



FCC / ISED Test Report

For:

Proxfinity Inc.

Model Name:

CUE 2.0

Product Description:

CUE 2.0 SMART BADGE

FCC ID: 2AFPT-CUE020

IC ID: 22224-CUE020

Applied Rules and Standards:

47 CFR Part 15.247 (DTS)

RSS-247 Issue 2 (DTSS) & RSS-Gen Issue 5

REPORT #: EMC_Project_Name_15.247_WIFI_DTS_Rev1

DATE: 2020-08-17



A2LA Accredited

IC recognized #
3462B-1

CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: info@cetecom.com • <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

TABLE OF CONTENTS

1	ASSESSMENT.....	3
2	ADMINISTRATIVE DATA	4
2.1	IDENTIFICATION OF THE TESTING LABORATORY ISSUING THE EMC TEST REPORT	4
2.2	IDENTIFICATION OF THE CLIENT	4
2.3	IDENTIFICATION OF THE MANUFACTURER.....	4
3	EQUIPMENT UNDER TEST (EUT).....	5
3.1	EUT SPECIFICATIONS	5
3.2	EUT SAMPLE DETAILS	6
3.3	ACCESSORY EQUIPMENT (AE) DETAILS.....	6
3.4	TEST SAMPLE CONFIGURATION	6
3.5	JUSTIFICATION FOR WORST CASE MODE OF OPERATION.....	6
4	SUBJECT OF INVESTIGATION	7
5	MEASUREMENT RESULTS SUMMARY	7
6	MEASUREMENT UNCERTAINTY.....	8
6.1	ENVIRONMENTAL CONDITIONS DURING TESTING:.....	8
6.2	DATES OF TESTING:	8
7	MEASUREMENT PROCEDURES	9
7.1	RADIATED MEASUREMENT.....	9
7.2	POWER LINE CONDUCTED MEASUREMENT PROCEDURE	11
7.3	RF CONDUCTED MEASUREMENT PROCEDURE	11
8	TEST RESULT DATA	12
8.1	MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER	12
8.2	BAND EDGE COMPLIANCE	23
8.3	RADIATED TRANSMITTER SPURIOUS EMISSIONS AND RESTRICTED BANDS	29
9	TEST SETUP PHOTOS	43
10	TEST EQUIPMENT AND ANCILLARIES USED FOR TESTING	43
11	HISTORY	44

1 **Assessment**

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
Proxfinity Inc.	CUE 2.0 SMART BADGE	CUE 2.0

Responsible for Testing Laboratory:

2020-08-17	Compliance	Cindy Li (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2020-08-17	Compliance	Kevin Wang (Senior EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Cindy Li
Responsible Project Leader:	Rami Saman

2.2 Identification of the Client

Client's Name:	PROXFINITY, INC.
Street Address:	227 W. MONROE ST. SUITE 5200
City/Zip Code	CHICAGO, IL 60606
Country	United States

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	-----
City/Zip Code	-----
Country	-----

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	CUE 2.0
HW Version :	2.0
SW Version :	v1.04.37
FCC-ID :	2AFPT-CUE020
IC-ID:	22224-CUE020
FVIN:	v1.04.37
HVIN:	CUE 2.0
PMN:	CUE
Product Description:	CUE2.0 Smart Badge
Frequency Range / number of channels:	Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Radio Information:	<u>WLAN (WiFi):</u> Module Name: Murata Module Number: LBEE5KL1DX-883 FCC ID: VPYLB1DX IC ID: 772C-LBV1DX Modes of Operation: 802.11b,g,n
Antenna Information as declared:	max gain -5.12 dBi
Max. Conducted Output Power:	Peak measurement: 22.4 dBm(From FCC Grant)
Power Supply/ Rated Operating Voltage Range:	Vmin: 3.3 VDC/ Vnom: 3.8 VDC / Vmax: 4.2 VDC
Operating Temperature Range	-10 °C to 85 °C
Other Radios included in the device:	Bluetooth Basic / EDR Bluetooth LE ZigBee, 802.15.4
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	#1	2.0	v1.04.37	Zigbee conducted sample #1
2	#2	2.0	v1.04.37	Zigbee conducted sample #2, Bluetooth radiated sample
3	#3	2.0	v1.04.37	Zigbee radiated sample #3, WiFi sample, 15B sample
4	#4	2.0	v1.04.37	WiFi Conducted Sample

3.3 Accessory Equipment (AE) details

N/A

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#3	The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle using software that is not available to the end user. The internal antenna was connected.
2	EUT#4	The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle using software that is not available to the end user. The measurement equipment was connected to the 50 ohm RF port of the EUT.

3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle. For radiated measurements, all data in this report show the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under

- FCC ID: 2AFPT-CUE020
- IC ID: 22224-CUE020

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(a)	Emission Bandwidth	Nominal	-----	☐	☐	☒	Note1
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	-----	☐	☐	☒	Note1
§15.247(b)(1) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	802.11b/g/n 20	☒	☐	☐	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	802.11g	☒	☐	☐	Note1 Note 2
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	802.11g	☒	☐	☐	Note1 Note 2
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions- Radiated	Nominal	802.11g	☒	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	-----	☐	☐	☒	Note1

Note: NA= Not Applicable; NP= Not Performed.

Note1: Data leveraged from modular approval, FCC ID: VPYLB1DX, IC ID: 772C-LBV1DX

Note2: Partially tested, for verification purpose only.

6 **Measurement Uncertainty**

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor $k=1$.

Radiated measurement

9 kHz to 30 MHz	± 2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	± 2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	± 2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	± 0.7 dB (LISN)
-------------------	---------------------

RF conducted measurement	± 0.5 dB
--------------------------	--------------

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 **Environmental Conditions During Testing:**

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 **Dates of Testing:**

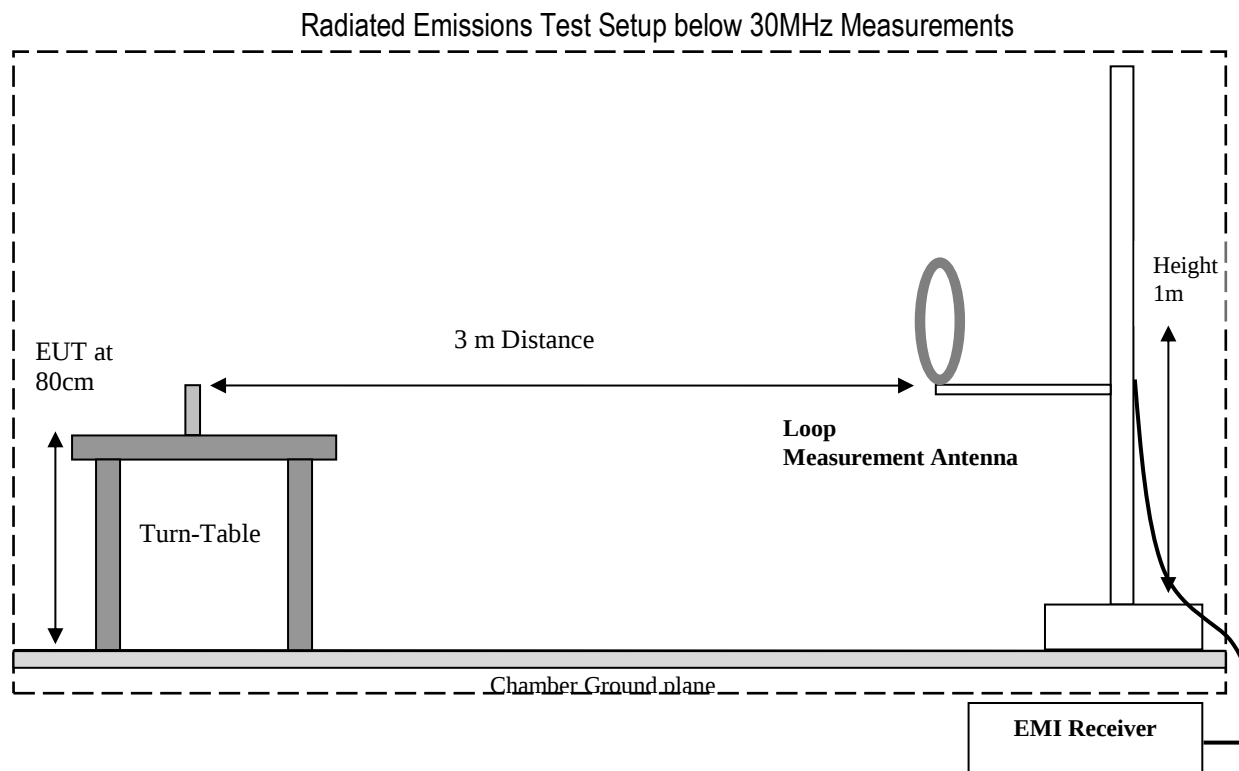
05/12/2020 - 05/13/2020

7 Measurement Procedures

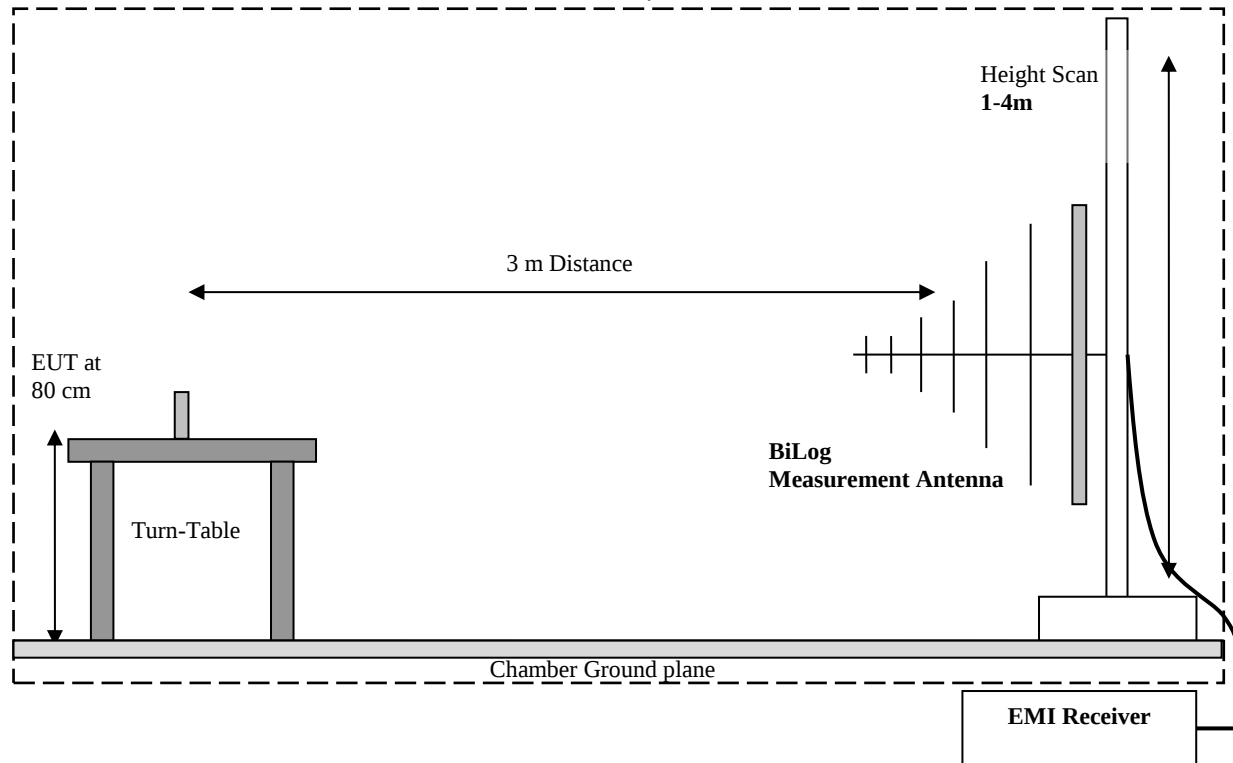
7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

