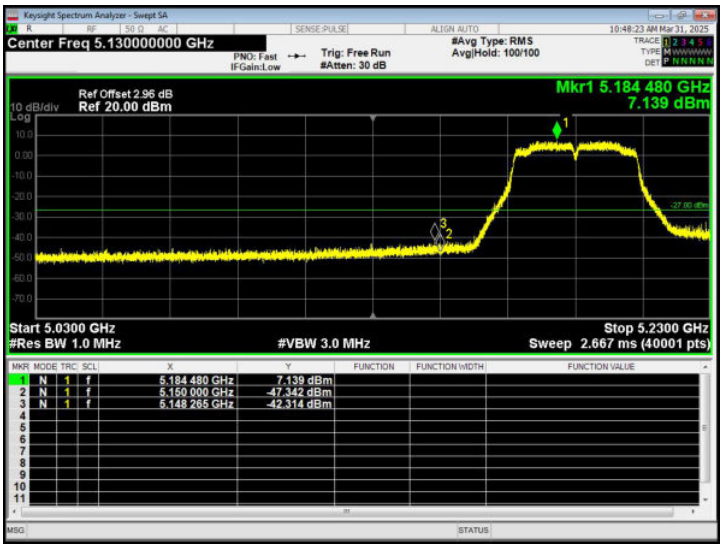
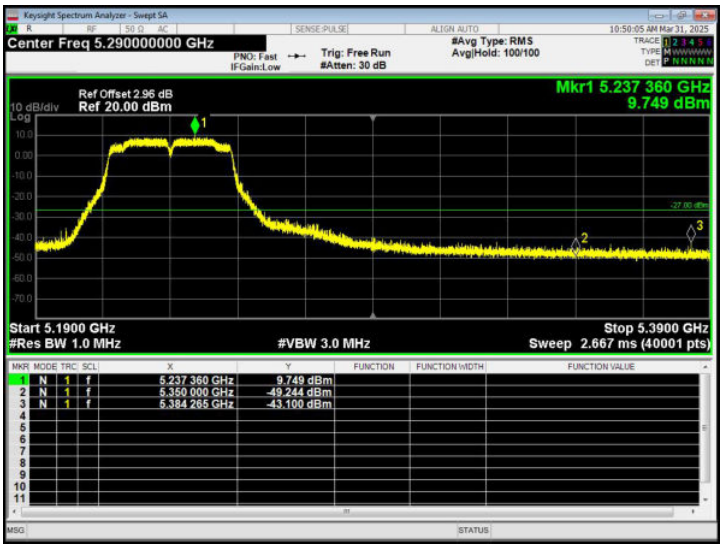
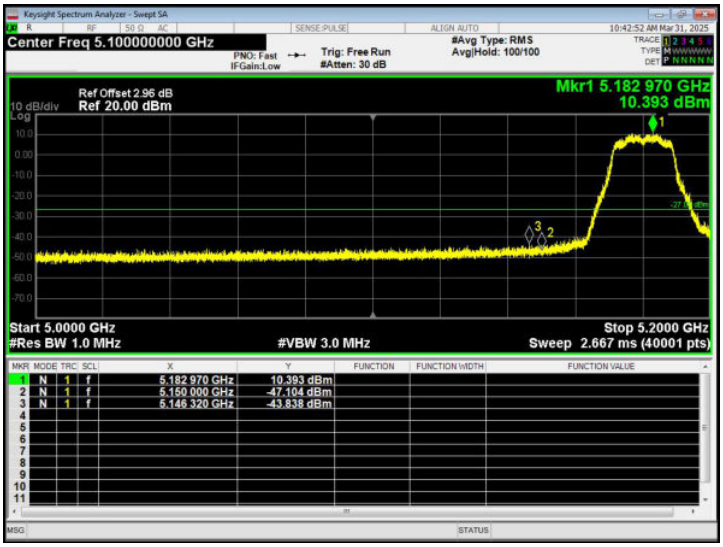
(802.11n40) Band Edge, Left Side



