



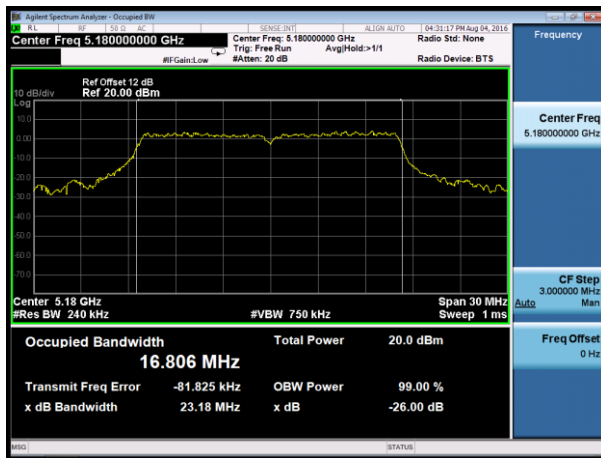
### 5.5 Test Result and Data

Test Item	Occupied Bandwidth
Test Mode	Transmit by 802.11a
Test Date	2016-08-04

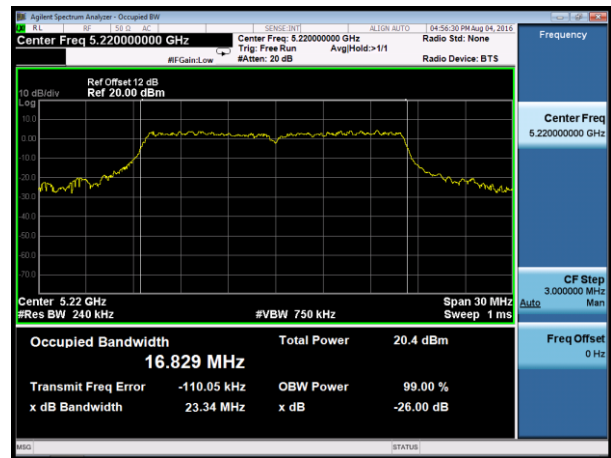
Channel No.	Frequency (MHz)	-26dB Measurement Level(MHz)	99% Occupied Bandwidth (MHz)	Result
36	5180	23.18	16.806	Pass
44	5220	23.34	16.829	Pass
48	5240	23.43	16.882	Pass
149	5745	23.36	16.795	Pass
157	5785	26.03	16.915	Pass
165	5825	26.83	16.938	Pass



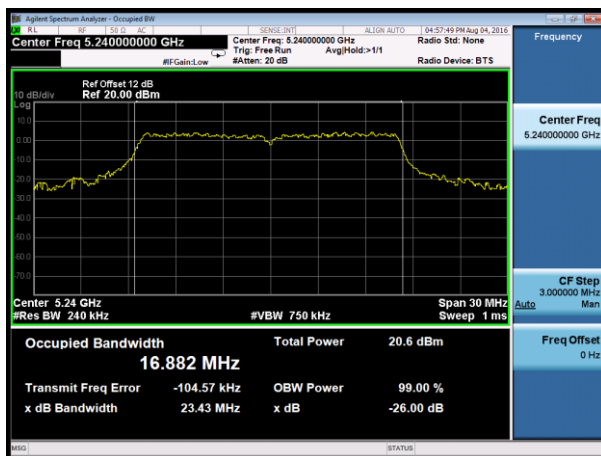
Channel 36 (5180MHz)



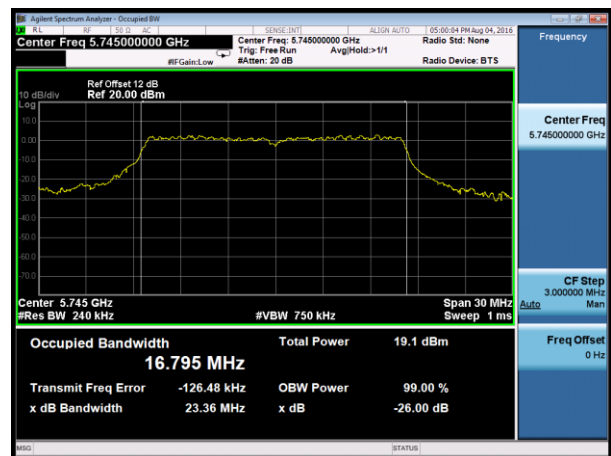
Channel 44 (5220MHz)



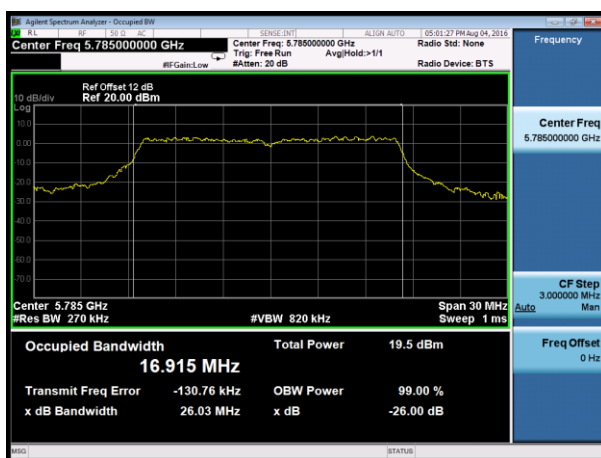
Channel 48 (5240MHz)



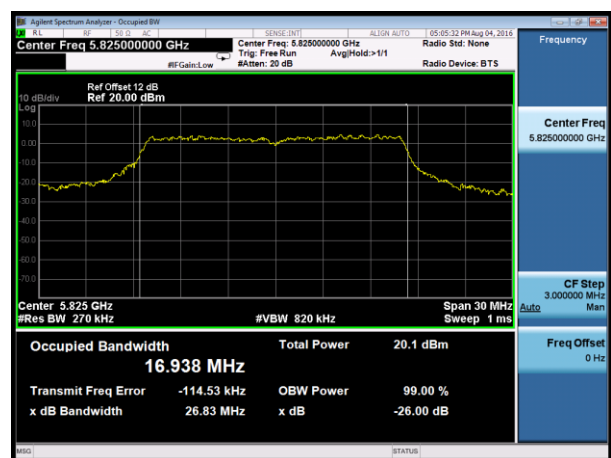
Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)



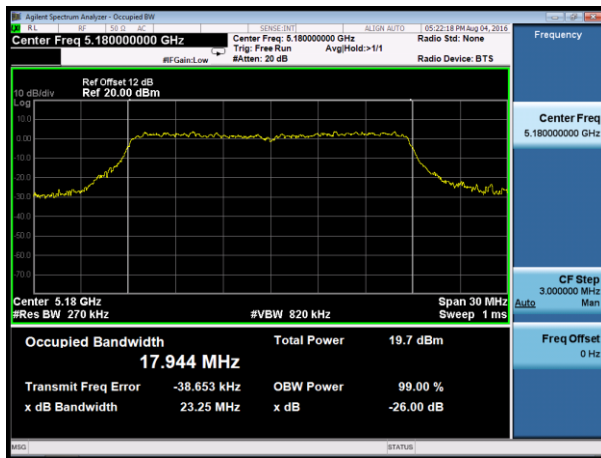


Test Item	Occupied Bandwidth
Test Mode	Transmit by 802.11n(20MHz)
Test Date	2016-08-04

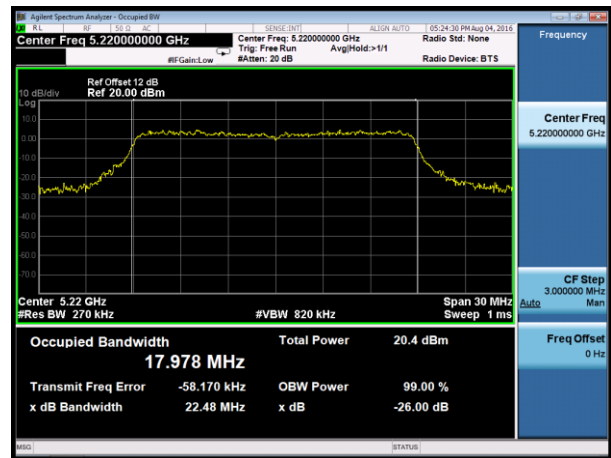
Channel No.	Frequency (MHz)	-26dB Measurement Level(MHz)	99% Occupied Bandwidth (MHz)	Result
36	5180	23.25	17.944	Pass
44	5220	22.48	17.978	Pass
48	5240	27.22	17.999	Pass
149	5745	24.43	17.939	Pass
157	5785	25.31	18.016	Pass
165	5825	26.11	18.064	Pass



