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Ademco Inc. TEST REPORT

SCOPE OF WORK

EMC TESTING – SMOKE / CO DETECTOR

REPORT NUMBER

104486676LEX-003

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EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 104486676LEX-003

Project Number: G104486676

Report Issue Date: 9/23/2021

Product Tested: Smoke / CO Detector

Model Number Tested: PROSIXCMBOVC

Models Not Tested but Declared Equivalent by Client: SIXCOMBOVA, PROSIXCMBOV

Standards: FCC Title 47 CFR Part 15.247
FCC Title 47 CFR Part 15 Subpart B
RSS-247 Issue 2
RSS-Gen Issue 5
ICES-003 Issue 7

Tested by:
Intertek Testing Services NA, Inc.
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Client:
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Report prepared 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
7	Receiver Spurious Emissions (ANSI C63.4: 2014)	Pass
8	Transmitter Spurious Emissions (FCC Part 15.247(d), RSS-247 Issue 2 § 5.5)	Pass
9	Output Power (FCC Part 15.247(b)(3), RSS-247 Issue 2 § 5.4(d))	Pass
10	Occupied Bandwidth (FCC Part 15.247, RSS-247 Issue 2 § 5.2(a))	Pass
11	Power Spectral Density (FCC Part 15.247(e), RSS-247 Issue 2 § 5.2(b))	Pass
12	Conducted Spurious Emissions (FCC Part 15.247(d), RSS-247 Issue 2 § 5.5)	Pass
13	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:	Ademco Inc.
Address:	2 Corporate Center Drive Suite 100 Melville, NY 11747 USA
Contact:	Divya Venkat
Email:	Divya.venkat@resideo.com
Manufacturer Information	
Manufacturer Name:	Ademco Inc.
Manufacturer Address:	2 Corporate Center Drive Suite 100 Melville, NY 11747 USA



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	Smoke / CO Detector
Model Number	PROSIXCMBOVC
Supported Transmit Bands	RF6 2405 – 2475MHz
Receive Date	7/10/2021
Test Start Date	7/14/2021
Test End Date	8/1/2021
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	3V Battery
Antenna	PCB Trace Antenna
Test Channels / Frequencies	Channel 11 2405MHz Channel 19 2445MHz Channel 25 2475MHz
Description of Equipment Under Test (provided by client)	
The Smoke / CO Detector is a battery powered device with wireless (RF6) connectivity to home security panels.	

4.1 Variant Models:

The following variant SKUs were covered by the testing shown in this report: SIXCOMBOVA, PROSIXCMBOV and PROSIXCMBOVC. According to Ademco Inc. all three SKUs are electrically identical with the only difference being purely marketing and ordering purposes.



5 System Setup and Method

5.1 Method:

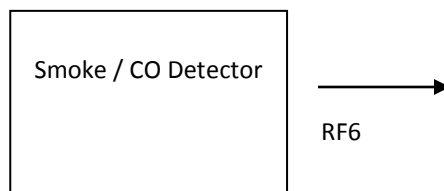
Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013

No.	Descriptions of EUT Exercising
1	Special test code allowed the device to be cycled through low, mid, and high channels on transmit antenna 1 and transmit antenna 2.
2	Idle, not transmitting.

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
None					

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5.2 EUT Block Diagram:

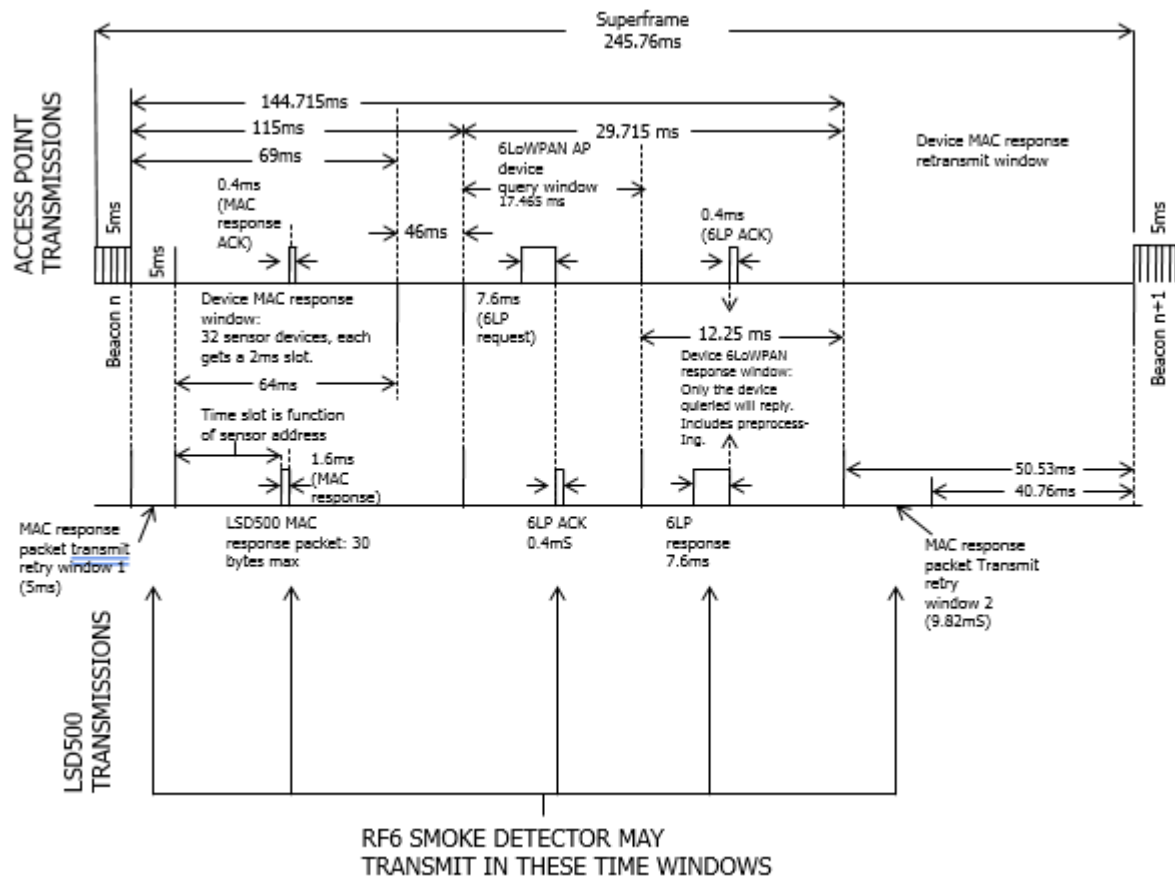




6 Duty Cycle Correction Factor

The following information was provided by the client and may influence measurement results:

The Access Point (coordinator) generates beacon every 245.76ms (superframe). As shown in the figure, the duration of the beacon is 5ms.



In the worst case, these four RF6 transmissions may occur within a 100ms window:

Retry Packet 1: 30 Bytes @ 250 kbps = $(30 \times 8) \times (1 / [250 \times 10^3]) = 960 \mu\text{s}$

Alarm Packet: 30 Bytes @ 250 kbps = $(30 \times 8) \times (1 / [250 \times 10^3]) = 960 \mu\text{s}$

Retry Packet 2: 30 Bytes @ 250 kbps = $(30 \times 8) \times (1 / [250 \times 10^3]) = 960 \mu\text{s}$

6LowPan Packet: 128 Bytes @ 250 kbps = $(128 \times 8) \times (1 / [250 \times 10^3]) = 4096 \mu\text{s}$

The Total Transmit Time is:

Retry Packet 1 (960uS) + Alarm Packet (960uS) + Retry Packet 2 (960uS) + 6LowPan Packet (4096uS)
= 960 uS + 960 uS + 960 uS + 4096 uS = **6.976 ms**

Duty cycle for purposes of calculating average radiated emissions is thus 6.976ms/100ms = 6.976%.

The Duty Cycle Correction Factor is therefore calculated as $20\log_{10}(6.976/100) = -23.12\text{dB}$ which will be applied to some measurement results when an average amplitude value is required to demonstrate compliance.



7 Receiver Spurious Emissions

7.1 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)	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.



7.2 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 dB μ V
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dB μ 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 = Net Reading in dB μ V

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$
$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$



7.3 Test Equipment Used

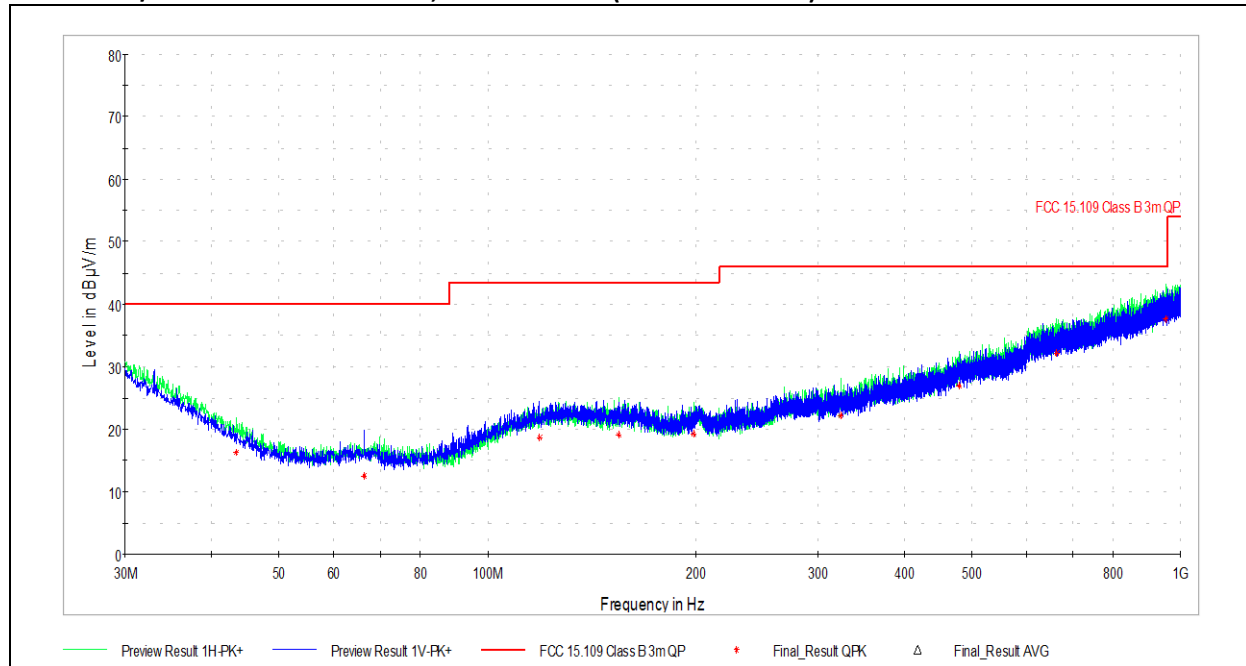
Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Horn Antenna	4001	ETS	3117	1/26/2021	1/26/2022
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time 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
Coaxial Cable	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	3339			12/21/2020	12/21/2021
Coaxial Cable	2592			12/21/2020	12/21/2021

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**.

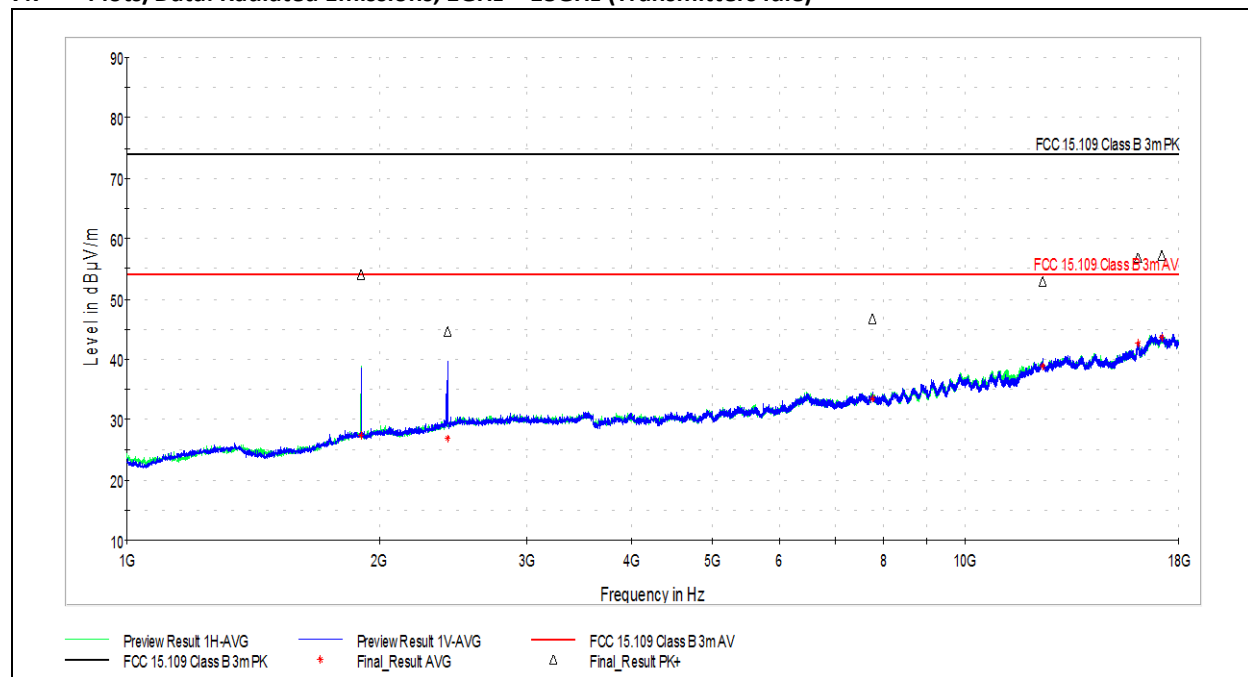
**7.6 Plots/Data: Radiated Emissions, 30MHz – 1GHz (Transmitters Idle)**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
43.418333	16.25	40.00	23.75	120.000	332.0	H	250.0	19
66.375000	12.48	40.00	27.52	120.000	105.0	V	17.0	15
118.916667	18.71	43.52	24.81	120.000	400.0	V	-1.0	22
154.752778	19.10	43.52	24.42	120.000	375.0	H	221.0	21
198.456667	19.24	43.52	24.29	120.000	177.0	H	324.0	22
323.209444	22.09	46.02	23.93	120.000	400.0	H	244.0	24
479.487222	26.91	46.02	19.11	120.000	206.0	H	89.0	29
662.655556	32.17	46.02	13.85	120.000	105.0	H	286.0	32
950.961111	37.57	46.02	8.45	120.000	320.0	H	202.0	38

Test Personnel: Bryan Taylor
 Supervising/Reviewing Engineer: N/A
 (Where Applicable) FCC Part 15B
 Product Standard: ICES-003 Issue 7
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/16/2021
 Limit Applied: Class B
 Ambient Temperature: 23.3°C
 Relative Humidity: 64.8%
 Atmospheric Pressure: 989.4 mbar

Deviations, Additions, or Exclusions: Note, the FCC limits are shown above since they are more restrictive than the ICES-007 limits.

