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KCF Technologies, Inc.
TEST REPORT

SCOPE OF WORK
EMC TESTING – SD-BASE-4

REPORT NUMBER
104699147LEX-001.1

ISSUE DATE **REVISED DATED**
8/5/2022 8/9/2022

PAGES
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DOCUMENT CONTROL NUMBER
Non-Specific EMC Report Shell Rev. December 2017

EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 104699147LEX-001.1
Project Number: G104699147

Report Issue Date: 8/5/2022
Report Revised Date: 8/9/2022

Model(s) Tested: SD-BASE-4

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

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

Client:
KCF Technologies, Inc.
336 S Fraser St
State College, PA 16801-4830
USA

Report prepared by

Seth Parker, Associated Engineer

Report reviewed by

Brian Lackey, Team Leader

Table of Contents

1 Introduction and Conclusion

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

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

2 Test Summary

Section	Test full name	Result
6	Occupied Bandwidth (FCC Part 15.247, RSS-247 Issue 2 § 5.2(a))	Pass
7	Output Power (FCC Part 15.247(b)(3), RSS-247 Issue 2 § 5.4(d))	Pass
8	Carrier Frequency Separation (FCC Part 15.247, RSS-247 Issue 2 § 5.2)	Pass
9	Number of Hopping Frequencies (FCC Part 15.247, RSS Issue 2)	Pass
10	Time of Occupancy (FCC Part 15.247, RSS Issue 2)	Pass
11	Radiated Spurious Emissions & Band Edge (FCC Part 15.247, RSS Issue 2)	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
14	Revision History	

3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	KCF Technologies, Inc.
Address:	336 S Fraser St State College, PA 16801-4830 USA
Contact:	Micah Gregory
Email:	mgregory@kcftech.com
Manufacturer Information	
Manufacturer Name:	KCF Technologies, Inc.
Manufacturer Address:	336 S Fraser St State College, PA 16801-4830 USA

4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	SD-BASE-4
Model Numbers	SD-BASE-4
Receive Date	6/4/2021
Test Start Date	7/13/2022
Test End Date	8/3/2022
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	120VAC
Frequency Band(s)	2400-2483.5MHz
Modulation Type(s)	GFSK
Test Channel(s)	2402MHz, 2441MHz, 2480MHz
Description of Equipment Under Test (provided by client)	
The SD-BASE-4 is an IoT Gateway device. It serves as a gateway for wireless industrial sensors, collecting, buffering and forwarding the sensor data to the cloud.	

4.1 Variant Models:

There were no variant models covered by this evaluation.

5 System Setup and Method

5.1 Method:

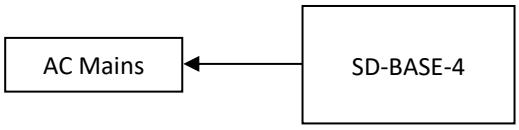
Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013

No.	Descriptions of EUT Exercising
1	The SD-BASE-4 was powered by 120V/60Hz and transmitting a Bluetooth BDR, 2-EDR, or 3-EDR signal on a low, middle, or high channel.

Cables					
Qty	Description	Length (m)	Shielding	Ferrites	Termination
1	AC Mains	2	No	No	Plug
1	Ethernet	2	No	No	RJ45

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
-	-	-	-

5.2 EUT Block Diagram:



6 20dB Bandwidth and 99% Occupied Bandwidth

6.1 Test Method

Tests are performed in accordance with ANSI C63.10: 2013 clause 6.9.2.

6.2 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Signal Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022

6.3 Test Conditions

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey		
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

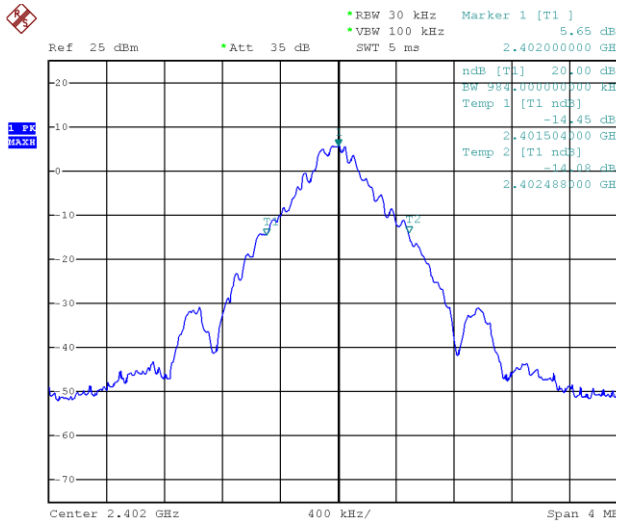
6.4 Test Data

Operating Mode	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
BDR	2402	0.984	0.928
	2441	0.984	0.920
	2480	0.976	0.920
2-EDR	2402	1.378	1.205
	2441	1.378	1.205
	2480	1.378	1.205
3-EDR	2402	1.353	1.212
	2441	1.353	1.212
	2480	1.353	1.212

Deviations, Additions, or Exclusions: None

6.5 Spectrum Plots

6.5.1 BDR, 2402 MHz



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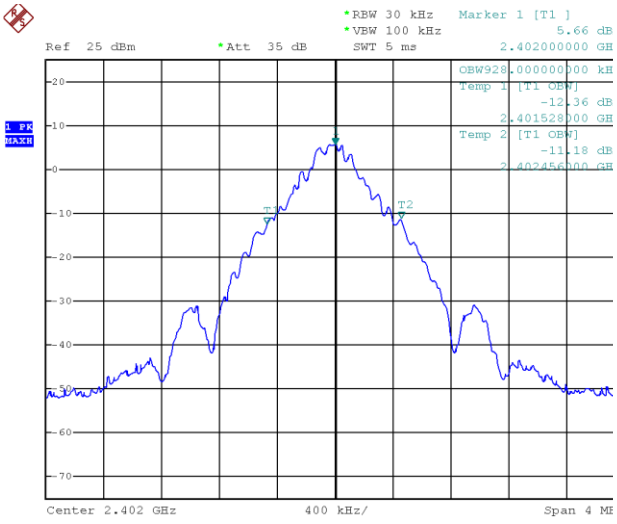

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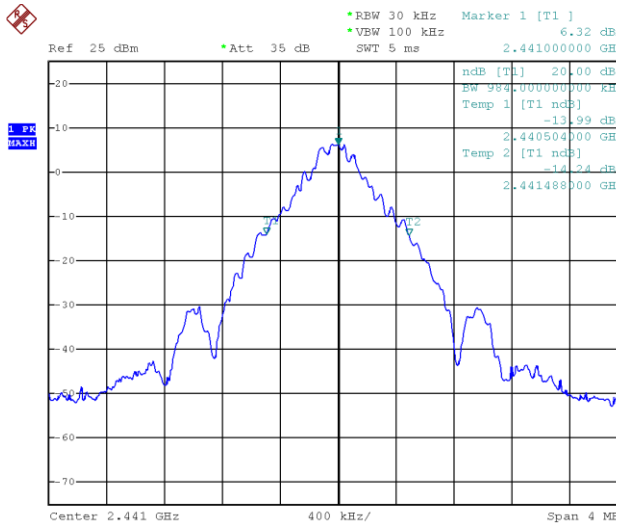
99% Bandwidth

6.5.2 BDR, 2441 MHz



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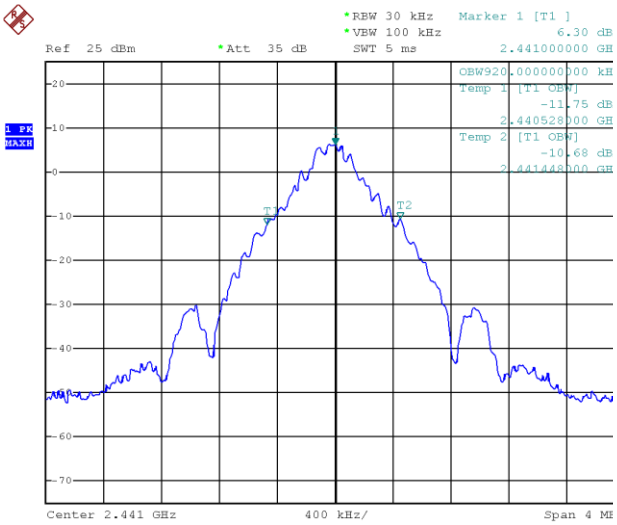

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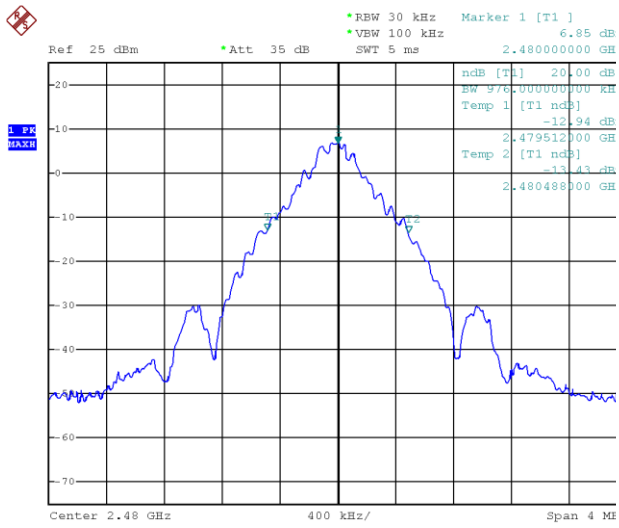
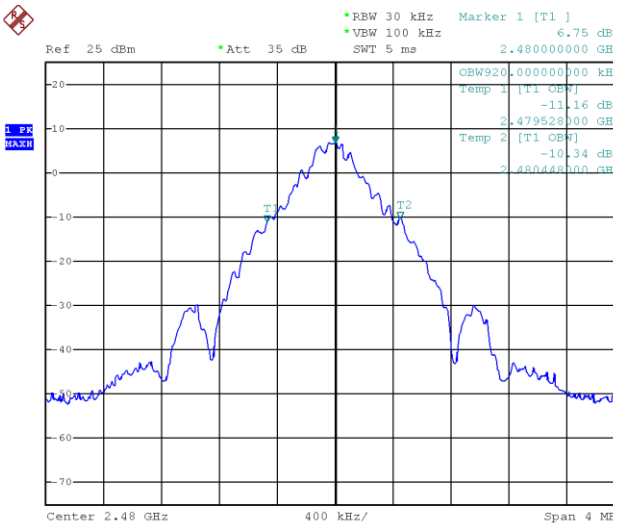
99% Bandwidth

6.5.3 BDR, 2480 MHz

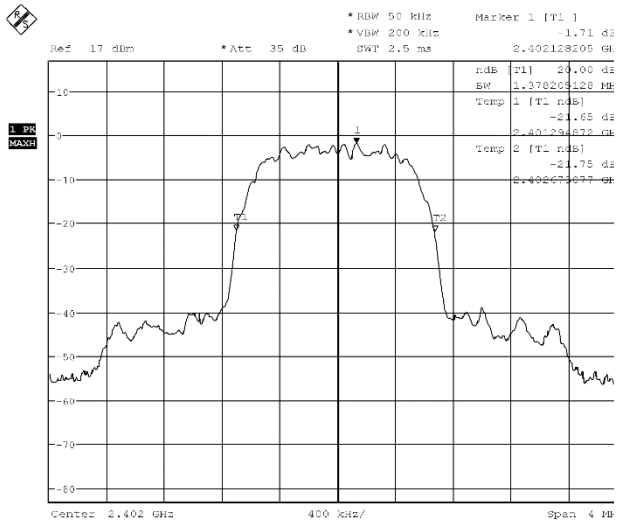


20dB Bandwidth

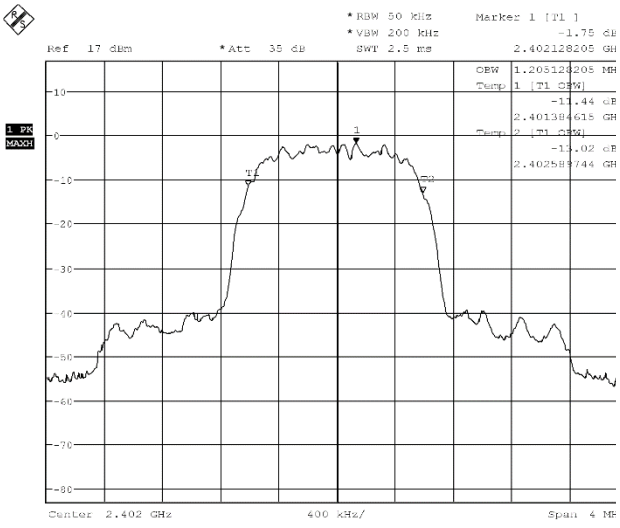


99% Bandwidth

6.5.4 2-EDR, 2402 MHz

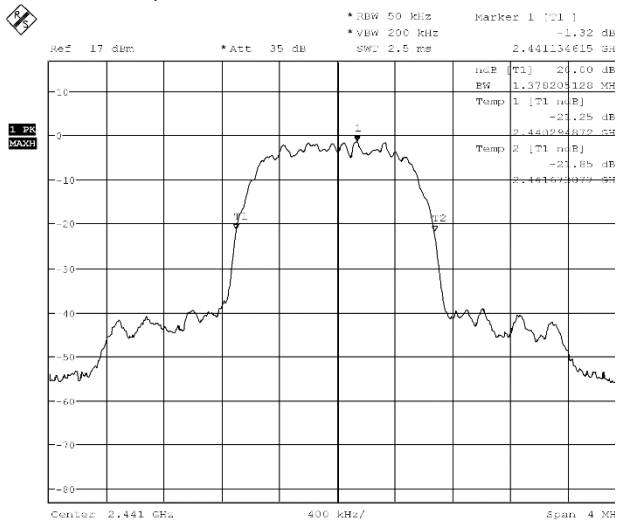


20dB Bandwidth



99% Bandwidth

6.5.5 2-EDR, 2441 MHz



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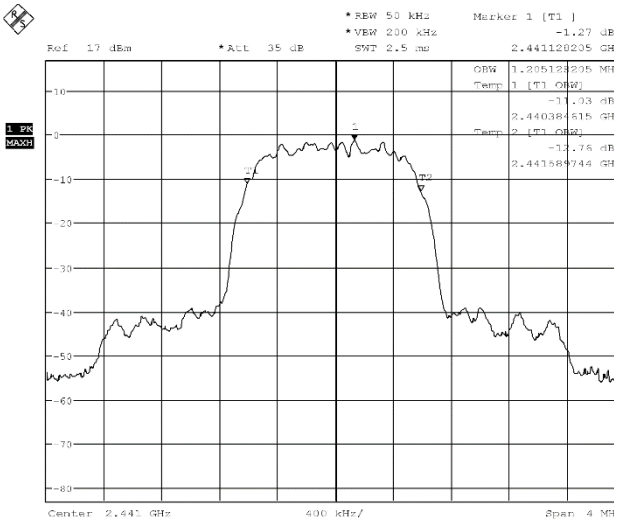
20dB Bandwidth



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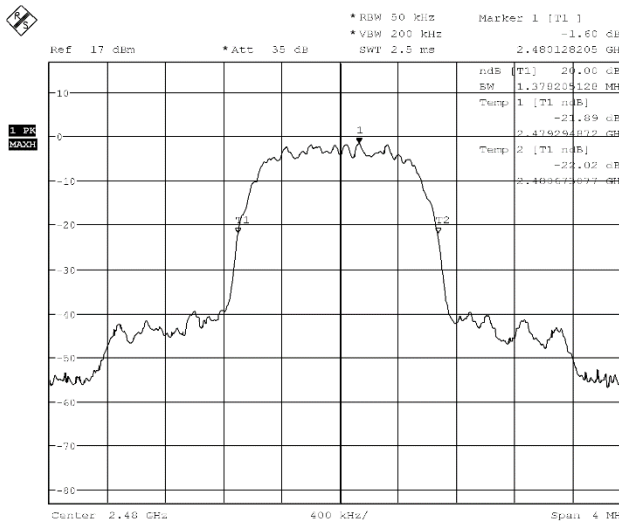
99% Bandwidth

6.5.6 2-EDR, 2480 MHz



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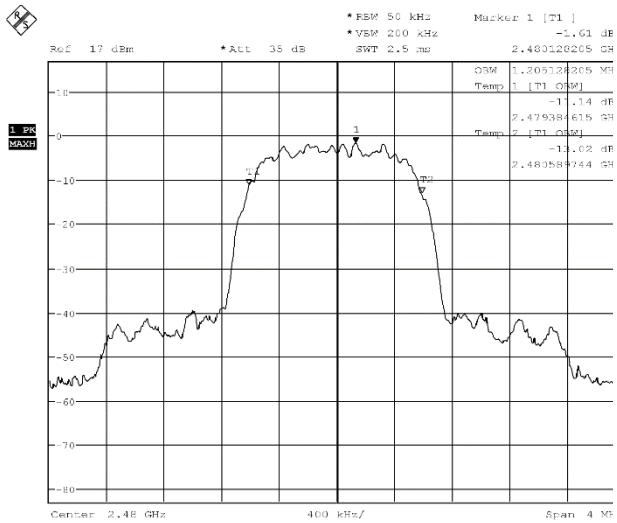
20dB Bandwidth



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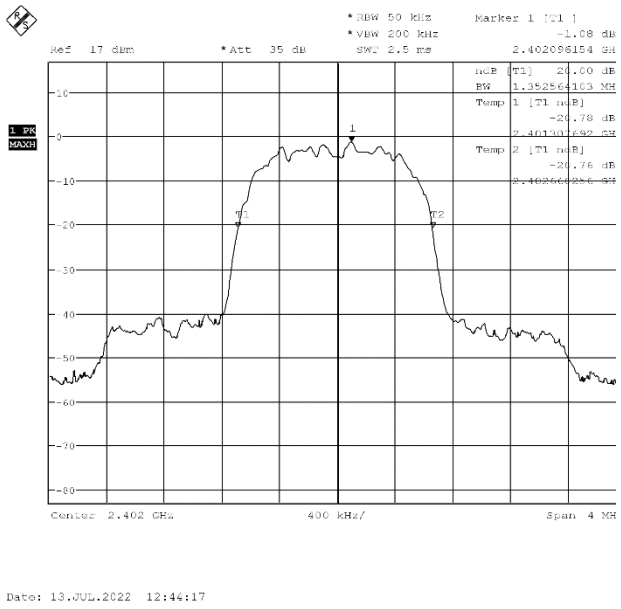
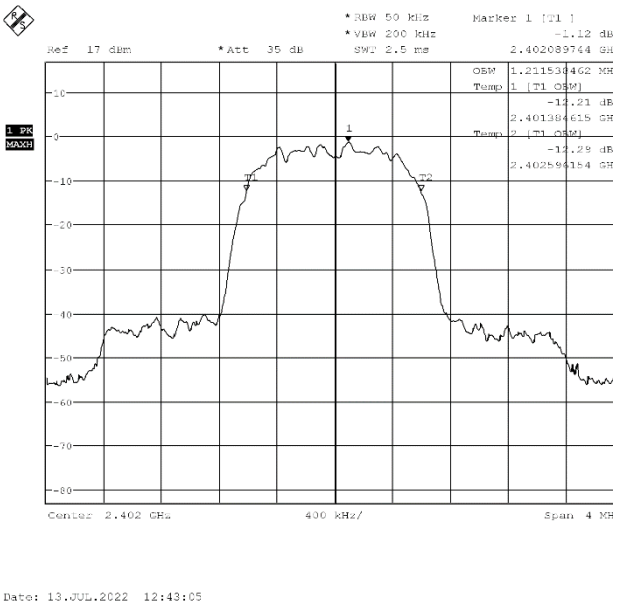
99% Bandwidth

