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April 20, 2021

NoiseAware
2800 Routh Street, Suite 215
Dallas, TX 75201

Dear Jake Umbrage,

Enclosed is the EMC Wireless test report for compliance testing of the NoiseAware, Gen3.1 Collector as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15 Subpart C for Intentional Radiators.

Thank you for using the services of Eurofins Electrical and Electronic Testing NA, Inc. If you have any questions regarding these results or if Eurofins Electrical and Electronic Testing NA, Inc. can be of further service to you, please feel free to contact me.

Sincerely yours,
Eurofins Electrical and Electronic Testing NA, Inc.

Michelle Tawmging

Michelle Tawmging
Documentation Department

Reference: (\NoiseAware\WIRA111308A-FCC247 BLE)

Electromagnetic Compatibility Criteria
Test Report

for the

NoiseAware
Gen3.1 Collector

Tested under
the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators

Report: WIRA111308A-FCC247 BLE

April 20, 2021

Prepared For:

NoiseAware
2800 Routh Street, Suite 215
Dallas, TX 75201

Prepared By:
Eurofins Electrical and Electronic Testing NA, Inc.
13501 McCallen Pass
Austin, TX 78753

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Report: WIRA111308A-FCC247 BLE

Adan Arab, Project Engineer
Electromagnetic Compatibility Lab

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.

Jonathan Tavira,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	April 20, 2021	Initial Issue.

Table of Contents

List of Figures

List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**micro**henry
µ	**micro**farad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the NoiseAware Gen3.1 Collector, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Gen3.1 Collector. NoiseAware should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Gen3.1 Collector, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with NoiseAware, purchase order number 180910-1. All tests were conducted using measurement procedure ANSI C63.10-2013.

FCC Reference 47 CFR Part 15.247:2020	Description	Compliance
Title 47 of the CFR, Part 15 §15.203	Antenna Requirement	Compliant
ANSI C63.10-2013 (11.6)	Duty Cycle	Completed
Title 47 of the CFR, Part 15 §15.207(a)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	6dB Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	Conducted Spurious Emissions in Non-restricted Bands	Not Applicable[1]
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	Maximum Permissible Exposure (MPE)	Compliant
Not Applicable[1]: The EUT did not have an antenna ports temporal or permanent, Spurious Emissions in 100 KHz Bandwidth test and the rest of the tests was performed on a radiated setup.		

Figure 1: Executive Summary of EMC Part 15.247 Compliance Testing

Equipment Configuration

A. Overview

Eurofins Electrical and Electronic Testing NA, Inc. was contracted by NoiseAware to perform testing on the Gen3.1 Collector, under NoiseAware's purchase order number 180910-1.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the NoiseAware, Gen3.1 Collector.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Gen3.1 Collector	
Model(s) Covered:	Gen3.1 Collector	
EUT Specifications:	Primary Power: 120VAC 60Hz	
	FCC ID: 2AQIP-NA3N301	
	Type of Modulations:	GFSK
	Equipment Code:	DTS
	Peak RF Output Power:	-6.38 dBm
	EUT Frequency Ranges:	2404-2480 MHz
	Antenna Gain:	3 dBi
	Antenna Type:	Trace Antenna
	EUT Software as tested:	Custom Software Version 2.0.0
	Support Software:	VNC Viewer
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Adan Arab	
Report Date(s):	April 20, 2021	

Figure 2: EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 v05	Guidance For Performing Compliance Measurements On Digital Transmission Systems (DTS) Operating Under Section 15.247

Figure 3: References

C. Test Site

All testing was performed at Eurofins Electrical and Electronic Testing NA, Inc., 13501 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at Eurofins Electrical and Electronic Testing NA, Inc.

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%
Radiated Emissions, (30 MHz – 1 GHz)	±2.95 dB	2	95%
Radiated Emissions, (1 GHz – 18 GHz)	±3.54 dB	2	95%
Radiated Emissions, (18 GHz – 25 GHz)	±4.53 dB	2	95%

Figure 4: Uncertainty Calculations Summary

E. Description of Test Sample

The Gen3.1 Collector, Equipment Under Test (EUT), is a WiFi-enabled noise monitoring device that mounts to most common US power outlets with an included screw. The device monitors volume levels and also acts as a gateway for the Outdoor Noise Sensor (Gen 3 Node), receiving data over Sub-1 GHz and relaying it over WiFi. It is intended to be used by professional property managers in indoor areas of short-term rental residences.

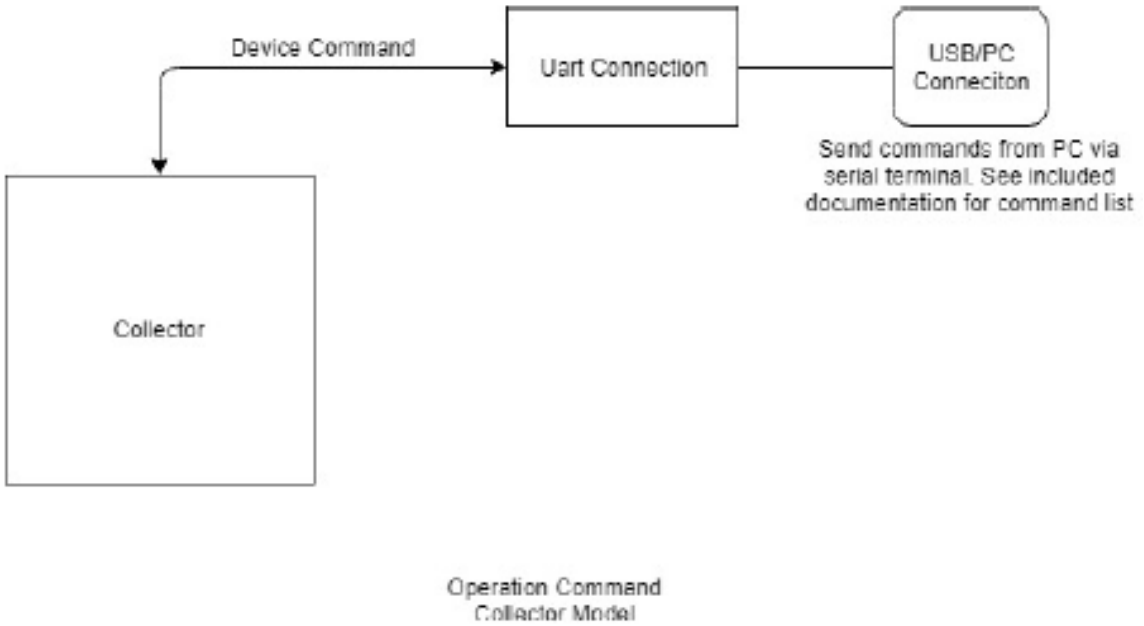

Figure 5: Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 5, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
1	N/A	Gen3.1 Collector	NA3N101	N/A	N/A	N/A

Figure 6: Equipment Configuration

G. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name/Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
1	Raspberry Pi	Raspberry Pii	B v1.1	N/A
2	Laptop	BOCCONI	N3350	N/A
3	Ethernet USB Adapter	BOCCONI	N/A	N/A
4	Outdoor Sensor	Noiseaware	NA3N102	N/A
The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.				

Figure 7: Support Equipment

H. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Desc. or reason for none	QTY	Length as tested (m)	Max Length (m)	Shielded?	Termination Box ID & Port Name
1	Power	Power adaptor	2	0.1	N/A	No	AC Mains
2	Pi 2 USB Port	USB	2	1	N/A	No	AC/DC Adapter
3	Pi 2 Ethernet port	Ethernet	1	0.5	N/A	No	Support PC

Figure 8: Port and Cabling Information

I. Mode of Operation

We will provide several samples that demonstrate the different modes. When you click the VNC Tool you will see multiple icons corresponding the provided different samples. When you click the outdoor shortcut, it opens the RF testing interface, choose executive terminal, the Menu has two working modes, choose BLE/WLAN Test mode and you will see the EUT is flashed with a debug enabled firmware for testing. The EUT flashing is completed, these options will be available to change the Modulation, channels and enable and change power setting. When you choose a specific channel, modulation and power setting then click start will start the operation. For BLE, these modes will be 2404 MHz, 2442 MHz and 2480 MHz single channels, Low, mid, High. These modes can all be used to measure characteristics of the RF system during normal operation. while stop will reset the sensor back to normal mode.

J. Method of Monitoring EUT Operation

While the device is powered, the LED indicator at the rear of the device indicates two modes of operation: 1) During normal operation the LED is off. 2) During setup mode the LED will blink periodically to indicate it is broadcasting a discoverable AP. The LED will blink quickly and then turn off when device has been set up successfully. The device can be reset into setup mode by depressing the button on the side of the device.

K. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

L. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to NoiseAware upon completion of testing.

Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203. PAR-Gen3 Collector Utilizes Integral Trace Antenna which is not accessible to the end user with the gain of 3 dBi as declared by the manufacturer. The EUT is complaint with the provisions of section 15.203.

Antenna Gain	Antenna Type
3 dBi	Integral Trace Antenna

Figure 9: Antenna List

Test Engineer: **Adan Arab**

Test Date: **March 16, 2021**

Duty Cycle

Test Procedure: The EUT was connected to a spectrum analyzer and was ran at the maximum achievable duty cycle for all modes. The duty cycle was measured in accordance with section 11.6 of ANSI C63.10-2013.

Test Engineer(s): Adan Arab

Test Date(s): February 25, 2021

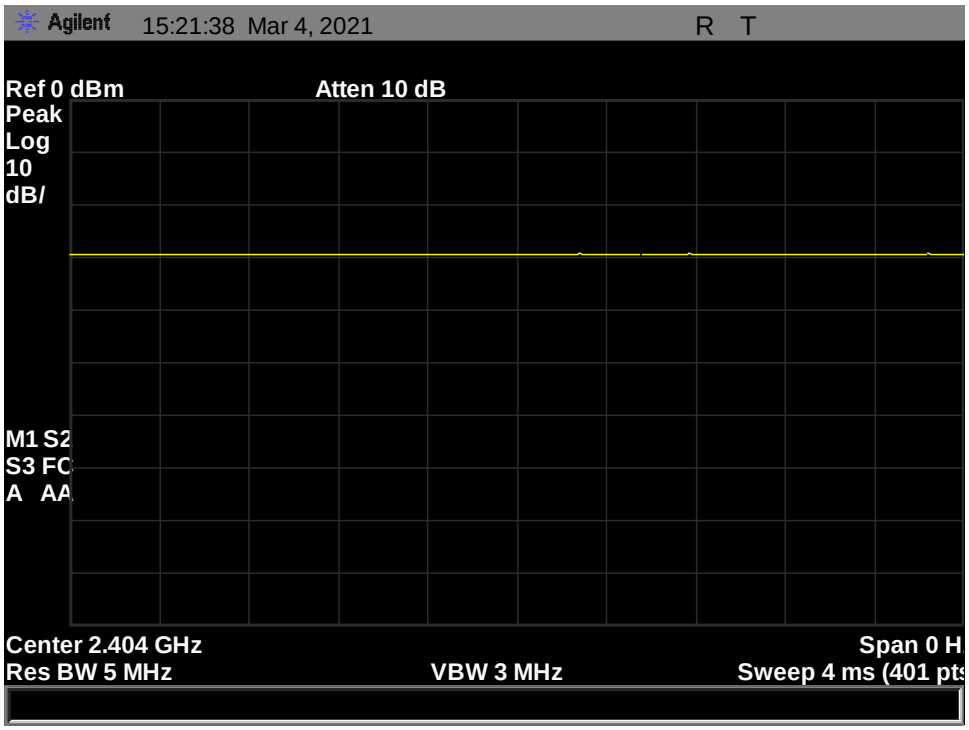

Figure 10: Duty Cycle, Test Data

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions Limits

Test Requirement(s): **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

Figure 11: Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

* - The level decreases linearly with the logarithm of the frequency.

Test Procedure: The EUT was placed on a 0.8m high non-conductive table. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). An EMI receiver, connected to the measurement port of the LISN. The EMI receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.10-2013*. All peak emissions close to the limit were re-measured using a quasi-peak and/or average detector as appropriate.

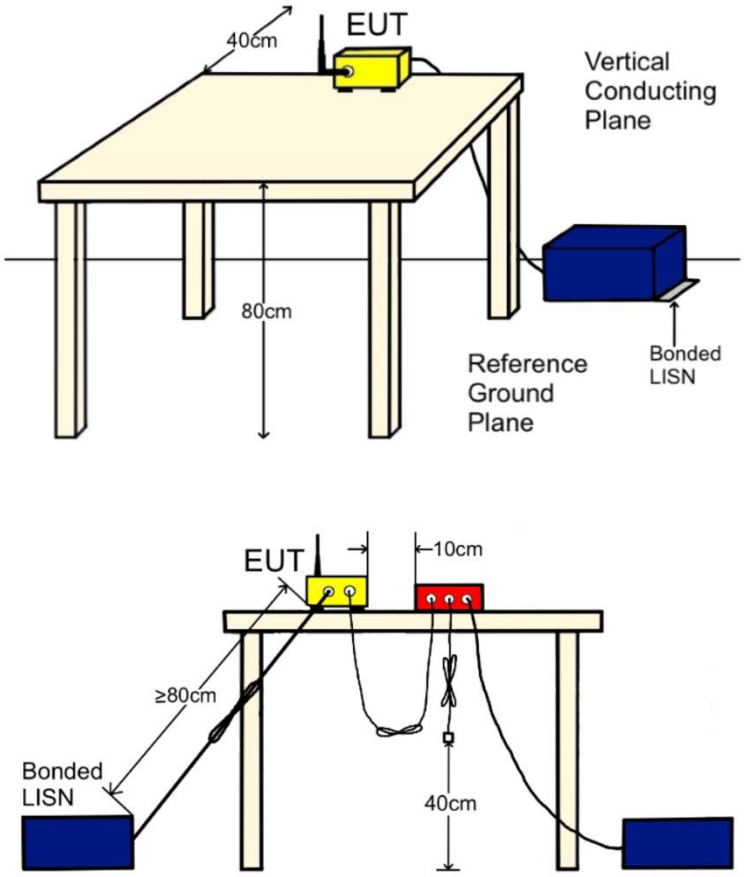

Figure 12: CEV Test Setup

Test Results: The EUT was **compliant** with this requirement **§ 15.207 (a)**. Measured emissions were below applicable limits. Photographs of test setup and the test results are presented below.

Test Engineer: **Adan Arab**

Test Date: **March 15, 2021**

Meas. Location	Meas. m	Limit	Result
Bonding measurement from LISN ground to ground plane	1.9 mΩ	< 2.5 mΩ	Pass

Line Name	Freq (MHz)	QP Amplitude (dBµV)	QP Limit (dBµV)	Margin (dB)	Result	Average Amplitude (dBµV)	Average Limit (dBµV)	Margin (dB)	Result
Line_120VAC 60Hz	0.422	44.700	57.432	-12.732	Pass	32.200	47.432	-15.232	Pass
Line_120VAC 60Hz	0.346	42.800	59.077	-16.277	Pass	32.100	49.077	-16.977	Pass
Line_120VAC 60Hz	0.378	47.000	58.344	-11.344	Pass	36.700	48.344	-11.644	Pass
Line_120VAC 60Hz	0.158	38.700	65.57	-26.87	Pass	23.400	55.57	-32.17	Pass
Line_120VAC 60Hz	0.838	36.600	56	-19.4	Pass	24.600	46	-21.4	Pass
Line_120VAC 60Hz	1.054	36.700	56	-19.3	Pass	25.600	46	-20.4	Pass
Neutral_120VAC 60Hz	0.382	47.000	58.257	-11.257	Pass	34.000	48.257	-14.257	Pass
Neutral_120VAC 60Hz	0.418	44.800	57.511	-12.711	Pass	32.400	47.511	-15.111	Pass
Neutral_120VAC 60Hz	0.350	43.000	58.982	-15.982	Pass	30.800	48.982	-18.182	Pass
Neutral_120VAC 60Hz	0.606	31.600	56	-24.4	Pass	23.600	46	-22.4	Pass
Neutral_120VAC 60Hz	1.314	32.400	56	-23.6	Pass	22.000	46	-24	Pass
Neutral_120VAC 60Hz	1.162	31.200	56	-24.8	Pass	21.700	46	-24.3	Pass

