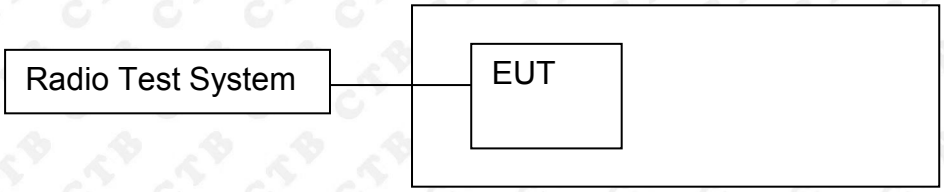
11. POWER SPECTRAL DENSITY

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

ANT 1+ANT2

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	-1.961	-2.34	/	11	Pass
	5200	-1.587	-2.065	/	11	Pass
	5240	-2.501	-1.624	/	11	Pass
802.11ac(VH20)	5180	-3.31	-3.335	-0.312	11	Pass
	5200	-2.861	-2.573	0.296	11	Pass
	5240	-3.361	-2.423	0.144	11	Pass
802.11ac(VH40)	5190	-6.071	-5.48	-2.755	11	Pass
	5230	-6.042	-5.05	-2.507	11	Pass
802.11ac(VH80)	5210	-8.889	-8.867	-5.868	11	Pass
802.11n(VH20)	5180	-2.187	-2.404	0.716	11	Pass
	5200	-2.013	-2.18	0.915	11	Pass
	5240	-2.106	-1.696	1.114	11	Pass
802.11n(VH40)	5190	-5.22	-5.519	-2.357	11	Pass
	5230	-5.577	-5.229	-2.389	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	-6.114	-5.435	/	30	Pass
	5785	-6.493	-5.378	/	30	Pass
	5825	-5.322	-5.199	/	30	Pass
802.11ac(VH20)	5745	-6.268	-5.764	-2.998	30	Pass
	5785	-6.714	-5.981	-3.322	30	Pass
	5825	-5.62	-5.561	-2.580	30	Pass
802.11ac(VH40)	5755	-9.692	-8.86	-6.246	30	Pass
	5795	-10.156	-9.027	-6.545	30	Pass
802.11n(VH20)	5775	-12.649	-11.71	-9.144	30	Pass
	5745	-6.121	-5.816	-2.956	30	Pass
	5785	-6.36	-5.883	-3.105	30	Pass
802.11n(VH40)	5825	-5.595	-5.471	-2.522	30	Pass
	5755	-10.033	-8.983	-6.466	30	Pass
802.11ac(VH80)	5795	-9.675	-8.992	-6.310	30	Pass

