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Foundation Fitness LLC TEST REPORT

SCOPE OF WORK

EMC TESTING – DASH L200 BIKE COMPUTER

REPORT NUMBER

105105027LEX-001a.1

ISSUE DATE

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EMC TEST REPORT
(FULL COMPLIANCE)

Report Number: 105105027LEX-001a.1

Project Number: G105105027

Report Issue Date: 8/4/2022

Report Revised Date: 8/23/2022

Model(s) Tested: L200

Standards: Title 47 CFR Part 15.247

RSS-247 Issue 2

RSS-Gen Issue 5

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

Client:
Foundation Fitness LLC
1220 Main Street
Suite 400
Vancouver, WA. 98660
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Report prepared by



Seth Parker, Associate Engineer

Report reviewed by



Brian Lackey, Team Leader

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Table of Contents

1 Introduction and Conclusion..... 4

2 Test Summary 4

3 Client Information 5

4 Description of Equipment under Test and Variant Models..... 6

5 System Setup and Method 7

6 Radiated Spurious Emissions 8

7 Output Power..... 17

8 Occupied Bandwidth 22

9 Power Spectral Density 32

10 Antenna Requirement 37

11 Revision History 38



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	Radiated Spurious Emissions (FCC Part 15.247(d), RSS-247 Issue 2 § 5.5)	Pass
7	Output Power (FCC Part 15.247(b)(3), RSS-247 Issue 2 § 5.4(d))	Pass
8	Occupied Bandwidth (FCC Part 15.247, RSS-247 Issue 2 § 5.2(a))	Pass
9	Power Spectral Density (FCC Part 15.247(e), RSS-247 Issue 2 § 5.2(b))	Pass
10	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:	Foundation Fitness LLC
Address:	1220 Main Street Suite 400 Vancouver, WA. 98660 USA
Contact:	Jim Stemper
Email:	jstemper@stagescycling.com
Manufacturer Information	
Manufacturer Name:	Digital Concepts, Inc.
Manufacturer Address:	3108 Riverport Tech Center Drive Maryland Heights, MO 63043 United States of America
Factory Address:	Digital Concepts de Mexico. S de RL de CV Ponciano Arriaga No. 716 Col. Parque Industrial Los Aztecas Cd. Juarez Chihuahua, Mexico, CP: 32679



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	Dash L200 Bike Computer
Model Numbers	L200
Serial Number	Test Sample 1
Receive Date	9/1/2021
Test Start Date	7/28/2022
Test End Date	8/1/2022
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	5VDC
Frequency Band(s)	2400-2483.5MHz
Modulation Type(s)	GFSK
Test Channel(s)	2402MHz, 2440MHz, 2480MHz
Maximum Antenna Gain (dBi)	1.6dBi Taiyo Yuden Model AH316M245001-T Antenna Information was provided by Foundation Fitness LLC and may affect compliance
Description of Equipment Under Test (provided by client)	
The Dash L200 Bike Computer is a 2.7" color display rechargeable bike computer with GPS, Bluetooth (Low Energy), Wi-Fi (approved module), ANT+, Barometric pressure sensor, piezoelectric buzzer, 16GB of memory, 5 buttons and a plastic mounting interface to connect to handlebars. This computer is built on Linux and is based on the existing M50 bike computer, utilizing all its existing features.	

4.1 Variant Models:

There were no variant models covered by this evaluation.



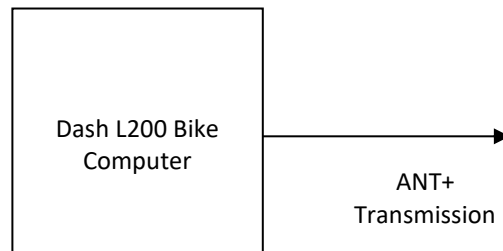
5 System Setup and Method

5.1 Method:

Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013

No.	Descriptions of EUT Exercising
1	Transmitting an ANT+ signal on a low, middle, or high channel

5.2 EUT Block Diagram:





6 Radiated Spurious Emissions

6.1 Test Limits

FCC Part 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 Issue 2 § 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.

6.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.12.1 Radiated emission measurements.



6.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8181	Rohde & Schwarz	ESW44	11/16/2021	11/16/2022
Bilog Antenna	7085	ETS	3142C	10/5/2021	10/5/2022
Horn Antenna	4001	ETS	3117	2/23/2022	2/23/2023
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time of Use
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Preamplifier	3918	Rohde & Schwarz	TS-PR18	1/13/2022	1/13/2023
Coaxial Cable	3074			1/13/2022	1/13/2023
Coaxial Cable	2588			1/13/2022	1/13/2023
Coaxial Cable	2593			1/13/2022	1/13/2023
Coaxial Cable	8185			1/13/2022	1/13/2023
Coaxial Cable	8188			1/13/2022	1/13/2023
Coaxial Cable	3339			1/13/2022	1/13/2023
Preamplifier	3919	Rohde & Schwarz	TS-PR3	1/13/2022	1/13/2023
Coaxial Cable	3172			1/13/2022	1/13/2023
Coaxial Cable	2590			1/13/2022	1/13/2023
Coaxial Cable	8186			1/13/2022	1/13/2023
Coaxial Cable	8187			1/13/2022	1/13/2023
Preamplifier (18-40GHz)	3921	Rohde & Schwarz	TS-PR40	1/13/2022	1/13/2023
Horn Antenna (18-40GHz)	3779	ETS	3116c	7/30/2021	9/28/2022 ⁽¹⁾

6.4 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 10.60.20

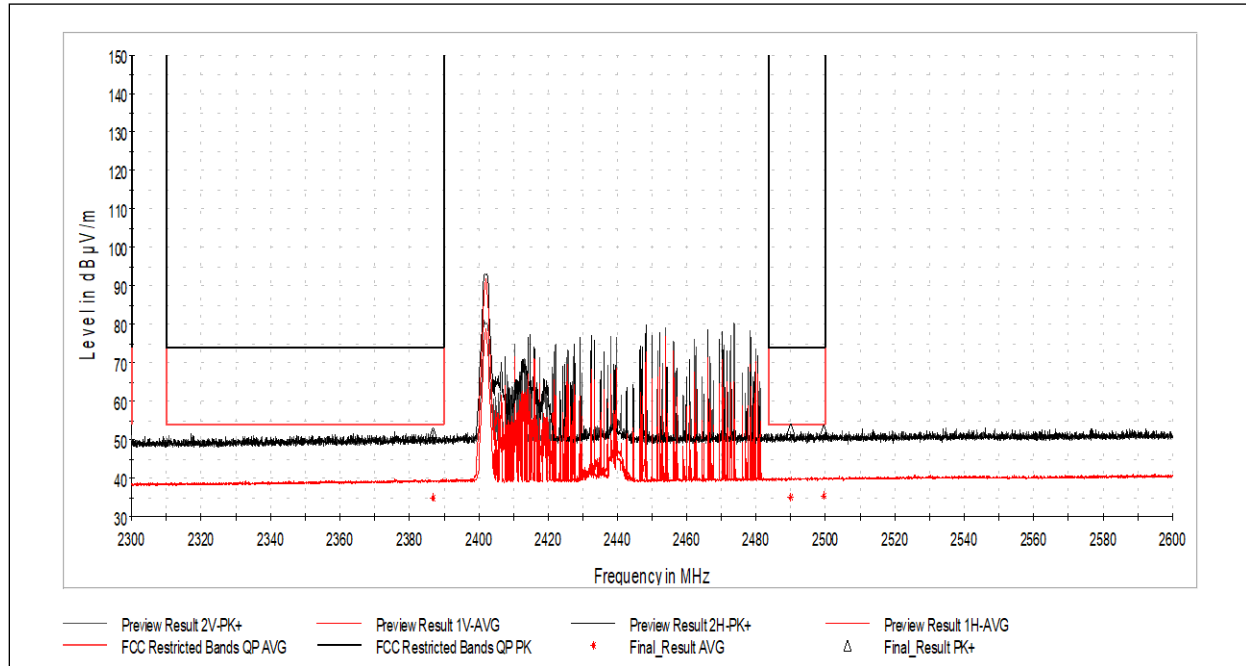
6.5 Test Results

The sample tested was found to be **compliant**. The data presented represents the worst-case emissions with the device positioned in three orthogonal positions. All observed emissions outside of the band of operation were attenuated by at least 20dB.

¹ Operating under a calibration extension during the time of testing.



6.6 ANT+ 2402MHz Spurious Emissions (Low Band Edge):



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2386.942308	51.98	73.979	22.00	1000.000	362.0	V	211.0	38.21
2489.865385	52.79	73.979	21.19	1000.000	410.0	V	284.0	38.52
2499.442308	52.46	73.979	21.52	1000.000	100.0	H	182.0	38.61

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2386.942308	34.74	53.979	19.24	1000.000	362.0	V	211.0	38.21
2489.865385	35.18	53.979	18.80	1000.000	410.0	V	284.0	38.52
2499.442308	35.31	53.979	18.67	1000.000	100.0	H	182.0	38.61