6.5.7 3-EDR, 2402 MHz

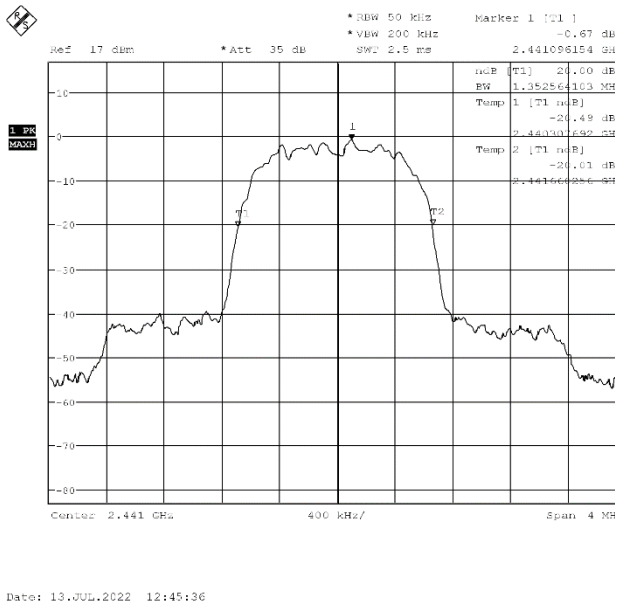


20dB Bandwidth

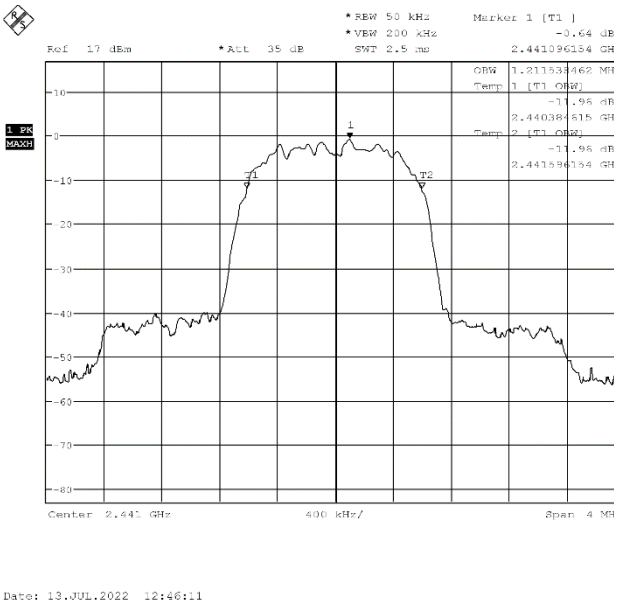


99% Bandwidth

6.5.8 3-EDR, 2441 MHz

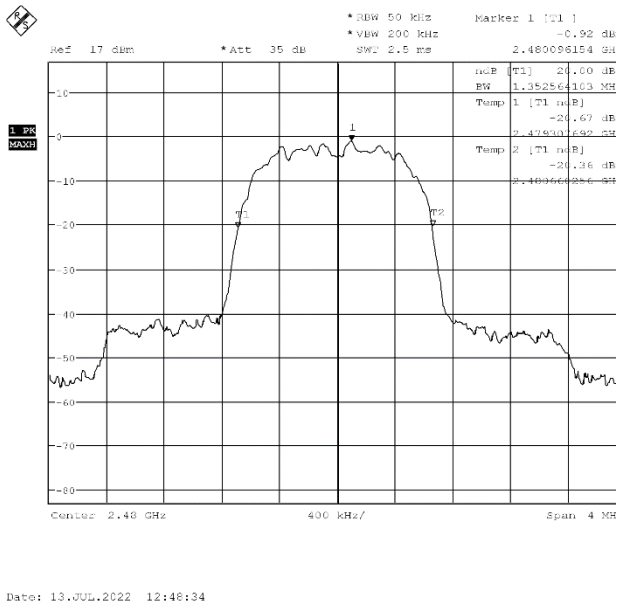


20dB Bandwidth

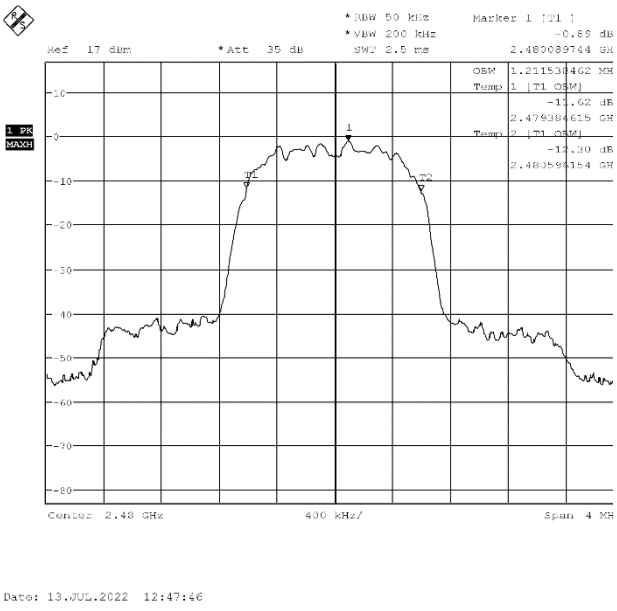


99% Bandwidth

6.5.9 3-EDR, 2480 MHz



20dB Bandwidth



99% Bandwidth

7 Maximum Peak Output Power

7.1 Test Limits

FCC Part 15.247(b)(1):

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 Issue 2 § 5.4(b):

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

7.2 Test Method

Tests are performed in accordance with ANSI C63.10: 2013 clause 7.8.5.

7.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Signal Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022

7.4 Test Conditions

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

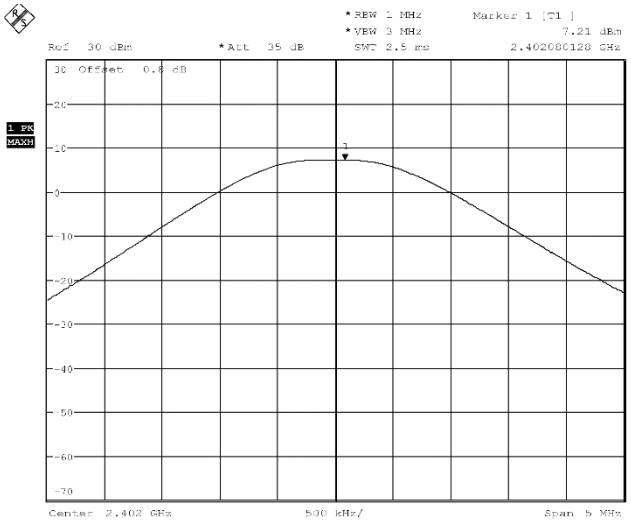
7.5 Test Data

Operating Mode	Frequency (MHz)	Conducted Power (dBm)	Limit		Margin (dB)
			(mW)	(dBm)	
BDR	2402	7.21	125	20.97	13.76
	2441	7.62			13.35
	2480	7.43			13.54
2-EDR	2402	5.81			15.16
	2441	6.27			14.70
	2480	6.04			14.93
3-EDR	2402	5.94			15.03
	2441	6.34			14.63
	2480	6.16			14.81

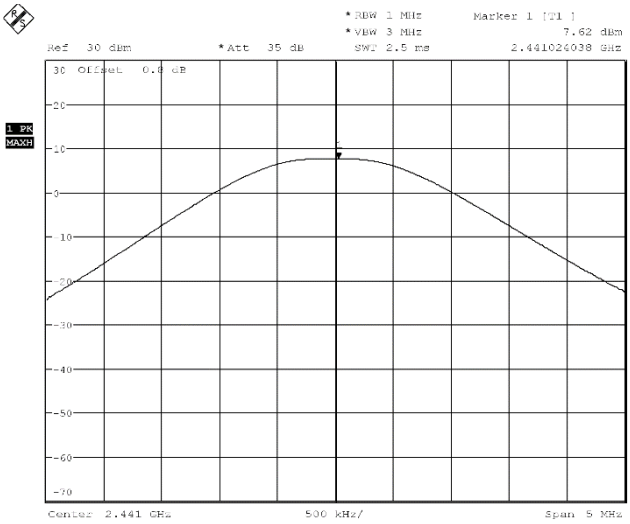
Deviations, Additions, or Exclusions: None

7.6 Spectrum Plots

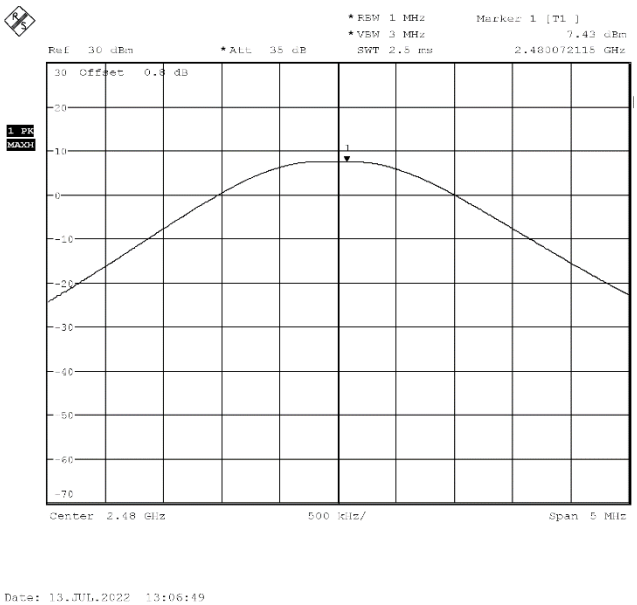
7.6.1 BDR



2402 MHz

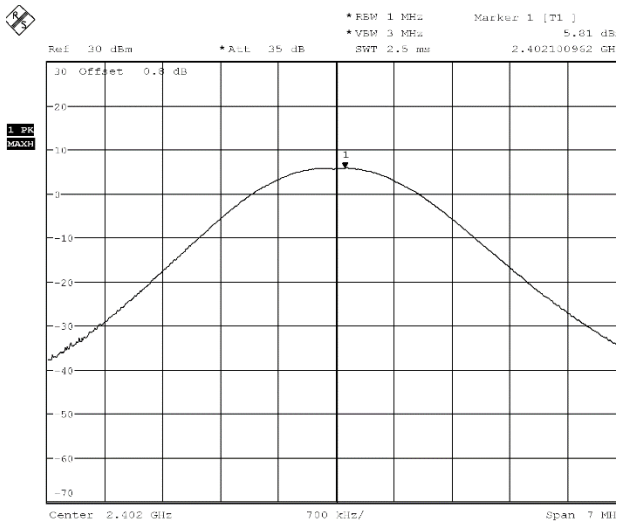


2440 MHz



2480 MHz

7.6.2 2-EDR



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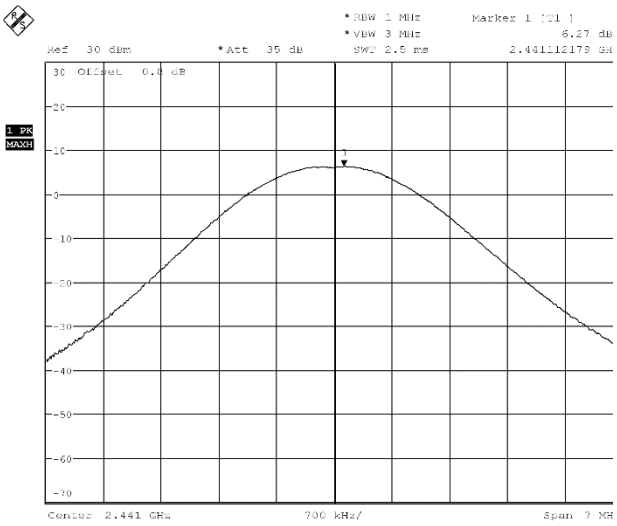
2402 MHz



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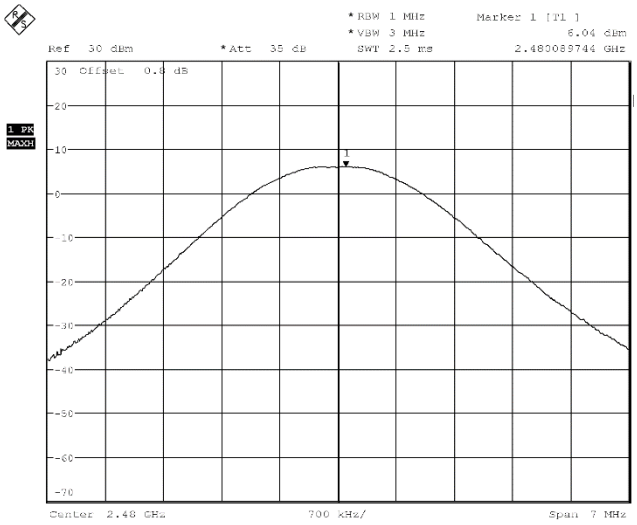
2441 MHz



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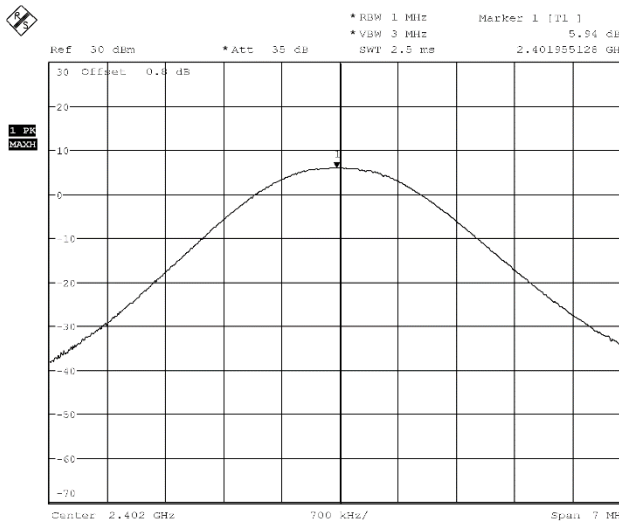
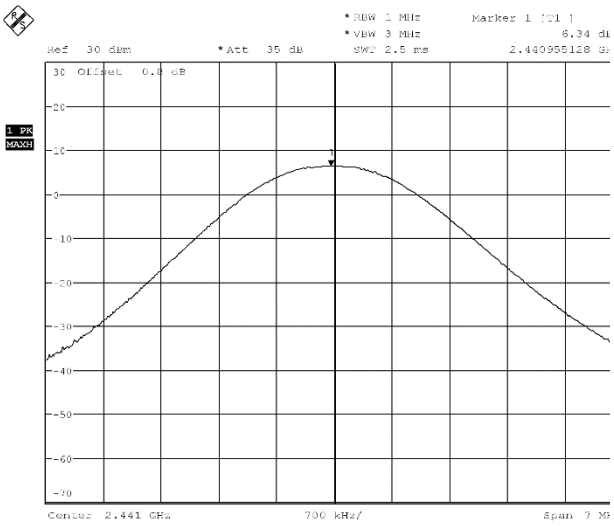
2480 MHz

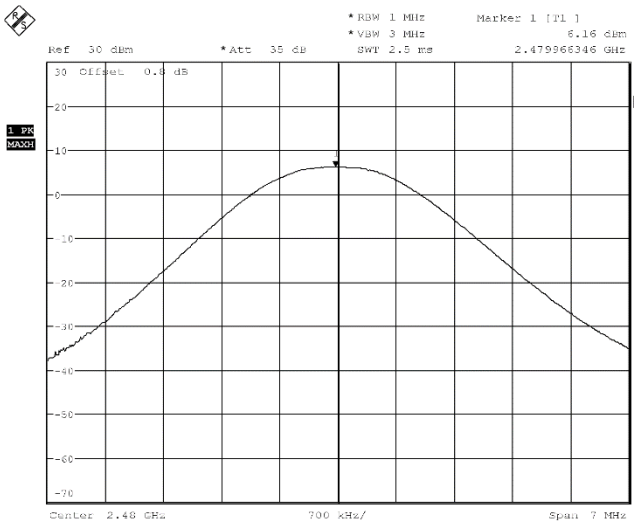
7.6.3 3-EDR



2402 MHz



2440 MHz



2480 MHz

8 Carrier Frequency Separation

8.1 Test Limit

FCC Title 47 CFR Part 15.247(a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

RSS-247 Issue 2 § 5.1(b):

FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

8.2 Test Method

Tests are performed in accordance with ANSI C63.10: 2013 clause 7.8.2.

8.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Signal Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022

8.4 Test Conditions

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

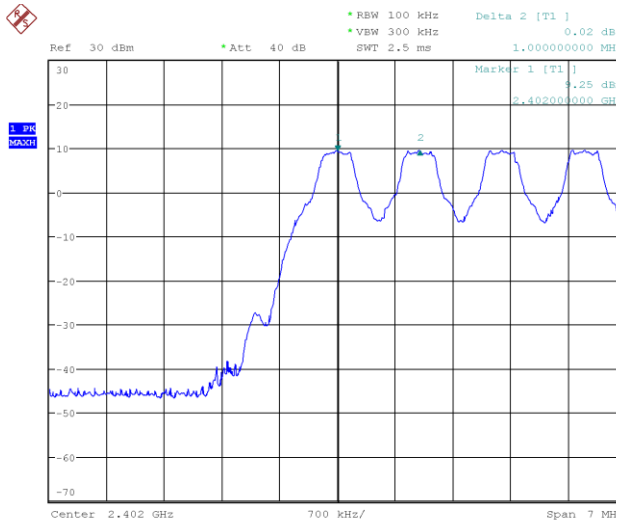
8.5 Test Data

Operating Mode	Frequency (MHz)	Measured Value (MHz)	Limit (MHz)
DH5	2402	1	≥ 0.618
	2441	1	≥ 0.613
	2480	1	≥ 0.613
2-DH5	2402	1	≥ 0.803
	2441	1	≥ 0.803
	2480	1	≥ 0.803
3-DH5	2402	1	≥ 0.808
	2441	1	≥ 0.808
	2480	1	≥ 0.808

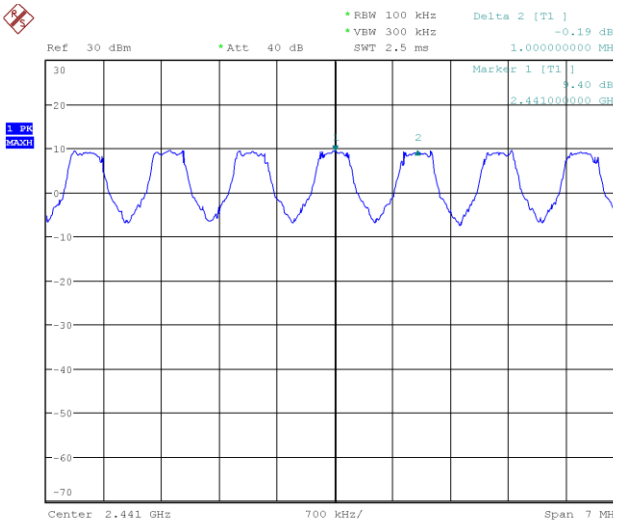
Deviations, Additions, or Exclusions: Limits were applied to two-thirds of the 20dB bandwidth specified in section 6.4.

