



FCC CFR 47 Part 90 Radar Test Report

APPLICANT	Guidance Marine Limited
ADDRESS	5 Tiber Way, Meridian Business Park Leicester LE19 1RP
FCC ID	VYMRAD-1100
MODEL NUMBER	RAD-1100
PRODUCT DESCRIPTION	Series 4 Responder Radar
DATE SAMPLE RECEIVED	FEB 20 2020
FINAL TEST DATE	AUG 10 2020
TESTED BY	Franklin Rose
APPROVED BY	Tim Royer
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Report Version	Description	Issue Date
325UT20_PT90 Radar TestReport_	Rev1	Initial Issue	AUG 10 2020
325UT20_PT90 Radar TestReport_	Rev2	Clerical Updates	SEP 18 2020

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

TABLE OF CONTENTS

SIGNATURE PAGE	2
TESTING INFORMATION	3
SUMMARY OF TESTING	4
RF POWER OUTPUT	5
TEST DATA: POWER OUTPUT 9.2 GHZ	6
TEST DATA: POWER OUTPUT 9.25 GHZ	7
TEST DATA: POWER OUTPUT 9.3 GHZ	8
TEST DATA: POWER AT THE FINAL AMPLIFIER	9
OCCUPIED BANDWIDTH	10
99% OCCUPIED BANDWIDTH RULE PARTS	10
TEST DATA: OCCUPIED BANDWIDTH MEASUREMENT TABLE	11
TEST DATA: 9.25 GHZ 99% OBW PLOT	12
EMISSION MASK	13
TEST DATA: MASK B, 9.2 GHZ.....	14
TEST DATA: MASK B, 9.25 GHZ	15
TEST DATA: MASK B, 9.3 GHZ.....	16
SPURIOUS EMISSIONS AT ANTENNA TERMINAL (CONDUCTED)	17
TEST DATA: 9.2 GHZ, 2 ND HARMONIC.....	18
TEST DATA: 9.2 GHZ, 3 RD HARMONIC.....	19
TEST DATA: 9.2 GHZ, 4 TH HARMONIC.....	20
TEST DATA: 9.25 GHZ, 2 ND HARMONIC.....	21
TEST DATA: 9.25 GHZ, 3 RD HARMONIC	22
TEST DATA: 9.25 GHZ, 4 TH HARMONIC	23
TEST DATA: 9.3 GHZ, 2 ND HARMONIC.....	24
TEST DATA: 9.3 GHZ, 3 RD HARMONIC.....	25
TEST DATA: 9.3 GHZ, 4 TH HARMONIC.....	26
FIELD STRENGTH OF SPURIOUS EMISSIONS	27
TEST DATA: 9.2 GHZ, RADIATED SPURIOUS EMISSIONS	29
TEST DATA: 9.25 GHZ, RADIATED SPURIOUS EMISSIONS.....	30
TEST DATA: 9.3 GHZ, RADIATED SPURIOUS EMISSIONS	31
FREQUENCY STABILITY	32
STATEMENT OF MEASUREMENT UNCERTAINTY	33
EMC EQUIPMENT LIST	34

SIGNATURE PAGE

Timco Engineering, Inc. attests that:

☒	The EUT tested herein fulfills all approval requirements and/or the customer requirements as identified in this test report.
☐	The EUT tested herein does not fulfill all approval requirements and/or the customer requirements as identified in this test report.

This report relates only to the Equipment Under Test (EUT) sample(s) tested.

This report shall not be reproduced except in full without the written approval of Timco Engineering, Inc.

To the best of my knowledge and belief, this device has been tested in accordance with the standards identified in this test report, and 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 measurements were made at:

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



Name and Title Franklin Rose, Project Manager / EMC Specialist



Name and Title Tim Royer, Project Manager / EMC Engineer

Date AUG 10 2020

GENERAL INFORMATION

The EUT is described by the manufacturer as an "Active Microwave Target" working in the band 9.2 – 9.3 GHz, and its class of device is not otherwise described within FCC 47 CFR Part 80. The EUT aides in dynamic positioning in the vicinity of an Oil Platform or similar asset.

The EUT can only be used in conjunction with FCC ID VYMRADASCAN. The device is unable to respond to any other device. It receives a Horizontally-polarized signal transmitted by FCC ID VYMRADASCAN, modulates the signal using SSB to encode information onto the "reflection", and it employs an amplifier in the final stage before re-transmit, which is designed to change the polarity by 90 degrees to Vertical.

The EUT is not considered a RACON (Radar Beacon) as it operates in a dissimilar manner.

Testing Information

EUT Description	Series 4 Responder Radar		
FCC ID	VYMRAD-1100		
Model Number	RAD-1100		
Operating Band(s)	Band 1: 9.2 – 9.3 GHz		
Emission Designator	131MP0N		
Measurement Method	99% Occupied Bandwidth		
Modulation	n/a. Device only re-transmits radar emission (P0N)		
EUT Power Source	☐ 110–120 VAC	☒ DC Power	☐ Battery Operated
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☒ Fixed	☐ Mobile	☐ Portable
Antenna Connector	n/a (receive and transmit antennas are internal, PCB trace antenna)		
Modification to the EUT	The EUT was not modified.		
Test Exercise	The EUT was operated in accordance with the user manual.		
Applicable Standards	FCC CFR 47 Part 2, Part 90, using ANSI C63.26-2015 Referencing: ITU-R M.1177-4		
Test Conditions	Laboratory temperature: 26°C, Relative humidity: 50%		
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070		

SUMMARY OF TESTING

FCC Rule Parts	Testing Performed	Result
2.1046(a), 90.205(r)	RF Power Output	PASS
2.1033(c)(4), 2.1049(i), 90.207(k), (n), 90.209(b)(5)	Occupied Bandwidth & Modulation Characteristics	PASS
90.210(n), (b)(1), (2)	Emission Masks	PASS
2.1051(a), 2.1057(a)(1), 90.210(n), (b)(3)	Spurious Emissions at Antenna Terminals	PASS
2.1053(a), 2.1057(a)(1), 90.210(n), (b)(3)	Field Strength of Spurious Emissions	PASS
2.1055(a)(2), 90.213(a)	Frequency Stability	n/a

RF POWER OUTPUT

Rule Part No.: FCC Part 2.1046(a), 90.205(r)

Requirements:

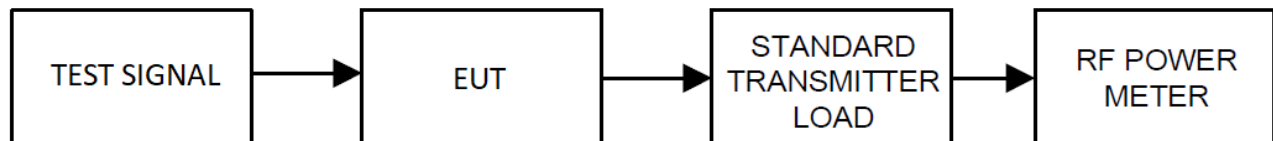
§90.205 Power and antenna height limits.

(r) All other frequency bands. Requested transmitter power will be considered and authorized on a case by case basis.

Note: the frequency bands referred to in 90.205 do not include 9.0 – 9.5 GHz. These frequencies are covered by clause (r).

Test Procedure: ANSI C63.26

Test Setup Block Diagram:

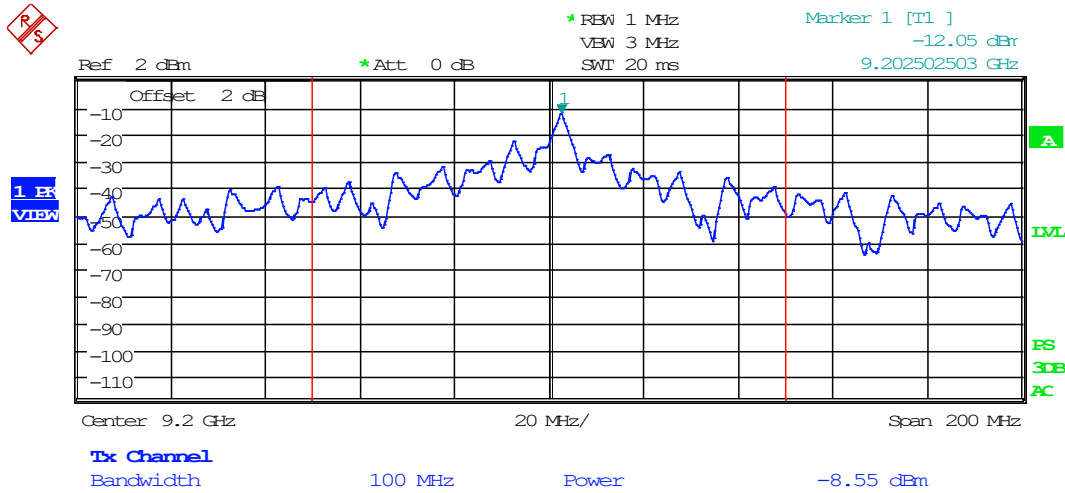


Note: The test procedure has been modified to include an input signal. This provides the EUT with the frequency/signal source.

