5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
In addition, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 1MHz for band 1 RBW ≥ 510KHz for band 4
VB	VBW ≥ 3RBW
Detector	RMS (i.e., power averaging).
Trace	Max Hold
Sweep Time	Auto

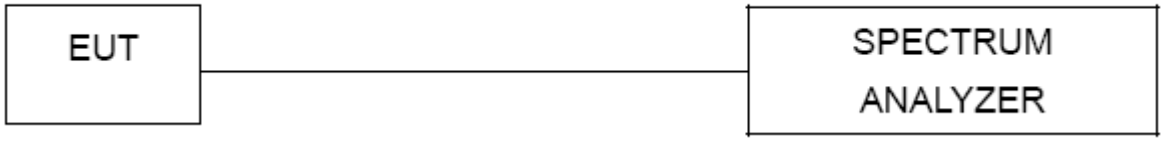
5.1.1 TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. For U-NII1, U-NII-2A, U-NII-2C Band:
Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
For U-NII-3 Band:
Set RBW=510 kHz, VBW=3*RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
5. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
we test all antennas, the antenna 1 was worst mode and the data recording in the report.
7. Duty factor Reference is made to the test results in Section 7.1.5.

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

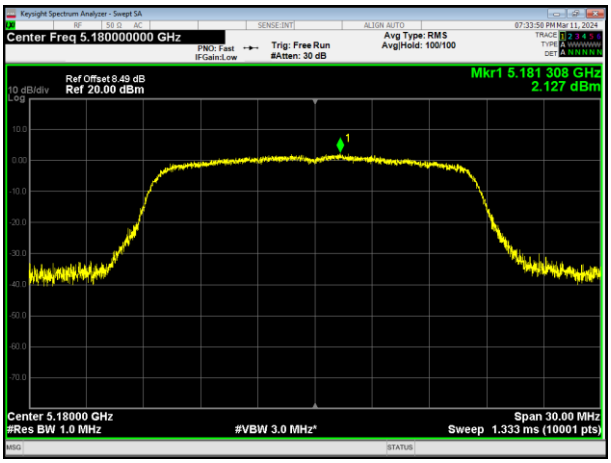
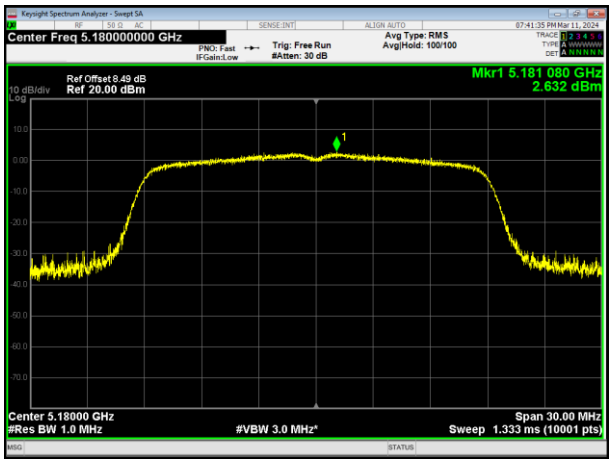
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

	Mode	Test Channel	Reading Level (dBm)	Duty factor (dB)	PSD (dBm/MHz)	Limit (dBm)	Result
Band1	802.11a	Low	2.127	0.87	2.997	11.00	PASS
		Middle	2.047	0.87	2.917	11.00	PASS
		High	2.096	0.87	2.966	11.00	PASS
	802.11n20	Low	2.632	0.13	2.762	11.00	PASS
		Middle	3.581	0.13	3.711	11.00	PASS
		High	2.358	0.13	2.488	11.00	PASS
	802.11n40	Low	0.708	2.51	3.218	11.00	PASS
		High	0.638	2.51	3.148	11.00	PASS
	802.11ac20	Low	3.582	2.45	6.032	11.00	PASS
		Middle	4.586	2.45	7.036	11.00	PASS
		High	4.423	2.45	6.873	11.00	PASS
	802.11ac40	Low	0.454	3.93	4.384	11.00	PASS
		High	0.594	3.93	4.524	11.00	PASS
	802.11ac80	/	-2.925	4.09	1.165	11.00	PASS

	Mode	Test Channel	Reading Level (dBm)	Duty factor (dB)	RB factor (dB)	PSD (dBm/ 500kHz)	Limit (dBm/ 500kHz)	Result
Band4	802.11a	Low	-0.649	5.77	0.1	5.221	30.00	PASS
		Middle	-1.37	5.77	0.1	4.5	30.00	PASS
		High	-1.219	5.77	0.1	4.651	30.00	PASS
	802.11n20	Low	-0.429	2.48	0.1	2.151	30.00	PASS
		Middle	-0.178	2.48	0.1	2.402	30.00	PASS
		High	-1.082	2.48	0.1	1.498	30.00	PASS
	802.11n40	Low	-2.625	2.51	0.1	-0.015	30.00	PASS
		High	-1.806	2.51	0.1	0.804	30.00	PASS
	802.11ac20	Low	1.671	1.43	0.1	3.201	30.00	PASS
		Middle	0.495	1.43	0.1	2.025	30.00	PASS
		High	0.888	1.43	0.1	2.418	30.00	PASS
	802.11ac40	Low	-2.355	2.54	0.1	0.285	30.00	PASS
		High	-2.481	2.54	0.1	0.159	30.00	PASS
	802.11ac80	/	-4.933	4.09	0.1	-0.743	30.00	PASS

Note: RB factor=10log(510/500k)

802.11a	802.11n HT20
	
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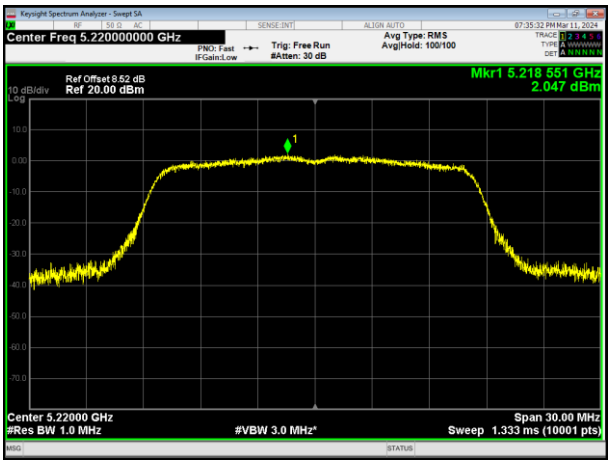	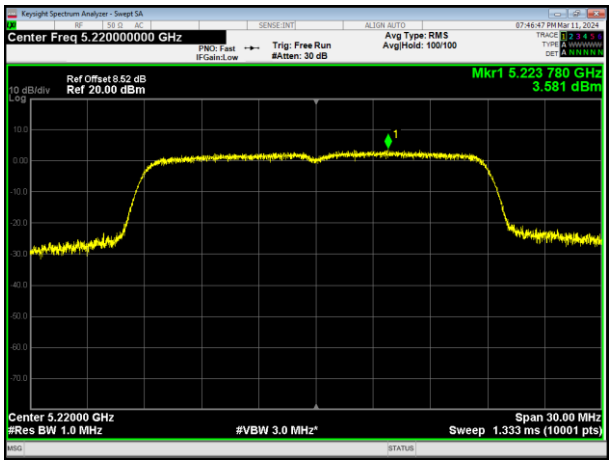
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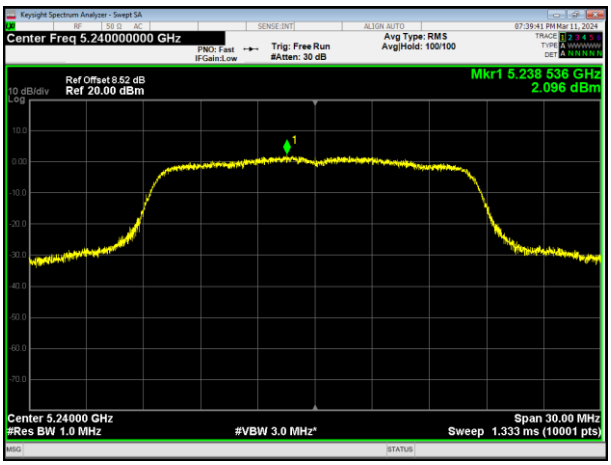
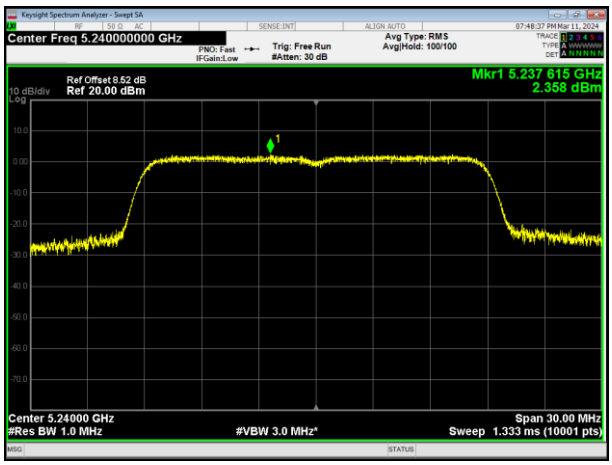
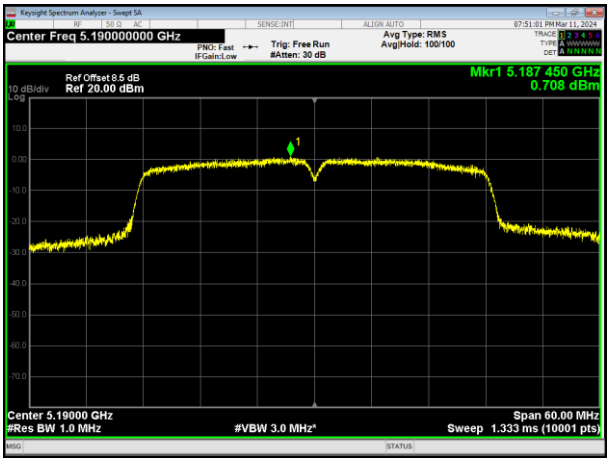
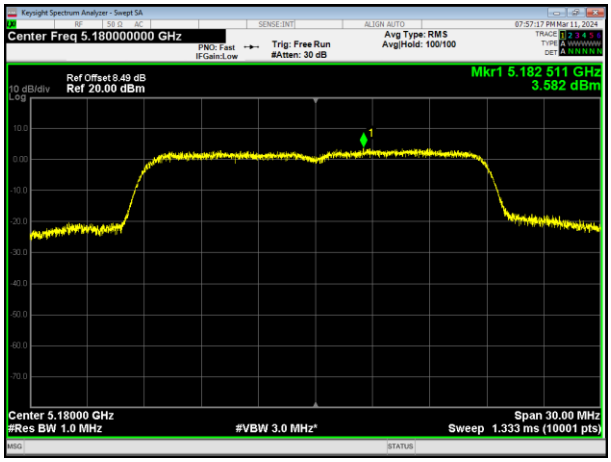
	