**7.7 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)
1900.500000	54.01	73.98	19.97	1000.000	385.0	H	322.0	4
2411.000000	44.65	73.98	29.33	1000.000	365.0	V	267.0	5
7756.000000	46.85	73.98	27.13	1000.000	410.0	V	293.0	14
12373.000000	52.96	73.98	21.02	1000.000	100.0	V	34.0	21
16111.000000	56.82	73.98	17.16	1000.000	399.0	V	233.0	25
17180.500000	57.18	73.98	16.80	1000.000	325.0	V	118.0	26

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1900.500000	27.37	53.98	26.61	1000.000	385.0	H	322.0	4
2411.000000	26.95	53.98	27.03	1000.000	365.0	V	267.0	5
7756.000000	33.50	53.98	20.48	1000.000	410.0	V	293.0	14
12373.000000	38.88	53.98	15.10	1000.000	100.0	V	34.0	21
16111.000000	42.68	53.98	11.30	1000.000	399.0	V	233.0	25
17180.500000	43.65	53.98	10.33	1000.000	325.0	V	118.0	26

Test Personnel: Bryan Taylor
 Supervising/Reviewing Engineer: N/A
 (Where Applicable) FCC Part 15B
 Product Standard: ICES-003 Issue 7
 Input Voltage: Battery
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/16/2021
 Limit Applied: Class B
 Ambient Temperature: 23.3°C
 Relative Humidity: 64.8%
 Atmospheric Pressure: 989.4 mbar

Deviations, Additions, or Exclusions: None



8 Transmitter Spurious Emissions

8.1 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.

8.2 Test Method

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



8.3 Test Equipment Used

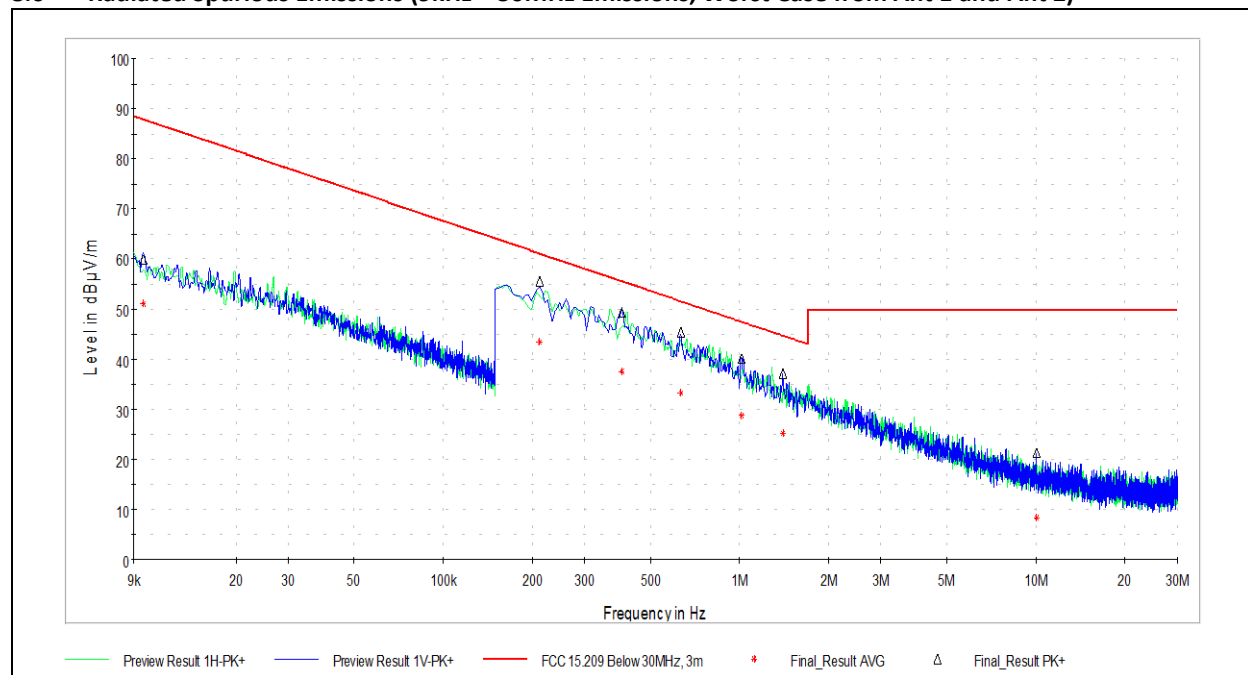
Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	10/5/2020	10/5/2021
Magnetic Loop Antenna	2366	ETS	6502	7/17/2020	7/17/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Horn Antenna (18-40GHz)	3779	ETS	3116c	7/23/2020	7/23/2021
Horn Antenna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

8.4 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

8.5 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. The frequency range from 18 – 26GHz was investigated at a 1m test distance and there were no observable spurious emissions detected.

**8.6 Radiated Spurious Emissions (9kHz – 30MHz Emissions, Worst Case from Ant 1 and Ant 2)**

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB/m)
0.009705	51.00	87.87	36.87	0.200	300.0	19
0.211456	43.54	61.10	17.56	9.000	42.0	12
0.400213	37.67	55.56	17.89	9.000	62.0	12
0.632868	33.34	51.58	18.23	9.000	138.0	12
1.014772	28.69	47.48	18.79	9.000	56.0	12
1.401066	25.22	44.68	19.46	9.000	0.0	12
10.070735	8.39	50.00	41.61	9.000	155.0	11

Test Personnel: Ben Coolbear

Supervising/Reviewing Engineer: N/A

(Where Applicable)

Product Standard: FCC Part 15C

Input Voltage: Battery

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/15/2021

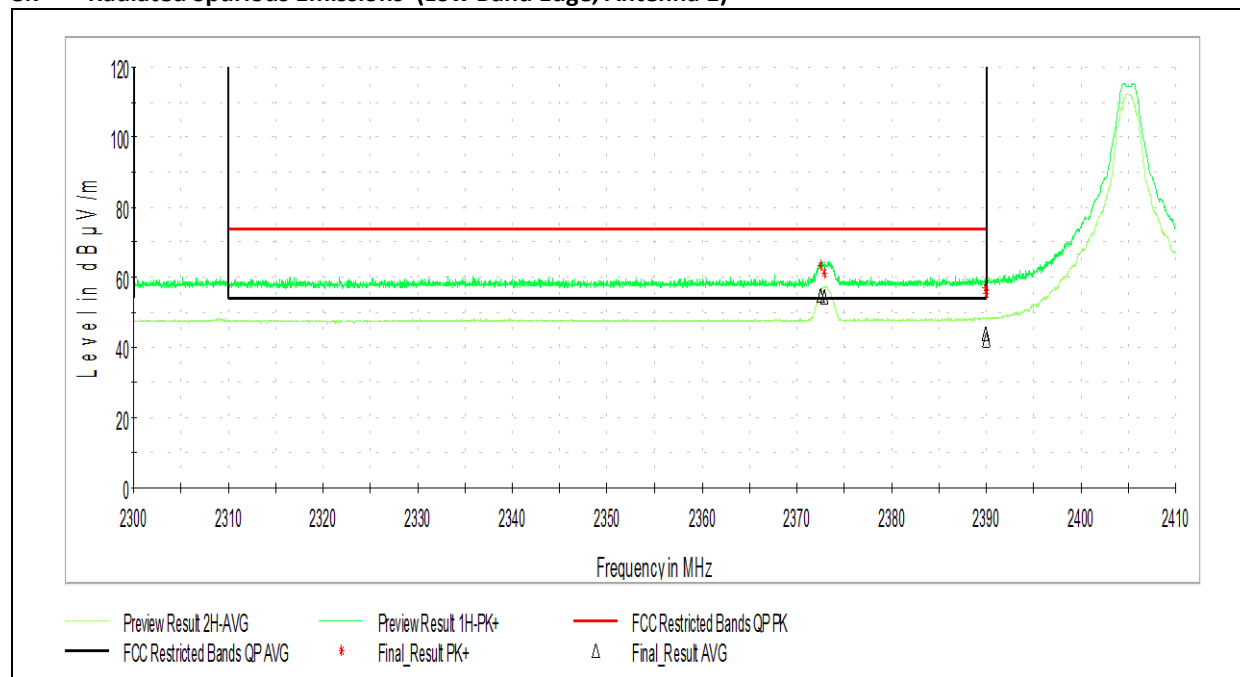
Limit Applied: 15.209

Ambient Temperature: 22.3°C

Relative Humidity: 64.2%

Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.7 Radiated Spurious Emissions (Low Band Edge, Antenna 1)**

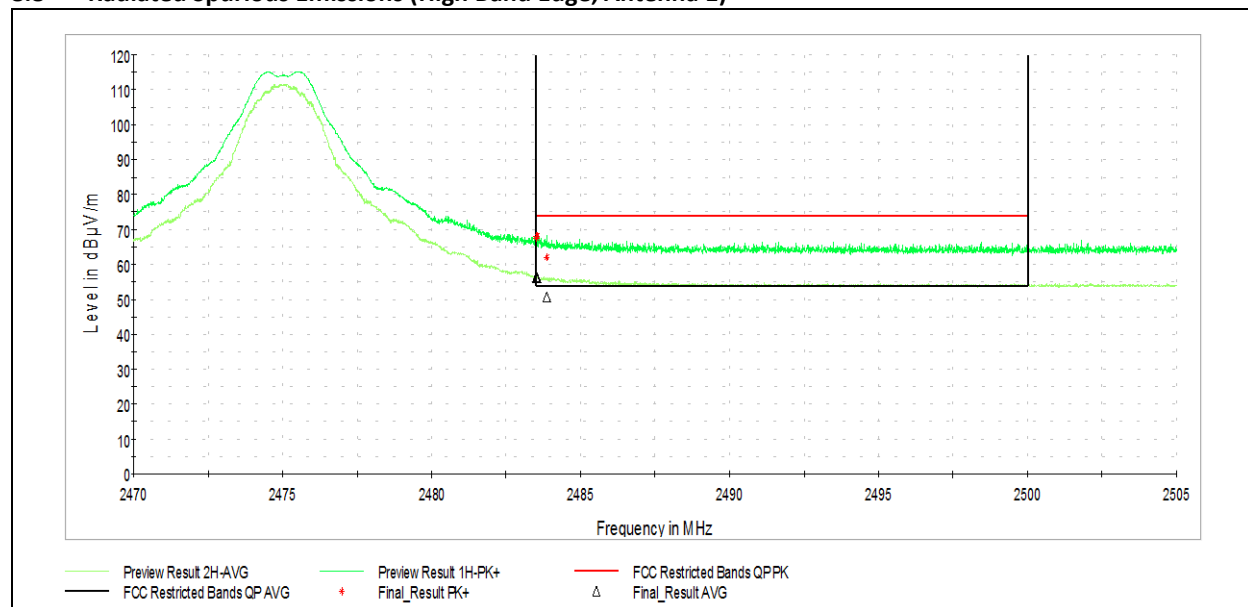
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2372.557692	63.21	73.98	10.77	1000.000	108.0	H	0.0	39
2372.938462	61.43	73.98	12.55	1000.000	158.0	H	10.0	39
2389.946154	56.88	73.98	17.10	1000.000	165.0	H	0.0	39

Frequency (MHz)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2372.557692	54.90 (31.78)	53.98	22.2	1000.000	108.0	H	0.0	39
2372.938462	54.40 (31.28)	53.98	22.7	1000.000	158.0	H	10.0	39
2389.946154	43.93	53.98	10.05	1000.000	165.0	H	0.0	39

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

Test Date: 7/15/2021
 Limit Applied: 15.209
 Ambient Temperature: 22.3°C
 Relative Humidity: 64.2%
 Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: Measurements appearing in parentheses (xxx) had an additional duty cycle correction factor applied ($20\log[\text{duty cycle}]$) in order to arrive at the true average value due to the pulsed nature of the signal. See KDB558074D.01, Section 11, Question 3, Answer C.

**8.8 Radiated Spurious Emissions (High Band Edge, Antenna 1)**

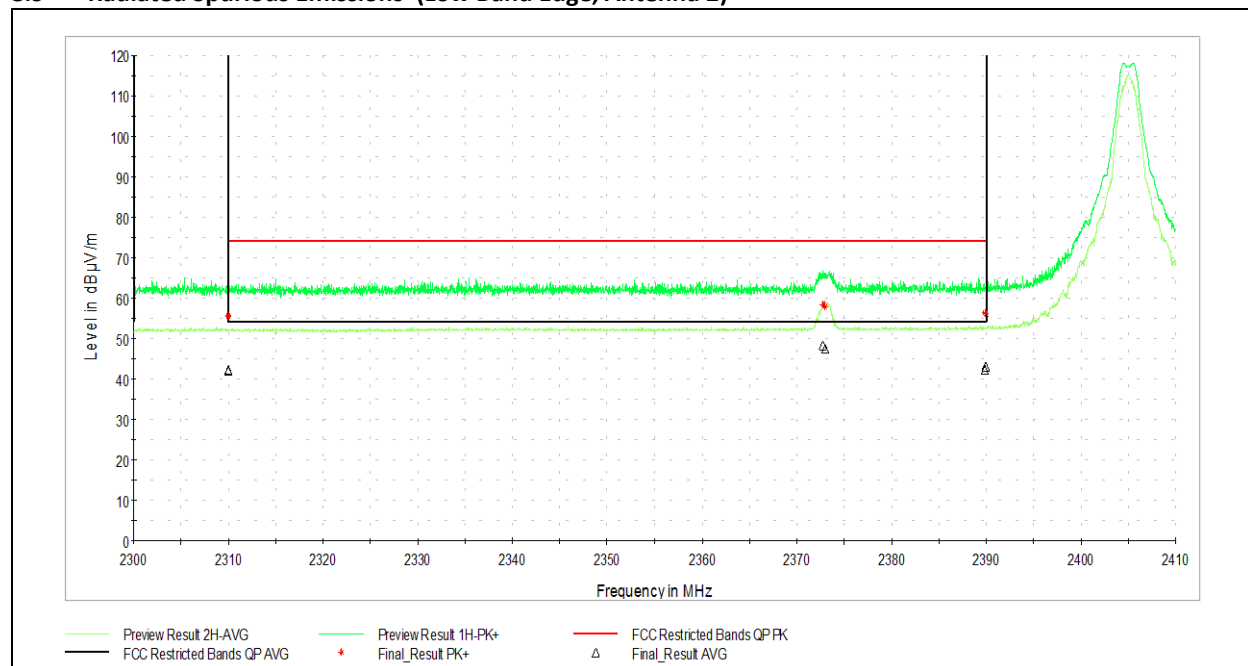
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.501923	68.02	73.98	5.96	1000.000	257.0	H	200.0	39
2483.522115	67.68	73.98	6.30	1000.000	258.0	H	200.0	39
2483.535577	68.08	73.98	5.90	1000.000	258.0	H	200.0	39
2483.865385	62.02	73.98	11.96	1000.000	258.0	H	124.0	39

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.501923	56.48 (33.36)	53.98	20.62	1000.000	257.0	H	200.0	39
2483.522115	56.27 (33.15)	53.98	20.83	1000.000	258.0	H	200.0	39
2483.535577	56.15 (33.03)	53.98	20.95	1000.000	258.0	H	200.0	39
2483.865385	50.64	53.98	3.34	1000.000	258.0	H	124.0	39

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

Test Date: 7/15/2021
 Limit Applied: 15.209
 Ambient Temperature: 22.3°C
 Relative Humidity: 64.2%
 Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: Measurements appearing in parentheses (xxx) had an additional duty cycle correction factor applied ($20\log[\text{duty cycle}]$) in order to arrive at the true average value due to the pulsed nature of the signal. See KDB558074D.01, Section 11, Question 3, Answer C.

