



FCC / ISED Test Report

For:
Ezlo Inc.

Model Name:
e550-US, EzloSecure-US

Product Description:
Smart Home Controller

FCC ID: 2AIYW-E550
IC ID: 26382-E550

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 2 (DTSs) & RSS-Gen Issue 5

REPORT #: EMC_ZELOI-001-20001_15.247_DTS_WiFi

DATE: 2020-10-20



A2LA Accredited

IC recognized #
3462B-1

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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 #
Ezlo Inc.	Smart Home Controller	e550-US, EzloSecure-US

Responsible for Testing Laboratory:

2020-10-20	Compliance	Cindy Li (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2020-10-20	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:	Akanksha Baskaran

2.2 Identification of the Client

Client's Name:	Ezlo Inc.
Street Address:	1255 Broad St.
City/Zip Code	Clifton, NJ / 07013
Country	US

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:	e550-US, EzloSecure-US
HW Version :	1.4
SW Version :	2.0.1.1112.7
FCC-ID :	2AIYW-E550
IC-ID:	26382-E550
FWIN:	N/A
HVIN:	e550-US, EzloSecure-US
PMN:	Ezlo Secure, Smart Home Controller, CC Compass Monitoring Hub, Connect Hub 2.0
Product Description:	Smart Home Controller All 4 variant models are electrically identical
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 Number: Ampak AP6256 - Modes of Operation: 802.11a,b,g,n,ac
Antenna Information as declared:	max gain 2.3 dBi
Max. Conducted Output Power:	Average measurement: 17.72 dBm
Power Supply/ Rated Operating Voltage Range:	4.8V (Low) / 5.0V (Nominal) / 5.2V (Max)
Operating Temperature Range	0°C to +35°C
Other Radios included in the device:	Bluetooth; Zigbee; Zwave; Cellular
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	#1	1.4	2.0.1.1112.7	Conducted Sample
2	#2	1.4	2.0.1.1112.7	Radiated Sample for Wi-Fi, Bluetooth, Zigbee, Zwave and 15B
3	#3	1.4	2.0.1.1112.7	Radiated Sample for Cellular

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adaptor	FX18U-050300C	-----	-----

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1 + AE#1	Conducted RF measurements were performed with EUT configured via customer provided commands and instructions.
2	EUT#2 + AE#1	Radiated RF measurements were performed with EUT configured via customer provided commands and instructions.
3	EUT#3 + AE#1	Radiated RF measurements were performed with EUT configured via customer provided commands and instructions.

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.

The channels and modulation schemes of the EUT were set with highest Duty Cycle possible using customer software (not available to the end user).

3.6 Power Setting Table

Operating Mode	Channel & Center Frequency										
	1	2	3	4	5	6	7	8	9	10	11
	2412MHz	2417MHz	2422MHz	2427MHz	2432MHz	2437MHz	2442MHz	2447MHz	2452MHz	2457MHz	2462MHz
b	Default	Default	Default	Default	Default	Default	Default	Default	Default	Default	Default
g	12	13	14	15	Default	Default	Default	Default	15	13	12
n20	13	14	15	16	Default	Default	Default	Default	16	15	14

Operating Mode	Channel & Center Frequency						
	1	2	3	4	5	6	7
	2422MHz	2427MHz	2432MHz	2437MHz	2442MHz	2447MHz	2452MHz
n40	9	10	11	12	12	11	10

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: 2AIYW-E550
- IC ID: 26382-E550

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	802.11b,g,n	■	□	□	Complies
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	802.11b,g,n	■	□	□	Complies
§15.247(b)(1) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	802.11b,g,n	■	□	□	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	802.11b,g,n	■	□	□	Complies
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	802.11b,g,n	■	□	□	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	802.11n	■	□	□	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	802.11n	■	□	□	Complies

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

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)
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RF conducted measurement	± 0.5 dB
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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:**

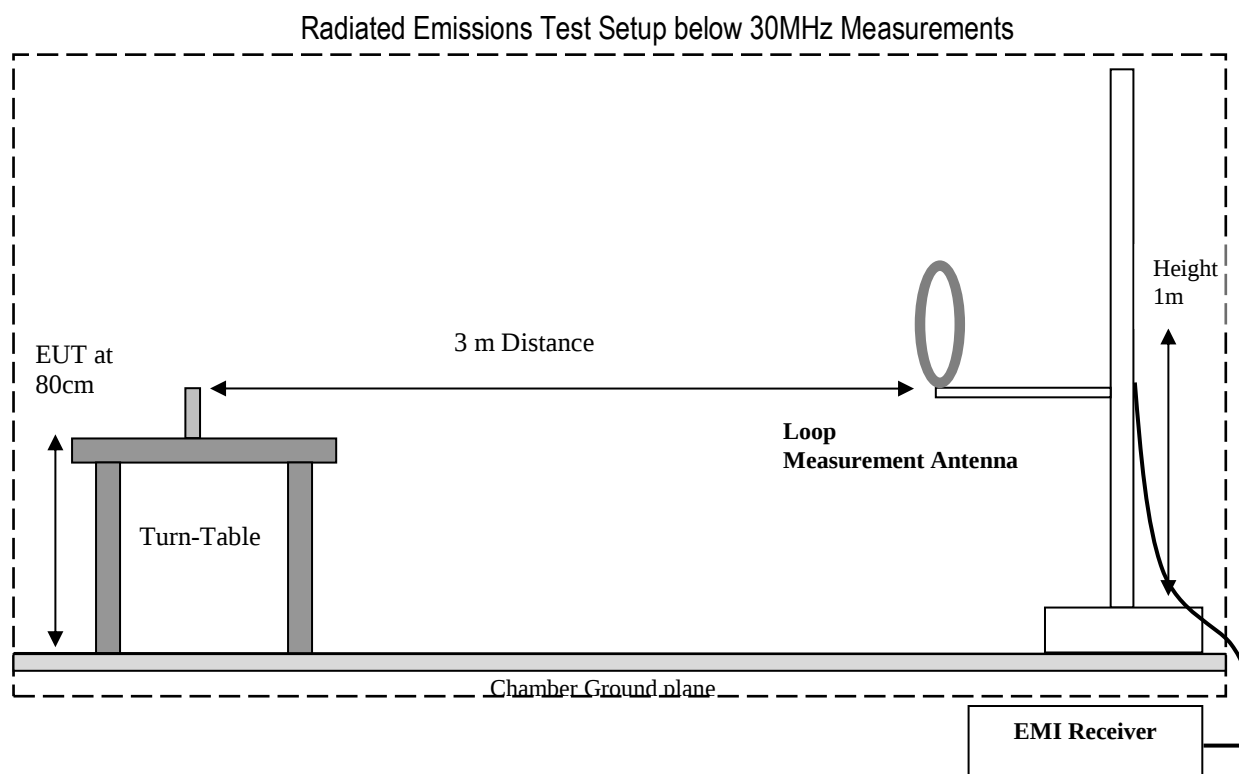
09/14/2020 – 10/15/2020

7 Measurement Procedures

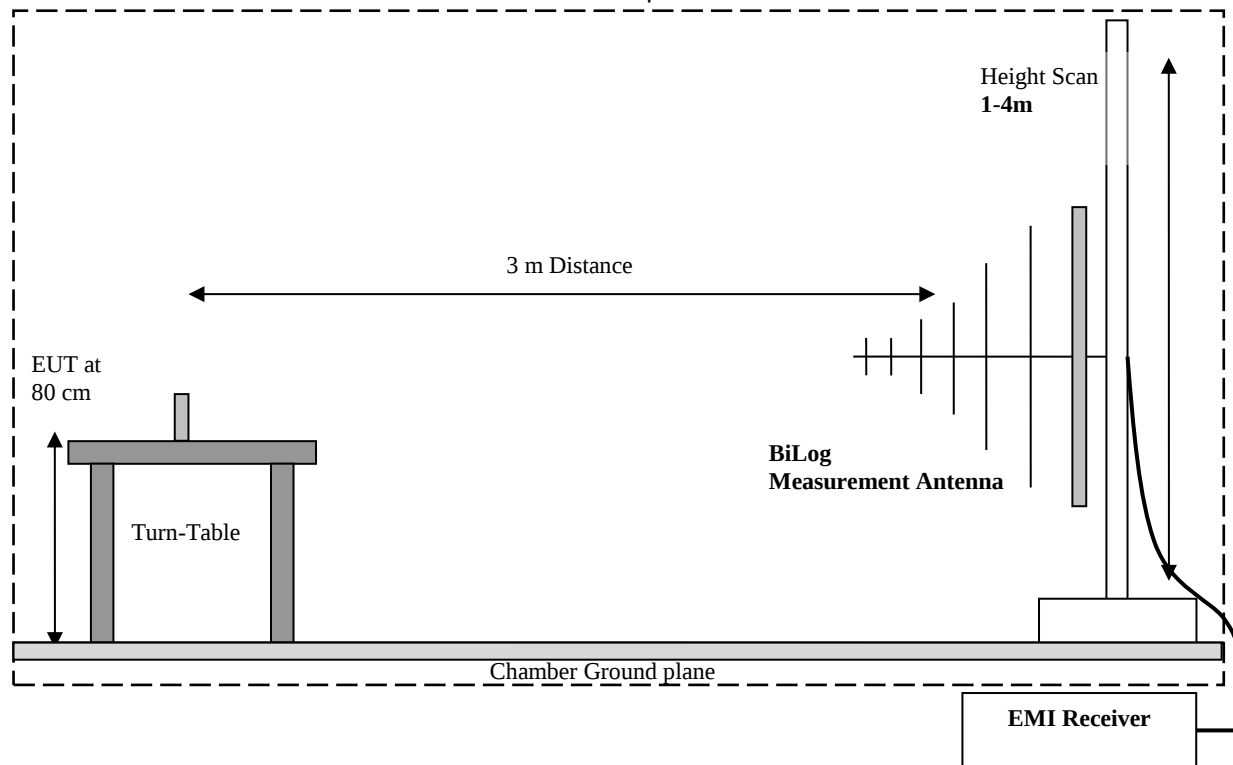
7.1 Radiated Measurement

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

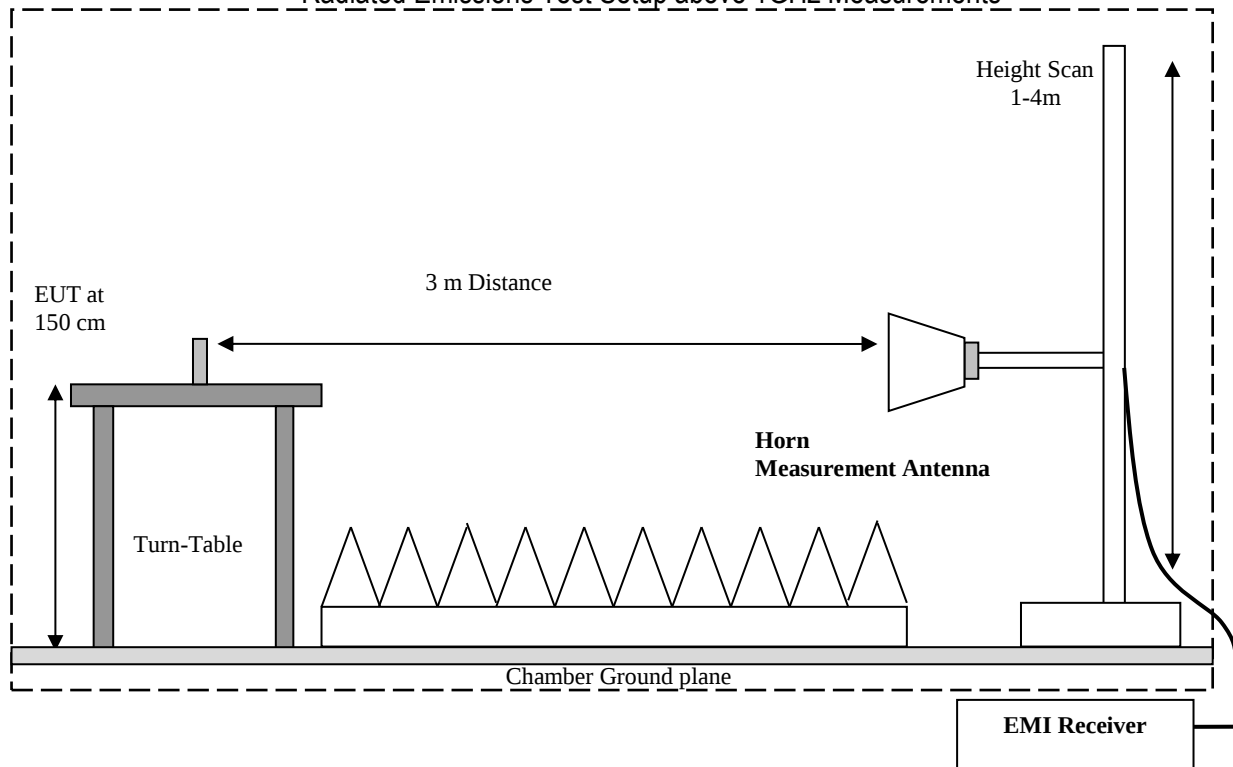
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to 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:

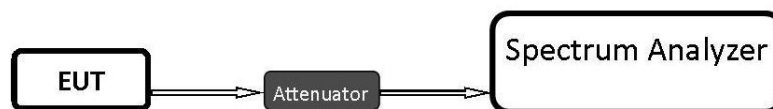
Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

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

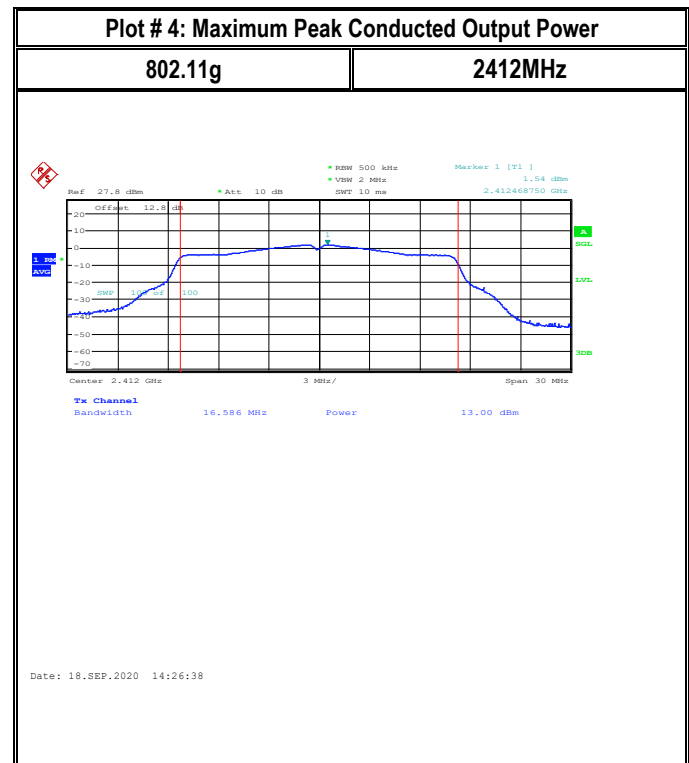
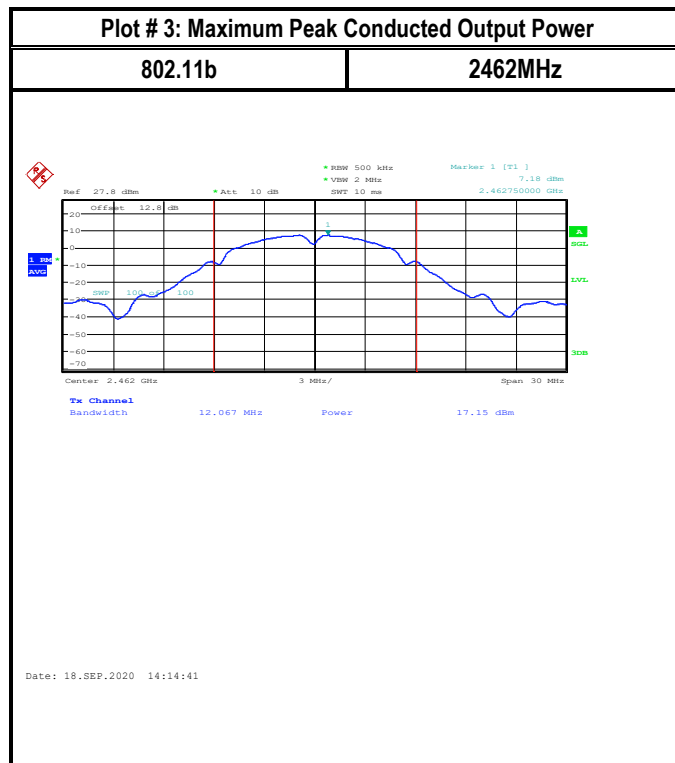
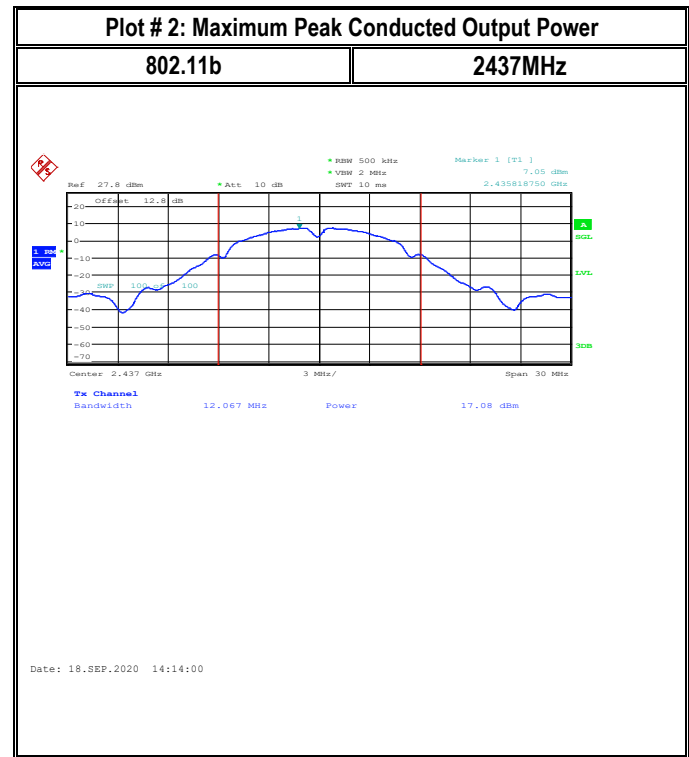
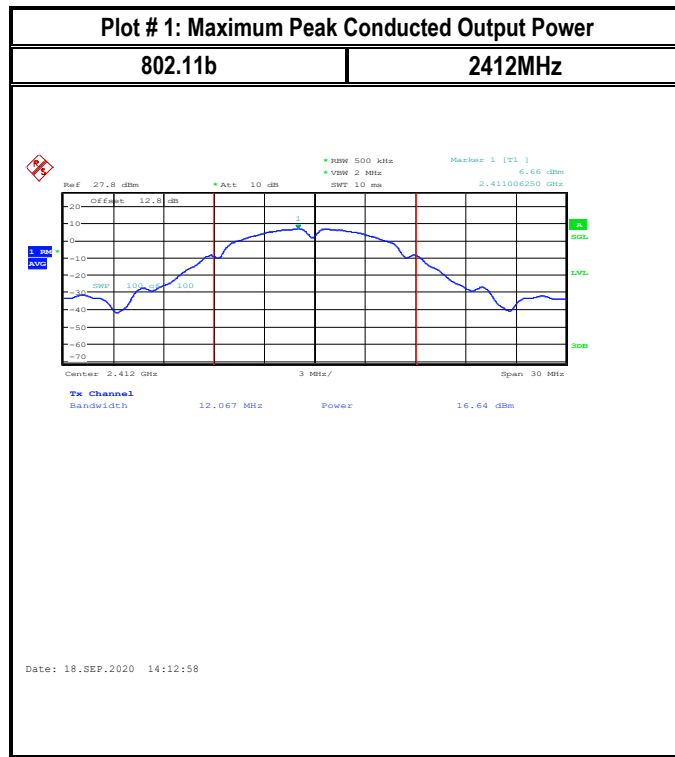
8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	802.11b,g,n	120 VAC	2.3 dBi

8.1.4 Measurement result:

Plot #	Mode	Channel/Frequency			Measured Result	Duty Cycle Factor	Antenna Gain	EIRP	Limit
					(dBm)	(dB)	(dBi)	(dBm)	(dBm)
1	802.11b	Low	1	2412	16.64	0	2.3	18.94	30/36
2		Mid	6	2437	17.08	0	2.3	19.38	30/36
3		High	11	2462	17.15	0	2.3	19.45	30/36
4	802.11g	Low	1	2412	13	0.1	2.3	15.40	30/36
5		Mid	6	2437	17.23	0.1	2.3	19.63	30/36
6		High	11	2462	13.65	0.1	2.3	16.05	30/36
7	802.11n20	Low	1	2412	13.6	0.09	2.3	15.99	30/36
8		Mid	6	2437	17.72	0.09	2.3	20.11	30/36
9		High	11	2462	15.07	0.09	2.3	17.46	30/36
10	802.11n40	Low	1	2422	10.74	0.16	2.3	13.20	30/36
11		Mid	4	2437	14.19	0.16	2.3	16.65	30/36
12		High	7	2452	12.37	0.16	2.3	14.83	30/36

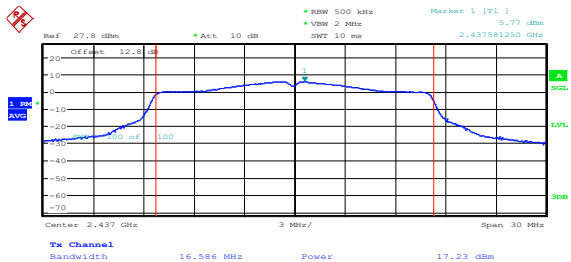
8.1.5 Measurement Plots:



Plot # 5: Maximum Peak Conducted Output Power

802.11g

2437MHz

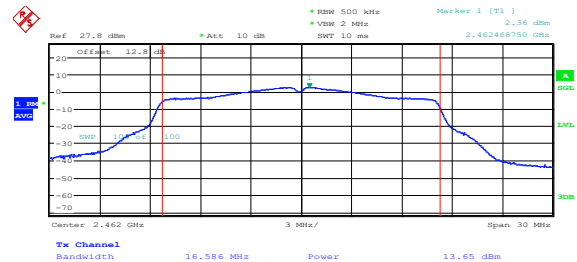


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Plot # 6: Maximum Peak Conducted Output Power

802.11g

2462MHz

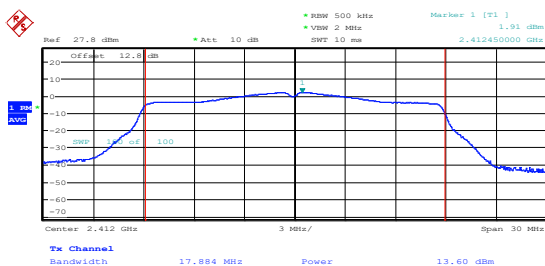


Date: 18.SEP.2020 14:30:16

Plot # 7: Maximum Peak Conducted Output Power

802.11n20

2412MHz

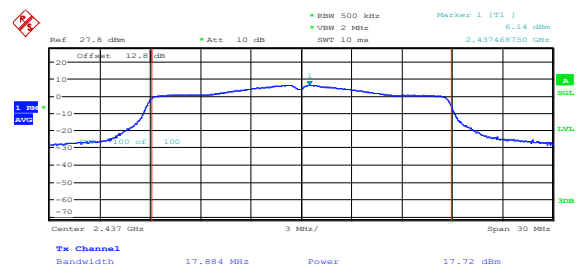


Date: 18.SEP.2020 14:33:52

Plot # 8: Maximum Peak Conducted Output Power

802.11n20

2437MHz

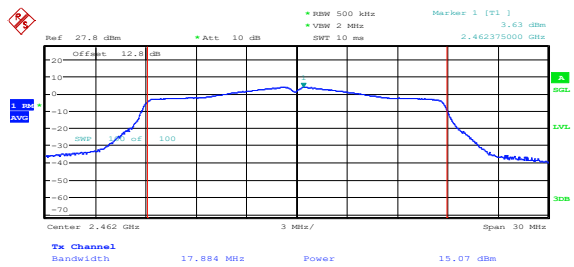


Date: 18.SEP.2020 14:33:04

Plot # 9: Maximum Peak Conducted Output Power

802.11n20

2462MHz

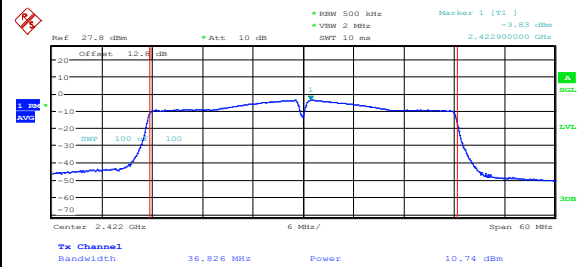


Date: 18.SEP.2020 14:32:17

Plot # 10: Maximum Peak Conducted Output Power

802.11n40

2422MHz

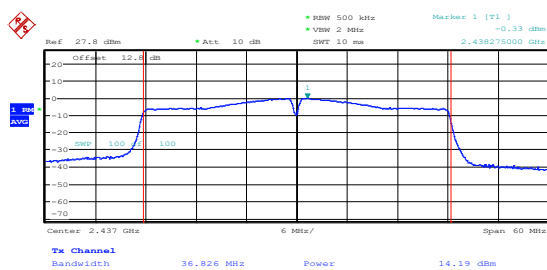


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Plot # 11: Maximum Peak Conducted Output Power

802.11n40

2437MHz

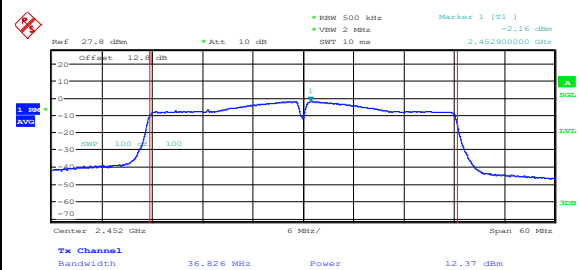


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Plot # 12: Maximum Peak Conducted Output Power

802.11n40

2452MHz



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8.2 Power Spectral Density

8.2.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

Spectrum Analyzer settings for Peak PSD method:

- Set analyzer center frequency to DTS channel center frequency
- Set the span to 1.5 x DTS bandwidth
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- Set the VBW $\geq 3 \times \text{RBW}$
- Detector = Peak
- Sweep time = Auto couple
- Trace mode = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level within the RBW
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

8.2.2 Limits:

FCC §15.247(e) & RSS-247 5.2(b):

