F2 Labs
16740 Peters Road
Middlefield, Ohio 44062
United States of America
www.f2labs.com

CERTIFICATION TEST REPORT

Manufacturer:	**Glassboard, LLC** **1060 N Capitol Ave** **Suite E-120** **Indianapolis, IN 46204 USA**
Applicant:	**Same as Above**
Product Name:	**WFM1MW**
Product Description:	**Wi-Fi & Bluetooth Wireless Module**
Model:	**WFM1MW**
FCC ID:	**2AWBKWFM1MW**
Testing Commenced:	2020-05-28
Testing Ended:	2020-08-17
Summary of Test Results:	**In Compliance** The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Rule(s):

- **FCC Part 15 Subpart E – Unlicensed National Information Infrastructure Devices, Section 15.407 General technical requirements ***

**Test report reflects limited testing for PCII.*

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Vice President of EMC

F2 Labs
26501 Ridge Road
Damascus, MD 20872
Ph 301.253.4500

F2 Labs
16740 Peters Road
Middlefield, OH 44062
Ph 440.632.5541

F2 Labs
8583 Zionsville Road
Indianapolis, IN 46268
Ph 317.610.0611

This test report may be reproduced in full; partial reproduction only may be made with the written consent of F2 Labs. The results in this report apply only to the equipment tested.

TABLE OF CONTENTS

Section	Title	Page
1	ADMINISTRATIVE INFORMATION	4
2	SUMMARY OF TEST RESULTS/MODIFICATIONS	7
3	ENGINEERING STATEMENT	8
4	EUT INFORMATION AND DATA	9
5	LIST OF MEASUREMENT INSTRUMENTATION	10
6	RADIATED SPURIOUS EMISSIONS	11
	Dipole Antenna	
	UNII 1	15
	UNII 2A	26
	UNII 2C	38
	UNII 3	46
	Chip Antenna	
	UNII 1	58
	UNII 2A	72
	UNII 2C	80
	UNII 3	92
7	PHOTOGRAPHS	104

1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to ANSI C63.10:2013 and recommended FCC procedure of measurement of NII operating under Section 15.407 and in KDB789033. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of k=2. The Uncertainty for a laboratory are referred to as *U*lab. For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the *U*cispr values to determine if a specific margin is required to deem compliance.

*U*lab

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

*U*cispr

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If *U*lab is less than or equal to *U*cispr, then:
- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If *U*lab is greater than *U*cispr in table 1, then:
- compliance is deemed to occur if no measured disturbance, increased by (*U*lab – *U*cispr), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by (*U*lab – *U*cispr), exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2P22918C-02E	First Issue	2020-08-27	K. Littell

2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
Radiated Spurious Emissions	CFR 47 Part 15.407(b) / KDB789033	Complies

Modifications Made to the Equipment
None

3 ENGINEERING STATEMENT

This report has been prepared on behalf of Glassboard, LLC to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.407 of the FCC Rules using ANSI C63.4 and KDB789033 standards. The test results found in this test report relate only to the items tested.

4 EUT INFORMATION AND DATA

4.1 Equipment Under Test:

Product: Wi-Fi & Bluetooth Wireless Module
Model: WFM1MW
Serial No.: Rev 2
FCC ID: **2AWBKWFM1MW**

4.2 Trade Name:

Glassboard, LLC

4.3 Power Supply:

N/A

4.4 Applicable Rules:

CFR 47, Part 15.407, subpart E

4.5 Equipment Category:

Radio Transmitter-NII

4.6 Antenna(s):

Chip Antenna – Ethertronics M830520, 2.6dBi Gain
PCB Dipole Antenna – Molex 146187, 4.75dBi Gain

4.7 Accessories:

Development PCB – Embedded Artist model V2, Rev E
AC Adaptor – PhiHong PSAA30R-120

4.8 Test Item Condition:

The equipment to be tested was received in good condition.

4.9 Testing Algorithm:

EUT was set to provide a continuous modulated carrier on selected low, mid and high channels in the 5 GHz Wi-Fi band. Band edge and spurious emissions were investigated. For 5 GHz spurs, 3.3VDC from Development Board, HT80 was worst case. Channels 42 (UNII I), 122 (UNII 2) and 155 (UNII 3) were tested. The highest emissions were recorded in the data tables.

5 LIST OF MEASUREMENT INSTRUMENTATION

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	AlbatrossProjects	B83117-DF435-T261	US140023	2021-01-03
Temp/Hum. Recorder	CL261	Extech	445814	04	2021-02-12
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2020-10-21
Antenna, Bilog	CL211	Sunol Sciences, Inc.	JB1	A021017	2021-10-03
Low Loss Cable Set	--	Pasternack	PE3C0666-252 / PE3C066-50CM	None Spec.	2020-07-16
Horn Antenna	CL098	Emco	3115	9809-5580	2021-01-31
Antenna, Horn	CL114	A. H. Systems, Inc.	SAS-572	237	2021-02-04
Pre-Amplifier	CL250	Com-Power	PAM-118A	18040011	2021-06-21
Antenna, Horn	CL188	Com-Power	AH-640	091065	2021-07-23
Pre-Amplifier	CL189	Com-Power	PAM-840A	461303	2021-07-31
Pre-Amplifier	CL153	Agilent	83006-69007	MY39500791	2020-08-05
Amplifier w/Monopole & 18” Loop	CL163-Loop	AH Systems, Inc.	EHA-52B	100	2020-07-24
Software:	Tile Version 3.4.B.3.		Software Verified: 2020-05-28 to 2020-06-15		

6 RADIATED SPURIOUS EMISSIONS

The EUT was fitted with its integral/internal chip antenna and then with a PCB dipole antenna. Radiated emissions were measured in a Semi-Anechoic Chamber. All emissions generated that fall in the restricted bands per FCC Part 15.205 were examined.

6.1 Requirements:

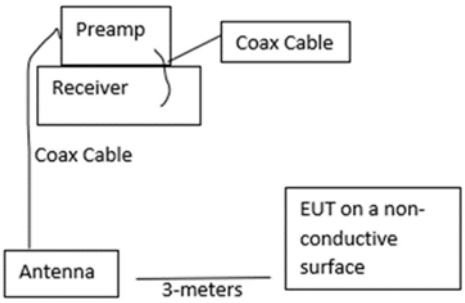
All emissions that fall in the restricted bands defined in FCC Part 15.205 shall not exceed the maximum field strength listed in FCC Part 15.209(a).

All other undesirable emission that do not fall under the provisions of Part 15.205, shall meet the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.



6.2 Radiated Spurious Emission Test Data

Test Date(s):	2020-05-28 to 20-06-15; 2020-07-28	**Test Engineer:**	J. Chiller
Standards:	CFR 47 Part 15.407; Part 15.209 / KDB789033	**Air Temperature:**	23.9ºC
		Relative Humidity:	34%

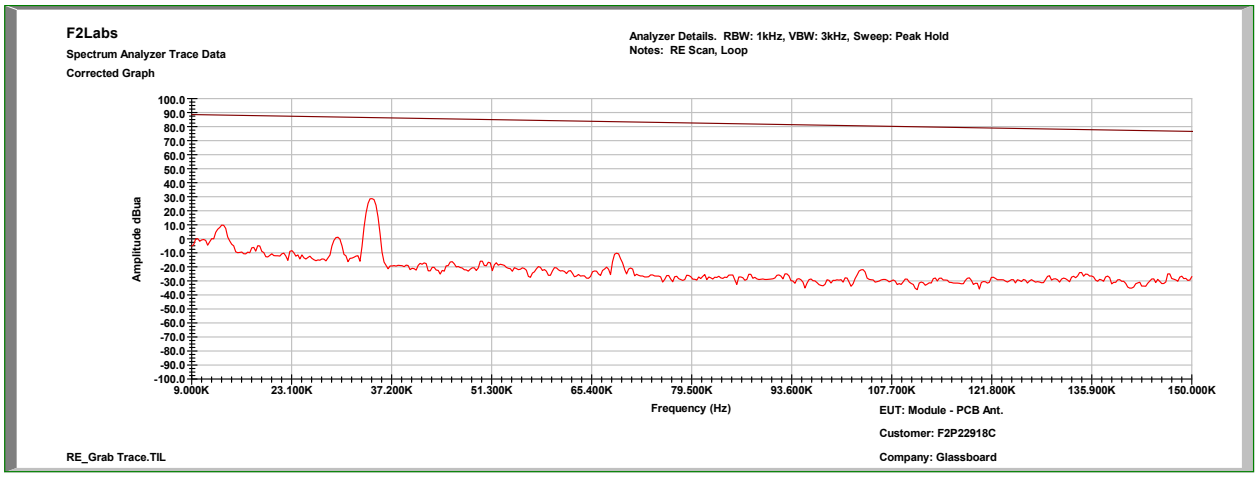
Notes: Plots are peak, max hold prescan data included only to determine what frequencies to investigate and measure. The EUT was initially placed in a semi-anechoic chamber, and rotated in all three orthogonal positions to maximize the emissions. The orthogonal position that showed the highest emissions was used. Characterization measurements were then performed to determine at which frequencies significant emissions occurred. These graphs are shown below.

The equipment was fully exercised with all cabling attached to the EUT and was positioned in a semi-anechoic chamber for maximum emissions. While the equipment was energized, the receiving antenna was scanned from 1.0 meter to 4.0 meters in both vertical and horizontal polarities while the turntable was adjusted 360 degrees to determine the maximum field strength. The tables of measured results can be found below.

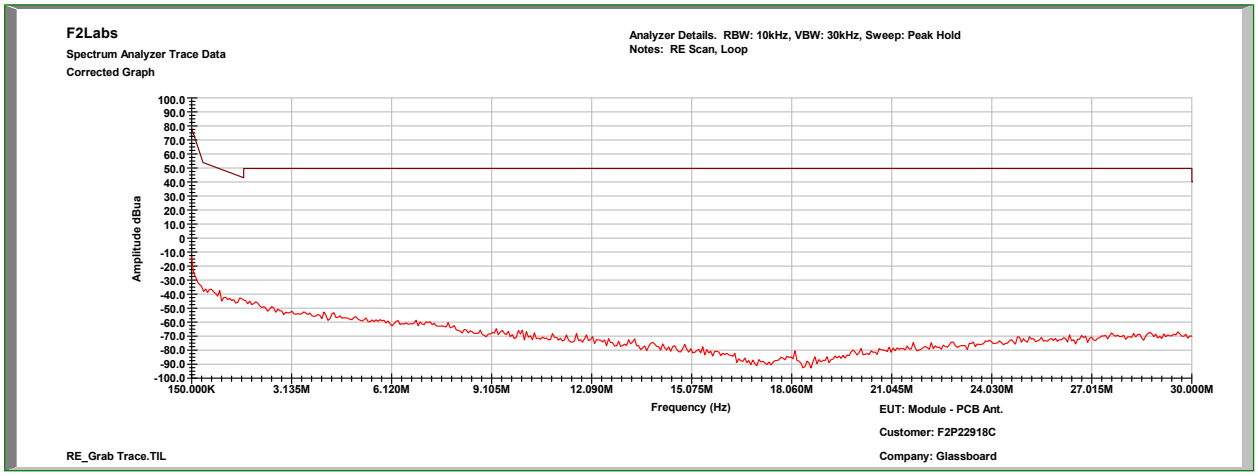
In the following plots, emissions to be found by the EUT were measured and listed in tables. The black lines are active scans while the green lines are the max peak scan of the unit during rotations. The plots are for the selected channels at 80 MHz Bandwidth, determined worst-case. The table of results includes results for all channels.

Dipole Antenna

Characterization Scan, 0.009 MHz to 0.15 MHz



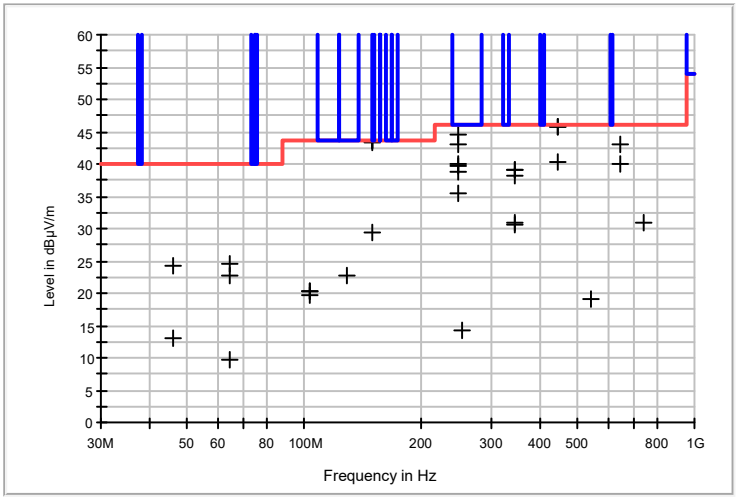
Characterization Scan, 0.15 MHz to 30.0 MHz



Dipole Antenna

Radiated Spurious Emissions 30 MHz to 1000 MHz (Data reflects all channels)

Note: All emissions recorded are from the development board used for testing. The radio was turned off and removed, and all emissions remained at the same levels.



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.000000	24.2	120.000	100.0	V	355.0	-4.5	15.8	40.0
46.000000	13.0	120.000	100.0	H	359.0	-4.5	27.0	40.0
64.560000	22.7	120.000	100.0	V	29.0	-6.7	17.3	40.0
64.560000	9.8	120.000	100.0	H	0.0	-6.7	30.2	40.0
64.560000	24.6	120.000	100.0	V	0.0	-6.7	15.4	40.0
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
103.160000	19.8	120.000	100.0	V	345.0	-3.0	23.7	43.5
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
127.800000	22.6	120.000	100.0	V	4.0	0.2	20.9	43.5
148.440000	29.5	120.000	100.0	V	136.0	-1.0	14.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.3	120.000	100.0	H	0.0	-1.0	0.2	43.5
247.480000	35.5	120.000	100.0	V	197.0	-0.7	10.5	46.0
247.480000	42.9	120.000	100.0	H	178.0	-0.7	3.1	46.0
247.480000	39.6	120.000	100.0	V	354.0	-0.7	6.4	46.0
247.480000	38.9	120.000	100.0	V	251.0	-0.7	7.1	46.0
247.480000	44.6	120.000	100.0	H	107.0	-0.7	1.4	46.0
247.480000	39.9	120.000	100.0	H	258.0	-0.7	6.1	46.0
252.400000	14.3	120.000	100.0	V	0.0	-0.7	31.7	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	30.5	120.000	100.0	V	116.0	2.6	15.5	46.0
346.400000	38.0	120.000	100.0	H	131.0	2.6	8.0	46.0
346.400000	30.9	120.000	100.0	V	67.0	2.6	15.1	46.0
445.400000	40.2	120.000	100.0	V	322.0	5.1	5.8	46.0
445.400000	45.8	120.000	100.0	H	0.0	5.1	0.2	46.0
445.400000	45.7	120.000	100.0	H	0.0	5.1	0.3	46.0
544.600000	19.0	120.000	100.0	V	355.0	7.1	27.0	46.0
643.400000	40.0	120.000	100.0	V	355.0	9.1	6.0	46.0
643.440000	43.0	120.000	100.0	H	131.0	9.1	3.0	46.0
742.560000	30.9	120.000	100.0	H	352.0	10.3	15.1	46.0

Dipole Antenna

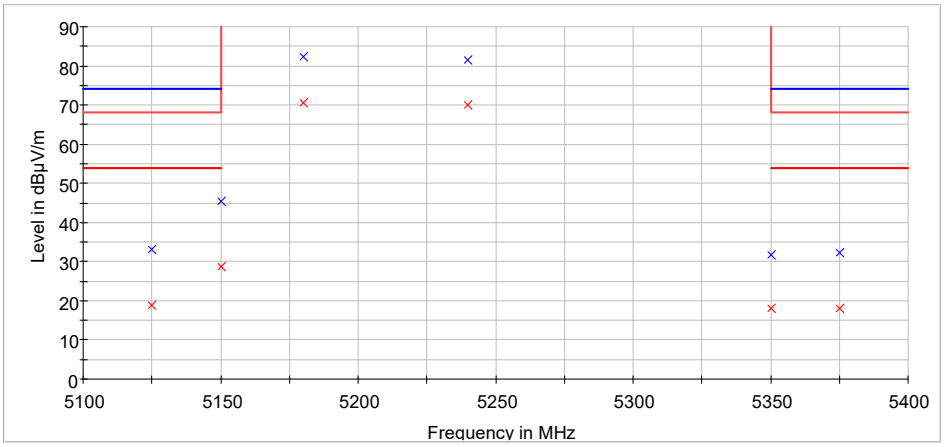
UNII 1, HT20: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5150.000000	H	150.00	84.00	68.5	-23.1	45.40	74.0	-28.6
5125.000000	H	150.00	84.00	56.2	-23.2	33.00	74.0	-41.0
5350.000000	H	150.00	84.00	54.2	-22.3	31.90	74.0	-42.1
5375.000000	H	150.00	84.00	54.3	-22.2	32.10	74.0	-41.9

Average

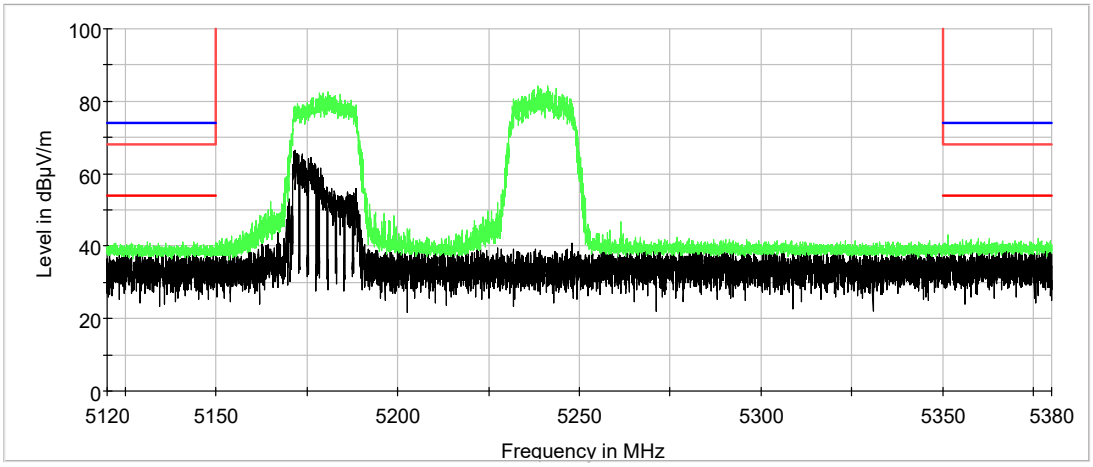
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5150.000000	H	150.00	84.00	51.8	-23.1	28.70	54.0	-25.3
5125.000000	H	150.00	84.00	42.1	-23.2	18.90	54.0	-35.1
5350.000000	H	150.00	84.00	40.4	-22.3	18.10	54.0	-35.9
5375.000000	H	150.00	84.00	40.3	-22.2	18.10	54.0	-35.9



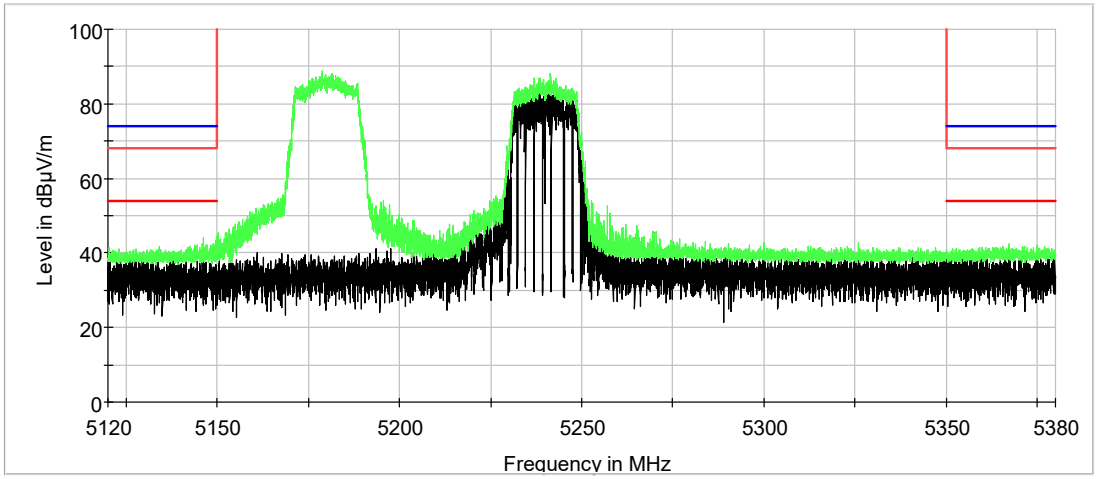
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna
UNII 1, HT20: Radiated Band Edge, Vertical



UNII 1, HT20: Radiated Band Edge, Horizontal



Dipole Antenna

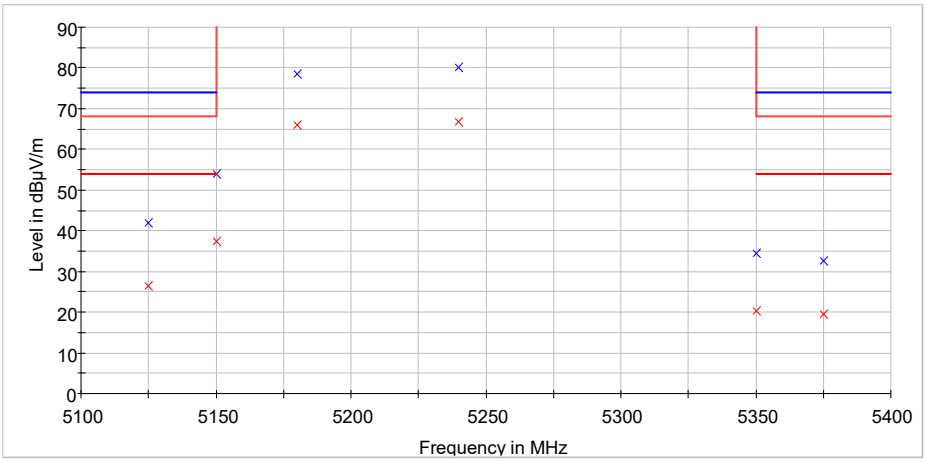
UNII 1, HT40: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	99.00	56.7	-22.3	34.40	74.0	-39.6
5375.000000	H	150.00	99.00	54.7	-22.2	32.50	74.0	-41.5
5150.000000	H	150.00	99.00	77.1	-23.1	54.00	74.0	-20.0
5125.000000	H	150.00	99.00	65.1	-23.2	41.90	74.0	-32.1

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	99.00	42.7	-22.3	20.40	54.0	-33.6
5375.000000	H	150.00	99.00	41.7	-22.2	19.50	54.0	-34.5
5150.000000	H	150.00	99.00	60.6	-23.1	37.50	54.0	-16.5
5125.000000	H	150.00	99.00	49.7	-23.2	26.50	54.0	-27.5

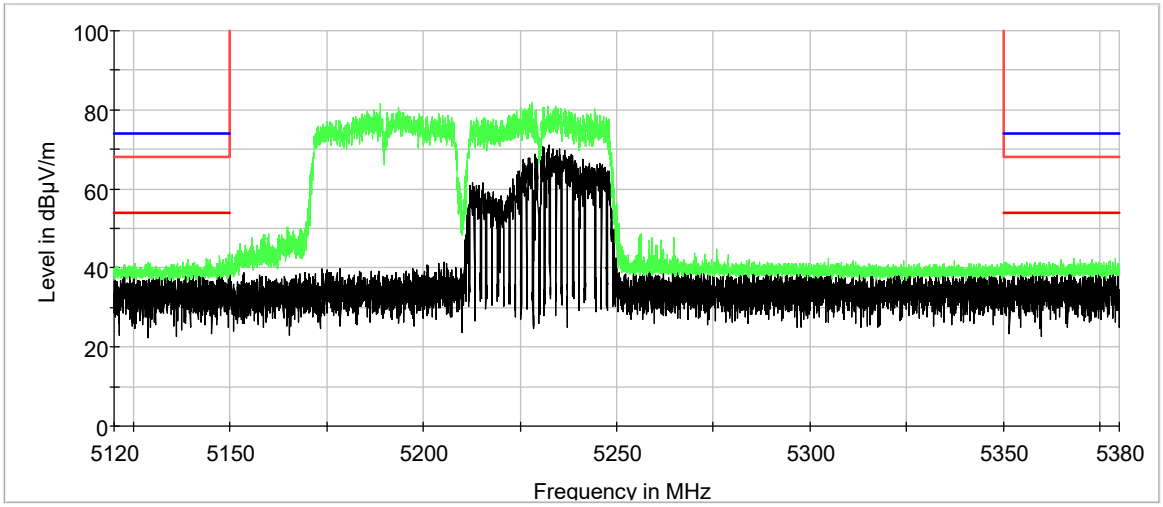


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

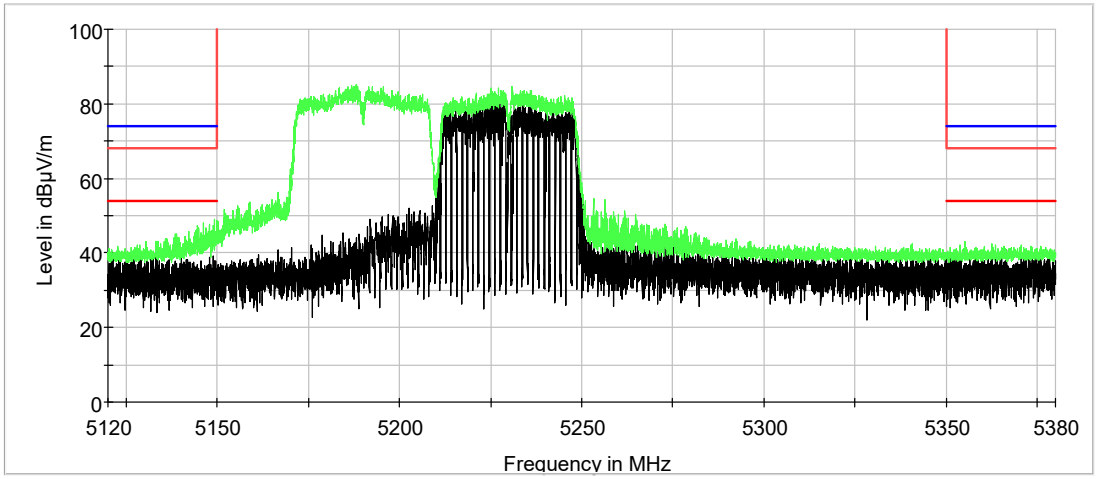
Dipole Antenna

UNII 1, HT40: Radiated Band Edge, Vertical



Dipole Antenna

UNII 1, HT40: Radiated Band Edge Horizontal



Dipole Antenna

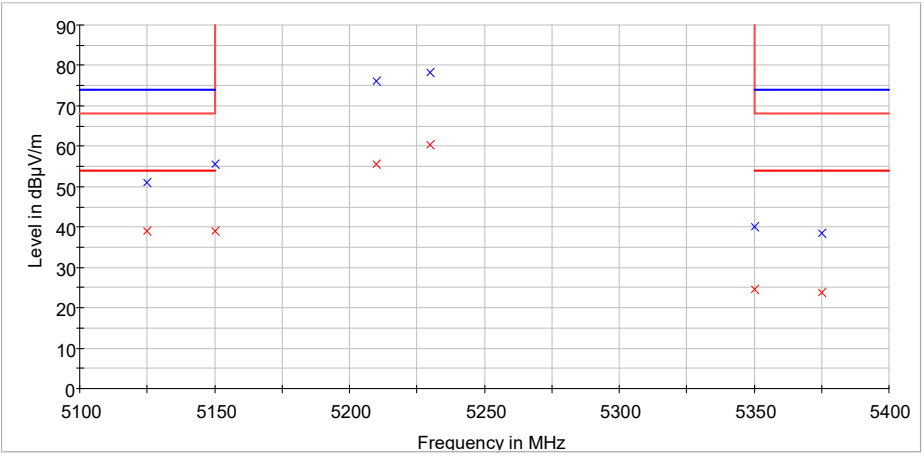
UNII 1, HT80: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5150.000000	H	150.00	99.00	78.6	-23.1	55.50	74.0	-18.5
5125.000000	H	150.00	99.00	74.3	-23.2	51.10	74.0	-22.9
5350.000000	H	150.00	99.00	62.3	-22.3	40.00	74.0	-34.0
5375.000000	H	150.00	99.00	60.7	-22.2	38.50	74.0	-35.5

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5150.000000	H	150.00	99.00	62.1	-23.1	39.00	54.0	-15.0
5125.000000	H	150.00	99.00	62.3	-23.2	39.10	54.0	-14.9
5350.000000	H	150.00	99.00	46.9	-22.3	24.60	54.0	-29.4
5375.000000	H	150.00	99.00	45.9	-22.2	23.70	54.0	-30.3

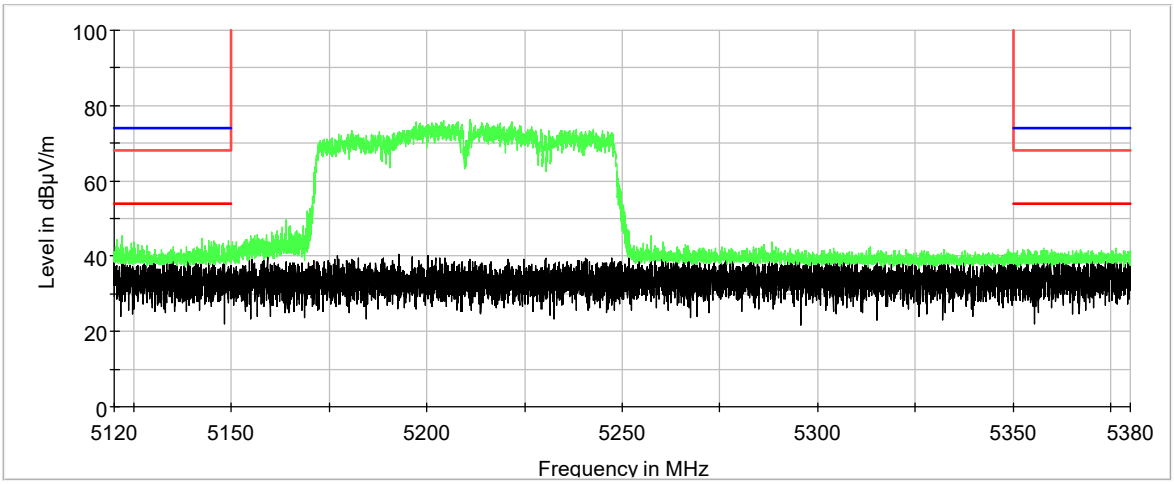


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

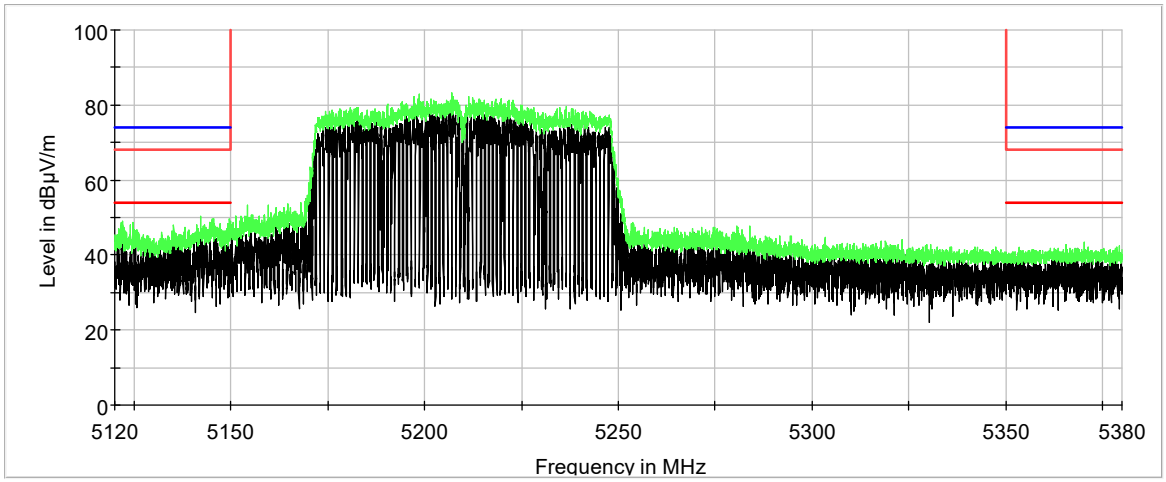
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 1, HT80: Radiated Band Edge, Vertical



UNII 1, HT80: Radiated Band Edge, Horizontal



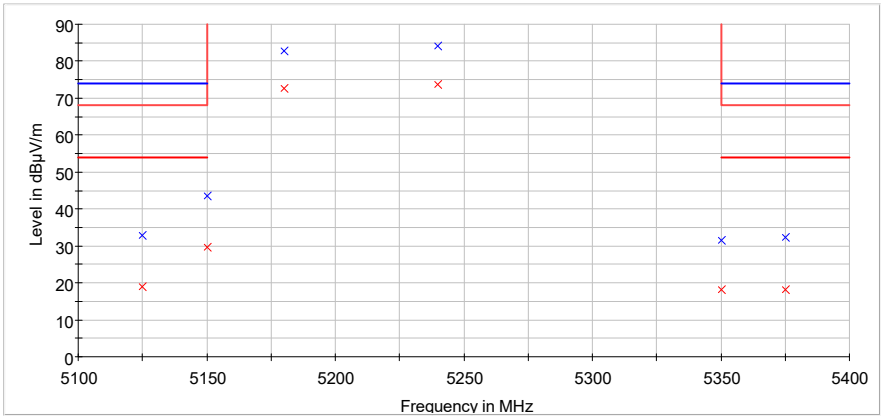
Dipole Antenna

UNII 1, OFDM: Radiated Band Edge Measurements
MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5150.000000	H	150.00	99.00	66.6	-23.1	43.50	74.0	-30.5
5125.000000	H	150.00	99.00	56.1	-23.2	32.90	74.0	-41.1
5350.000000	H	150.00	99.00	53.8	-22.3	31.50	74.0	-42.5
5375.000000	H	150.00	99.00	54.5	-22.2	32.30	74.0	-41.7

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5150.000000	H	150.00	99.00	52.8	-23.1	29.70	54.0	-24.3
5125.000000	H	150.00	99.00	42.2	-23.2	19.00	54.0	-35.0
5350.000000	H	150.00	99.00	40.5	-22.3	18.20	54.0	-35.8
5375.000000	H	150.00	99.00	40.4	-22.2	18.20	54.0	-35.8