Note: The test procedure has been modified to measure the power output over the modulated band by using Channel Power measurement.

RF POWER OUTPUT

Test Data: Power Output 9.2 GHz

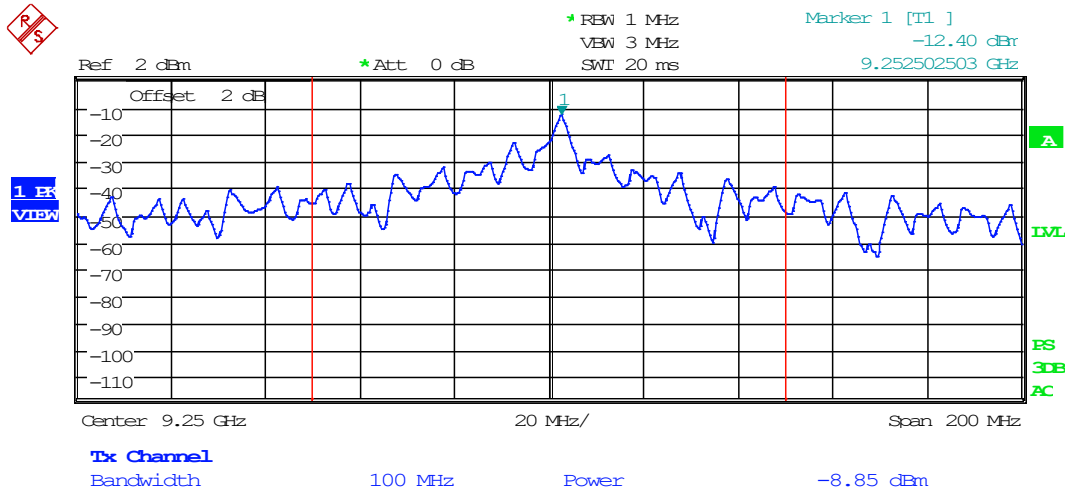


Date: 7.AUG.2020 13:03:08

Frequency	Measured Level (dBm)	Receive Ant. Gain (dB)	Output (dBm)	Rated Power (dBm)	Margin (dBm)
9200.00	-8.55	12.25	3.70	4.00	0.30

RF POWER OUTPUT

Test Data: Power Output 9.25 GHz

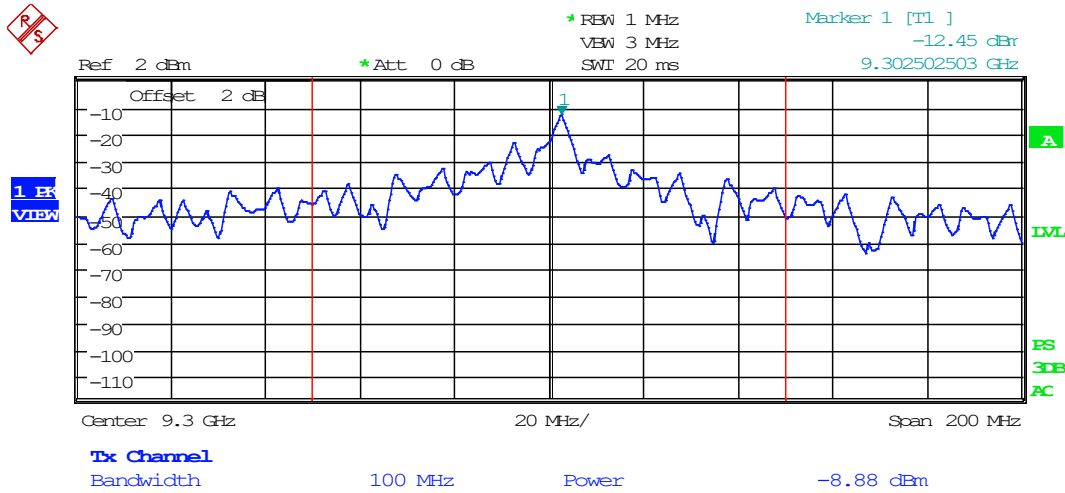


Date: 7.AUG.2020 13:03:59

Frequency	Measured Level (dBm)	Receive Ant. Gain (dB)	Output (dBm)	Rated Power (dBm)	Margin (dBm)
9250.00	-8.85	12.25	3.40	4.00	0.60

RF POWER OUTPUT

Test Data: Power Output 9.3 GHz



Date: 7.AUG.2020 13:01:42

Frequency	Measured Level (dBm)	Receive Ant. Gain (dB)	Output (dBm)	Rated Power (dBm)	Margin (dBm)
9300.00	-8.88	12.25	3.37	4.00	0.63

POWER AT THE FINAL AMPLIFIER

Rule Part No.: FCC Part 2.1033(c)(8)

Requirement:

(c) Applications for equipment other than that operating under parts 15, 11 and 18 of this chapter shall be accompanied by a technical report containing the following information:

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

Test Data: Power at the Final Amplifier

INPUT POWER: (4 VDC) (0.35 A) = **1.4 Watts Max**

OCCUPIED BANDWIDTH

Rule Part No.: Part 2.1033(c)(4), 2.1049(i)

99% Occupied Bandwidth Rule Parts

Rule Part No.: 90.207(k), (n), 90.209(b)(5)

§2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(i) Transmitters designed for other types of modulation—when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

§90.207 Types of emissions.

(k) For radiolocation operations as may be authorized in accordance with subpart F, unless otherwise provided for any type of emission may be authorized upon a satisfactory showing of need.

(n) *Other emissions.* Requests for emissions other than those listed in paragraphs (c) through (e) of this section will be considered on a case-by-case basis to ensure that the requested emission will not cause more interference than other currently permitted emissions.

§90.209 Bandwidth limitations.

(b) The maximum authorized single channel bandwidth of emission corresponding to the type of emission specified in §90.207 is as follows:

STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Above 2500 ²		

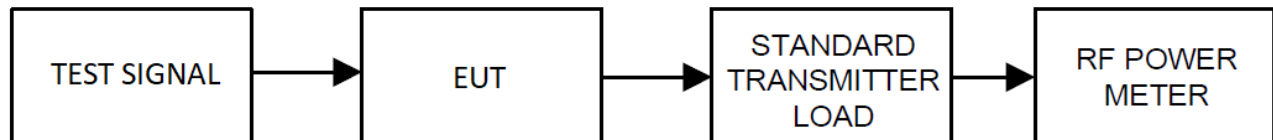
²Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.

Test Procedure: ANSI C63.26, 5.4.4

Note: The receiver's automatic 99% Occupied Bandwidth function was used. The function is identical in operation to the measurement method of ANSI C63.26, 5.4.4, Step e).

OCCUPIED BANDWIDTH

Test Setup Block Diagram:



Note: The test procedure has been modified to include an input signal. This provides the EUT with the frequency/signal source.

Test Data: Occupied Bandwidth Measurement Table

Frequency	99% Occupied Bandwidth (MHz)
9.25 GHz	131.38 MHz

Max Occupied Bandwidth of EUT = **131.38 MHz**

Emission Designator = **131MP0N**

Method of Measurement = **99% OBW**

EMISSION MASK

Rule Part No.: 90.210(c)(1), (2), 90.210(n), 90.210(b)(1), (2)

Requirements:

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: At least $83 \log(f_d/5)$ dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least $29 \log(f_d^2/11)$ dB or 50 dB, whichever is the lesser attenuation;

(n) *Other frequency bands.* Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.

