



# FCC TEST REPORT

**Test report**  
**On Behalf of**  
**Shenzhen Suichen Technology Co. Ltd.**  
**For**  
**Wireless pico projector**  
**Model No.: P105GW**  
  
**FCC ID: 2ATVI-P105GW**

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**Date of Test:** Aug. 20, 2019 ~ Aug. 27, 2019

**Date of Report:** Aug. 27, 2019

**Report Number:** HK1908162016-1E





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# 1. Test Result Summary

## 1.1. TEST PROCEDURES AND RESULTS

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a)	PASS
6dB Emission Bandwidth	§15.407(e)	PASS
26dB Emission Bandwidth & 99% Occupied Bandwidth	§15.407(a)	PASS
Power Spectral Density	§15.407(a)	PASS
Band edge	§15.407(a)	PASS
Radiated Emission	§15.407(a)	PASS
Frequency Stability	§15.407(g)	PASS

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

## 1.2. TEST FACILITY

Test Firm : Shenzhen HUAKE Testing Technology Co., Ltd.

Address : 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China



### 1.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$



## 2. EUT Description

### 2.1. GENERAL DESCRIPTION OF EUT

Equipment	Wireless pico projector
Model Name	P105GW
Serial No.	N/A
Trade Mark	N/A
Model Difference	N/A
FCC ID	<b>2ATVI-P105GW</b>
Operation Frequency:	IEEE 802.11a/n/ac(HT20) 5.180GHz-5.240GHz IEEE 802.11n/ac(HT40) 5.190GHz-5.230GHz IEEE 802.11ac(HT80) 5.210GHz
Modulation Technology:	IEEE 802.11a/n/ac
Modulation Type	CCK/OFDM/DBPSK/DAPSK
Antenna Type	Internal Antenna
Antenna Gain	Antenna 1:1dBi Antenna 2:1dBi MIMO: 4.010dBi
Power Source	DC7.6V from battery or DC12V from adapter With AC100-240V~50-60Hz, 1.0A Max
Power Supply:	DC7.6V from battery or DC12V from adapter With AC100-240V~50-60Hz, 1.0A Max
Note: The EUT incorporates a MIMO function. Physically, it provides two completed transmitters and receivers(2T2R), two transmit signals are completely correlated, then, Direction gain= $G_{ANT}+10*\log(2)$ dBi.	



## 2.2. Operation Frequency each of channel

802.11a/802.11n(HT20) 802.11ac(HT20)		802.11n(HT40)/ 802.11ac(HT40)		802.11ac(HT80)	
Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

**Note:**

*In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:*

## 2.3. Operation of EUT during testing

For 802.11a/n (HT20)/ac(HT20)

Band I (5150 - 5250 MHz)		
Channel Number	Channel	Frequency (MHz)
36	Low	5180
40	Mid	5200
48	High	5240

For 802.11n (HT40)/ ac(HT40)

Band I (5150 - 5250 MHz)		
Channel Number	Channel	Frequency (MHz)
38	Low	5190
46	High	5230

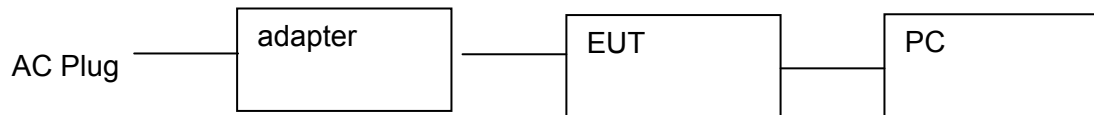
For 802.11ac(HT80)

Band I (5150 - 5250 MHz)	
Channel Number	Frequency (MHz)
42	5210

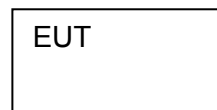


## 2.4. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing and Radiation testing:



Operation of EUT during Above1GHz Radiation testing:



- Adapter information  
Model: AD40ACH120300  
Input: 100-240V~, 50/60Hz, 1.0A Max.  
Output: 12VDC, 3.0A
- PC information  
Model: TP00067A  
Input: DC20V, 2.25/3.25A  
Output: 5VDC, 1A





### 3. Genera Information

#### 3.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%)
<p>The sample was placed 0.8m/1.5m for blow/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y &amp; Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

<p>We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:</p>	
<b>Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.</b>	
Mode	Data rate
802.11a	6 Mbps
802.11n(HT20)	MCS0
802.11n(HT40)	MCS0
802.11ac(HT20)/ac(HT40)/ac(HT80)	/
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation



### 3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

**Note:**

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*
- 3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.*



## 4. Test Results and Measurement Data

### 4.1. Conducted Emission

#### 4.1.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.207														
<b>Test Method:</b>	ANSI C63.10:2013														
<b>Frequency Range:</b>	150 kHz to 30 MHz														
<b>Receiver setup:</b>	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
<b>Limits:</b>	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
<b>Test Setup:</b>	<p><i>Remark:</i>  E.U.T: Equipment Under Test  LISN: Line Impedance Stabilization Network  Test table height=0.8m</p>														
<b>Test Mode:</b>	Tx Mode														
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.</li> </ol>														
<b>Test Result:</b>	PASS														



#### 4.1.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Receiver	R&S	ESCI 7	HKE-010	Dec. 27, 2019
LISN	R&S	ENV216	HKE-002	Dec. 27, 2019
Coax cable (9KHz-30MHz)	Times	381806-002	N/A	Dec. 27, 2019
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A

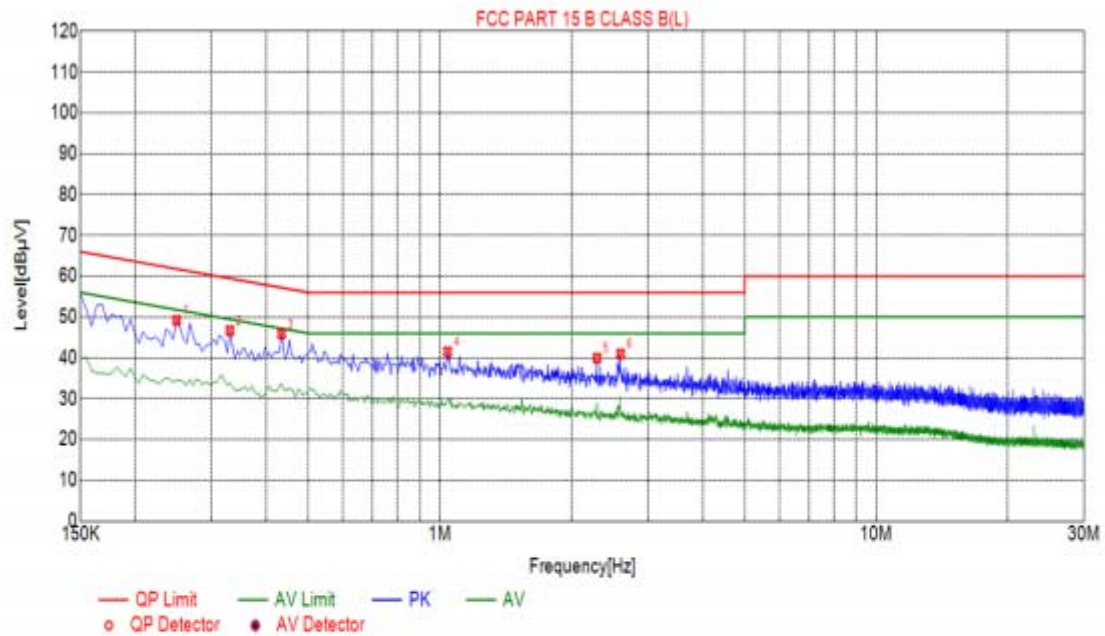
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



### 4.1.3. Test data

All the test modes completed for test. only the worst result of AC240V/60Hz(802.11a at 5180MHz) was reported as below:

**Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)**

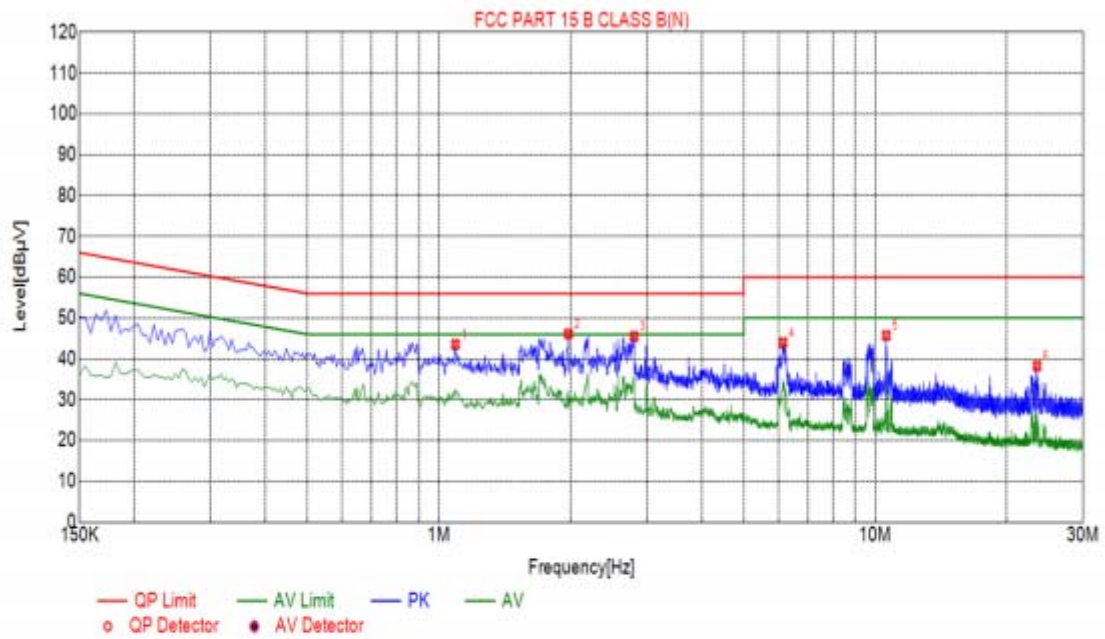


Suspected List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	0.2490	49.19	10.04	61.79	12.60	PK
2	0.3300	46.68	10.04	59.45	12.77	PK
3	0.4335	45.89	10.05	57.19	11.30	PK
4	1.0410	41.49	10.07	56.00	14.51	PK
5	2.2920	39.94	10.18	56.00	16.06	PK
6	2.5935	40.94	10.20	56.00	15.06	PK

Remark: Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level



**Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	1.0905	43.54	10.07	56.00	12.46	PK
2	1.9815	46.12	10.14	56.00	9.88	PK
3	2.8005	45.48	10.21	56.00	10.52	PK
4	6.1485	43.98	10.23	60.00	16.02	PK
5	10.6035	45.72	10.03	60.00	14.28	PK
6	23.5095	38.25	10.21	60.00	21.75	PK

Remark: Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level





#### 4.2.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2019
Power meter	Agilent	E4419B	HKE-085	Dec. 27, 2019
Power Sensor	Agilent	E9300A	HKE-086	Dec. 27, 2019
RF cable	Times	1-40G	HKE-034	Dec. 27, 2019
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).





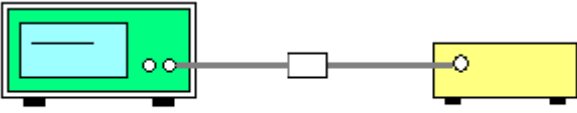
#### 4.2.3. Test Data

Configuration Band I (5150 - 5250 MHz )						
Mode	Test channel	Maximum Conducted Output Power (dBm)			FCC Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
11a	CH36	10.45	10.69	/	23.97	PASS
11a	CH40	10.39	10.71	/	23.97	PASS
11a	CH48	10.34	10.44	/	23.97	PASS
11n(HT20)	CH36	9.89	9.88	12.90	23.97	PASS
11n(HT20)	CH40	9.76	9.75	12.77	23.97	PASS
11n(HT20)	CH48	9.65	9.90	12.79	23.97	PASS
11n(HT40)	CH38	9.61	9.76	12.70	23.97	PASS
11n(HT40)	CH46	9.80	9.67	12.75	23.97	PASS
11ac(HT20)	CH36	9.58	9.76	12.68	23.97	PASS
11ac(HT20)	CH40	9.60	9.25	12.44	23.97	PASS
11ac(HT20)	CH48	8.56	8.79	11.69	23.97	PASS
11ac(HT40)	CH38	8.13	8.73	11.45	23.97	PASS
11ac(HT40)	CH46	8.01	8.85	11.46	23.97	PASS
11ac(HT80)	CH42	8.00	8.64	11.34	23.97	PASS



### 4.3. 6dB Emission Bandwidth

#### 4.3.1. Test Specification

<b>Test Requirement:</b>	FCC CFR47 Part 15 Section 15.407(e)& Part 2 J Section 2.1049
<b>Test Method:</b>	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C
<b>Limit:</b>	>500kHz
<b>Test Setup:</b>	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

#### 4.3.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2019
RF cable	Times	1-40G	HKE-034	Dec. 27, 2019
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).


#### 4.3.3. Test data

N/A



#### 4.4. 26dB Bandwidth and 99% Occupied Bandwidth

##### 4.4.1. Test Specification

<b>Test Requirement:</b>	47 CFR Part 15C Section 15.407 (a)& Part 2 J Section 2.1049
<b>Test Method:</b>	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C
<b>Limit:</b>	No restriction limits
<b>Test Setup:</b>	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Make the measurement with the spectrum analyzer's resolution bandwidth <math>RBW = 1\% EBW</math>, <math>VBW \geq 3RBW</math>, In order to make an accurate measurement.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

##### 4.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2019
RF cable	Times	1-40G	HKE-034	Dec. 27, 2019
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



#### 4.4.3. Test data

Band I

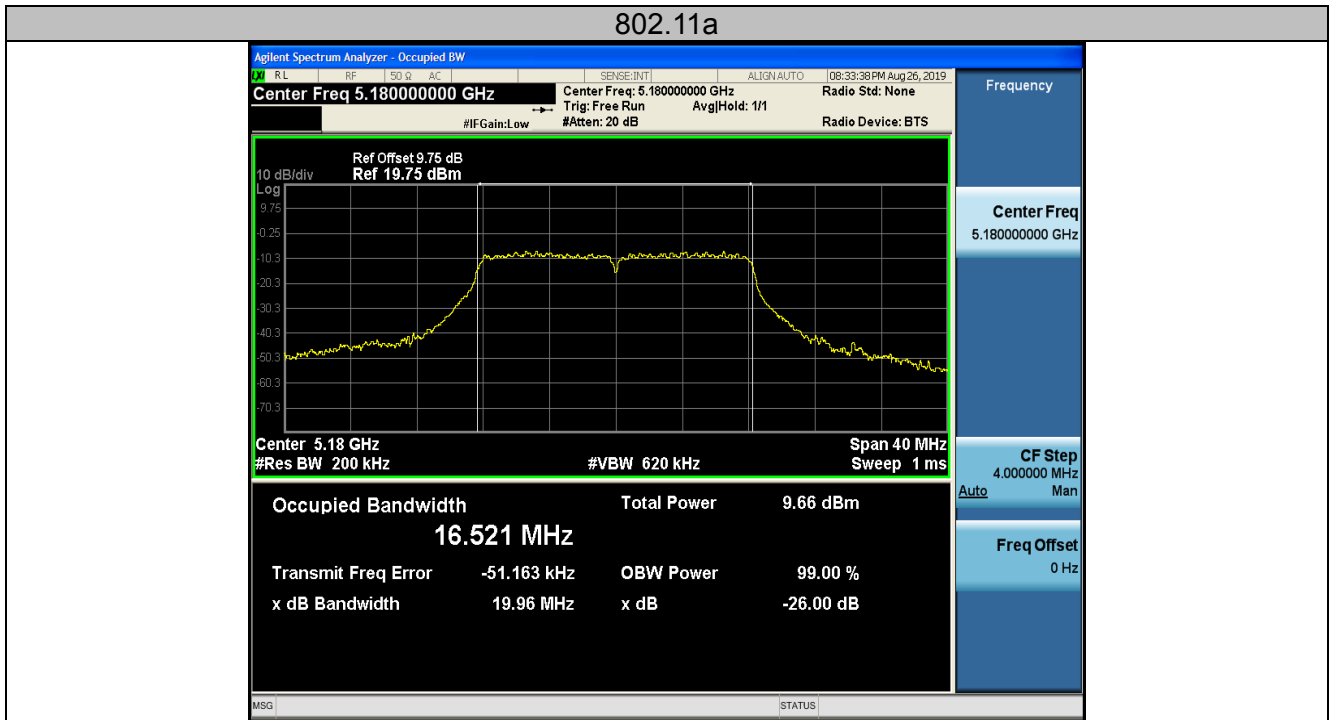
ANT 1

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Verdict
11a	CH36	5180	19.96	PASS
11a	CH40	5200	20.22	PASS
11a	CH48	5240	20.21	PASS
11n(HT20)	CH36	5180	20.08	PASS
11n(HT20)	CH40	5200	20.85	PASS
11n(HT20)	CH48	5240	20.97	PASS
11n(HT40)	CH38	5190	41.32	PASS
11n(HT40)	CH46	5230	41.72	PASS
11ac(HT20)	CH36	5180	20.91	PASS
11ac(HT20)	CH40	5200	21.01	PASS
11ac(HT20)	CH48	5240	20.66	PASS
11ac(HT40)	CH38	5190	41.63	PASS
11ac(HT40)	CH46	5230	40.91	PASS
11ac(HT80)	CH42	5210	81.22	PASS

Test plots as follows:



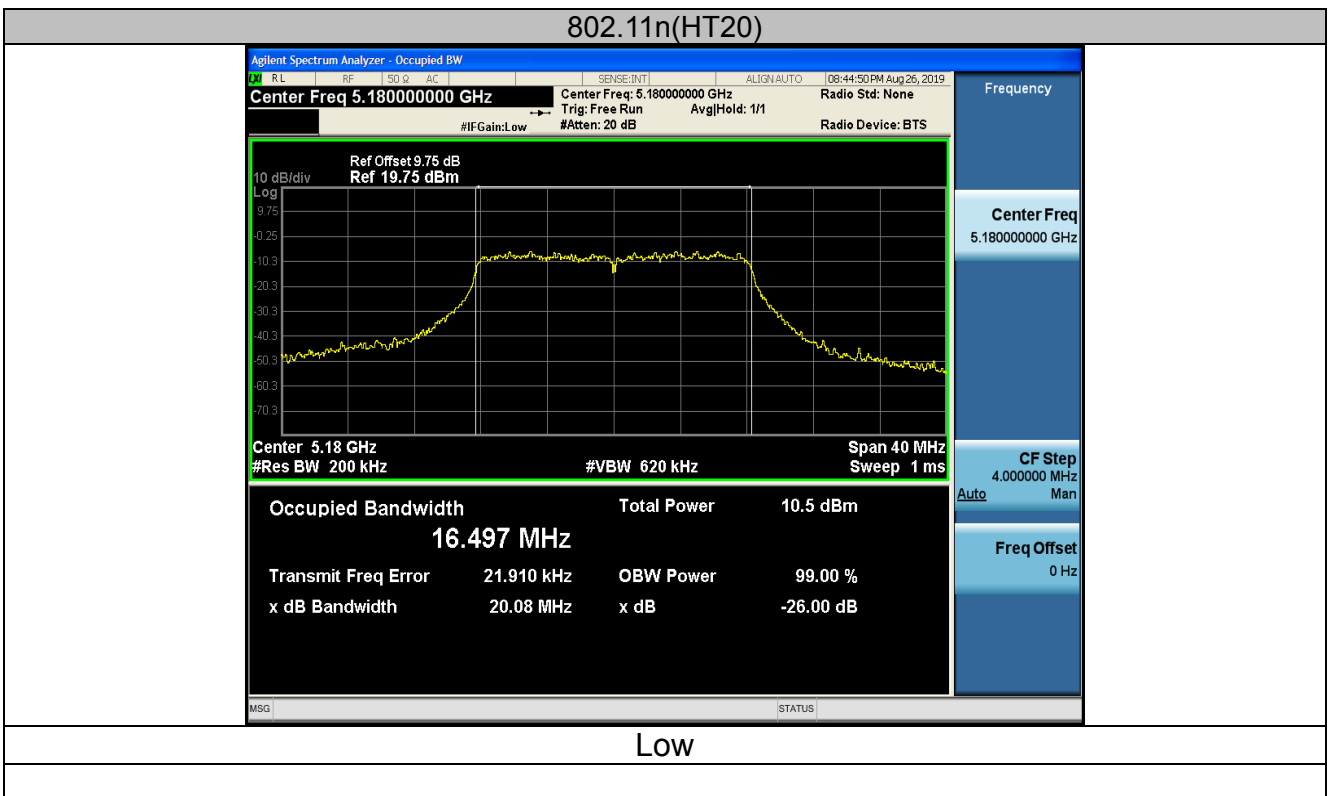
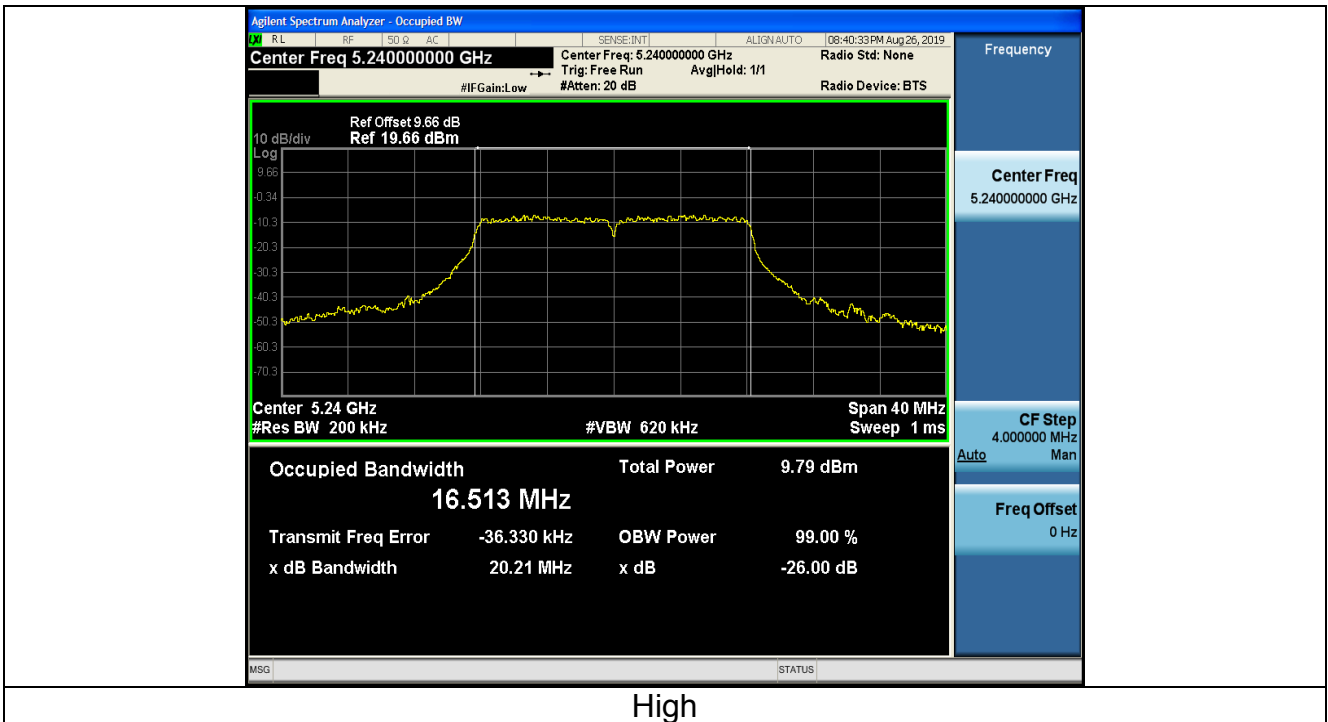
Band I (5150 – 5250 MHz)

