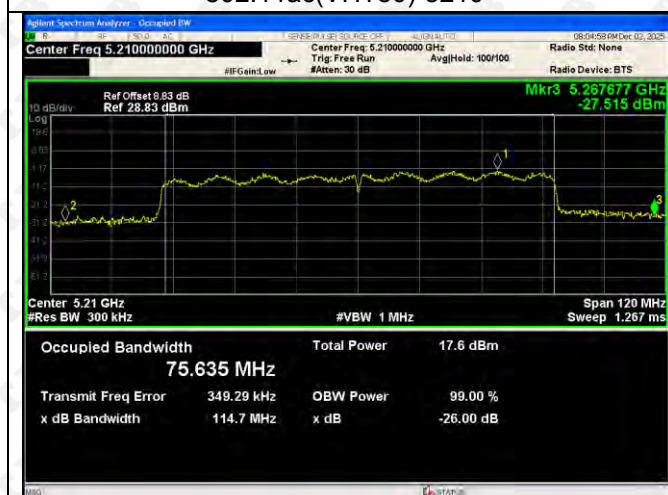
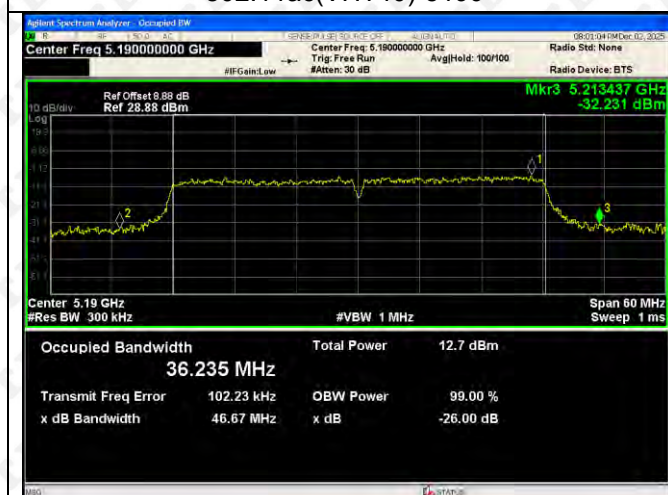
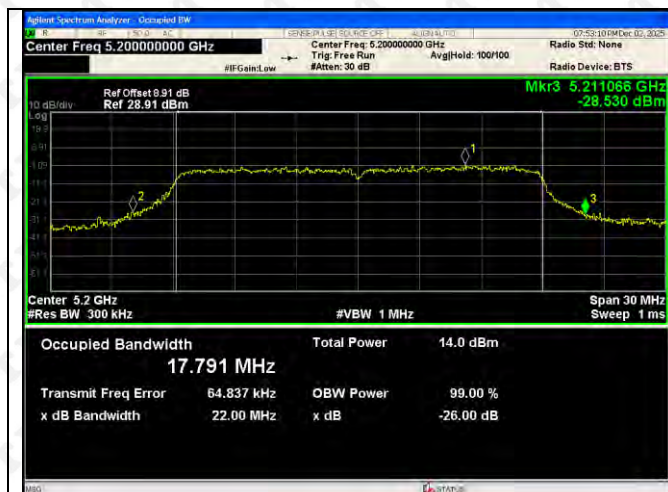




802.11n(HT40)-5190



802.11n(HT40)-5230



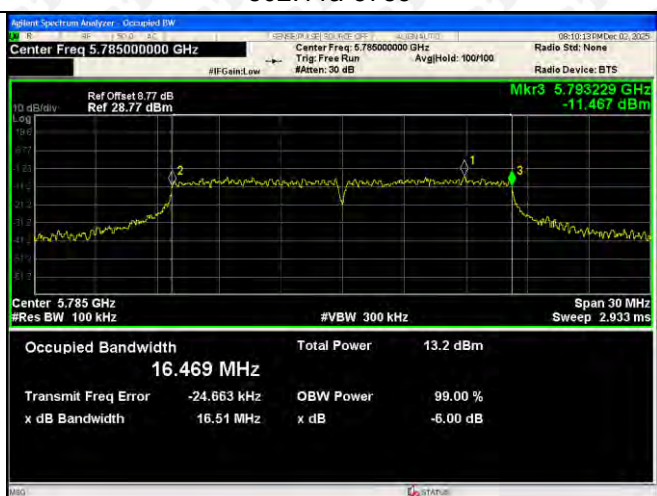
5745-5825MHz

ANT 1:

802.11a-5745



802.11a-5785



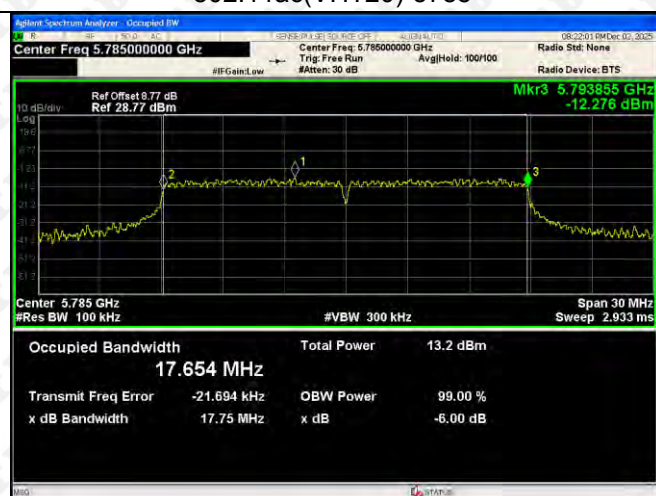
802.11a-5825



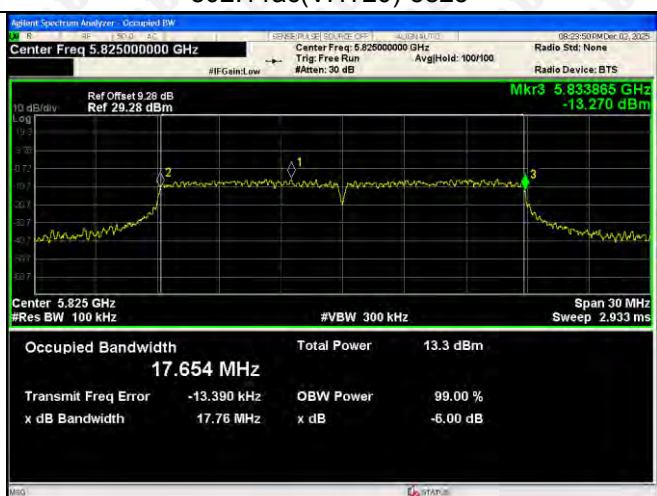
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802.11ac(VHT20)-5785



802.11ac(VHT20)-5825



802.11ac(VHT40)-5755

802.11ac(VHT40)-5795



802.11ac(VHT80)-5775



802.11n(HT20)-5745



802.11n(HT20)-5785



802.11n(HT20)-5745



5802.11n(HT40)-5755

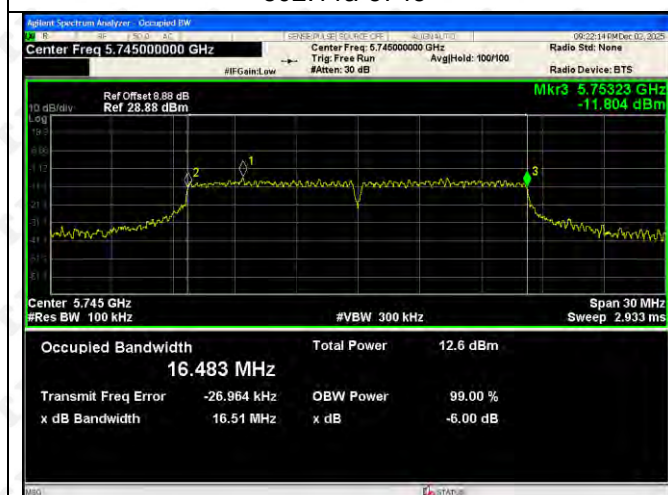


802.11n(HT40)-5795



ANT2:

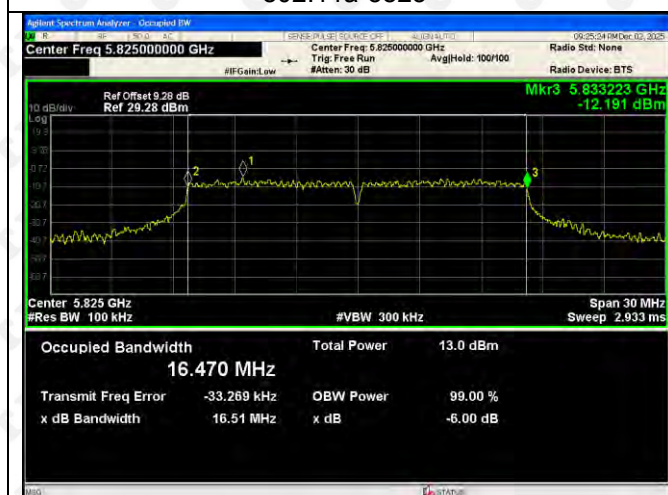
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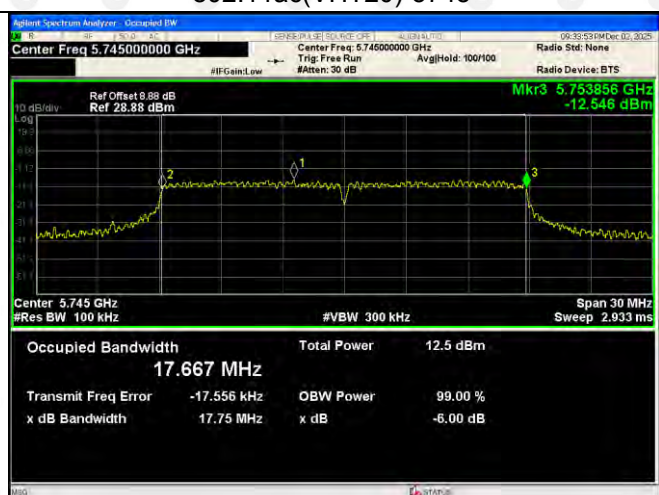
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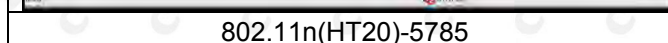
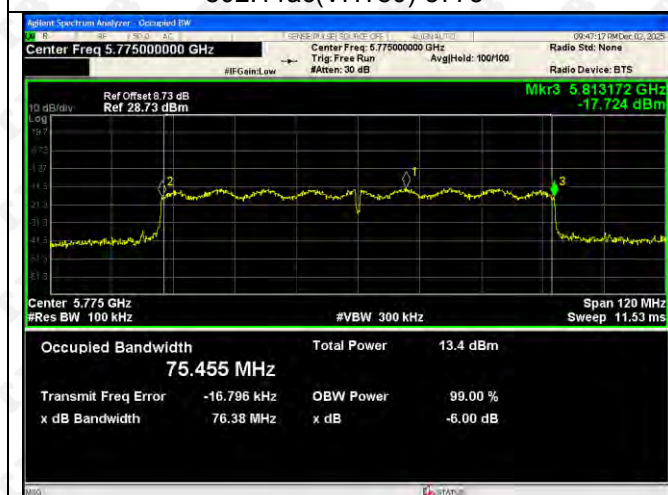


