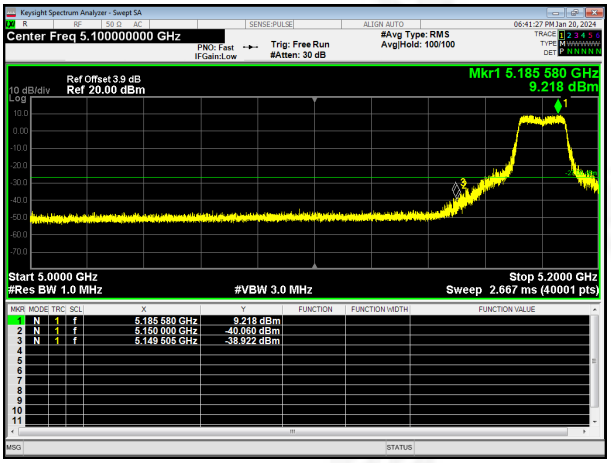
8.6 TEST RESULTS

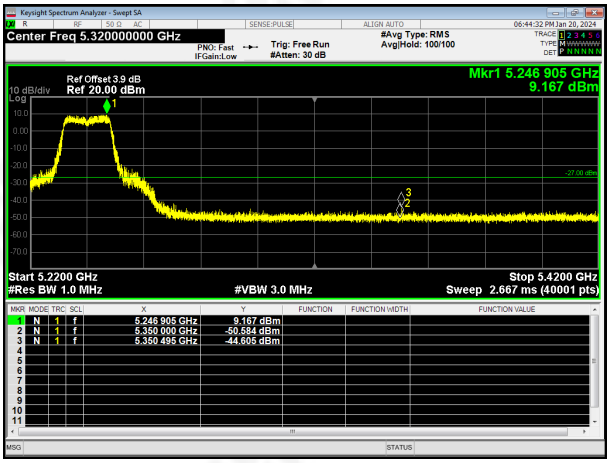
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage：	DC 24V
Test band：	5.2G	Antenna gain：	0.72dBi

