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OTODATA WIRELESS NETWORK INC. TEST REPORT

SCOPE OF WORK

EMC TESTING – GEN II

REPORT NUMBER

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EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 104681879LEX-002

Project Number: G104681879

Report Issue Date: 6/30/2021

Product Name: GEN II

Model(s) Tested: MT4AD16W1

Standards: Title 47 CFR Part 15.247
RSS-247 Issue 2
RSS-Gen Issue 5

Tested by:
Intertek Testing Services NA, Inc.
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Lexington, KY 40510
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Client:
OTODATA WIRELESS NETWORK INC.
9280 Boul. De l'Acadie
Montreal, QC H4N 3C5
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Report prepared by



Bryan Taylor, Team Leader

Report reviewed by



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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	Receiver Spurious Emissions (ANSI C63.4: 2014)	Pass
7	Transmitter Spurious Emissions (FCC Part 15.247(d), RSS-247 Issue 2 § 5.5)	Pass
8	Output Power (FCC Part 15.247(b)(3), RSS-247 Issue 2 § 5.4(d))	Pass
9	Occupied Bandwidth (FCC Part 15.247, RSS-247 Issue 2 § 5.2(a))	Pass
10	Power Spectral Density (FCC Part 15.247(e), RSS-247 Issue 2 § 5.2(b))	Pass
11	Conducted Spurious Emissions (FCC Part 15.247(d), RSS-247 Issue 2 § 5.5)	Pass
12	Antenna Requirement (FCC Part 15.203, RSS-Gen Issue 5 § 6.8)	Pass
---	Conducted Emissions (ANSI C63.4: 2014)	N/A ¹

¹ Not applicable since this device is battery powered and does not connect to the AC mains.



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	OTODATA WIRELESS NETWORK INC.
Address:	9280 Boul. De l'Acadie Montreal, QC H4N 3C5 Canada
Contact:	Pascal Turcotte
Email:	pturcotte@otodata.ca
Manufacturer Information	
Manufacturer Name:	OTODATA WIRELESS NETWORK INC.
Manufacturer Address:	9280 Boul. De l'Acadie Montreal, QC H4N 3C5 Canada



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	GEN II
Model Number	MT4AD16W1
Hardware Version	C024
Software Version	2009
Supported Transmit Bands	Bluetooth Low Energy 2402 – 2480MHz
Receive Date	10/02/2020
Test Start Date	10/2/2020
Test End Date	6/23/2021
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	3.6VDC Battery
Antenna	PCB Trace Antenna. 2.14dBi Gain
Description of Equipment Under Test (provided by client)	
<p>The MT4AD16W1 is a remote tank level monitoring device. It is intended to be powered by a non-rechargeable lithium battery pack for a predicted average lifetime of 10 years.</p> <p>The unit uses Bluetooth advertising to allow infield testing and diagnostics as well as enabling possible firmware upgrades. The microcontroller has an embedded 2.4GHz transceiver. The manufacturer provides the protocol stack for Bluetooth Low Energy. A PCB antenna over a ground plane is used as Bluetooth antenna.</p>	

4.1 Variant Models:

There were no variant models covered by this evaluation.



5 System Setup and Method

5.1 Method:

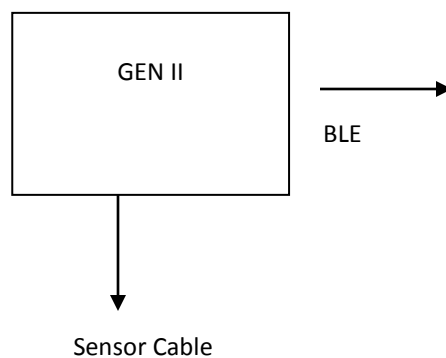
Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013

No.	Descriptions of EUT Exercising
1	Test commands were used to force the GEN II to transmit a Bluetooth Low Energy (BLE) signal or low, middle, or high channel.
2	Idle, not transmitting.

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	Sensor Cable	1	None	No	sensor

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5.2 EUT Block Diagram:





6 Receiver Spurious Emissions

6.1 Test Method

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

TEST SITE: 10m ALSE

Site Designation: 10m Chamber

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	U _{CISPR}
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.



6.2 Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

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

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

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$



6.3 Test Equipment Used

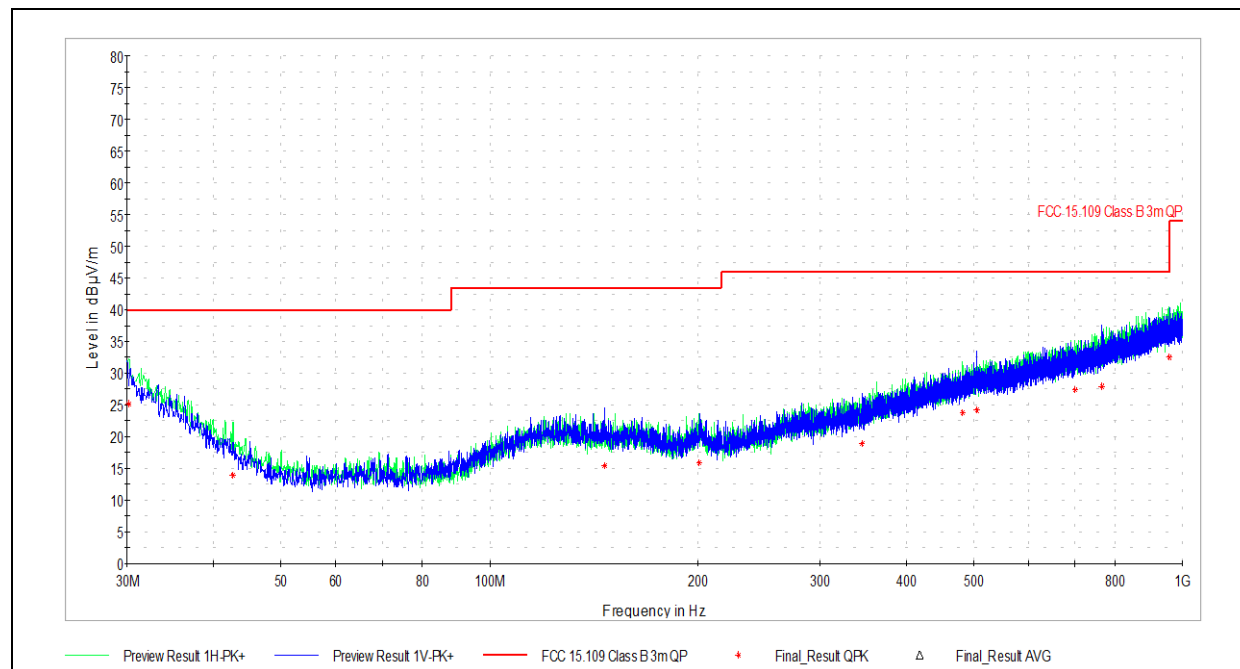
Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Horn Antenna (18-40GHz)	3779	ETS	3116c	7/23/2020	7/23/2021
Horn Antenna	4001	ETS	3117	1/26/2021	1/26/2022
System Controller	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
Coaxial Cable	3074			12/21/2020	12/21/2021
Preamplifier	3918	Rohde & Schwarz	TS-PR18	12/21/2020	12/21/2021
Coaxial Cable	2588			12/21/2020	12/21/2021
Coaxial Cable	2593			12/21/2020	12/21/2021
Coaxial Cable	2592			12/21/2020	12/21/2021
Coaxial Cable	3339			12/21/2020	12/21/2021

6.4 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

6.5 Test Results

The sample tested was found to be **compliant**.

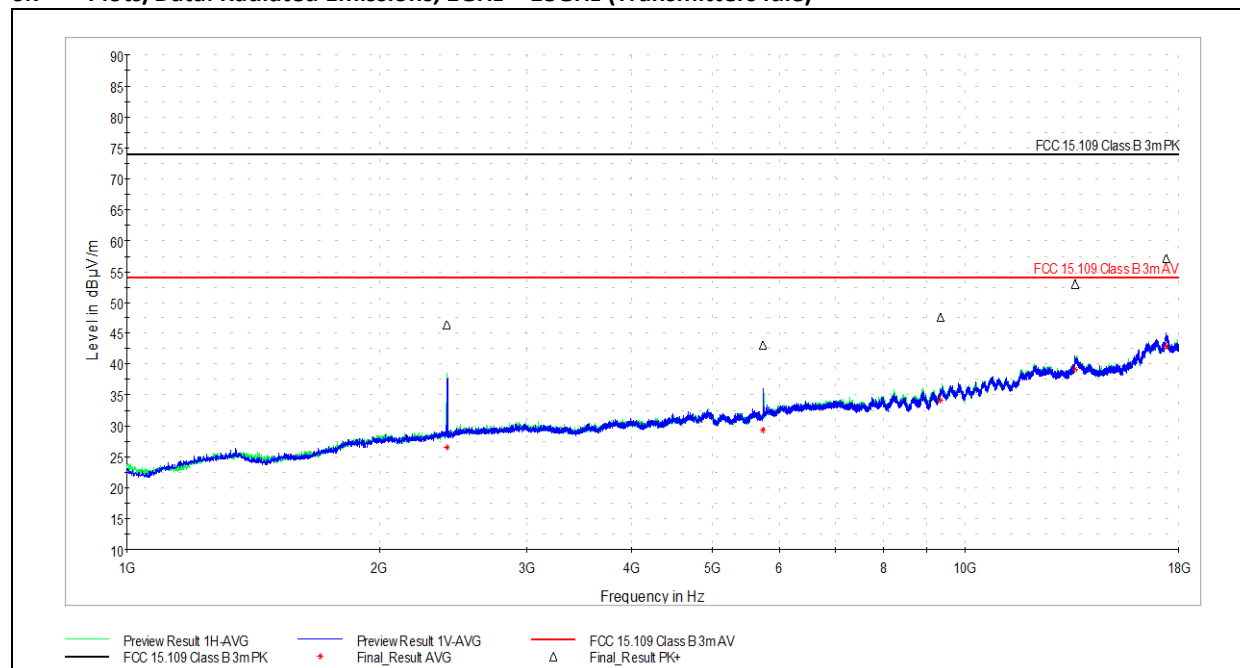
**6.6 Plots/Data: Radiated Emissions, 30MHz – 1GHz (Transmitters Idle)****Final_Result_QPK**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.161667	25.21	40.00	14.79	120.000	235.0	H	79.0	29
42.663889	13.92	40.00	26.08	120.000	344.0	H	301.0	20
146.507778	15.48	43.52	28.05	120.000	321.0	V	0.0	22
200.666111	15.78	43.52	27.75	120.000	365.0	H	48.0	22
344.549444	18.96	46.02	27.07	120.000	234.0	V	6.0	25
481.750556	23.75	46.02	22.27	120.000	189.0	H	196.0	29
504.437778	24.13	46.02	21.89	120.000	400.0	V	71.0	29
699.407778	27.29	46.02	18.73	120.000	400.0	H	27.0	33
764.397778	27.85	46.02	18.17	120.000	103.0	V	0.0	33
955.703333	32.53	46.02	13.49	120.000	333.0	H	27.0	38

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: ICES-003 Issue 7
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 5/22/2021
Limit Applied: Class B
Ambient Temperature: 26.3 °C
Relative Humidity: 40.5 %
Atmospheric Pressure: 985.3 mbar

Deviations, Additions, or Exclusions: None

**6.7 Plots/Data: Radiated Emissions, 1GHz – 18GHz (Transmitters Idle)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2409.000000	46.40	73.98	27.58	1000.000	239.0	H	310.0	5
5737.500000	43.16	73.98	30.82	1000.000	267.0	V	80.0	11
9353.500000	47.53	73.98	26.45	1000.000	236.0	H	340.0	16
13543.000000	52.99	73.98	20.99	1000.000	234.0	V	134.0	21
17392.500000	57.12	73.98	16.86	1000.000	260.0	V	224.0	25

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2409.000000	26.60	53.98	27.38	1000.000	239.0	H	310.0	5
5737.500000	29.30	53.98	24.68	1000.000	267.0	V	80.0	11
9353.500000	34.26	53.98	19.72	1000.000	236.0	H	340.0	16
13543.000000	39.18	53.98	14.80	1000.000	234.0	V	134.0	21
17392.500000	42.88	53.98	11.10	1000.000	260.0	V	224.0	25

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC Part 15B
Product Standard: ICES-003 Issue 7
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 5/22/2021
Limit Applied: Class B
Ambient Temperature: 24.7 °C
Relative Humidity: 46.6 %
Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None



7 Transmitter Spurious Emissions

7.1 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.

7.2 Test Method

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



7.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Magnetic Loop Antenna	2366	ETS	6502	7/17/2020	7/17/2021
Horn Antenna (18-40GHz)	3779	ETS	3116c	7/23/2020	7/23/2021
Horn Antenna	4001	ETS	3117	1/26/2021	1/26/2022
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 (18-40GHz)	3921	Rohde & Schwarz	TS-PR40	12/21/2020	12/21/2021
Coaxial Cable (40GHz)	7020			12/21/2020	12/21/2021
Coaxial Cable (40GHz)	7021			12/21/2020	12/21/2021
Coaxial Cable	3074			12/21/2020	12/21/2021
Preamplifier	3918	Rohde & Schwarz	TS-PR18	12/21/2020	12/21/2021
Coaxial Cable	2588			12/21/2020	12/21/2021
Coaxial Cable	2593			12/21/2020	12/21/2021
Coaxial Cable	2592			12/21/2020	12/21/2021
Coaxial Cable	3339			12/21/2020	12/21/2021

Equipment used for testing performed in 2021

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Magnetic Loop Antenna	2366	ETS	6502	7/17/2020	7/17/2021
Horn Antenna (18-40GHz)	3779	ETS	3116c	7/23/2020	7/23/2021
Horn Antenna	4001	ETS	3117	1/16/2020	1/16/2021
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 (18-40GHz)	3921	Rohde & Schwarz	TS-PR40	12/4/2019	12/4/2020
Coaxial Cable (40GHz)	7020			12/4/2019	12/4/2020
Coaxial Cable (40GHz)	7021			12/4/2019	12/4/2020
Coaxial Cable	12/4/2020			12/4/2019	12/4/2020
Preamplifier	3918	Rohde & Schwarz	TS-PR18	12/4/2019	12/4/2020
Coaxial Cable	2588			12/4/2019	12/4/2020
Coaxial Cable	2593			12/4/2019	12/4/2020
Coaxial Cable	2592			12/4/2019	12/4/2020
Coaxial Cable	3339			12/4/2019	12/4/2020