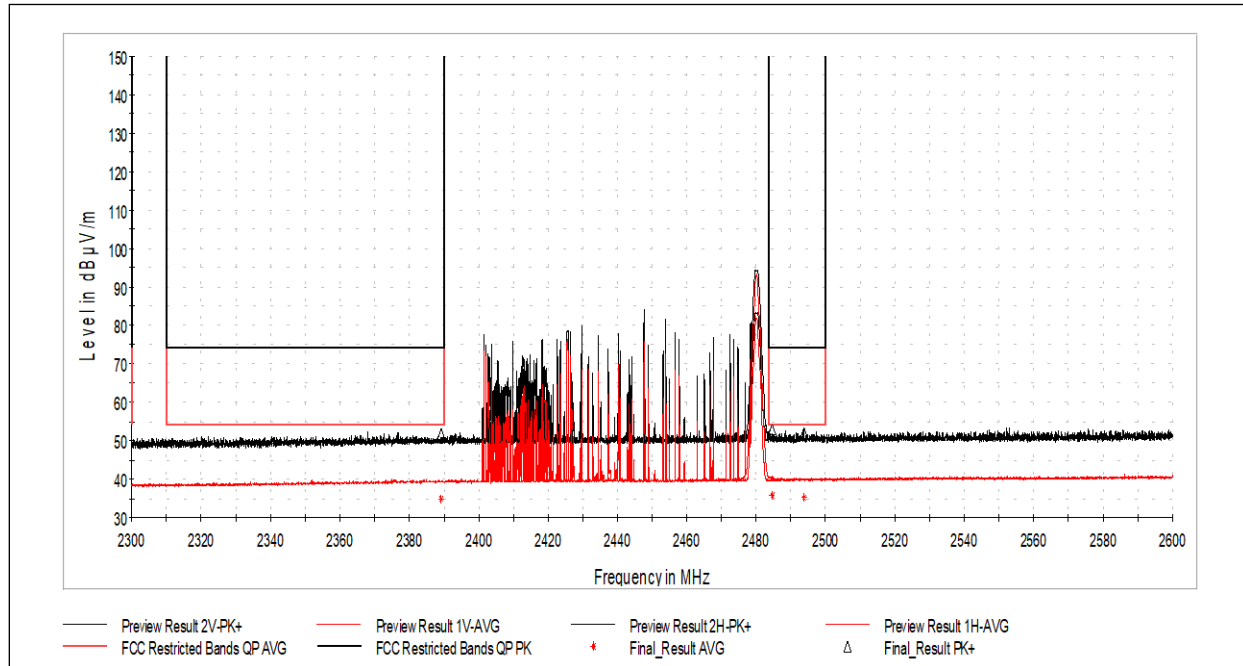
Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: None



6.7 ANT+ 2480MHz Spurious Emissions (High Band Edge):



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.134615	51.87	73.979	22.11	1000.000	410.0	V	59.0	38.22
2484.673077	52.82	73.979	21.16	1000.000	386.0	V	304.0	38.46
2493.788462	52.17	73.979	21.81	1000.000	191.0	V	57.0	38.55

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.134615	34.76	53.979	19.22	1000.000	410.0	V	59.0	38.22
2484.673077	35.72	53.979	18.26	1000.000	386.0	V	304.0	38.46
2493.788462	35.23	53.979	18.75	1000.000	191.0	V	57.0	38.55

Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

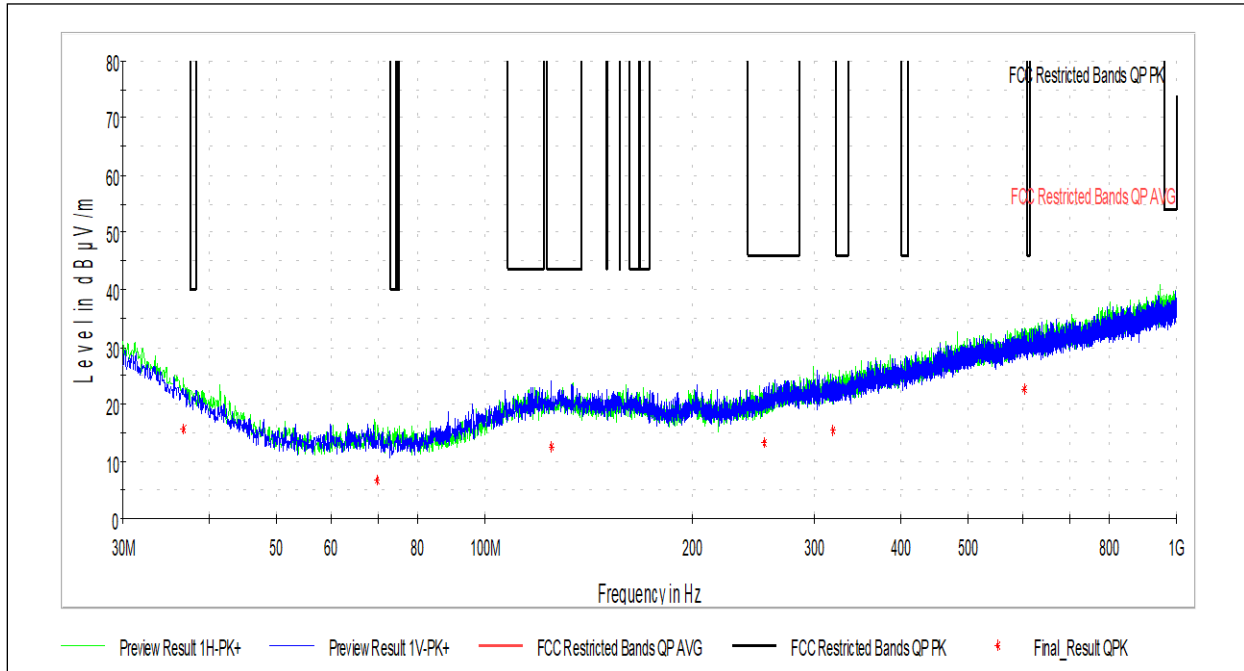
Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: None



6.8 Radiated Spurious Emissions, 30MHz-1GHz:

6.8.1 2440MHz



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
36.682222	15.75	1000.000	984.25	120.000	326.0	H	7.0	24.03
69.985556	6.85	1000.000	993.15	120.000	360.0	H	-1.0	15.74
124.790556	12.58	43.522	30.94	120.000	400.0	V	327.0	22.31
253.261667	13.21	46.021	32.81	120.000	151.0	V	253.0	21.88
318.359444	15.31	1000.000	984.69	120.000	133.0	H	327.0	24.57
602.515556	22.70	1000.000	977.30	120.000	400.0	V	109.0	30.89

Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

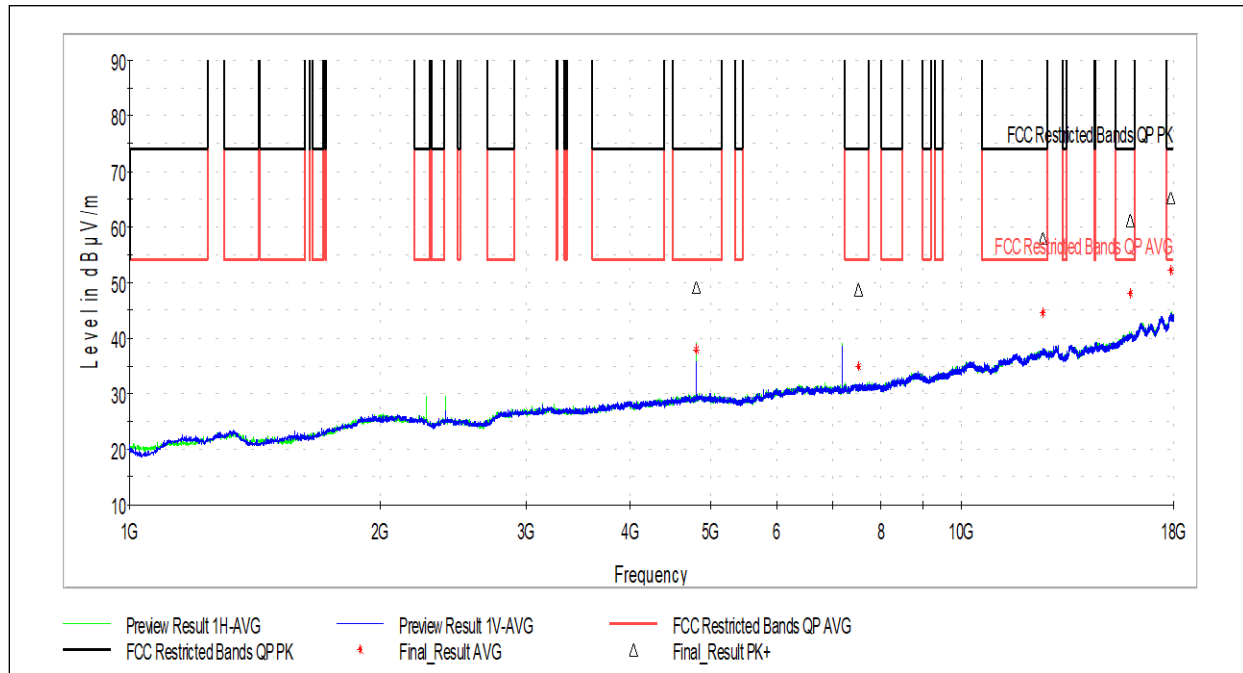
Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: This testing represents the worst case of low, middle, and high channels



6.9 Radiated Spurious Emissions, 1GHz - 18GHz

6.9.1 2402MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.000000	49.17	73.979	24.81	1000.000	100.0	H	207.0	9.36
7534.500000	48.75	73.979	25.23	1000.000	337.0	V	194.0	12.69
12547.500000	57.98	73.979	16.00	1000.000	266.0	V	180.0	20.60
15995.500000	61.20	73.979	12.78	1000.000	365.0	H	181.0	24.85
17869.000000	65.34	73.979	8.64	1000.000	100.0	H	193.0	27.87

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.000000	37.89	53.979	16.09	1000.000	100.0	H	207.0	9.36
7534.500000	34.90	53.979	19.08	1000.000	337.0	V	194.0	12.69
12547.500000	44.50	53.979	9.48	1000.000	266.0	V	180.0	20.60
15995.500000	48.14	53.979	5.84	1000.000	365.0	H	181.0	24.85
17869.000000	52.21	53.979	1.77	1000.000	100.0	H	193.0	27.87

