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Zurn Water, LLC TEST REPORT

SCOPE OF WORK

EMC TESTING – EZ GEAR FAUCET MODEL ZG6913

REPORT NUMBER

105704106LEX-001

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EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 105704106LEX-001

Project Number: G105704106

Report Issue Date: 4/12/2024

Model(s) Tested: EZ Gear Faucet model ZG6913

Variant Model(s) not Tested but Declared ZG6915, ZG6920, ZG6922, ZG6950,

By Manufacturer to be Electrically Identical: ZG6951, ZG6953, ZG6955, ZG6956

Standards: FCC Title 47 CFR Part 15.247

RSS-247 Issue 3

RSS-GEN Issue 5

Tested by:

Intertek Testing Services NA, Inc.
731 Enterprise Dr.
Lexington, KY 40510
USA

Client:

Zurn Water, LLC
3700 Regency Parkway
Suite 100
Cary, NC 27518
USA

Report prepared by



Brian Lackey, EMC Staff Engineer

Report reviewed by



Michael Carlson, Team Leader

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
6	Occupied/DTS Bandwidth (ANSI C63.10 (2020) §6.9.3 and §11.8)	Pass
7	Fundamental Emission Output Power (ANSI C63.10 (2020) §11.9)	Pass
8	Maximum Power Spectral Density (ANSI C63.10 (2020) §11.10)	Pass
9	Conducted Spurious Emissions (ANSI C63.10 (2020) §11.11)	Pass
10	Radiated Spurious Emissions ANSI C63.10 (2020) §6.3 §6.5 and §6.6	Pass
11	Antenna Requirement (FCC Part 15.203, RSS-Gen Issue 5 § 6.8)	Pass



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Zurn Water, LLC
Address:	3700 Regency Parkway Suite 100 Cary, NC 27518 USA
Contact:	Malcolm James
Telephone:	+1 (919) 777-6413
Email:	malcolm.james@zurn.com
Manufacturer Information	
Manufacturer Name:	Zurn Water, LLC
Manufacturer Address:	5900 Elwin Buckanan Dr. Sanford, NC 27330 USA



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	EZ Gear Faucet
Model Number	ZG6913
Serial Number	1
Receive Date	2/8/2024
Test Start Date	2/8/2024
Test End Date	2/29/2024
Device Received Condition	Good
Test Sample Type	Production
Transmit Band	2402MHz – 2480MHz
Test Channels	2402MHz, 2440MHz, 2480MHz
Antenna Type	Integral Antenna
Antenna Gain	1Mbit/s Data Rate: 1.52dBi (2402MHz), 0.27dBi (2440MHz), -0.70dBi (2480MHz) 2Mbit/s Data Rate: 0.97dBi (2402MHz), 0.27dBi (2440MHz), -0.79dBi (2480MHz)
Rated Voltage	3.0v AA 6 Cell Battery or 100-240Vac 32A LIFEPO
Description of Equipment Under Test (provided by client)	
Electronic Sensor Faucet	

4.1 Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

- ZG6915, ZG6920, ZG6922, ZG6950, ZG6951, ZG6953, ZG6955, and ZG6956 – alternate faucet style with identical electronics



5 System Setup and Method

5.1 Method:

Configuration as required by ANSI C63.10 (2020)

No.	Descriptions of EUT Exercising
1	The EUT was powered by an external DC supply. The EUT was configured to transmit a Bluetooth Low Energy (BLE) signal on a low, middle, or high channel in 1Mbit/s or 2Mbit/s mode
2	The EUT was powered by an external DC supply. The radio was idle.

Cables					
QTY	Description	Length (m)	Shielding	Ferrites	Termination
-	N/A	-	-	-	-

Support Equipment (Accessories)		
Description	Manufacturer	Model Number



6 Occupied/DTS Bandwidth

6.1 Test Method:

Tests are performed in accordance with ANSI C63.10 §6.9.3 and §11.8.

6.2 Test Limits:

Title 47 CFR 15.247(a)

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

RSS-247 §5.2

- a. The minimum 6 dB bandwidth shall be 500 kHz.

RSS-GEN §6.7

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



6.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	101472	Rohde & Schwarz	FSW26	12/19/2023	12/19/2024

6.4 Test Software Used:

Description	Manufacturer	Version
RSCommander	Rohde & Schwarz	2.4.2 64 bit (2023)

6.5 Measurement Uncertainty

Description	Expanded Uncertainty (k=2)
Automatic Bandwidth Measurement	2.89%

No measurement correction based on measurement uncertainty is performed.

6.6 Test Conditions

Test Personnel	Supervising / Reviewing Engineer	Test Date	Ambient Temperature	Relative Humidity	Pressure
Brian Lackey	NA	2/8/2024	23.9°C	20.3%	985.4mbar

6.7 Test Results:

The sample tested was found to Comply. The 6dB bandwidth was at least 500 kHz.



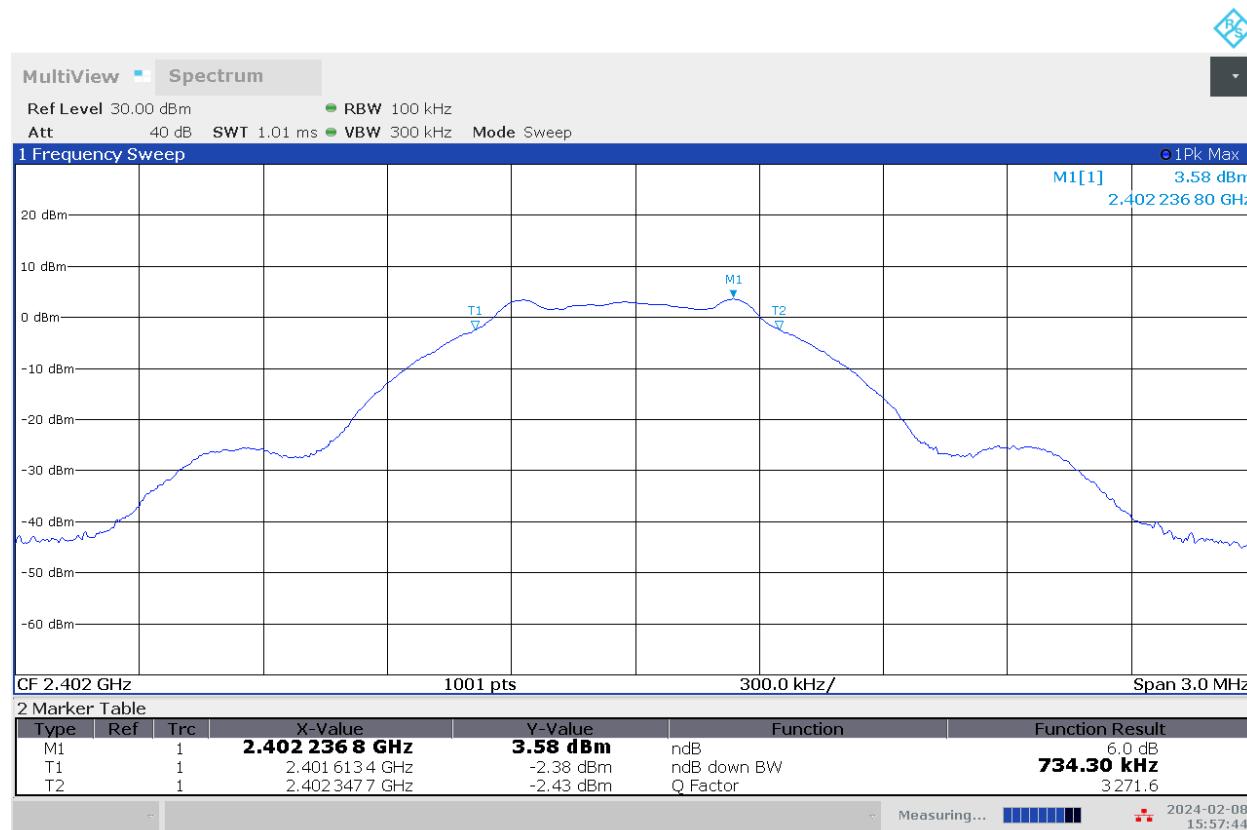
6.8 Test Data (1Mbit/s Data Rate)

Frequency (MHz)	6dB Bandwidth (kHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
2402	734.3	1220	1065	500
2440	734.3	1200	1069	500
2480	740.3	1220	1071	500



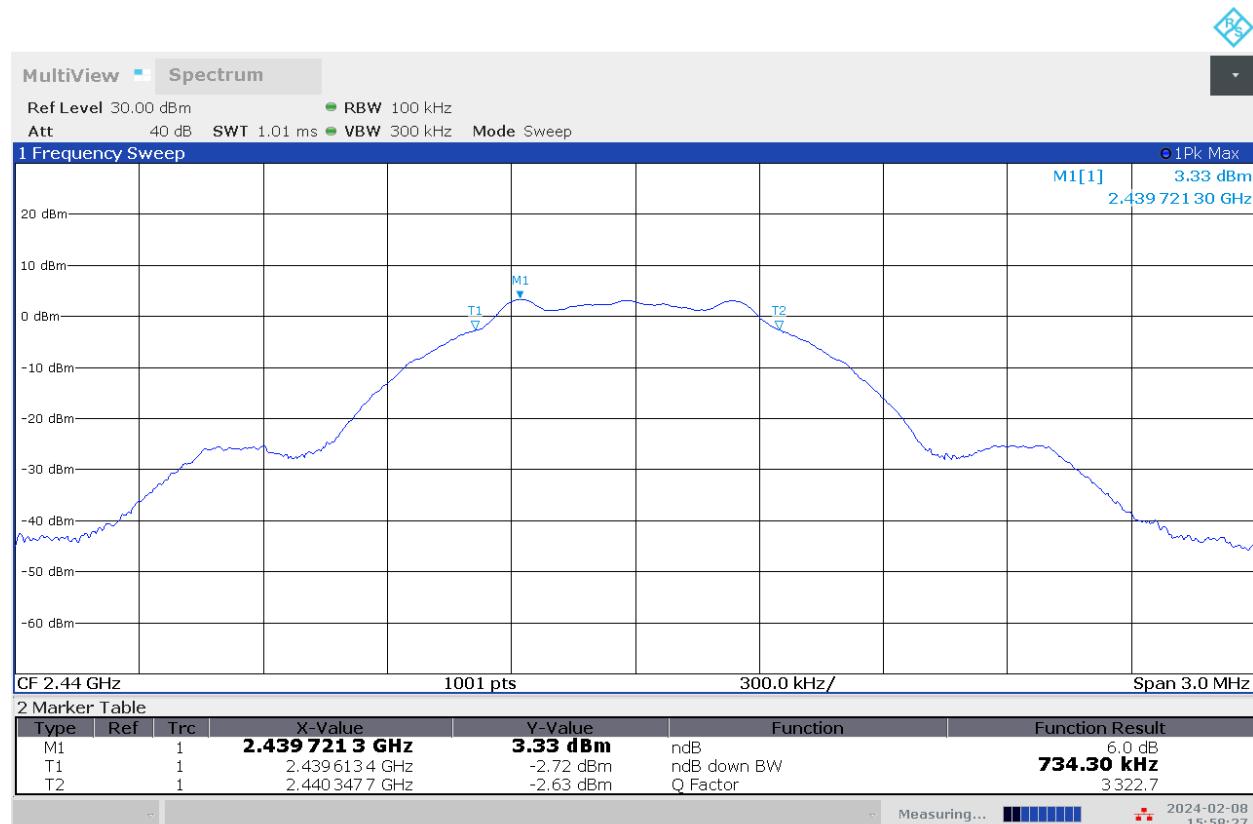
6.8.1 Test Plots: Occupied Channel Bandwidth (6dB Bandwidth)