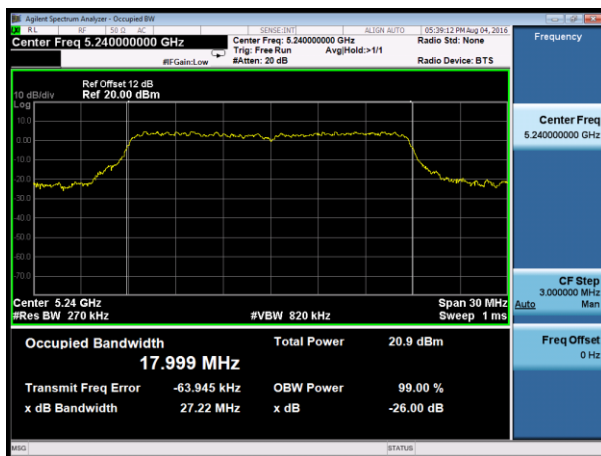
Channel 36 (5180MHz)



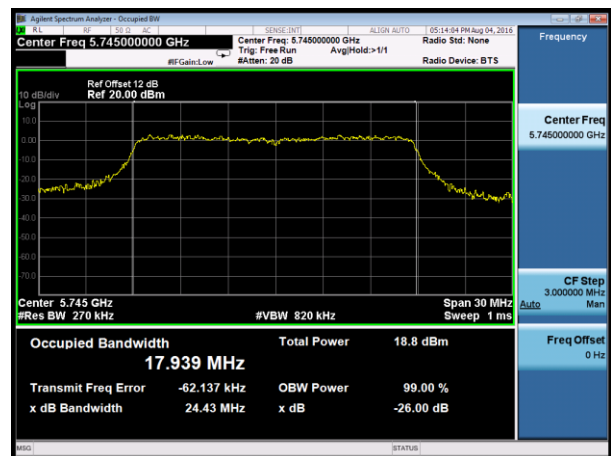
Channel 44 (5220MHz)



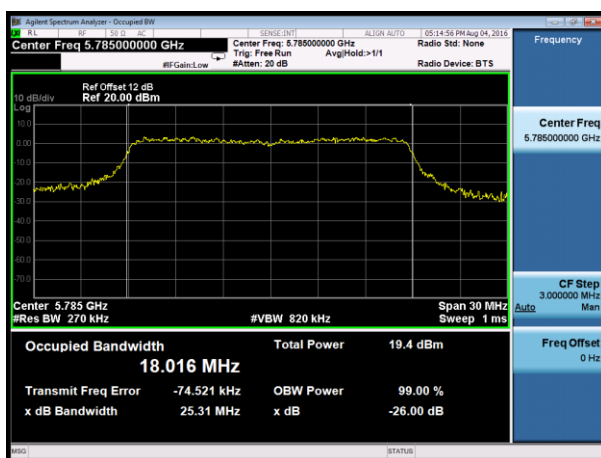
Channel 48 (5240MHz)



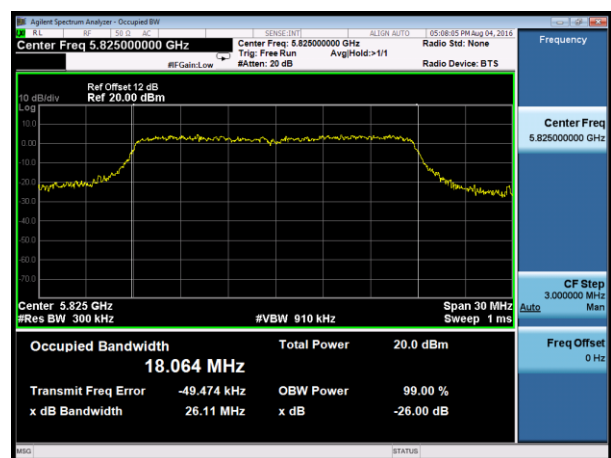
Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)



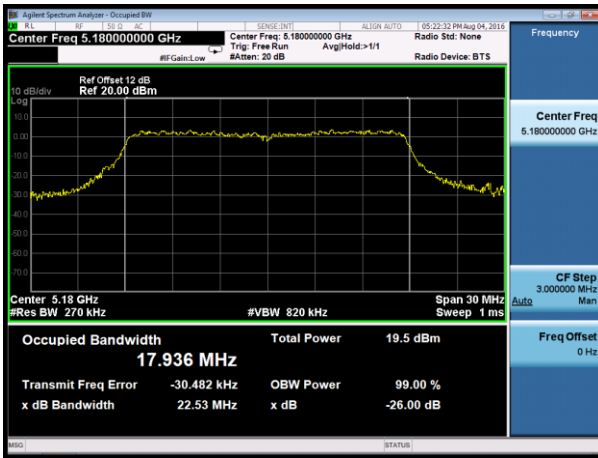


Test Item	Occupied Bandwidth
Test Mode	Transmit by 802.11ac(20MHz)
Test Date	2016-08-04

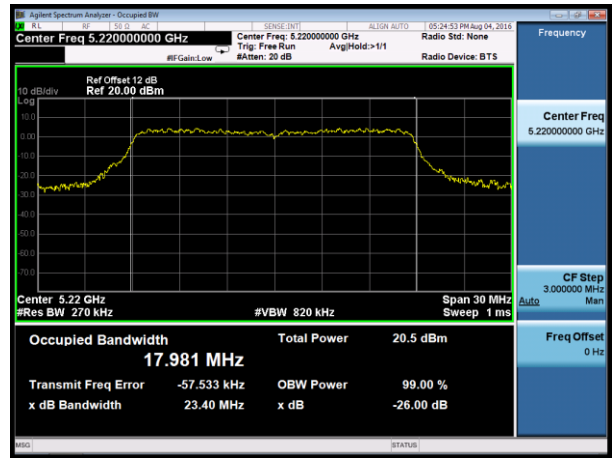
Channel No.	Frequency (MHz)	-26dB Measurement Level(MHz)	99% Occupied Bandwidth (MHz)	Result
36	5180	22.53	17.936	Pass
44	5220	23.40	17.981	Pass
48	5240	25.02	17.971	Pass
149	5745	24.47	17.973	Pass
157	5785	25.07	18.005	Pass
165	5825	26.20	18.061	Pass



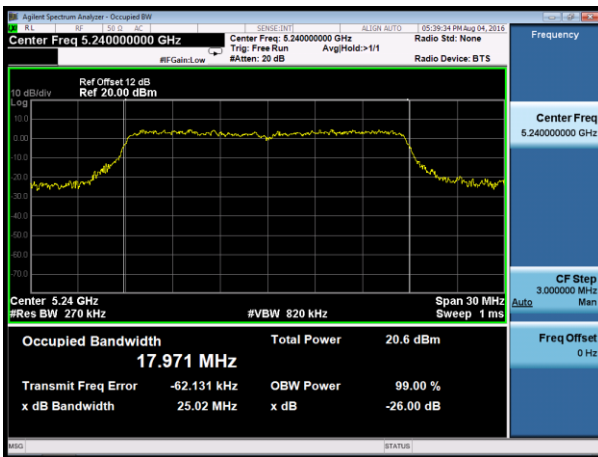
Channel 36 (5180MHz)