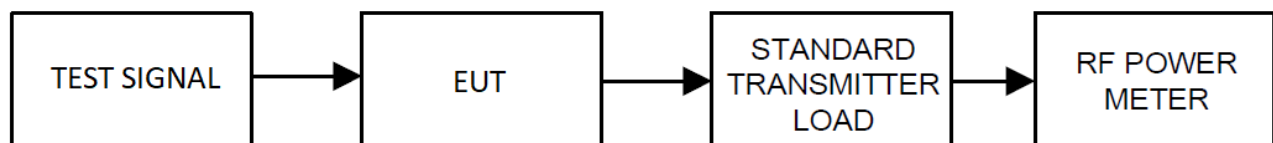
(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

Test Procedure: ANSI C63.26, 5.4.4; ITU-R M.1177-4

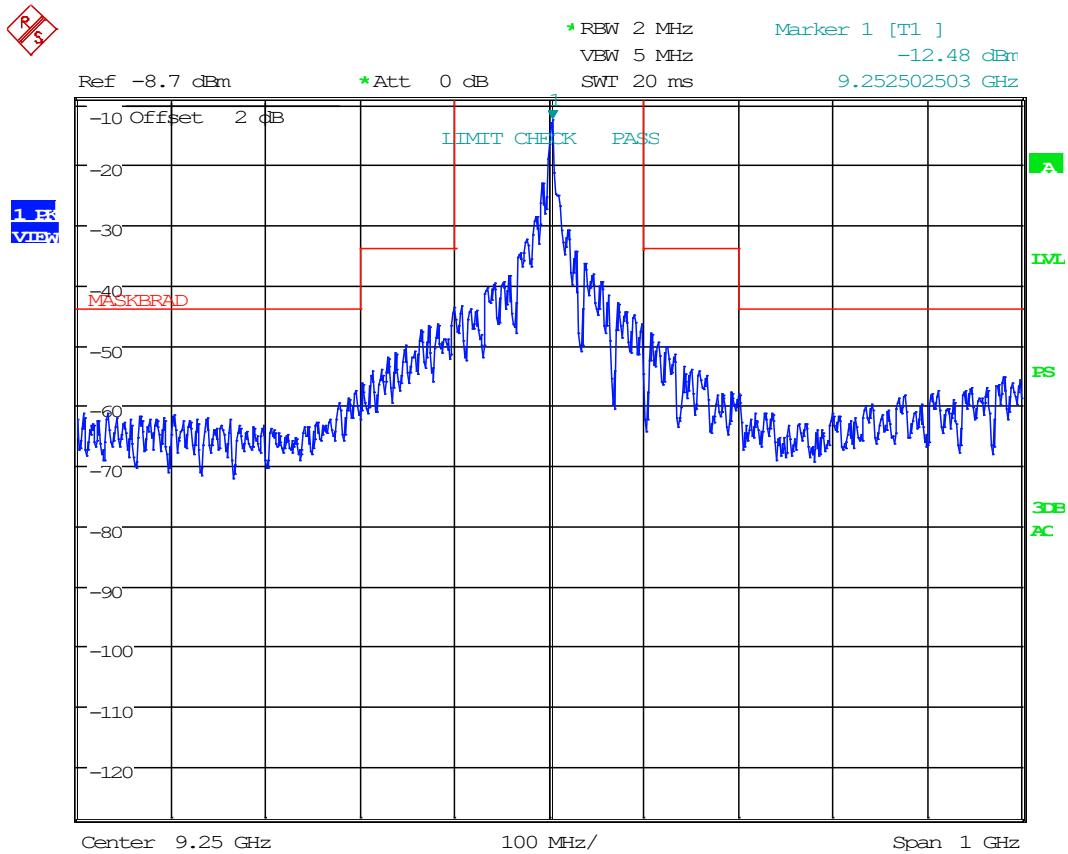
Test Setup Block Diagram:



Note: The test procedure has been modified to include an input signal. This provides the EUT with the frequency/signal source.

EMISSION MASK

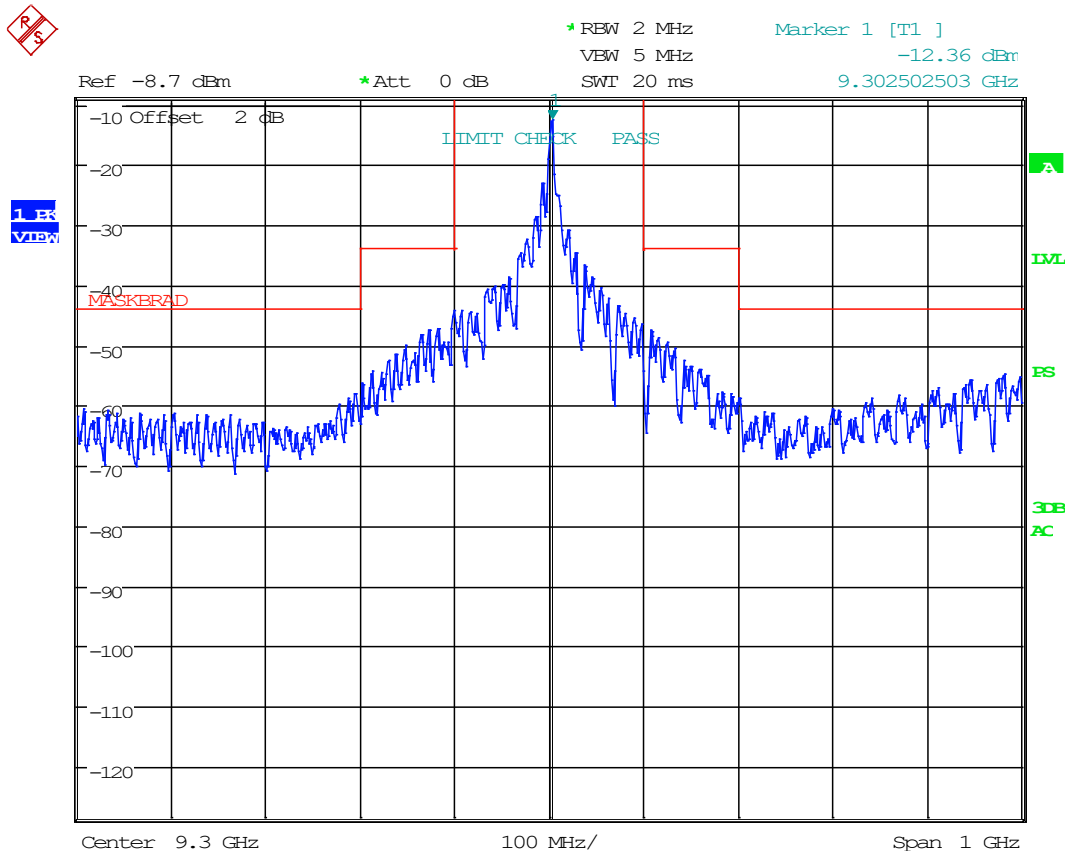
Test Data: Mask B, 9.25 GHz



Date: 7.AUG.2020 13:11:27

EMISSION MASK

Test Data: Mask B, 9.3 GHz



Date: 7.AUG.2020 13:12:45

SPURIOUS EMISSIONS AT ANTENNA TERMINAL (CONDUCTED)

Rule Part No.: Part 2.1051(a), 2.1057(a)(1), 90.210(c)(3), 90.210(n), 90.210(b)(3)

§2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in §§2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

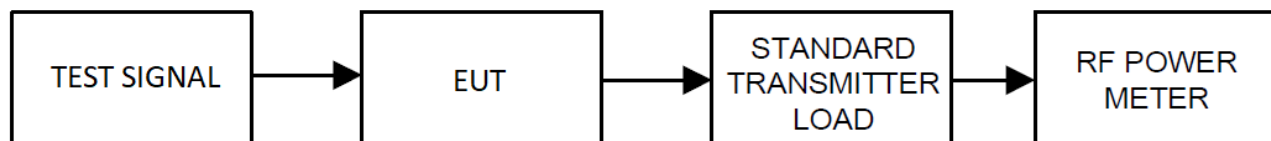
(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

(n) *Other frequency bands.* Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.