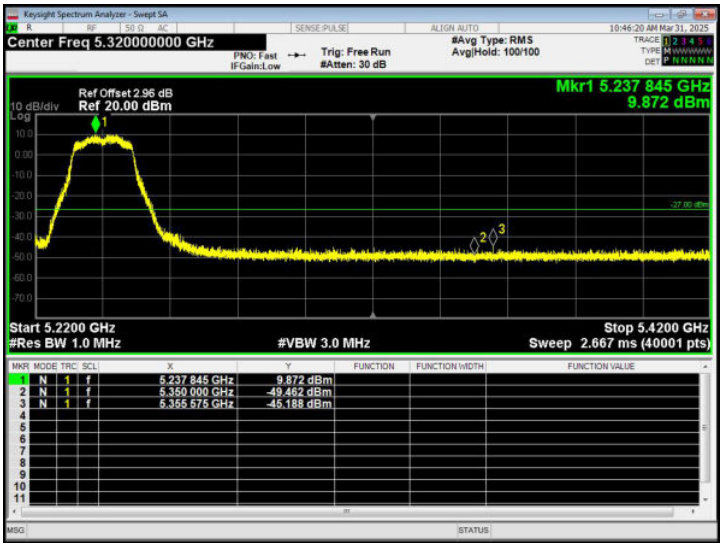
(802.11n40) Band Edge, Right Side



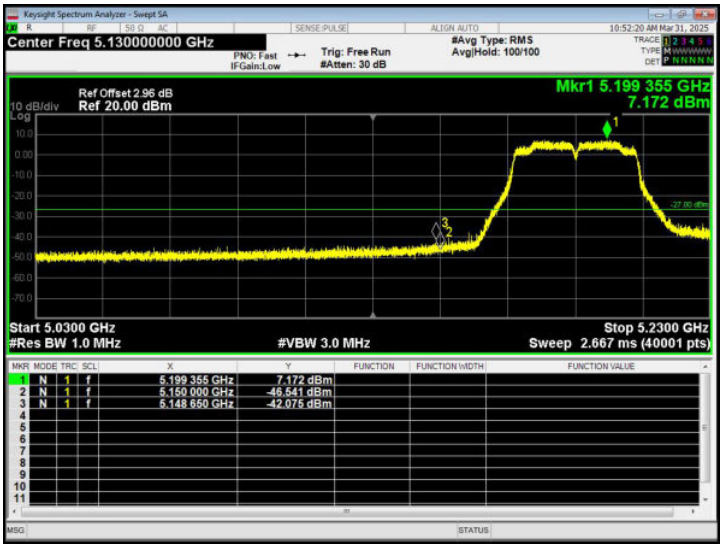
(802.11ac20) Band Edge, Left Side



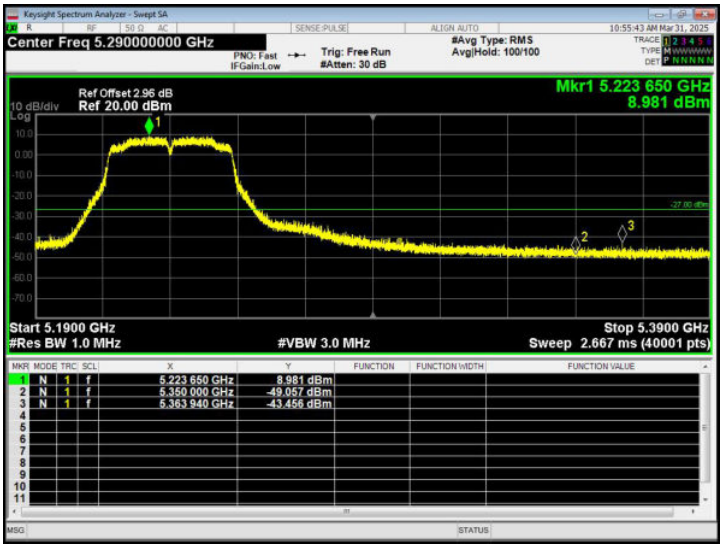
(802.11ac20) Band Edge, Right Side



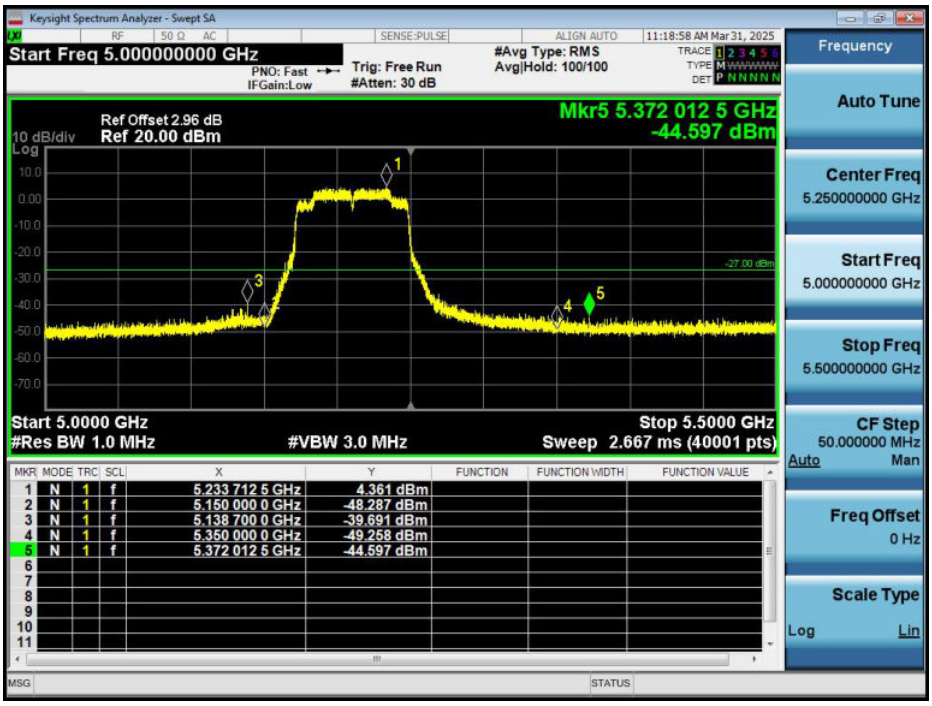
(802.11ac40) Band Edge, Left Side



(802.11ac40) Band Edge, Right Side



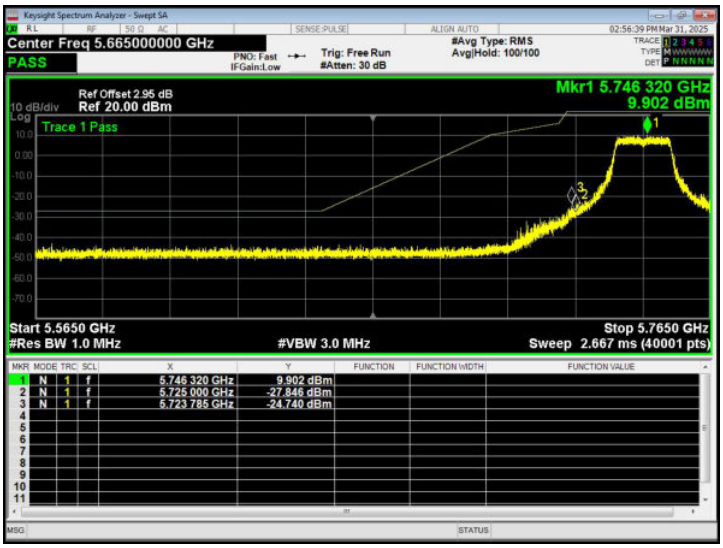
(802.11ac80) Band Edge - Channel 42



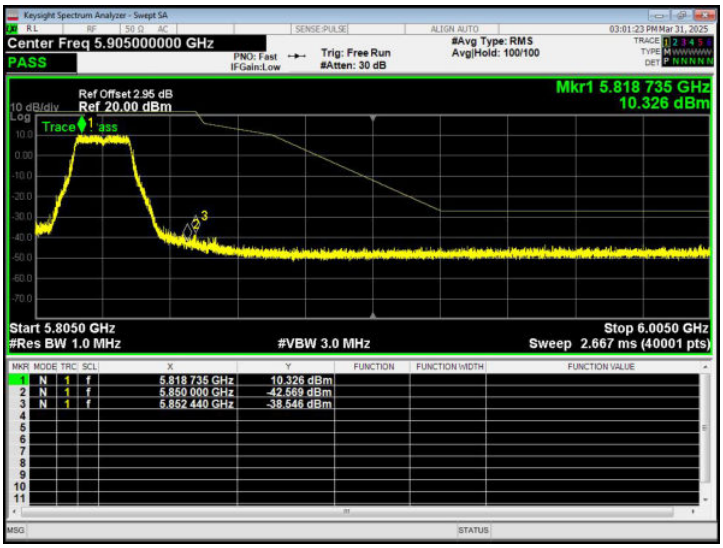
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage：	DC 12V
Test band：	5.8G	Antenna gain：	3.46dBi

5.745~5.825 GHz

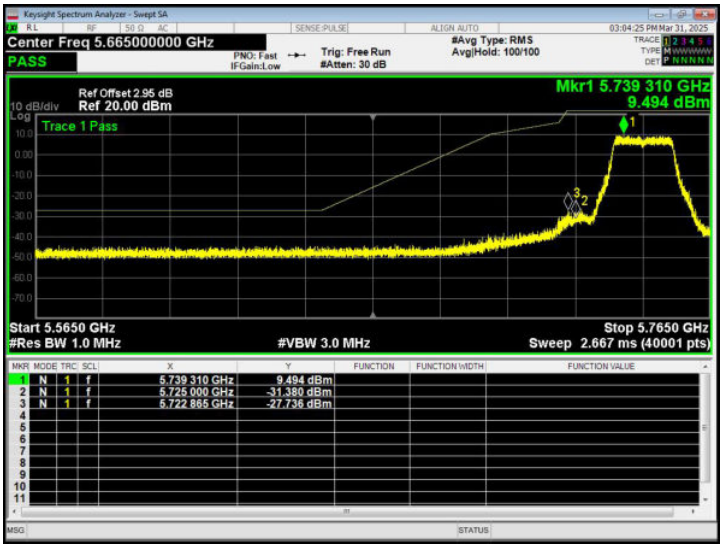
(802.11a) Band Edge, Left Side



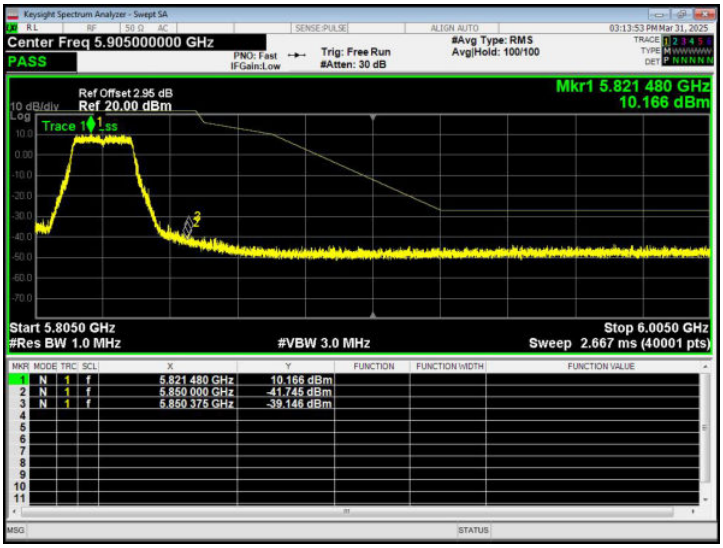
(802.11a) Band Edge, Right Side



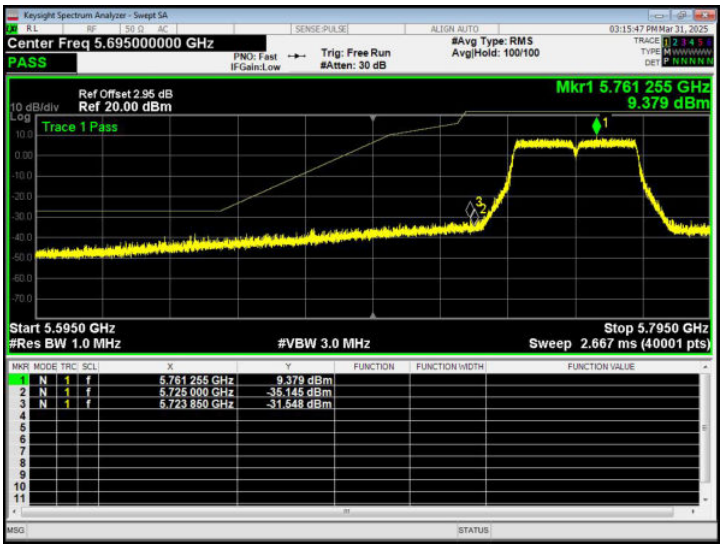
(802.11n20) Band Edge, Left Side



(802.11n20) Band Edge, Right Side

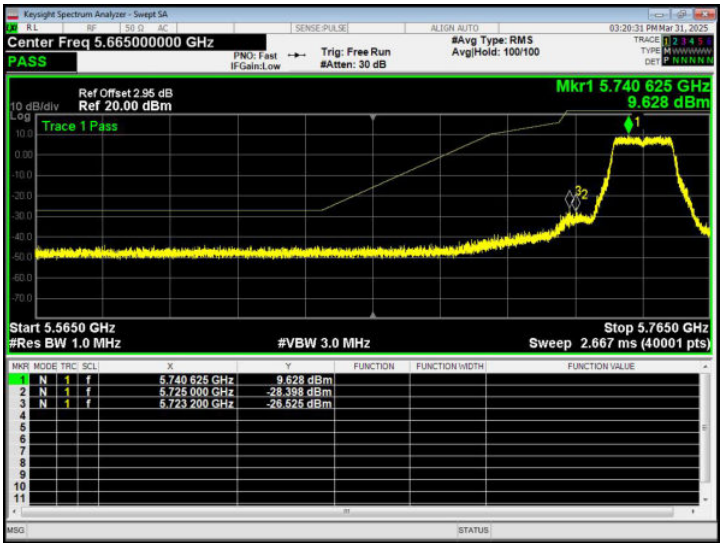


(802.11n40) Band Edge, Left Side

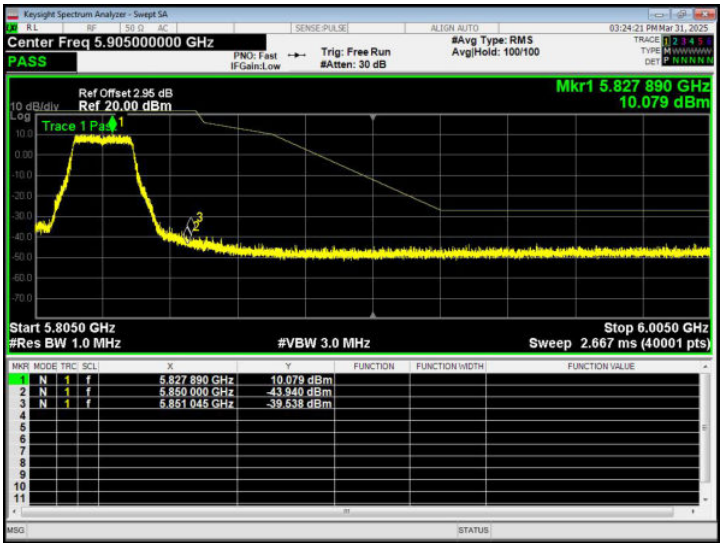


(802.11n40) Band Edge, Right Side

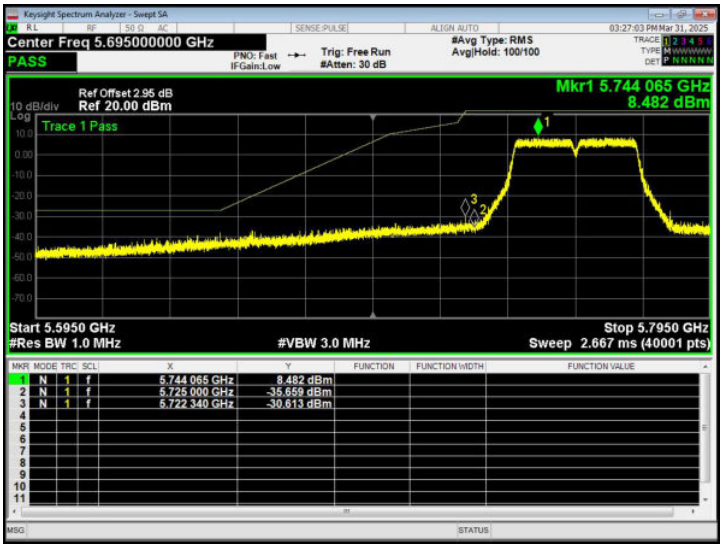
(802.11ac20) Band Edge, Left Side



(802.11ac20) Band Edge, Right Side



(802.11ac40) Band Edge, Left Side



(802.11ac40) Band Edge, Right Side

(802.11ac80) Band Edge - Channel 155

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 3.5 of this test report.

9.3 TEST SETUP

9.4 TEST PROCEDURE

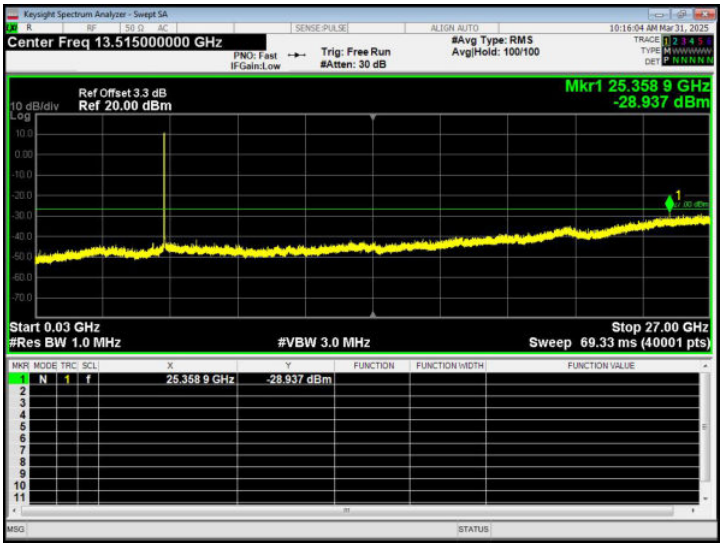
The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting 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 12V
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.			

