

Testing Tomorrow's Technology

**Application
For**

**Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an
Intentional Radiator per Part 15, Subpart C, paragraphs 15.207, 15.209 and 15.247**

For the

GE Grid Solutions

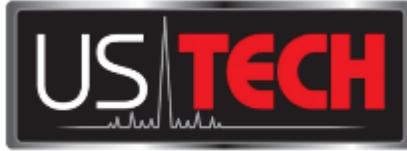
Model Number: Cap MD

FCC ID: 2BFVO-CAPMDSN

**UST Project: 24-0113
Issue Date: August 23, 2024**

Total Pages: 54

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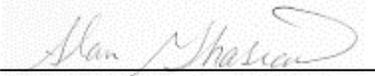


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I certify that I am authorized to sign for the Test Agency and that the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: 

Title: Compliance Engineer – President

Date: August 23, 2024



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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: GE Grid Solutions
ADDRESS: 1925 Calumet St. Clearwater, FL 33765 USA
MODEL: Cap MD
FCC ID: 2BFVO-CAPMDSN
IC: N/A
DATE: August 23, 2024

This report concerns (check one): Original grant Class II change

Equipment type: Low Power, 2.4GHz Transceiver

Technical:

Operating Frequency range: 2403.5 MHz – 2476.5 MHz

Type of modulation: O-QPSK

Data/Bit Rate: 250 kbps – 2 Mbps

Antenna Gain: 3.2 dBi (Flexible Trace Antenna)

Maximum Output Power: +4 dBm (rated)

Software Used to Program EUT: Bliss

EUT Firmware Number: N/A

Power Setting: maximum level

Report Prepared By:
US Tech
3505 Francis Circle
Alpharetta, GA30004

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List of Attachments

FCC Agency Agreement	Test Configuration Photographs
IC Agency Agreement	External Photographs
FCC Application Forms	Internal Photographs
IC Application Forms	Theory of Operation
Letter of Confidentiality	RF Exposure
Equipment Label(s)	User's Manual
Block Diagram(s)	IC Cross Reference
Schematic(s)	FCC Modular Approval Letter
	IC Modular Approval Letter

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1 General Information

1.1 Purpose of this Report

This report is prepared to convey test results and information concerning the suitability of this exact product for public distribution according to FCC Rules and Regulations Part 2, 15, and Part 15.247.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on June 21, 2024 in good operating condition.

1.3 Product Description

The Equipment Under Test (EUT) is the GE Grid Solutions model Cap MD. The EUT is device used for utilities maintenance. The EUT is a capacitor health monitoring sensor. It delivers information about the capacitor bank to the maintenance personnel. The EUT has an onboard electromechanical display that gives the user instant information when the EUT is energized. It can display the individual capacitor health status such as normal operation, warning or verge of failure and an actual capacitor unit failure.

The EUT does not require additional wiring for power or communication and is installed on each can. The current sensor design allows the EUT to be powered indirectly from the utilities.

The EUT incorporates IEEE 802.15.4, ZigBee technology. This report is an assessment of the ZigBee transceiver compared to FCC Part 15 Subpart C and Part 15.247 limits.

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1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.10:2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices* for the intentional radiator aspect of the device and *ANSI C63.4:2014, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2014)* for the unintentional radiator aspect of the device as well as FCC subpart B and C of Part 15 and per FCC KDB Publication number 558074 v03r05 for Digital Transmission Systems Operating Under section 15.247.

Digital RF conducted and radiated emissions data below 1 GHz were taken with the measuring receiver (or spectrum analyzer's) resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements performed above 1.0 GHz were made with a RBW of 1 MHz. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was set to 3 times the RBW or as required per the standard throughout the evaluation process.

A list of EUT and Peripherals is found in Table 1. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are provided in separate appendices.

1.5 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is US5301. Additionally, this site has been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1.

1.6 Related Submittal(s)/Grant(s)

The EUT is subject to the following FCC Equipment Authorizations:

- a) Certification of the transmitter incorporated within the EUT, see test data presented herein.

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Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC/IC ID	CABLES P/D
EUT/ GE Grid Solutions	Cap MD	Engineering Sample	FCC ID: 2BFVO-CAPMDSN (Pending)	PU

S= Shielded, U= Unshielded, P= Power, D= Data

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2 Tests and Measurements

2.1 Test Equipment

The table below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are included.

Table 2. Test Instruments

TEST INSTRUMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
Spectrum Analyzer	Agilent	E4440A	MY45304803	7/21/2025 2 yr.
RF Preamp 100 kHz To 1.3 GHz	Hewlett-Packard	8447D	1937A02980	7/20/2024
Preamp 1.0 GHz To 26.0 GHz	Hewlett-Packard	8449B	3008A00480	3/04/2025
Loop Antenna	ETS Lindgren	6502	9810-3246	7/20/2024 2 yr.
Biconical Antenna	EMCO	3110B	9306-1708	1/13/2025 2yr.
Log Periodic Antenna	EMCO	3146	9110-3236	3/13/2026 2 yr.
Horn Antenna	EMCO	3115	9107-3723	3/13/2025 2 yr.
High Pass Filter	Microwave Circuits	H3R020G2	001DC9528	8/02/2024

Note 1: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

2.2 Modifications to EUT Hardware

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 15.247 requirements.

2.3 Number of Measurements for Intentional Radiators (15.31(m), RSS-Gen 6.8)

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated, with the device operating at the number of frequencies in each band specified in Table 3.

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range Over which the Device Operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates over 2403.5 to 2476.5 MHz, 3 test frequencies will be used.

2.4 Frequency Range of Radiated Measurements (Part 15.33, RSS-Gen 6.13)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation.

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2.5 Measurement Detector Function and Bandwidth (CFR 15.35, RSS-Gen 6.9, 6.13)

The radiated and conducted emissions limits shown herein are based on the following:

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the Quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified, there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz, the Resolution Bandwidth shall be at least 1 MHz.

2.6 EUT Antenna Requirements (CFR 15.203, RSS-Gen 6.7)

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 is considered sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4. Allowed Antenna(s)

REPORT REFERENCE	MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB _i	TYPE OF CONNECTOR
Antenna	Molex	Flex trace	1461530100	+3.2	u.fl

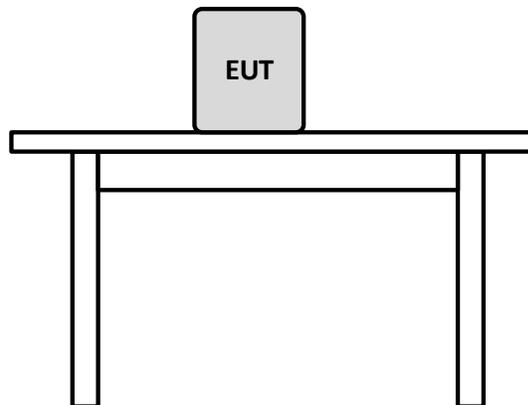


Figure 1. Block Diagram of Test Configuration

Note: PC used to program EUT for intentional spurious emissions

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2.7 Restricted Bands of Operation (Part 15.205, RSS-Gen 8.10)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious emissions cannot exceed the limits of 15.209. Radiated harmonics and other spurious emissions are examined for this requirement (see paragraph 2.10).

2.8 Transmitter Duty Cycle (Part 15.35 (c), RSS-Gen 6.10)

The EUT employs pulse transmission. However, for testing purpose the EUT was programmed to transmit at a rate >98%. The pulse transmission requirements of this subpart were acknowledged and considered during testing.

When the radiated emissions limit is expressed as an average value and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may also be expressed logarithmically in dB.

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2.9 Antenna Conducted Intentional and Spurious Emissions (CFR 15.209, 15.247(d)) (IC RSS 247, 5.5))

The EUT was put into a continuous-transmit mode of operation and tested per ANSI C63.10-2013 for conducted out-of-band emissions emanating from the antenna port over the frequency range of 30 MHz to ten times the highest clock frequency generated or used in this case, 25 GHz. A conducted scan was performed on the EUT to identify and record spurious signals that were related to the transmitter. Antenna Conducted Emissions of a significant magnitude that fell within restricted bands were then measured as radiated emissions in the EMC Chamber. The conducted emissions graphs are found in the figures below. The limit for antenna conducted power is 1 Watt (30 dBm) per 15.247 (b)(3).

For Conducted RF antenna tests, the RBW was set to 100 kHz, video bandwidth (VBW) > RBW, scan up through the 10th harmonic of the fundamental frequency. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band.



Figure 2. Bench Test Setup

Test Date: June 6-11, 2024

Tested by
Signature: *Ian Charboneau*

Name: Ian Charboneau

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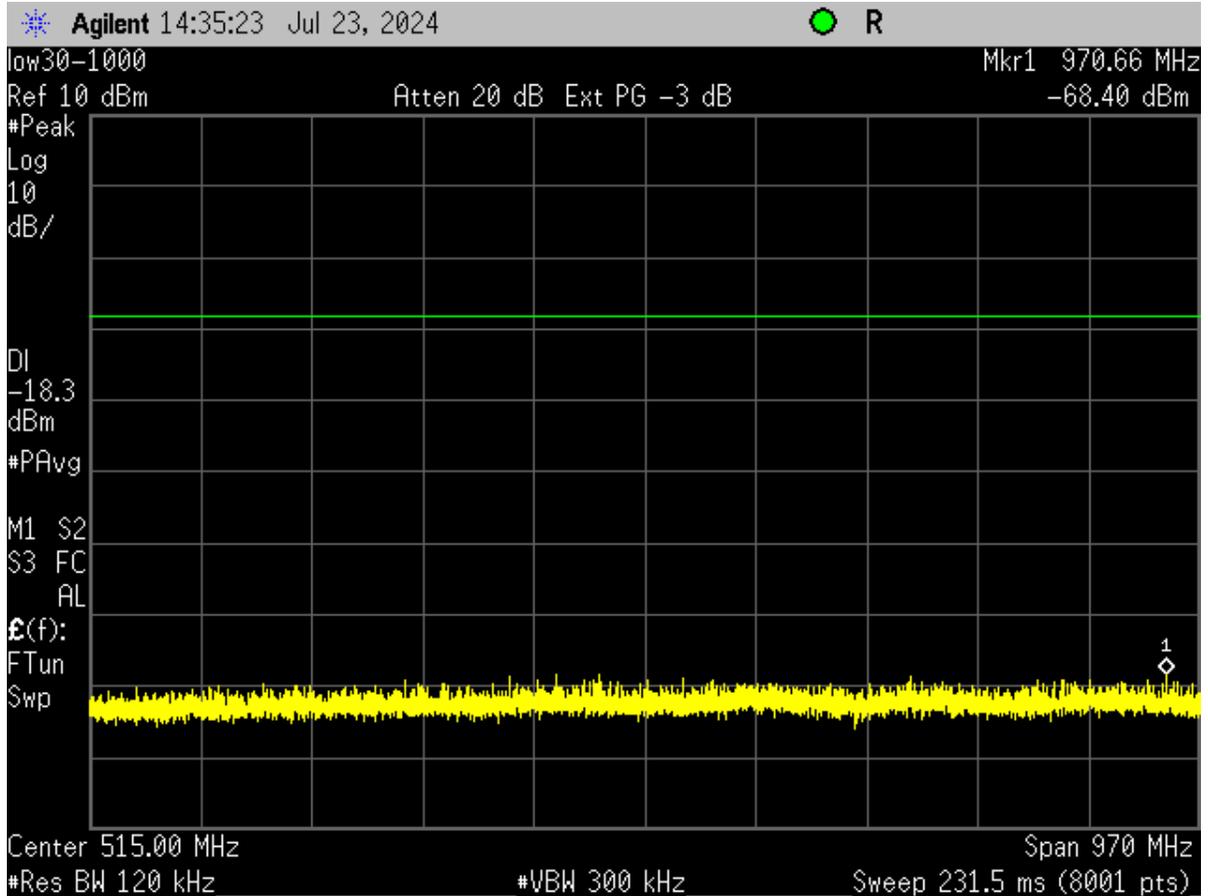


