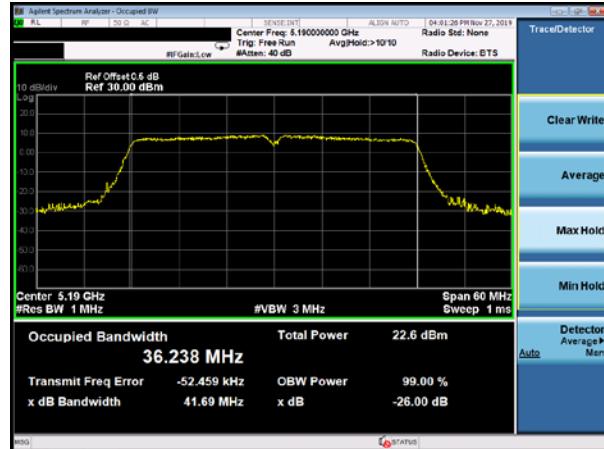




Test plot

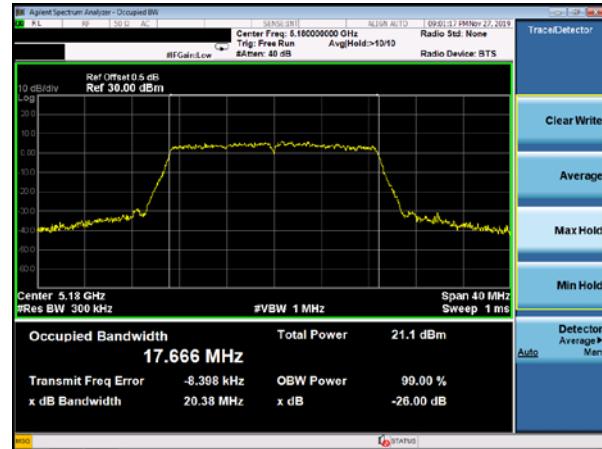
(802.11 n40) 26dB&99%Bandwidth plot on channel

38



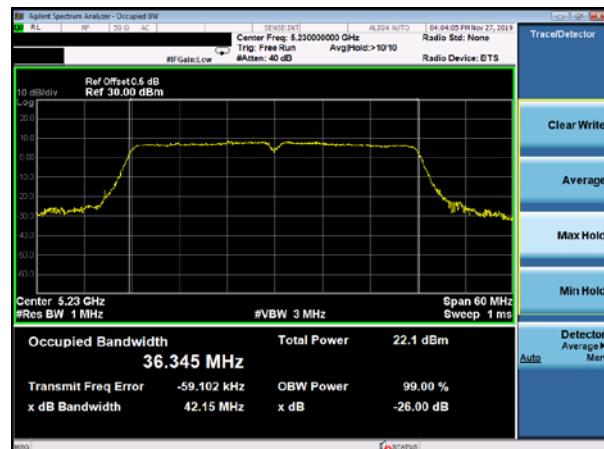
(802.11 AC20) 26dB&99%Bandwidth plot on

channel 36



(802.11 n40) 26dB&99%Bandwidth plot on channel

46



(802.11 AC20) 26dB&99%Bandwidth plot on

channel 40



(802.11 AC20) 26dB&99%Bandwidth plot on

channel 48



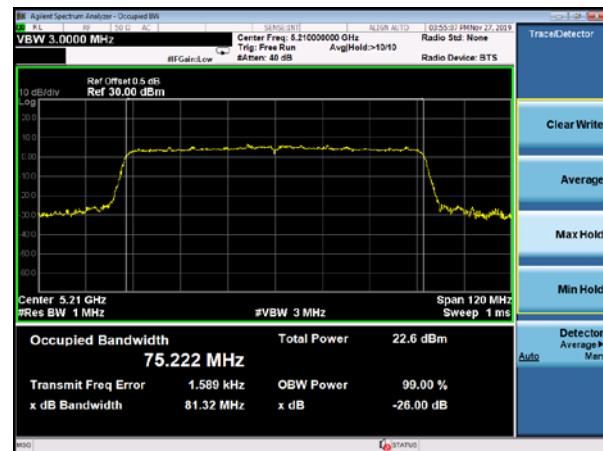


Test plot

(802.11 AC40) 26dB&99%Bandwidth plot on  
channel 38



(802.11 AC80) 26dB&99%Bandwidth plot on  
channel 42



(802.11 AC40) 26dB&99%Bandwidth plot on  
channel 46





## 6. MAXIMUM CONDUCTED OUTPUT POWER

### 6.1 APPLIED PROCEDURES / LIMIT

#### According to FCC §15.407

The maximum conducted output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	1W

The maximum e.i.r.p should not exceed:

Frequency Band(MHz)	Limit
5150~5250	200mW or 10dBm +10logB whichever is less

Note: Where "B" is the 99% emission bandwidth in MHz

### 6.2 TEST PROCEDURE

· Maximum conducted output power may be measured using a spectrum analyzer/EMI receiver or an RF power meter.

#### 1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

#### 2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.<sup>1</sup> However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).



a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

- The EUT transmits continuously (or with a duty cycle  $\geq$  98 percent).
- Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration  $T$  of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than  $\pm 2$  percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW  $\geq$  3 MHz.

(iv) 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.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle  $<$  98 percent, 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 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) 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



### 6.3 DEVIATION FROM STANDARD

No deviation.

### 6.4 TEST SETUP



### 6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



## 6.6 TEST RESULTS

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX (5G) Mode Frequency U-NII-1 (5180-5240MHz)		

Antenna A gain: 5dBi, Antenna B gain: 5dBi, Directional gain=[10log(GA+ G B)] dbi =8.01dbi  
limit=30-(8.03-6)=27.99

Test Channel	Frequency (MHz)	Maximum output power. Antenna port (AV)			LIMIT	Result
		ANT A(dBm)	ANT B(dBm)	Total(dBm)		
<b>TX 802.11a Mode</b>						
CH36	5180	19.037	19.548	/	30	Pass
CH40	5200	18.668	19.584	/	30	Pass
CH48	5240	18.360	18.796	/	30	Pass
<b>TX 802.11 n20M Mode</b>						
CH36	5180	18.155	18.412	21.30	27.99	Pass
CH40	5200	18.617	18.269	21.46	27.99	Pass
CH48	5240	18.811	18.718	21.78	27.99	Pass
<b>TX 802.11 n40M Mode</b>						
CH38	5190	16.091	16.522	19.32	27.99	Pass
CH46	5230	16.261	16.366	19.32	27.99	Pass
<b>TX 802.11 AC20M Mode</b>						
CH36	5180	18.242	18.790	21.53	27.99	Pass
CH40	5200	19.463	19.141	22.32	27.99	Pass
CH48	5240	18.460	18.510	21.50	27.99	Pass
<b>TX 802.11 AC40M Mode</b>						
CH38	5190	16.031	16.852	19.47	27.99	Pass
CH46	5230	16.509	16.277	19.40	27.99	Pass
<b>TX 802.11 AC80M Mode</b>						
CH42	5210	16.482	16.498	19.50	27.99	Pass



## 7. OUT OF BAND EMISSIONS

### 7.1 APPLICABLE STANDARD

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

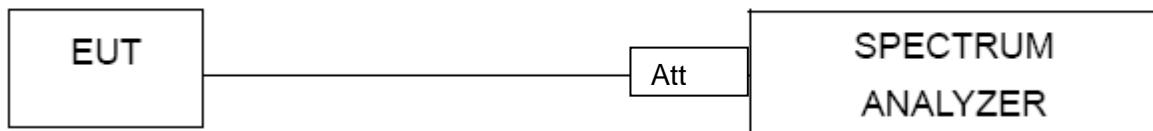
### 7.2 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### 7.3 DEVIATION FROM STANDARD

No deviation.

