



## 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 15.407 (NII) & 5 GHz (UNII)  
RSS-247 Issue 2 (DTSs) & (LE-LAN), and RSS-Gen Issue 5

REPORT #: EMC\_EZLOI-001-20001\_15.407\_UNII

DATE: 2020-10-23



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 15.407 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:**

2020-10-23	Compliance	Cindy Li (EMC Lab Manager)	
Date	Section	Name	Signature

**Responsible for the Report:**

2020-10-23	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 Section3. 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

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
<b>City/Zip Code</b>	Milpitas, CA 95035
<b>Country</b>	USA
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<b>EMC Lab Manager:</b>	Cindy Li
<b>Responsible Project Leader:</b>	Akanksha Baskaran

### 2.2 Identification of the Client

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

### 2.3 Identification of the Manufacturer

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

### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

<b>Model No:</b>	e550-US, EzloSecure-US	
<b>HW Version :</b>	1.4	
<b>SW Version :</b>	2.0.1.1112.7	
<b>FCC-ID :</b>	2AIYW-E550	
<b>IC-ID:</b>	26382-E550	
<b>FWIN:</b>	N/A	
<b>HVIN:</b>	e550-US, EzloSecure-US	
<b>PMN:</b>	Ezlo Secure, Smart Home Controller, CC Compass Monitoring Hub, Connect Hub 2.0	
<b>Product Description:</b>	Smart Home Controller All 4 variant models are electrically identical	
<b>Frequency Range / number of channels:</b>	Frequency Range (MHz)	Channel Number
	5150-5250	36-48 [4]
	5250-5350	52-64[4]
	5470-5725	100-140 [11]
	5725-5850	149-165 [5]
<b>Modes of Operation / Channel Bandwidths:</b>	IEEE Std. 802.11(xxxx)	Data Rate / MCS
	a	6-54 Mbps
	n: HT20 & HT40	MCS 0-7; MCS 8-15
	ac: VHT20; VHT40; VHT80	MCS 0-9
<b>Transmit Chains(N<sub>TX</sub>)</b>	1	
<b>Radio Information:</b>	Module Number: Ampak AP6256 Modulation: OFDM	
<b>Antenna Information as declared:</b>	max gain 2.3 dBi	
<b>Max. Output Power:</b>	Conducted Power 11.96dBm	
<b>Power Supply/ Rated Operating Voltage Range:</b>	4.8V (Low) / 5.0V (Nominal) / 5.2V (Max)	
<b>Operating Temperature Range</b>	0°C to +35°C	
<b>Other Radios included in the device:</b>	Wi-Fi 2.4GHz ; Cellular; Bluetooth; Zigbee; Zwave	
<b>Sample Revision</b>	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> 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 shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.



### 3.6 Power Setting Table

	CH36 - CH 64		CH100 - CH 140		CH149 - CH165
a	10		10		10
ac20	10		10		10

	CH38	CH46	CH54	CH62		CH102	CH110	CH118	CH126	CH134		CH151	CH159
ac40	10	10	10	10		10	10	10	10	10		10	10

	CH42	CH58		CH106	CH122		CH155
ac80	8	10		10	10		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 15.407 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 the:

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

#### 5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.407(e) RSS-247 6.2.4.1	Emission Bandwidth	Nominal	802.11a/ac	■	□	□	Complies
§15.407(a) RSS-247 6	Power Spectral Density	Nominal	802.11a/ac	■	□	□	Complies
§15.407(a) RSS-247 6	Maximum Output Power	Nominal	802.11a/ac	■	□	□	Complies
§15.407; 15.205 RSS-247 6; RSS-Gen 8.10	Band Edge Compliance	Nominal	802.11a/ac	■	□	□	Complies
§15.407(b); §15.209; 15.205 RSS-247 6; RSS-Gen 8.9; 8.10	Radiated TX Spurious Emissions	Nominal	802.11ac	■	□	□	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	802.11ac	■	□	□	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	$\pm 2.5$ dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	$\pm 2.0$ dB (Biconilog Antenna)
1 GHz to 40 GHz	$\pm 2.3$ dB (Horn Antenna)

### Conducted measurement

150 kHz to 30 MHz	$\pm 0.7$ dB (LISN)
-------------------	---------------------

RF conducted measurement	$\pm 0.5$ 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:

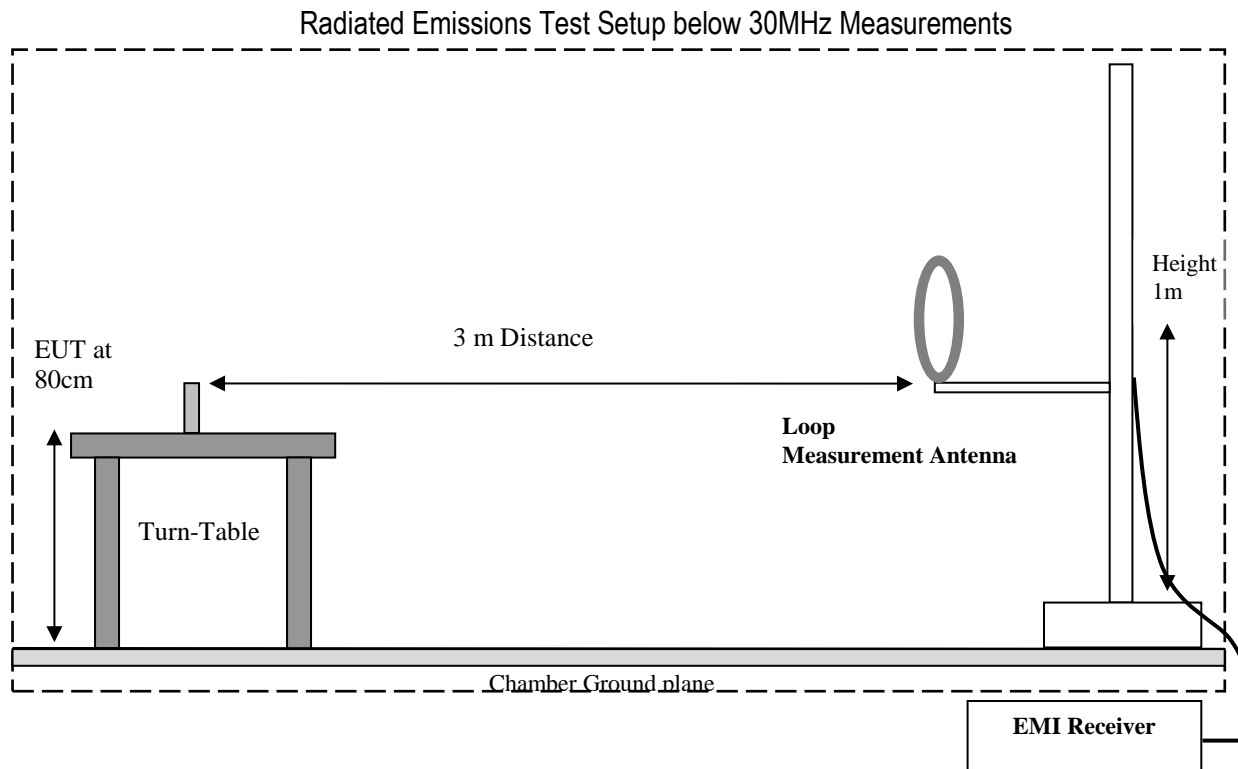
09/28/2020 - 10/15/2020

## 7 Measurement Procedures

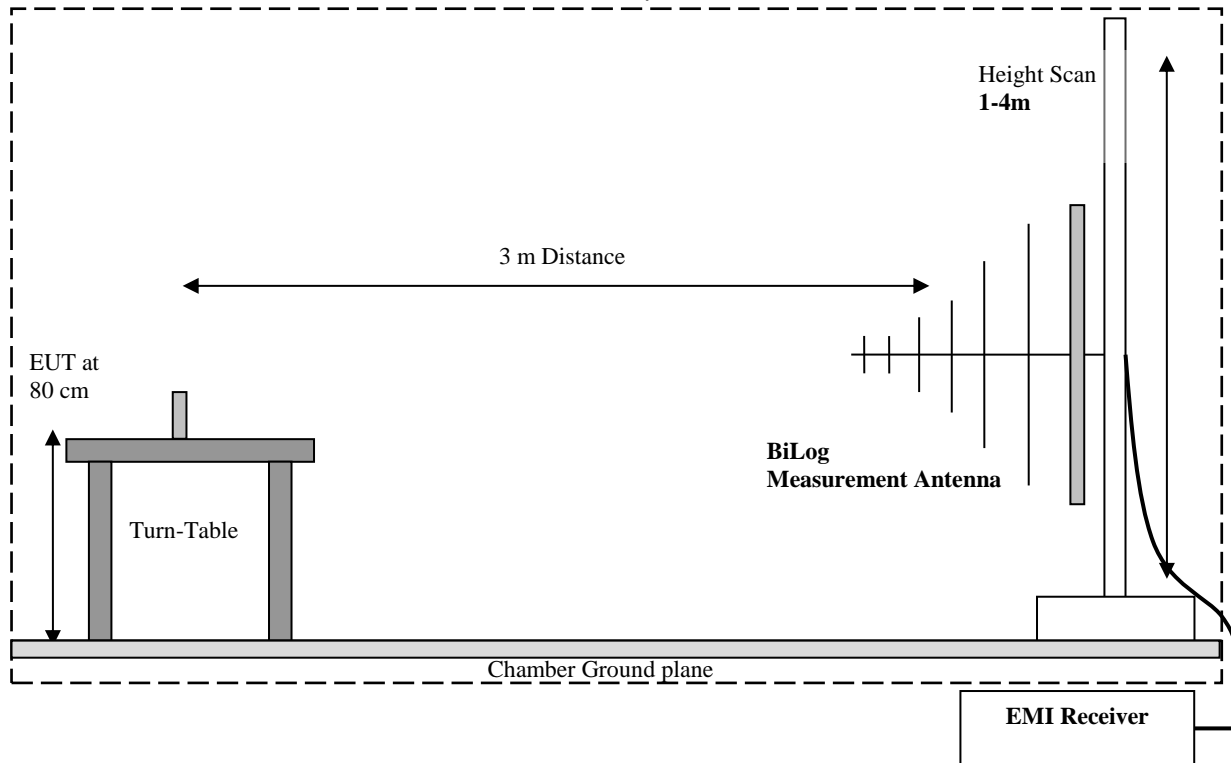
### 7.1 Radiated Measurement

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

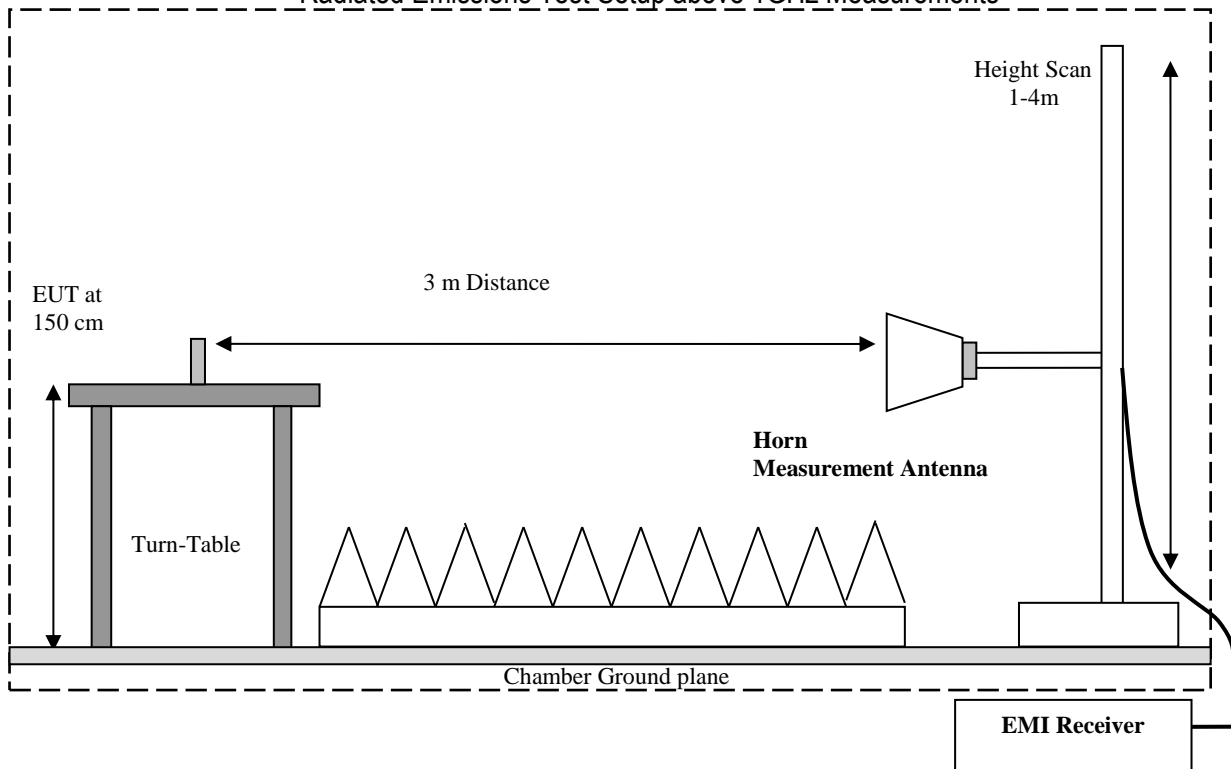
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to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

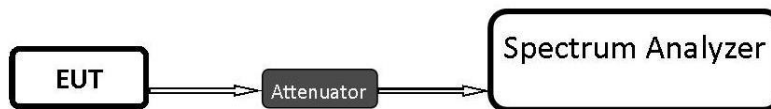
Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

### 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 Output Power

#### 8.1.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

##### Spectrum Analyzer settings for method SA-1:

- Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- Set RBW = 1 MHz
- Set the VBW  $\geq$  3 MHz
- Detector = RMS
- Number of points in sweep  $\geq$  2 Span / RBW. (This ensures that bin-to-bin spacing is  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
- Sweep time = Auto Couple
- Trace mode = Trace average at least 100 traces in power averaging (i.e., RMS mode).
- If transmit duty cycle  $<$  98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq$  98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
- Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

#### 8.1.2 Limits:

FCC§15.407

##### Sub-band 5150-5250 MHz

- For AP the maximum conducted output power over the frequency band of operation shall not exceed 1 W
- For Client Devices the maximum conducted output power over the frequency band of operation shall not exceed 250 mW

##### Sub-band 5250-5350 MHz and 5470-5725 MHz and

- The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz

##### Sub-band 5725-5850 MHz

- The maximum conducted output power over the frequency band of operation shall not exceed 1 W

## RSS-247

Sub-band 5150-5250 MHz

- For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10} B$ , dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
- For other devices, the maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

Sub-band 5250-5350 MHz

- For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10} B$ , dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
- Devices, other than devices installed in vehicles, shall comply with the following:
  - a) The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less.
  - b) The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.
- Additional requirements

In addition to the above requirements, devices shall comply with the following, where applicable:

- a) Outdoor fixed devices with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where  $\theta$  is the angle above the local horizontal plane (of the Earth) as shown below:

i. -13 dBW/MHz	for $0^\circ \leq \theta < 8^\circ$
ii. $-13 - 0.716(\theta - 8)$ dBW/MHz	for $8^\circ \leq \theta < 40^\circ$
iii. $-35.9 - 1.22(\theta - 40)$ dBW/MHz	for $40^\circ \leq \theta \leq 45^\circ$
iv. -42 dBW/MHz	for $\theta > 45^\circ$

The measurement procedure defined in Annex A of this document shall be used to verify the compliance to the e.i.r.p. at different elevations.

- b) Devices, other than outdoor fixed devices, having an e.i.r.p. greater than 200 mW shall comply with either i. or ii. below:

- i. devices shall comply with the e.i.r.p. elevation mask in 6.2.2.3(a); or

- ii. devices shall implement a method to permanently reduce their e.i.r.p. via a firmware feature in the event that the Department requires it. The test report must demonstrate how the device's power table can be updated to meet this firmware requirement. The manufacturer shall provide this firmware to update all systems automatically in compliance with the directions received from the Department.

#### Sub-band 5470-5600 MHz and 5650-5725 MHz

- The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less.
- The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### Sub-band 5725-5850 MHz

- The maximum conducted output power shall not exceed 1 W.

Note: All limits are conducted. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	1	a/ac	120 VAC	2.3 dBi



**8.1.4 Measurement result:**

**UNII-1:**

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)	FCC/IC Limit (dBm)	Result
a	6Mbps	Low	36	5180	10.65	2.3	12.95	23	Pass
		Mid	40	5200	11.65	2.3	13.95	23	Pass
		High	48	5240	11.96	2.3	14.26	23	Pass
ac20	MCS0	Low	36	5180	10.44	2.3	12.74	23	Pass
		Mid	40	5200	11.66	2.3	13.96	23	Pass
		High	48	5240	11.68	2.3	13.98	23	Pass
ac40	MCS0	Low	38	5190	10.95	2.3	13.25	23	Pass
		High	46	5230	11.62	2.3	13.92	23	Pass
ac80	MCS0	Mid	42	5210	9.05	2.3	11.35	23	Pass

**UNII-2A:**

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)	FCC/IC Limit (dBm)	Result
a	6Mbps	Low	52	5260	11.93	2.3	14.23	30	Pass
		Mid	60	5300	11.49	2.3	13.79	30	Pass
		High	64	5320	11.62	2.3	13.92	30	Pass
ac20	MCS0	Low	52	5260	11.7	2.3	14.00	30	Pass
		Mid	60	5300	10.98	2.3	13.28	30	Pass
		High	64	5320	10.67	2.3	12.97	30	Pass
ac40	MCS0	Low	54	5270	11.54	2.3	13.84	30	Pass
		High	62	5310	11.07	2.3	13.37	30	Pass
ac80	MCS0	Mid	58	5290	10.86	2.3	13.16	30	Pass

**UNII-2C:**

Mode	DR	Channel/Frequency(MHz)			Maximum Output Power	Antenna gain	EIRP dBm	FCC/IC Limit
					dBm	dBi		dBm
a	6Mbps	Low	100	5500	10.67	2.3	12.97	30
		Mid	116	5580	8.29	2.3	10.59	30
		High	140	5700	9.28	2.3	11.58	30
ac20	MCS0	Low	100	5500	9.99	2.3	12.29	30
		Mid	116	5580	7.96	2.3	10.26	30
		High	140	5700	8.81	2.3	11.11	30
ac40	MCS0	Low	102	5510	10	2.3	12.30	30
		Mid	110	5550	9.1	2.3	11.40	30
		High	134	5670	7.9	2.3	10.20	30
ac80	MCS0	Low	106	5530	8.89	2.3	11.19	30
		Mid	122	5610	7.22	2.3	9.52	30
		High	138	5690	8.05	2.3	10.35	30



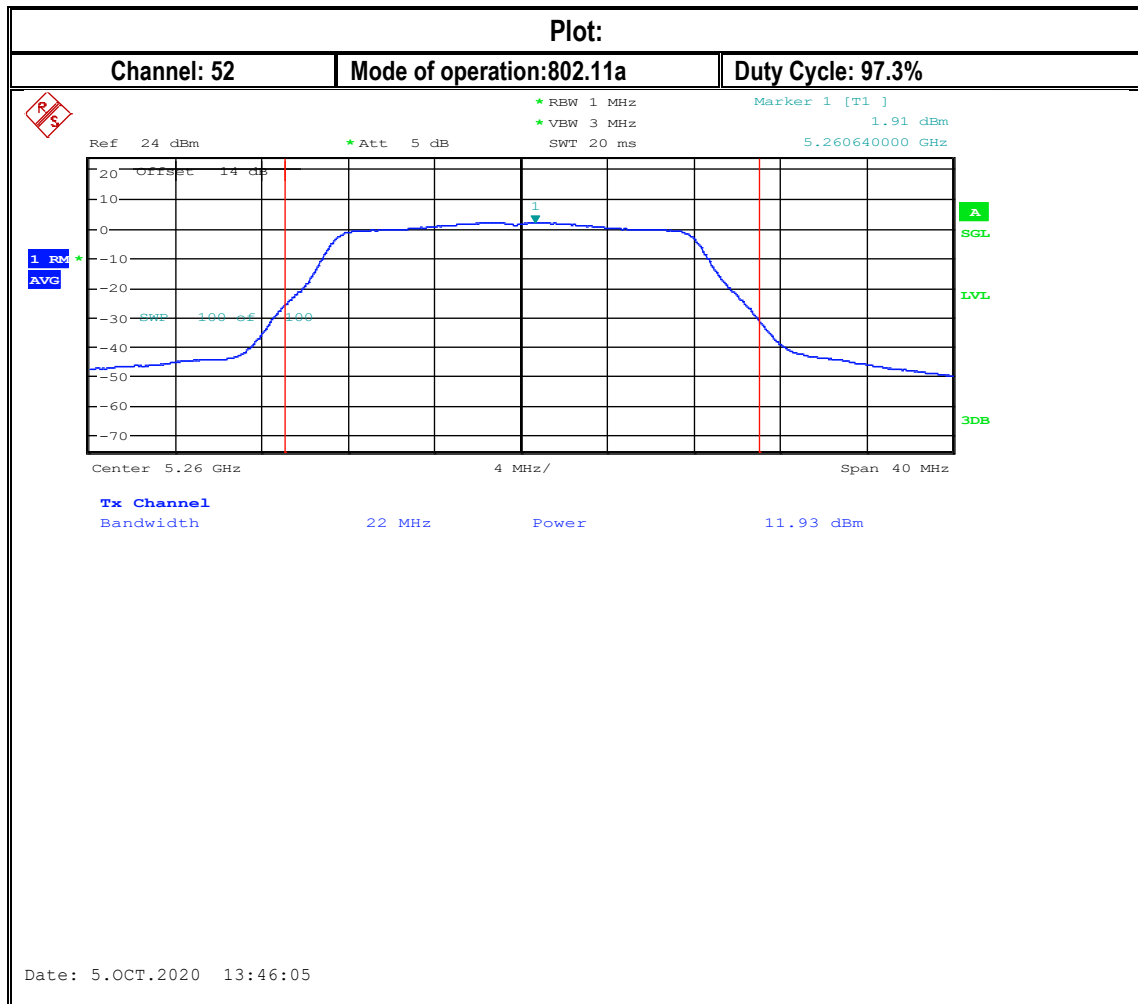


**UNII-3:**

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Output Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)	FCC/IC Limit (dBm)	Result
		Low	Mid	High					
a	6Mbps	Low	149	5745	10.1	2.3	12.40	36	Pass
		Mid	157	5785	8.47	2.3	10.77	36	Pass
		High	165	5825	7.14	2.3	9.44	36	Pass
ac20	MCS0	Low	149	5745	9.82	2.3	12.12	36	Pass
		Mid	157	5785	7.99	2.3	10.29	36	Pass
		High	165	5825	6.66	2.3	8.96	36	Pass
ac40	MCS0	Low	151	5755	9.73	2.3	12.03	36	Pass
		High	159	5795	7.92	2.3	10.22	36	Pass
ac80	MCS0	Mid	155	5775	8.29	2.3	10.59	36	Pass



### 8.1.5 Highest Power Measurement Plot:



## 8.2 Power Spectral Density

### 8.2.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

#### Spectrum Analyzer Settings for Peak PSD in 1 MHz Band with Method SA-1:

- Use the settings in section 8.1.1
- Use the peak marker function to determine the maximum amplitude level within the RBW. The result is the Maximum PSD over 1 MHz reference bandwidth

#### Spectrum Analyzer Settings for Peak PSD in 500 kHz Band with Method SA-1:

- Set RBW 500 kHz
- Set VBW  $\geq$  3 RBW.
- Measure the Maximum PSD in 500 kHz reference bandwidth for sub-band 5725-5850 MHz

### 8.2.2 Limits:

#### FCC§15.407

##### Sub-band 5150-5250 MHz

- For AP the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band
- For Client Devices the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band

##### Sub-band 5250-5350 MHz and 5470-5725 MHz and

- The maximum power spectral density shall not exceed 11 dBm in any 1 MHz band

##### Sub-band 5725-5850 MHz

- The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band

#### RSS-247

##### Sub-band 5150-5250 MHz

- PSD shall be less than 10 dBm in any 1 MHz band- EIRP

##### Sub-band 5250-5350 MHz

- PSD shall be less than 11 dBm in any 1 MHz band

##### Sub-band 5470-5600 MHz and 5650-5725 MHz

- PSD shall be less than 11 dBm in any 1 MHz band

##### Sub-band 5725-5850 MHz

- PSD shall be less than 30 dBm in any 500 kHz band

Note: All limits are conducted. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	1	a/ac	120 VAC	2.3 dBi

### 8.2.4 Measurement result:

#### UNII-1:

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Power Spectral Density (dBm/MHz)	FCC/IC Limit (dBm/MHz)	Result
a	6Mbps	Low	36	5180	0.56	10	Pass
		Mid	40	5200	1.62	10	Pass
		High	48	5240	1.9	10	Pass
ac20	MCS0	Low	36	5180	0.1	10	Pass
		Mid	40	5200	1.36	10	Pass
		High	48	5240	1.38	10	Pass
ac40	MCS0	Low	38	5190	-2.34	10	Pass
		High	46	5230	-1.56	10	Pass
ac80	MCS0	Mid	42	5210	-6.98	10	Pass

#### UNII-2A:

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Power Spectral Density (dBm/MHz)	FCC/IC Limit (dBm/MHz)	Result
a	6Mbps	Low	52	5260	2.44	11	Pass
		Mid	60	5300	1.46	11	Pass
		High	64	5320	1.24	11	Pass
ac20	MCS0	Low	52	5260	1.35	11	Pass
		Mid	60	5300	0.61	11	Pass
		High	64	5320	0.41	11	Pass
ac40	MCS0	Low	54	5270	-1.66	11	Pass
		High	62	5310	-2.11	11	Pass
ac80	MCS0	Mid	58	5290	-5.15	11	Pass

#### UNII-2C:

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Power Spectral Density (dBm/MHz)	FCC/IC Limit (dBm/MHz)	Result
a	6Mbps	Low	100	5500	0.56	11	Pass
		Mid	116	5580	-1.86	11	Pass
		High	140	5700	-0.83	11	Pass
ac20	MCS0	Low	100	5500	-0.36	11	Pass
		Mid	116	5580	-2.38	11	Pass
		High	140	5700	-1.54	11	Pass
ac40	MCS0	Low	102	5510	-3.05	11	Pass
		Mid	110	5550	-4.08	11	Pass
		High	134	5670	-5.31	11	Pass
ac80	MCS0	Low	106	5530	-7.3	11	Pass
		Mid	122	5610	-9.04	11	Pass
		High	138	5690	-7.89	11	Pass



**UNII-3:**

Mode	Data Rate	Channel / Frequency (MHz)			Maximum Power Spectral Density (dBm/MHz)	FCC/IC Limit (dBm/500kHz)	Result
a	6Mbps	Low	149	5745	-2.68	30	Pass
		Mid	157	5785	-4.37	30	Pass
		High	165	5825	-5.76	30	Pass
ac20	MCS0	Low	149	5745	-3.31	30	Pass
		Mid	157	5785	-5.14	30	Pass
		High	165	5825	-6.52	30	Pass
ac40	MCS0	Low	151	5755	-6.36	30	Pass
		High	159	5795	-8.53	30	Pass
ac80	MCS0	Mid	155	5775	-10.86	30	Pass



### 8.2.5 Highest PSD Measurement Plots:



### 8.3 Band Edge Compliance

#### 8.3.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01 and ANSI C63.10 (2013)

##### Non Restricted Band Edge and Restricted Band Edge Peak Measurement Spectrum Analyzer Settings:

- 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

##### Restricted Band Edge Average Measurement Spectrum Analyzer Settings:

- 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 = RMS (Power Averaging)
- Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of  $1 / D$ , where  $D$  is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- Perform band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured

##### Restricted Band Edge – Radiated measurement method - ANSI C63.10; 6.10.6.2 Marker-delta procedure:

1. Perform Peak and Average in-band field strength measurements with the following SA settings
  - RBW = 100 kHz
  - VBW  $\geq 3 \times$  RBW
2. Perform relative measurements of the fundamental and the band-edge levels using the following SA settings
  - RBW = 1% of the total span (but never less than 30 kHz),
  - VBW  $\geq 3 \times$  RBW
  - Record the delta of the peak levels of the fundamental emission and the relevant band-edge emission
3. Subtract the delta measured in step b) from the field strengths measured in step a). The resulting field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge emissions compliance, where required.

**8.3.2 Limits non restricted band:**

FCC§15.407 (b); RSS-247 6

- For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

**8.3.3 Limits for restricted band §15.407/15.209/15.205 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

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			





### 8.3.4 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	1	GFSK continuous fixed channel	3.7 VDC	3.5 dBi

### 8.3.5 Measurement result:

Plot #	EUT operating mode	Channel	Power Level	Band Edge	Measured Value	DC Factor	Antenna Gain	Corrected Value	Limit	Result
					(dBm)	dB	(dBi)	(dBm)	(dBm)	
1	a	36	10	Lower Restricted Peak	-38.12	0	2.3	-35.82	-21.23 Peak	Pass
2				Lower Restricted AVG	-52.64	0.12	2.3	-50.22	-41.23 AVG	Pass
3		64	10	Upper Restricted Peak	-38.62	0	2.3	-36.32	-21.23 Peak	Pass
4				Upper Restricted AVG	-55.16	0.12	2.3	-52.74	-41.23 AVG	Pass
5		100	10	Non-Restricted Band	-35.41	0	2.3	-33.11	-27	Pass
6		140	10	Non-Restricted Band	-37.81	0	2.3	-35.51	-27	Pass
7		149	10	Non-Restricted Band	Pass	-	-	-	See section 8.3.2	Pass
8		165	10	Non-Restricted Band	Pass	-	-	-	See section 8.3.2	Pass
9	ac20	36	10	Lower Restricted Peak	-38.07	0	2.3	-35.77	-21.23 Peak	Pass
10				Lower Restricted AVG	-51.12	0.13	2.3	-48.69	-41.23 AVG	Pass
11		64	10	Upper Restricted Peak	-35	0	2.3	-32.7	-21.23 Peak	Pass
12				Upper Restricted AVG	-53.77	0.13	2.3	-51.34	-41.23 AVG	Pass
13		100	10	Non-Restricted Band	-35.98	0	2.3	-33.68	-27	Pass
14		140	10	Non-Restricted Band	-36.31	0	2.3	-34.01	-27	Pass
15		149	10	Non-Restricted Band	pass	-	-	-	See section 8.3.2	Pass
16		165	10	Non-Restricted Band	Pass	-	-	-	See section 8.3.2	Pass
17	ac40	38	10	Lower Restricted Peak	-29.63	0	2.3	-27.33	-21.23 Peak	Pass
18				Lower Restricted AVG	-43.8	0.14	2.3	-41.36	-41.23 AVG	Pass



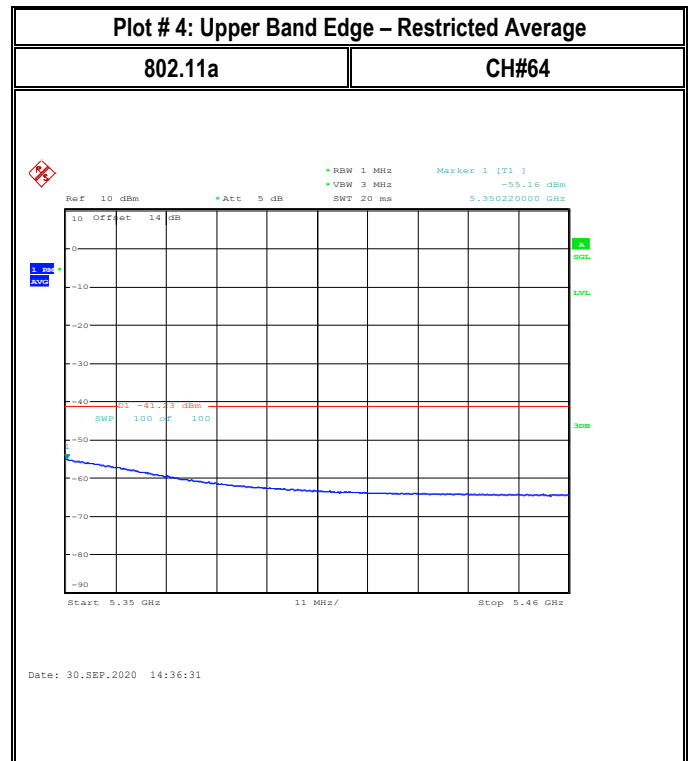
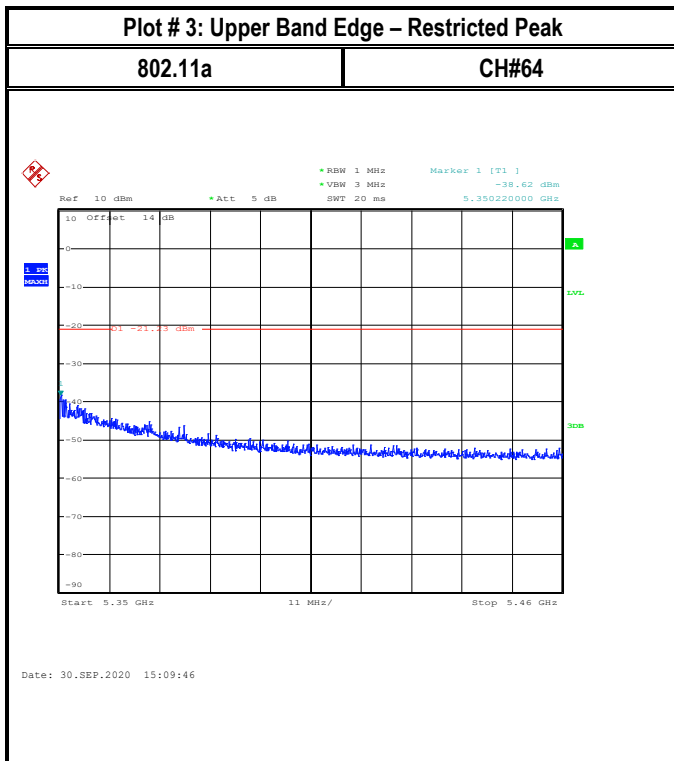
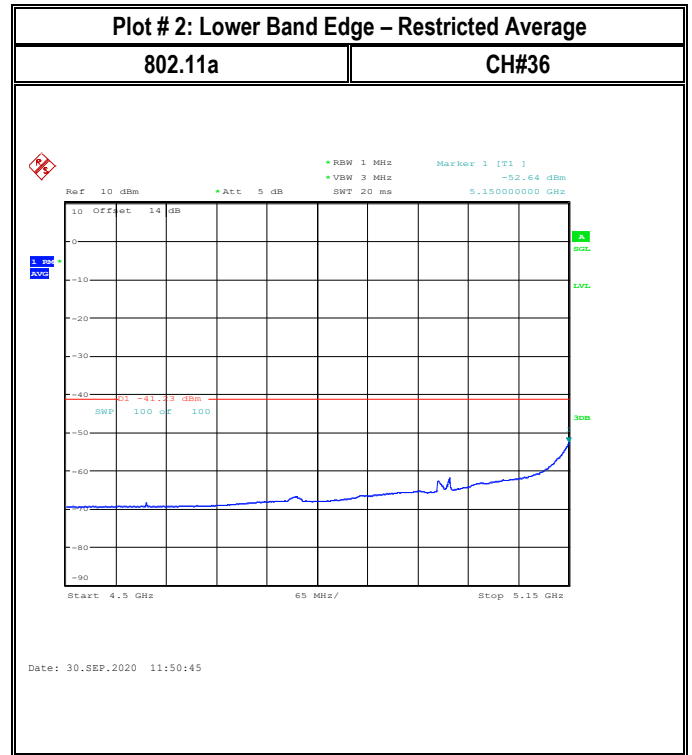
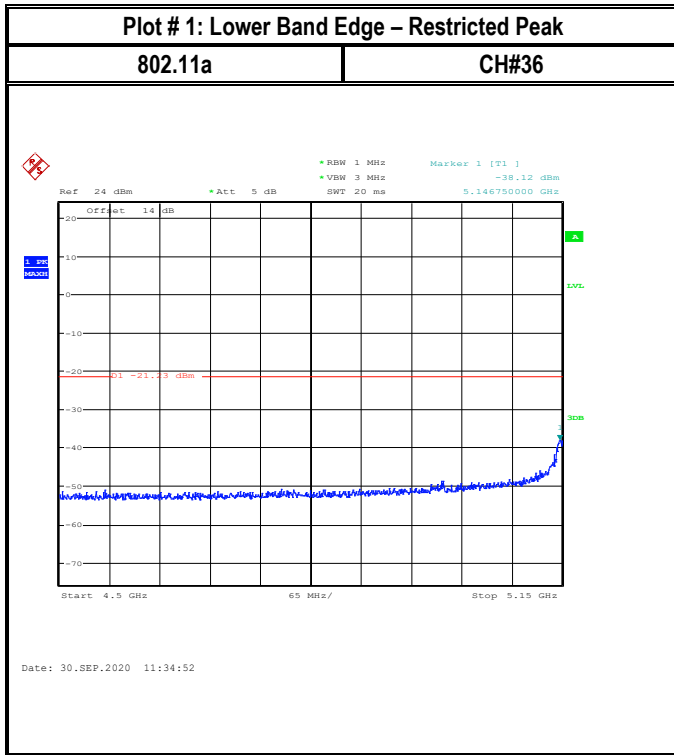
19		62	10	Upper Restricted Peak	-35.68	0	2.3	-33.38	-21.23 Peak	Pass	
20				Upper Restricted AVG	-48.7	0.14	2.3	-46.26	-41.23 AVG	Pass	
21		102	10	Non-Restricted Band	-33	0	2.3	-30.7	-27	Pass	
22		134	10	Non-Restricted Band	-42.07	0	2.3	-39.77	-27	Pass	
23		151	10	Non-Restricted Band	Pass	-	-	-	See section 8.3.2	Pass	
24		159	10	Non-Restricted Band	Pass	-	-	-	See section 8.3.2	Pass	
25		ac80	42	8	Lower Restricted Peak	-33.29	0	2.3	-30.99	-21.23 Peak	Pass
26					Lower Restricted AVG	-45.34	0.31	2.3	-42.73	-41.23 AVG	Pass
27			58	10	Lower Restricted Peak	-46.02	0	2.3	-43.72	-21.23 Peak	Pass
28					Lower Restricted AVG	-58.2	0.31	2.3	-55.59	-41.23 AVG	Pass
29	10		10	Upper Restricted Peak	-33.05	0	2.3	-30.75	-21.23 Peak	Pass	
30				Upper Restricted AVG	-46.69	0.31	2.3	-44.08	-41.23 AVG	Pass	
31	106		10	Lower Restricted Peak	-33.97	0	2.3	-31.67	-21.23 Peak	Pass	
32				Lower Restricted AVG	-46.07	0.31	2.3	-43.46	-41.23 AVG	Pass	
33				Non-Restricted Band	-32.11	0	2.3	-29.81	-27	Pass	
34	122		10	Non-Restricted Band	-42.79	0	2.3	-40.49	-27	Pass	
35	155	10	Non-Restricted Band	Pass	-	-	-	See section 8.3.2	Pass		