- For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

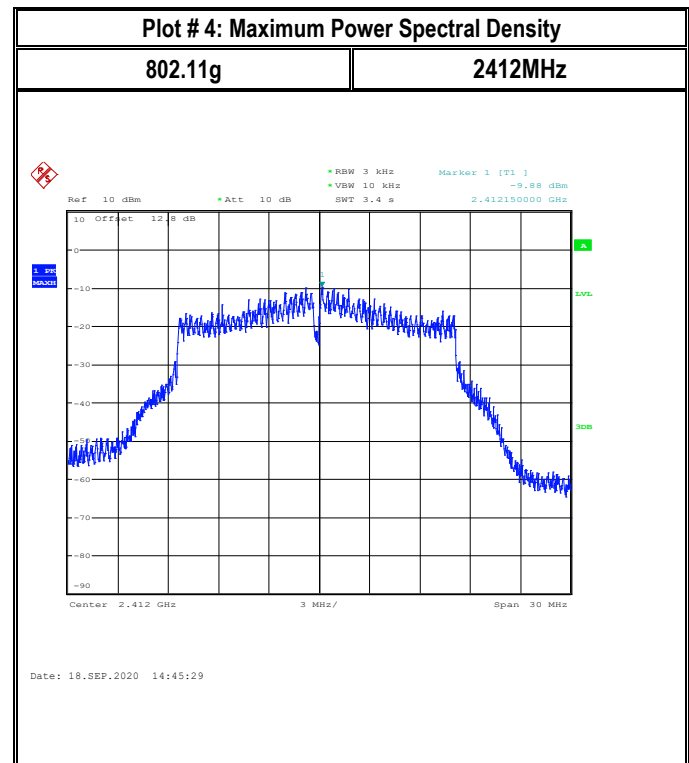
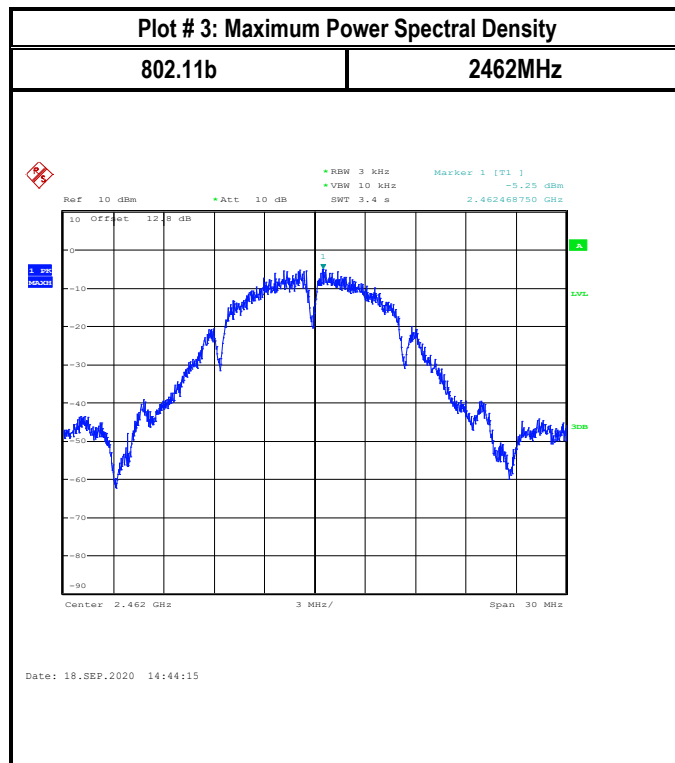
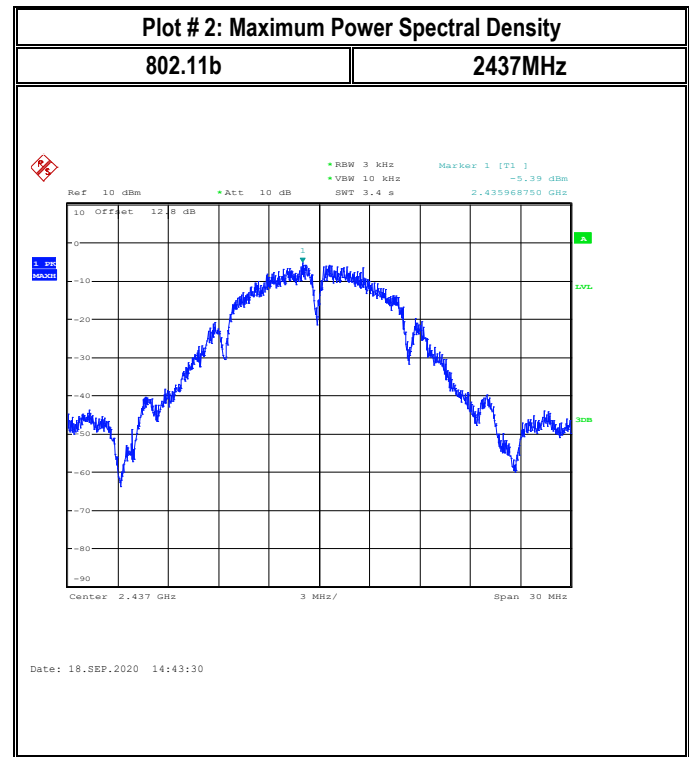
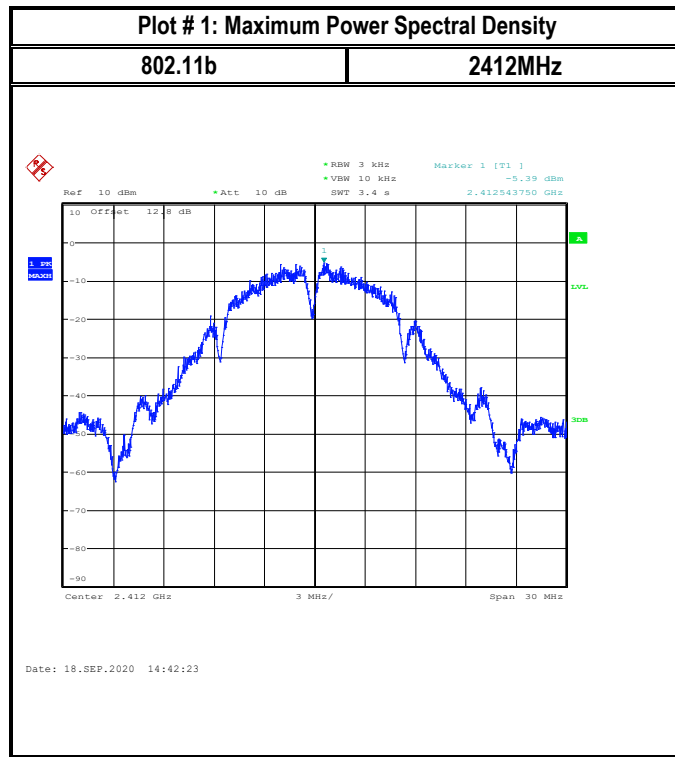
8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	802.11b,g,n	120 VAC	2.3 dBi

8.2.4 Measurement result:

Plot #	Mode	Data Rate	Channel/Frequency (MHz)			Maximum Power Spectral Density (dBm/3 kHz)	Limit (dBm / 3 kHz)	Result
1	802.11b	1Mbps	Low	1	2412	-5.39	8	Pass
2			Mid	6	2437	-5.39	8	Pass
3			High	11	2462	-5.25	8	Pass
4	802.11g	6Mbps	Low	1	2412	-9.88	8	Pass
5			Mid	6	2437	-6.05	8	Pass
6			High	11	2462	-9.65	8	Pass
7	802.11n20	MCS0	Low	1	2412	-8.32	8	Pass
8			Mid	6	2437	-5.42	8	Pass
9			High	11	2462	-8.62	8	Pass
10	802.11n40	MCS0	Low	1	2422	-16.08	8	Pass
11			Mid	6	2437	-12.53	8	Pass
12			High	11	2452	-13.68	8	Pass

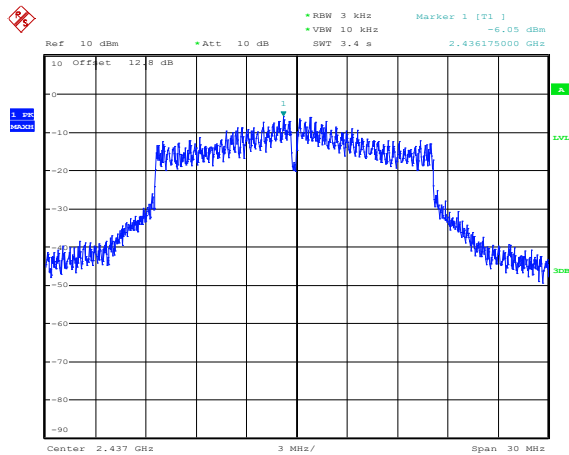
8.2.5 Measurement Plots:



Plot # 5: Maximum Power Spectral Density

802.11g

2437MHz

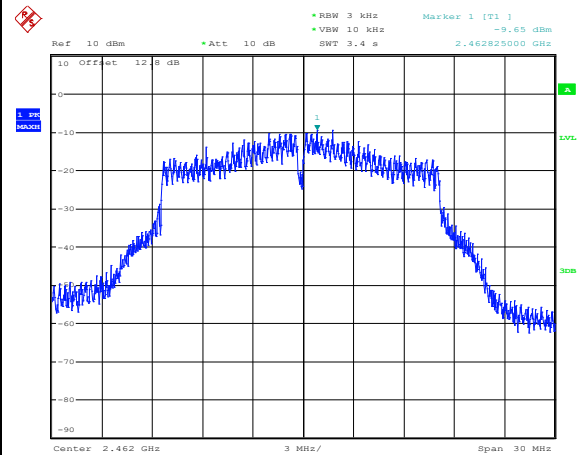


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Plot # 6: Maximum Power Spectral Density

802.11g

2462MHz

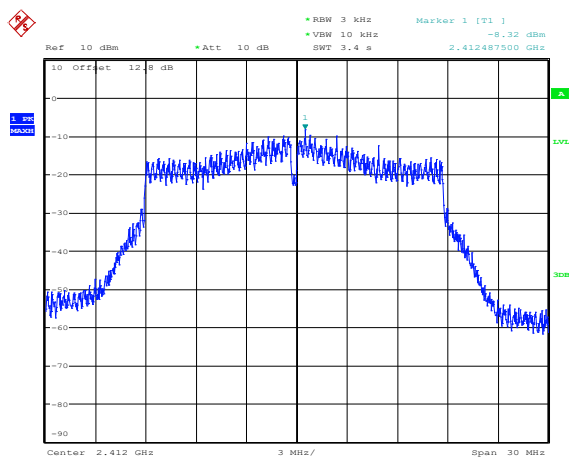


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Plot # 7: Maximum Power Spectral Density

802.11n20

2412MHz

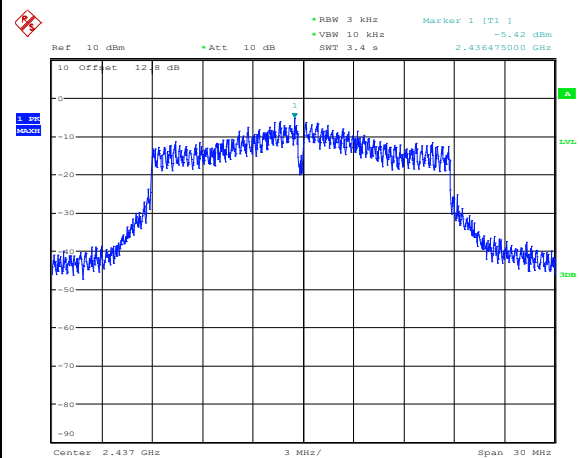


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Plot # 8: Maximum Power Spectral Density

802.11n20

2437MHz

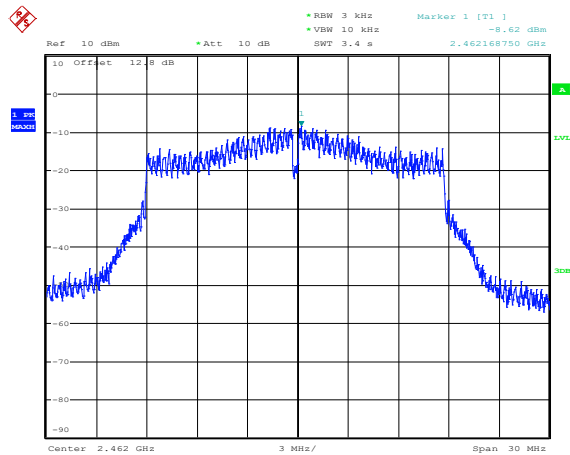


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Plot # 9: Maximum Power Spectral Density

802.11n20

2462MHz

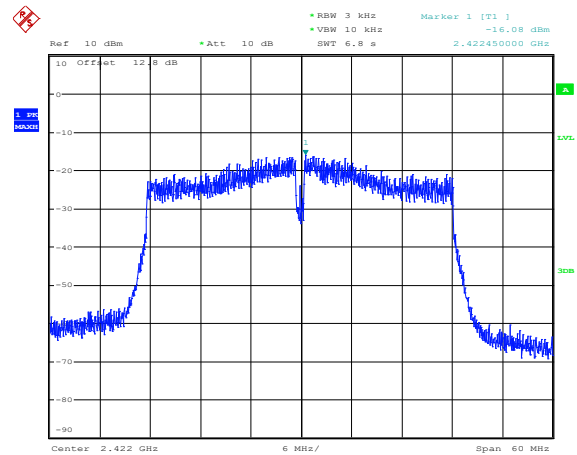


Date: 18.SEP.2020 14:51:55

Plot # 10: Maximum Power Spectral Density

802.11n40

2422MHz

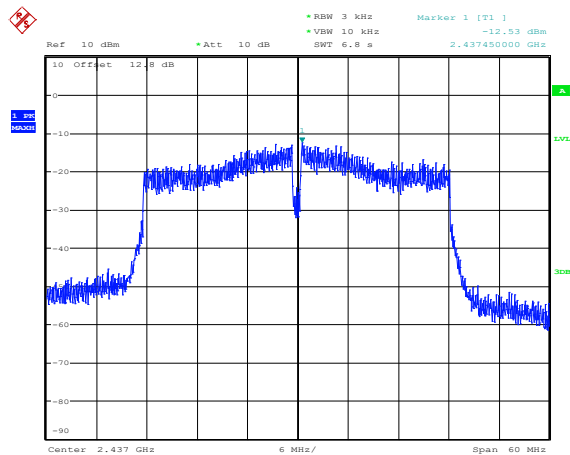


Date: 18.SEP.2020 14:56:13

Plot # 11: Maximum Power Spectral Density

802.11n40

2437MHz

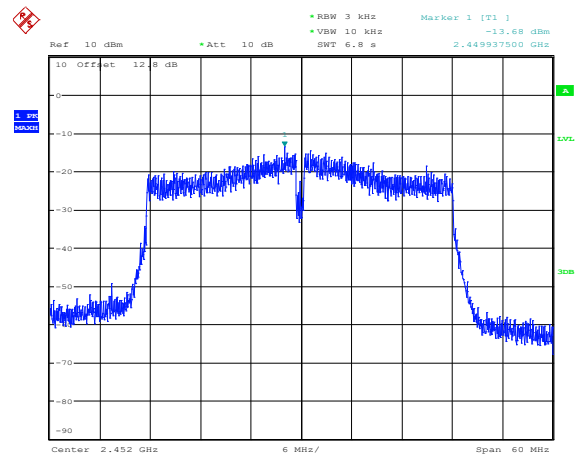


Date: 18.SEP.2020 14:57:14

Plot # 12: Maximum Power Spectral Density

802.11n40

2452MHz



Date: 18.SEP.2020 14:58:13

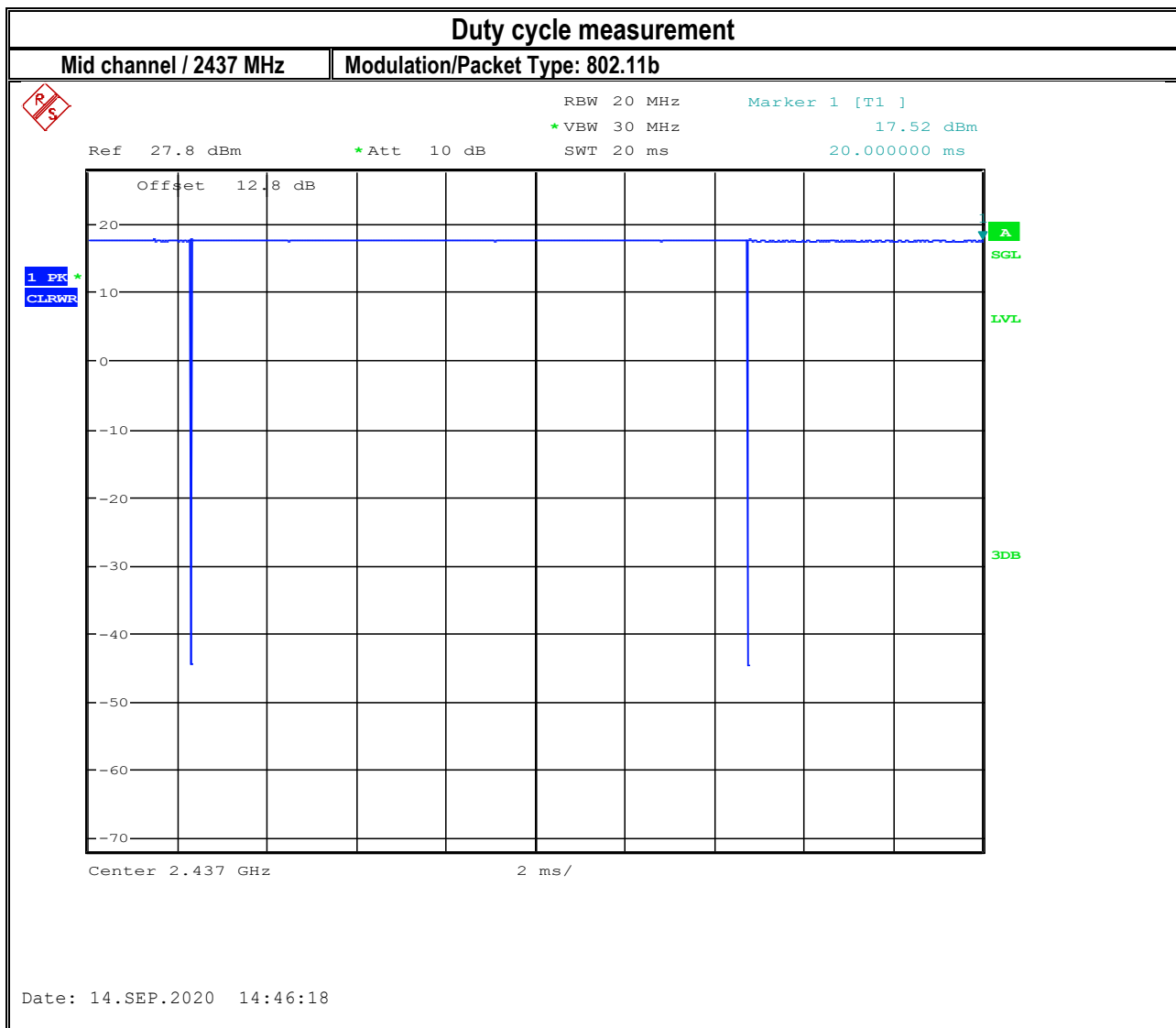
8.3 Duty cycle

8.3.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

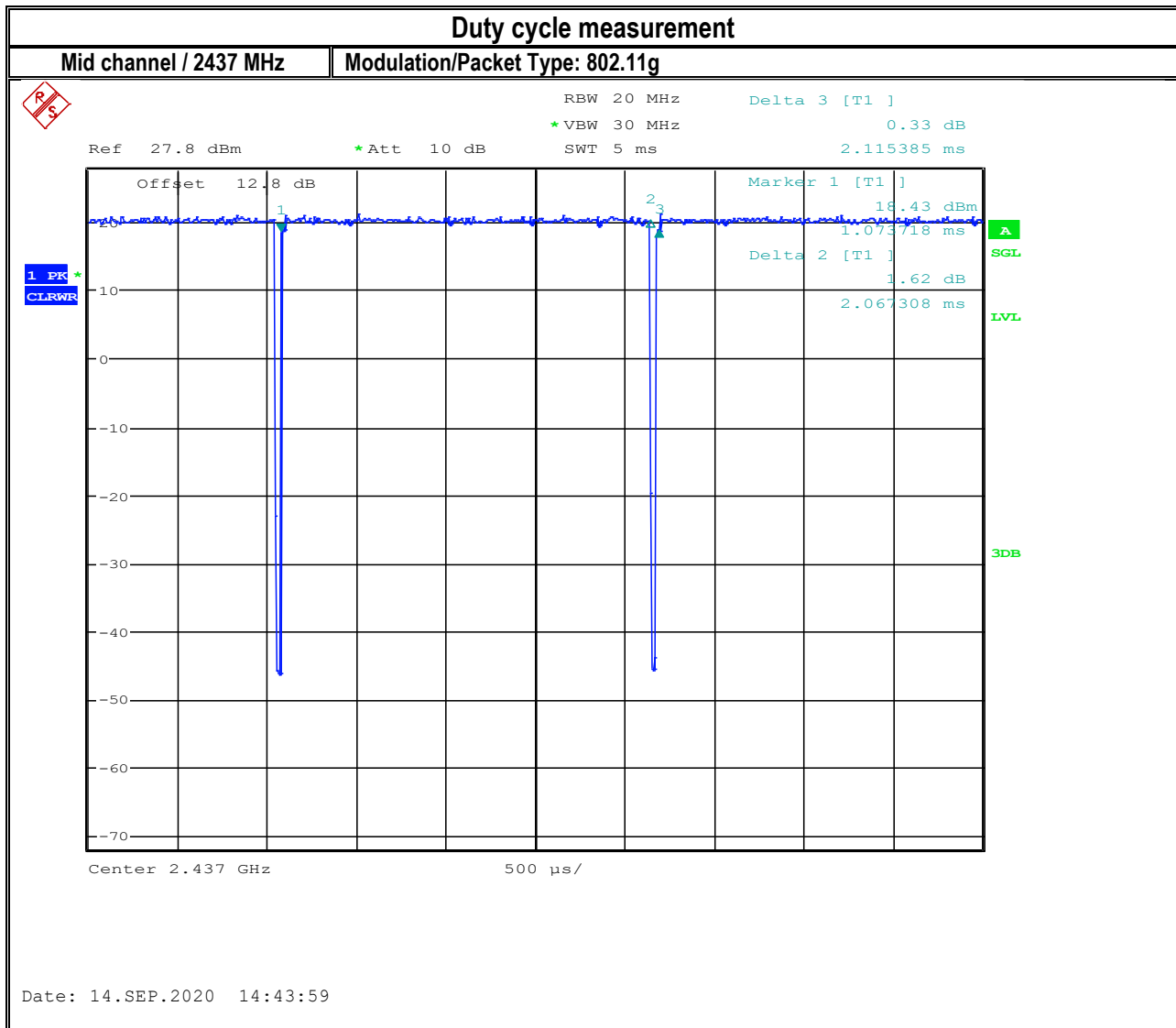
Spectrum Analyzer settings:

- Set the center frequency and of the instrument to the center frequency of the transmission
- Zero span
- Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value
- Detector = Peak or average

8.3.2 Measurement result

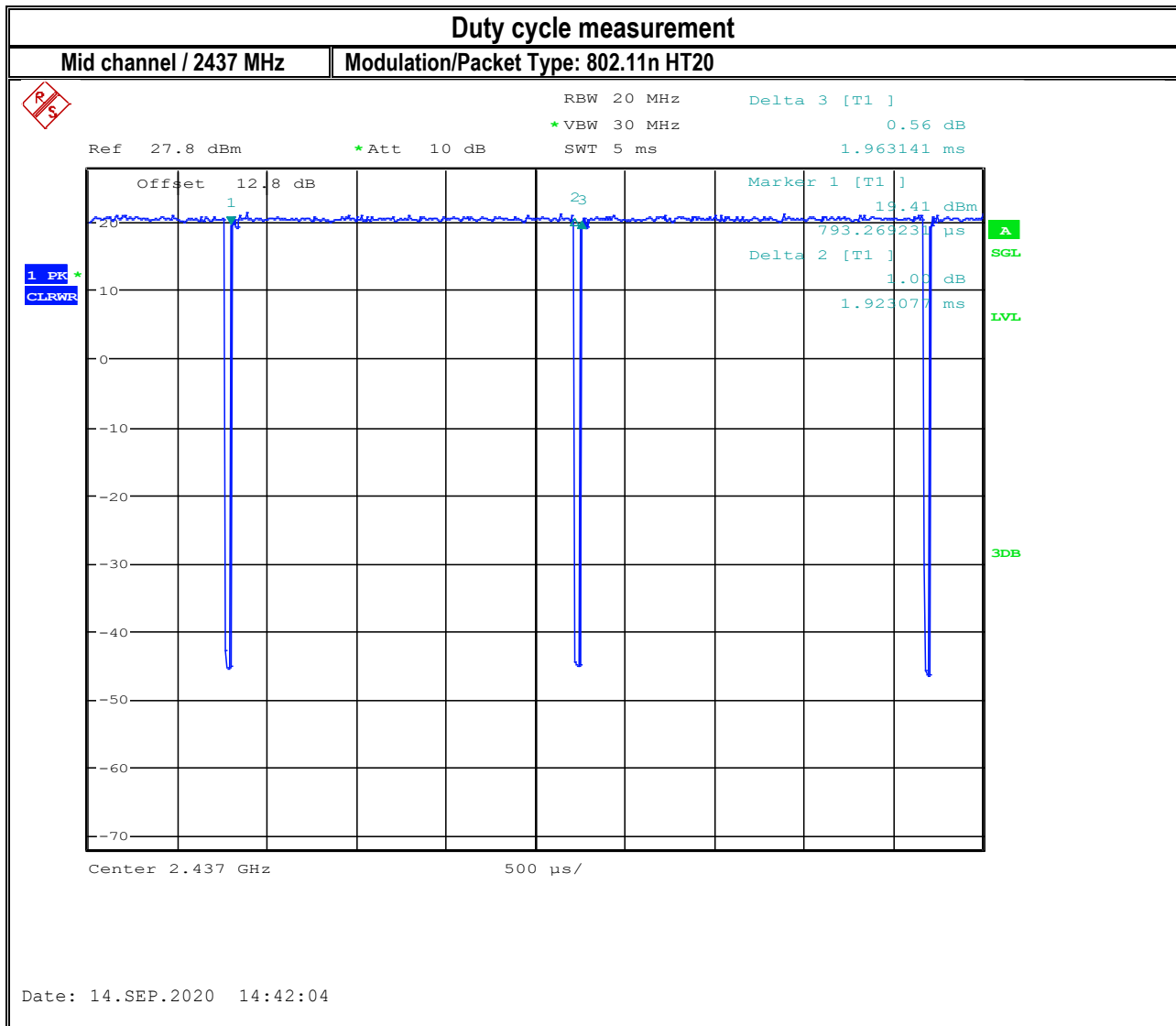


The Duty cycle is almost 100%.