Figure 3. Low Channel, Cond Spurious Emissions 30 MHz - 1000 MHz

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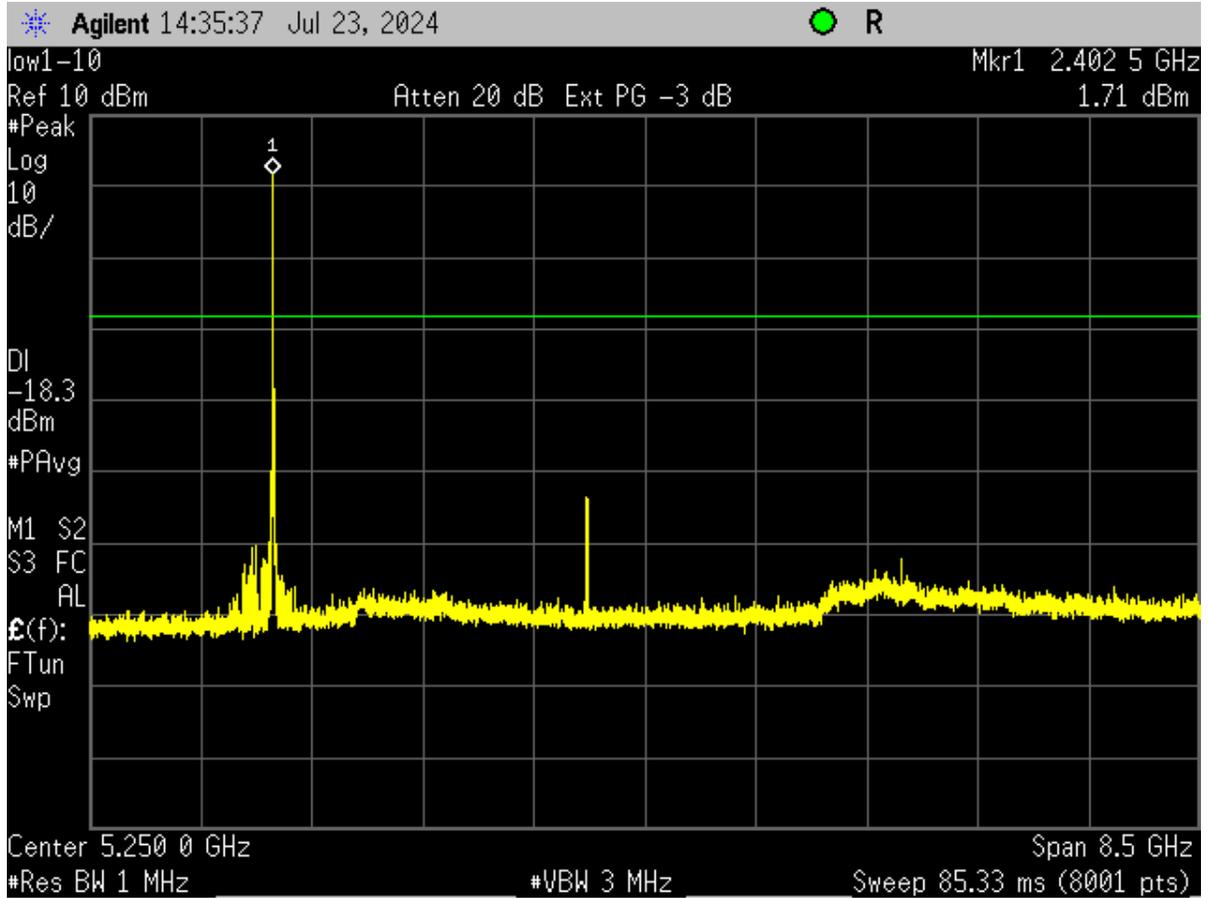


Figure 4. Low Channel, Cond Spurious Emissions 1 GHz - 8.5 GHz

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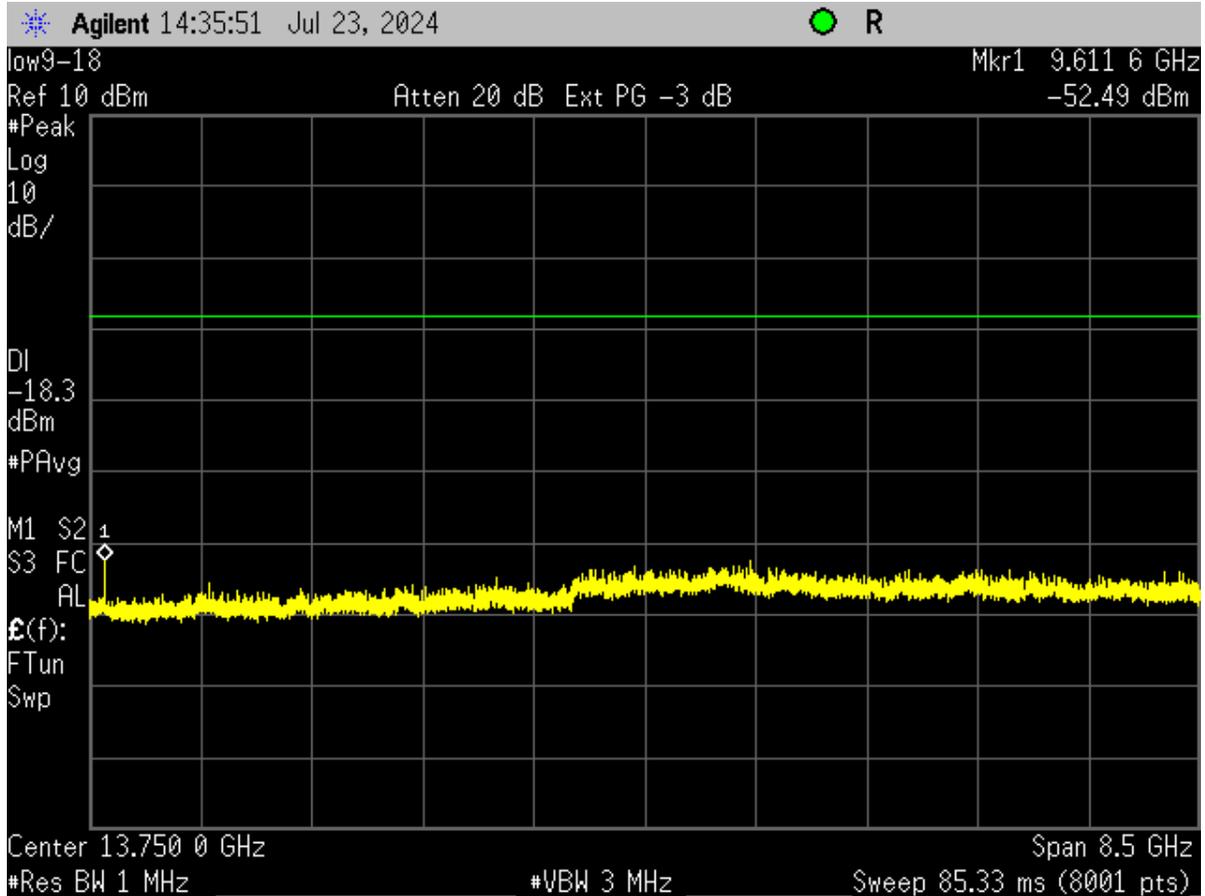


Figure 5. Low Channel, Cond Spurious Emissions 8.5 GHz - 18 GHz

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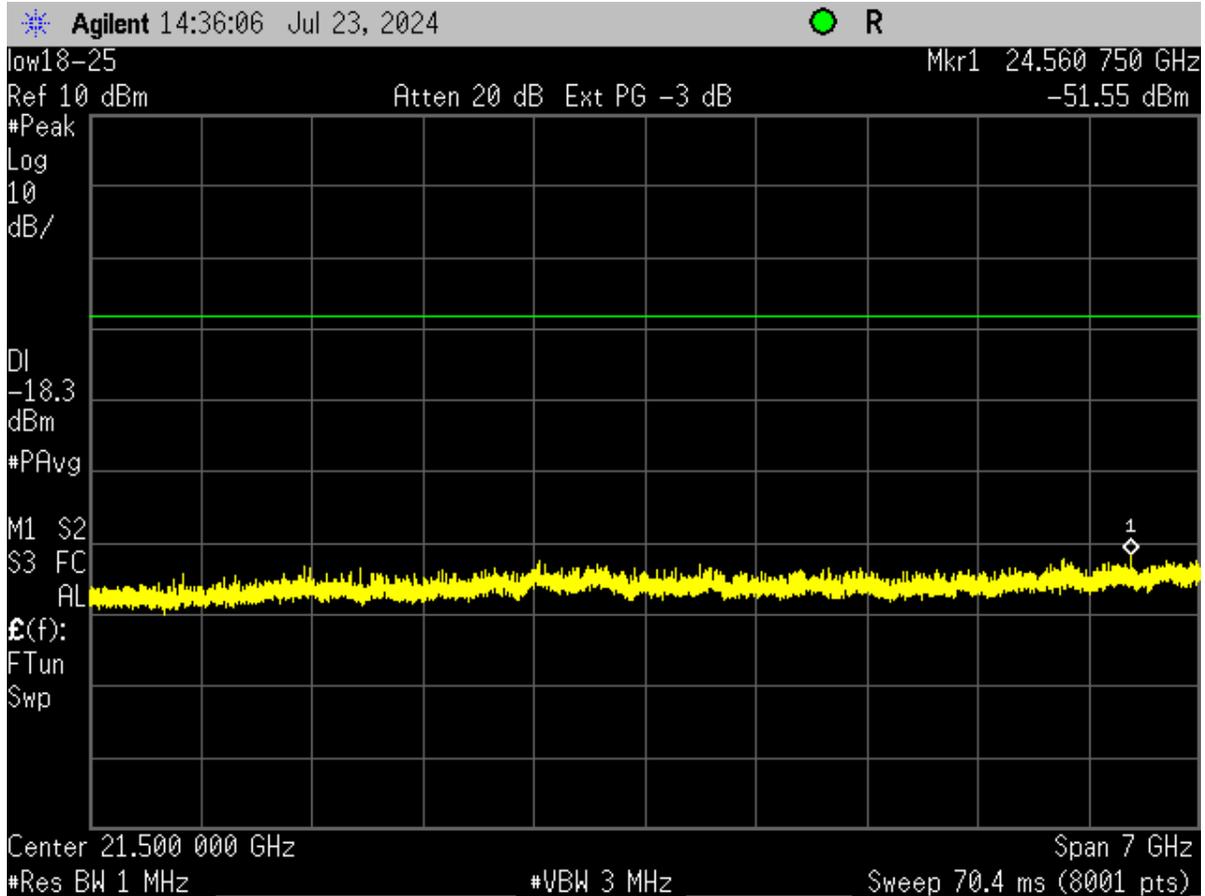


Figure 6. Low Channel, Cond Spurious Emissions 18 GHz – 25 GHz

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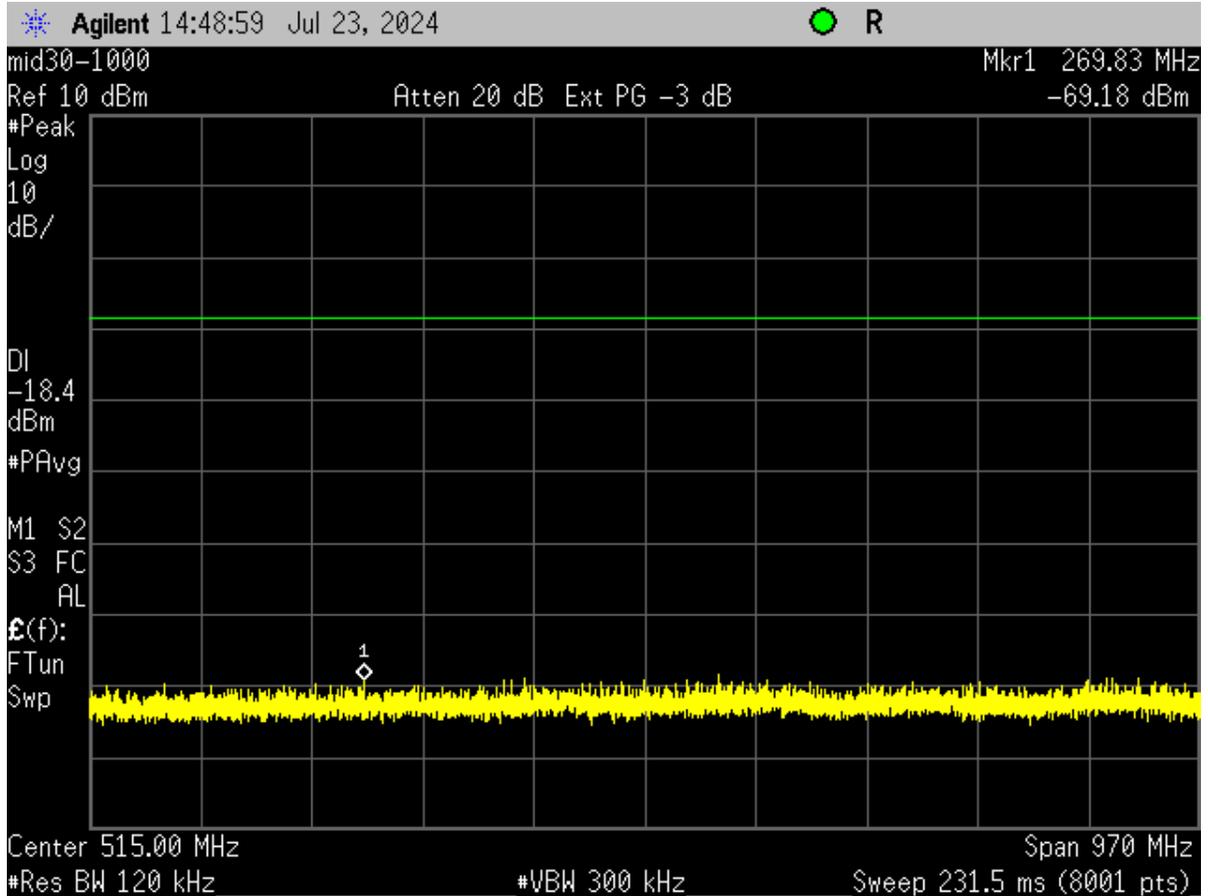