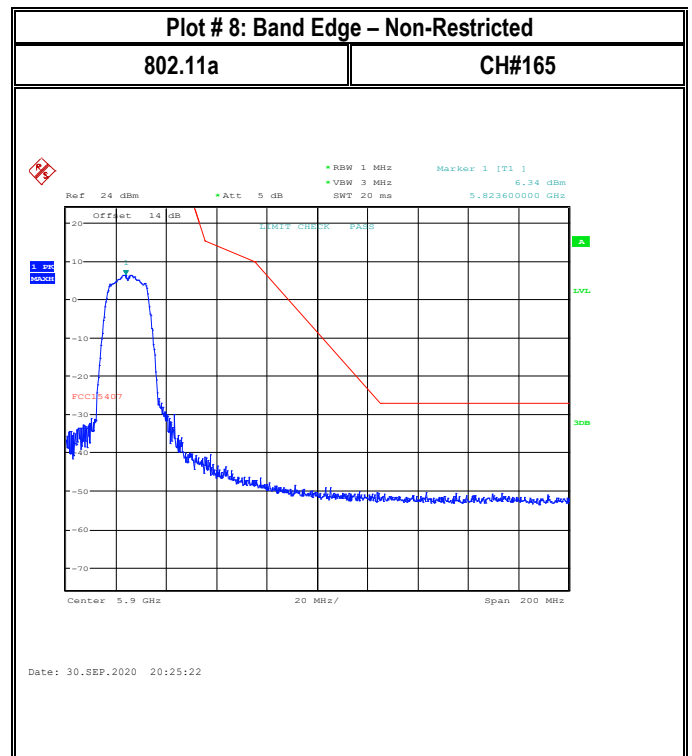
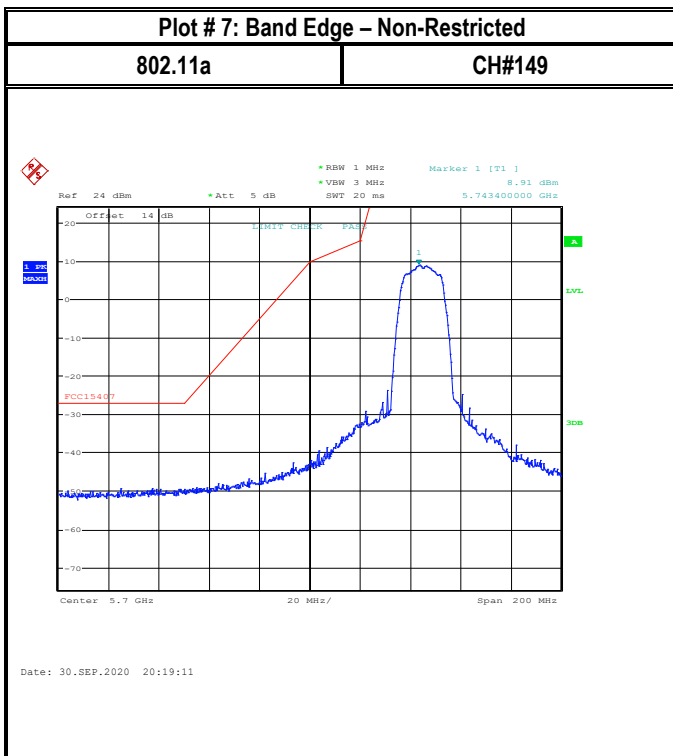
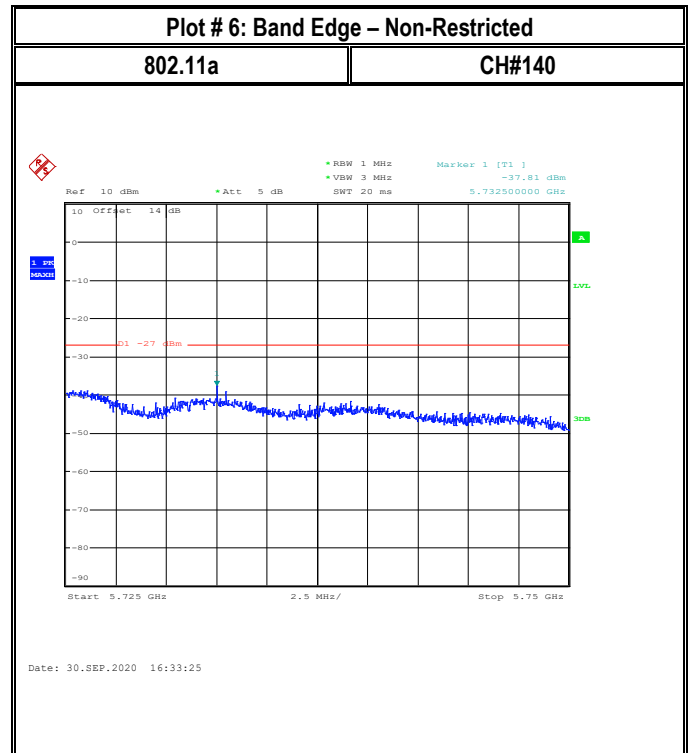
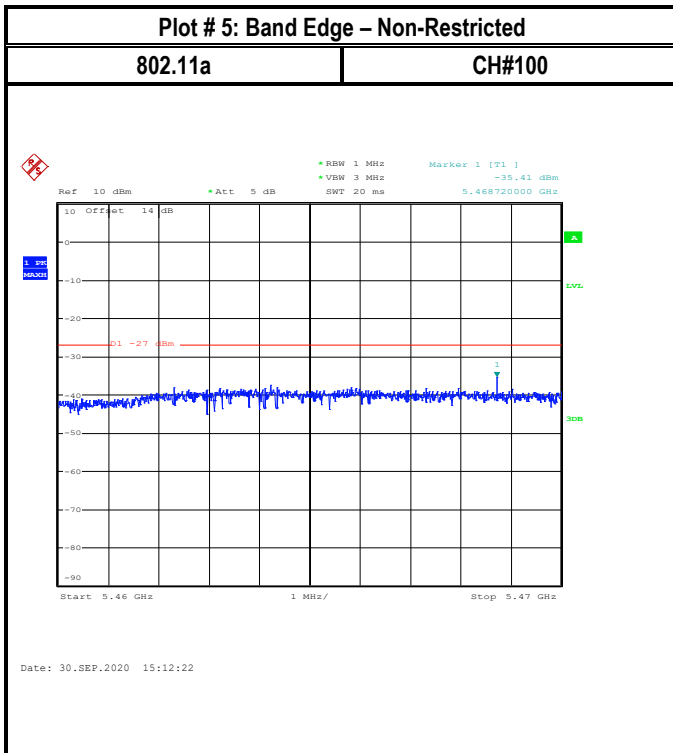
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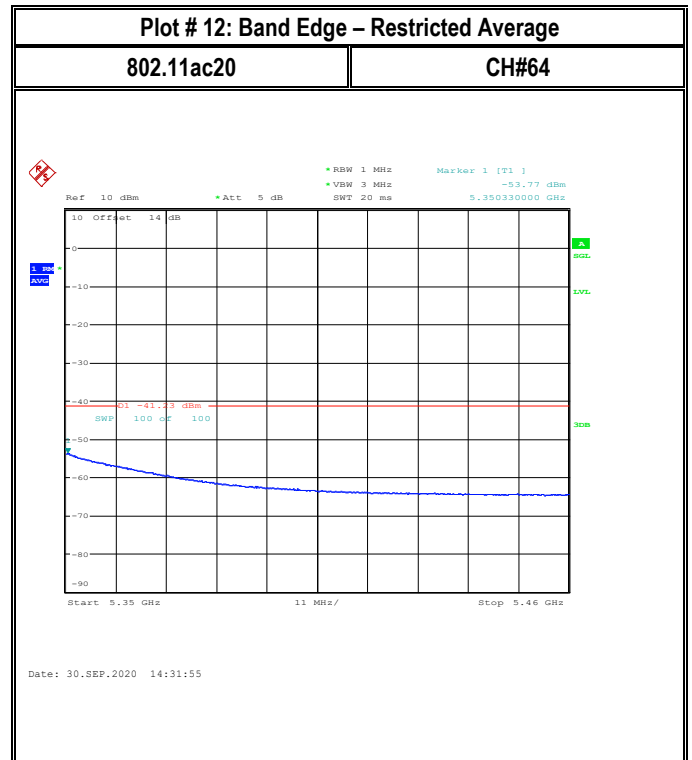
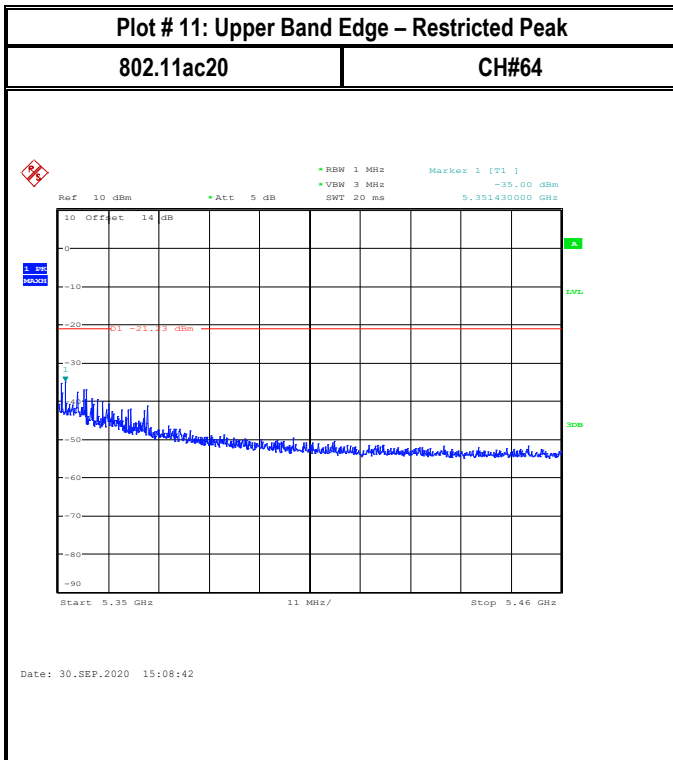
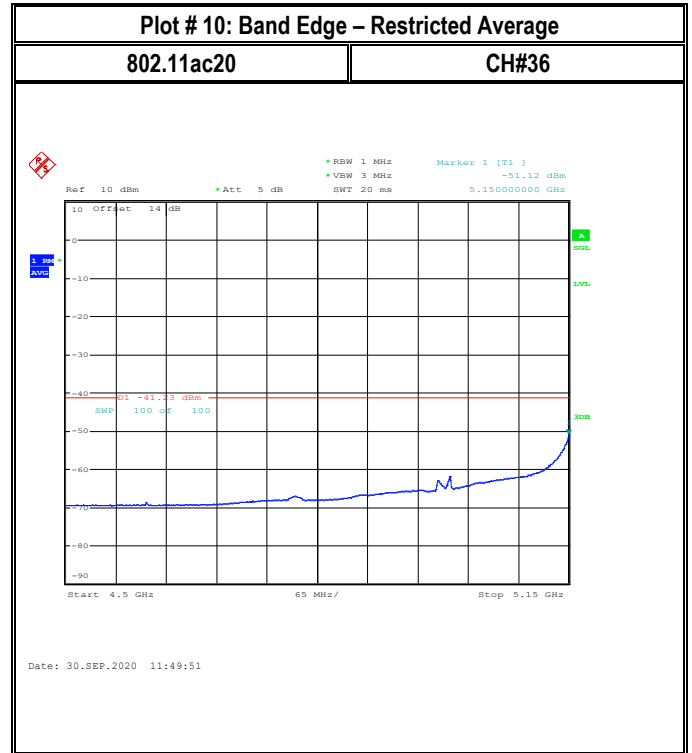
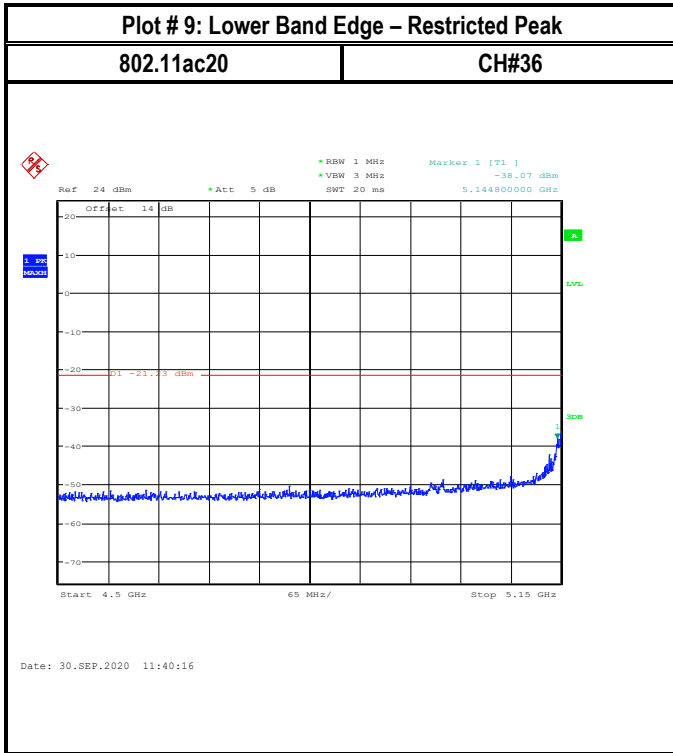
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					(dBm)	dB	(dBi)	(dBm)	(dBm)	
36	a	116	10	5600 – 5650 MHz	-28.27	0	2.3	-25.97	-	Pass
37		132	10	5600 – 5650 MHz	-5.73	0	2.3	-3.43	-	Pass
38	ac20	116	10	5600 – 5650 MHz	-28.65	0	2.3	-26.35	-	Pass
39		132	10	5600 – 5650 MHz	-4.48	0	2.3	-2.18	-	Pass
40	ac40	110	10	5600 – 5650 MHz	-39.32	0	2.3	-37.02	-	Pass
41		134	10	5600 – 5650 MHz	-13.06	0	2.3	-10.76	-	Pass
42	ac80	106	10	5600 – 5650 MHz	-37.15	0	2.3	-34.85	-	Pass

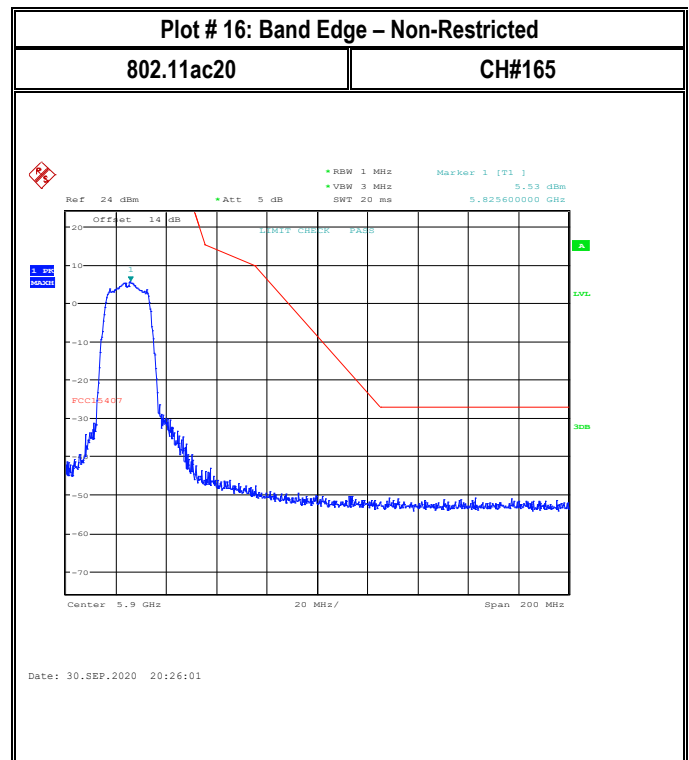
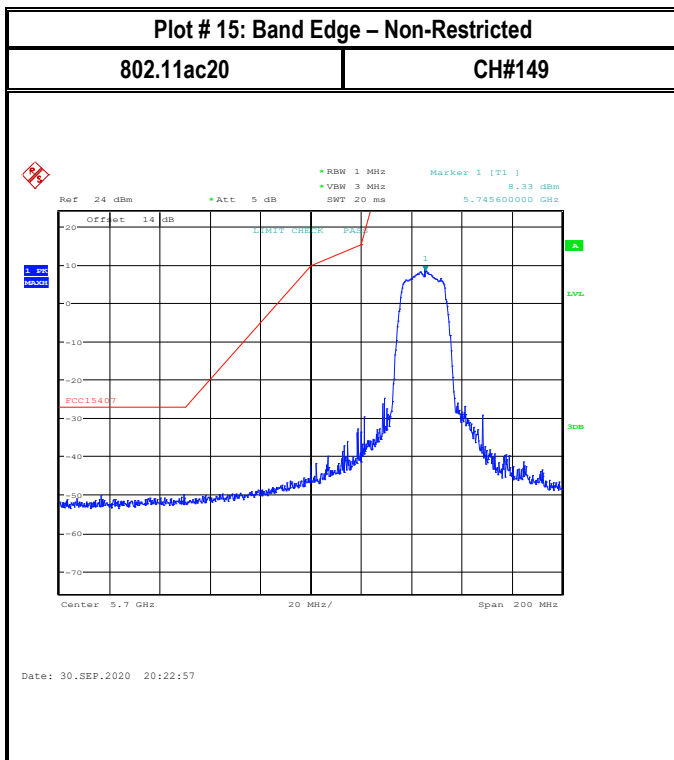
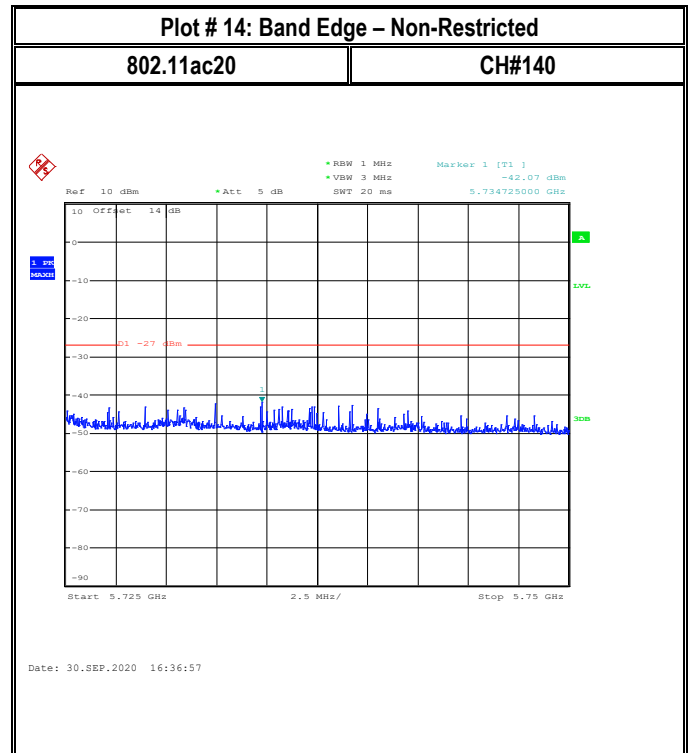
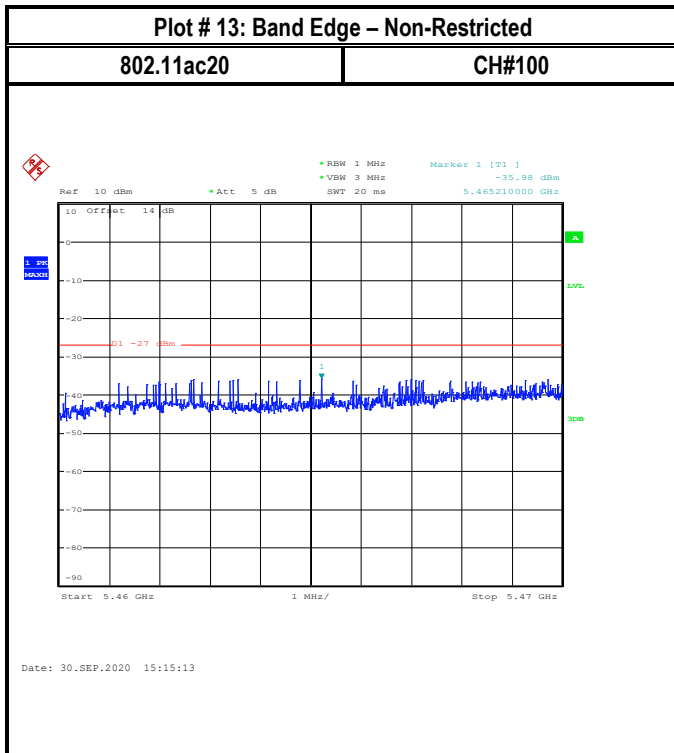


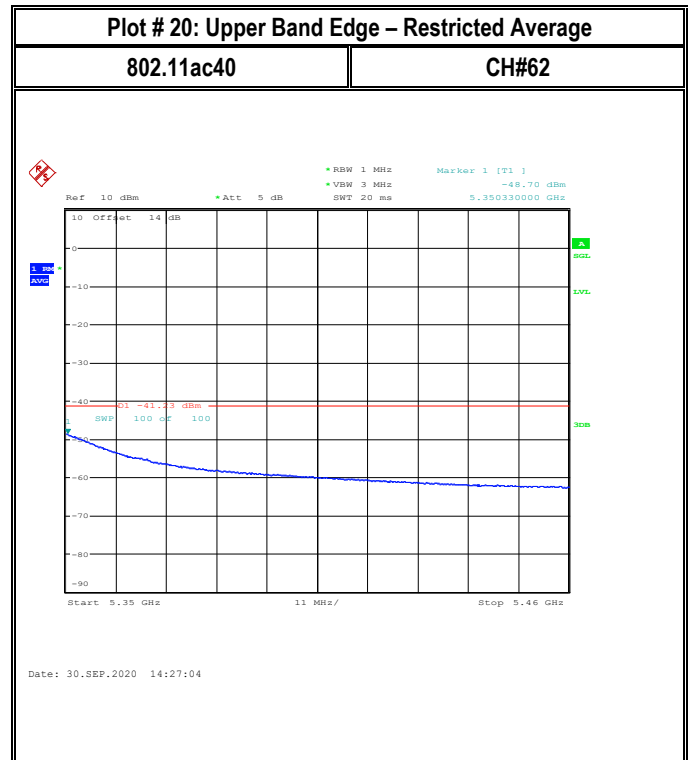
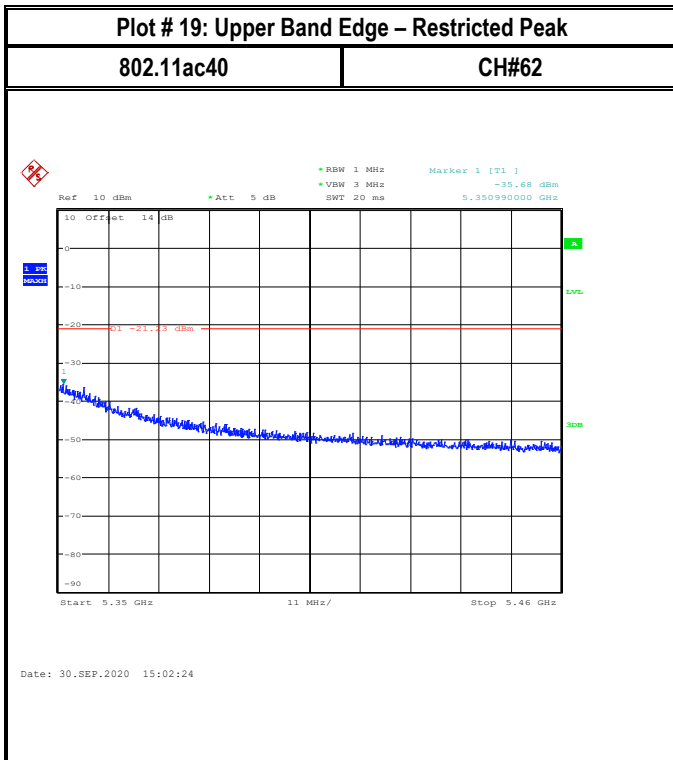
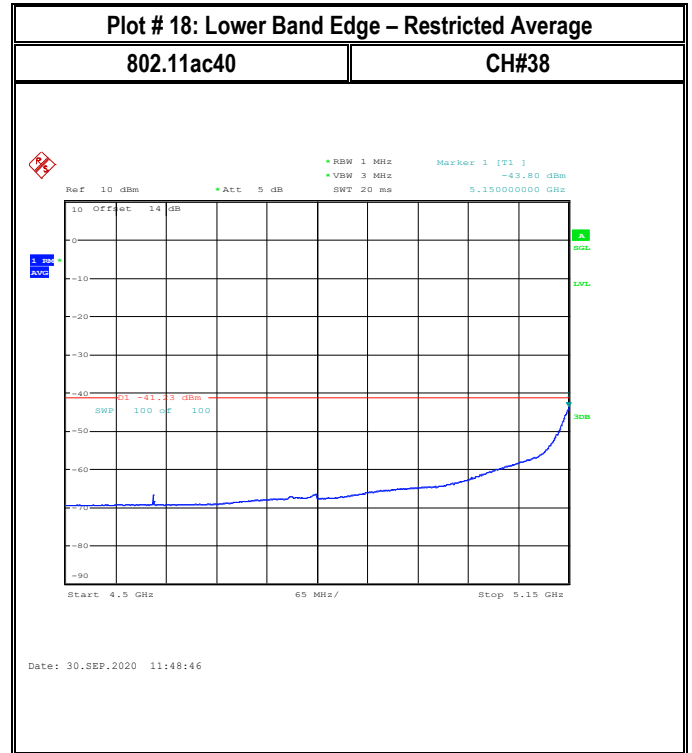
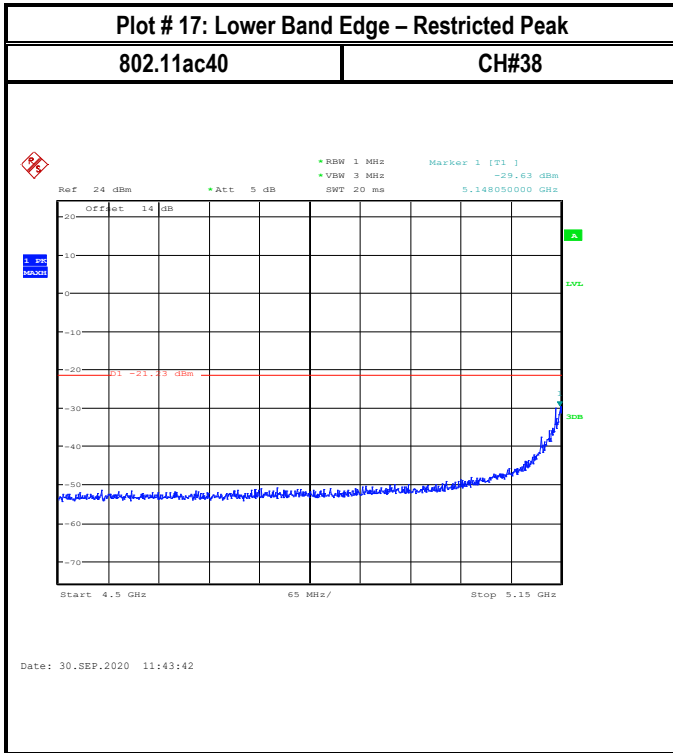
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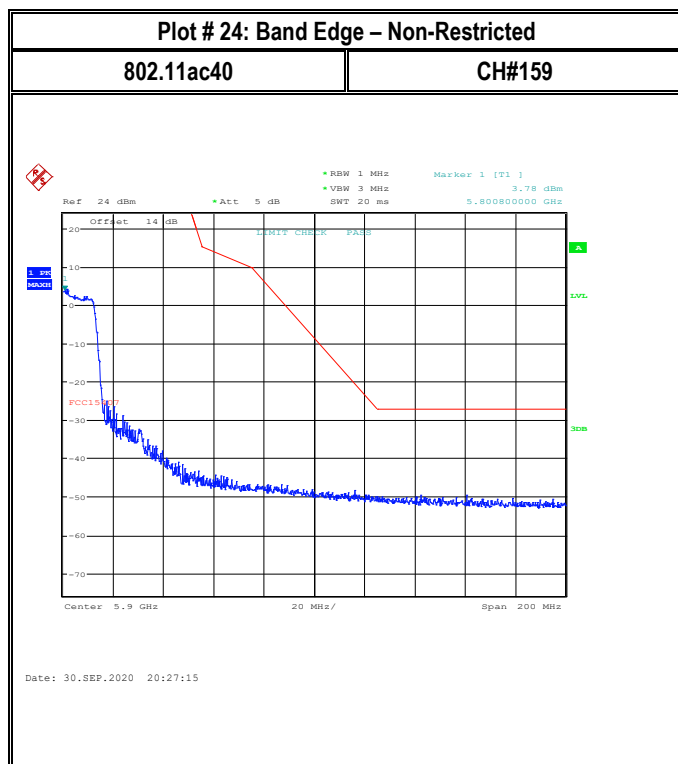
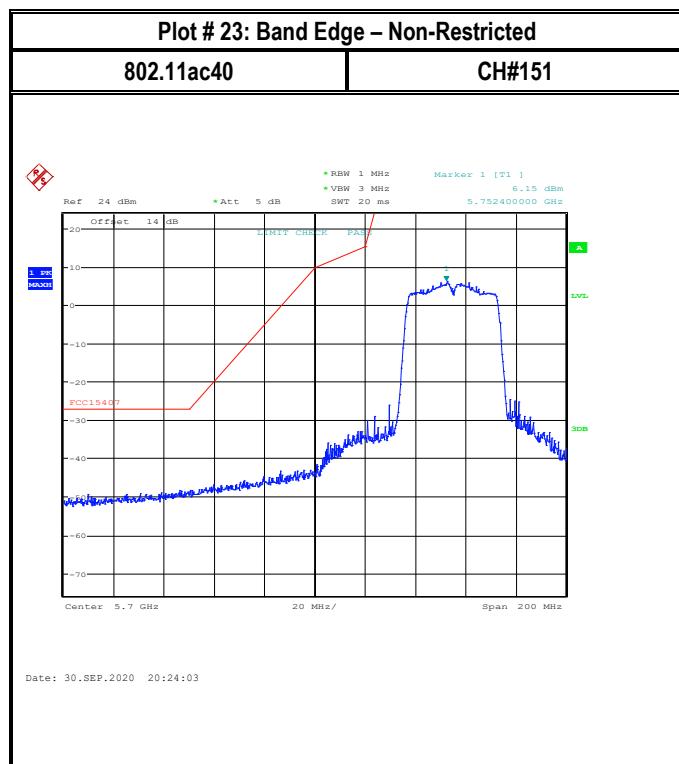
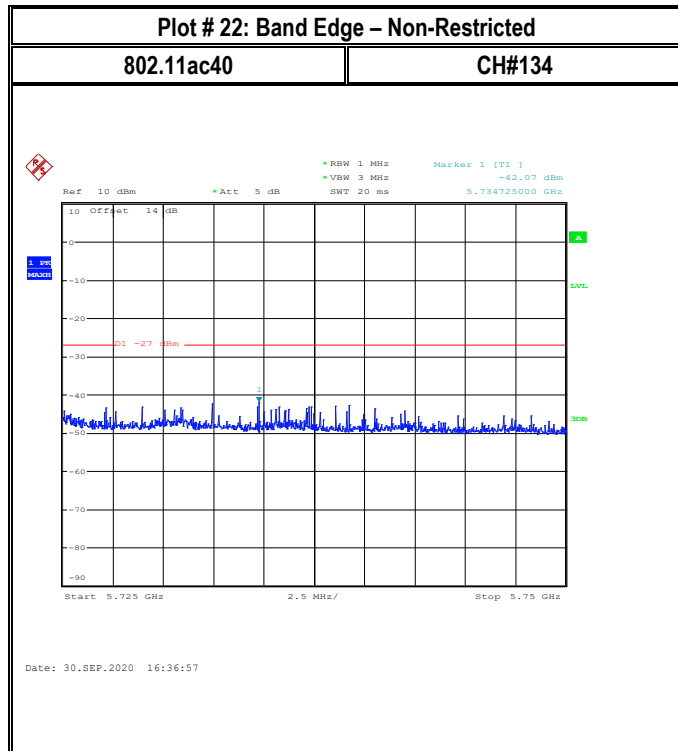
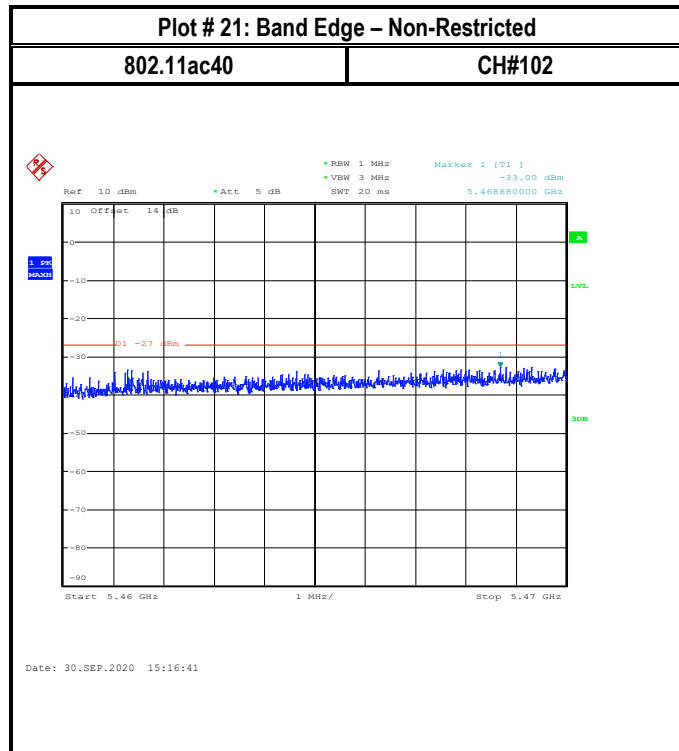