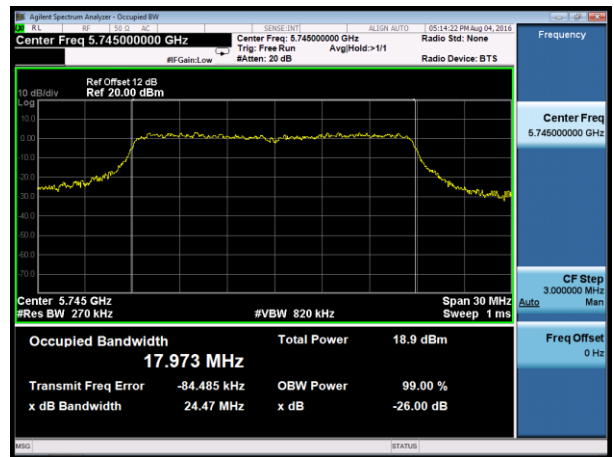
Channel 44 (5220MHz)



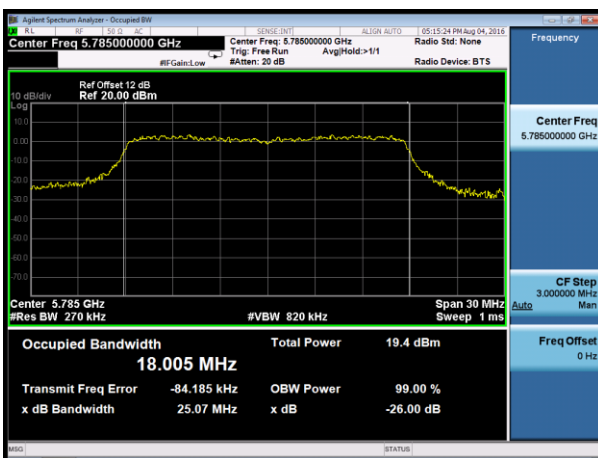
Channel 48 (5240MHz)



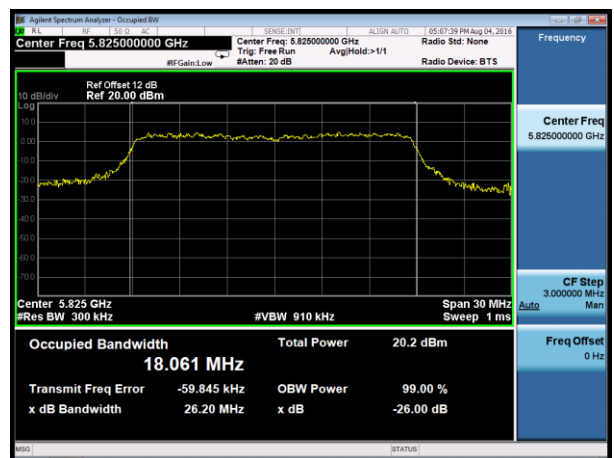
Channel 149 (5745MHz)



Channel 157 (5785MHz)



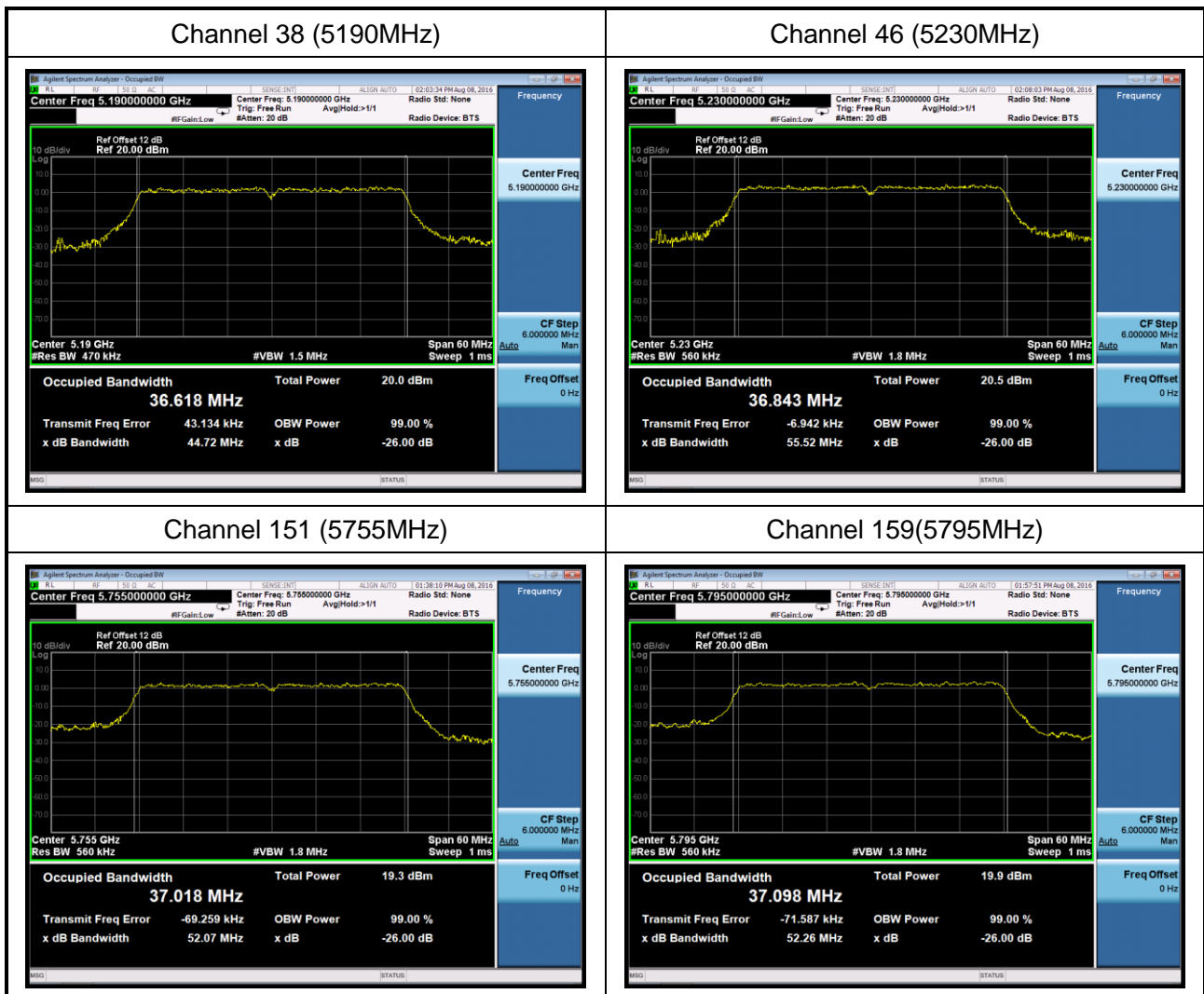
Channel 165 (5825MHz)





Test Item	Occupied Bandwidth
Test Mode	Transmit by 802.11n(40MHz)
Test Date	2016-08-04

Channel No.	Frequency (MHz)	-26dB Measurement Level(MHz)	99% Occupied Bandwidth (MHz)	Result
38	5190	44.72	36.618	Pass
46	5230	55.52	36.843	Pass
151	5755	52.07	37.018	Pass
159	5795	52.26	37.098	Pass





Test Item	Occupied Bandwidth
Test Mode	Transmit by 802.11ac(40MHz)
Test Date	2016-08-04

Channel No.	Frequency (MHz)	-26dB Measurement Level(MHz)	99% Occupied Bandwidth (MHz)	Result
38	5190	44.35	36.641	Pass
46	5230	56.30	36.903	Pass
151	5755	52.15	37.051	Pass
159	5795	52.39	37.103	Pass

