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8/18/2025

HLI Solutions, Inc.
701 Millennium Blvd.
Greenville SC 29607
USA

Dear Justin Foster,

Enclosed is the EMC Wireless test report for compliance testing of the HLI Solutions, Inc. NXSMP3 Family_1 as tested to the requirements of FCC Part 15.247 and RSS-247 Issue 3 for Intentional Radiators. This test report pertains specifically to the Bluetooth Low Energy (BLE) transmitter onboard which operates in the 2400-2483.5MHz band.

Thank you for using the services of Eurofins MET Labs. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
EUROFINS MET LABS

A handwritten signature in blue ink that reads "Nancy LaBrecque".

Nancy LaBrecque
Documentation Department

Reference: WIRA135742-FCC-IC-BLE_R1

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Bluetooth Low Energy Test Report

for the

HLI Solutions, Inc.
NXSMP3 Family_1

Tested under
FCC Part 15.247 and RSS-247 Issue 3
For Intentional Radiators



Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab



Nancy LaBrecque
Documentation Department

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.



Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	July 9, 2025	Initial Issue.
1	8/18/2025	TCB Review Comments

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB μ A	Decibels above one microamp
dB μ V	Decibels above one microvolt
dB μ A/m	Decibels above one microamp per meter
dB μ V/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μ H	microhenry
μ	microfarad
μ s	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the NXSMP3 Family_1, with the requirements of FCC Part 15.247 and RSS-247 Issue 3. HLI Solutions, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the NXSMP3 Family_1, 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 FCC Part 15.247 and RSS-247 Issue 3, in accordance with HLI Solutions, Inc. purchase order number 4710494213. All tests were conducted using measurement procedures ANSI C63.4-2014 and ANSI C63.10-2013.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-247 Issue 3: 2023 RSS-GEN Issue 5: 2018	Description	Compliance
Title 47 of the CFR, Part 15 §15.203	---	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-GEN(8.8)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-247 (5.2)	6dB Occupied Bandwidth	Compliant
---	RSS-GEN(6.7)	99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-247(5.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-GEN (6.13), (8.9), & (8.10)	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-247(5.5)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-247(5.2)	Peak Power Spectral Density	Compliant

Table 1. Executive Summary

II. Equipment Configuration

A. Overview

Eurofins MET Labs was contracted by HLI Solutions, Inc. to perform testing on the NXSMP3 Family_1, under HLI Solutions, Inc.'s purchase order number 4710494213.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the NXSMP3 Family_1.

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

Product Name:	NXSMP3 Family_1	
Model(s) Tested:	NXSMP3-LMI	
Model(s) Covered:	NXSMP3-LMI, BTXSMP-LMI, NXSMP3-LMO, BTXSMP-LMO, NXSMP3-HMO, BTXSMP-HMO, NXSMP3-OMNI, BTXSMP-OMNI, and NXSMP3-RM	
Serial Number or Sample Number:	25480-3	
EUT Specifications:	Primary Power: 12-24 VDC	
	Type of Modulations:	BLE: GFSK Wirepas: GFSK
	Equipment Code:	BLE: DTS Wirepas: DTS
	Peak RF Output Power:	BLE: 9.05dBm Wirepas: 9.04dBm
	EUT Frequency Ranges:	BLE: 2402MHz – 2480MHz Wirepas: 2402MHz – 2480MHz
	Antenna Gain ¹ :	BLE: 2dBi Wirepas: 2dBi
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:	Bryan Taylor	
Report Date(s):	8/18/2025	

Table 2. EUT Summary Table

¹ The antenna gain information was provided by HLI Solutions, Inc. and may affect compliance.

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
RSS-247, Issue 3, August 2023	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-GEN, Issue 5, March 2019	General Requirements and Information for the Certification of Radio Apparatus
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

Table 3. References

C. Test Site

All testing was performed at Eurofins MET Labs, 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 MET Laboratories.

ISED Lab Info:

CAB Identifier: US0004
Company Number: 2043D

FCC Lab Info:

Designation Number: US1127

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
Occupied Bandwidth Measurements	±4.52 Hz	2	95%
Conducted Power Measurements	±2.74 dB	2	95%
Power Spectral Density Measurements	±2.74 dB	2	95%
Conducted Spurious Emissions	±2.80 dB	2	95%
Conducted Emissions (Mains)	±2.97 dB	2	95%
Radiated Spurious Emissions (9kHz – 1GHz)	±2.95 dB	2	95%
Radiated Spurious Emissions (1GHz - 40GHz)	±3.54 dB	2	95%

Table 4. Uncertainty Calculations Summary

E. Description of Test Sample

The NXSMP3 family is a NX Wireless Mesh and Bluetooth-enabled occupancy/daylight sensor with a built-in actuator for control of a 0-10VDC dim-to-off enabled LED driver with auxiliary power supply. This family of products is designed for installation into a lighting fixture, ceiling tile, or other suitable mounting fixture. This family of products also includes the NXSMP3-RM which is a NX Wireless Mesh and Bluetooth-enabled device (without sensing capability) with a built-in actuator for control of a 0-10VDC dim-to-off enabled LED driver with auxiliary power supply.



Figure 1. Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 1 above. The test sample were configured to transmit on low, mid, or high channels at maximum output power automatically upon power up.

G. Support Equipment

No support equipment was used during this evaluation.

H. Ports and Cabling Information

Port Name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
DC Input	No cable provided	1	N/A	N/A	No	N/A

Table 5. Ports and Cabling Information

I. Mode of Operation

The test sample were configured to transmit on low, mid, or high channels at maximum output power automatically upon power up. Each time the sample was power cycled the transmit channel would switch from low, to mid, and then to high channel. No external software was used to control the transmitter and the samples operated at a fixed output power.

The EUT has the capability to operate in BLE and Wirepas modes. Wirepas has similar characteristics and power levels as BLE and uses the same physical layer as BLE. Based on the fact that the BLE had a higher measured output power vs Wirepas, BLE is treated as worst case. Therefore, test data for BLE is presented in this report with the Wirepas data appearing only in the output power section.

Transmit Band	Modulation	Channel Frequencies Tested
2400 – 2483.5MHz	BLE (GFSK)	2402MHz / 2440MHz / 2480MHz
2400 – 2483.5MHz	Wirepas (GFSK)	2402MHz / 2440MHz / 2480MHz

Table 6. Test Channels Utilized

J. Method of Monitoring EUT Operation

A spectrum analyzer was used to confirm proper transmitter operation.

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 HLI Solutions, Inc. upon completion of testing.

III. 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. The TX antenna is not accessible by the end user and is permanently attached to the unit.

Test Engineer(s): Bryan Taylor

Test Date(s): 05/03/2025

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 μ H/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 (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 - 56	56 - 46
0.5-5	56	46
5-30	60	50

Table 7. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

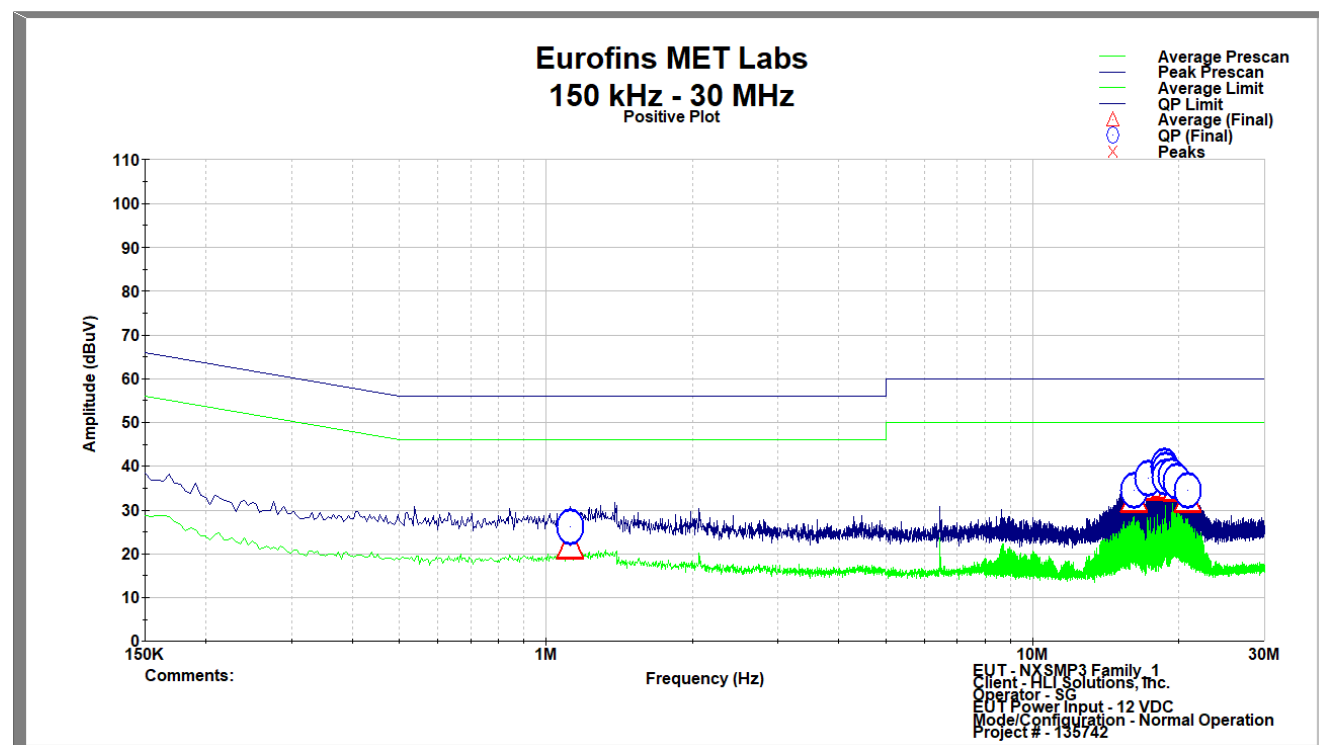
Test Procedure: The EUT was placed on a 0.8 m-high wooden table. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω /50 μ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed using a 50 Ω /50 μ H LISN as the input transducer to an EMI receiver. For the purpose of this testing, the transmitter was turned on.

Test Results: The EUT was compliant with this requirement.

Test Engineer(s): Sergio Gutierrez

Test Date(s): 04/29/2025

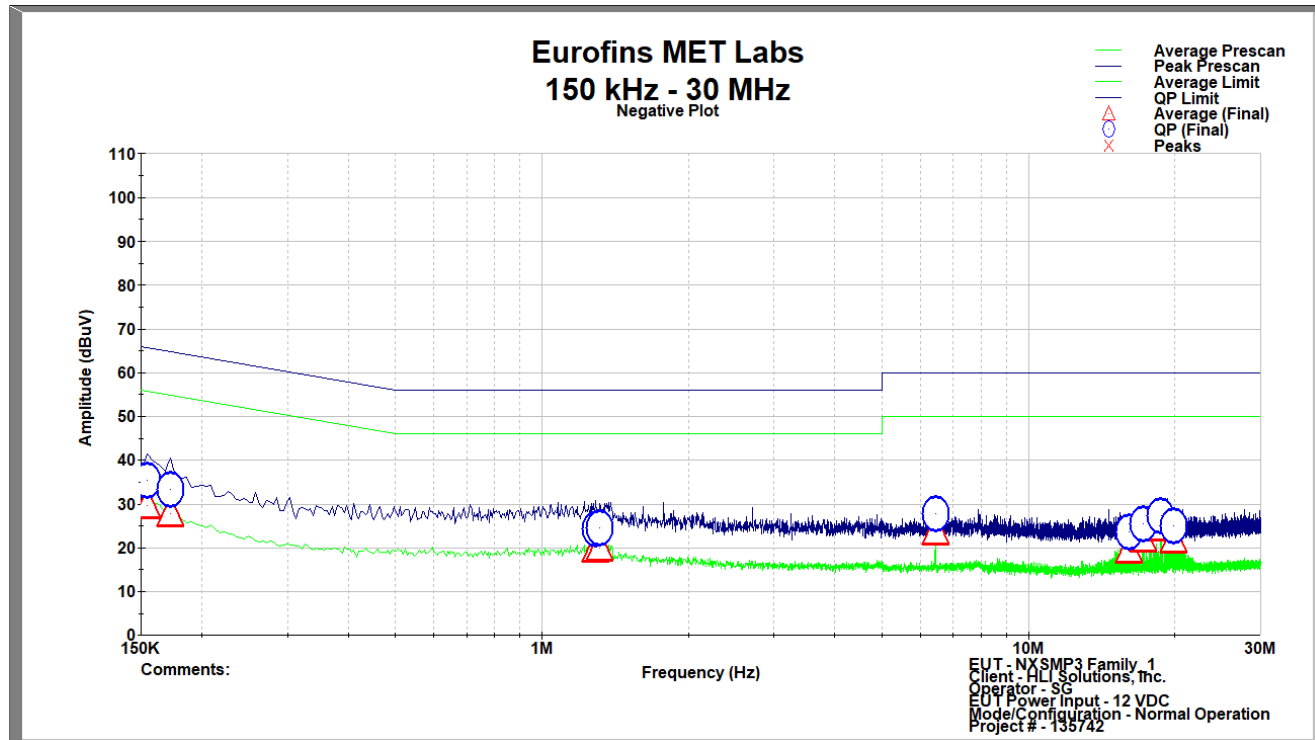
15.207(a) Conducted Emissions Test Results



