

## 8. SPECTRAL DENSITY TEST

### 8.1. Test Equipment

| Item | Equipment         | Manufacturer | Model No.   | Serial No. | Last Cal.  | Cal. Interval |
|------|-------------------|--------------|-------------|------------|------------|---------------|
| 1.   | Spectrum          | Agilent      | N9030A      | MY51380221 | Oct.29, 14 | 1 Year        |
| 2.   | Attenuator (20dB) | Agilent      | 8491B       | MY39262165 | Apr.28, 15 | 1 Year        |
| 3    | RF Cable          | Hubersuhner  | SUCOFLEX102 | 28610/2    | Apr.28, 15 | 1 Year        |

### 8.2. Limit

**Band 5150-5250 MHz:**

The e.i.r.p spectral density shall not exceed 11 dBm in any 1.0 MHz band.

**Band 5250-5350 MHz:**

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

**Band 5470-5725 MHz:**

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

**Band 5725-5850 MHz:**

The power spectral density shall not exceed 30 dBm in any 500 KHz band.

### 8.3. Test Procedure

For the Band 5.15-5.25GHz:

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW; Detector: RMS mode.

For the band 5.725-5.85 GHz:

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW, RMS Detector.

So use the test method described in KDB789033 clause E

- 1) Set the RBW=100kHz and VBW =3MHz
- 2) Number of points in sweep  $\geq 2$  Span / RBW. (This ensures that bin-to-bin spacing is  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
- 3) Sweep time = auto
- 4) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- 5) Use the "peak search" function of spectrum analyzer find the max value, then add  $10\log(500\text{kHz}/\text{RBW})$  to the measured result.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

## 8.4. Test Results

### 5180-5240MHz Band:

|                       |                         |                          |
|-----------------------|-------------------------|--------------------------|
| EUT: Notebook         |                         |                          |
| M/N: RZ09-0168        |                         |                          |
| Test date: 2015-08-21 | Pressure: 101.6±1.0 kpa | Humidity: 53.0±3.0%      |
| Tested by: Alice_Yang | Test site: RF site      | Temperature: 22.1±0.6 °C |

| Test Mode  | Frequency ( MHz ) | Power density (dBm/MHz) |        |       | Limit (dBm/MHz) |
|------------|-------------------|-------------------------|--------|-------|-----------------|
|            |                   | ANT0                    | ANT1   | Total |                 |
| 11a        | 5180              | 4.069                   | 4.952  | N/A   | 11              |
|            | 5200              | 4.253                   | 4.638  | N/A   | 11              |
|            | 5240              | 3.059                   | 3.374  | N/A   | 11              |
| 11n HT20   | 5180              | 3.977                   | 4.907  | 7.48  | 11              |
|            | 5200              | 3.946                   | 4.591  | 7.29  | 11              |
|            | 5240              | 2.595                   | 3.405  | 6.03  | 11              |
| 11n HT40   | 5190              | 0.157                   | 1.213  | 3.73  | 11              |
|            | 5230              | -0.877                  | 0.068  | 2.63  | 11              |
| 11ac VHT20 | 5180              | 4.225                   | 4.602  | 7.43  | 11              |
|            | 5200              | 3.815                   | 4.168  | 7.01  | 11              |
|            | 5240              | 2.711                   | 3.199  | 5.97  | 11              |
| 11ac VHT40 | 5190              | 0.465                   | 1.425  | 3.98  | 11              |
|            | 5230              | -1.107                  | 0.072  | 2.53  | 11              |
| 11ac VHT80 | 5210              | -4.150                  | -3.877 | -1.00 | 11              |

Conclusion: PASS

**5260-5320MHz Band:**

|                       |                         |                         |
|-----------------------|-------------------------|-------------------------|
| EUT: Notebook         |                         |                         |
| M/N: RZ09-0168        |                         |                         |
| Test date: 2015-08-21 | Pressure: 101.6±1.0 kpa | Humidity:53.0±3.0%      |
| Tested by: Alice_Yang | Test site: RF site      | Temperature:22.1±0.6 °C |

| Test Mode        | Frequency ( MHz ) | Power density (dBm/MHz) |        |       | Limit (dBm/MHz) |
|------------------|-------------------|-------------------------|--------|-------|-----------------|
|                  |                   | ANT0                    | ANT1   | Total |                 |
| 11a              | 5260              | 3.269                   | 3.779  | N/A   | 11              |
|                  | 5300              | 3.959                   | 3.910  | N/A   | 11              |
|                  | 5320              | 3.044                   | 2.550  | N/A   | 11              |
| 11n HT20         | 5260              | 2.815                   | 3.933  | 6.42  | 11              |
|                  | 5300              | 3.949                   | 3.830  | 6.90  | 11              |
|                  | 5320              | 2.808                   | 2.447  | 5.64  | 11              |
| 11n HT40         | 5270              | -0.870                  | 0.717  | 3.01  | 11              |
|                  | 5310              | -0.680                  | 0.127  | 2.75  | 11              |
| 11ac VHT20       | 5260              | 3.062                   | 3.540  | 6.32  | 11              |
|                  | 5300              | 3.866                   | 3.567  | 6.73  | 11              |
|                  | 5320              | 2.692                   | 2.173  | 5.45  | 11              |
| 11ac VHT40       | 5270              | -0.981                  | 0.560  | 2.87  | 11              |
|                  | 5310              | -0.675                  | 0.010  | 2.69  | 11              |
| 11ac VHT80       | 5290              | -4.761                  | -4.523 | -1.63 | 11              |
| Conclusion: PASS |                   |                         |        |       |                 |

