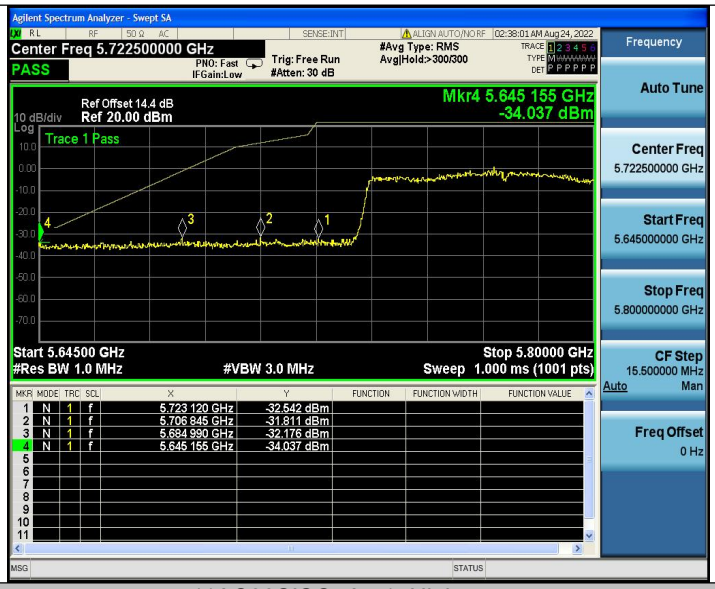


11AC80SISO_Ant1_High_5775

6.7 Restricted Band

Test Requirement : FCC Part15 E Section 15.407(b)

Test site : Measurement Distance: 3m

Test Limit :

Frequency	Limit (dBuV/m @3m)	Remark
Above 1GHz	74	Peak Value
	54	Average Value

Test Procedure:

1. The EUT was placed on a styrofoam table which is 1.5m above ground plane.

2. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room

Test Result:

Worst case mode:		802.11a(6Mbps)		Test channel:		36		
NO.	Freq. [MHz]	level [dBµV/m]	Factor [dB]	Emission level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector Type
1	5150	50.43	6.53	56.96	74	17.04	H	Peak
2	5150	39.75	6.53	46.28	54	7.72	H	Average
3	5150	49.7	6.53	56.23	74	17.77	V	Peak
4	5150	38.05	6.53	44.58	54	9.42	V	Average

Worst case mode:		802.11a(6Mbps)		Test channel:		48		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5350	50.58	6.53	57.11	74	16.89	H	Peak
2	5350	39.99	6.53	46.52	54	7.48	H	Average
3	5350	49.96	6.53	56.49	74	17.51	V	Peak
4	5350	38.3	6.53	44.83	54	9.17	V	Average

Worst case mode:		802.11n(HT20)(6.5 Mbps)		Test channel:		36		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5150	50.06	6.53	56.59	74	17.41	H	Peak
2	5150	39.86	6.53	46.39	54	7.61	H	Average
3	5150	50.01	6.53	56.54	74	17.46	V	Peak
4	5150	38.47	6.53	45.00	54	9.00	V	Average

Worst case mode:		802.11n(HT20)(6.5 Mbps)		Test channel:		48		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5350	50.7	6.53	57.23	74	16.77	H	Peak
2	5350	40.15	6.53	46.68	54	7.32	H	Average
3	5350	49.99	6.53	56.52	74	17.48	V	Peak
4	5350	38.45	6.53	44.98	54	9.02	V	Average

Worst case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		38		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5150	50.37	6.53	56.9	74	17.1	H	Peak
2	5150	39.89	6.53	46.42	54	7.58	H	Average
3	5150	49.63	6.53	56.16	74	17.84	V	Peak
4	5150	38.48	6.53	45.01	54	8.99	V	Average

Worst case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		46		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5350	50.77	6.56	57.33	74	16.67	H	Peak
2	5350	39.79	6.56	46.35	54	7.65	H	Average
3	5350	49.84	6.56	56.4	74	17.6	V	Peak
4	5350	38.5	6.56	45.06	54	8.94	V	Average

