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2/22/2024
Lutron Electronics Co., Inc.
7200 Suter Rd.
Coopersburg, PA 18036
USA

Dear Keith Kennedy,

Enclosed is the EMC Wireless test report for compliance testing of the Lutron Electronics Co., Inc. UN-D2MEMTRXX 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

Nancy LaBrecque
Documentation Department

Reference: WIRA130151-FCC-IC-BLE-R2

# Bluetooth Low Energy
# Test Report

for the

Lutron Electronics Co., Inc.
UN-D2MEMTRXX

**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 |
|---|---|---|
| ∅ | 1/18/2024 | Initial Issue. |
| 1 | 1/29/2024 | Made updates requested by client |
| 2 | 2/22/2024 | Made updates requested by client |

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# 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**ert**z** |
| **IEC** | **I**nternational **E**lectrotechnical **C**ommission |
| **kHz** | **k**ilo**h**ert**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** | **microh**enry |
| µ | **microf**arad |
| **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 |

# I. Executive Summary

## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the UN-D2MEMTRXX, with the requirements of FCC Part 15.247 and RSS-247 Issue 3. Lutron Electronics Co., Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the UN-D2MEMTRXX, 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 Lutron Electronics Co., Inc. purchase order number 5317304. 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 2: 2017; 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 Lutron Electronics Co., Inc. to perform testing on the UN-D2MEMTRXX, under Lutron Electronics Co., Inc.'s purchase order number 5317304.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the UN-D2MEMTRXX.

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

| | | |
|---|---|---|
| **Product Name:** | Universal D2 Module Emitter | |
| **Model(s) Tested:** | UN-D2MEMTRXX | |
| **Model(s) Covered:** | UN-D2MEMTRXX | |
| **Serial Number or Sample Number:** | Test Sample 1 | |
| **EUT Specifications:** | Primary Power: 18 – 20VDC | |
| | Type of Modulations: | GFSK |
| | Equipment Code: | DTS |
| | Peak RF Output Power: | 10.37dBm |
| | EUT Frequency Ranges: | 2402MHz – 2480MHz |
| | Antenna Gain[1]: | 5dBi (monopole) |
| **Analysis:** | The results obtained relate only to the item(s) tested. | |
| **Environmental Test Conditions:** | Temperature: 15-35º C | |
| | Relative Humidity: 30-60% | |
| | Barometric Pressure: 860-1060 mbar | |
| **Evaluated by:** | Bryan Taylor | |
| **Report Date(s):** | 12/21/2023 through 1/17/2024 | |

**Table 2. EUT Summary Table**

[1] The antenna gain information was provided by Lutron Electronics Co., 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.

## D. Measurement Uncertainty

| Test Method | Typical Expanded Uncertainty | K | Confidence Level |
|---|---|---|---|
| **RF Frequencies** | ±4.52 Hz | 2 | 95% |
| **RF Power Conducted Emissions** | ±2.97 dB | 2 | 95% |
| **RF Power Radiated Emissions** | ±2.95 dB | 2 | 95% |

**Table 4. Uncertainty Calculations Summary**

## E. Description of Test Sample

The EUT is a DC voltage, fully color tunable, dimmable LED product with integrated wireless communication. It contains a RF transceiver (EFR32MG24) with a reference crystal (38.4MHz) and an antenna that cannot be changed by the user. The device is used as part of an integrated lighting system. The purpose of the wireless communication is to send commands to and receive status information back from a control system.

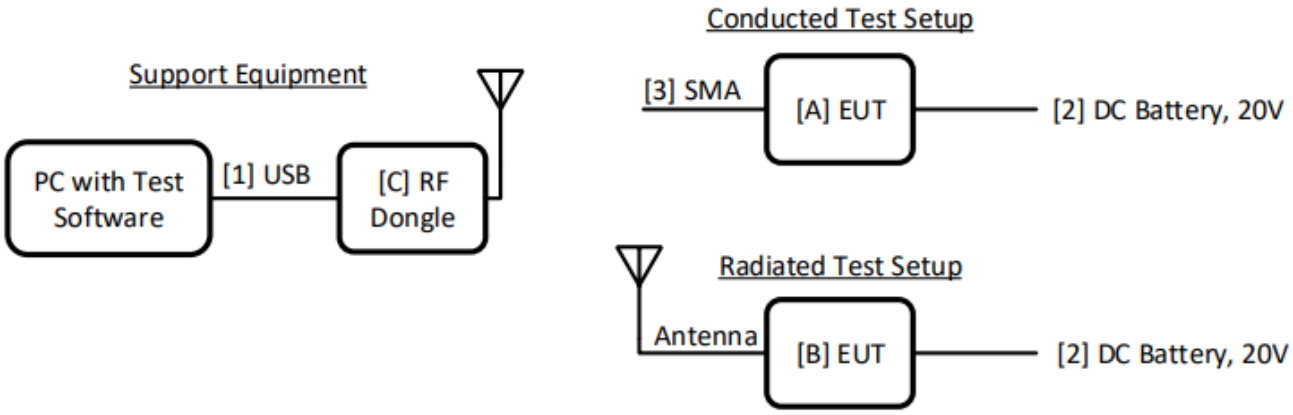



**Figure 1. Block Diagram of Test Configuration**

## F. Equipment Configuration

The EUT was set up as outlined in Figure 1 above. The laptop computer was used to send test commands to force the transmitters to operate in the appropriate test mode.

## 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 |
|---|---|---|---|---|
| None | Laptop Computer | Lenovo | ThinkPad | None |
| None | Lutron Radio Certification GUI | Lutron | Version 1.1.3 | None |

**Table 5. Support Equipment**

## H. Ports and Cabling Information

| Ref. ID | Name/Description | Model Number |
|---|---|---|
| A1 | Conducted Test Unit | UN-D2MEMTRXX |
| A2 | Backup - Conducted Test Unit | UN-D2MEMTRXX |
| B1 | Radiated Test Unit | UN-D2MEMTRXX |
| B2 | Backup - Radiated Test Unit | UN-D2MEMTRXX |
| C | RF Dongle | Digi USB |
| | | |
| 1 | USB Cable - RF Dongle to Support PC | |
| 2 | DC supply cable from battery to DUT | |
| 3 | SMA Cable for conducted test ; 0.55 dB loss | |
| | | |

**Table 6. Ports and Cabling Information**

## I. Mode of Operation

The transmitter uses the voltage-controlled oscillator, which is frequency modulated, and a power amplifier to produce the modulated carrier at 2.402GHz to 2.480GHz. The radio can switch between BLE 1Mbps(2.402GHz to 2.480GHz), BLE 2Mbps (2.402GHz to 2.480GHz) and 802.15.4 (2.405GHz to 2.480GHz) depending on the mode of operation. The modulation is either GFSK for BLE or O-QPSK for 802.15.4. The antenna is permanently attached and cannot be modified or replaced by the user.

User controlled Software is provided to enable the EUT to achieve 100% duty cycle during EMC testing in both BLE and 802.15.4 modes.

The support laptop provided a direct means of controlling transmitter parameters. Unless otherwise stated or shown, all tests were performed at worst-case modulation and data rates on the following channels.

| Transmit Band | Modulation | Channel Frequencies Tested | Test Tool Power Setting[2] |
|---|---|---|---|
| 2400 – 2483.5MHz | BLE (GFSK) | 2402MHz / 2440MHz / 2480MHz | 13dBm |

**Table 7. 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 Lutron Electronics Co., Inc. upon completion of testing.

[2] Note, the test tool power setting does not necessarily correspond to a power in dBm or Watts.

# 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 it uses a unique coupling.

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 1/3/2024

## 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 |

**Table 8. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

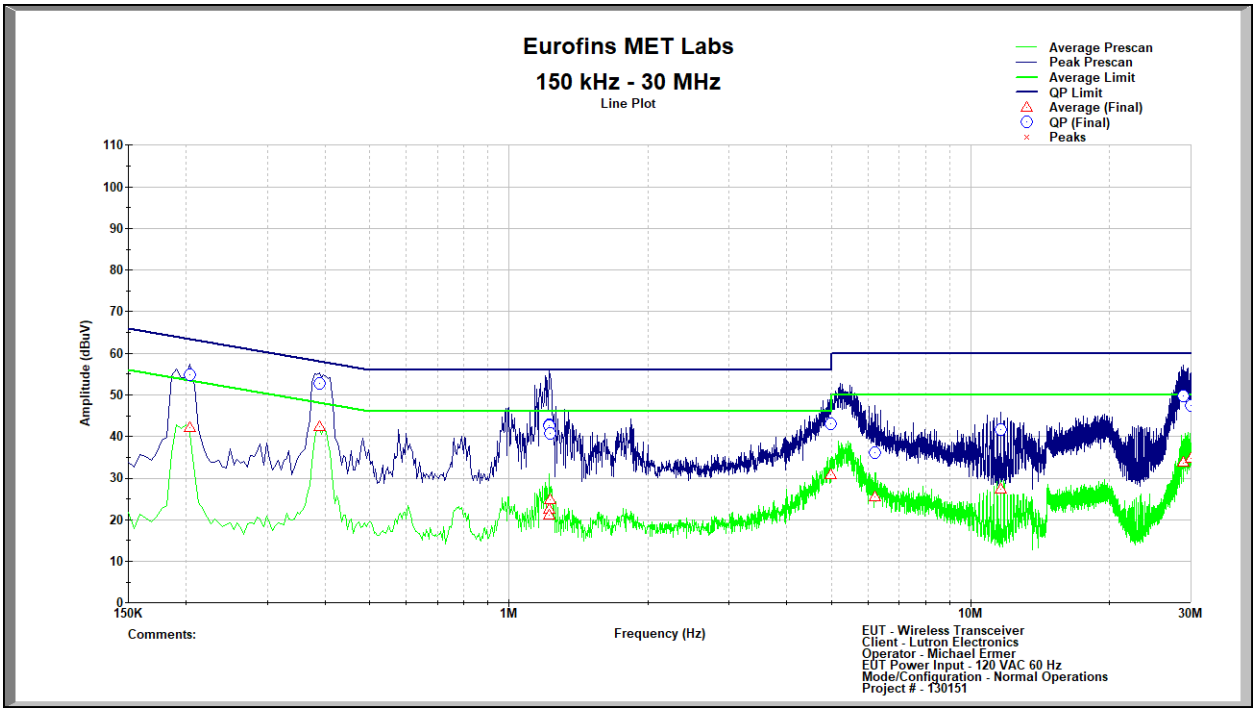
**Test Procedure:** The EUT was placed on a 0.8 m-high wooden table. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH 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 μH 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. During these tests the Universal D2 Module Emitter was connected to a D2-PS-120 AC/DC power adapter.

**Test Engineer(s):** Michael Ermer

**Test Date(s):** 1/17/2024

## 15.207(a) Conducted Emissions Test Results

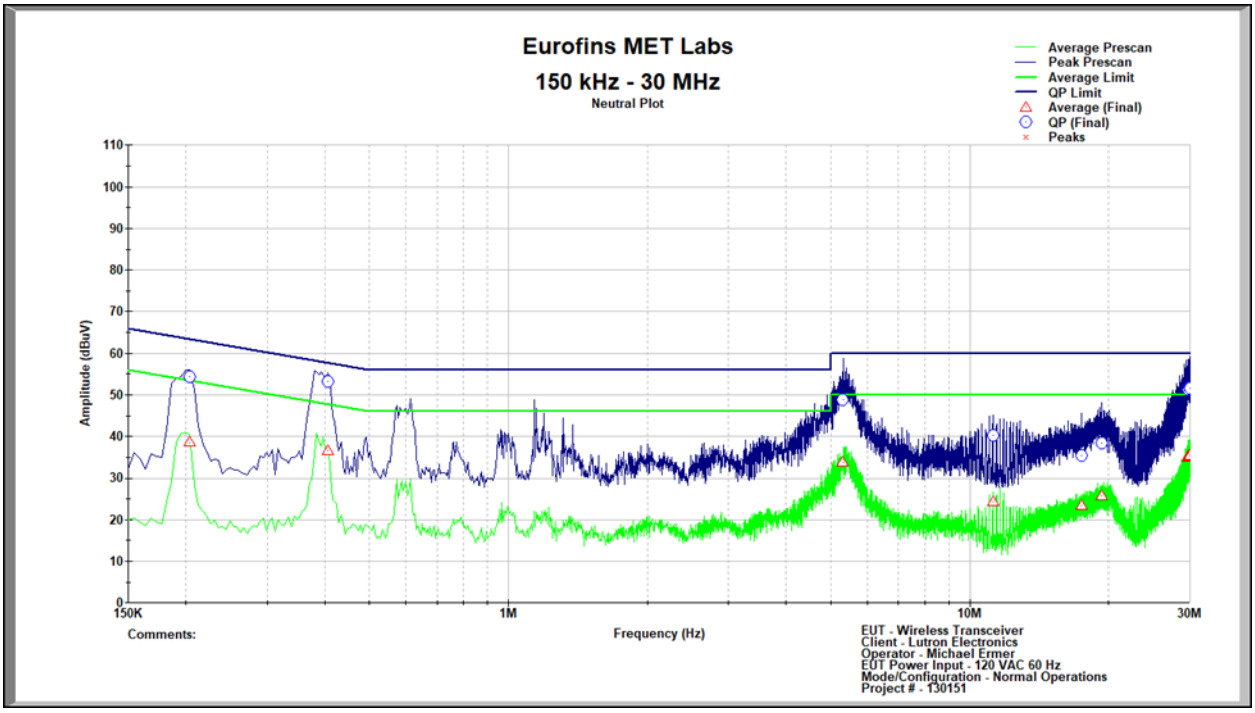



**Conducted Emissions, 15.207(a), Phase**

| 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) |
|---|---|---|---|---|---|---|
| 0.204 | 54.848 | 64.457 | 9.609 | 42.222 | 54.457 | 12.235 |
| 0.389 | 52.641 | 59.186 | 6.545 | 42.370 | 49.186 | 6.815 |
| 1.221 | 42.797 | 56.000 | 13.203 | 22.406 | 46.000 | 23.594 |
| 1.226 | 42.548 | 56.000 | 13.452 | 21.011 | 46.000 | 24.989 |
| 1.230 | 40.790 | 56.000 | 15.210 | 24.872 | 46.000 | 21.128 |
| 4.980 | 43.102 | 56.000 | 12.898 | 30.834 | 46.000 | 15.166 |
| 6.210 | 36.146 | 60.000 | 23.854 | 25.488 | 50.000 | 24.512 |
| 11.625 | 41.722 | 60.000 | 18.278 | 27.384 | 50.000 | 22.616 |
| 28.864 | 49.796 | 60.000 | 10.204 | 33.678 | 50.000 | 16.322 |
| 29.945 | 47.432 | 60.000 | 12.568 | 34.666 | 50.000 | 15.334 |

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

## 15.207(a) Conducted Emissions Test Results




**Conducted Emissions, 15.207(a), Neutral**

| 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) |
|---|---|---|---|---|---|---|
| 0.204 | 54.423 | 64.457 | 10.034 | 38.544 | 54.457 | 15.913 |
| 0.406 | 53.328 | 58.671 | 5.343 | 36.640 | 48.671 | 12.031 |
| 5.309 | 48.828 | 60.000 | 11.172 | 33.795 | 50.000 | 16.205 |
| 11.225 | 40.318 | 60.000 | 19.682 | 24.404 | 50.000 | 25.596 |
| 17.438 | 35.506 | 60.000 | 24.494 | 23.327 | 50.000 | 26.673 |
| 19.302 | 38.464 | 60.000 | 21.536 | 25.610 | 50.000 | 24.390 |
| 29.679 | 51.513 | 60.000 | 8.487 | 35.036 | 50.000 | 14.964 |
| 29.720 | 51.325 | 60.000 | 8.675 | 35.210 | 50.000 | 14.790 |
| 29.899 | 51.858 | 60.000 | 8.142 | 35.445 | 50.000 | 14.555 |
| 29.976 | 51.776 | 60.000 | 8.224 | 35.486 | 50.000 | 14.514 |

**Table 10. Conducted Emissions, 15.207(a), Neutral, 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):** 1/8/2024

## 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 rang between two points, one above and the other blow 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):** 1/8/2024

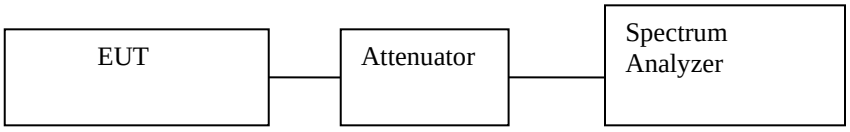


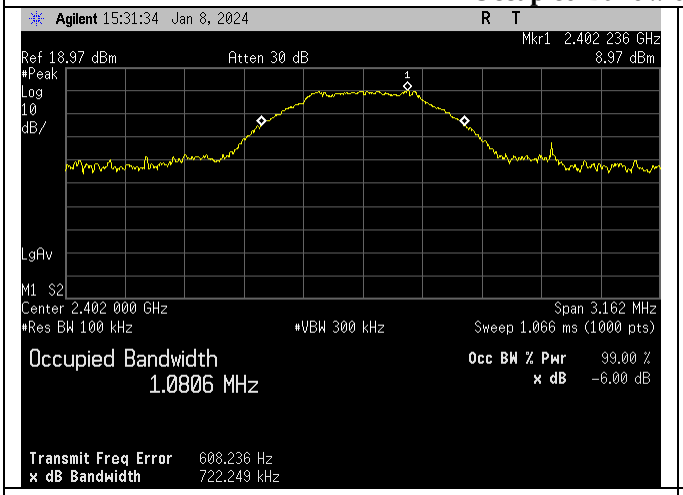

**Figure 2. Block Diagram, Occupied Bandwidth Test Setup**

| Data Rate | Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | 6dB Bandwidth Limit (MHz) | 99% Bandwidth (MHz) | Result |
|---|---|---|---|---|---|---|
| 1MBps | Low | 2402MHz | 0.722 | 0.5 | 1.041 | Pass |
| | Middle | 2440MHz | 0.701 | 0.5 | 1.035 | Pass |
| | High | 2480MHz | 0.696 | 0.5 | 1.037 | Pass |
| 2MBps | Low | 2402MHz | 1.316 | 0.5 | 2.101 | Pass |
| | Middle | 2440MHz | 1.353 | 0.5 | 2.118 | Pass |
| | High | 2480MHz | 1.327 | 0.5 | 2.130 | Pass |

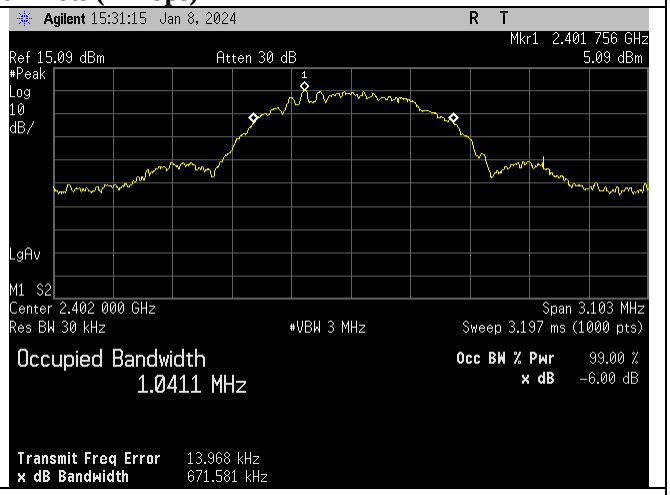
**Table 11. 99% and 6 dB Occupied Bandwidth, Test Results**