**8.9 Radiated Spurious Emissions (Low Band Edge, Antenna 2)**

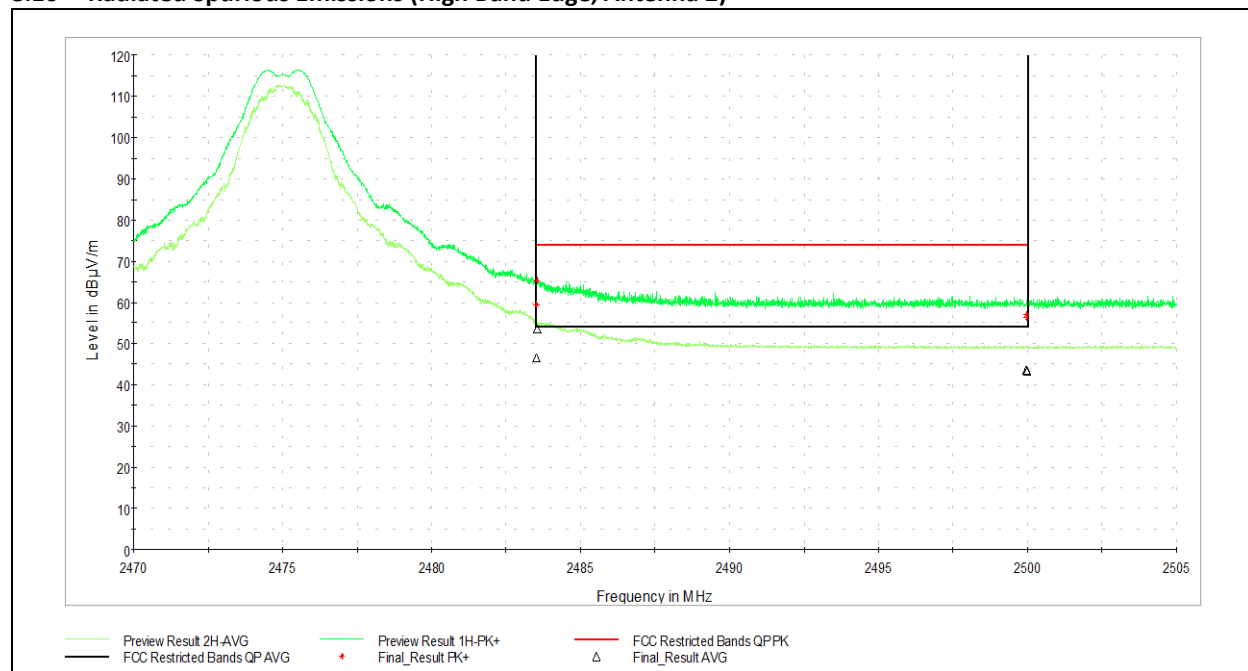
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2310.005769	55.44	73.98	18.54	1000.000	208.0	H	117.0	38
2310.026923	55.65	73.98	18.33	1000.000	300.0	H	0.0	38
2372.790385	58.35	73.98	15.63	1000.000	257.0	H	86.0	39
2373.023077	58.05	73.98	15.93	1000.000	260.0	H	85.0	39
2389.840385	56.41	73.98	17.57	1000.000	209.0	H	1.0	39
2389.946154	56.22	73.98	17.76	1000.000	208.0	H	92.0	39

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2310.005769	42.23	53.98	11.75	1000.000	208.0	H	117.0	38
2310.026923	42.04	53.98	11.94	1000.000	300.0	H	0.0	38
2372.790385	48.32	53.98	5.66	1000.000	257.0	H	86.0	39
2373.023077	47.50	53.98	6.48	1000.000	260.0	H	85.0	39
2389.840385	42.31	53.98	11.67	1000.000	209.0	H	1.0	39
2389.946154	43.17	53.98	10.81	1000.000	208.0	H	92.0	39

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

Test Date: 7/15/2021
 Limit Applied: 15.209
 Ambient Temperature: 22.3°C
 Relative Humidity: 64.2%
 Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.10 Radiated Spurious Emissions (High Band Edge, Antenna 2)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.501923	59.38	73.98	14.60	1000.000	266.0	H	150.0	39
2483.535577	65.30	73.98	8.68	1000.000	100.0	H	-9.0	39
2499.965385	56.96	73.98	17.02	1000.000	108.0	H	1.0	39
2499.978846	56.35	73.98	17.63	1000.000	200.0	H	231.0	39

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.501923	46.44	53.98	7.54	1000.000	266.0	H	150.0	39
2483.535577	53.57	53.98	0.41	1000.000	100.0	H	-9.0	39
2499.965385	43.59	53.98	10.39	1000.000	108.0	H	1.0	39
2499.978846	43.46	53.98	10.52	1000.000	200.0	H	231.0	39

Test Personnel: Ben Coolbear

Supervising/Reviewing Engineer: _____

(Where Applicable) N/A

Product Standard: FCC Part 15C

Input Voltage: Battery

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/15/2021

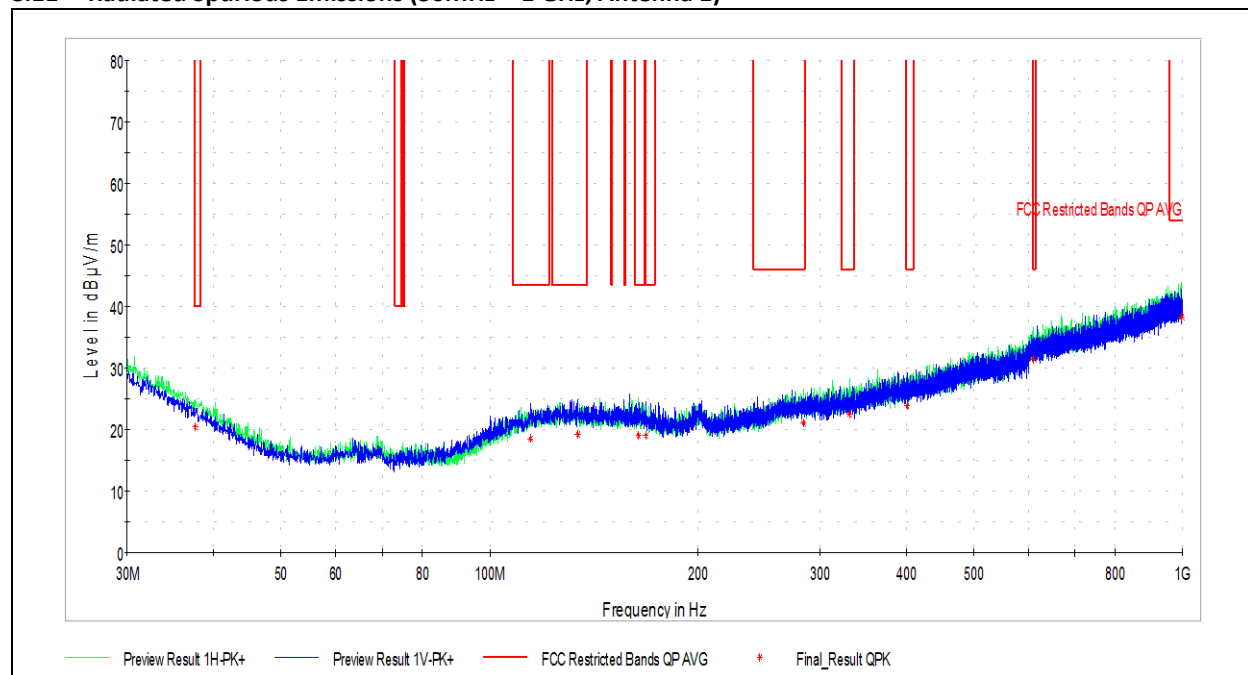
Limit Applied: 15.209

Ambient Temperature: 22.3°C

Relative Humidity: 64.2%

Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.11 Radiated Spurious Emissions (30MHz – 1 GHz, Antenna 1)**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.652222	20.28	40.00	19.72	120.000	382.0	H	87.0	23
114.713333	18.37	43.52	25.16	120.000	380.0	V	244.0	21
134.221111	19.19	43.52	24.33	120.000	260.0	V	264.0	22
164.021667	18.94	43.52	24.58	120.000	337.0	H	249.0	21
168.063333	18.92	43.52	24.61	120.000	178.0	V	182.0	21
283.816667	20.99	46.02	25.03	120.000	380.0	H	345.0	23
330.646111	22.36	46.02	23.66	120.000	222.0	H	6.0	25
400.593889	23.88	46.02	22.14	120.000	237.0	V	171.0	26
610.006111	31.30	46.02	14.72	120.000	120.0	H	213.0	32
997.359444	38.26	53.98	15.72	120.000	222.0	H	238.0	38

Test Personnel: Bryan Taylor

Supervising/Reviewing Engineer: _____

(Where Applicable) N/A

Product Standard: FCC Part 15C

Input Voltage: Battery

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/15/2021

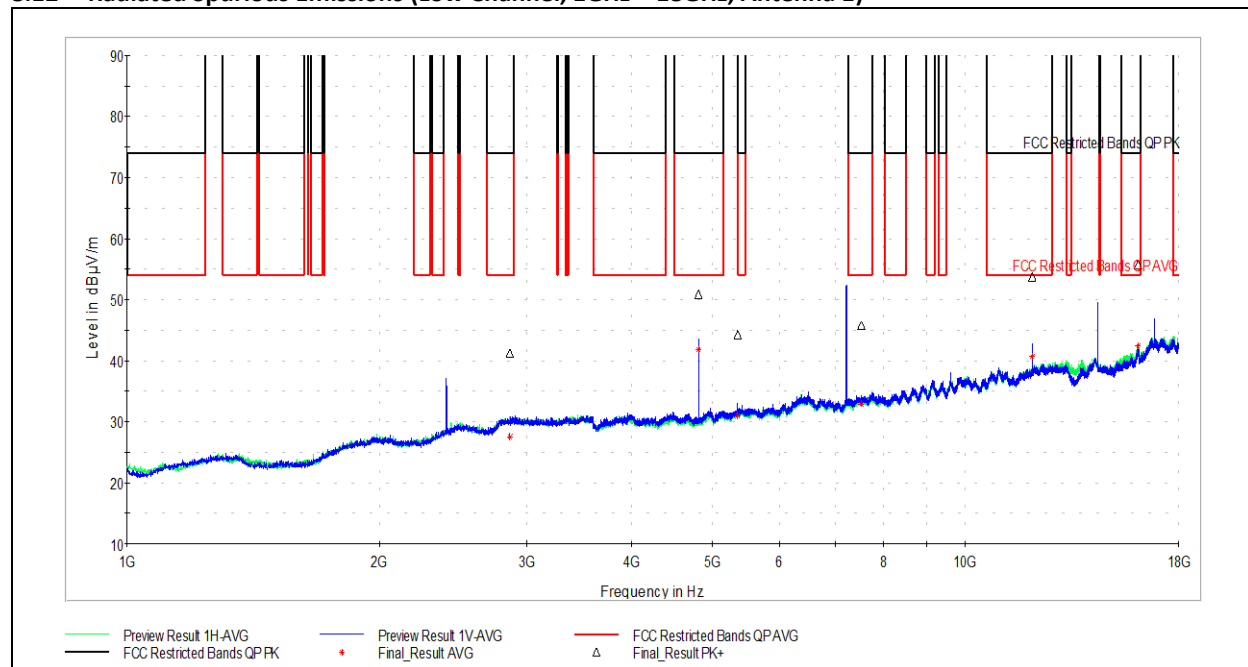
Limit Applied: 15.209

Ambient Temperature: 22.3°C

Relative Humidity: 64.2%

Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.12 Radiated Spurious Emissions (Low Channel, 1GHz – 18GHz, Antenna 1)**