### 7.4 TEST SETUP





## 7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



## 7.6 TEST RESULTS

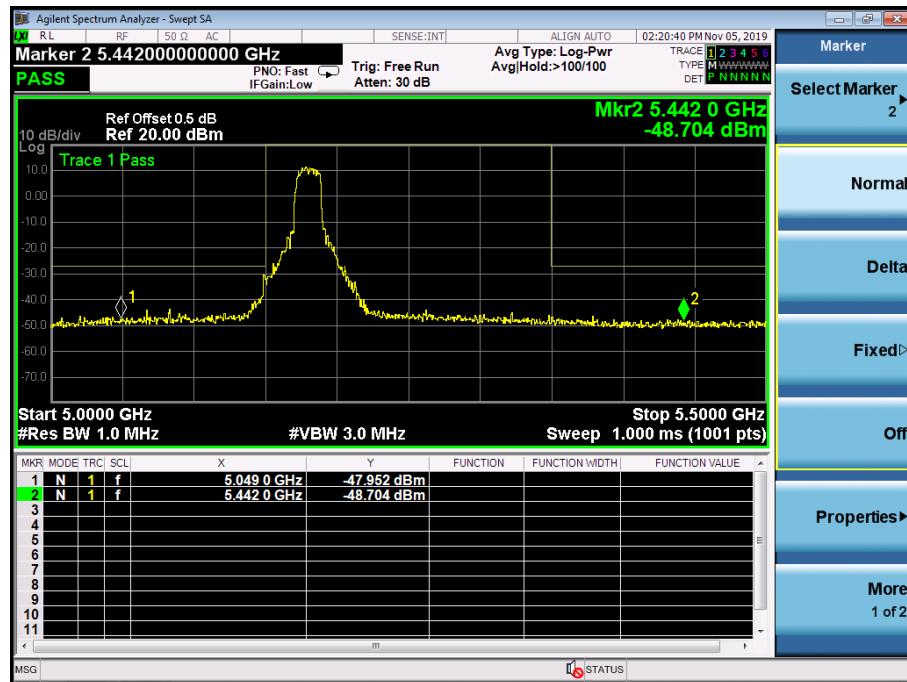
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A ,only shown Antenna A . Plot.Antenna A: 5180-5240MHz