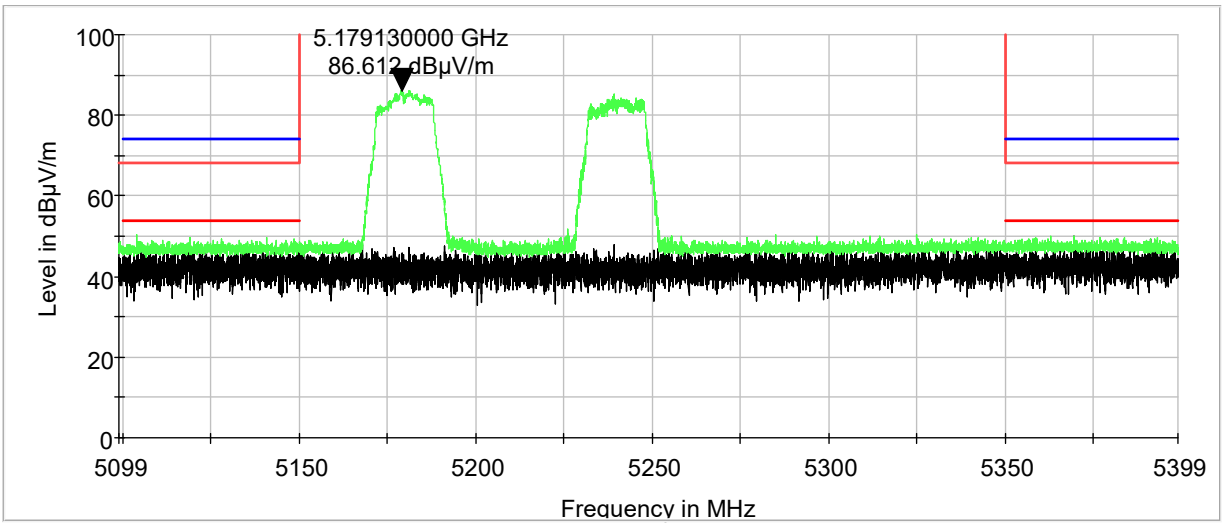


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

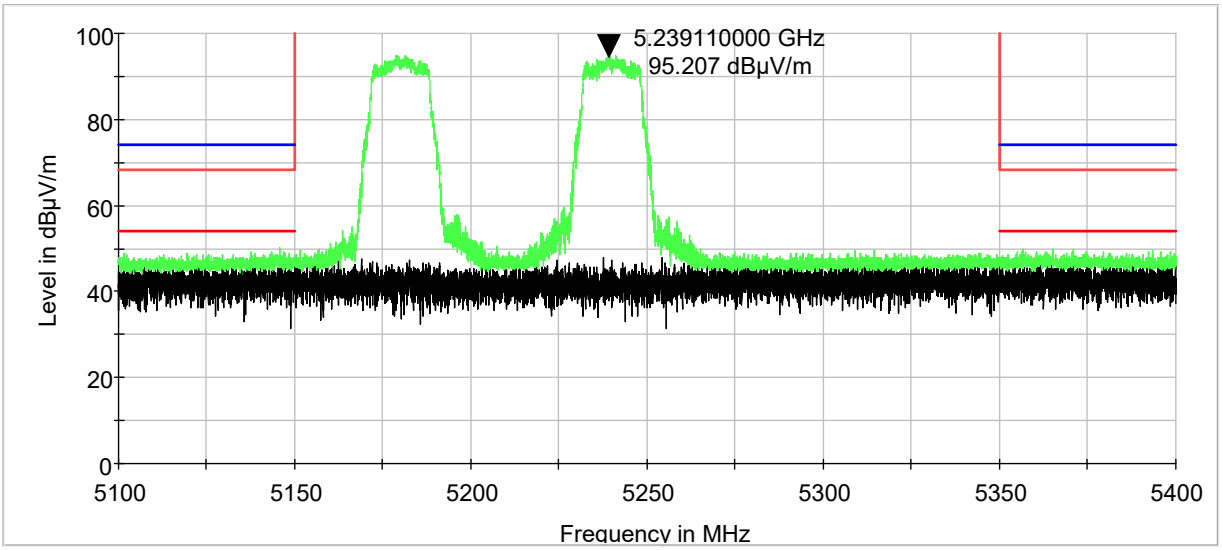
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 1, OFDM: Radiated Band Edge, Vertical



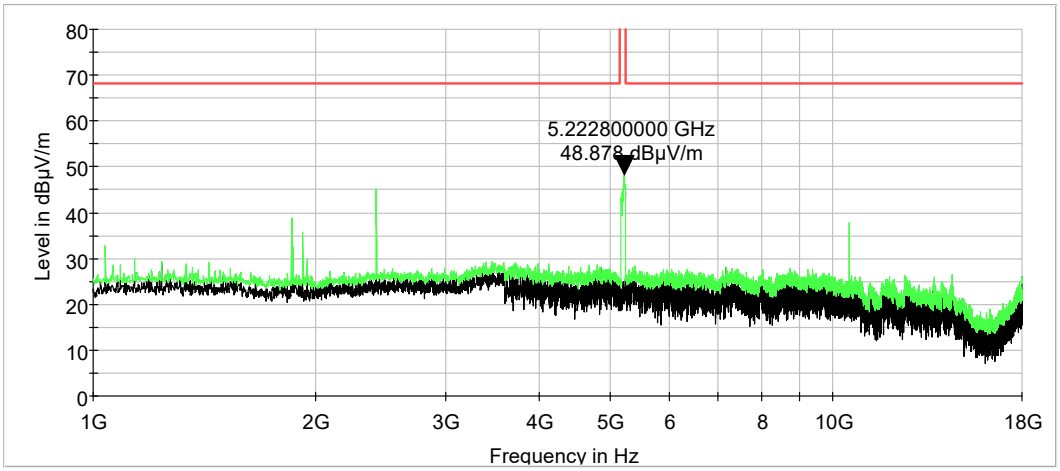
UNII 1, OFDM: Radiated Band Edge, Horizontal



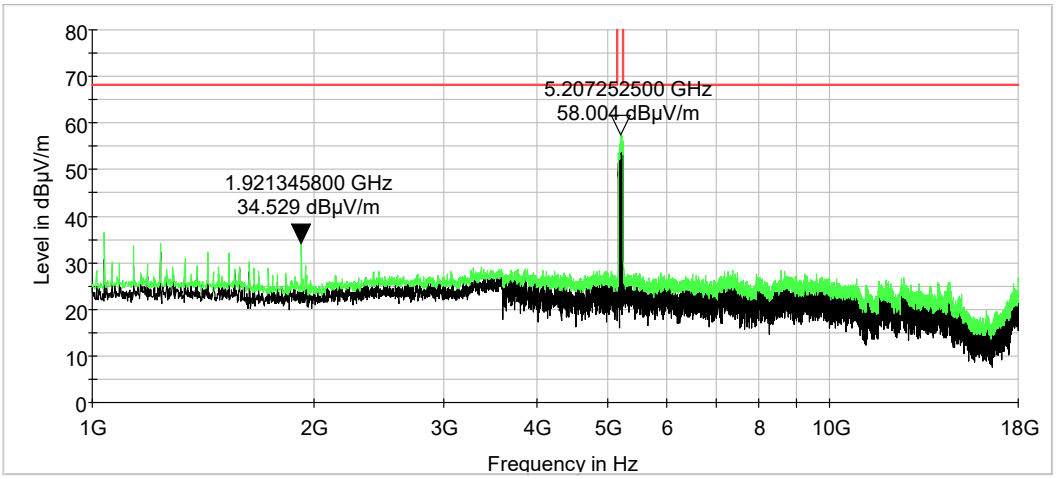
The following plots are from HT20n, which was the worst case.

Dipole Antenna

**UNII 1, Radiated Spurious Emissions:
1 GHz to 18 GHz, Vertical**

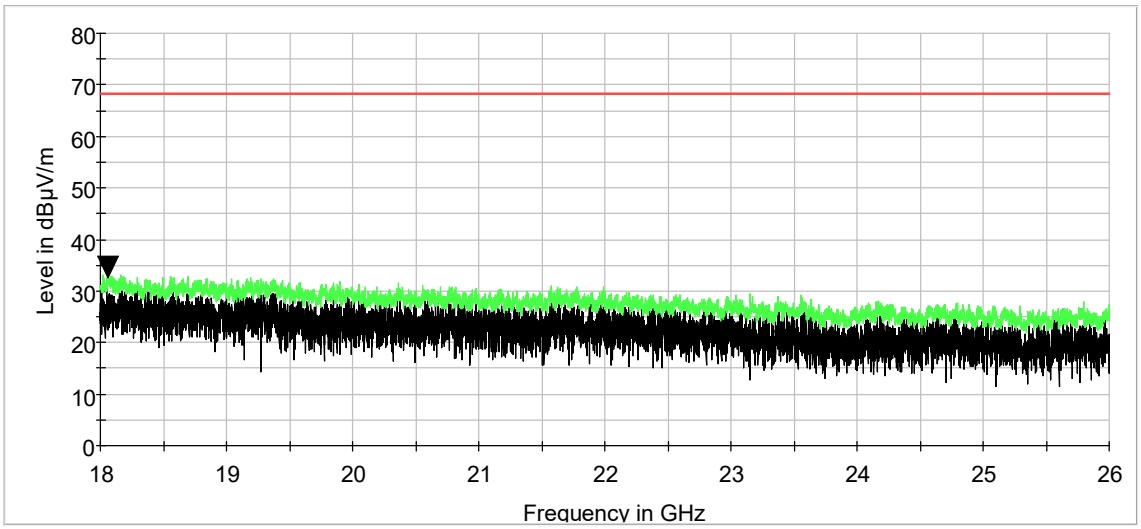


**UNII 1, Radiated Spurious Emissions:
1 GHz to 18 GHz, Horizontal**



Dipole Antenna

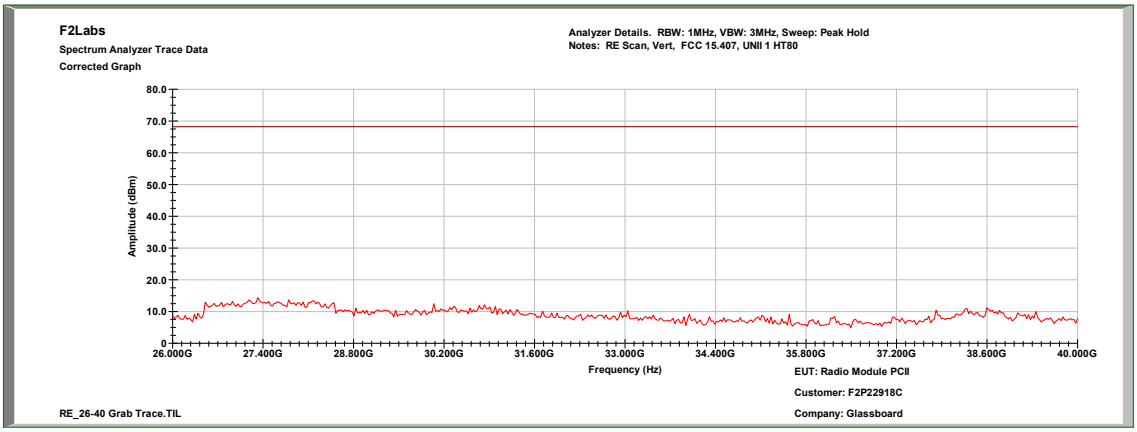
UNII 1, Radiated Spurious Emissions: 18 GHz to 26 GHz, Vertical



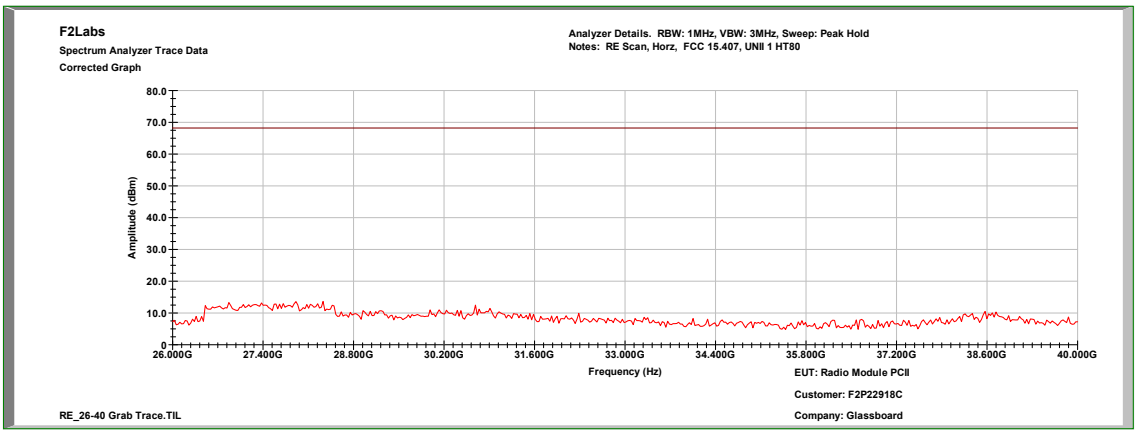
UNII 1, Radiated Spurious Emissions: 18 GHz to 26 GHz, Horizontal

Dipole Antenna

UNII 1, Radiated Spurious Emissions: 26 GHz to 40 GHz, Vertical



UNII 1, Radiated Spurious Emissions: 26 GHz to 40 GHz, Horizontal



Dipole Antenna

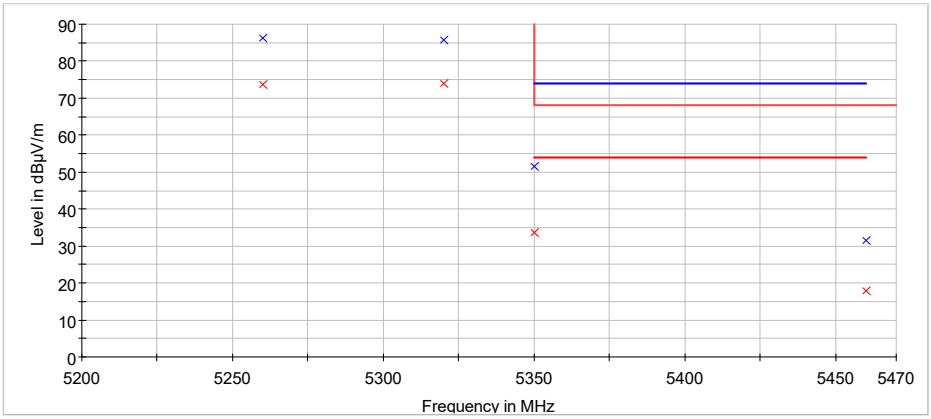
UNII 2A, HT20: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	91.00	73.9	-22.3	51.60	74.0	-22.4
5460.000000	H	150.00	91.00	53.4	-22.0	31.40	74.0	-42.6

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	91.00	56.0	-22.3	33.70	54.0	-20.3
5460.000000	H	150.00	91.00	39.9	-22.0	17.90	54.0	-36.1

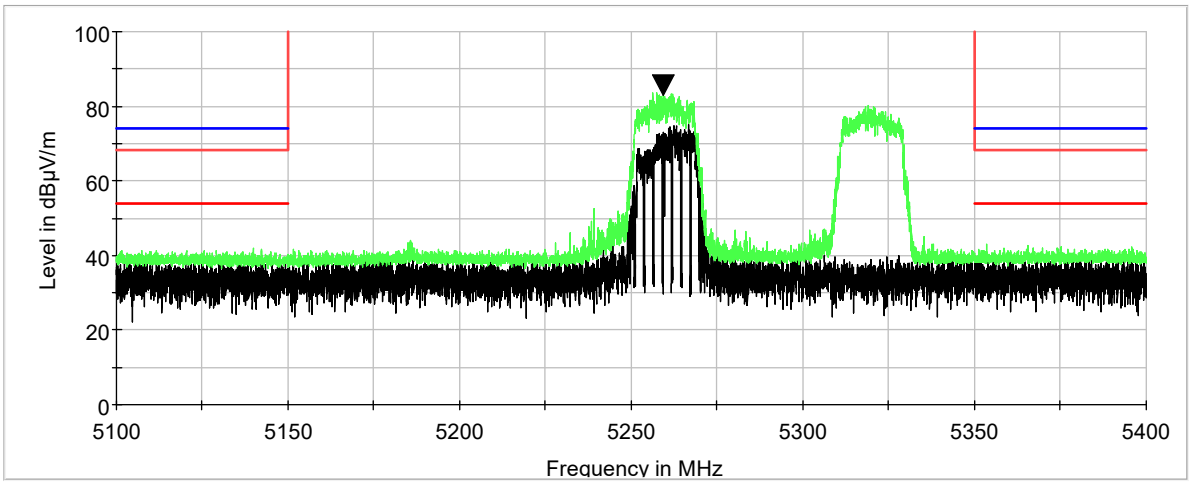


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

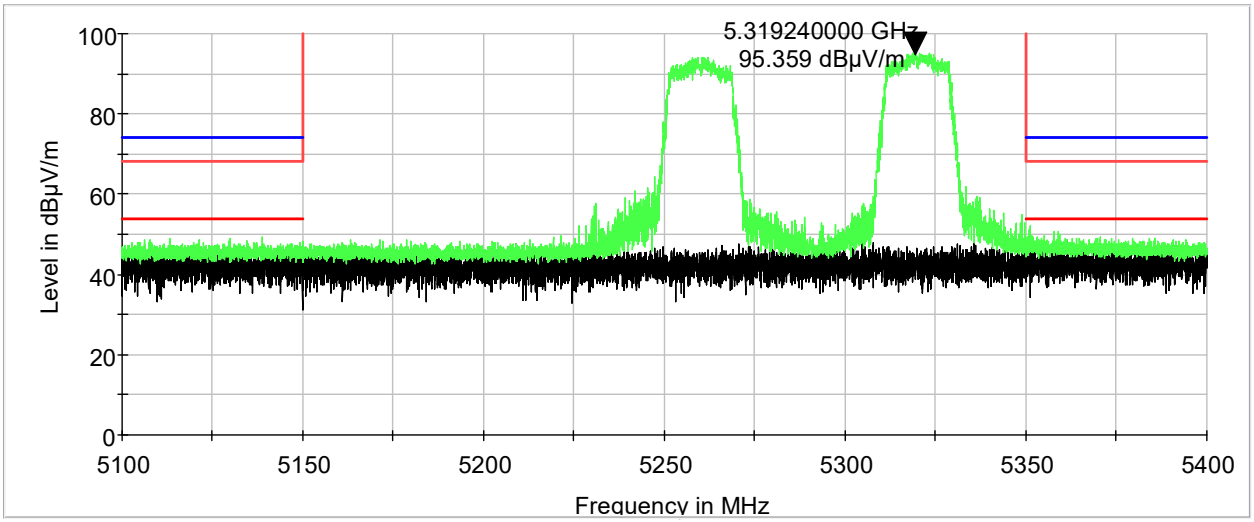
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2A, HT20: Radiated Band Edge, Vertical



UNII 2A, HT20: Radiated Band Edge, Horizontal



Dipole Antenna

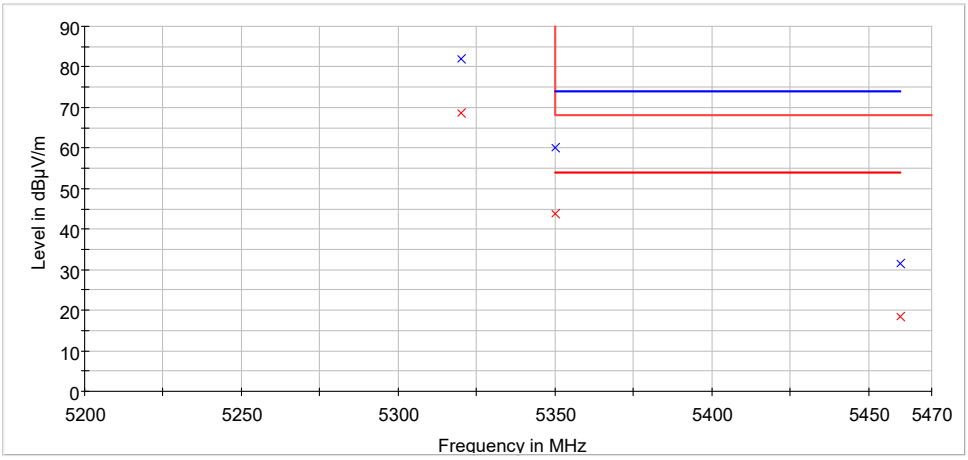
UNII 2A, HT40: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5320.000000	H	150.00	107.00	60.0	-22.4	37.60	74.0	-36.4
5350.000000	H	150.00	107.00	82.3	-22.3	60.00	74.0	-14.0
5460.000000	H	150.00	107.00	53.5	-22.0	31.50	74.0	-42.5

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5320.000000	H	150.00	107.00	60.0	-22.4	37.60	54.0	-16.4
5350.000000	H	150.00	107.00	66.0	-22.3	43.70	54.0	-10.3
5460.000000	H	150.00	107.00	40.4	-22.0	18.40	54.0	-35.6

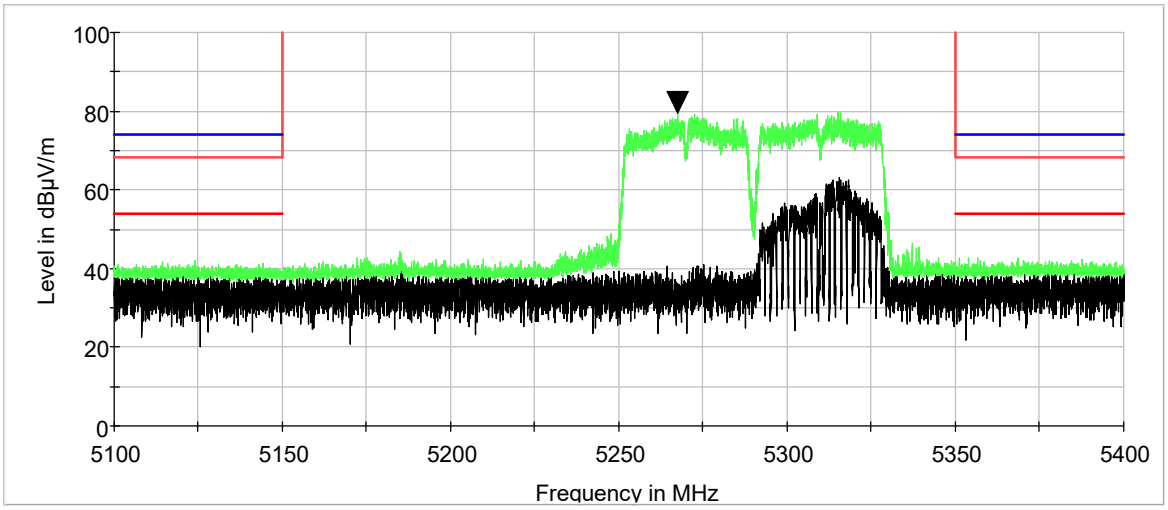


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

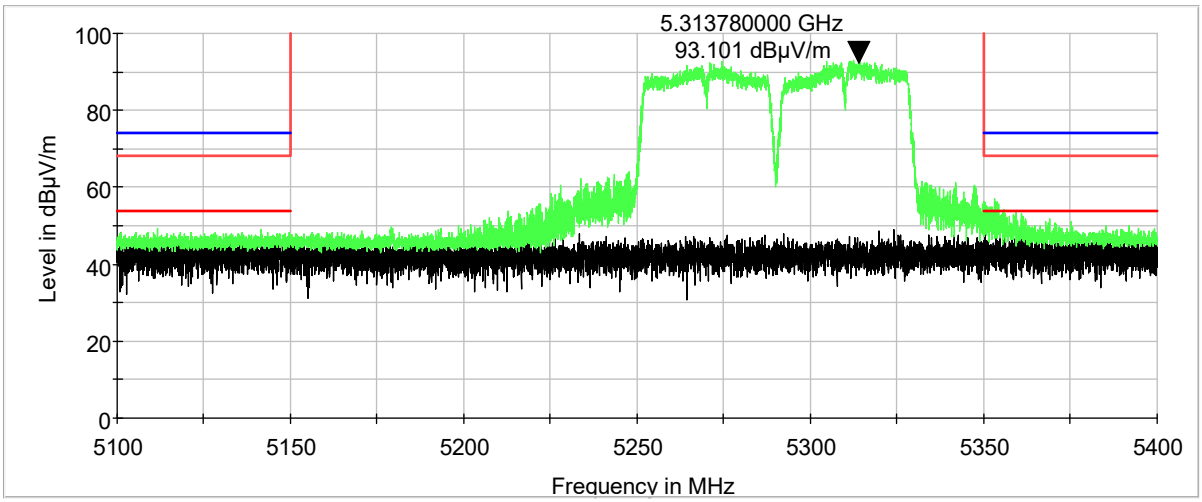
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2A, HT40: Radiated Band Edge, Vertical



UNII 2A, HT40: Radiated Band Edge, Horizontal



Dipole Antenna

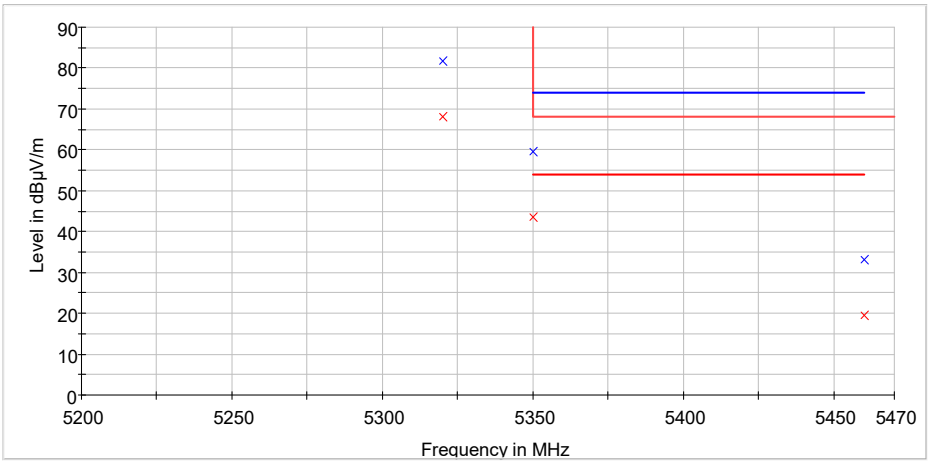
UNII 2A, HT80: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	107.00	81.9	-22.3	59.60	74.0	-14.4
5460.000000	H	150.00	107.00	55.2	-22.0	33.20	74.0	-40.8

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	107.00	65.7	-22.3	43.40	54.0	-10.6
5460.000000	H	150.00	107.00	41.5	-22.0	19.50	54.0	-34.5

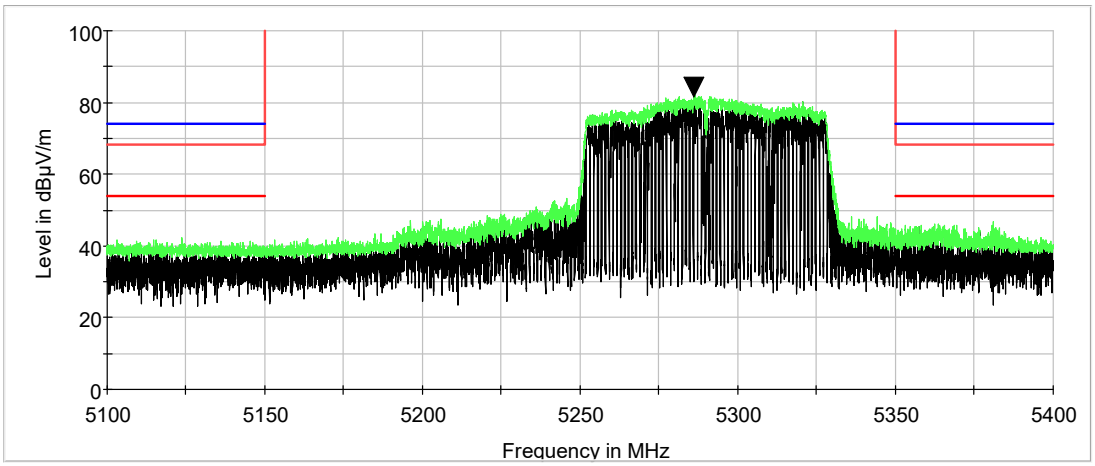


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

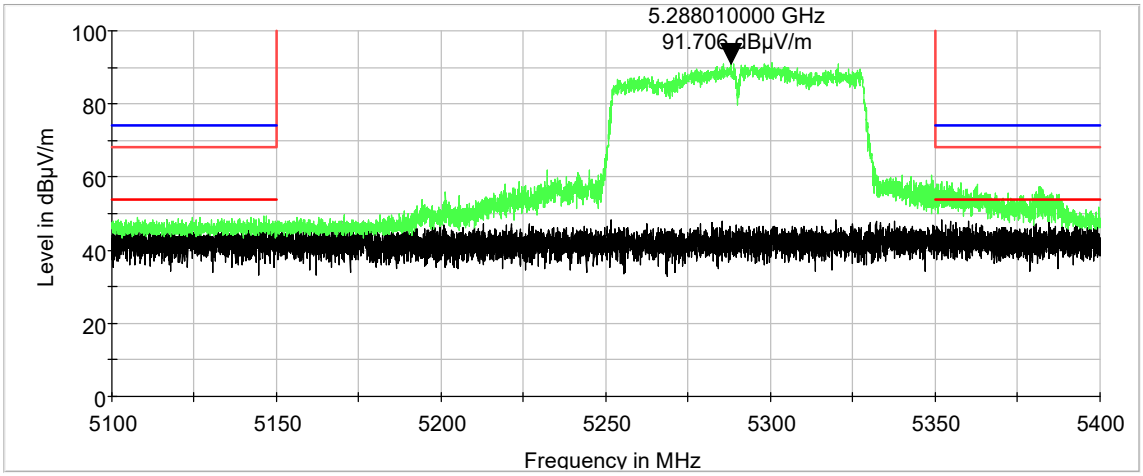
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2A, HT80: Radiated Band Edge, Vertical



UNII 2A, HT80: Radiated Band Edge, Horizontal



Dipole Antenna

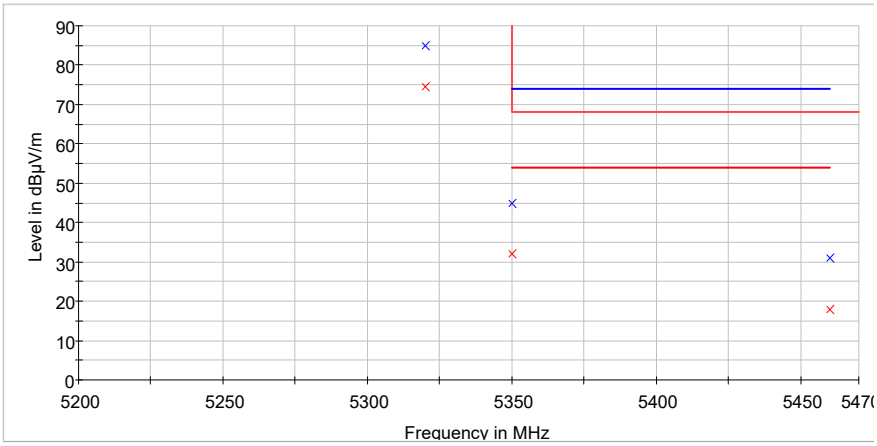
UNII 2A, OFDM: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	99.00	67.2	-22.3	44.90	74.0	-29.1
5460.000000	H	150.00	99.00	53.0	-22.0	31.00	74.0	-43.0

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	99.00	54.3	-22.3	32.00	54.0	-22.0
5460.000000	H	150.00	99.00	39.9	-22.0	17.90	54.0	-36.1

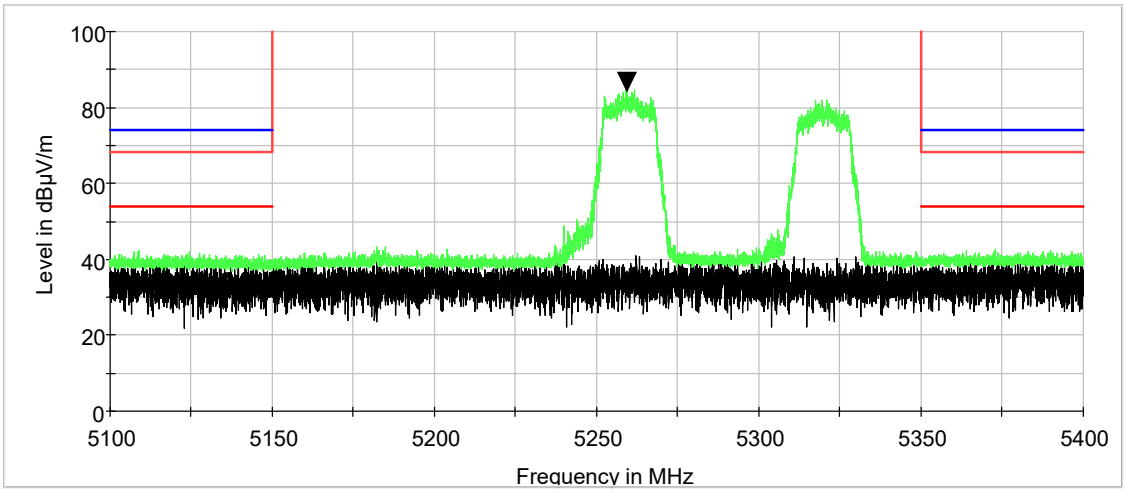


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

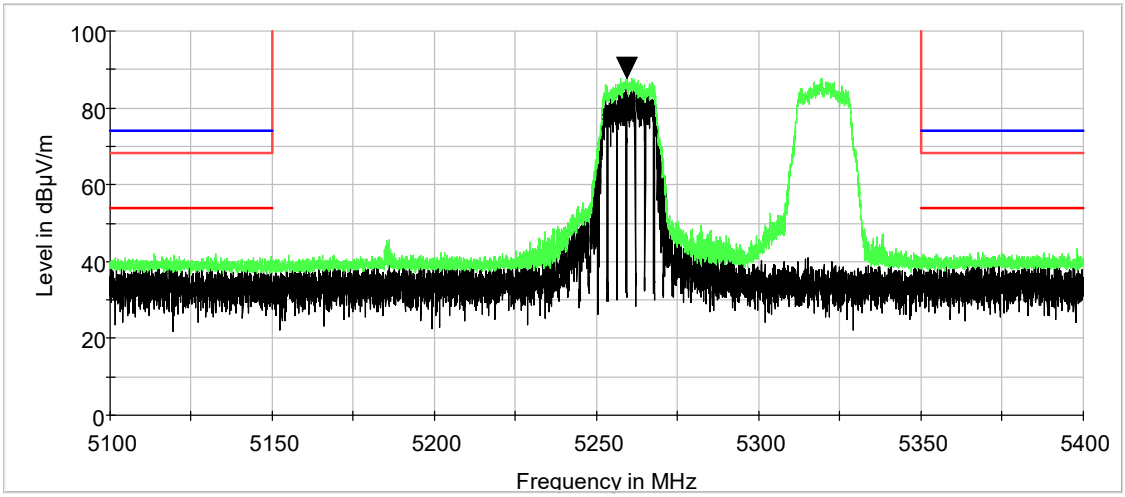
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2A, OFDM: Radiated Band Edge, Vertical

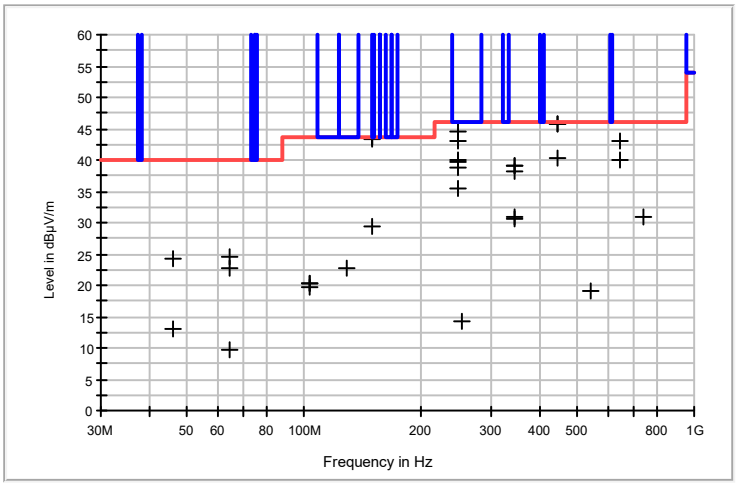


UNII 2A, OFDM: Radiated Band Edge, Horizontal



Dipole Antenna
UNII 2A & 2C, Radiated Spurious Emissions 30 MHz to 1 GHz
(Data reflects all channels.)