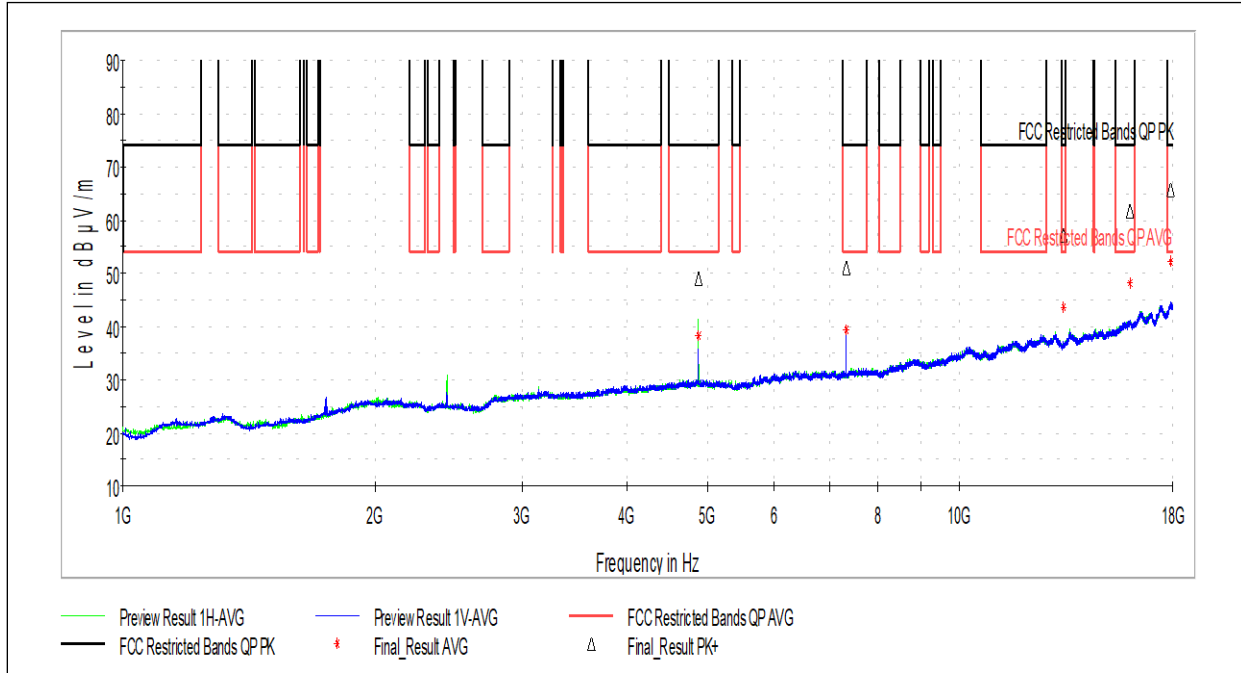
Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey (Where Applicable)
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: None



6.9.2 2440MHz



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4880.000000	49.01	73.979	24.97	1000.000	292.0	H	205.0	9.18
7321.000000	50.96	73.979	23.02	1000.000	325.0	H	159.0	12.50
13315.000000	57.08	73.979	16.90	1000.000	100.0	V	251.0	21.21
16010.500000	61.64	73.979	12.34	1000.000	100.0	V	135.0	24.93
17889.000000	65.75	73.979	8.23	1000.000	269.0	V	22.0	27.93

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4880.000000	38.19	53.979	15.79	1000.000	292.0	H	205.0	9.18
7321.000000	39.24	53.979	14.74	1000.000	325.0	H	159.0	12.50
13315.000000	43.48	53.979	10.50	1000.000	100.0	V	251.0	21.21
16010.500000	48.21	53.979	5.77	1000.000	100.0	V	135.0	24.93
17889.000000	52.21	53.979	1.77	1000.000	269.0	V	22.0	27.93

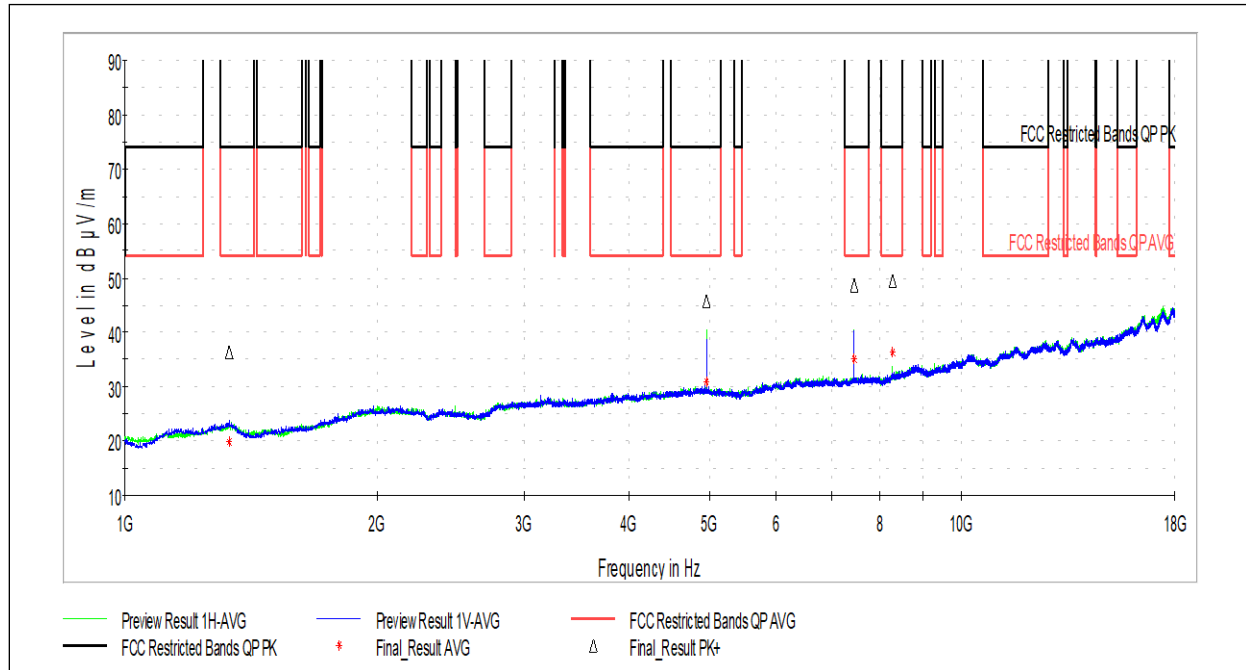
Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: None



6.9.3 2480MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1333.000000	36.41	73.979	37.57	1000.000	410.0	V	72.0	-0.22
4960.000000	45.70	73.979	28.28	1000.000	126.0	H	201.0	9.14
7439.500000	48.68	73.979	25.30	1000.000	100.0	H	23.0	12.63
8275.500000	49.45	73.979	24.53	1000.000	100.0	H	124.0	13.92

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1333.000000	19.82	53.979	34.16	1000.000	410.0	V	72.0	-0.22
4960.000000	30.97	53.979	23.01	1000.000	126.0	H	201.0	9.14
7439.500000	35.23	53.979	18.75	1000.000	100.0	H	23.0	12.63
8275.500000	36.44	53.979	17.54	1000.000	100.0	H	124.0	13.92

Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

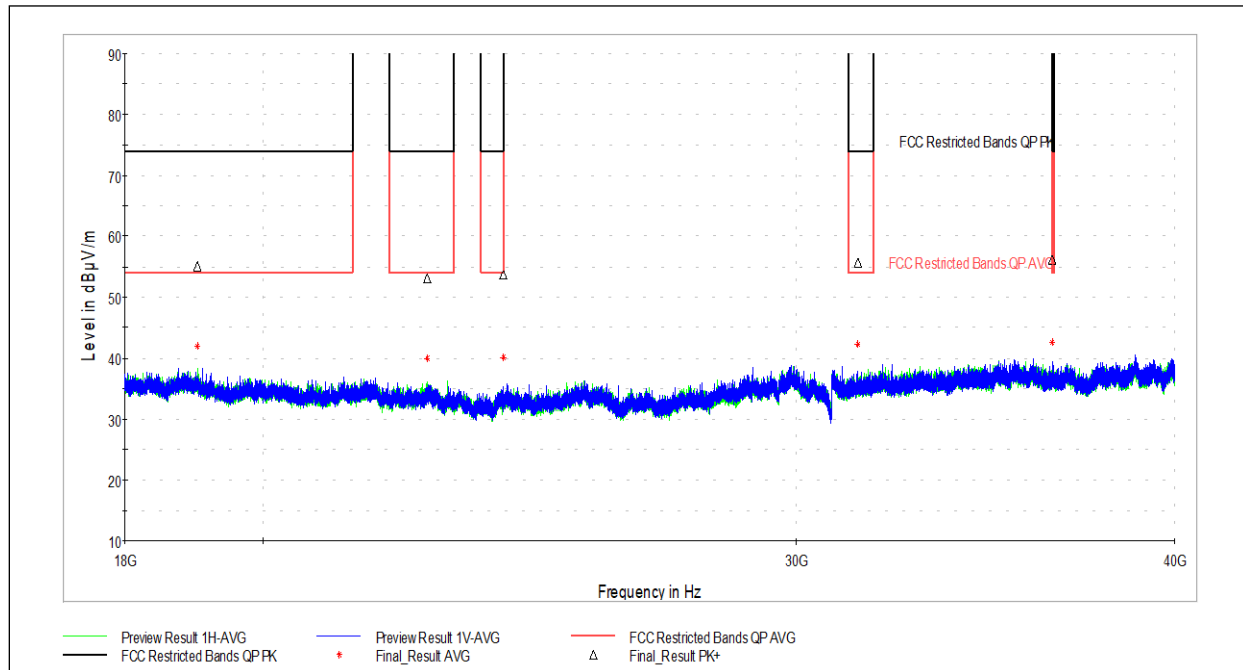
Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: None



6.10 Radiated Spurious Emissions, 18GHz-40GHz:

6.10.1 2440MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19017.000000	55.17	73.979	18.81	1000.000	410.0	H	106.0	18.05
22649.500000	53.12	73.979	20.86	1000.000	410.0	H	177.0	6.98
24003.500000	53.77	1000.000	946.23	1000.000	195.0	V	300.0	6.58
31433.500000	55.78	73.979	18.20	1000.000	100.0	V	68.0	11.31
36435.000000	56.16	73.979	17.82	1000.000	100.0	V	0.0	11.52

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19017.000000	42.03	53.979	11.95	1000.000	410.0	H	106.0	18.05
22649.500000	40.00	53.979	13.98	1000.000	410.0	H	177.0	6.98
24003.500000	40.18	1000.000	959.82	1000.000	195.0	V	300.0	6.58
31433.500000	42.23	53.979	11.75	1000.000	100.0	V	68.0	11.31
36435.000000	42.66	53.979	11.32	1000.000	100.0	V	0.0	11.52

Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: FCC Part 15.209 in Restricted Bands from FCC Part 15.205
 Ambient Temperature: 22.5C
 Relative Humidity: 59.2%
 Atmospheric Pressure: 977.2mbar

Deviations, additions, or exclusions: This testing represents the worst case of low, middle, and high channels



7 Output Power

7.1 Test Limits

FCC Part 15.247(b)(3):

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 Issue 2 § 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).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is 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 transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.



