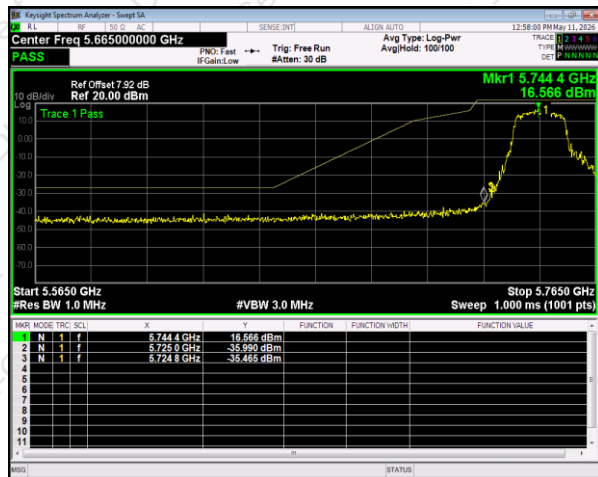




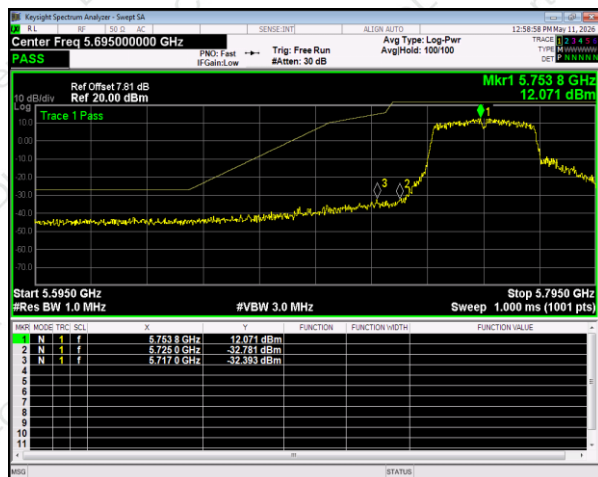
(802.11ac20 MIMO) Band Edge, Left Side



(802.11ac20 MIMO) Band Edge, Right Side



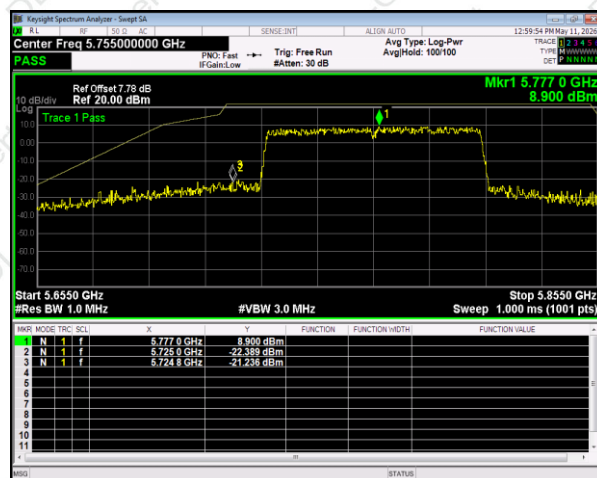
(802.11ac40 MIMO) Band Edge, Left Side



(802.11ac40 MIMO) Band Edge, Right Side



(802.11ac80 MIMO) Band Edge





9. Frequency Stability Measurement

9.1 LIMIT

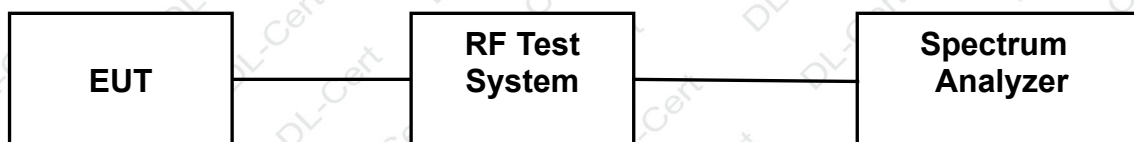
Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

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

9.2 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. f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 20 ppm (IEEE 802.11n specification).
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 $-20^\circ\text{C} \sim 70^\circ\text{C}$.