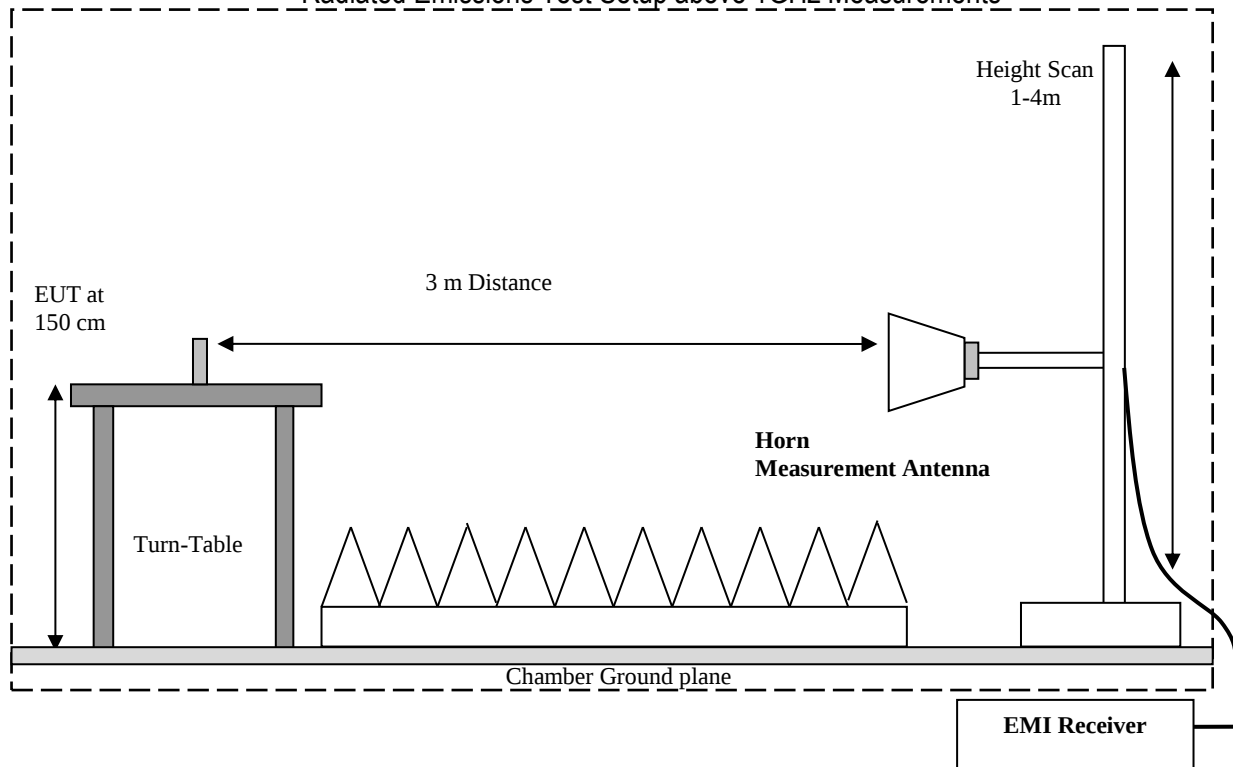
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB μ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

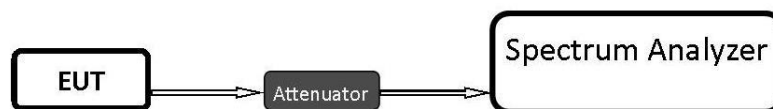
Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

8 Test Result Data

8.1 Maximum Conducted (Average) Output Power

8.1.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

Spectrum Analyzer settings:

- RBW = 1% to 5% of the OBW, not to exceed 1 MHz
- VBW $\geq 3 \times$ RBW
- Span = at least 1.5 times the OBW
- Sweep = Auto couple
- Detector function = RMS
- Trace = Average (at least 100 traces in power averaging (rms) mode)
- Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges
- Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times

8.1.2 Limits:

Maximum Output Power:

- FCC §15.247 (b)(1): 1 W
- IC RSS-247: 1 W

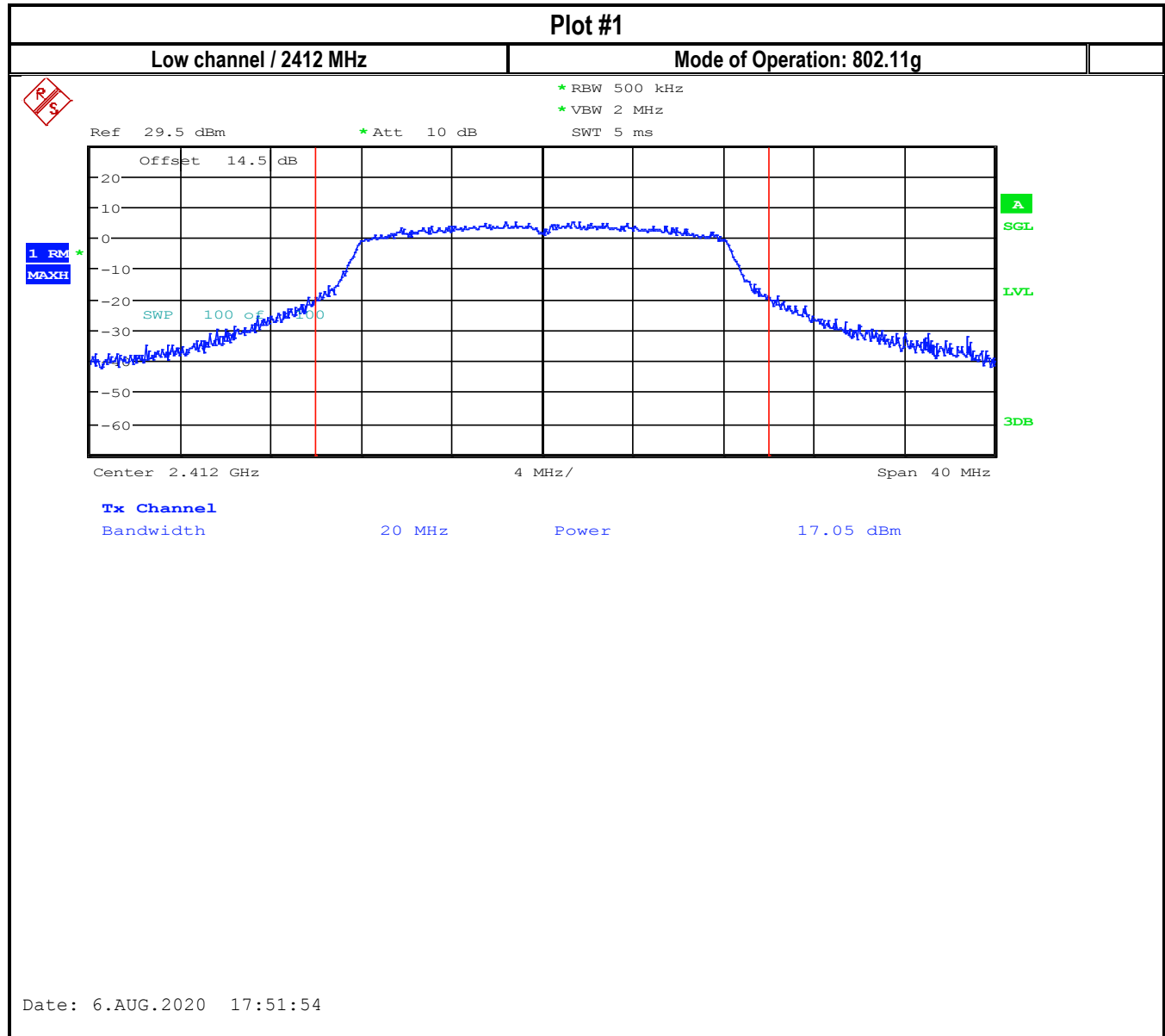
8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	2	802.11b/g/n20	120 VAC	-5.12 dBi

8.1.4 Measurement result:

Plot #	Frequency (MHz)	EUT Operating Mode	Maximum Peak Conducted Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
1	2412	802.11g	17.05	11.93	30 (Pk) / 36 (EIRP)	Pass
2	2437	802.11g	17.07	11.95	30 (Pk) / 36 (EIRP)	Pass
3	2462	802.11g	16.82	11.7	30 (Pk) / 36 (EIRP)	Pass
4	2412	802.11b	20.25	15.13	30 (Pk) / 36 (EIRP)	Pass
5	2437	802.11b	19.85	14.73	30 (Pk) / 36 (EIRP)	Pass
6	2462	802.11b	19.8	14.68	30 (Pk) / 36 (EIRP)	Pass
7	2412	802.11n20	16.55	11.43	30 (Pk) / 36 (EIRP)	Pass
8	2437	802.11n20	16.32	11.2	30 (Pk) / 36 (EIRP)	Pass
9	2462	802.11n20	16.3	11.18	30 (Pk) / 36 (EIRP)	Pass

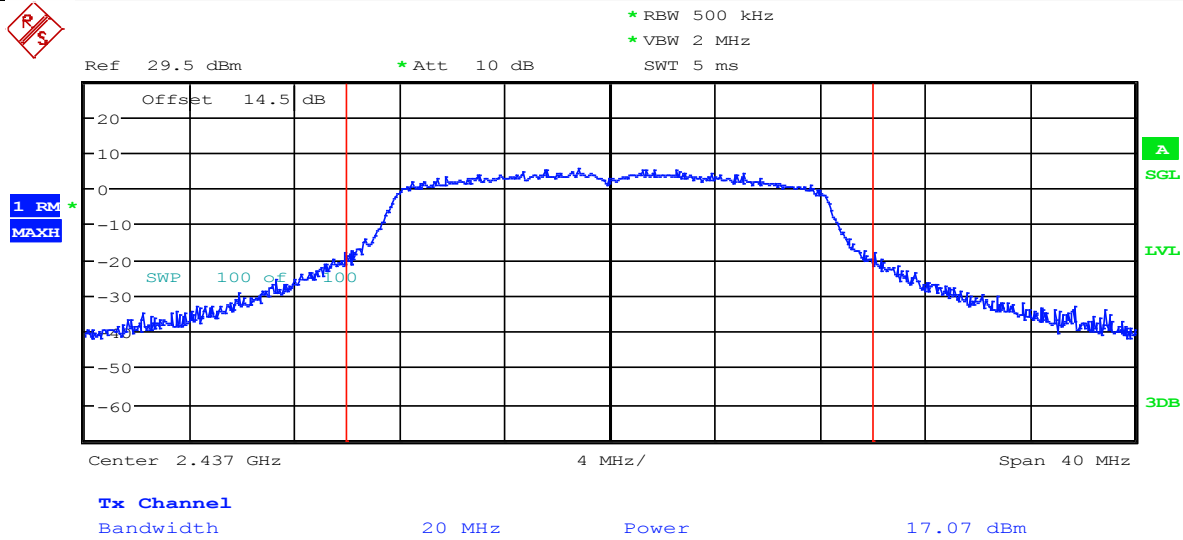
8.1.5 Measurement Plots:



Plot #2

Mid channel / 2437 MHz

Mode of Operation: 802.11g

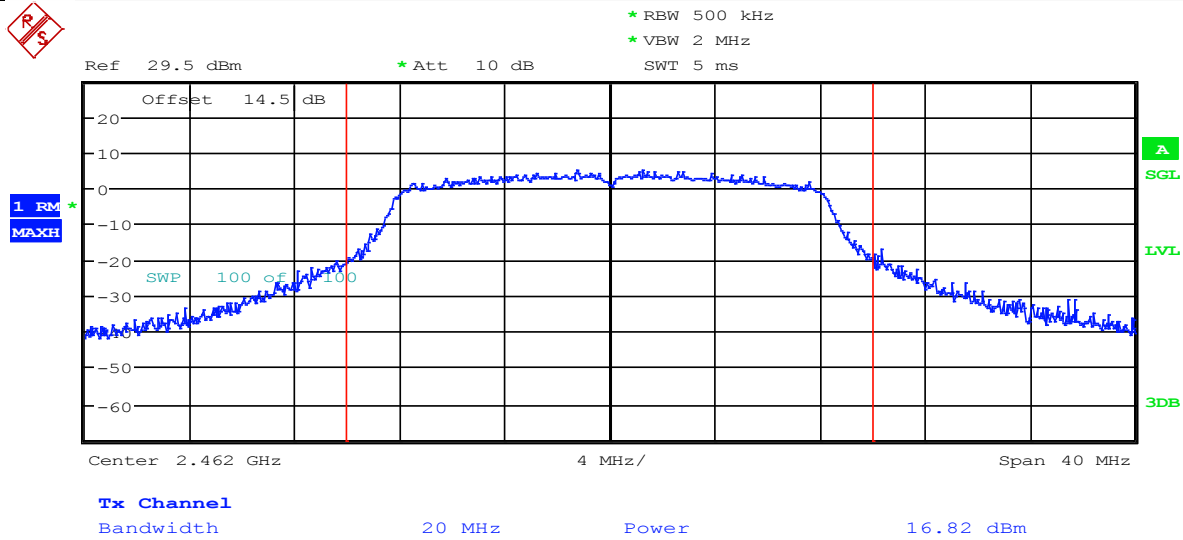


Date: 6.AUG.2020 17:51:24

Plot #3

High channel / 2462 MHz

Mode of Operation: 802.11g

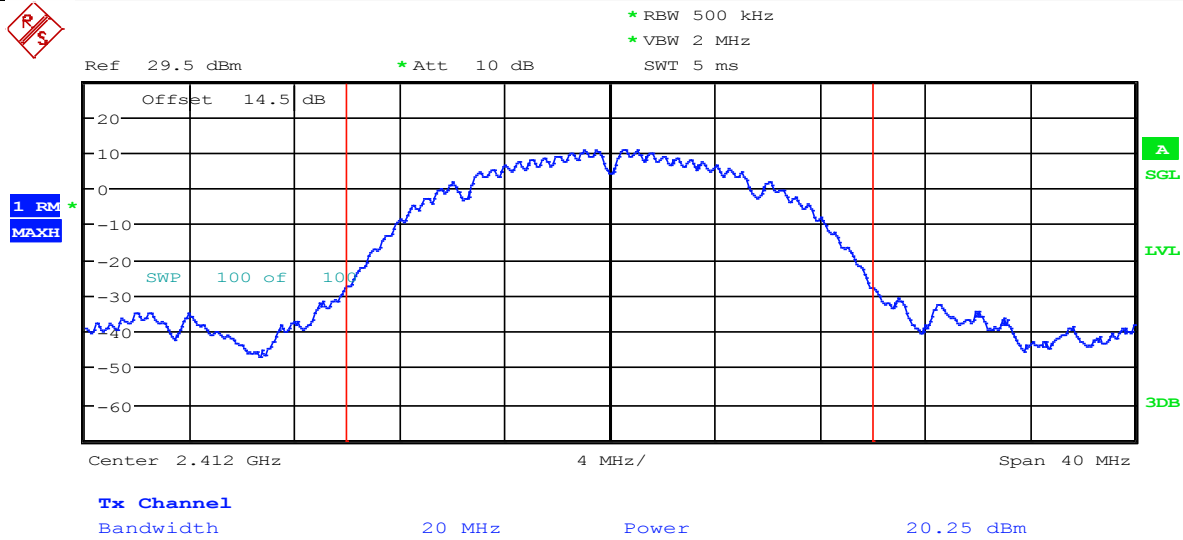


Date: 6.AUG.2020 17:50:55

Plot #4

Low channel / 2412 MHz

Mode of Operation: 802.11b

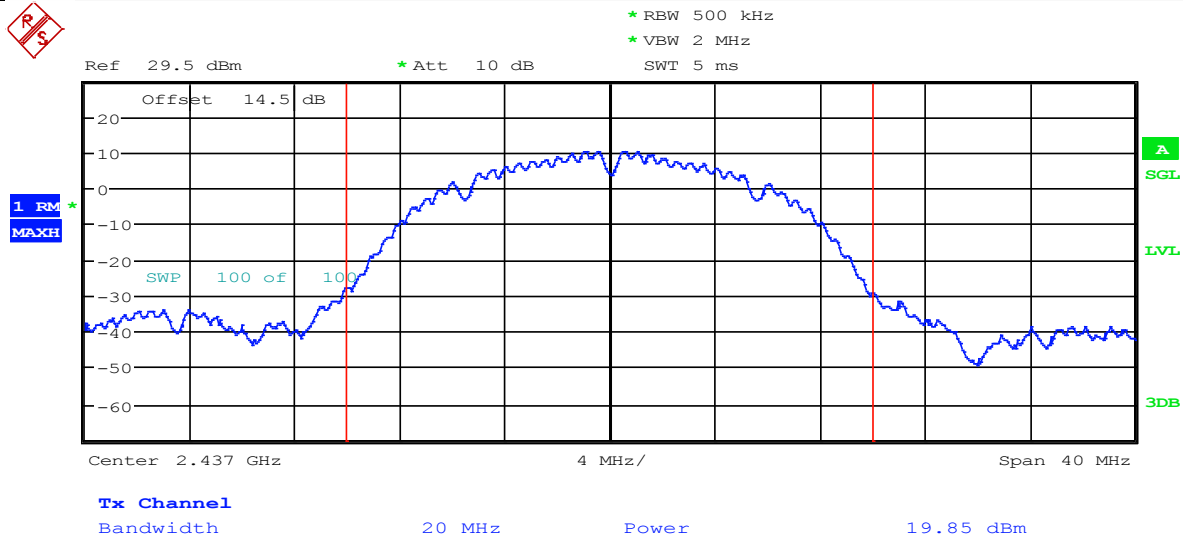


Date: 6.AUG.2020 17:46:36

Plot #5

Mid channel / 2437 MHz

Mode of Operation: 802.11b

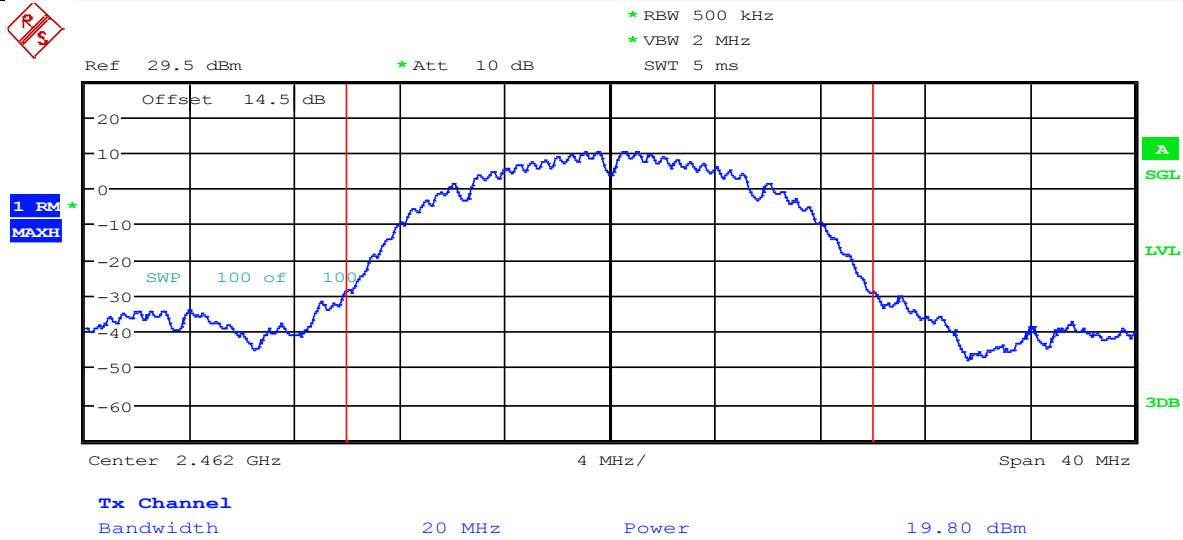


Date: 6.AUG.2020 17:49:15

Plot #6

High channel / 2462 MHz

Mode of Operation: 802.11b

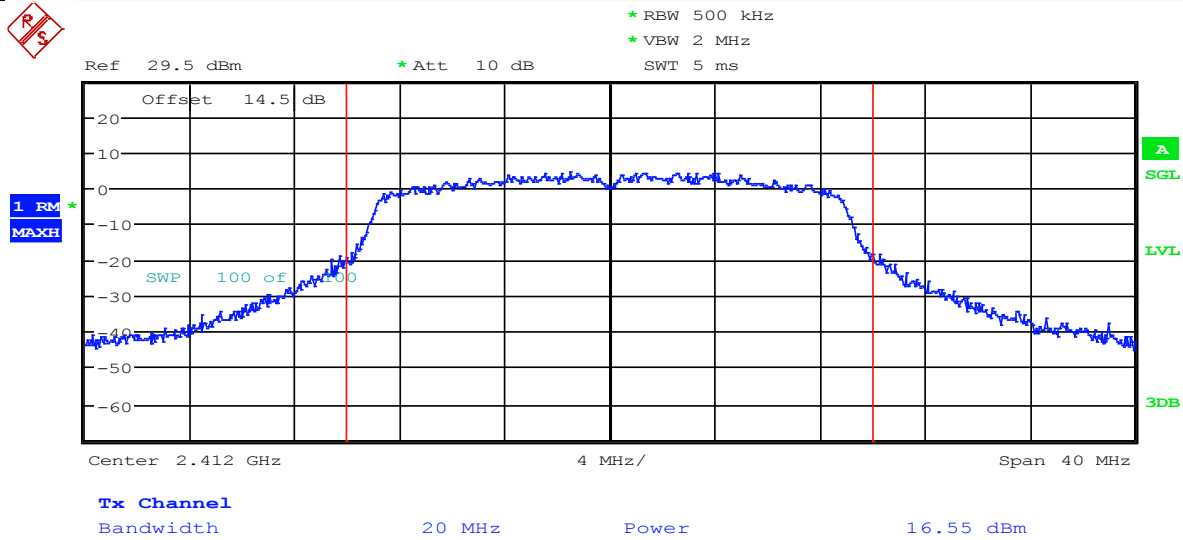


Date: 6.AUG.2020 17:50:15

Plot #7

Low channel / 2412 MHz

Mode of Operation: 802.11n20

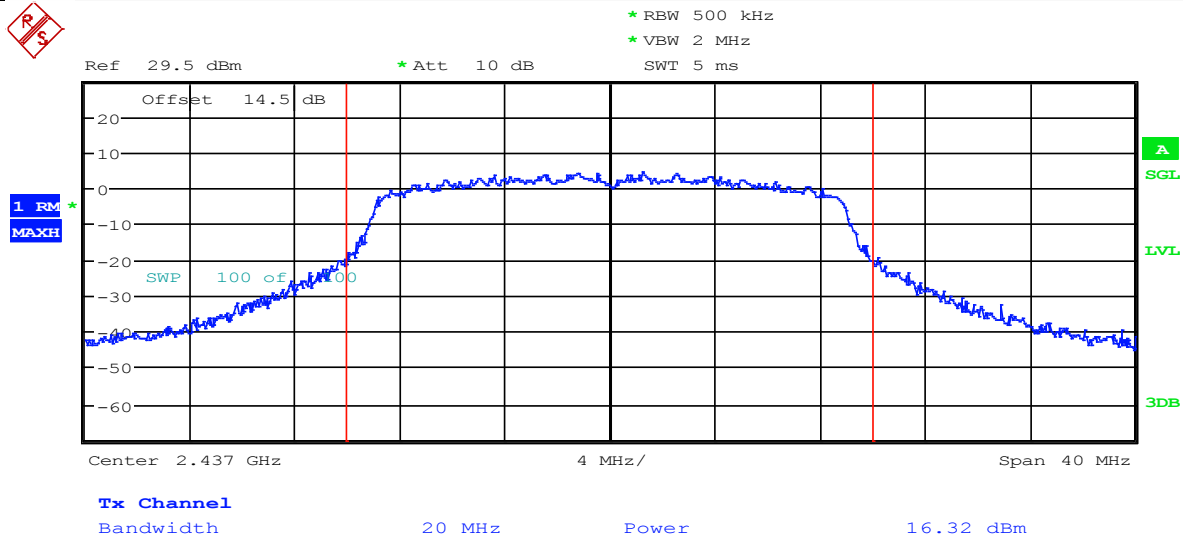


Date: 6.AUG.2020 17:52:39

Plot #8

Mid channel / 2437 MHz

Mode of Operation: 802.11n20

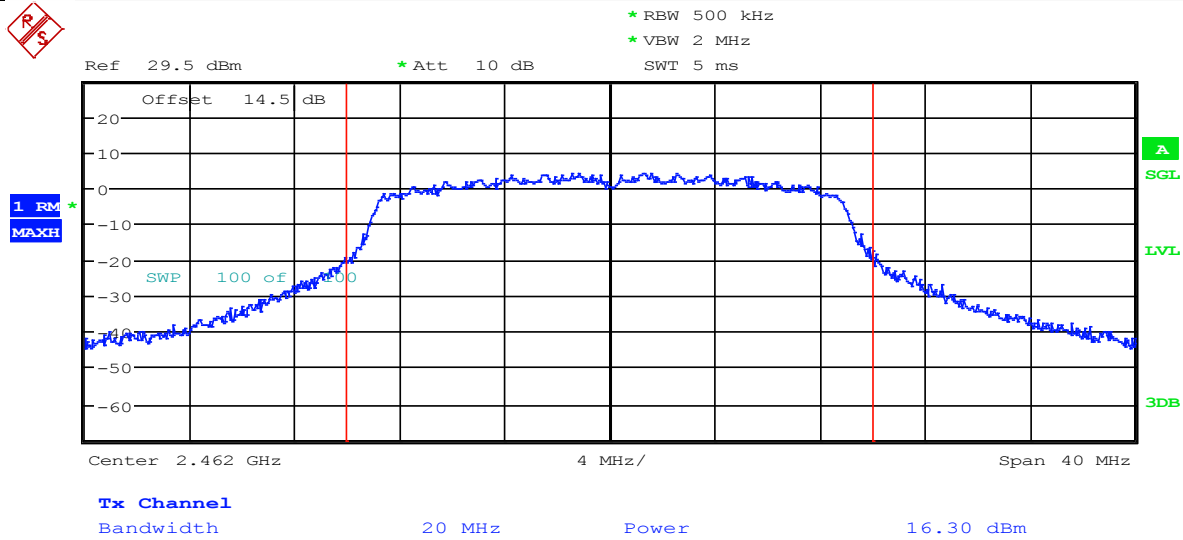


Date: 6.AUG.2020 17:53:15

Plot #9

High channel / 2462 MHz

Mode of Operation: 802.11n20



Date: 6.AUG.2020 17:53:42

8.2 Band Edge Compliance

8.2.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

Spectrum Analyzer settings for band edge:

- Set the center frequency and span to encompass frequency range to be measured
- RBW = 100 kHz
- VBW $\geq 3 \times$ RBW
- Sweep Time: Auto couple
- Detector = Peak
- Trace = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level
- Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge

8.2.2 Limits non restricted band:

FCC§15.247 (d)

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RSS-247 5/5

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB.

Spectrum Analyzer settings for restricted band:

- Peak measurements are made using a peak detector and RBW=1 MHz

8.2.3 Limits restricted band §15.247/15.209/15.205 and RSS-Gen 8.9/8.10

- *PEAK LIMIT= 74 dBμV/m @3m =-21.23 dBm
- *AVG. LIMIT= 54 dBμV/m @3m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205 & RSS-Gen 8.10
- Measurements with a peak detector were used to show compliance to average limits, thus showing compliance to both peak and average limits.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

8.2.4 Test conditions and setup:

Non-Restricted Band:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	802.11g	120 VAC	-5.12 dBi

Restricted Band:

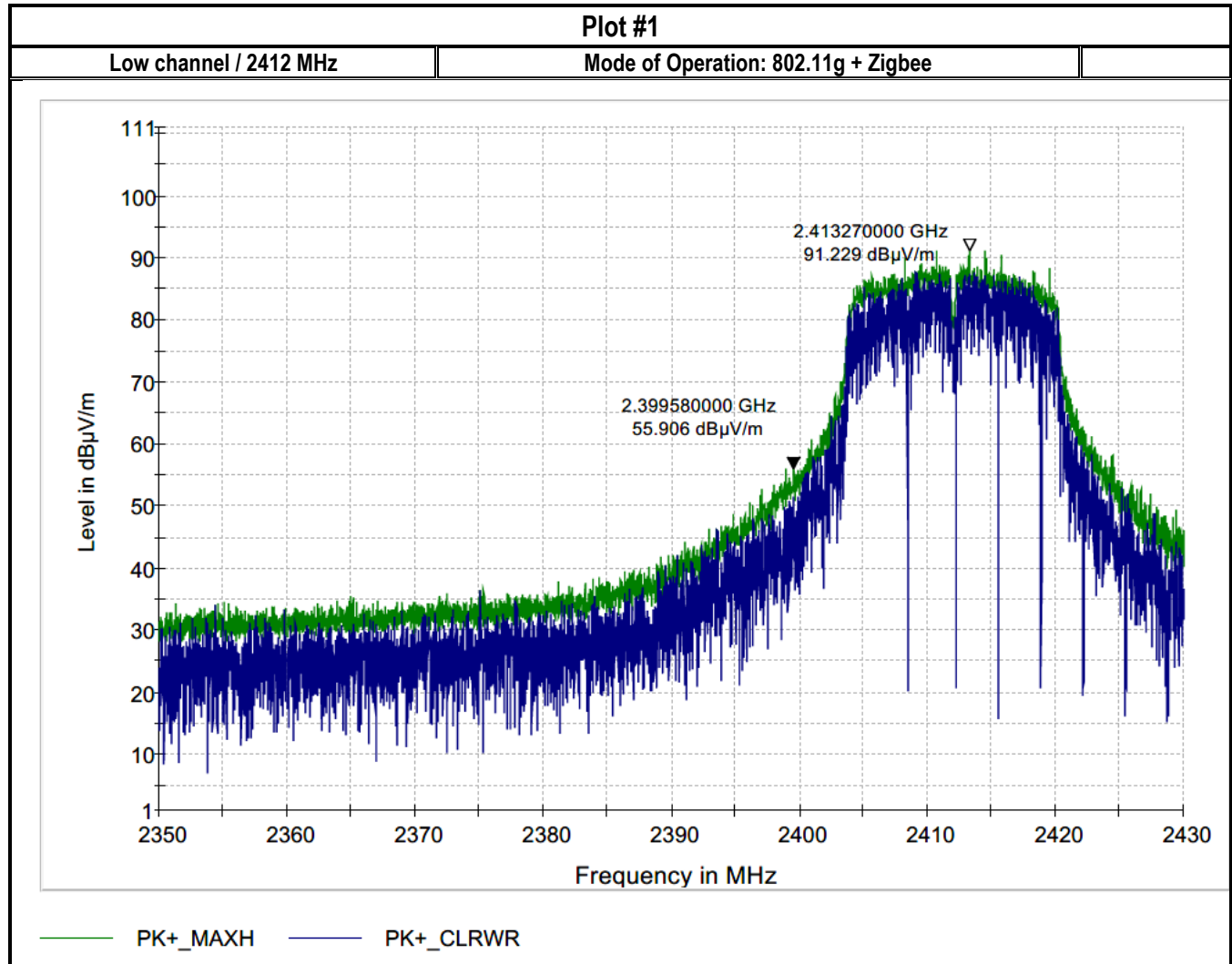
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	802.11g	12 VDC	-5.12 dBi

8.2.5 Measurement result:

Plot #	EUT operating mode	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
1	802.11g	Lower, Non-restricted	35.323	30	Pass

Plot #	EUT operating mode	Band Edge	Limit (dB μ V/m)	Result
2,3	802.11b	Lower Restricted Peak and Average	See section 8.4.3	Pass