5240MHz	5240MHz

802.11n HT40	802.11ac HT20
	
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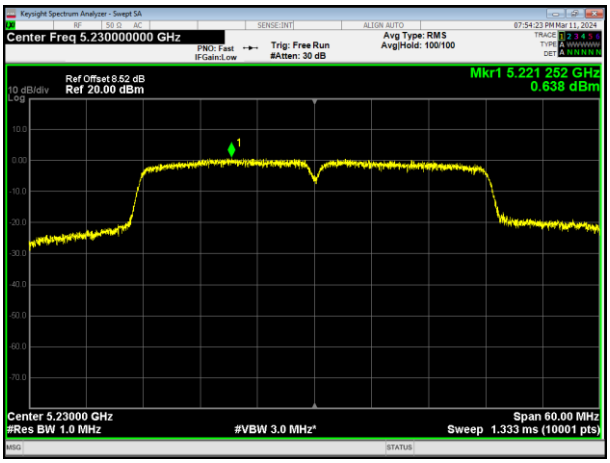	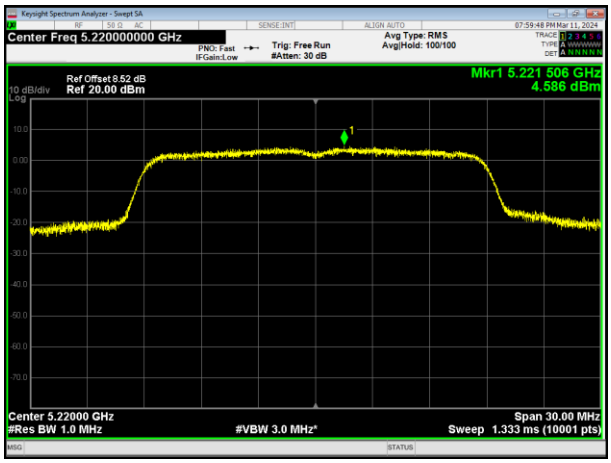
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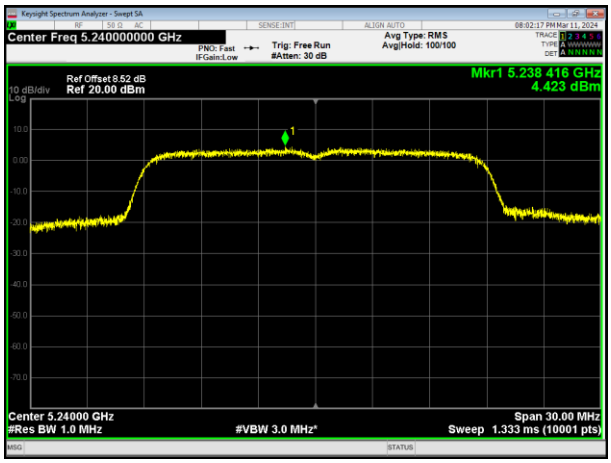
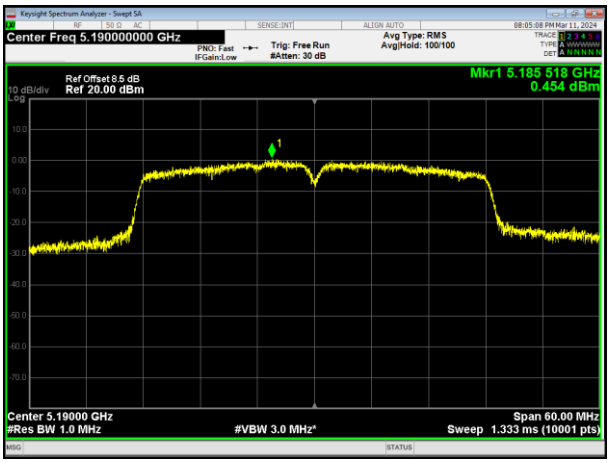
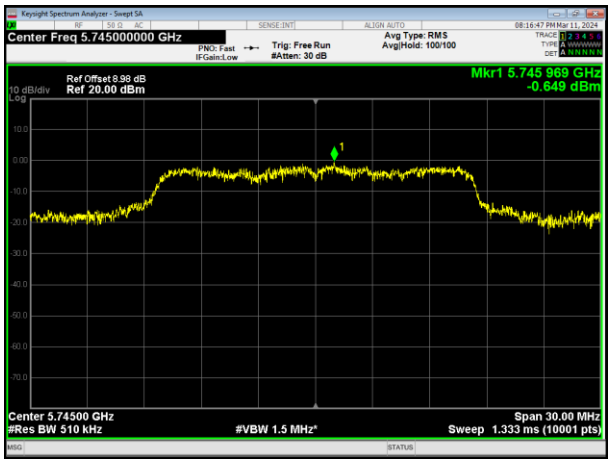
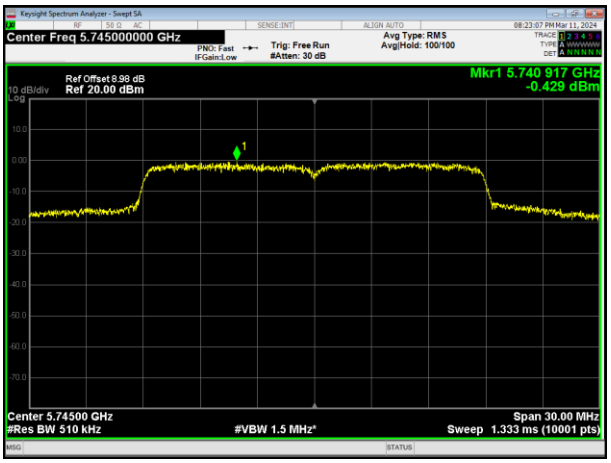
	
