



## 8. OUT OF BAND EMISSIONS AND SPURIOUS EMISSION

### 8.1 APPLICABLE STANDARD

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of  $-17$  dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

### 8.2 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### 8.3 DEVIATION FROM STANDARD

No deviation.

### 8.4 TEST SETUP



### 8.5 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.

### 8.6 TEST RESULTS

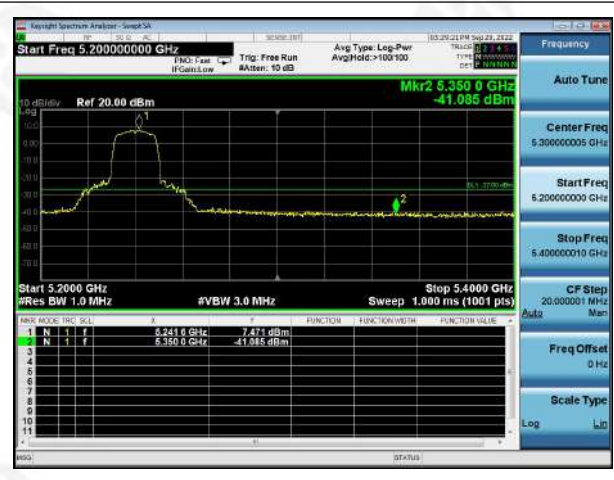