Note: All emissions recorded are from the development board used for testing. The radio was turned off and removed, and all emissions remained at the same levels.

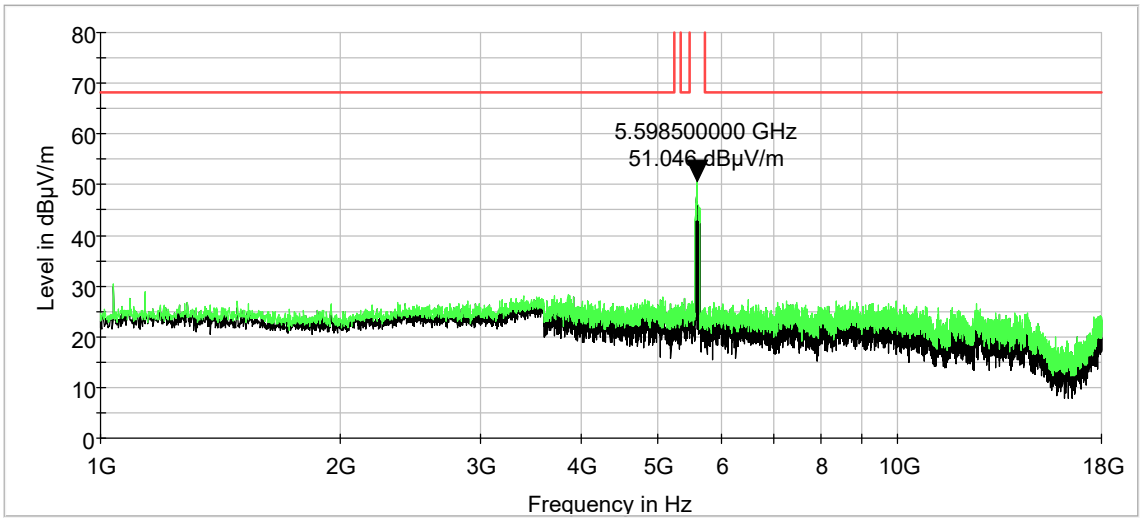


Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.000000	24.2	120.000	100.0	V	355.0	-4.5	15.8	40.0
46.000000	13.0	120.000	100.0	H	359.0	-4.5	27.0	40.0
64.560000	22.7	120.000	100.0	V	29.0	-6.7	17.3	40.0
64.560000	9.8	120.000	100.0	H	0.0	-6.7	30.2	40.0
64.560000	24.6	120.000	100.0	V	0.0	-6.7	15.4	40.0
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
103.160000	19.8	120.000	100.0	V	345.0	-3.0	23.7	43.5
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
127.800000	22.6	120.000	100.0	V	4.0	0.2	20.9	43.5
148.440000	29.5	120.000	100.0	V	136.0	-1.0	14.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.3	120.000	100.0	H	0.0	-1.0	0.2	43.5
247.480000	35.5	120.000	100.0	V	197.0	-0.7	10.5	46.0
247.480000	42.9	120.000	100.0	H	178.0	-0.7	3.1	46.0
247.480000	39.6	120.000	100.0	V	354.0	-0.7	6.4	46.0
247.480000	38.9	120.000	100.0	V	251.0	-0.7	7.1	46.0
247.480000	44.6	120.000	100.0	H	107.0	-0.7	1.4	46.0
247.480000	39.9	120.000	100.0	H	258.0	-0.7	6.1	46.0
252.400000	14.3	120.000	100.0	V	0.0	-0.7	31.7	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	30.5	120.000	100.0	V	116.0	2.6	15.5	46.0
346.400000	38.0	120.000	100.0	H	131.0	2.6	8.0	46.0
346.400000	30.9	120.000	100.0	V	67.0	2.6	15.1	46.0
445.400000	40.2	120.000	100.0	V	322.0	5.1	5.8	46.0
445.400000	45.8	120.000	100.0	H	0.0	5.1	0.2	46.0
445.400000	45.7	120.000	100.0	H	0.0	5.1	0.3	46.0
544.600000	19.0	120.000	100.0	V	355.0	7.1	27.0	46.0
643.400000	40.0	120.000	100.0	V	355.0	9.1	6.0	46.0
643.440000	43.0	120.000	100.0	H	131.0	9.1	3.0	46.0
742.560000	30.9	120.000	100.0	H	352.0	10.3	15.1	46.0

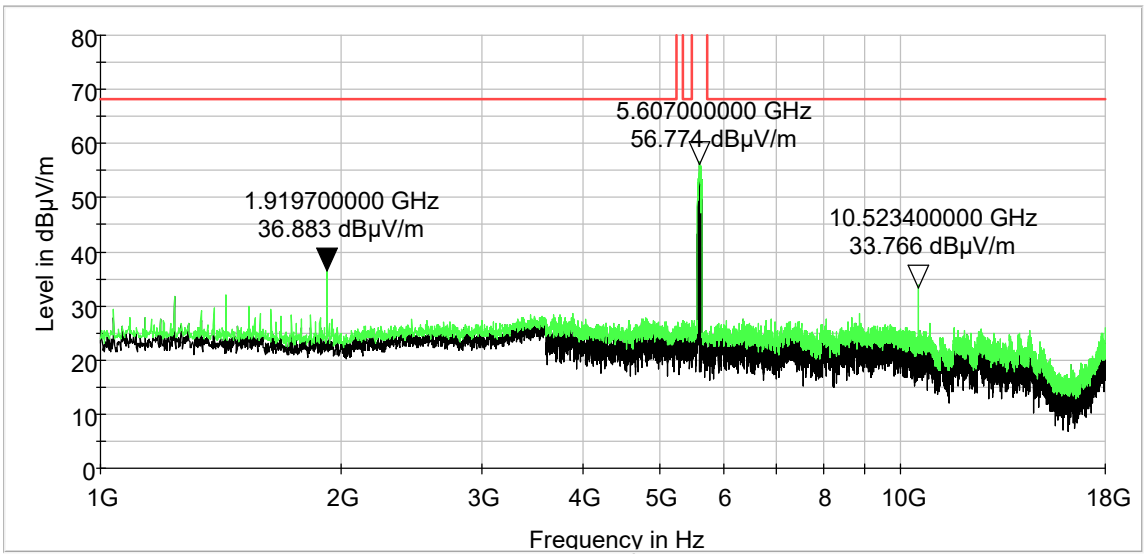
The following plots are from UNII 2A HT20, determined to be worst case between all modulations in UNII 2A and 2C.

Dipole Antenna

**UNII 2A & 2C, Radiated Spurious Emissions:
1 GHz to 18 GHz, Vertical**

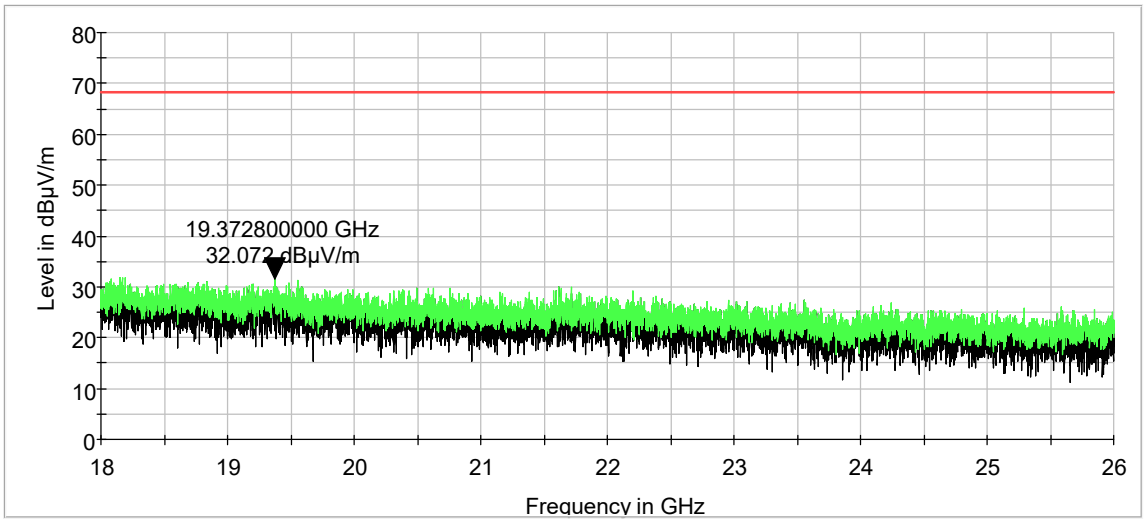


**UNII 2A & 2C, Radiated Spurious Emissions:
1 GHz to 18 GHz, Horizontal**



Dipole Antenna

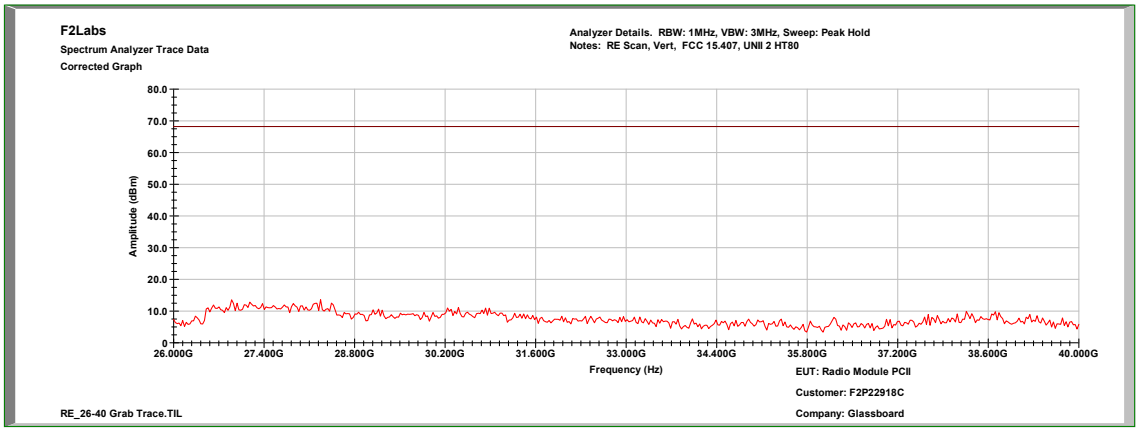
UNII 2A & 2C, Radiated Spurious Emissions: 18 GHz to 26 GHz, Vertical



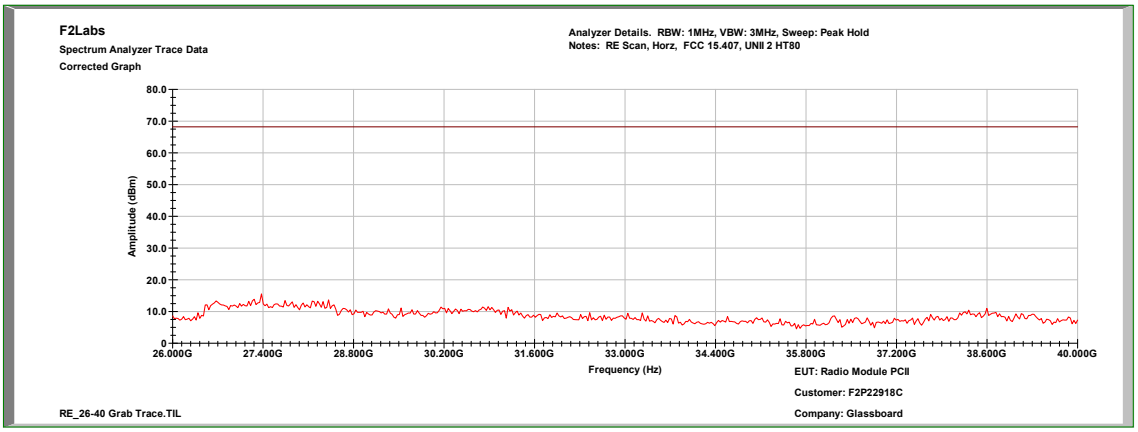
UNII 2A & 2C, Radiated Spurious Emissions: 18 GHz to 26 GHz, Horizontal

Dipole Antenna

UNII 2A & 2C, Radiated Spurious Emissions: 26 GHz to 40 GHz, Vertical



UNII 2A & 2C, Radiated Spurious Emissions: 26 GHz to 40 GHz, Horizontal



Dipole Antenna

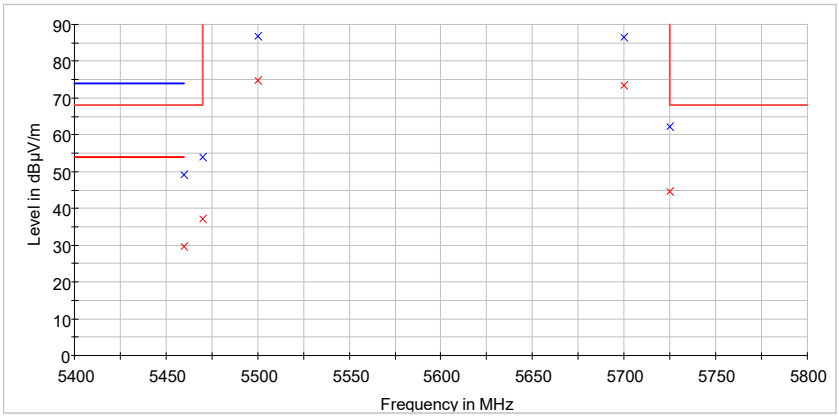
UNII 2C, HT20: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	107.00	75.8	-21.9	53.90	68.2	-14.3
5460.000000	H	150.00	107.00	71.2	-22.0	49.20	74.0	-24.8
5725.000000	H	150.00	107.00	83.7	-21.5	62.20	74.0	-11.8

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	107.00	59.1	-21.9	37.20	54.0	-16.8
5460.000000	H	150.00	107.00	51.7	-22.0	29.70	54.0	-24.3
5725.000000	H	150.00	107.00	66.2	-21.5	44.70	54.0	-9.3

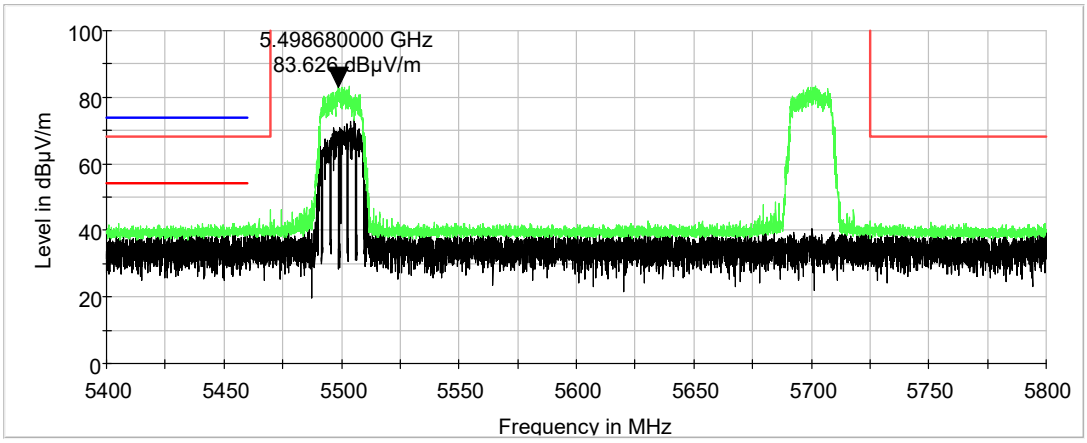


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

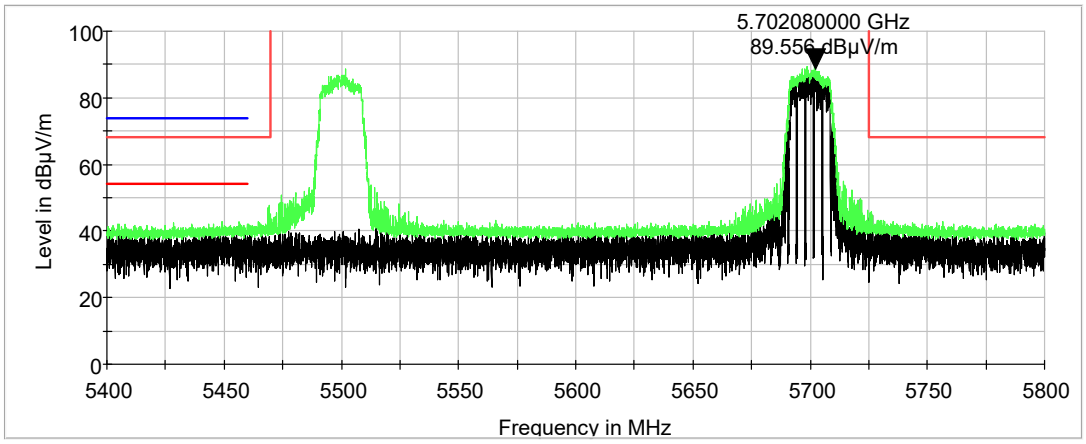
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2C, HT20: Radiated Band Edge, Vertical



UNII 2C, HT20: Radiated Band Edge, Horizontal



Dipole Antenna

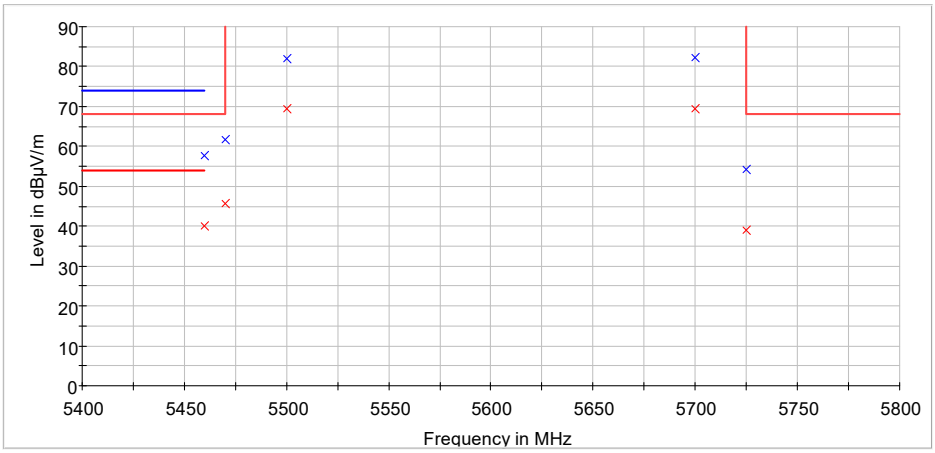
UNII 2C, HT40: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	107.00	83.6	-21.9	61.70	68.2	-6.5
5460.000000	H	150.00	107.00	79.8	-22.0	57.80	74.0	-16.2
5725.000000	H	150.00	107.00	75.8	-21.5	54.30	74.0	-19.7

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	107.00	67.7	-21.9	45.80	54.0	-8.2
5460.000000	H	150.00	107.00	62.2	-22.0	40.20	54.0	-13.8
5725.000000	H	150.00	107.00	60.4	-21.5	38.90	54.0	-15.1

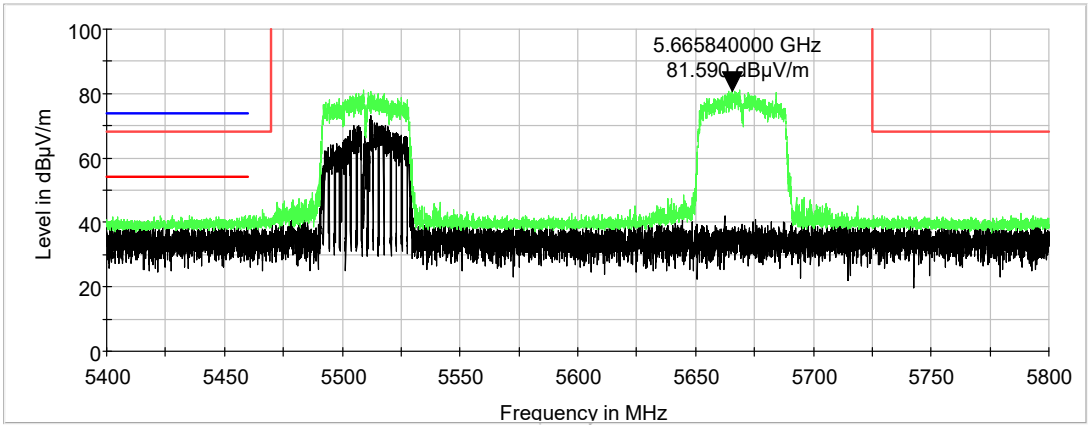


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

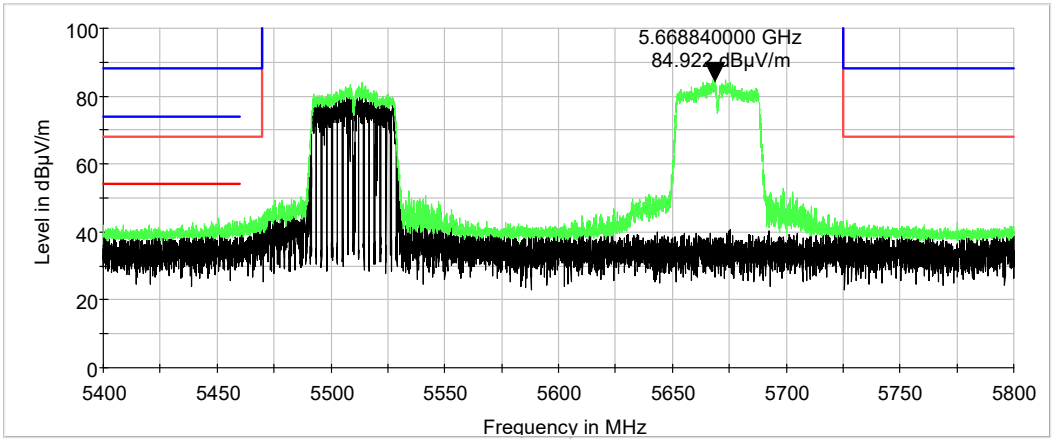
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2C, HT40: Radiated Band Edge, Vertical



UNII 2C, HT40: Radiated Band Edge, Horizontal



Dipole Antenna

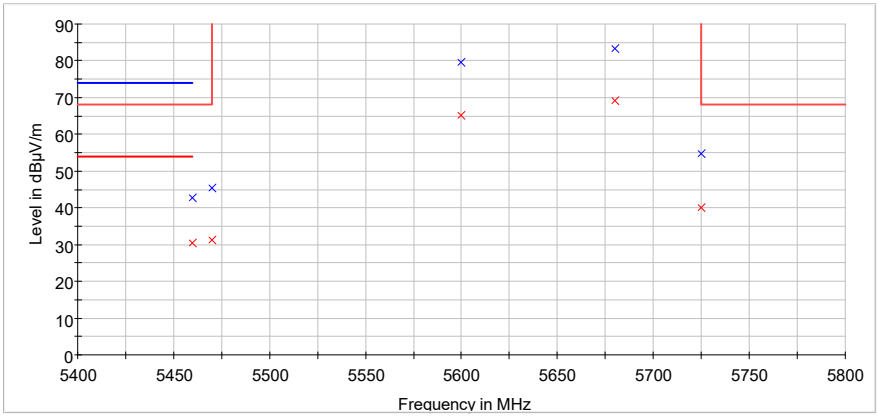
UNII 2C, HT80: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	H	150.00	107.00	76.2	-21.5	54.70	74.0	-19.3
5460.000000	H	150.00	91.00	64.7	-22.0	42.70	74.0	-31.3
5470.000000	H	150.00	91.00	67.4	-21.9	45.50	68.2	-22.7

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	H	150.00	107.00	61.6	-21.5	40.10	54.0	-13.9
5460.000000	H	150.00	91.00	52.4	-22.0	30.40	54.0	-23.6
5470.000000	H	150.00	91.00	53.1	-21.9	31.20	54.0	-22.8

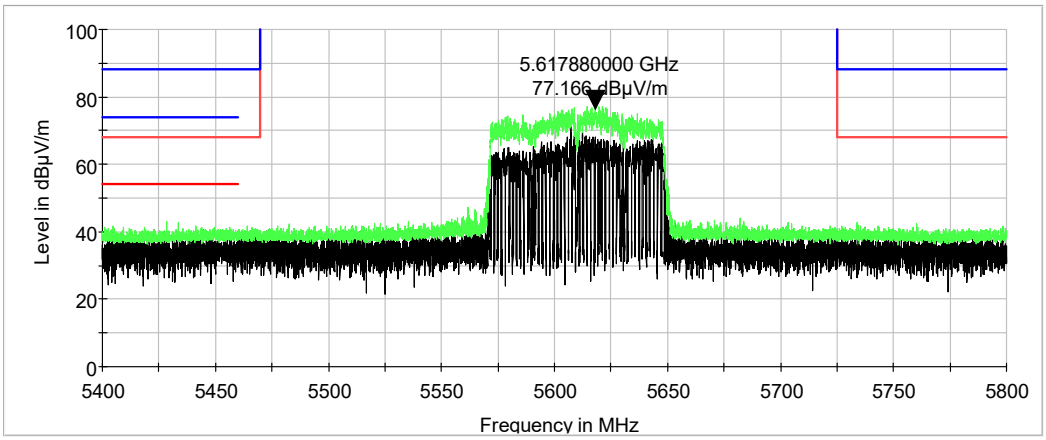


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

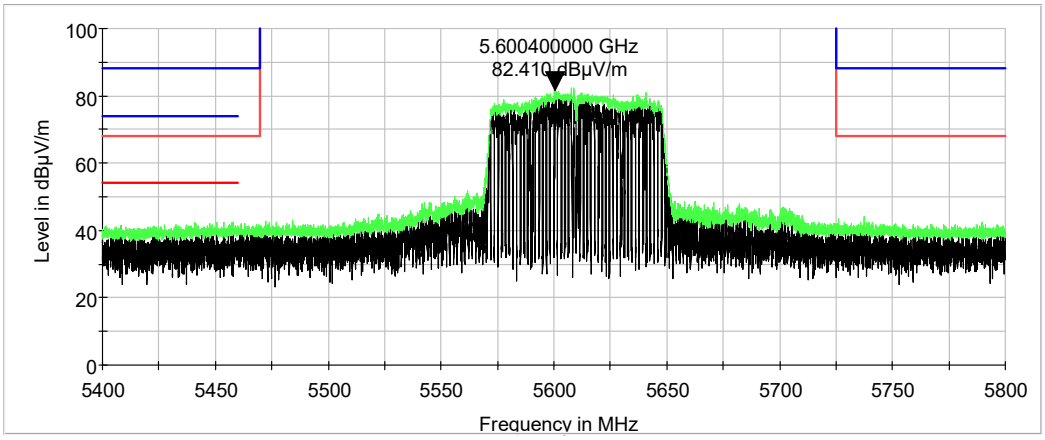
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2C, HT80: Radiated Band Edge, Vertical



UNII 2C, HT80: Radiated Band Edge, Horizontal



Dipole Antenna

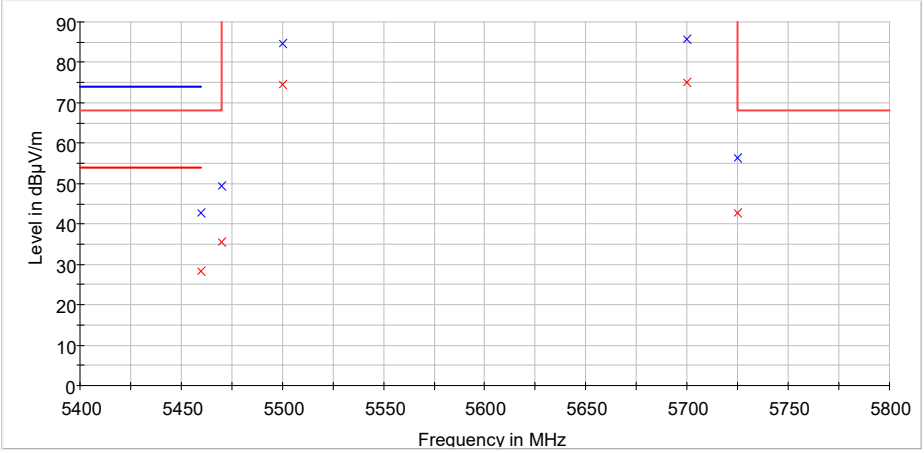
UNII 2C, OFDM: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	107.00	71.2	-21.9	49.30	68.2	-18.9
5460.000000	H	150.00	107.00	64.6	-22.0	42.60	74.0	-31.4
5725.000000	H	150.00	107.00	77.9	-21.5	56.40	74.0	-17.6

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	107.00	57.5	-21.9	35.60	54.0	-18.4
5460.000000	H	150.00	107.00	50.4	-22.0	28.40	54.0	-25.6
5725.000000	H	150.00	107.00	64.3	-21.5	42.80	54.0	-11.2

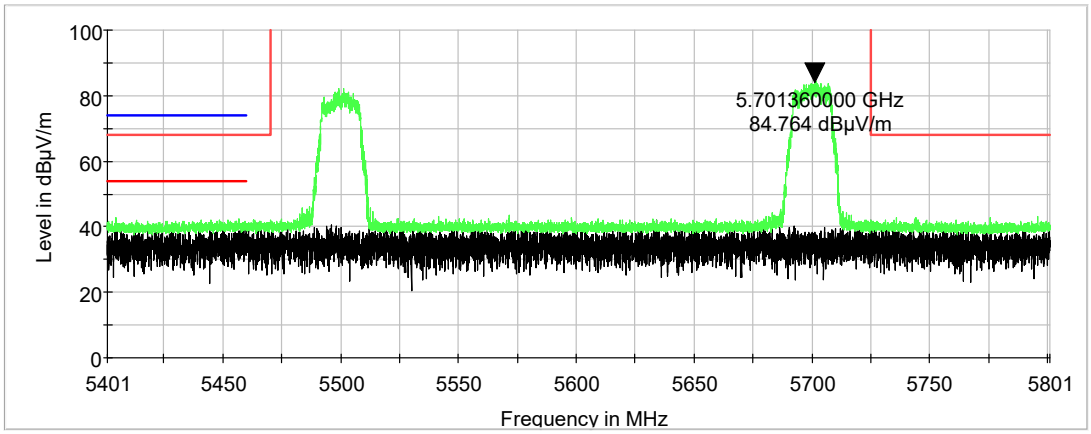


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

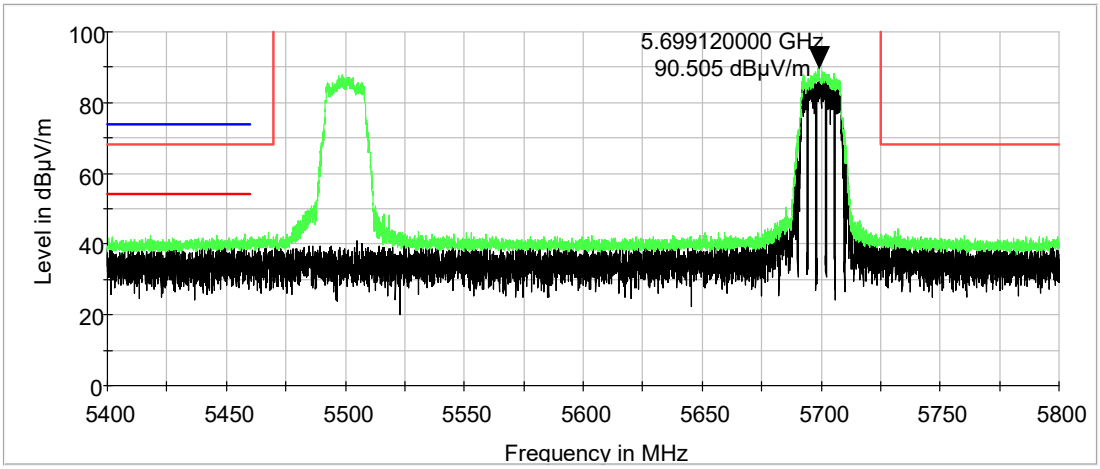
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

