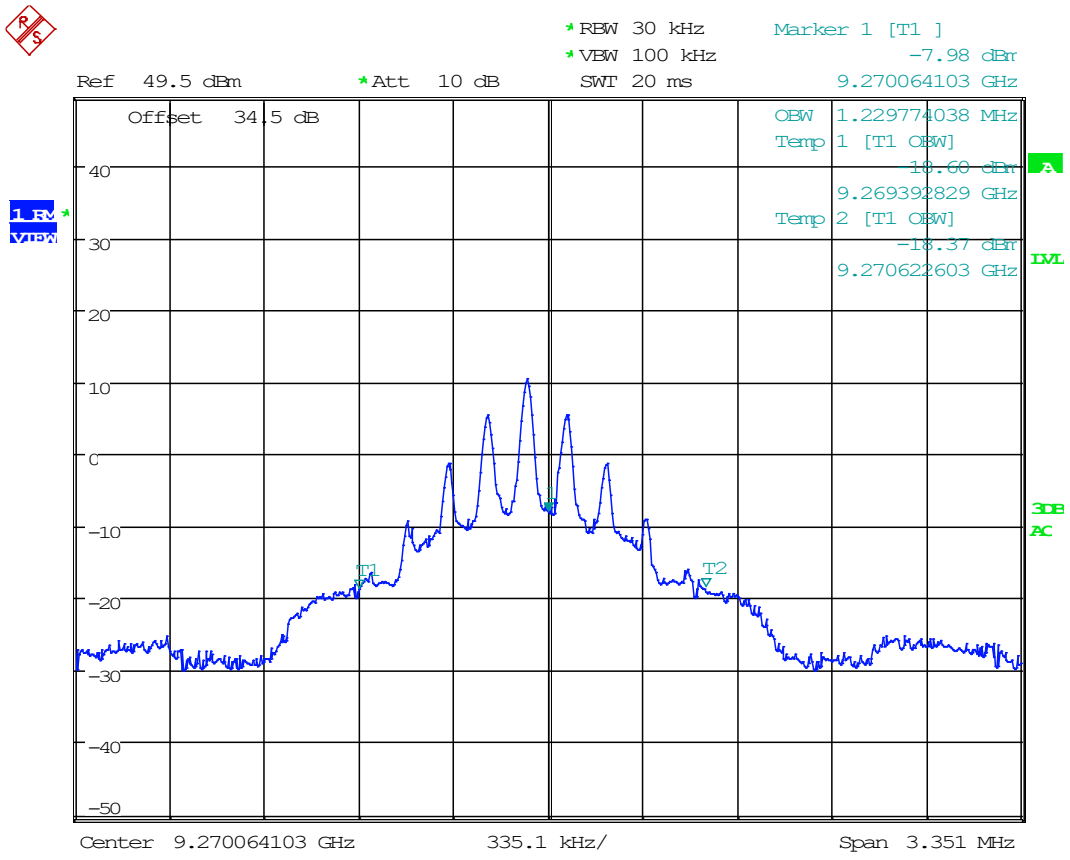
8.2.1 99% Bandwidth Plot, 9270 MHz



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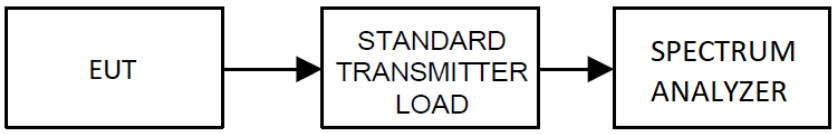
8.3 Emission Limitations, Out-of-Band

Limits from FCC Parts 2.1051, 80.211 (f) and test procedure from ANSI C63.26-2015.