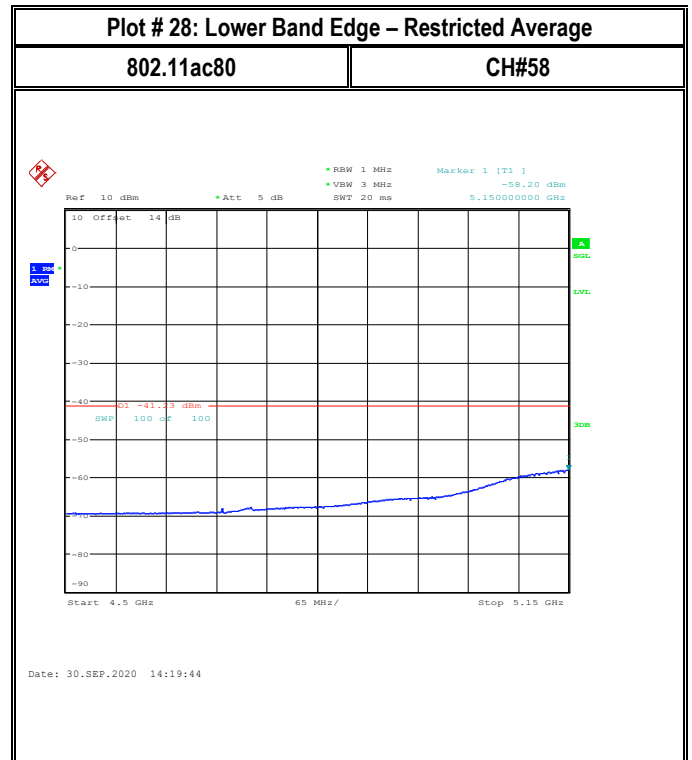
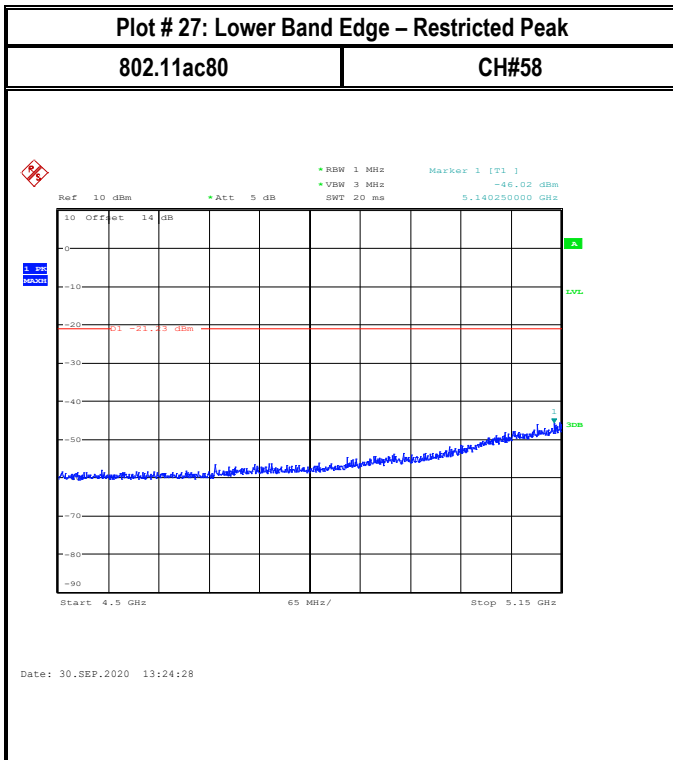
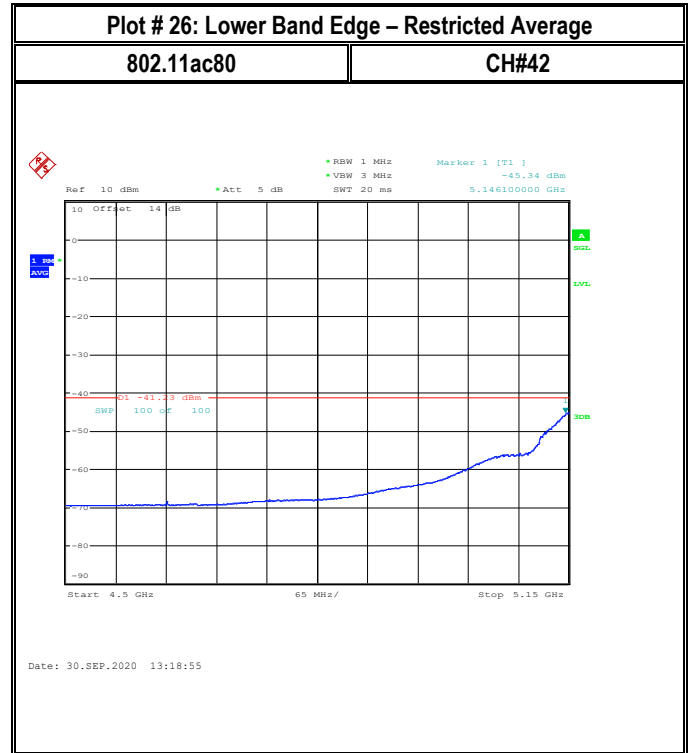
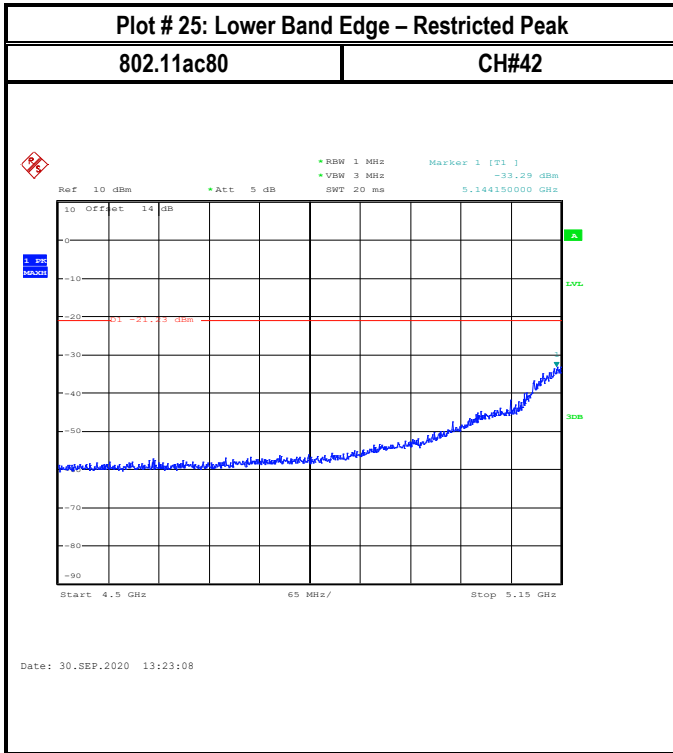


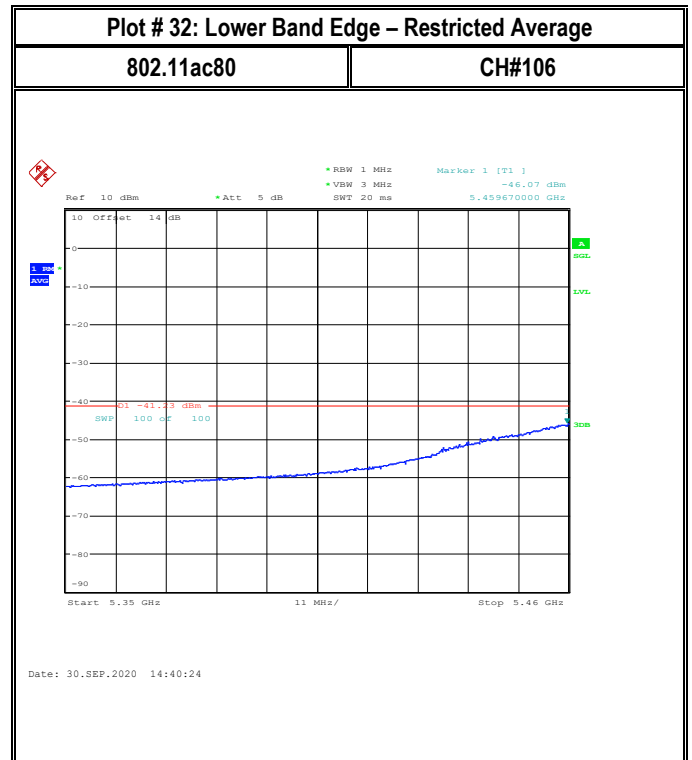
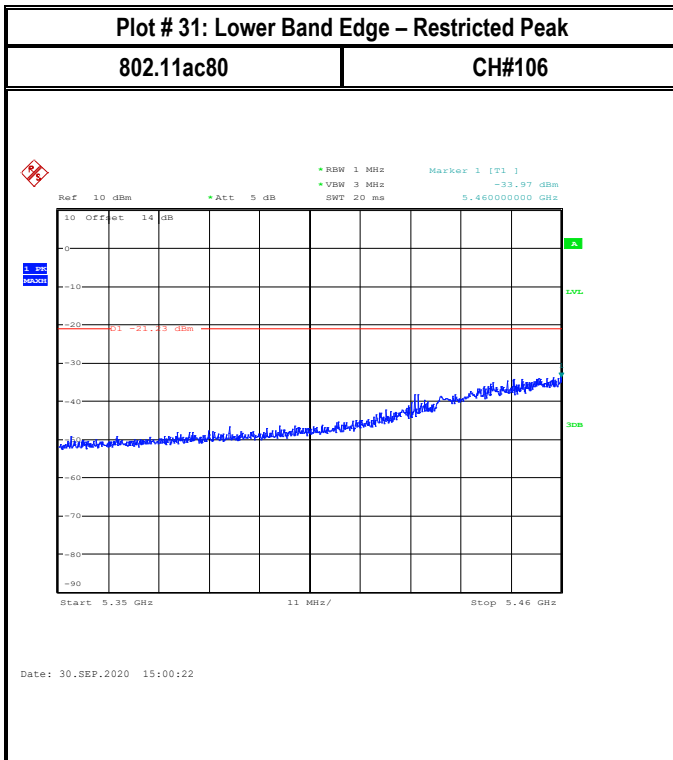
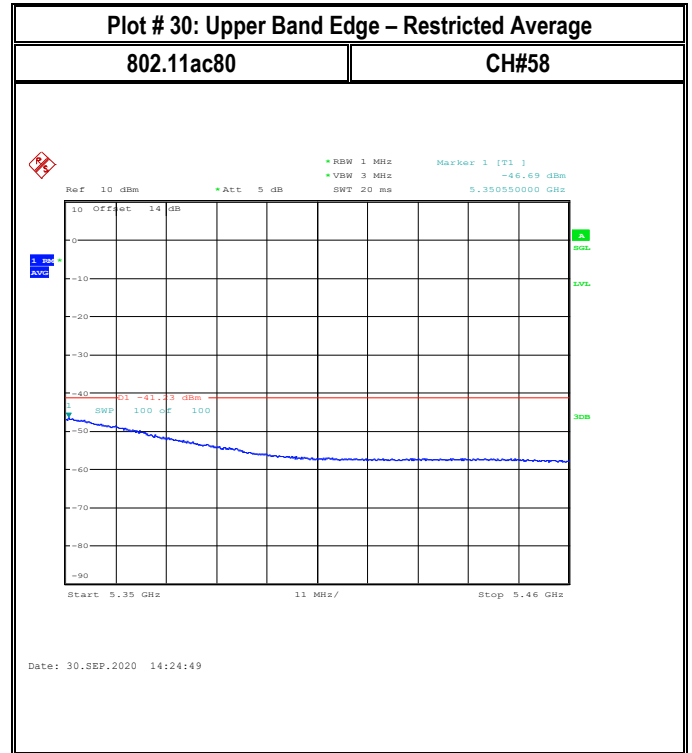
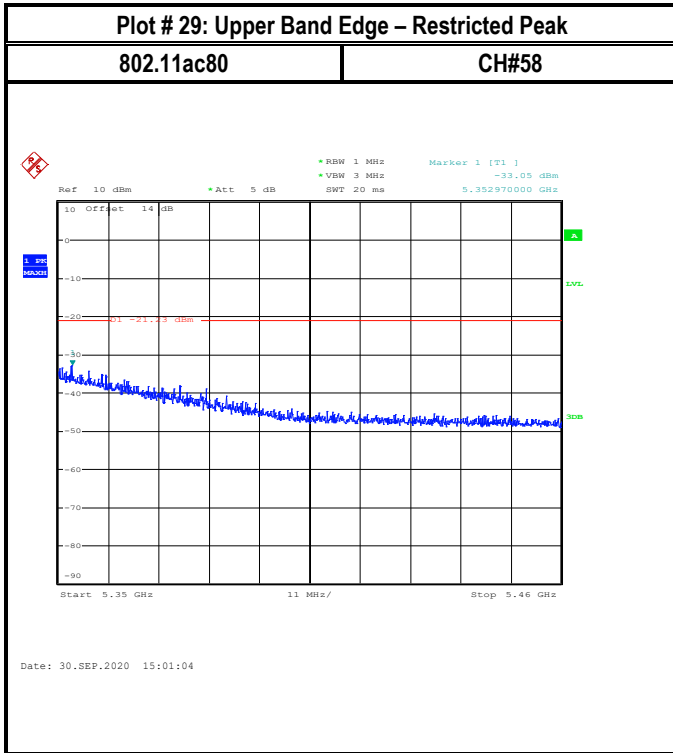


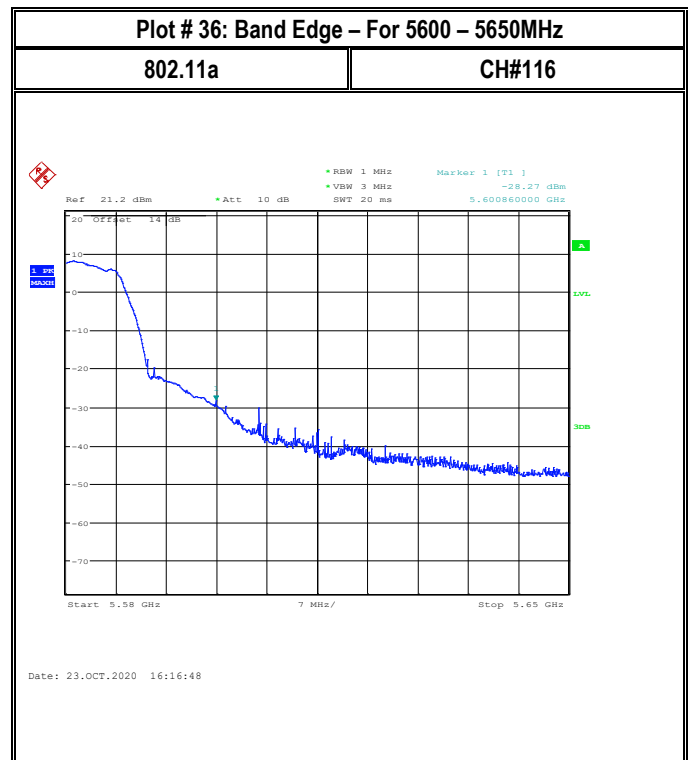
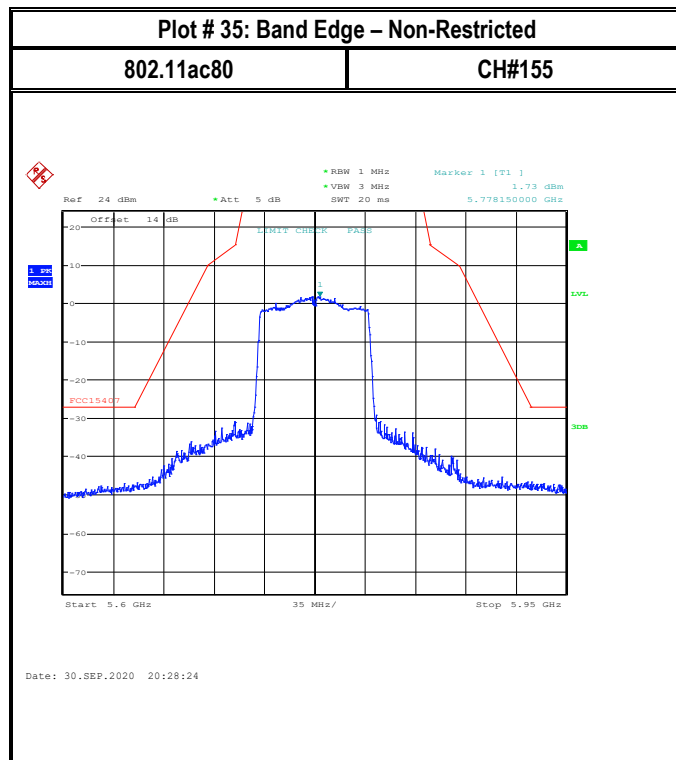
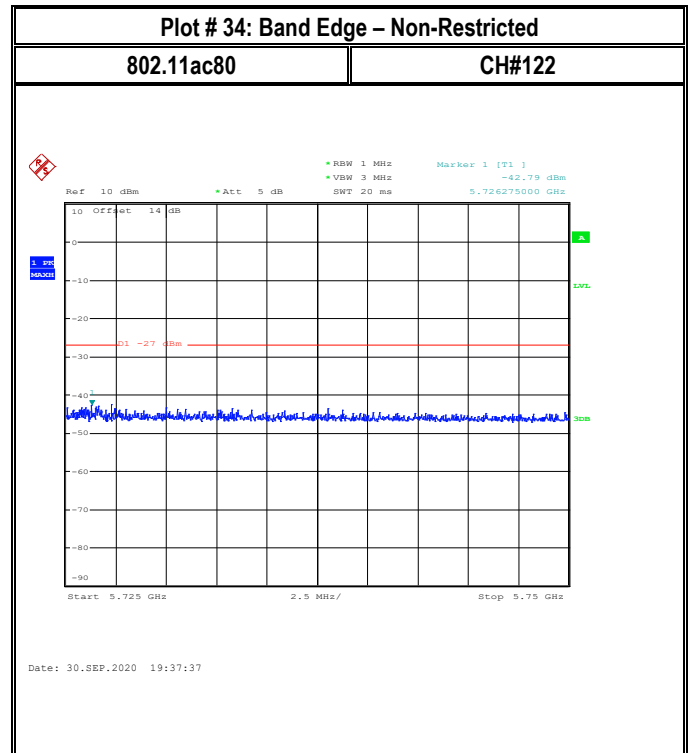
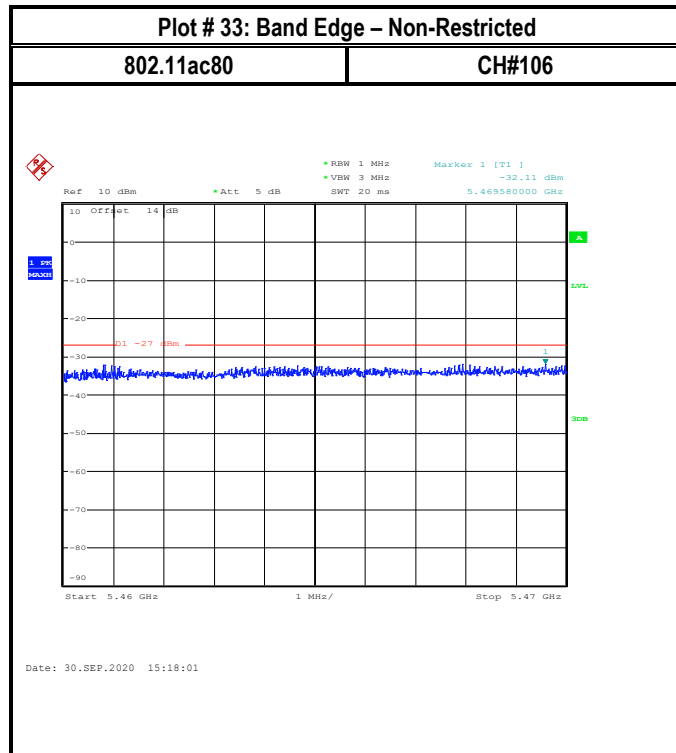


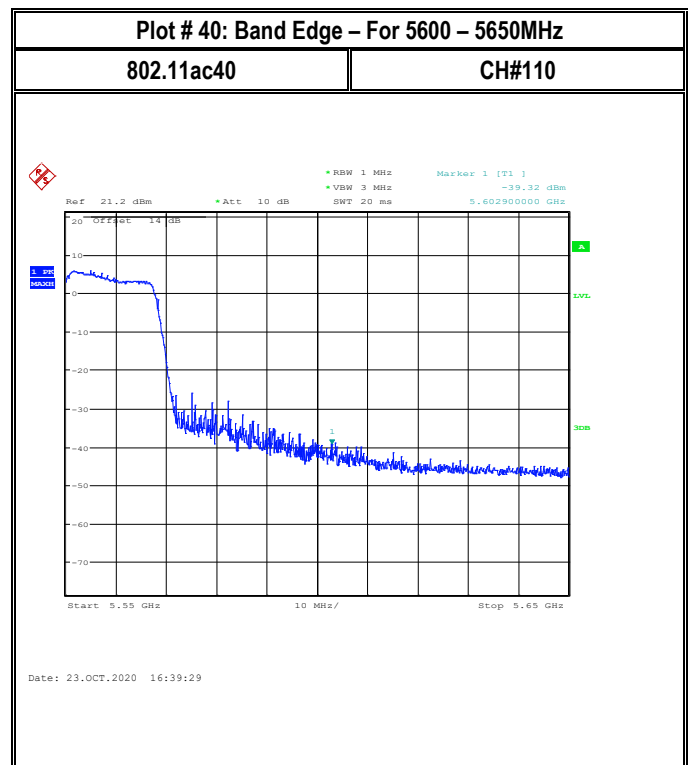
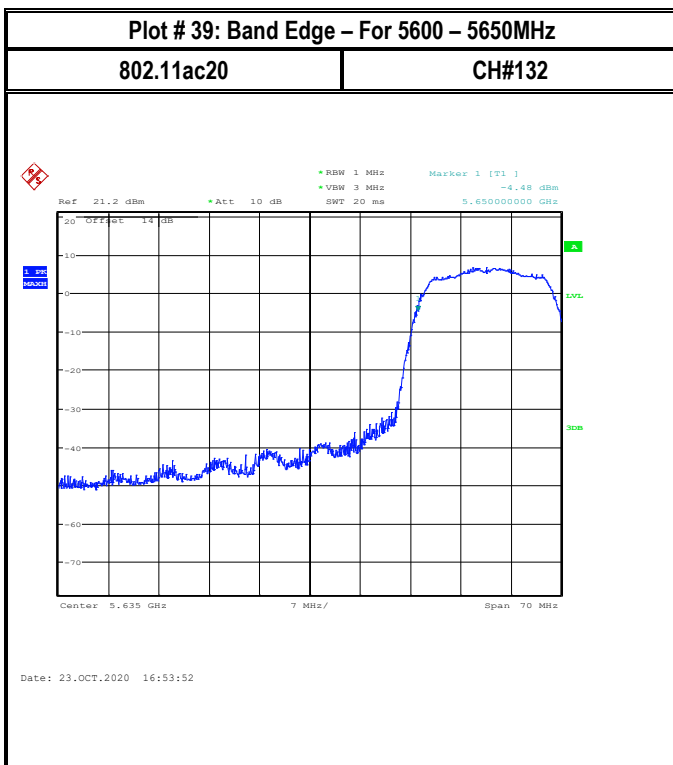
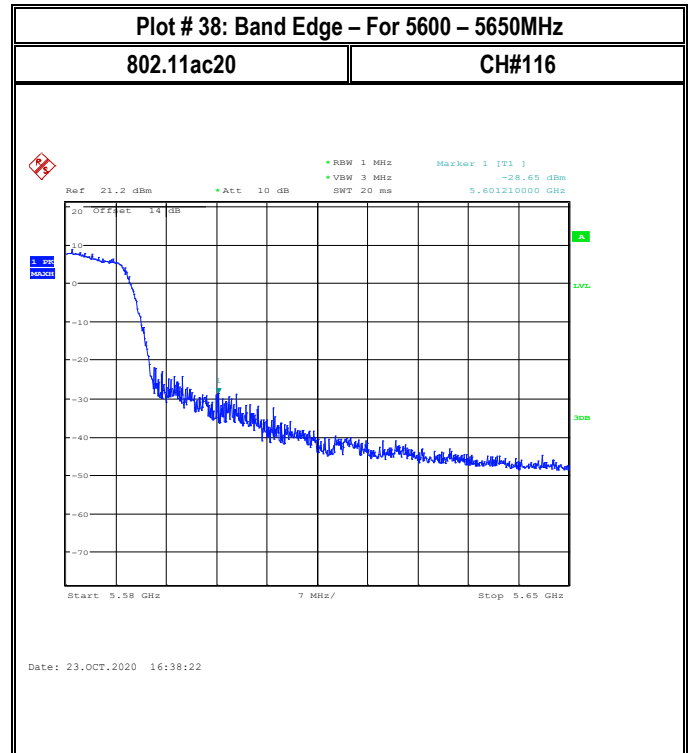
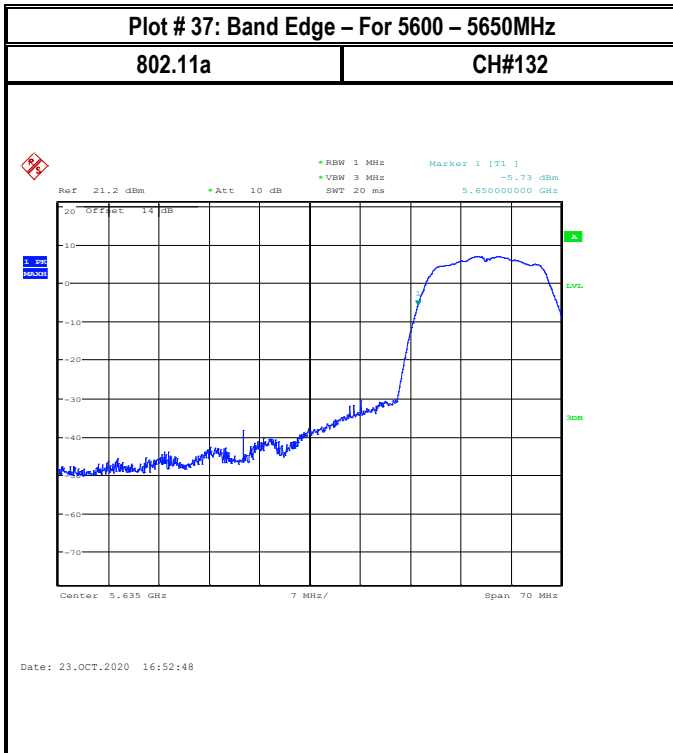


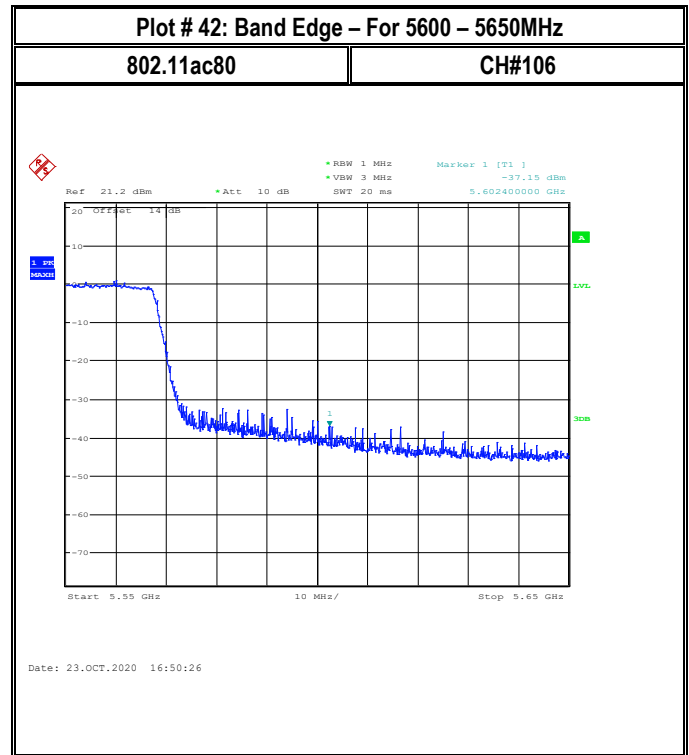
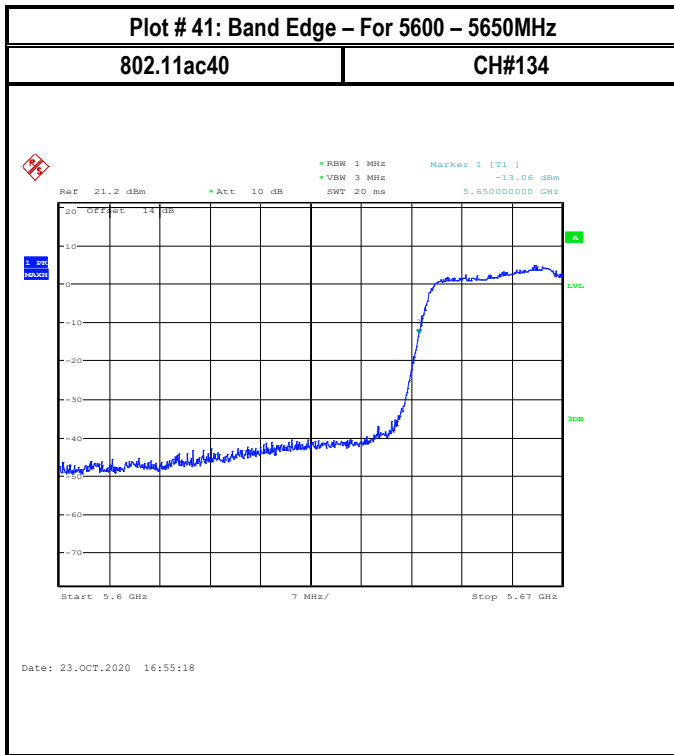












## 8.4 Emission Bandwidth 6 dB, 26 dB, and 99%

### 8.4.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

- For the band 5.150-5.250 GHz the 99% EBW is measured
- For the bands 5.250-5.350 GHz and 5.470-5.725 GHz the 26 dB and 99% EBW is measured
- For the band 5.725-5.850 GHz the 6 dB EBW is measured

#### Spectrum Analyzer Settings for 26 dB EBW:

- Set RBW = approximately 1% of the emission bandwidth
- Set the VBW > RBW
- Detector = Peak
- Trace mode = Max Hold
- Sweep = Auto Couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%

#### Spectrum Analyzer Settings for 6 dB EBW in band 5.725 – 5.850 GHz:

- 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

#### Spectrum Analyzer Settings for 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency
- Set span = 1.5 times to 5.0 times the OBW
- Set RBW = 1% to 5% of the OBW
- Set VBW  $\geq 3 \times$  RBW
- Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used
- Use the 99% power bandwidth function of the instrument (if available)
- If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. 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% occupied bandwidth is the difference between these two frequencies

#### 8.4.2 Limits:

FCC §15.247(e) and RSS-407 6.2.4.1

- For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 8.4.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	802.11 a/ac	120 VAC

#### 8.4.4 Measurement result:

Plot #	Mode	Channel	Frequency (MHz)	99% Emissions Bandwidth (MHz)
1	a	40	5200	17.8
2		60	5300	17.8
3		116	5580	17.88
4		157	5785	17.84
5	ac20	40	5200	18.76
6		60	5300	18.84
7		116	5580	18.76
8		157	5785	18.8
9	ac40	38	5190	36.48
10		62	5310	36.4
11		110	5550	36.4
12		159	5795	36.4
13	ac80	42	5210	76
14		58	5290	75.52
15		106	5530	75.52
16		155	5775	75.68

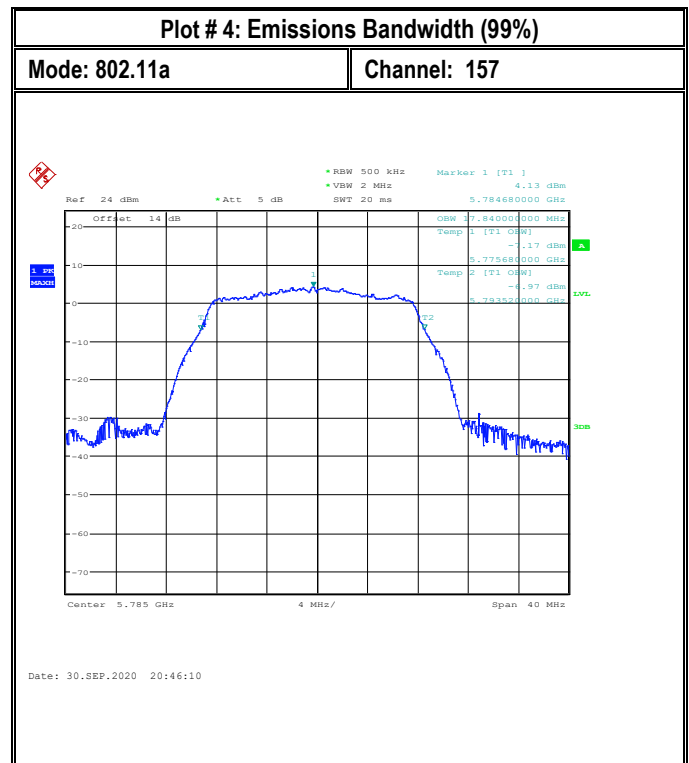
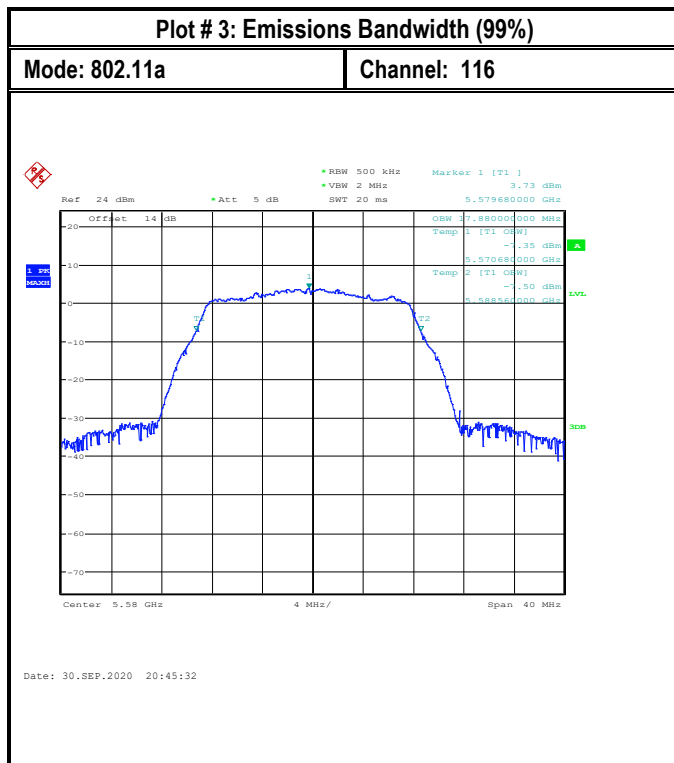
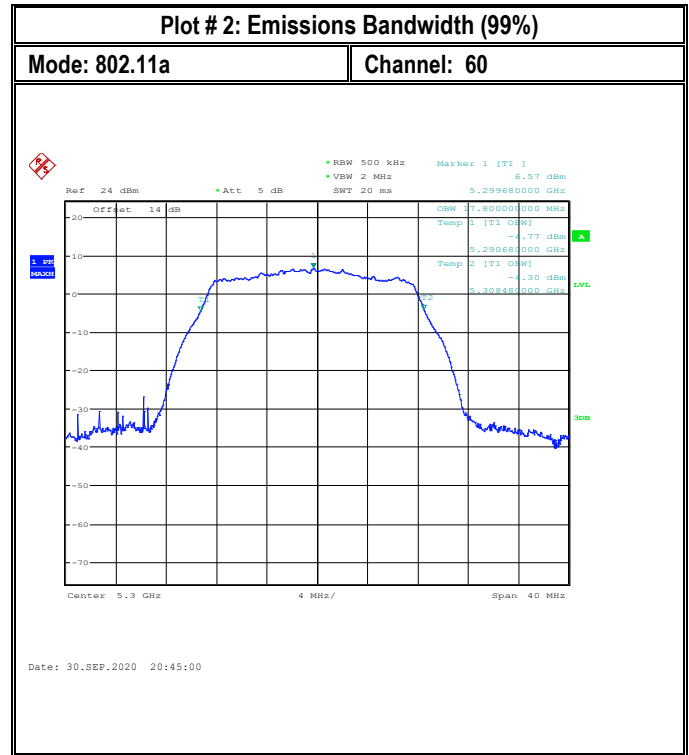
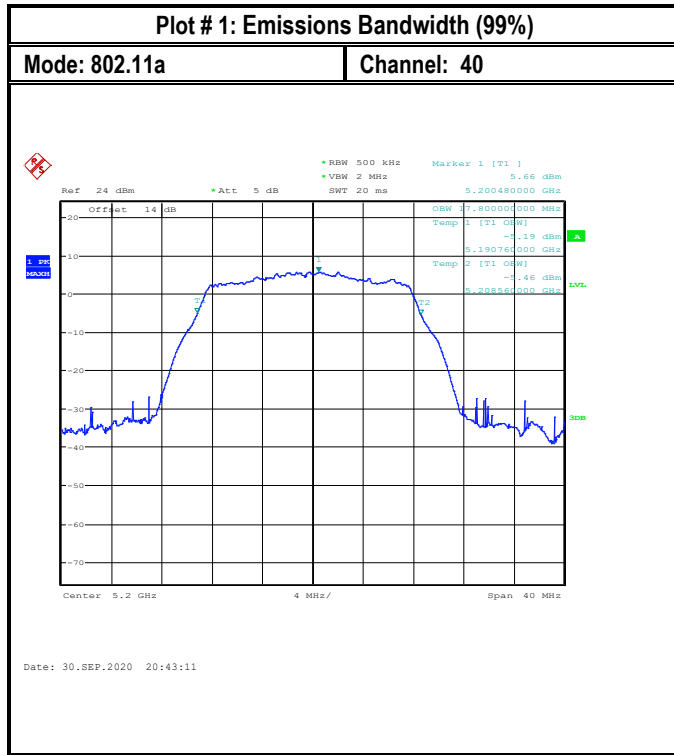
Plot #	Mode	Channel	Frequency (MHz)	26 dB Emissions Bandwidth (MHz)
17	a	40	5200	21.55
18		60	5300	21.55
19		116	5580	21.55
20		157	5785	21.6
21	ac20	40	5200	21.85
22		60	5300	21.85
23		116	5580	21.9
24		157	5785	22
25	ac40	38	5190	40.2
26		62	5310	40.2
27		110	5550	40.4
28		159	5795	40.1
29	ac80	42	5210	82.2
30		58	5290	81.75
31		106	5530	82.5
32		155	5775	82.05

