e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described in this section. For devices that use channel aggregation refer to III.A and III.C for determining emission bandwidth.

D. 99% Occupied Bandwidth

The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is *required* only as a condition for using the optional band-edge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the 789033 D02 General UNII Test Procedures New Rules v02r01 Page 4 spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with Section 15.407(a).
The following procedure shall be used for measuring (99%) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.

2. Set span = 1.5 times to 5.0 times the OBW.

3. Set RBW = 1% to 5% of the OBW

4. Set VBW ≥ 3 * RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

6. Use the 99% power bandwidth function of the instrument (if available).

7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

10.4 Test Results

5150-5250MHz

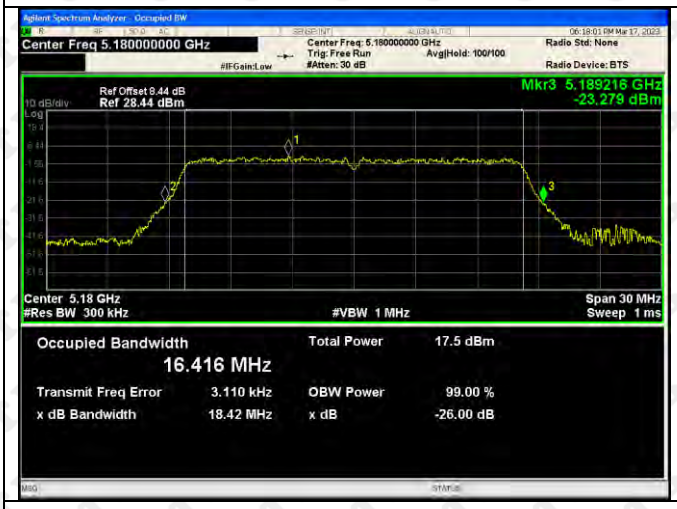
Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5180	18.425	18.364
	5200	18.229	18.595
	5240	18.534	18.369
802.11ac20	5180	19.505	19.701
	5200	19.54	19.386
	5240	19.546	19.497
802.11ac40	5190	39.995	40.82
	5230	40.642	40.113
802.11ac80	5210	79.076	79.47
802.11n(HT20)	5180	19.654	19.574
	5200	19.407	19.284
	5240	19.464	19.43
802.11n(HT40)	5190	39.157	39.482
	5230	39.479	39.197

5725-5850MHz

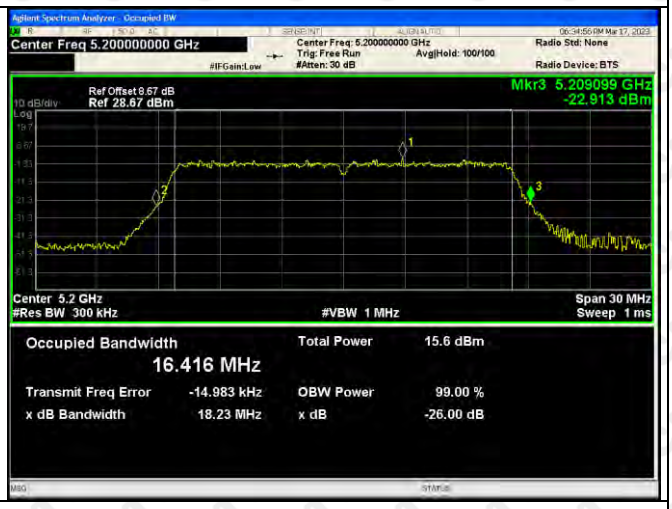
Test mode	Test Channel (MHz)	6dB Bandwidth (MHz)&ANT1	6dB Bandwidth (MHz)&ANT2
802.11a	5745	16.419	16.381
	5785	16.414	16.435
	5825	16.164	16.359
802.11ac20	5745	17.048	17.59
	5785	17.594	17.559
	5825	17.586	17.543
802.11ac40	5755	35.084	35.105
	5795	35.16	35.14
802.11ac80	5775	68.964	73.882
802.11n(HT20)	5745	17.612	17.623
	5785	17.687	17.65
	5825	17.61	17.624
802.11n(HT40)	5755	35.171	35.159
	5795	35.778	35.746