Figure 13: Conducted Emissions, Test Data

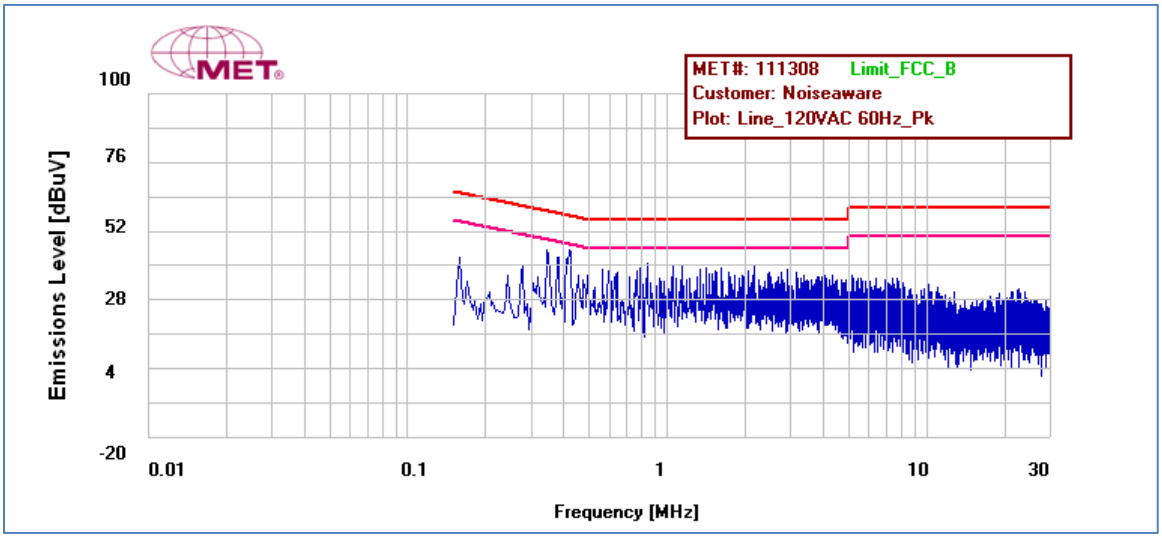

Figure 14: Conducted Emissions, Line Plot

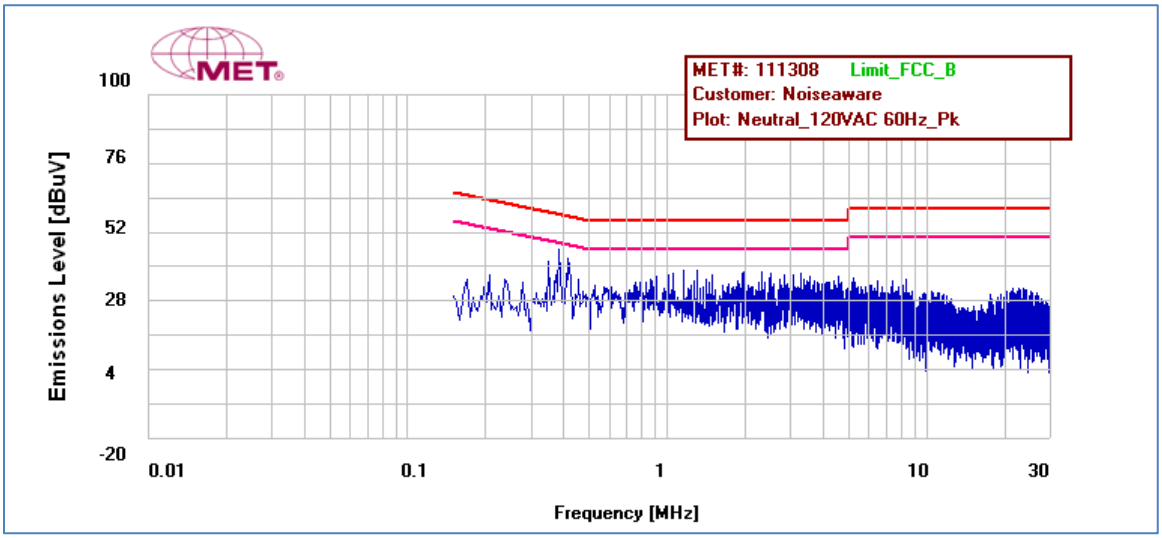

Figure 15: Conducted Emissions, Neutral Line

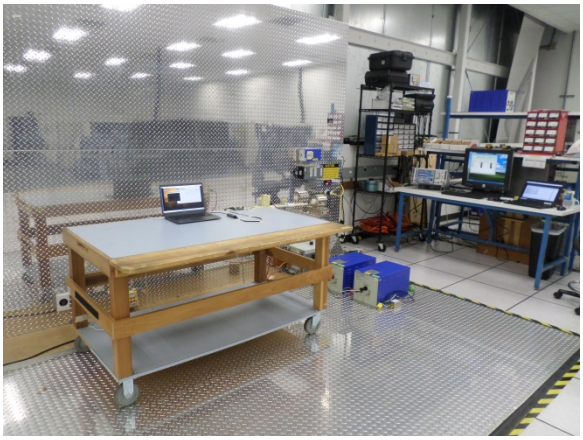

Figure 16: Conducted Emissions, Setup Front View

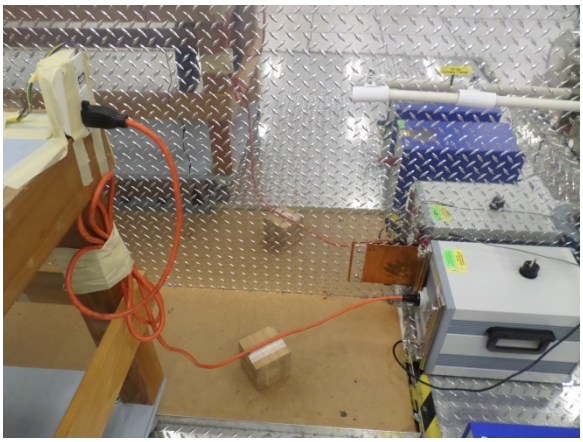

Figure 17: Conducted Emissions, Setup LISN View

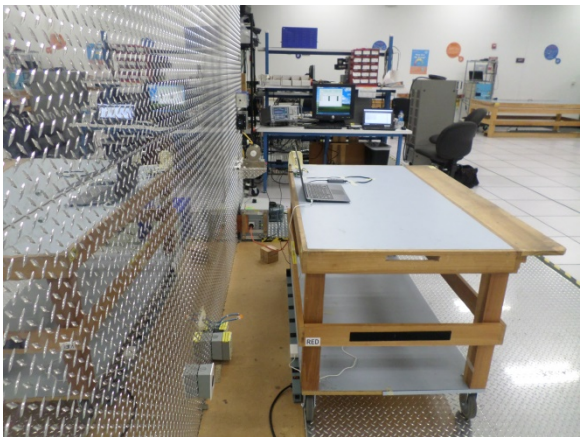

Figure 18: Conducted Emissions, Setup Rear View

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(2) 6 dB Bandwidth

Test Requirements: **§ 15.247(a)(2):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW = 100kHz, VBW = 3*RBW. The 6 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(2).

The 6 dB Bandwidth was determined from the plots on the following pages.

Test Engineer: **Adan Arab**

Test Date: **March 4, 2021**

Center Frequency (MHz)	6 dB Occupied Bandwidth (KHz)	Limit (KHz)
2404	651.698	>500
2442	649.613	>500
2480	653.557	>500

Figure 19: 6 dB Occupied Bandwidth, Test Results

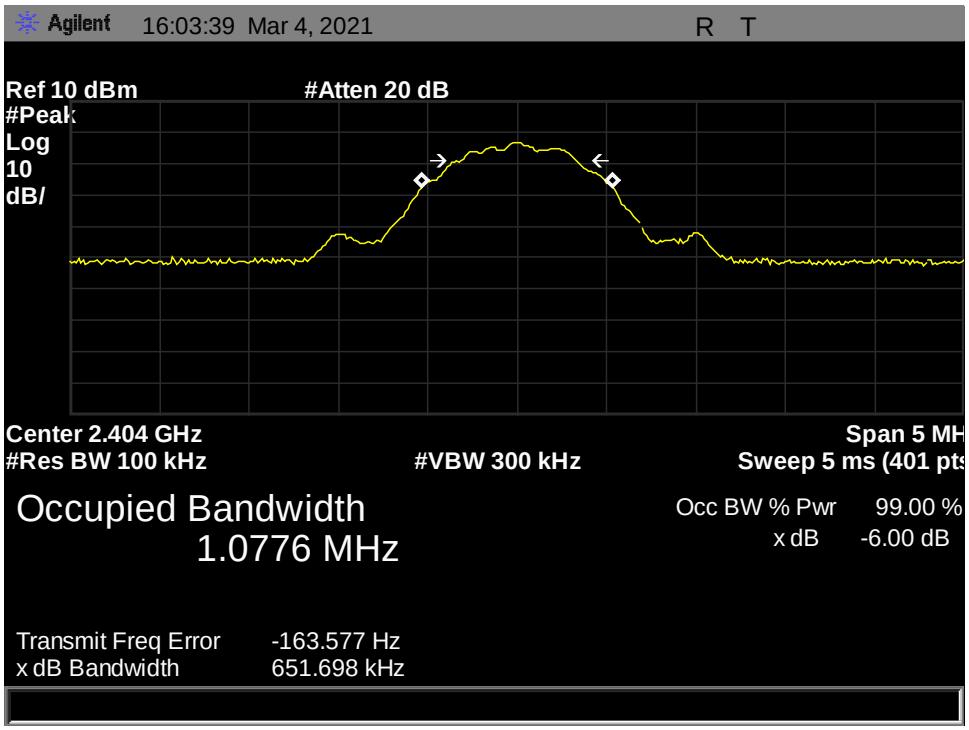

Figure 20: 6 dB Bandwidth, 2404 MHz - 651.698 KHz

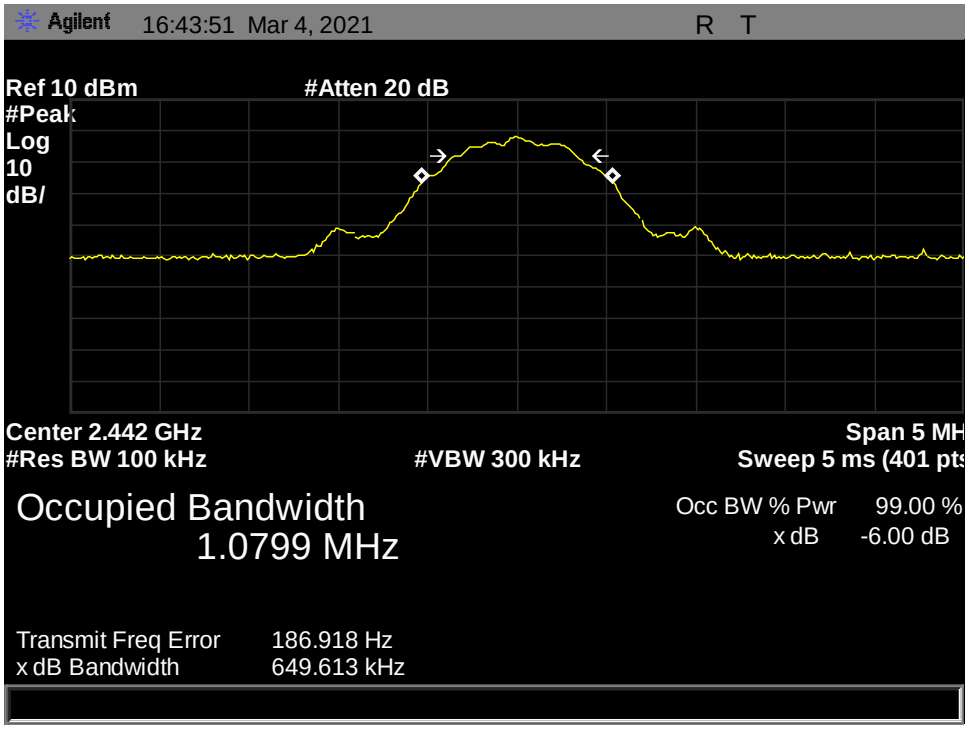

Figure 21: 6 dB Bandwidth, 2442 MHz - 649.613 KHz

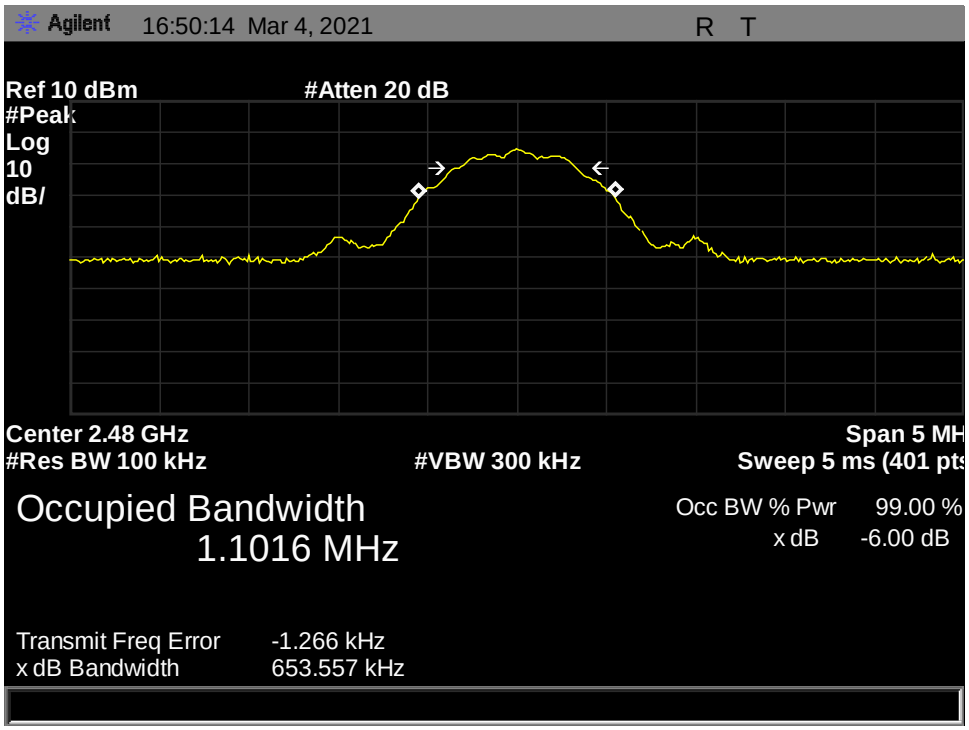

Figure 22: 6 dB Bandwidth, 2480 MHz - 653.557 KHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

Test Requirements: **§15.247(b):** The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
2400–2483.5	1.000

Figure 23: Output Power Requirements from §15.247(b)

Test Procedure: The EUT was measured at the low, mid and high channels of each band at the maximum power level. Procedure 11.9.1.1 from ANSI C63.10-2013 was used to measure the peak power output.

The EUT utilizes a 3 dBi Antenna.

The EUT did not have antenna ports temporal or permanent, the test was performed on a radiated setup.

The measured field strength was converted to conducted power with the following formula:

EIRP (dBm) = E (dBuV/m) + 20log(d) – 104.77 = P (dBm) + G (dBi)
P (dBm) = E (dBuV/m) + 20log(d) – 104.77 – G (dBi)

Where, P is conducted power
E is field strength
G is antenna gain.

Test Results: The EUT was compliant with the Peak Power Output limits of **§15.247(b)**.

Test Engineer: **Adan Arab**

Test Date: March 11, 2021

Freq (MHz)	Field Strength (dBuV/m)	Output Power EIRP (dBm)	Antenna Gain (dBi)	Conducted Power (dBm)	Limit (dBm)	Result
2404	91.85	-3.38	3	-6.38	30	Pass
2442	88.54	-6.69	3	-9.69	30	Pass
2480	86.5	8.73	3	-11.73	30	Pass