7.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.9.1.1. EIRP measurements were converted to output power based on customer-supplied antenna gain values.

7.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8181	Rohde & Schwarz	ESW44	11/16/2021	11/16/2022
Horn Antenna	4001	ETS	3117	2/23/2022	2/23/2023
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Coaxial Cable	3074			1/13/2022	1/13/2023
Coaxial Cable	2588			1/13/2022	1/13/2023
Coaxial Cable	2593			1/13/2022	1/13/2023
Coaxial Cable	2592			1/13/2022	1/13/2023

7.4 Test Results

The device was found to be **compliant**. The peak output power was less than 1W.

7.5 Test Data

Frequency (MHz)	Rx Reading	Correction Factor	Field Strength (dBuV/m)	EIRP (dBm)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
2402	55.92	38.50	94.42	-0.81	-2.41	30	32.41	PASS
2440	53.63	38.50	92.13	-3.10	-4.70	30	34.70	PASS
2480	56.43	38.50	94.93	-0.30	-1.90	30	31.90	PASS

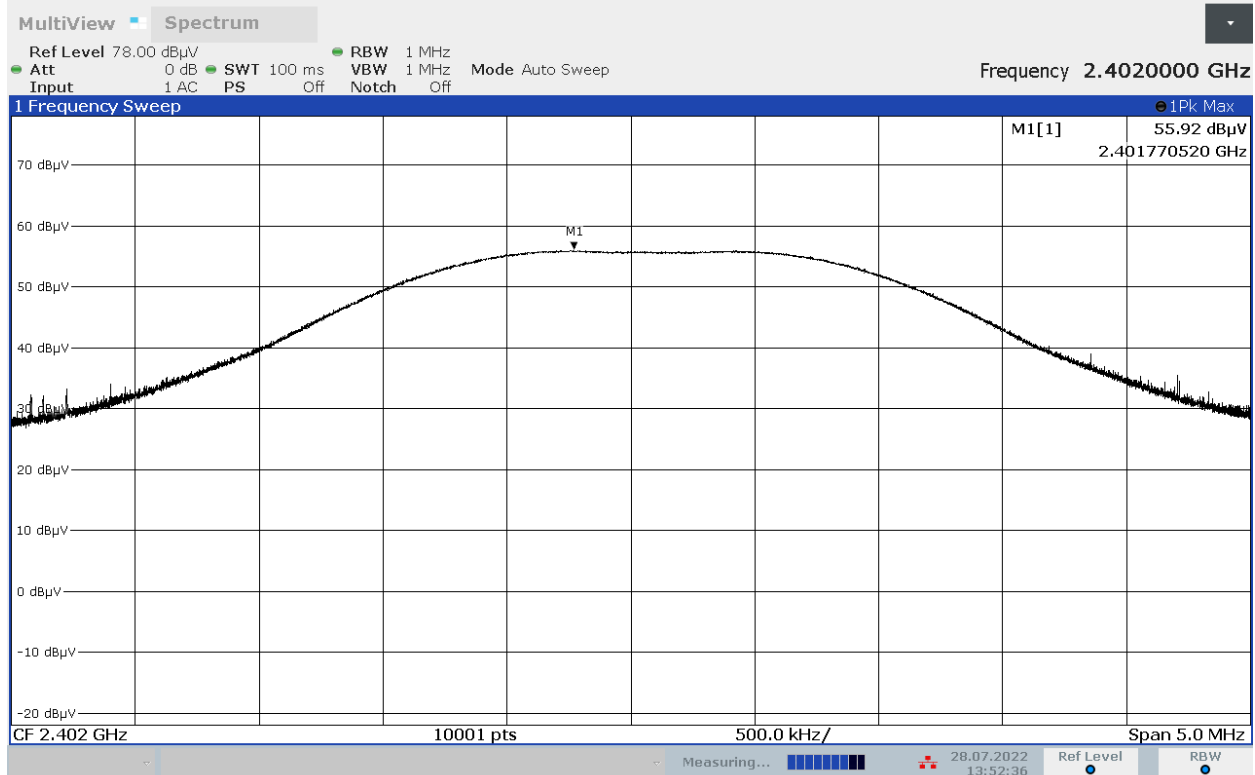
Test Personnel: Seth Parker
 Supervising/Reviewing Engineer: Brian Lackey
 (Where Applicable) FCC Part 15.247
 Product Standard: RSS-247 Issue 2
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/28/2022 – 8/1/2022
 Limit Applied: See Above
 Ambient Temperature: 25.6C
 Relative Humidity: 52.2%
 Atmospheric Pressure: 985.4mbar