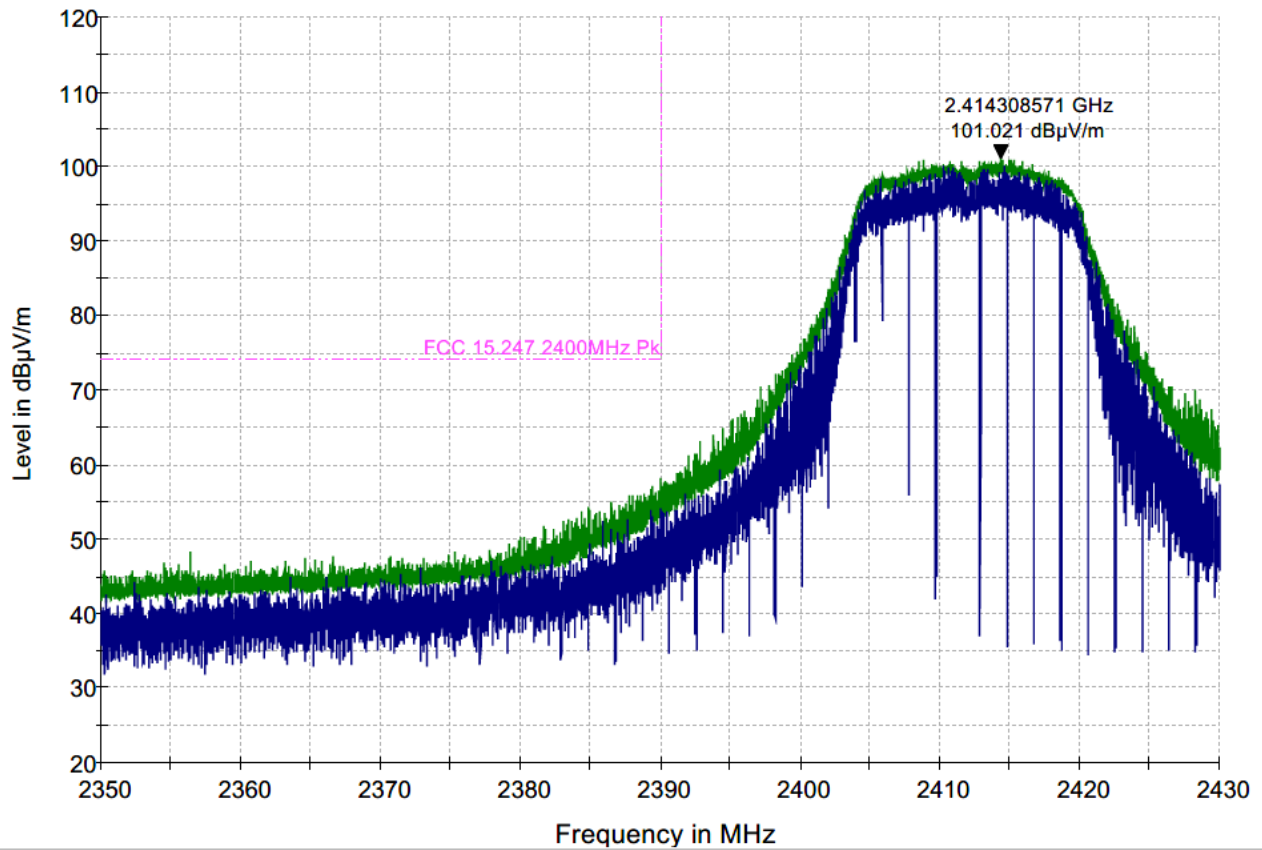
8.2.6 Measurement Plots:



Plot #2

Low channel / 2412 MHz

Mode of Operation: 802.11g + Zigbee

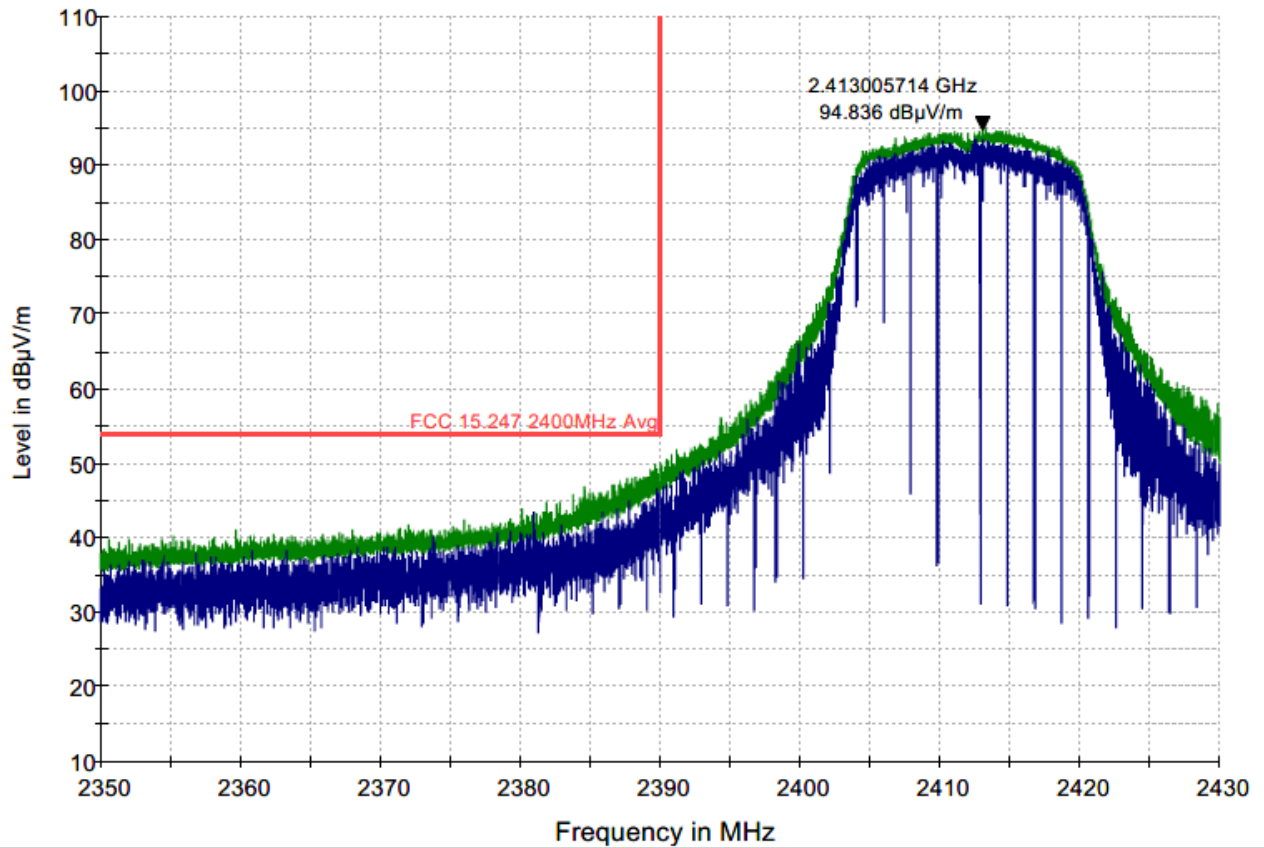


PK+_MAXH PK+_CLRWR FCC 15.247 2400MHz Pk

Plot #3

Low channel / 2412 MHz

Mode of Operation: 802.11g + Zigbee



— RMS_MAXH — RMS_CLRWR — FCC 15.247 2400MHz Avg

8.3 Radiated Transmitter Spurious Emissions and Restricted Bands

8.3.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing frequencies below 30 MHz at distance other than the specified in the standard, the limit conversion is calculated by using the FCC materials for the ANSI 63 committee issued on January, 27 1991.

8.3.2 Limits:

FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (μV/m)	Measurement Distance (m)	Field strength @ 3m (dBμV/m)
0.009–0.490	2400/F(kHz) / -----	300	-
0.490–1.705	24000/F(kHz) / -----	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBμV/m
88–216	150	3	43.5 dBμV/m
216–960	200	3	46 dBμV/m
Above 960	500	3	54 dBμV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

*PEAK LIMIT= 74 dBμV/m

*AVG. LIMIT= 54 dBμV/m

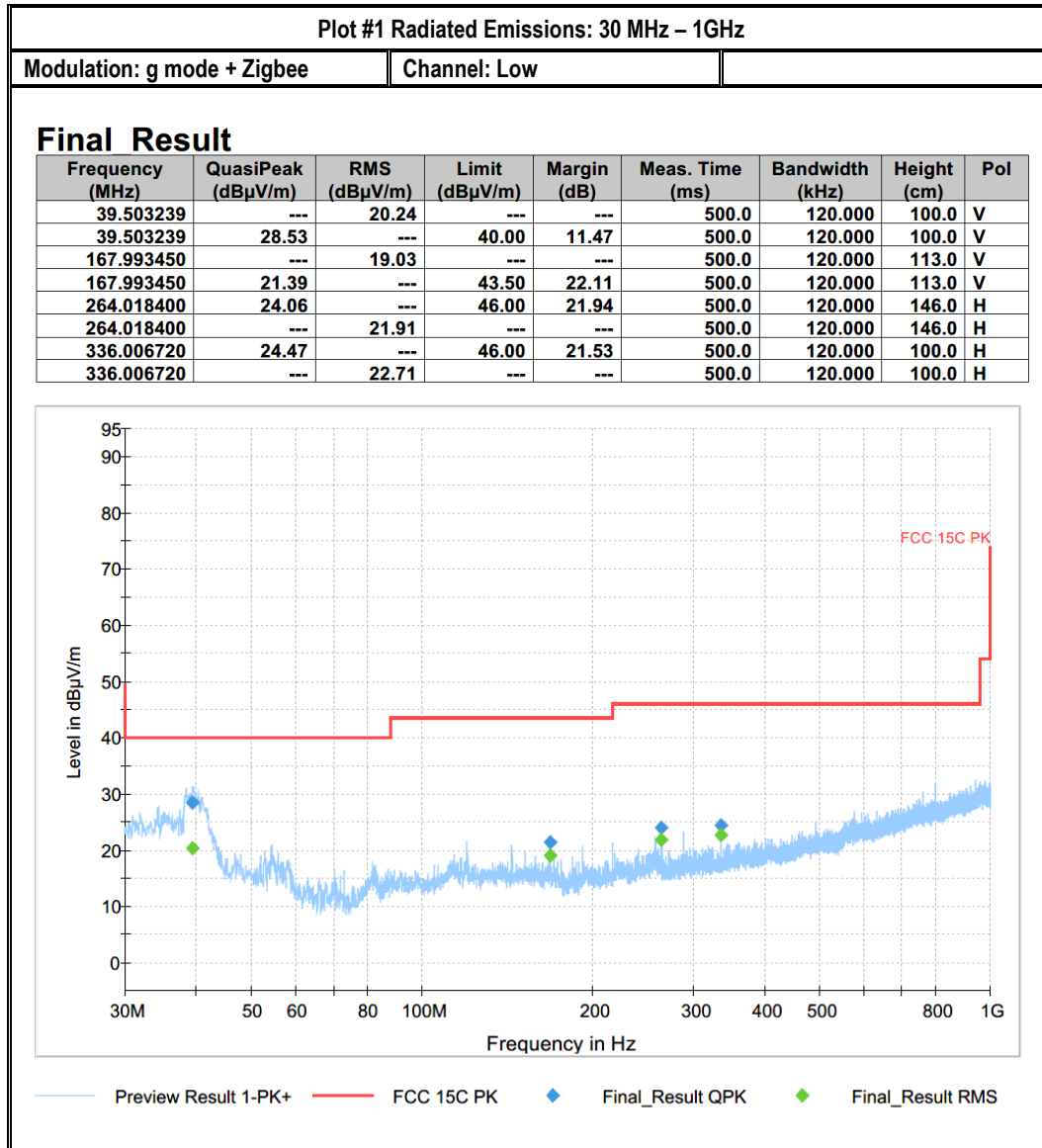
8.3.3 Test conditions and setup:

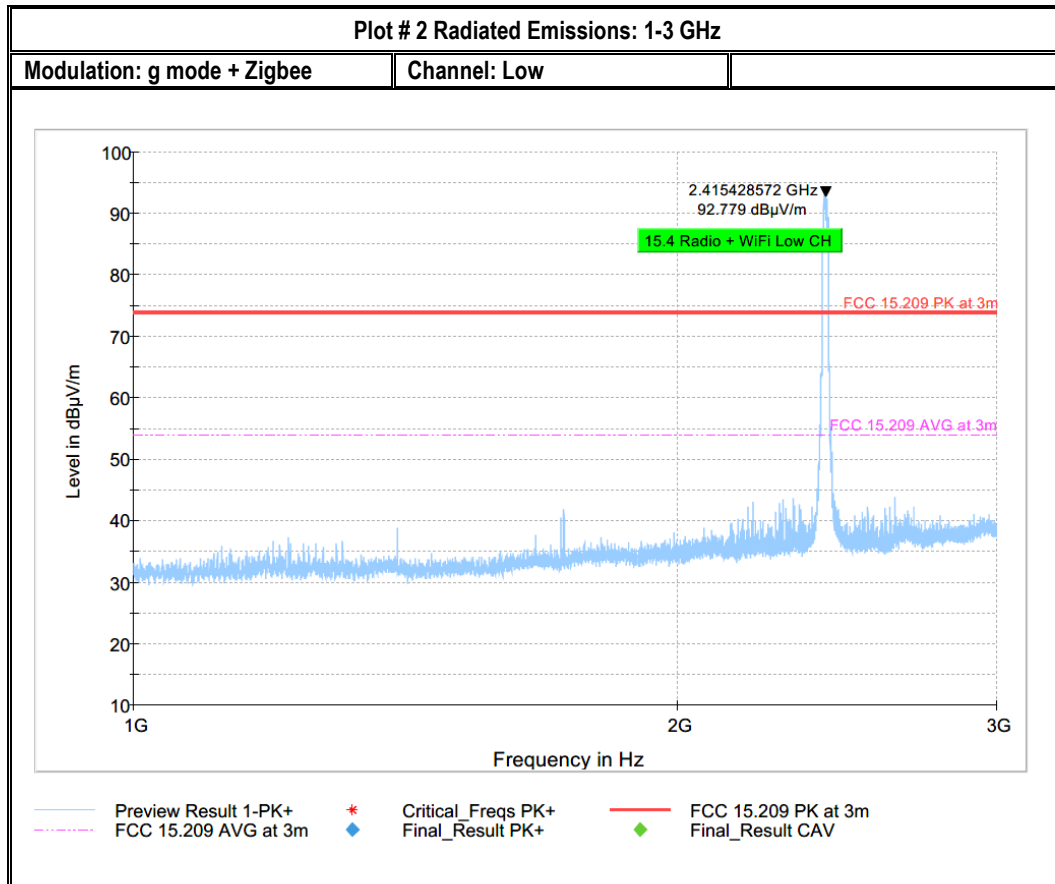
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22.0° C	1	802.11g + Zigbee	120 VAC

8.3.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Zigbee + Low	30 MHz – 18 GHz	See section 8.6.2	Pass
4-8	Zigbee + Mid	9 kHz – 26 GHz	See section 8.6.2	Pass
9-11	Zigbee + High	30 MHz – 18 GHz	See section 8.6.2	Pass

8.3.5 Measurement Plots:





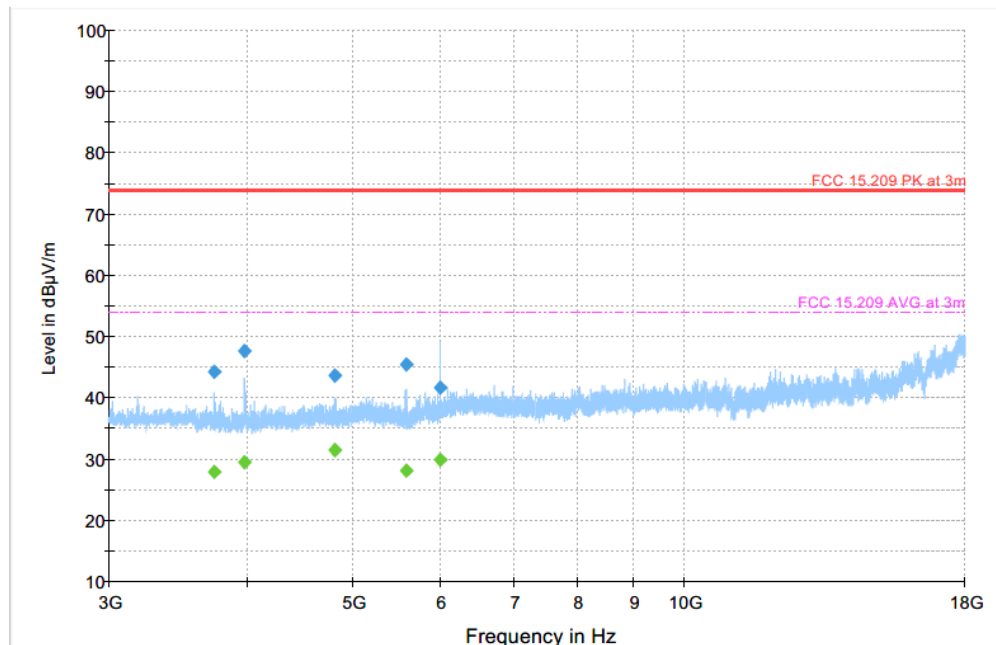
Plot # 3 Radiated Emissions: 3-18 GHz

Modulation: g mode + Zigbee

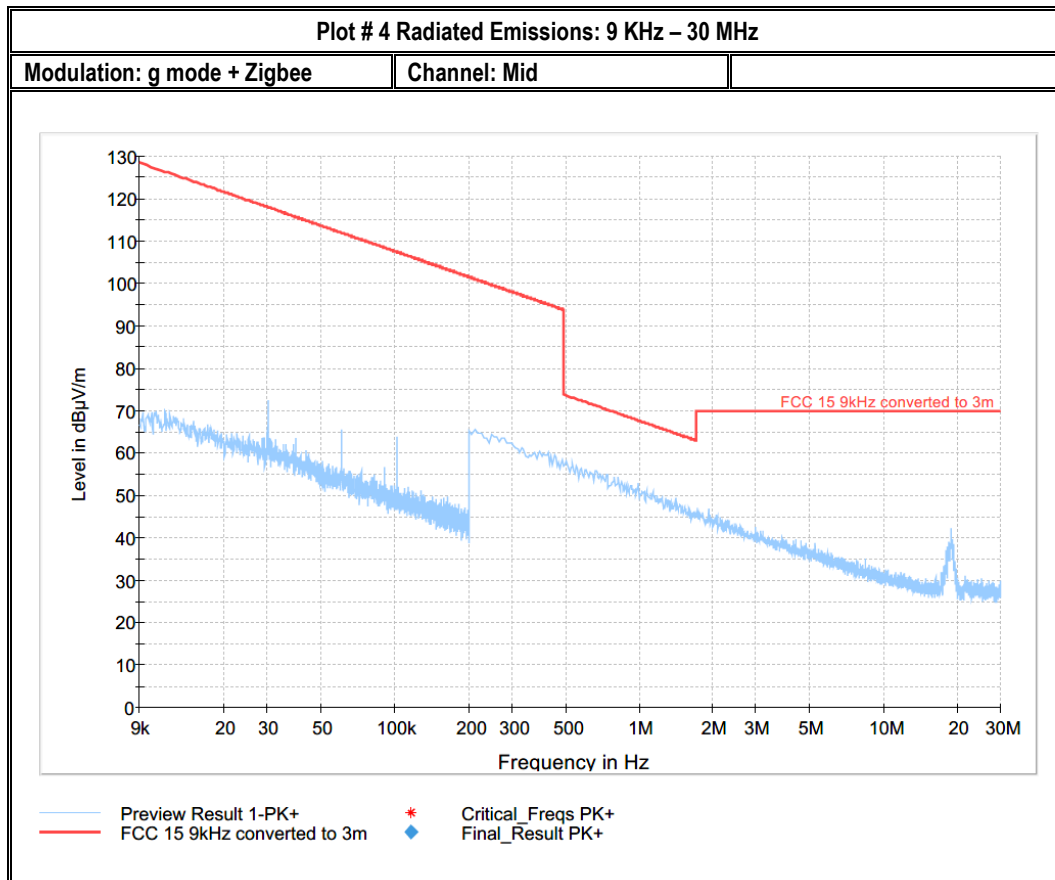
Channel: Low

Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
3739.000	44.30	---	73.98	29.68	500.0	1000.000	274.0	V	264.0	-6.4	
3739.000	---	27.93	53.98	26.05	500.0	1000.000	274.0	V	264.0	-6.4	
3989.000	---	29.58	53.98	24.40	500.0	1000.000	315.0	V	325.0	-6.1	
3989.000	47.59	---	73.98	26.39	500.0	1000.000	315.0	V	325.0	-6.1	
4810.500	43.63	---	73.98	30.35	500.0	1000.000	152.0	V	273.0	-4.8	
4810.500	---	31.55	53.98	22.43	500.0	1000.000	152.0	V	273.0	-4.8	
5588.500	45.45	---	73.98	28.53	500.0	1000.000	163.0	V	223.0	-4.4	
5588.500	---	28.07	53.98	25.91	500.0	1000.000	163.0	V	223.0	-4.4	
6000.000	41.71	---	73.98	32.27	500.0	1000.000	140.0	H	33.0	-2.2	
6000.000	---	29.95	53.98	24.03	500.0	1000.000	140.0	H	33.0	-2.2	



— Preview Result 1-PK+
— FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
◆ Final Result CAV