Figure 7. Mid Channel, Cond Spurious Emissions 30 MHz - 1000 MHz

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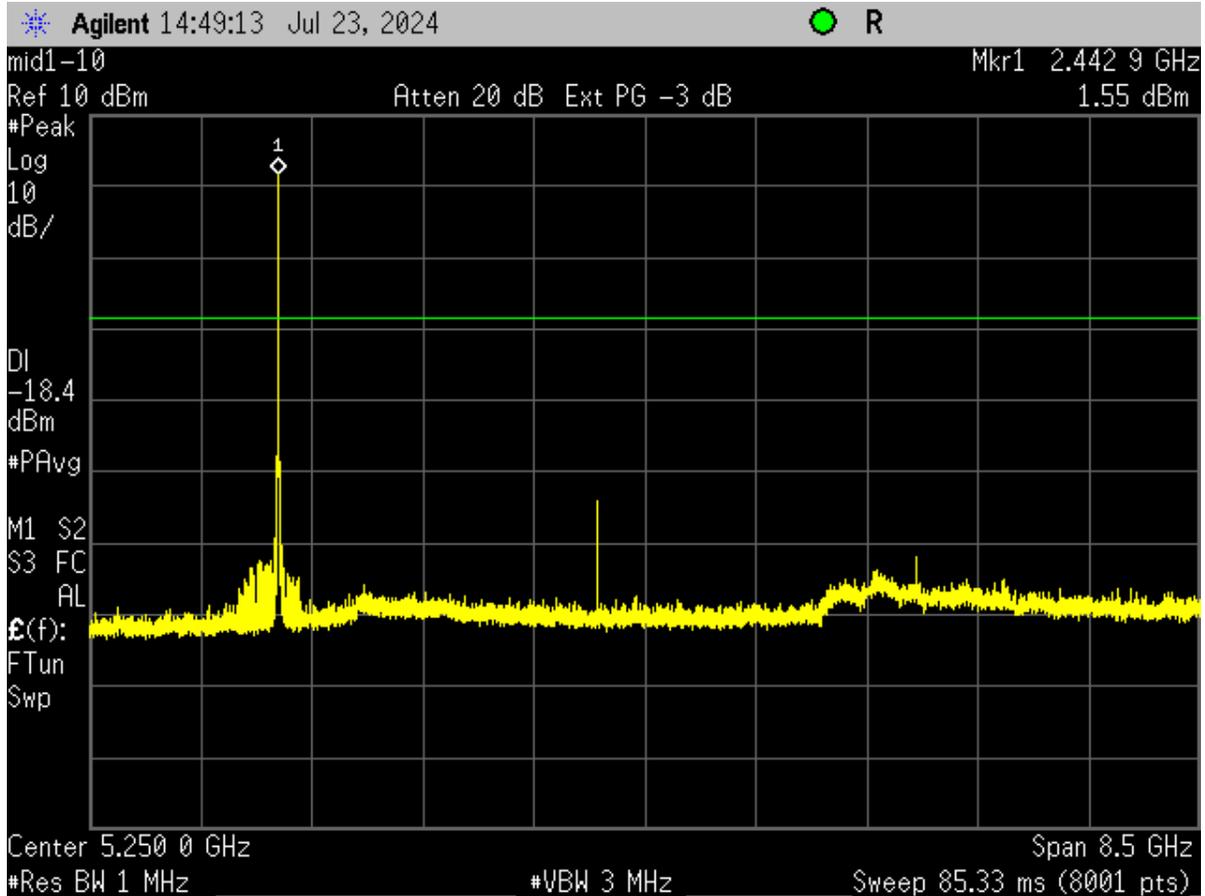


Figure 8. Mid Channel, Cond Spurious Emissions 1 GHz - 8.5 GHz

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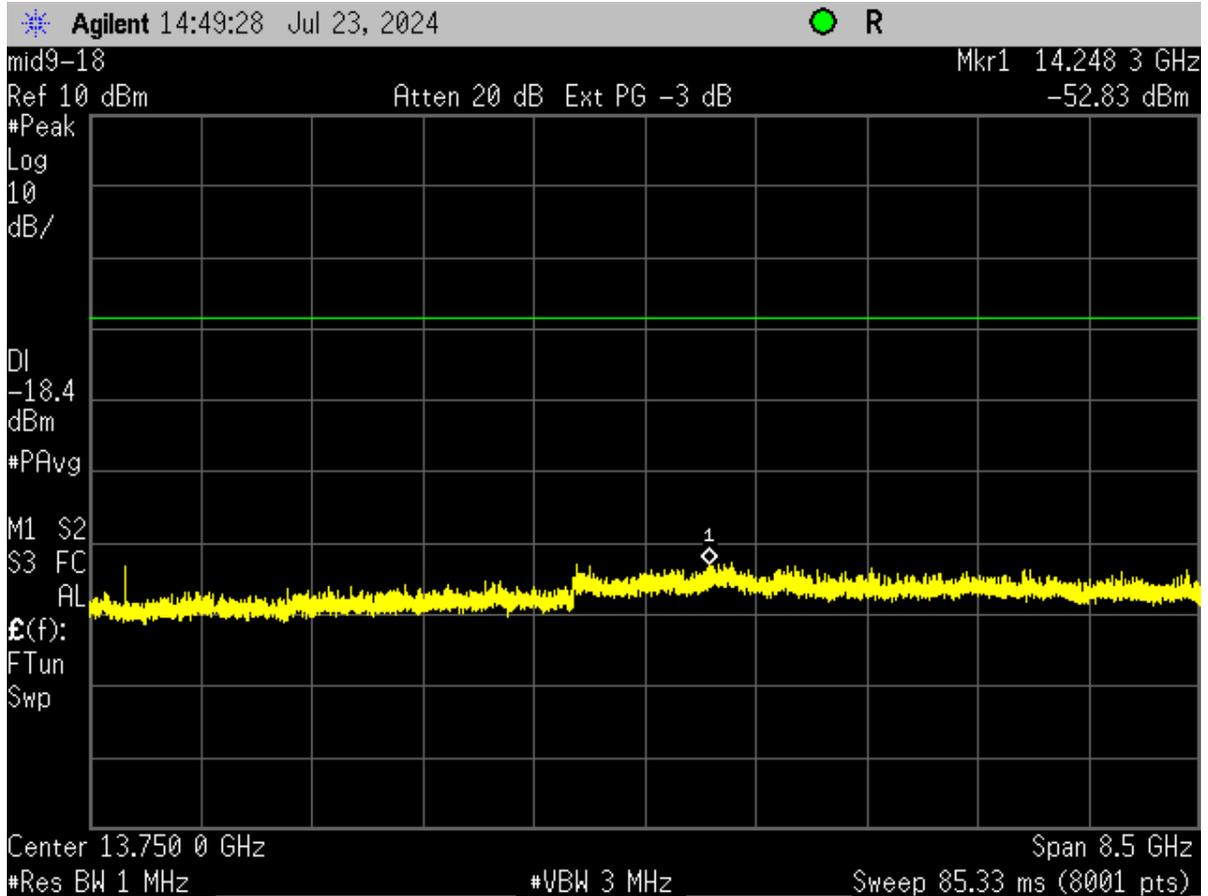


Figure 9. Mid Channel, Cond Spurious Emissions 8.5 GHz - 18 GHz

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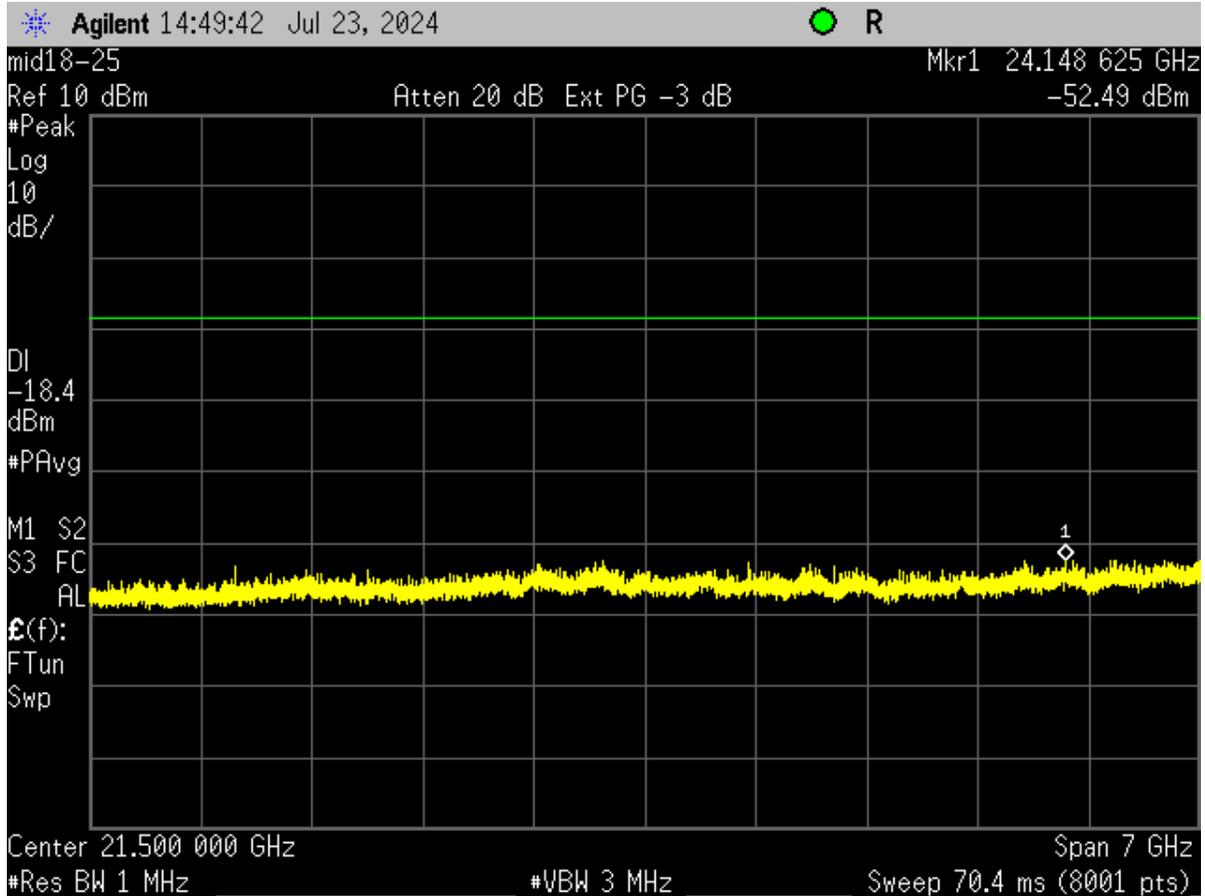


Figure 10. Mid Channel, Cond Spurious Emissions 18 GHz – 25 GHz

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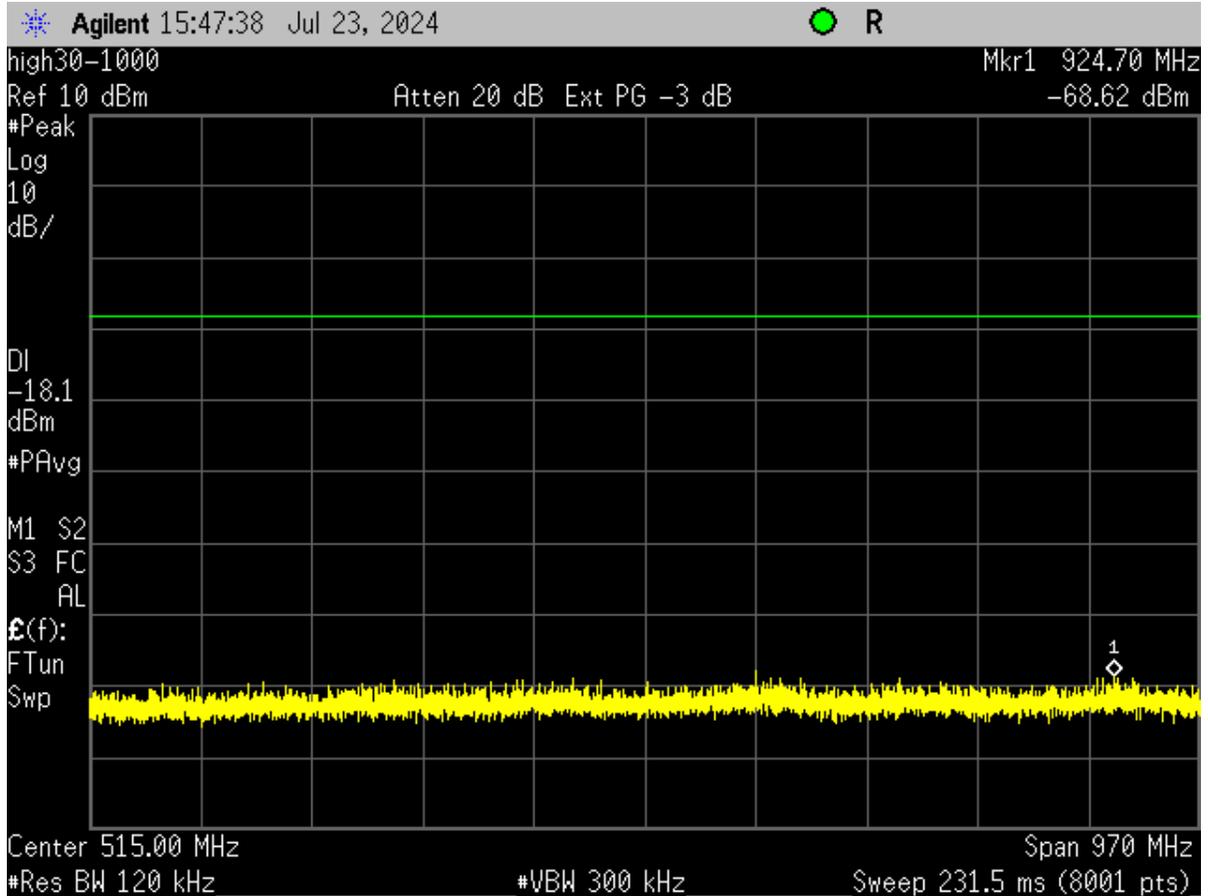