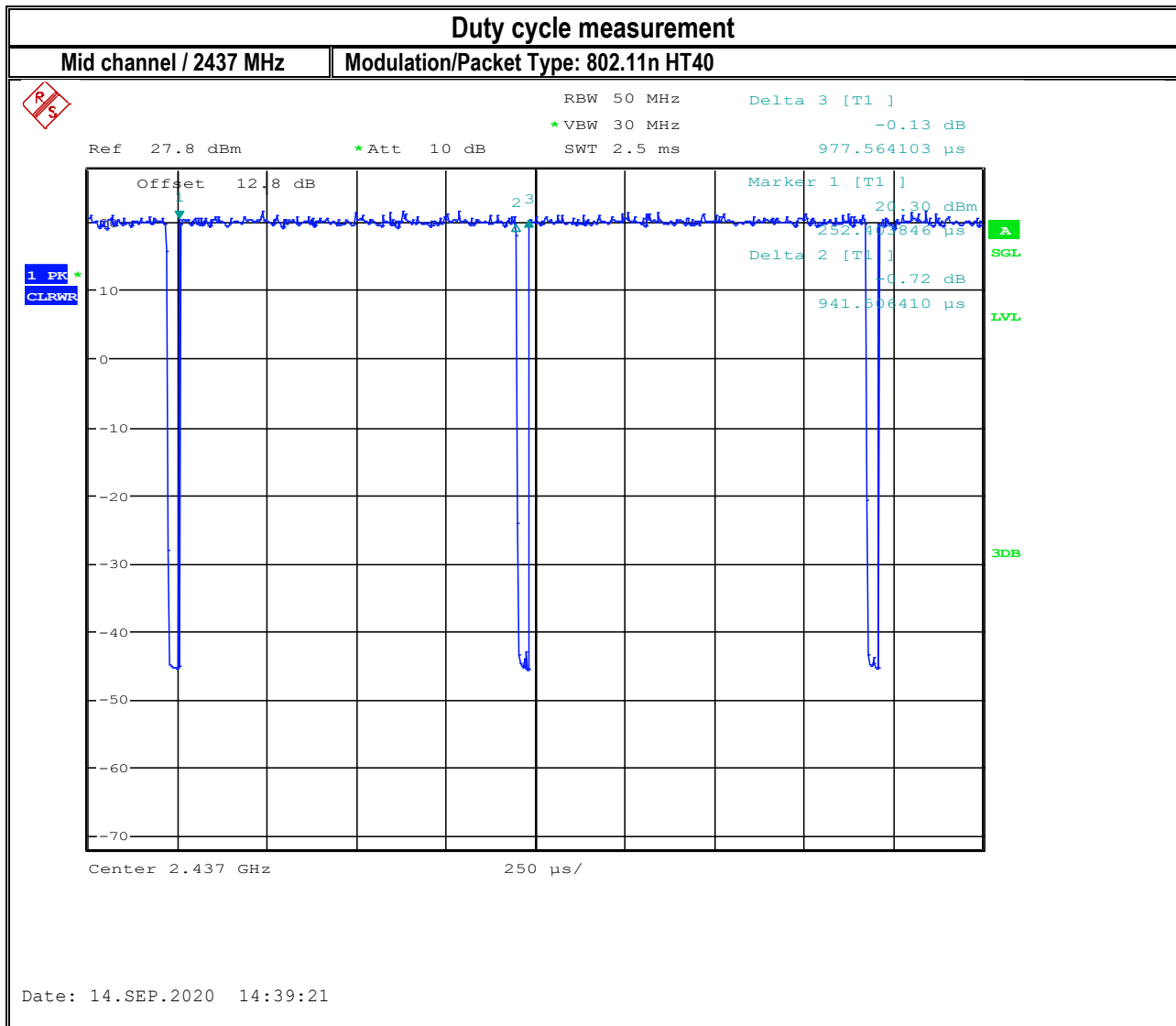
Duty cycle = 97.73%

Duty cycle correction factor = $10 \cdot \log(1/0.9773) = 0.1$ dB



Duty cycle = 97.96%

Duty cycle correction factor = $10 \cdot \log(1/0.9796) = 0.09$ dB



Duty cycle = 96.31%

Duty cycle correction factor = $10 \cdot \log(1/0.9631) = 0.16$ dB

8.4 Band Edge Compliance

8.4.1 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

8.4.2 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

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

- *PEAK LIMIT= 74 dB μ V/m @3m =-21.23 dBm
- *AVG. LIMIT= 54 dB μ V/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			

8.4.4 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23°C	2	802.11b,g,n	120VAC	2.3 dBi

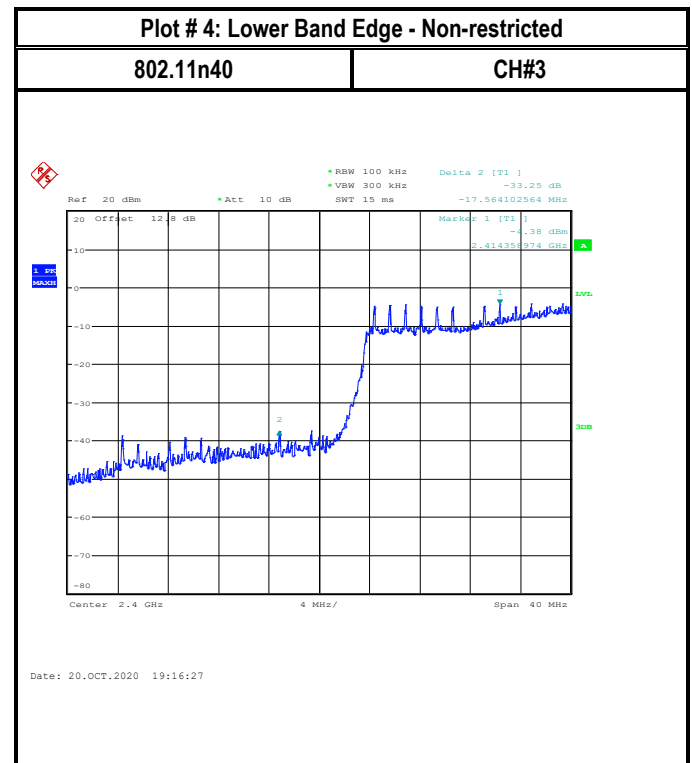
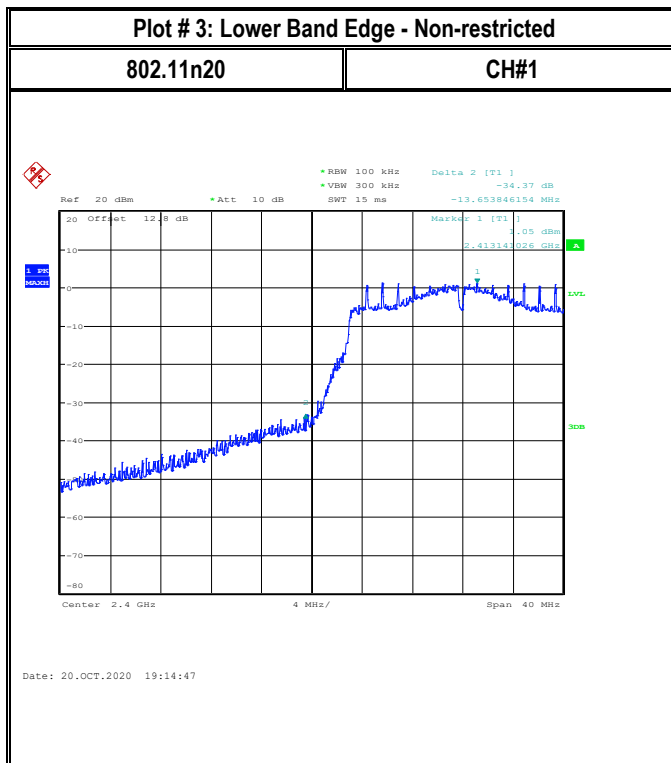
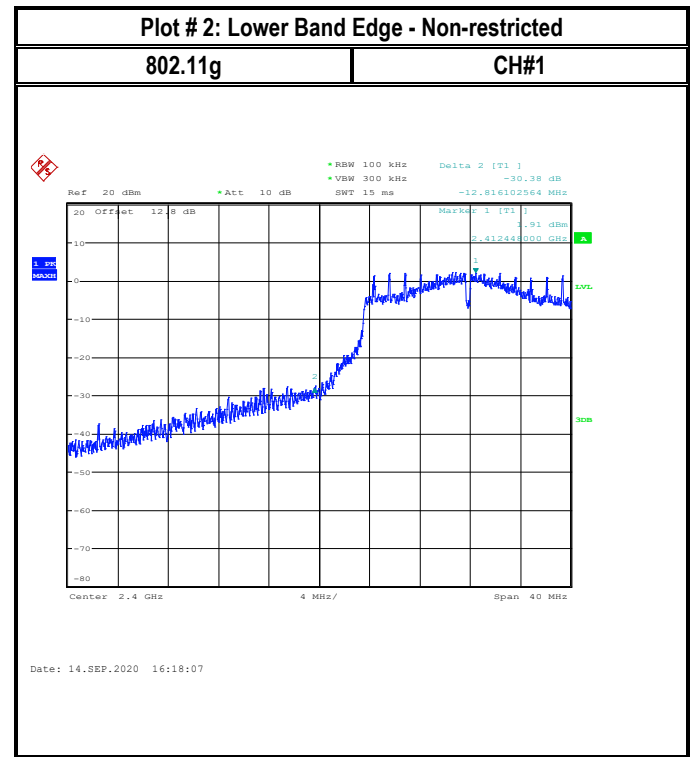
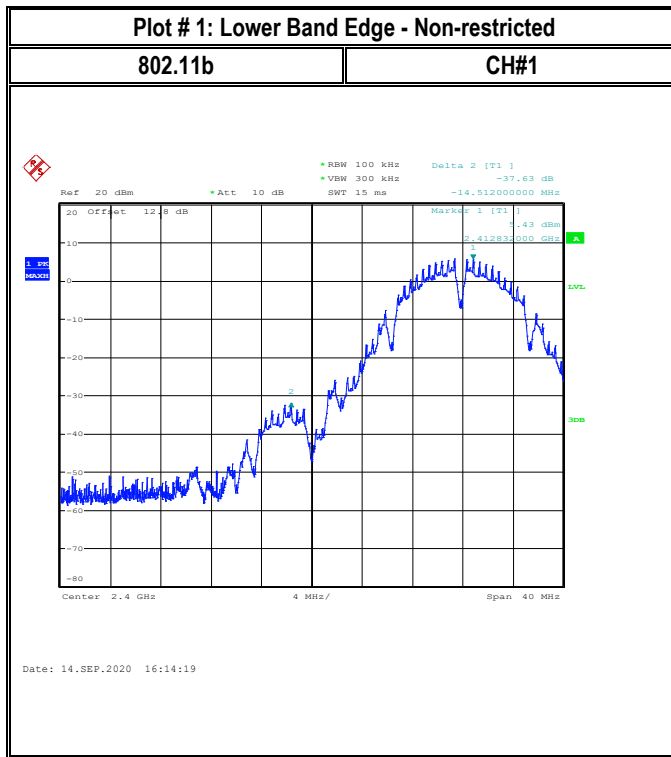
8.4.5 Measurement result:

Plot #	EUT operating mode	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
1	b	Lower, Non-restricted	-37.63	20	Pass
2	g	Lower, Non-restricted	-30.38	20	Pass
3	n20	Lower, Non-restricted	-34.37	20	Pass
4	n40	Lower, Non-restricted	-33.25	20	Pass

Plot #	EUT operating mode	Channel	Power Level	Band Edge	Measured Value	DC Factor	Antenna Gain	Corrected Value	Limit	Result
					(dBm)			(dBm)	(dBm)	
5	b	1	default	Lower Restricted Peak	-44.8	0	2.3	-42.5	-21.23 Peak	Pass
6				Lower Restricted AVG	-52.19	0	2.3	-49.89	-41.23 AVG	Pass
7		11	default	Upper Restricted Peak	-40.96	0	2.3	-38.66	-21.23 Peak	Pass
8				Upper Restricted AVG	-46.62	0	2.3	-44.32	-41.23 AVG	Pass
9	g	1	12	Lower Restricted Peak	-26.96	0.1	2.3	-24.56	-21.23 Peak	Pass
10				Lower Restricted AVG	-45.16	0.1	2.3	-42.76	-41.23 AVG	Pass
11		2	13	Lower Restricted Peak	-28.32	0.1	2.3	-25.92	-21.23 Peak	Pass
12				Lower Restricted AVG	-45.8	0.1	2.3	-43.4	-41.23 AVG	Pass
13		3	14	Lower Restricted Peak	-29.99	0.1	2.3	-27.59	-21.23 Peak	Pass
14				Lower Restricted AVG	-45.24	0.1	2.3	-42.84	-41.23 AVG	Pass
15		4	15	Lower Restricted Peak	-31.13	0.1	2.3	-28.73	-21.23 Peak	Pass
16				Lower Restricted AVG	-44.17	0.1	2.3	-41.77	-41.23 AVG	Pass
17		9	15	Upper Restricted Peak	-29.04	0.1	2.3	-26.64	-21.23 Peak	Pass
18				Upper Restricted AVG	-44.1	0.1	2.3	-41.7	-41.23 AVG	Pass
19		10	13	Upper Restricted Peak	-30.05	0.1	2.3	-27.65	-21.23 Peak	Pass
20				Upper Restricted AVG	-45.77	0.1	2.3	-43.37	-41.23 AVG	Pass
21		11	12	Upper Restricted Peak	-28	0.1	2.3	-25.6	-21.23 Peak	Pass
22				Upper Restricted AVG	-45.96	0.1	2.3	-43.56	-41.23 AVG	Pass
23	n20	1	13	Lower Restricted Peak	-25.2	0.09	2.3	-22.81	-21.23 Peak	Pass

24				Lower Restricted AVG	-46.2	0.09	2.3	-43.81	-41.23 AVG	Pass
25		2	14	Lower Restricted Peak	-28.07	0.09	2.3	-25.68	-21.23 Peak	Pass
26				Lower Restricted AVG	-46.46	0.09	2.3	-44.07	-41.23 AVG	Pass
27		3	15	Lower Restricted Peak	-29.16	0.09	2.3	-26.77	-21.23 Peak	Pass
28				Lower Restricted AVG	-45.45	0.09	2.3	-43.06	-41.23 AVG	Pass
29		4	16	Lower Restricted Peak	-29.77	0.09	2.3	-27.38	-21.23 Peak	Pass
30				Lower Restricted AVG	-44.9	0.09	2.3	-42.51	-41.23 AVG	Pass
31		9	16	Upper Restricted Peak	-27.03	0.09	2.3	-24.64	-21.23 Peak	Pass
32				Upper Restricted AVG	-46.14	0.09	2.3	-43.75	-41.23 AVG	Pass
33		10	15	Upper Restricted Peak	-27.74	0.09	2.3	-25.35	-21.23 Peak	Pass
34				Upper Restricted AVG	-45.94	0.09	2.3	-43.55	-41.23 AVG	Pass
35		11	14	Upper Restricted Peak	-25.01	0.09	2.3	-22.62	-21.23 Peak	Pass
36				Upper Restricted AVG	-44.85	0.09	2.3	-42.46	-41.23 AVG	Pass
37	n40	1	9	Lower Restricted Peak	-31.02	0.16	2.3	-28.56	-21.23 Peak	Pass
38				Lower Restricted AVG	-46.66	0.16	2.3	-44.2	-41.23 AVG	Pass
39		2	10	Lower Restricted Peak	-29.58	0.16	2.3	-27.12	-21.23 Peak	Pass
40				Lower Restricted AVG	-44.75	0.16	2.3	-42.29	-41.23 AVG	Pass
41		3	11	Lower Restricted Peak	-28.98	0.16	2.3	-26.52	-21.23 Peak	Pass
42				Lower Restricted AVG	-45.79	0.16	2.3	-43.33	-41.23 AVG	Pass
43		4	12	Lower Restricted Peak	-28.33	0.16	2.3	-25.87	-21.23 Peak	Pass
44				Lower Restricted AVG	-45.57	0.16	2.3	-43.11	-41.23 AVG	Pass
45		5	12	Upper Restricted Peak	-28.55	0.16	2.3	-26.09	-21.23 Peak	Pass
46				Upper Restricted AVG	-45.5	0.16	2.3	-43.04	-41.23 AVG	Pass
47		6	11	Upper Restricted Peak	-25.4	0.16	2.3	-22.94	-21.23 Peak	Pass
48				Upper Restricted AVG	-44.54	0.16	2.3	-42.08	-41.23 AVG	Pass
49		7	10	Upper Restricted Peak	-25.25	0.16	2.3	-22.79	-21.23 Peak	Pass
50				Upper Restricted AVG	-46.34	0.16	2.3	-43.88	-41.23 AVG	Pass

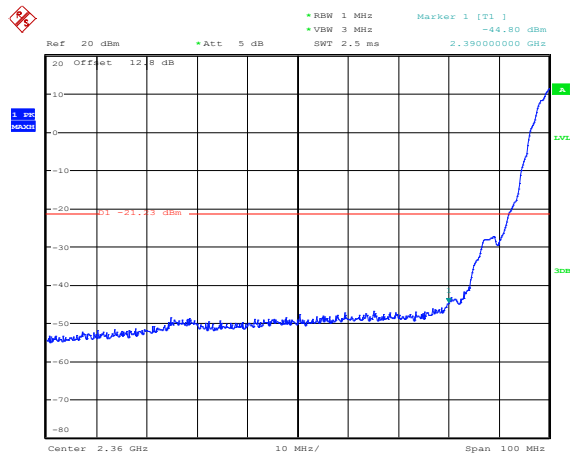
8.4.6 Measurement Plots:



Plot # 5: Lower Band Edge – Restricted - Peak

802.11b

CH#1

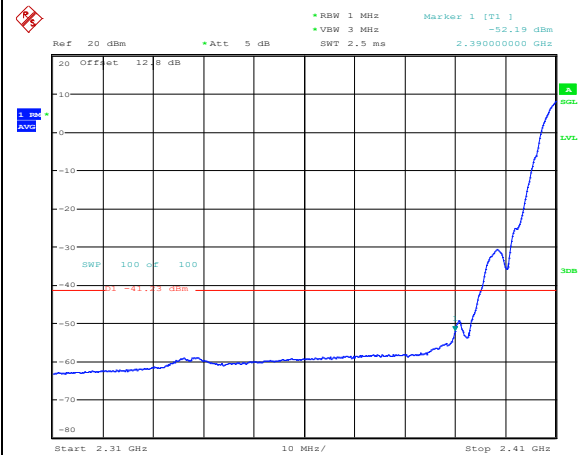


Date: 17.SEP.2020 17:40:51

Plot # 6: Lower Band Edge – Restricted – Average

802.11b

CH#1

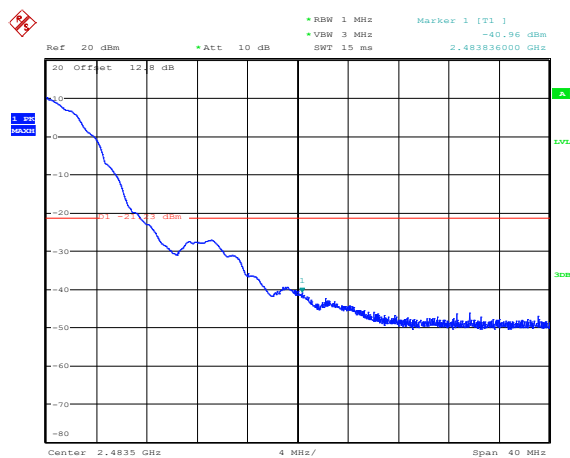


Date: 17.SEP.2020 10:07:26

Plot # 7: Upper Band Edge – Restricted - Peak

802.11b

CH#11

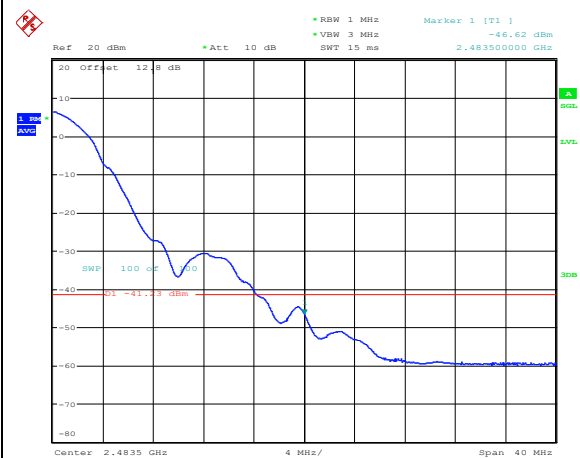


Date: 14.SEP.2020 16:48:47

Plot # 8: Upper Band Edge – Restricted – Average

802.11b

CH#11

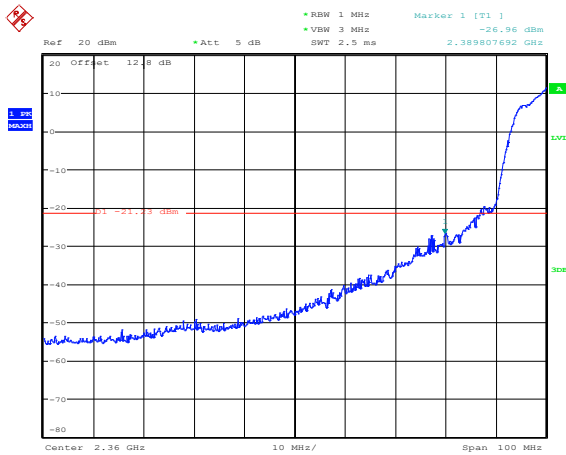


Date: 14.SEP.2020 16:50:48

Plot # 9: Lower Band Edge – Restricted - Peak

802.11g

CH#1

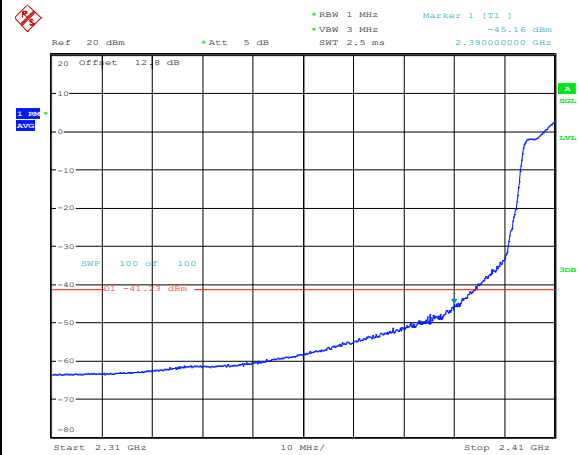


Date: 17.SEP.2020 17:27:05

Plot # 10: Lower Band Edge – Restricted – Average

802.11g

CH#1

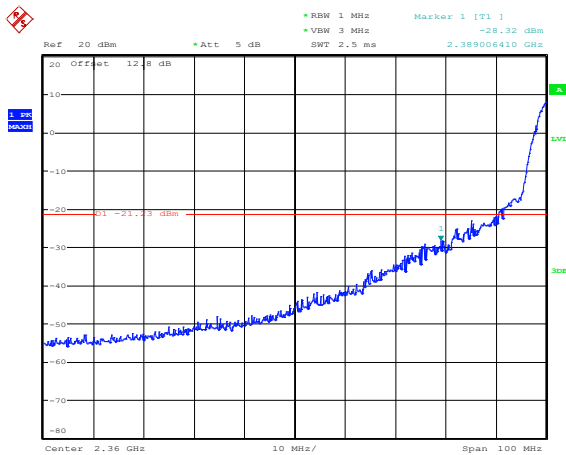


Date: 17.SEP.2020 14:12:34

Plot # 11: Lower Band Edge – Restricted - Peak

802.11g

CH#2

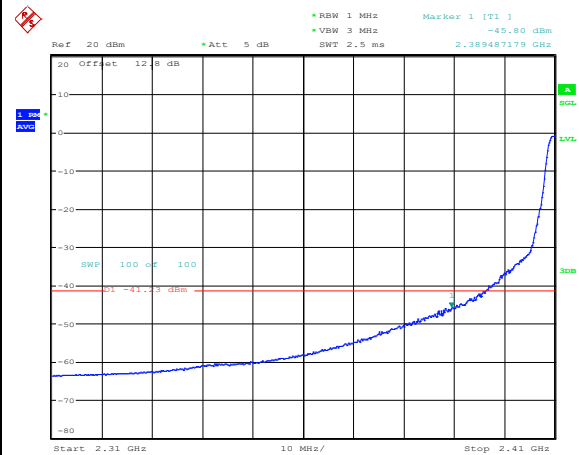


Date: 17.SEP.2020 17:28:35

Plot # 12: Lower Band Edge – Restricted – Average

802.11g

CH#2

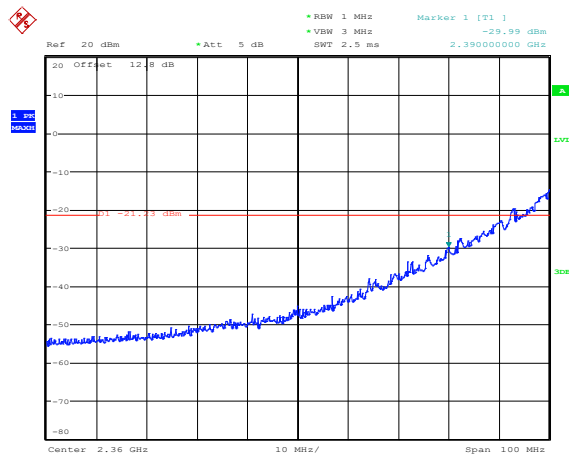


Date: 17.SEP.2020 14:14:34

Plot # 13: Lower Band Edge – Restricted - Peak

802.11g

CH#3

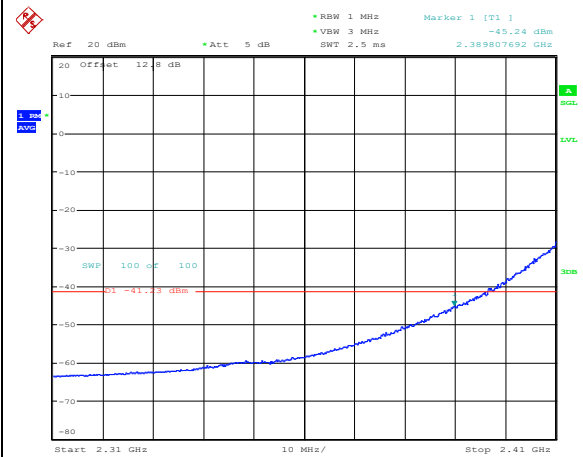


Date: 17.SEP.2020 17:29:35

Plot # 14: Lower Band Edge – Restricted – Average

802.11g

CH#3

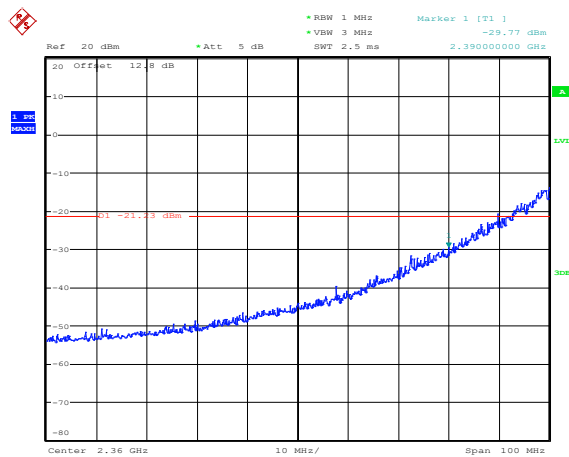


Date: 17.SEP.2020 14:21:24

Plot # 15: Lower Band Edge – Restricted - Peak

802.11g

CH#4

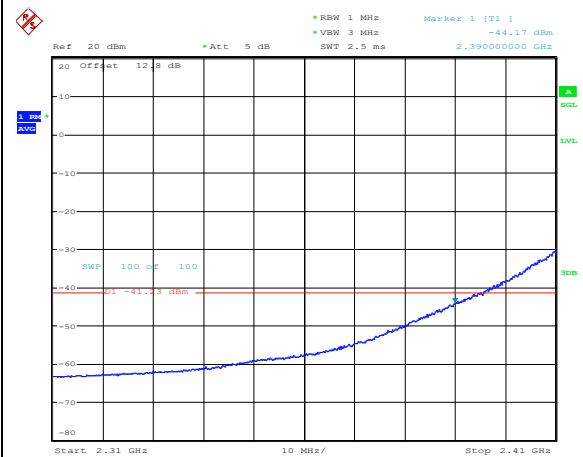


Date: 17.SEP.2020 17:39:22

Plot # 16: Lower Band Edge – Restricted – Average

802.11g

CH#4

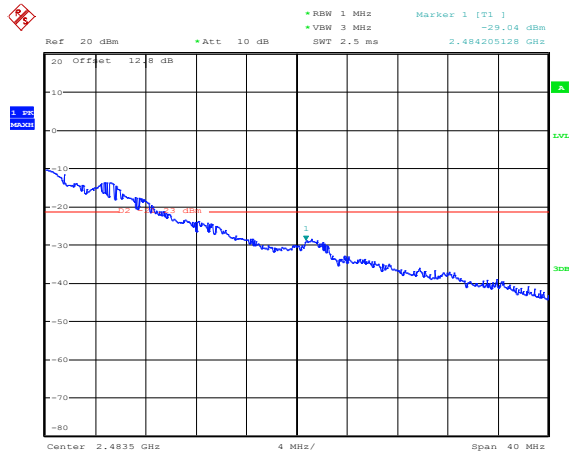


Date: 17.SEP.2020 14:24:59

Plot # 17: Upper Band Edge – Restricted - Peak

802.11g

CH#9

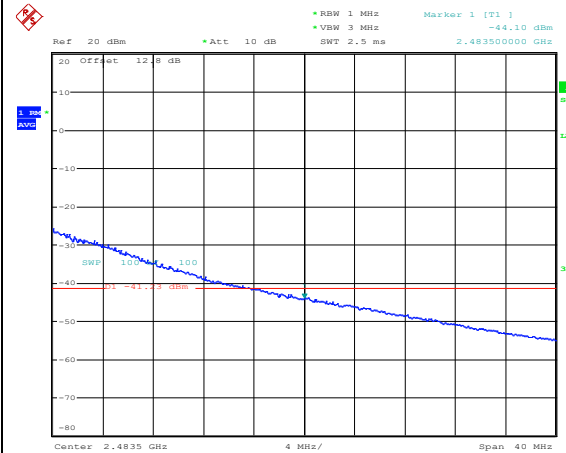


Date: 16.SEP.2020 14:04:49

Plot # 18: Upper Band Edge – Restricted – Average

802.11g

CH#9

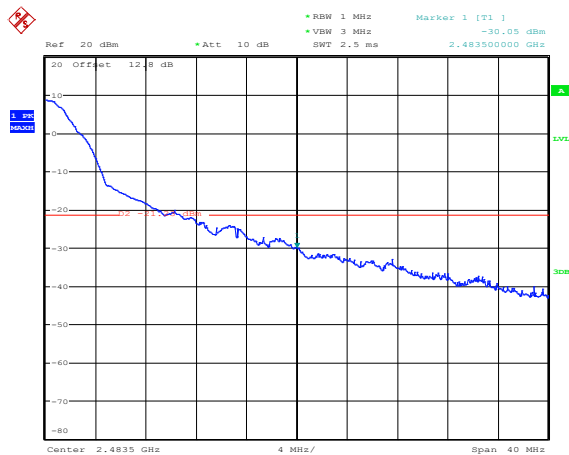


Date: 16.SEP.2020 13:56:27

Plot # 19: Upper Band Edge – Restricted - Peak

802.11g

CH#10

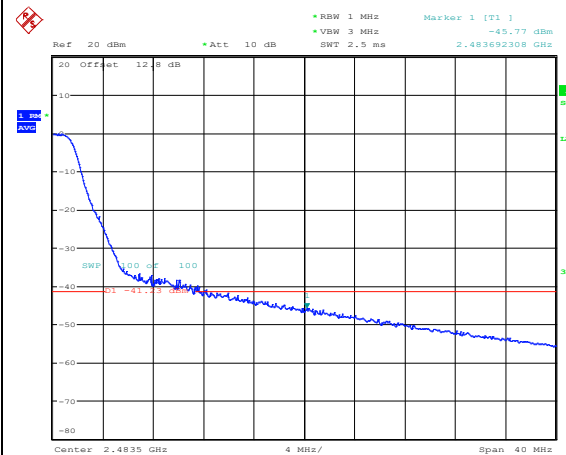


Date: 16.SEP.2020 14:02:35

Plot # 20: Upper Band Edge – Restricted – Average

802.11g

CH#10

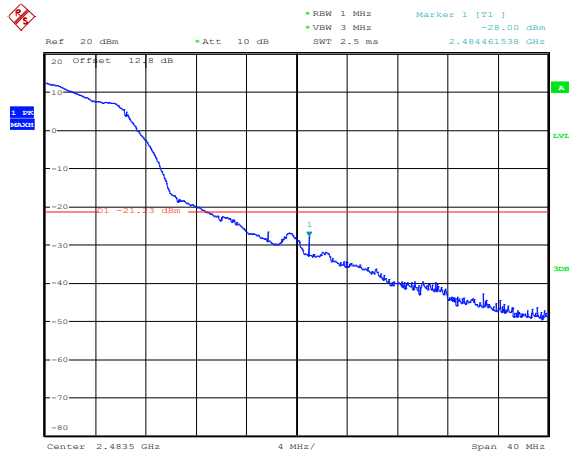


Date: 16.SEP.2020 14:00:15

Plot # 21: Upper Band Edge – Restricted - Peak

802.11g

CH#11

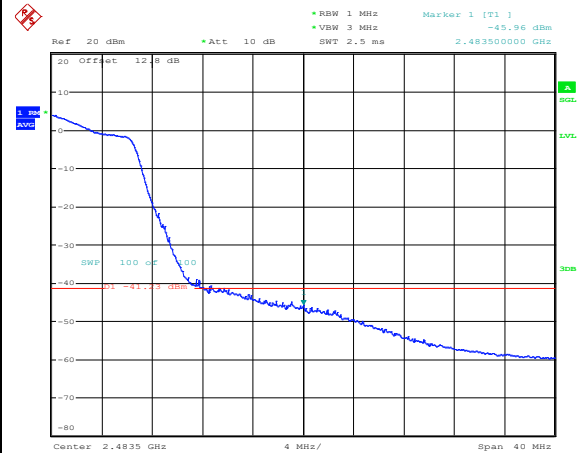


Date: 16.SEP.2020 13:52:35

Plot # 22: Upper Band Edge – Restricted – Average

802.11g

CH#11

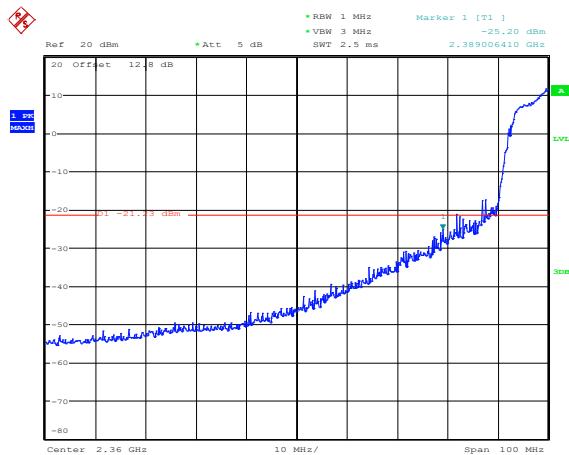


Date: 16.SEP.2020 13:45:25

Plot # 23: Lower Band Edge – Restricted - Peak

802.11n20

CH#1

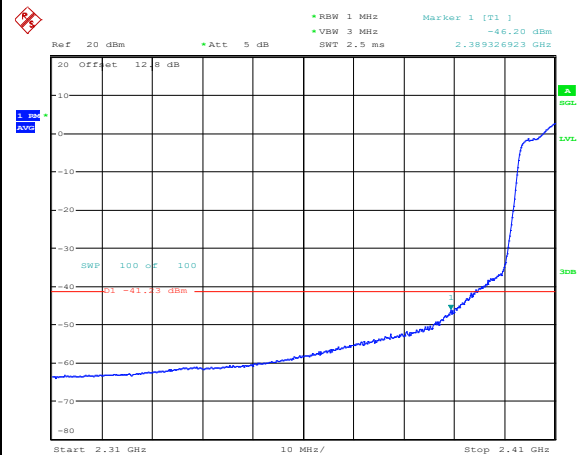


Date: 17.SEP.2020 17:35:09

Plot # 24: Lower Band Edge – Restricted – Average

802.11n20

CH#1

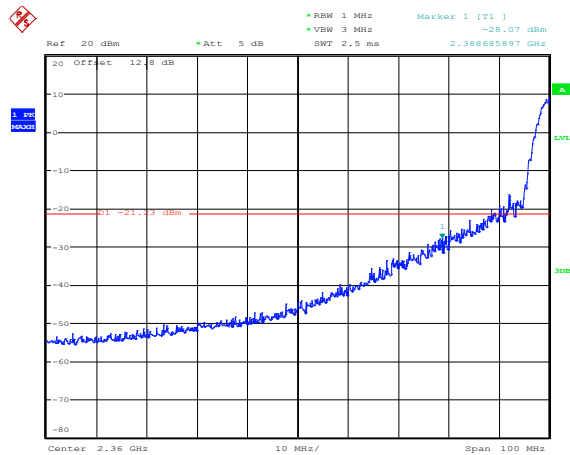


Date: 17.SEP.2020 15:57:02

Plot # 25: Lower Band Edge – Restricted - Peak

802.11n20

CH#2

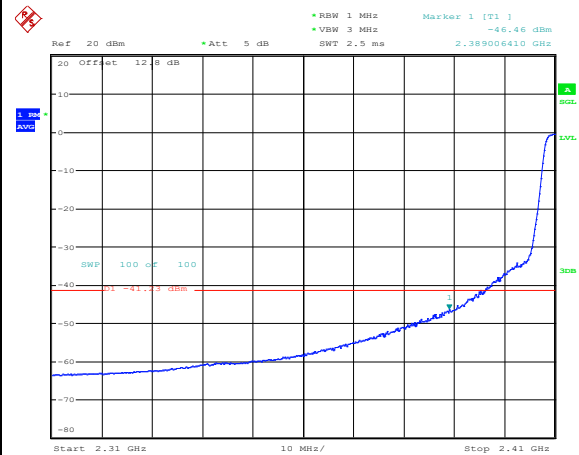


Date: 17.SEP.2020 17:36:27

Plot # 26: Lower Band Edge – Restricted – Average

802.11n20

CH#2

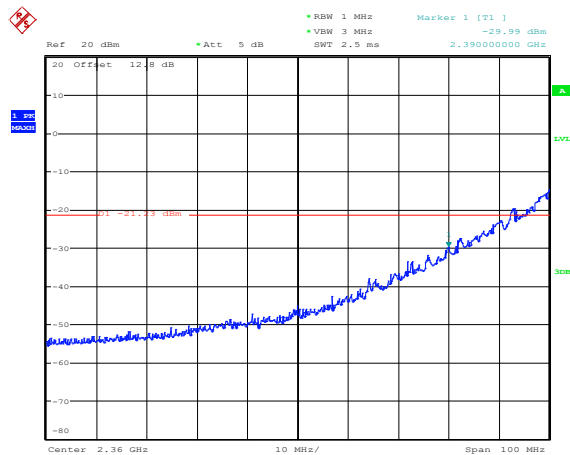


Date: 17.SEP.2020 16:00:02

Plot # 27: Lower Band Edge – Restricted - Peak

802.11n20

CH#3

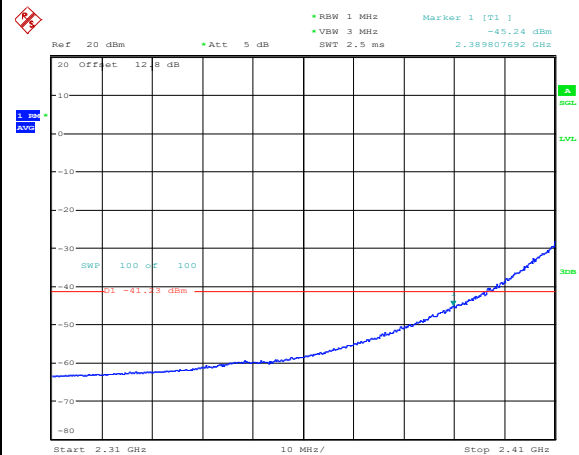


Date: 17.SEP.2020 17:29:35

Plot # 28: Lower Band Edge – Restricted – Average

802.11n20

CH#3

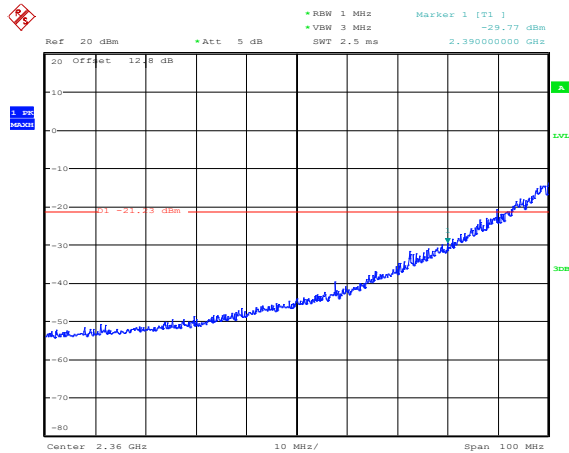


Date: 17.SEP.2020 14:21:24

Plot # 29: Lower Band Edge – Restricted - Peak

802.11n20

CH#4

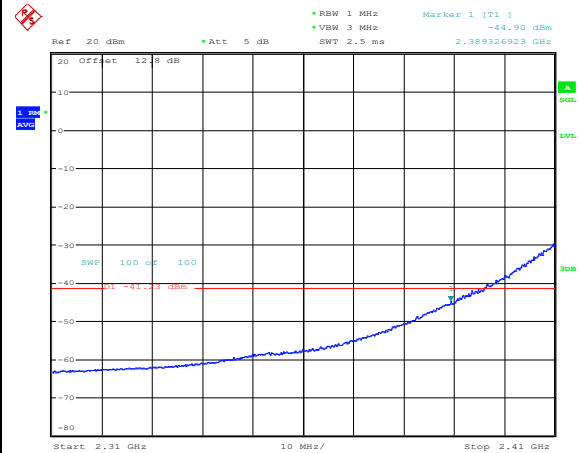


Date: 17.SEP.2020 17:39:22

Plot # 30: Lower Band Edge – Restricted – Average

802.11n20

CH#4

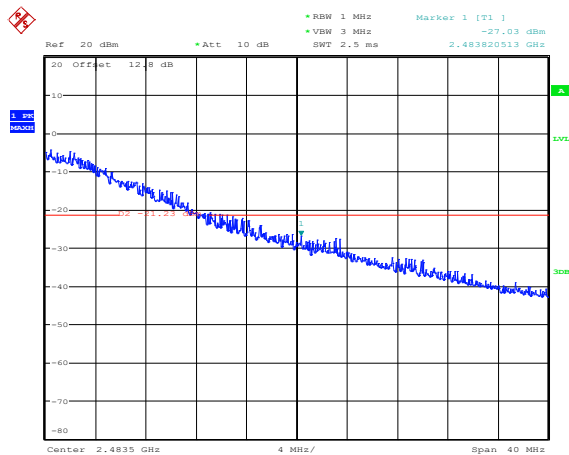


Date: 17.SEP.2020 16:07:45

Plot # 31: Upper Band Edge – Restricted - Peak

802.11n20

CH#9

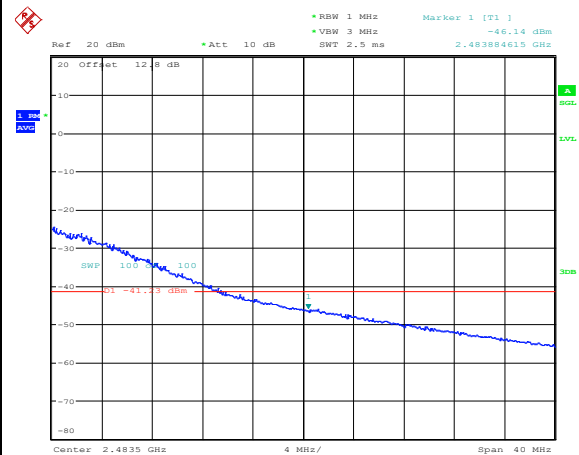


Date: 16.SEP.2020 14:32:47

Plot # 32: Upper Band Edge – Restricted – Average

802.11

CH#9

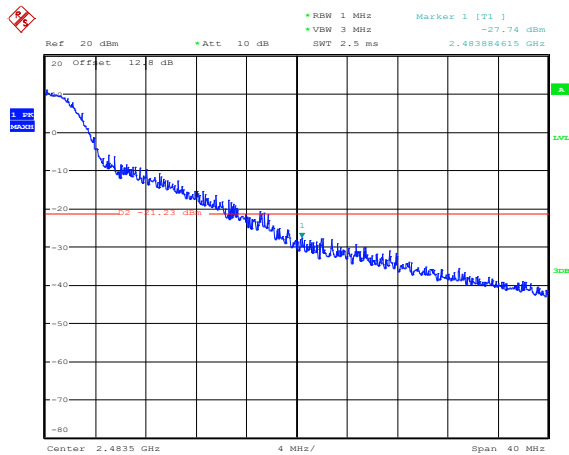


Date: 16.SEP.2020 14:47:47

Plot # 33: Upper Band Edge – Restricted - Peak

802.11n20

CH#10

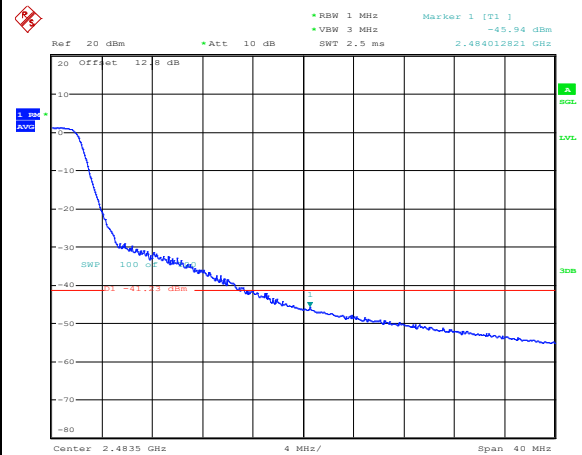


Date: 16.SEP.2020 14:37:21

Plot # 34: Upper Band Edge – Restricted – Average

802.11n20

CH#10

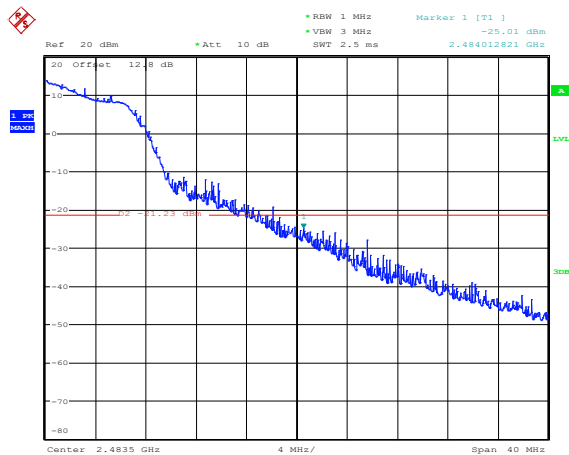


Date: 16.SEP.2020 14:25:45

Plot # 35: Upper Band Edge – Restricted - Peak

802.11n20

CH#11

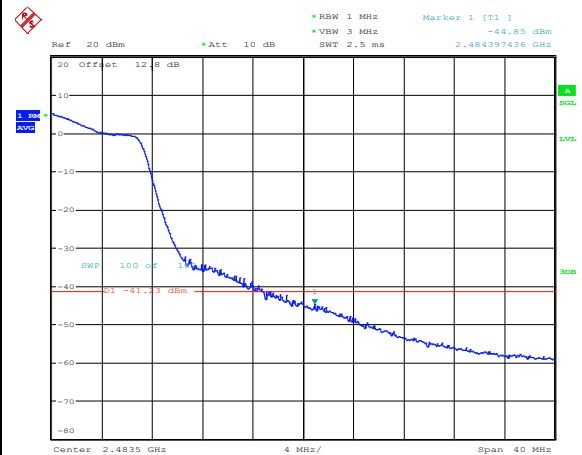


Date: 16.SEP.2020 14:38:36

Plot # 36: Upper Band Edge – Restricted – Average

802.11n20

CH#11

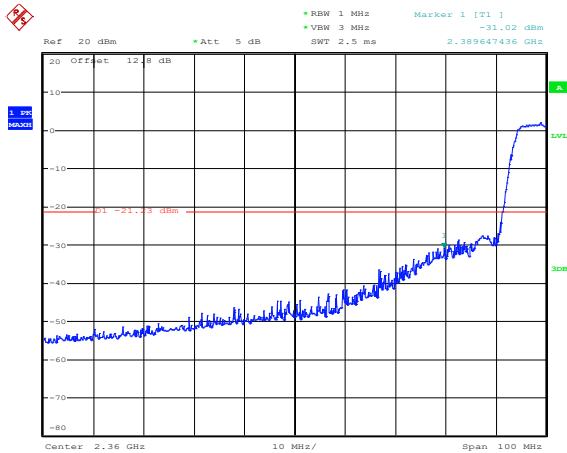


Date: 16.SEP.2020 14:19:37

Plot # 37: Lower Band Edge – Restricted - Peak

802.11n40

CH#1

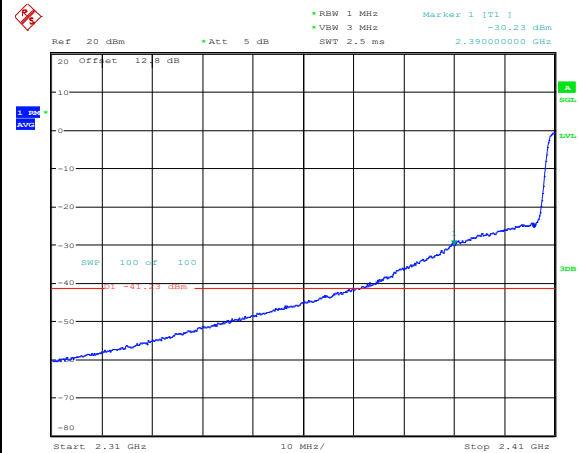


Date: 17.SEP.2020 17:25:32

Plot # 38: Lower Band Edge – Restricted – Average

802.11n40