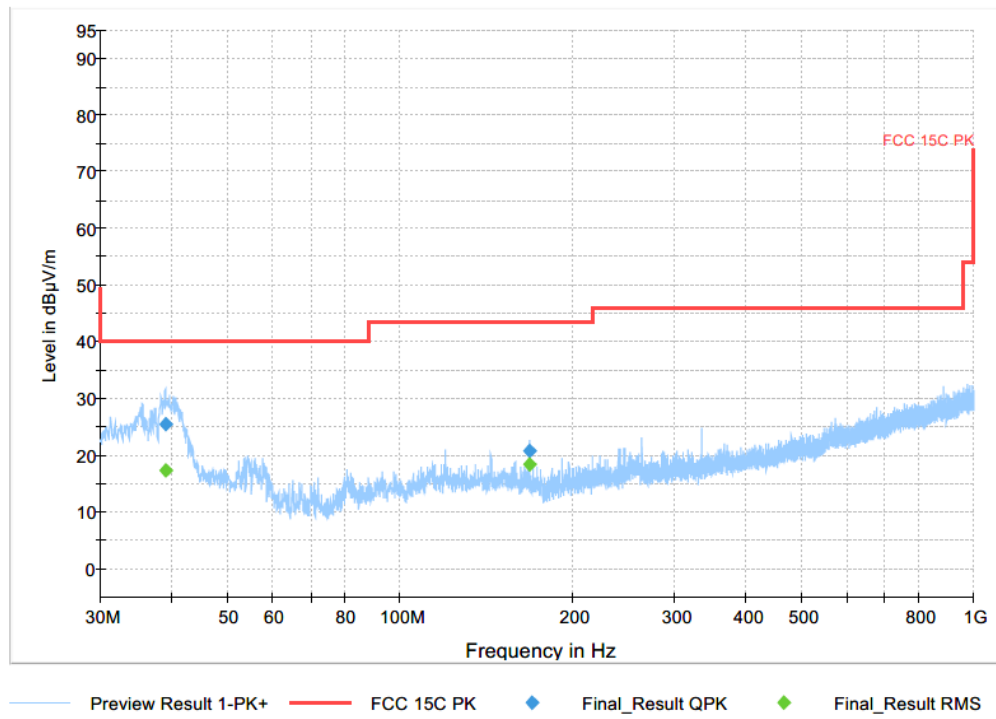
Plot #5 Radiated Emissions: 30 MHz – 1GHz

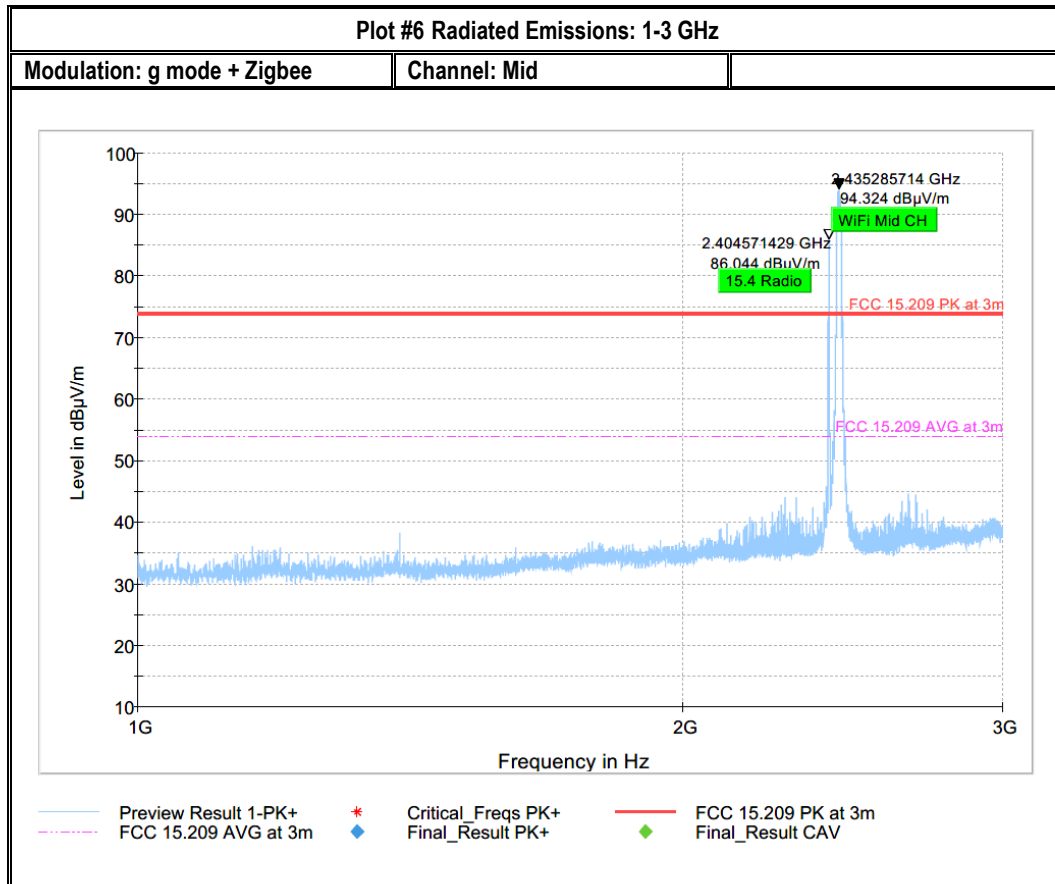
Modulation: g mode + Zigbee

Channel: Mid

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
38.947820	25.52	---	40.00	14.48	500.0	120.000	107.0	V
38.947820	---	17.22	---	---	500.0	120.000	107.0	V
167.990233	20.70	---	43.50	22.80	500.0	120.000	135.0	V
167.990233	---	18.31	---	---	500.0	120.000	135.0	V





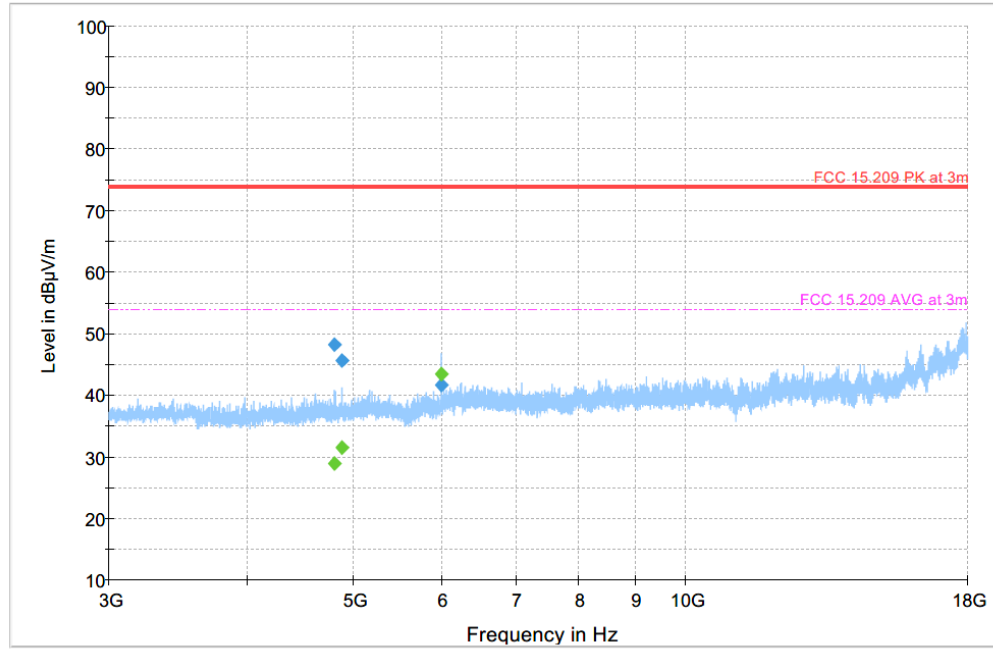
Plot #7 Radiated Emissions: 3-18 GHz

Modulation: g mode + Zigbee

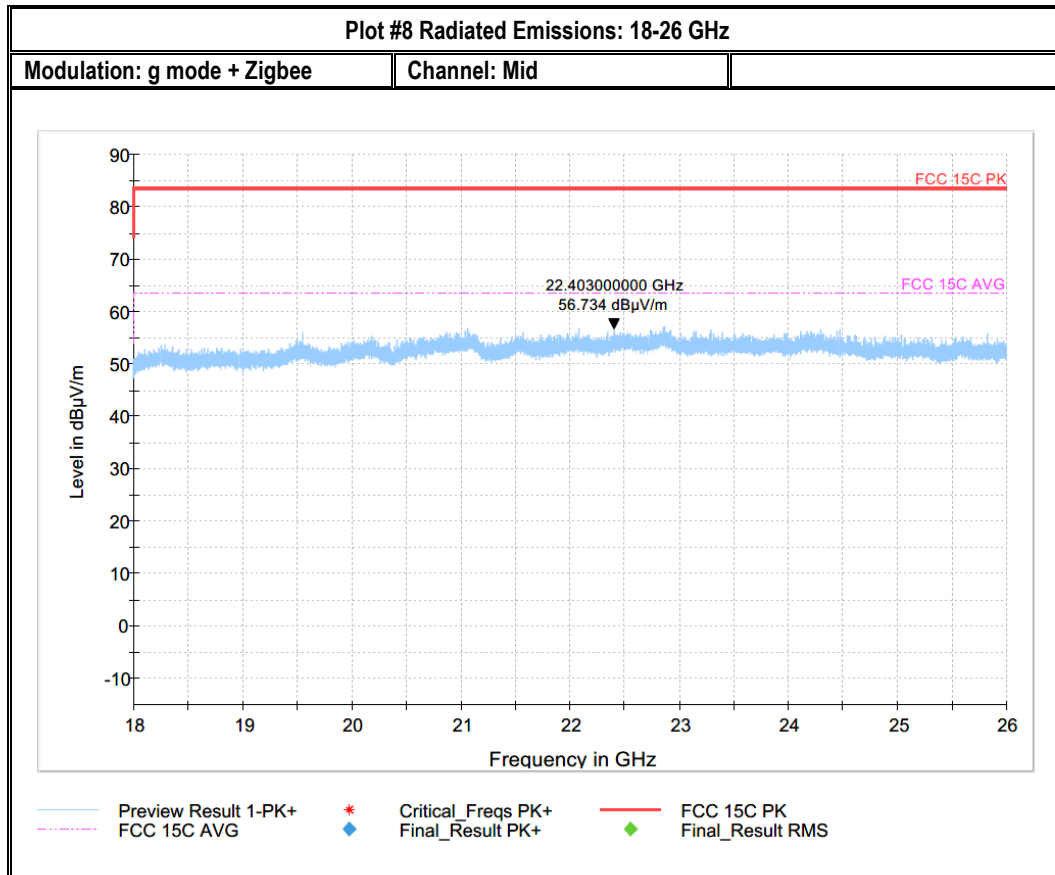
Channel: Mid

Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
4799.000	48.31	---	73.98	25.67	500.0	1000.000	152.0	V	276.0	-4.8	
4799.000	---	28.92	53.98	25.06	500.0	1000.000	152.0	V	276.0	-4.8	
4879.000	---	31.48	53.98	22.50	500.0	1000.000	140.0	V	82.0	-5.0	
4879.000	45.61	---	73.98	28.36	500.0	1000.000	140.0	V	82.0	-5.0	
6000.000	41.73	---	73.98	32.25	500.0	1000.000	315.0	H	347.0	-2.2	
6000.000	---	43.52	53.98	10.46	500.0	1000.000	315.0	H	347.0	-2.2	