5.180~5.240 GHz

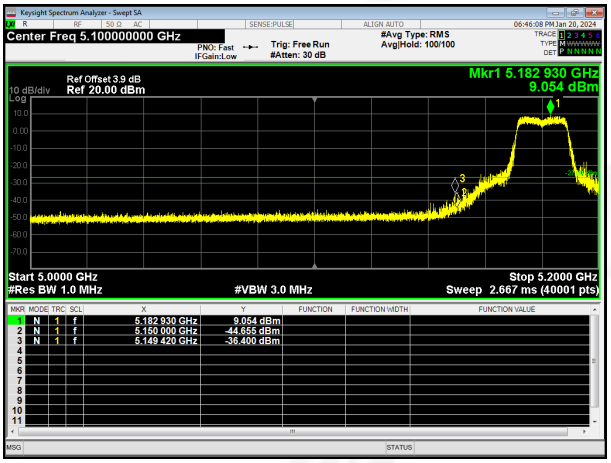
(802.11a) Band Edge, Left Side



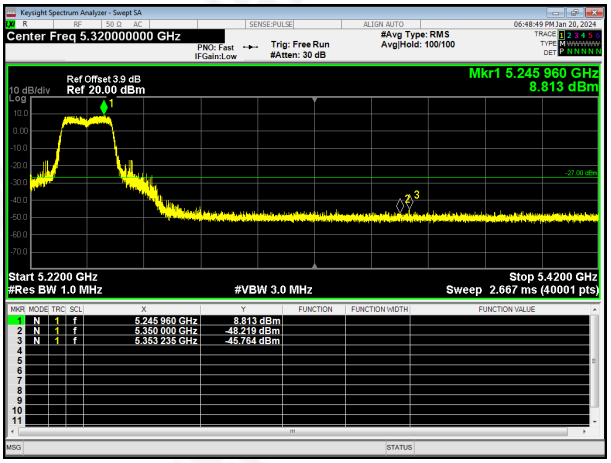
(802.11a) Band Edge, Right Side



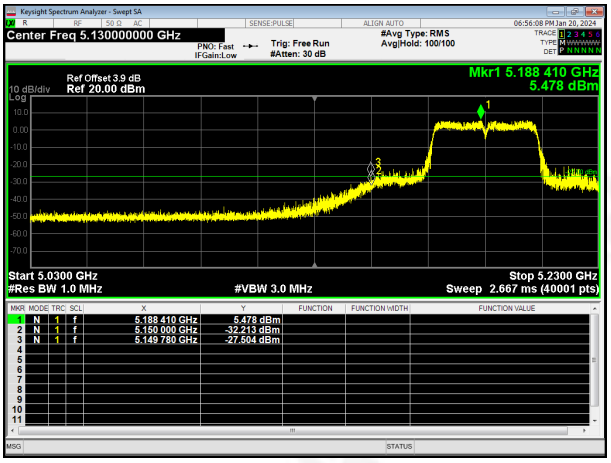
(802.11n20) Band Edge, Left Side



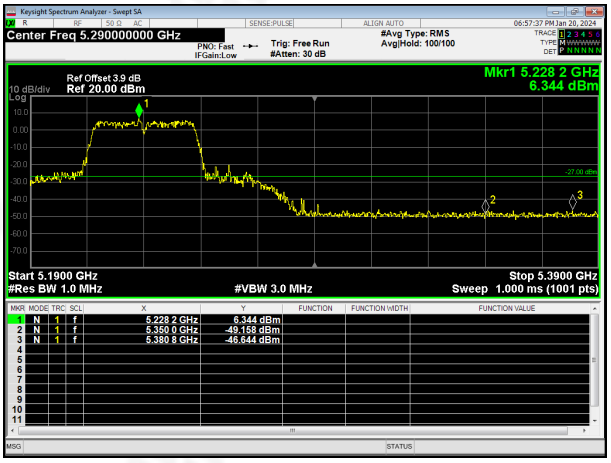
(802.11n20) Band Edge, Right Side



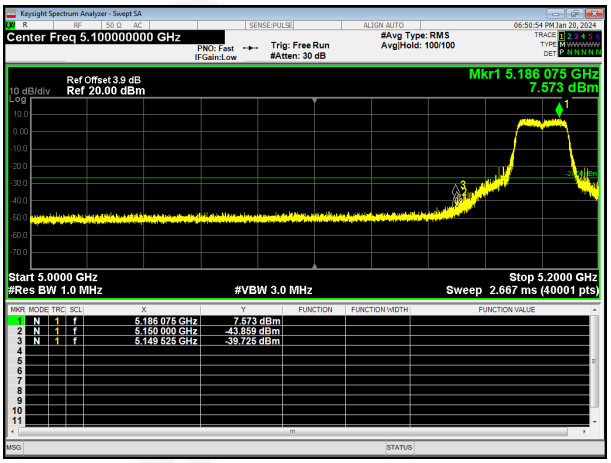
(802.11n40) Band Edge, Left Side



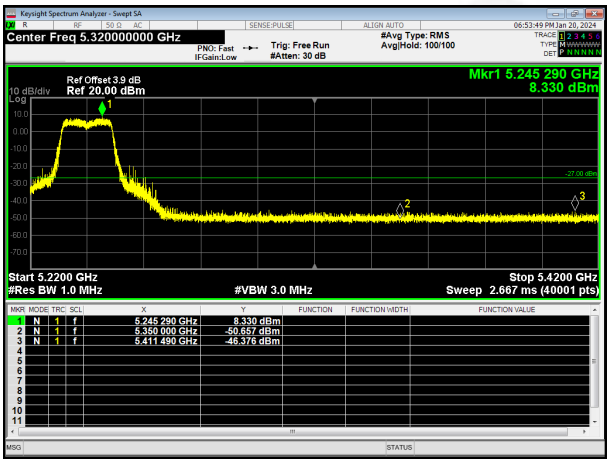
(802.11n40) Band Edge, Right Side



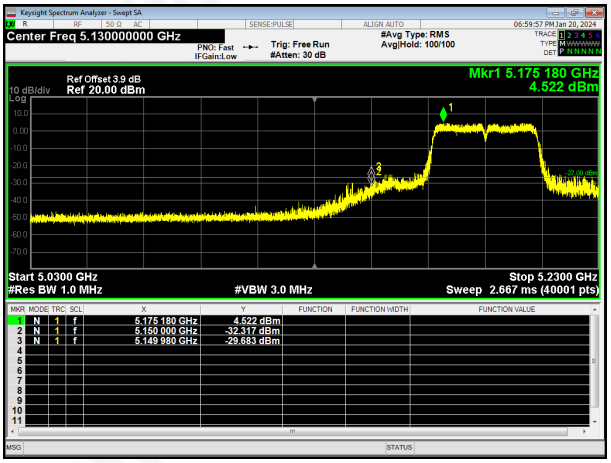
(802.11ac20) Band Edge, Left Side



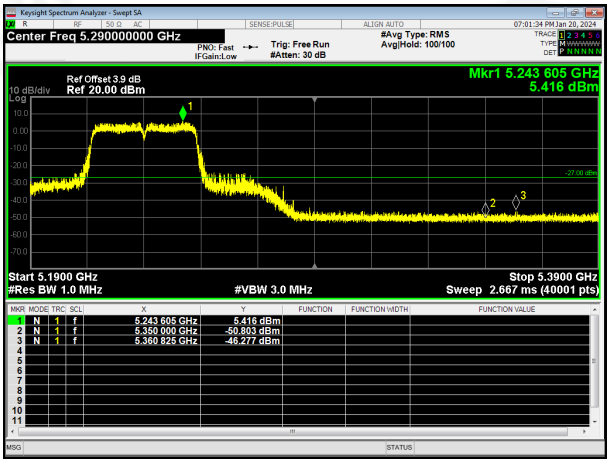
(802.11ac20) Band Edge, Right Side



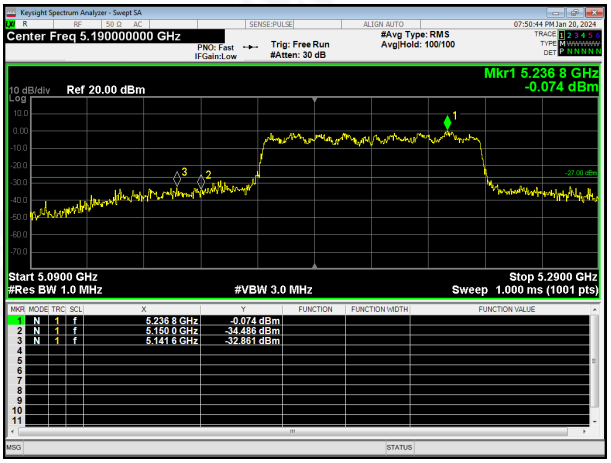
(802.11ac40) Band Edge, Left Side



(802.11ac40) Band Edge, Right Side



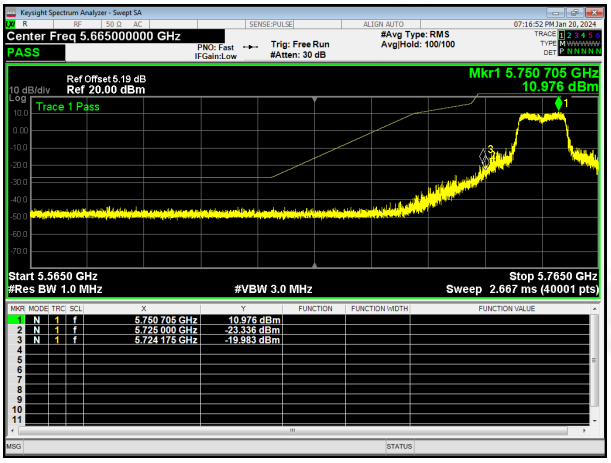
(802.11ac80) Band Edge, Left Side



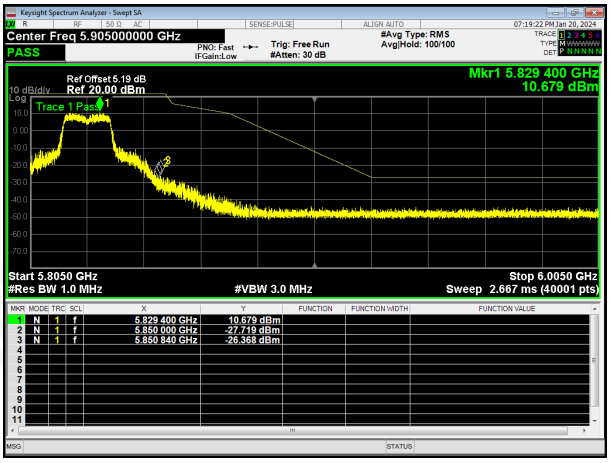
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage：	DC 24V
Test band：	5.8G	Antenna gain：	0.56dBi

