



Total Quality. Assured.

Intertek
731 Enterprise Drive
Lexington, KY 40510

Tel 859 226 1000
Fax 859 226 1040

www.intertek.com

Oreon Holding BV TEST REPORT

SCOPE OF WORK

EMC TESTING – OLCC TRANSCEIVER MODULE

REPORT NUMBER

105659039LEX-001.1

ISSUE DATE

5/2/2024

REVISE DATE

5/17/2024

PAGES

47

DOCUMENT CONTROL NUMBER

Non-Specific EMC Report Shell Rev. December 2017
© 2017 INTERTEK



EMC TEST REPORT (FULL COMPLIANCE)

Report Number: 105659039LEX-001.1

Project Number: G105659039

Report Issue Date: 5/17/2024

Model(s) Tested: OLCC Transceiver Module

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:
Oreon Holding BV
Lorentzlaan 6, 3401MX IJsselstein (UT), The
Netherlands

Report prepared by



Brian Lackey, Staff Engineer

Report reviewed by



Michael Carlson, Team Leader

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.





Table of Contents

1	<i>Introduction and Conclusion.....</i>	4
2	<i>Test Summary</i>	4
3	<i>Client Information</i>	5
4	<i>Description of Equipment under Test and Variant Models.....</i>	6
5	<i>System Setup and Method</i>	7
6	<i>Occupied/DTS Bandwidth.....</i>	8
7	<i>Fundamental Emissions Output Power.....</i>	19
8	<i>Maximum Power Spectral Density (PSD)</i>	24
9	<i>Conducted Spurious Emissions.....</i>	Error! Bookmark not defined.
10	<i>Radiated Spurious Emissions</i>	29
11	<i>Antenna Requirement</i>	40
12	<i>Revision History.....</i>	41



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	Radiated Spurious Emissions ANSI C63.10 (2020) §6.3 §6.5 and §6.6	Pass
10	Antenna Requirement (FCC Part 15.203, RSS-Gen Issue 5 § 6.8)	Pass
11	Conducted Emissions (FCC Part 15.207, RSS-Gen Issue 5 § 7.2)	Pass



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Oreon Holding BV
Address:	Lorentzlaan 6, 3401MX IJsselstein (UT), The Netherlands
Contact:	Guido Dirkx
Telephone:	+31(0)627299710
Email:	guido@oreon-led.com
Manufacturer Information	
Manufacturer Name:	Oreon Holding BV
Manufacturer Address:	Lorentzlaan 6, 3401MX IJsselstein (UT), The Netherlands



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	OLCC Transceiver Module
Model Number	OLCC-TM017-B
Serial Number	BL04002
Receive Date	4/23/2024
Test Start Date	4/23/2024
Test End Date	4/30/2024
Device Received Condition	Good
Test Sample Type	Production
Transmit Band	2402MHz – 2480MHz
Test Channels	2402MHz, 2426MHz, 2480MHz
Antenna Type	Integral Antenna
Antenna Gain ¹	1.95 dBi
Rated Voltage	12V
Description of Equipment Under Test (provided by client)	
The Oreon Holding BV OLCC Transceiver Module model OLCC-TM017-B is a device for connecting to Bluetooth mesh networks.	

4.1 Variant Models:

There were no variant models covered under this evaluation.

¹ This information was provided by the client and may affect compliance. Intertek does not make any claim of compliance for values other than those shown.



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.
2	The EUT was powered by an external DC supply. The radio was idle.

Cables					
QTY	Description	Length (m)	Shielding	Ferrites	Termination
1	AC Mains	2	No	No	Plug

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
EMI Test Receiver	8258	Rohde & Schwarz	ESW44	9/19/2023	9/19/2024
Horn Antenna (1-18GHz)	3780	ETS	3117	8/8/2023	8/8/2024
1-18GHz Signal Path without Preamplifier	3074, 2588, 2593, 8188, 8185			1/12/2024	1/12/2025

6.4 Test Software Used:

Description	Manufacturer	Version
RSCCommander	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	4/23/2024	21.1°C	28.0%	985.4mbar

6.7 Test Results:

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

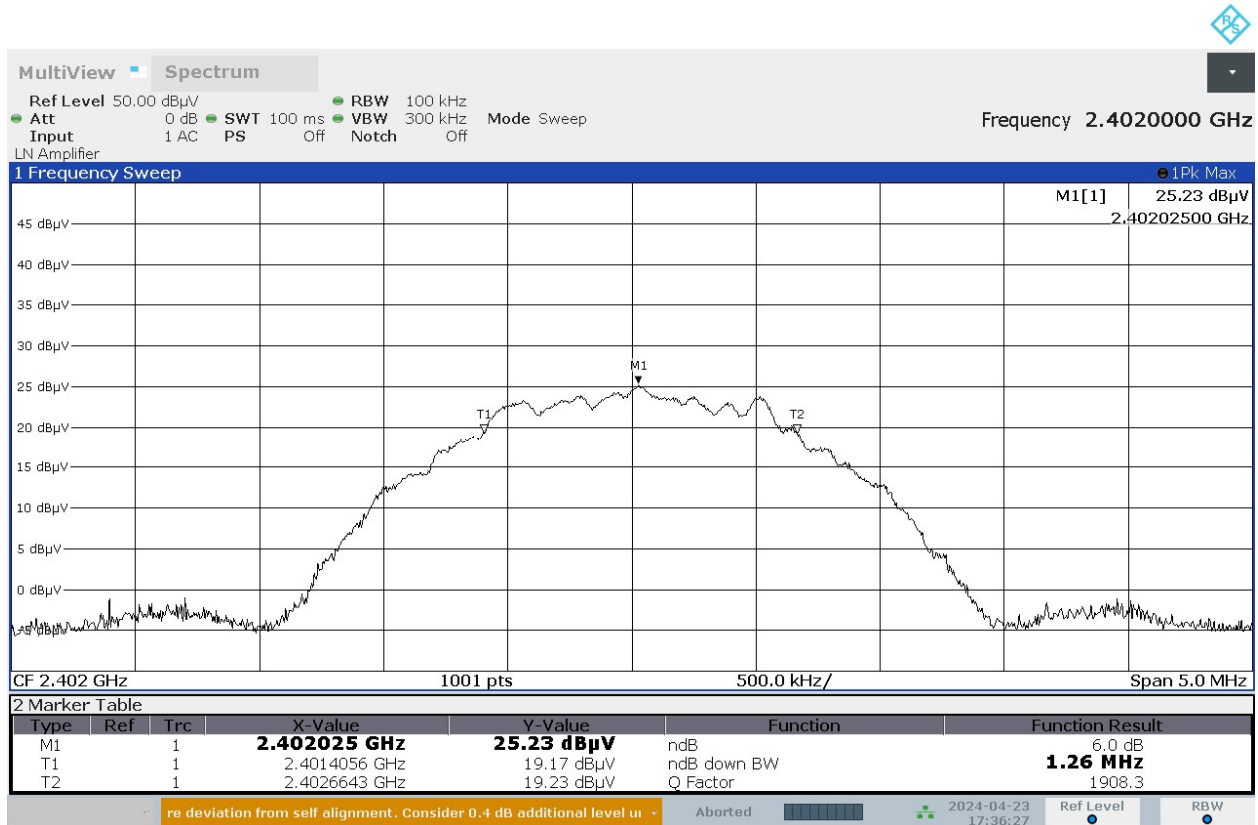
6.8 Test Data:

Frequency (MHz)	6dB Bandwidth (kHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
2402	1260	2260	2212	500
2426	1240	2270	2336	500
2480	1330	2420	2289	500