8.6 Spectrum Plots

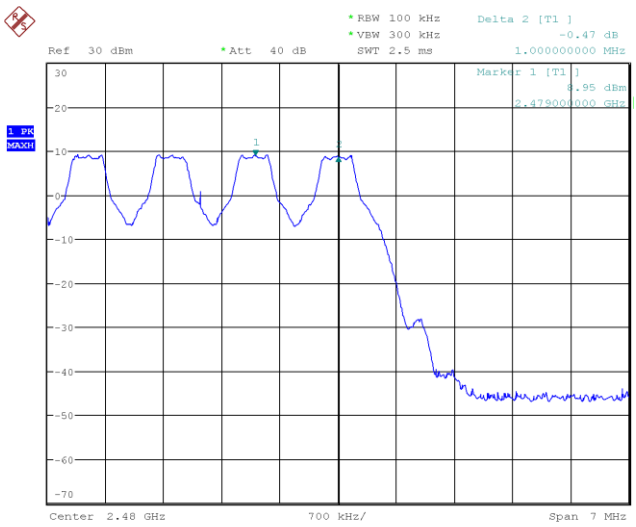
8.6.1 DH5, FHSS On



2402 MHz

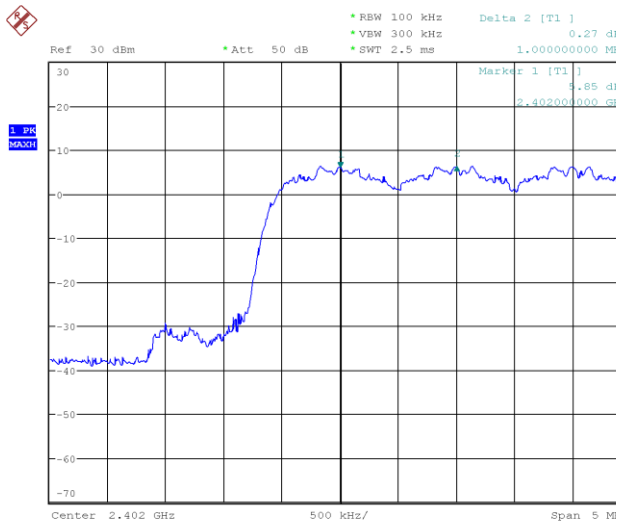


2441 MHz

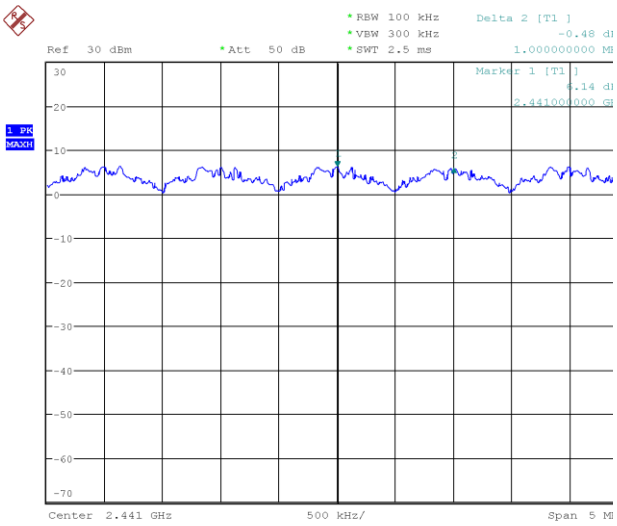


2480 MHz

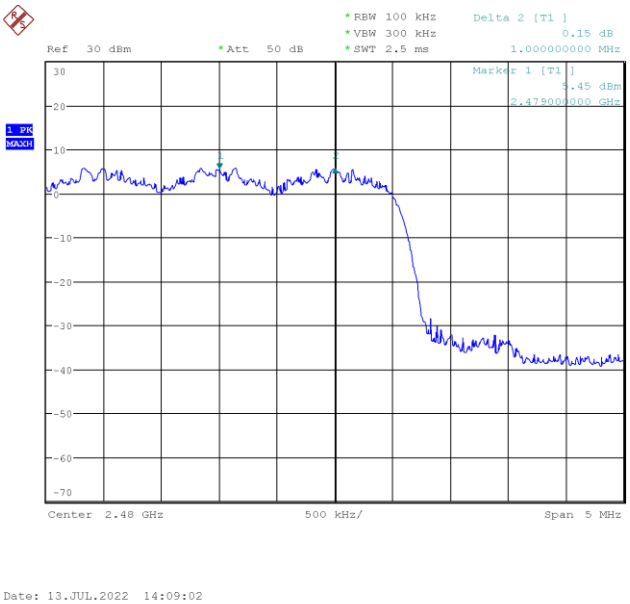
8.6.2 2-DH5, FHSS On



2402 MHz

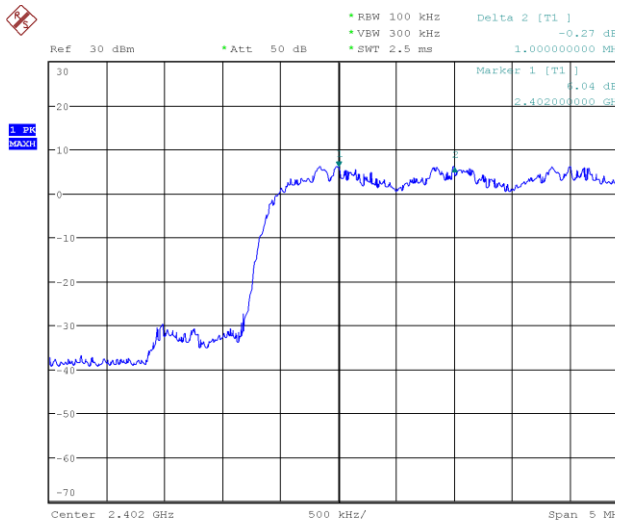


2441 MHz

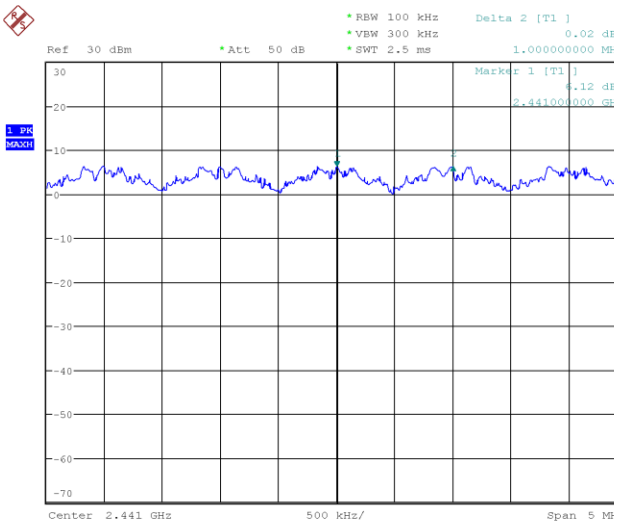


2480 MHz

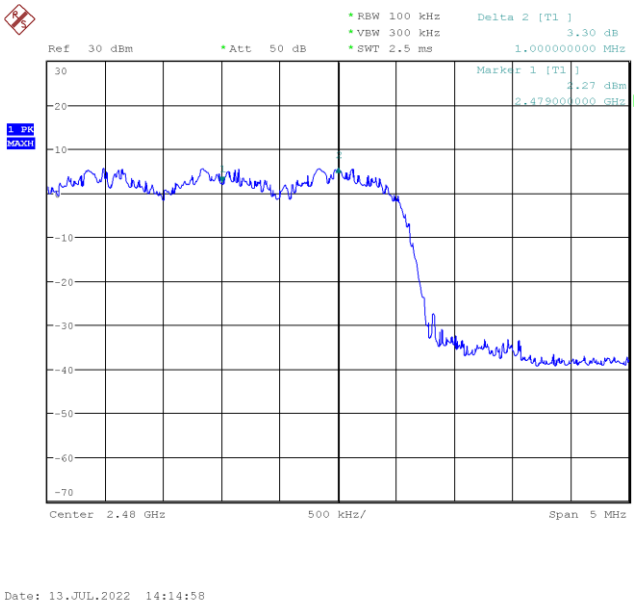
8.6.3 3-DH5, FHSS On



2402 MHz



2441 MHz



2480 MHz

9 Number of Hopping Frequencies

9.1 Test Limits

FCC Part 15.247(a)(1)(iii):

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used

RSS-247 Issue 2 § 5.1(d):

FHSs operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

9.2 Test Method

Tests are performed in accordance with ANSI C63.10: 2013 clause 7.8.3.

9.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Signal Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022

9.4 Test Conditions

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

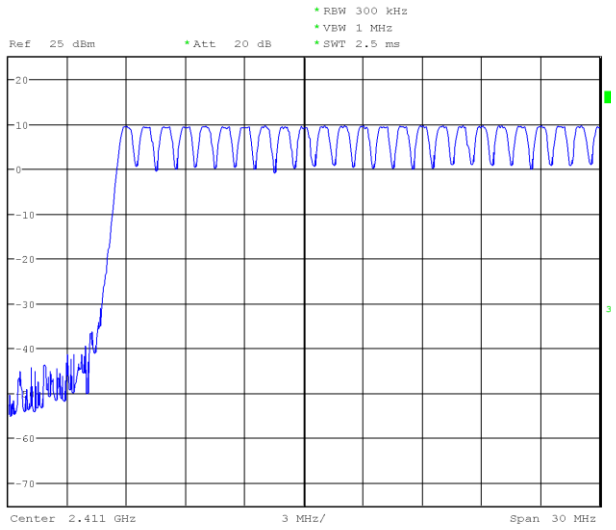
9.5 Test Data

Operating Mode	Measured Value	Limit
DH5	79	≥ 15
2-DH5	79	≥ 15
3-DH5	79	≥ 15

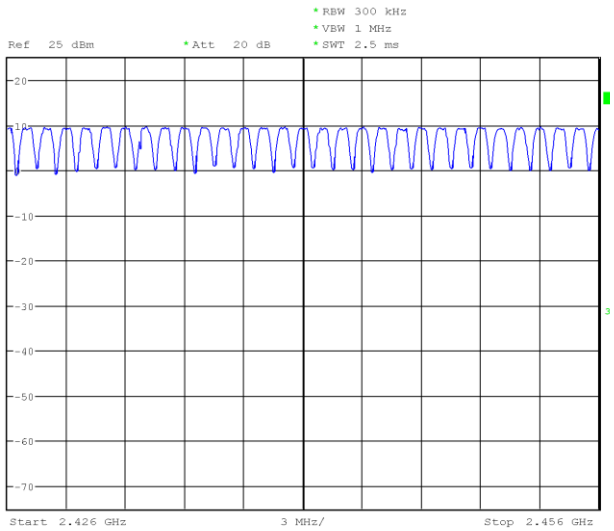
Deviations, Additions, or Exclusions: None

9.6 Spectrum Plots

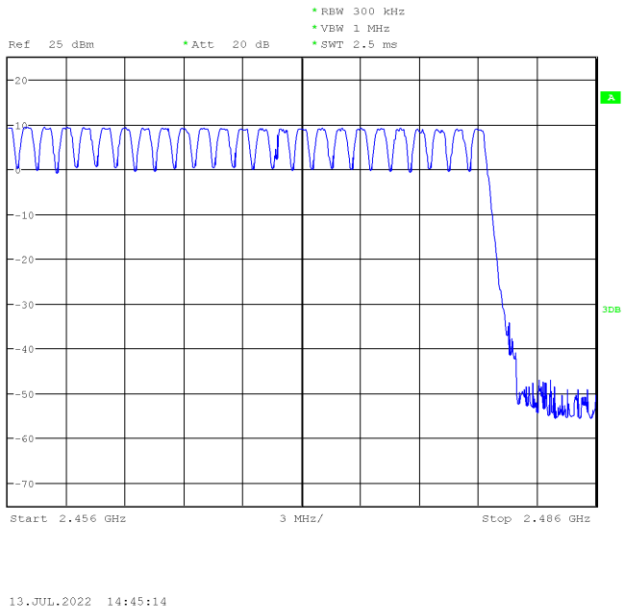
9.6.1 DH5, FHSS On



2402 MHz

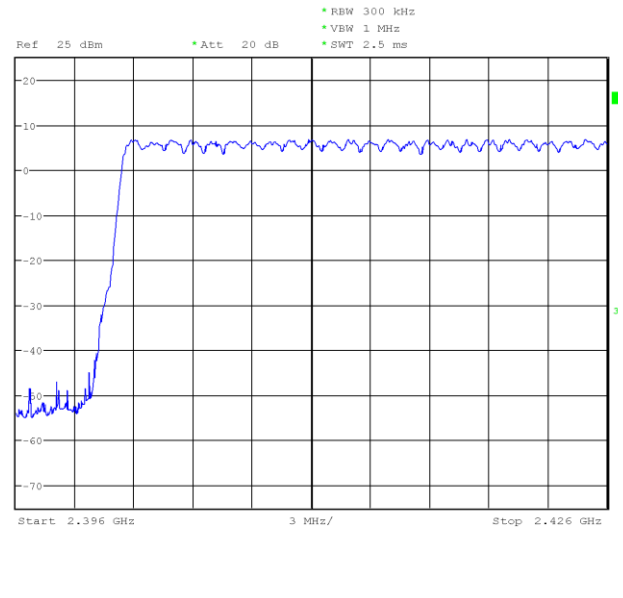


2441 MHz

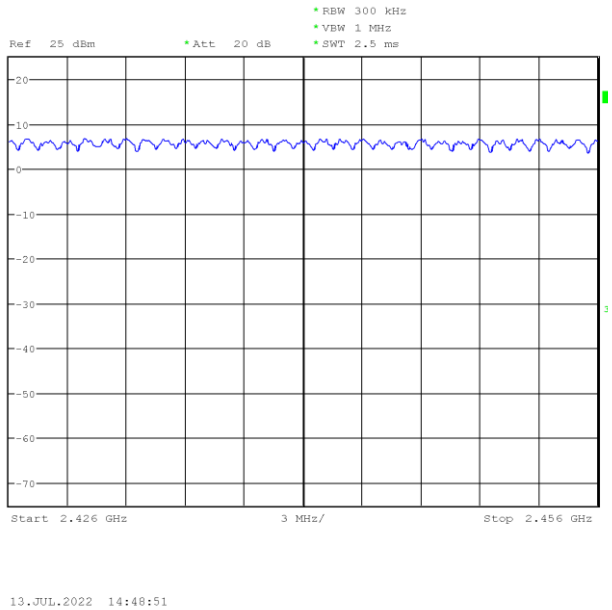


2480 MHz

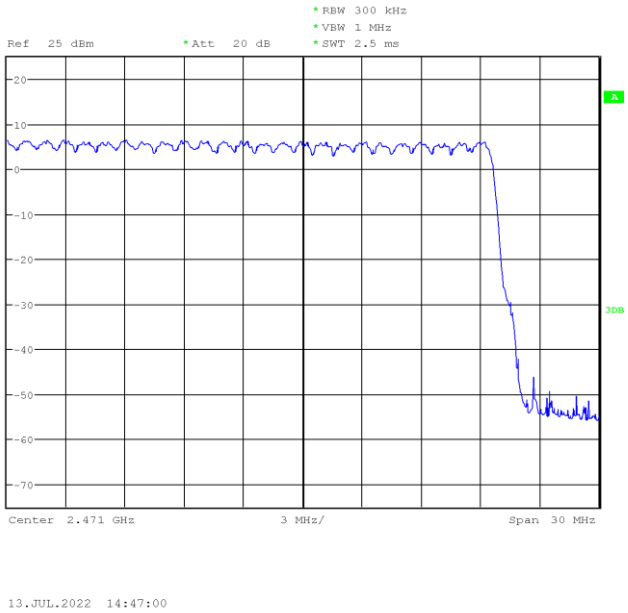
9.6.2 2-DH5, FHSS On



2402 MHz

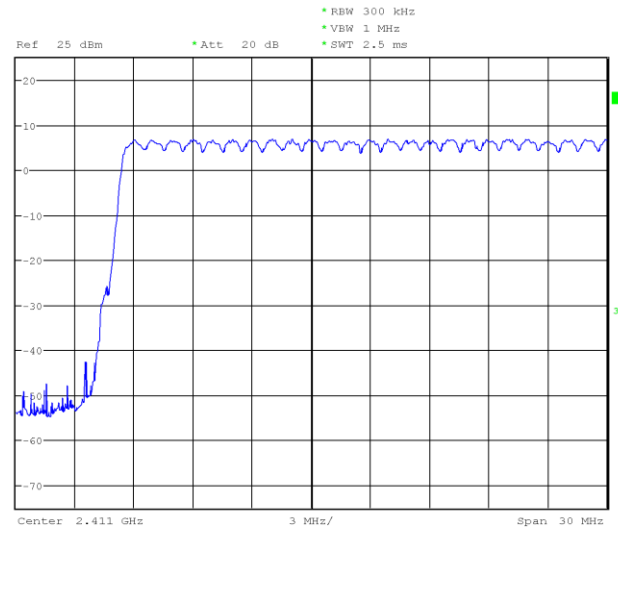


2441 MHz

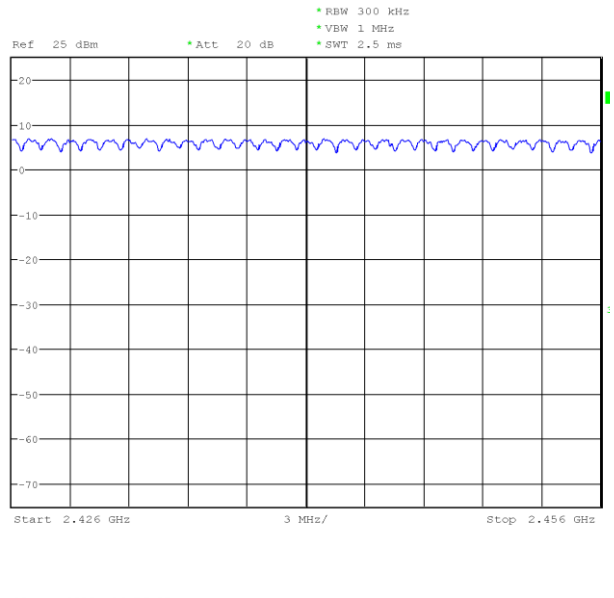


2480 MHz

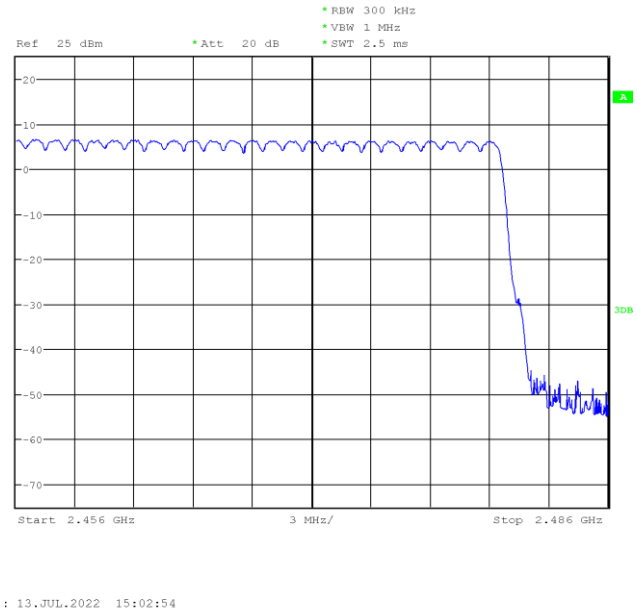
9.6.3 3-DH5, FHSS On



2402 MHz



2441 MHz



2480 MHz

10 Time of Occupancy

10.1 Test Limits

FCC Part 15.247(a)(1)(iii):

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used

RSS-247 Issue 2 § 5.1(d):

FHSs operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

10.2 Test Method

Tests are performed in accordance with ANSI C63.10: 2013 clause 7.8.4.

10.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Signal Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022

10.4 Test Conditions

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

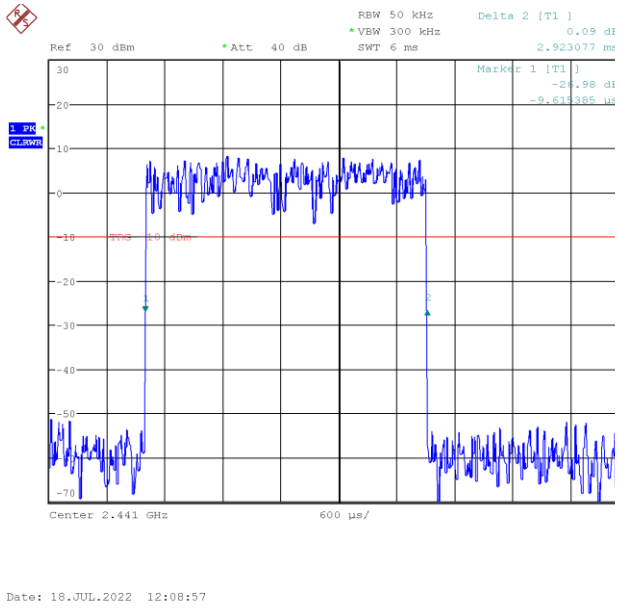
10.5 Test Data

Operating Mode	Pulse Width (ms)	Number of hops per channel in specified period	Time of Occupancy (ms)
DH5	2.923	84	245.5
2-DH5	2.917	120	350.0
3-DH5	2.913	100	291.3

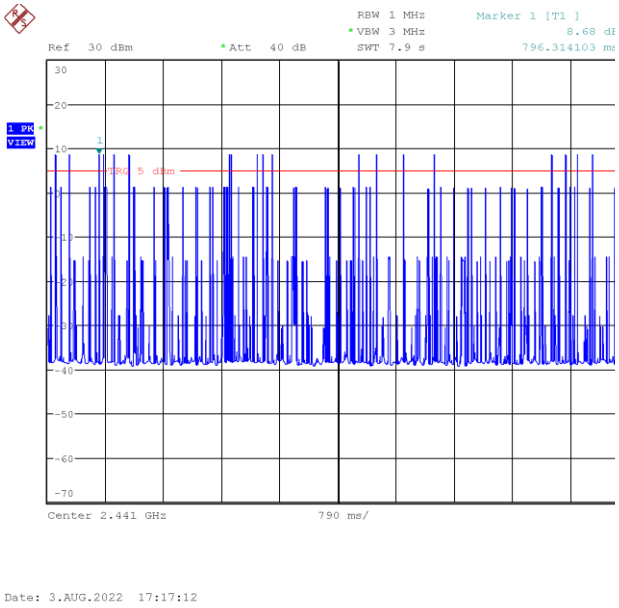
Deviations, Additions, or Exclusions: To find the number of hops in the specified period of 31.6 seconds, the number of hops in 7.9 seconds was counted and multiplied by 4.

10.6 Spectrum Plots

10.6.1 DH5, 2441 MHz

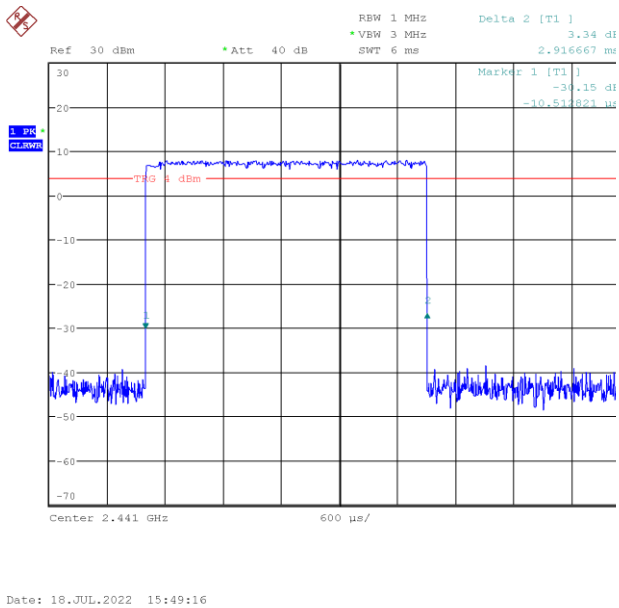


Pulse Width

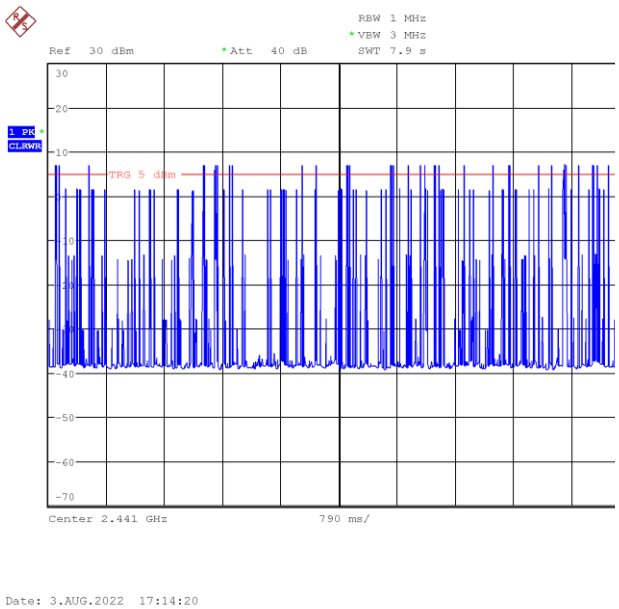


Number of Hops in 7.9s

10.6.2 2-DH5, 2441 MHz

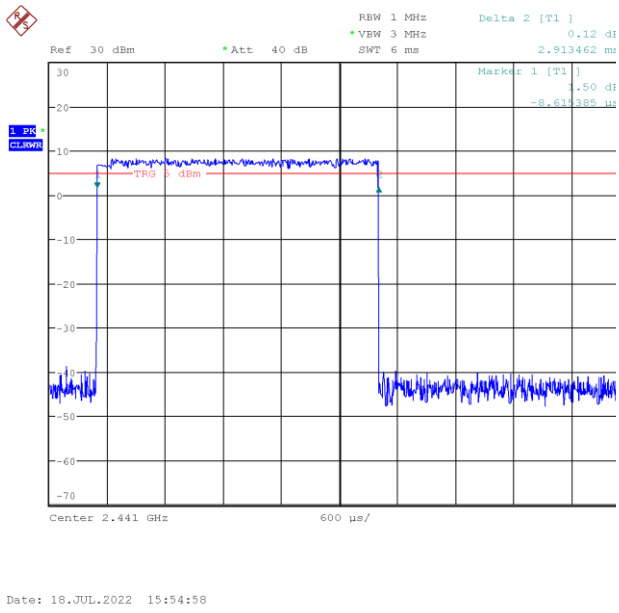


Pulse Width

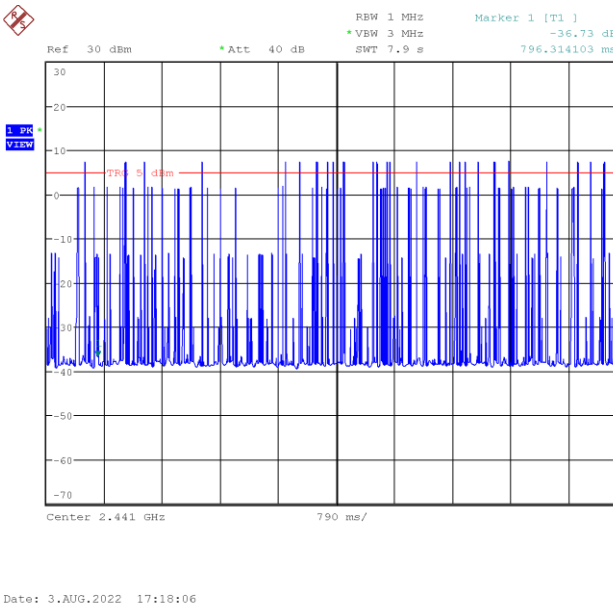


Number of Hops in 7.9s

10.6.3 3-DH5, 2441 MHz



Pulse Width



Number of Hops in 7.9s

11 Radiated Spurious Emissions & Band Edge

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 § 11.12.1 Radiated emission measurements.