Equipment used for testing in 2020

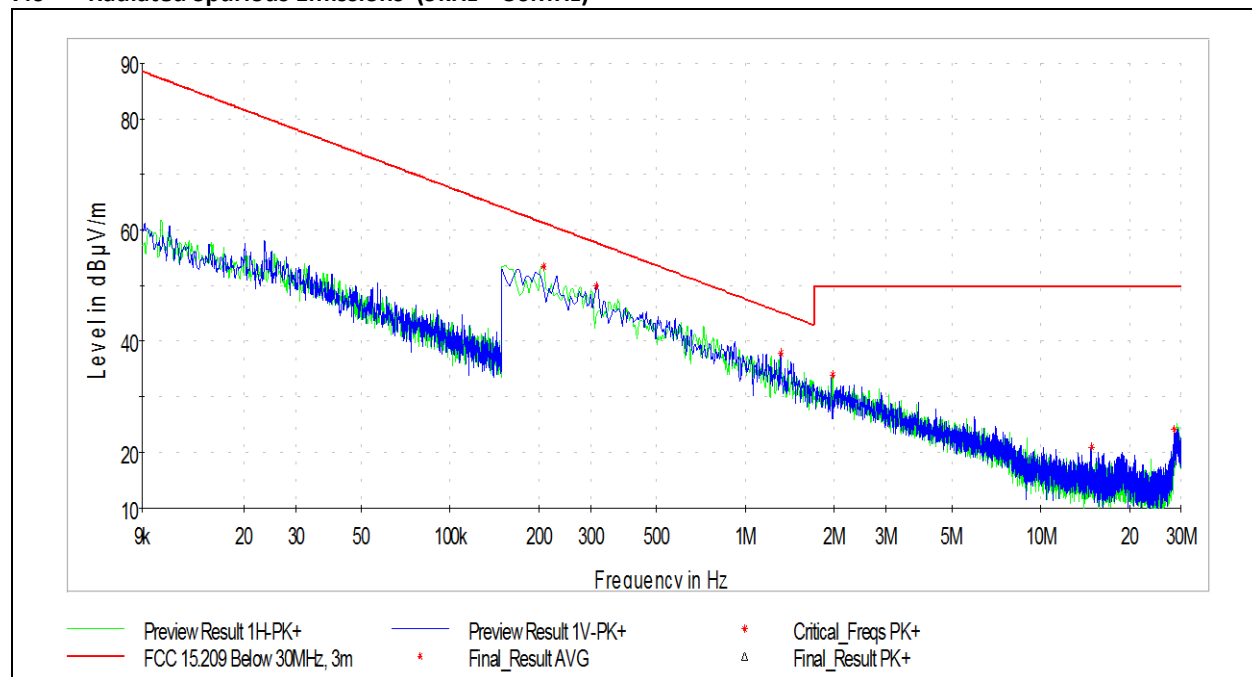


7.4 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

7.5 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.

**7.6 Radiated Spurious Emissions (9kHz – 30MHz)**

Note: The scan above was performed in a continuous max-hold mode and includes the worst case emissions with the transmitter operating on low, mid, and high channels.

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.207066	53.45	61.28	7.83	9kHz	180.0	12.1
0.312419	49.89	57.71	7.82	9kHz	0.0	11.9
1.317662	38.01	45.21	7.20	9kHz	180.0	11.9
1.971728	33.93	50.00	16.07	9kHz	0.0	11.8
14.859904	20.98	50.00	29.02	9kHz	0.0	11.3
28.454824	24.08	50.00	25.92	9kHz	0.0	9.4

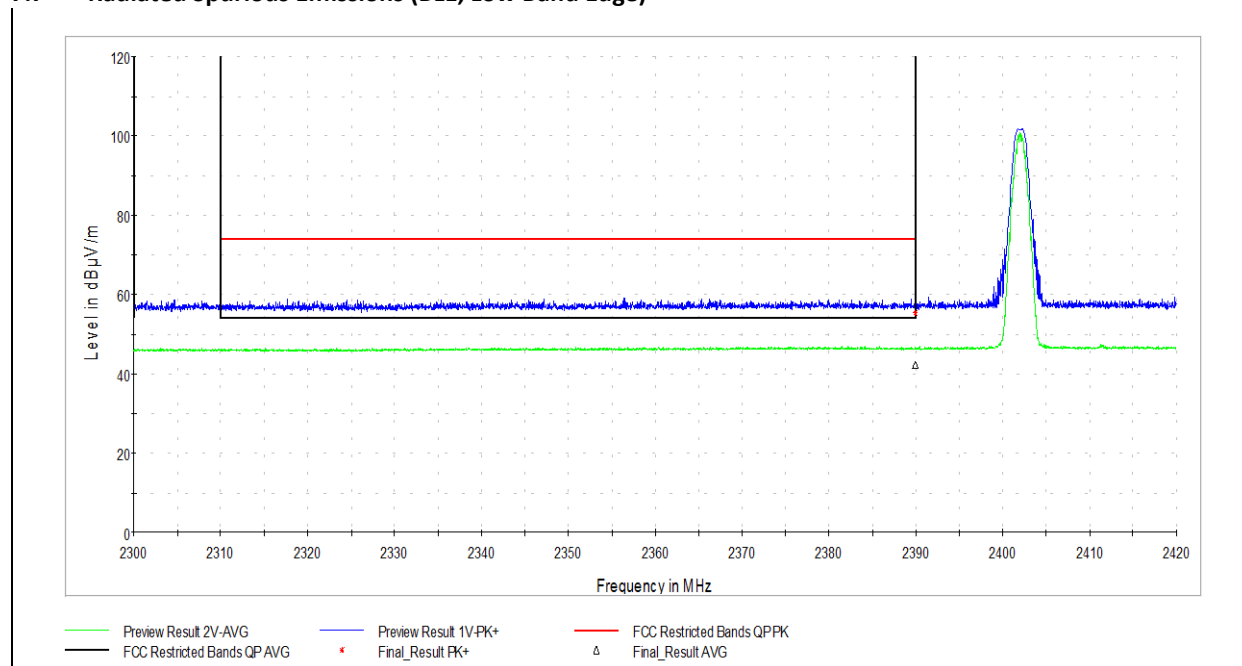
Test Personnel: Bryan Taylor
Supervising/Reviewing Engineer: _____
(Where Applicable) N/A
Product Standard: FCC Part 15C
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 1/30/2021
Limit Applied: 15.209
Ambient Temperature: 24.3°C
Relative Humidity: 52.8%
Atmospheric Pressure: 987.3 mbar

Deviations, Additions, or Exclusions: This data was measured in a semi-anechoic chamber that has been correlated to measurements performed in an open field.



7.7 Radiated Spurious Emissions (BLE, Low Band Edge)



Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2389.976923	55.25	73.98	18.73	1000.000	182.0	V	200.0	38.6

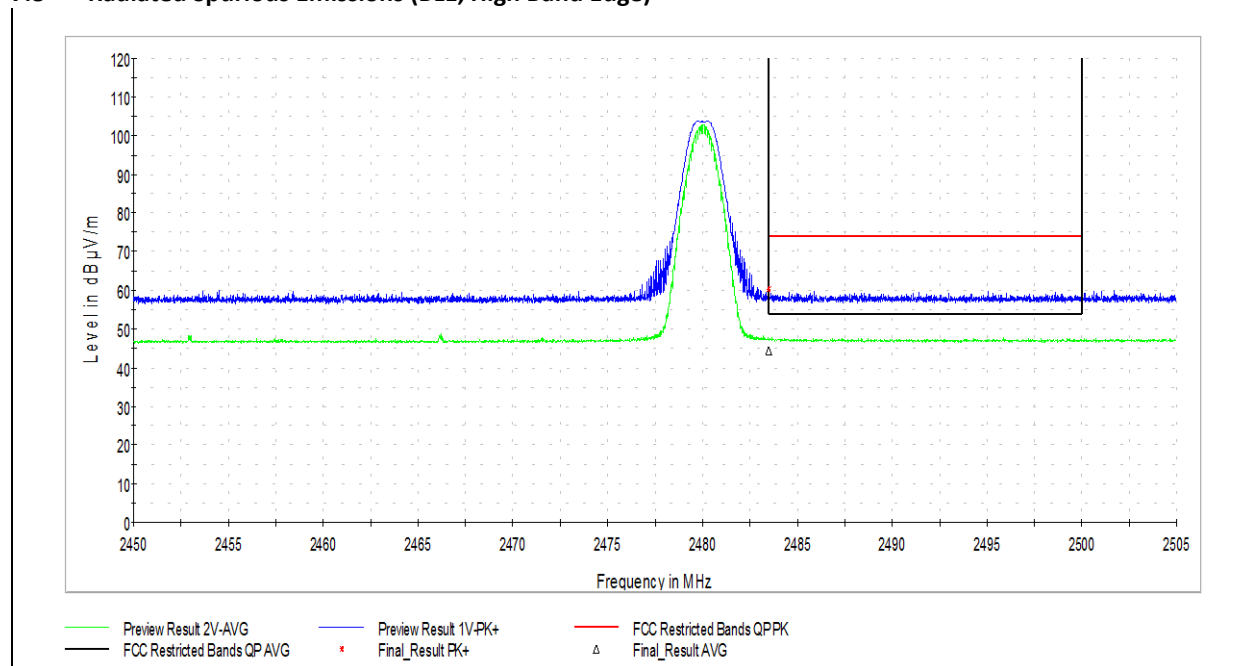
Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2389.976923	42.30	53.98	11.68	1000.000	182.0	V	200.0	38.6

Test Personnel: Bryan Taylor
 Supervising/Reviewing Engineer: N/A
 (Where Applicable)
 Product Standard: FCC Part 15C
 Input Voltage: 3.6VDC (Battery)
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 9/18/2020
 Limit Applied: 15.205 Restricted Bands
 Ambient Temperature: 24.3°C
 Relative Humidity: 52.8%
 Atmospheric Pressure: 987.3 mbar

Deviations, Additions, or Exclusions: None

**7.8 Radiated Spurious Emissions (BLE, High Band Edge)****Final_Result_PK+**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.507692	60.39	73.98	13.59	1000.000	358.0	V	189.0	39.0

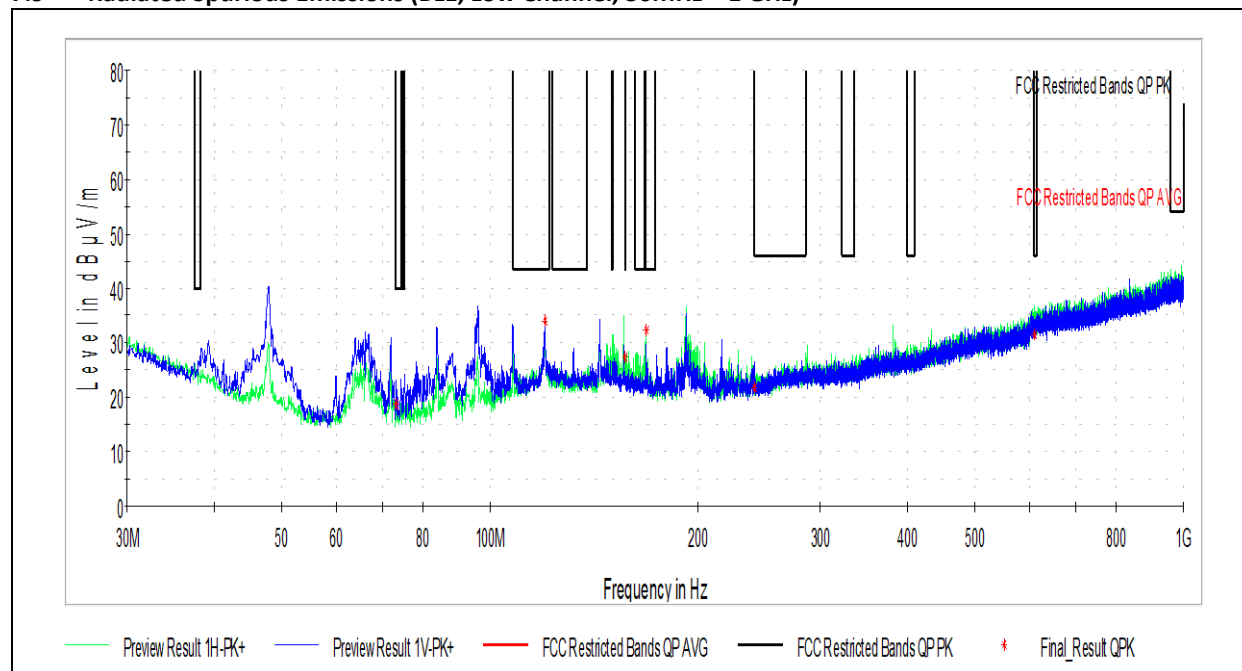
Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.507692	44.50	53.98	9.48	1000.000	358.0	V	189.0	39.0

Test Personnel: Bryan Taylor
Supervising/Reviewing Engineer: N/A
(Where Applicable)
Product Standard: FCC Part 15C
Input Voltage: 3.6VDC (Battery)
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 10/10/2020
Limit Applied: 15.205 Restricted Bands
Ambient Temperature: 24.3°C
Relative Humidity: 52.8%
Atmospheric Pressure: 987.3 mbar

Deviations, Additions, or Exclusions: None

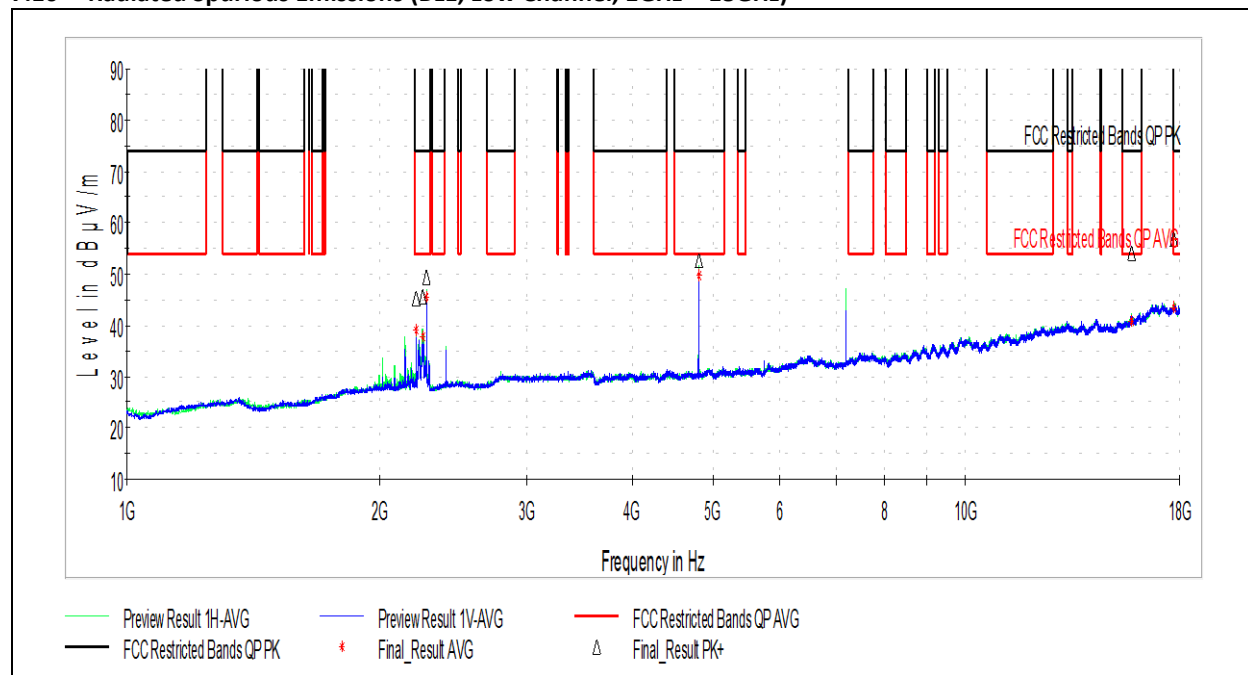
**7.9 Radiated Spurious Emissions (BLE, Low Channel, 30MHz – 1 GHz)**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
73.218889	18.78	40.00	21.22	120.000	105.0	V	18.0	15
119.940556	33.95	43.52	9.57	120.000	100.0	V	48.0	22
168.009444	32.47	43.52	11.05	120.000	135.0	H	158.0	21
240.597778	21.72	46.02	24.30	120.000	105.0	V	154.0	22
610.491111	31.41	46.02	14.61	120.000	331.0	H	173.0	32