802.11ac(VHT20)-5745



802.11ac(VHT20)-5785

802.11ac(VHT20)-5825





5802.11n(HT40)-5755

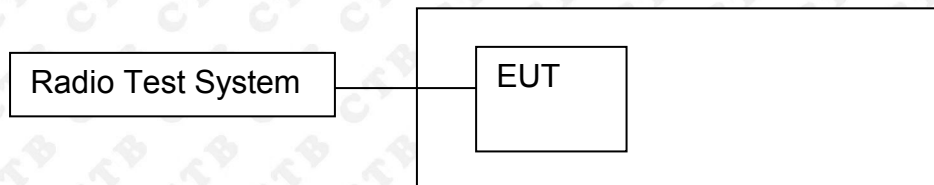


802.11n(HT40)-5795



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 $11 \text{ dBm} + 10 \log B$, 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 ($< 1 \text{ MHz}$, or $< 500 \text{ kHz}$) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set $\text{RBW} \geq 1/T$, where T is defined in II.B.I.a).

b) Set $\text{VBW} \geq 3 \text{ RBW}$.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500 \text{ kHz}/\text{RBW})$ 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 $10 \log (1\text{MHz}/\text{RBW})$ 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	2.232	2.18	/	11	Pass
	5200	2.813	3.438	/	11	Pass
	5240	3.126	3.022	/	11	Pass
802.11ac(VHT20)	5180	2.784	1.779	5.321	11	Pass
	5200	3.163	2.933	6.060	11	Pass
	5240	2.911	2.918	5.925	11	Pass
802.11ac(VHT40)	5190	-0.728	-1.291	2.010	11	Pass
	5230	0.127	-0.296	2.931	11	Pass
802.11ac(VHT80)	5230	-6.822	-4.832	-2.704	11	Pass
802.11n(HT20)	5180	2.675	1.601	5.181	11	Pass
	5200	3.576	3.162	6.384	11	Pass
	5240	3.467	3.16	6.327	11	Pass
802.11n(HT40)	5190	-0.188	-0.607	2.618	11	Pass
	5230	0.395	0.067	3.244	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	-0.42	-0.883	/	30	Pass
	5785	-0.603	-0.846	/	30	Pass
	5825	-0.835	-0.87	/	30	Pass
802.11ac(VHT20)	5745	-1.077	-1.568	1.695	30	Pass
	5785	-0.775	-0.677	2.285	30	Pass
	5825	-0.884	-0.504	2.320	30	Pass
802.11ac(VHT40)	5755	-3.959	-4.321	-1.126	30	Pass
	5795	-3.462	-3.655	-0.547	30	Pass
802.11ac(VHT80)	5795	-6.76	-6.774	-3.757	30	Pass
802.11n(HT20)	5775	-0.693	-0.696	2.316	30	Pass
	5745	-0.798	-0.153	2.547	30	Pass
	5785	-0.24	-0.583	2.602	30	Pass
802.11n(HT40)	5825	-4.275	-4.283	-1.269	30	Pass
	5755	-3.346	-3.469	-0.397	30	Pass

5180-5240MHz

ANT 1

802.11a-5180



802.11a-5200



802.11a-5240



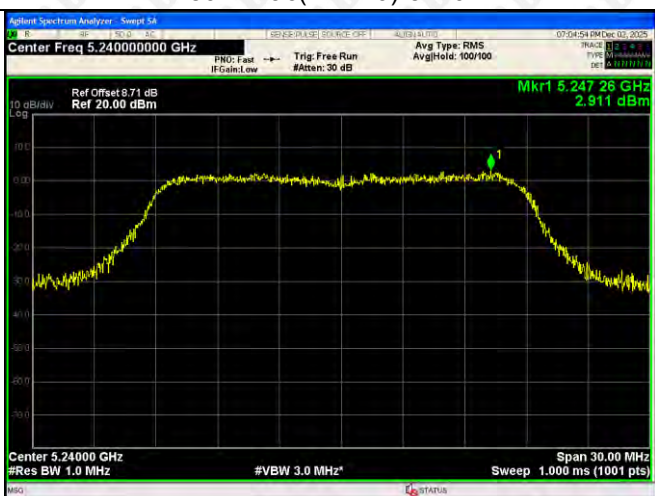
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802.11ac(VHT20)-5200

