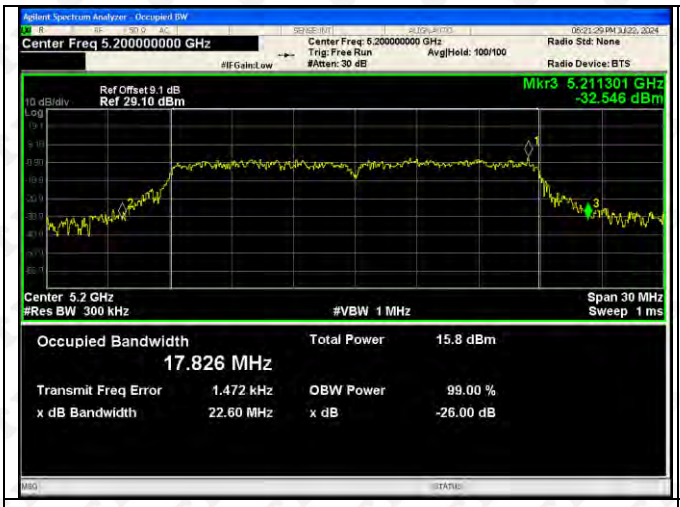
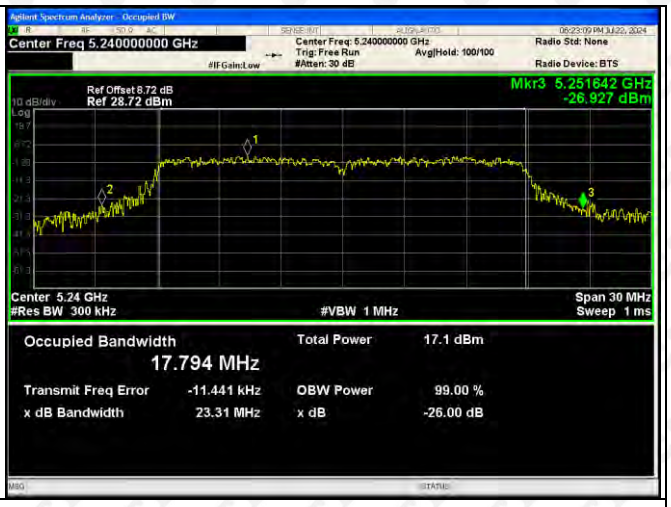
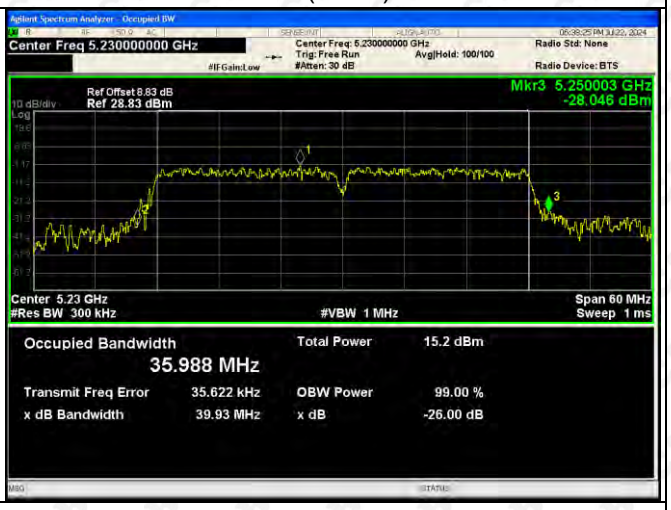


802.11ac(VH40)-5190

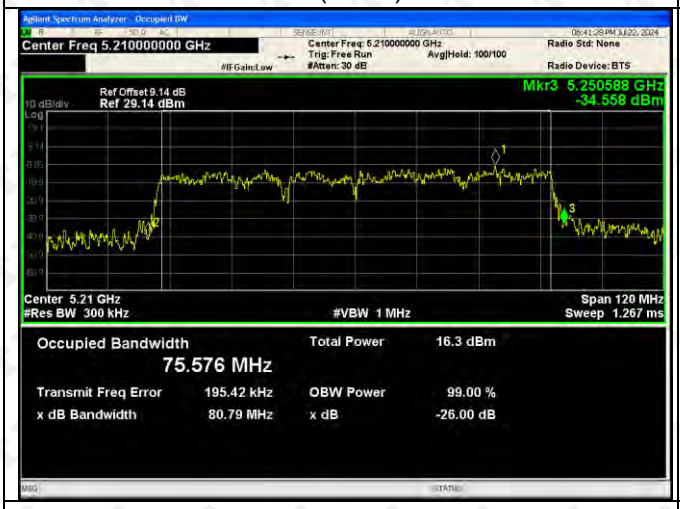


802.11ac(VH40)-5230

802.11ac(VH80)-5210



802.11n(HT20)-5180



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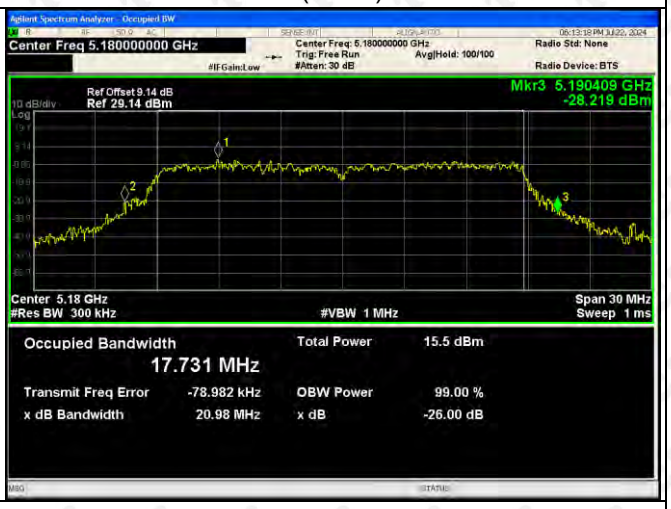

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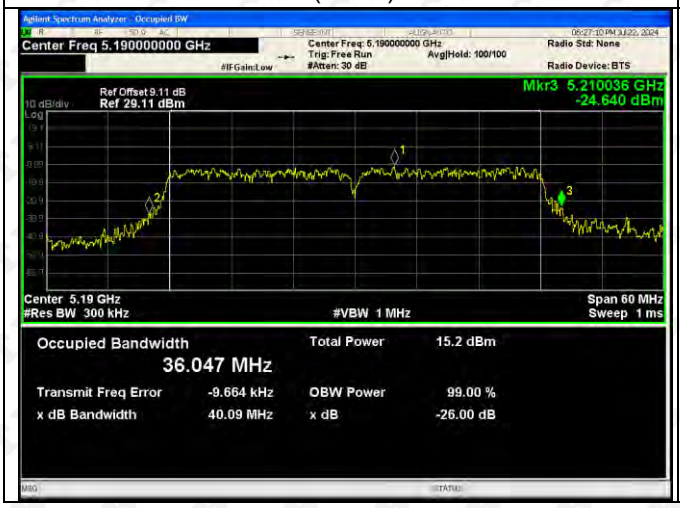
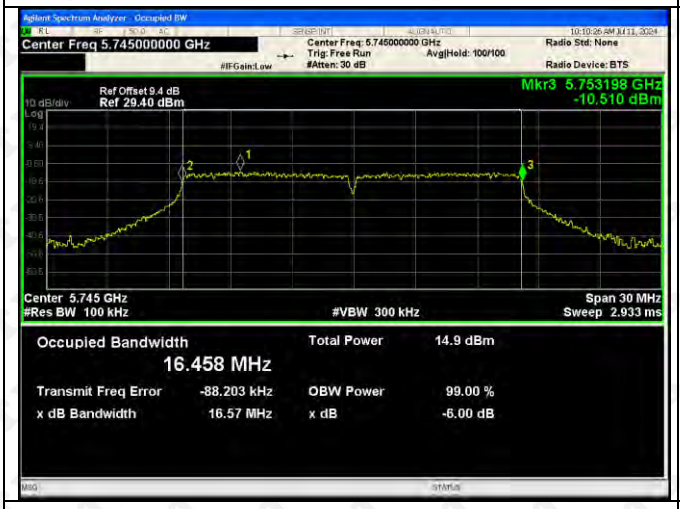
802.11n(HT40)-5190