	5240MHz

802.11ac HT40	802.11ac HT80
	
5190MHz	5210MHz
	
5230MHz	

802.11a	802.11n HT20
	
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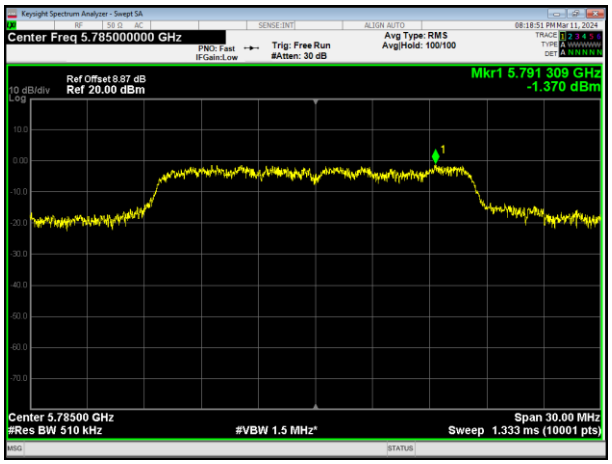
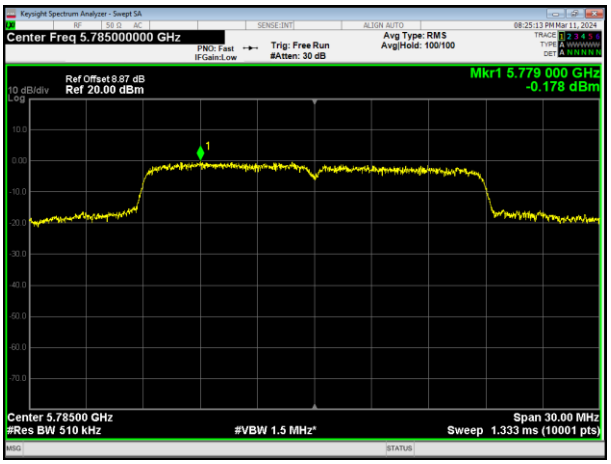
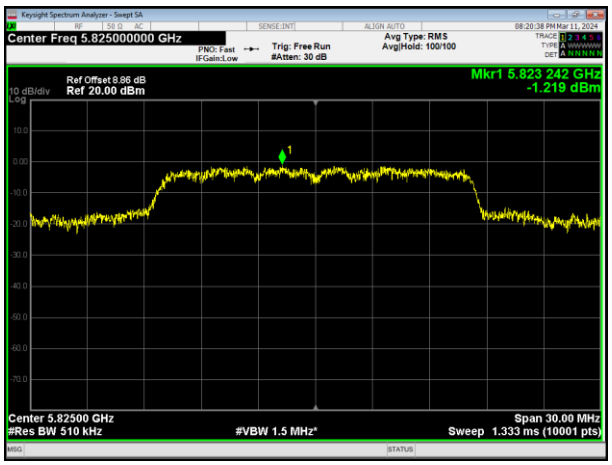
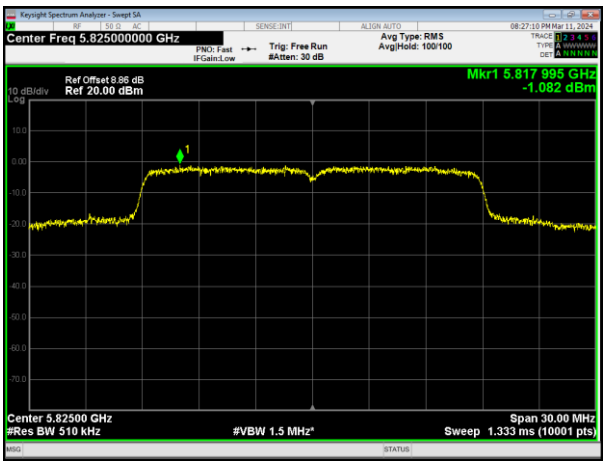
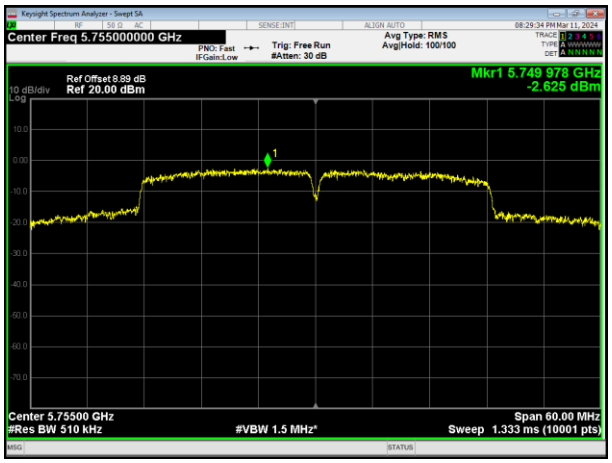
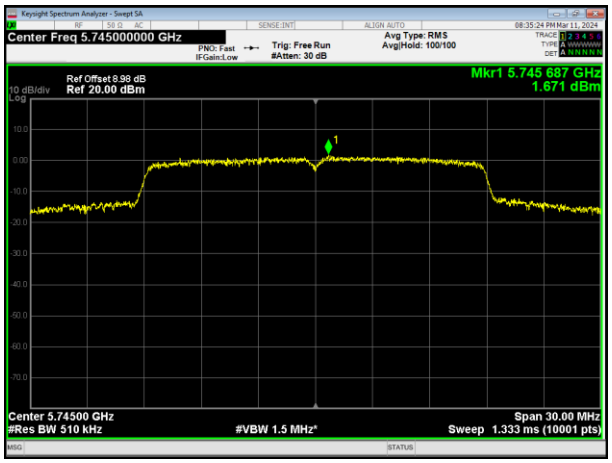
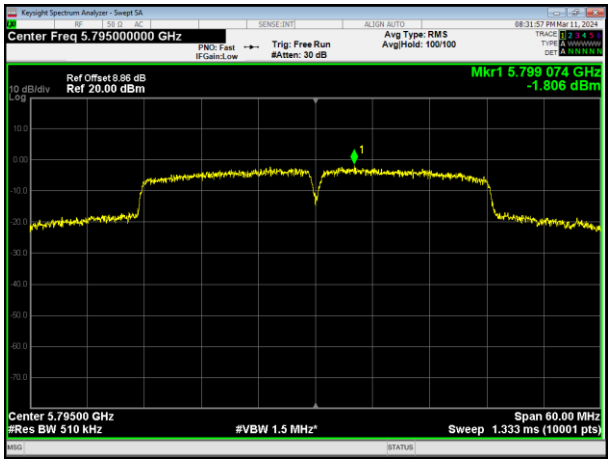
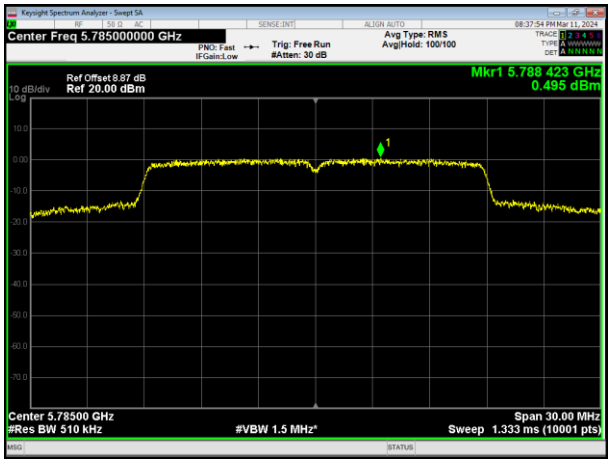
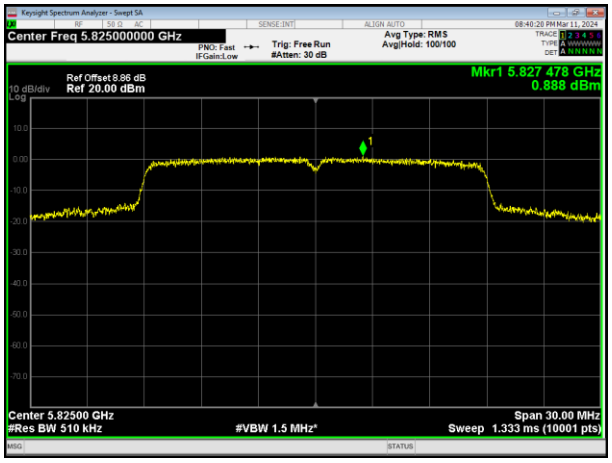
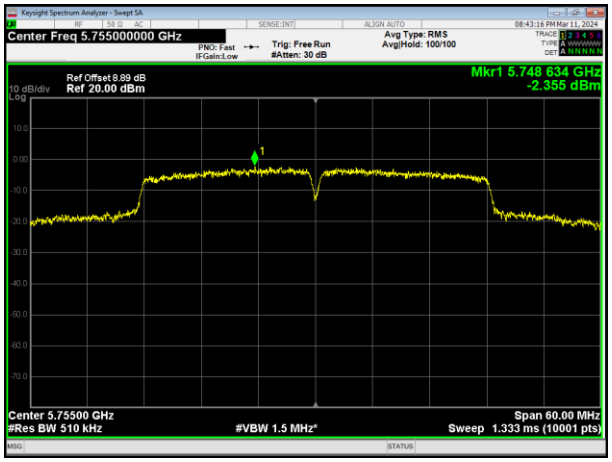
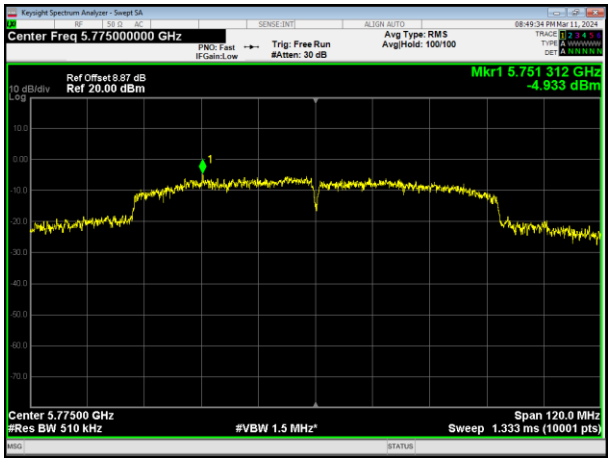
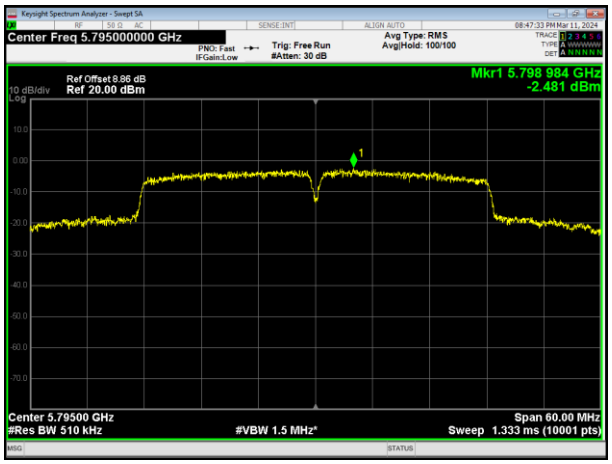
	
5785MHz	5785MHz
	
5825MHz	5825MHz

802.11n HT40	802.11ac HT20
	
5755MHz	5745MHz
	
5795MHz	5785MHz
	
	5825MHz

802.11ac HT40	802.11ac HT80
	
5755MHz	5775MHz
	
5795MHz	

6. 6DB&26DB&99% BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

The 26 dB bandwidth is used to determine the conducted power limits.
There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

6.1.1 TEST PROCEDURE

6dB Bandwidth	
Spectrum Parameters	Setting
RBW	100KHz
VBW	300KHz
Span	30MHz(20MHz Bandwidth mode) 60MHz(40MHz Bandwidth mode) 120MHz(80MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

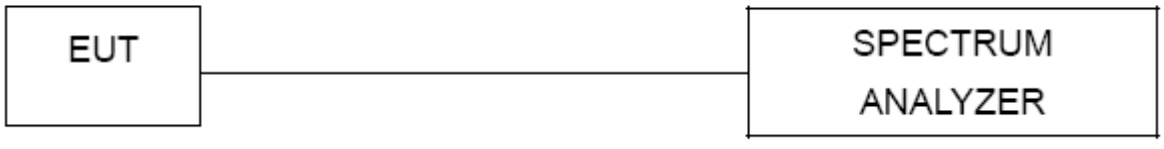
26dB Bandwidth	
Spectrum Parameters	Setting
RBW	approximately 1% of the emission bandwidth
VBW	>RBW
Span	30MHz(20MHz Bandwidth mode) 60MHz(40MHz Bandwidth mode) 120MHz(80MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