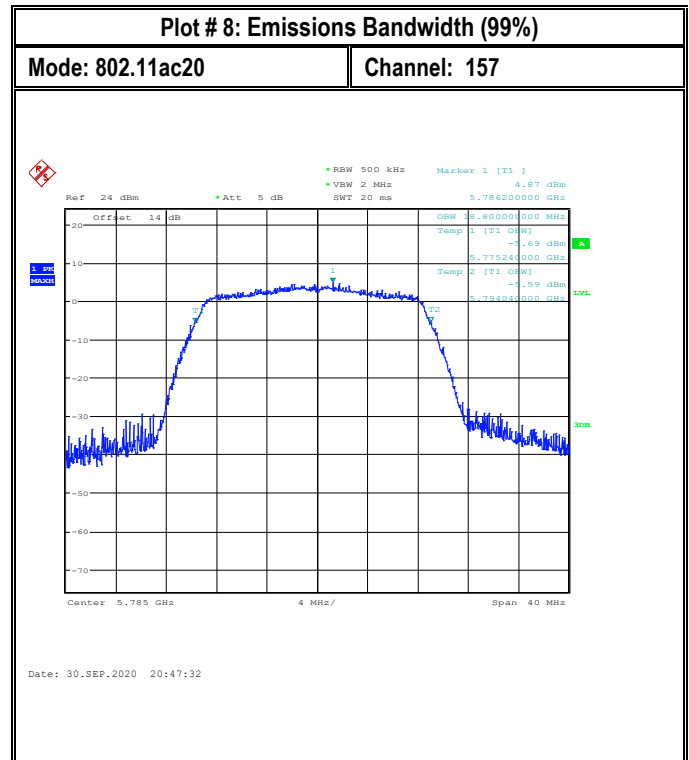
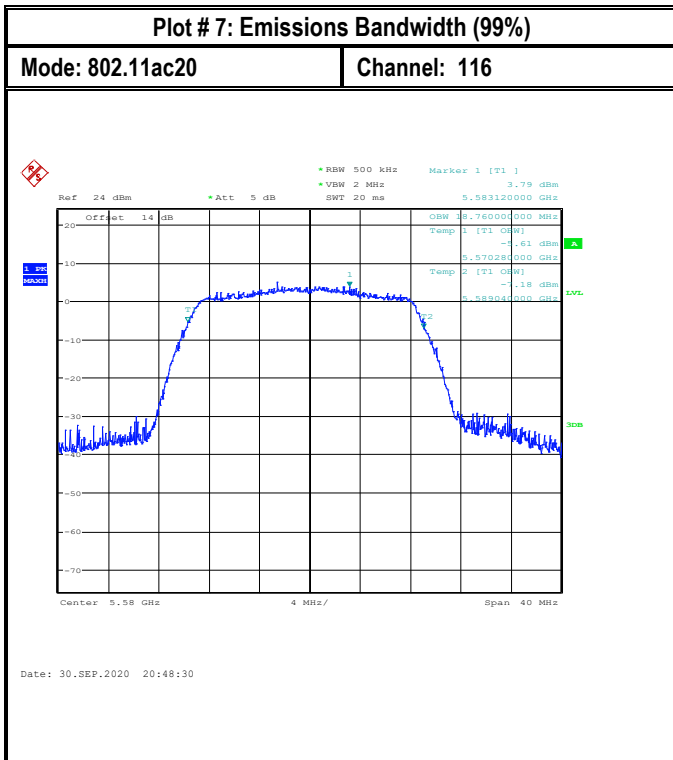
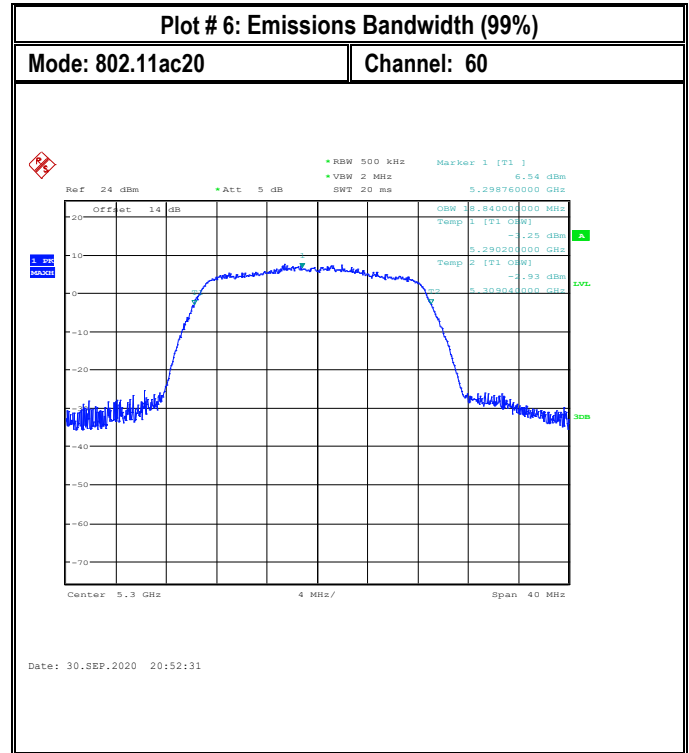
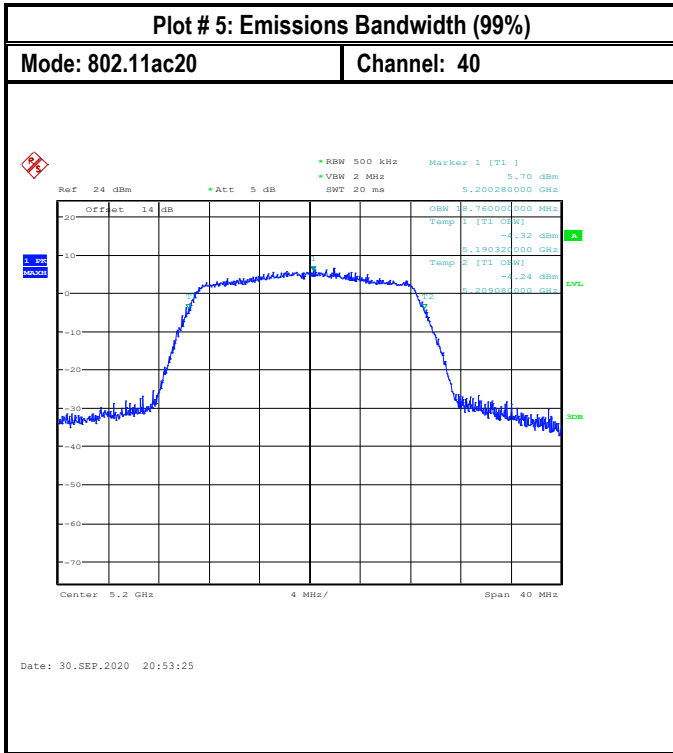
Plot #	Mode	Channel	Frequency (MHz)	6 dB Emissions Bandwidth (MHz)	Limit (MHz)	Result
33	a	157	5785	16.41	> 0.5	Pass
34	ac20	157	5785	17.63	> 0.5	Pass
35	ac40	159	5795	35.98	> 0.5	Pass
36	ac80	155	5775	75.64	> 0.5	Pass

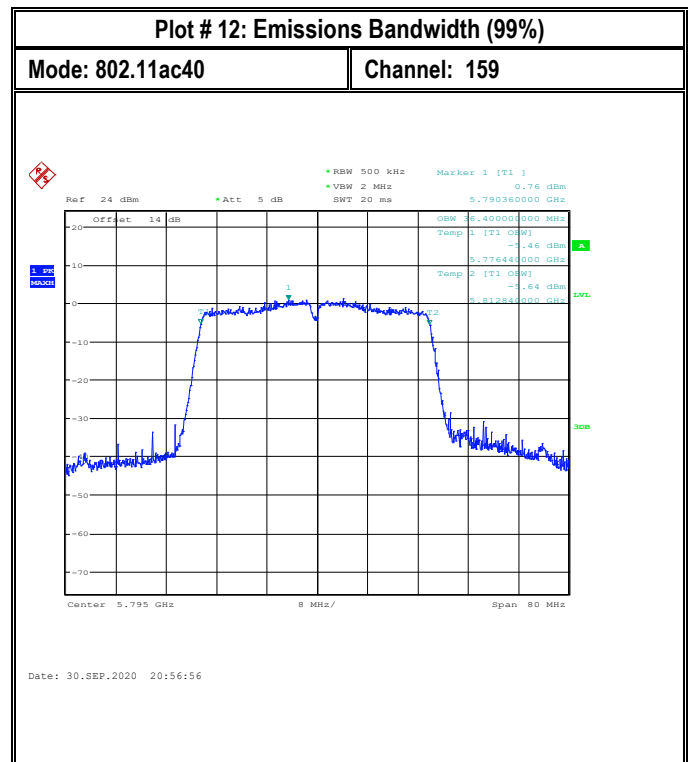
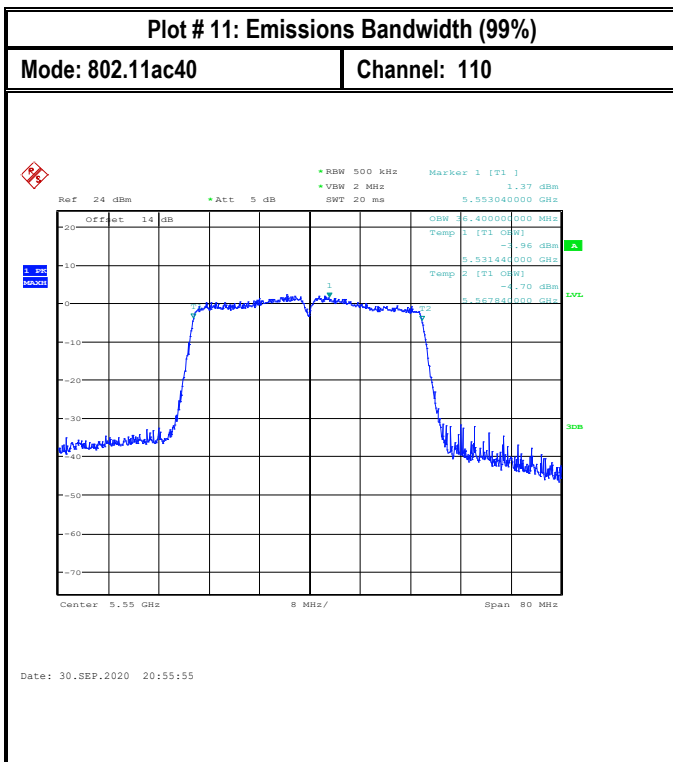
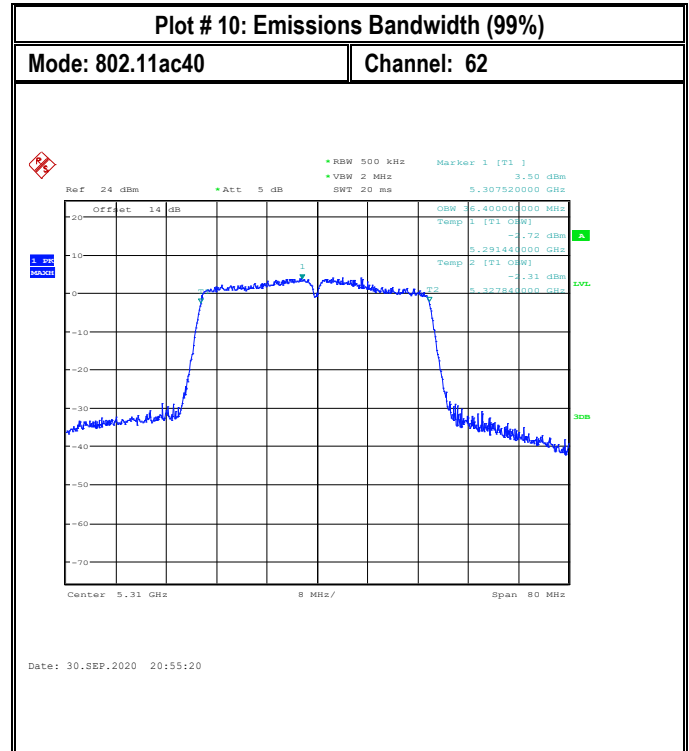
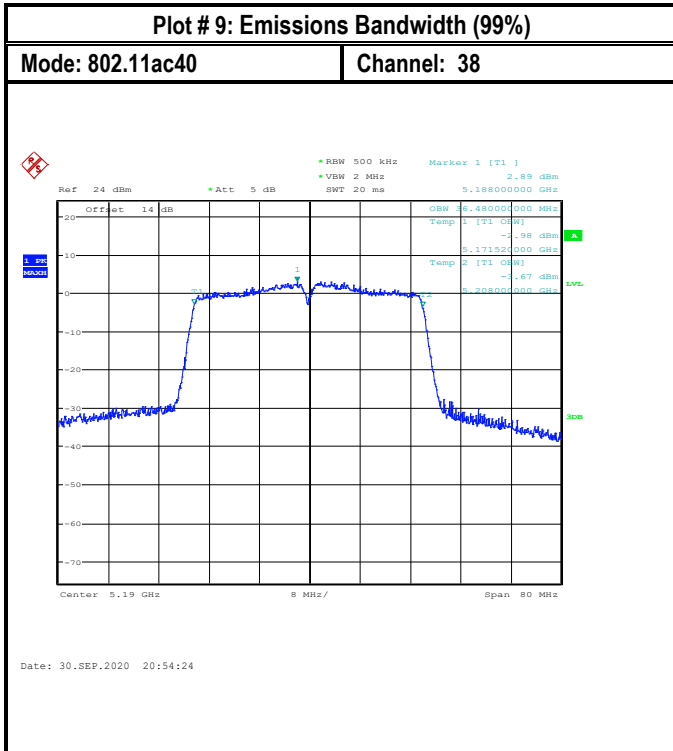


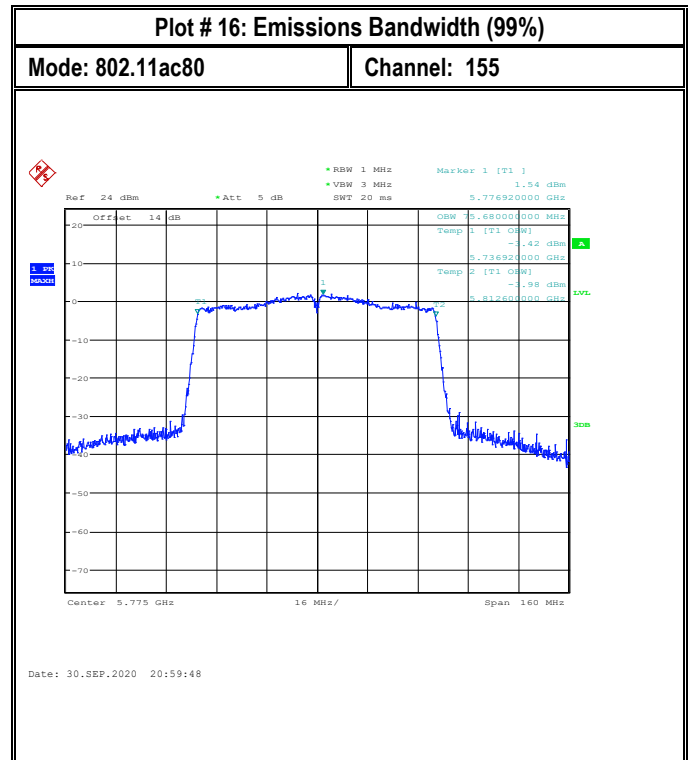
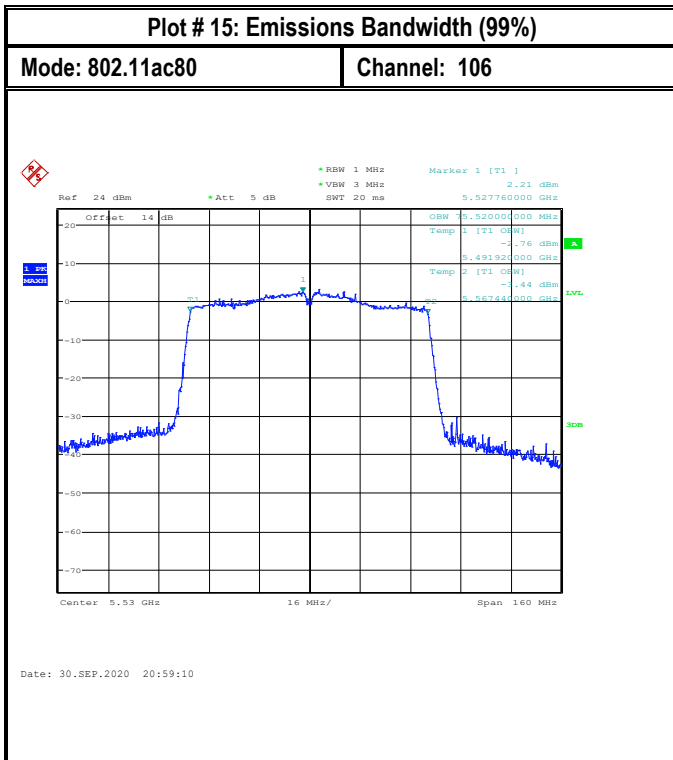
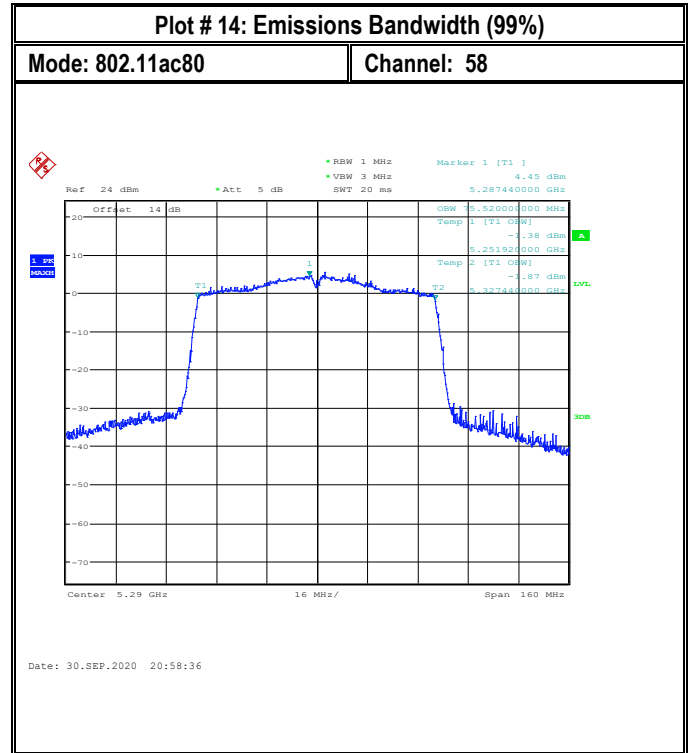
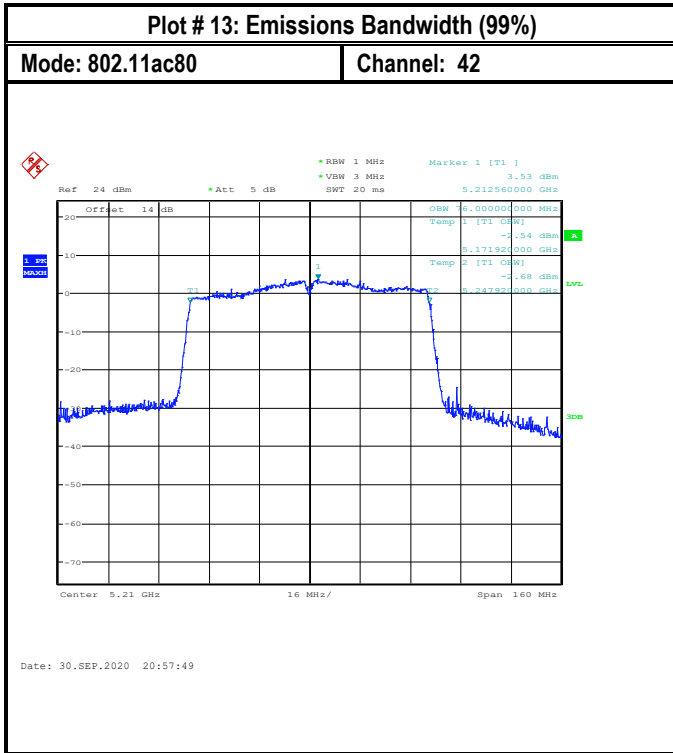


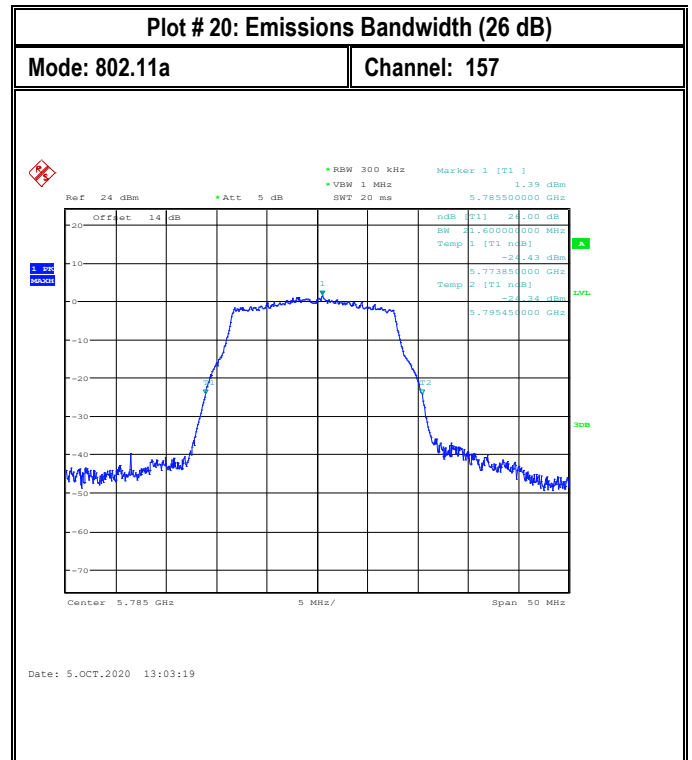
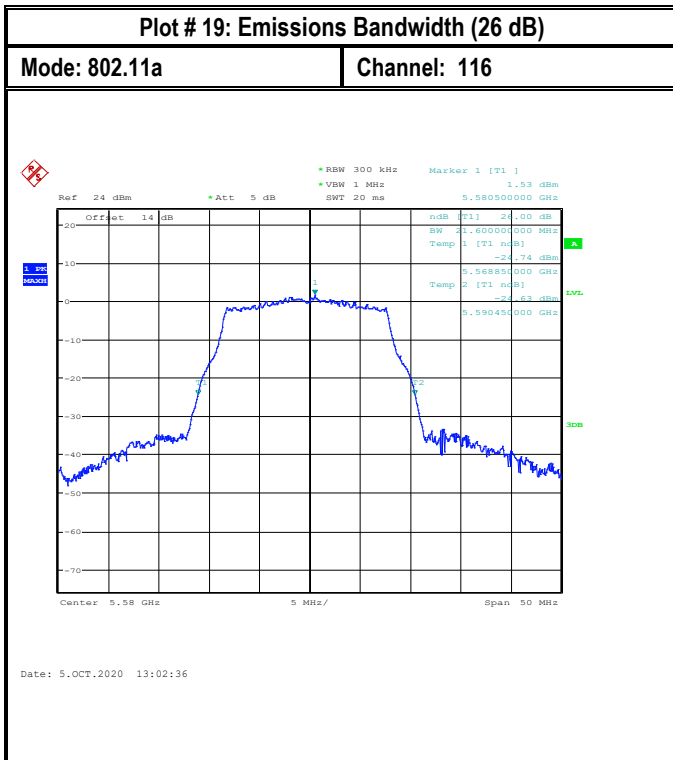
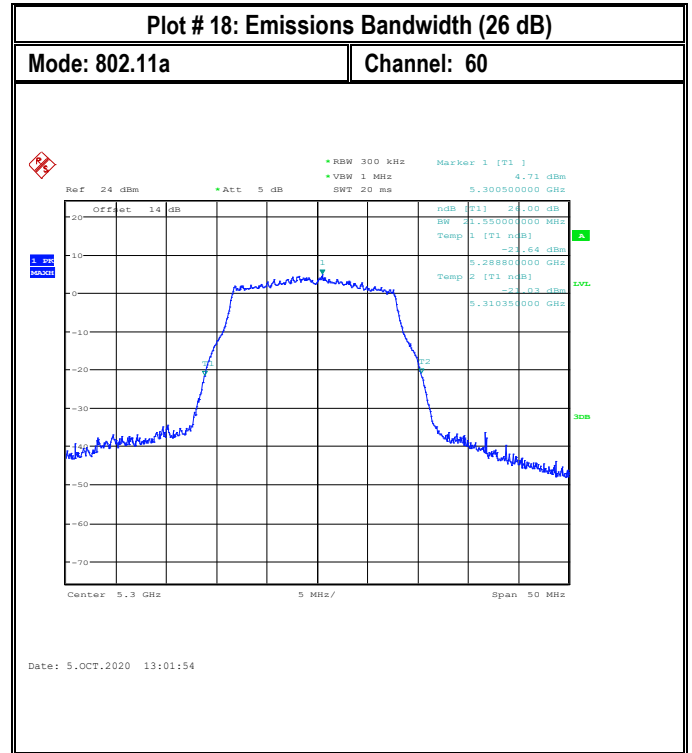
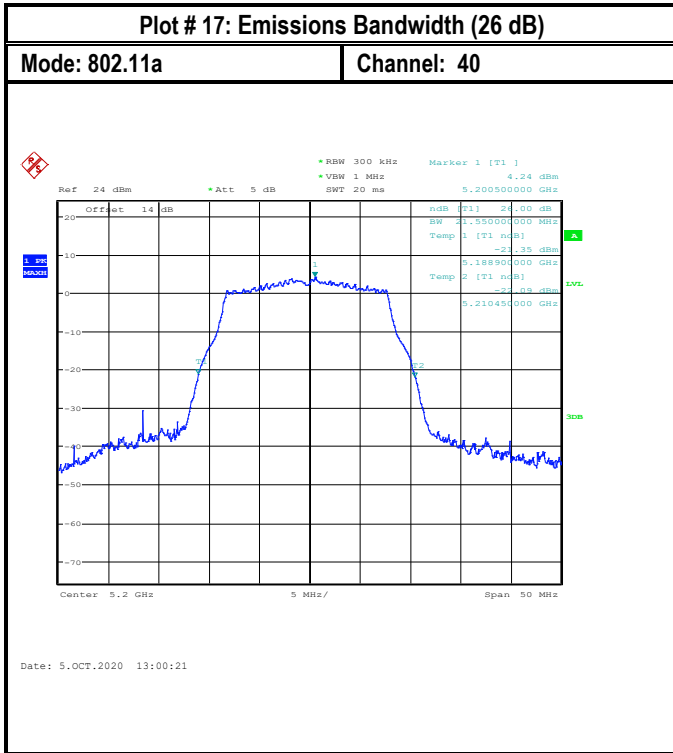
### 8.4.5 Measurement Plots:

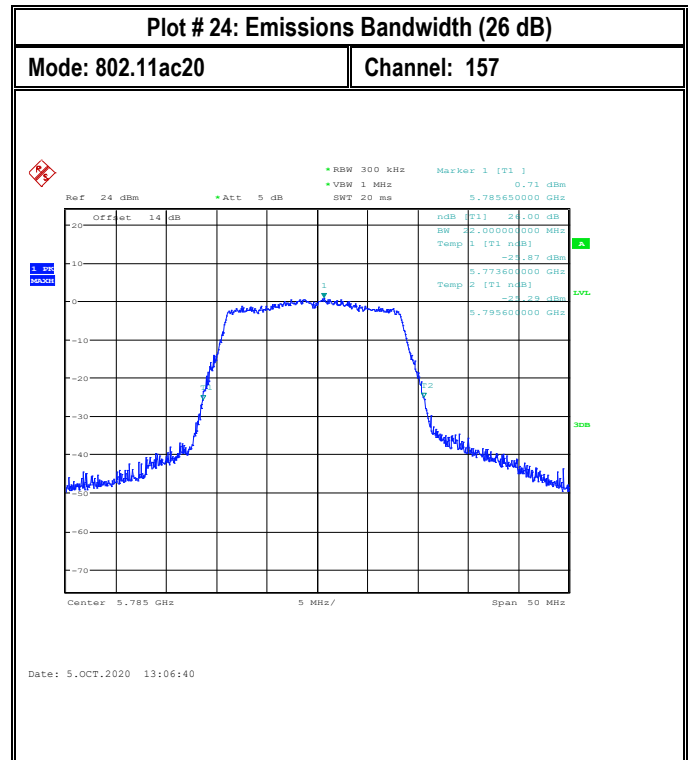
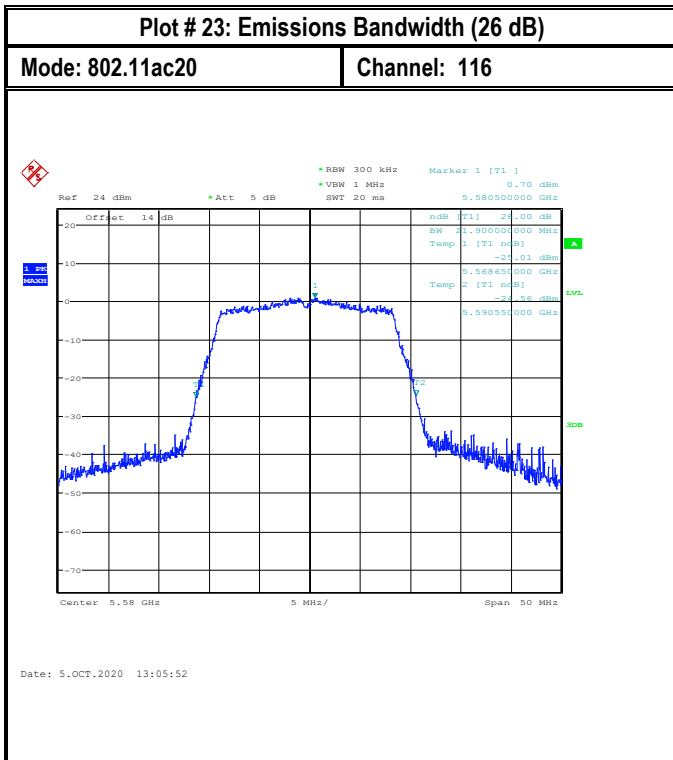
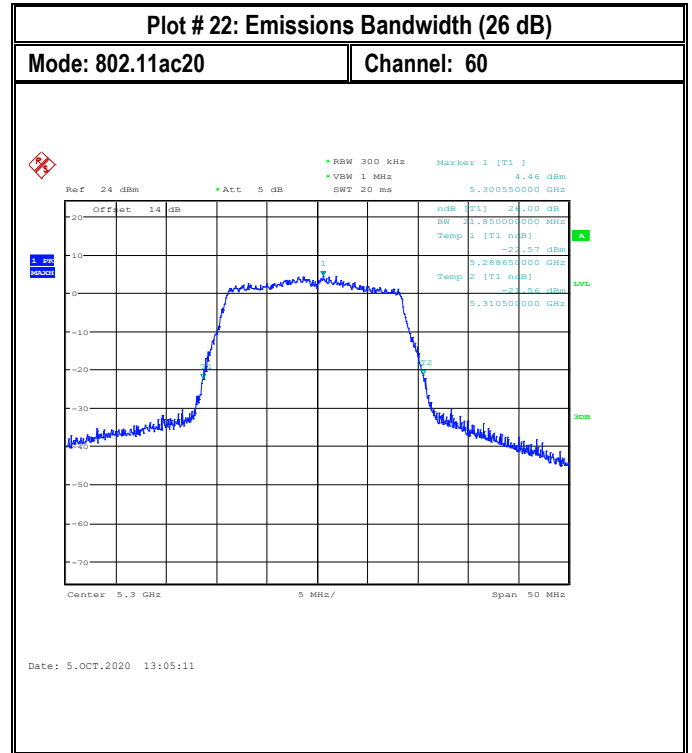
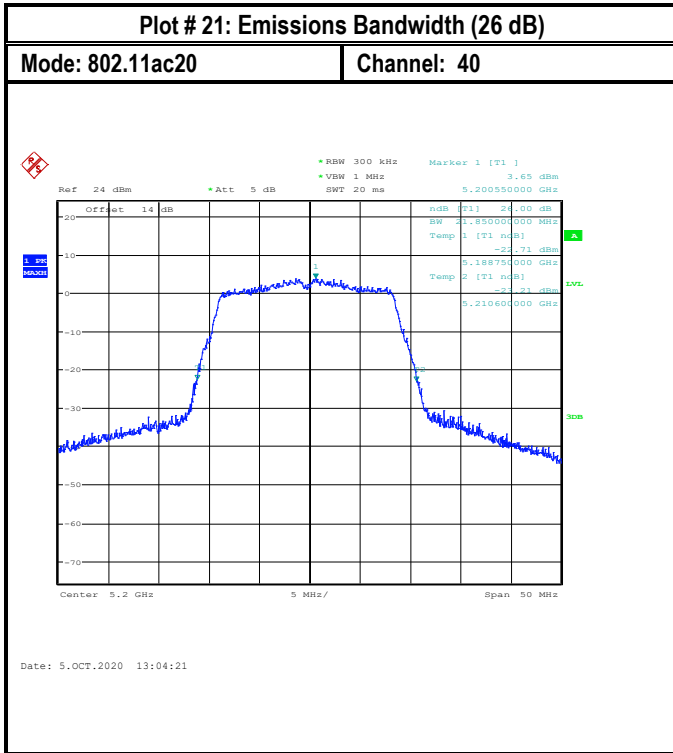


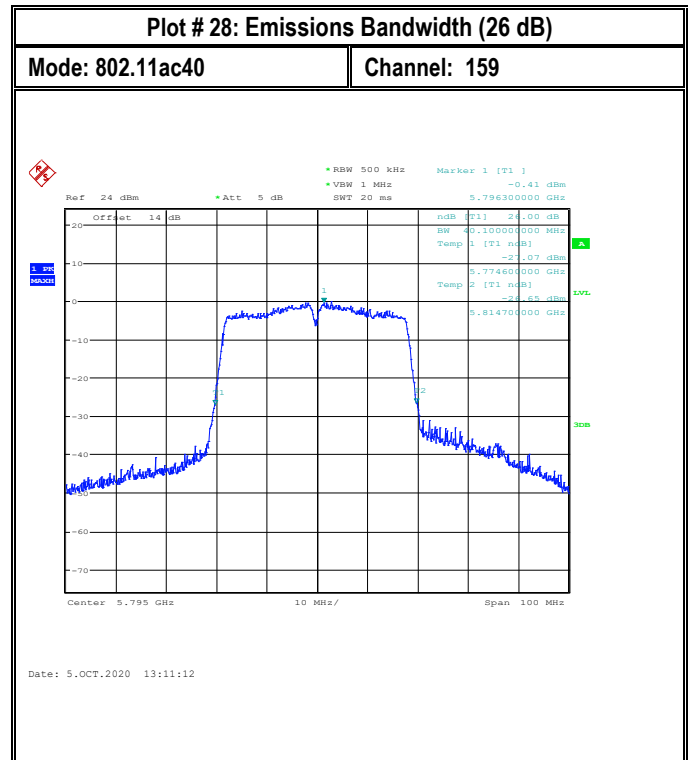
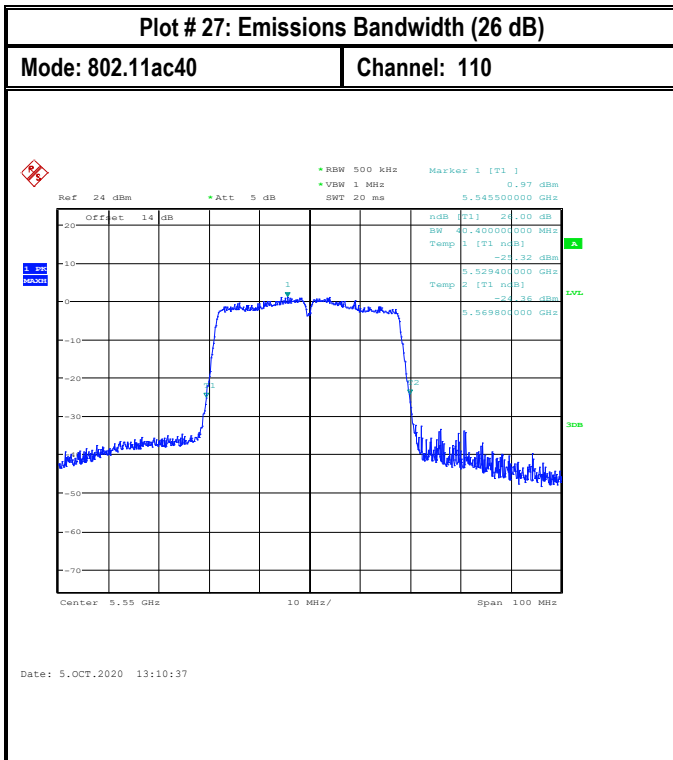
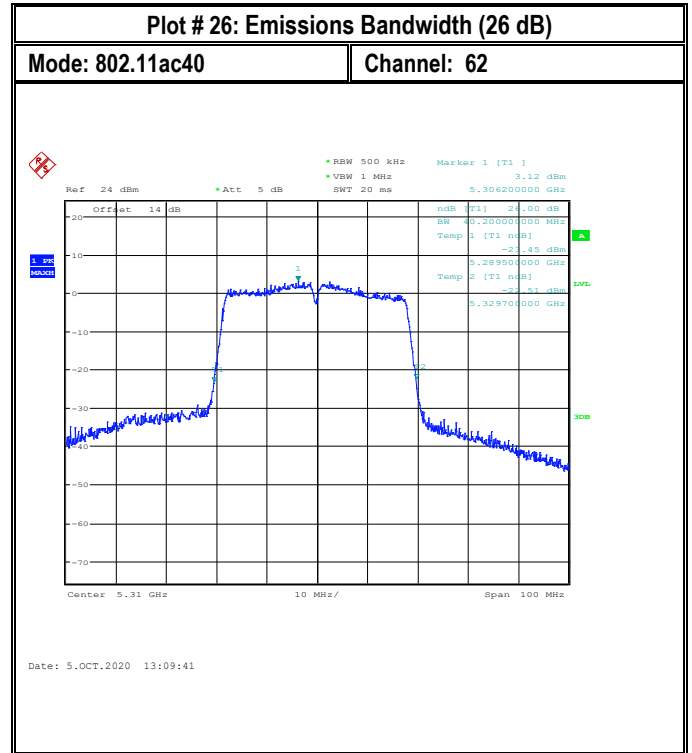
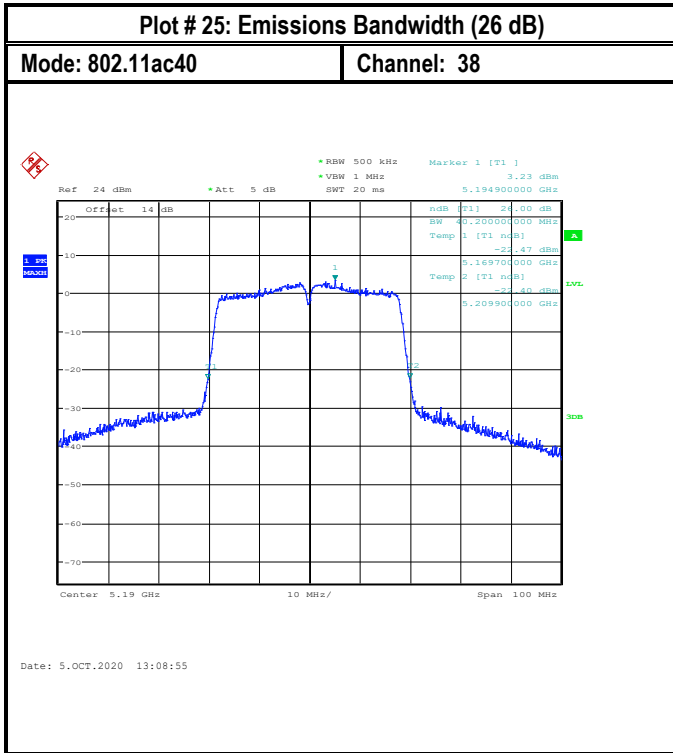