6.8.1.1 Low Channel



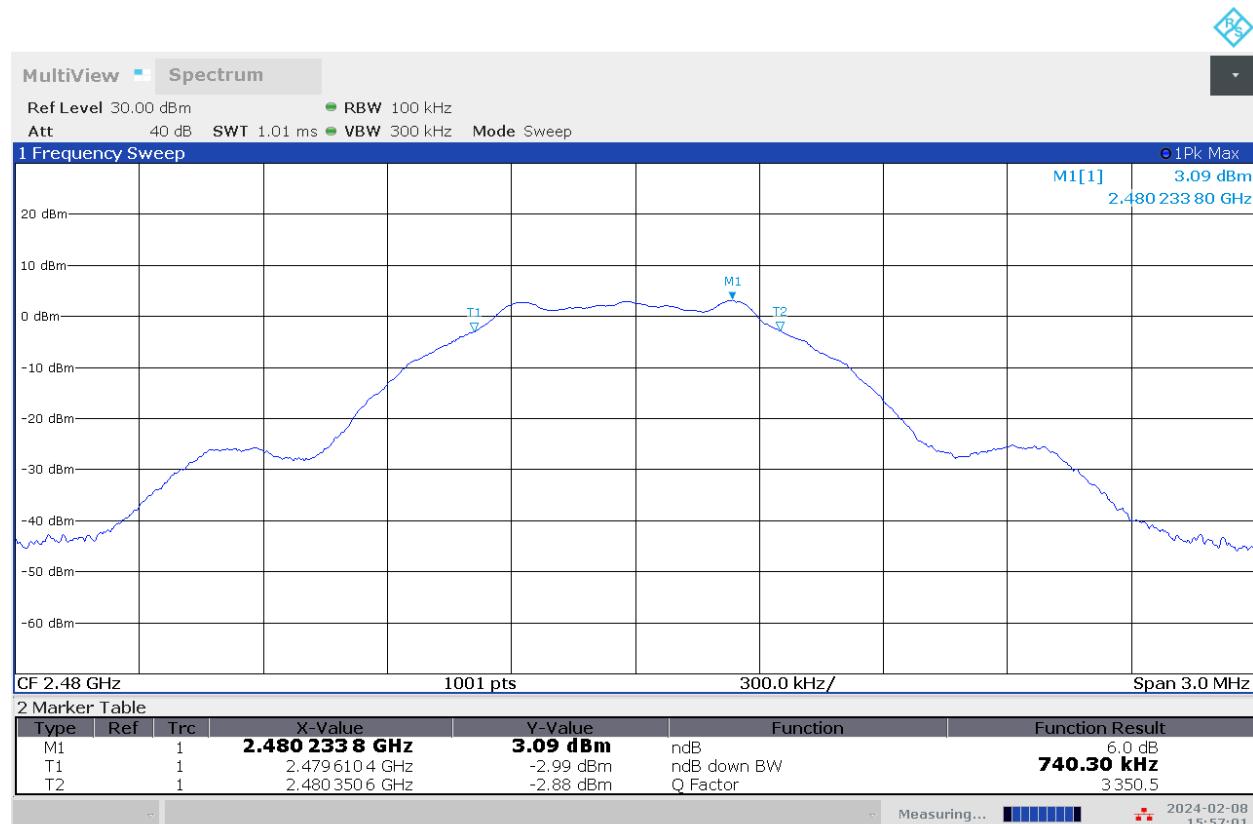


6.8.1.2 Mid Channel





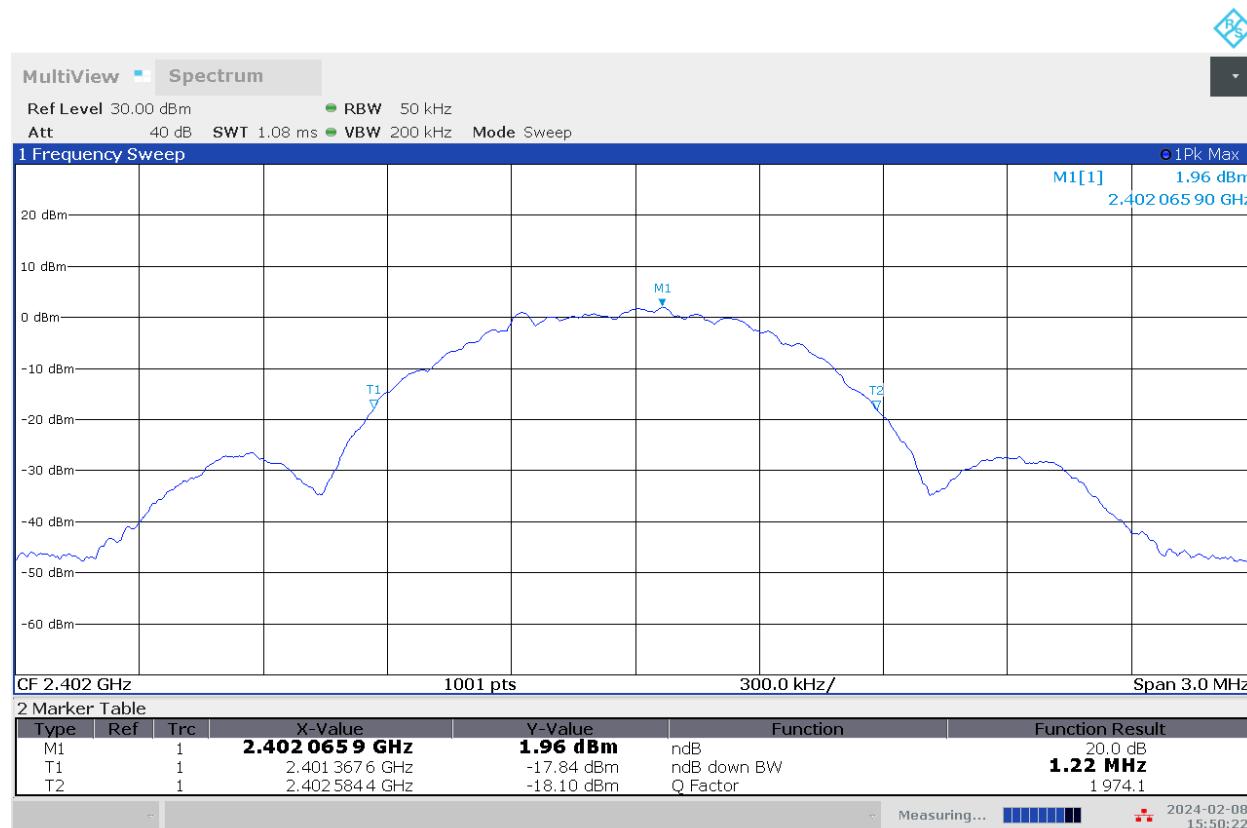
6.8.1.3 High Channel





6.8.2 Test Plots: Occupied Channel Bandwidth (20dB Bandwidth)

6.8.2.1 Low Channel





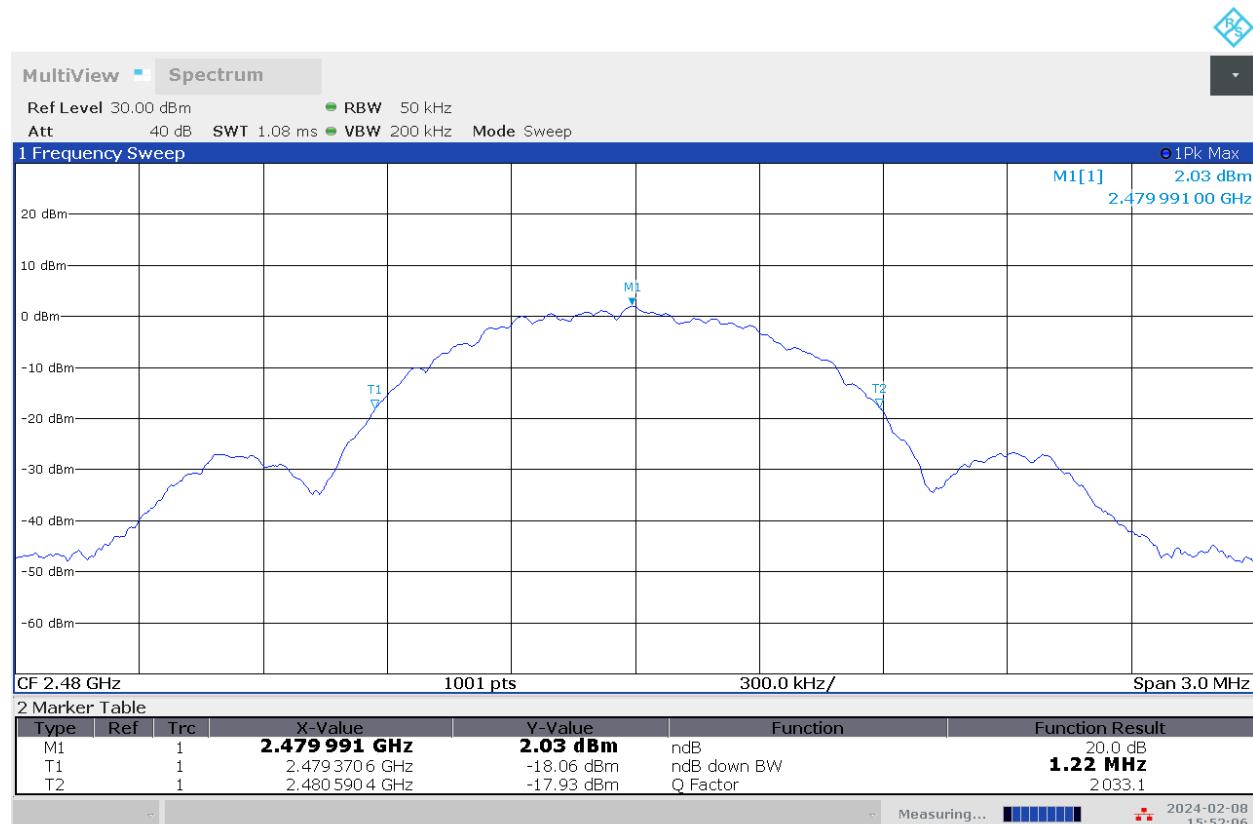
6.8.2.2 Mid Channel



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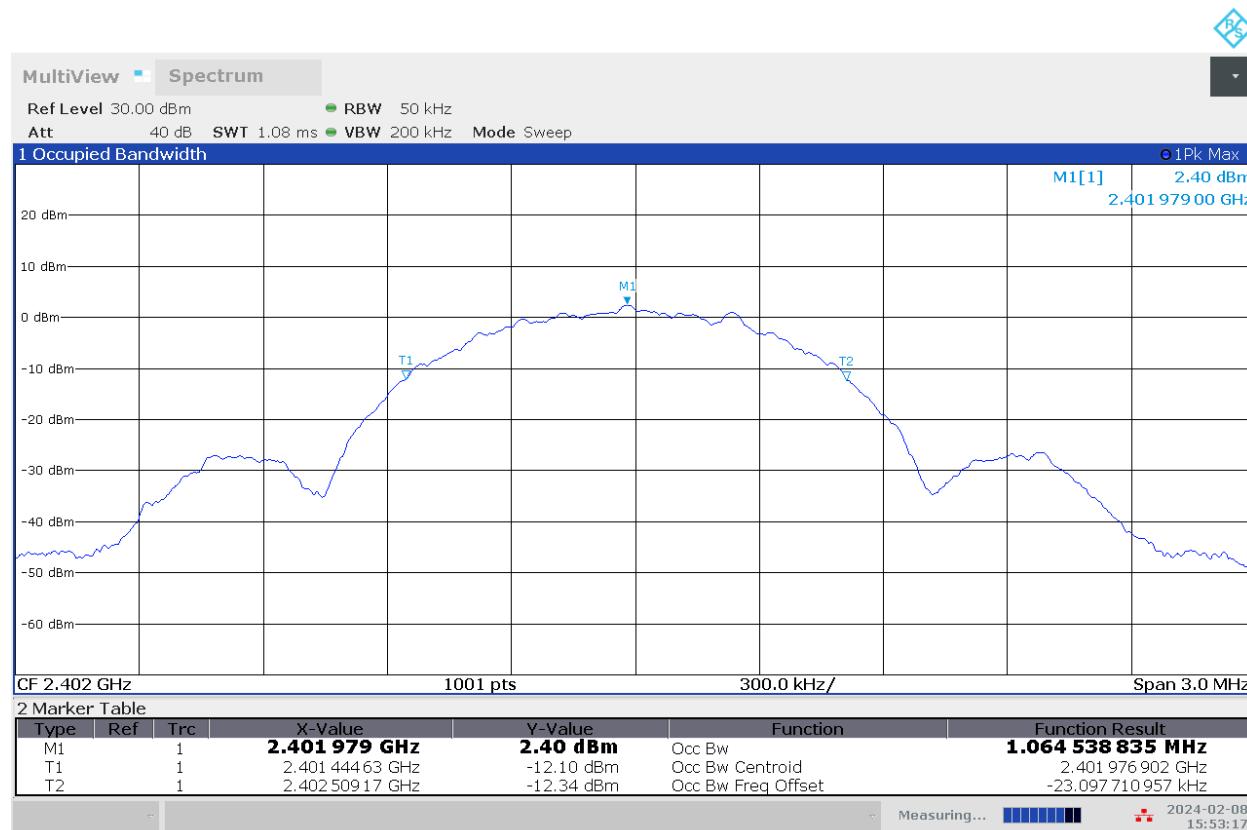
6.8.2.3 High Channel





6.8.3 Test Plots: Occupied Channel Bandwidth (99% Bandwidth)

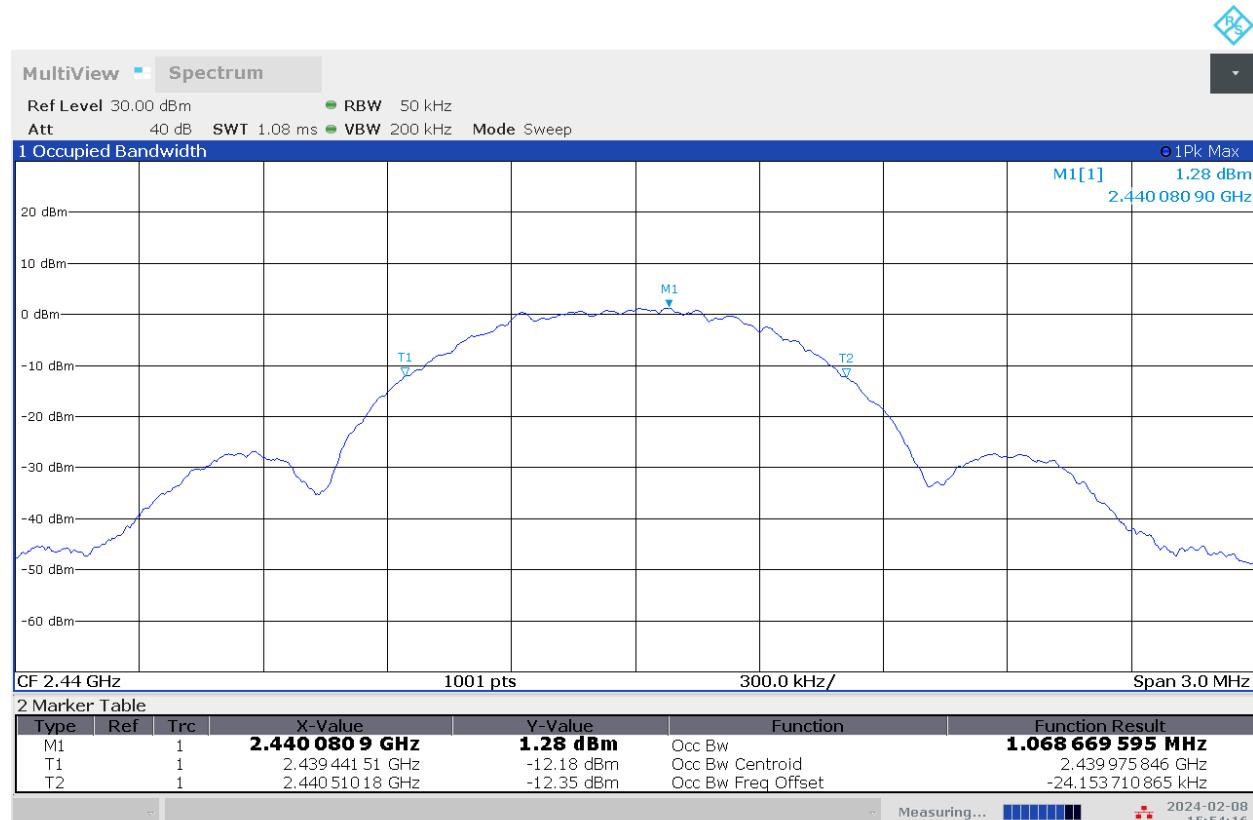
6.8.3.1 Low Channel



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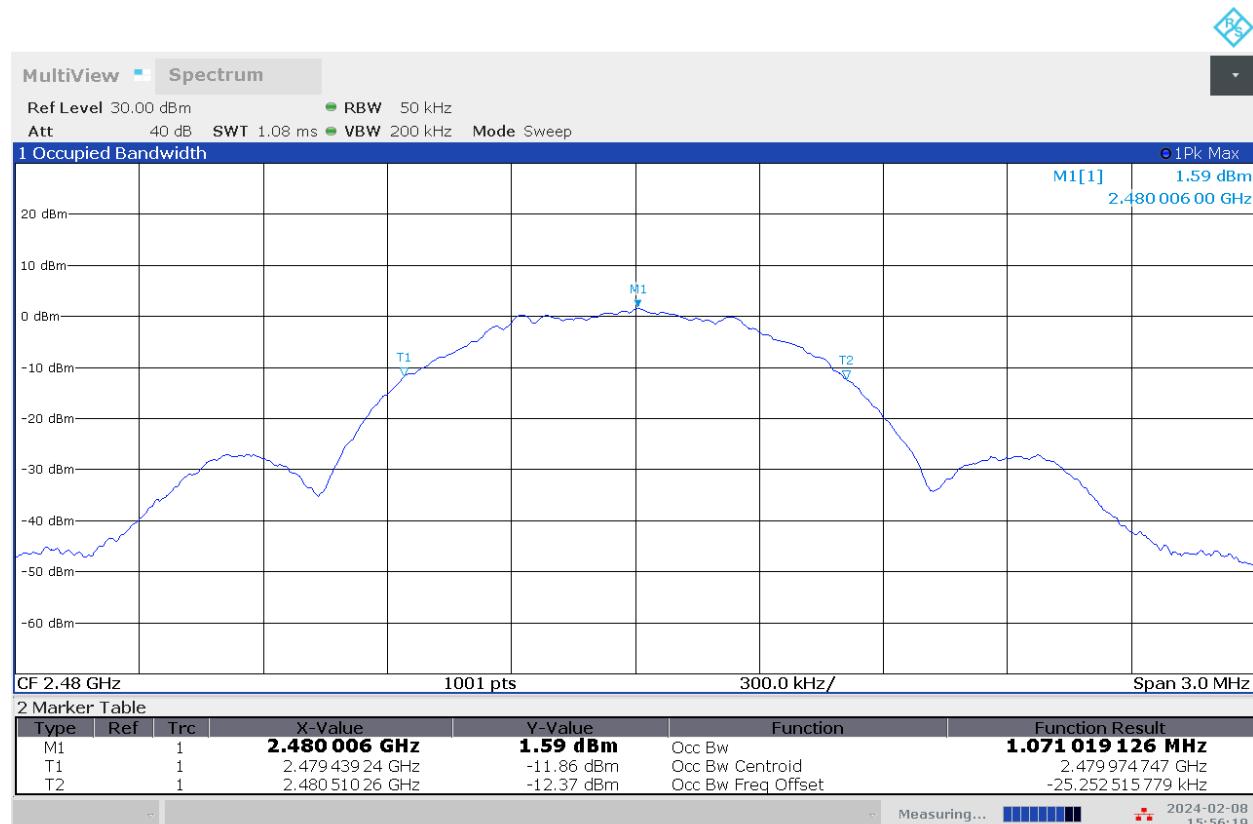
6.8.3.2 Mid Channel



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6.8.3.3 High Channel



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6.9 Test Data (2Mbit/s Data Rate)

Frequency (MHz)	6dB Bandwidth (kHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
2402	1260	2400	2123	500
2440	1240	2410	2115	500
2480	1290	2380	2101	500



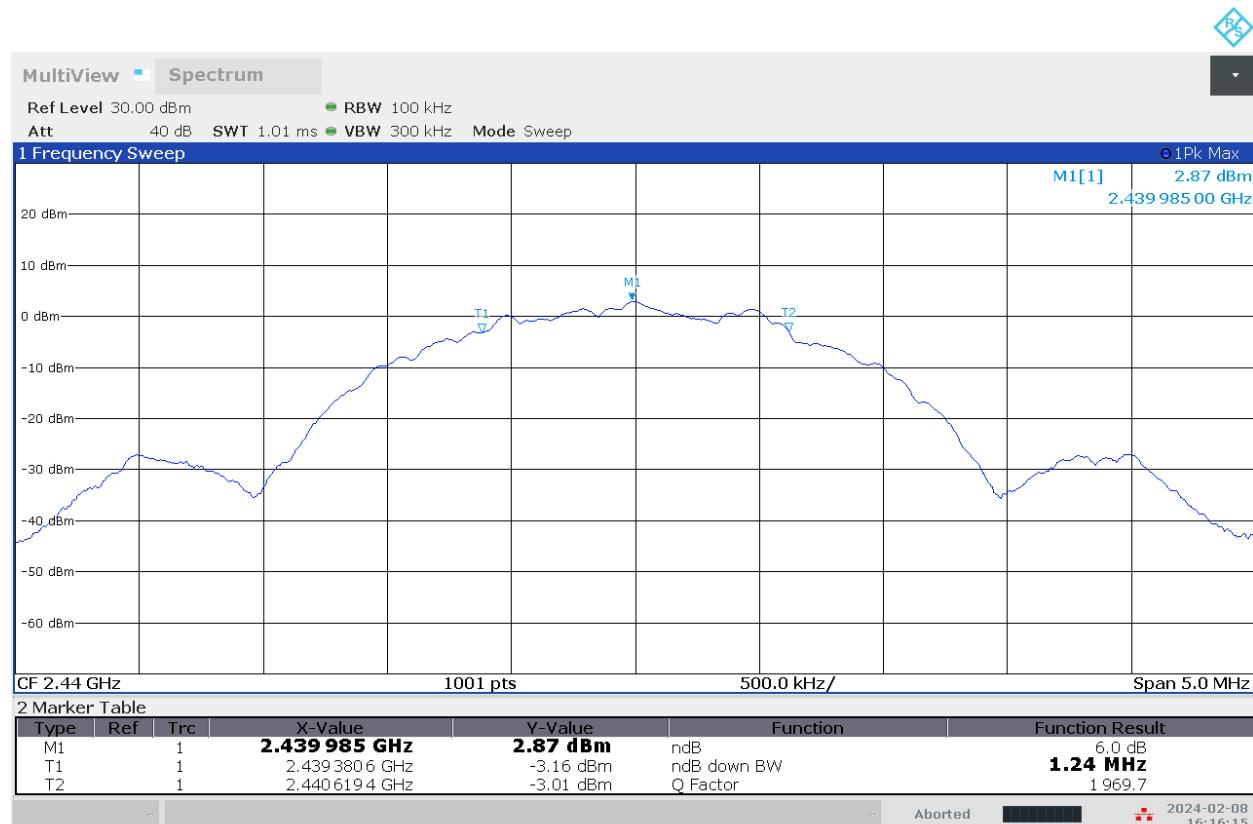
6.9.1 Test Plots: Occupied Channel Bandwidth (6dB Bandwidth)

6.9.1.1 Low Channel



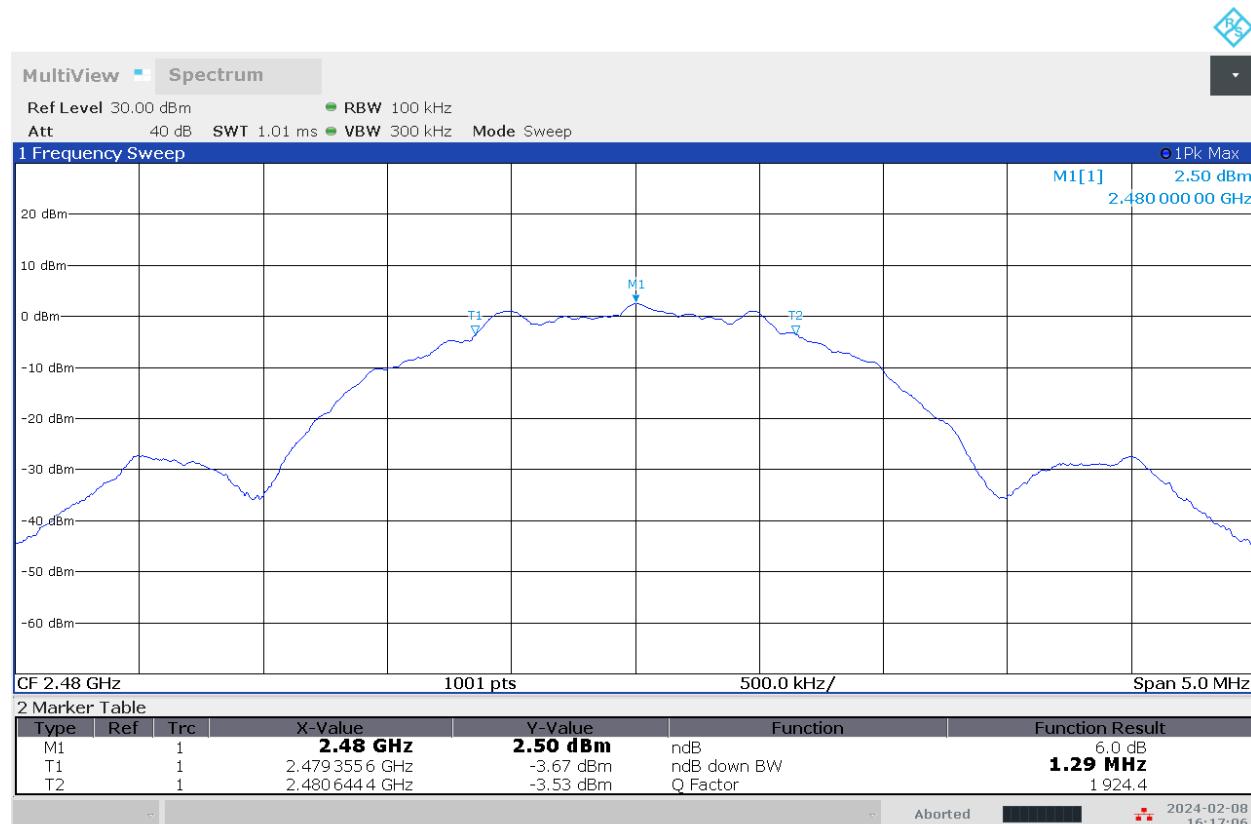


6.9.1.2 Mid Channel





6.9.1.3 High Channel





6.9.2 Test Plots: Occupied Channel Bandwidth (20dB Bandwidth)

6.9.2.1 Low Channel



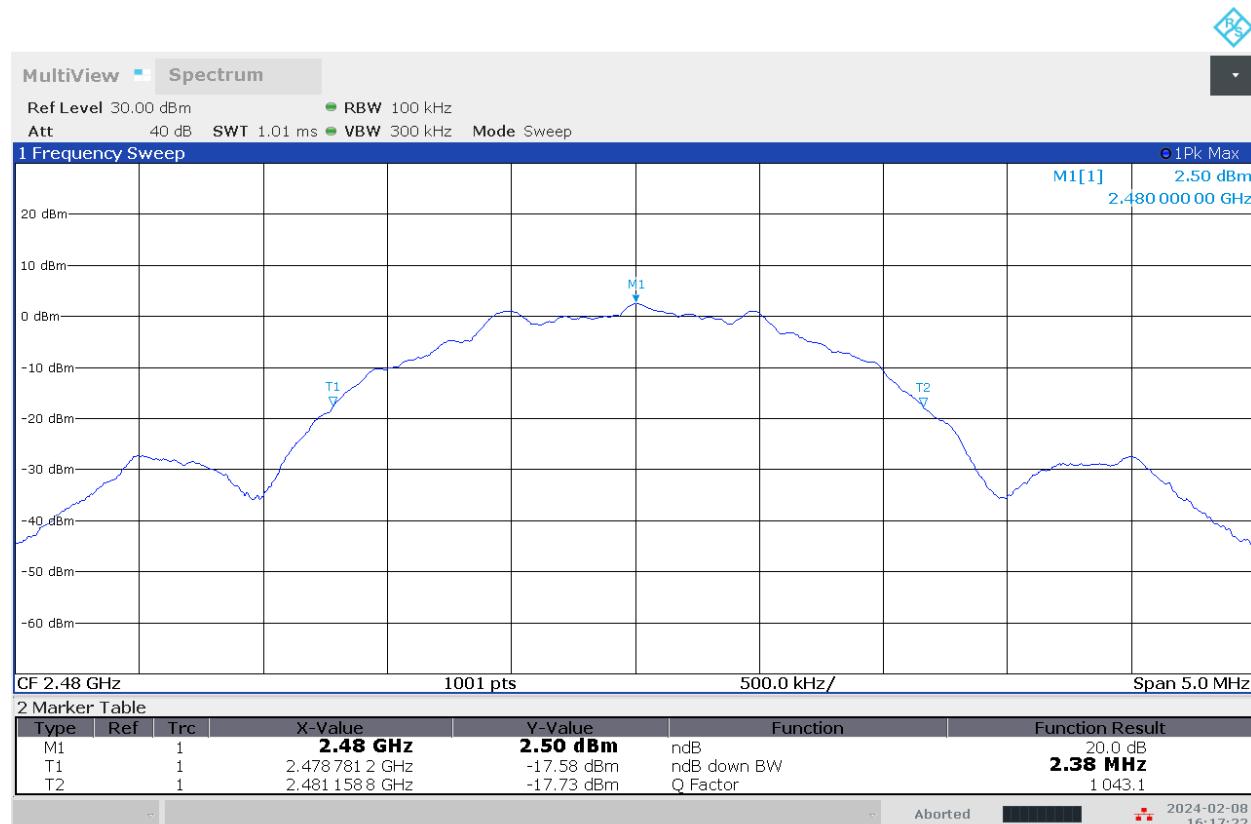


6.9.2.2 Mid Channel





6.9.2.3 High Channel





6.9.3 Test Plots: Occupied Channel Bandwidth (99% Bandwidth)

6.9.3.1 Low Channel



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6.9.3.2 Mid Channel





6.9.3.3 High Channel





7 Fundamental Emissions Output Power

7.1 Test Method:

Tests are performed in accordance with ANSI C63.10 §11.9.