Dipole Antenna

UNII 2C, OFDM: Radiated Band Edge, Vertical



UNII 2C, OFDM: Radiated Band Edge, Horizontal

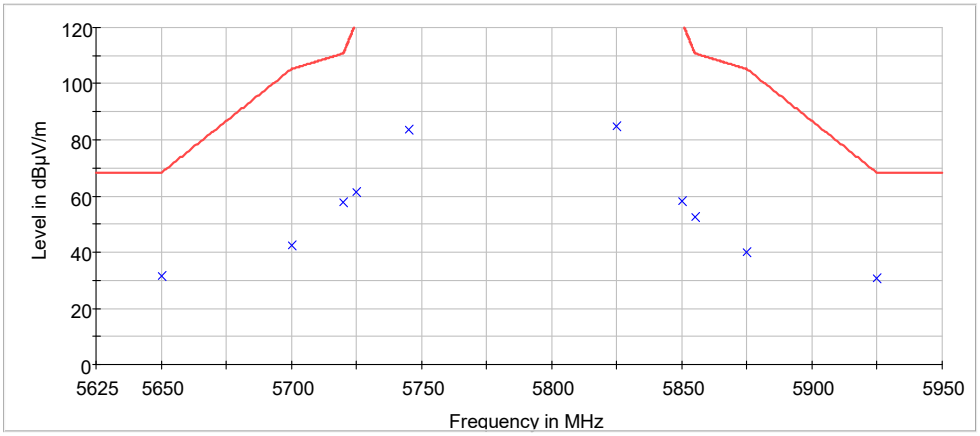


Dipole Antenna

UNII 3, HT20: Radiated Band Edge Measurements

MaxPeak

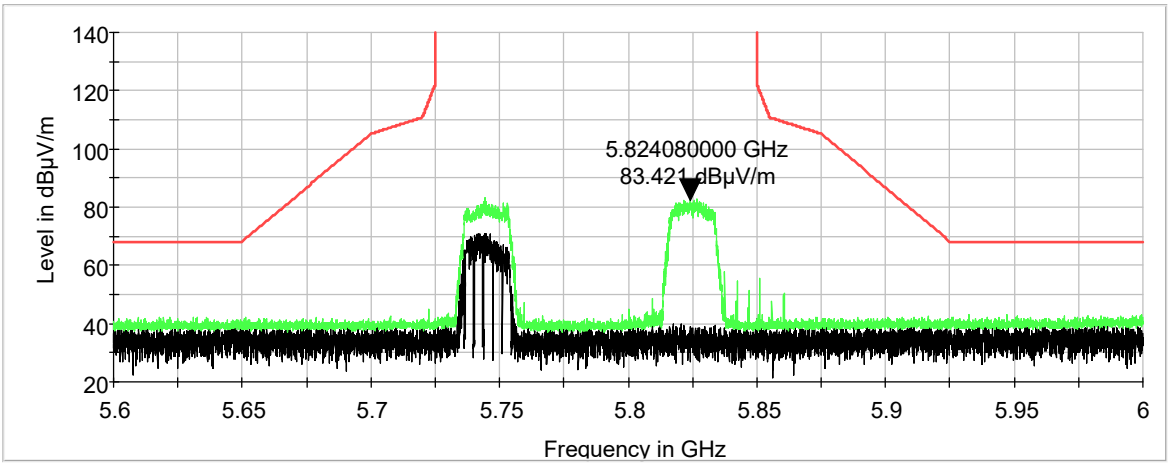
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5850.000000	H	150.00	91.00	83.1	-21.5	61.60	74.0	-12.4
5850.000000	H	150.00	91.00	79.1	-21.5	57.60	74.0	-16.4
5850.000000	H	150.00	91.00	64.1	-21.5	42.60	74.0	-31.4
5850.000000	H	150.00	91.00	53.1	-21.6	31.50	74.0	-42.5
5850.000000	H	150.00	91.00	73.6	-21.3	52.30	74.0	-21.7
5850.000000	H	150.00	91.00	61.1	-21.2	39.90	74.0	-34.1
5850.000000	H	150.00	91.00	51.9	-21.0	30.90	74.0	-43.1



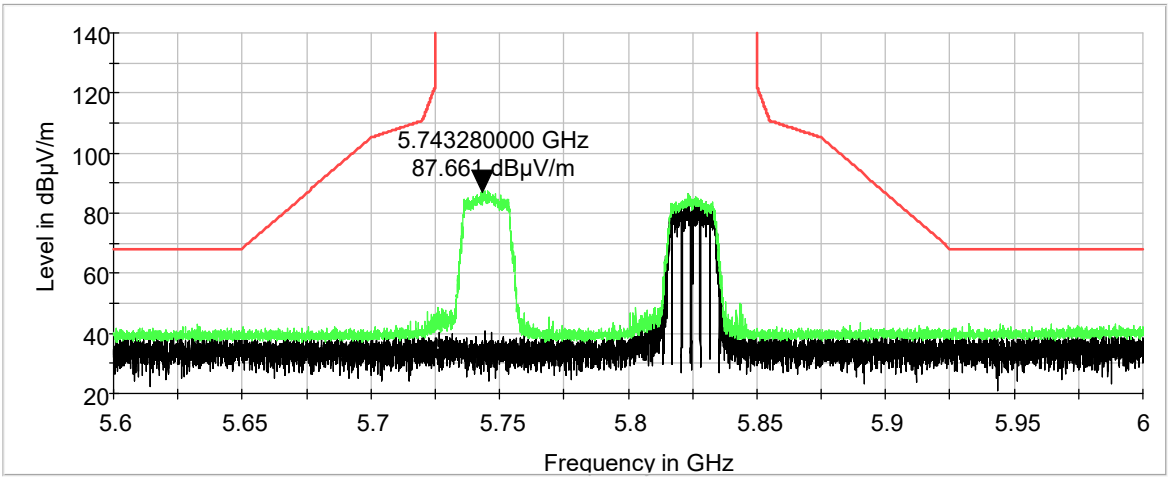
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

Dipole Antenna

UNII 3, HT20: Radiated Band Edge, Vertical



UNII 3, HT20: Radiated Band Edge, Horizontal

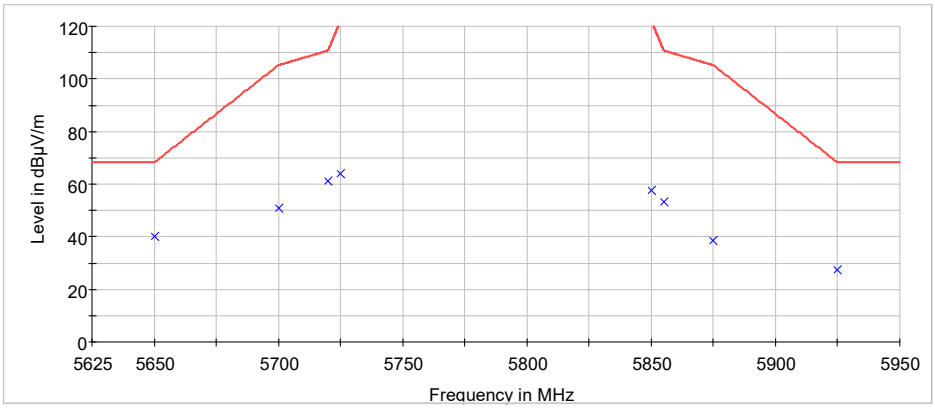


Dipole Antenna

UNII 3, HT40: Radiated Band Edge Measurements

MaxPeak

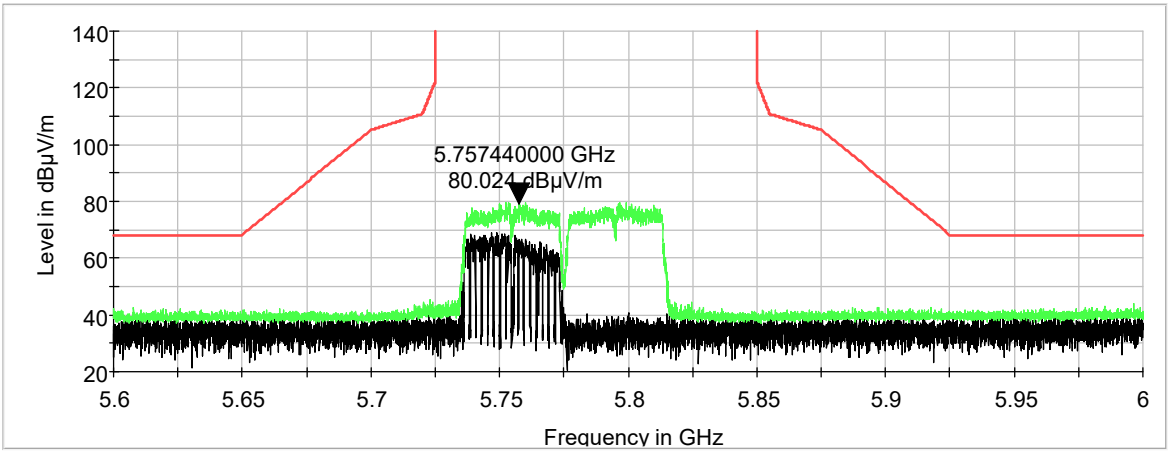
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5925.000000	H	150.00	91.00	48.5	-21.0	27.50	74.0	-46.5
5875.000000	H	150.00	91.00	59.9	-21.2	38.70	74.0	-35.3
5855.000000	H	150.00	91.00	74.7	-21.3	53.40	74.0	-20.6
5850.000000	H	150.00	91.00	79.1	-21.3	57.80	74.0	-16.2
5725.000000	H	150.00	91.00	85.5	-21.5	64.00	74.0	-10.0
5720.000000	H	150.00	91.00	82.9	-21.5	61.40	74.0	-12.6
5700.000000	H	150.00	91.00	72.2	-21.5	50.70	74.0	-23.3
5650.000000	H	150.00	91.00	61.6	-21.6	40.00	74.0	-34.0



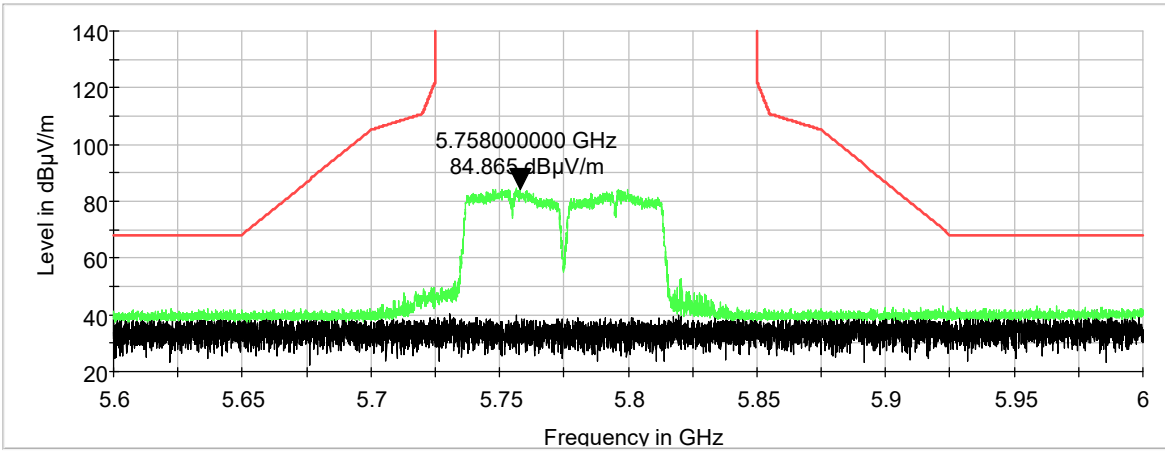
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

Dipole Antenna

UNII 3, HT40: Radiated Band Edge, Vertical



UNII 3, HT40: Radiated Band Edge, Horizontal

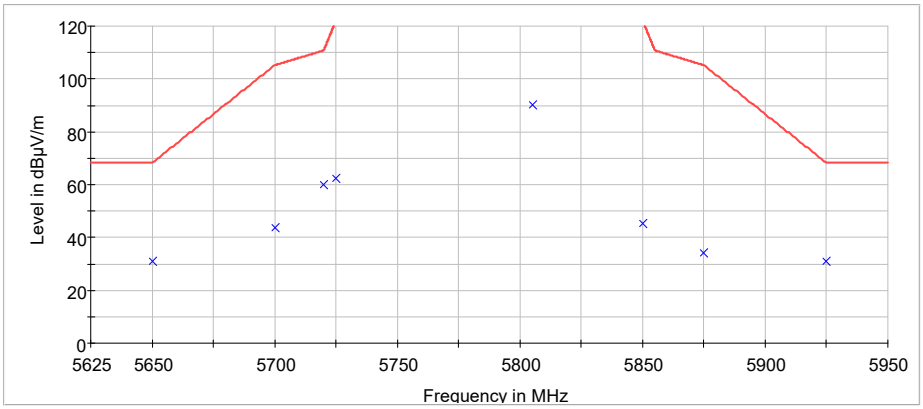


Dipole Antenna

UNII 3, HT80: Radiated Band Edge Measurements

MaxPeak

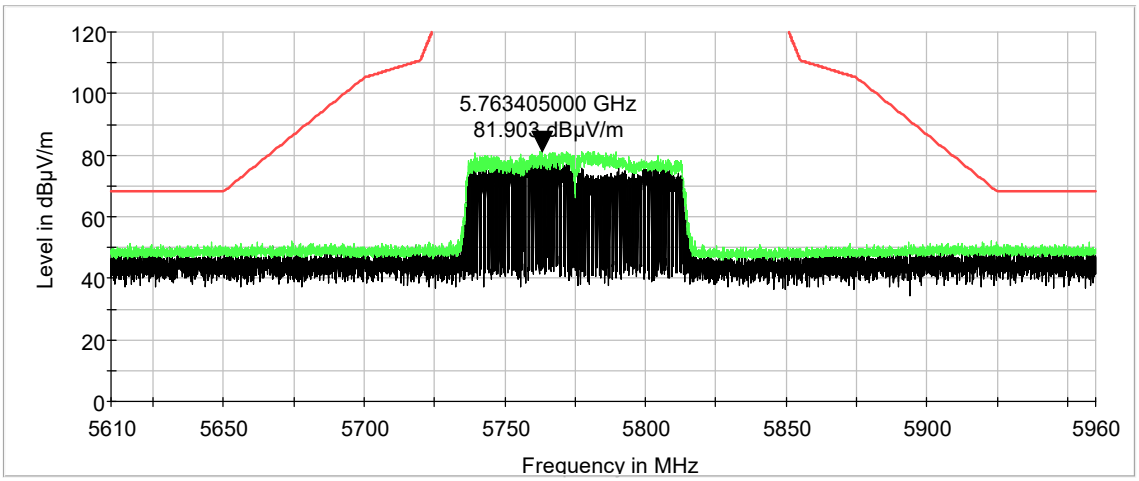
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	H	150.00	91.00	83.7	-21.5	62.20	74.0	-11.8
5720.000000	H	150.00	91.00	81.3	-21.5	59.80	74.0	-14.2
5700.000000	H	150.00	91.00	65.0	-21.5	43.50	74.0	-30.5
5650.000000	H	150.00	91.00	52.6	-21.6	31.00	74.0	-43.0
5850.000000	H	150.00	91.00	66.5	-21.3	45.20	74.0	-28.8
5805.000000	H	150.00	91.00	111.7	-21.5	90.20	74.0	16.2
5875.000000	H	150.00	91.00	55.3	-21.2	34.10	74.0	-39.9
5925.000000	H	150.00	91.00	51.8	-21.0	30.80	74.0	-43.2



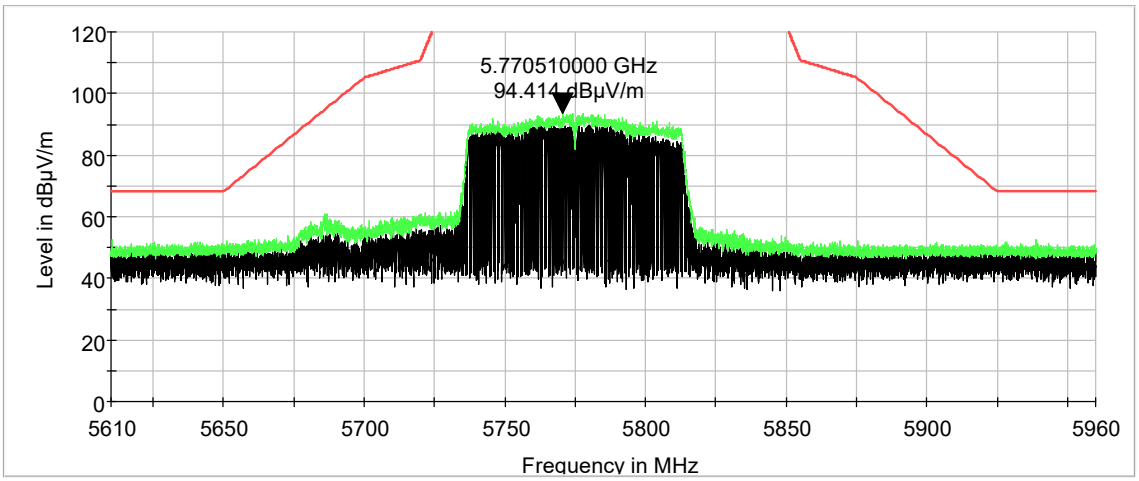
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

Dipole Antenna

UNII 3, HT80: Radiated Band Edge, Vertical



UNII 3, HT80: Radiated Band Edge, Horizontal

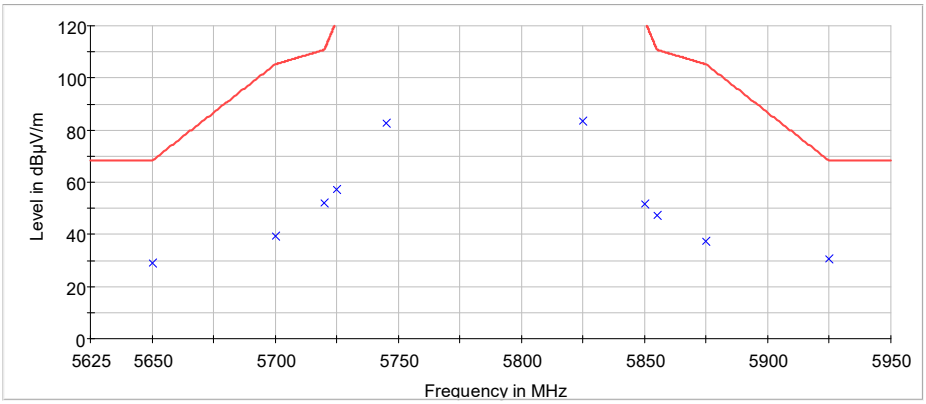


Dipole Antenna

UNII 3, OFDM: Radiated Band Edge Measurements

MaxPeak

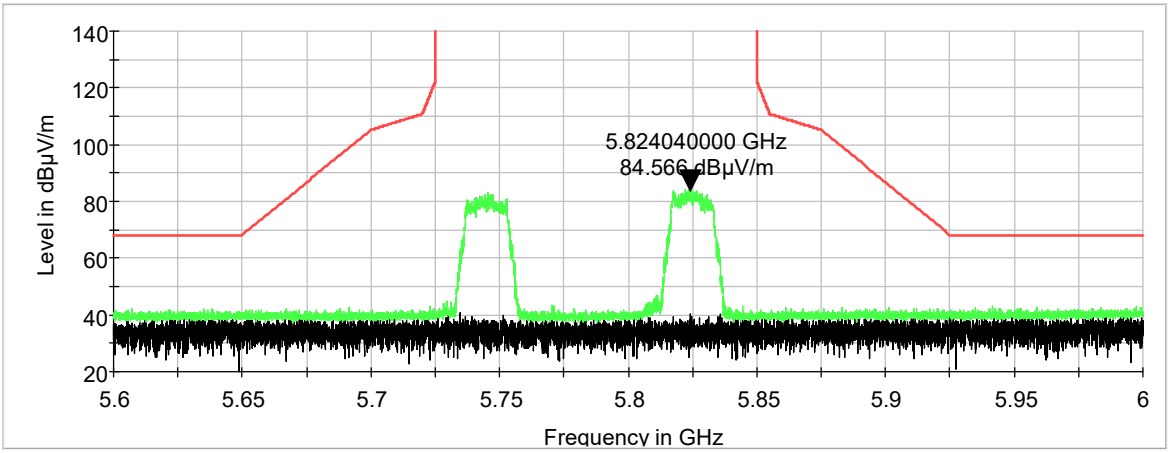
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5650.000000	H	150.00	91.00	50.6	-21.6	29.00	74.0	-45.0
5700.000000	H	150.00	91.00	60.7	-21.5	39.20	74.0	-34.8
5720.000000	H	150.00	91.00	73.7	-21.5	52.20	74.0	-21.8
5725.000000	H	150.00	91.00	78.8	-21.5	57.30	74.0	-16.7
5850.000000	H	150.00	91.00	73.0	-21.3	51.70	74.0	-22.3
5855.000000	H	150.00	91.00	68.5	-21.3	47.20	74.0	-26.8
5875.000000	H	150.00	91.00	58.5	-21.2	37.30	74.0	-36.7
5925.000000	H	150.00	91.00	51.7	-21.0	30.70	74.0	-43.3



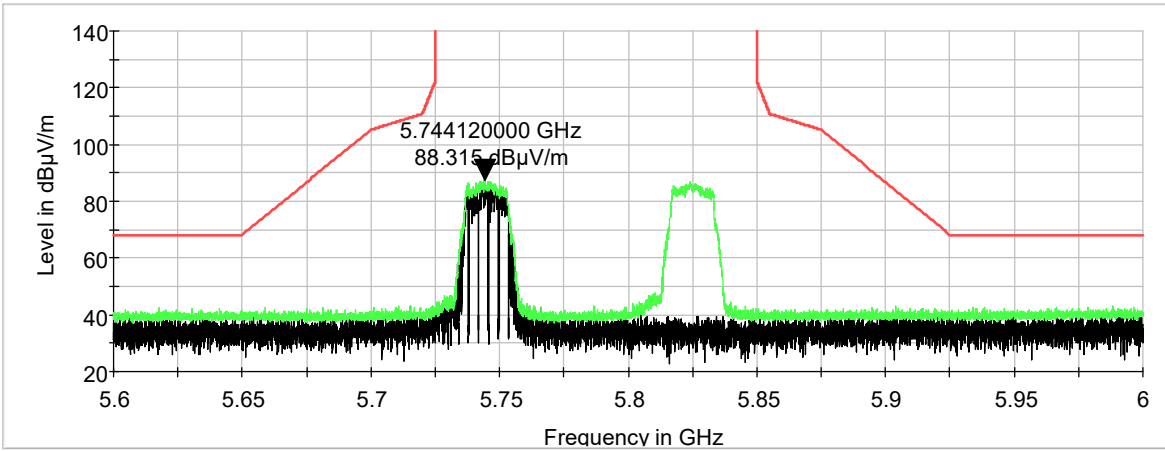
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

Dipole Antenna

UNII 3, OFDM: Radiated Band Edge, Vertical

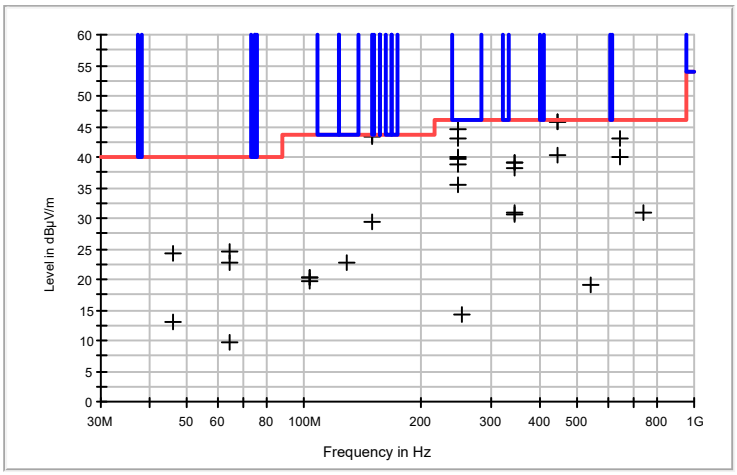


UNII 3, OFDM: Radiated Band Edge, Horizontal



Dipole Antenna
UNII 3, Radiated Spurious Emissions 30 MHz to 1000 MHz (Data reflects all channels)

Note: All emissions recorded are from the development board used for testing. The radio was turned off and removed, and all emissions remained at the same levels.

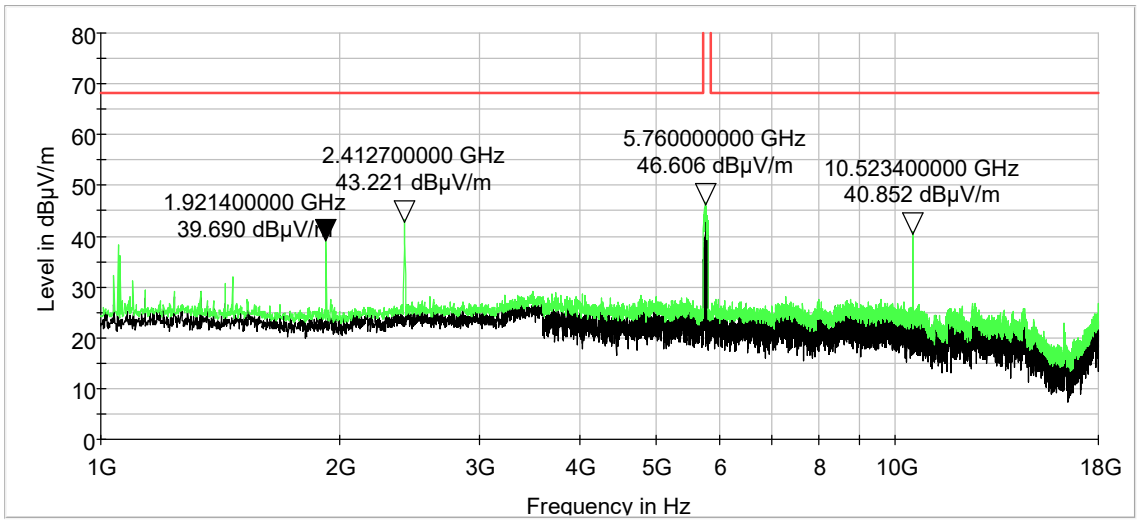


Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.000000	24.2	120.000	100.0	V	355.0	-4.5	15.8	40.0
46.000000	13.0	120.000	100.0	H	359.0	-4.5	27.0	40.0
64.560000	22.7	120.000	100.0	V	29.0	-6.7	17.3	40.0
64.560000	9.8	120.000	100.0	H	0.0	-6.7	30.2	40.0
64.560000	24.6	120.000	100.0	V	0.0	-6.7	15.4	40.0
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
103.160000	19.8	120.000	100.0	V	345.0	-3.0	23.7	43.5
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
127.800000	22.6	120.000	100.0	V	4.0	0.2	20.9	43.5
148.440000	29.5	120.000	100.0	V	136.0	-1.0	14.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.3	120.000	100.0	H	0.0	-1.0	0.2	43.5
247.480000	35.5	120.000	100.0	V	197.0	-0.7	10.5	46.0
247.480000	42.9	120.000	100.0	H	178.0	-0.7	3.1	46.0
247.480000	39.6	120.000	100.0	V	354.0	-0.7	6.4	46.0
247.480000	38.9	120.000	100.0	V	251.0	-0.7	7.1	46.0
247.480000	44.6	120.000	100.0	H	107.0	-0.7	1.4	46.0
247.480000	39.9	120.000	100.0	H	258.0	-0.7	6.1	46.0
252.400000	14.3	120.000	100.0	V	0.0	-0.7	31.7	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	30.5	120.000	100.0	V	116.0	2.6	15.5	46.0
346.400000	38.0	120.000	100.0	H	131.0	2.6	8.0	46.0
346.400000	30.9	120.000	100.0	V	67.0	2.6	15.1	46.0
445.400000	40.2	120.000	100.0	V	322.0	5.1	5.8	46.0
445.400000	45.8	120.000	100.0	H	0.0	5.1	0.2	46.0
445.400000	45.7	120.000	100.0	H	0.0	5.1	0.3	46.0
544.600000	19.0	120.000	100.0	V	355.0	7.1	27.0	46.0
643.400000	40.0	120.000	100.0	V	355.0	9.1	6.0	46.0
643.440000	43.0	120.000	100.0	H	131.0	9.1	3.0	46.0
742.560000	30.9	120.000	100.0	H	352.0	10.3	15.1	46.0

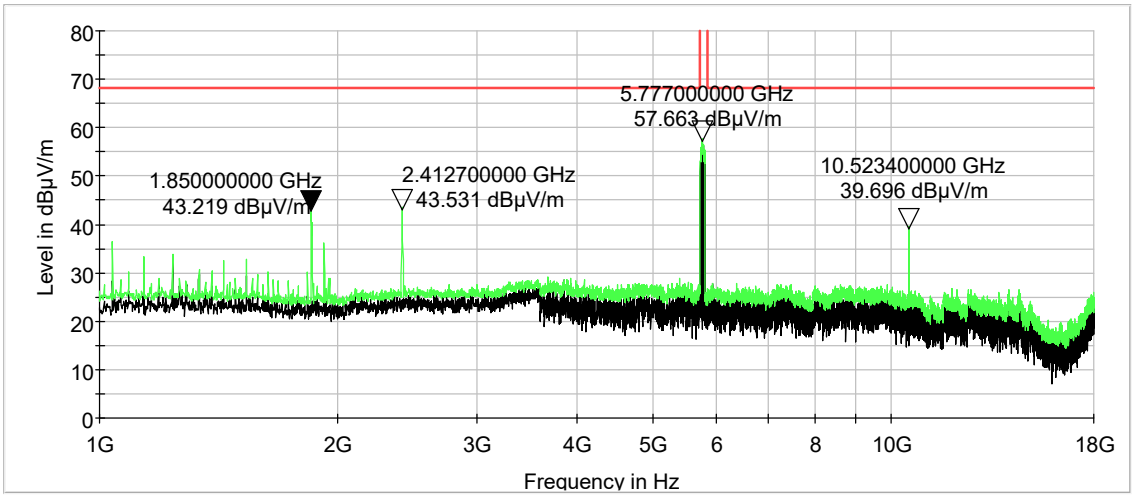
The following plots are from HT20 which was worst case.

Dipole Antenna

**UNII 3, Radiated Spurious Emissions:
1 GHz to 18 GHz, Vertical**

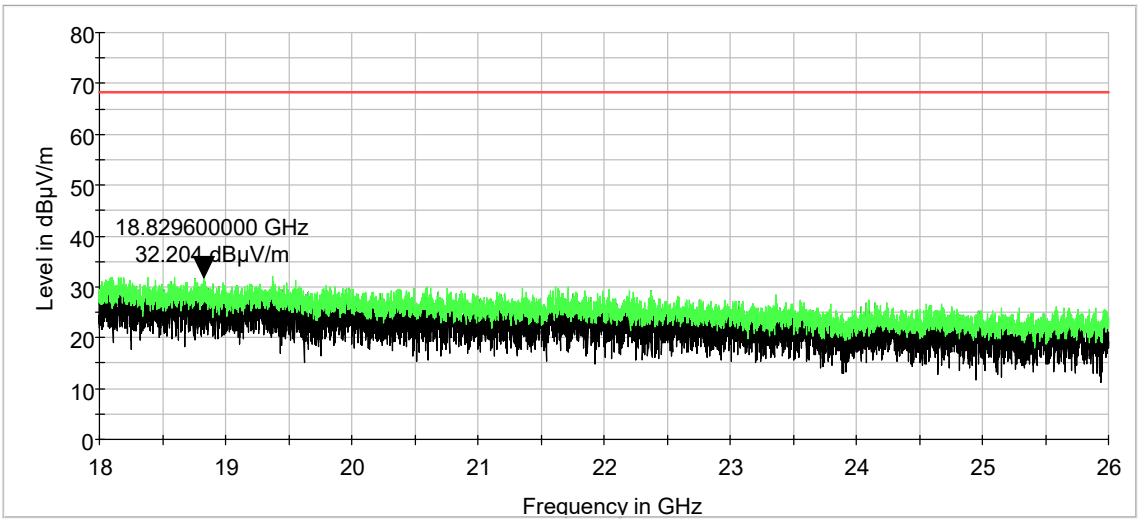


**UNII 3, Radiated Spurious Emissions:
1 GHz to 18 GHz, Horizontal**



Dipole Antenna

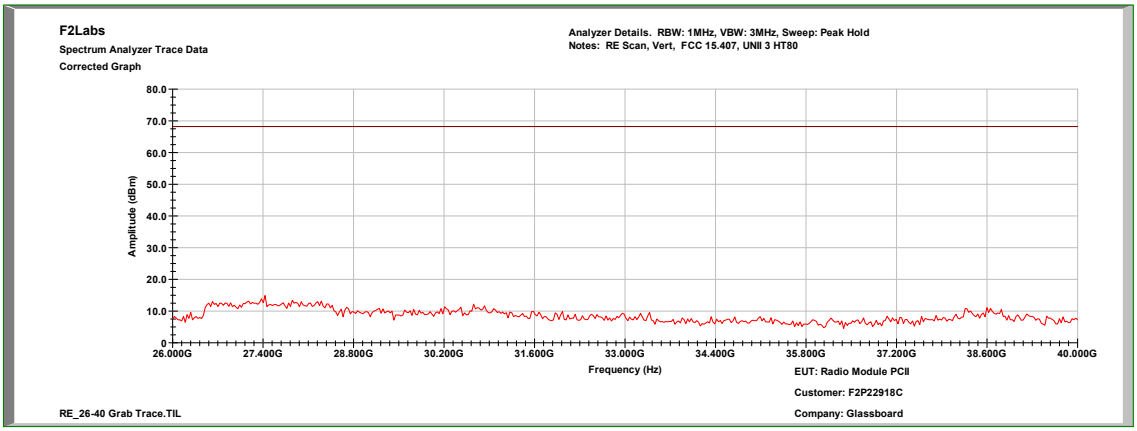
UNII 3, Radiated Spurious Emissions: 18 GHz to 26 GHz, Vertical



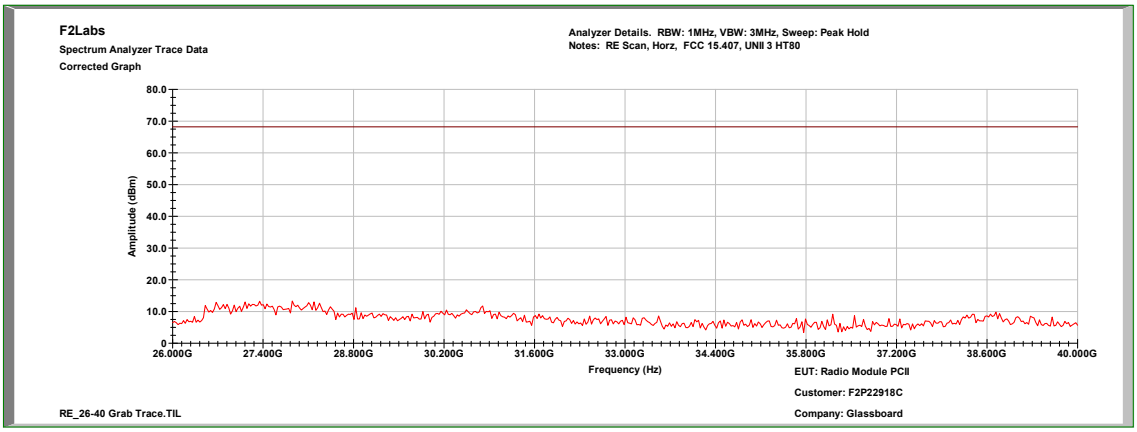
UNII 3, Radiated Spurious Emissions: 18 GHz to 26 GHz, Horizontal