5.745~5.825 GHz

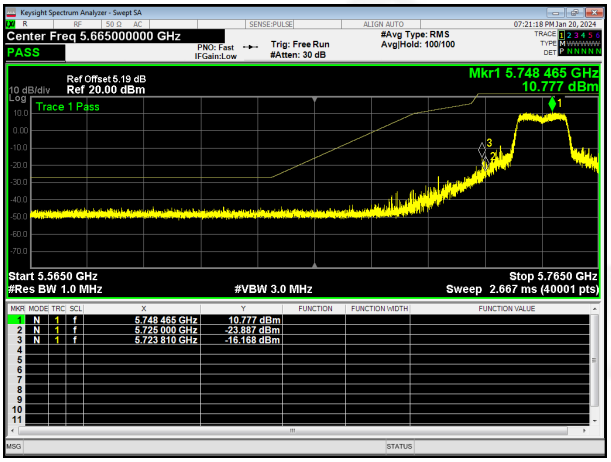
(802.11a) Band Edge, Left Side



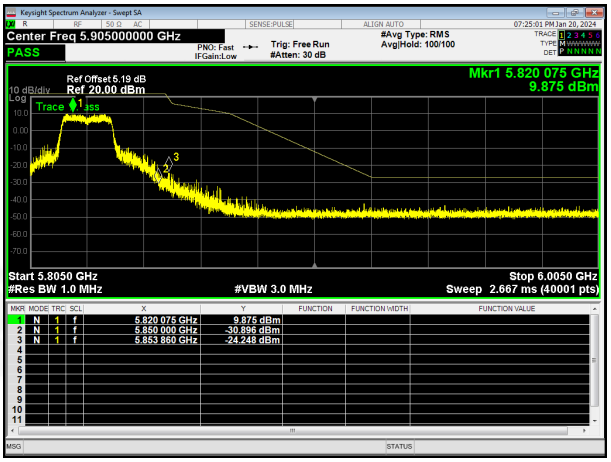
(802.11a) Band Edge, Right Side



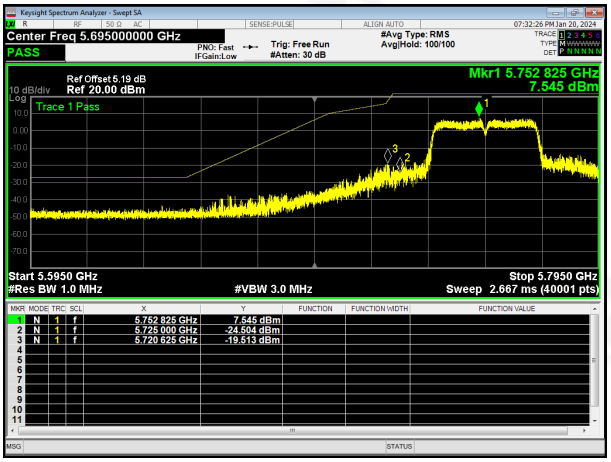
(802.11n20) Band Edge, Left Side



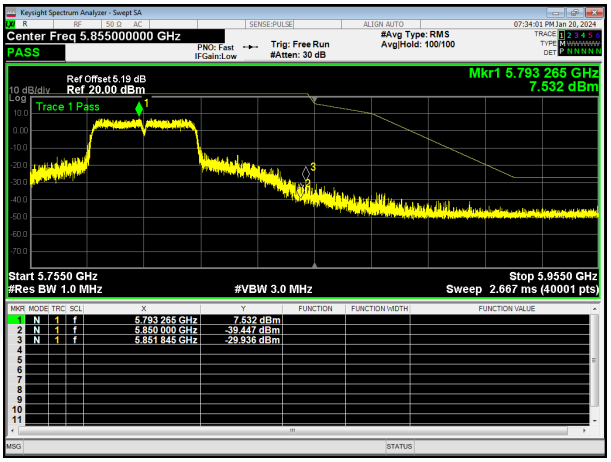
(802.11n20) Band Edge, Right Side



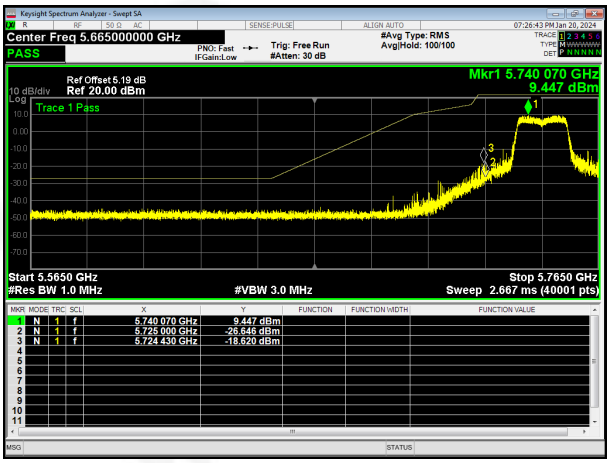
(802.11n40) Band Edge, Left Side



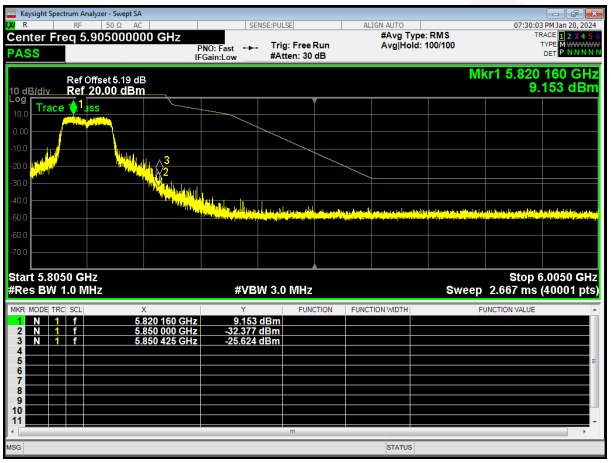
(802.11n40) Band Edge, Right Side



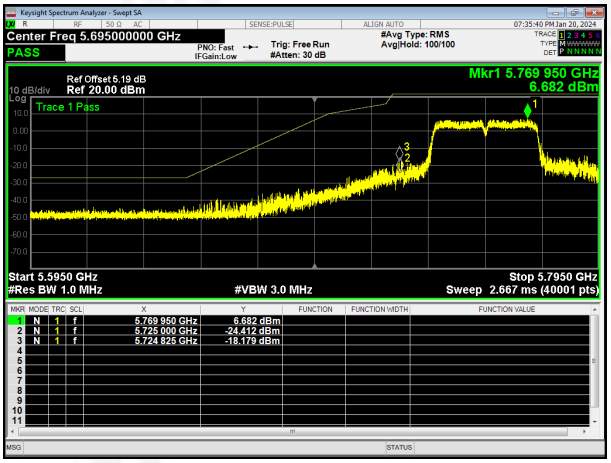
(802.11ac20) Band Edge, Left Side



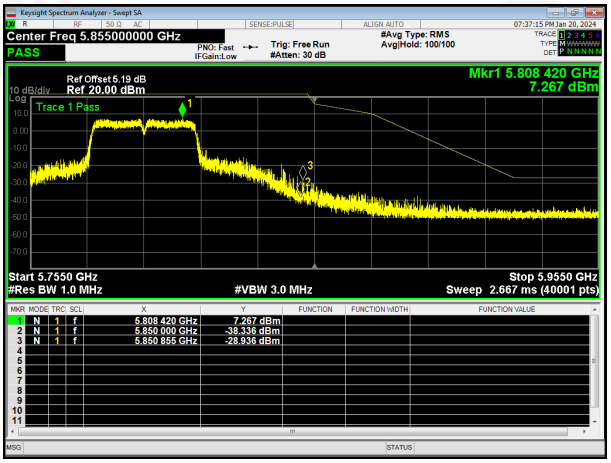
(802.11ac20) Band Edge, Right Side



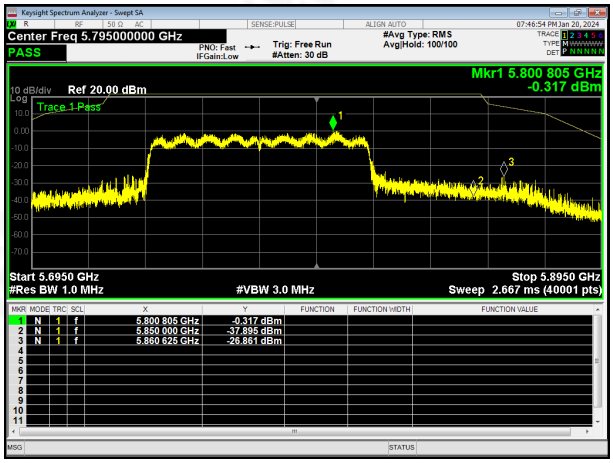
(802.11ac40) Band Edge, Left Side



(802.11ac40) Band Edge, Right Side



(802.11ac80) Band Edge, Left Side



9.SPURIOUS RF CONDUCTED EMISSIONS

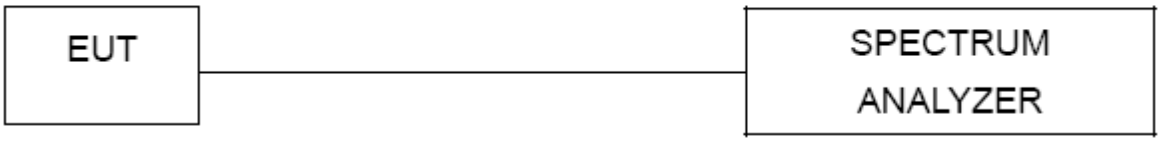
9.1 CONFORMANCE LIMIT

Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

9.2 MEASURING INSTRUMENTS

The Measuring equipment is listed in the section 6.3 of this test report.

9.3 TEST SETUP



9.4 TEST PROCEDURE

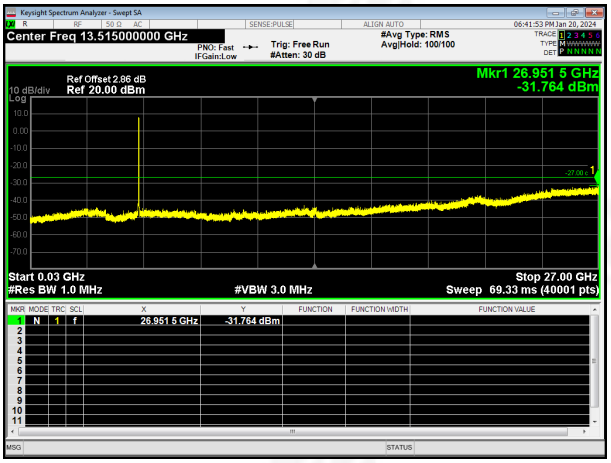
The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=1MHz and VBW= 3MHz to measure the peak field strength, and measure frequency range from 30MHz to 26.5GHz.

9.5 TEST RESULTS

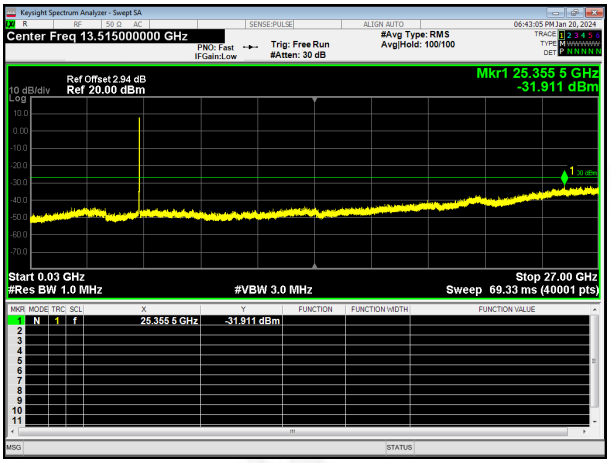
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage：	DC 24V
Test band：	5.2G & 5.8G		
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. And above 26.5GHz of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.			