Figure 24: Peak Output Power, Test Results

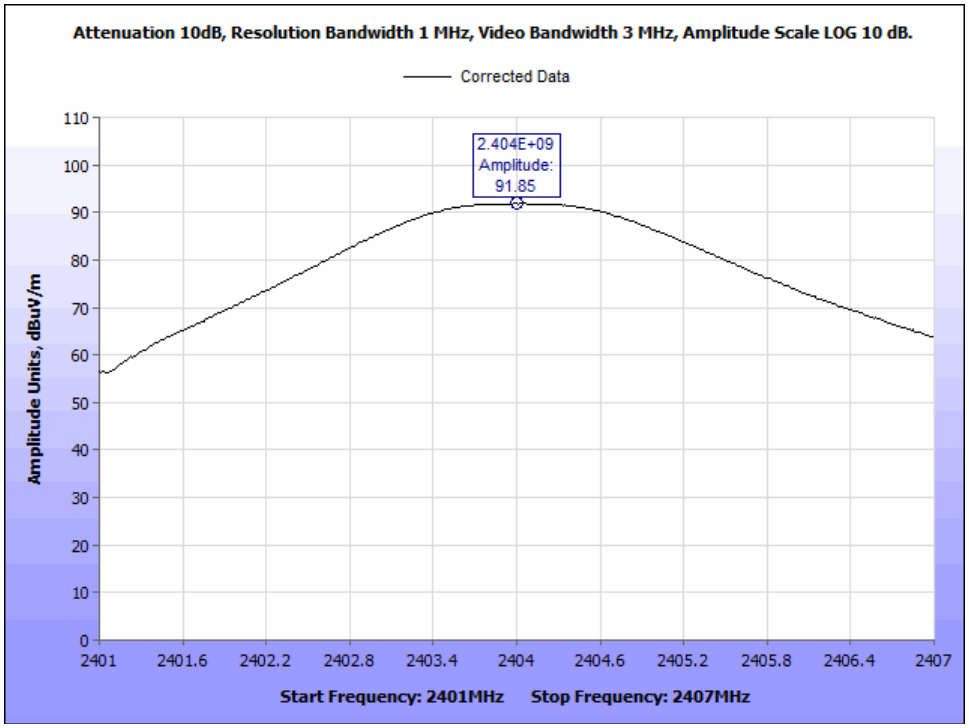

Figure 25: Output Power, 2404 MHz, Low Channel

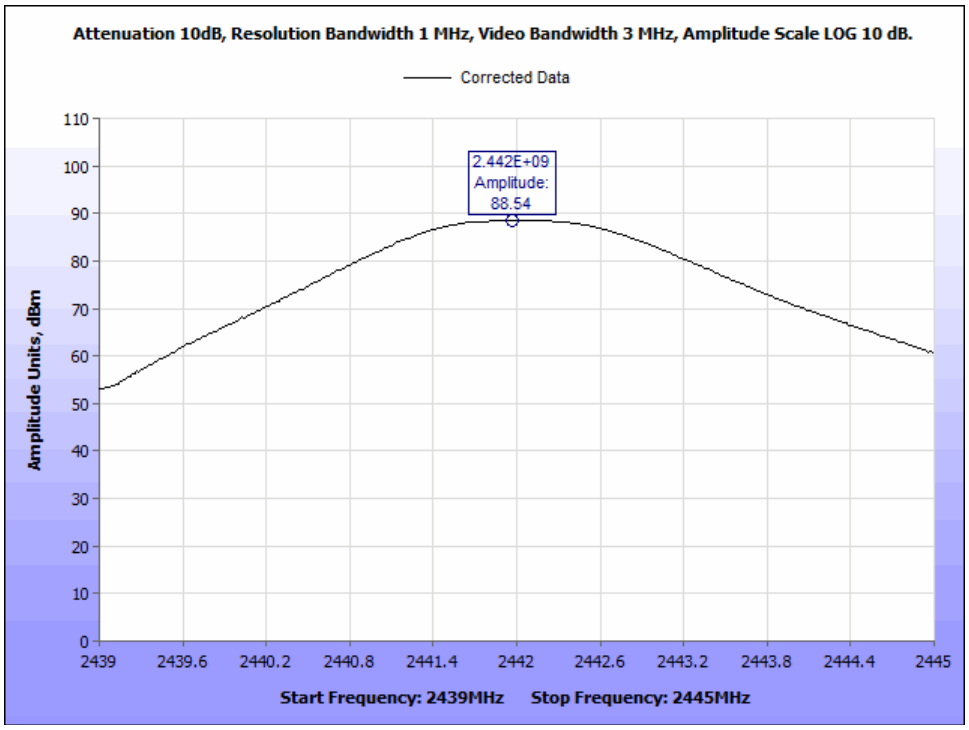

Figure 26: Output Power, 2442 MHz, Mid Channel

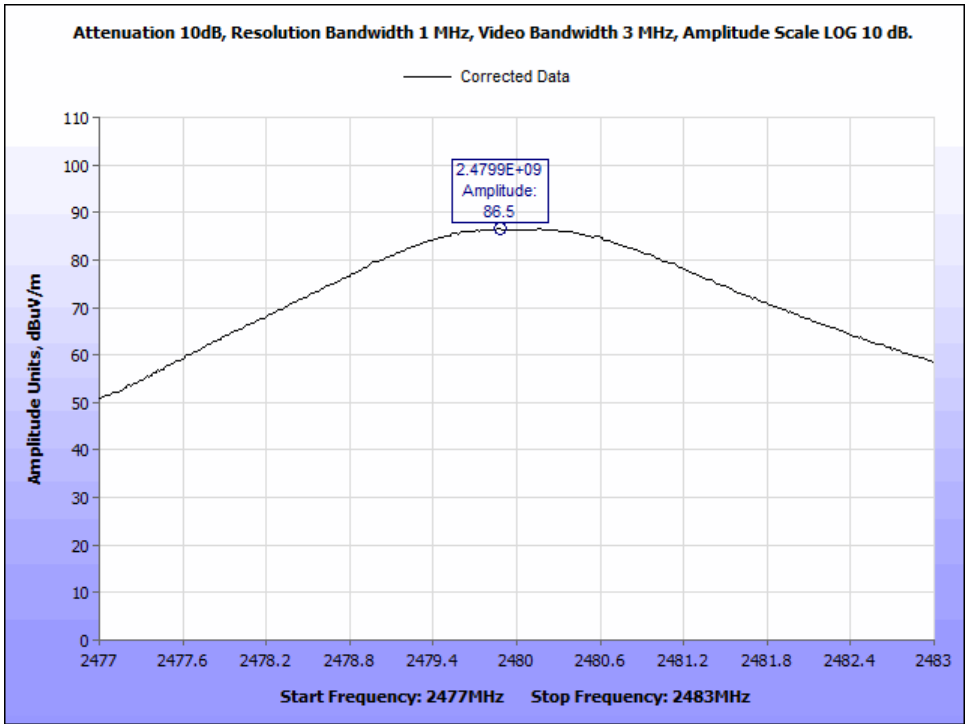

Figure 27: Output Power, 2480 MHz, High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.209 Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: **§15.247(d); §15.205:** Emissions outside the frequency band.

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110----------	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505----------	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905----------	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128----------	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775----------	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775----------	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218----------	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825----------	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225----------	123–138	2200–2300	14.47–14.5
8.291–8.294----------	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366----------	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675----------	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475----------	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293----------	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025----------	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725----------	322–335.4	3600–4400	([2])

Figure 28: Restricted Bands of Operation

[1] Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

[2] Above 38.6

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Figure 29.

Frequency (MHz)	§ 15.209(a),Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Figure 29: Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedures: The transmitter was set to the mid channel at the highest output power and placed on a 0.8 m high non-conductive table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast with 1 m to 4 m height to determine worst case orientation for maximum emissions. Measurement were repeated the measurement at the low and highest channels.

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

In accordance with §15.35(b) the limit on the radio frequency emissions as measured using instrumentation with a peak detector function shall be 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

The EUT did not have an antenna ports temporal or permanent, Spurious Emissions in 100 KHz Bandwidth test was performed on a radiated setup.

EUT Field Strength Final Amplitude = Raw Amplitude – Preamp gain + Antenna Factor + Cable Loss – Distance Correction Factor.

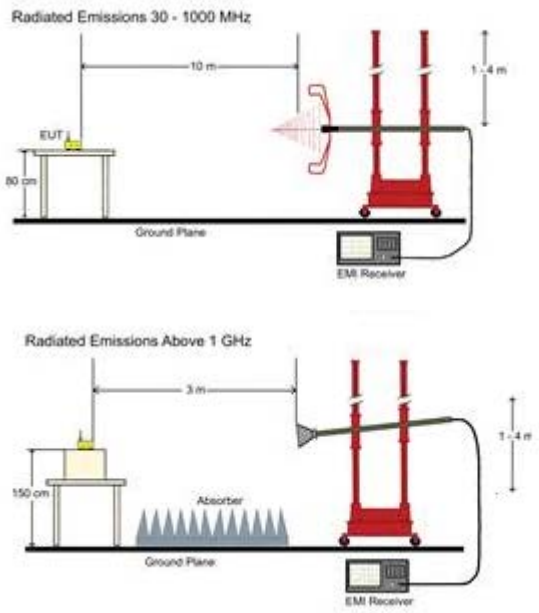

Figure 30: Radiated Spurious Emissions Test Setup

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d) and § 15.209**. Measured emissions were within applicable limits.

Test Engineer: **Adan Arab**

Test Date: **March 12, 2021**

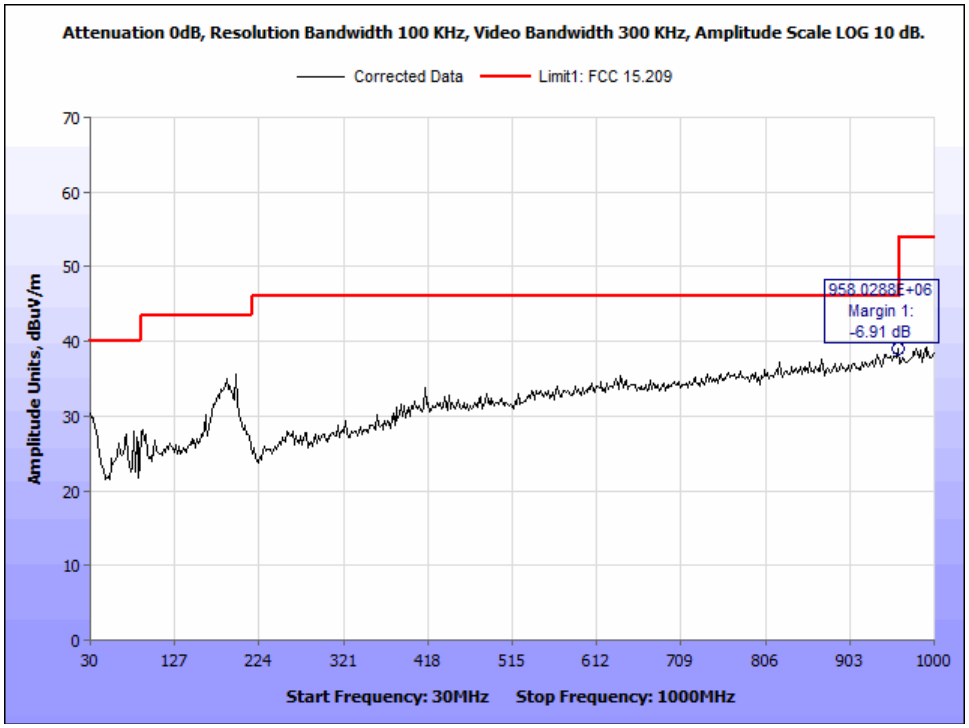

Figure 31: Radiated Spurious Emissions, 2404 MHz - 30MHz-1000MHz - Horizontal

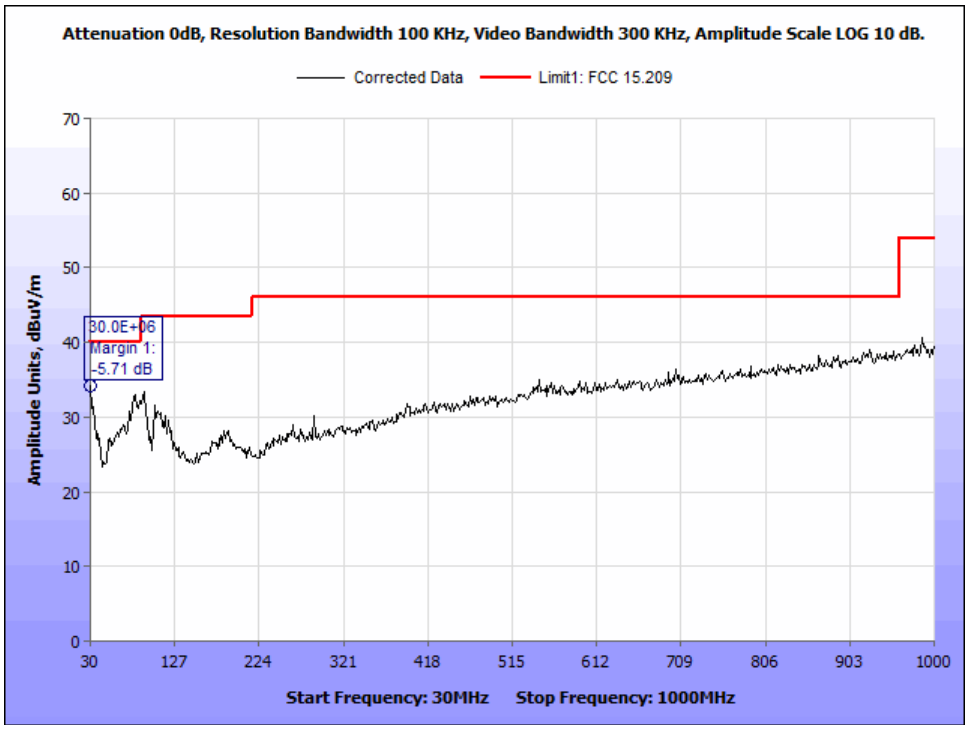

Figure 32: Radiated Spurious Emissions, 2404 MHz - 30MHz-1000MHz – Vertical

Frequency (MHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth	Uncorrected Amplitude (dBuV)	DCF (dB)	ACF (dB/m)	Pre-amp Factor & CBL (dB)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
958.0288	H	134	54	22.48	10.46	25.3	-19.16	39.09	46	-6.91
956.4744	H	205	198	21.11	10.46	25.35	-19.17	37.75	46	-8.25
954.9199	H	152	63	21.49	10.46	25.31	-19.19	38.07	46	-7.93
30.0000	V	228	175	26.35	10.46	22.3	-24.82	34.29	40	-5.71
925.3846	V	200	239	22.59	10.46	25.4	-19.42	39.04	46	-6.96
81.2981	V	400	312	34.77	10.46	11.63	-23.89	32.97	40	-7.03

Figure 33: Radiated Spurious Emissions, 2404 MHz - 30MHz-1000MHz, Test Results

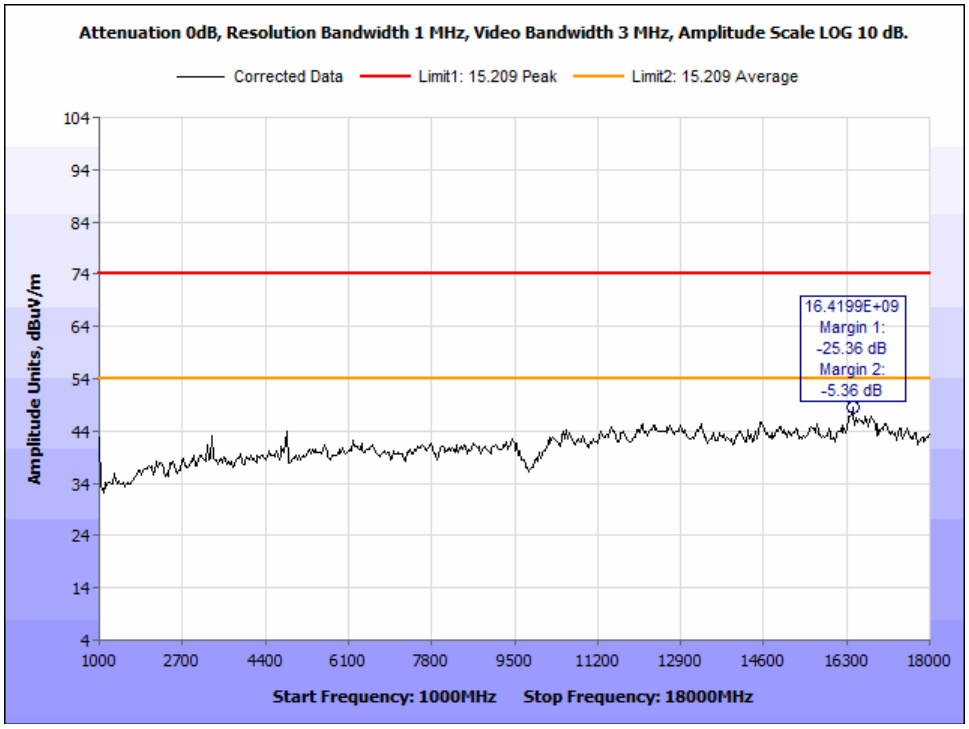

Figure 34: Radiated Spurious Emissions, 2404 MHz - 1GHz-18GHz - Peak - Horizontal

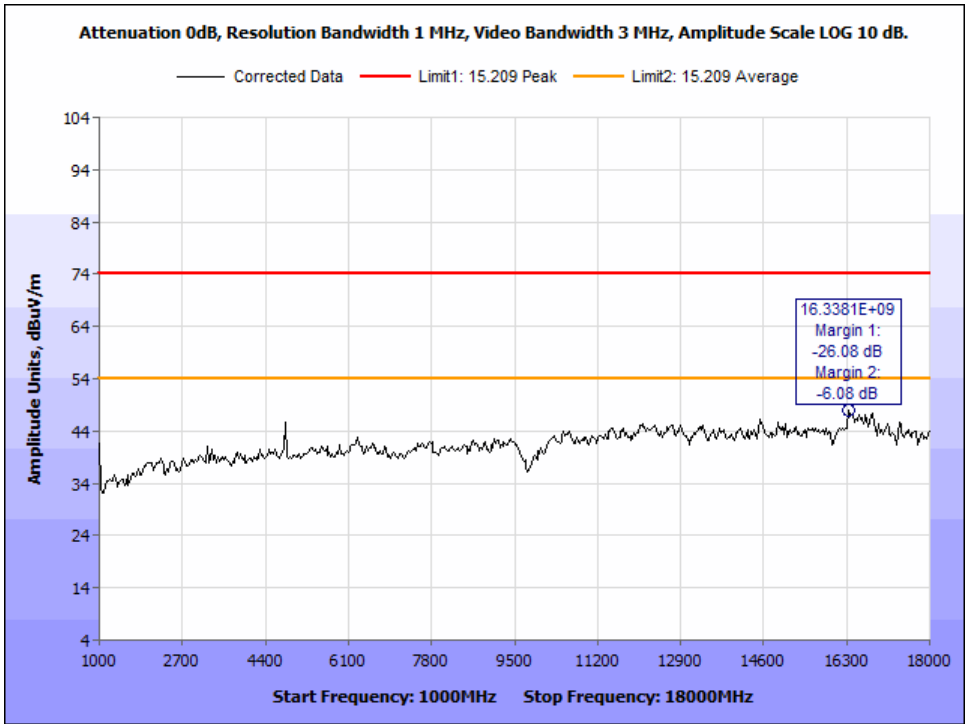

Figure 35: Radiated Spurious Emissions, 2404 MHz - 1GHz-18GHz - Peak – Vertical

Frequency (GHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Preamp Factor & CBL (dB)	Corrected Amplitude (dBuV/m)	Limit 1, 15.209 Peak (dBuV/m)	Margin 1 (dB)	Limit 2, 15.209 Average (dBuV/m)	Margin 2 (dB)
16.4199	H	100	49	49.02	40.61	-40.99	48.64	74	-25.36	54	-5.36
16.4471	H	300	185	47.44	40.66	-40.96	47.14	74	-26.86	54	-6.86
16.3926	H	100	239	47.48	40.57	-41.03	47.02	74	-26.98	54	-6.98
16.3381	V	400	320	48.6	40.48	-41.16	47.92	74	-26.08	54	-6.08
16.8285	V	200	138	48.89	41.24	-42.82	47.31	74	-26.69	54	-6.69
16.3654	V	100	129	47.75	40.52	-41.1	47.17	74	-26.83	54	-6.83