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.

11.3 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 dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
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 dBμV 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 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

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

11.4 Test Equipment Used

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

11.5 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 10.60.20

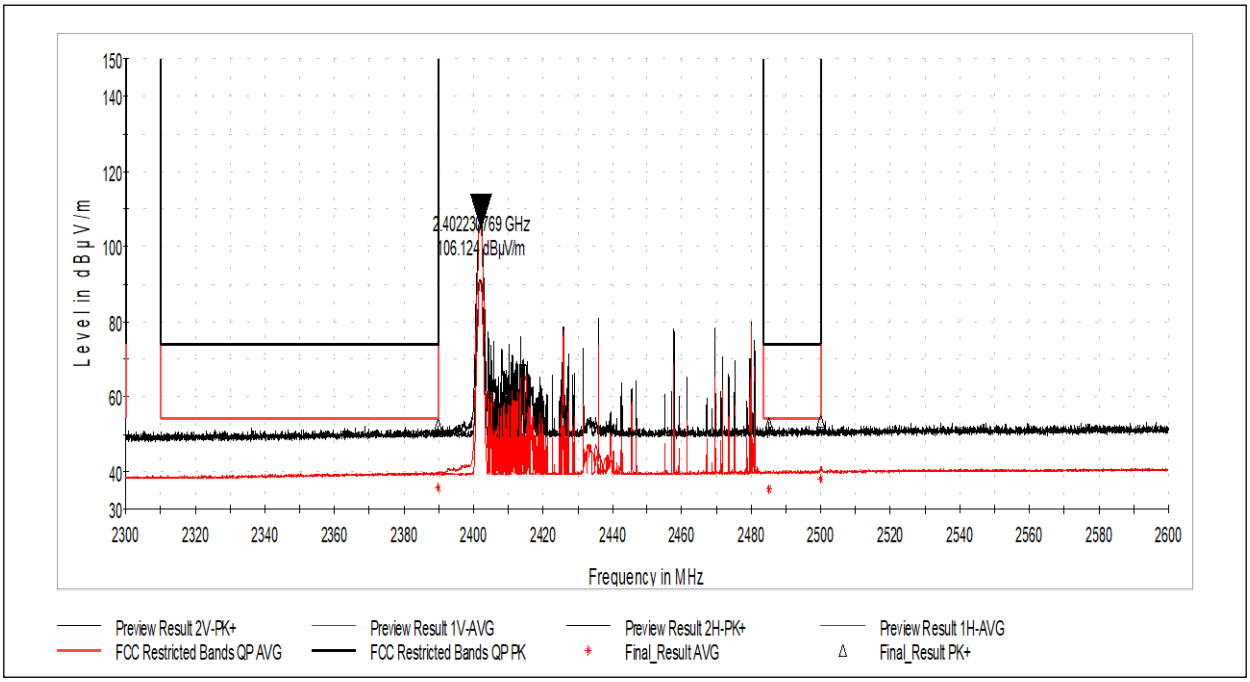
11.6 Test Results

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

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

11.7 Test Data: Radiated Band Edge

11.7.1 BDR, 2402 MHz



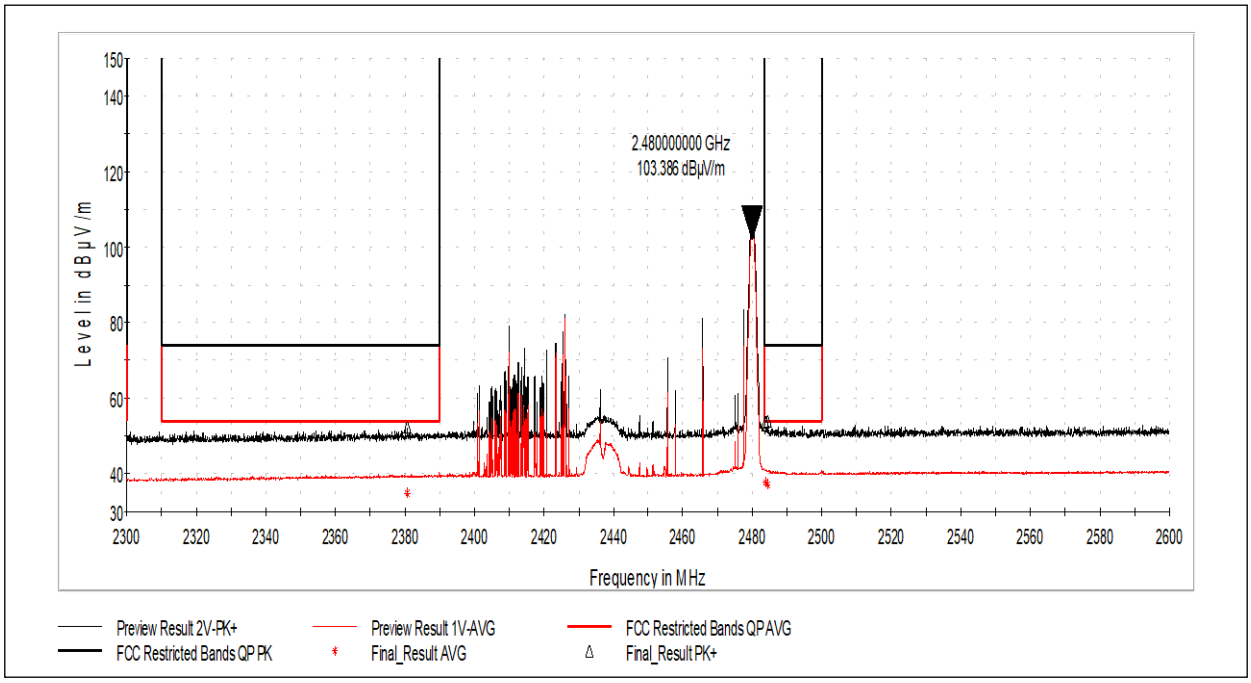
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.884615	52.38	73.979	21.60	1000.000	213.0	V	68.0	38.22
2485.019231	52.97	73.979	21.01	1000.000	216.0	V	0.0	38.47
2499.903846	53.42	73.979	20.56	1000.000	348.0	H	96.0	38.61

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.884615	35.47	53.979	18.51	1000.000	213.0	V	68.0	38.22
2485.019231	35.14	53.979	18.84	1000.000	216.0	V	0.0	38.47
2499.903846	37.78	53.979	16.20	1000.000	348.0	H	96.0	38.61

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	Limits from 15.209 in restricted bands from 15.205.
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.7.2 BDR, 2480 MHz



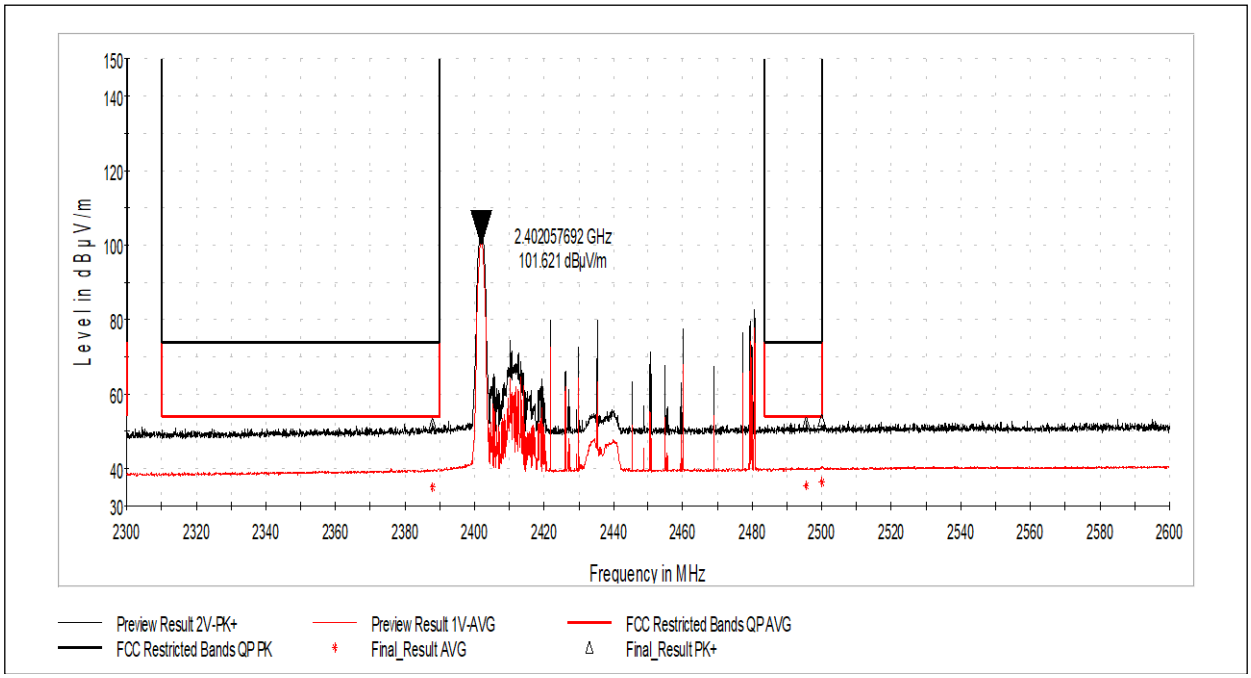
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2380.711539	52.42	73.979	21.56	1000.000	291.0	V	329.0	38.18
2483.807692	53.58	73.979	20.40	1000.000	225.0	V	69.0	38.45
2484.326923	54.01	73.979	19.97	1000.000	201.0	V	58.0	38.46

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2380.711539	34.70	53.979	19.28	1000.000	291.0	V	329.0	38.18
2483.807692	37.84	53.979	16.14	1000.000	225.0	V	69.0	38.45
2484.326923	37.21	53.979	16.77	1000.000	201.0	V	58.0	38.46

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.7.3 2-EDR, 2402 MHz



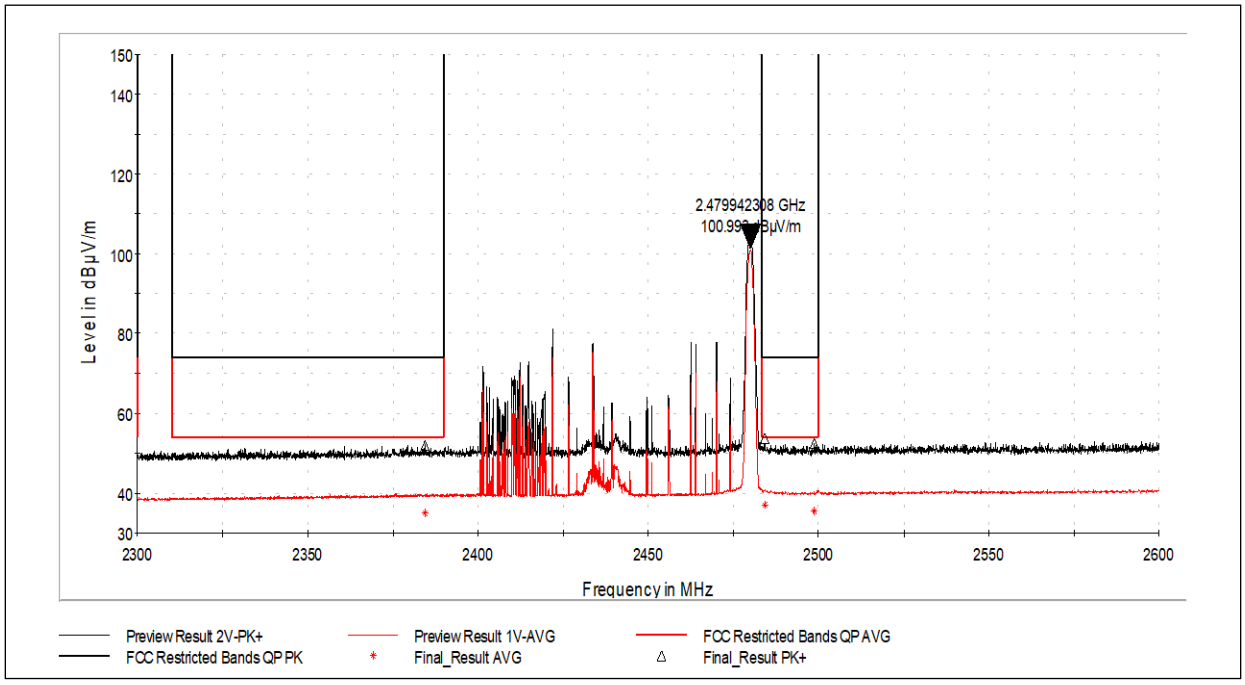
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.038462	52.05	73.979	21.93	1000.000	299.0	V	202.0	38.21
2495.519231	52.36	73.979	21.62	1000.000	114.0	V	0.0	38.57
2499.961539	52.89	73.979	21.09	1000.000	115.0	V	330.0	38.61

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.038462	35.06	53.979	18.92	1000.000	299.0	V	202.0	38.21
2495.519231	35.26	53.979	18.72	1000.000	114.0	V	0.0	38.57
2499.961539	36.46	53.979	17.52	1000.000	115.0	V	330.0	38.61

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.7.4 2-EDR, 2480 MHz



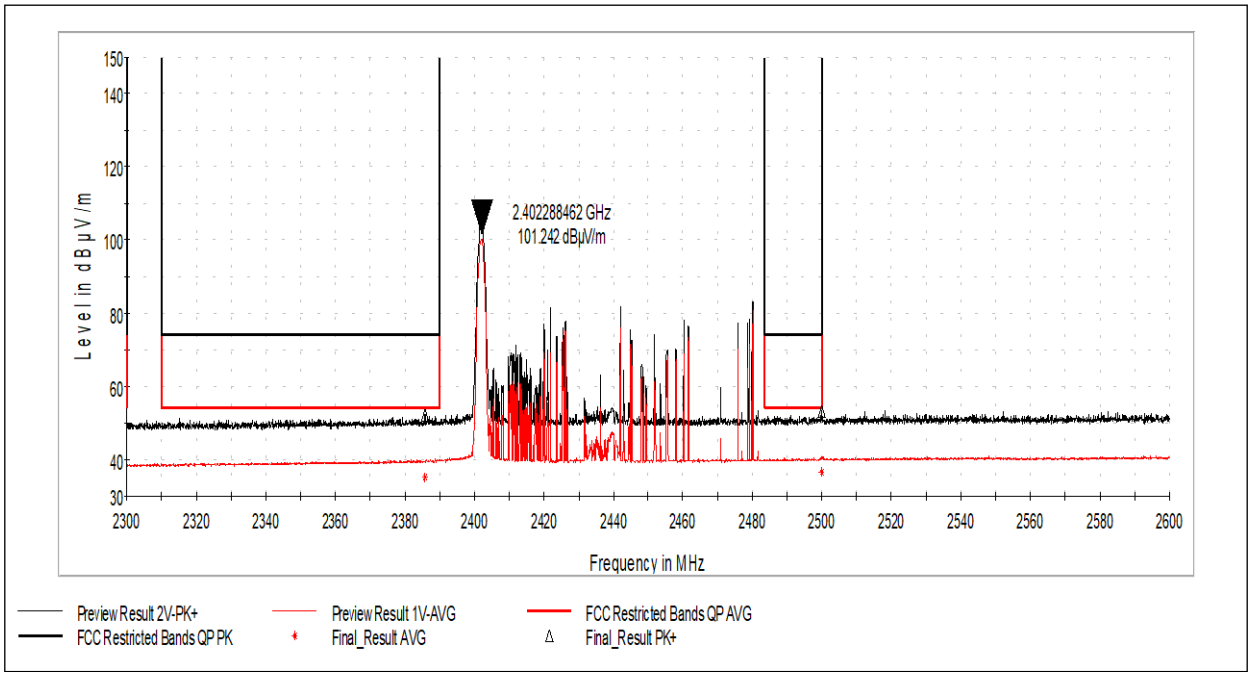
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2384.576923	51.99	73.979	21.99	1000.000	348.0	V	11.0	38.20
2484.269231	53.73	73.979	20.25	1000.000	201.0	V	62.0	38.46
2498.807692	52.33	73.979	21.65	1000.000	238.0	V	69.0	38.60

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2384.576923	34.94	53.979	19.04	1000.000	348.0	V	11.0	38.20
2484.269231	36.92	53.979	17.06	1000.000	201.0	V	62.0	38.46
2498.807692	35.41	53.979	18.57	1000.000	238.0	V	69.0	38.60

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.7.5 3-EDR, 2402 MHz



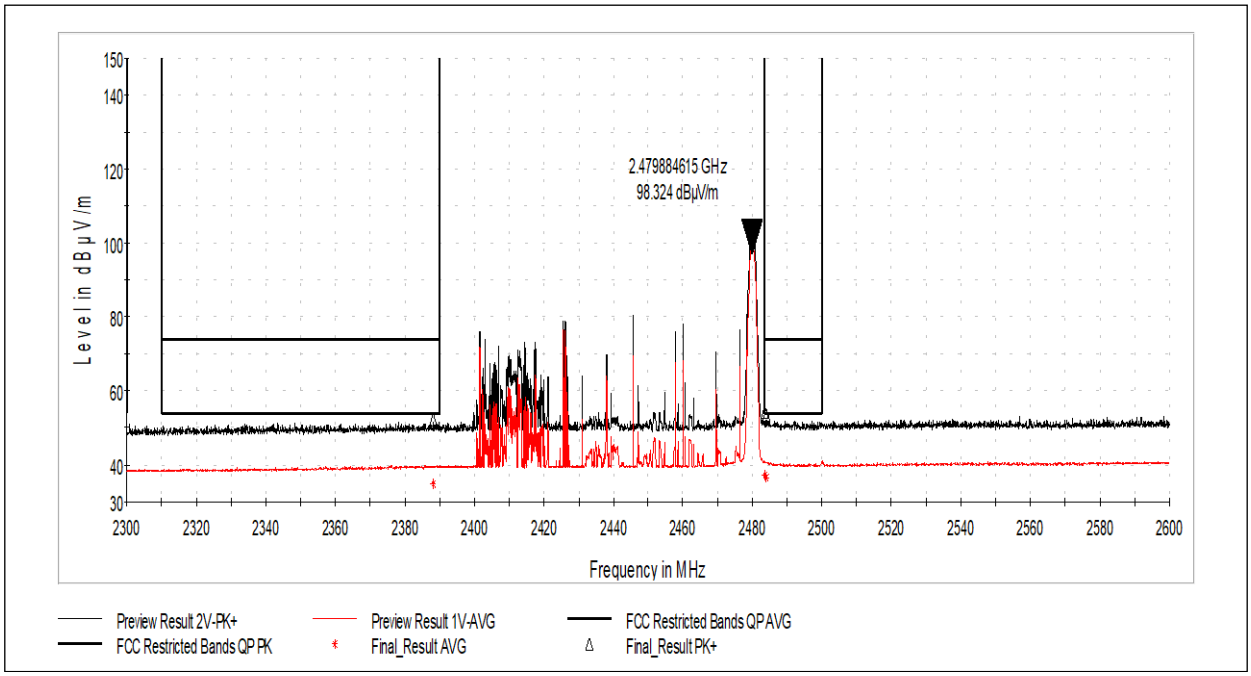
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2385.903846	51.87	73.979	22.11	1000.000	238.0	V	58.0	38.20
2499.903846	53.08	73.979	20.90	1000.000	100.0	V	330.0	38.61

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2385.903846	35.04	53.979	18.94	1000.000	238.0	V	58.0	38.20
2499.903846	36.59	53.979	17.39	1000.000	100.0	V	330.0	38.61

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.7.6 3-EDR, 2480 MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.211539	52.32	73.979	21.66	1000.000	143.0	V	104.0	38.21
2483.634615	54.36	73.979	19.62	1000.000	201.0	V	56.0	38.45
2484.038462	53.60	73.979	20.38	1000.000	316.0	V	316.0	38.46

