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## FCC PART 80 TEST REPORT

For

### GUIDANCE MARINE LIMITED

APPLICANT	GUIDANCE MARINE LIMITED
	5 TIBER WAY MERIDIAN BUSINESS PARK
	LEICESTER LE19 1RP UNITED KINGDOM
FCC ID	VYMVALIDATOR
MODEL NUMBER	VALIDATOR
PRODUCT DESCRIPTION	X BAND RADAR
DATE SAMPLE RECEIVED	10/27/2016
DATE TESTED	01/17/2017, 01/18/2017, 02/20/2017
TESTED BY	Christian Pawlak
APPROVED BY	Sid Sanders
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Version Number	Description	Issue Date
2171AUT16TestReport.docx	Rev1	Initial Issue	02/21/17
2171AUT16TestReport.docx	Rev2	Added applicable standards and notes on frequency stability Pg 6 and 23	03/17/17

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

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## GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

## 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**



**Tested by:**  
**Christian Pawlak, Engineering Project Manager**  
**Date: 02/21/2017**

**Reviewed and approved by:**   
**Sid Sanders, Engineer**  
**Date: 2/23/2017**

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## EUT SPECIFICATION

EUT Description	X BAND RADAR
FCC ID	VYMVALIDATOR
Model Number	VALIDATOR
Serial Number	N/A
Operating Frequency	9.2 – 9.3 GHz
Type of Emission	Pulsed
EUT Power Source	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz – Shipboard only
	<input type="checkbox"/> DC Power ( )
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input checked="" type="checkbox"/> Prototype
	<input type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input type="checkbox"/> Portable

## TEST SETUP INFORMATION

Test facility	Timco Engineering, Inc. 849 NW State Road 45 Newberry, FL 32669
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 C63.26, FCC 47 CFR Part 80

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## TEST RESULTS SUMMARY

Test	Regulatory Body	Rule	Result
RF Power Output	FCC	Part 80.215(a)(3)	Pass
Occupied Bandwidth	FCC	Part 80.205(a)	Pass
Spurious Emissions at Antenna Terminals	FCC	Part 80.211(f)	Pass
Field Strength of Spurious Emissions	FCC	Part 80.211(f)	Pass
Frequency Stability	FCC	Part 80.209(b)	Pass

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## RF POWER OUTPUT

**Rule Part No.:** Part 2.1033(c)(8), Part 2.1046(a), Part 80.215(a)(3)

### Requirements:

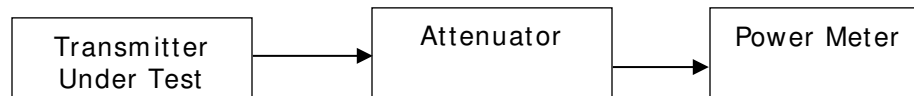
Part 80.215(a)(3) – Mean power shall be measured

### Method of Measurement:

Mean RF power is measured by connecting a 50-ohm Peak Power meter to the RF output connector and measuring the peak power of each state.

### Test Setup Diagram:

#### b) Method of Measurement



### Test Data:

As the EUT cycles between high and low power states, the power of each state was multiplied by the respective duty cycle to obtain mean output power.

The formula used was:  $DC_L P_L + DC_H P_H = P_{AVG}$

An external 3dB attenuator was used.

State	Power (dBm)	Power (mW)	Duty Cycle	Contribution (mW)
High	19.72	93.76	11.27%	10.57
Low	11.82	15.21	88.73%	13.49
		Total:		24.06

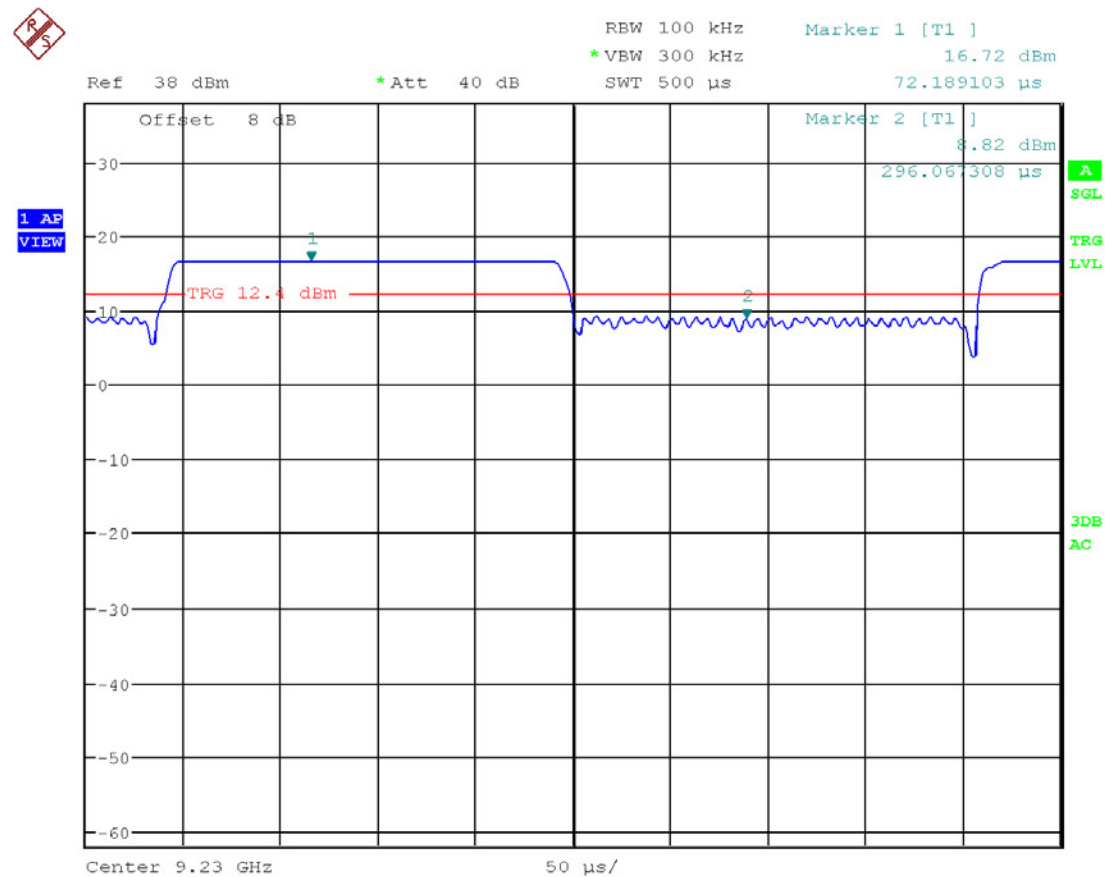
DC input to the final amplifier was less than 24 VDC, 2.5A.