Dipole Antenna

UNII 3, Radiated Spurious Emissions: 26 GHz to 40 GHz, Vertical



UNII 3, Radiated Spurious Emissions: 26 GHz to 40 GHz, Horizontal



CHIP Antenna

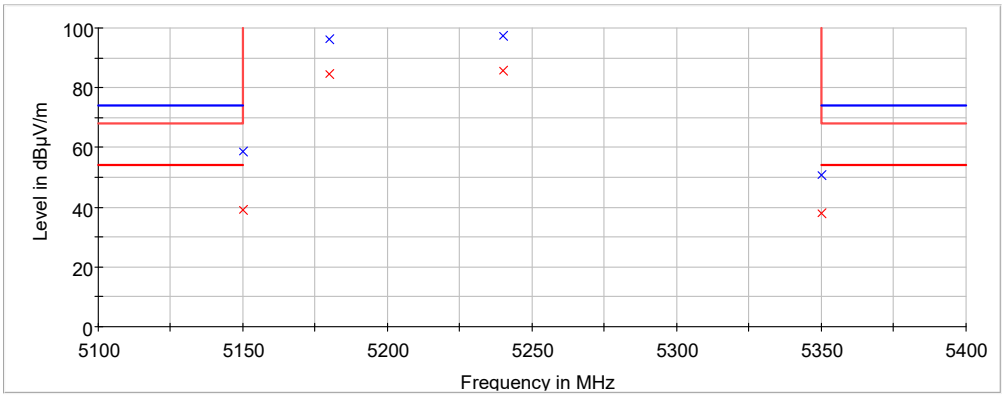
UNII 1, HT20: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5180.000000	H	150.00	0.00	92.5	3.9	96.40	--	--
5150.000000	H	150.00	0.00	54.7	3.8	58.50	74.0	-15.5
5240.000000	H	150.00	0.00	93.2	4.1	97.30	--	--
5350.000000	H	150.00	0.00	46.3	4.5	50.80	74.0	-23.2

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5180.000000	H	150.00	0.00	80.7	3.9	84.60	--	--
5150.000000	H	150.00	0.00	35.5	3.8	39.30	54.0	-14.7
5240.000000	H	150.00	0.00	81.5	4.1	85.60	--	--
5350.000000	H	150.00	0.00	33.4	4.5	37.90	54.0	-16.1

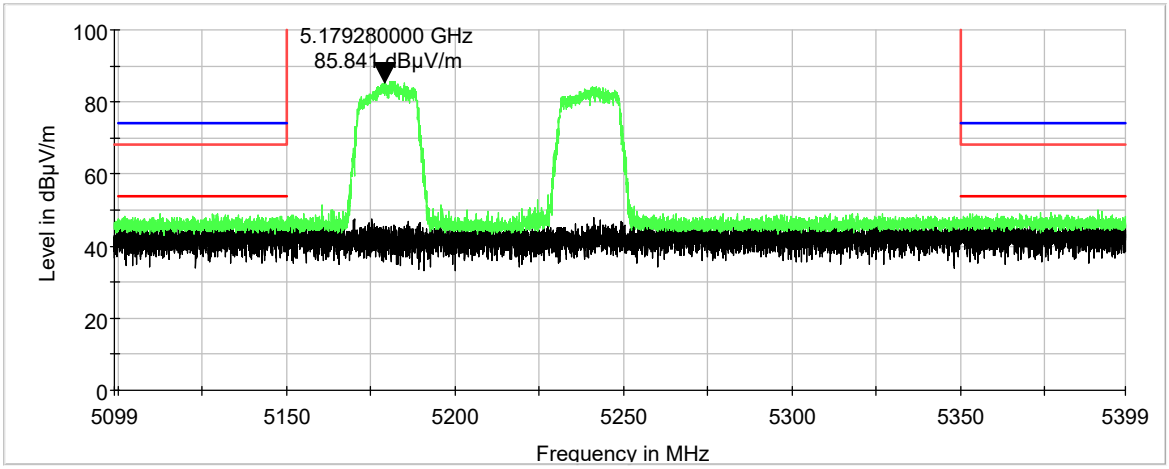


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

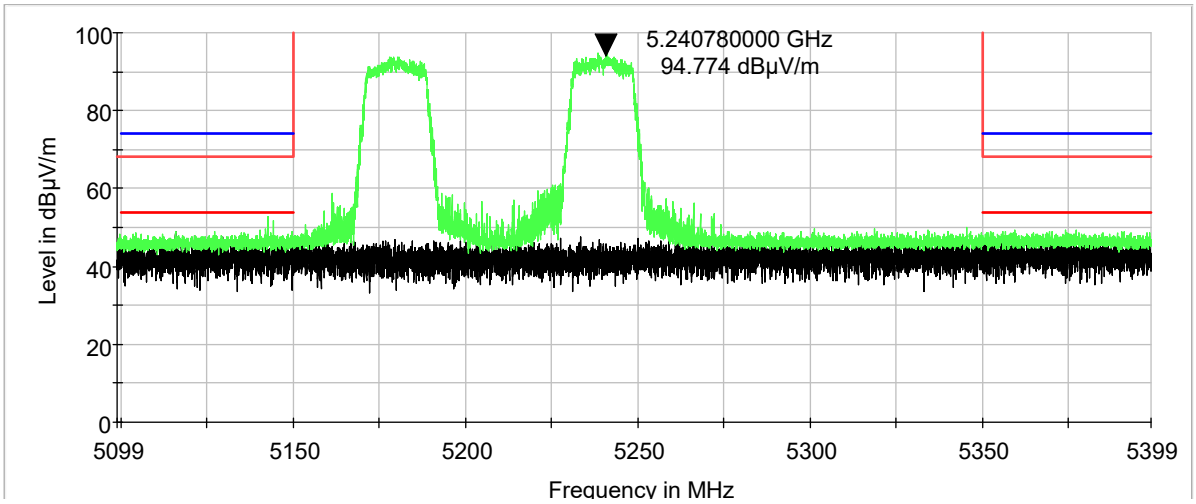
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 1, HT20: Radiated Band Edge, Vertical



UNII 1, HT20: Radiated Band Edge, Horizontal



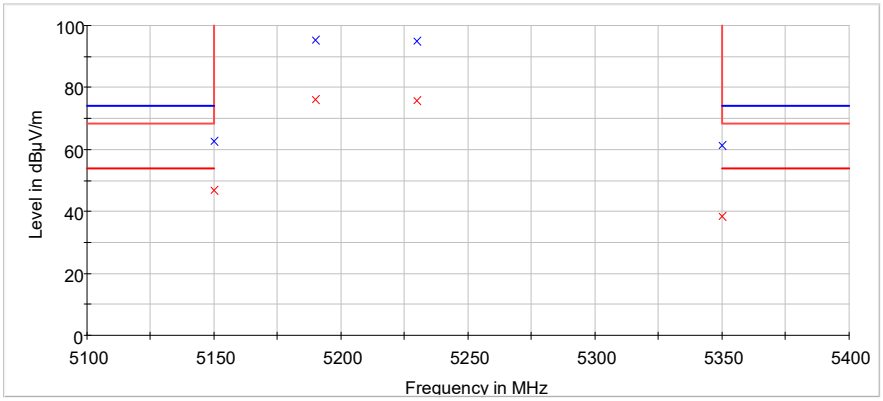
CHIP Antenna

UNII 1, HT40: Radiated Band Edge Measurements
MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5190.000000	H	150.00	79.00	91.4	3.9	95.30	--	--
5150.000000	H	150.00	79.00	58.9	3.8	62.70	74.0	-11.3
5230.000000	H	150.00	79.00	90.7	4.1	94.80	--	--
5350.000000	H	150.00	79.00	56.6	4.5	61.10	74.0	-12.9

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5190.000000	H	150.00	79.00	72.3	3.9	76.20	--	--
5150.000000	H	150.00	79.00	43.0	3.8	46.80	54.0	-7.2
5230.000000	H	150.00	79.00	71.5	4.1	75.60	--	--
5350.000000	H	150.00	79.00	34.0	4.5	38.50	54.0	-15.5

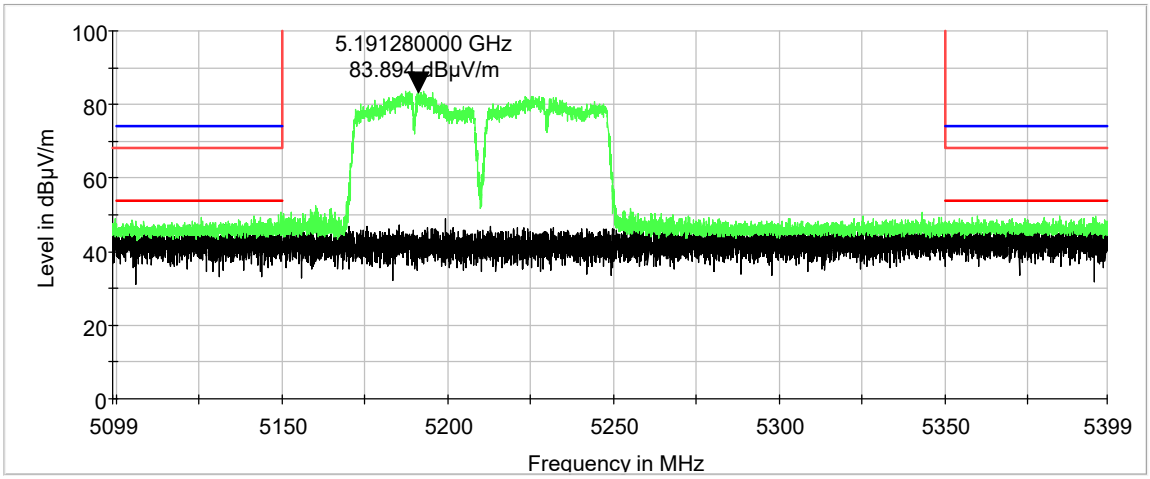


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

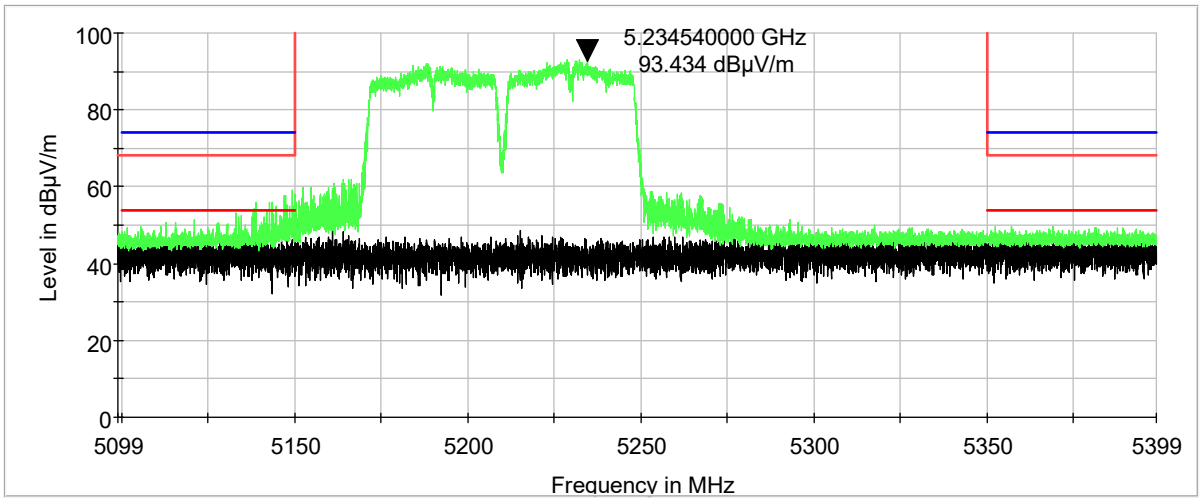
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 1, HT40: Radiated Band Edge, Vertical



UNII 1, HT40: Radiated Band Edge, Horizontal



CHIP Antenna

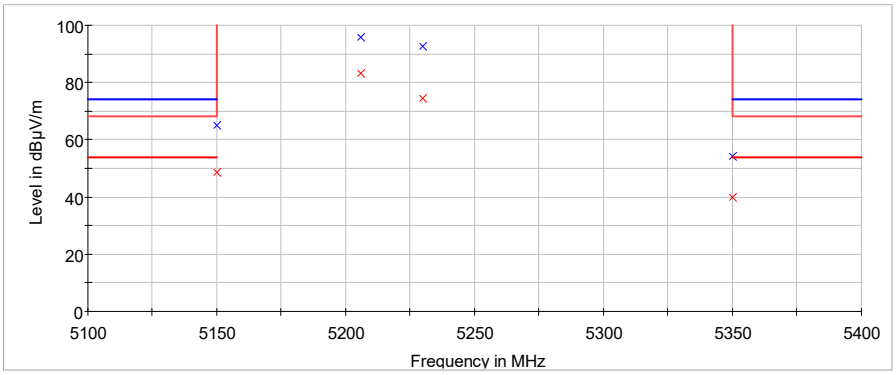
UNII 1, HT80: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5206.000000	H	150.00	87.00	92.0	4.0	96.00	--	--
5150.000000	H	150.00	87.00	61.2	3.8	65.00	74.0	-9.0
5350.000000	H	150.00	87.00	49.8	4.5	54.30	74.0	-19.7
5230.000000	H	150.00	87.00	88.7	4.1	92.80	--	--

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5206.000000	H	150.00	87.00	79.1	4.0	83.10	--	--
5150.000000	H	150.00	87.00	44.8	3.8	48.60	54.0	-5.4
5350.000000	H	150.00	87.00	35.2	4.5	39.70	54.0	-14.3
5230.000000	H	150.00	87.00	70.2	4.1	74.30	--	--

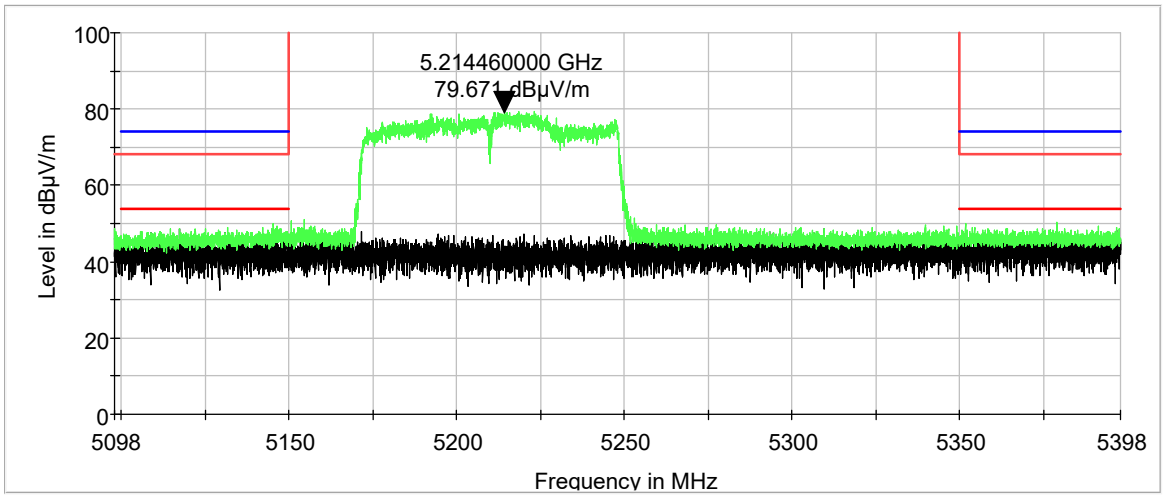


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

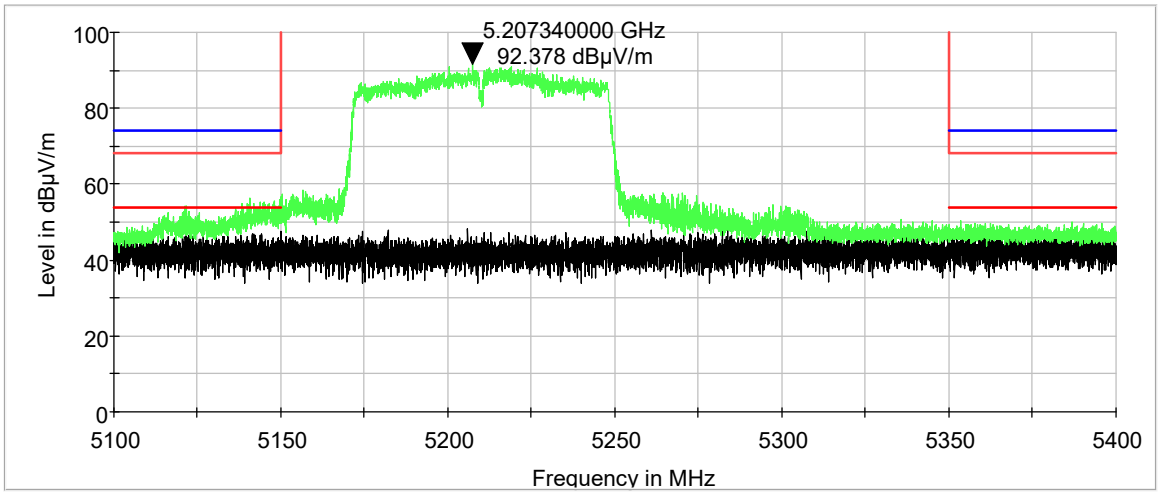
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 1, HT80: Radiated Band Edge, Vertical



UNII 1, HT80: Radiated Band Edge, Horizontal



CHIP Antenna

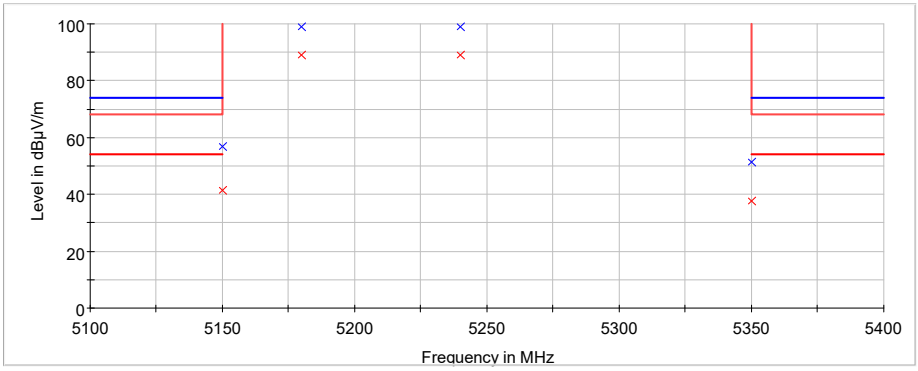
UNII 1, OFDM: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5180.000000	H	150.00	87.00	95.2	3.9	99.10	--	--
5150.000000	H	150.00	87.00	53.2	3.8	57.00	74.0	-17.0
5350.000000	H	150.00	87.00	46.9	4.5	51.40	74.0	-22.6
5240.000000	H	150.00	87.00	95.0	4.1	99.10	--	--

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5180.000000	H	150.00	87.00	85.1	3.9	89.00	--	--
5150.000000	H	150.00	87.00	37.5	3.8	41.30	54.0	-12.7
5350.000000	H	150.00	87.00	33.3	4.5	37.80	54.0	-16.2
5240.000000	H	150.00	87.00	85.0	4.1	89.10	--	--

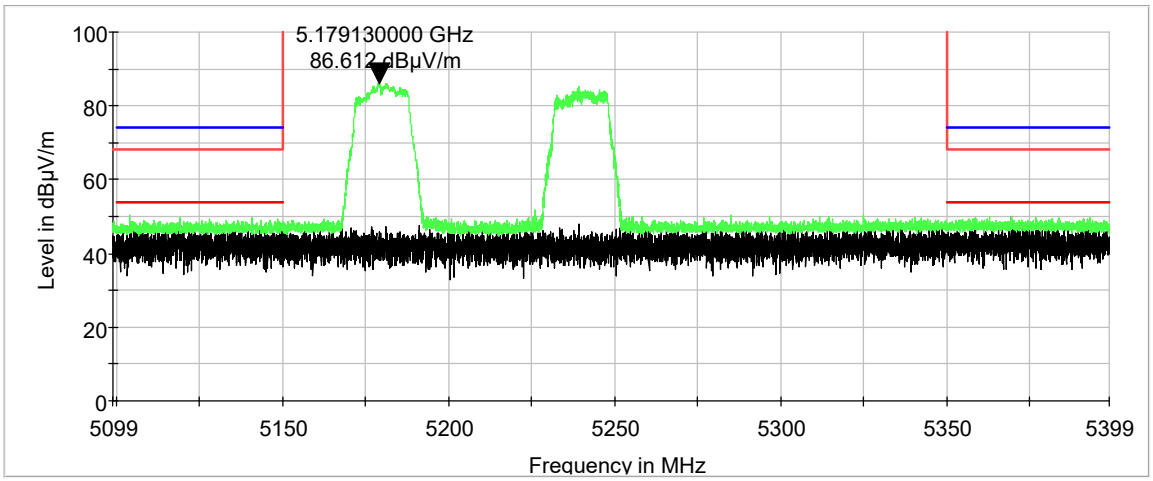


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

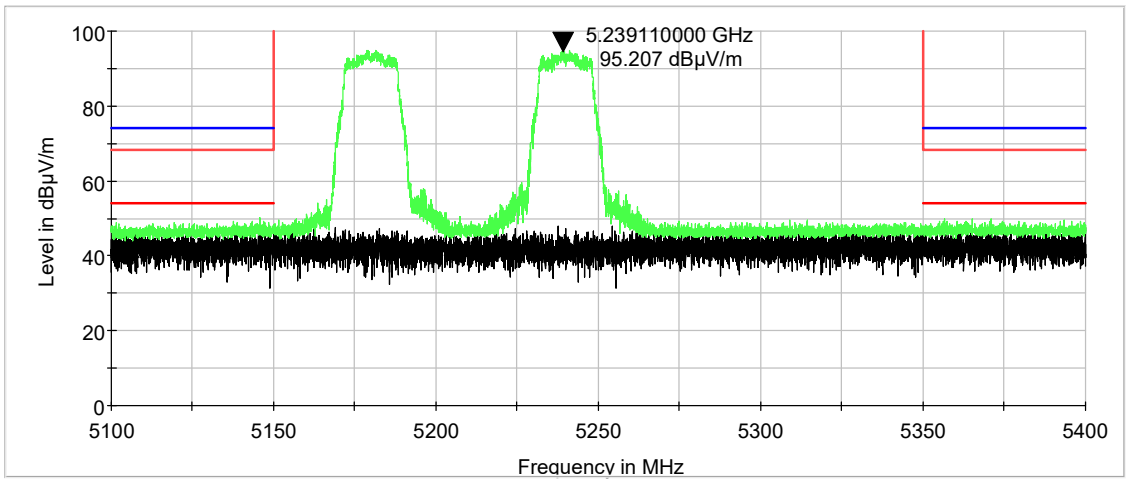
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 1, OFDM: Radiated Band Edge, Vertical



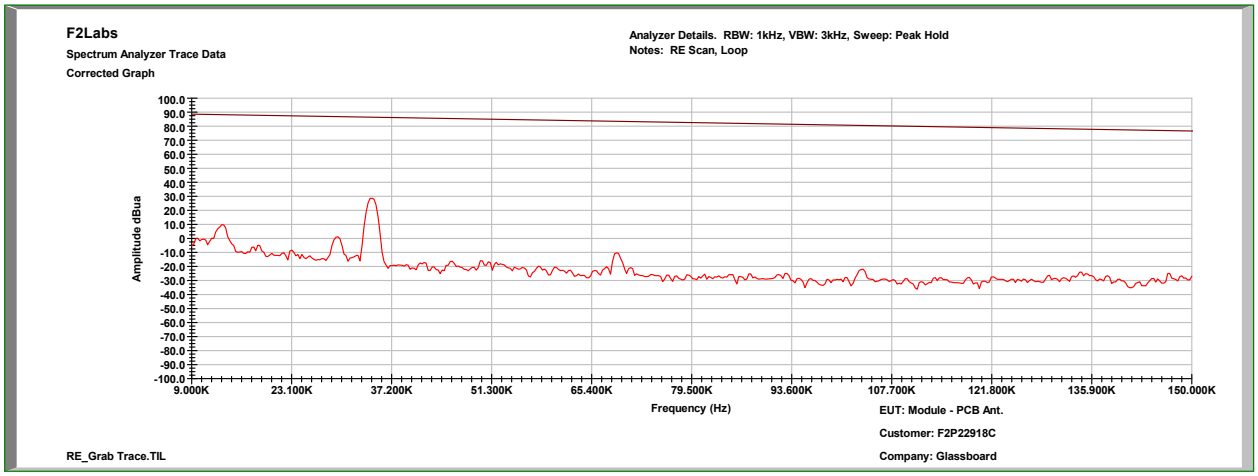
UNII 1, OFDM: Radiated Band Edge, Horizontal



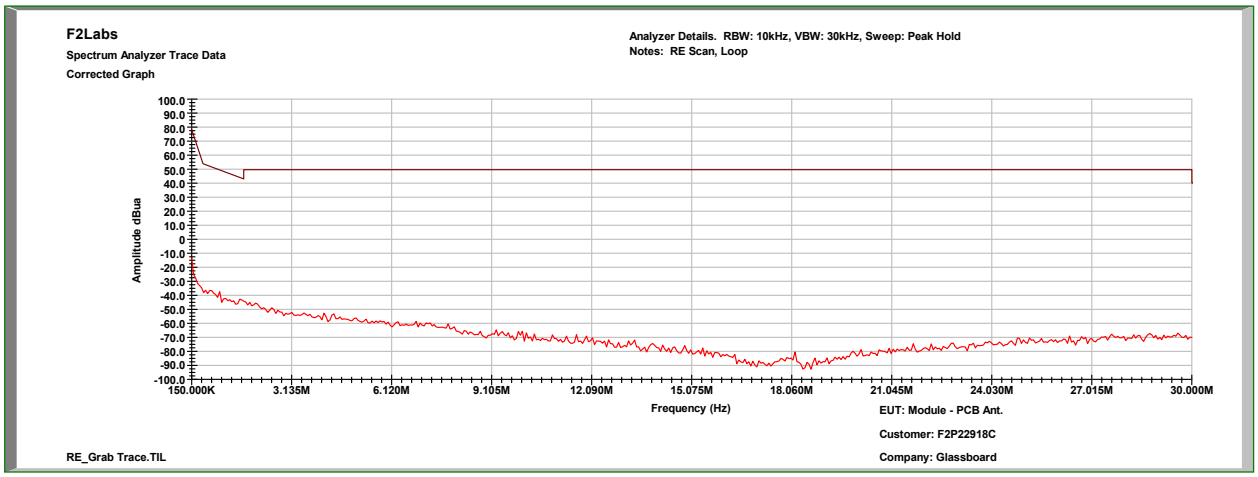
The following plots are from HT20, which was worst case.

CHIP Antenna

Characterization Scan, 0.009 MHz to 0.15 MHz



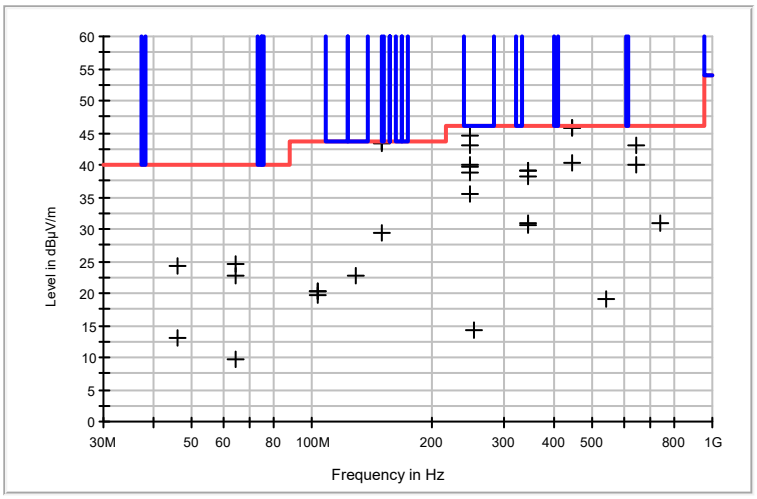
Characterization Scan, 0.15 MHz to 30.0 MHz



Chip Antenna
Radiated Spurious Emissions 30 MHz to 1000 MHz (Data reflects all channels)

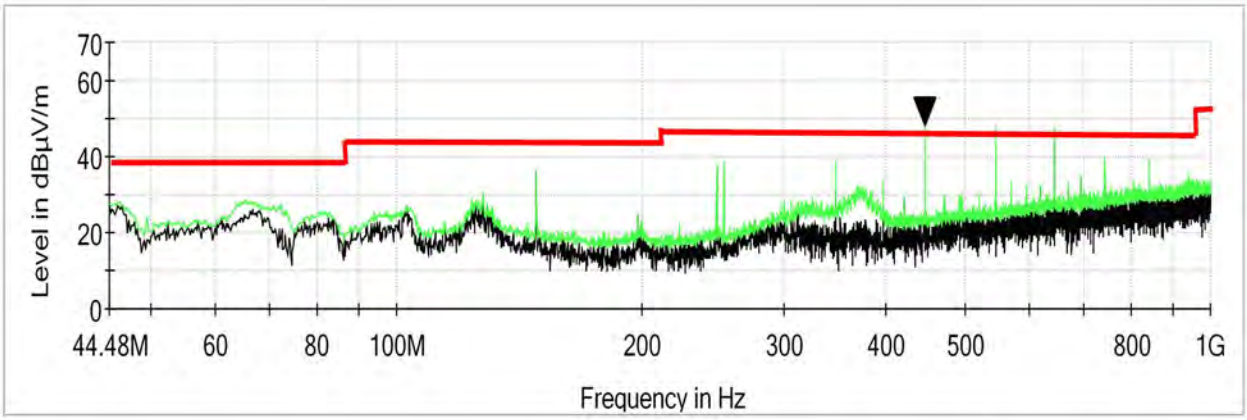
Note: All emissions recorded are from the development board used for testing.
The radio was turned off and removed, and all emissions remained at the same levels.