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

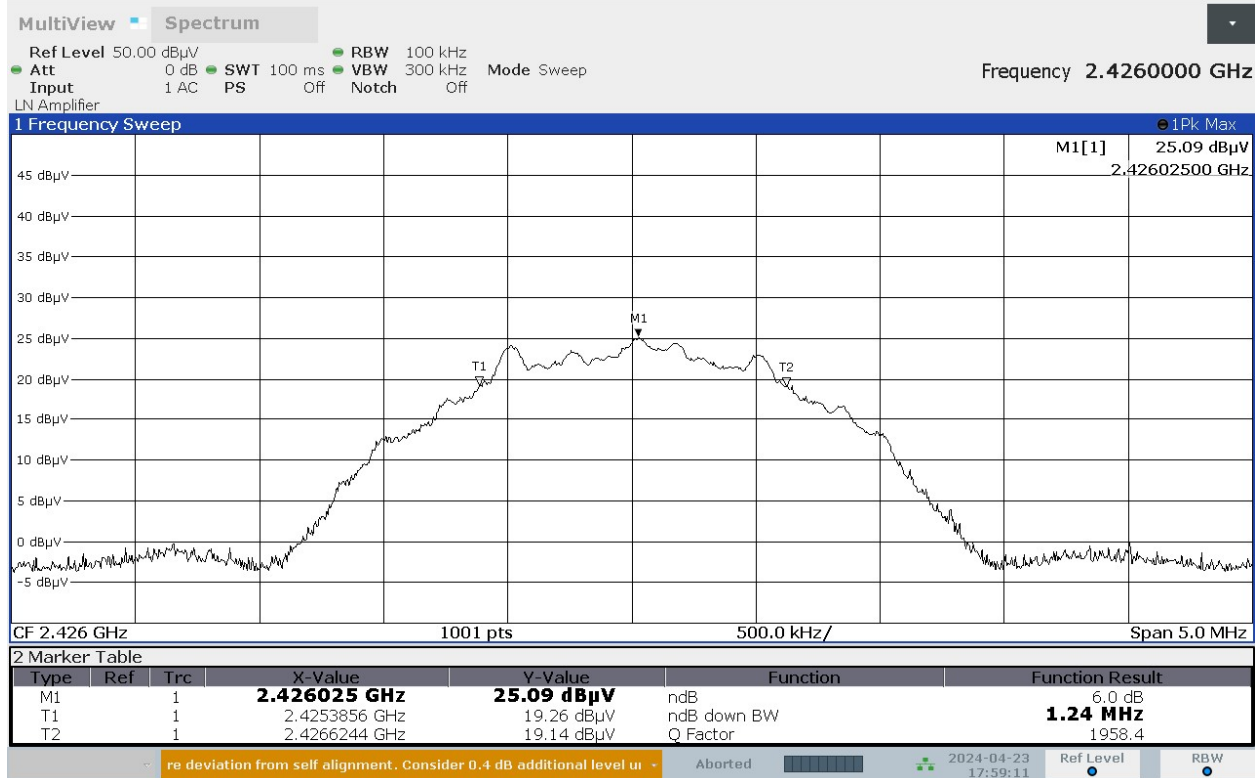
6.9.1 Low Channel



05:36:28 PM 04/23/2024



6.9.2 Mid Channel



05:59:11 PM 04/23/2024



6.9.3 High Channel



03:08:35 PM 04/23/2024



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

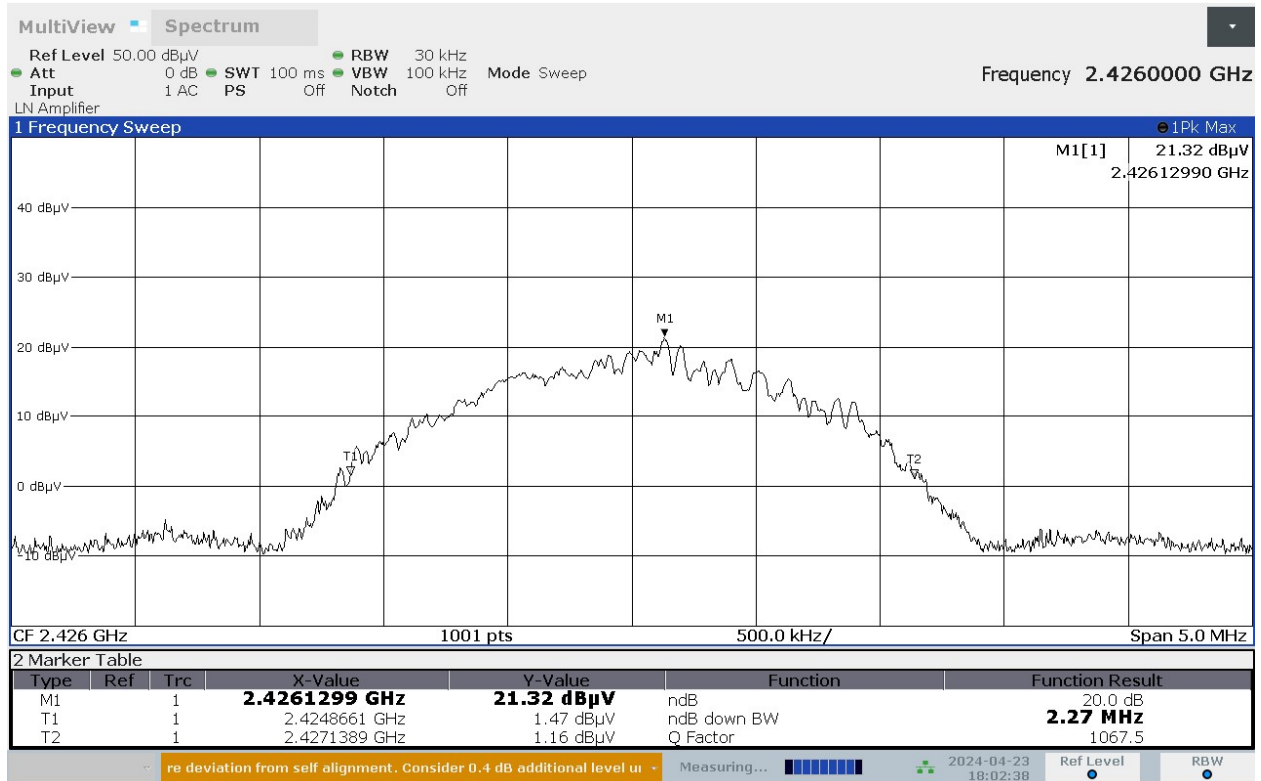
6.10.1 Low Channel



05:39:32 PM 04/23/2024



6.10.2 Mid Channel



06:02:38 PM 04/23/2024



6.10.3 High Channel



03:11:34 PM 04/23/2024



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

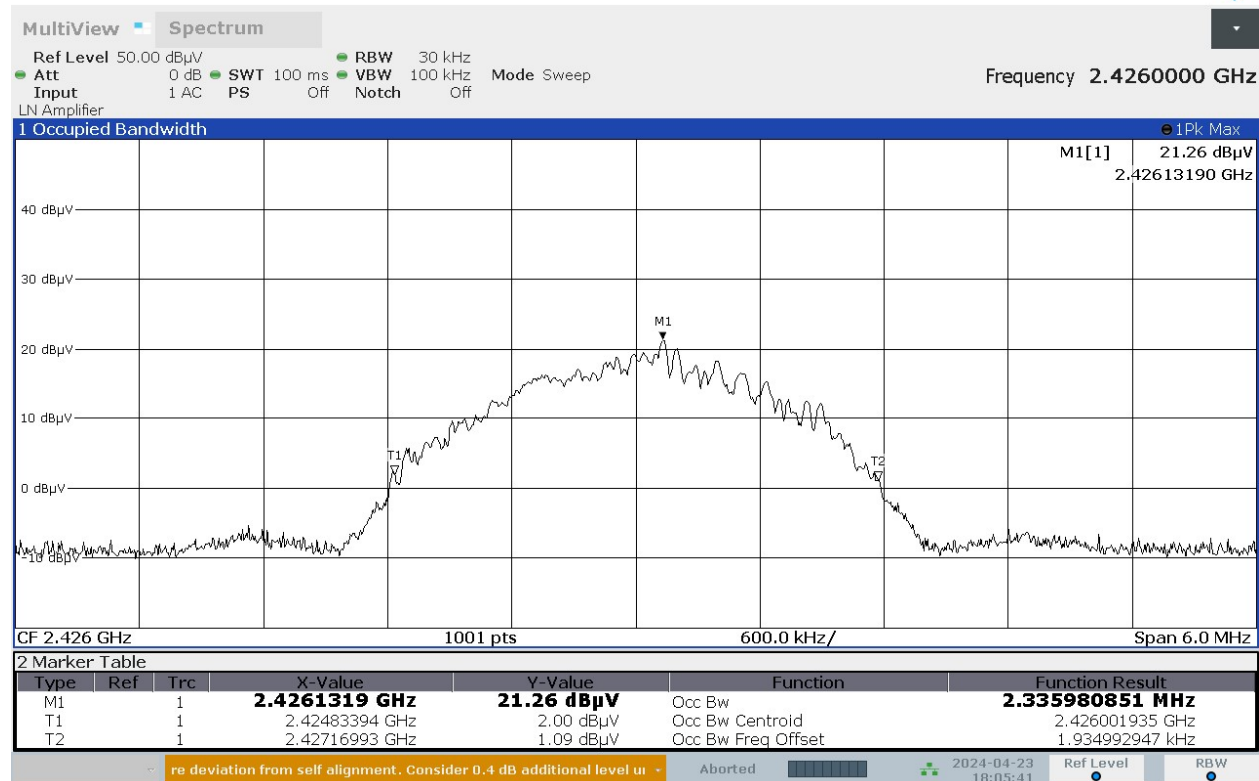
6.11.1 Low Channel



05:41:29 PM 04/23/2024



6.11.2 Mid Channel



06:05:42 PM 04/23/2024



6.11.3 High Channel



03:16:59 PM 04/23/2024



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
EMI Test Receiver	8258	Rohde & Schwarz	ESW44	9/19/2023	9/19/2024
Horn Antenna (1-18GHz)	3780	ETS	3117	8/8/2023	8/8/2024
1-18GHz Signal Path without Preamplifier	3074, 2588, 2593, 8188, 8185			1/12/2024	1/12/2025

7.4 Test Software Used:

Description	Manufacturer	Version
RSCCommander	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	4/23/2024	21.1°C	28.0%	985.4mbar

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.

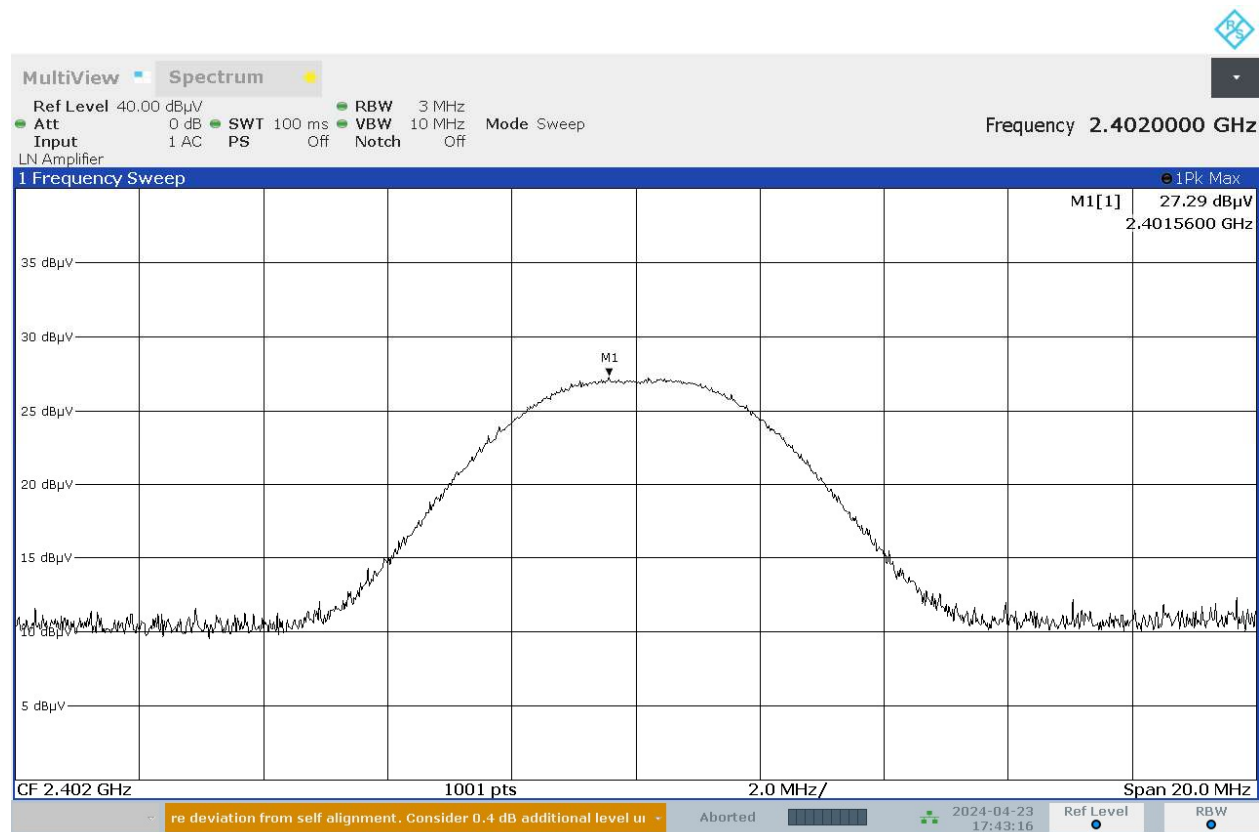
7.8 Test Data:

Frequency (MHz)	Receiver Reading (dBμV)	Cable Loss (dB)	Antenna Factor (dBm ⁻¹)	Electric Field (dBμV/m)	EIRP (dBm)	Antenna Gain (dBi)	Calculated Conducted Power (dBm)
2402	27.29	7.04	32.02	66.35	-28.88	1.95	-30.83
2426	27.14	7.08	32.20	66.42	-28.81	1.95	-30.76
2480	27.48	7.18	32.48	67.14	-28.09	1.95	-30.04



7.9 Test Plots: Output Power

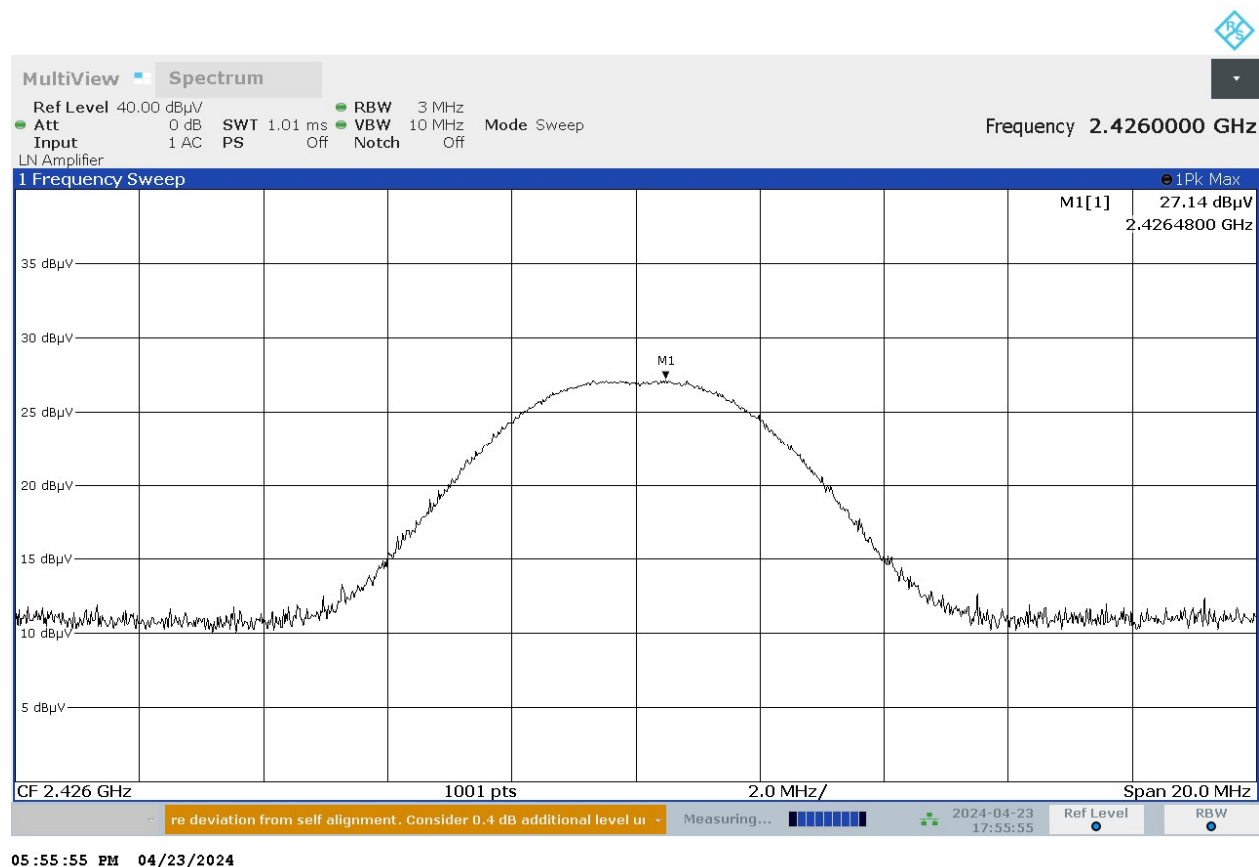
7.9.1 Low Channel



05:43:16 PM 04/23/2024

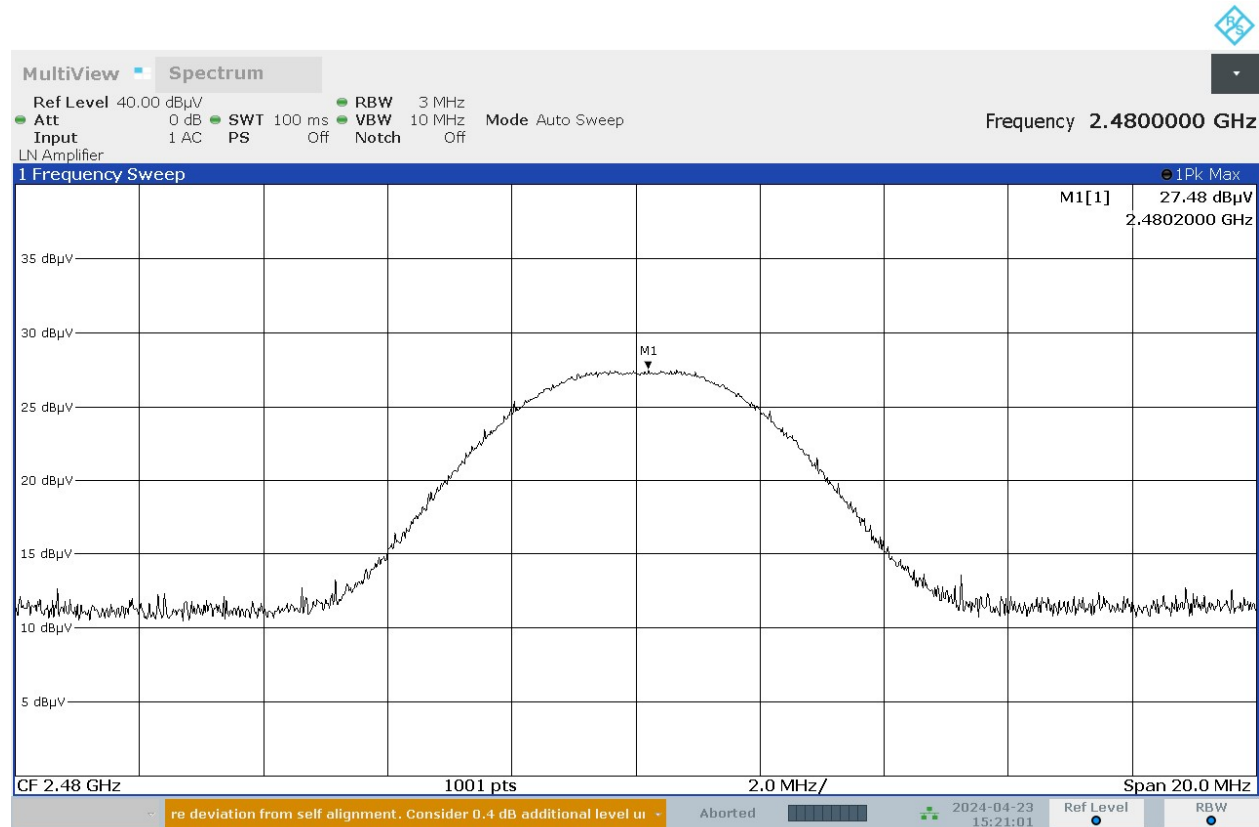


7.9.2 Mid Channel





7.9.3 High Channel



03:21:01 PM 04/23/2024



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
EMI Test Receiver	8258	Rohde & Schwarz	ESW44	9/19/2023	9/19/2024
Horn Antenna (1-18GHz)	3780	ETS	3117	8/8/2023	8/8/2024
1-18GHz Signal Path without Preamplifier	3074, 2588, 2593, 8188, 8185			1/12/2024	1/12/2025

8.4 Test Software Used:

Description	Manufacturer	Version
RSCCommander	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	4/23/2024	21.1°C	28.0%	985.4mbar

8.7 Test Results:

The sample tested was found to Comply. The power spectral density was less than 8 dBm/3kHz.