### Results Meet Requirements

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## RF POWER OUTPUT PLOTS

### RF POWER OUTPUT – PEAK POWER



Date: 18.JAN.2017 11:21:17

**Results Meet Requirements**

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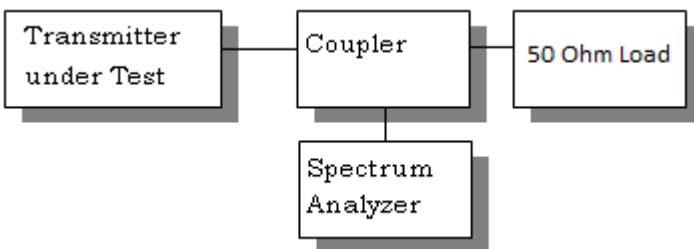
## MODULATION CHARACTERISTICS

**Rule Part No.:** None

**Requirements:** None

**Method of Measurement:** Modulation Characteristics are reported using a 50-ohm peak power sensor or spectrum analyzer in zero span mode.

### Test Setup Diagram:



### Test Data:

Pulse Type	Pulse Width (us)	Period (us)	Duty Cycle
High	802	7114	11.27%
Low	6312	7114	88.73%

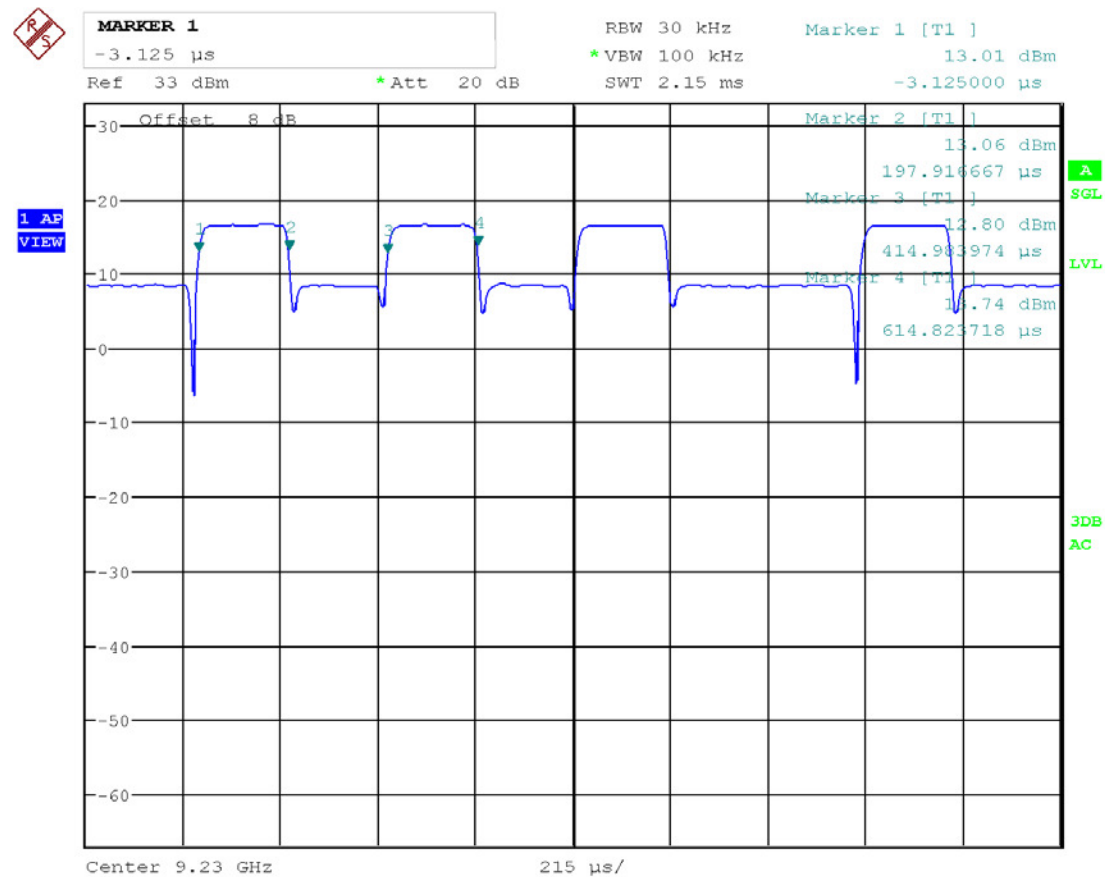
### Results Meet Requirements

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## MODULATION CHARACTERISTICS PLOTS