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.000000	24.2	120.000	100.0	V	355.0	-4.5	15.8	40.0
46.000000	13.0	120.000	100.0	H	359.0	-4.5	27.0	40.0
64.560000	22.7	120.000	100.0	V	29.0	-6.7	17.3	40.0
64.560000	9.8	120.000	100.0	H	0.0	-6.7	30.2	40.0
64.560000	24.6	120.000	100.0	V	0.0	-6.7	15.4	40.0
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
103.160000	19.8	120.000	100.0	V	345.0	-3.0	23.7	43.5
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
127.800000	22.6	120.000	100.0	V	4.0	0.2	20.9	43.5
148.440000	29.5	120.000	100.0	V	136.0	-1.0	14.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.3	120.000	100.0	H	0.0	-1.0	0.2	43.5
247.480000	35.5	120.000	100.0	V	197.0	-0.7	10.5	46.0
247.480000	42.9	120.000	100.0	H	178.0	-0.7	3.1	46.0
247.480000	39.6	120.000	100.0	V	354.0	-0.7	6.4	46.0
247.480000	38.9	120.000	100.0	V	251.0	-0.7	7.1	46.0
247.480000	44.6	120.000	100.0	H	107.0	-0.7	1.4	46.0
247.480000	39.9	120.000	100.0	H	258.0	-0.7	6.1	46.0
252.400000	14.3	120.000	100.0	V	0.0	-0.7	31.7	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	30.5	120.000	100.0	V	116.0	2.6	15.5	46.0
346.400000	38.0	120.000	100.0	H	131.0	2.6	8.0	46.0
346.400000	30.9	120.000	100.0	V	67.0	2.6	15.1	46.0
445.400000	40.2	120.000	100.0	V	322.0	5.1	5.8	46.0
445.400000	45.8	120.000	100.0	H	0.0	5.1	0.2	46.0
445.400000	45.7	120.000	100.0	H	0.0	5.1	0.3	46.0
544.600000	19.0	120.000	100.0	V	355.0	7.1	27.0	46.0
643.400000	40.0	120.000	100.0	V	355.0	9.1	6.0	46.0
643.440000	43.0	120.000	100.0	H	131.0	9.1	3.0	46.0
742.560000	30.9	120.000	100.0	H	352.0	10.3	15.1	46.0

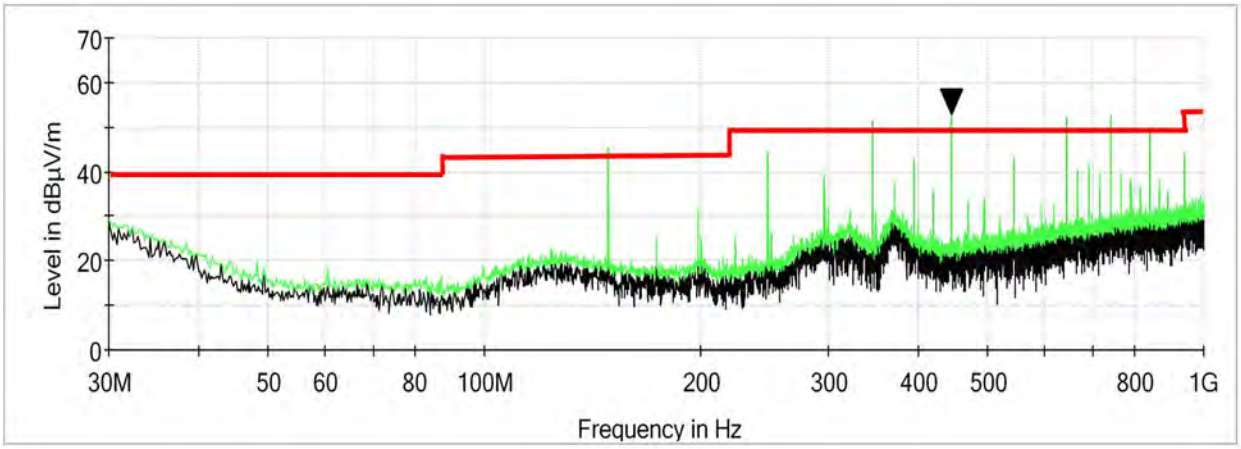


CHIP Antenna

Characterization Scan, 30 MHz to 1000 MHz, Vertical

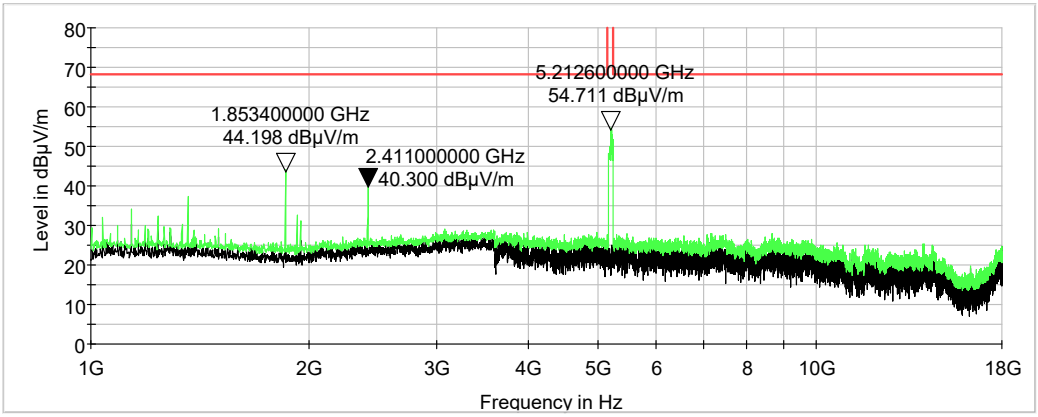


Characterization Scan, 30 MHz to 1000 MHz, Horizontal

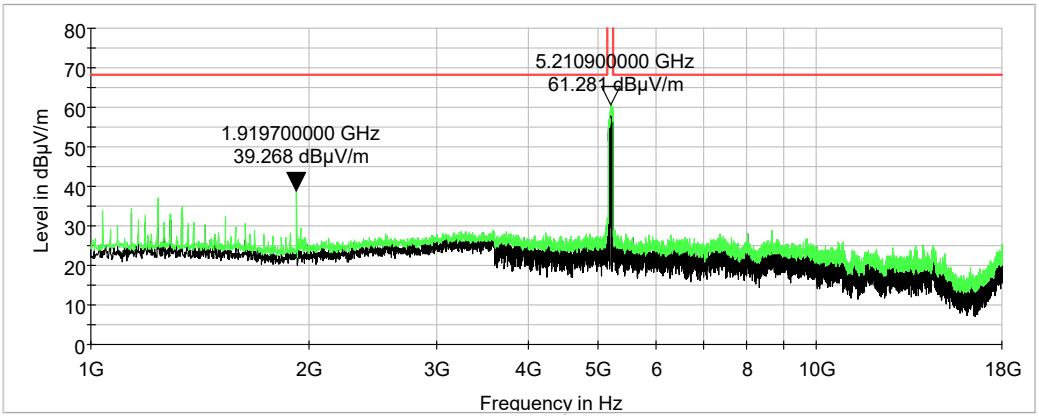


CHIP Antenna

UNII 1, Radiated Spurious Emissions: 1 GHz to 18 GHz, Vertical



UNII 1, Radiated Spurious Emissions: 1 GHz to 18 GHz, Horizontal



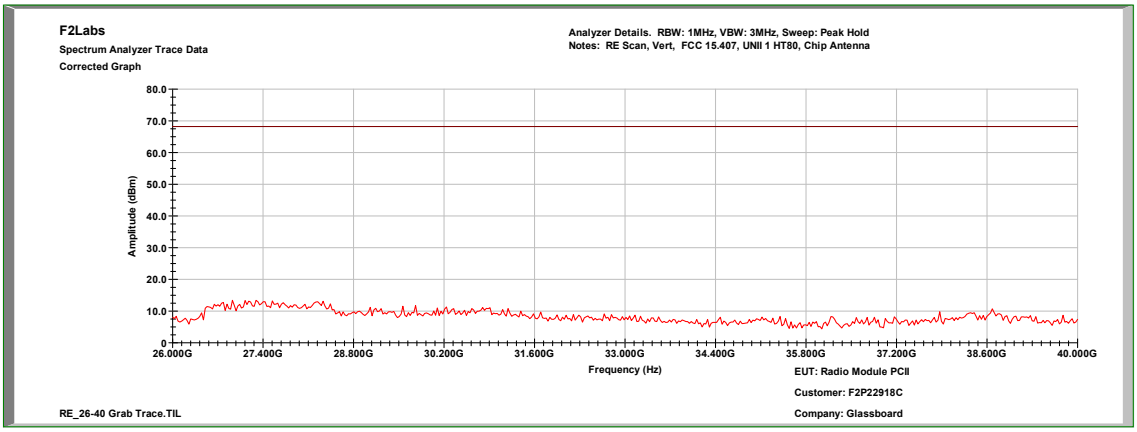
CHIP Antenna

UNII 1, Radiated Spurious Emissions: 18 GHz to 26 GHz, Vertical

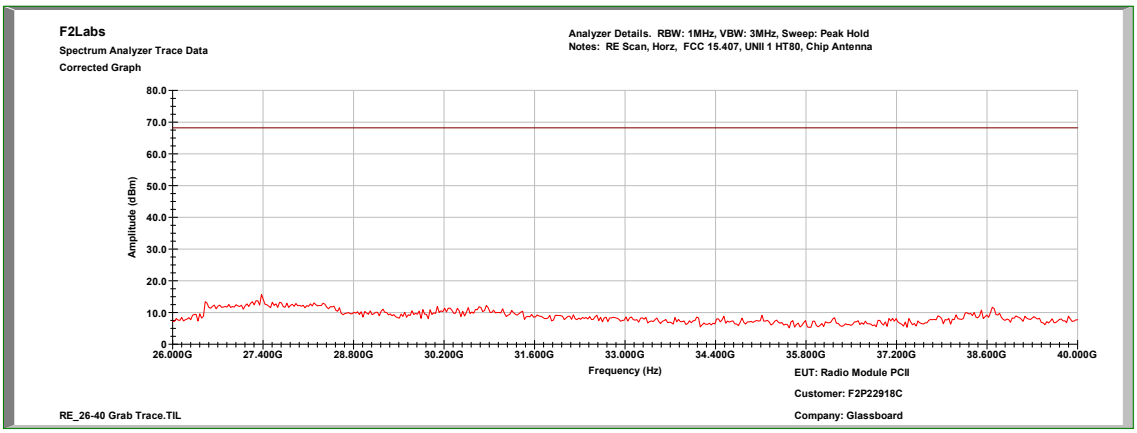
UNII 1, Radiated Spurious Emissions: 18 GHz to 26 GHz, Horizontal

CHIP Antenna

UNII 1, Radiated Spurious Emissions: 26 GHz to 40 GHz, Vertical



UNII 1, Radiated Spurious Emissions: 26 GHz to 40 GHz, Horizontal



CHIP Antenna

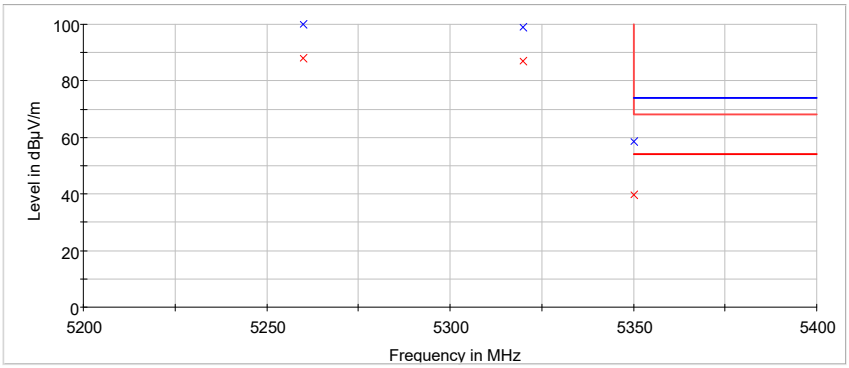
UNII 2A, HT20: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5260.000000	H	150.00	87.00	95.7	4.2	99.90	--	--
5320.000000	H	150.00	87.00	94.6	4.4	99.00	--	--
5350.000000	H	150.00	87.00	53.9	4.5	58.40	74.0	-15.6

Average

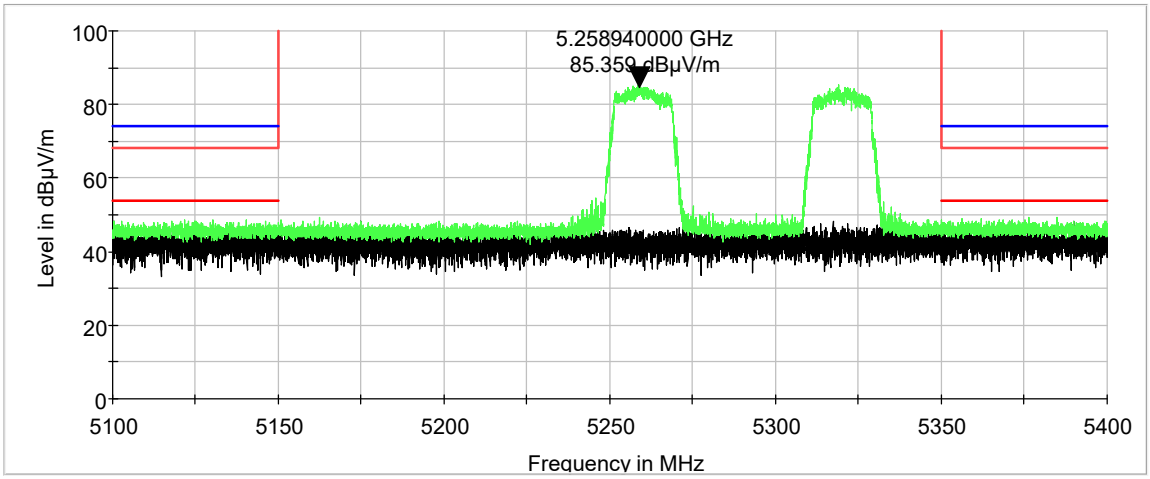
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5260.000000	H	150.00	87.00	83.7	4.2	87.90	--	--
5320.000000	H	150.00	87.00	82.6	4.4	87.00	--	--
5350.000000	H	150.00	87.00	35.3	4.5	39.80	54.0	-14.2



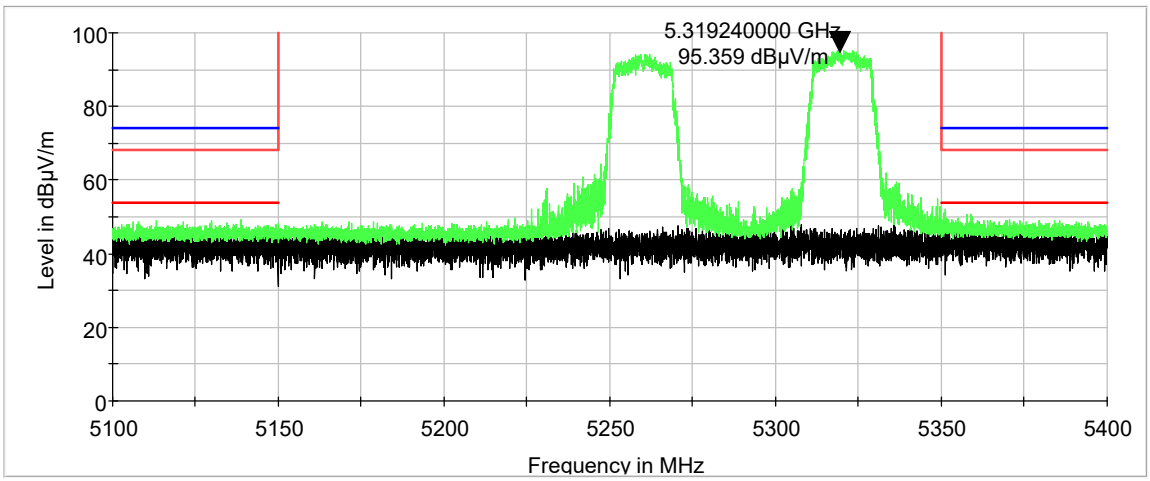
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2A, HT20: Radiated Band Edge, Vertical



UNII 2A, HT20: Radiated Band Edge, Horizontal



CHIP Antenna

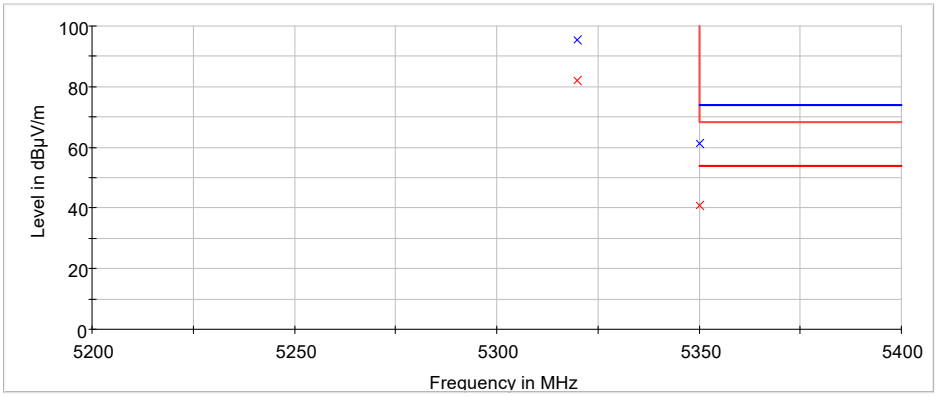
UNII 2A, HT40: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	87.00	56.9	4.5	61.40	74.0	-12.6
5320.000000	H	150.00	87.00	91.1	4.4	95.50	--	--

Average

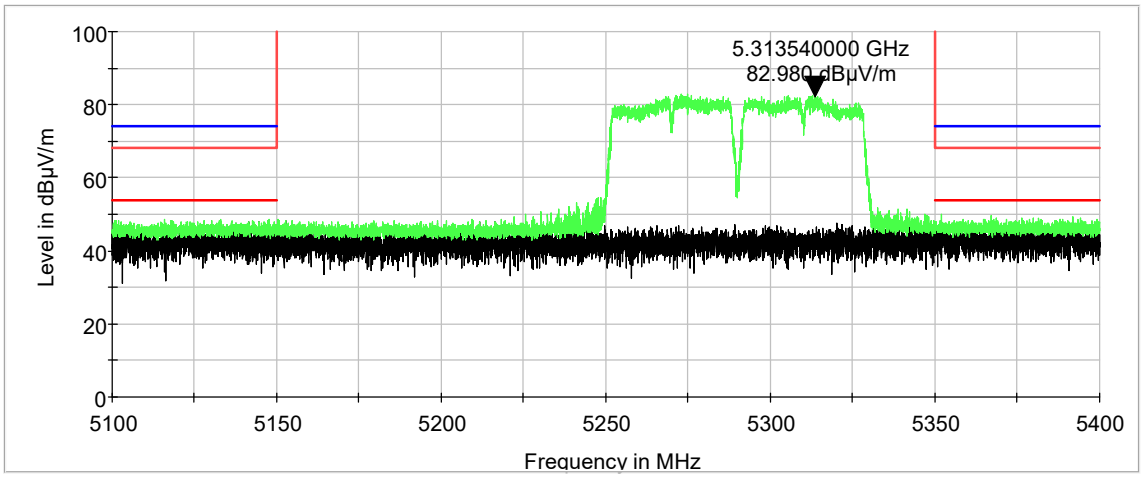
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.000000	H	150.00	87.00	36.3	4.5	40.80	54.0	-13.2
5320.000000	H	150.00	87.00	77.7	4.4	82.10	--	--



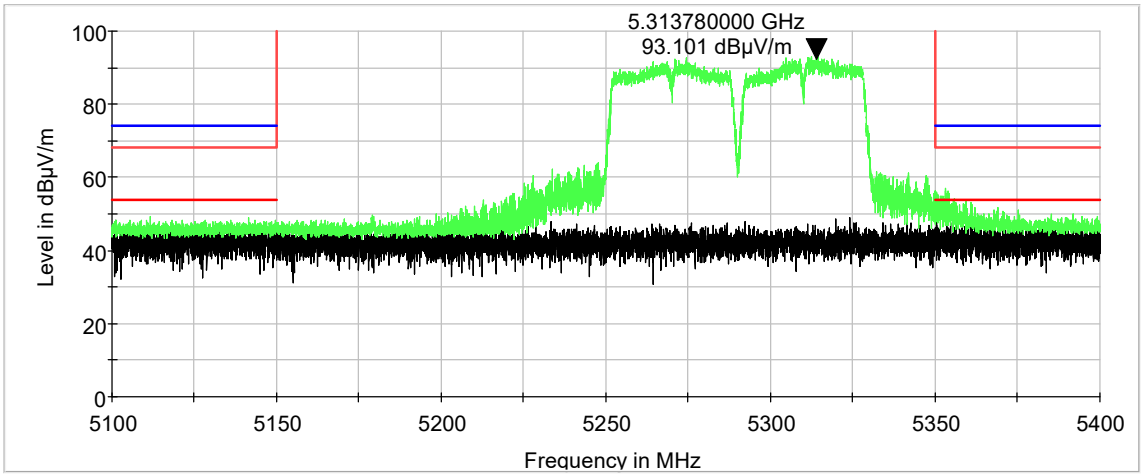
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2A, HT40: Radiated Band Edge, Vertical



UNII 2A, HT40: Radiated Band Edge, Horizontal



CHIP Antenna

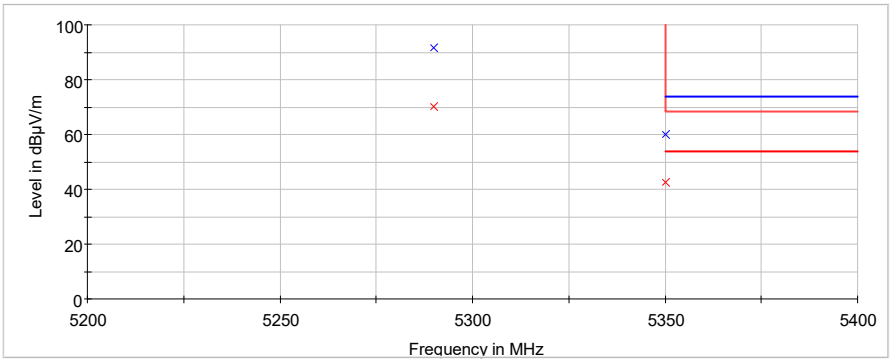
UNII 2A, HT80: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5290.000000	H	150.00	87.00	87.3	4.3	91.60	--	--
5350.000000	H	150.00	87.00	55.5	4.5	60.00	74.0	-14.0

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5290.000000	H	150.00	87.00	65.9	4.3	70.20	--	--
5350.000000	H	150.00	87.00	38.1	4.5	42.60	54.0	-11.4

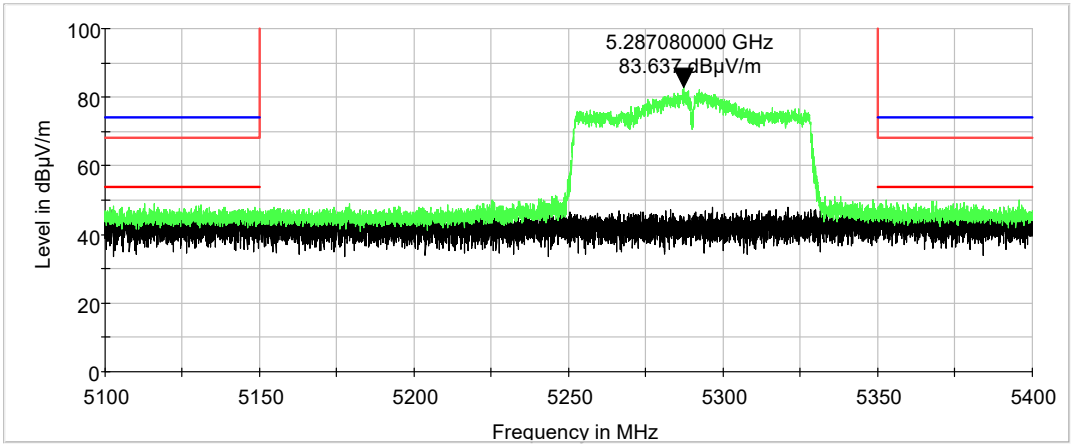


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

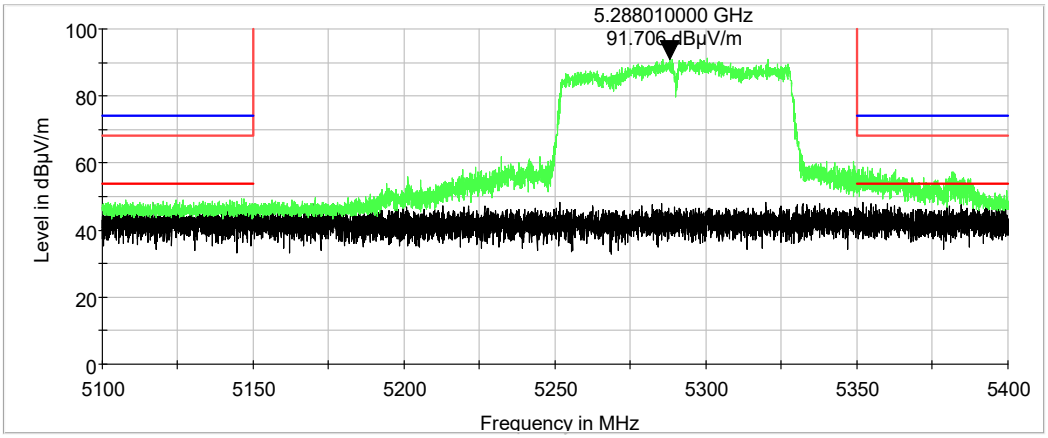
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2A, HT80: Radiated Band Edge, Vertical



UNII 2A, HT80: Radiated Band Edge, Horizontal



CHIP Antenna

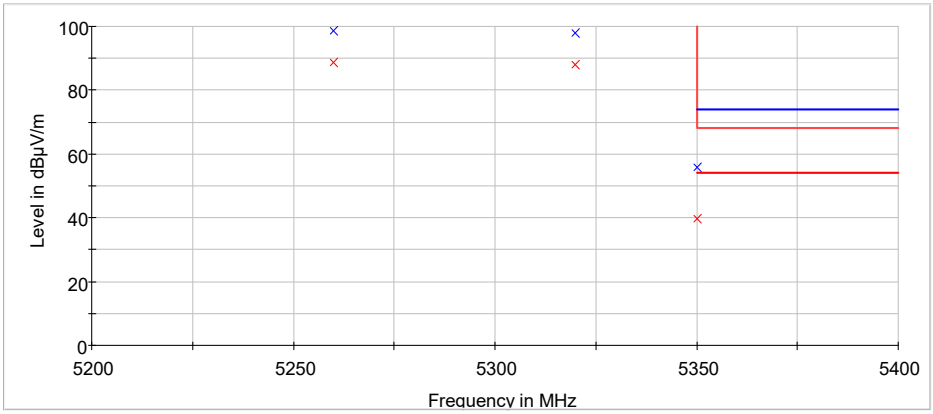
UNII 2A, OFDM: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5260.000000	H	150.00	87.00	94.4	4.2	98.60	--	--
5320.000000	H	150.00	87.00	93.6	4.4	98.00	--	--
5350.000000	H	150.00	87.00	51.3	4.5	55.80	74.0	-18.2

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5260.000000	H	150.00	87.00	84.5	4.2	88.70	--	--
5320.000000	H	150.00	87.00	83.6	4.4	88.00	--	--
5350.000000	H	150.00	87.00	35.3	4.5	39.80	54.0	-14.2

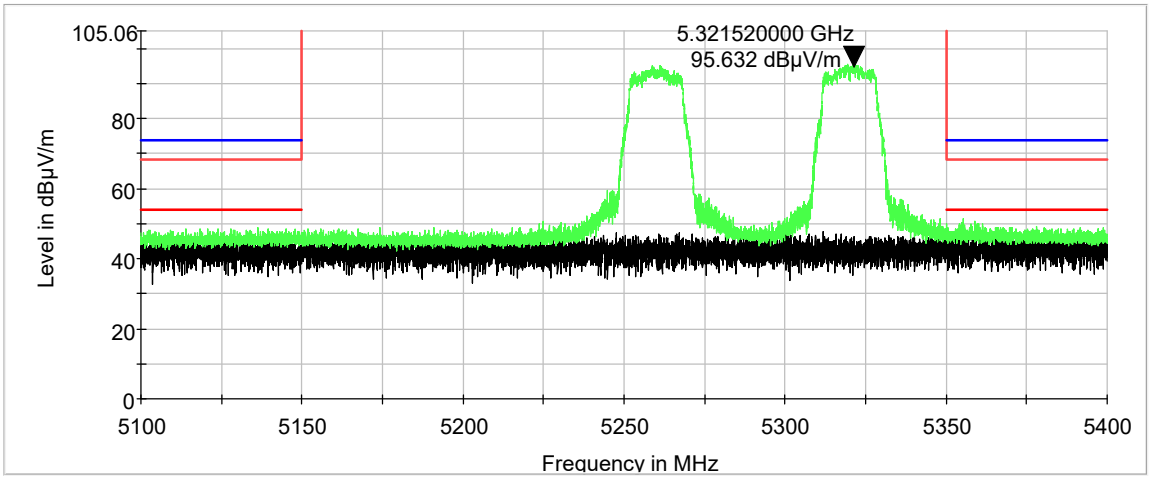


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

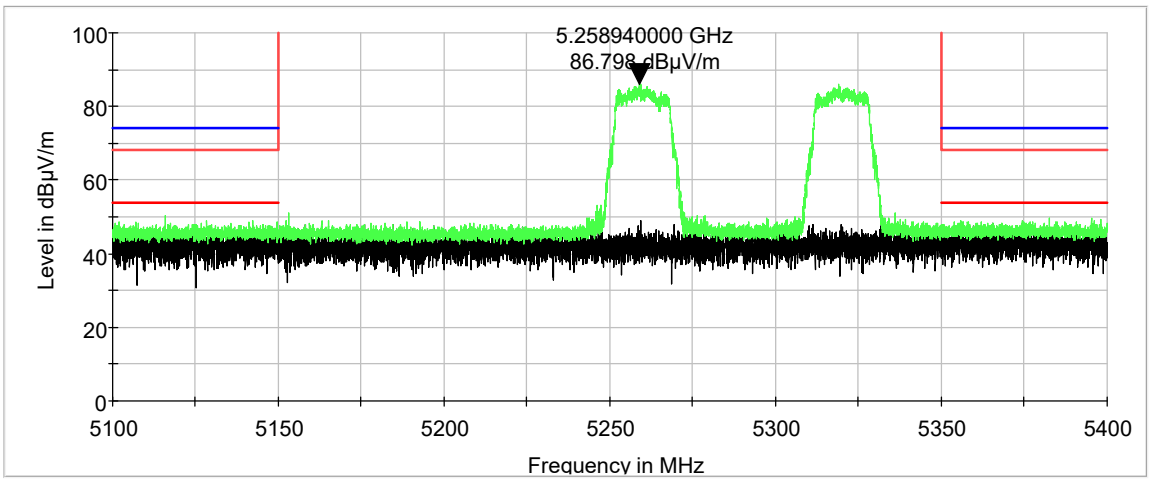
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2A, OFDM: Radiated Band Edge, Vertical



UNII 2A, OFDM: Radiated Band Edge, Horizontal



CHIP Antenna

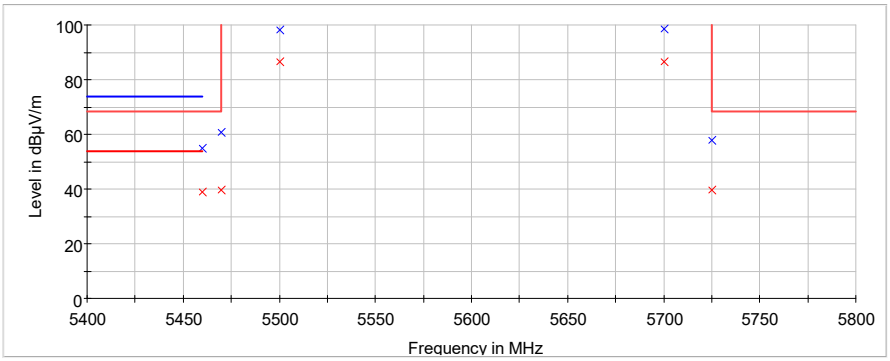
UNII 2C, HT20: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	87.00	50.0	4.8	54.80	68.2	-13.4
5460.000000	H	150.00	87.00	55.9	4.9	60.80	74.0	-13.2
5725.000000	H	150.00	87.00	93.2	5.0	98.20	--	--
5725.000000	H	150.00	87.00	93.2	5.2	98.40	--	--
5725.000000	H	150.00	87.00	52.5	5.2	57.70	74.0	-16.3

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5470.000000	H	150.00	87.00	34.1	4.8	38.90	54.0	-15.1
5460.000000	H	150.00	87.00	34.7	4.9	39.60	54.0	-14.4
5725.000000	H	150.00	87.00	81.4	5.0	86.40	--	--
5725.000000	H	150.00	87.00	81.5	5.2	86.70	--	--
5725.000000	H	150.00	87.00	34.4	5.2	39.60	54.0	-14.4

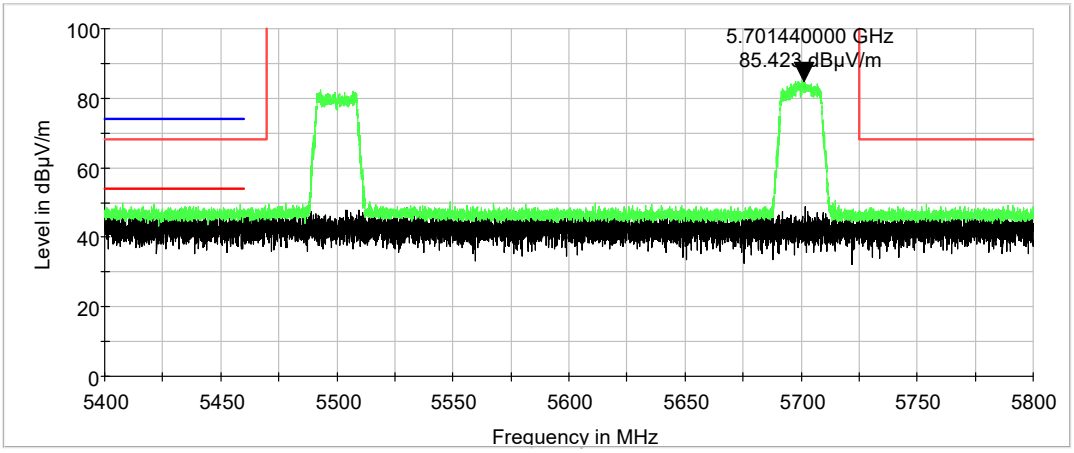


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

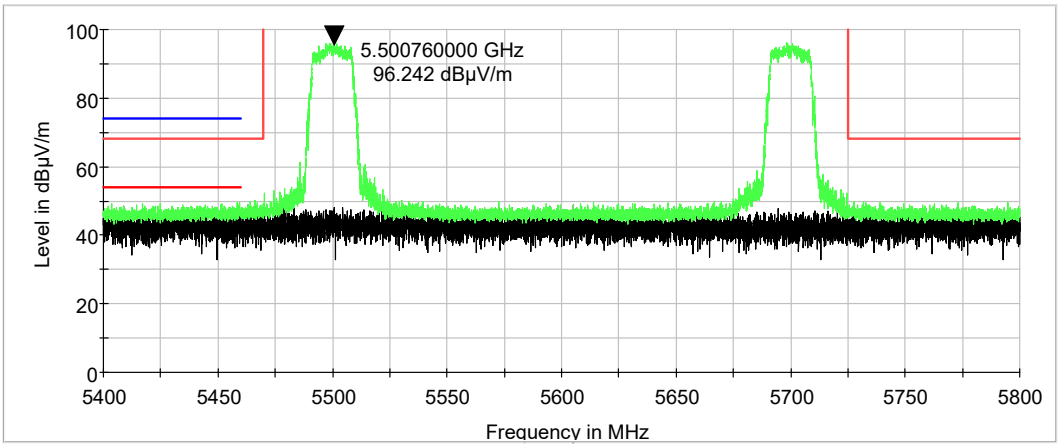
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2C, HT20: Radiated Band Edge, Vertical



UNII 2C, HT20: Radiated Band Edge, Horizontal



CHIP Antenna

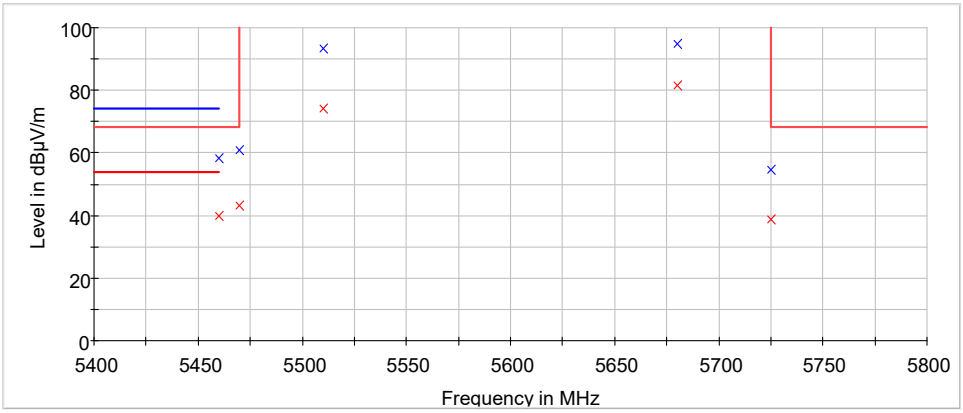
UNII 2C, HT40: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5510.000000	H	150.00	87.00	88.2	5.0	93.20	--	--
5470.000000	H	150.00	87.00	55.9	4.9	60.80	68.2	-7.4
5460.000000	H	150.00	87.00	53.6	4.8	58.40	74.0	-15.6
5725.000000	H	150.00	87.00	49.4	5.2	54.60	74.0	-19.4
5680.000000	H	150.00	87.00	89.7	5.2	94.90	--	--

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5510.000000	H	150.00	87.00	69.0	5.0	74.00	--	--
5470.000000	H	150.00	87.00	38.1	4.9	43.00	54.0	-11.0
5460.000000	H	150.00	87.00	35.1	4.8	39.90	54.0	-14.1
5725.000000	H	150.00	87.00	33.7	5.2	38.90	54.0	-15.1
5680.000000	H	150.00	87.00	76.2	5.2	81.40	--	--