Worst case mode:		802.11ac(HT20)		Test channel:		36		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5150	50.71	6.53	57.24	74	16.76	H	Peak
2	5150	39.95	6.53	46.48	54	7.52	H	Average
3	5150	49.63	6.53	56.16	74	17.84	V	Peak
4	5150	38.08	6.53	44.61	54	9.39	V	Average

Worst case mode:		802.11ac(HT20)		Test channel:		48		
NO.	Freq. [MHz]	level [dBμV/m]	Factor [dB]	Emission level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector Type
1	5350	50.74	6.56	57.3	74	16.7	H	Peak
2	5350	39.81	6.56	46.37	54	7.63	H	Average
3	5350	49.59	6.56	56.15	74	17.85	V	Peak
4	5350	38.49	6.56	45.05	54	8.95	V	Average

Worst case mode:		802.11ac(VHT40)		Test channel:		38		
NO.	Freq. [MHz]	level [dBµV/m]	Factor [dB]	Emission level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector Type
1	5150	50.57	6.53	57.1	74	16.9	H	Peak
2	5150	39.96	6.53	46.49	54	7.51	H	Average
3	5150	49.88	6.53	56.41	74	17.59	V	Peak
4	5150	38.45	6.53	44.98	54	9.02	V	Average

Worst case mode:		802.11ac(VHT40)		Test channel:		46		
NO.	Freq. [MHz]	level [dBµV/m]	Factor [dB]	Emission level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector Type
1	5350	50.19	6.56	56.75	74	17.25	H	Peak
2	5350	39.99	6.56	46.55	54	7.45	H	Average
3	5350	49.39	6.56	55.95	74	18.05	V	Peak
4	5350	38.35	6.56	44.91	54	9.09	V	Average

Worst case mode:		802.11ac(VHT80)		Test channel:		42		
NO.	Freq. [MHz]	level [dBµV/m]	Factor [dB]	Emission level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector Type
1	5150	50.59	6.53	57.12	74	16.88	H	Peak
2	5150	39.94	6.53	46.47	54	7.53	H	Average
3	5150	49.95	6.53	56.48	74	17.52	V	Peak
4	5150	38.16	6.53	44.69	54	9.31	V	Average
5	5350	50.63	6.56	57.19	74	16.81	H	Peak
6	5350	40.19	6.56	46.75	54	7.25	H	Average
7	5350	49.64	6.56	56.2	74	17.8	V	Peak
8	5350	38.14	6.56	44.7	54	9.3	V	Average

7 Emission Bandwidth and Occupied Bandwidth

Test Requirement	:	FCC CFR47 Part 15 Section 15.407(a)(e)
Test Method	:	ANSI C63.10:2013
Test Limit		According to FCC §15.407(a), The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth. As per FCC §15.407(e): for equipment operating in the band 5725 – 5850 MHz, the minimum 6 dB bandwidth of U-NII devices shall be 500 kHz.

7.1 Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01,
Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth; b) Set the VBW > RBW; c) Detector = Peak; d) Trace mode = max hold; e) Measure the maximum width of the emission that is 26 dB 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%;99% Occupied Bandwidth
The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

The following procedure shall be used for measuring (99 %) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geqslant$ 3 • RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise,
peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency.

The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

7.2 Test Result

PASS

Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations / data rates and antenna ports.
Following channel was selected for the final test as listed below.