Test Graph
5150-5250MHz
ANT1

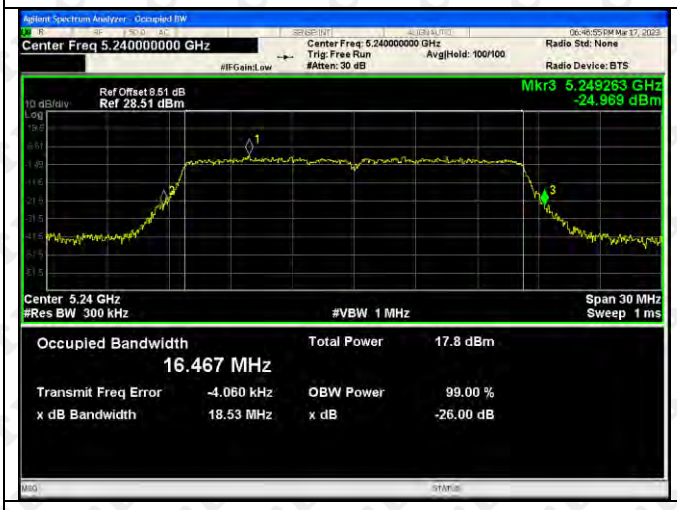
802.11a-5180



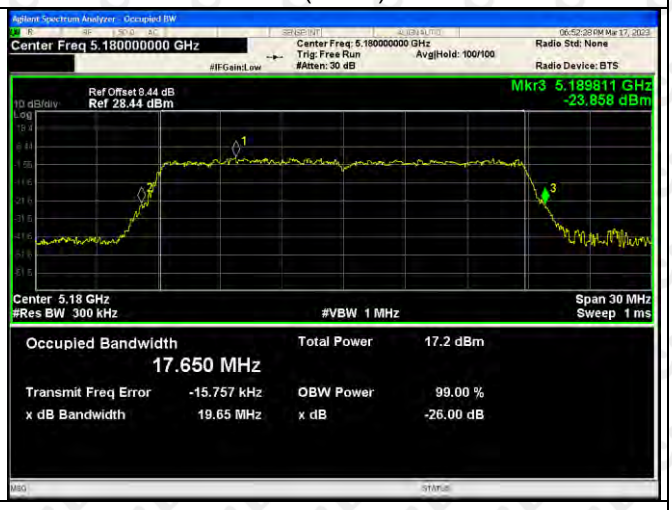
802.11a-5200



802.11a-5240

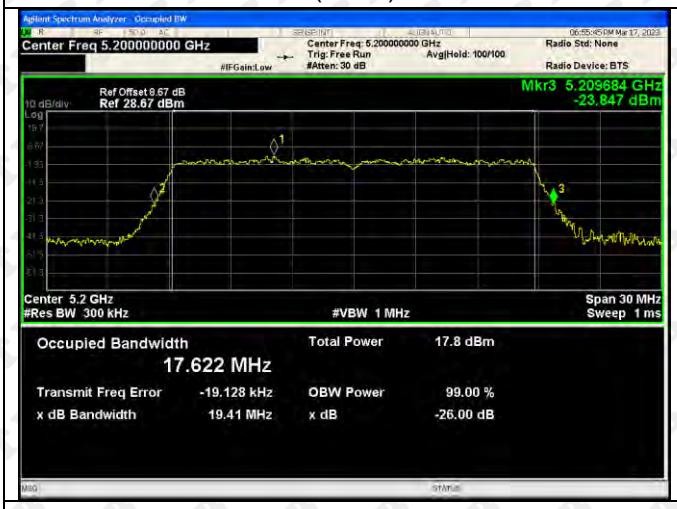


802.11n(HT20)-5180

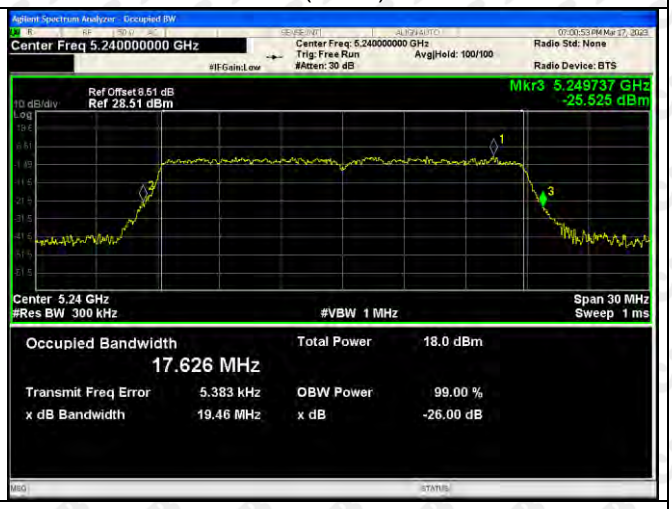


802.11n(HT20)-5200

802.11n(HT20)-5240



802.11n(HT40)-5190

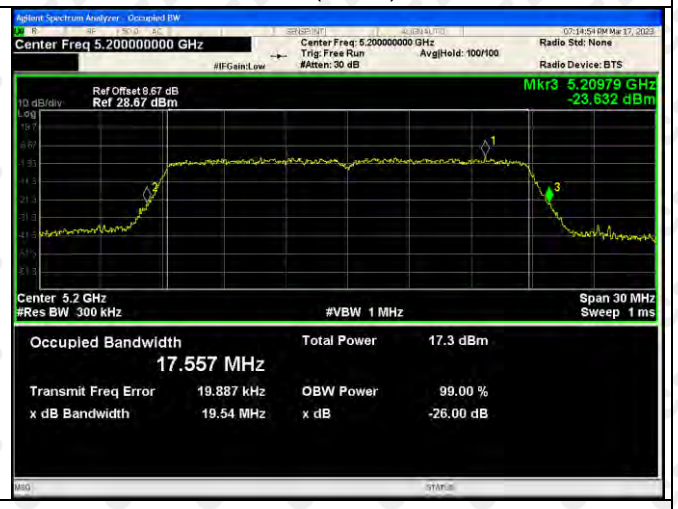


802.11n(HT40)-5230

802.11ac(VH20)-5180

802.11ac(VH20)-5200

802.11ac(VH20)-5240

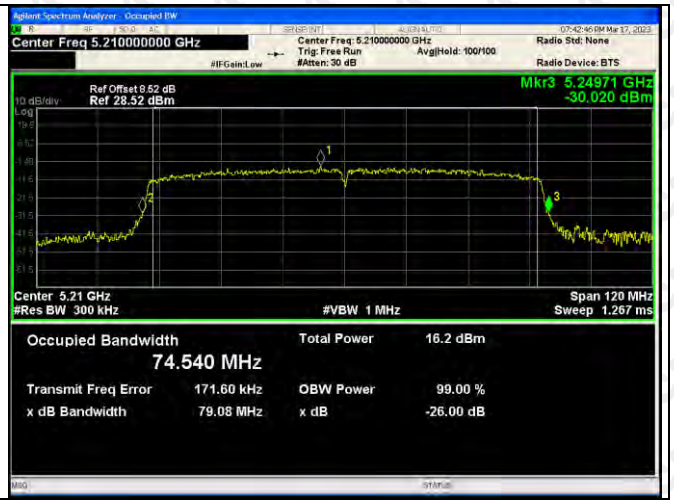


802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

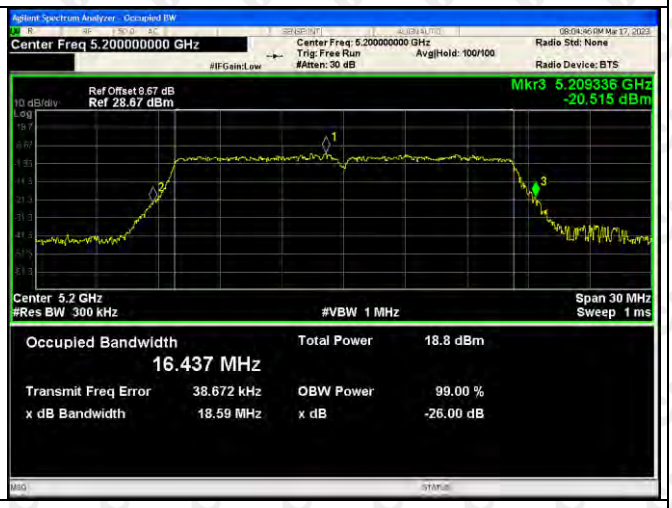

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.230000000 GHz
Center Freq: 5.230000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.48 dB
10 dB/div
Ref 28.48 dBm
Mkr3 5.250335 GHz
-30.442 dBm
Center 5.23 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
36.009 MHz
Total Power 17.2 dBm
Transmit Freq Error 14.187 kHz
OBW Power 99.00 %
x dB Bandwidth 40.64 MHz
x dB -26.00 dB


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.210000000 GHz
Center Freq: 5.210000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.52 dB
10 dB/div
Ref 28.52 dBm
Mkr3 5.24971 GHz
-30.020 dBm
Center 5.21 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 120 MHz
Sweep 1.267 ms
Occupied Bandwidth
74.540 MHz
Total Power 16.2 dBm
Transmit Freq Error 171.60 kHz
OBW Power 99.00 %
x dB Bandwidth 79.08 MHz
x dB -26.00 dB