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC Part 15C
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/22/2021
Limit Applied: 15.205 Restricted Bands
Ambient Temperature: 24.7 °C
Relative Humidity: 46.4 %
Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

**7.10 Radiated Spurious Emissions (BLE, Low Channel, 1GHz – 18GHz)**

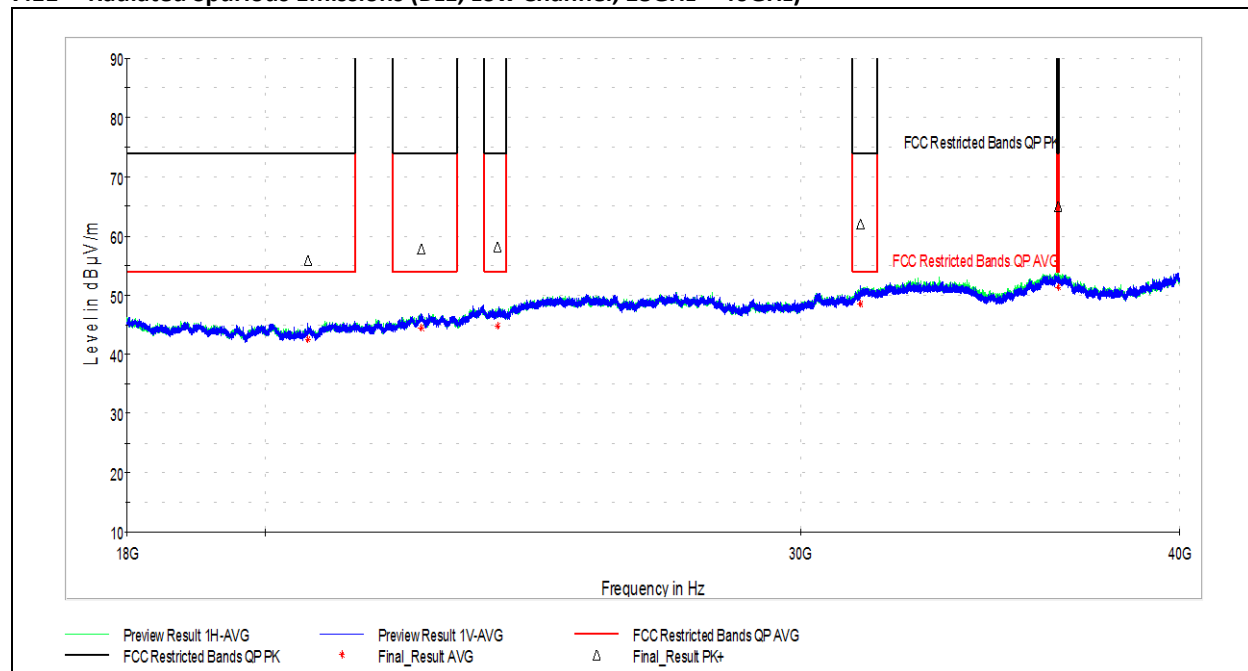
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2210.000000	45.30	73.98	28.68	1000.000	276.0	H	265.0	4
2250.000000	45.70	73.98	28.28	1000.000	100.0	H	267.0	5
2274.000000	49.32	73.98	24.66	1000.000	325.0	H	281.0	5
4804.000000	52.78	73.98	21.20	1000.000	287.0	H	201.0	9
15766.500000	54.29	73.98	19.69	1000.000	143.0	H	330.0	23
17722.000000	56.88	73.98	17.10	1000.000	100.0	H	278.0	25

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2210.000000	38.96	53.98	15.02	1000.000	276.0	H	265.0	4
2250.000000	37.80	53.98	16.18	1000.000	100.0	H	267.0	5
2274.000000	45.55	53.98	8.43	1000.000	325.0	H	281.0	5
4804.000000	49.84	53.98	4.14	1000.000	287.0	H	201.0	9
15766.500000	40.91	53.98	13.07	1000.000	143.0	H	330.0	23
17722.000000	43.55	53.98	10.43	1000.000	100.0	H	278.0	25

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: FCC Part 15C
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/21/2021
Limit Applied: 15.205 Restricted Bands
Ambient Temperature: 24.7 °C
Relative Humidity: 46.4 %
Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

**7.11 Radiated Spurious Emissions (BLE, Low Channel, 18GHz – 40GHz)**

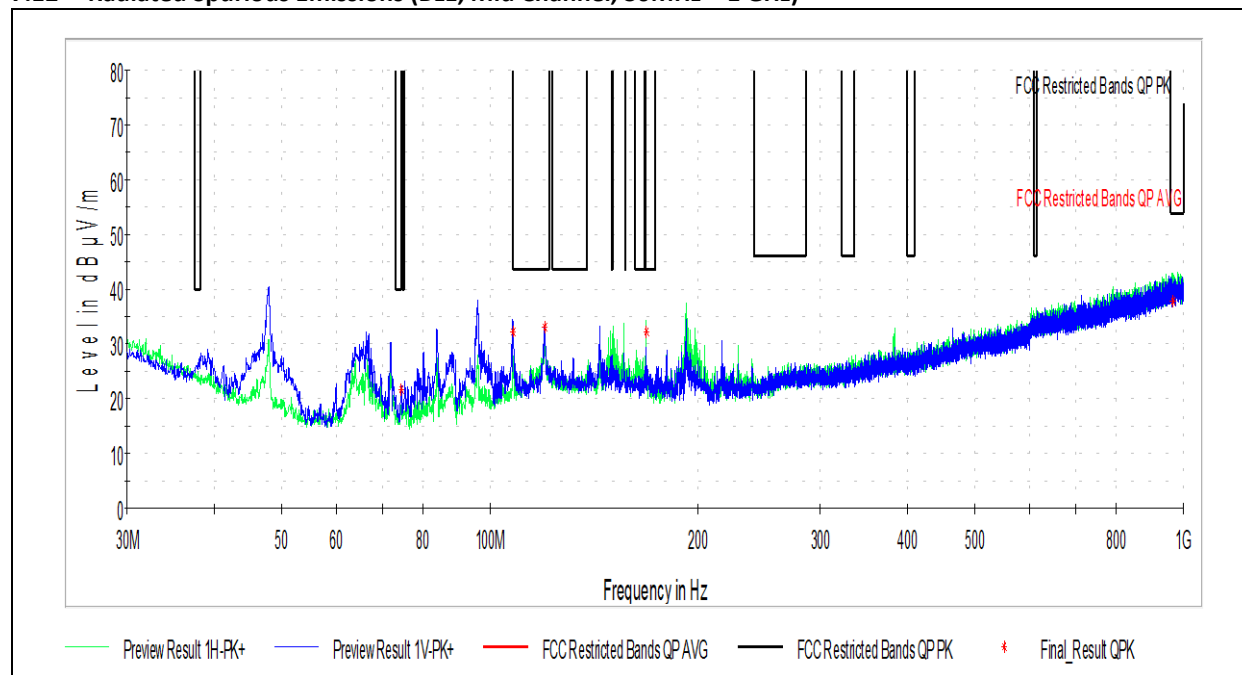
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20639.500000	55.92	73.98	18.06	1000.000	109.0	V	48.0	14
22493.500000	57.81	73.98	16.17	1000.000	410.0	V	296.0	11
23845.500000	58.25	73.98	15.73	1000.000	100.0	H	224.0	11
31400.500000	62.02	73.98	11.96	1000.000	410.0	V	0.0	17
36479.000000	64.95	73.98	9.03	1000.000	410.0	H	0.0	19

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20639.500000	42.54	53.98	11.44	1000.000	109.0	V	48.0	14
22493.500000	44.40	53.98	9.58	1000.000	410.0	V	296.0	11
23845.500000	44.89	53.98	9.09	1000.000	100.0	H	224.0	11
31400.500000	48.53	53.98	5.45	1000.000	410.0	V	0.0	17
36479.000000	51.28	53.98	2.70	1000.000	410.0	H	0.0	19

Test Personnel: Ben Coolbear
 Supervising/Reviewing Engineer: (Where Applicable) NA
 Product Standard: FCC Part 15C
 Input Voltage: 3.9 VDC
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/22/2021
 Limit Applied: 15.205 Restricted Bands
 Ambient Temperature: 24.7 °C
 Relative Humidity: 46.4 %
 Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

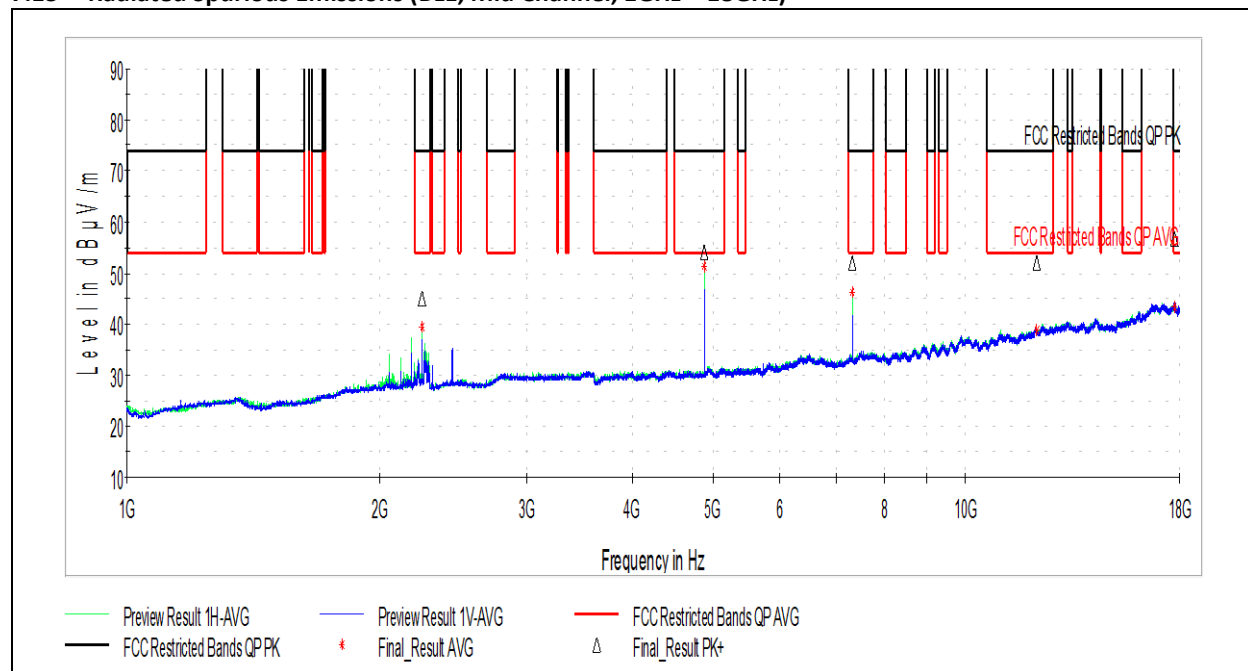
**7.12 Radiated Spurious Emissions (BLE, Mid Channel, 30MHz – 1 GHz)**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
74.566111	21.60	40.00	18.40	120.000	100.0	V	16.0	15
108.031111	32.13	43.52	11.39	120.000	99.0	V	0.0	21
119.940556	33.17	43.52	10.36	120.000	100.0	V	48.0	22
168.009444	32.11	43.52	11.41	120.000	136.0	H	146.0	21
966.804444	37.82	53.98	16.16	120.000	100.0	H	92.0	38

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC Part 15C
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/22/2021
Limit Applied: 15.205 Restricted Bands
Ambient Temperature: 24.7 °C
Relative Humidity: 46.4 %
Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

**7.13 Radiated Spurious Emissions (BLE, Mid Channel, 1GHz – 18GHz)**

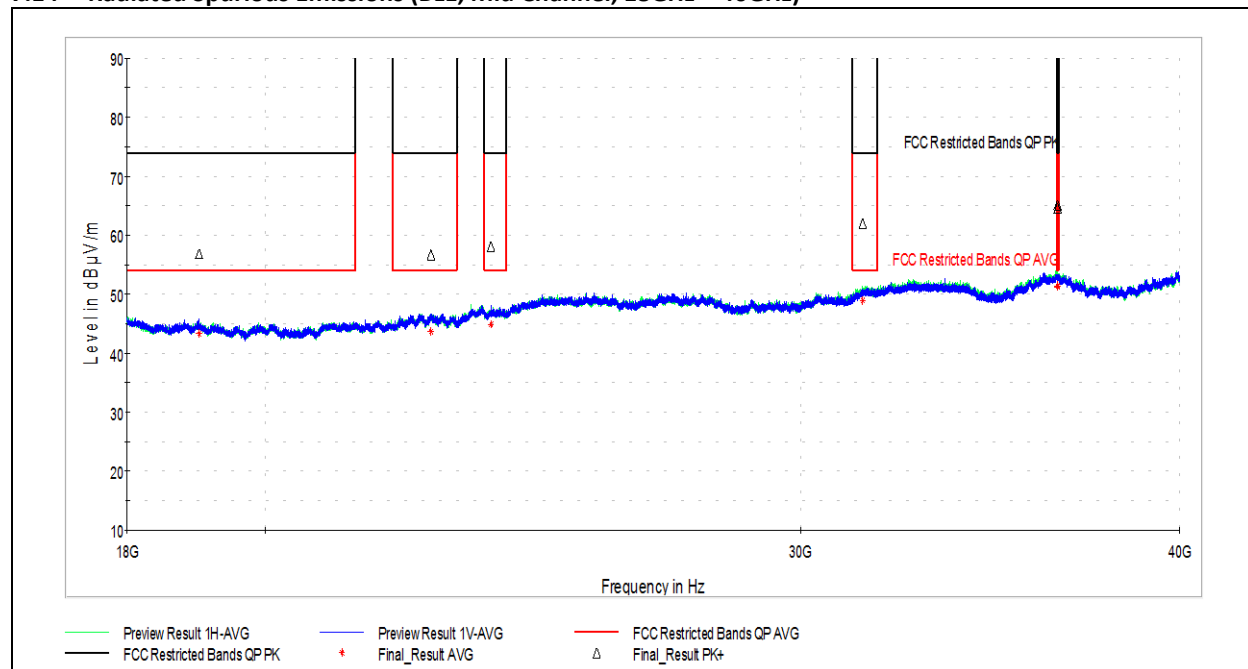
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2248.000000	45.20	73.98	28.78	1000.000	410.0	H	106.0	5
4880.000000	53.93	73.98	20.05	1000.000	100.0	H	0.0	10
7320.000000	51.80	73.98	22.18	1000.000	346.0	H	70.0	13
12163.500000	51.99	73.98	21.99	1000.000	100.0	H	270.0	20
17748.500000	56.69	73.98	17.29	1000.000	100.0	H	0.0	25