7.2 Test Limits:

47 CFR 15.247(b)

(2) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

RSS-247 §5.4

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



7.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	101472	Rohde & Schwarz	FSW26	12/19/2023	12/19/2024

7.4 Test Software Used:

Description	Manufacturer	Version
RSCommander	Rohde & Schwarz	2.4.2 64 bit (2023)

7.5 Measurement Uncertainty

Description	Expanded Uncertainty (k=2)
Output Power	1.2dB

No measurement correction based on measurement uncertainty is performed.

7.6 Test Conditions

Test Personnel	Supervising / Reviewing Engineer	Test Date	Ambient Temperature	Relative Humidity	Pressure
Brian Lackey	NA	2/8/2024	23.9°C	20.3%	985.4mbar
Brian Lackey	NA	2/14/2024	23.2°C	21.9%	982.0mbar

7.7 Test Results:

The sample tested was found to Comply. The conducted output power was less than 1 W. The EIRP was last than 4 W.



7.8 Test Data (1Mbit/s Data Rate)

Frequency (MHz)	Average Output Power (dBm)	Peak Output Power (dBm)	Peak Output Power (mW)	Antenna Gain (dBi)	Peak EIRP (dBm)	Peak EIRP (mW)	Output Power Limit (mW)	EIRP Limit (mW)
2402	1.93	4.15	2.60	1.52	5.67	3.69	1000	4000
2440	1.59	3.93	2.47	0.27	4.20	2.63	1000	4000
2480	1.53	3.79	2.39	-0.70	3.09	2.04	1000	4000



7.8.1 Test Plots: Output Power

7.8.1.1 Low Channel

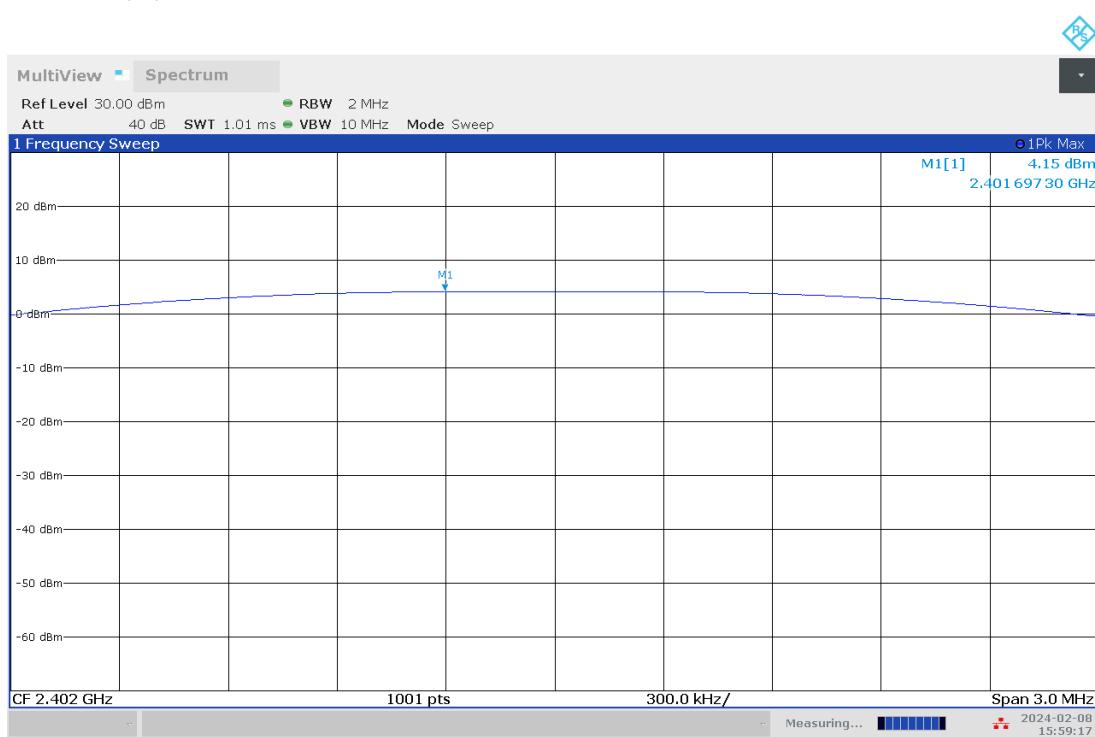
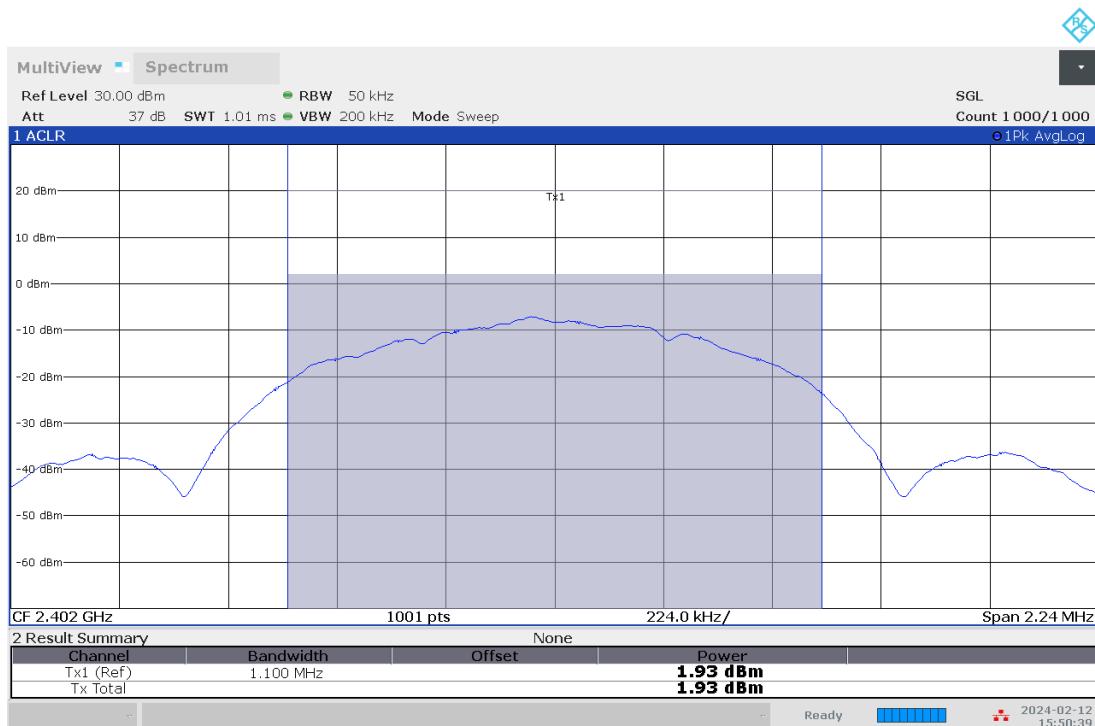


Figure 1 – 2402MHz Average Power (top) and Peak Power (bottom)



7.8.1.2 Mid Channel

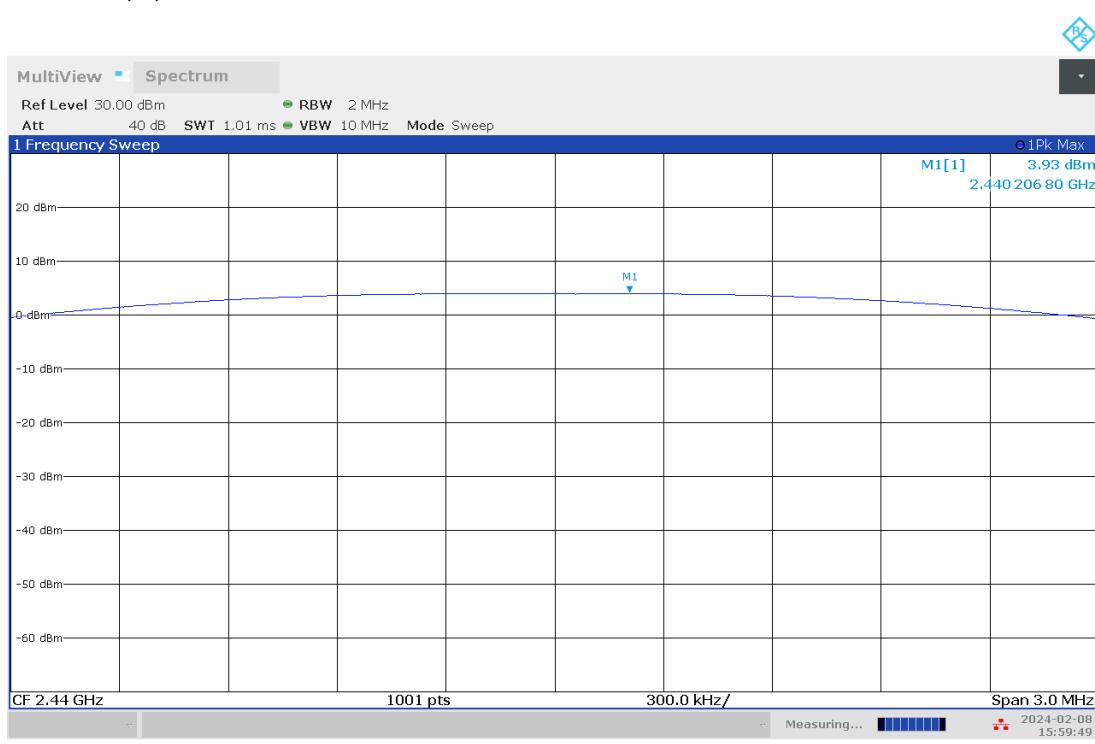


Figure 2 – 2440MHz Average Power (top) and Peak Power (bottom)



7.8.1.3 High Channel

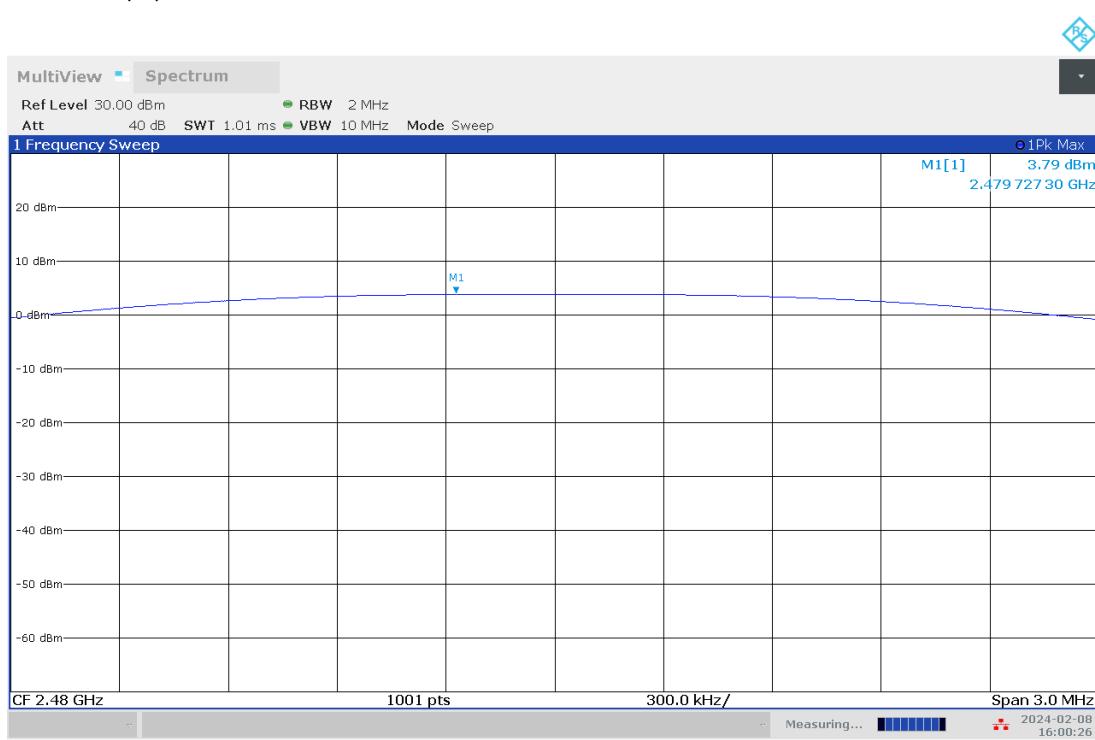
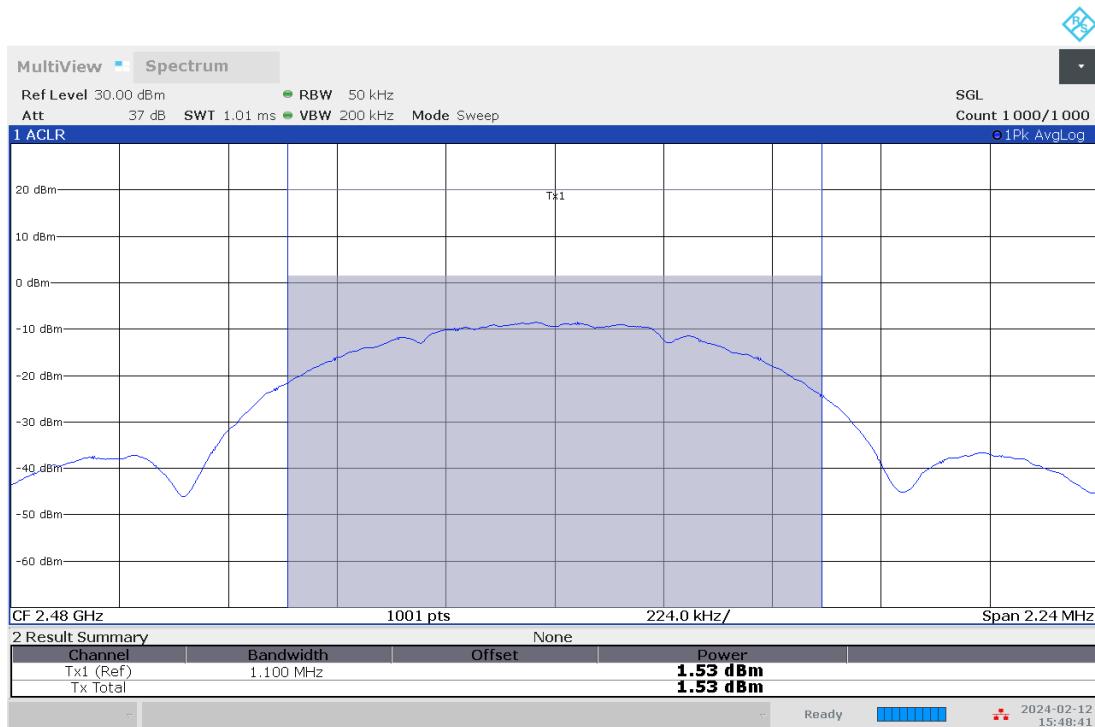


Figure 3 – 2480MHz Average Power (top) and Peak Power (bottom)



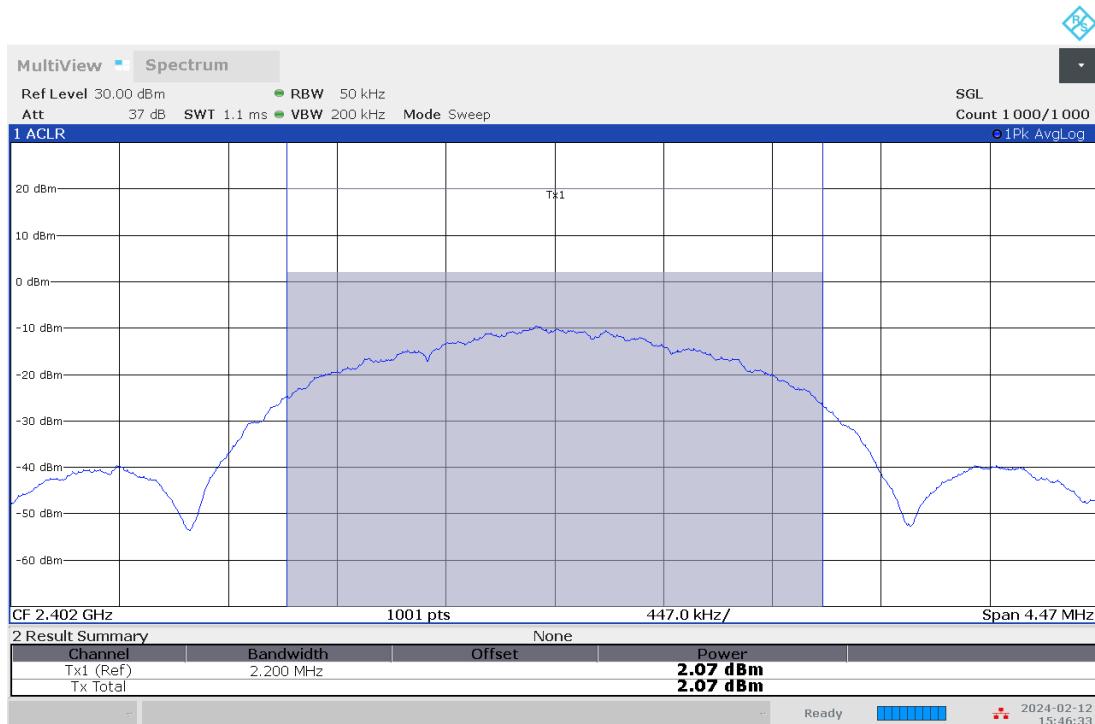
7.9 Test Data (2Mbit/s Data Rate)

Frequency (MHz)	Average Output Power (dBm)	Peak Output Power (dBm)	Peak Output Power (mW)	Antenna Gain (dBi)	Peak EIRP (dBm)	Peak EIRP (mW)	Output Power Limit (mW)	EIRP Limit (mW)
2402	2.07	4.17	2.61	0.97	5.14	3.27	1000	4000
2440	1.80	3.95	2.48	0.27	4.22	2.64	1000	4000
2480	1.62	3.81	2.40	-0.79	3.02	2.00	1000	4000