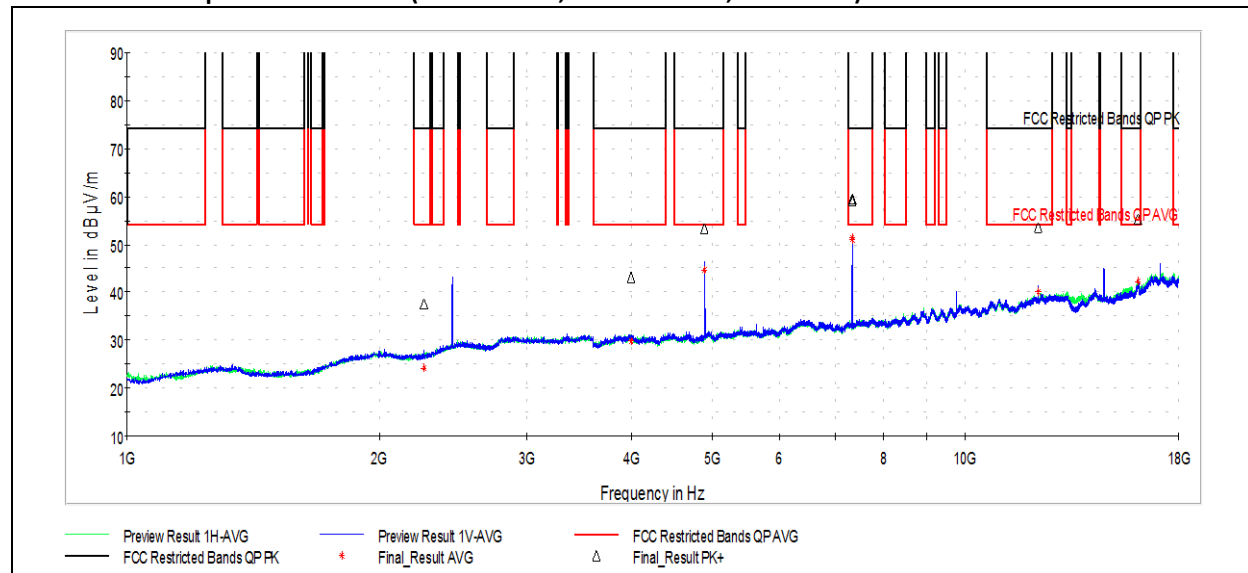
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2863.000000	41.25	73.98	32.73	1000.000	100.0	H	303.0	7
4809.000000	50.87	73.98	23.11	1000.000	214.0	V	86.0	9
5357.000000	44.27	73.98	29.71	1000.000	100.0	V	84.0	11
7525.000000	45.84	73.98	28.14	1000.000	224.0	V	0.0	13
12022.500000	53.81	73.98	20.17	1000.000	410.0	V	212.0	19
16098.000000	55.81	73.98	18.17	1000.000	358.0	H	168.0	25

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2863.000000	27.57	53.98	26.41	1000.000	100.0	H	303.0	7
4809.000000	41.81	53.98	12.17	1000.000	214.0	V	86.0	9
5357.000000	31.03	53.98	22.95	1000.000	100.0	V	84.0	11
7525.000000	32.83	53.98	21.15	1000.000	224.0	V	0.0	13
12022.500000	40.67	53.98	13.31	1000.000	410.0	V	212.0	19
16098.000000	42.36	53.98	11.62	1000.000	358.0	H	168.0	25

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

Test Date: 7/15/2021
Limit Applied: 15.209
Ambient Temperature: 22.3°C
Relative Humidity: 64.2%
Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.13 Radiated Spurious Emissions (Mid Channel, 1GHz – 18GHz, Antenna 1)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2261.500000	37.59	73.98	36.39	1000.000	225.0	V	276.0	4
3999.500000	43.06	73.98	30.92	1000.000	223.0	V	0.0	9
4889.000000	53.29	73.98	20.69	1000.000	316.0	V	335.0	10
7333.500000	59.40	73.98	14.58	1000.000	410.0	V	92.0	13
7336.500000	59.10	73.98	14.88	1000.000	346.0	V	102.0	13
12227.500000	53.61	73.98	20.37	1000.000	321.0	V	201.0	20
16085.000000	55.35	73.98	18.63	1000.000	352.0	H	0.0	25

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2261.500000	24.08	53.98	29.90	1000.000	225.0	V	276.0	4
3999.500000	29.77	53.98	24.21	1000.000	223.0	V	0.0	9
4889.000000	44.72	53.98	9.26	1000.000	316.0	V	335.0	10
7333.500000	51.43	53.98	2.55	1000.000	410.0	V	92.0	13
7336.500000	50.90	53.98	3.08	1000.000	346.0	V	102.0	13
12227.500000	40.14	53.98	13.84	1000.000	321.0	V	201.0	20
16085.000000	42.20	53.98	11.78	1000.000	352.0	H	0.0	25

Test Personnel: Ben Coolbear

Supervising/Reviewing Engineer: (Where Applicable) N/A

Product Standard: FCC Part 15C

Input Voltage: Battery

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/15/2021

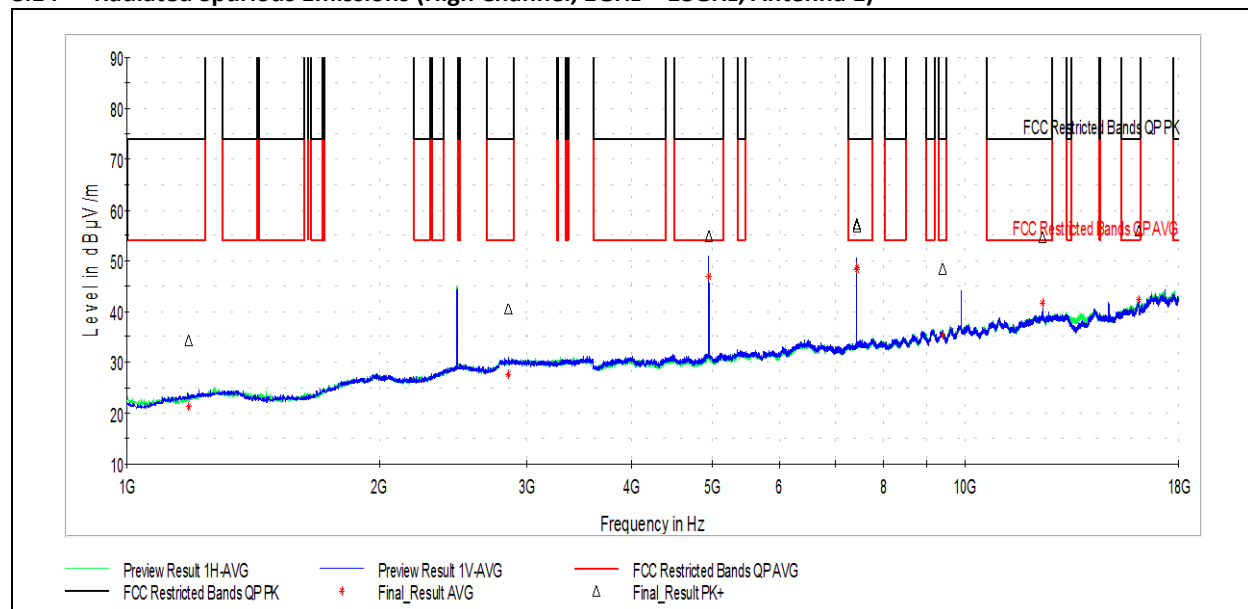
Limit Applied: 15.209

Ambient Temperature: 22.3°C

Relative Humidity: 64.2%

Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None.

**8.14 Radiated Spurious Emissions (High Channel, 1GHz – 18GHz, Antenna 1)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1185.000000	34.32	73.98	39.66	1000.000	100.0	V	0.0	0
2849.500000	40.44	73.98	33.54	1000.000	222.0	V	307.0	7
4949.000000	54.73	73.98	19.25	1000.000	292.0	V	341.0	10
7423.500000	56.92	73.98	17.06	1000.000	305.0	V	116.0	13
7426.500000	57.31	73.98	16.67	1000.000	340.0	V	118.0	13
9408.500000	48.46	73.98	25.52	1000.000	100.0	H	11.0	17
12377.500000	54.52	73.98	19.46	1000.000	259.0	V	24.0	21
16122.000000	55.94	73.98	18.04	1000.000	349.0	H	46.0	25

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1185.000000	21.29	53.98	32.69	1000.000	100.0	V	0.0	0
2849.500000	27.52	53.98	26.46	1000.000	222.0	V	307.0	7
4949.000000	46.99	53.98	6.99	1000.000	292.0	V	341.0	10
7423.500000	48.29	53.98	5.69	1000.000	305.0	V	116.0	13
7426.500000	48.79	53.98	5.19	1000.000	340.0	V	118.0	13
9408.500000	35.35	53.98	18.63	1000.000	100.0	H	11.0	17
12377.500000	41.68	53.98	12.30	1000.000	259.0	V	24.0	21
16122.000000	42.35	53.98	11.63	1000.000	349.0	H	46.0	25

Test Personnel: Ben Coolbear

Supervising/Reviewing Engineer: (Where Applicable) N/A

Product Standard: FCC Part 15C

Input Voltage: Battery

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/15/2021

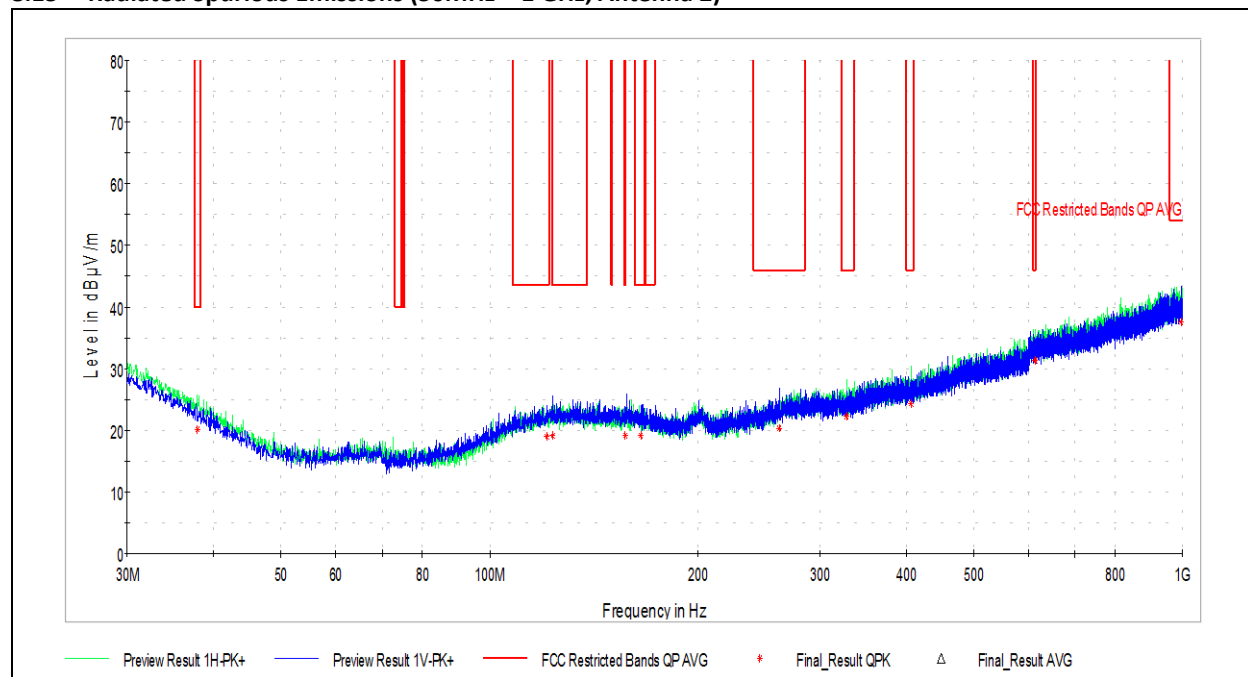
Limit Applied: 15.209

Ambient Temperature: 22.3°C

Relative Humidity: 64.2%

Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

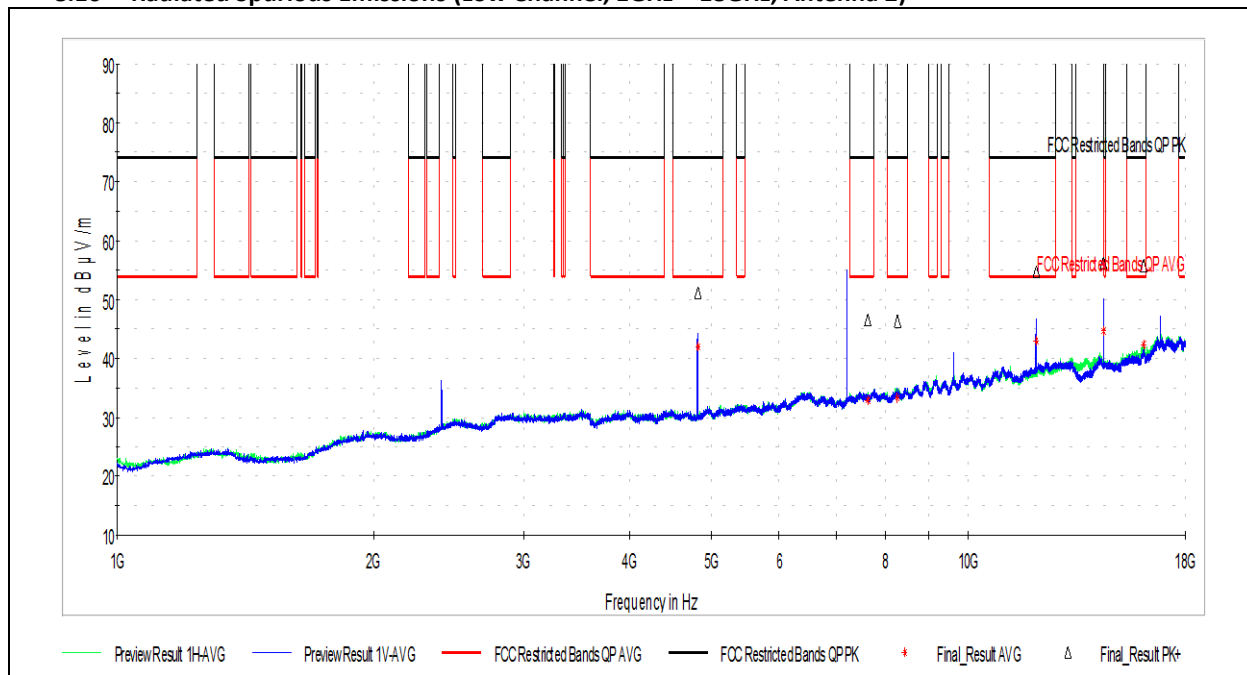
**8.15 Radiated Spurious Emissions (30MHz – 1 GHz, Antenna 2)**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.867778	20.12	40.00	19.88	120.000	178.0	H	223.0	23
121.072222	18.89	43.52	24.63	120.000	378.0	V	160.0	22
123.281667	19.06	43.52	24.46	120.000	101.0	V	284.0	22
156.854444	19.14	43.52	24.38	120.000	161.0	H	0.0	22
165.422778	19.05	43.52	24.48	120.000	381.0	V	181.0	22
261.560556	20.35	46.02	25.67	120.000	307.0	V	16.0	23
327.790000	22.24	46.02	23.78	120.000	336.0	H	172.0	25
406.036667	24.34	46.02	21.68	120.000	192.0	H	284.0	27
612.862222	31.30	46.02	14.72	120.000	352.0	H	20.0	32
994.934444	37.54	53.98	16.44	120.000	190.0	V	58.0	38

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

Test Date: 7/15/2021
 Limit Applied: 15.209
 Ambient Temperature: 22.3°C
 Relative Humidity: 64.2%
 Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.16 Radiated Spurious Emissions (Low Channel, 1GHz – 18GHz, Antenna 2)**