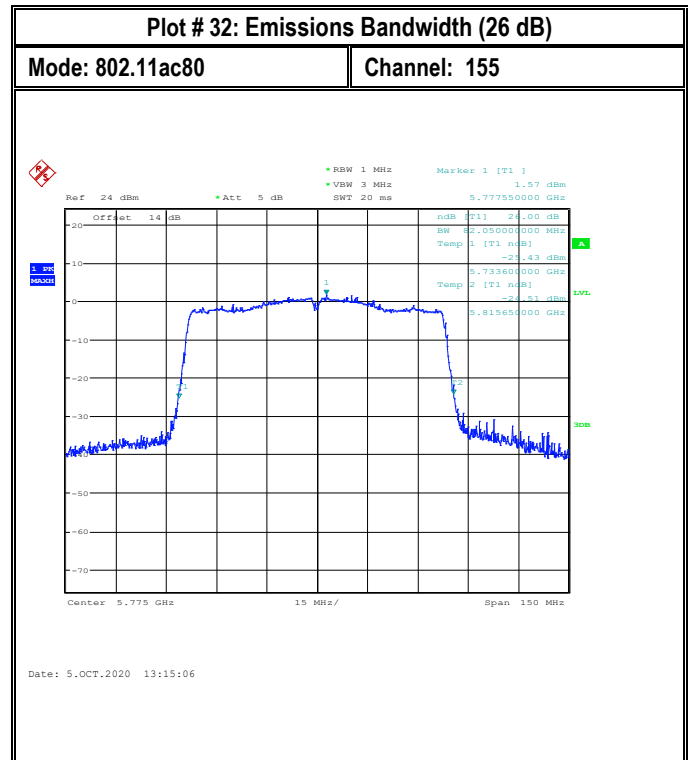
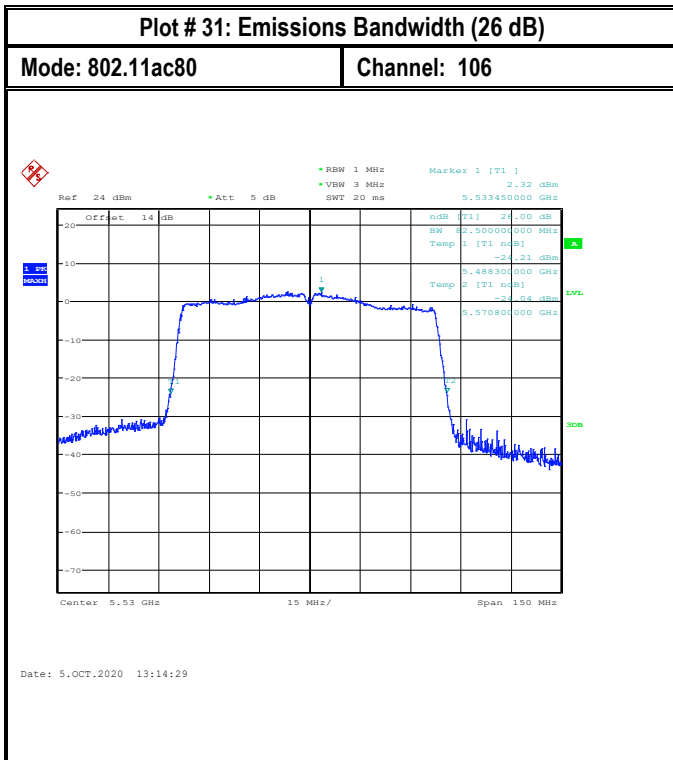
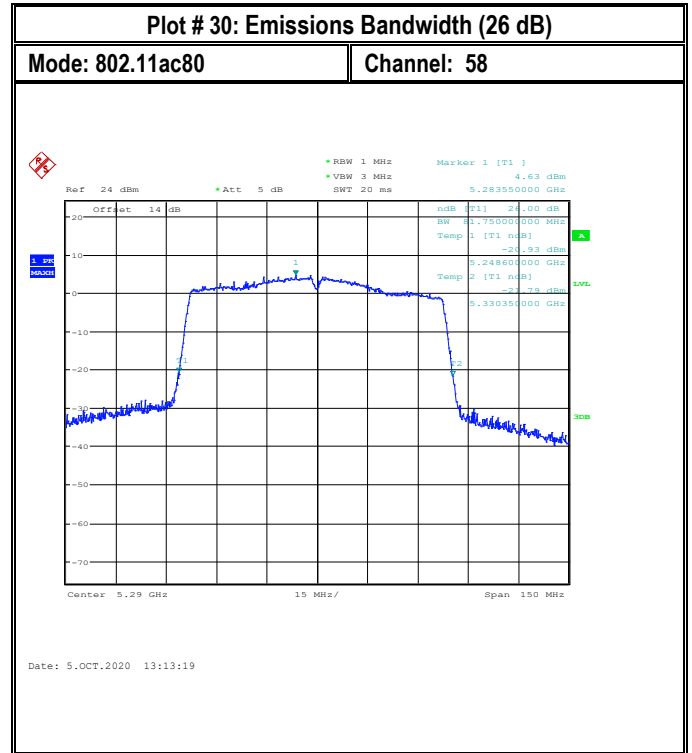
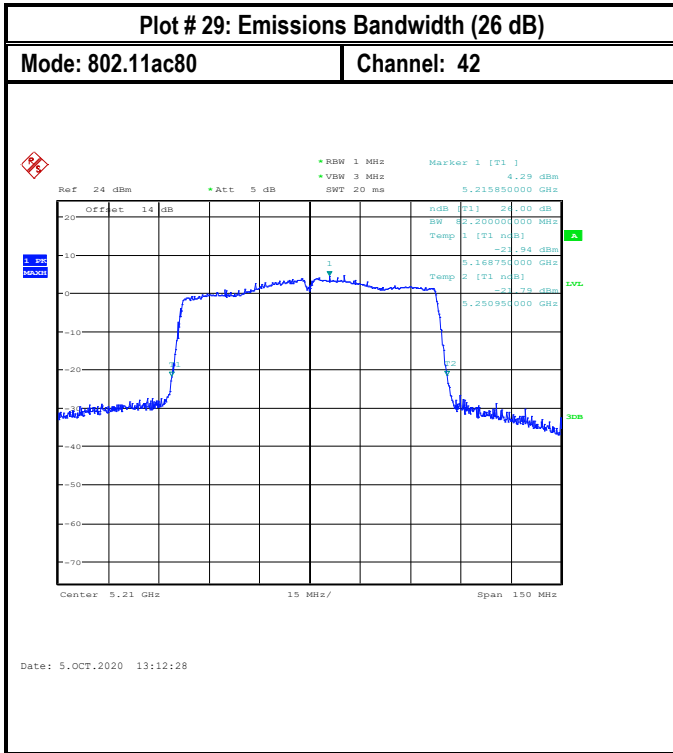




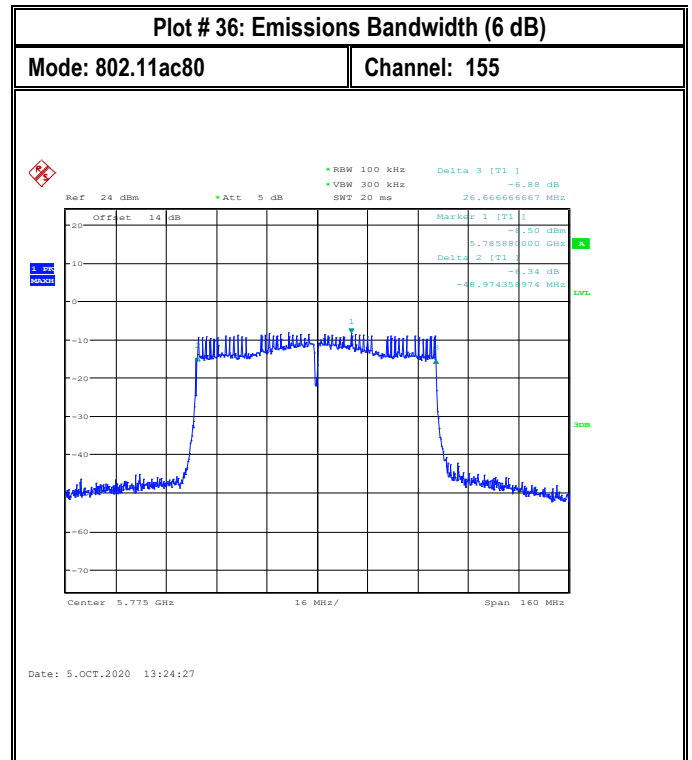
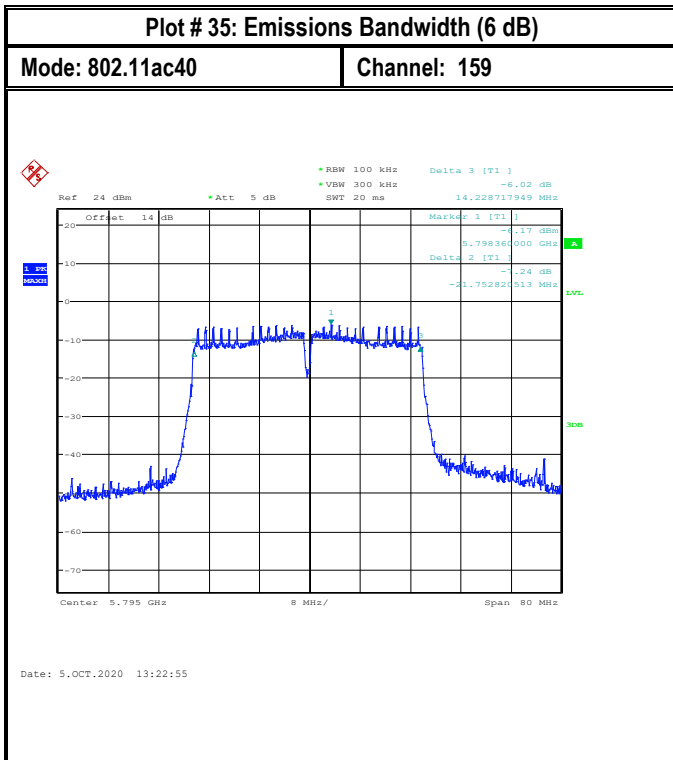
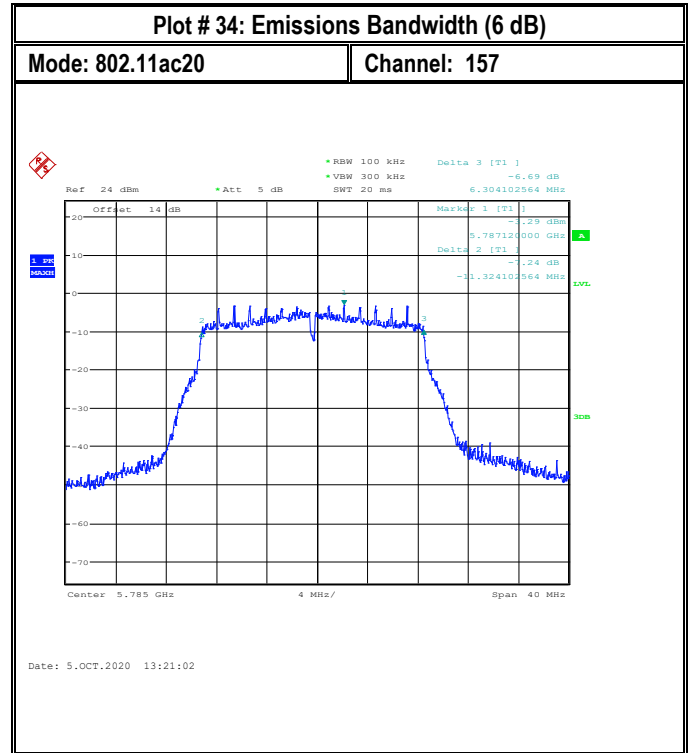
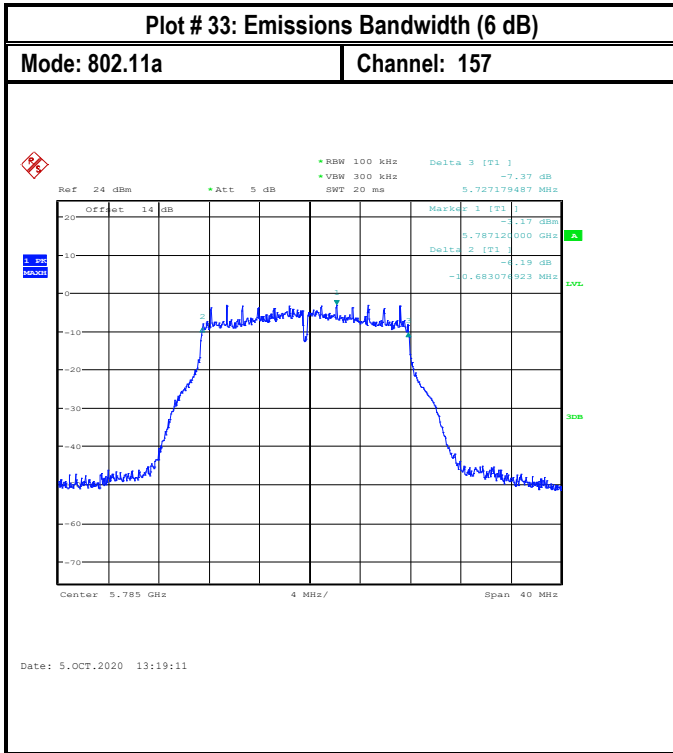












## 8.5 Radiated Transmitter Spurious Emissions

### 8.5.1 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.

### 8.5.2 Limits:

#### FCC §15.407

- Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.
- The provisions of §15.205 apply to intentional radiators operating under this section.



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

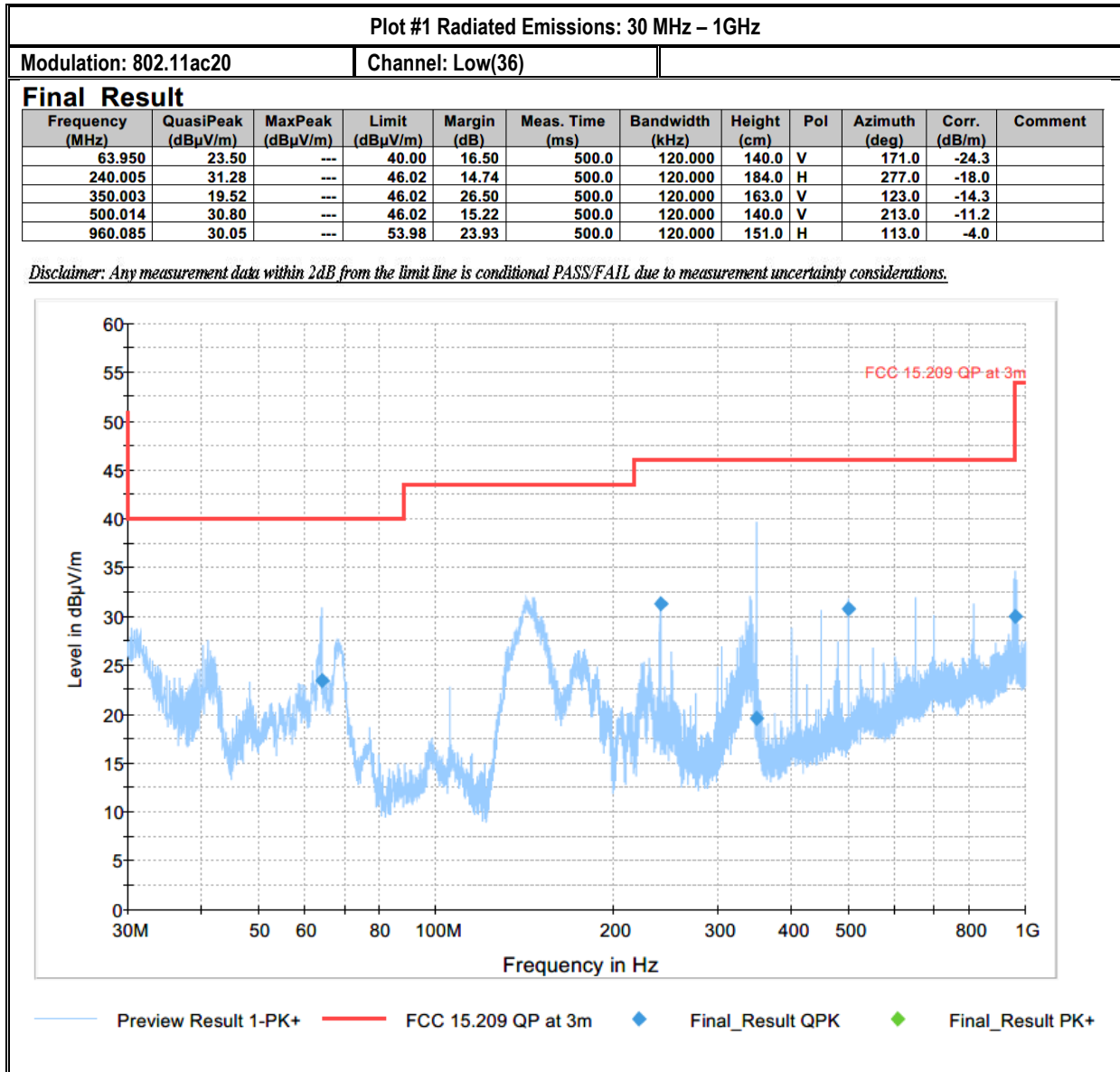
### 8.5.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	2	802.11ac20	120VAC

### 8.5.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Low (36)	30 MHz – 18 GHz	See section 8.5.2	Pass
4-8	Mid (44)	9 kHz – 40 GHz	See section 8.5.2	Pass
9-11	High (48)	30 MHz – 18 GHz	See section 8.5.2	Pass
12-14	Low (52)	30 MHz – 18 GHz	See section 8.5.2	Pass
15-19	Mid (60)	9 kHz – 40 GHz	See section 8.5.2	Pass
20-22	High (64)	30 MHz – 18 GHz	See section 8.5.2	Pass
23-25	Low (100)	30 MHz – 18 GHz	See section 8.5.2	Pass
26-30	Mid (116)	9 kHz – 40 GHz	See section 8.5.2	Pass
31-33	High (140)	30 MHz – 18 GHz	See section 8.5.2	Pass
34-36	Low (149)	30 MHz – 18 GHz	See section 8.5.2	Pass
37-41	Mid (157)	9 kHz – 40 GHz	See section 8.5.2	Pass
42-44	High (165)	30 MHz – 18 GHz	See section 8.5.2	Pass

### 8.5.5 Measurement Plots:





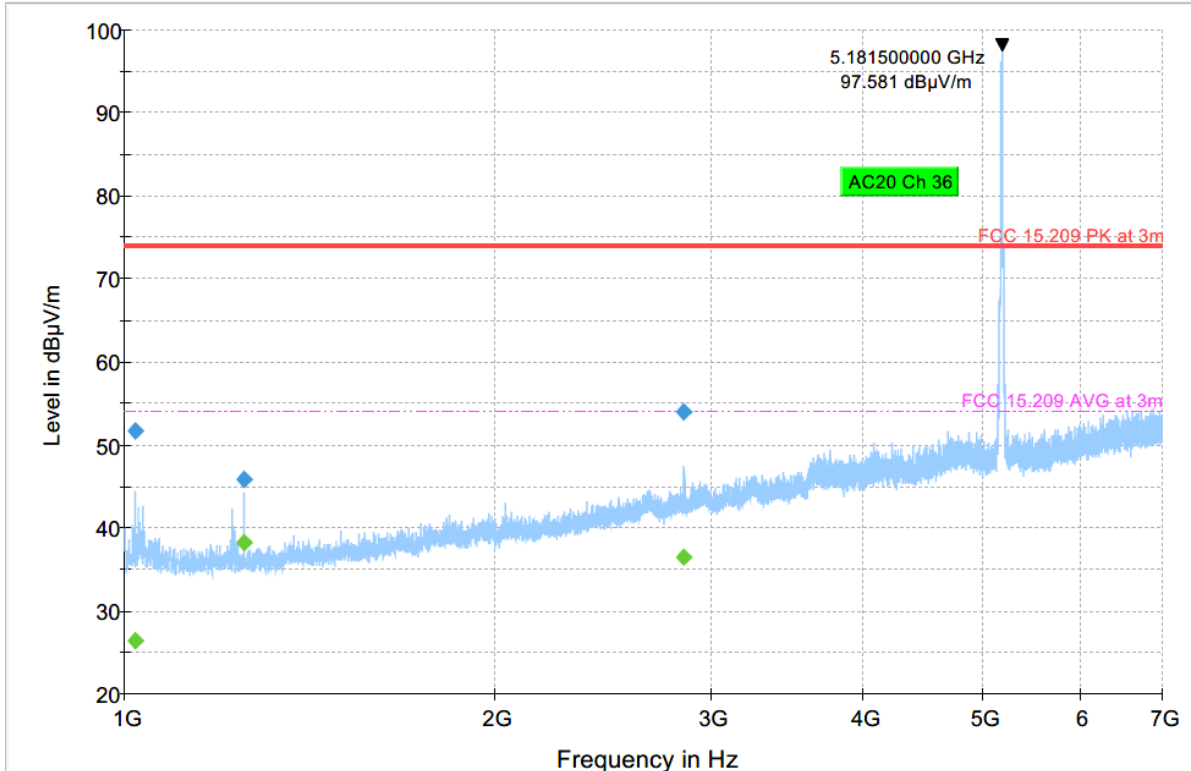
Plot # 2 Radiated Emissions: 1-7 GHz

Modulation: 802.11ac20

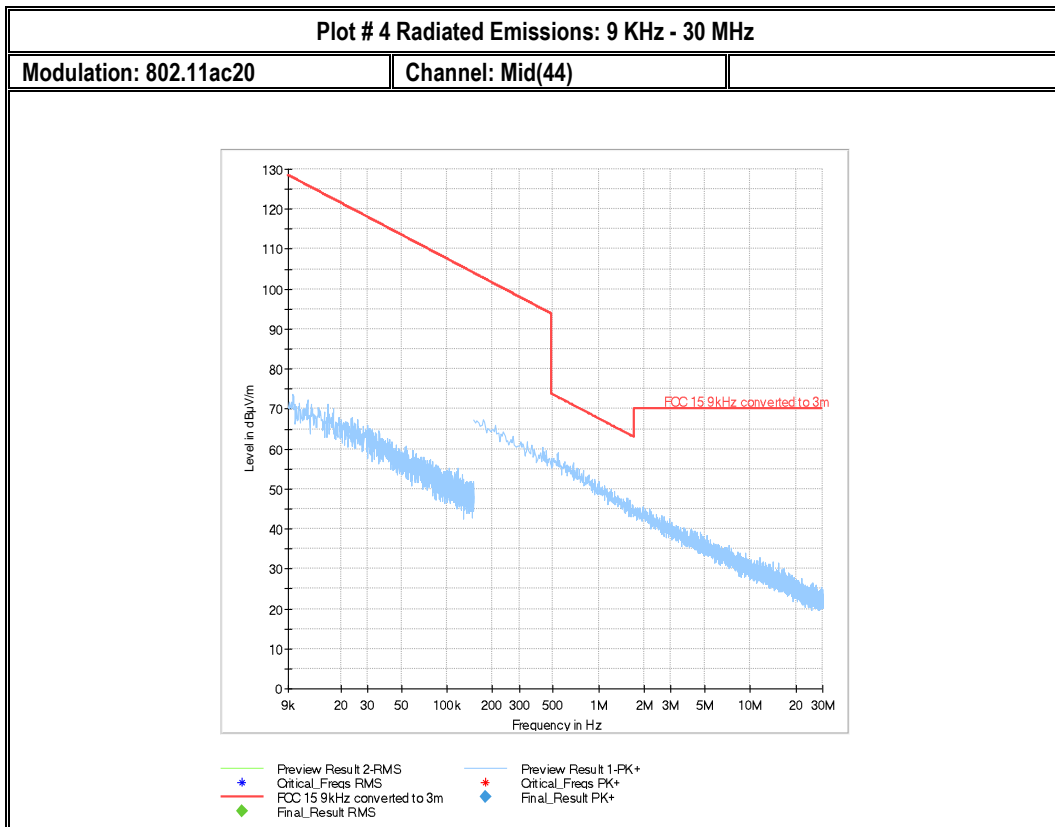
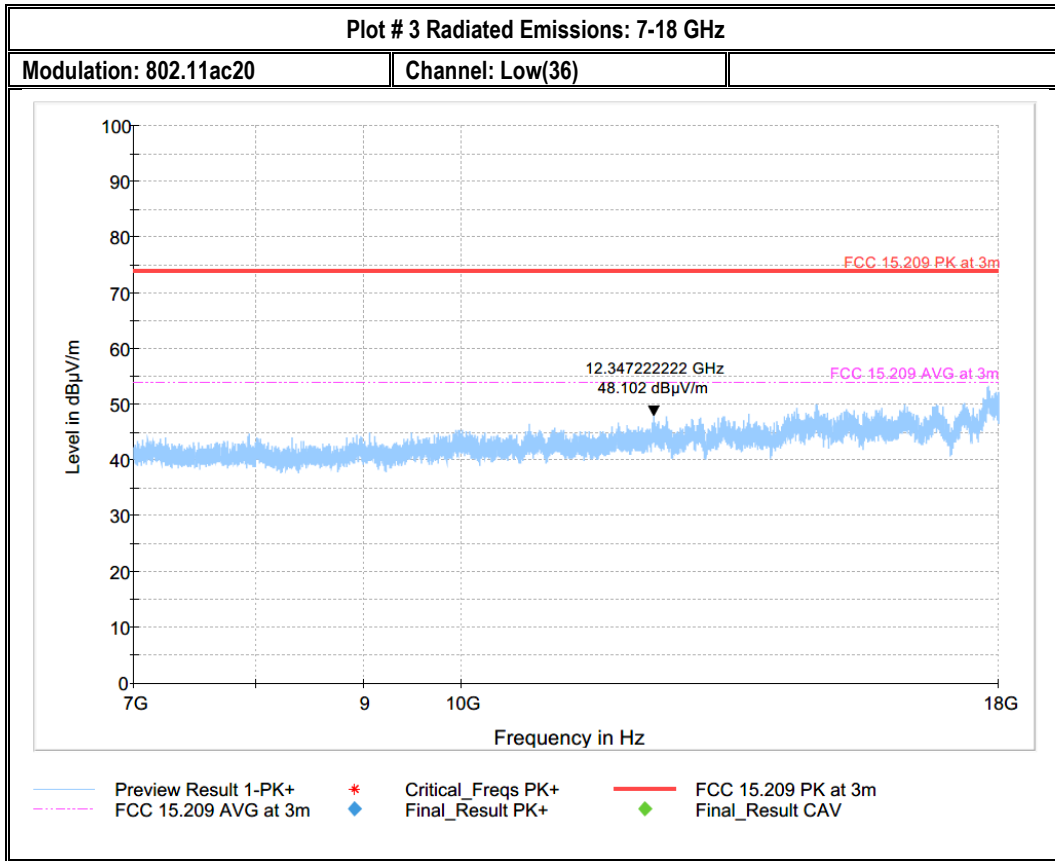
Channel: Low(36)

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
1019.000	---	26.45	53.98	27.53	500.0	1000.000	315.0	V	-13.0	4.2	
1019.000	51.70	---	73.98	22.28	500.0	1000.000	315.0	V	-13.0	4.2	
1250.000	---	38.15	53.98	15.83	500.0	1000.000	140.0	V	66.0	4.2	
1250.000	45.77	---	73.98	28.21	500.0	1000.000	140.0	V	66.0	4.2	
2856.000	---	36.39	53.98	17.59	500.0	1000.000	187.0	V	248.0	11.2	
2856.000	53.90	---	73.98	20.08	500.0	1000.000	187.0	V	248.0	11.2	



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





**Plot #5 Radiated Emissions: 30 MHz – 1GHz**

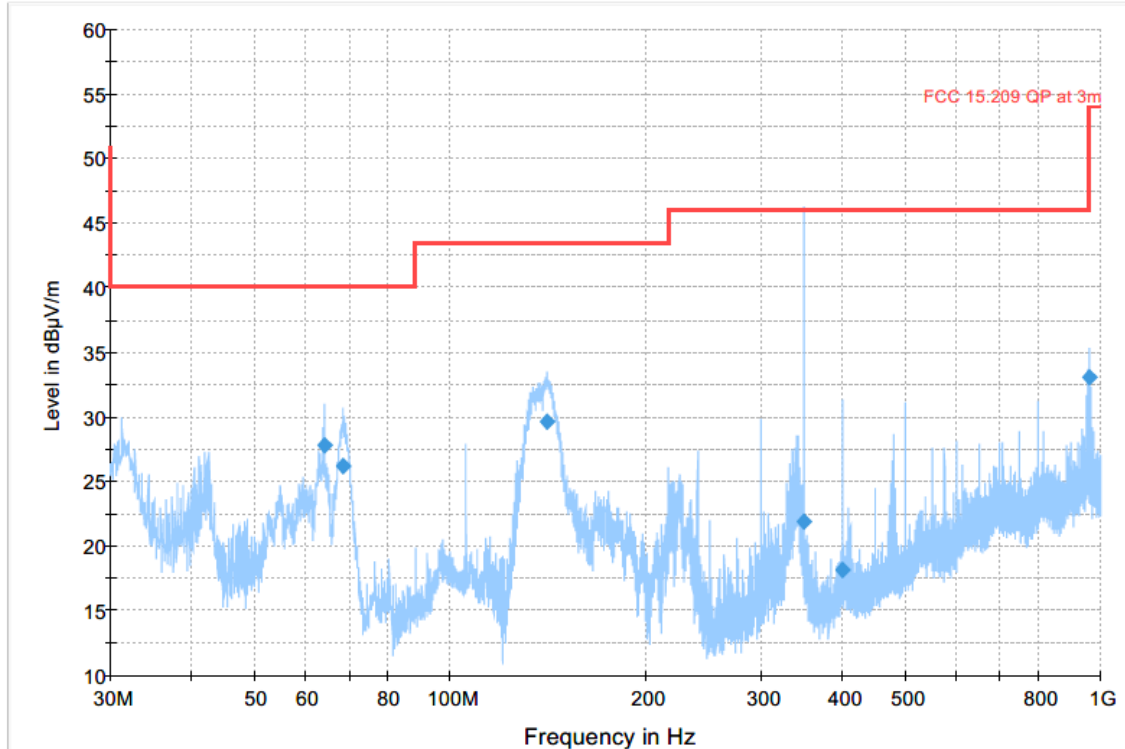
Modulation: 802.11ac20

Channel: Mid(44)

**Final Result**

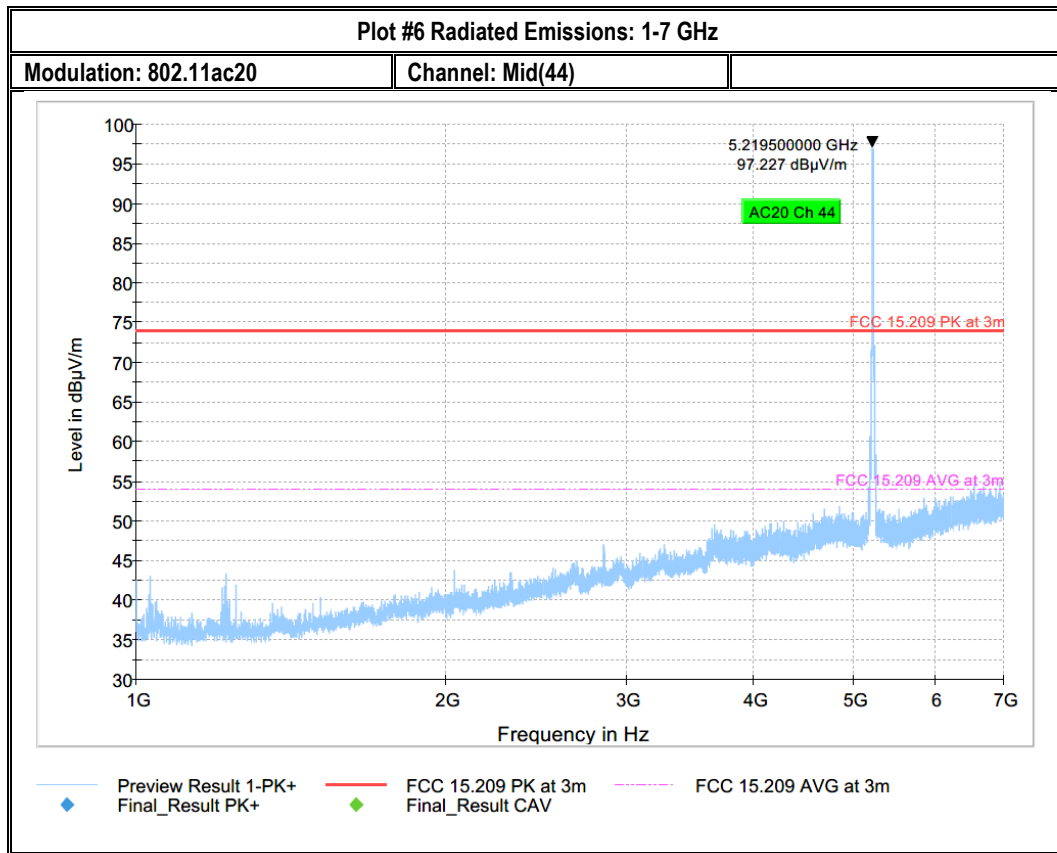
Frequency (MHz)	QuasiPeak (dBuV/m)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
63.999	27.81	---	40.00	12.19	500.0	120.000	140.0	V	109.0	-24.2	
68.461	26.17	---	40.00	13.84	500.0	120.000	152.0	V	123.0	-23.7	
140.532	29.64	---	43.50	13.86	500.0	120.000	208.0	H	259.0	-22.1	
350.003	21.90	---	46.02	24.13	500.0	120.000	175.0	V	243.0	-14.3	
400.007	18.16	---	46.02	27.86	500.0	120.000	274.0	V	224.0	-12.6	
960.036	33.04	---	53.98	20.94	500.0	120.000	152.0	H	215.0	-4.0	

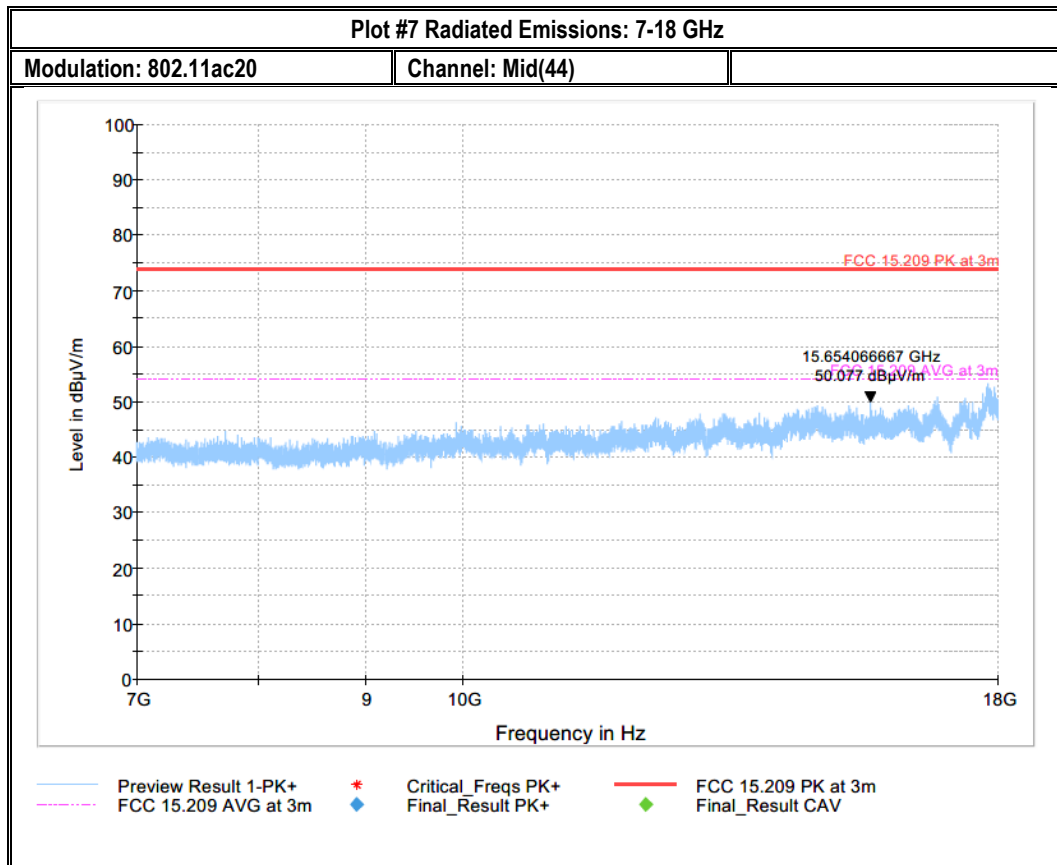
*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*



— Preview Result 1-PK+    — FCC 15.209 QP at 3m    ◆ Final\_Result QPK    ◆ Final\_Result PK+









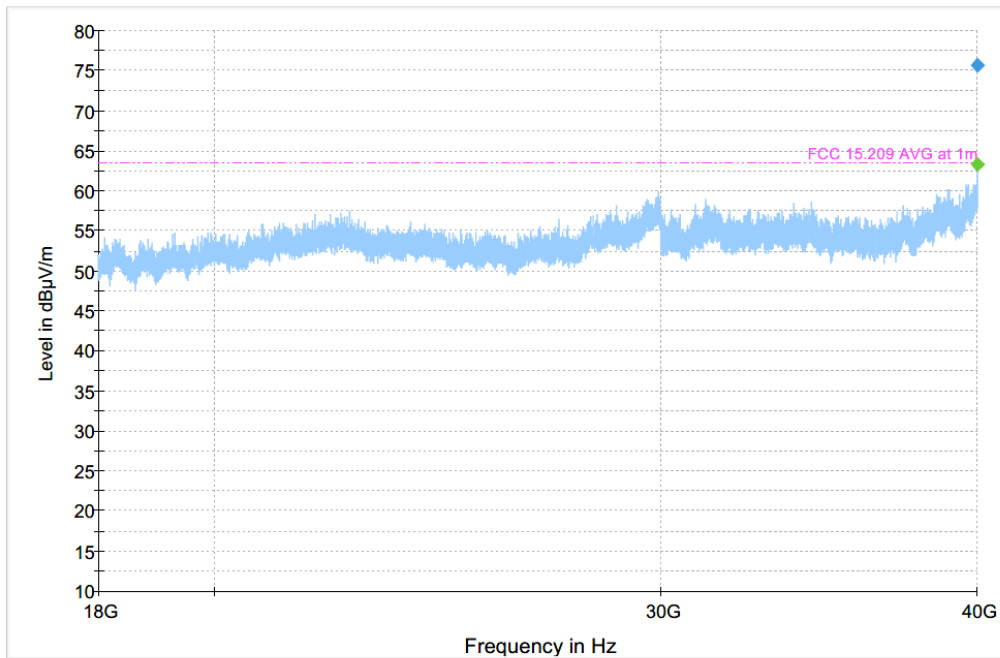
**Plot #8 Radiated Emissions: 18-40 GHz**