Conducted Emissions, 15.207(a), Positive

Frequency (MHz)	Quasi-Peak (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Quasi-Peak Margin (dB)	Average (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)
1.122	26.261	56.000	29.739	21.720	46.000	24.280
16.160	34.568	60.000	25.432	32.293	50.000	17.707
17.280	37.348	60.000	22.652	35.126	50.000	14.874
18.681	39.742	60.000	20.258	36.983	50.000	13.017
18.721	40.025	60.000	19.975	38.423	50.000	11.577
18.762	39.175	60.000	20.825	37.942	50.000	12.058
18.802	37.594	60.000	22.406	35.628	50.000	14.372
19.360	37.654	60.000	22.346	35.465	50.000	14.535
19.802	36.628	60.000	23.372	34.938	50.000	15.062
20.841	34.590	60.000	25.410	32.408	50.000	17.592

Table 8. Conducted Emissions, 15.207(a), Positive, Test Results



Conducted Emissions, 15.207(a), Negative

Frequency (MHz)	Quasi-Peak (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Quasi-Peak Margin (dB)	Average (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)
0.154	35.421	65.871	30.450	29.705	55.871	26.167
0.172	33.326	65.357	32.031	27.834	55.357	27.523
1.288	24.367	56.000	31.633	19.666	46.000	26.334
1.315	24.497	56.000	31.503	19.820	46.000	26.180
6.439	27.680	60.000	32.320	23.721	50.000	26.279
16.119	23.720	60.000	36.280	19.354	50.000	30.646
17.239	25.392	60.000	34.608	21.880	50.000	28.120
18.721	27.353	60.000	32.647	24.504	50.000	25.496
19.842	25.051	60.000	34.949	21.753	50.000	28.247

Table 9. Conducted Emissions, 15.207(a), Negative, Test Results

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 approximately 1% of the total emission bandwidth, and the VBW > 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(s): Bryan Taylor

Test Date(s): 05/03/2025

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN (6.7) 99% Bandwidth

Test Requirements: The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Test Procedure: The transmitter was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, and the VBW > RBW. The 99% Bandwidth was measured and recorded.

Test Results The 99% Bandwidth determined from the plots on the following pages.

Test Engineer(s): Bryan Taylor

Test Date(s): 05/03/2025

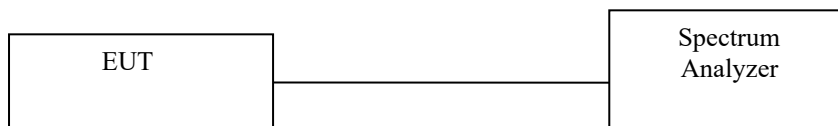
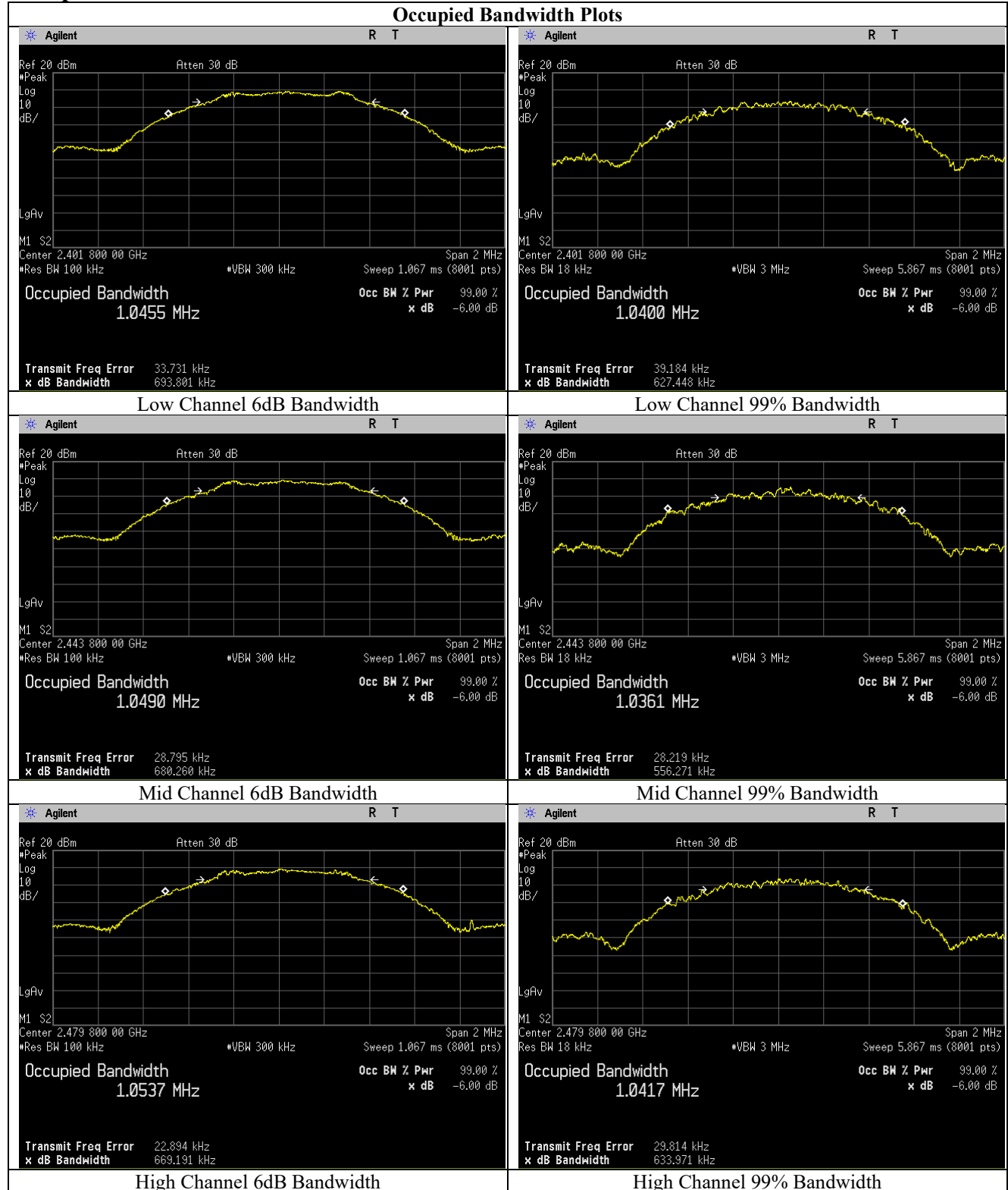


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Limit (MHz)	99% Bandwidth (MHz)	Result
Low	2402MHz	0.694	0.5	1.0400	Pass
Middle	2440MHz	0.680	0.5	1.0361	Pass
High	2480MHz	0.669	0.5	1.0417	Pass

Table 10. 99% and 6 dB Occupied Bandwidth, Test Results

Occupied Bandwidth Test Results



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)
902-928	1.000
2400-2483.5	1.000
5725- 5850	1.000

Table 11. Output Power Requirements from §15.247(b)

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 11, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band and using a point to point application may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, Omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

RSS-247 EIRP Limit: For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer. The analyzer reference level was offset by cable loss connecting to the test sample. The peak power was measured at the low, mid and high channels of each band at the maximum power level.

The analyzer settings are shown in the following table:

RBW:	3MHz	Detector:	Peak	Reference Level:	30dBm
VBW:	10MHz	Sweep Time:	Auto	Internal Attenuation:	30dB

Figure 3. Analyzer Settings During Measurement

Test Software: TILE Version 7.4.2.5 (Manufactured by ETS Lindgren) was utilized to perform these measurements.

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

Test Engineer(s): Bryan Taylor

Test Date(s): 05/03/2025

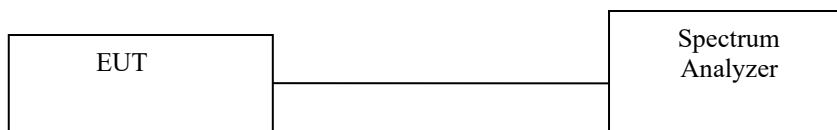


Figure 4. Peak Power Output Test Setup

Peak Power Output Test Results

Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
Low	2402MHz	9.05	30	2	11.05	36	Pass
Middle	2440MHz	9.05	30	2	11.05	36	Pass
High	2480MHz	9.01	30	2	11.01	36	Pass

Table 12. Peak Power Output, Test Results - BLE

Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
Low	2402MHz	9.03	30	2	11.03	36	Pass
Middle	2440MHz	9.04	30	2	11.04	36	Pass
High	2480MHz	9.02	30	2	11.02	36	Pass

Table 13. Peak Power Output, Test Results - Wirepas

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 transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level. The RBW was set between 3kHz and 100 kHz. The VBW was set to 3x the RBW. 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 analyzer settings are shown in the following table:

RBW:	3kHz	Detector:	Peak	Reference Level:	10dBm
VBW:	30kHz	Sweep Time:	Auto	Internal Attenuation:	20dB

Figure 5. Analyzer Settings During Measurement

Test Software: TILE Version 7.4.2.5 (Manufactured by ETS Lindgren) was utilized to perform these measurements.

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: Bryan Taylor

Test Date: 05/03/2025

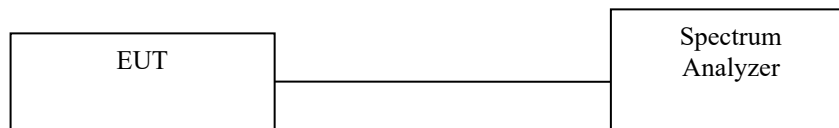
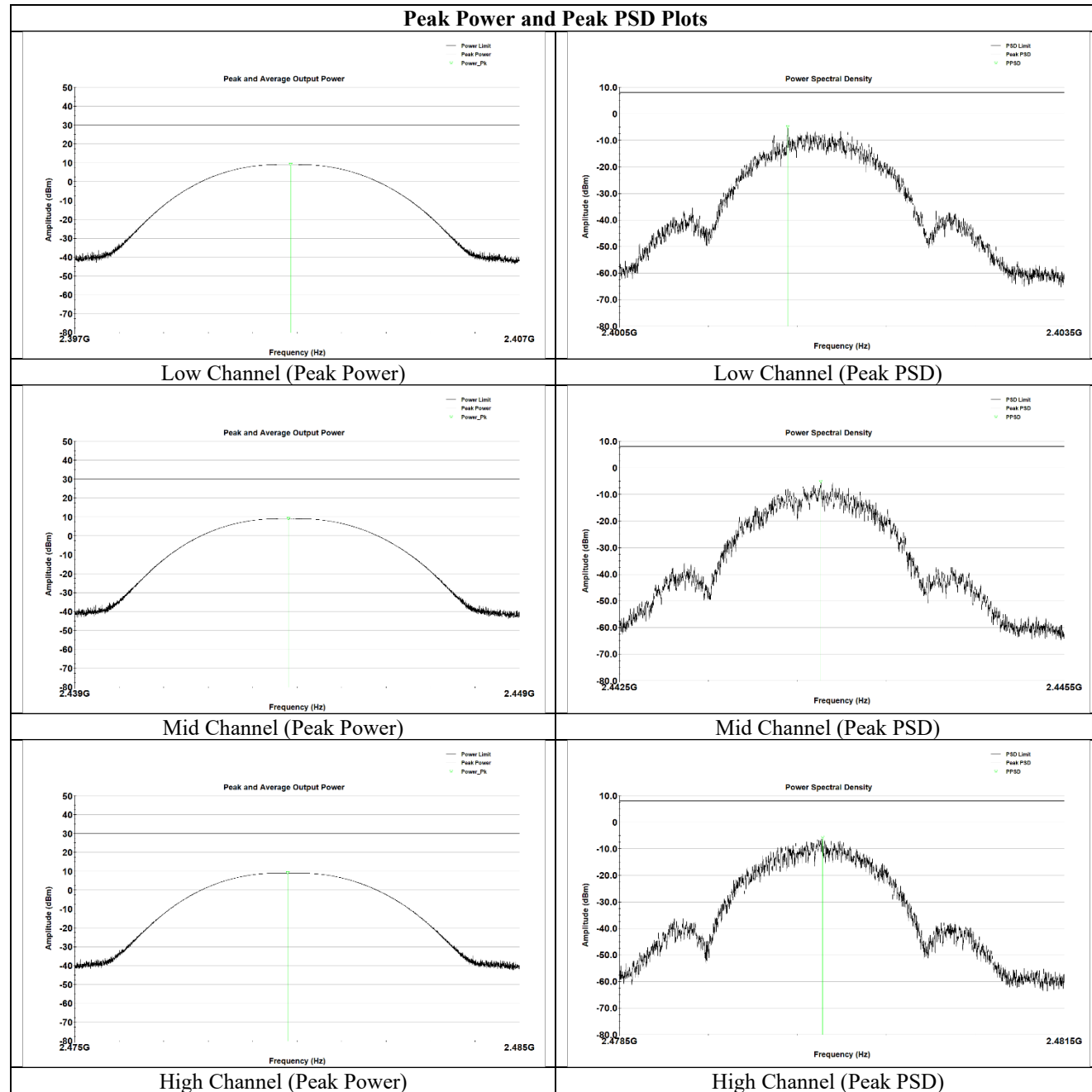


Figure 6. Block Diagram, Peak Power Spectral Density Test Setup

Channel	Frequency (MHz)	Peak Power Spectral Density (dBm / 3kHz)	Peak Power Spectral Density Limit (dBm / 3kHz)	Result
Low	2402MHz	-4.89	8	Pass
Middle	2440MHz	-5.06	8	Pass
High	2480MHz	-5.67	8	Pass

Table 14. Peak Power Spectral Density, Test Results



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements

Test Requirement: **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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure: 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.