802.11n(HT40)-5230

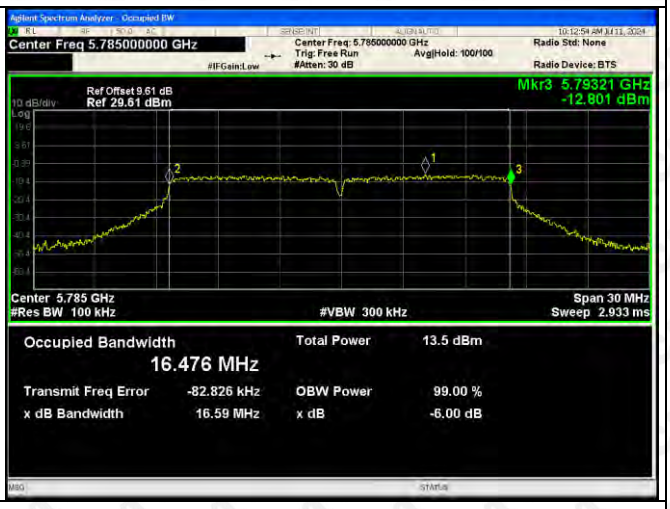


ANT1:
5745-5825MHz

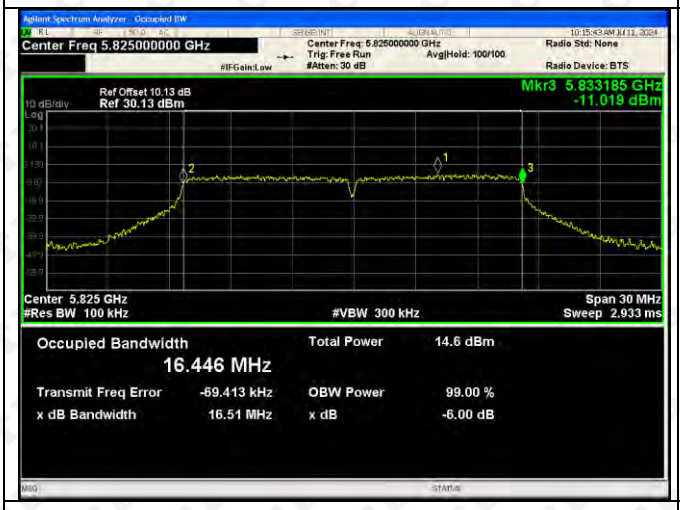
802.11a-5745



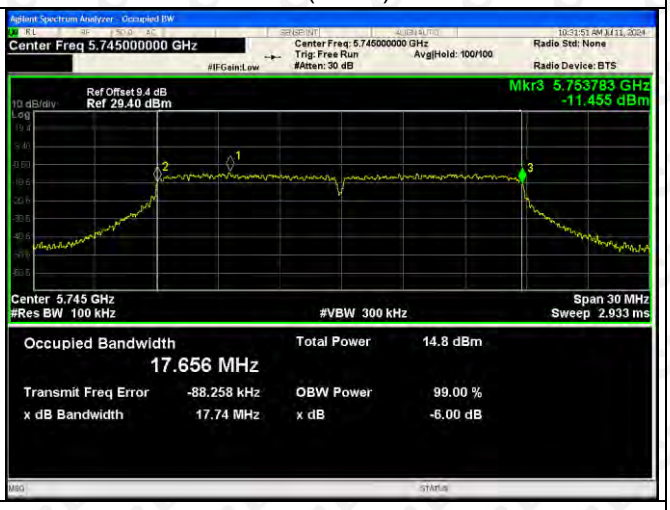
802.11a-5785



802.11a-5825



802.11ac(VH20)-5745



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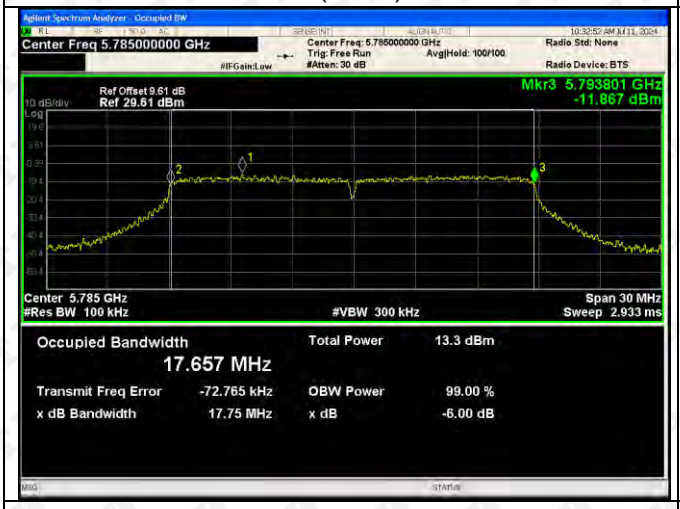
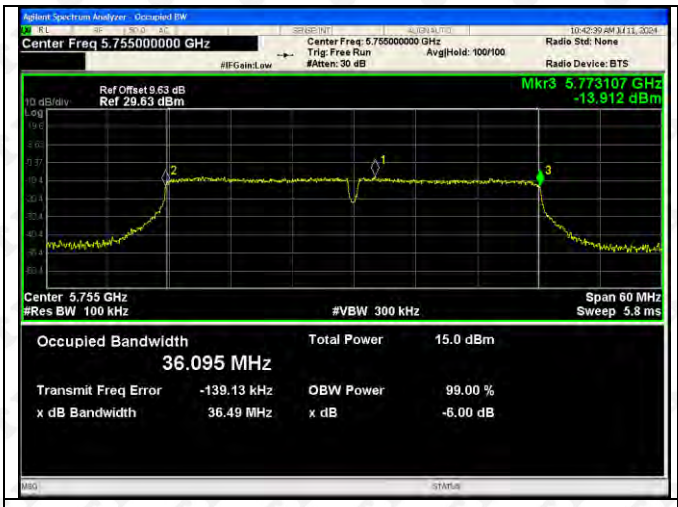