**5500-5700MHz Band:**

|                       |                         |                         |
|-----------------------|-------------------------|-------------------------|
| EUT: Notebook         |                         |                         |
| M/N: RZ09-0168        |                         |                         |
| Test date: 2015-08-21 | Pressure: 101.6±1.0 kpa | Humidity:53.0±3.0%      |
| Tested by: Alice_Yang | Test site: RF site      | Temperature:22.1±0.6 °C |

| Test Mode     | Frequency<br>( MHz ) | Power density<br>(dBm/MHz) |        |       | Limit<br>(dBm/MHz) |
|---------------|----------------------|----------------------------|--------|-------|--------------------|
|               |                      | ANT0                       | ANT1   | Total |                    |
| 11a           | 5500                 | 4.260                      | 3.079  | N/A   | 10.7               |
|               | 5600                 | 4.474                      | 3.698  | N/A   | 10.7               |
|               | 5700                 | 4.924                      | 4.517  | N/A   | 10.7               |
| 11n<br>HT20   | 5500                 | 4.024                      | 3.106  | 6.60  | 10.7               |
|               | 5600                 | 4.182                      | 3.709  | 6.96  | 10.7               |
|               | 5700                 | 4.620                      | 4.380  | 7.51  | 10.7               |
| 11n<br>HT40   | 5510                 | 0.047                      | -0.692 | 2.70  | 10.7               |
|               | 5590                 | 0.578                      | 0.507  | 3.55  | 10.7               |
|               | 5670                 | 0.173                      | 0.893  | 3.56  | 10.7               |
| 11ac<br>VHT20 | 5500                 | 3.971                      | 2.843  | 6.45  | 10.7               |
|               | 5600                 | 4.172                      | 3.409  | 6.82  | 10.7               |
|               | 5700                 | 4.738                      | 4.084  | 7.43  | 10.7               |
| 11ac<br>VHT40 | 5510                 | 0.220                      | -0.743 | 2.78  | 10.7               |
|               | 5590                 | 0.484                      | 0.394  | 3.45  | 10.7               |
|               | 5670                 | 0.790                      | 0.896  | 3.85  | 10.7               |
| 11ac<br>VHT80 | 5530                 | -4.265                     | -5.459 | -1.81 | 10.7               |

Conclusion: PASS

Note: 11ac/n Mode

$$\begin{aligned} \text{Directional Gain} &= 10 \log[(10^{3.52/20} + 10^{3.07/20})^2 / 2] \text{dBi} \\ &= 6.3 \text{dBi} > 6 \text{dBi} \end{aligned}$$

**5745-5825MHz Band:**

|                       |                         |                         |
|-----------------------|-------------------------|-------------------------|
| EUT: Notebook         |                         |                         |
| M/N: RZ09-0168        |                         |                         |
| Test date: 2015-08-21 | Pressure: 101.6±1.0 kpa | Humidity:53.0±3.0%      |
| Tested by: Alice_Yang | Test site: RF site      | Temperature:22.1±0.6 °C |

| Test Mode        | Frequency ( MHz ) | Power density (dBm/500KHz) |        |       | Limit ( dBm/500KHz ) |
|------------------|-------------------|----------------------------|--------|-------|----------------------|
|                  |                   | ANT0                       | ANT1   | Total |                      |
| 11a              | 5745              | 2.042                      | 1.177  | N/A   | 29.7                 |
|                  | 5785              | 2.732                      | 2.190  | N/A   | 29.7                 |
|                  | 5825              | 2.467                      | 1.540  | N/A   | 29.7                 |
| 11n HT20         | 5745              | 1.946                      | 1.023  | 4.52  | 29.7                 |
|                  | 5785              | 2.035                      | 1.548  | 4.81  | 29.7                 |
|                  | 5825              | 1.648                      | 1.329  | 4.50  | 29.7                 |
| 11n HT40         | 5755              | -1.730                     | -2.591 | 0.87  | 29.7                 |
|                  | 5790              | -1.107                     | -1.562 | 1.68  | 29.7                 |
| 11ac VHT20       | 5745              | 2.004                      | 0.678  | 4.40  | 29.7                 |
|                  | 5785              | 2.257                      | 1.403  | 4.86  | 29.7                 |
|                  | 5825              | 1.857                      | 1.104  | 4.51  | 29.7                 |
| 11ac VHT40       | 5755              | -1.671                     | -2.245 | 1.06  | 29.7                 |
|                  | 5790              | -0.768                     | -1.349 | 1.96  | 29.7                 |
| 11ac VHT80       | 5775              | -6.060                     | -6.071 | -3.06 | 29.7                 |
| Conclusion: PASS |                   |                            |        |       |                      |

Note 1: 11ac/n Mode

$$\text{Directional Gain} = 10 \log[(10^{3.48/20} + 10^{3.18/20})^2 / 2] \text{dBi} \\ = 6.3 \text{dBi} > 6 \text{dBi}$$

Note 2:

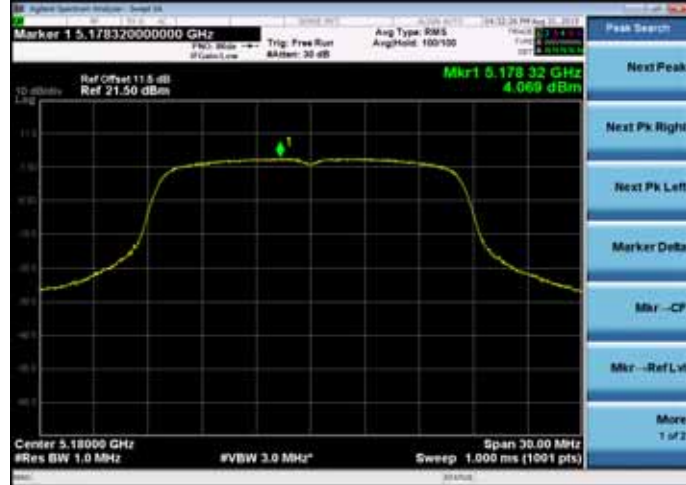
1. Correction factor =  $10 \log(500 \text{kHz} / 100 \text{kHz}) = 6.9897$
2. Result = Reading value + Correction factor