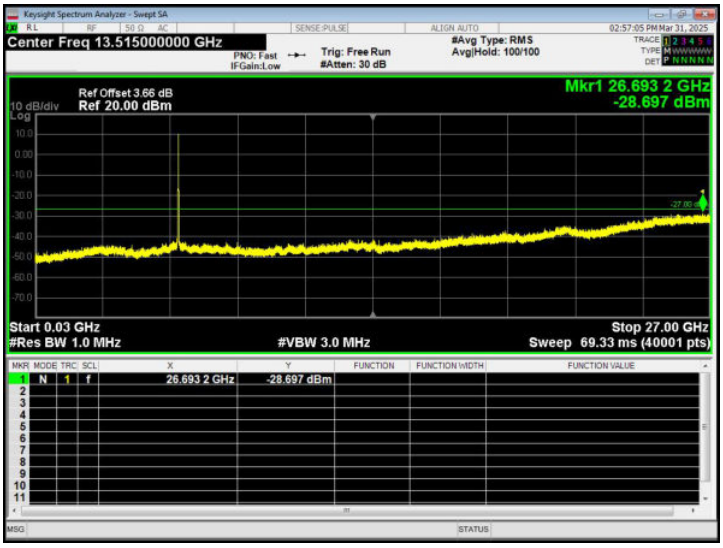
5.2G - 802.11a

CH36

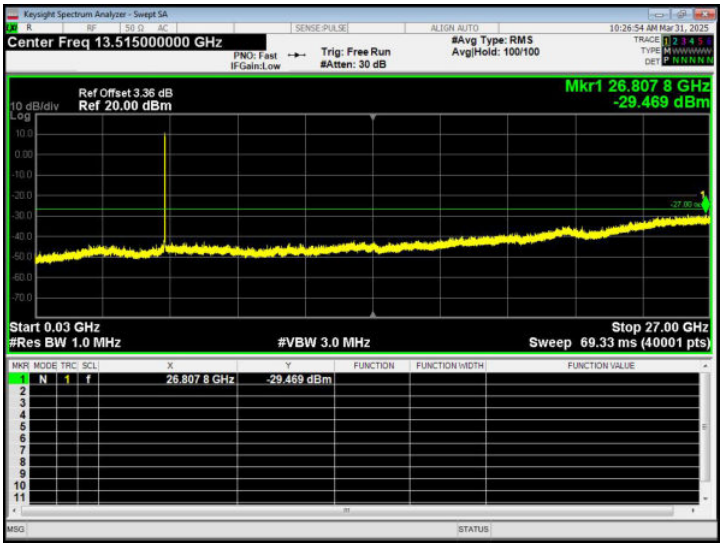


5.8G - 802.11a

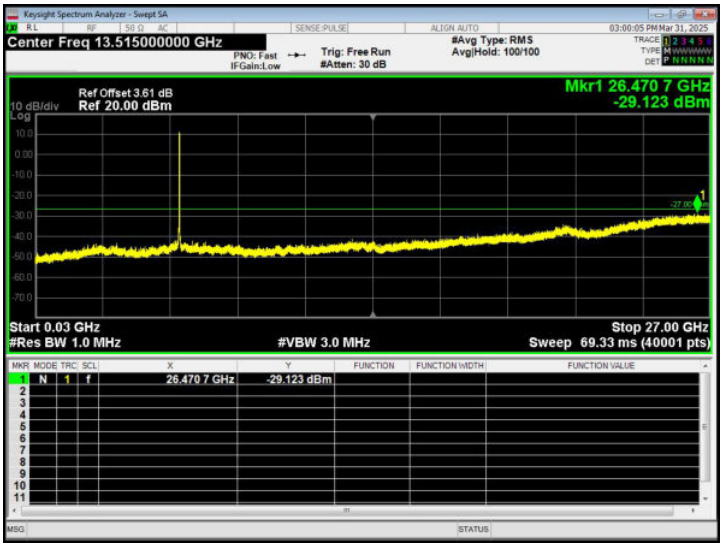
CH149



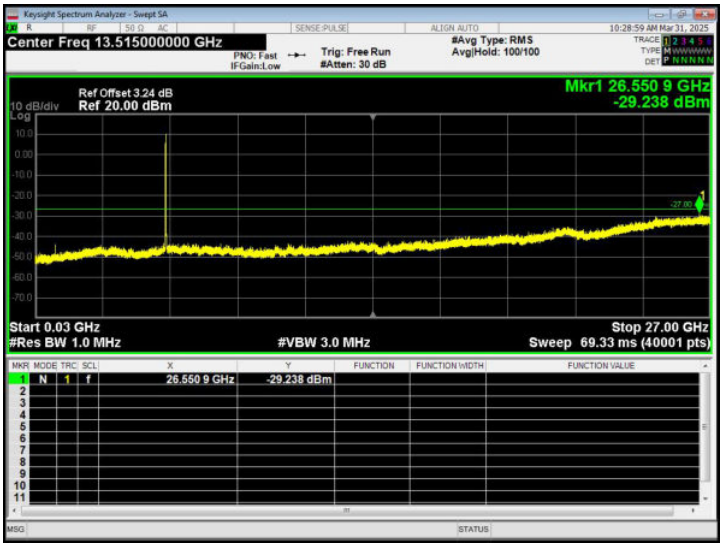
CH40



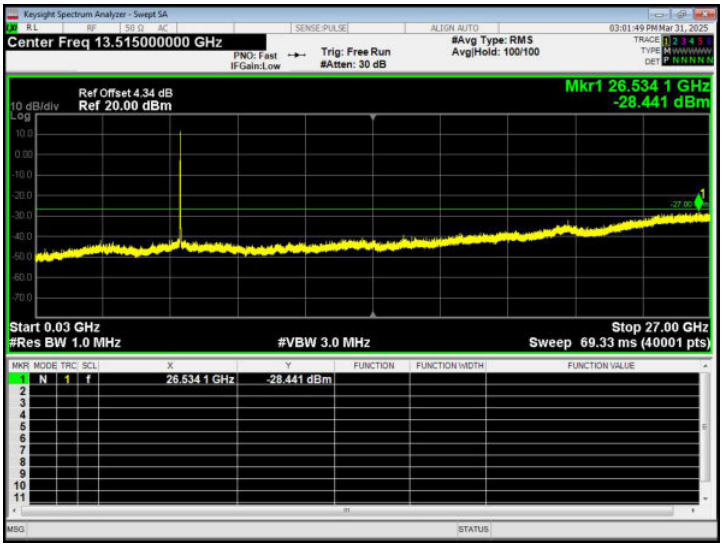
CH157



CH48

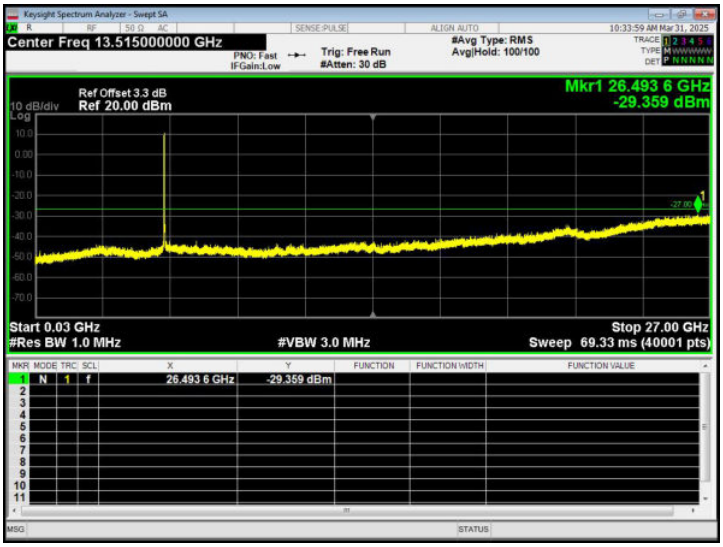


CH165



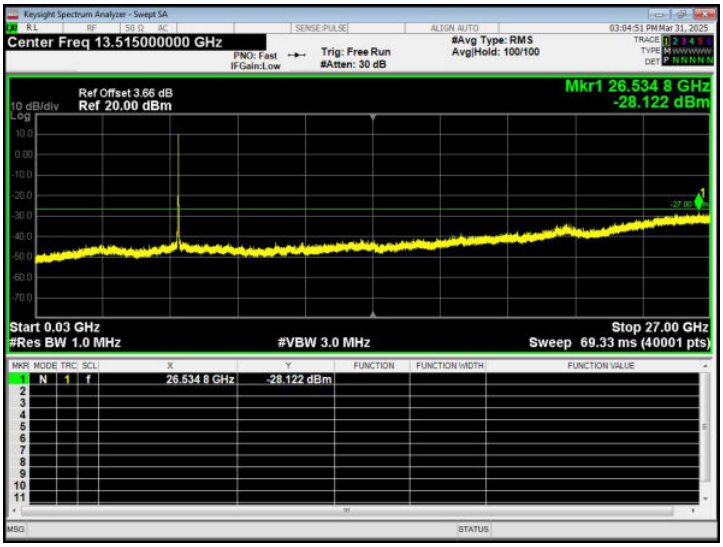
5.2G - 802.11n20

CH36

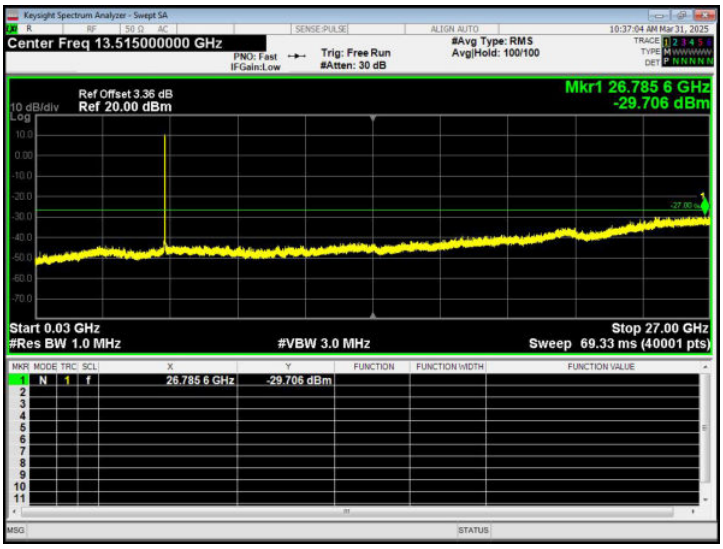


5.8G - 802.11n20

CH149



CH40



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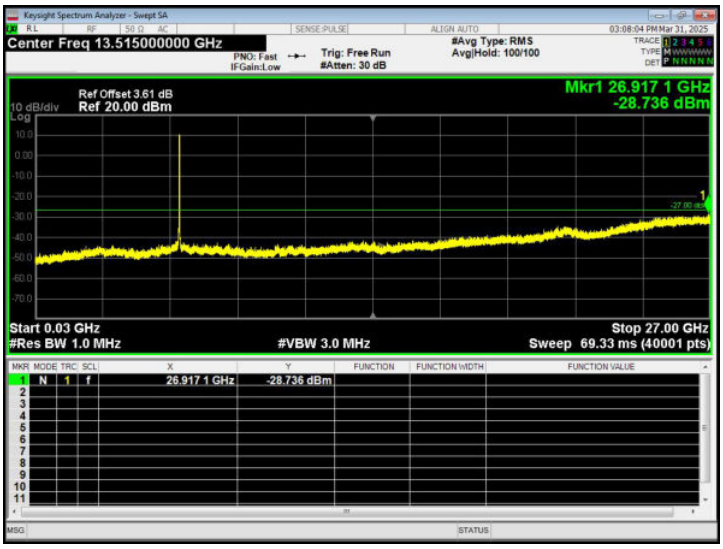