Figure 11. High Channel, Cond Spurious Emissions 30 MHz – 1000 MHz

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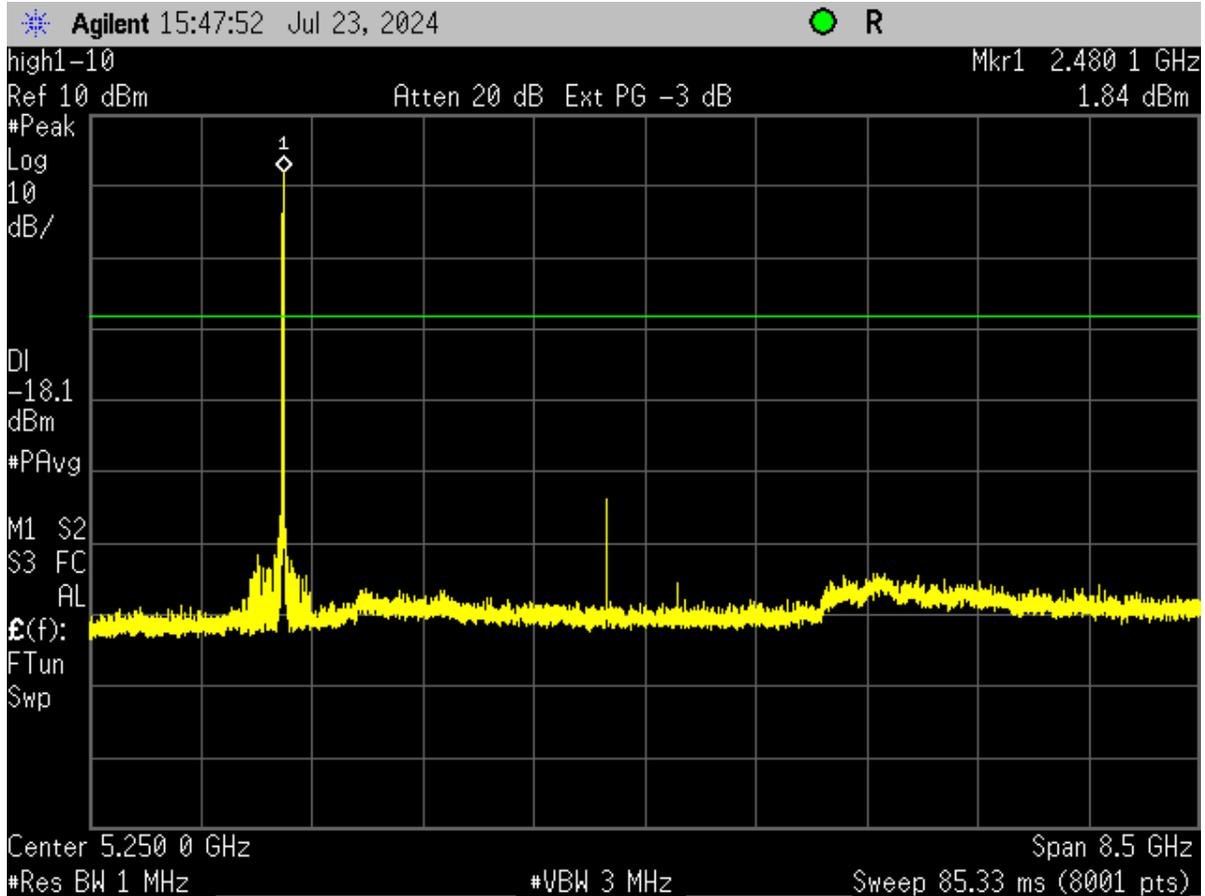


Figure 12. High Channel, Cond Spurious Emissions 1 GHz – 8.5 GHz

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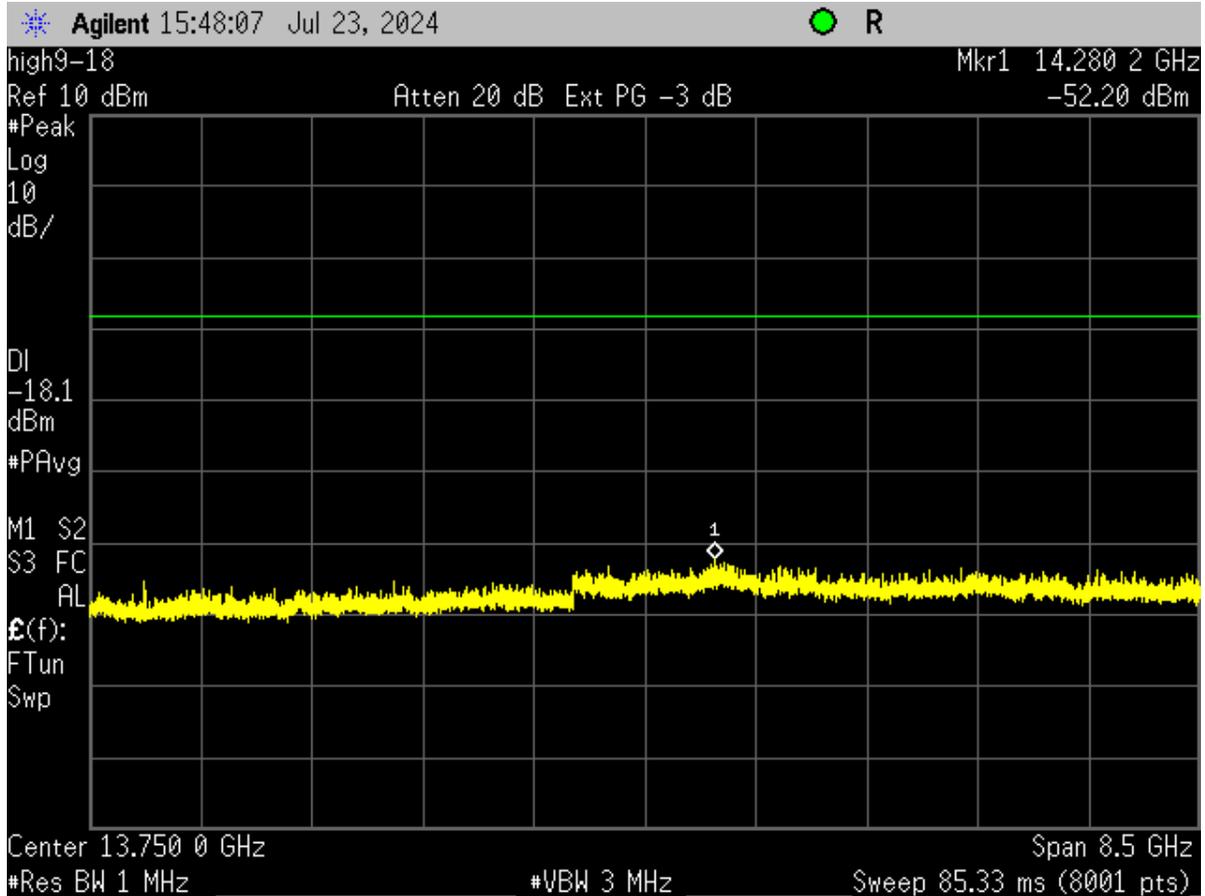


Figure 13. High Channel, Cond Spurious Emissions 8.5 GHz – 18 GHz

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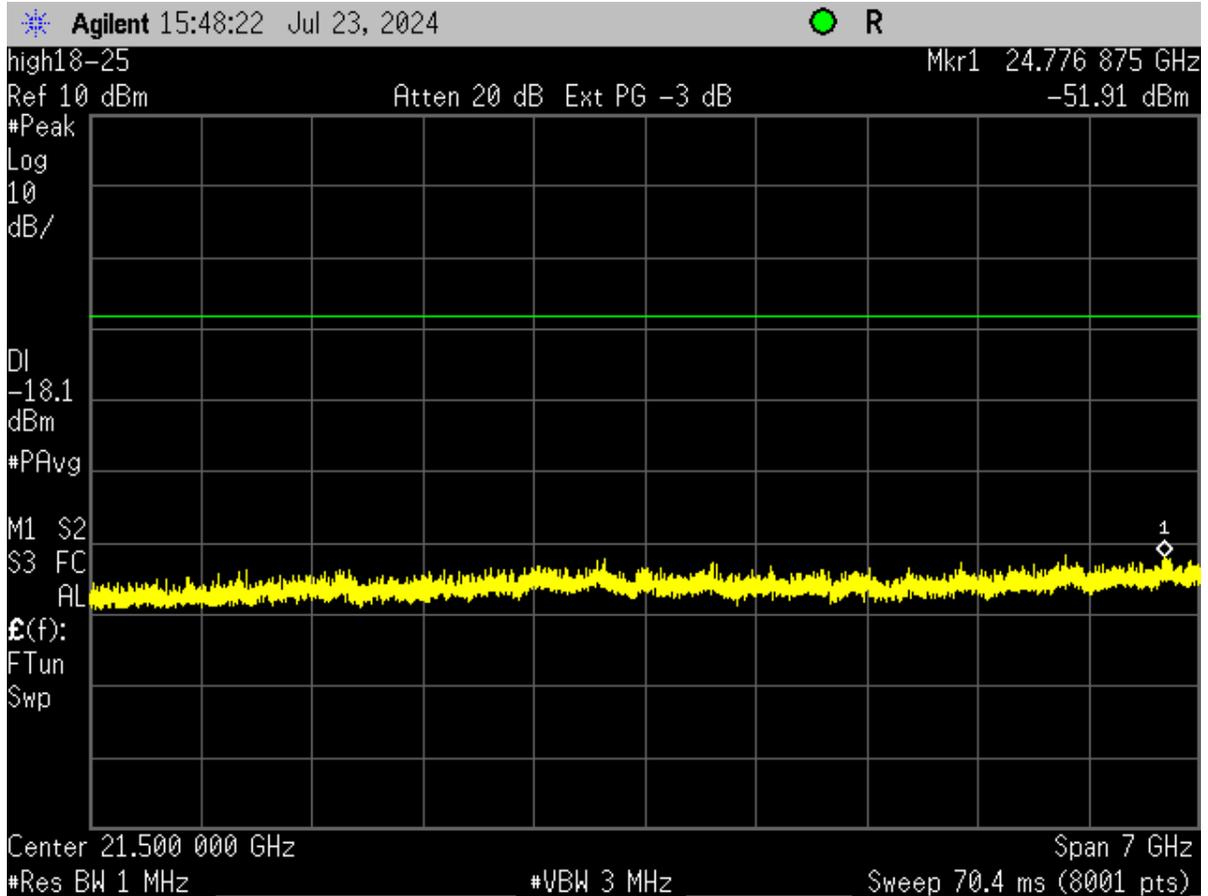


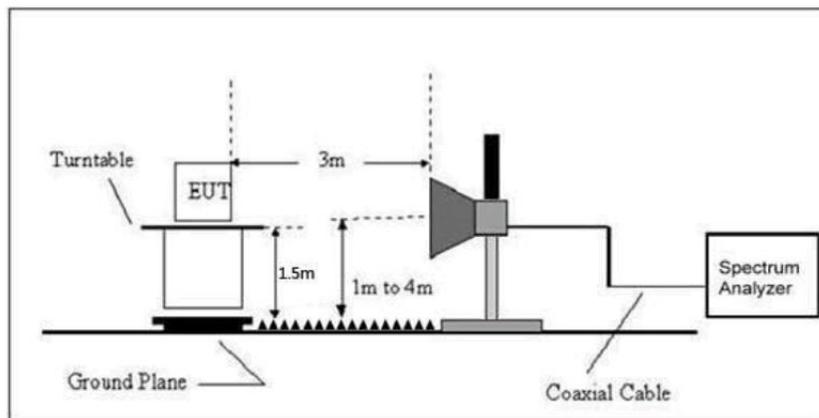
Figure 14. High Channel, Cond Spurious Emissions 18 GHz – 25 GHz

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d), RSS-247, 5.5)

On the test site, the EUT was placed on top of a non-conductive table 80 cm above the floor for measurements below 1 GHz and 150 cm above the floor for measurements > 1 GHz. The EUT was also evaluated in three orthogonal positions to determine the worst case position. The front of the EUT faced the measurement antenna located 3 meters away. Each signal measured was maximized by raising and lowering the receive antenna between 1 and 4 meters in height while monitoring the spectrum analyzer display (with channel A in the Clear-Write mode and channel B in the Max-Hold mode) for the largest signal visible. The exact antenna height where the signal was maximized was recorded for reproducibility purposes. Additionally, the EUT was rotated about its Y-axis while monitoring the Spectrum Analyzer display for maximum. The EUT azimuth was recorded for reproducibility purposes. The EUT was measured when both maxima were simultaneously satisfied.

For radiated measurements, the EUT was set into a continuous transmit mode. Below 1 GHz, the RBW of the measuring instrument was set equal to 120 kHz. Peak measurements above 1 GHz were measured using a RBW = 1 MHz, with a VBW \geq RBW. The results of peak radiated spurious emissions falling within restricted bands are given in Table 6 below.

For average measurements above 1 GHz, the emissions were measured using RBW = 1 MHz and VBW = 10 Hz, or the duty cycle correction factor was applied to the Peak recorded value.



