

6. -26 DB & 6DBM EMISSION BANDWIDTH

Test Requirement:	Part 15 Subpart C Section 15.407 (e)
Test Method:	KDB 789033 D02 v02r01

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15.407 (e)		
Bandwidth		
Limit	U-NII-1	N/A
	U-NII-3	≥ 500 kHz

6.2 TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.

Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.

Set the spectrum analyzers RBW = approximately 1% of the emission bandwidth, VBW >RBW, Detector = Peak, Span>26dB bandwidth, and Sweep = auto ,Trace mode = max hold.

Measure the maximum width of the emission that is 26dB down from the maximum of the emission.

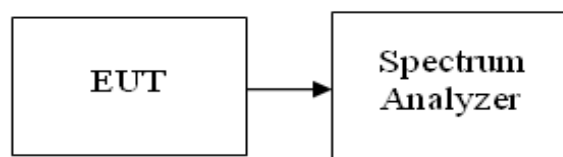
Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Repeat until all the rest channels were investigated.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 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.

6.6 TEST RESULT

Temperature :	26℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V
Test Mode :	TX		

U-NII-1

802.11 Mode	Channel No.	Frequency [MHz]	26dB Bandwidth [MHz]	
			ANT1	ANT2
a	36	5180	19.07	19.14
	40	5200	19.15	19.16
	48	5240	19.21	19.12
n (20MHz)	36	5180	19.34	19.52
	40	5200	19.44	19.71
	48	5240	19.70	19.56
n (40MHz)	38	5190	19.78	20.00
	46	5230	20.11	19.96
ac (20MHz)	36	5180	20.04	19.98
	40	5200	39.57	39.00
	48	5240	39.37	39.13
ac(40MHz)	38	5190	39.84	40.18
	46	5230	40.50	40.00
ac(80MHz)	42	5210	80.07	80.15

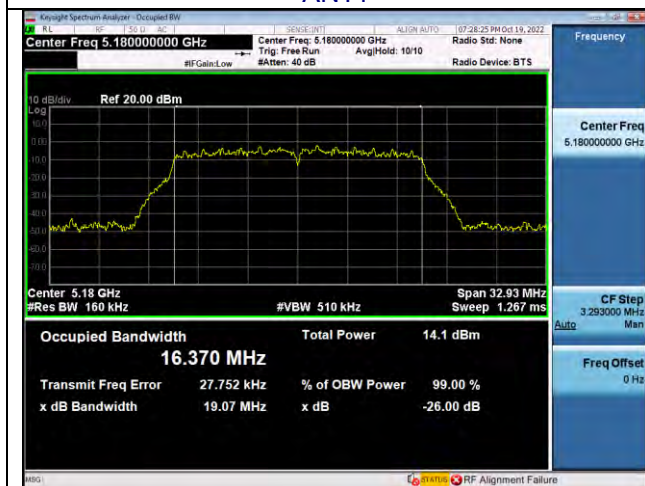
U-NII-3

802.11 Mode	Channel No.	Frequency [MHz]	-6db Bandwidth [MHz]		Limit
			ANT1	ANT2	
a	149	5745	16.32	16.34	≥ 500 kHz
	157	5785	16.04	16.33	
	165	5825	16.40	16.09	
n (20MHz)	149	5745	17.61	15.24	
	157	5785	16.00	16.86	
	165	5825	16.07	16.68	
ac (20MHz)	149	5745	17.69	17.66	
	157	5785	17.71	17.65	
	165	5825	17.66	17.62	
n (40MHz)	151	5755	35.12	35.10	
	159	5795	35.13	35.12	
ac(40MHz)	151	5755	35.96	36.43	
	159	5795	36.26	36.42	
ac(80MHz)	155	5775	76.34	76.51	

Test plot as follows:

U-NII-1 – 802.11a

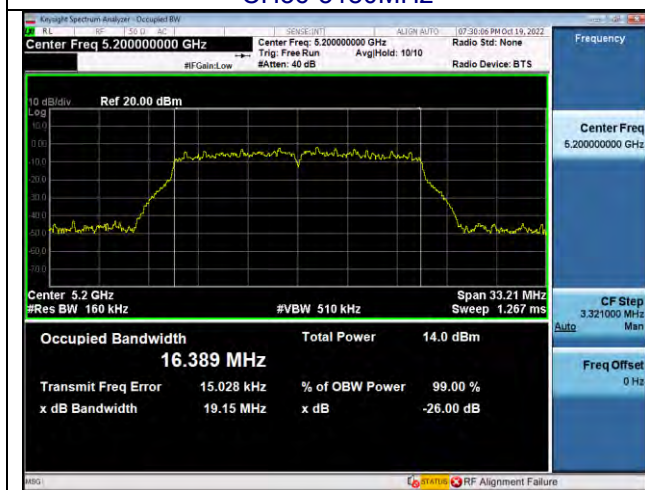
ANT1



ANT2



CH36-5180MHz



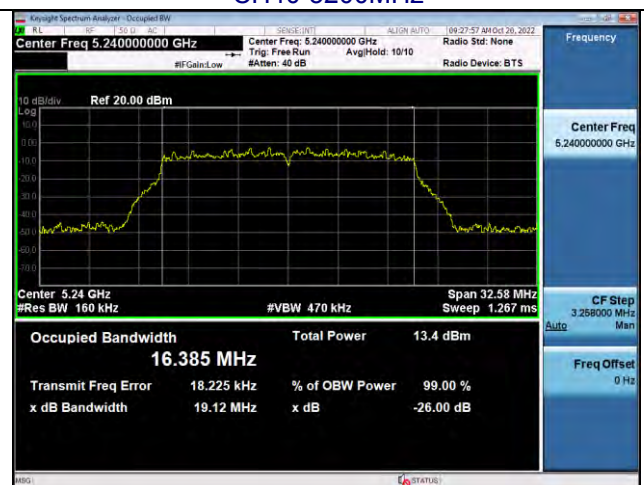
CH36-5180MHz



CH40-5200MHz



CH40-5200MHz



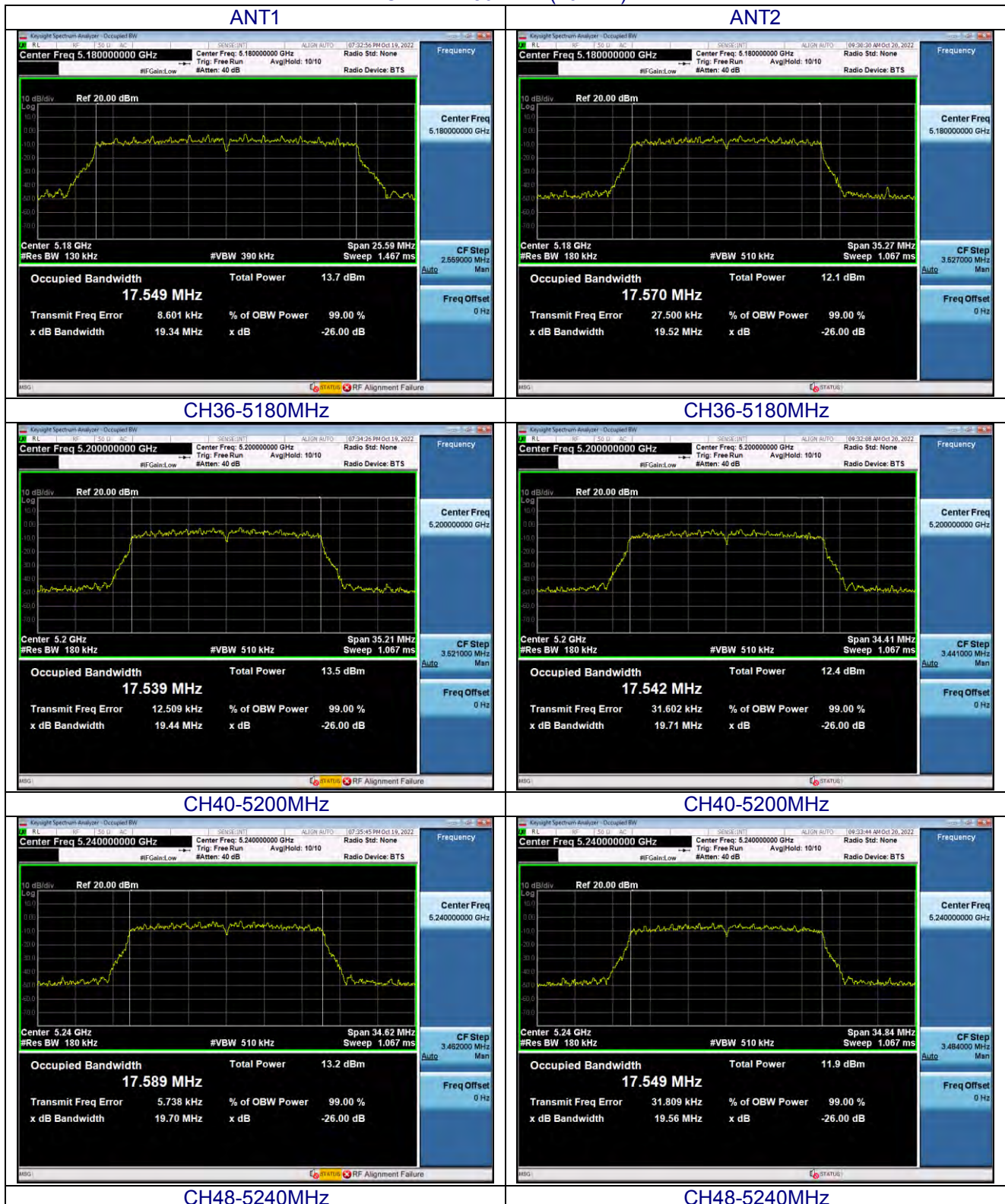
CH48-5240MHz



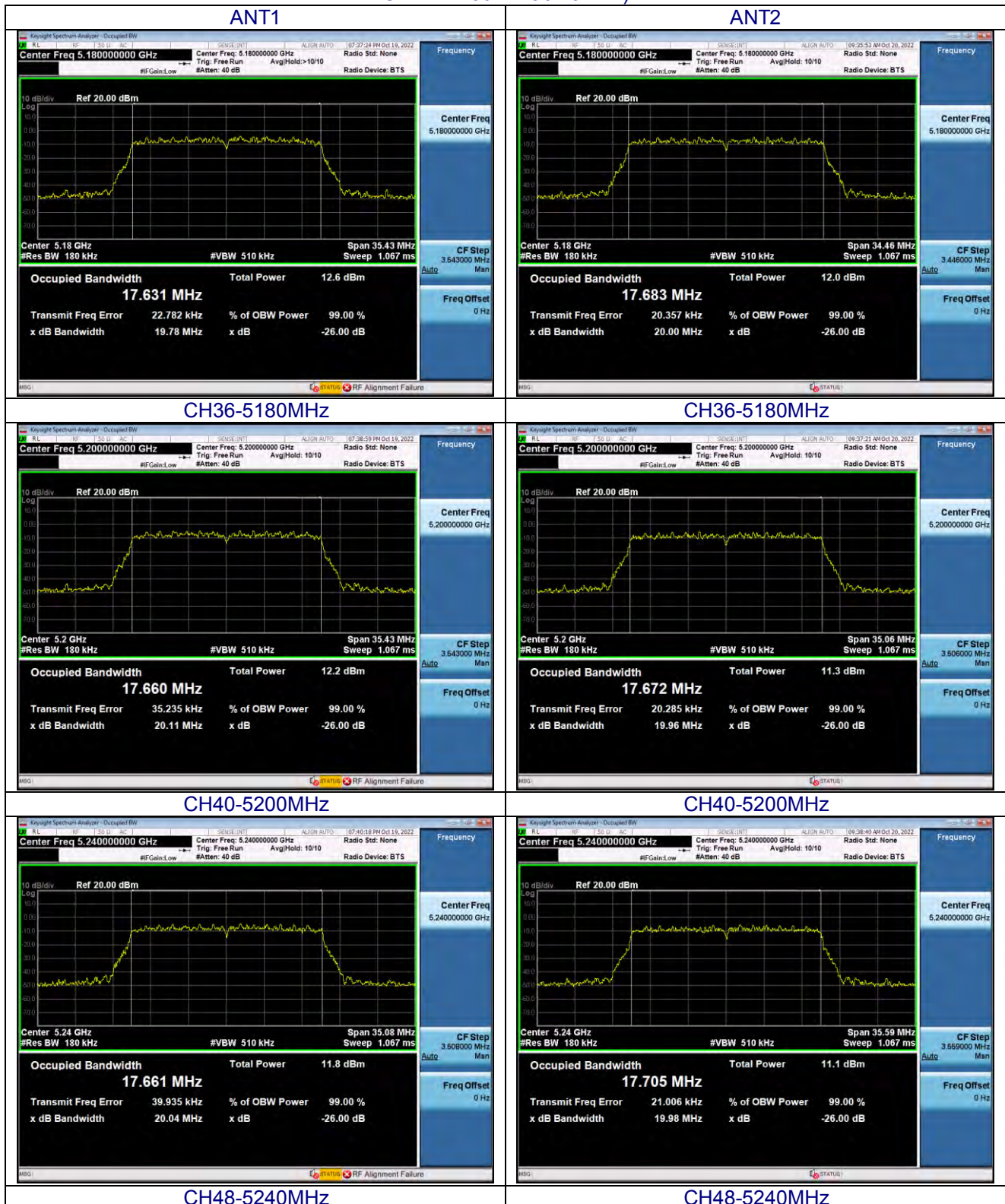
CH48-5240MHz



U-NII-1 – 802.11n (20MHz)