The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level. The RBW was set to 100 kHz. The VBW was set to 3x the RBW. 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.

See following pages for detailed test results with RF Conducted Spurious Emissions.

The analyzer settings are shown in the following table:

RBW:	100kHz	Detector:	Peak	Reference Level:	30dBm
VBW:	300kHz	Sweep Time:	Auto	Internal Attenuation:	30dB

Figure 7. Analyzer Settings During Measurement

Test Software: TILE Version 7.4.2.5 (Manufactured by ETS Lindgren) was utilized to perform these measurements.

Test Results: The EUT was compliant with the Conducted Spurious Emission limits of **§15.247(d)**.

Test Engineer(s): Bryan Taylor

Test Date(s): 05/03/2025

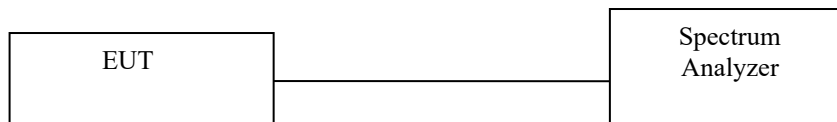


Figure 8. Block Diagram, Conducted Spurious Emissions Test Setup

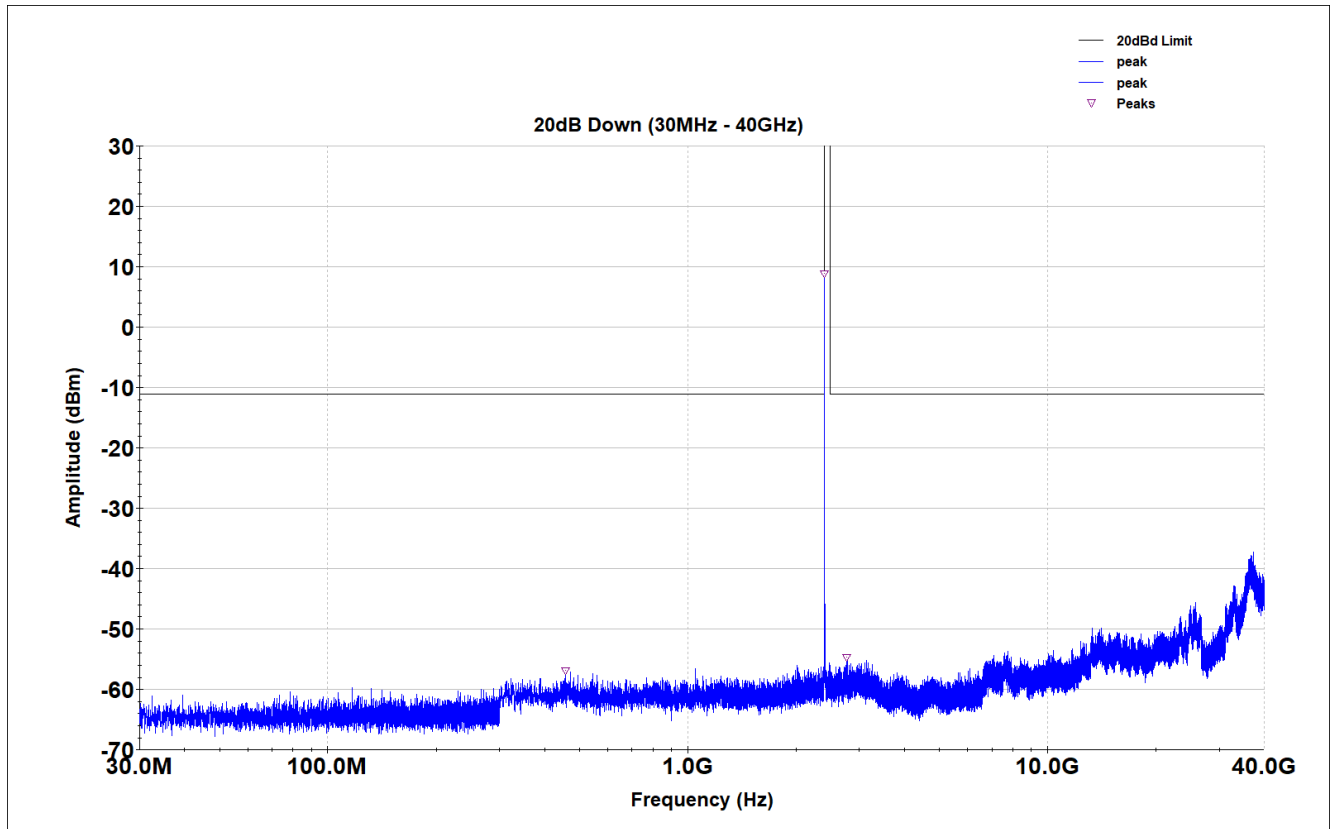


Figure 9. Low Channel, 30MHz – 40GHz Conducted Spurious Emissions

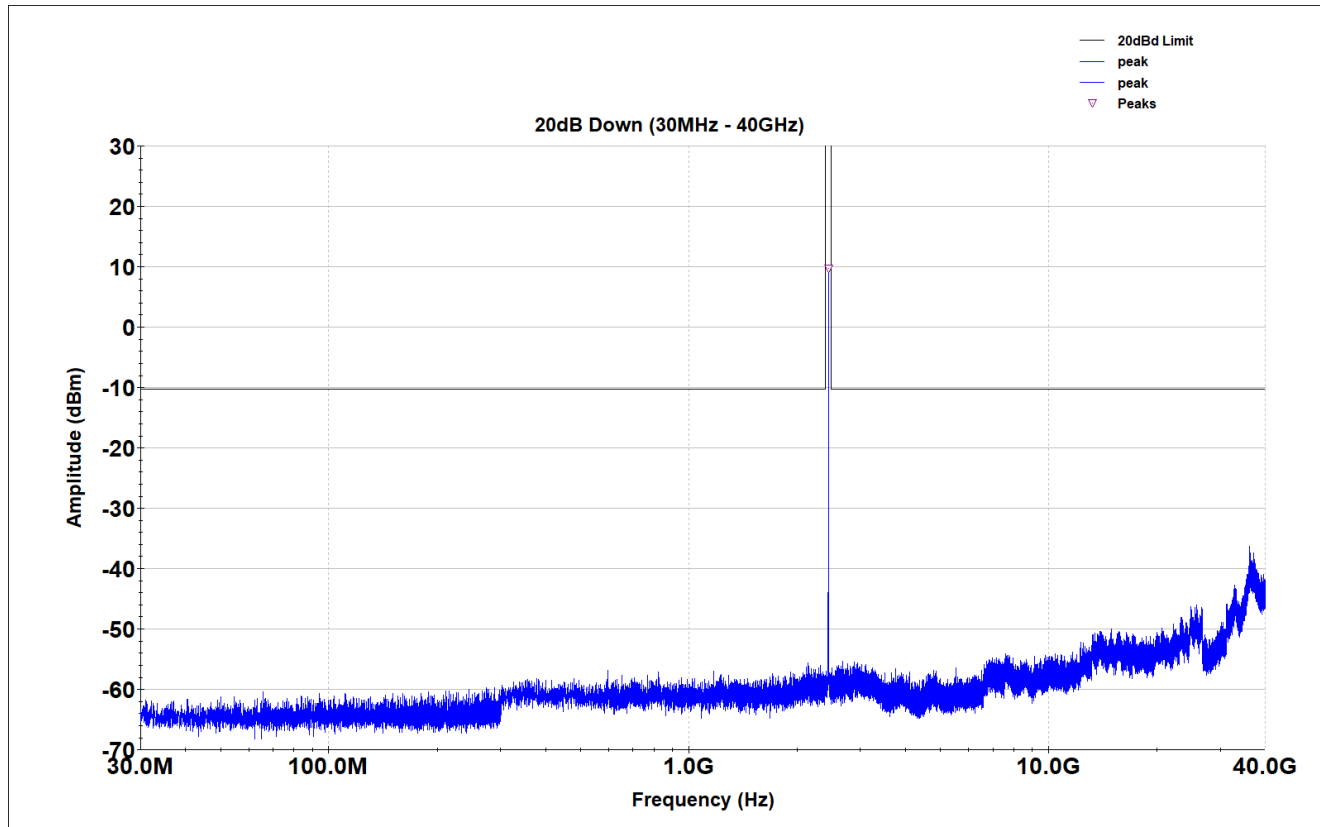


Figure 10. Mid Channel, 30MHz – 40GHz Conducted Spurious Emissions

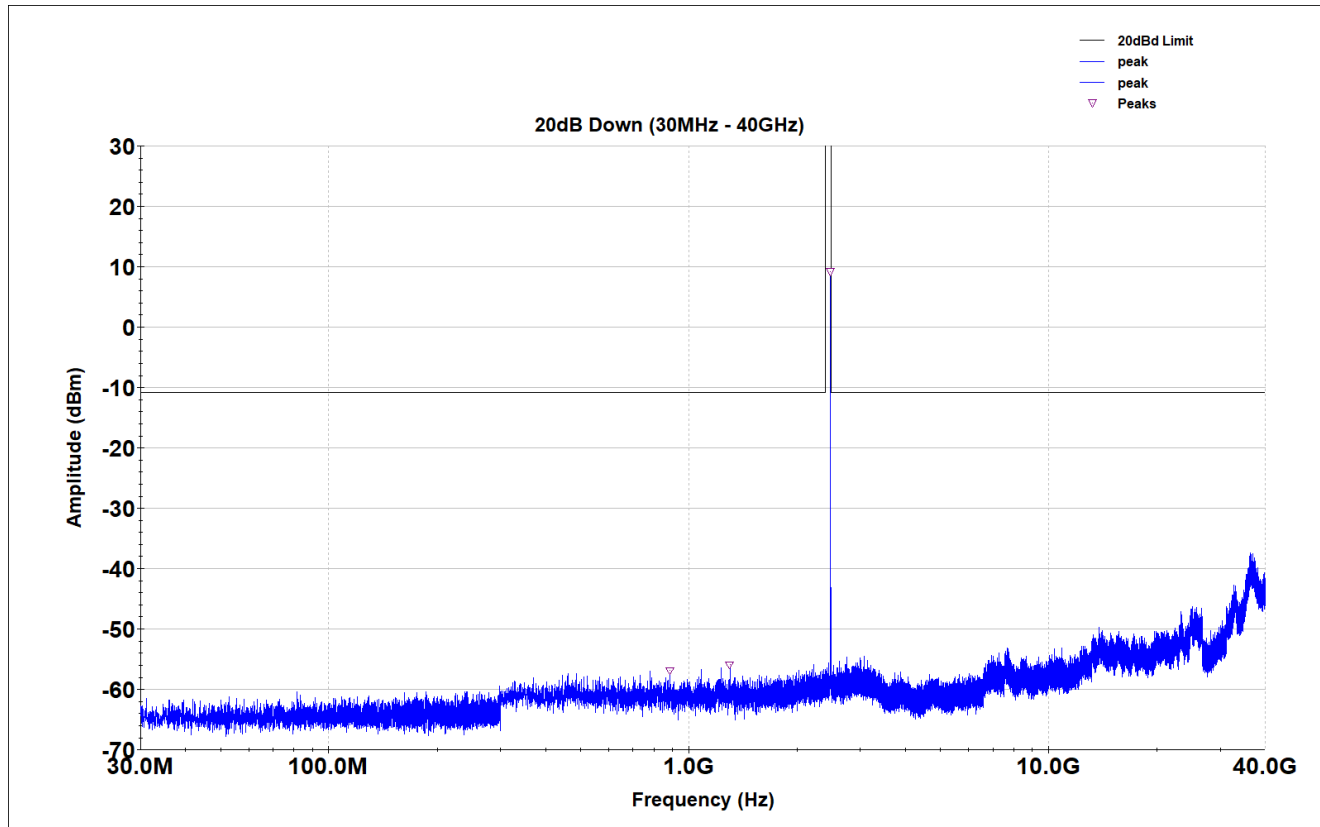


Figure 11. High Channel, 30MHz – 40GHz Conducted Spurious Emissions

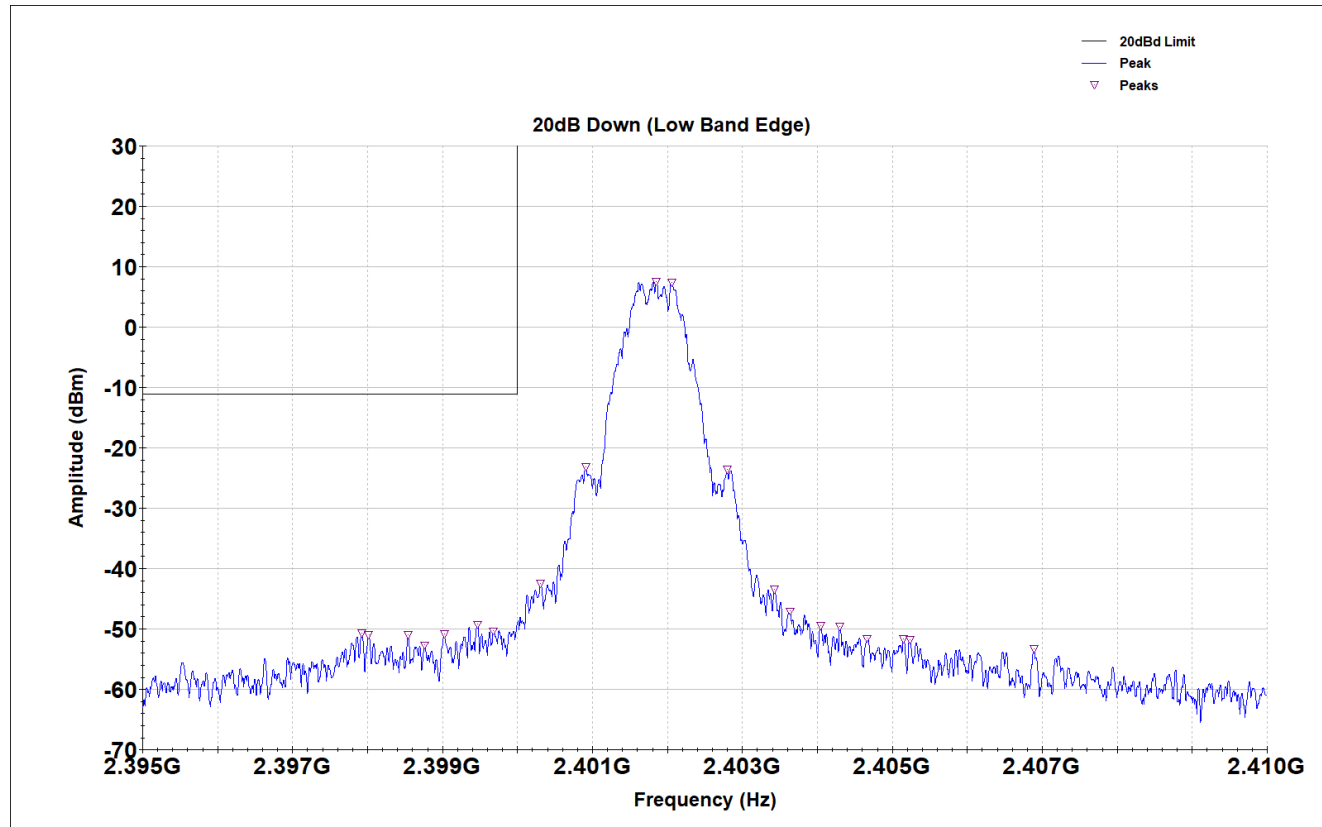
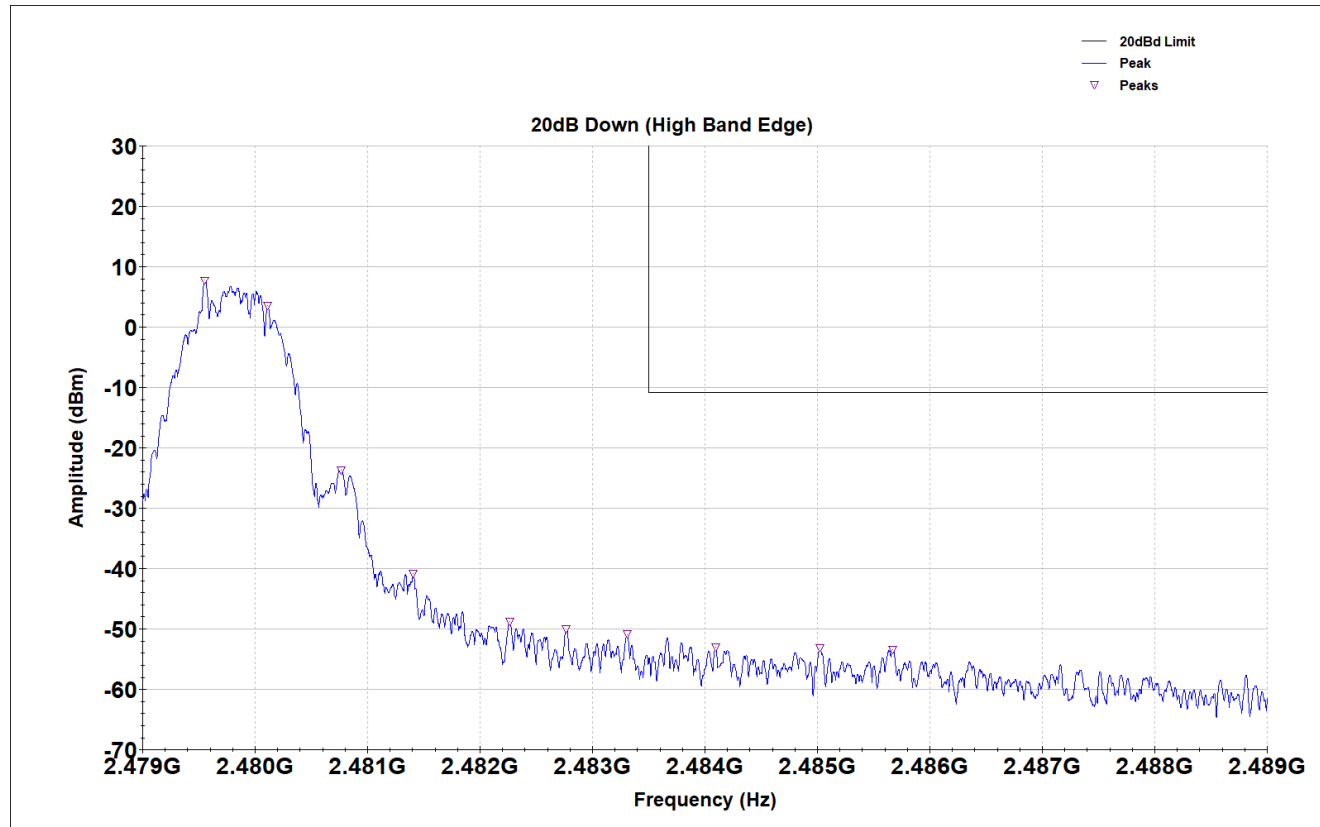


Figure 12. Low Channel, Low Band Edge



Spurious Frequency (MHz)	Peak Amplitude (dBm)	-20dBd Limit (dBm)	Margin (dB)	Result
2484.094	-53.07	-10.86	42.21	Pass
2485.021	-53.18	-10.86	42.32	Pass
2485.671	-53.36	-10.86	42.5	Pass

Figure 13. High Channel, Low Band Edge

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) 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)

Table 15. 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 Table 16.

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

Table 16. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedures: The radiated methodology referenced in ANSI C63.10: 2013 Section 11.12.1 was utilized in order to assess the unwanted emissions in the restricted bands.

A radiated scan was performed with the antenna of proper impedance installed. The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes if multiple mounting orientations are supported. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.

Radiated measurements below 30MHz were performed in a semi-anechoic chamber that has been correlated to an open area site.

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of § 15.247(d).