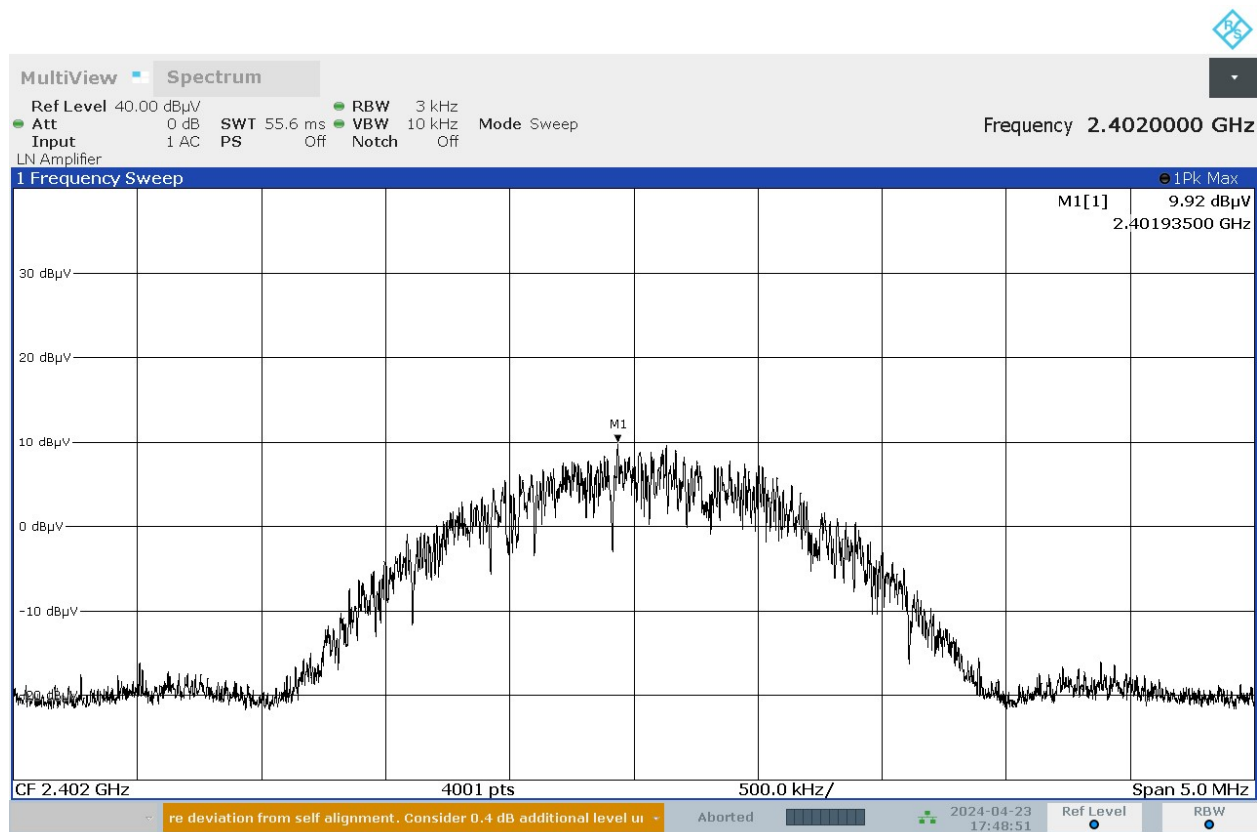
8.8 Test Data:

Frequency (MHz)	Receiver Reading (dBμV/3kHz)	Cable Loss (dB)	Antenna Factor (dBm ⁻¹)	Electric Field (dBμVm ⁻¹ /3kHz)	EIRP (dBm/3kHz)	Antenna Gain (dBi)	Calculated Conducted PPSP (dBm/3kHz)
2402	9.92	7.04	32.02	48.98	-46.25	1.95	-48.20
2426	12.25	7.08	32.20	51.53	-43.70	1.95	-45.65
2480	11.11	7.18	32.48	50.77	-44.46	1.95	-46.41



8.9 Test Plots: Power Spectral Density

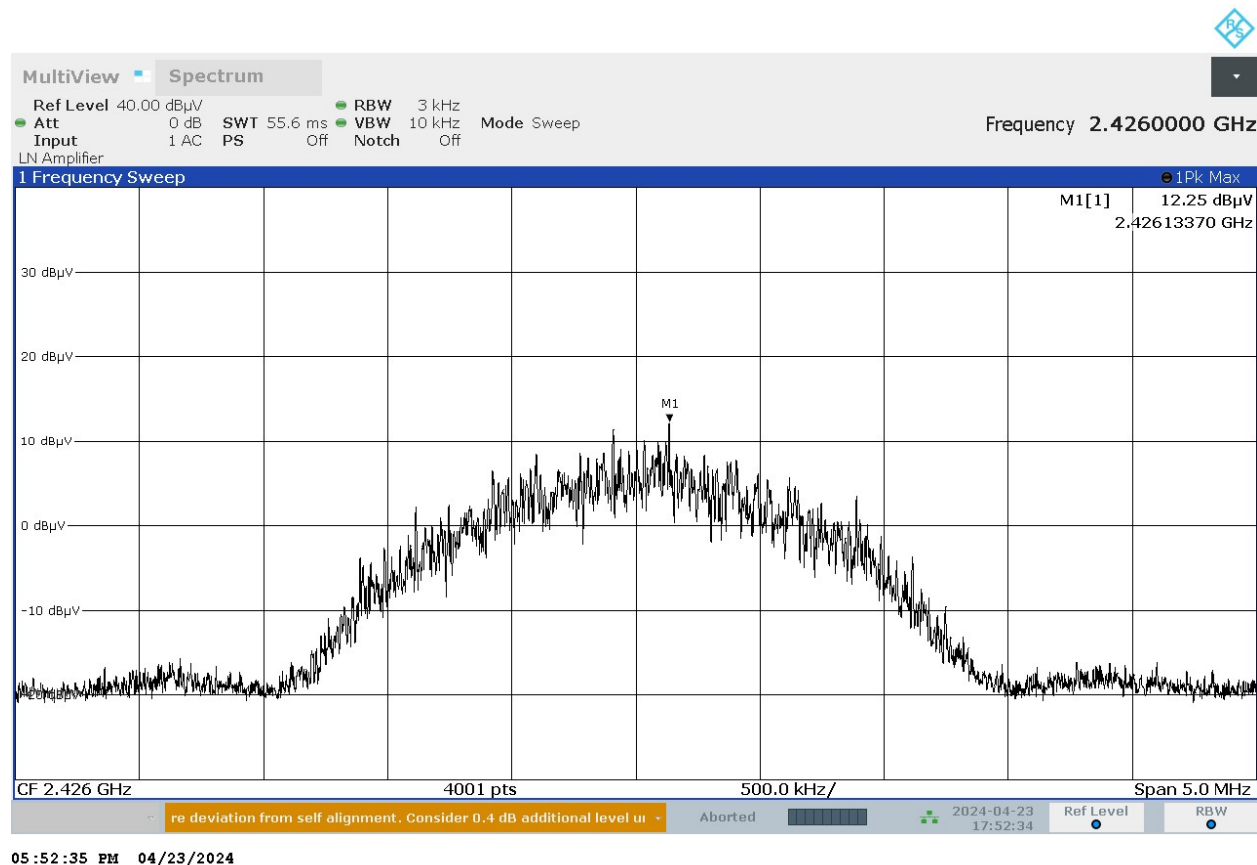
8.9.1 Low Channel



05:48:51 PM 04/23/2024

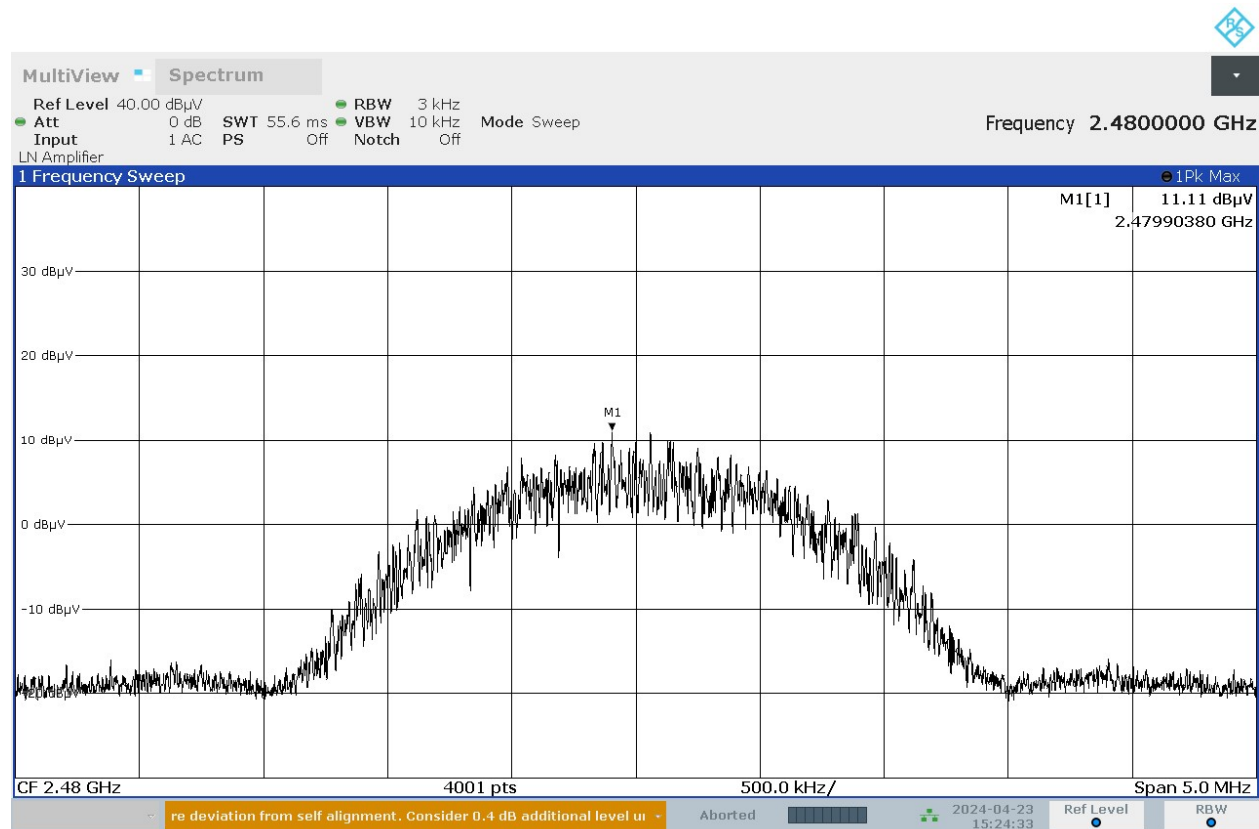


8.9.2 Mid Channel





8.9.3 High Channel



03:24:33 PM 04/23/2024



9 Radiated Spurious Emissions

9.1 Test Method:

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

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
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)	3780	ETS	3117	8/8/2023	8/8/2024
Bilog Antenna	7085	SunAR	JB6	3/18/2024	3/18/2025
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
Band Reject Filter	7033	Micro-Tronics	BRM50 702	Verify at Time of Use	Verify at Time of Use

9.4 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.