5.2G Test Plot

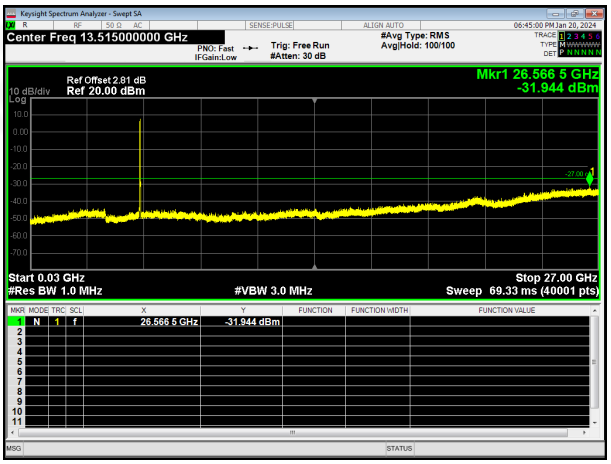
802.11a on channel 36



802.11a on channel 40

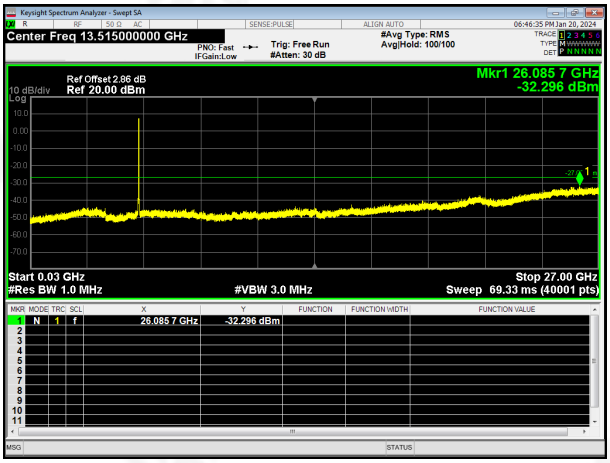


802.11a on channel 48

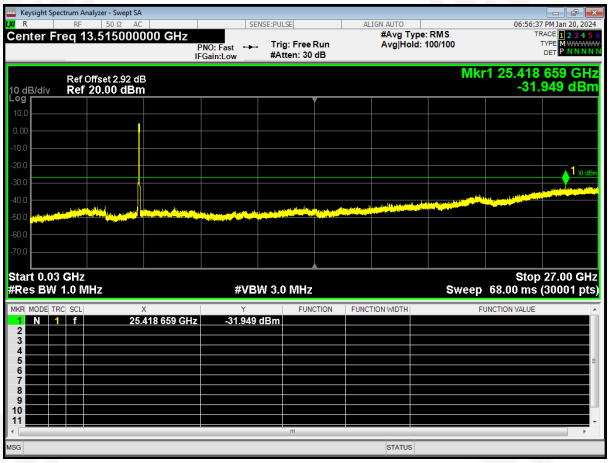


5.2G Test Plot

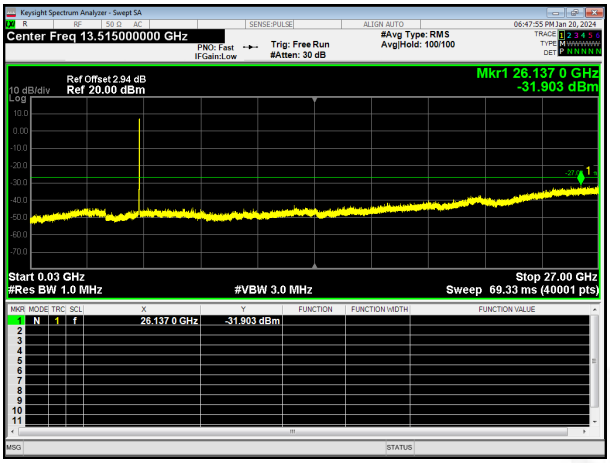
802.11n20 on channel 36



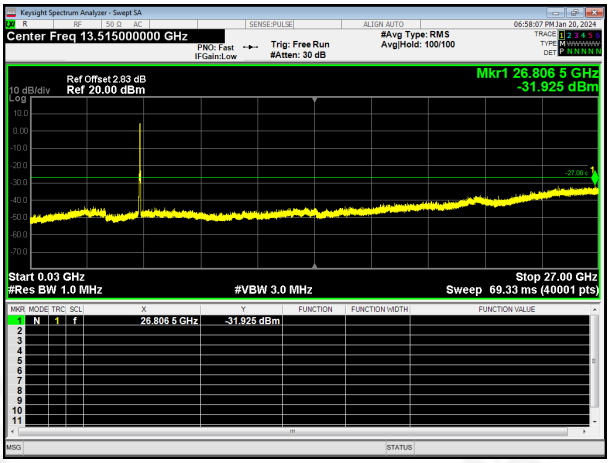
802.11n40 on channel 38



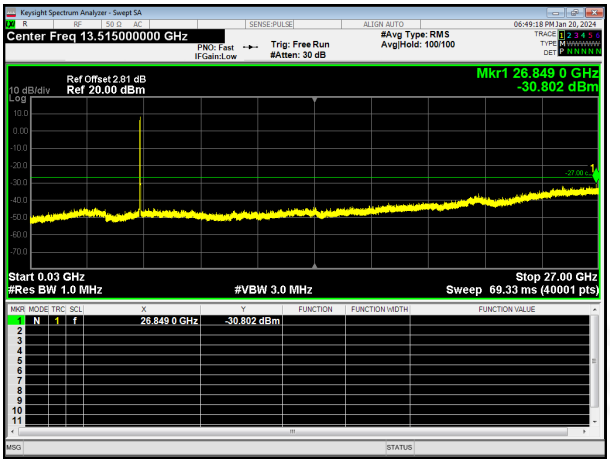
802.11n20 on channel 40



802.11n40 on channel 46

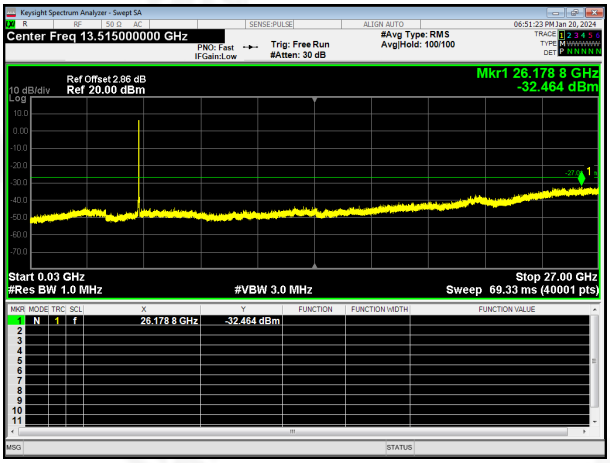


802.11n20 on channel 48

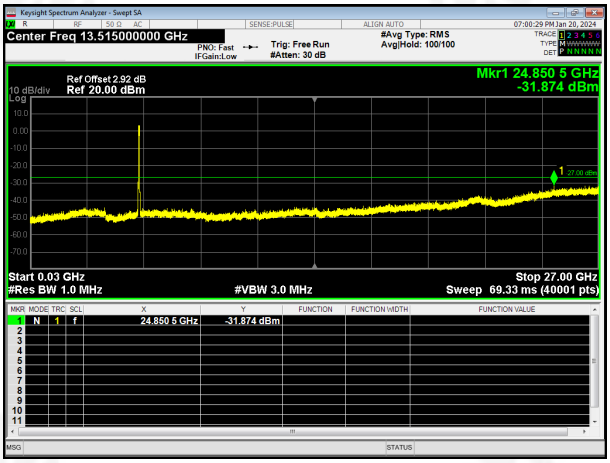


5.2G Test Plot

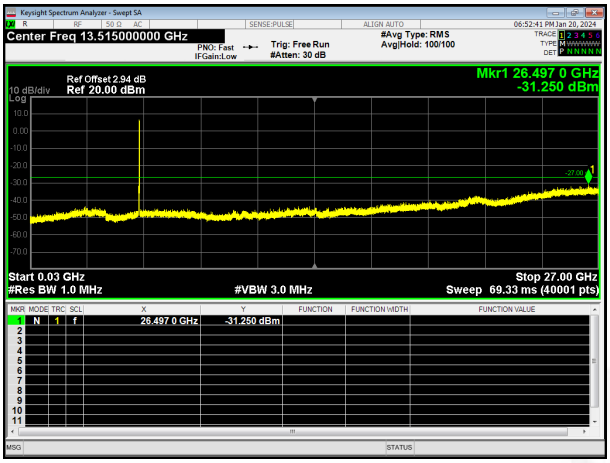
802.11ac20 on channel 36



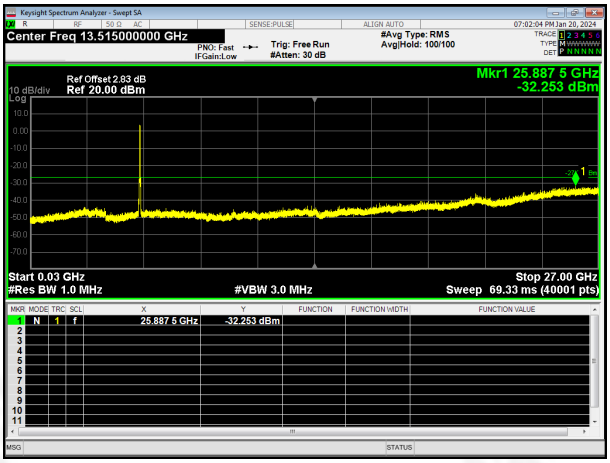
802.11ac40 on channel 46



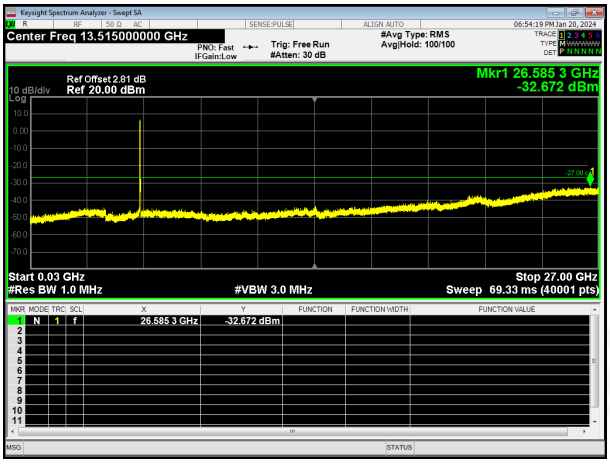
802.11ac20 on channel 40



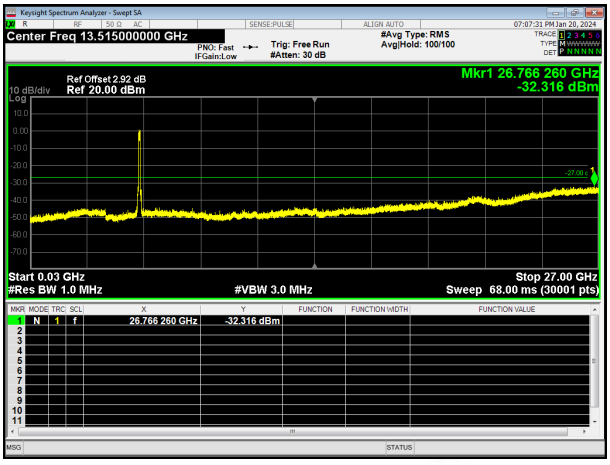
802.11ac40 on channel 46



802.11ac20 on channel 48

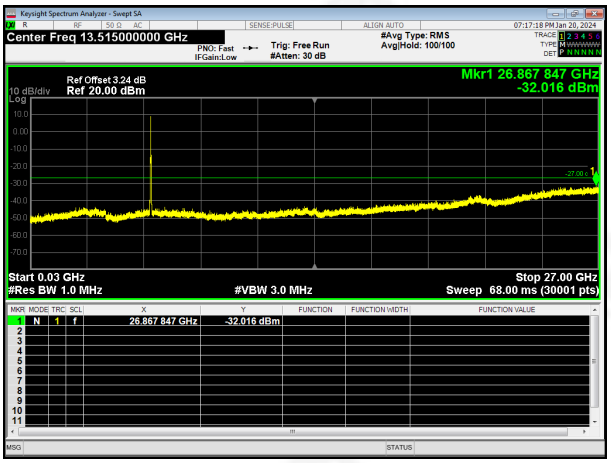


802.11ac80 on channel 42

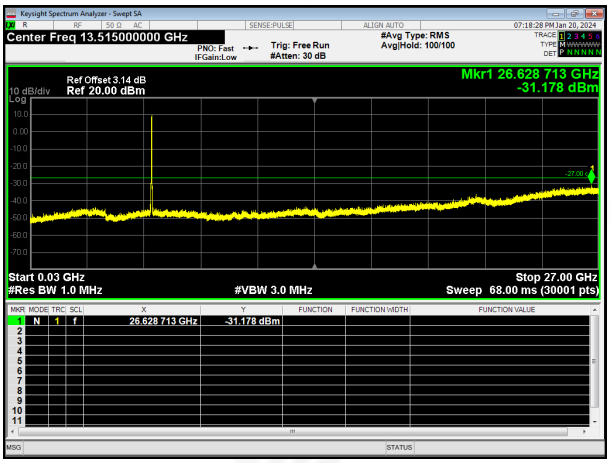


5.8G Test Plot

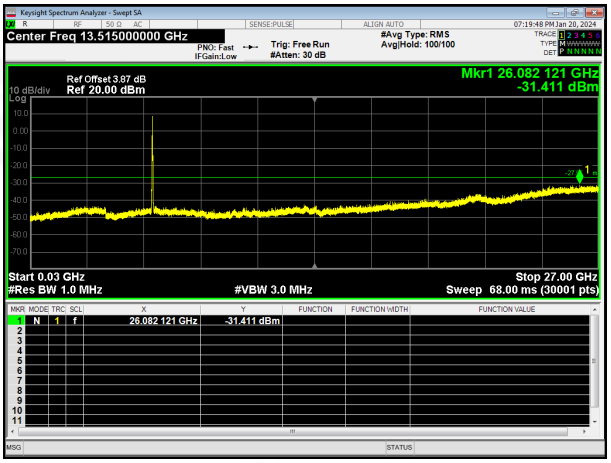
802.11a on channel 149



802.11a on channel 157

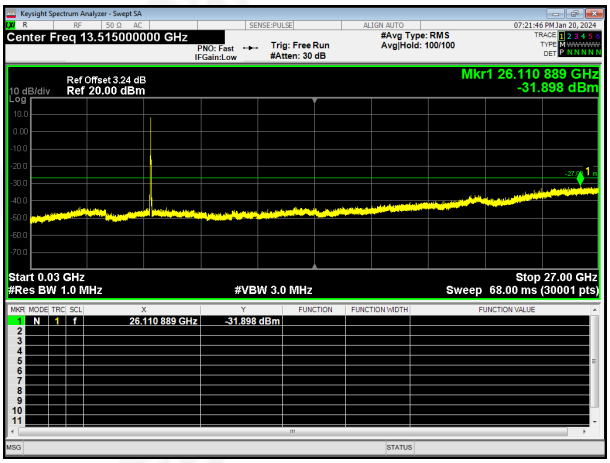


802.11a on channel 165

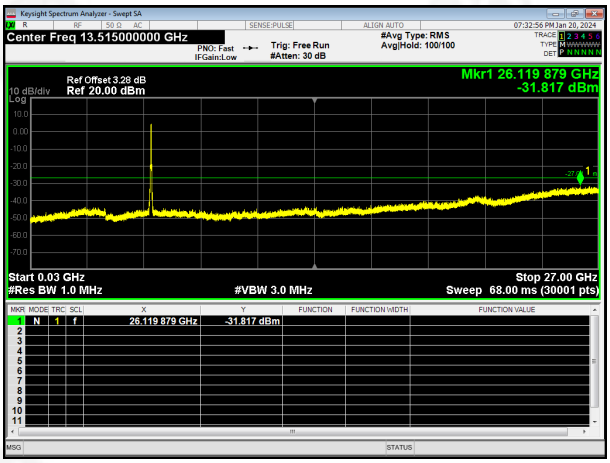


5.8G Test Plot

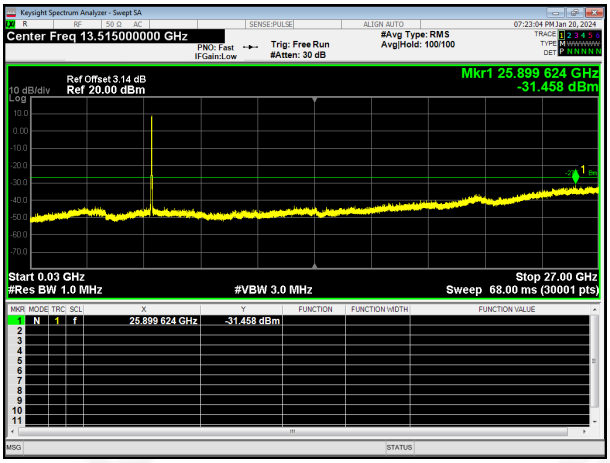