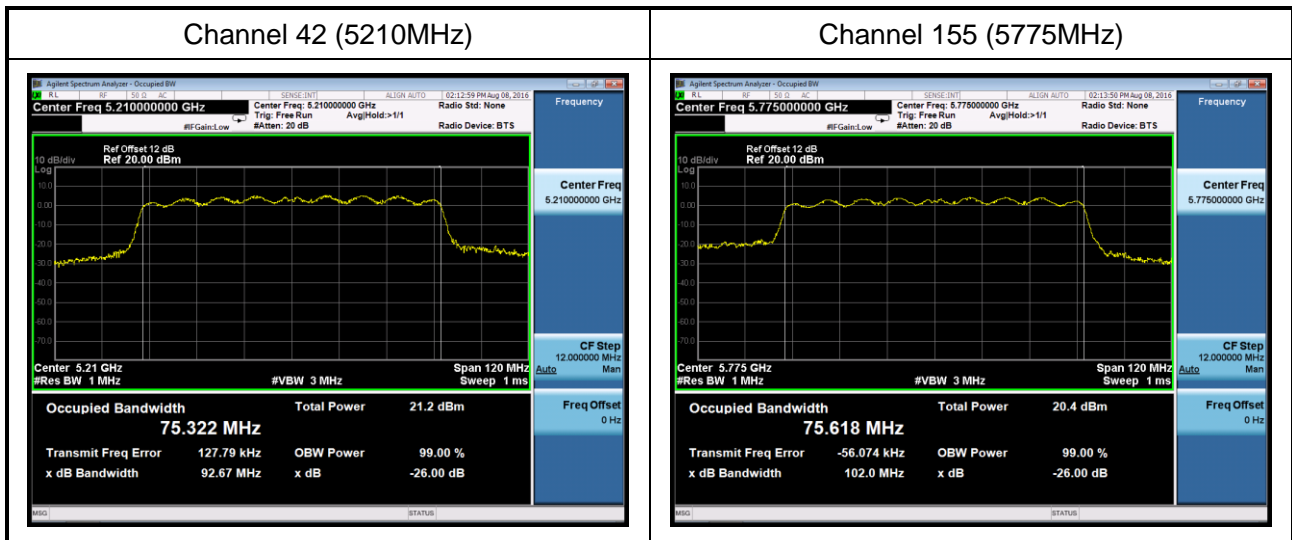






Test Item	Occupied Bandwidth
Test Mode	Transmit by 802.11ac(80MHz)
Test Date	2016-08-04

Channel No.	Frequency (MHz)	-26dB Measurement Level(MHz)	99% Occupied Bandwidth (MHz)	Result
42	5210	92.67	75.322	Pass
155	5775	102.00	75.618	Pass





## 6. 6dB Bandwidth Measurement

### 6.1 Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Calibration Date	Valid Date.
Spectrum Analyzer	Agilent	N9010A	MY53400169	2014.11.03	2015.11.03
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-003	2015.03.31	2016.03.30

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

### 6.2 Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

### 6.3 Test Procedure used

KDB 789033 D02v01r02 – Section C.2

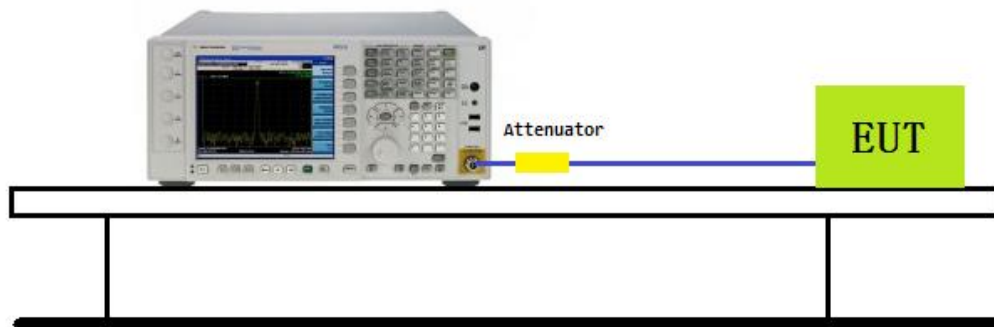
### 6.4 Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW  $\cong$  3  $\times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. 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.



### 6.5 Test Setup

## Spectrum Analyzer



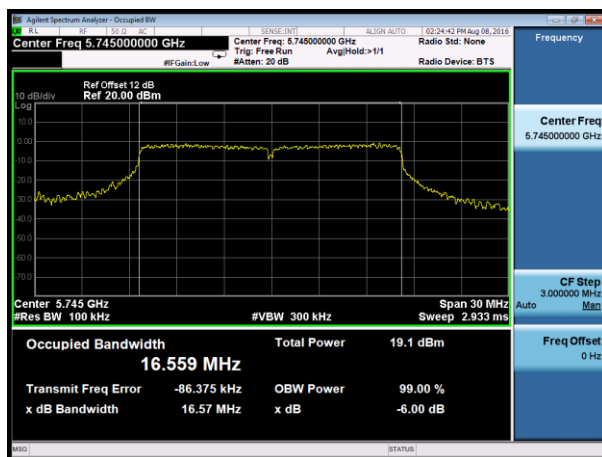


### 6.6 Test Result

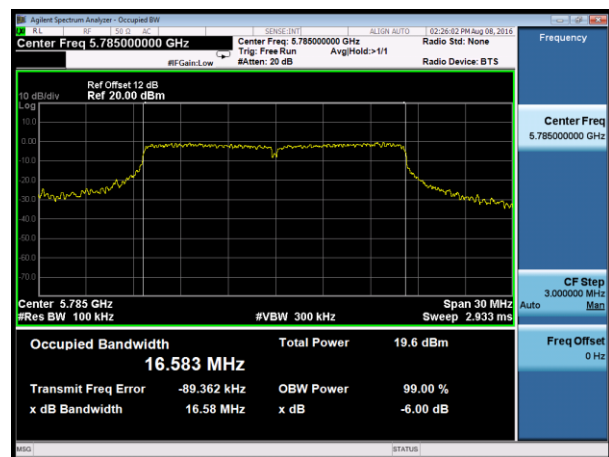
Test Item	6dB Bandwidth Measurement
Test Mode	Transmit by 802.11a
Test Date	2016-08-08

Channel No.	Frequency (MHz)	Measurement Level (MHz)	Result
149	5745	16.57	Pass
157	5785	16.58	Pass
165	5825	16.57	Pass

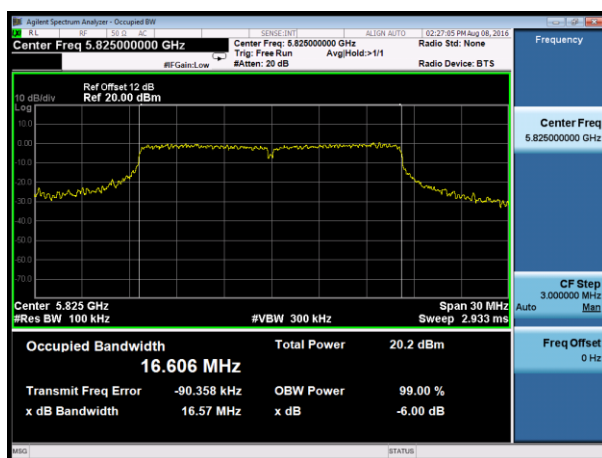
Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)





Test Item	6dB Bandwidth Measurement
Test Mode	Transmit by 802.11n(20MHz)
Test Date	2016-08-08