## Occupied Bandwidth Test Results

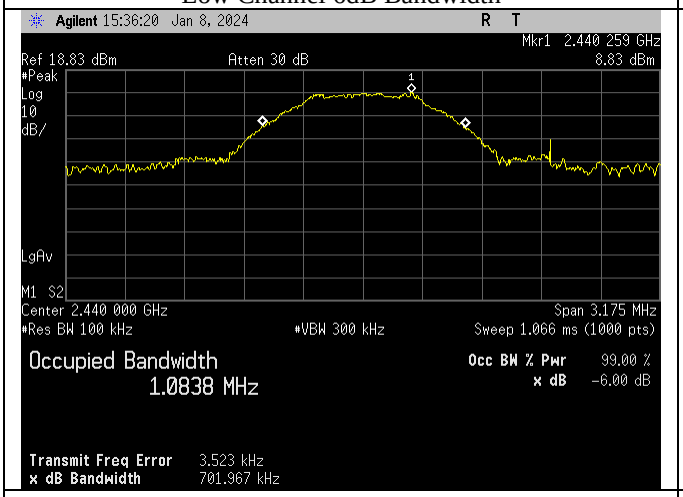
**Occupied Bandwidth Plots (1 Mbps)**



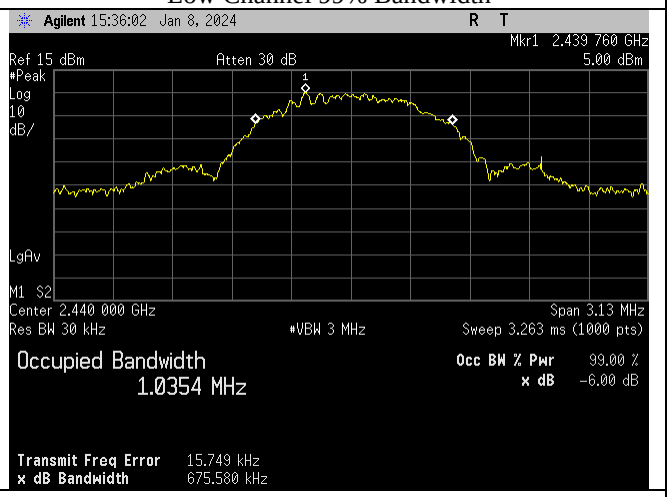

Low Channel 6dB Bandwidth



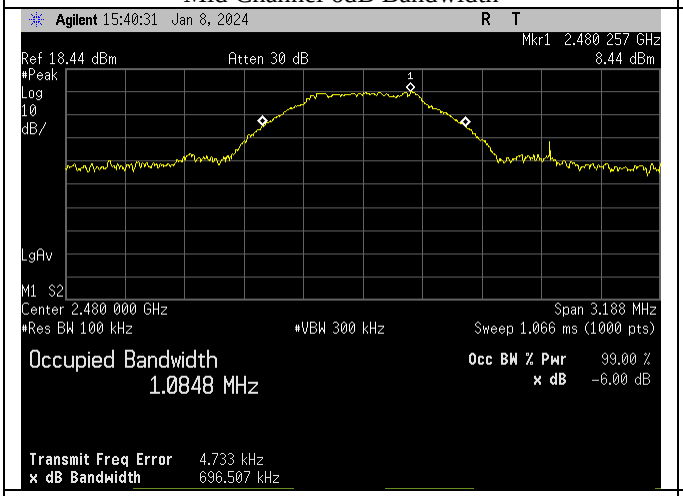

Low Channel 99% Bandwidth



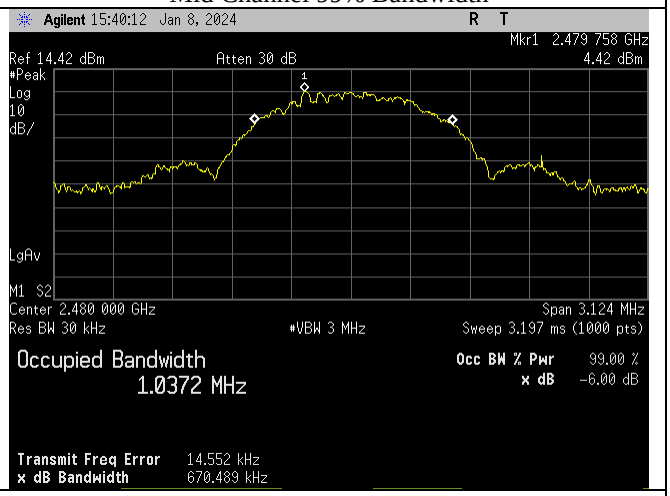

Mid Channel 6dB Bandwidth




Mid Channel 99% Bandwidth

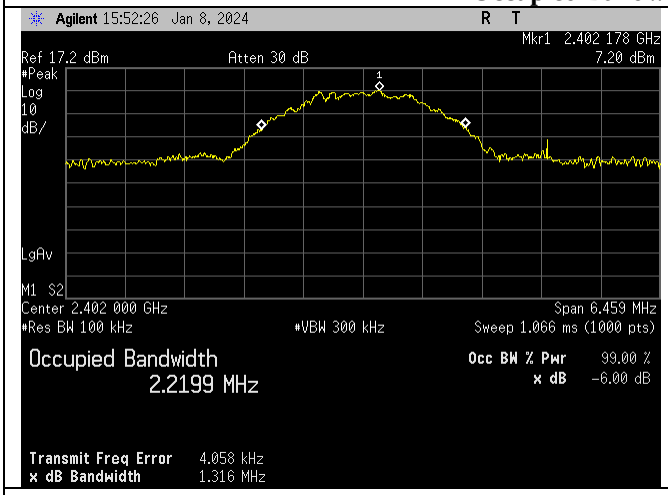



High Channel 6dB Bandwidth

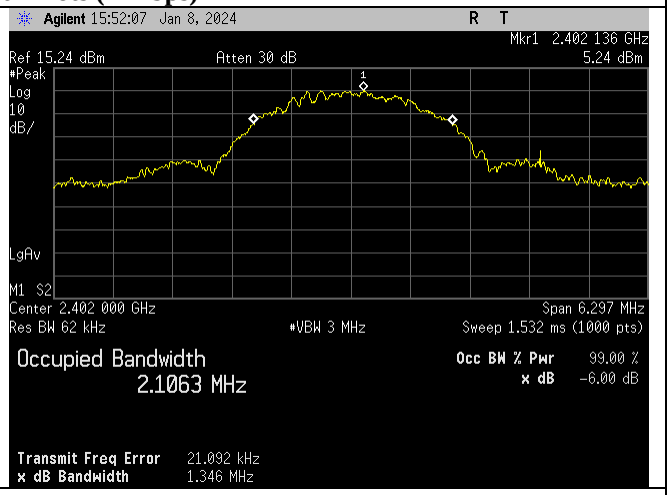



High Channel 99% Bandwidth

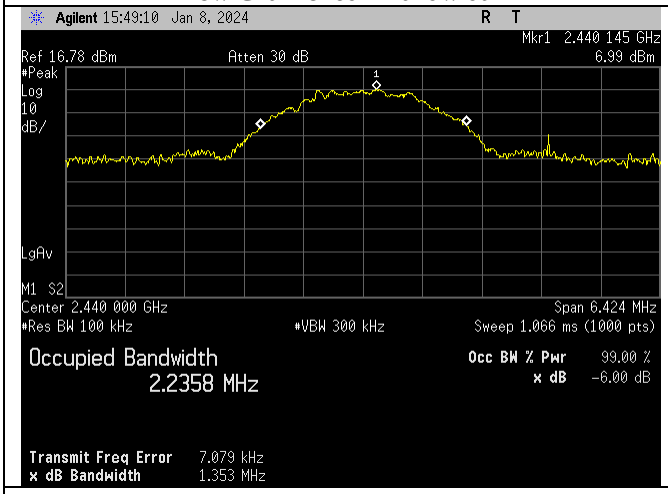
## Occupied Bandwidth Plots (2 Mbps)



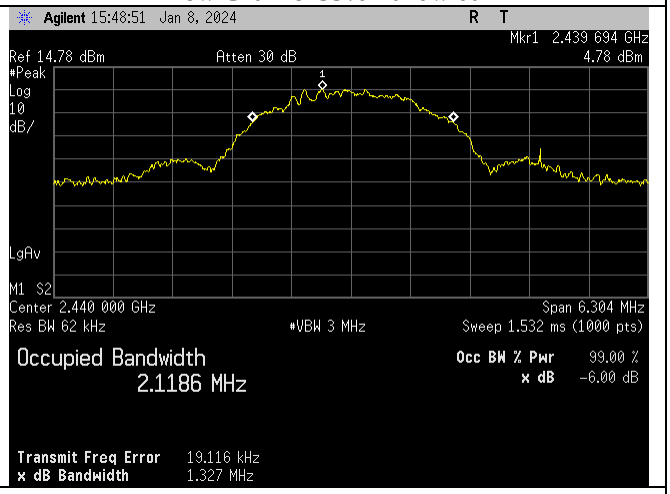

Low Channel 6dB Bandwidth



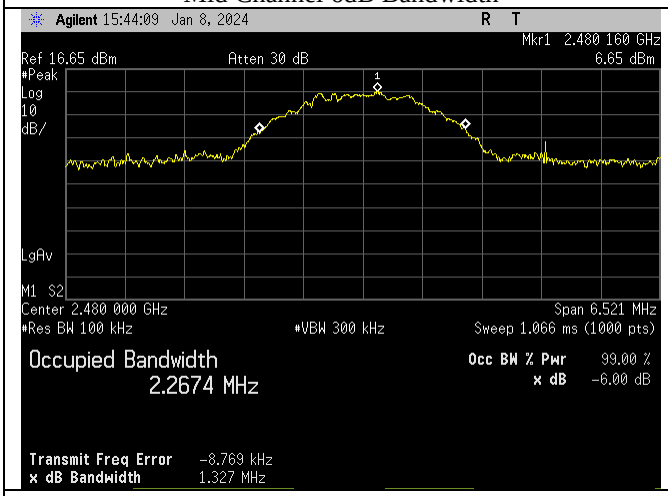

Low Channel 99% Bandwidth



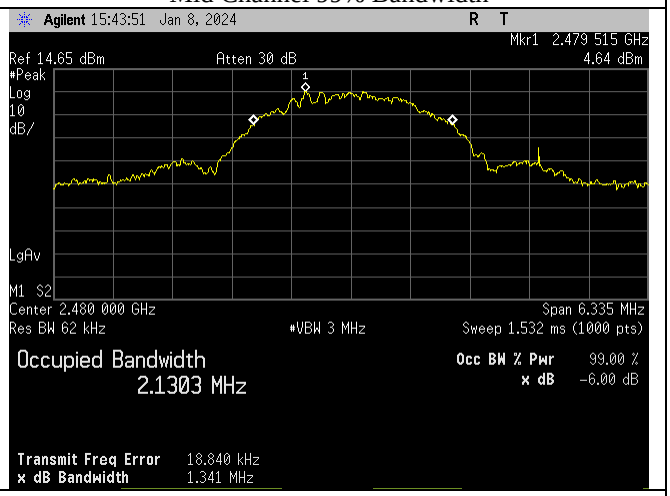

Mid Channel 6dB Bandwidth




Mid Channel 99% Bandwidth




High Channel 6dB Bandwidth




High Channel 99% Bandwidth

## 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 12. 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 12, 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.

**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.

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

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 1/8/2024

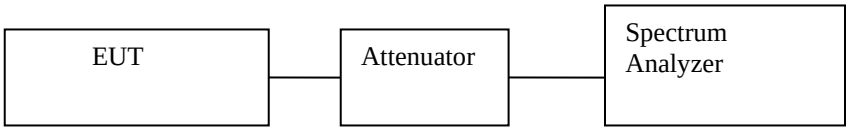


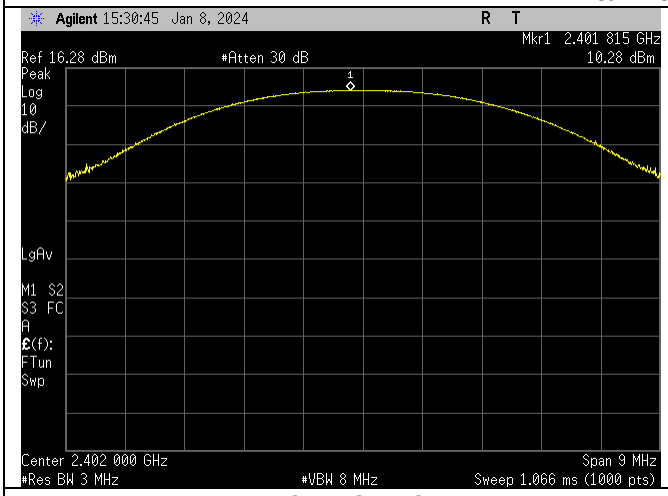

**Figure 3. Peak Power Output Test Setup**

## Peak Power Output Test Results

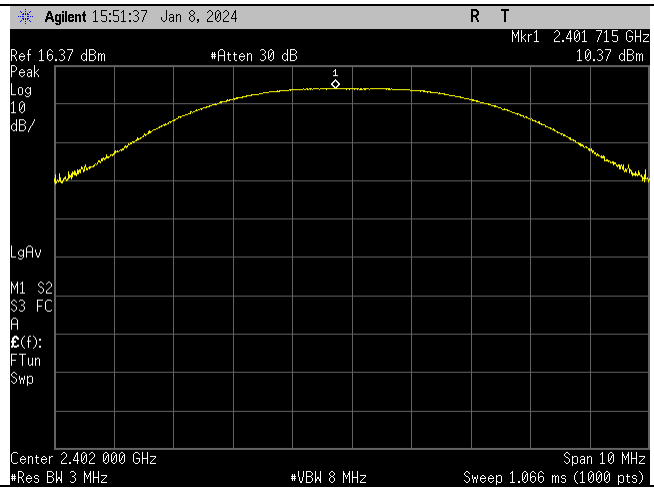
| Data Rate | Channel | Frequency (MHz) | Peak Power (dBm) | Peak Power Limit (dBm) | Result |
|---|---|---|---|---|---|
| 1MBps | Low | 2402MHz | 10.28 | 30 | Pass |
| | Middle | 2440MHz | 10.15 | 30 | Pass |
| | High | 2480MHz | 9.76 | 30 | Pass |
| 2MBps | Low | 2402MHz | 10.37 | 30 | Pass |
| | Middle | 2440MHz | 10.15 | 30 | Pass |
| | High | 2480MHz | 9.77 | 30 | Pass |

**Table 13. Peak Power Output, Test Results**

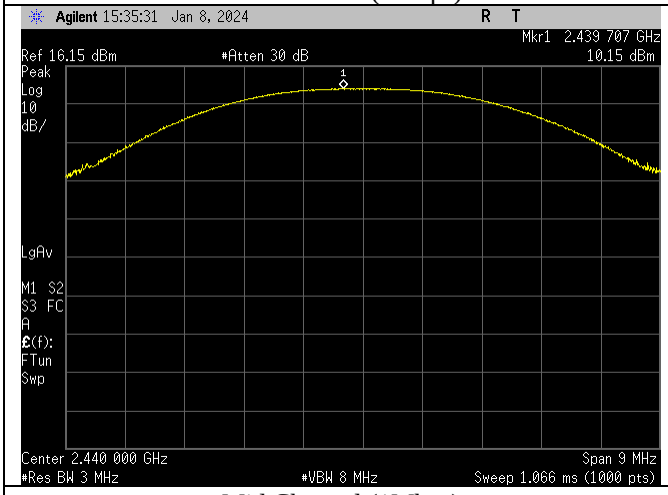
## Peak Power Plots



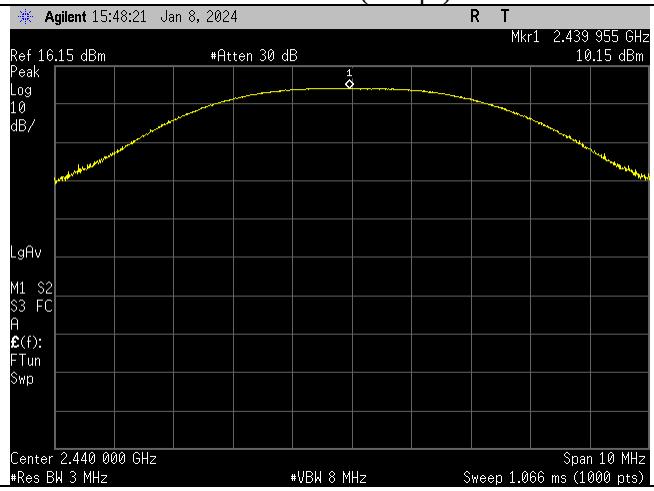

Low Channel (1Mbps)



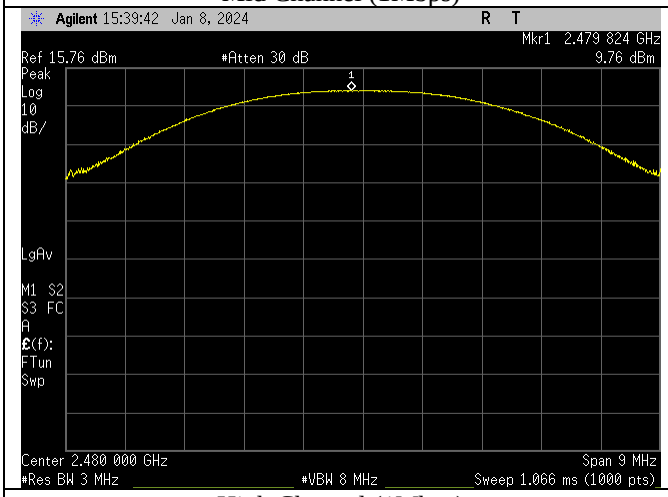

Low Channel (2Mbps)



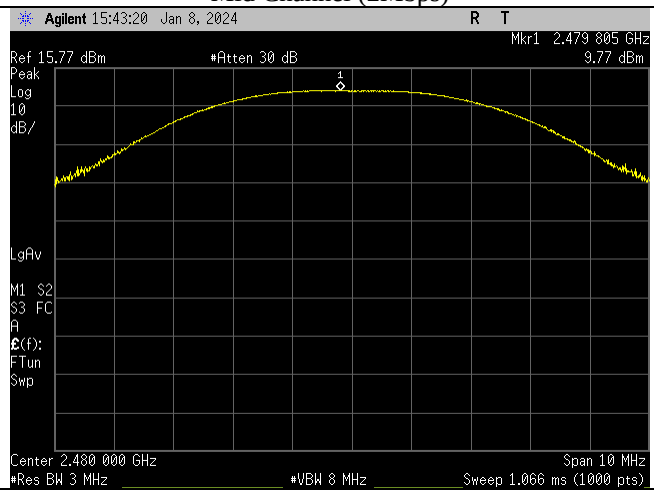

Mid Channel (1Mbps)




Mid Channel (2Mbps)




High Channel (1Mbps)




High Channel (2Mbps)

## 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.

**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:** 1/8/2024

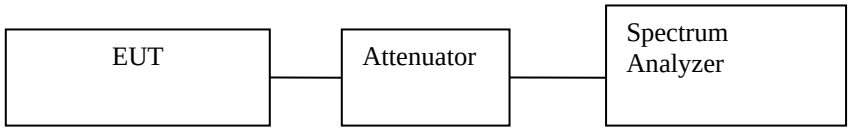
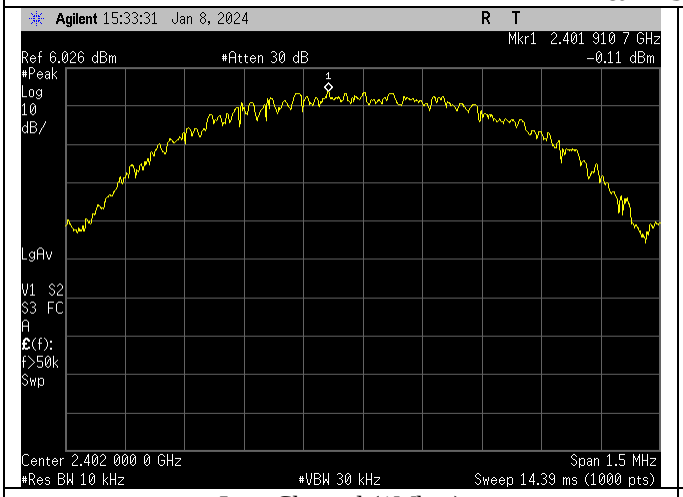



**Figure 4. Block Diagram, Peak Power Spectral Density Test Setup**

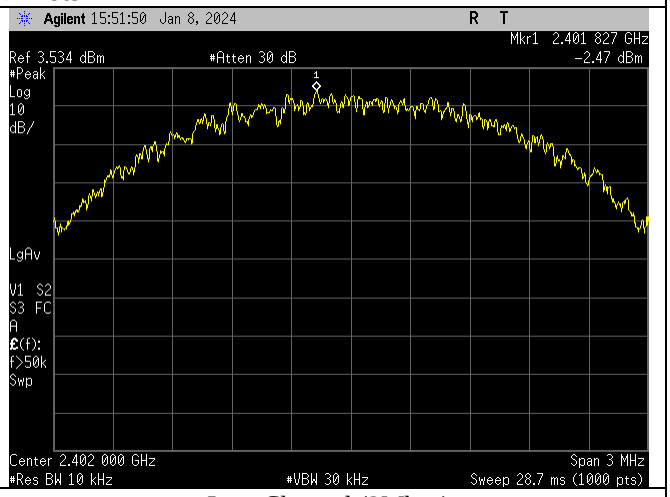
| Data Rate | Channel | Frequency (MHz) | Peak Power Spectral Density (dBm / 8kHz) | Peak Power Spectral Density Limit (dBm / 8kHz) | Result |
|---|---|---|---|---|---|
| 1MBps | Low | 2402MHz | -0.11 | 8 | Pass |
| | Middle | 2440MHz | -0.17 | 8 | Pass |
| | High | 2480MHz | -0.52 | 8 | Pass |
| 2Mbps | Low | 2402MHz | -2.47 | 8 | Pass |
| | Middle | 2440MHz | -2.72 | 8 | Pass |
| | High | 2480MHz | -3.12 | 8 | Pass |

**Table 14. Peak Power Spectral Density, Test Results**

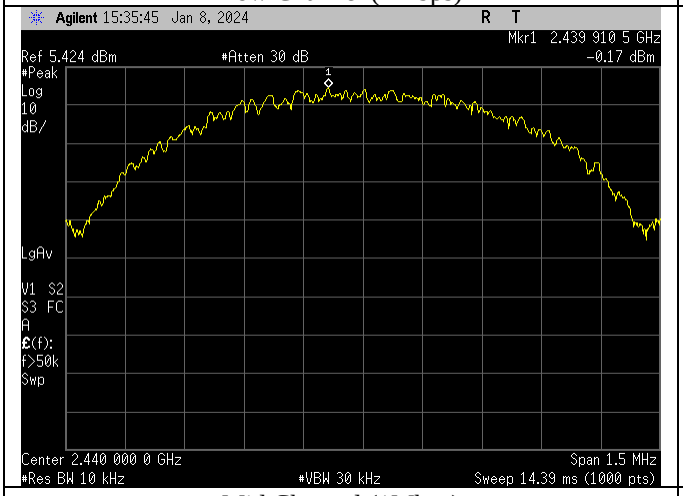
## Peak PSD Plots



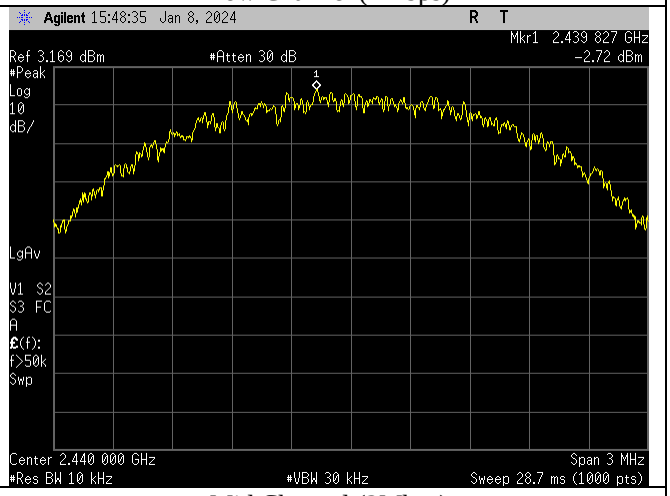

Low Channel (1Mbps)



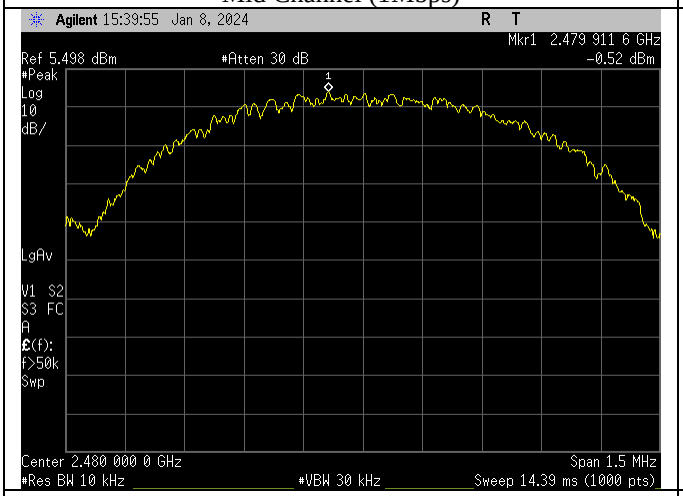

Low Channel (2Mbps)



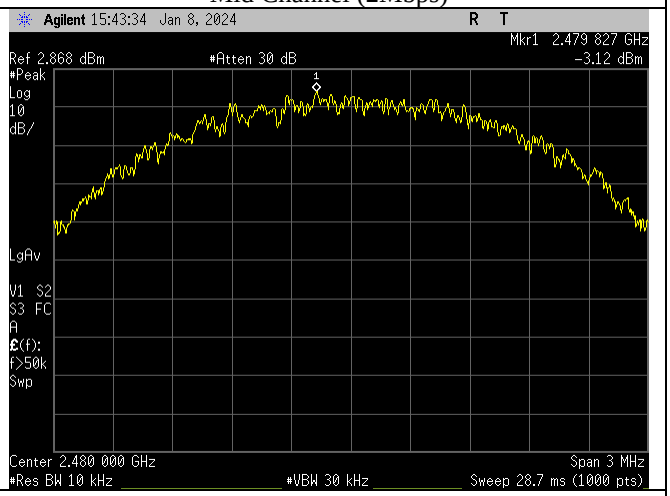

Mid Channel (1Mbps)




Mid Channel (2Mbps)




High Channel (1Mbps)




High Channel (2Mbps)

## 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 10$^{th}$ 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.