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2248.000000	39.41	53.98	14.57	1000.000	410.0	H	106.0	5
4880.000000	51.31	53.98	2.67	1000.000	100.0	H	0.0	10
7320.000000	46.16	53.98	7.82	1000.000	346.0	H	70.0	13
12163.500000	38.71	53.98	15.27	1000.000	100.0	H	270.0	20
17748.500000	43.44	53.98	10.54	1000.000	100.0	H	0.0	25

Test Personnel: Ben Coolbear
 Supervising/Reviewing Engineer: _____
 (Where Applicable) NA
 Product Standard: FCC Part 15C
 Input Voltage: 3.9 VDC
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/21/2021
 Limit Applied: 15.205 Restricted Bands
 Ambient Temperature: 24.7 °C
 Relative Humidity: 46.4 %
 Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

**7.14 Radiated Spurious Emissions (BLE, Mid Channel, 18GHz – 40GHz)**

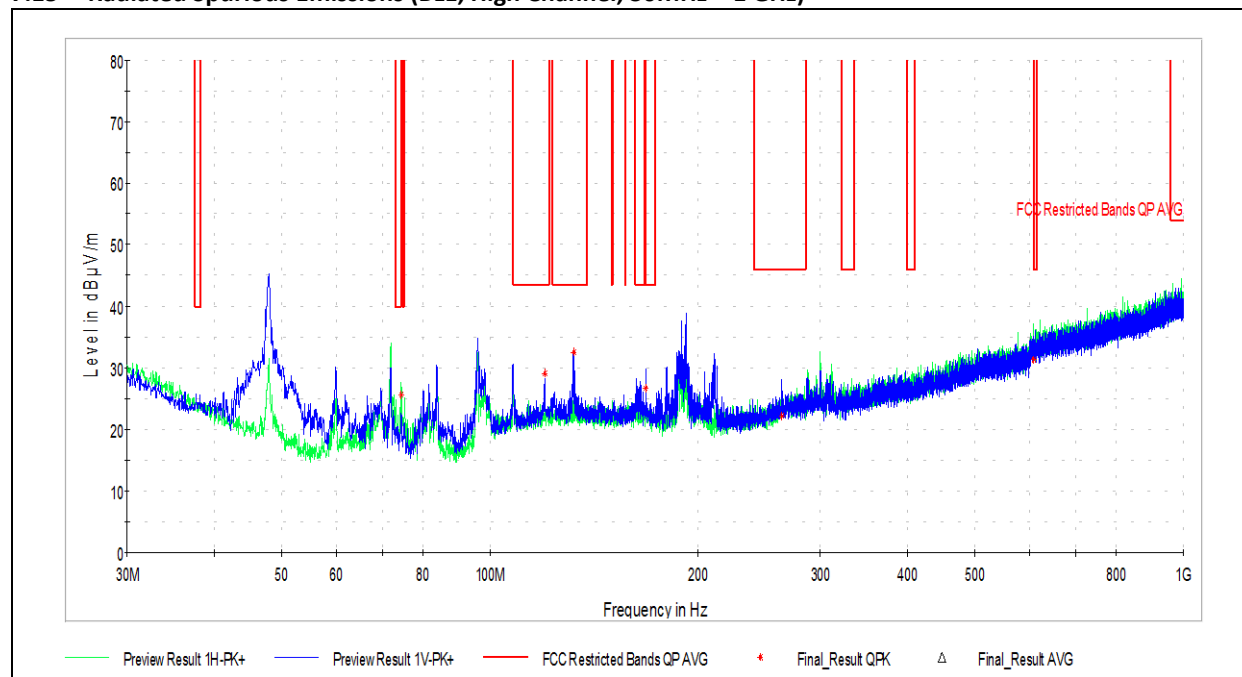
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19010.000000	56.91	73.98	17.07	1000.000	410.0	V	264.0	18
22667.500000	56.78	73.98	17.20	1000.000	126.0	V	0.0	11
23717.000000	58.10	73.98	15.88	1000.000	100.0	V	142.0	11
31455.000000	61.90	73.98	12.08	1000.000	359.0	H	270.0	17
36449.000000	64.60	73.98	9.38	1000.000	144.0	H	202.0	19
36463.000000	65.23	73.98	8.75	1000.000	348.0	H	264.0	19

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19010.000000	43.35	53.98	10.63	1000.000	410.0	V	264.0	18
22667.500000	43.70	53.98	10.28	1000.000	126.0	V	0.0	11
23717.000000	44.85	53.98	9.13	1000.000	100.0	V	142.0	11
31455.000000	48.89	53.98	5.09	1000.000	359.0	H	270.0	17
36449.000000	51.38	53.98	2.60	1000.000	144.0	H	202.0	19
36463.000000	51.30	53.98	2.68	1000.000	348.0	H	264.0	19

Test Personnel: Ben Coolbear
 Supervising/Reviewing Engineer: _____
 (Where Applicable) NA
 Product Standard: FCC Part 15C
 Input Voltage: 3.9 VDC
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/22/2021
 Limit Applied: 15.205 Restricted Bands
 Ambient Temperature: 24.7 °C
 Relative Humidity: 46.4 %
 Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

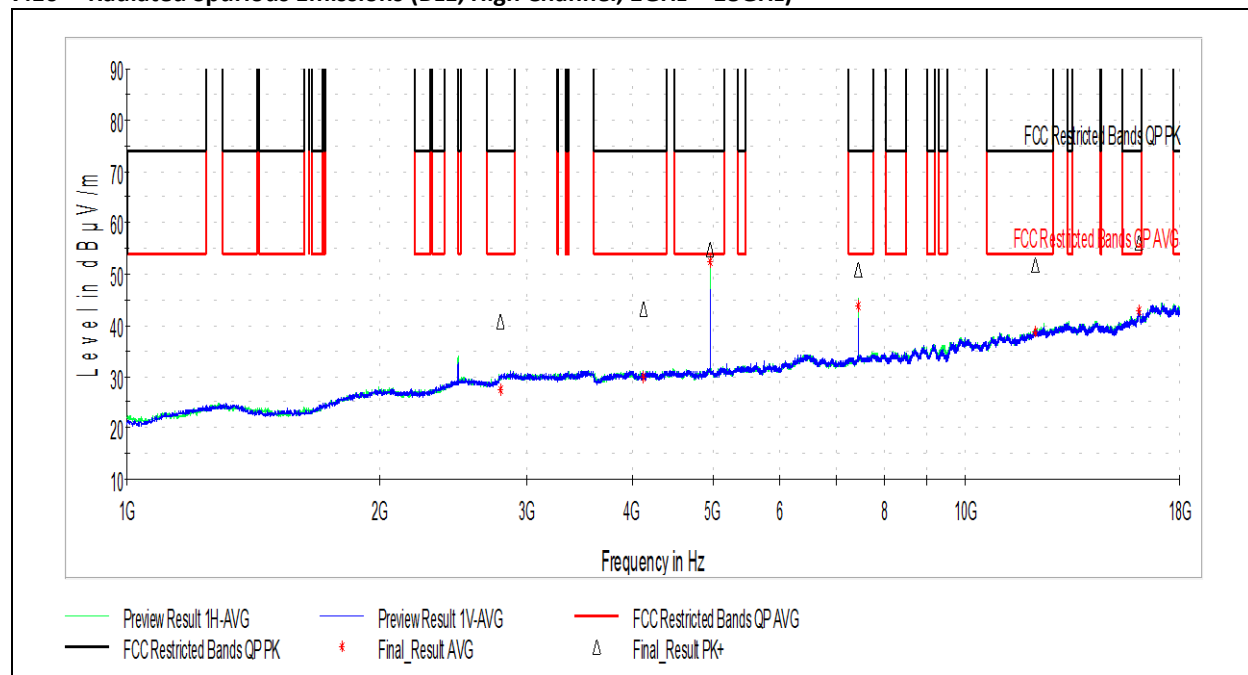
**7.15 Radiated Spurious Emissions (BLE, High Channel, 30MHz – 1 GHz)**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
74.512222	25.56	40.00	14.44	120.000	229.0	H	339.0	16
120.048333	29.03	43.52	14.49	120.000	100.0	V	174.0	22
132.011667	32.55	43.52	10.97	120.000	100.0	V	182.0	22
167.847778	26.68	43.52	16.85	120.000	100.0	V	212.0	21
263.931667	22.15	46.02	23.87	120.000	100.0	V	18.0	23
608.820556	31.31	46.02	14.71	120.000	332.0	H	348.0	32

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: (Where Applicable) NA
Product Standard: FCC Part 15C
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/22/2021
Limit Applied: 15.205 Restricted Bands
Ambient Temperature: 24.7 °C
Relative Humidity: 46.4 %
Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

**7.16 Radiated Spurious Emissions (BLE, High Channel, 1GHz – 18GHz)**

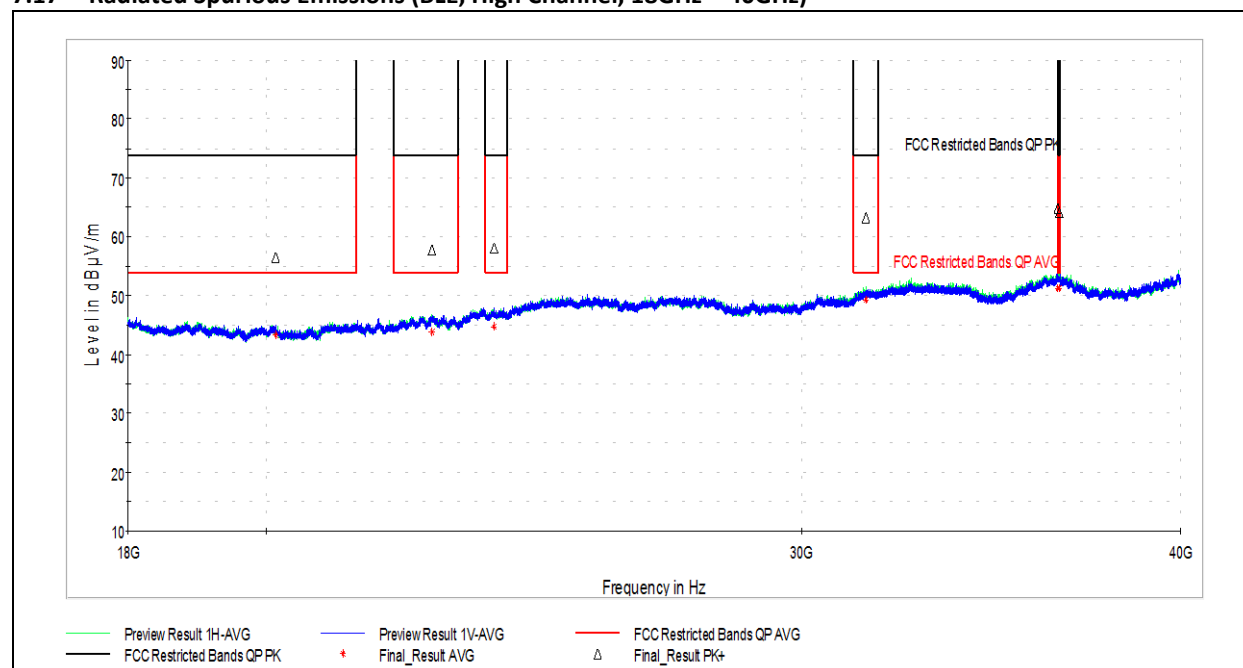
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2788.500000	40.96	73.98	33.02	1000.000	410.0	H	128.0	6
4124.500000	43.08	73.98	30.90	1000.000	100.0	H	0.0	9
4960.000000	54.76	73.98	19.22	1000.000	328.0	H	70.0	10
7440.000000	50.90	73.98	23.08	1000.000	100.0	H	45.0	13
12098.500000	51.89	73.98	22.09	1000.000	100.0	H	46.0	20
16094.500000	56.14	73.98	17.84	1000.000	410.0	H	285.0	25

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2788.500000	27.54	53.98	26.44	1000.000	410.0	H	128.0	6
4124.500000	29.80	53.98	24.18	1000.000	100.0	H	0.0	9
4960.000000	52.24	53.98	1.74	1000.000	328.0	H	70.0	10
7440.000000	43.73	53.98	10.25	1000.000	100.0	H	45.0	13
12098.500000	38.88	53.98	15.10	1000.000	100.0	H	46.0	20
16094.500000	42.77	53.98	11.21	1000.000	410.0	H	285.0	25

Test Personnel: Ben Coolbear
Supervising/Reviewing Engineer: _____
(Where Applicable) NA
Product Standard: FCC Part 15C
Input Voltage: 3.9 VDC
Pretest Verification w / Ambient
Signals or BB Source: Yes

Test Date: 6/21/2021
Limit Applied: 15.205 Restricted Bands
Ambient Temperature: 24.7 °C
Relative Humidity: 46.4 %
Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None

**7.17 Radiated Spurious Emissions (BLE, High Channel, 18GHz – 40GHz)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20130.500000	56.50	73.98	17.48	1000.000	153.0	V	294.0	15
22658.500000	57.79	73.98	16.19	1000.000	134.0	H	0.0	11
23753.000000	58.17	73.98	15.81	1000.000	322.0	V	335.0	11
31503.500000	63.26	73.98	10.72	1000.000	109.0	H	36.0	17
36430.500000	64.85	73.98	9.13	1000.000	410.0	H	0.0	19
36471.500000	64.22	73.98	9.76	1000.000	100.0	H	12.0	19

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20130.500000	43.20	53.98	10.78	1000.000	153.0	V	294.0	15
22658.500000	43.75	53.98	10.23	1000.000	134.0	H	0.0	11
23753.000000	44.75	53.98	9.23	1000.000	322.0	V	335.0	11
31503.500000	49.25	53.98	4.73	1000.000	109.0	H	36.0	17
36430.500000	51.31	53.98	2.67	1000.000	410.0	H	0.0	19
36471.500000	51.20	53.98	2.78	1000.000	100.0	H	12.0	19

Test Personnel: Ben Coolbear

Supervising/Reviewing Engineer: (Where Applicable) NA

Product Standard: FCC Part 15C

Input Voltage: 3.9 VDC

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/22/2021

Limit Applied: 15.205 Restricted Bands

Ambient Temperature: 24.7 °C

Relative Humidity: 46.4 %

Atmospheric Pressure: 989.1 mbar

Deviations, Additions, or Exclusions: None



8 Output Power

8.1 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 signalling 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.



