



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 | 68.23 | 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: | | Ant1_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 | 68.23 | 11.27 | H | Peak |
| 2 | 5150 | 40.03 | 6.53 | 46.56 | 54 | 7.44 | H | Average |
| 3 | 5150 | 49.42 | 6.53 | 55.95 | 68.23 | 12.28 | V | Peak |
| 4 | 5150 | 38.15 | 6.53 | 44.68 | 54 | 9.32 | V | Average |



| Worst case mode: | | Ant1_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 | 50.82 | 6.56 | 57.38 | 68.23 | 10.85 | H | Peak |
| 2 | 5350 | 39.9 | 6.56 | 46.46 | 54 | 7.54 | H | Average |
| 3 | 5350 | 49.56 | 6.56 | 56.12 | 68.23 | 12.11 | V | Peak |
| 4 | 5350 | 38.5 | 6.56 | 45.06 | 54 | 8.94 | V | Average |

| Worst case mode: | | Ant2_802.11a(6Mbps) | | Test channel: | | 165 | | |
|------------------|-------------|---------------------|-------------|-------------------------|----------------|-------------|----------|---------------|
| NO. | Freq. [MHz] | level [dBμV/m] | Factor [dB] | Emission level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Detector Type |
| 1 | 5850 | 50.51 | 6.53 | 57.04 | 68.23 | 11.19 | H | Peak |
| 2 | 5850 | 40 | 6.53 | 46.53 | 54 | 7.47 | H | Average |
| 3 | 5850 | 49.66 | 6.53 | 56.19 | 68.23 | 12.04 | V | Peak |
| 4 | 5850 | 38.21 | 6.53 | 44.74 | 54 | 9.26 | V | Average |

| Worst case mode: | | Ant2_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 | 50.13 | 6.56 | 56.69 | 68.23 | 11.54 | H | Peak |
| 2 | 5150 | 40.07 | 6.56 | 46.63 | 54 | 7.37 | H | Average |
| 3 | 5150 | 49.53 | 6.56 | 56.09 | 68.23 | 12.14 | V | Peak |
| 4 | 5150 | 38.48 | 6.56 | 45.04 | 54 | 8.96 | V | Average |

| Worst case mode: | | Ant3_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 | 49.97 | 6.64 | 56.61 | 68.23 | 11.62 | H | Peak |
| 2 | 5350 | 40.05 | 6.64 | 46.69 | 54 | 7.31 | H | Average |
| 3 | 5350 | 49.04 | 6.64 | 55.68 | 68.23 | 12.55 | V | Peak |
| 4 | 5350 | 37.89 | 6.64 | 44.53 | 54 | 9.47 | V | Average |



| Worst case mode: | | Ant2_802.11a(6Mbps) | | Test channel: | | 165 | | |
|------------------|-------------|---------------------|-------------|-------------------------|----------------|-------------|----------|---------------|
| NO. | Freq. [MHz] | level [dBμV/m] | Factor [dB] | Emission level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Detector Type |
| 1 | 5850 | 50.11 | 6.64 | 56.75 | 68.23 | 11.48 | H | Peak |
| 2 | 5850 | 40.03 | 6.64 | 46.67 | 54 | 7.33 | H | Average |
| 3 | 5850 | 48.71 | 6.64 | 55.35 | 68.23 | 12.88 | V | Peak |
| 4 | 5850 | 38.48 | 6.64 | 45.12 | 54 | 8.88 | V | Average |

Note: Only recorded the worst case in the report.



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 | <p>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.</p> <p>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.</p> <p>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.</p> |

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).

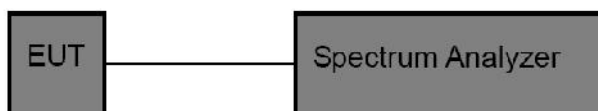
The following procedure shall be used for measuring (99 %) power bandwidth:

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 $VBW \geq 3 \cdot RBW$
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 setup