9.5 Test Software Used:

Description	Manufacturer	Version
EMC32	Rohde & Schwarz	10.60.20

9.6 Test Results:

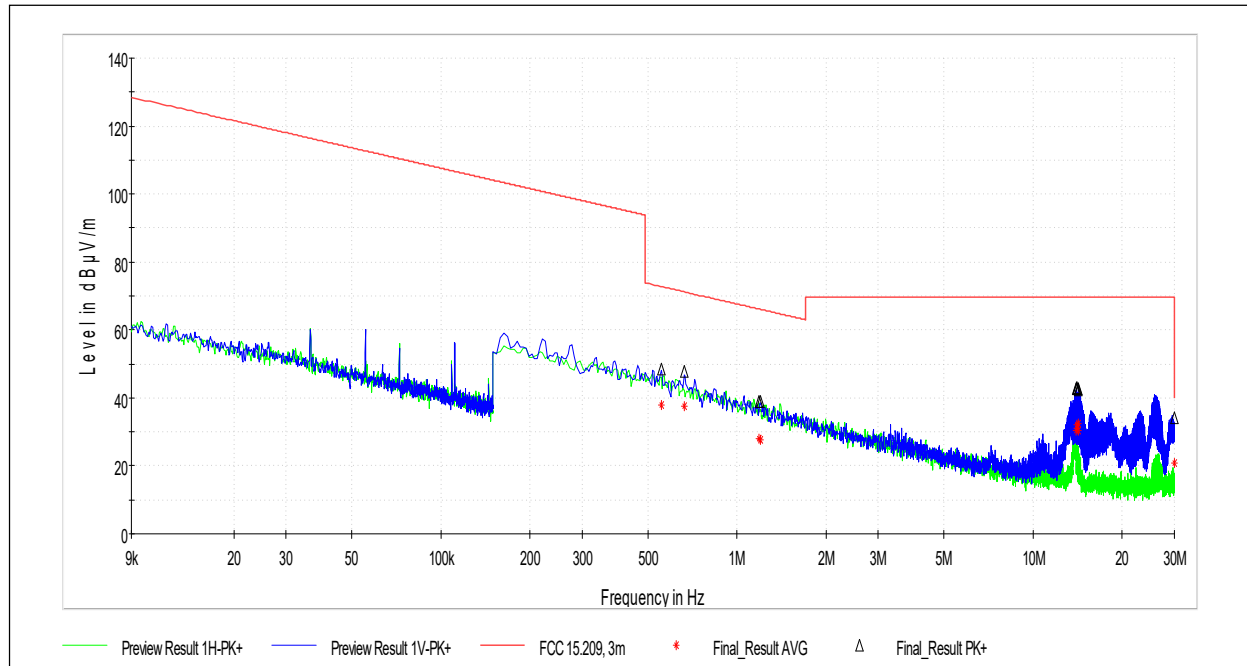
The sample tested was found to Comply. The device was investigated in three orthogonal axes.



9.7 Test Data: Radiated Spurious Emissions, General

9.7.1 Frequency Range 9kHz – 30MHz

9.7.1.1 Middle Channel¹



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.554	48.58	72.74	24.16	100.0	V	108.0	12.4
0.664	47.77	71.17	23.40	100.0	V	0.0	12.3
1.186	38.97	66.14	27.17	100.0	H	262.0	12.4
1.199	38.92	66.05	27.13	100.0	V	290.0	12.4
13.986	42.51	69.50	26.99	100.0	V	331.0	11.3
14.026	42.87	69.50	26.63	100.0	V	0.0	11.3
14.065	42.85	69.50	26.65	100.0	V	6.0	11.3
14.184	42.66	69.50	26.84	100.0	V	0.0	11.3
14.223	42.36	69.50	27.14	100.0	V	0.0	11.3
30.000	34.16	40.00	5.84	100.0	V	6.0	8.8

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC 15.247
Product Standard: RSS-247
Input Voltage: 120V/60Hz

Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

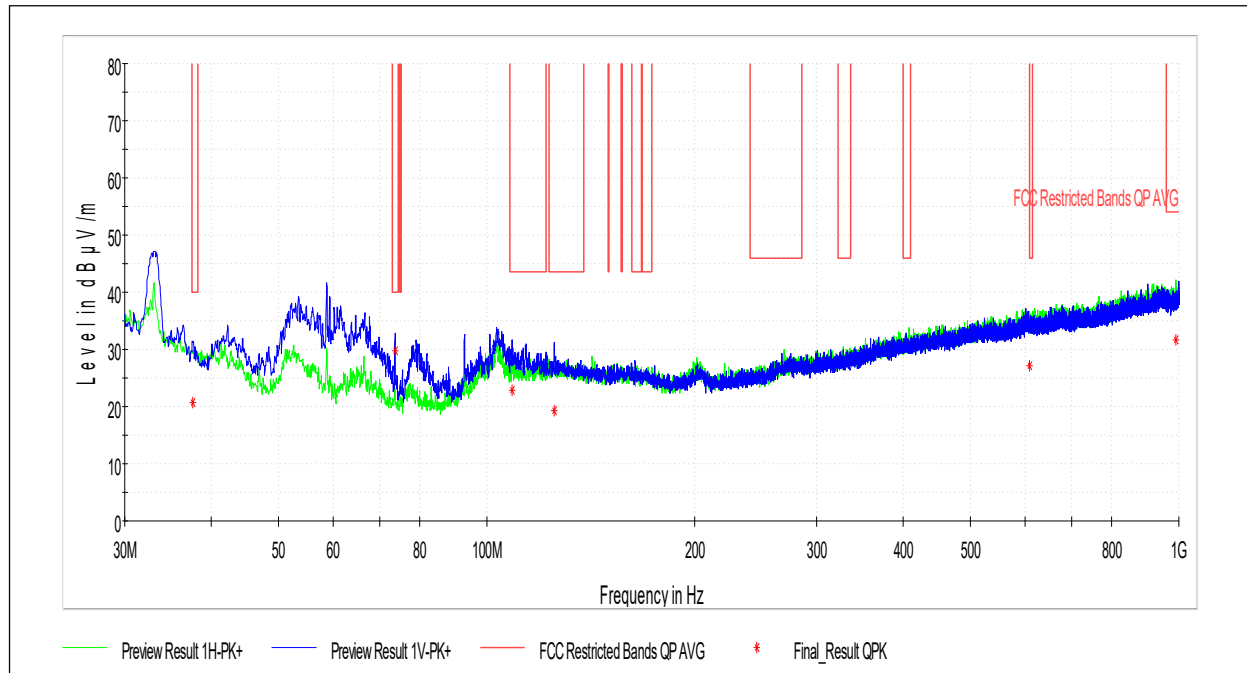
Deviations, Additions, or Exclusions: The peak emissions were less than the quasipeak limit and the device is thereby deemed to comply.

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



9.7.2 Frequency Range 30MHz – 1GHz

9.7.2.1 Middle Channel¹



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.598	20.70	40.00	19.30	120.0	V	268.0	21.8
73.704	29.87	40.00	10.13	119.0	V	296.0	14.5
108.786	22.92	43.52	20.60	99.0	V	330.0	19.8
125.168	19.24	43.52	24.29	250.0	V	256.0	21.0
608.120	27.25	46.02	18.77	350.0	H	200.0	28.3
989.923	31.59	53.98	22.39	308.0	H	152.0	32.7

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC 15.247
Product Standard: RSS-247
Input Voltage: 120V/60Hz

Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

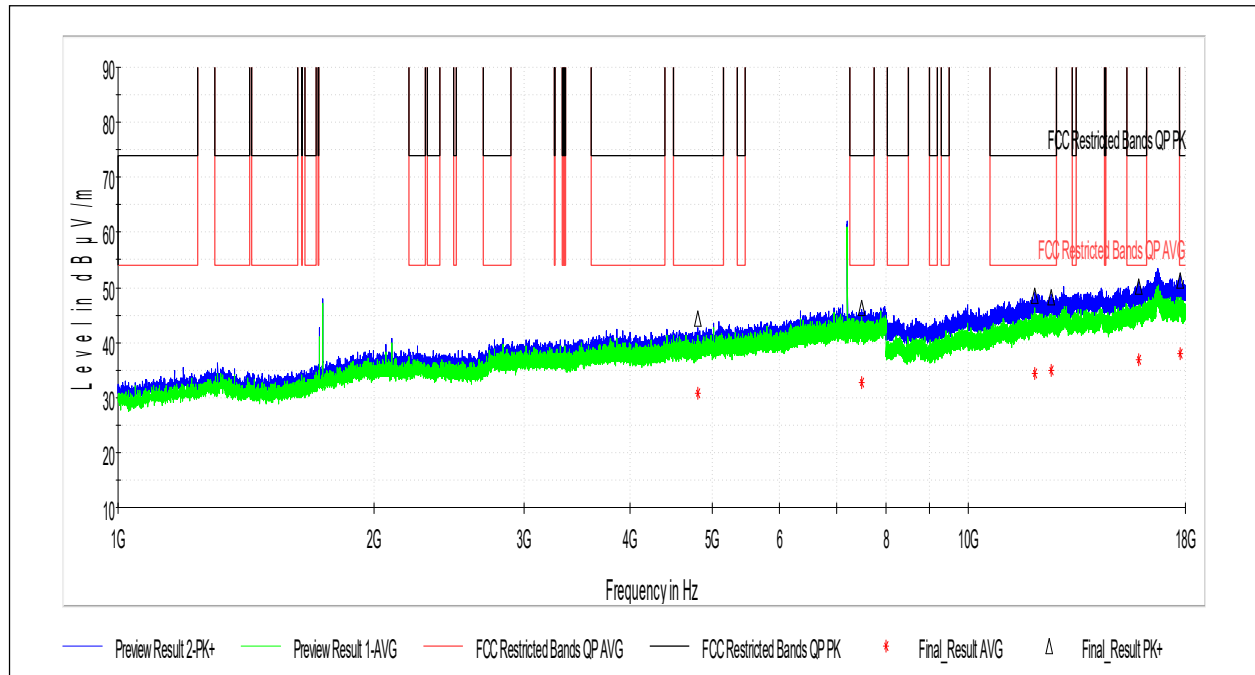
Deviations, Additions, or Exclusions: None

