

9.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

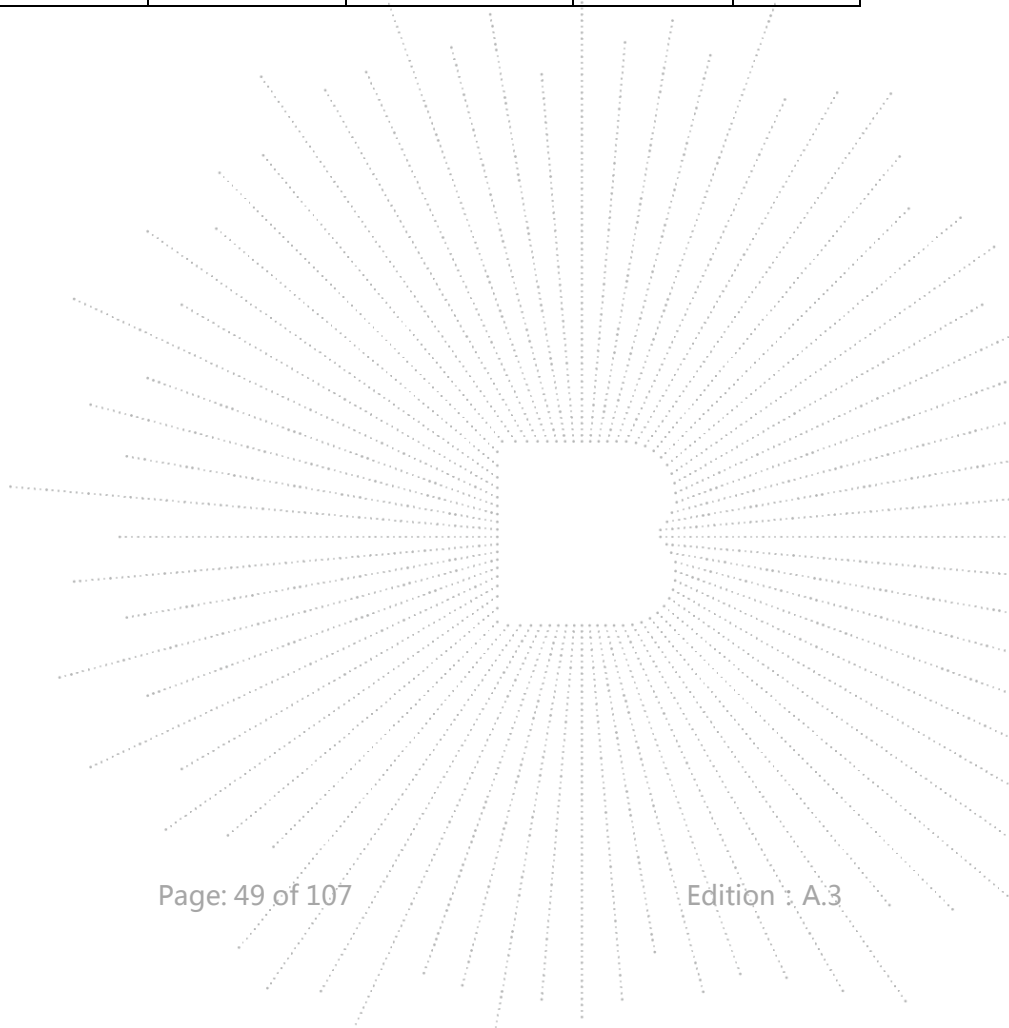
9.5 Test Result

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC120V/60Hz
Test Mode :	TX Frequency U-NII-1 (5180-5240MHz)		

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

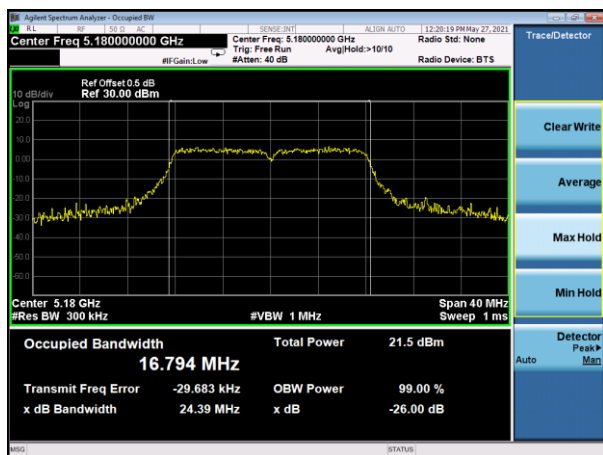
Mode	Channel	Frequency (MHz)	99% bandwidth(MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11a	CH36	5180	16.79	24.39	N/A	Pass
	CH40	5200	16.72	20.55	N/A	Pass
	CH48	5240	16.73	21.15	N/A	Pass
802.11 n20	CH36	5180	17.73	21.41	N/A	Pass
	CH40	5200	17.71	21.23	N/A	Pass
	CH48	5240	17.73	21.78	N/A	Pass
802.11 n40	CH 38	5190	37.04	46.23	N/A	Pass
	CH 46	5230	37.12	56.14	N/A	Pass
802.11 ac20	CH36	5180	17.75	21.28	N/A	Pass
	CH40	5200	17.74	20.98	N/A	Pass
	CH48	5240	17.91	22.03	N/A	Pass
802.11 ac40	CH 38	5190	37.05	48.39	N/A	Pass
	CH 46	5230	36.96	47.78	N/A	Pass
802.11 AC80	CH 42	5210	75.79	117.9	N/A	Pass

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11a	CH36	5180	16.69	20.74	N/A	Pass
	CH40	5200	16.72	20.89	N/A	Pass
	CH48	5240	16.64	20.79	N/A	Pass
802.11 n20	CH36	5180	17.67	21.11	N/A	Pass
	CH40	5200	17.70	21.49	N/A	Pass
	CH48	5240	17.74	21.41	N/A	Pass
802.11 n40	CH 38	5190	36.68	50.17	N/A	Pass
	CH 46	5230	36.60	48.54	N/A	Pass
802.11 ac20	CH36	5180	17.65	21.13	N/A	Pass
	CH40	5200	17.74	20.91	N/A	Pass
	CH48	5240	17.66	20.80	N/A	Pass
802.11 ac40	CH 38	5190	36.64	46.58	N/A	Pass
	CH 46	5230	36.92	47.55	N/A	Pass
802.11 AC80	CH 42	5210	75.72	90.64	N/A	Pass

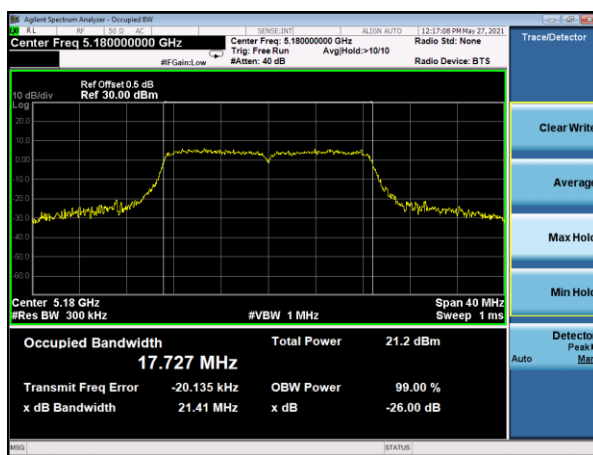


Test plot

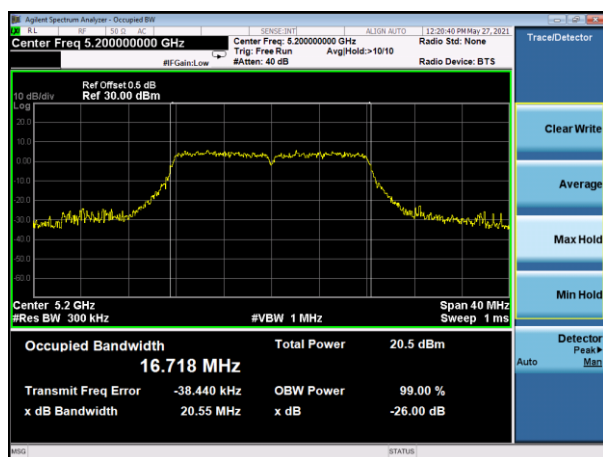
(802.11a) 26dB&99%Bandwidth plot on channel 36