26 dB emission bandwidth:

TestMode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	21.040	5169.800	5190.840	---	---
		5220	21.000	5209.760	5230.760	---	---
		5240	20.560	5229.680	5250.240	---	---
		5745	20.760	5734.720	5755.480	---	---
		5785	20.680	5774.840	5795.520	---	---
		5825	21.040	5814.800	5835.840	---	---
11N20SISO	Ant1	5180	21.120	5169.520	5190.640	---	---
		5220	21.080	5209.640	5230.720	---	---
		5240	21.320	5229.360	5250.680	---	---
		5745	20.880	5734.600	5755.480	---	---
		5785	21.280	5774.440	5795.720	---	---
		5825	21.120	5814.520	5835.640	---	---
11N40SISO	Ant1	5190	42.800	5170.640	5213.440	---	---
		5230	39.200	5210.560	5249.760	---	---
		5755	39.760	5735.240	5775.000	---	---
		5795	39.760	5775.240	5815.000	---	---
11AC20SISO	Ant1	5180	21.360	5169.320	5190.680	---	---
		5220	21.160	5209.440	5230.600	---	---
		5240	21.280	5229.400	5250.680	---	---
		5745	21.240	5734.360	5755.600	---	---
		5785	21.160	5774.400	5795.560	---	---
		5825	21.320	5814.400	5835.720	---	---
11AC40SISO	Ant1	5190	40.160	5170.080	5210.240	---	---
		5230	40.000	5210.080	5250.080	---	---
		5755	40.000	5735.000	5775.000	---	---
		5795	40.080	5775.000	5815.080	---	---
11AC80SISO	Ant1	5210	81.120	5170.000	5251.120	---	---
		5775	80.480	5735.000	5815.480	---	---

minimum 6 dB bandwidth:

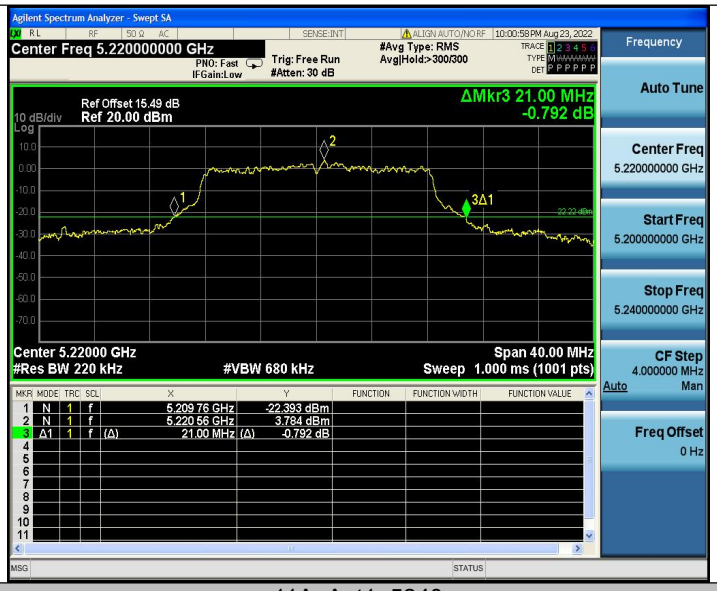
TestMode	Antenna	Frequency[MHz]	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	16.400	5736.880	5753.280	0.5	PASS
		5785	16.400	5776.880	5793.280	0.5	PASS
		5825	16.360	5816.920	5833.280	0.5	PASS
11N20SISO	Ant1	5745	17.600	5736.280	5753.880	0.5	PASS
		5785	17.600	5776.280	5793.880	0.5	PASS
		5825	17.440	5816.400	5833.840	0.5	PASS
11N40SISO	Ant1	5755	36.400	5736.840	5773.240	0.5	PASS
		5795	36.400	5776.840	5813.240	0.5	PASS
11AC20SISO	Ant1	5745	17.640	5736.240	5753.880	0.5	PASS
		5785	17.600	5776.240	5793.840	0.5	PASS
		5825	17.560	5816.280	5833.840	0.5	PASS
11AC40SISO	Ant1	5755	36.400	5736.840	5773.240	0.5	PASS
		5795	36.400	5776.920	5813.320	0.5	PASS
11AC80SISO	Ant1	5775	75.520	5737.080	5812.600	0.5	PASS

Test Graphs：

Emission Bandwidth Graphs:

11A_Ant1_5180

11A_Ant1_5220



11A_Ant1_5240

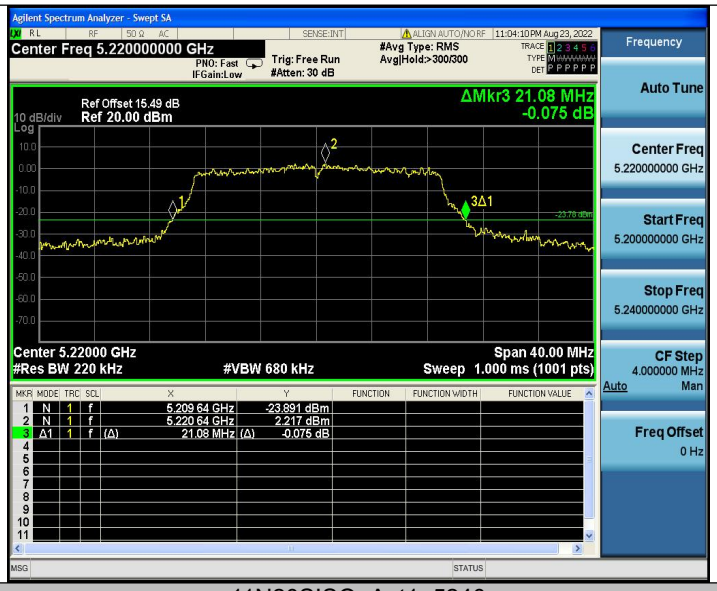
11A_Ant1_5745

11A_Ant1_5785

11A_Ant1_5825

11N20SISO_Ant1_5180

11N20SISO_Ant1_5220

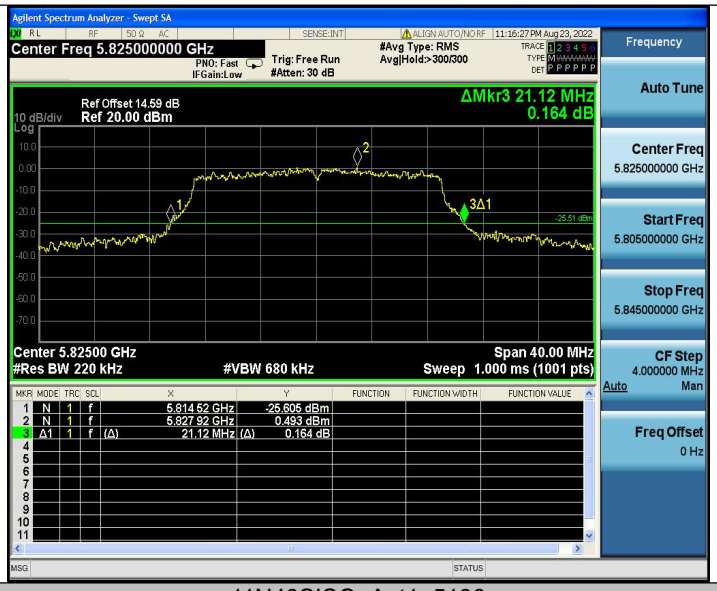


11N20SISO_Ant1_5240

11N20SISO_Ant1_5745

11N20SISO_Ant1_5785

11N20SISO_Ant1_5825



11N40SISO_Ant1_5190

11N40SISO_Ant1_5230

11N40SISO_Ant1_5755