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



9.7.3 Frequency Range 1GHz – 18GHz

9.7.3.1 Low Channel



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.818	44.26	73.98	29.72	153.0	V	259.0	9.6
7484.545	46.34	73.98	27.64	410.0	H	116.0	13.6
11971.000	48.39	73.98	25.59	410.0	V	0.0	20.5
12521.500	48.22	73.98	25.76	410.0	H	342.0	21.2
15863.500	50.26	73.98	23.72	410.0	H	309.0	24.2
17748.500	51.11	73.98	22.87	100.0	H	36.0	26.4

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.818	30.74	53.98	23.24	153.0	V	259.0	9.6
7484.545	32.79	53.98	21.19	410.0	H	116.0	13.6
11971.000	34.47	53.98	19.51	410.0	V	0.0	20.5
12521.500	34.80	53.98	19.18	410.0	H	342.0	21.2
15863.500	36.98	53.98	17.00	410.0	H	309.0	24.2
17748.500	37.86	53.98	16.12	100.0	H	36.0	26.4

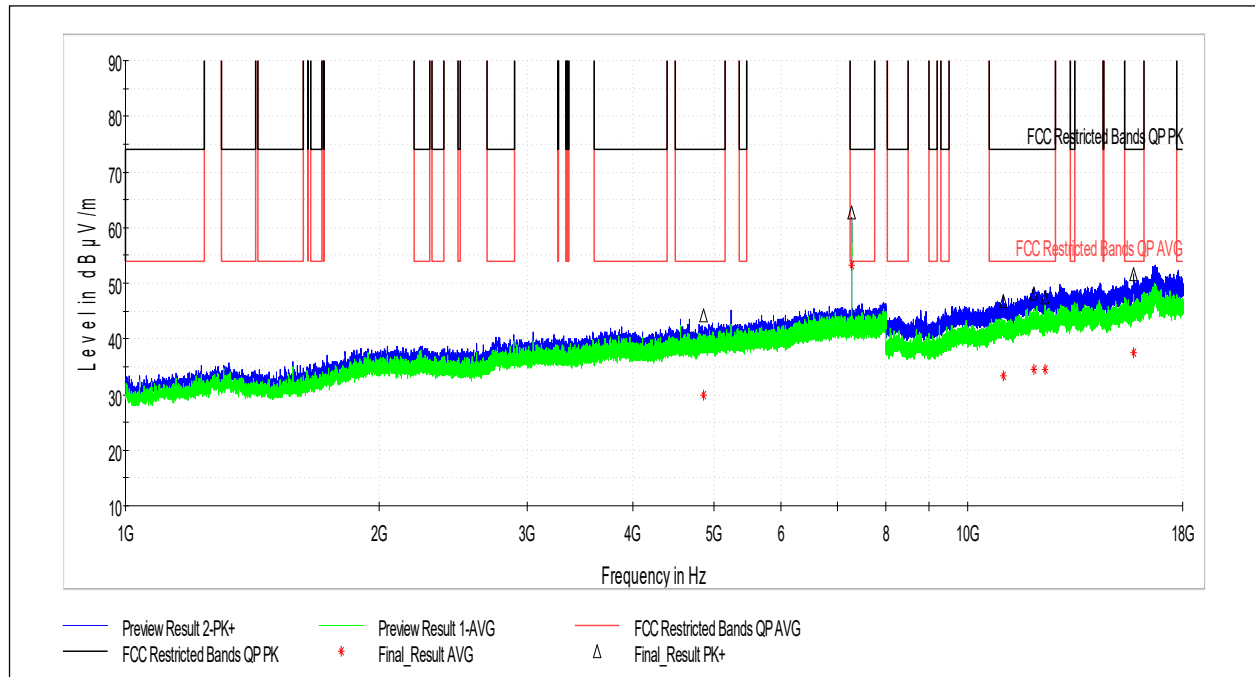
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC 15.247
Product Standard: RSS-247
Input Voltage: 120V/60Hz

Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



9.7.3.2 Middle Channel



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4852.864	44.25	73.98	29.73	304.0	V	246.0	9.7
7279.636	62.69	73.98	11.29	143.0	V	203.0	13.4
11014.000	46.86	73.98	27.12	410.0	H	334.0	19.1
11985.000	48.07	73.98	25.91	410.0	H	258.0	20.4
12347.500	47.52	73.98	26.46	410.0	V	46.0	20.9
15743.000	51.63	73.98	22.35	100.0	V	208.0	23.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4852.864	29.93	53.98	24.05	304.0	V	246.0	9.7
7279.636	53.22	53.98	0.76	143.0	V	203.0	13.4
11014.000	33.42	53.98	20.56	410.0	H	334.0	19.1
11985.000	34.58	53.98	19.40	410.0	H	258.0	20.4
12347.500	34.43	53.98	19.55	410.0	V	46.0	20.9
15743.000	37.56	53.98	16.42	100.0	V	208.0	23.9

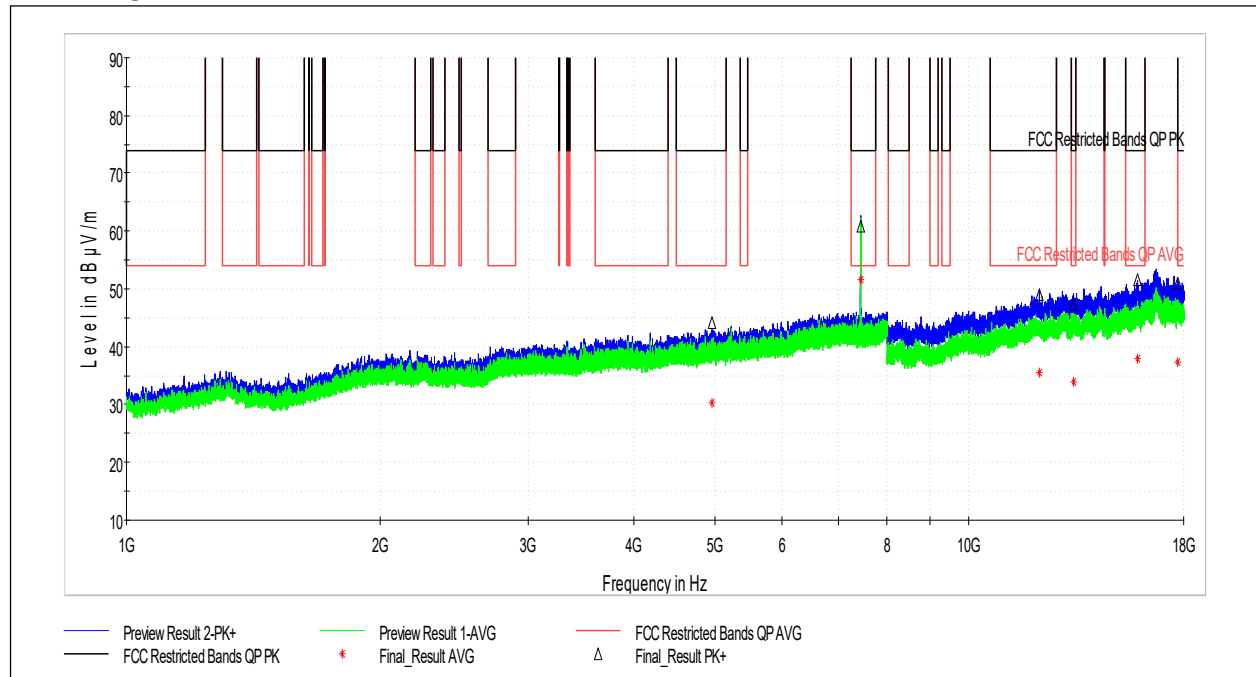
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: RSS-247
120V/60Hz

Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



9.7.3.3 High Channel



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4960.091	44.13	73.98	29.85	309.0	H	188.0	9.8
7441.591	60.94	73.98	13.04	144.0	V	202.0	13.5
12136.500	48.96	73.98	25.02	410.0	H	188.0	20.6
13330.500	47.35	73.98	26.63	410.0	H	258.0	21.8
15879.000	51.63	73.98	22.35	410.0	V	282.0	24.3
17703.000	51.06	73.98	22.92	100.0	H	56.0	26.4

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4960.091	30.21	53.98	23.77	309.0	H	188.0	9.8
7441.591	51.65	53.98	2.33	144.0	V	202.0	13.5
12136.500	35.46	53.98	18.52	410.0	H	188.0	20.6
13330.500	34.00	53.98	19.98	410.0	H	258.0	21.8
15879.000	38.01	53.98	15.97	410.0	V	282.0	24.3
17703.000	37.28	53.98	16.70	100.0	H	56.0	26.4