9.3 TEST SETUP LAYOUT



9.4 EUT OPERATION DURING TEST

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

9.5 TEST RESULTS

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 19
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)
-20	19	33	0.00991
-10	19	47	0.00927
10	19	50	0.01085
20	19	54	0.01312
30	19	69	0.01106
40	19	38	0.00621
50	19	35	0.00900
60	19	34	0.01278
70	19	39	0.00853

802.11 n20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	63	0.00900
-10	19	44	0.00664
10	19	32	0.00621
20	19	39	0.01348
30	19	36	0.00633
40	19	60	0.00965
50	19	50	0.01251
60	19	61	0.01121
70	19	35	0.00698



802.11n40

Reference Frequency(Middle Channel): 5190MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	61	0.01087
-10	19	52	0.00902
10	19	43	0.00779
20	19	44	0.00793
30	19	34	0.00621
40	19	22	0.00414
50	19	36	0.00656
60	19	43	0.00777
70	19	51	0.00914

802.11ac20

Reference Frequency(Middle Channel): 5180MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	67	0.01124
-10	19	52	0.01141
10	19	35	0.01021
20	19	64	0.01068
30	19	60	0.00628
40	19	48	0.01000
50	19	34	0.00873
60	19	62	0.01036
70	19	63	0.00941



802.11 ac40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	69	0.01332
-10	19	58	0.01120
10	19	48	0.00927
20	19	34	0.00656
30	19	48	0.00927
40	19	51	0.00985
50	19	55	0.01062
60	19	34	0.00656
70	19	39	0.00753

802.11ac80

Reference Frequency(Middle Channel): 5210MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	45	0.01062
-10	19	40	0.01312
10	19	68	0.00580
20	19	40	0.00641
30	19	40	0.01294
40	19	53	0.00773
50	19	63	0.01096
60	19	70	0.01154
70	19	48	0.00984

**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)
-20	19	66	0.01002
40	19	31	0.01287
70	19	59	0.00650

802.11n20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
-20	19	70	0.01351
40	19	66	0.01274
70	19	56	0.01081

802.11n40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
-20	19	42	0.00811
40	19	69	0.01332
70	19	48	0.00927

802.11ac20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
-20	19	53	0.00977
40	19	46	0.01085
70	19	52	0.01145



802.11ac40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
-20	19	47	0.01056
40	19	68	0.00865
70	19	60	0.01171

802.11ac80

Reference Frequency(Middle Channel): 5210 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency	Error (ppm)
-20	19	51	0.00628
40	19	36	0.00944
70	19	32	0.00671

**5.8G:**

802.11a

Reference Frequency(Middle Channel): 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	53	0.00754
-10	19	43	0.00882
10	19	56	0.01158
20	19	40	0.00870
30	19	35	0.01318
40	19	39	0.01324
50	19	63	0.00684
60	19	40	0.01010
70	19	57	0.00585

802.11n20

Reference Frequency(Middle Channel): 5745MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	53	0.00758
-10	19	43	0.00882
10	19	56	0.00866
20	19	40	0.01263
30	19	35	0.00811
40	19	39	0.01080
50	19	63	0.00973
60	19	40	0.01198
70	19	57	0.01211



802.11n40

Reference Frequency(Middle Channel): 5755MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	60	0.01175
-10	19	31	0.00825
10	19	61	0.00989
20	19	51	0.00627
30	19	42	0.01160
40	19	69	0.01025
50	19	64	0.00631
60	19	53	0.00729
70	19	48	0.00779

802.11ac20

Reference Frequency(Middle Channel): 5745 MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	43	0.00748
-10	19	51	0.00888
10	19	23	0.00400
20	19	26	0.00453
30	19	23	0.00400
40	19	26	0.00453
50	19	22	0.00383
60	19	36	0.00627
70	19	26	0.00453



802.11ac40

Reference Frequency(Middle Channel): 5755MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	60	0.00675
-10	19	55	0.00614
10	19	47	0.00341
20	19	45	0.00481
30	19	32	0.0034
40	19	26	0.00381
50	19	38	0.00312
60	19	43	0.00554
70	19	54	0.00428

802.11ac80

Reference Frequency(Middle Channel): 5775MHz			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF	Error (ppm)
-20	19	52	0.00866
-10	19	41	0.00705
10	19	43	0.00711
20	19	41	0.00676
30	19	36	0.00589
40	19	32	0.0052
50	19	34	0.00555
60	19	32	0.0052
70	19	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)
-20	19	46	0.00815
40	19	27	0.00757
70	19	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)
-20	19	42	0.00658
40	19	24	0.00534
70	19	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)
-20	19	62	0.00953
40	19	54	0.00801
70	19	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)
-20	19	43	0.00709
40	19	51	0.00648
70	19	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)
-20	19	60	0.00675
40	19	55	0.00614
70	19	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)
-20	19	52	0.00866
40	19	41	0.00705
70	19	52	0.00866