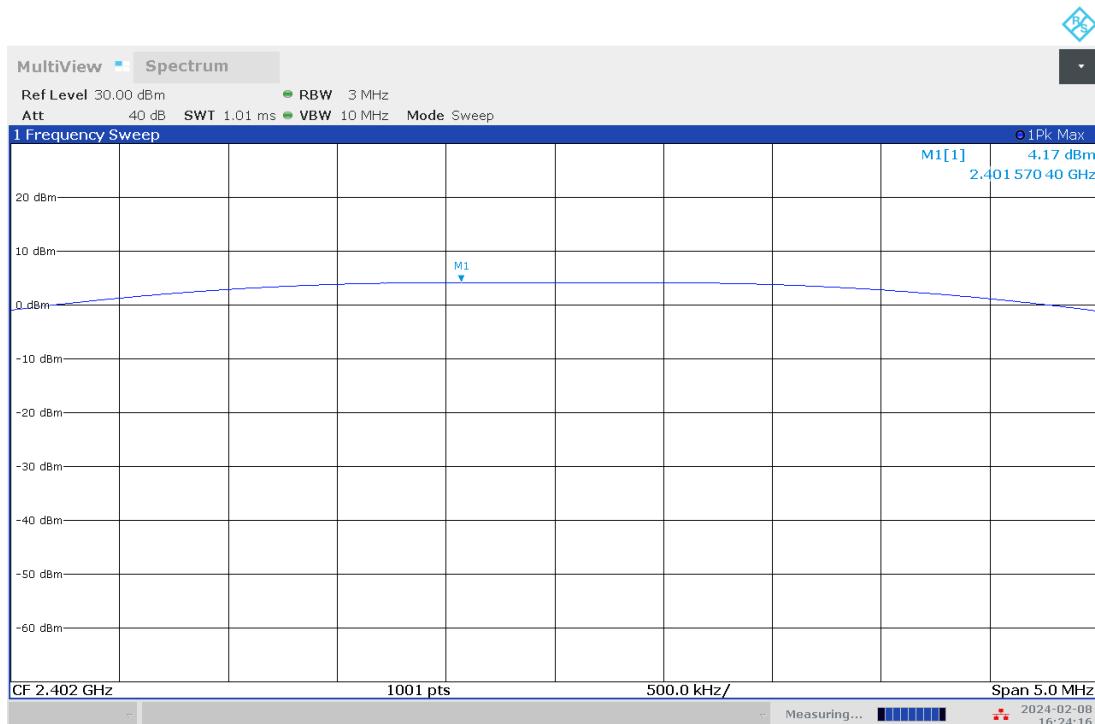


7.9.1 Test Plots: Output Power

7.9.1.1 Low Channel



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Figure 4 – 2402MHz Average Power (top) and Peak Power (bottom)



7.9.1.2 Mid Channel

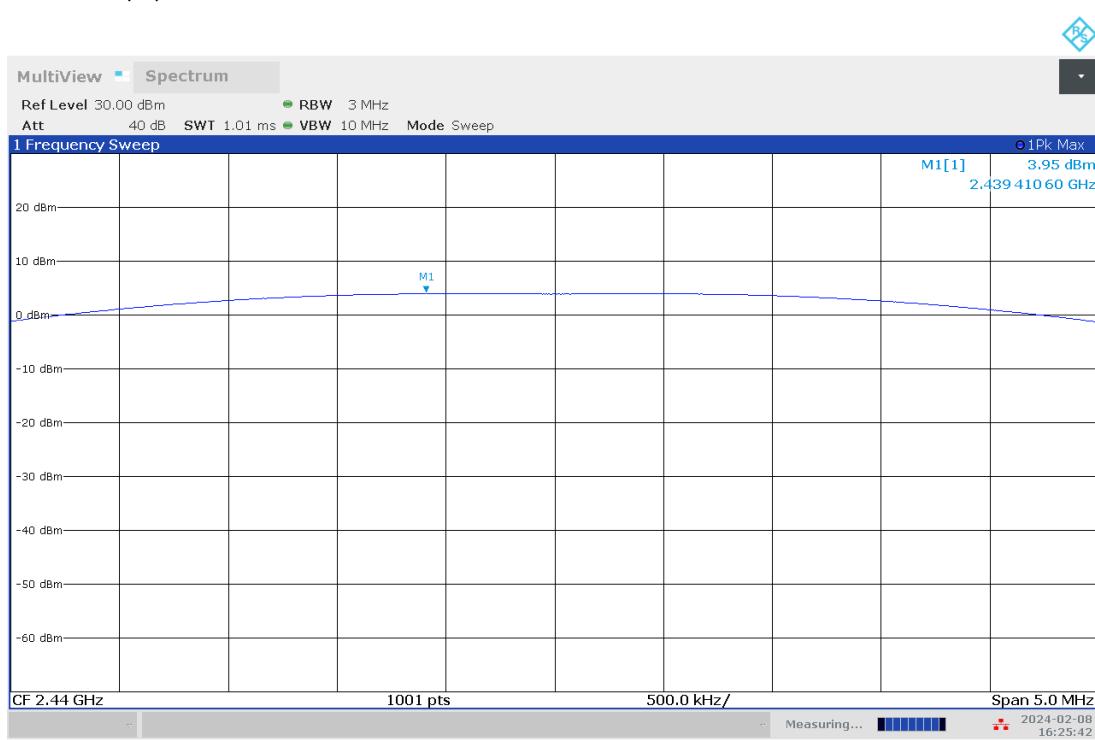
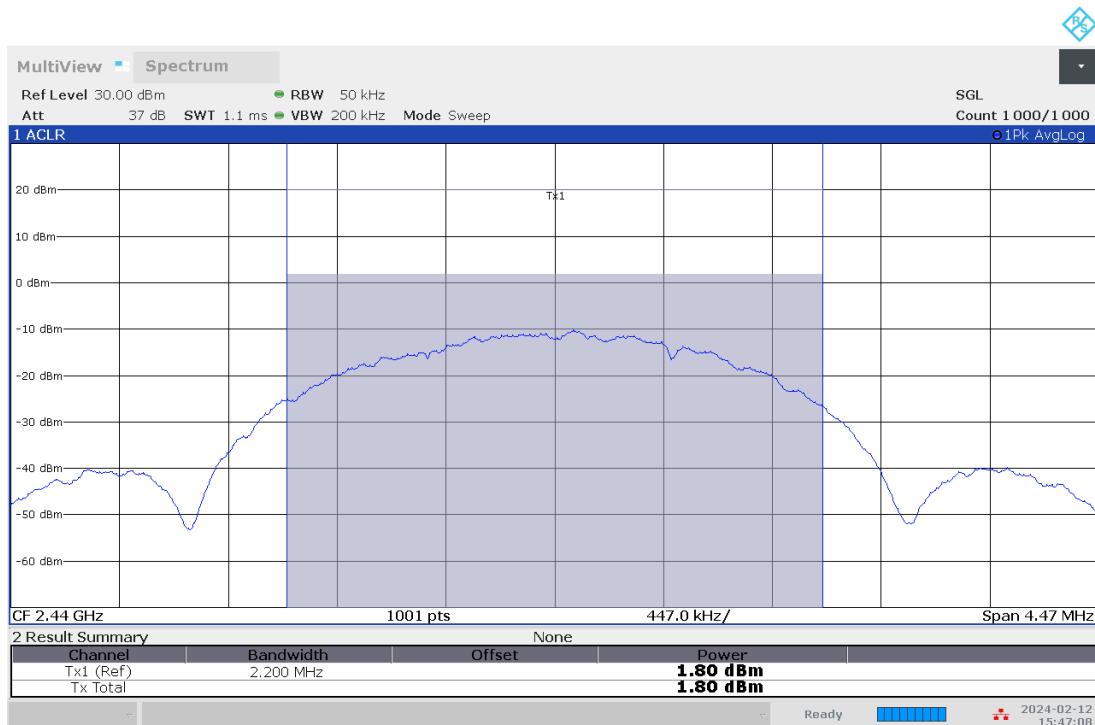


Figure 5 – 2440MHz Average Power (top) and Peak Power (bottom)



7.9.1.3 High Channel

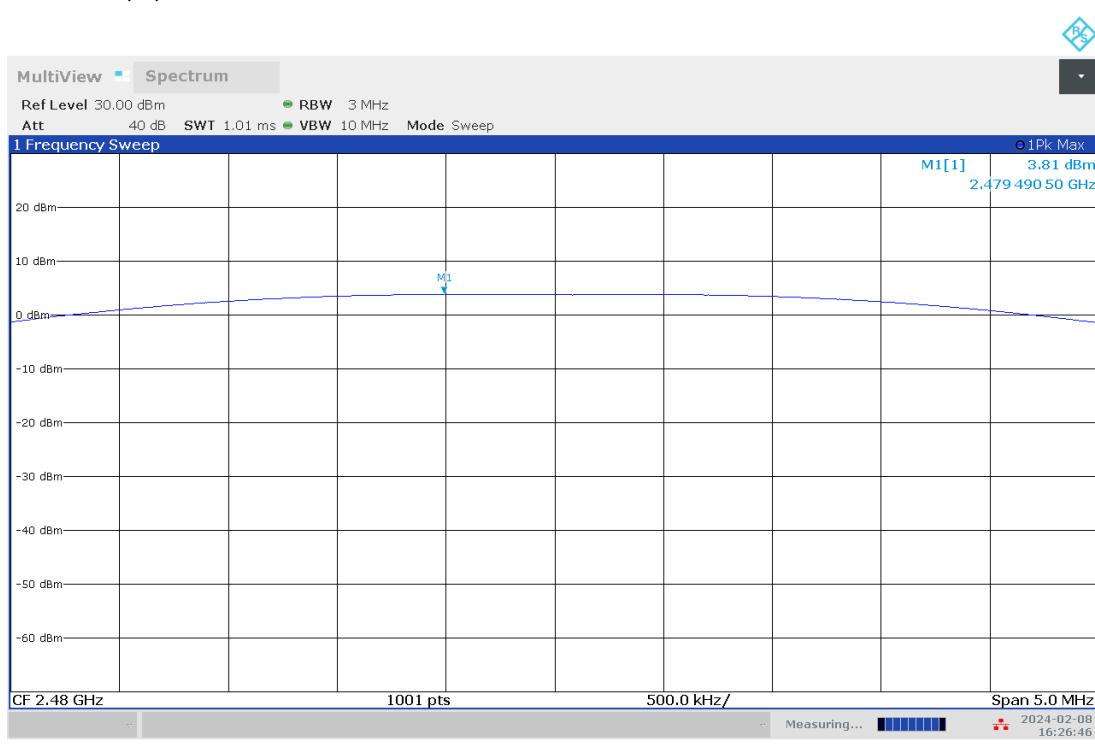
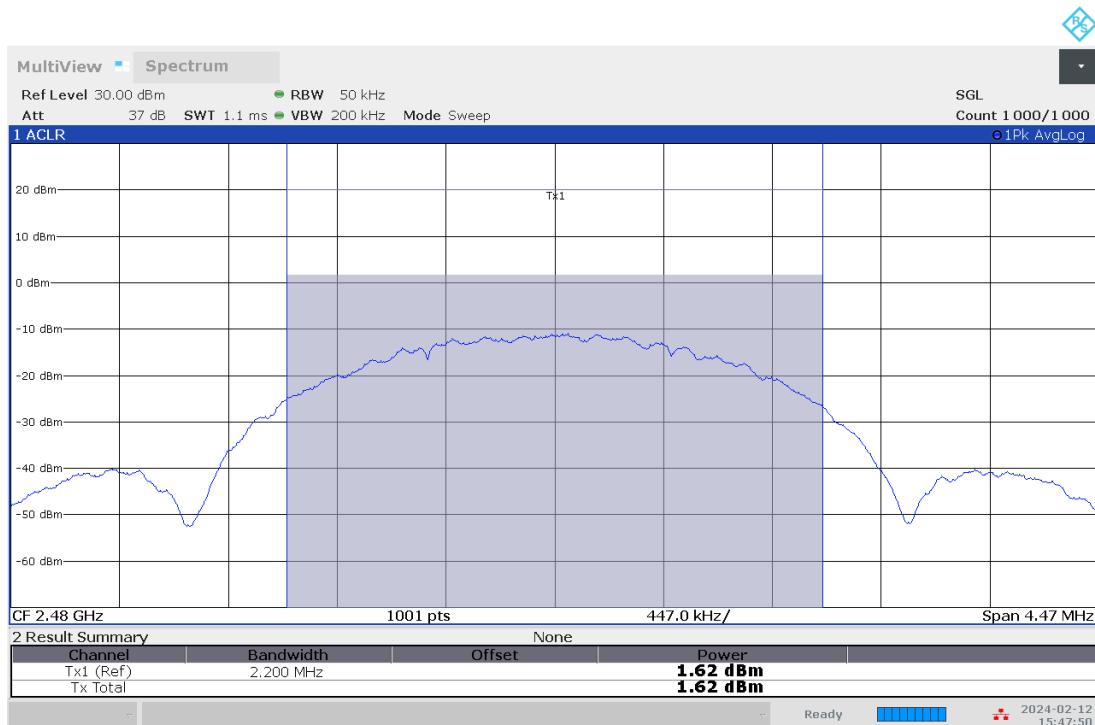


Figure 6 – 2480MHz Average Power (top) and Peak Power (bottom)



8 Maximum Power Spectral Density (PSD)

8.1 Test Method:

Tests are performed in accordance with ANSI C63.10 §11.10.

8.2 Test Limits:

47 CFR 15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

RSS-247 §5.2

- b. The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).



8.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	101472	Rohde & Schwarz	FSW26	12/19/2023	12/19/2024

8.4 Test Software Used:

Description	Manufacturer	Version
RSCommander	Rohde & Schwarz	2.4.2 64 bit (2023)

8.5 Measurement Uncertainty

Description	Expanded Uncertainty (k=2)
PPSD	1.2dB

No measurement correction based on measurement uncertainty is performed.

8.6 Test Conditions

Test Personnel	Supervising / Reviewing Engineer	Test Date	Ambient Temperature	Relative Humidity	Pressure
Brian Lackey	NA	2/8/2024	23.9°C	20.3%	985.4mbar

8.7 Test Results:

The sample tested was found to Comply. The power spectral density was less than 8 dBm/100kHz and is deemed to comply with the 8 dBm/3kHz limit.

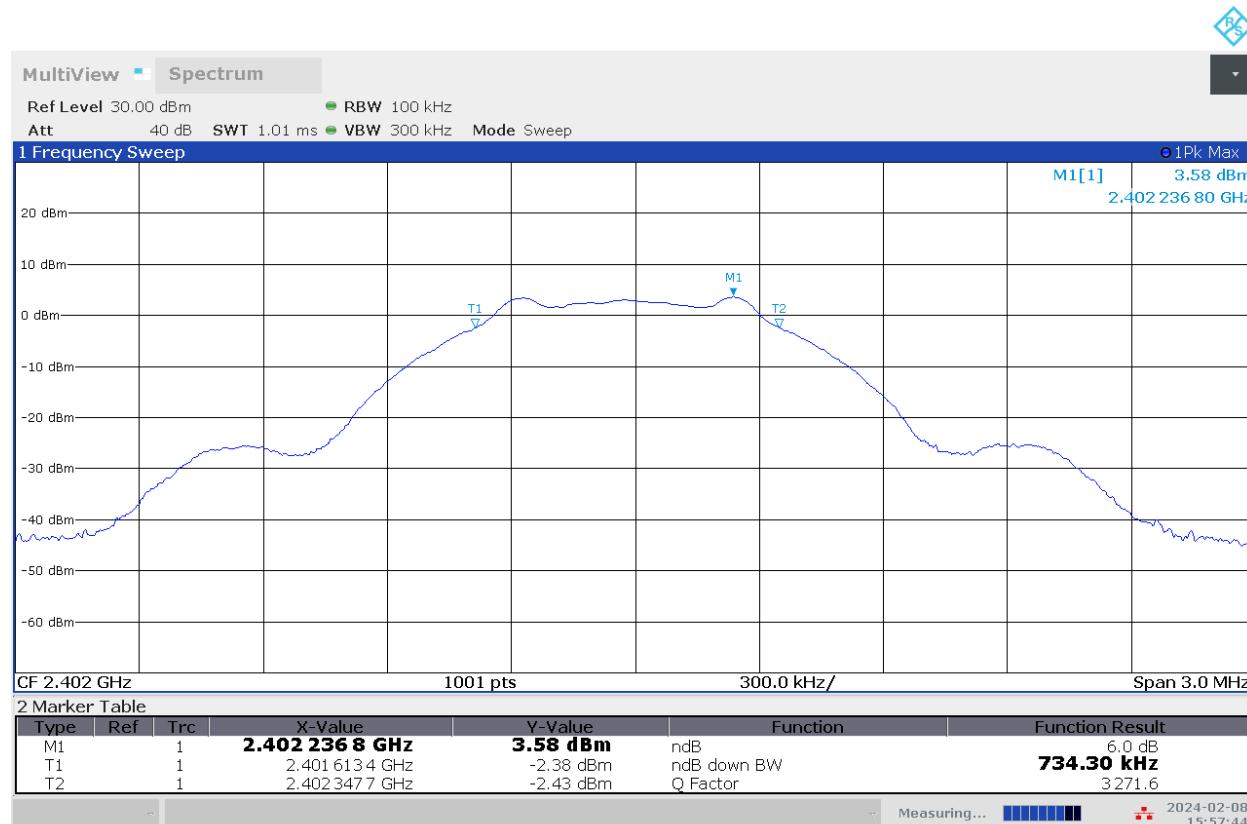
8.8 Test Data (1Mbit/s Data Rate)

Frequency (MHz)	Conducted PSD (dBm/100kHz)	Antenna Gain (dBi)	PSD EIRP (dBm/100kHz)	Limit (dBm/3kHz)
2402	3.58	1.52	5.10	8
2440	3.33	0.27	3.60	8
2480	3.09	-0.70	2.39	8



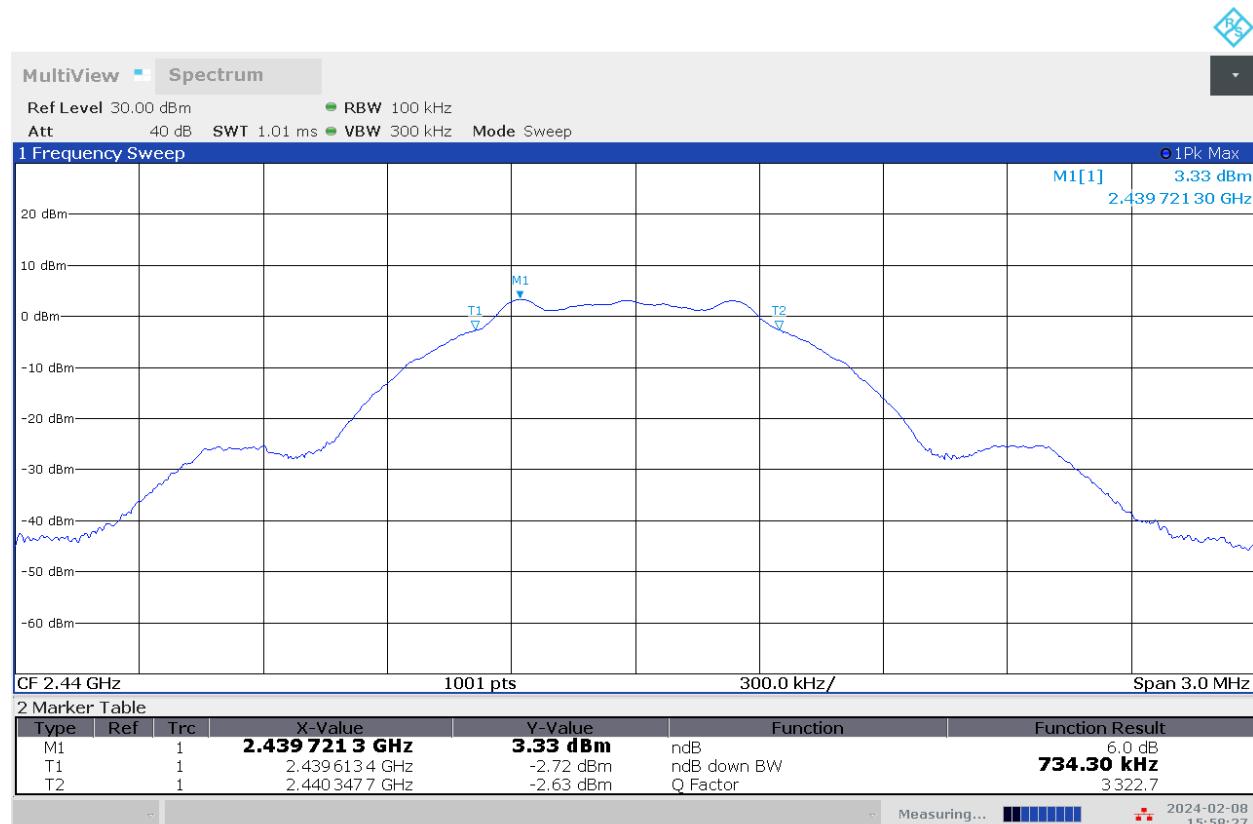
8.8.1 Test Plots: Power Spectral Density