7.3 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 | 18.360 | 5170.840 | 5189.200 | --- | --- |
| 11A | Ant1 | 5200 | 18.240 | 5190.920 | 5209.160 | --- | --- |
| 11A | Ant1 | 5240 | 18.520 | 5230.760 | 5249.280 | --- | --- |
| 11N20SISO | Ant1 | 5180 | 19.600 | 5170.240 | 5189.840 | --- | --- |
| 11N20SISO | Ant1 | 5200 | 19.280 | 5190.280 | 5209.560 | --- | --- |
| 11N20SISO | Ant1 | 5240 | 19.400 | 5230.360 | 5249.760 | --- | --- |
| 11N40SISO | Ant1 | 5190 | 41.040 | 5169.360 | 5210.400 | --- | --- |
| 11N40SISO | Ant1 | 5230 | 40.480 | 5209.680 | 5250.160 | --- | --- |
| 11AC20SISO | Ant1 | 5180 | 19.440 | 5170.320 | 5189.760 | --- | --- |
| 11AC20SISO | Ant1 | 5200 | 19.360 | 5190.280 | 5209.640 | --- | --- |
| 11AC20SISO | Ant1 | 5240 | 19.320 | 5230.400 | 5249.720 | --- | --- |
| 11AC40SISO | Ant1 | 5190 | 40.560 | 5169.760 | 5210.320 | --- | --- |
| 11AC40SISO | Ant1 | 5230 | 40.480 | 5210.000 | 5250.480 | --- | --- |
| 11AC80SISO | Ant1 | 5210 | 80.000 | 5170.160 | 5250.160 | --- | --- |
| 11A | Ant1 | 5745 | 18.320 | 5735.800 | 5754.120 | --- | --- |
| 11A | Ant1 | 5785 | 18.440 | 5775.760 | 5794.200 | --- | --- |
| 11A | Ant1 | 5825 | 18.360 | 5815.840 | 5834.200 | --- | --- |
| 11N20SISO | Ant1 | 5745 | 19.480 | 5735.200 | 5754.680 | --- | --- |
| 11N20SISO | Ant1 | 5785 | 19.320 | 5775.360 | 5794.680 | --- | --- |
| 11N20SISO | Ant1 | 5825 | 19.440 | 5815.280 | 5834.720 | --- | --- |
| 11N40SISO | Ant1 | 5755 | 41.360 | 5734.440 | 5775.800 | --- | --- |
| 11N40SISO | Ant1 | 5795 | 41.040 | 5774.280 | 5815.320 | --- | --- |
| 11AC20SISO | Ant1 | 5745 | 19.480 | 5735.280 | 5754.760 | --- | --- |
| 11AC20SISO | Ant1 | 5785 | 19.320 | 5775.400 | 5794.720 | --- | --- |
| 11AC20SISO | Ant1 | 5825 | 19.280 | 5815.440 | 5834.720 | --- | --- |
| 11AC40SISO | Ant1 | 5755 | 41.200 | 5734.920 | 5776.120 | --- | --- |
| 11AC40SISO | Ant1 | 5795 | 40.720 | 5774.760 | 5815.480 | --- | --- |
| 11AC80SISO | Ant1 | 5775 | 80.000 | 5735.160 | 5815.160 | --- | --- |
| 11A | Ant2 | 5745 | 18.360 | 5735.840 | 5754.200 | --- | --- |
| 11A | Ant2 | 5785 | 18.440 | 5775.800 | 5794.240 | --- | --- |
| 11A | Ant2 | 5825 | 18.400 | 5815.880 | 5834.280 | --- | --- |
| 11N20SISO | Ant2 | 5745 | 19.480 | 5735.240 | 5754.720 | --- | --- |
| 11N20SISO | Ant2 | 5785 | 19.400 | 5775.280 | 5794.680 | --- | --- |