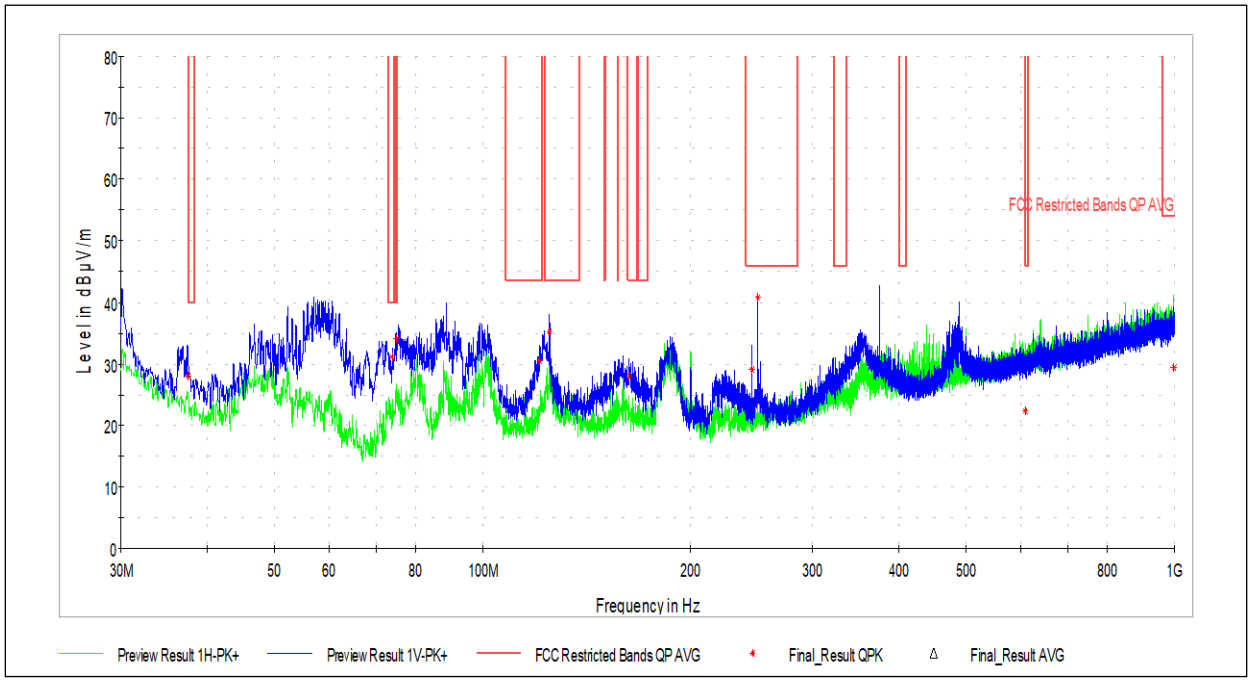
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.211539	34.79	53.979	19.19	1000.000	143.0	V	104.0	38.21
2483.634615	37.25	53.979	16.73	1000.000	201.0	V	56.0	38.45
2484.038462	36.40	53.979	17.58	1000.000	316.0	V	316.0	38.46

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.8 Test Data: 30 MHz – 1 GHz

11.8.1 BDR, 2441 MHz

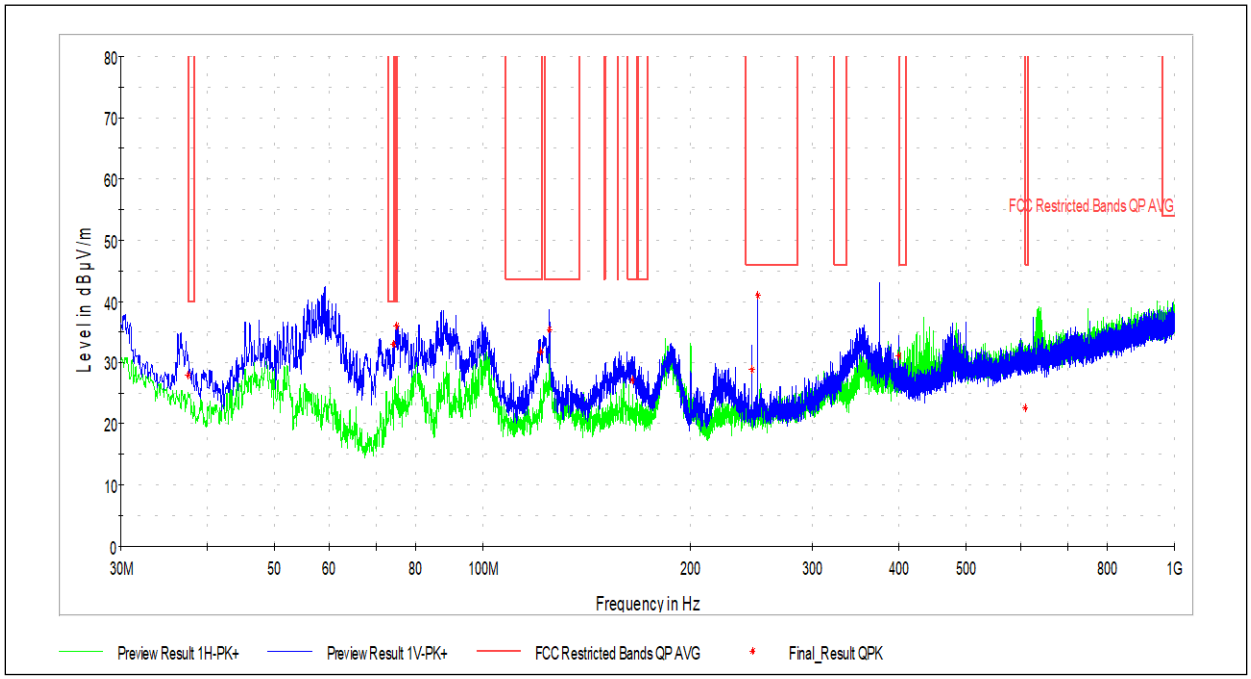


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.544444	27.97	40.000	12.03	120.000	100.0	V	316.0	22.14
74.027222	31.18	40.000	8.82	120.000	105.0	V	0.0	14.99
75.105000	34.10	40.000	5.90	120.000	100.0	V	284.0	15.10
121.018333	30.40	43.522	13.12	120.000	100.0	V	166.0	22.06
124.952222	35.19	43.522	8.33	120.000	100.0	V	122.0	22.31
162.943889	28.05	43.522	15.48	120.000	100.0	V	314.0	21.79
244.962778	28.99	46.021	17.03	120.000	198.0	V	168.0	21.71
249.974444	40.83	46.021	5.19	120.000	153.0	V	71.0	21.75
609.036111	22.31	46.021	23.71	120.000	95.0	H	131.0	31.63
997.197778	29.38	53.979	24.60	120.000	206.0	H	176.0	37.49

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: Testing represents the worst case of low, middle, and high channels.

11.8.2 2-EDR, 2441 MHz

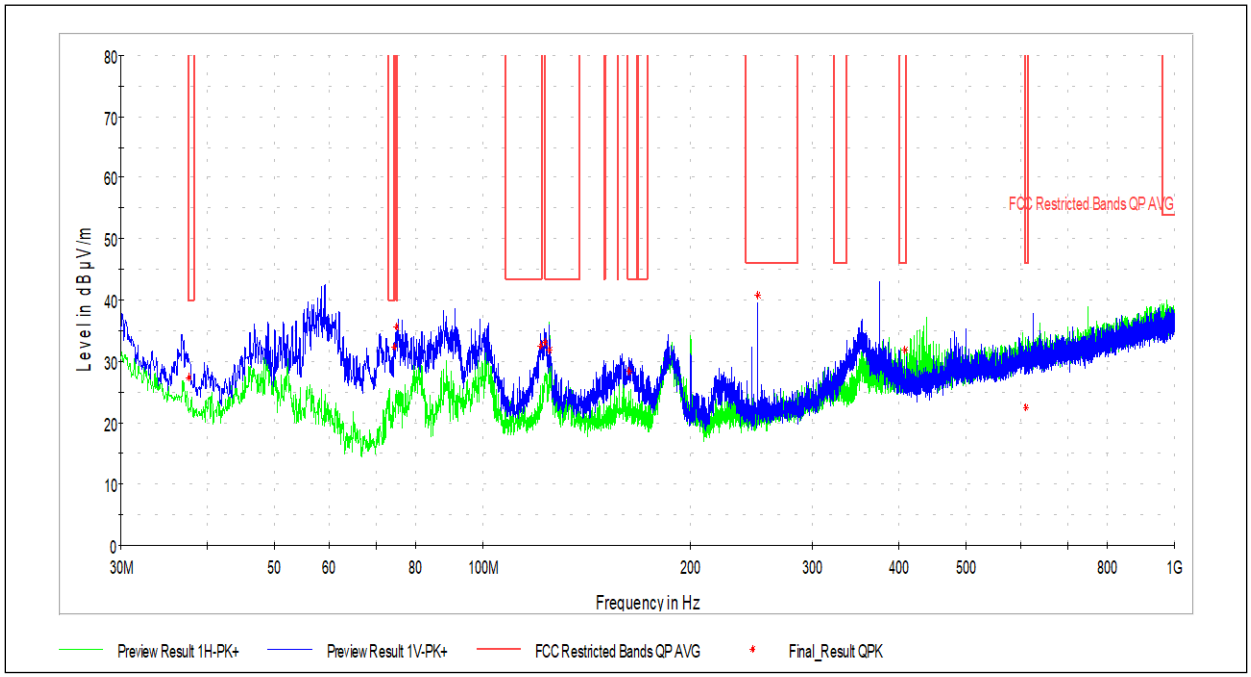


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.544444	28.01	40.000	11.99	120.000	100.0	V	296.0	22.14
74.404444	33.01	40.000	6.99	120.000	100.0	V	348.0	15.03
75.158889	36.00	40.000	4.00	120.000	101.0	V	340.0	15.10
121.233889	31.75	43.522	11.77	120.000	100.0	V	158.0	22.09
124.952222	35.34	43.522	8.18	120.000	100.0	V	134.0	22.31
164.614444	27.21	43.522	16.31	120.000	100.0	V	310.0	21.75
244.962778	28.83	46.021	17.19	120.000	197.0	V	157.0	21.71
249.974444	40.99	46.021	5.03	120.000	162.0	V	71.0	21.75
400.001111	31.15	46.021	14.87	120.000	100.0	V	60.0	26.41
608.766667	22.63	46.021	23.39	120.000	201.0	H	0.0	31.63

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: Testing represents the worst case of low, middle, and high channels.

11.8.3 3-EDR, 2441 MHz



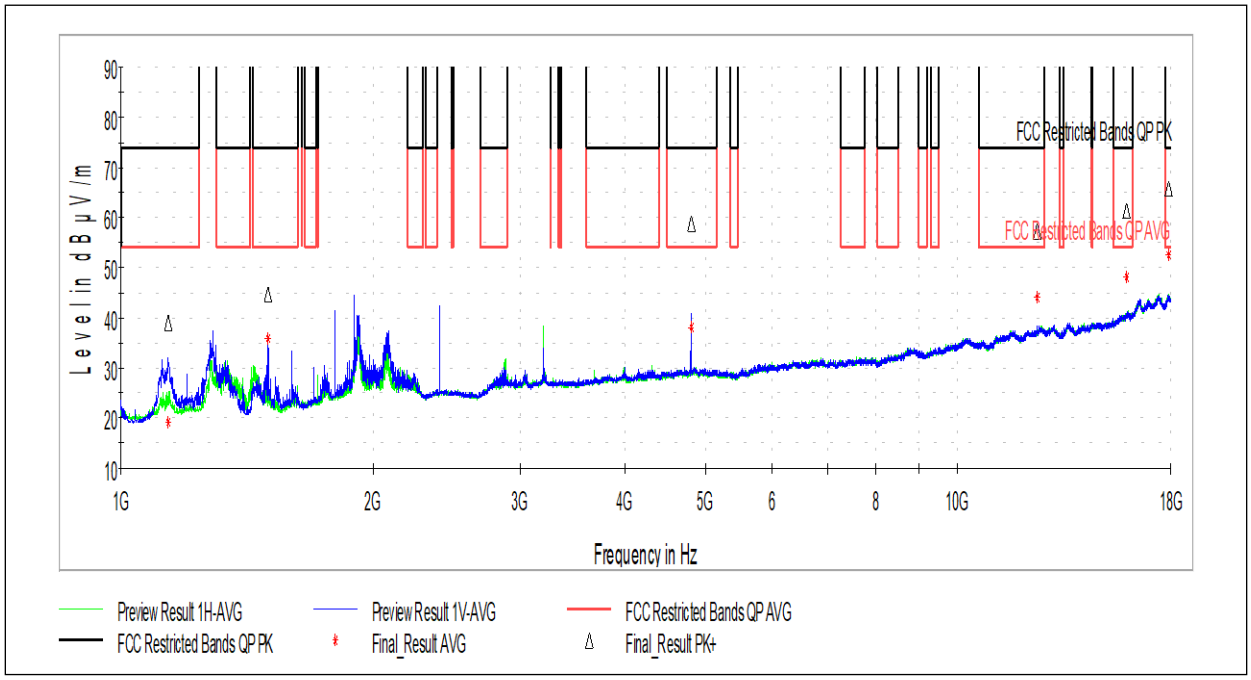
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.598333	27.33	40.000	12.67	120.000	100.0	V	284.0	22.10
74.458333	32.40	40.000	7.60	120.000	105.0	V	316.0	15.04
75.158889	35.74	40.000	4.26	120.000	100.0	V	359.0	15.10
121.341667	32.47	43.522	11.05	120.000	105.0	V	135.0	22.10
123.066111	33.00	43.522	10.52	120.000	100.0	V	136.0	22.29
124.952222	31.89	43.522	11.63	120.000	115.0	H	0.0	22.11
162.836111	28.41	43.522	15.11	120.000	100.0	V	318.0	21.79
249.974444	40.81	46.021	5.21	120.000	151.0	V	71.0	21.75
407.168333	31.93	46.021	14.09	120.000	222.0	H	180.0	26.95
609.575000	22.55	46.021	23.47	120.000	175.0	H	38.0	31.63

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: Testing represents the worst case of low, middle, and high channels.

11.9 Test Data: 1 GHz – 18 GHz

11.9.1 BDR, 2402 MHz



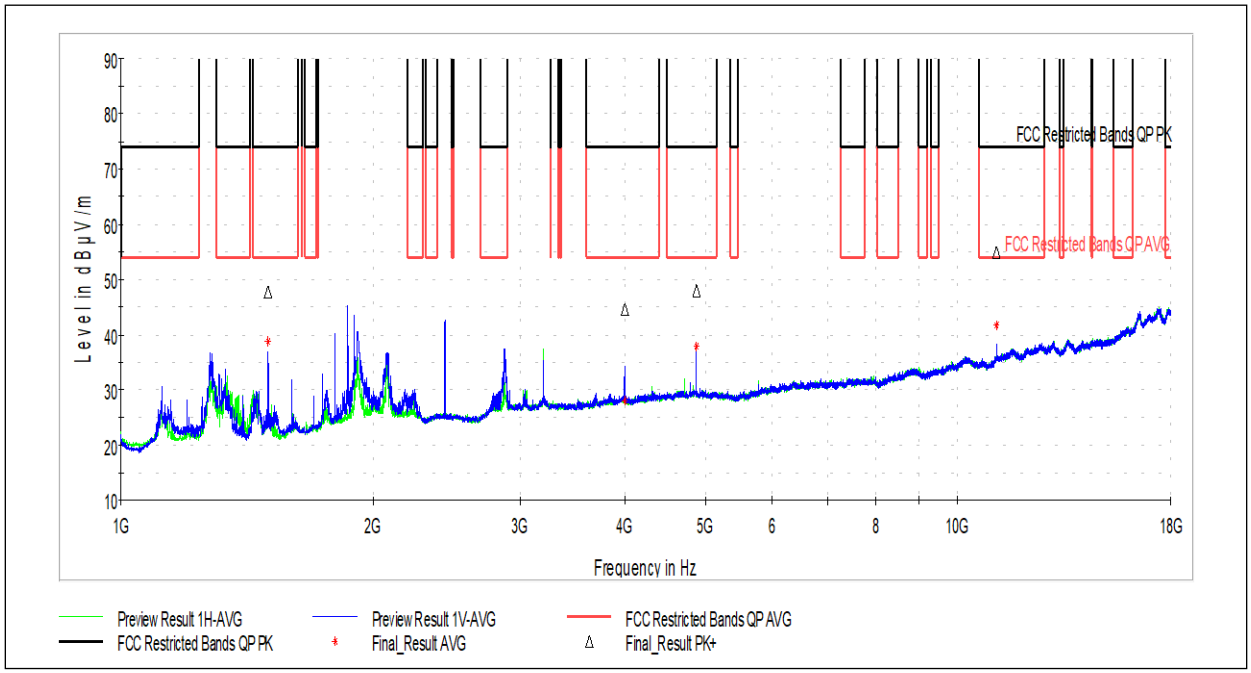
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1138.000000	38.85	73.979	35.13	1000.000	184.0	V	150.0	-1.64
1500.000000	44.63	73.979	29.35	1000.000	249.0	V	10.0	-1.27
4804.000000	58.71	73.979	15.27	1000.000	177.0	V	196.0	9.31
12468.000000	57.15	73.979	16.83	1000.000	145.0	V	100.0	20.43
15940.000000	61.45	73.979	12.53	1000.000	242.0	H	348.0	24.67
17873.000000	65.77	73.979	8.21	1000.000	212.0	H	135.0	27.89

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1138.000000	19.08	53.979	34.90	1000.000	184.0	V	150.0	-1.64
1500.000000	35.71	53.979	18.27	1000.000	249.0	V	10.0	-1.27
4804.000000	37.95	53.979	16.03	1000.000	177.0	V	196.0	9.31
12468.000000	43.96	53.979	10.02	1000.000	145.0	V	100.0	20.43
15940.000000	48.04	53.979	5.94	1000.000	242.0	H	348.0	24.67
17873.000000	52.42	53.979	1.56	1000.000	212.0	H	135.0	27.89

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.2 BDR, 2441 MHz



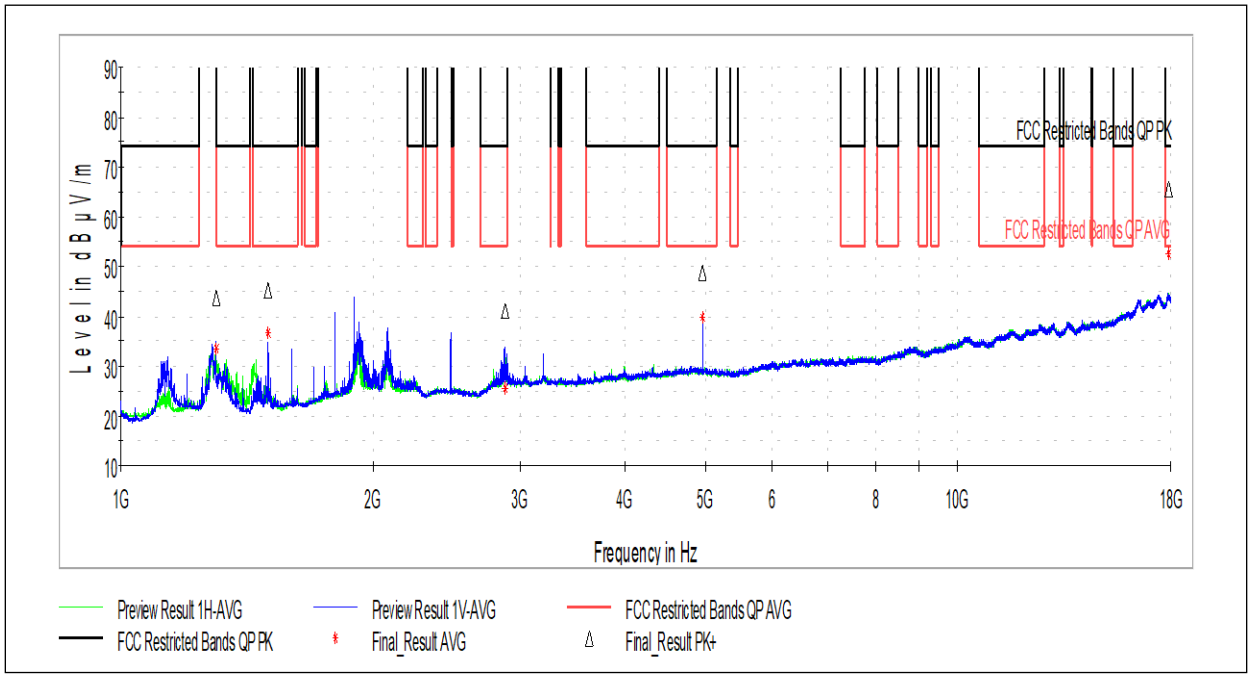
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1500.000000	47.81	73.979	26.17	1000.000	354.0	V	187.0	-1.27
4000.000000	44.70	73.979	29.28	1000.000	339.0	V	74.0	7.74
4880.000000	48.06	73.979	25.92	1000.000	194.0	V	45.0	9.21
11138.000000	54.90	73.979	19.08	1000.000	341.0	V	142.0	18.59

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1500.000000	38.75	53.979	15.23	1000.000	354.0	V	187.0	-1.27
4000.000000	28.04	53.979	25.94	1000.000	339.0	V	74.0	7.74
4880.000000	37.86	53.979	16.12	1000.000	194.0	V	45.0	9.21
11138.000000	41.78	53.979	12.20	1000.000	341.0	V	142.0	18.59