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

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 1/9/2024

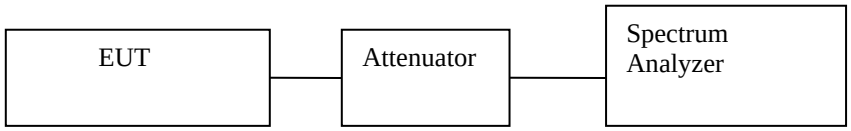



**Figure 5. Block Diagram, Conducted Spurious Emissions Test Setup**

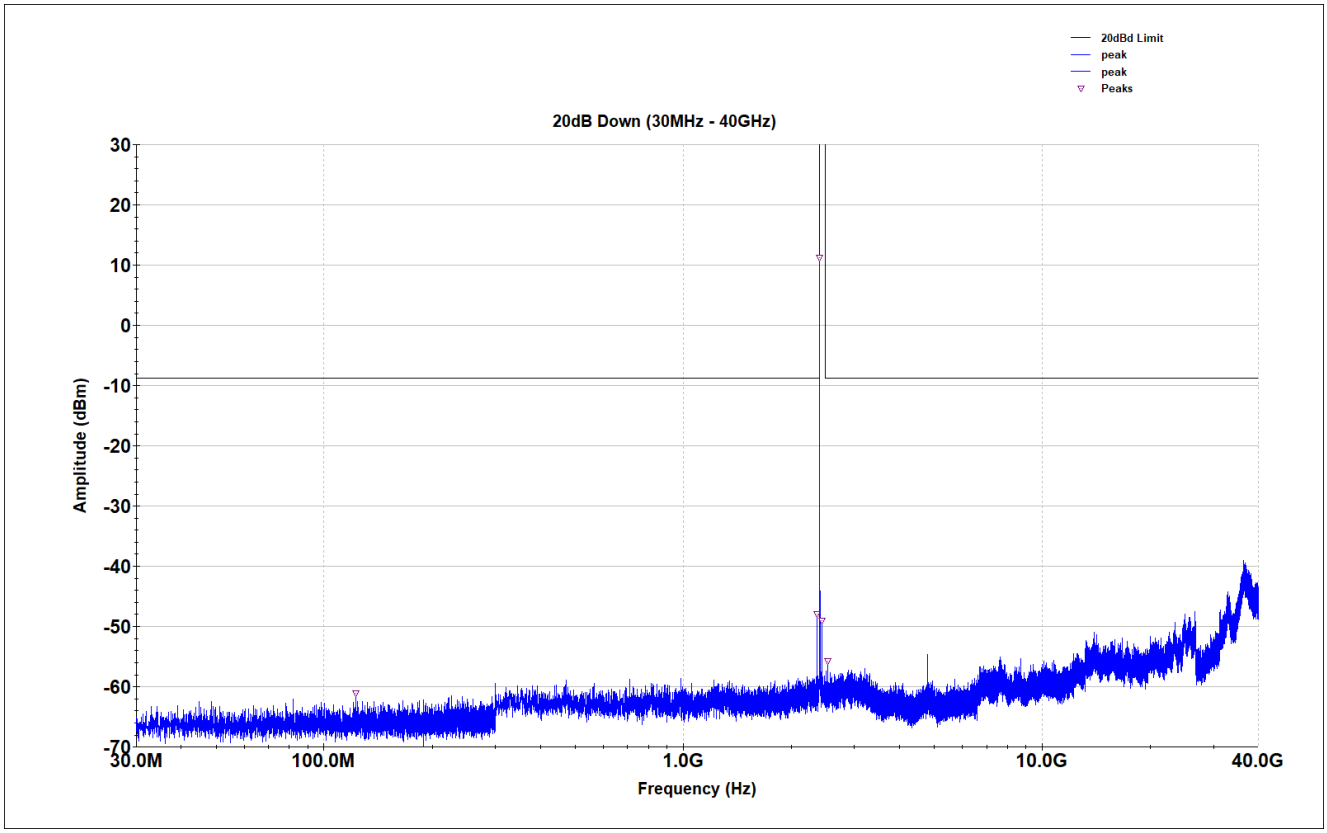



**Figure 6. Low Channel, 30MHz – 40GHz Conducted Spurious Emissions (1Mbps)**

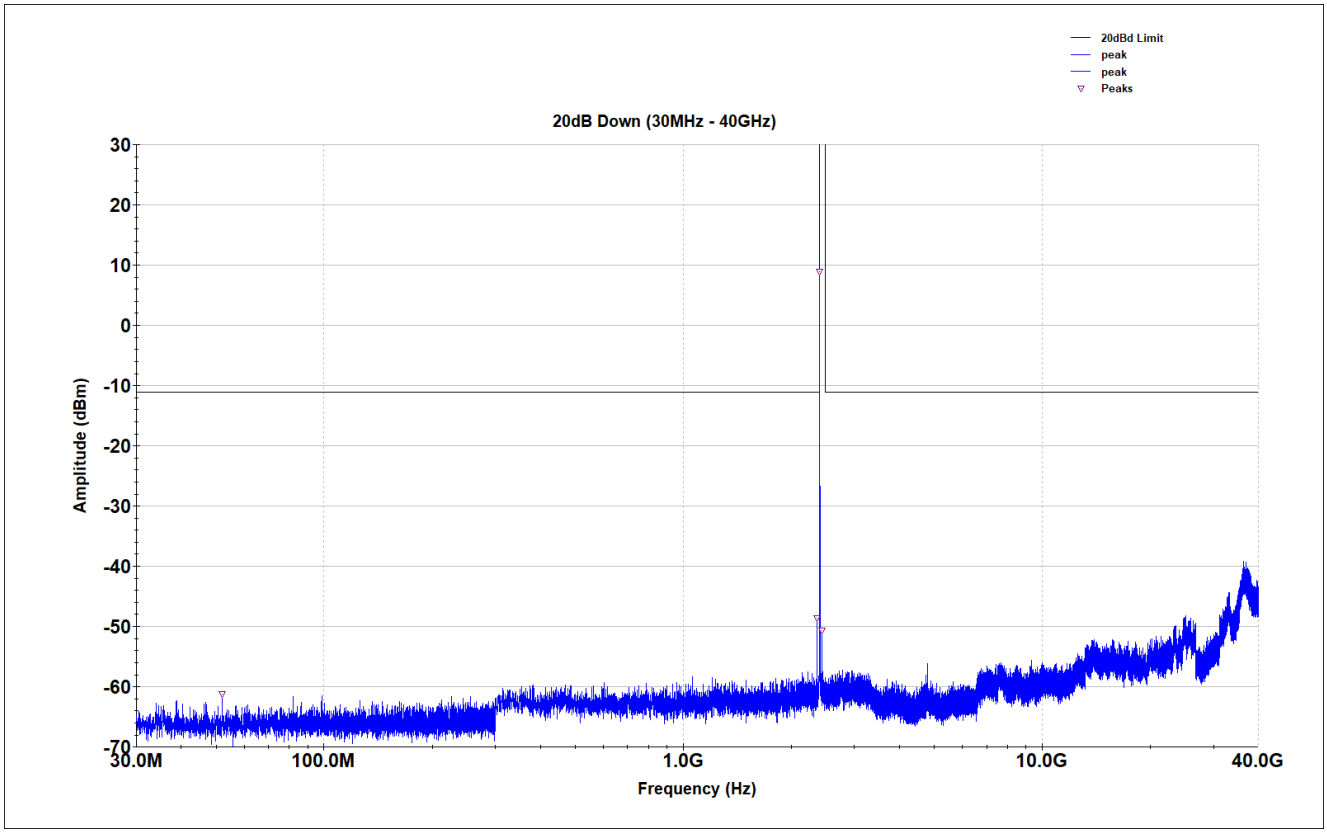



**Figure 7. Low Channel, 30MHz – 40GHz Conducted Spurious Emissions (2Mbps)**

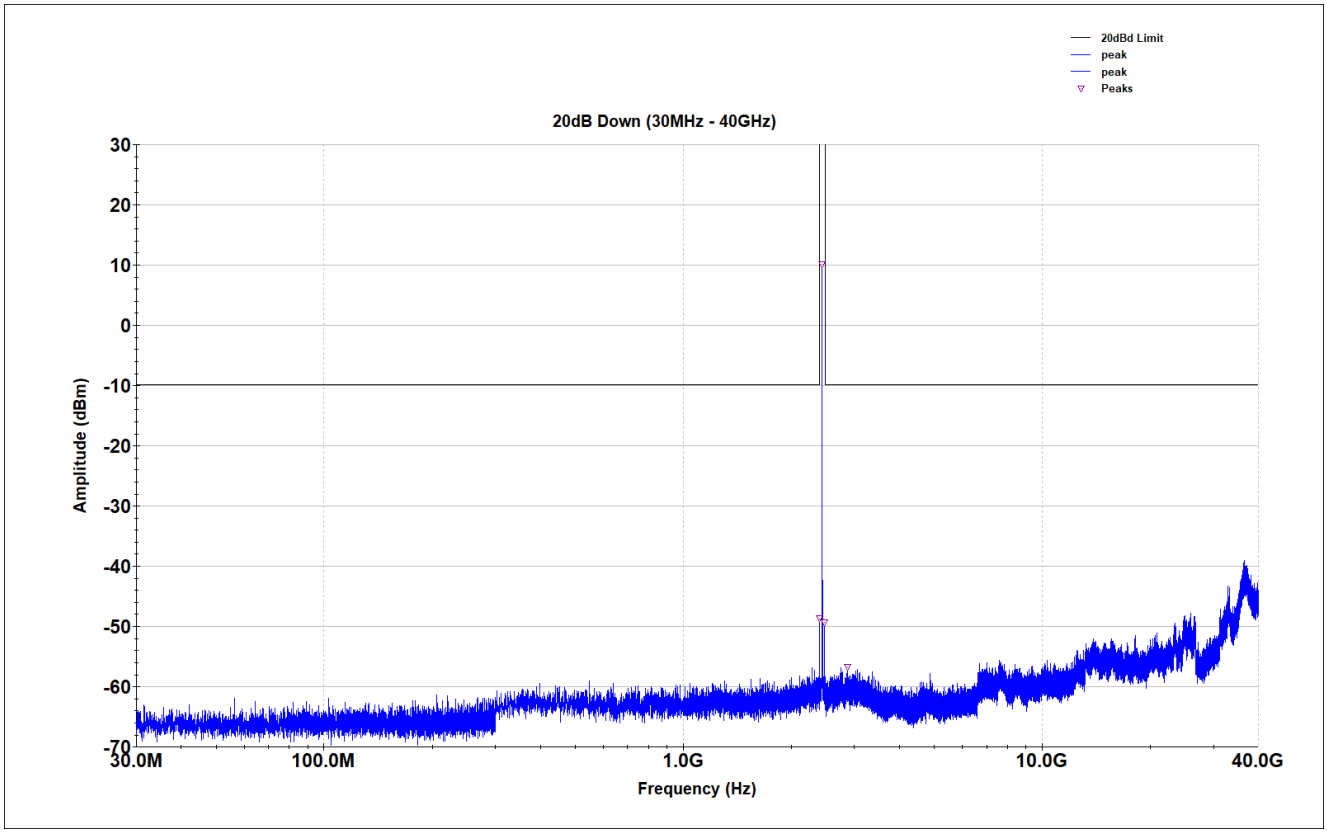



**Figure 8. Mid Channel, 30MHz – 40GHz Conducted Spurious Emissions (1Mbps)**

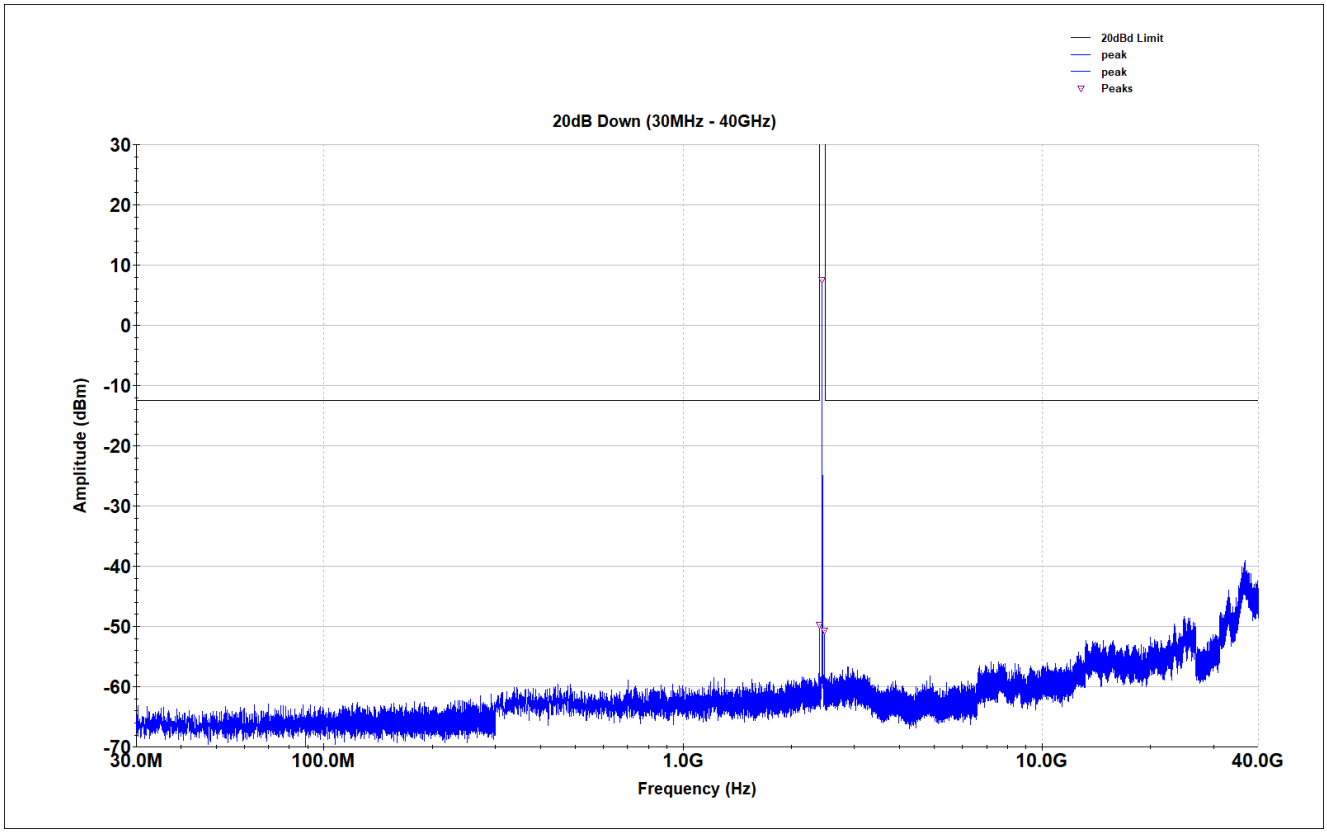



**Figure 9. Mid Channel, 30MHz – 40GHz Conducted Spurious Emissions (2Mbps)**

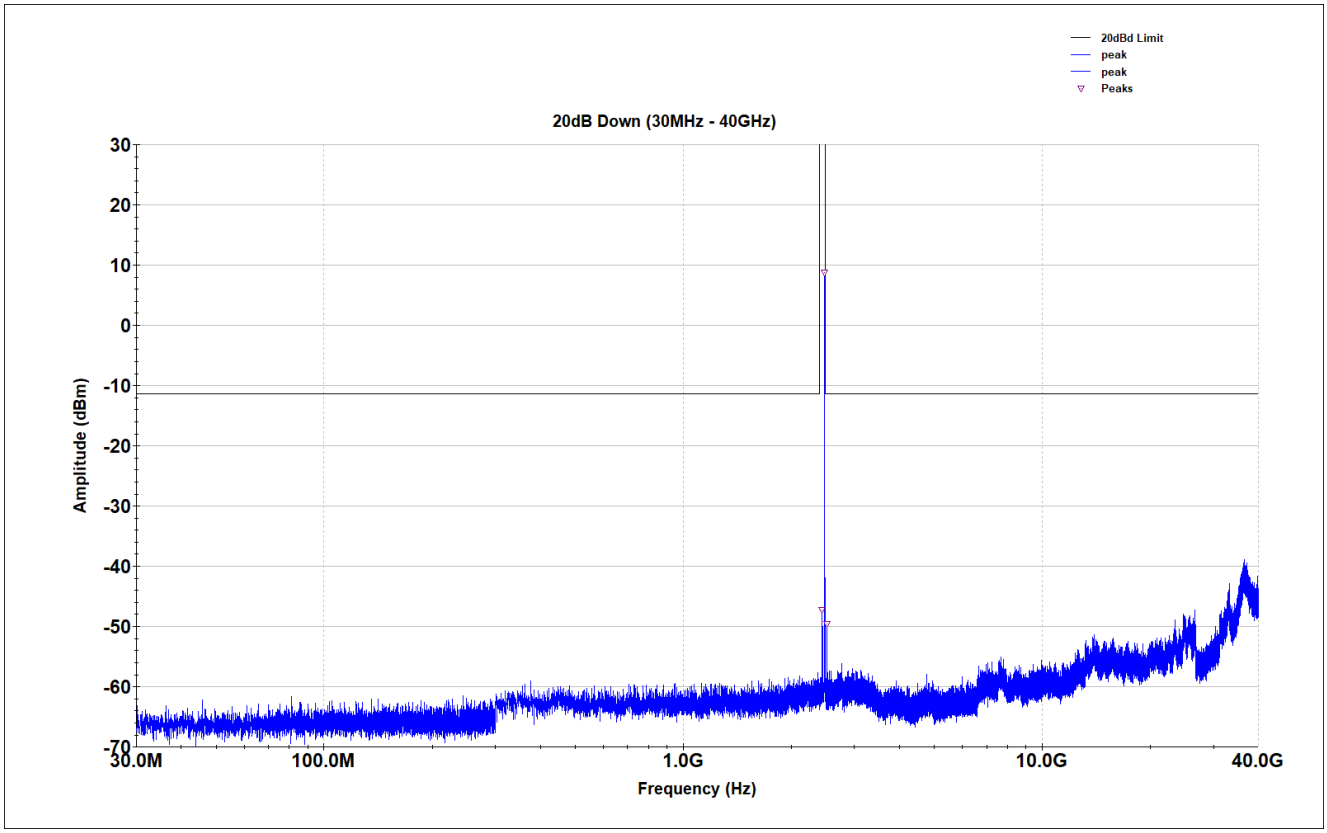



**Figure 10. High Channel, 30MHz – 40GHz Conducted Spurious Emissions (1Mbps)**

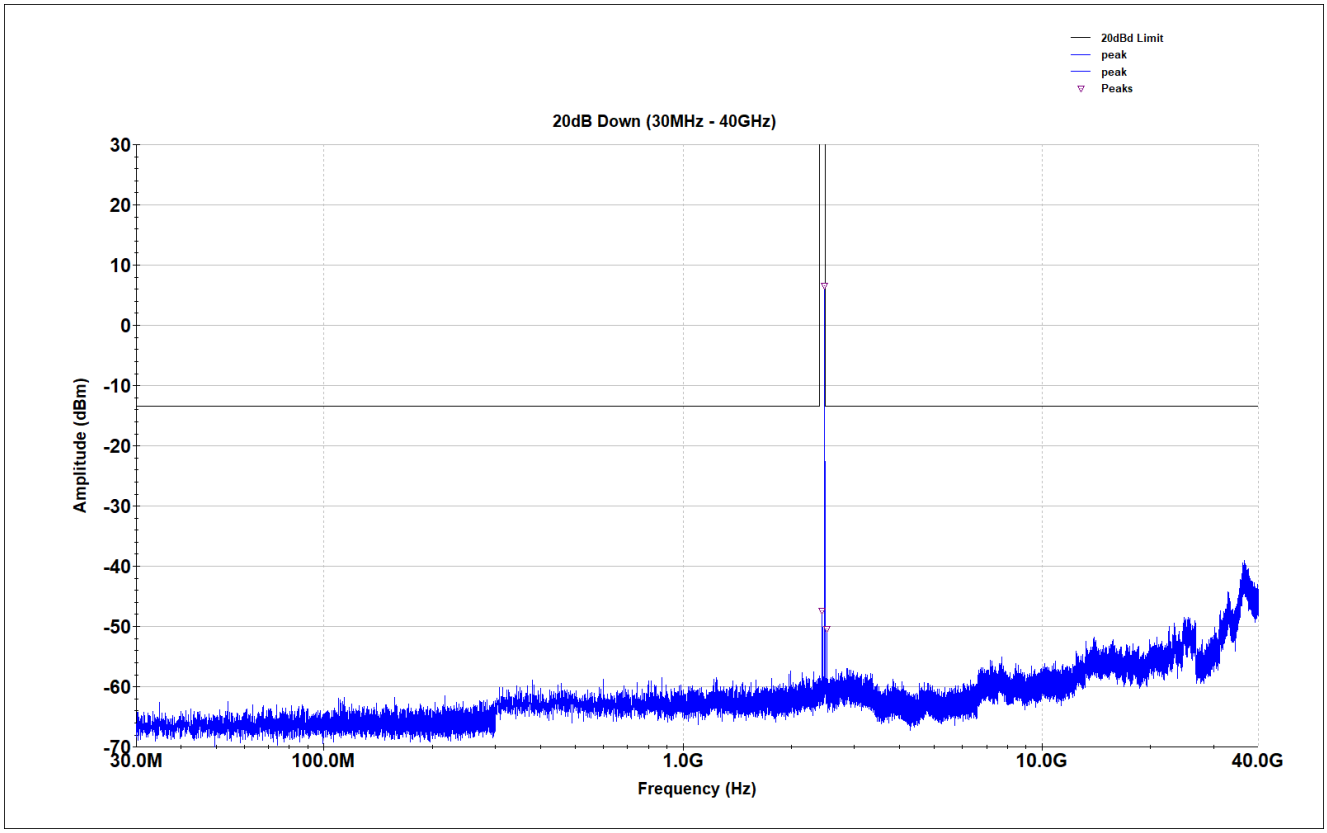
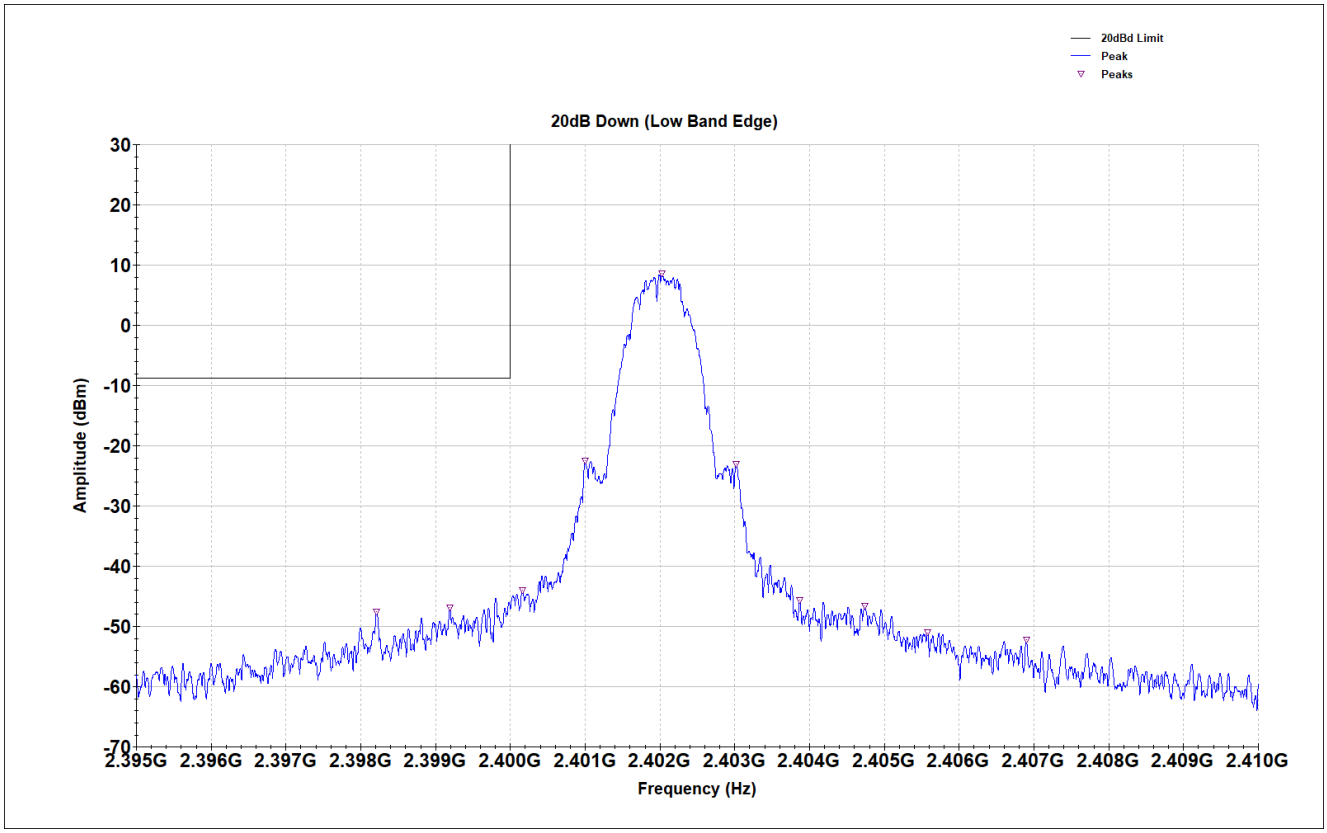
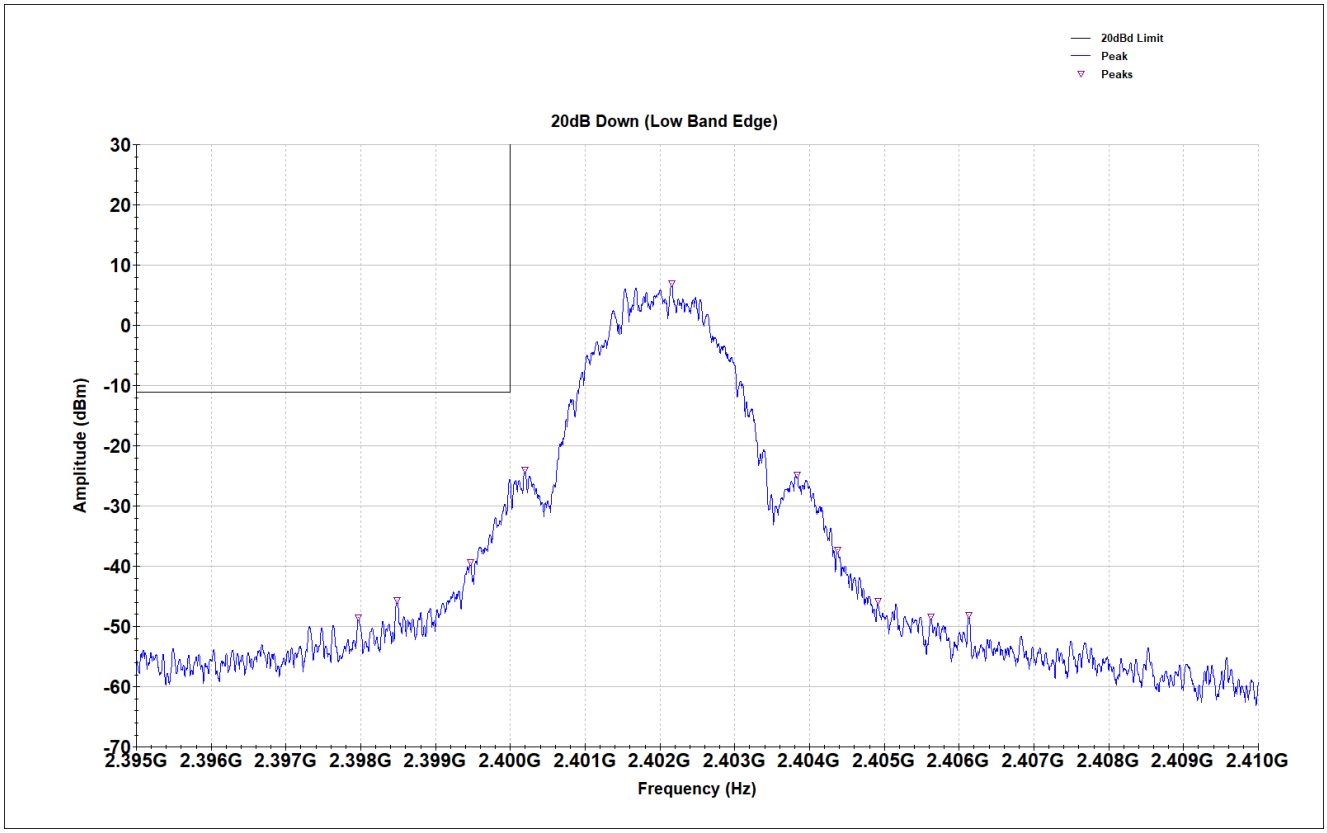



**Figure 11. High Channel, 30MHz – 40GHz Conducted Spurious Emissions (2Mbps)**



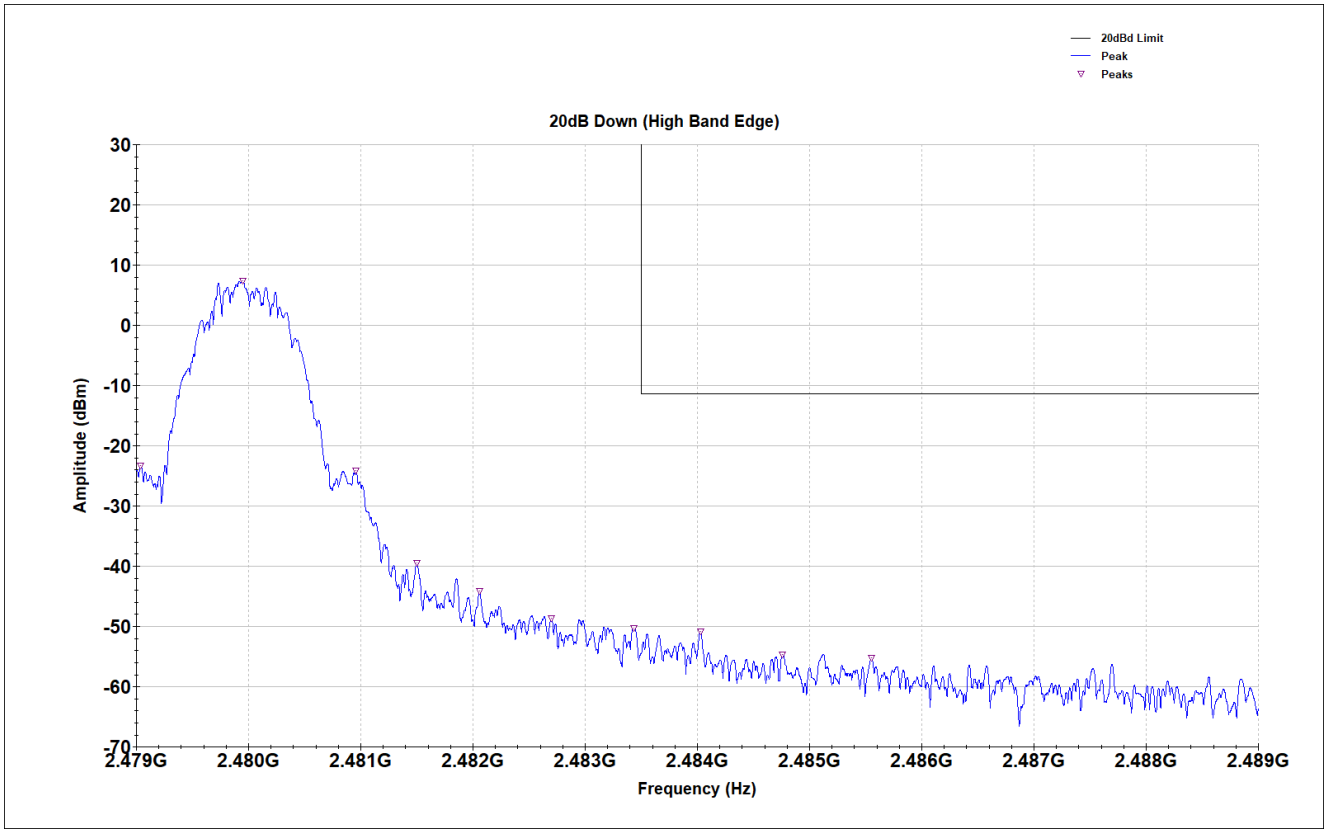

| Spurious Frequency (MHz) | Peak Amplitude (dBm) | -20dBd Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 2398.212 | -47.57 | -8.74 | 38.83 | Pass |