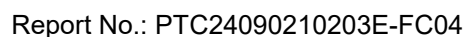


| | | | | | | | |
|------------|------|------|--------|----------|----------|-----|-----|
| 11N20SISO | Ant2 | 5825 | 19.440 | 5815.280 | 5834.720 | --- | --- |
| 11N40SISO | Ant2 | 5755 | 42.720 | 5734.920 | 5777.640 | --- | --- |
| 11N40SISO | Ant2 | 5795 | 40.400 | 5774.760 | 5815.160 | --- | --- |
| 11AC20SISO | Ant2 | 5745 | 19.400 | 5735.240 | 5754.640 | --- | --- |
| 11AC20SISO | Ant2 | 5785 | 19.280 | 5775.320 | 5794.600 | --- | --- |
| 11AC20SISO | Ant2 | 5825 | 19.440 | 5815.240 | 5834.680 | --- | --- |
| 11AC40SISO | Ant2 | 5755 | 40.800 | 5734.680 | 5775.480 | --- | --- |
| 11AC40SISO | Ant2 | 5795 | 40.480 | 5774.520 | 5815.000 | --- | --- |
| 11AC80SISO | Ant2 | 5775 | 80.320 | 5735.160 | 5815.480 | --- | --- |
| 11A | Ant2 | 5180 | 18.600 | 5170.800 | 5189.400 | --- | --- |
| 11A | Ant2 | 5200 | 18.360 | 5190.800 | 5209.160 | --- | --- |
| 11A | Ant2 | 5240 | 18.440 | 5230.760 | 5249.200 | --- | --- |
| 11N20SISO | Ant2 | 5180 | 19.520 | 5170.280 | 5189.800 | --- | --- |
| 11N20SISO | Ant2 | 5200 | 19.240 | 5190.320 | 5209.560 | --- | --- |
| 11N20SISO | Ant2 | 5240 | 19.400 | 5230.240 | 5249.640 | --- | --- |
| 11N40SISO | Ant2 | 5190 | 40.400 | 5170.160 | 5210.560 | --- | --- |
| 11N40SISO | Ant2 | 5230 | 40.400 | 5209.760 | 5250.160 | --- | --- |
| 11AC20SISO | Ant2 | 5180 | 19.560 | 5170.200 | 5189.760 | --- | --- |
| 11AC20SISO | Ant2 | 5200 | 19.480 | 5190.280 | 5209.760 | --- | --- |
| 11AC20SISO | Ant2 | 5240 | 19.360 | 5230.360 | 5249.720 | --- | --- |
| 11AC40SISO | Ant2 | 5190 | 40.320 | 5169.840 | 5210.160 | --- | --- |
| 11AC40SISO | Ant2 | 5230 | 40.160 | 5210.080 | 5250.240 | --- | --- |
| 11AC80SISO | Ant2 | 5210 | 80.800 | 5170.000 | 5250.800 | --- | --- |



minimum 6 dB bandwidth:

| TestMode | Antenna | Frequency[MHz] | 6db EBW [MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | Verdict |
|------------|---------|----------------|---------------|----------|----------|------------|---------|
| 11A | Ant1 | 5745 | 16.360 | 5736.800 | 5753.160 | 0.5 | PASS |
| 11A | Ant1 | 5785 | 16.320 | 5776.840 | 5793.160 | 0.5 | PASS |
| 11A | Ant1 | 5825 | 16.320 | 5816.840 | 5833.160 | 0.5 | PASS |
| 11N20SISO | Ant1 | 5745 | 17.520 | 5736.240 | 5753.760 | 0.5 | PASS |
| 11N20SISO | Ant1 | 5785 | 17.520 | 5776.240 | 5793.760 | 0.5 | PASS |
| 11N20SISO | Ant1 | 5825 | 17.520 | 5816.240 | 5833.760 | 0.5 | PASS |
| 11N40SISO | Ant1 | 5755 | 35.120 | 5737.400 | 5772.520 | 0.5 | PASS |
| 11N40SISO | Ant1 | 5795 | 35.040 | 5777.480 | 5812.520 | 0.5 | PASS |
| 11AC20SISO | Ant1 | 5745 | 16.880 | 5736.600 | 5753.480 | 0.5 | PASS |
| 11AC20SISO | Ant1 | 5785 | 17.560 | 5776.200 | 5793.760 | 0.5 | PASS |
| 11AC20SISO | Ant1 | 5825 | 17.160 | 5816.240 | 5833.400 | 0.5 | PASS |
| 11AC40SISO | Ant1 | 5755 | 35.120 | 5737.400 | 5772.520 | 0.5 | PASS |
| 11AC40SISO | Ant1 | 5795 | 35.120 | 5777.400 | 5812.520 | 0.5 | PASS |
| 11AC80SISO | Ant1 | 5775 | 73.920 | 5738.680 | 5812.600 | 0.5 | PASS |
| 11A | Ant2 | 5745 | 16.320 | 5736.840 | 5753.160 | 0.5 | PASS |
| 11A | Ant2 | 5785 | 16.280 | 5776.840 | 5793.120 | 0.5 | PASS |
| 11A | Ant2 | 5825 | 16.280 | 5816.840 | 5833.120 | 0.5 | PASS |
| 11N20SISO | Ant2 | 5745 | 17.320 | 5736.440 | 5753.760 | 0.5 | PASS |
| 11N20SISO | Ant2 | 5785 | 17.560 | 5776.200 | 5793.760 | 0.5 | PASS |
| 11N20SISO | Ant2 | 5825 | 17.560 | 5816.200 | 5833.760 | 0.5 | PASS |
| 11N40SISO | Ant2 | 5755 | 34.400 | 5738.360 | 5772.760 | 0.5 | PASS |
| 11N40SISO | Ant2 | 5795 | 35.040 | 5777.480 | 5812.520 | 0.5 | PASS |
| 11AC20SISO | Ant2 | 5745 | 17.280 | 5736.480 | 5753.760 | 0.5 | PASS |
| 11AC20SISO | Ant2 | 5785 | 16.920 | 5776.560 | 5793.480 | 0.5 | PASS |
| 11AC20SISO | Ant2 | 5825 | 17.560 | 5816.200 | 5833.760 | 0.5 | PASS |
| 11AC40SISO | Ant2 | 5755 | 33.840 | 5738.680 | 5772.520 | 0.5 | PASS |
| 11AC40SISO | Ant2 | 5795 | 33.760 | 5777.480 | 5811.240 | 0.5 | PASS |
| 11AC80SISO | Ant2 | 5775 | 72.640 | 5738.680 | 5811.320 | 0.5 | PASS |