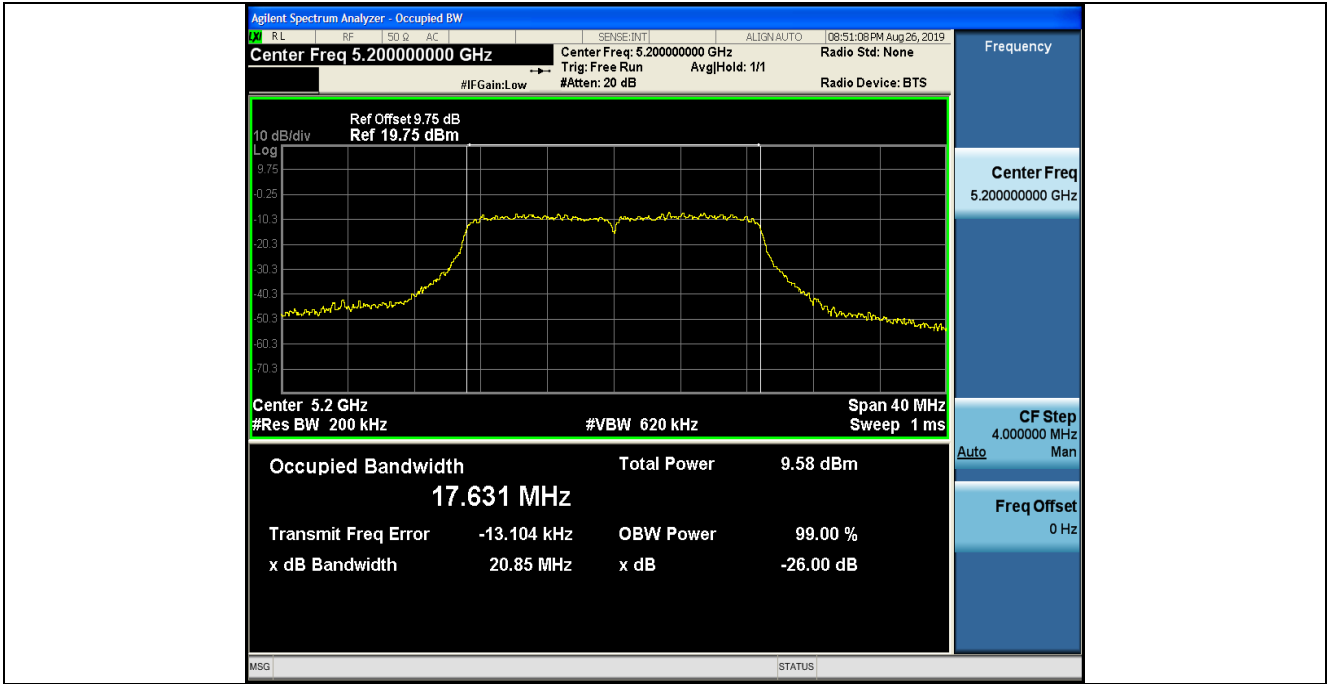


Low

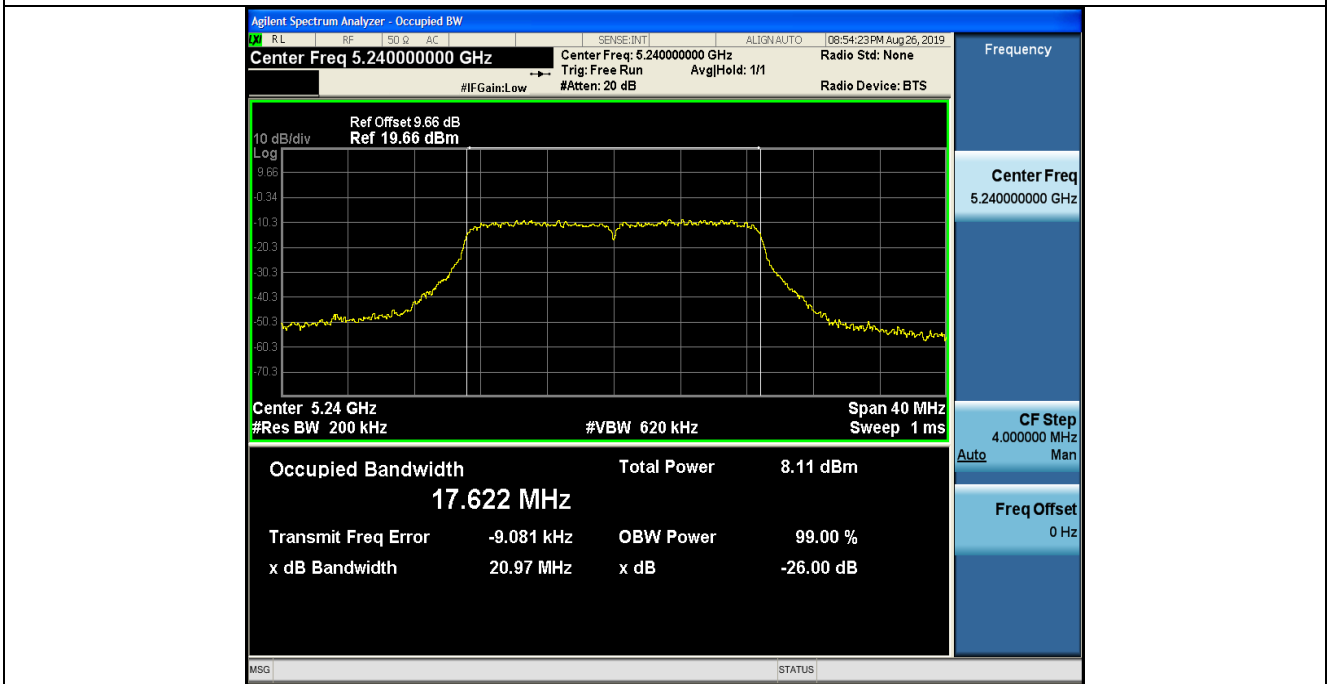


Mid





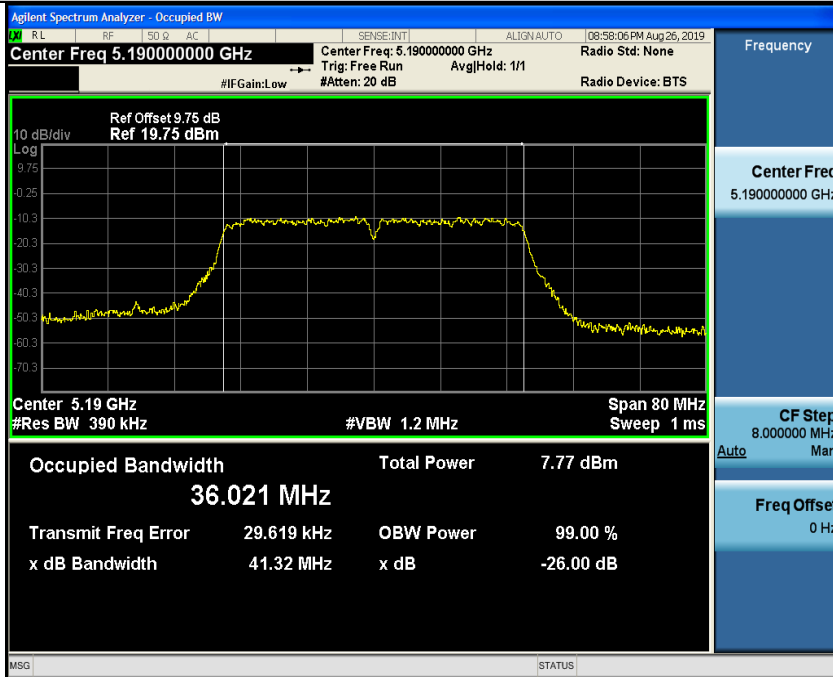
Mid



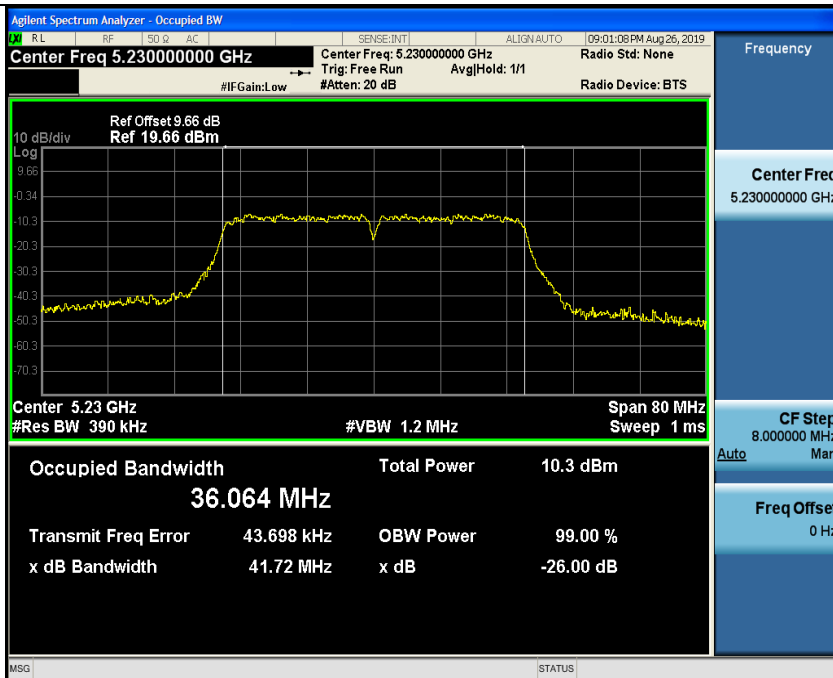
High



### 802.11n(HT40)



### Low

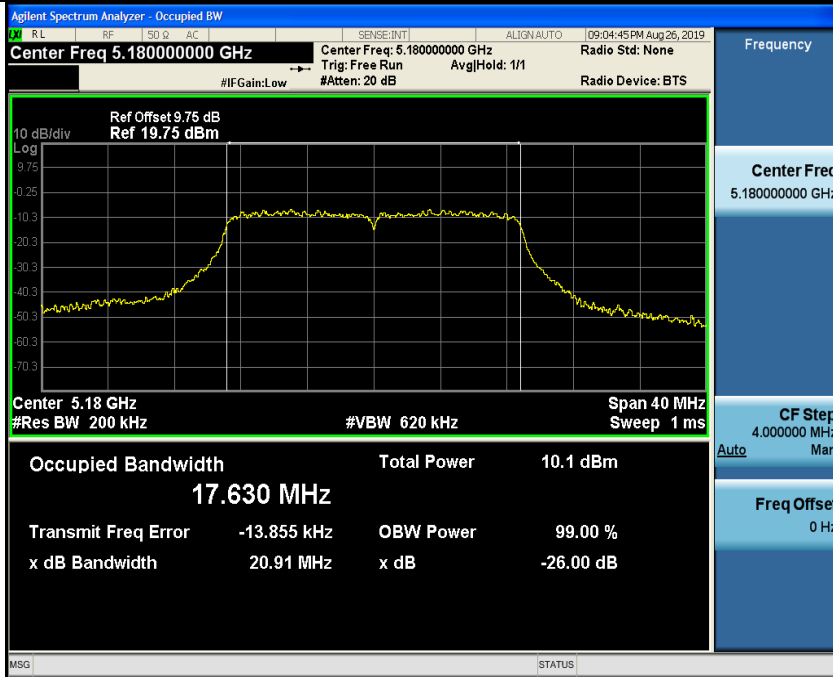


### High

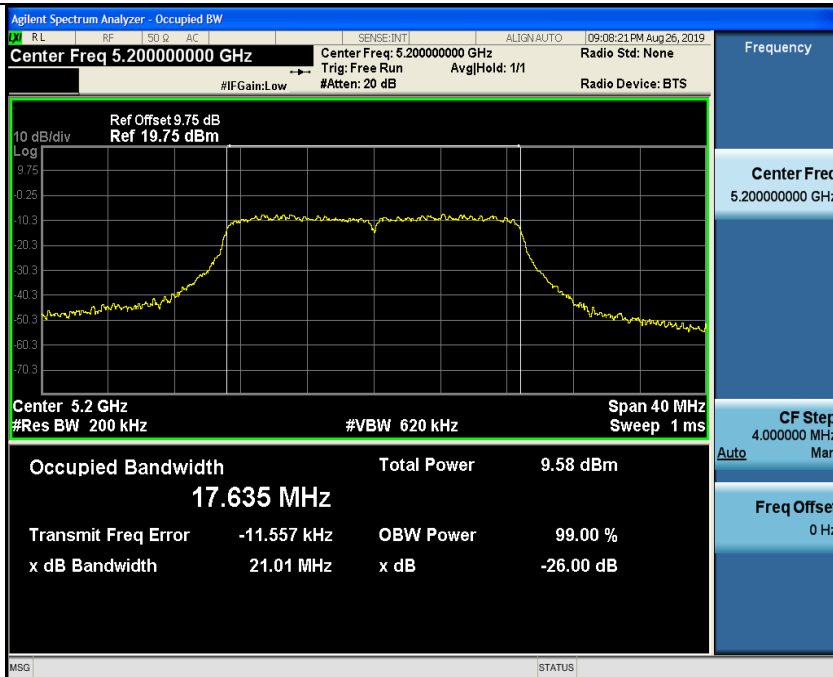




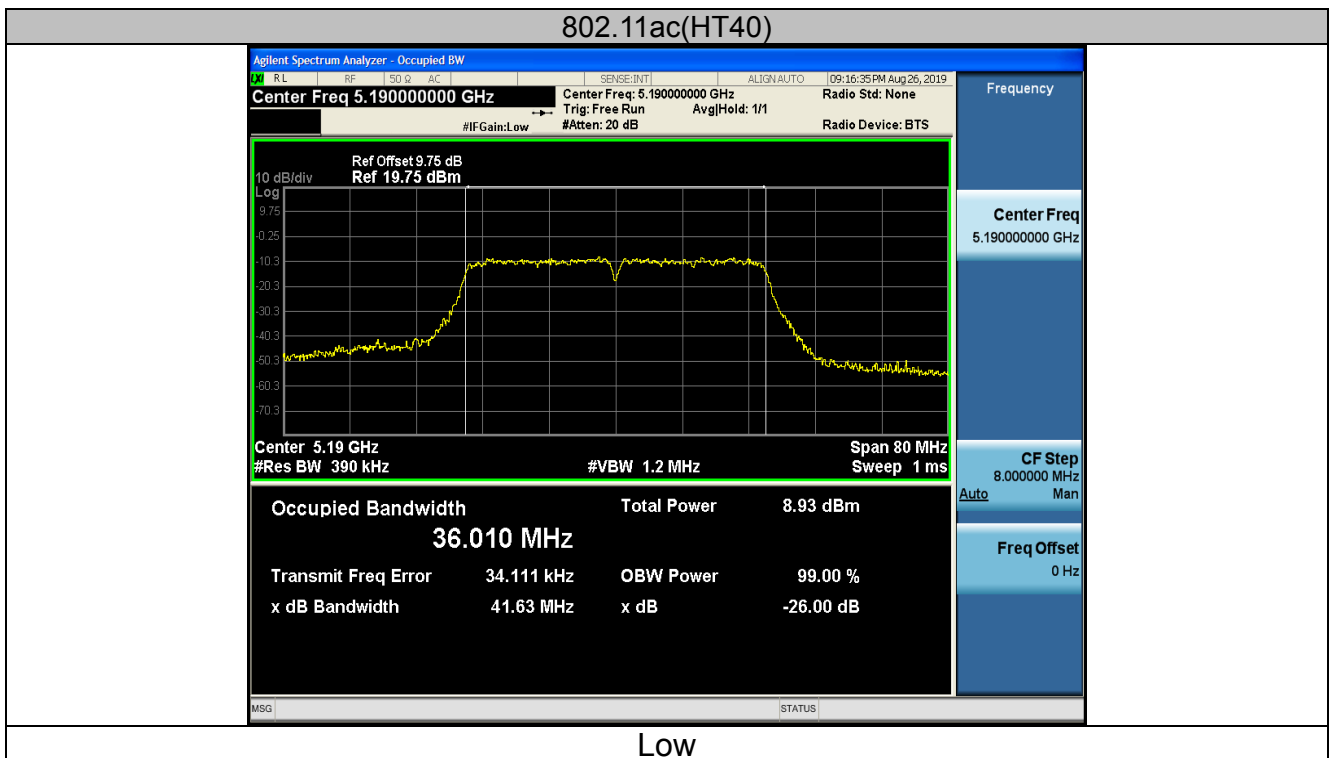
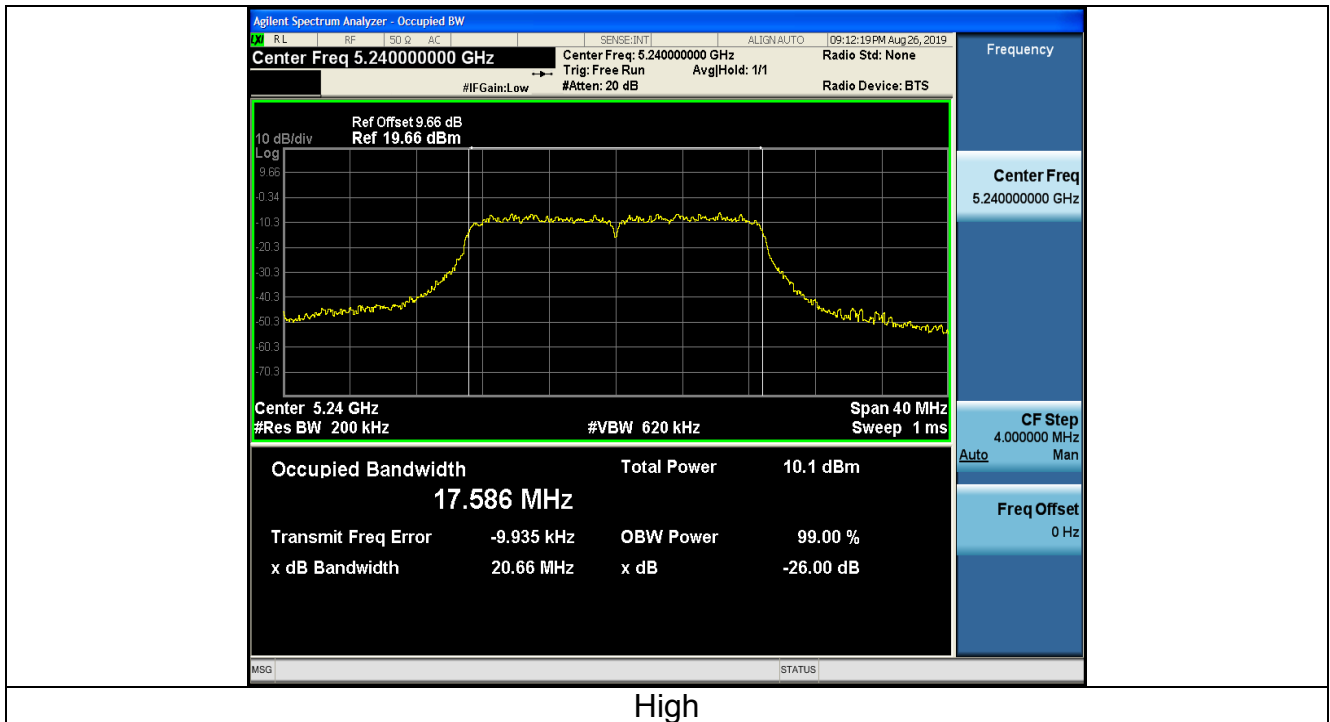
### 802.11ac(HT20)

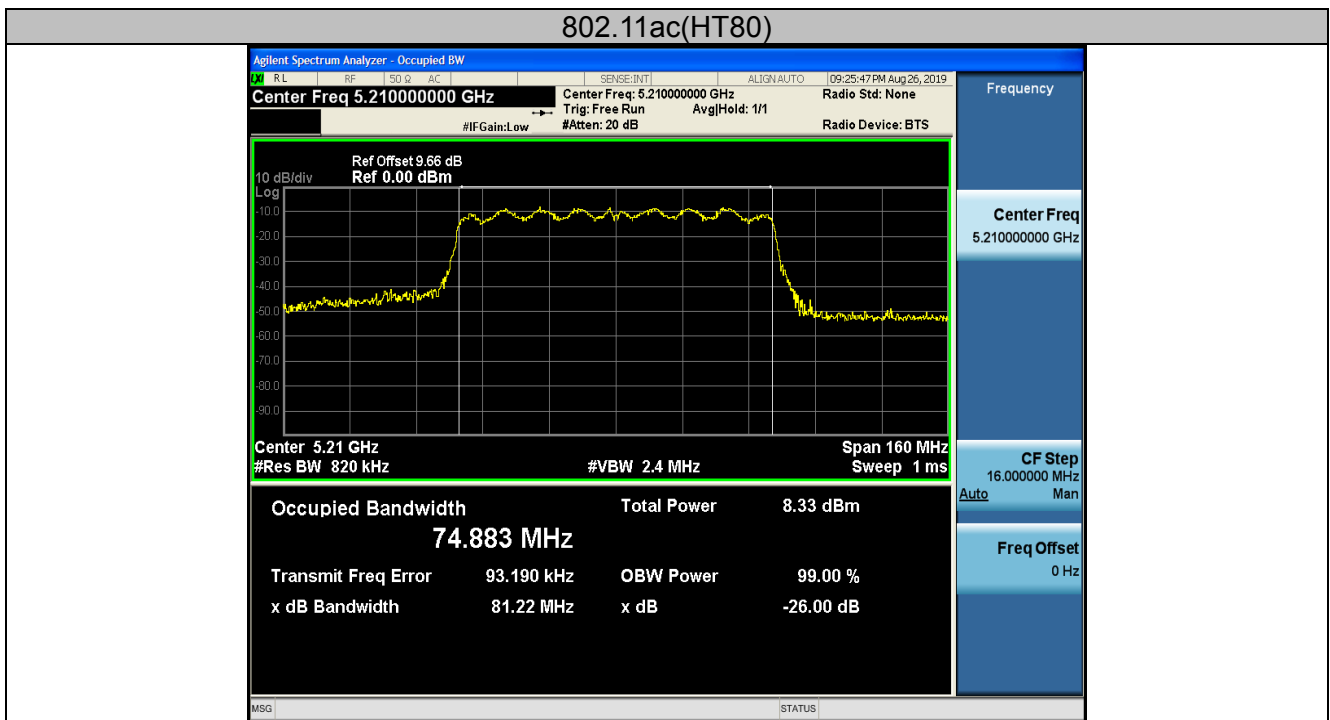


Low



Mid





**ANT 2**

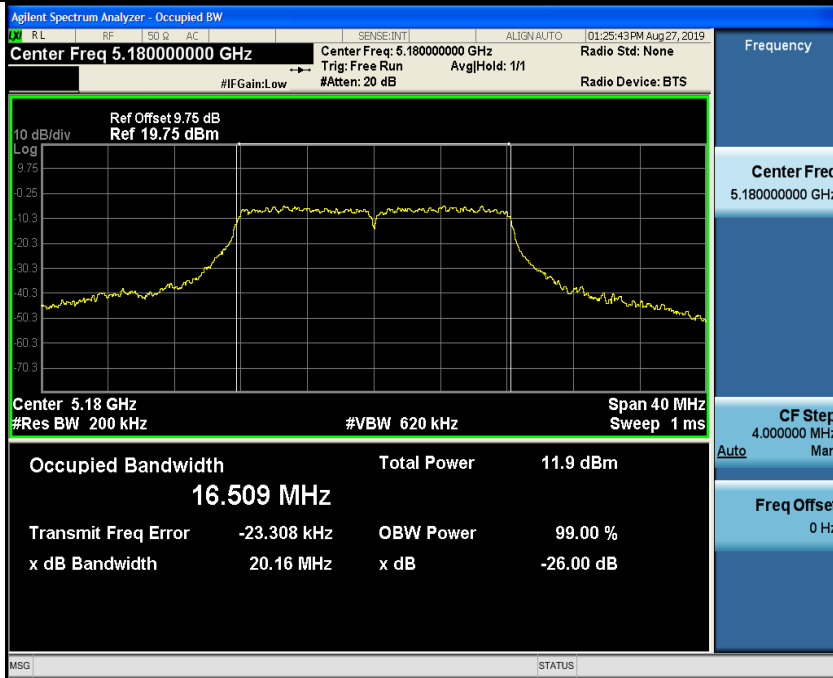
Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Verdict
11a	CH36	5180	20.16	PASS
11a	CH40	5200	20.15	PASS
11a	CH48	5240	20.18	PASS
11n(HT20)	CH36	5180	21.06	PASS
11n(HT20)	CH40	5200	21.00	PASS
11n(HT20)	CH48	5240	21.02	PASS
11n(HT40)	CH38	5190	41.51	PASS
11n(HT40)	CH46	5230	41.50	PASS
11ac(HT20)	CH36	5180	20.99	PASS
11ac(HT20)	CH40	5200	20.88	PASS
11ac(HT20)	CH48	5240	20.90	PASS
11ac(HT40)	CH38	5190	41.62	PASS
11ac(HT40)	CH46	5230	41.41	PASS
11ac(HT80)	CH42	5210	81.14	PASS

Test plots as follows:

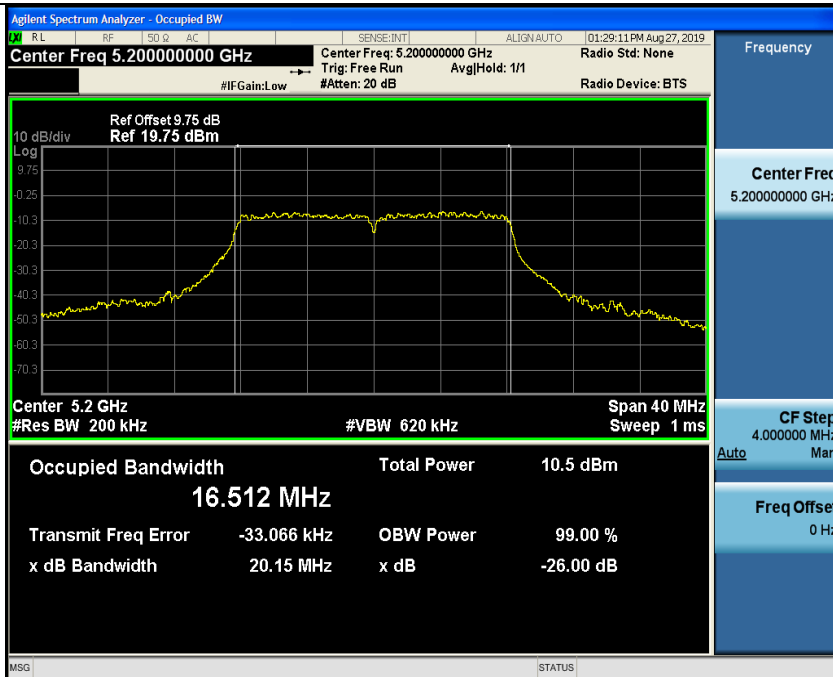


Band I (5150 – 5250 MHz)