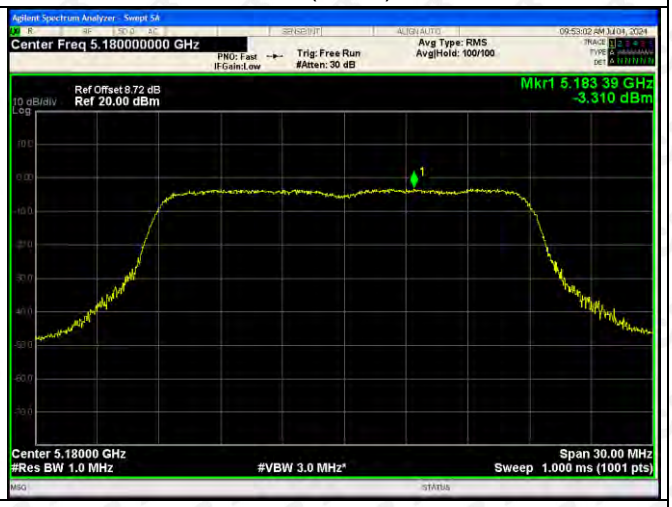
ANT 1

802.11a-5180

802.11a-5200

802.11a-5240

802.11ac(VH20)-5180



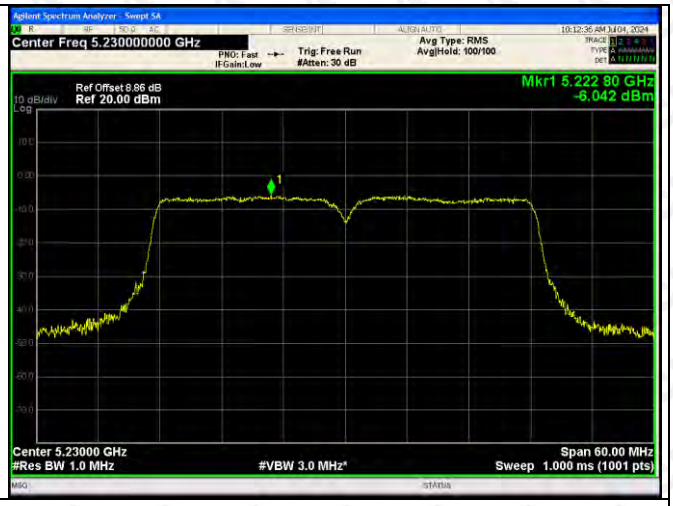
802.11ac(VH20)-5200

802.11ac(VH20)-5240

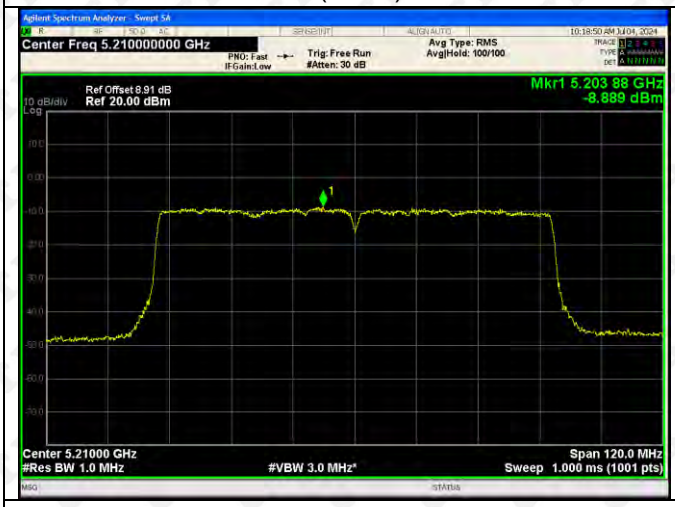
802.11ac(VH40)-5190

802.11ac(VH40)-5230