Test Engineer(s): Bryan Taylor, Sergio Gutierrez

Test Date(s): 04/29/2025 – 05/03/2025

Radiated Spurious Emissions Test Results

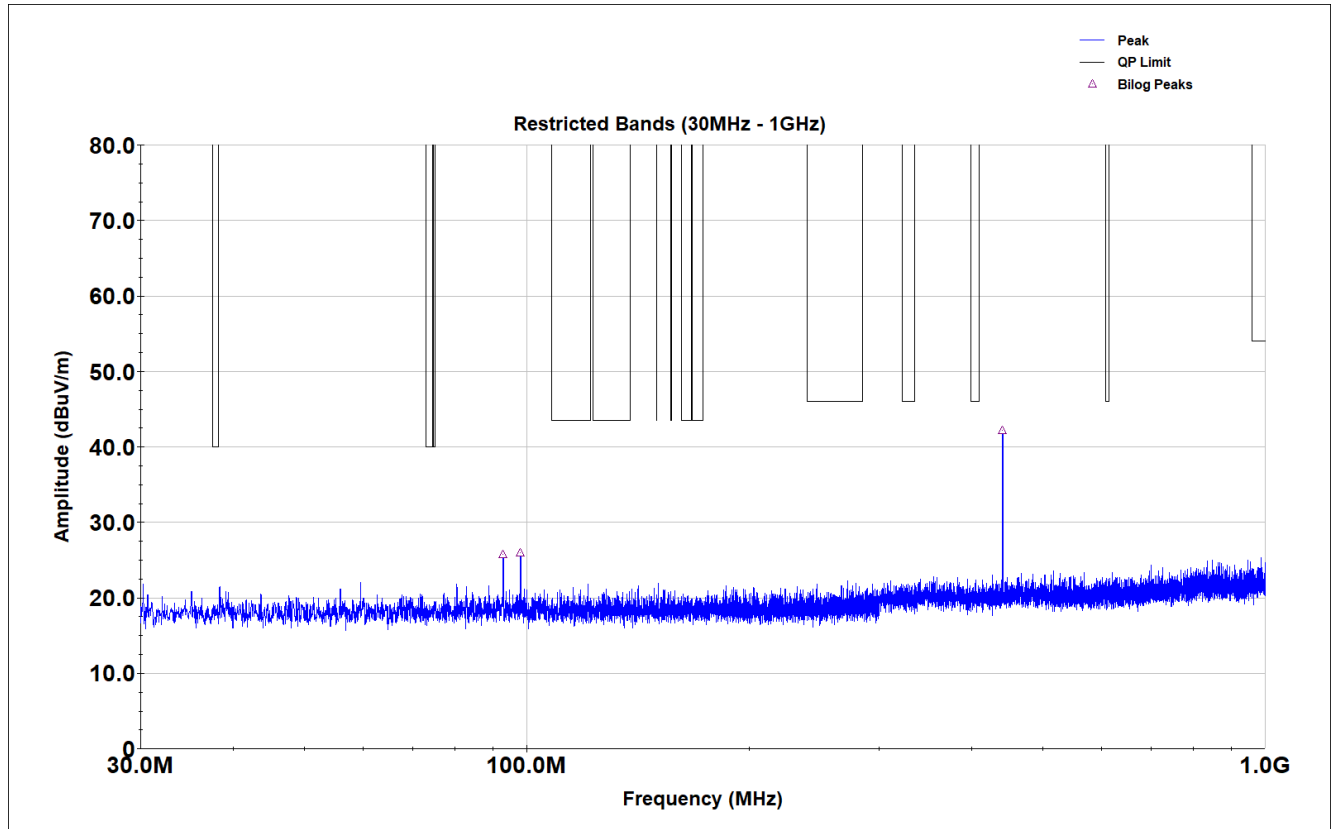


Figure 14. Low Channel, 30MHz – 1GHz Restricted Band Spurious Emissions

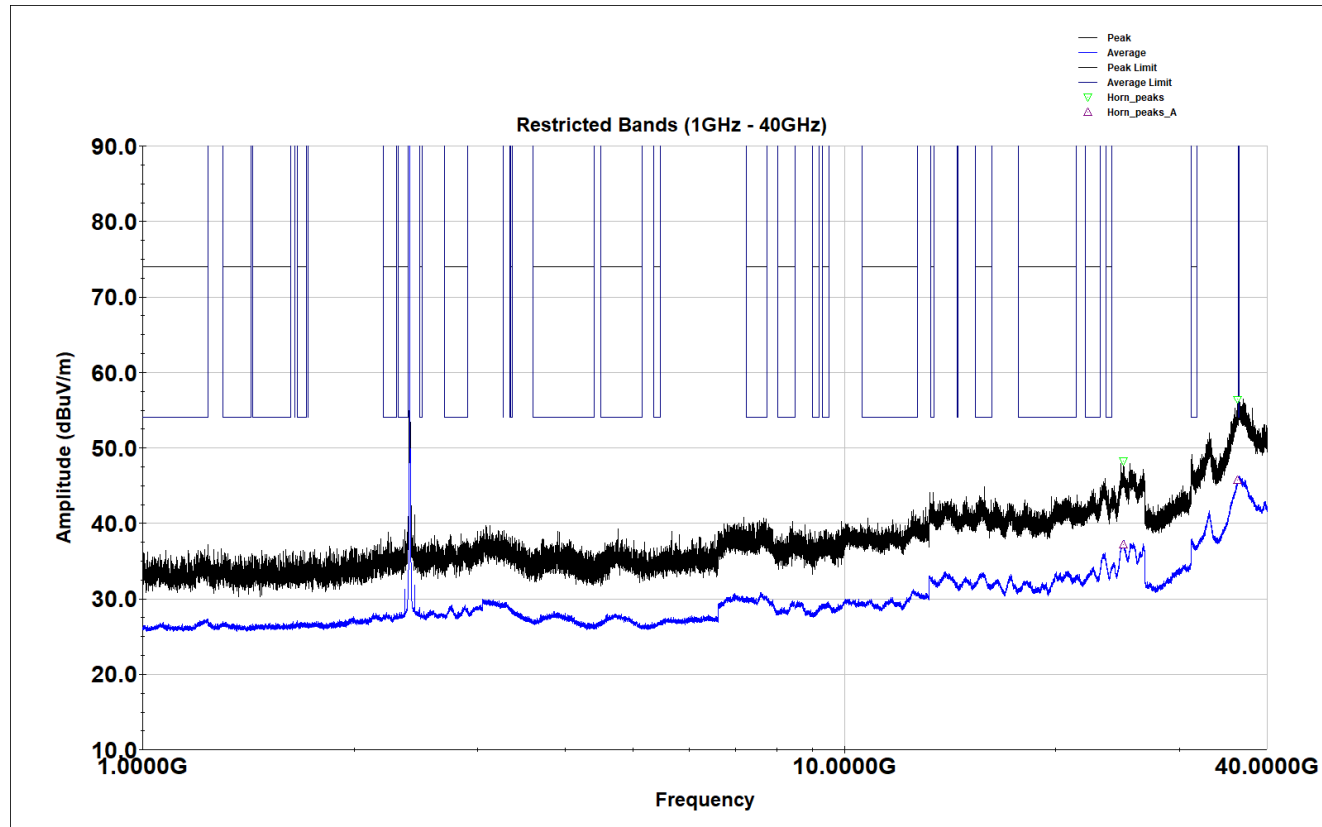


Figure 15. Low Channel, 1GHz – 40GHz Restricted Band Spurious Emissions

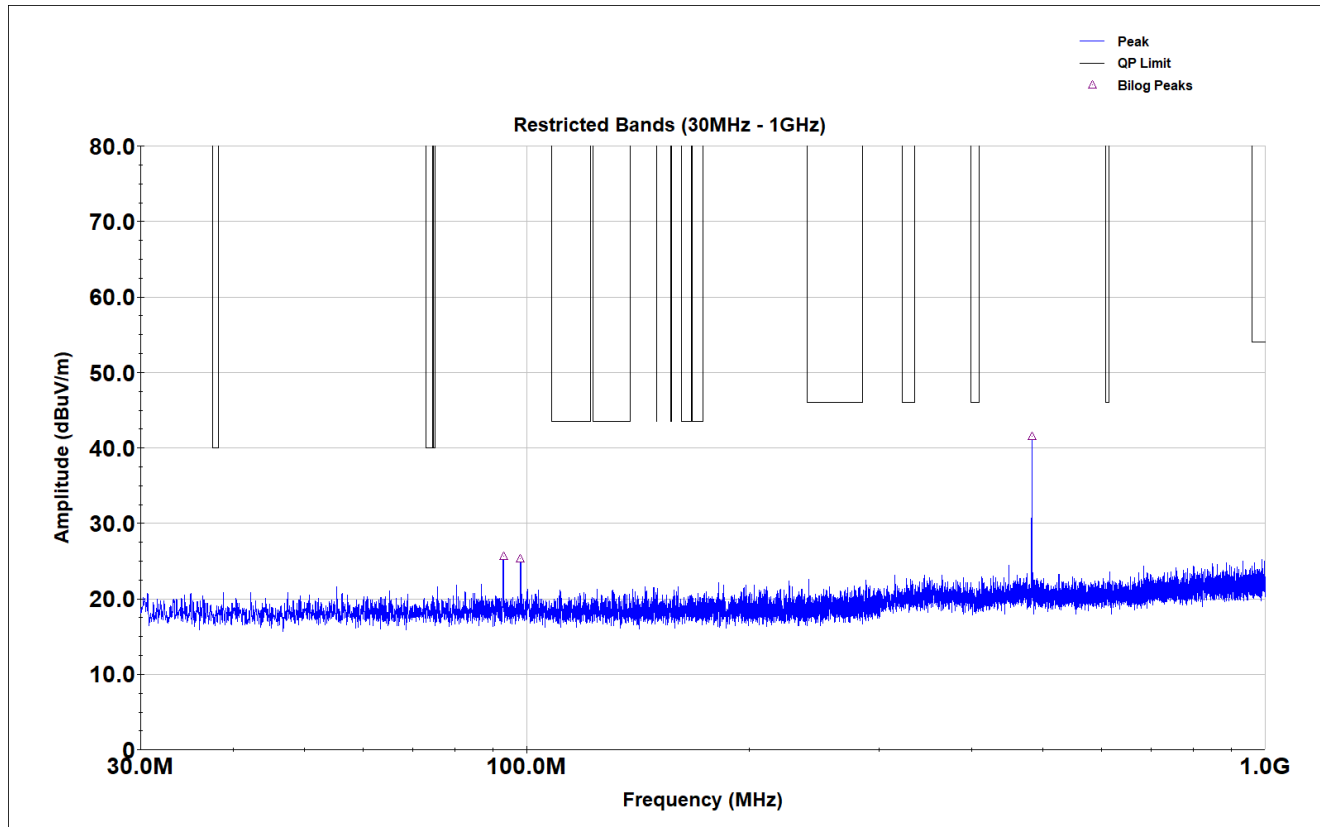


Figure 16. Middle Channel, 30MHz – 1GHz Restricted Band Spurious Emissions

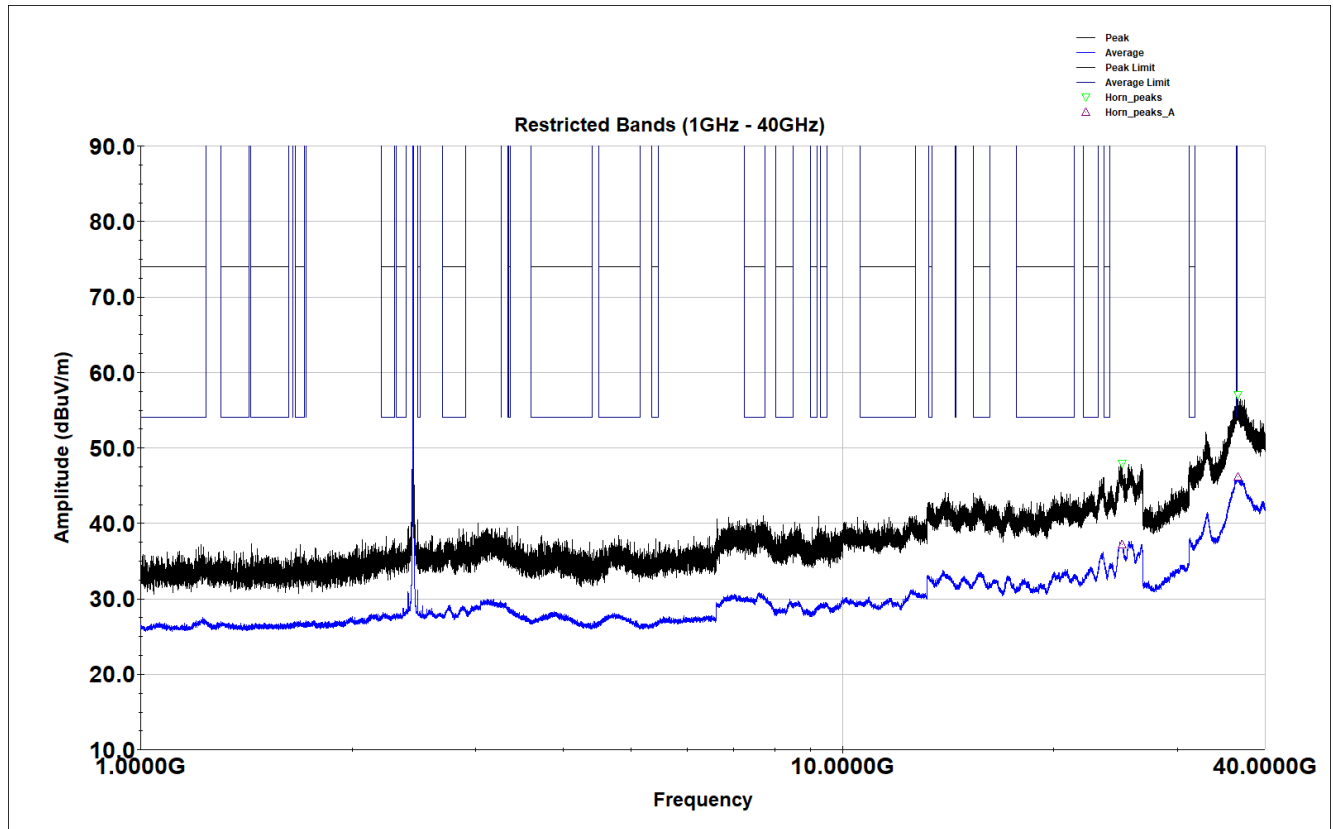


Figure 17. Middle Channel, 1GHz – 40GHz Restricted Band Spurious Emissions

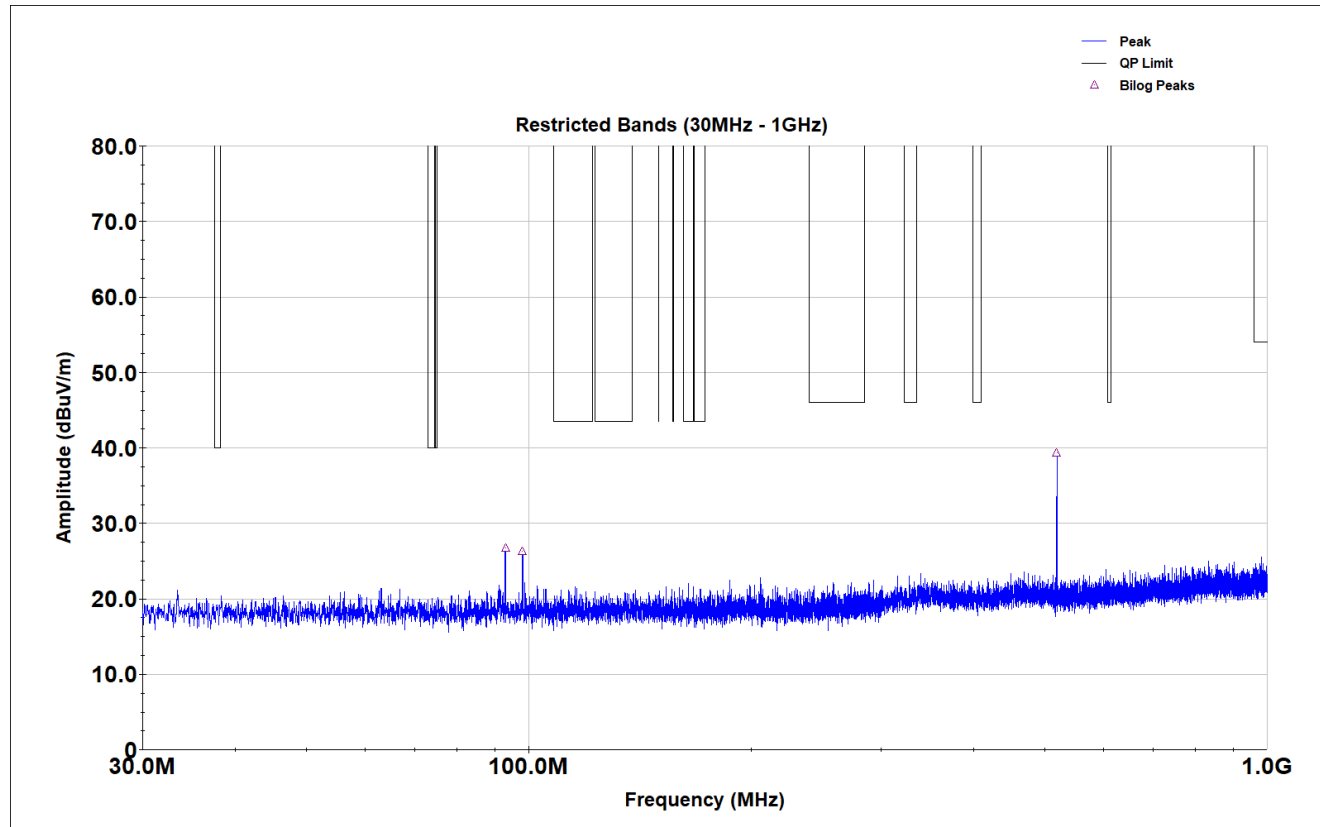


Figure 18. High Channel, 30MHz – 1GHz Restricted Band Spurious Emissions

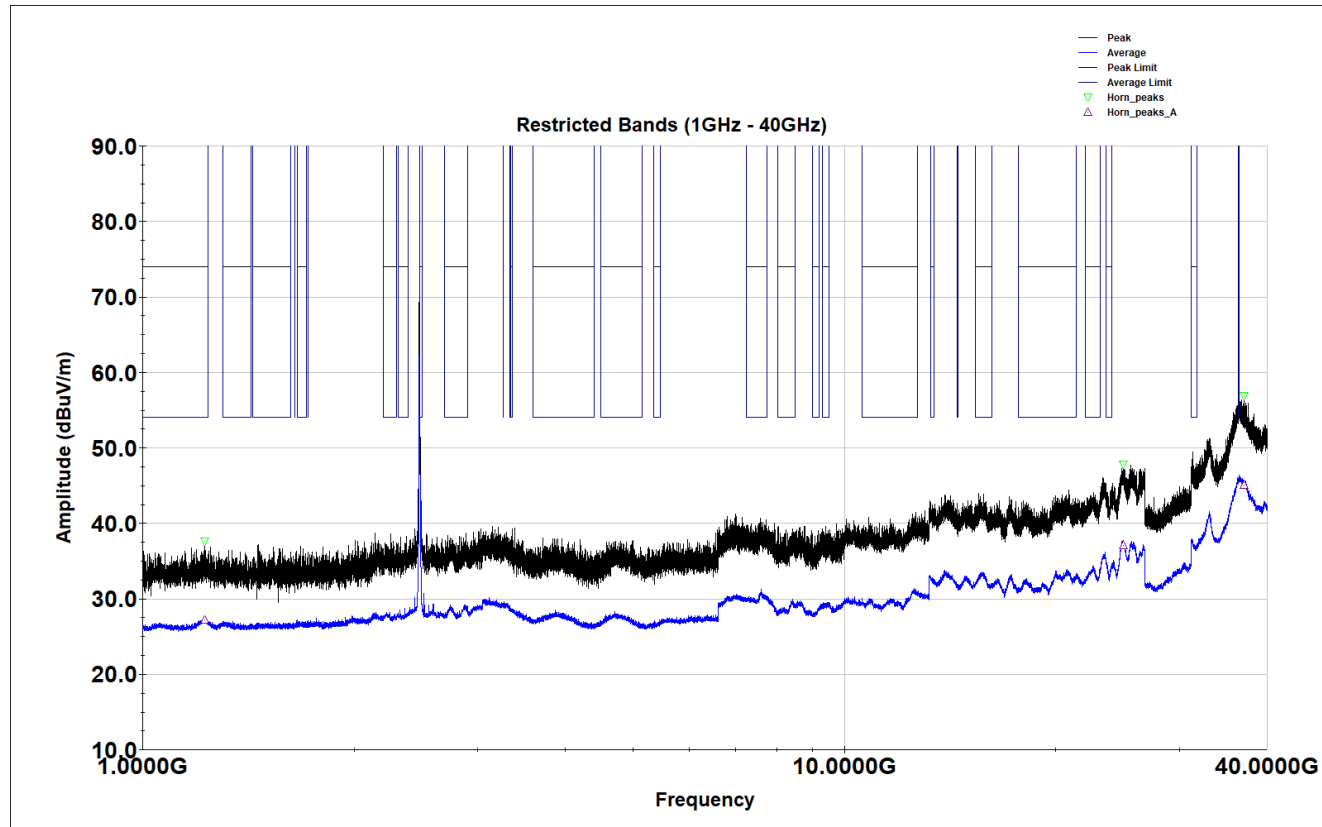
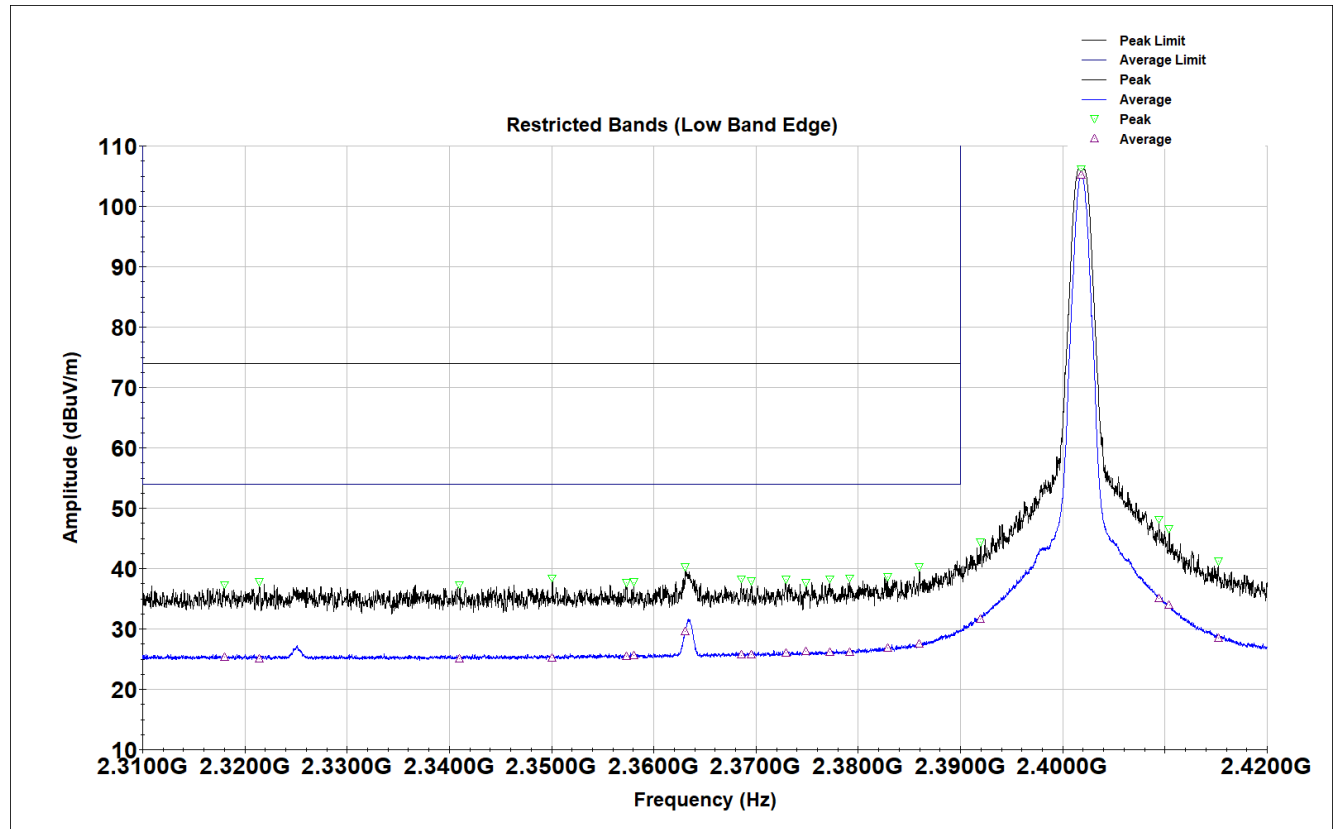
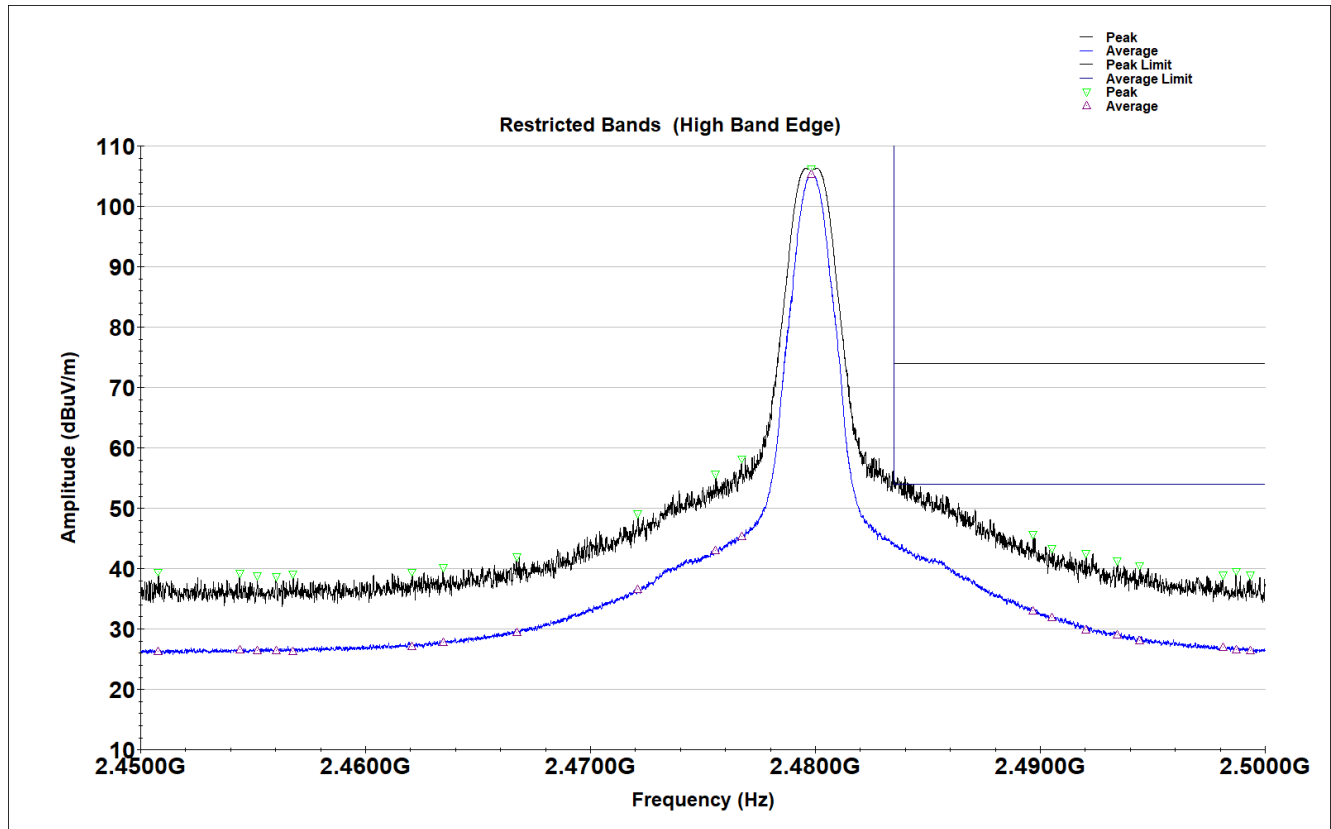


Figure 19. High Channel, 1GHz – 40GHz Restricted Band Spurious Emissions



Frequency	Peak Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Avg Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dBuV/m)	Result
2317.989	37.37	74	36.63	25.29	54	28.71	Pass
2321.399	37.78	74	36.22	25.12	54	28.88	Pass
2341.006	37.42	74	36.58	25.07	54	28.93	Pass
2350.068	38.5	74	35.5	25.27	54	28.73	Pass
2357.286	37.7	74	36.3	25.44	54	28.56	Pass
2358.043	37.74	74	36.26	25.64	54	28.36	Pass
2363.075	40.32	74	33.68	29.53	54	24.47	Pass
2368.561	38.31	74	35.69	25.68	54	28.32	Pass