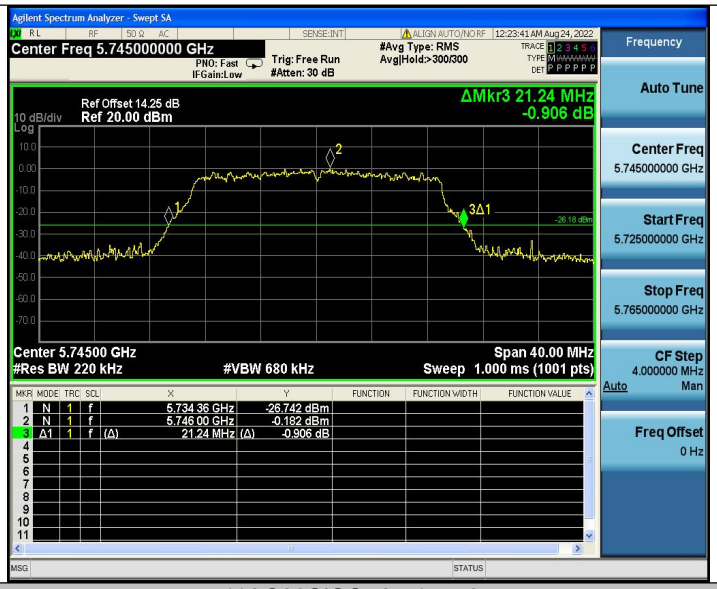
11N40SISO_Ant1_5795

11AC20SISO_Ant1_5180

11AC20SISO_Ant1_5220

11AC20SISO_Ant1_5240

11AC20SISO_Ant1_5745



11AC20SISO_Ant1_5785

11AC20SISO_Ant1_5825

11AC40SISO_Ant1_5190

11AC40SISO_Ant1_5230

11AC40SISO_Ant1_5755

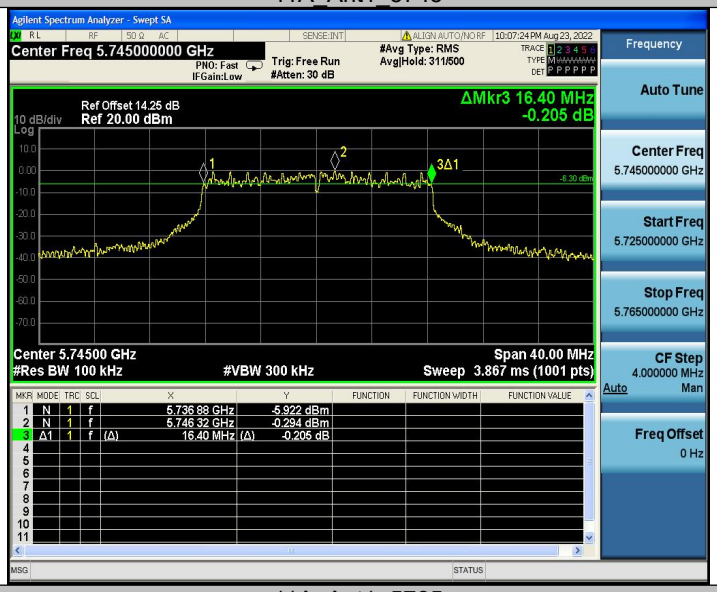
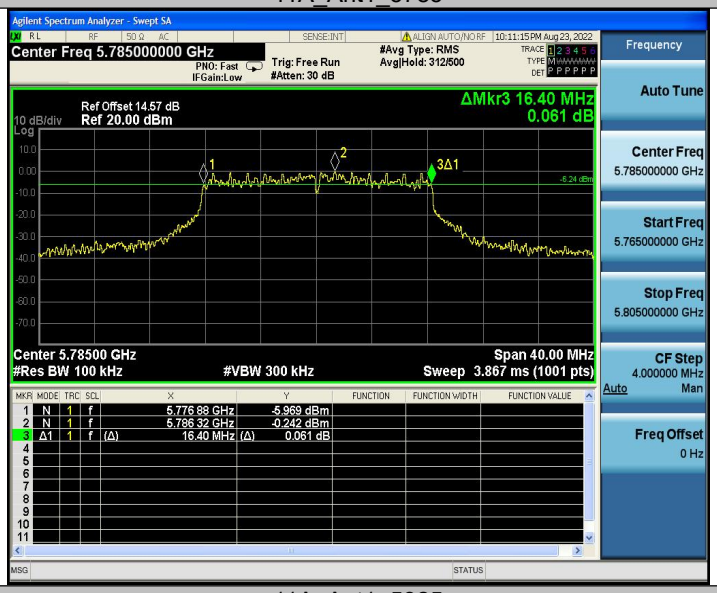
11AC40SISO_Ant1_5795