5180-5240MHz Band:

ANT 0

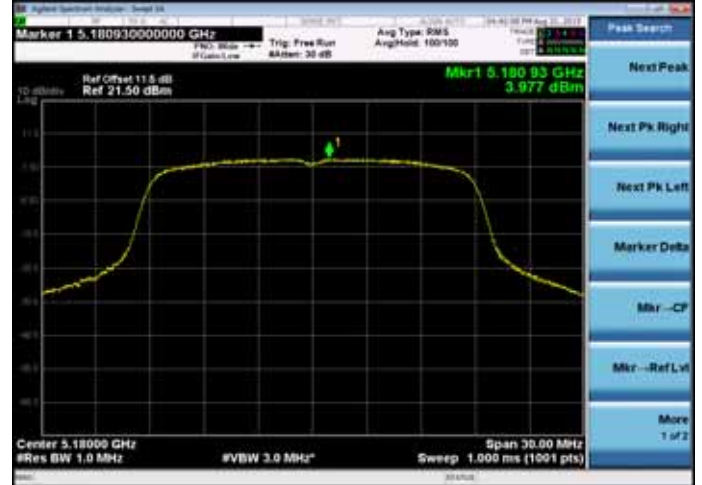
11a

5180MHz

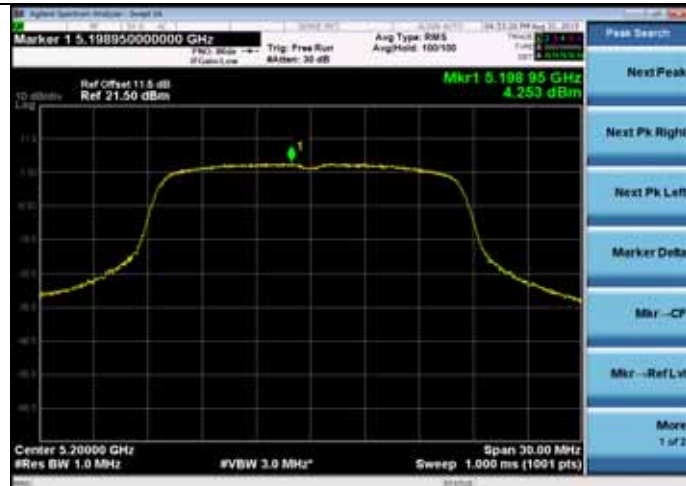


11n HT20

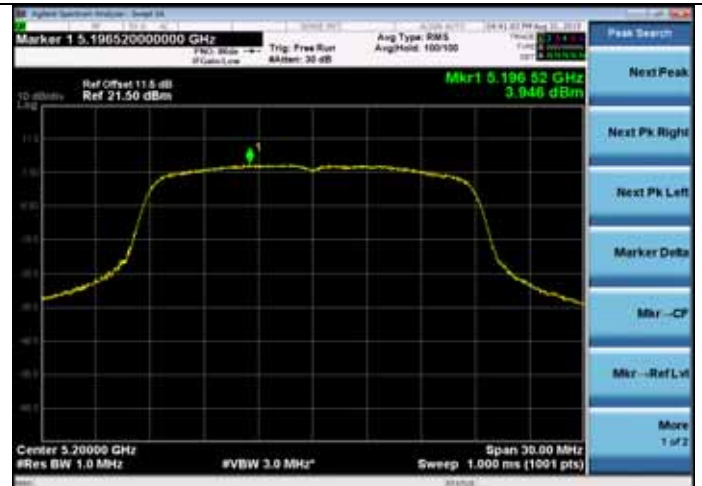
5180MHz



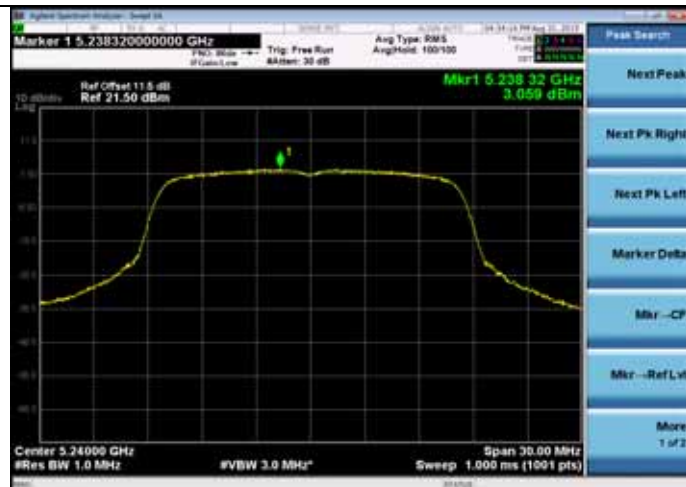
5200MHz



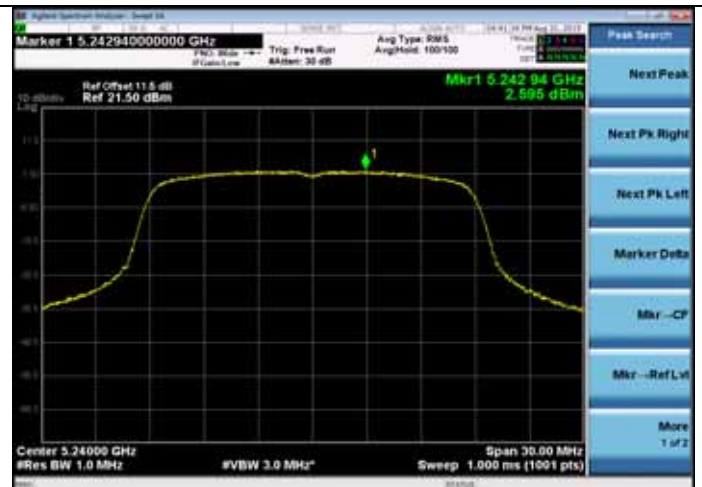
5200MHz



5240MHz

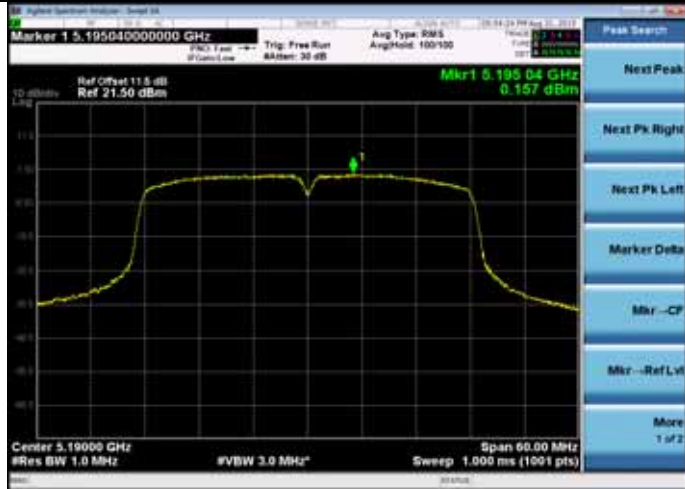