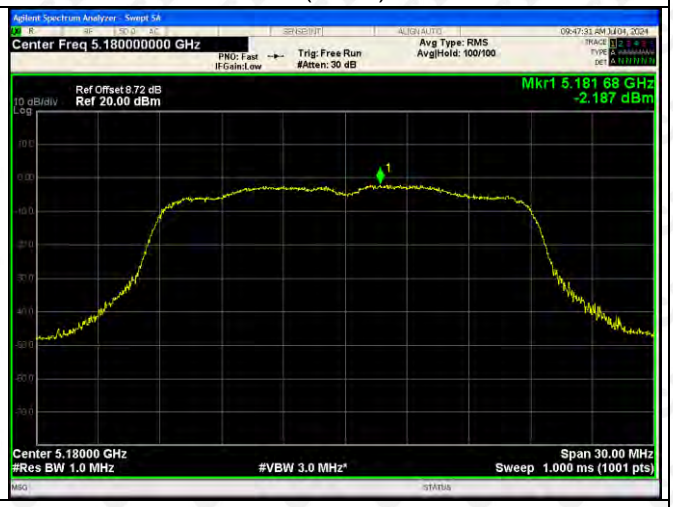
802.11ac(VH80)-5210



802.11n(HT20)-5180



802.11n(HT20)-5200

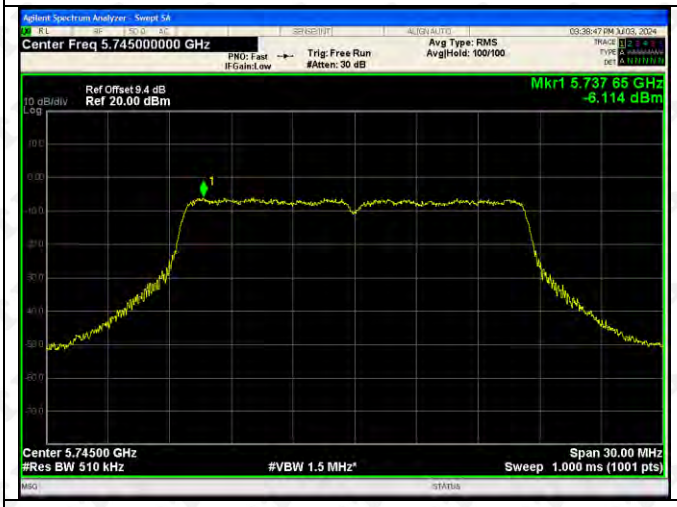
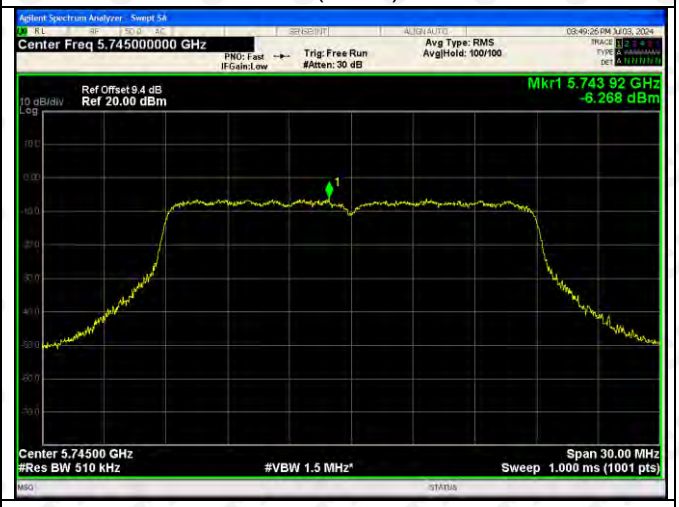


802.11n(HT20)-5240

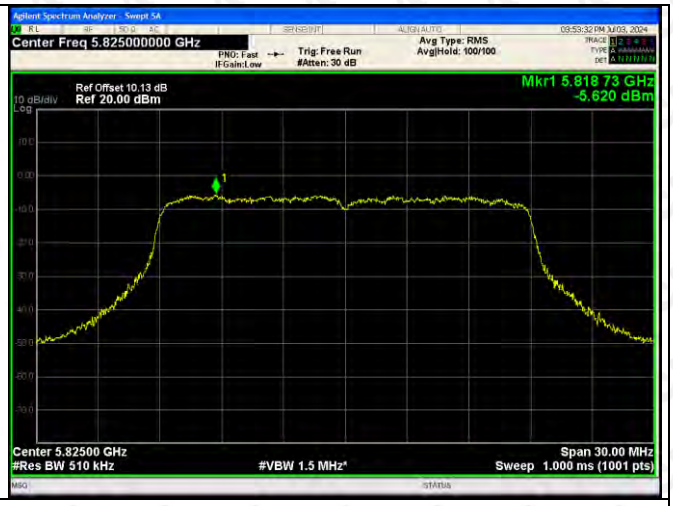
802.11n(HT40)-5190

802.11n(HT40)-5230

ANT1:

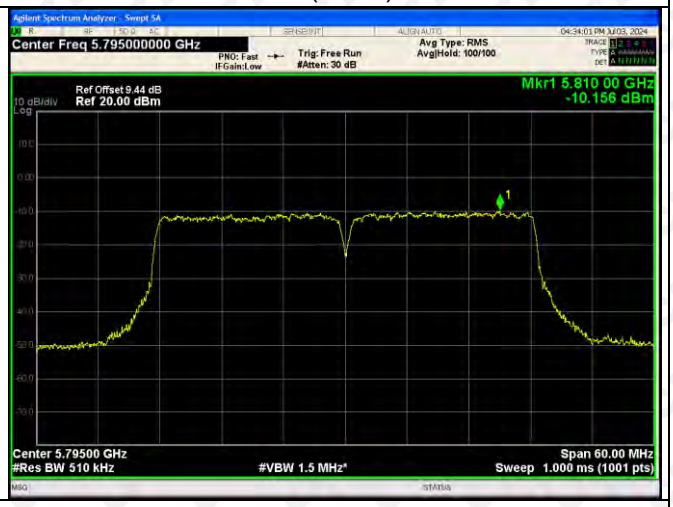
802.11a-5745	802.11a-5785
	
802.11a-5825	802.11ac(VH20)-5745
	
802.11ac(VH20)-5785	802.11ac(VH20)-5825

802.11ac(VH40)-5755



802.11ac(VH40)-5795

802.11ac(VH80)-5775

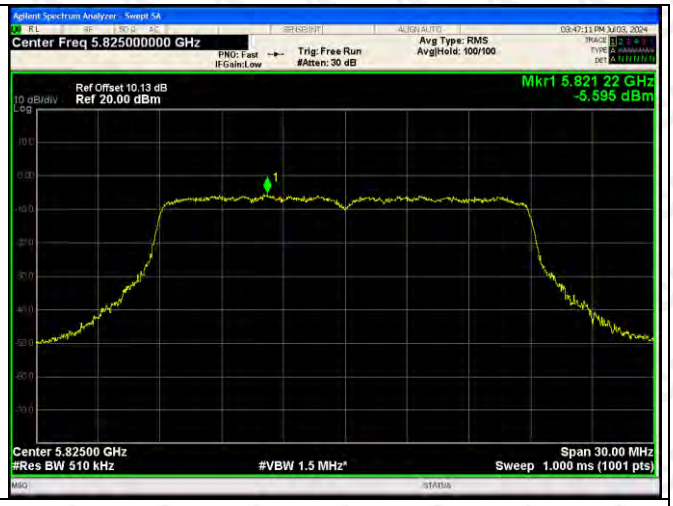


802.11n(HT20)-5745

802.11n(HT20)-5785

802.11n(HT20)-5825

5802.11n(HT40)-5755

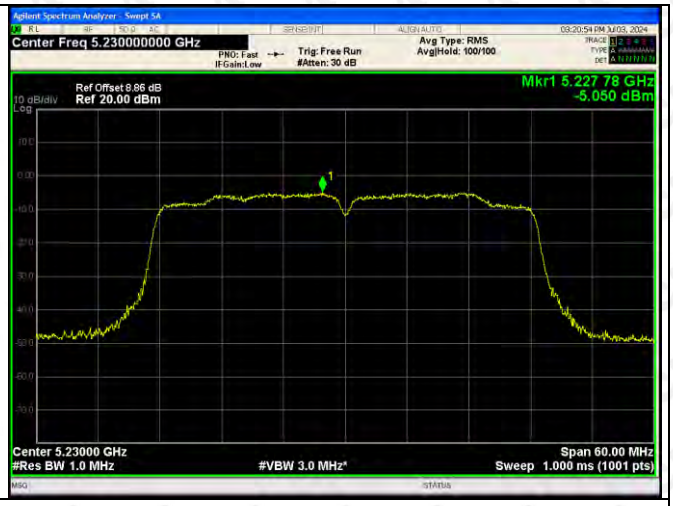


802.11n(HT40)-5795

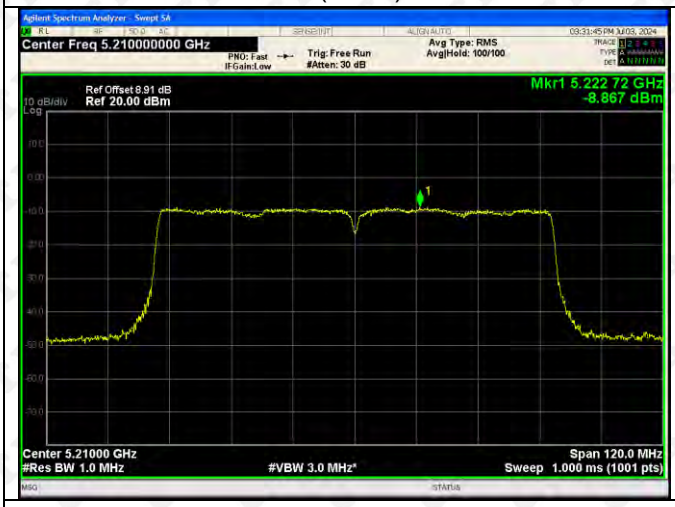
ANT 2

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

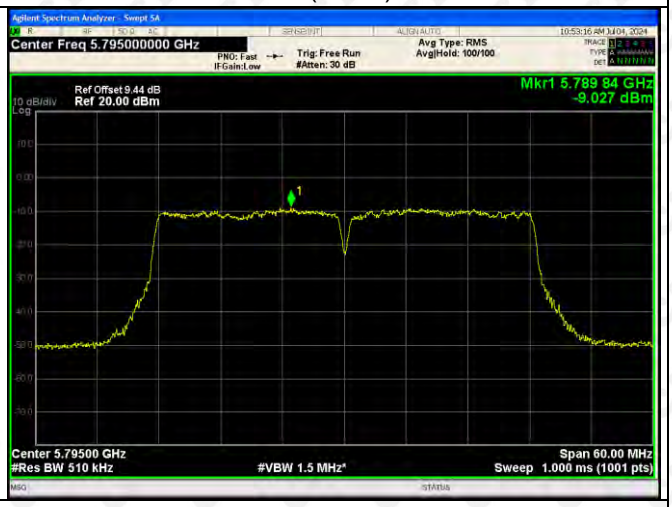
ANT2:

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

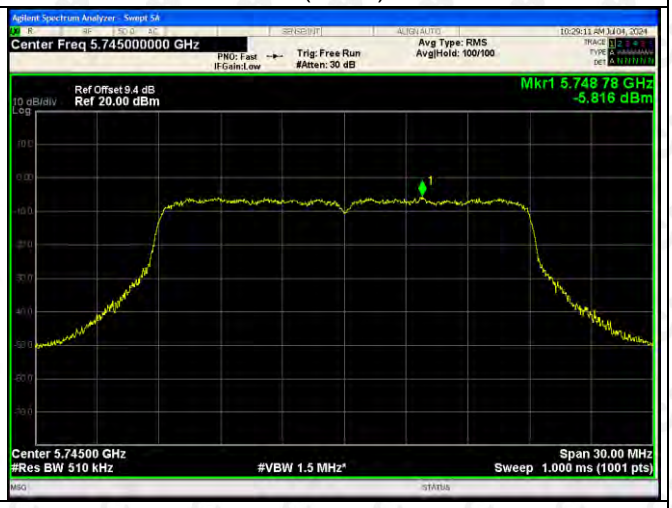
802.11ac(VH40)-5795

802.11ac(VH80)-5775

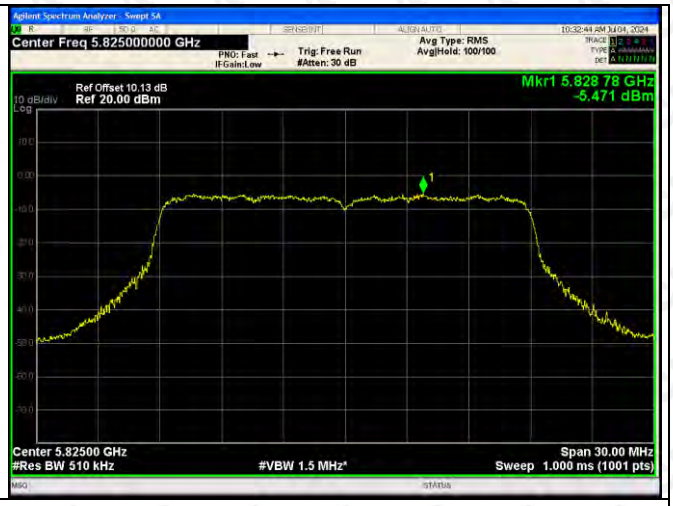


802.11n(HT20)-5745

802.11n(HT20)-5785

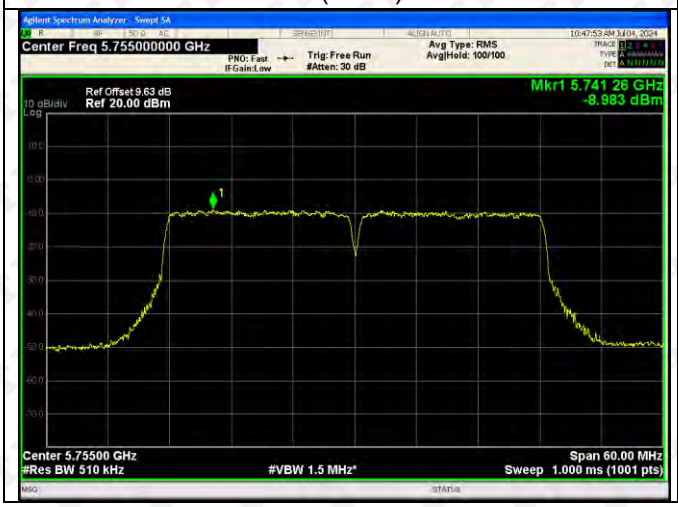


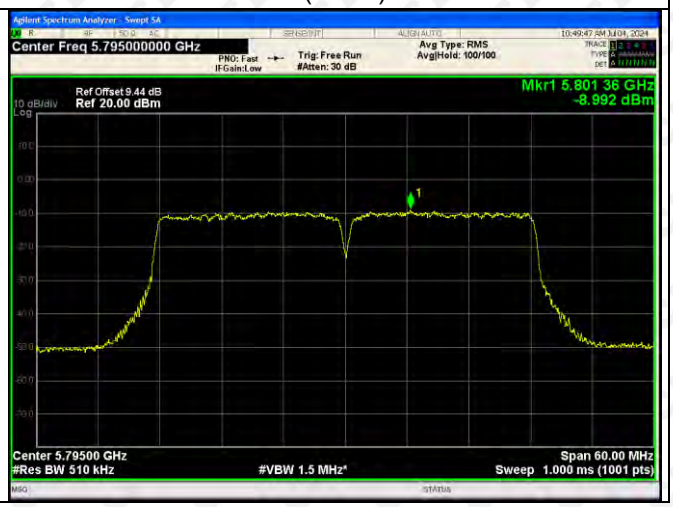
802.11n(HT20)-5825



5802.11n(HT40)-5755

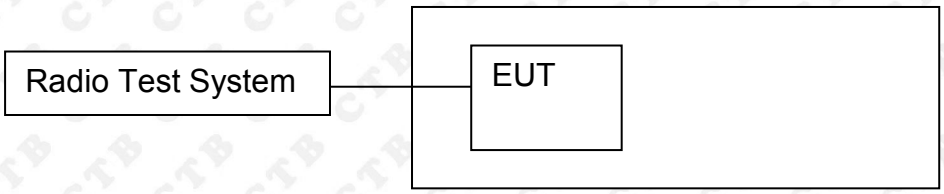
802.11n(HT40)-5795





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

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)	120	5180.0094	5180	0.0094	1.8182
		V max (V)	132	5180.0313	5180	0.0313	6.0456
		V min (V)	108	5180.0300	5180	0.0300	5.7927
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	5180.0260	5180	0.0260	5.0120
		T (°C)	10	5180.0448	5180	0.0448	8.6493
		T (°C)	20	5180.0283	5180	0.0283	5.4699
		T (°C)	30	5180.0471	5180	0.0471	9.0846
		T (°C)	40	5180.0509	5180	0.0509	9.8248
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	5200.0426	5200	0.0426	8.1903
		V max (V)	132	5200.0326	5200	0.0326	6.2684
		V min (V)	108	5200.0007	5200	0.0007	0.1381
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	5200.0062	5200	0.0062	1.1909
		T (°C)	10	5200.0144	5200	0.0144	2.7695
		T (°C)	20	5200.0165	5200	0.0165	3.1687
		T (°C)	30	5200.0077	5200	0.0077	1.4721
		T (°C)	40	5200.0056	5200	0.0056	1.0820
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	5240.0037	5240	0.0037	0.7100
		V max (V)	132	5240.0455	5240	0.0455	8.6888
		V min (V)	108	5240.0079	5240	0.0079	1.5095
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	5240.0080	5240	0.0080	1.5255
		T (°C)	10	5240.0245	5240	0.0245	4.6843
		T (°C)	20	5240.0340	5240	0.0340	6.4957
		T (°C)	30	5240.0286	5240	0.0286	5.4651
		T (°C)	40	5240.0031	5240	0.0031	0.5956
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)	120	5745.0716	5745	0.0716	12.4616
		V max (V)	132	5745.0425	5745	0.0425	7.4024
		V min (V)	108	5745.0716	5745	0.0716	12.4616
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	5745.0798	5745	0.0798	13.8915