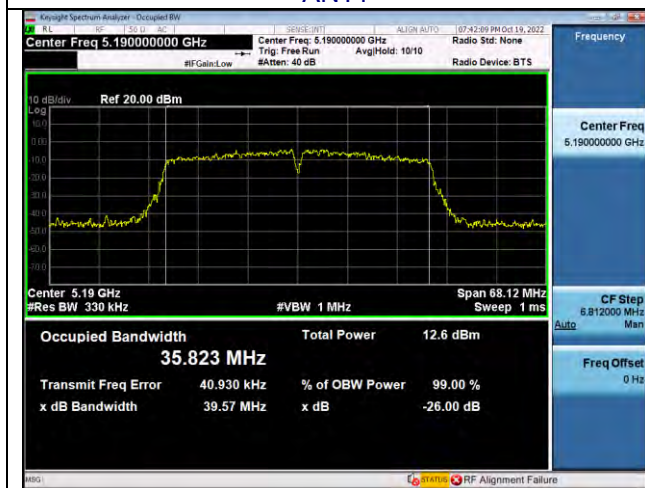


U-NII-1 – 802.11ac 20MHz)

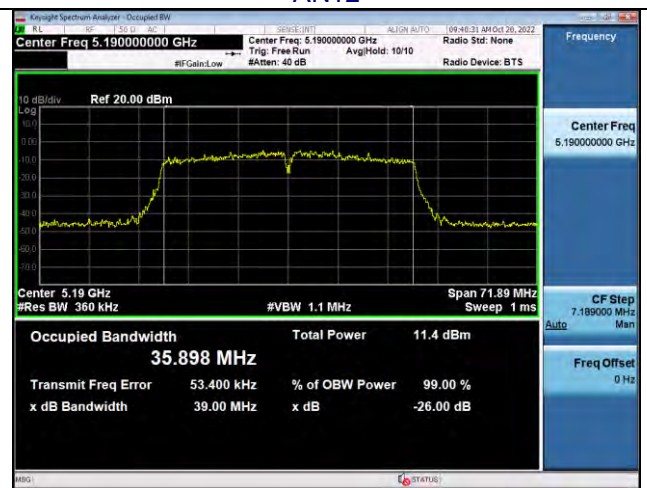


U-NII-1 – 802.11n (40MHz)

ANT1



ANT2



CH38-5190MHz



CH38-5190MHz



CH46-5230MHz

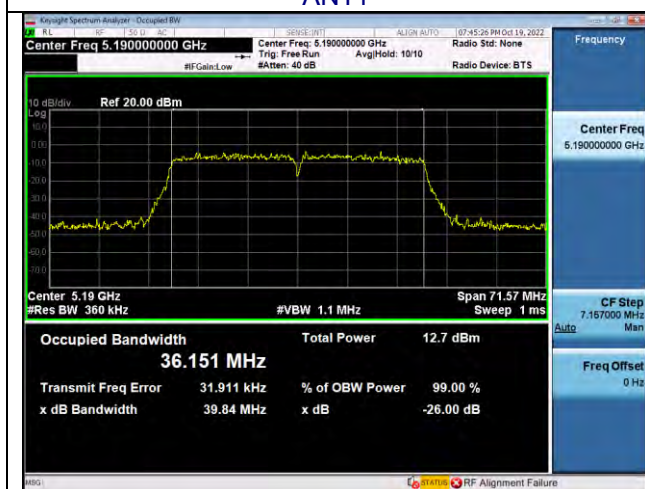


CH46-5230MHz

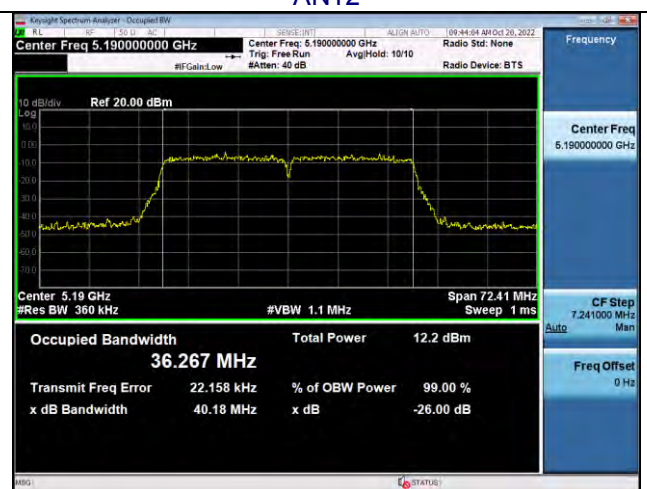


U-NII-1 – 802.11ac (40MHz)

ANT1



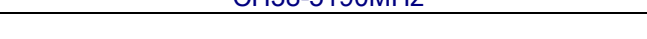
ANT2

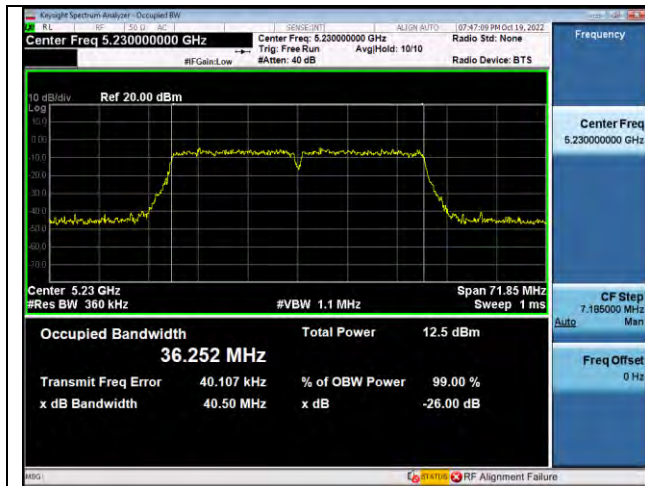


CH38-5190MHz

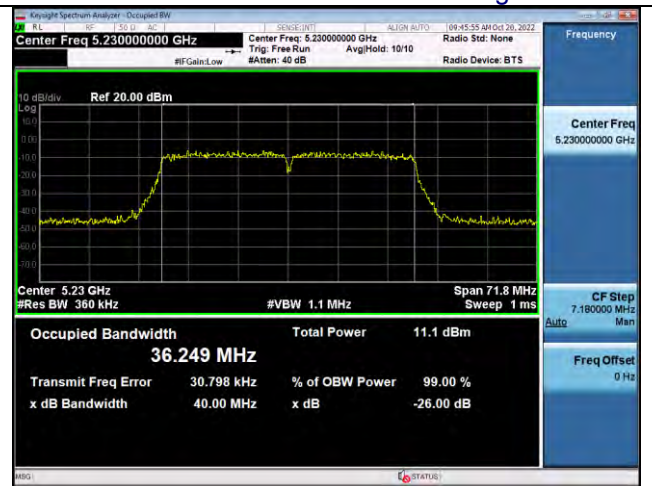


CH38-5190MHz





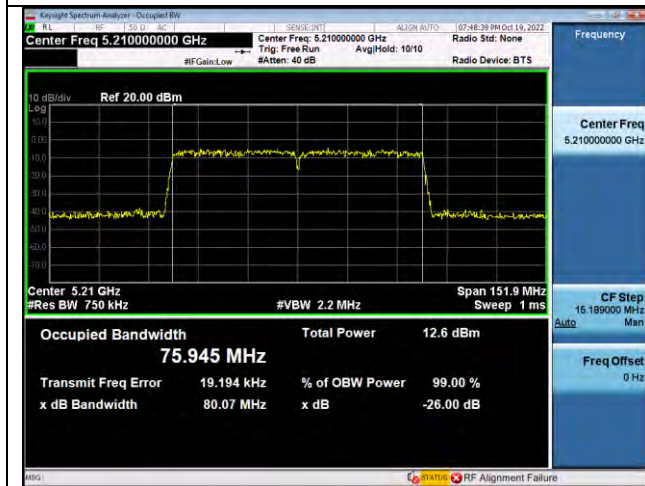
CH46-5230MHz



CH46-5230MHz

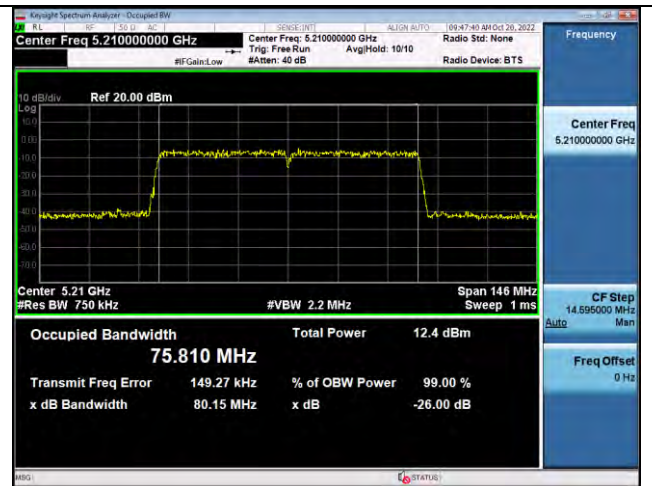
U-NII-1-802.11ac (80MHz)