**Figure 15. Radiated Emissions Setup
(Fundamental and Harmonics)**

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 IC:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

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Table 5. Radiated Fundamental & Harmonic Emissions- PEAK

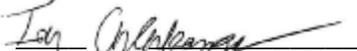
Test: FCC Part 15,247(d)								
Frequency (MHz)	Test Data (dBuV)	Additional Factor	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
Low Channel - PEAK								
2403.99	68.62	0.00	31.32	99.94	--	3.0m./VERT	--	PK
4805.93	63.58	0.00	2.62	66.20	74.0	3.0m./VERT	7.8	PK
7211.73	39.68	0.00	8.27	47.95	74.0	3.0m./HORZ	26.1	PK
9615.86	38.02	0.00	9.17	47.19	74.0	3.0m./VERT	26.8	
Mid Channel – PEAK								
2443.49	70.50	0.00	31.39	101.89	--	3.0m./VERT	--	PK
4887.94	63.51	0.00	2.66	66.17	74.0	3.0m./VERT	7.8	PK
7331.78	39.35	0.00	8.74	48.09	74.0	3.0m./VERT	25.9	PK
9775.99	37.59	0.00	10.69	48.28	74.0	3.0m./VERT	25.7	
High Channel– PEAK								
2476.50	69.93	0.00	31.29	101.22	--	3.0m./VERT	--	PK
4951.96	63.65	0.00	2.34	65.99	74.0	3.0m./VERT	8.0	PK
7430.85	36.95	0.00	8.60	45.55	74.0	3.0m./VERT	28.5	PK
9907.89	37.07	0.00	10.50	47.57	74.0	3.0m./VERT	26.4	

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209& 15.247.
2. No other signals detected within 20 dB of specification limit. Harmonics are investigated up to the 10th harmonic.
3. The EUT was placed in three orthogonal positions, tested while broadcasting from each antenna, and the transmitter was in constant broadcast mode with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 2403.99 MHz:

Magnitude of Measured Frequency	68.62	dBuV
+Additional Factor	0.00	dB
+Antenna Factor + Cable Loss+ Amplifier Gain	31.32	dB/m
Corrected Result	99.94	dBuV/m

Test Date: August 21, 2024

Tested by
 Signature: 

Name: Ian Charboneau

US Tech Test Report:
 FCC ID:
 IC:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

FCC Part 15/IC RSS Certification
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Table 6. Sensor-Average Radiated Fundamental & Harmonic Emissions

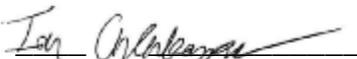
Test: FCC Part 15,247(d)								
Frequency (MHz)	Test Data (dBuV)	Additional Factor	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
Low Channel - Average								
2403.52	52.01	0.00	31.35	83.36	--	3.0m./VERT	--	AVG
4807.96	45.19	0.00	2.45	47.64	54.0	3.0m./VERT	6.4	AVG
7211.73	26.44	0.00	8.27	34.71	54.0	3.0m./HORZ	19.3	AVG
9615.86	24.82	0.00	9.17	33.99	54.0	3.0m./VERT	20.0	AVG
Mid Channel-Average								
2443.49	53.31	0.00	31.39	84.70	--	3.0m./VERT	--	AVG
4887.94	45.20	0.00	2.66	47.86	54.0	3.0m./VERT	6.1	AVG
7331.78	27.39	0.00	8.74	36.13	54.0	3.0m./VERT	17.9	AVG
9775.99	25.59	0.00	10.69	36.28	54.0	3.0m./VERT	17.7	AVG
High Channel-Average								
2476.50	52.85	0.00	31.29	84.14	--	3.0m./VERT	--	AVG
4954.02	45.41	0.00	2.34	47.75	54.0	3.0m./VERT	6.2	AVG
7430.85	24.00	0.00	8.60	32.60	54.0	3.0m./VERT	21.4	AVG
9907.89	25.61	0.00	10.50	36.11	54.0	3.0m./VERT	17.9	AVG

- (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 CFR 15.35.
- No other signals detected within 20 dB of specification limit. Harmonics are investigated up to the 10th harmonic
- The EUT was placed in three orthogonal positions, tested while broadcasting from each antenna, and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 2403.52 MHz:

Magnitude of Measured Frequency	52.01	dBuV
+Additional Factor (filter + duty cycle)	0.00	dB
+Antenna Factor + Cable Loss+ Amplifier Gain – Duty Cycle	31.35	dB/m
Corrected Result	83.36	dBuV/m

Test Date: August 21, 2024

Tested by
 Signature: 

Name: Ian Charboneau

2.11 Band Edge Measurements (CFR 15.247(d), RSS-247, 5.5)

Band Edge measurements are made following the guidelines in ANSI C63.10-2013 Clause 6.10 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Restricted band and band edge tests are performed as radiated measurements. The test instrument used for testing has both Peak and Average detection. In consideration of Clause 5.8 of ANSI C63.10-2013, the EUT was set to its highest rated output power level during testing. The results are collected and presented below.

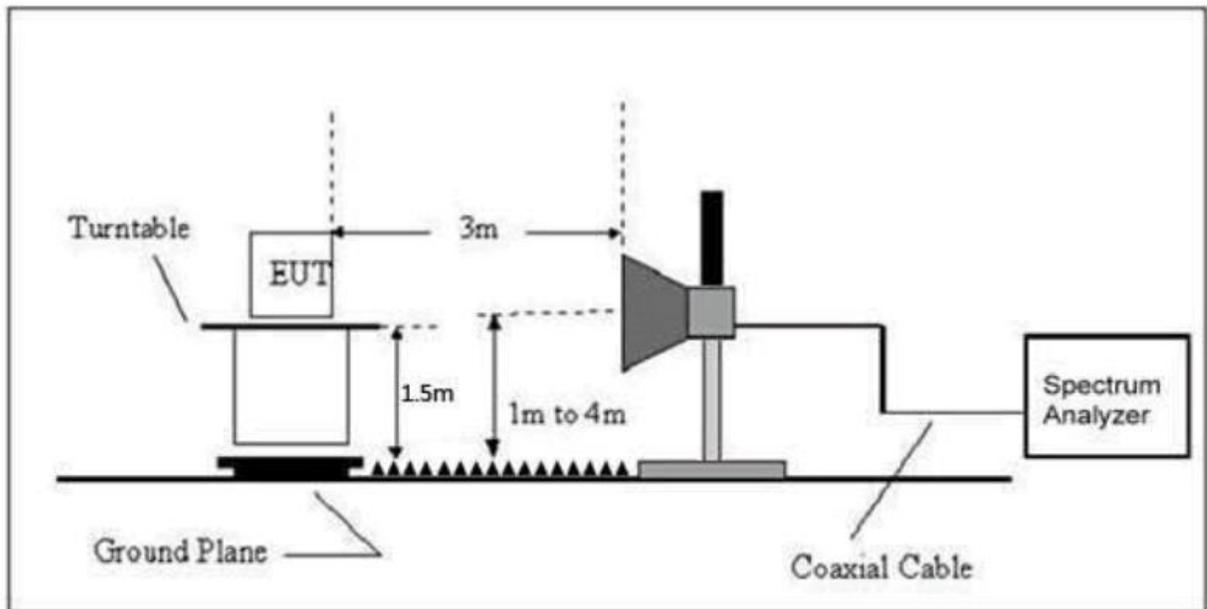


Figure 16. Radiated Emissions Setup

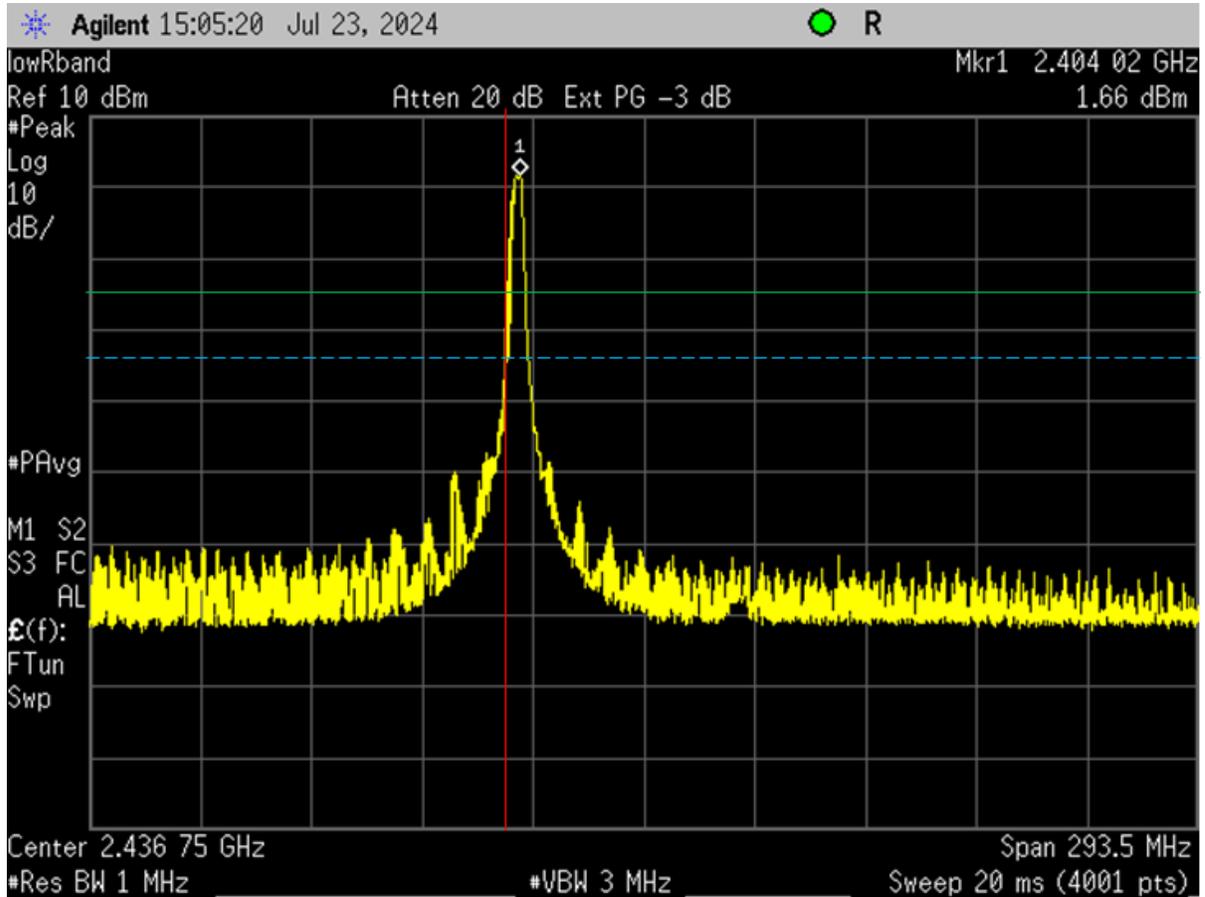


Figure 17. Band Edge Compliance, Low Channel- Peak

RED display line = 2400 MHz.
GREEN display line= 20dBc
Dash line= 54 dBuV/m @ 3m

Lower bandedge meets the 20 dBc requirement.

The emissions within the band 2310 – 2390 MHz are below the restricted band limits.

The EUT meets the low channel bandedge and restricted band limits.

Test Date: July 23, 2024

Tested by
Signature: *Ian Charboneau*

Name: Ian Charboneau

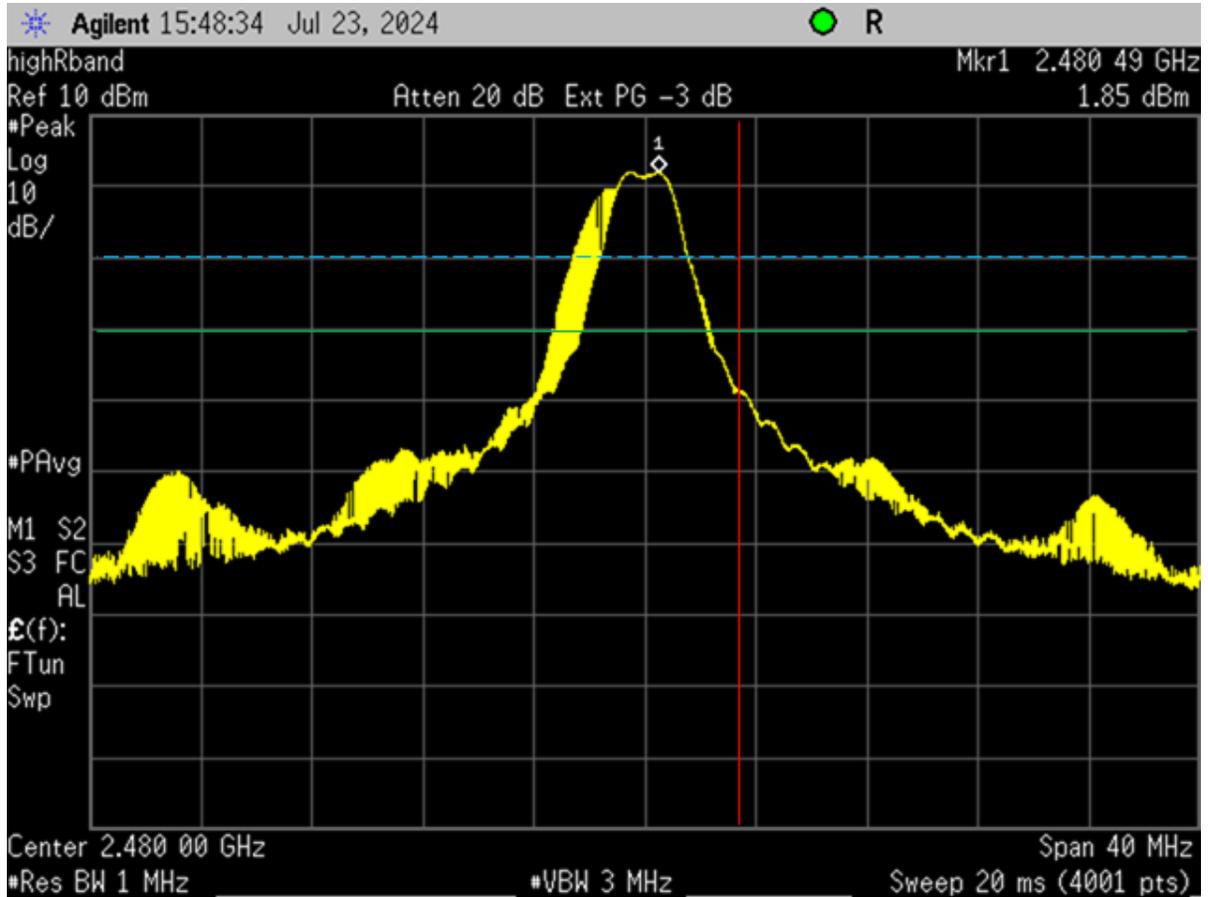


Figure 18. Band Edge Compliance, High Channel- Peak

RED display line = 2483.5 MHz.