| 2399.191 | -46.89 | -8.74 | 38.15 | Pass |

**Figure 12. Low Channel, Low Band Edge (1Mbps)**



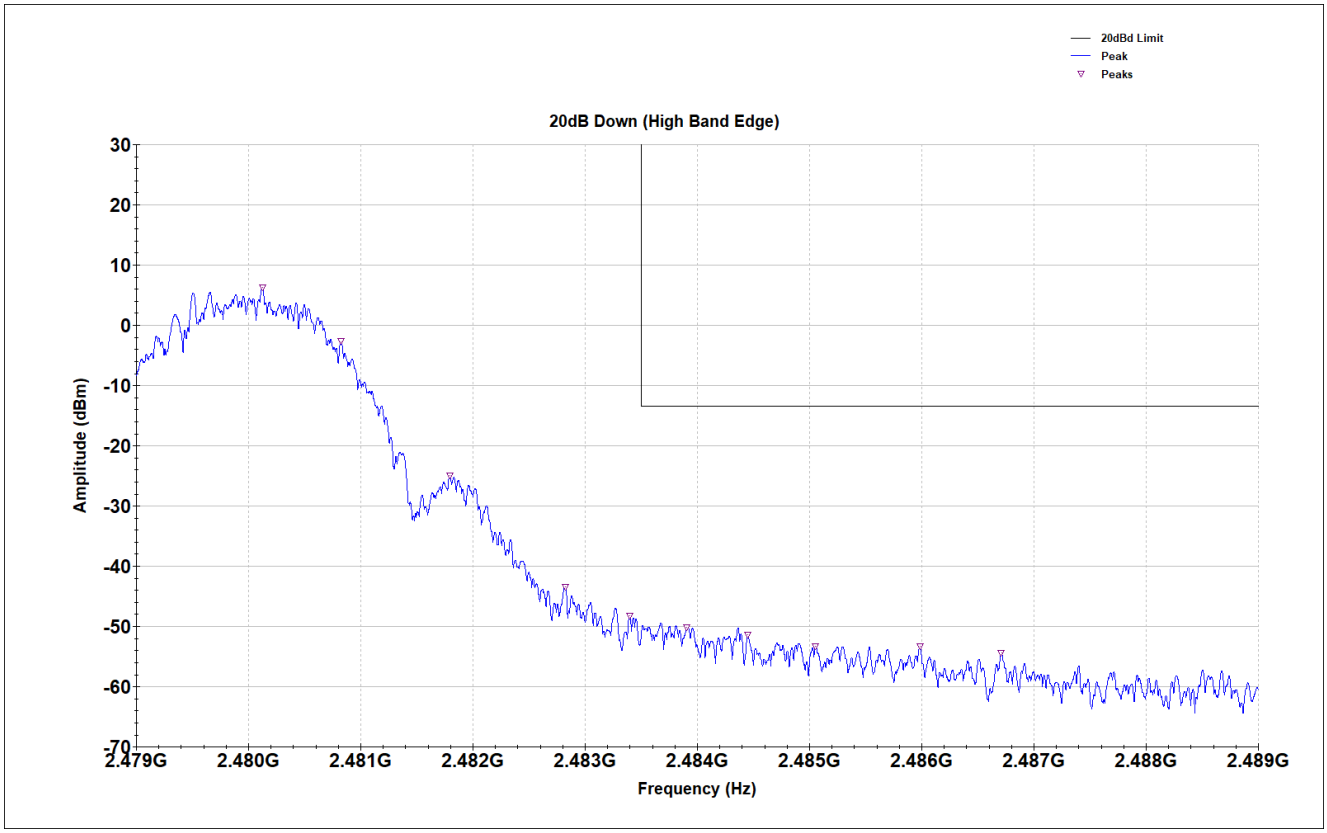

| Spurious Frequency (MHz) | Peak Amplitude (dBm) | -20dBd Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 2397.97 | -48.44 | -11.11 | 37.33 | Pass |
| 2398.486 | -45.62 | -11.11 | 34.51 | Pass |
| 2399.464 | -39.35 | -11.11 | 28.24 | Pass |
| 2397.97 | -48.44 | -11.11 | 37.33 | Pass |

**Figure 13. Low Channel, Low Band Edge (2Mbps)**




| Spurious Frequency (MHz) | Peak Amplitude (dBm) | -20dBd Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 2484.028 | -50.84 | -11.31 | 39.53 | Pass |
| 2484.76 | -54.63 | -11.31 | 43.32 | Pass |
| 2485.552 | -55.24 | -11.31 | 43.93 | Pass |

**Figure 14. High Channel, High Band Edge (1Mbps)**




| Spurious Frequency (MHz) | Peak Amplitude (dBm) | -20dBd Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.906 | -50.18 | -13.49 | 36.69 | Pass |
| 2484.451 | -51.35 | -13.49 | 37.86 | Pass |
| 2485.055 | -53.28 | -13.49 | 39.79 | Pass |
| 2485.983 | -53.23 | -13.49 | 39.74 | Pass |
| 2486.71 | -54.39 | -13.49 | 40.9 | Pass |