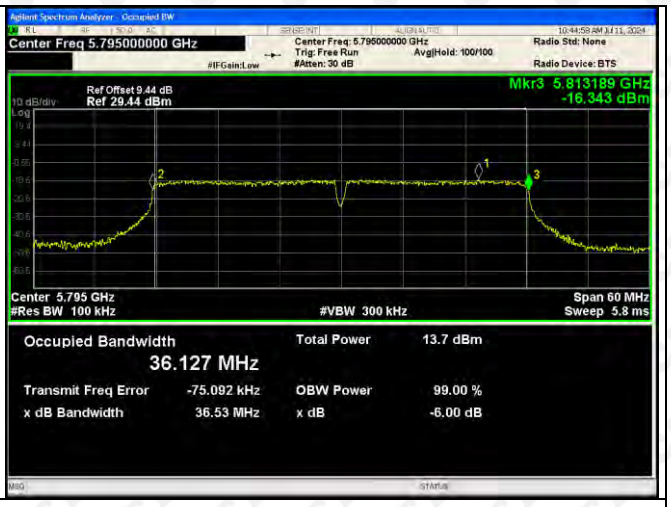
802.11ac(VH20)-5825

802.11ac(VH40)-5755

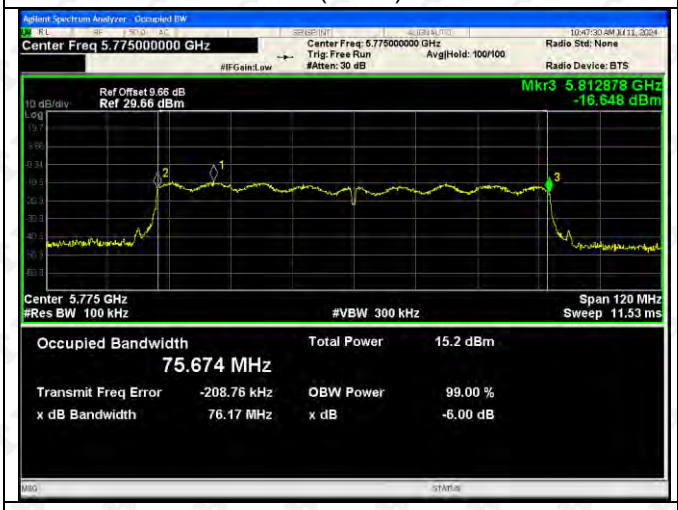
802.11ac(VH40)-5795



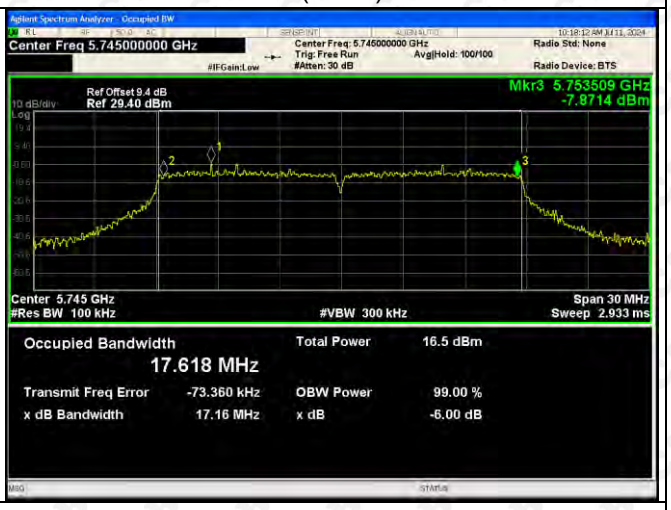
802.11ac(VH80)-5775



802.11n(HT20)-5745



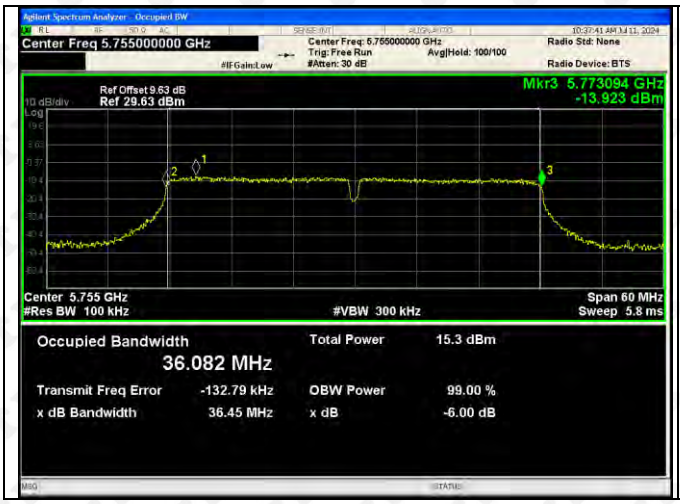
802.11n(HT20)-5785

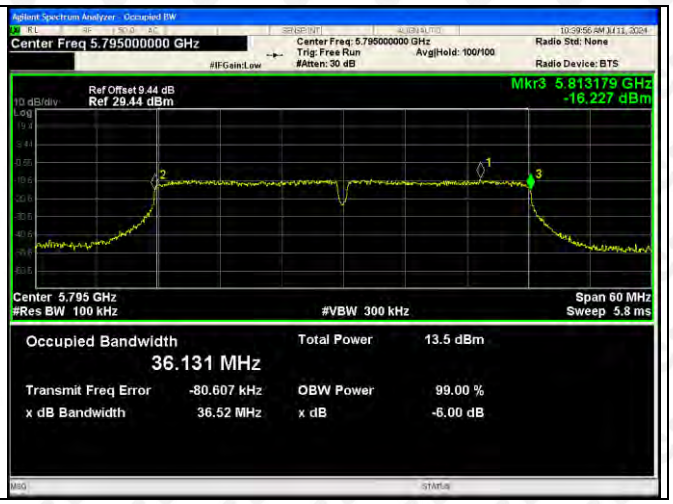


802.11n(HT20)-5825

5802.11n(HT40)-5755

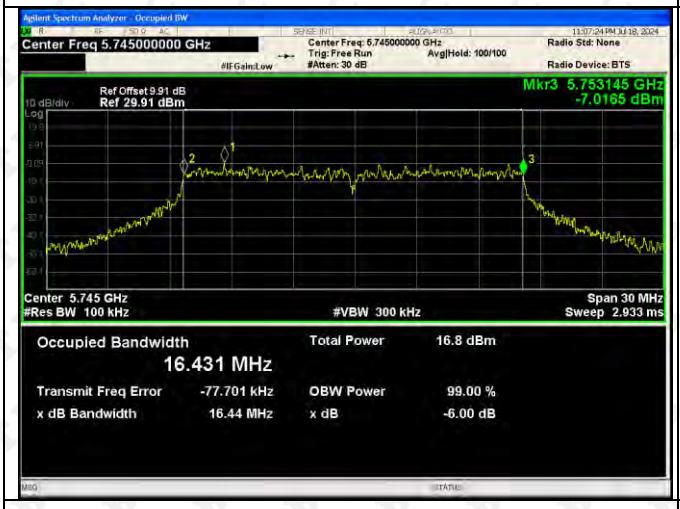
802.11n(HT40)-5795



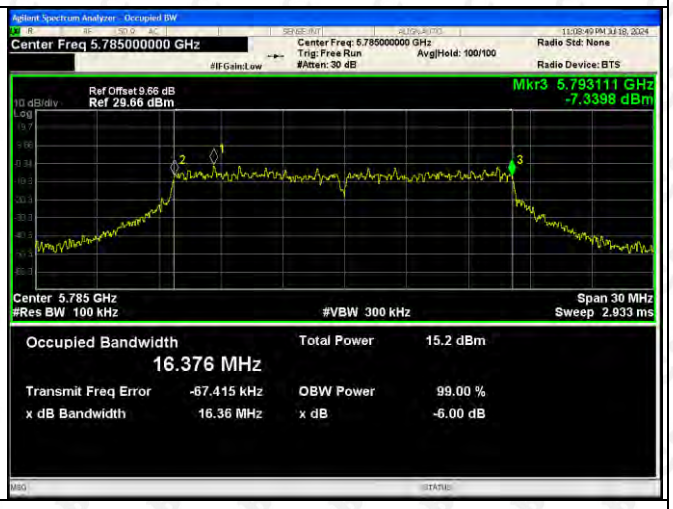


ANT2:
5745-5825MHz

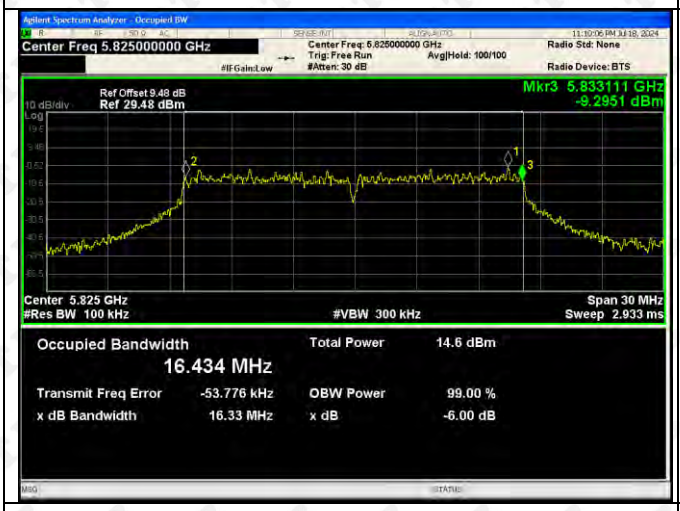
802.11a-5745



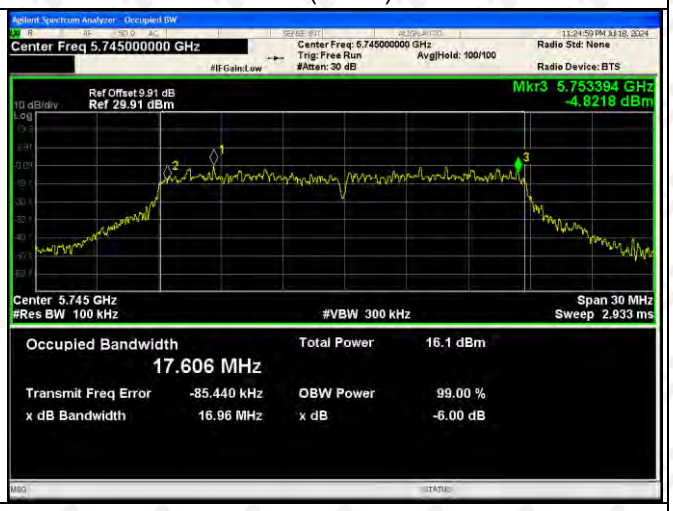
802.11a-5785



802.11a-5825

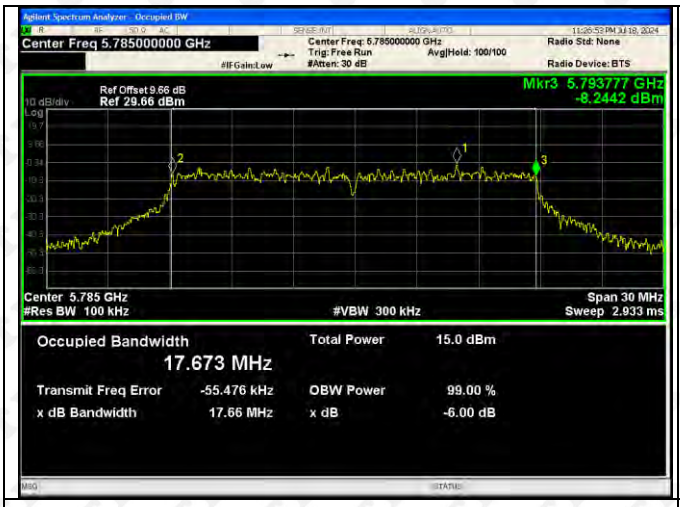


