

6. 6dB &26dB Bandwidth Test

6.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY53311015	Oct.15,17	1 Year
2.	Attenuator (20dB)	Agilent	8491B	MY39262165	Apr.27,17	1 Year
3.	RF Cable	Marvelous Microwave Inc	SFL402105FLEX	NO.1	Oct.15,17	1 Year

6.2.Limit

6dB Bandwidth should be not less than 500kHz

6.3.Test Procedure

6dB Bandwidth:

The transmitter output was connected to a spectrum analyzer, The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300 KHz VBW for signal width below 20MHz and 300KHz RBW ,1MHz VBW for Above 20MHz signal Bandwidth.

26dB Bandwidth:

The transmitter output was connected to a spectrum analyzer, The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300 KHz VBW The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

6.4.Test Results

5180-5240MHz Band:
6dB bandwidth

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-18	Pressure: 102.4±1.0 kpa	Humidity:52.6±3.0%
Tested by: Kayle	Test site: RF site	Temperature:23.2±0.6 °C

Test Mode	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)
11a	5180	16.27	≥ 500
	5200	16.39	≥ 500
	5240	16.30	≥ 500
11n HT20	5180	17.60	≥ 500
	5200	17.60	≥ 500
	5240	17.61	≥ 500
11n HT40	5190	35.73	≥ 500
	5230	36.26	≥ 500
11ac VHT20	5180	17.63	≥ 500
	5200	17.61	≥ 500
	5240	17.63	≥ 500
11ac VHT40	5190	36.30	≥ 500
	5230	36.00	≥ 500
11ac VHT80	5210	76.43	≥ 500

Conclusion: PASS

26dB bandwidth

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-18	Pressure: 102.4±1.0 kpa	Humidity:52.6±3.0%
Tested by: Kayle	Test site: RF site	Temperature:23.2±0.6 °C

Test Mode	Frequency (MHz)	26dB Bandwidth (MHz)	Limit (KHz)
11a	5180	19.50	N/A
	5200	19.48	N/A
	5240	18.90	N/A
11n HT20	5180	19.51	N/A
	5200	19.58	N/A
	5240	19.67	N/A
11n HT40	5190	39.13	N/A
	5230	39.12	N/A
11ac VHT20	5180	19.63	N/A
	5200	19.57	N/A
	5240	19.64	N/A
11ac VHT40	5190	39.44	N/A
	5230	39.12	N/A
11ac VHT80	5210	79.64	N/A
Conclusion: PASS			

5745-5825MHz Band:
6dB bandwidth

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-19	Pressure: 102.4±1.0 kpa	Humidity:52.6±3.0%
Tested by: Kayle	Test site: RF site	Temperature:23.2±0.6 °C

Test Mode	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)
11a	5745	16.38	≥ 500
	5785	16.41	≥ 500
	5825	16.40	≥ 500
11n HT20	5745	17.62	≥ 500
	5785	17.64	≥ 500
	5825	17.63	≥ 500
11n HT40	5755	35.69	≥ 500
	5795	36.30	≥ 500
11ac VHT20	5745	17.59	≥ 500
	5785	17.61	≥ 500
	5825	17.62	≥ 500
11ac VHT40	5755	36.00	≥ 500
	5795	36.30	≥ 500
11ac VHT80	5775	76.43	≥ 500

Conclusion: PASS

26dB bandwidth

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-19	Pressure: 102.4±1.0 kpa	Humidity:52.6±3.0%
Tested by: Kayle	Test site: RF site	Temperature:23.2±0.6 °C

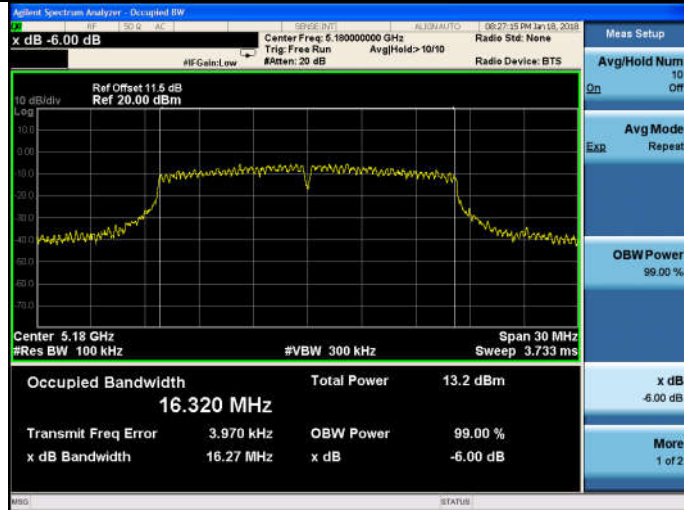
Test Mode	Frequency (MHz)	26dB Bandwidth (MHz)	Limit (KHz)
11a	5745	19.22	N/A
	5785	19.16	N/A
	5825	19.76	N/A
11n HT20	5745	19.88	N/A
	5785	19.89	N/A
	5825	19.88	N/A
11n HT40	5755	39.45	N/A
	5795	39.33	N/A
11ac VHT20	5745	19.85	N/A
	5785	19.59	N/A
	5825	19.95	N/A
11ac VHT40	5755	39.41	N/A
	5795	39.09	N/A
11ac VHT80	5775	80.39	N/A
Conclusion: PASS			

5180-5240MHz Band:

6dB bandwidth

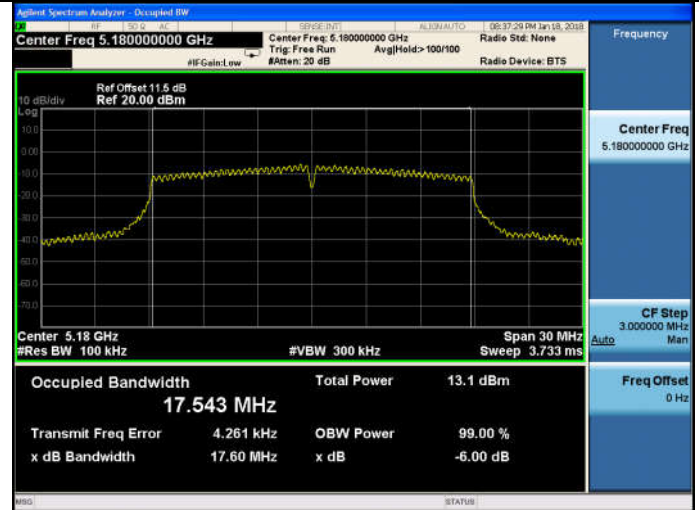
11a

5180MHz

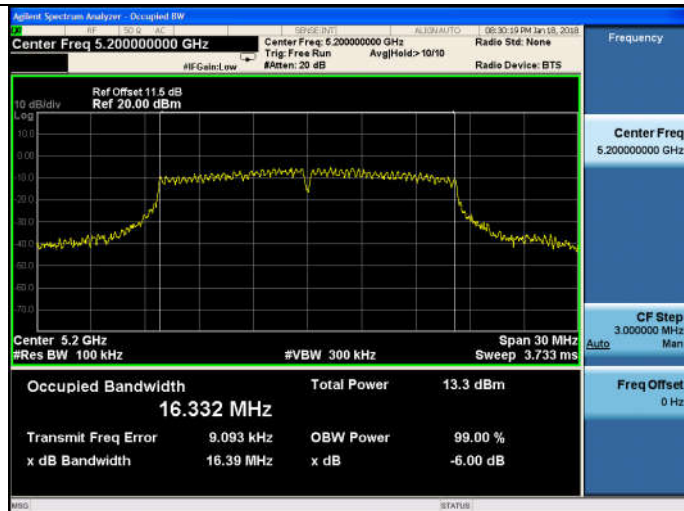


11n HT20

5180MHz



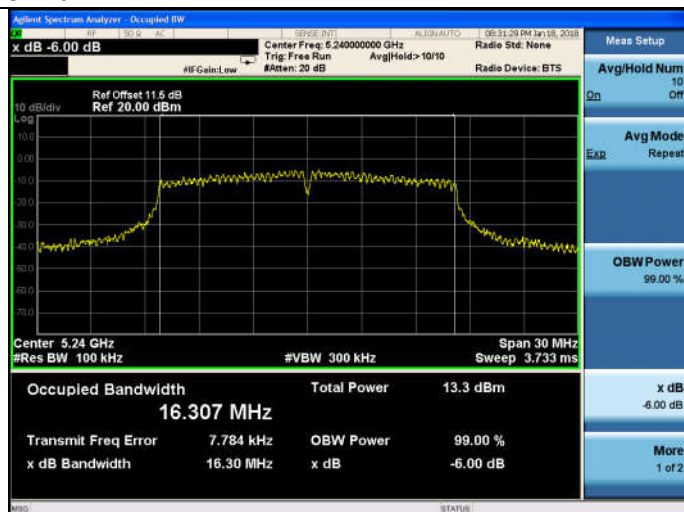
5200MHz



5200MHz



5240MHz



5240MHz

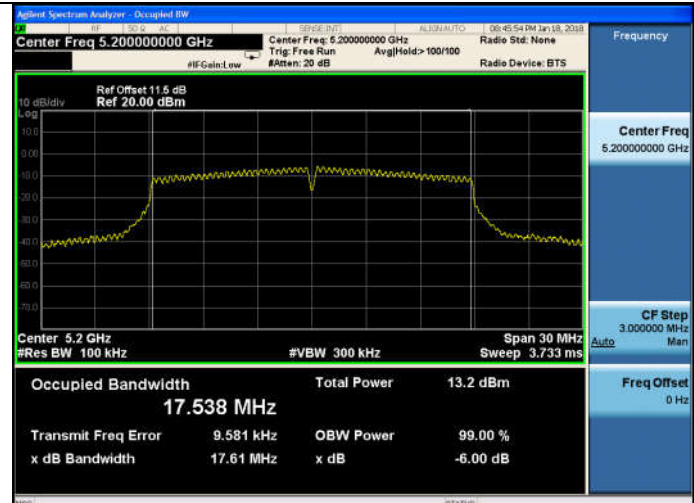


11n HT40

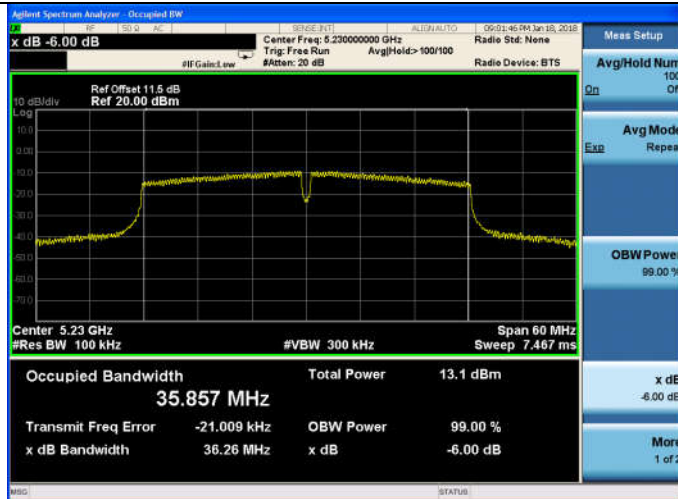
5190MHz



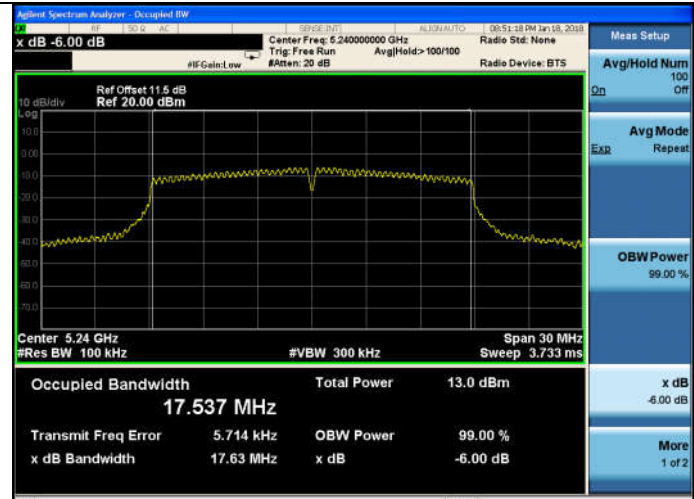
5200MHz



5230MHz



5240MHz



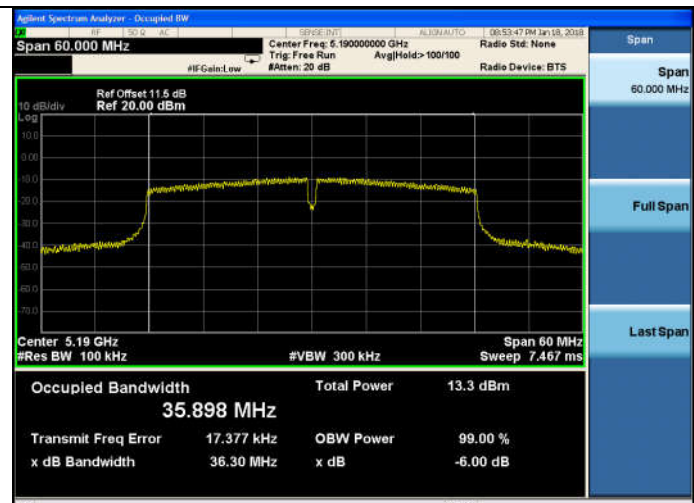
11ac VHT20

5180MHz

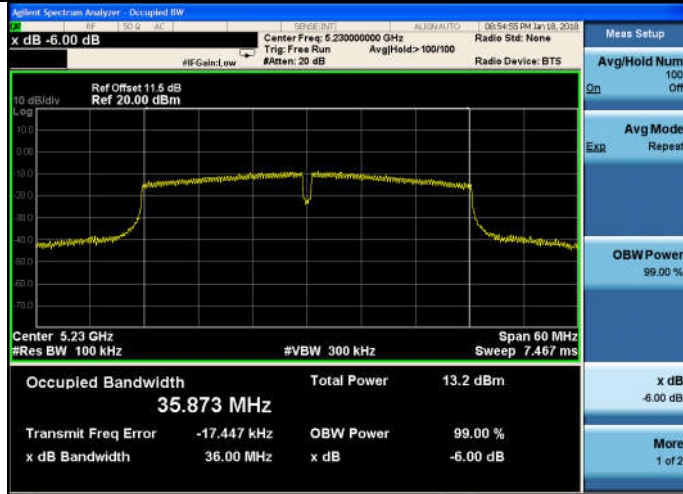


11ac VHT40

5190MHz

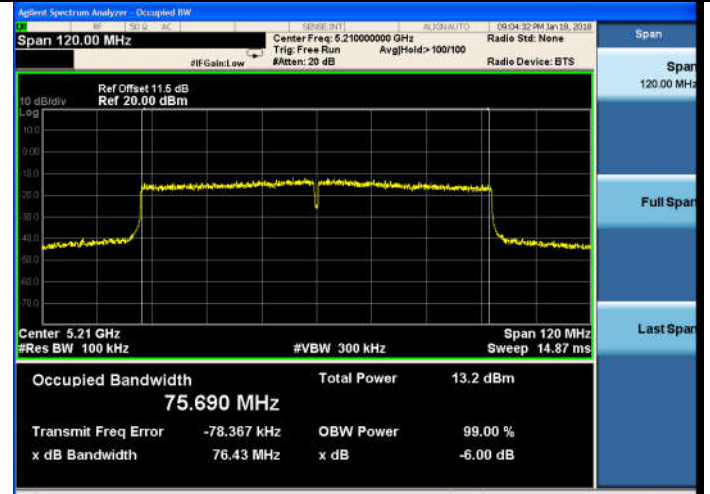


5230MHz



11ac VHT80

5210MHz

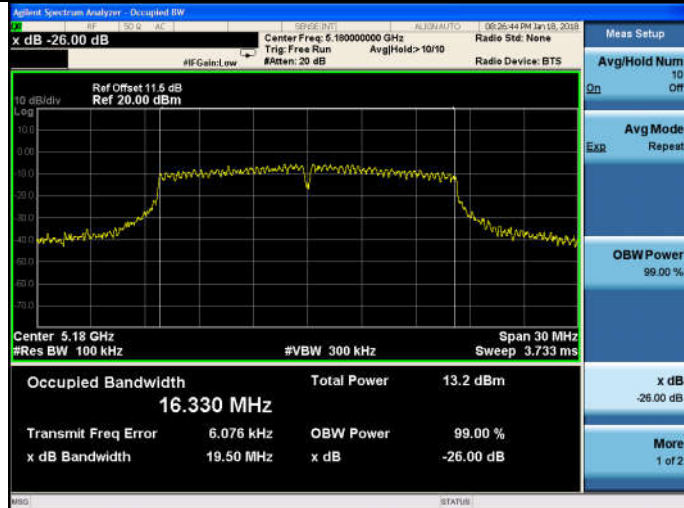


5180-5240MHz Band:

26dB bandwidth

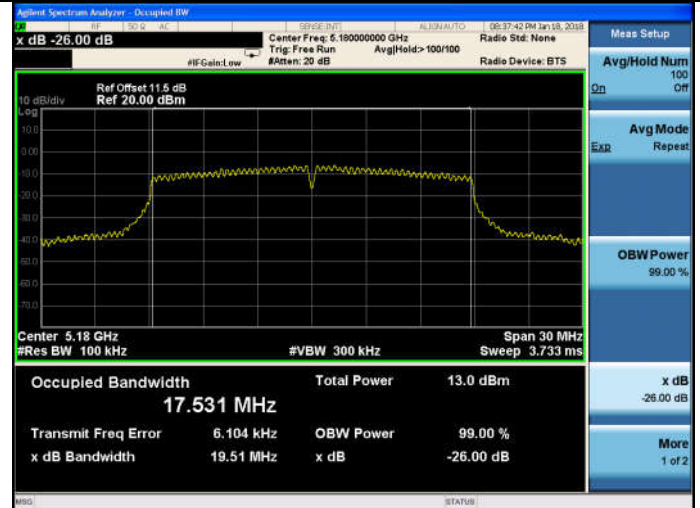
11a

5180MHz

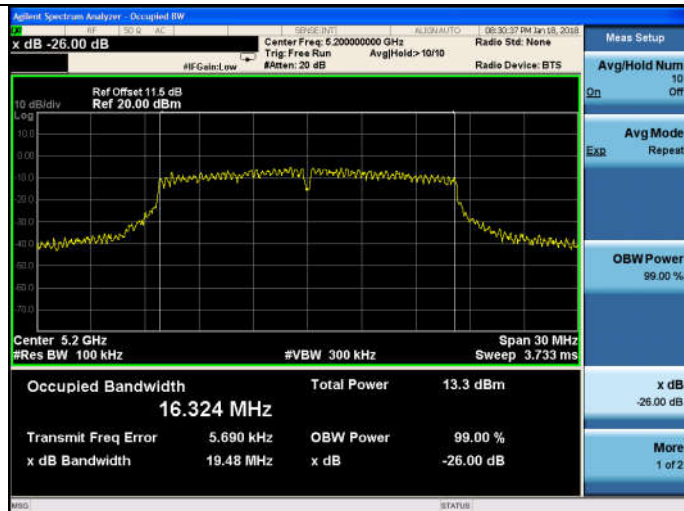


11n HT20

5180MHz



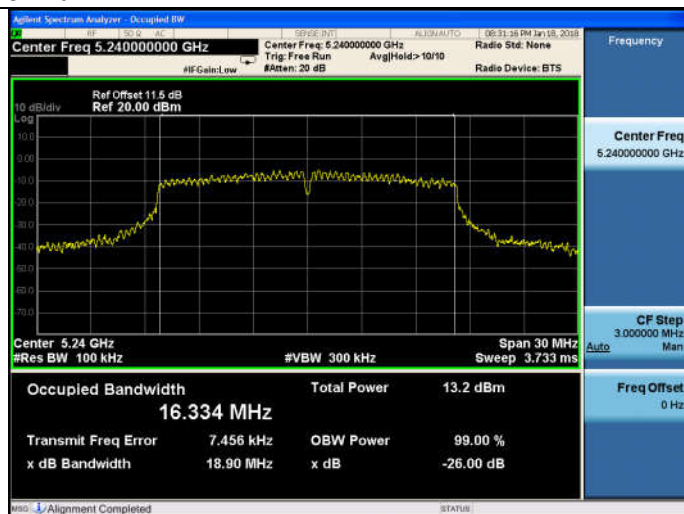
5200MHz



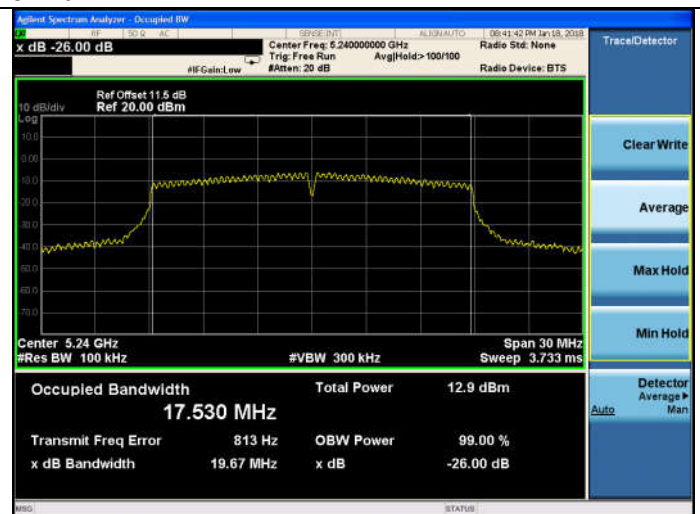
5200MHz



5240MHz



5240MHz

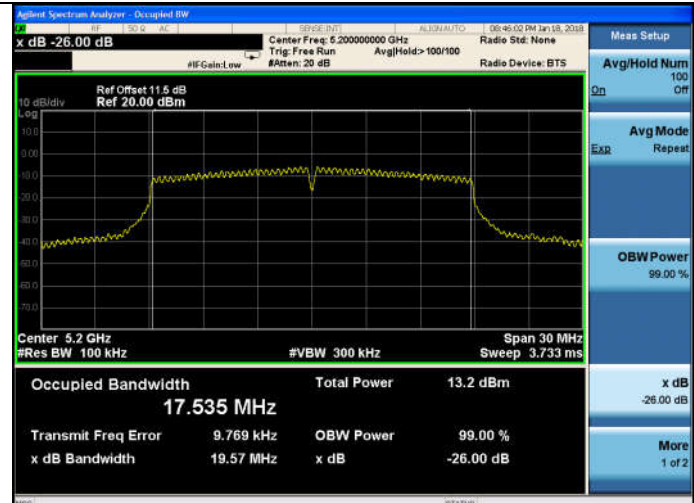


11n HT40

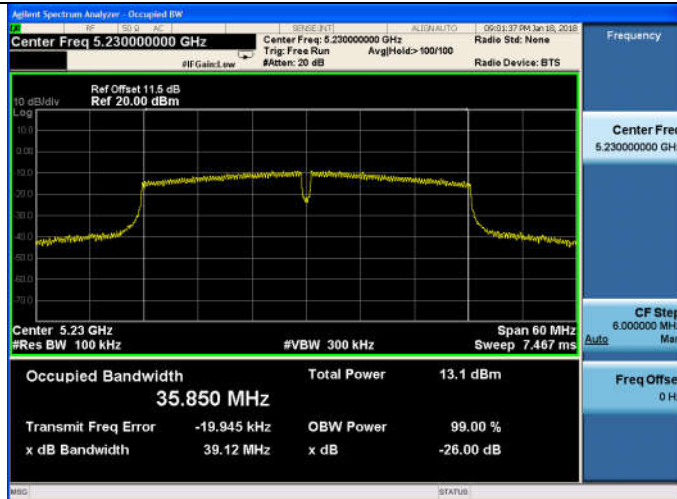
5190MHz



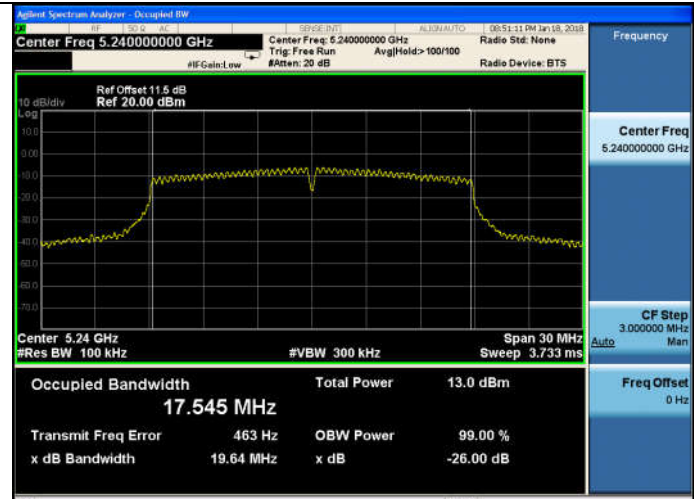
5200MHz



5230MHz



5240MHz



11ac VHT20

5180MHz

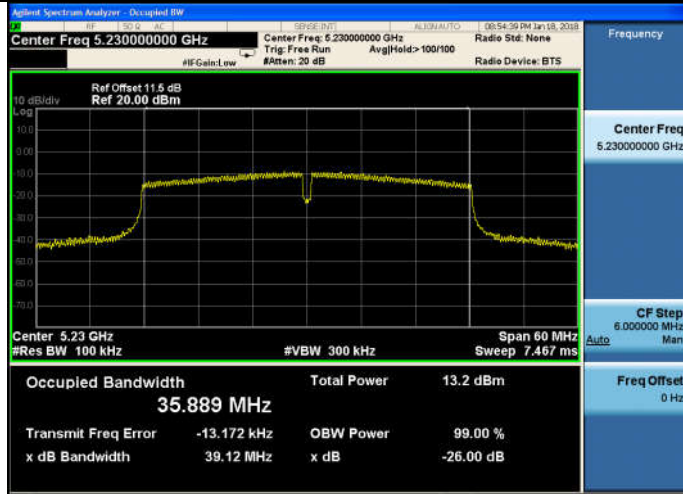


11ac VHT40

5190MHz

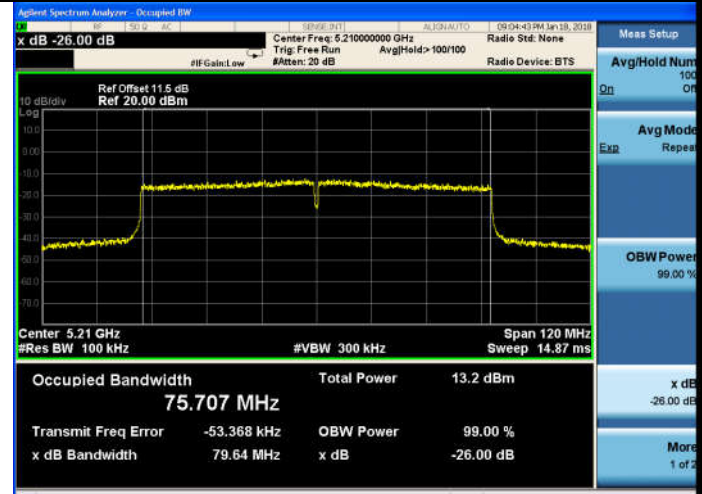


5230MHz



11ac VHT80

5210MHz



5745-5825MHz Band:

6dB bandwidth

11a

5745MHz

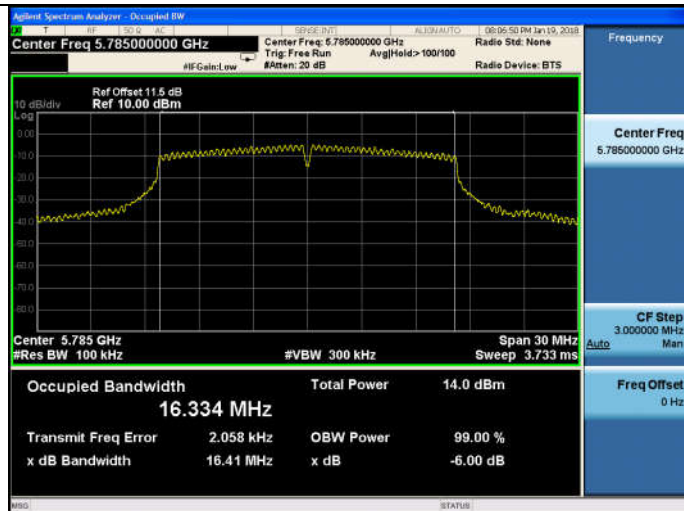


11n HT20

5745MHz



5785MHz



5785MHz



5825MHz

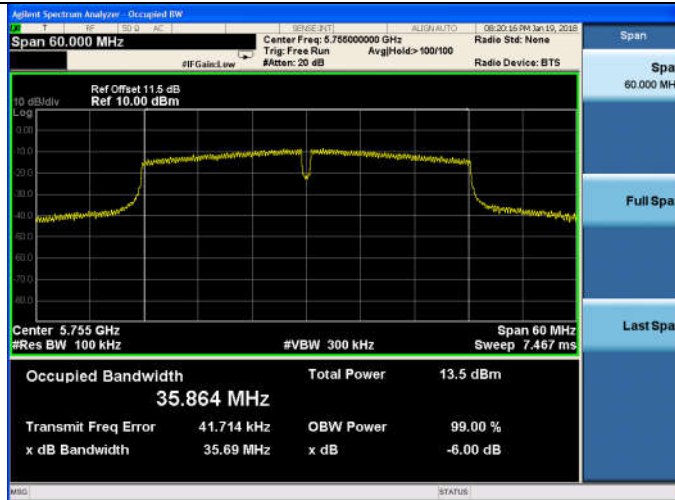


5825MHz



11n HT40

5755MHz



5785MHz



5795MHz

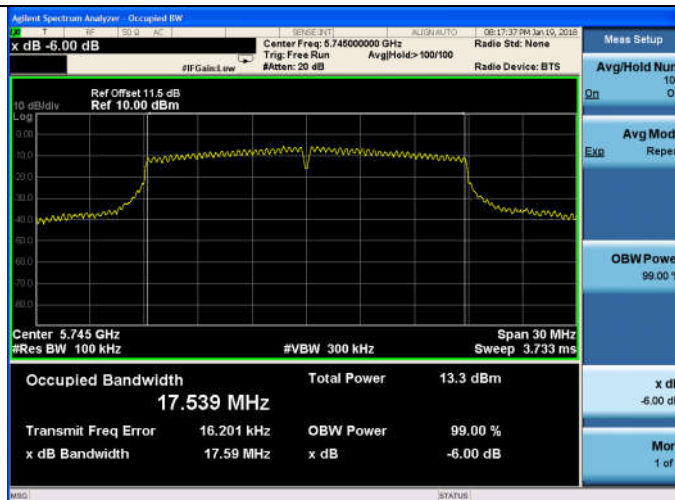


5825MHz



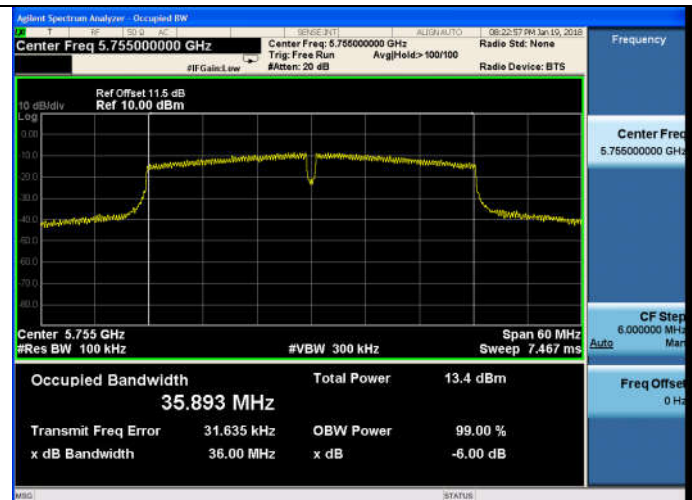
11ac VHT20

5745MHz



11ac VHT40

5755MHz

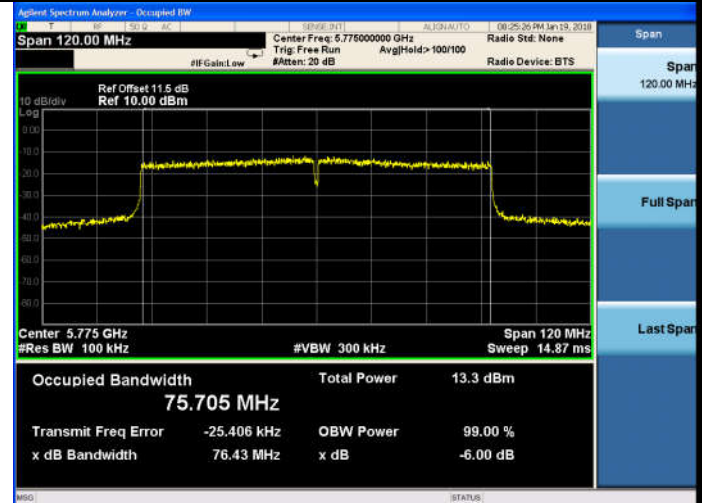


5795MHz



11ac VHT80

5775MHz



5745-5825MHz Band:

26dB bandwidth

11a

5745MHz



11n HT20

5745MHz



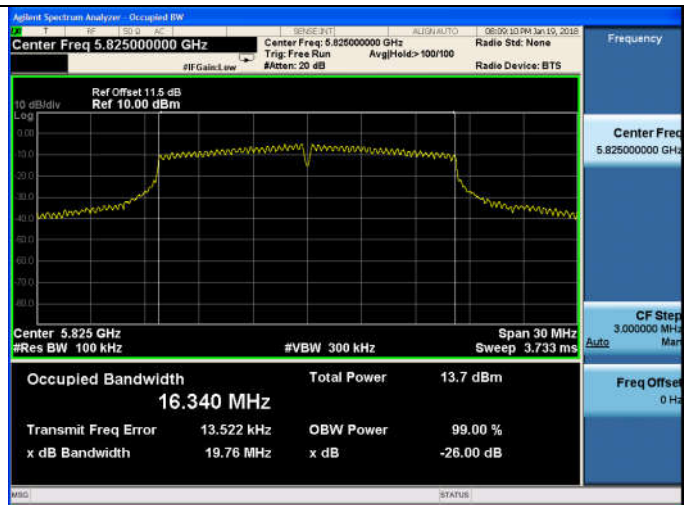
5785MHz



5785MHz



5825MHz



5825MHz



11n HT40

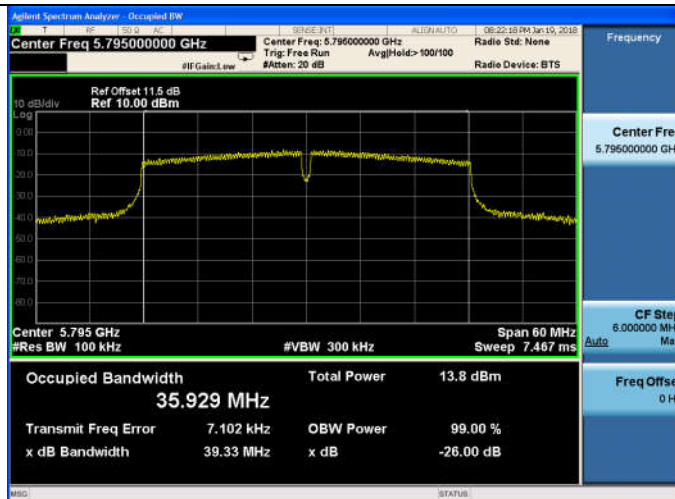
5755MHz



5785MHz



5795MHz

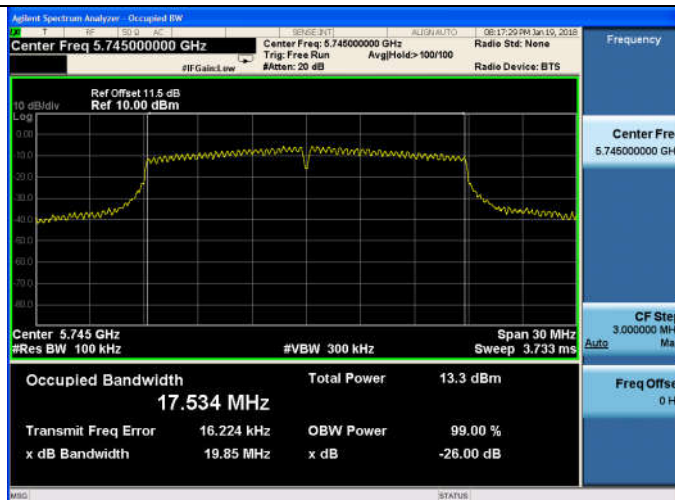


5825MHz



11ac VHT20

5745MHz



11ac VHT40

5755MHz

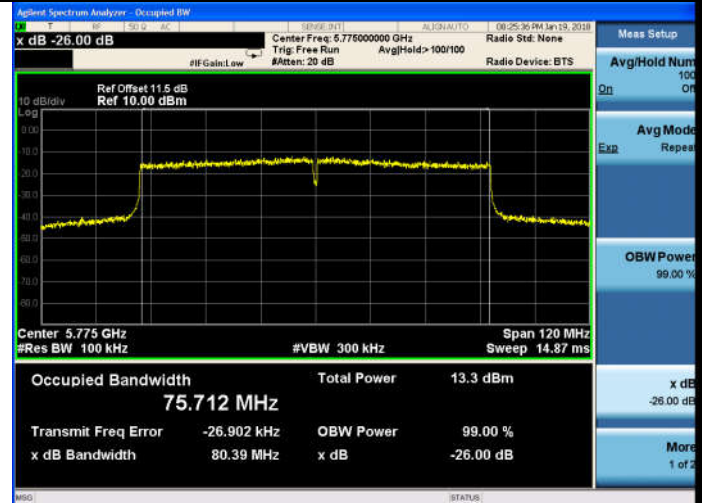


5795MHz



11ac VHT80

5775MHz



7. OUTPUT POWER TEST

7.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY53311015	Oct.15,17	1 Year
2.	Power meter	Anritsu	ML2487A	6K00002472	Apr.22,17	1 Year
3.	Power sensor	Anritsu	MA2491A	0033005	Apr.22,17	1 Year
4.	Attenuator (20dB)	Agilent	8491B	MY39262165	Apr.22,17	1 Year
5.	RF Cable	Marvelous Microwave Inc	SFL402105FLEX	NO.1	Oct.15,17	1 Year

7.2. Limit

For the band 5.15–5.25 GHz.

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

For the 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 + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

7.3. Test Procedure

1. Connected the EUT's antenna port to measure device by 20dB attenuator.
2. Use the test method described in KBD789033 clause E Method SA-1
 - 1) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
 - 2) Set RBW = 1 MHz.
 - 3) Set VBW $\geq$ 3 MHz.
 - 4) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$.
 - 5) Sweep time = auto.
 - 6) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.
 - 7) If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq$ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
 - 8) Trace average at least 100 traces in power averaging (rms) mode.
 - 9) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

7.4. Test Results

5180-5240MHz Band:

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-18	Pressure: 102.8±1.0 kpa	Humidity: 53.2±3.0%
Tested by: Kayle	Test site: RF site	Temperature: 23.6±0.6 °C

Test Mode	Frequency (MHz)	Maximum Conducted output power (dBm)	Limit (dBm)
11a	5180	13.27	23.98
	5200	13.40	23.98
	5240	13.17	23.98
11n HT20	5180	12.74	23.98
	5200	13.24	23.98
	5240	12.90	23.98
11n HT40	5190	13.36	23.98
	5230	13.17	23.98
11ac VHT20	5180	13.08	23.98
	5200	13.21	23.98
	5240	12.97	23.98
11ac VHT40	5190	13.41	23.98
	5230	13.24	23.98
11ac VHT80	5210	13.37	23.98
Conclusion: PASS			

Note: Antenna Gain= 0.42dBi<6dBi.