**Figure 15. High Channel, High Band Edge (2Mbps)**

## 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):** 12/26/2023 – 1/9/2024

## Radiated Spurious Emissions Test Results

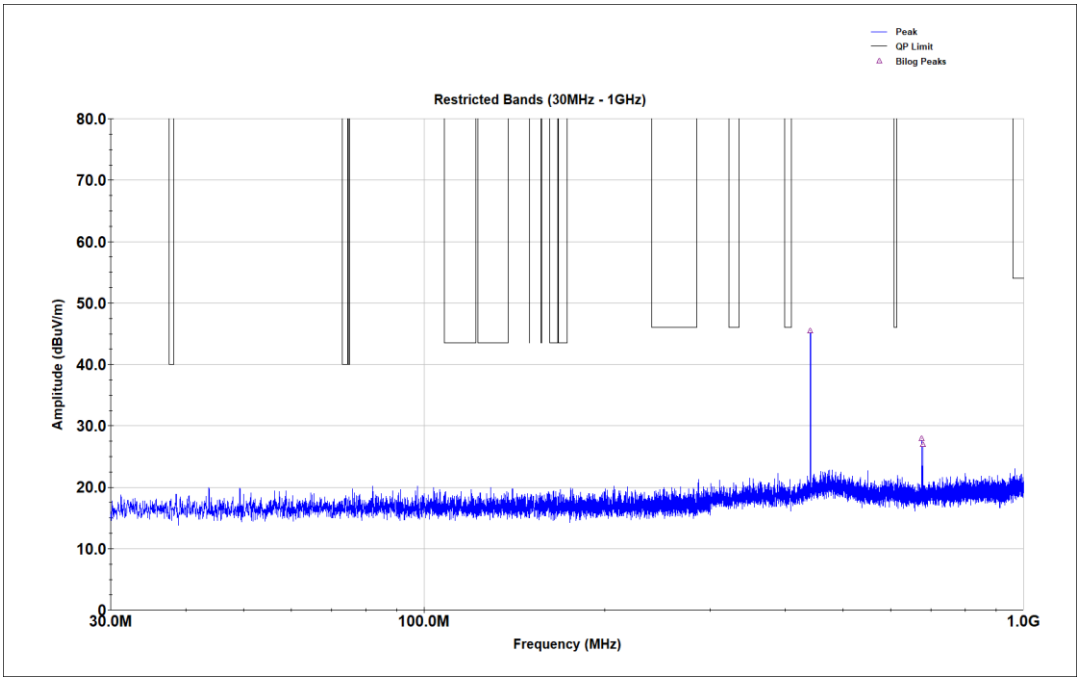



**Figure 16. Low Channel, 30MHz – 1GHz Restricted Band Spurious Emissions (1Mbps)**

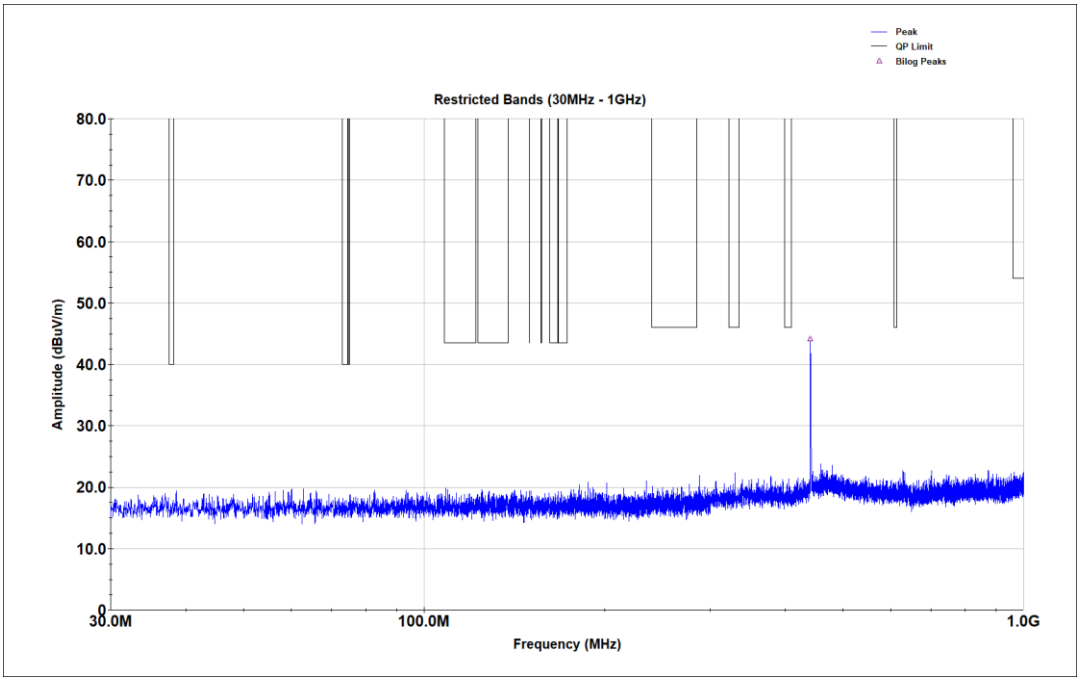



**Figure 17. Low Channel, 30MHz – 1GHz Restricted Band Spurious Emissions (2Mbps)**

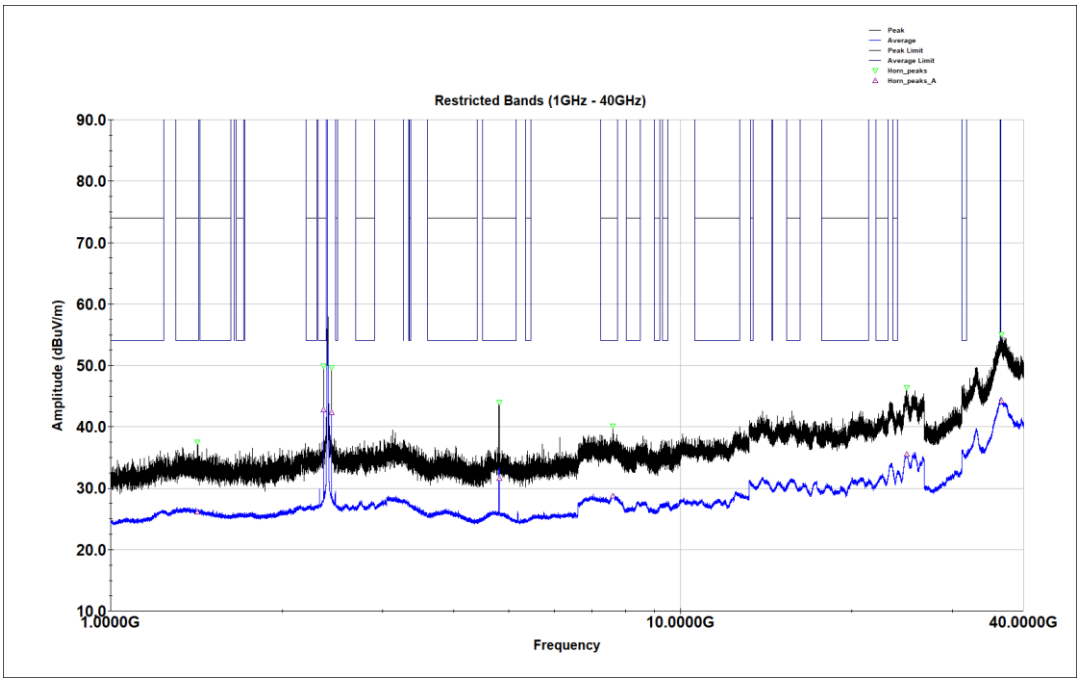



**Figure 18. Low Channel, 1GHz – 40GHz Restricted Band Spurious Emissions (1Mbps)**

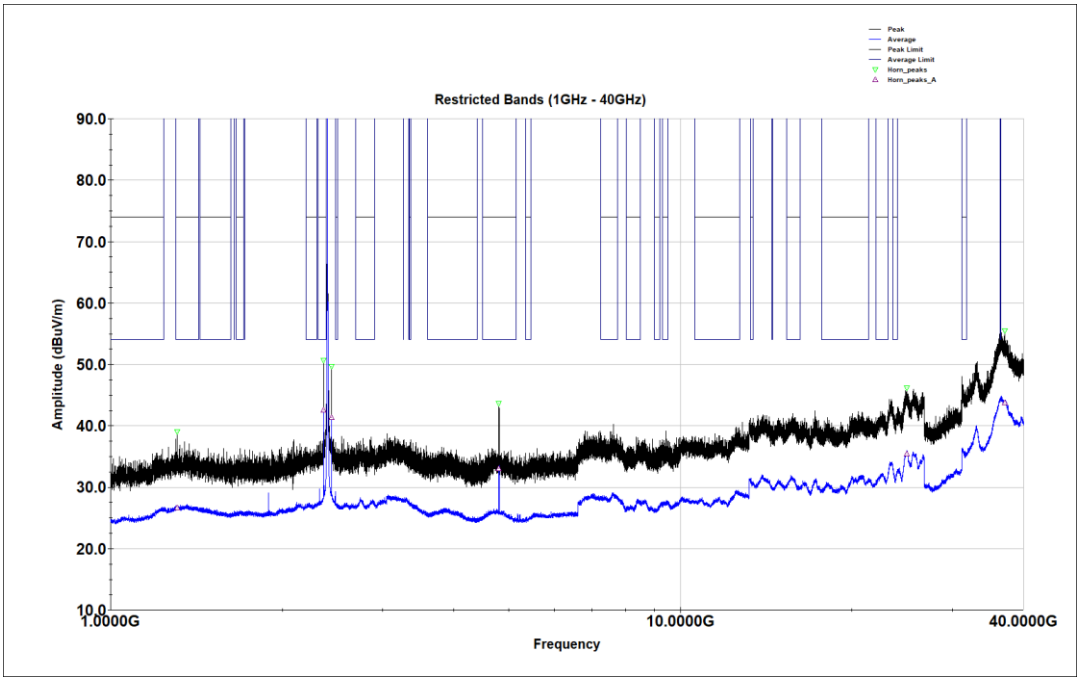



**Figure 19. Low Channel, 1GHz – 40GHz Restricted Band Spurious Emissions (2Mbps)**

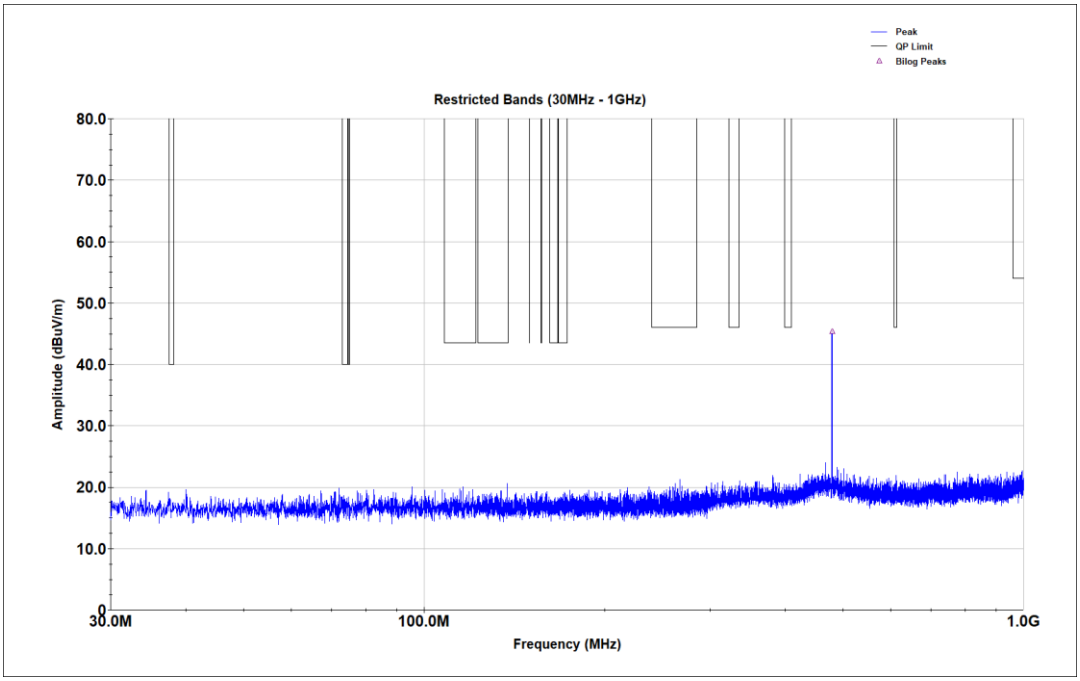



**Figure 20. Middle Channel, 30MHz – 1GHz Restricted Band Spurious Emissions (1Mbps)**

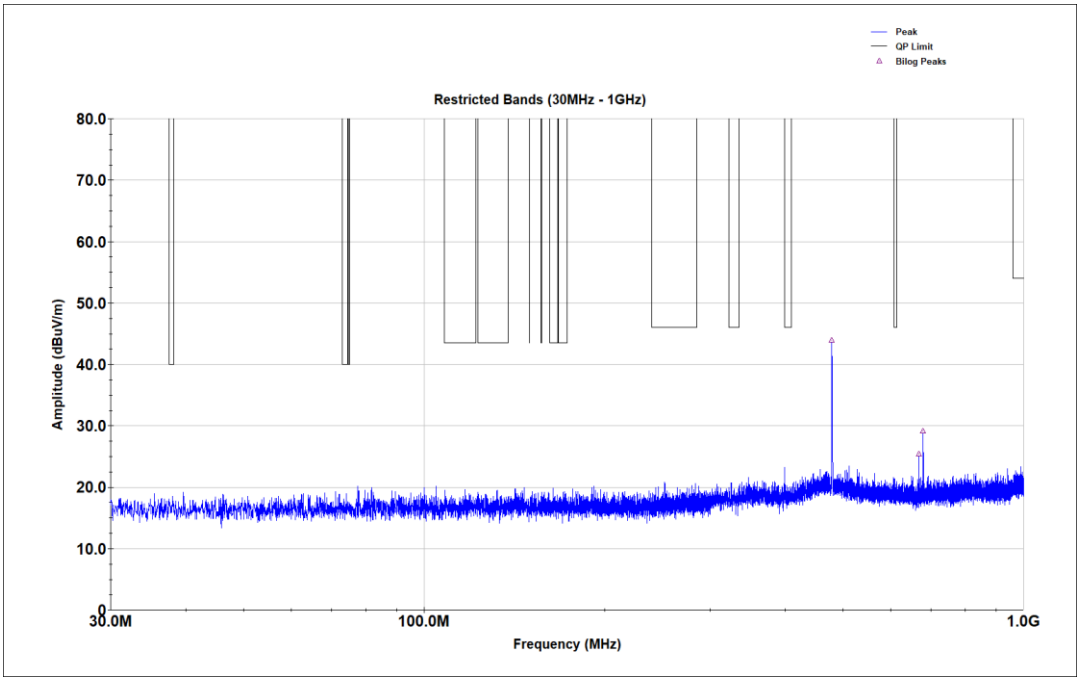



**Figure 21. Middle Channel, 30MHz – 1GHz Restricted Band Spurious Emissions (2Mbps)**

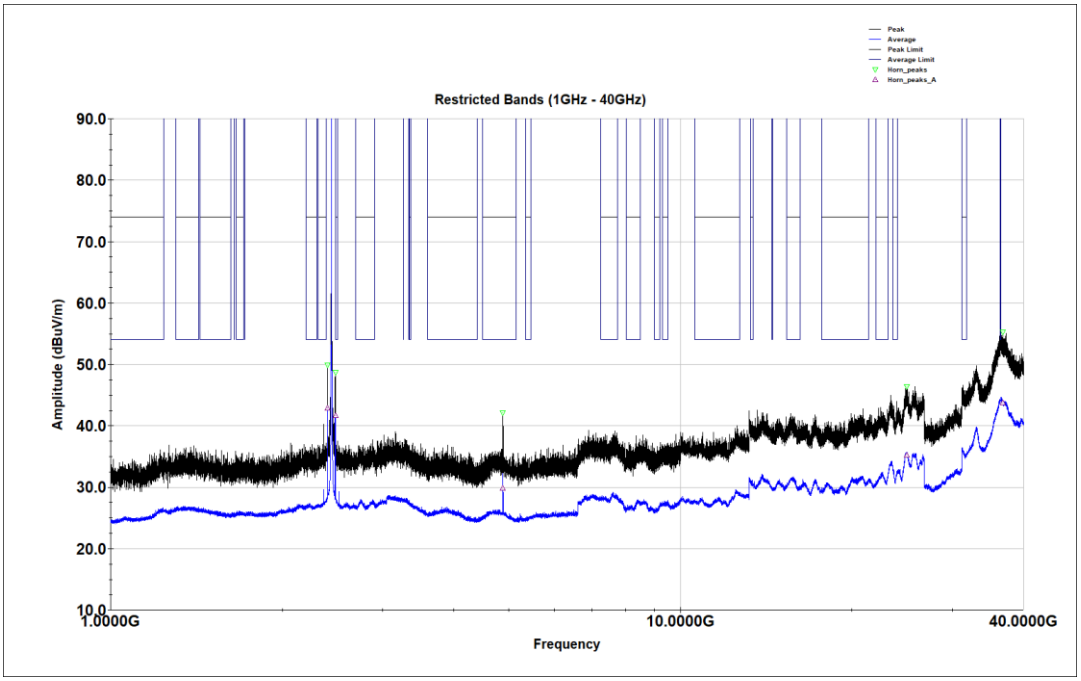



**Figure 22. Middle Channel, 1GHz – 40GHz Restricted Band Spurious Emissions (1Mbps)**

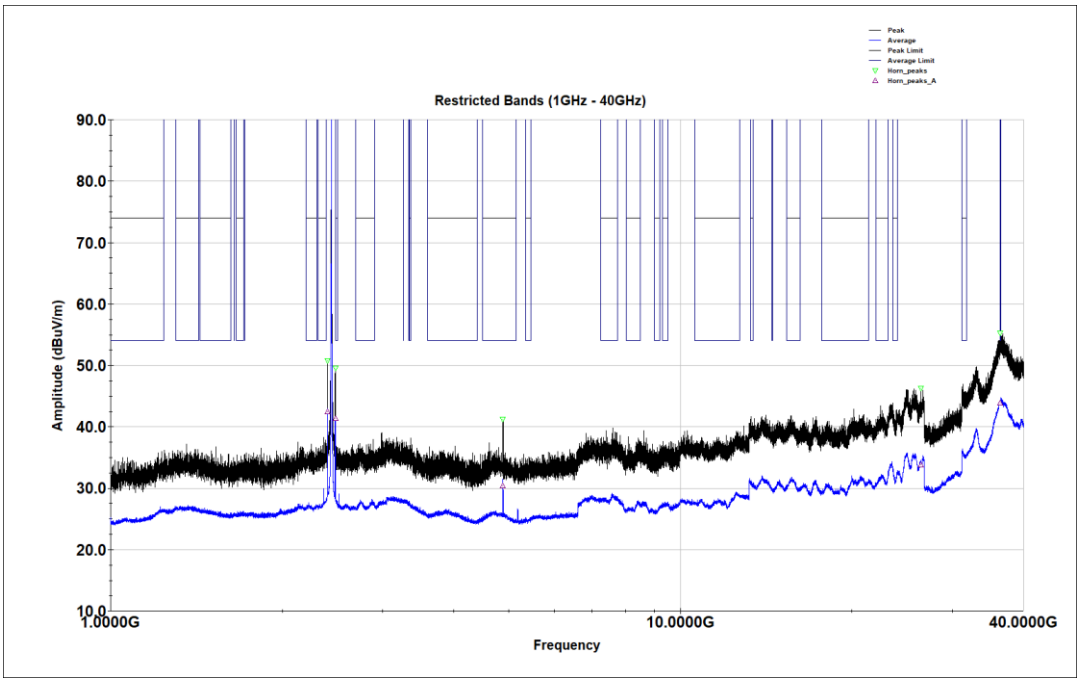



**Figure 23. Middle Channel, 1GHz – 40GHz Restricted Band Spurious Emissions (2Mbps)**

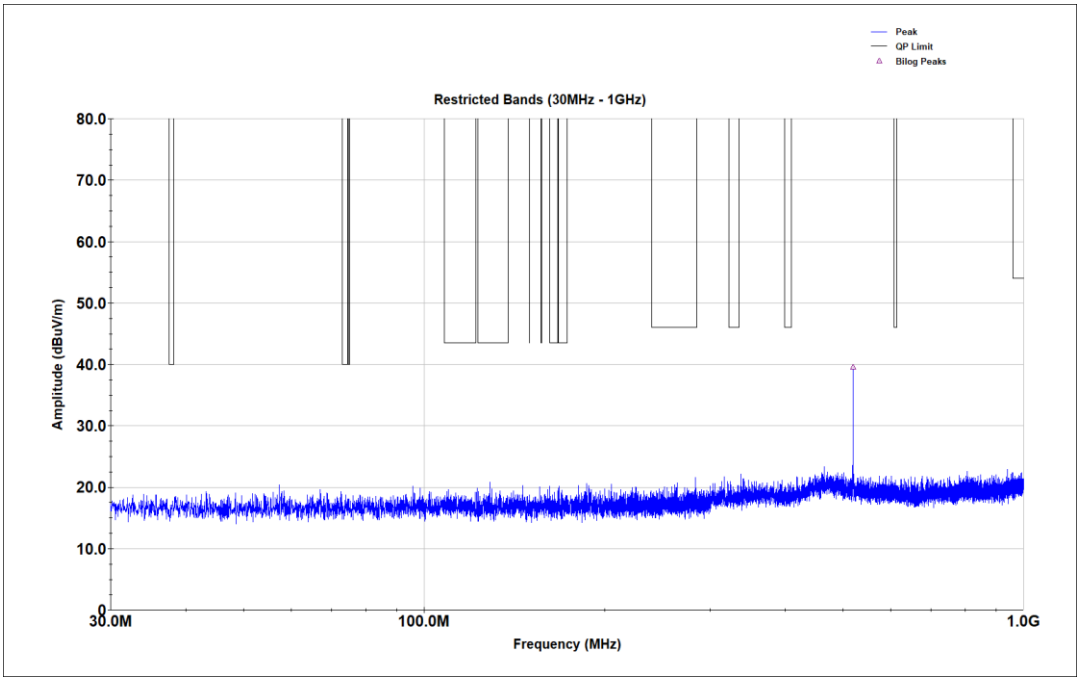



**Figure 24. High Channel, 30MHz – 1GHz Restricted Band Spurious Emissions (1Mbps)**

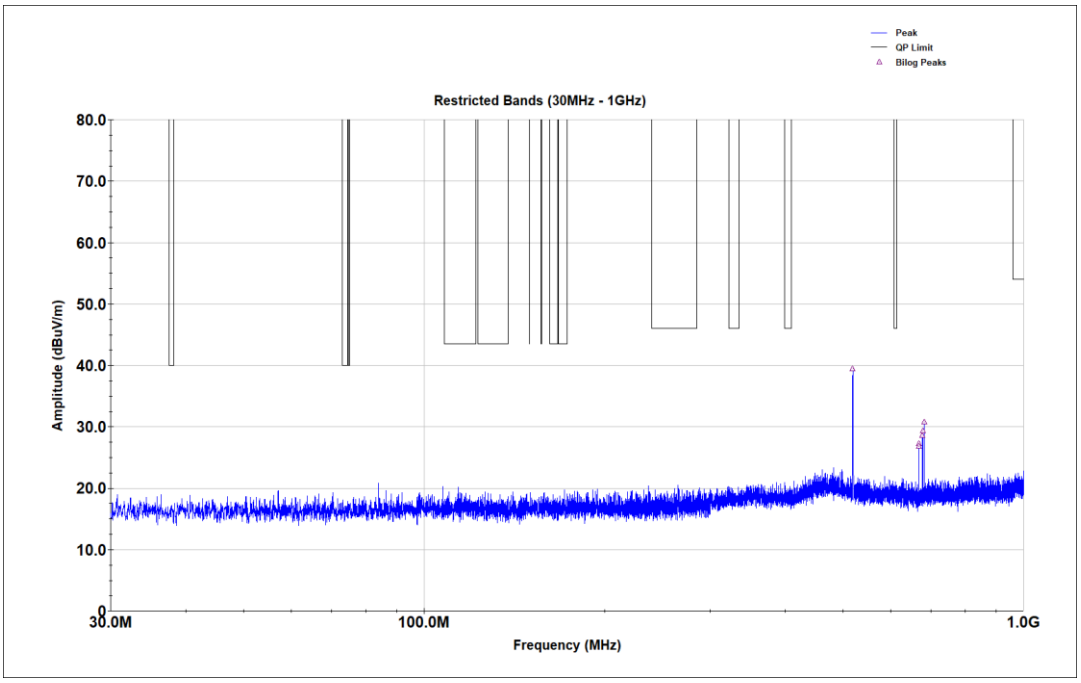



**Figure 25. High Channel, 30MHz – 1GHz Restricted Band Spurious Emissions (2Mbps)**

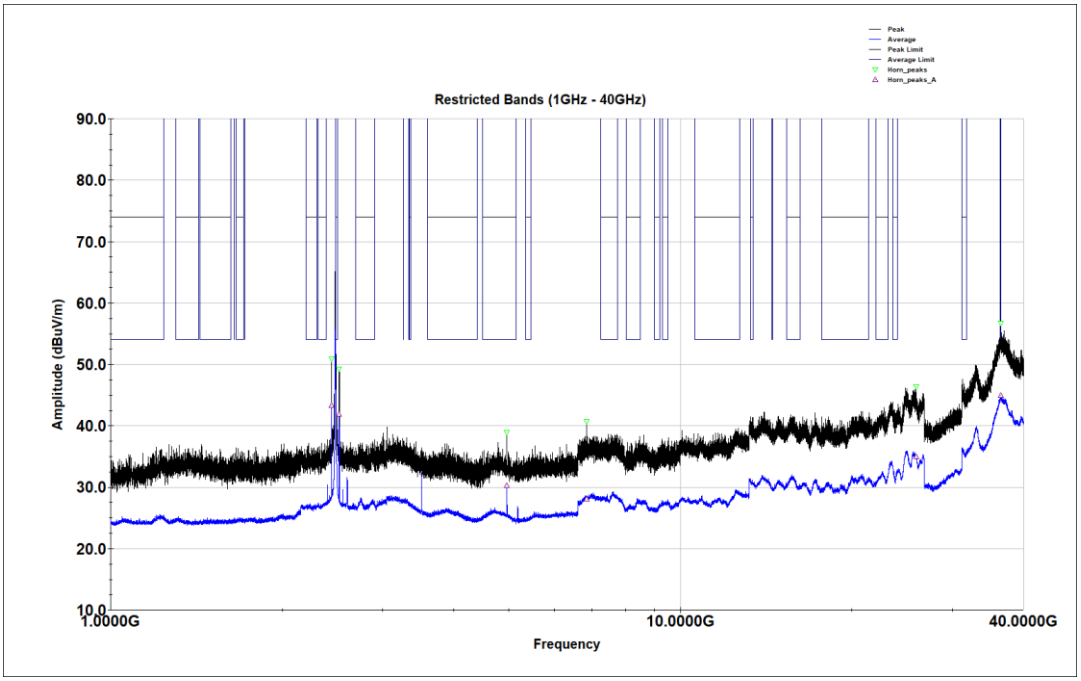



**Figure 26. High Channel, 1GHz – 40GHz Restricted Band Spurious Emissions (1Mbps)**

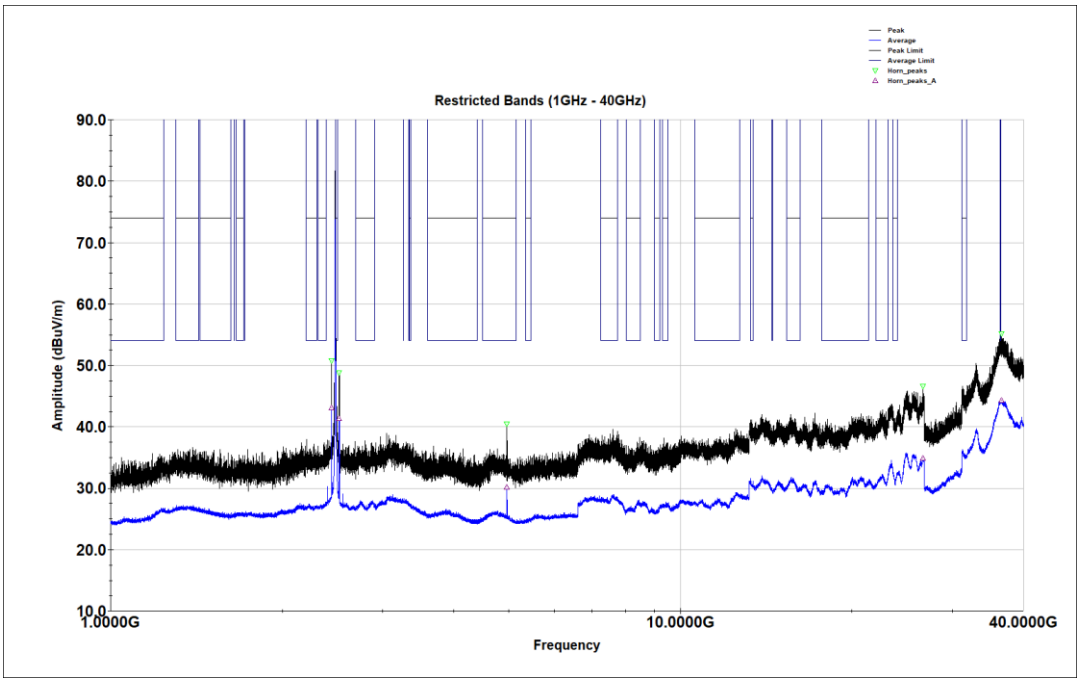
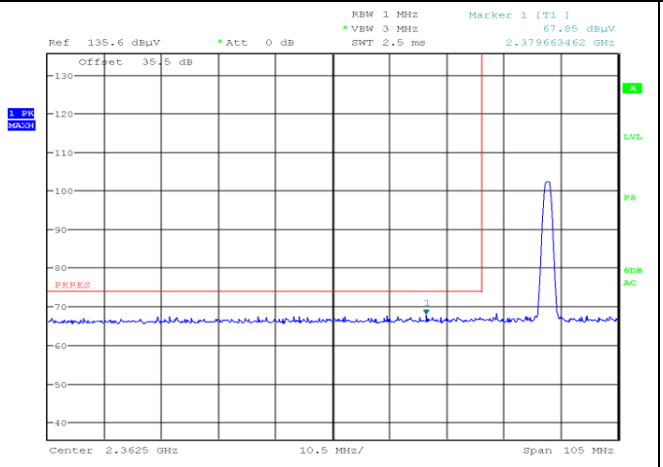
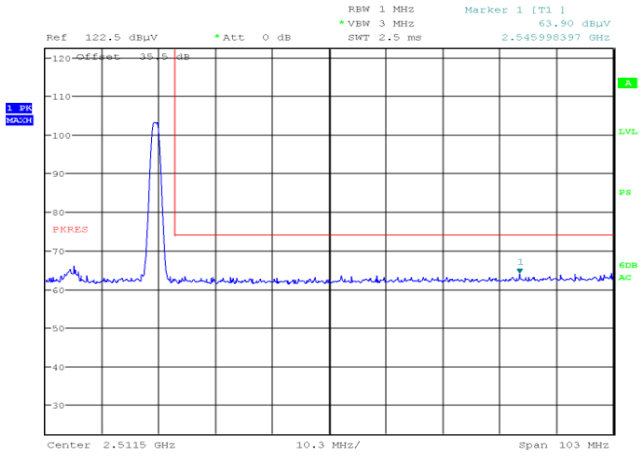
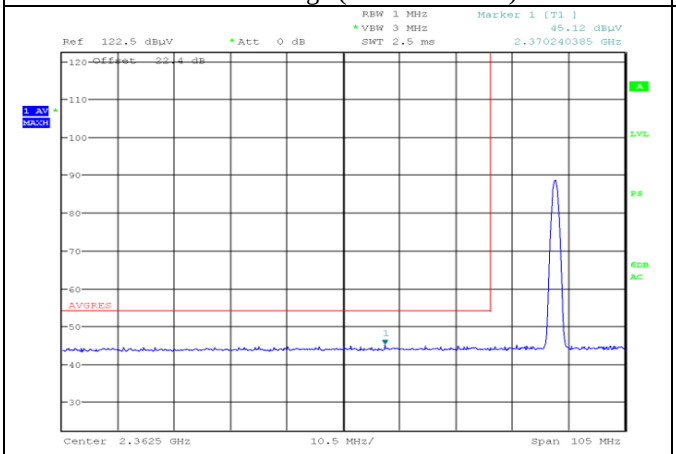
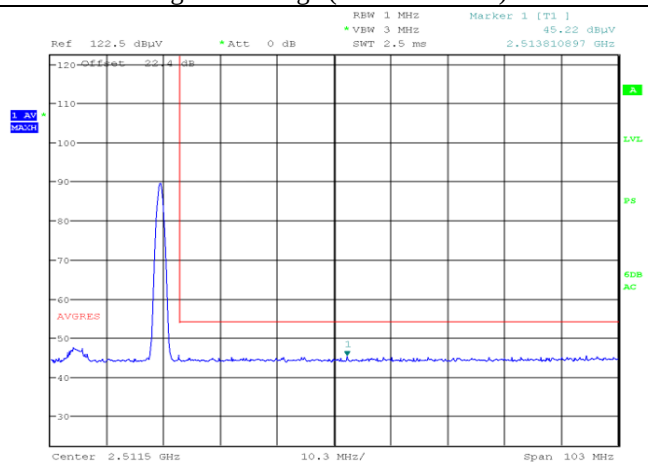