802.11ac(VH20)-5745



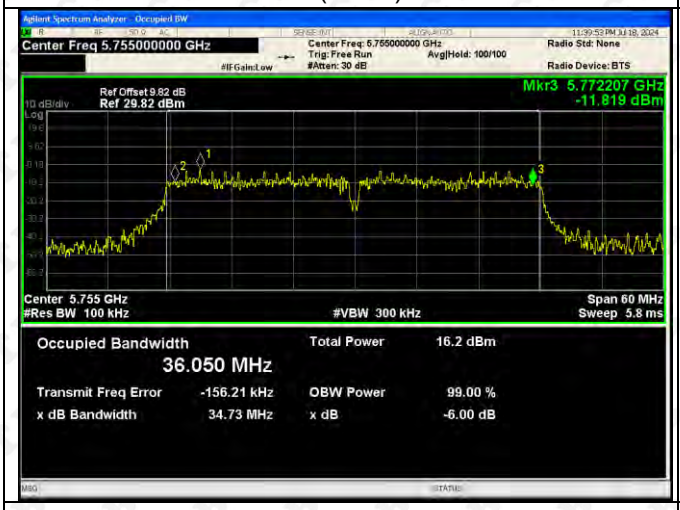
802.11ac(VH20)-5785

802.11ac(VH20)-5825

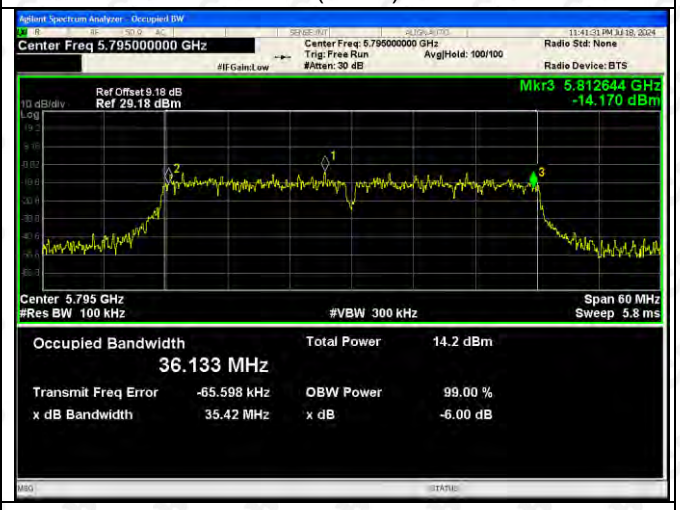


802.11ac(VH40)-5755

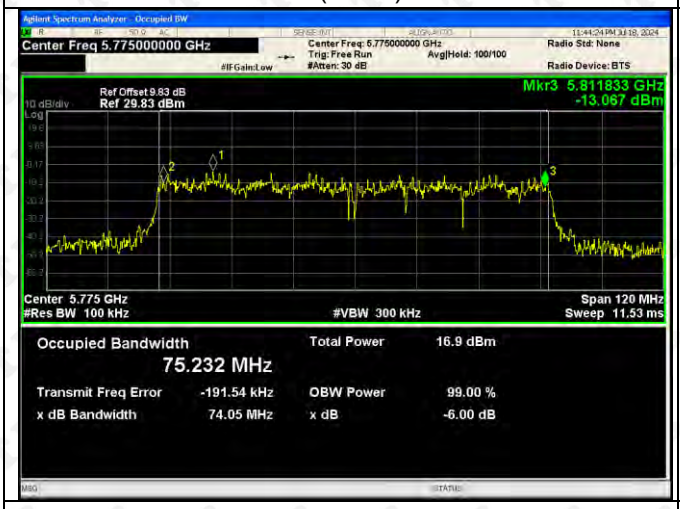
802.11ac(VH40)-5795



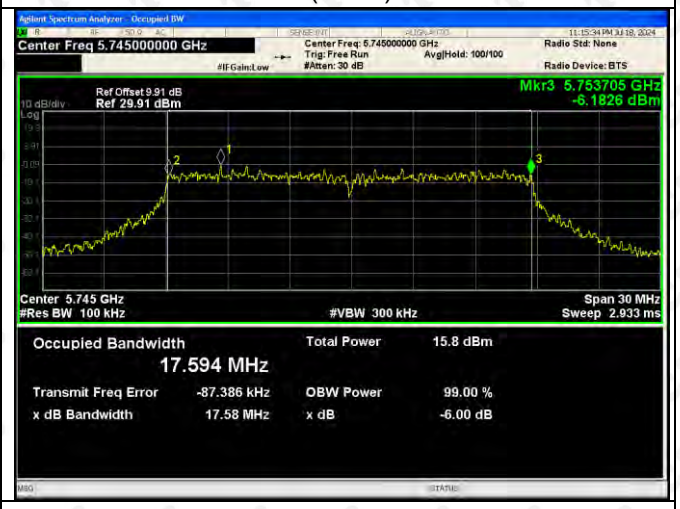
802.11ac(VH80)-5775



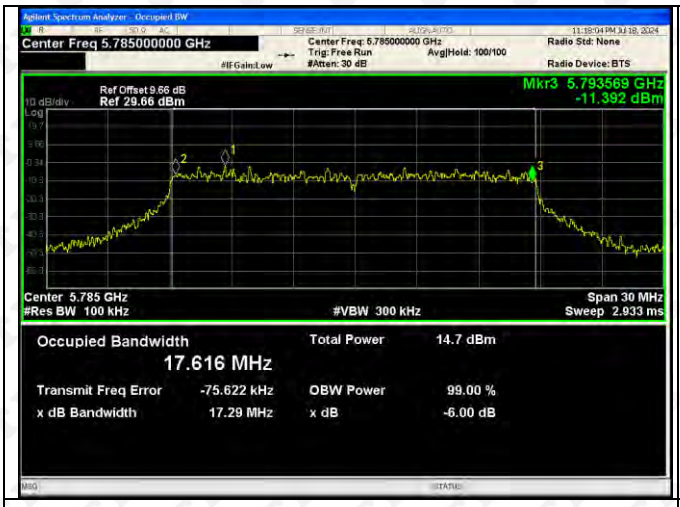
802.11n(HT20)-5745



802.11n(HT20)-5785

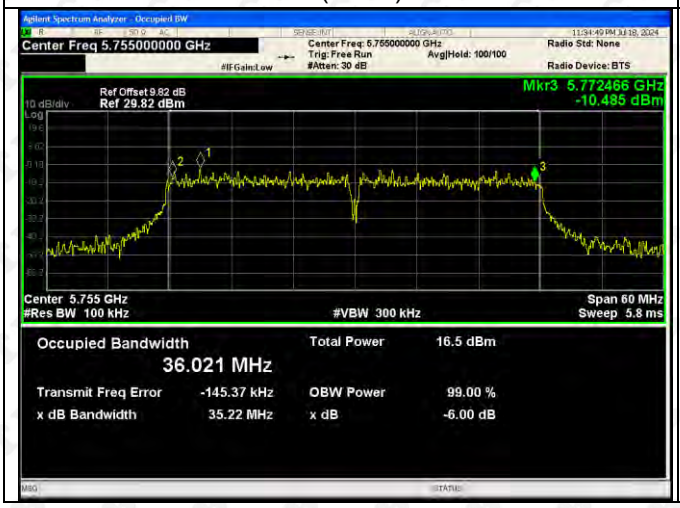


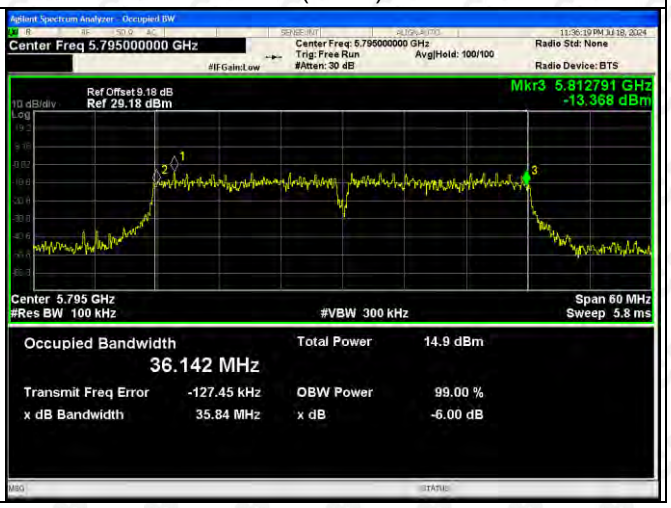
802.11n(HT20)-5825



5802.11n(HT40)-5755

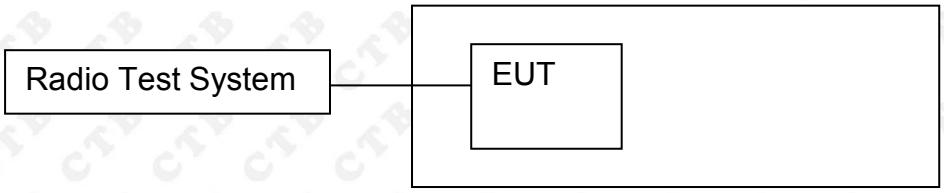
802.11n(HT40)-5795





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

Test mode	Test Channel (MHz)	PSD [dBm/MHz] ANT 1	PSD [dBm/MHz] ANT 2	PSD [dBm/MHz] Total	Limit (dBm/MHz)	Result
802.11a	5180	-2.25	-8.423	/	11	Pass
	5200	-1.592	-7.107	/	11	Pass
	5240	-0.934	-6.766	/	11	Pass
802.11ac(VH20)	5180	-3.281	-8.005	-2.020	11	Pass
	5200	-2.804	-7.092	-1.429	11	Pass
	5240	-1.916	-6.558	-0.634	11	Pass
802.11ac(VH40)	5190	-6.104	-12.316	-5.173	11	Pass
	5230	-5.222	-10.724	-4.144	11	Pass
802.11n(VH20)	5180	-6.989	-12.916	-6.001	11	Pass
	5200	-3.069	-7.095	-1.621	11	Pass
	5240	-2.723	-6.357	-1.160	11	Pass
802.11n(VH40)	5190	-1.557	-5.991	-0.221	11	Pass
	5230	-5.679	-11.932	-4.755	11	Pass
802.11ac(VH80)	5230	-5.053	-10.98	-4.065	11	Pass