ANT 1

802.11a

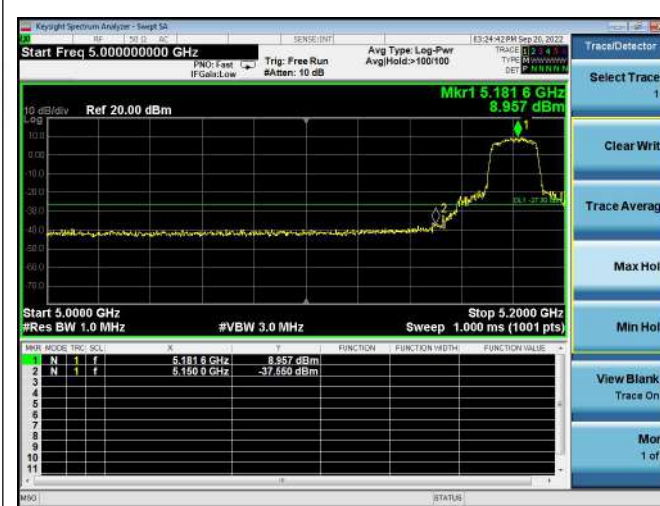


5180MHz



5240MHz

802.11n HT20

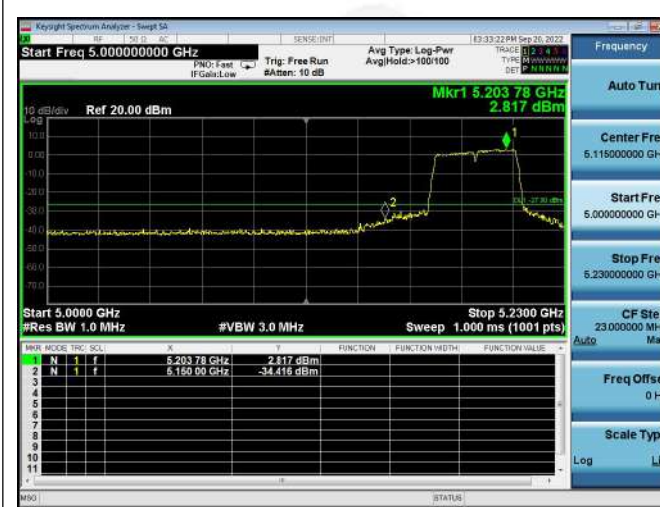


5180MHz



5240MHz

802.11n HT40



5190MHz



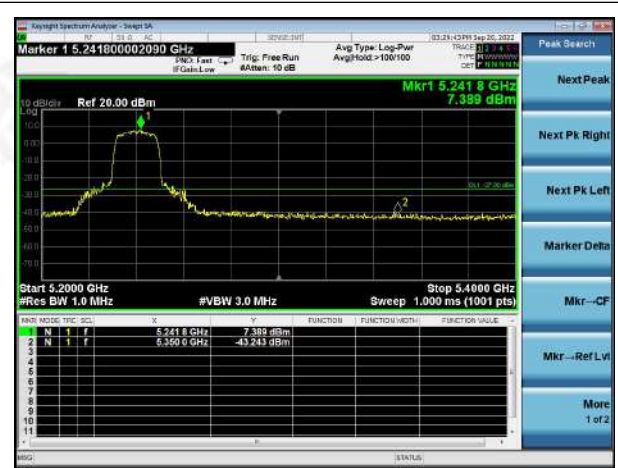
5230MHz



802.11ac HT20

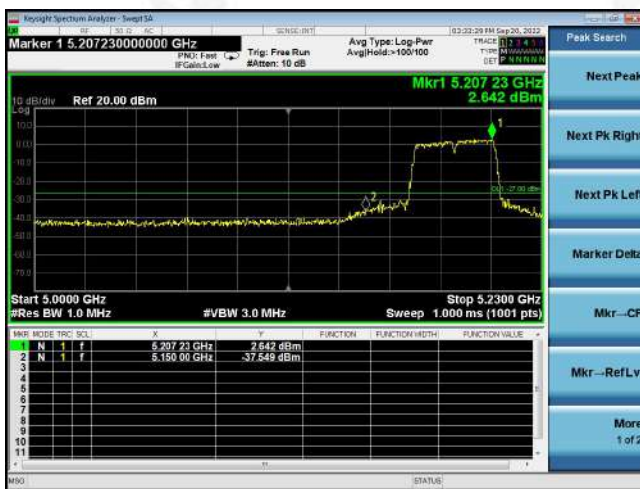


5180MHz



5240MHz

802.11ac HT40

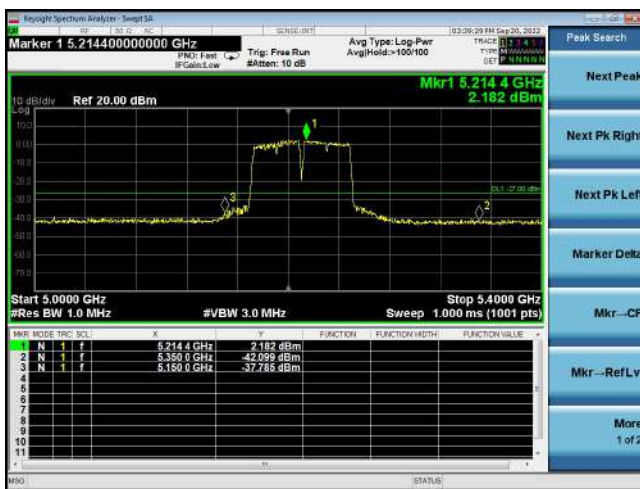


5190MHz



5230MHz

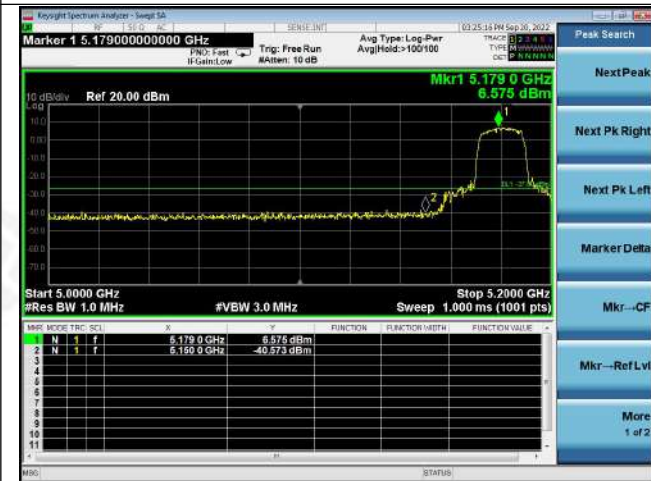
802.11ac HT80