2369.537	38.01	74	35.99	25.73	54	28.27	Pass
2372.92	38.26	74	35.74	25.97	54	28.03	Pass
2374.9	37.69	74	36.31	26.26	54	27.74	Pass
2377.21	38.34	74	35.66	26.14	54	27.86	Pass
2379.149	38.55	74	35.45	26.23	54	27.77	Pass
2382.861	38.59	74	35.41	26.9	54	27.1	Pass
2385.969	40.22	74	33.78	27.5	54	26.5	Pass

Figure 20. Restricted Band Edge Spurious Emissions (Low Band Edge)



Frequency	Peak Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Avg Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dBuV/m)	Result
2489.681	45.6	74	28.4	33.06	54	20.94	Pass
2490.525	43.34	74	30.66	31.95	54	22.05	Pass
2492.037	42.51	74	31.49	29.89	54	24.11	Pass
2493.419	41.21	74	32.79	28.98	54	25.02	Pass
2494.419	40.54	74	33.46	28.12	54	25.88	Pass
2498.119	38.86	74	35.14	26.94	54	27.06	Pass
2498.706	39.63	74	34.37	26.55	54	27.45	Pass
2499.331	38.94	74	35.06	26.46	54	27.54	Pass

Figure 21. Restricted Band Edge Spurious Emissions (High Band Edge)

Worst Case Cabinet Spurious Emissions

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
0.090	41.90	108.51	66.61	11.75	V	295.7	1	0.200	Pass
0.092	41.19	108.34	67.15	11.66	H	251.9	1	0.200	Pass
0.501	46.03	73.69	27.66	11.27	H	128.2	1	9.000	Pass
0.501	45.20	73.69	28.50	11.27	V	315	1	9.000	Pass
2.184	31.91	69.54	37.63	11.69	V	97.7	1	9.000	Pass
2.189	33.35	69.54	36.19	11.69	H	44.9	1	9.000	Pass
8.363	21.22	69.54	48.32	10.83	H	8.5	1	9.000	Pass