CH#1

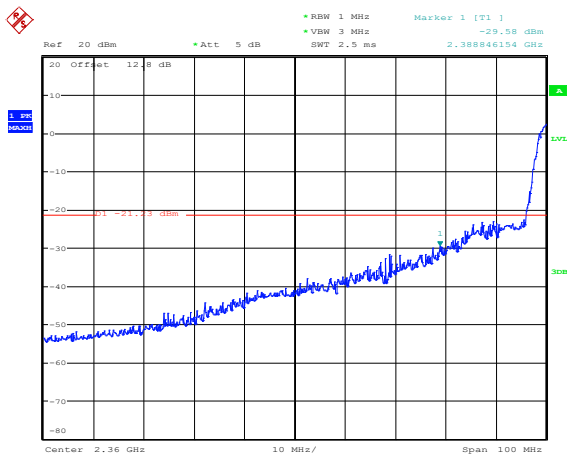


Date: 17.SEP.2020 16:35:31

Plot # 39: Lower Band Edge – Restricted - Peak

802.11n40

CH#2

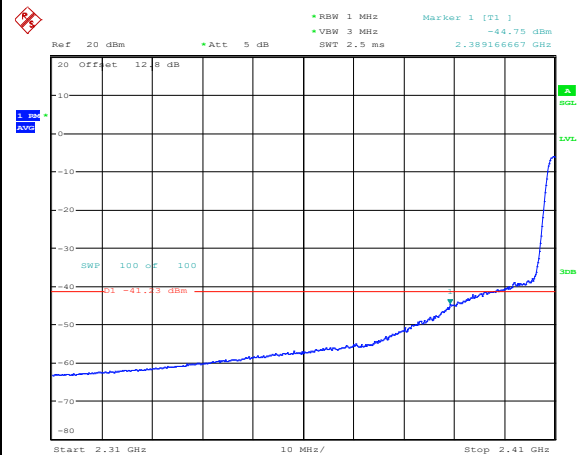


Date: 17.SEP.2020 17:23:52

Plot # 40: Lower Band Edge – Restricted – Average

802.11n40

CH#2

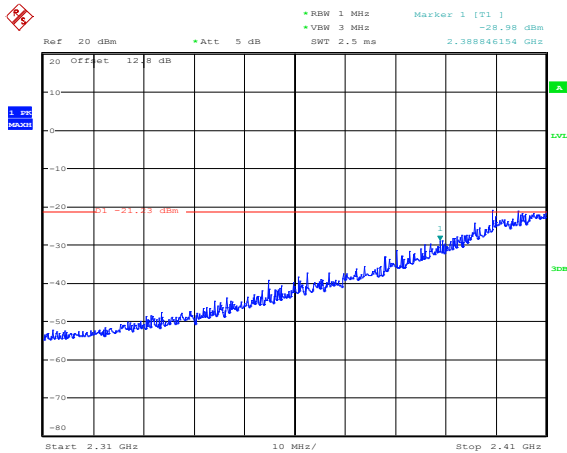


Date: 17.SEP.2020 17:02:55

Plot # 41: Lower Band Edge – Restricted - Peak

802.11n40

CH#3

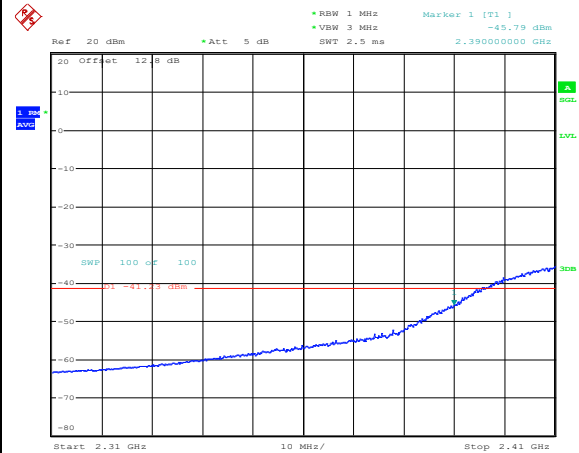


Date: 17.SEP.2020 17:22:22

Plot # 42: Lower Band Edge – Restricted – Average

802.11n40

CH#3

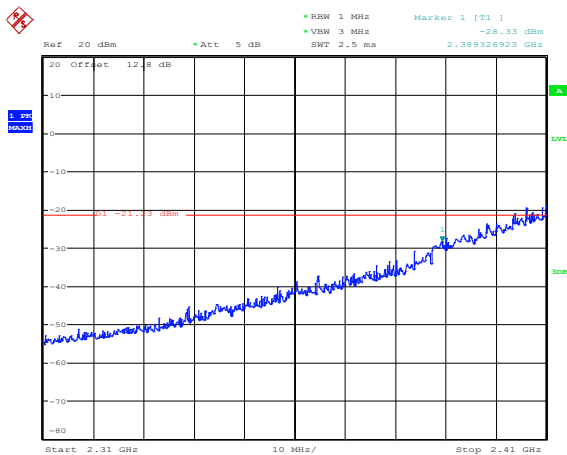


Date: 17.SEP.2020 17:07:26

Plot # 43: Lower Band Edge – Restricted - Peak

802.11n40

CH#4

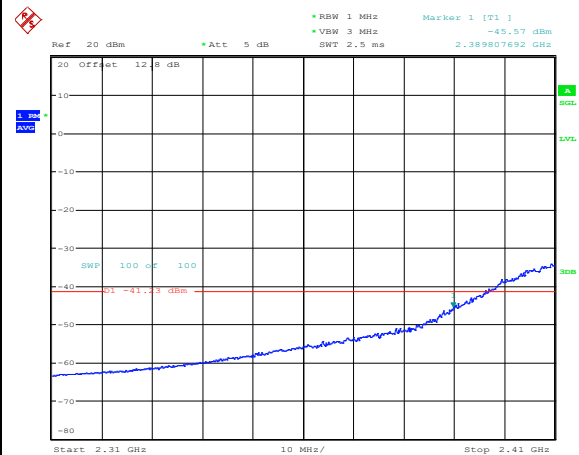


Date: 17.SEP.2020 17:21:18

Plot # 44: Lower Band Edge – Restricted – Average

802.11n40

CH#4

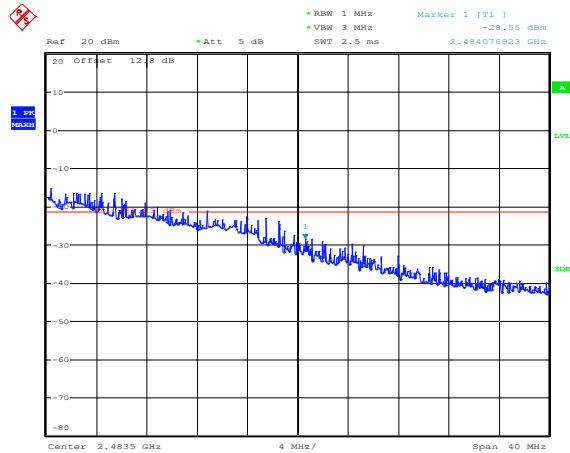


Date: 17.SEP.2020 17:13:30

Plot # 45: Upper Band Edge – Restricted - Peak

802.11n40

CH#5

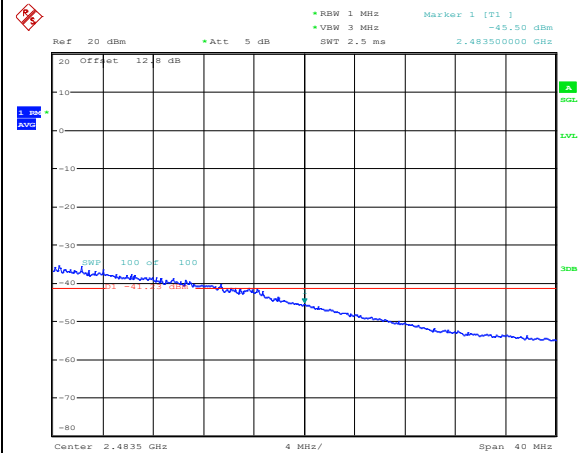


Date: 16.SEP.2020 17:04:59

Plot # 46: Upper Band Edge – Restricted – Average

802.11n40

CH#5

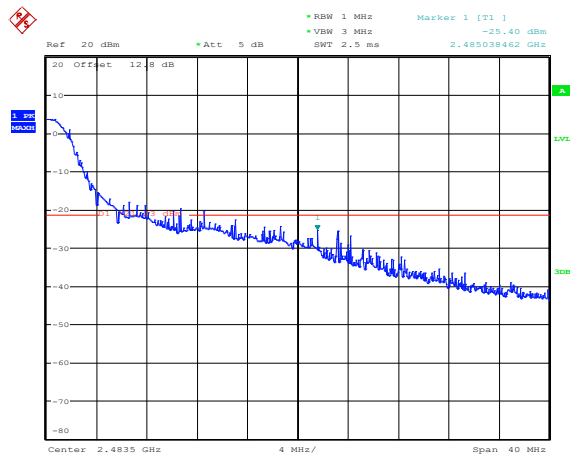


Date: 16.SEP.2020 16:37:02

Plot # 47: Upper Band Edge – Restricted - Peak

802.11n40

CH#6

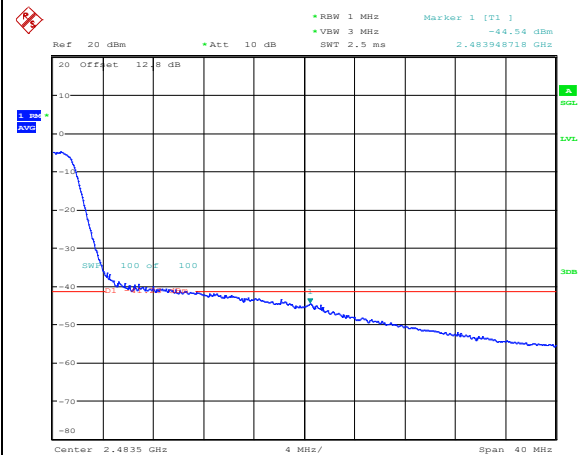


Date: 16.SEP.2020 17:05:50

Plot # 48: Upper Band Edge – Restricted – Average

802.11n40

CH#6

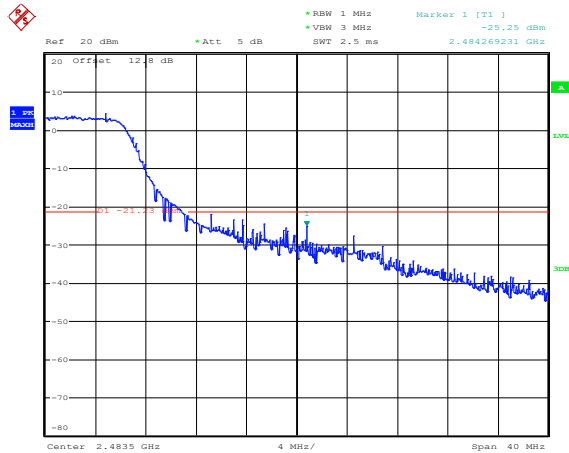


Date: 16.SEP.2020 16:15:04

Plot # 49: Upper Band Edge – Restricted - Peak

802.11n40

CH#7

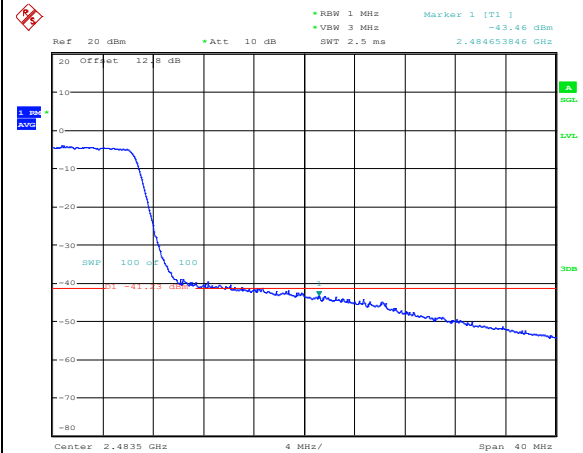


Date: 16.SEP.2020 17:06:40

Plot # 50: Upper Band Edge – Restricted – Average

802.11n40

CH#7



Date: 16.SEP.2020 14:51:36

8.5 Emission Bandwidth 6dB and 99% Occupied Bandwidth

8.5.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

Spectrum Analyzer settings:

6dB (DTS) Bandwidth:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

99% Occupied Bandwidth:

- Set frequency = nominal EUT channel center frequency
- Set Span = 1.5 x to 5.0 x OBW
- Set RBW = 1% to 5% of OBW
- Set the video bandwidth (VBW) $\approx 3 \times$ RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth
- If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

8.5.2 Limits:

FCC §15.247(a)(2) and RSS-247 5.2(a)

- Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.5.3 Test conditions and setup:

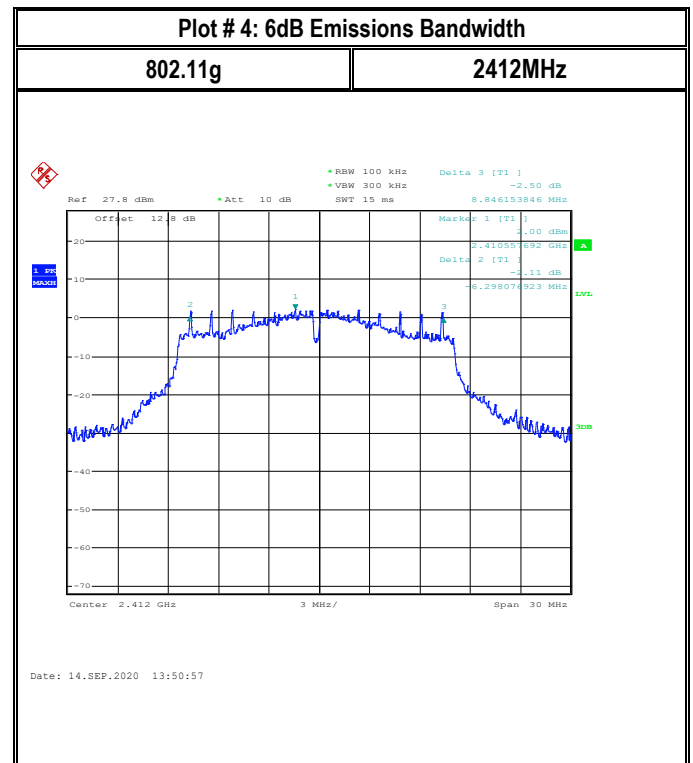
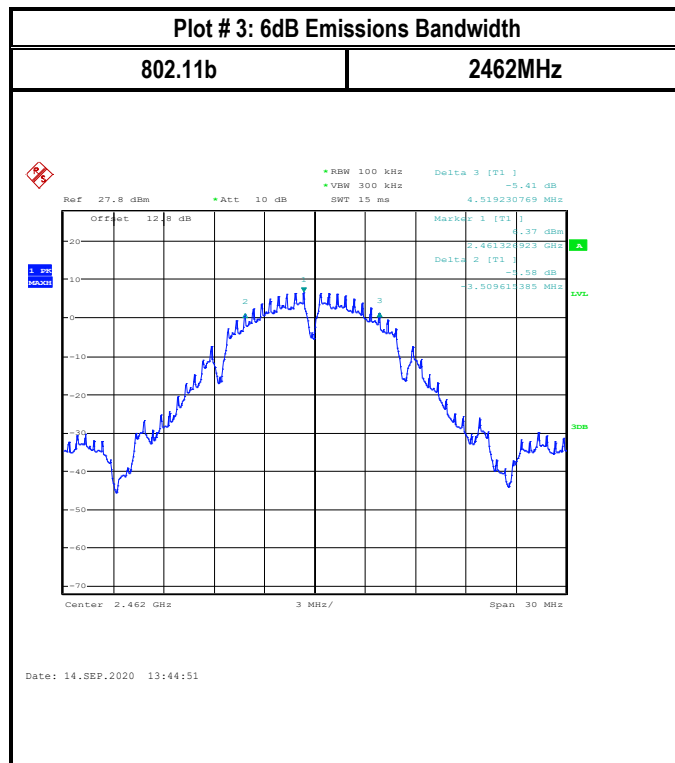
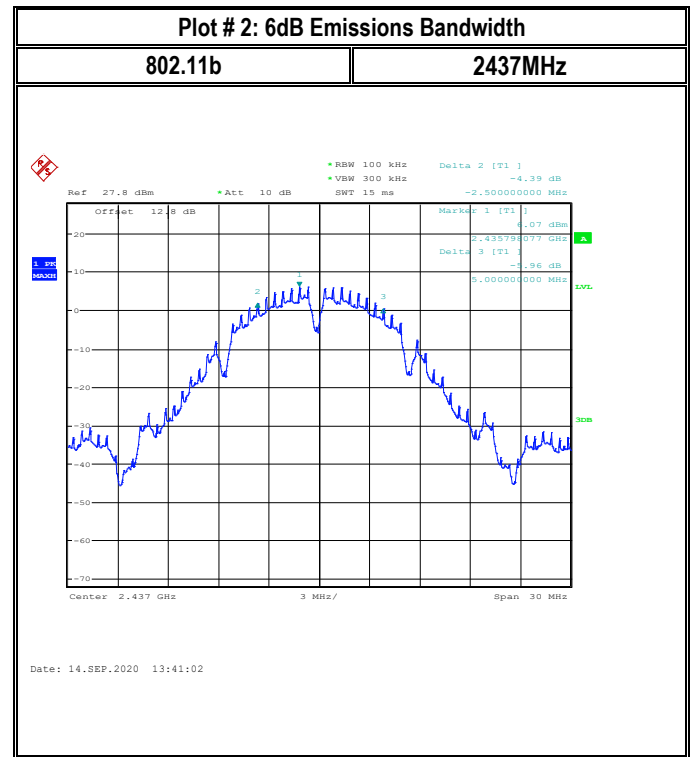
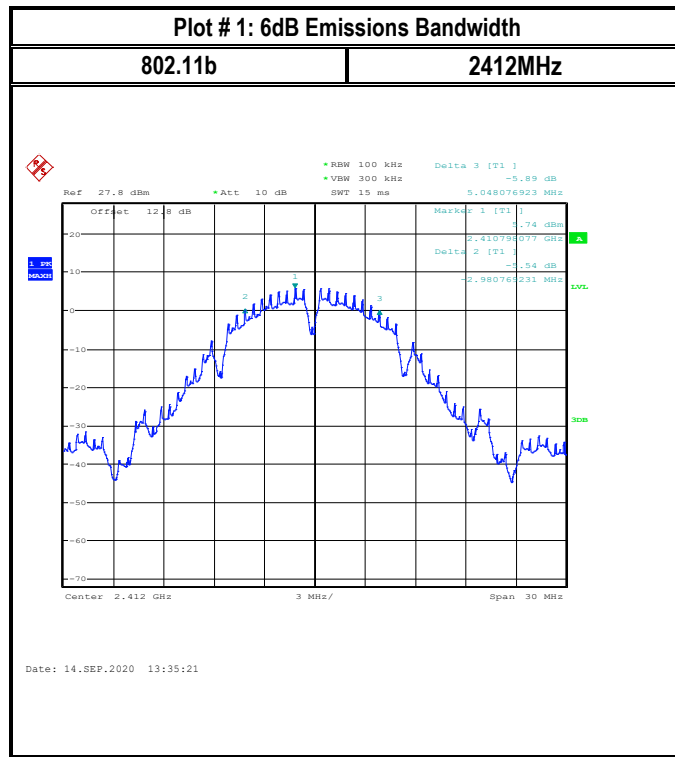
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23.8°C	1	802.11b,g,n	120VAC

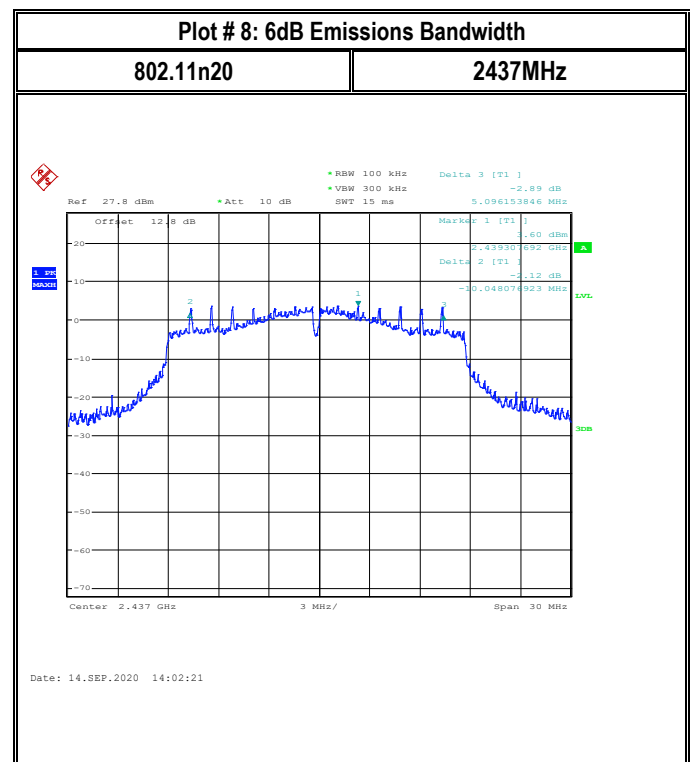
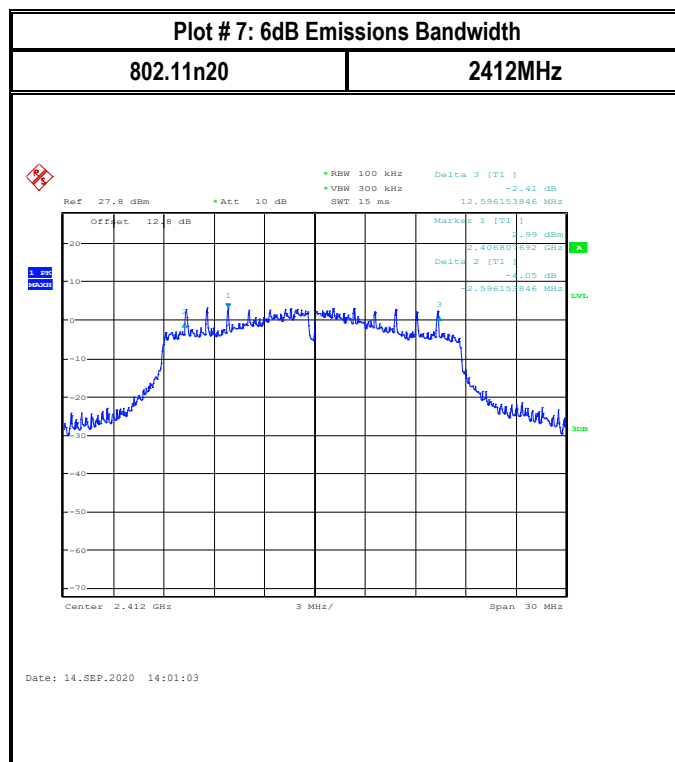
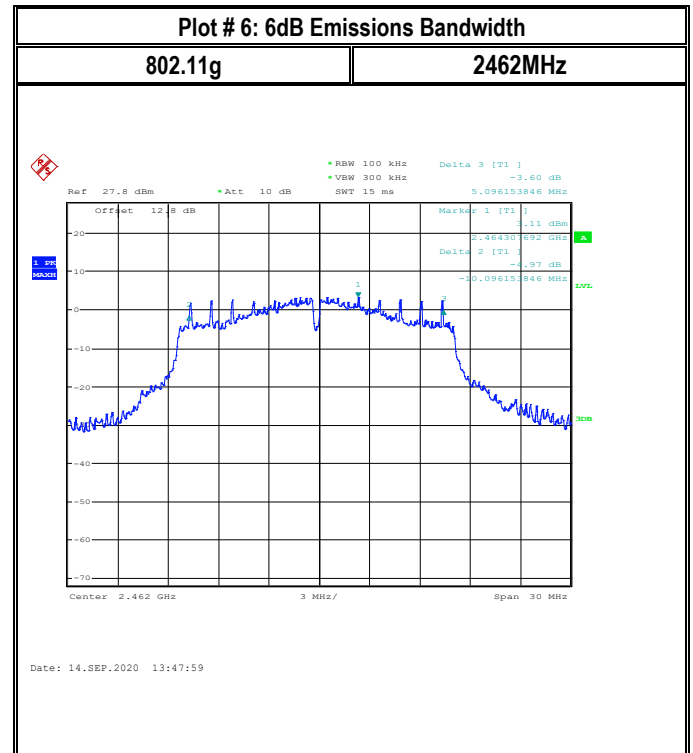
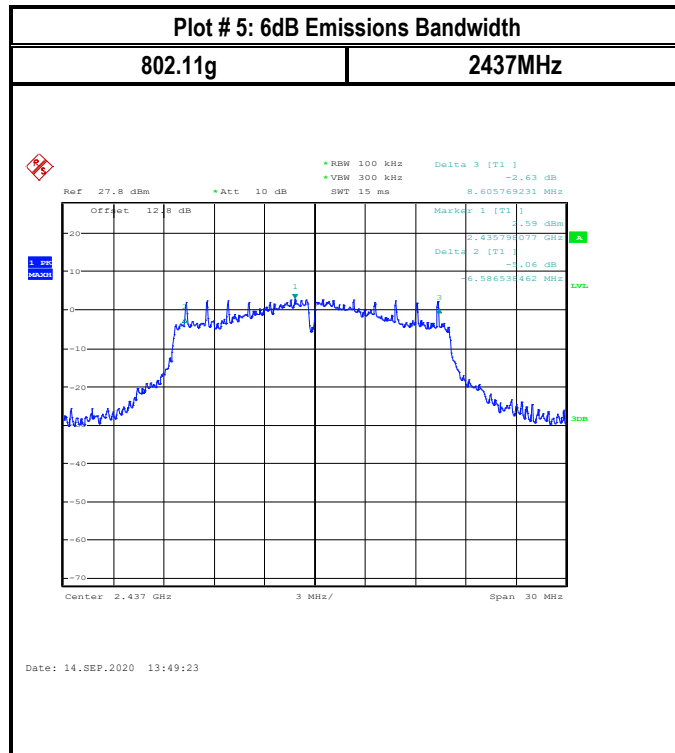
8.5.4 Measurement result:

Plot #	Mode	Data Rate	Channel/Frequency (MHz)			6dB Emissions Bandwidth (MHz)	Limit (MHz)	Result
1	802.11b	1Mbps	Low	1	2412	8.028	> 0.5	Pass
2			Mid	6	2437	7.5	> 0.5	Pass
3			High	11	2462	8.028	> 0.5	Pass
4	802.11g	6Mbps	Low	1	2412	15.144	> 0.5	Pass
5			Mid	6	2437	15.191	> 0.5	Pass
6			High	11	2462	15.192	> 0.5	Pass
7	802.11n20	MCS0	Low	1	2412	15.1856	> 0.5	Pass
8			Mid	6	2437	15.144	> 0.5	Pass
9			High	11	2462	15.144	> 0.5	Pass
10	802.11n40	MCS0	Low	1	2422	35.176	> 0.5	Pass
11			Mid	4	2437	35.176	> 0.5	Pass
12			High	7	2452	35.176	> 0.5	Pass

Plot #	Mode	Data Rate	Channel/Frequency (MHz)			99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
13	802.11b	1Mbps	Low	1	2412	12.067	> 0.5	Pass
14			Mid	6	2437	11.923	> 0.5	Pass
15			High	11	2462	11.923	> 0.5	Pass
16	802.11g	6Mbps	Low	1	2412	16.586	> 0.5	Pass
17			Mid	6	2437	16.586	> 0.5	Pass
18			High	11	2462	16.49	> 0.5	Pass
19	802.11n20	MCS0	Low	1	2412	17.884	> 0.5	Pass
20			Mid	6	2437	17.884	> 0.5	Pass
21			High	11	2462	17.836	> 0.5	Pass
22	802.11n40	MCS0	Low	1	2422	36.73	> 0.5	Pass
23			Mid	4	2437	36.826	> 0.5	Pass
24			High	71	2452	36.73	> 0.5	Pass

8.5.5 Measurement Plots:

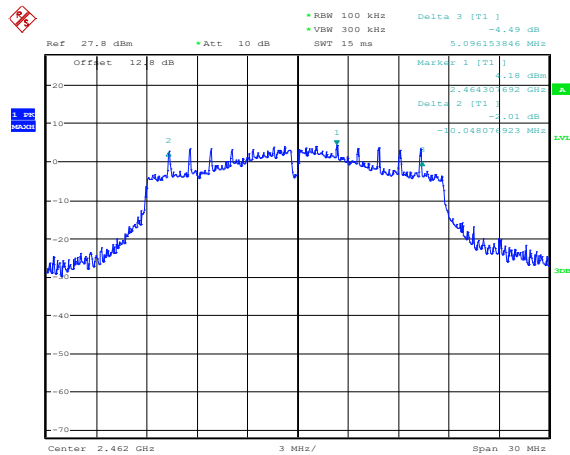




Plot # 9: 6dB Emissions Bandwidth

802.11n20

2462MHz

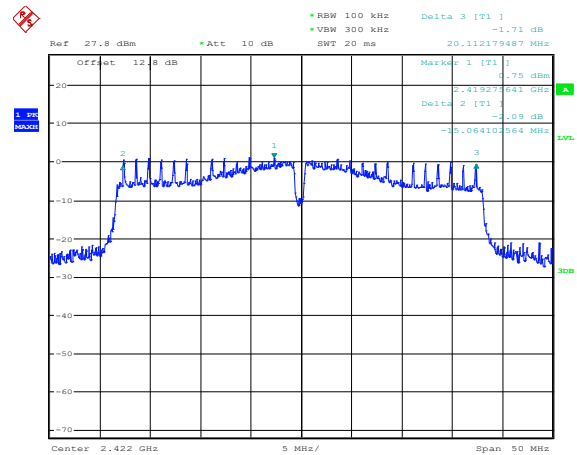


Date: 14.SEP.2020 14:03:33

Plot # 10: 6dB Emissions Bandwidth

802.11n40

2422MHz

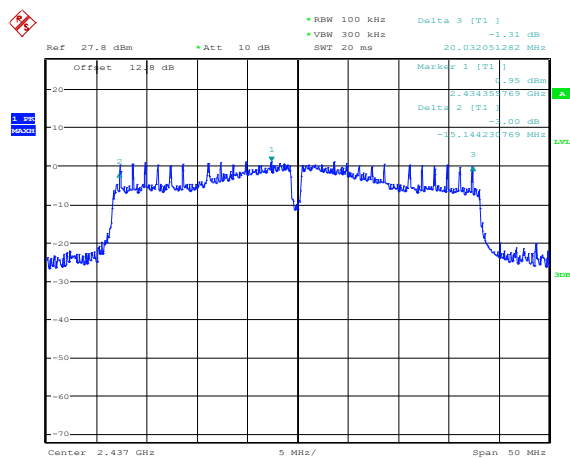


Date: 14.SEP.2020 14:06:22

Plot # 11: 6dB Emissions Bandwidth

802.11n40

2437MHz

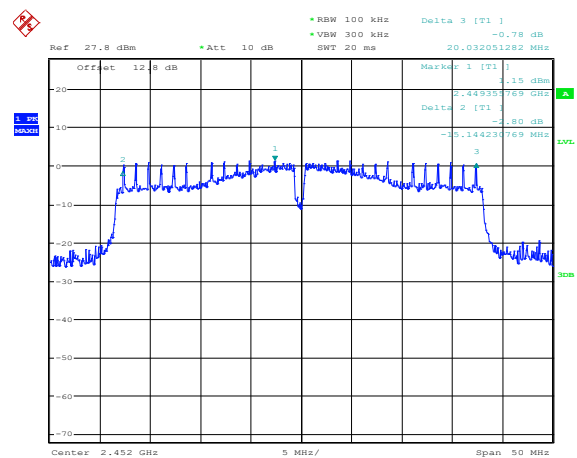


Date: 14.SEP.2020 14:08:18

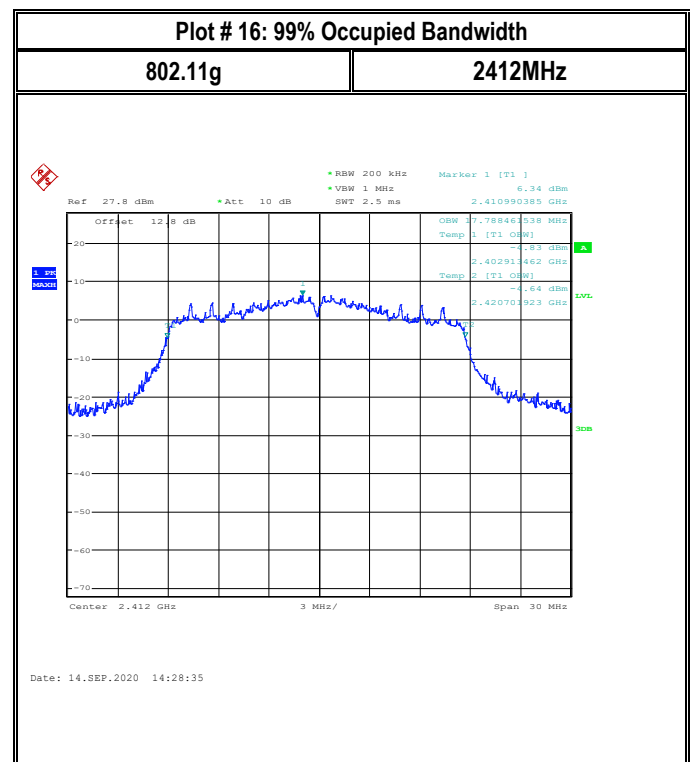
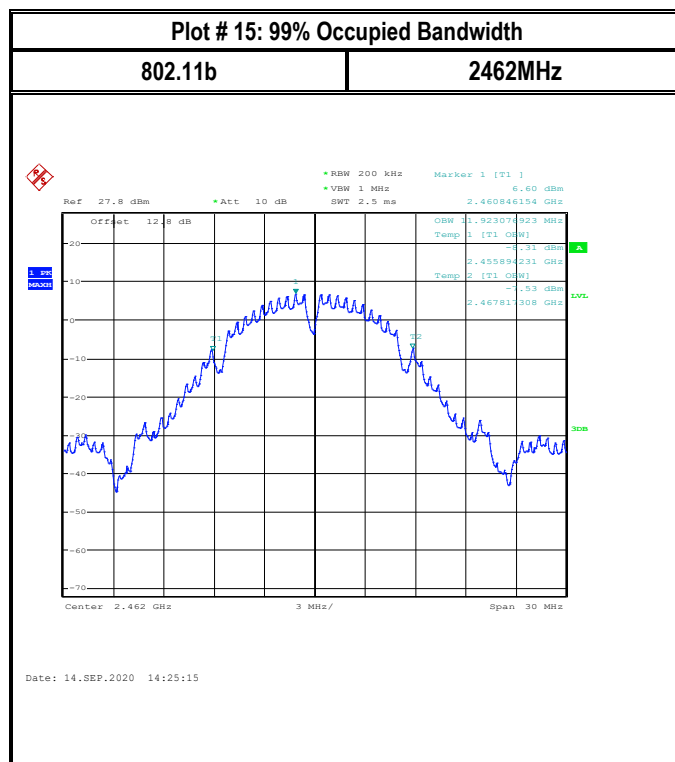
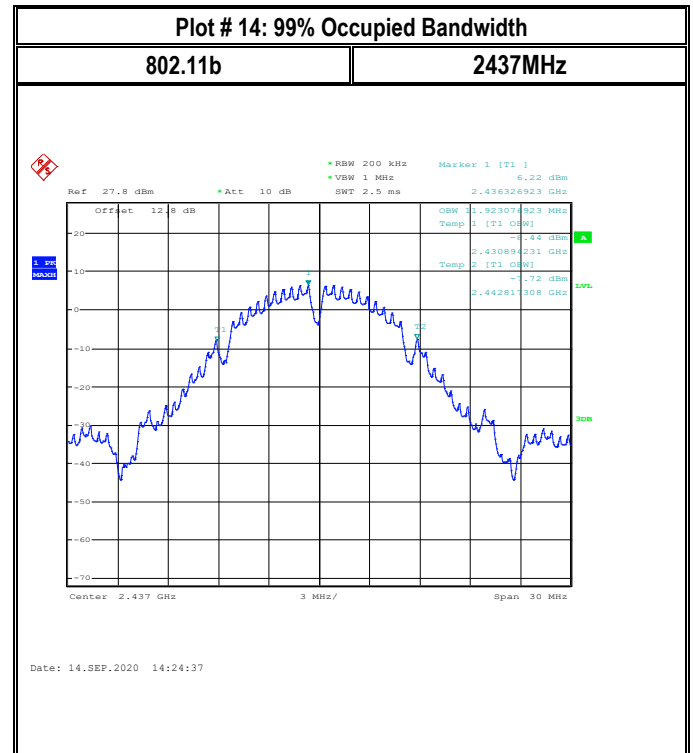
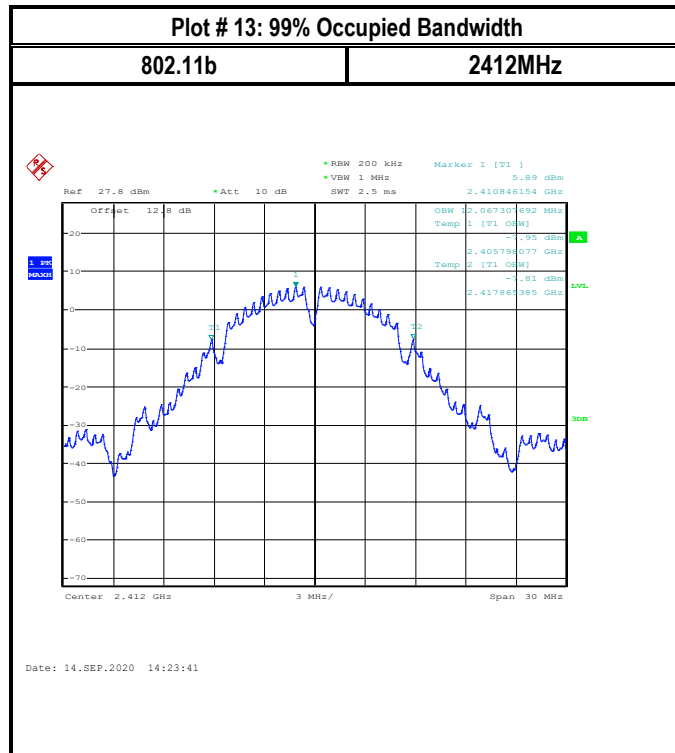
Plot # 12: 6dB Emissions Bandwidth