GREEN display line= 20dBc

Dash line= 74 dBuV/m @ 3m

Upper bandedge meets the 20 dBc requirement.

The emissions within the band 2483.5 – 2500 MHz are below the Peak restricted band limits.

Test Date: July 23, 2024

Tested by

Signature: *Ian Charboneau*

Name: Ian Charboneau

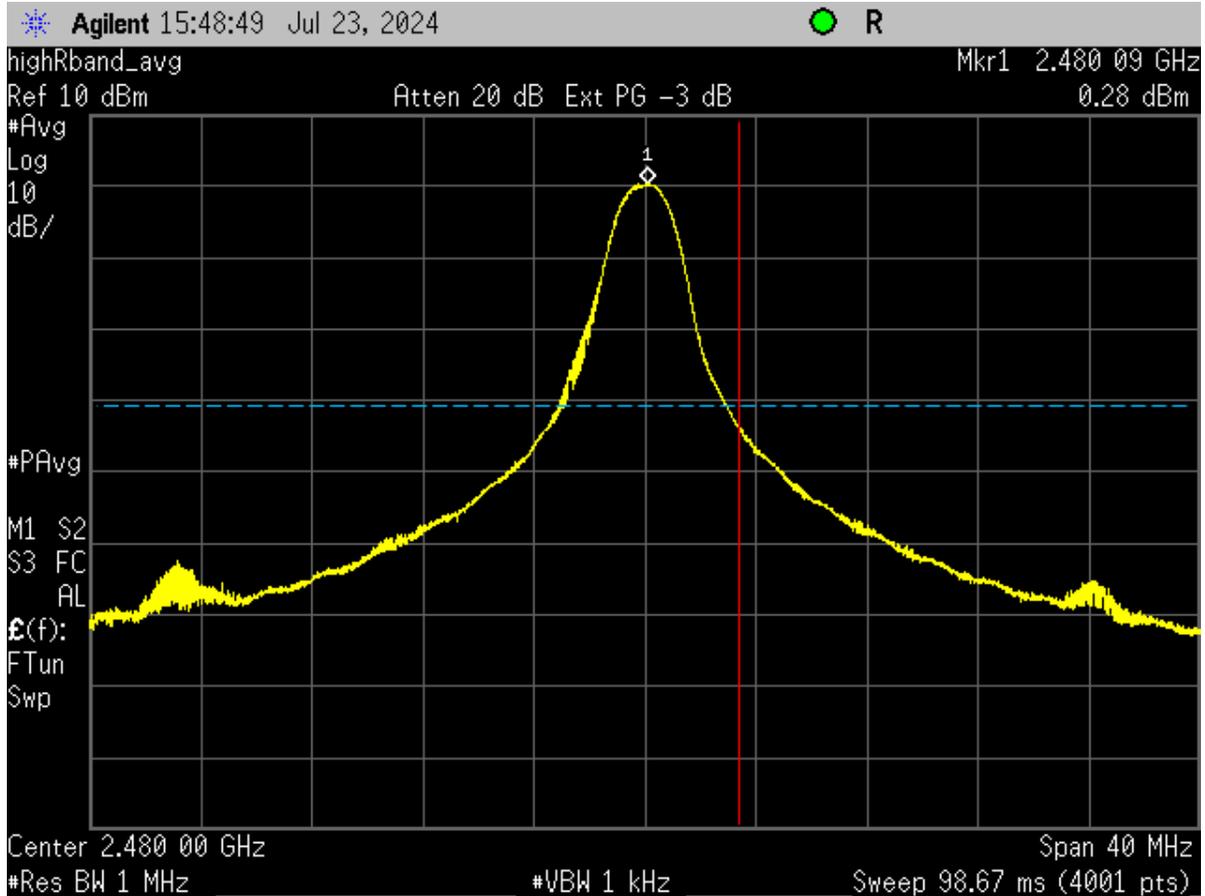


Figure 19. Band Edge Compliance, High Channel- Average

RED display line = 2483.5 MHz.
Dash line= 54 dBuV/m @ 3m

The emissions within the band 2483.5 – 2500 MHz are below the AVG restricted band limits.

The EUT meets the Upper channel bandedge and restricted band limits.

Test Date: July 23, 2024

Tested by
Signature: Ian Charboneau

Name: Ian Charboneau

US Tech Test Report:
 FCC ID:
 IC:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

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2.12 Six (6) dB Bandwidth (CFR 15.247(a)(2), RSS-247, 5.2(a))

The EUT antenna port was connected to a spectrum analyzer having a 50 Ω input impedance. Measurements were performed per ANSI C63.10-2013, clause 11.8. The RBW was set to 100 kHz and the VBW ≥ RBW. The results of this test are given in the table and figures below.



Figure 20. Bench Test Setup

Table 7. Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
2403.50	1.537	0.5
2443.50	1.590	0.5
2476.50	1.585	0.5

Test Date: July 23, 2024

Tested by
 Signature: *Ian Charboneau*

Name: Ian Charboneau

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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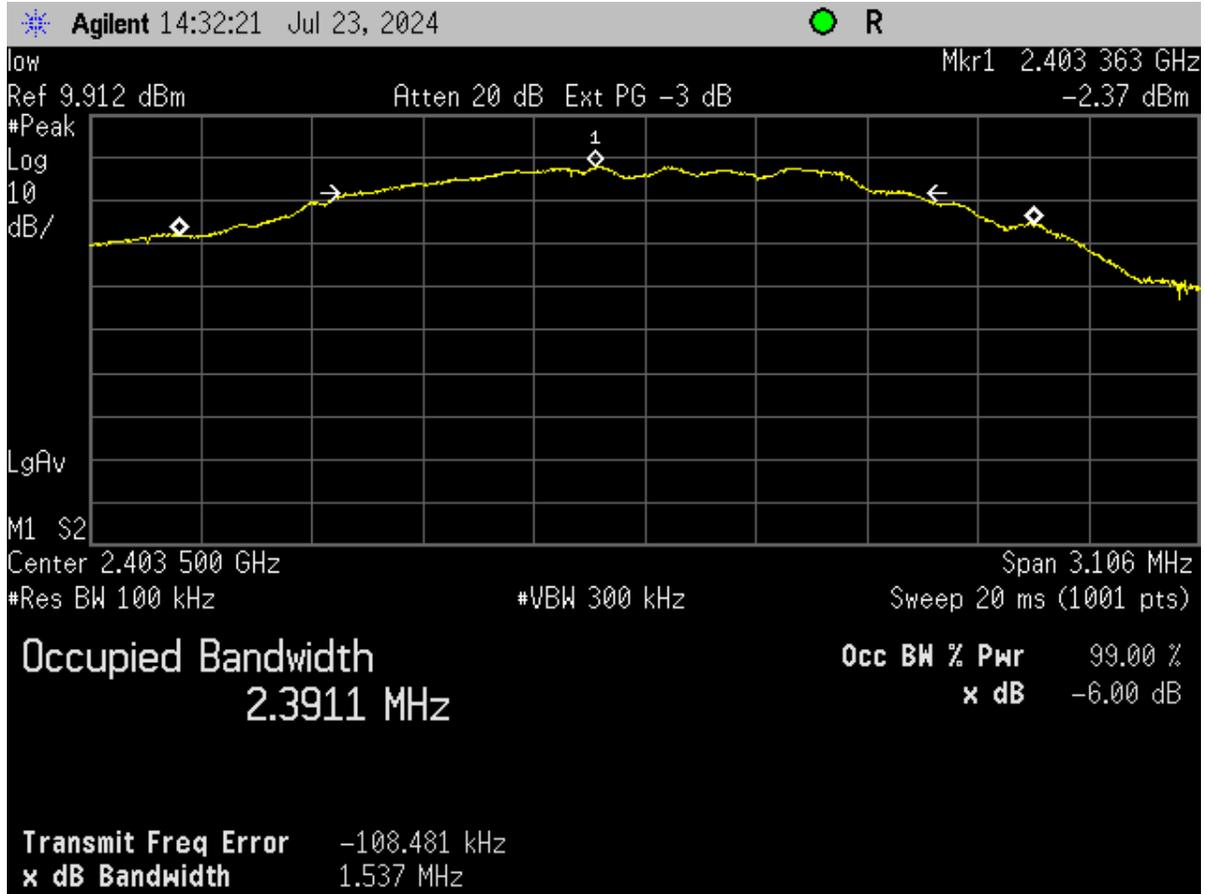


Figure 21. Low Channel DTS Bandwidth

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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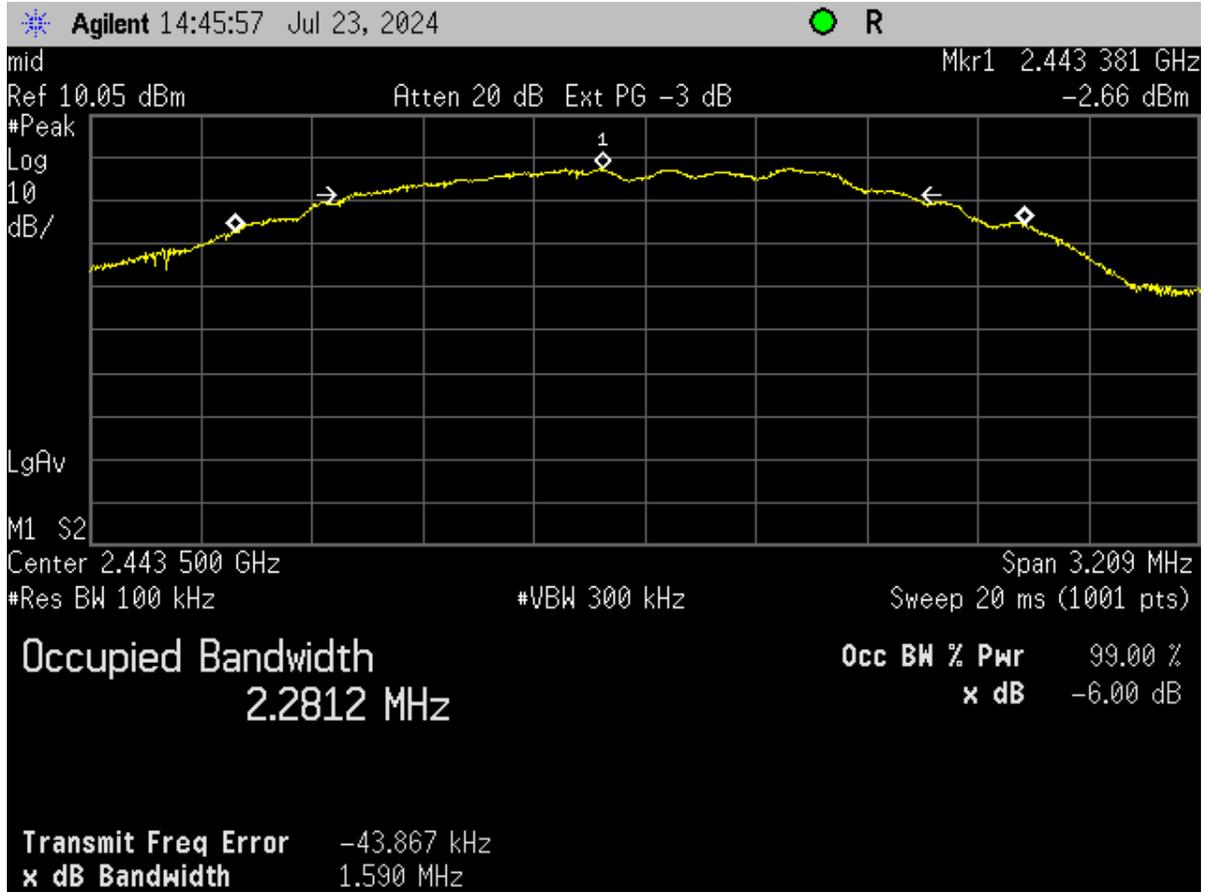