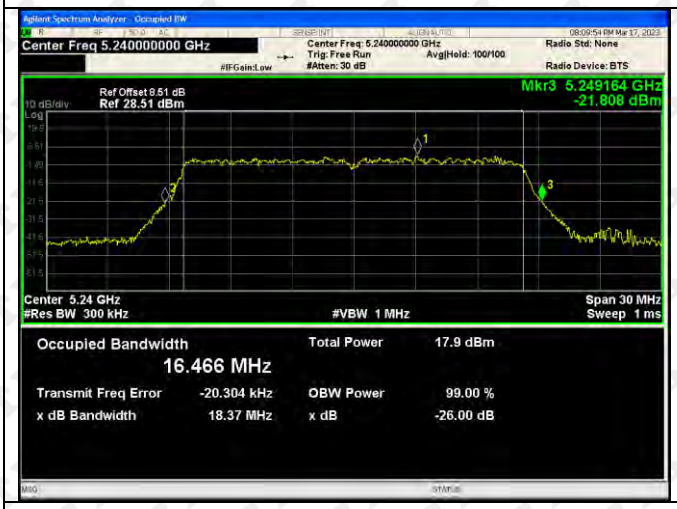
ANT2

802.11a-5180

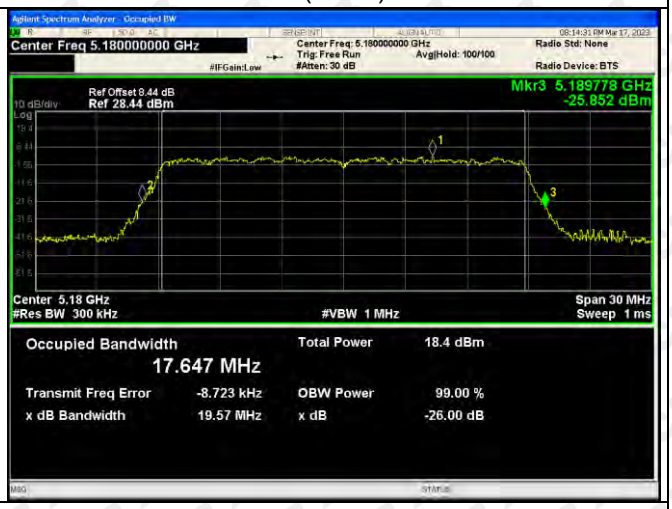
802.11a-5200



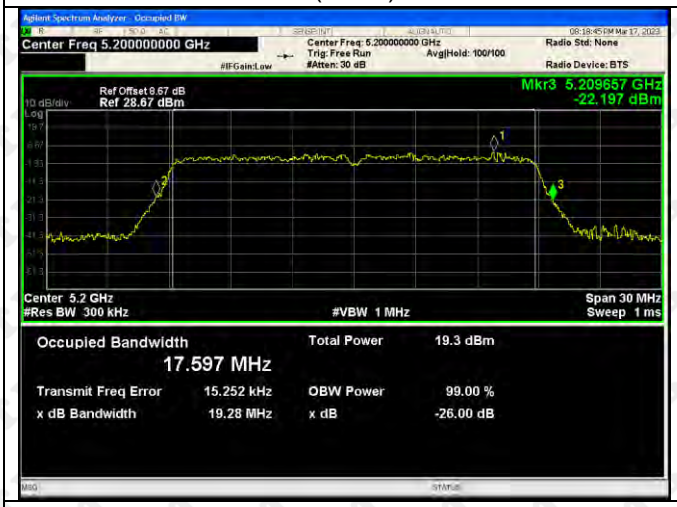
802.11a-5240



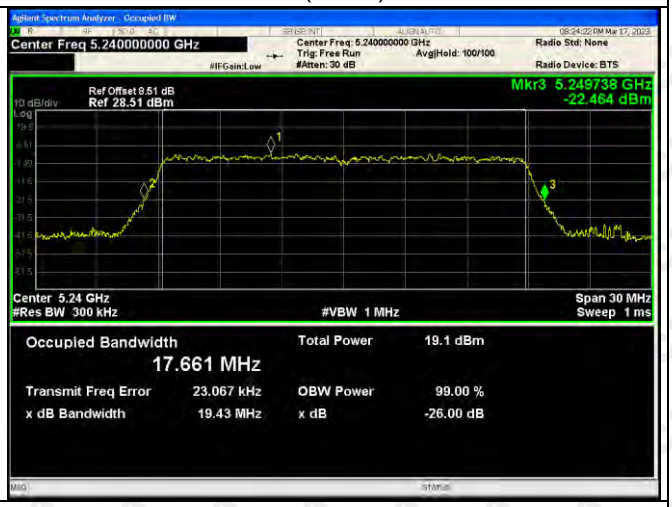
802.11n(HT20)-5180



802.11n(HT20)-5200

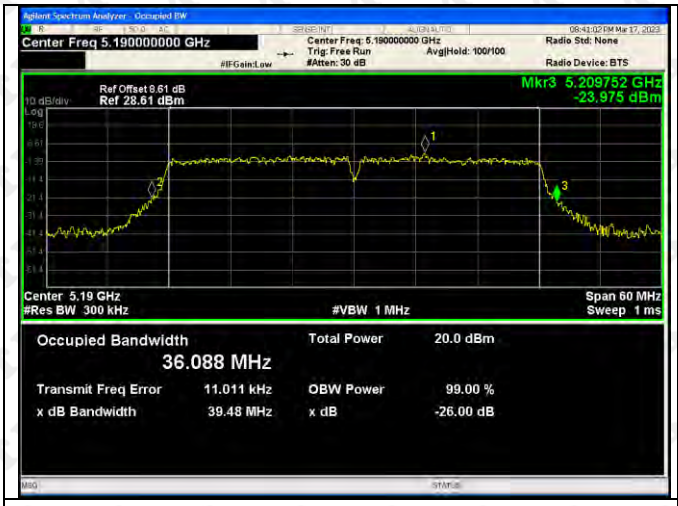


802.11n(HT20)-5240

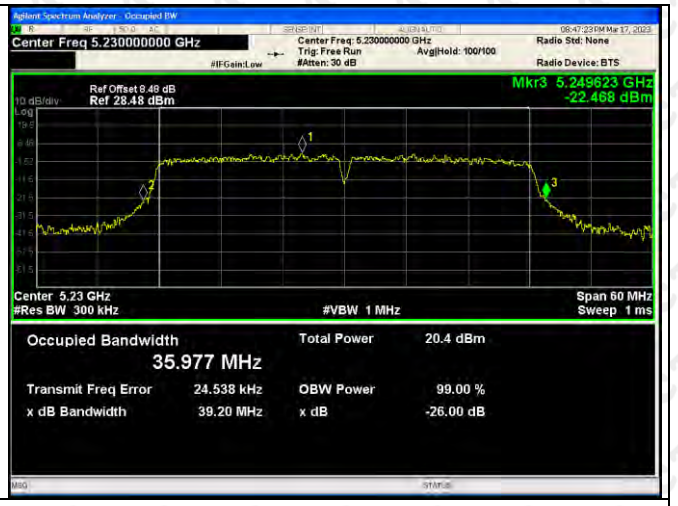


802.11n(HT40)-5190

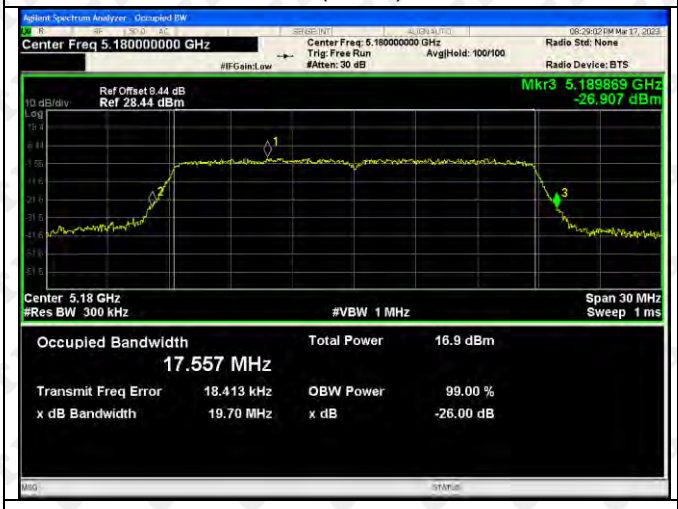
802.11n(HT40)-5230



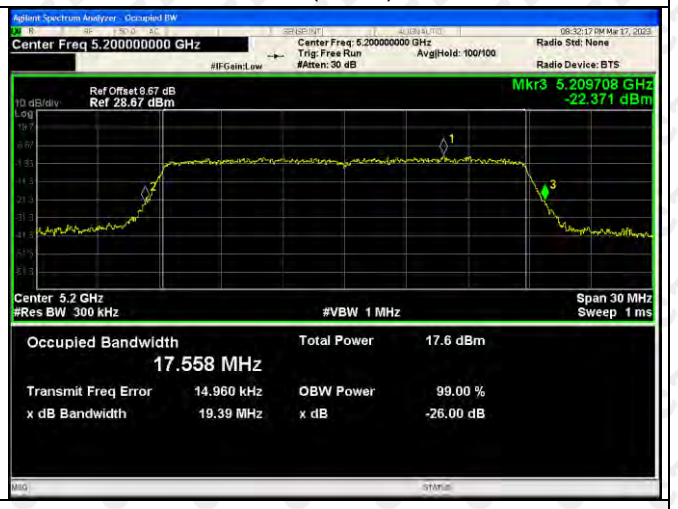
802.11ac(VH20)-5180



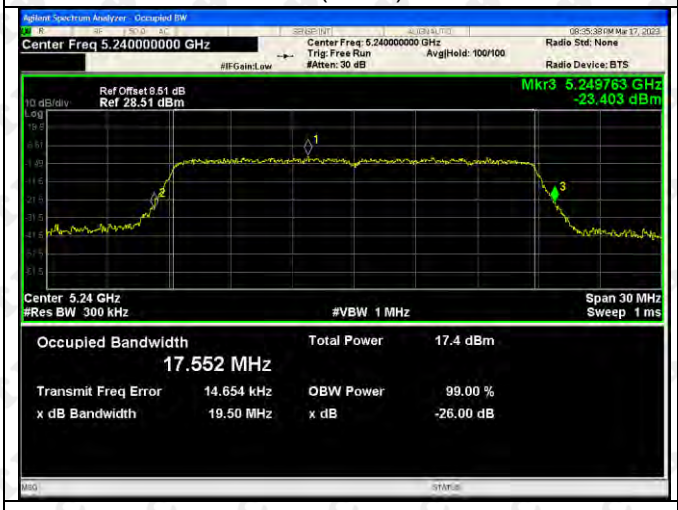
802.11ac(VH20)-5200



802.11ac(VH20)-5240



802.11ac(VH40)-5190



802.11ac(VH40)-5230

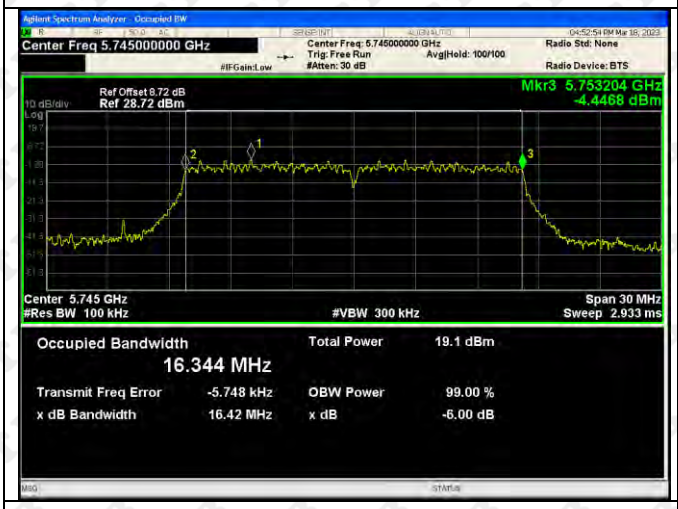
802.11ac(VH80)-5210


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.230000000 GHz
Center Freq: 5.230000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.48 dB
10 dB/div
Ref 28.48 dBm
Mkr3 5.250106 GHz
-27.228 dBm
Center 5.23 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
35.957 MHz
Total Power 17.5 dBm
Transmit Freq Error 49.142 kHz
OBW Power 99.00 %
x dB Bandwidth 40.11 MHz
x dB -26.00 dB

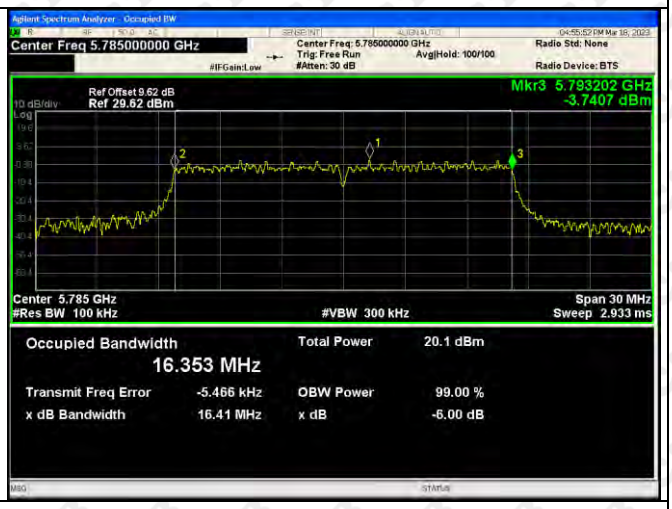

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.210000000 GHz
Center Freq: 5.210000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.52 dB
10 dB/div
Ref 28.52 dBm
Mkr3 5.249867 GHz
-30.556 dBm
Center 5.21 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 120 MHz
Sweep 1.267 ms
Occupied Bandwidth
74.569 MHz
Total Power 16.3 dBm
Transmit Freq Error 132.31 kHz
OBW Power 99.00 %
x dB Bandwidth 79.47 MHz
x dB -26.00 dB