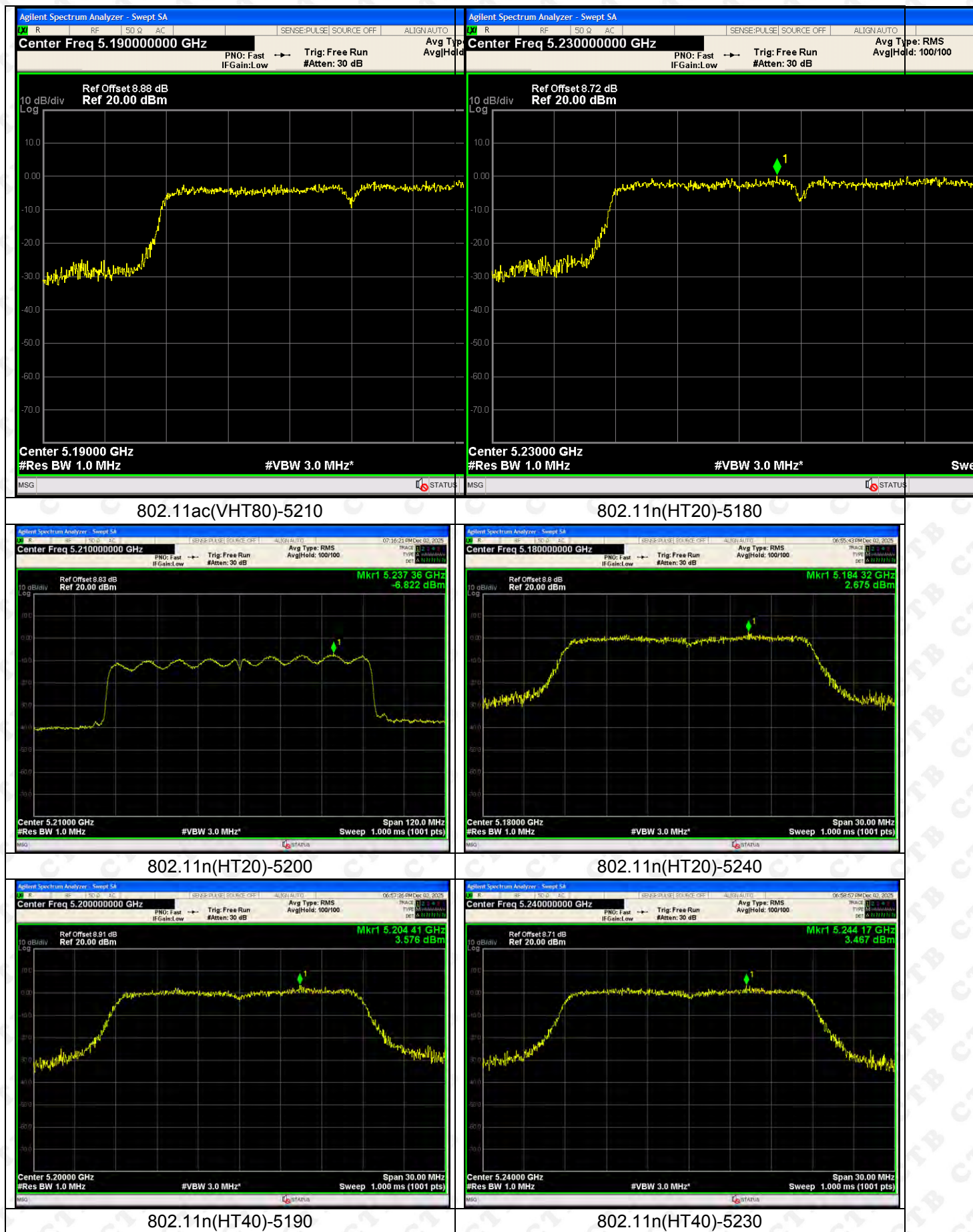


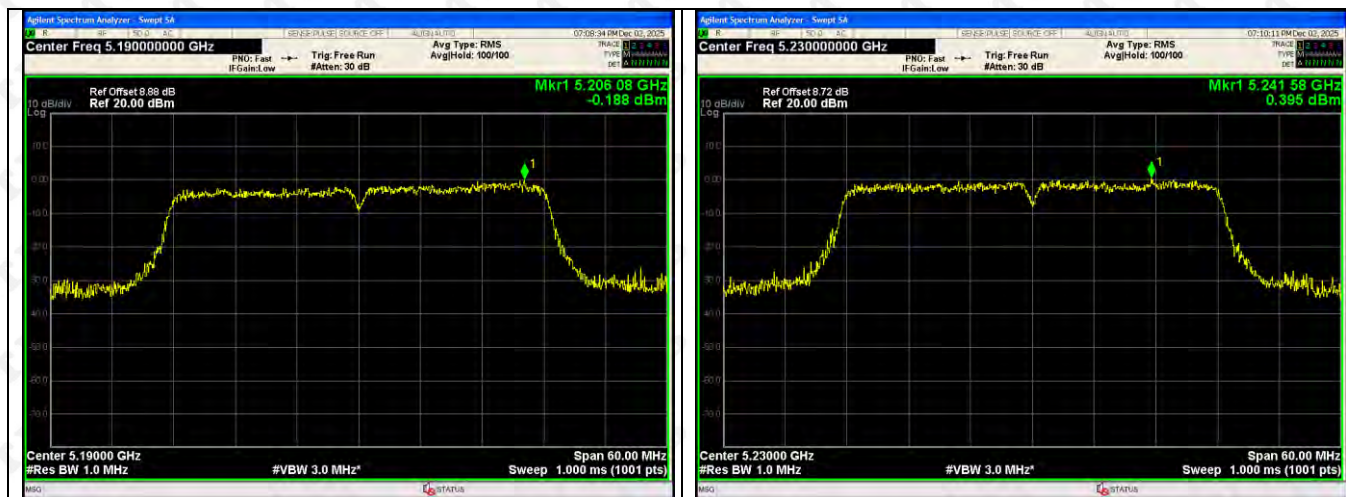
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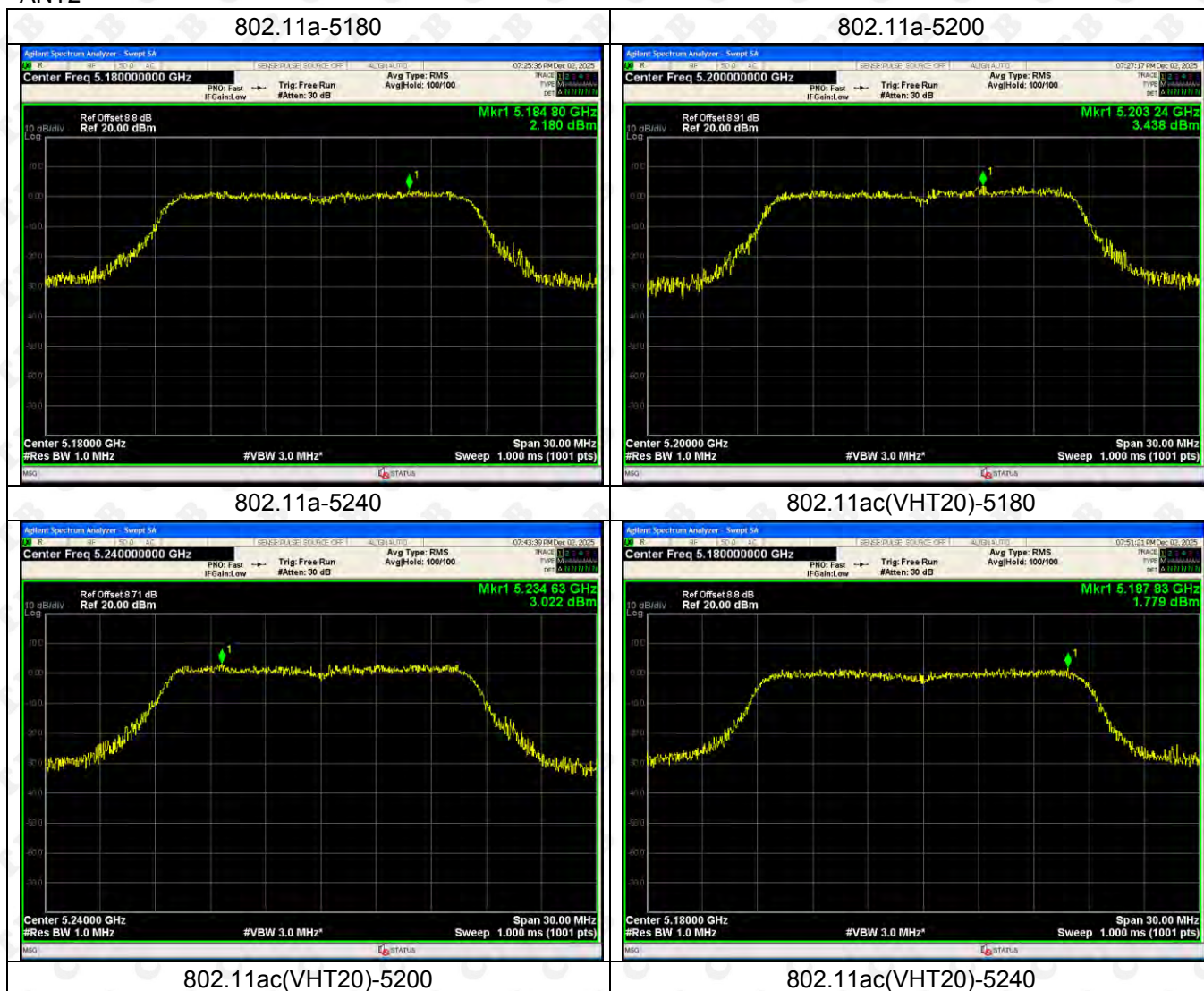
802.11ac(VHT40)-5190