Figure 22. Worst Case Cabinet Radiation, 9kHz - 30MHz

Frequency [MHz]	QPK Level [dBμV/m]	QPK Limit [dBμV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
37.650	12.62	40.00	27.38	-6.12	V	224.3	3.62	120.000	Pass
37.890	10.04	40.00	29.96	-5.96	H	79	3.68	120.000	Pass
74.250	2.08	40.00	37.92	-12.21	V	53.3	2.80	120.000	Pass
116.490	6.19	43.52	37.33	-6.65	H	89.7	1.34	120.000	Pass
117.720	5.93	43.52	37.59	-7.24	V	301.3	1.34	120.000	Pass
131.490	6.30	43.52	37.22	-6.48	H	267	3.57	120.000	Pass
277.020	6.95	46.02	39.07	-5.92	H	12.4	2.80	120.000	Pass
612.060	13.98	46.02	32.04	1.46	V	294.6	1.47	120.000	Pass

Figure 23. Worst Case Cabinet Radiation, 30MHz - 1GHz

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Result
4,887.500	49.70	74.00	24.31	42.13	54.00	11.87	-3.22	H	308.9	2.49	Pass
4,887.500	49.19	74.00	24.81	41.43	54.00	12.57	-3.22	V	75.3	2.01	Pass
7,320.500	41.56	74.00	32.44	28.68	54.00	25.32	-2.79	H	195	2.16	Pass
7,326.500	41.25	74.00	32.75	28.61	54.00	25.39	-2.76	V	77.8	2.47	Pass
12,210.000	44.85	74.00	29.15	31.62	54.00	22.38	-1.93	H	288.3	3.16	Pass
12,221.000	44.65	74.00	29.35	32.21	54.00	21.79	-1.96	V	123.2	3.49	Pass
19,929.813	52.19	74.00	21.81	40.76	54.00	13.24	12.30	H	241.4	1.35	Pass
20,464.688	50.96	74.00	23.04	39.34	54.00	14.66	12.16	H	7.2	1.89	Pass
22,217.125	51.55	74.00	22.45	40.31	54.00	13.69	13.33	V	93.7	2.91	Pass
23,858.875	51.97	74.00	22.03	40.84	54.00	13.16	14.45	H	80.5	3.99	Pass
31,244.688	54.61	74.00	19.39	41.45	54.00	12.55	16.63	V	199.2	1.1	Pass
31,506.625	54.81	74.00	19.19	42.94	54.00	11.06	16.77	V	360.2	2.69	Pass
31,636.563	54.59	74.00	19.41	43.48	54.00	10.52	16.68	H	214.3	1.36	Pass
36,466.938	54.10	74.00	19.90	42.51	54.00	11.49	15.84	H	168.5	1.51	Pass