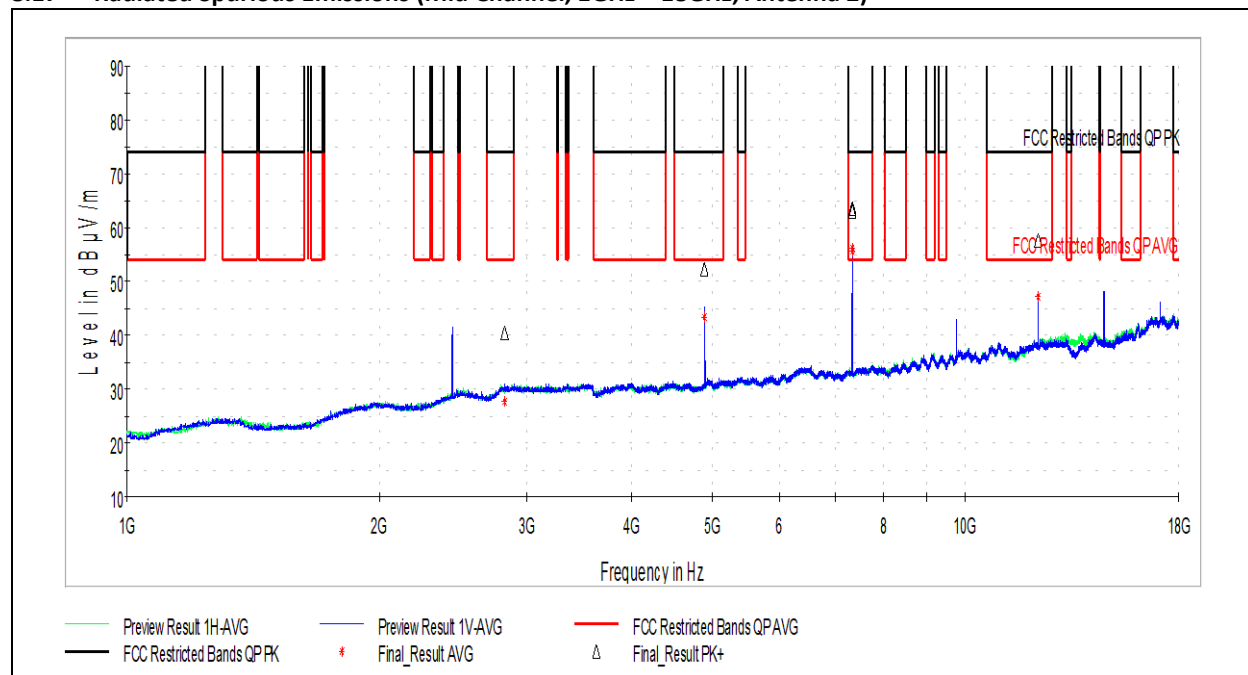
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4811.000000	51.20	73.98	22.78	1000.000	349.0	V	95.0	9
7623.000000	46.45	73.98	27.53	1000.000	100.0	H	319.0	13
8265.500000	46.42	73.98	27.56	1000.000	100.0	V	282.0	15
12022.500000	54.74	73.98	19.24	1000.000	216.0	V	224.0	19
16093.000000	55.70	73.98	18.28	1000.000	292.0	H	22.0	25

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4811.000000	42.01	53.98	11.97	1000.000	349.0	V	95.0	9
7623.000000	32.80	53.98	21.18	1000.000	100.0	H	319.0	13
8265.500000	33.37	53.98	20.61	1000.000	100.0	V	282.0	15
12022.500000	42.97	53.98	11.01	1000.000	216.0	V	224.0	19
16093.000000	42.41	53.98	11.57	1000.000	292.0	H	22.0	25

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

Test Date: 7/15/2021
 Limit Applied: 15.209
 Ambient Temperature: 22.3°C
 Relative Humidity: 64.2%
 Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: None

**8.17 Radiated Spurious Emissions (Mid Channel, 1GHz – 18GHz, Antenna 2)**

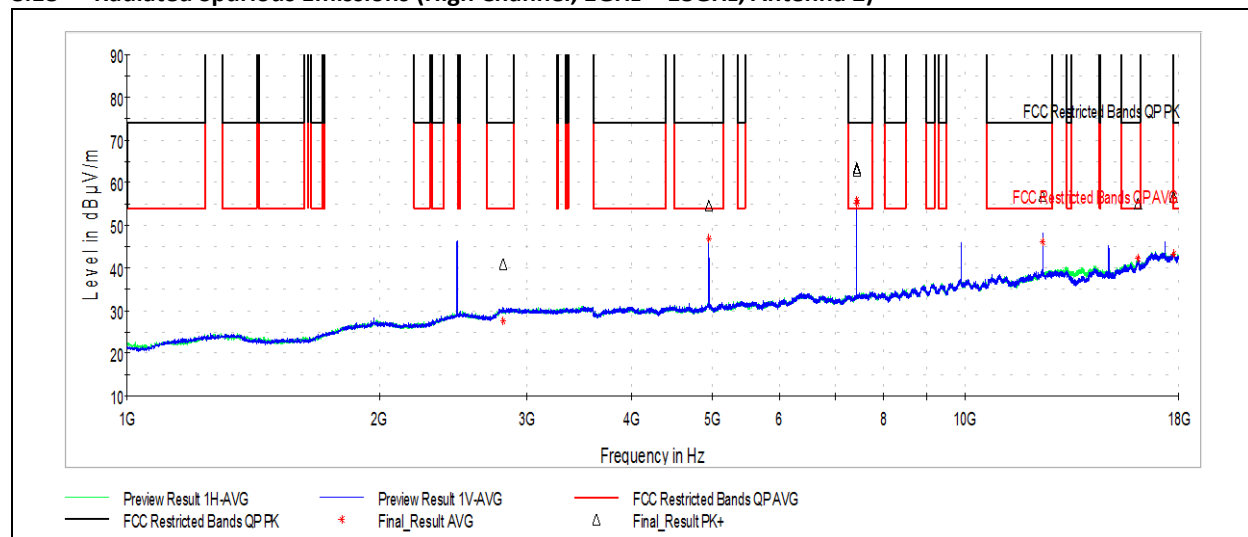
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2824.500000	40.61	73.98	33.37	1000.000	410.0	V	0.0	7
4891.000000	52.19	73.98	21.79	1000.000	296.0	V	210.0	10
7333.500000	63.56	73.98	10.42	1000.000	380.0	V	48.0	13
7336.500000	63.16	73.98	10.82	1000.000	410.0	V	51.0	13
12227.500000	57.60	73.98	16.38	1000.000	302.0	V	226.0	20

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2824.500000	27.68	53.98	26.30	1000.000	410.0	V	0.0	7
4891.000000	43.44	53.98	10.54	1000.000	296.0	V	210.0	10
7333.500000	56.10 (32.98)	53.98	21.00	1000.000	380.0	V	48.0	13
7336.500000	55.62 (32.5)	53.98	21.48	1000.000	410.0	V	51.0	13
12227.500000	47.21	53.98	6.77	1000.000	302.0	V	226.0	20

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

Test Date: 7/15/2021
 Limit Applied: 15.209
 Ambient Temperature: 22.3°C
 Relative Humidity: 64.2%
 Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: Measurements appearing in parentheses (xxx) had an additional duty cycle correction factor applied ($20\log[\text{duty cycle}]$) in order to arrive at the true average value due to the pulsed nature of the signal. See KDB558074D.01, Section 11, Question 3, Answer C.

**8.18 Radiated Spurious Emissions (High Channel, 1GHz – 18GHz, Antenna 2)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2810.500000	40.88	73.98	33.10	1000.000	313.0	V	186.0	7
4949.000000	54.73	73.98	19.25	1000.000	326.0	V	346.0	10
7423.500000	63.35	73.98	10.63	1000.000	376.0	V	117.0	13
7426.500000	62.83	73.98	11.15	1000.000	323.0	V	116.0	13
12377.500000	56.99	73.98	16.99	1000.000	278.0	V	216.0	21
16109.500000	55.15	73.98	18.83	1000.000	118.0	H	59.0	25
17743.500000	56.65	73.98	17.33	1000.000	132.0	H	44.0	25

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2810.500000	27.58	53.98	26.40	1000.000	313.0	V	186.0	7
4949.000000	46.90	53.98	7.08	1000.000	326.0	V	346.0	10
7423.500000	55.98 (32.86)	53.98	21.12	1000.000	376.0	V	117.0	13
7426.500000	55.15 (32.03)	53.98	21.95	1000.000	323.0	V	116.0	13
12377.500000	46.12	53.98	7.86	1000.000	278.0	V	216.0	21
16109.500000	42.34	53.98	11.64	1000.000	118.0	H	59.0	25
17743.500000	43.24	53.98	10.74	1000.000	132.0	H	44.0	25

Test Personnel: Ben Coolbear

Supervising/Reviewing Engineer: _____

(Where Applicable) N/A

Product Standard: FCC Part 15C

Input Voltage: Battery

Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 7/15/2021

Limit Applied: 15.209

Ambient Temperature: 22.3°C

Relative Humidity: 64.2%

Atmospheric Pressure: 982.3 mbar

Deviations, Additions, or Exclusions: Measurements appearing in parentheses (xxx) had an additional duty cycle correction factor applied ($20\log[\text{duty cycle}]$) in order to arrive at the true average value due to the pulsed nature of the signal. See KDB558074D.01, Section 11, Question 3, Answer C.



9 Output Power

9.1 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.



9.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.9.1.3

9.3 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

9.4 Test Results

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

9.5 Test Conditions

Test Personnel:	Bryan Taylor	Test Date:	7/14/2021
Supervising/Reviewing Engineer:		Limit Applied:	See Above
(Where Applicable)	NA	Ambient Temperature:	23.8
Product Standard:	FCC Part 15.247	Relative Humidity:	51.3%
Input Voltage:	RSS-247 Issue 2	Atmospheric Pressure:	994.3mbar
Pretest Verification w / Ambient	Battery		
Signals or BB Source:	Yes		

Deviations, Additions, or Exclusions: None

9.6 Test Data (Peak Power, Antenna Path 1)

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
11	2405	20.13	30	9.87	PASS
19	2445	20.78	30	9.22	PASS
25	2475	20.19	30	9.81	PASS

9.7 Test Data (Peak Power, Antenna Path 2)

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
11	2405	19.74	30	10.26	PASS
19	2445	20.13	30	9.87	PASS
25	2475	20.13	30	9.87	PASS



10 Occupied Bandwidth

10.1 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.

10.2 Test Method

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

10.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3720	Rohde & Schwarz	FSEK30	10/13/2020	10/13/2021

10.4 Test Results

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

10.5 Test Conditions

Test Personnel:	Bryan Taylor	Test Date:	7/14/2021
Supervising/Reviewing Engineer:		Limit Applied:	See Above
(Where Applicable)	NA	Ambient Temperature:	23.8
Product Standard:	FCC Part 15.247	Relative Humidity:	51.3%
Input Voltage:	RSS-247 Issue 2	Atmospheric Pressure:	994.3mbar
Pretest Verification w / Ambient	Battery		
Signals or BB Source:	Yes		

Deviations, Additions, or Exclusions: None

**10.6 Test Data (Antenna Path 1)**

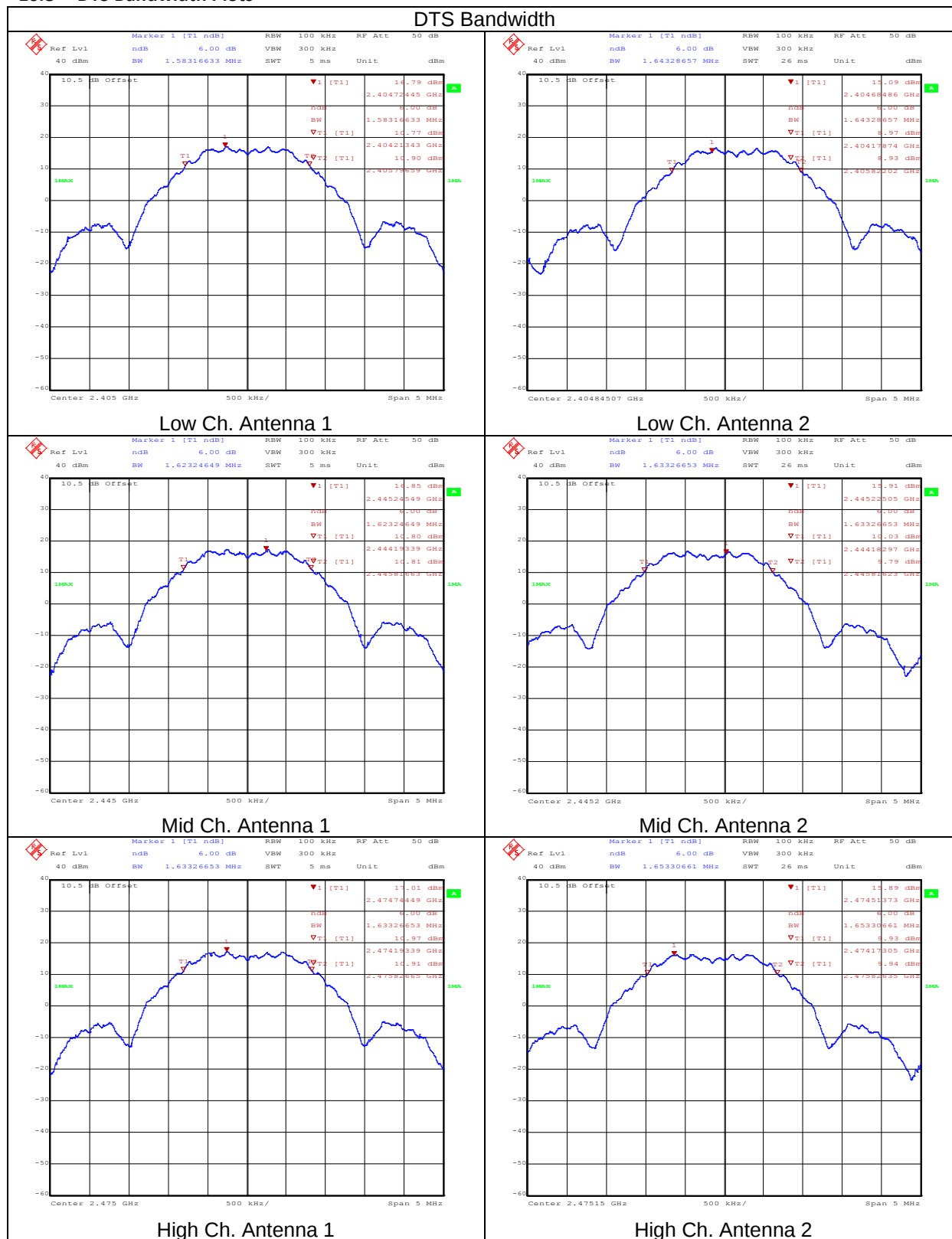
Channel	Frequency (MHz)	DTS BW (MHz)	6dB BW (MHz)	99% BW (MHz)	20dB BW (MHz)
11	2405	1.58	1.37	2.34	2.56
19	2445	1.62	1.59	2.37	2.57
25	2475	1.63	1.73	2.43	2.6