8.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.9.1.1

8.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Wideband RF Power Meter	4022	Rohde&Schwarz	NRP-Z81	9/22/2020	9/22/2021

8.4 Test Results

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

8.5 Test Conditions

Test Personnel:	Bryan Taylor	Test Date:	6/23/2021
Supervising/Reviewing Engineer:		Limit Applied:	1 Watt
(Where Applicable)	NA	Ambient Temperature:	22.6C
	FCC Part 15.247	Relative Humidity:	41.2%
Product Standard:	RSS-247 Issue 2	Atmospheric Pressure:	991.2mbar
Input Voltage:	3.6VDC		
Pretest Verification w / Ambient			
Signals or BB Source:	Yes		

8.6 Test Data

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
0	2402	3.75	30	26.25	PASS
39	2440	3.95	30	26.05	PASS
79	2480	3.85	30	26.15	PASS

Deviations, Additions, or Exclusions: None



9 Occupied Bandwidth

9.1 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.

9.2 Test Method

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

9.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Coaxial Cable	6086	Megaphase	SF26-S1S1-40	12/4/2019	12/4/2020

9.4 Test Results

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

9.5 Test Conditions

Test Personnel:	Bryan Taylor	Test Date:	10/25/2020
Supervising/Reviewing Engineer:			
(Where Applicable)	NA	Limit Applied:	500kHz (for 6dB bandwidth)
	FCC Part 15.247		
Product Standard:	RSS-247 Issue 2	Ambient Temperature:	22.1C
Input Voltage:	3.6VDC	Relative Humidity:	47.7%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	992mbar

9.6 Test Data

Channel	Frequency (MHz)	DTS BW (kHz)	6dB BW (kHz)	99% BW (MHz)
0	2402	865.3	647.4	1.86
39	2440	826.9	551.3	1.77
79	2480	833.3	544.8	1.83

**MARKER 1**

2.402012821 GHz

*RBW 30 kHz

Marker 1 [T1]

*VBW 100 kHz

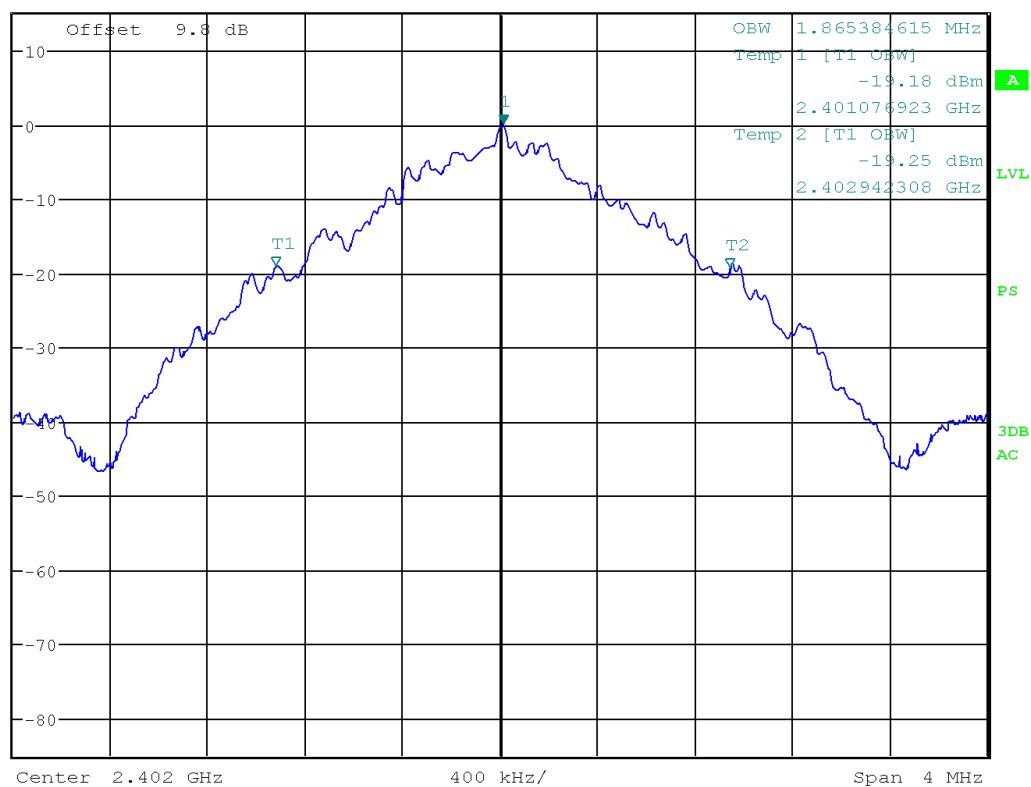
-0.09 dBm

Ref 15 dBm

*Att 40 dB

SWT 20 ms

2.402012821 GHz

1 PK
MAXH

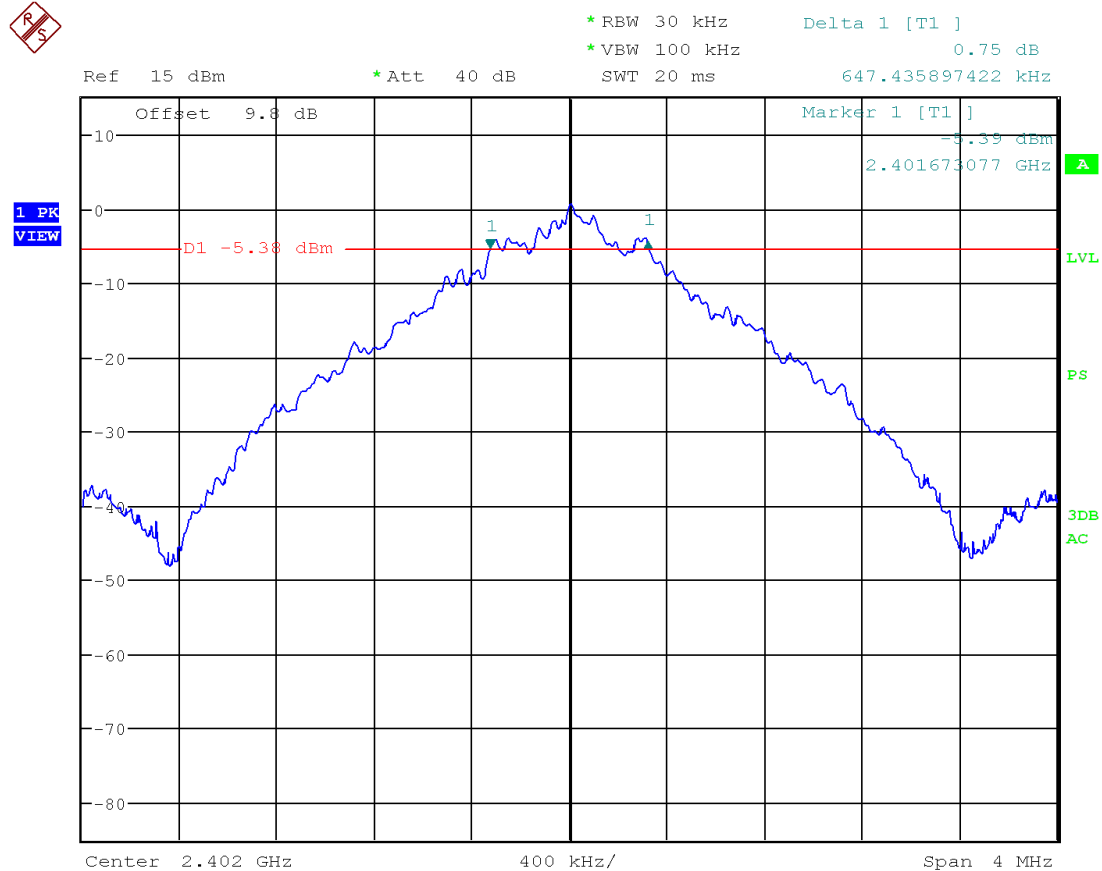
Date: 25.OCT.2020 16:06:36

99% Bandwidth 2402MHz



Date: 25.OCT.2020 16:10:58

20dB Down Bandwidth 2402MHz



Date: 25.OCT.2020 16:15:52

6dB Down Bandwidth 2402MHz

**MARKER 1**

2.40200641 GHz

*RBW 100 kHz

Marker 1 [T1]

*VBW 300 kHz

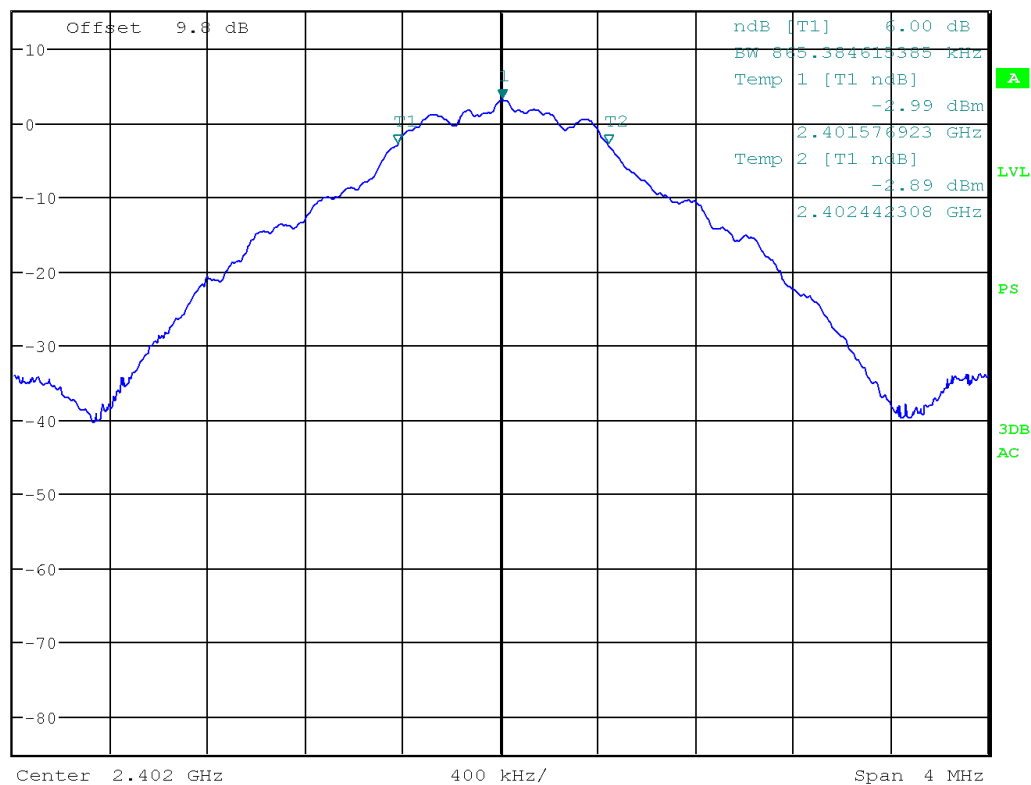
3.03 dBm

Ref 15 dBm

*Att 40 dB

SWT 2.5 ms

2.402006410 GHz

1 PK
MAXH

Date: 25.OCT.2020 16:22:51

DTS Bandwidth 2402MHz

**MARKER 1**

2.44000641 GHz

*RBW 30 kHz

Marker 1 [T1]