Figure 36: Radiated Spurious Emissions, 2404 MHz – 1GHz-18GHz, Test Results

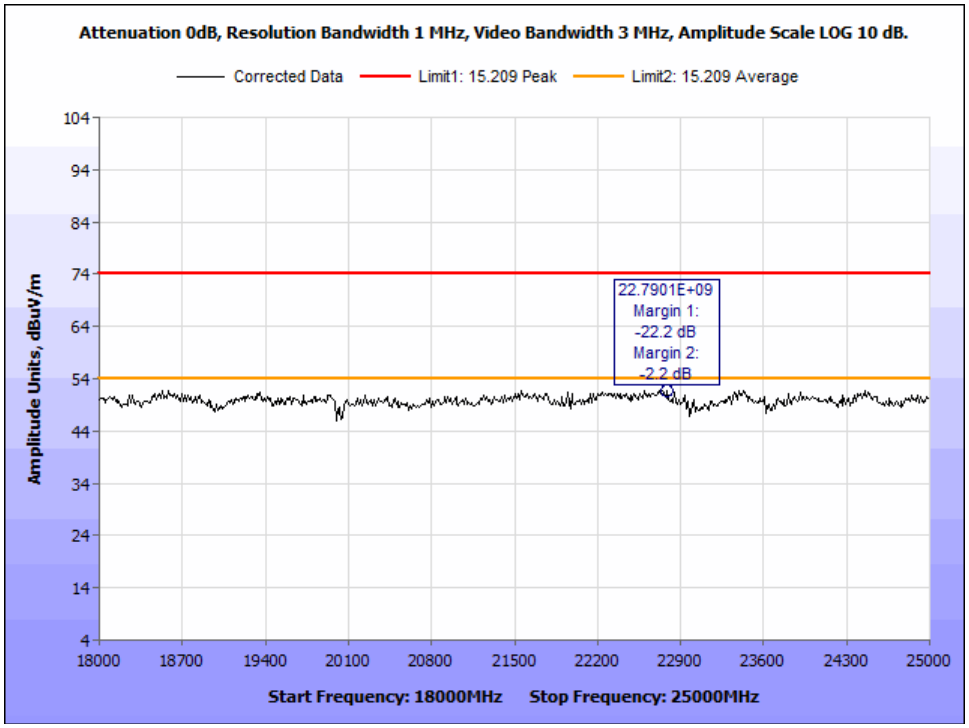

Figure 37: Radiated Spurious Emissions, 2404 MHz - 18-25GHz - Peak - Horizontal

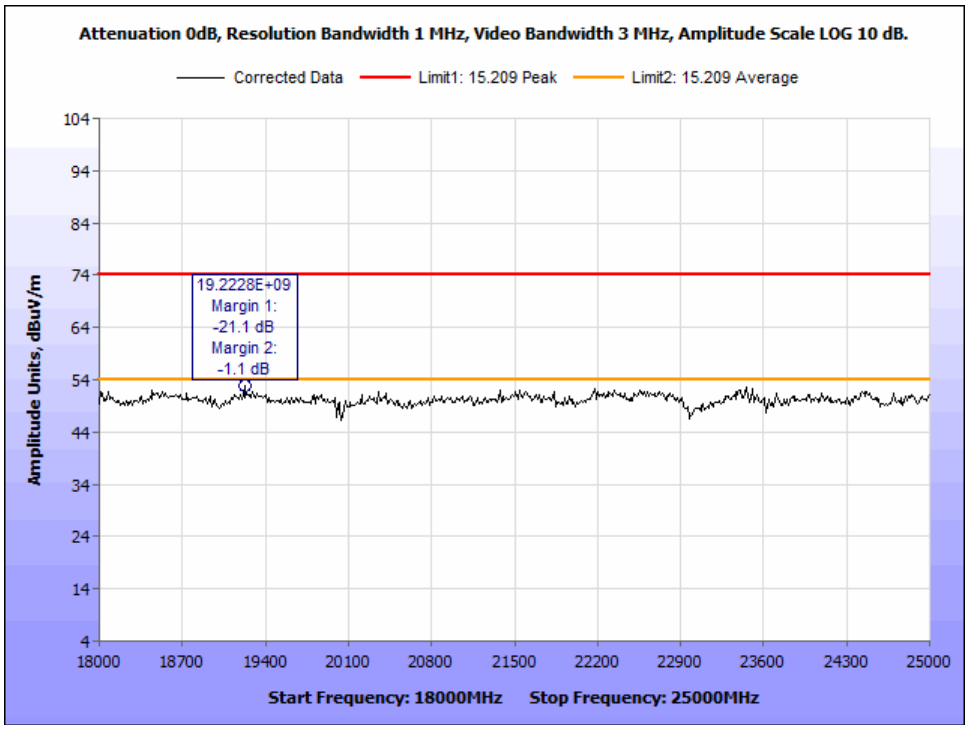

Figure 38: Radiated Spurious Emissions, 2404 MHz - 18-25GHz - Peak – Vertical

Frequency (GHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	CBL (dB)	Preamp Factor (dB)	Corrected Amplitude (dBuV/m)	Limit 1, 15.209 Peak (dBuV/m)	Margin 1 (dB)	Limit 2, 15.209 Average (dBuV/m)	Margin 2 (dB)
22.7901	H	134	54	38.93	45.24	7.92	-40.28	51.8	74	-22.2	54	-2.2
22.7452	H	205	198	38.74	45.22	8.08	-40.32	51.72	74	-22.28	54	-2.28
18.5833	H	152	63	39.48	44.07	7.28	-39.12	51.71	74	-22.29	54	-2.29
19.2228	V	228	175	41.15	44.47	7.37	-40.09	52.9	74	-21.1	54	-1.1
23.4519	V	200	239	39.59	45.21	7.59	-39.86	52.54	74	-21.46	54	-1.46
22.1731	V	400	312	40.03	45.15	8.04	-40.88	52.34	74	-21.66	54	-1.66

Figure 39: Radiated Spurious Emissions, 2404 MHz – 18GHz-25GHz, Test Results

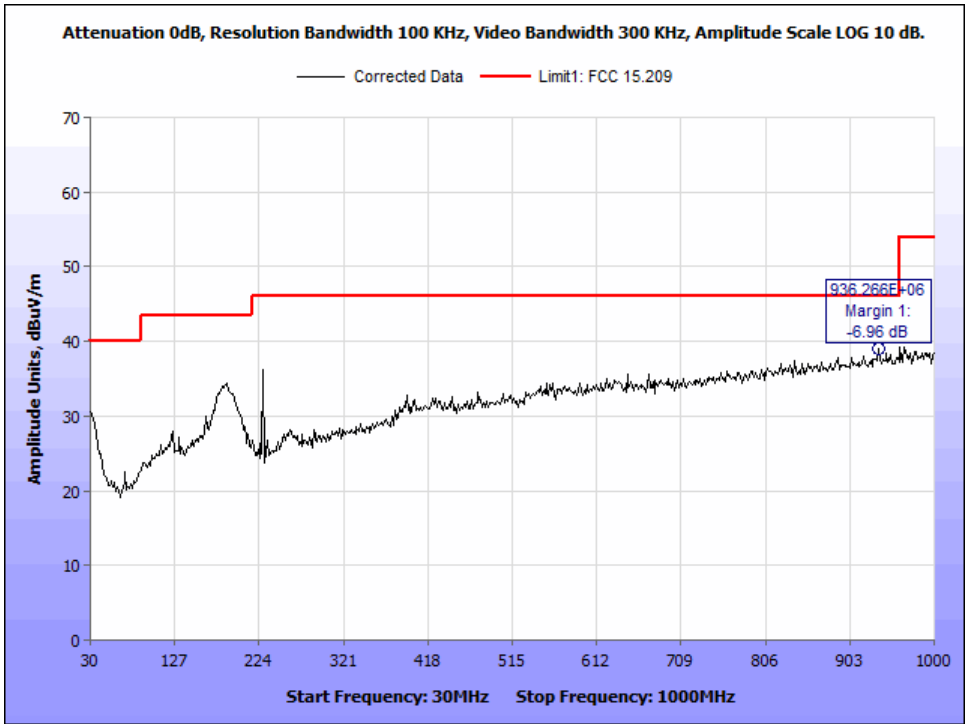

Figure 40: Radiated Spurious Emissions, 2442 MHz - 30MHz-1000MHz - Horizontal

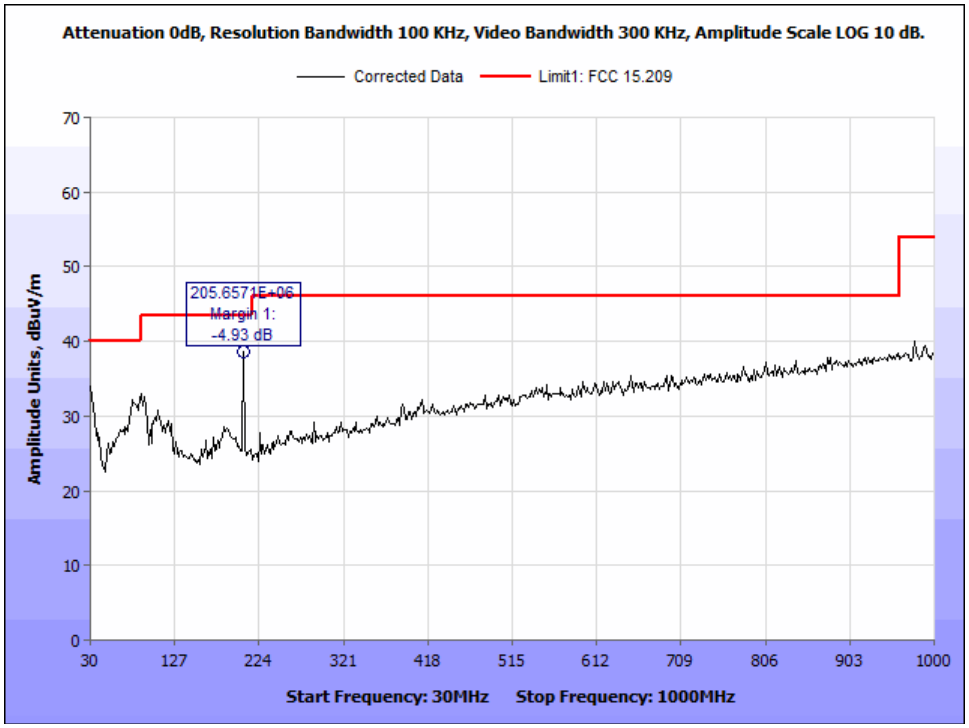

Figure 41: Radiated Spurious Emissions, 2442 MHz - 30MHz-1000MHz – Vertical

Frequency (MHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth	Uncorrected Amplitude (dBuV)	DCF (dB)	ACF (dB/m)	Pre-amp Factor & CBL (dB)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
936.266	H	200	152	22.7	10.46	25.2	-19.32	39.04	46	-6.96
945.5929	H	150	118	21.88	10.46	25.3	-19.25	38.39	46	-7.61
950.2564	H	173	126	21.52	10.46	25.37	-19.23	38.13	46	-7.87
205.6571	V	128	135	36.44	10.46	14.57	-22.9	38.57	43.5	-4.93
30.0000	V	265	149	26.07	10.46	22.3	-24.82	34.01	40	-5.99
31.5545	V	300	222	25.53	10.46	21.37	-24.72	32.63	40	-7.37

Figure 42: Radiated Spurious Emissions, 2442 MHz - 30MHz-1000MHz, Test Results

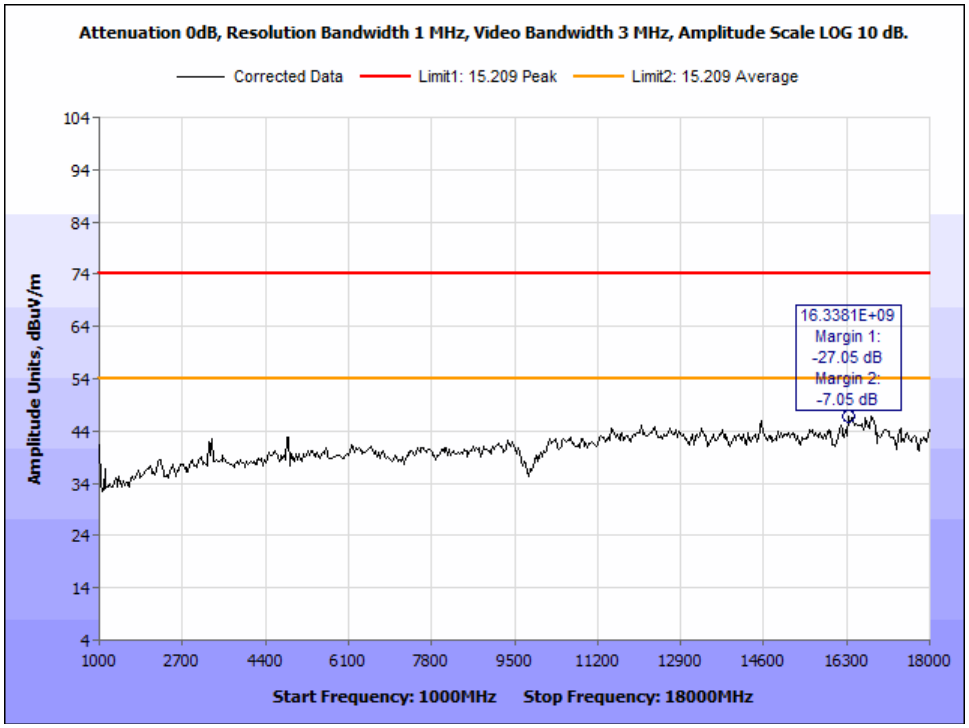

Figure 43: Radiated Spurious Emissions, 2442 MHz - 1GHz-18GHz - Peak - Horizontal

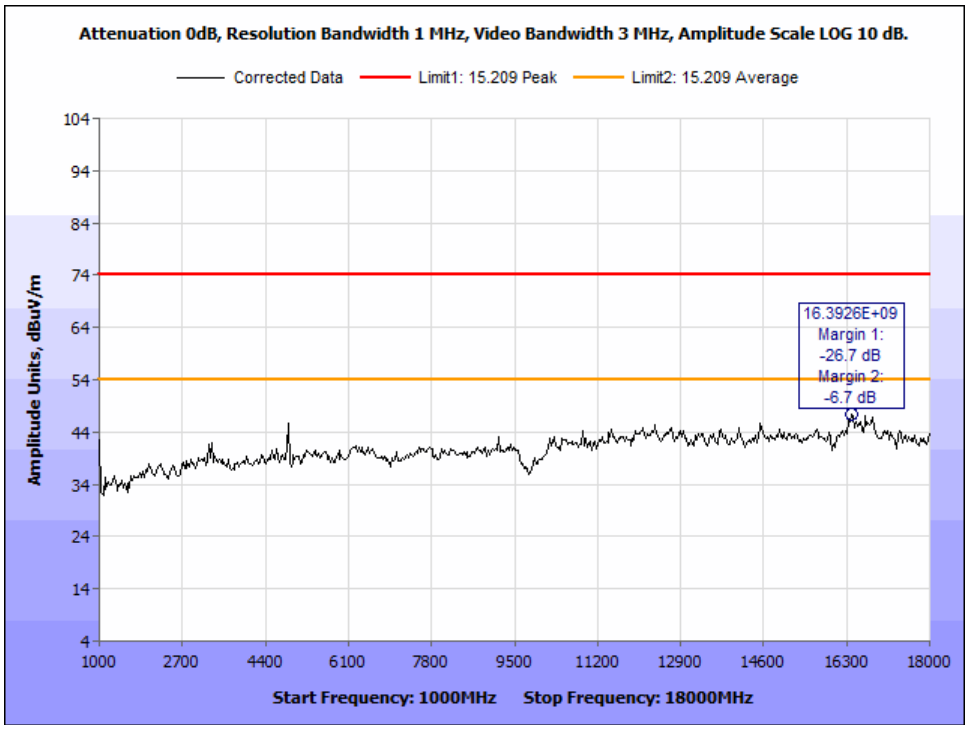

Figure 44: Radiated Spurious Emissions, 2442 MHz - 1GHz-18GHz - Peak – Vertical

Frequency (GHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Preamp Factor & CBL (dB)	Corrected Amplitude (dBuV/m)	Limit 1, 15.209 Peak (dBuV/m)	Margin 1 (dB)	Limit 2, 15.209 Average (dBuV/m)	Margin 2 (dB)
16.3381	H	100	122	47.62	40.5	-41.16	46.95	74	-27.05	54	-7.05
16.8013	H	300	105	48.4	41.27	-42.84	46.83	74	-27.17	54	-7.17
16.3926	H	100	244	47	40.57	-41.03	46.54	74	-27.46	54	-7.46
16.3926	V	400	180	47.78	40.55	-41.03	47.3	74	-26.7	54	-6.7
16.4199	V	200	90	47.49	40.6	-40.99	47.1	74	-26.9	54	-6.9
16.6923	V	100	72	48.25	41.14	-42.32	47.07	74	-26.93	54	-6.93