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.3 BDR, 2480 MHz



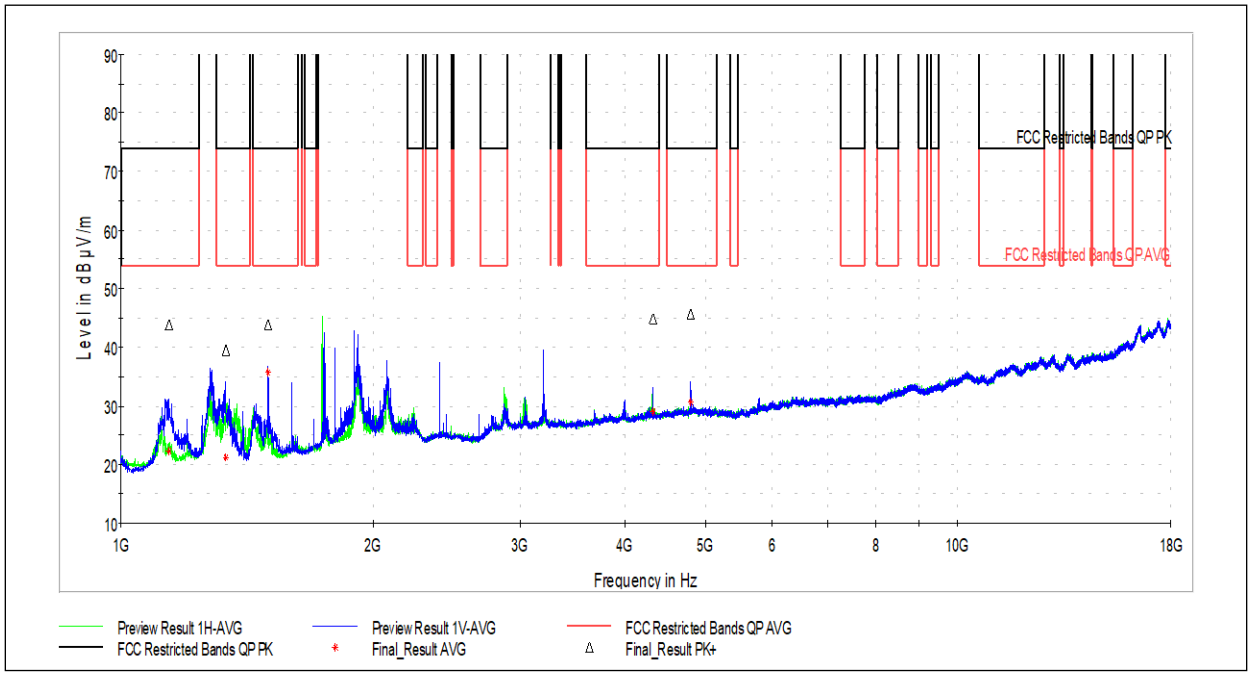
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1300.000000	43.61	73.979	30.37	1000.000	381.0	V	163.0	-0.41
1500.000000	45.08	73.979	28.90	1000.000	221.0	V	10.0	-1.27
2879.500000	41.24	73.979	32.74	1000.000	155.0	V	35.0	5.02
4960.000000	48.80	73.979	25.18	1000.000	183.0	V	221.0	9.13
17885.500000	65.50	73.979	8.48	1000.000	362.0	H	129.0	27.93

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1300.000000	33.46	53.979	20.52	1000.000	381.0	V	163.0	-0.41
1500.000000	36.63	53.979	17.35	1000.000	221.0	V	10.0	-1.27
2879.500000	25.49	53.979	28.49	1000.000	155.0	V	35.0	5.02
4960.000000	39.69	53.979	14.29	1000.000	183.0	V	221.0	9.13
17885.500000	52.40	53.979	1.58	1000.000	362.0	H	129.0	27.93

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.4 2-EDR, 2402 MHz



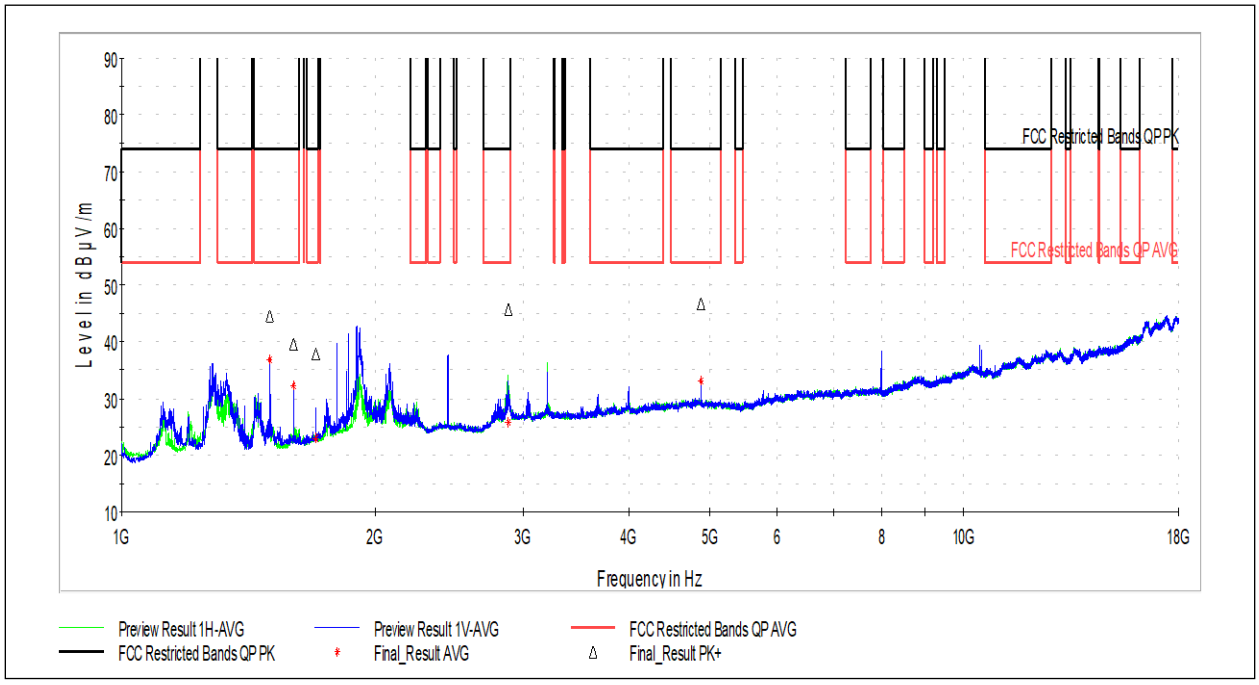
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1141.000000	43.81	73.979	30.17	1000.000	100.0	V	327.0	-1.59
1335.500000	39.50	73.979	34.48	1000.000	239.0	V	120.0	-0.23
1500.000000	43.92	73.979	30.06	1000.000	355.0	V	158.0	-1.27
4323.000000	44.92	73.979	29.06	1000.000	392.0	V	84.0	8.49
4800.000000	45.57	73.979	28.41	1000.000	293.0	V	207.0	9.31

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1141.000000	22.29	53.979	31.69	1000.000	100.0	V	327.0	-1.59
1335.500000	21.26	53.979	32.72	1000.000	239.0	V	120.0	-0.23
1500.000000	35.64	53.979	18.34	1000.000	355.0	V	158.0	-1.27
4323.000000	28.95	53.979	25.03	1000.000	392.0	V	84.0	8.49
4800.000000	30.70	53.979	23.28	1000.000	293.0	V	207.0	9.31

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.5 2-EDR, 2441 MHz

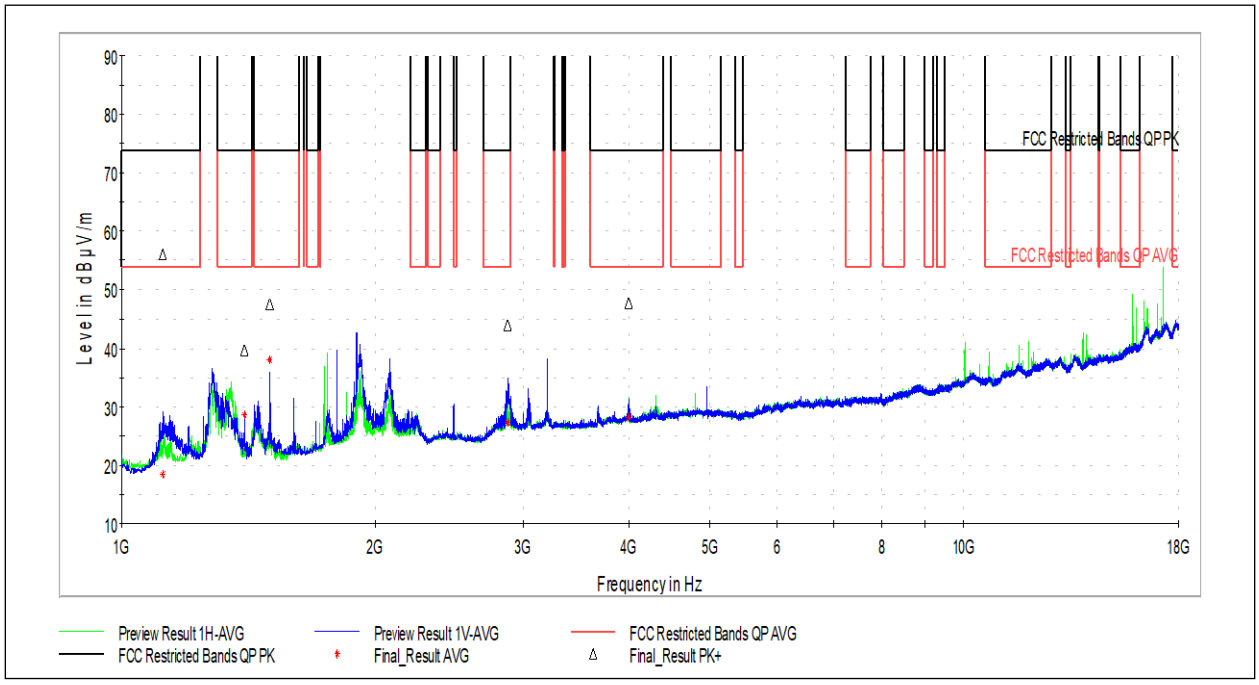


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.544444	28.01	40.000	11.99	120.000	100.0	V	296.0	22.14
74.404444	33.01	40.000	6.99	120.000	100.0	V	348.0	15.03
75.158889	36.00	40.000	4.00	120.000	101.0	V	340.0	15.10
121.233889	31.75	43.522	11.77	120.000	100.0	V	158.0	22.09
124.952222	35.34	43.522	8.18	120.000	100.0	V	134.0	22.31
164.614444	27.21	43.522	16.31	120.000	100.0	V	310.0	21.75
244.962778	28.83	46.021	17.19	120.000	197.0	V	157.0	21.71
249.974444	40.99	46.021	5.03	120.000	162.0	V	71.0	21.75
400.001111	31.15	46.021	14.87	120.000	100.0	V	60.0	26.41
608.766667	22.63	46.021	23.39	120.000	201.0	H	0.0	31.63

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.6 2-EDR, 2480 MHz



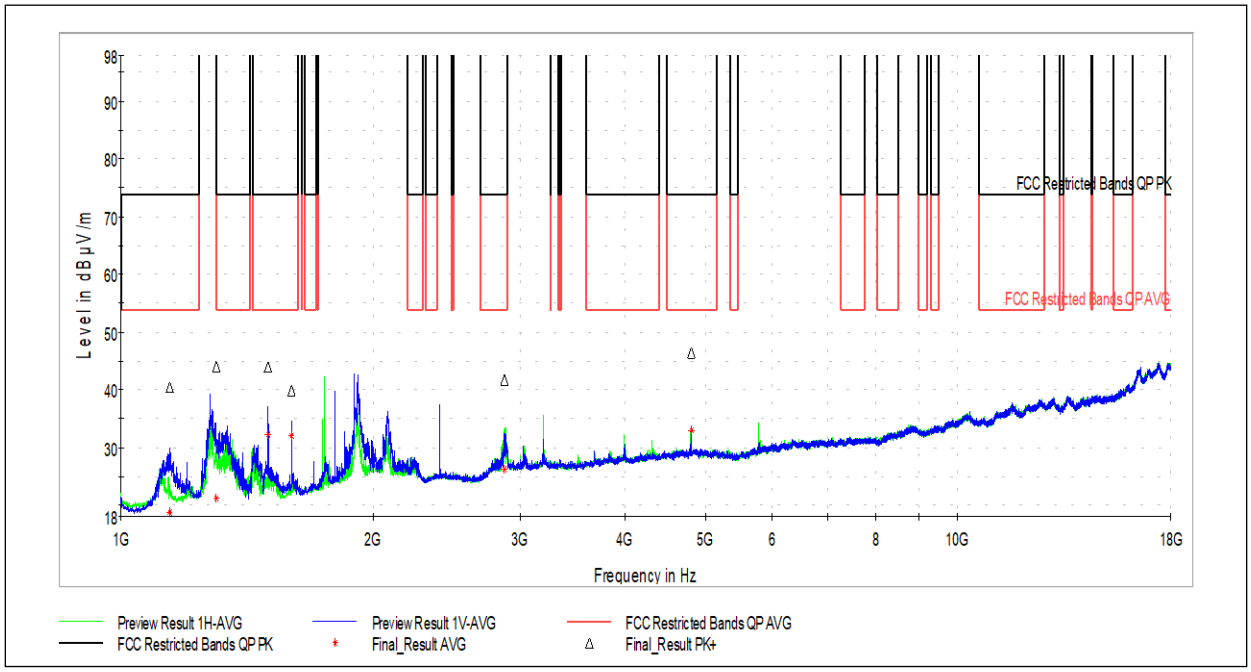
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1119.500000	56.13	73.979	17.85	1000.000	233.0	V	194.0	-1.92
1400.000000	39.73	73.979	34.25	1000.000	146.0	V	329.0	-1.27
1500.000000	47.64	73.979	26.34	1000.000	360.0	V	184.0	-1.27
2874.500000	43.91	73.979	30.07	1000.000	249.0	V	84.0	5.00
4000.000000	47.76	73.979	26.22	1000.000	169.0	H	92.0	7.51

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1119.500000	18.47	53.979	35.51	1000.000	233.0	V	194.0	-1.92
1400.000000	28.64	53.979	25.34	1000.000	146.0	V	329.0	-1.27
1500.000000	37.94	53.979	16.04	1000.000	360.0	V	184.0	-1.27
2874.500000	27.26	53.979	26.72	1000.000	249.0	V	84.0	5.00
4000.000000	28.13	53.979	25.85	1000.000	169.0	H	92.0	7.51

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.7 3-EDR, 2402 MHz



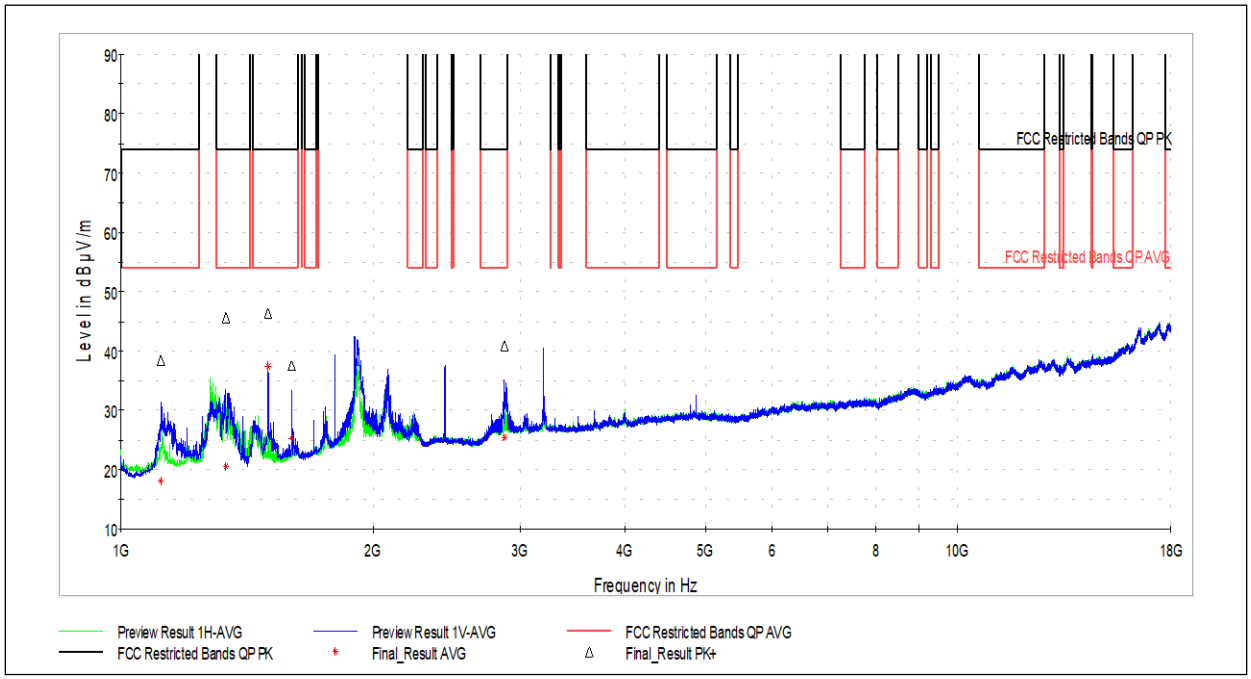
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1144.500000	40.40	73.979	33.58	1000.000	332.0	V	-1.0	-1.53
1300.000000	43.95	73.979	30.03	1000.000	258.0	V	331.0	-0.41
1499.500000	44.05	73.979	29.93	1000.000	354.0	V	184.0	-1.27
1600.000000	39.83	73.979	34.15	1000.000	318.0	V	175.0	-0.72
2876.000000	41.79	73.979	32.19	1000.000	347.0	H	45.0	4.99
4804.000000	46.50	73.979	27.48	1000.000	188.0	V	36.0	9.31

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1144.500000	18.82	53.979	35.16	1000.000	332.0	V	-1.0	-1.53
1300.000000	21.10	53.979	32.88	1000.000	258.0	V	331.0	-0.41
1499.500000	32.24	53.979	21.74	1000.000	354.0	V	184.0	-1.27
1600.000000	32.01	53.979	21.97	1000.000	318.0	V	175.0	-0.72
2876.000000	26.25	53.979	27.73	1000.000	347.0	H	45.0	4.99
4804.000000	32.93	53.979	21.05	1000.000	188.0	V	36.0	9.31

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.8 3-EDR, 2441 MHz



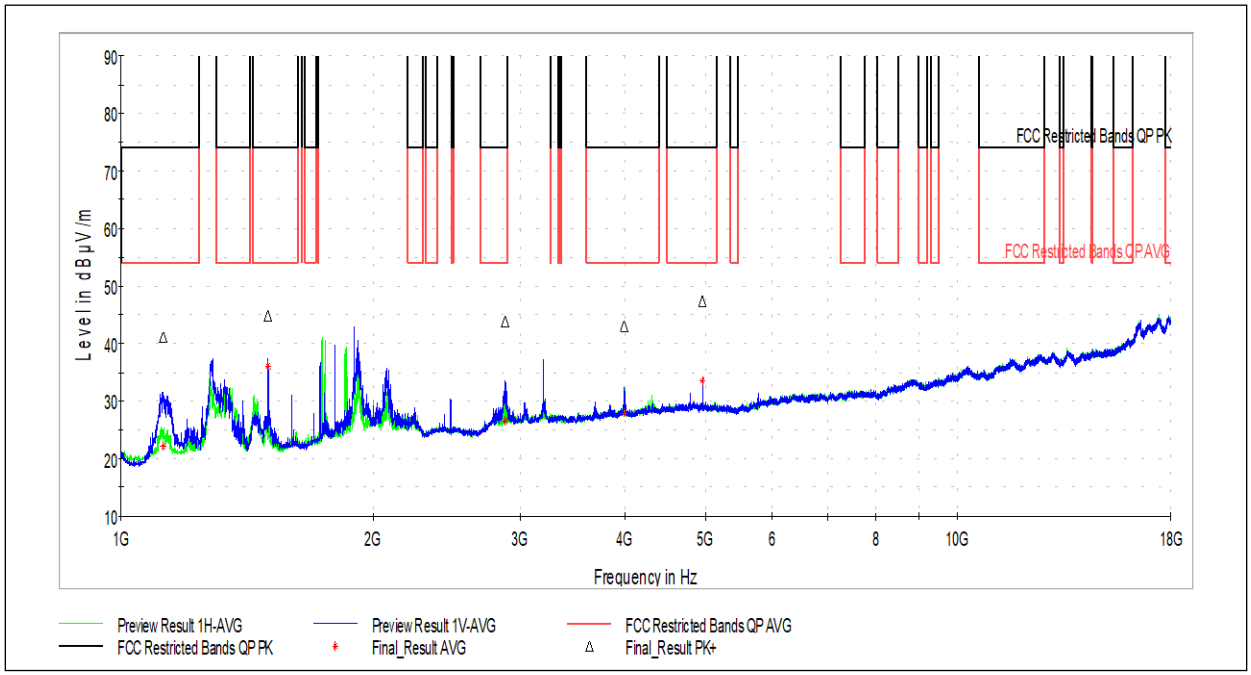
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1116.000000	38.46	73.979	35.52	1000.000	224.0	V	150.0	-2.03
1334.000000	45.60	73.979	28.38	1000.000	311.0	V	311.0	-0.22
1500.000000	46.32	73.979	27.66	1000.000	361.0	V	185.0	-1.27
1599.500000	37.55	73.979	36.43	1000.000	280.0	V	174.0	-0.72
2873.500000	40.91	73.979	33.07	1000.000	410.0	V	318.0	5.00

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1116.000000	18.05	53.979	35.93	1000.000	224.0	V	150.0	-2.03
1334.000000	20.60	53.979	33.38	1000.000	311.0	V	311.0	-0.22
1500.000000	37.37	53.979	16.61	1000.000	361.0	V	185.0	-1.27
1599.500000	25.35	53.979	28.63	1000.000	280.0	V	174.0	-0.72
2873.500000	25.49	53.979	28.49	1000.000	410.0	V	318.0	5.00