Modulation: 802.11ac20

Channel: Mid(44)

**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
39997.188	---	63.24	63.50	0.26	500.0	1000.000	186.0	V	123.0	24.9	
39997.188	75.71	---	83.50	7.79	500.0	1000.000	186.0	V	123.0	24.9	



- Preview Result 1-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**

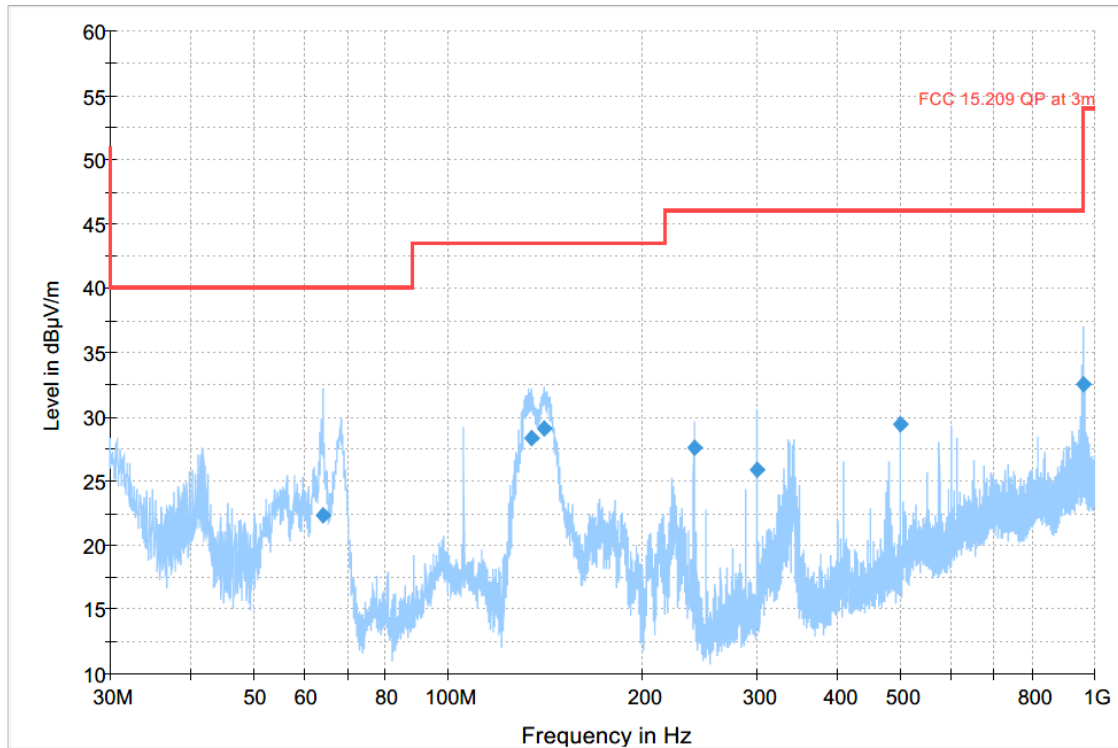
Modulation: 802.11ac20

Channel: High(48)

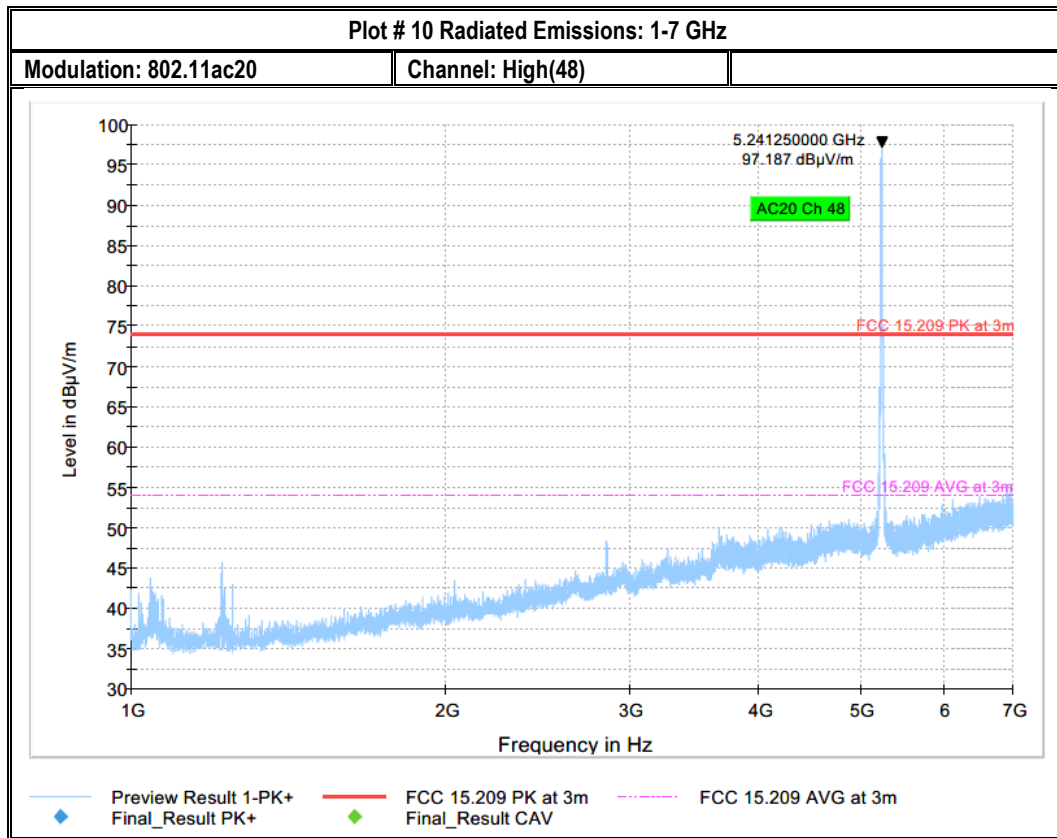
**Final Result**

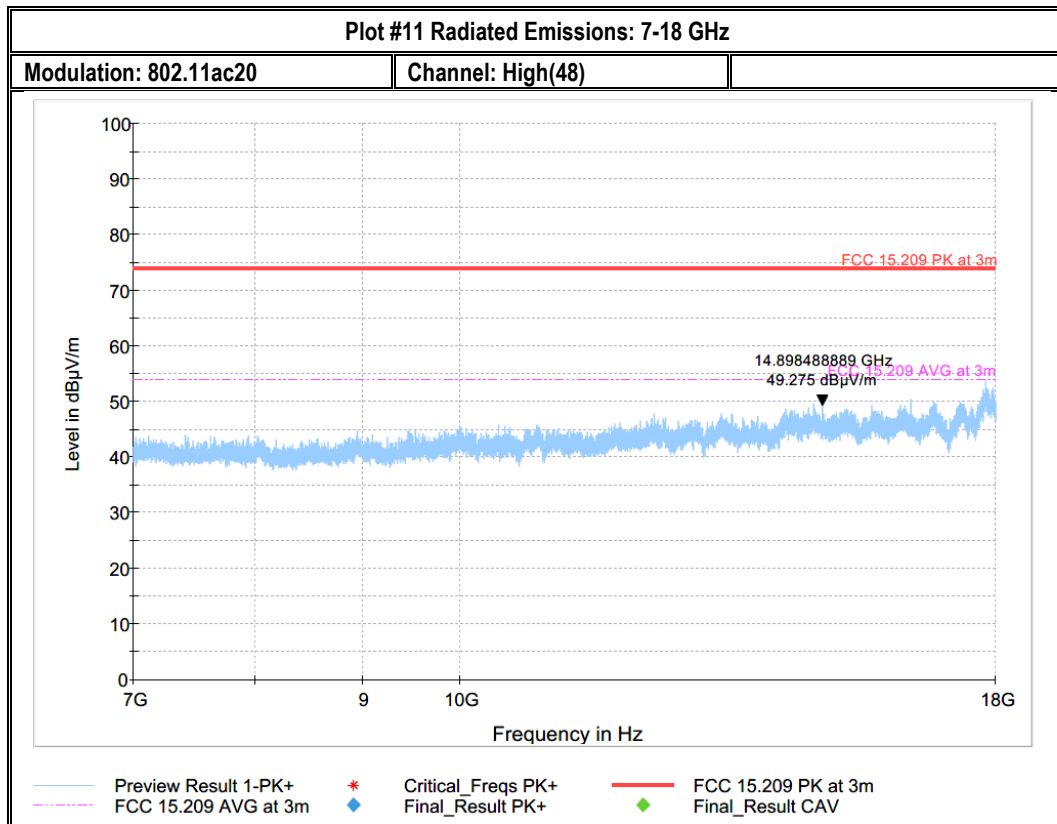
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
63.999	22.37	---	40.00	17.63	500.0	120.000	284.0	V	272.0	-24.2	
134.663	28.40	---	43.50	15.10	500.0	120.000	253.0	H	284.0	-22.0	
141.017	29.11	---	43.50	14.39	500.0	120.000	290.0	H	251.0	-22.1	
240.005	27.63	---	46.02	18.39	500.0	120.000	152.0	H	55.0	-18.0	
300.000	25.86	---	46.02	20.16	500.0	120.000	243.0	H	266.0	-16.2	
500.014	29.38	---	46.02	16.64	500.0	120.000	163.0	H	212.0	-11.2	
961.588	32.57	---	53.98	21.41	500.0	120.000	140.0	H	217.0	-4.0	

*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    ◆ Final\_Result PK+







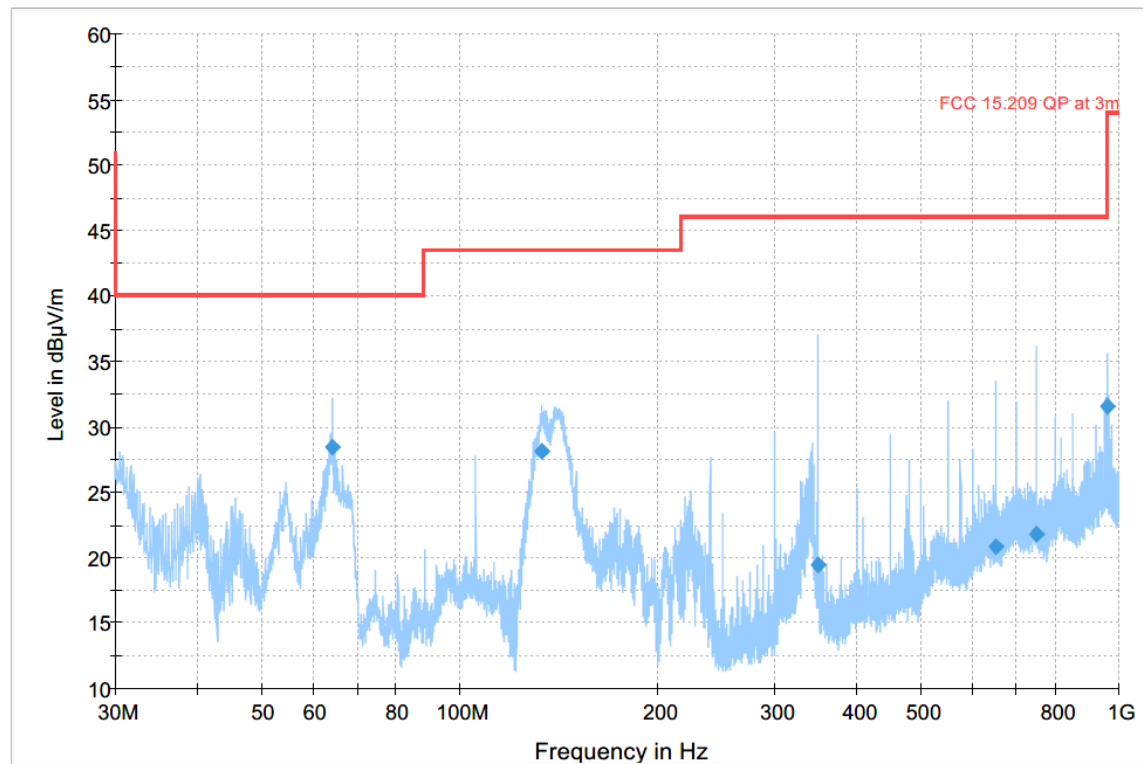
**Plot #12 Radiated Emissions: 30 MHz – 1GHz**

**Modulation: 802.11ac20**      **Channel: Low(52)**

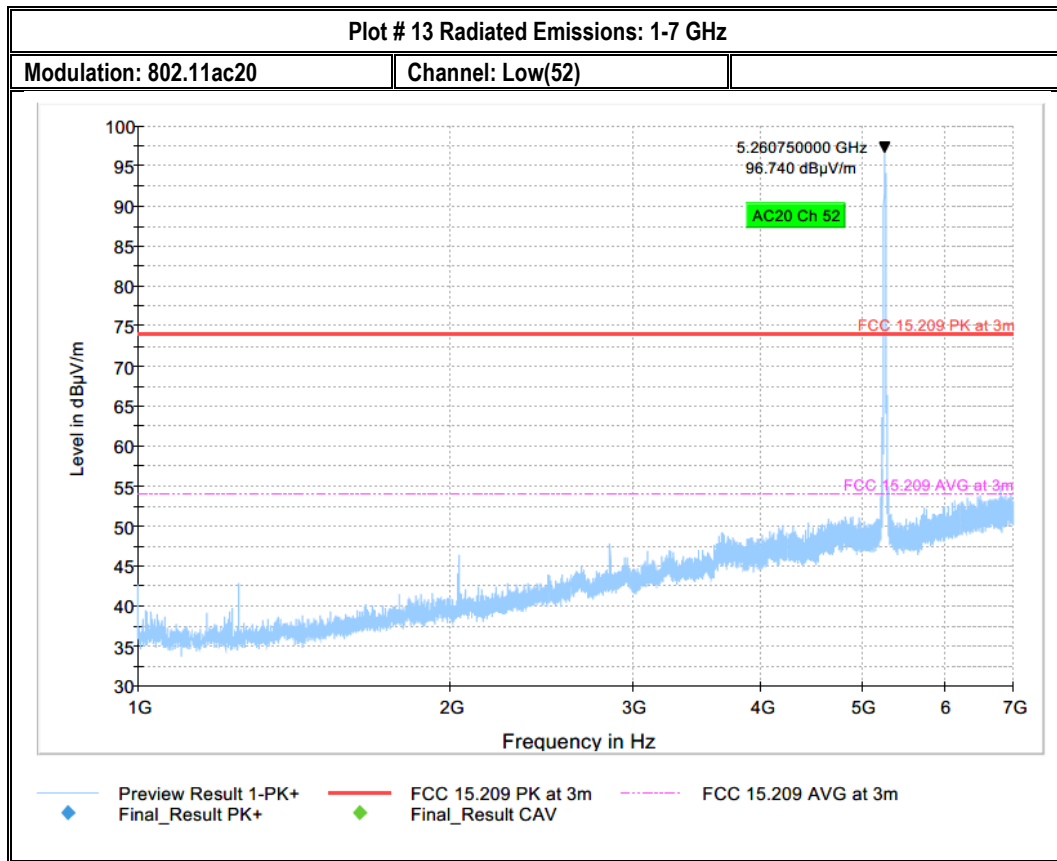
**Final Result**

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
63.999	28.49	---	40.00	11.51	500.0	120.000	140.0	V	194.0	-24.2	
133.402	28.17	---	43.50	15.33	500.0	120.000	261.0	H	268.0	-22.0	
350.003	19.48	---	46.02	26.54	500.0	120.000	152.0	V	140.0	-14.3	
650.024	20.86	---	46.02	25.16	500.0	120.000	140.0	V	161.0	-7.7	
750.031	21.78	---	46.02	24.24	500.0	120.000	297.0	V	119.0	-6.2	
960.861	31.57	---	53.98	22.41	500.0	120.000	140.0	H	209.0	-4.0	

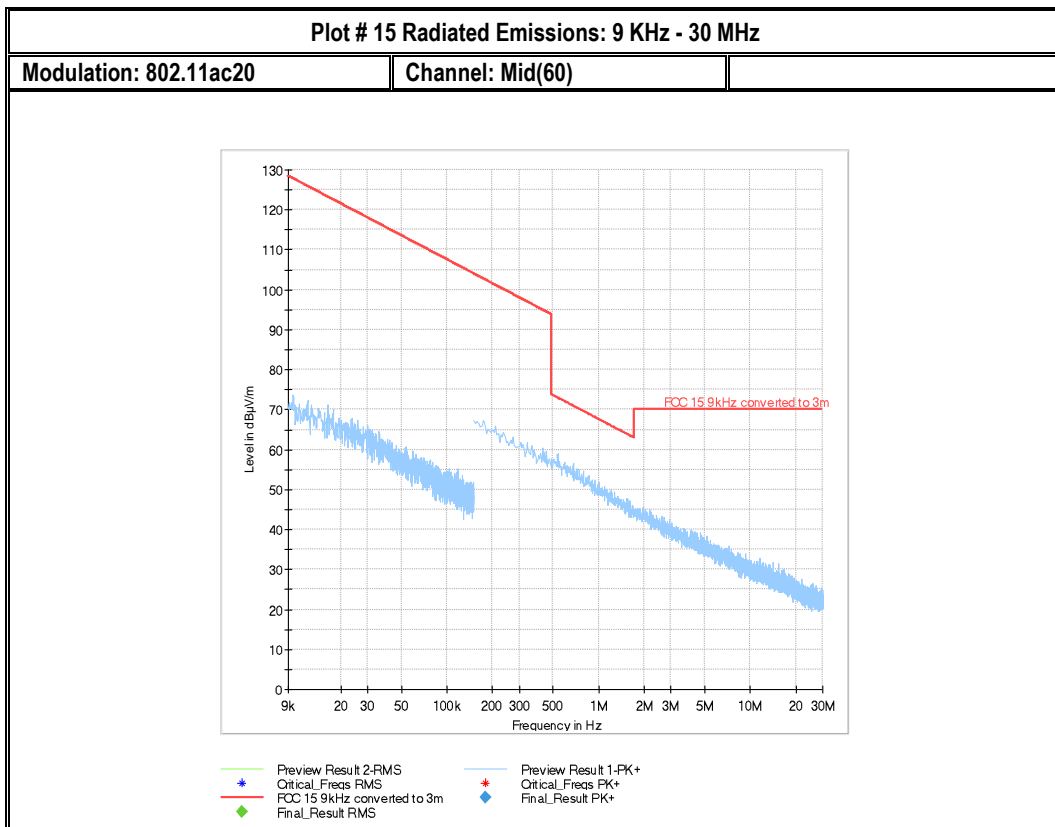
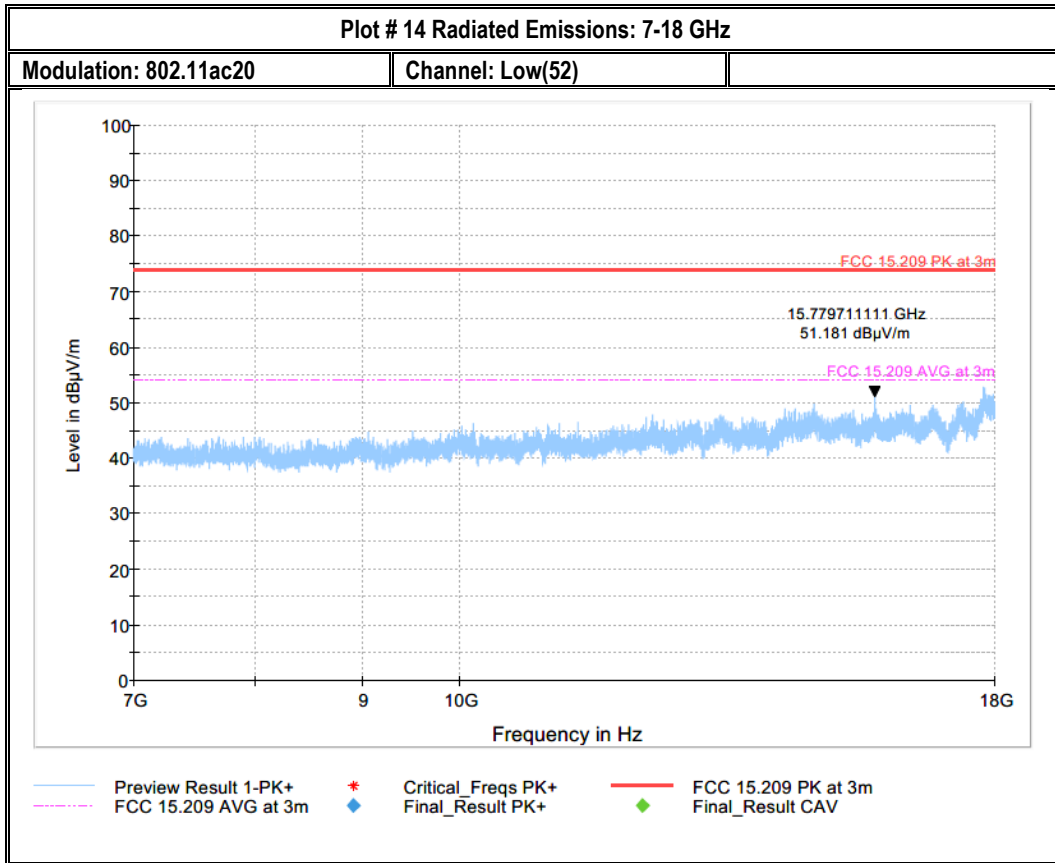
*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*



— Preview Result 1-PK+      — FCC 15.209 QP at 3m      ◆ Final\_Result QPK      ◆ Final\_Result PK+









**Plot #16 Radiated Emissions: 30 MHz – 1GHz**

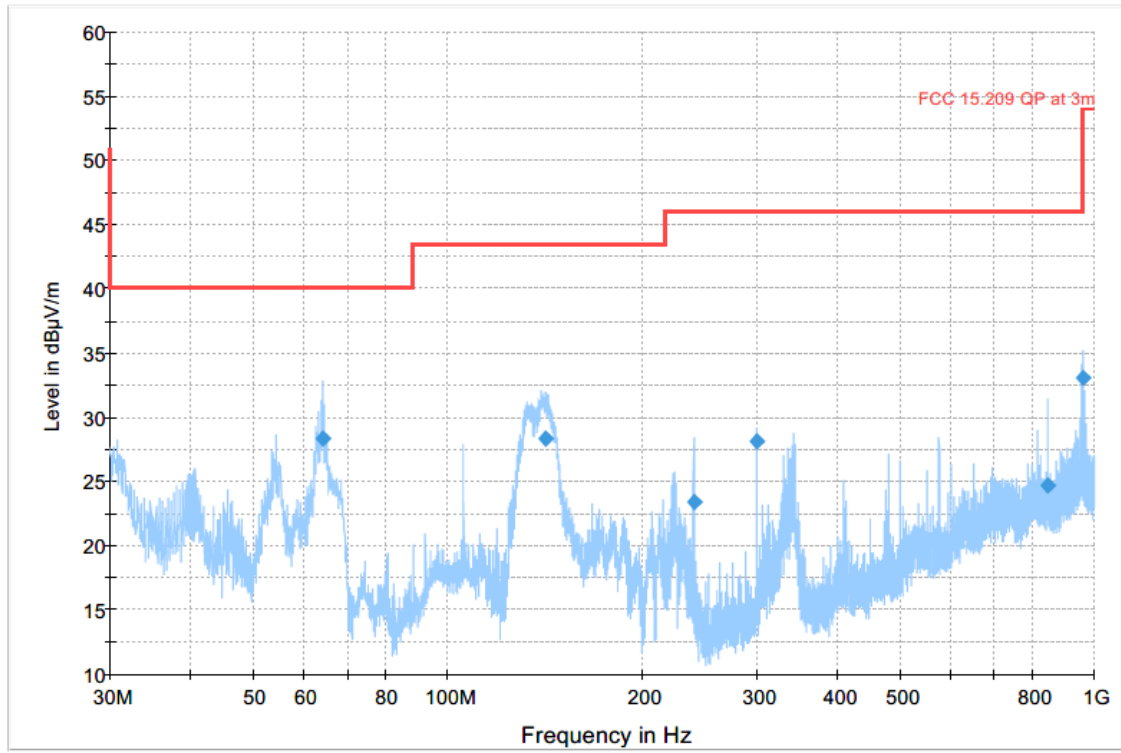
Modulation: 802.11ac20

Channel: Mid(60)

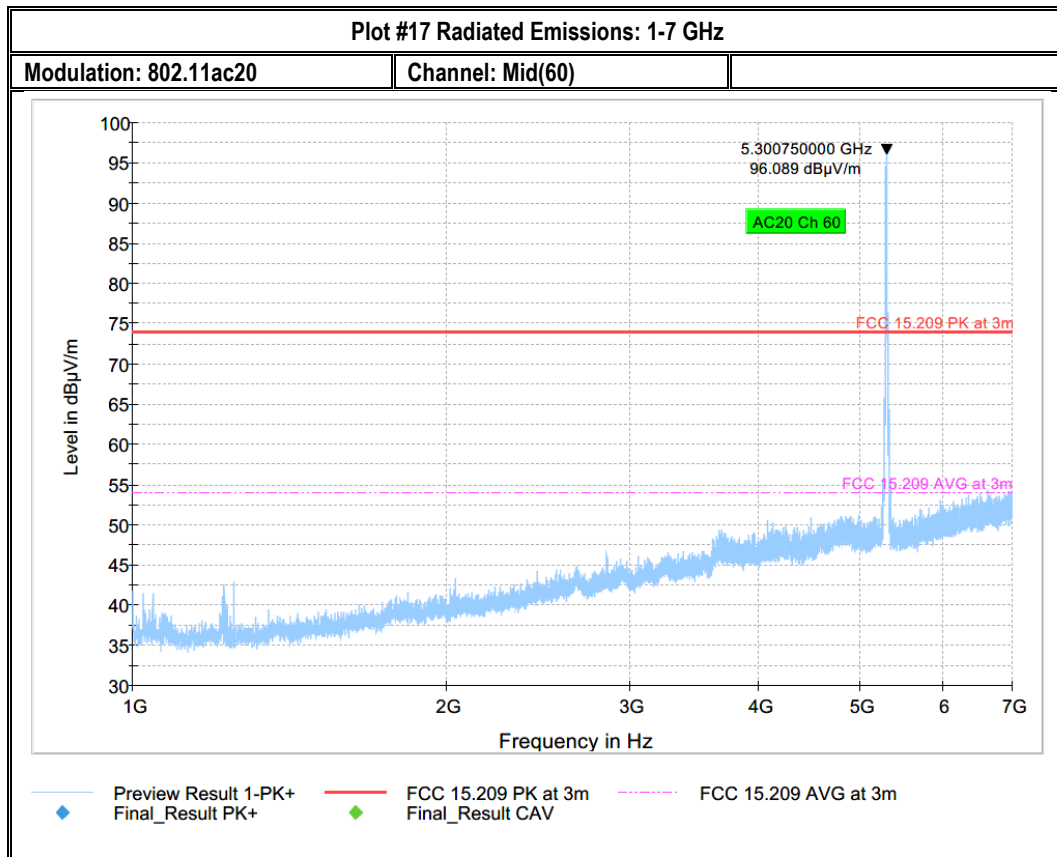
**Final Result**

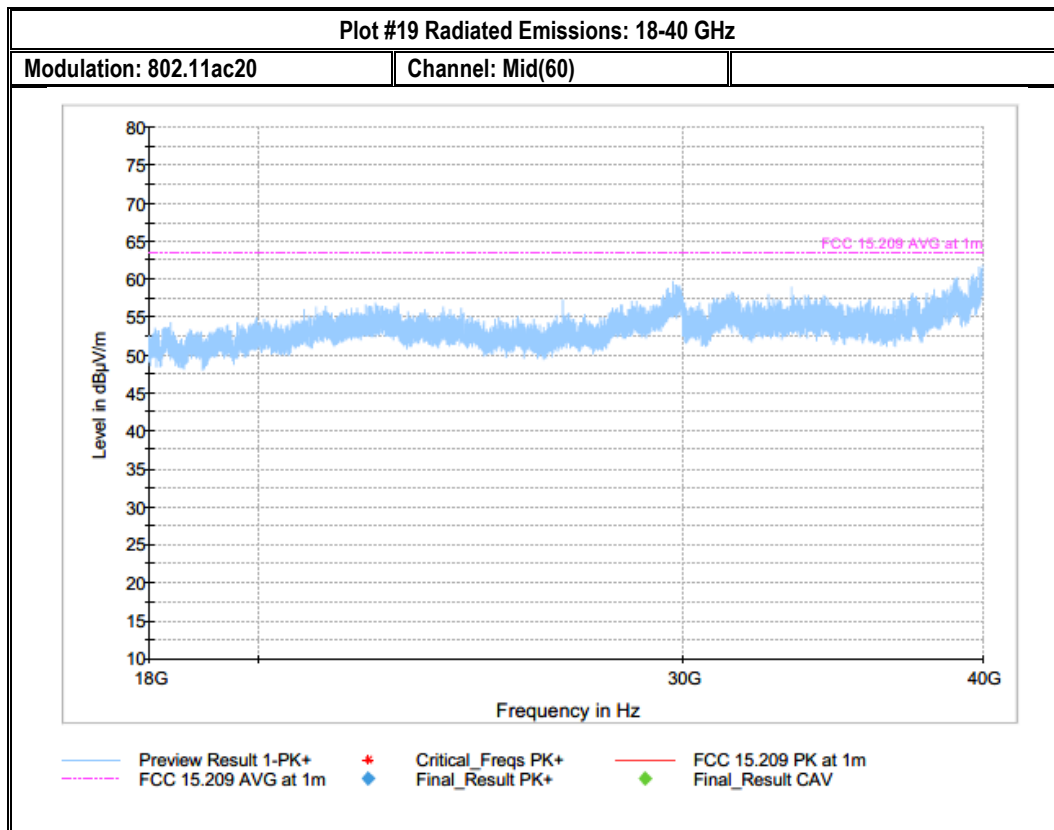
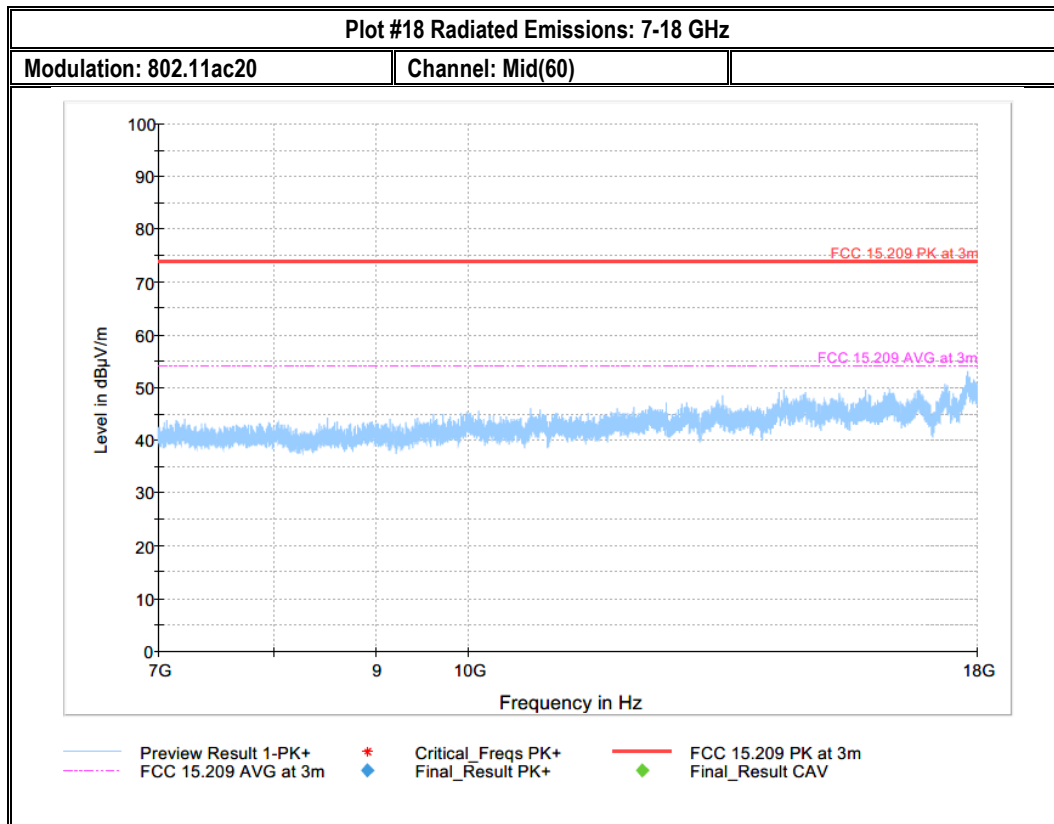
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
63.999	28.35	---	40.00	11.65	500.0	120.000	152.0	V	126.0	-24.2	
141.841	28.34	---	43.50	15.16	500.0	120.000	218.0	H	276.0	-22.2	
239.957	23.41	---	46.02	22.61	500.0	120.000	162.0	H	302.0	-18.0	
300.000	28.08	---	46.02	17.94	500.0	120.000	140.0	H	261.0	-16.2	
846.498	24.65	---	46.02	21.37	500.0	120.000	152.0	H	-13.0	-5.8	
960.812	33.02	---	53.98	20.96	500.0	120.000	140.0	H	212.0	-4.0	

*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    ◆ Final\_Result PK+





Plot #20 Radiated Emissions: 30 MHz – 1GHz

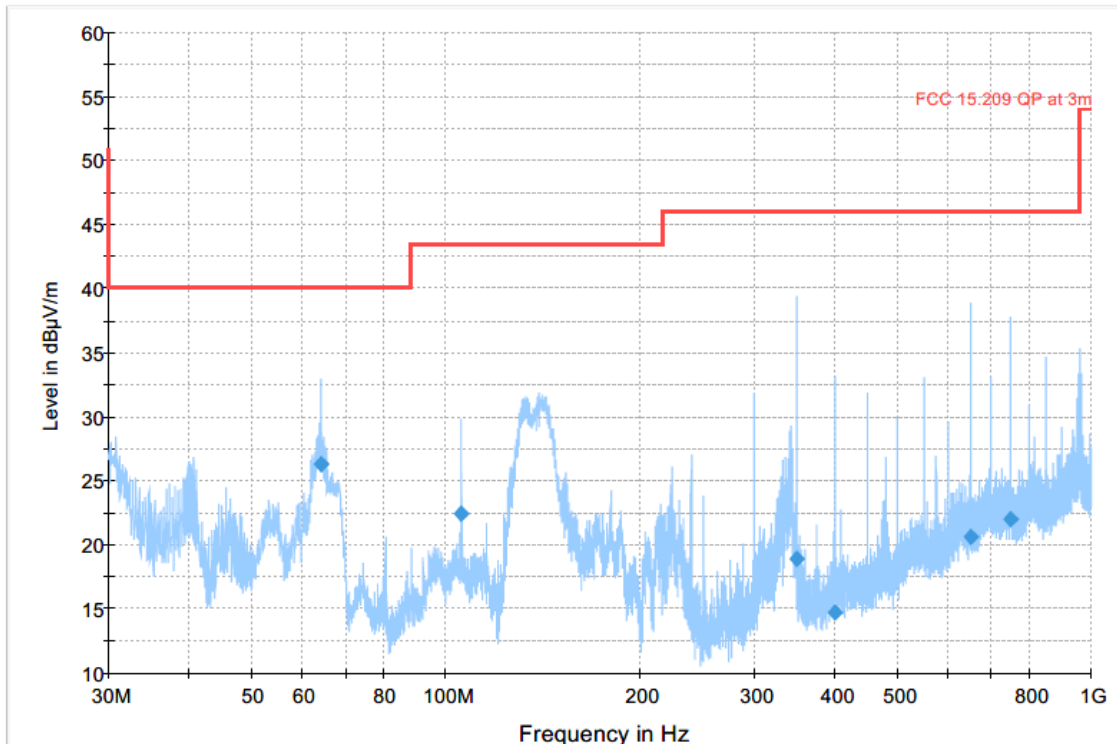
Modulation: 802.11ac20

Channel: High(64)