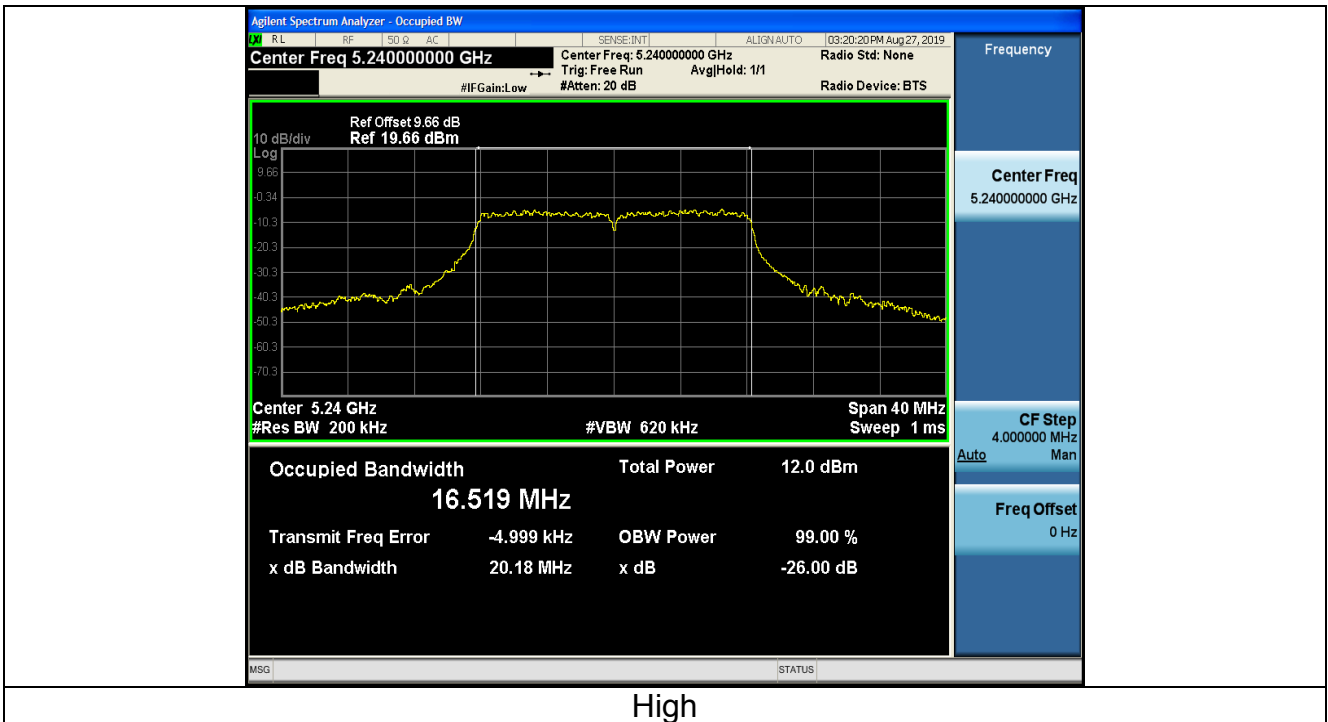
802.11a

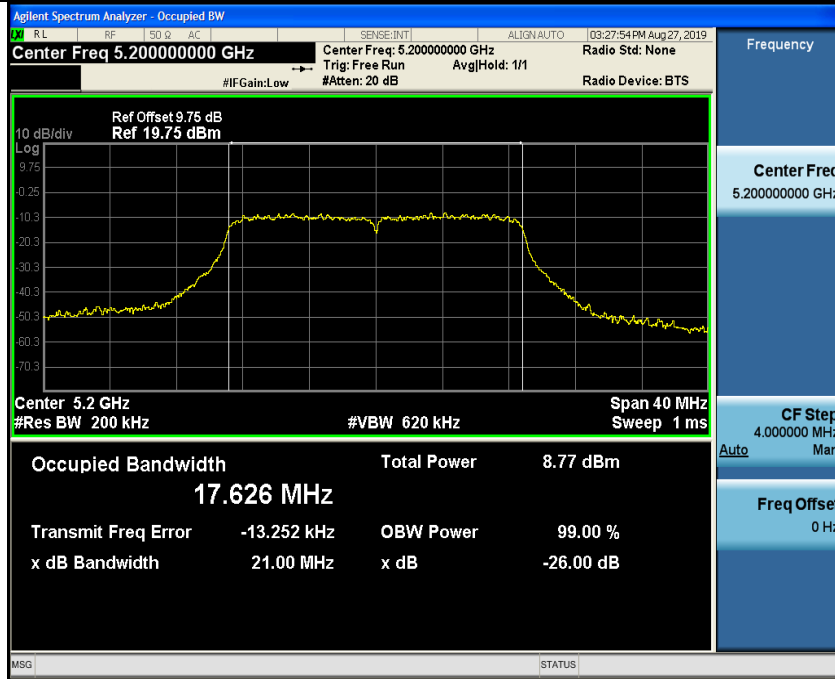


Low

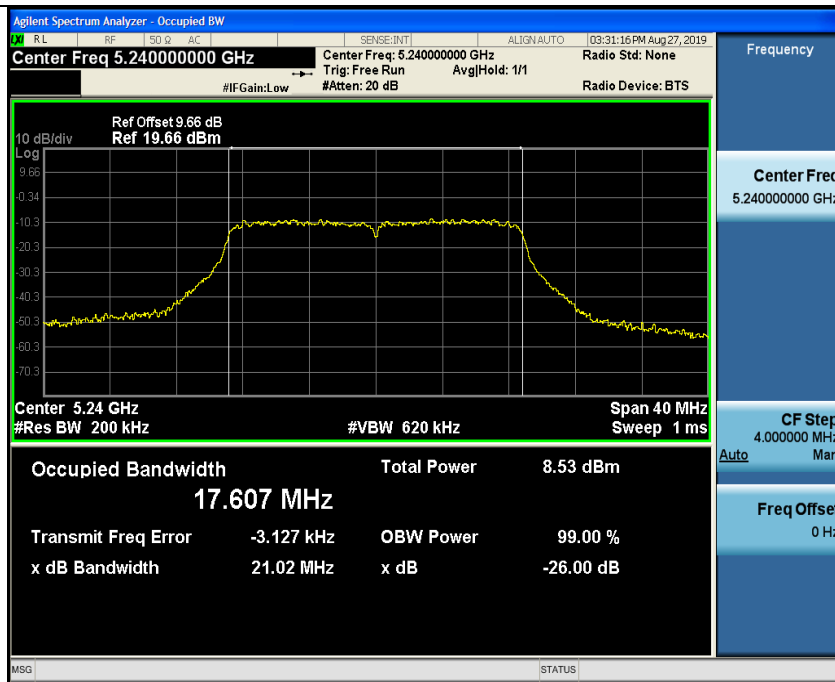


Mid





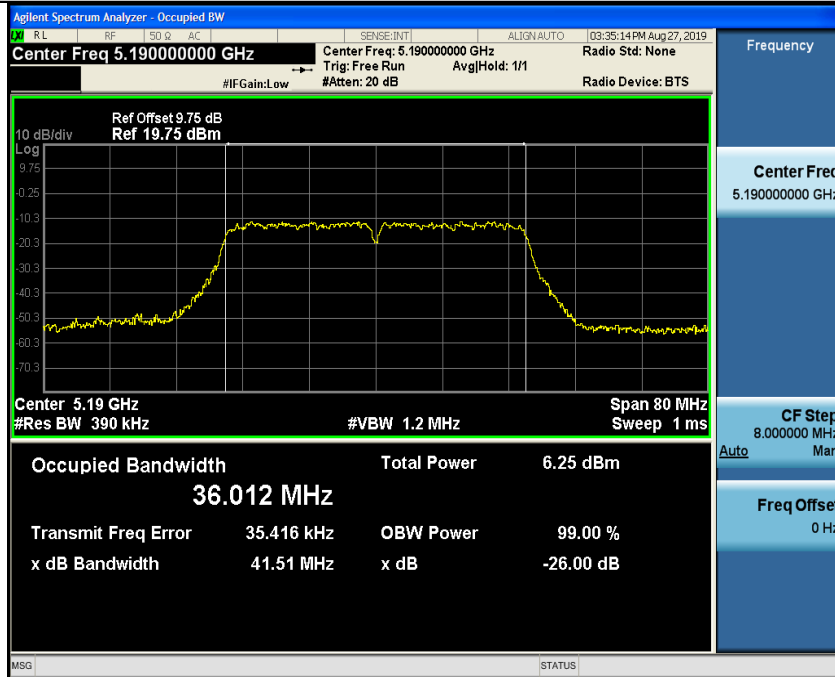
Mid



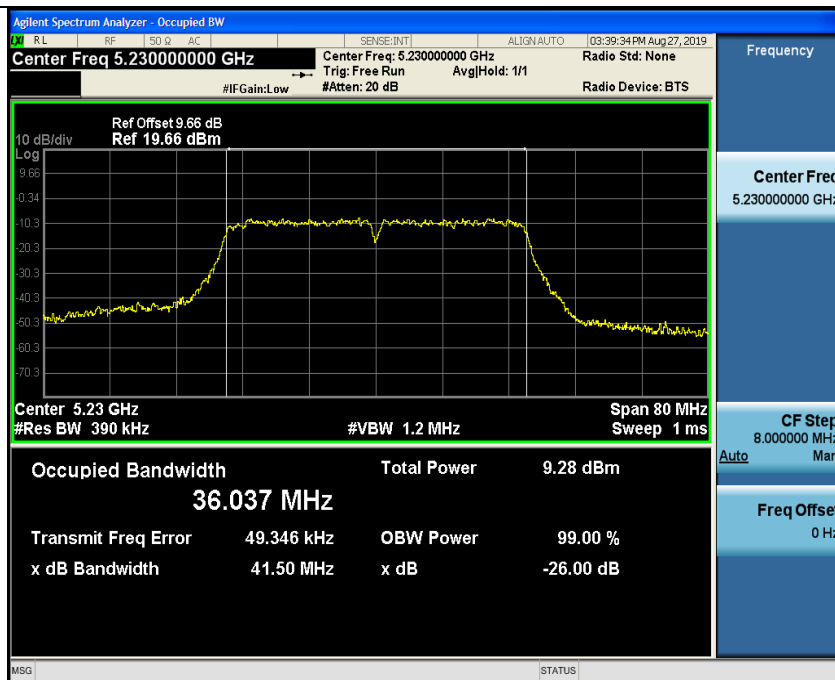
High



### 802.11n(HT40)



### Low

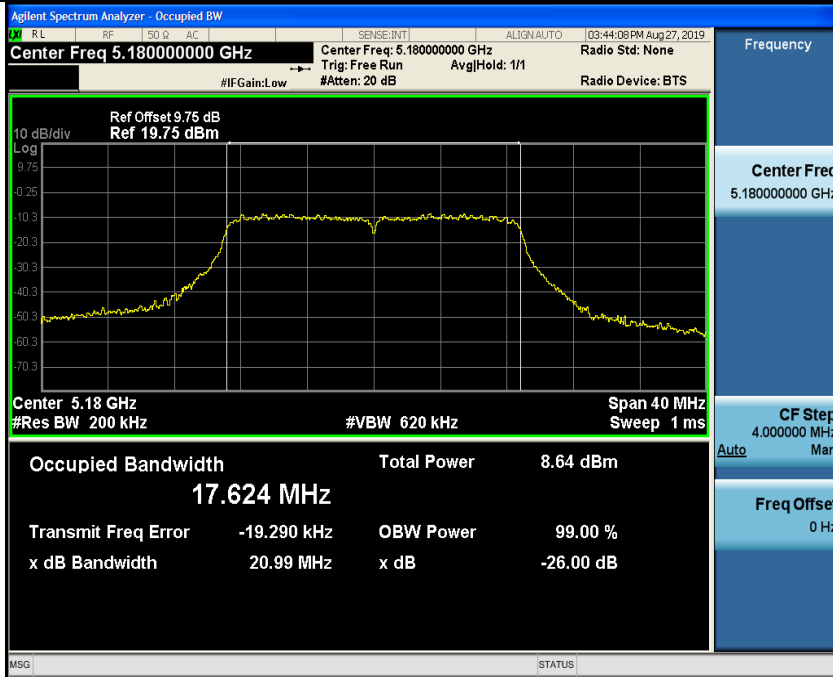


### High

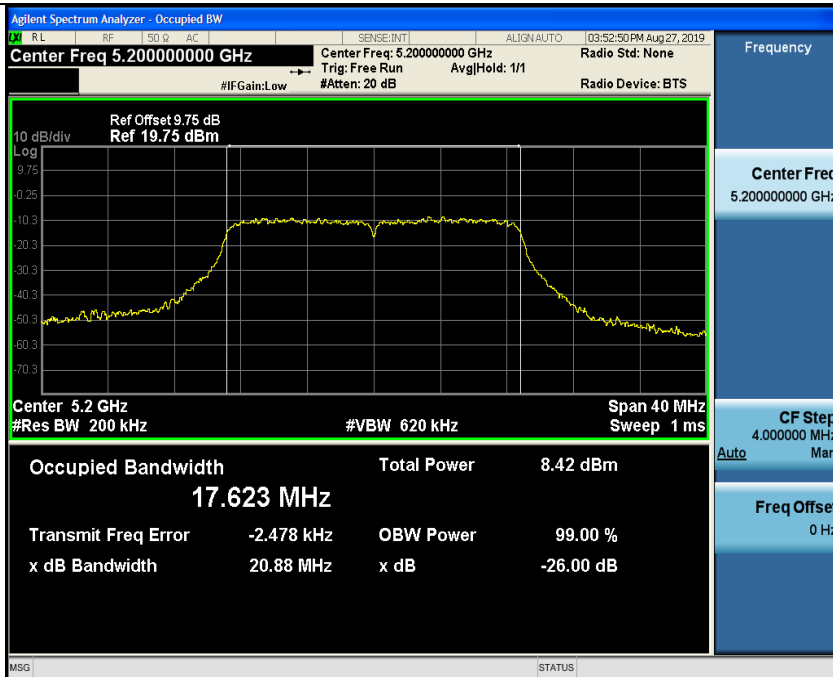




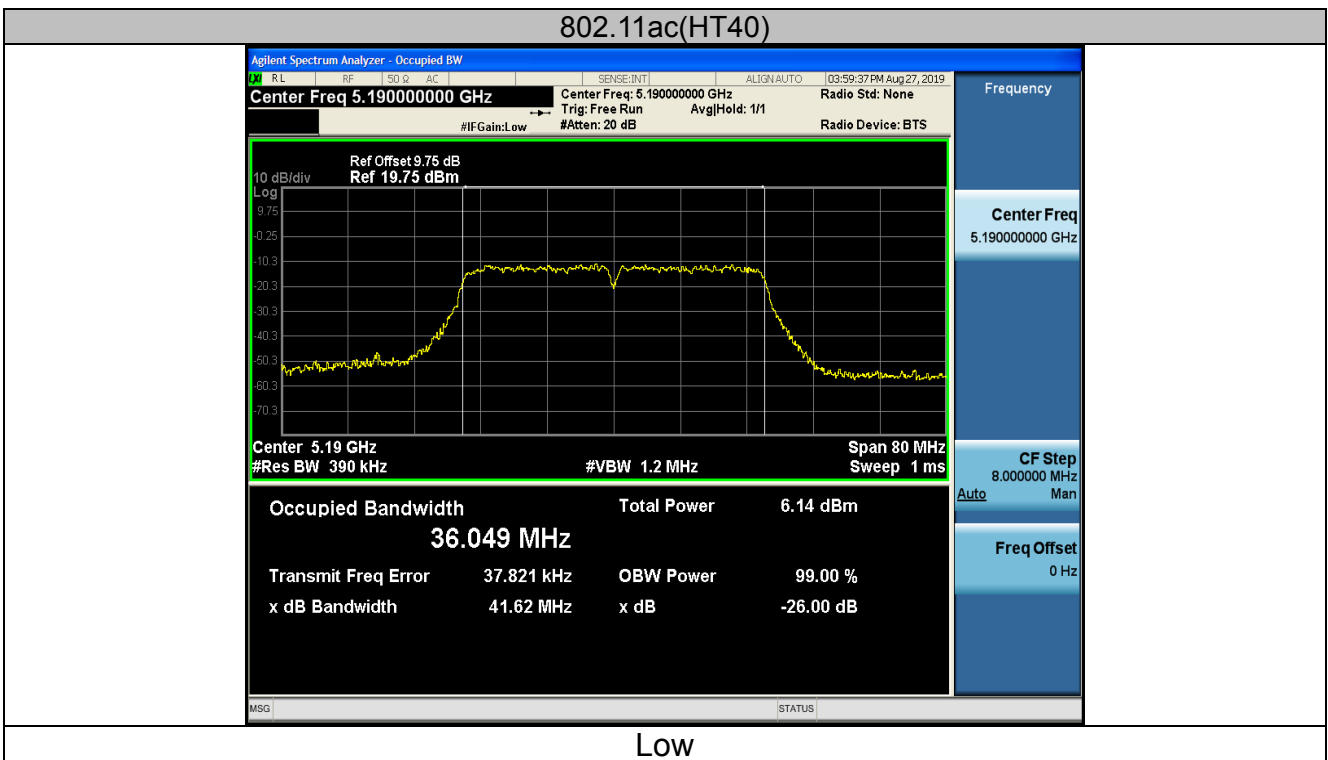
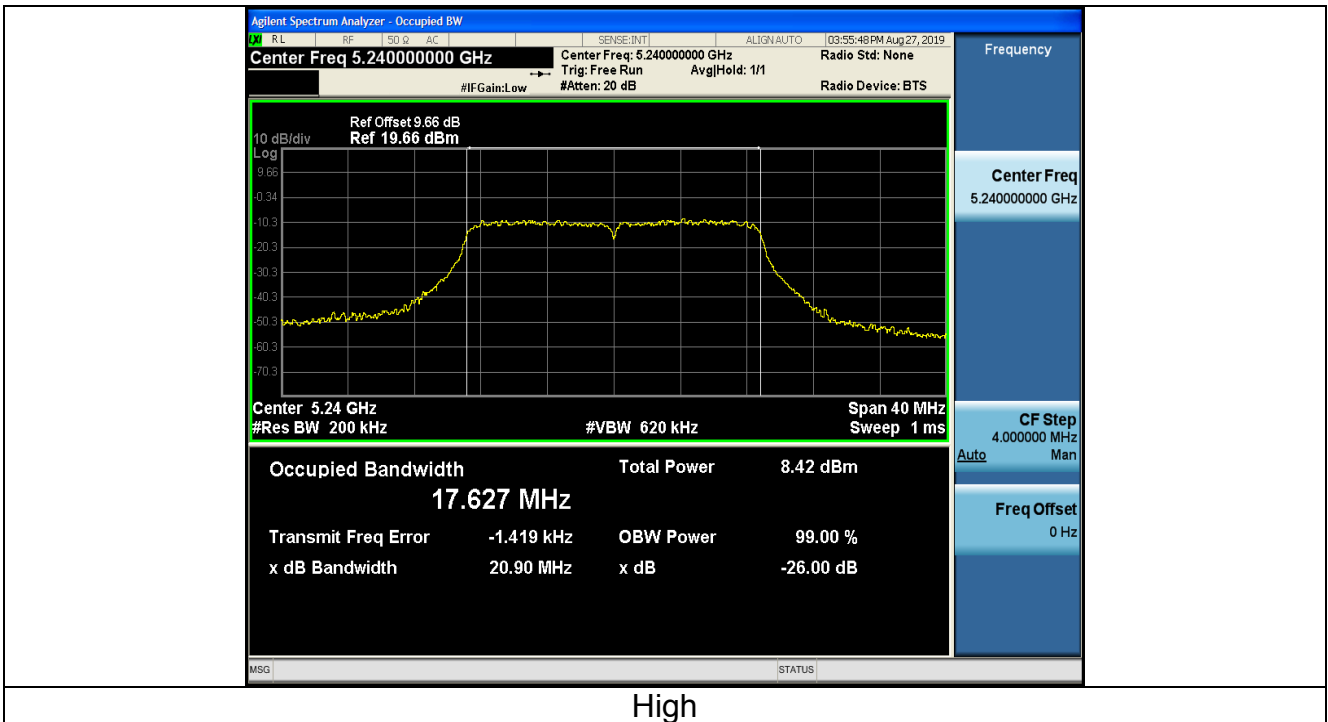
### 802.11ac(HT20)

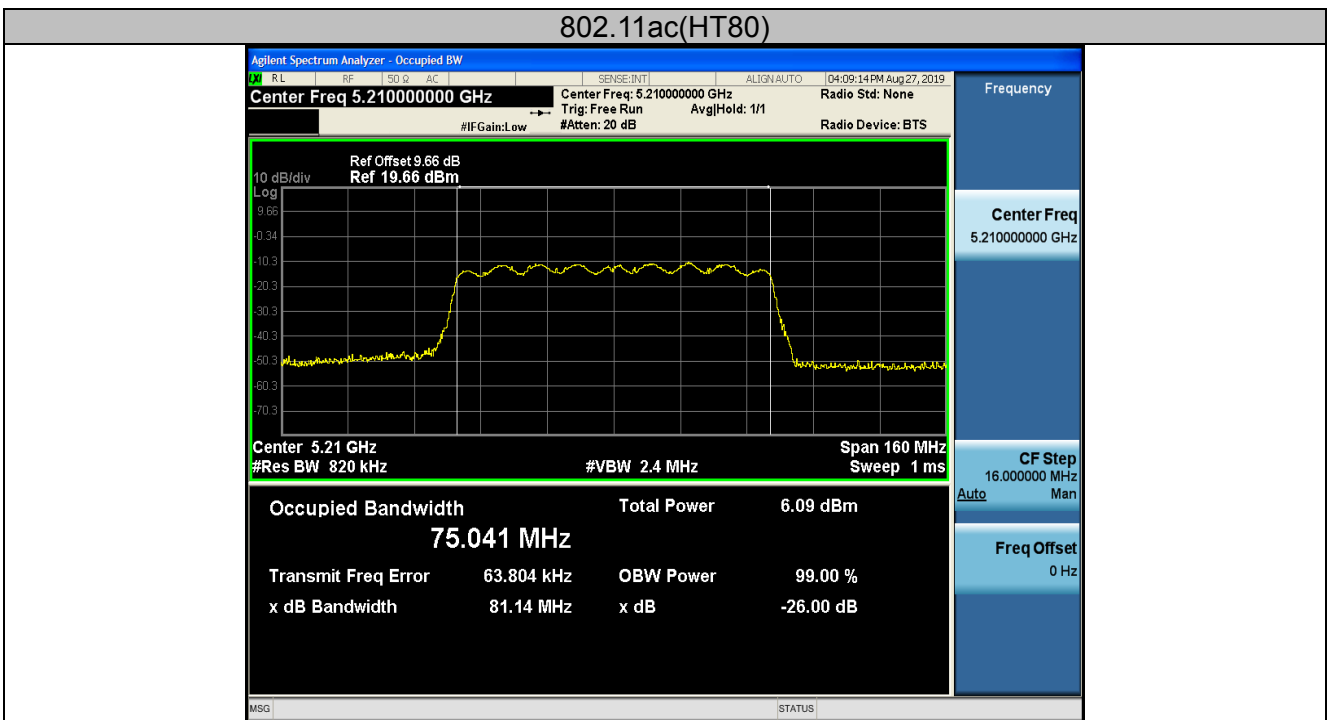
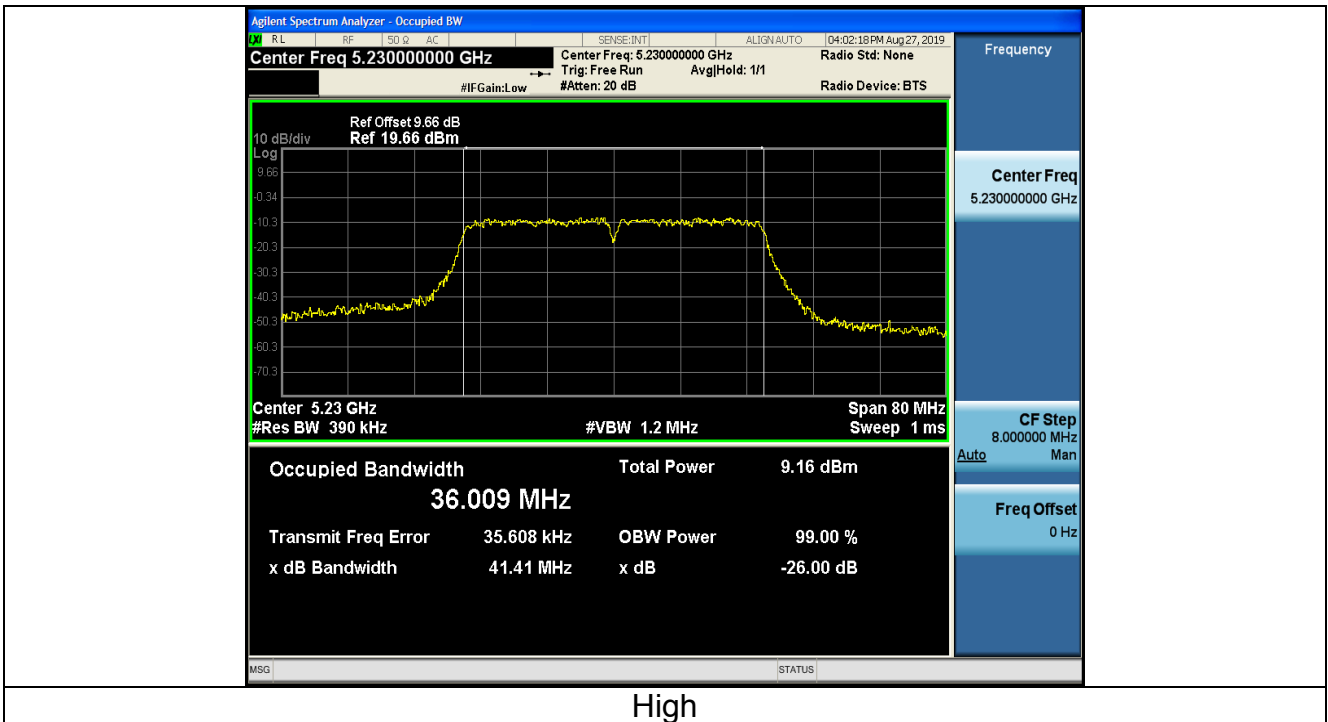