(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

Test Setup Block Diagram:



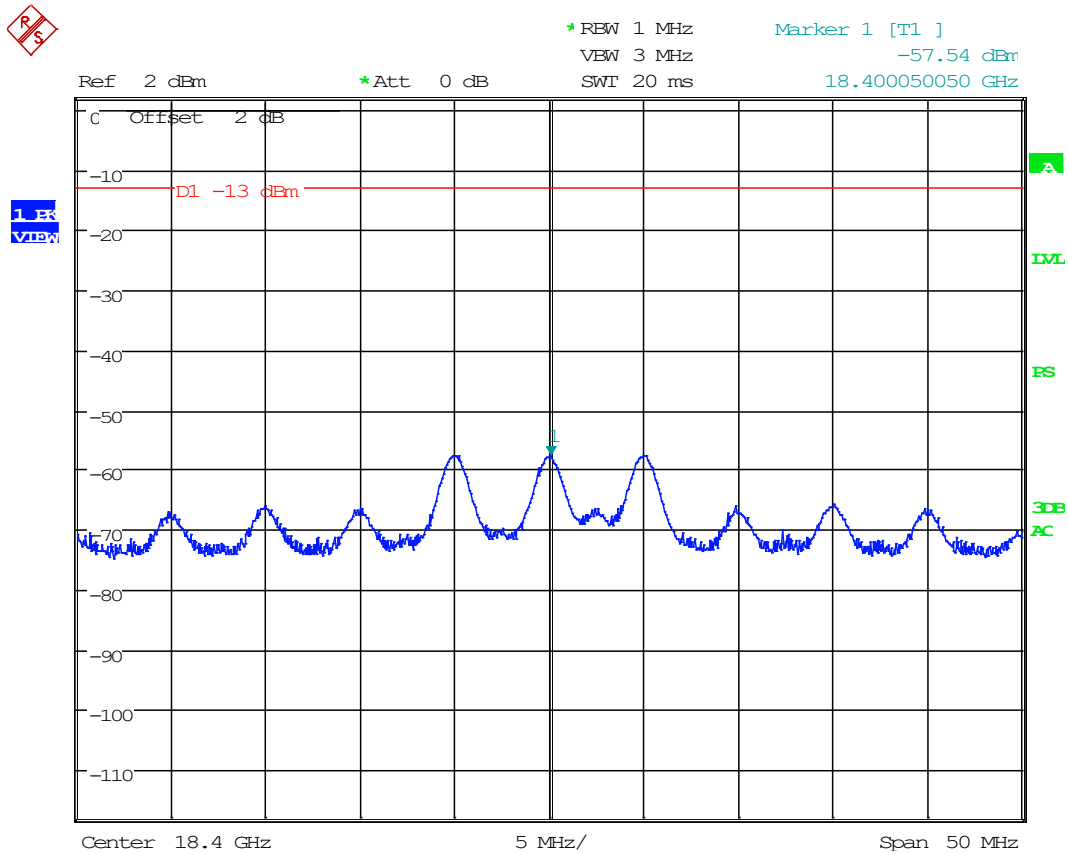
Note: The test procedure has been modified to include an input signal. This provides the EUT with the frequency/signal source.

Note: The harmonic frequencies are provided below. All other emissions were at the noise floor of the receiving test equipment (> 20 dB below the fundamental).

Applicant: Guidance Marine Limited
 FCC ID: VYMRAD-1100
 Report: 325UT20_PT90 Radar TestReport_Rev2