### MODULATION CHARACTERISTICS – PULSE PROFILE – Marker Set 1



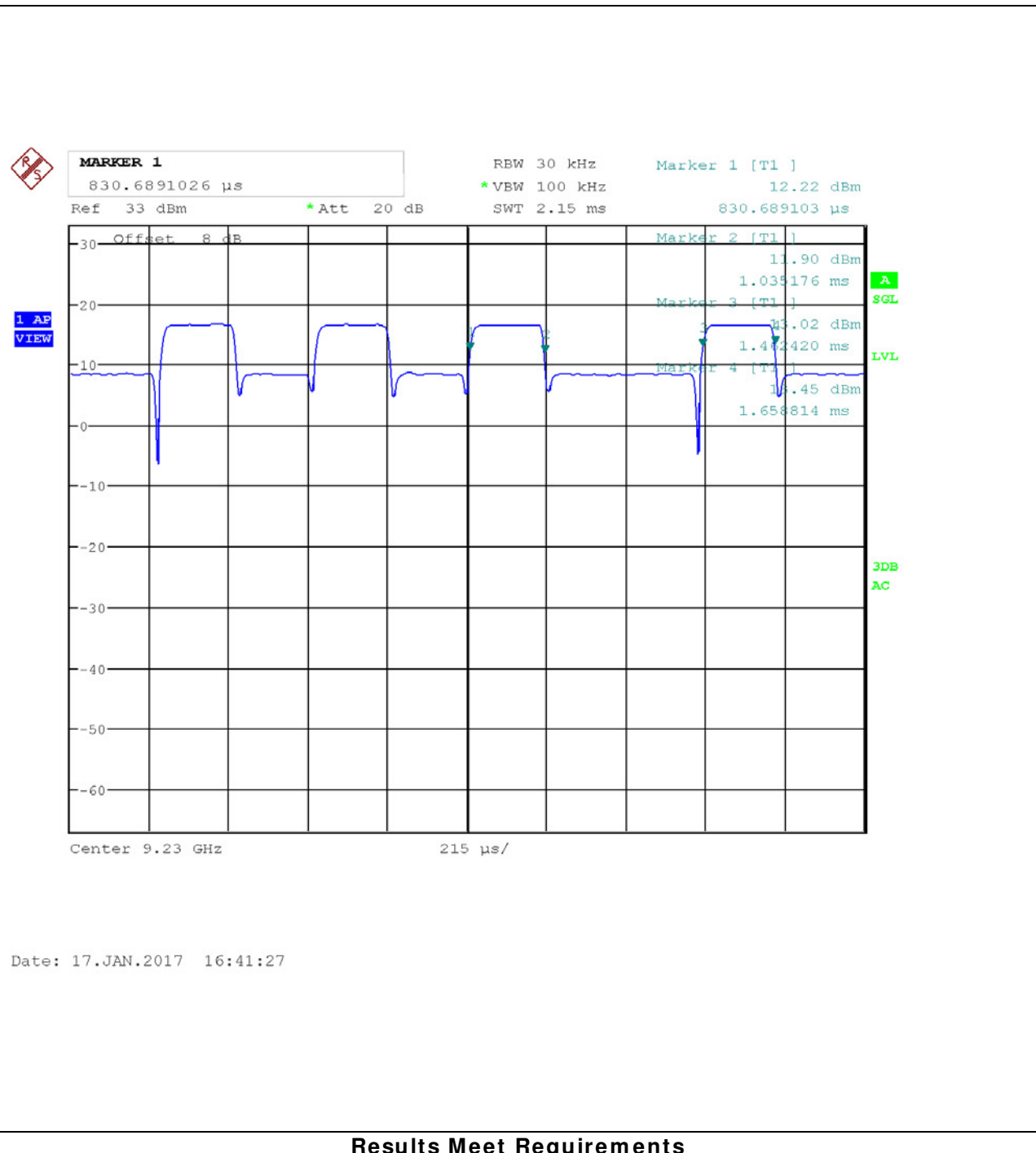
Date: 17.JAN.2017 16:38:27

**Results Meet Requirements**

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## MODULATION CHARACTERISTICS PLOTS

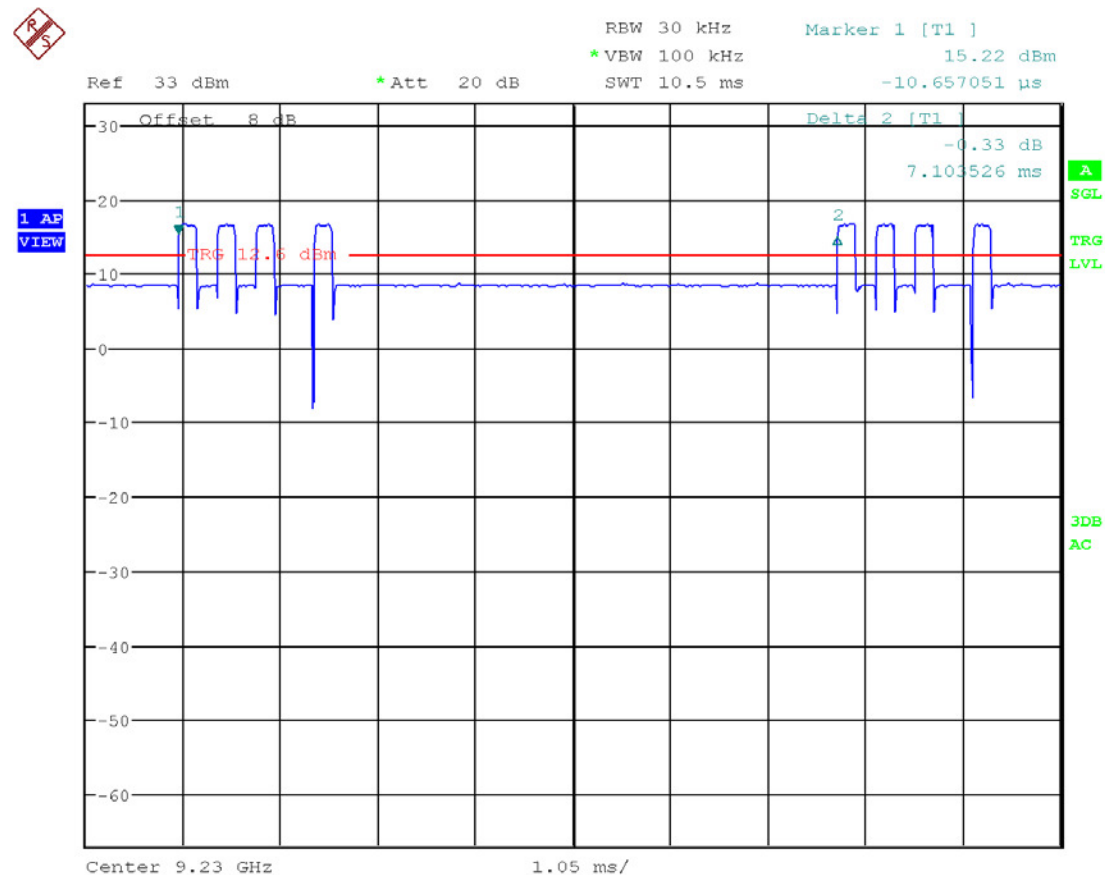
### MODULATION CHARACTERISTICS – PULSE PROFILE – Marker Set 2



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## MODULATION CHARACTERISTICS PLOTS

### MODULATION CHARACTERISTICS – PULSE INTERVAL



Date: 17.JAN.2017 16:45:44

**Results Meet Requirements**

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## OCCUPIED BANDWIDTH

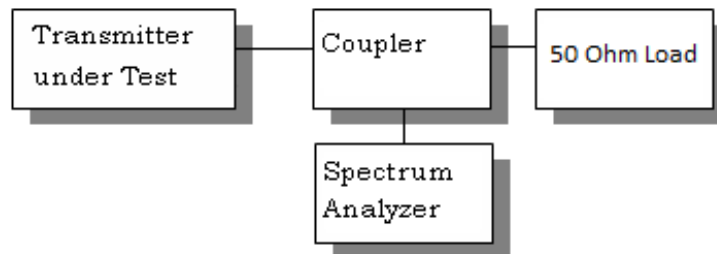
**Rule Part No.:** Part 80.205(a)