Conducted Test Setup


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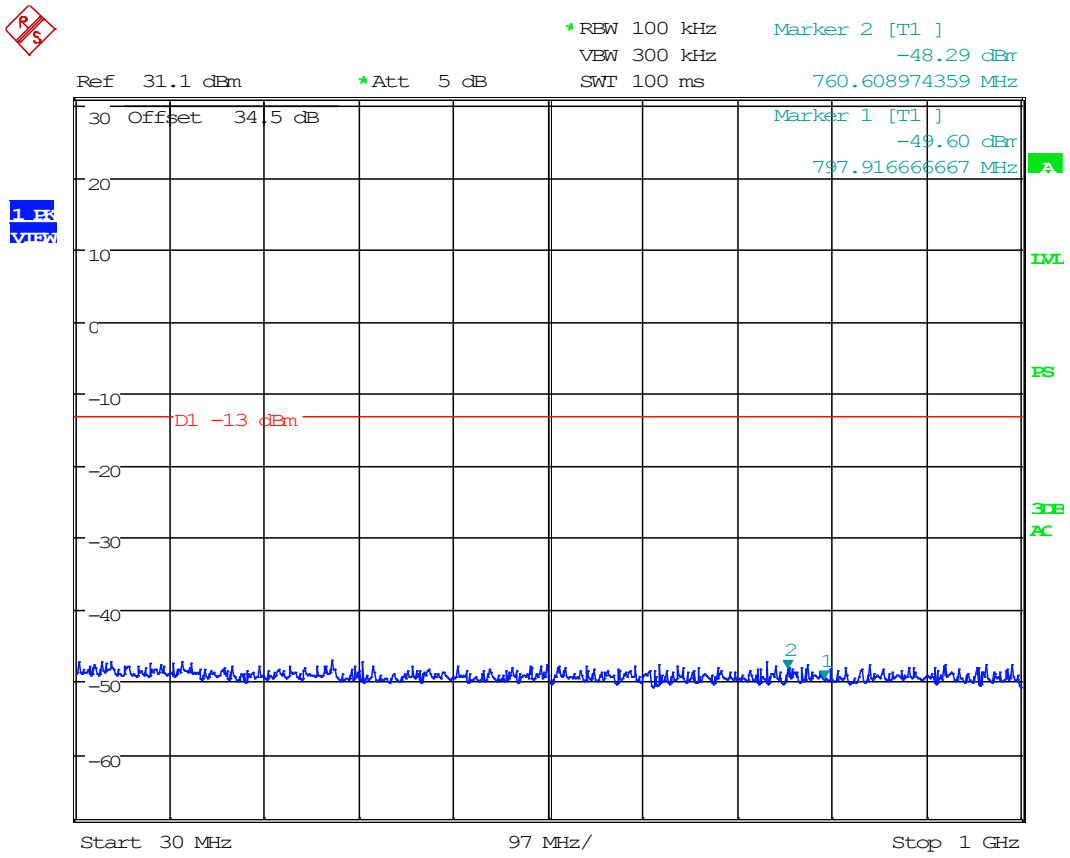
8.3.1 Conducted Emissions, Below 1GHz, 9270 MHz



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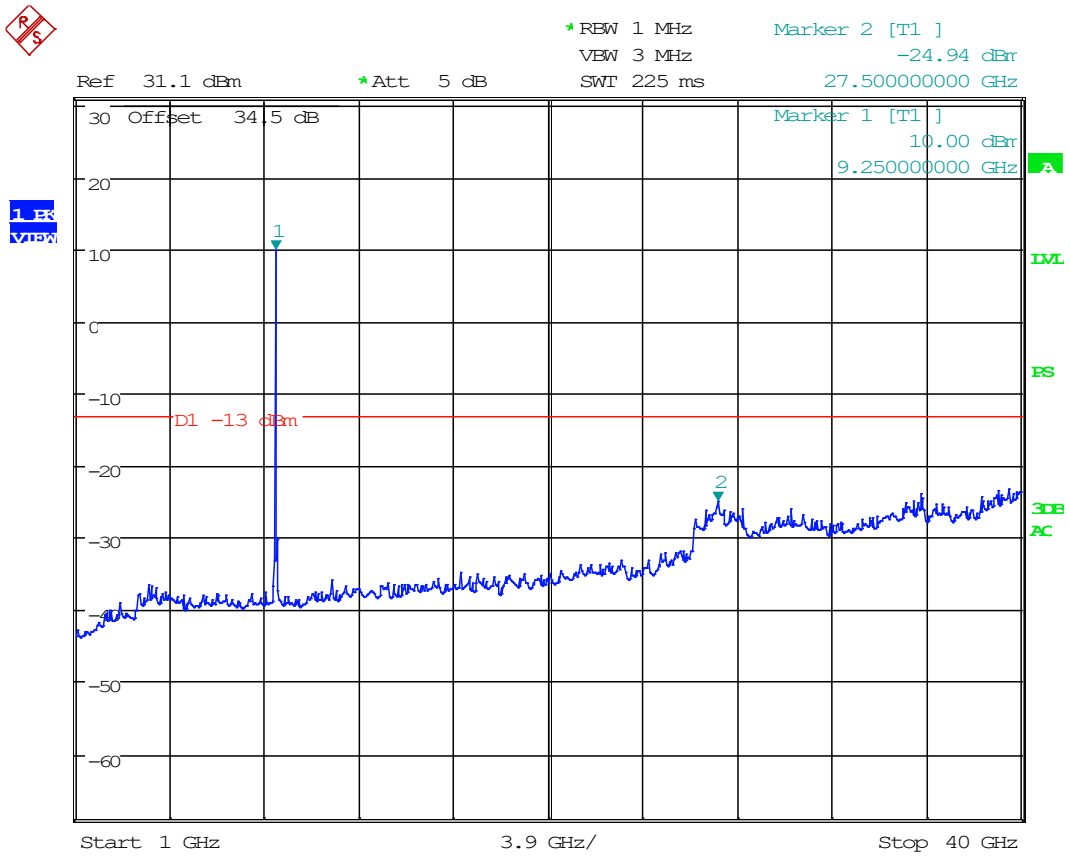
8.3.2 Conducted Emissions, Above 1GHz, 9270 MHz



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9. ANNEX-A - Photographs of the EUT

Photographs of the EUT and any manufacturer supplied accessories to be used with the EUT are in separate supplementary documents labelled EXTERNAL PHOTOS and INTERNAL PHOTOS.

10. ANNEX-B – Test Setup Photographs

Test setup photographs are located in a separate supplementary ANNEX-B document.

11. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_7753-23_C2PC_FCC 80_Radar_	1	Initial release	5/30/2023
	2	Updated Page 3 and 4	8/8/2023

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