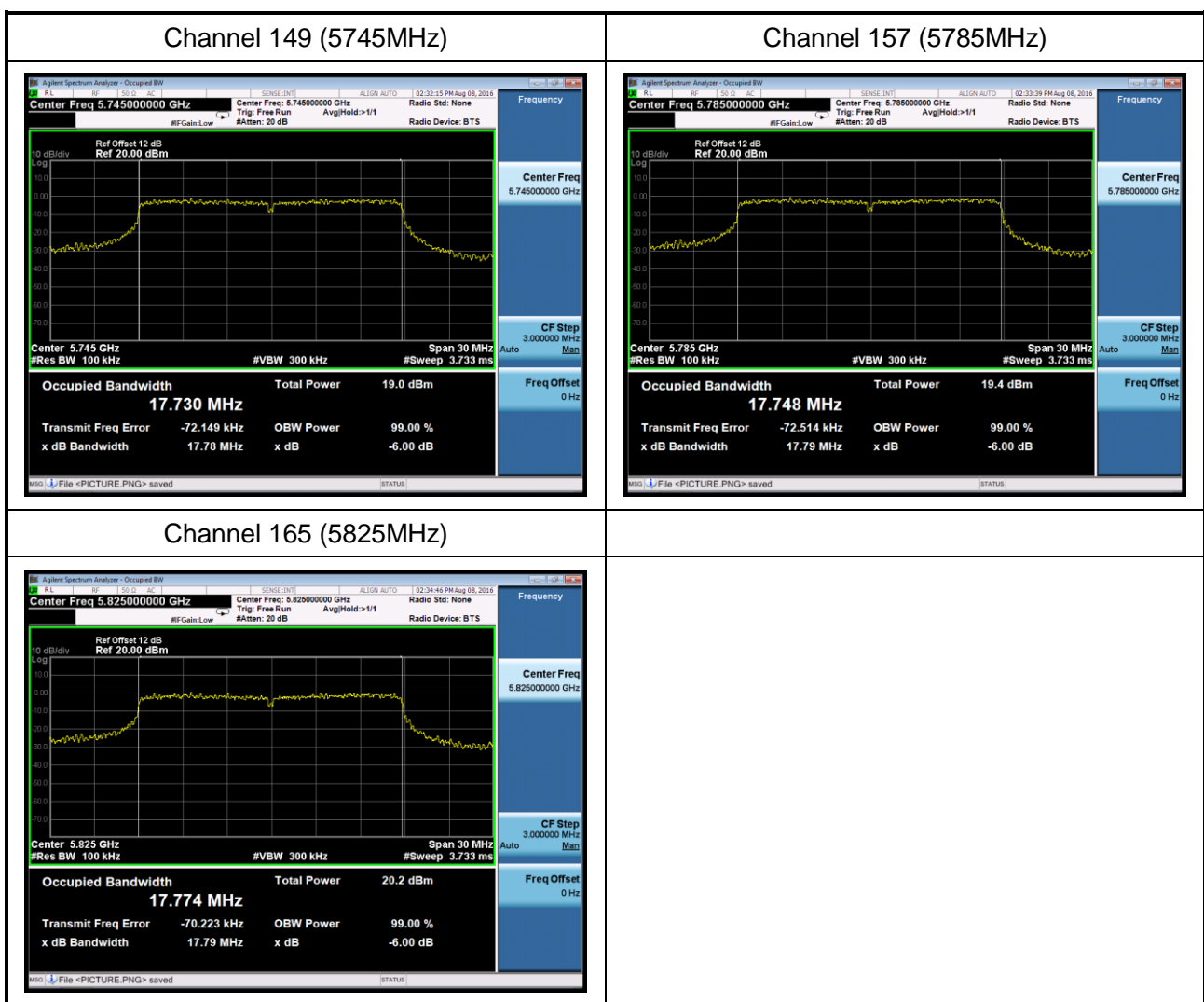
Channel No.	Frequency (MHz)	Measurement Level (MHz)	Result
149	5745	17.81	Pass
157	5785	17.81	Pass
165	5825	17.78	Pass





Test Item	6dB Bandwidth Measurement
Test Mode	Transmit by 802.11ac(20MHz)
Test Date	2016-08-08

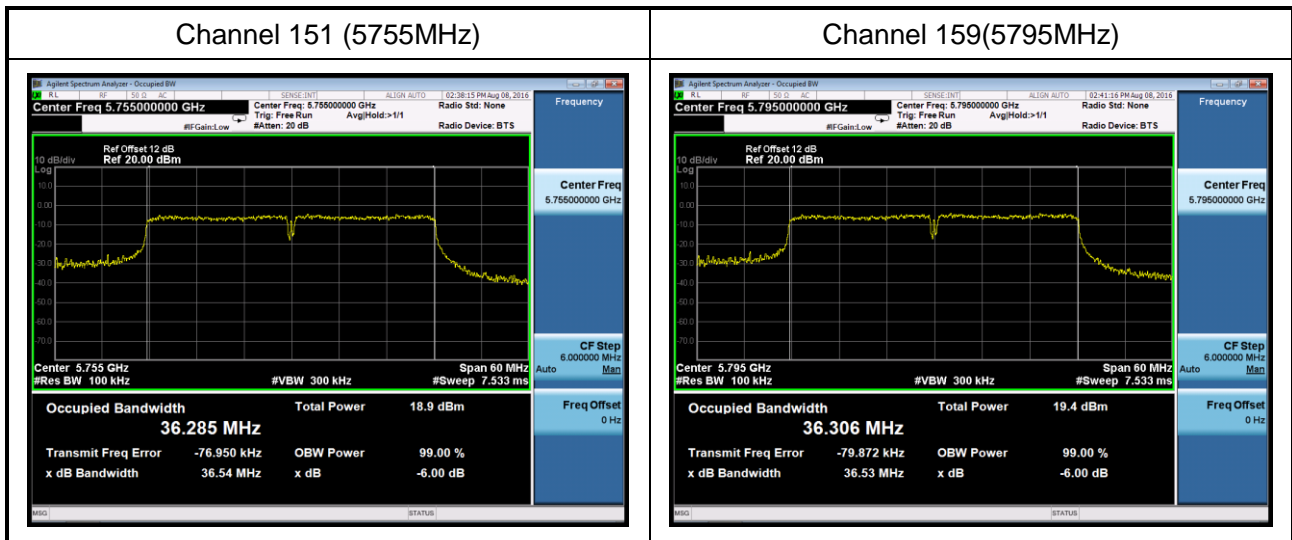
Channel No.	Frequency (MHz)	Measurement Level (MHz)	Result
149	5745	17.78	Pass
157	5785	17.79	Pass
165	5825	17.79	Pass





Test Item	6dB Bandwidth Measurement
Test Mode	Transmit by 802.11n(40MHz)
Test Date	2016-08-08

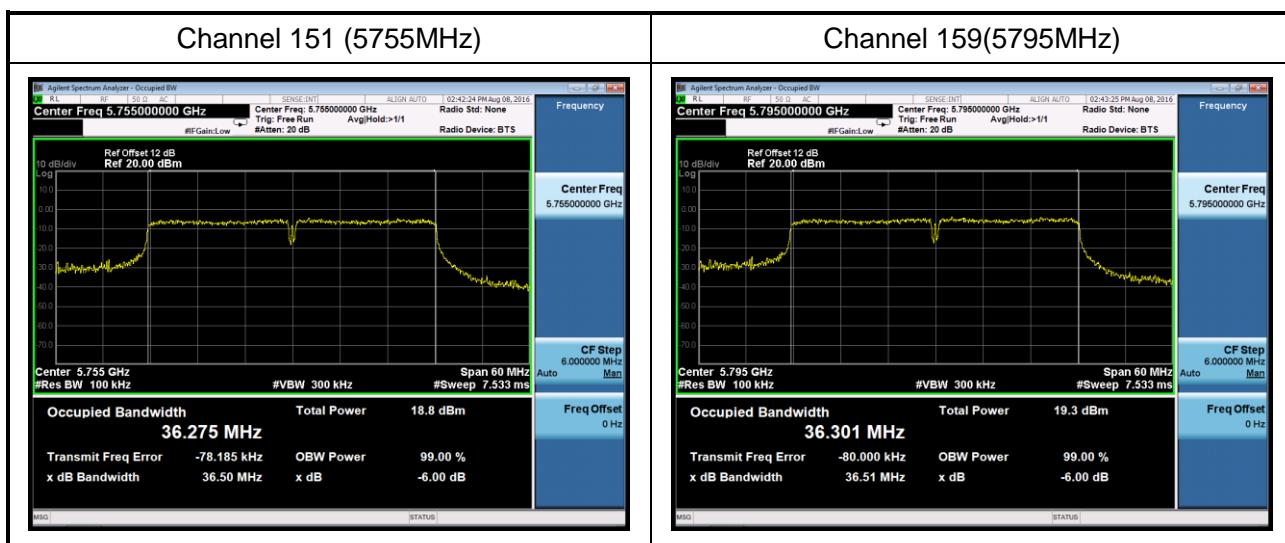
Channel No.	Frequency (MHz)	Measurement Level (MHz)	Result
151	5755	36.54	Pass
159	5795	36.53	Pass