### Requirements:

Part 80.205(a): Emissions must remain within the band

**Method of Measurement:** Measurements were made in accordance with standard listed above.

### Block Diagram:



### Test Data:

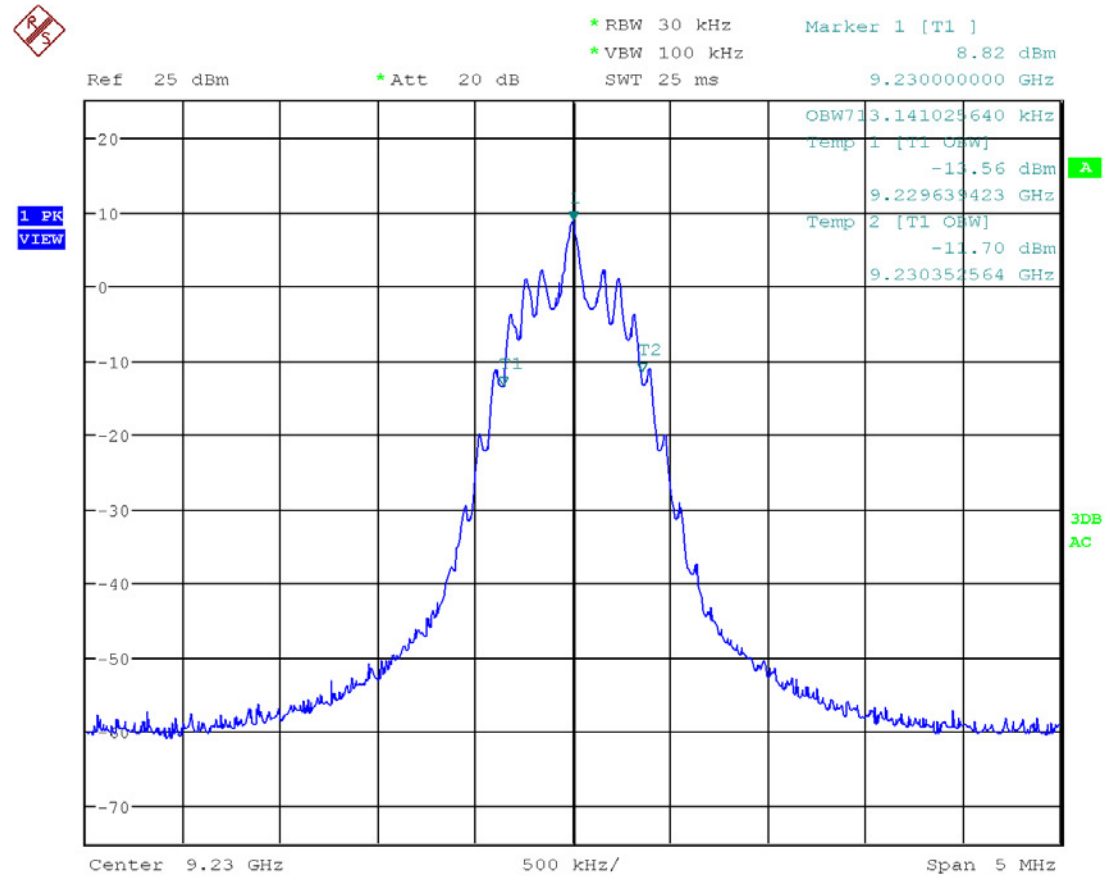
Measurement Type	Occupied Bandwidth (kHz)
99%	713.14

### Results Meet Requirements

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## OCCUPIED BANDWIDTH PLOT(S)

### OCCUPIED BANDWIDTH - 99 PERCENT



Date: 17.JAN.2017 16:29:50

**Results Meet Requirements**

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

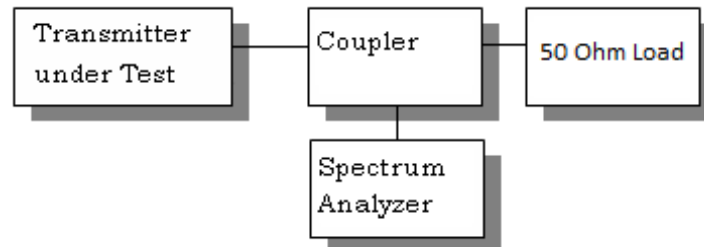
**Rule Part No.:** Part 2.1051(a), Part 80.211(f)

### Requirements:

Part 80.211(f):  $43 + 10\log(\text{mean power in watts})$   
 $43 + 10\log(0.0126) = -23.8 \text{ dBc}$   
Average emissions must not exceed  $10.8 - 23.8 = -13 \text{ dBm}$

**Method of Measurement:** Measurements were made in accordance with standards listed.

### Block Diagram:



### Test Data:

See Plots.

### Results Meet Requirements

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## CONDUCTED SPURIOUS EMISSIONS – 9 kHz to 1 GHz