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.9.9 3-EDR, 2480 MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1122.500000	41.15	73.979	32.83	1000.000	343.0	V	0.0	-1.87
1500.000000	44.92	73.979	29.06	1000.000	297.0	V	178.0	-1.27
2882.500000	43.84	73.979	30.14	1000.000	250.0	V	297.0	5.03
3999.500000	43.04	73.979	30.94	1000.000	145.0	V	84.0	7.74
4960.000000	47.30	73.979	26.68	1000.000	188.0	V	12.0	9.13

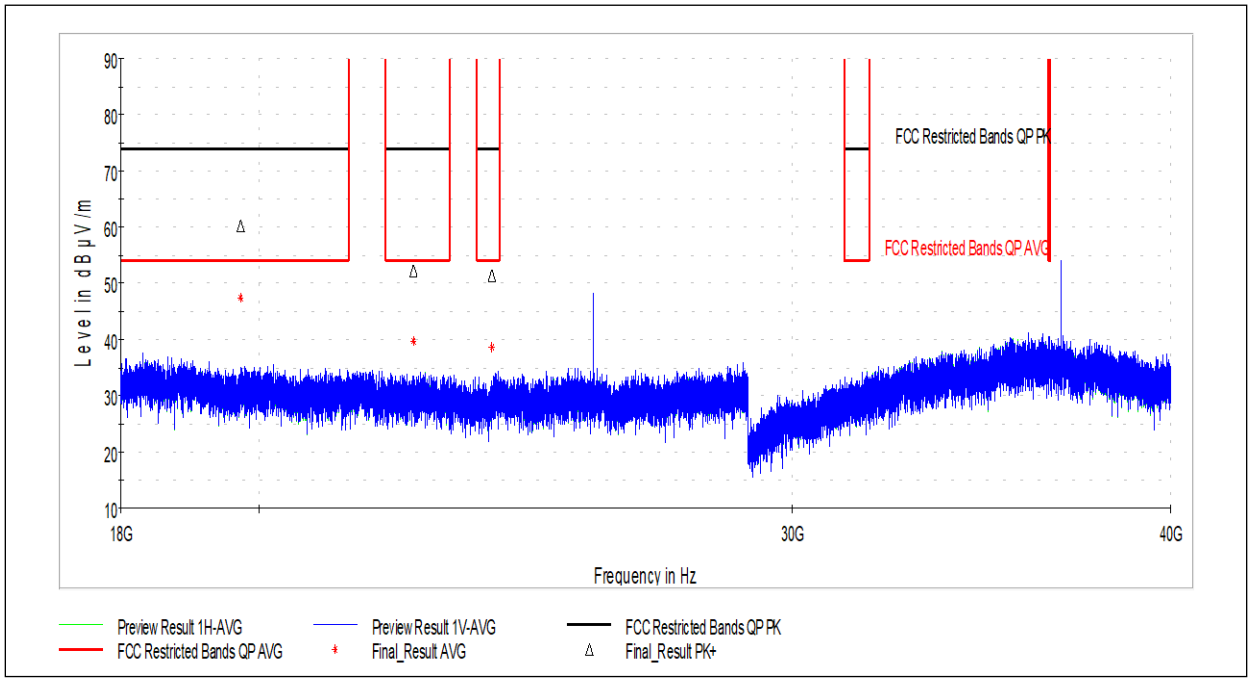
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1122.500000	22.12	53.979	31.86	1000.000	343.0	V	0.0	-1.87
1500.000000	36.05	53.979	17.93	1000.000	297.0	V	178.0	-1.27
2882.500000	26.53	53.979	27.45	1000.000	250.0	V	297.0	5.03
3999.500000	27.93	53.979	26.05	1000.000	145.0	V	84.0	7.74
4960.000000	33.59	53.979	20.39	1000.000	188.0	V	12.0	9.13

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: None

11.10 Test Data: 18 GHz – 40 GHz

11.10.1 BDR, 2441 MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19720.000000	60.29	73.979	13.689	1000.000	204.0	H	116.0	14.89
22483.500000	52.42	73.979	21.559	1000.000	220.0	H	124.0	7.02
23864.000000	51.47	73.979	22.509	1000.000	207.0	H	126.0	6.07

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19720.000000	47.55	53.979	6.429	1000.000	204.0	H	116.0	14.89
22483.500000	39.68	53.979	14.299	1000.000	220.0	H	124.0	7.02
23864.000000	38.72	53.979	15.259	1000.000	207.0	H	126.0	6.07

Test Personnel:	Seth Parker	Test Date:	7/13/2022 - 8/3/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.247 & RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	120V/60Hz	Relative Humidity:	52.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

Deviations, Additions, or Exclusions: Testing represents the worst case of all modes and of low, middle, and high channels.

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

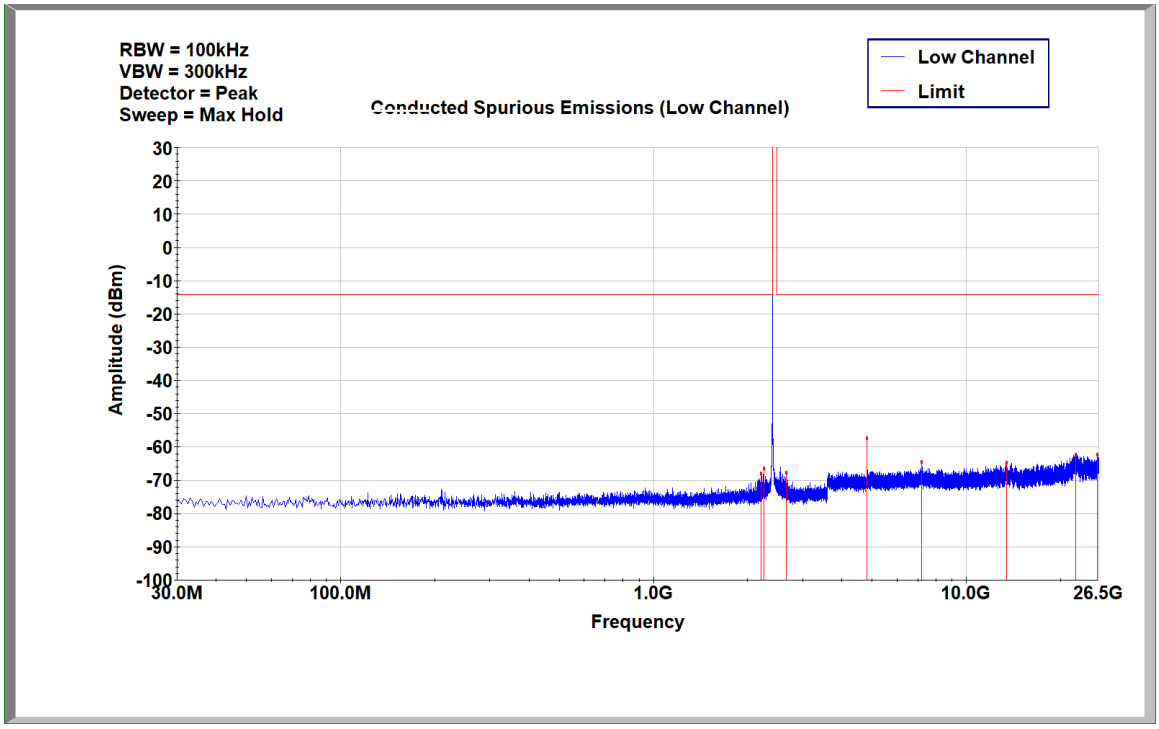
Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	3/10/2022	3/10/2024
Signal Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022

12.4 Test Results

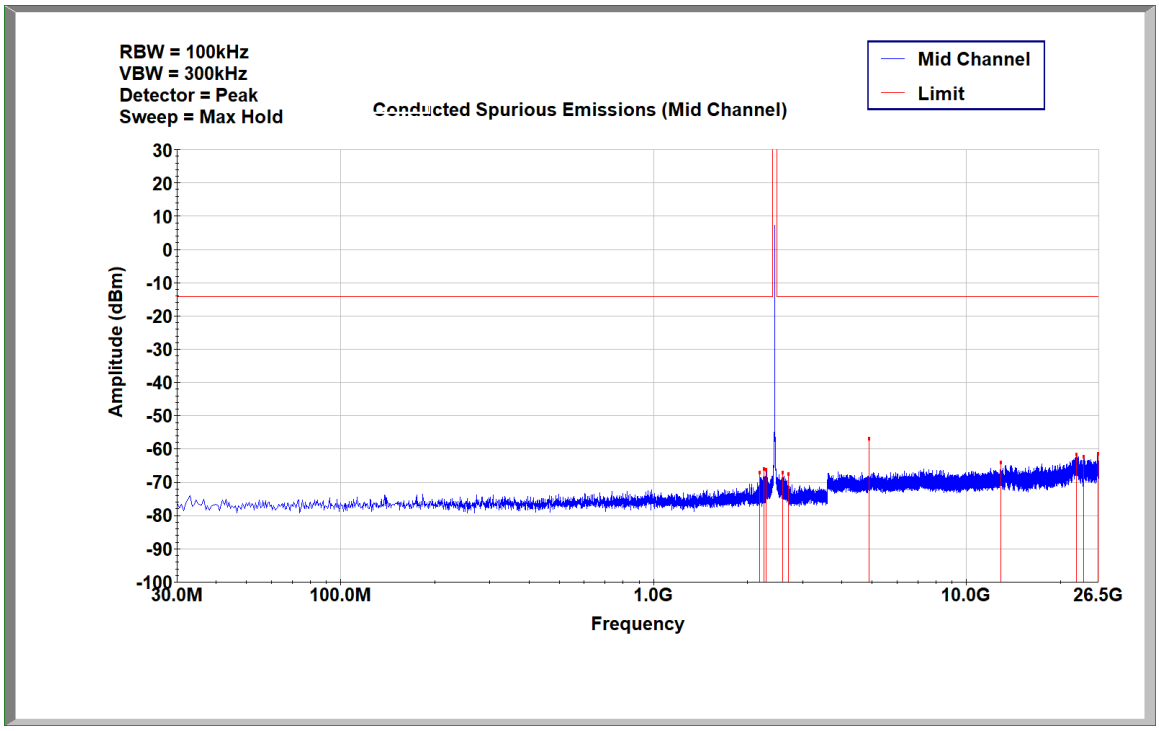
The device was found to be **compliant**. All spurious emissions were found to be attenuated more than 20dB below the level of the fundamental.