*VBW 100 kHz

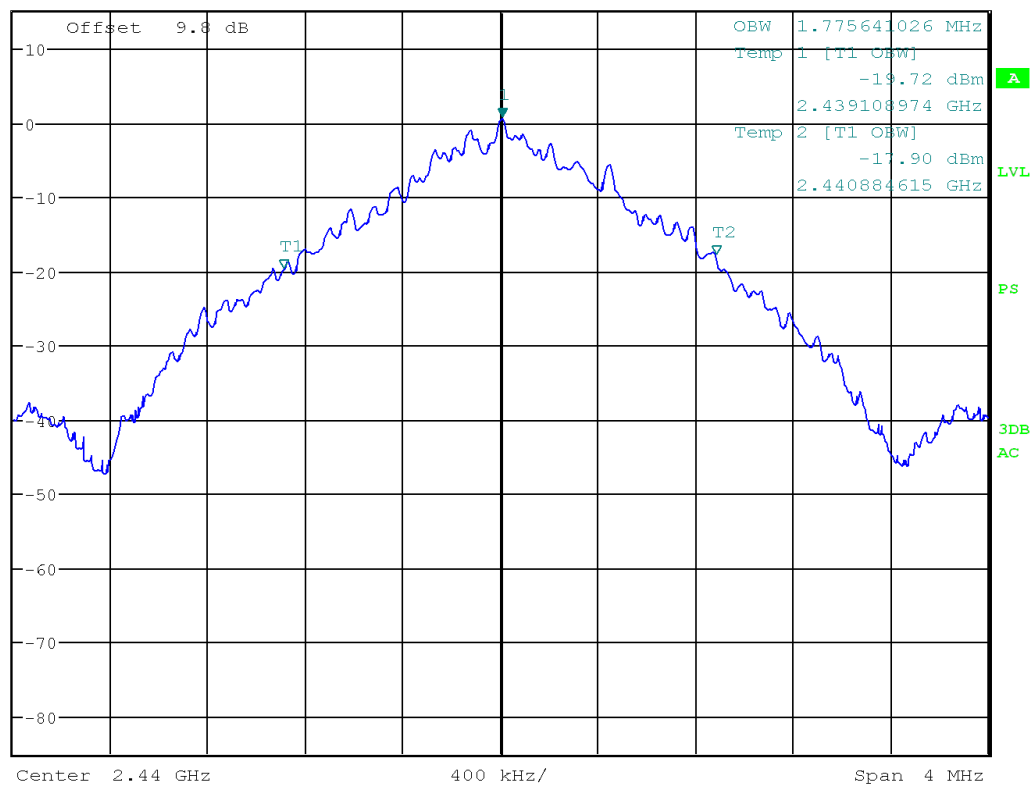
0.59 dBm

Ref 15 dBm

*Att 40 dB

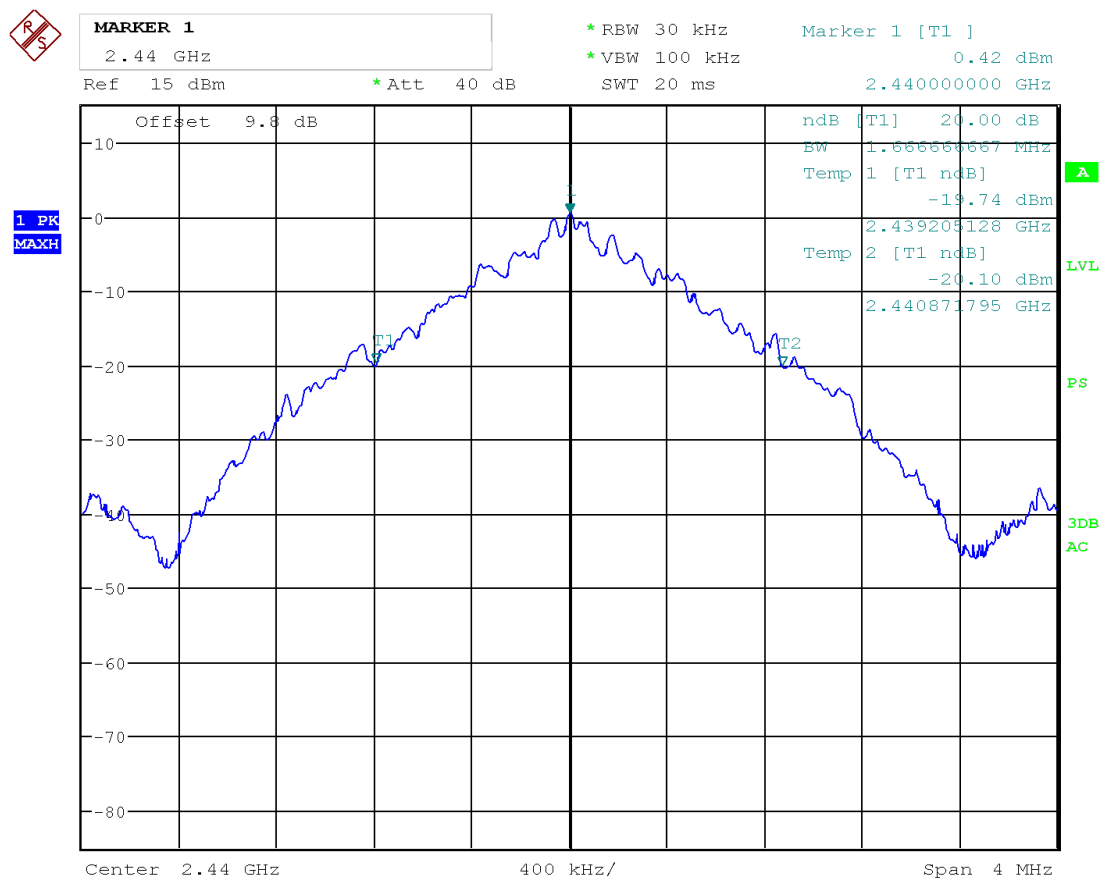
SWT 20 ms

2.440006410 GHz

1 PK
MAXH

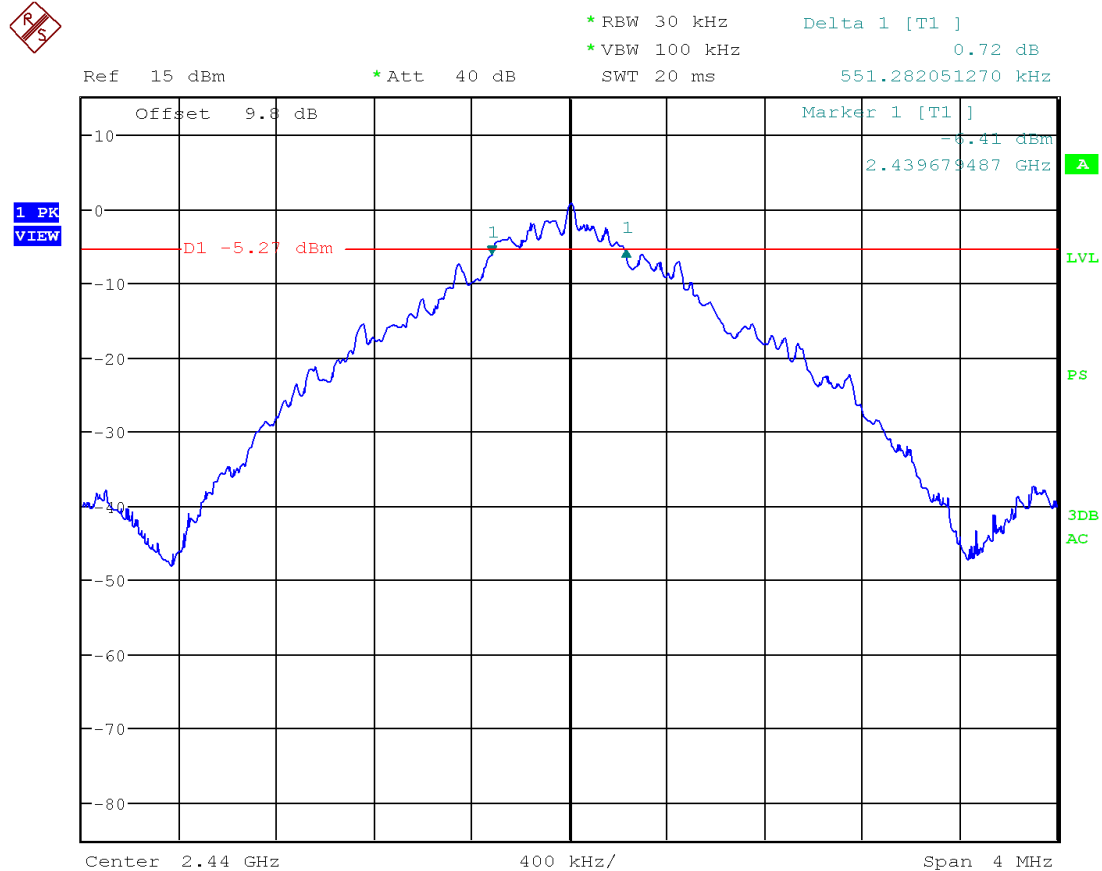
Date: 25.OCT.2020 16:07:28

99% Bandwidth 2440MHz



Date: 25.OCT.2020 16:11:41

20dB Down Bandwidth 2440MHz



Date: 25.OCT.2020 16:18:07

6dB Down Bandwidth 2440MHz

**MARKER 1**

2.440012821 GHz

*RBW 100 kHz

Marker 1 [T1]

*VBW 300 kHz

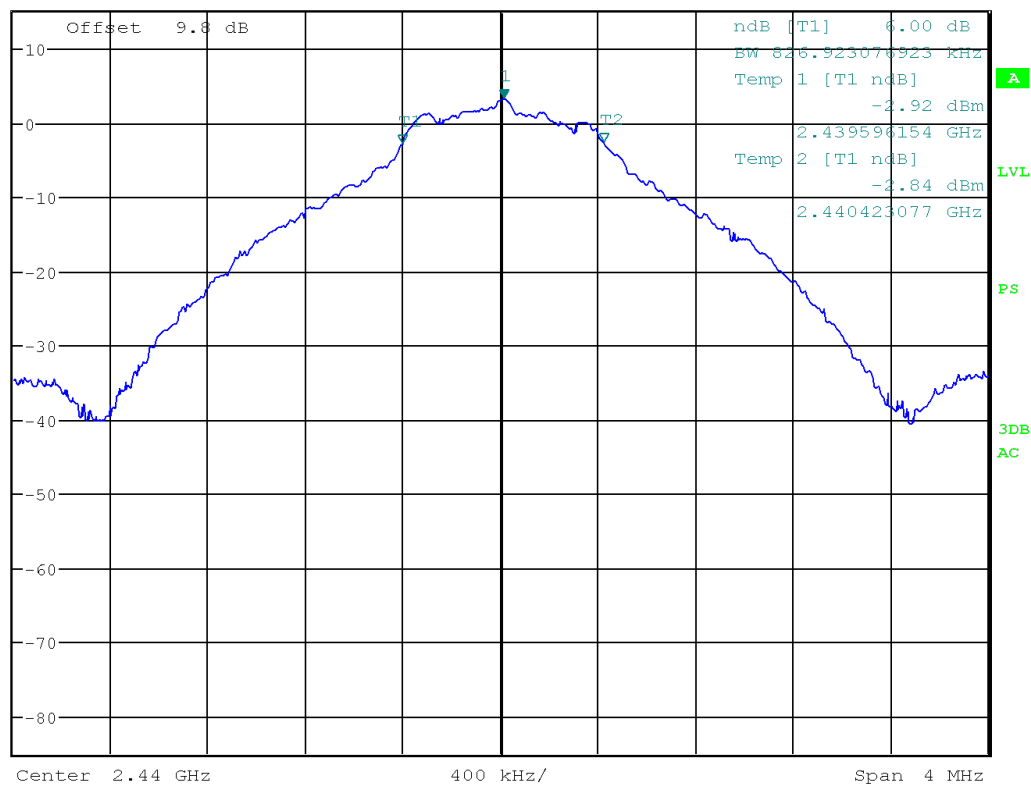
3.15 dBm

Ref 15 dBm

*Att 40 dB

SWT 2.5 ms

2.440012821 GHz

1 PK
MAXH

Date: 25.OCT.2020 16:23:38

DTS Bandwidth 2440MHz

**MARKER 1**

2.48 GHz

Ref 15 dBm

*Att 40 dB

*RBW 30 kHz

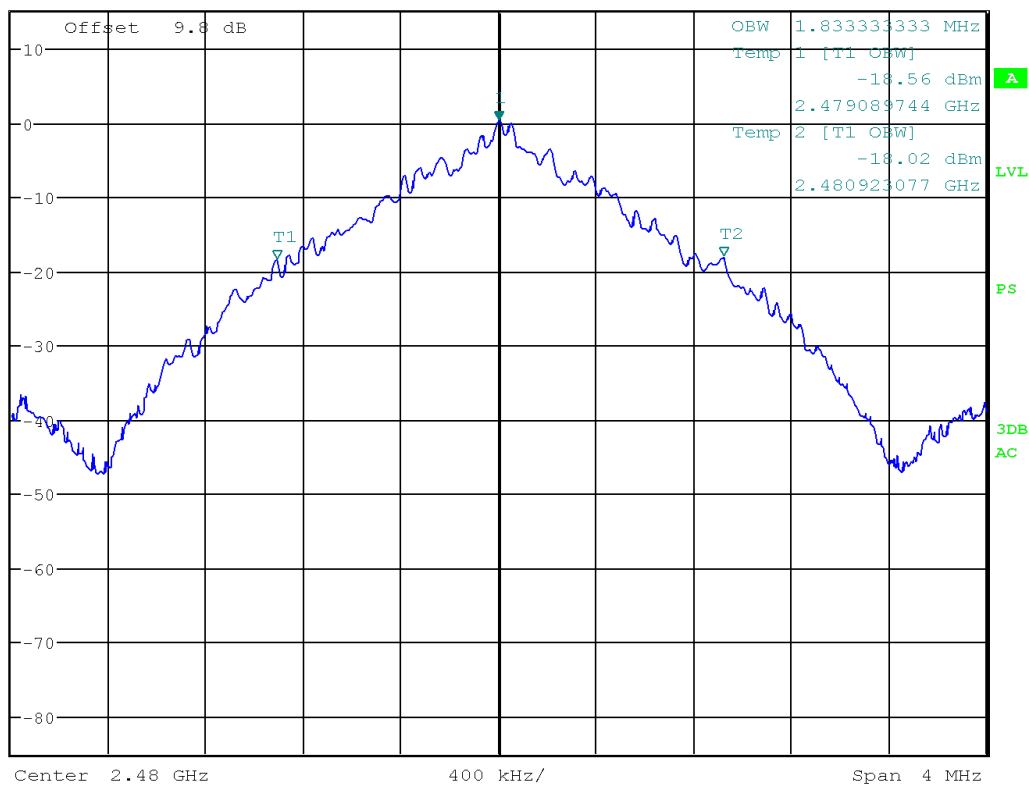
*VBW 100 kHz

SWT 20 ms

Marker 1 [T1]

0.16 dBm

2.480000000 GHz

1 PK
MAXH

Date: 25.OCT.2020 16:08:35

99% Bandwidth 2480MHz

**MARKER 1**

2.48 GHz

*RBW 30 kHz

Marker 1 [T1]