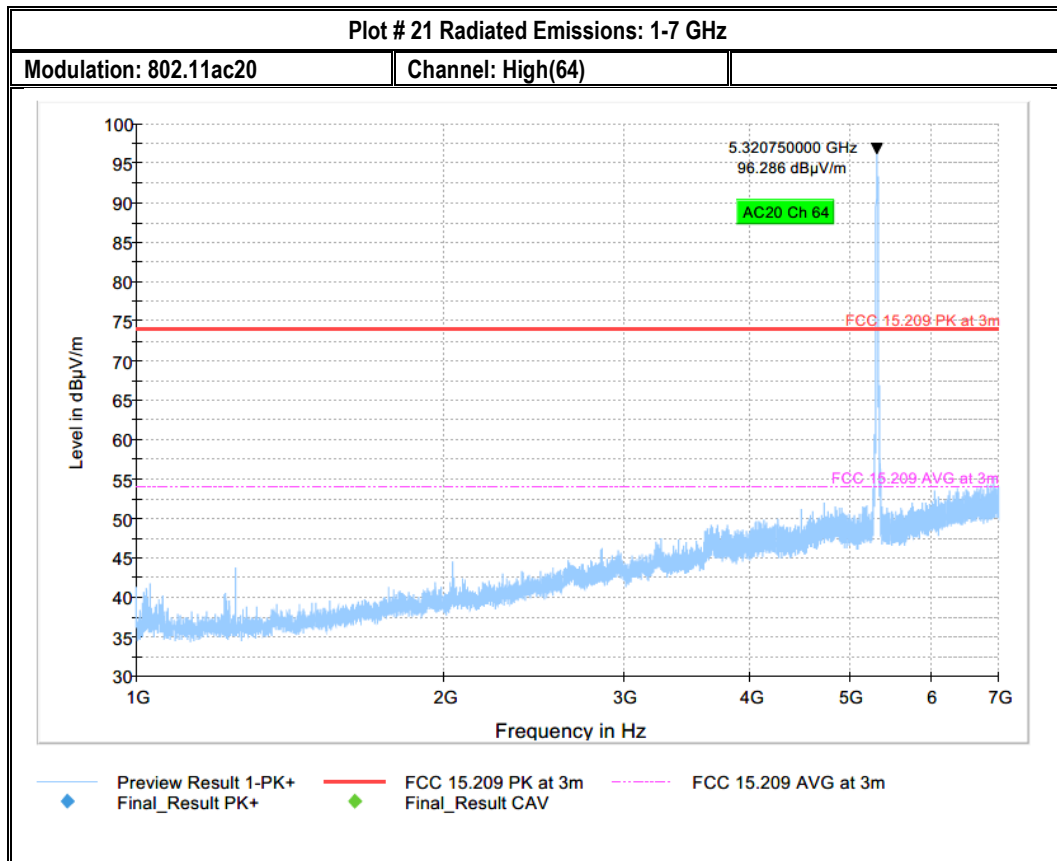
Final Result

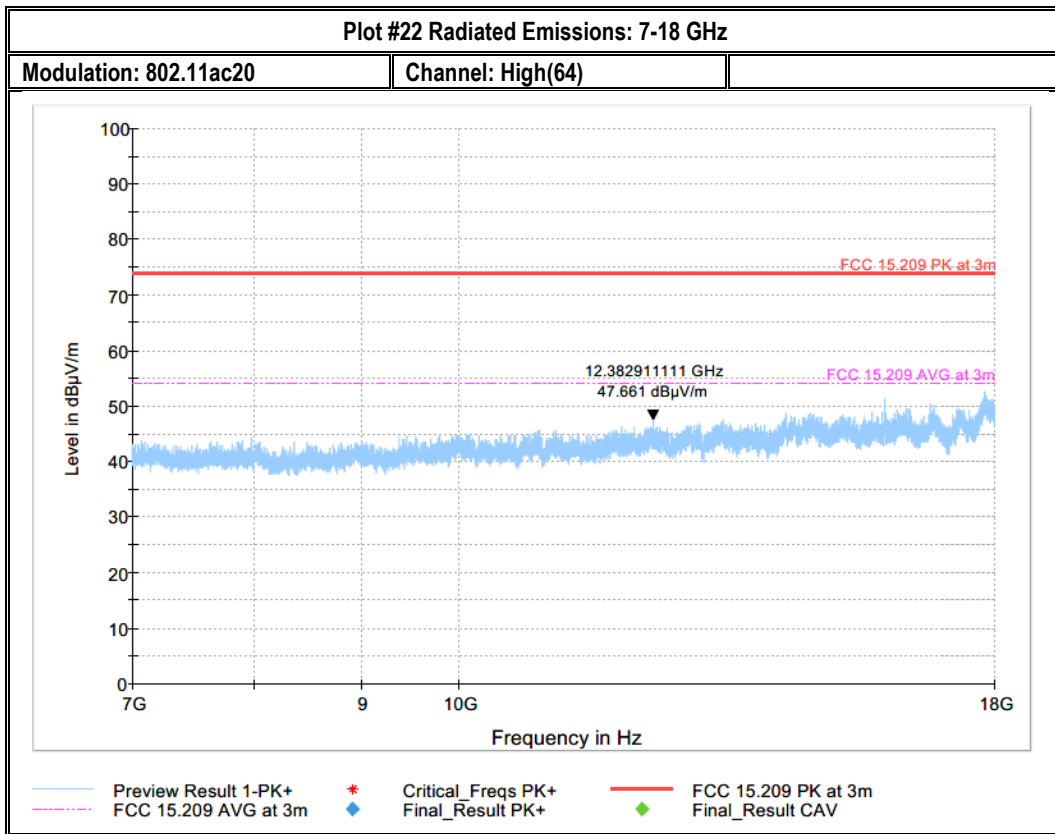
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
63.999	26.36	---	40.00	13.64	500.0	120.000	140.0	V	221.0	-24.2	
105.709	22.41	---	43.50	21.09	500.0	120.000	152.0	H	72.0	-21.8	
350.003	18.93	---	46.02	27.09	500.0	120.000	175.0	V	142.0	-14.3	
399.958	14.68	---	46.02	31.34	500.0	120.000	152.0	V	169.0	-12.6	
650.024	20.65	---	46.02	25.37	500.0	120.000	315.0	V	167.0	-7.7	
750.031	22.07	---	46.02	23.95	500.0	120.000	239.0	V	154.0	-6.2	

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    Final\_Result PK+





Plot #23 Radiated Emissions: 30 MHz – 1GHz

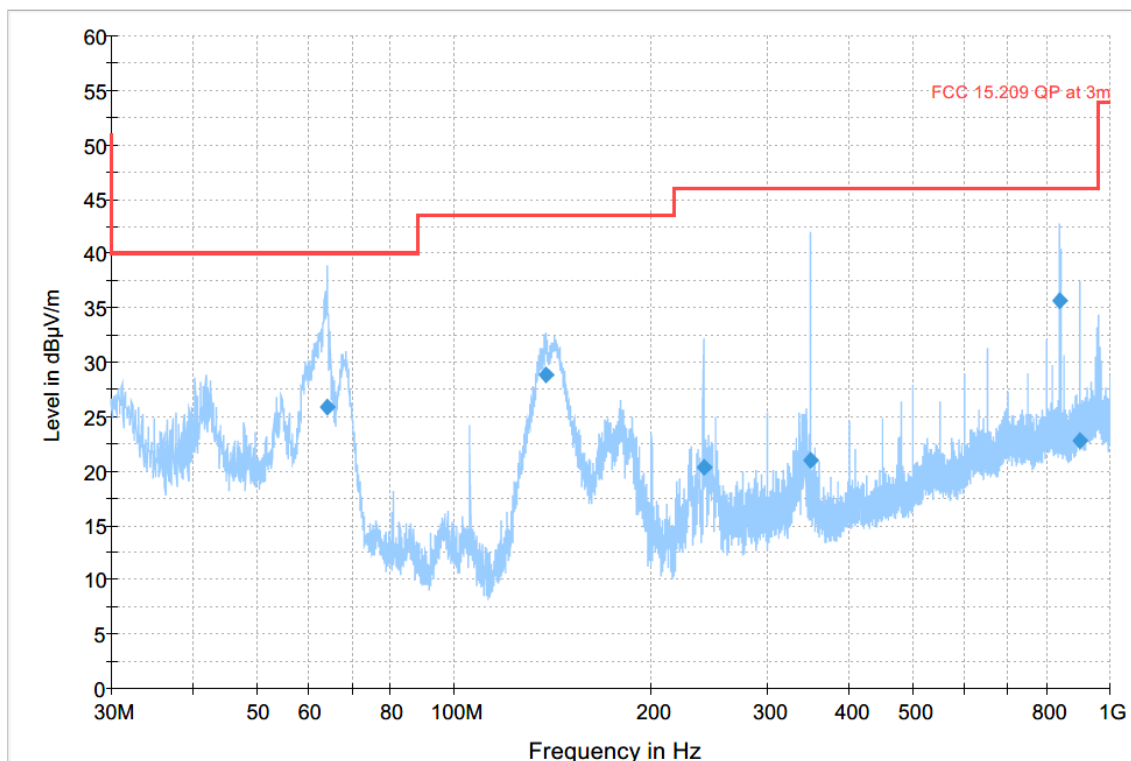
Modulation: 802.11ac20

Channel: Low(100)

Final Result

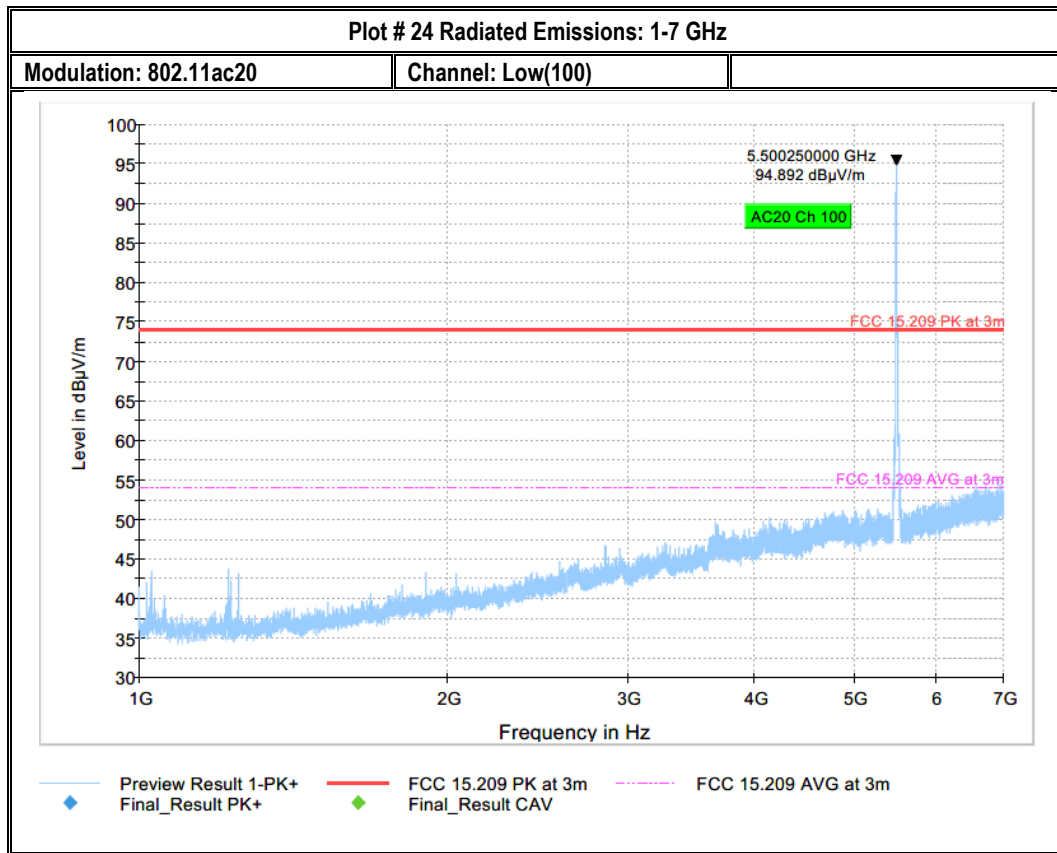
Frequency (MHz)	QuasiPeak (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
63.950	25.88	---	40.00	14.12	500.0	120.000	140.0	V	-33.0	-24.3	
137.913	28.80	---	43.50	14.70	500.0	120.000	140.0	V	117.0	-22.0	
239.957	20.35	---	46.02	25.67	500.0	120.000	307.0	H	59.0	-18.0	
350.003	21.00	---	46.02	25.02	500.0	120.000	140.0	H	195.0	-14.3	
838.495	35.72	---	46.02	10.30	500.0	120.000	295.0	H	245.0	-5.6	
900.042	22.83	---	46.02	23.19	500.0	120.000	174.0	H	119.0	-5.0	

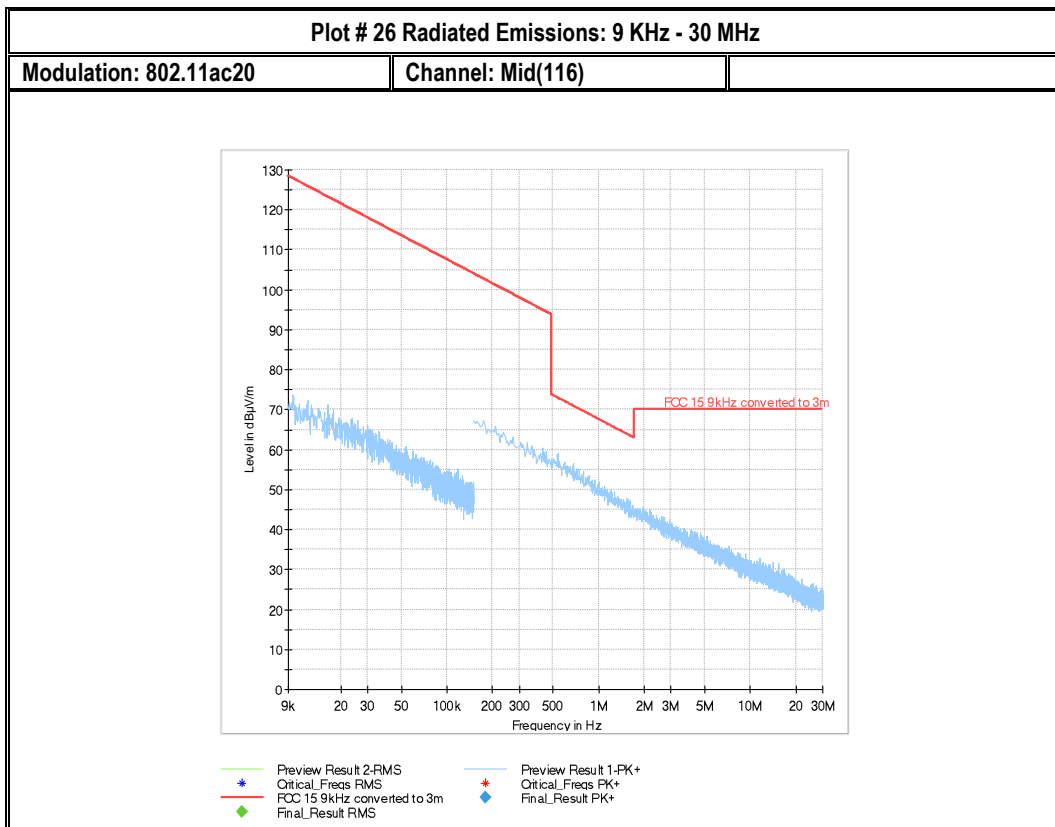
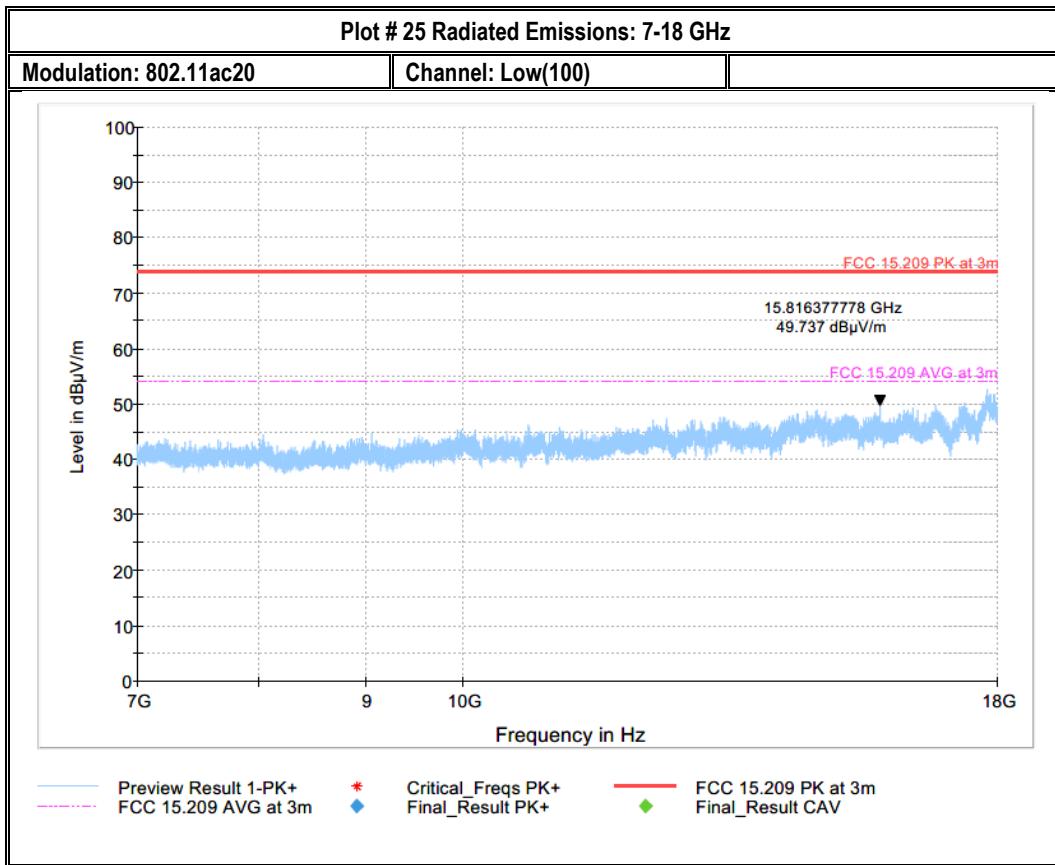
Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.

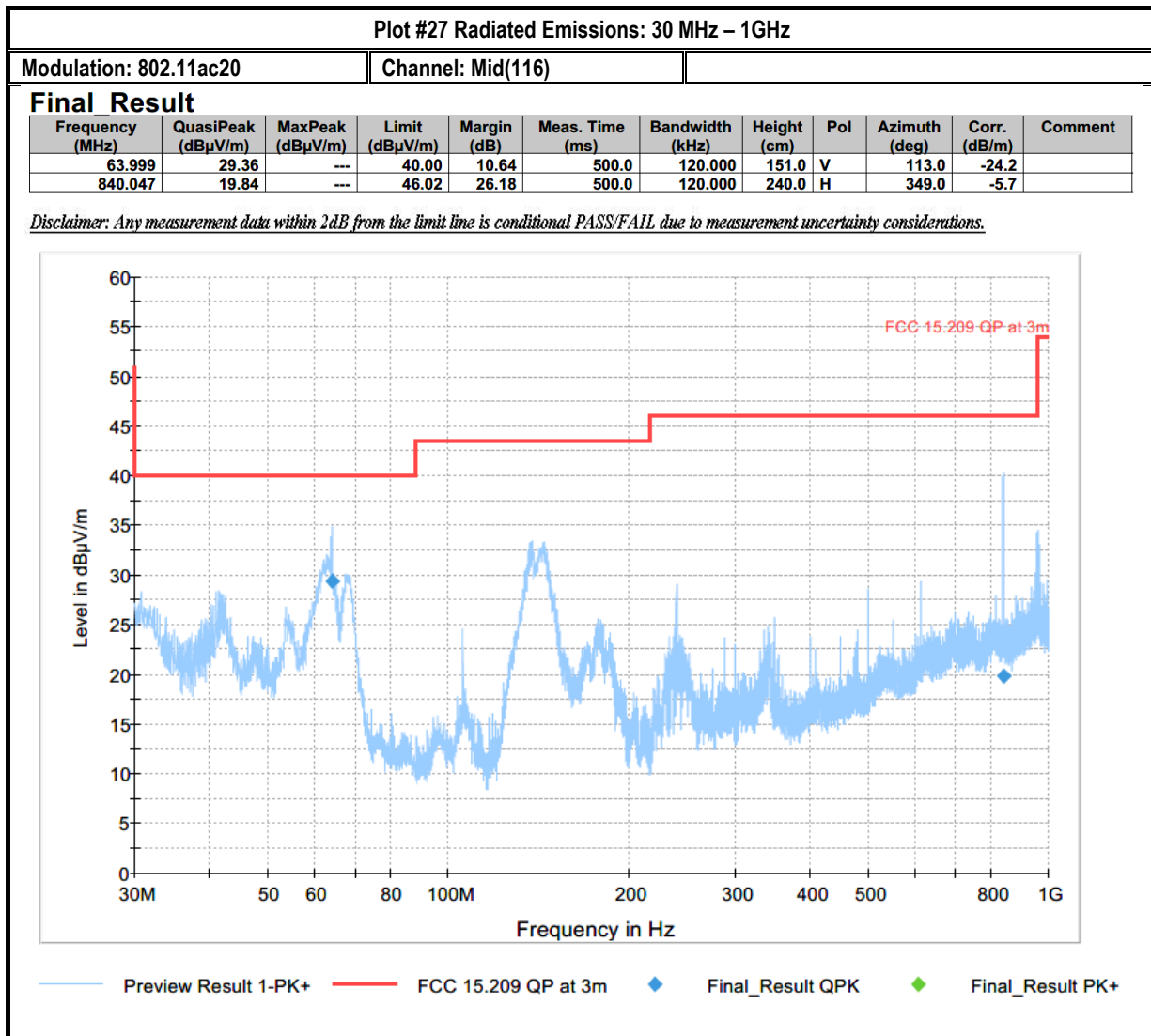


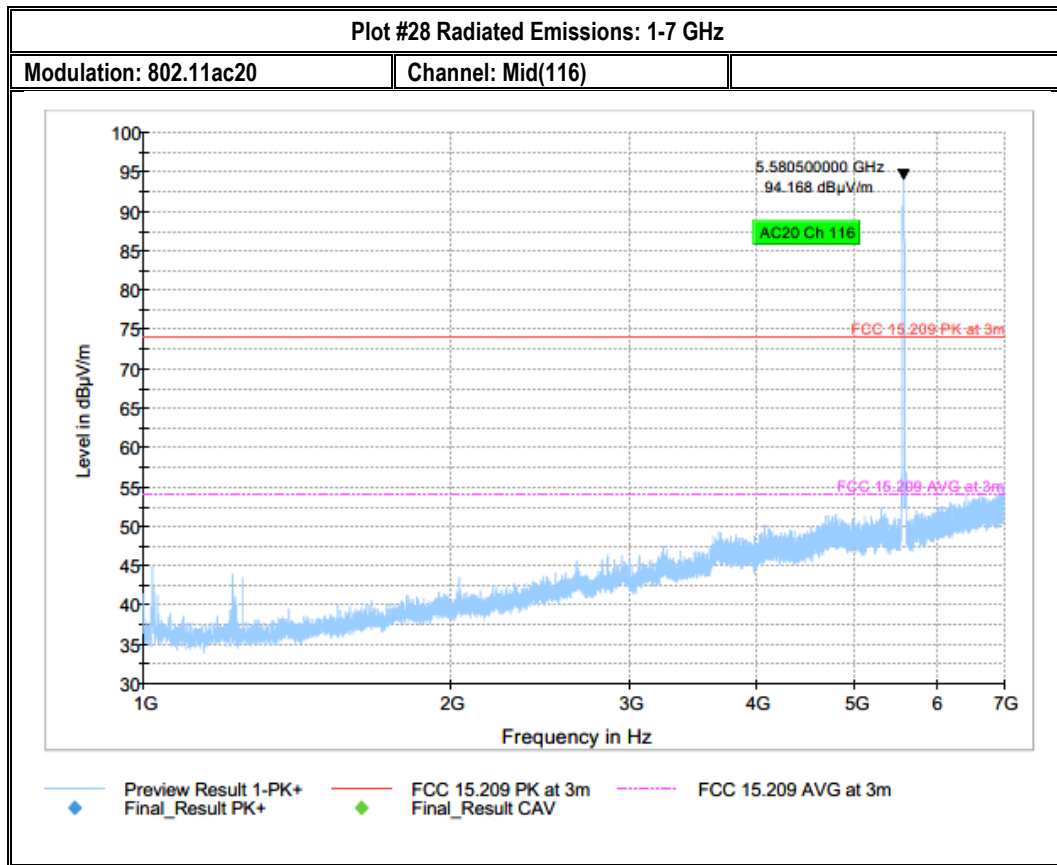
Preview Result 1-PK+    FCC 15.209 QP at 3m    Final\_Result QPK    Final\_Result PK+

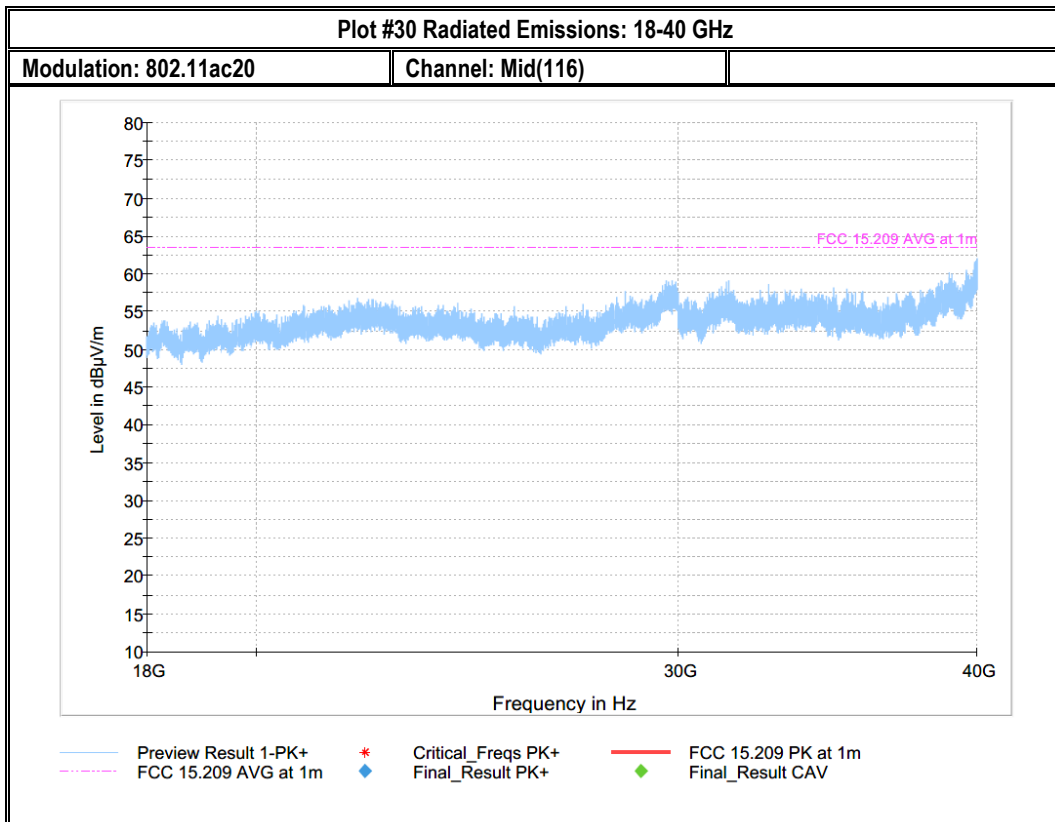
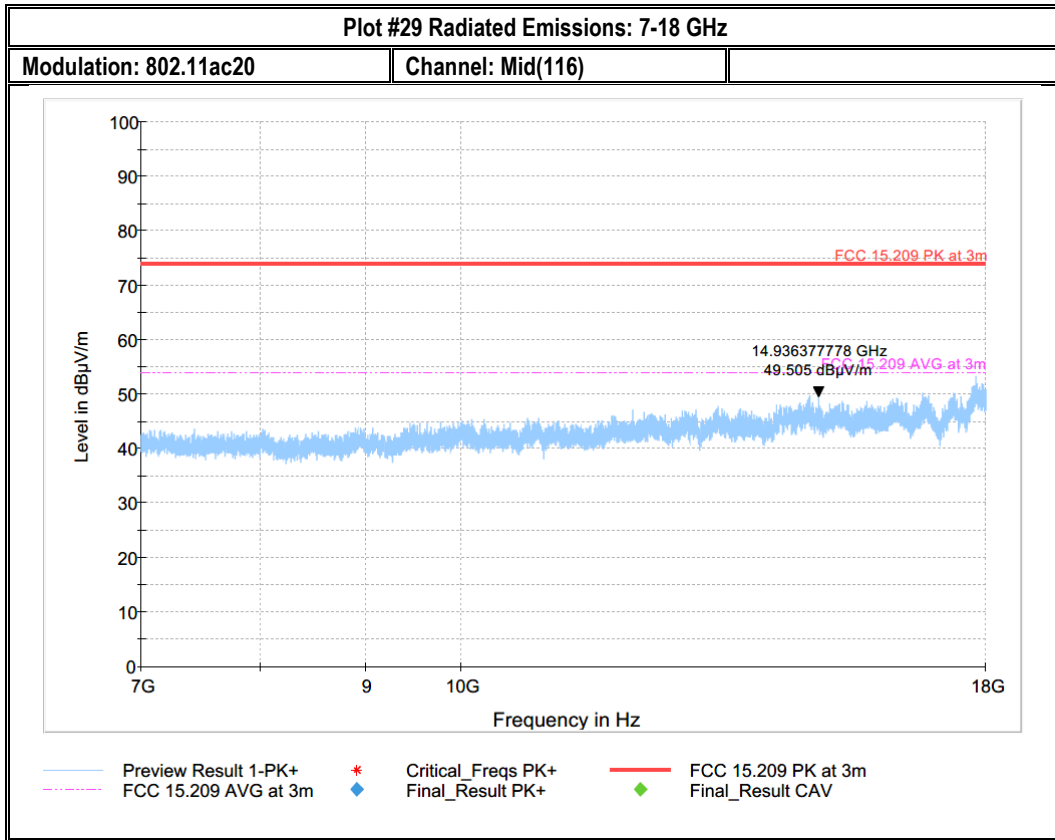


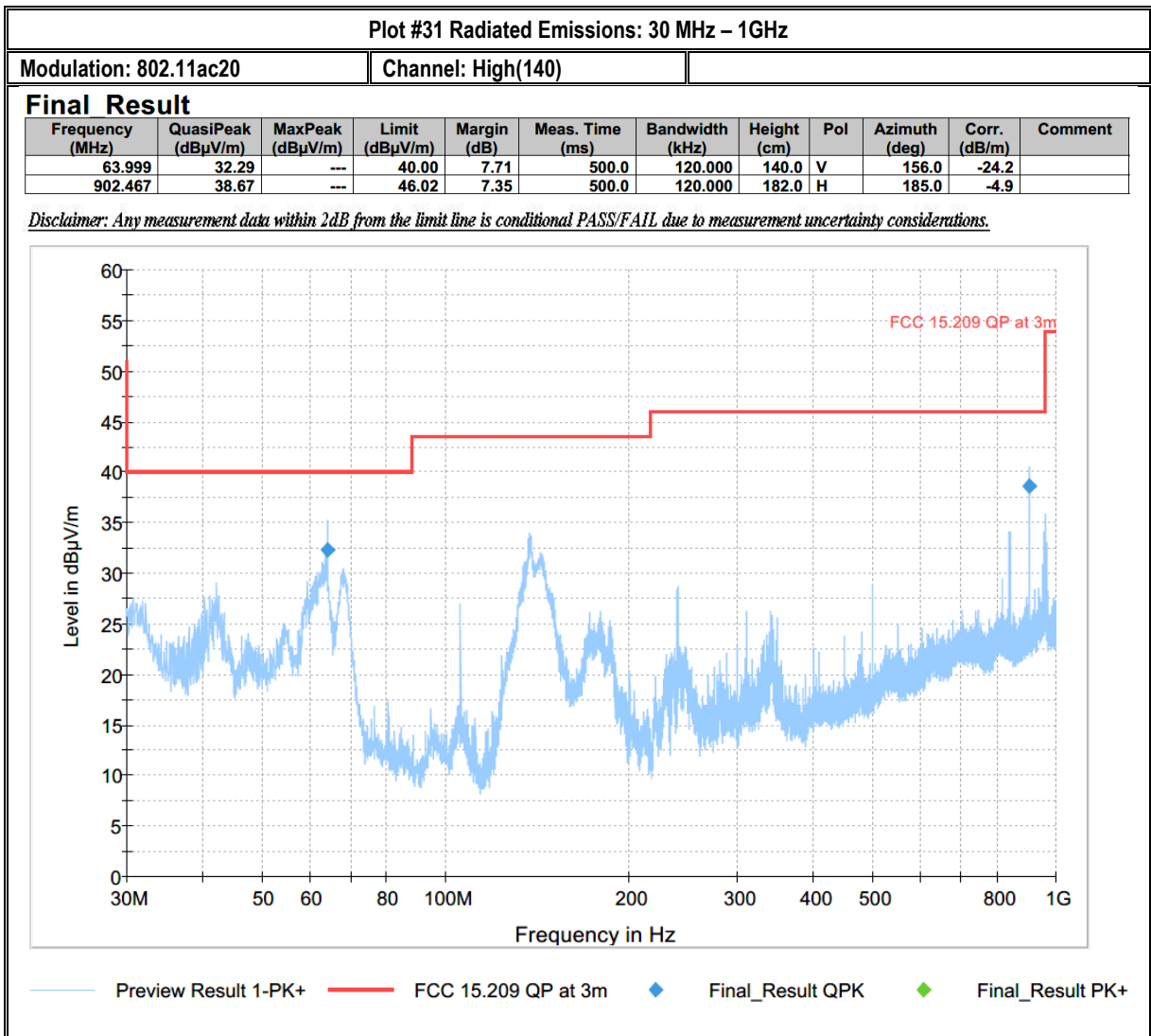


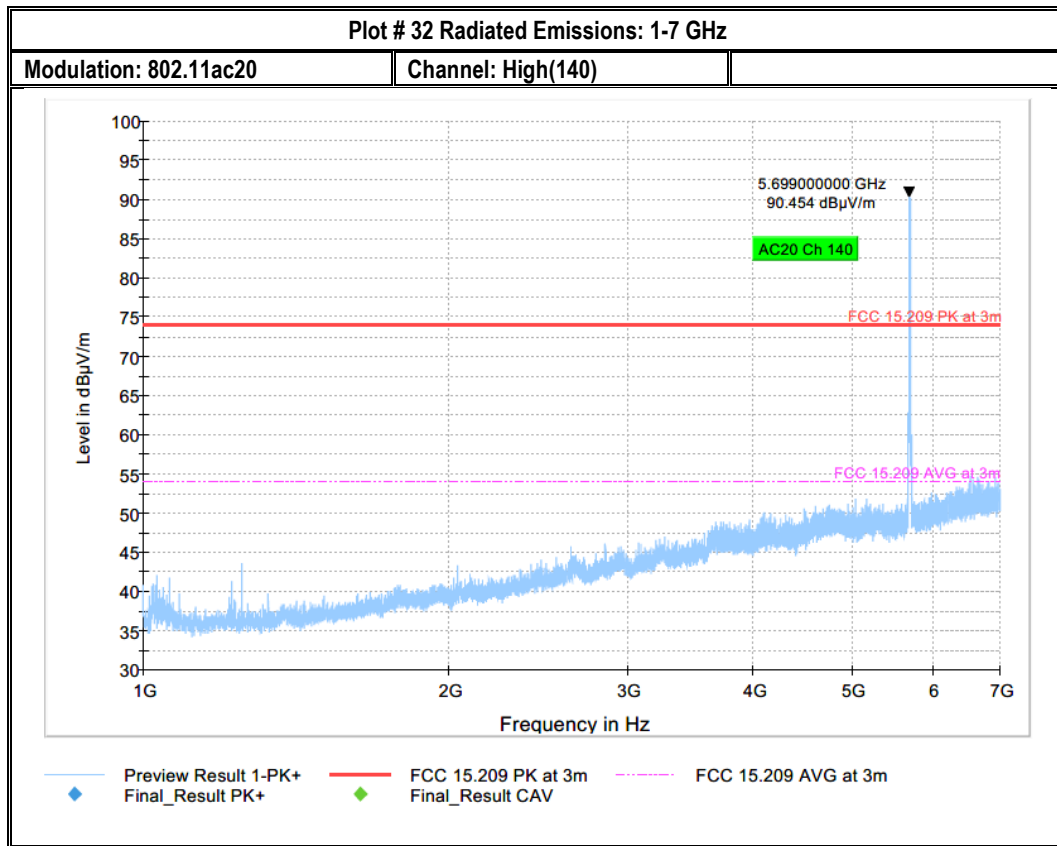


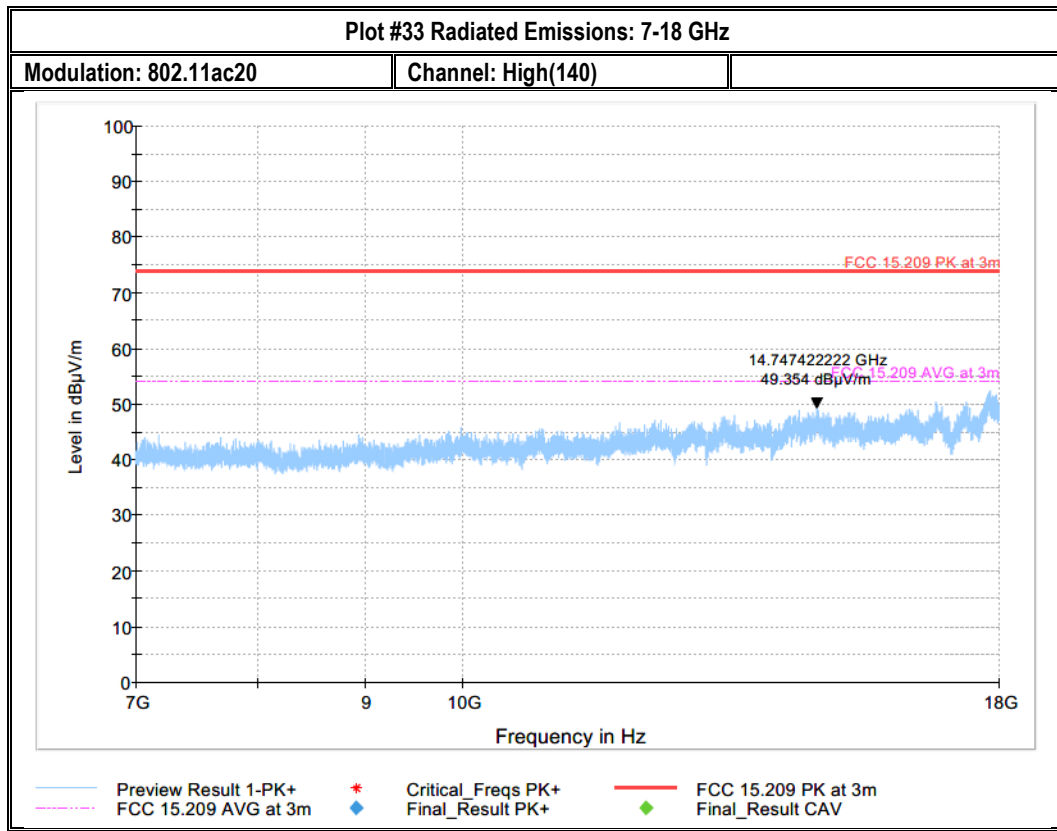














Plot #34 Radiated Emissions: 30 MHz – 1GHz

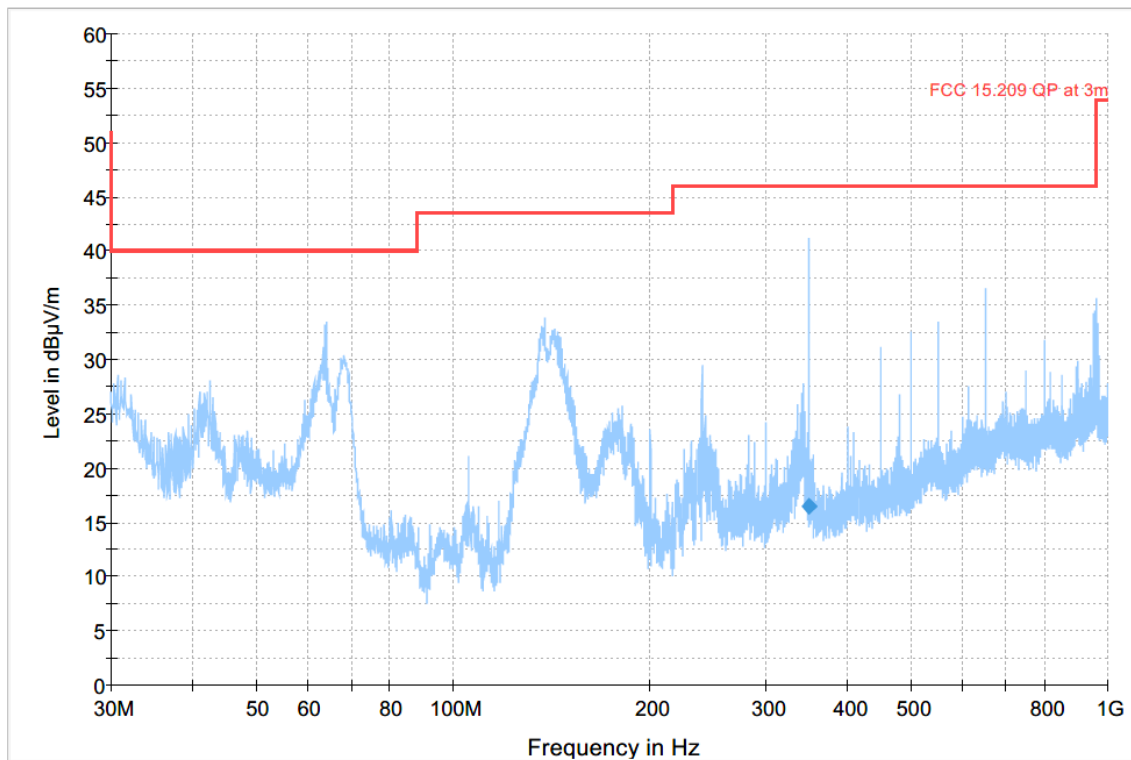
Modulation: 802.11ac20

Channel: Low(149)