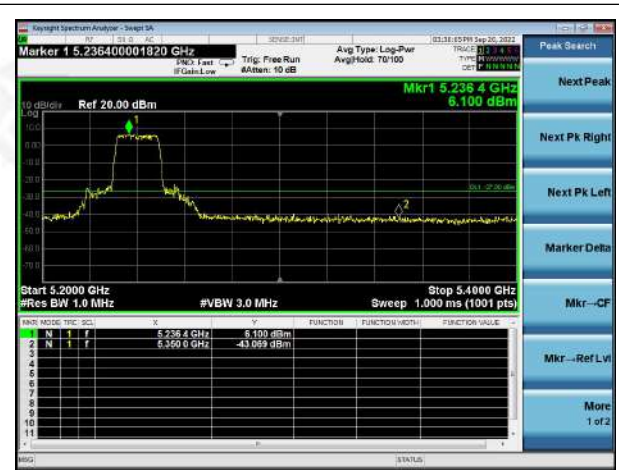
5210MHz



802.11ax HT20



5180MHz



5240MHz

802.11ax HT40

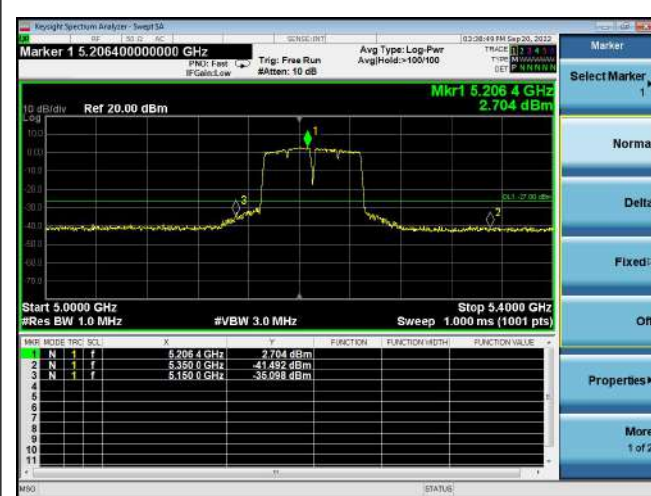


5190MHz



5230MHz

802.11ax HT80



5210MHz



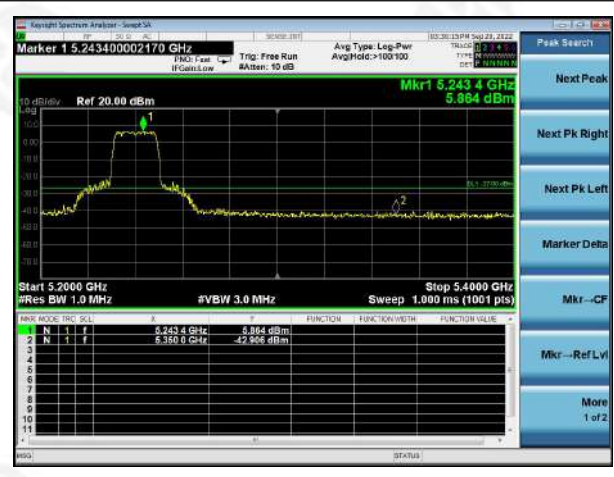


ANT 2

802.11a

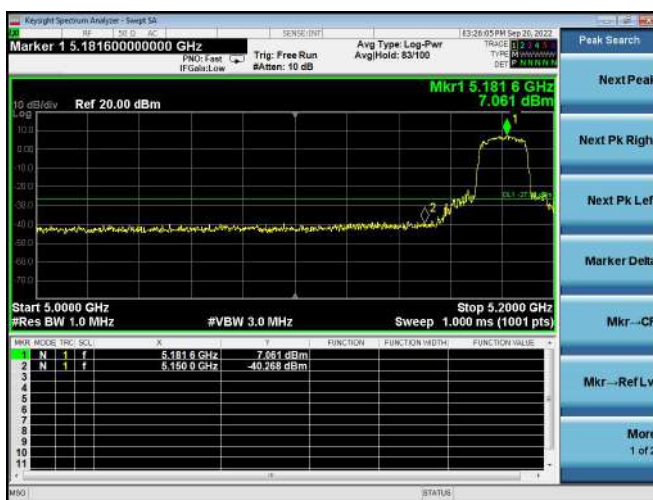


5180MHz



5240MHz

802.11n HT20



5180MHz



5240MHz

802.11n HT40



5190MHz



5230MHz



802.11ac HT20



5180MHz



5240MHz

802.11ac HT40