Figure 24. Worst Case Cabinet Radiation, Above 1GHz

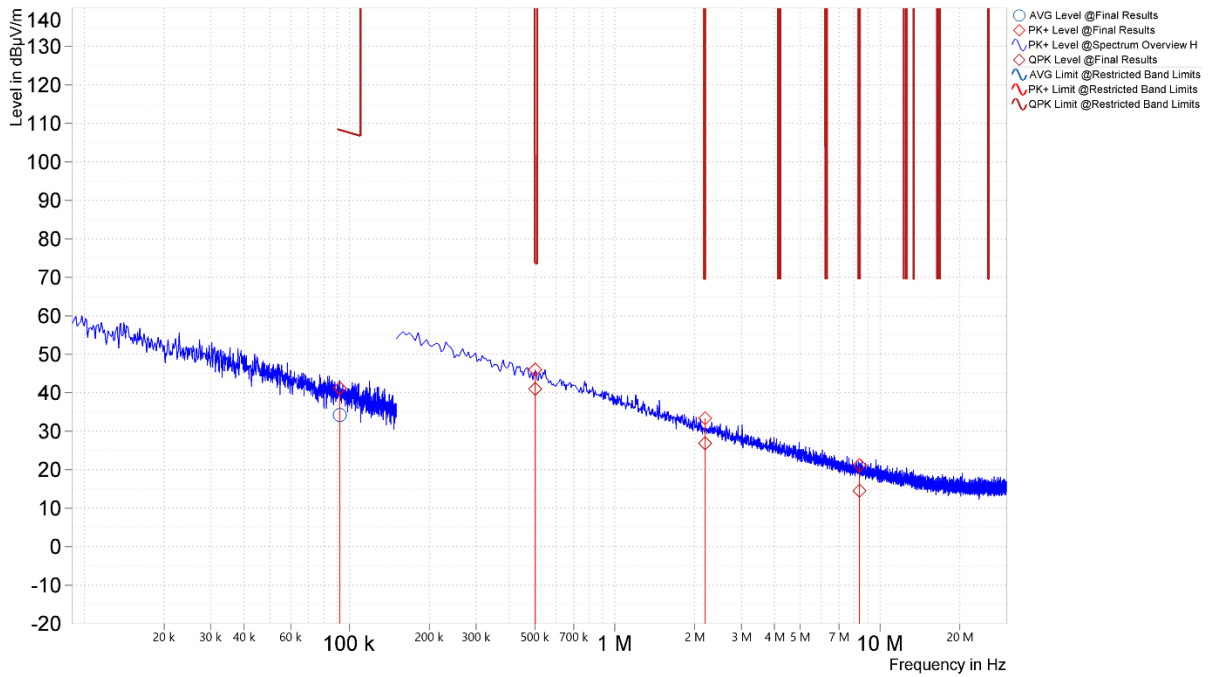


Figure 25. Worst Case Cabinet Radiation, 9kHz – 30MHz, Coaxial Loop

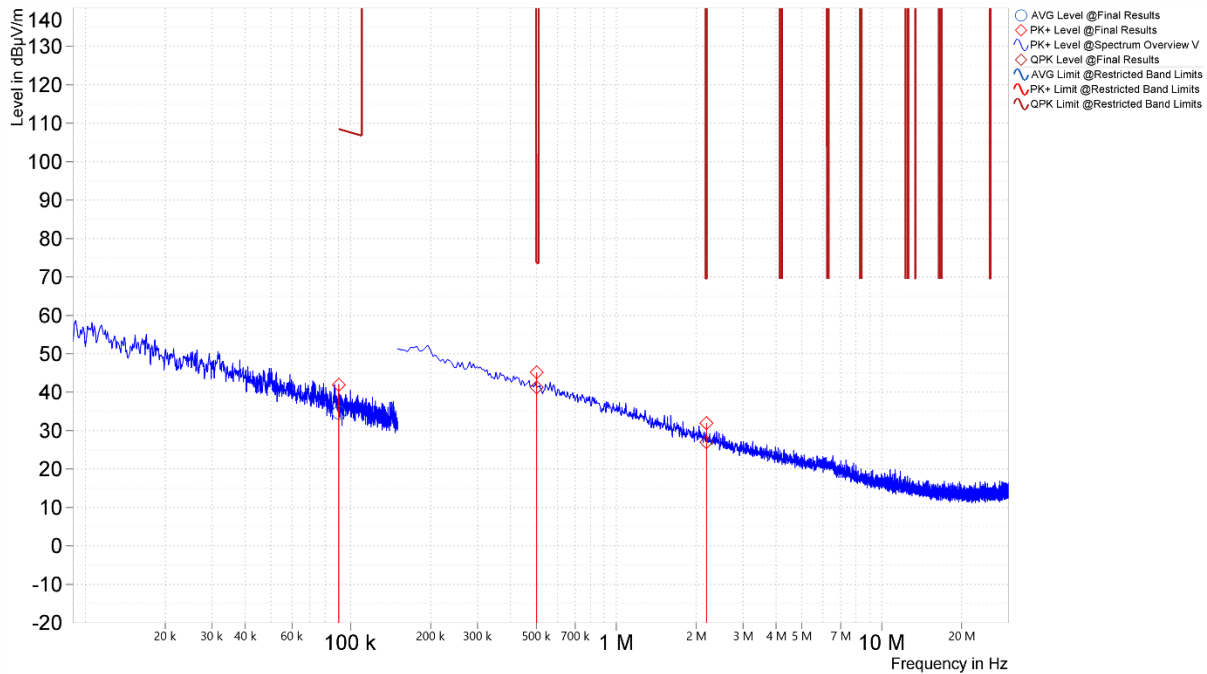


Figure 26. Worst Case Cabinet Radiation, 9kHz – 30MHz, Coplanar Loop

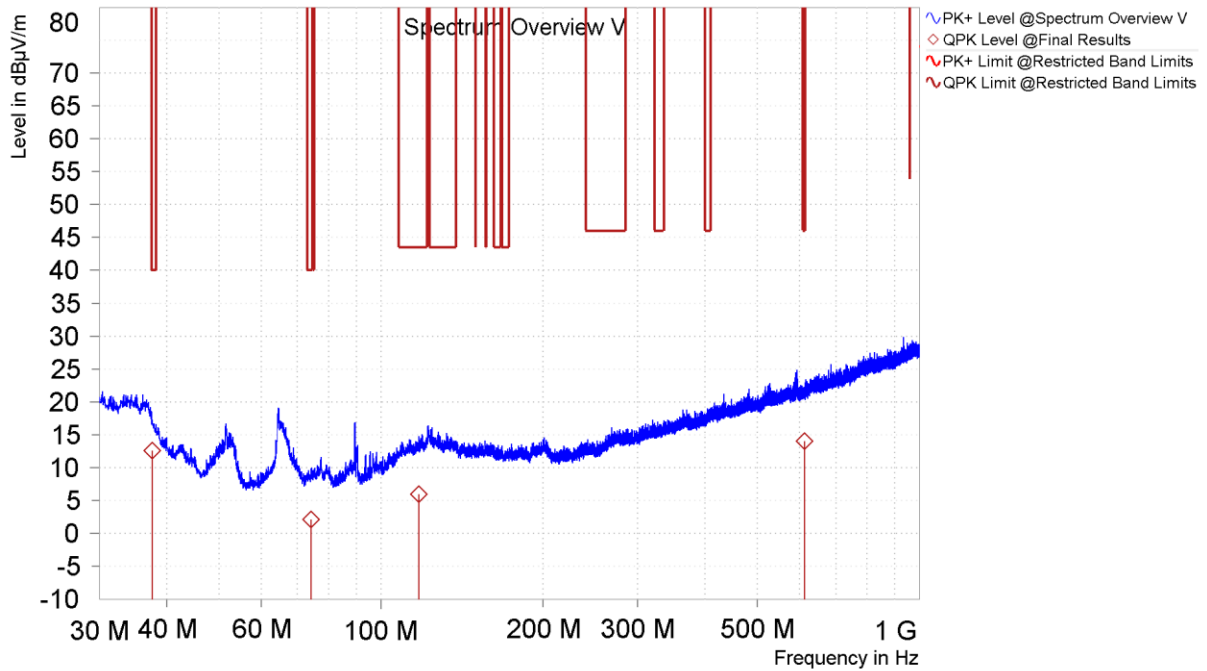


Figure 27. Worst Case Cabinet Radiation, 30MHz – 1GHz, Vertical Polarity

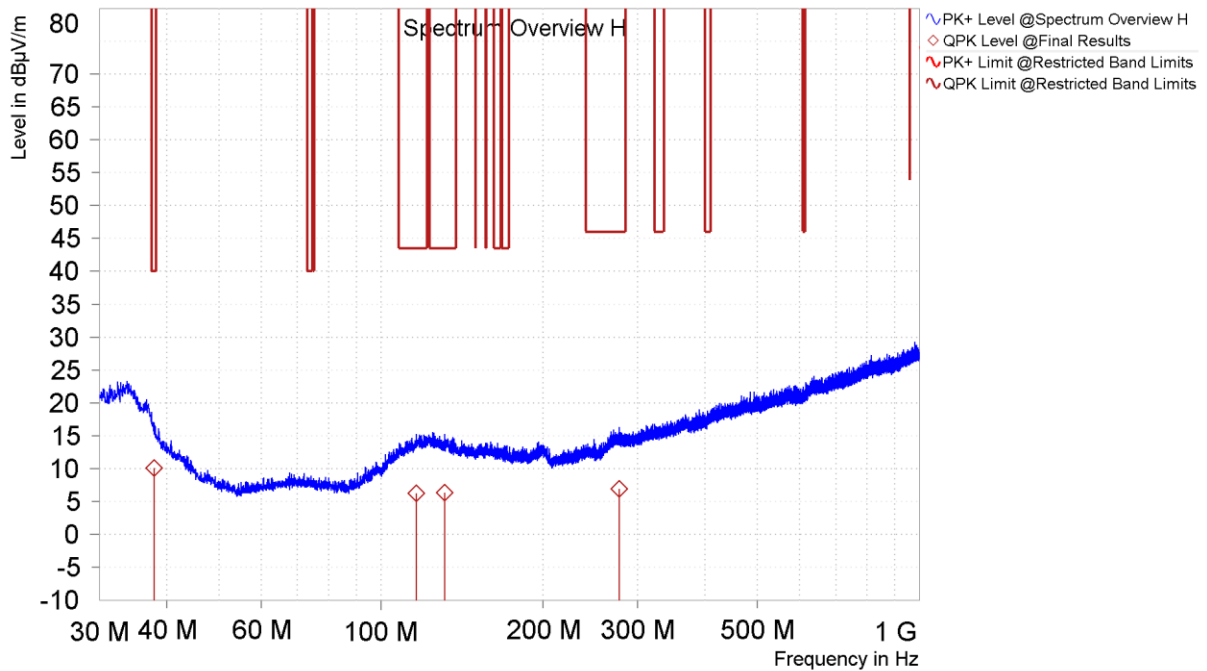


Figure 28. Worst Case Cabinet Radiation, 30MHz – 1GHz, Horizontal Polarity

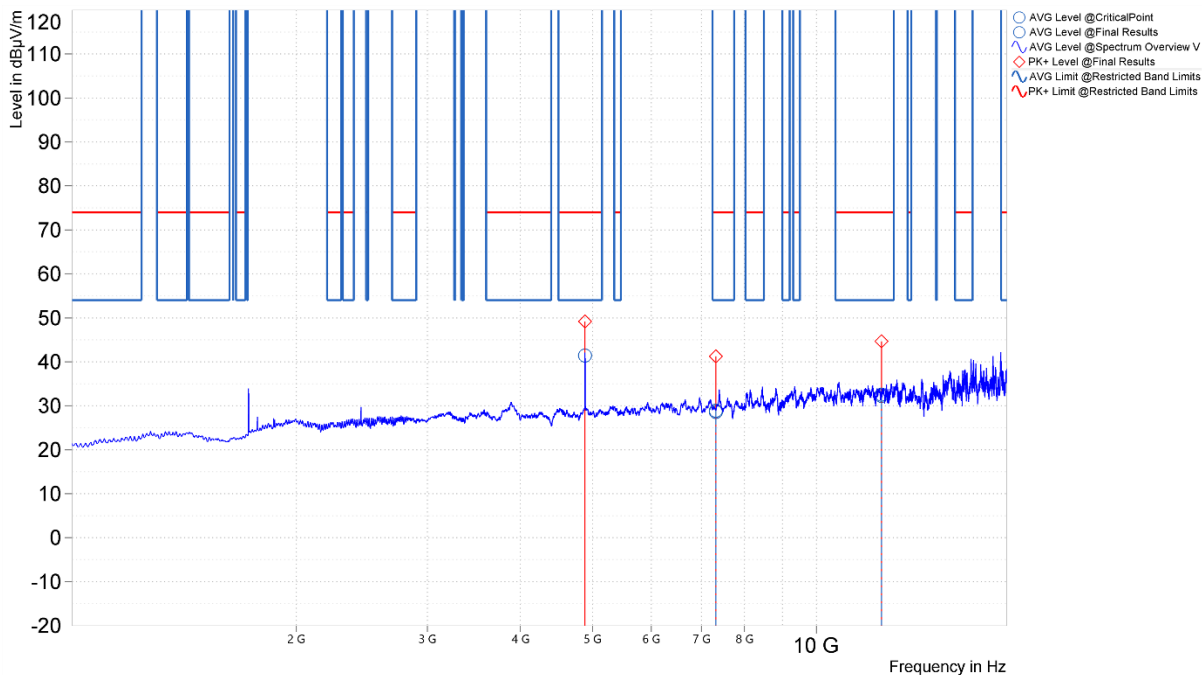


Figure 29. Worst Case Cabinet Radiation, 1GHz – 18GHz, Vertical Polarity

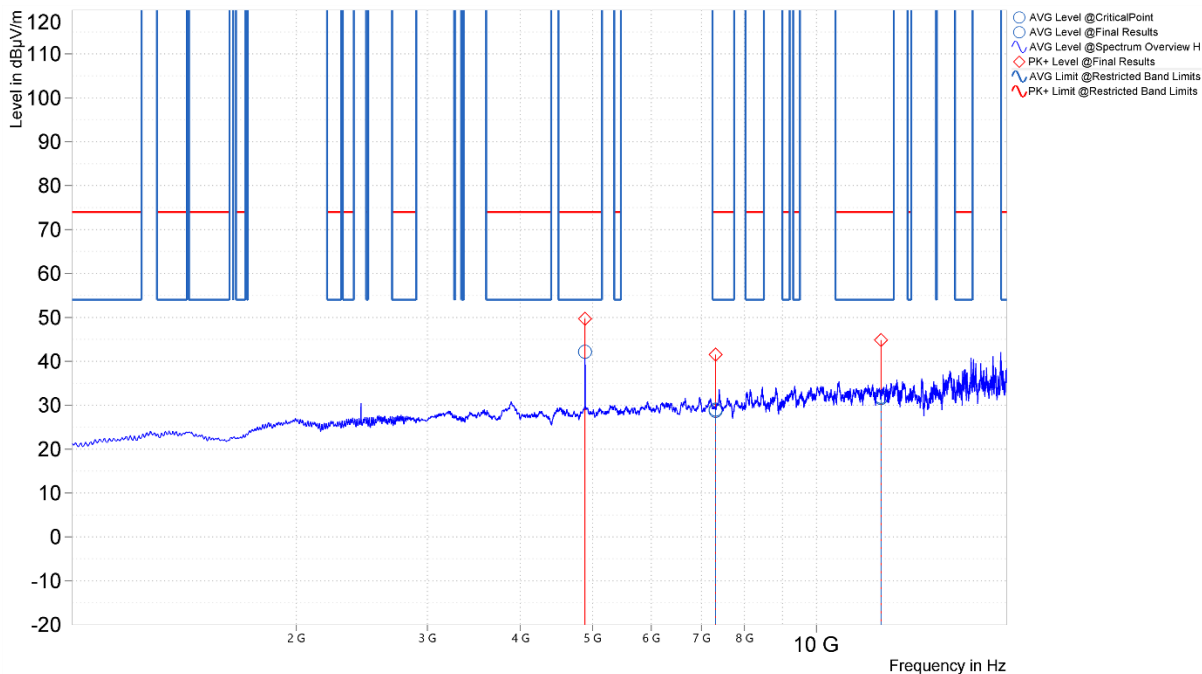


Figure 30. Worst Case Cabinet Radiation, 1GHz – 18GHz, Horizontal Polarity

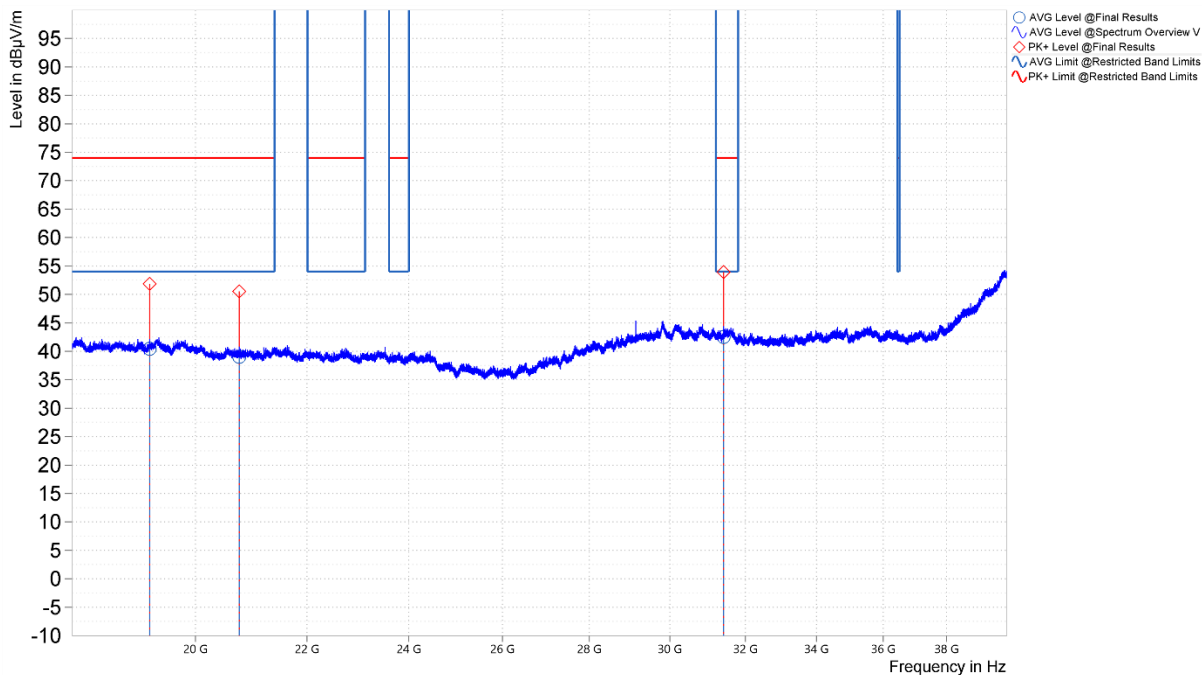


Figure 31. Worst Case Cabinet Radiation, 18GHz – 40GHz, Vertical Polarity

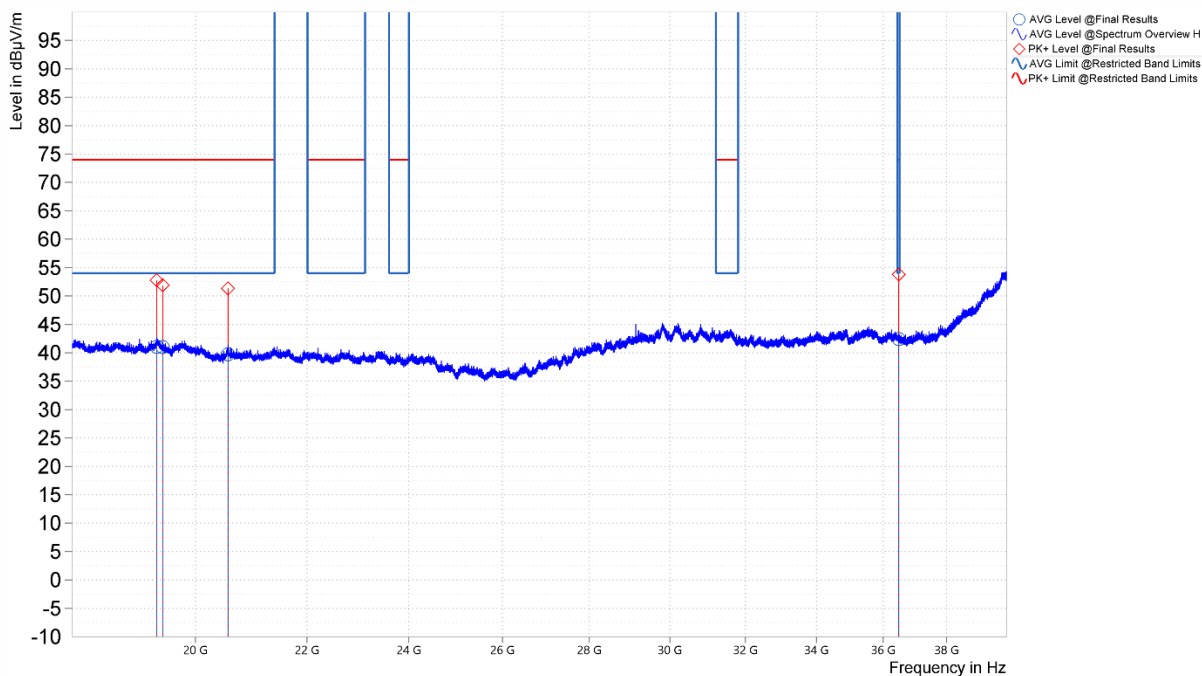


Figure 32. Worst Case Cabinet Radiation, 18GHz – 40GHz, Horizontal Polarity

IV. Test Equipment

Test Equipment

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

MET Asset #	Description	Manufacturer	Model	Last Cal Date	Cal Due Date