802.11n20 on channel 149



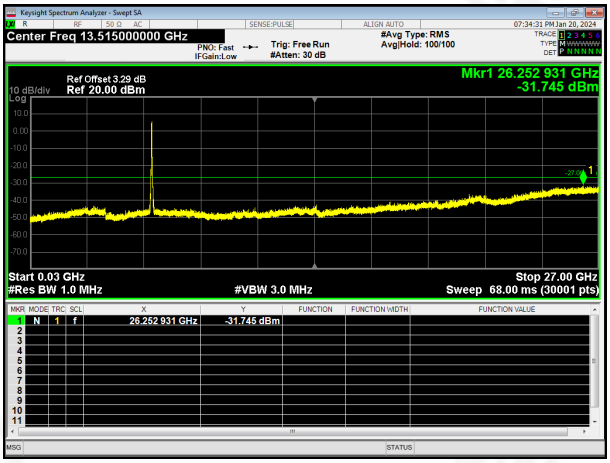
802.11n40 on channel 151



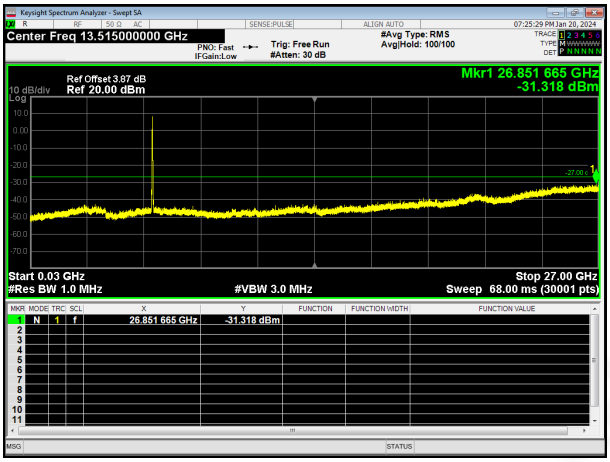
802.11n20 on channel 157



802.11n40 on channel 159

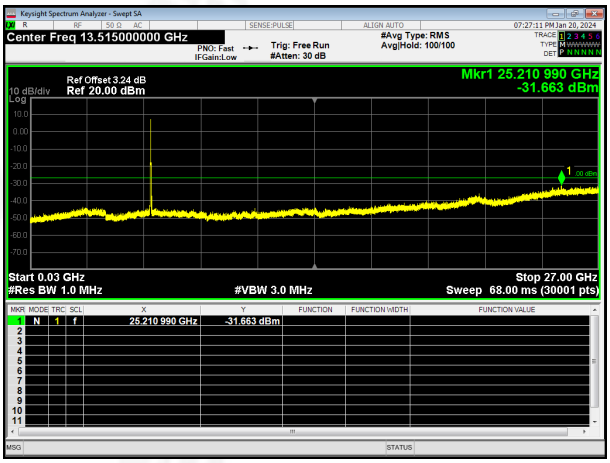


802.11n20 on channel 165

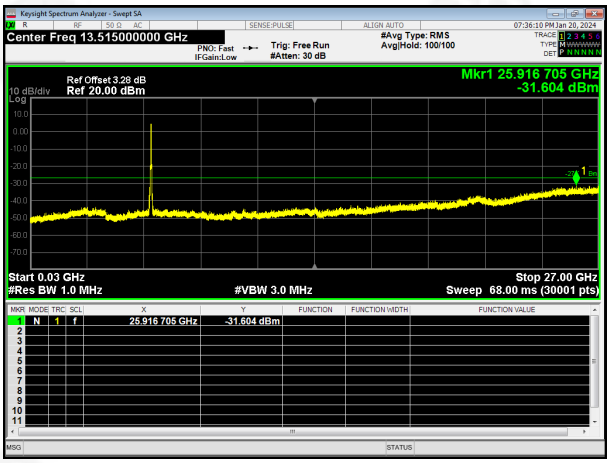


5.8G Test Plot

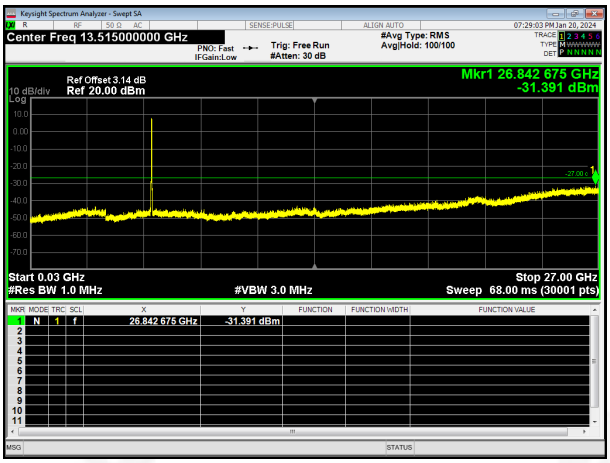
802.11ac20 on channel 149



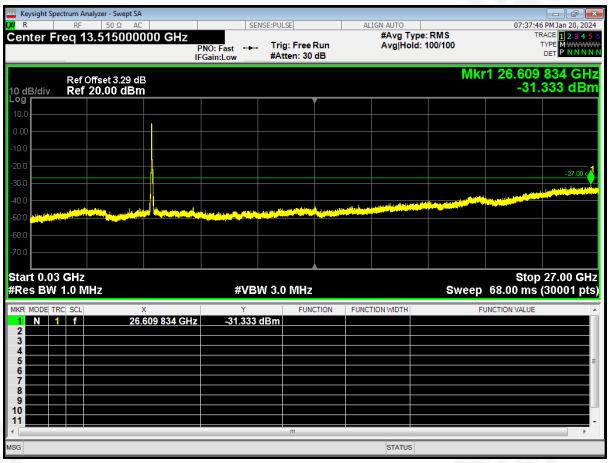
802.11ac40 on channel 151



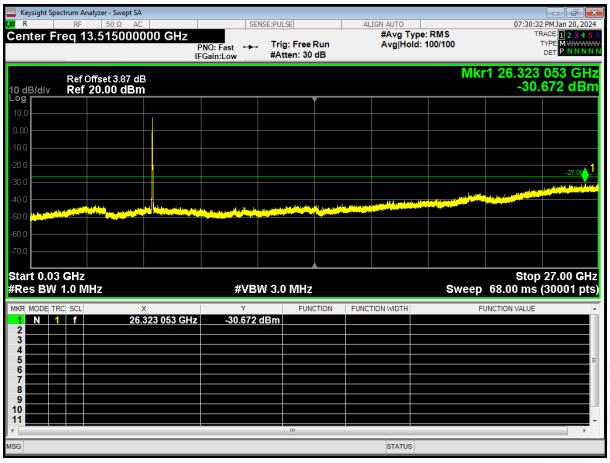
802.11ac20 on channel 157



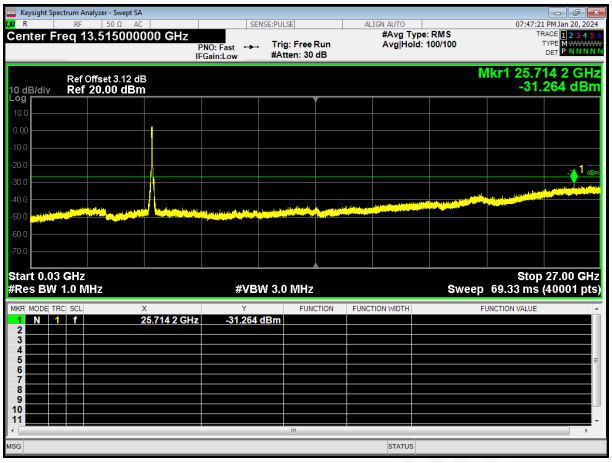
802.11ac40 on channel 159



802.11ac20 on channel 165



802.11ac80 on channel 155



10.Frequency Stability Measurement

10.1 LIMIT

Manufactures 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.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

10.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 106 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is -20°C~70°C.

10.3 TEST SETUP LAYOUT

10.4 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously un-modulation transmitting mode.

10.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 24V
Test Band :	5.2G & 5.8G		
Note: All channels have been tested, and only the worst test data is recorded in this report.			