10.7 Test Data (Antenna Path 2)

Channel	Frequency (MHz)	DTS BW (MHz)	6dB BW (MHz)	99% BW (MHz)	20dB BW (MHz)
11	2405	1.64	1.4	2.33	2.56
19	2445	1.63	1.56	2.39	2.57
25	2475	1.65	1.85	2.43	2.6

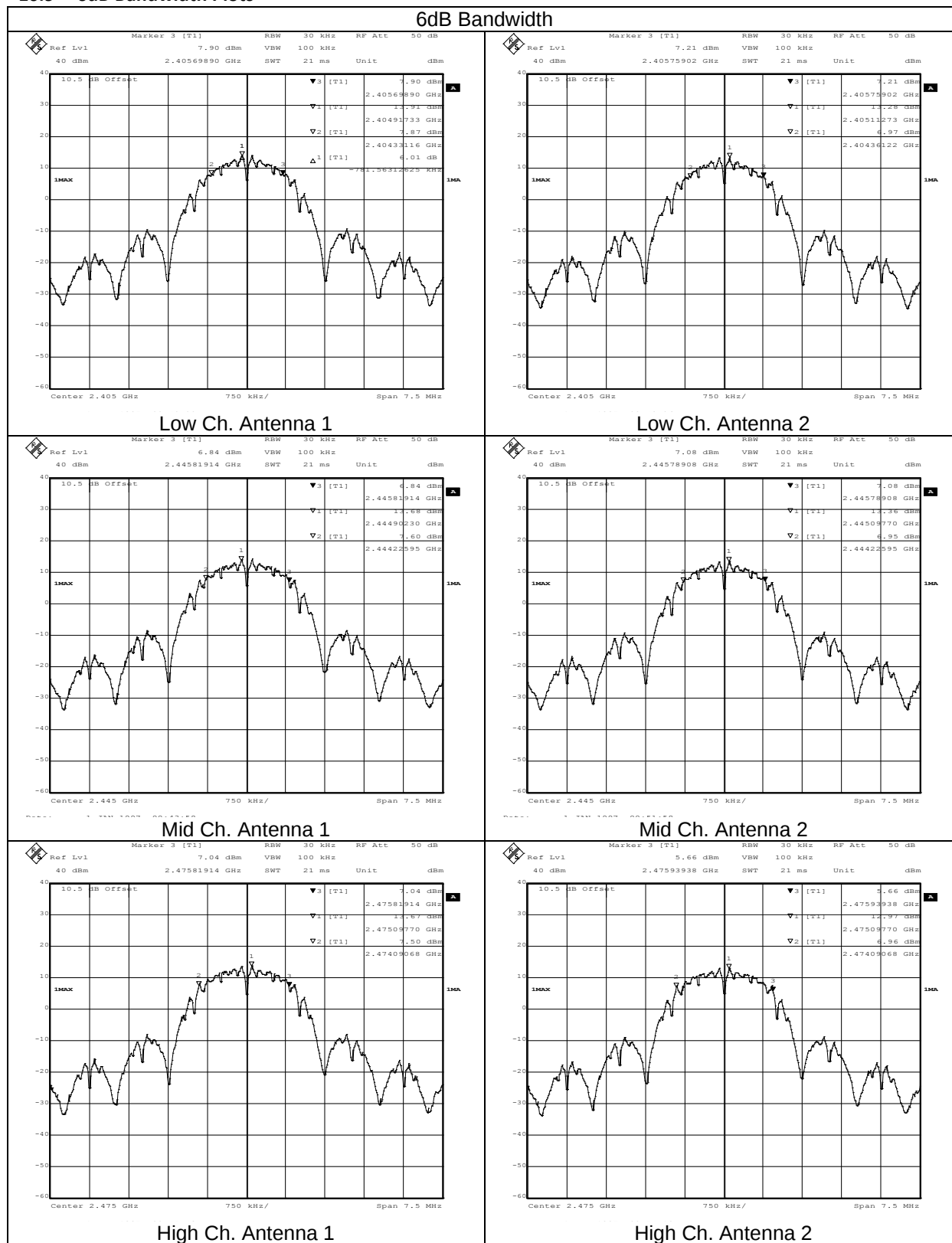


10.8 DTS Bandwidth Plots



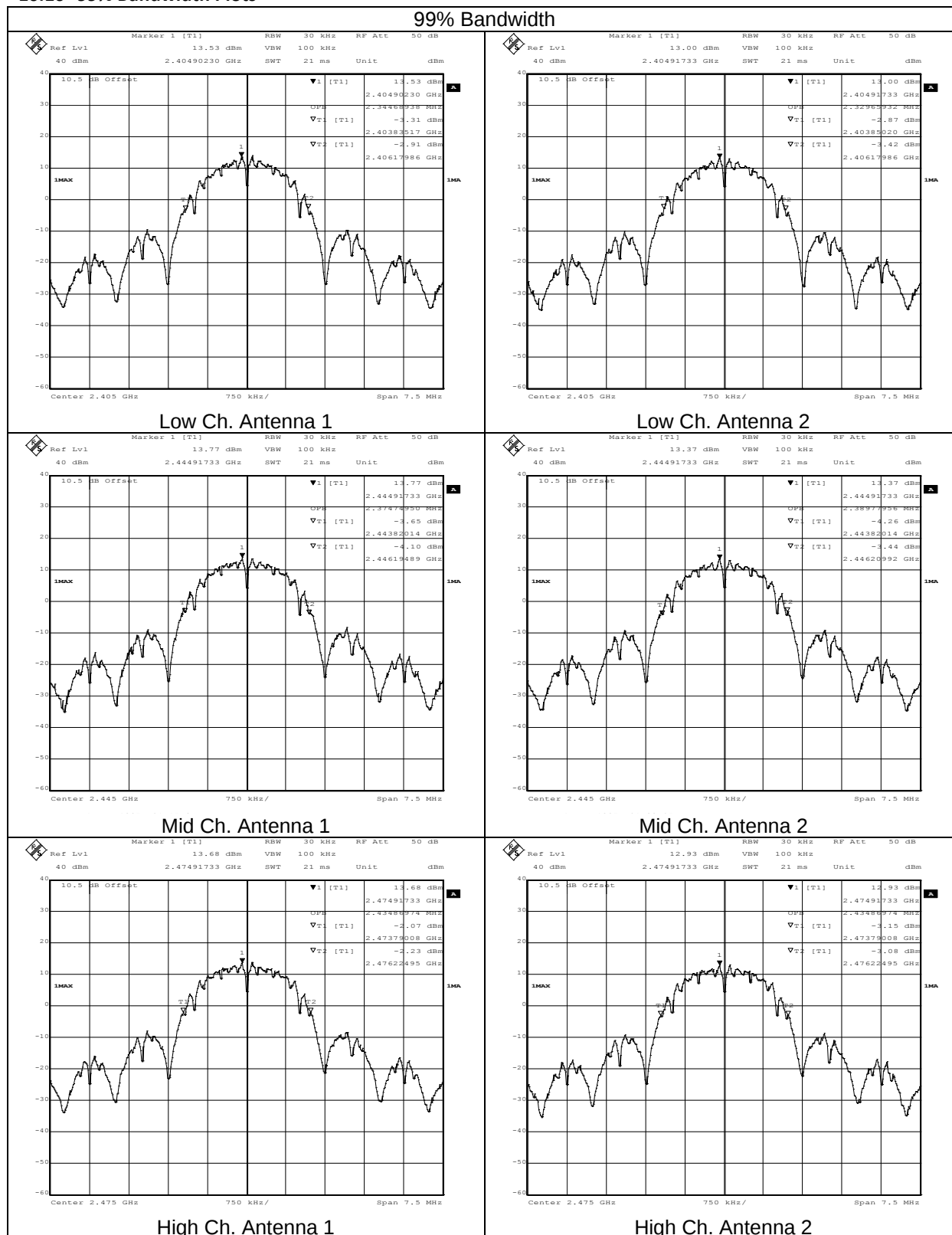


10.9 6dB Bandwidth Plots



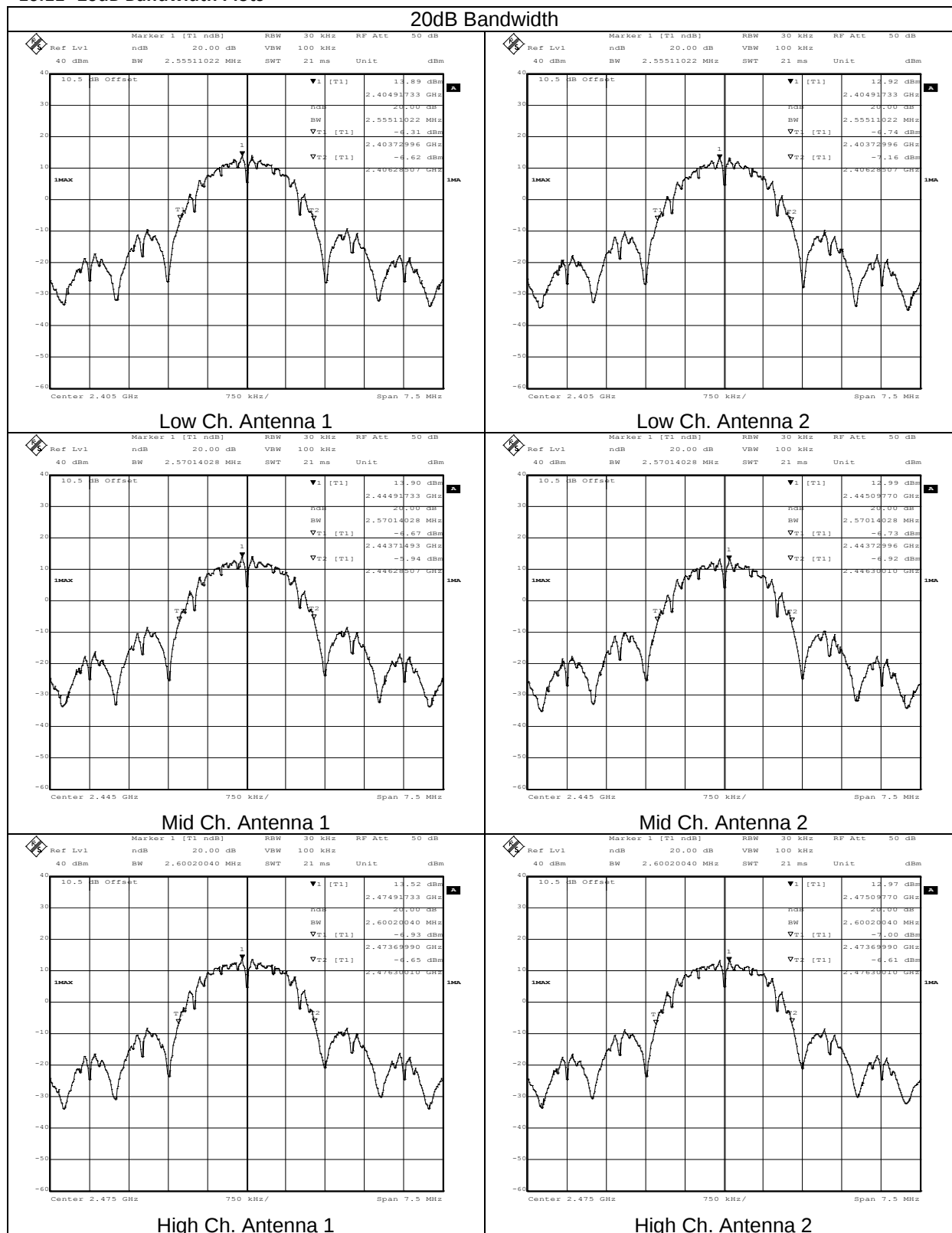


10.10 99% Bandwidth Plots





10.11 20dB Bandwidth Plots





11 Power Spectral Density

11.1 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).