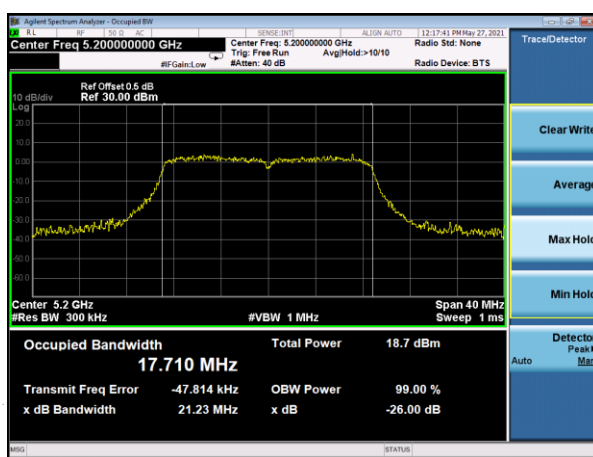
(802.11 n20) 26dB&99%Bandwidth plot on channel 36



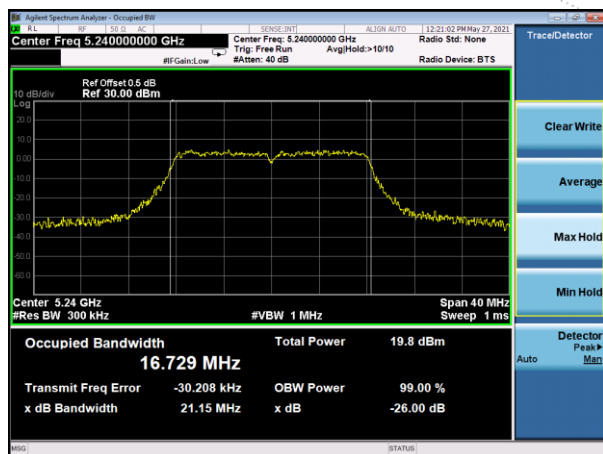
(802.11a) 26dB&99%Bandwidth plot on channel 40



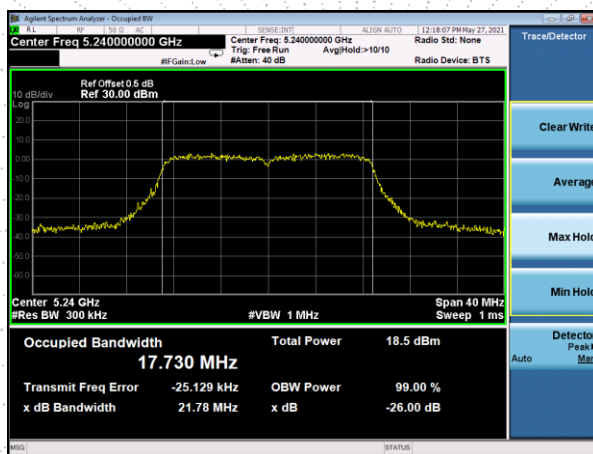
(802.11 n20) 26dB&99%Bandwidth plot on channel 40



(802.11a) 26dB&99%Bandwidth plot on channel 48

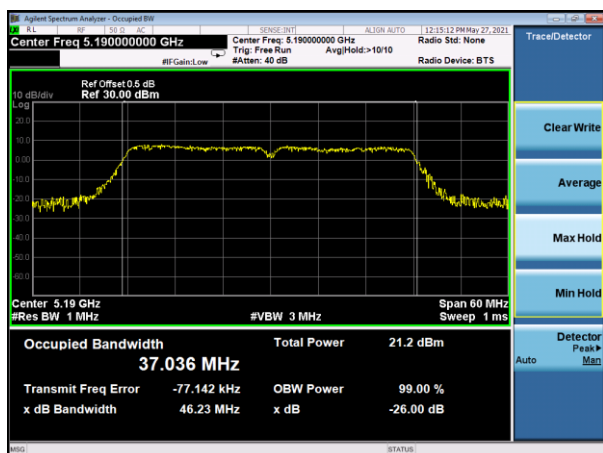


(802.11 n20) 26dB&99%Bandwidth plot on channel 48

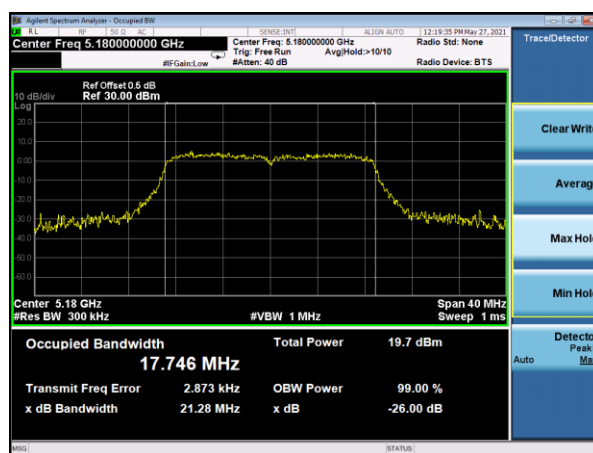


Test plot

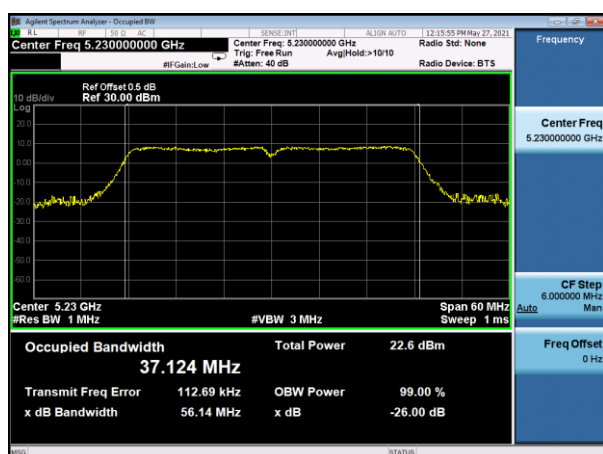
(802.11 n40) 26dB&99%Bandwidth plot on channel 38



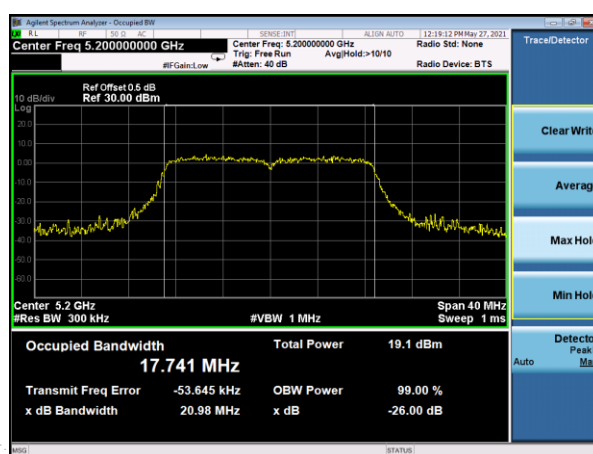
(802.11 AC20) 26dB&99%Bandwidth plot on channel 36



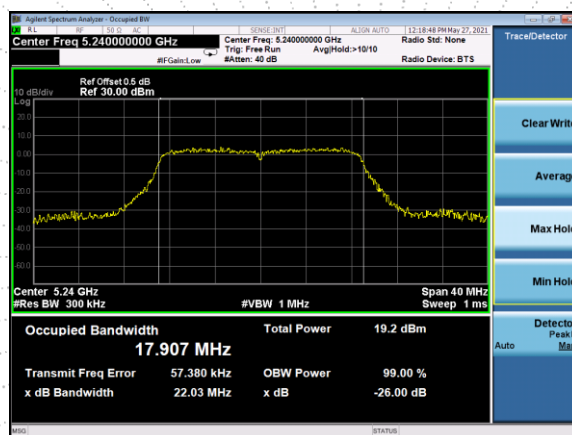
(802.11 n40) 26dB&99%Bandwidth plot on channel 46