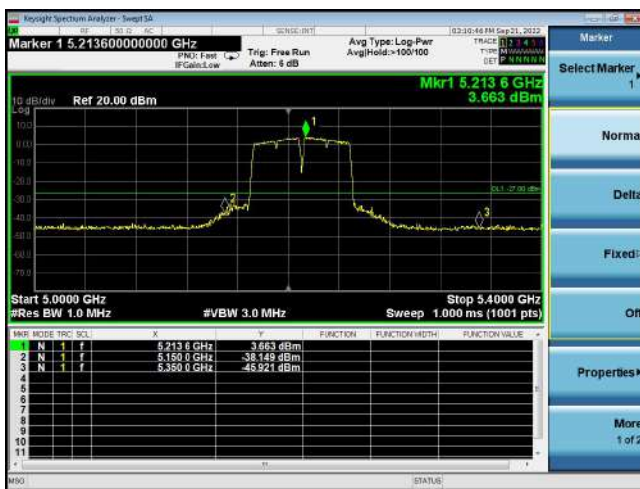


5190MHz



5230MHz

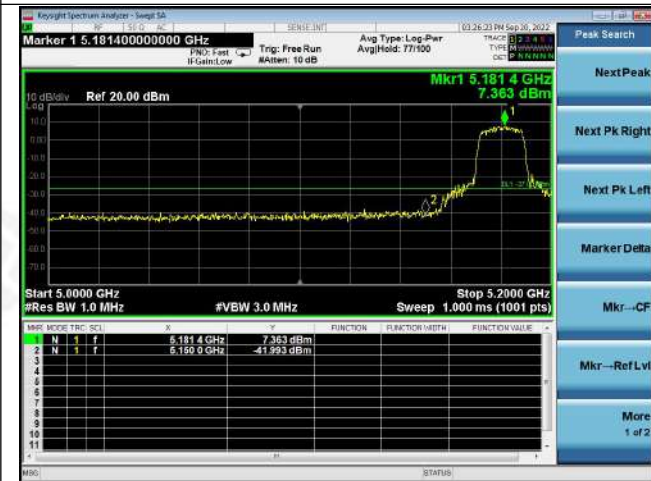
802.11ac HT80



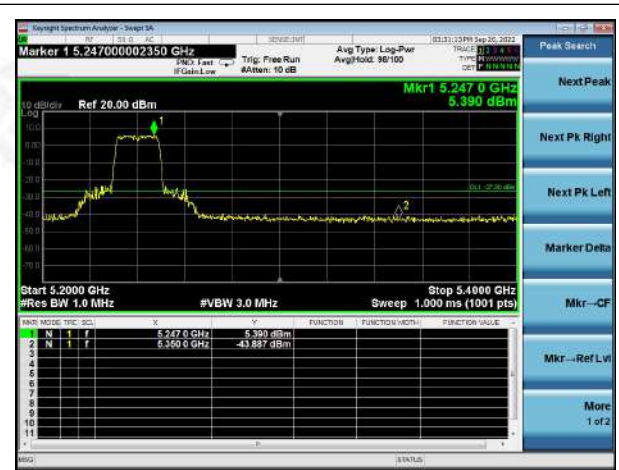
5210MHz



802.11ax HT20



5180MHz



5240MHz

802.11ax HT40

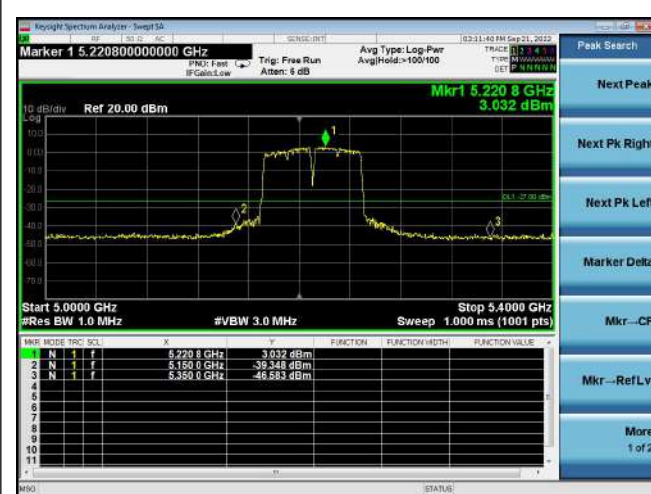


5190MHz



5230MHz

802.11ax HT80



5210MHz



ANT 1

802.11a

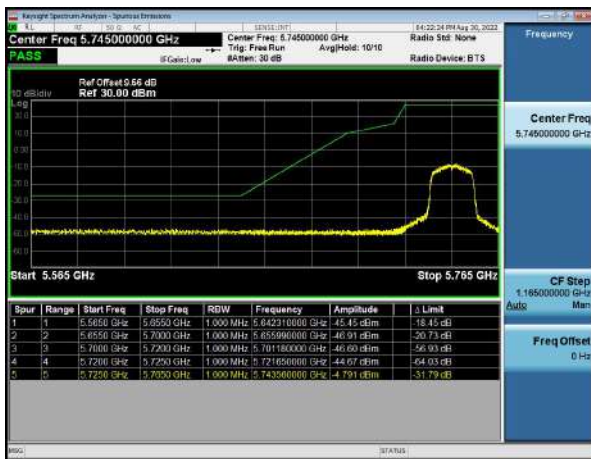


5745MHz



5825MHz

802.11n HT20

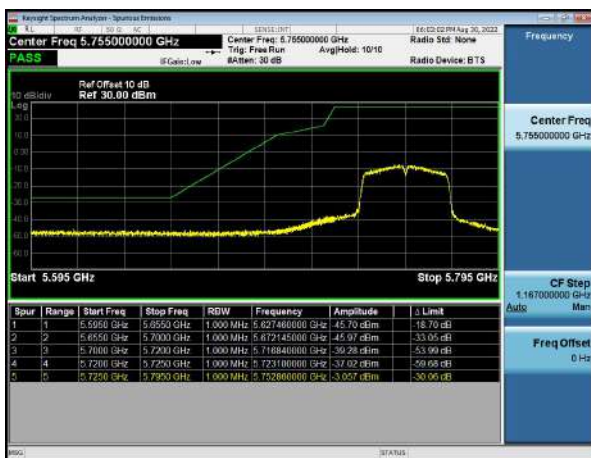


5745MHz



5825MHz