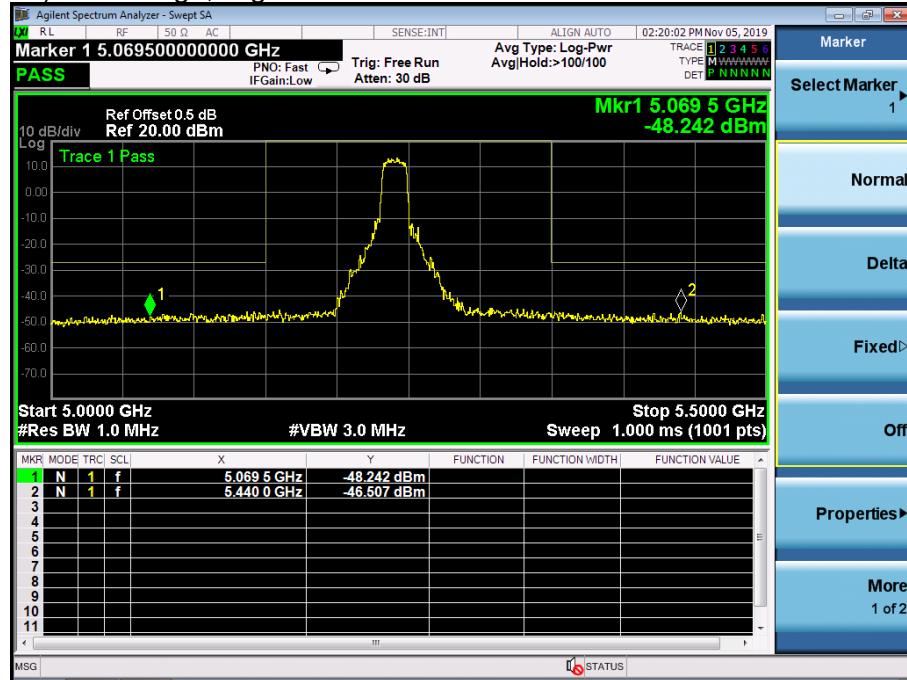
5.2G

### 5.180~5.240 GHz

(802.11a) Band Edge, Left Side

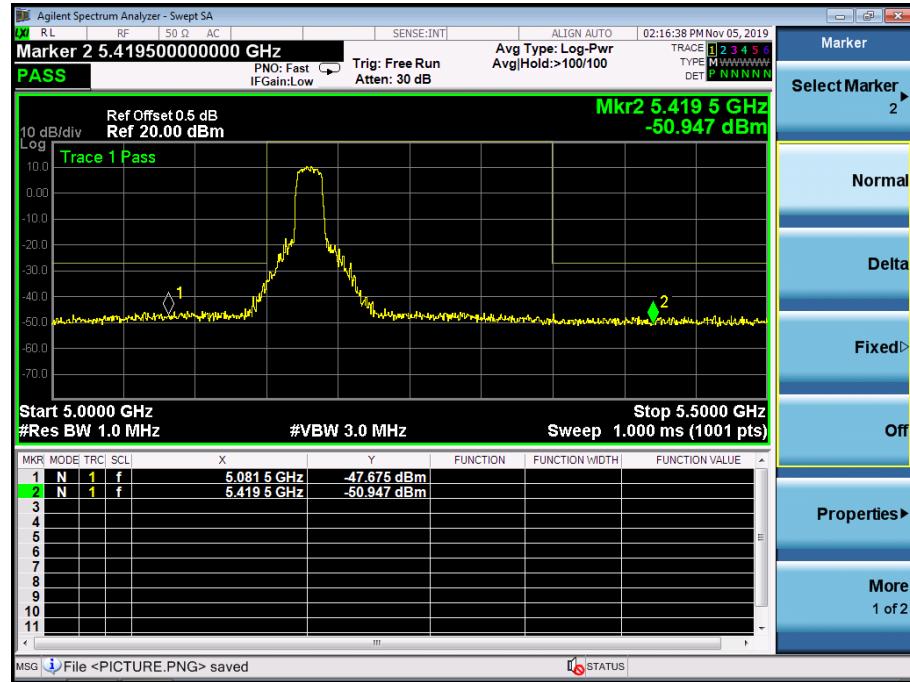


(802.11a) Band Edge, Right Side

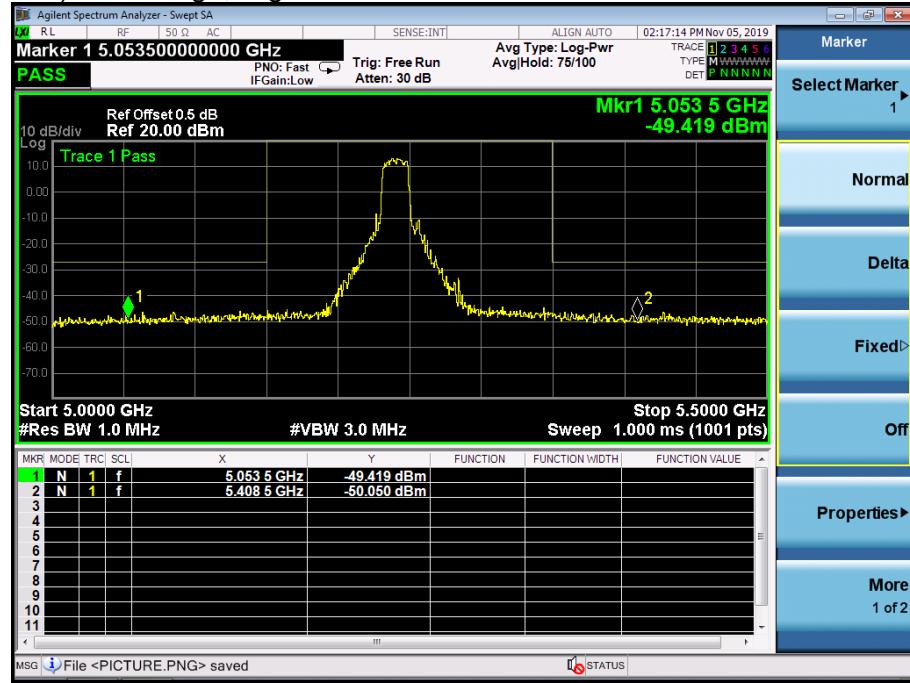




(802.11n20) Band Edge, Left Side



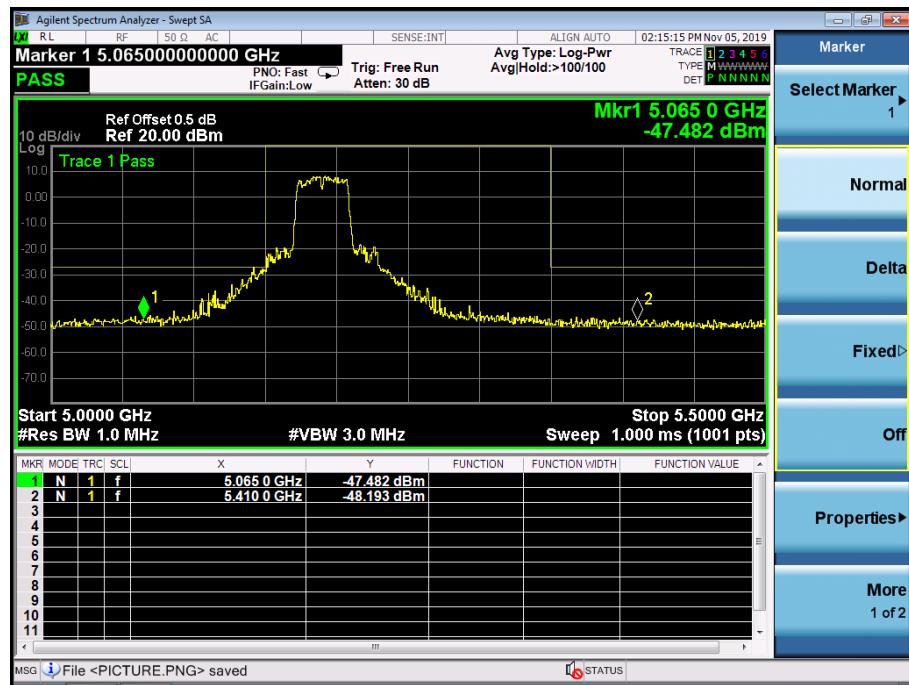
(802.11n20) Band Edge, Right Side



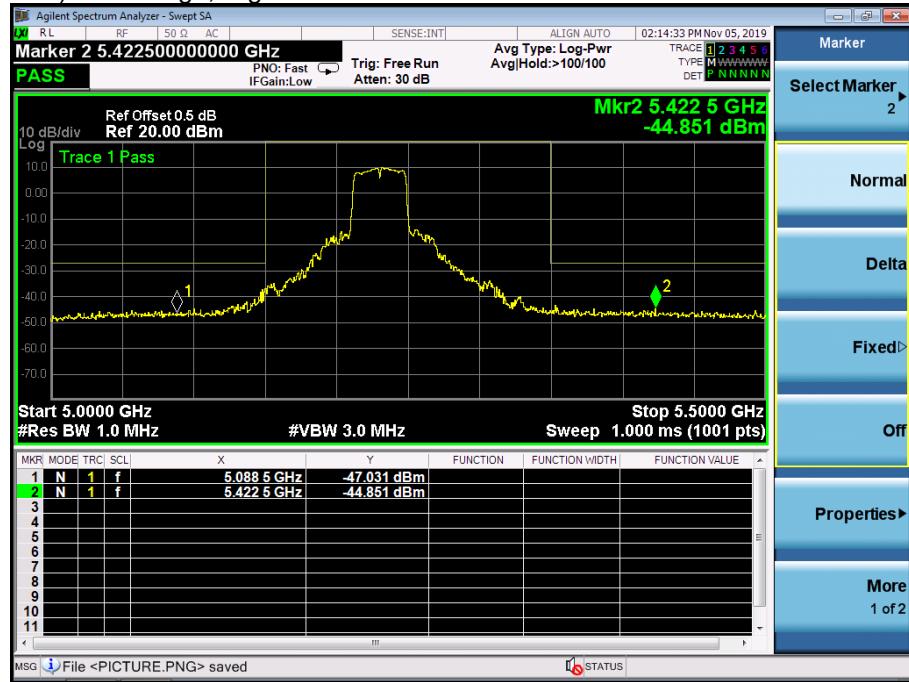


5.180~5.240 GHz

(802.11n40) Band Edge, Left Side



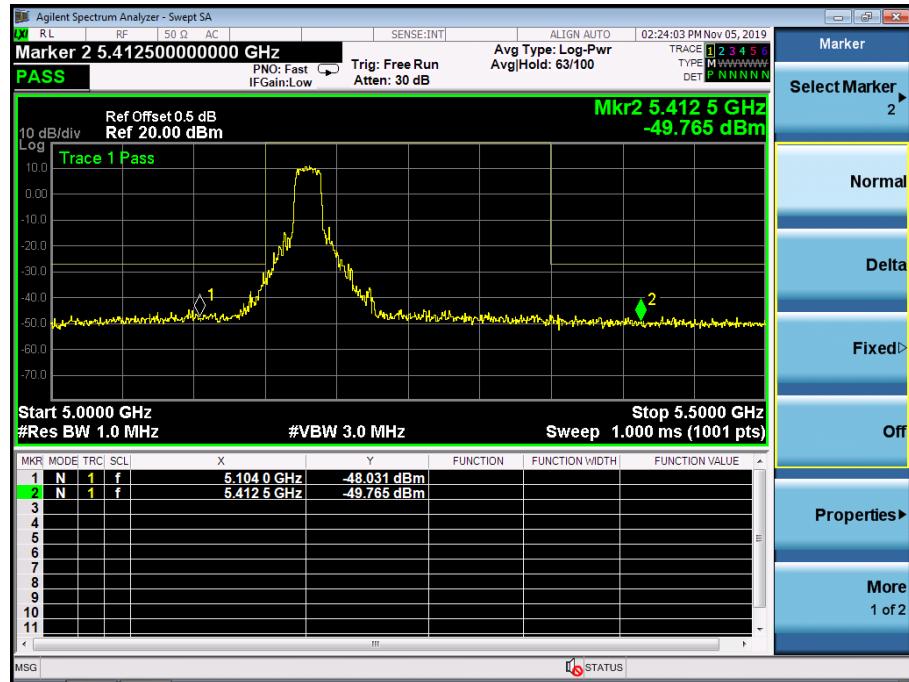
(802.11n40) Band Edge, Right Side



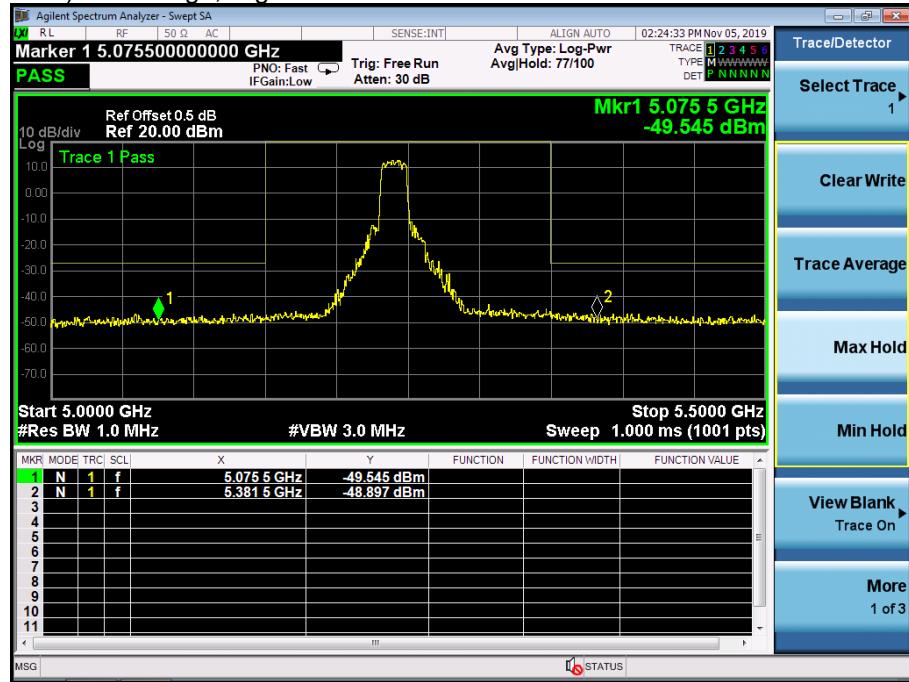


## 5.180~5.240 GHz

(802.11ac20) Band Edge, Left Side



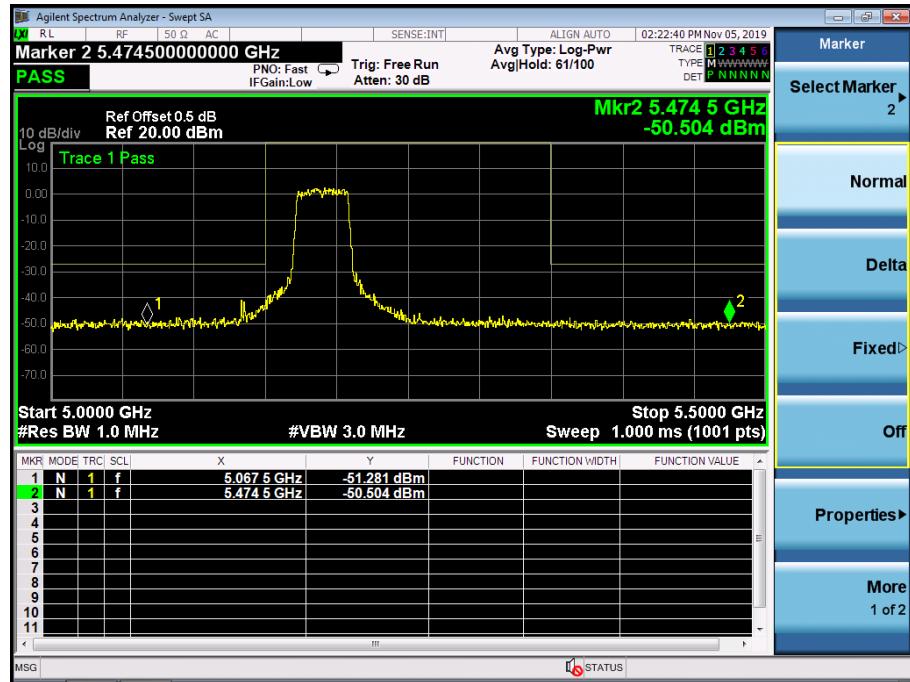
(802.11ac20) Band Edge, Right Side



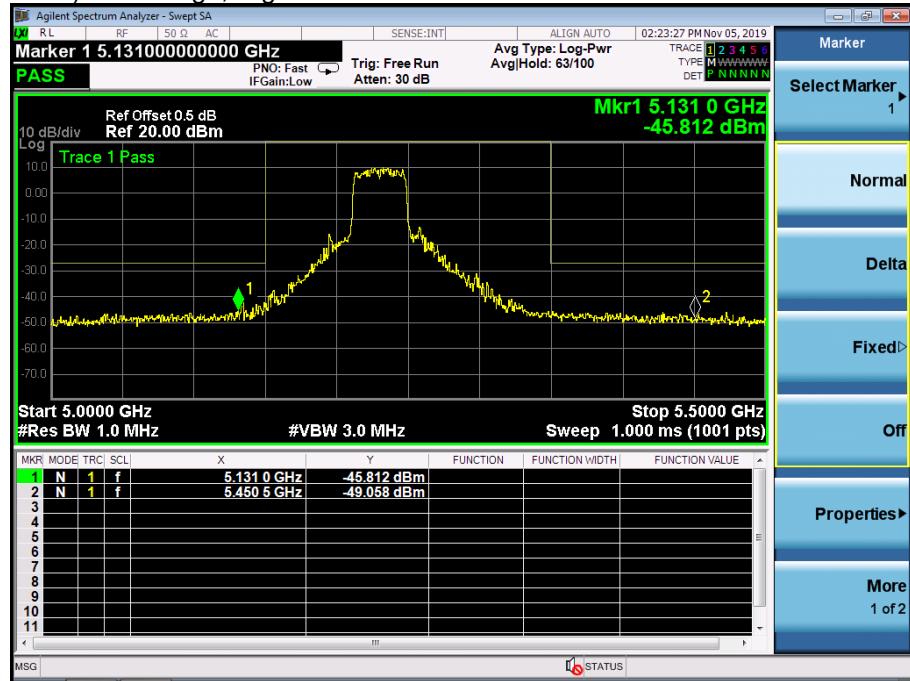


## 5.180~5.240 GHz

(802.11ac40) Band Edge, Left Side



(802.11ac40) Band Edge, Right Side