Low



Mid









### 4.5.3. Test data

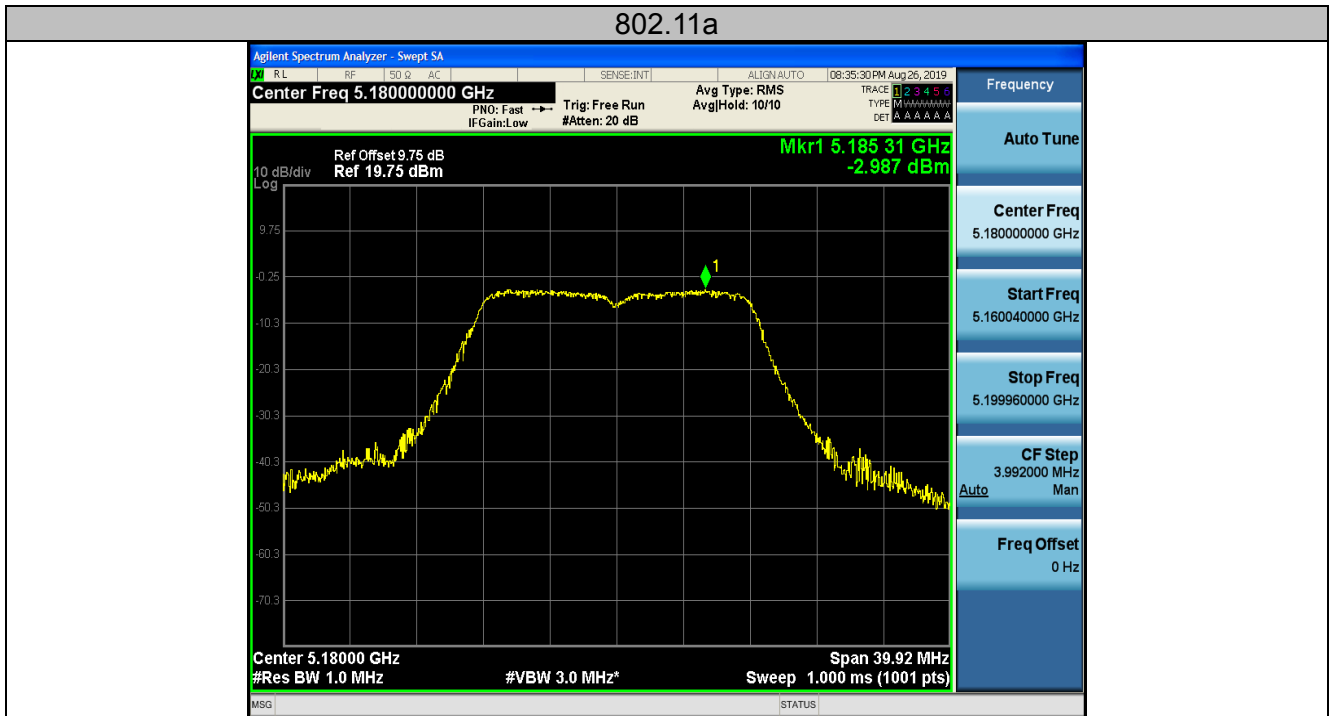
ANT 1

Configuration Band I (5150 - 5250 MHz )						
Mode	Test channel	Level [dBm/MHz]	10log(1/x) Factor [dB]	Power Spectral Density	Limit (dBm/MHz)	Result
11a	CH36	-2.99	0	-2.99	11	PASS
11a	CH40	-2.92	0	-2.92	11	PASS
11a	CH48	-2.67	0	-2.67	11	PASS
11n(HT20)	CH36	-2.94	0	-2.94	11	PASS
11n(HT20)	CH40	-2.96	0	-2.96	11	PASS
11n(HT20)	CH48	-4.12	0	-4.12	11	PASS
11n(HT40)	CH38	-7.99	0	-7.99	11	PASS
11n(HT40)	CH46	-5.55	0	-5.55	11	PASS
11ac(HT20)	CH36	-2.21	0	-2.21	11	PASS
11ac(HT20)	CH40	-2.91	0	-2.91	11	PASS
11ac(HT20)	CH48	-2.10	0	-2.10	11	PASS
11ac(HT40)	CH38	-7.08	0	-7.08	11	PASS
11ac(HT40)	CH46	-5.33	0	-5.33	11	PASS
11ac(HT80)	CH42	-9.45	0	-9.45	11	PASS

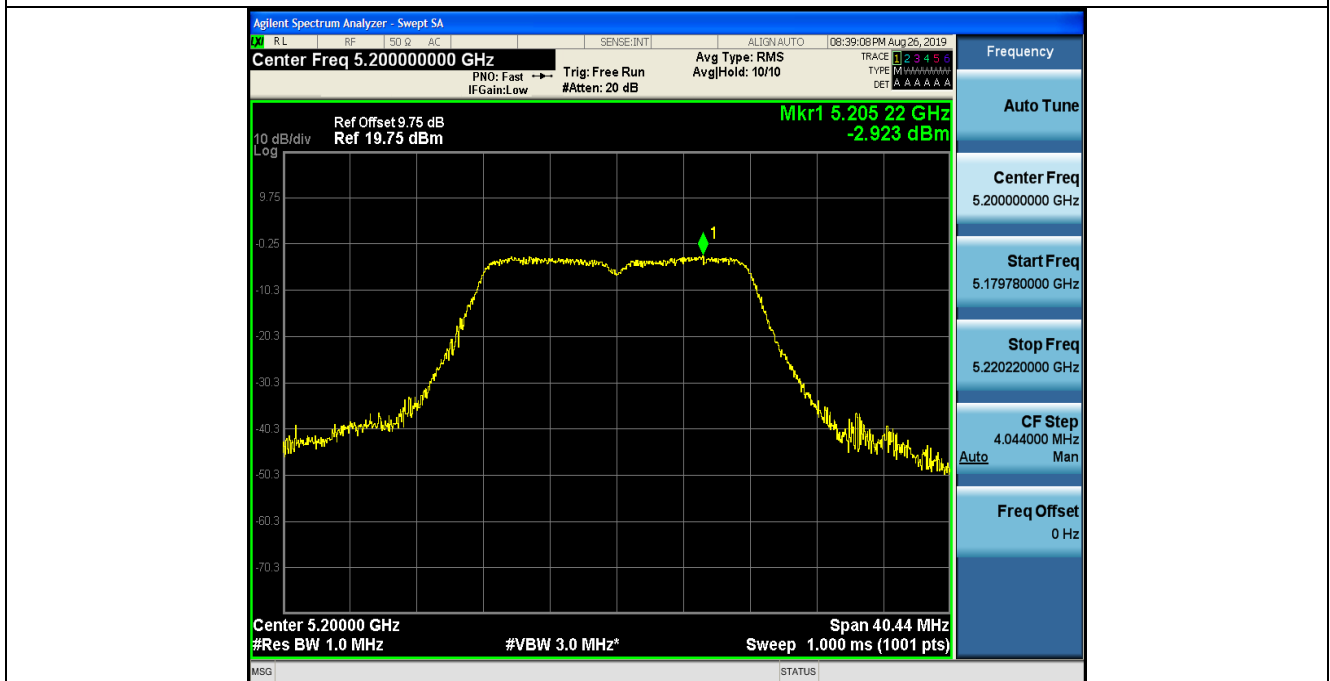


Test plots as follows:

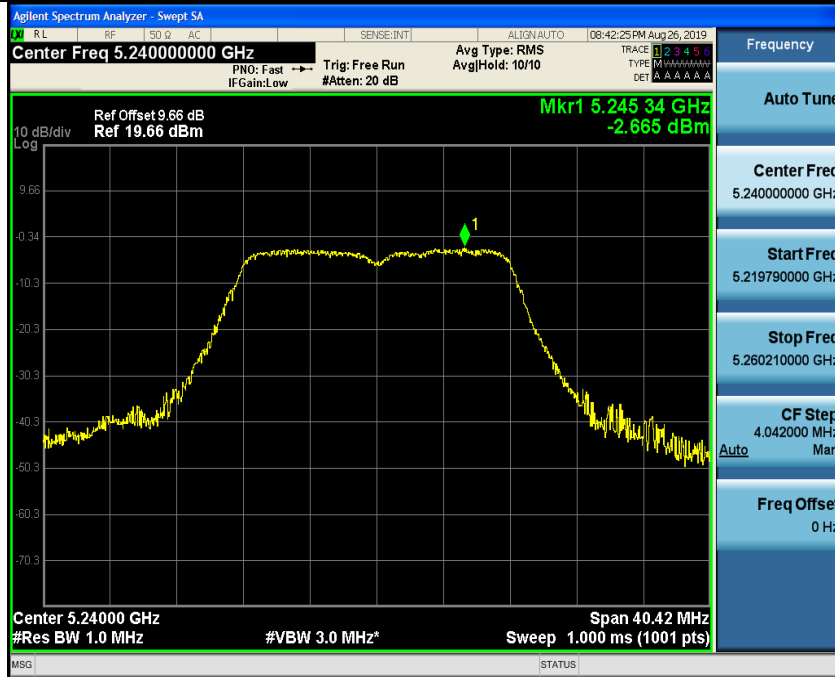
Band I (5150 – 5250 MHz)



Low

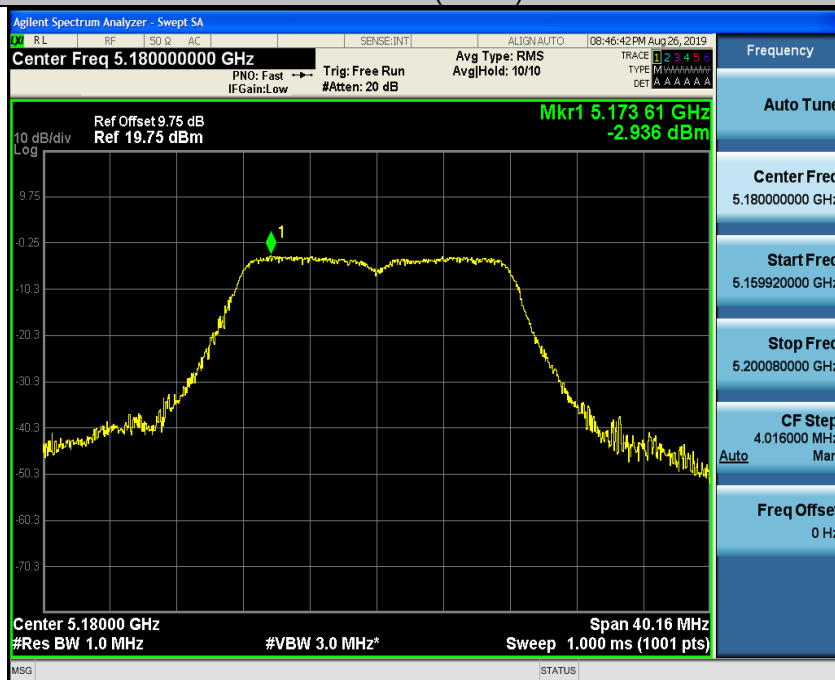


Mid

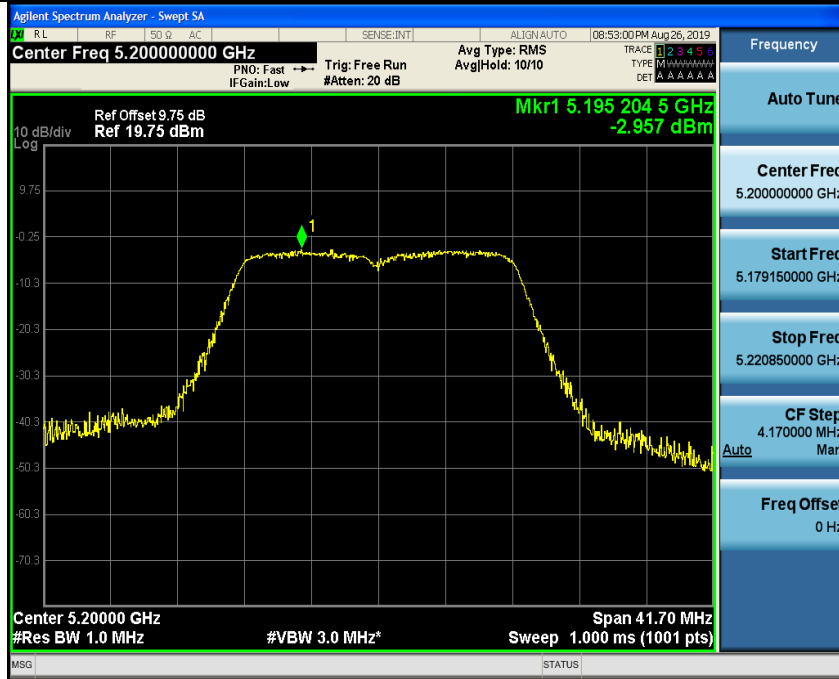


High

802.11n(HT20)



Low



Mid

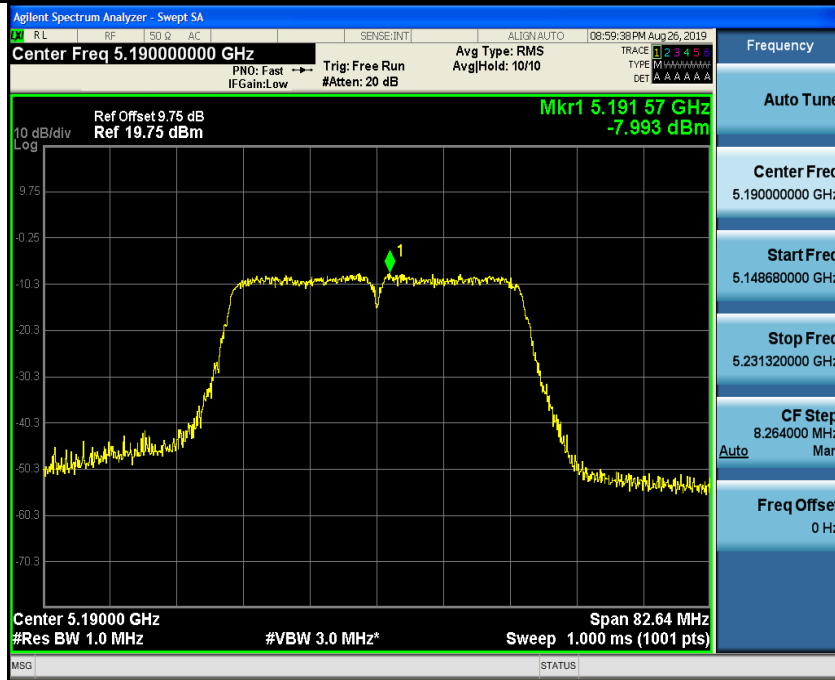


High

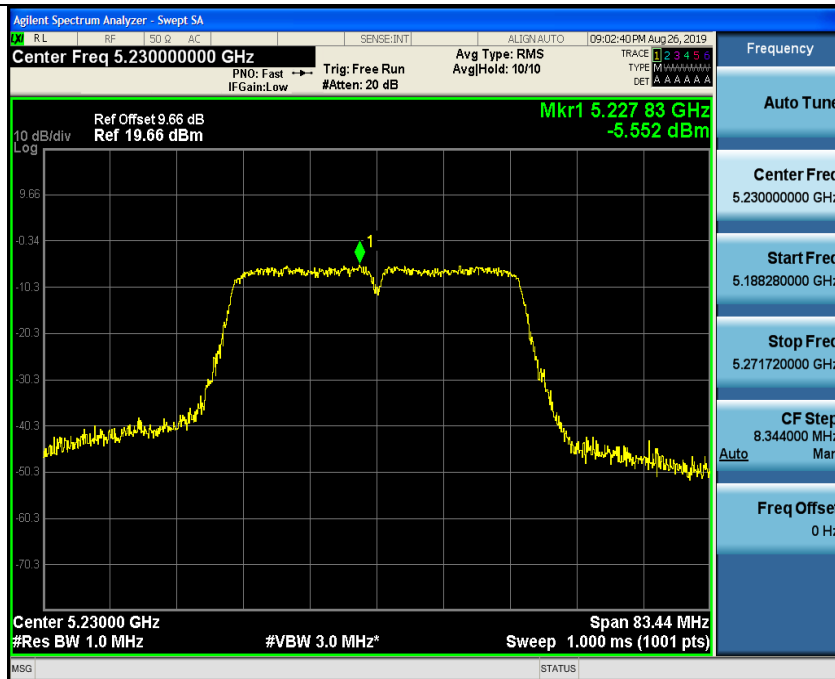




### 802.11n(HT40)



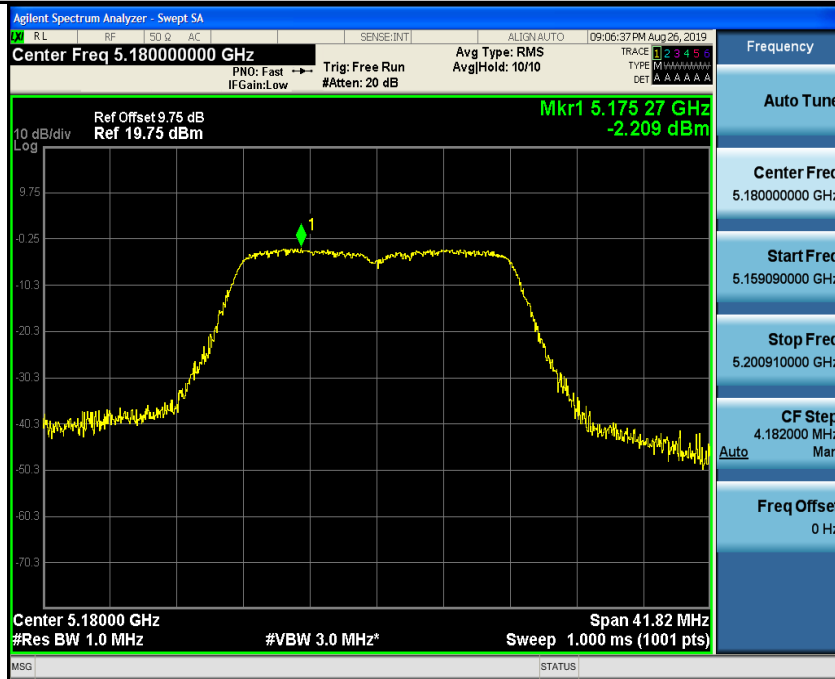
Low



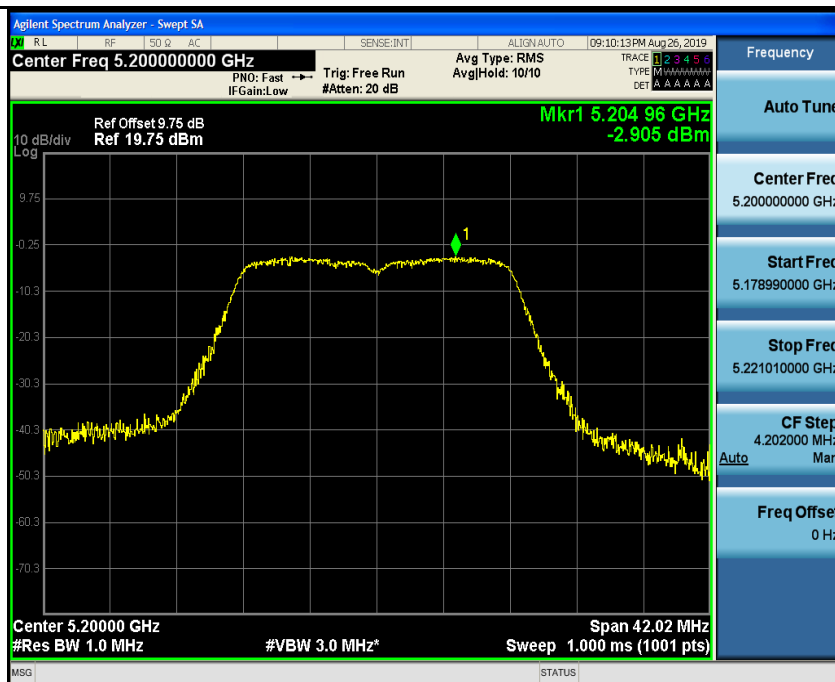
High



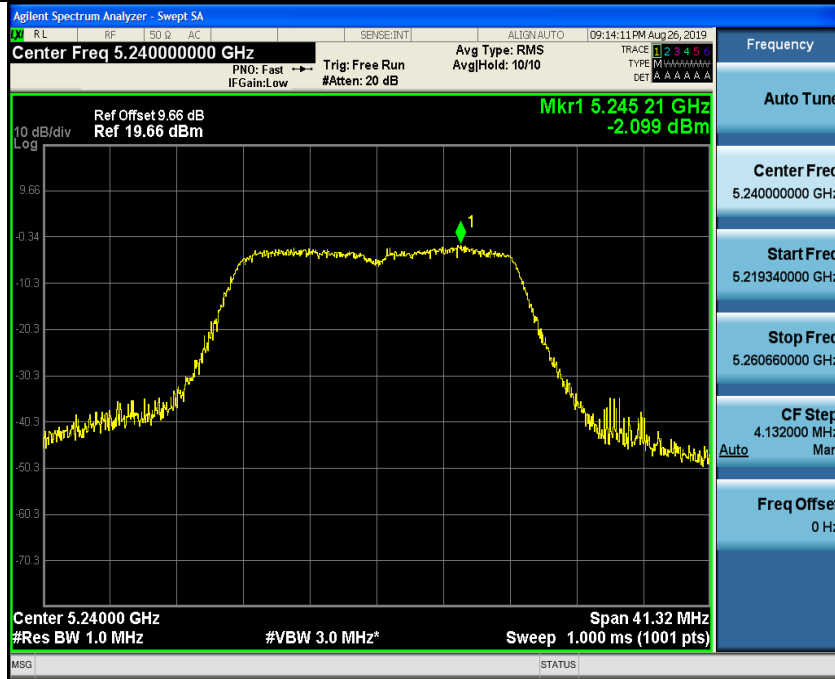
### 802.11ac(HT20)