UNWANTED SPURIOUS EMISSIONS

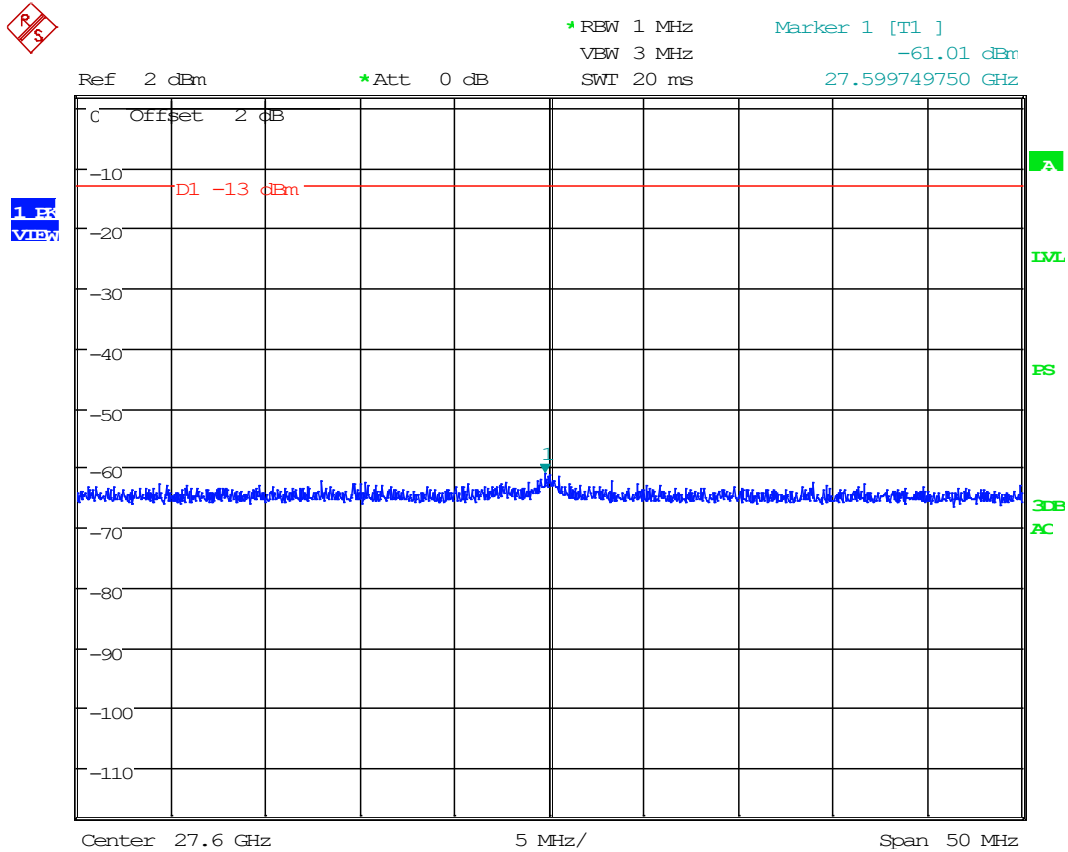
Test Data: 9.2 GHz, 2nd Harmonic



Date: 7.AUG.2020 12:57:14

UNWANTED SPURIOUS EMISSIONS

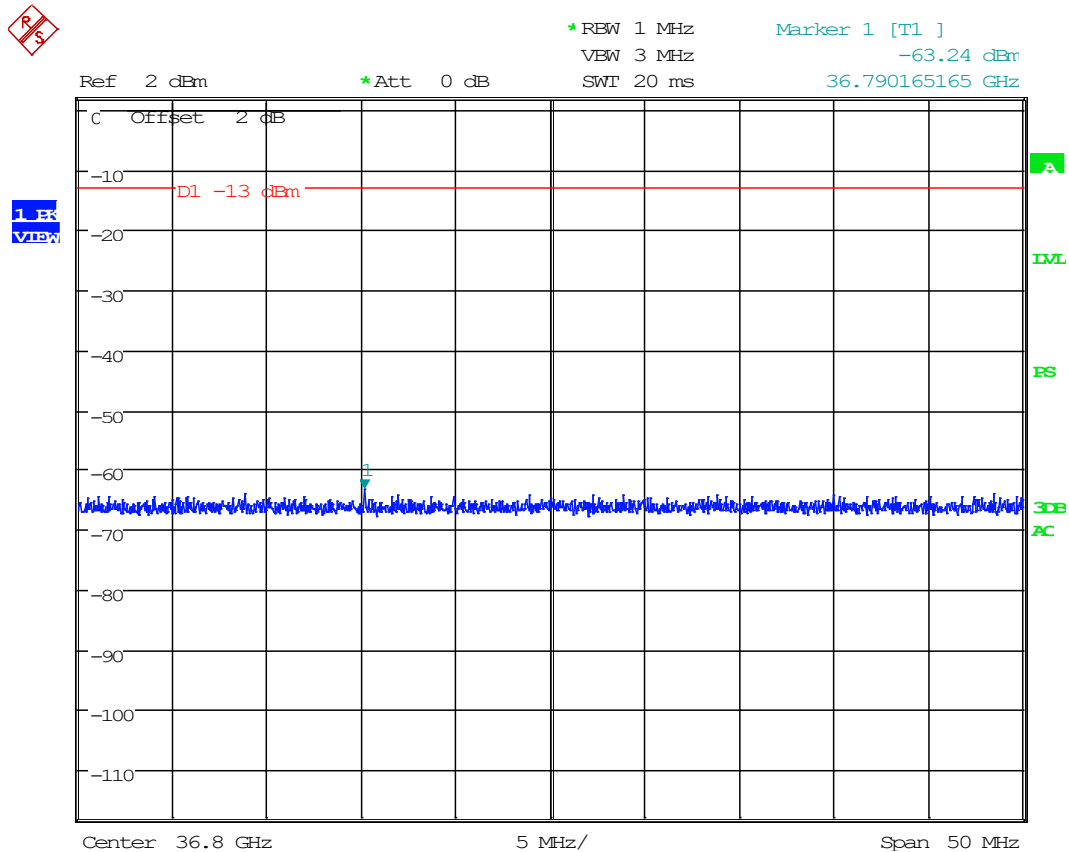
Test Data: 9.2 GHz, 3rd Harmonic



Date: 7.AUG.2020 12:57:49

UNWANTED SPURIOUS EMISSIONS

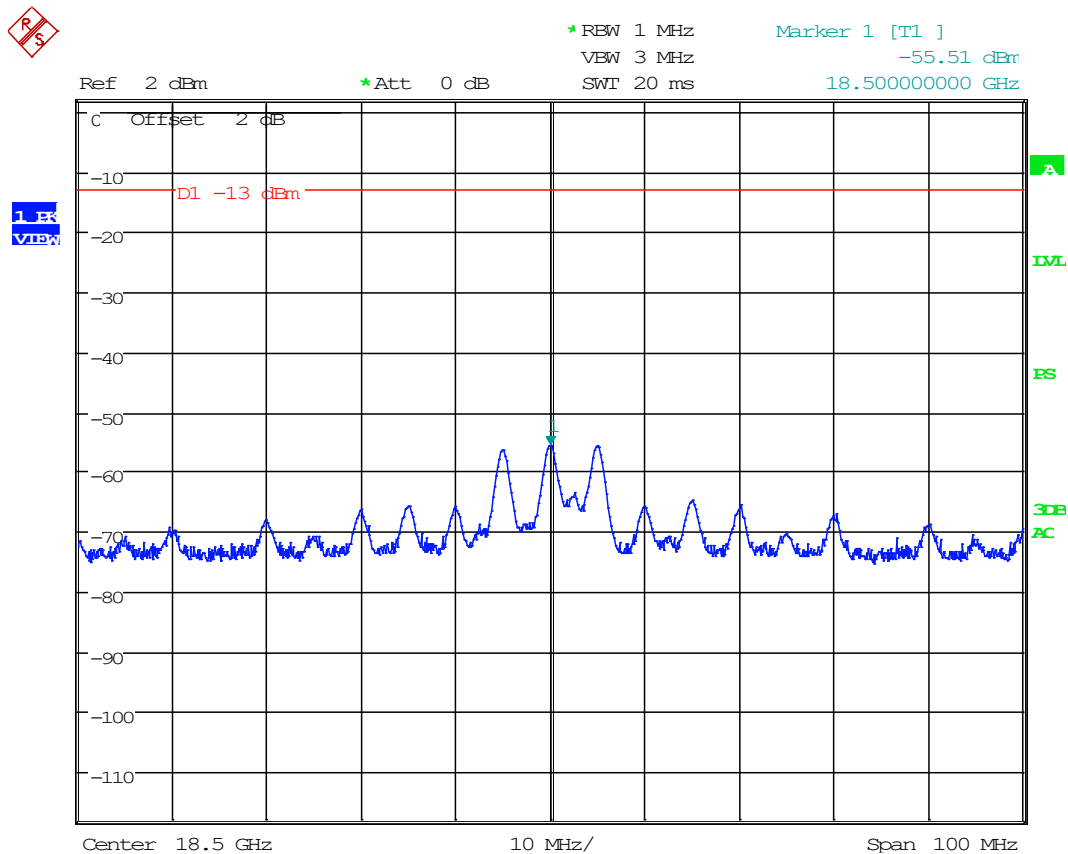
Test Data: 9.2 GHz, 4th Harmonic



Date: 7.AUG.2020 12:58:19

UNWANTED SPURIOUS EMISSIONS

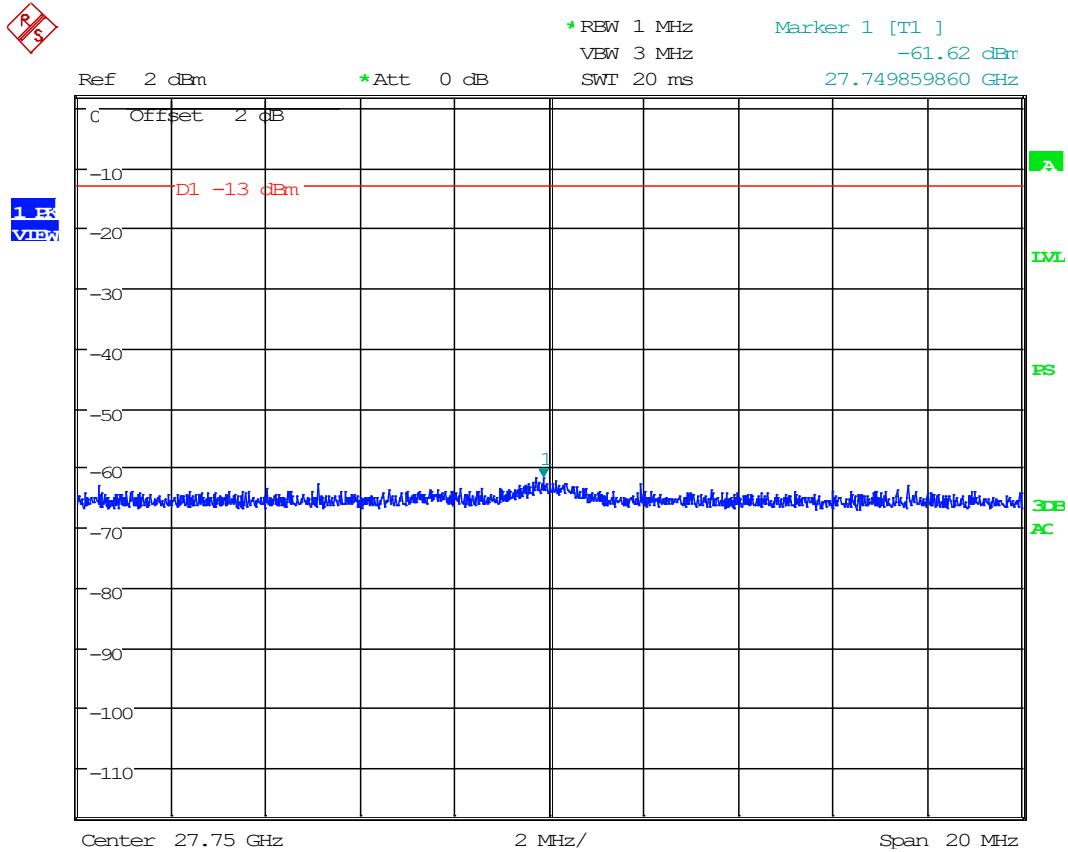
Test Data: 9.25 GHz, 2nd Harmonic



Date: 7.AUG.2020 12:54:44

UNWANTED SPURIOUS EMISSIONS

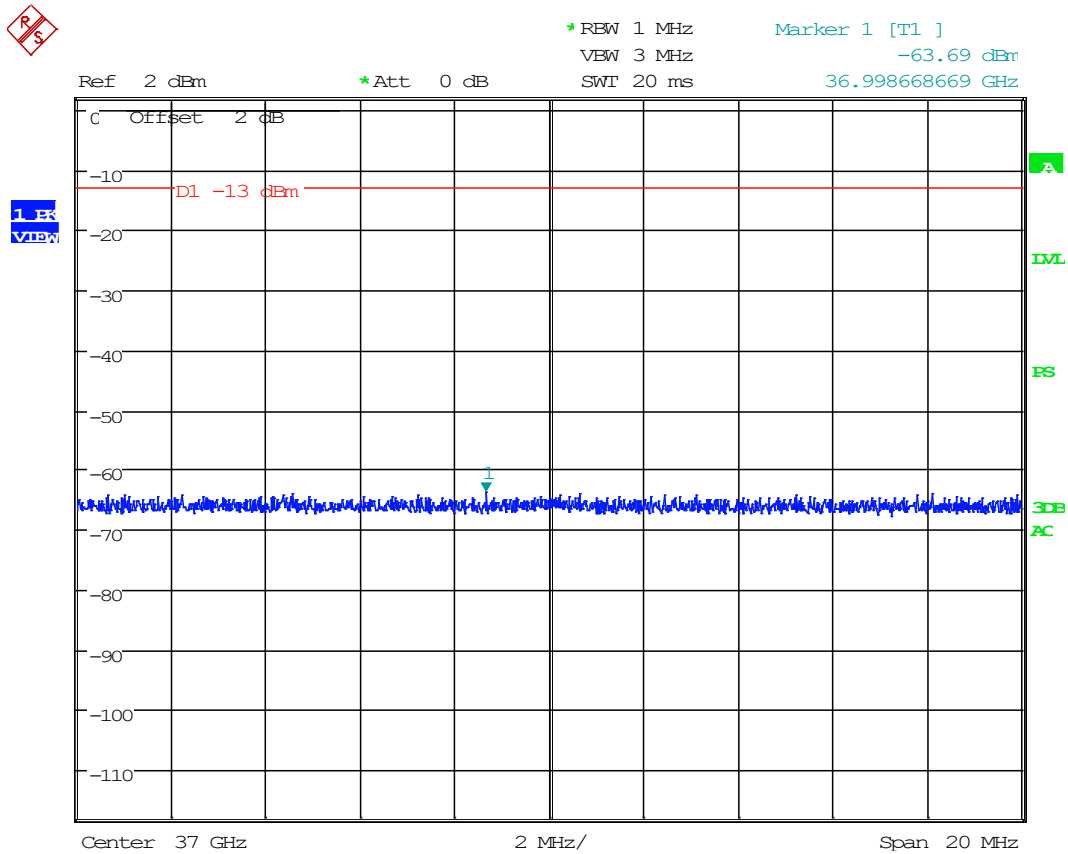
Test Data: 9.25 GHz, 3rd Harmonic



Date: 7.AUG.2020 12:55:34

UNWANTED SPURIOUS EMISSIONS

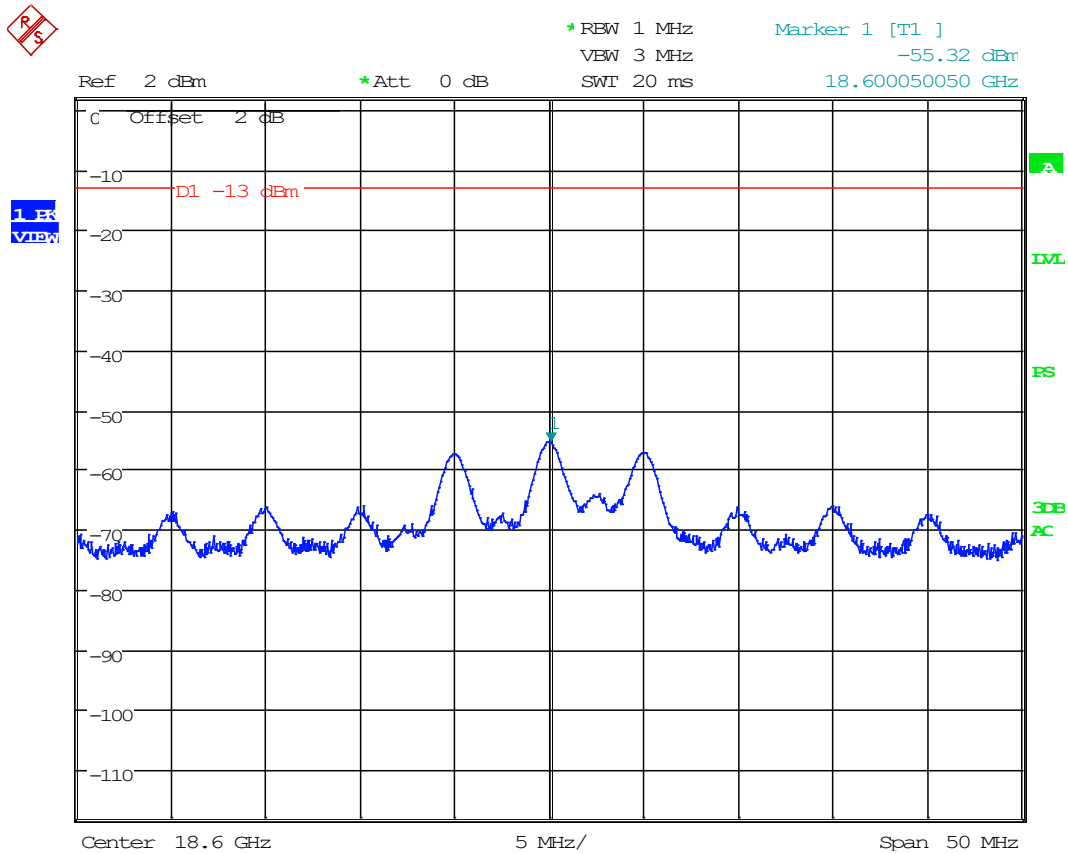
Test Data: 9.25 GHz, 4th Harmonic



Date: 7.AUG.2020 12:56:06

UNWANTED SPURIOUS EMISSIONS

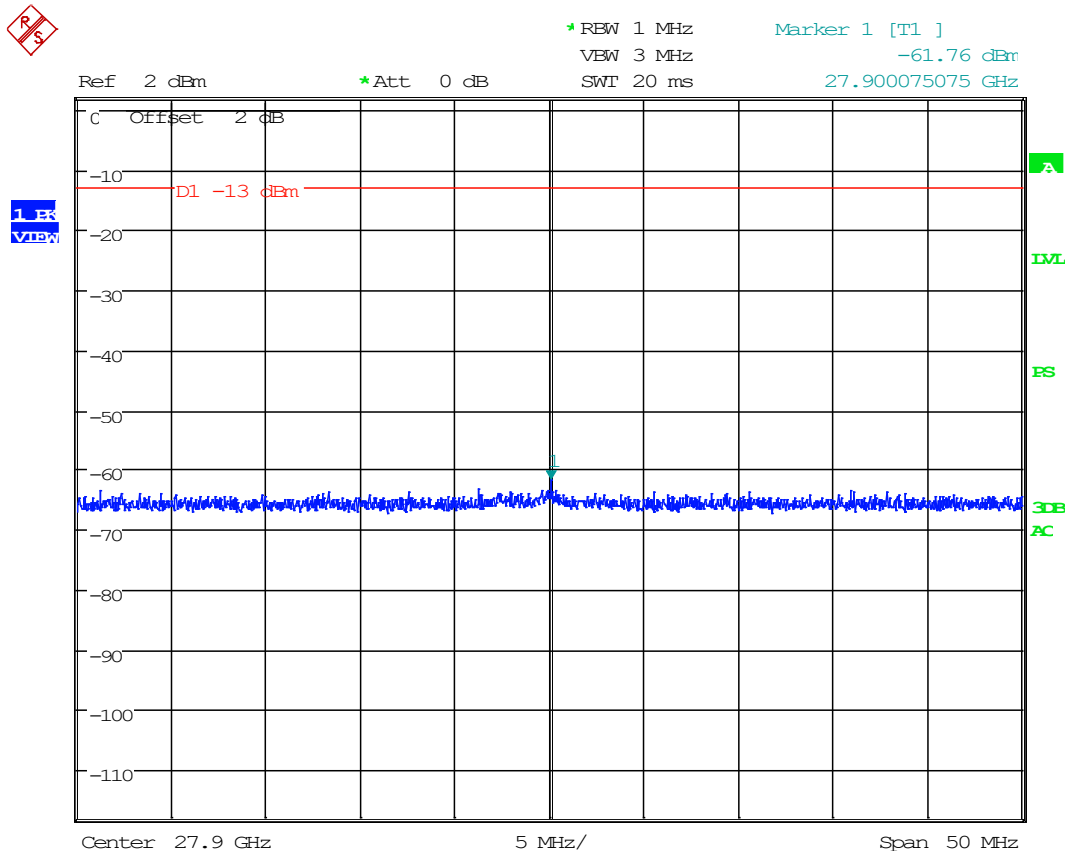
Test Data: 9.3 GHz, 2nd Harmonic



Date: 7.AUG.2020 12:59:35

UNWANTED SPURIOUS EMISSIONS

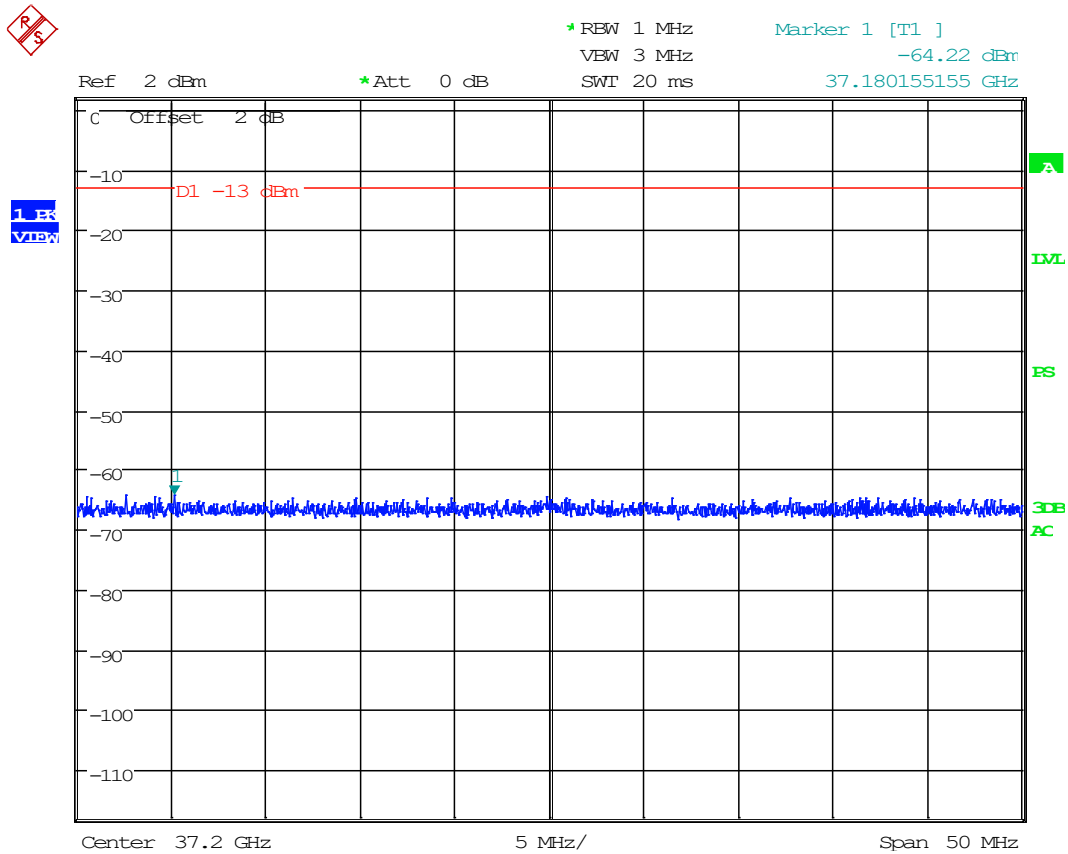
Test Data: 9.3 GHz, 3rd Harmonic



Date: 7.AUG.2020 13:00:11

UNWANTED SPURIOUS EMISSIONS

Test Data: 9.3 GHz, 4th Harmonic



Date: 7.AUG.2020 13:00:41

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Part No.: Part 2.1053(a), 2.1057(a)(1), 90.210(c)(3), 90.210(n), 90.210(b)(3)

Requirements:

§2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

§2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in §§2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

(n) *Other frequency bands.* Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.

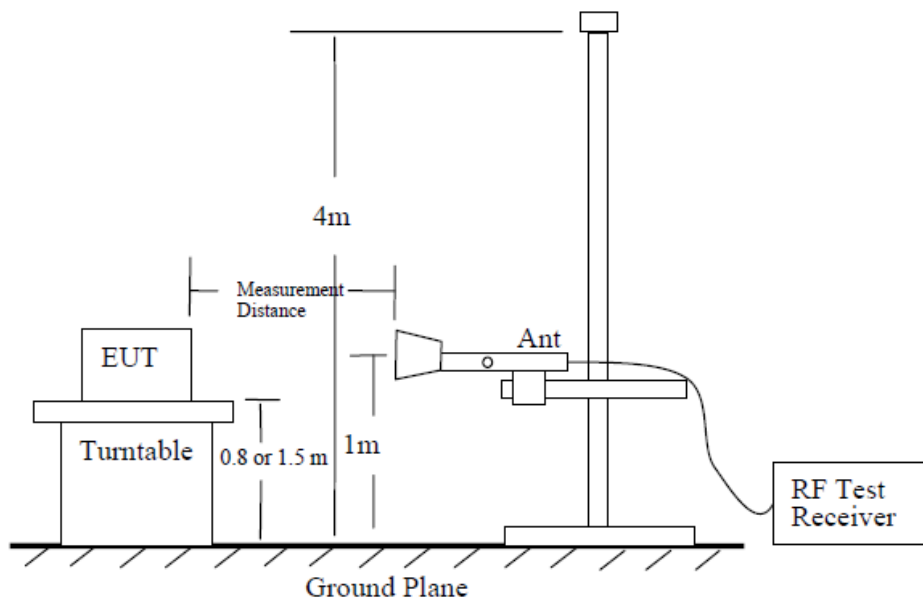
FIELD STRENGTH OF SPURIOUS EMISSIONS

(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

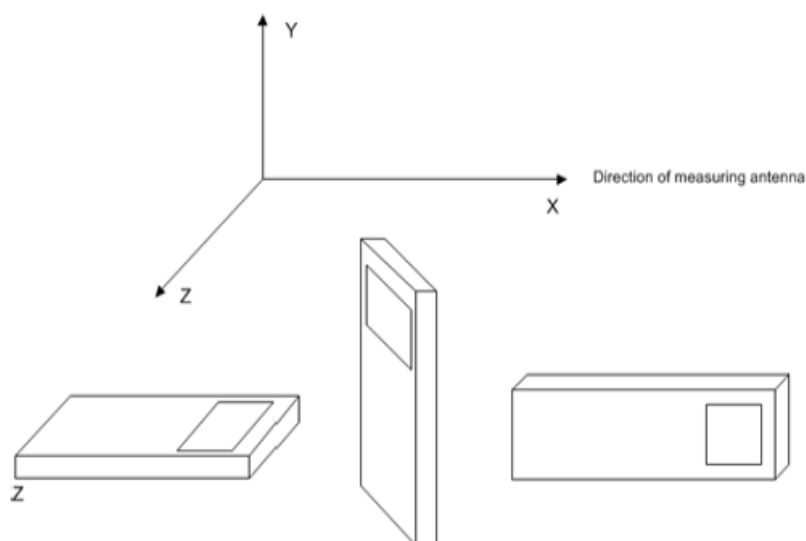
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

Test Procedure: ANSI C63.26, 5.5.4; ITU-R M.1177-4, ANNEX 1

Test Site Setup:



EUT Orientation(s):



FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 9.2 GHz, Radiated Spurious Emissions

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Antenna Polarity	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
9200.00	43.87	PK	V	3.00	37.46	-59.92	-13.00	46.92
9200.00	103.71	PK	H	3.00	30.29	-67.08	-13.00	54.08
9200.00	180.28	PK	H	3.00	42.53	-54.84	-13.00	41.84
9200.00	180.28	PK	V	3.00	42.39	-54.98	-13.00	41.98
9200.00	291.52	PK	V	3.00	41.38	-56.00	-13.00	43.00
9200.00	296.64	PK	H	3.00	39.12	-58.26	-13.00	45.26
9200.00	423.36	PK	V	3.00	50.44	-46.93	-13.00	33.93
9200.00	428.48	PK	H	3.00	44.48	-52.89	-13.00	39.89
9200.00	504.64	PK	V	3.00	47.54	-49.84	-13.00	36.84
9200.00	674.88	PK	H	3.00	53.28	-44.10	-13.00	31.10