Figure 45: Radiated Spurious Emissions, 2442 MHz – 1GHz-18GHz, Test Results

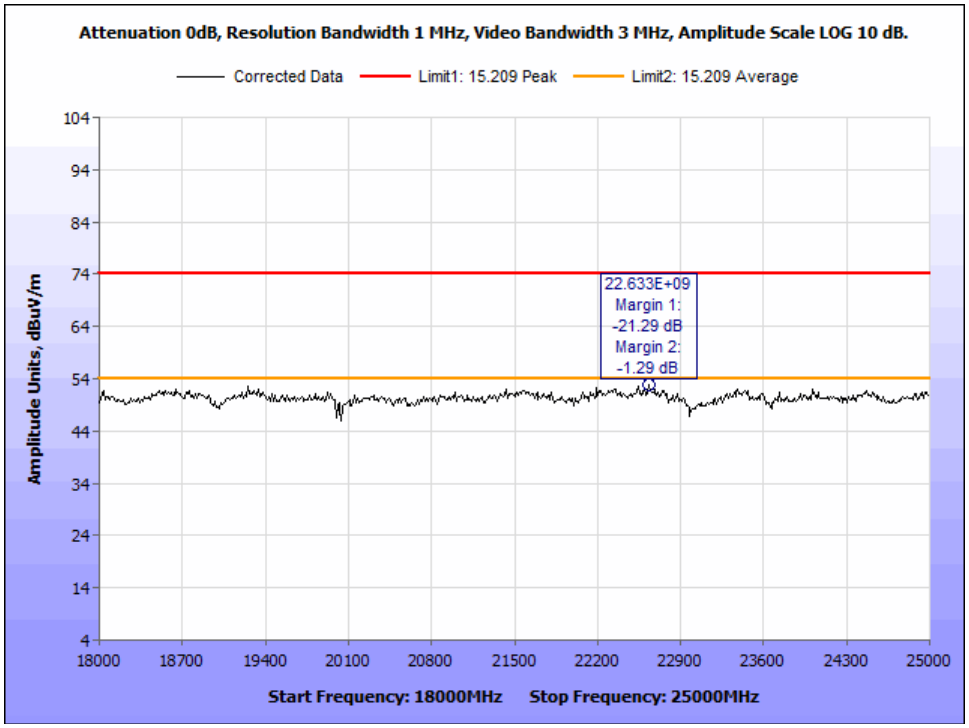

Figure 46: Radiated Spurious Emissions, 2442 MHz - 18-25GHz - Peak - Horizontal

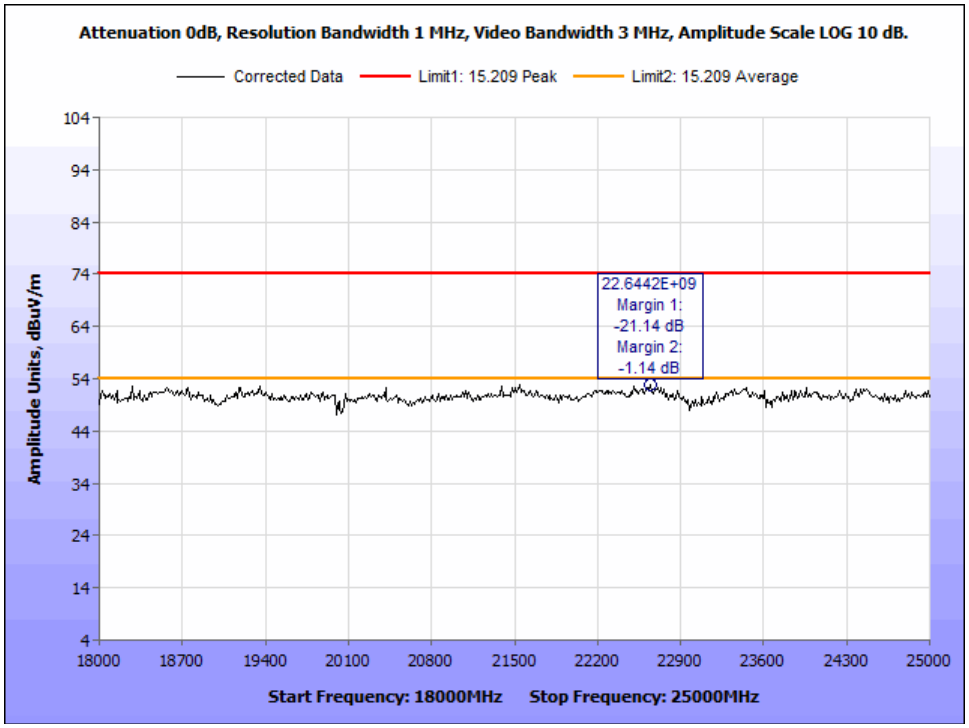

Figure 47: Radiated Spurious Emissions, 2442 MHz - 18-25GHz - Peak – Vertical

Frequency (GHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	CBL (dB)	Preamp Factor (dB)	Corrected Amplitude (dBuV/m)	Limit 1, 15.209 Peak (dBuV/m)	Margin 1 (dB)	Limit 2, 15.209 Average (dBuV/m)	Margin 2 (dB)
22.6330	H	134	54	39.96	45.12	8.1	-40.46	52.71	74	-21.29	54	-1.29
22.7452	H	205	198	38.74	45.22	8.08	-40.32	51.72	74	-22.28	54	-2.28
18.5833	H	152	63	39.48	44.07	7.28	-39.12	51.71	74	-22.29	54	-2.29
22.6442	V	228	175	40.05	45.16	8.1	-40.45	52.86	74	-21.14	54	-1.14
23.4519	V	200	239	39.59	45.21	7.59	-39.86	52.54	74	-21.46	54	-1.46
22.1731	V	400	312	40.03	45.15	8.04	-40.88	52.34	74	-21.66	54	-1.66

Figure 48: Radiated Spurious Emissions, 2442 MHz – 18GHz-25GHz, Test Results

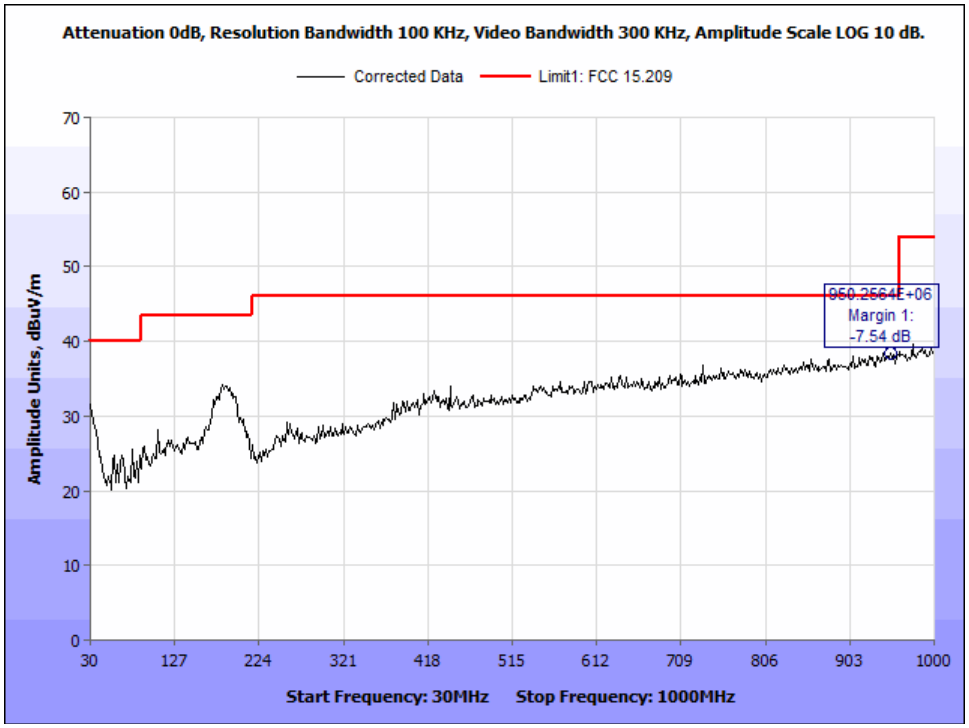

Figure 49: Radiated Spurious Emissions, 2480 MHz - 30MHz-1000MHz - Horizontal

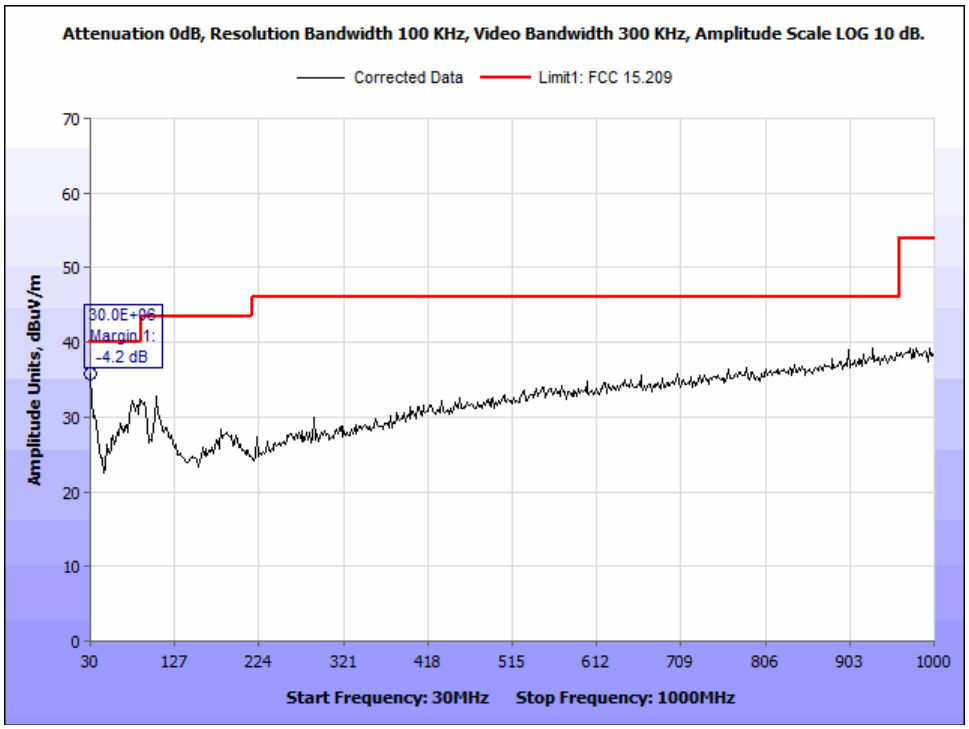

Figure 50: Radiated Spurious Emissions, 2480 MHz - 30MHz-1000MHz – Vertical

Frequency (MHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	DCF (dB)	ACF (dB/m)	Pre-amp Factor & CBL (dB)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
950.2564	H	100	152	21.86	10.46	25.37	-19.23	38.46	46	-7.54
940.9295	H	240	118	21.94	10.46	25.2	-19.28	38.32	46	-7.68
958.0288	H	123	126	21.63	10.46	25.3	-19.16	38.24	46	-7.76
30.0000	V	148	135	27.86	10.46	22.3	-24.82	35.8	40	-4.20
930.0481	V	215	149	22.79	10.46	25.4	-19.39	39.26	46	-6.74
902.0673	V	100	222	23.17	10.46	25.09	-19.62	39.10	46	-6.90

Figure 51: Radiated Spurious Emissions, 2480 MHz - 30MHz-1000MHz, Test Results

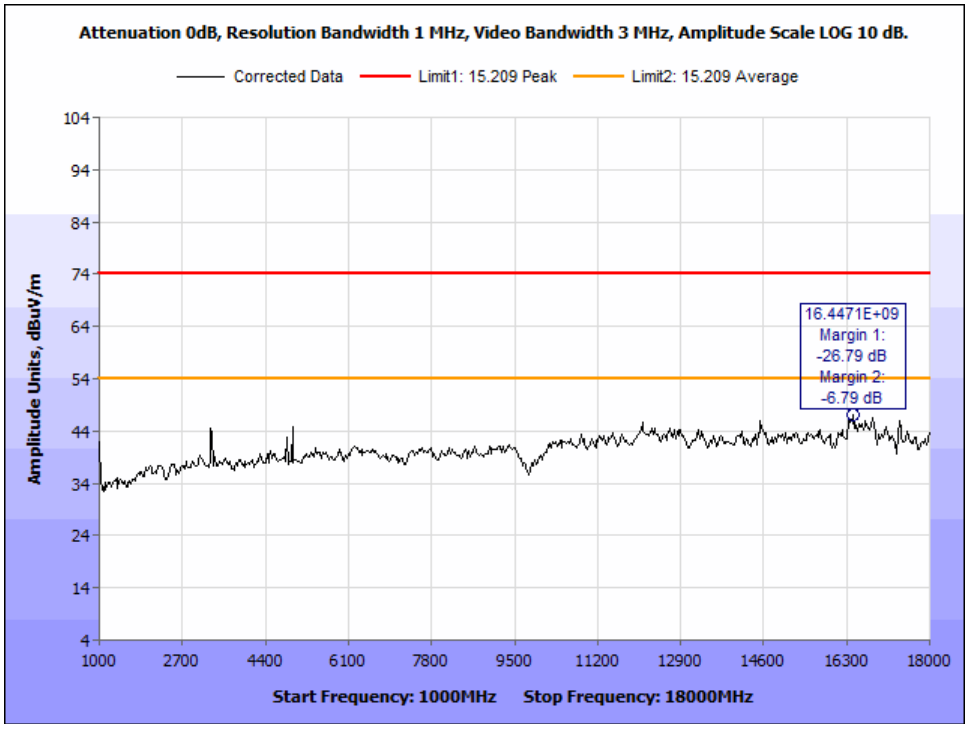

Figure 52: Radiated Spurious Emissions, 2480 MHz - 1GHz-18GHz - Peak - Horizontal

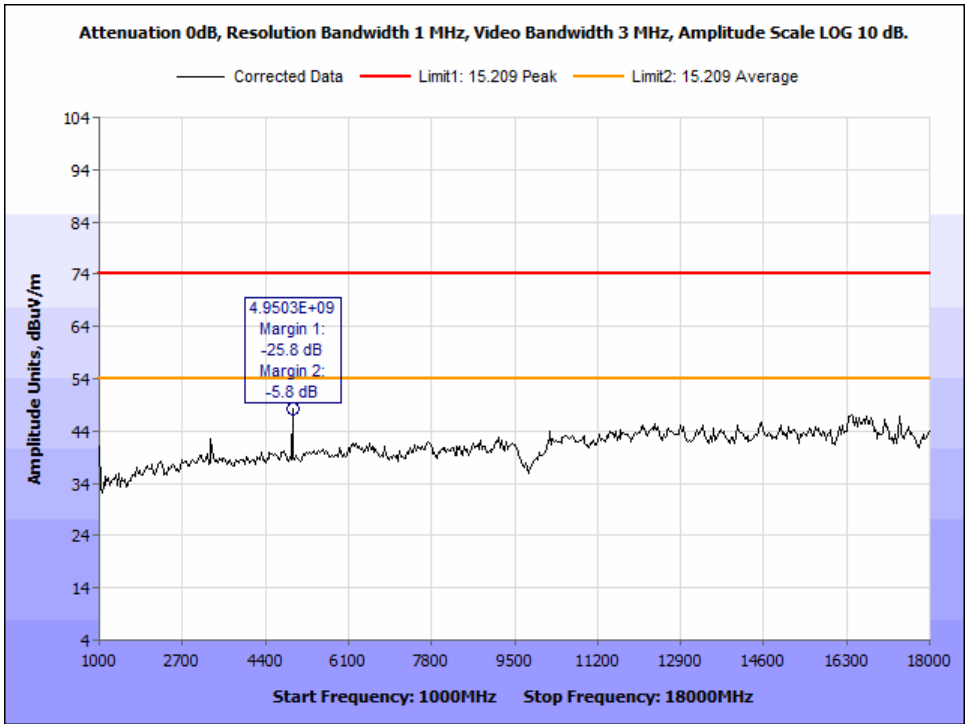

Figure 53: Radiated Spurious Emissions, 2480 MHz - 1GHz-18GHz - Peak – Vertical

Frequency (GHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Preamp Factor & CBL (dB)	Corrected Amplitude (dBuV/m)	Limit 1, 15.209 Peak (dBuV/m)	Margin 1 (dB)	Limit 2, 15.209 Average (dBuV/m)	Margin 2 (dB)
16.4471	H	100	132	47.51	40.66	-40.96	47.21	74	-26.79	54	-6.79
16.8285	H	300	109	47.96	41.25	-42.82	46.39	74	-27.61	54	-7.61
16.3381	H	100	44	46.83	40.5	-41.16	46.16	74	-27.84	54	-7.84
4.9503	V	400	80	53.3	33.69	-38.8	48.2	74	-25.8	54	-5.8
16.3926	V	200	190	47.49	40.55	-41.03	47.01	74	-26.99	54	-6.99
17.3734	V	100	172	47.51	40.53	-41.12	46.92	74	-27.08	54	-7.08