8.8.1.1 Low Channel





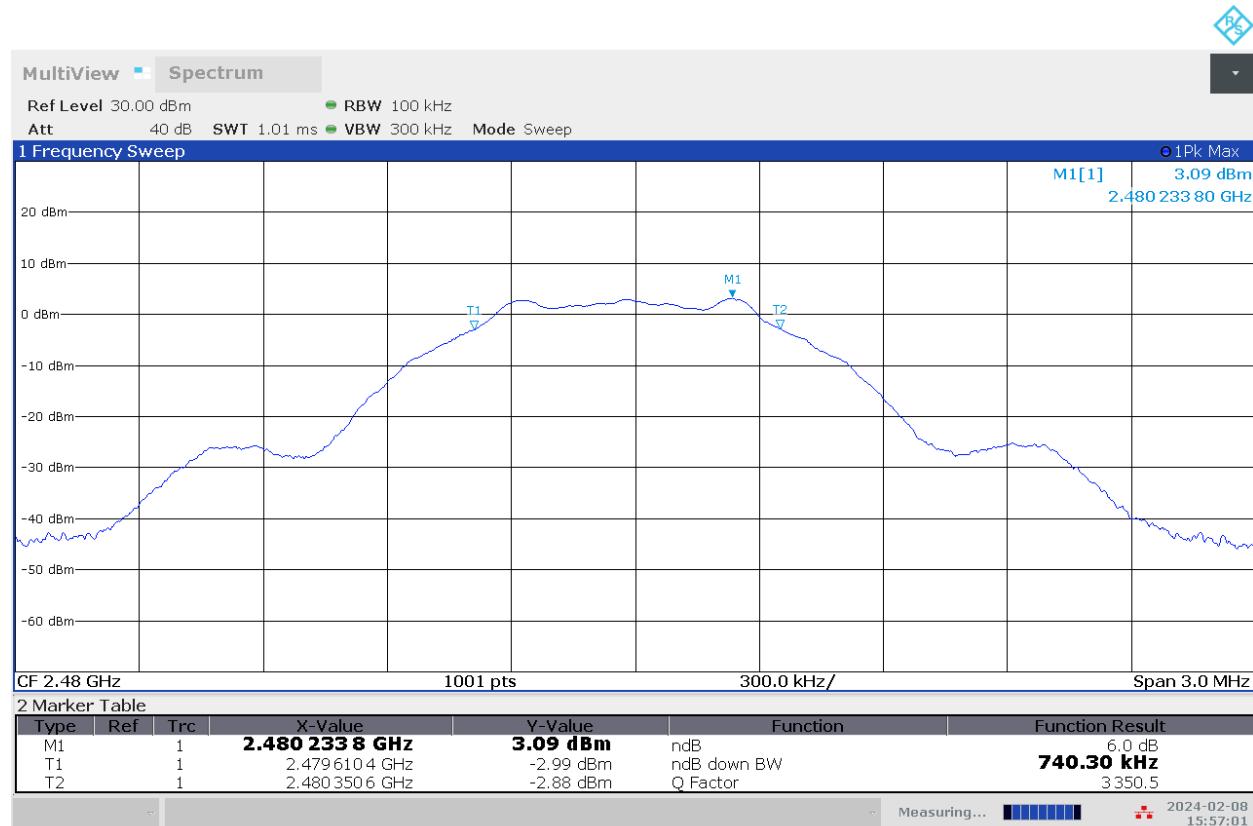
8.8.1.2 Mid Channel



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8.8.1.3 High Channel





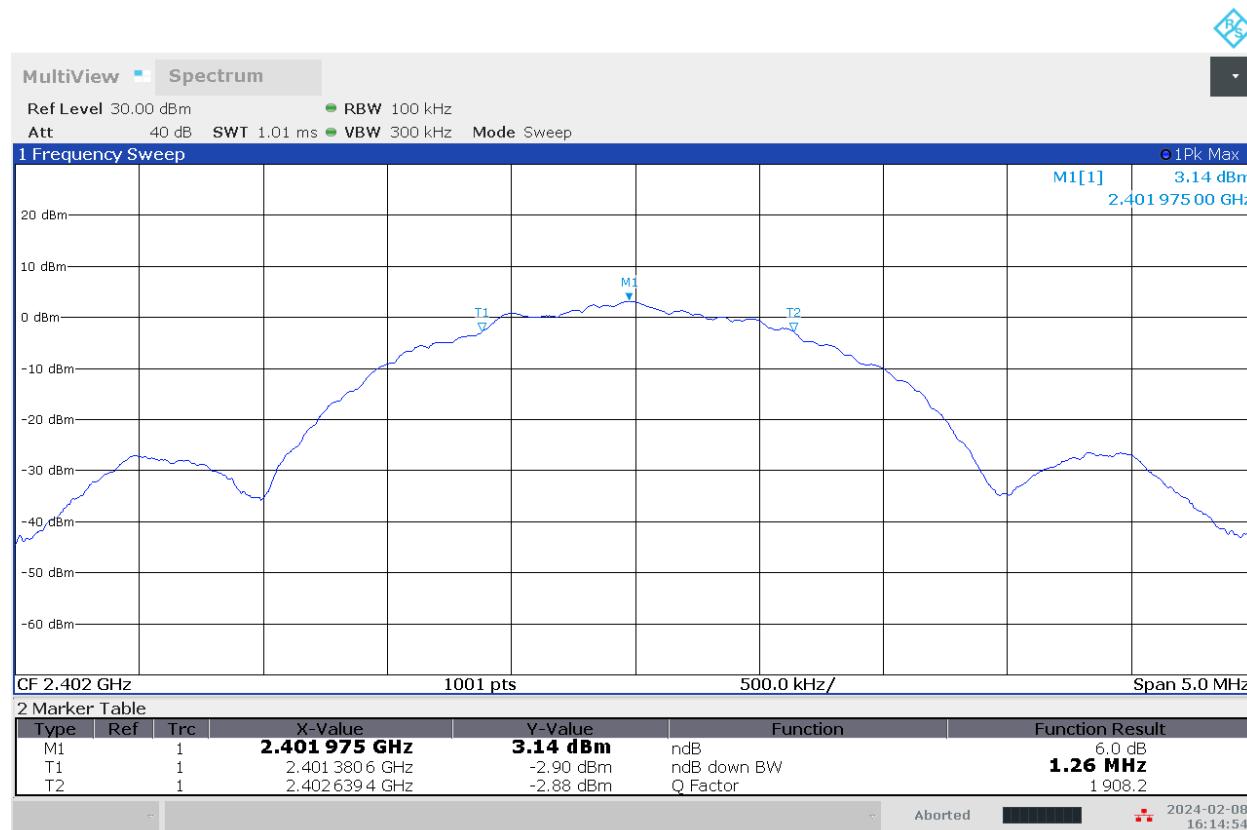
8.9 Test Data (2Mbit/s Data Rate)

Frequency (MHz)	Conducted PSD (dBm/100kHz)	Antenna Gain (dBi)	PSD EIRP (dBm/100kHz)	Limit (dBm/3kHz)
2402	3.14	0.97	4.11	8
2440	2.87	0.27	3.14	8
2480	2.50	-0.79	1.71	8



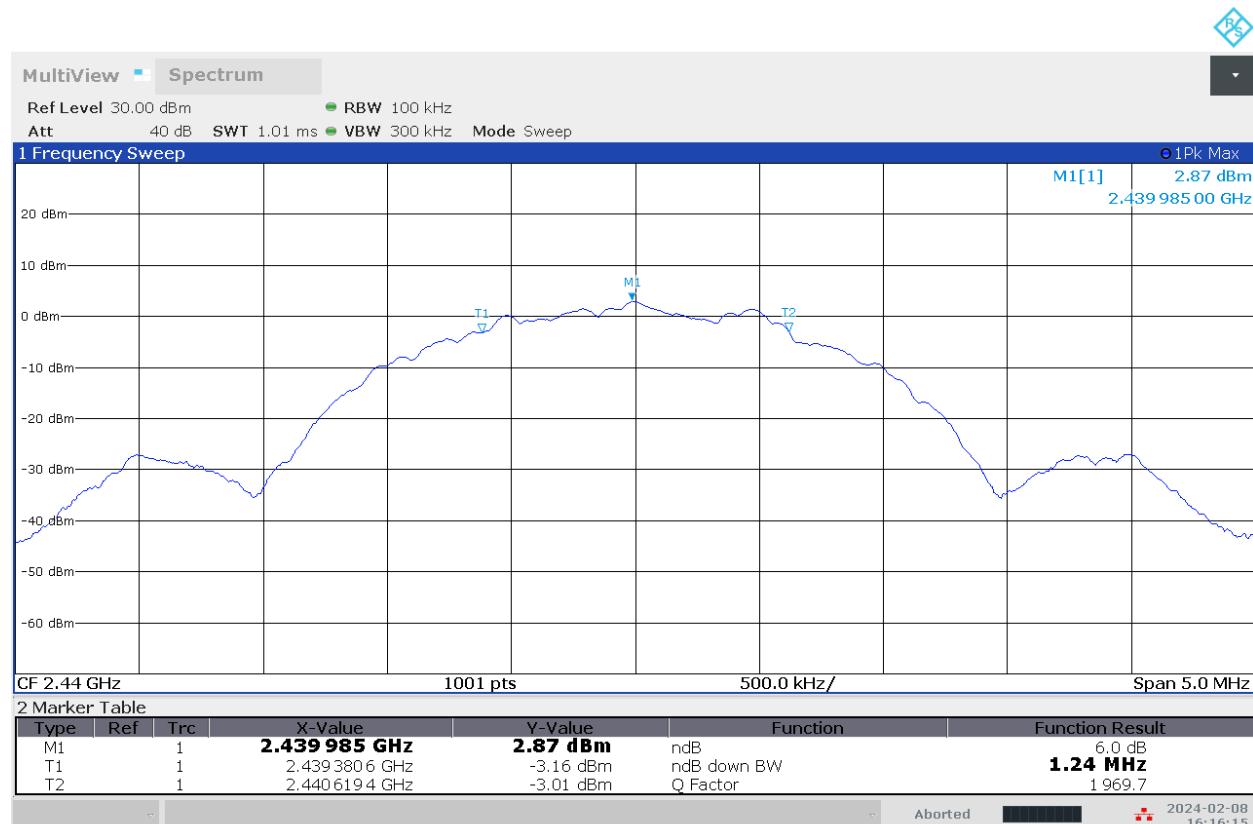
8.9.1 Test Plots: Power Spectral Density

8.9.1.1 Low Channel



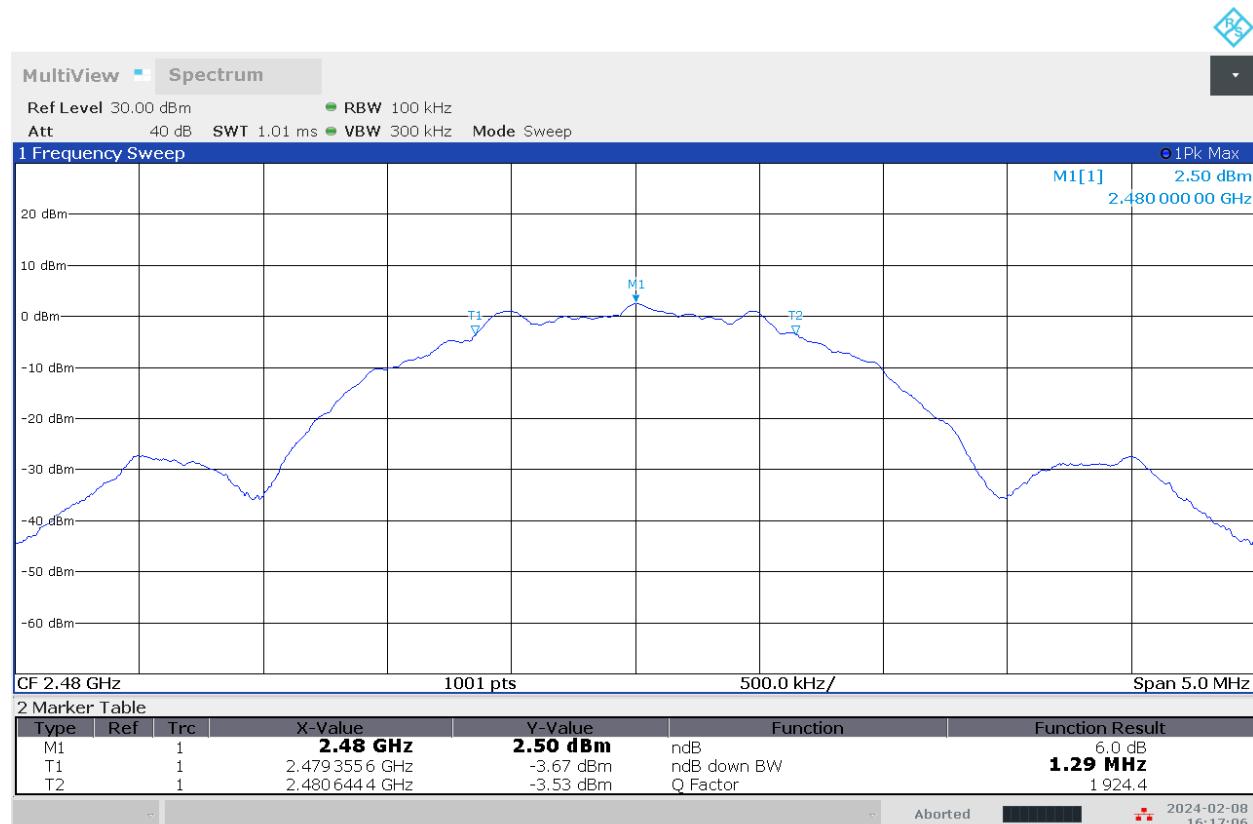


8.9.1.2 Mid Channel





8.9.1.3 High Channel





9 Conducted Spurious Emissions

9.1 Test Method:

Tests are performed in accordance with ANSI C63.10 §11.11.

9.2 Test Limits:

47 CFR 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. 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) (see § 15.205(c)).

RSS-247 §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



9.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	101472	Rohde & Schwarz	FSW26	12/19/2023	12/19/2024

9.4 Test Software Used:

Description	Manufacturer	Version
RSCommander	Rohde & Schwarz	2.4.2 64 bit (2023)

9.5 Measurement Uncertainty

Description	Expanded Uncertainty (k=2)
Conducted Spurious Emissions	1.2dB

No measurement correction based on measurement uncertainty is performed.

9.6 Test Conditions

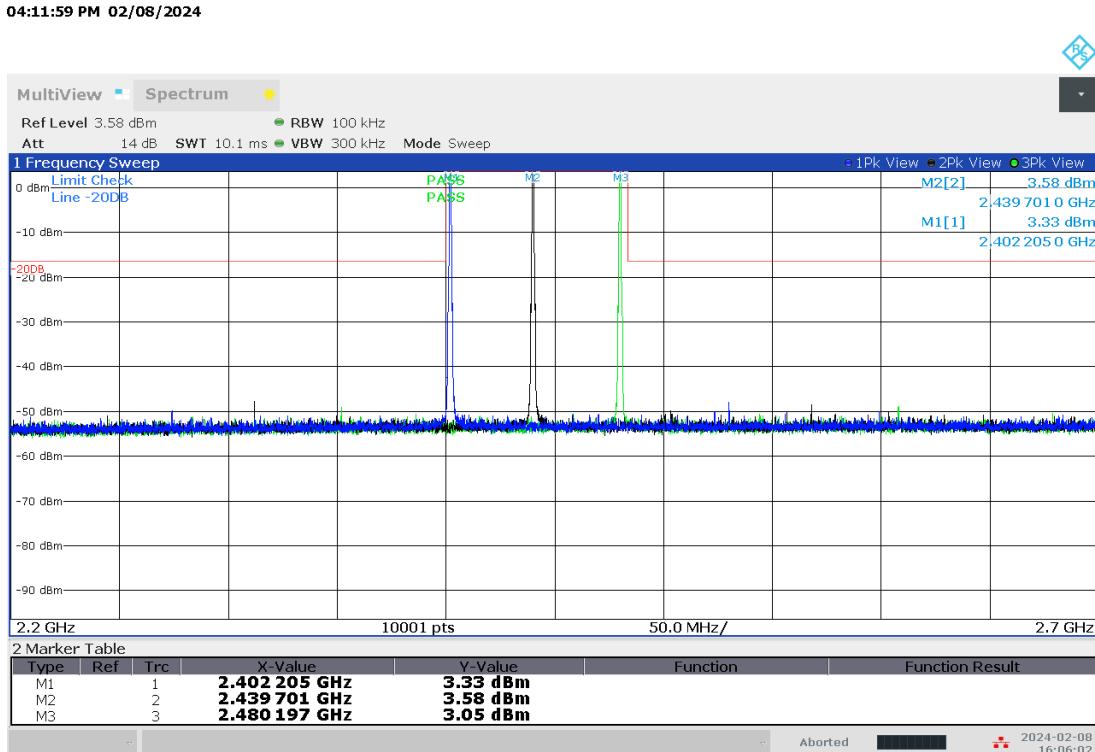
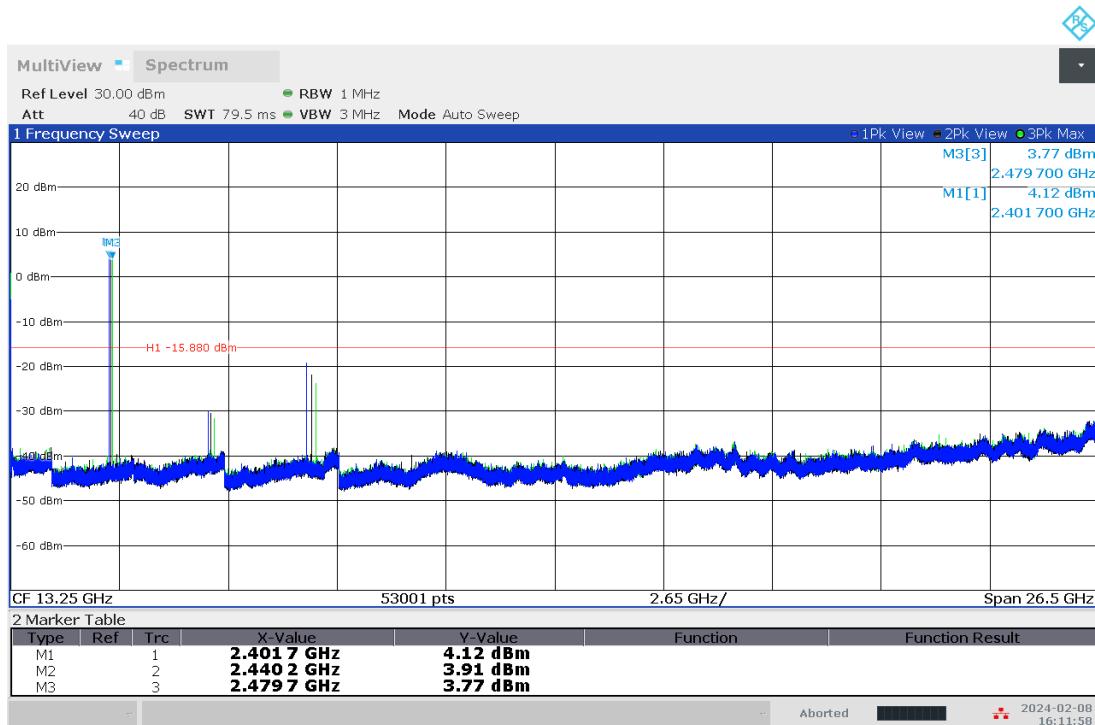
Test Personnel	Supervising / Reviewing Engineer	Test Date	Ambient Temperature	Relative Humidity	Pressure
Brian Lackey	NA	2/8/2024	23.9°C	20.3%	985.4mbar

9.7 Test Results:

The sample tested was found to Comply. Spurious emissions in 1MHz measurement bandwidth were below the level required in 100kHz bandwidth.