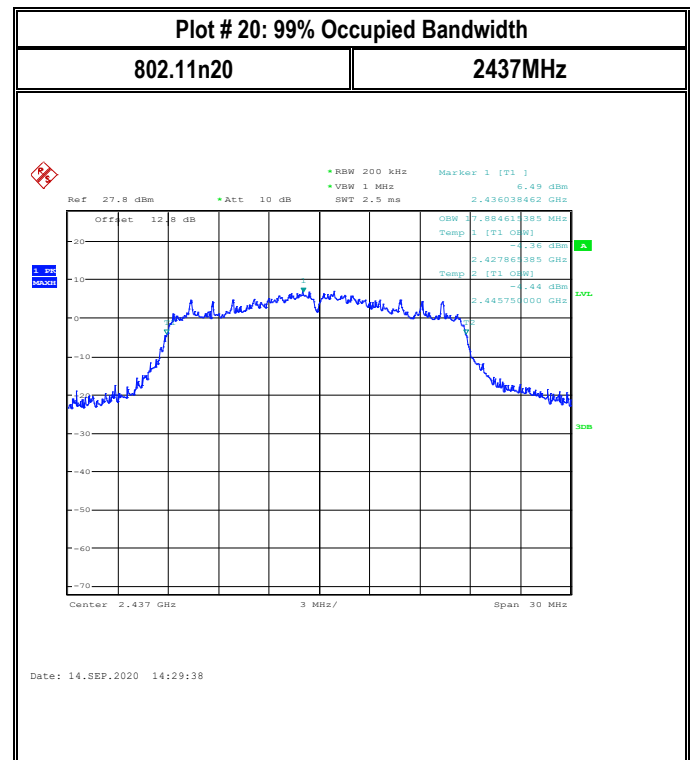
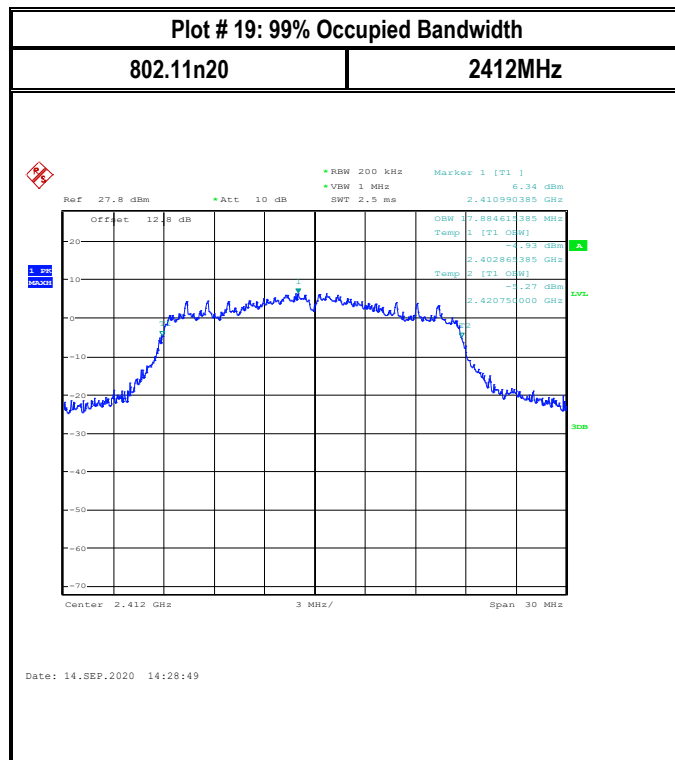
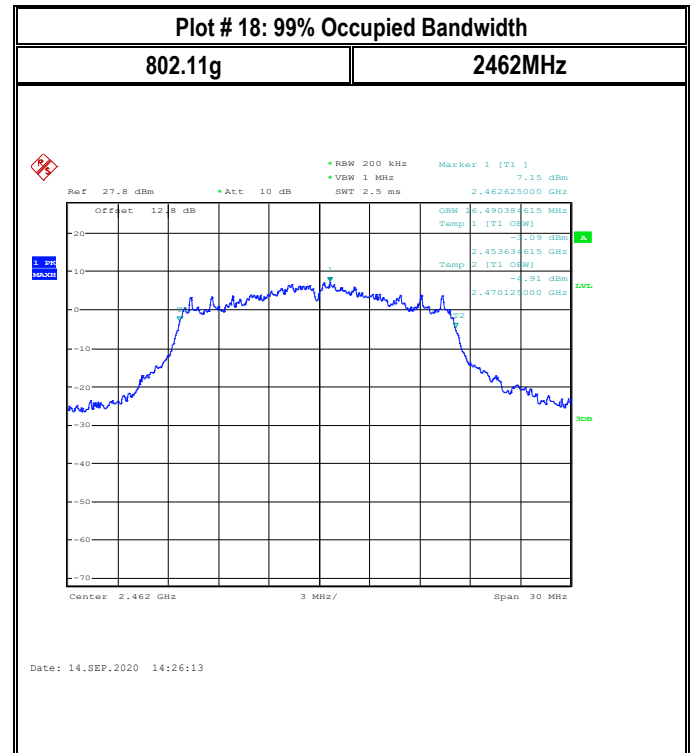
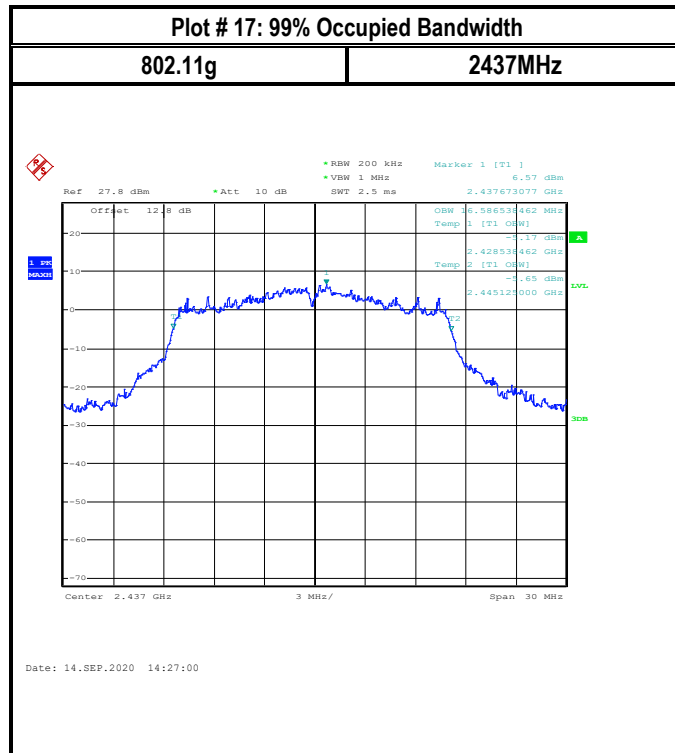
802.11n40

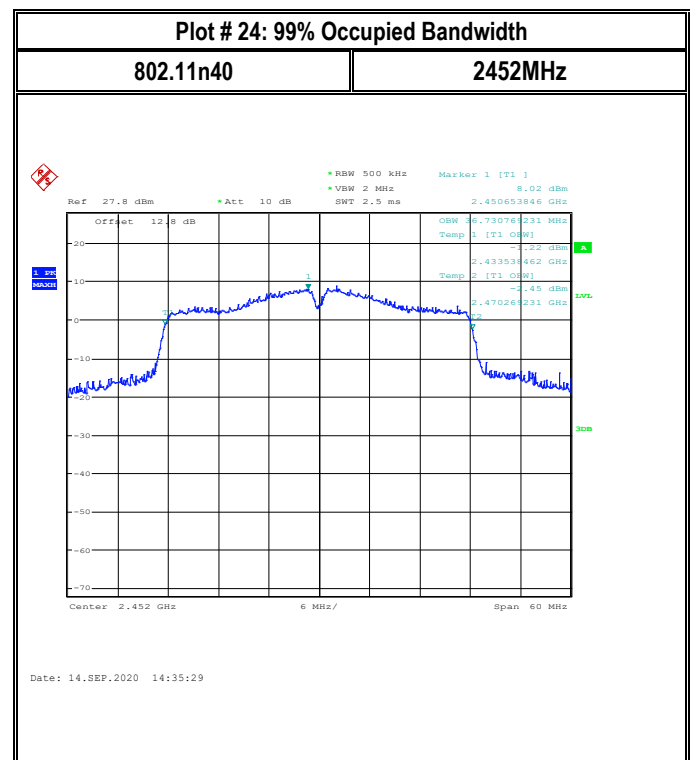
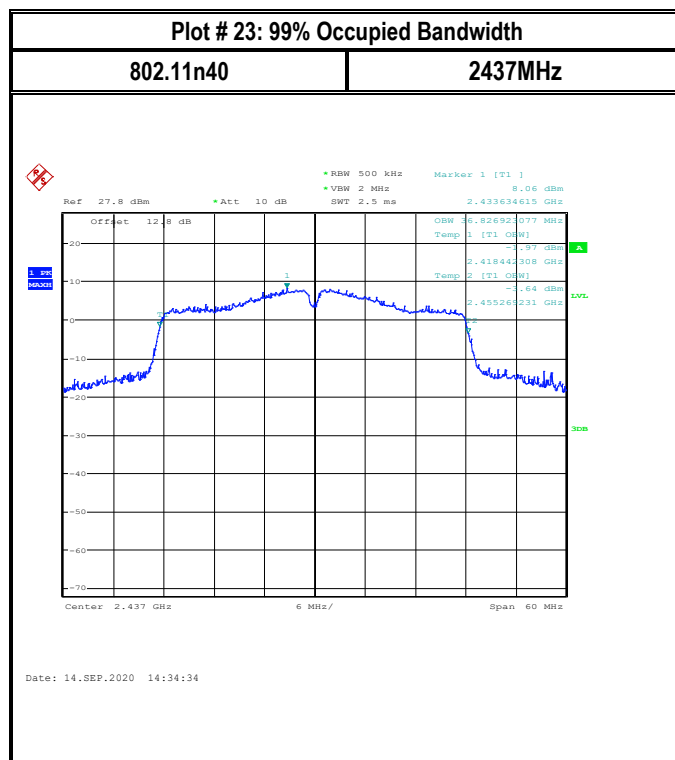
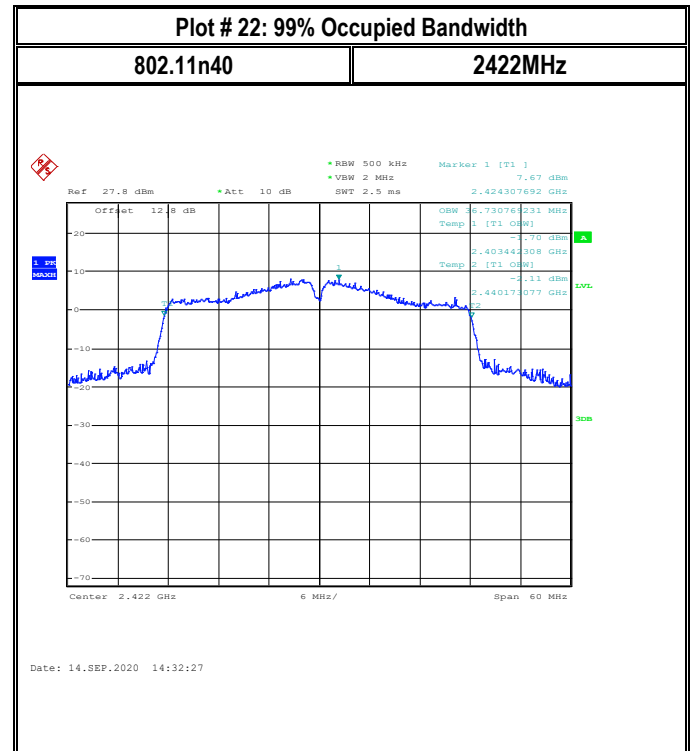
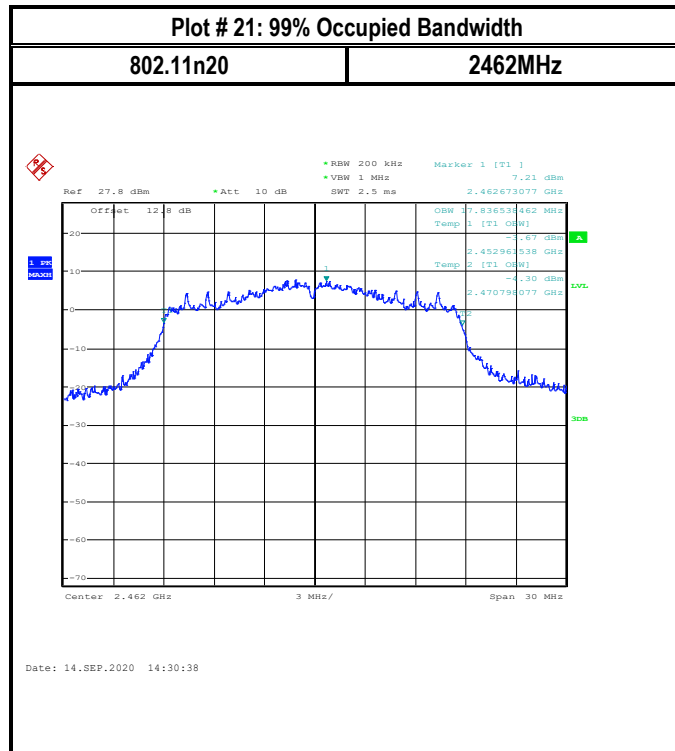
2452MHz



Date: 14.SEP.2020 14:09:48







8.6 Radiated Transmitter Spurious Emissions and Restricted Bands

8.6.1 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.

8.6.2 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

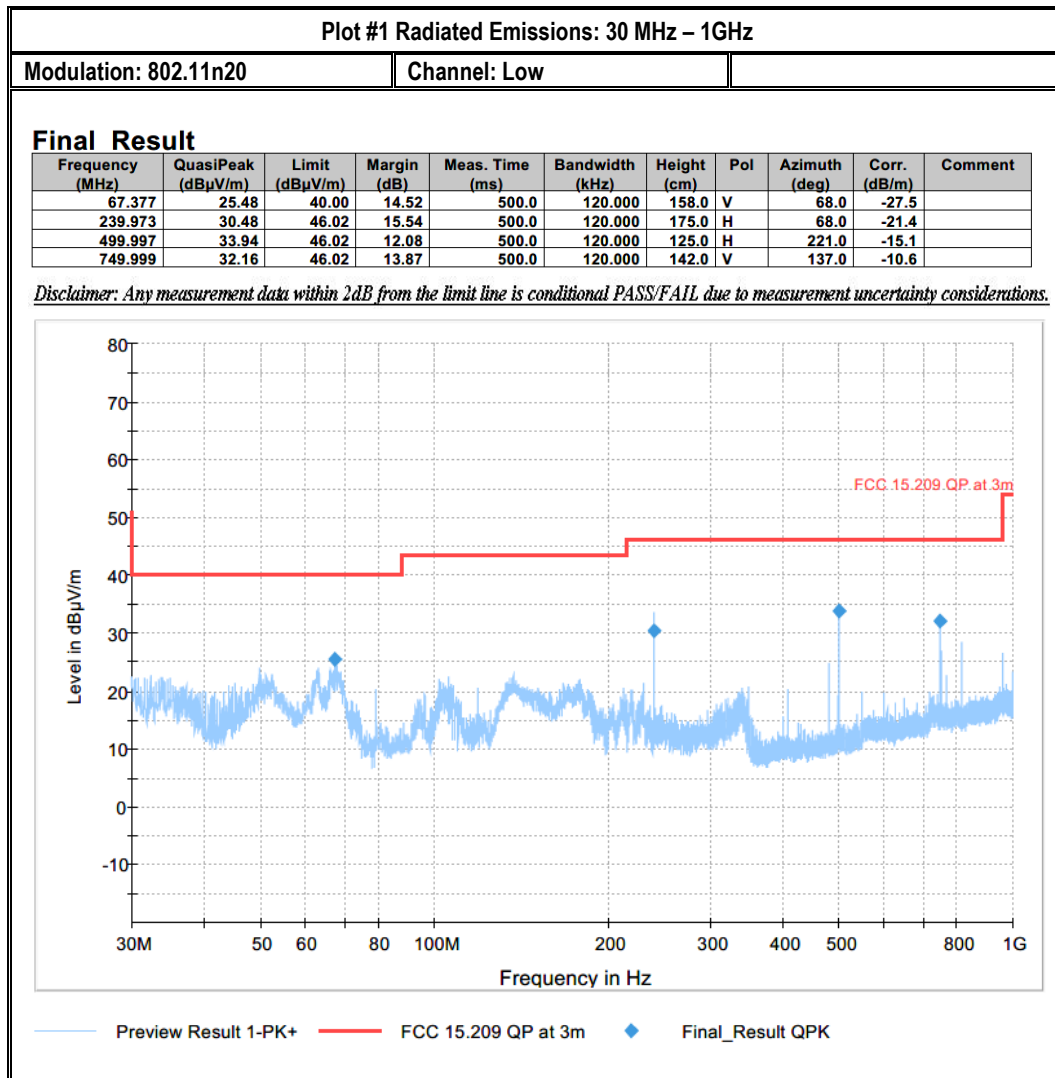
8.6.3 Test conditions and setup:

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

8.6.4 Measurement result:

Plot #	Mode	Channel #	Scan Frequency	Limit	Result
1-3	N20	Low	30 MHz – 18 GHz	See section 8.6.2	Pass
4-8	N20	Mid	9 kHz – 26 GHz	See section 8.6.2	Pass
9-11	N20	High	30 MHz – 18 GHz	See section 8.6.2	Pass
12-14	N40	Low	30 MHz – 18 GHz	See section 8.6.2	Pass
15-19	N40	Mid	9 kHz – 26 GHz	See section 8.6.2	Pass
20-22	N40	High	30 MHz – 18 GHz	See section 8.6.2	Pass

8.6.5 Measurement Plots:

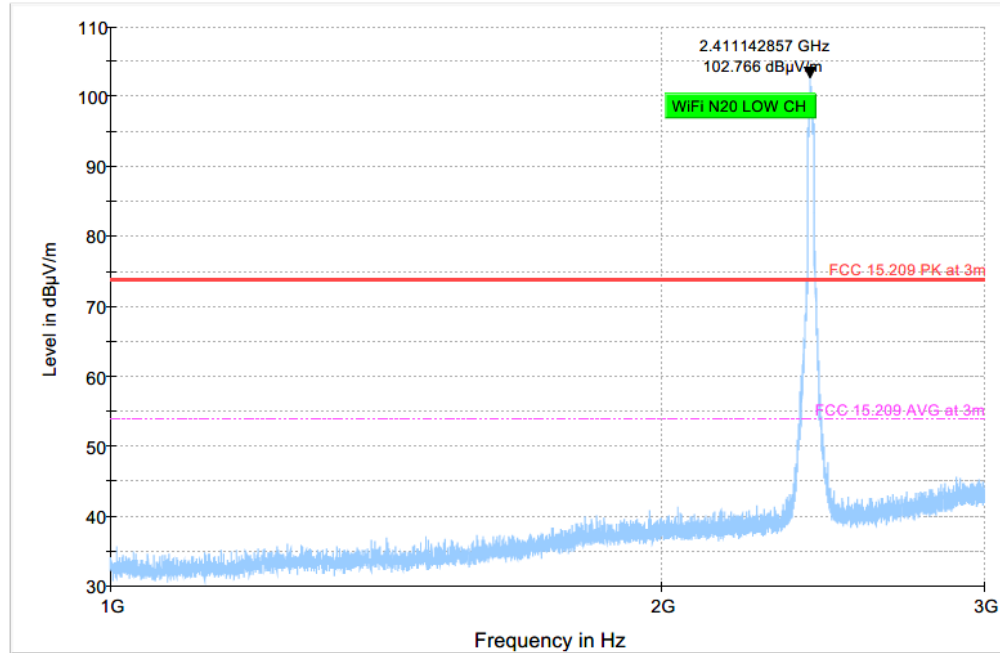


Plot # 2 Radiated Emissions: 1-3 GHz

Modulation: 802.11n20

Channel: Low

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

* Critical_Freqs PK+
◆ Final_Result PK+

— FCC 15.209 PK at 3m
◆ Final_Result CAV

Plot # 3 Radiated Emissions: 3-18 GHz

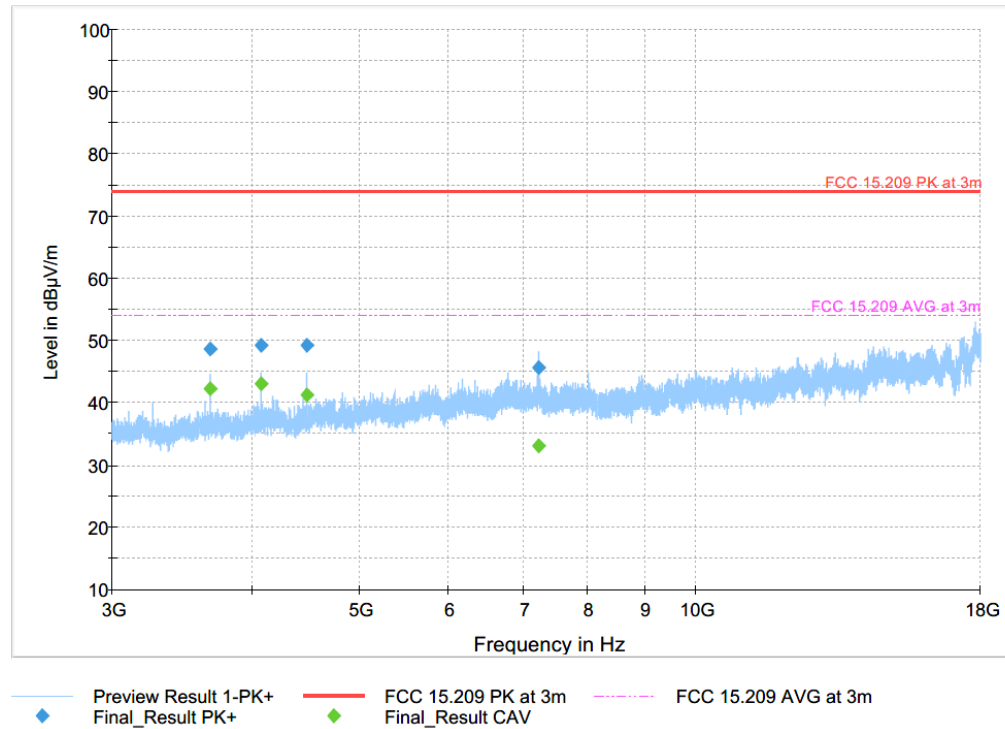
Modulation: 802.11n20

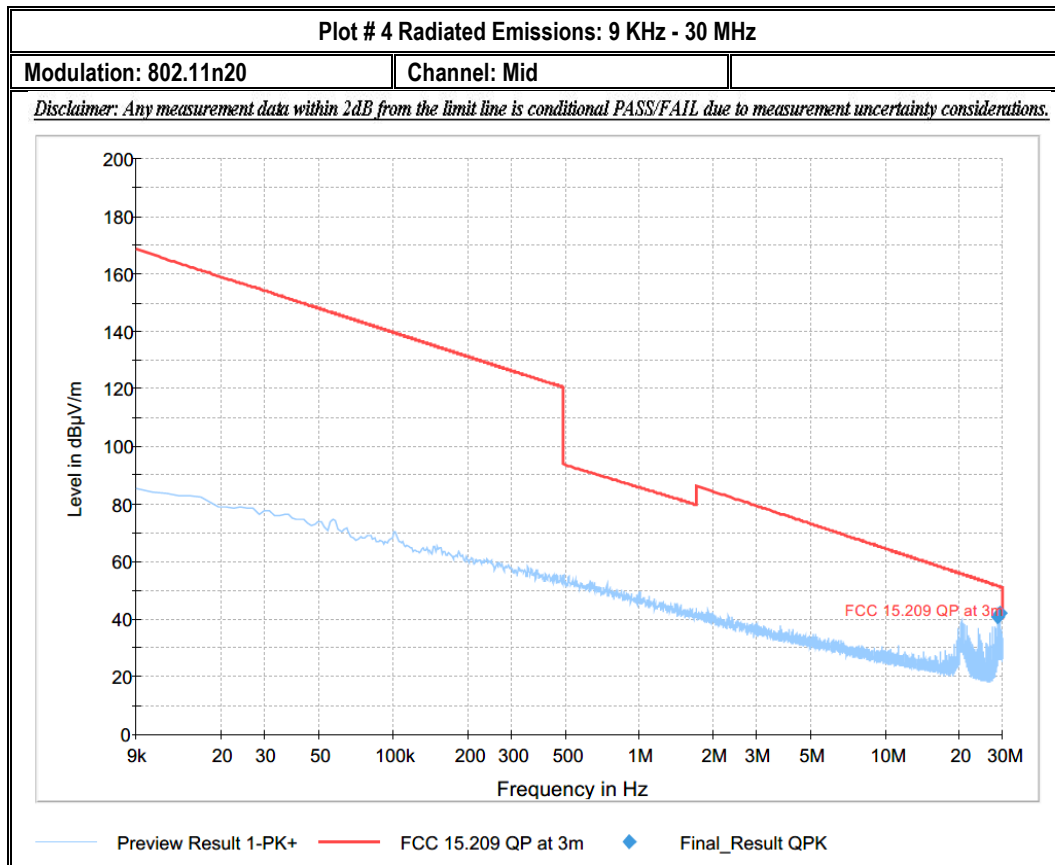
Channel: Low

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
3671.750	48.54	---	73.98	25.44	500.0	1000.000	305.0	V	304.0	-6.9	
3671.750	---	42.27	53.98	11.71	500.0	1000.000	305.0	V	304.0	-6.9	
4079.750	49.16	---	73.98	24.82	500.0	1000.000	274.0	V	299.0	-5.6	
4079.750	---	43.02	53.98	10.96	500.0	1000.000	274.0	V	299.0	-5.6	
4487.750	49.20	---	73.98	24.78	500.0	1000.000	313.0	V	-16.0	-5.3	
4487.750	---	41.23	53.98	12.75	500.0	1000.000	313.0	V	-16.0	-5.3	
7237.500	45.57	---	73.98	28.41	500.0	1000.000	100.0	H	329.0	-1.8	
7237.500	---	33.11	53.98	20.87	500.0	1000.000	100.0	H	329.0	-1.8	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.