9200.00	992.96	PK	H	3.00	57.16	-40.22	-13.00	27.22
9200.00	998.08	PK	V	3.00	57.94	-39.44	-13.00	26.44
9200.00	1046.50	PK	H	3.00	48.55	-48.83	-20.00	28.83
9200.00	1137.50	PK	V	3.00	48.78	-48.60	-20.00	28.60
9200.00	1409.75	PK	H	3.00	48.98	-48.40	-20.00	28.40
9200.00	1416.25	PK	V	3.00	48.27	-49.11	-20.00	29.11
9200.00	1955.50	PK	H	3.00	47.65	-49.73	-20.00	29.73
9200.00	1957.25	PK	V	3.00	48.53	-48.85	-20.00	28.85
9200.00	2617.75	PK	H	3.00	45.51	-51.87	-20.00	31.87
9200.00	2626.25	PK	V	3.00	45.30	-52.08	-20.00	32.08
9200.00	3583.75	PK	H	3.00	44.41	-52.97	-20.00	32.97
9200.00	3589.50	PK	V	3.00	44.96	-52.42	-20.00	32.42
9200.00	5030.75	PK	V	3.00	41.96	-55.42	-20.00	35.42
9200.00	5556.75	PK	H	3.00	41.63	-55.75	-20.00	35.75
9200.00	6724.00	PK	H	3.00	42.60	-54.78	-20.00	34.78
9200.00	7133.50	PK	V	3.00	41.97	-55.41	-20.00	35.41
9200.00	11271.50	PK	H	3.00	42.91	-54.47	-20.00	34.47
9200.00	11692.75	PK	V	3.00	43.04	-54.34	-20.00	34.34
9200.00	18400.00	PK	H	3.00	37.14	-60.24	-20.00	40.24
9200.00	18400.00	PK	V	3.00	35.67	-61.71	-20.00	41.71
9200.00	27600.00	PK	H	3.00	35.12	-62.26	-20.00	42.26
9200.00	27600.00	PK	V	3.00	32.19	-65.19	-20.00	45.19
9200.00	36800.00	PK	H	3.00	30.95	-66.43	-20.00	46.43
9200.00	36800.00	PK	V	3.00	28.45	-68.93	-20.00	48.93

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 9.25 GHz, Radiated Spurious Emissions