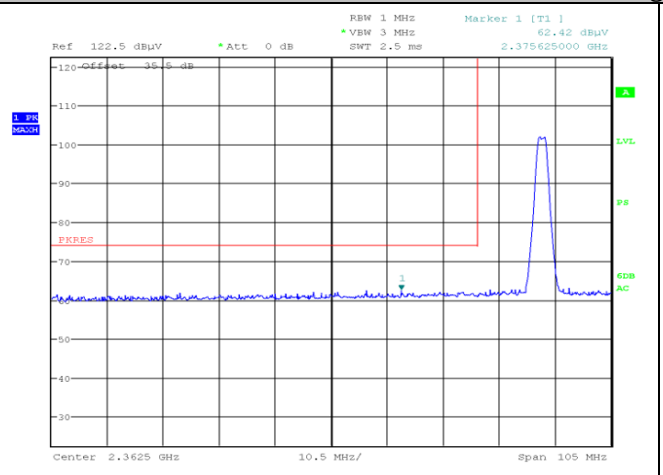
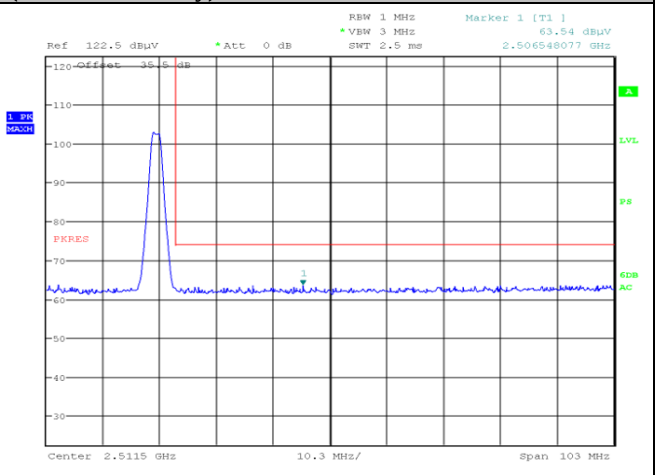
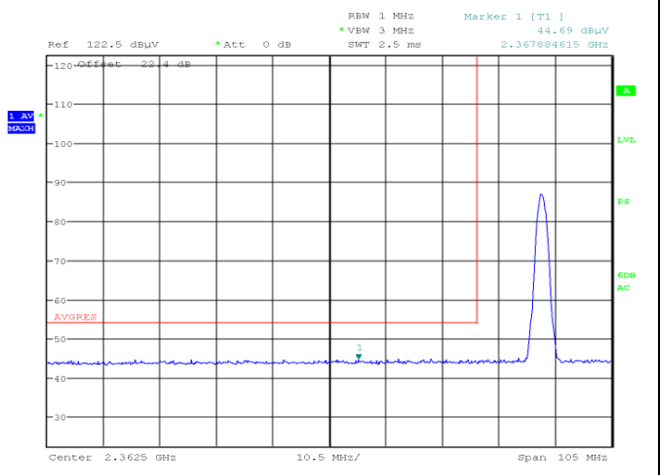
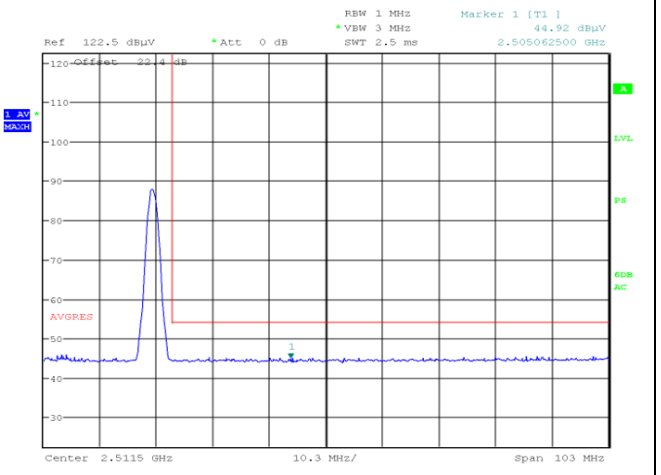

**Figure 27. High Channel, 1GHz – 40GHz Restricted Band Spurious Emissions (2Mbps)**

| Restricted Band Edge (Vertical Polarity) | |
|---|---|
|  |  |
| Low Band Edge (Peak Detection) | High Band Edge (Peak Detection) |
|  |  |
| Low Band Edge (Average Detection) | High Band Edge (Average Detection) |

| 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 |
|---|---|---|---|---|---|---|---|
| 2.379GHz | 67.85 | 74.00 | 6.15 | | | | Pass |
| 2.546GHz | 63.90 | 74.00 | 10.1 | | | | Pass |
| 2.370GHz | | | | 45.12 | 54.00 | 8.88 | Pass |
| 2.514GHz | | | | 45.22 | 54.00 | 8.78 | Pass |

**Figure 28. Restricted Band Edge Spurious Emissions (1MBps, Vertical Polarity)[3]**

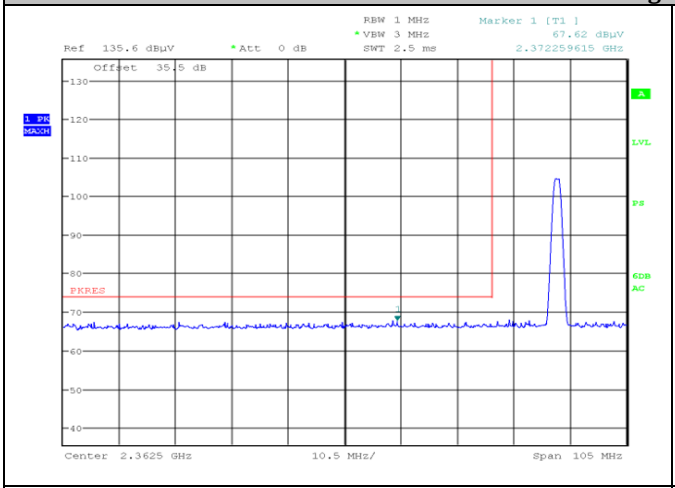
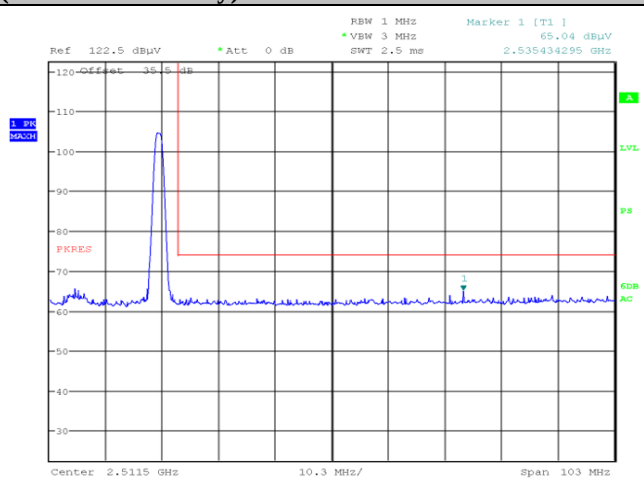
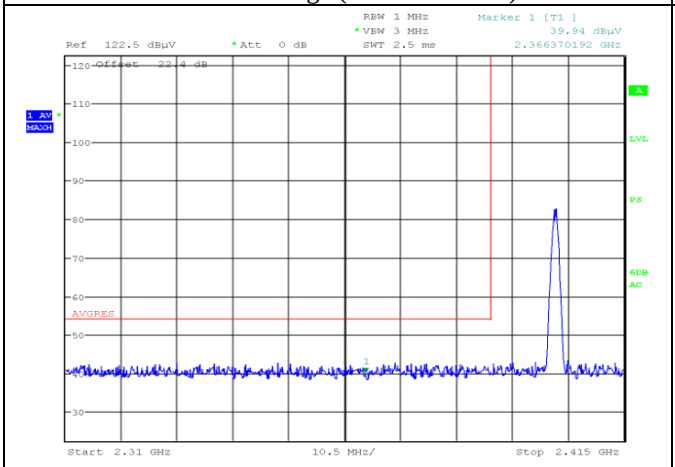
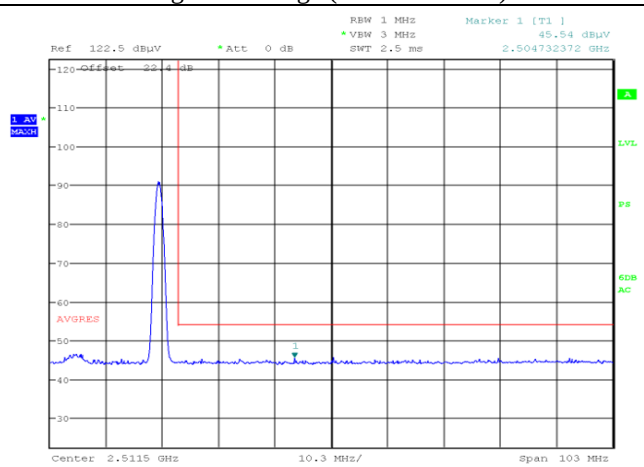
[3] The average measurements include a duty cycle correction factor of -13.15dB due to a 22% duty cycle. Lutron Electronics Co., Inc. will provide documentation which justifies the use of this specific duty cycle correction factor.

| Restricted Band Edge (Vertical Polarity) | |
|---|---|
|  |  |
| Low Band Edge (Peak Detection) | High Band Edge (Peak Detection) |
|  |  |
| Low Band Edge (Average Detection) | High Band Edge (Average Detection) |

| 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 |
|---|---|---|---|---|---|---|---|
| 2.375GHz | 62.42 | 74.00 | 11.58 | | | | Pass |
| 2.506GHz | 63.54 | 74.00 | 10.46 | | | | Pass |
| 2.368GHz | | | | 44.69 | 54.00 | 9.31 | Pass |
| 2.505GHz | | | | 44.92 | 54.00 | 9.08 | Pass |

**Figure 29. Restricted Band Edge Spurious Emissions (2MBps, Vertical Polarity)[4]**

[4] The average measurements include a duty cycle correction factor of -13.15dB due to a 22% duty cycle. Lutron Electronics Co., Inc. will provide documentation which justifies the use of this specific duty cycle correction factor.

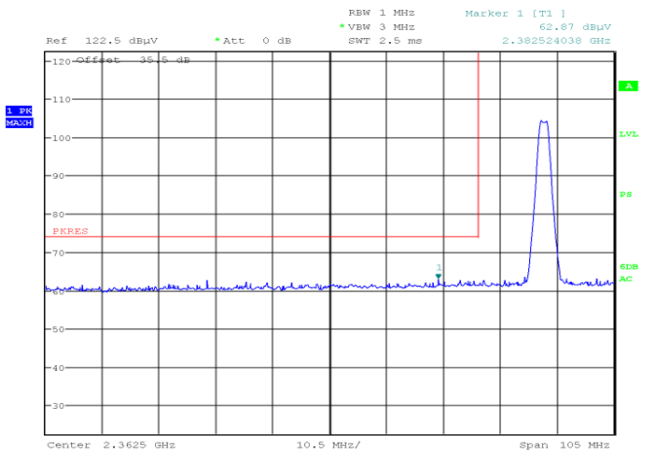
| Restricted Band Edge (Horizontal Polarity) | |
|---|---|
|  |  |
| Low Band Edge (Peak Detection) | High Band Edge (Peak Detection) |
|  |  |
| Low Band Edge (Average Detection) | High Band Edge (Average Detection) |

| 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 |
|---|---|---|---|---|---|---|---|
| 2.372GHz | 67.62 | 74.00 | 6.38 | | | | Pass |
| 2.535GHz | 65.04 | 74.00 | 8.96 | | | | Pass |
| 2.366GHz | | | | 39.94 | 54.00 | 14.06 | Pass |
| 2.505GHz | | | | 45.54 | 54.00 | 8.46 | Pass |

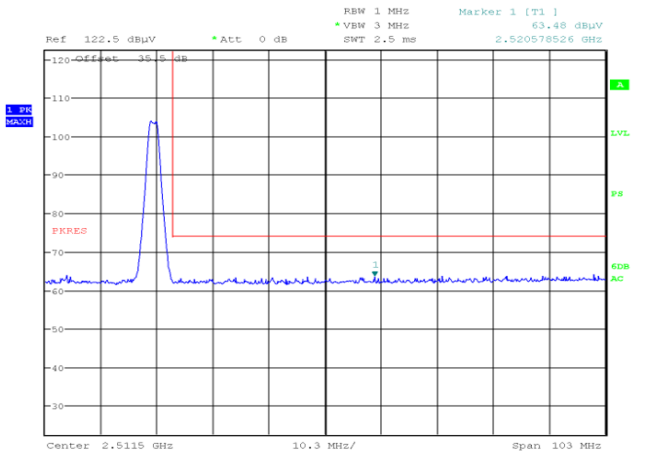
**Figure 30. Restricted Band Edge Spurious Emissions (1Mbps, Horizontal Polarity) [5]**

[5] The average measurements include a duty cycle correction factor of -13.15dB due to a 22% duty cycle. Lutron Electronics Co., Inc. will provide documentation which justifies the use of this specific duty cycle correction factor.

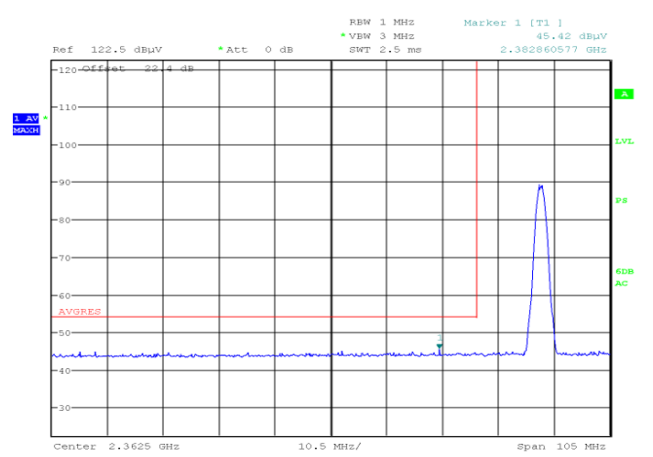
**Restricted Band Edge (Horizontal Polarity)**



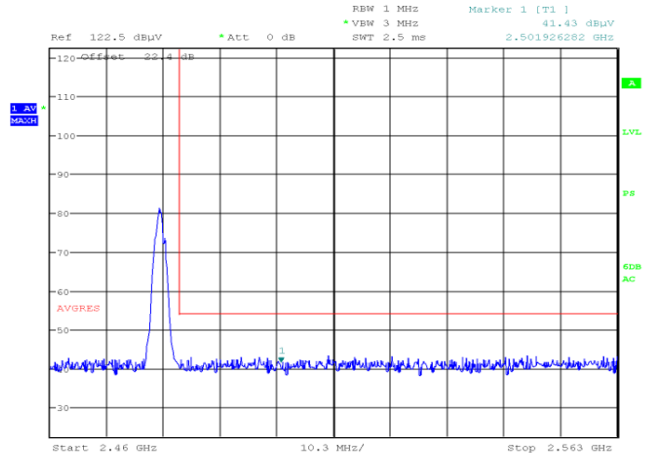

Low Band Edge (Peak Detection)




High Band Edge (Peak Detection)




Low Band Edge (Average Detection)




High Band Edge (Average Detection)

| 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 |
|---|---|---|---|---|---|---|---|
| 2.382GHz | 62.87 | 74.00 | 11.13 | | | | Pass |
| 2.521GHz | 63.48 | 74.00 | 10.52 | | | | Pass |
| 2.382GHz | | | | 45.42 | 54.00 | 8.58 | Pass |
| 2.501GHz | | | | 41.42 | 54.00 | 12.58 | Pass |

**Figure 31. Restricted Band Edge Spurious Emissions (2Mbps, Horizontal Polarity) [6]**

[6] The average measurements include a duty cycle correction factor of -13.15dB due to a 22% duty cycle. Lutron Electronics Co., Inc. will provide documentation which justifies the use of this specific duty cycle correction factor.

**Worst Case Cabinet Spurious Emissions**

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 280.470 | 27.01 | 46.02 | 19.01 | -6.19 | V | 158.6 | 3.58 | 120.000 | Pass |
| 281.520 | 28.05 | 46.02 | 17.97 | -6.14 | H | 26.1 | 3.5 | 120.000 | Pass |
| 333.600 | 32.56 | 46.02 | 13.46 | -4.49 | V | 153.9 | 2.69 | 120.000 | Pass |
| 334.890 | 33.21 | 46.02 | 12.81 | -4.48 | H | 33.9 | 2.11 | 120.000 | Pass |

**Figure 32. Worst Case Cabinet Radiation, Below 1GHz (1Mbps)**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4,879.500 | 43.99 | 74.00 | 30.01 | 32.34 | 54.00 | 21.66 | -3.35 | H | 229.3 | 3.95 | Pass |
| 4,884.500 | 41.82 | 74.00 | 32.18 | 28.95 | 54.00 | 25.05 | -3.27 | V | 45.3 | 3.97 | Pass |
| 7,392.500 | 45.35 | 74.00 | 28.65 | 32.19 | 54.00 | 21.81 | -2.49 | H | 81.7 | 2.99 | Pass |
| 7,397.500 | 45.49 | 74.00 | 28.51 | 32.25 | 54.00 | 21.75 | -2.47 | V | 228.3 | 1.23 | Pass |
| 12,242.000 | 45.78 | 74.00 | 28.22 | 32.93 | 54.00 | 21.07 | -2.00 | V | 84.8 | 1.72 | Pass |
| 12,256.500 | 45.87 | 74.00 | 28.13 | 33.31 | 54.00 | 20.69 | -2.04 | H | 360.3 | 3.88 | Pass |
| 19,520.000 | 51.34 | 74.00 | 22.66 | 36.92 | 54.00 | 17.08 | 12.33 | H | 350.9 | 2.92 | Pass |

**Figure 33. Worst Case Cabinet Radiation, Above 1GHz (1Mbps)**

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 280.440 | 32.92 | 46.02 | 13.10 | -6.19 | H | 13.8 | 3.34 | 120.000 | Pass |
| 281.550 | 22.64 | 46.02 | 23.38 | -6.14 | V | 125 | 3.78 | 120.000 | Pass |
| 331.290 | 36.73 | 46.02 | 9.29 | -4.51 | H | 16.9 | 2.53 | 120.000 | Pass |
| 334.740 | 26.41 | 46.02 | 19.61 | -4.48 | V | 68.2 | 2.82 | 120.000 | Pass |

**Figure 34. Worst Case Cabinet Radiation, Below 1GHz (2Mbps)**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4,818.000 | 40.62 | 74.00 | 33.38 | 27.88 | 54.00 | 26.12 | -4.39 | H | 70.2 | 2.7 | Pass |
| 4,888.000 | 41.97 | 74.00 | 32.03 | 28.88 | 54.00 | 25.12 | -3.21 | V | 346.7 | 1.91 | Pass |
| 7,363.500 | 44.29 | 74.00 | 29.71 | 30.88 | 54.00 | 23.12 | -2.60 | H | 11.4 | 2.47 | Pass |
| 7,379.500 | 44.51 | 74.00 | 29.49 | 31.27 | 54.00 | 22.73 | -2.54 | V | 352.6 | 3.11 | Pass |
| 12,217.000 | 45.73 | 74.00 | 28.27 | 32.80 | 54.00 | 21.20 | -1.95 | H | 9.3 | 2.65 | Pass |
| 12,224.500 | 46.30 | 74.00 | 27.70 | 33.49 | 54.00 | 20.51 | -1.96 | V | 267.1 | 2.57 | Pass |
| 19,520.000 | 50.01 | 74.00 | 23.99 | 36.14 | 54.00 | 17.86 | 12.33 | H | 191.1 | 1.21 | Pass |