802.11ac(VHT40)-5230





ANT2





802.11ac(VHT40)-5190



802.11ac(VHT40)-5230



802.11ac(VHT80)-5210



802.11n(HT20)-5180



802.11n(HT20)-5200



802.11n(HT20)-5240



802.11n(HT40)-5190

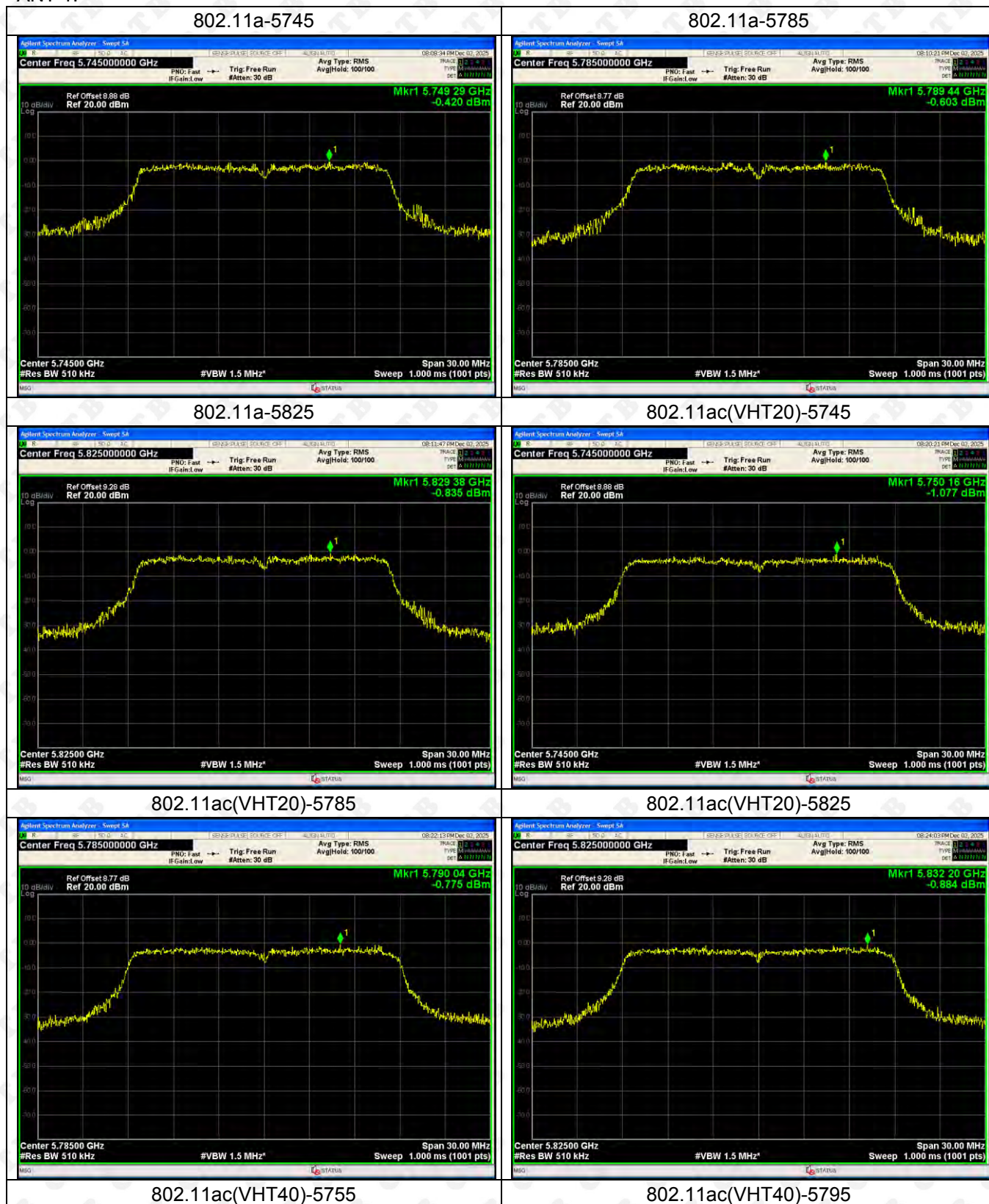


802.11n(HT40)-5230