11.2 Test Method

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

11.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3720	Rohde & Schwarz	FSEK30	10/13/2020	10/13/2021
Coaxial cable	6088			12/21/2020	12/21/2021

11.4 Test Results

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

11.5 Test Conditions

Test Personnel:	Bryan Taylor	Test Date:	7/14/2021
Supervising/Reviewing Engineer:		Limit Applied:	See Above
(Where Applicable)	NA	Ambient Temperature:	23.8
Product Standard:	FCC Part 15.247	Relative Humidity:	51.3%
Input Voltage:	Battery	Atmospheric Pressure:	994.3mbar
Pretest Verification w / Ambient			
Signals or BB Source:	Yes		

Deviations, Additions, or Exclusions: None

**11.6 Test Data (Antenna Path 1)**

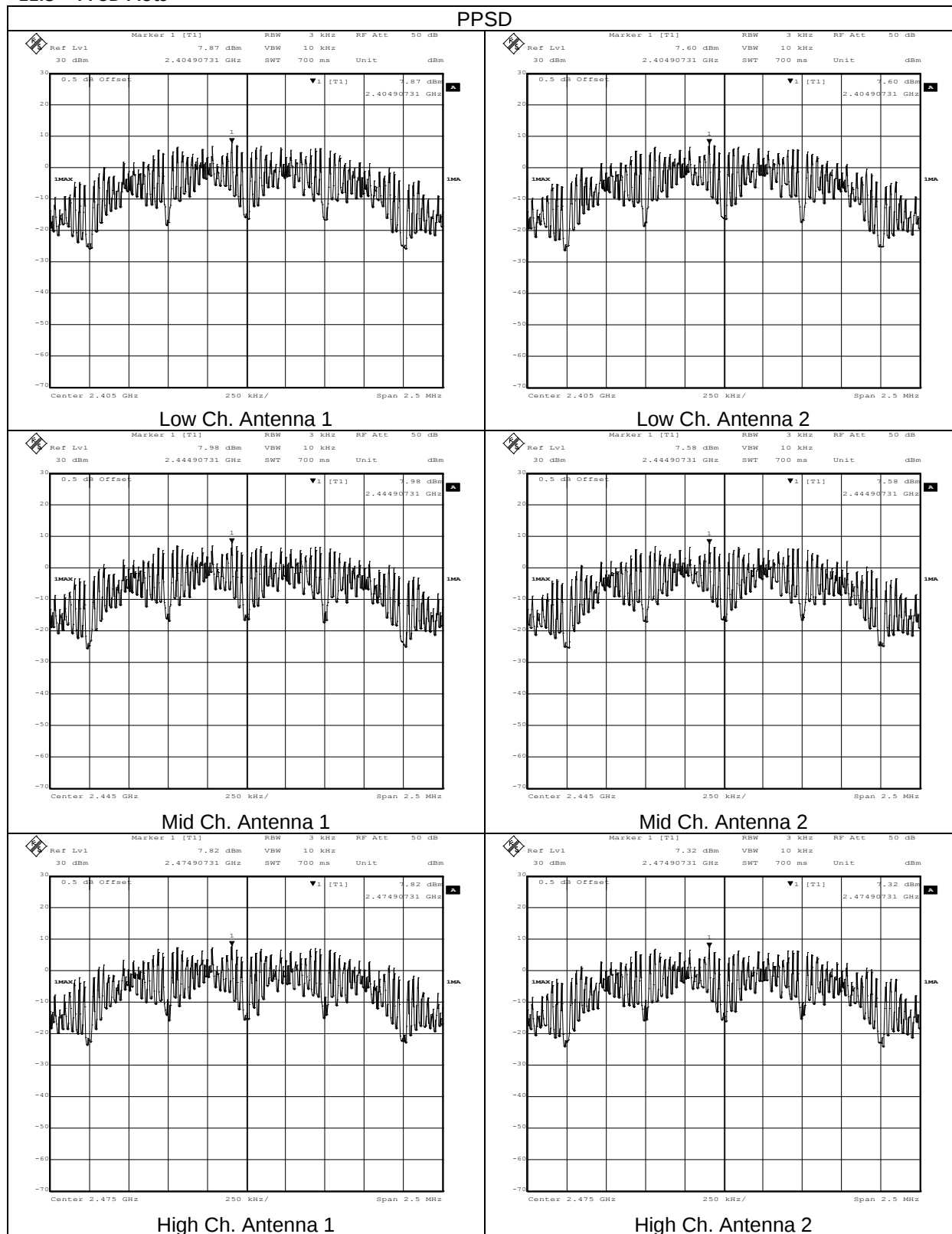
Channel	Frequency (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Result
11	2405	7.87	8	0.13	PASS
19	2445	7.98	8	0.02	PASS
25	2475	7.82	8	0.18	PASS

11.7 Test Data (Antenna Path 2)

Channel	Frequency (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Result
11	2405	7.6	8	0.4	PASS
19	2445	7.58	8	0.42	PASS
25	2475	7.32	8	0.68	PASS



11.8 PPSP Plots





12 Conducted Spurious Emissions

12.1 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.

12.2 Test Method

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

12.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3720	Rohde & Schwarz	FSEK30	10/13/2020	10/13/2021
Coaxial cable	6088			12/21/2020	12/21/2021

12.4 Test Results

The device was found to be **compliant**. All spurious emissions were found to be attenuated more than 30dB below the level of the fundamental.

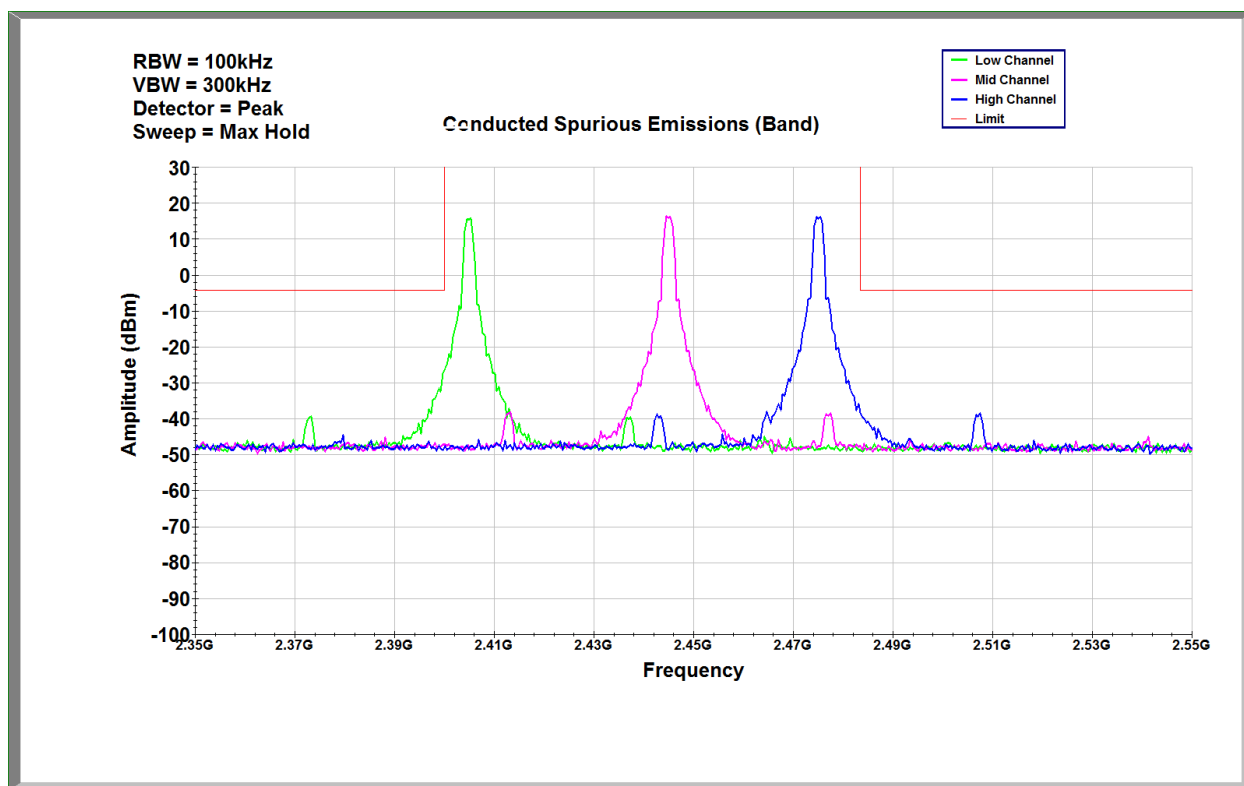


12.5 Test Conditions

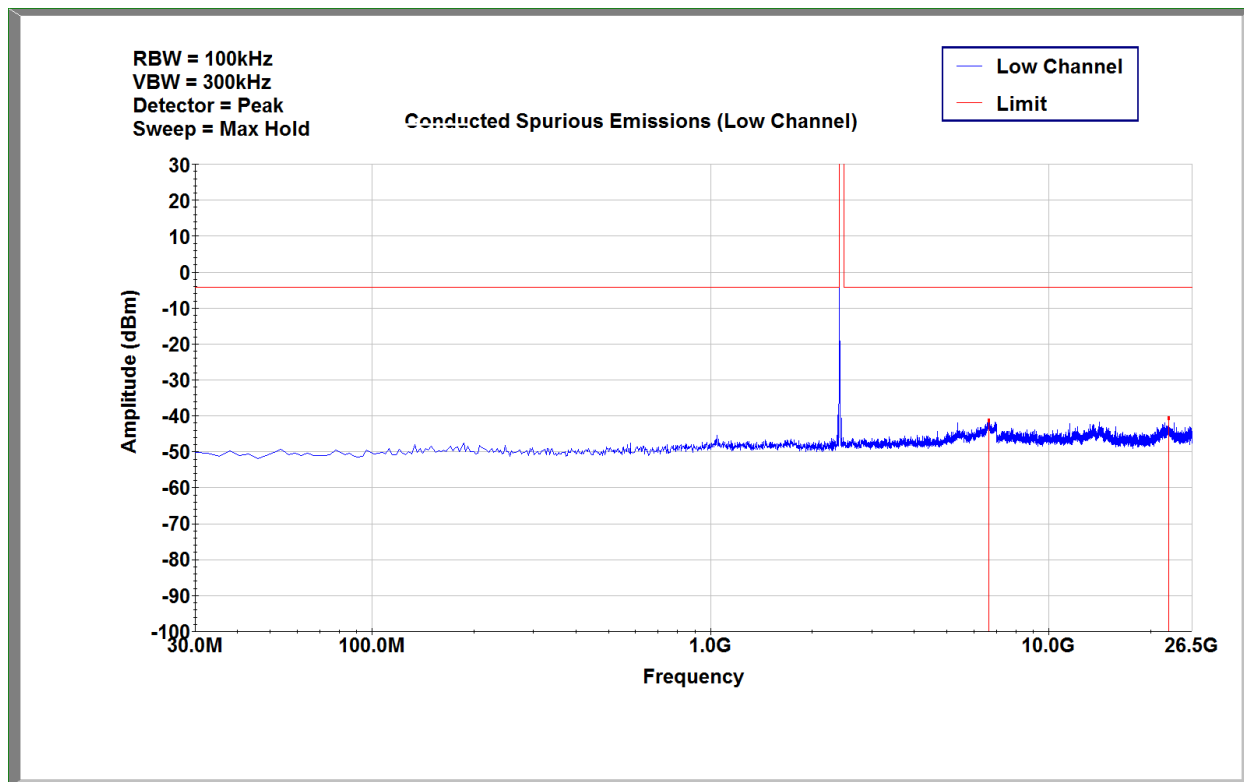
Test Personnel:	Bryan Taylor	Test Date:	7/13/2021
Supervising/Reviewing Engineer:		Limit Applied:	See Above
(Where Applicable)	NA		
Product Standard:	FCC Part 15.247	Ambient Temperature:	22.2C
Input Voltage:	RSS-247 Issue 2	Relative Humidity:	48.4%
Pretest Verification w / Ambient	Battery		
Signals or BB Source:	Yes	Atmospheric Pressure:	993.7mbar

Deviations, Additions, or Exclusions: None

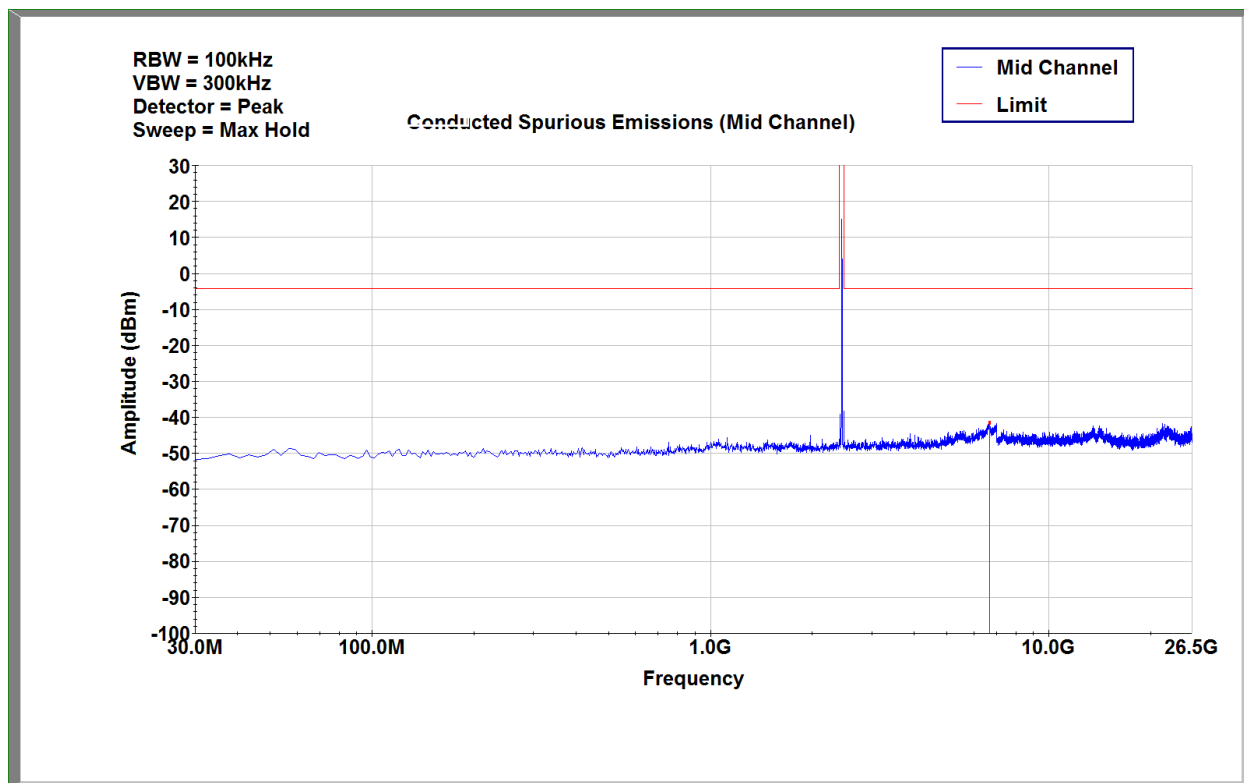
12.6 Test Data (Antenna Path 1)