Deviations, Additions, or Exclusions: None



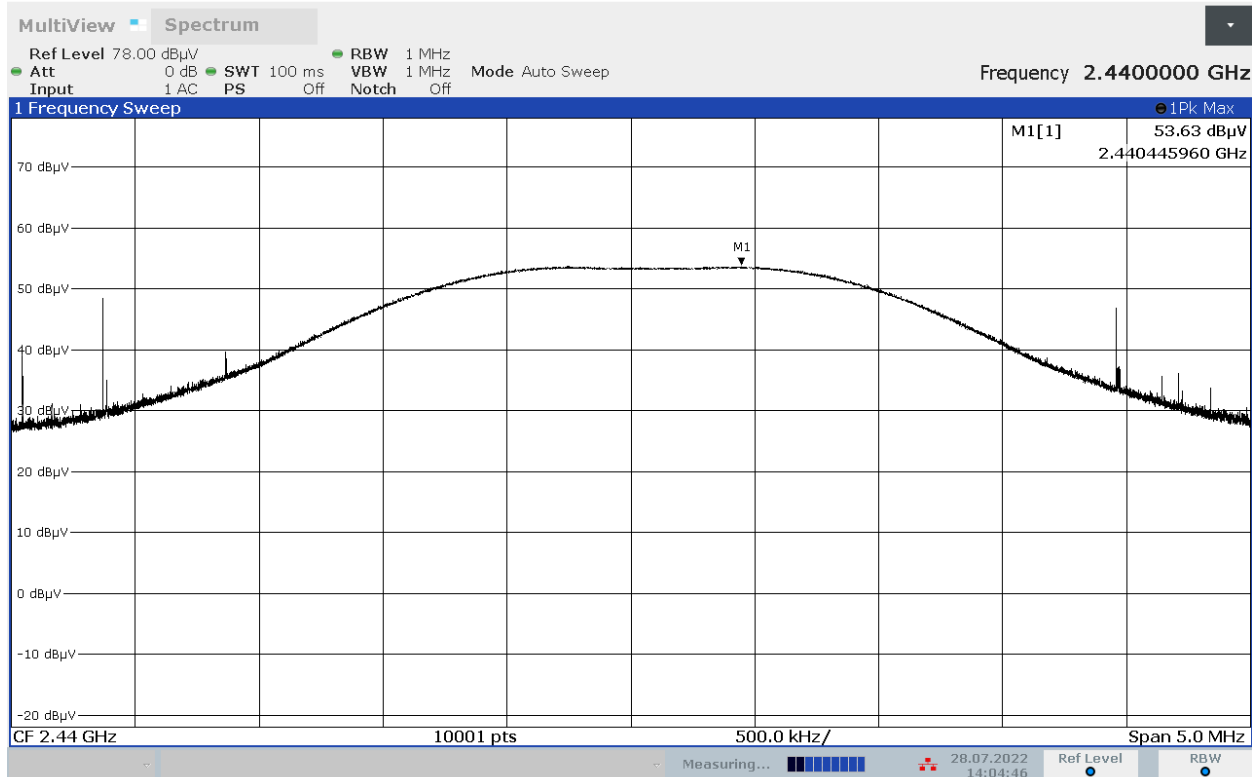
7.5.1 2402MHz



13:52:37 28.07.2022



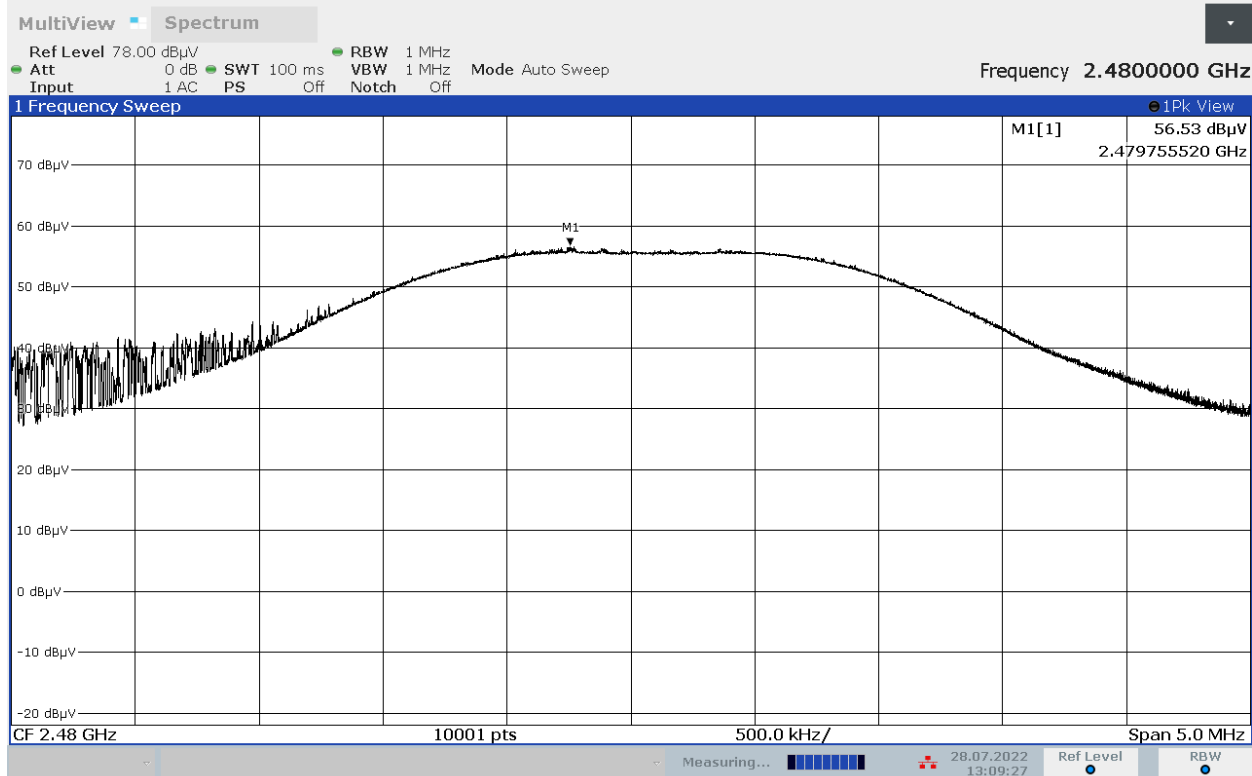
7.5.2 2440MHz



14:04:46 28.07.2022



7.5.3 2480MHz



13:09:27 28.07.2022



8 Occupied Bandwidth

8.1 Test Limits

FCC Part 15.247(a)(2):

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 Issue 2 § 5.2(a):

The minimum 6 dB bandwidth shall be 500 kHz.

8.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.8.1.

8.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Signal Analyzer	3727	Rohde & Schwarz	FSQ	Verify at Time of Use	Verify at Time of Use

8.4 Test Results

The device was found to be **compliant**. The 6dB bandwidth was at least 500kHz.

8.5 Test Data

Frequency (MHz)	DTS BW (kHz)	OBW (kHz)	99% BW (kHz)
2402	915	2021	1775
2440	912	2019	1760
2480	918	2027	1790

Test Personnel:	Seth Parker	Test Date:	7/28/2022 – 8/1/2022
Supervising/Reviewing Engineer: (Where Applicable)	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	Battery	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

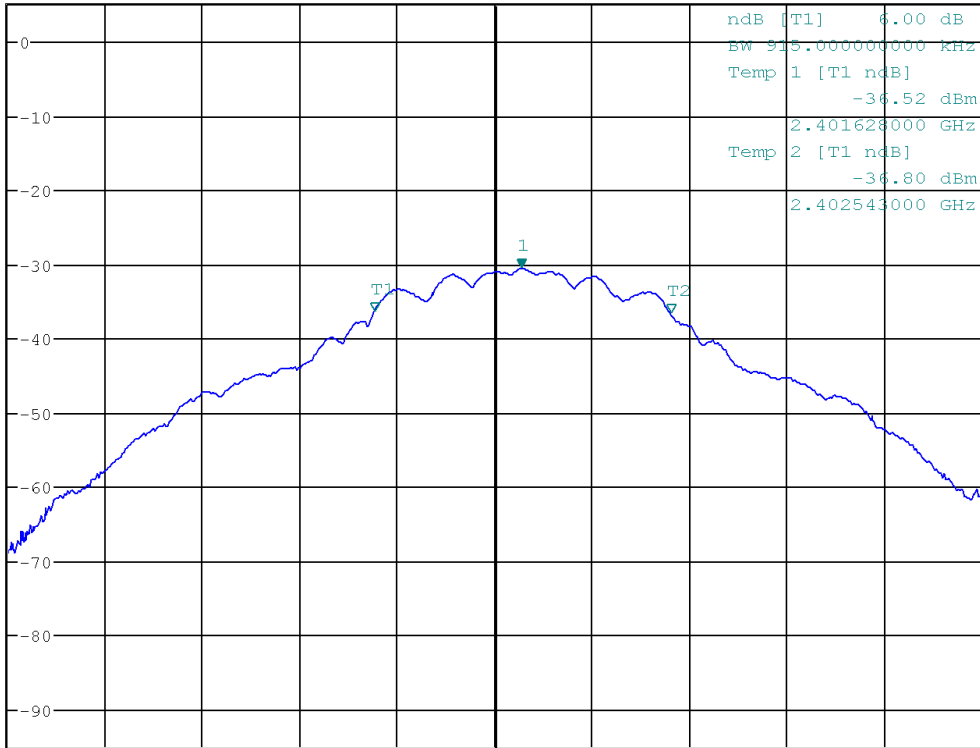


8.6 DTS Bandwidth, 2402MHz



*RBW 100 kHz Marker 1 [T1]
 VBW 300 kHz -30.69 dBm
 Ref 5 dBm *Att 15 dB SWT 5 ms 2.402084000 GHz

1 PK
MAXH



Center 2.402 GHz 300 kHz/ Span 3 MHz

Date: 27.JUL.2022 15:41:55



8.7 DTS Bandwidth, 2440MHz

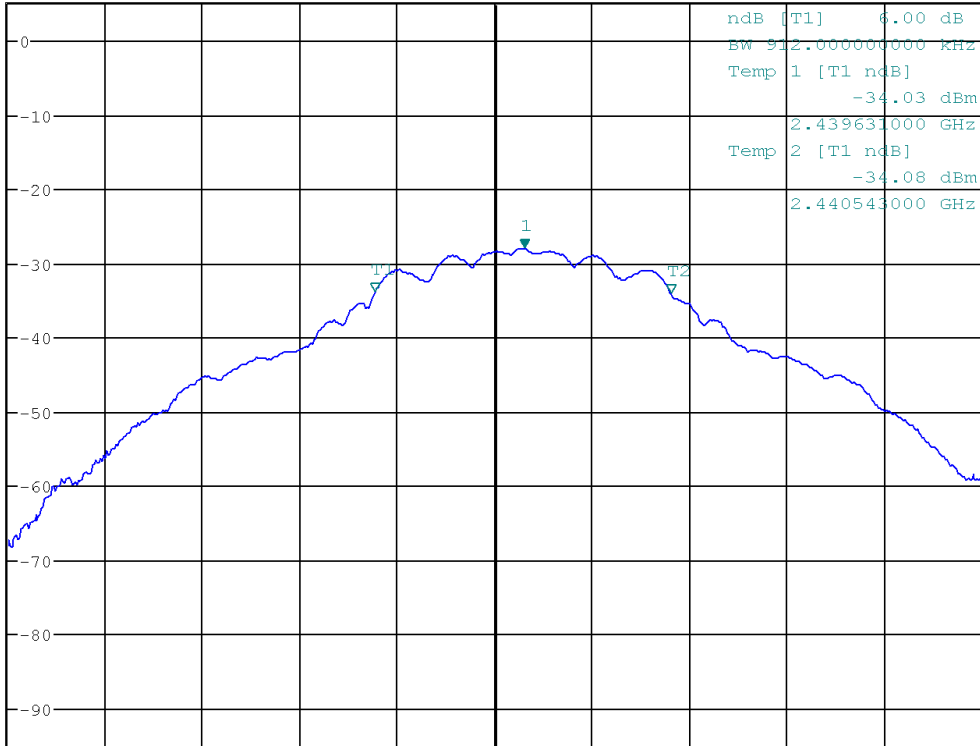


*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz -28.02 dBm
SWT 5 ms 2.440090000 GHz