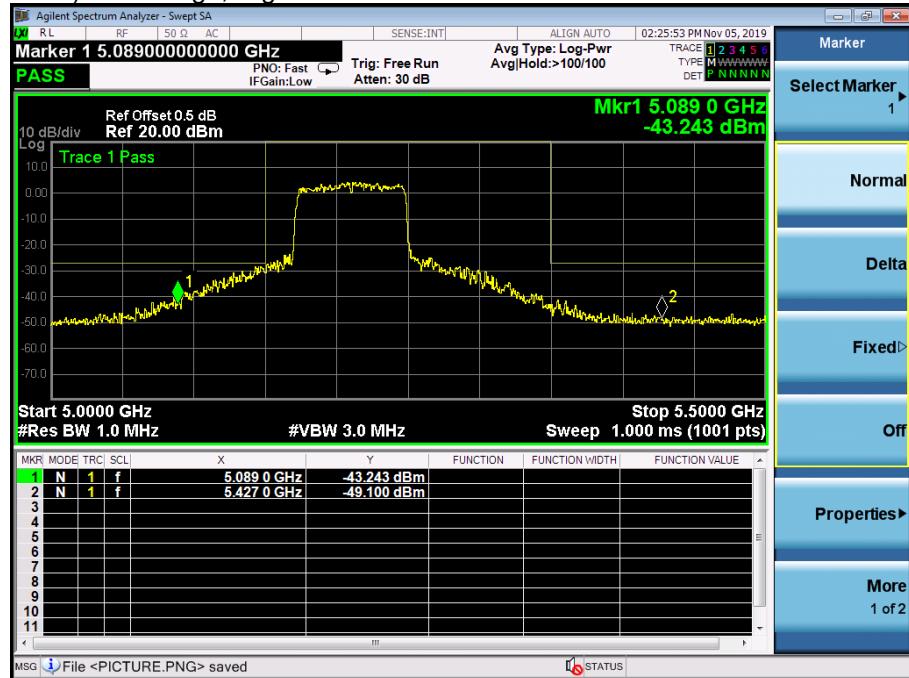


## 5.180~5.240 GHz

(802.11 ac80) Band Edge, Left Side



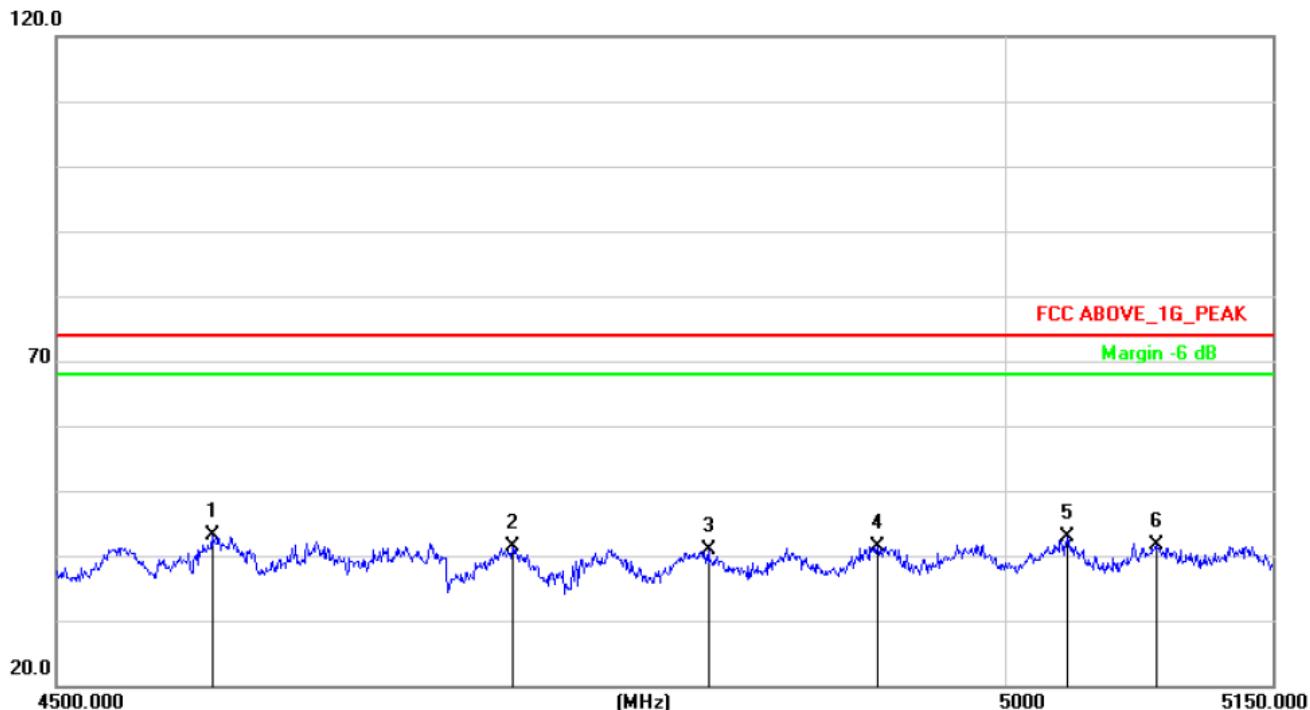
(802.11ac80) Band Edge, Right Side





## Radiated bandedge

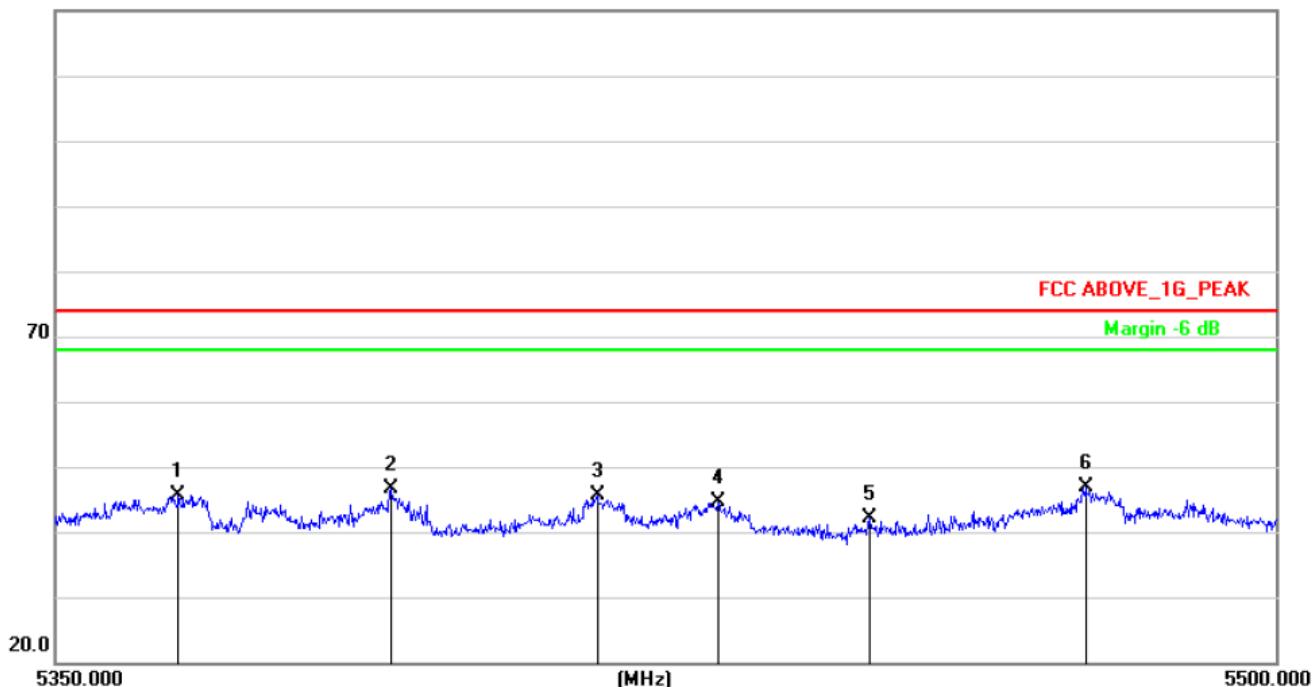
802.11 a  
For the frequency band 5180-5240MHz



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4578.650	43.71	-0.59	43.12	74.00	-30.88	peak
2	4734.000	41.85	-0.48	41.37	74.00	-32.63	peak
3	4838.000	41.24	-0.41	40.83	74.00	-33.17	peak
4	4929.650	41.83	-0.34	41.49	74.00	-32.51	peak
5	5034.300	43.13	-0.14	42.99	74.00	-31.01	peak
6	5084.350	41.54	0.07	41.61	74.00	-32.39	peak



120.0 dB<sub>uV/m</sub>



No.	Frequency (MHz)	Reading (dB <sub>uV/m</sub> )	Correct Factor(dB/m)	Result (dB <sub>uV/m</sub> )	Limit (dB <sub>uV/m</sub> )	Margin (dB)	Remark
1	5365.000	44.46	1.26	45.72	74.00	-28.28	peak
2	5390.950	45.23	1.37	46.60	74.00	-27.40	peak
3	5416.150	44.26	1.48	45.74	74.00	-28.26	peak
4	5431.000	43.05	1.54	44.59	74.00	-29.41	peak
5	5449.600	40.60	1.62	42.22	74.00	-31.78	peak
6	5476.450	45.24	1.73	46.97	74.00	-27.03	peak

Note:

1. This EUT was tested in 802.11a/n(HT20), n(HT40) mode and 802.11a the worst case position data was reported.



## 8.SPURIOUS RF CONDUCTED EMISSIONS

### 8.1 CONFORMANCE LIMIT

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

### 8.2 MEASURING INSTRUMENTS

The Measuring equipment is listed in the section 6.3 of this test report.

### 8.3 TEST SETUP

Please refer to Section 6.1 of this test report.

### 8.4 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### 8.5 TEST RESULTS

Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A ,only shown Antenna A Plot.