ANT1



CH42 5210MHz

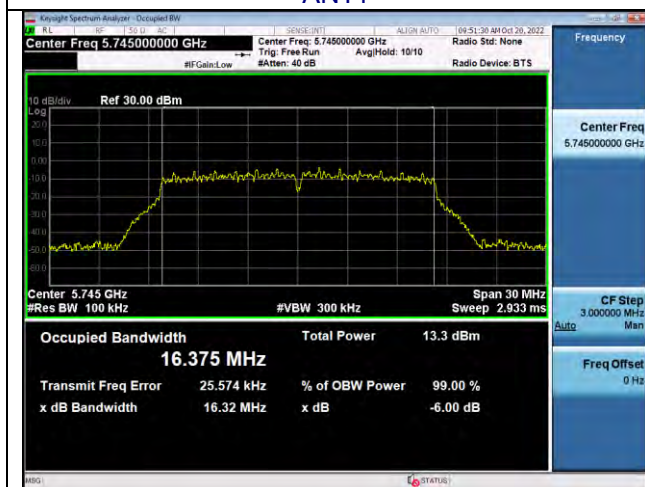
ANT2



CH42 5210MHz

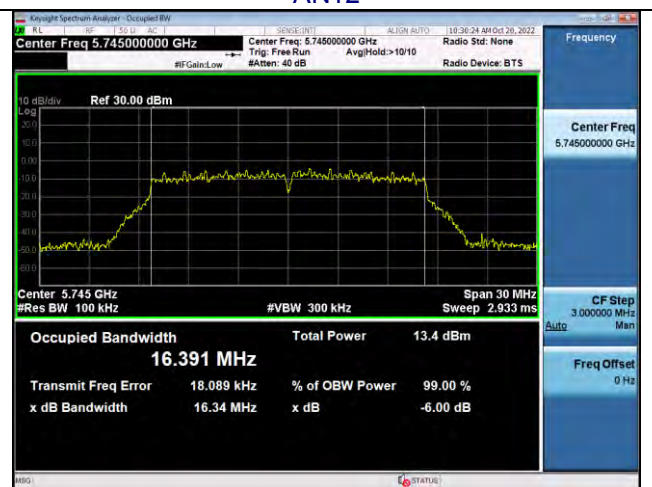
U-NII-3 -802.11a

ANT1

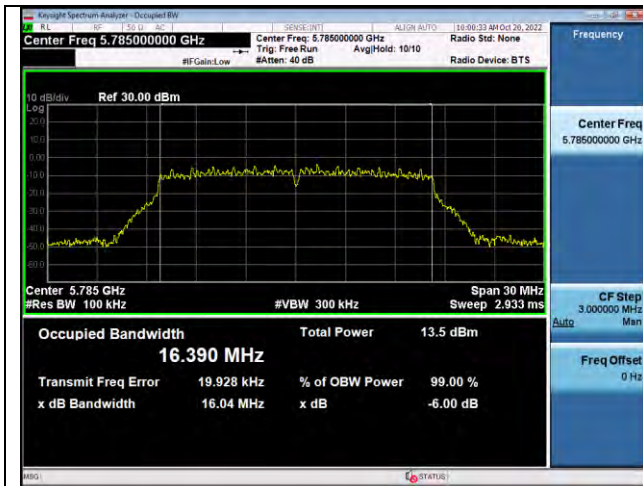


CH149 -5745MHz

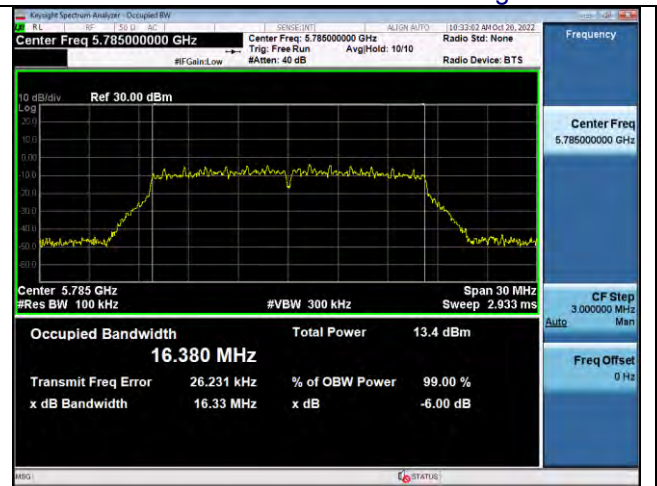
ANT2



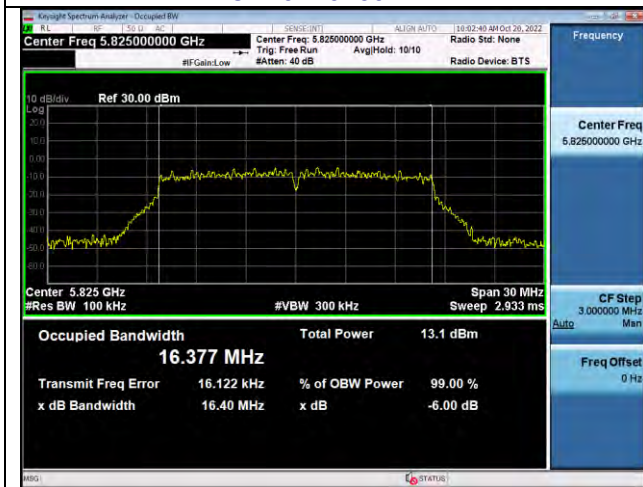
CH149 -5745MHz



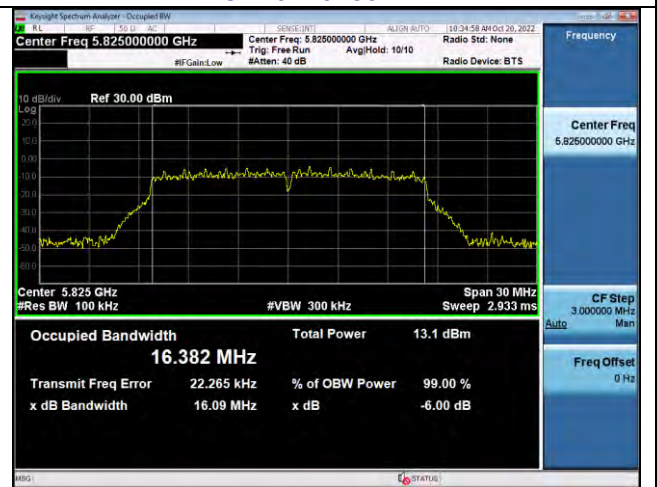
CH157 -5785MHz



CH157 -5785MHz

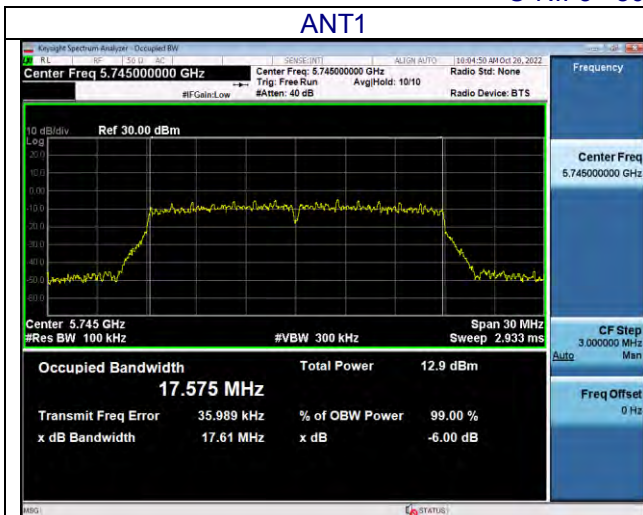


CH165 -5825MHz

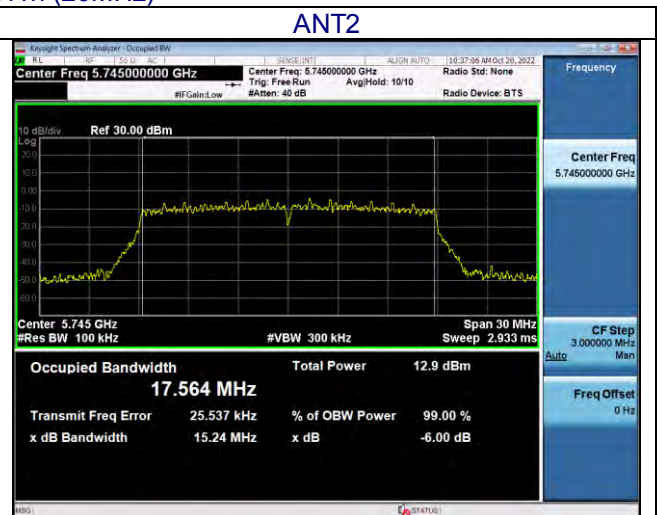


CH165 -5825MHz

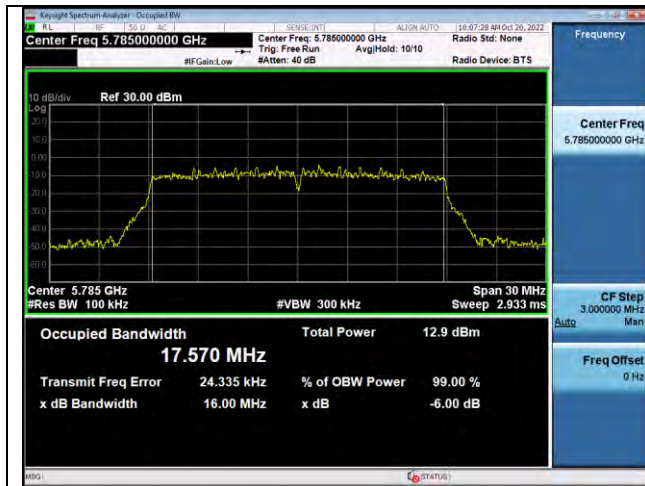
U-NII-3 -802.11n (20MHz)



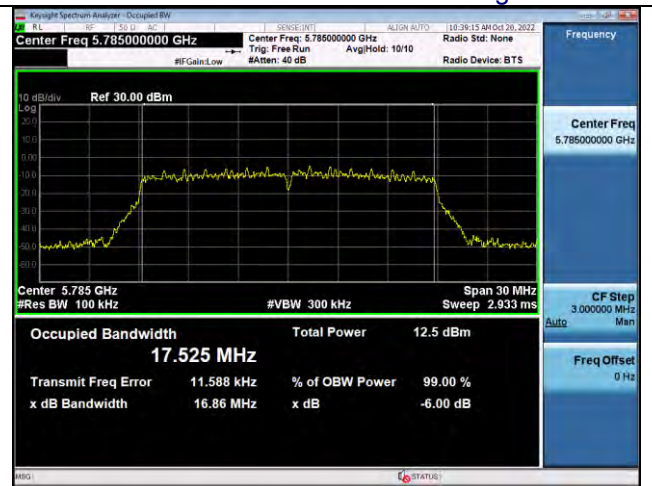
CH149 -5745MHz



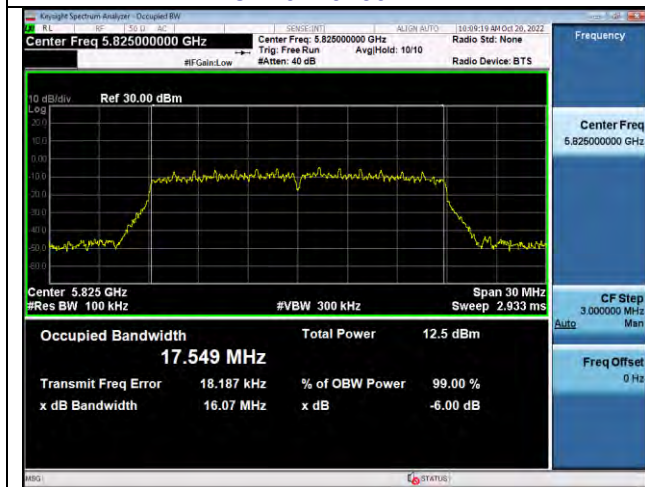
CH149 -5745MHz



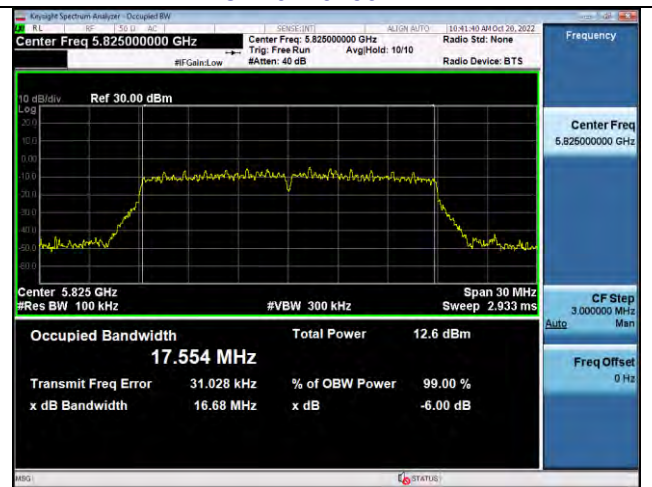
CH157 -5785MHz



CH157 -5785MHz

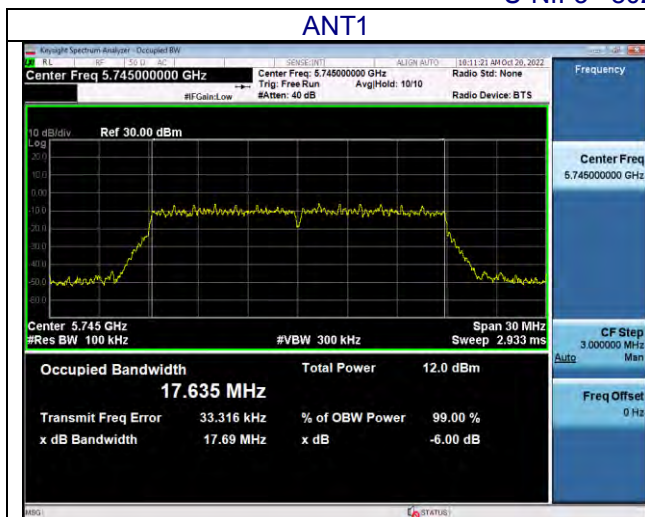


CH165 -5825MHz

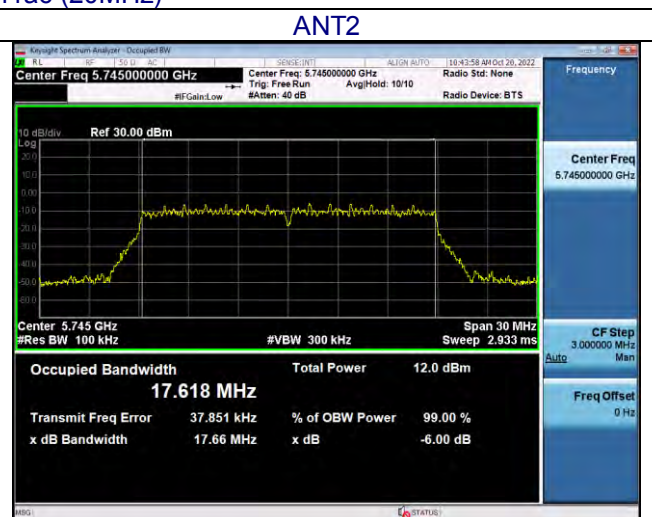


CH165 -5825MHz

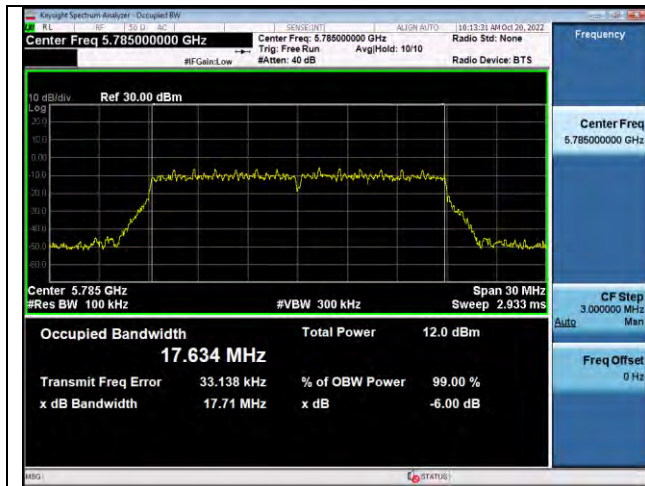
U-NII-3 -802.11ac (20MHz)