Ref 5 dBm

*Att 15 dB

1 PK
MAXH



Center 2.44 GHz 300 kHz/ Span 3 MHz

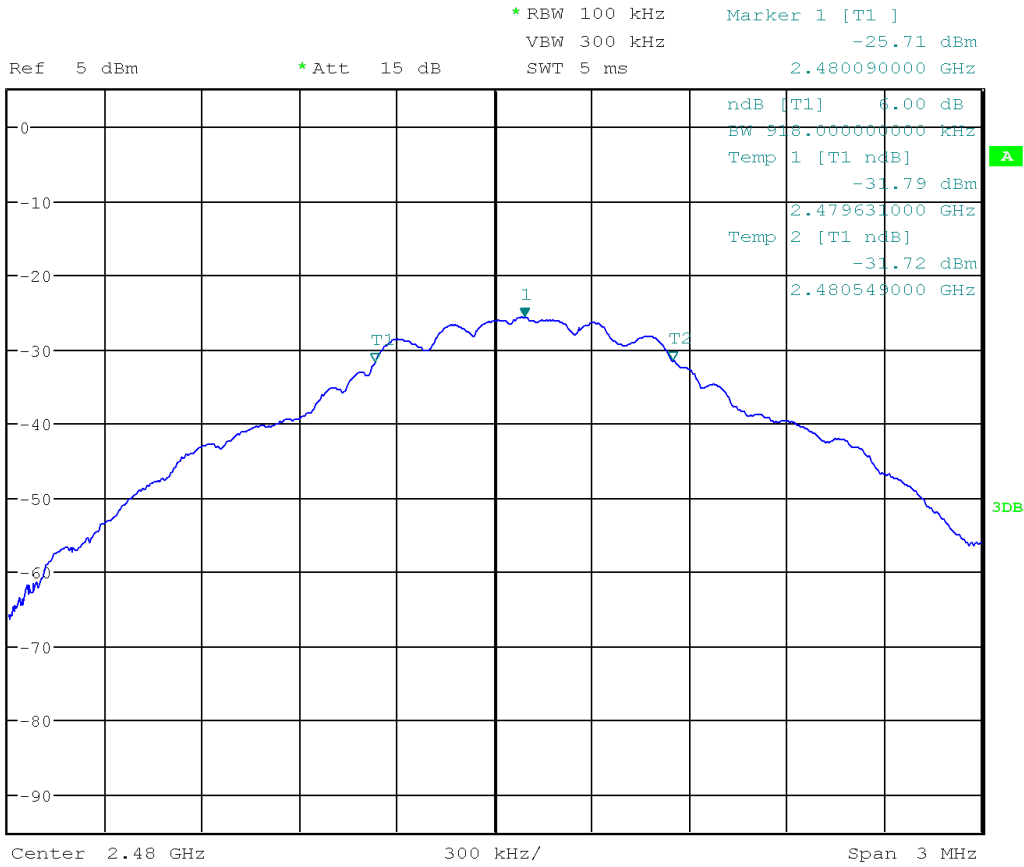
Date: 27.JUL.2022 15:46:12



8.8 DTS Bandwidth, 2480MHz



1 PK
MAXH



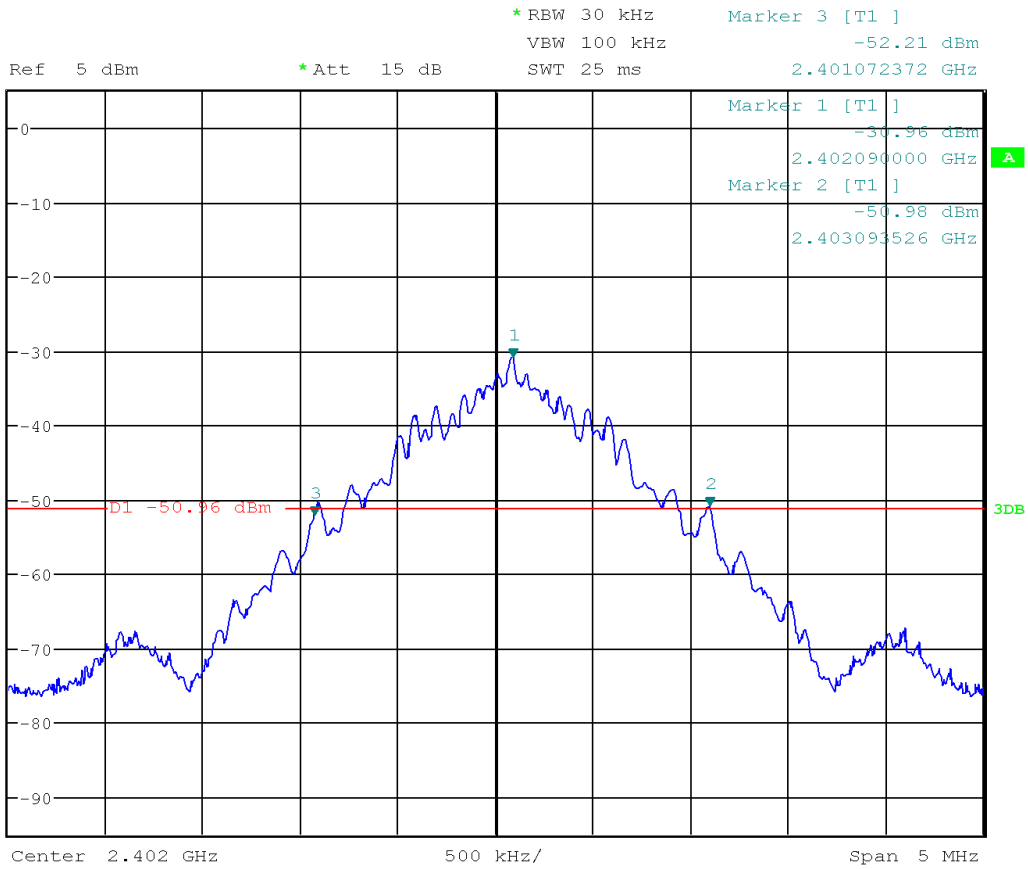
Date: 27.JUL.2022 15:51:10



8.9 Occupied Bandwidth, 2402MHz



1 PK
MAXH



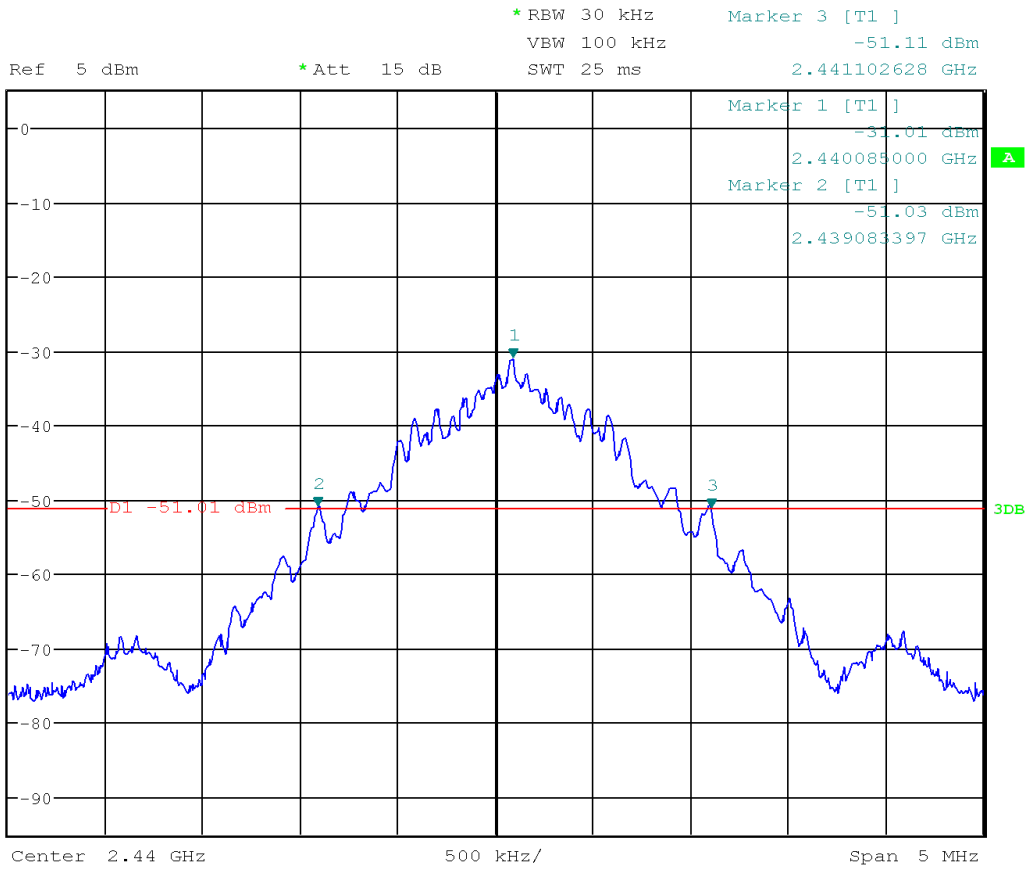
Date: 27.JUL.2022 16:15:10



8.10 Occupied Bandwidth, 2440MHz



1 PK
MAXH



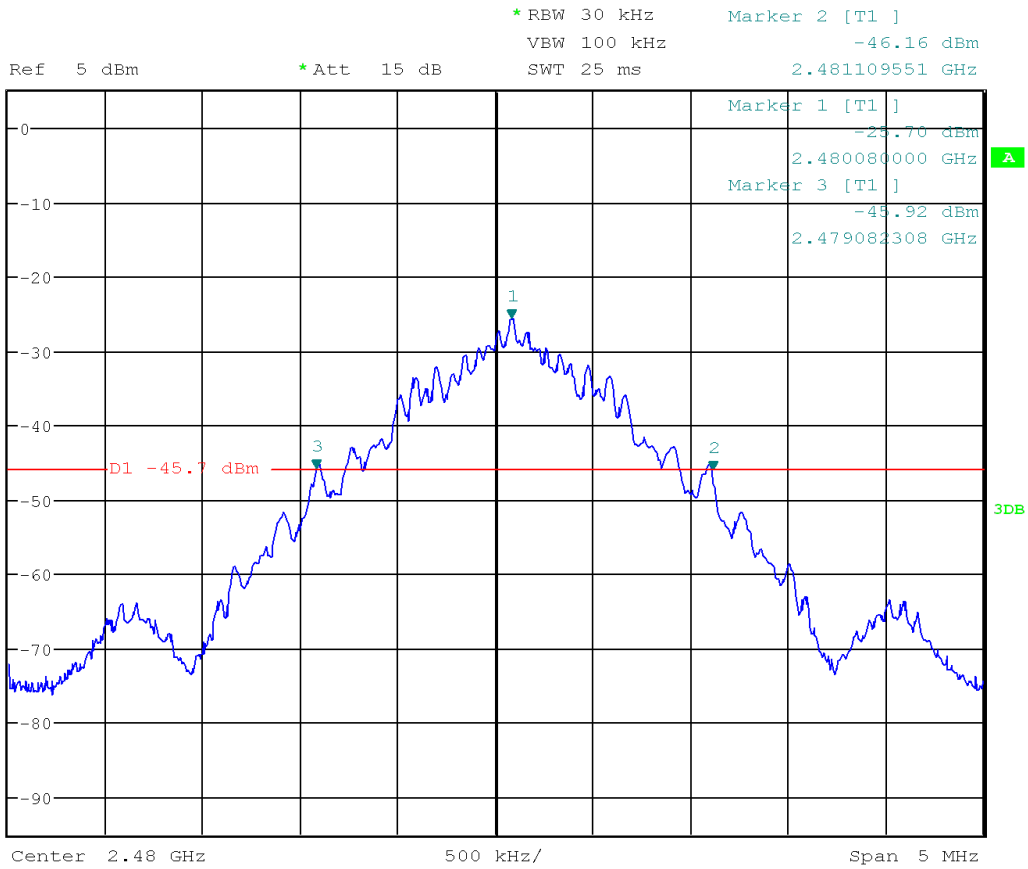
Date: 27.JUL.2022 16:05:09



8.11 Occupied Bandwidth, 2480MHz



1 PK
MAXH



Date: 27.JUL.2022 16:00:53



8.12 99% Bandwidth, 2402MHz

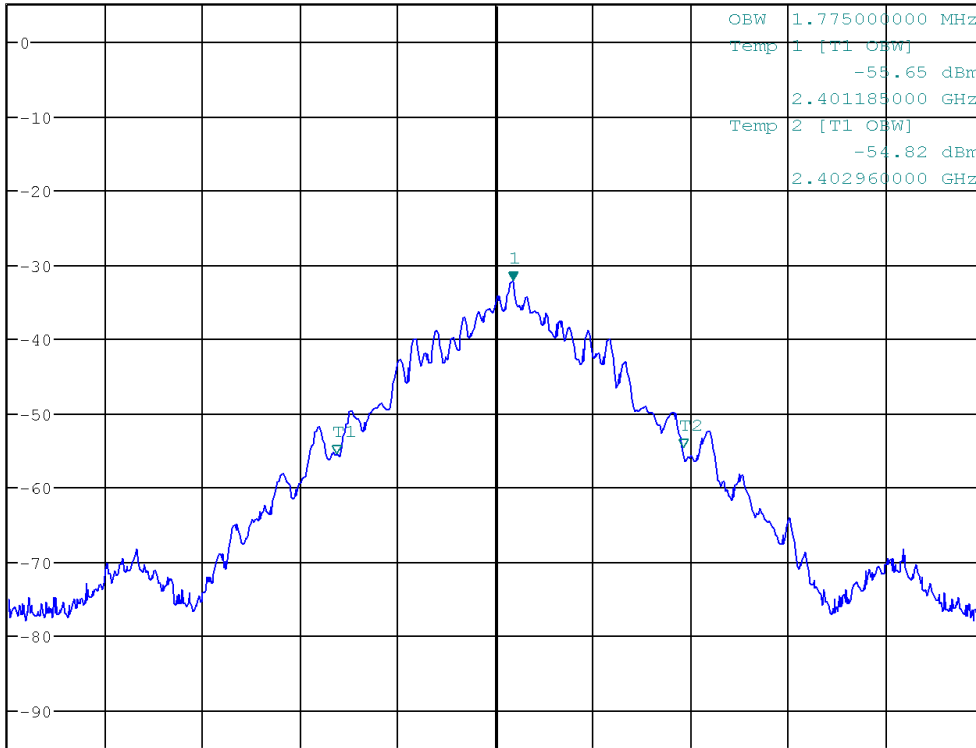


*RBW 30 kHz Marker 1 [T1]
 VBW 100 kHz -32.33 dBm
 SWT 25 ms 2.402084000 GHz

Ref 5 dBm

*Att 15 dB

1 PK
MAXH



Center 2.402 GHz

500 kHz/

Span 5 MHz

Date: 27.JUL.2022 15:44:44



8.13 99% Bandwidth, 2440MHz

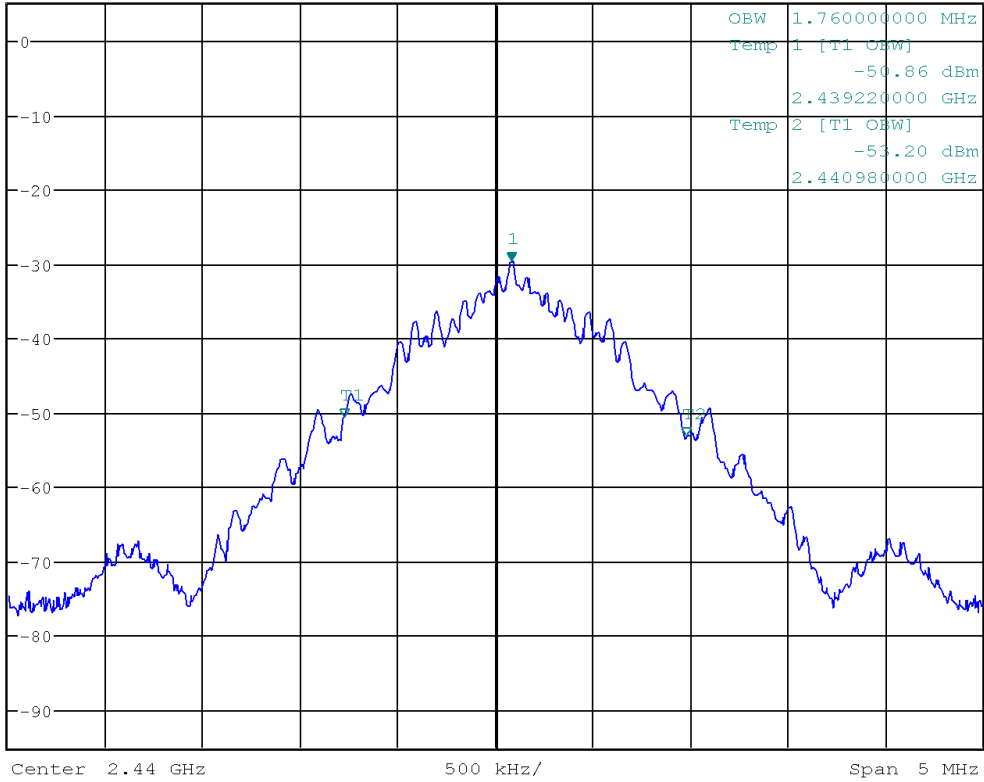


*RBW 30 kHz Marker 1 [T1]
 VBW 100 kHz -29.75 dBm
 SWT 25 ms 2.440080000 GHz

Ref 5 dBm