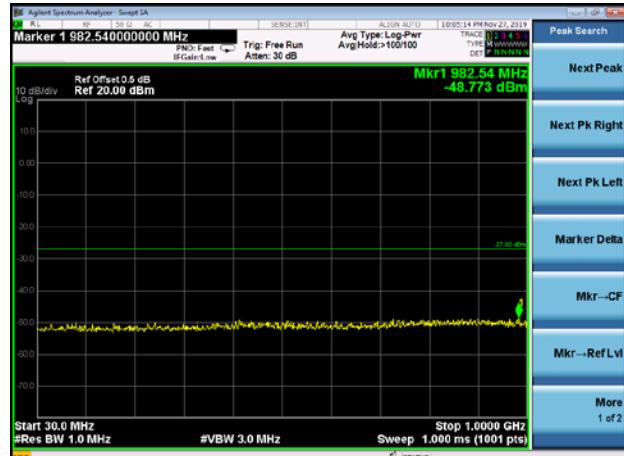
5.2G

Test Plot

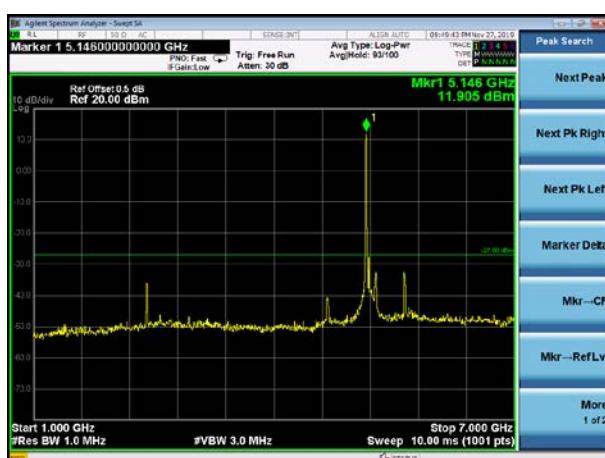
802.11a on channel 36



802.11a on channel 40



802.11a on channel 36



802.11a on channel 40



802.11a on channel 36



802.11a on channel 40



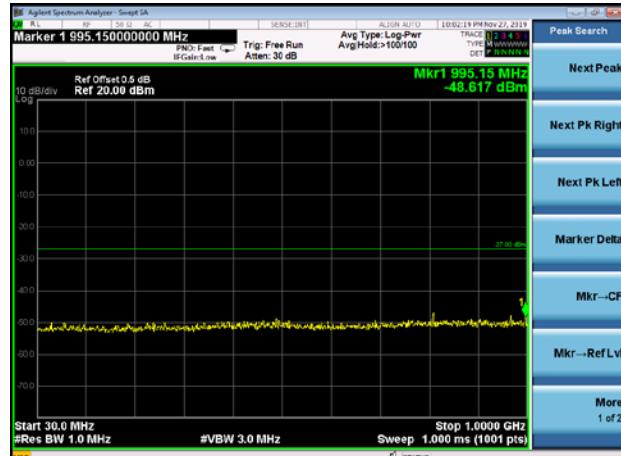


### Test Plot

802.11a on channel 48



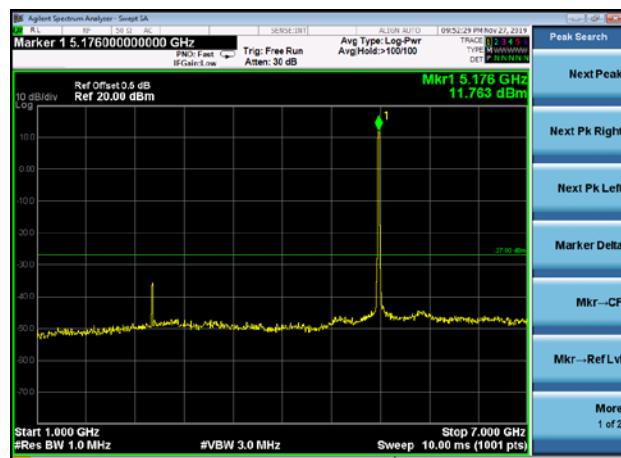
802.11n20 on channel 36



802.11a on channel 48



802.11n20 on channel 36



802.11a on channel 48



802.11n20 on channel 36



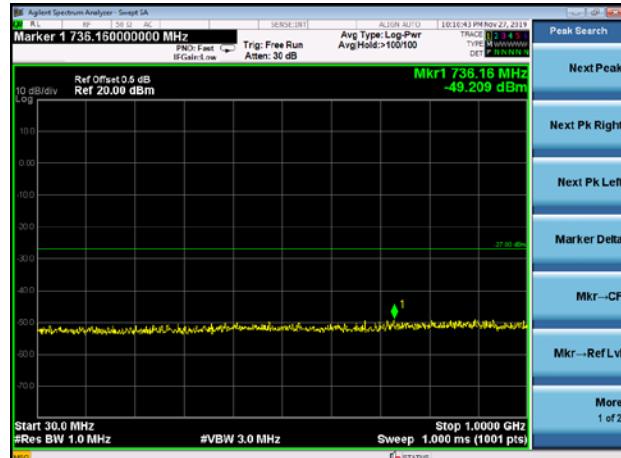


### Test Plot

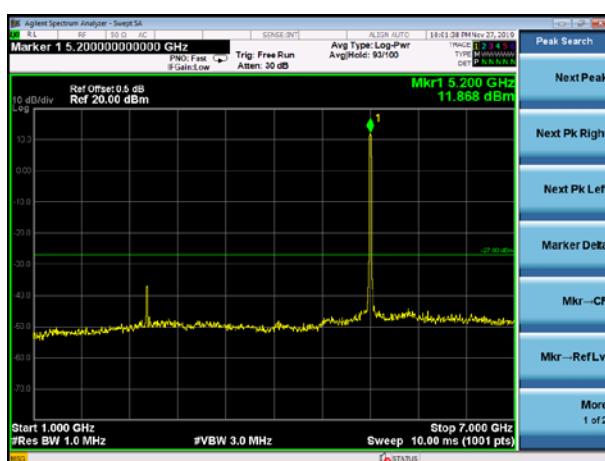
802.11n20 on channel 40



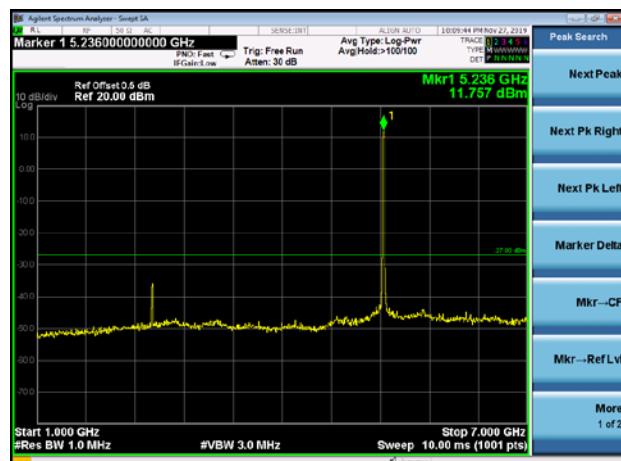
802.11n20 on channel 48



802.11n20 on channel 40



802.11n20 on channel 48



802.11n20 on channel 40



802.11n20 on channel 48



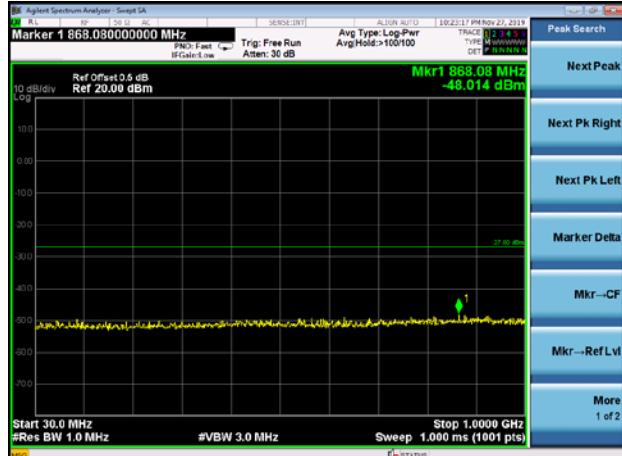


### Test Plot

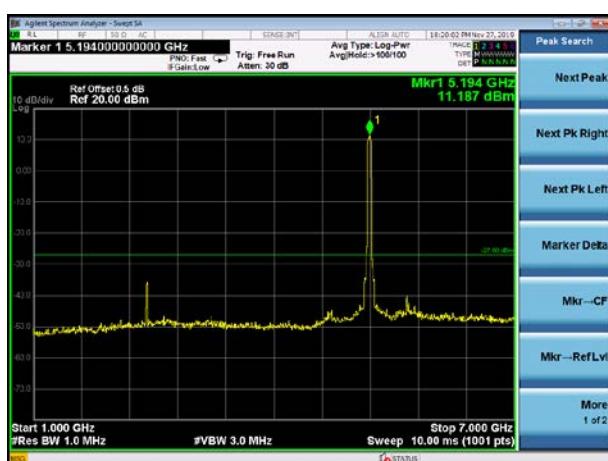
802.11n40 on channel 38



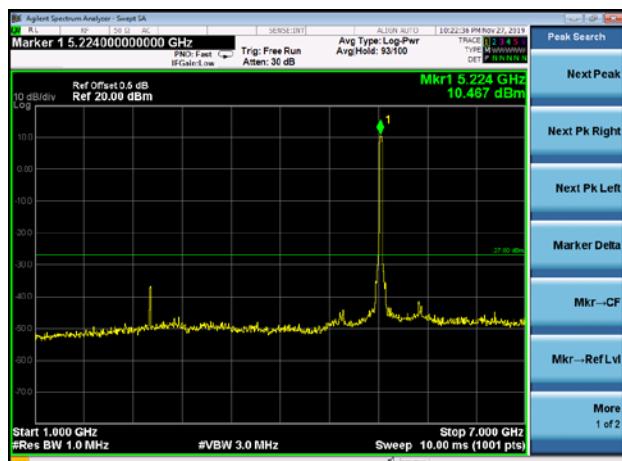
802.11n40 on channel 46



802.11n40 on channel 38



802.11n40 on channel 46



802.11n40 on channel 38



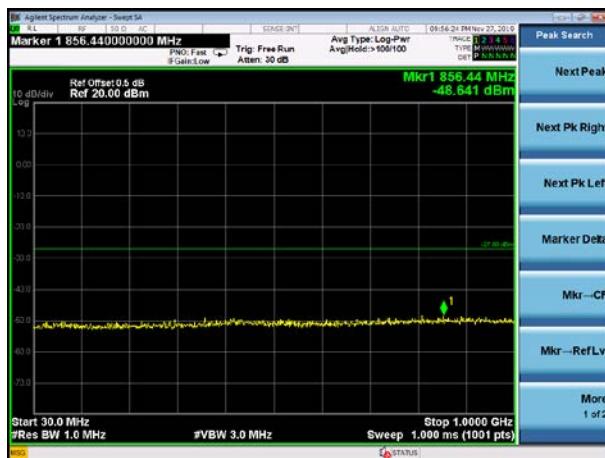
802.11n40 on channel 46



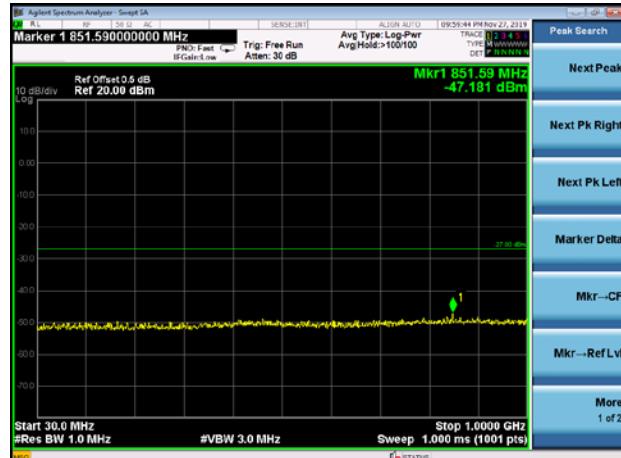


### Test Plot

802.11ac20 on channel 36



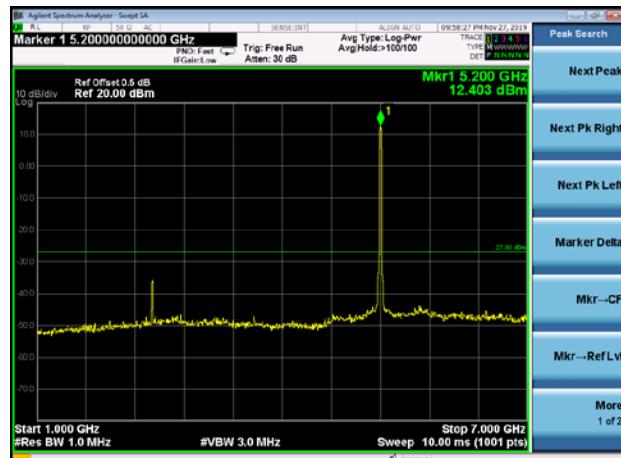
802.11ac20 on channel 40



802.11ac20 on channel 36



802.11ac20 on channel 40



802.11ac20 on channel 36



802.11ac20 on channel 40



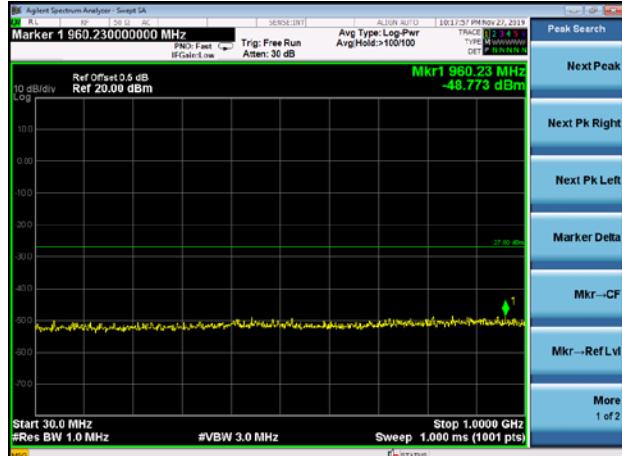


### Test Plot

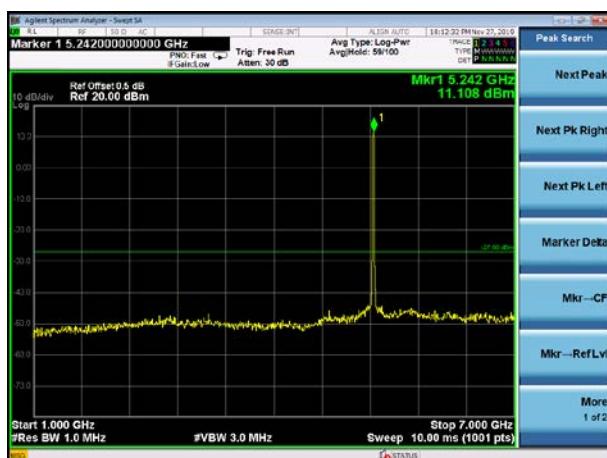
802.11ac20 on channel 48



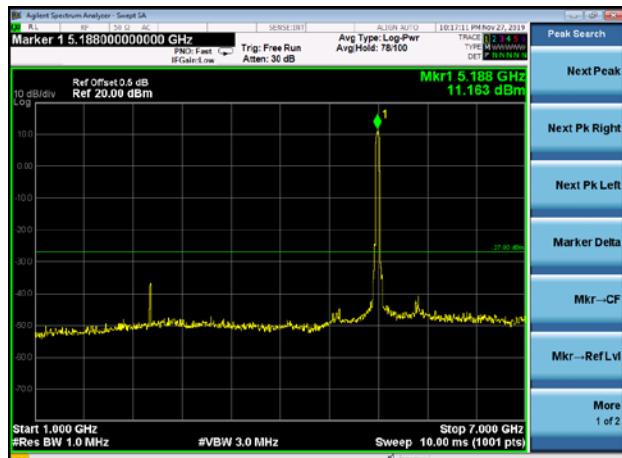
802.11ac40 on channel 38



802.11ac20 on channel 48



802.11ac40 on channel 38



802.11ac20 on channel 48



802.11ac40 on channel 38





### Test Plot

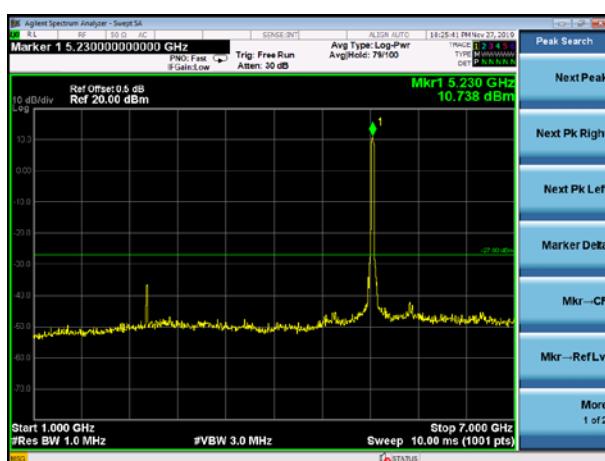
802.11ac40 on channel 46



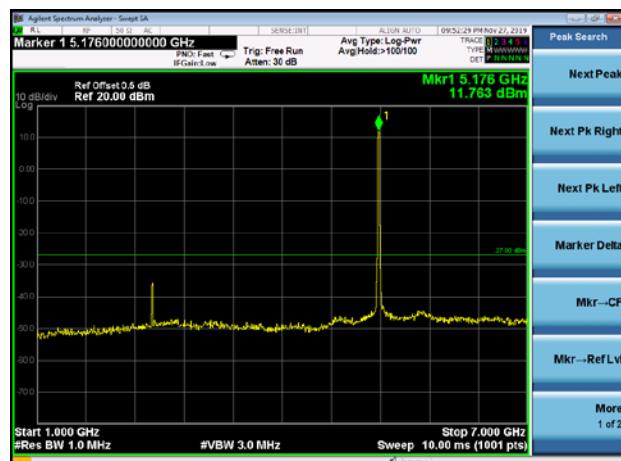
802.11ac80 on channel 42



802.11 ac40 on channel 46



802.11 ac80 on channel 42



802.11 ac40 on channel 46



802.11 ac80 on channel 42