10. DUTY CYCLE

10.1 APPLIED PROCEDURES / LIMIT

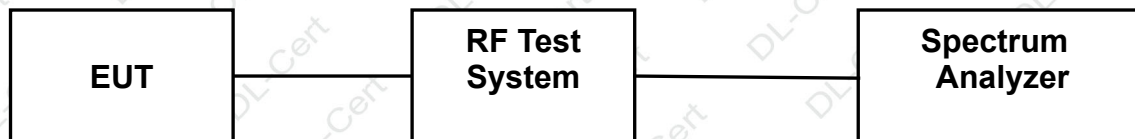
Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

- 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.
- 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:
 - Set the center frequency of the instrument to the center frequency of the transmission.
 - Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value.
 - Set $VBW \geq RBW$. Set detector = peak or average.
 - 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 $T \leq 16.7 \mu s$.)

10.2 DEVIATION FROM STANDARD

No deviation.

10.3 TEST SETUP



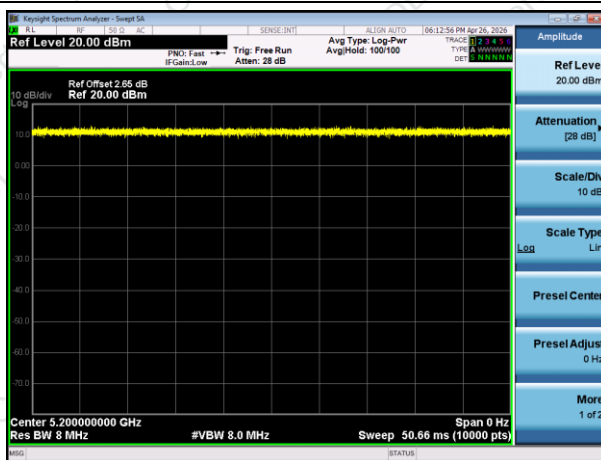


10.4 TEST RESULTS

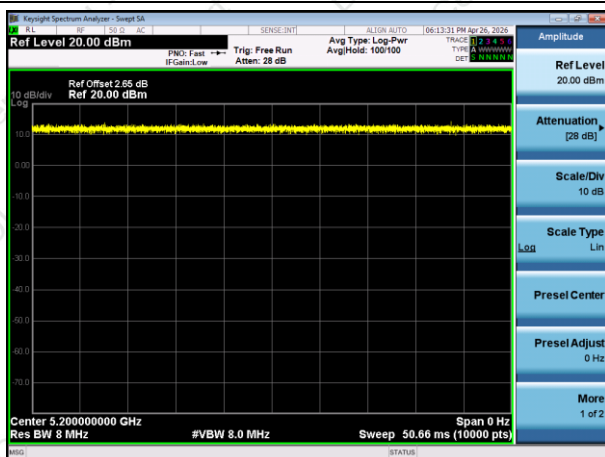
5.2G			
Mode	Frequency (MHz)	Duty Cycle (%)	Result
802.11a	5200	100	Pass
802.11n20	5200	100	Pass
802.11n40	5200	100	Pass
802.11ac20	5200	100	Pass
802.11ac40	5190	100	Pass
802.11ac80	5210	100	Pass