*Att 15 dB

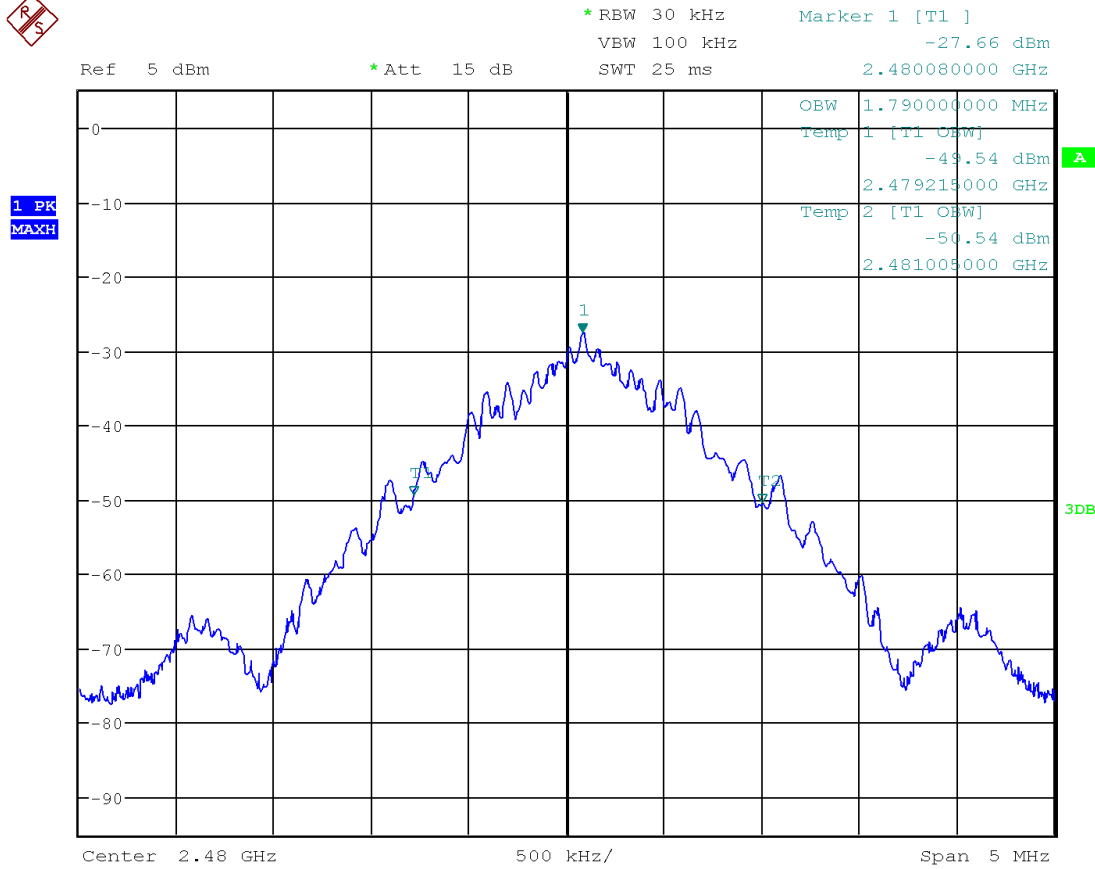
1 PK
MAXH



Date: 27.JUL.2022 15:48:48



8.14 99% Bandwidth, 2480MHz



Date: 27.JUL.2022 15:53:29



9 Power Spectral Density

9.1 Test Limits

FCC Part 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 Issue 2 § 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).

9.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.10.2 Method PKPSD (peak PSD). EIRP measurements were converted to conducted PPSD values based on customer-supplied antenna gain.

9.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8181	Rohde & Schwarz	ESW44	11/16/2021	11/16/2022
Horn Antenna	4001	ETS	3117	2/23/2022	2/23/2023
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Coaxial Cable	3074			1/13/2022	1/13/2023
Coaxial Cable	2588			1/13/2022	1/13/2023
Coaxial Cable	2593			1/13/2022	1/13/2023
Coaxial Cable	2592			1/13/2022	1/13/2023

9.4 Test Results

The device was found to be **compliant**. The peak power spectral density was less than 8dBm.