802.11n HT40



5755MHz

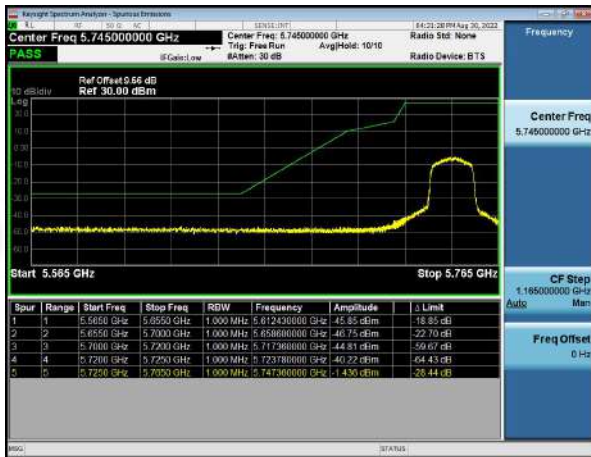


5795MHz





802.11ac VHT20



5745MHz



5825MHz

802.11ac VHT40

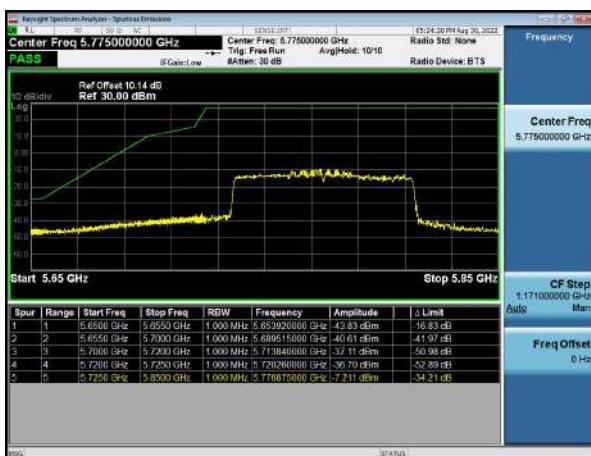


5755MHz



5795MHz

802.11ac VHT80

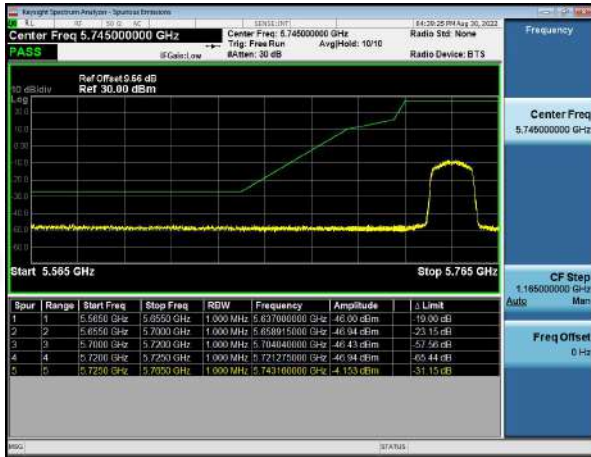


5775MHz

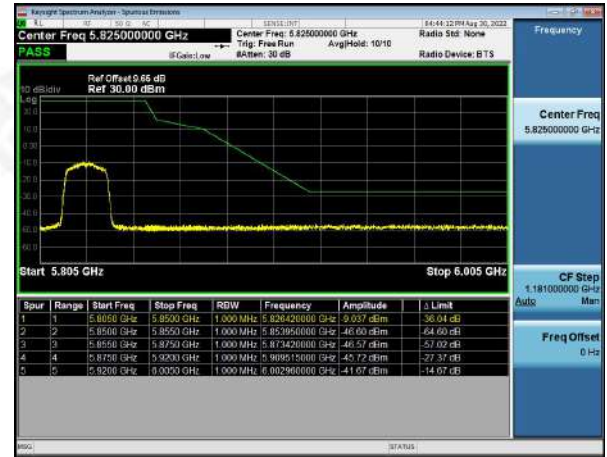




802.11ax HE20



5745MHz



5825MHz

802.11ax HE40

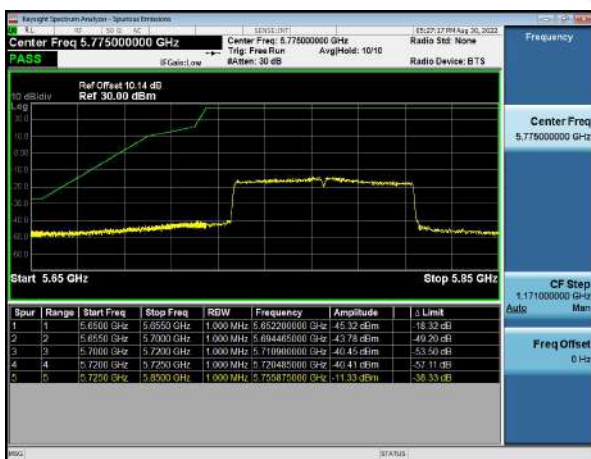


5755MHz



5795MHz

802.11ax HE80



5775MHz