5.2G:

802.11a

Reference Frequency(Middle Channel): 5180MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	56	0.01002
40	24	45	0.00766
30	24	33	0.00616
20	24	28	0.00459
10	24	24	0.00427
0	24	15	0.00279
-10	24	14	0.00271
-20	24	24	0.00408
-30	24	37	0.00630

802.11 n20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	62	0.01121
40	24	52	0.00918
30	24	42	0.00782
20	24	32	0.00587
10	24	23	0.00432
0	24	26	0.00483
-10	24	22	0.00414
-20	24	36	0.00656
-30	24	40	0.00787

802.11n40

Reference Frequency(Middle Channel): 5190MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	61	0.01087
40	24	52	0.00902
30	24	43	0.00779
20	24	44	0.00793
10	24	34	0.00621
0	24	22	0.00414
-10	24	36	0.00656
-20	24	43	0.00777
-30	24	51	0.00914

802.11ac20

Reference Frequency(Middle Channel): 5180MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	57	0.00919
40	24	43	0.00694
30	24	31	0.00523
20	24	25	0.00382
10	24	24	0.00348
0	24	13	0.00171
-10	24	14	0.00193
-20	24	20	0.00328
-30	24	33	0.00527

802.11 ac40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	65	0.01058
40	24	52	0.00851
30	24	44	0.00707
20	24	33	0.00521
10	24	25	0.00362
0	24	27	0.00413
-10	24	23	0.00348
-20	24	38	0.00591
-30	24	45	0.00713

802.11ac80

Reference Frequency(Middle Channel): 5210MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	63	0.01057
40	24	52	0.00866
30	24	43	0.00711
20	24	41	0.00676
10	24	36	0.00589
0	24	32	0.0052
-10	24	34	0.00555
-20	24	43	0.00711
-30	24	52	0.00851

So, Frequency Stability Versus Input Voltage is:

802.11a

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	56	0.01002
40	24	45	0.00766
-30	24	33	0.00616

802.11n20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	62	0.01121
40	24	52	0.00918
-30	24	42	0.00782

802.11n40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	61	0.01087
40	24	52	0.00902
-30	24	51	0.00914

802.11ac20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	57	0.00919
40	24	43	0.00694
-30	24	33	0.00527

802.11ac40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	65	0.01058
40	24	52	0.00851
-30	24	45	0.00713

802.11ac80

Reference Frequency(Middle Channel): 5210 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	63	0.01057
40	24	52	0.00866
-30	24	52	0.00851

5.8G:

802.11a

Reference Frequency(Middle Channel): 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	46	0.00815
40	24	27	0.00757
30	24	36	0.00462
20	24	23	0.00419
10	24	14	0.00306
0	24	16	0.00324
-10	24	13	0.00342
-20	24	27	0.00443
-30	24	38	0.00632

802.11n20

Reference Frequency(Middle Channel): 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	42	0.00658
40	24	24	0.00534
30	24	32	0.00385
20	24	24	0.00347
10	24	13	0.00157
0	24	12	0.00139
-10	24	13	0.00157
-20	24	21	0.00295
-30	24	32	0.00543

802.11n40

Reference Frequency(Middle Channel): 5755MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	62	0.00953
40	24	54	0.00801
30	24	42	0.00725
20	24	44	0.00759
10	24	34	0.00587
0	24	32	0.00552
-10	24	34	0.00587
-20	24	42	0.00725
-30	24	51	0.00884

802.11ac20

Reference Frequency(Middle Channel): 5745 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	43	0.00709
40	24	51	0.00648
30	24	23	0.00375
20	24	26	0.00515
10	24	23	0.00374
0	24	26	0.00415
-10	24	22	0.00346
-20	24	36	0.00588
-30	24	26	0.00462

802.11ac40

Reference Frequency(Middle Channel): 5755MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	60	0.00675
40	24	55	0.00614
30	24	47	0.00341
20	24	45	0.00481
10	24	32	0.0034
0	24	26	0.00381
-10	24	38	0.00312
-20	24	43	0.00554
-30	24	54	0.00428

802.11ac80

Reference Frequency(Middle Channel): 5775MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
50	24	52	0.00866
40	24	41	0.00705
30	24	43	0.00711
20	24	41	0.00676
10	24	36	0.00589
0	24	32	0.0052
-10	24	34	0.00555
-20	24	32	0.0052
-30	24	52	0.00866

So, Frequency Stability Versus Input Voltage is:

802.11a

Reference Frequency(Middle Channel): 5745 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	46	0.00815
40	24	27	0.00757
-30	24	38	0.00632

802.11n20

Reference Frequency(Middle Channel): 5745 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	42	0.00658
40	24	24	0.00534
-30	24	32	0.00543

802.11n40

Reference Frequency(Middle Channel): 5755 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	62	0.00953
40	24	54	0.00801
-30	24	51	0.00884

802.11ac20

Reference Frequency(Middle Channel): 5745 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	43	0.00709
40	24	51	0.00648
-20	24	36	0.00588

802.11ac40

Reference Frequency(Middle Channel): 5755 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	60	0.00675
40	24	55	0.00614
-20	24	43	0.00554

802.11ac80

Reference Frequency(Middle Channel): 5775 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
50	24	52	0.00866
40	24	41	0.00705
-30	24	52	0.00866

11. DUTY CYCLE

11.1 APPLIED PROCEDURES / LIMIT

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

1) Set the center frequency of the instrument to the center frequency of the transmission.

2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.

3) Set VBW ≥ RBW. Set detector = peak or average.

4) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/*T* and the number of sweep points across duration *T* exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if $T \leq 16.7$ μs.)

11.2 DEVIATION FROM STANDARD

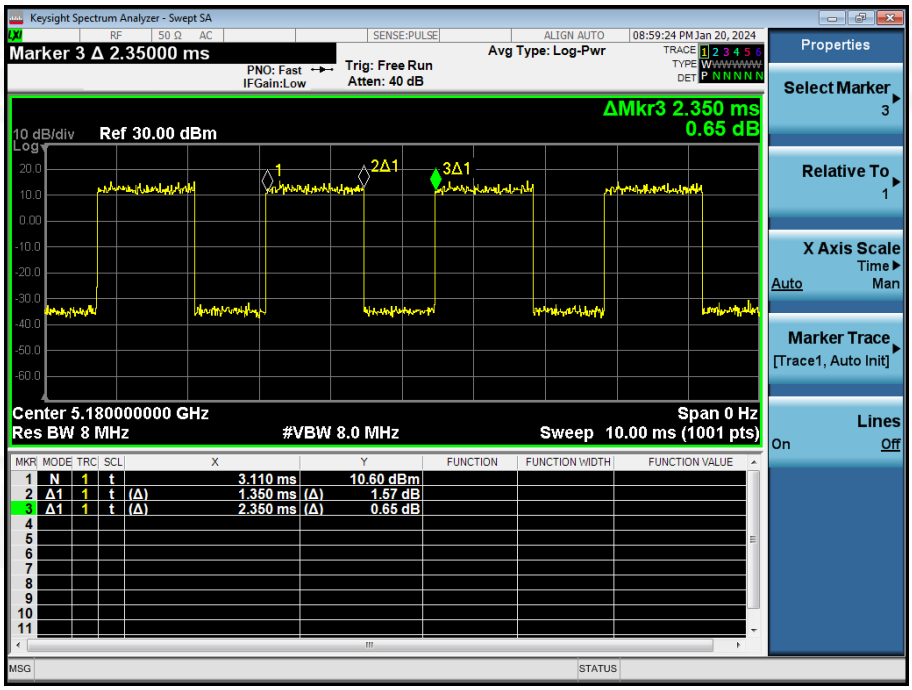
No deviation.

11.3 TEST SETUP

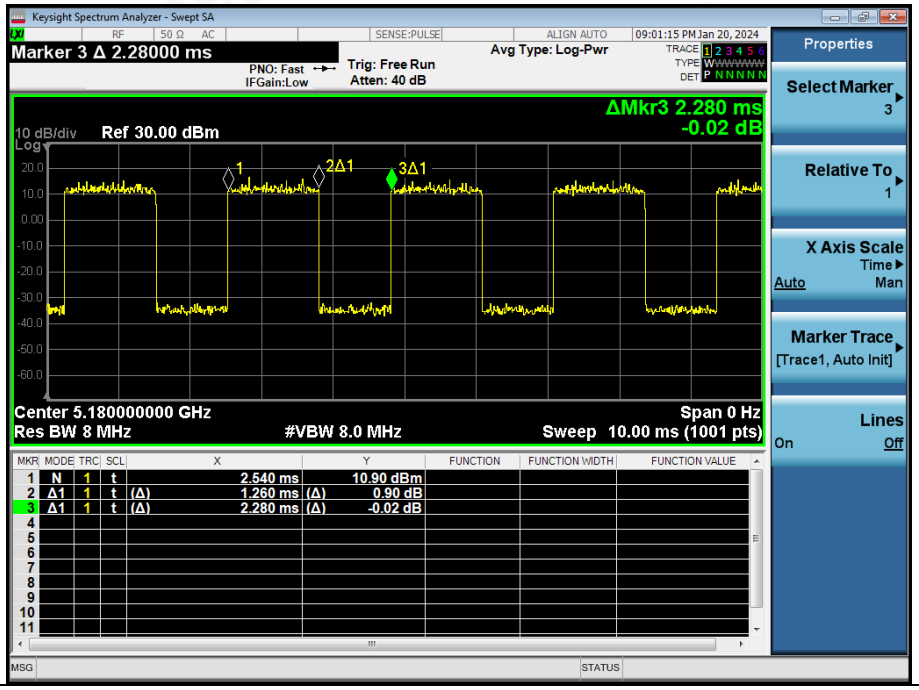
11.4 TEST RESULTS

5.2G				
Mode	Frequency (MHz)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Result
802.11a	5180	57.45	2.41	Pass
802.11n20	5180	55.26	2.58	Pass
802.11n40	5190	38.84	2.55	Pass
802.11ac20	5180	55.65	2.55	Pass
802.11ac40	5190	38.29	4.17	Pass
802.11ac80	5210	23.67	6.26	Pass