5745-5825MHz

ANT 1:





802.11ac(VHT80)-5775



802.11n(HT20)-5745



802.11n(HT20)-5785



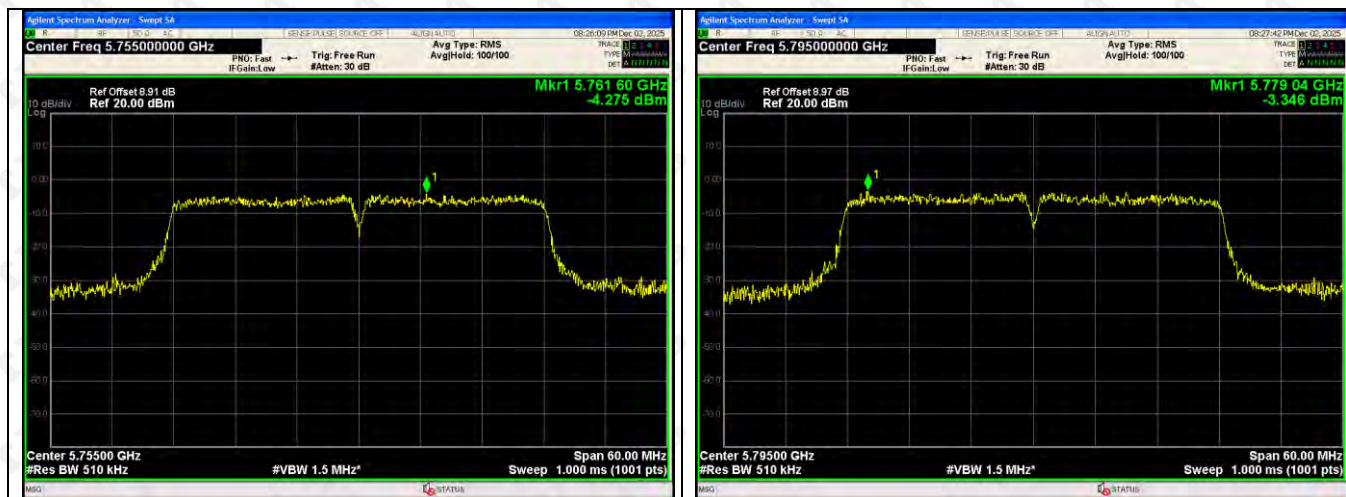
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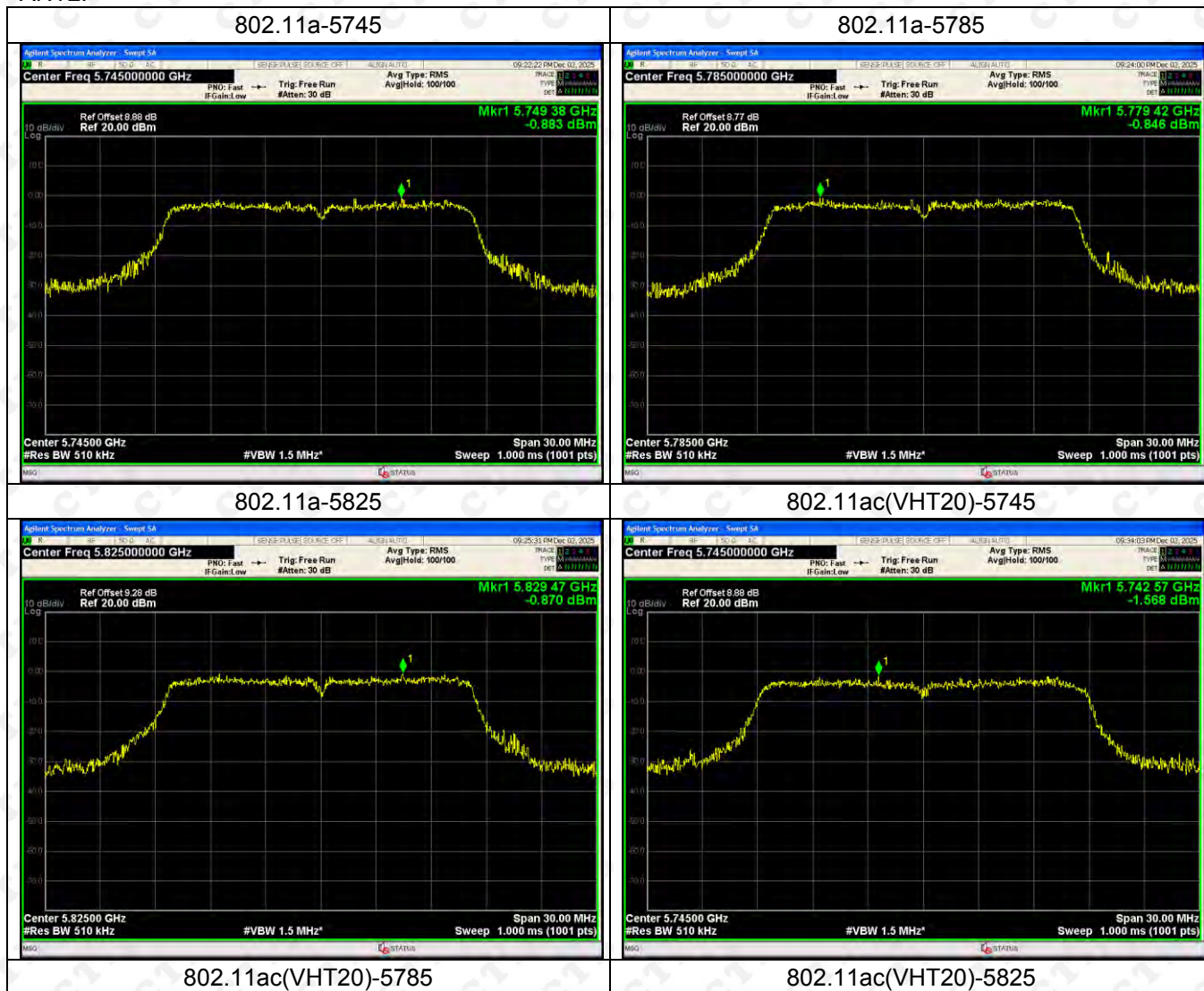
5802.11n(HT40)-5755