5240MHz



## 11n HT40

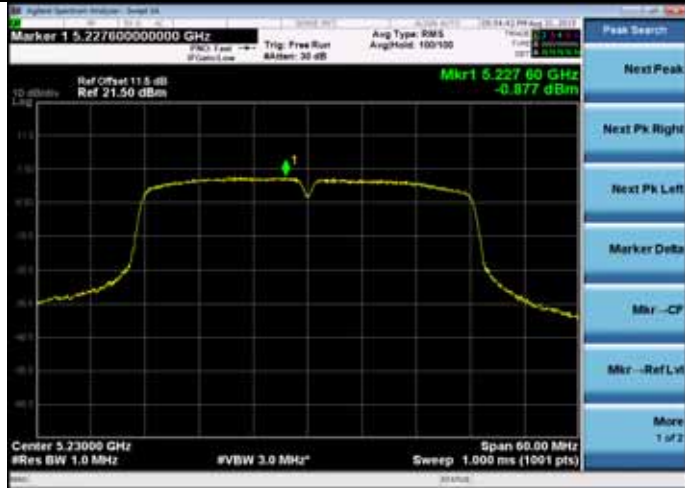
5190MHz



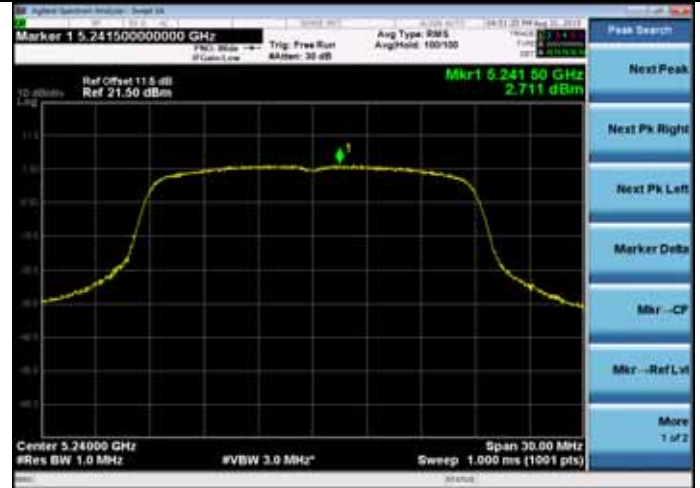
5200MHz



5230MHz

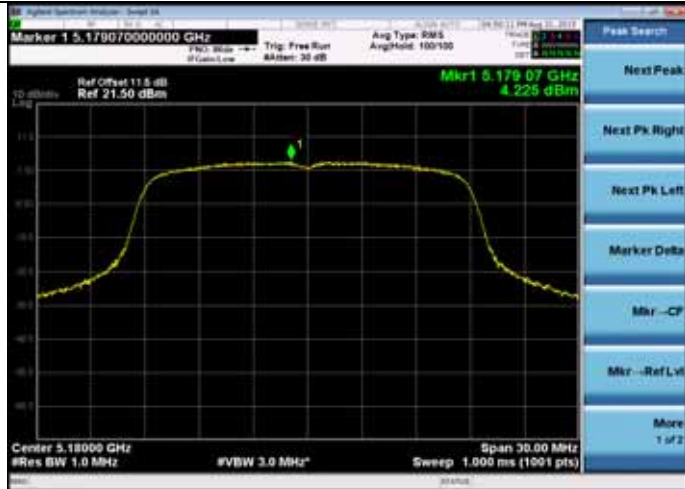


5240MHz



## 11ac VHT20

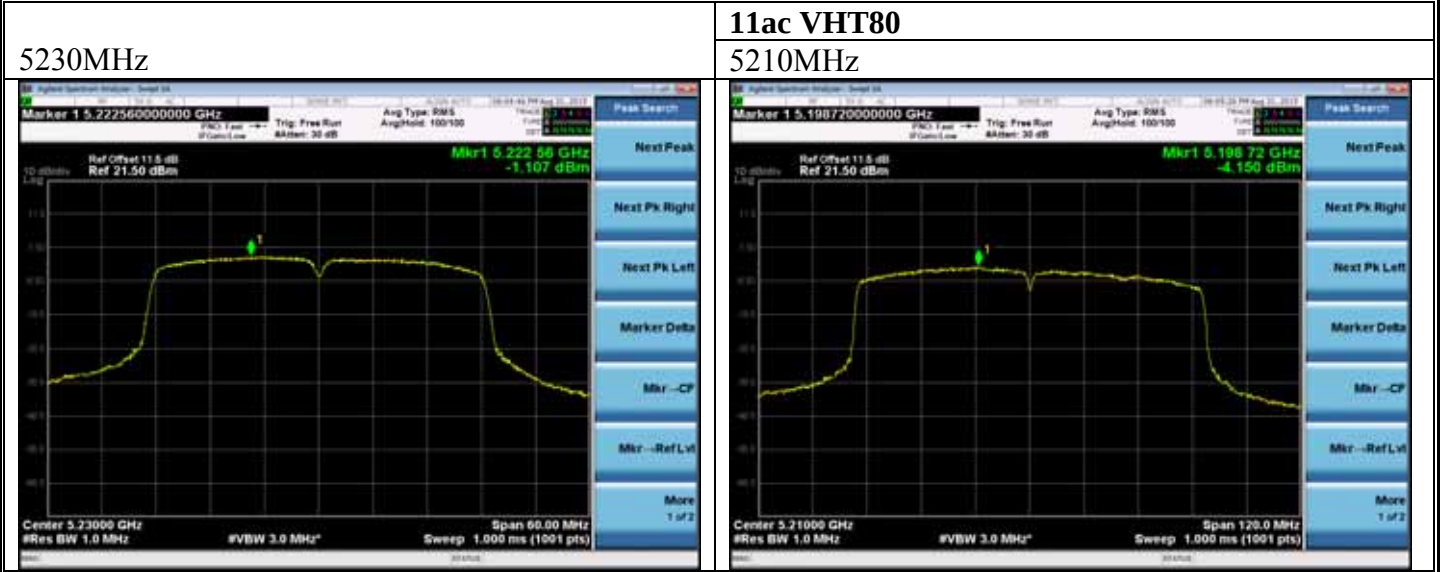
5180MHz



## 11ac VHT40

5190MHz





5180-5240MHz Band:

ANT 1

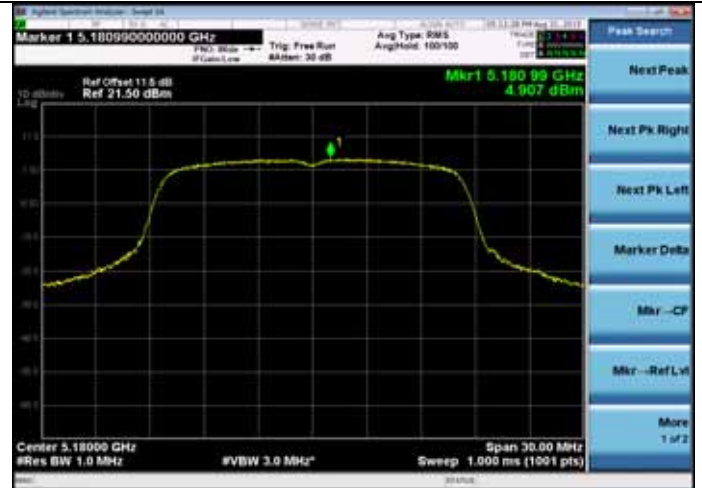
11a

5180MHz

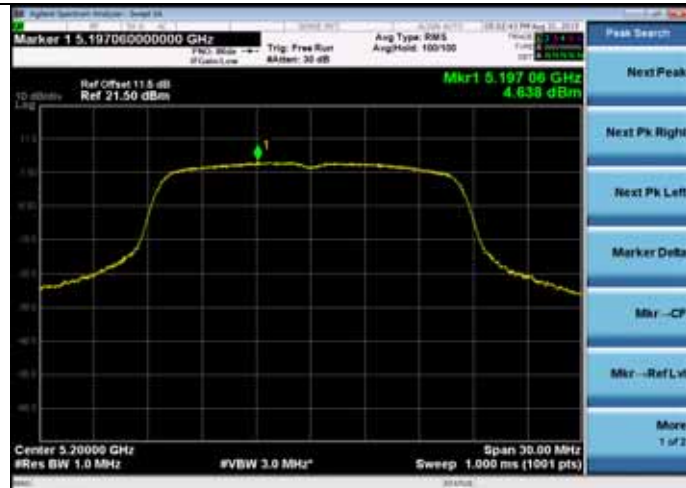


11n HT20

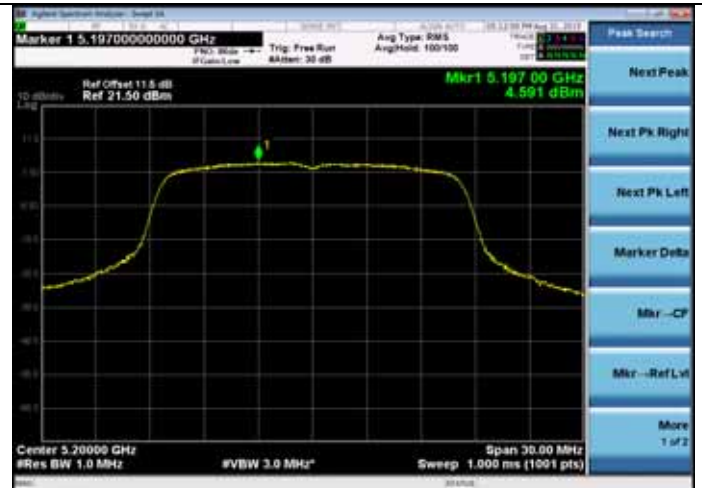
5180MHz



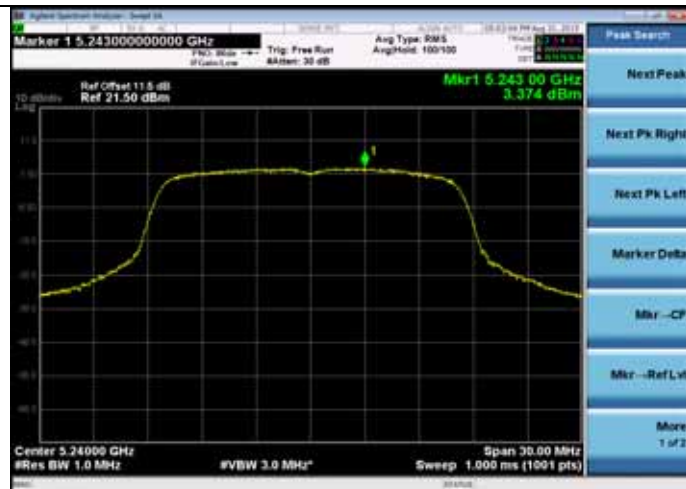
5200MHz



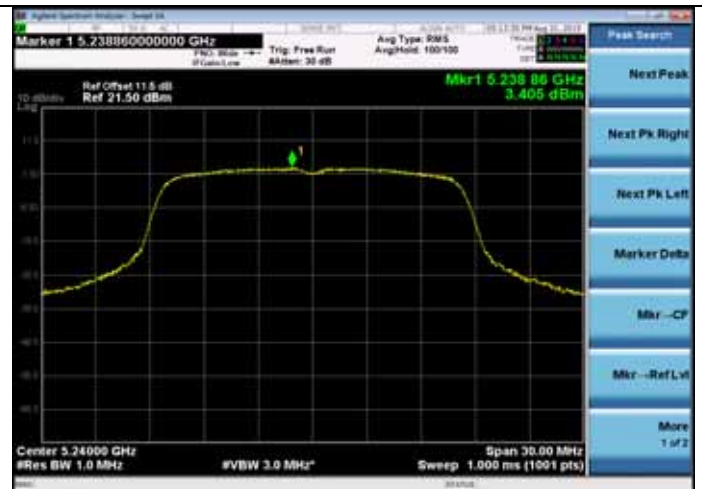
5200MHz



5240MHz