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: RSS-247
120V/60Hz

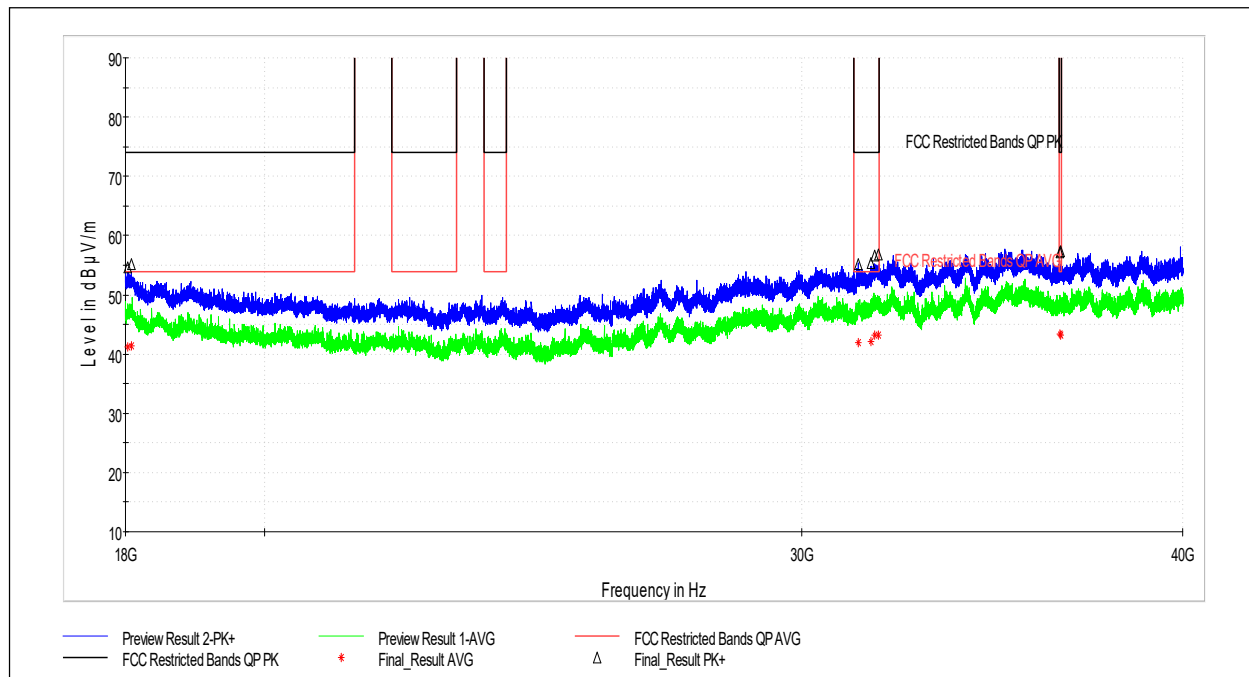
Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



9.7.4 Frequency Range 18GHz – 40GHz

9.7.4.1 Middle Channel¹



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18030.000	54.56	73.98	19.42	100.0	H	0.0	29.1
18085.000	55.10	73.98	18.88	410.0	H	0.0	28.9
31313.000	55.18	73.98	18.80	410.0	V	0.0	22.2
31610.000	55.39	73.98	18.59	410.0	V	346.0	22.5
31702.000	56.55	73.98	17.43	410.0	V	0.0	22.3
31779.000	56.72	73.98	17.26	410.0	V	0.0	22.3
36456.000	57.24	73.98	16.74	410.0	H	264.0	23.5
36488.000	57.39	73.98	16.59	410.0	V	0.0	23.4

¹ The “worst-case” scenario between the low, middle, and high channels



Frequency (MHz)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18030.000	41.17	53.98	12.81	100.0	H	0.0	29.1
18085.000	41.37	53.98	12.61	410.0	H	0.0	28.9
31313.000	41.95	53.98	12.03	410.0	V	0.0	22.2
31610.000	42.12	53.98	11.86	410.0	V	346.0	22.5
31702.000	43.13	53.98	10.85	410.0	V	0.0	22.3
31779.000	43.18	53.98	10.80	410.0	V	0.0	22.3
36456.000	43.39	53.98	10.59	410.0	H	264.0	23.5
36488.000	43.19	53.98	10.79	410.0	V	0.0	23.4

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer:
(Where Applicable) NA
FCC 15.247
Product Standard: RSS-247
Input Voltage: 120V/60Hz

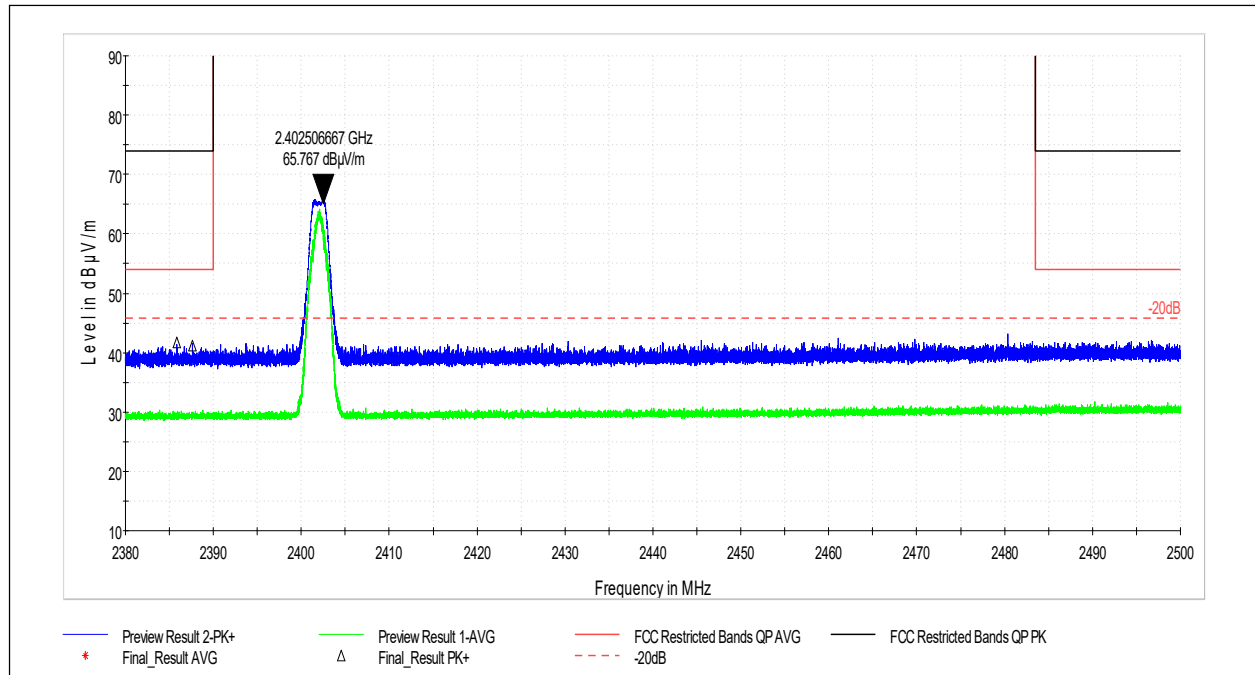
Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



9.8 Test Data: Radiated Emissions, Band Edge

9.8.1 Low Channel Band Edge



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2385.820	41.64	73.98	32.34	293.0	H	335.0	39.0
2387.647	41.19	73.98	32.79	187.0	H	0.0	39.0

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2385.820	8.02	53.98	45.96	293.0	H	335.0	39.0
2387.647	8.15	53.98	45.83	187.0	H	0.0	39.0

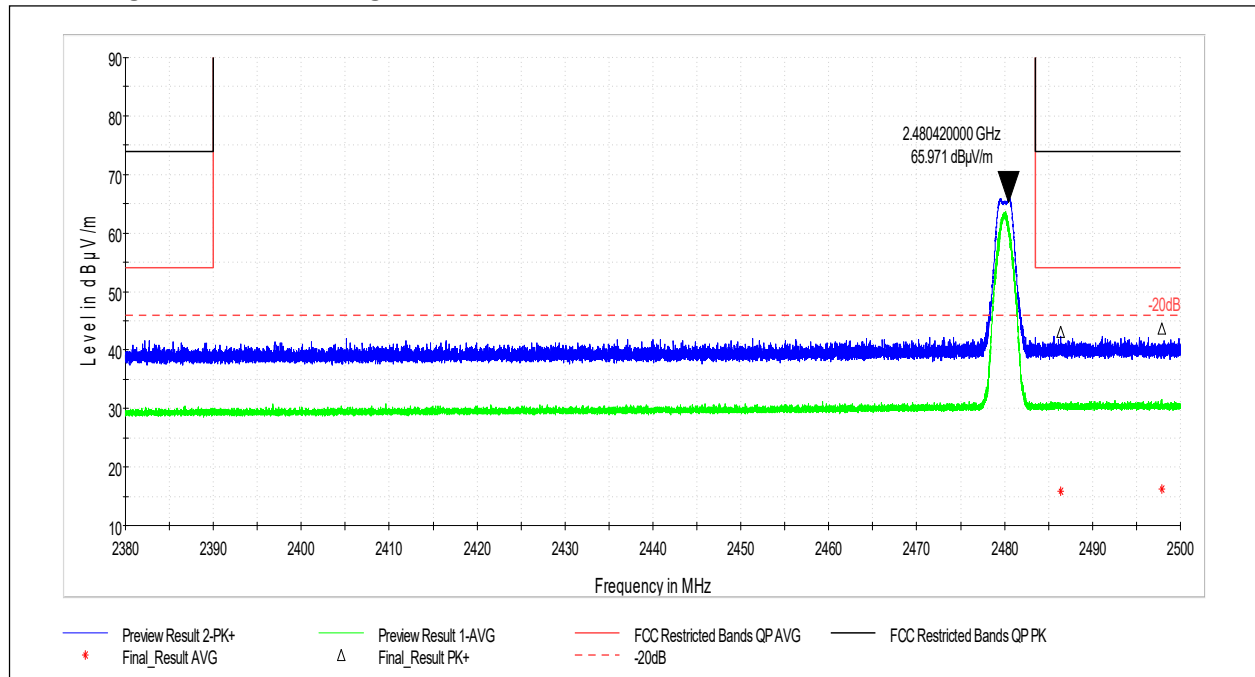
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC 15.247
Product Standard: RSS-247
Input Voltage: 120V/60Hz

Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



9.8.2 High Channel Band Edge



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2486.407	43.11	73.98	30.87	410.0	H	210.0	39.7
2497.860	43.73	73.98	30.25	393.0	H	69.0	39.6

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2486.407	15.90	53.98	38.08	410.0	H	210.0	39.7
2497.860	16.27	53.98	37.71	393.0	H	69.0	39.6

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: FCC 15.247
Input Voltage: RSS-247
120V/60Hz

Test Date: 4/23/2024
Limit Applied: See Section 9.2
Ambient Temperature: 21.1°C
Relative Humidity: 28.0%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



10 Antenna Requirement

10.1 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).