99% Occupied Bandwidth	
Spectrum Parameters	Setting
RBW	1% to 5% of the OBW
VBW	Approximately three times the RBW
Span	between 1.5 times and 5.0 times the OBW
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



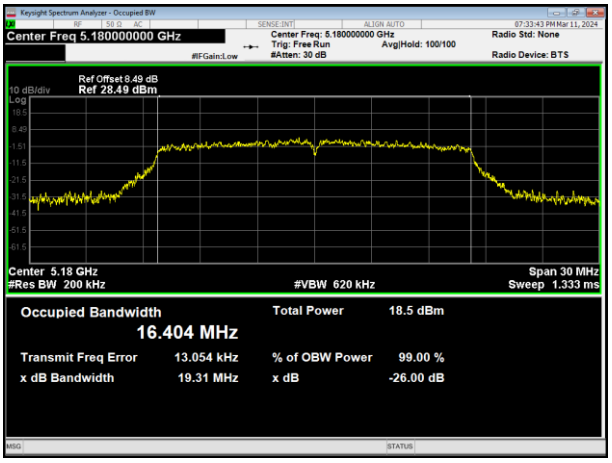
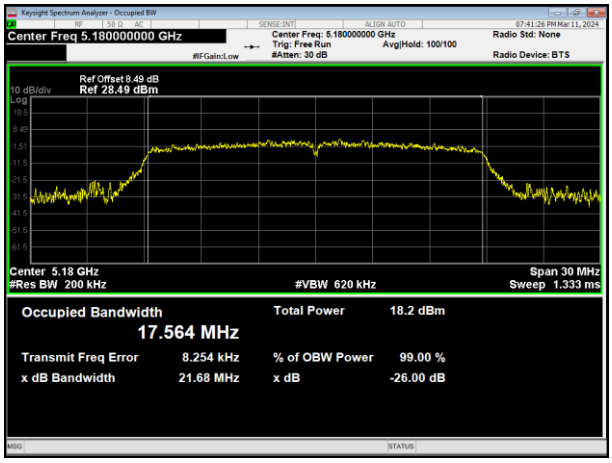
6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 TEST RESULTS

		Test Channel	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Band 1	802.11a	Low	19.31	16.404	Pass
		Middle	19.85	16.408	Pass
		High	20.52	16.433	Pass
	802.11n HT20	Low	21.68	17.564	Pass
		Middle	25.90	17.637	Pass
		High	28.05	17.666	Pass
	802.11n HT40	Low	59.06	36.575	Pass
		High	59.80	37.231	Pass
	802.11ac HT20	Low	28.83	17.700	Pass
		Middle	29.71	17.786	Pass
		High	29.69	18.421	Pass
	802.11ac HT40	Low	57.13	36.755	Pass
		High	59.98	38.803	Pass
	802.11ac HT80	/	119.6	75.908	Pass

		Test Channel	6dB Bandwidth (MHz)	6dB Bandwidth Limit (MHz)	Result
Band 4	802.11a	Low	15.849	>0.5	Pass
		Middle	15.302	>0.5	Pass
		High	15.409	>0.5	Pass
	802.11n HT20	Low	16.929	>0.5	Pass
		Middle	16.914	>0.5	Pass
		High	15.932	>0.5	Pass
	802.11n HT40	Low	33.522	>0.5	Pass
		High	33.514	>0.5	Pass
	802.11ac HT20	Low	15.666	>0.5	Pass
		Middle	17.26	>0.5	Pass
		High	16.287	>0.5	Pass
	802.11ac HT40	Low	35.068	>0.5	Pass
		High	34.392	>0.5	Pass
	802.11ac HT80	/	67.623	>0.5	Pass

802.11a	802.11n HT20
	
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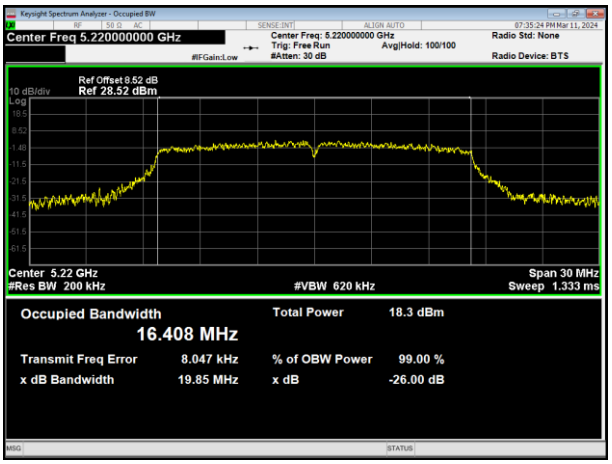	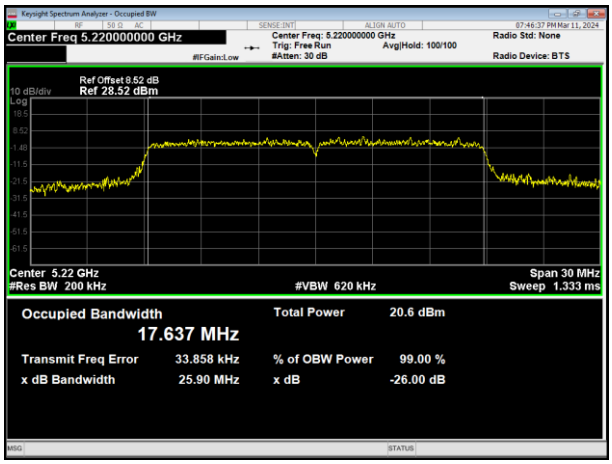
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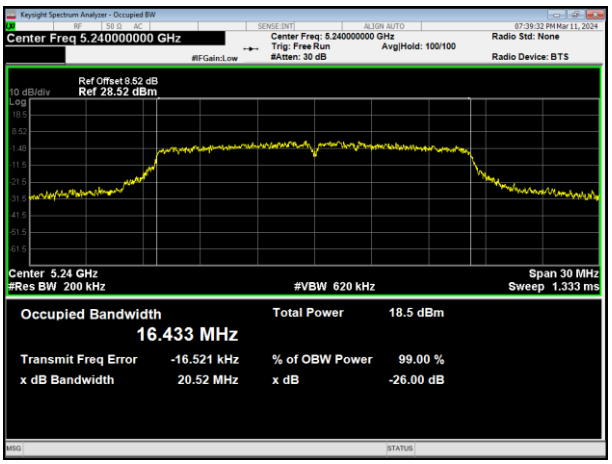
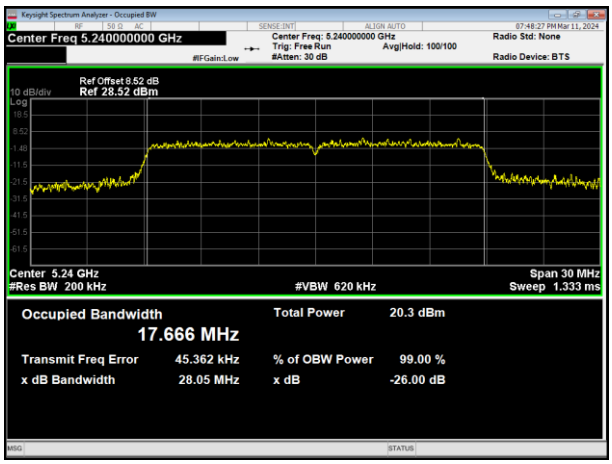
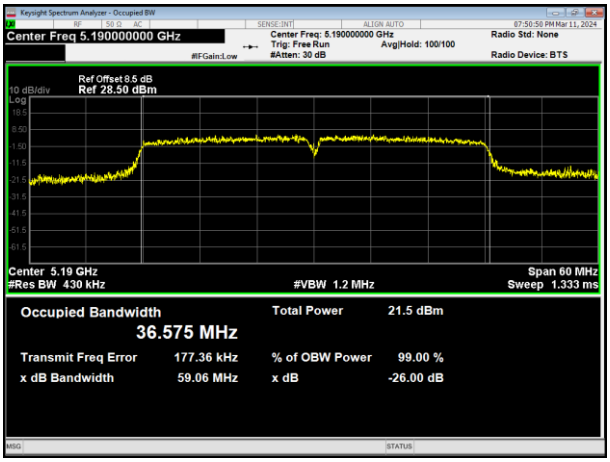
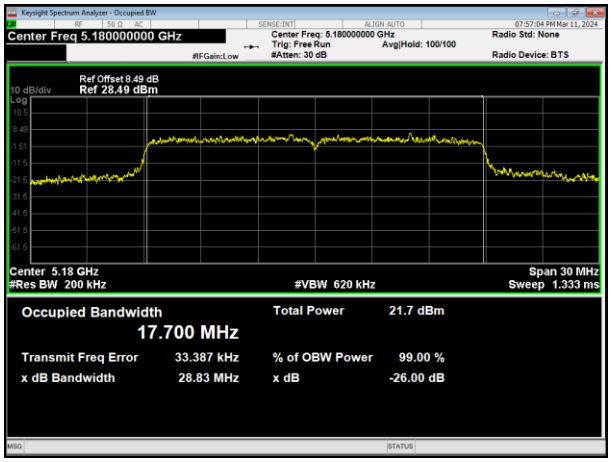
	