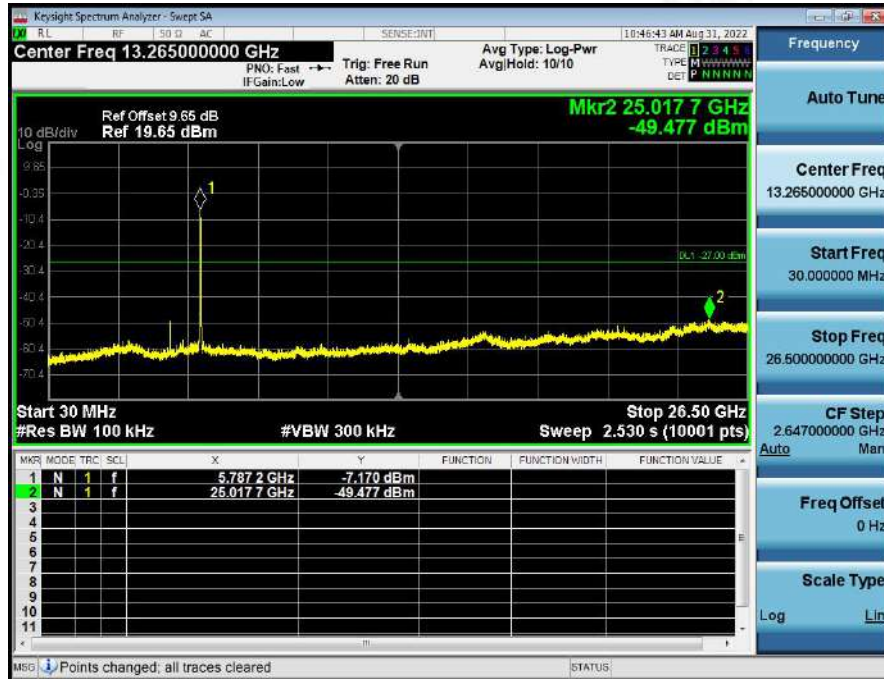


Test plot as follows:  
We test all the modes and recorded the worst mode

ANT1- 802.11a  
Lowest channel

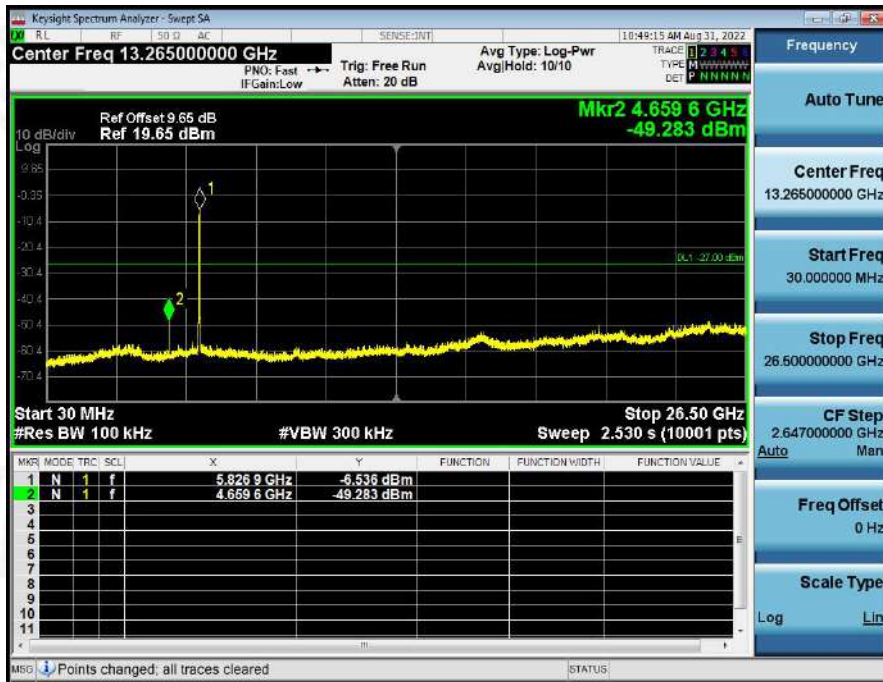


Middle channel





Highest channel





ANT 2

802.11a

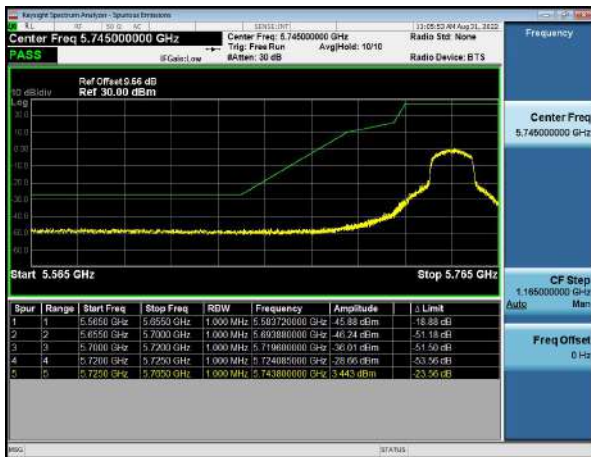


5745MHz



5825MHz

802.11n HT20



5745MHz



5825MHz

802.11n HT40



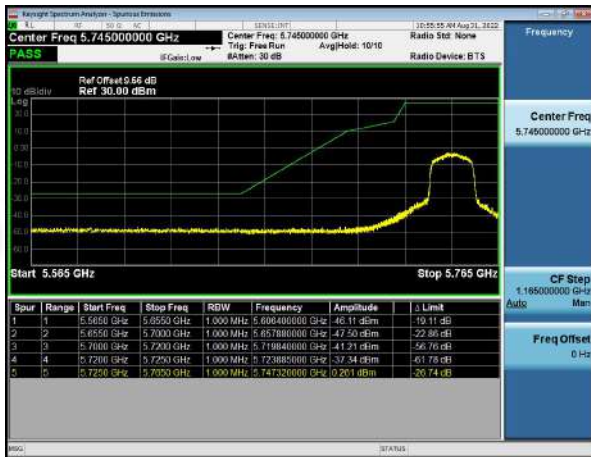
5755MHz



5795MHz



### 802.11ac VHT20



5745MHz



5825MHz