		T (°C)	10	5745.0618	5745	0.0618	10.7635
		T (°C)	20	5745.0108	5745	0.0108	1.8762
		T (°C)	30	5745.0698	5745	0.0698	12.1464
		T (°C)	40	5745.0593	5745	0.0593	10.3277
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	5785.0791	5785	0.0791	13.6696
		V max (V)	132	5785.0339	5785	0.0339	5.8525
		V min (V)	108	5785.0177	5785	0.0177	3.0581
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	5785.0591	5785	0.0591	10.2186
		T (°C)	10	5785.0197	5785	0.0197	3.4123
		T (°C)	20	5785.0239	5785	0.0239	4.1283
		T (°C)	30	5785.0932	5785	0.0932	16.1034
		T (°C)	40	5785.0647	5785	0.0647	11.1854
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	5825.0098	5825	0.0098	1.6826
		V max (V)	132	5825.0875	5825	0.0875	15.0136
		V min (V)	108	5825.0265	5825	0.0265	4.5444
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	5825.0124	5825	0.0124	2.1350
		T (°C)	10	5825.0124	5825	0.0124	2.1373
		T (°C)	20	5825.0615	5825	0.0615	10.5502
		T (°C)	30	5825.0400	5825	0.0400	6.8682
		T (°C)	40	5825.0496	5825	0.0496	8.5193
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	5180.0785	5180	0.0785	15.1563
		V max (V)	132	5180.0674	5180	0.0674	13.0133
		V min (V)	108	5180.0363	5180	0.0363	7.0030
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	5180.0748	5180	0.0748	14.4400
		T (°C)	10	5180.0889	5180	0.0889	17.1576
		T (°C)	20	5180.0363	5180	0.0363	7.0065
		T (°C)	30	5180.0860	5180	0.0860	16.6085
		T (°C)	40	5180.0506	5180	0.0506	9.7760
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	5200.0548	5200	0.0548	10.5446
		V max (V)	132	5200.0826	5200	0.0826	15.8913
		V min (V)	108	5200.0170	5200	0.0170	3.2622
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	5200.0761	5200	0.0761	14.6380
		T (°C)	10	5200.0688	5200	0.0688	13.2223
		T (°C)	20	5200.0250	5200	0.0250	4.8170
		T (°C)	30	5200.0249	5200	0.0249	4.7818
		T (°C)	40	5200.0820	5200	0.0820	15.7777
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	5240.0052	5240	0.0052	0.9855
		V max (V)	132	5240.0039	5240	0.0039	0.7461
		V min (V)	108	5240.0508	5240	0.0508	9.7023