Test Item	6dB Bandwidth Measurement
Test Mode	Transmit by 802.11ac(40MHz)
Test Date	2016-08-08

Channel No.	Frequency (MHz)	Measurement Level (MHz)	Result
151	5755	36.50	Pass
159	5795	36.51	Pass

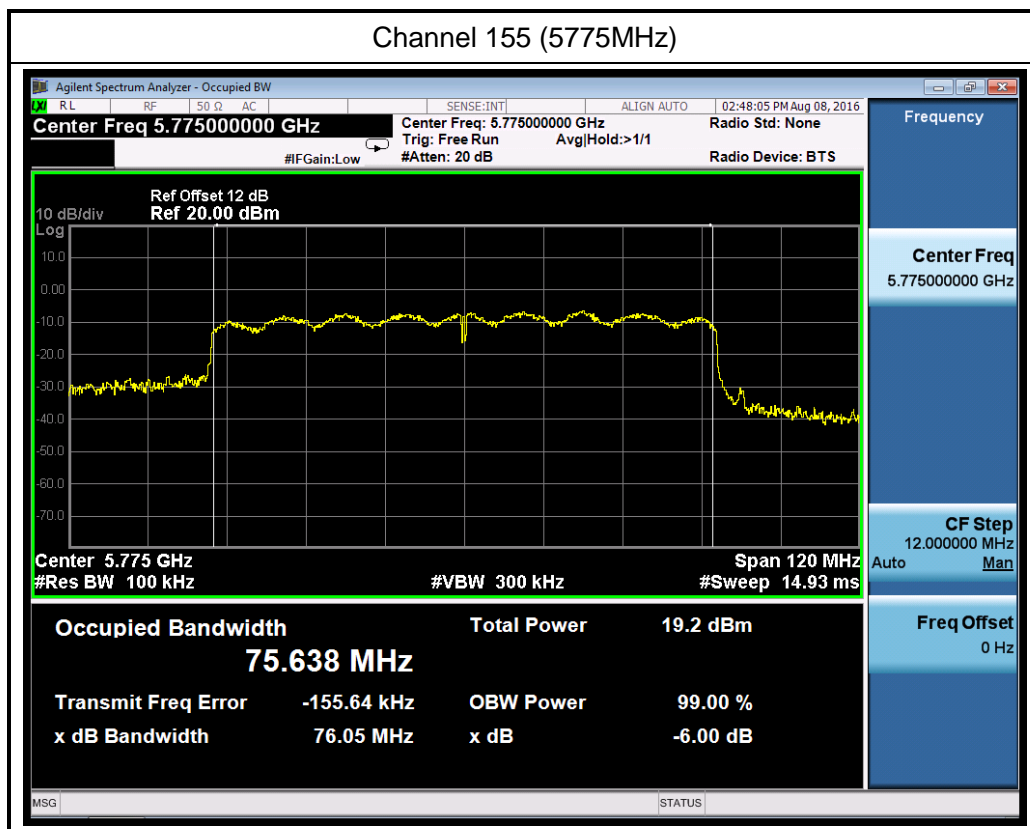






Test Item	6dB Bandwidth Measurement
Test Mode	Transmit by 802.11ac(80MHz)
Test Date	2016-08-08

Channel No.	Frequency (MHz)	Measurement Level (MHz)	Result
155	5775	76.05	Pass





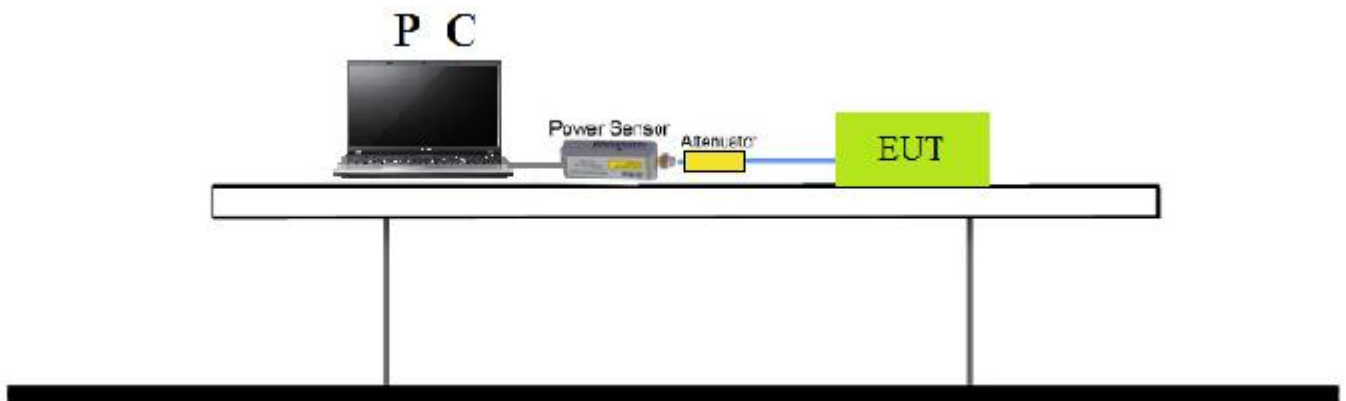
## 7. Power Output

### 7.1 Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Calibration Date	Valid Date.
PC	Lenovo	E40-70	MP078UQV	N/A	N/A
POWER SENSOR	Agilent	U2021XA	MY53260020	2015/03/27	2016/03/26
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-003	2015.03.31	2016.03.30

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

### 7.2 Test Setup





### 7.3 Limit

#### For FCC 15.407 Power Limit:

- For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).. If transmitting antenna of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
- For the band 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antenna of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
- For the band 5.725-5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10log B, where B is the 26 dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antenna with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power for each 1 dB of antenna gain in excess of 23 dBi would be required.



#### **7.4 Test Procedure**

The EUT was tested according to KDB 789033 D02v01r02-Section E.3.a for compliance to FCC 47CFR 15.407 requirements.

Use the wideband power meter to test RMS power and record the result.



## 7.5 Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (yellow marker) for final test of each channel.

MCS Index for 802.11n	Spatial Streams	Data Rate (Mbps)				
		802.11a	20MHz Bandwidth		40MHz Bandwidth	
			800ns GI	400ns GI	800ns GI	400ns GI
0	1	6	6.5	7.2	13.5	15.0
1	1	9	13.0	14.4	27.0	30.0
2	1	12	19.5	21.7	40.5	45.0
3	1	18	26.0	28.9	54.0	60.0
4	1	24	39.0	43.3	81.0	90.0
5	1	36	52.0	57.8	108.0	120.0
6	1	48	58.5	65.0	121.5	135.0
7	1	54	65.0	72.2	135.0	150.0

Spatial Streams	MCS Index	Modulation type	Coding rate	Data Rate(Mb/s)							
				20MHz		40MHz		80MHz		160MHz	
				Guard Interval		Guard Interval		Guard Interval		Guard Interval	
				800ns	400ns	800ns	400ns	800ns	400ns	800ns	400ns
1	0	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	58.5	65
	1	QPSK	1/2	13	14.4	27	30	58.5	65	117	130
	2	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	175.5	195
	3	16-QAM	1/2	26	28.9	54	60	117	130	234	260
	4	16-QAM	3/4	39	43.3	81	90	175.5	195	351	390
	5	64-QAM	2/3	52	57.8	108	120	234	260	468	520
	6	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585
	7	64-QAM	5/6	65	72.2	135	150	292.5	325	585	650
	8	256-QAM	3/4	78	86.7	162	180	351	390	702	780
	9	256-QAM	5/6	N/A	N/A	180	200	390	433.3	780	866.7