(802.11 AC20) 26dB&99%Bandwidth plot on channel 40

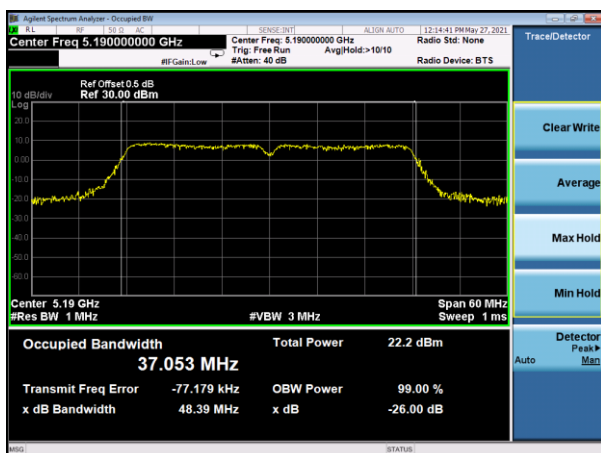


(802.11 AC20) 26dB&99%Bandwidth plot on channel 40

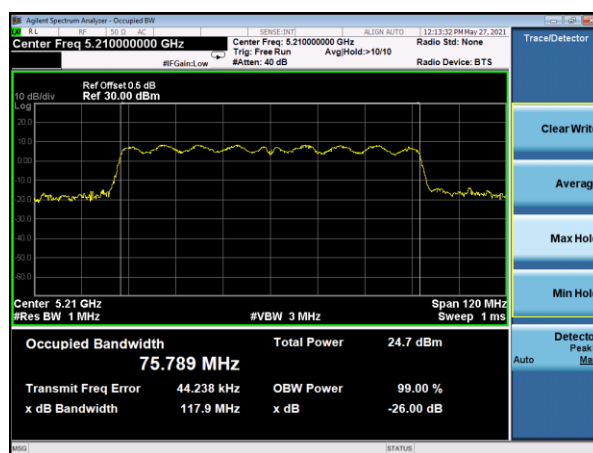


Test plot

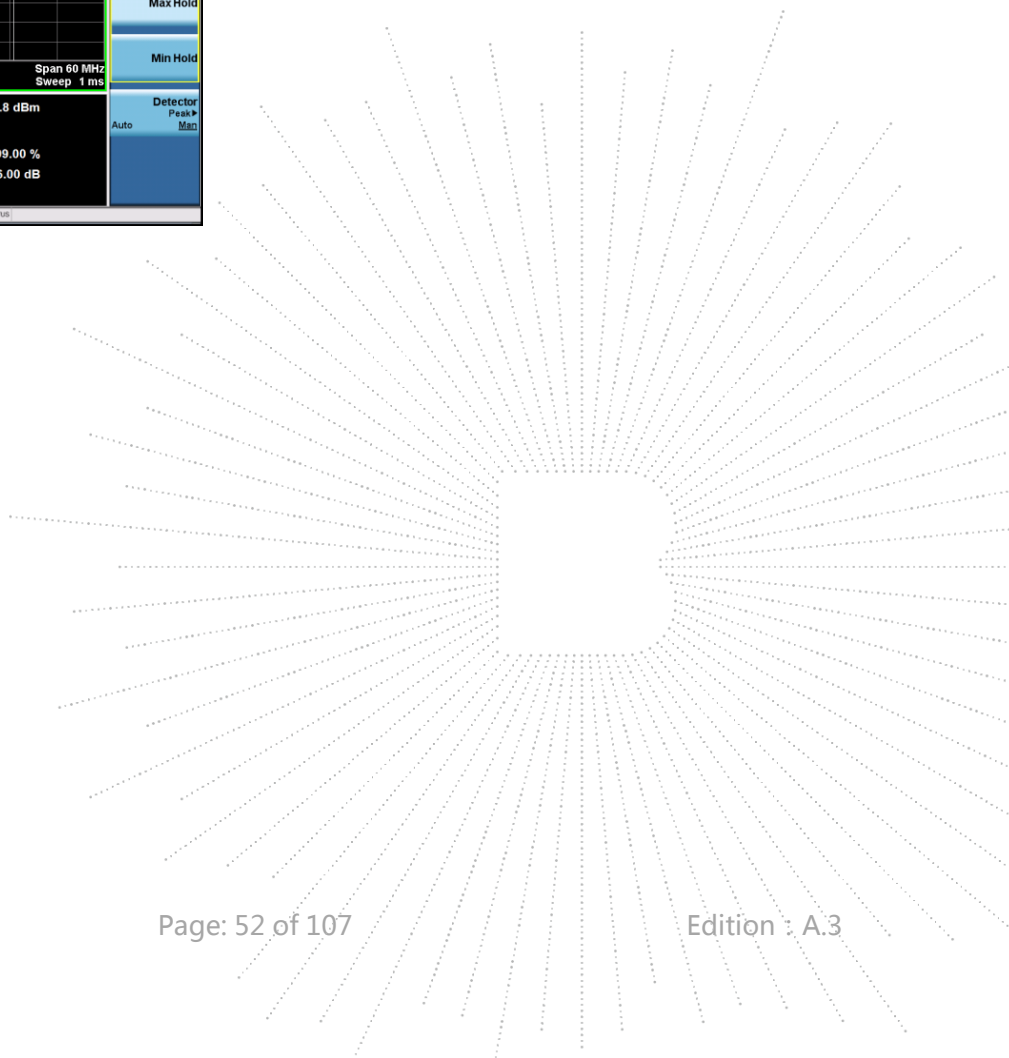
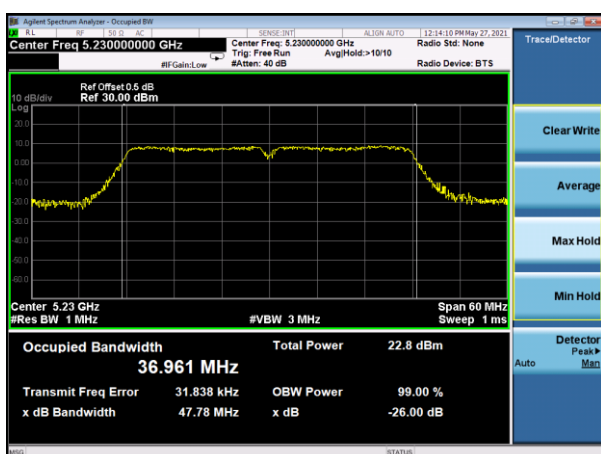
(802.11 AC40) 26dB&99%Bandwidth plot on channel 38