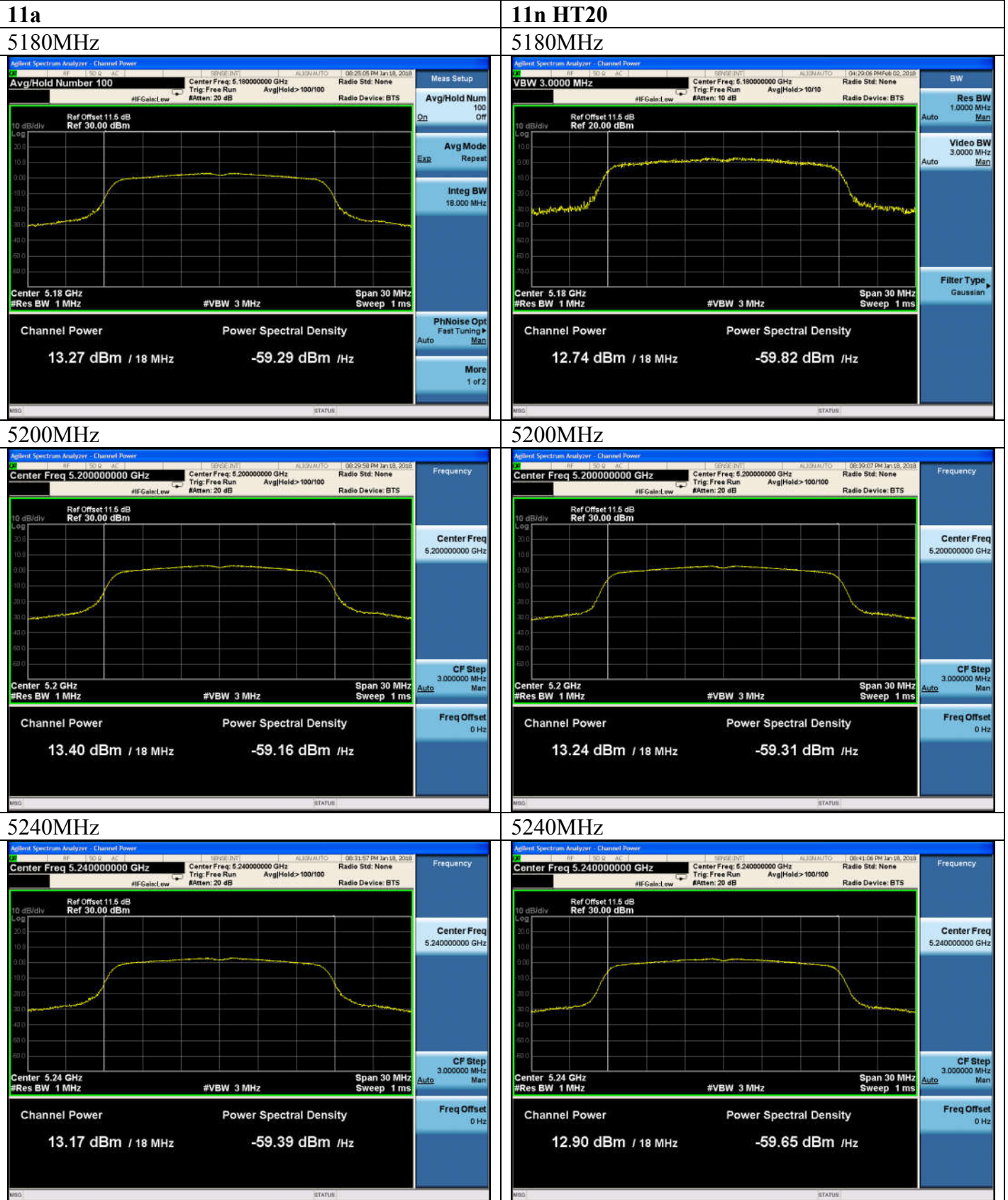
5745-5825MHz Band:

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-19	Pressure: 102.8±1.0 kpa	Humidity:53.2±3.0%
Tested by: Kayle	Test site: RF site	Temperature:23.6±0.6 °C

Test Mode	Frequency (MHz)	Maximum Conducted output power (dBm)	Limit (dBm)
11a	5745	13.34	30
	5785	14.07	30
	5825	13.63	30
11n HT20	5745	13.29	30
	5785	13.65	30
	5825	13.41	30
11n HT40	5755	13.51	30
	5795	13.93	30
11ac VHT20	5745	13.32	30
	5785	13.73	30
	5825	13.44	30
11ac VHT40	5755	13.50	30
	5795	13.86	30
11ac VHT80	5775	13.47	30
Conclusion: PASS			

Note: Antenna Gain= 0.42dBi<6dBi.

5180-5240MHz Band:



11n HT40

5190MHz



5200MHz



5230MHz



5240MHz



11ac VHT20

5180MHz



11ac VHT40

5190MHz

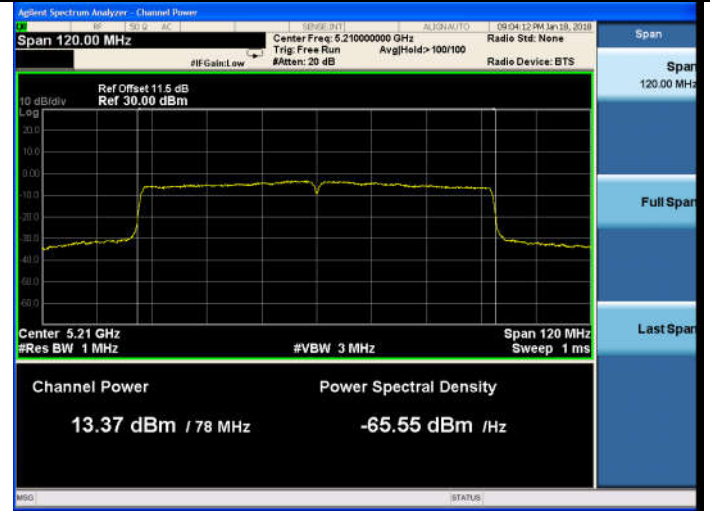


5230MHz



11ac VHT80

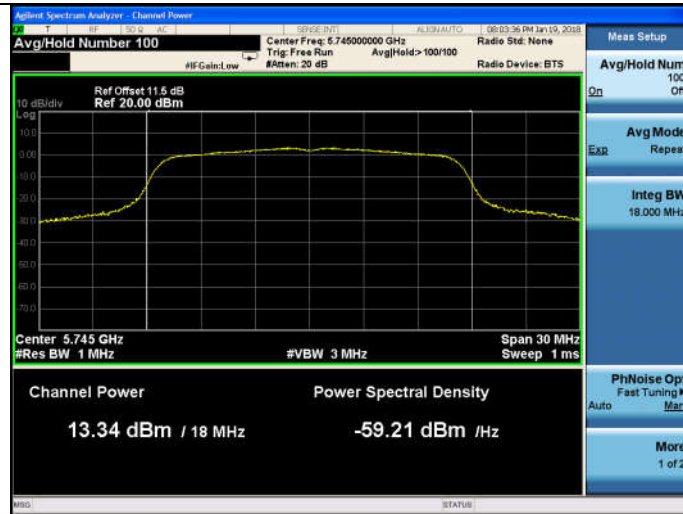
5210MHz



5745-5825MHz Band:

11a

5745MHz



11n HT20

5745MHz



5785MHz



5785MHz



5825MHz



5825MHz

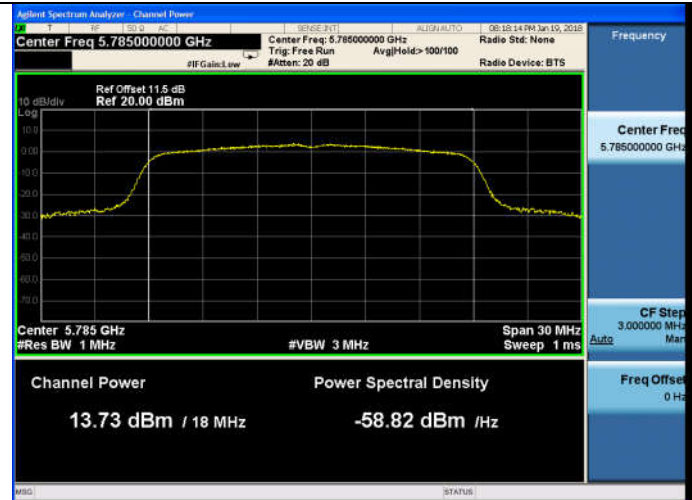


11n HT40

5755MHz



5785MHz



5795MHz



5825MHz



11ac VHT20

5745MHz



11ac VHT40

5755MHz



5795MHz



11ac VHT80

5775MHz



8. SPECTRAL DENSITY TEST

8.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY53311015	Oct.15,17	1 Year
2.	Attenuator (20dB)	Agilent	8491B	MY39262165	Apr.22,17	1 Year
3.	RF Cable	Marvelous Microwave Inc	SFL402105FLEX	NO.1	Oct.15,17	1 Year

8.2. Limit

Band 5150-5250 MHz:

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

Band 5250-5350 MHz:

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

Band 5470-5725 MHz:

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

Band 5725-5850 MHz:

The power spectral density shall not exceed 30 dBm in any 500 KHz band.

8.3. Test Procedure

For the Band 5.15-5.35GHz; 5.47-5.725 GHz:

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW; Detector: RMS mode.

For the band 5.725-5.85 GHz:

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW,RMS Detector.

So use the test method described in KDB789033 clause E

- 1) Set the RBW=100kHz and VBW =3MHz
- 2) Number of points in sweep ≥ 2 Span / RBW.(This ensures that bin-to-bin spacing is $\leq$ RBW/2, so that narrowband signals are not lost between frequency bins.)
- 3) Sweep time = auto
- 4) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- 5) Use the “peak search” function of spectrum analyzer find the max value, then add $10\log(500\text{kHz}/\text{RBW})$ to the measured result.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

8.4.Test Results

5180-5240MHz Band:

EUT: Gemini		
M/N:Gemini WiFi		
Test date: 2018-01-18	Test date: 2018-01-23	Test date: 2018-01-23
Tested by: Kayle	Tested by: Kayle	Tested by: Kayle

Test Mode	Frequency (MHz)	Power density (dBm/MHz)	Limit (dBm/MHz)
11a	5180	10.908	11
	5200	10.891	11
	5240	10.765	11
11n HT20	5180	10.551	11
	5200	10.687	11
	5240	10.360	11
11n HT40	5190	8.287	11
	5230	8.117	11
11ac VHT20	5180	10.635	11
	5200	10.718	11
	5240	10.323	11
11ac VHT40	5190	8.159	11
	5230	8.079	11
11ac VHT80	5210	6.043	11
Conclusion: PASS			

Note: Antenna Gain= 0.42dBi<6dBi.