802.11n(HT40)-5795



ANT2:





802.11ac(VHT40)-5755



802.11ac(VHT40)-5795



802.11ac(VHT80)-5775



802.11n(HT20)-5745



802.11n(HT20)-5785



802.11n(HT20)-5825



5802.11n(HT40)-5755

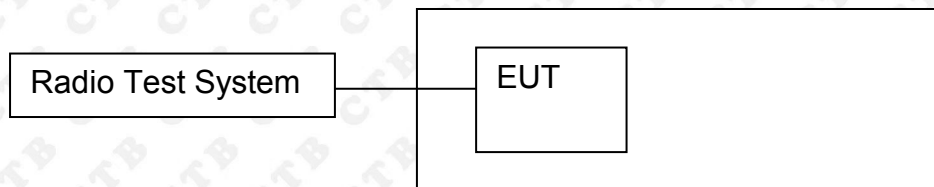


802.11n(HT40)-5795



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 (5180-5240MHzMHz)

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	5180.0145	5180	0.0145	2.7954
		V max (V)	132	5180.0225	5180	0.0225	4.3379
		V min (V)	108	5180.0396	5180	0.0396	7.6358
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	5180.0525	5180	0.0525	10.1334
		T (°C)	10	5180.0324	5180	0.0324	6.2622
		T (°C)	20	5180.0131	5180	0.0131	2.5227
		T (°C)	30	5180.0099	5180	0.0099	1.9077
		T (°C)	40	5180.0082	5180	0.0082	1.5803
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	5200.0314	5200	0.0314	6.0299
		V max (V)	132	5200.0147	5200	0.0147	2.8320
		V min (V)	108	5200.0504	5200	0.0504	9.6924
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	5200.0054	5200	0.0054	1.0396
		T (°C)	10	5200.0344	5200	0.0344	6.6102
		T (°C)	20	5200.0208	5200	0.0208	4.0095
		T (°C)	30	5200.0133	5200	0.0133	2.5638
		T (°C)	40	5200.0258	5200	0.0258	4.9664
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	5240.0497	5240	0.0497	9.4824
		V max (V)	132	5240.0501	5240	0.0501	9.5633
		V min (V)	108	5240.0274	5240	0.0274	5.2272
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	5240.0503	5240	0.0503	9.5951
		T (°C)	10	5240.0414	5240	0.0414	7.9034
		T (°C)	20	5240.0386	5240	0.0386	7.3594
		T (°C)	30	5240.0283	5240	0.0283	5.4083
		T (°C)	40	5240.0059	5240	0.0059	1.1342
Limits				±20ppm			
Result				Complies			

ANT2:

TX Frequency (5180-5240MHzMHz)