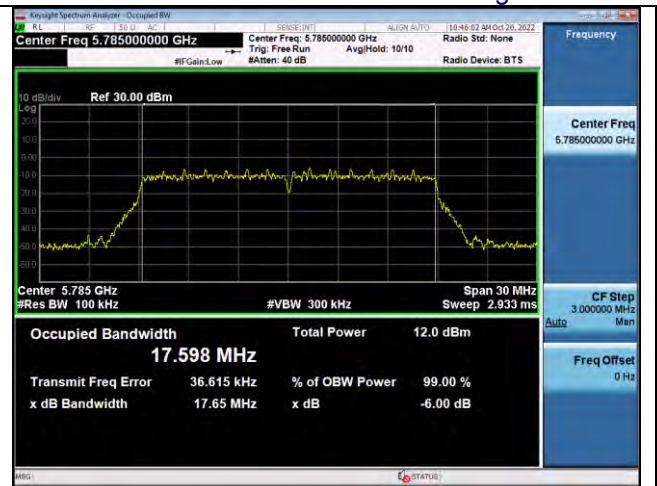
CH149 -5745MHz



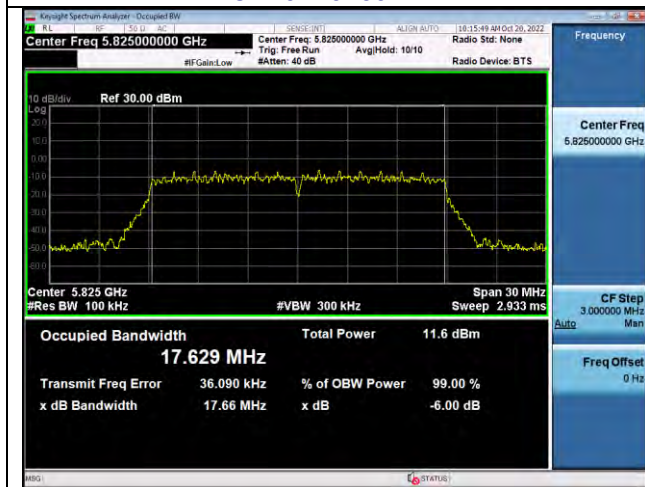
CH149 -5745MHz



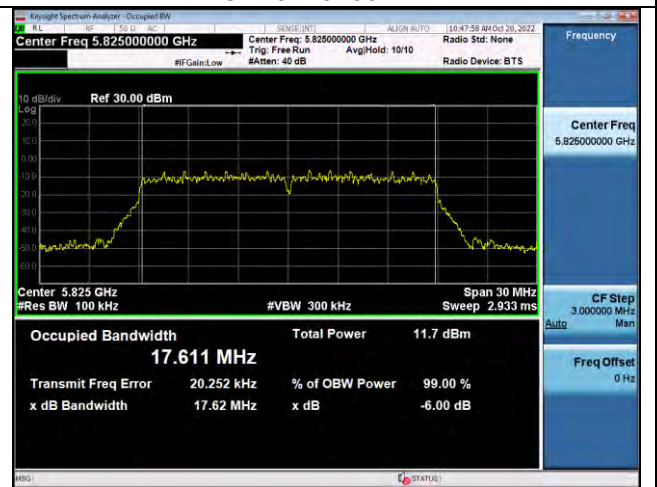
CH157 -5785MHz



CH157 -5785MHz

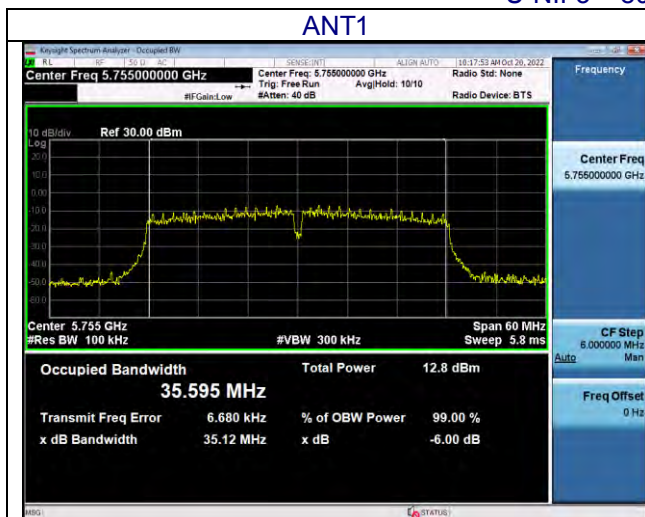


CH165 -5825MHz

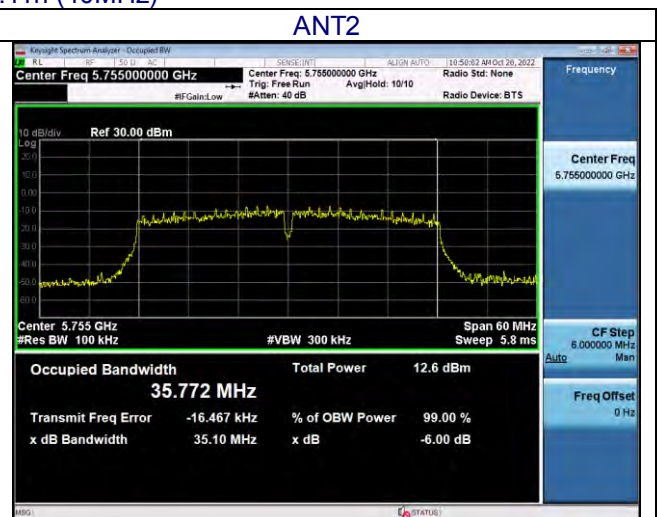


CH165 -5825MHz

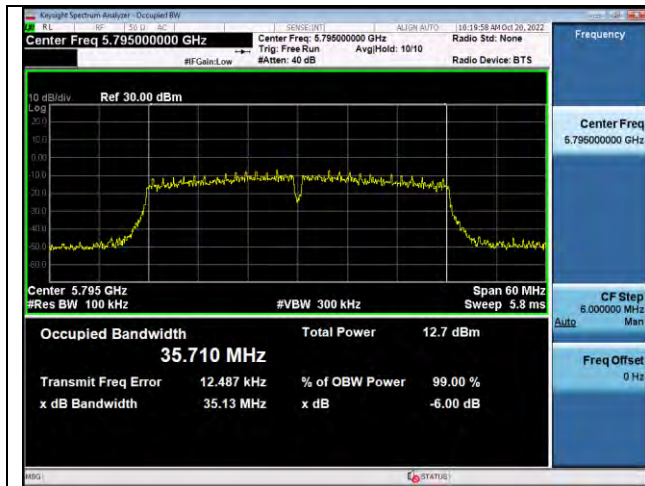
U-NII-3 – 802.11n (40MHz)



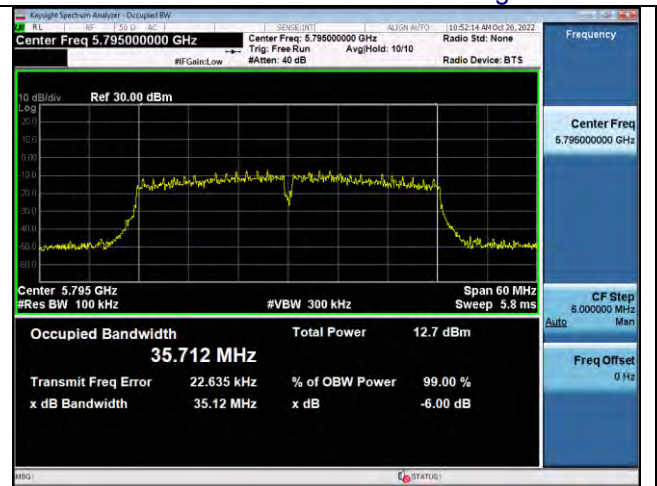
CH151 -5755MHz



CH151 -5755MHz



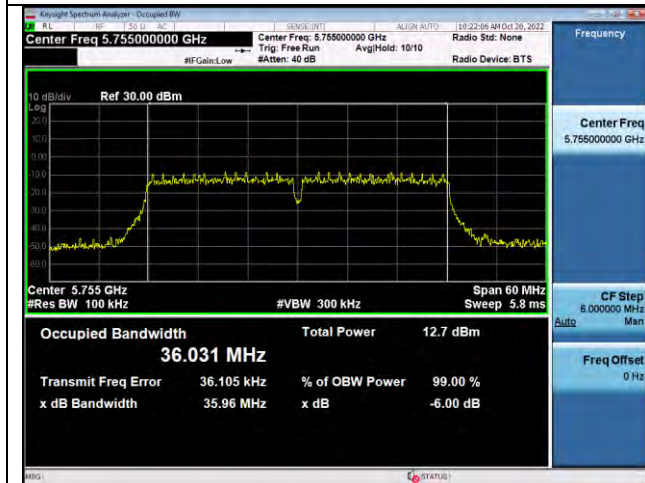
CH159 -5795MHz



CH159 -5795MHz

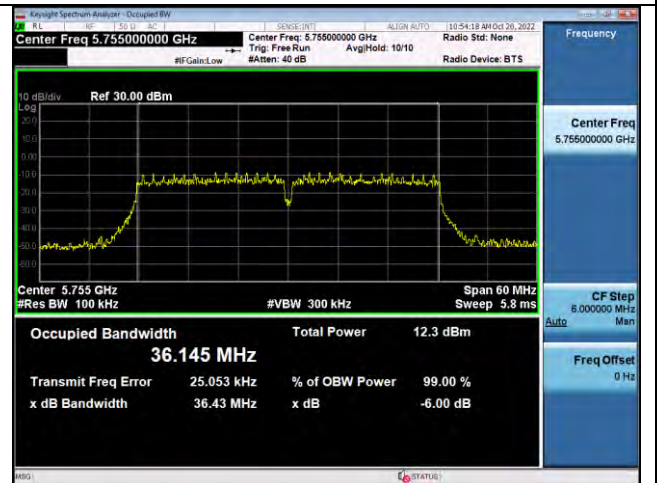
U-NII-3 – 802.11ac (40MHz)

ANT1



CH151 -5755MHz

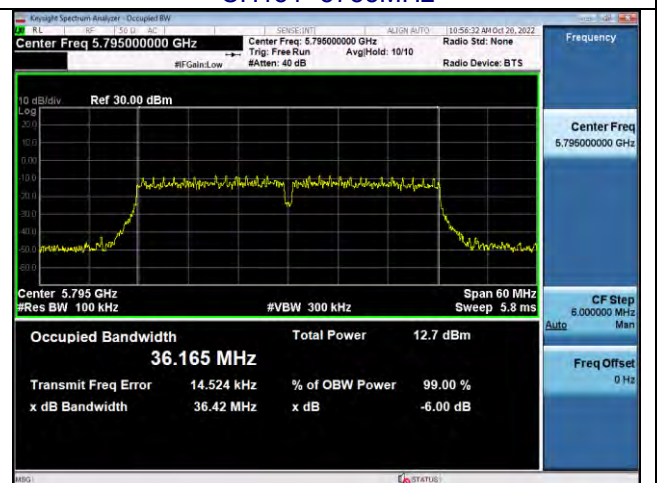
ANT2



CH151 -5755MHz

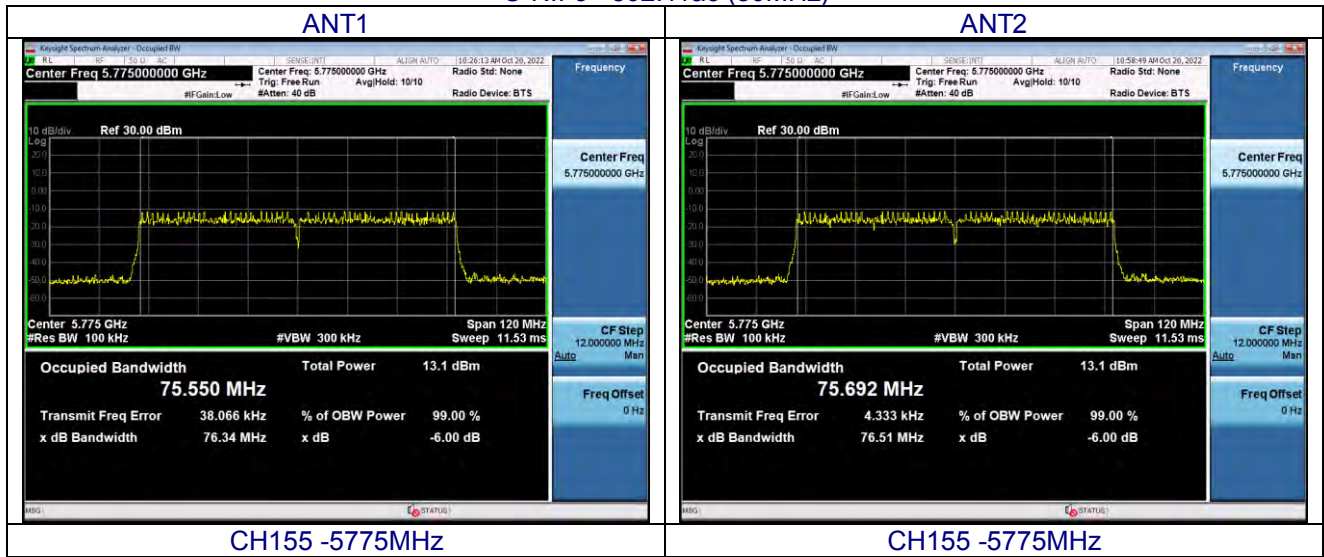


CH159 -5795MHz



CH159 -5795MHz

U-NII-3— 802.11ac (80MHz)



7. OUTPUT POWER TEST

Test Requirement:	15.407 (a)(1)(2)(3)
Test Method:	KDB 789033 D02 v02r01

7.1 APPLIED PROCEDURES/LIMIT

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

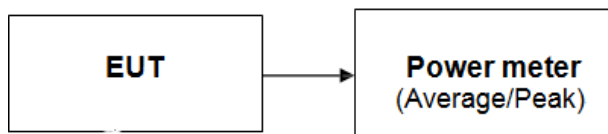
For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

Test Item	Limit	Result
Max conducted output power	1W / 30dbm	Pass
Max conducted output power	1 W / 30dbm	Pass

7.2 DEVIATION FROM STANDARD

No deviation.