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



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



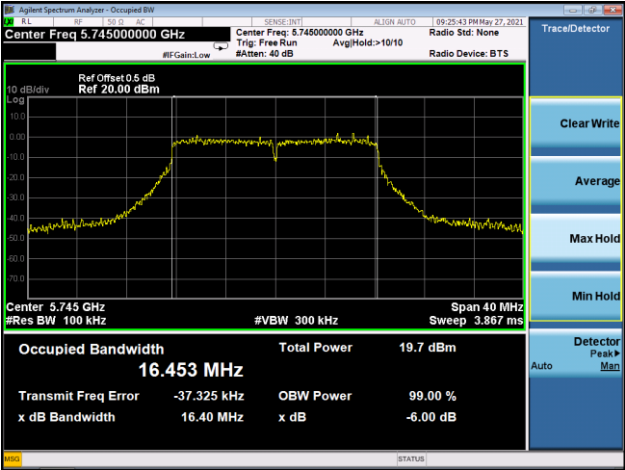
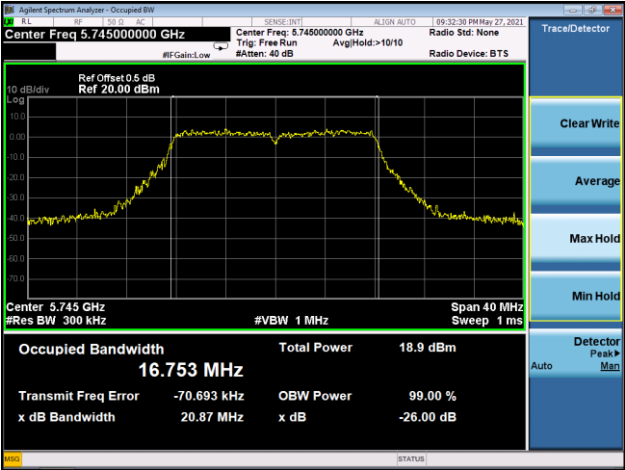
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC120V/60Hz
Test Mode :	TX Frequency U-NII-3(5745-5825MHz)		

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

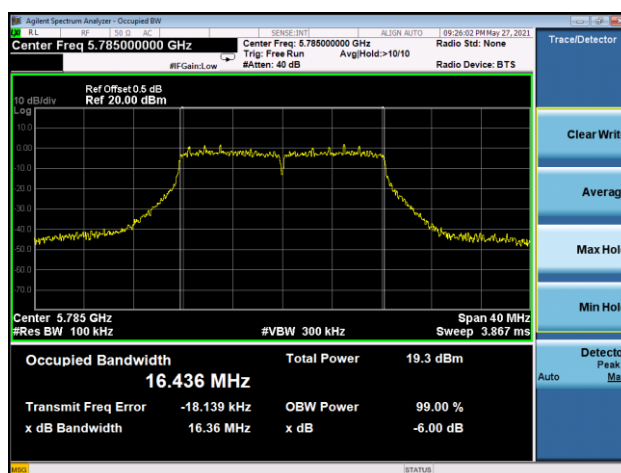
Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	6dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11a	CH149	5745	16.75	16.40	≥500	Pass
	CH157	5785	16.71	16.36	≥500	Pass
	CH165	5825	16.87	16.34	≥500	Pass
802.11 n20	CH149	5745	17.66	16.60	≥500	Pass
	CH157	5785	17.78	16.68	≥500	Pass
	CH165	5825	17.74	17.58	≥500	Pass
802.11 n40	CH151	5755	36.83	35.98	≥500	Pass
	CH159	5795	36.95	36.07	≥500	Pass
802.11 ac20	CH149	5745	17.69	16.58	≥500	Pass
	CH157	5785	17.67	16.70	≥500	Pass
	CH165	5825	17.73	17.15	≥500	Pass
802.11 ac40	CH151	5755	36.94	36.14	≥500	Pass
	CH159	5795	36.79	35.62	≥500	Pass
802.11 AC80	CH155	5775	75.47	75.27	≥500	Pass

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	6dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11a	CH149	5745	16.58	16.33	≥500	Pass
	CH157	5785	16.58	16.08	≥500	Pass
	CH165	5825	16.71	16.30	≥500	Pass
802.11 n20	CH149	5745	17.67	16.81	≥500	Pass
	CH157	5785	17.68	17.31	≥500	Pass
	CH165	5825	17.69	16.72	≥500	Pass
802.11 n40	CH151	5755	36.56	35.81	≥500	Pass
	CH159	5795	36.66	35.82	≥500	Pass
802.11 ac20	CH149	5745	17.64	16.62	≥500	Pass
	CH157	5785	17.65	16.66	≥500	Pass
	CH165	5825	17.67	17.07	≥500	Pass
802.11 ac40	CH151	5755	36.67	35.87	≥500	Pass
	CH159	5795	36.65	35.66	≥500	Pass
802.11 AC80	CH155	5775	75.33	75.11	≥500	Pass

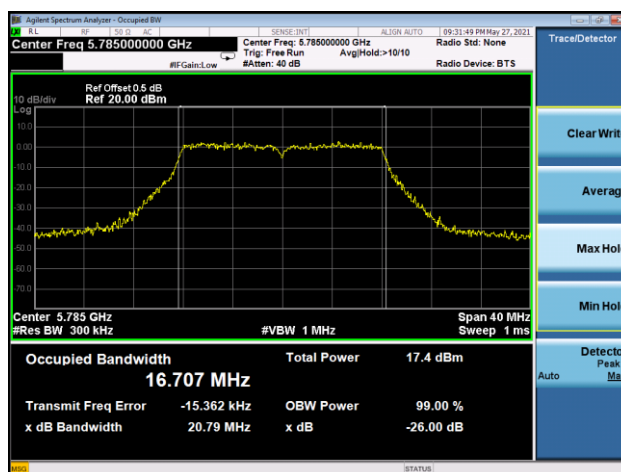
Antenna A: 5725-5850MHz

Mode:	802.11a
<p>5745MHz 6dB bandwidth</p>	
<p>5745MHz 99% bandwidth</p>	

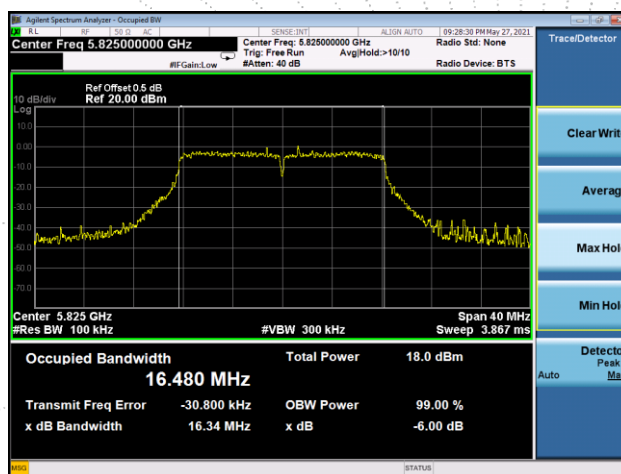
5785MHz
6dB bandwidth



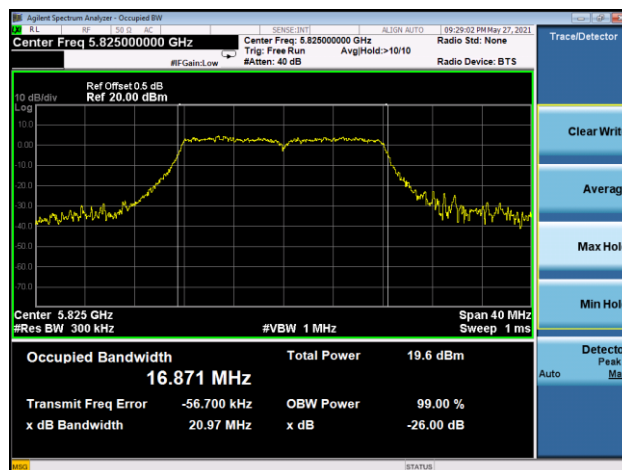
5785MHz
99% bandwidth

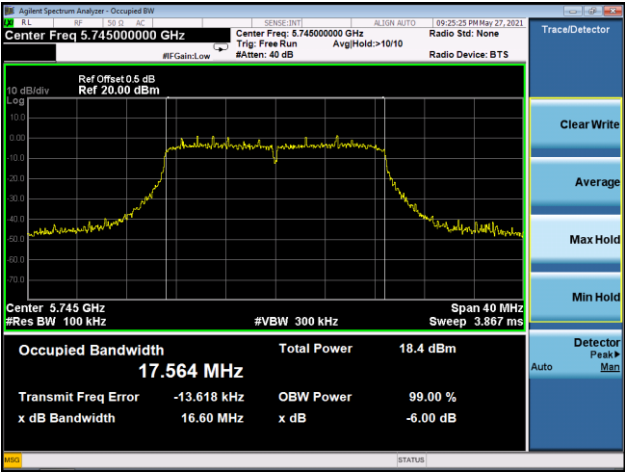
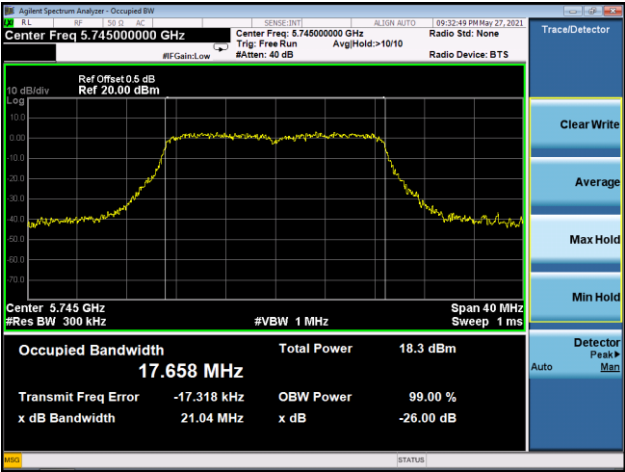