Agilent Spectrum Analyzer - Swept SA

Center Freq 5.180000000 GHz

Ref Offset 15.75 dB
Ref 20.00 dBm

ΔMkr3 18.36 MHz
-1.015 dB

10 dB/div
Log

Center 5.18000 GHz
#Res BW 220 kHz
#VBW 680 kHz
Sweep 1.000 ms (1001 pts)

| MKR | MODE | TRC | SCL | X | Y | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|-----|-------|---------------|-------------|----------|----------------|----------------|
| 1 | N | 1 | f | 5.170 84 GHz | -24.769 dBm | | | |
| 2 | N | 1 | f | 5.184 56 GHz | 1.707 dBm | | | |
| 3 | Δ1 | 1 | f (Δ) | 18.36 MHz (Δ) | -1.015 dB | | | |

Frequency

Auto Tune

Center Freq
5.18000000 GHz

Start Freq
5.16000000 GHz

Stop Freq
5.20000000 GHz

CF Step
4.000000 MHz
Auto Man

Freq Offset
0 Hz

11A-Ant1-5180

Agilent Spectrum Analyzer - Swept SA

Center Freq 5.200000000 GHz

Ref Offset 15.84 dB
Ref 20.00 dBm

ΔMkr3 18.24 MHz
0.130 dB

10 dB/div
Log

Center 5.20000 GHz
#Res BW 220 kHz
#VBW 680 kHz
Sweep 1.000 ms (1001 pts)

| MKR | MODE | TRC | SCL | X | Y | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|-----|-------|---------------|-------------|----------|----------------|----------------|
| 1 | N | 1 | f | 5.190 92 GHz | -23.902 dBm | | | |
| 2 | N | 1 | f | 5.204 56 GHz | 2.355 dBm | | | |
| 3 | Δ1 | 1 | f (Δ) | 18.24 MHz (Δ) | 0.130 dB | | | |