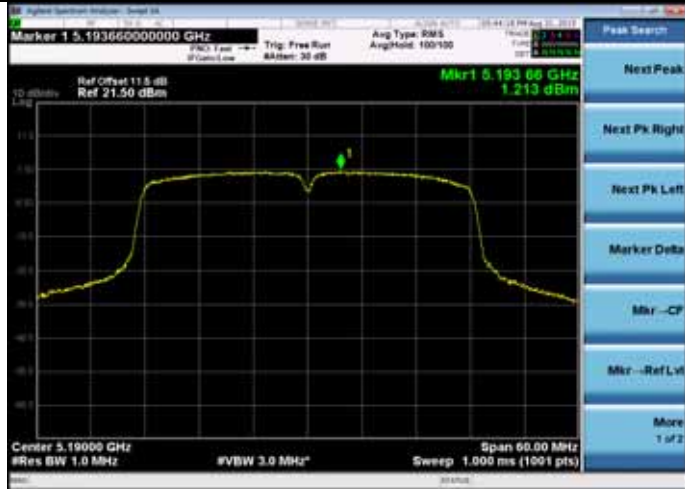


5240MHz



## 11n HT40

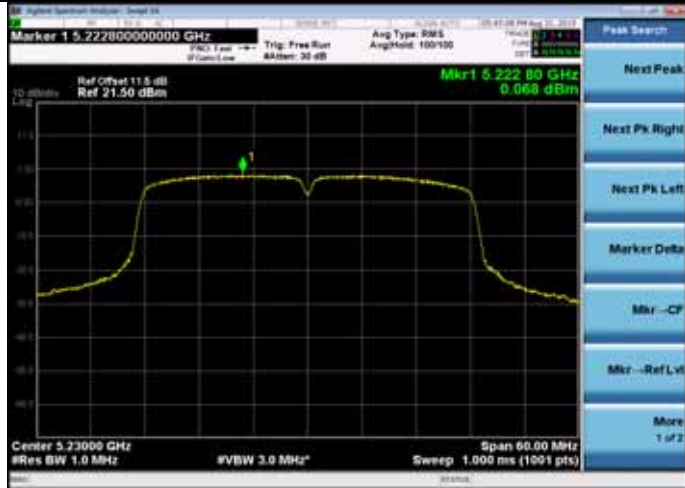
5190MHz



5200MHz



5230MHz



5240MHz



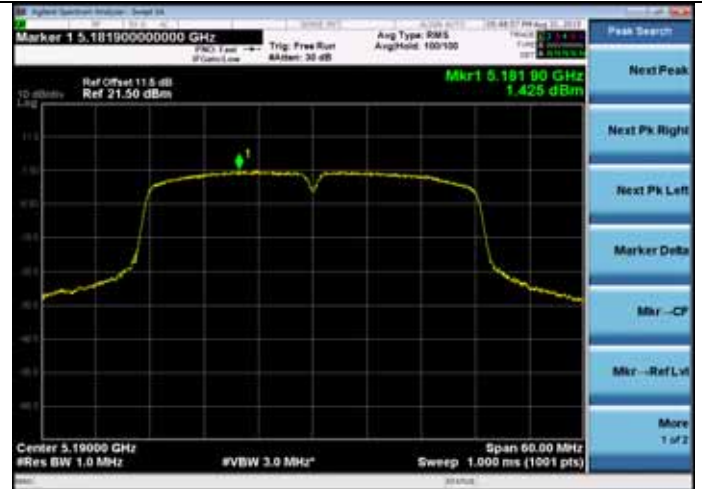
## 11ac VHT20

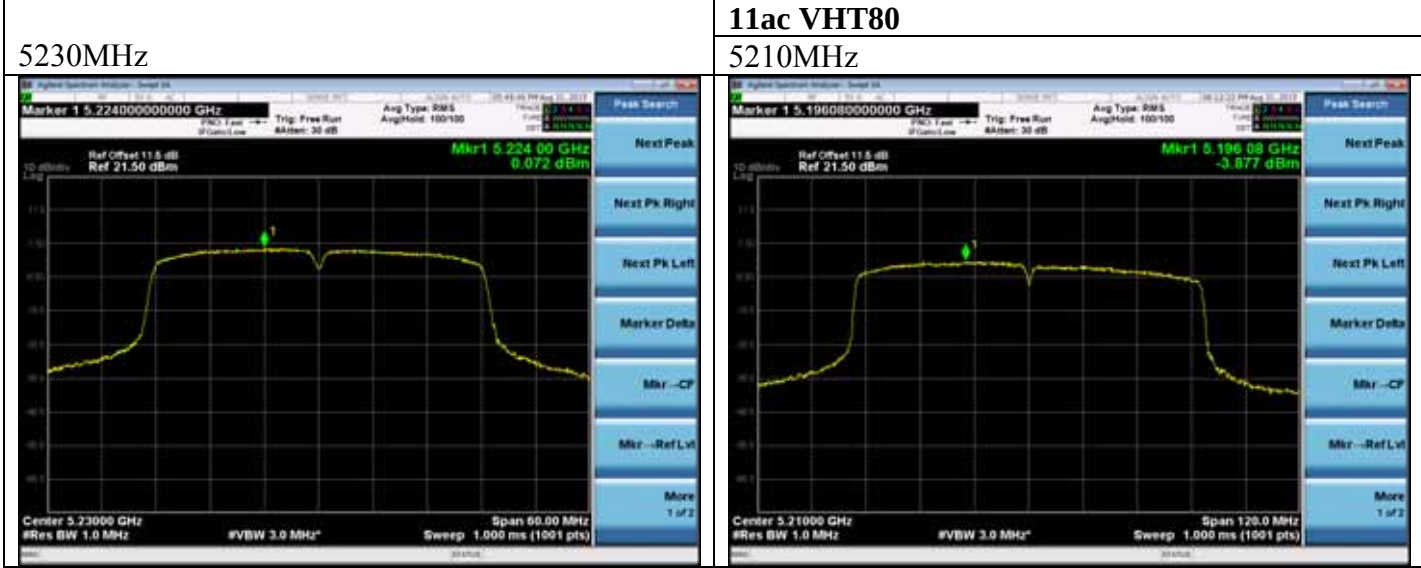
5180MHz



## 11ac VHT40

5190MHz





5260-5320MHz Band:

ANT 0

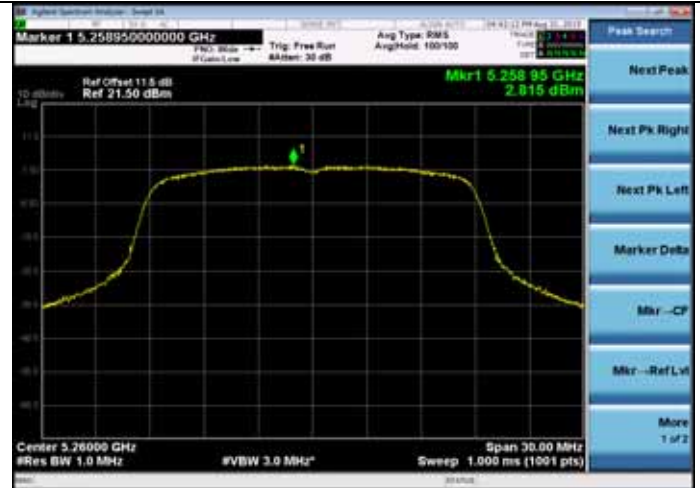
11a

5260MHz

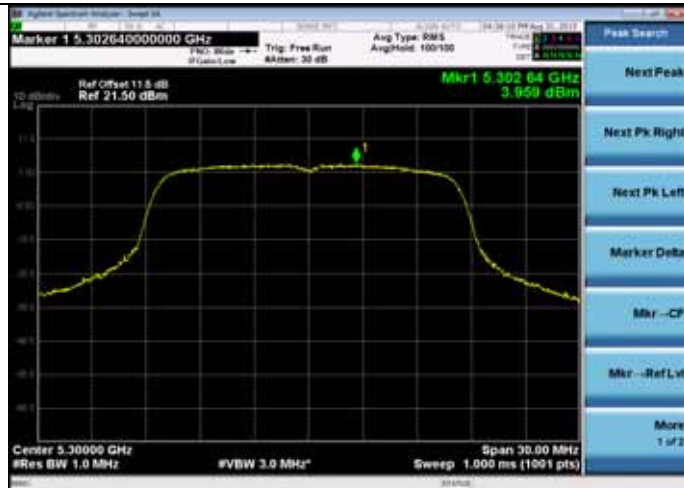


11n HT20

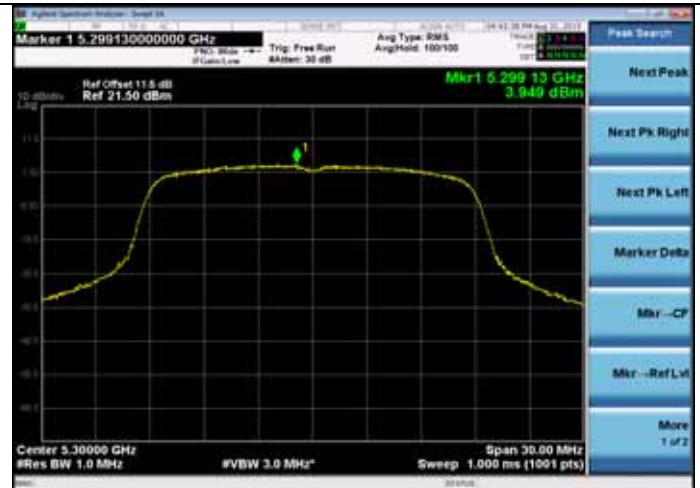
5260MHz



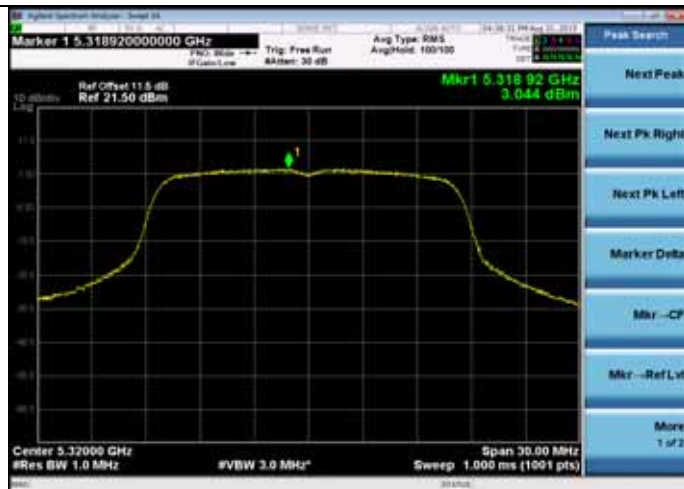
5300MHz