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	-4.775	-9.195	/	30	Pass
	5785	-6.254	-10.053	/	30	Pass
	5825	-4.554	-11.495	/	30	Pass
802.11ac(VH20)	5745	-4.859	-10.929	-3.900	30	Pass
	5785	-6.458	-11.474	-5.269	30	Pass
	5825	-5.401	-11.076	-4.361	30	Pass
802.11ac(VH40)	5755	-7.389	-13.64	-6.465	30	Pass
	5795	-9.358	-15.935	-8.495	30	Pass
802.11n(VH20)	5775	-9.57	-17.018	-8.851	30	Pass
	5745	-5.668	-11.387	-4.637	30	Pass
	5785	-6.747	-11.872	-5.583	30	Pass
802.11n(VH40)	5825	-4.996	-12.039	-4.213	30	Pass
	5755	-7.672	-13.349	-6.632	30	Pass
802.11ac(VH80)	5795	-9.615	-14.353	-8.357	30	Pass

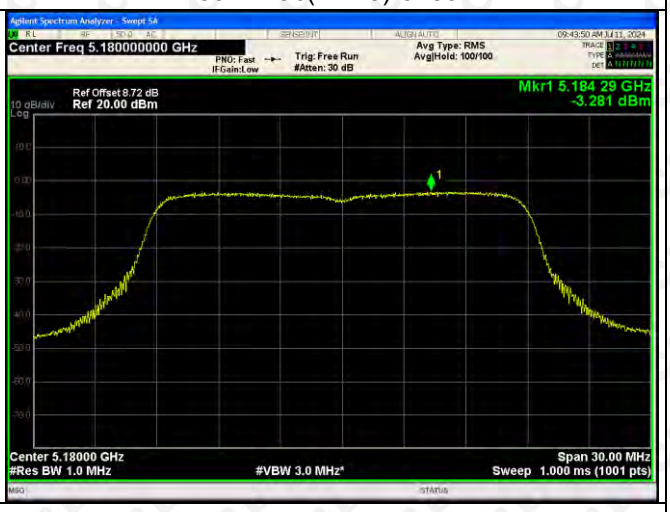
ANT1:
5180-5240MHz

802.11a-5180

802.11a-5200

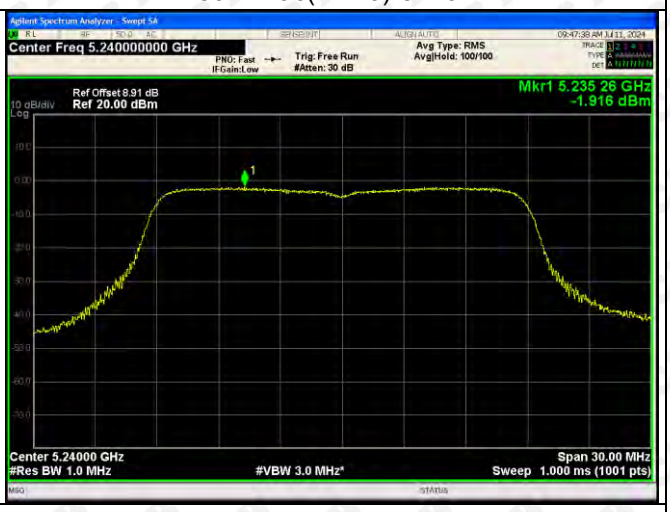
802.11a-5240

802.11ac(VH20)-5180



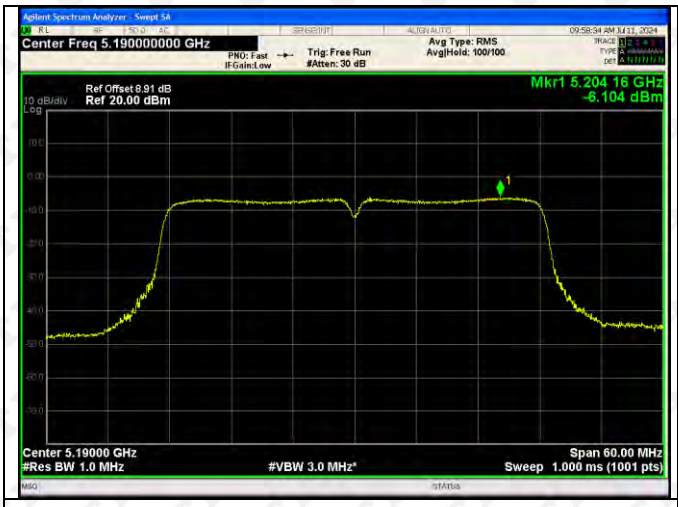
802.11ac(VH20)-5200

802.11ac(VH20)-5240

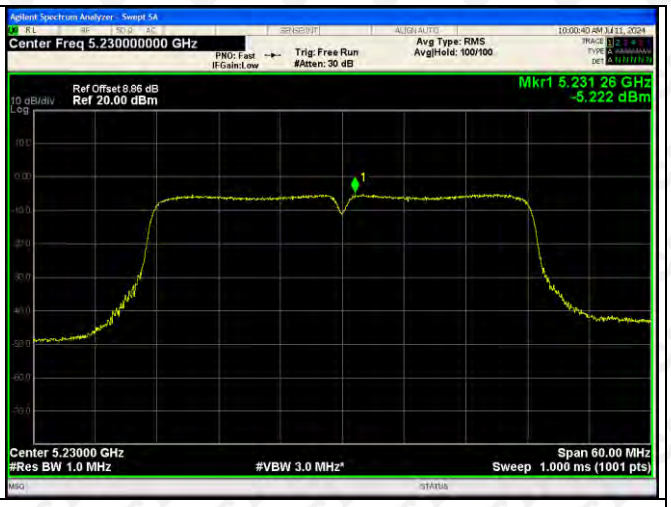


802.11ac(VH40)-5190

802.11ac(VH40)-5230



802.11ac(VH80)-5210



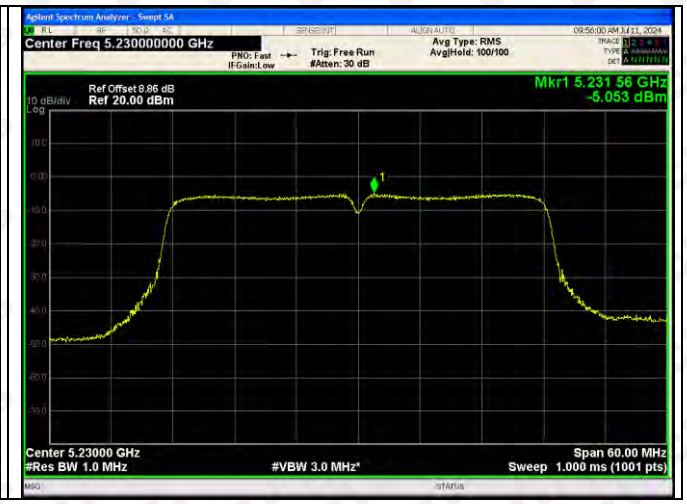
802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230



ANT2: 5180-5240MHz

802.11a-5180	802.11a-5200
802.11a-5240	802.11ac(VH20)-5180
802.11ac(VH20)-5200	802.11ac(VH20)-5240