◆ Preview Result 1-PK+ Final_Result PK+
 ◆ FCC 15.209 PK at 3m Final_Result CAV
 --- FCC 15.209 AVG at 3m



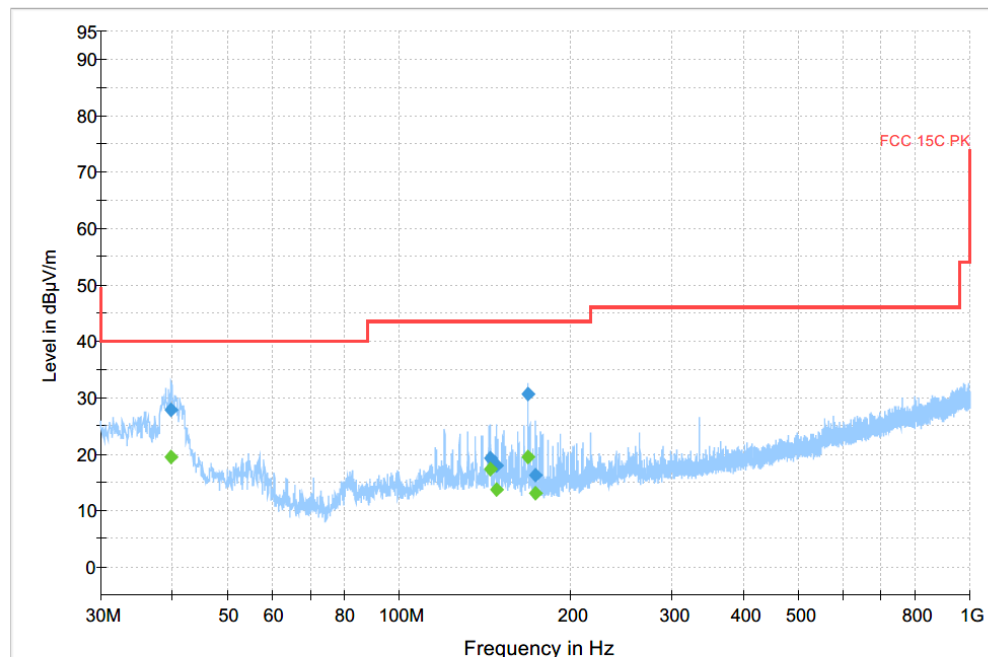
Plot #9 Radiated Emissions: 30 MHz – 1GHz

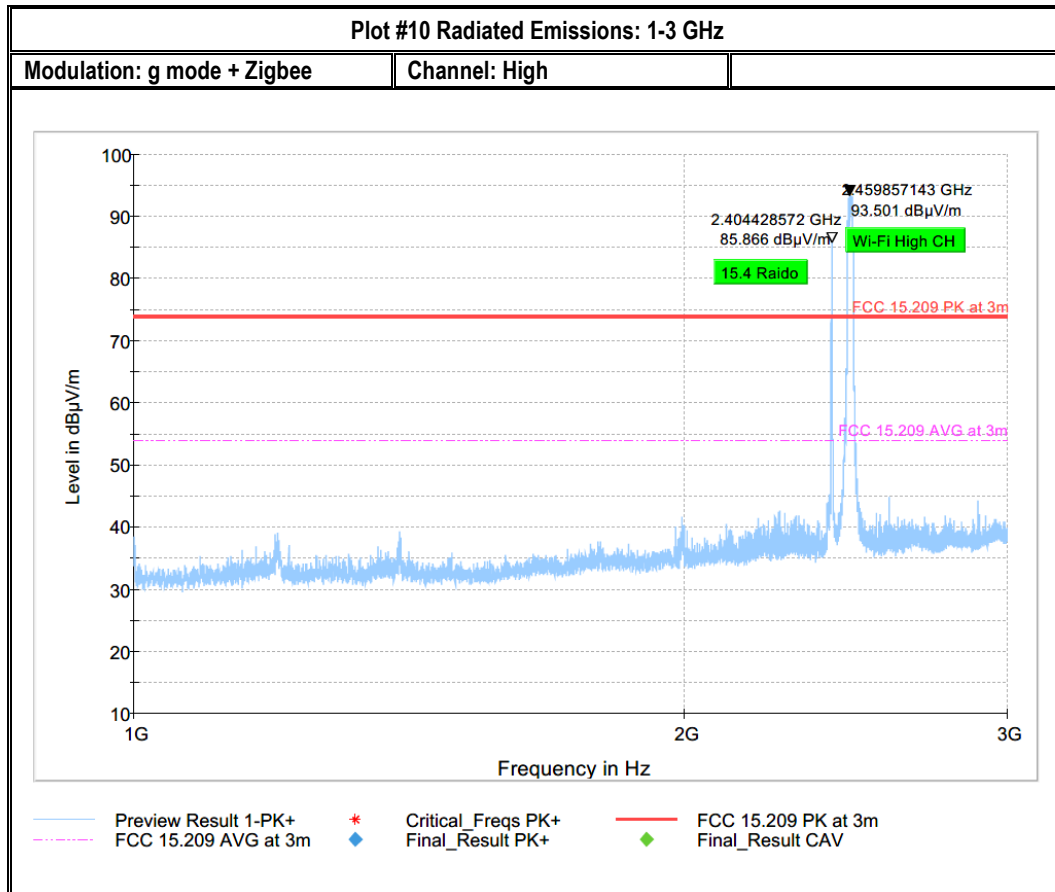
Modulation: g mode + Zigbee

Channel: High

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
39.908258	27.73	---	40.00	12.27	500.0	120.000	100.0	V
39.908258	---	19.46	---	---	500.0	120.000	100.0	V
144.323978	19.30	---	43.50	24.20	500.0	120.000	213.0	H
144.323978	---	17.22	---	---	500.0	120.000	213.0	H
148.233319	18.06	---	43.50	25.44	500.0	120.000	199.0	H
148.233319	---	13.62	---	---	500.0	120.000	199.0	H
168.007220	---	19.56	---	---	500.0	120.000	145.0	H
168.007220	30.54	---	43.50	12.96	500.0	120.000	145.0	H
173.192602	16.32	---	43.50	27.18	500.0	120.000	263.0	H
173.192602	---	13.03	---	---	500.0	120.000	263.0	H





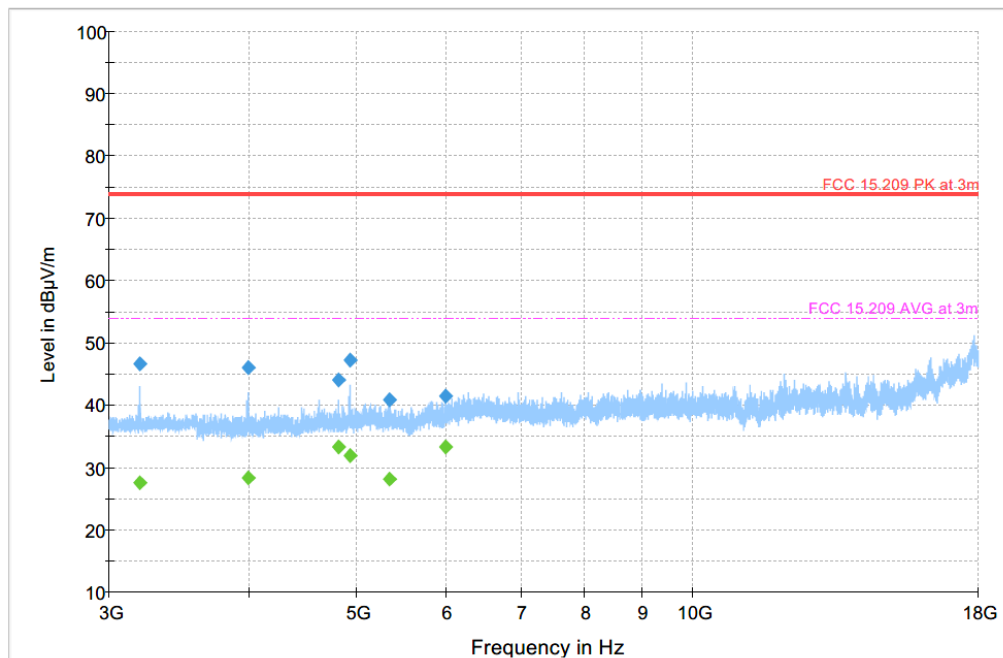
Plot #11 Radiated Emissions: 3-18 GHz

Modulation: g mode + Zigbee

Channel: High

Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
3194.500	---	27.49	53.98	26.49	500.0	1000.000	184.0	V	272.0	-8.6	
3194.500	46.67	---	73.98	27.31	500.0	1000.000	184.0	V	272.0	-8.6	
3992.500	---	28.40	53.98	25.58	500.0	1000.000	140.0	H	206.0	-6.1	
3992.500	46.04	---	73.98	27.94	500.0	1000.000	140.0	H	206.0	-6.1	
4811.000	---	33.27	53.98	20.71	500.0	1000.000	140.0	V	296.0	-4.8	
4811.000	43.98	---	73.98	30.00	500.0	1000.000	140.0	V	296.0	-4.8	
4923.500	---	31.83	53.98	22.15	500.0	1000.000	174.0	V	82.0	-4.7	
4923.500	47.22	---	73.98	26.75	500.0	1000.000	174.0	V	82.0	-4.7	
5354.000	40.78	---	73.98	33.20	500.0	1000.000	153.0	V	110.0	-4.0	
5354.000	---	28.12	53.98	25.86	500.0	1000.000	153.0	V	110.0	-4.0	
6000.000	41.52	---	73.98	32.46	500.0	1000.000	306.0	H	191.0	-2.2	
6000.000	---	33.28	53.98	20.70	500.0	1000.000	306.0	H	191.0	-2.2	



◆ Preview Result 1-PK+ Final_Result PK+
 — FCC 15.209 PK at 3m
 — FCC 15.209 AVG at 3m
 ◆ Final_Result CAV

9 Test setup photos

Setup photos are included in supporting file name: "EMC_PROXF-001-19001_FCC_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	Biconilog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6512	164698	3 years	7/28/2017
Antenna Horn 3115 SN 35111	Horn Antenna	EMCO	3115	35111	3 years	7/31/2017
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	10/31/2017
Antenna Horn 3117	Horn Antenna	ETS Lindgren	3117-PA	159547	3 years	8/8/2017
FSU26	Spectrum Analyzer	R&S	FSU26	200302	3 years	7/16/2019
LISN	Line Impedance Stabilization Network	FCC	FCC-LISN-50-25-2-08	8014	1 Year	7/19/2019
Thermometer Humidity	Thermometer Humidity	Control Company	36934-164	19187199 4	2 Year	1/10/2019

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Report prepared by
2020-07-15	EMC_PROXF-001-19001_15.247_WIFI_DTS	Initial Version	Kevin Wang
2020-08-17	EMC_PROXF-001-19001_15.247_WIFI_DTS_Rev1	Added Conducted output power data and Band Edge data, and updated RSE data with co-transition	Kevin Wang

<<< The End >>>