MY46180897	Spectrum Analyzer	Keysight	E4448A	08/28/2024	08/28/2025
1A1250	EMI Test Receiver	Rohde & Schwarz	ESW44	03/28/2025	03/28/2026
1A1176	Active Loop Antenna (9KHz-30MHz)	ETS-Lindgren	6502	08/22/2024	08/22/2026
1A1050	Bi-Log Antenna	Schaffner	CBL-6112D	03/05/2024	03/05/2026
1A1183	Horn Antenna	ETS - Lindgren	3117	02/20/2024	02/20/2026
1A1161	Horn Antenna (18GHz – 40GHz)	ETS Lindgren	3116C	08/01/2024	08/01/2026
1A1065	EMI Receiver	Rohde & Schwarz	ESCI	08/20/2024	08/20/2025
1A1177	Pulse Limiter	Rohde & Schwarz	ESH3Z2	12/11/2024	12/11/2025
1A1217	LISN	COM-POWER	L1-1100	12/11/2024	12/11/2025
1A1218	LISN	COM-POWER	L1-1100	12/11/2024	12/11/2025
3A3215	ATC Digital Ohmmeter	Valhalla Scientific	4150	05/24/2024	05/24/2025
1A1099	Generator	Com-Power	CGO-51000	See Note	
1A1088	Preamplifier	Rohde & Schwarz	TS-PR1	See Note	
1A1044	Generator	Com-Power	CG-520	See Note	
1A1073	Multi Device Controller	ETS	2090	See Note	
1A1074	System Controller	Panasonic	WV-CU101	See Note	
1A1080	Multi-Device	ETS	2090	See Note	
1A1180	Preamplifier	Miteq	AMF-7D- 01001800-22- 10P	See Note	

Table 17. Test Equipment List

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

End of Report