Low

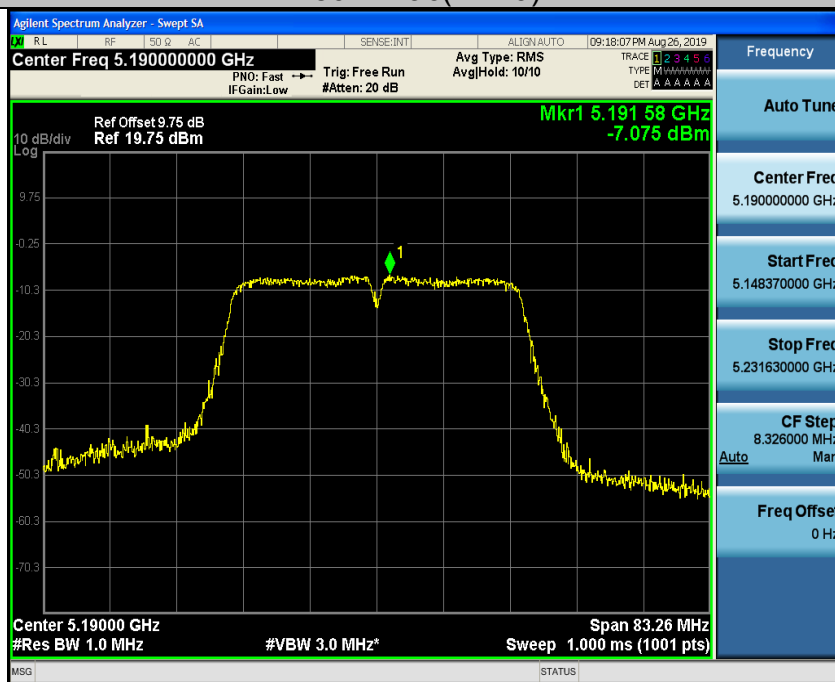


Mid

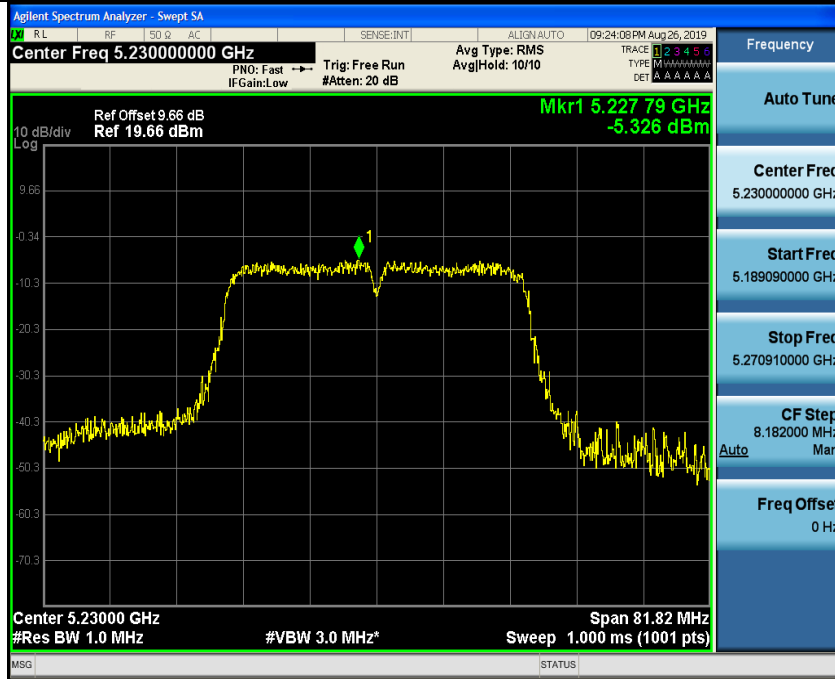


High

802.11ac(HT40)



Low



High

802.11ac(HT80)



Low



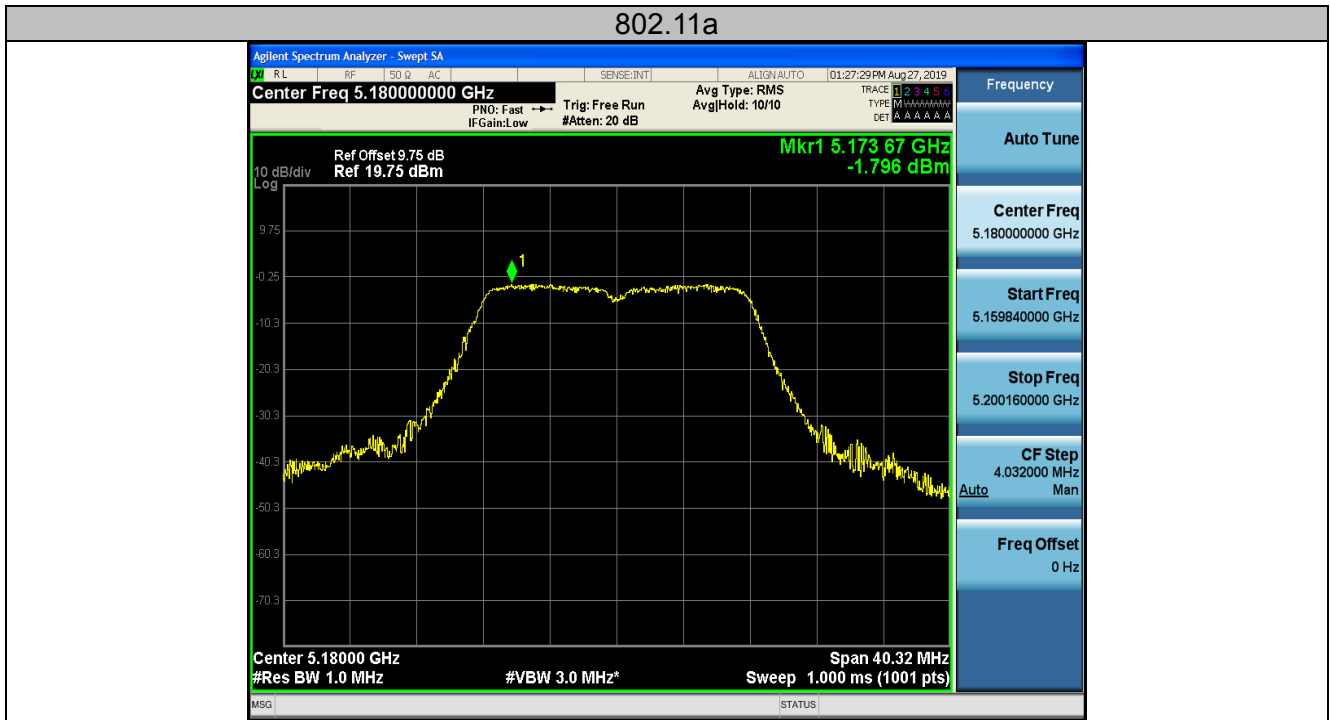
## ANT 2

Configuration Band I (5150 - 5250 MHz )						
Mode	Test channel	Level [dBm/MHz]	10log(1/x) Factor [dB]	Power Spectral Density	Limit (dBm/MHz)	Result
11a	CH36	-1.80	0	-1.80	11	PASS
11a	CH40	-2.37	0	-2.37	11	PASS
11a	CH48	-1.75	0	-1.75	11	PASS
11n(HT20)	CH36	-3.50	0	-3.50	11	PASS
11n(HT20)	CH40	-3.61	0	-3.61	11	PASS
11n(HT20)	CH48	-3.84	0	-3.84	11	PASS
11n(HT40)	CH38	-9.33	0	-9.33	11	PASS
11n(HT40)	CH46	-5.92	0	-5.92	11	PASS
11ac(HT20)	CH36	-3.63	0	-3.63	11	PASS
11ac(HT20)	CH40	-3.90	0	-3.90	11	PASS
11ac(HT20)	CH48	-4.00	0	-4.00	11	PASS
11ac(HT40)	CH38	-9.56	0	-9.56	11	PASS
11ac(HT40)	CH46	-6.71	0	-6.71	11	PASS
11ac(HT80)	CH42	-11.76	0	-11.76	11	PASS

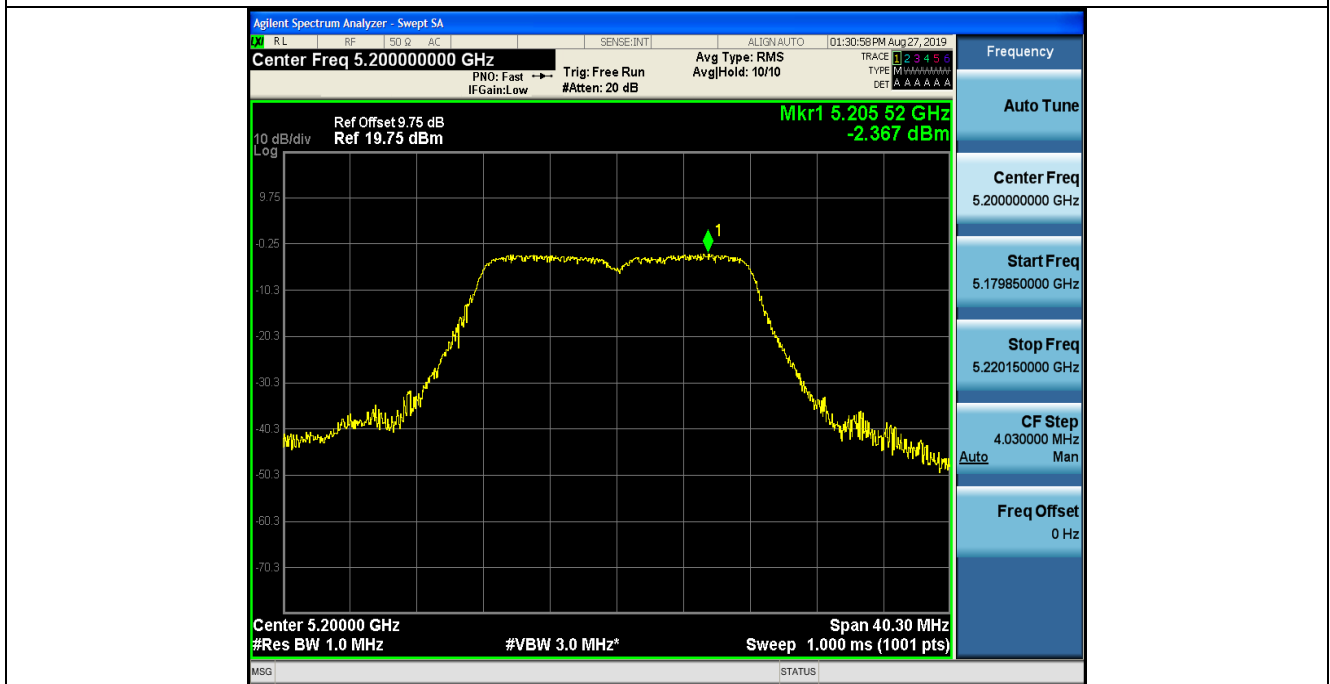


Test plots as follows:

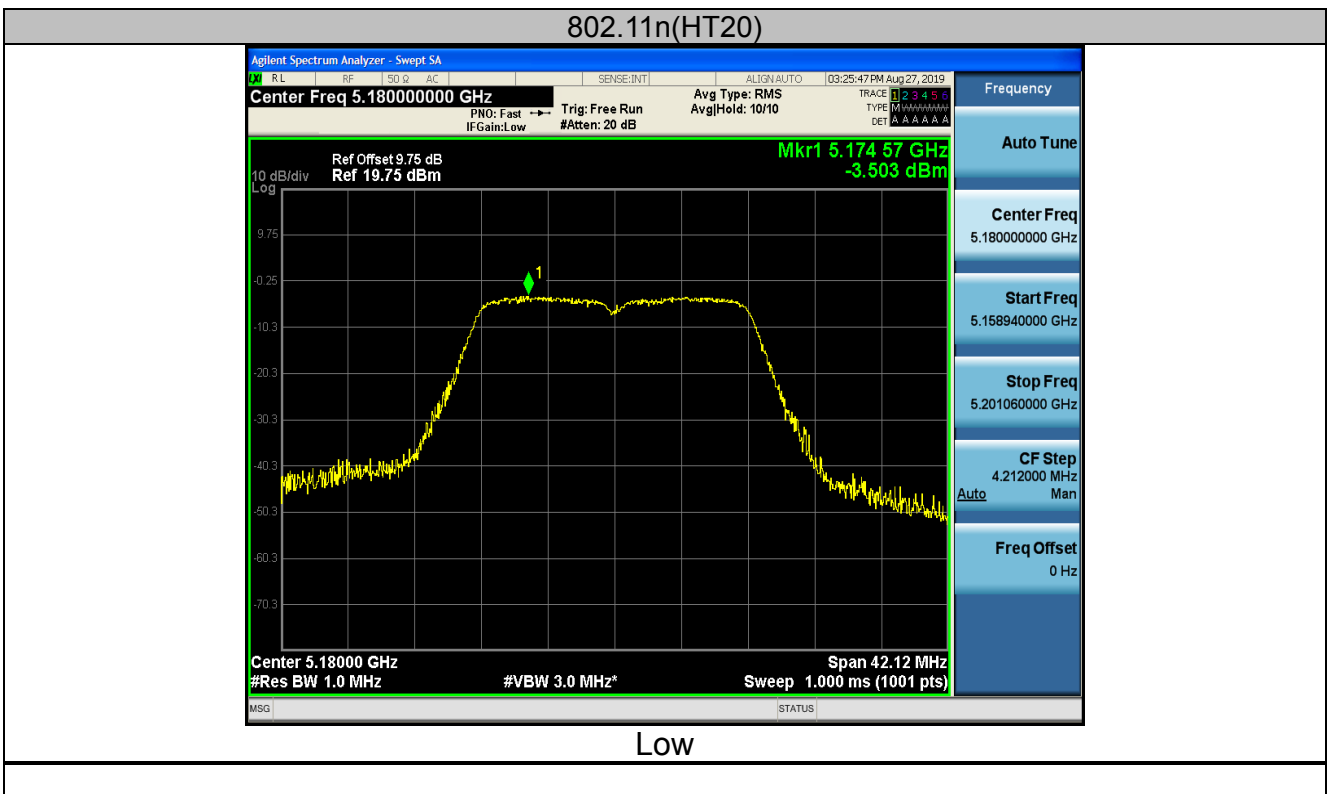
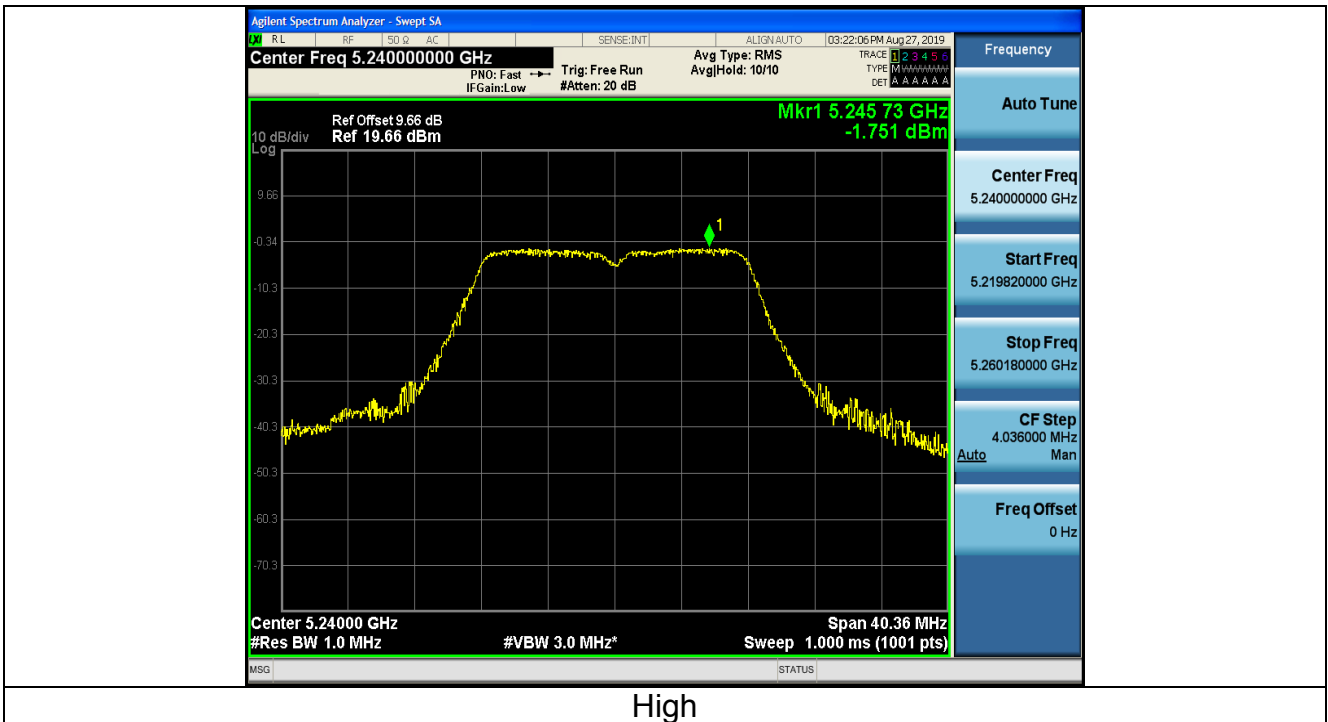
Band I (5150 – 5250 MHz)