Figure 22. Mid Channel DTS Bandwidth

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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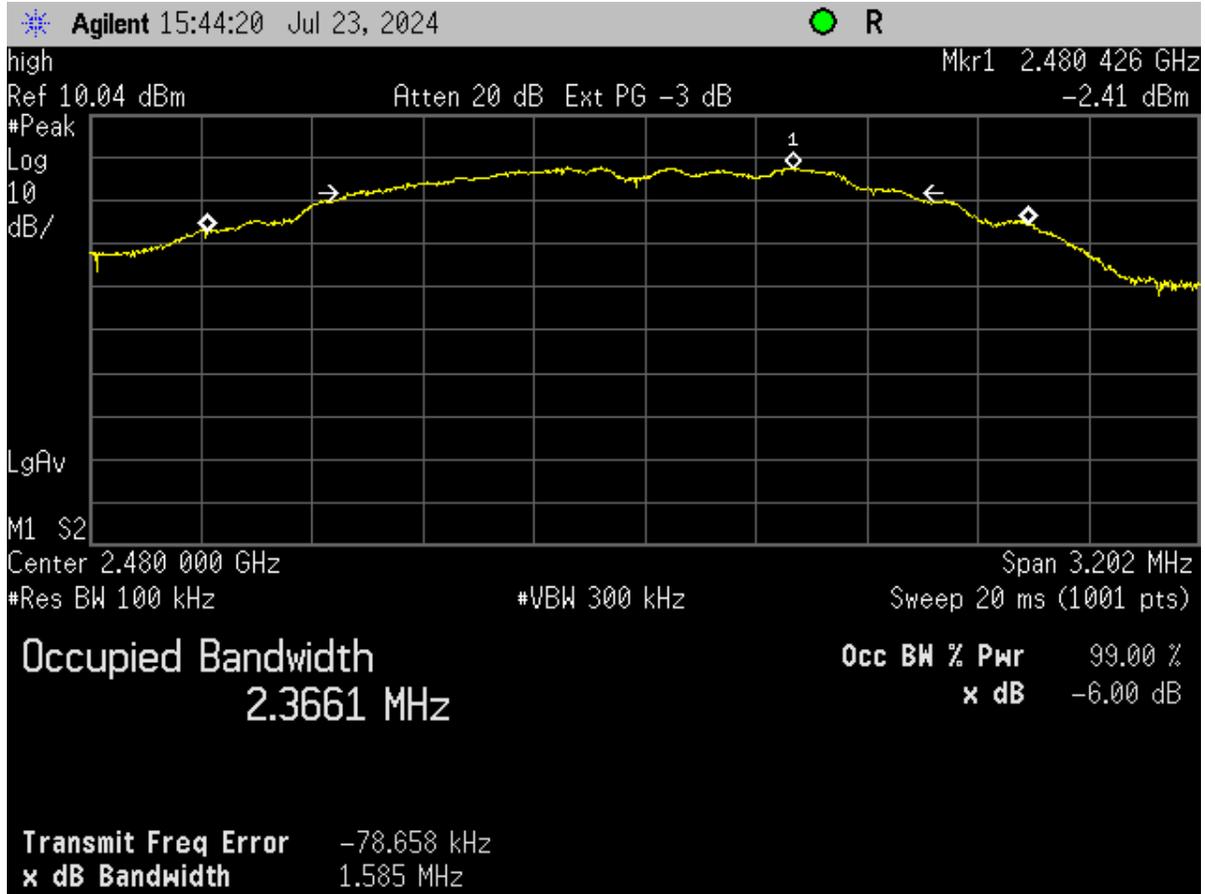


Figure 23. High Channel DTS Bandwidth

2.13 Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))

The transmitter was programmed to operate at a maximum output power across the bandwidth. For this test the output power of the radio was set to the maximum data rate, with 11Mbps for mode b, 54 Mbps for made g, and MSC-7 for mode n, in order to meet all test requirements.

Peak power within the band 2400 MHz to 2483.5 MHz was measured per ANSI C63.10-2013 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, and attenuators to the antenna output terminals on the EUT. The spectrum analyzer was set to a RBW of 1 MHz, and the VBW \geq RBW. The integration method was used. Peak antenna conducted output power is tabulated below.



Figure 24. Bench Test Setup

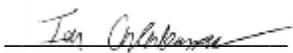
US Tech Test Report:
FCC ID:
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Table 8. Peak Antenna Conducted Output Power per Part 15.247 (b)(3)

Frequency of Fundamental (MHz)	Raw Test Data dBm	Converted Data (mW)	FCC Limit (mW Maximum)
2403.5	1.73	1.490	1000
2443.5	1.61	1.449	1000
2476.5	1.89	1.545	1000

Test Date: July 23, 2024

Tested by
Signature: 

Name: Ian Charboneau

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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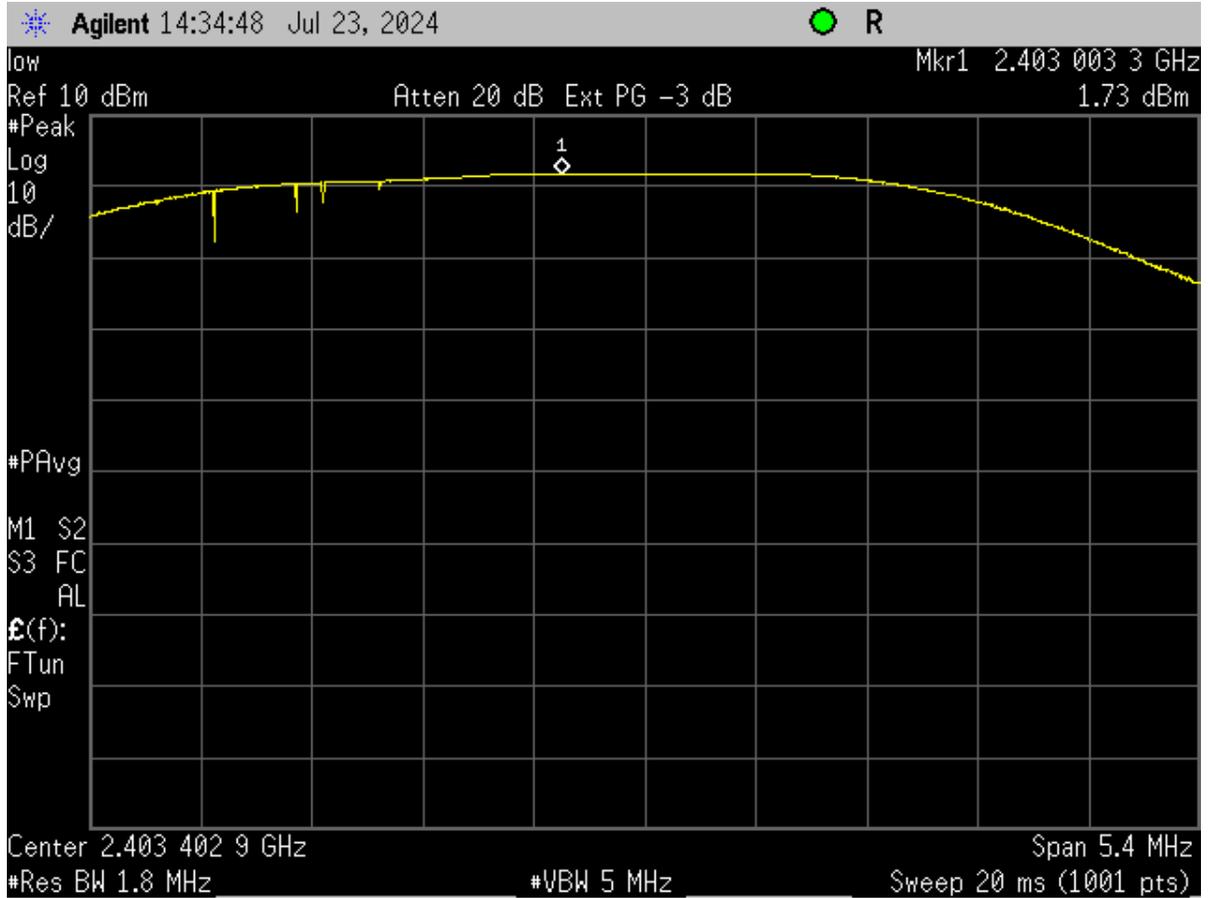


Figure 25. Low Channel Conducted Maximum Output Power

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
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Customer:
Model:

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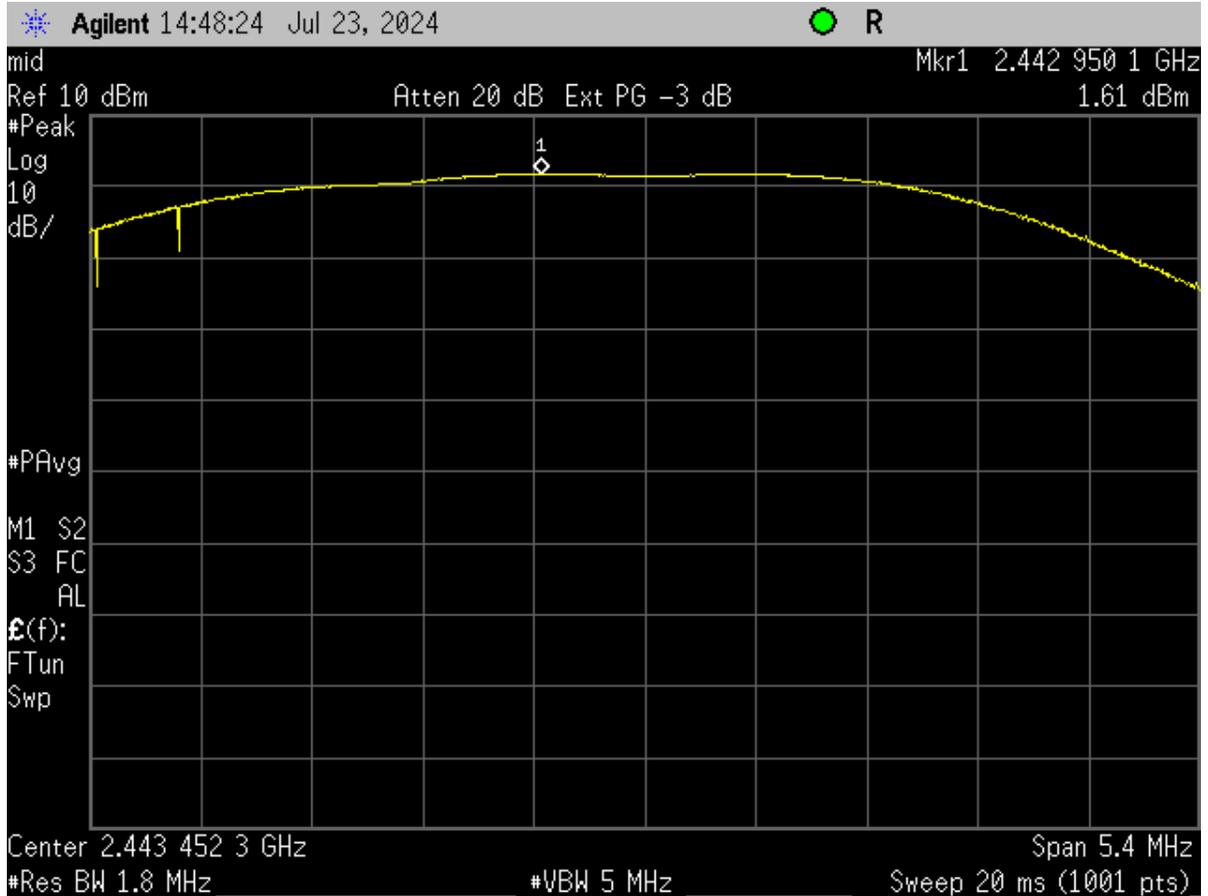