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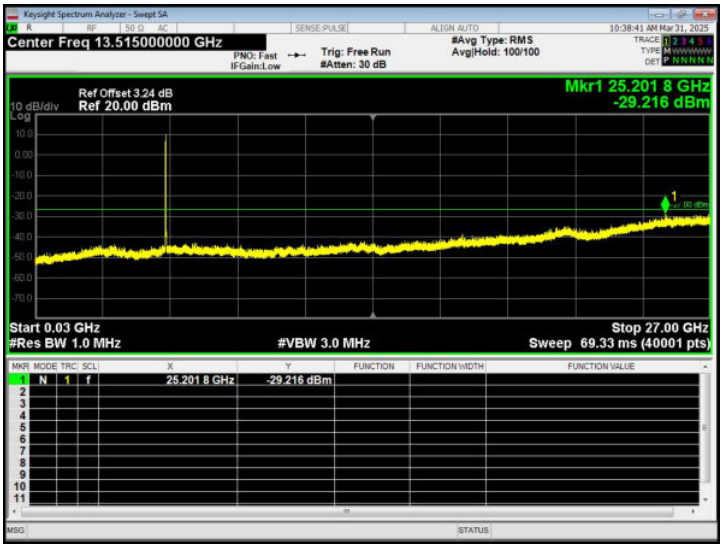

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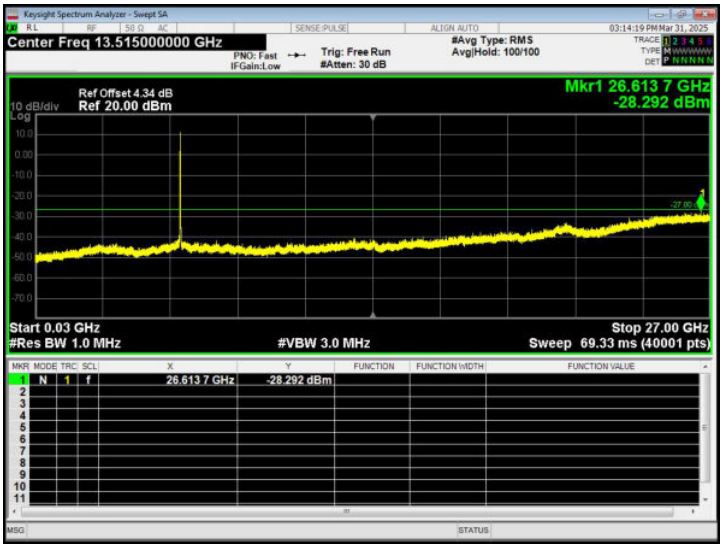
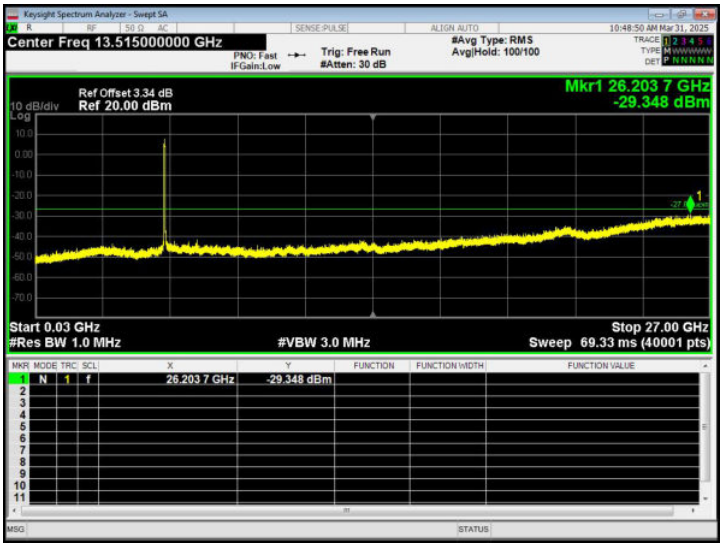