Figure 54: Radiated Spurious Emissions, 2480 MHz – 1GHz-18GHz, Test Results

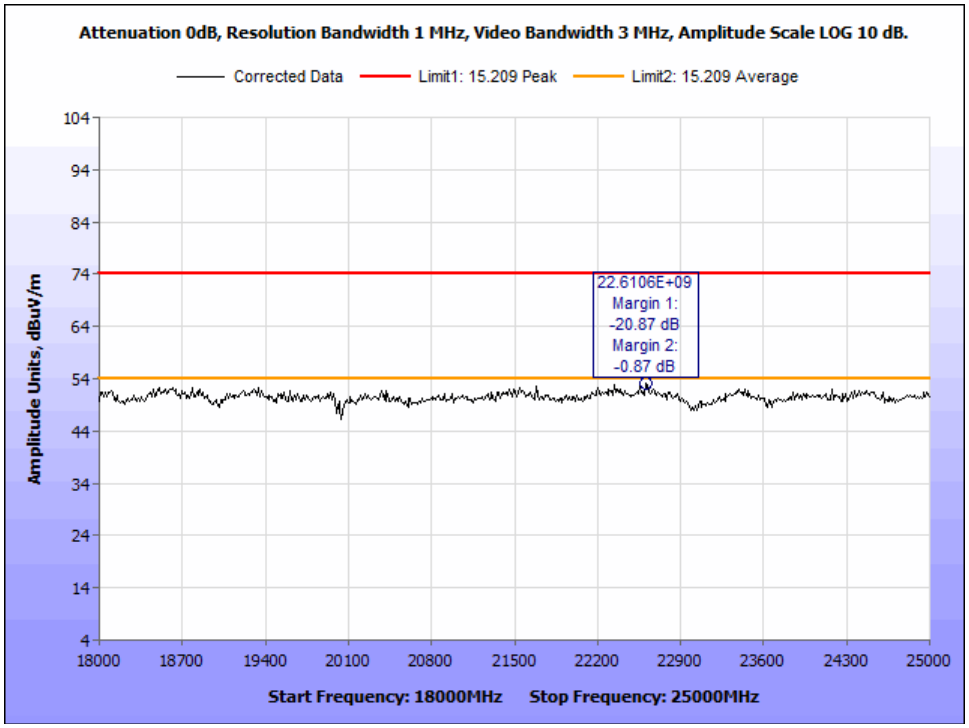

Figure 55: Radiated Spurious Emissions, 2480 MHz - 18-25GHz - Peak - Horizontal

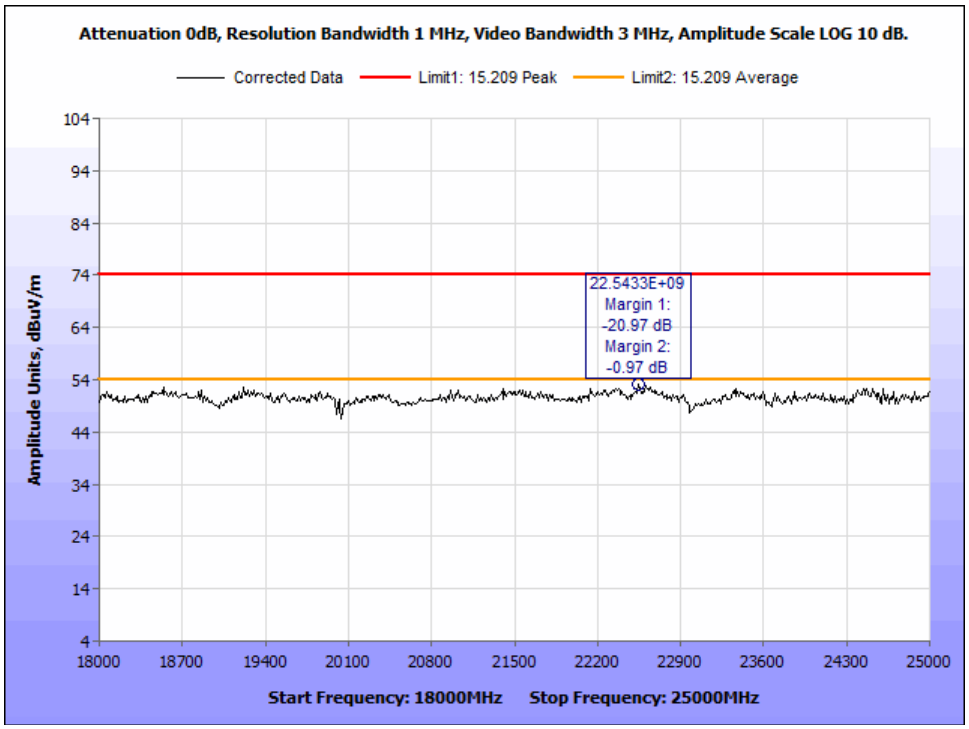

Figure 56: Radiated Spurious Emissions, 2480 MHz - 18-25GHz - Peak - Vertical

Frequency (GHz)	Antenna Polarity	Antenna Height (cm)	EUT Azimuth (Degrees)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	CBL (dB)	Preamp Factor (dB)	Corrected Amplitude (dBuV/m)	Limit 1, 15.209 Peak (dBuV/m)	Margin 1 (dB)	Limit 2, 15.209 Average (dBuV/m)	Margin 2 (dB)
22.6106	H	134	54	40.4	45.12	8.1	-40.5	53.13	74	-20.87	54	-0.87
22.7452	H	205	198	38.74	45.22	8.08	-40.32	51.72	74	-22.28	54	-2.28
18.5833	H	152	63	39.48	44.07	7.28	-39.12	51.71	74	-22.29	54	-2.29
22.5433	V	228	175	40.38	45.11	8.11	-40.57	53.03	74	-20.97	54	-0.97
24.6747	V	200	239	38.84	45.39	7.05	-40.86	50.42	74	-23.58	54	-3.58
24.6859	V	400	312	38.71	45.39	7.01	-40.88	50.22	74	-23.78	54	-3.78

Figure 57: Radiated Spurious Emissions, 2480 MHz – 18GHz-25GHz, Test Results

Radiated Band Edge Measurements

Test Procedures: The transmitter was turned on. Measurements were performed of the low and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.