**Figure 35. Worst Case Cabinet Radiation, Above 1GHz (2Mbps)**

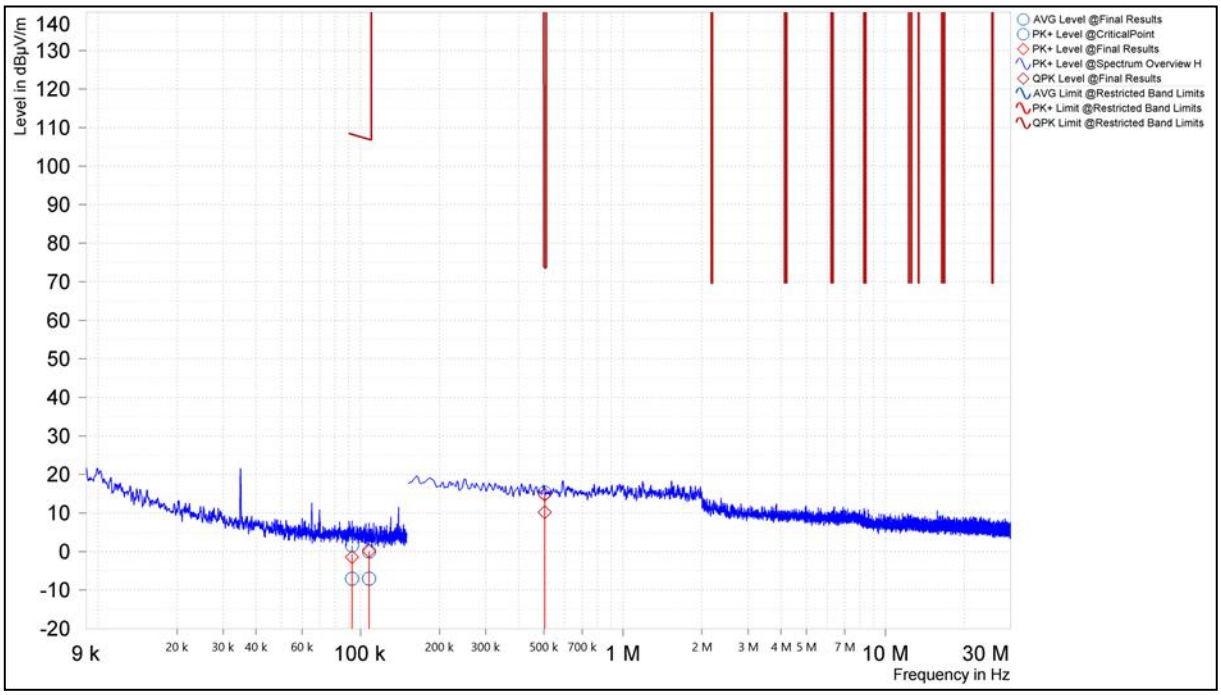



**Figure 36. Worst Case Cabinet Radiation, 9kHz – 30MHz, Coaxial Loop (1MBps)**

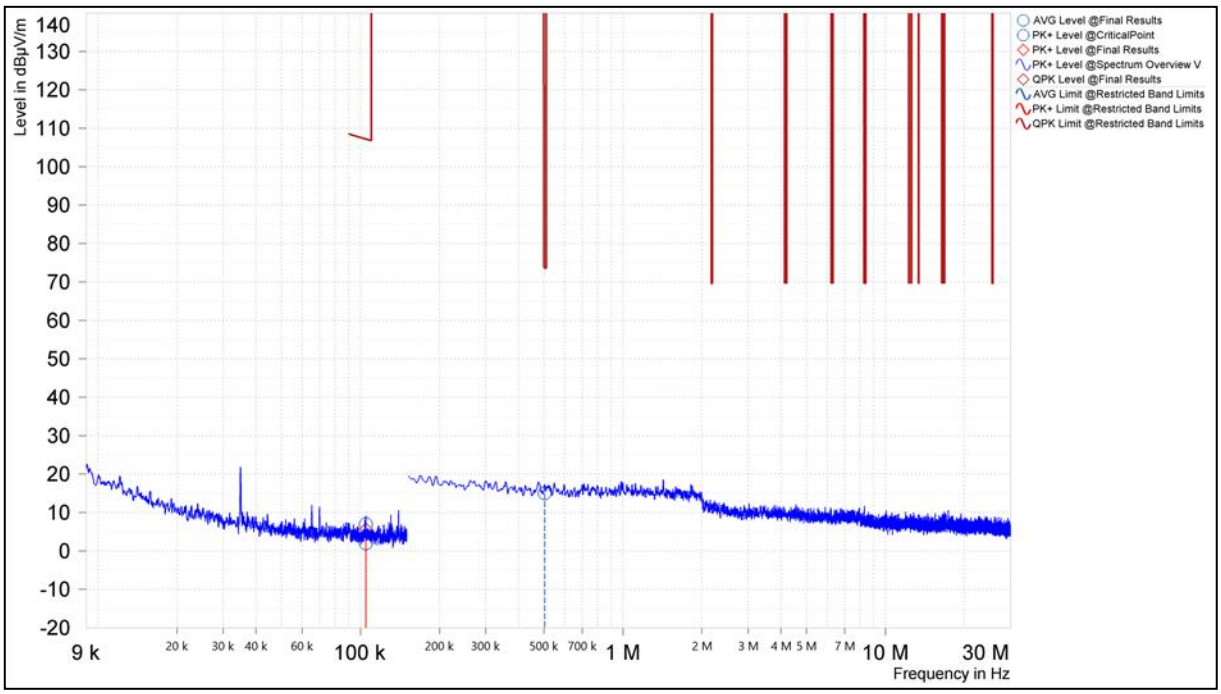



**Figure 37. Worst Case Cabinet Radiation, 9kHz – 30MHz, Coplanar Loop (1MBps)**

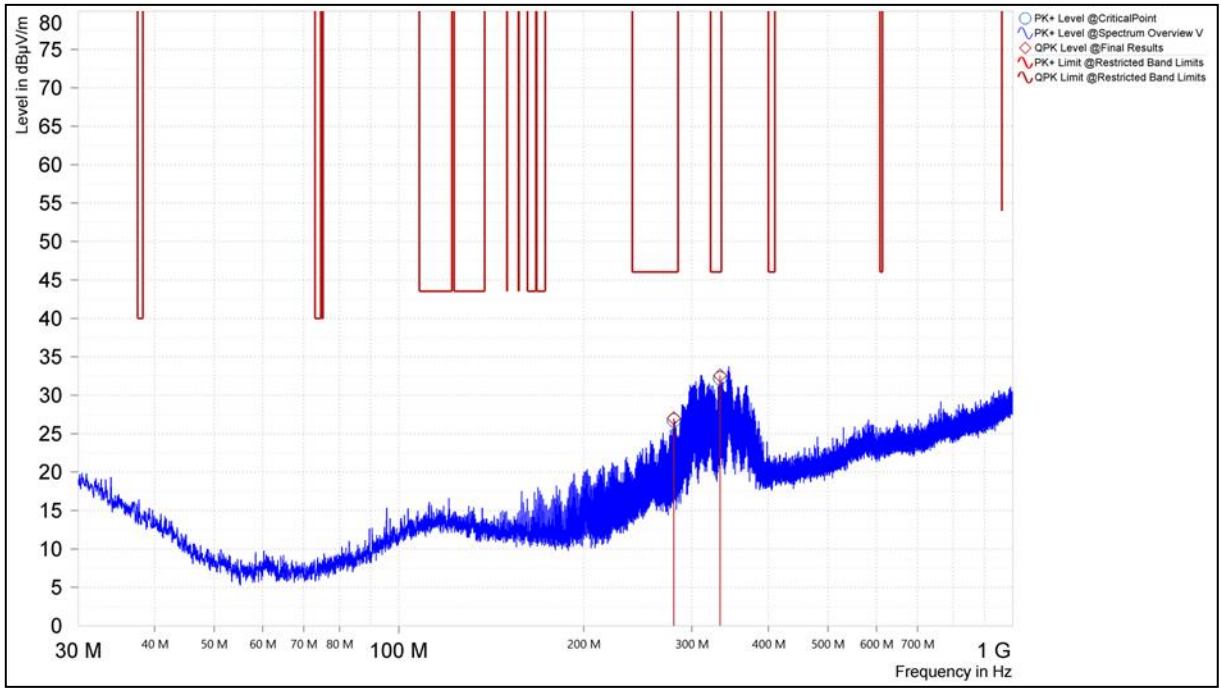



**Figure 38. Worst Case Cabinet Radiation, 30MHz – 1GHz, Vertical Polarity (1MBps)**

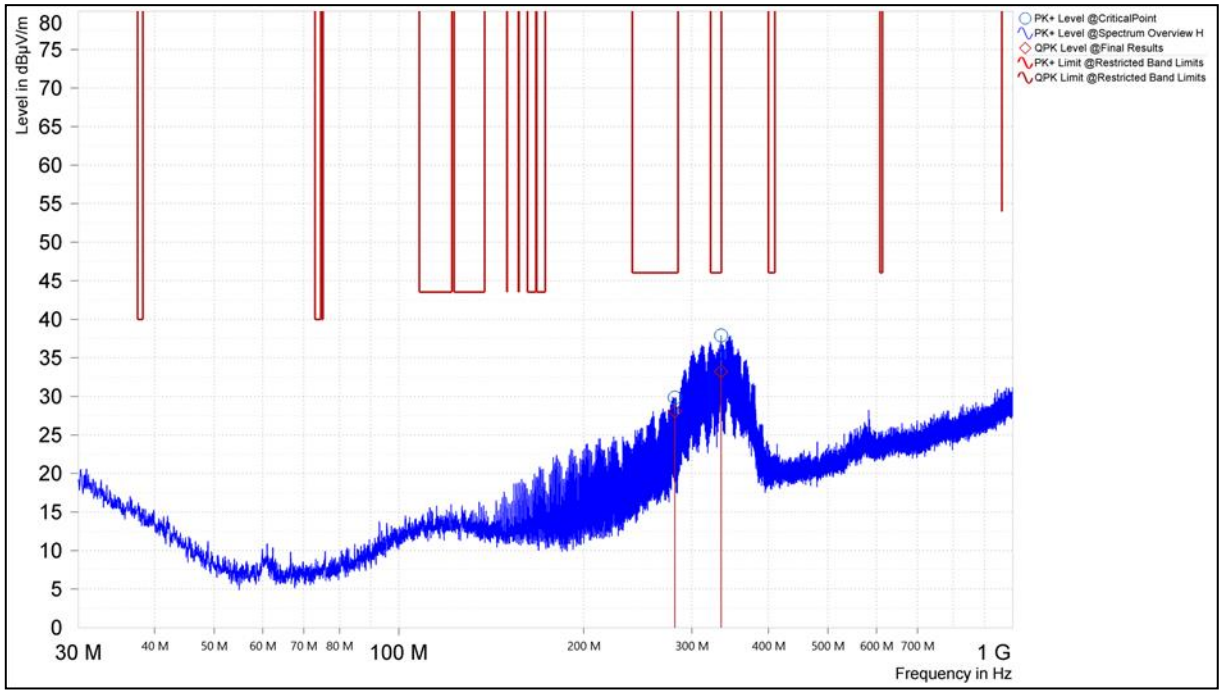



**Figure 39. Worst Case Cabinet Radiation, 30MHz – 1GHz, Horizontal Polarity (1MBps)**

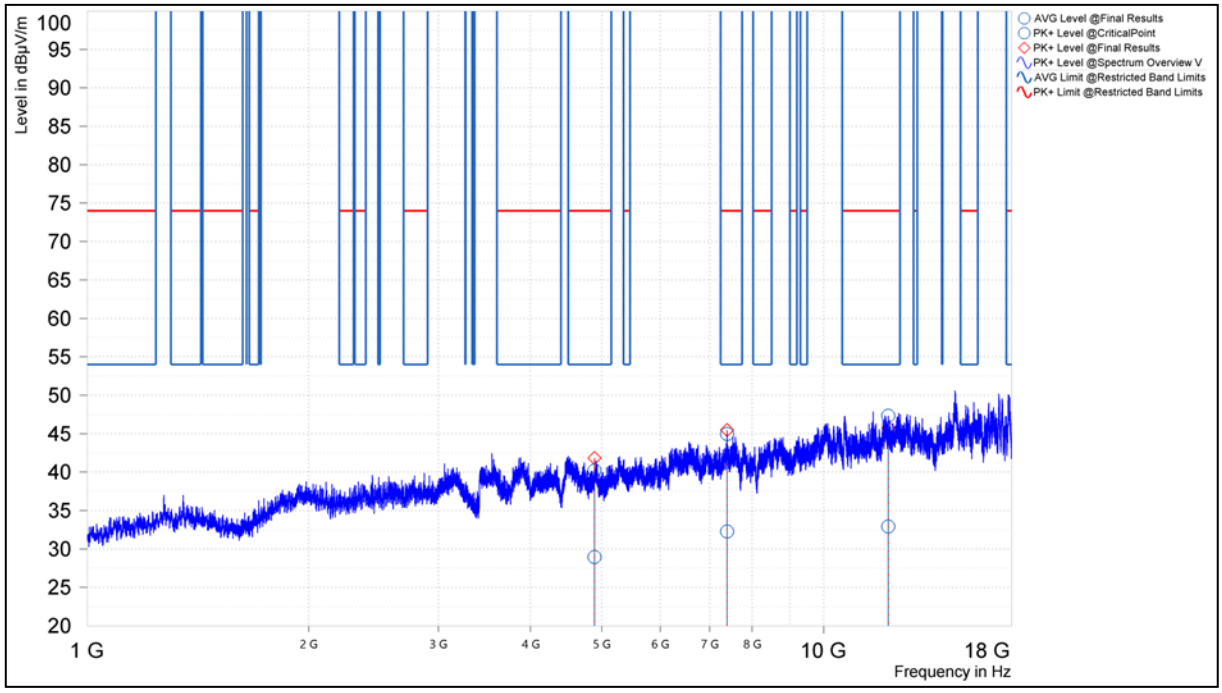



**Figure 40. Worst Case Cabinet Radiation, 1GHz – 18GHz, Vertical Polarity (1MBps)**

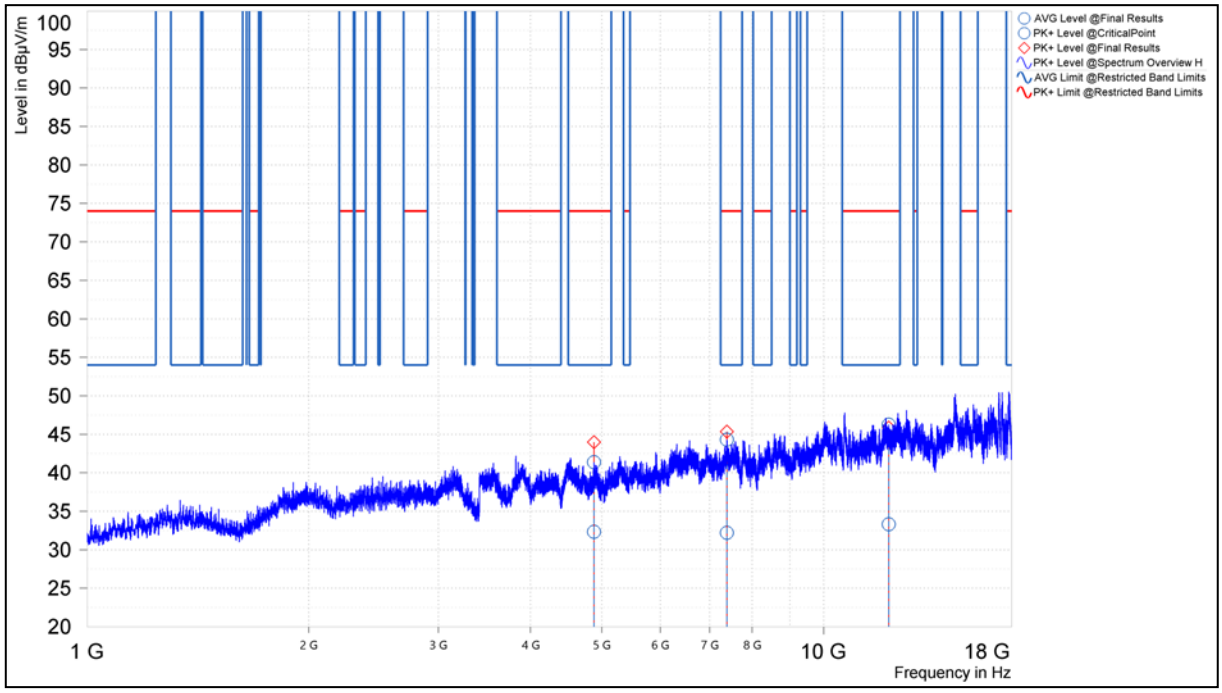



**Figure 41. Worst Case Cabinet Radiation, 1GHz – 18GHz, Horizontal Polarity (1MBps)**

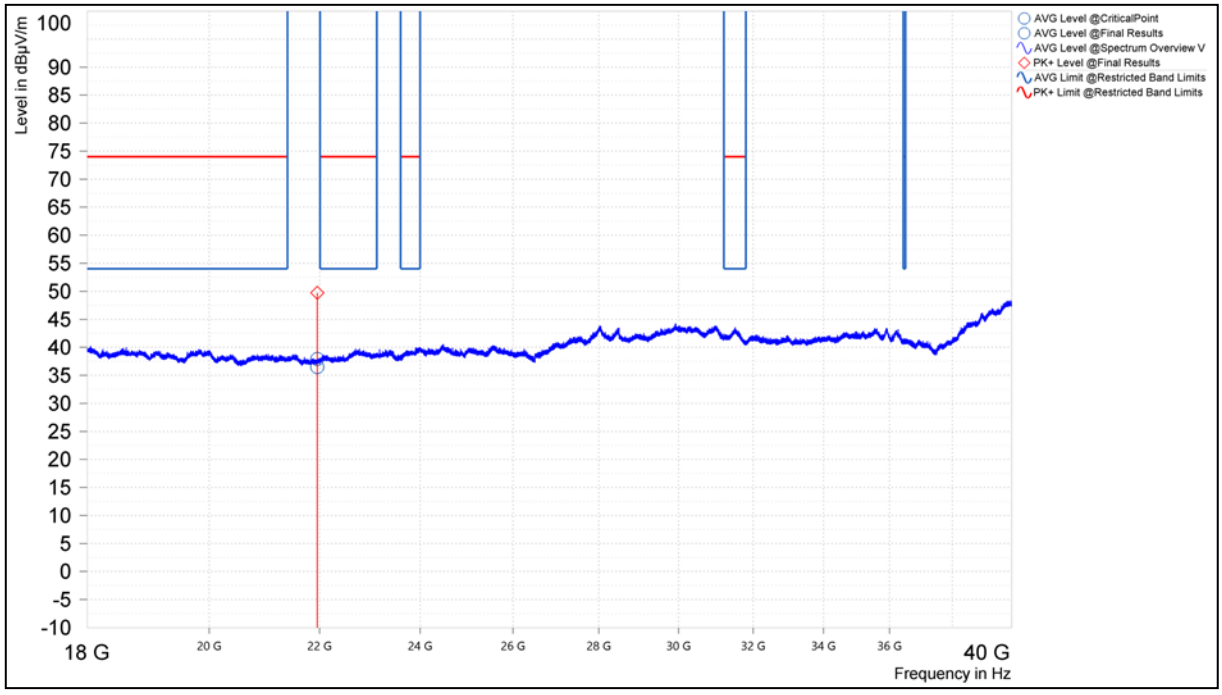



**Figure 42. Worst Case Cabinet Radiation, 18GHz – 40GHz, Vertical Polarity (1MBps)**

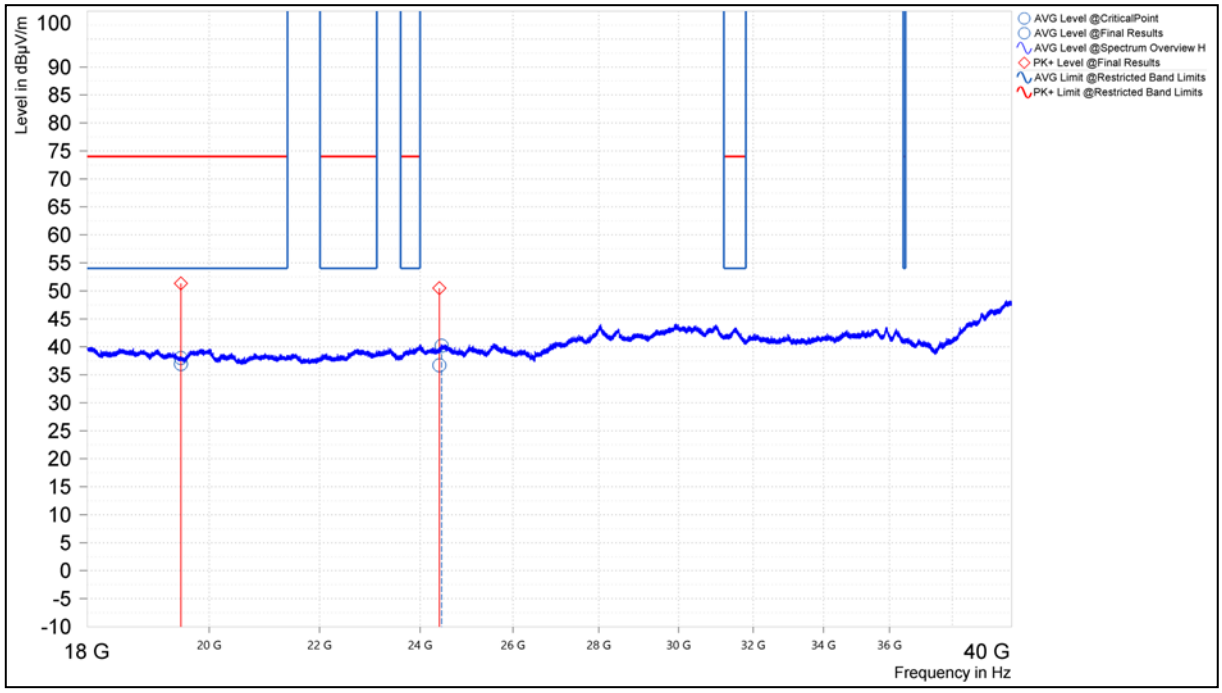



**Figure 43. Worst Case Cabinet Radiation, 18GHz – 40GHz, Horizontal Polarity (1MBps)**

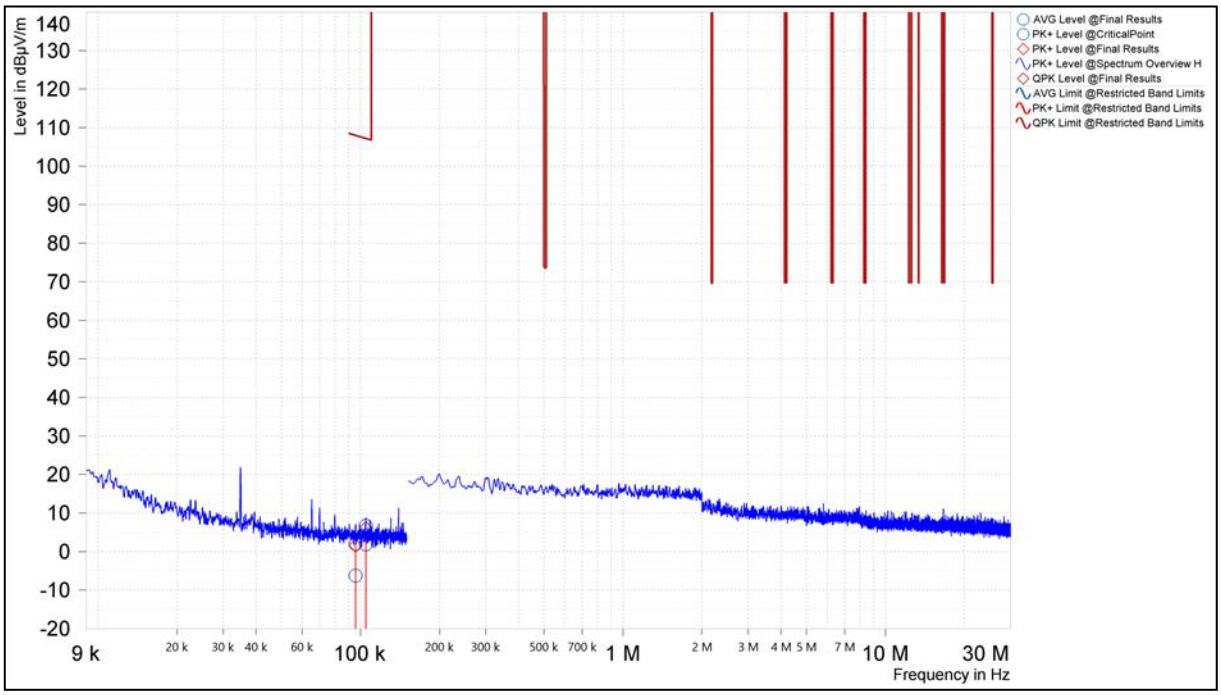



**Figure 44. Worst Case Cabinet Radiation, 9kHz – 30MHz, Coaxial Loop (2MBps)**

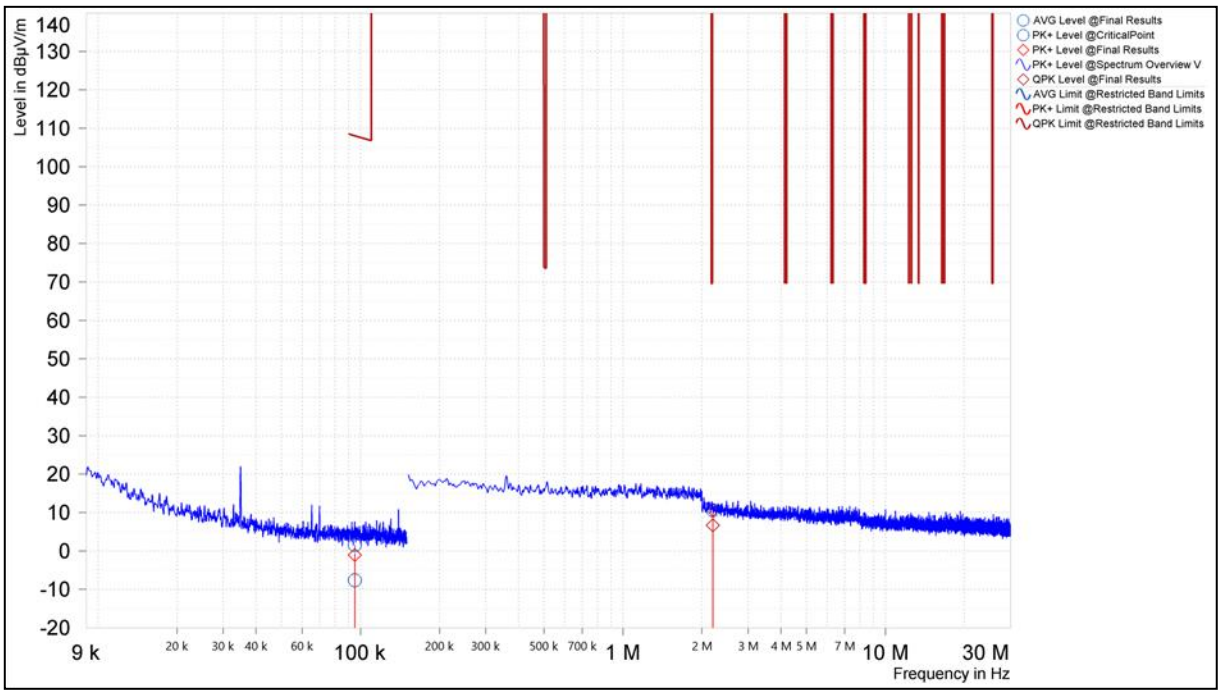



**Figure 45. Worst Case Cabinet Radiation, 9kHz – 30MHz, Coplanar Loop (2MBps)**

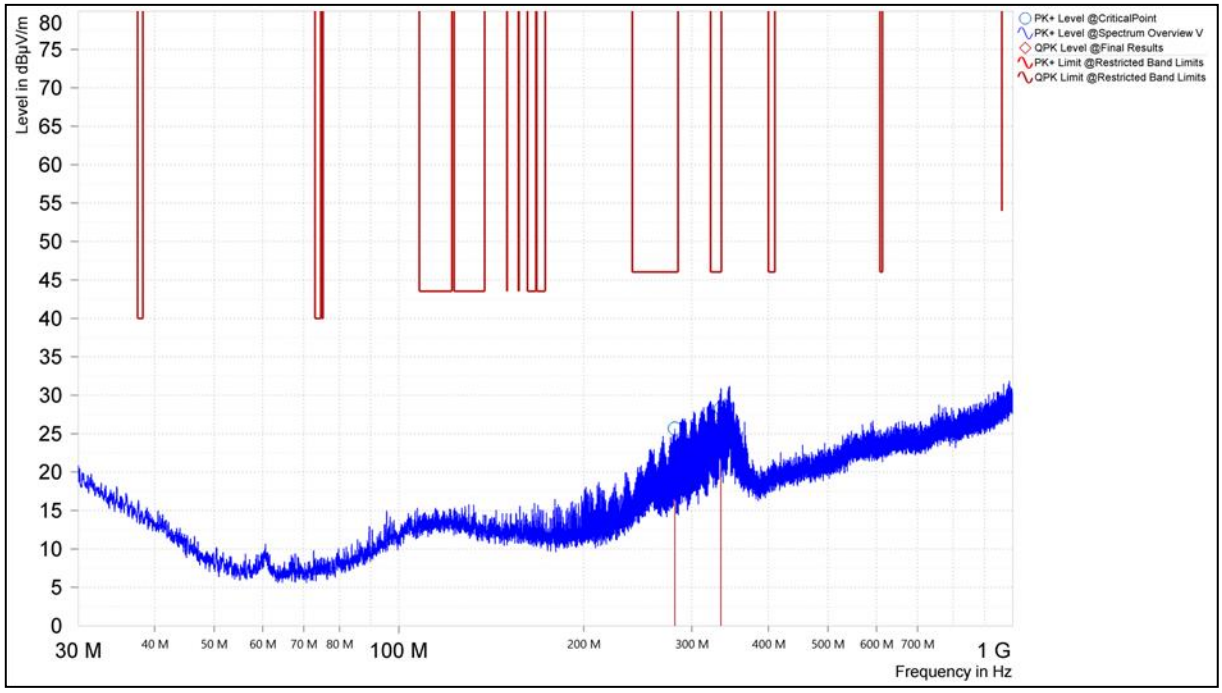



**Figure 46. Worst Case Cabinet Radiation, 30MHz – 1GHz, Vertical Polarity (2MBps)**

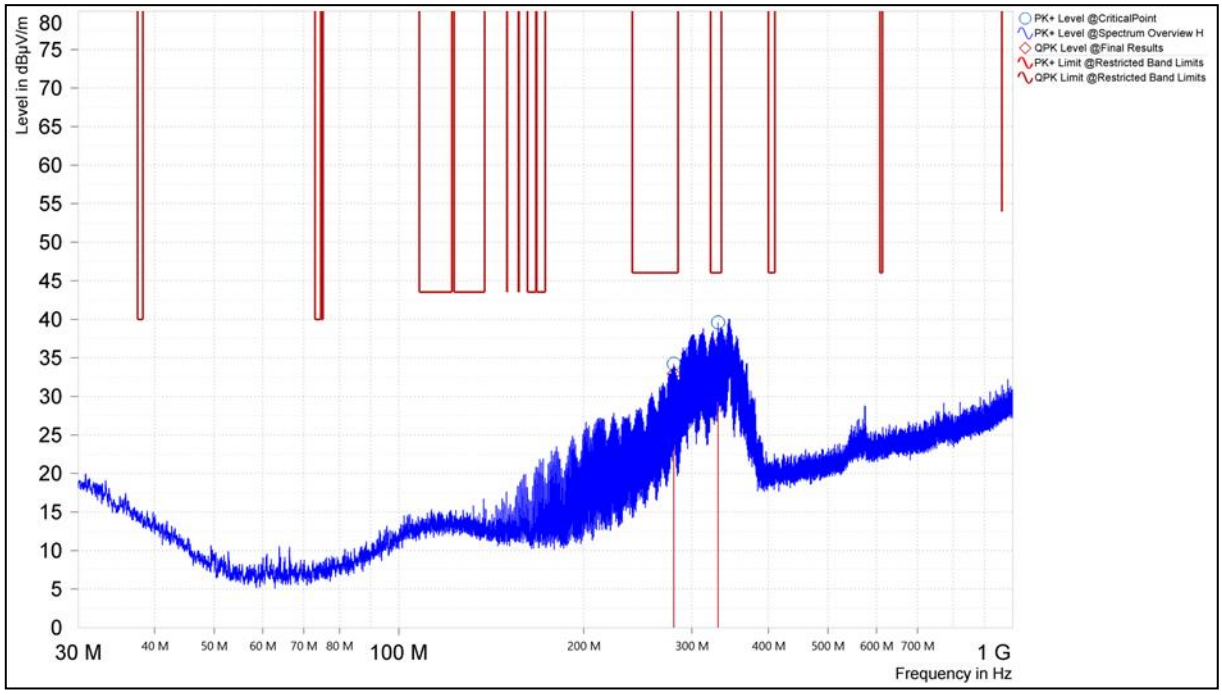