802.11a

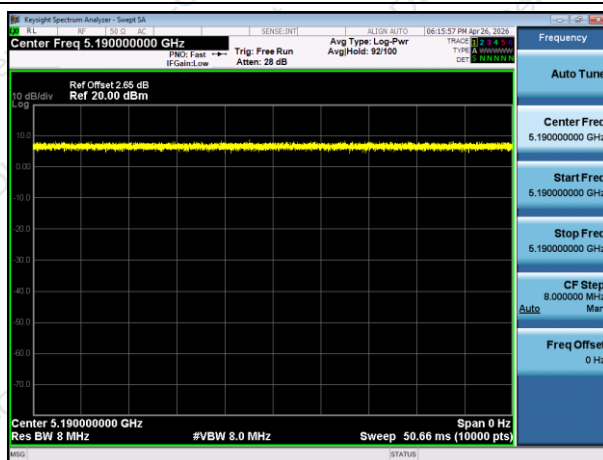


802.11n20

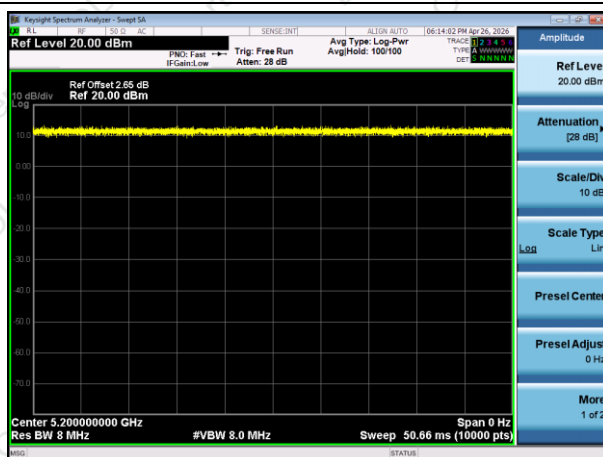




802.11n40

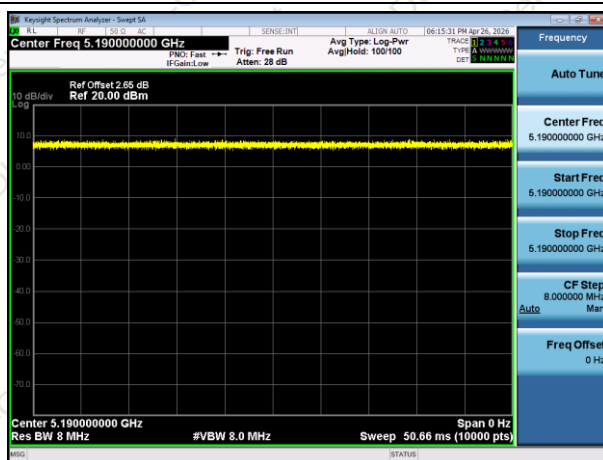


802.11ac20

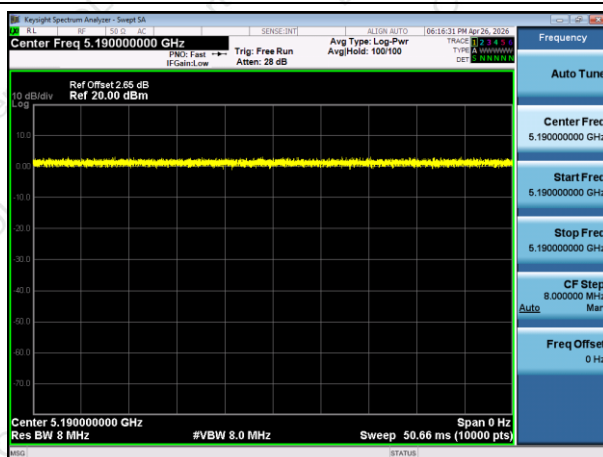




802.11ac40



802.11ac80



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

Duty Cycle= Ton /Total*100%

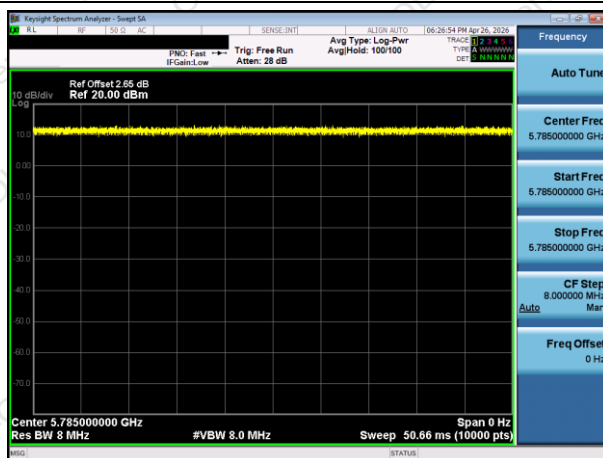
Duty Cycle Correction Factor = 10log (1/Duty Cycle)



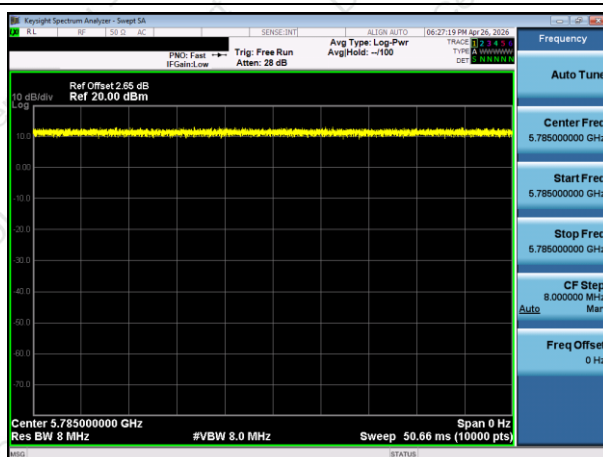
5.8G			
Mode	Frequency (MHz)	Duty Cycle (%)	Result
802.11a	5785	100	Pass
802.11n20	5785	100	Pass
802.11n40	5755	100	Pass
802.11ac20	5785	100	Pass
802.11ac40	5755	100	Pass
802.11ac80	5775	100	Pass