5240MHz	5240MHz

802.11n HT40	802.11ac HT20
	
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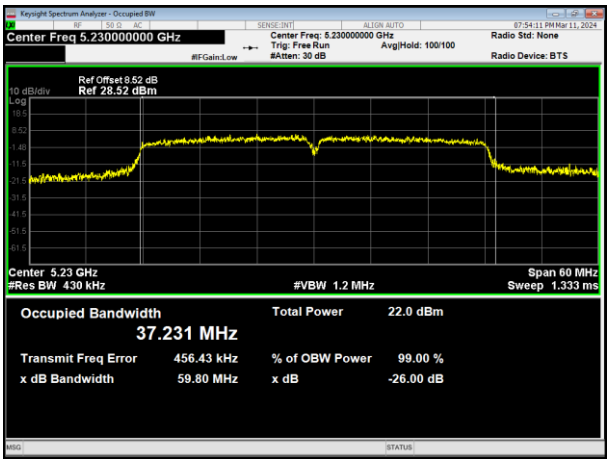
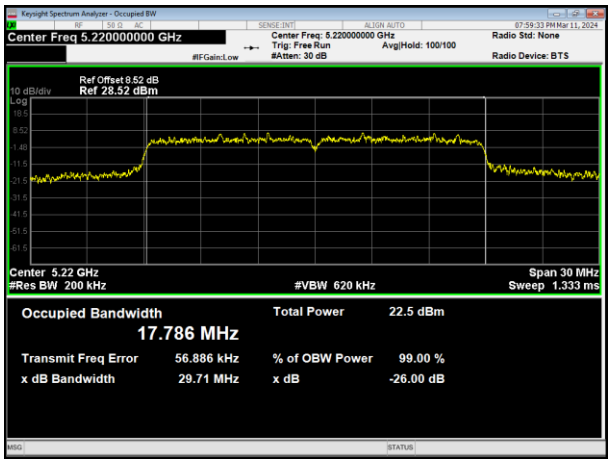
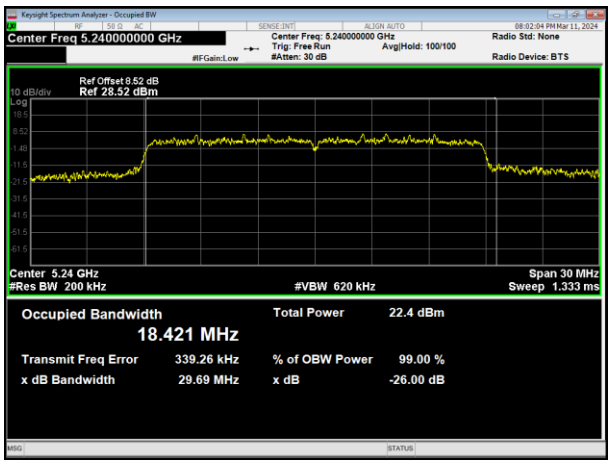
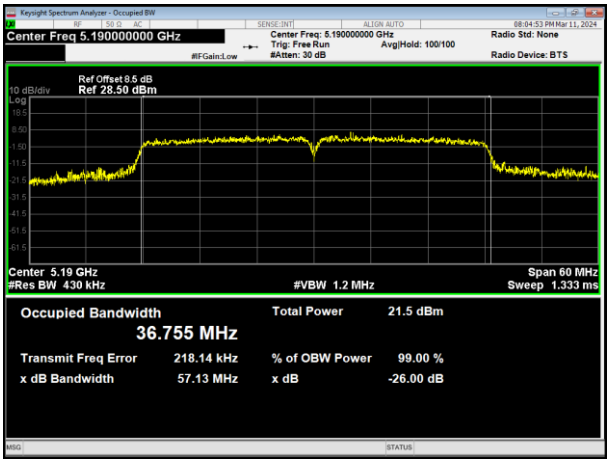
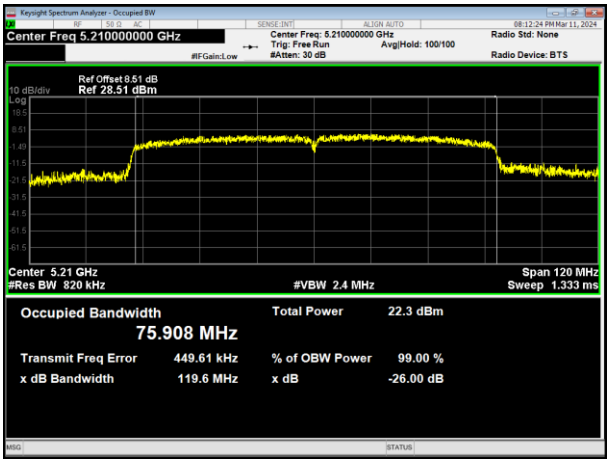
	