5745-5825MHz Band:

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-19	Test date: 2018-01-23	Test date: 2018-01-23
Tested by: Kayle	Tested by: Kayle	Tested by: Kayle

Test Mode	Frequency (MHz)	Power density (dBm/500KHz)	Limit (dBm/500KHz)
11a	5745	10.108	30
	5785	10.747	30
	5825	9.883	30
11n HT20	5745	9.971	30
	5785	11.168	30
	5825	10.889	30
11n HT40	5755	7.945	30
	5795	8.156	30
11ac VHT20	5745	10.680	30
	5785	11.460	30
	5825	10.376	30
11ac VHT40	5755	7.826	30
	5795	8.136	30
11ac VHT80	5775	4.714	30
Conclusion: PASS			

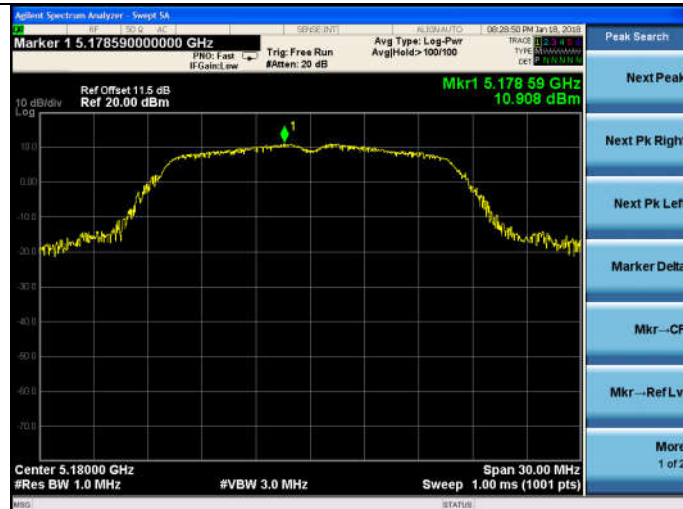
Note: 1. Antenna Gain= 0.42dBi<6dBi.

2. The total result = Reading + 10log(500kHz/100kHz)

5180-5240MHz Band:

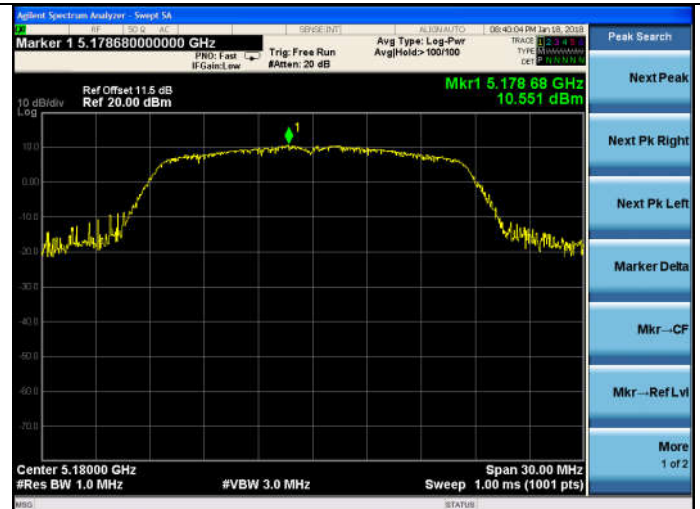
11a

5180MHz

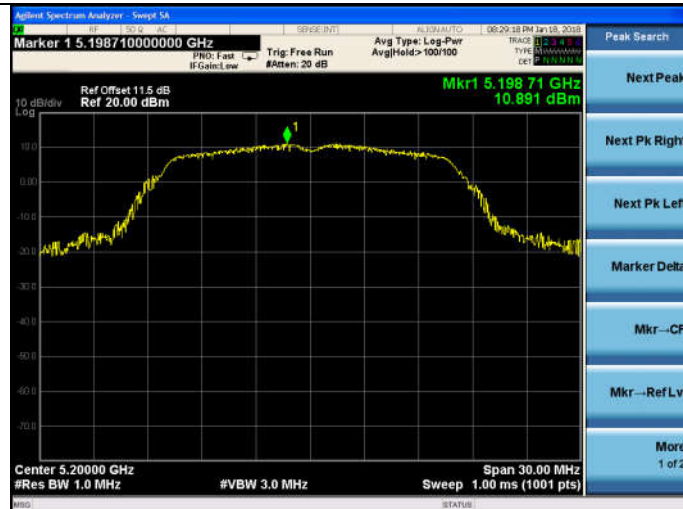


11n HT20

5180MHz



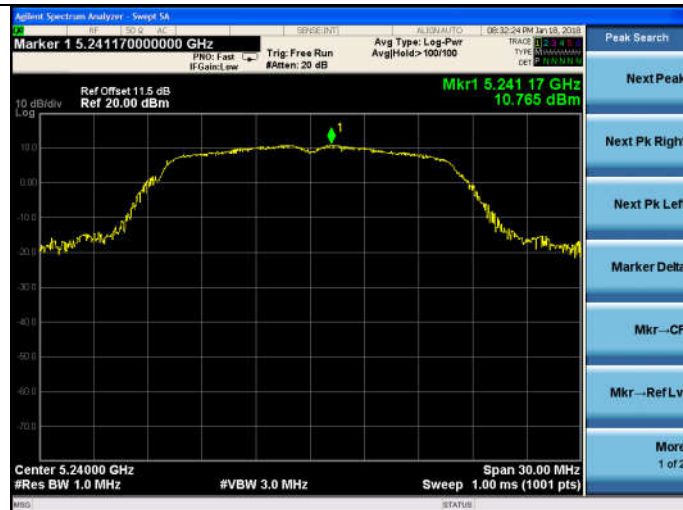
5200MHz



5200MHz



5240MHz



5240MHz

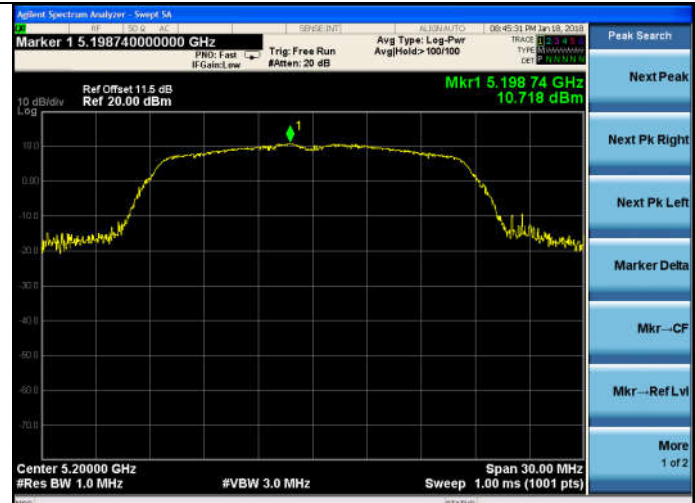


11n HT40

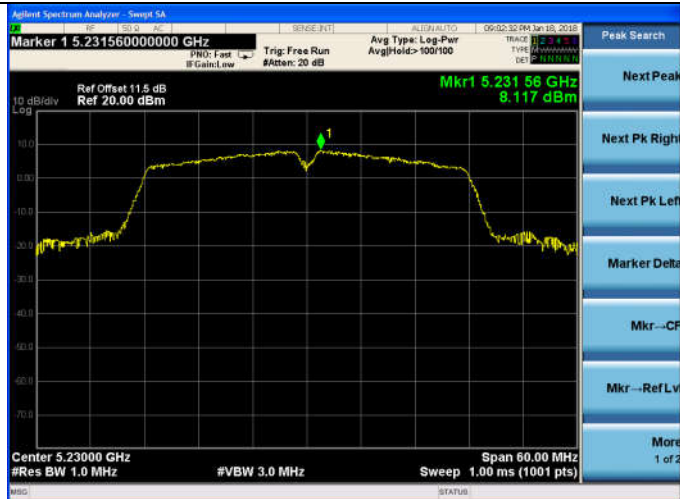
5190MHz



5200MHz



5230MHz

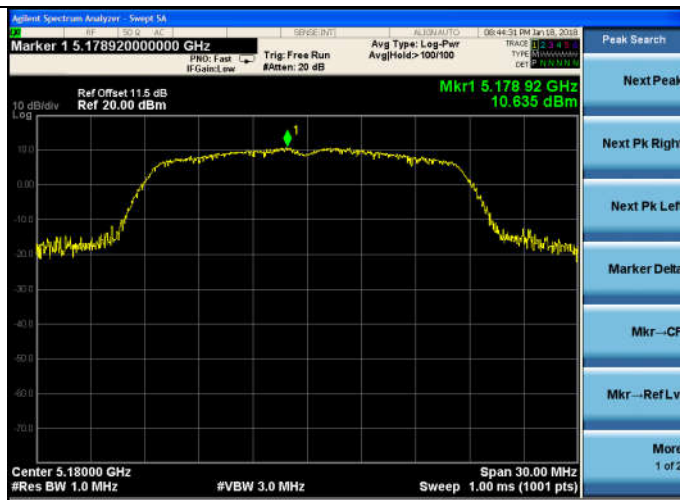


5240MHz



11ac VHT20

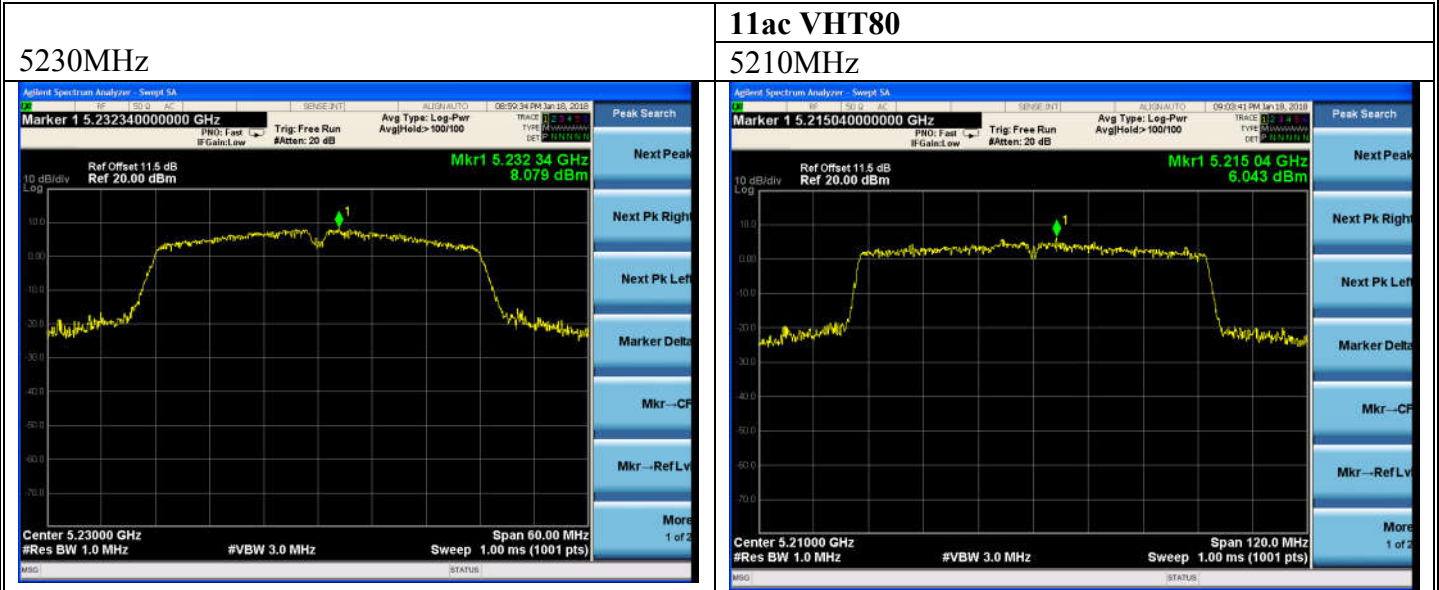
5180MHz



11ac VHT40

5190MHz

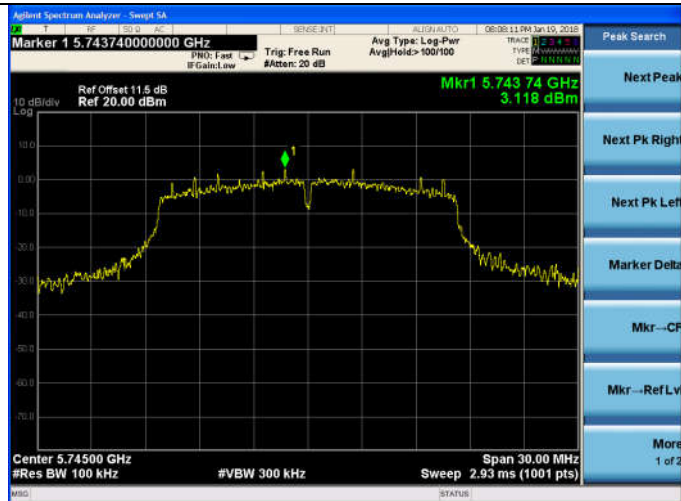




5745-5825MHz Band:

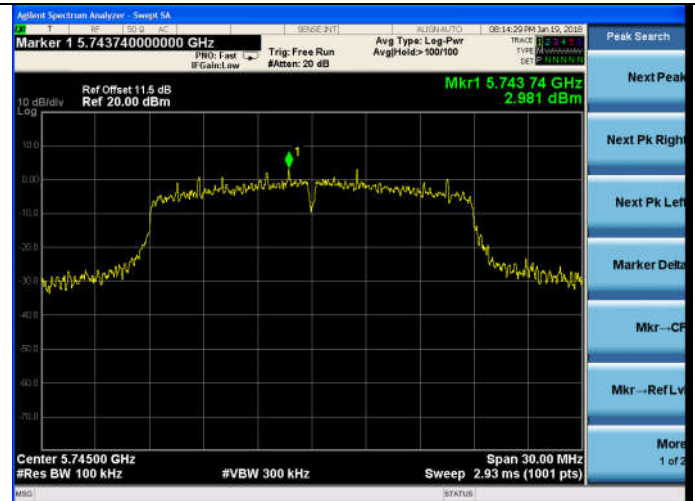
11a

5745MHz

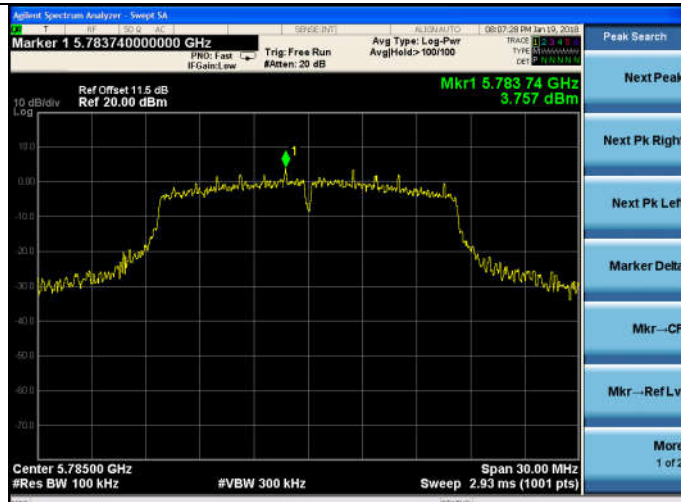


11n HT20

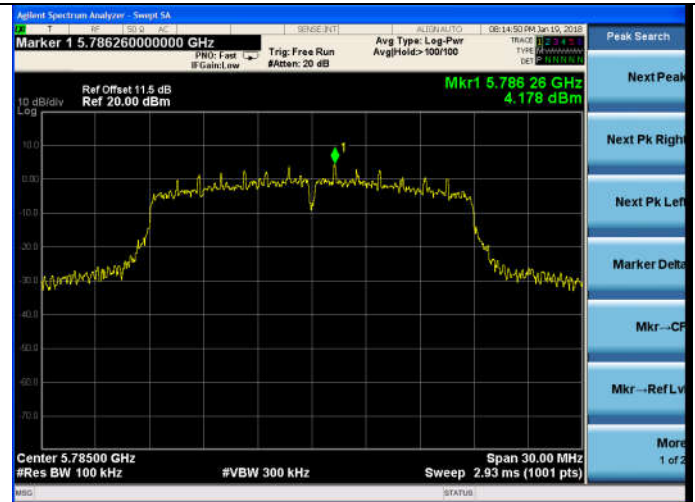
5745MHz



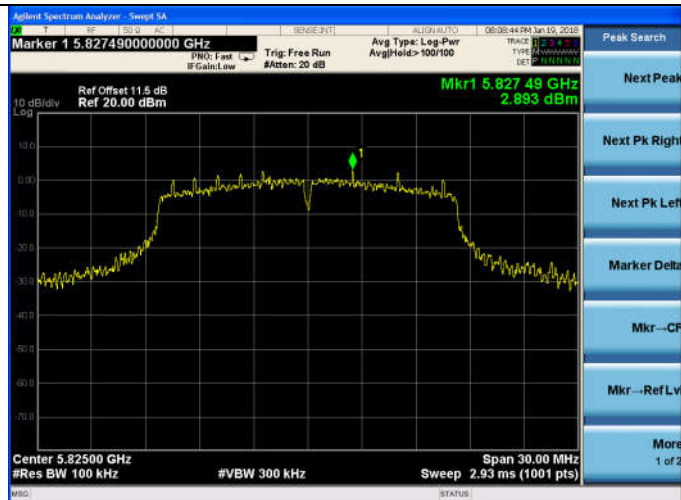
5785MHz



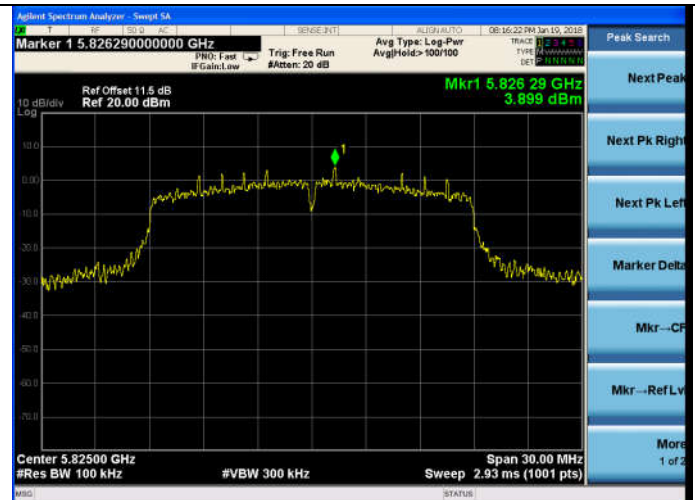
5785MHz



5825MHz

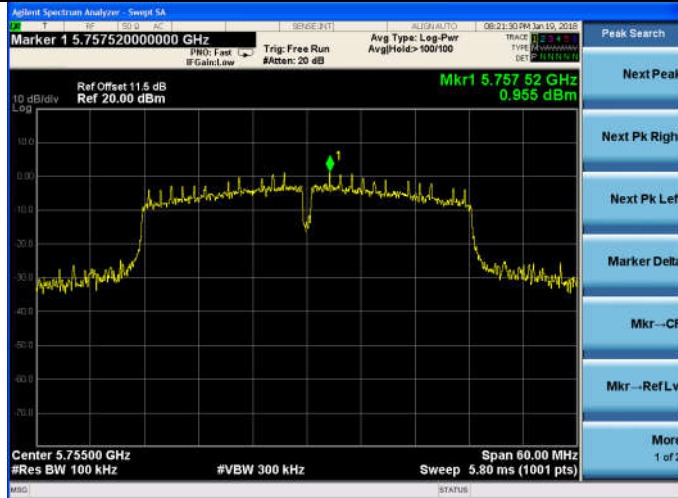


5825MHz

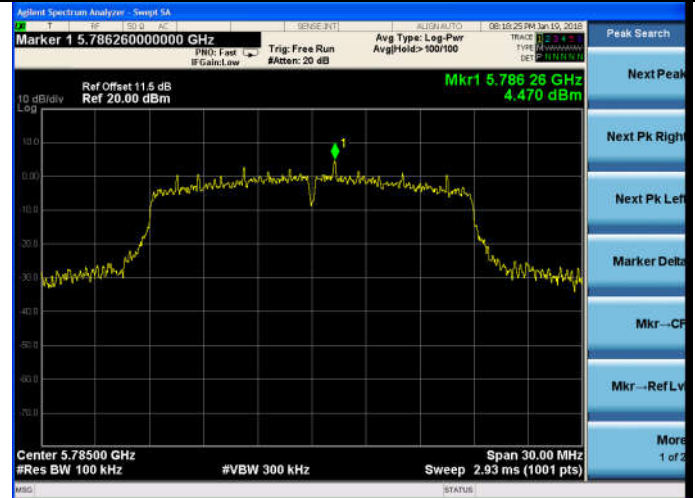


11n HT40

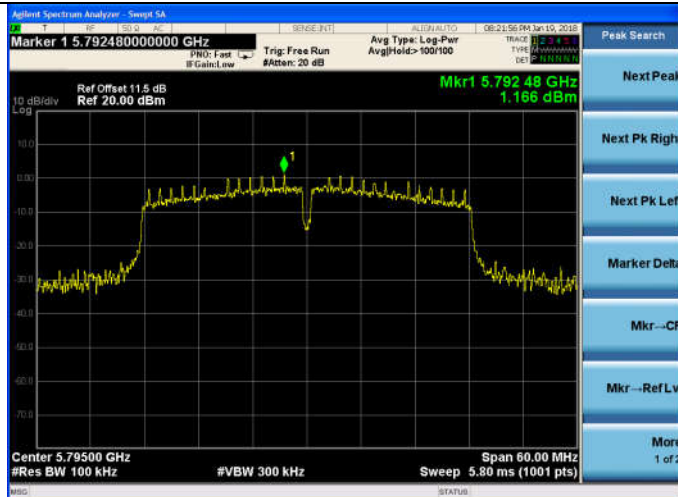
5755MHz



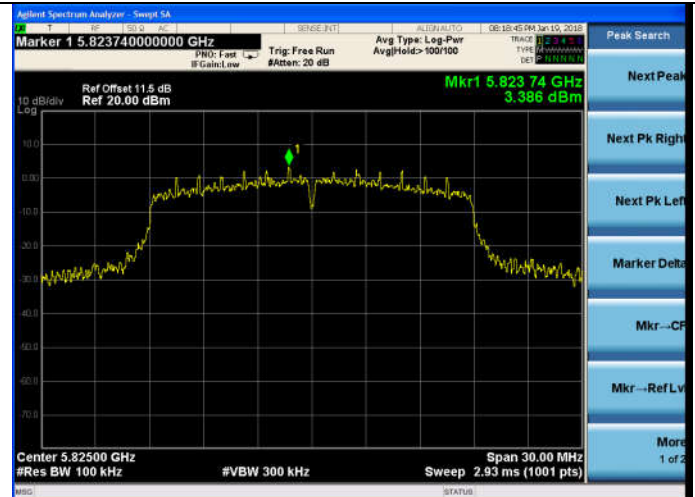
5785MHz



5795MHz

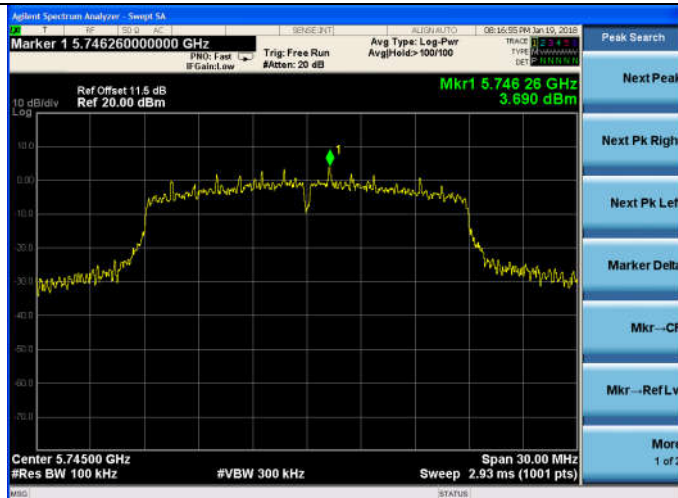


5825MHz



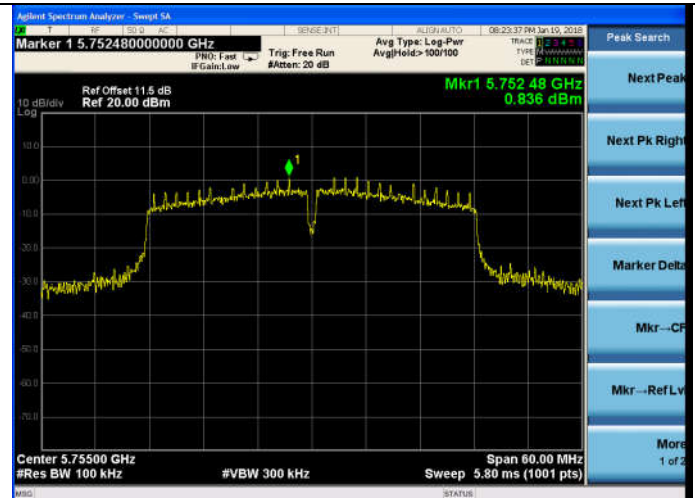
11ac VHT20

5745MHz

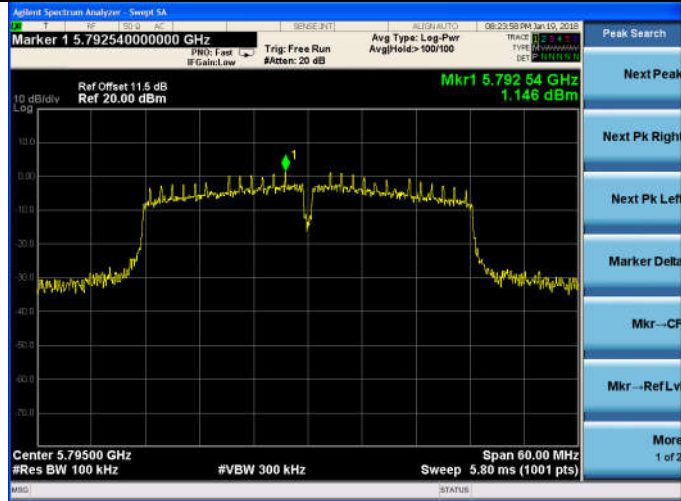


11ac VHT40

5755MHz

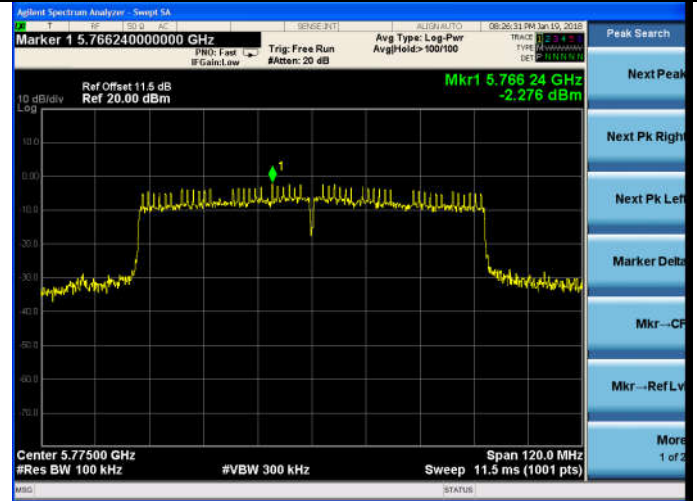


5795MHz



11ac VHT80

5775MHz



9. FREQUENCY STABILITY MEASUREMENT

9.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Oct.15,17	1 Year
2.	Amp	HP	8449B	3008A02495	Apr.22.17	1 Year
3.	Horn Antenna	ETC	MCTD 1209	DRH15F03006	MAY.15,17	1 Year
4.	HF Cable	Hubersuhner	Sucoflex104	274094/4	Apr.22,17	1 Year

9.2. Limit

Manufacturers 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.

9.3. Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
EUT have transmitted absence of modulation signal and fixed channelise. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings. fc is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f \times 106\text{ppm}$. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
2. Extreme temperature rule is -30°C~50°C.

9.4. Test Result

EUT: Gemini		
M/N: Gemini WiFi		
Test date: 2018-01-26	Pressure: 102.4±1.0 kpa	Humidity: 52.6±3.0%
Tested by: Kayle	Test site: RF site	Temperature: 23.2±0.6 °C

Test Voltage	Temperature	CH	Max. Reading (MHz)	Target Frequency (MHz)	Result (ppm)
AC 120V	25°C	CH36	5180.0005	5180	0.097
		CH38	5190.0005	5190	0.096
		CH40	5200.0005	5200	0.096
		CH42	5210.0005	5210	0.096
		CH46	5230.0005	5230	0.096
		CH48	5240.0005	5240	0.095
		CH149	5745.0005	5745	0.087
		CH151	5755.0005	5755	0.087
		CH155	5775.0005	5775	0.087
		CH157	5785.0005	5785	0.086
		CH159	5795.0005	5795	0.086
		CH165	5825.0005	5825	0.086
AC 108V	-20°C	CH36	5180.0013	5180	0.251
		CH38	5190.0017	5190	0.328
		CH40	5200.0012	5200	0.231
		CH42	5210.0012	5210	0.230
		CH46	5230.0014	5230	0.268
		CH48	5240.0012	5240	0.229
		CH149	5745.0010	5745	0.174
		CH151	5755.0008	5755	0.139
		CH155	5775.0006	5775	0.104
		CH157	5785.0006	5785	0.104
		CH159	5795.0009	5795	0.155
		CH165	5825.0011	5825	0.189
		CH36	5180.0008	5180	0.251
Conclusion: PASS					

Test Voltage	Temperature	CH	Max. Reading (MHz)	Target Frequency (MHz)	Result (ppm)
AC 132V	15°C	CH36	5180.0013	5180	0.251
		CH38	5190.0010	5190	0.193
		CH40	5200.0012	5200	0.231
		CH42	5210.0009	5210	0.173
		CH46	5230.0008	5230	0.153
		CH48	5240.0006	5240	0.115
		CH149	5745.0008	5745	0.139
		CH151	5755.0005	5755	0.087
		CH155	5775.0012	5775	0.208
		CH157	5785.0010	5785	0.173
		CH159	5795.0002	5795	0.035
		CH165	5825.0004	5825	0.069
AC 108V	35°C	CH36	5180.0009	5180	0.174
		CH38	5190.0008	5190	0.154
		CH40	5200.0006	5200	0.115
		CH42	5210.0010	5210	0.192
		CH46	5230.0008	5230	0.153
		CH48	5240.0007	5240	0.134
		CH149	5745.0013	5745	0.226
		CH151	5755.0007	5755	0.122
		CH155	5775.0009	5775	0.156
		CH157	5785.0006	5785	0.104
		CH159	5795.0008	5795	0.138
		CH165	5825.0012	5825	0.206
Conclusion: PASS					

Test Voltage	Temperature	CH	Max. Reading (MHz)	Target Frequency (MHz)	Result (ppm)
AC 120V	50℃	CH36	5180.0008	5180	0.154
		CH38	5190.0013	5190	0.250
		CH40	5200.0016	5200	0.308
		CH42	5210.0017	5210	0.326
		CH46	5230.0012	5230	0.229
		CH48	5240.0011	5240	0.210
		CH149	5745.0012	5745	0.209
		CH151	5755.0008	5755	0.139
		CH155	5775.0008	5775	0.139
		CH157	5785.0015	5785	0.259
		CH159	5795.0008	5795	0.138
		CH165	5825.0013	5825	0.223
Conclusion: PASS					

10. ANTENNA REQUIREMENT

10.1. 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 15.407 (a), 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.

10.2. Antenna Connected Construction

The antennas used for this product are PIFA antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 0.42dBi.

11. DEVIATION TO TEST SPECIFICATIONS

[NONE]