Plot #5 Radiated Emissions: 30 MHz – 1GHz

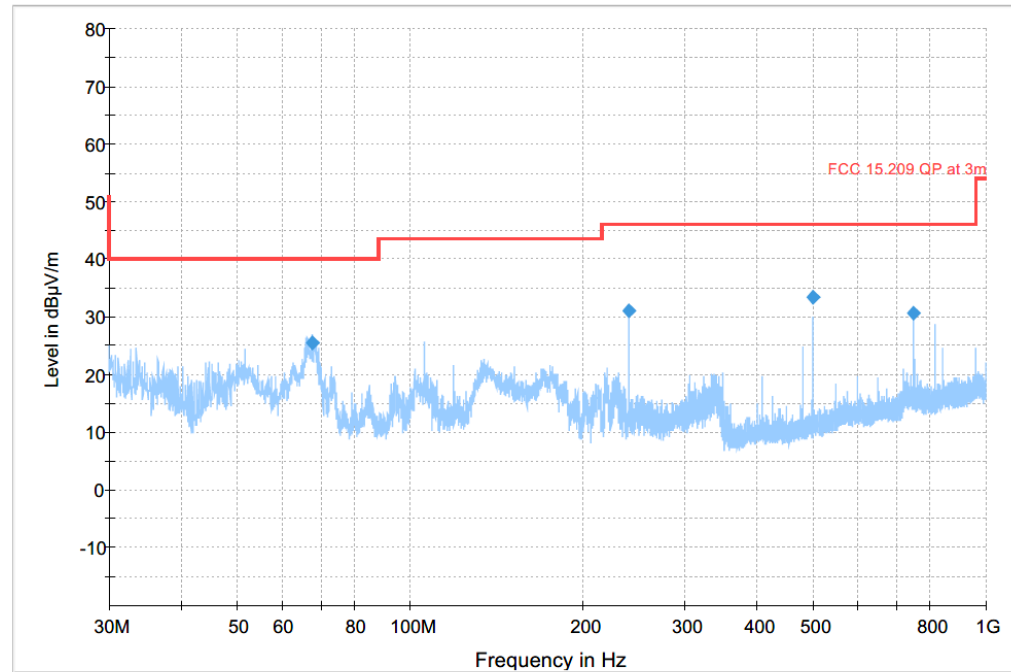
Modulation: 802.11n20

Channel: Mid

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
67.636	25.56	40.00	14.44	500.0	120.000	151.0	V	32.0	-27.5	
239.973	31.00	46.02	15.02	500.0	120.000	140.0	H	63.0	-21.4	
499.997	33.47	46.02	12.55	500.0	120.000	239.0	V	170.0	-15.7	
749.999	30.59	46.02	15.43	500.0	120.000	315.0	H	81.0	-10.8	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



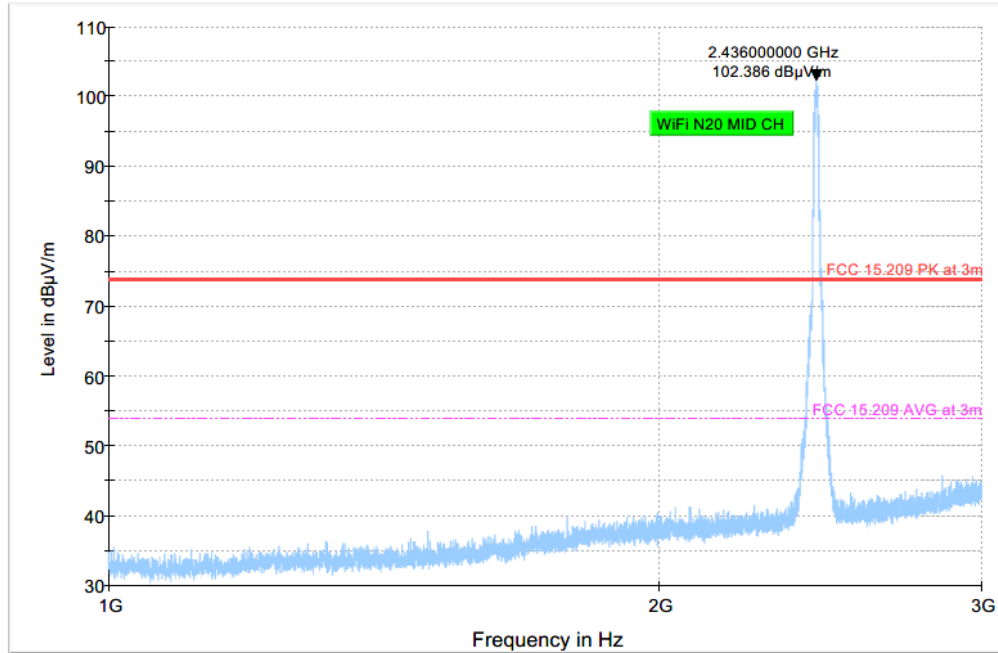
— Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final_Result QPK

Plot #6 Radiated Emissions: 1-3 GHz

Modulation: 802.11n20

Channel: Mid

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

Plot #7 Radiated Emissions: 3-18 GHz

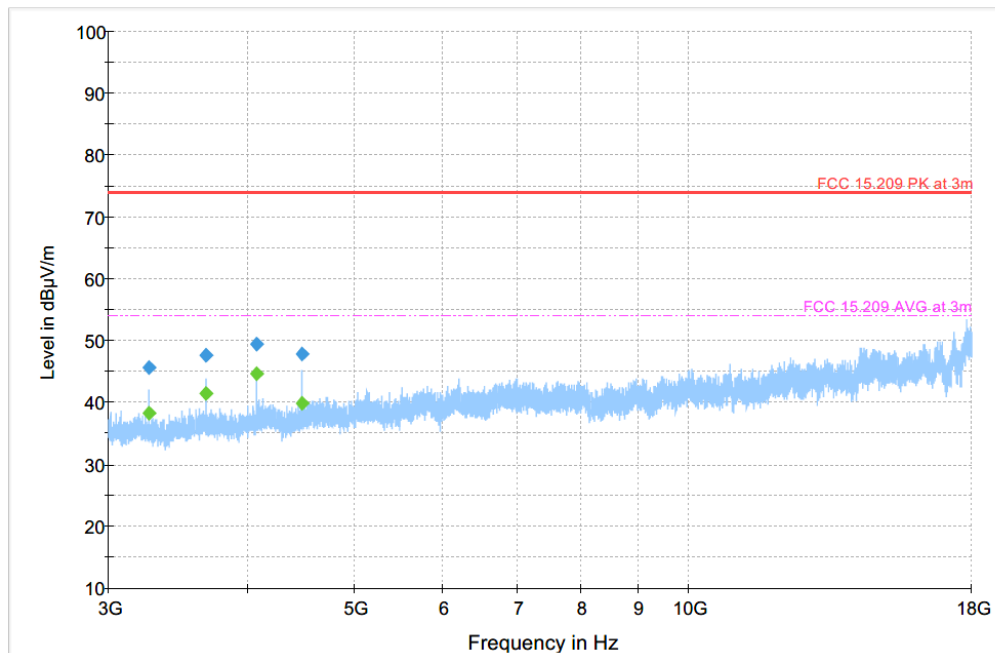
Modulation: 802.11n20

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
3263.750	---	38.37	53.98	15.61	500.0	1000.000	142.0	V	295.0	-8.9	
3263.750	45.57	---	73.98	28.41	500.0	1000.000	142.0	V	295.0	-8.9	
3671.750	---	41.52	53.98	12.46	500.0	1000.000	253.0	V	290.0	-6.9	
3671.750	47.68	---	73.98	26.30	500.0	1000.000	253.0	V	290.0	-6.9	
4080.000	49.48	---	73.98	24.50	500.0	1000.000	254.0	V	306.0	-5.6	
4080.000	---	44.65	53.98	9.33	500.0	1000.000	254.0	V	306.0	-5.6	
4487.750	47.87	---	73.98	26.11	500.0	1000.000	116.0	V	-20.0	-5.3	
4487.750	---	39.86	53.98	14.12	500.0	1000.000	116.0	V	-20.0	-5.3	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Preview Result 1-PK+
Final Result PK+

FCC 15.209 PK at 3m
Final Result CAV

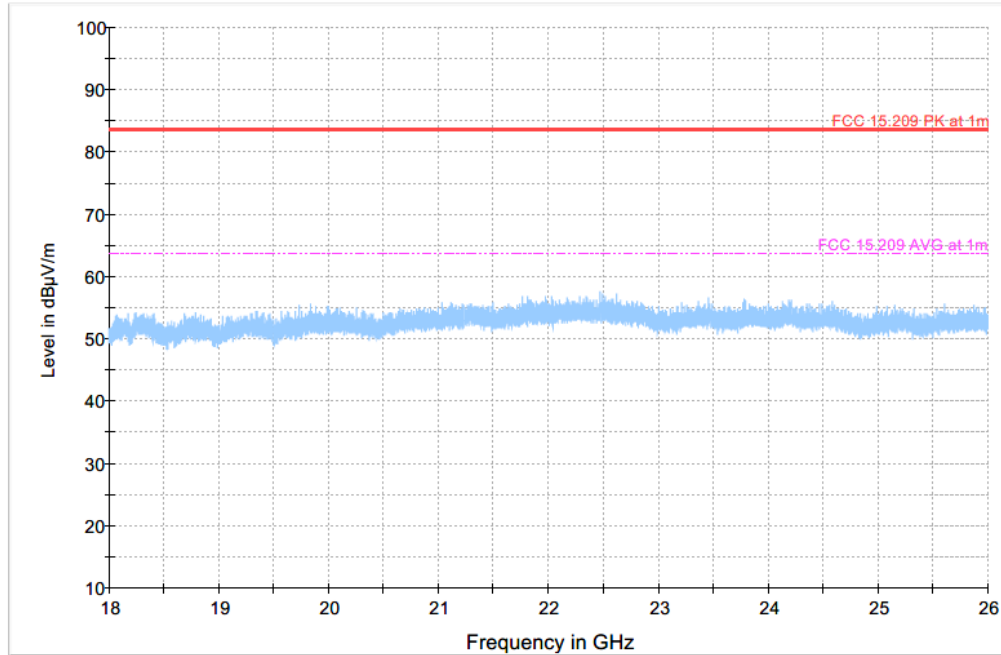
FCC 15.209 AVG at 3m

Plot #8 Radiated Emissions: 18-26 GHz

Modulation: 802.11n20

Channel: Mid

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

Plot #9 Radiated Emissions: 30 MHz – 1GHz

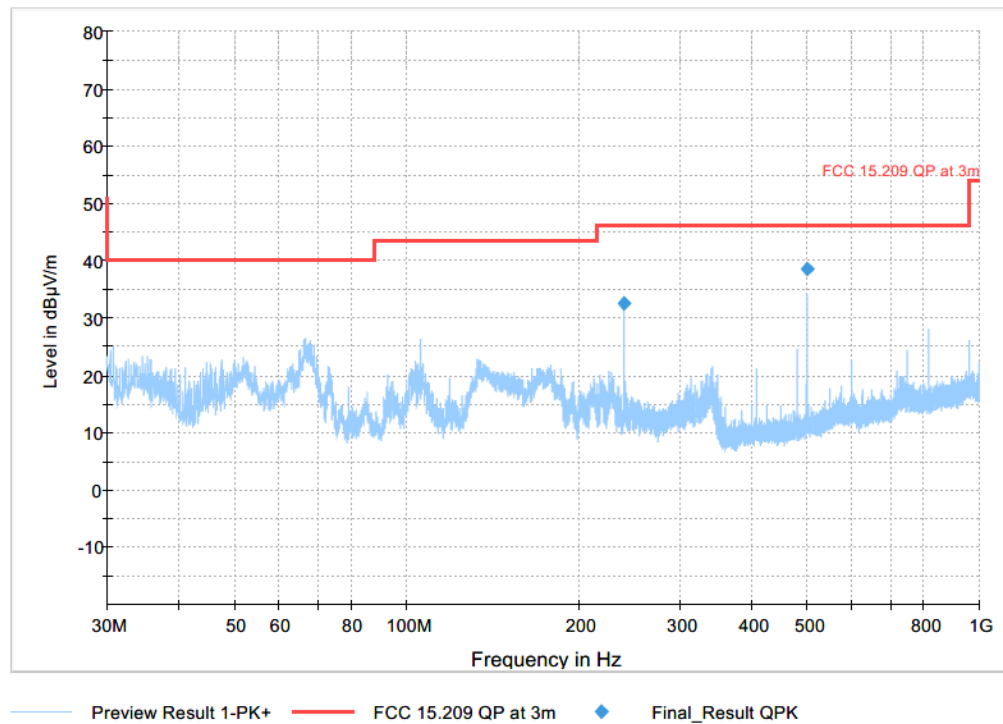
Modulation: 802.11n20

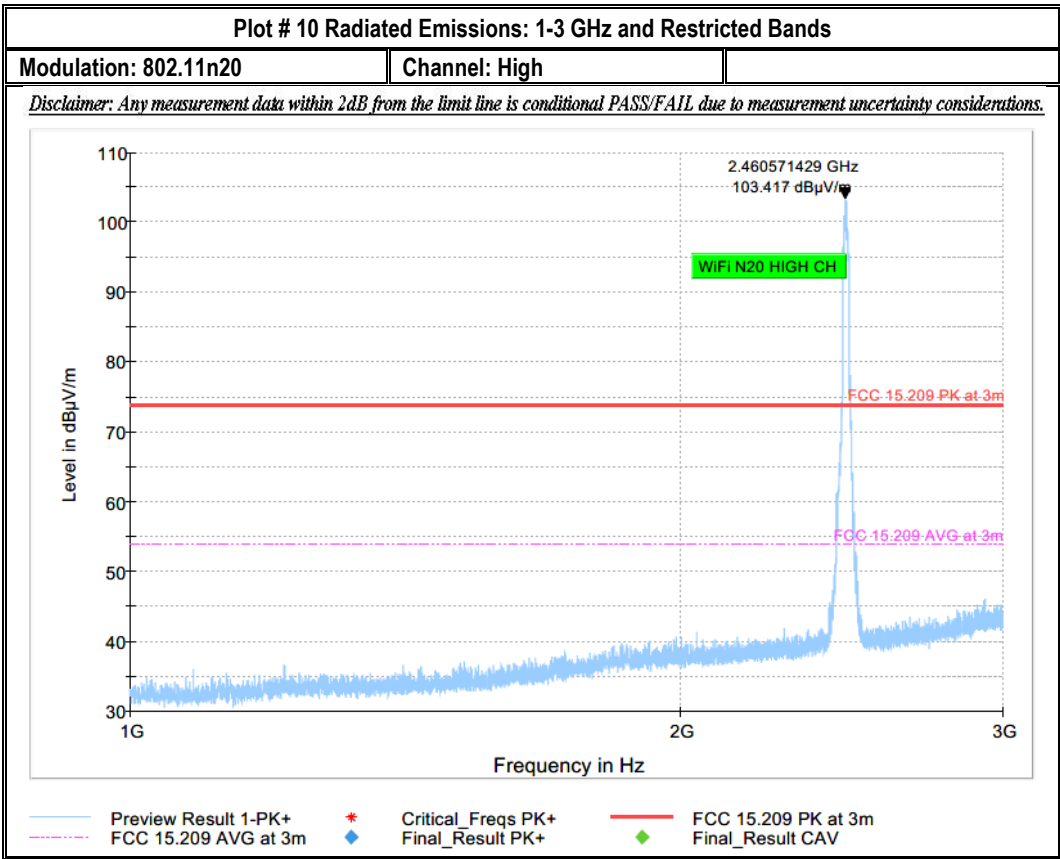
Channel: High

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
239.973	32.68	46.02	13.35	500.0	120.000	177.0	H	69.0	-21.4	
499.997	38.49	46.02	7.53	500.0	120.000	184.0	H	57.0	-15.1	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.





Plot #11 Radiated Emissions: 3-18 GHz

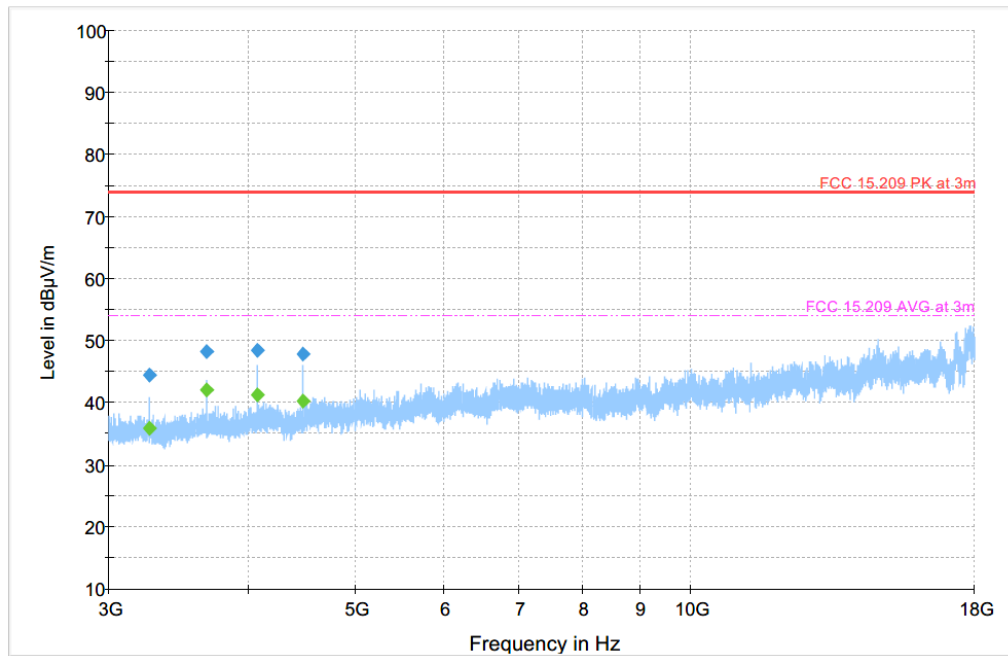
Modulation: 802.11n20

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
3263.750	---	35.85	53.98	18.13	500.0	1000.000	107.0	V	284.0	-8.9	
3263.750	44.35	---	73.98	29.63	500.0	1000.000	107.0	V	284.0	-8.9	
3671.750	---	42.04	53.98	11.94	500.0	1000.000	194.0	V	305.0	-6.9	
3671.750	48.18	---	73.98	25.79	500.0	1000.000	194.0	V	305.0	-6.9	
4079.750	48.39	---	73.98	25.59	500.0	1000.000	159.0	V	299.0	-5.6	
4079.750	---	41.25	53.98	12.73	500.0	1000.000	159.0	V	299.0	-5.6	
4487.750	47.79	---	73.98	26.19	500.0	1000.000	224.0	V	-15.0	-5.3	
4487.750	---	40.26	53.98	13.72	500.0	1000.000	224.0	V	-15.0	-5.3	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

Plot #12 Radiated Emissions: 30 MHz – 1GHz

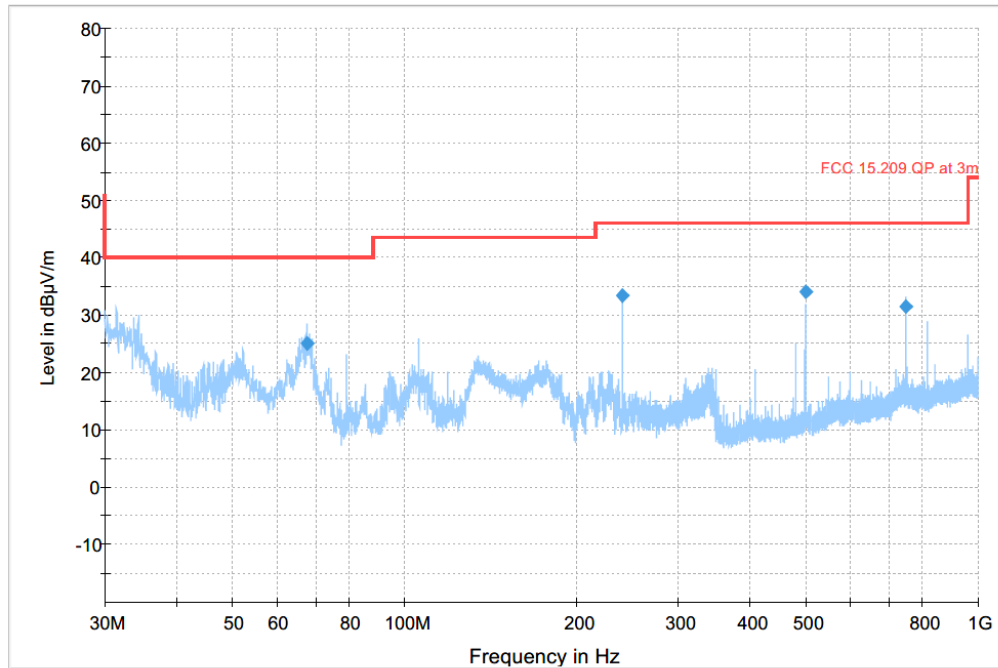
Modulation: 802.11n40

Channel: Low

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
67.539	25.09	40.00	14.91	500.0	120.000	116.0	V	17.0	-27.5	
239.973	33.47	46.02	12.55	500.0	120.000	143.0	H	80.0	-21.4	
499.997	34.04	46.02	11.98	500.0	120.000	137.0	H	140.0	-15.1	
749.999	31.52	46.02	14.50	500.0	120.000	302.0	V	-8.0	-10.6	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



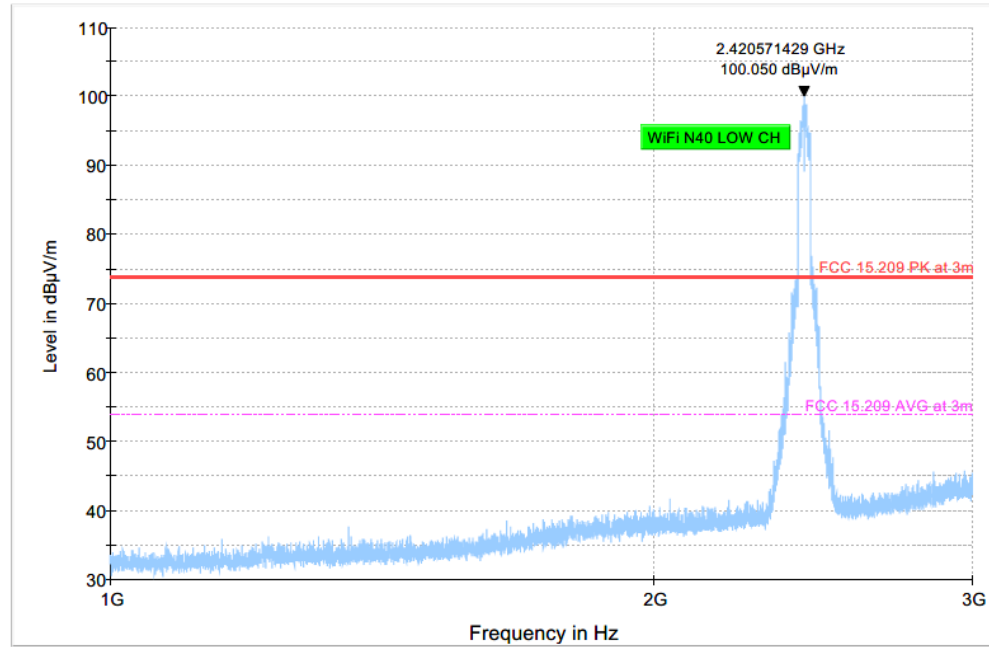
— Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final_Result QPK