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	5240.0845	5240	0.0845	16.1315
		T (°C)	10	5240.0381	5240	0.0381	7.2781
		T (°C)	20	5240.0433	5240	0.0433	8.2636
		T (°C)	30	5240.0321	5240	0.0321	6.1301
		T (°C)	40	5240.0861	5240	0.0861	16.4234
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)	120	5745.0443	5745	0.0443	7.7145
		V max (V)	132	5745.0158	5745	0.0158	2.7540
		V min (V)	108	5745.0459	5745	0.0459	7.9814
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	5745.0233	5745	0.0233	4.0488
		T (°C)	10	5745.0917	5745	0.0917	15.9637
		T (°C)	20	5745.0545	5745	0.0545	9.4928
		T (°C)	30	5745.0240	5745	0.0240	4.1754
		T (°C)	40	5745.0719	5745	0.0719	12.5198
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	5785.0135	5785	0.0135	2.3327
		V max (V)	132	5785.0000	5785	0.0000	0.0049
		V min (V)	108	5785.0084	5785	0.0084	1.4552
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	5785.0404	5785	0.0404	6.9795
		T (°C)	10	5785.0317	5785	0.0317	5.4827
		T (°C)	20	5785.0127	5785	0.0127	2.1986
		T (°C)	30	5785.0776	5785	0.0776	13.4150
		T (°C)	40	5785.0675	5785	0.0675	11.6619
		T (°C)	50	5785.0645	5785	0.0645	11.1467
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	5825.0666	5825	0.0666	11.4293
		V max (V)	132	5825.0043	5825	0.0043	0.7386
		V min (V)	108	5825.0574	5825	0.0574	9.8550
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	5825.0528	5825	0.0528	9.0644
		T (°C)	10	5825.0357	5825	0.0357	6.1314
		T (°C)	20	5825.0038	5825	0.0038	0.6485
		T (°C)	30	5825.0628	5825	0.0628	10.7840
		T (°C)	40	5825.0820	5825	0.0820	14.0849
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.
15.247(b) (4) requirement:
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is Internal antenna and no consideration of replacement. The best case gain of the antenna is WiFi (5.2G):Ant1: 0.96dBi, Ant2: 0.96dBi, WiFi (5.8G):Ant1: 1.05dBi, Ant2: 1.05dBi

15. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 1G

Above 1G

Conducted Emission

※※※※※ END OF REPORT ※※※※※