5230MHz	5200MHz
	
	5240MHz

802.11ac HT40	802.11ac HT80
	
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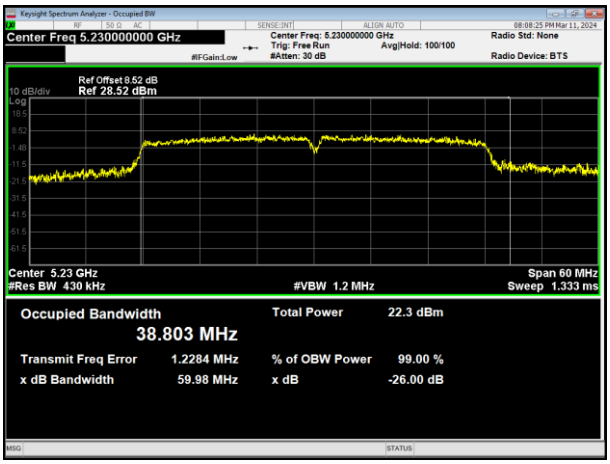
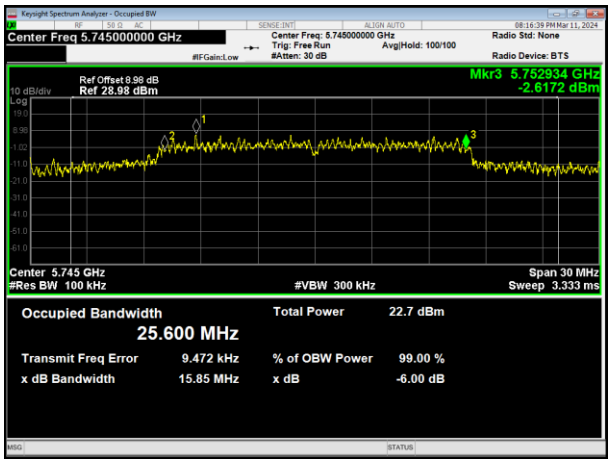
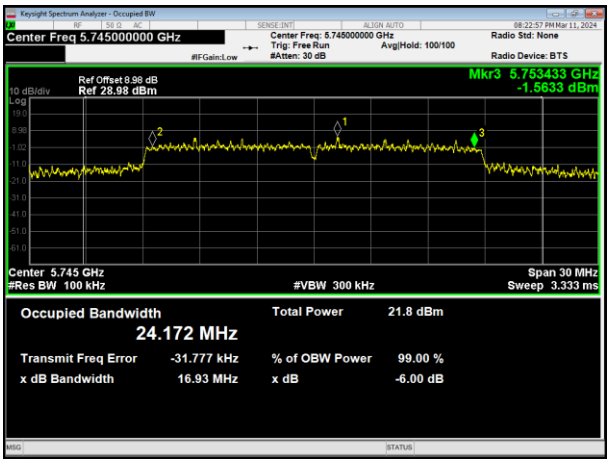
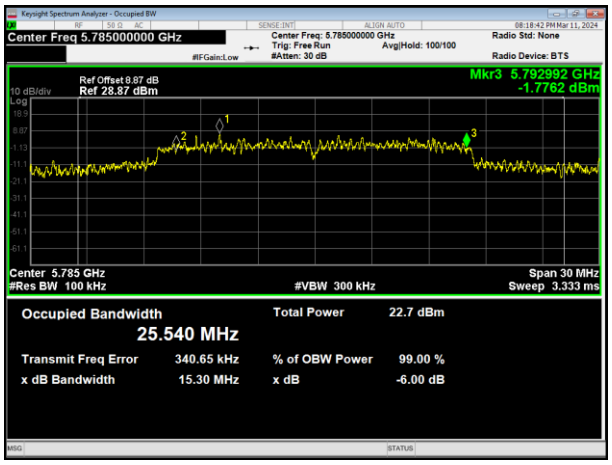
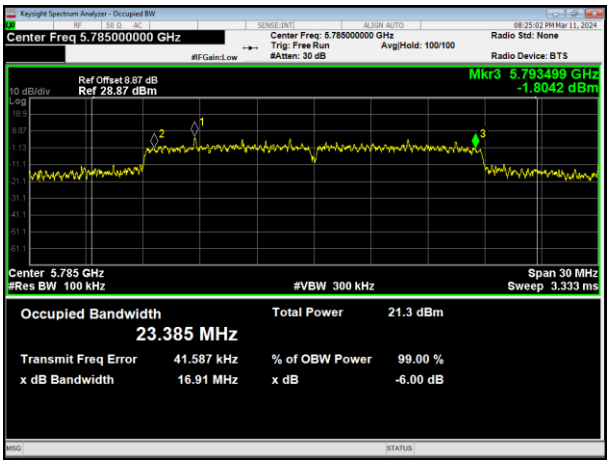
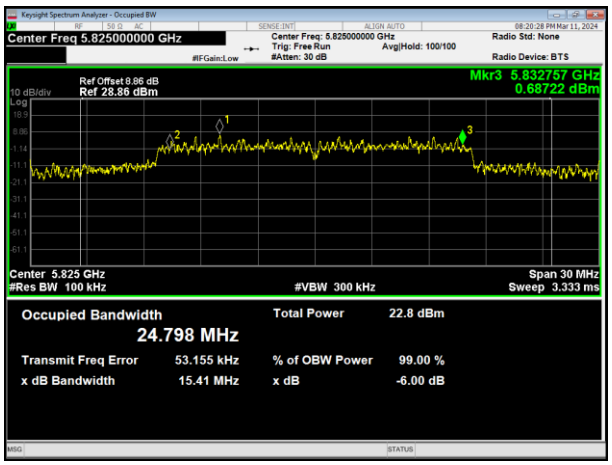
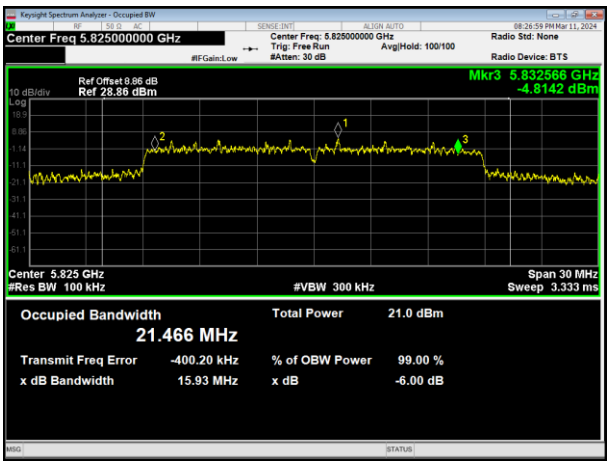
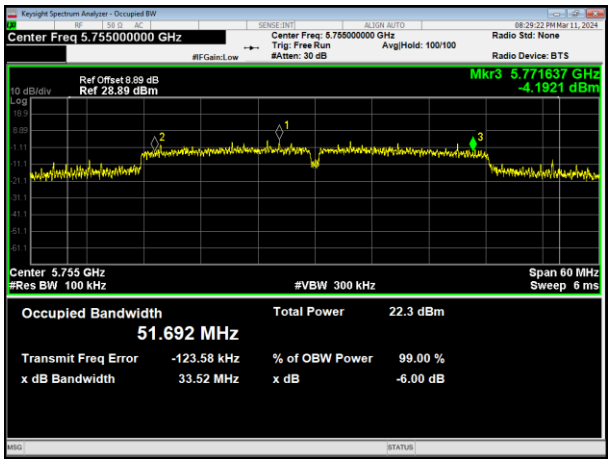
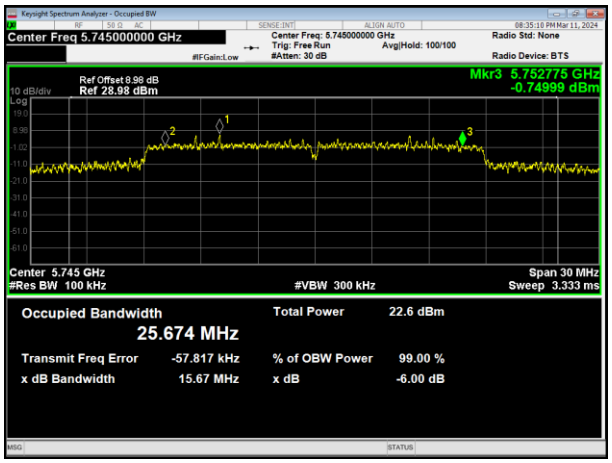
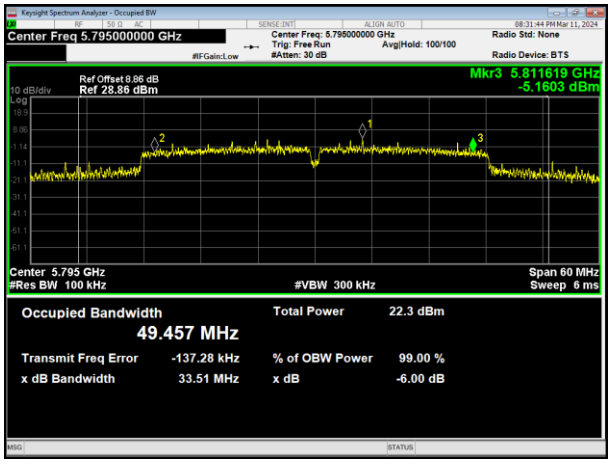
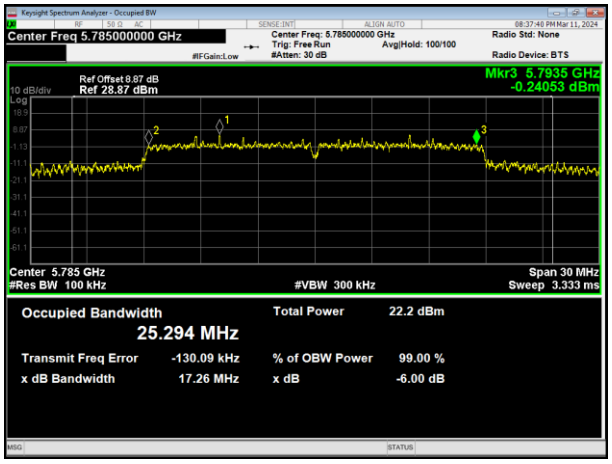
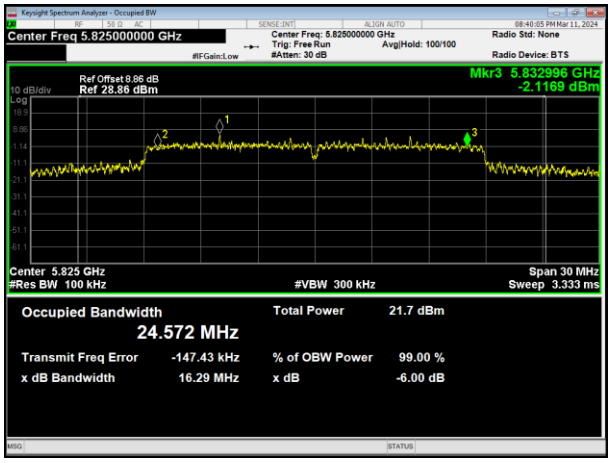
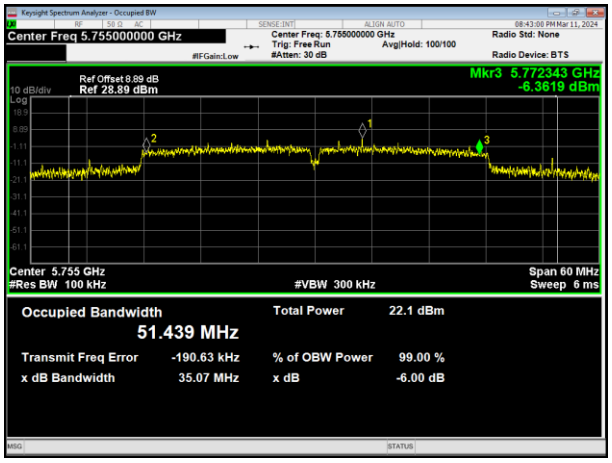
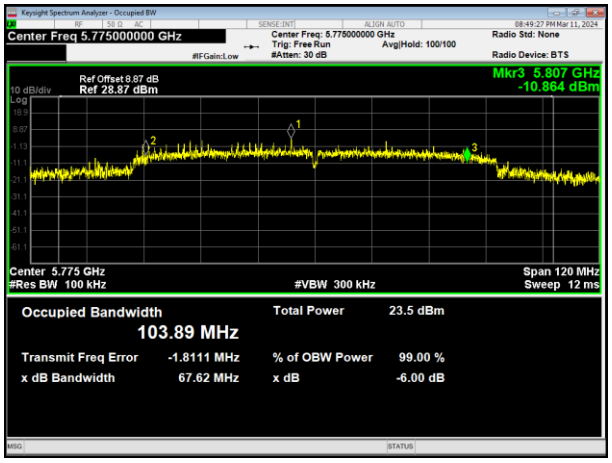
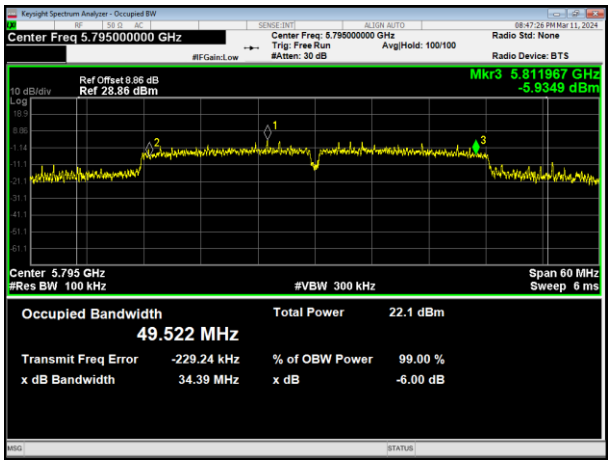
	
5230MHz	

802.11a	802.11n HT20
	
5745MHz	5745MHz
	
5785MHz	5785MHz
	
5825MHz	5825MHz

802.11n HT40	802.11ac HT20
	
5755MHz	5745MHz
	
5795MHz	5785MHz
	
	5825MHz

802.11ac HT40	802.11ac HT80
	
5755MHz	5775MHz
	
5795MHz	

7. DUTY CYCLE TEST SIGNAL

7.1 APPLIED PROCEDURES / LIMIT

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle. All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

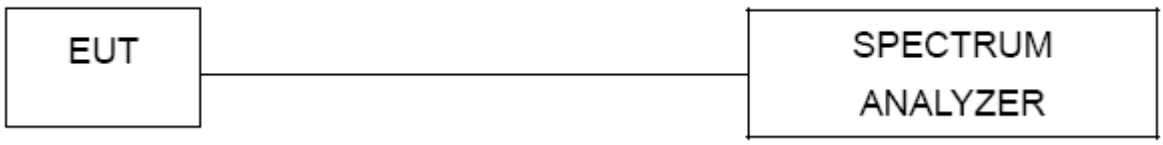
7.1.1 TEST PROCEDURE

1. Set RBW = 1 MHz.
2. Set the video bandwidth (VBW) ≥RBW.
3. Detector = Peak.
4. Sweep = auto couple.
5. Allow the trace to stabilize.
6. Span=0