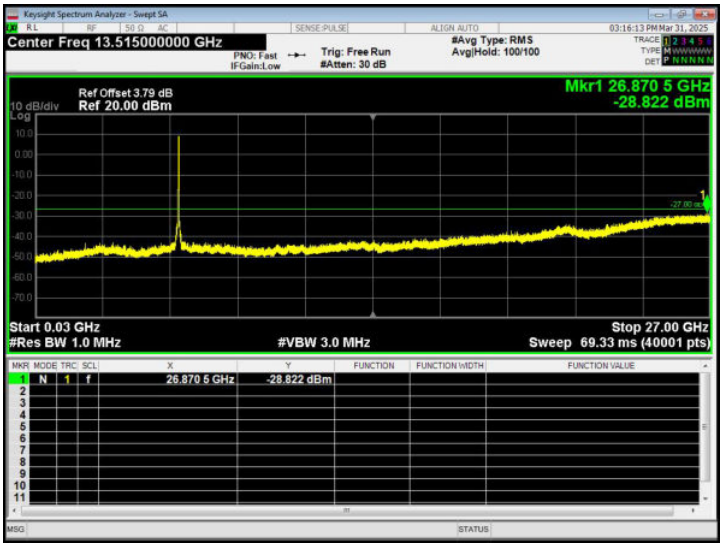
5.2G - 802.11n40

CH38

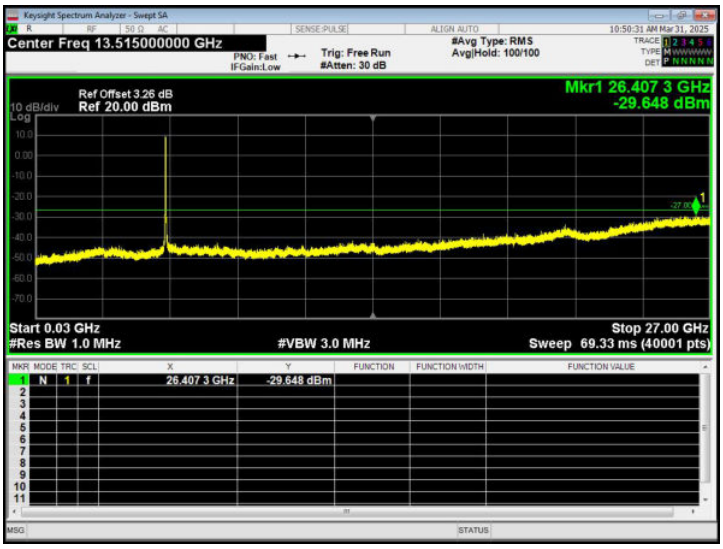


5.8G - 802.11n40

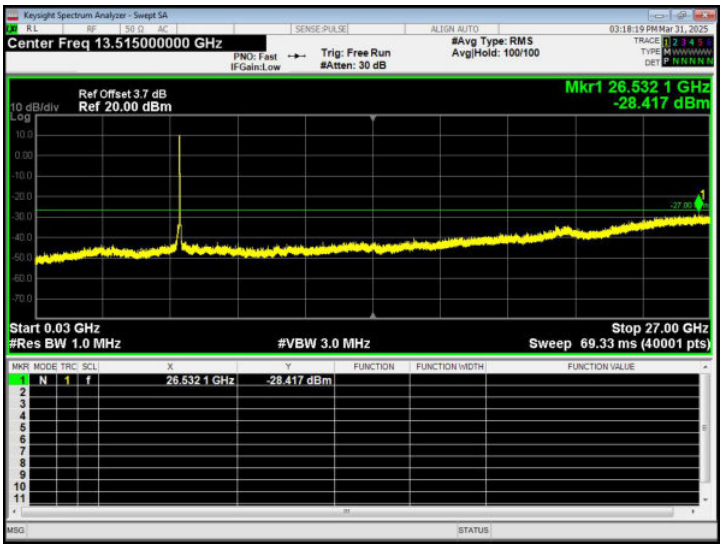
CH151



CH46

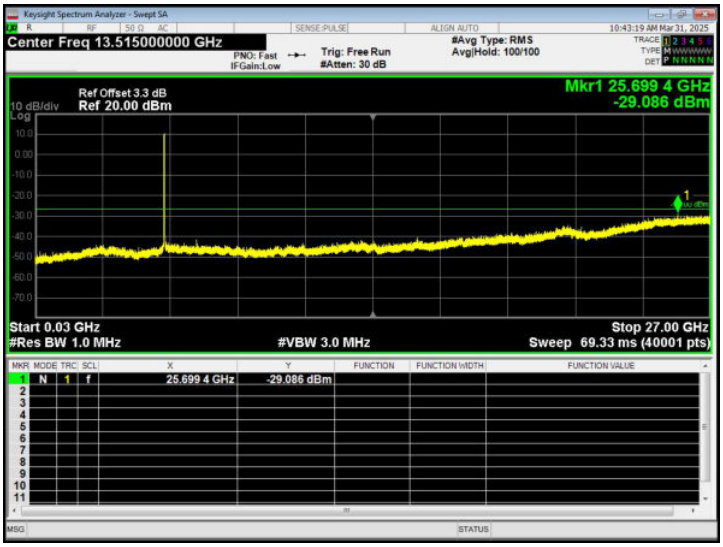


CH159



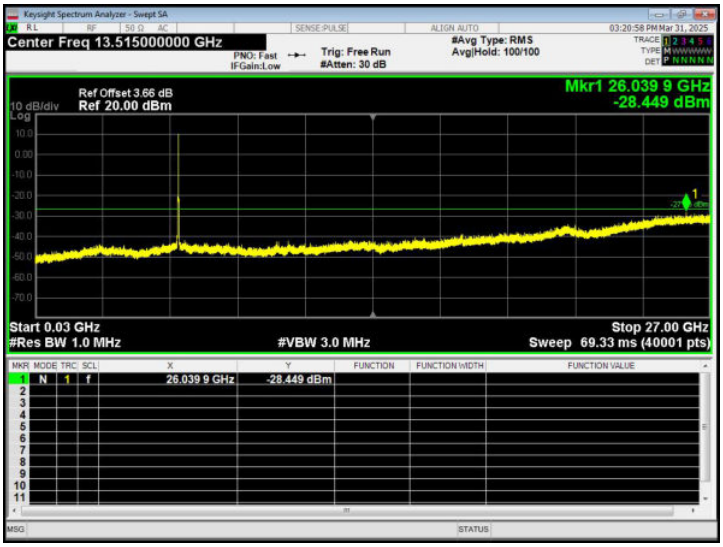
5.2G - 802.11ac20

CH36

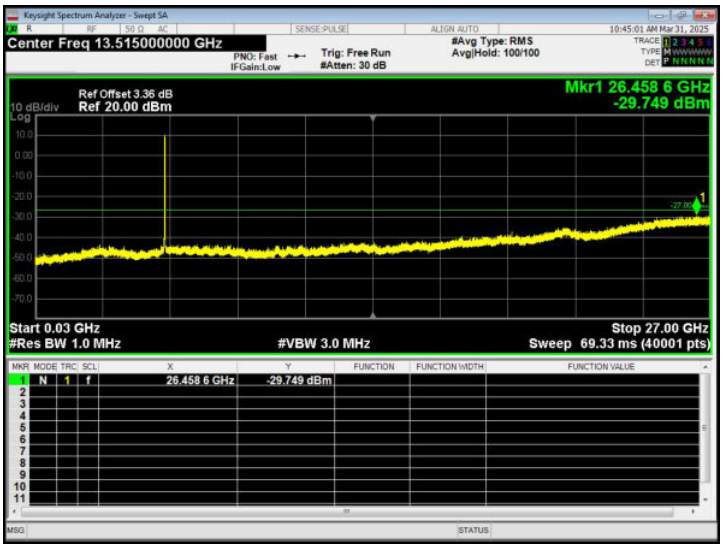


5.8G - 802.11ac20

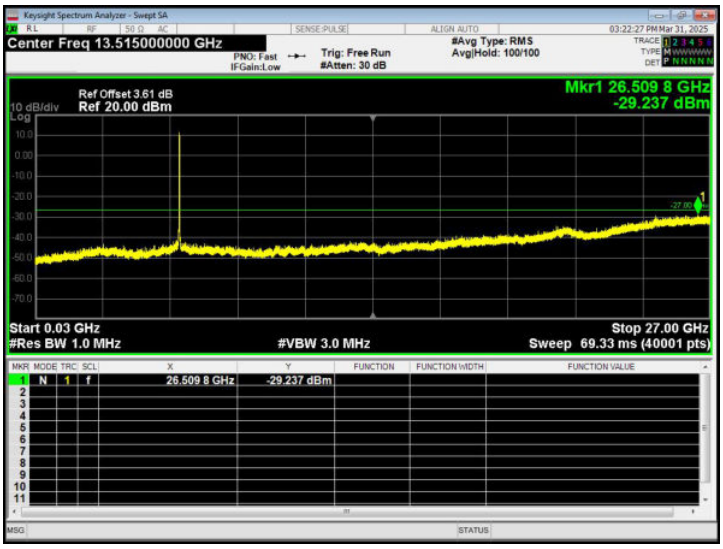
CH149



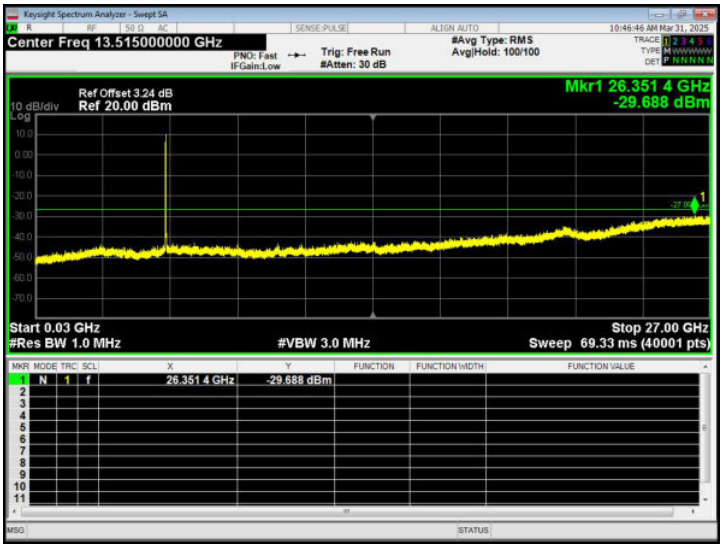
CH40



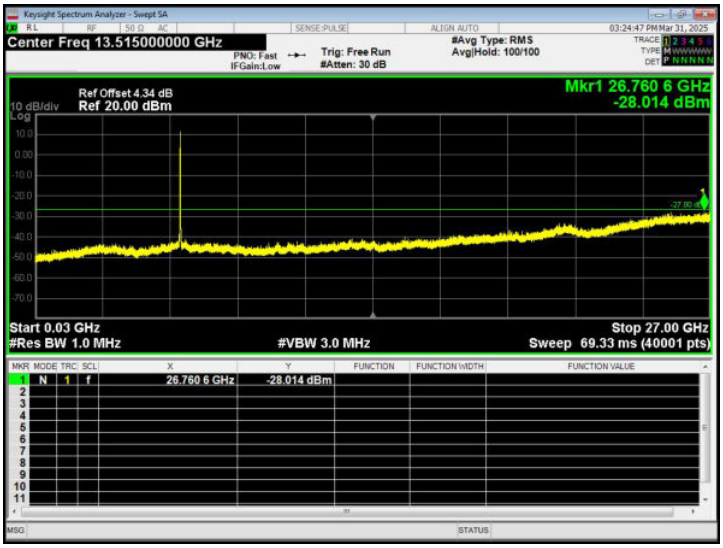
CH157



CH48

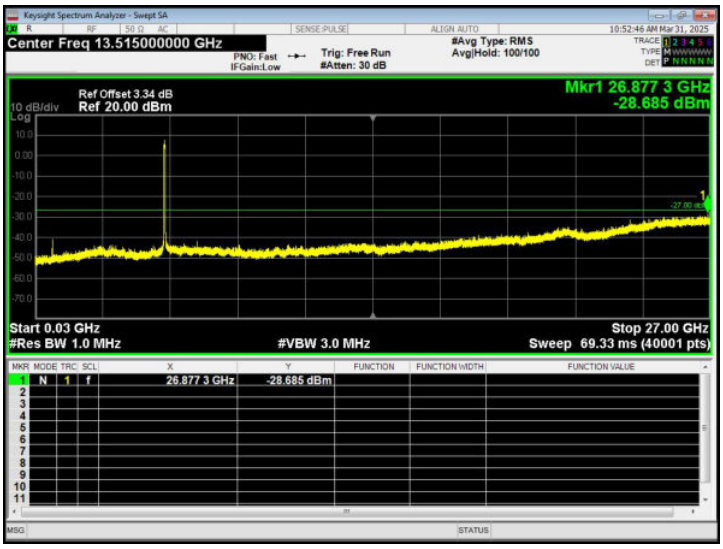


CH165



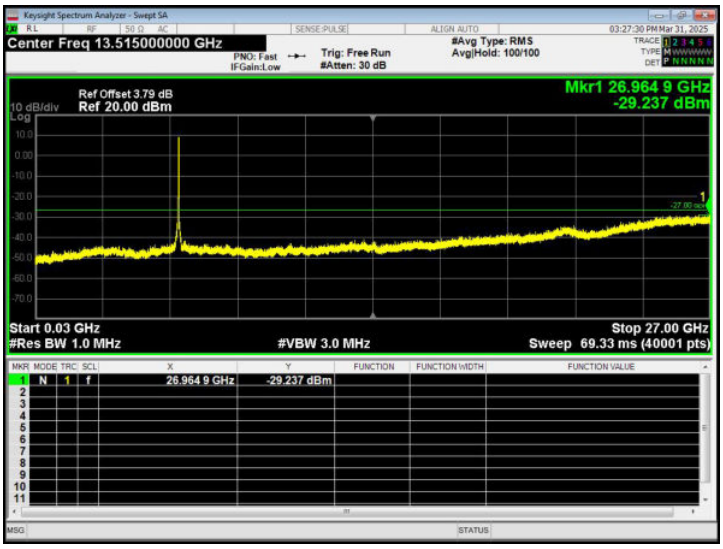
5.2G - 802.11ac40

CH38

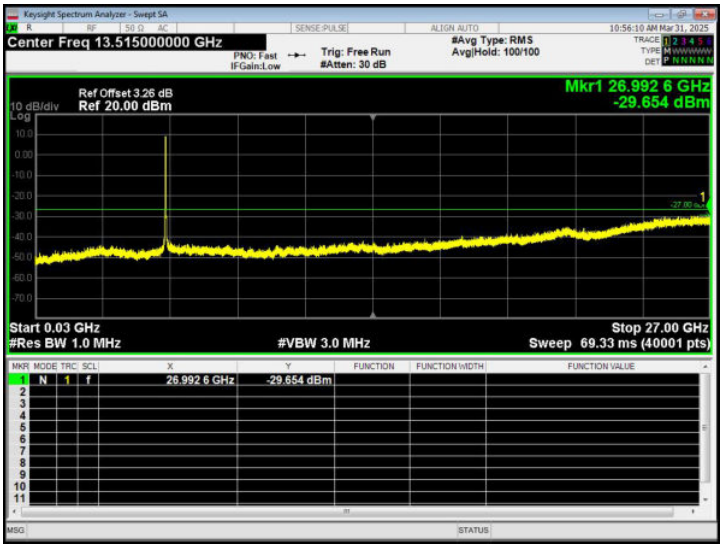


5.8G - 802.11ac40

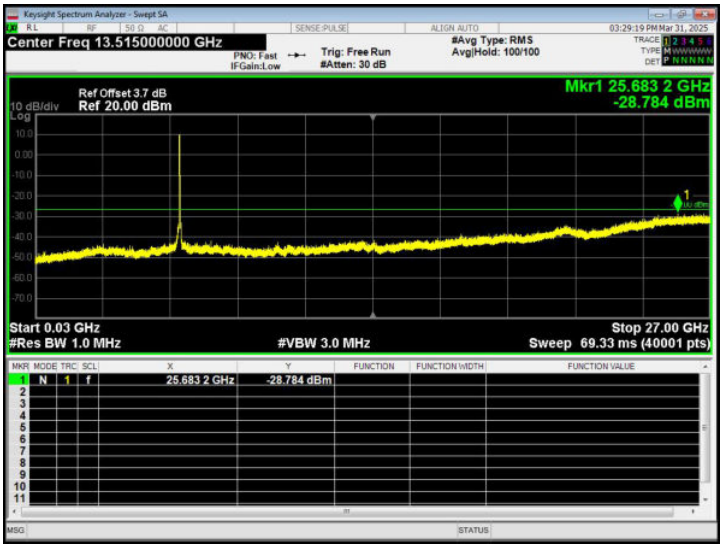
CH151



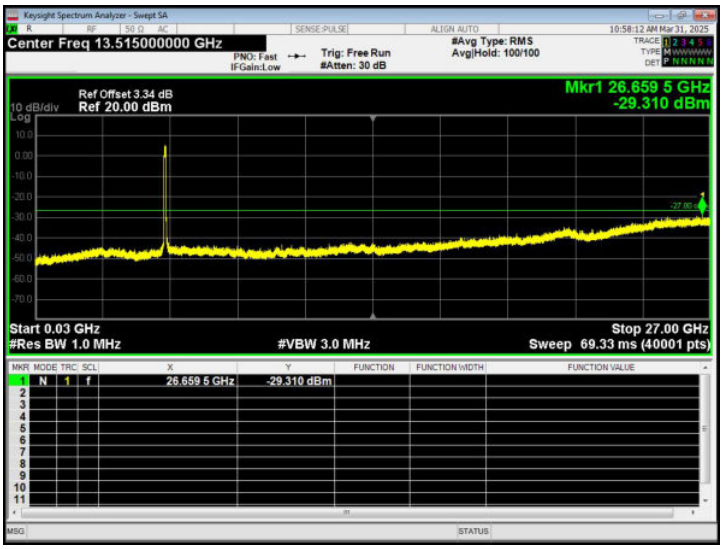
CH46



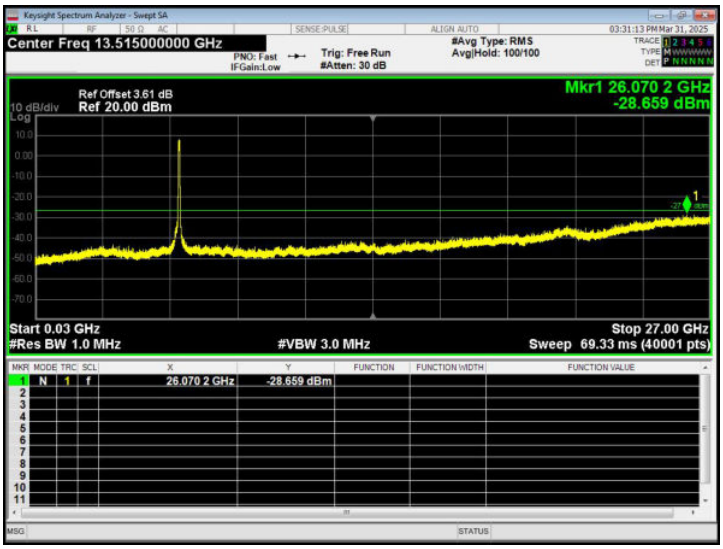
CH159



5.2G - 802.11ac80 - CH42



5.8G - 802.11ac80 - CH155



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 tested system was configured as the statements of chapter 3, Unless otherwise a special operating condition is specified in the follows during the testing.

10.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V
Test Band :	5.2G		
Note: Note: All channels have been tested, and only the worst test data is recorded in this report.			

Reference Frequency: 802.11a - 5180MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5179.983	-3.207
40	12	5179.972	-5.440
30	12	5179.986	-2.778
25	12	5179.981	-3.669
10	12	5179.983	-3.272
0	12	5179.974	-4.939
-10	12	5179.980	-3.913
-20	12	5179.980	-3.941

Reference Frequency: 802.11n20 - 5180MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5179.990	-1.955
40	12	5179.974	-4.972
30	12	5179.984	-3.077
25	12	5179.980	-3.895
10	12	5179.985	-2.810
0	12	5179.985	-2.836
-10	12	5179.985	-2.960
-20	12	5179.974	-5.016

Reference Frequency: 802.11n40 - 5190MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5189.972	-5.359
40	12	5189.981	-3.752
30	12	5189.978	-4.200
25	12	5189.983	-3.255
10	12	5189.972	-5.353
0	12	5189.975	-4.878
-10	12	5189.982	-3.527
-20	12	5189.970	-5.758

Reference Frequency: 802.11ac20 - 5180MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5179.975	-4.907
40	12	5179.988	-2.255
30	12	5179.987	-2.462
25	12	5179.985	-2.988
10	12	5179.990	-1.990
0	12	5179.973	-5.233
-10	12	5179.987	-2.590
-20	12	5179.977	-4.439

Reference Frequency: 802.11ac40 - 5190MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5189.978	-4.303
40	12	5189.970	-5.831
30	12	5189.984	-3.054
25	12	5189.977	-4.340
10	12	5189.988	-2.219
0	12	5189.972	-5.407
-10	12	5189.990	-2.010
-20	12	5189.976	-4.610

Reference Frequency: 802.11ac80 - 5210MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5209.983	-3.265