12.5 Test Data: BDR

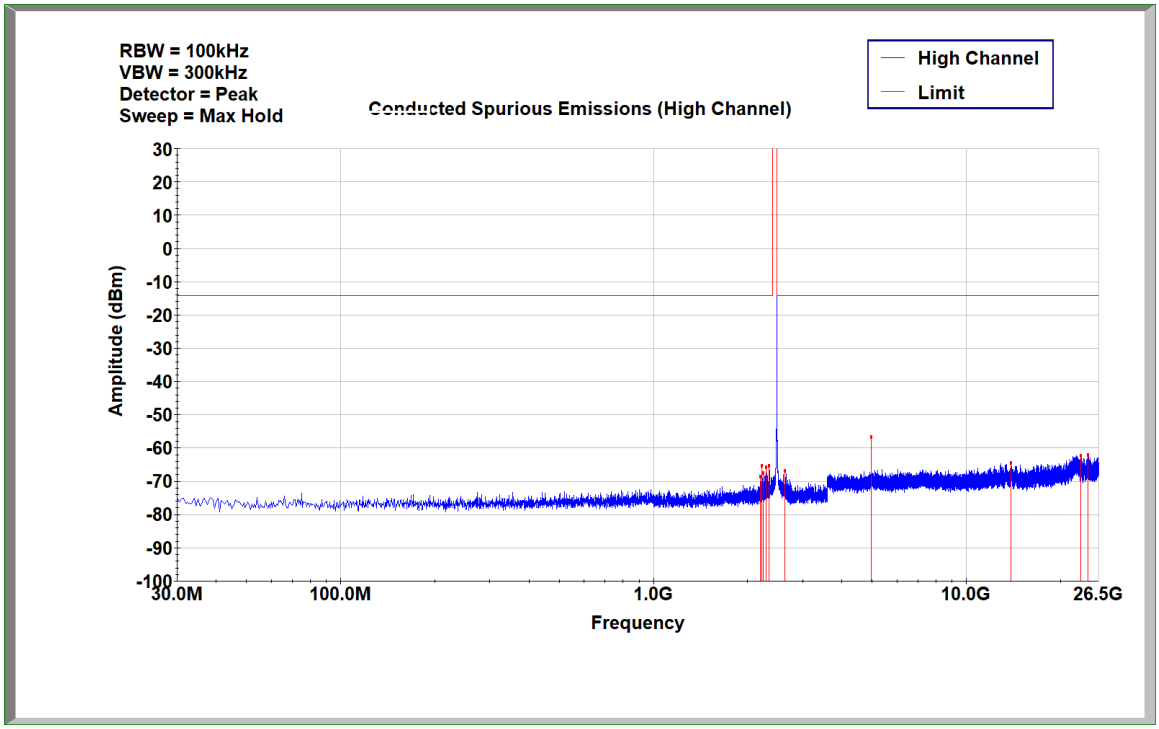
12.5.1 2402 MHz



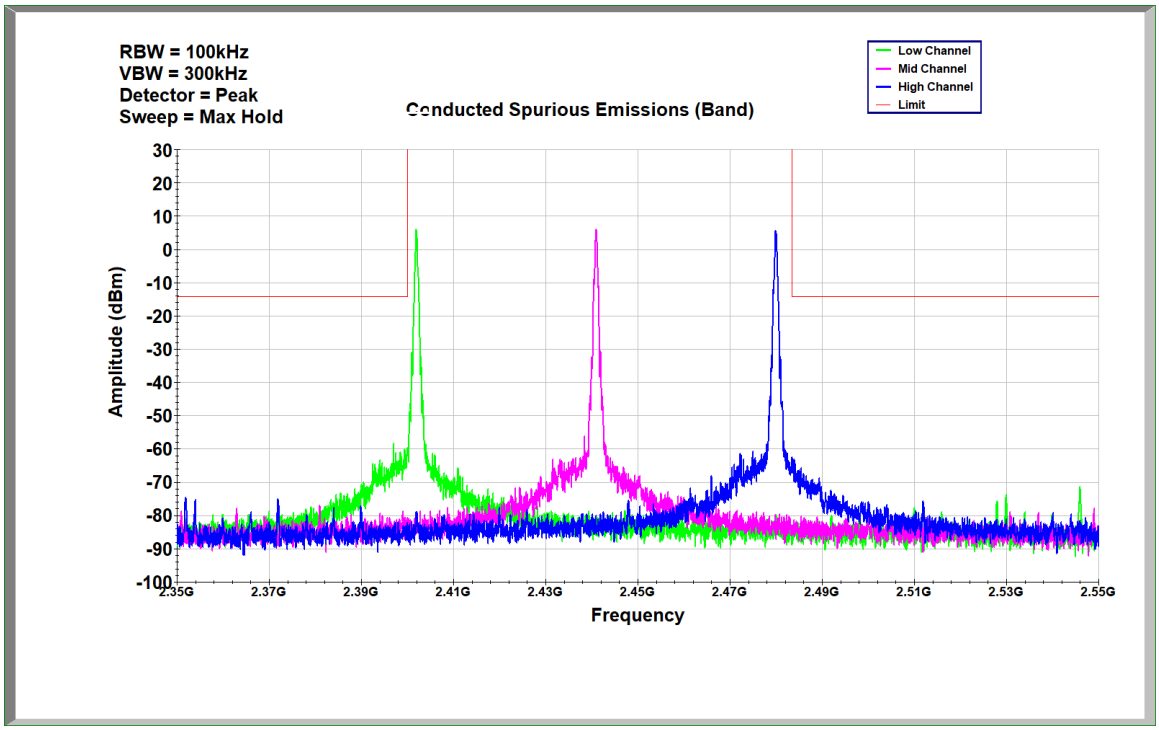
12.5.2 2440 MHz



12.5.3 2480 MHz

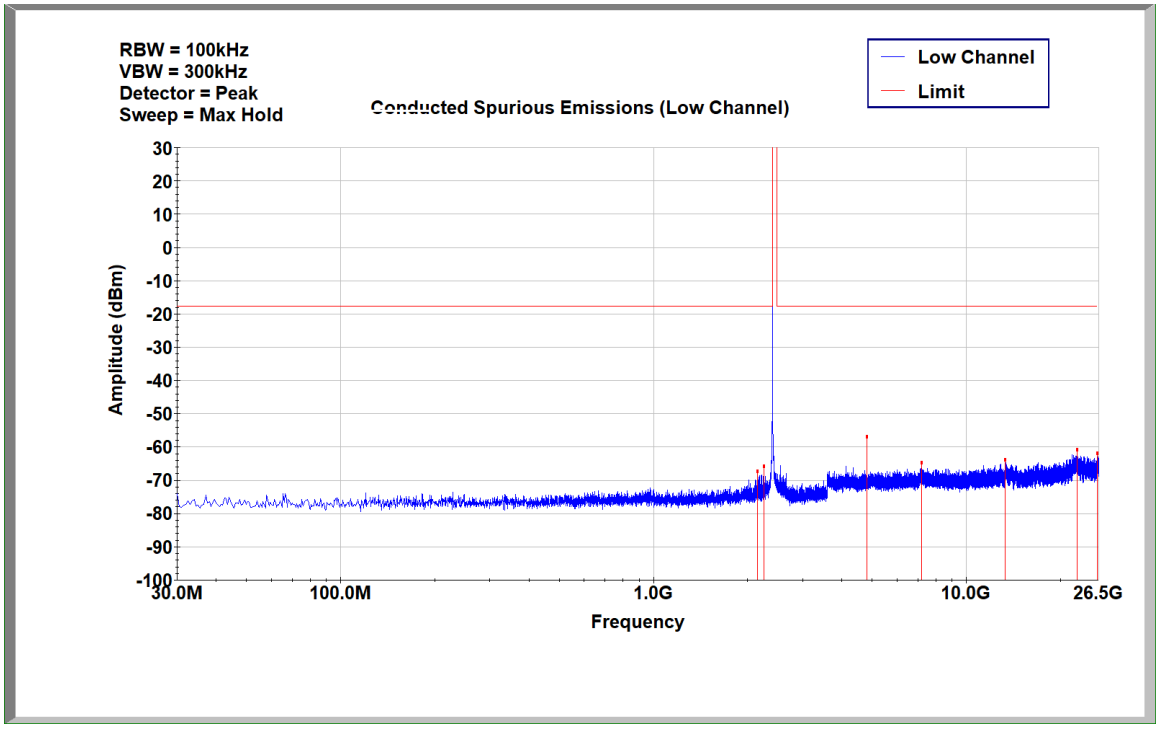


12.5.4 Band Edge

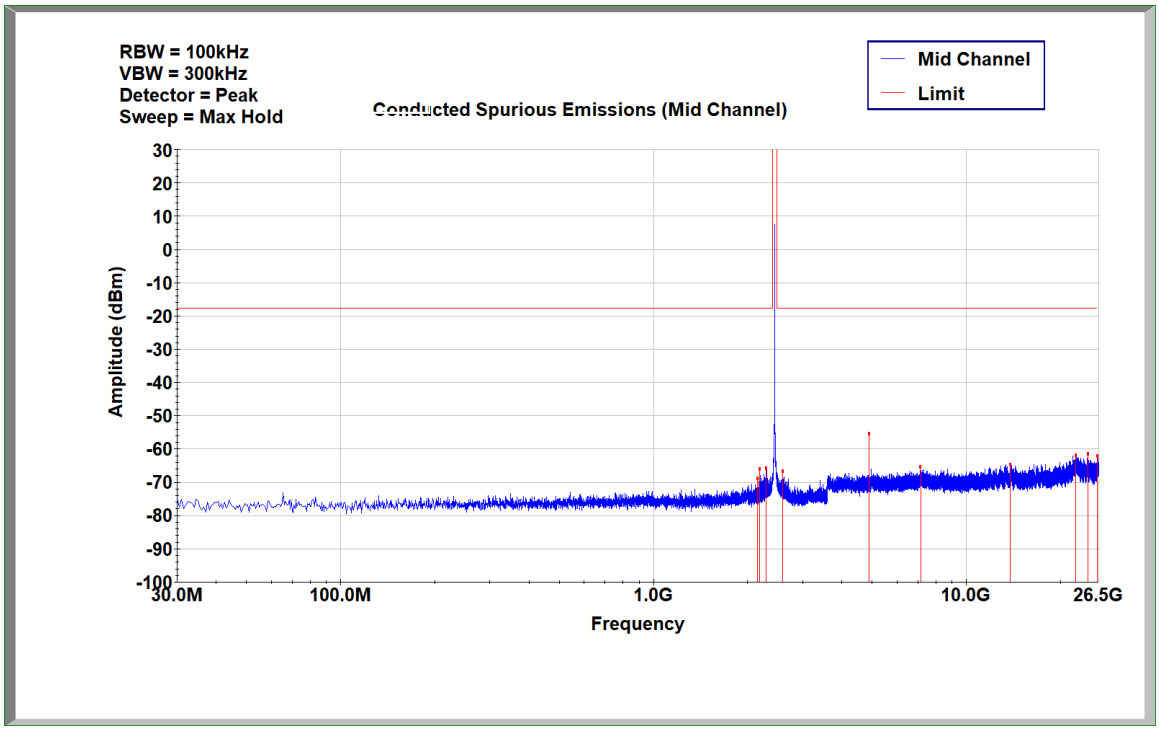


12.6 Test Data: 2-EDR

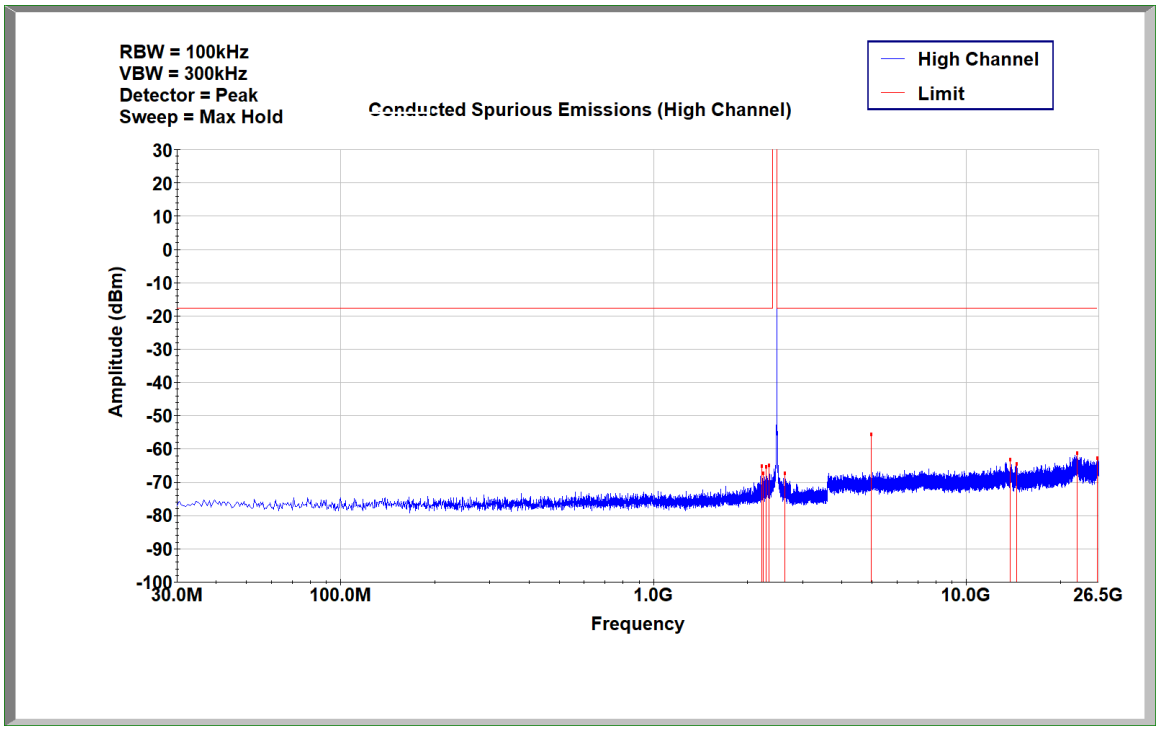
12.6.1 2401 MHz



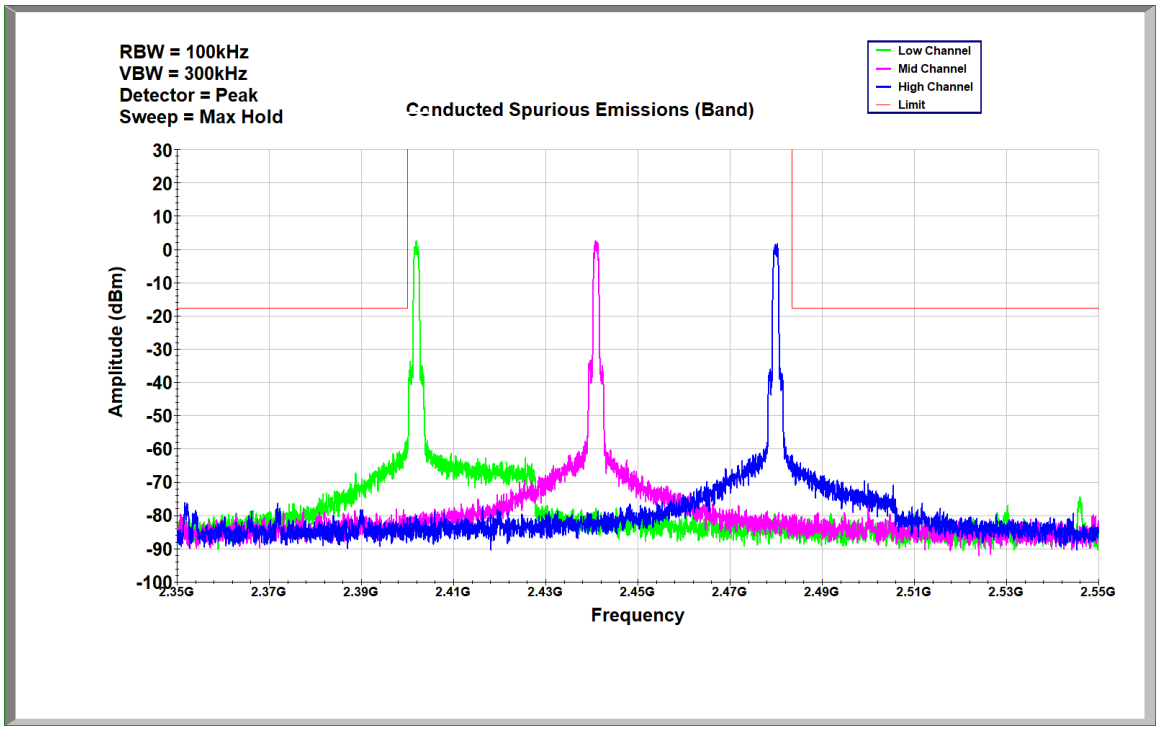
12.6.2 2440 MHz



12.6.3 2480 MHz

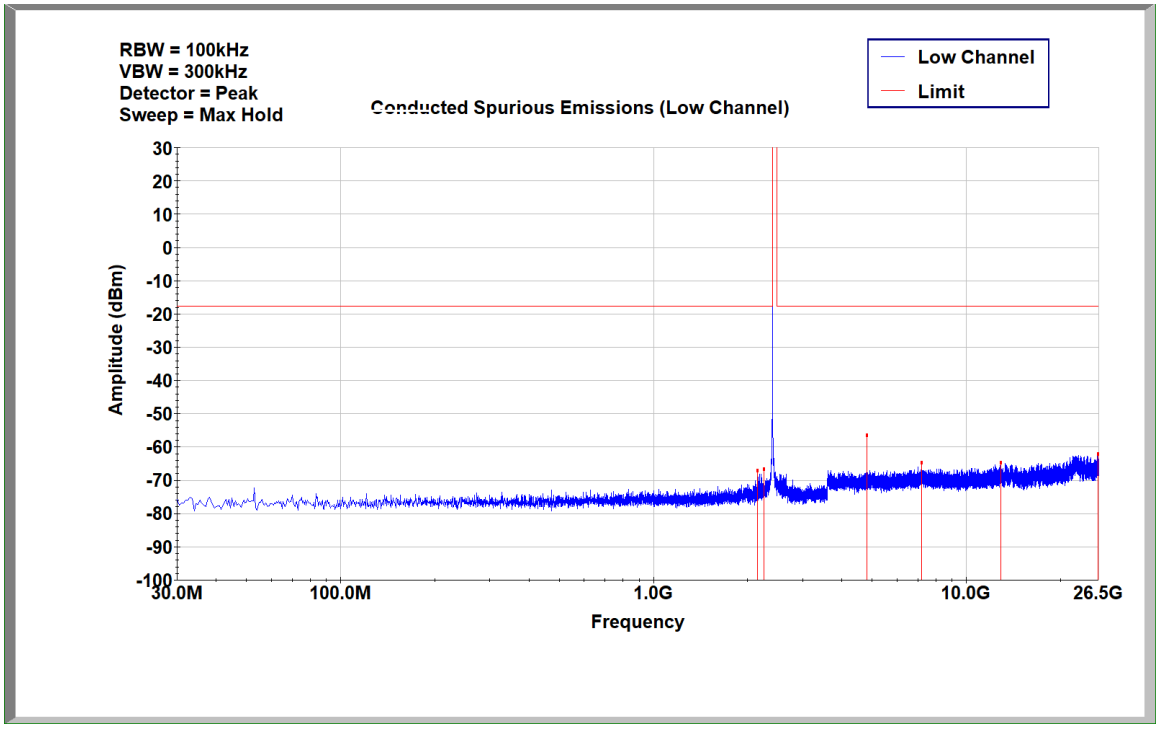


12.6.4 Band Edge

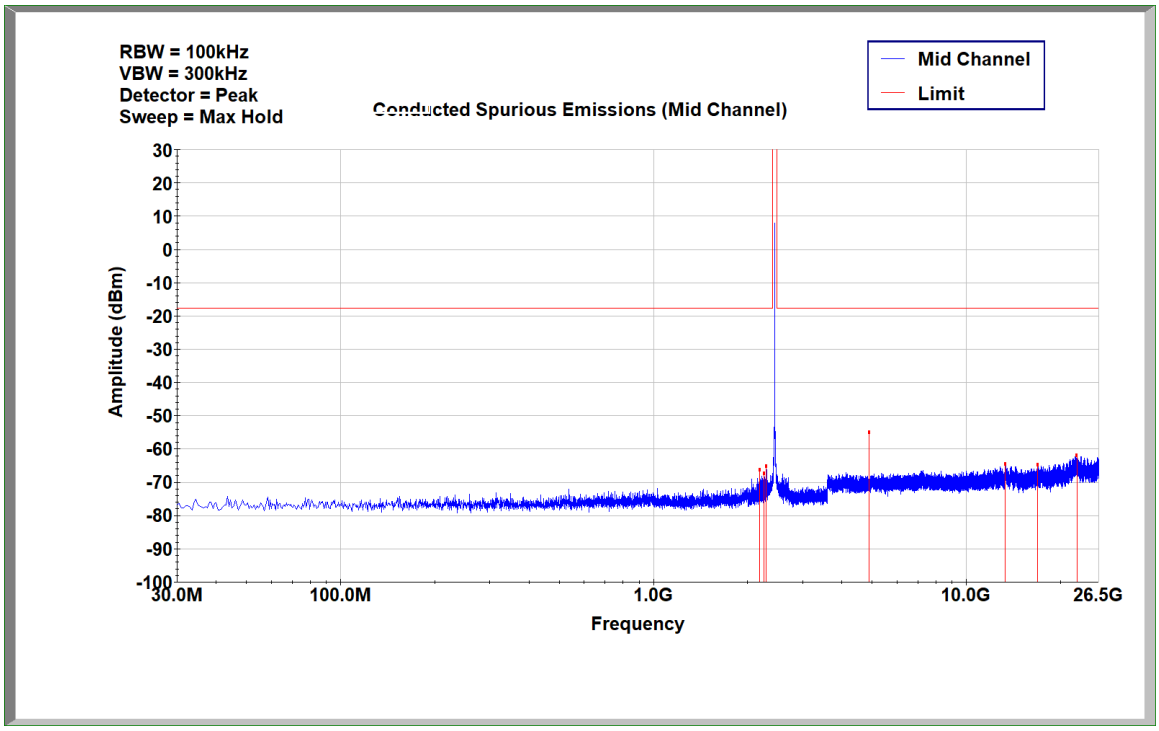


12.7 Test Data: 3-EDR

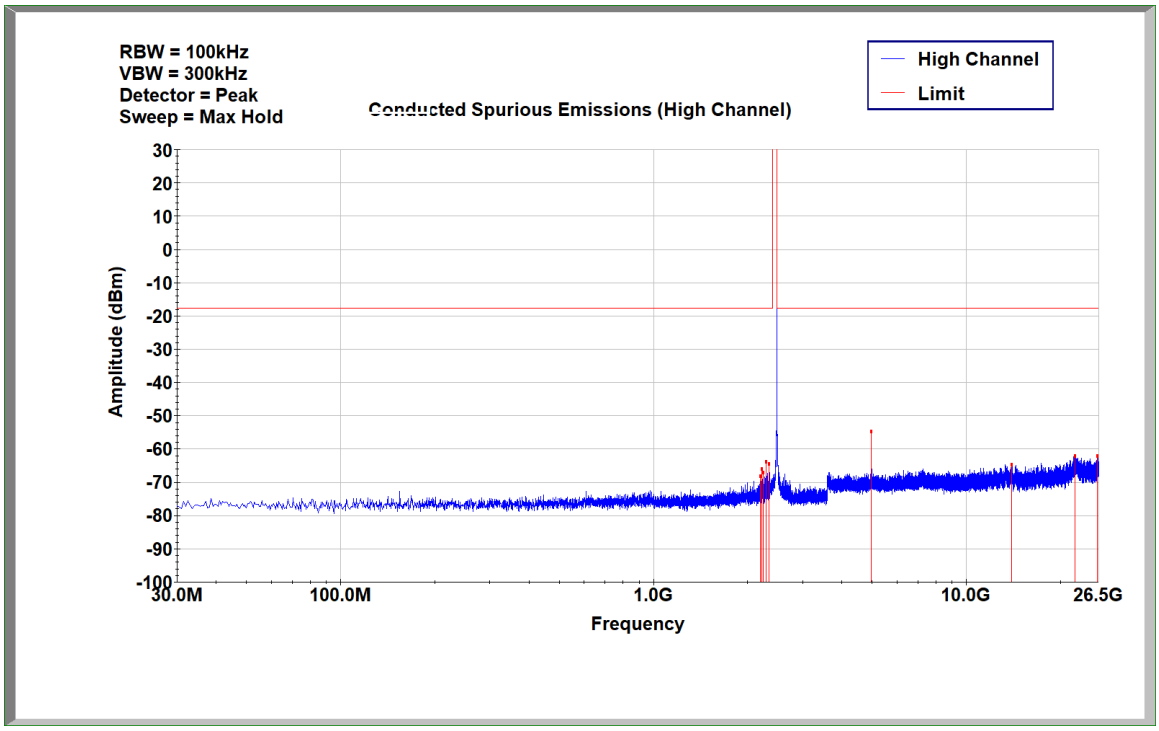
12.7.1 2402 MHz



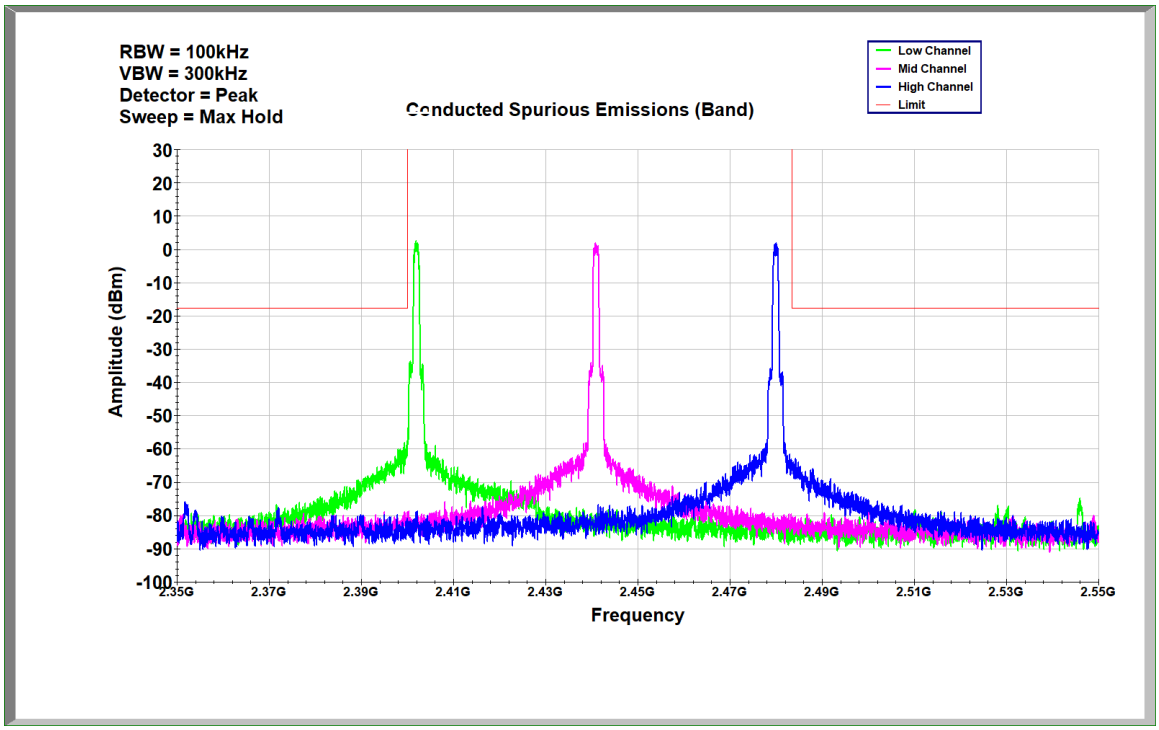
12.7.2 2440 MHz



12.7.3 2480 MHz

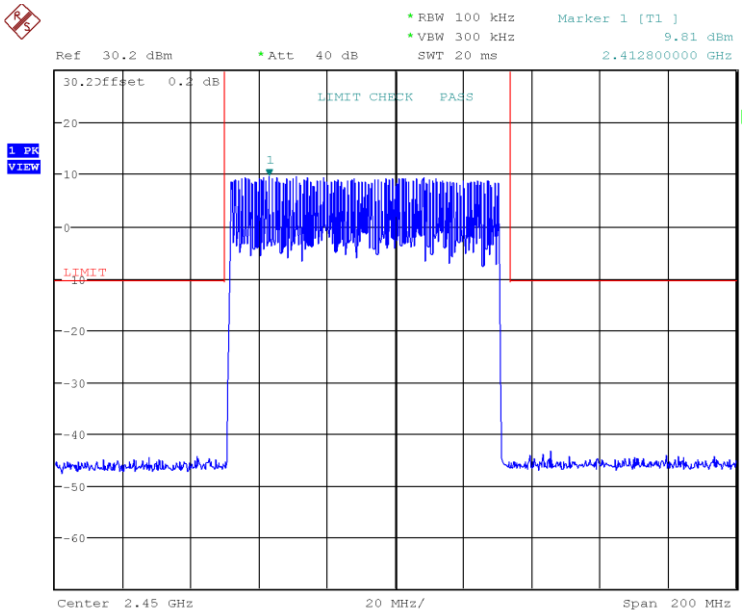


12.7.4 Band Egde



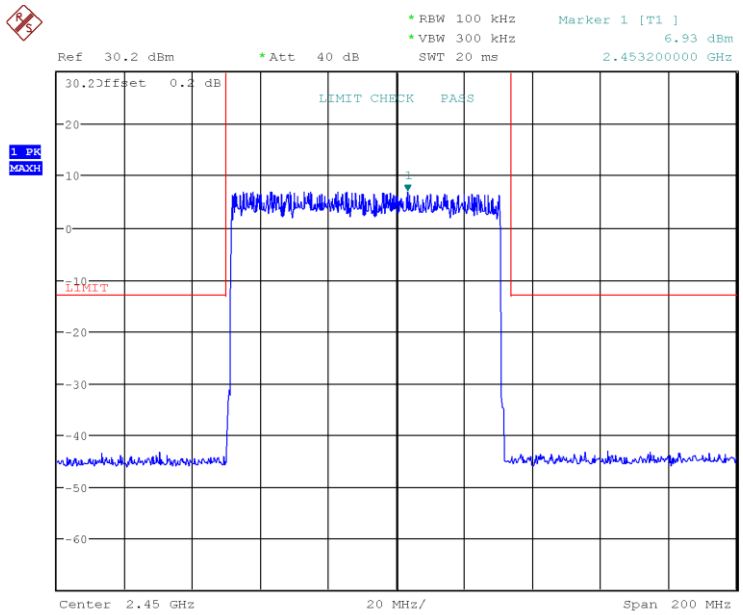
12.8 Test Data: FHSS On

12.8.1 DH5



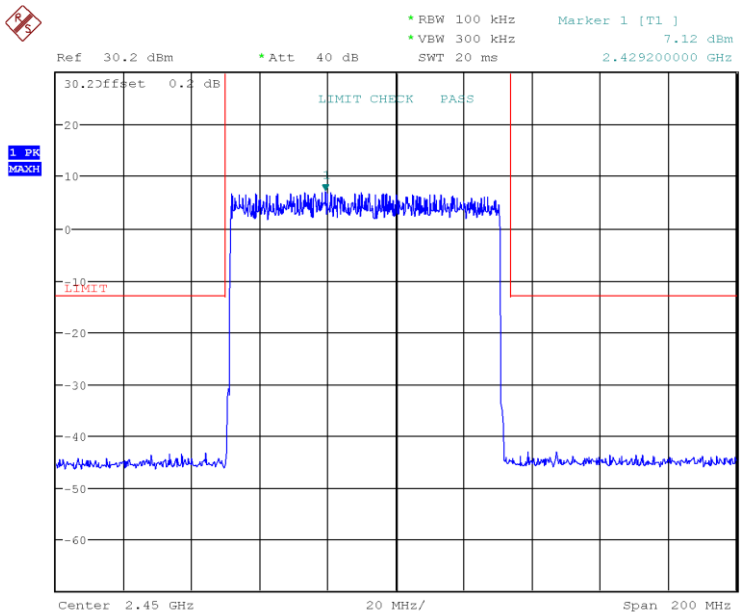
Date: 18.JUL.2022 16:22:51

12.8.2 2-DH5



Date: 18.JUL.2022 16:30:41

12.8.3 3-DH5


RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
7.12 dBm
2.429200000 GHz
Ref 30.2 dBm
Att 40 dB
Offset 0.2 dB
LIMIT CHECK PASS
1 PK
MAXH
LIMIT
Center 2.45 GHz
20 MHz/
Span 200 MHz
Date: 18.JUL.2022 16:36:07

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

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

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

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

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

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

13.2 Test Results

The device was found to be **exempt**. The device is professionally installed.

14 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	8/5/2022	104699147LEX-001			Original Issue
1	8/9/2022	104699147LEX-001.1			Updated customer contact information