7.3 TEST SETUP



7.4 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.

7.5 TEST RESULT

Temperature :	26℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V

U-NII-1

802.11 Mode	Channel No.	Frequency [MHz]	Conducted Power [dBm]		Limit [dBm]	MIMO [dBm]	MIMO Limit [dBm]
			ANT1	ANT2			
a	36	5180	12.36	12.82	30.00	/	/
	40	5200	12.59	12.55	30.00	/	/
	48	5240	12.24	11.06	30.00	/	/
n(20MHz)	36	5180	11.93	10.25	30.00	14.18	30.00
	40	5200	11.83	10.63	30.00	14.28	30.00
	48	5240	11.41	10.19	30.00	13.85	30.00
ac(20MHz)	36	5180	11.20	10.63	30.00	13.93	30.00
	40	5200	11.07	10.86	30.00	13.98	30.00
	48	5240	10.69	10.52	30.00	13.62	30.00
n(40MHz)	38	5190	9.43	9.37	30.00	12.41	30.00
	46	5230	9.06	9.90	30.00	12.51	30.00
ac(40MHz)	38	5190	9.40	9.65	30.00	12.54	30.00
	46	5230	9.38	9.32	30.00	12.36	30.00
ac(80MHz)	42	5210	7.20	7.85	30.00	10.55	30.00

U-NII-3

802.11 Mode	Channel No.	Frequency [MHz]	Conducted Power [dBm]		Limit [dBm]	MIMO [dBm]	MIMO Limit [dBm]
			ANT1	ANT2			
a	149	5745	14.58	14.83	30.00	/	/
	157	5785	14.94	14.77	30.00	/	/
	165	5825	14.33	14.50	30.00	/	/
n(20MHz)	149	5745	13.97	13.89	30.00	16.94	30.00
	157	5785	14.17	14.09	30.00	17.14	30.00
	165	5825	13.95	13.80	30.00	16.89	30.00
ac(20MHz)	149	5745	13.76	13.50	30.00	16.64	30.00
	157	5785	13.76	13.55	30.00	16.67	30.00
	165	5825	13.21	13.47	30.00	16.35	30.00
n(40MHz)	151	5755	12.54	12.48	30.00	15.52	30.00
	159	5795	12.41	12.38	30.00	15.41	30.00
ac(40MHz)	151	5755	12.26	12.31	30.00	15.30	30.00
	159	5795	12.23	12.22	30.00	15.24	30.00
ac(80MHz)	155	5775	10.27	10.81	30.00	13.56	30.00

8. OUT OF BAND EDGE EMISSION

Test Requirement:	15.407 (b)
Test Method:	KDB 789033 D02 v02r01

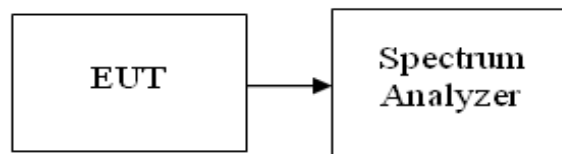
8.1 TEST PROCEDURE

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.

8.2 DEVIATION FROM STANDARD

No deviation.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

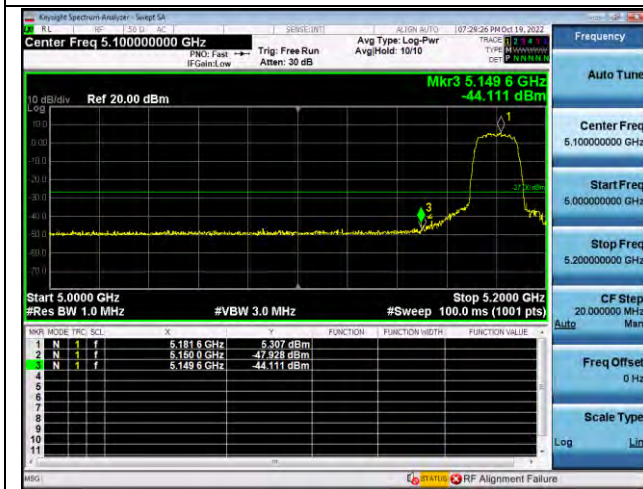
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.5 TEST RESULTS

Test plot as follows:

ANT1- U-NII-1

Test mode:



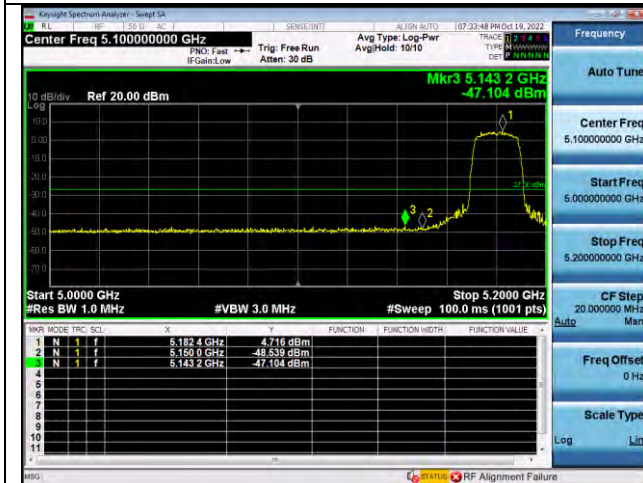
Lowest channel

802.11a



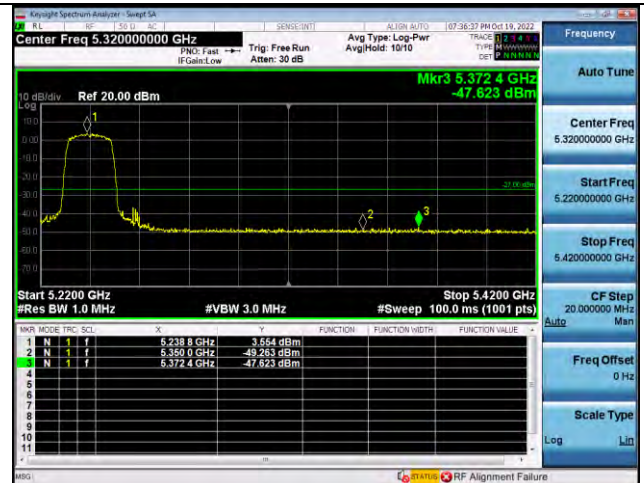
Highest channel

Test mode:



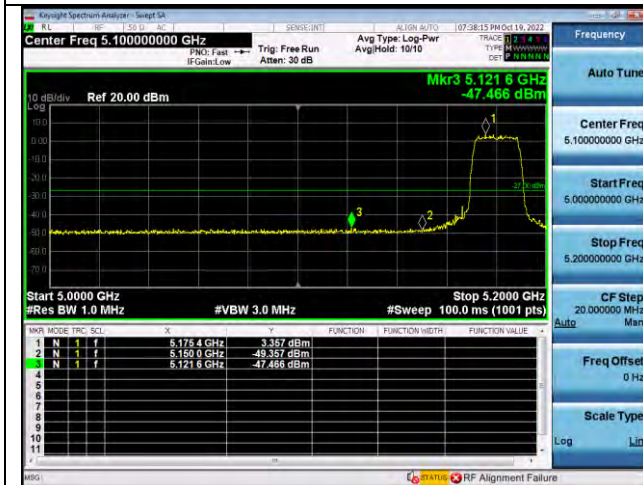
Lowest channel

802.11n20



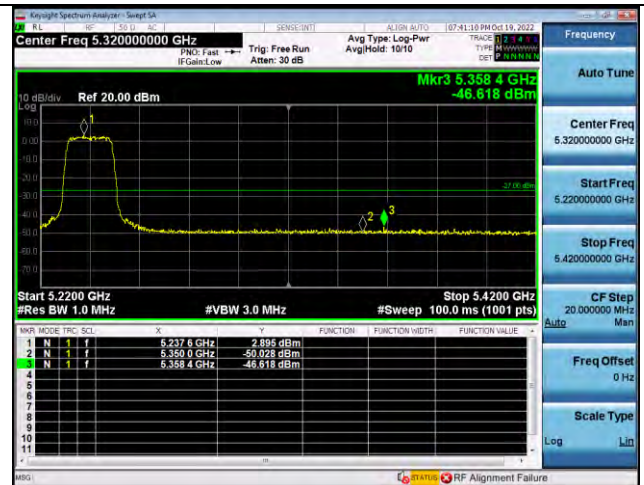
Highest channel

Test mode:



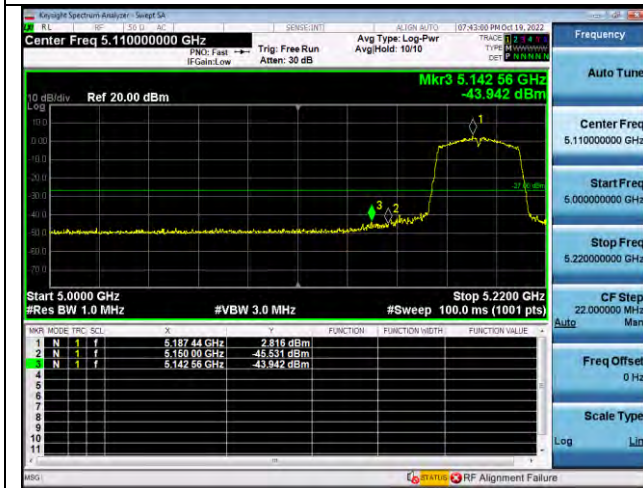
Lowest channel

802.11ac20



Highest channel

Test mode:



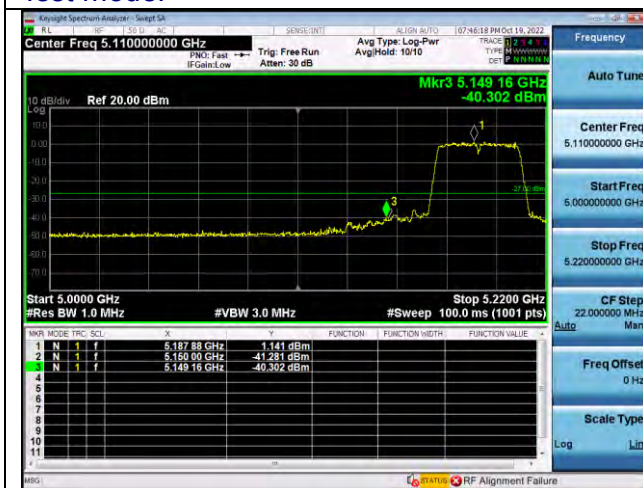
Lowest channel

802.11n40



Highest channel

Test mode:



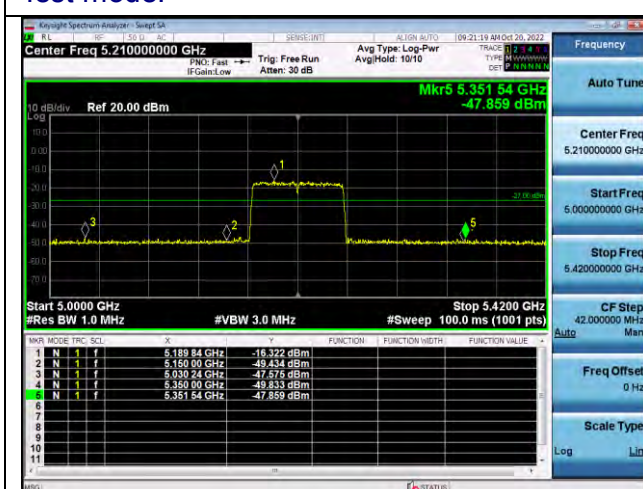
Lowest channel

802.11ac40



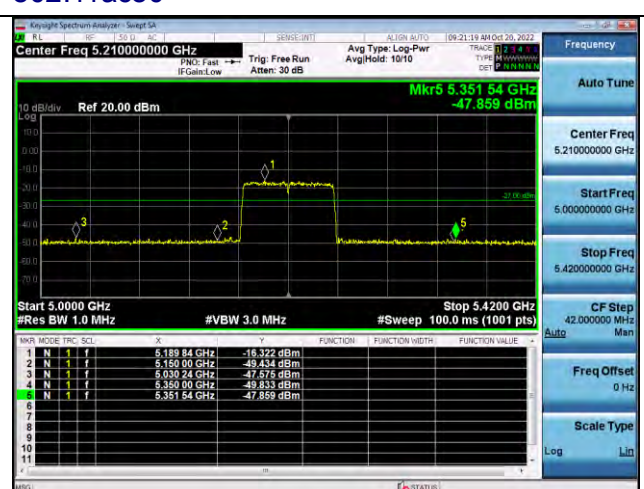
Highest channel

Test mode:



Lowest channel

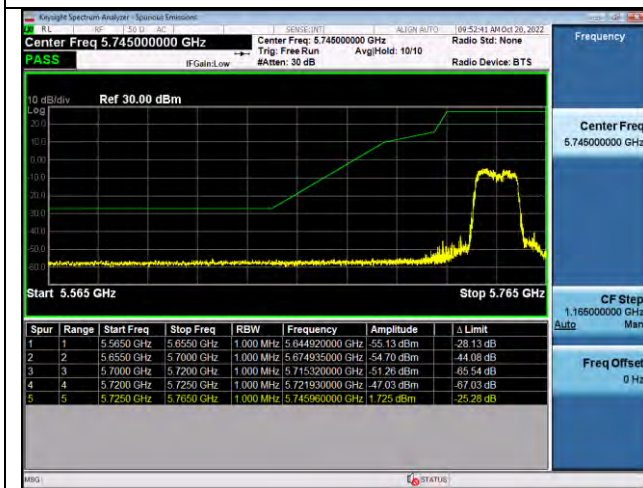
802.11ac80



Highest channel

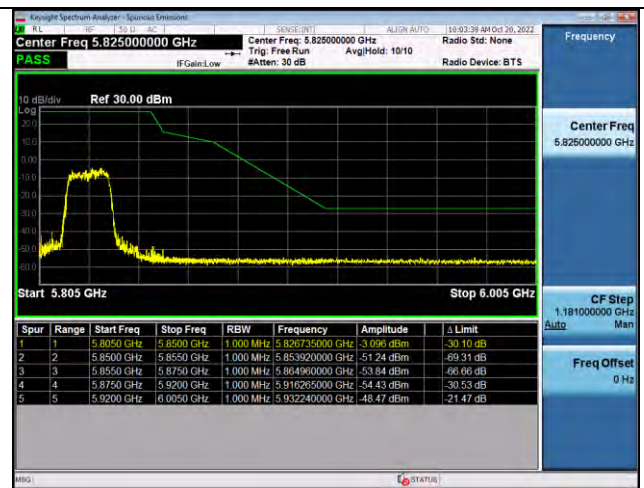
ANT1- U-NII-3

Test mode:



Lowest channel

802.11a



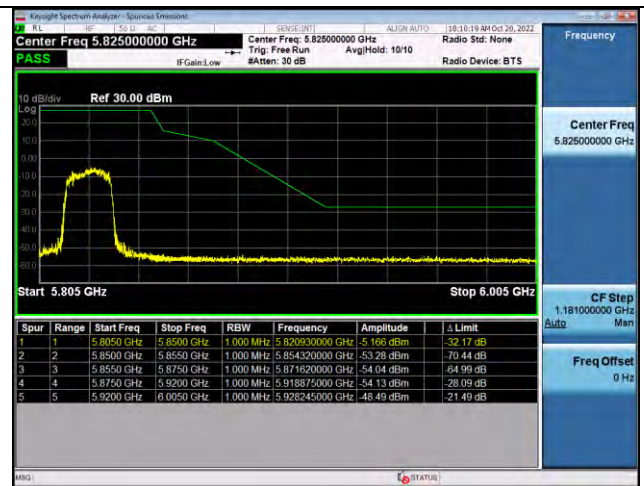
Highest channel

Test mode:



Lowest channel

802.11n20



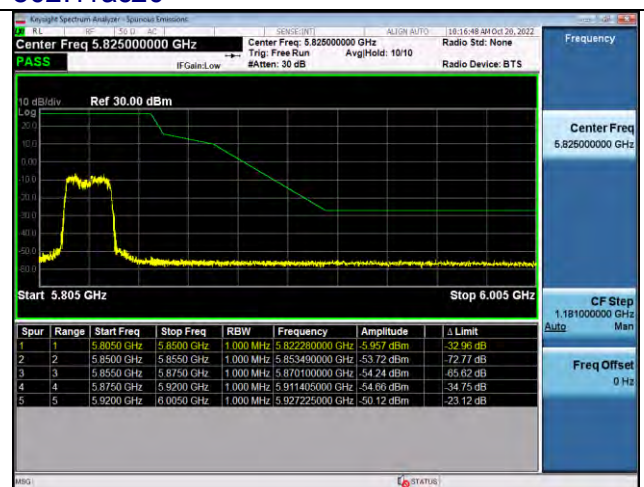
Highest channel

Test mode:



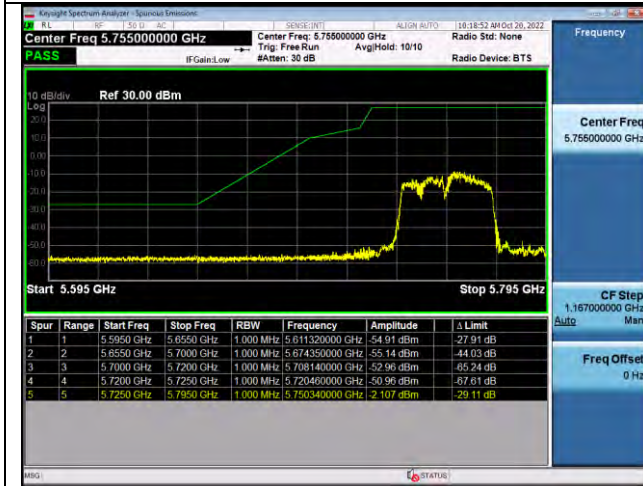
Lowest channel

802.11ac20



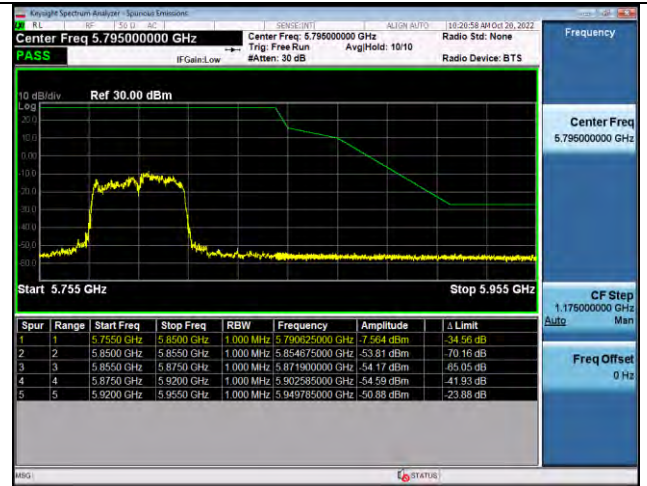
Highest channel

Test mode:



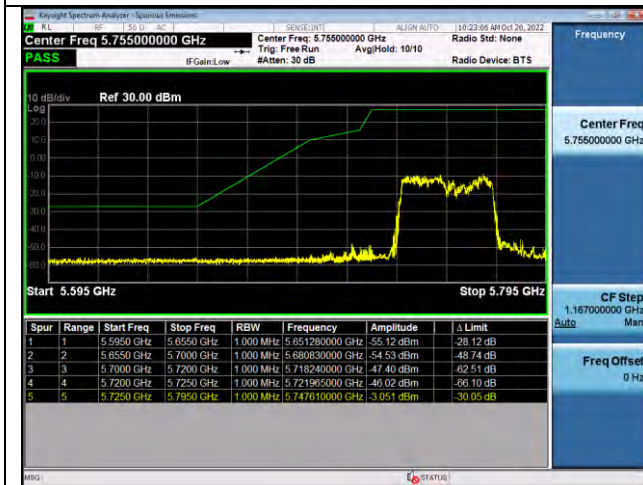
Lowest channel

802.11n40



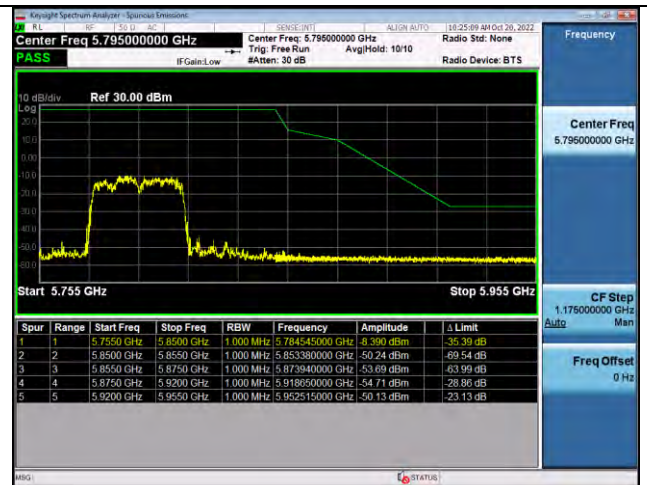
Highest channel

Test mode:



Lowest channel

802.11ac40



Highest channel

Test mode:



Lowest channel

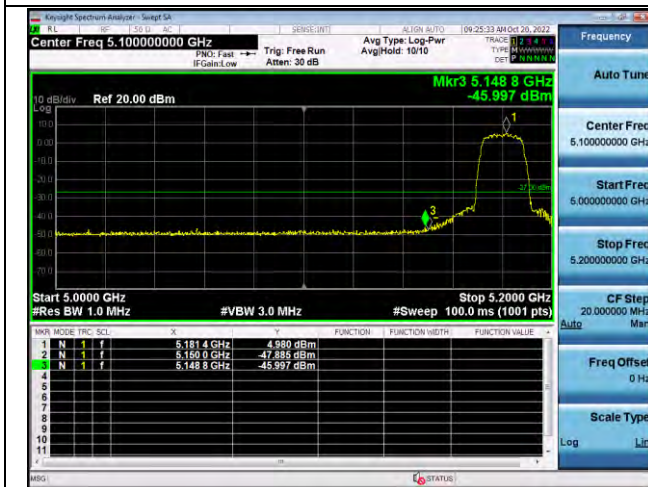
802.11ac80



Highest channel

ANT2- U-NII-1

Test mode:



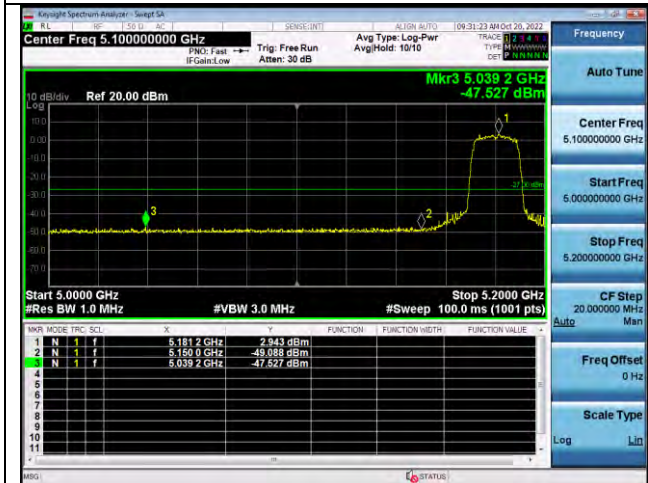
Lowest channel

802.11a



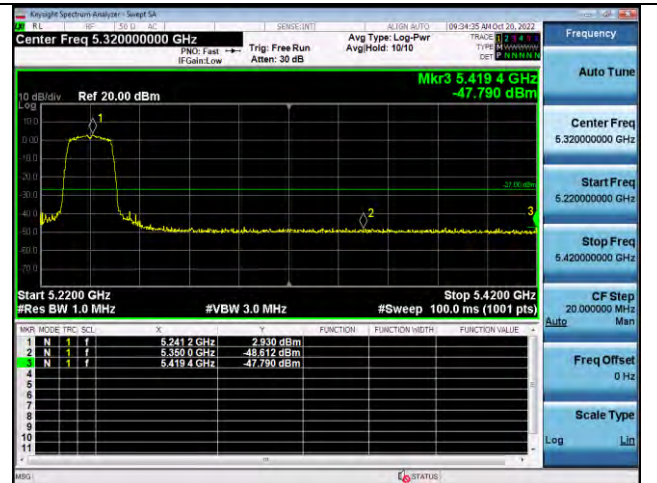
Highest channel

Test mode:



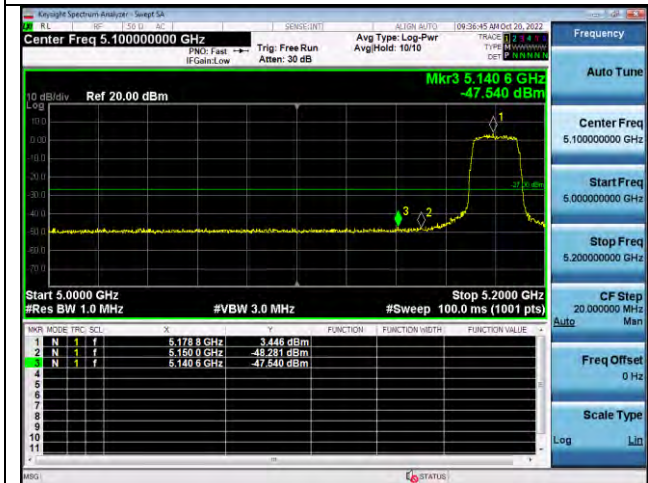
Lowest channel

802.11n20



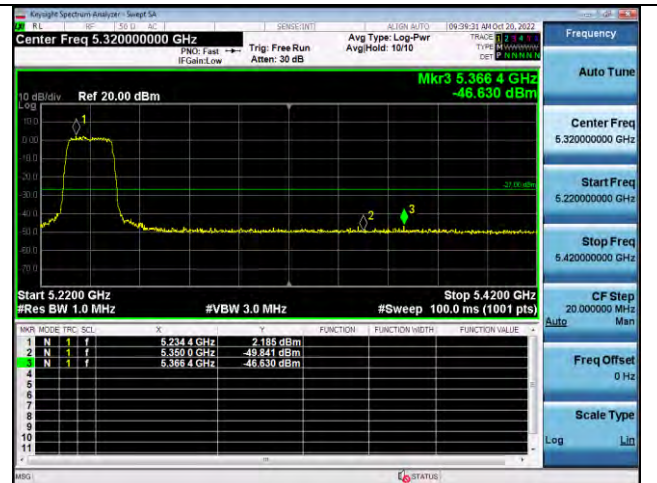
Highest channel

Test mode:



Lowest channel

802.11ac20



Highest channel

Test mode:



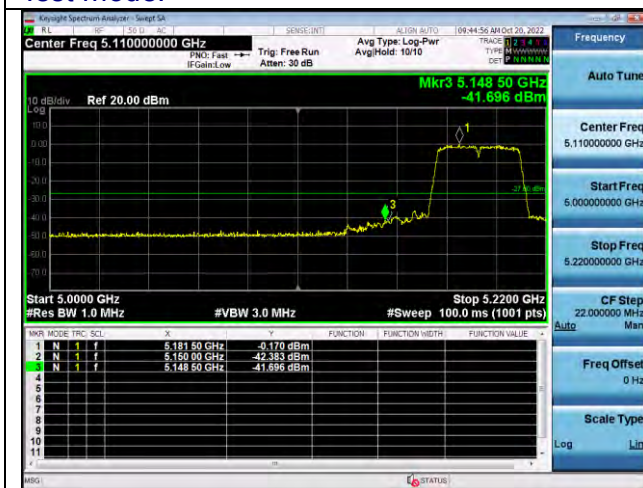
Lowest channel

802.11n40



Highest channel

Test mode:



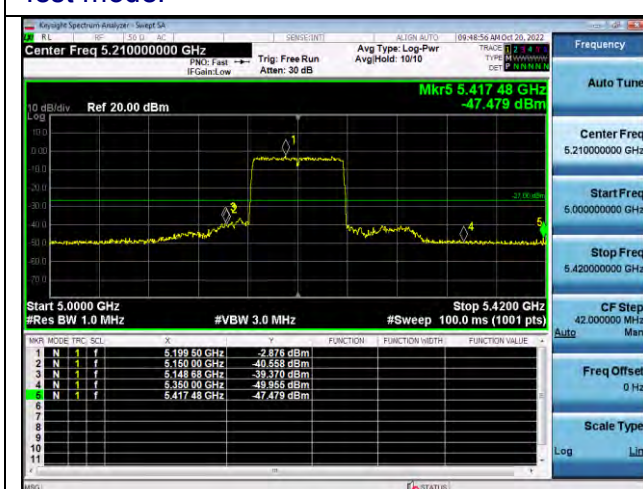
Lowest channel

802.11ac40



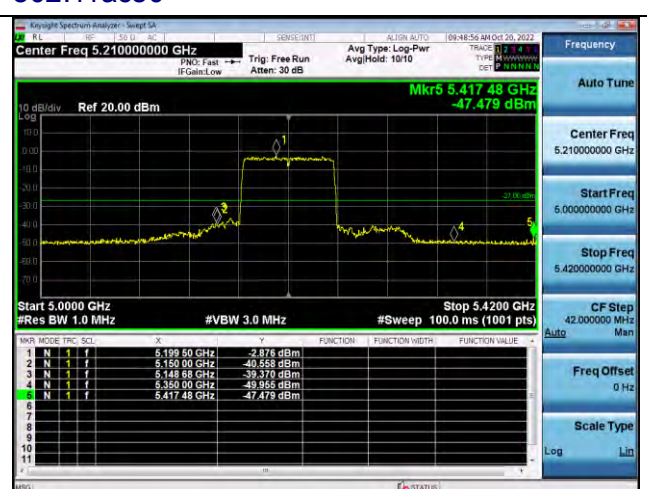
Highest channel

Test mode:



Lowest channel

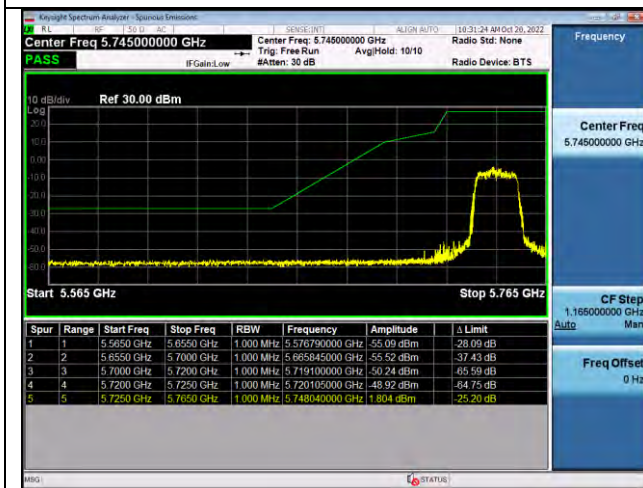
802.11ac80



Highest channel

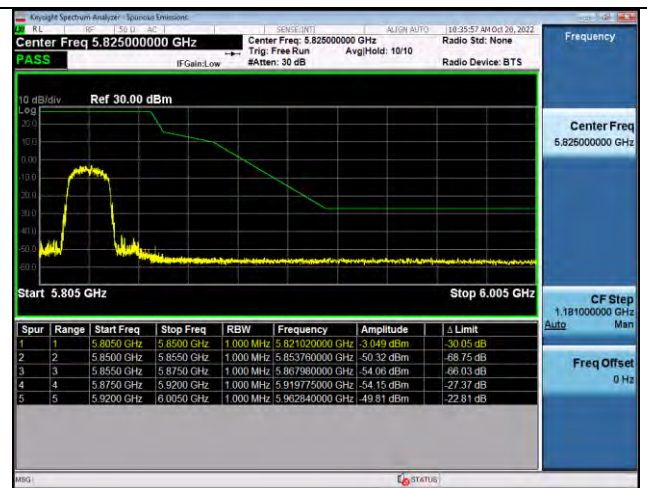
ANT2- U-NII-3

Test mode:



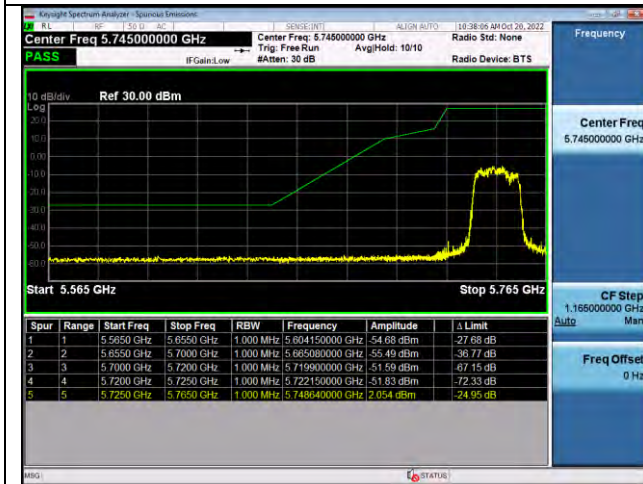
Lowest channel

802.11a



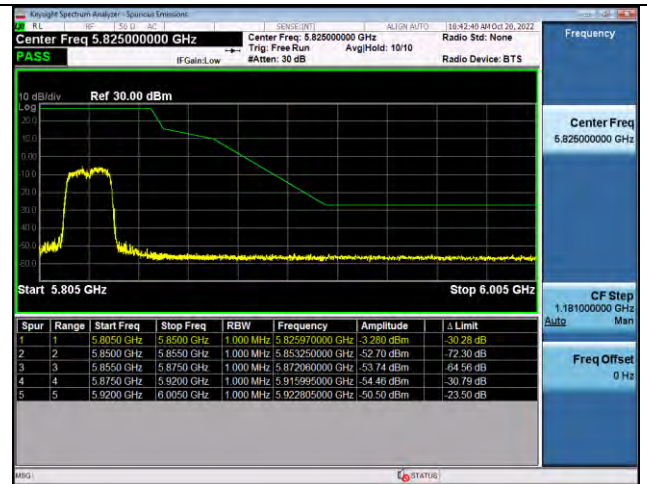
Highest channel

Test mode:



Lowest channel

802.11n20



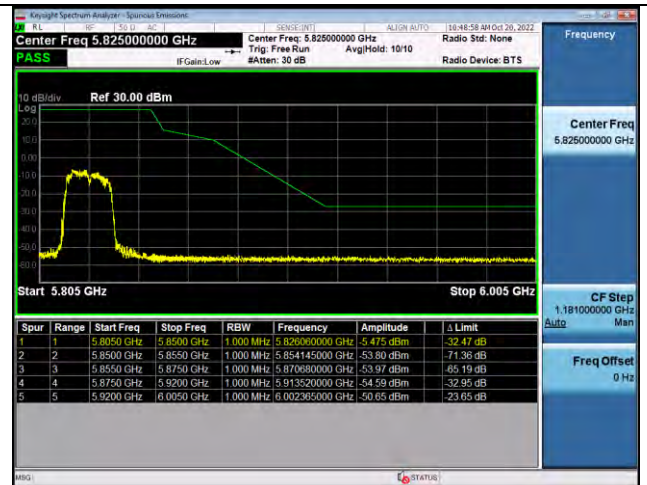
Highest channel

Test mode:



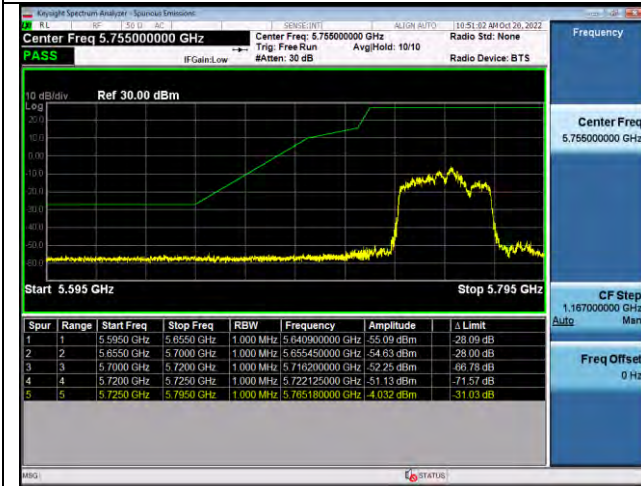
Lowest channel

802.11ac20



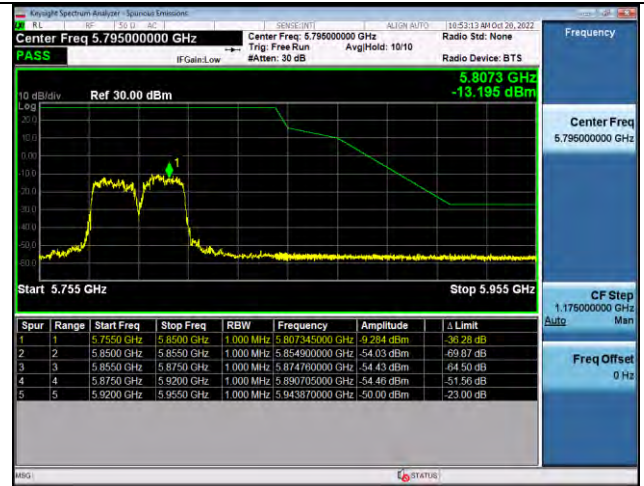
Highest channel

Test mode:



Lowest channel

802.11n40



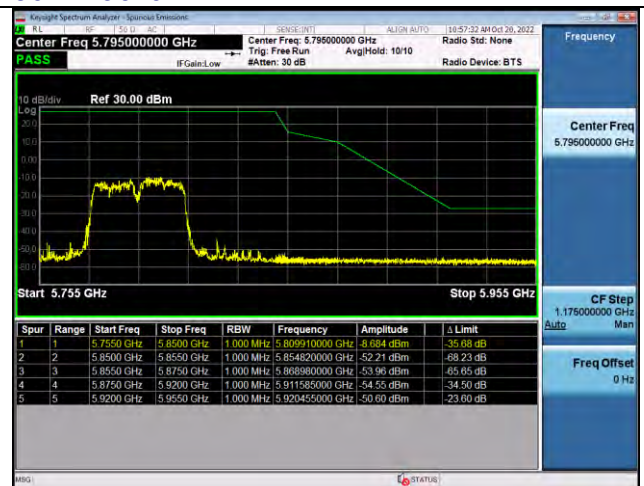
Highest channel

Test mode:



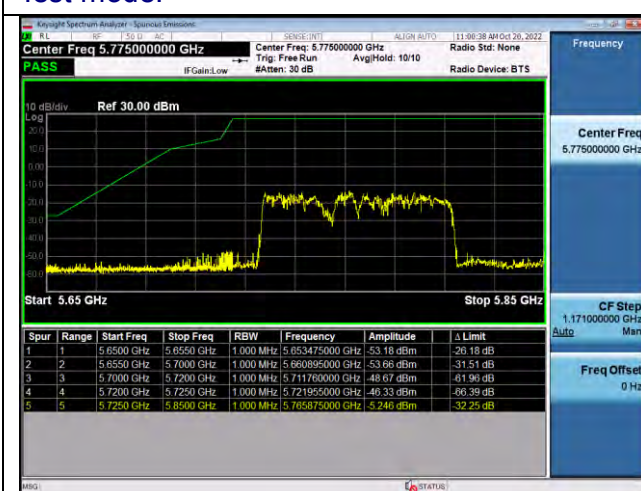
Lowest channel

802.11ac40



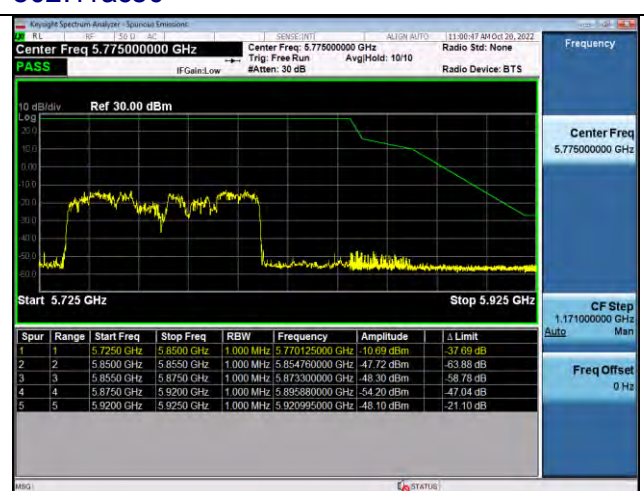
Highest channel

Test mode:



Lowest channel

802.11ac80



Highest channel

9. FREQUENCY STABILITY MEASUREMENT

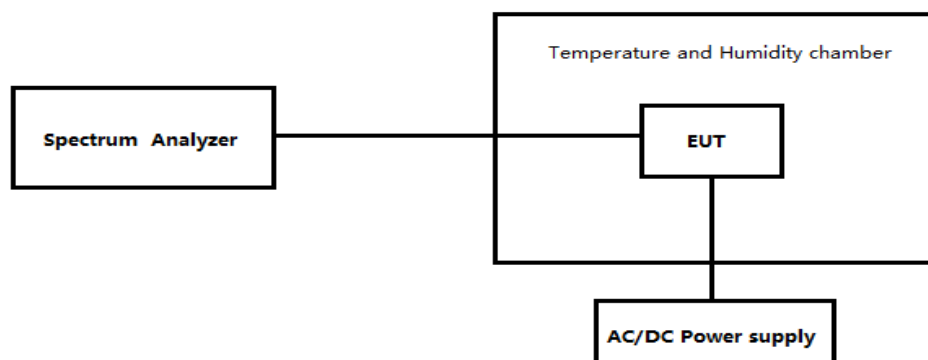
9.1 LIMIT

According to §15.407(g), 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.

9.2 TEST PROCEDURE

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

9.3 TEST CONFIGURATION



9.4 TEST RESULT

Temperature :	26°C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC120V

Note: Only the test results of the worst channel are displayed

ANT1-802.11a- CH36

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	83	0.0160
40	120	99	0.0191
30	120	84	0.0163
20	120	75	0.0145
10	120	100	0.0192
0	120	94	0.0181
-10	120	71	0.0136

-20	120	96	0.0186
-30	120	91	0.0175

ANT1-802.11a- CH48

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	91	0.0174
40	120	92	0.0175
30	120	90	0.0172
20	120	76	0.0144
10	120	90	0.0171
0	120	85	0.0163
-10	120	74	0.0141
-20	120	79	0.0150
-30	120	97	0.0185

ANT1-802.11a- CH149

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	81	0.0141
40	120	84	0.0147
30	120	82	0.0143
20	120	91	0.0158
10	120	92	0.0159
0	120	85	0.0147
-10	120	76	0.0133
-20	120	75	0.0131
-30	120	93	0.0163

ANT1-802.11a- CH165

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	76	0.0130
40	120	77	0.0133
30	120	90	0.0154
20	120	72	0.0123
10	120	96	0.0165
0	120	77	0.0131
-10	120	98	0.0169
-20	120	75	0.0129
-30	120	94	0.0162

ANT1-802.11n20- CH36

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	83	0.0160
40	120	93	0.0179
30	120	86	0.0166

20	120	97	0.0187
10	120	77	0.0148
0	120	80	0.0154
-10	120	81	0.0156
-20	120	71	0.0137
-30	120	94	0.0181

ANT1-802.11n20- CH149

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	88	0.0153
40	120	78	0.0135
30	120	97	0.0169
20	120	81	0.0141
10	120	92	0.0159
0	120	89	0.0155
-10	120	75	0.0131
-20	120	91	0.0158
-30	120	75	0.0131

ANT1-802.11n20- CH165

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	90	0.0154
40	120	96	0.0166
30	120	94	0.0161
20	120	93	0.0159
10	120	87	0.0150
0	120	90	0.0154
-10	120	95	0.0162
-20	120	84	0.0144
-30	120	80	0.0137

ANT1-802.11n40- CH38

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	93	0.0180
40	120	95	0.0183
30	120	77	0.0148
20	120	95	0.0182
10	120	74	0.0142
0	120	89	0.0172
-10	120	94	0.0181
-20	120	70	0.0136
-30	120	90	0.0174

ANT1-802.11n40- CH151

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	98	0.0171
40	120	98	0.0171
30	120	95	0.0165
20	120	79	0.0137
10	120	82	0.0142
0	120	70	0.0122
-10	120	99	0.0172
-20	120	98	0.0170
-30	120	82	0.0142

ANT1-802.11n40- CH159

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	99	0.0171
40	120	74	0.0127
30	120	73	0.0126
20	120	74	0.0128
10	120	94	0.0163
0	120	83	0.0143
-10	120	77	0.0133
-20	120	91	0.0156
-30	120	82	0.0141

ANT1-802.11ac20- CH36

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	97	0.0188
40	120	74	0.0142
30	120	82	0.0158
20	120	83	0.0160
10	120	88	0.0170
0	120	75	0.0145
-10	120	100	0.0192
-20	120	71	0.0137
-30	120	78	0.0150

ANT1-802.11ac20- CH149

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	91	0.0158
40	120	79	0.0137
30	120	72	0.0125
20	120	99	0.0173
10	120	100	0.0174
0	120	82	0.0142
-10	120	72	0.0125
-20	120	96	0.0167
-30	120	99	0.0172

ANT1-802.11ac20- CH165

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	78	0.0133
40	120	94	0.0162
30	120	95	0.0164
20	120	87	0.0149
10	120	79	0.0135
0	120	85	0.0145
-10	120	88	0.0152
-20	120	81	0.0139
-30	120	97	0.0167

ANT1-802.11ac40- CH38

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	82	0.0159
40	120	75	0.0144
30	120	71	0.0136
20	120	97	0.0187
10	120	84	0.0162
0	120	90	0.0174
-10	120	77	0.0149
-20	120	75	0.0144
-30	120	84	0.0162

ANT1-802.11ac40- CH46

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	84	0.0161
40	120	81	0.0155
30	120	85	0.0163
20	120	97	0.0186
10	120	96	0.0184
0	120	99	0.0189
-10	120	77	0.0147
-20	120	94	0.0180
-30	120	77	0.0147

ANT1-802.11ac40- CH151

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	92	0.0160
40	120	97	0.0168
30	120	93	0.0162
20	120	79	0.0137
10	120	89	0.0154
0	120	87	0.0151

-10	120	87	0.0151
-20	120	71	0.0124
-30	120	76	0.0133

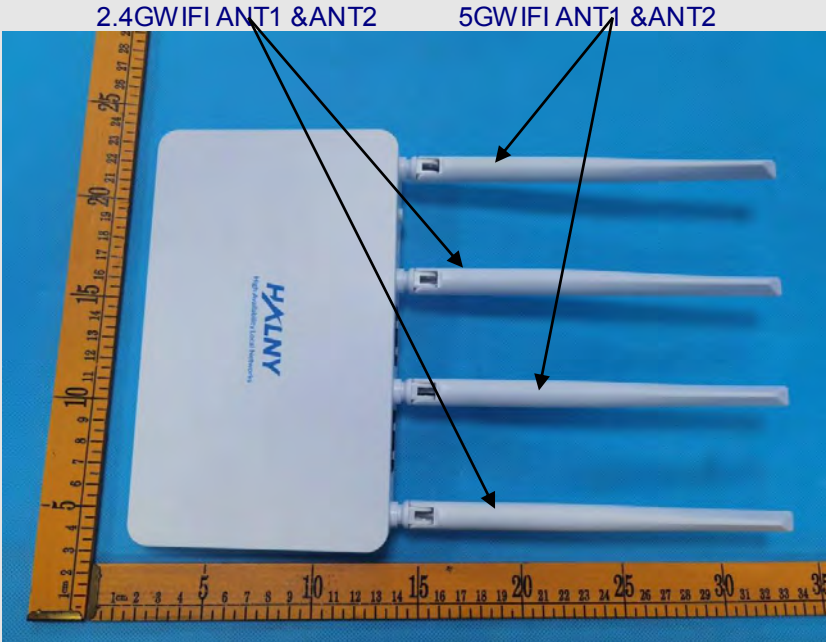
ANT1-802.11ac40- CH159

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		Rating	(ppm)
50	120	MCF	(ppm)
40	120	81	0.0140
30	120	72	0.0124
20	120	75	0.0129
10	120	97	0.0168
0	120	82	0.0141
-10	120	71	0.0122
-20	120	88	0.0152
-30	120	82	0.0141

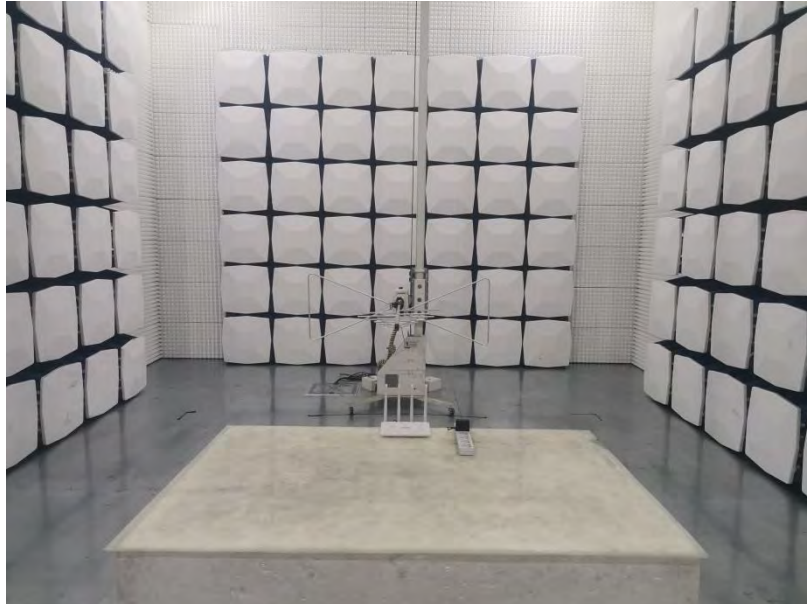
ANT1-802.11ac80- CH155

Temperature (°C)	Voltage (AC:V)	Frequency Measure with time Elapsed	
		MCF	(ppm)
50	120	72	0.0125
40	120	73	0.0126
30	120	71	0.0123
20	120	87	0.0151
10	120	83	0.0143
0	120	86	0.0149
-10	120	90	0.0155
-20	120	96	0.0167
-30	120	85	0.0147

10.ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. Refer to statement below for compliance. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed. Antenna Connected Construction The antenna used in this product is a Glue stick antenna, and the best case gain of the antenna is antenna port 1: 1.35dBi and Antenna port 2: 1.35dBi.	
UT Antenna: 	

10. TEST SETUP PHOTO





11. EUT CONSTRUCTIONAL DETAILS

Reference to the external photos file and internal photos file for details.

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