5725-5850MHz
ANT1

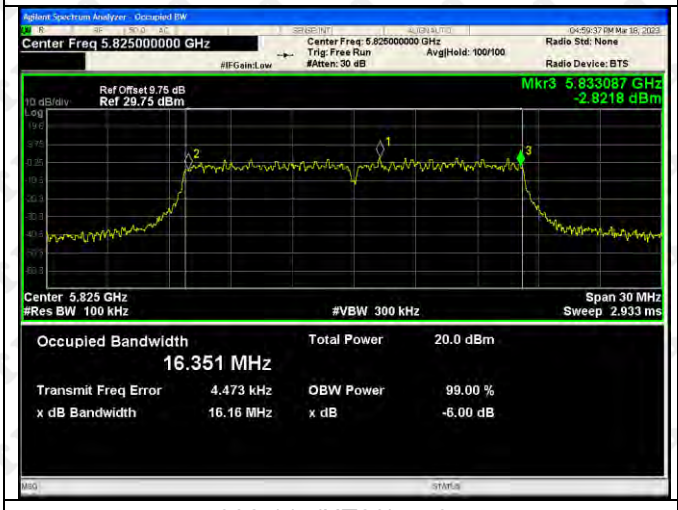
802.11a-5745



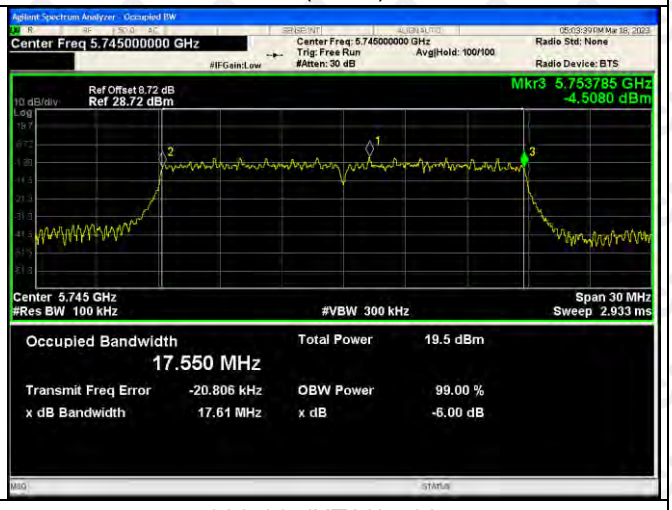
802.11a-5785



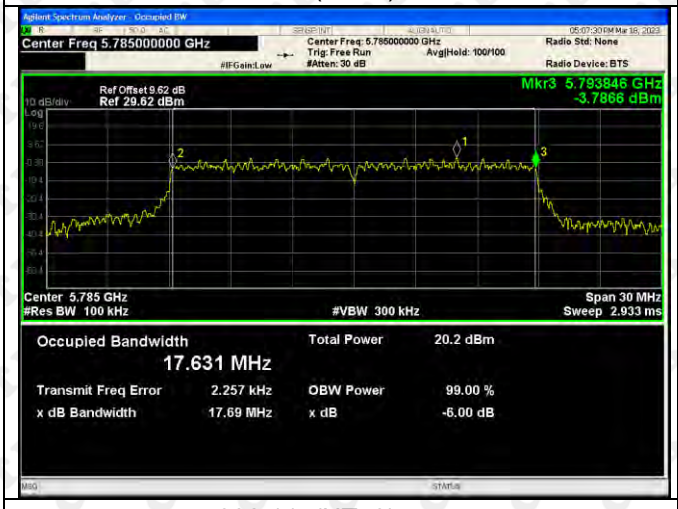
802.11a-5825



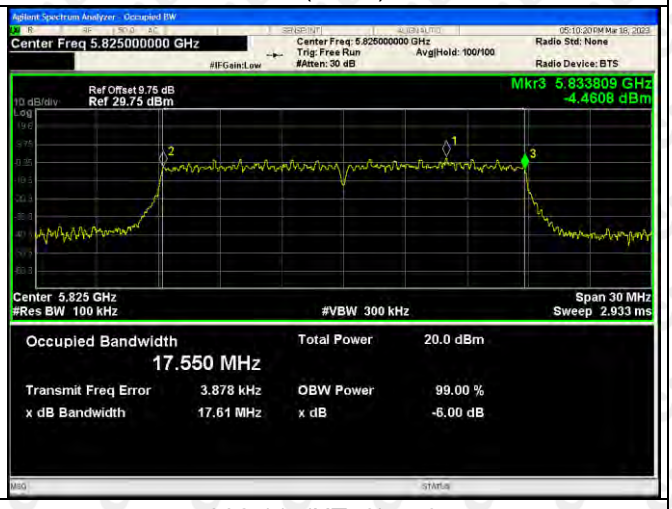
802.11n(HT20)-5745



802.11n(HT20)-5785

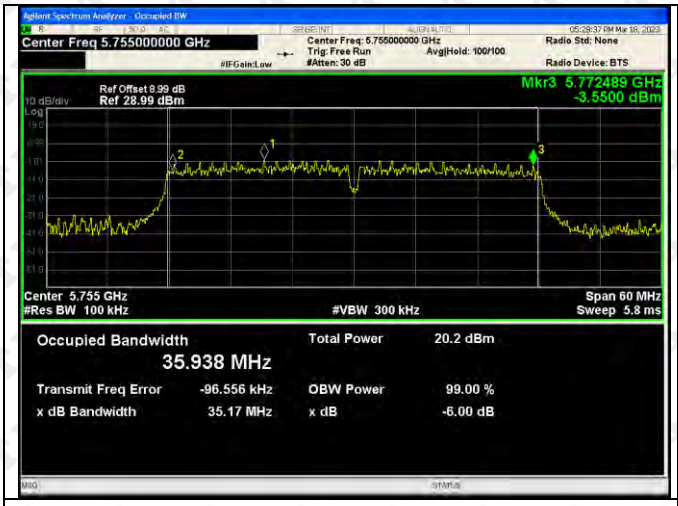


802.11n(HT20)-5825



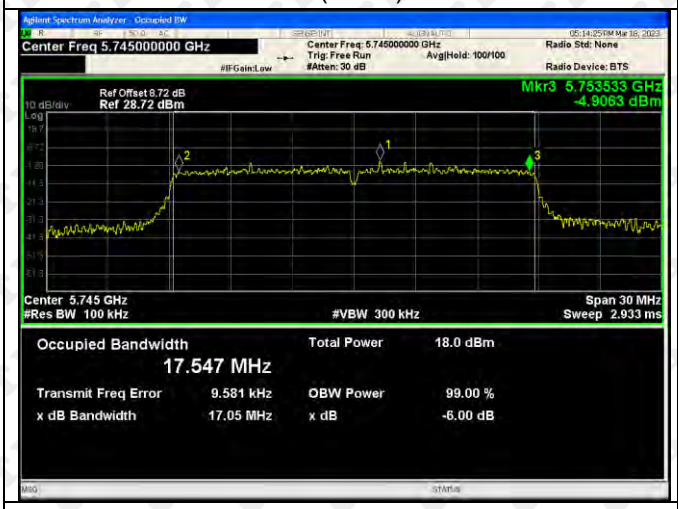
802.11n(HT40)-5755

802.11n(HT40)-5795

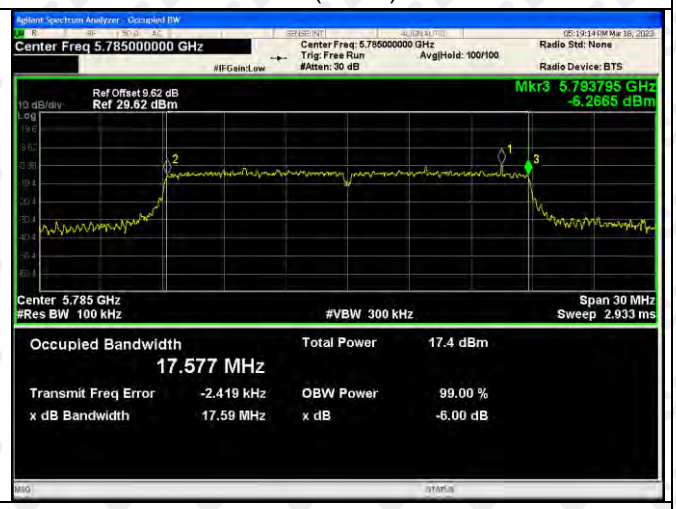


802.11ac(VH20)-5745

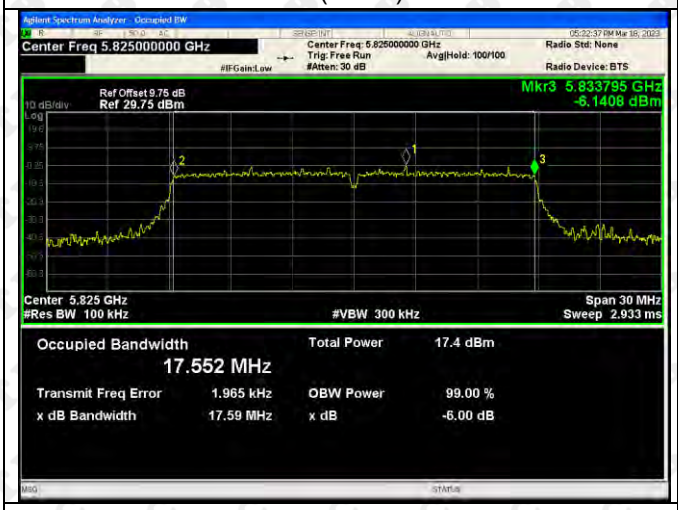
802.11ac(VH20)-5785



802.11ac(VH20)-5825

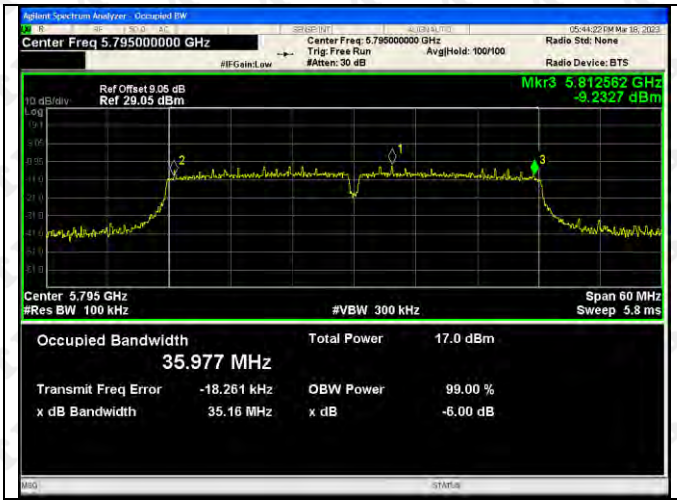


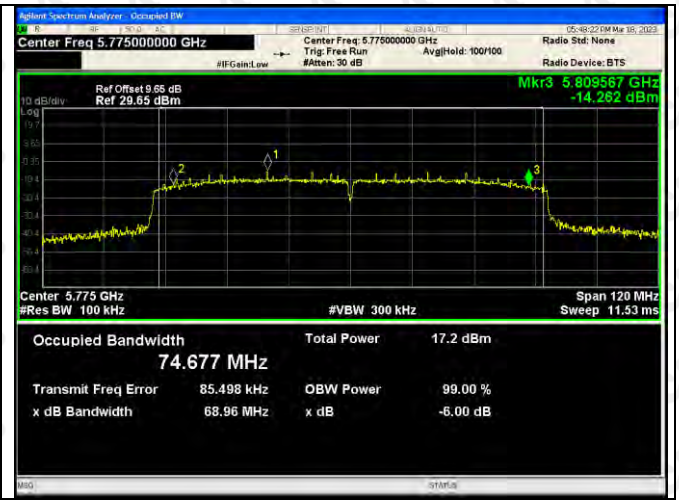
802.11ac(VH40)-5755



802.11ac(VH40)-5795

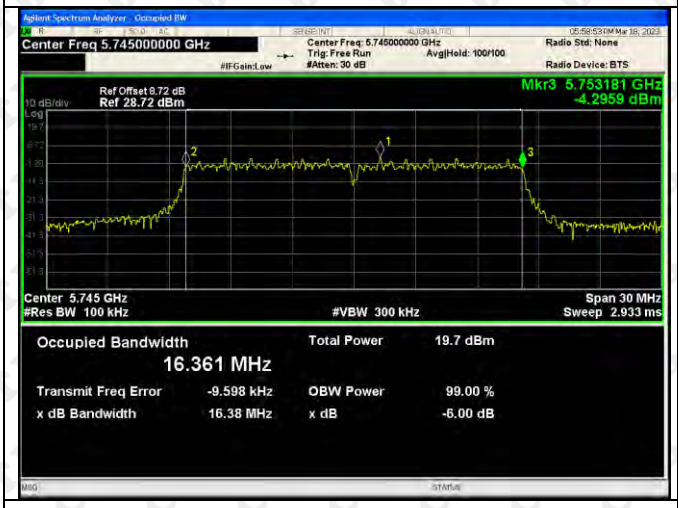
802.11ac(VH80)-5775


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.05 dB
10 dB/div
Ref 29.05 dBm
Mkr3 5.812562 GHz
-9.2327 dBm
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
35.977 MHz
Total Power 17.0 dBm
Transmit Freq Error -18.261 kHz
OBW Power 99.00 %
x dB Bandwidth 35.16 MHz
x dB -6.00 dB


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.65 dB
10 dB/div
Ref 29.65 dBm
Mkr3 5.809567 GHz
-14.262 dBm
Center 5.775 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 120 MHz
Sweep 11.53 ms
Occupied Bandwidth
74.677 MHz
Total Power 17.2 dBm
Transmit Freq Error 85.498 kHz
OBW Power 99.00 %
x dB Bandwidth 68.96 MHz
x dB -6.00 dB