Figure 26. Mid Channel Conducted Maximum Output Power

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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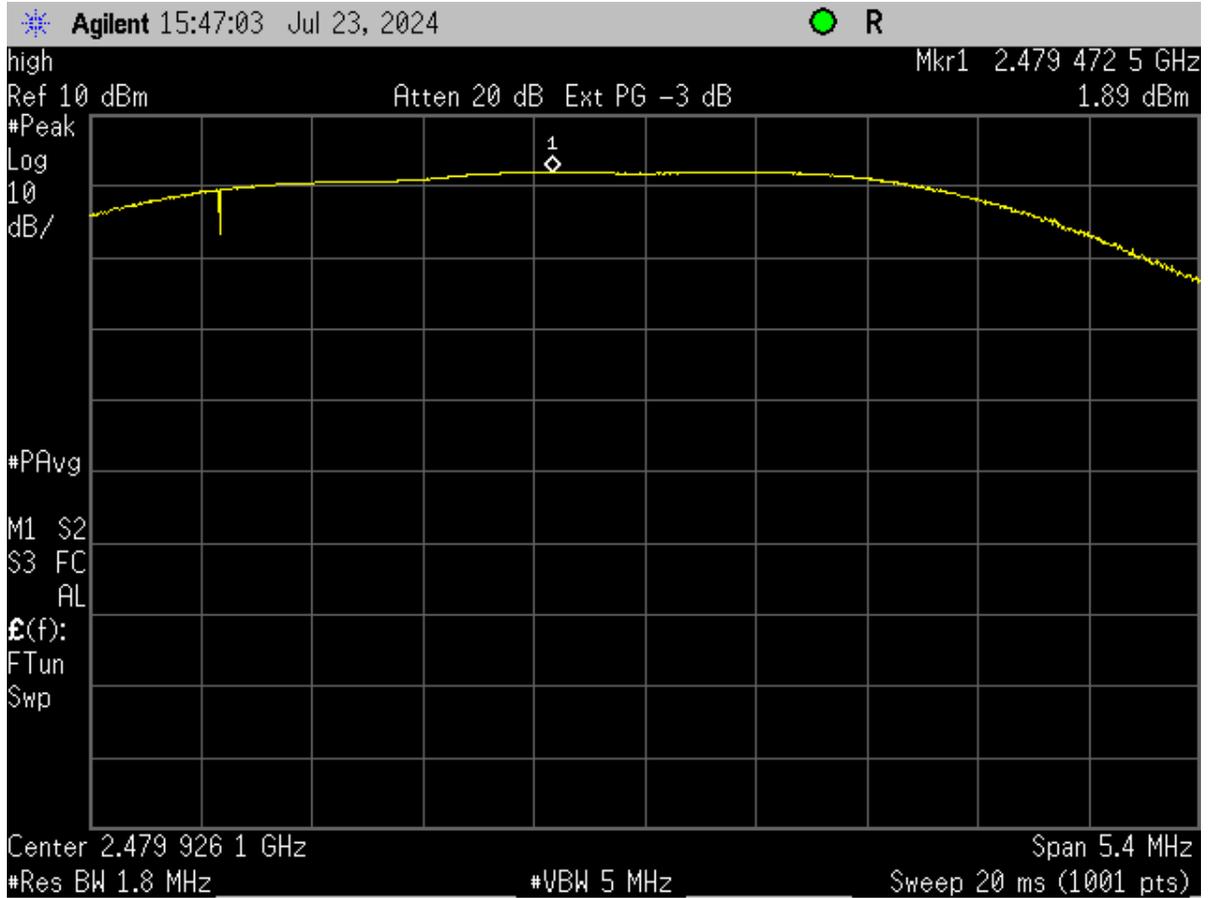


Figure 27. High Channel Conducted Maximum Output Power

2.14 Power Spectral Density (CFR 15.247(e), RSS-247, 5.2(b))

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of ANSI C63.10-2013. The RBW was set to 3 kHz, and the Video Bandwidth was set to \geq RBW. The trace capture time was set to (Span/3 kHz).

In accordance with 15.247 (e), the power spectral density shall be no greater than +8 dBm per any 3 kHz band.

Results are shown in the table and figures below. All are less than +8 dBm per 3 kHz band.



Figure 28. Bench Test Setup

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Model:

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Table 9. Power Spectral Density for Low, Mid and High Bands

Frequency (MHz)	Measured Result (dBm/3 kHz)	FCC Limit (dBm/3 kHz)
2403.5	-6.83*	+8.0
2443.5	-7.30*	+8.0
2476.5	-7.16*	+8.0

*= RBW @ 30 kHz

Test Date: July 23, 2024

Tested by
Signature: 

Name: Ian Charboneau

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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Figure 29. Low Channel PSD

US Tech Test Report:
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IC:
Test Report Number:
Issue Date:
Customer:
Model:

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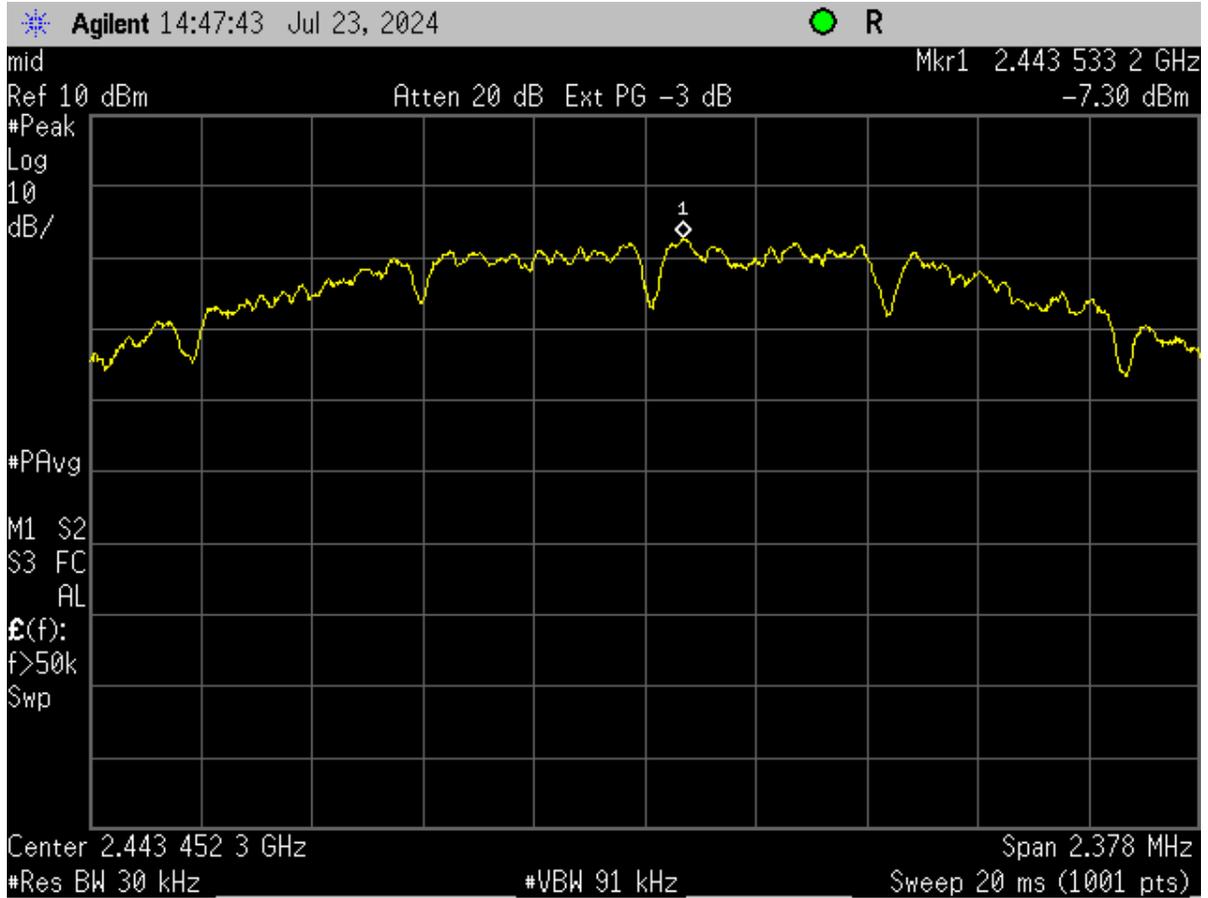


Figure 30. Mid Channel PSD

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15/IC RSS Certification
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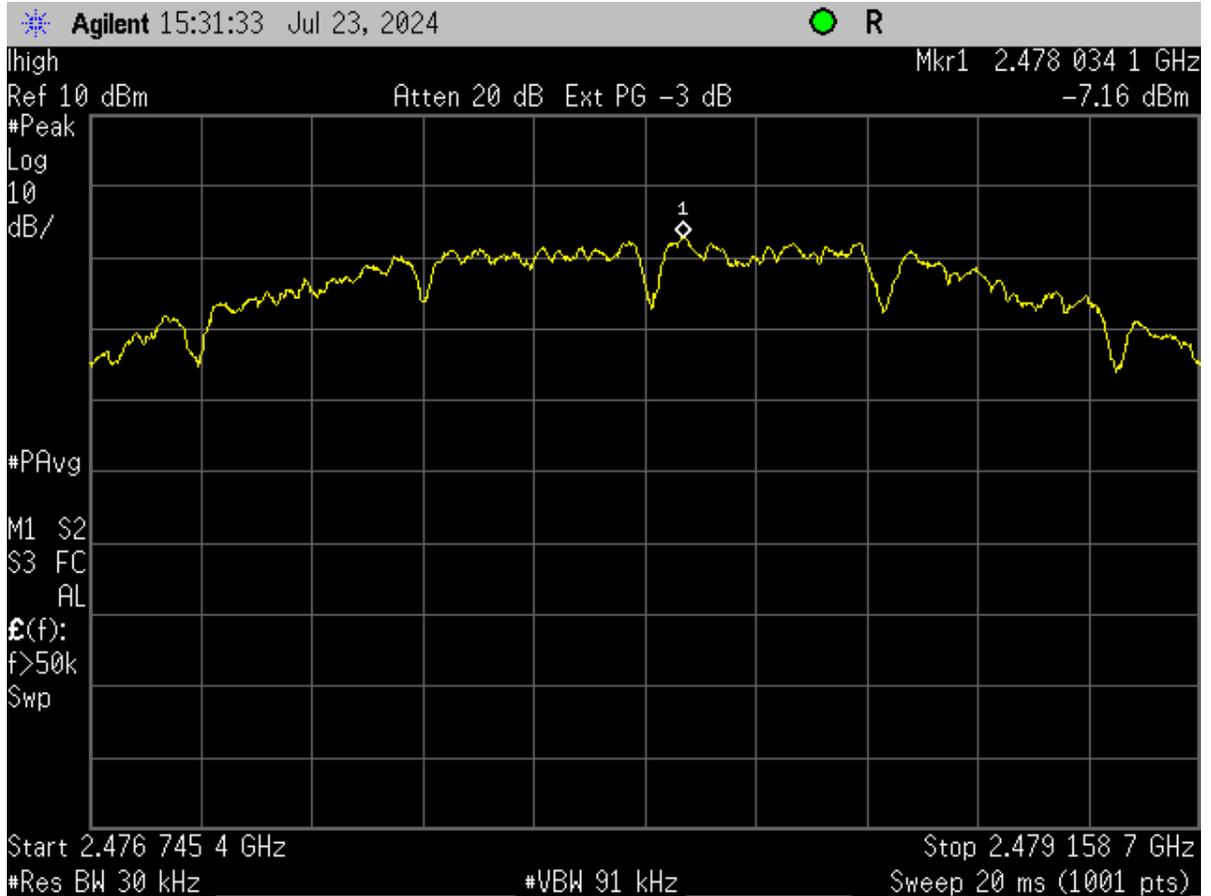


Figure 31. High Channel PSD

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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2.15 Intentional Radiator Power Lines Conducted Emissions (CFR 15.207, RSS-Gen 8.8)

The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.207, per ANSI C63.10:2013, Clause 6.2, with a spectrum analyzer connected to an LISN and the EUT placed into a continuous mode of transmission.

This device does not connect to AC powerlines. This test is not applicable

Test Date: July 23, 2024

Tested by 
Signature: _____

Name: Ian Charboneau

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15/IC RSS Certification
2BFVO-CAPMDSN
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2.16 Intentional Radiator, Radiated Emissions (CFR 15.209, RSS-Gen, 8.9)

The test data provided herein is to support the verification requirement for radiated emissions coming for the EUT in a transmitting state per 15.209 and were investigated from 9kHz or the lowest operating clock frequency to 25 GHz and tested as detailed in ANSI C63.10:2013, Clause 6.4-6.6.

Radiated emissions within the band of 9 kHz to 30 MHz were investigated using a calibrated Loop Antenna and per the requirements of ANSI C63.10:2013.

Measurements were made with the analyzer's resolution bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made above 1 GHz. The video bandwidth was set to three times the resolution bandwidth; 1 MHz RBW and 3 MHz VBW. The test data were maximized for magnitude by rotating the turn-table through 360 degrees and raising and lowering the receiving antenna between 1 to 4 meters as a part of the measurement procedure.

The worst-case radiated emission was greater than 20.0 dB below the specification limit. The results are shown in the table below. These results are meant to show that this EUT has met the intentional transmitter requirements of CFR Part 15.209.

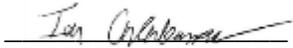
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FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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Table 10. Spurious Radiated Emissions (150 kHz-30MHz)

Test: FCC Part 15.209							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
All other emissions were more than 20 dB below the applicable limit.							

Test Date: July 16, 2024

Tested by
Signature: 

Name: Ian Charboneau

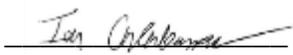
US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

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Table 11. Spurious Radiated Emissions (30 MHz – 1 GHz)

Test: FCC Part 15.209							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
All other emissions were more than 20 dB below the applicable limit.							

Test Date: July 5, 2024

Tested by
Signature: 

Name: Ian Charboneau

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15/IC RSS Certification
2BFVO-CAPMDSN
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Table 12. Spurious Radiated Emissions (1 GHz – 25 GHz)

Test: FCC Part 15.209							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
Except for Fundamental and Harmonics emissions, all other emissions are more than 20 dB below the applicable limit.							

Test Date: July 5, 2024

Tested by
Signature: 

Name: Ian Charboneau

US Tech Test Report:
FCC ID:
IC:
Test Report Number:
Issue Date:
Customer:
Model:

FCC Part 15/IC RSS Certification
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2.17 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4-2:2011. A coverage factor of $k=2$ was used to give a level of confidence of approximately 95%.

2.17.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ± 2.85 dB.

2.17.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m, the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ± 5.39 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ± 5.18 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna (1 GHz to 26 GHz) is ± 5.21 dB.

3 Conclusions

The EUT is deemed to have met the requirements of the standards cited within the test report when tested as detailed in the present test report.