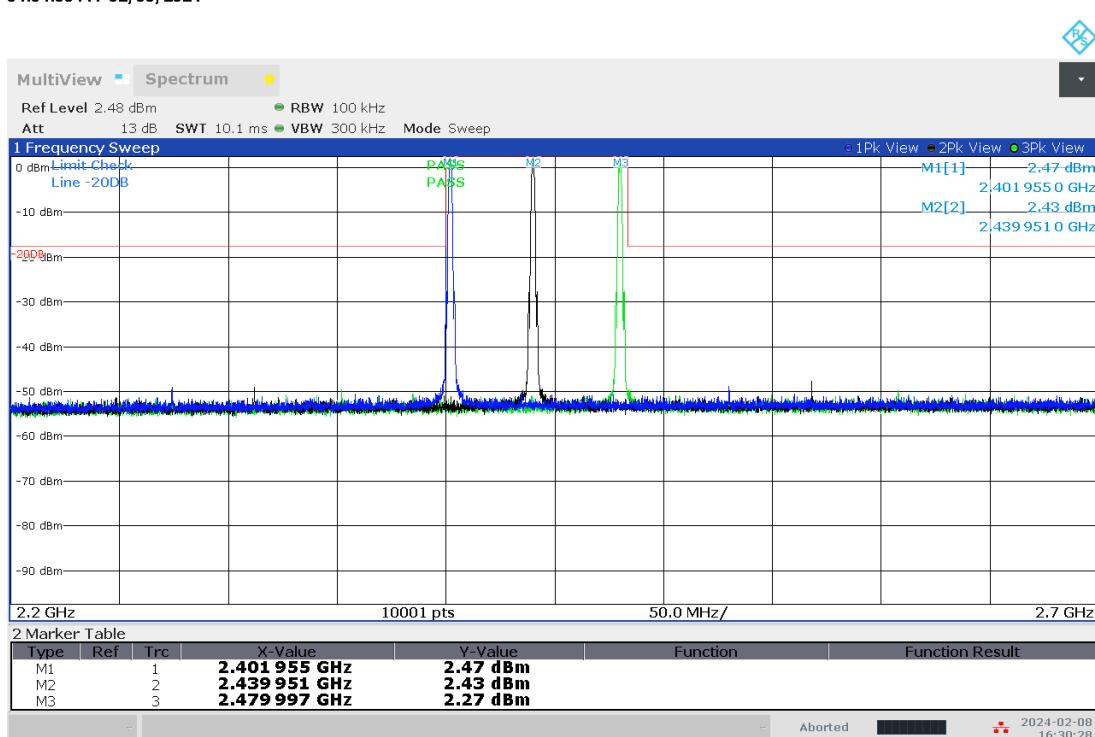
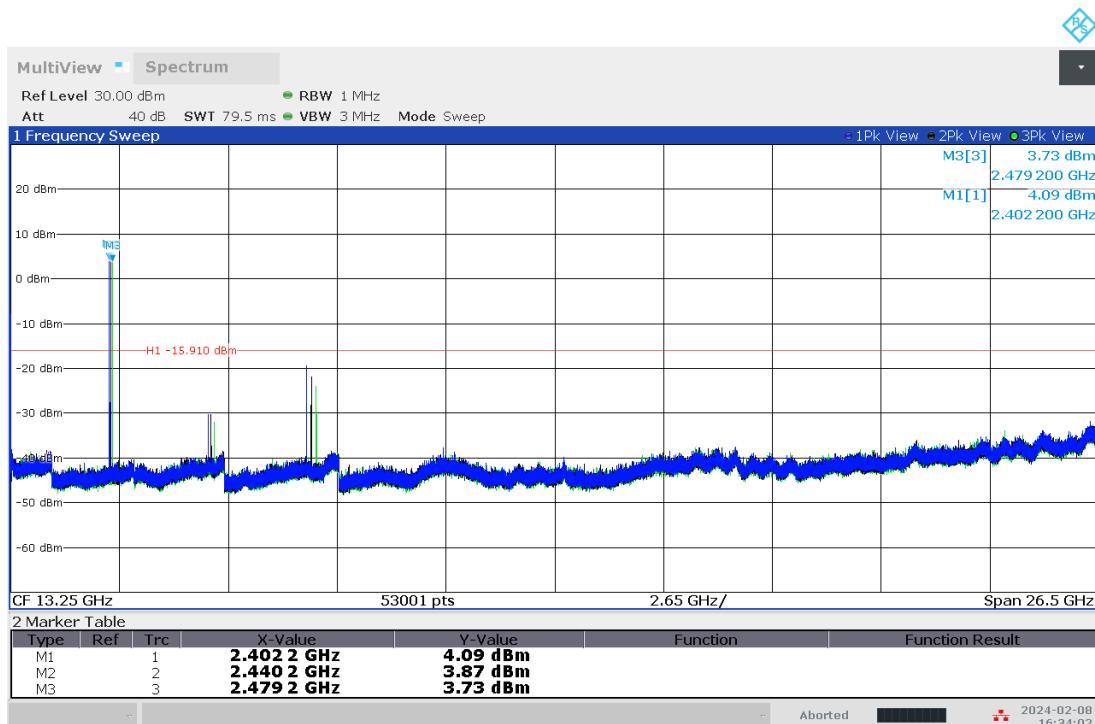


9.8 Test Data (1Mbit/s Data Rate)





9.9 Test Data (2Mbit/s Data Rate)





10 Radiated Spurious Emissions

10.1 Test Method:

Tests are performed in accordance with ANSI C63.10 §6.3 §6.5 and §6.6.

10.2 Test Limits:

47 CFR 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. 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) (see § 15.205(c)).

RSS-247 §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



10.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8258	Rohde & Schwarz	ESW44	9/19/2023	9/19/2024
Horn Antenna (18-40GHz)	3779	ETS	3116c	8/23/2023	8/23/2024
Horn Antenna (1-18GHz)	4001	ETS	3117	2/28/2023	2/28/2024
Bilog Antenna	7085	SunAR	JB6	3/7/2023	3/7/2024
Magnetic Loop Antenna	2366	ETS	6502	8/28/2023	8/28/2024
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Preamplifier (1-18GHz)	3918	Rohde & Schwarz	TS-PR18	1/12/2024	1/12/2025
1-18GHz Signal Path with Preamplifier	3074, 3918, 2588, 2593, 8188, 8185			1/12/2024	1/12/2025
30M-1G 3m Signal Path without Preamplifier	3339, 2592, 8188, 8185			1/12/2024	1/12/2025
1-18GHz Signal Path without Preamplifier	3074, 2588, 2593, 8188, 8185			1/12/2024	1/12/2025
18-40GHz Signal Path with Preamplifier	7020, 3921, 7021			1/12/2024	1/12/2025

10.4 Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	3.9dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.0dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.7dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.

10.5 Test Software Used:

Description	Manufacturer	Version
EMC32	Rohde & Schwarz	10.60.20

10.6 Test Results:

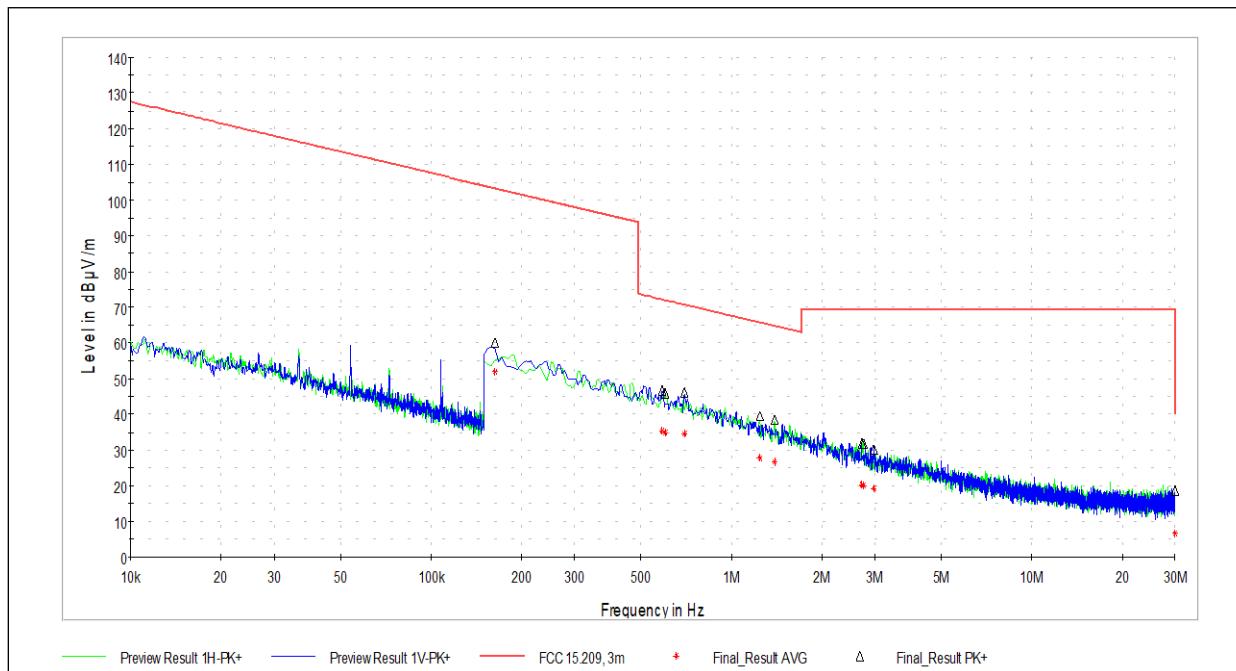
The sample tested was found to Comply. The device was investigated in three orthogonal axes.



10.7 Test Data: Radiated Spurious Emissions, General

10.7.1 Frequency Range 9kHz – 30MHz

10.7.1.1 Middle Channel¹



Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.163	60.11	51.92	103.35	43.24	100.0	V	237.0	12.1
0.589	46.75	35.36	72.21	25.46	100.0	V	43.0	11.9
0.602	45.84	34.75	72.02	26.18	100.0	H	149.0	11.9
0.699	46.11	34.55	70.73	24.62	100.0	V	0.0	11.9
1.243	39.55	27.77	65.74	26.19	100.0	H	26.0	12.0
1.392	38.49	26.66	64.76	26.27	100.0	H	320.0	11.9
2.718	31.80	20.22	69.50	37.70	100.0	V	34.0	11.6
2.744	31.84	20.08	69.50	37.66	100.0	H	138.0	11.5
2.981	30.07	19.34	69.50	39.43	100.0	V	168.0	11.5
30.000	18.63	6.64	40.00	21.37	100.0	V	342.0	8.8

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2VDC

Test Date: 2/26/2024
Limit Applied: See Section 10.2
Ambient Temperature: 25.7°C
Relative Humidity: 26.5%
Atmospheric Pressure: 982.0mbar

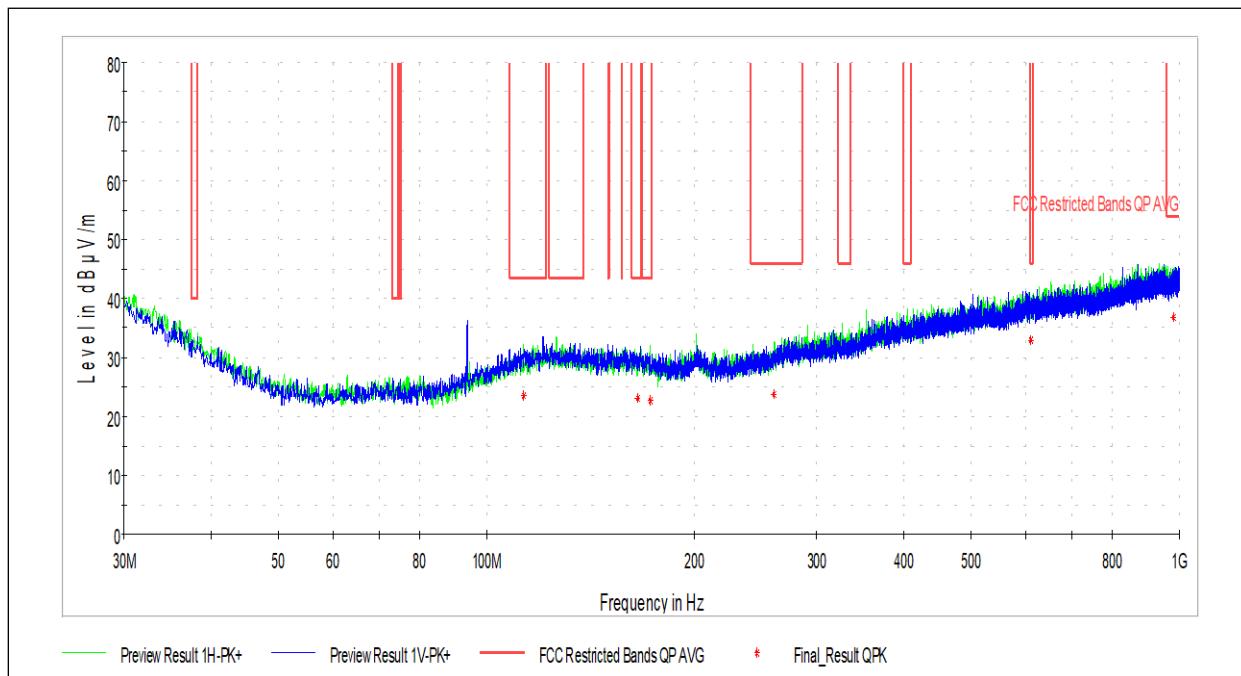
Deviations, Additions, or Exclusions: Testing represents the worst case of 1Mbit/s and 2Mbit/s data rates. The peak emissions were less than the quasipeak limit and the device is thereby deemed to comply.

¹ Testing represents the worst case of low, middle, and high channels.



10.7.2 Frequency Range 30MHz – 1GHz

10.7.2.1 Middle Channel (1Mbit/s Data Rate)¹



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
113.204	23.45	43.52	20.07	95.0	H	232.0	20.2
165.477	23.19	43.52	20.33	205.0	V	181.0	20.3
172.159	22.59	43.52	20.93	154.0	H	242.0	19.4
260.159	23.75	46.02	22.27	257.0	H	173.0	20.6
610.491	32.86	46.02	13.16	150.0	H	168.0	28.6
980.438	36.77	53.98	17.21	340.0	H	-1.0	33.1

Test Personnel: Seth Parker
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
FCC 15.247
Product Standard: RSS-247
Input Voltage: 2V DC

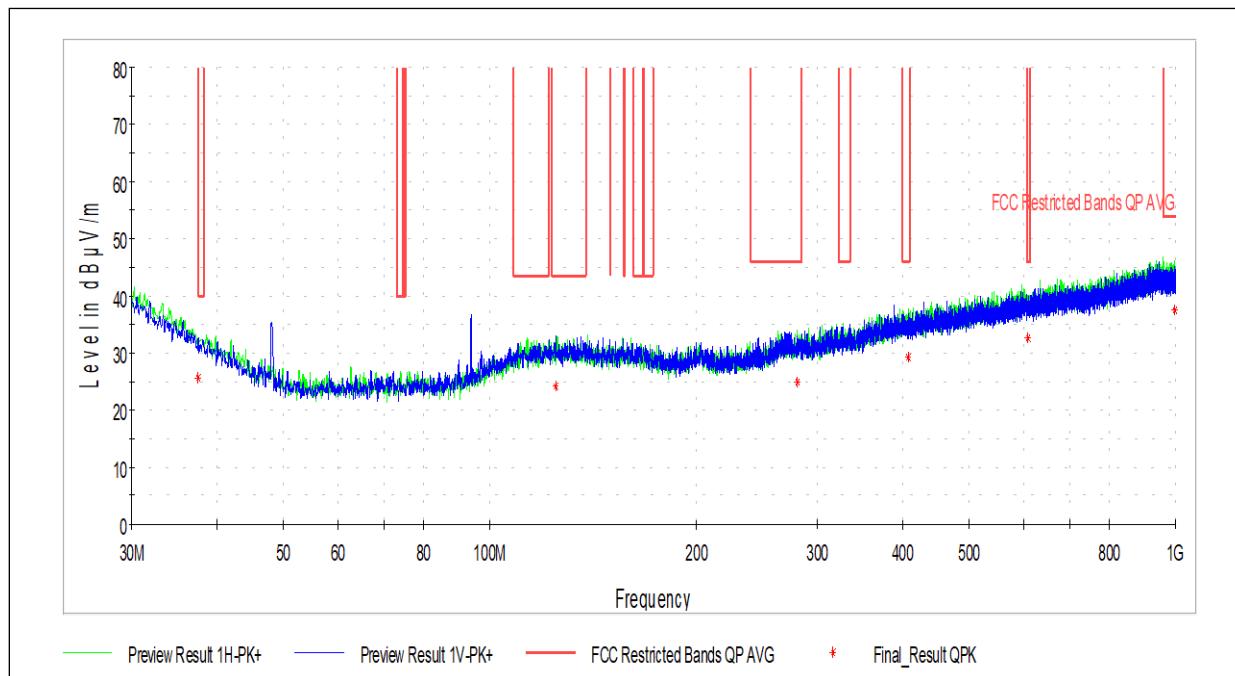
Test Date: 2/17/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None

¹ Testing represents the worst case of low, middle, and high channels.



10.7.2.2 Middle Channel (2Mbit/s Data Rate)¹



Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.544	25.73	40.00	14.27	228.0	V	261.0	21.8
124.521	24.26	43.52	19.26	297.0	V	16.0	21.2
280.745	25.01	46.02	21.01	283.0	H	161.0	21.7
407.923	29.18	46.02	16.84	146.0	H	180.0	24.7
609.844	32.70	46.02	13.32	95.0	H	176.0	28.6
997.306	37.49	53.98	16.49	275.0	H	78.0	33.3

Test Personnel: Seth Parker
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: RSS-247
2V DC

Test Date: 2/17/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

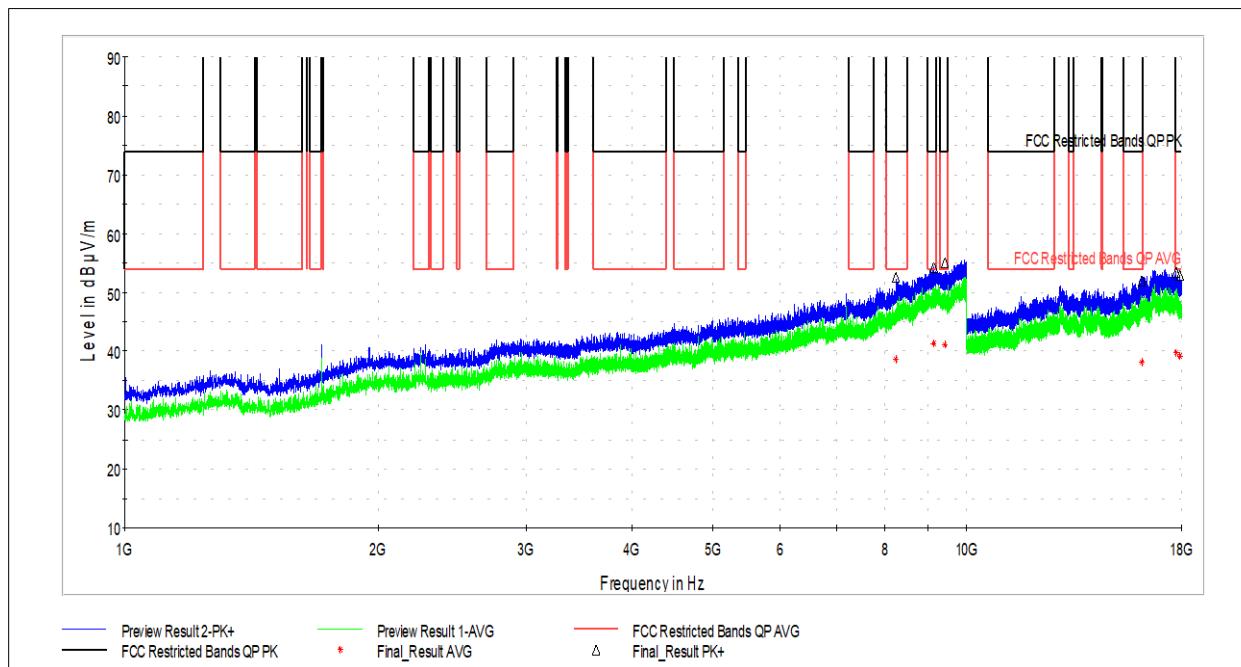
Deviations, Additions, or Exclusions: None

¹ Testing represents the worst case of low, middle, and high channels.