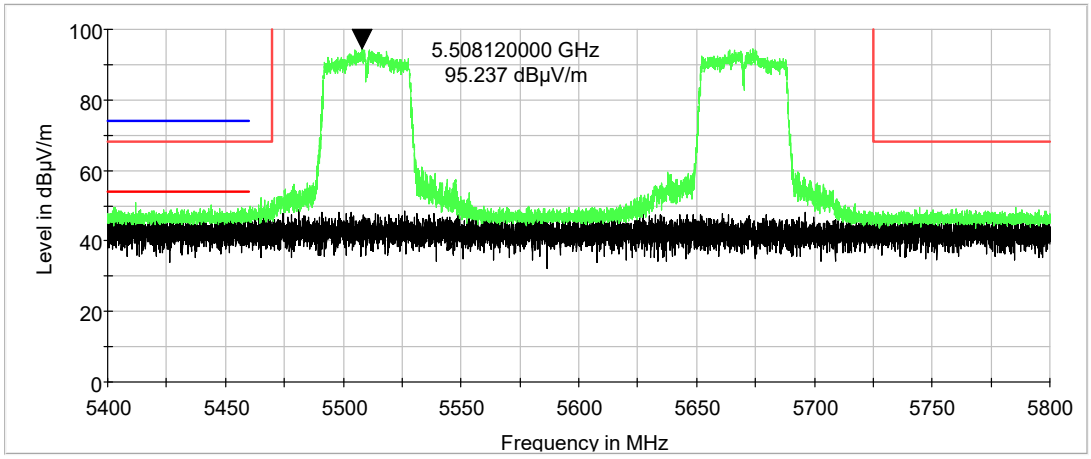


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

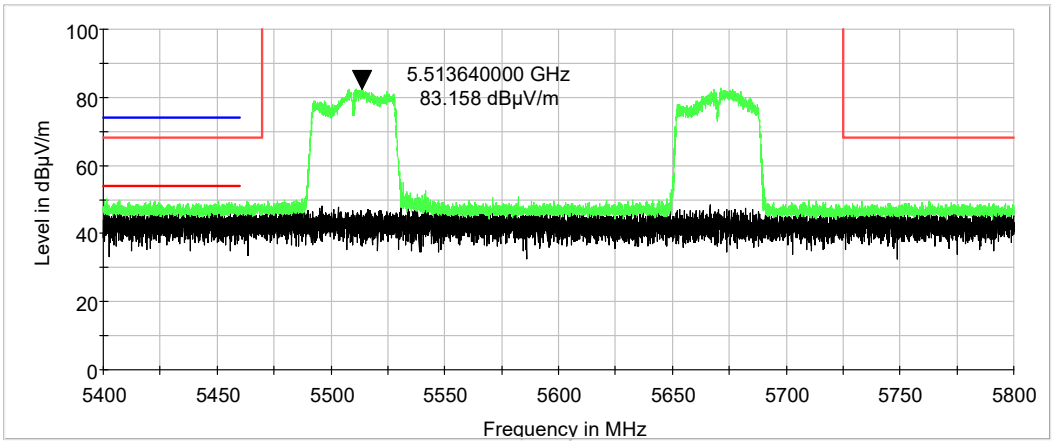
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2C, HT40: Radiated Band Edge, Vertical



UNII 2C, HT40: Radiated Band Edge, Horizontal



CHIP Antenna

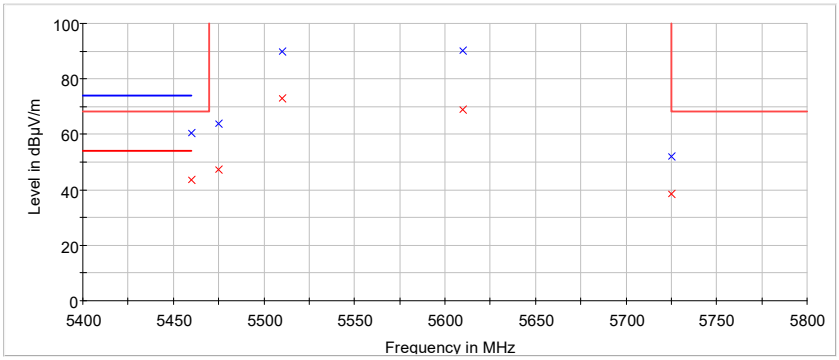
UNII 2C, HT80: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5610.000000	H	150.00	87.00	85.2	5.0	90.20	--	--
5725.000000	H	150.00	87.00	47.0	5.2	52.20	74.0	-21.8
5470.000000	H	150.00	87.00	59.1	4.9	64.00	68.2	-4.2
5460.000000	H	150.00	87.00	55.6	4.8	60.40	74.0	-13.6
5510.000000	H	150.00	87.00	84.9	5.0	89.90	--	--

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5610.000000	H	150.00	87.00	64.1	5.0	69.10	--	--
5725.000000	H	150.00	87.00	33.2	5.2	38.40	54.0	-15.6
5475.000000	H	150.00	87.00	42.3	4.9	47.20	54.0	-6.8
5460.000000	H	150.00	87.00	38.9	4.8	43.70	54.0	-10.3
5510.000000	H	150.00	87.00	67.8	5.0	72.80	--	--

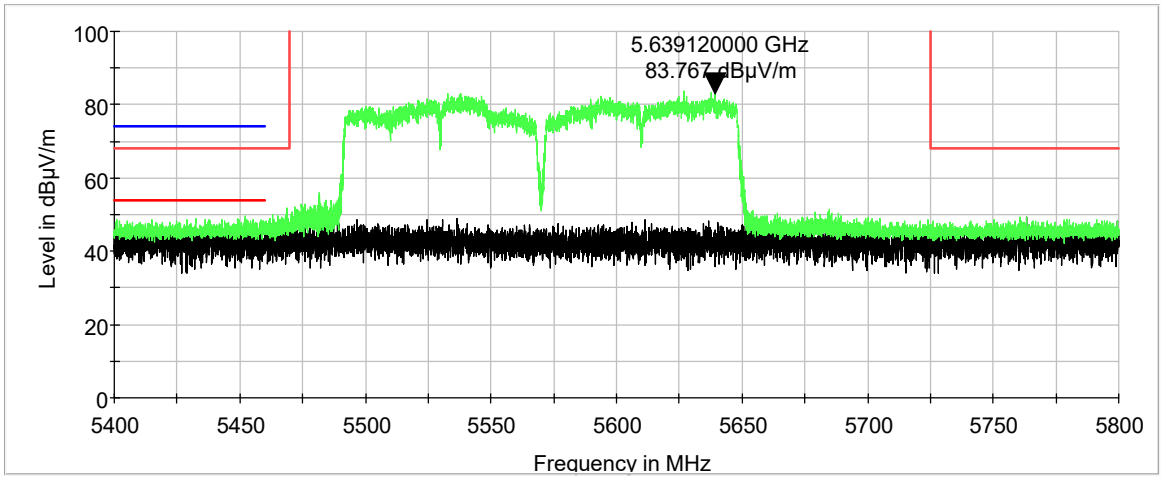


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

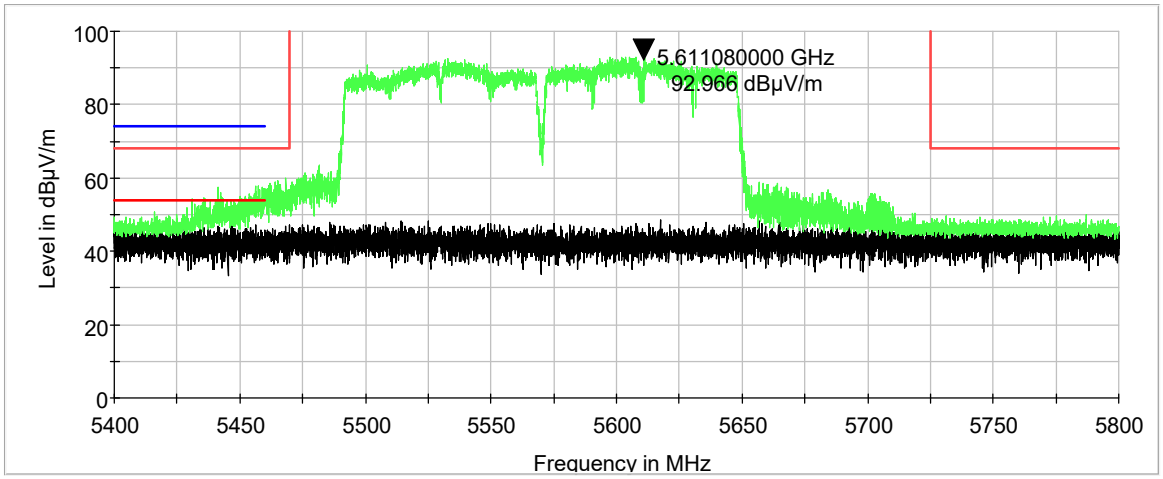
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2C, HT80: Radiated Band Edge, Vertical



UNII 2C, HT80: Radiated Band Edge, Horizontal



CHIP Antenna

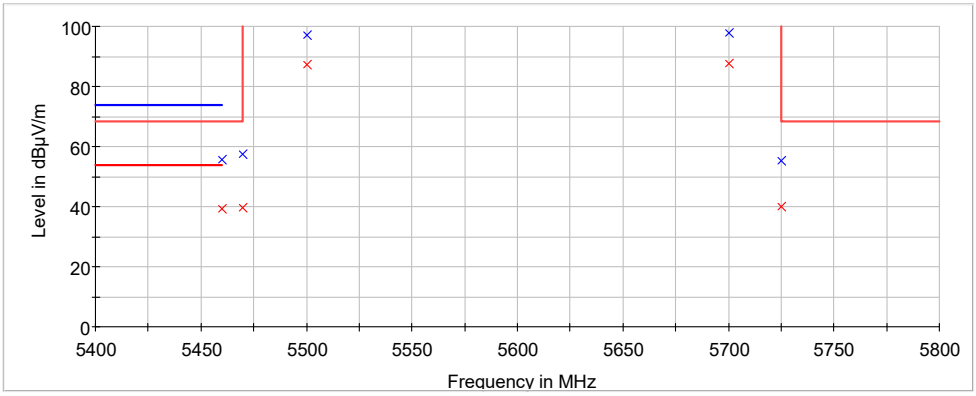
UNII 2C, OFDM: Radiated Band Edge Measurements

MaxPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5700.000000	H	150.00	87.00	92.5	5.2	97.70	--	--
5725.000000	H	150.00	87.00	50.1	5.2	55.30	74.0	-18.7
5500.000000	H	150.00	87.00	92.2	5.0	97.20	--	--
5470.000000	H	150.00	87.00	52.7	4.9	57.60	68.2	-10.6
5460.000000	H	150.00	87.00	51.0	4.8	55.80	74.0	-18.2

Average

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5700.000000	H	150.00	87.00	82.3	5.2	87.50	--	--
5725.000000	H	150.00	87.00	34.6	5.2	39.80	54.0	-14.2
5500.000000	H	150.00	87.00	82.4	5.0	87.40	--	--
5470.000000	H	150.00	87.00	34.8	4.9	39.70	54.0	-14.3
5460.000000	H	150.00	87.00	34.6	4.8	39.40	54.0	-14.6

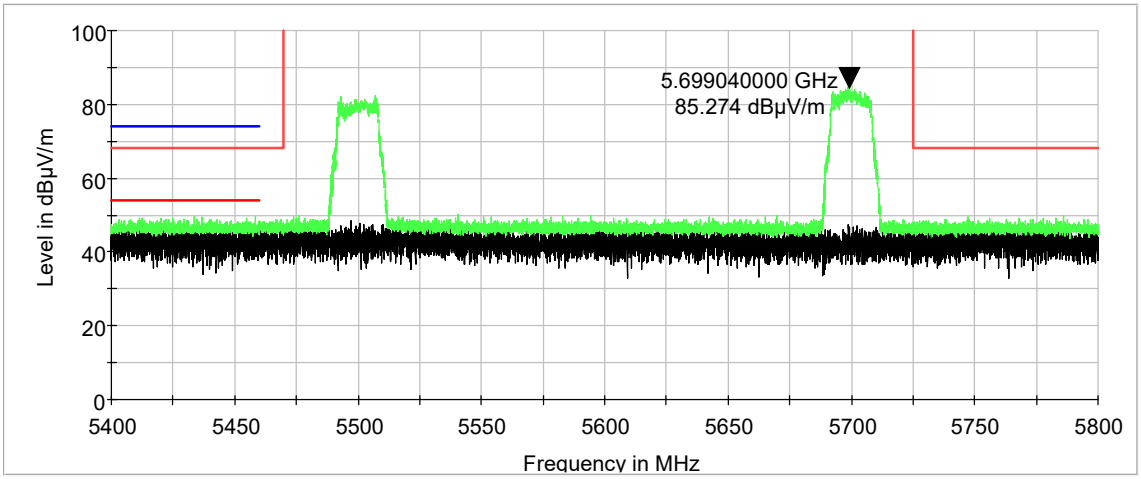


NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

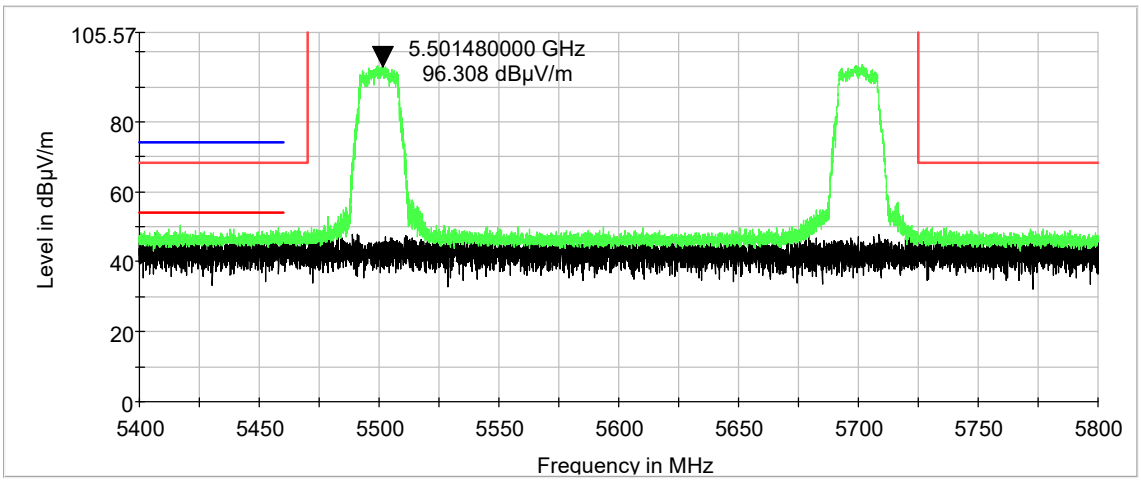
Note: In the following graphs, the green emissions are the peak emissions. The red limit line is the Average limit and the blue limit line is the Peak limit.

CHIP Antenna

UNII 2C, OFDM: Radiated Band Edge, Vertical



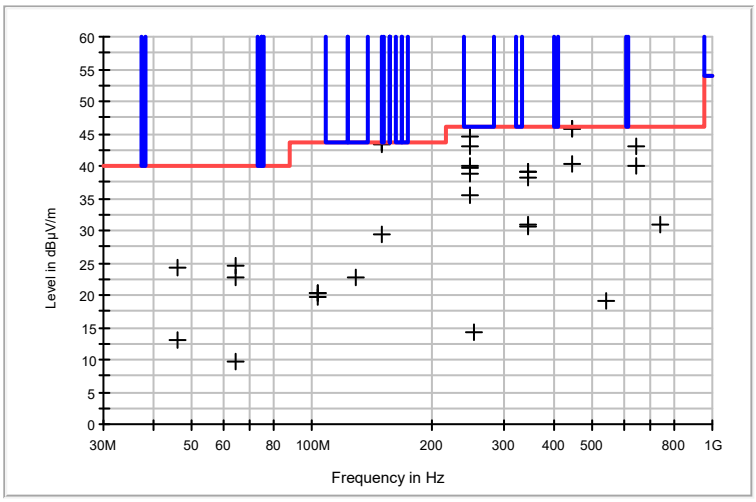
UNII 2C, OFDM: Radiated Band Edge, Horizontal



Chip Antenna UNII 2A & 2C
Radiated Spurious Emissions 30 MHz to 1000 MHz (Reflects Data from all channels)

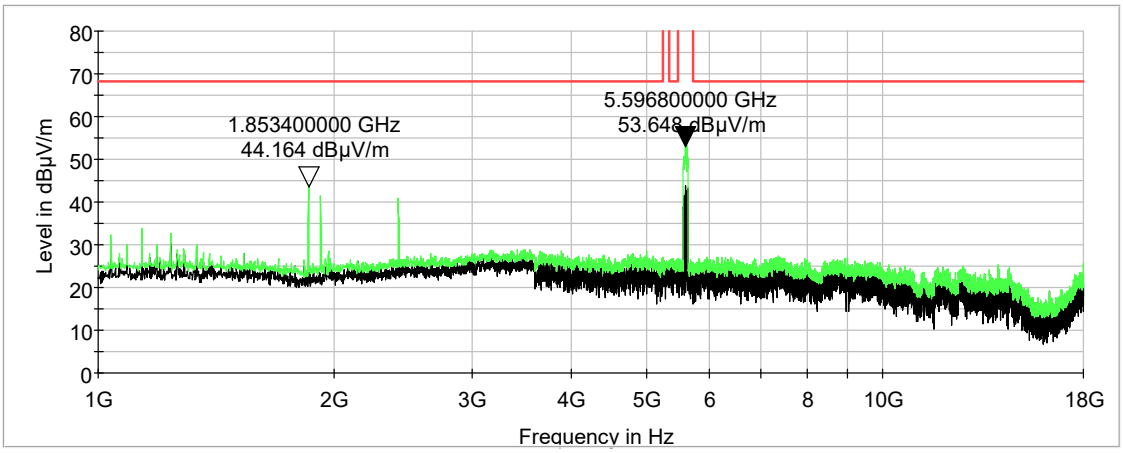
Note: All emissions recorded are from the development board used for testing.
The radio was turned off and removed, and all emissions remained at the same levels.

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.000000	24.2	120.000	100.0	V	355.0	-4.5	15.8	40.0
46.000000	13.0	120.000	100.0	H	359.0	-4.5	27.0	40.0
64.560000	22.7	120.000	100.0	V	29.0	-6.7	17.3	40.0
64.560000	9.8	120.000	100.0	H	0.0	-6.7	30.2	40.0
64.560000	24.6	120.000	100.0	V	0.0	-6.7	15.4	40.0
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
103.160000	19.8	120.000	100.0	V	345.0	-3.0	23.7	43.5
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
127.800000	22.6	120.000	100.0	V	4.0	0.2	20.9	43.5
148.440000	29.5	120.000	100.0	V	136.0	-1.0	14.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.3	120.000	100.0	H	0.0	-1.0	0.2	43.5
247.480000	35.5	120.000	100.0	V	197.0	-0.7	10.5	46.0
247.480000	42.9	120.000	100.0	H	178.0	-0.7	3.1	46.0
247.480000	39.6	120.000	100.0	V	354.0	-0.7	6.4	46.0
247.480000	38.9	120.000	100.0	V	251.0	-0.7	7.1	46.0
247.480000	44.6	120.000	100.0	H	107.0	-0.7	1.4	46.0
247.480000	39.9	120.000	100.0	H	258.0	-0.7	6.1	46.0
252.400000	14.3	120.000	100.0	V	0.0	-0.7	31.7	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	30.5	120.000	100.0	V	116.0	2.6	15.5	46.0
346.400000	38.0	120.000	100.0	H	131.0	2.6	8.0	46.0
346.400000	30.9	120.000	100.0	V	67.0	2.6	15.1	46.0
445.400000	40.2	120.000	100.0	V	322.0	5.1	5.8	46.0
445.400000	45.8	120.000	100.0	H	0.0	5.1	0.2	46.0
445.400000	45.7	120.000	100.0	H	0.0	5.1	0.3	46.0
544.600000	19.0	120.000	100.0	V	355.0	7.1	27.0	46.0
643.400000	40.0	120.000	100.0	V	355.0	9.1	6.0	46.0
643.440000	43.0	120.000	100.0	H	131.0	9.1	3.0	46.0
742.560000	30.9	120.000	100.0	H	352.0	10.3	15.1	46.0

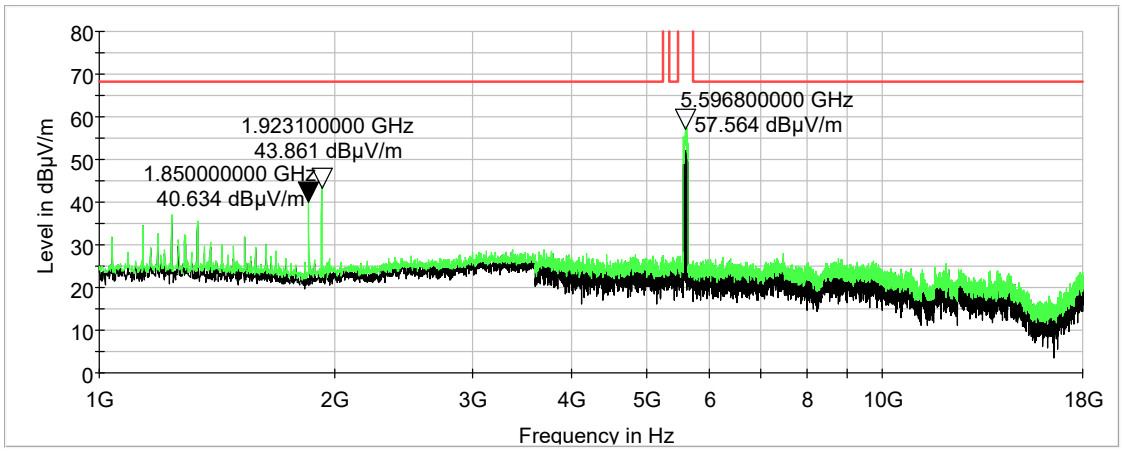


The following plots are from UNII 2A HT20, determined to be worst case between all modulations in UNII 2A and 2C.

**UNII 2A & 2C, Radiated Spurious Emissions:
1 GHz to 18 GHz, Vertical**



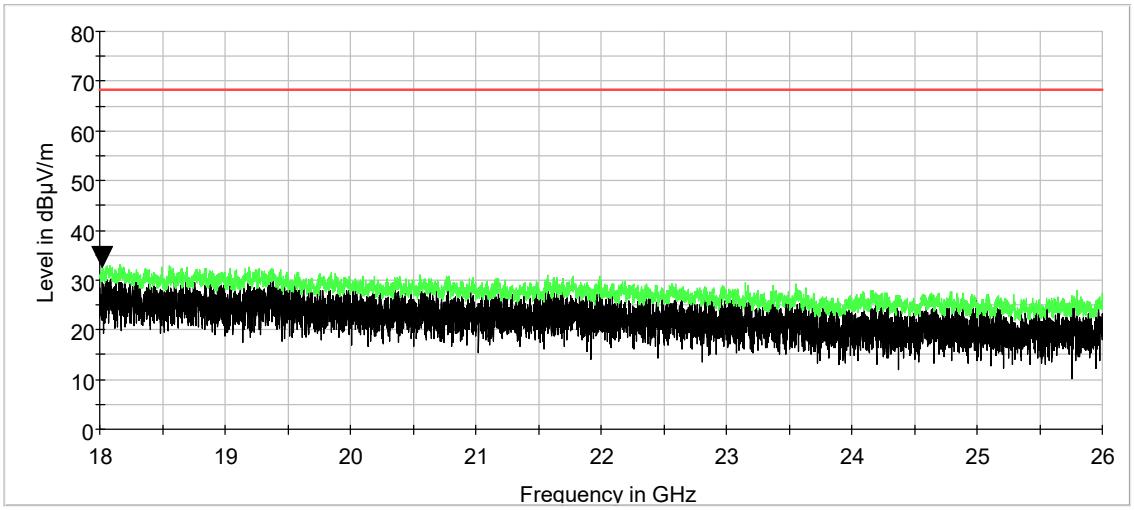
**UNII 2A & 2C, Radiated Spurious Emissions:
1 GHz to 18 GHz, Horizontal**



CHIP Antenna

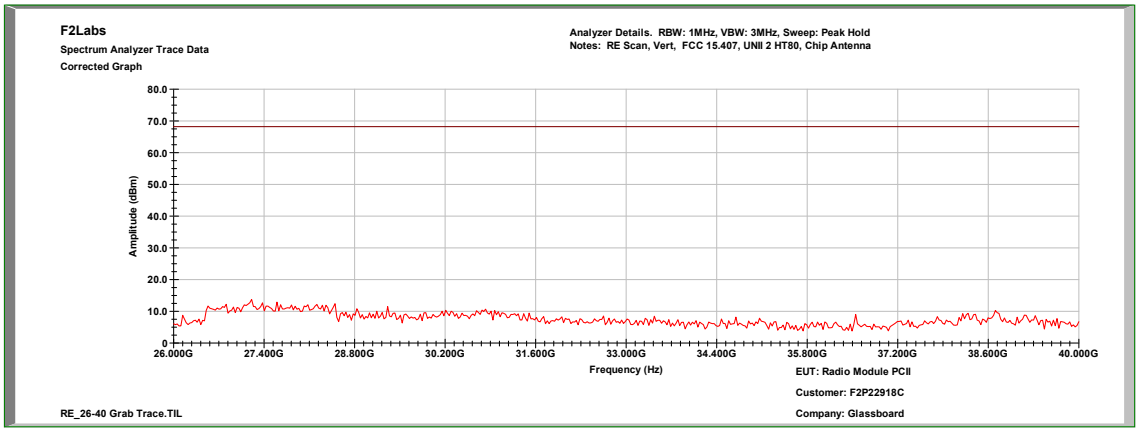
UNII 2A & 2C, Radiated Spurious Emissions: 18 GHz to 26 GHz, Vertical

UNII 2A & 2C, Radiated Spurious Emissions: 18 GHz to 26 GHz, Horizontal

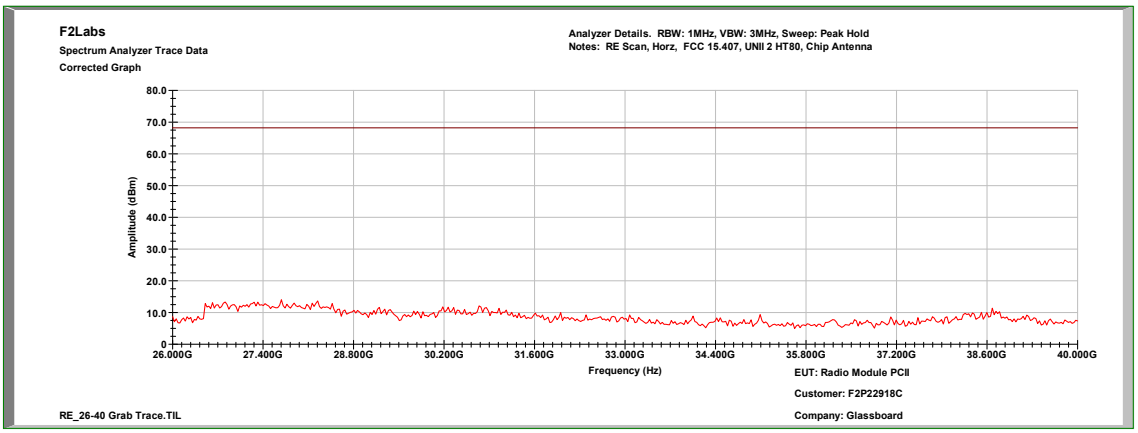


CHIP Antenna

UNII 2A & 2C, Radiated Spurious Emissions: 26 GHz to 40 GHz, Vertical



UNII 2A & 2C, Radiated Spurious Emissions: 26 GHz to 40 GHz, Horizontal

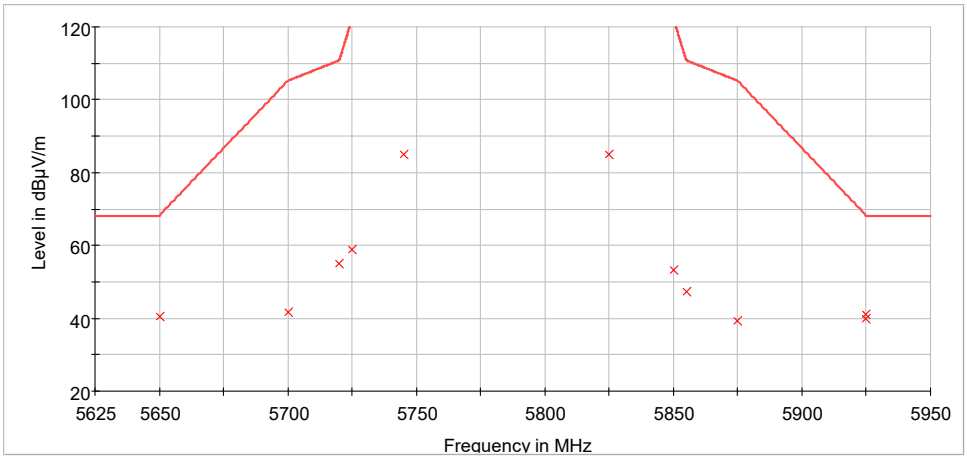


CHIP Antenna

UNII 3, HT20: Radiated Band Edge Measurements

MaxPeak

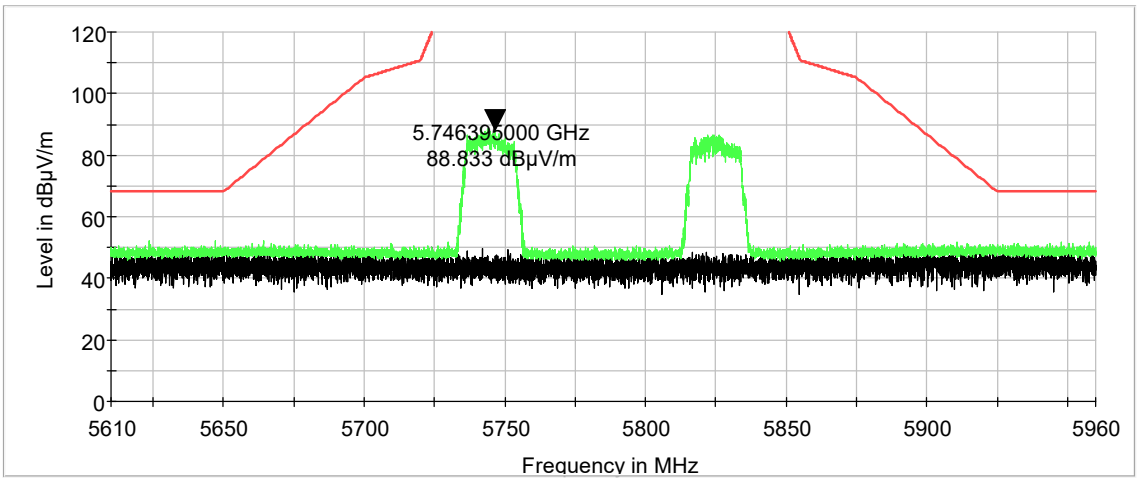
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	H	149.00	97.00	80.4	-21.5	58.90	74.0	-15.1
5720.000000	H	149.00	97.00	76.6	-21.5	55.10	74.0	-18.9
5700.000000	H	149.00	97.00	63.0	-21.5	41.50	74.0	-32.5
5650.000000	H	149.00	97.00	62.1	-21.6	40.50	74.0	-33.5
5850.000000	H	149.00	89.00	74.5	-21.3	53.20	74.0	-20.8
5855.000000	H	149.00	89.00	68.7	-21.3	47.40	74.0	-26.6
5875.000000	H	149.00	89.00	60.5	-21.2	39.30	74.0	-34.7
5925.000000	H	149.00	89.00	60.9	-21.0	39.90	74.0	-34.1
5925.000000	H	149.00	89.00	62.9	-21.0	41.90	74.0	-32.1



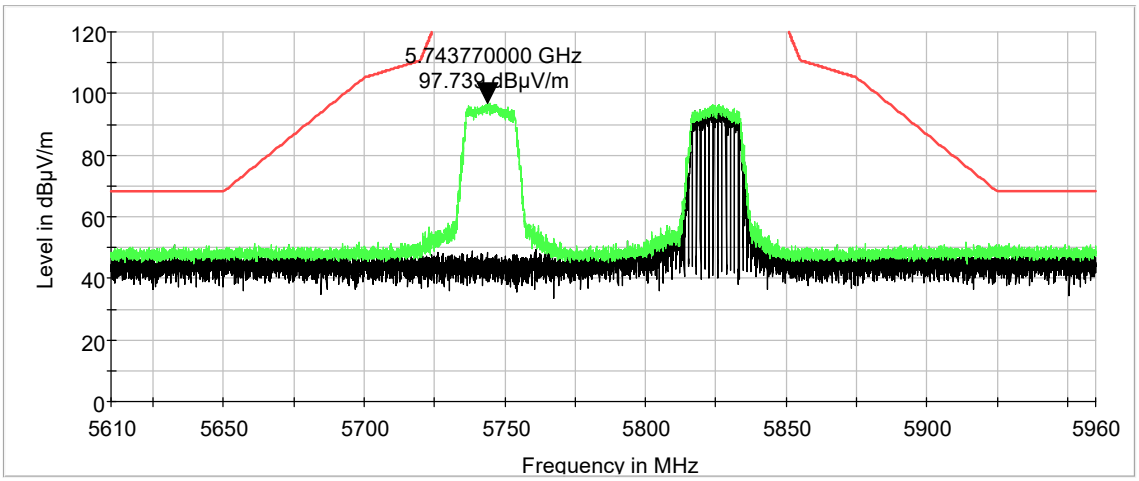
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