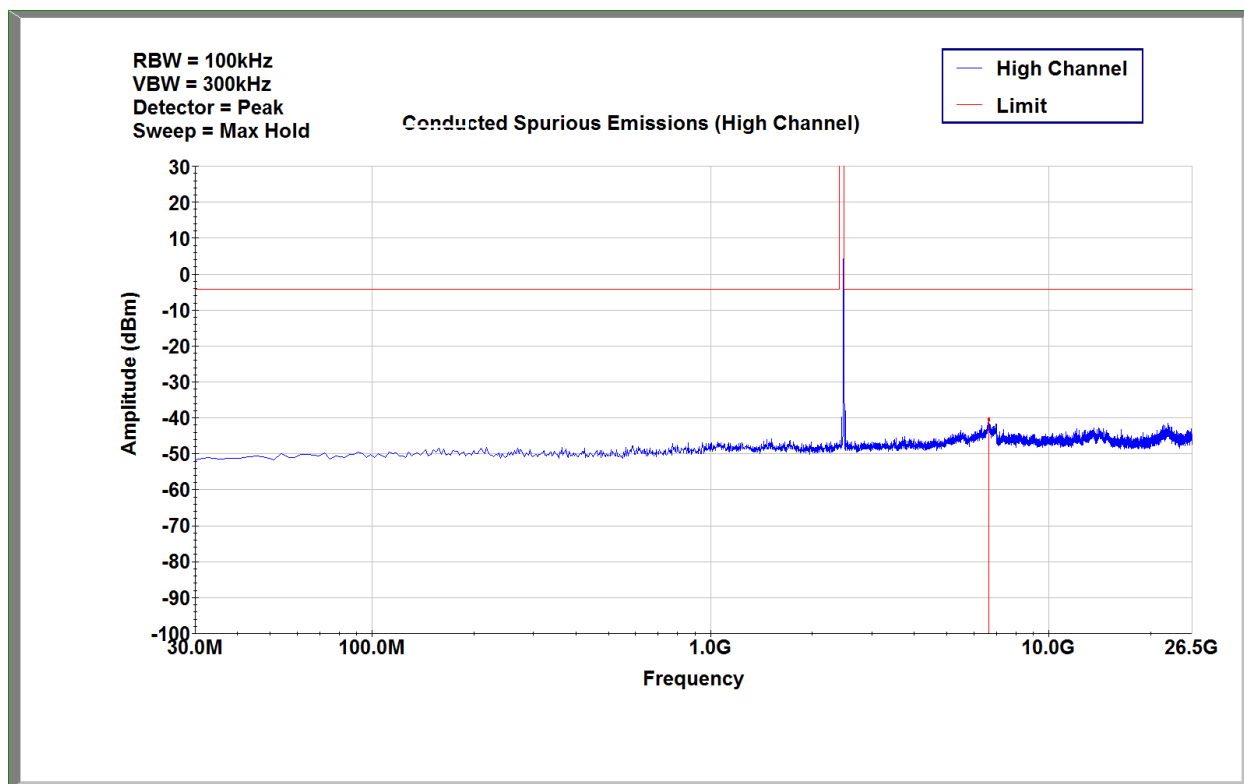
Conducted Spurious Emissions, Antenna 1 (Band Edge)



Conducted Spurious Emissions Channel 11, Antenna 1



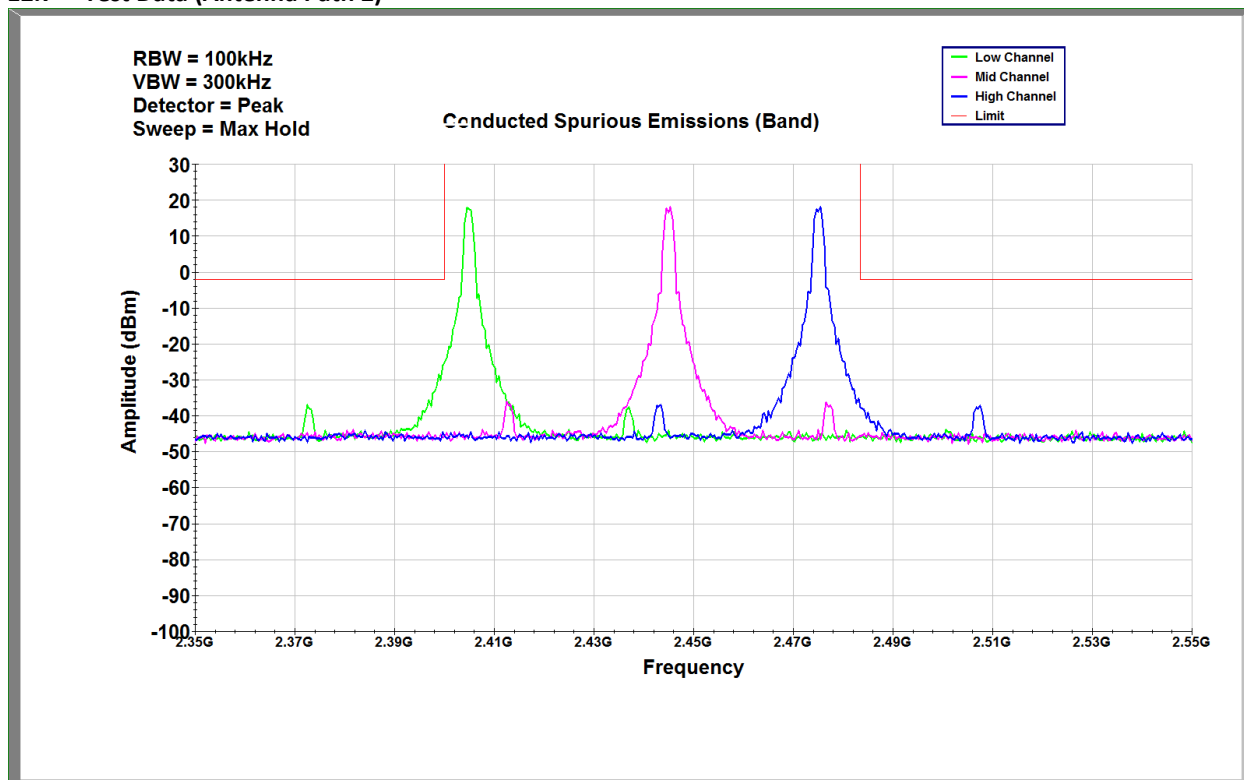
Conducted Spurious Emissions Channel 19, Antenna 1



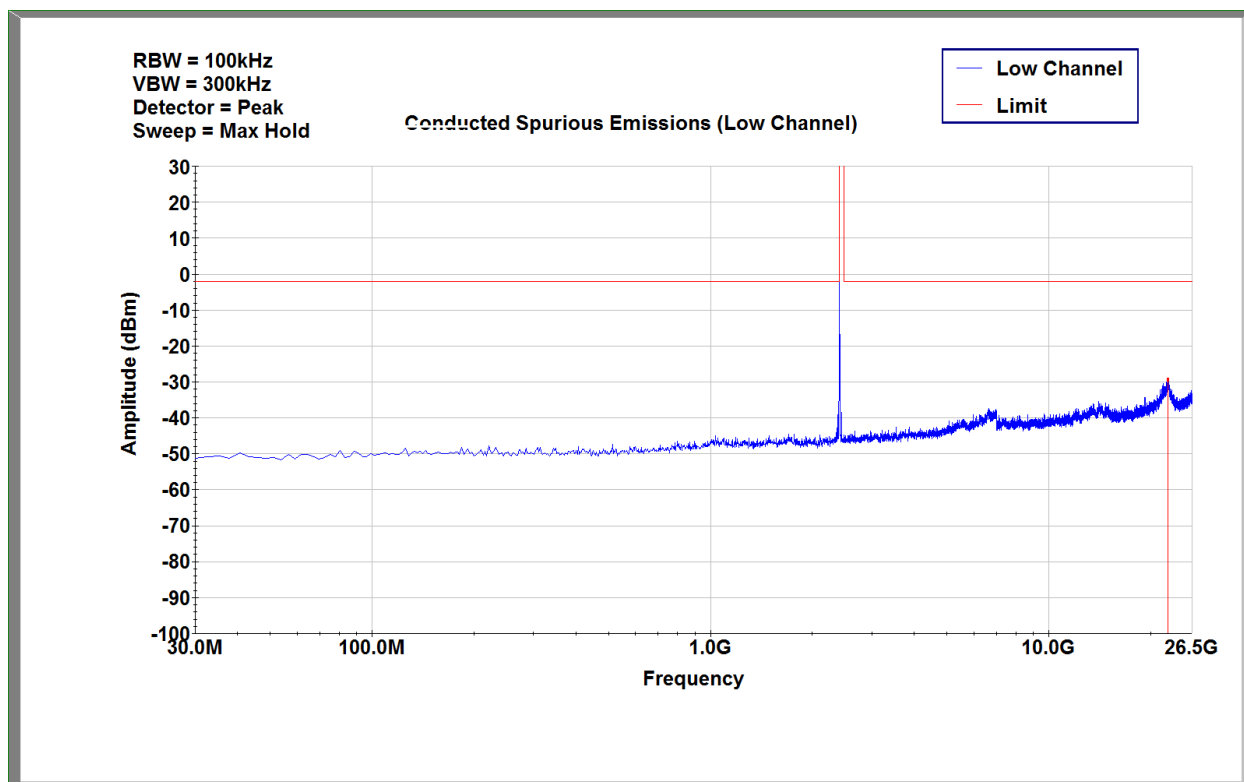
Conducted Spurious Emissions Channel 25, Antenna 1



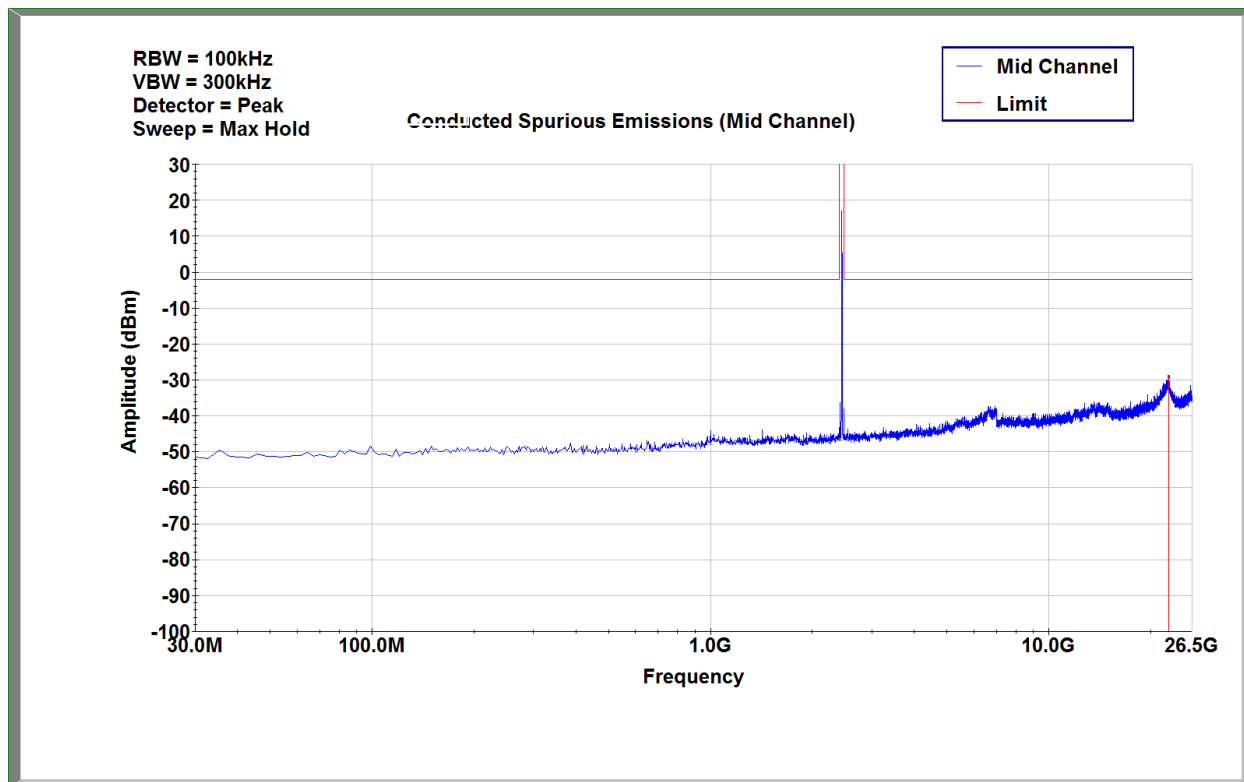
12.7 Test Data (Antenna Path 2)



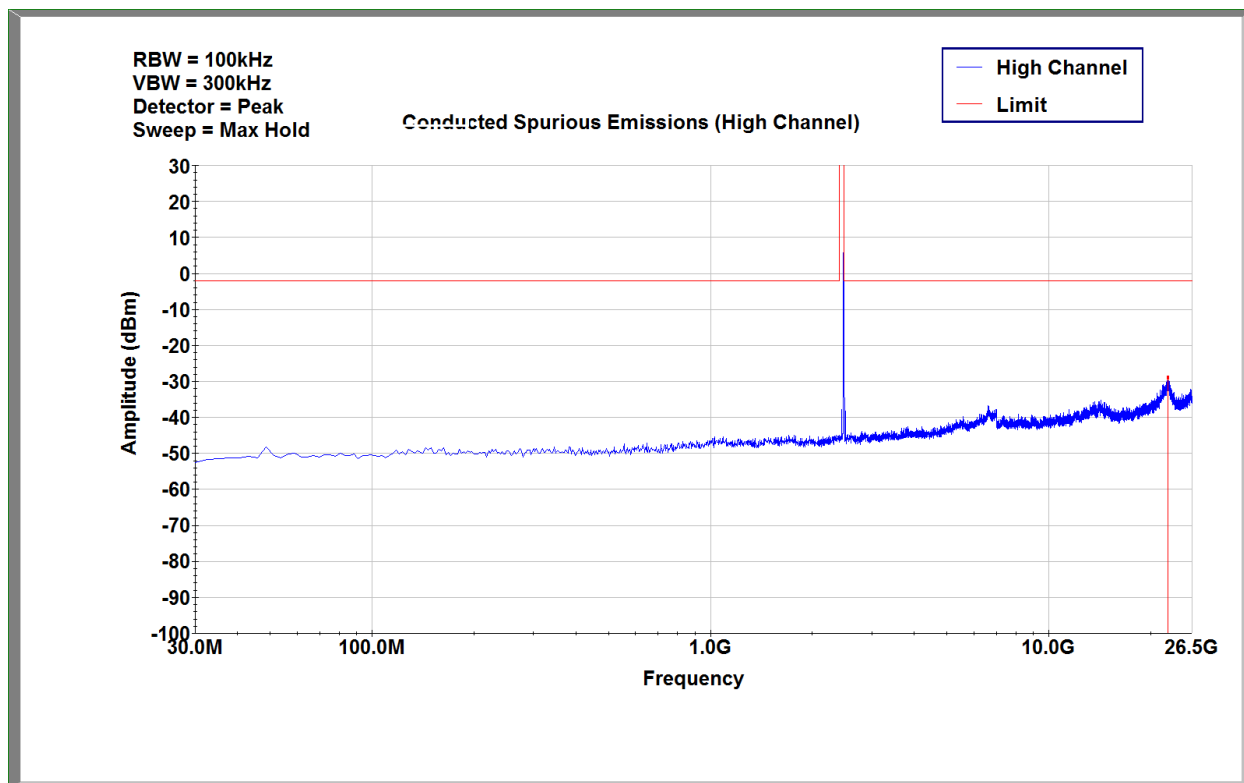
Conducted Spurious Emissions, Antenna 2 (Band Edge)



Conducted Spurious Emissions Channel 11, Antenna 2



Conducted Spurious Emissions Channel 19, Antenna 2



Conducted Spurious Emissions Channel 25, Antenna 2



13 Antenna Requirement

13.1 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).

13.2 Test Results

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

**14 Revision History**

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	9/23/2021	104486676LEX-003	BCT	BZ	Original Issue