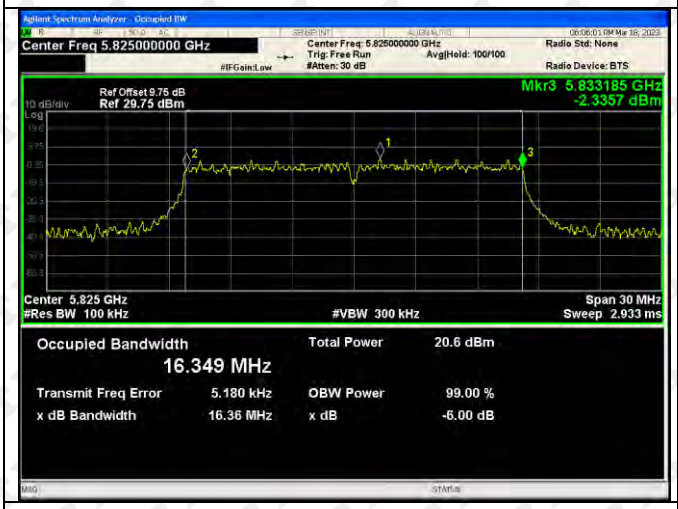
ANT2

802.11a-5745

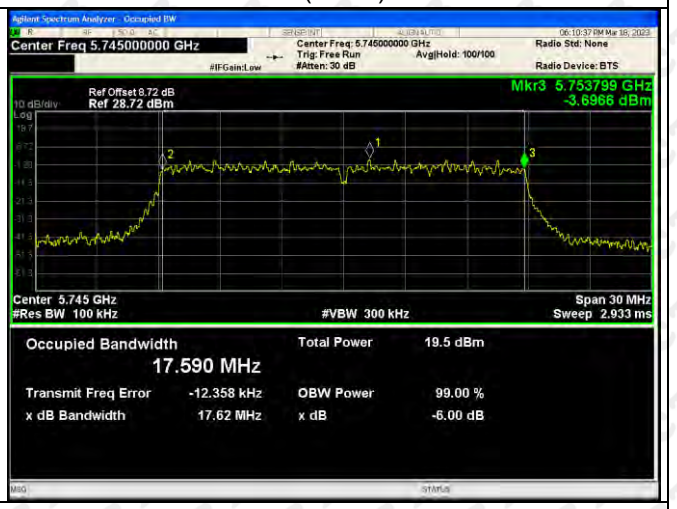


802.11a-5785

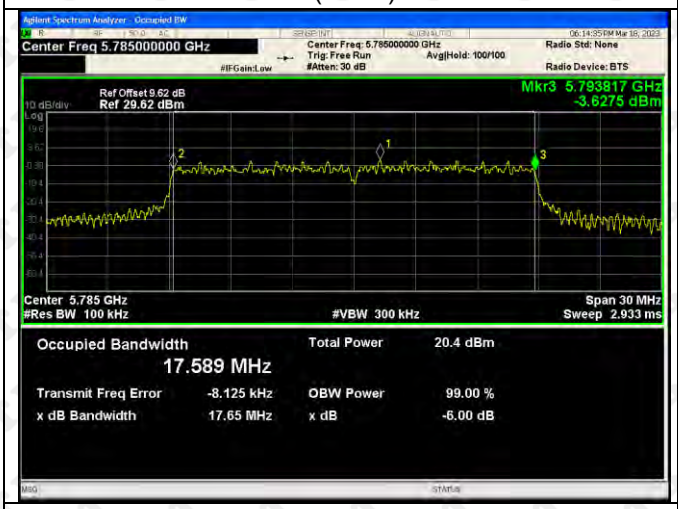
802.11a-5825



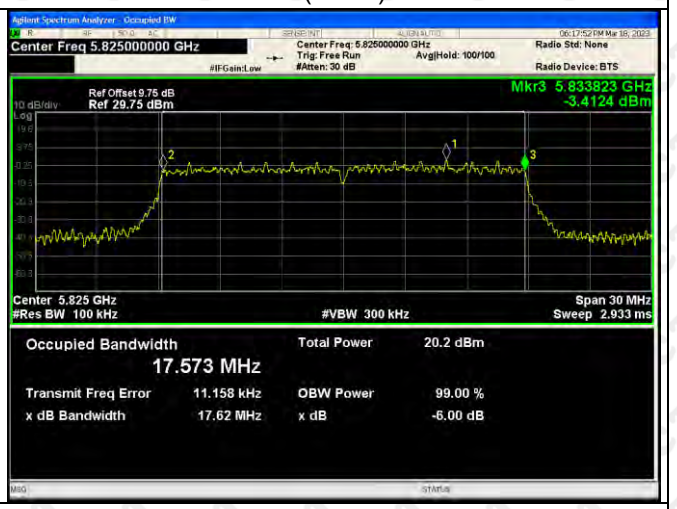
802.11n(HT20)-5745



802.11n(HT20)-5785



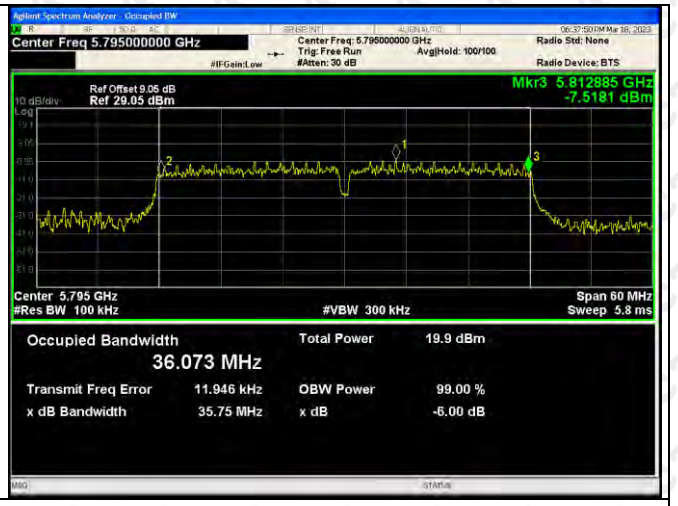
802.11n(HT20)-5825



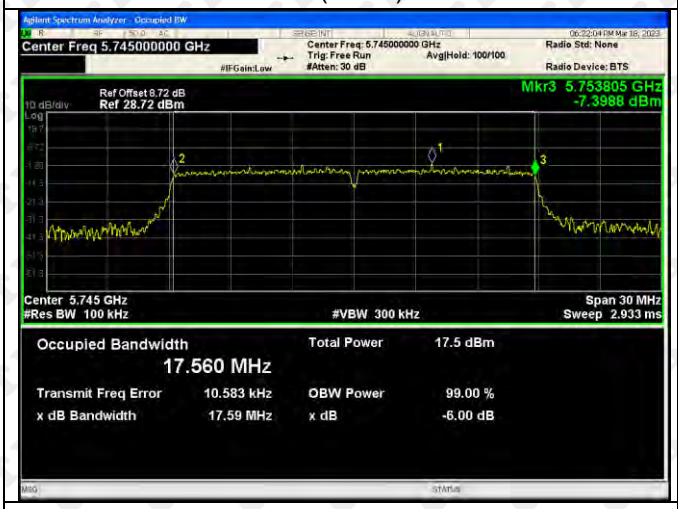
802.11n(HT40)-5755

802.11n(HT40)-5795

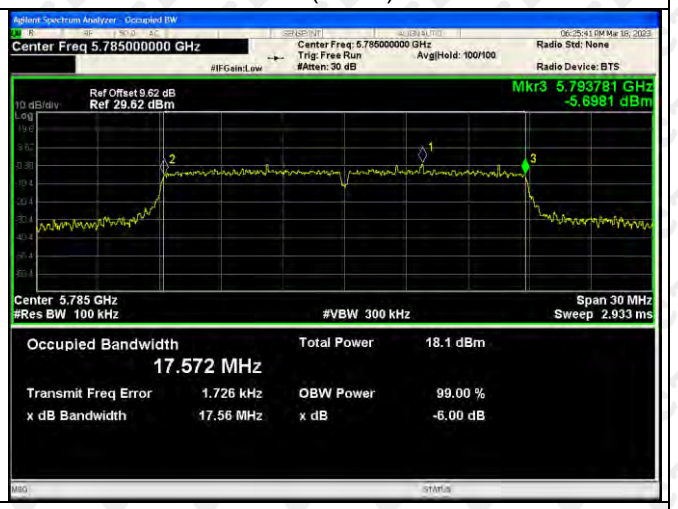
802.11ac(VH20)-5745



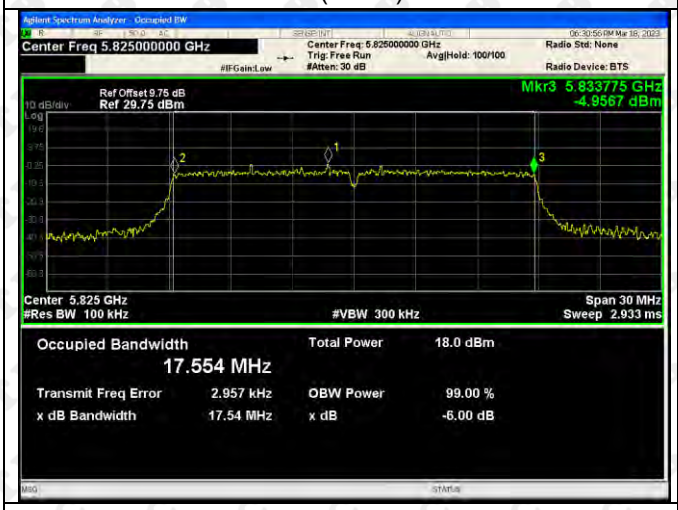
802.11ac(VH20)-5785



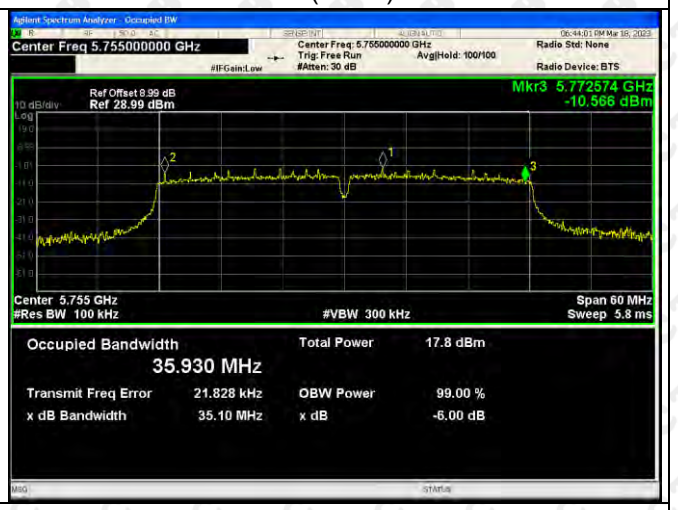
802.11ac(VH20)-5825



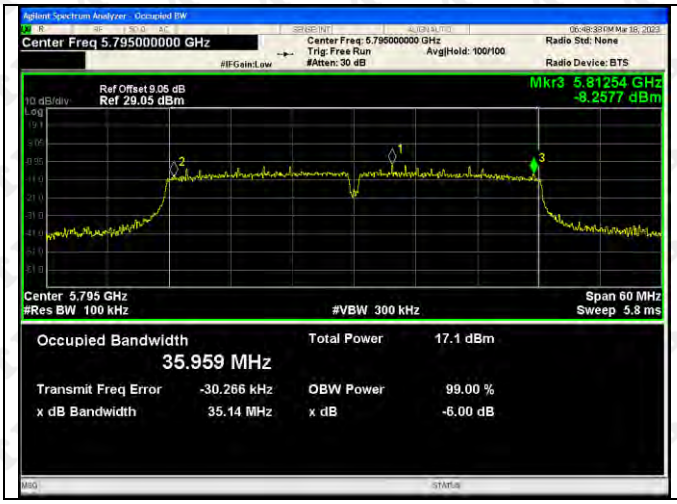
802.11ac(VH40)-5755

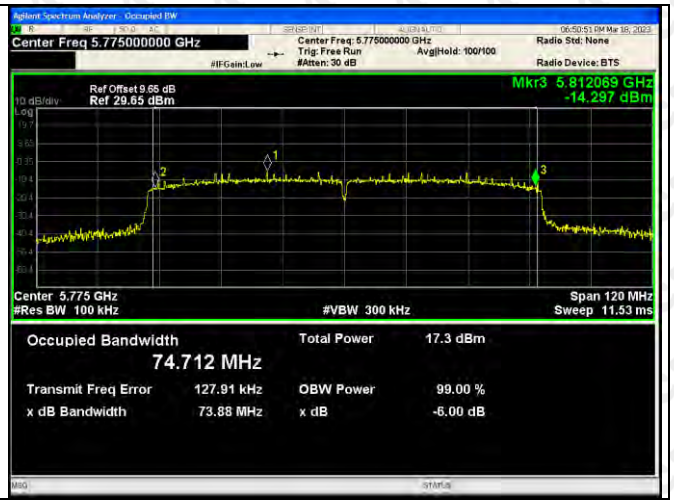


802.11ac(VH40)-5795



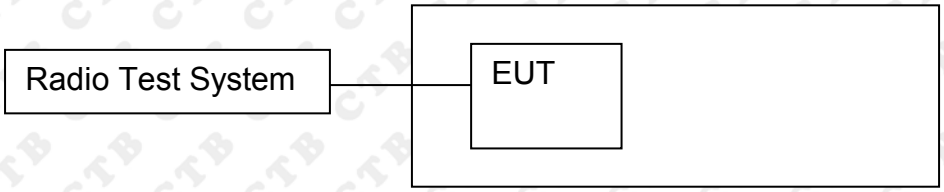
802.11ac(VH80)-5775


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.05 dB
10 dB/div
Ref 29.05 dBm
Mkr3 5.81254 GHz
-8.2577 dBm
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
35.959 MHz
Total Power 17.1 dBm
Transmit Freq Error -30.266 kHz
OBW Power 99.00 %
x dB Bandwidth 35.14 MHz
x dB -6.00 dB


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.65 dB
10 dB/div
Ref 29.65 dBm
Mkr3 5.812069 GHz
-14.297 dBm
Center 5.775 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 120 MHz
Sweep 11.53 ms
Occupied Bandwidth
74.712 MHz
Total Power 17.3 dBm
Transmit Freq Error 127.91 kHz
OBW Power 99.00 %
x dB Bandwidth 73.88 MHz
x dB -6.00 dB

11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

(1) For the band 5.15-5.25 GHz.