11AC80SISO_Ant1_5210

11AC80SISO_Ant1_5775


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold:>300/300
02:36:22 AM Aug 24, 2022
Ref Offset 14.4 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 80.48 MHz
0.336 dB
-26.01 dBm
Center 5.77500 GHz
#Res BW 820 kHz
#VBW 2.7 MHz
Span 160.0 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 5.735 00 GHz -26.662 dBm
2 N 1 f 5.772 44 GHz -0.009 dBm
3 Δ1 1 f (Δ) 80.48 MHz (Δ) 0.336 dB
Frequency
Auto Tune
Center Freq
5.775000000 GHz
Start Freq
5.695000000 GHz
Stop Freq
5.855000000 GHz
CF Step
16.000000 MHz
Auto
Man
Freq Offset
0 Hz

Min emission bandwidth Test Graphs:

11A_Ant1_5745

11A_Ant1_5785

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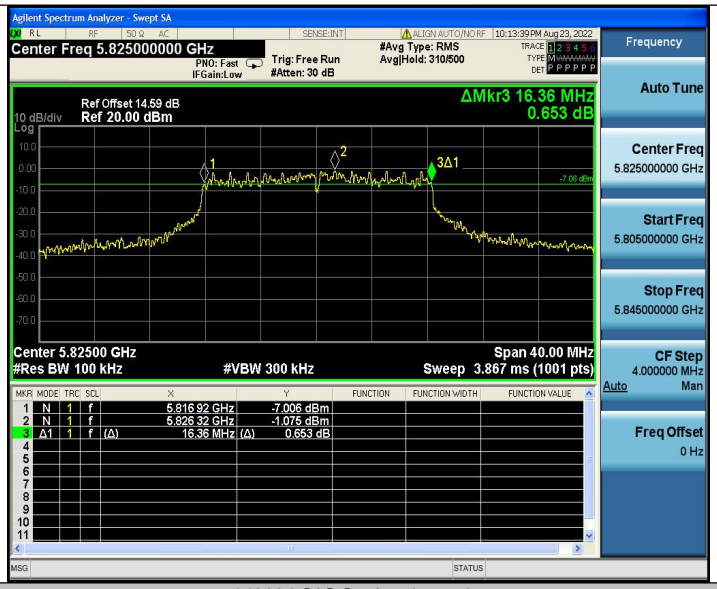
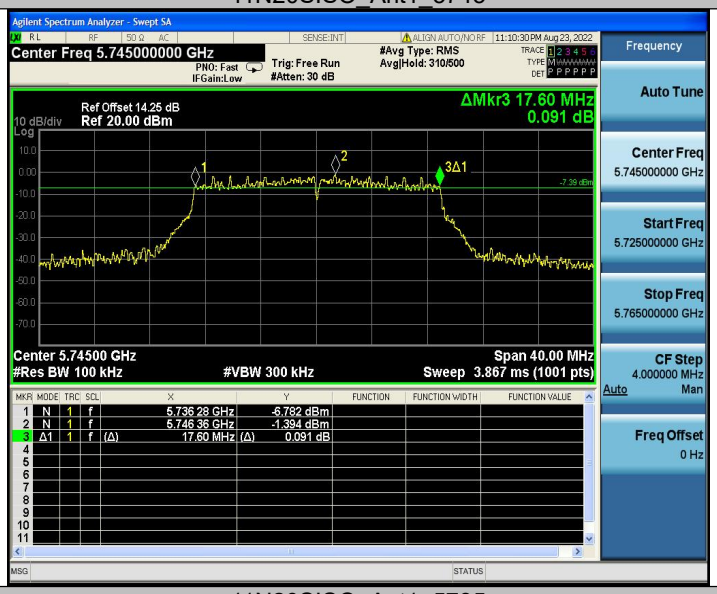


11N20SISO_Ant1_5745



11N20SISO_Ant1_5785