10.7.3 Frequency Range 1GHz – 18GHz

10.7.3.1 Low Channel (1Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8242.000	52.53	73.98	21.45	410.0	V	236.0	14.8
9145.500	54.38	73.98	19.60	334.0	H	92.0	16.2
9419.000	54.98	73.98	19.00	380.0	H	318.0	16.8
16152.500	52.01	73.98	21.97	410.0	V	190.0	24.5
17746.500	53.43	73.98	20.55	410.0	V	59.0	26.2
17930.500	52.96	73.98	21.02	136.0	H	165.0	26.1

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8242.000	38.62	53.98	15.36	410.0	V	236.0	14.8
9145.500	41.21	53.98	12.77	334.0	H	92.0	16.2
9419.000	41.14	53.98	12.84	380.0	H	318.0	16.8
16152.500	38.05	53.98	15.93	410.0	V	190.0	24.5
17746.500	39.74	53.98	14.24	410.0	V	59.0	26.2
17930.500	39.24	53.98	14.74	136.0	H	165.0	26.1

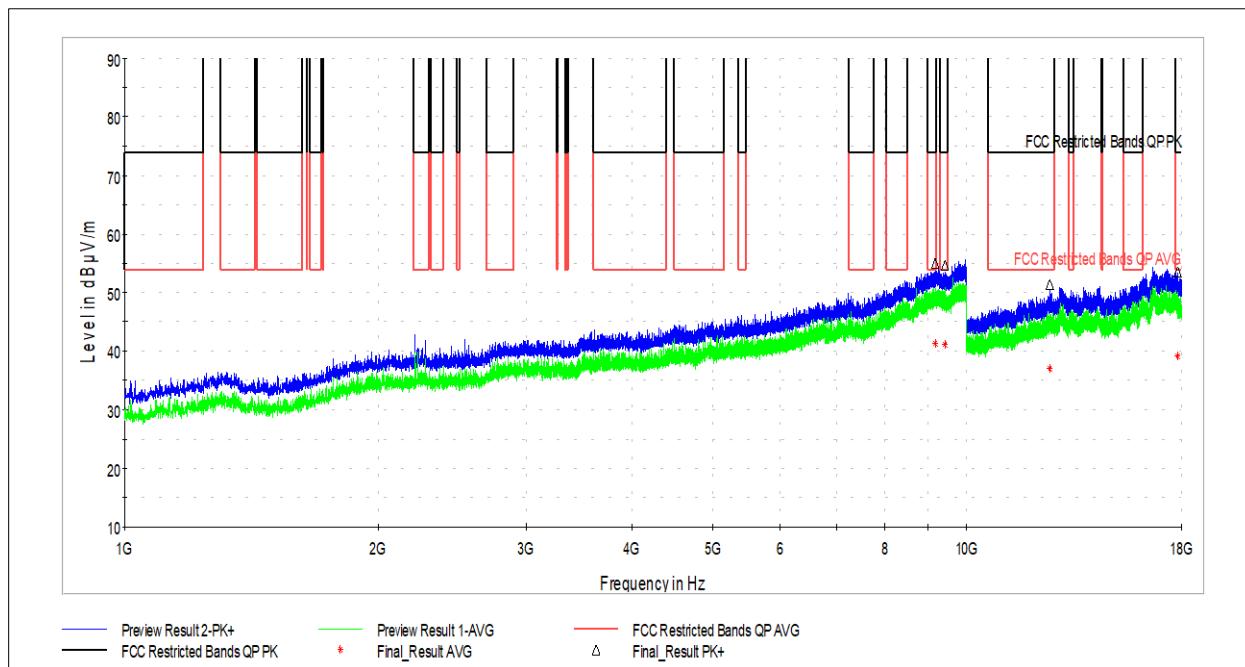
Test Personnel: Jordan Coughenour
 Supervising/Reviewing Engineer:
 (Where Applicable) NA
FCC 15.247
 Product Standard: RSS-247
 Input Voltage: 2VDC

Test Date: 2/16/2024
 Limit Applied: See Section 10.2
 Ambient Temperature: 23.0°C
 Relative Humidity: 24.2%
 Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



10.7.3.2 Low Channel (2Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9178.000	55.01	73.98	18.97	410.0	H	199.0	16.2
9436.000	54.66	73.98	19.32	410.0	V	294.0	16.7
12563.500	51.41	73.98	22.57	410.0	V	0.0	21.0
17831.000	53.61	73.98	20.37	396.0	V	96.0	26.1

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9178.000	41.28	53.98	12.70	410.0	H	199.0	16.2
9436.000	41.04	53.98	12.94	410.0	V	294.0	16.7
12563.500	37.05	53.98	16.93	410.0	V	0.0	21.0
17831.000	39.08	53.98	14.90	396.0	V	96.0	26.1

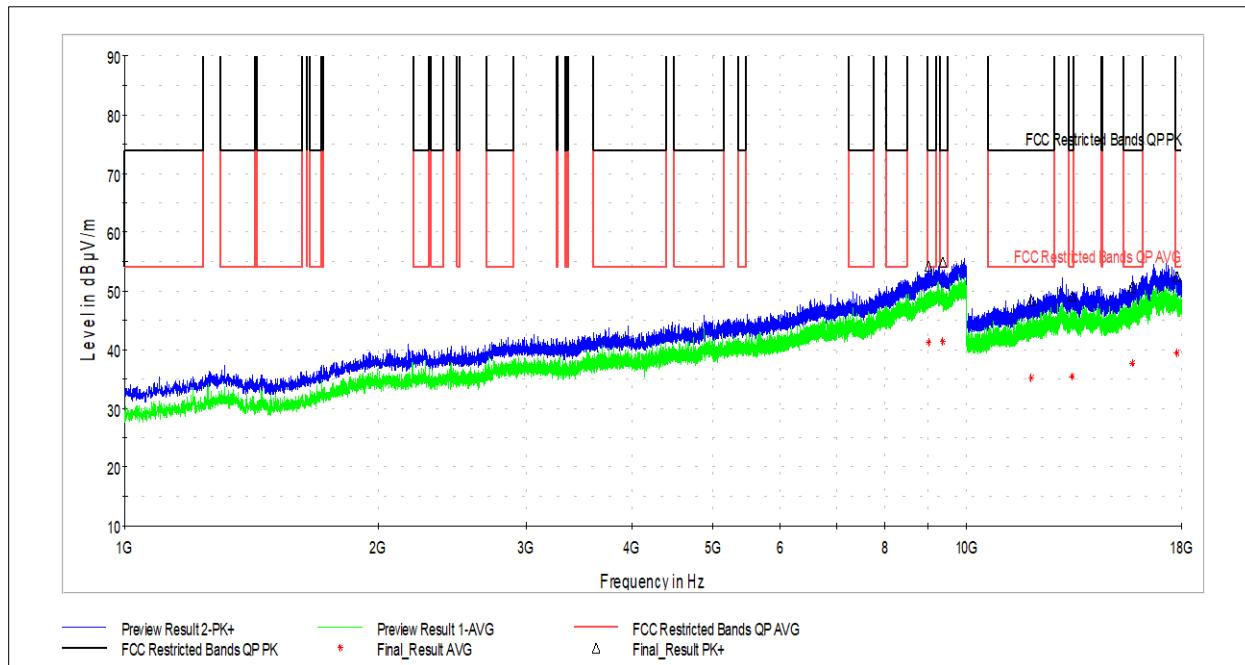
Test Personnel: Jordan Coughenour
Supervising/Reviewing Engineer:
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2VDC

Test Date: 2/16/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



10.7.3.3 Middle Channel (1Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9007.000	54.22	73.98	19.76	343.0	V	91.0	15.8
9373.000	54.98	73.98	19.00	410.0	H	238.0	16.6
11935.500	48.33	73.98	25.65	100.0	V	127.0	20.0
13335.000	49.05	73.98	24.93	410.0	H	283.0	21.4
15729.500	50.72	73.98	23.26	117.0	V	59.0	23.6
17782.500	52.53	73.98	21.45	297.0	H	23.0	26.1

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9007.000	41.23	53.98	12.75	343.0	V	91.0	15.8
9373.000	41.30	53.98	12.68	410.0	H	238.0	16.6
11935.500	35.25	53.98	18.73	100.0	V	127.0	20.0
13335.000	35.30	53.98	18.68	410.0	H	283.0	21.4
15729.500	37.69	53.98	16.29	117.0	V	59.0	23.6
17782.500	39.50	53.98	14.48	297.0	H	23.0	26.1

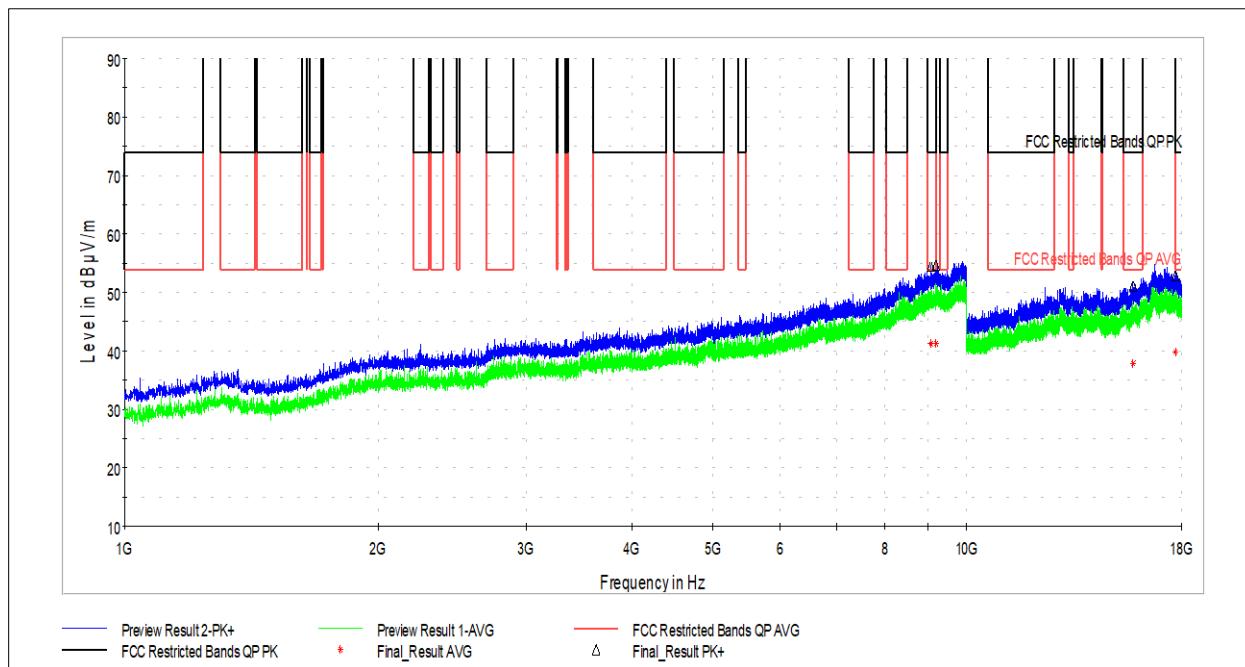
Test Personnel: Jordan Coughenour
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC 15.247
Product Standard: RSS-247
Input Voltage: 2VDC

Test Date: 2/16/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



10.7.3.4 Middle Channel (2Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9076.000	54.48	73.98	19.50	321.0	H	68.0	15.9
9193.000	54.68	73.98	19.30	410.0	V	175.0	16.2
15759.000	51.03	73.98	22.95	390.0	V	316.0	23.7
17709.000	52.94	73.98	21.04	410.0	H	188.0	26.1

Frequency (MHz)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9076.000	41.20	53.98	12.78	321.0	H	68.0	15.9
9193.000	41.25	53.98	12.73	410.0	V	175.0	16.2
15759.000	37.81	53.98	16.17	390.0	V	316.0	23.7
17709.000	39.76	53.98	14.22	410.0	H	188.0	26.1
9076.000	41.20	53.98	12.78	321.0	H	68.0	15.9

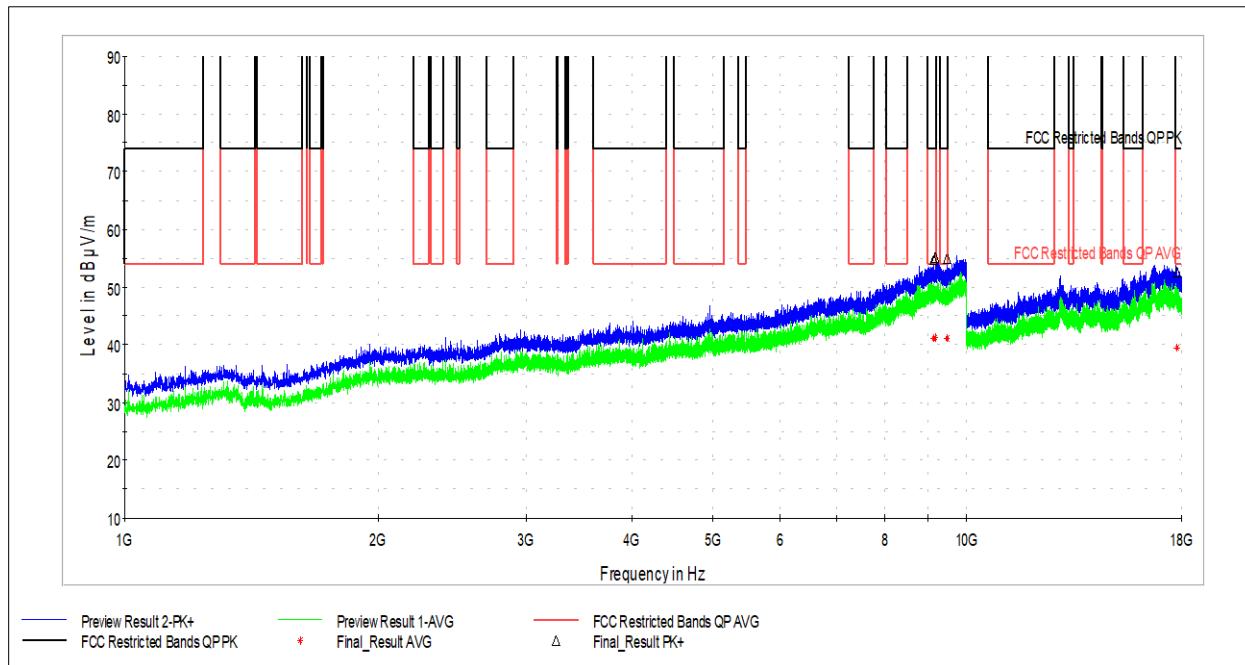
Test Personnel: Jordan Coughenour
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2VDC

Test Date: 2/16/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



10.7.3.5 High Channel (1Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9138.500	54.73	73.98	19.25	386.0	H	260.0	16.2
9188.000	55.14	73.98	18.84	410.0	V	320.0	16.2
9478.500	54.94	73.98	19.04	410.0	H	45.0	16.9
17795.500	52.59	73.98	21.39	181.0	V	70.0	26.1

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9138.500	41.16	53.98	12.82	386.0	H	260.0	16.2
9188.000	41.21	53.98	12.77	410.0	V	320.0	16.2
9478.500	41.15	53.98	12.83	410.0	H	45.0	16.9
17795.500	39.54	53.98	14.44	181.0	V	70.0	26.1

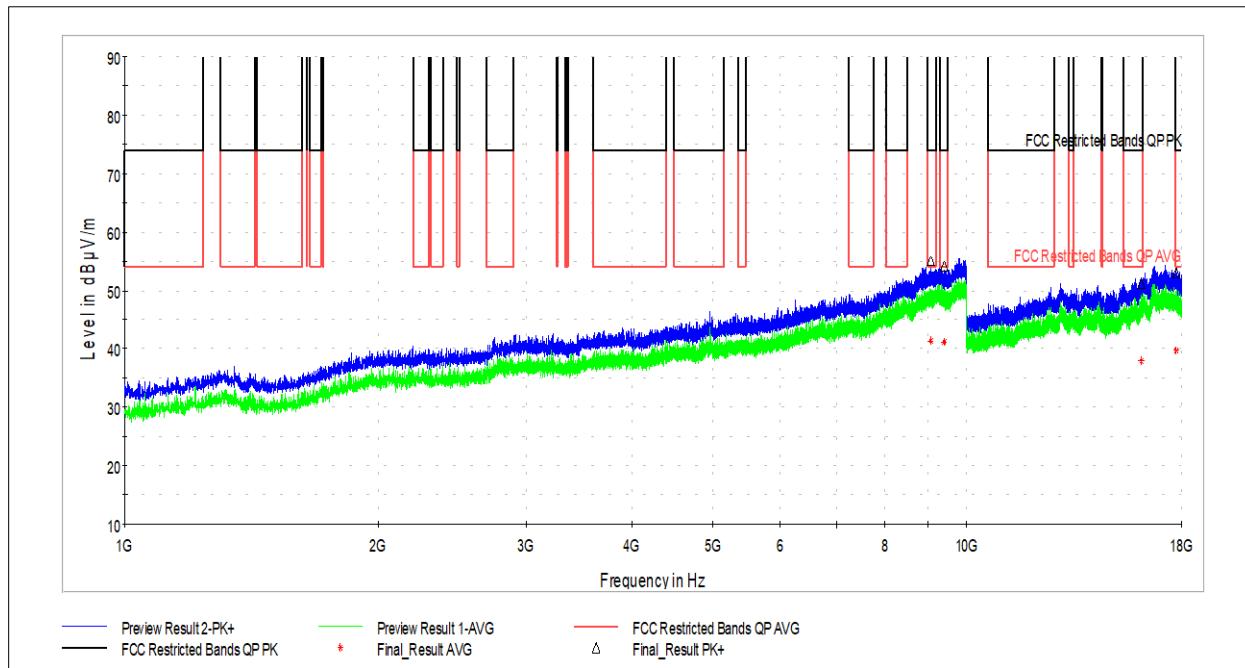
Test Personnel: Jordan Coughenour
Supervising/Reviewing Engineer:
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2VDC

Test Date: 2/16/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



10.7.3.6 High Channel (2Mbit/s Data Rate)



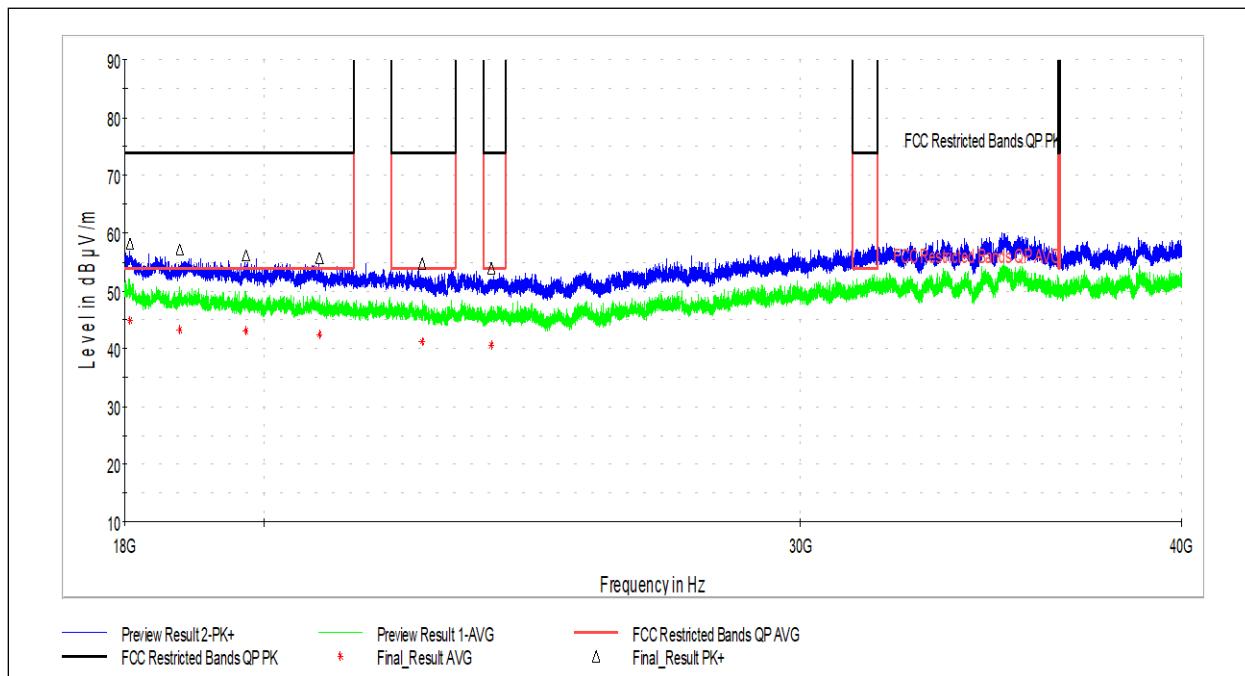
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9071.000	55.08	73.98	18.90	381.0	V	0.0	16.0
9415.000	54.18	73.98	19.80	385.0	H	106.0	16.7
16134.000	51.13	73.98	22.85	410.0	V	190.0	24.5
17752.000	52.98	73.98	21.00	117.0	H	296.0	26.0

Frequency (MHz)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9071.000	41.29	53.98	12.69	381.0	V	0.0	16.0
9415.000	41.16	53.98	12.82	385.0	H	106.0	16.7
16134.000	37.96	53.98	16.02	410.0	V	190.0	24.5
17752.000	39.76	53.98	14.22	117.0	H	296.0	26.0

Test Personnel: Jordan Coughenour
Supervising/Reviewing Engineer:
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2VDC

Test Date: 2/16/2024
Limit Applied: See Section 10.2
Ambient Temperature: 23.0°C
Relative Humidity: 24.2%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None