10.2 Test Results

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



11 Conducted Emissions

11.1 Method

Tests are performed in accordance with ANSI C63.4:2014.

TEST SITE: Ground Plane

Site Designation: Ground Plane

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	U _{CISPR}
Power Line Conducted Emissions	150 kHz - 30 MHz	3.1dB	3.4dB

As shown in the table above our conducted 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.

11.2 Sample Calculations

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where NF = Net Reading in dB μ V

RF = Reading from receiver in dB μ V

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 285.1 \mu\text{V/m}$$

**11.3 Test Equipment Used:**

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8296	Rohde & Schwarz	EPL1000	1/1/2024	1/1/2025
LISN	2508	Fischer Custom Communication	FCC-LISN-50-50-2M	7/31/2023	7/31/2024
Coaxial Cable	8307			1/22/2024	1/22/2025

11.4 Software Utilized:

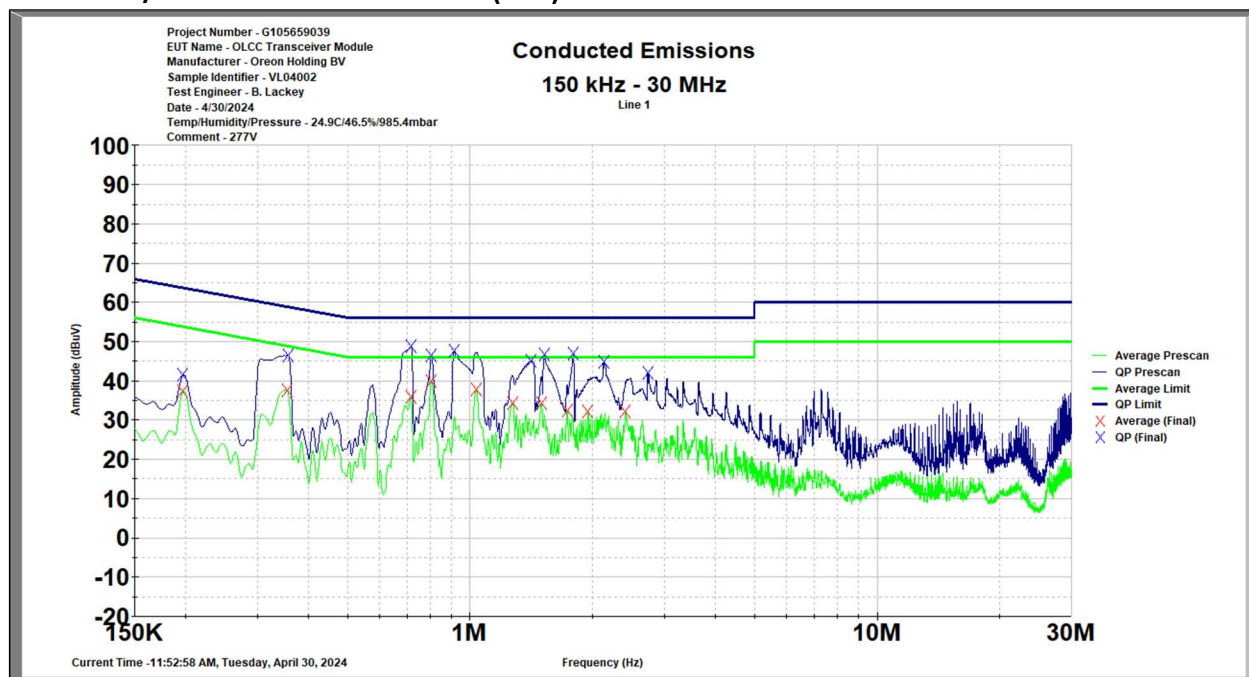
Name	Manufacturer	Version
TILE	ETS Lindgren	V7.0.6.545

11.5 Results:

The sample tested was found to Comply.



11.6 Plots/Data: Conducted Emissions (Line)



Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Margin (dB)
0.197	41.420	64.650	23.230
0.357	46.549	60.086	13.537
0.717	48.866	56.000	7.134
0.805	46.459	56.000	9.541
0.915	47.537	56.000	8.463
1.415	45.004	56.000	10.996
1.525	46.772	56.000	9.228
1.793	46.923	56.000	9.077
2.135	44.849	56.000	11.151
2.742	42.072	56.000	13.928



Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)
0.197	37.430	54.650	17.220
0.355	37.627	50.150	12.523
0.715	35.803	46.000	10.197
0.805	39.953	46.000	6.047
1.034	37.679	46.000	8.321
1.273	34.272	46.000	11.728
1.498	34.283	46.000	11.717
1.732	32.414	46.000	13.586
1.950	32.130	46.000	13.870
2.409	32.268	46.000	13.732

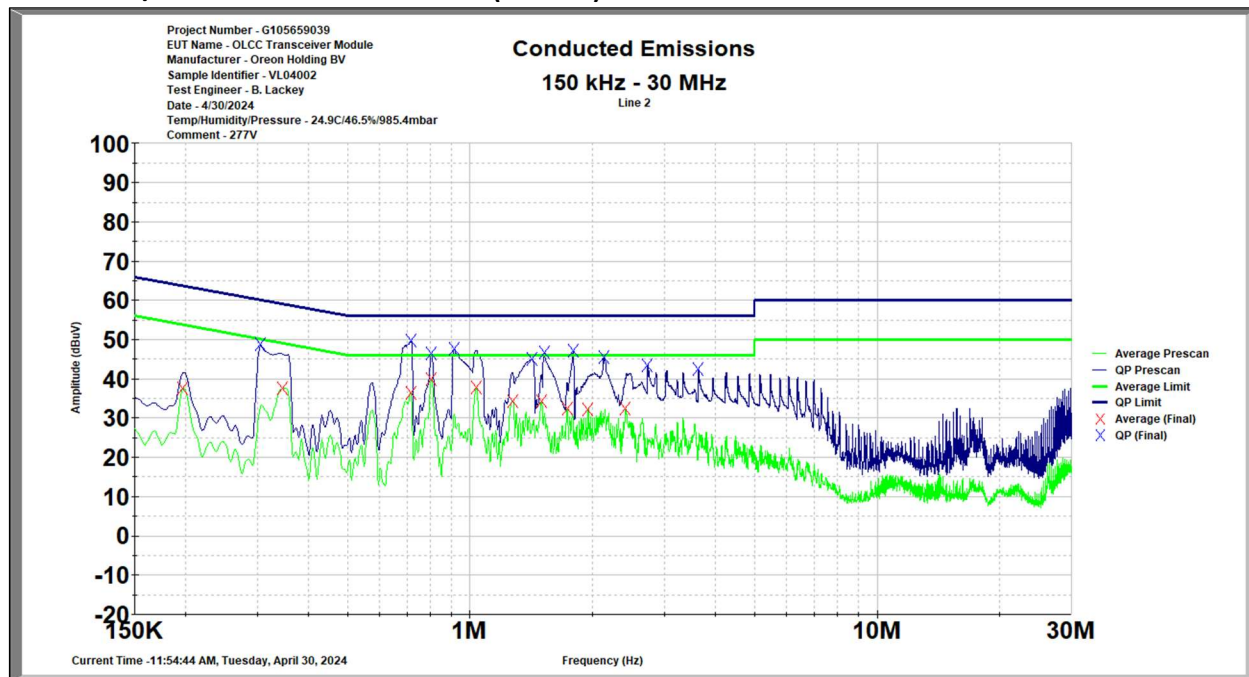
Test Personnel: Brian Lackey
Supervising/Reviewing Engineer:
(Where Applicable) NA
FCC Part 15.207
Product Standard: RSS-Gen Issue 5
Input Voltage: 120V/60Hz
Pretest Verification w / Ambient
Signals or BB Source: Yes

Test Date: 4/30/2024
FCC Part 15.207
Limit Applied: RSS-Gen Issue 5 Table 3
Ambient Temperature: 24.9°C
Relative Humidity: 46.5%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



11.7 Plots/Data: Conducted Emissions (Neutral)



Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Margin (dB)
0.305	48.678	61.564	12.887
0.717	49.691	56.000	6.309
0.805	46.468	56.000	9.532
0.915	47.684	56.000	8.316
1.421	44.980	56.000	11.020
1.523	46.703	56.000	9.297
1.793	47.108	56.000	8.892
2.132	45.488	56.000	10.512
2.726	43.405	56.000	12.595
3.635	42.424	56.000	13.576



Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)
0.197	37.484	54.650	17.166
0.346	37.586	50.407	12.821
0.715	36.488	46.000	9.512
0.805	39.965	46.000	6.035
1.034	37.703	46.000	8.297
1.273	34.310	46.000	11.690
1.498	34.328	46.000	11.672
1.732	32.527	46.000	13.473
1.950	32.226	46.000	13.774
2.409	32.475	46.000	13.525

Test Personnel: Brian Lackey
Supervising/Reviewing Engineer:
(Where Applicable) NA
FCC Part 15.207
Product Standard: RSS-Gen Issue 5
Input Voltage: 120V/60Hz
Pretest Verification w / Ambient
Signals or BB Source: Yes

Test Date: 4/30/2024
FCC Part 15.207
Limit Applied: RSS-Gen Issue 5 Table 3
Ambient Temperature: 24.9°C
Relative Humidity: 46.5%
Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	5/2/2024	105659039LEX-001	BZ	MC	Original Issue
1	5/17/2024	105659039LEX-001.1	BZ	MC	Corrected naming/labeling/units