9.6 Test Data

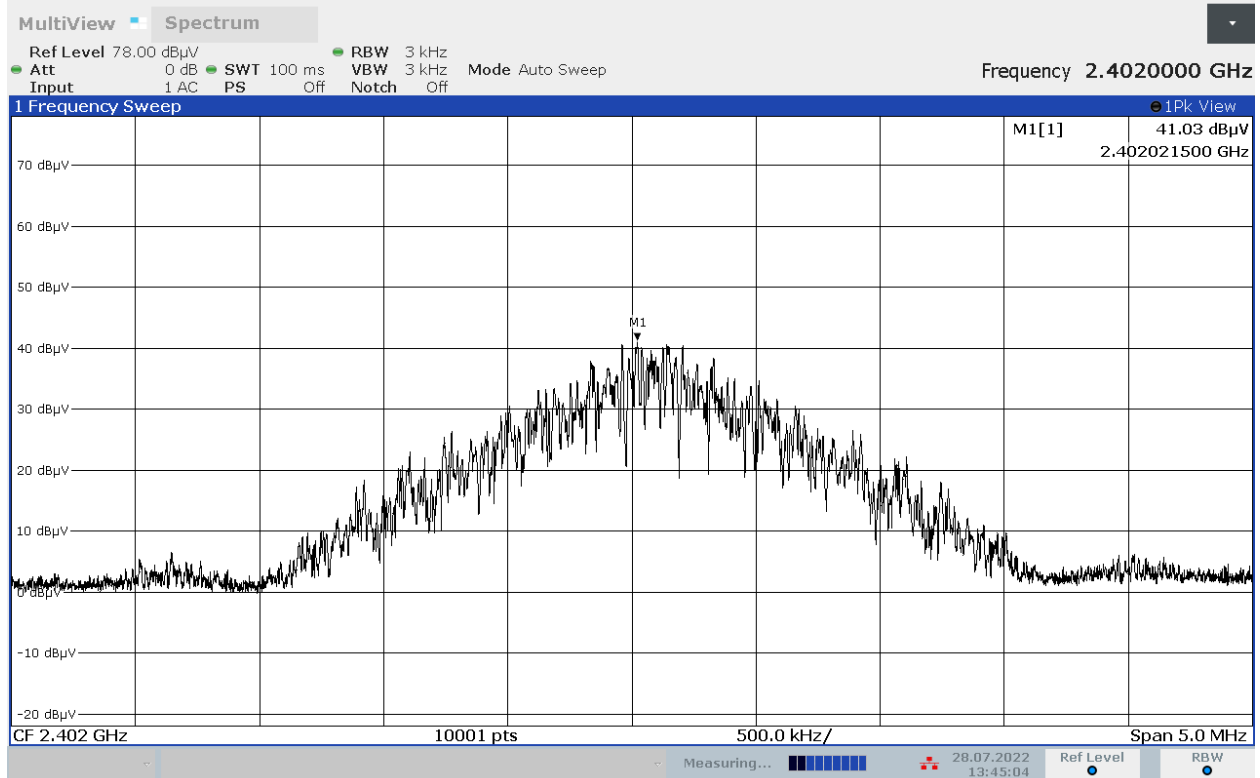
Frequency (MHz)	Rx Reading	Correction Factor	Field Strength (dBuV/m)	EIRP (dBm)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Result
2402	41.03	38.50	79.53	-15.70	-17.30	8.00	25.30	PASS
2440	42.11	38.50	80.61	-14.62	-16.22	8.00	24.22	PASS
2480	41.07	38.50	79.57	-15.66	-17.26	8.00	25.26	PASS

Test Personnel:	<u>Seth Parker</u>	Test Date:	<u>7/28/2022</u>
Supervising/Reviewing Engineer:	<u>Brian Lackey</u>	Limit Applied:	<u>See Above</u>
(Where Applicable)	<u>FCC Part 15.247</u>	Ambient Temperature:	<u>23.3C</u>
Product Standard:	<u>RSS-247 Issue 2</u>	Relative Humidity:	<u>48.2%</u>
Input Voltage:	<u>Battery</u>	Atmospheric Pressure:	<u>998mbar</u>
Pretest Verification w / Ambient Signals or BB Source:	<u>Yes</u>		

Deviations, Additions, or Exclusions: None.



9.7 PPSD, 2402MHz

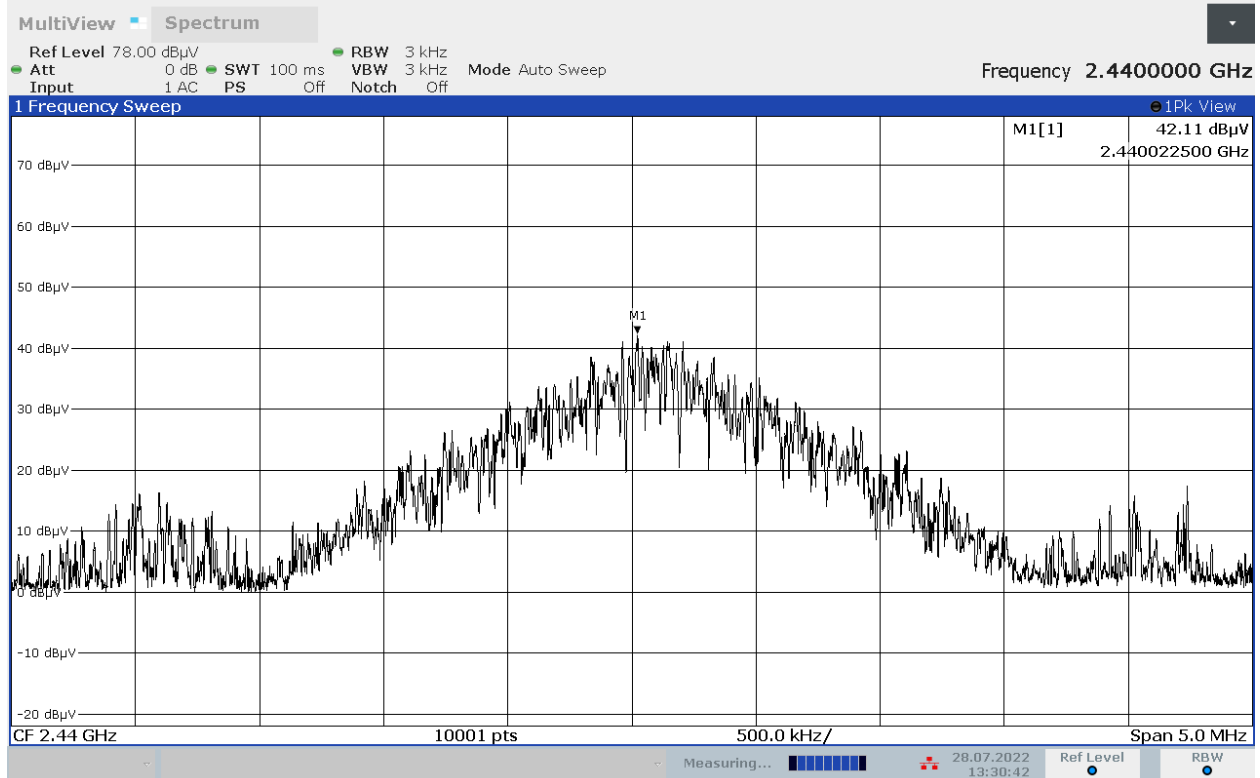


13:45:05 28.07.2022



EMC Test Report

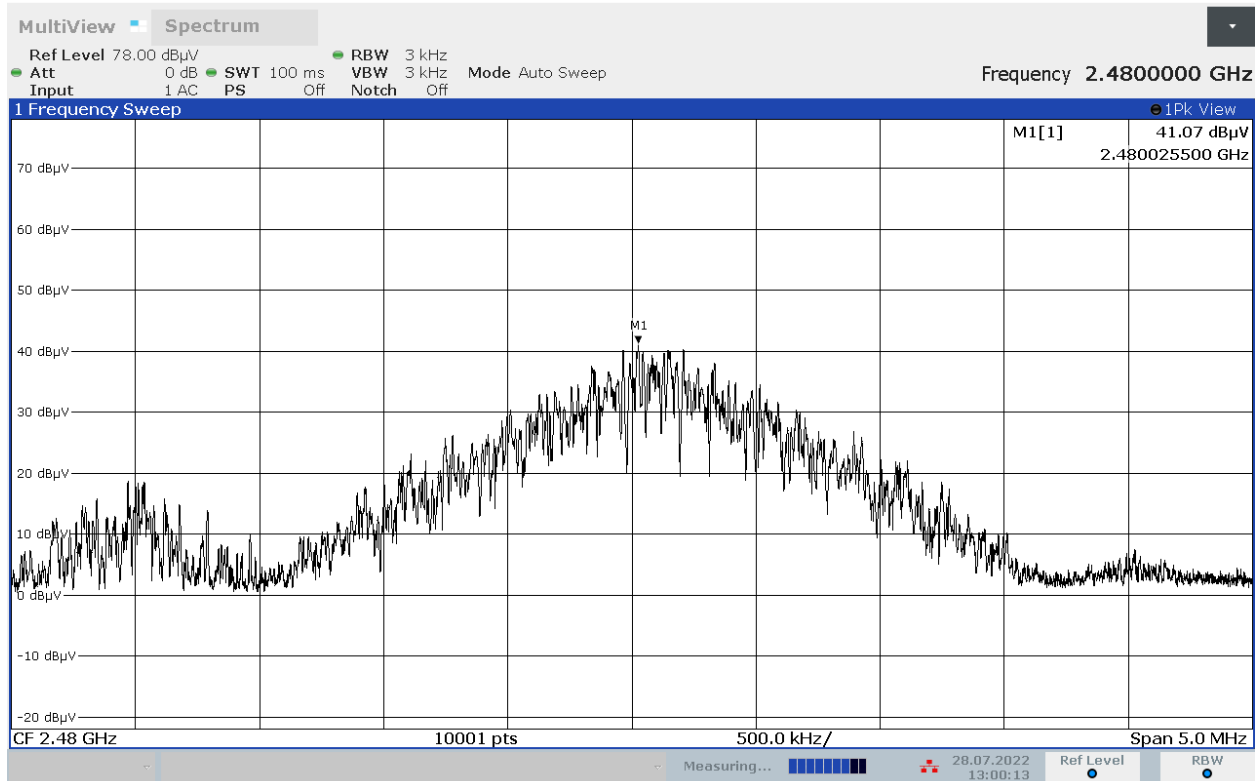
9.8 PPSD, 2440MHz



13:30:43 28.07.2022



9.9 PPST, 2480MHz



13:00:14 28.07.2022



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 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	8/4/2022	105105027LEX-001a	<i>GP</i>	<i>BZ</i>	Original Issue
1	8/23/2022	105105027LEX-001a.1	<i>GP</i>	<i>BZ</i>	Updated antenna gain