**10.7.4 Frequency Range 18GHz – 40GHz****10.7.4.1 Middle Channel (1Mbit/s Data Rate)¹**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18072.000	58.21	73.98	15.77	410.0	H	0.0	29.0
18766.000	57.17	73.98	16.81	410.0	V	210.0	26.8
19725.000	56.05	73.98	17.93	410.0	V	0.0	24.0
20857.000	55.65	73.98	18.33	410.0	H	0.0	20.0
22538.000	54.64	73.98	19.34	410.0	V	316.0	14.8
23749.000	53.83	73.98	20.15	410.0	V	0.0	13.7

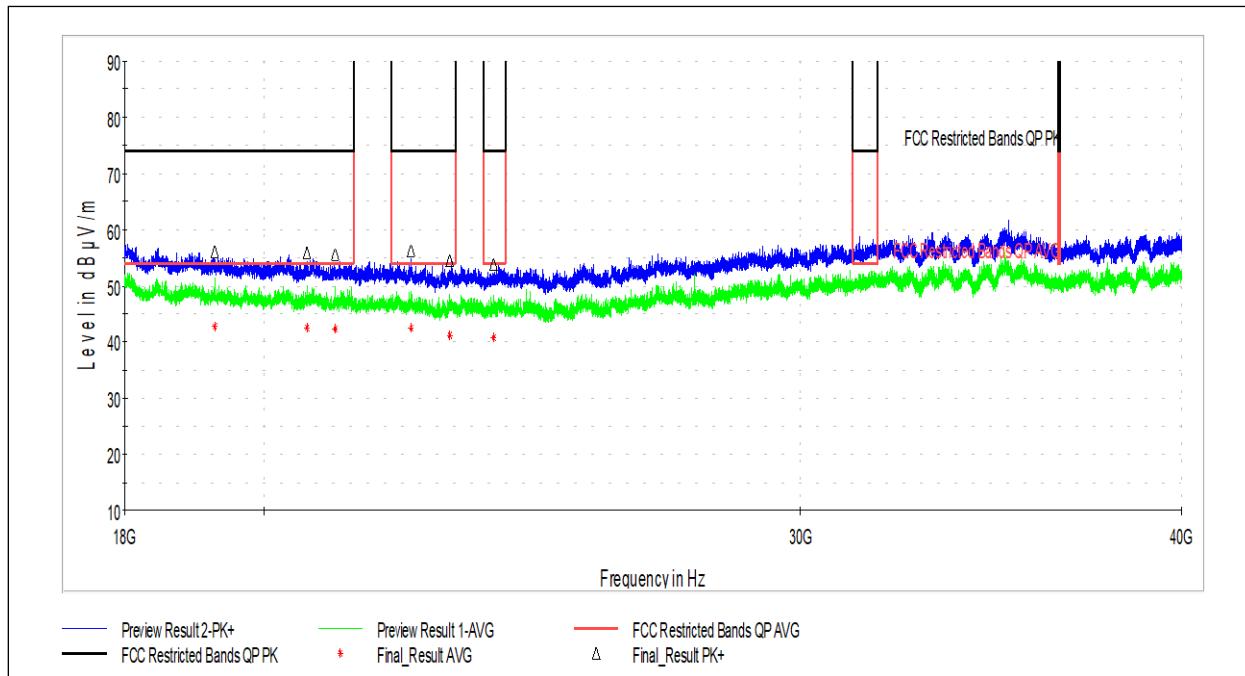
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18072.000	44.88	53.98	9.10	410.0	H	0.0	29.0
18766.000	43.28	53.98	10.70	410.0	V	210.0	26.8
19725.000	43.09	53.98	10.89	410.0	V	0.0	24.0
20857.000	42.39	53.98	11.59	410.0	H	0.0	20.0
22538.000	41.32	53.98	12.66	410.0	V	316.0	14.8
23749.000	40.54	53.98	13.44	410.0	V	0.0	13.7

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2V DC

Test Date: 2/29/2024
Limit Applied: See Section 10.2
Ambient Temperature: 24.4°C
Relative Humidity: 18.7%
Atmospheric Pressure: 988.8mbar

Deviations, Additions, or Exclusions: None

¹ Testing represents the worst case between the low, middle, and high channels

10.7.4.2 Middle Channel (2Mbit/s Data Rate)¹

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19263.000	56.13	73.98	17.85	100.0	H	0.0	25.7
20658.000	56.01	73.98	17.97	410.0	V	0.0	20.6
21097.000	55.75	73.98	18.23	410.0	V	317.0	19.4
22350.000	56.43	73.98	17.55	410.0	H	0.0	15.5
23014.000	54.58	73.98	19.40	410.0	V	0.0	14.1
23788.000	53.83	73.98	20.15	410.0	V	0.0	13.7

Frequency (MHz)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19263.000	42.85	53.98	11.13	100.0	H	0.0	25.7
20658.000	42.56	53.98	11.42	410.0	V	0.0	20.6
21097.000	42.40	53.98	11.58	410.0	V	317.0	19.4
22350.000	42.49	53.98	11.49	410.0	H	0.0	15.5
23014.000	41.22	53.98	12.76	410.0	V	0.0	14.1
23788.000	40.74	53.98	13.24	410.0	V	0.0	13.7

Test Personnel: Brian Lackey
 Supervising/Reviewing Engineer:
 (Where Applicable) NA
 Product Standard: FCC 15.247
 Input Voltage: 2V DC

Test Date: 2/29/2024
 Limit Applied: See Section 10.2
 Ambient Temperature: 24.4°C
 Relative Humidity: 18.7%
 Atmospheric Pressure: 988.8mbar

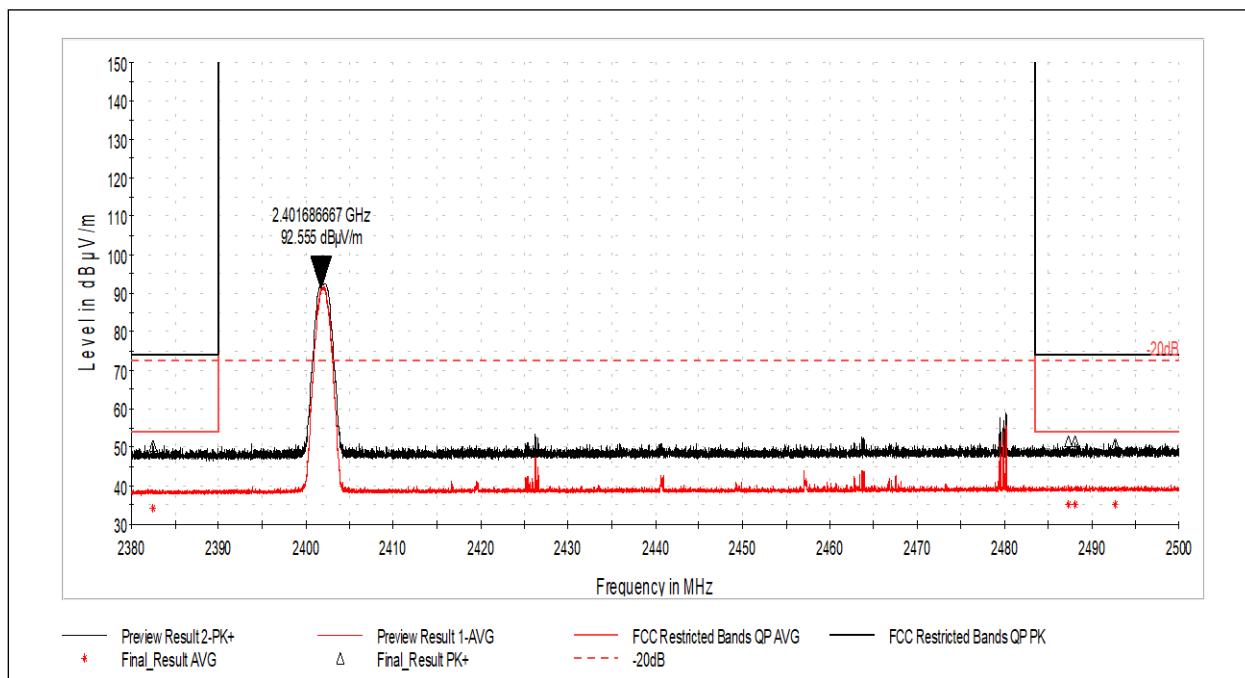
Deviations, Additions, or Exclusions: None

¹ Testing represents the worst case between the low, middle, and high channels



10.8 Test Data: Radiated Emissions, Band Edge

10.8.1 Low Channel Band Edge (1Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2382.507	50.41	73.98	23.57	383.0	V	0.0	38.2
2487.320	51.55	73.98	22.43	198.0	H	11.0	38.9
2488.087	51.59	73.98	22.39	410.0	V	315.0	38.9
2492.693	51.15	73.98	22.83	130.0	V	0.0	38.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2382.507	34.06	53.98	19.92	383.0	V	0.0	38.2
2487.320	35.04	53.98	18.94	198.0	H	11.0	38.9
2488.087	35.04	53.98	18.94	410.0	V	315.0	38.9
2492.693	35.00	53.98	18.98	130.0	V	0.0	38.9

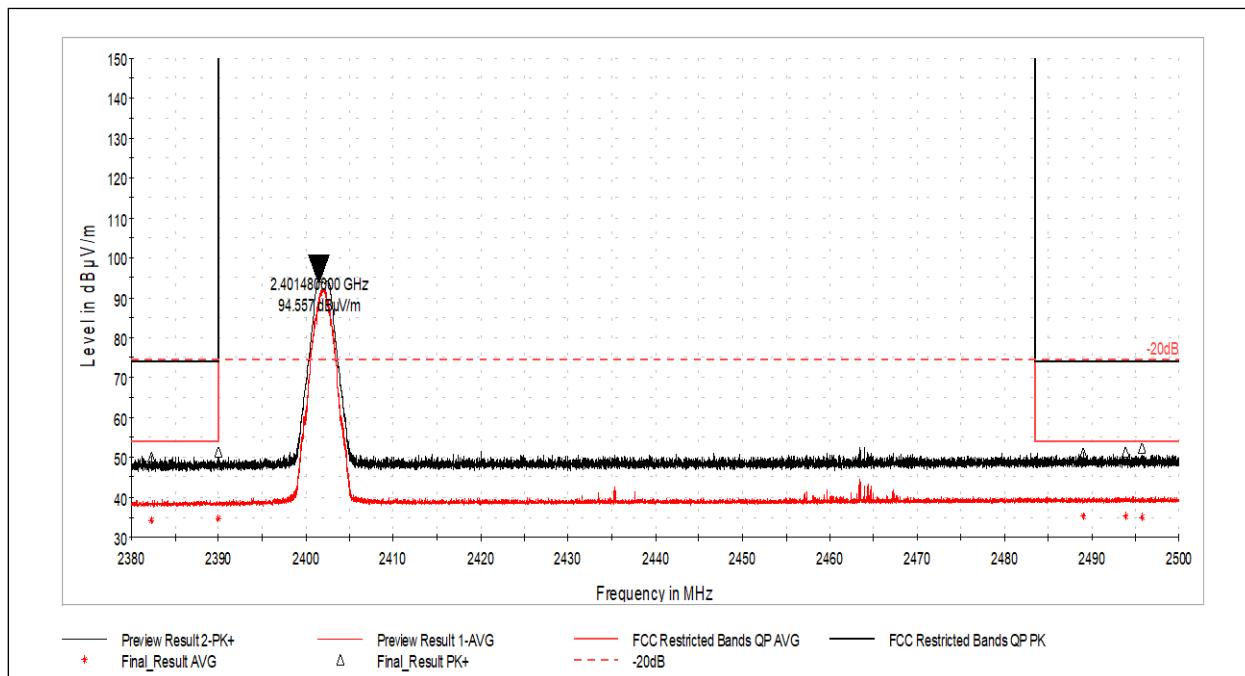
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2V DC

Test Date: 2/29/2024
Limit Applied: See Section 10.2
Ambient Temperature: 24.4°C
Relative Humidity: 18.7%
Atmospheric Pressure: 988.8mbar

Deviations, Additions, or Exclusions: None



10.8.2 Low Channel Band Edge (2Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2382.340	50.08	73.98	23.90	410.0	V	339.0	38.2
2389.947	51.23	73.98	22.75	352.0	V	0.0	38.3
2489.047	51.05	73.98	22.93	177.0	H	30.0	38.9
2493.867	51.30	73.98	22.68	410.0	H	275.0	38.9
2495.767	52.26	73.98	21.72	351.0	H	315.0	38.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2382.340	34.12	53.98	19.86	410.0	V	339.0	38.2
2389.947	34.57	53.98	19.41	352.0	V	0.0	38.3
2489.047	35.09	53.98	18.89	177.0	H	30.0	38.9
2493.867	35.08	53.98	18.90	410.0	H	275.0	38.9
2495.767	35.06	53.98	18.92	351.0	H	315.0	38.9

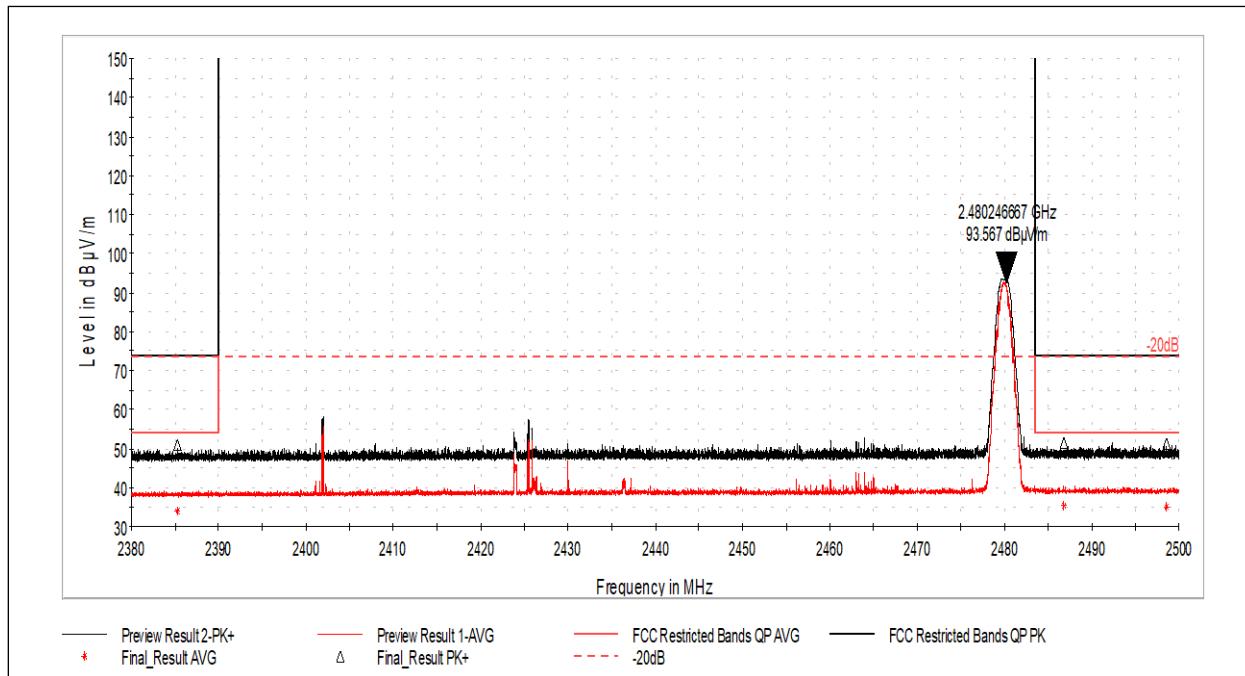
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2V DC

Test Date: 2/29/2024
Limit Applied: See Section 10.2
Ambient Temperature: 24.4°C
Relative Humidity: 18.7%
Atmospheric Pressure: 988.8mbar

Deviations, Additions, or Exclusions: None



10.8.3 High Channel Band Edge (1Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2385.280	50.94	73.98	23.04	256.0	H	1.0	38.3
2486.760	51.49	73.98	22.49	329.0	H	11.0	38.9
2498.527	51.19	73.98	22.79	246.0	V	222.0	38.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2385.280	34.08	53.98	19.90	256.0	H	1.0	38.3
2486.760	35.28	53.98	18.70	329.0	H	11.0	38.9
2498.527	35.05	53.98	18.93	246.0	V	222.0	38.9

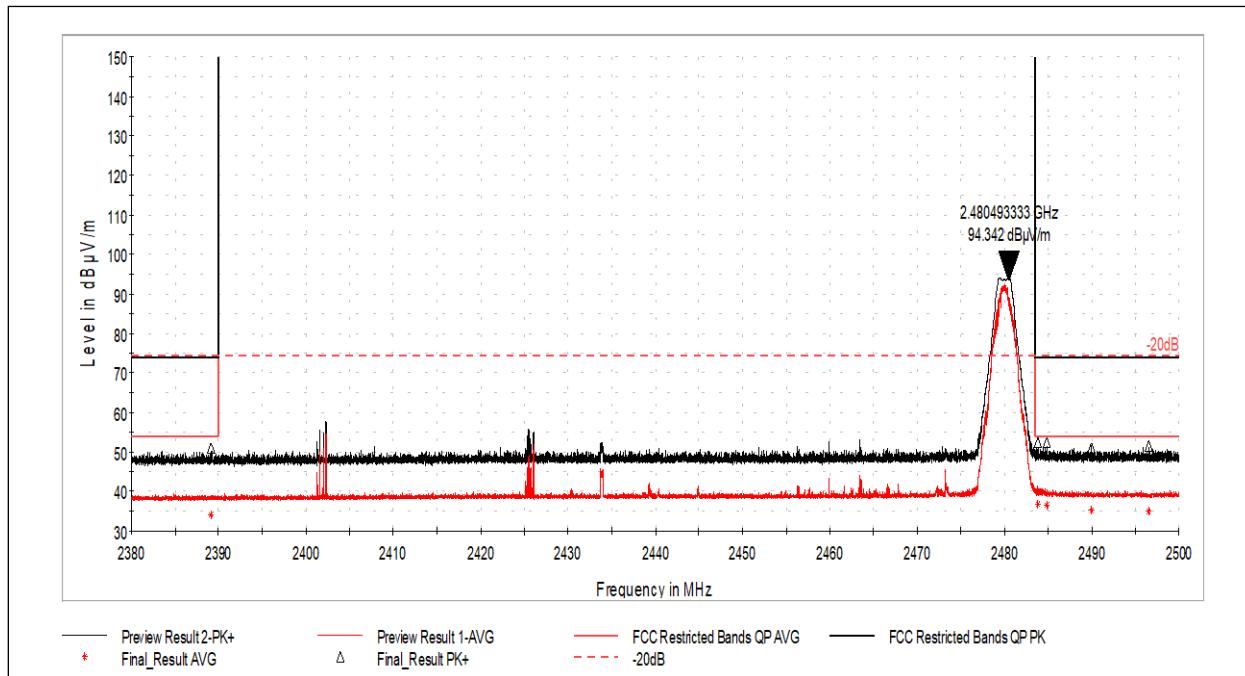
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: 2V DC

Test Date: 2/29/2024
Limit Applied: See Section 10.2
Ambient Temperature: 24.4°C
Relative Humidity: 18.7%
Atmospheric Pressure: 988.8mbar

Deviations, Additions, or Exclusions: None



10.8.4 High Channel Band Edge (2Mbit/s Data Rate)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.133	50.94	73.98	23.04	307.0	V	0.0	38.3
2483.800	52.33	73.98	21.65	294.0	H	11.0	38.9
2484.807	52.49	73.98	21.49	293.0	H	30.0	38.9
2489.987	51.07	73.98	22.91	352.0	H	90.0	38.9
2496.513	51.48	73.98	22.50	341.0	H	263.0	38.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.133	34.09	53.98	19.89	307.0	V	0.0	38.3
2483.800	36.82	53.98	17.16	294.0	H	11.0	38.9
2484.807	36.51	53.98	17.47	293.0	H	30.0	38.9
2489.987	35.13	53.98	18.85	352.0	H	90.0	38.9
2496.513	35.04	53.98	18.94	341.0	H	263.0	38.9

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: RSS-247
2V DC

Test Date: 2/29/2024
Limit Applied: See Section 10.2
Ambient Temperature: 24.4°C
Relative Humidity: 18.7%
Atmospheric Pressure: 988.8mbar

Deviations, Additions, or Exclusions: None



11 Antenna Requirement

11.1 Test Limits

FCC Part 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen Issue 5 § 6.8:

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the license-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

License-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the license-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of license-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

11.2 Test Results

The device was found to be **compliant**. The device has an internal, permanently affixed antenna.



12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	4/12/2024	105704106LEX-001	BZ	MC	Original Issue