### 802.11ac VHT40

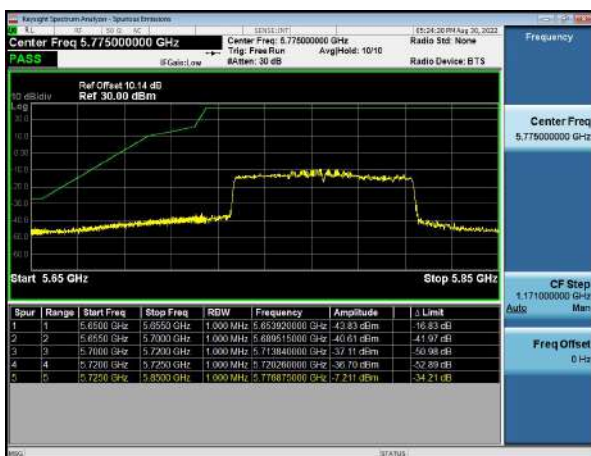


5755MHz



5795MHz

### 802.11ac VHT80

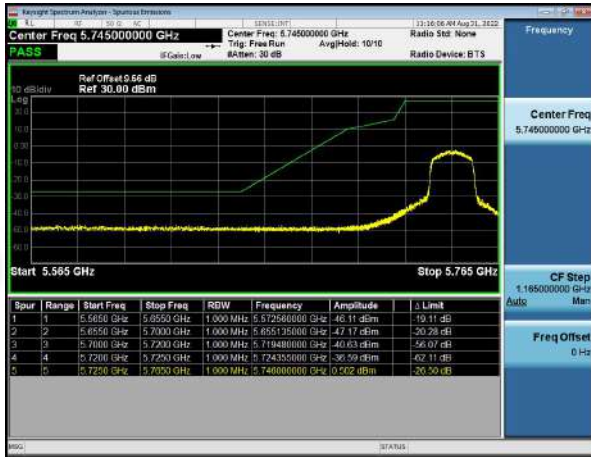


5775MHz





802.11ax HE20



5745MHz



5825MHz

802.11ax HE40

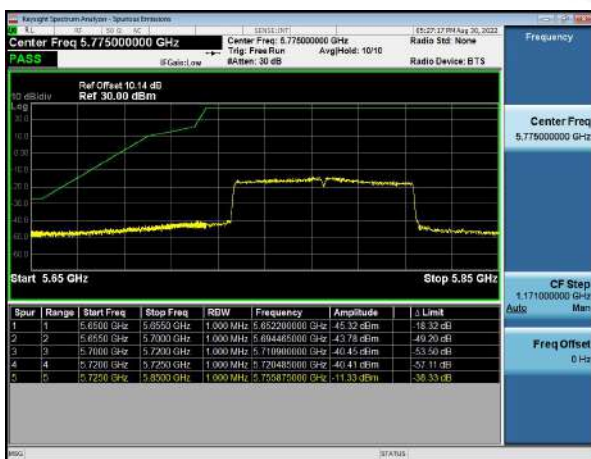


5755MHz



5795MHz

802.11ax HE80



5775MHz

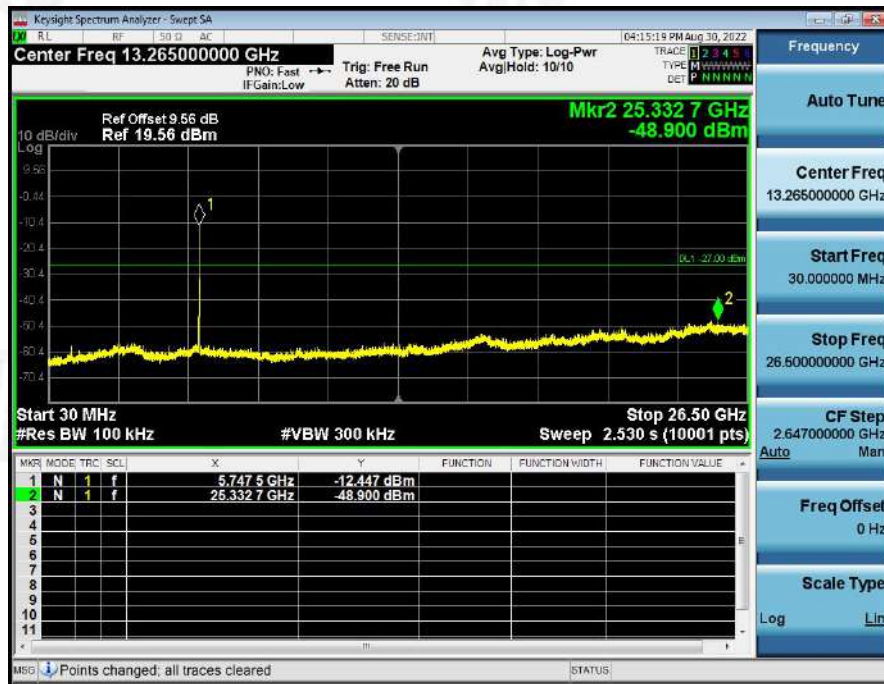




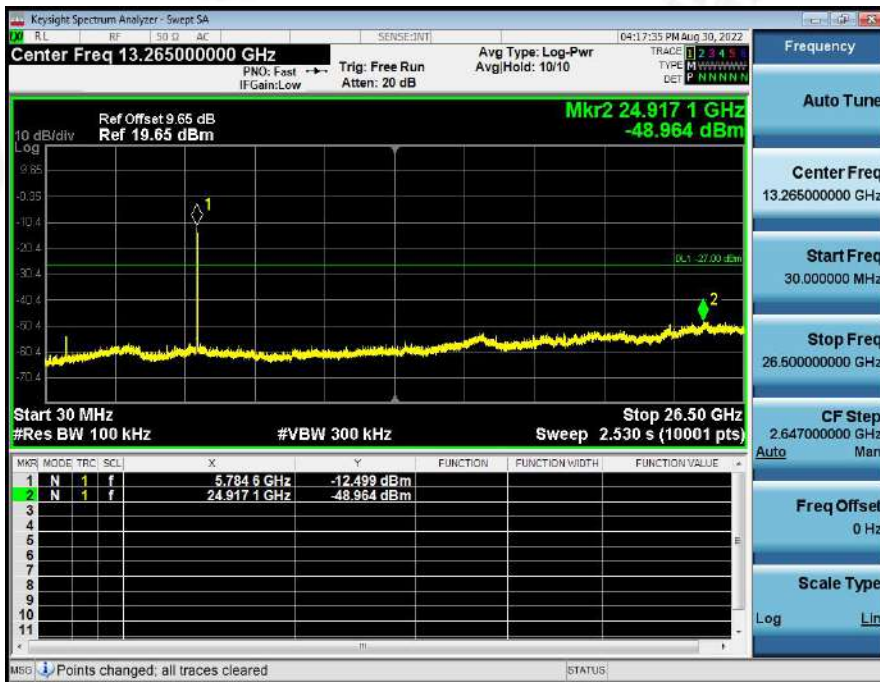
Test plot as follows:  
We test all the modes and recorded the worst mode