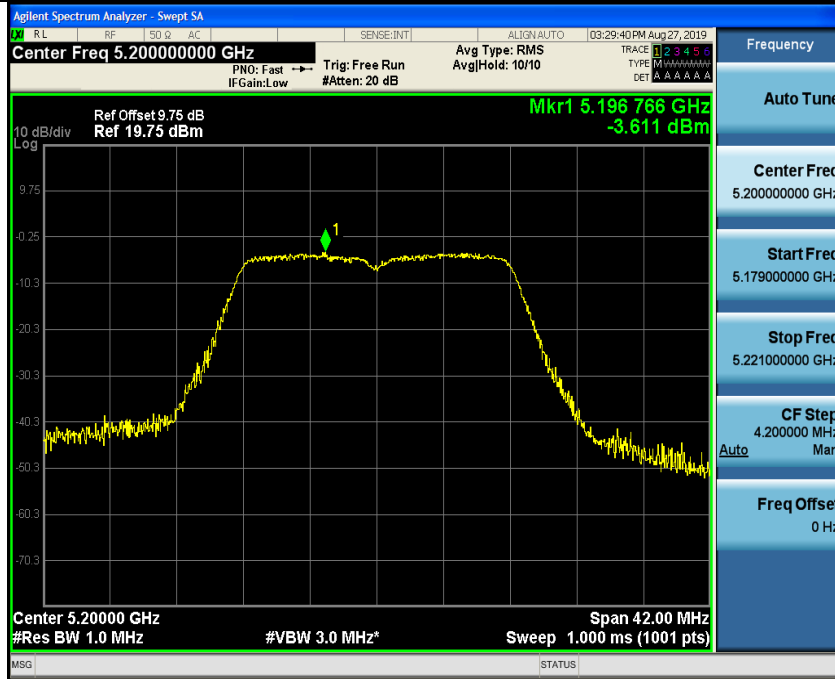


Low

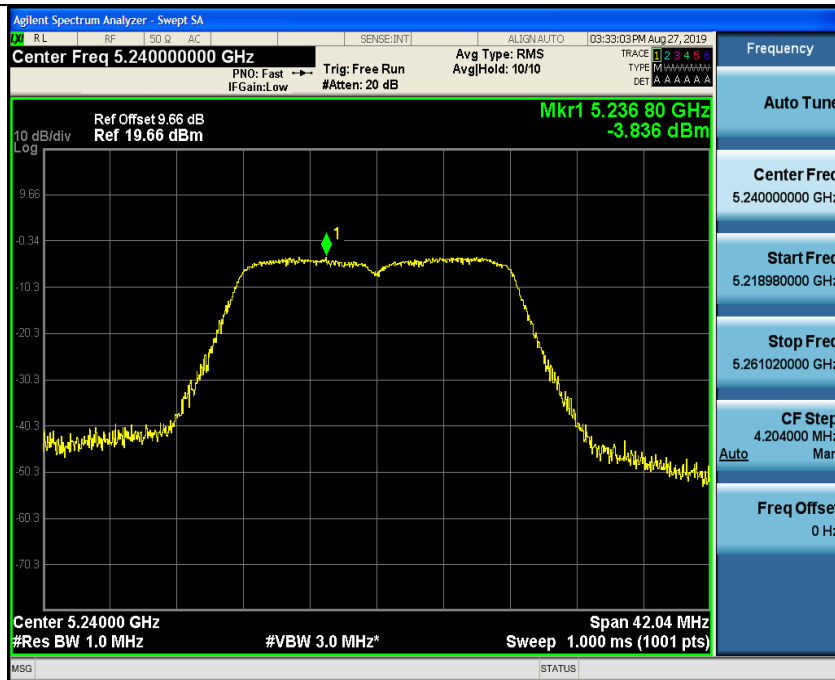


Mid





Mid

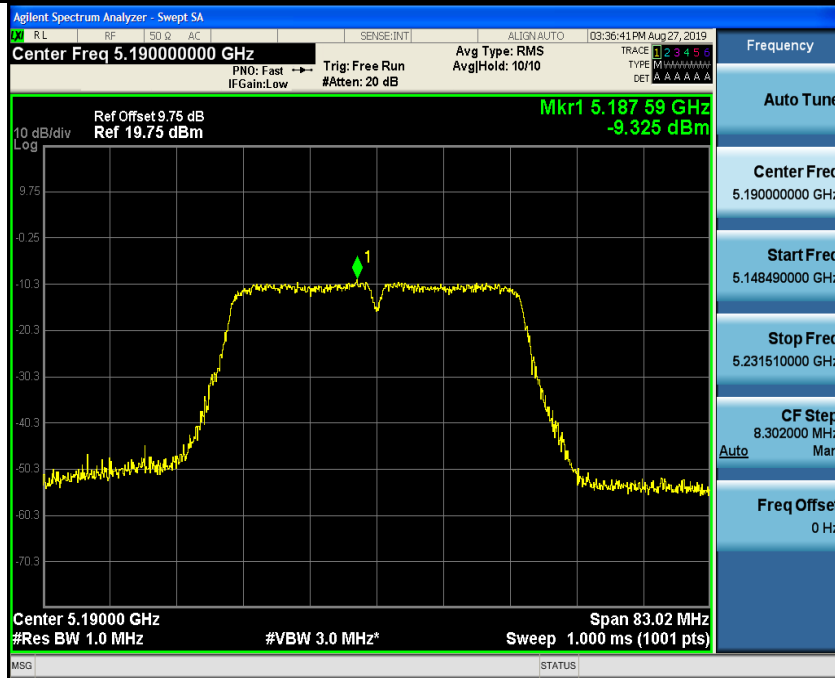


High

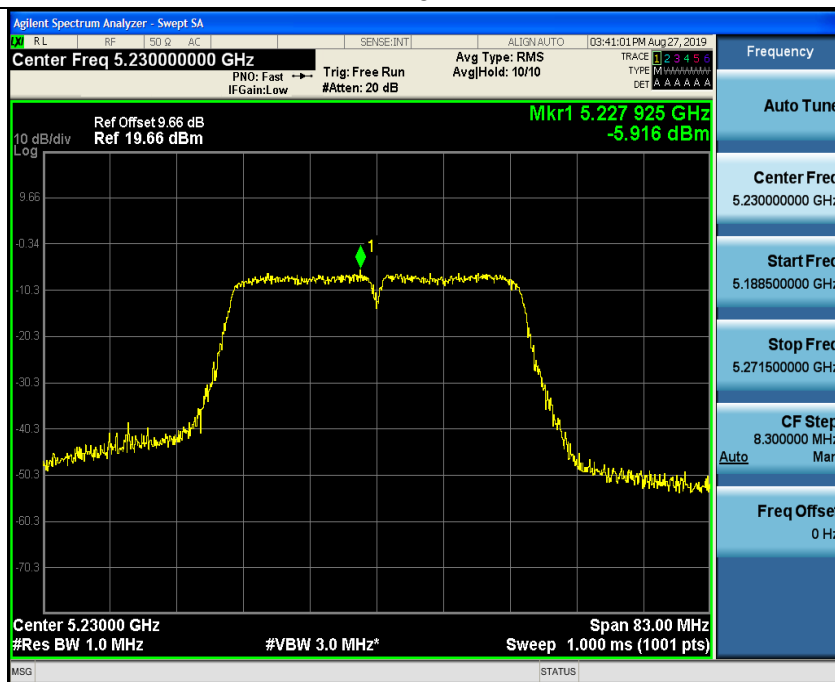




### 802.11n(HT40)



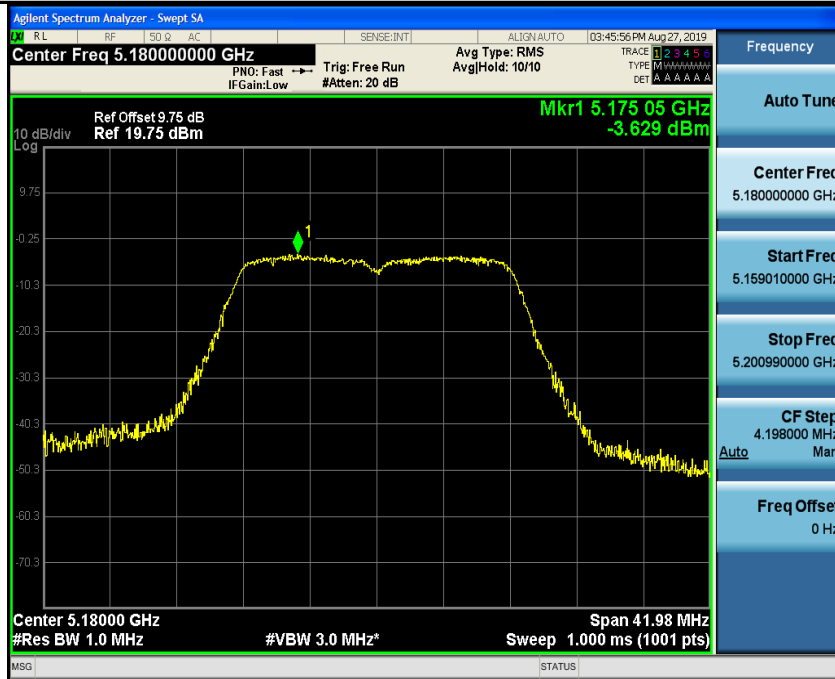
Low



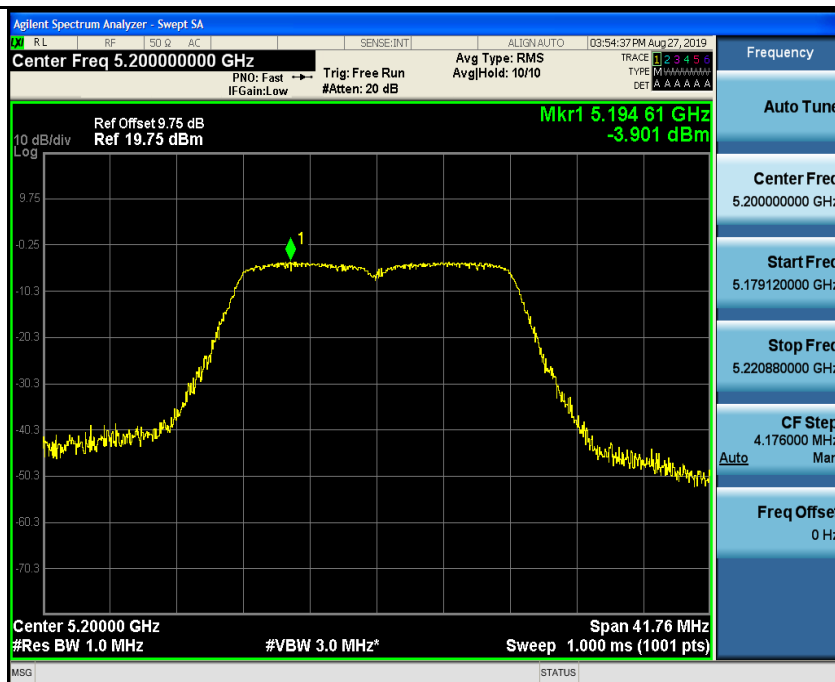
High



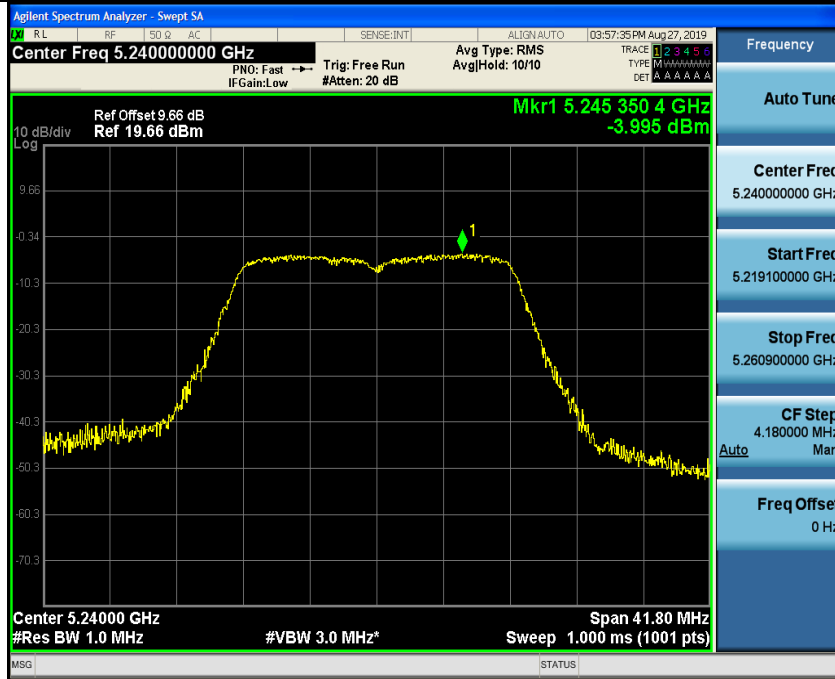
### 802.11ac(HT20)



Low

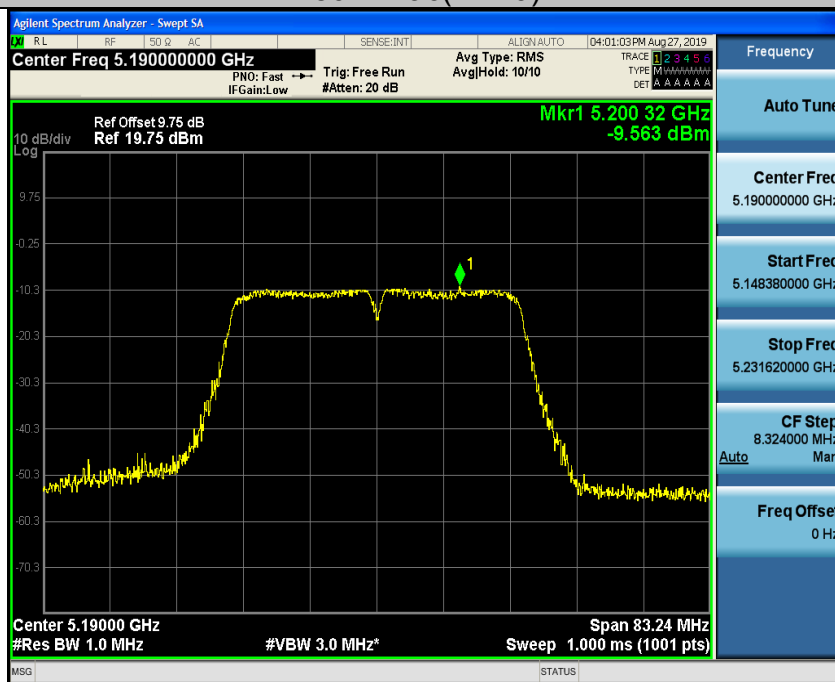


Mid

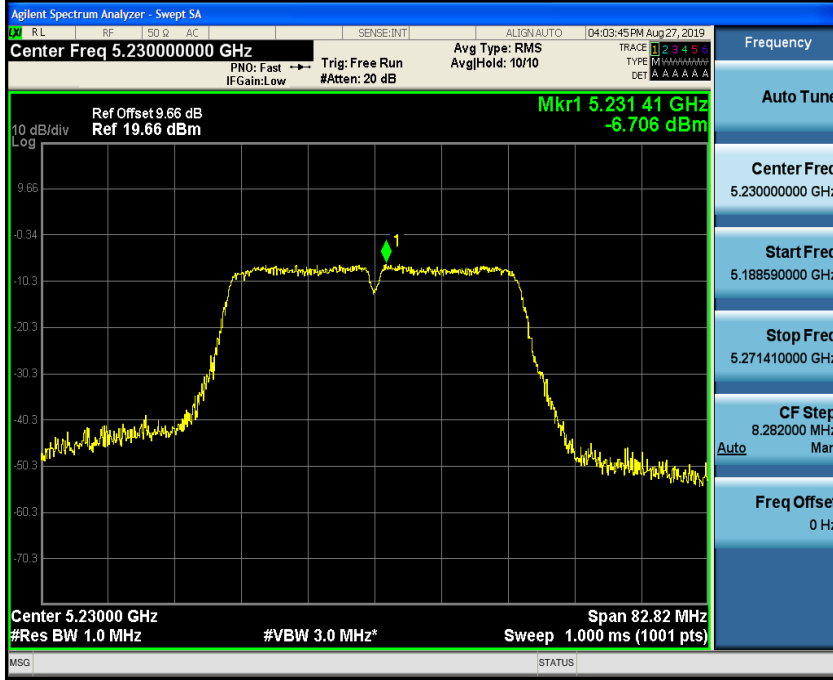


High

### 802.11ac(HT40)

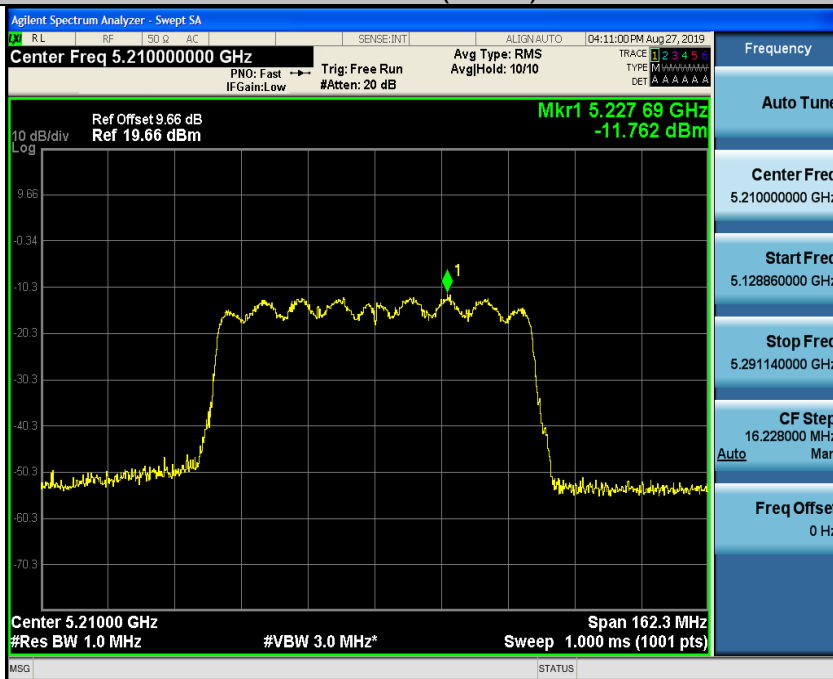


Low



High

802.11ac(HT80)



Low



**For MIMO antenna port 1+antenna port 2  
Configuration Band IV (5180 - 5240 MHz )**

Mode	Test channel	Power Density (dBm)	Limit (dBm)	Result
11a	CH36	/	11	/
11a	CH40	/	11	/
11a	CH48	/	11	/
11n(HT20)	CH36	-0.20	11	PASS
11n(HT20)	CH40	-0.26	11	PASS
11n(HT20)	CH48	-0.97	11	PASS
11n(HT40)	CH38	-5.60	11	PASS
11n(HT40)	CH46	-2.72	11	PASS
11ac(HT20)	CH36	0.15	11	PASS
11ac(HT20)	CH40	-0.37	11	PASS
11ac(HT20)	CH48	0.06	11	PASS
11ac(HT40)	CH38	-5.14	11	PASS
11ac(HT40)	CH46	-2.96	11	PASS
11ac(HT80)	CH42	-7.44	11	PASS
Note: 1 According to KDB 662911, Result power = $10\log(10^{\text{ant1}/10}+10^{\text{ant2}/10})$ . 2 Result unit: W, The end result is converted to units of dBm.				

Note: This product supports antenna 1 and antenna 2 launch, but only support 802.11 n/ac for MIMO mode, not support 802.11 a for MIMO mode.

## 4.6. Band edge

### 4.6.1. Test Specification

<b>Test Requirement:</b>	FCC CFR47 Part 15E Section 15.407
<b>Test Method:</b>	ANSI C63.10 2013
<b>Limit:</b>	<p>For band I&amp;II&amp;III: <math>E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}</math>, for <math>\text{EIRP}(\text{dBm}) = -27\text{dBm}</math></p> <p>For transmitters operating in the 5.725-5.85 GHz band:</p> <p>All emissions shall be limited to a level of <math>-27 \text{ dBm}/\text{MHz}</math> at 75 MHz or more above or below the band edge increasing linearly to <math>10 \text{ dBm}/\text{MHz}</math> 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 <math>15.6 \text{ dBm}/\text{MHz}</math> 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 <math>27 \text{ dBm}/\text{MHz}</math> at the band edge.</p> <p>For band IV(5715-5725MHz&amp;5850-5860MHz): <math>E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 78.2 \text{ dB}\mu\text{V}/\text{m}</math>, for <math>\text{EIRP}(\text{dBm}) = -27\text{dBm}</math>;</p> <p>For band IV(other un-restricted band): <math>E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}</math>, for <math>\text{EIRP}(\text{dBm}) = -27\text{dBm}</math></p>
<b>Test Setup:</b>	<p>The diagram illustrates the test setup. A rotating table (labeled 'Turntable') is positioned 1.5m above a 'Ground Reference Plane'. On the table, an 'AC' source and an 'EUT' (Equipment Under Test) are connected. A '3m' distance is marked between the EUT and a 'Horn Antenna' mounted on an 'Antenna Tower'. The antenna tower is connected to a 'Test Receiver' which includes a 'Pre-amplifier' and a 'Controller'.</p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the</li> </ol>



	<p>maximum reading.</p> <p>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasipeak or average method as specified and then reported in a data sheet.</p>
<b>Test Result:</b>	PASS



#### 4.6.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Receiver	R&S	ESRP3	HKE-005	Dec. 27, 2019
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2019
Preamplifier	EMCI	EMC051845S E	HKE-015	Dec. 27, 2019
Preamplifier	Agilent	83051A	HKE-016	Dec. 27, 2019
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 26, 2019
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	Dec. 26, 2019
Horn antenna	Schwarzbeck	9120D	HKE-013	Dec. 26, 2019
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Position controller	Taiwan MF	MF7802	HKE-011	Dec. 27, 2019
Radiated test software	Tonscend	TS+ Rev 2.5.0.0	HKE-082	N/A
RF cable (9KHz-1GHz)	Times	381806-001	N/A	N/A
Hf antenna	Schwarzbeck	LB-180400-KF	HKE-031	Dec. 27, 2019
RF cable	Tonscend	1-18G	HKE-099	Dec. 27, 2019
RF cable	Times	1-40G	HKE-034	Dec. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).