*VBW 100 kHz

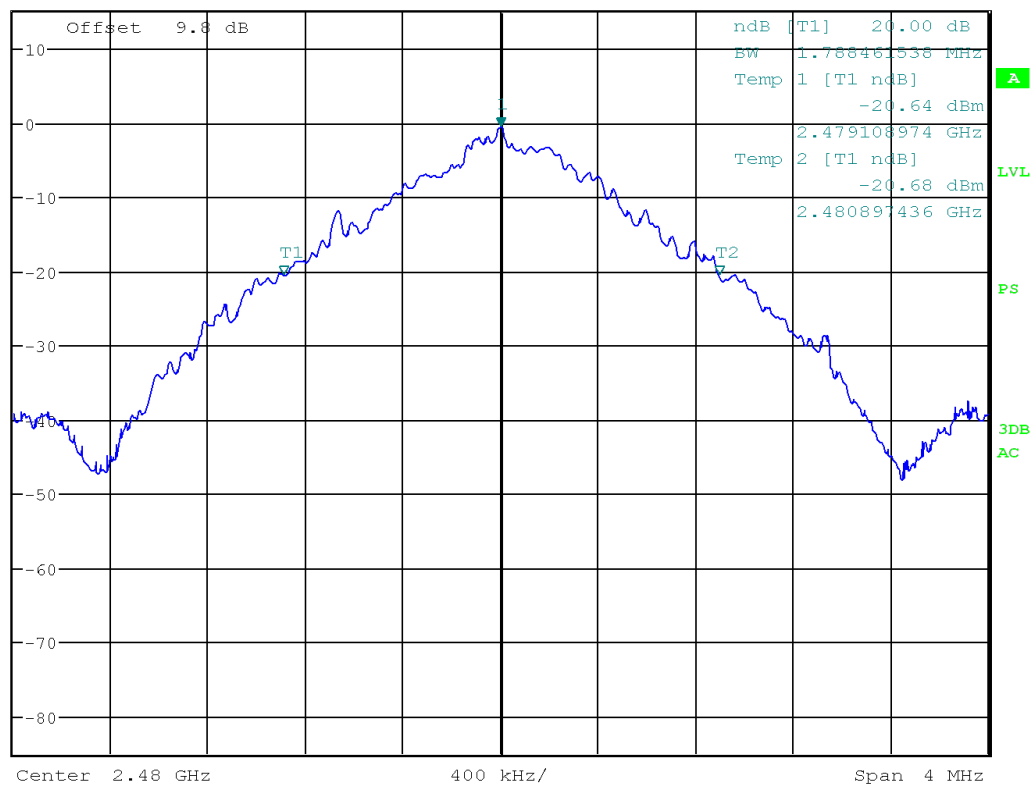
-0.63 dBm

Ref 15 dBm

*Att 40 dB

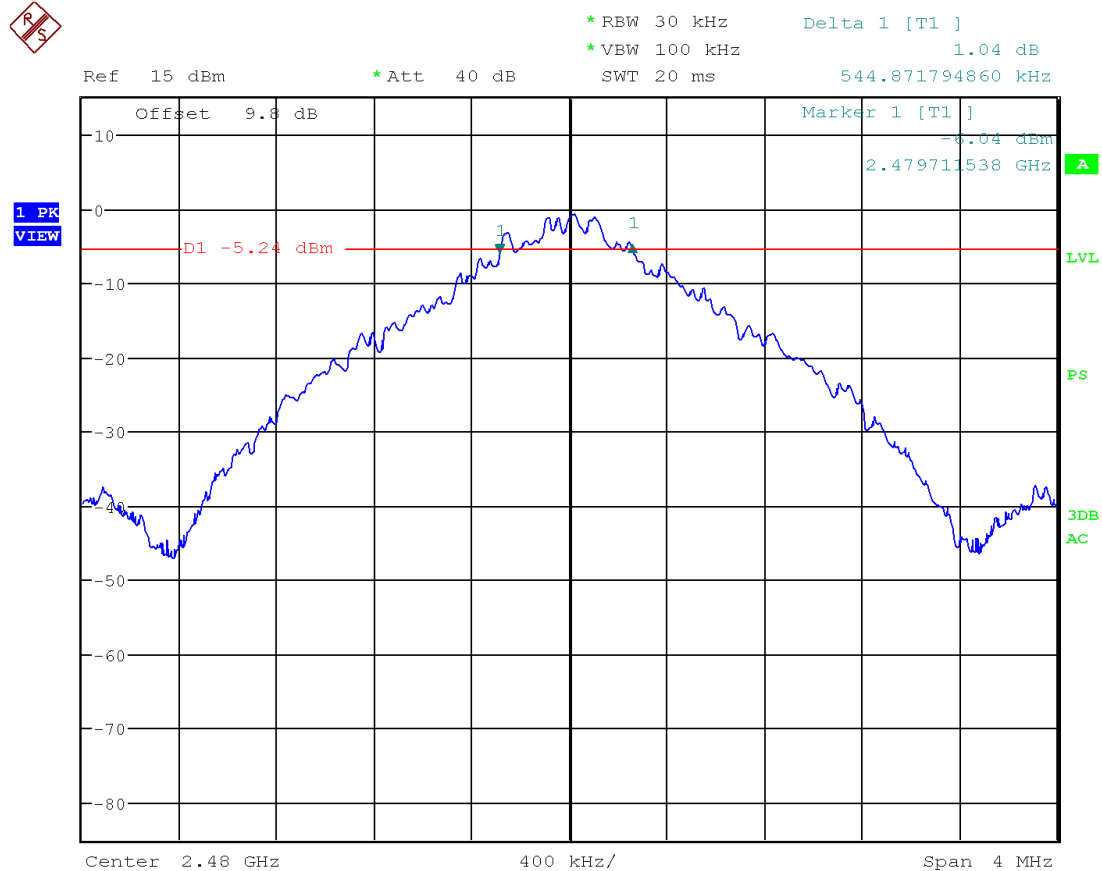
SWT 20 ms

2.480000000 GHz

1 PK
MAXH

Date: 25.OCT.2020 16:12:29

20dB Down Bandwidth 2480MHz



Date: 25.OCT.2020 16:19:45

6dB Down Bandwidth 2480MHz

**MARKER 1**

2.48 GHz

Ref 15 dBm

*Att 40 dB

*RBW 100 kHz

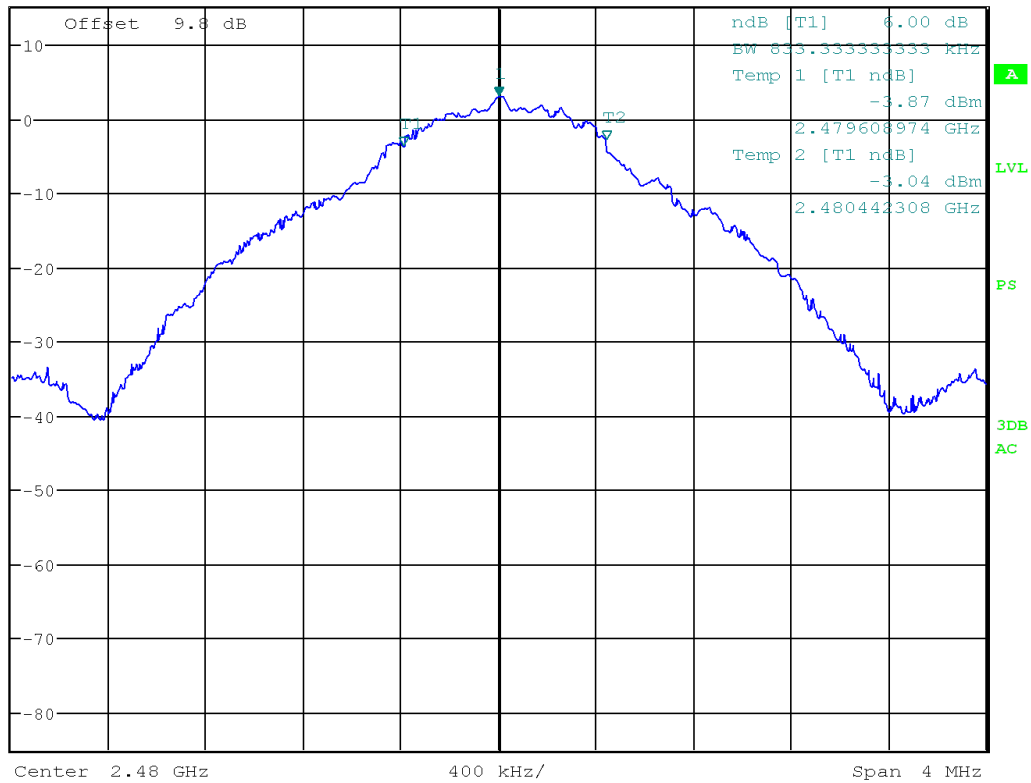
*VBW 300 kHz

SWT 2.5 ms

Marker 1 [T1]

2.92 dBm

2.480000000 GHz

1 PK
MAXH

Date: 25.OCT.2020 16:24:28

DTS Bandwidth 2480MHz



10 Power Spectral Density

10.1 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).

10.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.10.2 Method PKPSD (peak PSD).

10.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Coaxial Cable	6086	Megaphase	SF26-S1S1-40	12/4/2019	12/4/2020

10.4 Test Results

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

10.5 Test Conditions

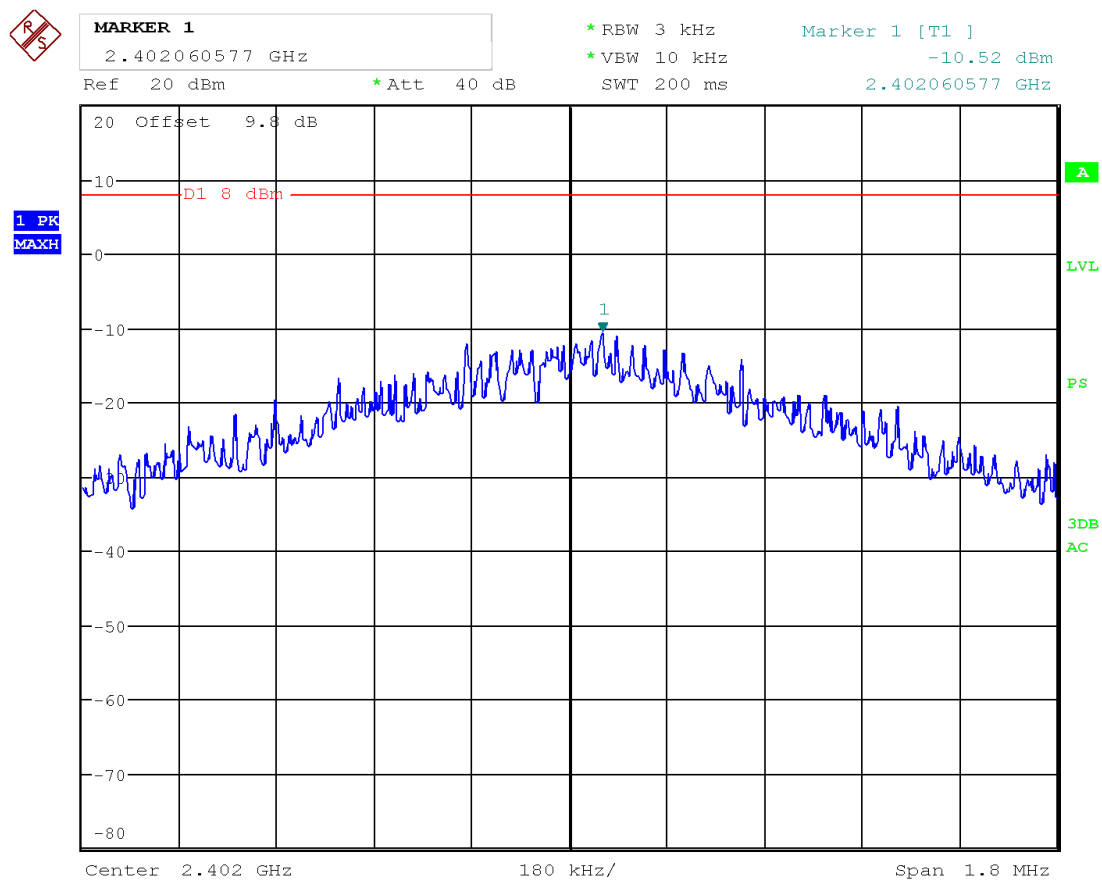
Test Personnel:	Bryan Taylor	Test Date:	10/25/2020
Supervising/Reviewing Engineer:		Limit Applied:	8dBm / 3kHz
(Where Applicable)	NA	Ambient Temperature:	22.6C
Product Standard:	FCC Part 15.247	Relative Humidity:	41.2%
Input Voltage:	RSS-247 Issue 2	Atmospheric Pressure:	991.2mbar
Pretest Verification w / Ambient	3.6VDC		
Signals or BB Source:	Yes		

Deviations, Additions, or Exclusions: None.



10.6 Test Data

Channel	Frequency (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Result
0	2402	-10.52	8	18.52	PASS
39	2440	-9.68	8	17.68	PASS
79	2480	-10.81	8	18.81	PASS



Date: 25.OCT.2020 16:01:25

Peak PSD 2402MHz

**MARKER 1**

2.439847115 GHz

*RBW 3 kHz

Marker 1 [T1]

*VBW 10 kHz

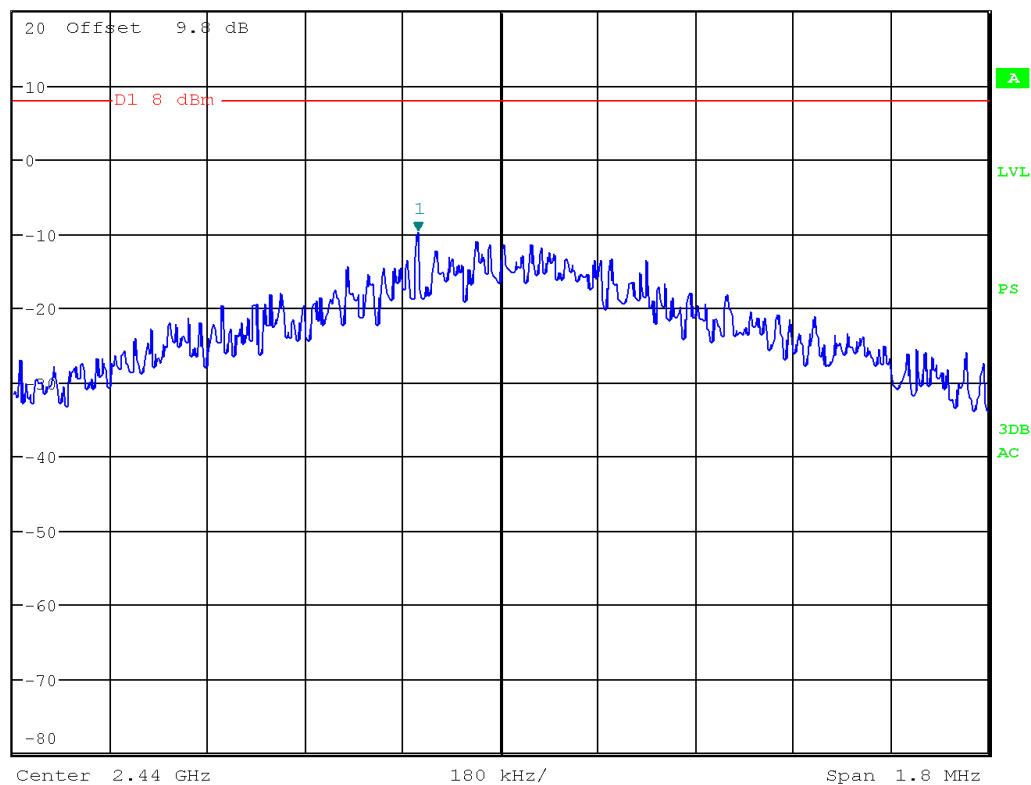
-9.68 dBm

Ref 20 dBm

*Att 40 dB

SWT 200 ms

2.439847115 GHz

1 PK
MAXH

Date: 25.OCT.2020 16:02:54

Peak PSD 2440MHz

**MARKER 1**

2.479922115 GHz

*RBW 3 kHz

Marker 1 [T1]

*VBW 10 kHz

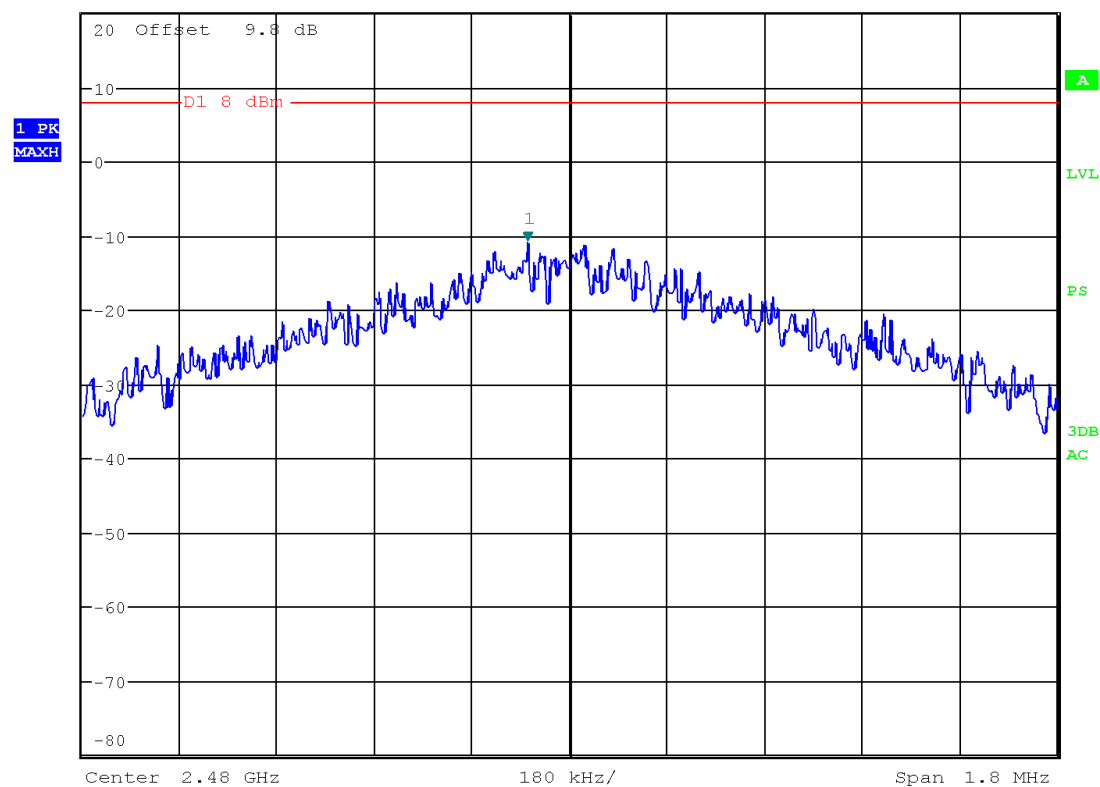
-10.81 dBm

Ref 20 dBm

*Att 40 dB

SWT 200 ms

2.479922115 GHz



Date: 25.OCT.2020 16:03:41

Peak PSD 2480MHz



11 Conducted Spurious Emissions

11.1 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.