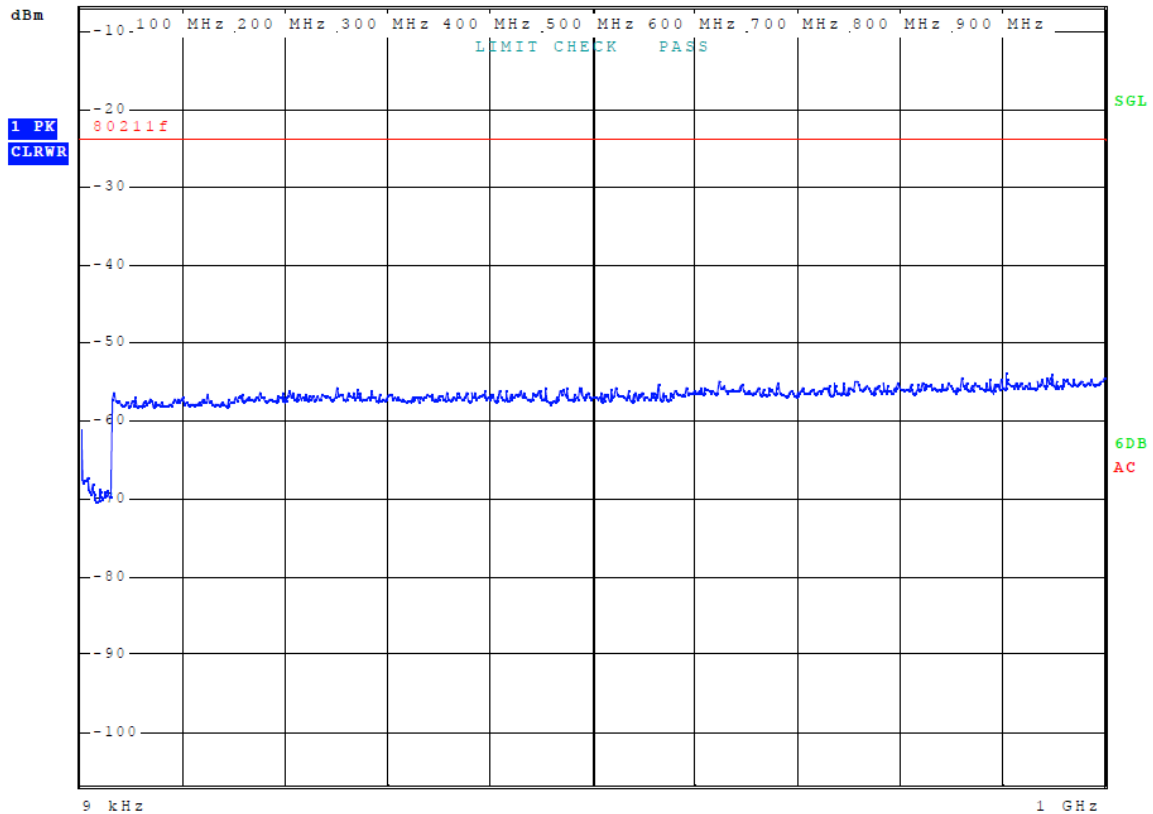


RBW 120 kHz

MT 100 ms

Step TD AUTO PULSE Att 40 dB

PREAMP OFF



**Results Meet Requirements**

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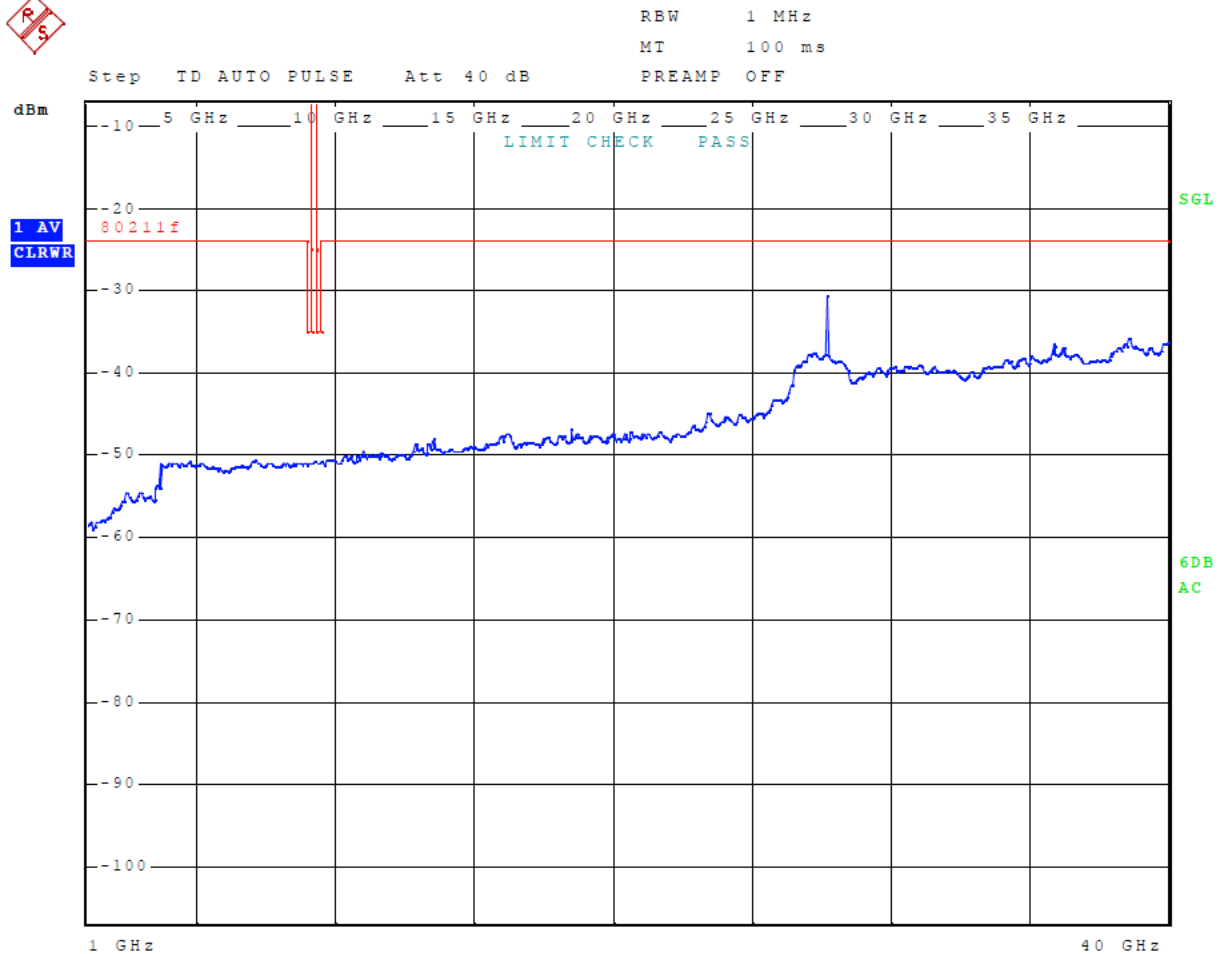
Applicant: GUIDANCE MARINE LIMITED

FCC ID: VYMVALIDATOR

Report: G\GUIDANCE\2171AUT16\2171AUT16TestReport.docx

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## CONDUCTED SPURIOUS EMISSIONS – 1 GHz to 40 GHz



**Results Meet Requirements**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS

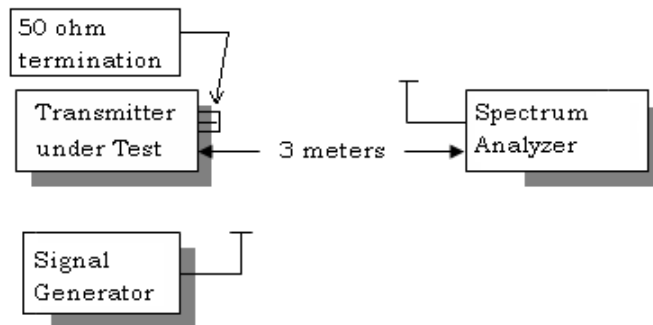
**Rule Parts. No.:** FCC Part 2.1053, Part 80.211(f)