**Power output at various data rates**

Test Mode	Bandwidth	Frequency (MHz)	Channel	Data Rate	Average Power (dBm)
802.11a	20	5180	36	6	13.67
				24	13.33
				54	13.54
802.11n(20MHz)	20	5180	36	MCS0	13.54
				MCS3	13.12
				MCS7	13.36
802.11ac(20MHz)	20	5180	36	MCS0NSS1	13.45
				MCS5NSS1	13.22
				MCS9NSS1	13.43
802.11n(40MHz)	40	5190	38	MCS0	13.39
				MCS3	13.27
				MCS7	13.31
802.11ac(40MHz)	40	5190	38	MCS0NSS1	13.42
				MCS5NSS1	13.33
				MCS9NSS1	13.21
802.11ac(80MHz)	80	5210	42	MCS0NSS1	12.52
				MCS5NSS1	12.11
				MCS9NSS1	12.47



Test Mode	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)	Result
802.11a	6	36	5180	13.67	30	Pass
		44	5220	14.41	30	Pass
		48	5240	14.44	30	Pass
		149	5745	12.97	30	Pass
		157	5785	13.33	30	Pass
		165	5825	14.24	30	Pass
802.11n(20MHz)	Mcs0	36	5180	13.54	30	Pass
		44	5220	14.38	30	Pass
		48	5240	14.54	30	Pass
		149	5745	12.99	30	Pass
		157	5785	13.22	30	Pass
		165	5825	14.13	30	Pass
802.11ac(20MHz)	MCS0NSS1	36	5180	13.45	30	Pass
		44	5220	14.25	30	Pass
		48	5240	14.47	30	Pass
		149	5745	12.84	30	Pass
		157	5785	13.28	30	Pass
		165	5825	14.12	30	Pass
802.11n(40MHz)	Mcs0	38	5190	13.39	30	Pass
		46	5230	14.03	30	Pass
		151	5755	12.54	30	Pass
		159	5795	13.12	30	Pass
802.11ac(40MHz)	MCS0NSS1	38	5190	13.42	30	Pass
		46	5230	14.11	30	Pass
		151	5755	12.53	30	Pass
		159	5795	13.16	30	Pass
802.11ac(80MHz)	MCS0NSS1	42	5210	12.52	30	Pass
		155	5775	13.41	30	Pass



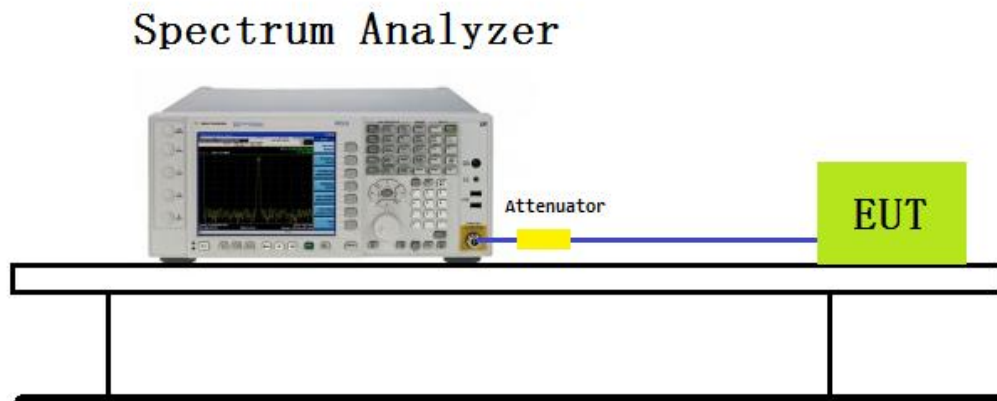
## 8. Power Spectral Density

### 8.1 Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Calibration Date	Valid Date.
Spectrum Analyzer	Agilent	N9010A	MY53400169	2014.11.03	2015.11.03
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-003	2015.03.31	2016.03.30

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

### 8.2 Test Setup







### 8.3 Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.



## 8.4 Test Procedure

According to KDB789033 D02v01r02-Section E.2.b)- Method SA-1 .

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz, RBW = 100 kHz
4. VBW = 3MHz
5. Number of sweep points  $\geq 2 \times (\text{span} / \text{RBW})$
6. Detector = power averaging (RMS)
7. Sweep time = auto
8. Trigger = free run
9. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
10. Add  $10 \cdot \log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \cdot \log(1/0.25) = 6 \text{ dB}$  if the duty cycle is 25 percent.
11. When the measurement bandwidth of Maximum PSD is specified in 500 kHz, add a constant factor  $10 \cdot \log(500\text{kHz}/100\text{kHz}) = 7 \text{ dB}$  to the measured result.



## 8.5 Test Result

Test Mode	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Duty Cycle(%)	Total PSD	Limit	Result
802.11a	6	36	5180	100	7.68	17	Pass
		44	5220		8.52	17	Pass
		48	5240		8.57	17	Pass
802.11n (20MHz)	Mcs0	36	5180	100	7.43	17	Pass
		44	5220		8.18	17	Pass
		48	5240		8.36	17	Pass
802.11ac (20MHz)	MCS0NSS1	36	5180	100	7.47	17	Pass
		44	5220		8.25	17	Pass
		48	5240		8.34	17	Pass
802.11n (40MHz)	Mcs0	38	5190	100	4.90	17	Pass
		46	5230		5.22	17	Pass
802.11ac (40MHz)	MCS0NSS1	38	5190	100	4.50	17	Pass
		46	5230		5.28	17	Pass
802.11ac (80MHz)	MCS0NSS1	42	5210	100	3.12	17	Pass

Note: When EUT duty cycle < 98%, the total PSD =  $10 \cdot \log\{10(\text{Ant 0 PSD}/10) + 10(\text{Ant 1 PSD}/10)\} + 10 \cdot \log(1/\text{duty cycle})$



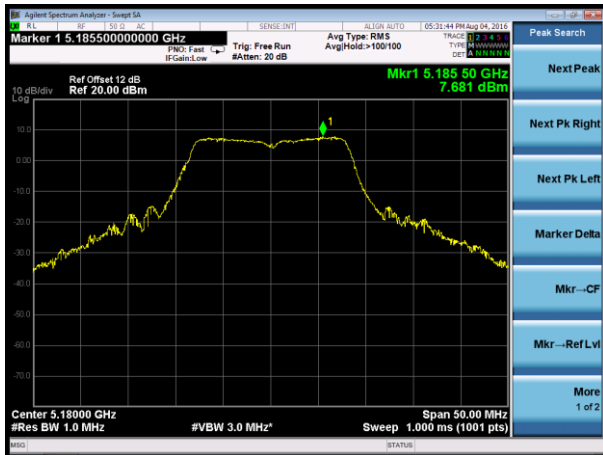
Test Mode	Data Rate (Mbps)	CH.	Freq. (MHz)	Duty Cycle(%)	Constant Factor	Total PSD	Limit	Result
802.11a	6	149	5745	100	7	4.56	30	Pass
		157	5785		7	5.07	30	Pass
		165	5825		7	6.00	30	Pass
802.11n (20MHz)	Mcs0	149	5745	100	7	5.11	30	Pass
		157	5785		7	6.03	30	Pass
		165	5825		7	5.80	30	Pass
802.11ac (20MHz)	MCS0NSS1	149	5745	100	7	4.65	30	Pass
		157	5785		7	6.12	30	Pass
		165	5825		7	6.09	30	Pass
802.11n (40MHz)	Mcs0	151	5755	100	7	1.24	30	Pass
		159	5795		7	1.65	30	Pass
802.11ac (40MHz)	MCS0NSS1	151	5755	100	7	1.31	30	Pass
		159	5795		7	1.77	30	Pass
802.11ac (80MHz)	MCS0NSS1	155	5775	100	7	8.63	30	Pass

Note: When EUT duty cycle < 98%, the total PSD =  $10 \cdot \log\{10(\text{Ant 0 PSD}/10) + 10(\text{Ant 1 PSD}/10)\} + 10 \cdot \log(1/\text{duty cycle}) + \text{Constant Factor}$ .