### 4.6.3. Test Data

#### ANT 1

Operation Mode: 802.11a Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.67	-2.49	50.18	74	-23.82	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.64	-2.49	51.15	74	-22.85	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.21	-2.28	51.93	74	-22.07	peak
5250	/	-2.28	/	54	/	AVG
5350	52.35	-2.11	50.24	74	-23.76	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	53.61	-2.28	51.33	74	-22.67	peak
5250	/	-2.28	/	54	/	AVG
5350	50.98	-2.11	48.87	74	-25.13	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11n20 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.66	-2.49	51.17	74	-22.83	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.34	-2.49	49.85	74	-24.15	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	52.12	-2.28	49.84	74	-24.16	peak
5250	/	-2.28	/	54	/	AVG
5350	51.34	-2.11	49.23	74	-24.77	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.21	-2.28	51.93	74	-22.07	peak
5250	/	-2.28	/	54	/	AVG
5350	51.34	-2.11	49.23	74	-24.77	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11 n40 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.67	-2.49	50.18	74	-23.82	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.64	-2.49	51.15	74	-22.85	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.37	-2.28	52.09	74	-21.91	peak
5250	/	-2.28	/	54	/	AVG
5350	51.62	-2.11	49.51	74	-24.49	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	53.24	-2.28	50.96	74	-23.04	peak
5250	/	-2.28	/	54	/	AVG
5350	50.11	-2.11	48	74	-26	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11 ac20 Mode with 5.2G TX CH Low

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.34	-2.49	50.85	74	-23.15	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.42	-2.49	50.93	74	-23.07	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.73	-2.28	52.45	74	-21.55	peak
5250	/	-2.28	/	54	/	AVG
5350	52.89	-2.11	50.78	74	-23.22	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.32	-2.28	52.04	74	-21.96	peak
5250	/	-2.28	/	54	/	AVG
5350	50.87	-2.11	48.76	74	-25.24	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.





Operation Mode: 802.11 ac40 Mode with 5.2G TX CH Low

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	54.22	-2.49	51.73	74	-22.27	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	50.99	-2.49	48.5	74	-25.5	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	66.24	-2.28	63.96	74	-10.04	peak
5250	/	-2.28	/	54	/	AVG
5350	53.45	-2.11	51.34	74	-22.66	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	65.34	-2.28	63.06	74	-10.94	peak
5250	/	-2.28	/	54	/	AVG
5350	52.78	-2.11	50.67	74	-23.33	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11 ac80 Mode with 5.2G TX CH Low

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	54.37	-2.49	51.88	74	-22.12	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.48	-2.49	49.99	74	-24.01	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.21	-2.28	51.93	74	-22.07	peak
5250	/	-2.28	/	54	/	AVG
5350	52.98	-2.11	50.87	74	-23.13	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.67	-2.28	52.39	74	-21.61	peak
5250	/	-2.28	/	54	/	AVG
5350	51.52	-2.11	49.41	74	-24.59	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

**ANT 2**

Operation Mode: 802.11a Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.78	-2.49	50.29	74	-23.71	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	51.97	-2.49	49.48	74	-24.52	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.62	-2.28	52.34	74	-21.66	peak
5250	/	-2.28	/	54	/	AVG
5350	51.42	-2.11	49.31	74	-24.69	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	53.89	-2.28	51.61	74	-22.39	peak
5250	/	-2.28	/	54	/	AVG
5350	52.64	-2.11	50.53	74	-23.47	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11n20 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	55.89	-2.49	53.4	74	-20.6	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.66	-2.49	50.17	74	-23.83	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	56.1	-2.28	53.82	74	-20.18	peak
5250	/	-2.28	/	54	/	AVG
5350	51.75	-2.11	49.64	74	-24.36	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.34	-2.28	52.06	74	-21.94	peak
5250	/	-2.28	/	54	/	AVG
5350	51.42	-2.11	49.31	74	-24.69	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.





Operation Mode: 802.11 n40 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.12	-2.49	50.63	74	-23.37	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	54.37	-2.49	51.88	74	-22.12	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.23	-2.28	51.95	74	-22.05	peak
5250	/	-2.28	/	54	/	AVG
5350	51.42	-2.11	49.31	74	-24.69	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	53.28	-2.28	51	74	-23	peak
5250	/	-2.28	/	54	/	AVG
5350	42.32	-2.11	40.21	74	-33.79	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11 ac20 Mode with 5.2G TX CH Low

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	55.12	-2.49	52.63	74	-21.37	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	53.51	-2.49	51.02	74	-22.98	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	55.84	-2.28	53.56	74	-20.44	peak
5250	/	-2.28	/	54	/	AVG
5350	54.61	-2.11	52.5	74	-21.5	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.26	-2.28	51.98	74	-22.02	peak
5250	/	-2.28	/	54	/	AVG
5350	51.12	-2.11	49.01	74	-24.99	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11 ac40 Mode with 5.2G TX CH Low

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	54.46	-2.49	51.97	74	-22.03	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	52.15	-2.49	49.66	74	-24.34	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	57.31	-2.28	55.03	74	-18.97	peak
5250	/	-2.28	/	54	/	AVG
5350	53.86	-2.11	51.75	74	-22.25	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.85	-2.28	52.57	74	-21.43	peak
5250	/	-2.28	/	54	/	AVG
5350	51.24	-2.11	49.13	74	-24.87	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: 802.11 ac80 Mode with 5.2G TX CH Low

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	55.32	-2.49	52.83	74	-21.17	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5150	50.78	-2.49	48.29	74	-25.71	peak
5150	/	-2.49	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	56.78	-2.28	54.5	74	-19.5	peak
5250	/	-2.28	/	54	/	AVG
5350	51.34	-2.11	49.23	74	-24.77	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
5250	54.25	-2.28	51.97	74	-22.03	peak
5250	/	-2.28	/	54	/	AVG
5350	51.87	-2.11	49.76	74	-24.24	peak
5350	/	-2.11	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.





## 4.7. Spurious Emission

### 4.7.1.1. Test Specification

<b>Test Requirement:</b>	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205				
<b>Test Method:</b>	KDB 789033 D02 v02r01				
<b>Frequency Range:</b>	9kHz to 40GHz				
<b>Measurement Distance:</b>	3 m				
<b>Antenna Polarization:</b>	Horizontal & Vertical				
<b>Operation mode:</b>	Transmitting mode with modulation				
<b>Receiver Setup:</b>	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Peak		1MHz	10Hz	Average Value	
<b>Limit:</b>	Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,				
	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)		
	0.009-0.490	2400/F(KHz)	300		
	0.490-1.705	24000/F(KHz)	30		
	1.705-30	30	30		
	30-88	100	3		
	88-216	150	3		
	216-960	200	3		
	Above 960	500	3		
	Frequency	Limit (dBuV/m @3m)	Detector		
Above 1G	74.0	Peak			
	54.0	Average			
<b>Test setup:</b>	For radiated emissions below 30MHz				
	30MHz to 1GHz				

	<p>Above 1GHz</p>
<p><b>Test Procedure:</b></p>	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> </ol>
<p><b>Test results:</b></p>	<p>PASS</p>



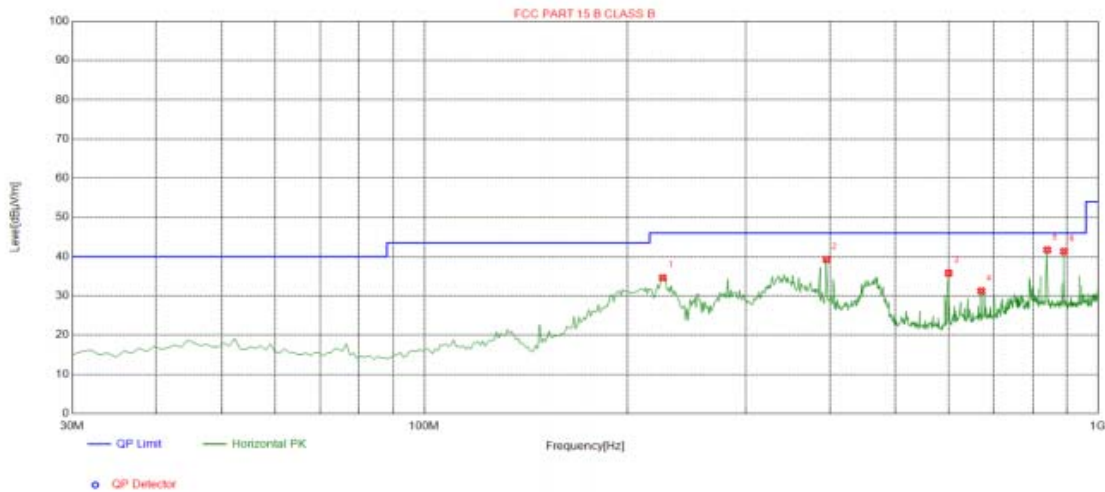
### 4.7.2. Test Data

test mode: TX 802.11a 5180MHz

All the test modes completed for test. The worst case of Radiated Emission; the test data of this mode was reported.

Below 1GHz

Horizontal

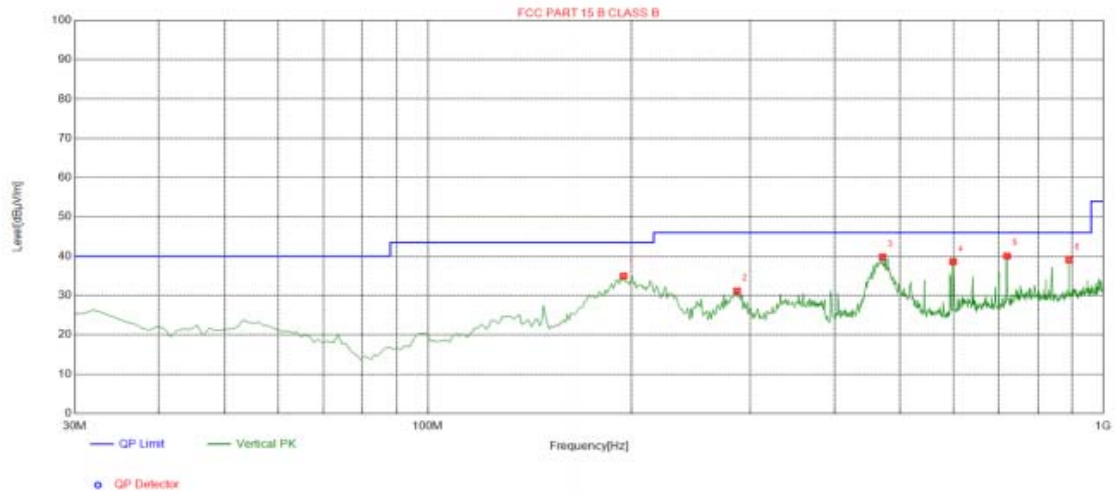


Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	225.940	34.61	-14.42	46.00	11.39	100	42	Horizontal
2	395.690	39.28	-10.51	46.00	6.72	100	157	Horizontal
3	600.360	35.78	-6.09	46.00	10.22	100	151	Horizontal
4	671.170	31.27	-4.60	46.00	14.73	100	149	Horizontal
5	840.920	41.73	-2.57	46.00	4.27	100	149	Horizontal
6	890.390	41.35	-1.88	46.00	4.65	100	15	Horizontal

Remark: Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level



**Vertical**



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	194.900	34.97	-15.54	43.50	8.53	100	292	Vertical
2	287.050	31.14	-12.96	46.00	14.86	100	73	Vertical
3	471.350	39.79	-8.35	46.00	6.21	100	319	Vertical
4	599.390	38.64	-6.15	46.00	7.36	100	319	Vertical
5	720.640	40.05	-4.70	46.00	5.95	100	316	Vertical
6	890.390	39.08	-1.88	46.00	6.92	100	208	Vertical

Remark:  $Transd = Cable\ lose + Antenna\ factor - Pre\text{-}amplifier$ ;  $Margin = Limit - Level$

**Above 1GHz**

LOW CH 36 (802.11 a Mode with 5.2G)/5180

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
3647	62.54	-4.59	57.95	74	-16.05	peak
3647	48.26	-4.59	43.67	54	-10.33	AVG
10360	53.94	3.74	57.68	74	-16.32	peak
10360	42.49	3.74	46.23	54	-7.77	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
3647	62.34	-4.59	57.75	74	-16.25	peak
3647	46.05	-4.59	41.46	54	-12.54	AVG
10360	51.05	3.74	54.79	74	-19.21	peak
10360	40.37	3.74	44.11	54	-9.89	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



MID CH40 (802.11 a Mode with 5.2G)/5200

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3647	63.55	-4.59	58.96	74	-15.04	peak
3647	46.24	-4.59	41.65	54	-12.35	AVG
10400	54.32	3.74	58.06	74	-15.94	peak
10400	41.78	3.74	45.52	54	-8.48	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3647	61.98	-4.59	57.39	74	-16.61	peak
3647	45.32	-4.59	40.73	54	-13.27	AVG
10400	53.78	3.74	57.52	74	-16.48	peak
10400	41.56	3.74	45.3	54	-8.7	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



HIGH CH 48 (802.11a Mode with 5.2G)/5240  
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3647	61.92	-4.59	57.33	74	-16.67	
3647	45.78	-4.59	41.19	54	-12.81	AVG
10480	54.75	3.75	58.5	74	-15.5	peak
10480	41.25	3.75	45	54	-9	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3647	61.34	-4.59	56.75	74	-17.25	
3647	46.77	-4.59	42.18	54	-11.82	AVG
10480	52.89	3.75	56.64	74	-17.36	peak
10480	62.45	3.75	66.2	54	12.2	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.



## 4.8. Frequency Stability Measurement

### 4.8.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 Section 15.407(g) &Part2 J Section 2.1055
<b>Test Method:</b>	ANSI C63.10: 2013
<b>Limit:</b>	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.
<b>Test Setup:</b>	<pre> graph TD     SA[Spectrum Analyzer] --- EUT[EUT]     subgraph TC [Temperature Chamber]         EUT     end     P[AC/DC Power supply] --- EUT     </pre>
<b>Test Procedure:</b>	The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
<b>Test Result:</b>	PASS
<b>Remark:</b>	N/A



**Test Result as follows:**

Mode	Voltage (V)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
5.2G Band	10.8V	5180.121	13	5239.811	14
	12.0V	5179.978	12	5239.914	17
	13.2 V	5179.475	16	5240.012	12

Mode	Temperature (°C)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
5.2G Band	-30	5179.987	32	5240.044	34
	-20	5179.741	33	5239.619	32
	-10	5179.730	29	5239.733	27
	0	5179.877	26	5240.018	25
	10	5179.720	28	5239.863	18
	20	5179.956	14	5239.911	20
	30	5179.665	19	5239.998	23
	40	5179.797	21	5240.221	21
	50	5179.662	28	5240.023	34

## 4.9. ANTENNA REQUIREMENT

### Standard Applicable

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

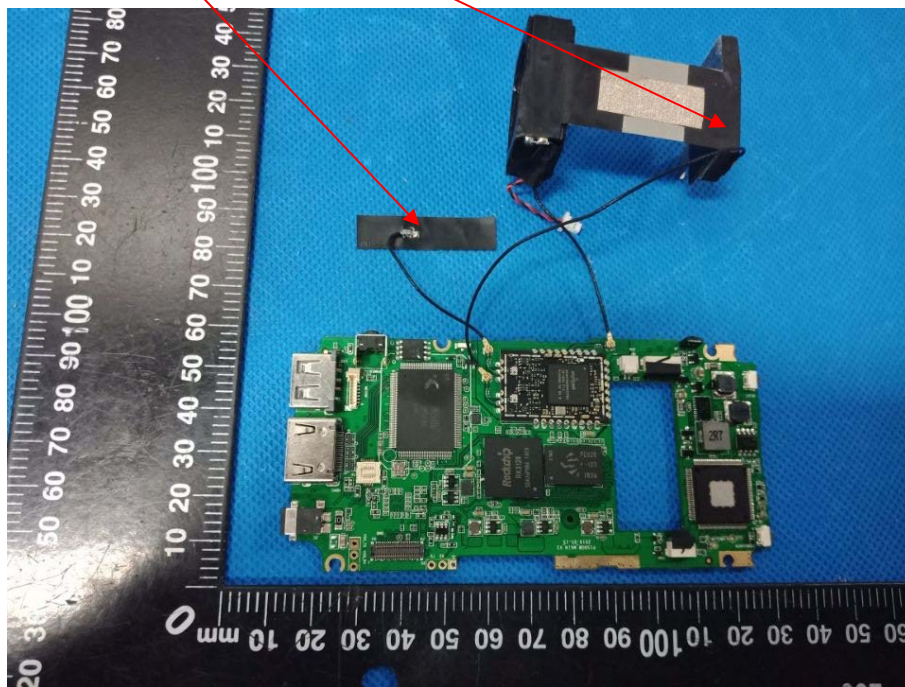
### Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### Antenna Connected Construction

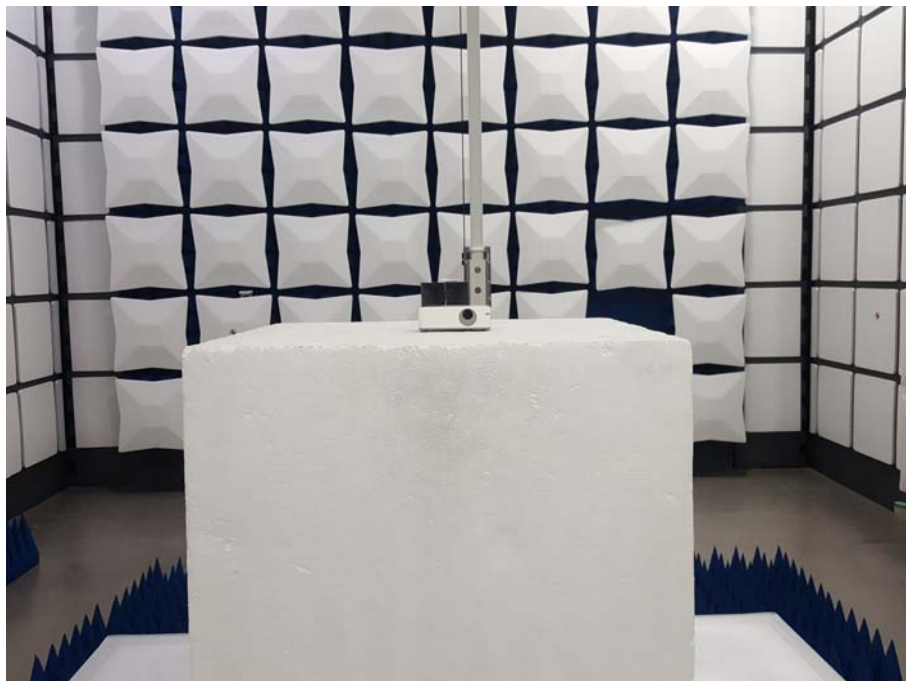
The antenna used in this product is a Internal Antenna, and the best case gain of the antenna is Antenna port 1:1dBi and Antenna port 2:1dBi.

### WIFI ANTENNA



## 4.10. Photographs of Test Setup

### Radiated Emission





## Conducted Emission





#### **4.11. PHOTOS OF THE EUT**

Reference to the reporter : ANNEX A of external photos and ANNEX B of internal photos