CHIP Antenna

UNII 3, HT20: Radiated Band Edge, Vertical



UNII 3, HT20: Radiated Band Edge, Horizontal

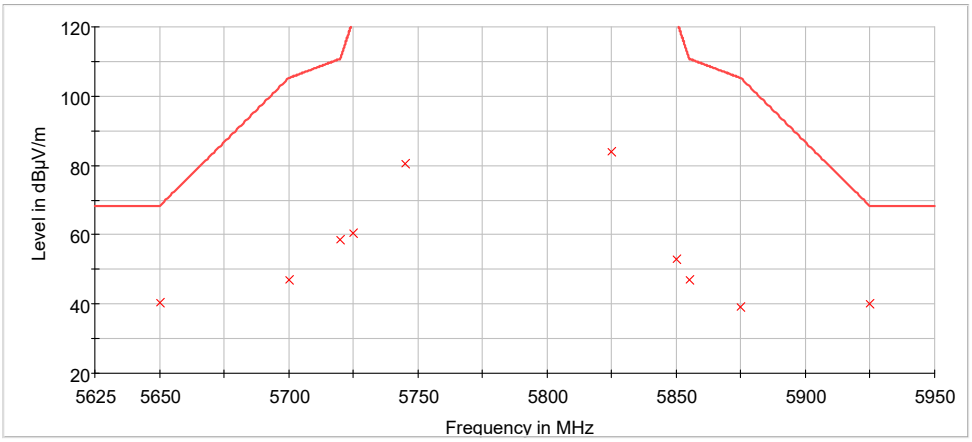


CHIP Antenna

UNII 3, HT40: Radiated Band Edge Measurements

MaxPeak

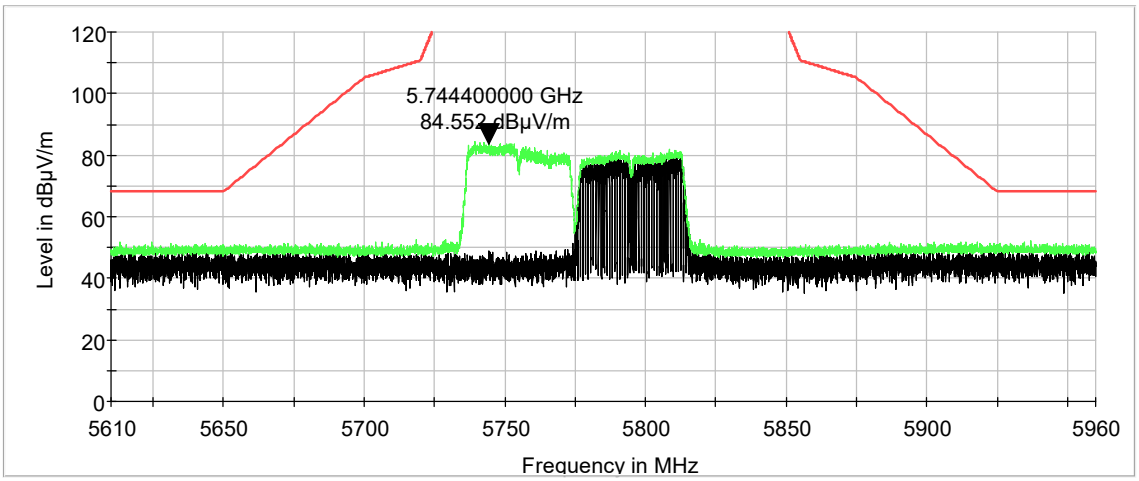
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5925.000000	H	149.00	89.00	61.1	-21.0	40.10	74.0	-33.9
5875.000000	H	149.00	89.00	60.4	-21.2	39.20	74.0	-34.8
5855.000000	H	149.00	89.00	68.2	-21.3	46.90	74.0	-27.1
5850.000000	H	149.00	89.00	74.3	-21.3	53.00	74.0	-21.0
5725.000000	H	149.00	96.00	81.8	-21.5	60.30	74.0	-13.7
5700.000000	H	149.00	96.00	68.6	-21.5	47.10	74.0	-26.9
5720.000000	H	149.00	96.00	80.0	-21.5	58.50	74.0	-15.5
5650.000000	H	149.00	96.00	61.9	-21.6	40.30	74.0	-33.7



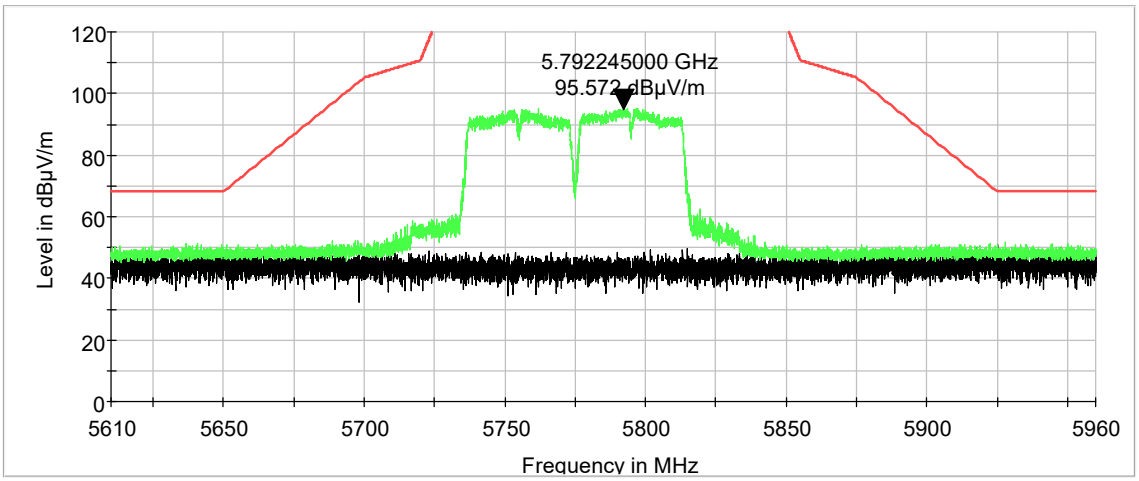
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

CHIP Antenna

UNII 3, HT40: Radiated Band Edge, Vertical



UNII 3, HT40: Radiated Band Edge, Horizontal

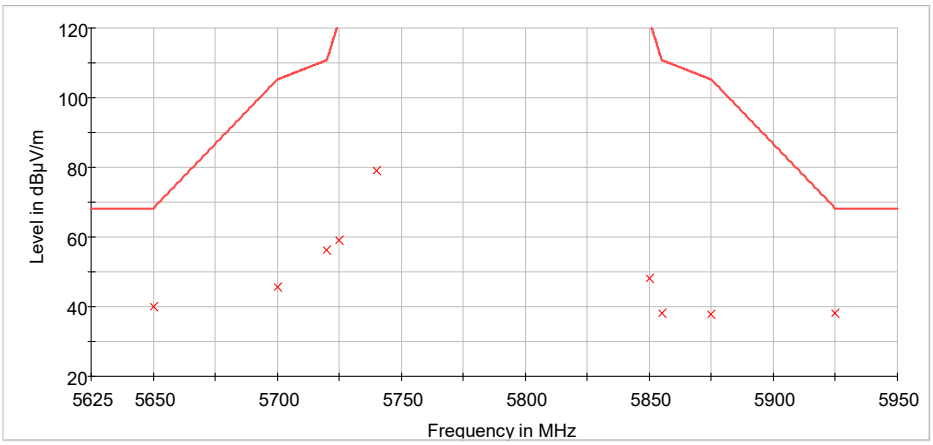


CHIP Antenna

UNII 3, HT80: Radiated Band Edge Measurements

MaxPeak

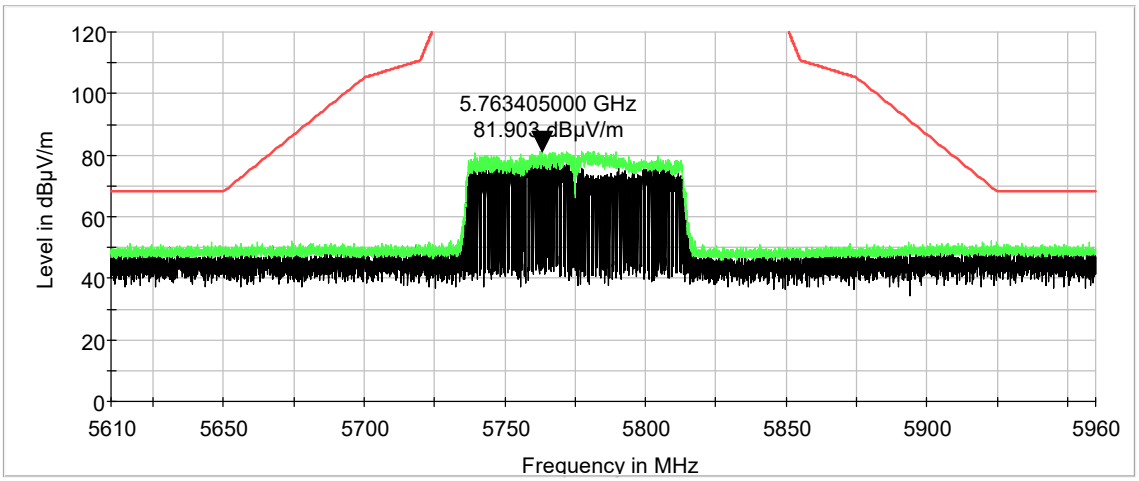
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	H	149.00	96.00	80.5	-21.5	59.00	74.0	-15.0
5720.000000	H	149.00	96.00	77.6	-21.5	56.10	74.0	-17.9
5700.000000	H	149.00	96.00	67.0	-21.5	45.50	74.0	-28.5
5650.000000	H	149.00	96.00	61.6	-21.6	40.00	74.0	-34.0
5850.000000	H	149.00	70.00	69.4	-21.3	48.10	74.0	-25.9
5855.000000	H	149.00	70.00	59.5	-21.3	38.20	74.0	-35.8
5875.000000	H	149.00	70.00	59.1	-21.2	37.90	74.0	-36.1
5925.000000	H	149.00	70.00	59.1	-21.0	38.10	74.0	-35.9



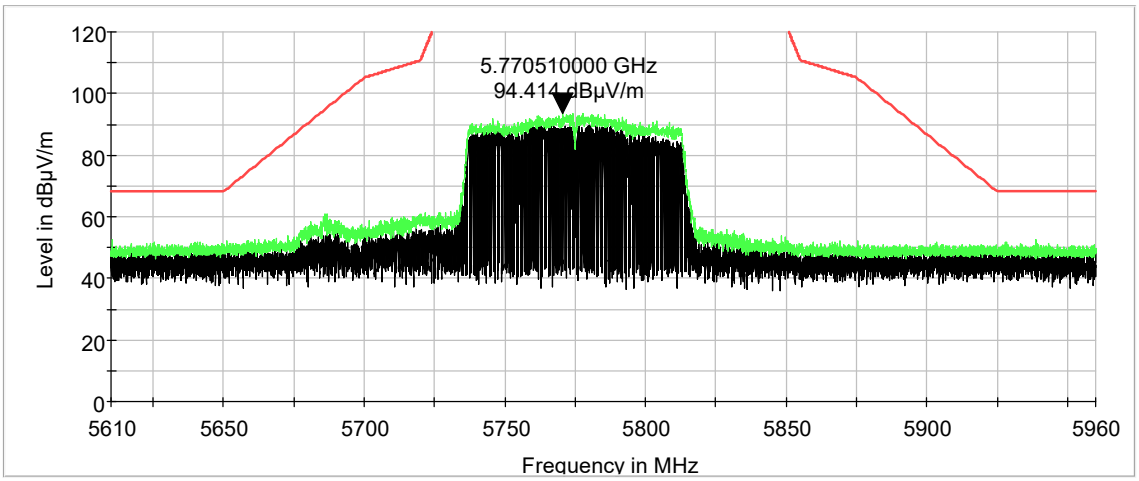
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

CHIP Antenna

UNII 3, HT80: Radiated Band Edge, Vertical



UNII 3, HT80: Radiated Band Edge, Horizontal

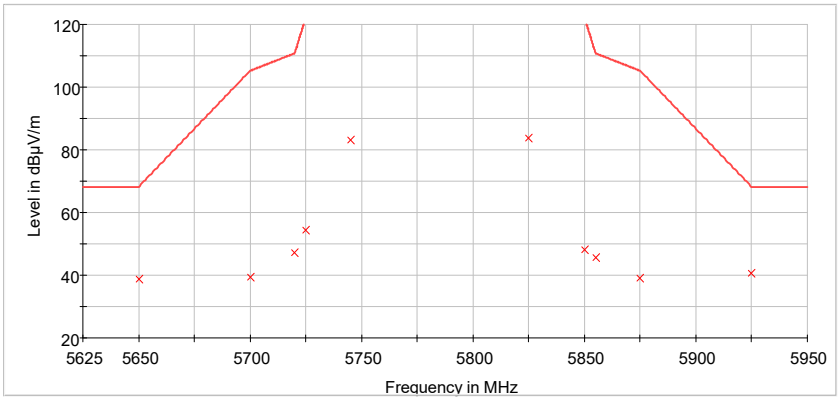


CHIP Antenna

UNII 3, OFDM: Radiated Band Edge Measurements

MaxPeak

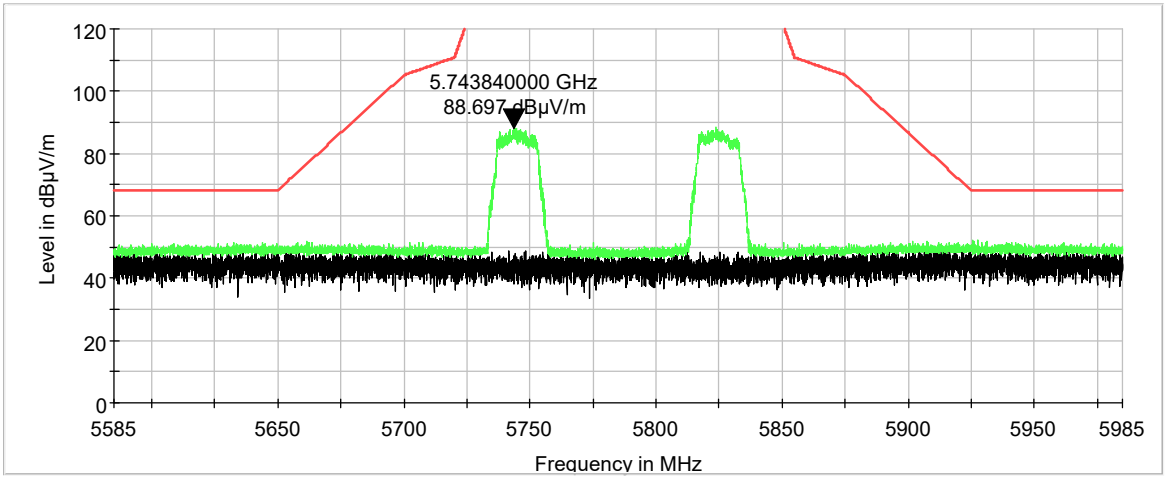
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	H	149.00	93.00	75.7	-21.5	54.20	74.0	-19.8
5700.000000	H	149.00	93.00	60.8	-21.5	39.30	74.0	-34.7
5650.000000	H	149.00	93.00	60.2	-21.6	38.60	74.0	-35.4
5850.000000	H	149.00	93.00	69.3	-21.3	48.00	74.0	-26.0
5855.000000	H	149.00	93.00	66.8	-21.3	45.50	74.0	-28.5
5875.000000	H	149.00	93.00	60.4	-21.2	39.20	74.0	-34.8
5925.000000	H	149.00	93.00	61.6	-21.0	40.60	74.0	-33.4
5720.000000	H	149.00	93.00	68.8	-21.5	47.30	74.0	-26.7



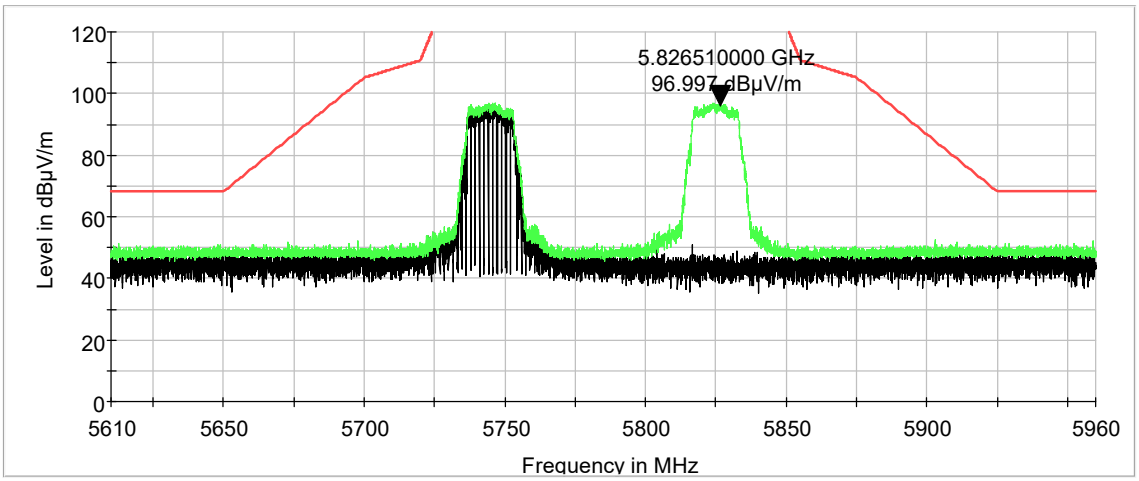
NOTE: The above table and graph are in dBuV/m. The -27dBm limit converted would be +68.2 dBuV/m. The results in the table show that the peak emissions are below the Average Limit. The above graph displays limit lines just for reference. The table above reflects the measurements taken in dBuV/m.

CHIP Antenna

UNII 3, OFDM: Radiated Band Edge, Vertical



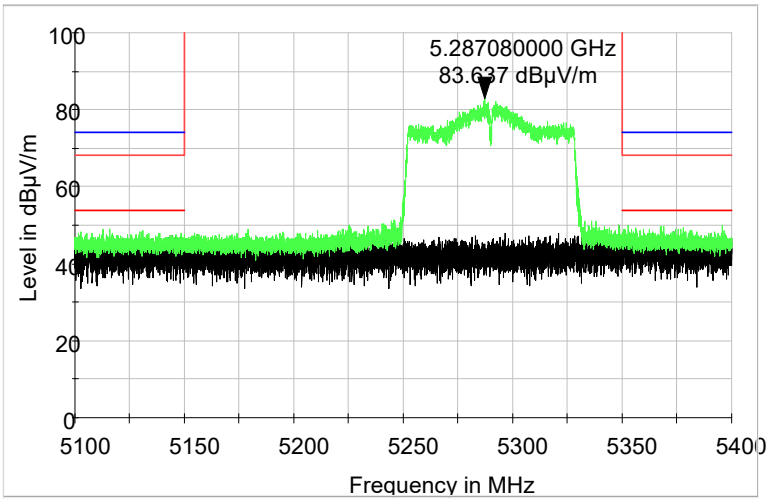
UNII 3, OFDM: Radiated Band Edge, Horizontal



Chip Antenna
Radiated Spurious Emissions 30 MHz to 1000 MHz

Note: All emissions recorded are from the development board used for testing. The radio was turned off and removed, and all emissions remained at the same levels.

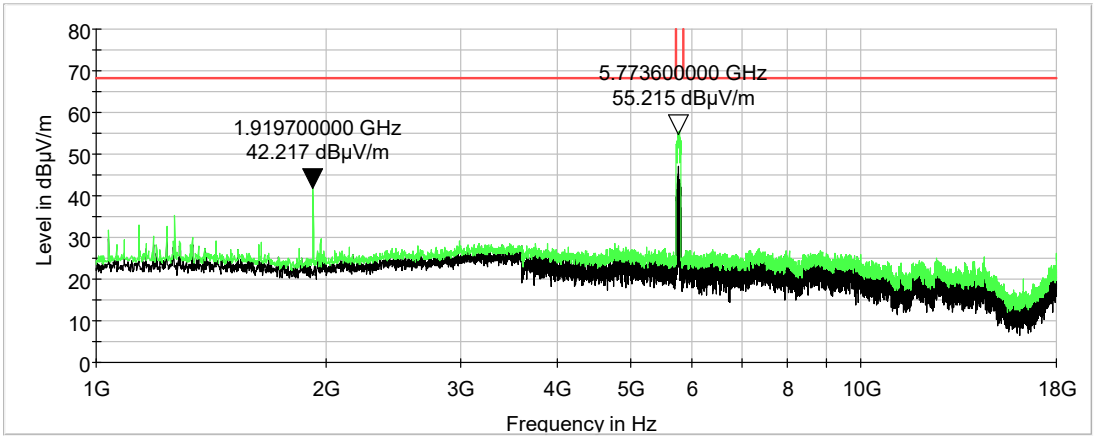
Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.000000	24.2	120.000	100.0	V	355.0	-4.5	15.8	40.0
46.000000	13.0	120.000	100.0	H	359.0	-4.5	27.0	40.0
64.560000	22.7	120.000	100.0	V	29.0	-6.7	17.3	40.0
64.560000	9.8	120.000	100.0	H	0.0	-6.7	30.2	40.0
64.560000	24.6	120.000	100.0	V	0.0	-6.7	15.4	40.0
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
103.160000	19.8	120.000	100.0	V	345.0	-3.0	23.7	43.5
103.160000	20.3	120.000	100.0	V	0.0	-3.0	23.2	43.5
127.800000	22.6	120.000	100.0	V	4.0	0.2	20.9	43.5
148.440000	29.5	120.000	100.0	V	136.0	-1.0	14.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.5	120.000	100.0	H	355.0	-1.0	0.0	43.5
148.520000	43.3	120.000	100.0	H	0.0	-1.0	0.2	43.5
247.480000	35.5	120.000	100.0	V	197.0	-0.7	10.5	46.0
247.480000	42.9	120.000	100.0	H	178.0	-0.7	3.1	46.0
247.480000	39.6	120.000	100.0	V	354.0	-0.7	6.4	46.0
247.480000	38.9	120.000	100.0	V	251.0	-0.7	7.1	46.0
247.480000	44.6	120.000	100.0	H	107.0	-0.7	1.4	46.0
247.480000	39.9	120.000	100.0	H	258.0	-0.7	6.1	46.0
252.400000	14.3	120.000	100.0	V	0.0	-0.7	31.7	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	39.0	120.000	100.0	H	142.0	2.6	7.0	46.0
346.400000	30.5	120.000	100.0	V	116.0	2.6	15.5	46.0
346.400000	38.0	120.000	100.0	H	131.0	2.6	8.0	46.0
346.400000	30.9	120.000	100.0	V	67.0	2.6	15.1	46.0
445.400000	40.2	120.000	100.0	V	322.0	5.1	5.8	46.0
445.400000	45.8	120.000	100.0	H	0.0	5.1	0.2	46.0
445.400000	45.7	120.000	100.0	H	0.0	5.1	0.3	46.0
544.600000	19.0	120.000	100.0	V	355.0	7.1	27.0	46.0
643.400000	40.0	120.000	100.0	V	355.0	9.1	6.0	46.0
643.440000	43.0	120.000	100.0	H	131.0	9.1	3.0	46.0
742.560000	30.9	120.000	100.0	H	352.0	10.3	15.1	46.0



The following plots are from HT20 which was worst case.

CHIP Antenna

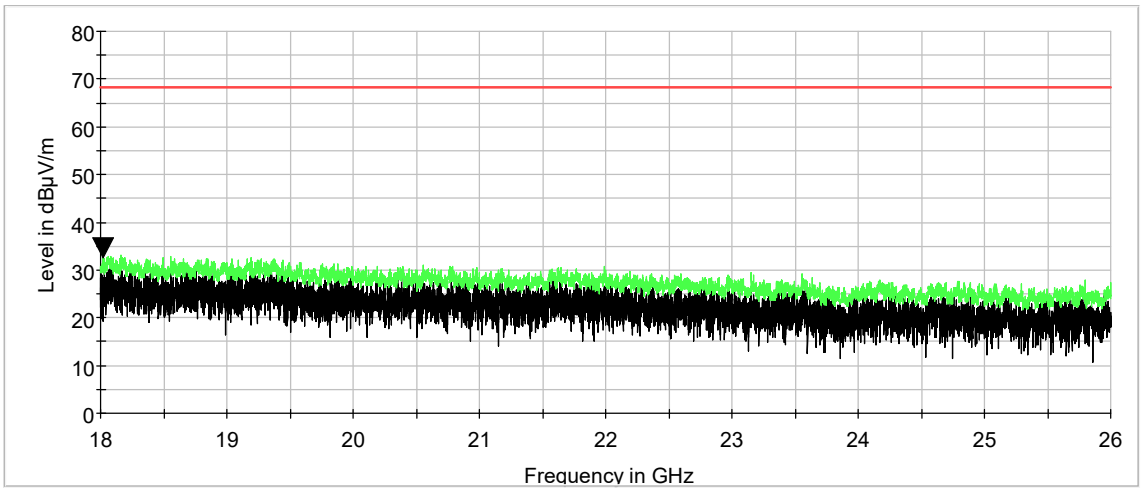
**UNII 3, Radiated Spurious Emissions:
1 GHz to 18 GHz, Vertical**



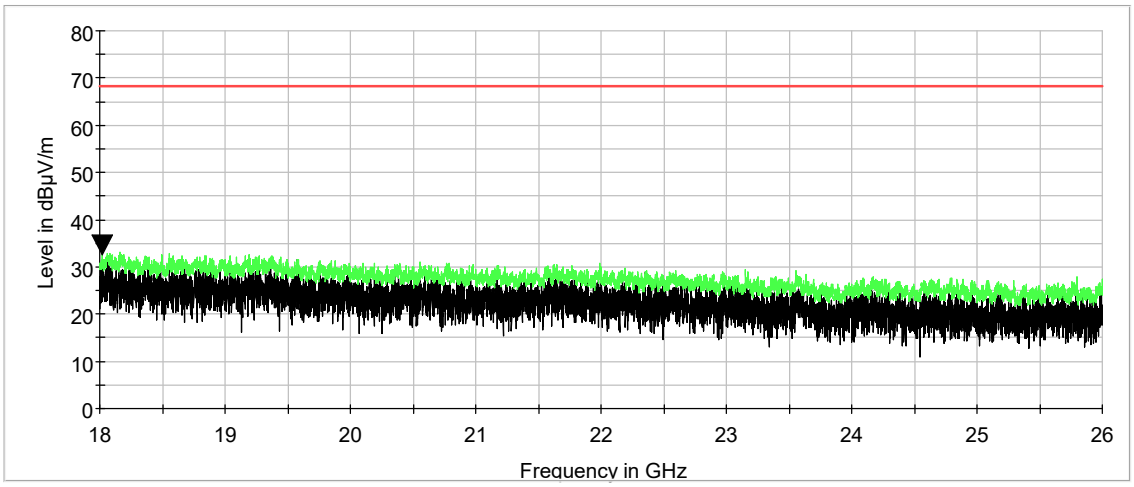
**UNII 3, Radiated Spurious Emissions:
1 GHz to 18 GHz, Horizontal**

CHIP Antenna

UNII 3, Radiated Spurious Emissions: 18 GHz to 26 GHz, Vertical

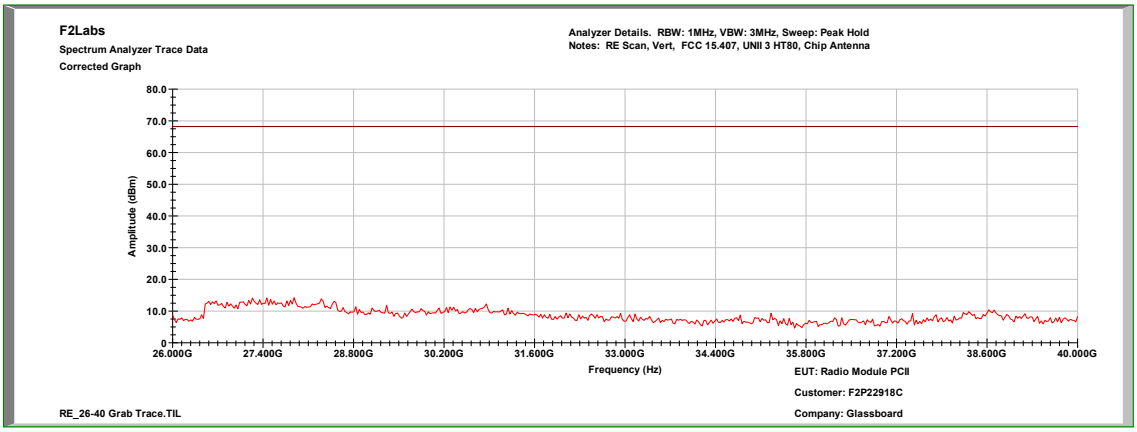


UNII 3, Radiated Spurious Emissions: 18 GHz to 26 GHz, Horizontal

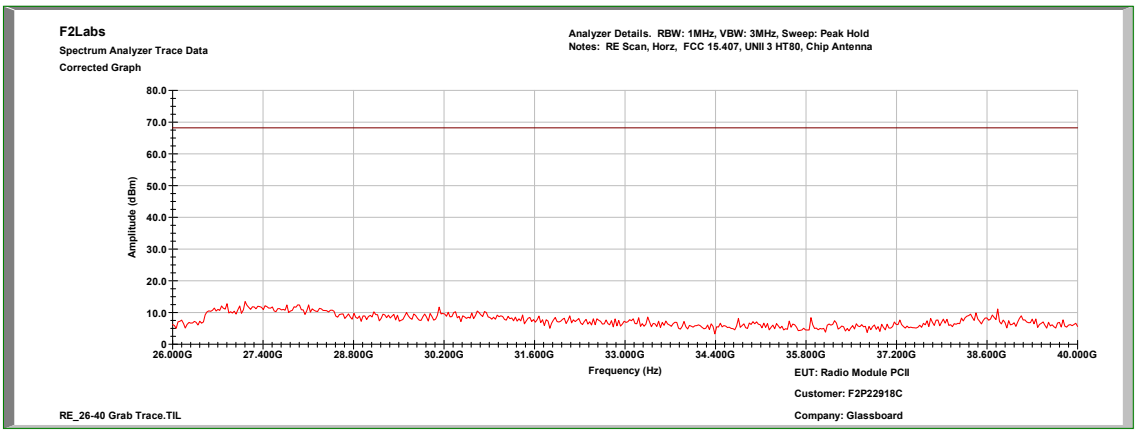


CHIP Antenna

UNII 3, Radiated Spurious Emissions: 26 GHz to 40 GHz, Vertical

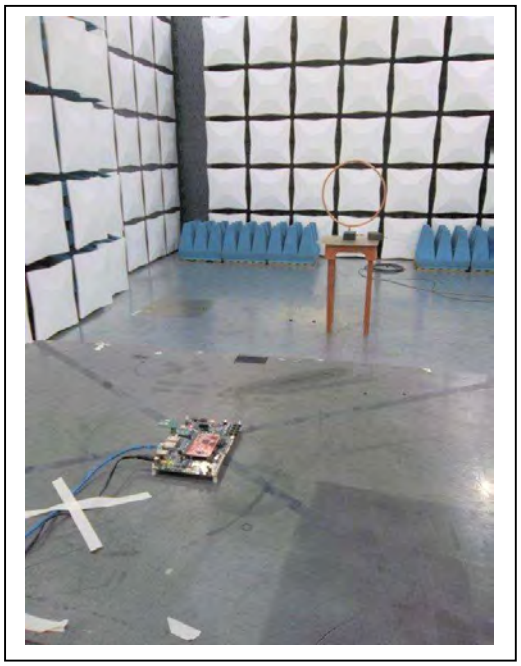


UNII 3, Radiated Spurious Emissions: 26 GHz to 40 GHz, Horizontal

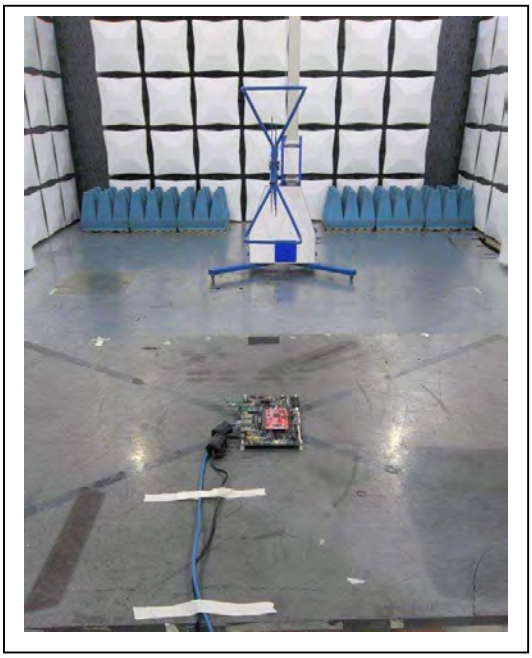


7 PHOTOGRAPHS

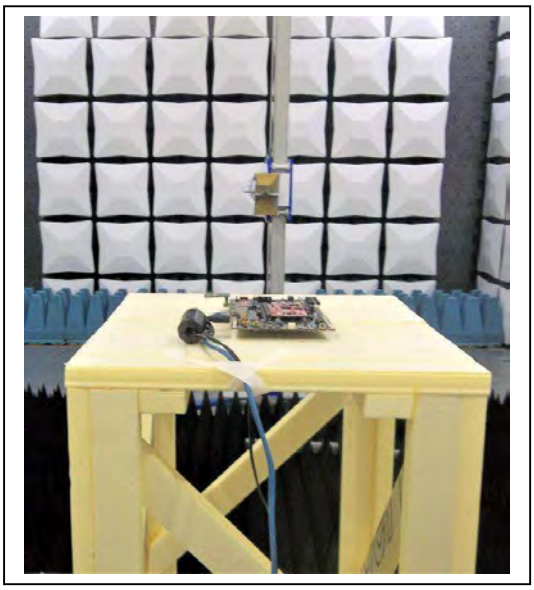
Loop Antenna



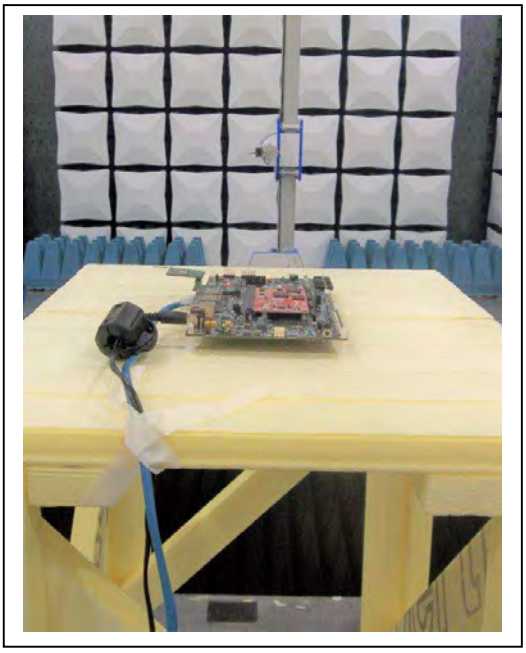
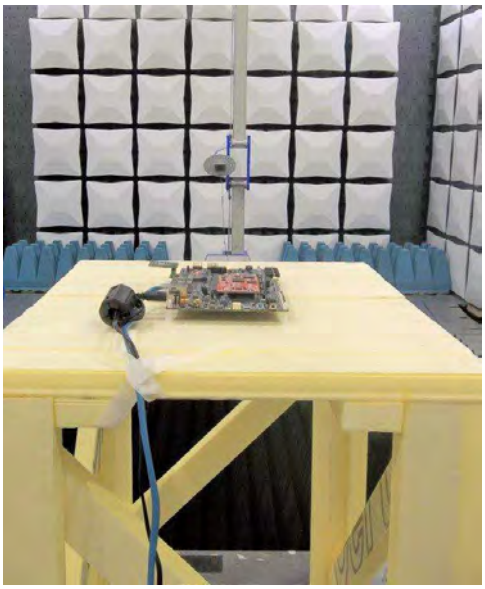
30 MHz to 1000 MHz



1 to 18 GHz



18 to 26 GHz



26 to 40 GHz