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Antenna Polarity	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
9250.00	43.87	PK	V	3.00	37.26	-60.12	-13.00	47.12
9250.00	103.71	PK	H	3.00	32.58	-64.79	-13.00	51.79
9250.00	180.28	PK	V	3.00	43.70	-53.67	-13.00	40.67
9250.00	180.42	PK	H	3.00	40.10	-57.28	-13.00	44.28
9250.00	264.00	PK	V	3.00	40.10	-57.27	-13.00	44.27
9250.00	307.52	PK	H	3.00	41.37	-56.01	-13.00	43.01
9250.00	369.60	PK	V	3.00	45.48	-51.89	-13.00	38.89
9250.00	420.16	PK	H	3.00	43.89	-53.48	-13.00	40.48
9250.00	422.08	PK	V	3.00	49.80	-47.57	-13.00	34.57
9250.00	674.88	PK	H	3.00	51.85	-45.53	-13.00	32.53
9250.00	837.44	PK	V	3.00	54.81	-42.57	-13.00	29.57
9250.00	962.24	PK	H	3.00	55.82	-41.55	-13.00	28.55
9250.00	1226.00	PK	H	3.00	49.38	-48.00	-20.00	28.00
9250.00	1339.00	PK	V	3.00	48.64	-48.74	-20.00	28.74
9250.00	1399.00	PK	H	3.00	47.90	-49.48	-20.00	29.48
9250.00	1866.75	PK	V	3.00	48.62	-48.76	-20.00	28.76
9250.00	1930.75	PK	V	3.00	46.99	-50.39	-20.00	30.39
9250.00	1962.75	PK	H	3.00	47.71	-49.67	-20.00	29.67
9250.00	2708.50	PK	H	3.00	45.56	-51.82	-20.00	31.82
9250.00	2720.50	PK	V	3.00	45.39	-51.99	-20.00	31.99
9250.00	3570.75	PK	H	3.00	44.16	-53.22	-20.00	33.22
9250.00	3584.25	PK	V	3.00	44.15	-53.23	-20.00	33.23
9250.00	4925.50	PK	V	3.00	41.96	-55.42	-20.00	35.42
9250.00	5176.25	PK	H	3.00	42.56	-54.82	-20.00	34.82
9250.00	7009.75	PK	H	3.00	41.10	-56.28	-20.00	36.28
9250.00	7044.00	PK	V	3.00	41.38	-56.00	-20.00	36.00
9250.00	11427.00	PK	V	3.00	42.17	-55.21	-20.00	35.21
9250.00	11847.75	PK	H	3.00	41.76	-55.62	-20.00	35.62
9250.00	18500.00	PK	H	3.00	36.89	-60.49	-20.00	40.49
9250.00	18500.00	PK	V	3.00	35.56	-61.82	-20.00	41.82
9250.00	27750.00	PK	H	3.00	35.44	-61.94	-20.00	41.94
9250.00	27750.00	PK	V	3.00	32.48	-64.90	-20.00	44.90
9250.00	37000.00	PK	H	3.00	31.46	-65.92	-20.00	45.92
9250.00	37000.00	PK	V	3.00	29.37	-68.01	-20.00	48.01

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 9.3 GHz, Radiated Spurious Emissions

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Antenna Polarity	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
9300.00	43.87	PK	V	3.00	37.48	-59.90	-13.00	46.90
9300.00	103.71	PK	H	3.00	32.03	-65.34	-13.00	52.34
9300.00	103.71	PK	V	3.00	37.26	-60.11	-13.00	47.11
9300.00	180.42	PK	H	3.00	37.99	-59.39	-13.00	46.39
9300.00	180.42	PK	V	3.00	40.73	-56.65	-13.00	43.65
9300.00	303.68	PK	H	3.00	40.67	-56.71	-13.00	43.71
9300.00	369.60	PK	V	3.00	45.00	-52.37	-13.00	39.37
9300.00	418.24	PK	V	3.00	49.74	-47.63	-13.00	34.63
9300.00	424.00	PK	H	3.00	44.87	-52.51	-13.00	39.51
9300.00	504.64	PK	V	3.00	47.13	-50.25	-13.00	37.25
9300.00	674.88	PK	H	3.00	52.57	-44.81	-13.00	31.81
9300.00	847.04	PK	V	3.00	55.86	-41.52	-13.00	28.52
9300.00	993.60	PK	H	3.00	56.61	-40.76	-13.00	27.76
9300.00	1022.00	PK	H	3.00	48.77	-48.61	-20.00	28.61
9300.00	1218.00	PK	V	3.00	50.05	-47.33	-20.00	27.33
9300.00	1399.25	PK	H	3.00	47.98	-49.40	-20.00	29.40
9300.00	1858.25	PK	V	3.00	48.06	-49.32	-20.00	29.32
9300.00	1960.25	PK	H	3.00	48.09	-49.29	-20.00	29.29
9300.00	1967.50	PK	V	3.00	47.87	-49.51	-20.00	29.51
9300.00	2612.50	PK	V	3.00	44.75	-52.63	-20.00	32.63
9300.00	2707.00	PK	H	3.00	46.29	-51.09	-20.00	31.09
9300.00	3537.50	PK	H	3.00	43.42	-53.96	-20.00	33.96
9300.00	3595.00	PK	V	3.00	43.56	-53.82	-20.00	33.82
9300.00	4955.25	PK	H	3.00	41.48	-55.90	-20.00	35.90
9300.00	5161.00	PK	V	3.00	41.87	-55.51	-20.00	35.51
9300.00	6743.00	PK	V	3.00	40.83	-56.55	-20.00	36.55
9300.00	7251.50	PK	H	3.00	41.47	-55.91	-20.00	35.91
9300.00	11275.00	PK	V	3.00	42.86	-54.52	-20.00	34.52
9300.00	11302.00	PK	H	3.00	43.23	-54.15	-20.00	34.15
9300.00	18600.00	PK	V	3.00	36.27	-61.11	-20.00	41.11
9300.00	18600.00	PK	V	3.00	35.59	-61.79	-20.00	41.79
9300.00	27900.00	PK	V	3.00	35.41	-61.97	-20.00	41.97
9300.00	27900.00	PK	V	3.00	32.48	-64.90	-20.00	44.90
9300.00	37200.00	PK	V	3.00	30.84	-66.54	-20.00	46.54
9300.00	37200.00	PK	V	3.00	29.18	-68.20	-20.00	48.20

FREQUENCY STABILITY

Rule Part No.: Part 2.1055(a)(2), 90.213(a)

§90.213 Frequency stability.

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

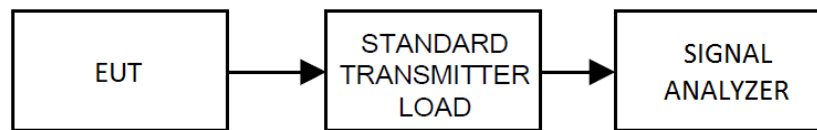
MINIMUM FREQUENCY STABILITY
[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Above 2450 ¹⁰			

¹⁰Except for DSRC equipment in the 5850-5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRC equipment in the 5850-5925 MHz band is specified in subpart M of this part.

Test Procedure: TIA 603-E, 2.2.2

Test Setup Block Diagram:



Note: This EUT does not incorporate a transmitter, and only re-transmits its received signal. Therefore, Frequency Stability is not applicable to this test item.

STATEMENT OF 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 EN TR 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:

Parameters	Measurement Uncertainty
CONDUCTED POWER MEASUREMENT	± 0.643 dB
CONDUCTED EMISSIONS 9 kHz – 150 kHz	± 3.14 dB
CONDUCTED EMISSIONS 150 kHz – 30 MHz	± 3.08 dB
RADIATED EMISSIONS 30 MHz – 200 MHz	± 2.16 dB
RADIATED EMISSIONS 200 MHz – 1 GHz	± 2.15 dB
RADIATED EMISSIONS 1 GHz – 18 GHz	± 2.14 dB
RADIATED EMISSIONS 18 GHz – 40 GHz	± 2.31 dB

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

EMC EQUIPMENT LIST

Device	Manufacturer	Model	SN	Calibrati on Date	Cal Due Date
EMI Test Receiver R & S ESU 40 firmware v 4.43 SP 3 BIOS v5.1-24-3	Rohde & Schwarz	ESU 40	100320	08/28/18	08/28/20
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 KMKM-0670-01 KFKF-0197-00	02/27/19	02/27/21
CHAMBER	Panashield	3M	N/A	03/15/19	03/15/21
Antenna: Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/11/20
Antenna: Biconical 1057	Eaton	94455-1	1057	12/13/17	12/13/20
Antenna: Log-Periodic 1243	Electro-Metrics	96005	1243	04/20/18	04/20/21
Ant: Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	02/25/20	02/25/23

END OF REPORT