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	5180.0050	5180	0.0050	0.9649
		V max (V)	132	5180.0460	5180	0.0460	8.8797
		V min (V)	108	5180.0414	5180	0.0414	7.9899
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	5180.0316	5180	0.0316	6.0996
		T (°C)	10	5180.0275	5180	0.0275	5.3124
		T (°C)	20	5180.0935	5180	0.0935	18.0514
		T (°C)	30	5180.0442	5180	0.0442	8.5278
		T (°C)	40	5180.0156	5180	0.0156	3.0022
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	5200.0390	5200	0.0390	7.4966
		V max (V)	132	5200.0698	5200	0.0698	13.4245
		V min (V)	108	5200.0567	5200	0.0567	10.9022
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	5200.0714	5200	0.0714	13.7360
		T (°C)	10	5200.0791	5200	0.0791	15.2144
		T (°C)	20	5200.0808	5200	0.0808	15.5374
		T (°C)	30	5200.0056	5200	0.0056	1.0712
		T (°C)	40	5200.0112	5200	0.0112	2.1586
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	5240.0009	5240	0.0009	0.1718
		V max (V)	132	5240.0486	5240	0.0486	9.2774
		V min (V)	108	5240.0778	5240	0.0778	14.8551
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	5240.0820	5240	0.0820	15.6435
		T (°C)	10	5240.0287	5240	0.0287	5.4684
		T (°C)	20	5240.0264	5240	0.0264	5.0450
		T (°C)	30	5240.0625	5240	0.0625	11.9335
		T (°C)	40	5240.0495	5240	0.0495	9.4548
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	5745.0755	5745	0.0755	13.1469
		V max (V)	132	5745.0692	5745	0.0692	12.0479
		V min (V)	108	5745.0755	5745	0.0755	13.1469
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	5745.0668	5745	0.0668	11.6267
		T (°C)	10	5745.0310	5745	0.0310	5.4036
		T (°C)	20	5745.0528	5745	0.0528	9.1905
		T (°C)	30	5745.0437	5745	0.0437	7.6107
		T (°C)	40	5745.0435	5745	0.0435	7.5724
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	5785.0401	5785	0.0401	6.9238
		V max (V)	132	5785.0061	5785	0.0061	1.0573
		V min (V)	108	5785.0399	5785	0.0399	6.8895
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	5785.0633	5785	0.0633	10.9416
		T (°C)	10	5785.0567	5785	0.0567	9.7975
		T (°C)	20	5785.0394	5785	0.0394	6.8149
		T (°C)	30	5785.0856	5785	0.0856	14.7913
		T (°C)	40	5785.0866	5785	0.0866	14.9747
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	5825.0502	5825	0.0502	8.6162
		V max (V)	132	5825.0636	5825	0.0636	10.9235
		V min (V)	108	5825.0514	5825	0.0514	8.8235
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	5825.0139	5825	0.0139	2.3907
		T (°C)	10	5825.0643	5825	0.0643	11.0324
		T (°C)	20	5825.0882	5825	0.0882	15.1424
		T (°C)	30	5825.0141	5825	0.0141	2.4146
		T (°C)	40	5825.0845	5825	0.0845	14.5056
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	5745.0118	5745	0.0118	2.0467
		V max (V)	132	5745.0709	5745	0.0709	12.3418
		V min (V)	108	5745.0441	5745	0.0441	7.6736
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	5745.0921	5745	0.0921	16.0370
		T (°C)	10	5745.0268	5745	0.0268	4.6613
		T (°C)	20	5745.0610	5745	0.0610	10.6176
		T (°C)	30	5745.0317	5745	0.0317	5.5221
		T (°C)	40	5745.0230	5745	0.0230	4.0056
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	5785.0107	5785	0.0107	1.8411
		V max (V)	132	5785.0658	5785	0.0658	11.3659
		V min (V)	108	5785.0255	5785	0.0255	4.4121
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	5785.0231	5785	0.0231	3.9925
		T (°C)	10	5785.0471	5785	0.0471	8.1372
		T (°C)	20	5785.0599	5785	0.0599	10.3497
		T (°C)	30	5785.0695	5785	0.0695	12.0122
		T (°C)	40	5785.0563	5785	0.0563	9.7342
		T (°C)	50	5785.0263	5785	0.0263	4.5395
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	5825.0907	5825	0.0907	15.5691
		V max (V)	132	5825.0634	5825	0.0634	10.8811
		V min (V)	108	5825.0674	5825	0.0674	11.5645
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	5825.0458	5825	0.0458	7.8686
		T (°C)	10	5825.0033	5825	0.0033	0.5651
		T (°C)	20	5825.0332	5825	0.0332	5.6966
		T (°C)	30	5825.0194	5825	0.0194	3.3295
		T (°C)	40	5825.0736	5825	0.0736	12.6432
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.

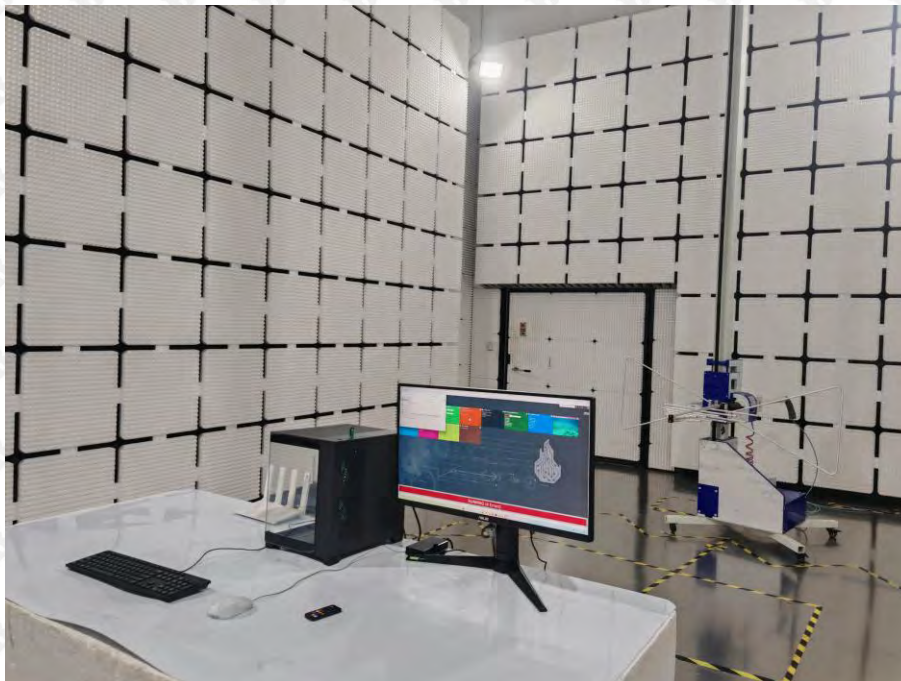
EUT Antenna:

The antenna is external antenna and no consideration of replacement. The best case gain of the antenna is WiFi (5.2G):Ant1: 3.47dBi, Ant2: 3.47dBi, WiFi (5.8G):Ant1: 2.88dBi, Ant2: 2.88dBi.

15. EUT TEST SETUP PHOTOGRAPHS

Spurious emissions

Below 1GHz



Above 1GHz



Conducted Emission



***** END OF REPORT *****