5825MHz
6dB bandwidth

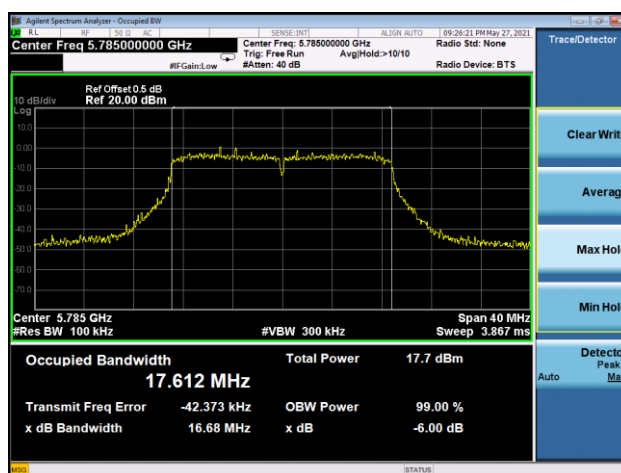


5825MHz
99% bandwidth

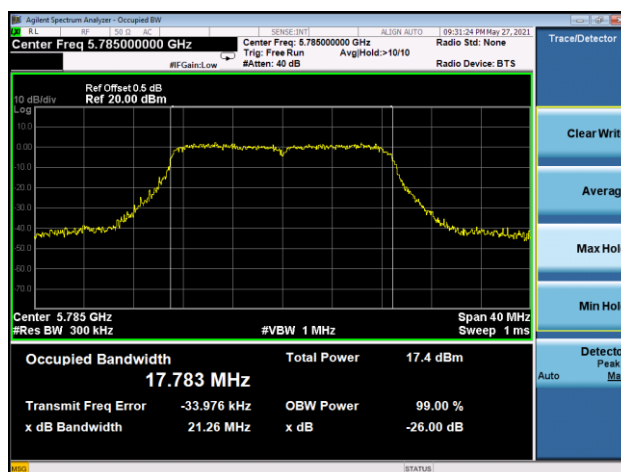


Mode:	802.11n-HT20
5745MHz 6dB bandwidth	
5745MHz 99% bandwidth	

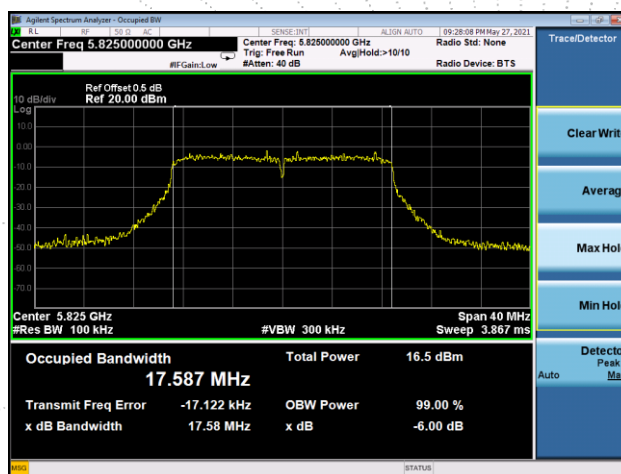
5785MHz
6dB bandwidth



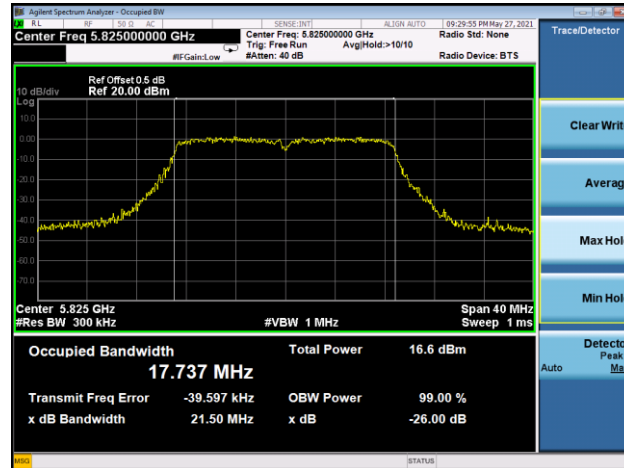
5785MHz
99% bandwidth

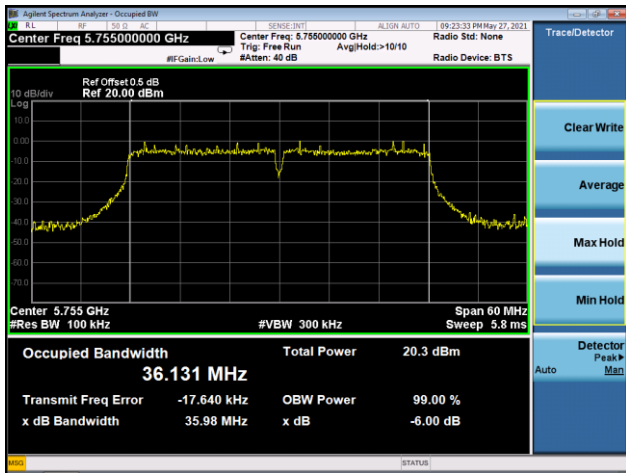
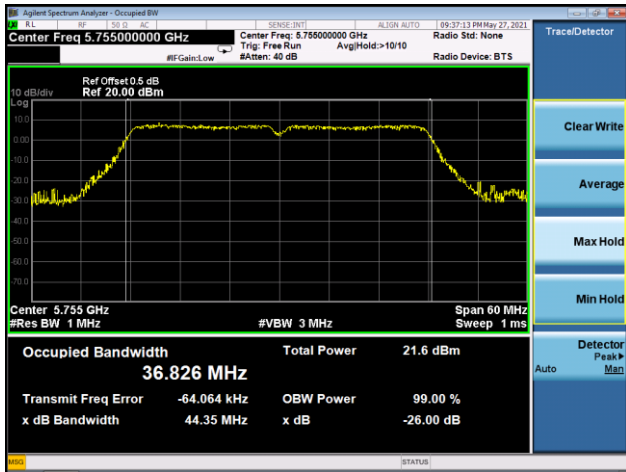