## 9. Frequency Stability Measurement

### 9.1 LIMIT

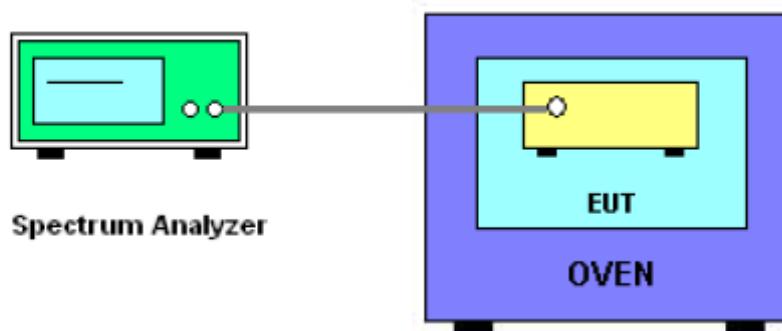
Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be  $\pm 20$  ppm maximum for the 5 GHz band (IEEE 802.11n specification).

### 9.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is  $(f - fc)/fc \times 10^6$  ppm and the limit is less than  $\pm 20$  ppm (IEEE 802.11n specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is -20°C~70°C.

### 9.3 TEST SETUP LAYOUT



### 9.4 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously un-modulation transmitting mode.



### 9.5 TEST RESULTS

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Frequency U-NII-1 (5180-5240MHz)		

#### Voltage vs. Frequency Stability

TEST CONDITIONS			Reference Frequency: 5180MHz				
			f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)	
T nom (°C)	20	V nom (V)	12.00	5180.0527	5180	0.0527	10.1737
		V max (V)	13.80	5180.0325	5180	0.0325	6.2741
		V min (V)	10.20	5180.0243	5180	0.0243	4.6911
Limits			5150-5250				
Result			Complies				

#### Temperature vs. Frequency Stability

TEST CONDITIONS			Reference Frequency: 5180MHz				
			f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)	
V nom (V)	12	T (°C)	-20	5180.0057	5180	0.0057	1.1004
		T (°C)	-10	5180.0108	5180	0.0108	2.0849
		T (°C)	0	5180.0327	5180	0.0327	6.3127
		T (°C)	10	5180.0388	5180	0.0388	7.4903
		T (°C)	20	5180.0295	5180	0.0295	5.6950
		T (°C)	30	5180.0216	5180	0.0216	4.1699
		T (°C)	40	5180.0123	5180	0.0123	2.3745
		T (°C)	50	5180.0098	5180	0.0098	1.8919
		T (°C)	60	5180.0413	5180	0.0413	7.9730
		T (°C)	70	5180.0696	5180	0.0696	13.4363
Limits			5150-5250				
Result			Complies				



Voltage vs. Frequency Stability

TEST CONDITIONS			Reference Frequency: 5200MHz				
			f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)	
T nom (°C)	20	V nom (V)	12.00	5200.0257	5200	0.0257	4.9423
		V max (V)	13.80	5200.0425	5200	0.0425	8.1731
		V min (V)	10.20	5200.0697	5200	0.0697	13.4038
Limits			5150-5250				