**Figure 47. Worst Case Cabinet Radiation, 30MHz – 1GHz, Horizontal Polarity (2MBps)**

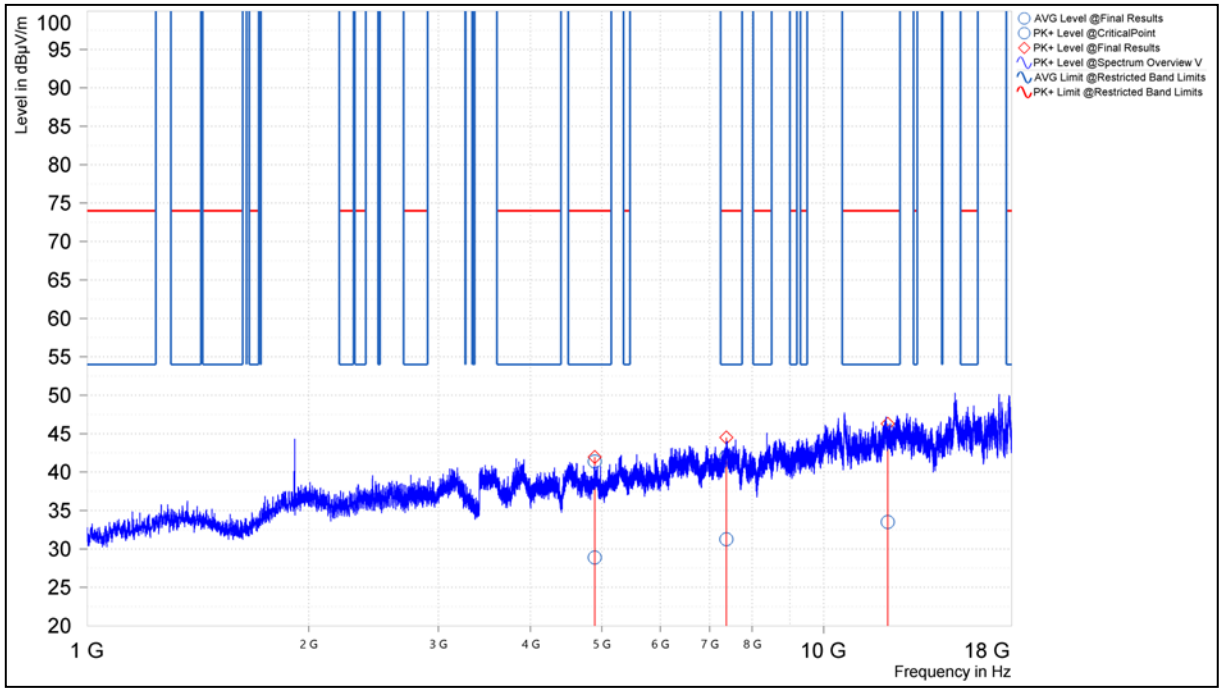



**Figure 48. Worst Case Cabinet Radiation, 1GHz – 18GHz, Vertical Polarity (2MBps)**

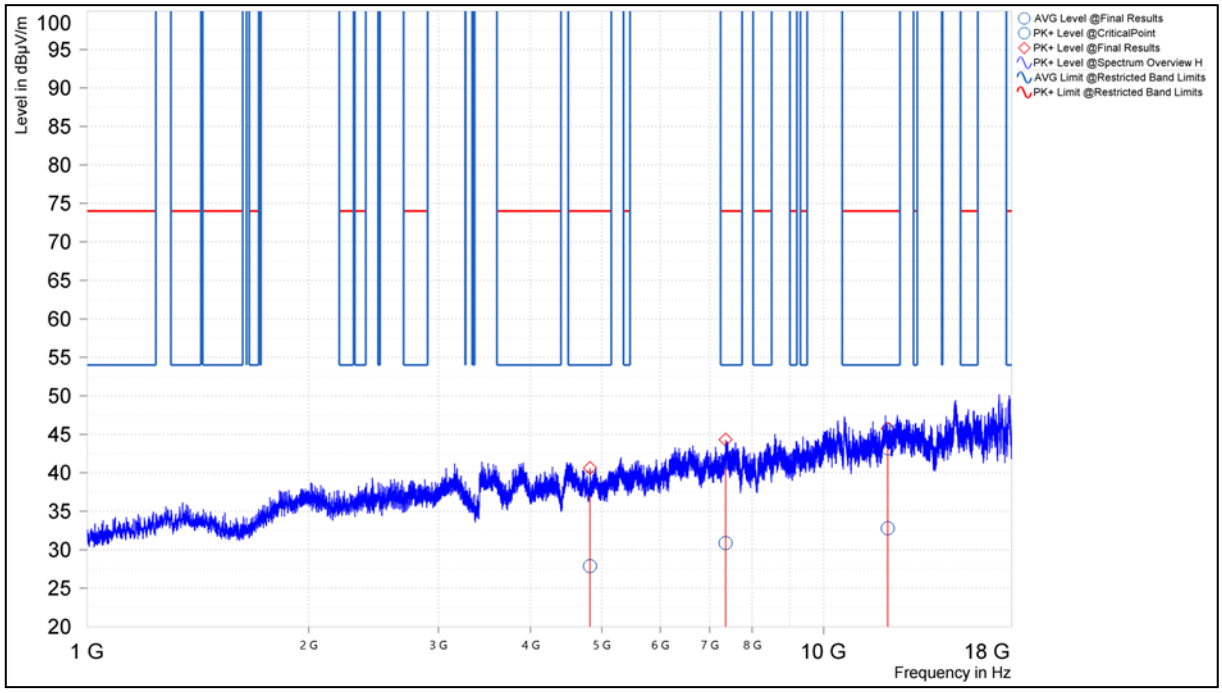



**Figure 49. Worst Case Cabinet Radiation, 1GHz – 18GHz, Horizontal Polarity (2MBps)**

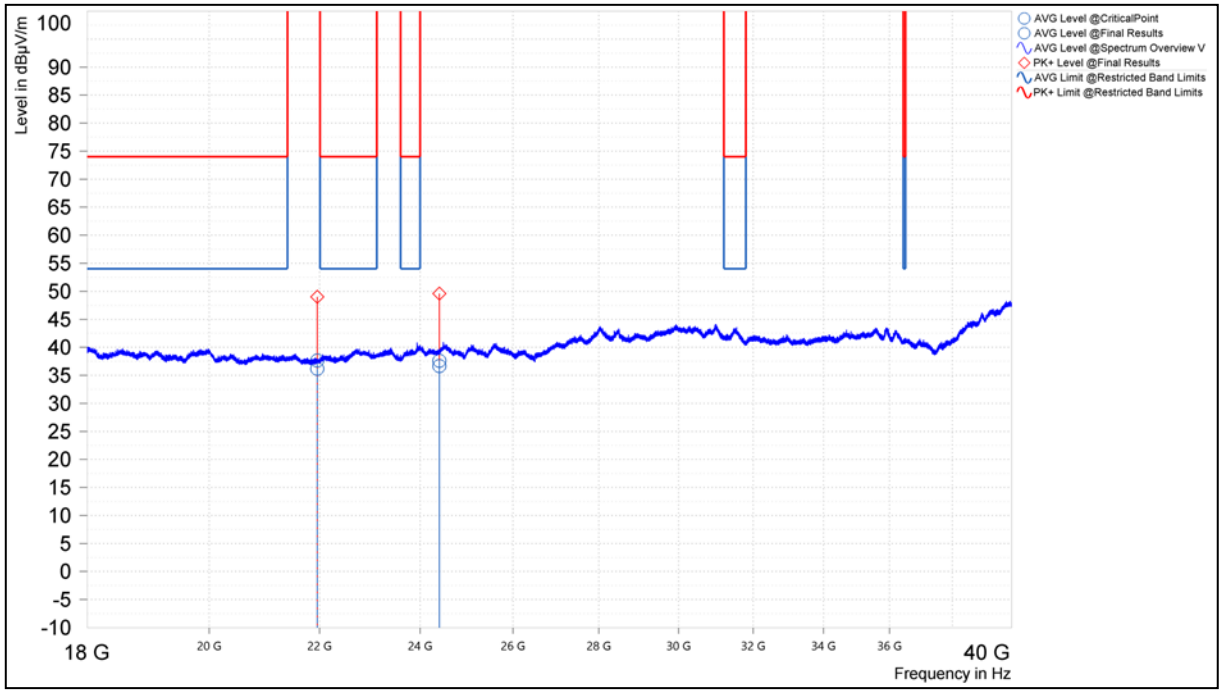



**Figure 50. Worst Case Cabinet Radiation, 18GHz – 40GHz, Vertical Polarity (2MBps)**

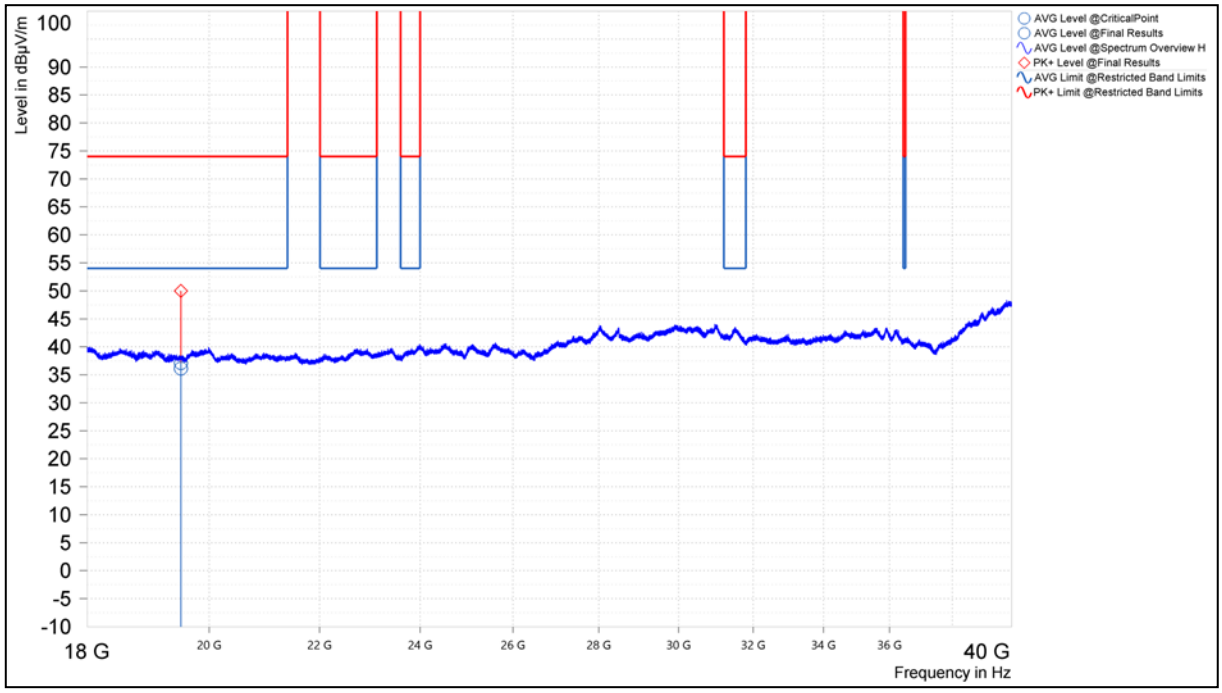



**Figure 51. Worst Case Cabinet Radiation, 18GHz – 40GHz, Horizontal Polarity (2MBps)**

# 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 | 7/27/2023 | 7/27/2024 |
| 1A1083 | Receiver | Rohde & Schwarz | ESU40 | 11/20/2023 | 11/20/2024 |
| 1A1176 | Active Loop Antenna (9KHz-30MHz) | ETS-Lindgren | 6502 | 7/13/2023 | 7/13/2024 |
| 1A1050 | Bilog Antenna (30MHz – 1GHz) | Schaffner | CBL 6112D | 1/24/2023 | 1/24/2024 |
| 1A1183 | Horn Antenna (1GHz – 18GHz) | ETS Lindgren | 3117 | 1/4/2023 | 1/4/2024 |
| 1A1161 | Horn Antenna (18GHz – 40GHz) | ETS Lindgren | 3116C | 7/11/2023 | 7/11/2024 |
| 1A1065 | EMI Receiver | Rohde & Schwarz | ESCI | 8/4/2023 | 8/4/2024 |
| 1A1087 | Pulse Limiter | Rohde & Schwarz | ESH3Z2 | 12/21/2022 | 12/21/2023 |
| 1A1122 | LISN | Teseq | NNB 51 | 9/19/2023 | 9/19/2024 |
| 1A1123 | LISN | Teseq | NNB 51 | 12/20/2023 | 12/20/2024 |
| 1A1149 | DC Milliohm Meter | GW Instek | GOM-802 | 9/20/2023 | 9/20/2024 |
| 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