40	12	5209.988	-2.358
30	12	5209.984	-2.975
25	12	5209.981	-3.671
10	12	5209.989	-2.074
0	12	5209.988	-2.246
-10	12	5209.986	-2.636
-20	12	5209.986	-2.687

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V
Test Band :	5.8G		
Note: Note: All channels have been tested, and only the worst test data is recorded in this report.			

Reference Frequency: 802.11a - 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5744.975	-4.419
40	12	5744.964	-6.198
30	12	5744.968	-5.647
25	12	5744.957	-7.421
10	12	5744.973	-4.736
0	12	5744.976	-4.194
-10	12	5744.959	-7.173
-20	12	5744.977	-3.972

Reference Frequency: 802.11n20 - 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5744.965	-6.047
40	12	5744.966	-5.999
30	12	5744.980	-3.524
25	12	5744.966	-5.959
10	12	5744.969	-5.470
0	12	5744.968	-5.551
-10	12	5744.968	-5.655
-20	12	5744.978	-3.878

Reference Frequency: 802.11n40 - 5755MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5754.972	-4.798
40	12	5754.970	-5.129
30	12	5754.973	-4.715
25	12	5754.969	-5.361
10	12	5754.967	-5.785
0	12	5754.964	-6.200
-10	12	5754.954	-7.946
-20	12	5754.978	-3.830

Reference Frequency: 802.11ac20 - 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5744.976	-4.145
40	12	5744.951	-8.506
30	12	5744.970	-5.186
25	12	5744.964	-6.292
10	12	5744.976	-4.135
0	12	5744.969	-5.391
-10	12	5744.964	-6.296
-20	12	5744.978	-3.843

Reference Frequency: 802.11ac40 - 5755MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5754.960	-6.935
40	12	5754.952	-8.300
30	12	5754.976	-4.185
25	12	5754.978	-3.794
10	12	5754.966	-5.869
0	12	5754.958	-7.382
-10	12	5754.960	-6.992
-20	12	5754.970	-5.197

Reference Frequency: 802.11ac80 - 5775MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	Deviation (ppm)
50	12	5774.982	-3.056
40	12	5774.977	-3.976
30	12	5774.971	-4.988
25	12	5774.982	-3.104
10	12	5774.979	-3.717
0	12	5774.977	-4.039
-10	12	5774.973	-4.718
-20	12	5774.987	-2.201

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 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of chapter 3, Unless otherwise a special operating condition is specified in the follows during the testing.

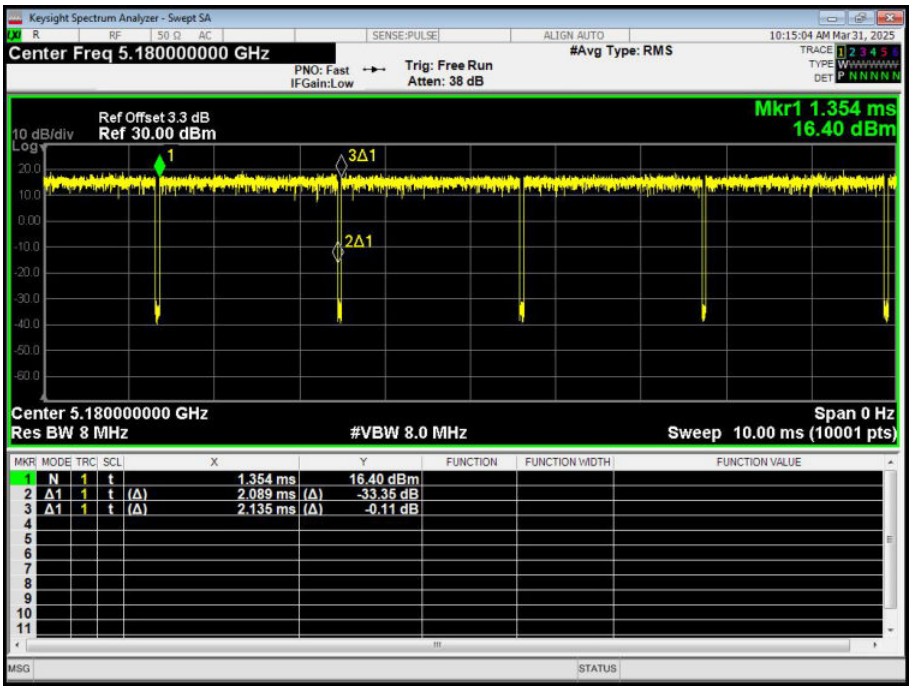
11.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V
Test Band :	5.2G & 5.8G		

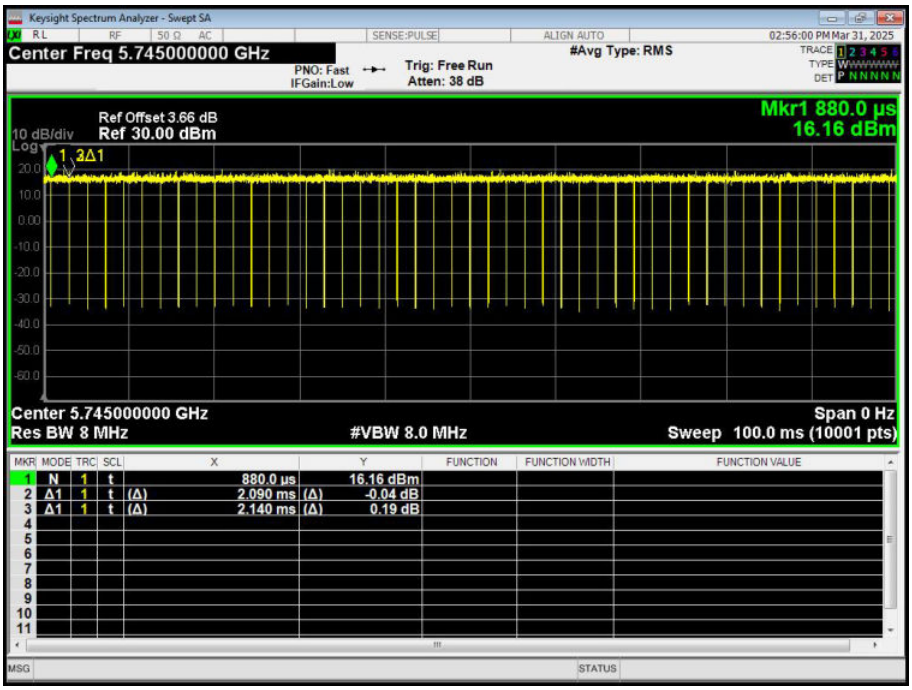
5.2G				
Test Mode	Frequency (MHz)	Duty Cycle (%)	Factor (dB)	Result
802.11a	5180	97.85	0.09	Pass
802.11n20	5180	98.81	0.05	Pass
802.11n40	5190	98.86	0.05	Pass
802.11ac20	5180	98.80	0.05	Pass
802.11ac40	5190	98.85	0.05	Pass
802.11ac80	5210	98.75	0.05	Pass
Note: Duty Cycle= Ton /Total*100% Duty Cycle Correction Factor = 10log (1/Duty Cycle)				