### Requirements:

Part 80.211(f):  $43 + 10\log(\text{mean power in watts})$   
 $43 + 10\log(0.0126) = -23.8 \text{ dBc}$   
 $10.8 - 23.8 = -13 \text{ dBm ERP} = 84.38 \text{ dBuV/m at 3m}$   
Radiated emissions must not exceed 84.38 dBuV/m at 3m

**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.

### Test Setup Diagram:



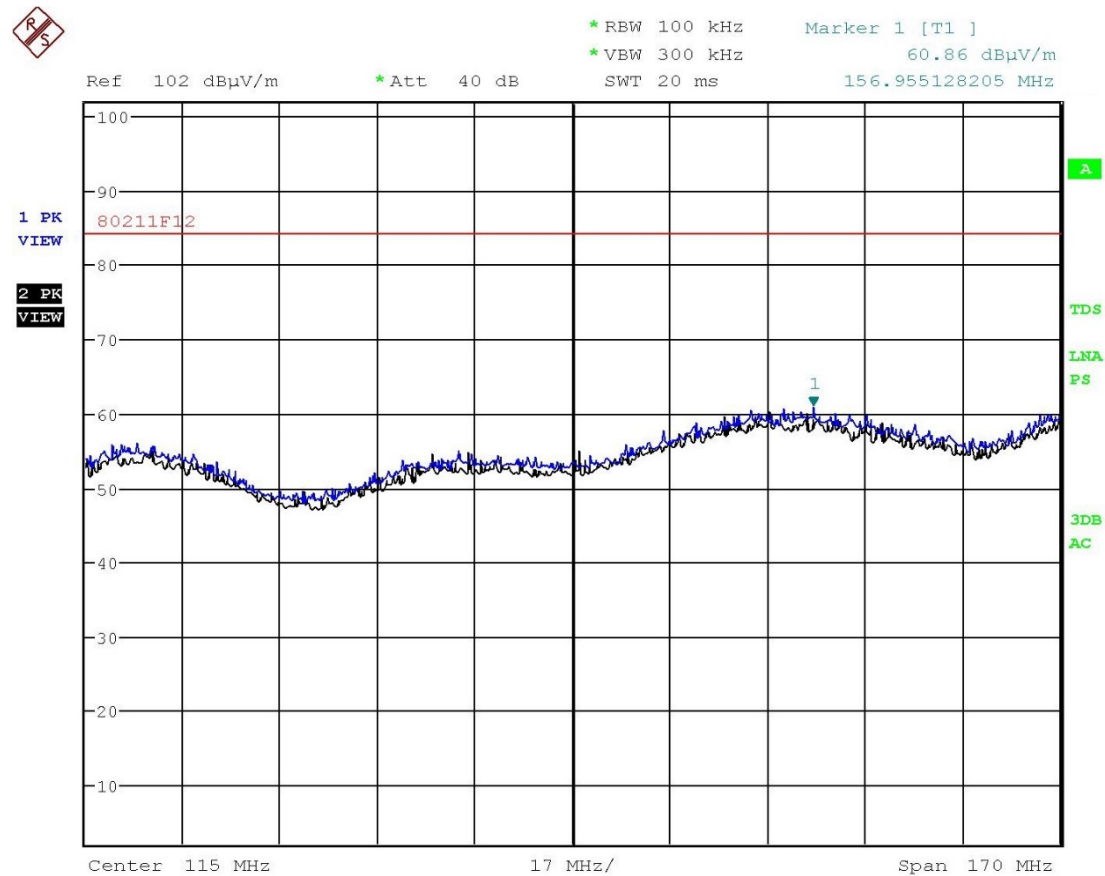
**Test Data:**

**See Plots.**

**Results Meet Requirements**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS- 30 MHz to 200 MHz

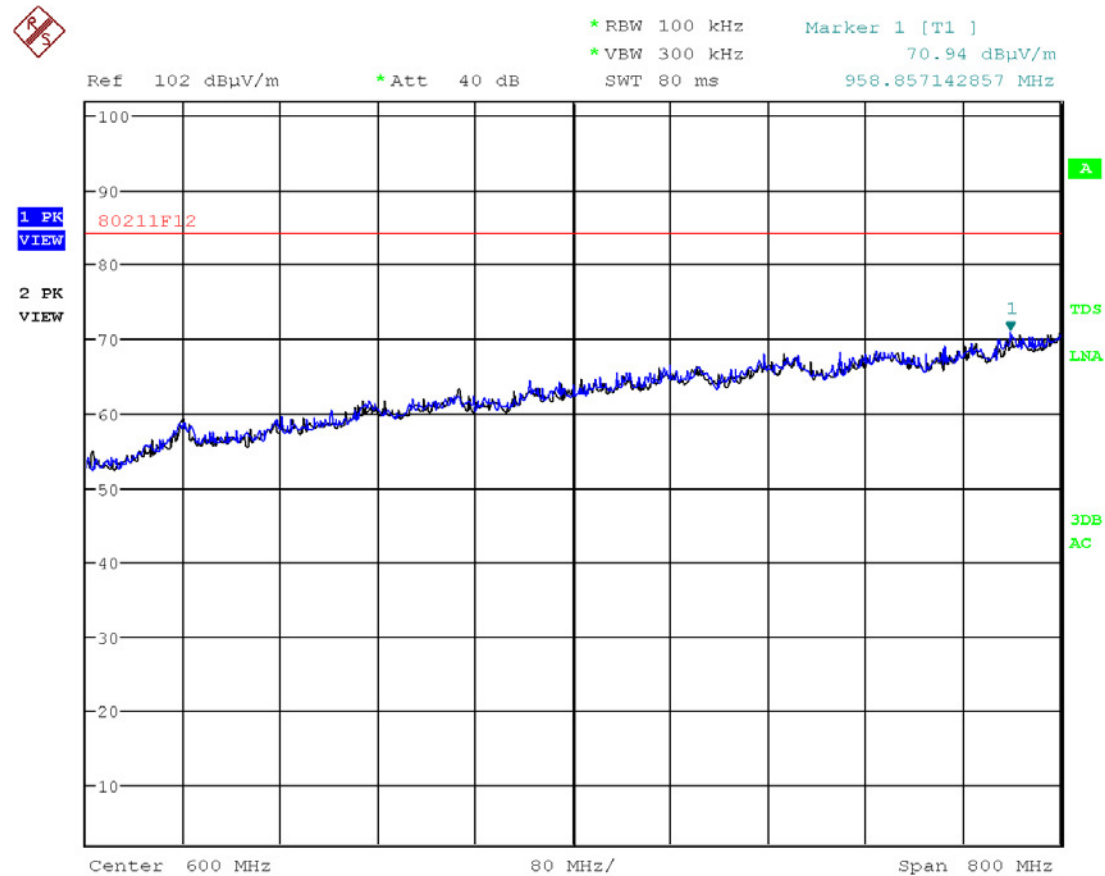


Date: 20.FEB.2017 20:39:51

**Results Meet Requirements**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS– 200 MHz to 1 GHz

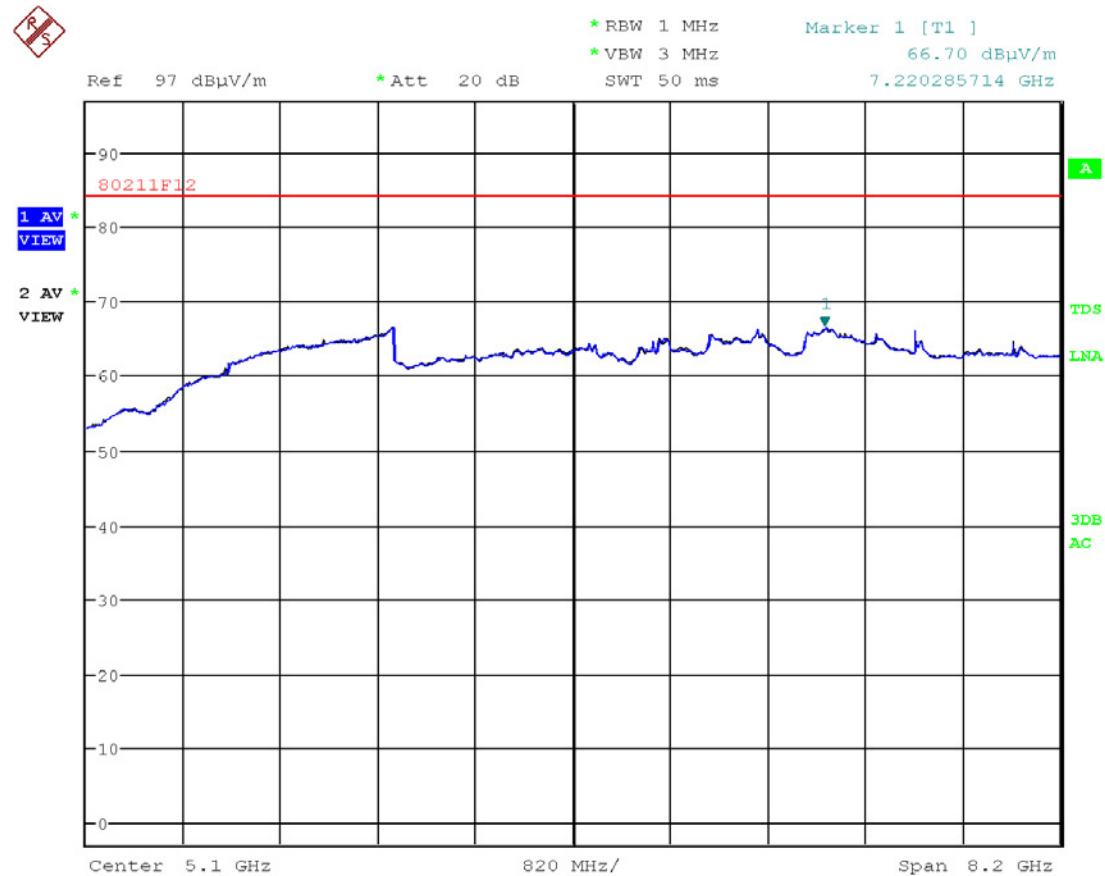


Date: 20.FEB.2017 21:46:32

**Results Meet Requirements**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS- 1 GHz to 9.2 GHz

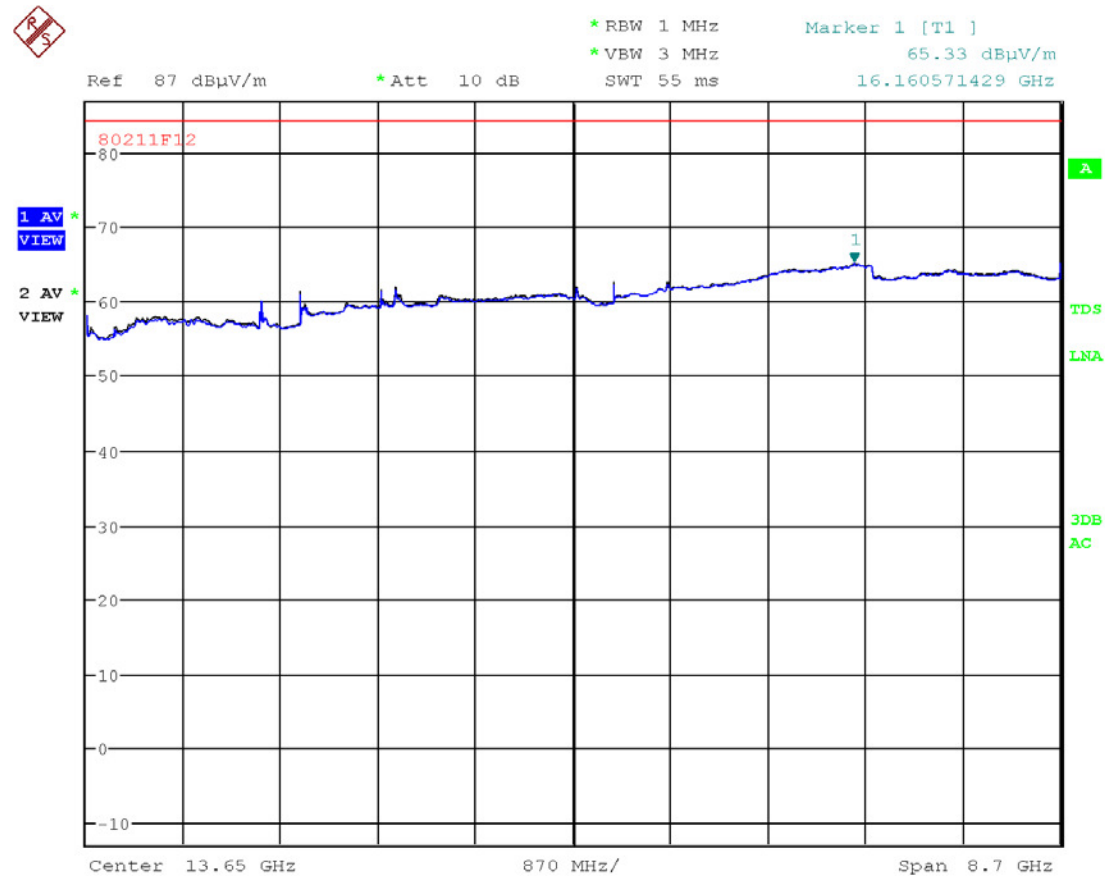


Date: 20.FEB.2017 21:21:09

**Results Meet Requirements**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS- 9.3 GHz to 18 GHz

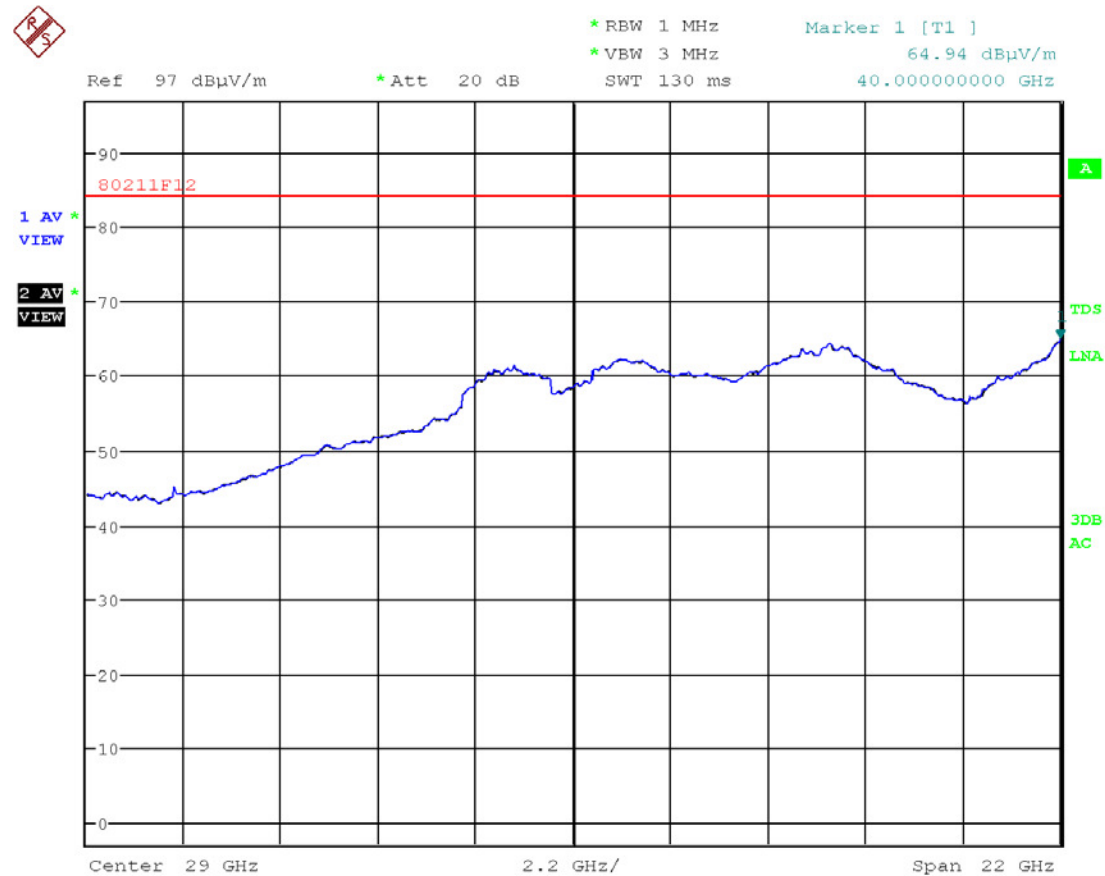