(iv) 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

11.3 Test procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

For devices operating in the bands 5.15−5.25 GHz, 5.25−5.35 GHz, and 5.47−5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725−5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
a) Set RBW ≥ 1/*T*, where *T* is defined in II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

11.4 Test Result

5150-5250MHz
ANT1+ANT2

Test mode	Test Channel (MHz)	PSD [dBm/MHz] ANT 1	PSD [dBm/MHz] ANT 2	PSD [dBm/MHz] Total	Limit (dBm)	Result
802.11a	5180	6.631	4.942	/	10.02	Pass
	5200	3.924	4.73	/	10.02	Pass
	5240	6.814	3.864	/	10.02	Pass
802.11n(HT20)	5180	6.459	5.609	9.065	10.02	Pass
	5200	6.694	5.935	9.341	10.02	Pass
	5240	6.735	5.344	9.105	10.02	Pass
802.11n(HT40)	5190	4.347	2.09	6.374	10.02	Pass
	5230	3.987	2.615	6.365	10.02	Pass
802.11ac(VH20)	5210	5.013	4.976	8.005	10.02	Pass
	5180	5.37	6.928	9.229	10.02	Pass
	5200	5.394	5.731	8.576	10.02	Pass
802.11ac(VH40)	5240	2.733	2	5.392	10.02	Pass
	5190	2.084	2.288	5.197	10.02	Pass
802.11ac(VH80)	5230	-1.362	-1.391	1.634	10.02	Pass

5725-5850MHz
ANT1+ANT2

Test mode	Test Channel (MHz)	PSD [dBm/MHz] ANT 1	PSD [dBm/MHz] ANT 2	PSD [dBm/MHz] Total	Limit (dBm)	Result
802.11a	5745	-2.938	-2.343	/	28.6	Pass
	5785	-2.173	-1.273	/	28.6	Pass
	5825	-1.28	-1.063	/	28.6	Pass
802.11n(HT20)	5745	-2.696	-2.731	0.297	28.6	Pass
	5785	-2.209	-2.425	0.695	28.6	Pass
	5825	-2.464	-2.4	0.578	28.6	Pass
802.11n(HT40)	5755	-5.689	-6.237	-2.944	28.6	Pass
	5795	-5.834	-6.299	-3.050	28.6	Pass
802.11ac(VH20)	5745	-2.471	-3.149	0.214	28.6	Pass
	5785	-2.866	-2.346	0.412	28.6	Pass
	5825	-2.892	-2.197	0.480	28.6	Pass
802.11ac(VH40)	5755	-5.851	-6.157	-2.991	28.6	Pass
	5795	-6.788	-6.938	-3.852	28.6	Pass
802.11ac(VH80)	5775	-9.518	-9.939	-6.713	28.6	Pass

5150-5250MHz
ANT1

802.11a-5180

802.11a-5200

802.11a-5240

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230

802.11ac(VH20)-5180

802.11ac(VH20)-5200

802.11ac(VH20)-5240

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.230000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.48 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.226 46 GHz
2.084 dBm
Center 5.23000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.210000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.52 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.219 48 GHz
-1.362 dBm
Center 5.21000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

ANT2

802.11a-5180

802.11a-5200

802.11a-5240

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230

802.11ac(VH20)-5180

802.11ac(VH20)-5200

802.11ac(VH20)-5240

802.11ac(VH40)-5190

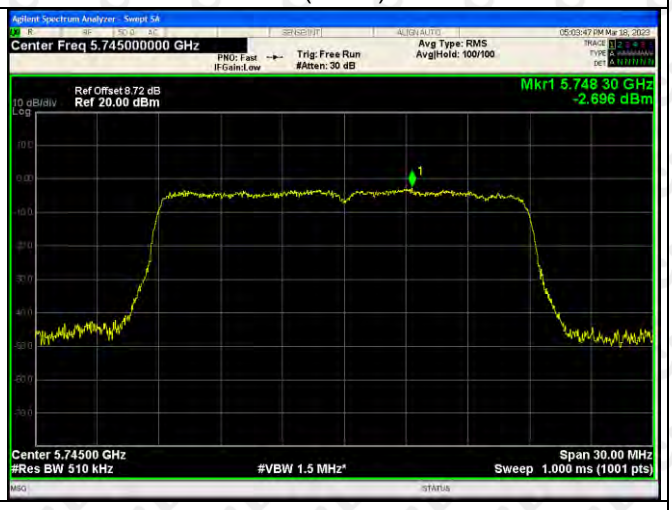
802.11ac(VH40)-5230

802.11ac(VH80)-5210


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.230000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.48 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.219 32 GHz
2.288 dBm
Center 5.23000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.210000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.52 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.222 96 GHz
-1.391 dBm
Center 5.21000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

5745-5825MHz
ANT1

802.11a-5745	802.11a-5785
	
802.11a-5825	802.11n(HT20)-5745
	
802.11n(HT20)-5785	802.11n(HT20)-5825
	
802.11n(HT40)-5755	802.11n(HT40)-5795

802.11ac(VH20)-5745

802.11ac(VH20)-5785

802.11ac(VH20)-5825

802.11ac(VH40)-5755

802.11ac(VH40)-5795

802.11ac(VH80)-5775


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.795000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.05 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 5.787 44 GHz
-6.788 dBm
Center 5.79500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.65 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 5.763 00 GHz
-9.518 dBm
Center 5.77500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

ANT2

802.11a-5745

802.11a-5785

802.11a-5825

802.11n(HT20)-5745

802.11n(HT20)-5785

802.11n(HT20)-5825

802.11n(HT40)-5755

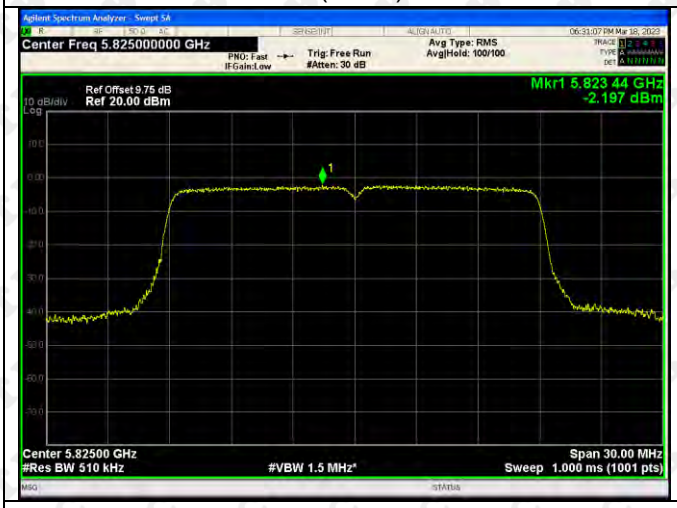
802.11n(HT40)-5795

802.11ac(VH20)-5745

802.11ac(VH20)-5785

802.11ac(VH20)-5825

802.11ac(VH40)-5755



802.11ac(VH40)-5795

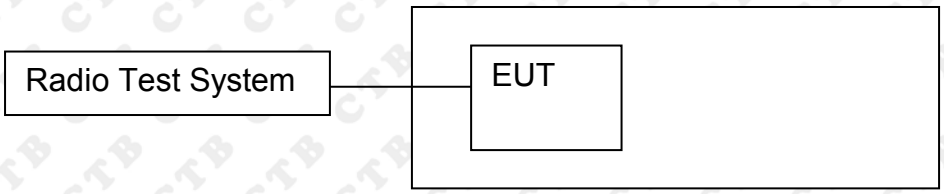
802.11ac(VH80)-5775


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.795000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.05 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.797 58 GHz
-6.938 dBm
Center 5.79500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.65 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.774 04 GHz
-9.939 dBm
Center 5.77500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

12. FREQUENCY STABILITY

12.1 Block Diagram Of Test Setup



12.2 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.

12.3 Test procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.

2. Set EUT as normal operation.

3. Turn the EUT on and couple its output to spectrum.

4. Turn the EUT off and set the chamber to the highest temperature specified.

5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.

6. Repeat step with the temperature chamber set to the lowest temperature.

12.4 Test Result

TX Frequency (5150-5250MHz)

ANT1

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5180.0950	5180	0.0950	18.3302
		V max (V)	5.5	5180.0886	5180	0.0886	17.1131
		V min (V)	4.5	5180.0818	5180	0.0818	15.8009
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5180.0429	5180	0.0429	8.2887
		T (°C)	10	5180.0512	5180	0.0512	9.8922
		T (°C)	20	5180.0152	5180	0.0152	2.9286
		T (°C)	30	5180.0461	5180	0.0461	8.8991
		T (°C)	40	5180.0471	5180	0.0471	9.1019
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5200.0037	5200	0.0037	0.7100
		V max (V)	5.5	5200.0406	5200	0.0406	7.8098
		V min (V)	4.5	5200.0441	5200	0.0441	8.4792
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5200.0096	5200	0.0096	1.8397
		T (°C)	10	5200.0150	5200	0.0150	2.8876
		T (°C)	20	5200.0290	5200	0.0290	5.5849
		T (°C)	30	5200.0254	5200	0.0254	4.8765
		T (°C)	40	5200.0340	5200	0.0340	6.5307
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5240.0125	5240	0.0125	2.3841
		V max (V)	5.5	5240.0140	5240	0.0140	2.6729
		V min (V)	4.5	5240.0003	5240	0.0003	0.0602
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5240.0313	5240	0.0313	5.9702
		T (°C)	10	5240.0011	5240	0.0011	0.2095
		T (°C)	20	5240.0194	5240	0.0194	3.6954
		T (°C)	30	5240.0471	5240	0.0471	8.9800
		T (°C)	40	5240.0276	5240	0.0276	5.2642
Limits				±20ppm			
Result				Complies			