802.11a Power Spectral Density

Channel 36 (5180MHz)



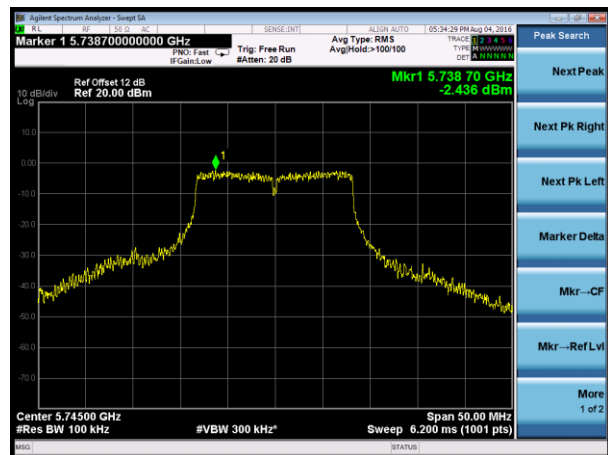
Channel 40 (5200MHz)



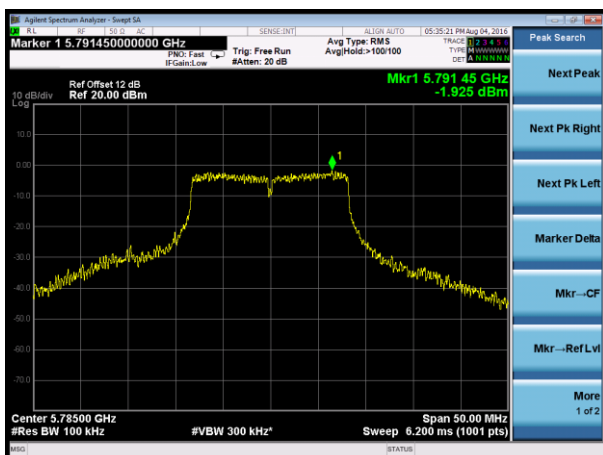
Channel 48 (5240MHz)



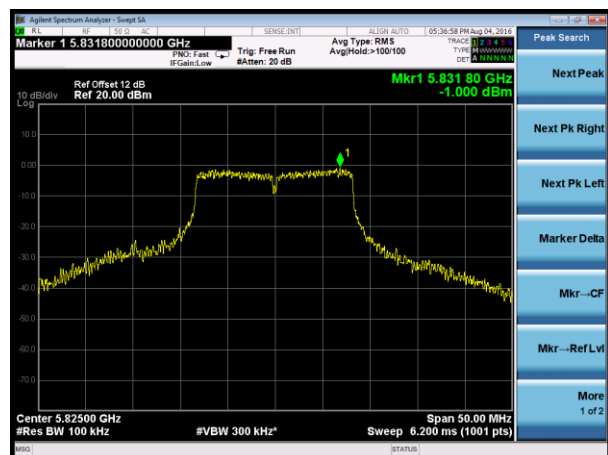
Channel 149 (5745MHz)



Channel 157 (5785MHz)



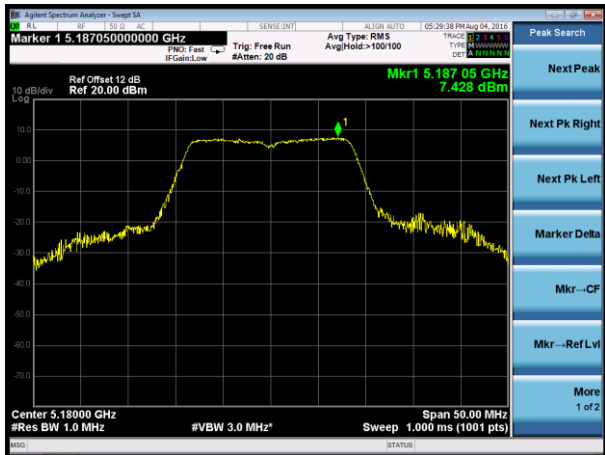
Channel 165 (5825MHz)



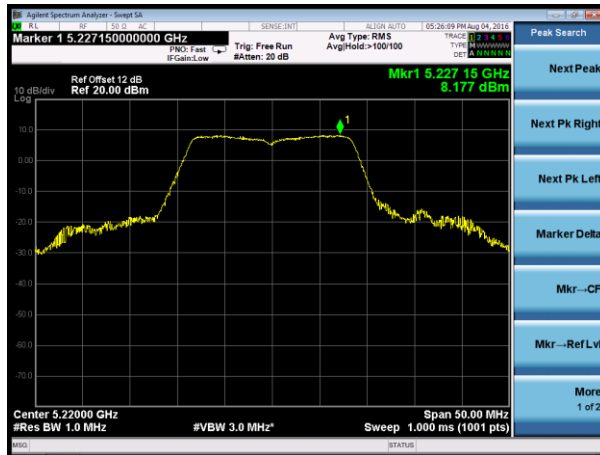


802.11n(20MHz) Power Spectral Density

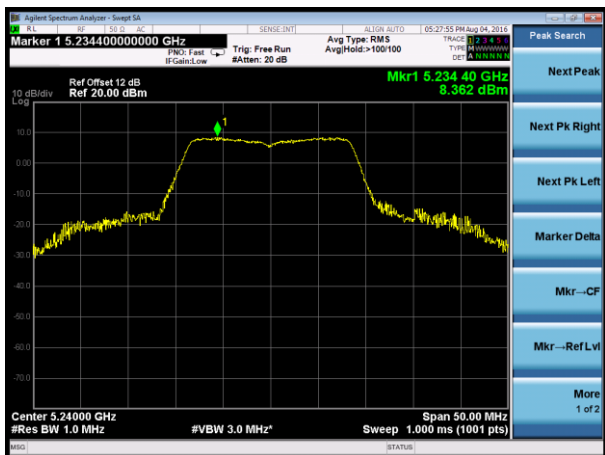
Channel 36 (5180MHz)



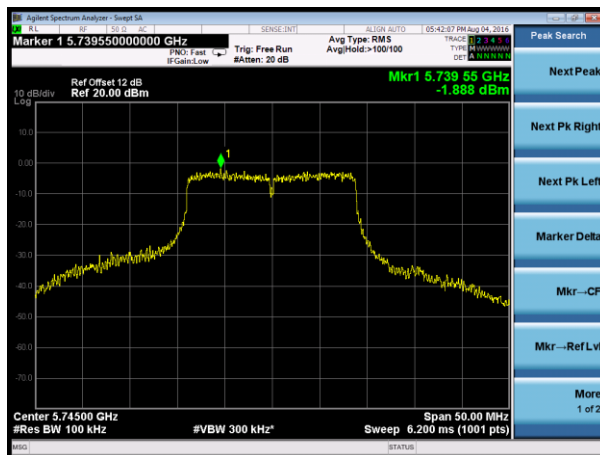
Channel 44 (5220MHz)



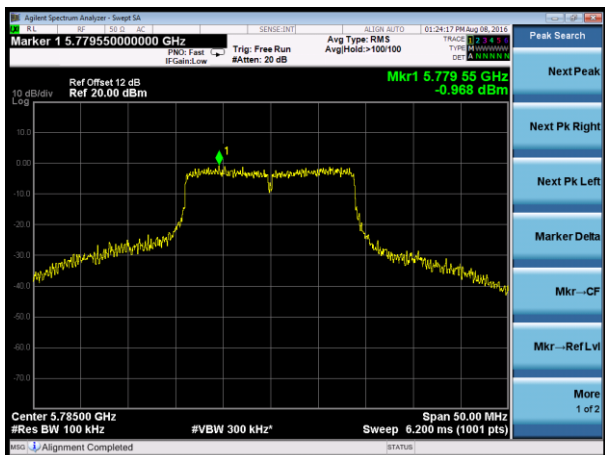
Channel 48 (5240MHz)



Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)