ANT2- 802.11a

Lowest channel



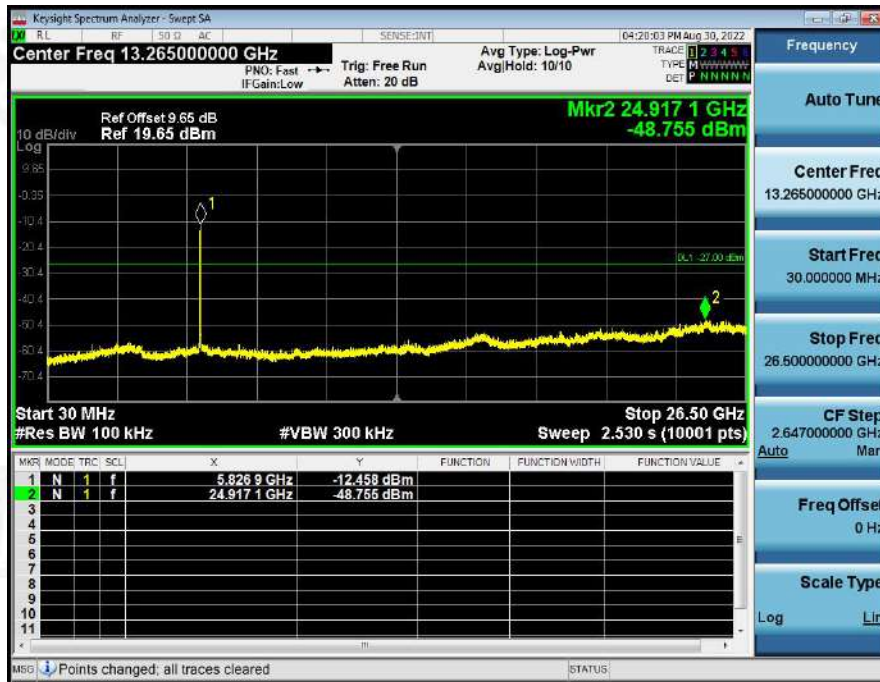
Middle channel







Highest channel





## 9. TRANSMISSION IN THE ABSENCE OF DATA

### 9.1 CONFORMANCE LIMIT

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 RESULTS

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



## 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  $\pm 20$  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.  $f_c$  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  $\pm 20$  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  $-20^\circ\text{C} \sim 70^\circ\text{C}$ .

### 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 °C	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	AC 120V
Test Mode :	TX		



Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)				ΔFrequency (MHz)			
			802.11a	802.11n HT20	802.11ac VHT20	802.11ax HE20	802.11a	802.11n HT20	802.11ac VHT20	802.11ax HE20
132V	-20 °C	5745	5745.0347	5745.0332	5745.0363	5745.0318	-0.0347	-0.0332	-0.0363	-0.0318
		5785	5785.0321	5785.0314	5785.0335	5785.0362	-0.0321	-0.0314	-0.0335	-0.0362
		5825	5825.0314	5825.0365	5825.0324	5825.0426	-0.0314	-0.0365	-0.0324	-0.0426
108V		5745	5745.0234	5745.0271	5745.0253	5745.0351	-0.0234	-0.0271	-0.0253	-0.0351
		5785	5785.0373	5785.0369	5785.0331	5785.0432	-0.0373	-0.0369	-0.0331	-0.0432
		5825	5825.0445	5825.0444	5825.0463	5825.0381	-0.0445	-0.0444	-0.0463	-0.0381
120V	25 °C	5745	5745.0334	5745.0321	5745.0327	5745.0421	-0.0334	-0.0321	-0.0327	-0.0421
		5785	5785.0421	5785.0414	5785.0454	5785.0362	-0.0421	-0.0414	-0.0454	-0.0362
		5825	5825.0237	5825.0233	5825.0233	5825.0426	-0.0237	-0.0233	-0.0233	-0.0426
132V	50 °C	5745	5745.0655	5745.0675	5745.0655	5745.0369	-0.0655	-0.0675	-0.0655	-0.0369
		5785	5785.0431	5785.0454	5785.0484	5785.0328	-0.0431	-0.0454	-0.0484	-0.0328
		5825	5825.0643	5825.0663	5825.0636	5825.0344	-0.0643	-0.0663	-0.0636	-0.0344
108V	50 °C	5745	5745.0464	5745.0424	5745.0458	5745.0372	-0.0464	-0.0424	-0.0458	-0.0372
		5785	5785.0213	5785.0264	5785.0264	5785.0442	-0.0213	-0.0264	-0.0264	-0.0442
		5825	5825.0754	5825.0751	5825.0772	5825.0428	-0.0754	-0.0751	-0.0772	-0.0428

Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)			ΔFrequency (MHz)		
			802.11n HT40	802.11ac VHT40	802.11ax HE40	802.11n HT40	802.11ac VHT40	802.11ax HE40
132V	-20 °C	5755	5755.0544	5755.0551	5755.0538	-0.0544	-0.0551	-0.0538
		5795	5795.0666	5795.0633	5795.0514	-0.0666	-0.0633	-0.0514
108V		5755	5755.0238	5755.0548	5755.0496	-0.0238	-0.0548	-0.0496
		5795	5795.0476	5795.0444	5795.0427	-0.0476	-0.0444	-0.0427
120V	25 °C	5755	5755.0284	5755.0238	5755.0358	-0.0284	-0.0238	-0.0358
		5795	5795.0533	5795.0557	5795.0368	-0.0533	-0.0557	-0.0368
132V	50 °C	5755	5755.0448	5755.0453	5755.0512	-0.0448	-0.0453	-0.0512
		5795	5795.0364	5795.0368	5795.0416	-0.0364	-0.0368	-0.0416
108V	50 °C	5755	5755.0323	5755.0322	5755.0682	-0.0323	-0.0322	-0.0682
		5795	5795.0437	5795.0434	5795.0745	-0.0437	-0.0434	-0.0745



Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)		ΔFrequency (MHz)	
			802.11ac VHT80	802.11ax HE80	802.11ac VHT80	802.11ax HE80
132V	-20°C	5775	5775.0142	5775.0136	-0.0142	-0.0136
108V		5775	5775.0338	5775.0285	-0.0338	-0.0285
120V	25°C	5775	5775.0431	5775.0341	-0.0431	-0.0341
132V	50°C	5775	5775.0244	5775.0186	-0.0244	-0.0186
108V	50°C	5775	5775.0535	5775.0261	-0.0535	-0.0261



## 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 product has 2 antennas, The antenna is External Antenna, the best case gain of the antenna is 2.94 dBi@5G, 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 \*\*\*\*\*