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



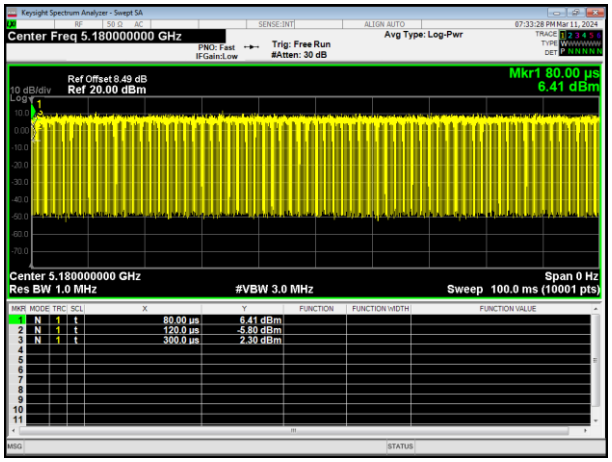
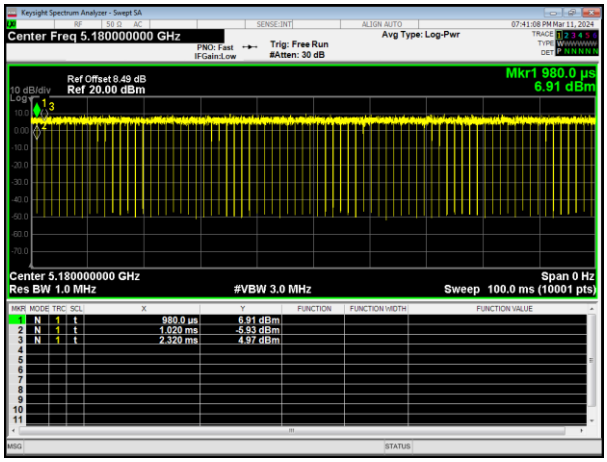
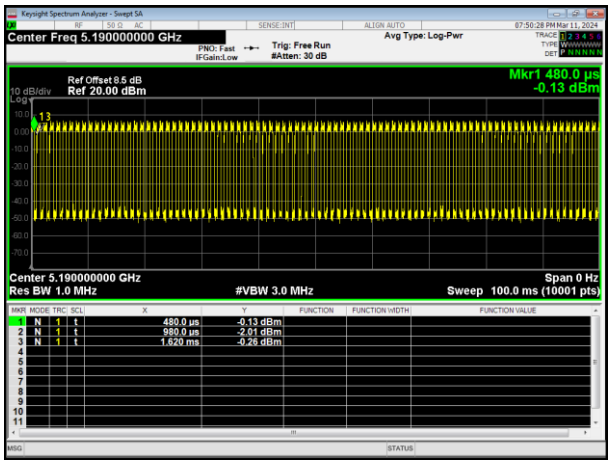
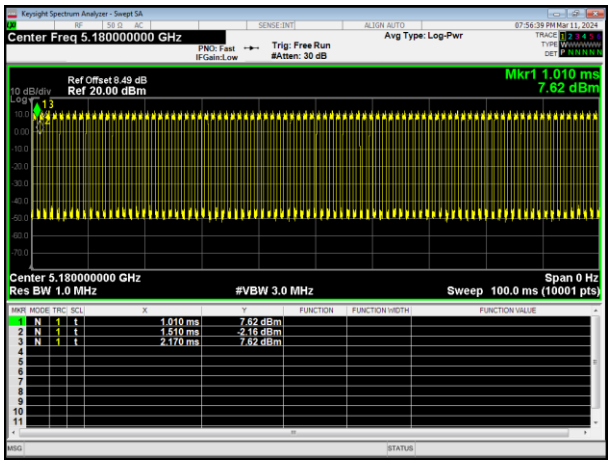
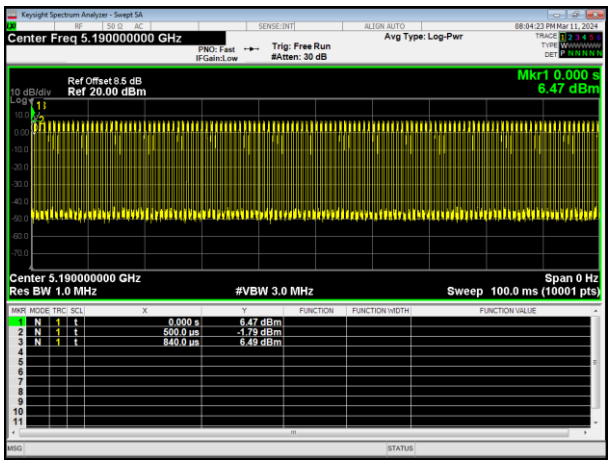
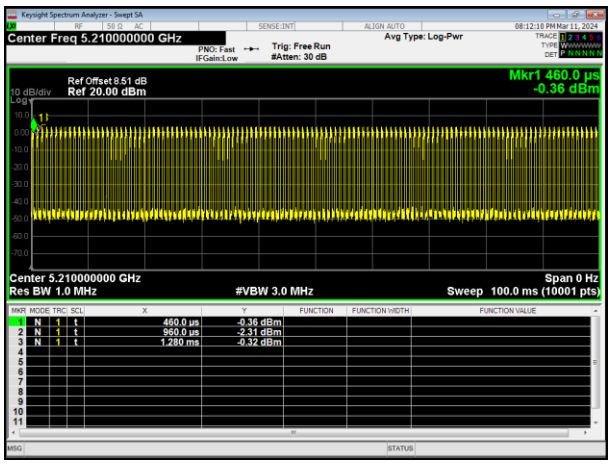
7.1.4 EUT OPERATION CONDITIONS

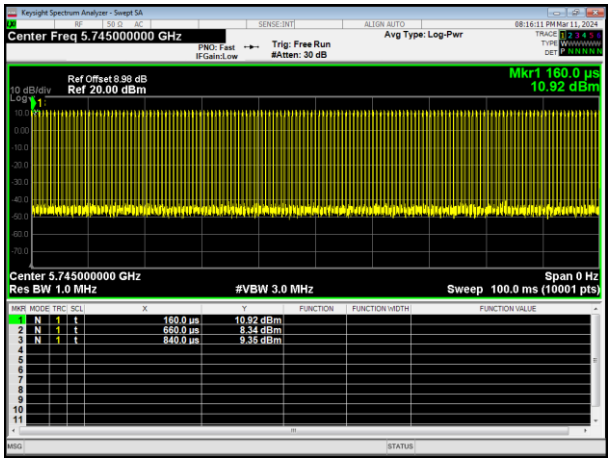
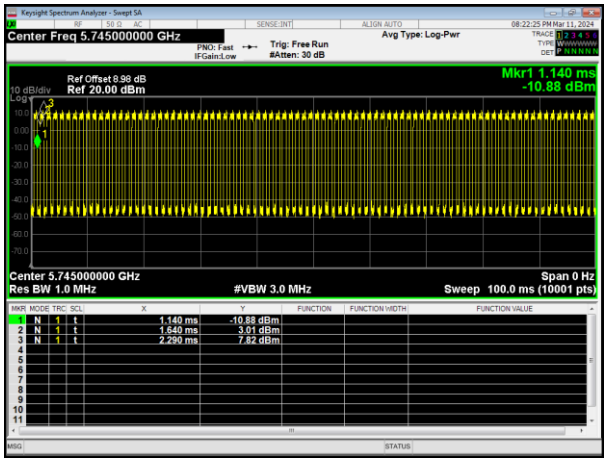
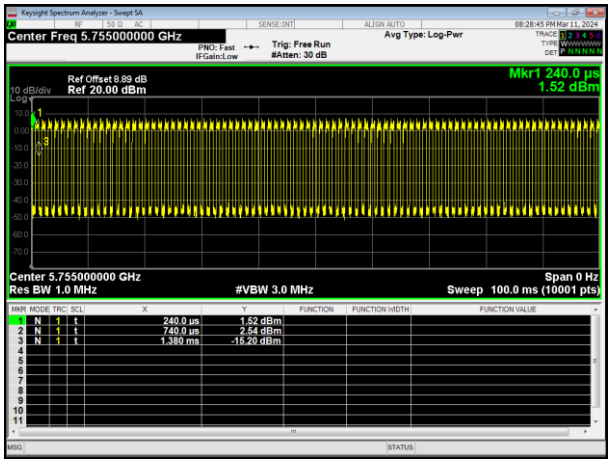
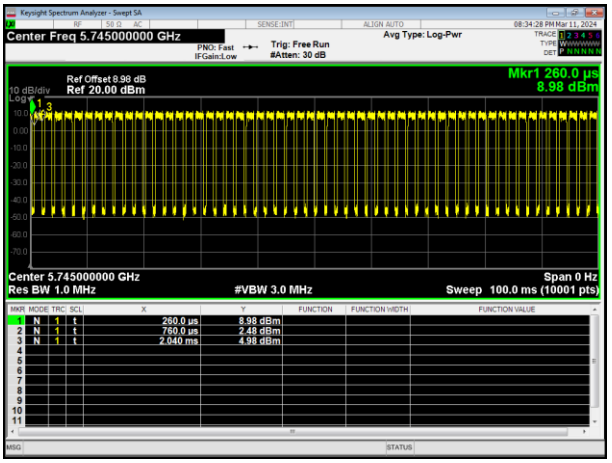
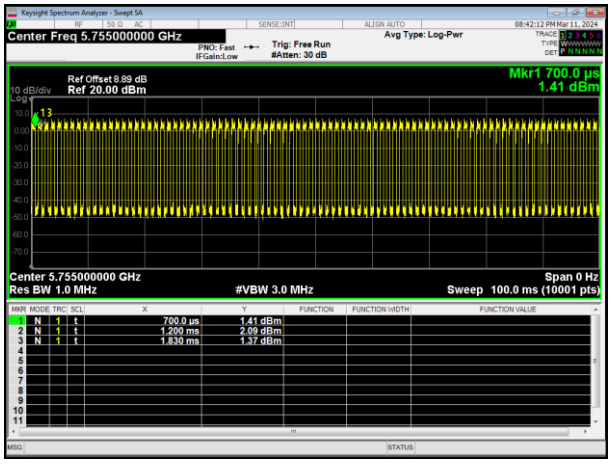
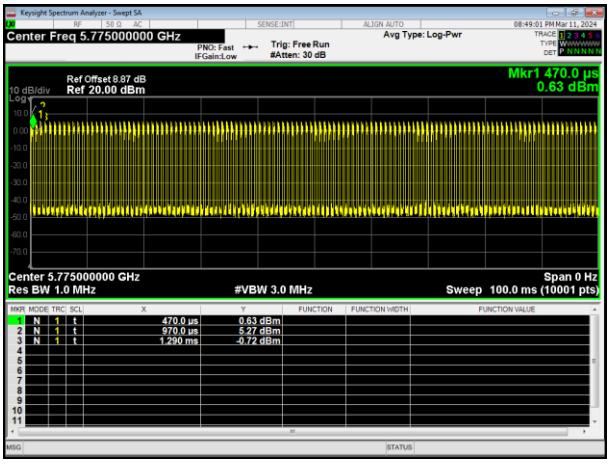
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 TEST RESULTS