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230

ANT1:
5745-5825MHz

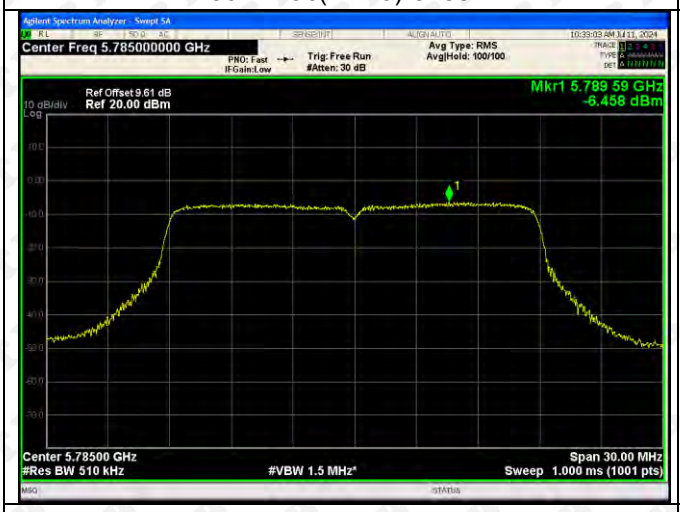
802.11a-5745

802.11a-5785

802.11a-5825

802.11ac(VH20)-5745

802.11ac(VH20)-5785

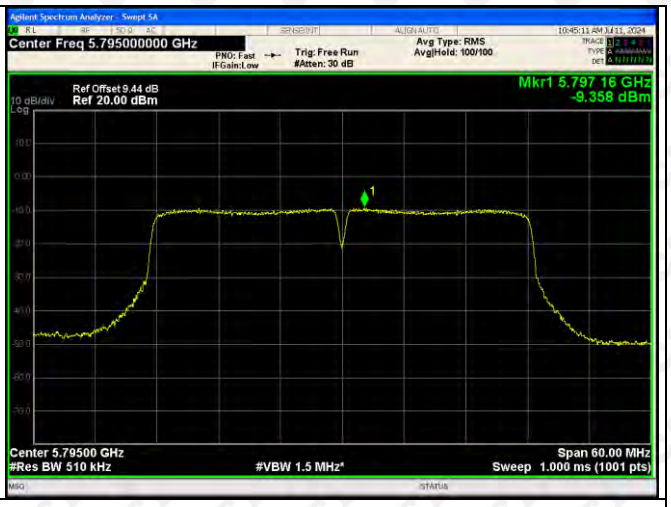


802.11ac(VH20)-5825

802.11ac(VH40)-5755

802.11ac(VH40)-5795

802.11ac(VH80)-5775



802.11n(HT20)-5745

802.11n(HT20)-5785

802.11n(HT20)-5825

5802.11n(HT40)-5755

802.11n(HT40)-5795

ANT2:
5745-5825MHz

802.11a-5745	802.11a-5785
802.11a-5825	802.11ac(VH20)-5745
802.11ac(VH20)-5785	802.11ac(VH20)-5825

802.11ac(VH40)-5755

802.11ac(VH40)-5795

802.11ac(VH80)-5775

802.11n(HT20)-5745

802.11n(HT20)-5785

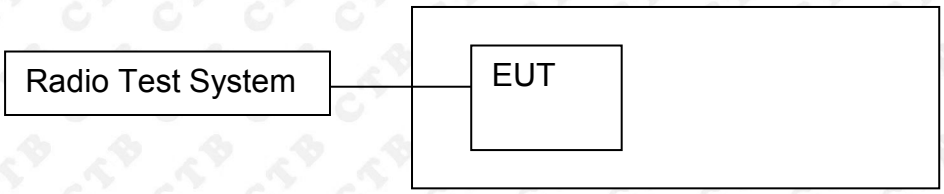
802.11n(HT20)-5825

5802.11n(HT40)-5755

802.11n(HT40)-5795

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

ANT1:

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)	120	5180.0640	5180	0.0640	12.3616
		V max (V)	132	5180.0402	5180	0.0402	7.7610
		V min (V)	108	5180.0892	5180	0.0892	17.2148
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5180.0432	5180	0.0432	8.3430
		T (°C)	10	5180.0357	5180	0.0357	6.8837
		T (°C)	20	5180.0168	5180	0.0168	3.2418
		T (°C)	30	5180.0079	5180	0.0079	1.5298
		T (°C)	40	5180.0474	5180	0.0474	9.1590
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)	120	5200.0276	5200	0.0276	5.2996
		V max (V)	132	5200.0405	5200	0.0405	7.7936
		V min (V)	108	5200.0386	5200	0.0386	7.4282
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5200.0329	5200	0.0329	6.3288
		T (°C)	10	5200.0096	5200	0.0096	1.8490
		T (°C)	20	5200.0237	5200	0.0237	4.5485
		T (°C)	30	5200.0131	5200	0.0131	2.5213
		T (°C)	40	5200.0333	5200	0.0333	6.3986
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)	120	5240.0306	5240	0.0306	5.8386
		V max (V)	132	5240.0507	5240	0.0507	9.6840
		V min (V)	108	5240.0514	5240	0.0514	9.8161
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5240.0048	5240	0.0048	0.9215
		T (°C)	10	5240.0231	5240	0.0231	4.4109
		T (°C)	20	5240.0166	5240	0.0166	3.1595
		T (°C)	30	5240.0281	5240	0.0281	5.3692
		T (°C)	40	5240.0016	5240	0.0016	0.3110
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)	120	5180.0139	5180	0.0139	2.6876
		V max (V)	132	5180.0296	5180	0.0296	5.7133
		V min (V)	108	5180.0927	5180	0.0927	17.9034
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5180.0465	5180	0.0465	8.9764
		T (°C)	10	5180.0118	5180	0.0118	2.2689
		T (°C)	20	5180.0643	5180	0.0643	12.4180
		T (°C)	30	5180.0225	5180	0.0225	4.3402
		T (°C)	40	5180.0618	5180	0.0618	11.9388
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)	120	5200.0304	5200	0.0304	5.8367
		V max (V)	132	5200.0359	5200	0.0359	6.8944
		V min (V)	108	5200.0918	5200	0.0918	17.6510
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5200.0507	5200	0.0507	9.7566
		T (°C)	10	5200.0473	5200	0.0473	9.0971
		T (°C)	20	5200.0490	5200	0.0490	9.4317
		T (°C)	30	5200.0199	5200	0.0199	3.8299
		T (°C)	40	5200.0863	5200	0.0863	16.5999
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)	120	5240.0146	5240	0.0146	2.7782
		V max (V)	132	5240.0456	5240	0.0456	8.6938
		V min (V)	108	5240.0890	5240	0.0890	16.9834
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5240.0174	5240	0.0174	3.3276
		T (°C)	10	5240.0640	5240	0.0640	12.2072
		T (°C)	20	5240.0743	5240	0.0743	14.1744
		T (°C)	30	5240.0312	5240	0.0312	5.9535
		T (°C)	40	5240.0041	5240	0.0041	0.7873
Limits				±20ppm			
Result				Complies			

ANT1:

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)	120	5745.0415	5745	0.0415	7.2306
		V max (V)	132	5745.0573	5745	0.0573	9.9781
		V min (V)	108	5745.0415	5745	0.0415	7.2306
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5745.0490	5745	0.0490	8.5356
		T (°C)	10	5745.0383	5745	0.0383	6.6719
		T (°C)	20	5745.0634	5745	0.0634	11.0367
		T (°C)	30	5745.0813	5745	0.0813	14.1485
		T (°C)	40	5745.0445	5745	0.0445	7.7460
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)	120	5785.0681	5785	0.0681	11.7647
		V max (V)	132	5785.0502	5785	0.0502	8.6778
		V min (V)	108	5785.0234	5785	0.0234	4.0477
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5785.0061	5785	0.0061	1.0535
		T (°C)	10	5785.0070	5785	0.0070	1.2117
		T (°C)	20	5785.0676	5785	0.0676	11.6845
		T (°C)	30	5785.0453	5785	0.0453	7.8317
		T (°C)	40	5785.0477	5785	0.0477	8.2465
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)	120	5825.0127	5825	0.0127	2.1724
		V max (V)	132	5825.0671	5825	0.0671	11.5264
		V min (V)	108	5825.0914	5825	0.0914	15.6957
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5825.0928	5825	0.0928	15.9383
		T (°C)	10	5825.0202	5825	0.0202	3.4635
		T (°C)	20	5825.0517	5825	0.0517	8.8696
		T (°C)	30	5825.0891	5825	0.0891	15.2902
		T (°C)	40	5825.0312	5825	0.0312	5.3534
Limits				±20ppm			
Result				Complies			

ANT2:

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)	120	5745.0768	5745	0.0768	13.3751
		V max (V)	132	5745.0416	5745	0.0416	7.2490
		V min (V)	108	5745.0544	5745	0.0544	9.4642
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5745.0283	5745	0.0283	4.9333
		T (°C)	10	5745.0268	5745	0.0268	4.6644
		T (°C)	20	5745.0124	5745	0.0124	2.1633
		T (°C)	30	5745.0030	5745	0.0030	0.5299
		T (°C)	40	5745.0782	5745	0.0782	13.6154
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)	120	5785.0358	5785	0.0358	6.1917
		V max (V)	132	5785.0812	5785	0.0812	14.0415
		V min (V)	108	5785.0615	5785	0.0615	10.6355
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5785.0598	5785	0.0598	10.3359
		T (°C)	10	5785.0272	5785	0.0272	4.7001
		T (°C)	20	5785.0644	5785	0.0644	11.1300
		T (°C)	30	5785.0061	5785	0.0061	1.0460
		T (°C)	40	5785.0800	5785	0.0800	13.8360
		T (°C)	50	5785.0794	5785	0.0794	13.7276
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)	120	5825.0935	5825	0.0935	16.0526
		V max (V)	132	5825.0884	5825	0.0884	15.1684
		V min (V)	108	5825.0124	5825	0.0124	2.1296
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5825.0630	5825	0.0630	10.8230
		T (°C)	10	5825.0740	5825	0.0740	12.7091
		T (°C)	20	5825.0561	5825	0.0561	9.6326
		T (°C)	30	5825.0783	5825	0.0783	13.4379
		T (°C)	40	5825.0436	5825	0.0436	7.4840
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 WLAN message transmitting from remote device and verify whether it shall reconnect. (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.

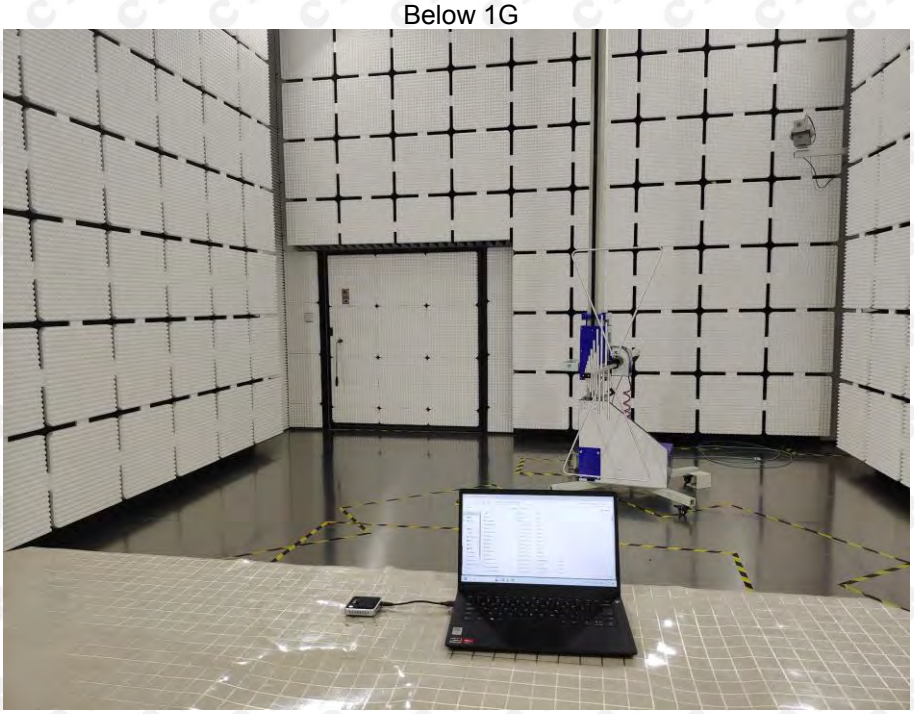
EUT Antenna:

The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is 5.2GWIFI: ANT1: -1.98dBi, ANT2: -0.55dBi, 5.8GWIFI: ANT1:-0.71dBi, ANT2:-0.13dBi.

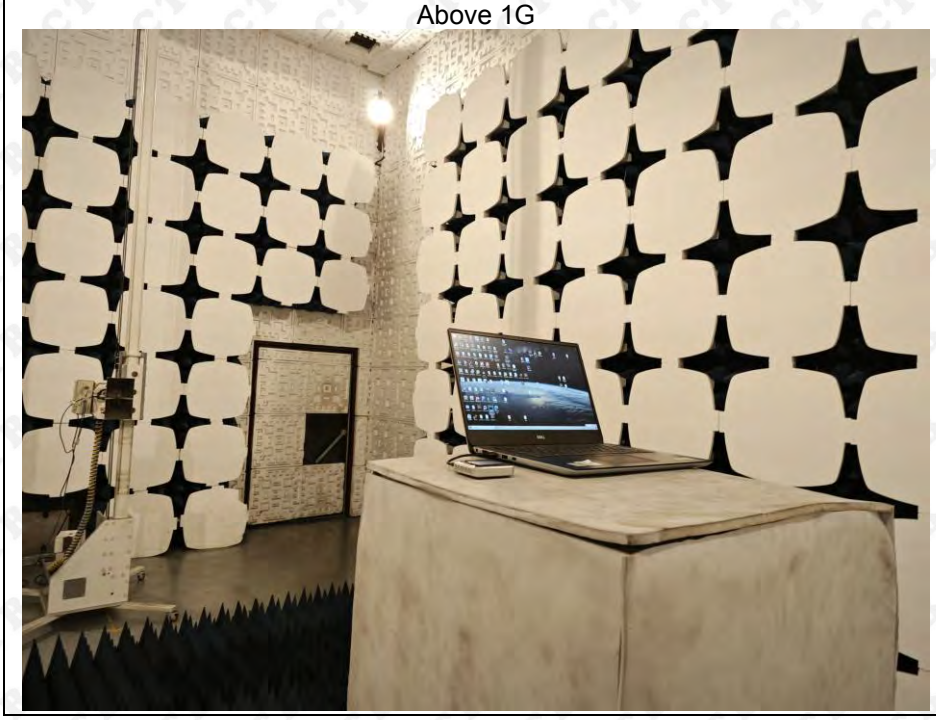
15. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 1G



Above 1G



Conducted Emission

※※※※※ **END OF REPORT** ※※※※※