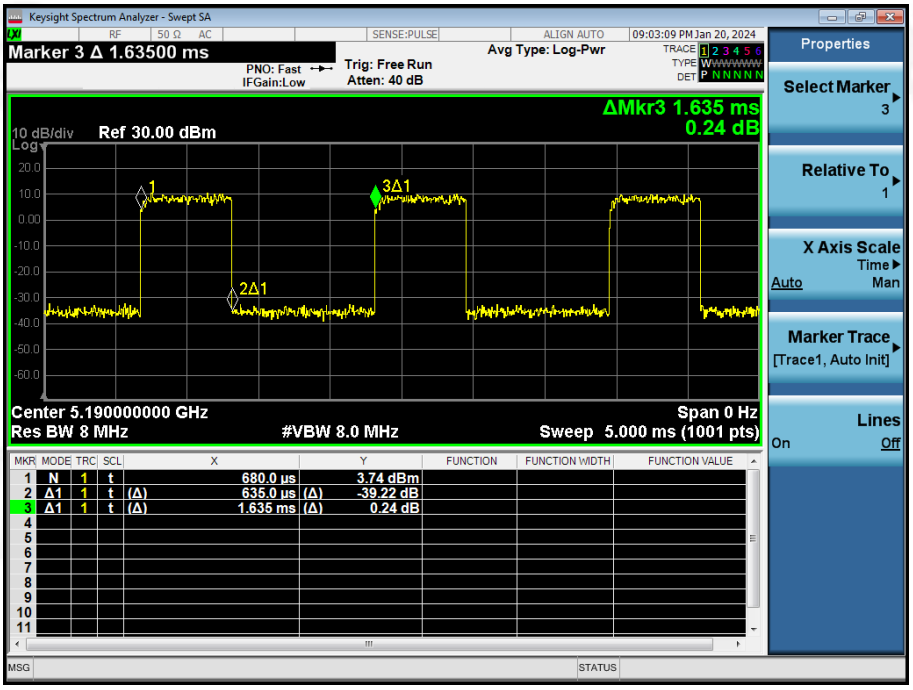
802.11a



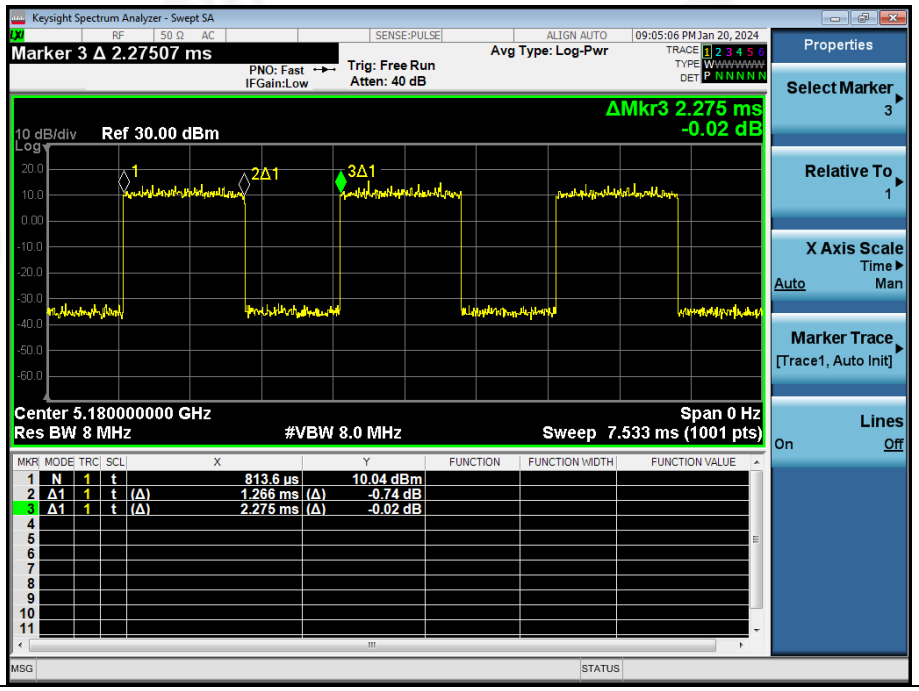
802.11n20



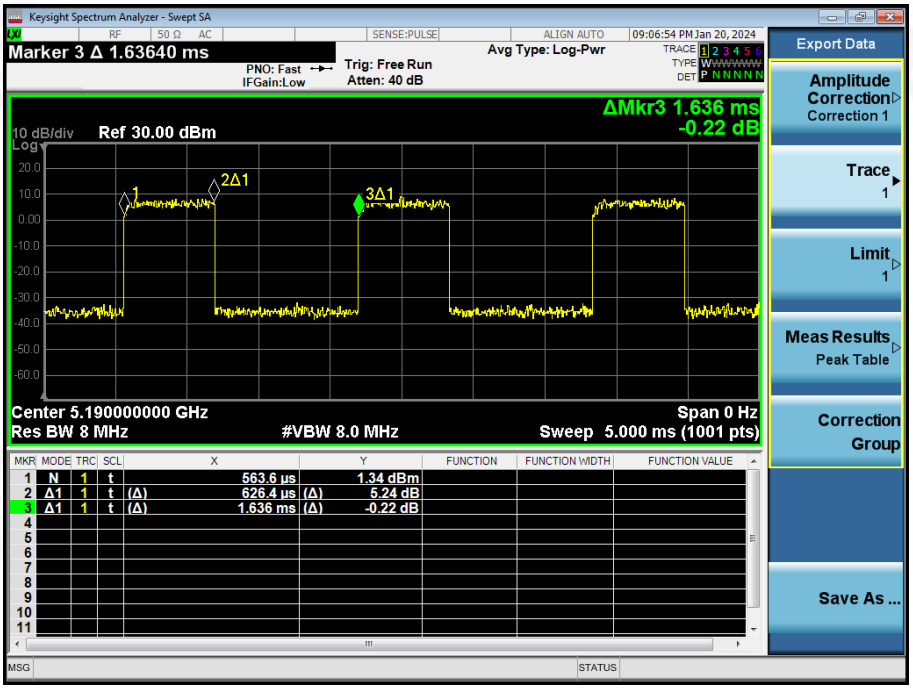
802.11n40



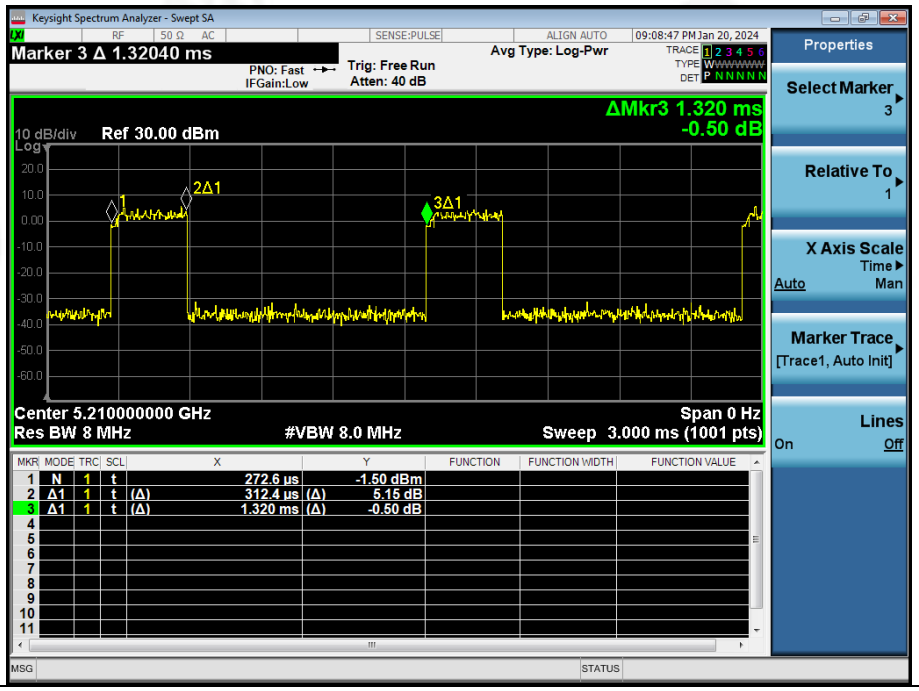
802.11ac20



802.11ac40



802.11ac80



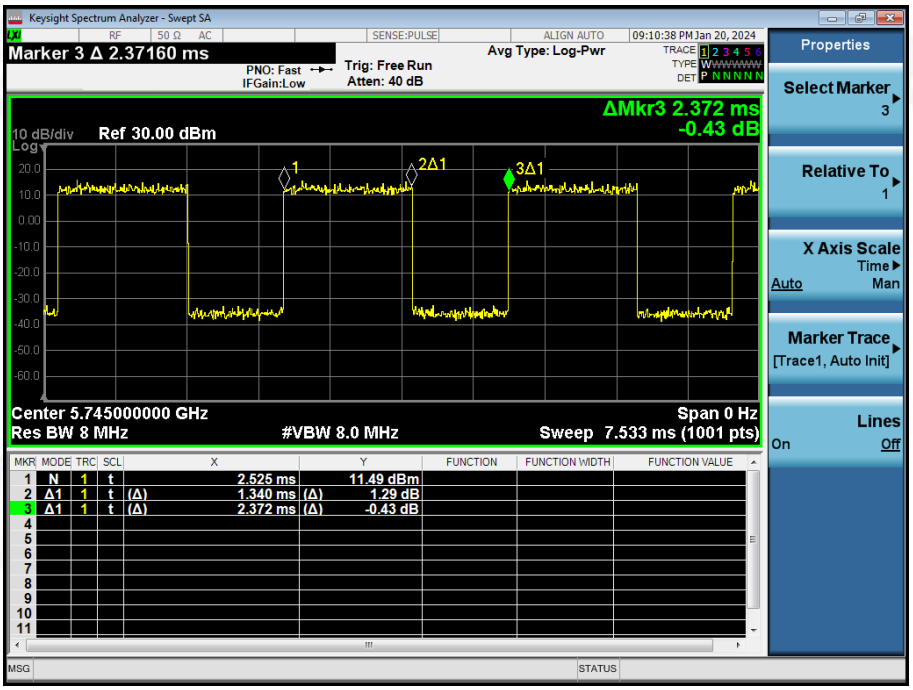
Note: All channel have been tested, and the report only reflects the worst case data.