Operation Mode		Duty Cycle(%)	Duty Fator (dB) 10 * log (1/ Duty cycle)
Band 1	802.11a	81.82	0.87
	802.11n(HT20)	97.01	0.13
	802.11n(HT40)	56.14	2.51
	802.11ac(HT20)	56.9	2.45
	802.11ac(HT40)	40.48	3.93
	802.11ac(HT80)	39.02	4.09

Operation Mode		Duty Cycle(%)	Duty Fator (dB) 10 * log (1/ Duty cycle)
Band 4	802.11a	26.47	5.77
	802.11n(HT20)	56.52	2.48
	802.11n(HT40)	56.14	2.51
	802.11ac(HT20)	71.91	1.43
	802.11ac(HT40)	55.75	2.54
	802.11ac(HT80)	39.02	4.09

802.11a	802.11n HT20
	
802.11n HT40	802.11ac HT20
	
802.11ac HT40	802.11ac HT80
	

802.11a	802.11n HT20
	
802.11n HT40	802.11ac HT20
	
802.11ac HT40	802.11ac HT80
	

8. FREQUENCY STABILITY

8.1 APPLIED PROCEDURES / 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.

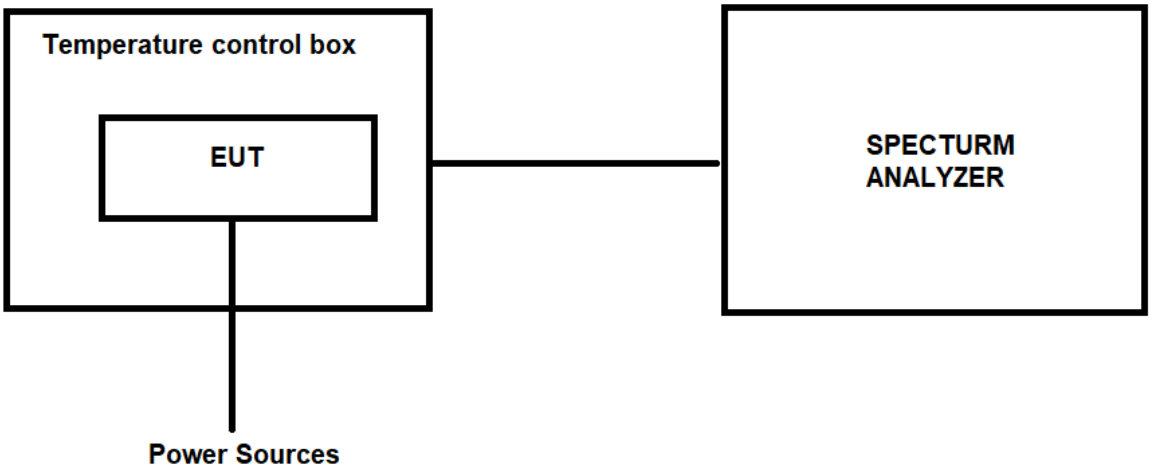
8.1.1 TEST PROCEDURE

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.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 TEST RESULTS

Test Voltage	Test Temp.	Measured Frequency	Spectrum Frequency (MHz)			Δ Frequency (MHz)		
		(MHz)	802.11a	802.11n HT20	802.11ac HT20	802.11a	802.11n HT20	802.11ac HT20
5.5V	-20℃	5180	5180.0329	5180.0354	5180.0357	6.3514	6.8340	6.8919
		5220	5220.0336	5220.0359	5220.0336	6.4368	6.8774	6.4368
		5240	5240.0253	5240.0244	5240.0252	4.8282	4.6565	4.8092
		5745	5745.0333	5745.0323	5745.0325	5.7963	5.6223	5.6571
		5785	5785.0385	5785.0334	5785.0358	6.6551	5.7736	6.1884
		5825	5825.0337	5825.0336	5825.0366	5.7854	5.7682	6.2833
4.5V		5180	5180.0235	5180.0248	5180.0217	4.5367	4.7876	4.1892
		5220	5220.0368	5220.0346	5220.0364	7.0498	6.6284	6.9732
		5240	5240.0246	5240.0265	5240.0233	4.6947	5.0573	4.4466
		5745	5745.0266	5745.0268	5745.0293	4.6301	4.6649	5.1001
		5785	5785.0325	5785.0336	5785.0354	5.6180	5.8081	6.1193
		5825	5825.0413	5825.0454	5825.0418	7.0901	7.7940	7.1760
5V	25℃	5180	5180.0555	5180.0541	5180.0547	10.7143	10.4440	10.5598
		5220	5220.0244	5220.0235	5220.0223	4.6743	4.5019	4.2720
		5240	5240.0363	5240.0364	5240.0325	6.9275	6.9466	6.2023
		5745	5745.0354	5745.0323	5745.0346	6.1619	5.6223	6.0226
		5785	5785.0436	5785.0418	5785.0465	7.5367	7.2256	8.0380
		5825	5825.0218	5825.0225	5825.0224	3.7425	3.8627	3.8455
5.5V	50℃	5180	5180.0384	5180.0312	5180.0324	7.4131	6.0232	6.2548
		5220	5220.0255	5220.0237	5220.0229	4.8851	4.5402	4.3870
		5240	5240.0353	5240.0323	5240.0314	6.7366	6.1641	5.9924
		5745	5745.0664	5745.0656	5745.0684	11.5579	11.4186	11.9060
		5785	5785.0428	5785.0425	5785.0443	7.3984	7.3466	7.6577
		5825	5825.0643	5825.0623	5825.0668	11.0386	10.6953	11.4678
4.5V	50℃	5180	5180.0344	5180.0352	5180.0326	6.6409	6.7954	6.2934
		5220	5220.0258	5220.0244	5220.0247	4.9425	4.6743	4.7318
		5240	5240.0357	5240.0346	5240.0366	6.8130	6.6031	6.9847
		5745	5745.0467	5745.0438	5745.0431	8.1288	7.6240	7.5022
		5785	5785.0253	5785.0254	5785.0285	4.3734	4.3907	4.9265
		5825	5825.0727	5825.0733	5825.0764	12.4807	12.5837	13.1159

Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)		Δ Frequency (MHz)	
			802.11n HT40	802.11ac HT40	802.11n HT40	802.11ac HT40
5.5V	-20℃	5190	5190.0254	5190.0251	4.8940	4.8362
		5230	5230.0368	5230.0316	7.0363	6.0421
		5755	5190.0256	5190.0287	4.9326	5.5299
		5795	5795.0657	5795.0663	11.3374	11.4409
4.5V		5190	5190.0256	5190.0287	4.9326	5.5299
		5230	5230.0354	5230.0366	6.7686	6.9981
		5755	5755.0235	5755.0652	4.0834	11.3293
		5795	5795.0456	5795.0494	7.8689	8.5246
5V	25℃	5190	5190.0252	5190.0264	4.8555	5.0867
		5230	5230.0634	5230.0586	12.1224	11.2046
		5755	5755.0258	5755.0237	4.4831	4.1182
		5795	5795.0564	5795.0533	9.7325	9.1976
5.5V	50℃	5190	5190.0616	5190.0667	11.8690	12.8516
		5230	5230.0587	5230.0554	11.2237	10.5927
		5755	5755.0463	5755.0485	8.0452	8.4275
		5795	5795.0328	5795.0354	5.6601	6.1087
4.5V	50℃	5190	5190.0564	5190.0526	10.8671	10.1349
		5230	5230.0343	5230.0367	6.5583	7.0172
		5755	5755.0356	5755.0369	6.1859	6.4118
		5795	5795.0467	5795.0487	8.0587	8.4038

Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
			802.11ac HT80	802.11ac HT80
5.5V	-20℃	5210	5210.0136	2.6104
		5775	5775.0163	2.8225
4.5V		5210	5210.0224	4.2994
		5775	5775.0345	5.9740
5V	25℃	5210	5210.0467	8.9635
		5775	5775.0369	6.3896
5.5V	50℃	5210	5210.0352	6.7562
		5775	5775.0267	4.6234
4.5V	50℃	5210	5210.0323	6.1996
		5775	5775.0545	9.4372

9. TRANSMISSION IN THE ABSENCE OF DATA

9.1 STANDARD REQUIREMENT

According to §15.407(c)

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 signaling 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.

9.2 TEST RESULT

No non-compliance noted:
Refer to the theory of operation.

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: 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.

10.2 EUT ANTENNA

The EUT antenna is External Antenna, It comply with the standard requirement.

11. TEST SEUUP PHOTO

Reference to the appendix I for details.

12. EUT PHOTO

Reference to the appendix II for details.

※※※※※ **END OF REPORT** ※※※※※