5825MHz
6dB bandwidth

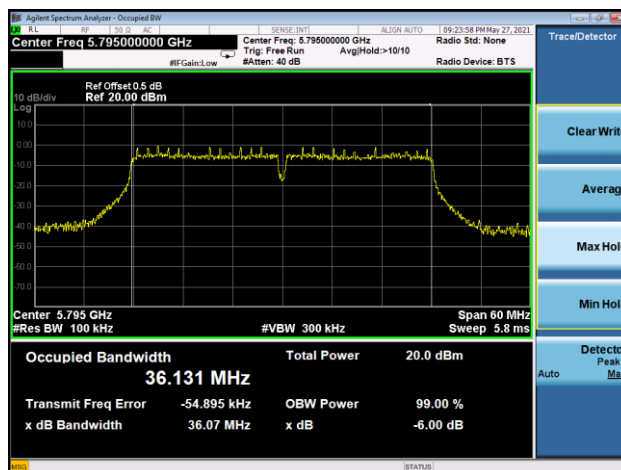


5825MHz
99% bandwidth

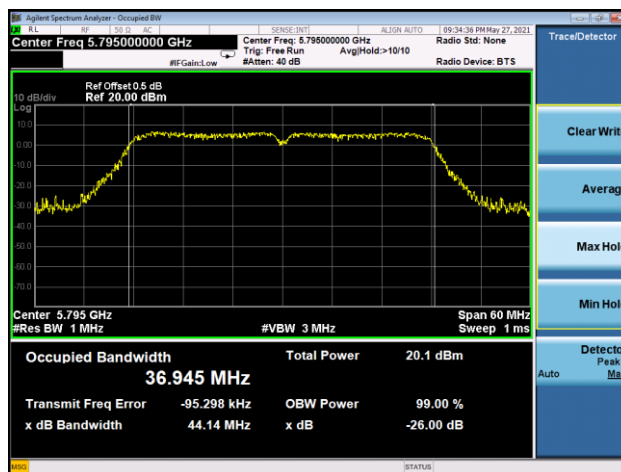


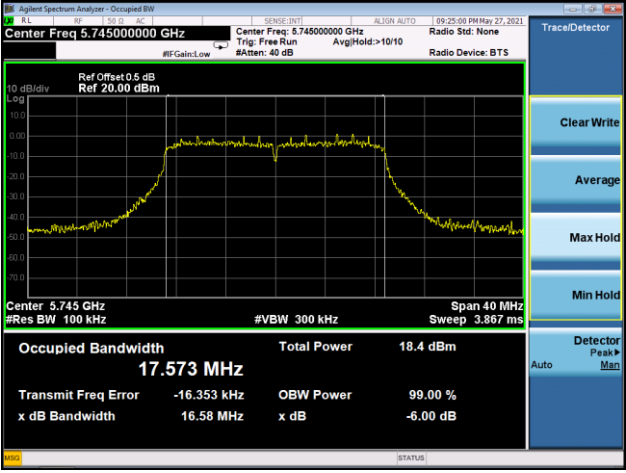
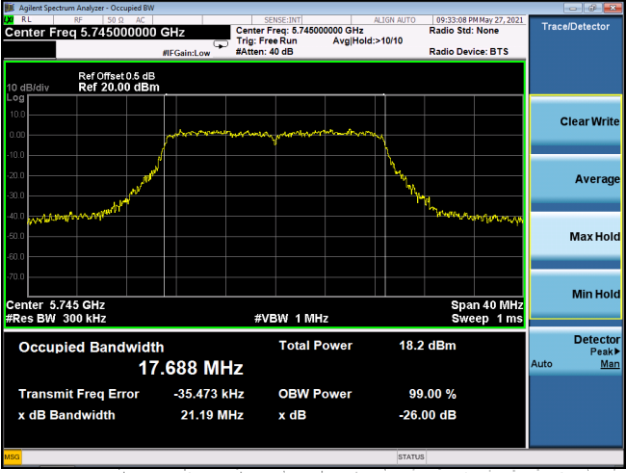
Mode:		802.11n-HT40
5755 MHz 6dB bandwidth		
5755 MHz 99% bandwidth		