Plot # 13 Radiated Emissions: 1-3 GHz

Modulation: 802.11n40

Channel: Low

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

Plot # 14 Radiated Emissions: 3-18 GHz

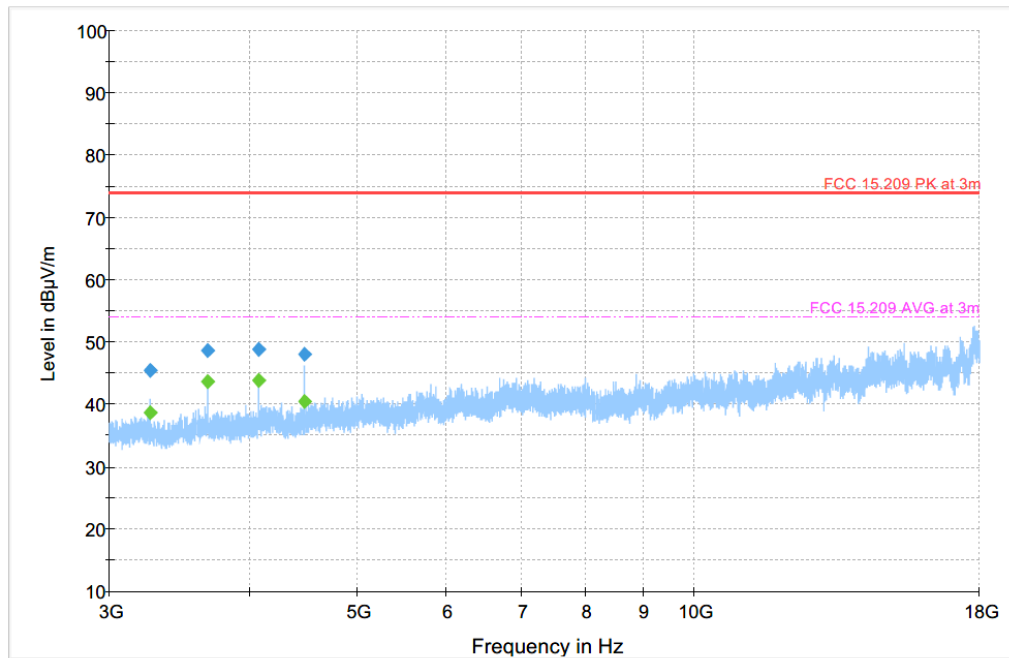
Modulation: 802.11n40

Channel: Low

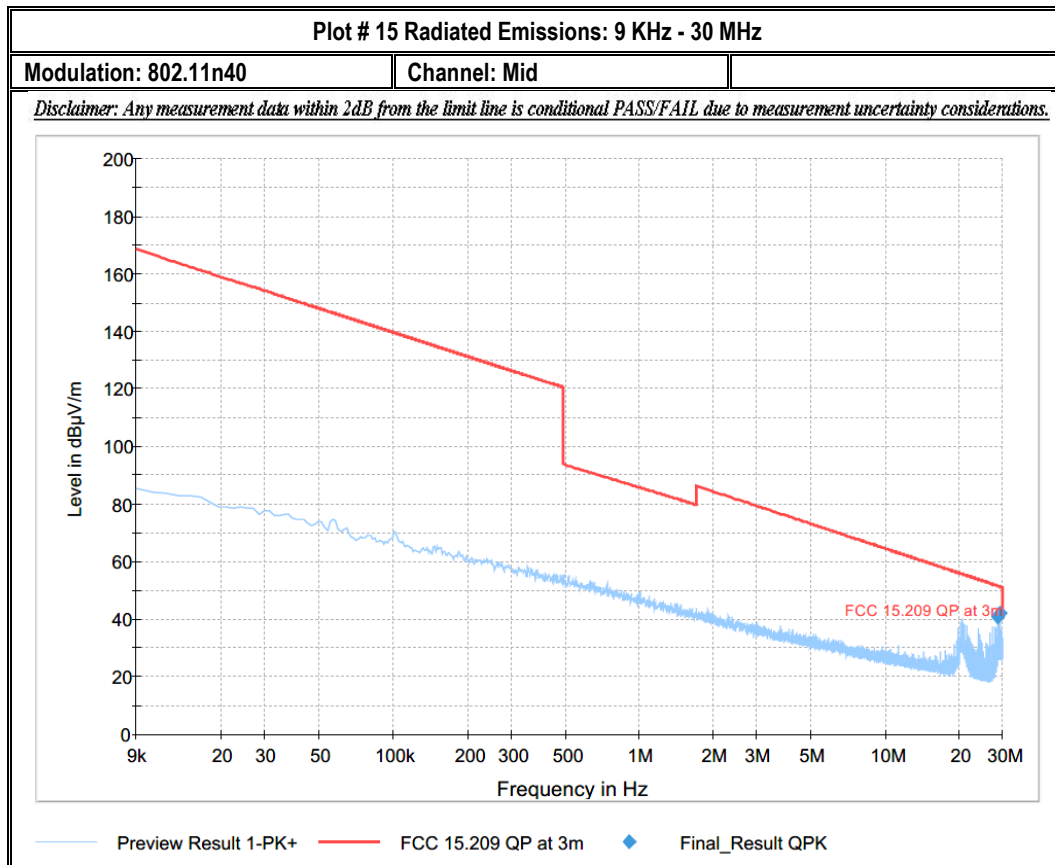
Final Result

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
3263.750	45.42	---	73.98	28.56	500.0	1000.000	325.0	V	299.0	-8.9	
3263.750	---	38.65	53.98	15.33	500.0	1000.000	325.0	V	299.0	-8.9	
3672.000	48.64	---	73.98	25.34	500.0	1000.000	194.0	V	304.0	-6.9	
3672.000	---	43.74	53.98	10.24	500.0	1000.000	194.0	V	304.0	-6.9	
4080.000	---	43.81	53.98	10.17	500.0	1000.000	234.0	V	290.0	-5.6	
4080.000	48.89	---	73.98	25.09	500.0	1000.000	234.0	V	290.0	-5.6	
4487.750	---	40.53	53.98	13.45	500.0	1000.000	228.0	V	0.0	-5.3	
4487.750	48.04	---	73.98	25.94	500.0	1000.000	228.0	V	0.0	-5.3	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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



Plot # 16 Radiated Emissions: 30 MHz – 1GHz

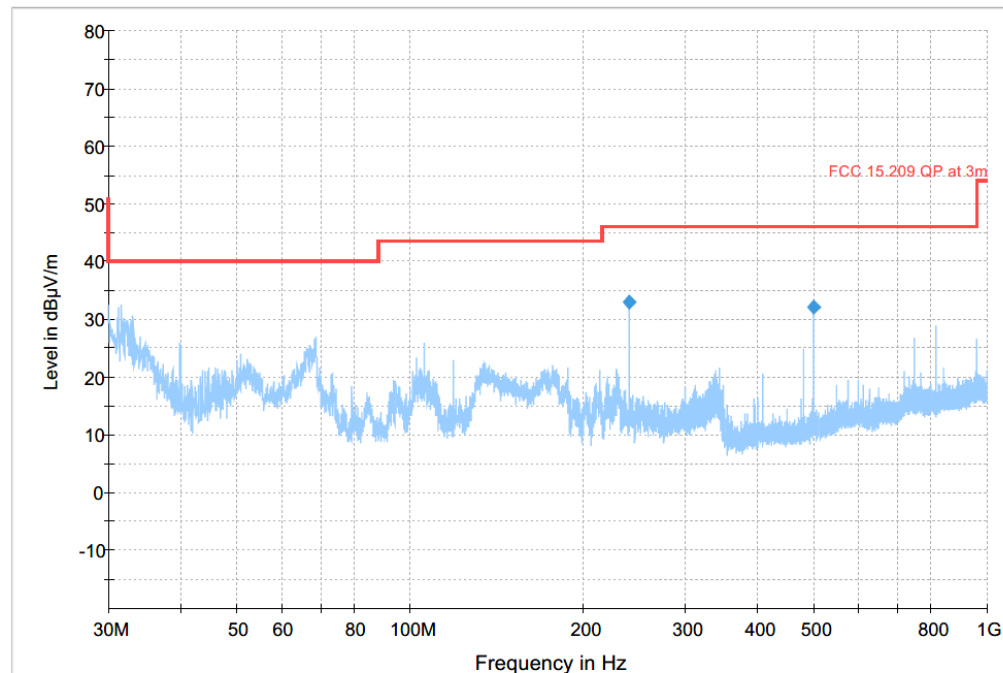
Modulation: 802.11n40

Channel: Mid

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
239.973	32.91	46.02	13.11	500.0	120.000	142.0	H	65.0	-21.4	
499.965	32.17	46.02	13.85	500.0	120.000	201.0	H	134.0	-15.1	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



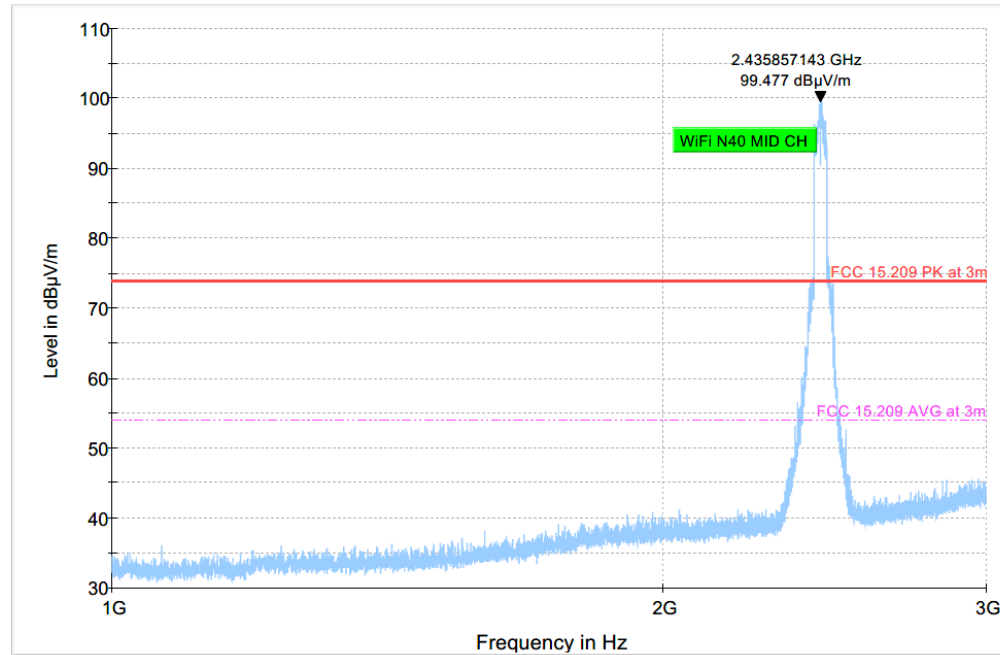
Preview Result 1-PK+ FCC 15.209 QP at 3m Final_Result QPK

Plot # 17 Radiated Emissions: 1-3 GHz

Modulation: 802.11n40

Channel: Mid

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

Plot # 18 Radiated Emissions: 3-18 GHz

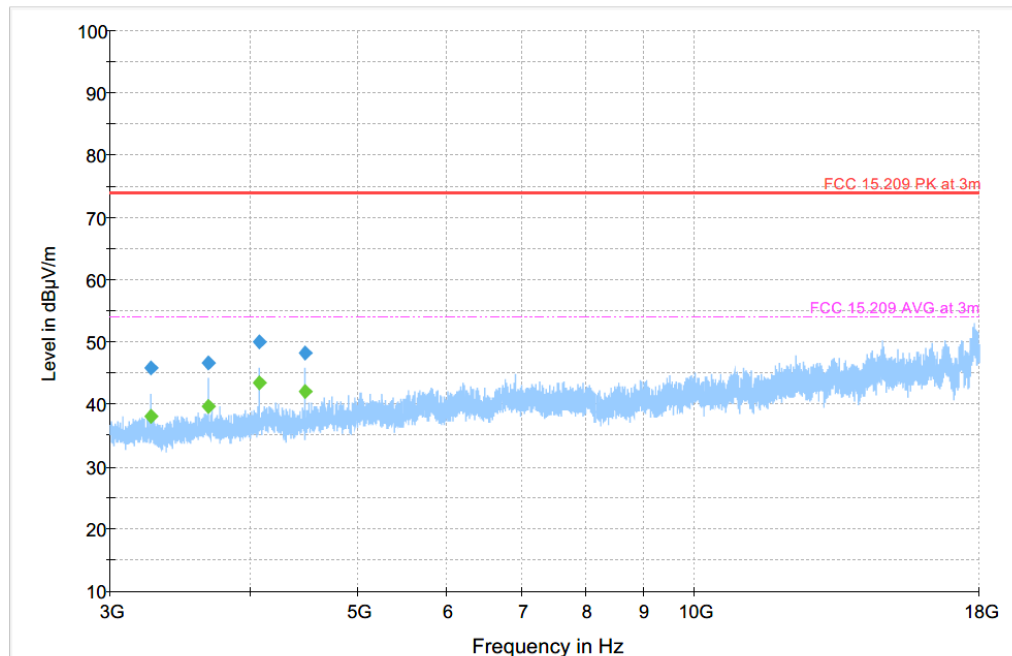
Modulation: 802.11n40

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
3263.750	45.85	---	73.98	28.13	500.0	1000.000	244.0	V	289.0	-8.9	
3263.750	---	38.02	53.98	15.96	500.0	1000.000	244.0	V	289.0	-8.9	
3671.750	46.56	---	73.98	27.42	500.0	1000.000	100.0	V	302.0	-6.9	
3671.750	---	39.60	53.98	14.38	500.0	1000.000	100.0	V	302.0	-6.9	
4079.750	---	43.45	53.98	10.52	500.0	1000.000	279.0	V	300.0	-5.6	
4079.750	49.95	---	73.98	24.03	500.0	1000.000	279.0	V	300.0	-5.6	
4488.000	---	42.04	53.98	11.94	500.0	1000.000	100.0	V	345.0	-5.3	
4488.000	48.30	---	73.98	25.68	500.0	1000.000	100.0	V	345.0	-5.3	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Preview Result 1-PK+
Final_Result PK+

FCC 15.209 PK at 3m
Final_Result CAV

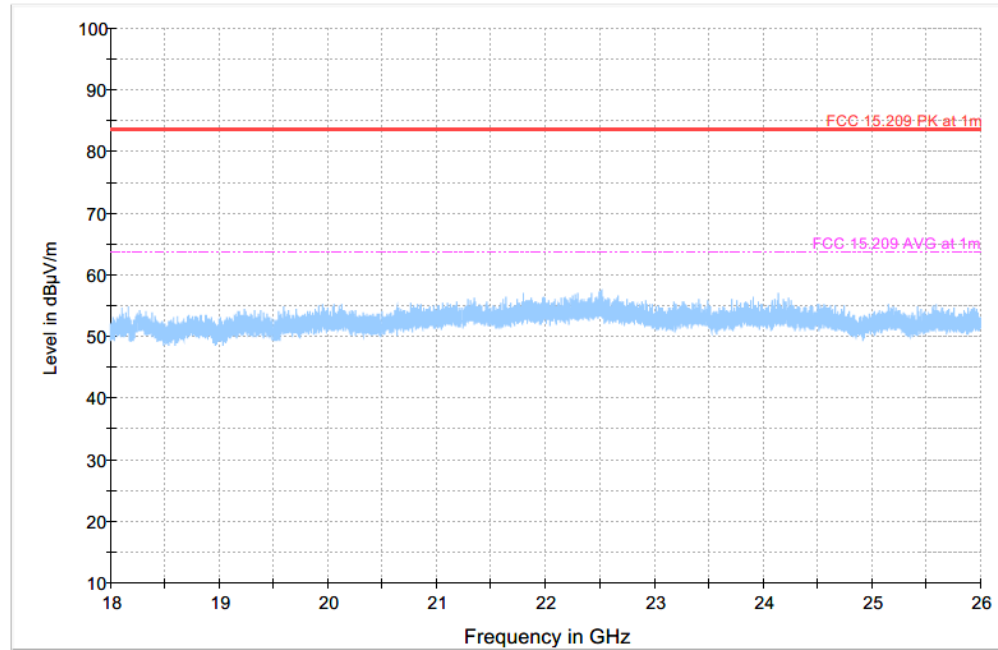
FCC 15.209 AVG at 3m

Plot # 19 Radiated Emissions: 18-26 GHz

Modulation: 802.11n40

Channel: Mid

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

Plot # 20 Radiated Emissions: 30 MHz – 1GHz

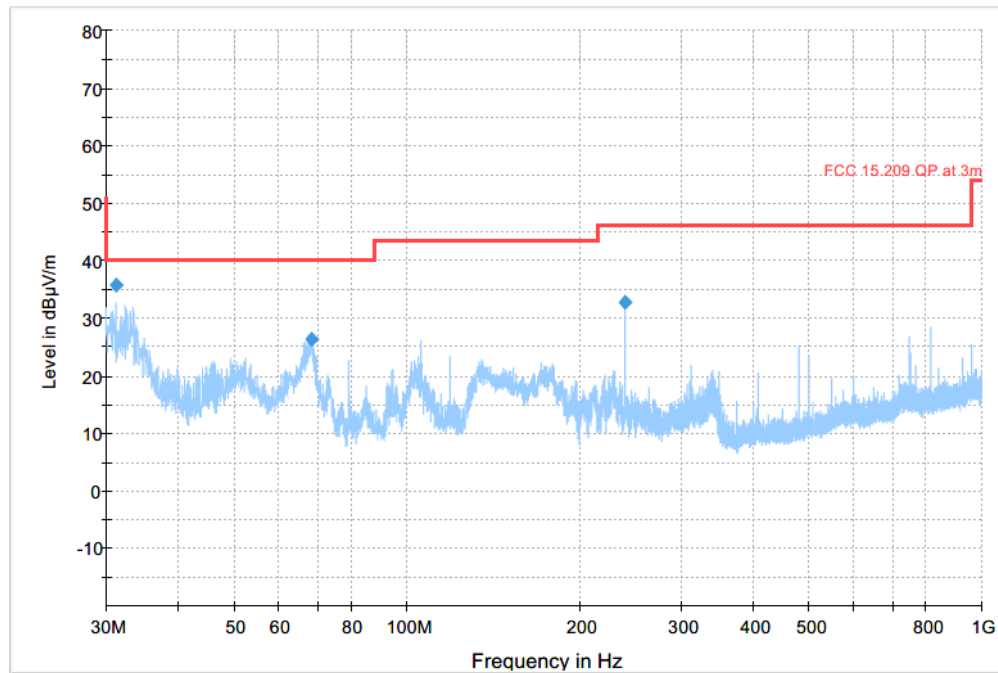
Modulation: 802.11n40

Channel: High

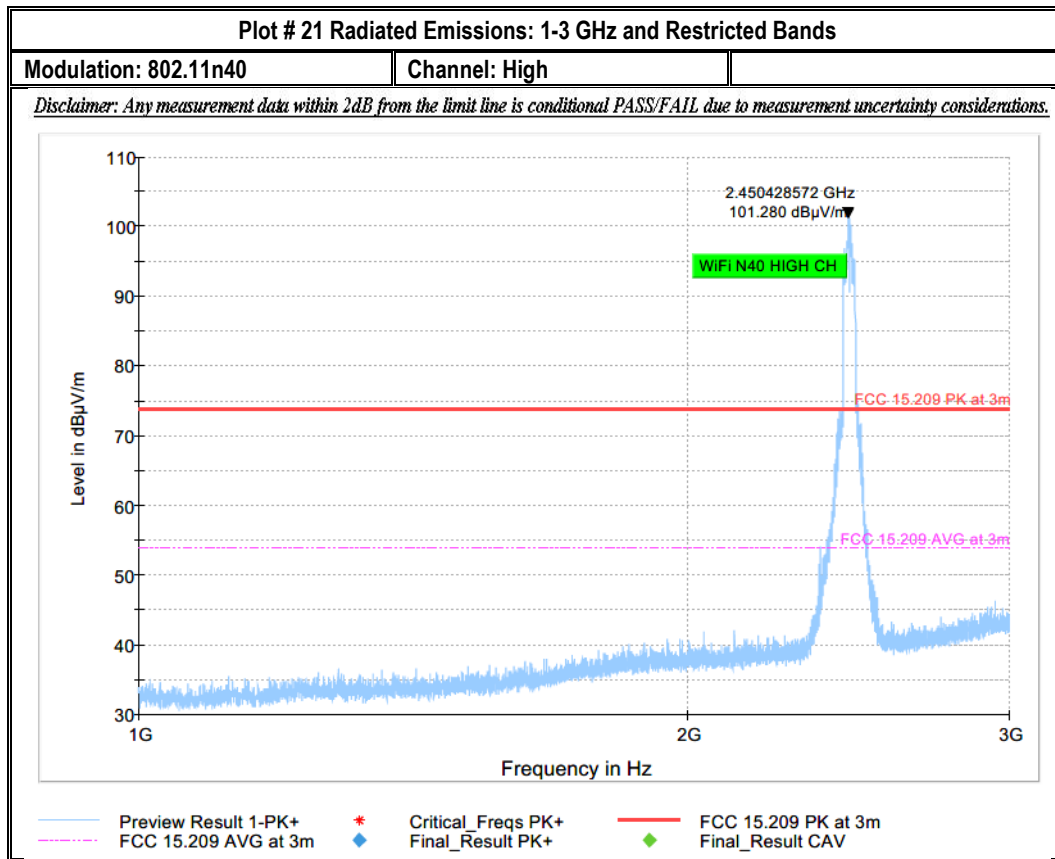
Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
31.229	35.84	40.00	4.16	500.0	120.000	191.0	H	7.0	-11.9	
68.315	26.37	40.00	13.63	500.0	120.000	133.0	V	57.0	-27.6	
239.973	32.88	46.02	13.14	500.0	120.000	125.0	H	66.0	-21.4	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



— Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final_Result QPK



Plot # 22 Radiated Emissions: 3-18 GHz

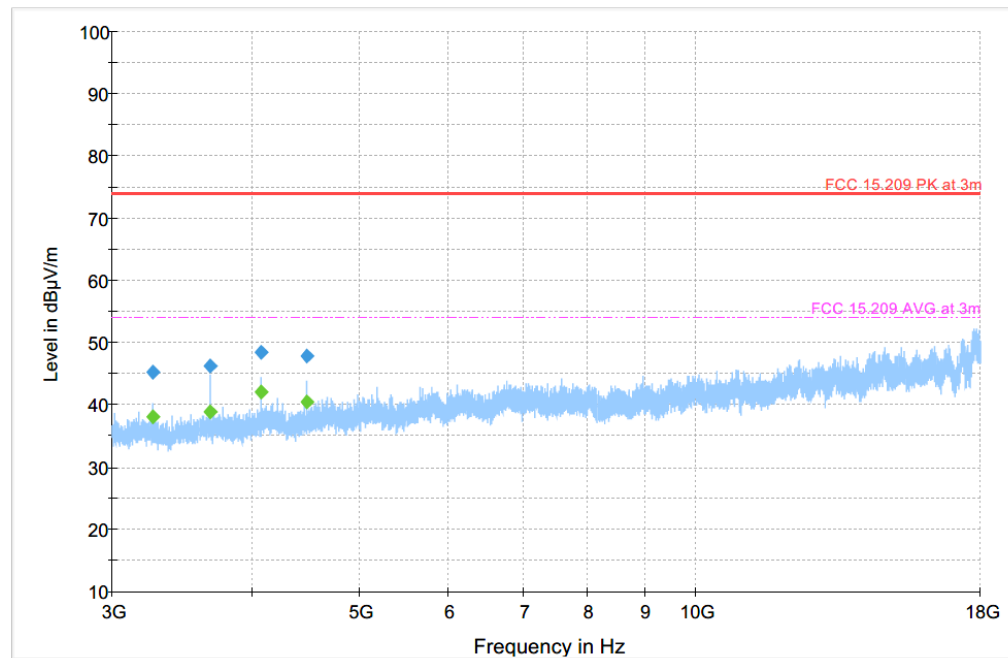
Modulation: 802.11n40

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
3263.750	45.18	---	73.98	28.80	500.0	1000.000	306.0	V	309.0	-8.9	
3263.750	---	38.17	53.98	15.81	500.0	1000.000	306.0	V	309.0	-8.9	
3671.750	---	38.91	53.98	15.07	500.0	1000.000	325.0	V	49.0	-6.9	
3671.750	46.33	---	73.98	27.65	500.0	1000.000	325.0	V	49.0	-6.9	
4079.750	48.43	---	73.98	25.55	500.0	1000.000	270.0	V	297.0	-5.6	
4079.750	---	42.07	53.98	11.91	500.0	1000.000	270.0	V	297.0	-5.6	
4487.750	---	40.44	53.98	13.54	500.0	1000.000	100.0	V	-1.0	-5.3	
4487.750	47.76	---	73.98	26.22	500.0	1000.000	100.0	V	-1.0	-5.3	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



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

8.7 AC Power Line Conducted Emissions

8.7.1 Measurement according to ANSI C63.4

Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

8.7.2 Limits: §15.207 & RSS-Gen 8.8

FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

8.7.3 Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22° C	2	802.11n20	Line & Neutral	110V / 60Hz

8.7.4 Measurement Result:

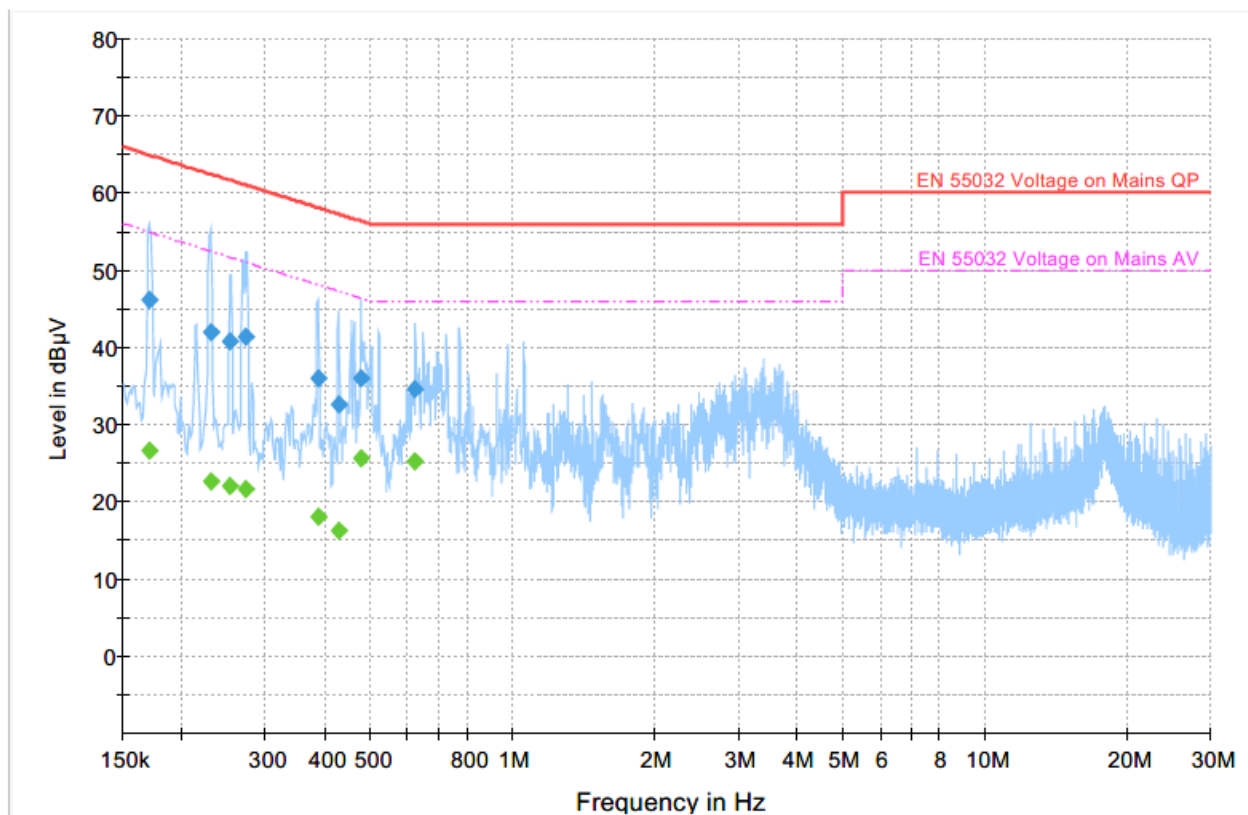
Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	2	802.11n20	150 kHz – 30 MHz	See section 8.7.2	Pass

8.7.5 Measurement Plots:

Plot # 1

Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.171	---	26.71	54.90	28.19	500.0	9.000	L1	GND	10.6	
0.171	46.10	---	64.90	18.79	500.0	9.000	L1	GND	10.6	
0.230	---	22.60	52.45	29.85	500.0	9.000	L1	GND	10.1	
0.230	42.01	---	62.45	20.44	500.0	9.000	L1	GND	10.1	
0.253	---	22.00	51.65	29.64	500.0	9.000	L1	GND	10.1	
0.253	40.82	---	61.65	20.82	500.0	9.000	L1	GND	10.1	
0.274	---	21.67	51.01	29.34	500.0	9.000	L1	GND	10.1	
0.274	41.45	---	61.01	19.56	500.0	9.000	L1	GND	10.1	
0.389	---	18.05	48.09	30.04	500.0	9.000	L1	GND	10.0	
0.389	35.99	---	58.09	22.10	500.0	9.000	L1	GND	10.0	
0.429	---	16.22	47.27	31.05	500.0	9.000	L1	GND	10.0	
0.429	32.69	---	57.27	24.58	500.0	9.000	L1	GND	10.0	
0.478	---	25.54	46.37	20.82	500.0	9.000	L1	GND	10.0	
0.478	36.08	---	56.37	20.29	500.0	9.000	L1	GND	10.0	
0.623	---	25.28	46.00	20.72	500.0	9.000	N	GND	10.0	
0.623	34.65	---	56.00	21.35	500.0	9.000	N	GND	10.0	



Preview Result 1-PK+
Final_Result QPK

EN 55032 Voltage on Mains QP
Final_Result CAV

EN 55032 Voltage on Mains AV

9 Test setup photos

Setup photos are included in supporting file name: "EMC_EZLOI-001-20001_FCC_IC_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	03/12/2020
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6507	161344	3 years	10/26/2017
Antenna Horn 3115 SN 35111	Horn Antenna	EMCO	3115	35111	3 years	04/17/2019
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	10/31/2017
Antenna Horn 3117	Horn Antenna	ETS Lindgren	3117-PA	169547	3 years	09/01/2020
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	3 Year	7/19/2019
Thermometer Humidity	Thermometer Humidity	Control Company	36934-164	191871994	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
2020-10-20	EMC_EZLOI-001-20001_15.247_DTS_WiFi	Initial Version	Kevin Wang

<<< The End >>>