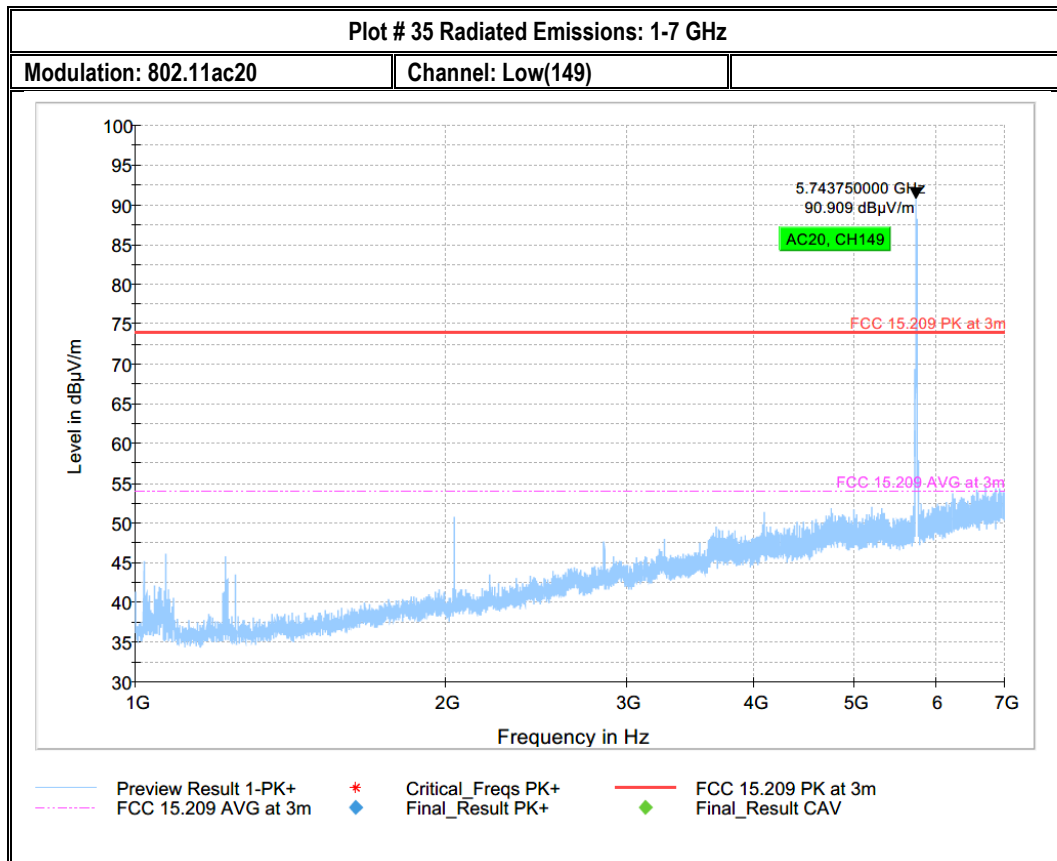
Final Result

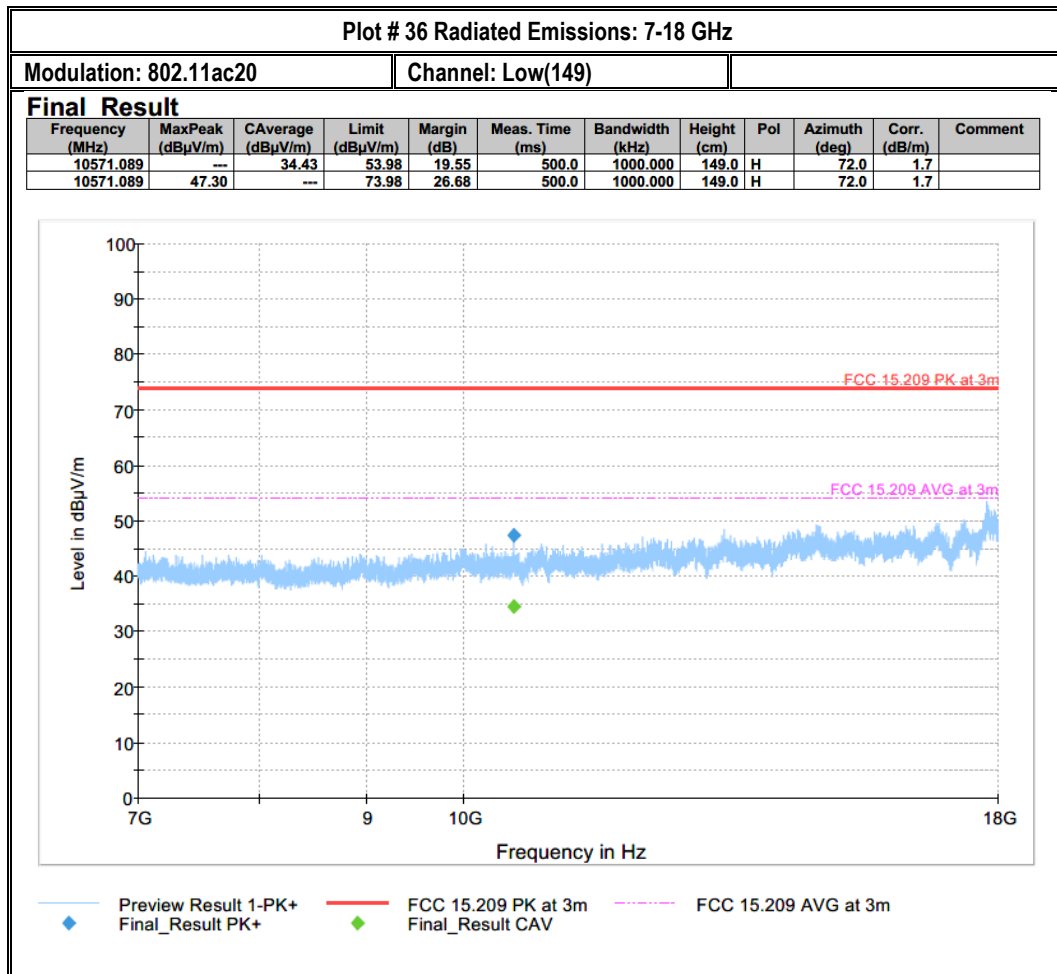
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
350.003	16.44	---	46.02	29.58	500.0	120.000	295.0	H	213.0	-14.3	

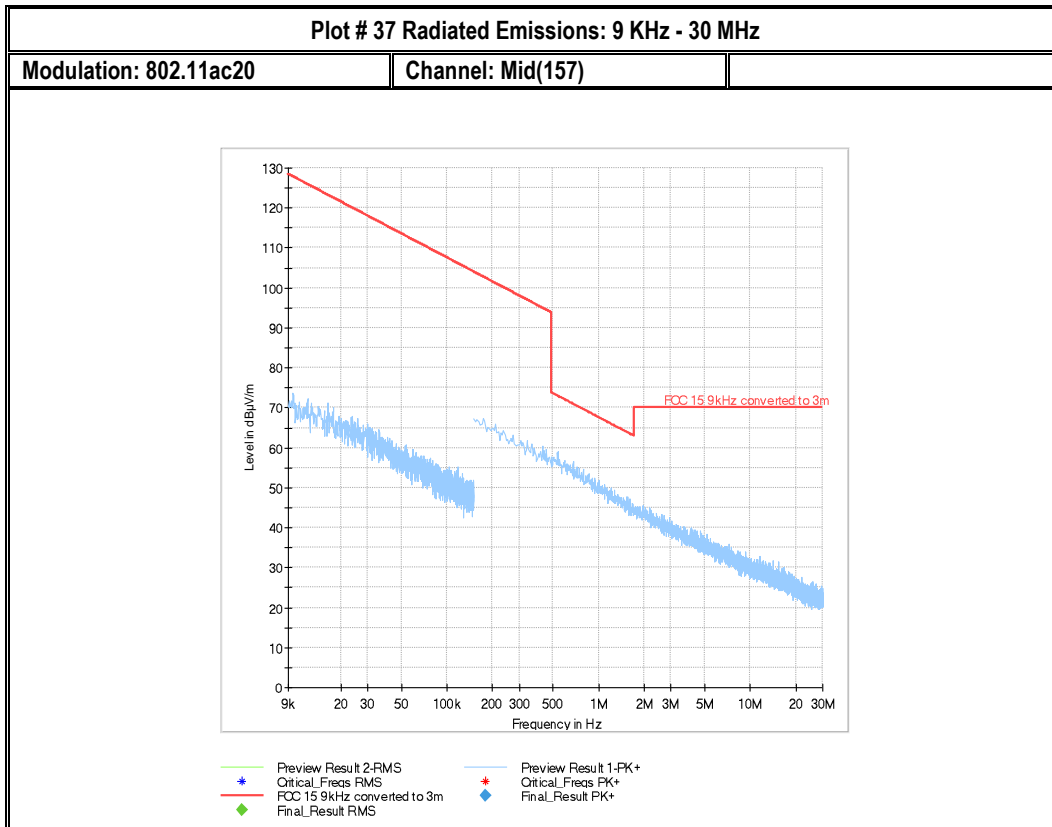
Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Preview Result 1-PK+    FCC 15.209 QP at 3m    Final\_Result QPK    Final\_Result PK+





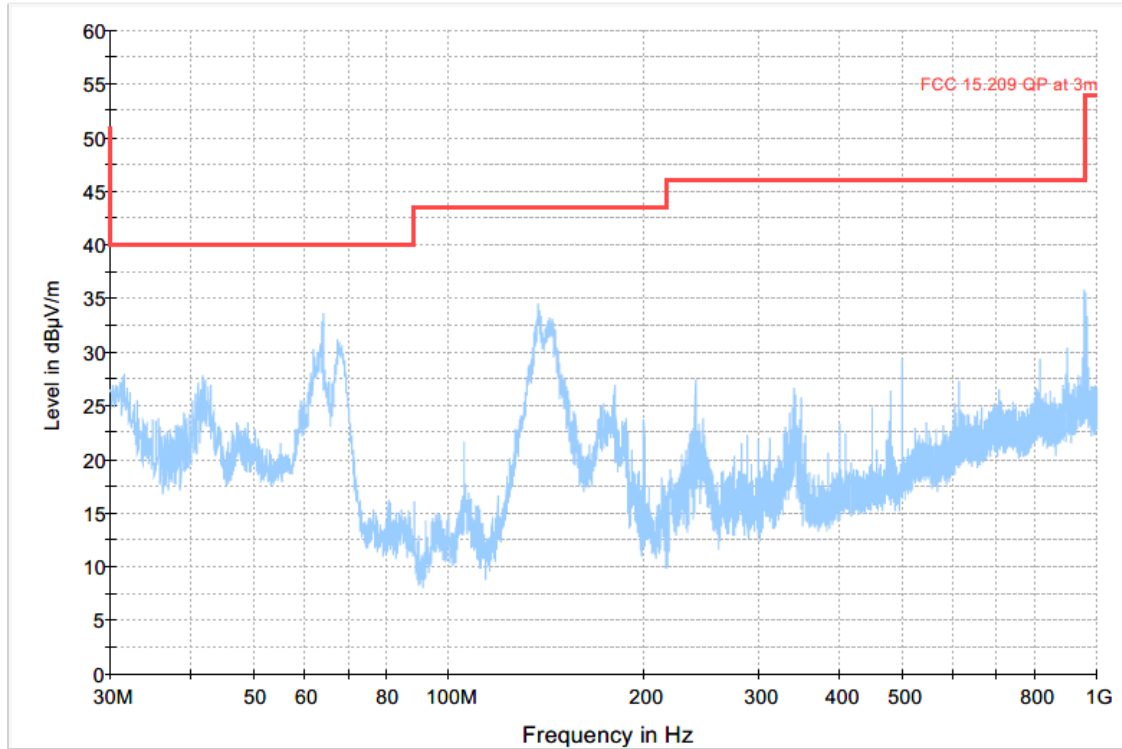


Plot #38 Radiated Emissions: 30 MHz – 1GHz

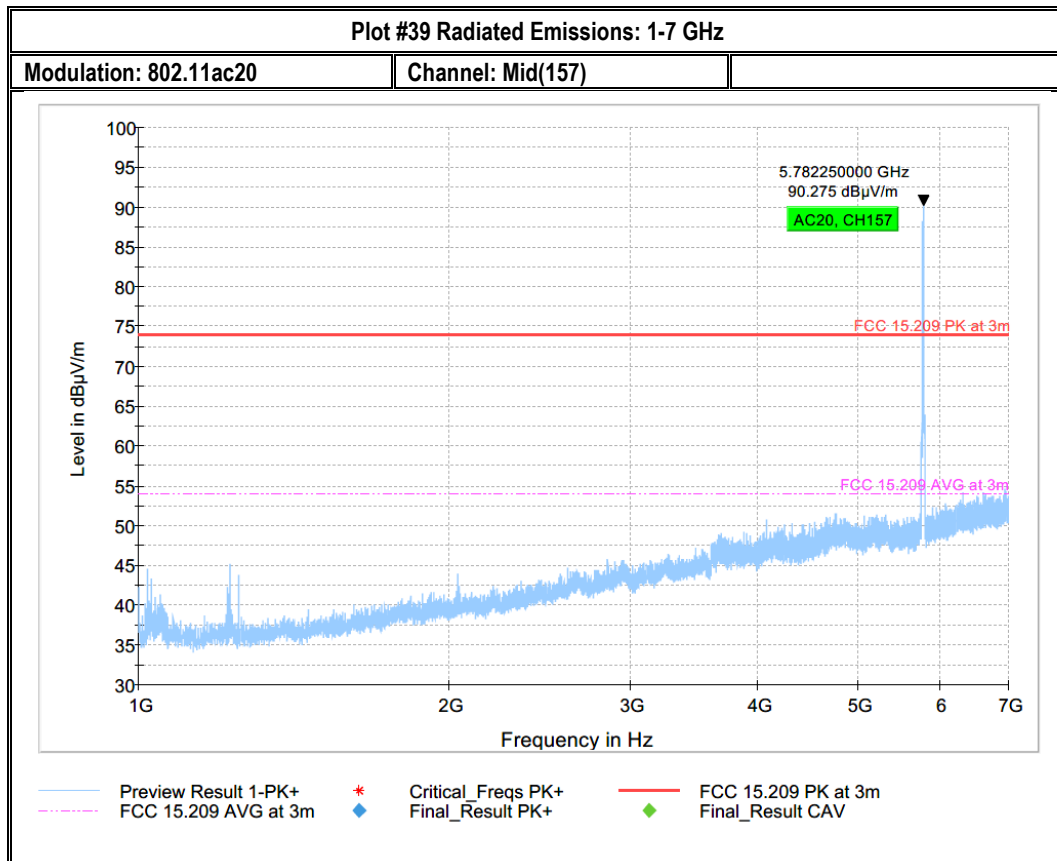
Modulation: 802.11ac20

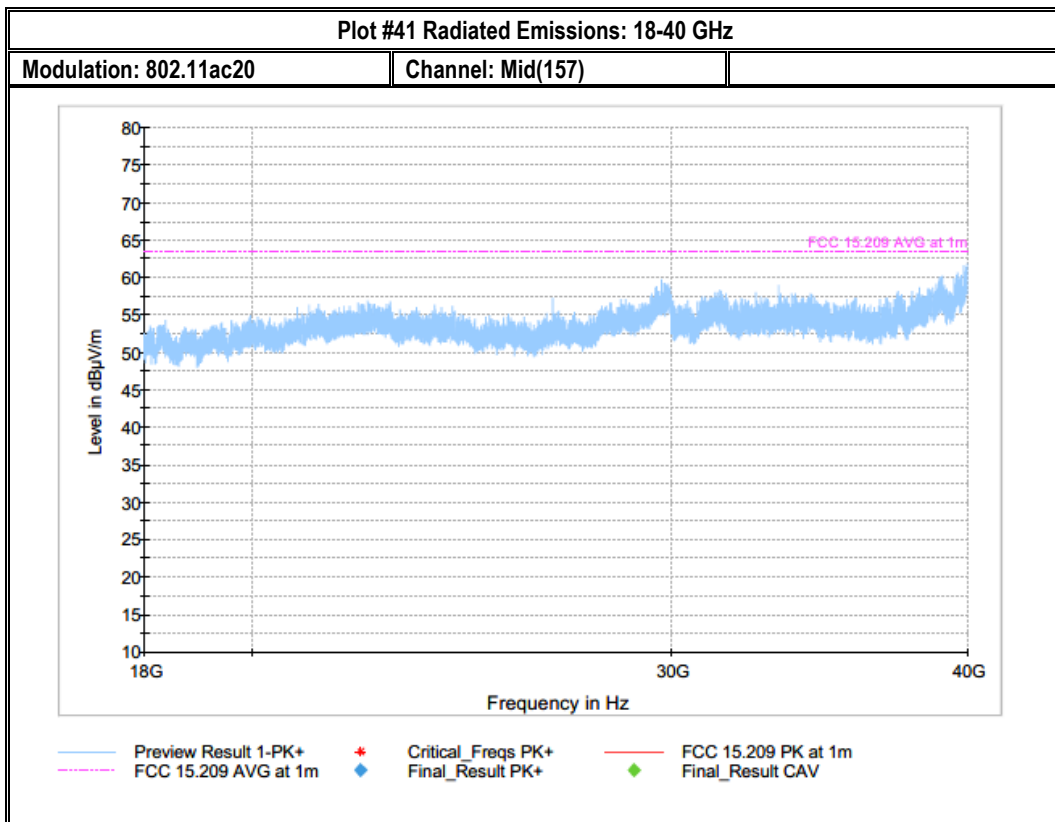
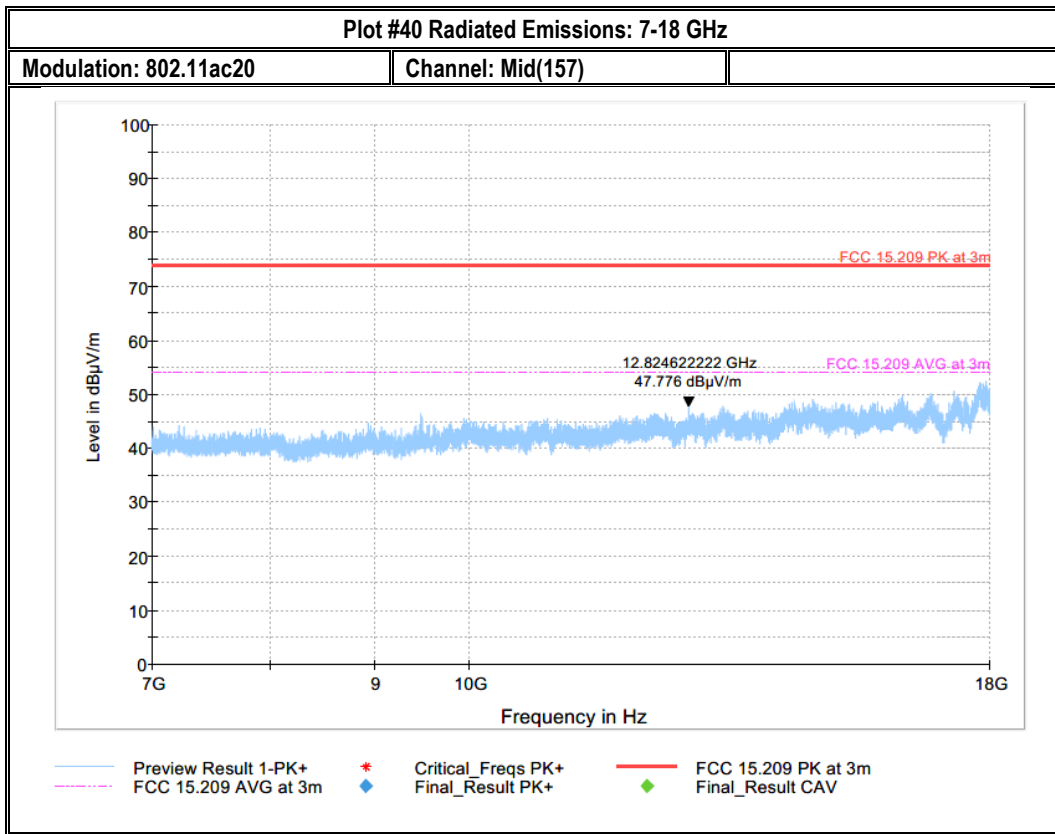
Channel: Mid(157)

*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    Final\_Result PK+



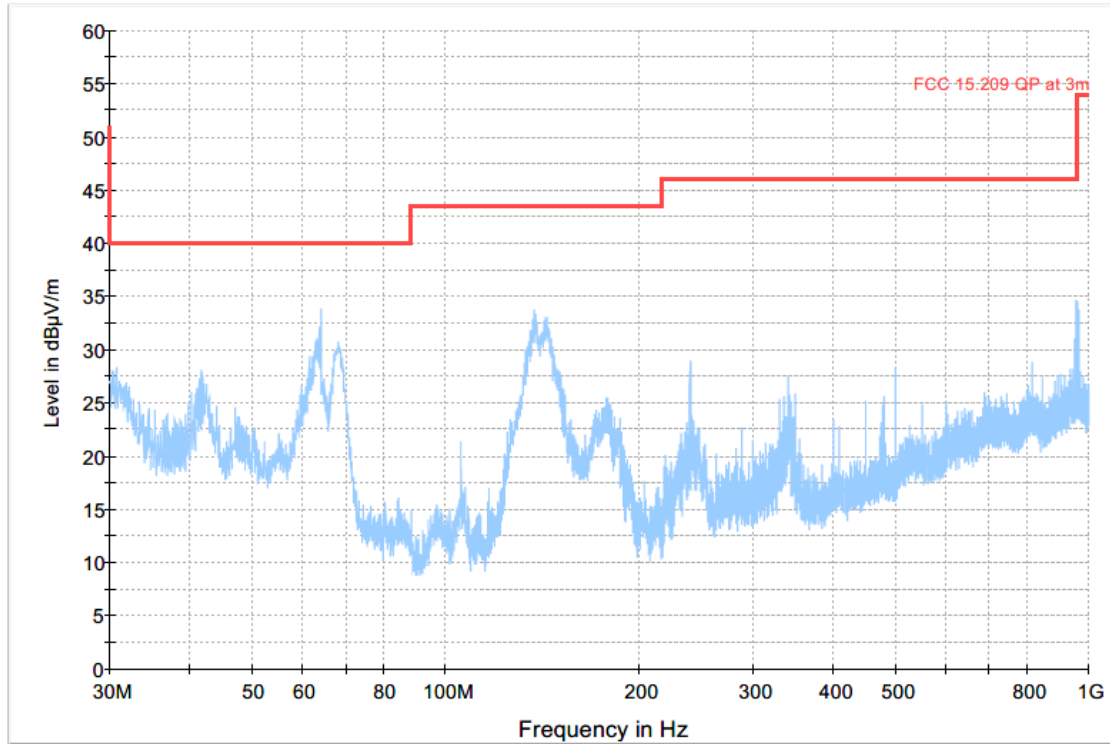


Plot #42 Radiated Emissions: 30 MHz – 1GHz

Modulation: 802.11ac20

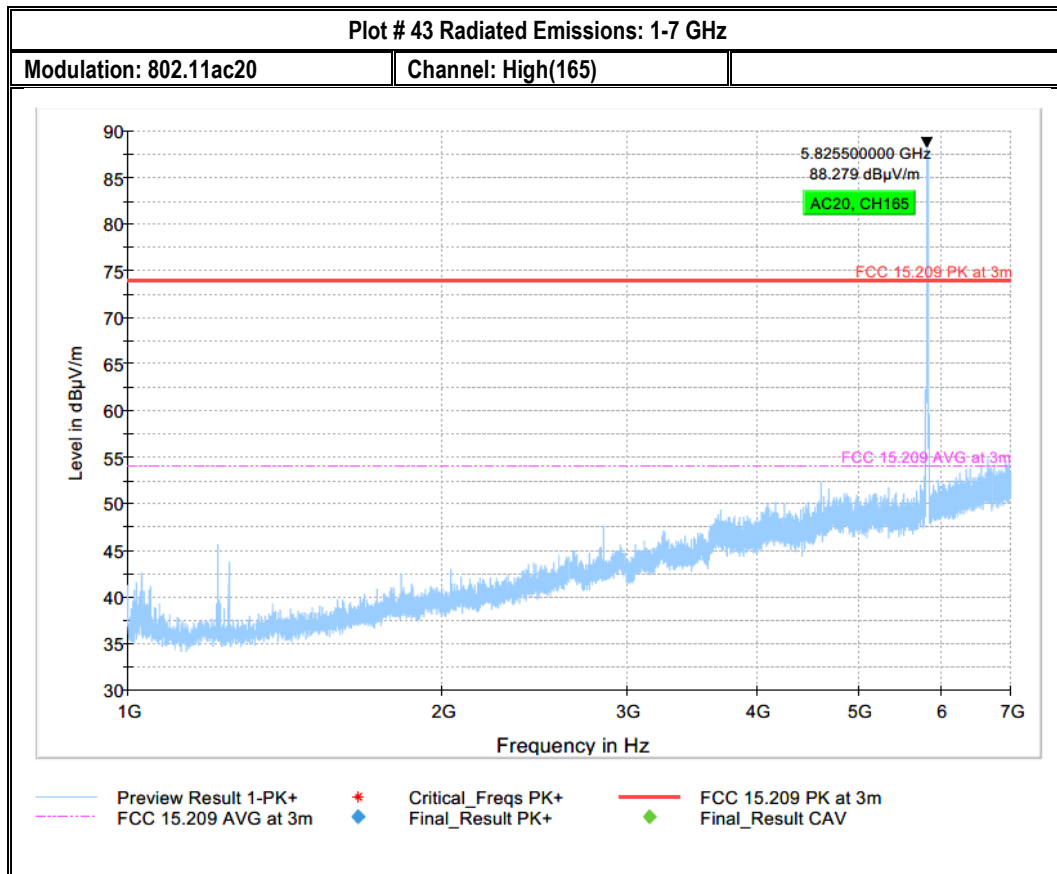
Channel: High(165)

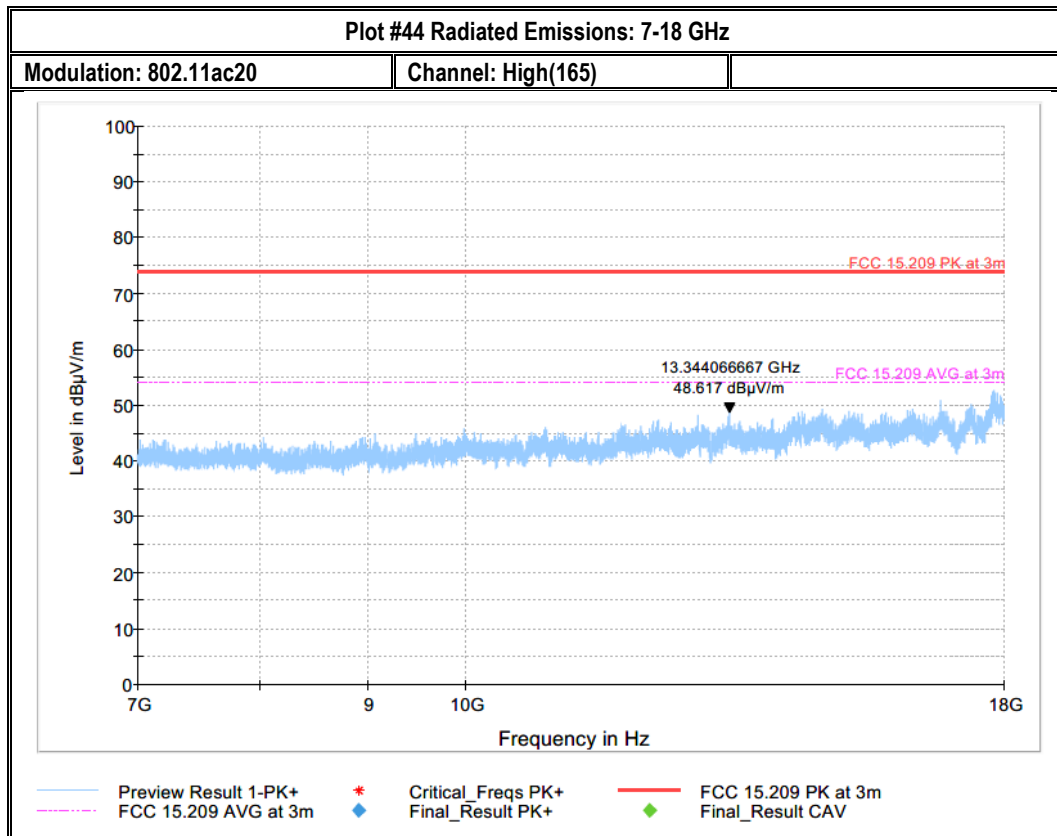
*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*



— Preview Result 1-PK+    — FCC 15.209 QP at 3m    ◆ Final\_Result QPK    ◆ Final\_Result PK+







## 8.6 AC Power Line Conducted Emissions

### 8.6.1 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

### 8.6.2 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  $\mu$ 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 $\mu$ 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.

### 8.6.3 Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22° C	2	802.11ac20	Line & Neutral	110V / 60Hz

### 8.6.4 Measurement Result:

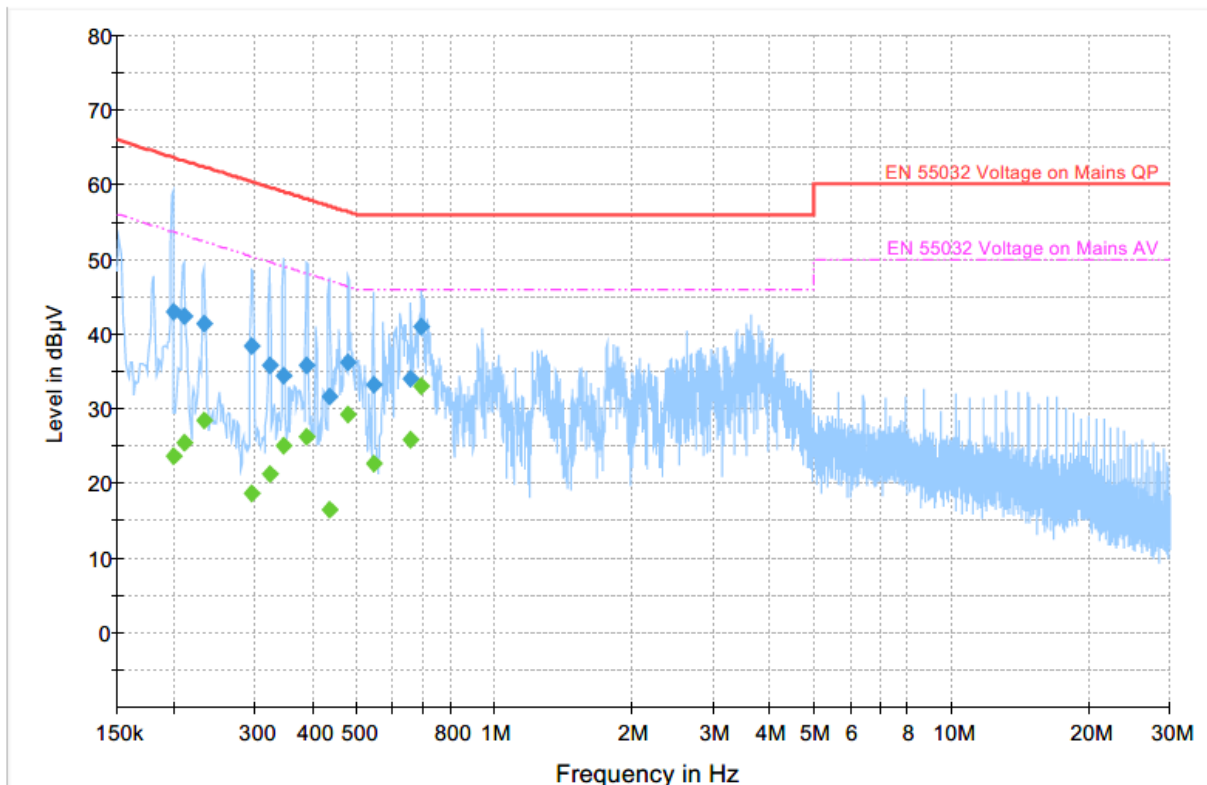
Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	2	802.11ac20	150 kHz – 30 MHz	See section 8.6.2	Pass

8.6.5 Measurement Plots:

Plot # 1

Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.199	---	23.69	53.65	29.96	500.0	9.000	L1	GND	10.2	
0.199	42.98	---	63.65	20.67	500.0	9.000	L1	GND	10.2	
0.210	---	25.48	53.22	27.74	500.0	9.000	L1	GND	10.2	
0.210	42.35	---	63.22	20.87	500.0	9.000	L1	GND	10.2	
0.232	---	28.43	52.38	23.94	500.0	9.000	N	GND	10.2	
0.232	41.29	---	62.38	21.08	500.0	9.000	N	GND	10.2	
0.296	---	18.58	50.35	31.78	500.0	9.000	N	GND	10.1	
0.296	38.35	---	60.35	22.00	500.0	9.000	N	GND	10.1	
0.324	---	21.29	49.61	28.32	500.0	9.000	N	GND	10.1	
0.324	35.80	---	59.61	23.81	500.0	9.000	N	GND	10.1	
0.347	---	24.98	49.03	24.04	500.0	9.000	N	GND	10.0	
0.347	34.41	---	59.03	24.62	500.0	9.000	N	GND	10.0	
0.390	35.78	---	58.07	22.29	500.0	9.000	N	GND	10.0	
0.390	---	26.14	48.07	21.92	500.0	9.000	N	GND	10.0	
0.436	---	16.44	47.14	30.70	500.0	9.000	L1	GND	10.0	
0.436	31.52	---	57.14	25.62	500.0	9.000	L1	GND	10.0	
0.480	---	29.24	46.33	17.10	500.0	9.000	N	GND	10.0	
0.480	36.29	---	56.33	20.04	500.0	9.000	N	GND	10.0	
0.546	33.18	---	56.00	22.82	500.0	9.000	N	GND	10.0	
0.546	---	22.69	46.00	23.31	500.0	9.000	N	GND	10.0	
0.657	---	25.92	46.00	20.08	500.0	9.000	L1	GND	10.0	
0.657	34.08	---	56.00	21.92	500.0	9.000	L1	GND	10.0	
0.693	---	33.10	46.00	12.90	500.0	9.000	N	GND	10.0	
0.693	41.02	---	56.00	14.98	500.0	9.000	N	GND	10.0	



- ◆ Preview Result 1-PK+ Final\_Result QPK
- EN 55032 Voltage on Mains QP
- - - EN 55032 Voltage on Mains AV
- ◆ Final\_Result CAV

## 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	Biconlog 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_15.407_UNII	Initial Version	Kevin Wang

<<< The End >>>