802.11a

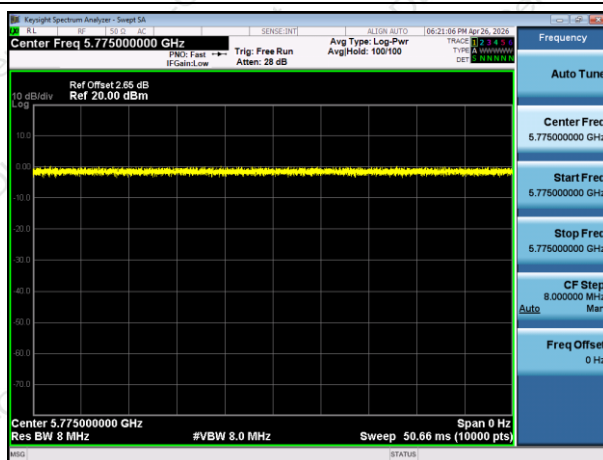


802.11n20

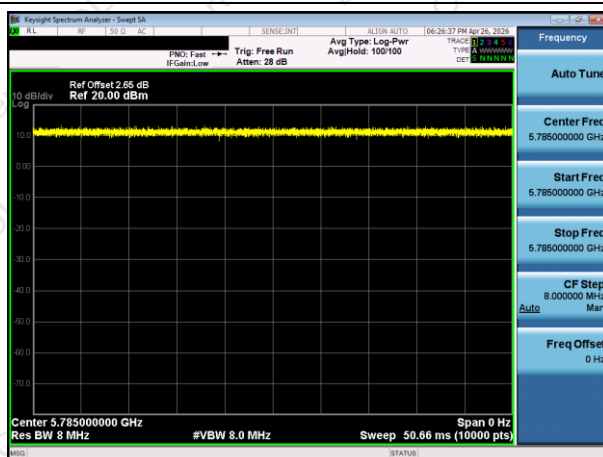




802.11n40

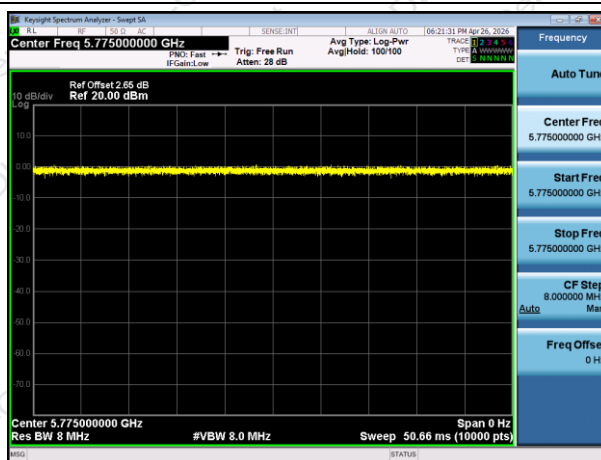


802.11ac20

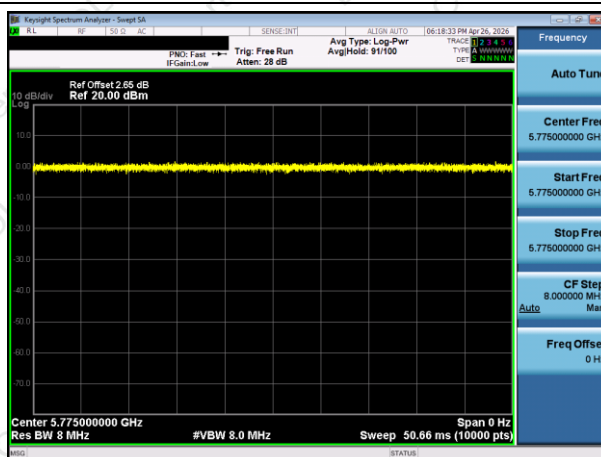




802.11ac40



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)

**11.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 FPCB Antenna, the best case gain of the antenna A/B is 2.46dBi, reference to the appendix II for details	



12. TEST SETUP PHOTO

Reference to the appendix I for details.

13. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

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