Result			Complies				

Temperature vs. Frequency Stability

TEST CONDITIONS			Reference Frequency: 5200MHz				
			f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)	
V nom (V)	12	T (°C)	-20	5200.0638	5200	0.0638	12.2692
		T (°C)	-10	5200.0527	5200	0.0527	10.1346
		T (°C)	0	5200.0438	5200	0.0438	8.4231
		T (°C)	10	5200.0926	5200	0.0926	17.8077
		T (°C)	20	5200.0634	5200	0.0634	12.1923
		T (°C)	30	5200.0125	5200	0.0125	2.4038
		T (°C)	40	5200.0732	5200	0.0732	14.0769
		T (°C)	50	5200.0417	5200	0.0417	8.0192
		T (°C)	60	5200.0328	5200	0.0328	6.3077
		T (°C)	70	5200.0425	5200	0.0425	8.1731
Limits			5150-5250				
Result			Complies				



Voltage vs. Frequency Stability

TEST CONDITIONS			Reference Frequency: 5240MHz				
			f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)	
T nom (°C)	20	V nom (V)	12.00	5240.0134	5240	0.0134	2.5573
		V max (V)	13.80	5240.0417	5240	0.0417	7.9580
		V min (V)	10.20	5240.0092	5240	0.0092	1.7557
Limits			5150-5250				
Result			Complies				

Temperature vs. Frequency Stability

TEST CONDITIONS			Reference Frequency: 5240MHz				
			f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)	
V nom (V)	12	T (°C)	-20	5240.0095	5240	0.0095	1.8130
		T (°C)	-10	5240.0037	5240	0.0037	0.7061
		T (°C)	0	5240.0142	5240	0.0142	2.7099
		T (°C)	10	5240.0851	5240	0.0851	16.2405
		T (°C)	20	5240.0116	5240	0.0116	2.2137
		T (°C)	30	5240.0128	5240	0.0128	2.4427
		T (°C)	40	5240.0067	5240	0.0067	1.2786
		T (°C)	50	5240.0074	5240	0.0074	1.4122
		T (°C)	60	5240.0056	5240	0.0056	1.0687
		T (°C)	70	5240.0107	5240	0.0107	2.0420
Limits			5150-5250				
Result			Complies				



## 10. ANTENNA REQUIREMENT

### 10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### 10.2 EUT ANTENNA

The EUT antenna is External antenna (antenna gain (A): 5dBi; antenna gain (B) : 5dBi). It comply with the standard requirement.



## 11. EUT TEST PHOTO

Conducted Measurement Photos





### Radiated Measurement Photos







## 12. EUT PHOTO





\*\*\*\*\* END OF REPORT \*\*\*\*\*