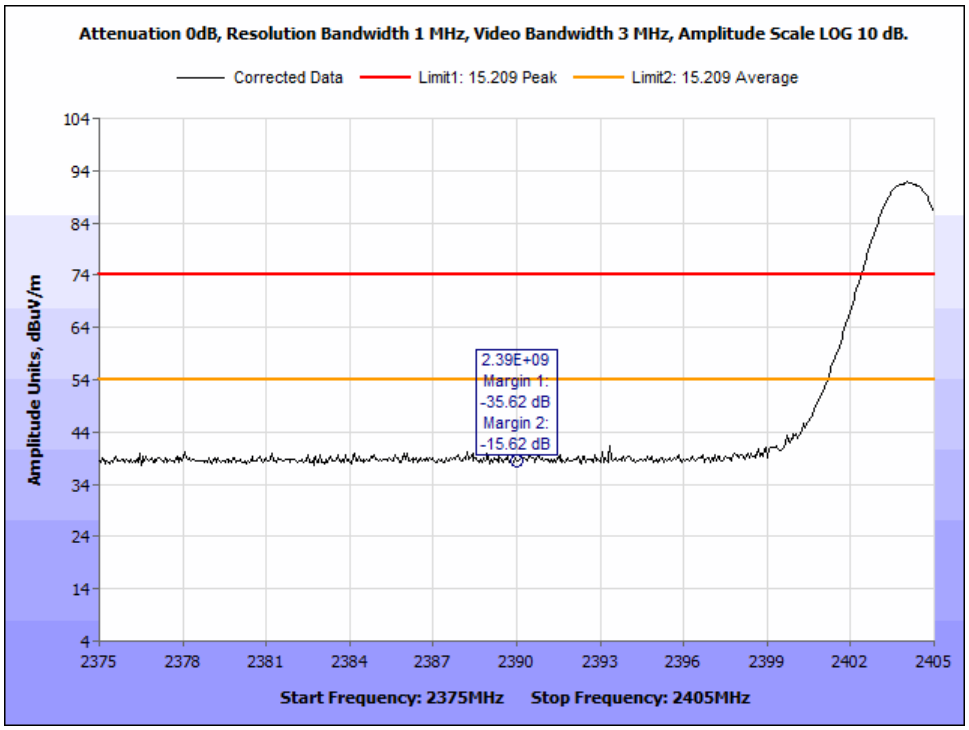

Figure 58: Radiated Band Edge, 2404 MHz - Peak - Horizontal

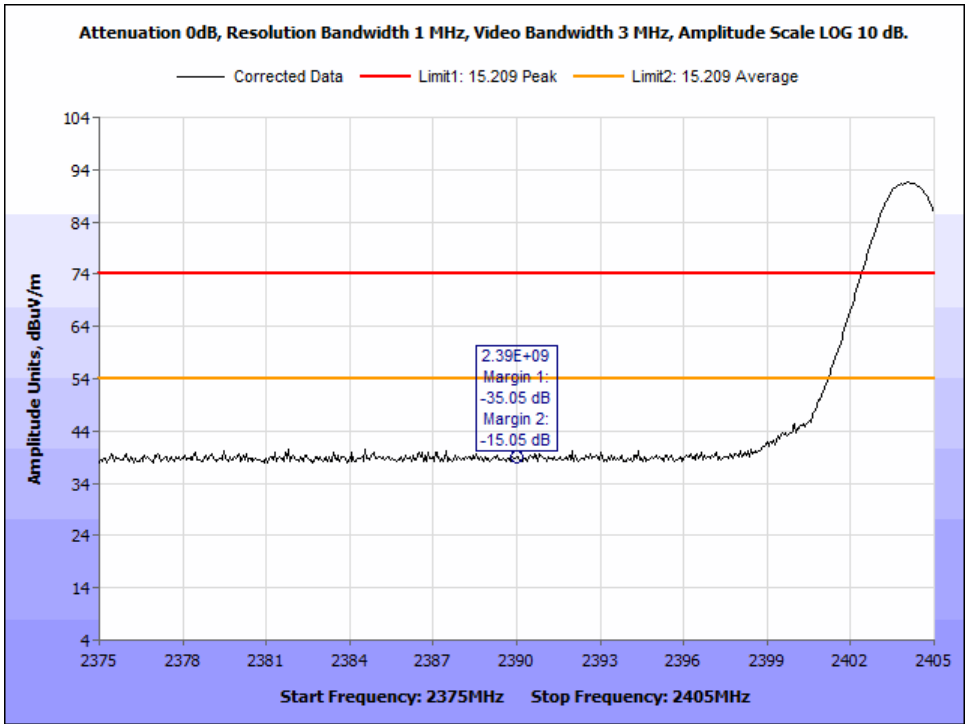

Figure 59: Radiated Band Edge, 2404 MHz - Peak - Vertical

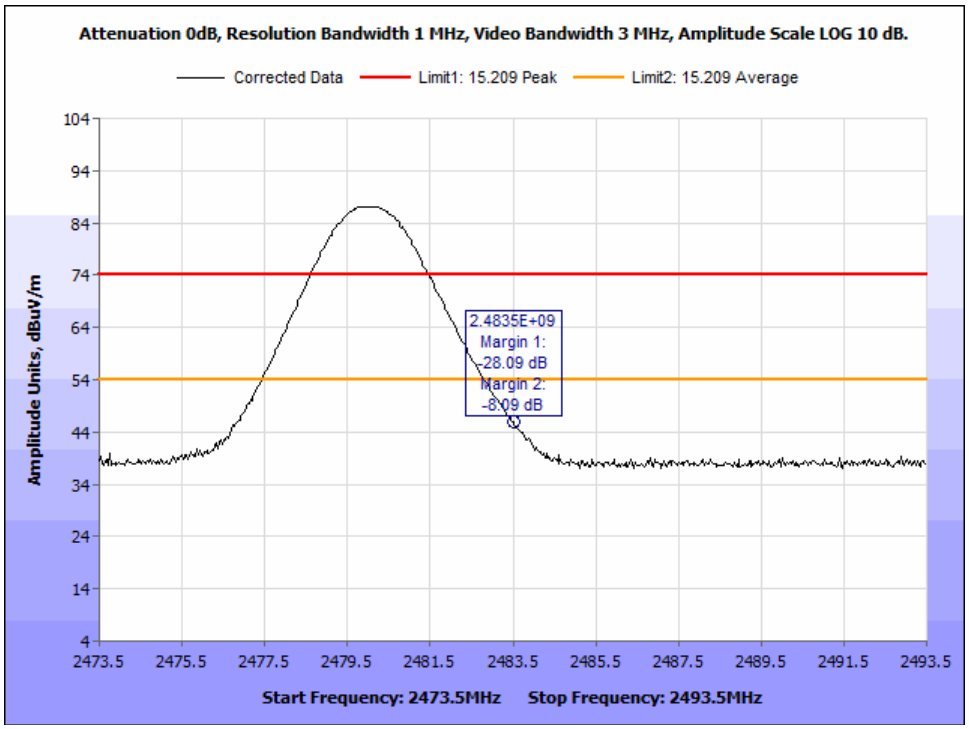

Figure 60: Radiated Band Edge, 2480 MHz - Peak - Horizontal

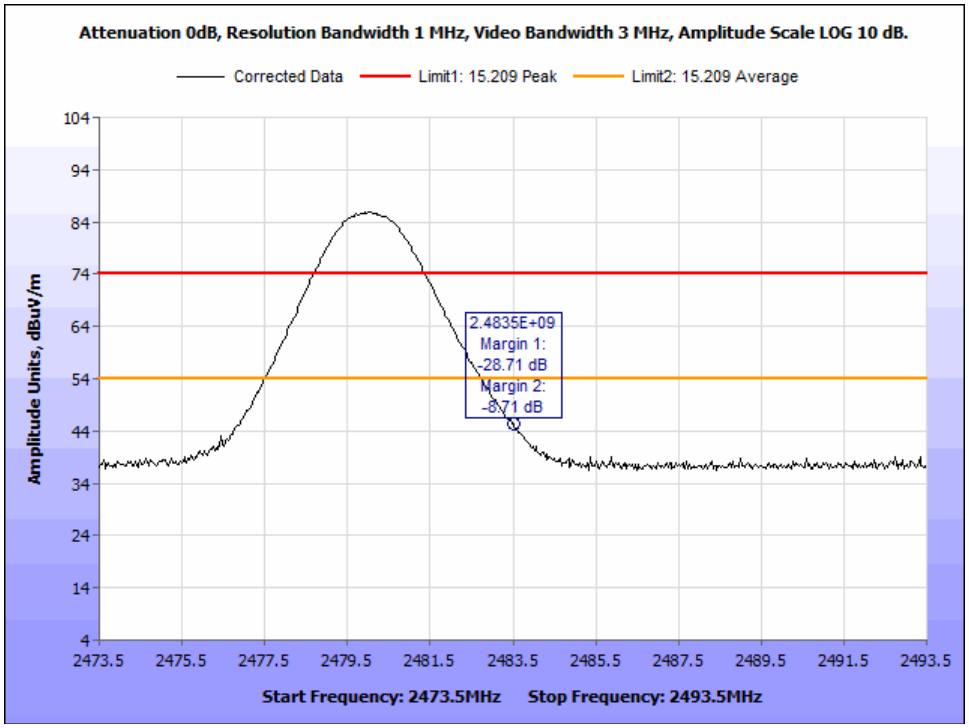

Figure 61: Radiated Band Edge, 2480 MHz - Peak - Vertical

100 KHz Bandwidth Radiated Spurious Emissions Test Results:

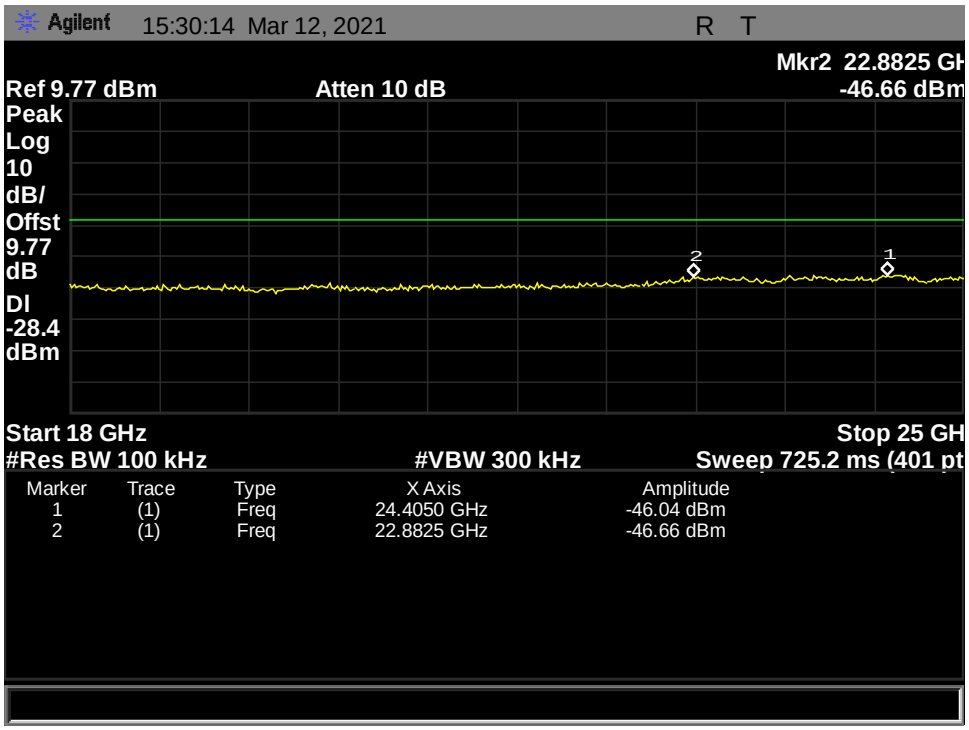

Figure 62: Radiated Spurious Emissions, 2404 MHz - 18GHz-25GHz

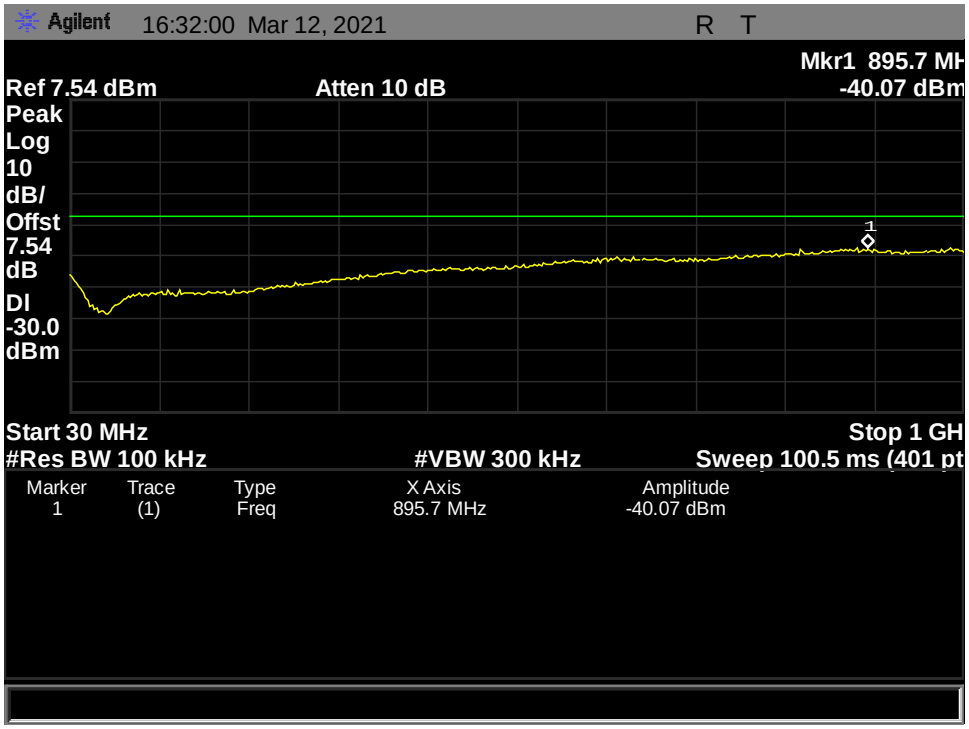

Figure 63: Radiated Spurious Emissions, 2442 MHz - 30MHz-1GHz

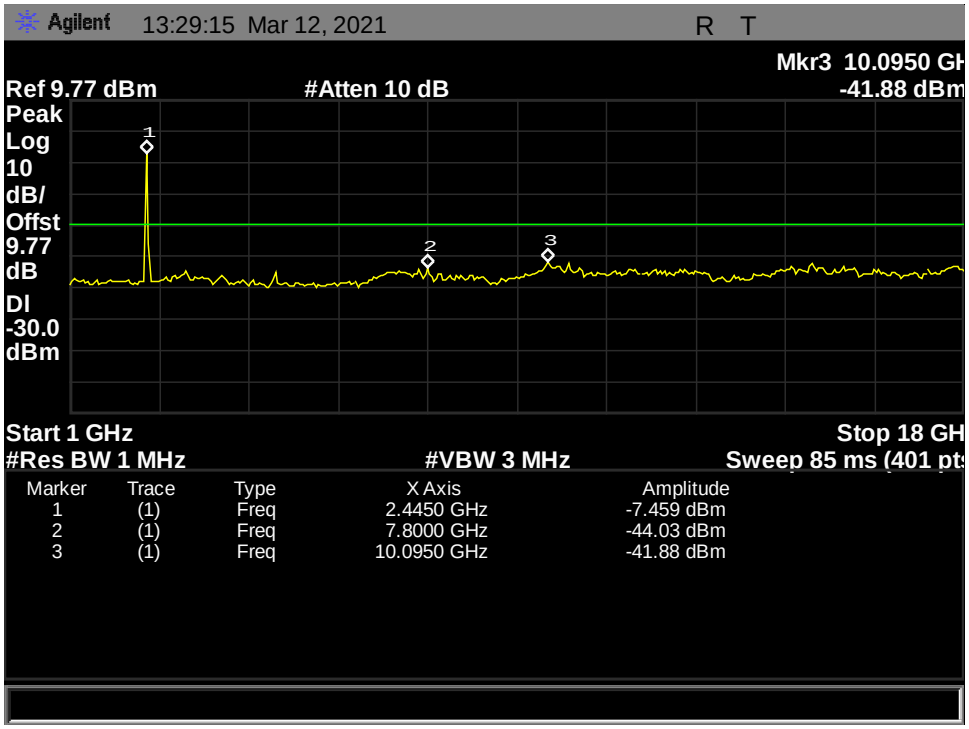

Figure 64: Radiated Spurious Emissions, 2442 MHz - 1GHz-18GHz

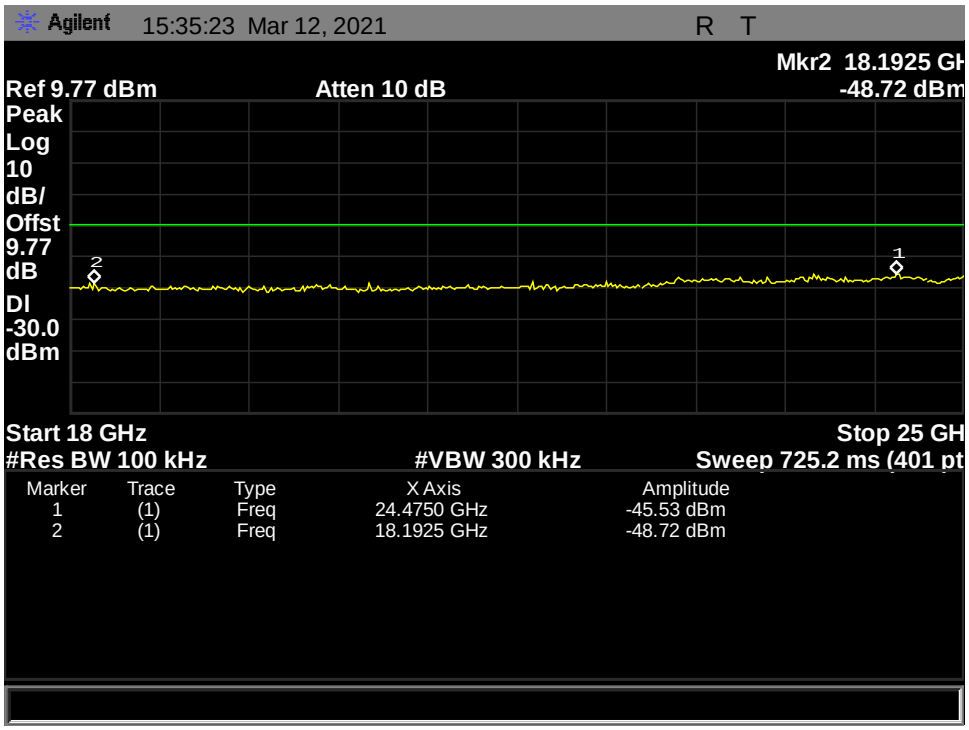

Figure 65: Radiated Spurious Emissions, 2442 MHz - 18GHz-25GHz

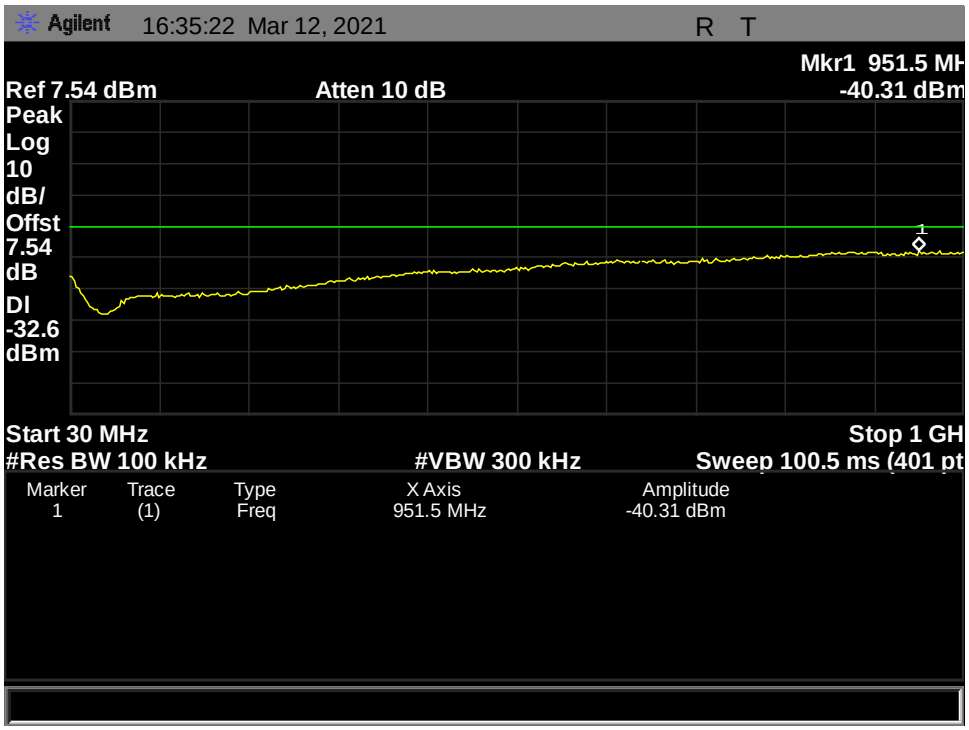

Figure 66: Radiated Spurious Emissions, 2480 MHz - 30MHz-1GHz

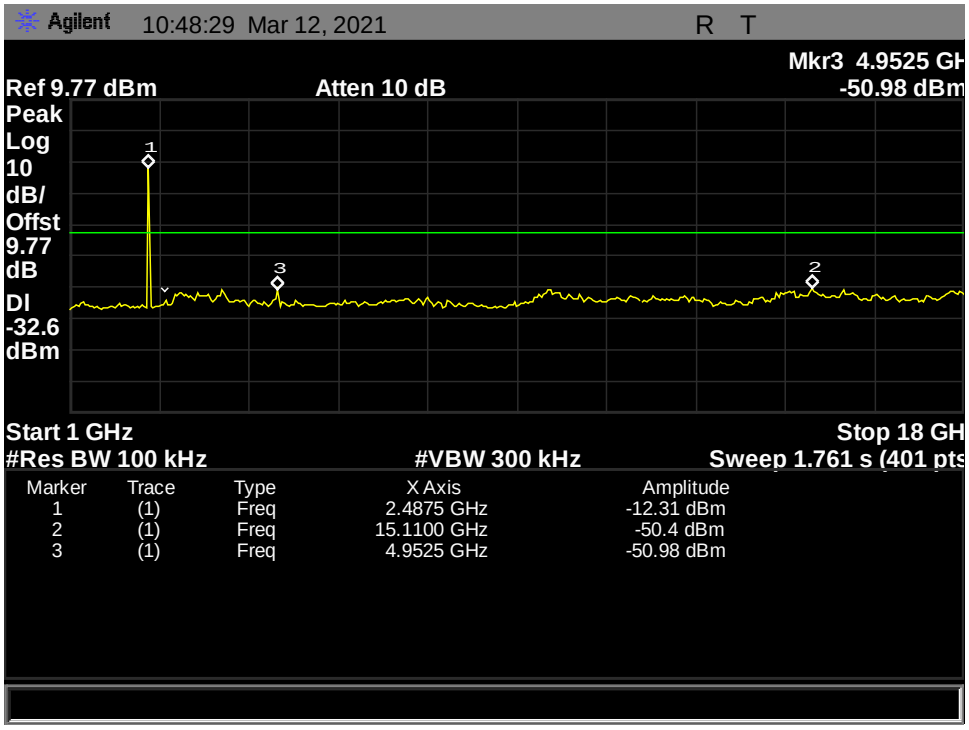

Figure 67: Radiated Spurious Emissions, 2480 MHz - 1GHz-18GHz

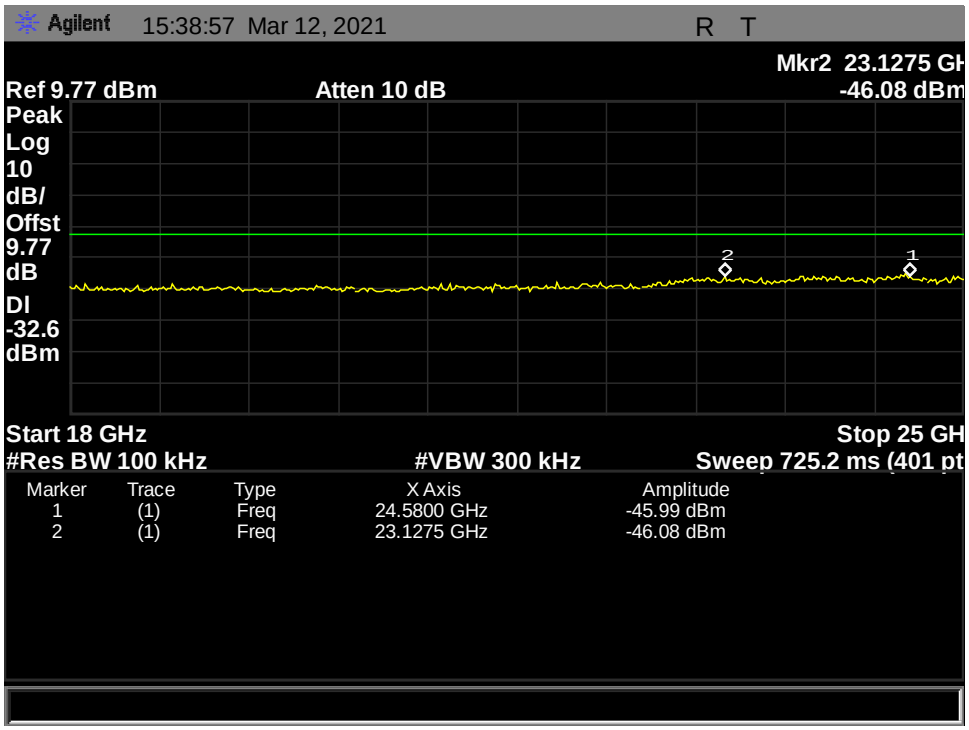

Figure 68: Radiated Spurious Emissions, 2480 MHz - 18GHz-25GHz

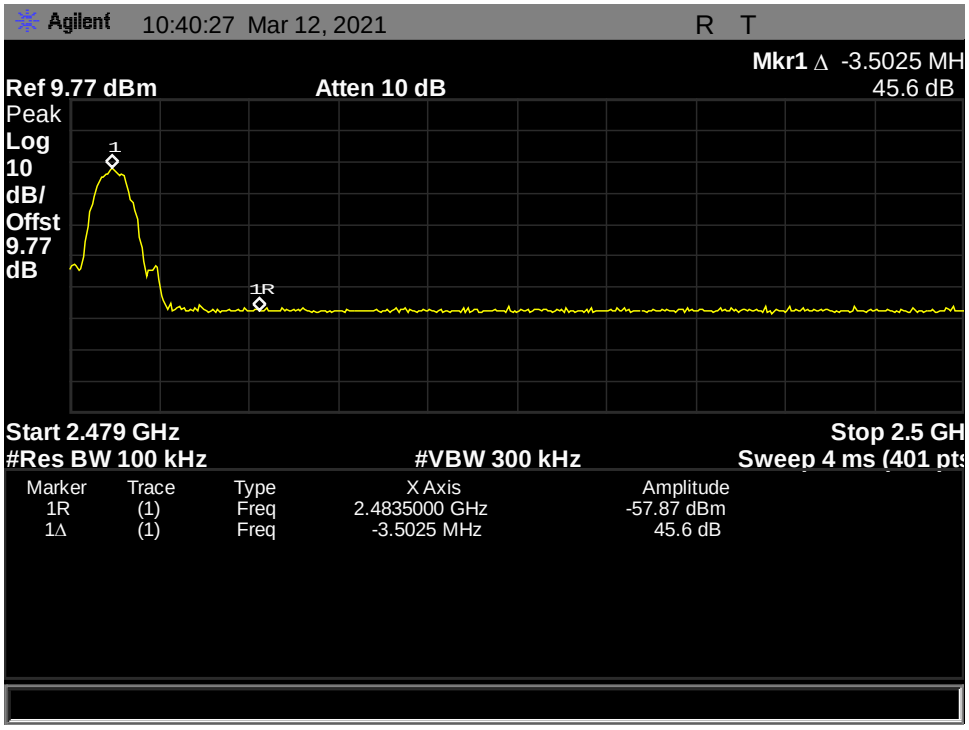

Figure 69: Radiated Band Edge, Higher Bandedge - 2480 MHz

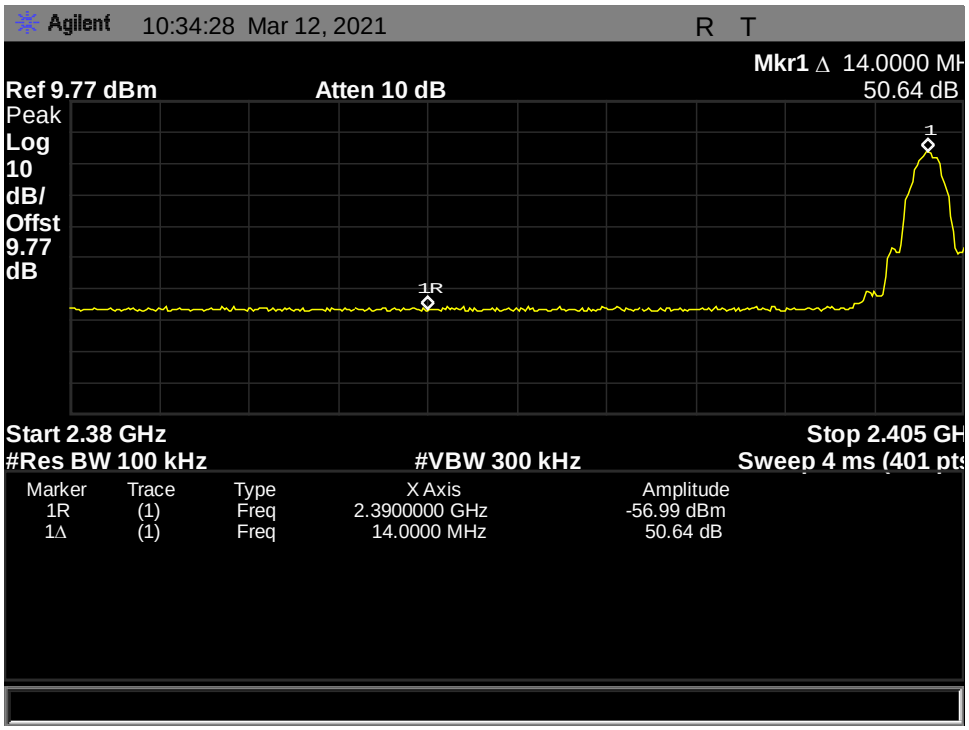

Figure 70: Radiated Band Edge, Lower Bandedge - 2404 MHz

Radiated Spurious Emissions Test Setup

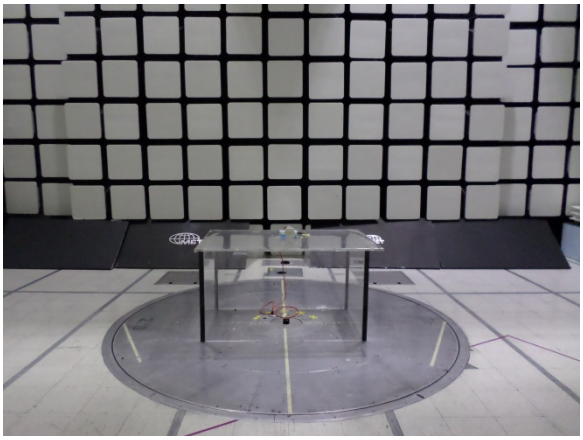

Figure 71: Radiated Spurious Emissions, 30MHz-1000MHz - Setup Front View

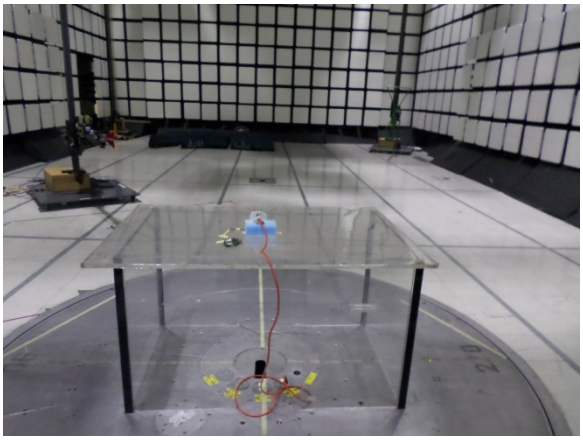

Figure 72: Radiated Spurious Emissions, 30MHz-1000MHz - Setup Rear View

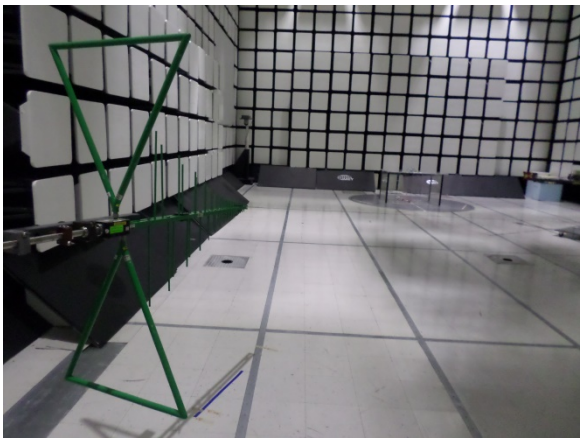

Figure 73: Radiated Spurious Emissions, 30MHz-1000MHz - Setup Antenna View

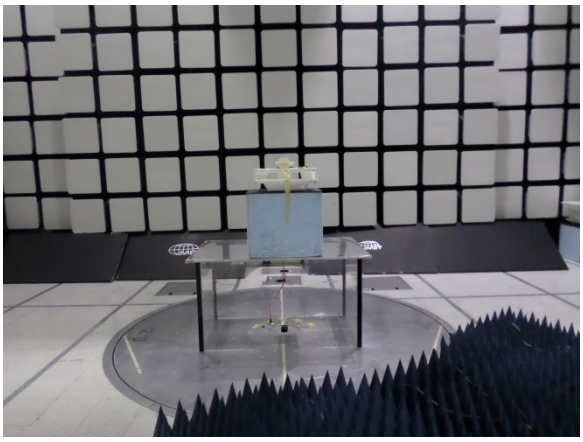

Figure 74: Radiated Spurious Emissions, 1GHz-18GHz - Setup Front View

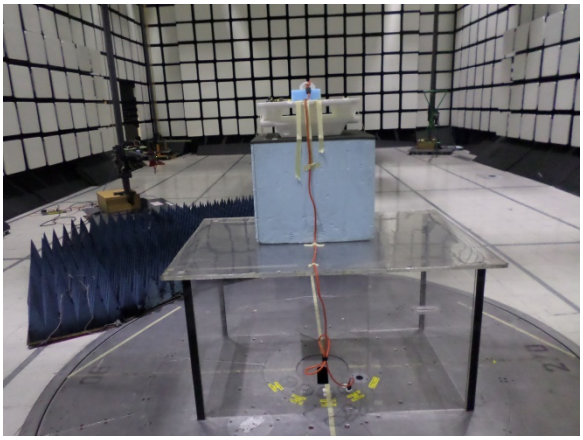

Figure 75: Radiated Spurious Emissions, 1GHz-18GHz - Setup Rear View

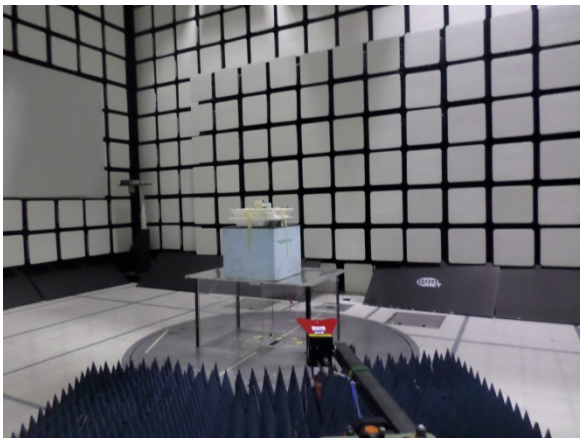

Figure 76: Radiated Spurious Emissions, 1GHz-18GHz - Setup Antenna View

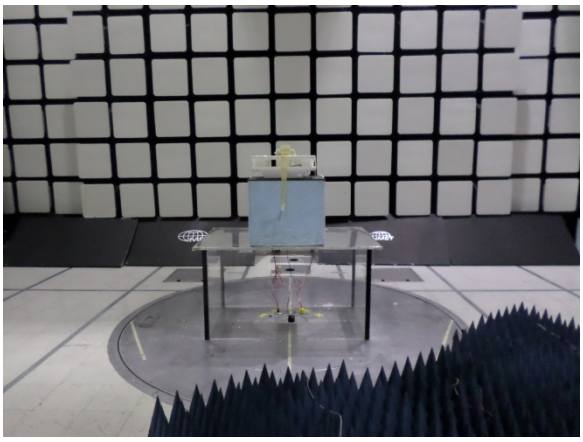

Figure 77: Radiated Spurious Emissions, 18GHz-25GHz - Setup Front View

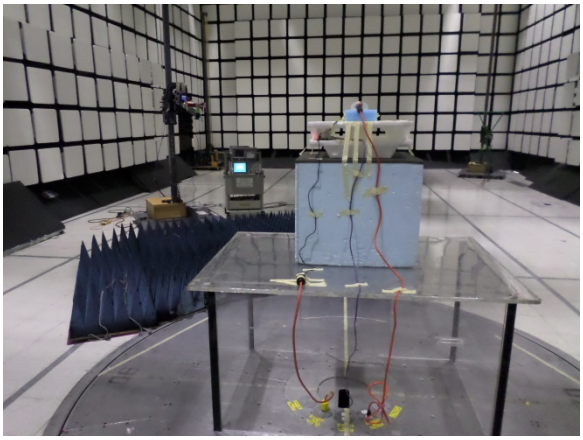

Figure 78: Radiated Spurious Emissions, 18GHz-25GHz - Setup Rear View

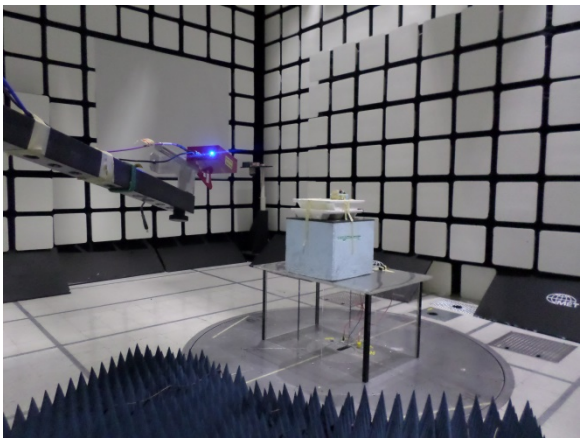

Figure 79: Radiated Spurious Emissions, 18GHz-25GHz - Setup Antenna View

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure: The power level was set to the maximum level. The RBW was set to 100 kHz and a VBW set to 300 kHz. The spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels.

The EUT did not have an antenna ports temporal or permanent, Peak Power Spectral Density test was performed on a radiated setup.

The measured field strength was converted to conducted power with the following formula:

EIRP (dBm) = E (dBuV/m) + 20log(d) – 104.77 = P (dBm) + G (dBi)
P (dBm) = E (dBuV/m) + 20log(d) – 104.77 – G (dBi)