5795 MHz
6dB bandwidth

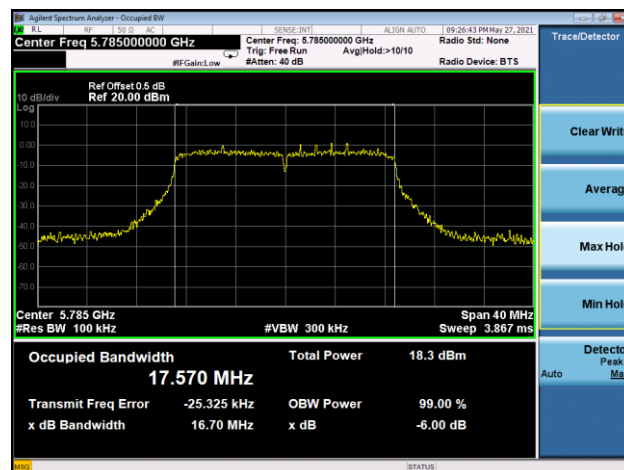


5795 MHz
99% bandwidth

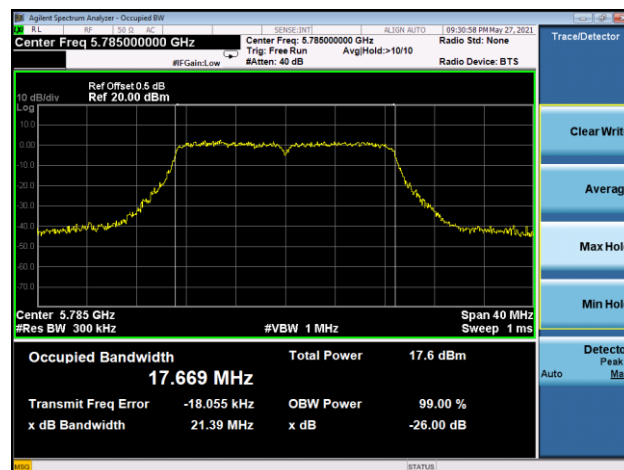


Mode:		802.11ac-HT20
5745MHz 6dB bandwidth		
5745MHz 99% bandwidth		

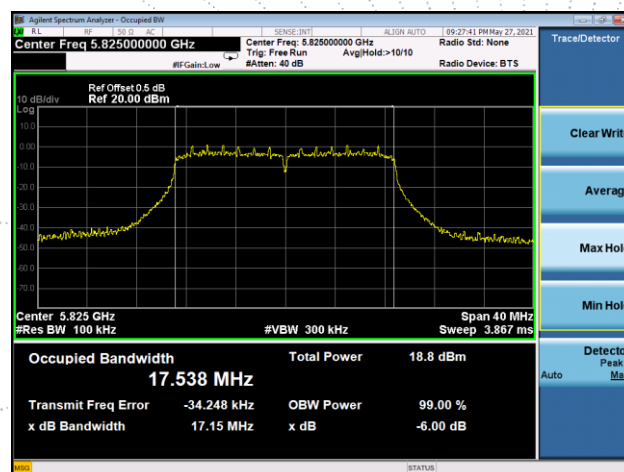
5785MHz
6dB bandwidth



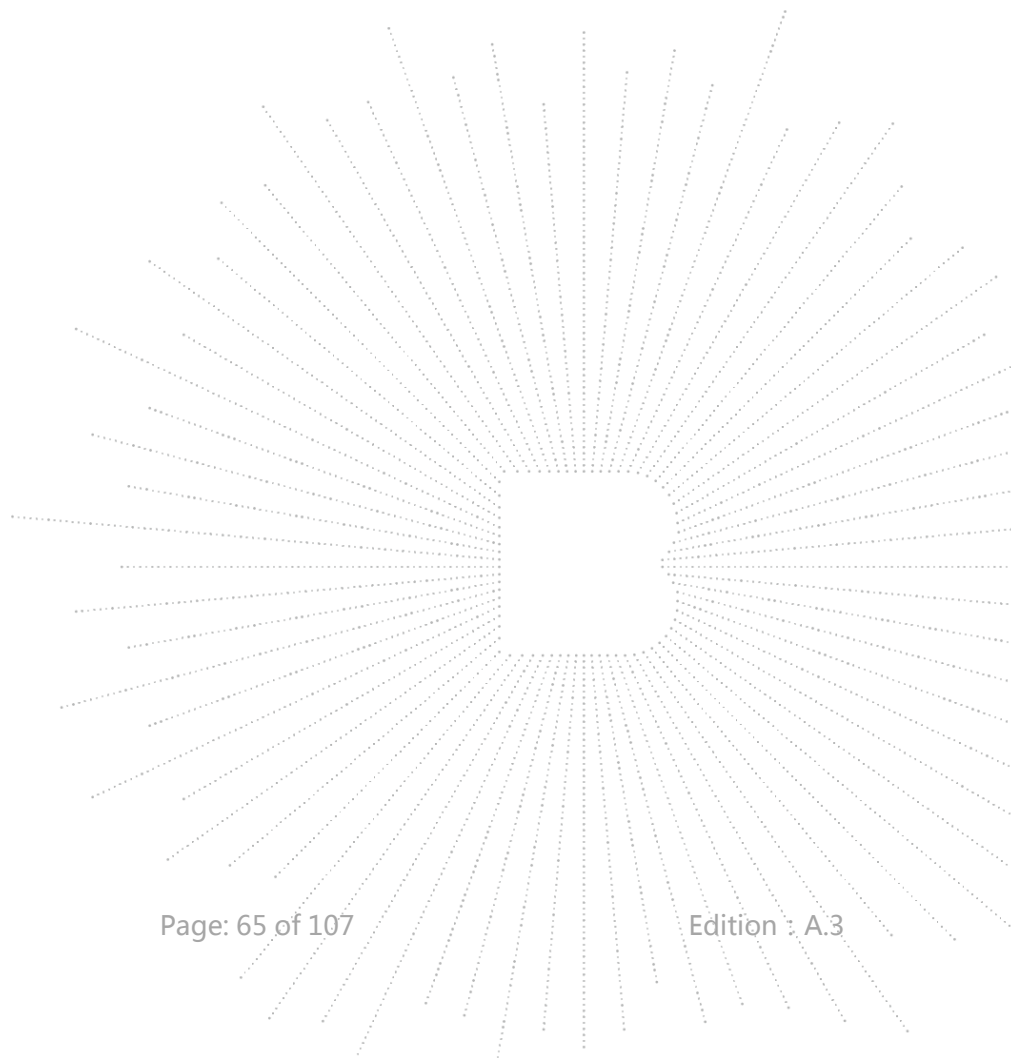
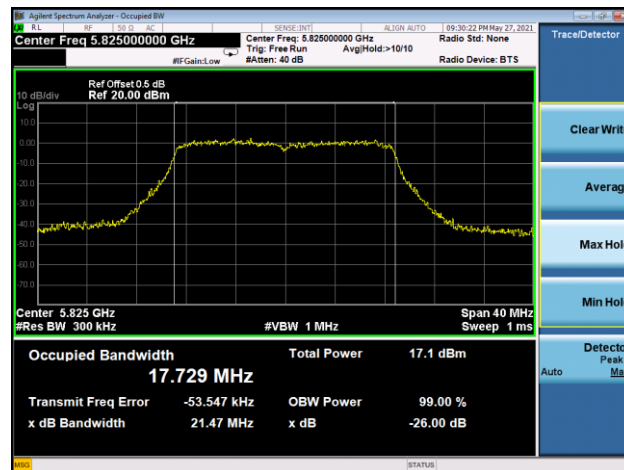
5785MHz
99% bandwidth

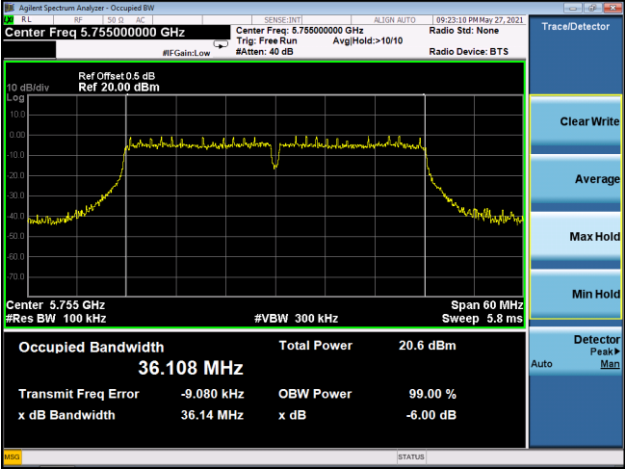
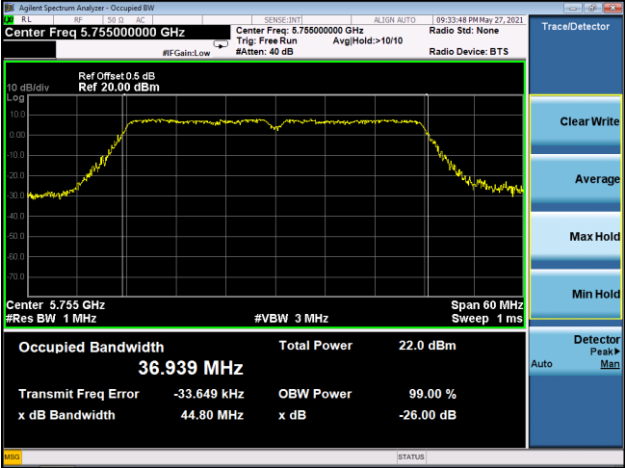


5825MHz
6dB bandwidth

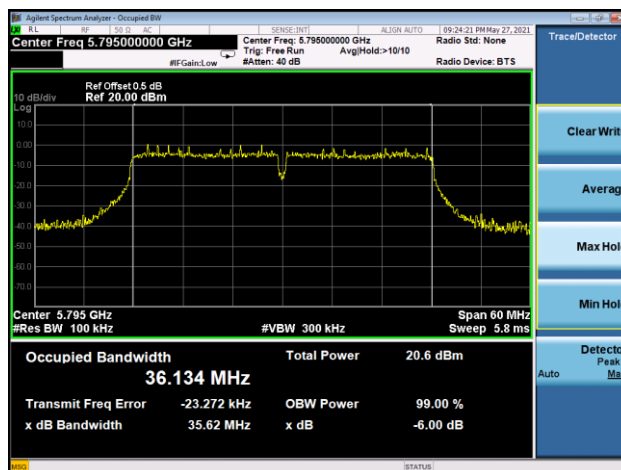


5825MHz
99% bandwidth

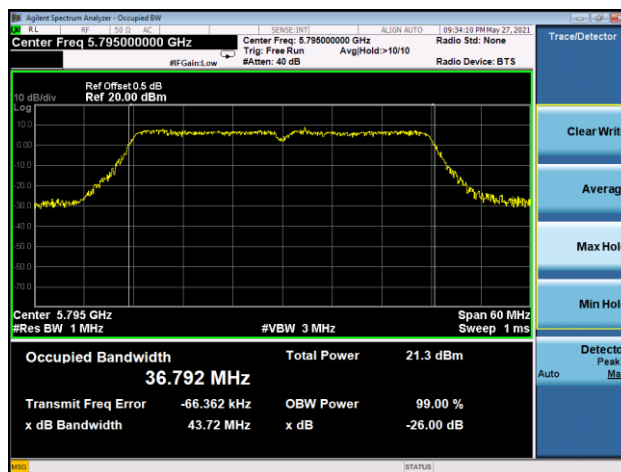


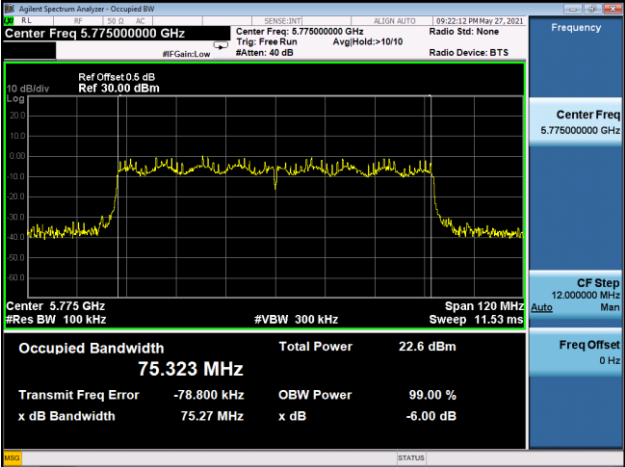
Mode:	802.11ac-HT40
<p>5755 MHz 6dB bandwidth</p>	
<p>5755 MHz 99% bandwidth</p>	