11.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.11 Emissions in nonrestricted frequency bands.

11.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Coaxial Cable	6086	Megaphase	SF26-S1S1-40	12/4/2019	12/4/2020

11.4 Test Results

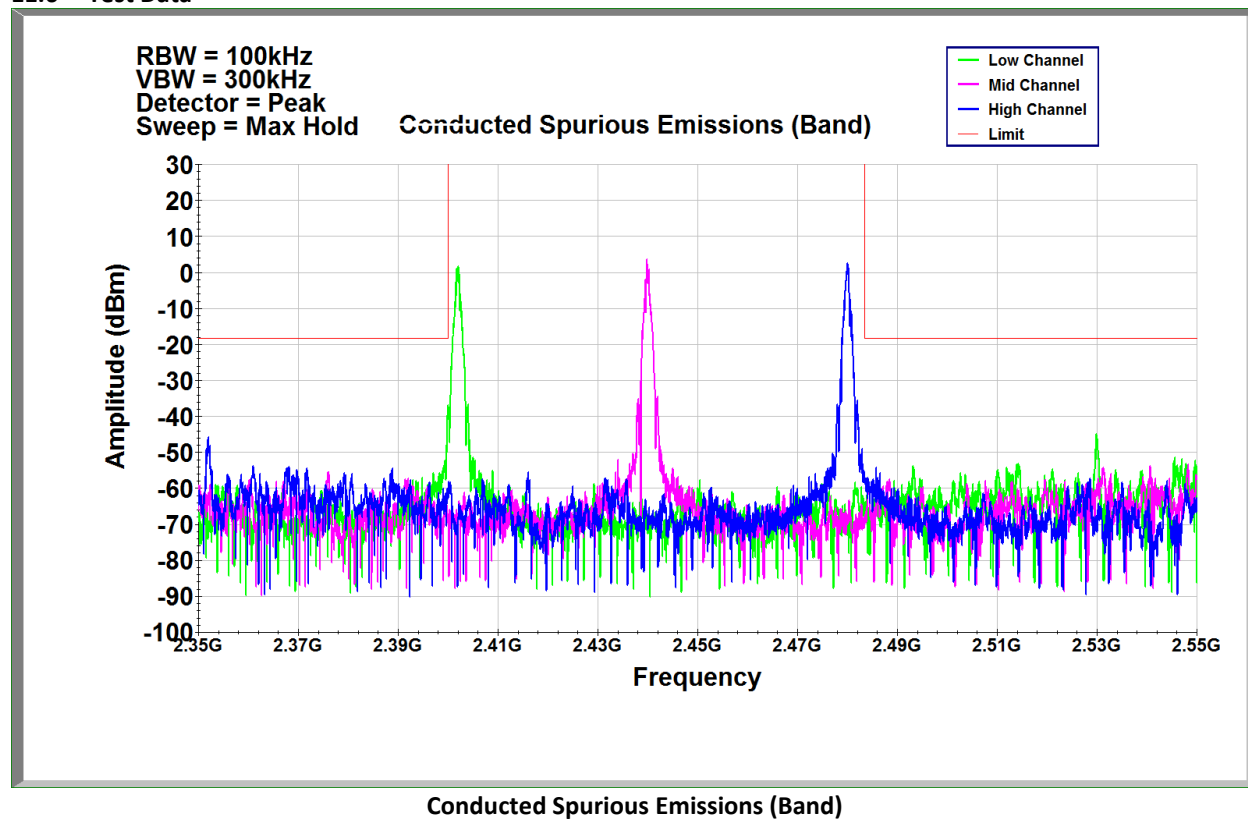
The device was found to be **compliant**. All spurious emissions were found to be attenuated more than 20dB below the level of the fundamental.

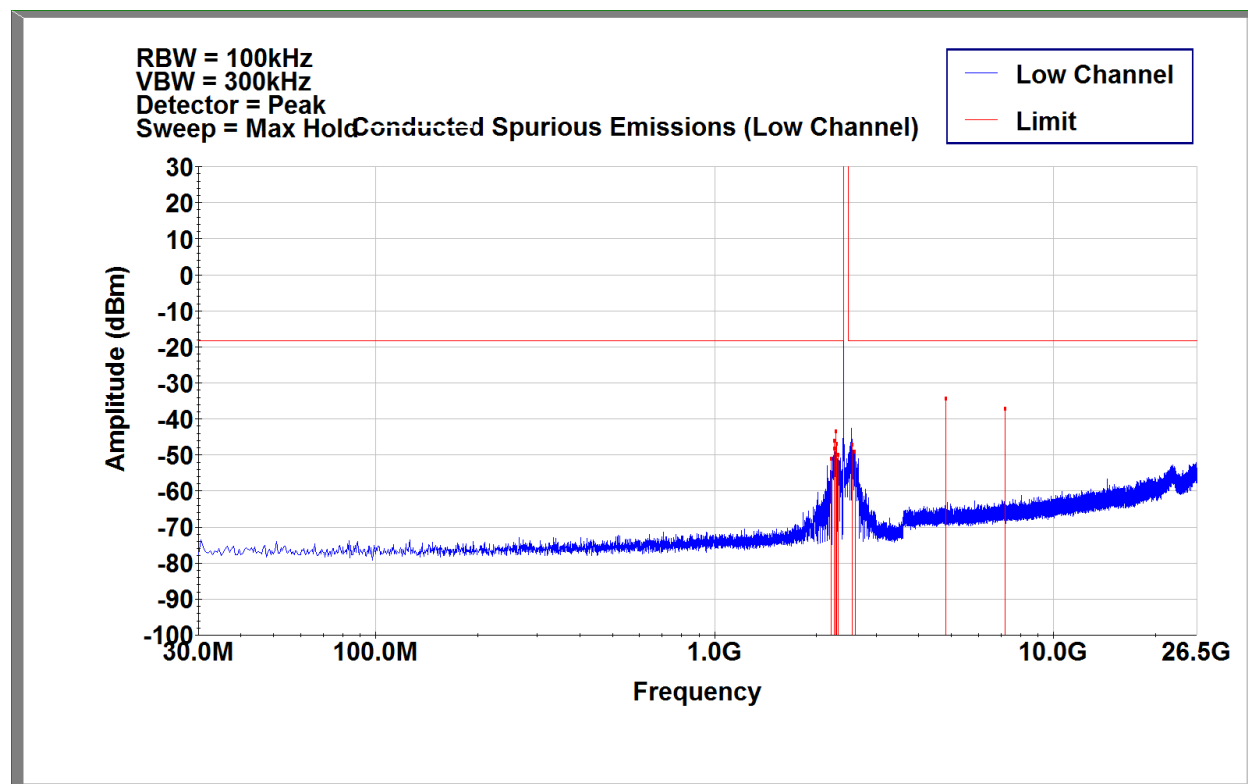


11.5 Test Conditions

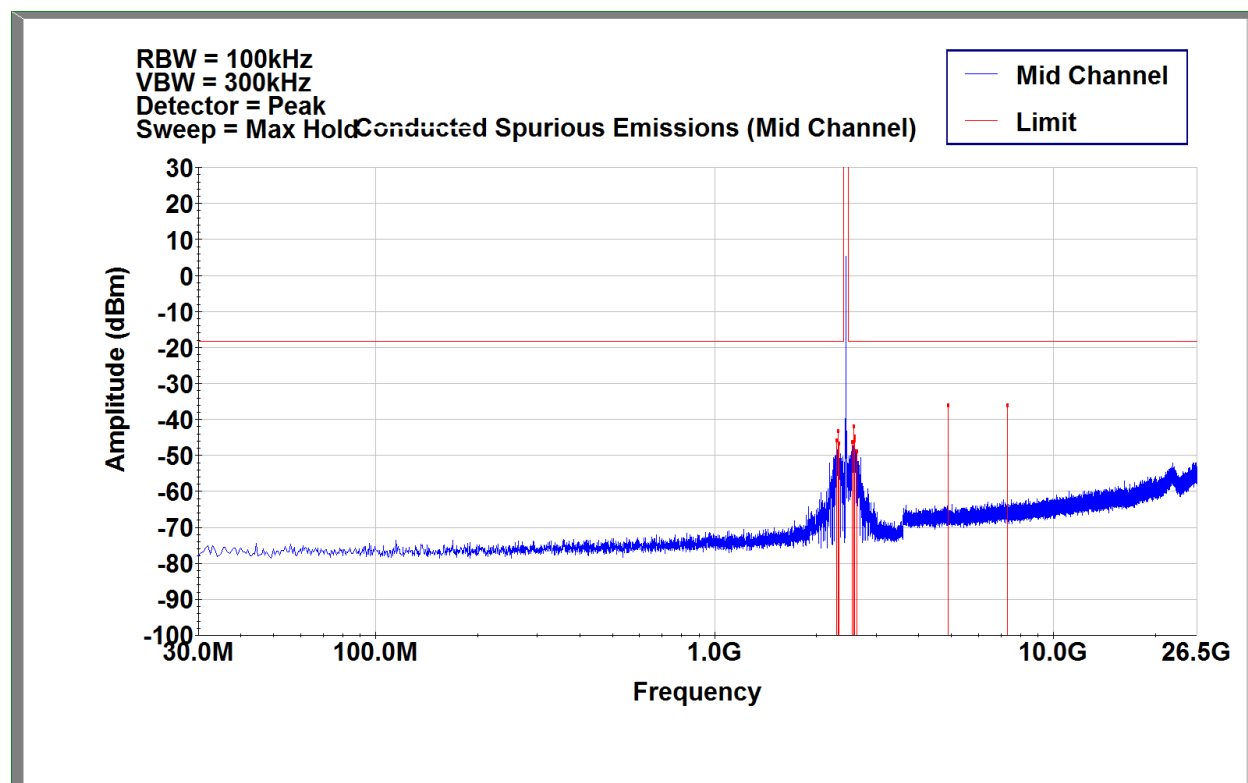
Test Personnel:	Bryan Taylor	Test Date:	10/25/2020
Supervising/Reviewing Engineer:			
(Where Applicable)	NA	Limit Applied:	-20dBc
	FCC Part 15.247		
Product Standard:	RSS-247 Issue 2	Ambient Temperature:	22.6C
Input Voltage:	3.6VDC	Relative Humidity:	41.2%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	991.2mbar

11.6 Test Data

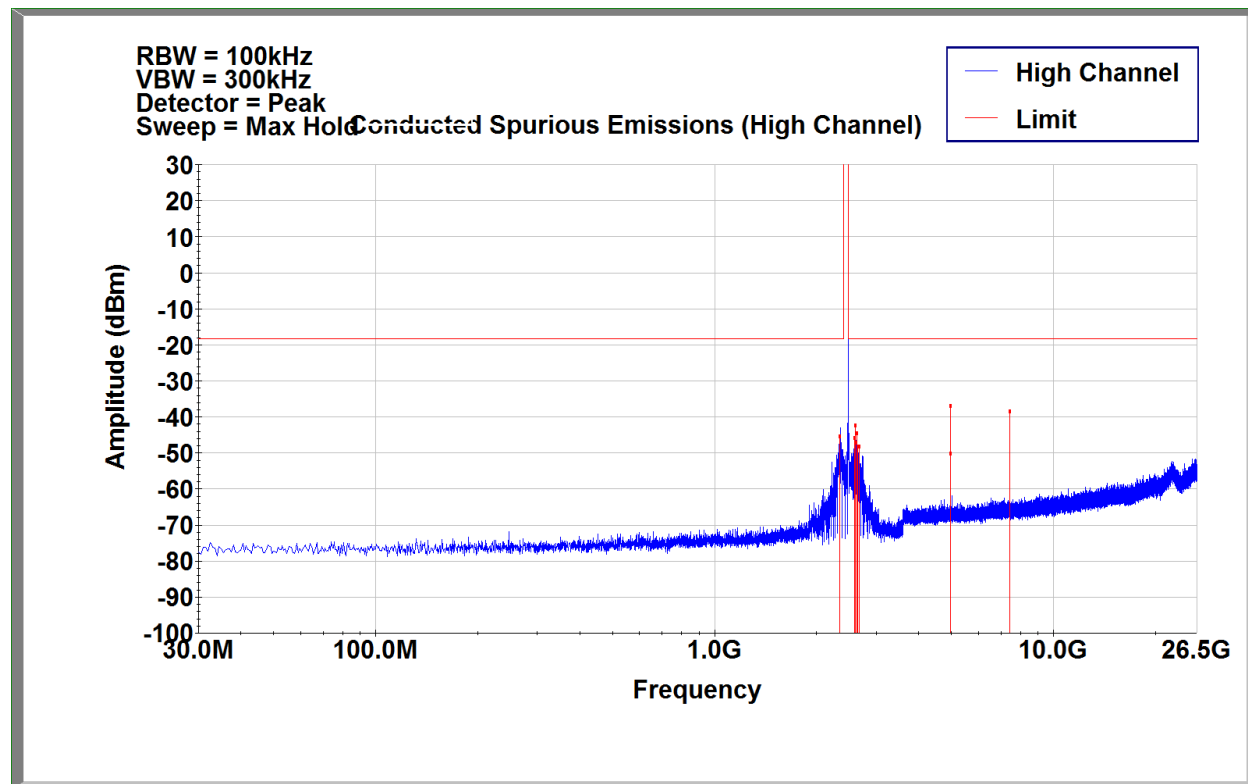




2402MHz Conducted Spurious Emissions



2440MHz Conducted Spurious Emissions



2480MHz Conducted Spurious Emissions



12 Antenna Requirement

12.1 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 licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-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 licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-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).

12.2 Test Results

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



13 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	6/30/2021	104681879LEX-002	BCT	BZ	Original Issue