Where, P is conducted power
E is field strength
G is antenna gain.

Test Results: The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**.

The peak power spectral density was determined from plots on the following page(s).

Test Engineer: **Adan Arab**

Test Date: **March 11, 2021**

Freq (MHz)	Field Strength (dBuV/m)	Spectral Power Density EIRP (dBm)	Antenna Gain (dBi)	Conducted Spectral Power Density (dBm)	Limit (dBm/3 KHz)	Result
2404	89.79	-5.44	3	-8.44	8	Pass
2442	88.22	-7.01	3	-10.01	8	Pass
2480	85.61	-9.62	3	-12.62	8	Pass

Figure 80: Peak Power Spectral Density, Test Results

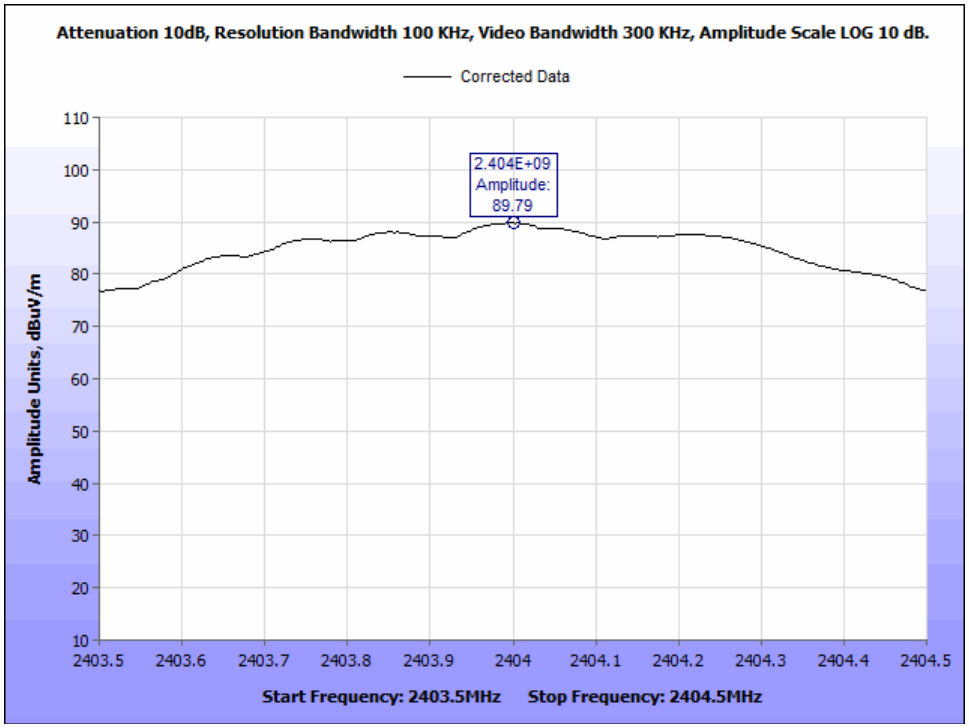

Figure 81: Peak Power Spectral Density, 2404 MHz, Low Channel

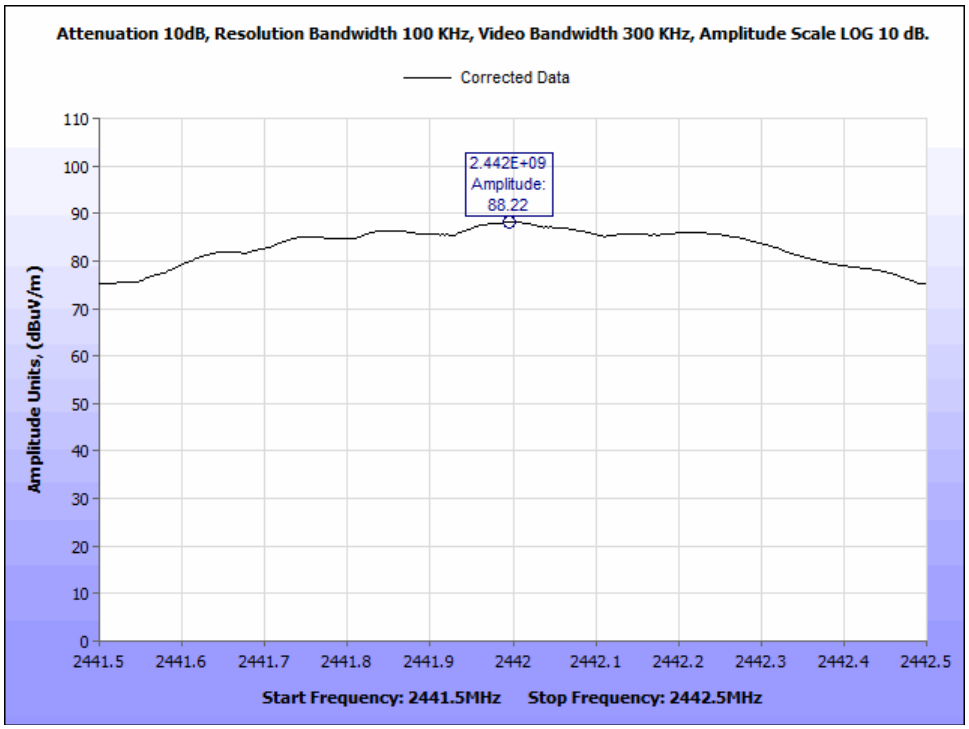

Figure 82: Peak Power Spectral Density, 2442 MHz, Mid Channel

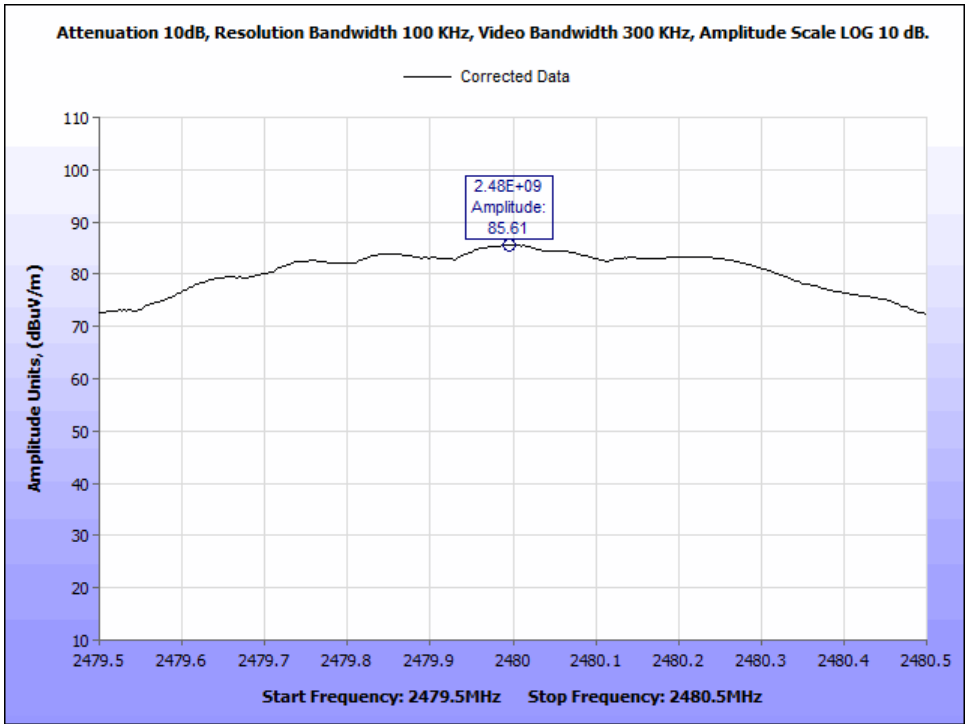

Figure 83: Peak Power Spectral Density, 2480 MHz, High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit: EUT's operating frequencies @ 2400-2483.5 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)

FCC											
Frequency (MHz)	Conducted Power (dBm)	Tune-up Tolerance (+/- dB)	Conducted Power +Tune-up Tolerance (dBm)	Con. Pwr. + Tune-Up Tolerance (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
2404	-6.38	1	-5.38	0.29	3	1.995	0.00012	1	0.99988	20	Pass

Figure 84: RF Human Exposure, Test Results

The safe distance where Power Density is less than the MPE Limit listed above was found to be 20 cm.

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

ASSET #	NOMENCLATURE	MANUFACTURER	MODEL	LAST CAL	CAL DUE
1A1065	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI	06/22/2020	06/22/2021
1A1177	PULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	06/10/2020	06/10/2021
1A1227	TRUE RMS METER	FLUKE	114	10/16/2020	10/16/2021
1A1119	CONDUCTED EMISSIONS GROUND PLANE	N/A	N/A	06/10/2020	06/10/2021
1A1149	DC MILLIOHM METER	GW INSTEK	GOM-802	06/10/2020	06/10/2021
1A1169	TEMP, HUMIDITY, AND PRESSURE RECORDER	OMEGA	OM-CP-PRHTEMP2000	02/19/2021	02/19/2022
1A1184	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	08/24/2020	08/24/2021
1A1083	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	10/16/2020	10/16/2021
1A1050	BILOG ANTENNA (30-1000 MHZ)	SUNOL SCIENCES CORP	JB3	12/01/2020	12/01/2022
1A1183	DOUBLE RIDGED WAVEGUIDE ANTENNA (1-18 GHZ)	ETS LINDGREN	3117	06/01/2020	06/01/2022
1A1099	1A1099	GENERATOR	COM-POWER CORP	SEE NOTE	SEE NOTE
1A1044	1A1044	GENERATOR	COM-POWER CORP	SEE NOTE	SEE NOTE
1A1088	PRE-AMP	ROHDE & SCHWARZ	TS-PR1	SEE NOTE	SEE NOTE
1A1080	MULTI-DEVICE CONTROLLER	ETS-EMCO	2090	SEE NOTE	SEE NOTE
1A1073	MULTI-DEVICE CONTROLLER	ETS-EMCO	2090	SEE NOTE	SEE NOTE
1A1180	PRE-AMP	MITEQ	AMF-7D-01001800-22-10P	SEE NOTE	SEE NOTE
1A1106	10M SEMI-ANECHOIC CHAMBER	LINDGREN	N/A	SEE NOTE	SEE NOTE

Figure 85: Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Certification & User's Manual Information

Certification & User's Manual Information

M. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

1. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

End of Report