Frequency

Auto Tune

Center Freq
5.20000000 GHz

Start Freq
5.18000000 GHz

Stop Freq
5.22000000 GHz

CF Step
4.000000 MHz
Auto Man

Freq Offset
0 Hz

11A-Ant1-5200



11A-Ant1-5240



11N20SISO-Ant1-5180



11N20SISO-Ant1-5200



11N20SISO-Ant1-5240



11N40SISO-Ant1-5190



11N40SISO-Ant1-5230



11AC20SISO-Ant1-5180



11AC20SISO-Ant1-5200



11AC40SISO-Ant1-5190



11AC40SISO-Ant1-5230



11AC80SISO-Ant1-5210



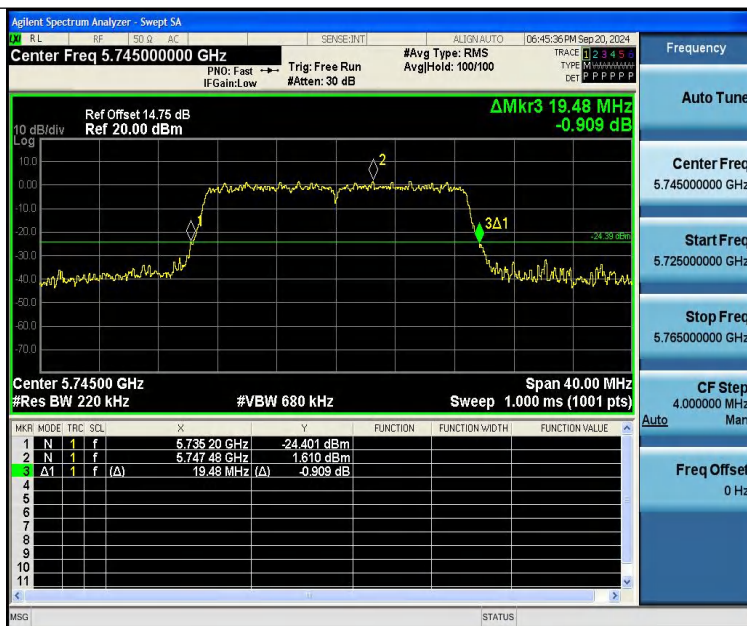
11A-Ant1-5745



11A-Ant1-5785



11A-Ant1-5825



11N20SISO-Ant1-5745



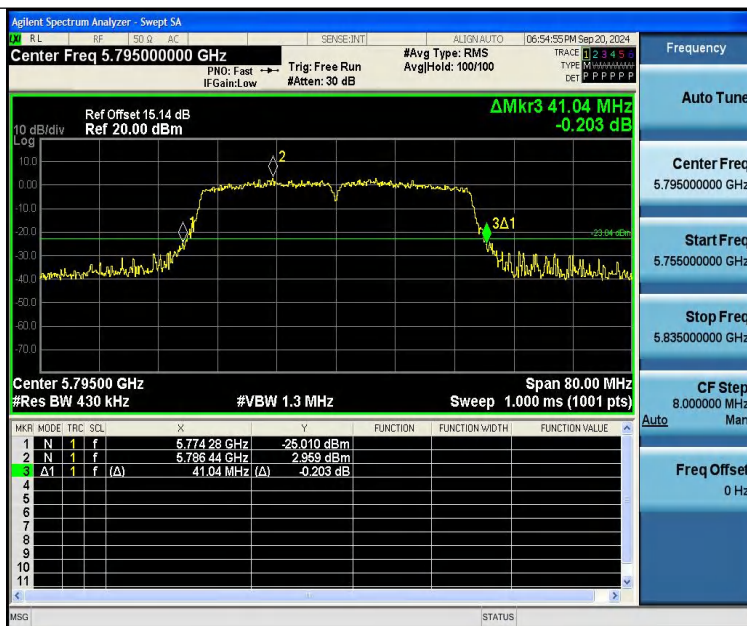
11N20SISO-Ant1-5785



11N20SISO-Ant1-5825



11N40SISO-Ant1-5755



11N40SISO-Ant1-5795



11AC20SISO-Ant1-5745



11AC20SISO-Ant1-5785



11AC20SISO-Ant1-5825



11AC40SISO-Ant1-5755



11AC40SISO-Ant1-5795



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11A-Ant2-5745



11A-Ant2-5785



11A-Ant2-5825



11N20SISO-Ant2-5745



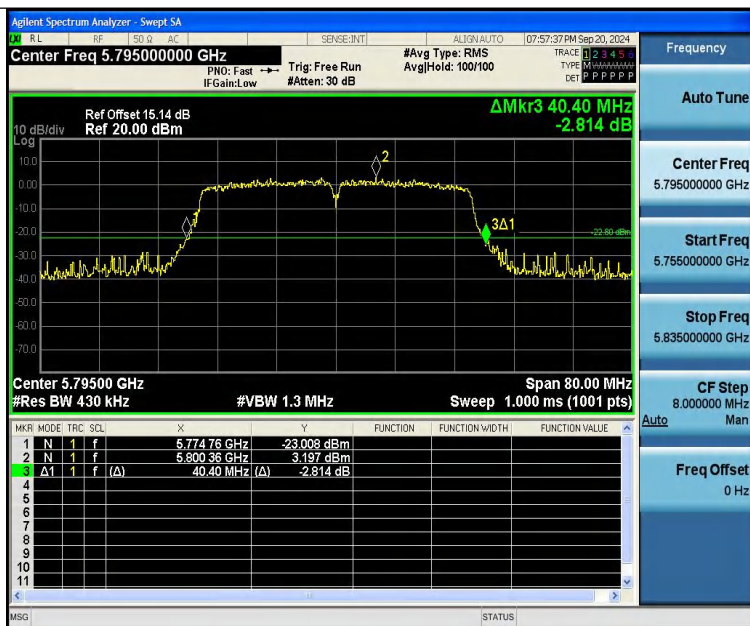
11N20SISO-Ant2-5785



11N20SISO-Ant2-5825



11N40SISO-Ant2-5755



11N40SISO-Ant2-5795



11AC20SISO-Ant2-5745



11AC20SISO-Ant2-5785



11AC20SISO-Ant2-5825



11AC40SISO-Ant2-5755



11AC40SISO-Ant2-5795



11AC80SISO-Ant2-5775



11A-Ant2-5180



11A-Ant2-5200



11A-Ant2-5240



11N20SISO-Ant2-5180



11N20SISO-Ant2-5200



11N20SISO-Ant2-5240



11N40SISO-Ant2-5190



11N40SISO-Ant2-5230



11AC20SISO-Ant2-5180