Duty Cycle= Ton /Total*100%

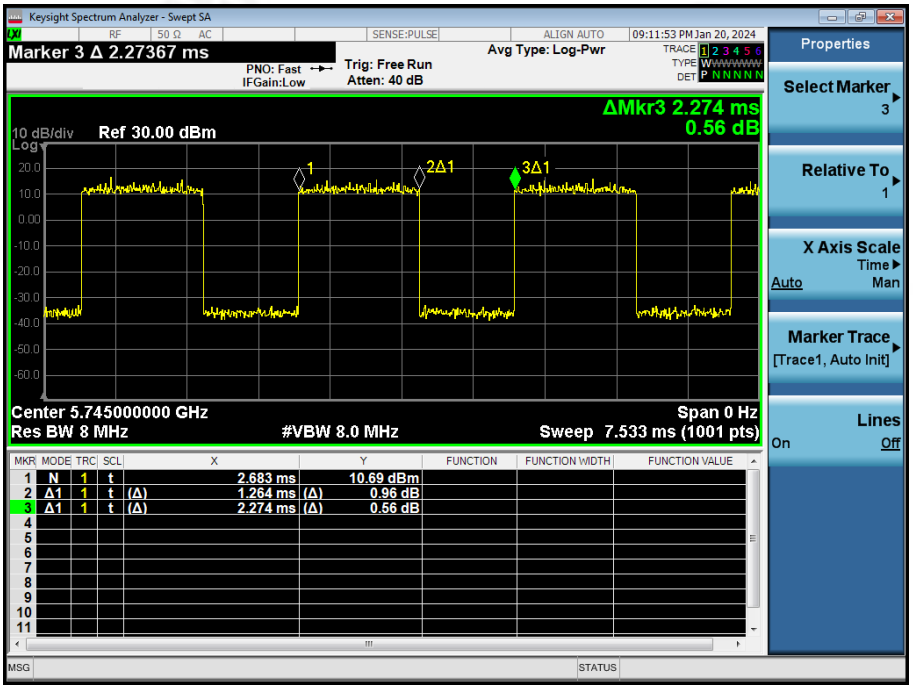
Duty Cycle Correction Factor = 10log (1/Duty Cycle)

5.8G				
Mode	Frequency (MHz)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Result
802.11a	5745	56.49	2.48	Pass
802.11n20	5745	55.58	2.55	Pass
802.11n40	5755	38.59	4.14	Pass
802.11ac20	5745	55.01	2.60	Pass
802.11ac40	5755	38.54	4.14	Pass
802.11ac80	5775	23.58	6.27	Pass

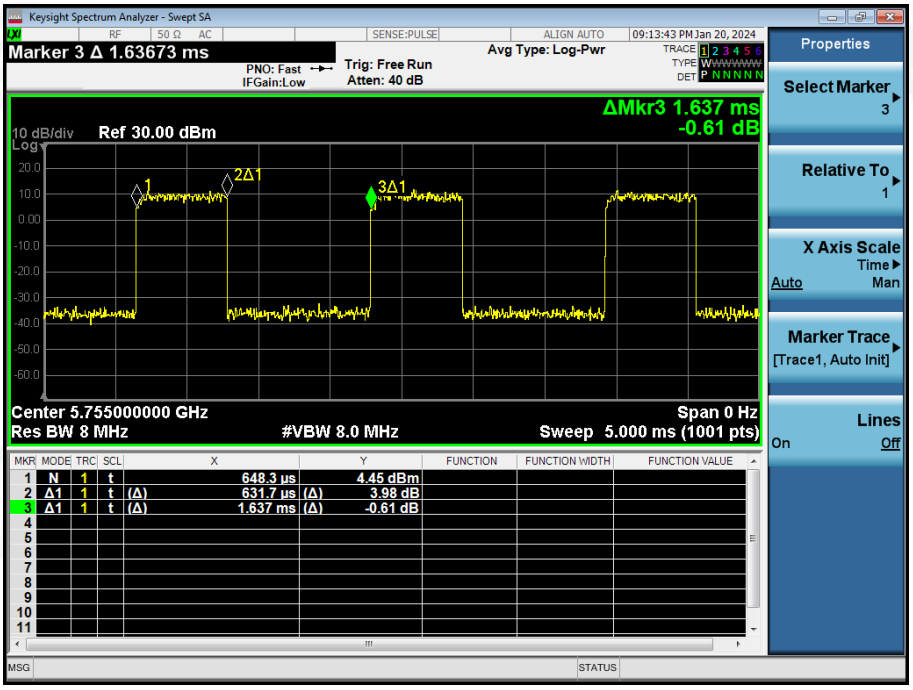
802.11a



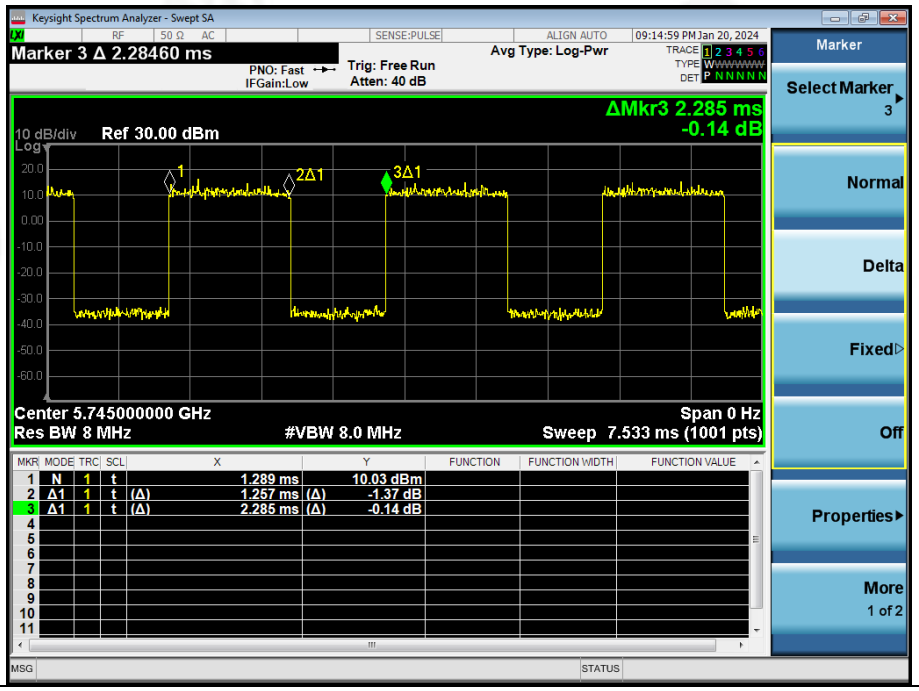
802.11n20



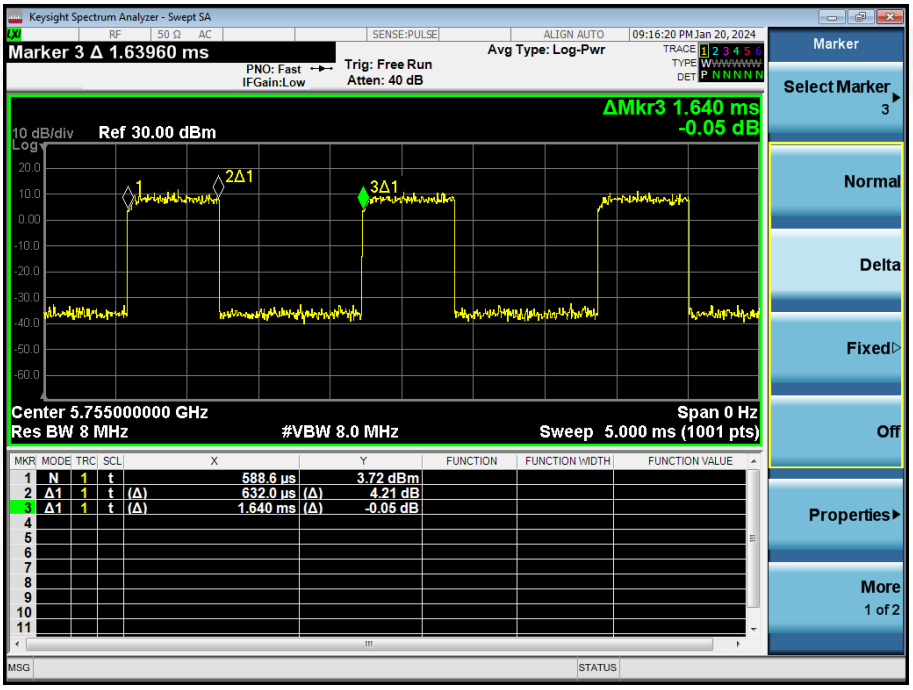
802.11n40



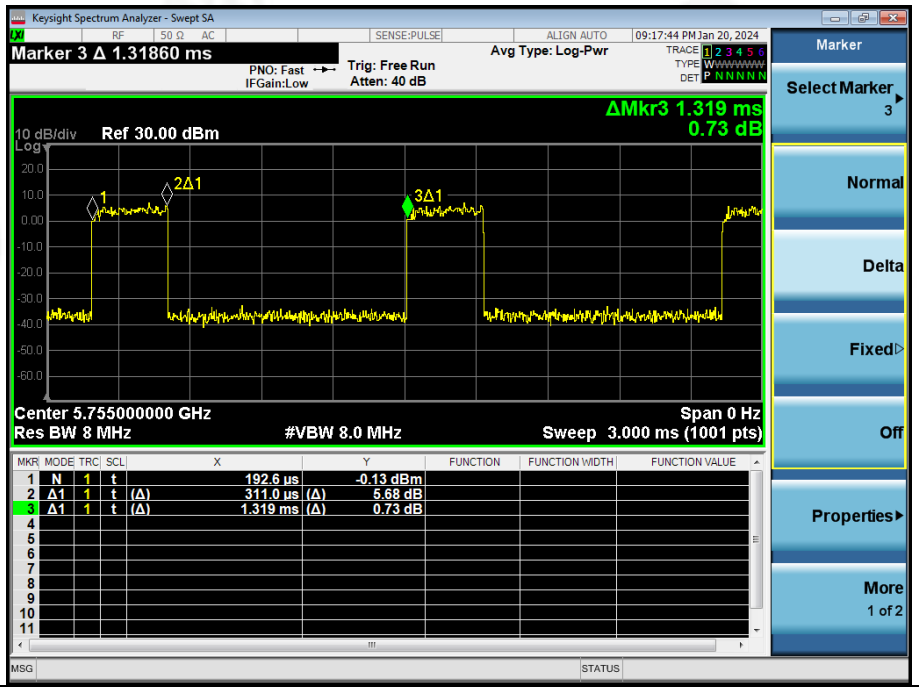
802.11ac20



802.11ac40



802.11ac80



Note: All channel have been tested, and the report only reflects the worst case data.

Duty Cycle= Ton /Total*100%

Duty Cycle Correction Factor = 10log (1/Duty Cycle)

12.ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203
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, the best case gain of the antenna is 0.72dBi (Max), reference to the appendix II for details	

13. TEST SETUP PHOTO

Reference to the appendix I for details.

14. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

※※※※※ END OF REPORT ※※※※※