5.8G				
Test Mode	Frequency (MHz)	Duty Cycle (%)	Factor (dB)	Result
802.11a	5745	97.66	0.10	Pass
802.11n20	5745	99.00	0.04	Pass
802.11n40	5755	98.76	0.05	Pass
802.11ac20	5745	98.75	0.05	Pass
802.11ac40	5755	98.75	0.05	Pass
802.11ac80	5775	99.00	0.04	Pass
Note: Duty Cycle= Ton /Total*100% Duty Cycle Correction Factor = 10log (1/Duty Cycle)				

802.11a - 5180MHz

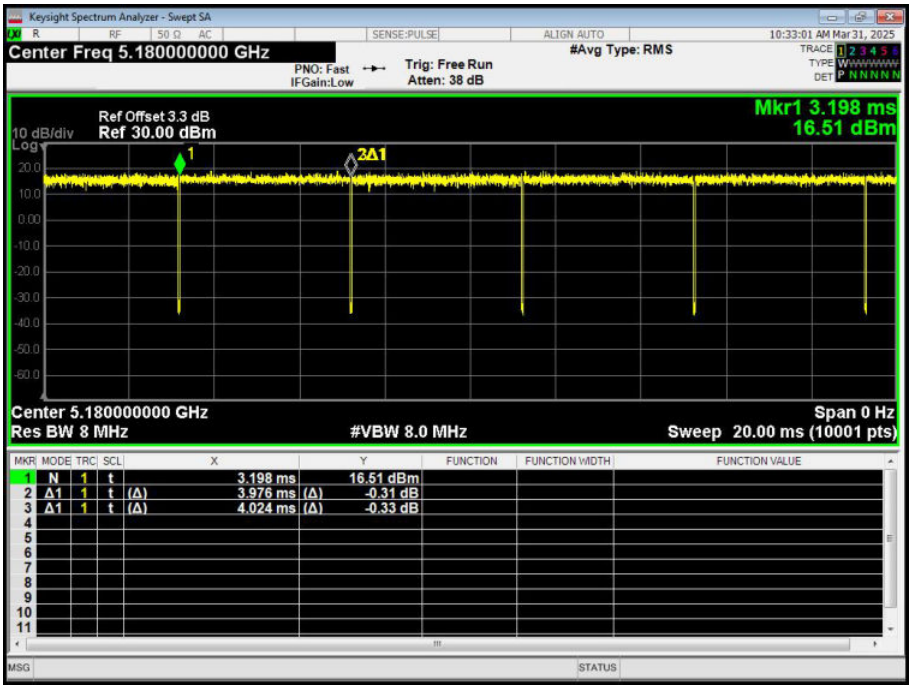


802.11a - 5745MHz

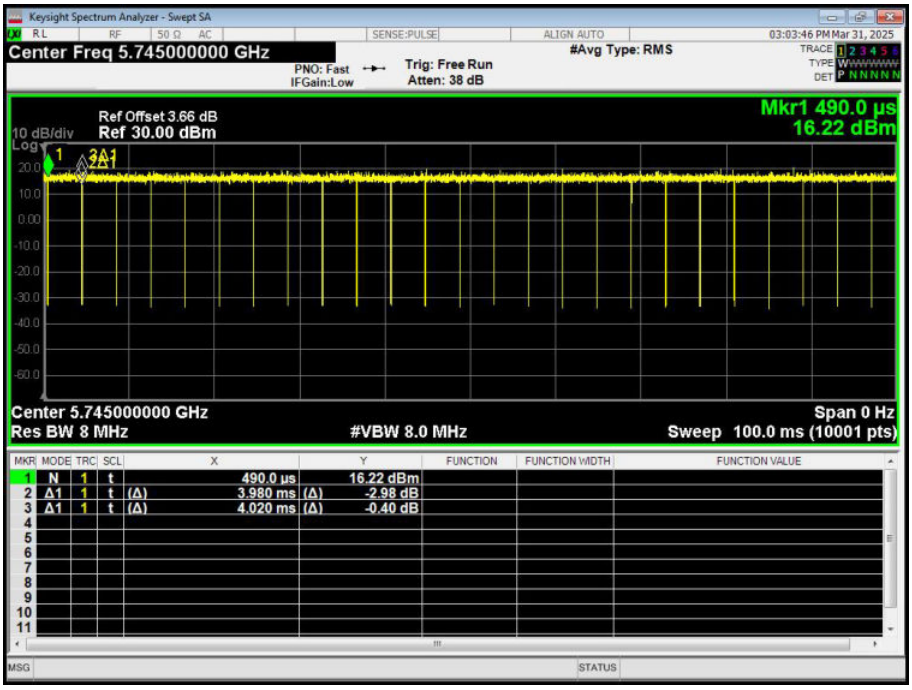


Note: All channel have been tested, and the report only reflects the worst case data.

802.11n20 - 5180MHz

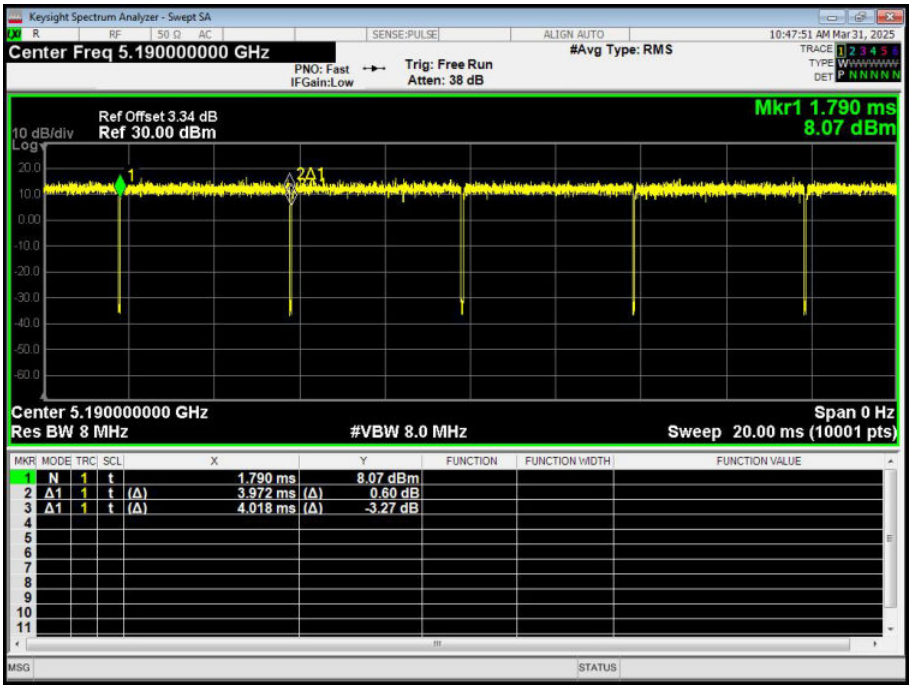


802.11n20 - 5745MHz

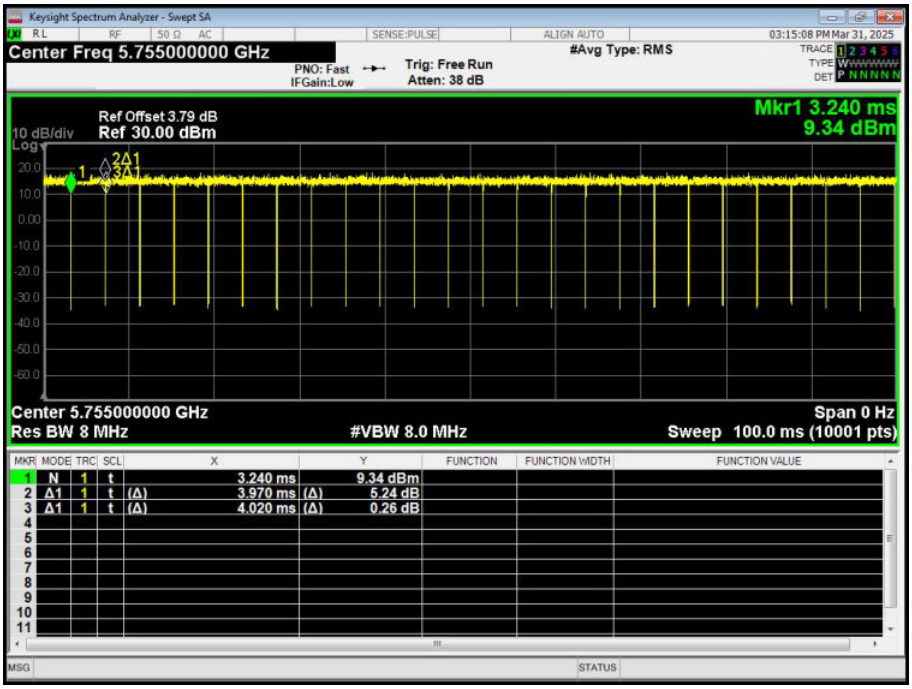


Note: All channel have been tested, and the report only reflects the worst case data.