TX Frequency (5725-5850MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5745.0760	5745	0.0760	13.2280
		V max (V)	5.5	5745.0378	5745	0.0378	6.5878
		V min (V)	4.5	5745.0760	5745	0.0760	13.2280
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5745.0222	5745	0.0222	3.8654
		T (°C)	10	5745.0739	5745	0.0739	12.8636
		T (°C)	20	5745.0352	5745	0.0352	6.1269
		T (°C)	30	5745.0461	5745	0.0461	8.0211
		T (°C)	40	5745.0012	5745	0.0012	0.2079
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5785.0331	5785	0.0331	5.7249
		V max (V)	5.5	5785.0026	5785	0.0026	0.4579
		V min (V)	4.5	5785.0688	5785	0.0688	11.8889
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5785.0864	5785	0.0864	14.9331
		T (°C)	10	5785.0774	5785	0.0774	13.3741
		T (°C)	20	5785.0507	5785	0.0507	8.7606
		T (°C)	30	5785.0191	5785	0.0191	3.3061
		T (°C)	40	5785.0156	5785	0.0156	2.6903
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5825.0150	5825	0.0150	2.5815
		V max (V)	5.5	5825.0723	5825	0.0723	12.4118
		V min (V)	4.5	5825.0785	5825	0.0785	13.4790
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5825.0234	5825	0.0234	4.0102
		T (°C)	10	5825.0078	5825	0.0078	1.3474
		T (°C)	20	5825.0566	5825	0.0566	9.7156
		T (°C)	30	5825.0563	5825	0.0563	9.6644
		T (°C)	40	5825.0180	5825	0.0180	3.0951
Limits				±20ppm			
Result				Complies			

ANT2:

TX Frequency (5150-5250MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5180.0022	5180	0.0022	0.4168
		V max (V)	5.5	5180.0459	5180	0.0459	8.8554
		V min (V)	4.5	5180.0733	5180	0.0733	14.1540
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5180.0611	5180	0.0611	11.7878
		T (°C)	10	5180.0088	5180	0.0088	1.7033
		T (°C)	20	5180.0601	5180	0.0601	11.6111
		T (°C)	30	5180.0493	5180	0.0493	9.5193
		T (°C)	40	5180.0019	5180	0.0019	0.3741
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5200.0583	5200	0.0583	11.2171
		V max (V)	5.5	5200.0327	5200	0.0327	6.2849
		V min (V)	4.5	5200.0369	5200	0.0369	7.0907
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5200.0661	5200	0.0661	12.7194
		T (°C)	10	5200.0104	5200	0.0104	2.0052
		T (°C)	20	5200.0664	5200	0.0664	12.7667
		T (°C)	30	5200.0492	5200	0.0492	9.4688
		T (°C)	40	5200.0095	5200	0.0095	1.8213
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5240.0474	5240	0.0474	9.0459
		V max (V)	5.5	5240.0329	5240	0.0329	6.2820
		V min (V)	4.5	5240.0831	5240	0.0831	15.8554
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5240.0466	5240	0.0466	8.9009
		T (°C)	10	5240.0516	5240	0.0516	9.8463
		T (°C)	20	5240.0037	5240	0.0037	0.7062
		T (°C)	30	5240.0602	5240	0.0602	11.4845
		T (°C)	40	5240.0201	5240	0.0201	3.8329
Limits				±20ppm			
Result				Complies			

TX Frequency (5725-5850MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5745.0313	5745	0.0313	5.4493
		V max (V)	5.5	5745.0752	5745	0.0752	13.0974
		V min (V)	4.5	5745.0332	5745	0.0332	5.7827
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5745.0285	5745	0.0285	4.9688
		T (°C)	10	5745.0274	5745	0.0274	4.7647
		T (°C)	20	5745.0462	5745	0.0462	8.0352
		T (°C)	30	5745.0321	5745	0.0321	5.5889
		T (°C)	40	5745.0876	5745	0.0876	15.2507
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5785.0724	5785	0.0724	12.5069
		V max (V)	5.5	5785.0767	5785	0.0767	13.2642
		V min (V)	4.5	5785.0505	5785	0.0505	8.7277
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5785.0839	5785	0.0839	14.5081
		T (°C)	10	5785.0616	5785	0.0616	10.6513
		T (°C)	20	5785.0709	5785	0.0709	12.2489
		T (°C)	30	5785.0259	5785	0.0259	4.4762
		T (°C)	40	5785.0328	5785	0.0328	5.6647
		T (°C)	50	5785.0496	5785	0.0496	8.5698
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5	5825.0134	5825	0.0134	2.3028
		V max (V)	5.5	5825.0383	5825	0.0383	6.5763
		V min (V)	4.5	5825.0914	5825	0.0914	15.6838
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5825.0563	5825	0.0563	9.6579
		T (°C)	10	5825.0515	5825	0.0515	8.8341
		T (°C)	20	5825.0868	5825	0.0868	14.8997
		T (°C)	30	5825.0853	5825	0.0853	14.6365
		T (°C)	40	5825.0684	5825	0.0684	11.7499
Limits				±20ppm			
Result				Complies			

13. OPERATION IN THE ABSENCE OF INFORMATION TO THE TRANSMIT

13.1 Requirement

15.407(c) requirement:
The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signal ling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

13.2 Test Results

Operation in the absence of information to the transmit:

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling
signal of ASK message transmitting from remote device and verify whether it shall resend or
discontinue transmission. (manufacturer declare)

14. ANTENNA REQUIREMENT

15.203 requirement:
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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
15.407(a)(1)(ii) requirement:
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
15.407(a)(3)(i) requirement:
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is FPC antenna and no consideration of replacement. The best case I gain of the antenna 5.2G is 3.97dBi, 5.8G is 4.39dBi.

15. EUT PHOTOGRAPHS

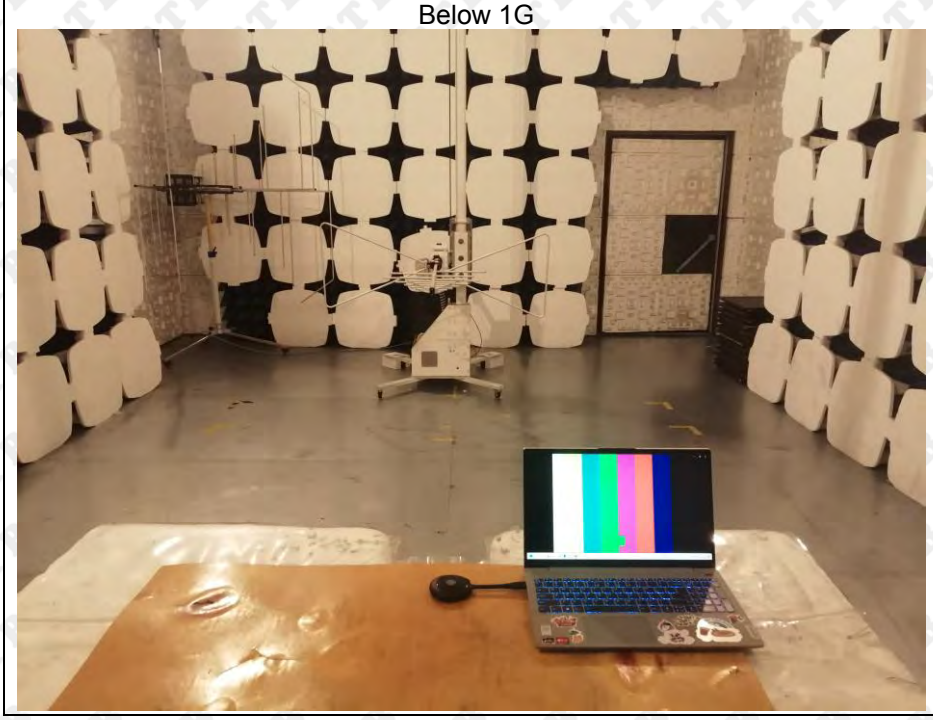
External Photos
EUT Photo 1

EUT Photo 2

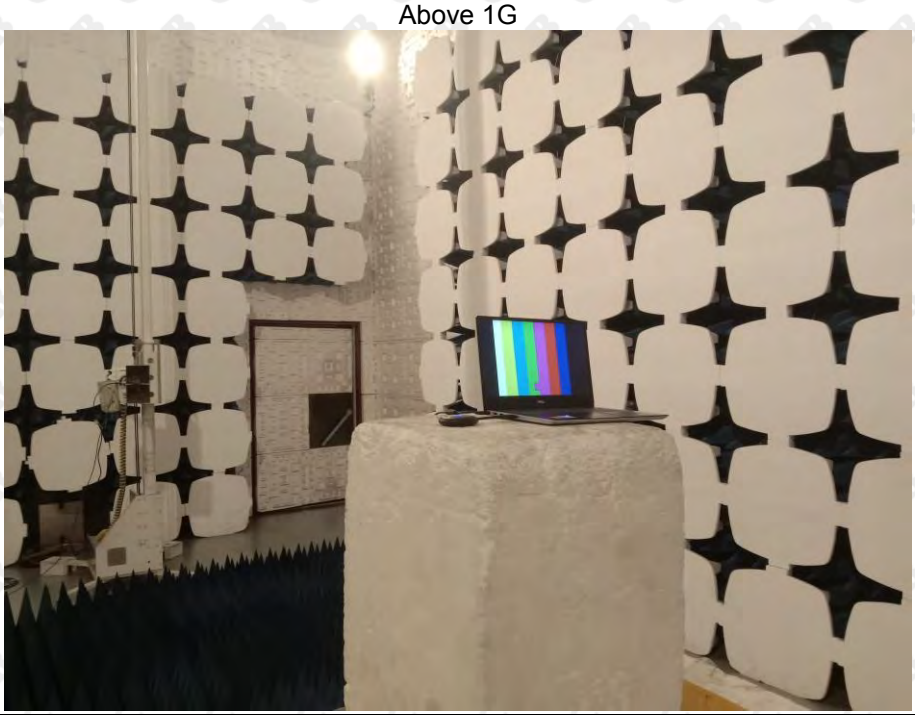
16. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 1G



Above 1G



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