Date: 20.FEB.2017 21:42:42

**Results Meet Requirements**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS- 18 GHz to 40 GHz



Date: 20.FEB.2017 22:41:05

**Results Meet Requirements**

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## FREQUENCY STABILITY

**Rule Parts. No.:** FCC Part 2.1055, Part 80.209(b)

### Requirements

Part 80.209(b): Emissions must not be closer than  $1.5/T$  MHz from the band edges, where T is the pulse duration in microseconds

Duration of shortest pulse is 199.84 us

Emissions must not be closer than  $1.5 / 199.84 = 0.0075$  MHz from the band edge

**Method of Measurements:** The test procedure was modified to measure the peak point of the emission envelope.

### Test Data:

Temperature (°C)	Frequency (MHz)	Margin Below (MHz)	Margin Above (MHz)
25 (ref)	9230	30	70
-20	9230	30	70
-10	9230	30	70
0	9230	30	70
10	9230	30	70
20	9230	30	70
30	9230	30	70
40	9230	30	70
50	9230	30	70

Carrier did not deviate more than 1 MHz. Worst case frequency stability is:  
 $1 \text{ MHz} / 9230 \text{ MHz} = 108.3 \text{ PPM}$

### Results Meet Requirements

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## EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
CHAMBER	Panashield	3M	N/A	04/25/16	12/31/17
Antenna: Biconical 1096 Chamber	Eaton	94455-1	1096	07/14/15	07/14/17
Antenna: Log- Periodic 1122	Electro- Metrics	LPA-25	1122	07/14/15	07/14/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren Chamber	3117	00041534	02/25/15	02/25/17
Antenna: Double-Ridged Horn	Emco	3116	9011-2145	11/18/2015	11/18/2017
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM- 0244-00; KMKM- 0670-00; KFKF-0198- 00	12/05/15	12/05/17
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	N/A	NA	NA
Pre-amp	RF-LAMBDA	RLNA00M45GA	NA	01/04/16	01/04/18
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	09/01/16	09/01/18
Coaxial Cable	Micro-Coax	UFB142A-0- 0720-200200	225363-002	08/05/2015	08/05/2017

### \* EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

## END OF REPORT

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