802.11n40 - 5190MHz

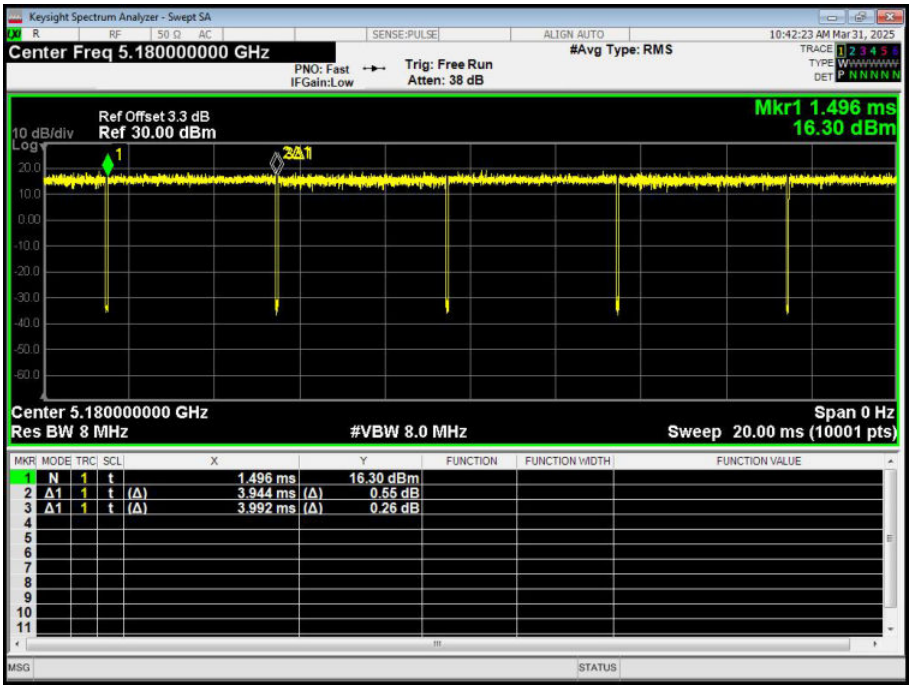


802.11n40 - 5755MHz

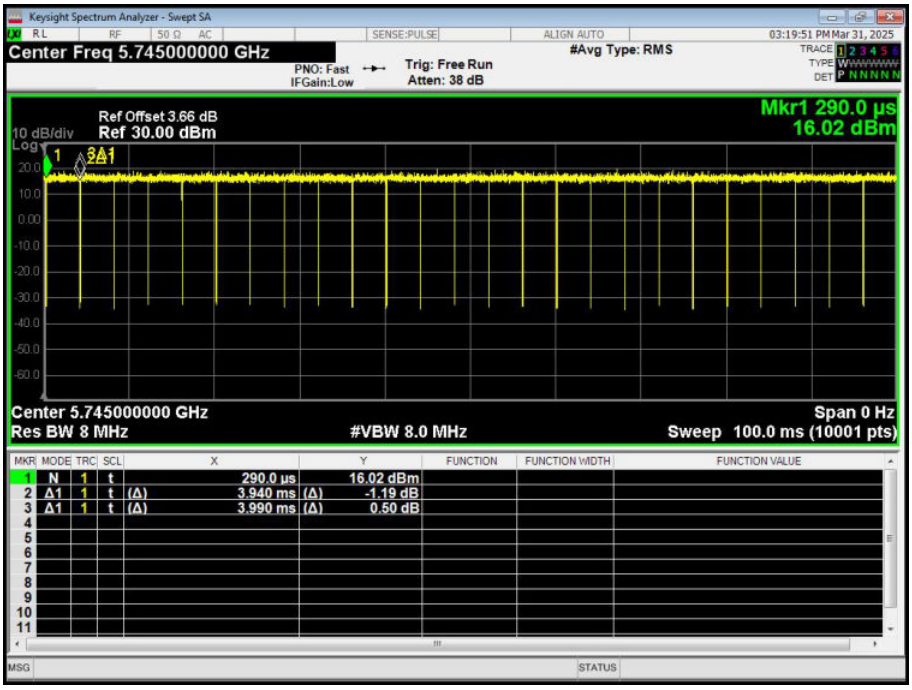


Note: All channel have been tested, and the report only reflects the worst case data.

802.11ac20 - 5180MHz

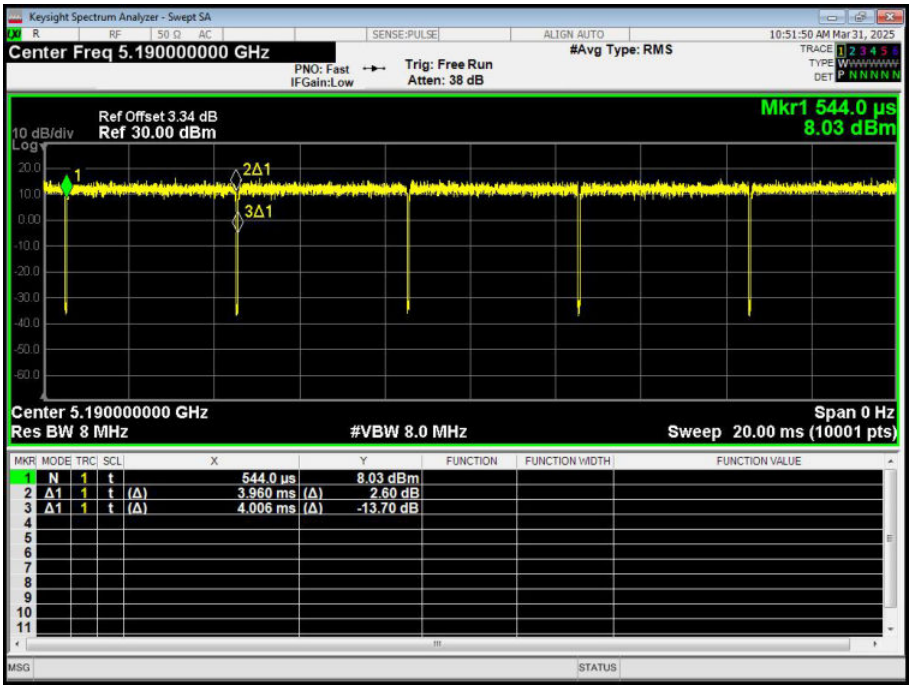


802.11ac20 - 5745MHz

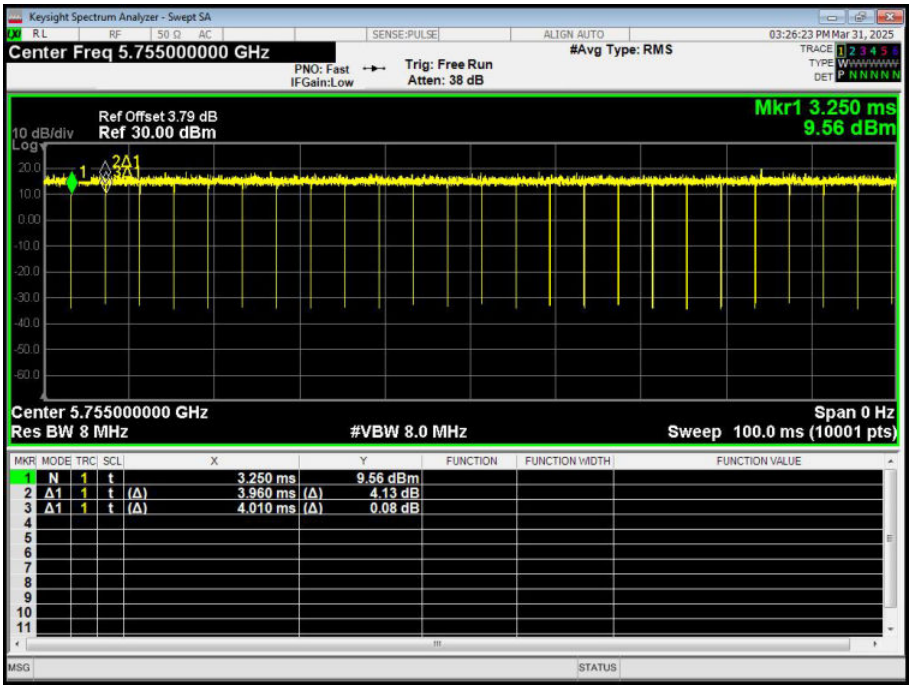


Note: All channel have been tested, and the report only reflects the worst case data.

802.11ac40 - 5190MHz

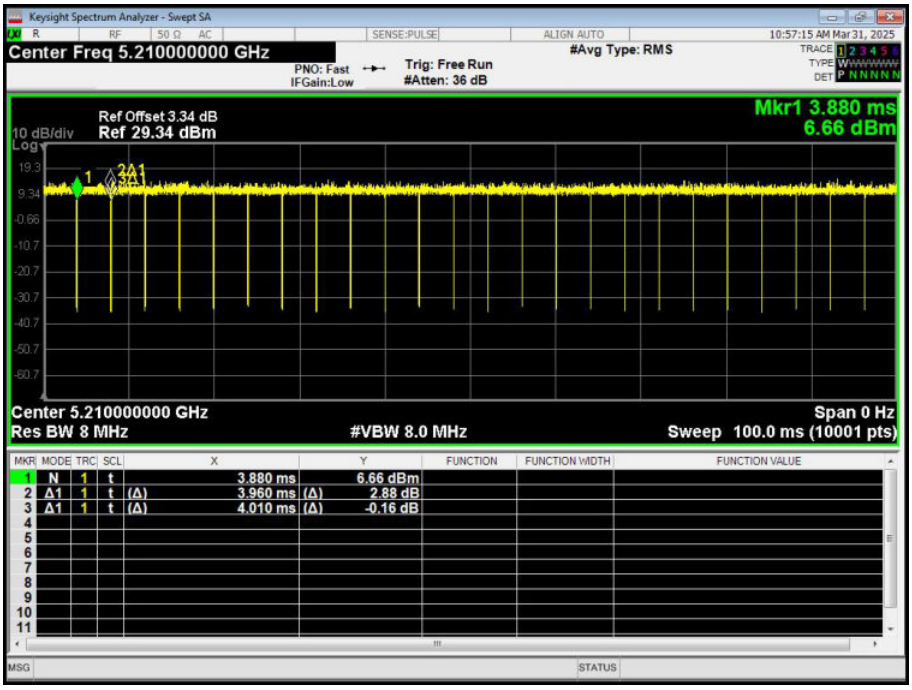


802.11ac40 - 5755MHz

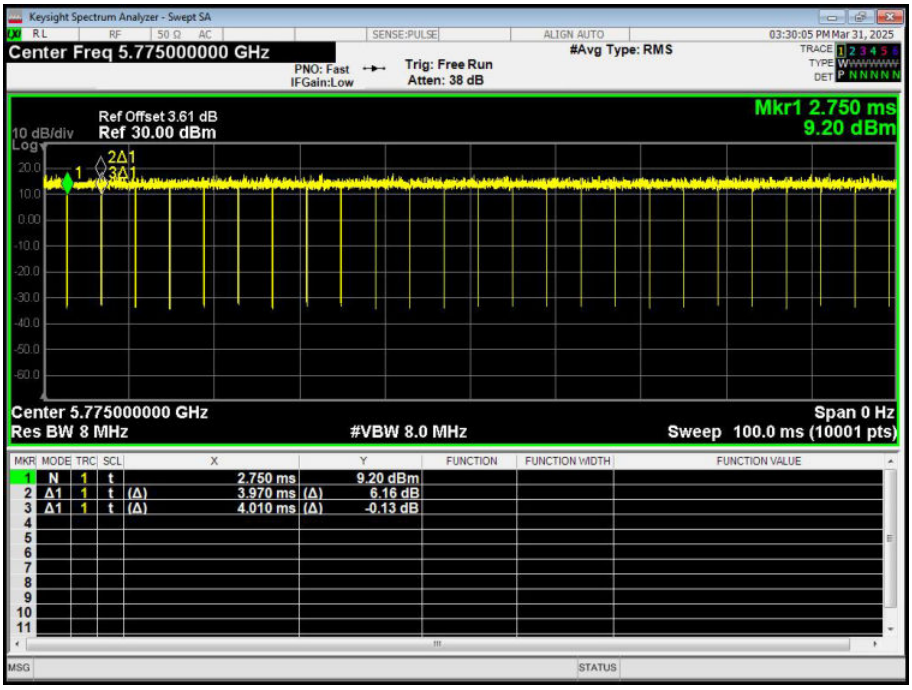


Note: All channel have been tested, and the report only reflects the worst case data.

802.11ac80 - 5210MHz



802.11ac80 - 5775MHz



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

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 FPC antenna, the best case gain of the antenna is 5.2G is 2.88dBi / 5.8G is 3.46dBi, 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 ※※※※※