5795 MHz
6dB bandwidth



5795 MHz
99% bandwidth



Mode:	802.11ac-HT80
<p>5775 MHz 6dB bandwidth</p>	 <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 5.775000000 GHz</p> <p>Ref Offset 0.5 dB Ref 30.00 dBm</p> <p>Center 5.775 GHz #Res BW 100 kHz #VBW 300 kHz Span 120 MHz Sweep 11.53 ms</p> <p>Occupied Bandwidth 75.323 MHz</p> <p>Total Power 22.6 dBm</p> <p>Transmit Freq Error -78.800 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 75.27 MHz</p> <p>x dB -6.00 dB</p>
<p>5775 MHz 99% bandwidth</p>	 <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 5.775000000 GHz</p> <p>Ref Offset 0.5 dB Ref 20.00 dBm</p> <p>Center 5.775 GHz #Res BW 1 MHz #VBW 3 MHz Span 120 MHz Sweep 1 ms</p> <p>Occupied Bandwidth 75.470 MHz</p> <p>Total Power 22.9 dBm</p> <p>Transmit Freq Error -16.921 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 82.72 MHz</p> <p>x dB -26.00 dB</p>

10. MAXIMUM CONDUCTED OUTPUT POWER

10.1 Block Diagram Of Test Setup



10.2 Limit

According to FCC §15.407

The maximum conducted output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	0.125W
5725~5850	1W

10.3 Test procedure

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

1. Device Configuration

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

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

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

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

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

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

- The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

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

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

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

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

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) 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.)

(v) Sweep time = auto.

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

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

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

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

10.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

10.5 Test Result

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC120V/60Hz
Test Mode :	TX (5.1G) Mode Frequency U-NII-1 (5180-5240MHz)		

Test Channel	Frequency	Maximum output power. Antenna port (AV)			LIMIT	Result
	(MHz)	ANT A(dBm)	ANT B(dBm)	Total(dBm)	dBm	
TX 802.11a Mode						
CH36	5180	17.285	17.525	/	21	Pass
CH40	5200	16.001	17.212	/	21	Pass
CH48	5240	16.806	17.825	/	21	Pass
TX 802.11 n20M Mode						
CH36	5180	16.739	16.776	19.768	21	Pass
CH40	5200	15.775	16.444	19.133	21	Pass
CH48	5240	16.012	16.274	19.155	21	Pass
TX 802.11 n40M Mode						
CH38	5190	15.479	15.681	18.591	21	Pass
CH46	5230	13.351	15.025	17.278	21	Pass
TX 802.11 AC20M Mode						
CH36	5180	16.081	16.926	19.534	21	Pass
CH40	5200	15.750	16.365	19.079	21	Pass
CH48	5240	16.860	16.794	19.837	21	Pass
TX 802.11 AC40M Mode						
CH38	5190	13.882	15.504	17.779	21	Pass
CH46	5230	15.372	14.545	17.988	21	Pass
TX 802.11 AC80M Mode						
CH42	5210	14.337	13.199	16.815	21	Pass

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC120V/60Hz
Test Mode :	TX (5.8G) Mode Frequency U-NII-3 (5745-5825MHz)		

Test Channel	Frequency	Maximum output power. Antenna port (AV)			LIMIT	Result
	(MHz)	ANT A(dBm)	ANT B(dBm)	Total(dBm)	dBm	
TX 802.11a Mode						
CH 149	5745	17.495	17.516	/	30	Pass
CH 157	5785	16.137	16.686	/	30	Pass
CH 165	5825	16.719	16.373	/	30	Pass
TX 802.11 n20M Mode						
CH 149	5745	16.777	16.210	19.513	30	Pass
CH 157	5785	16.040	16.192	19.127	30	Pass
CH 165	5825	15.121	15.356	18.250	30	Pass
TX 802.11 n40M Mode						
CH 151	5755	15.584	15.115	18.366	30	Pass
CH 159	5795	14.612	14.658	17.645	30	Pass
TX 802.11 AC20M Mode						
CH 149	5745	16.688	16.383	19.548	30	Pass
CH 157	5785	16.859	15.298	19.159	30	Pass
CH 165	5825	15.023	14.186	17.635	30	Pass
TX 802.11 AC40M Mode						
CH 151	5755	15.213	15.200	18.217	30	Pass
CH 159	5795	14.845	14.836	17.851	30	Pass
TX 802.11 AC80M Mode						
CH 155	5775	13.067	13.111	16.099	30	Pass

11. OUT OF BAND EMISSIONS

11.1 Block Diagram Of Test Setup



11.2 Limit

According to FCC §15.407(b)

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

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

11.3 Test procedure

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

11.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

11.5 Test Result

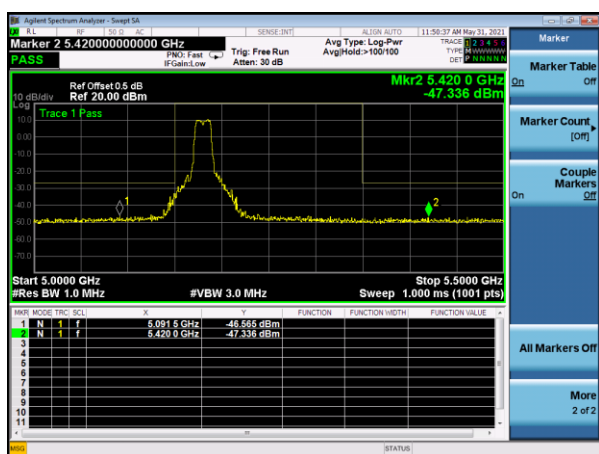
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC120V/60Hz

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

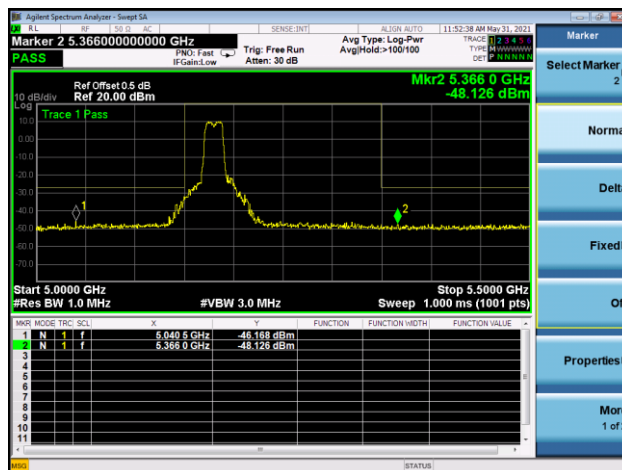
5.1G

5.180~5.240 GHz

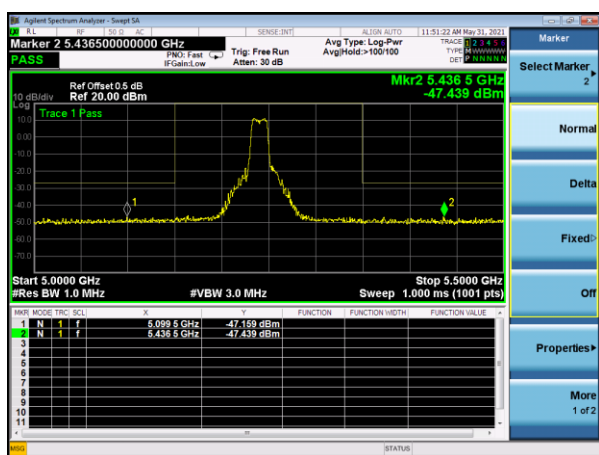
(802.11a) Band Edge, Left Side



(802.11n20) Band Edge, Left Side



(802.11a) Band Edge, Right Side



(802.11n20) Band Edge, Right Side