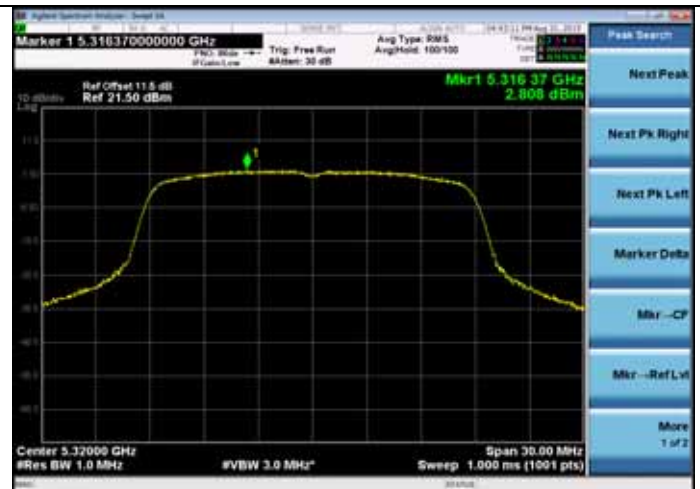
5300MHz



5320MHz

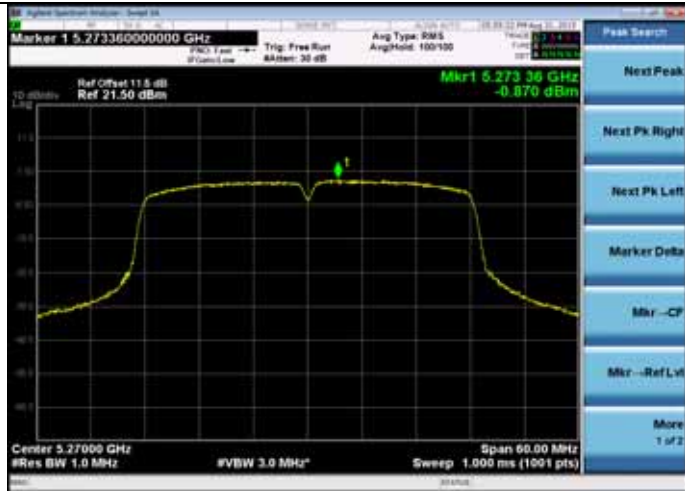


5320MHz

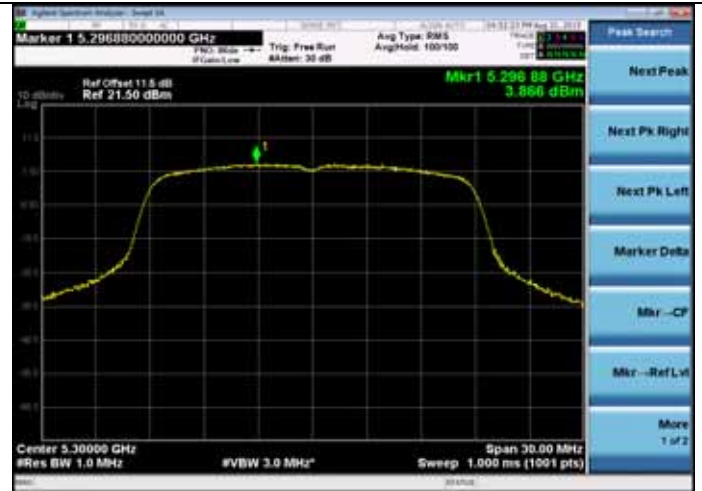


### 11n HT40

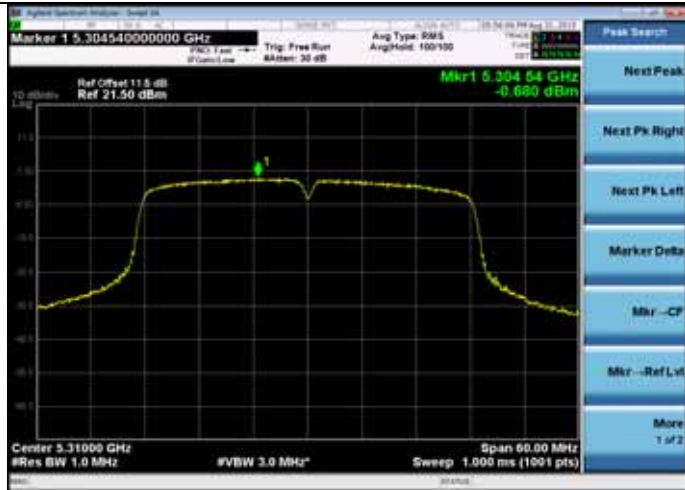
5270MHz



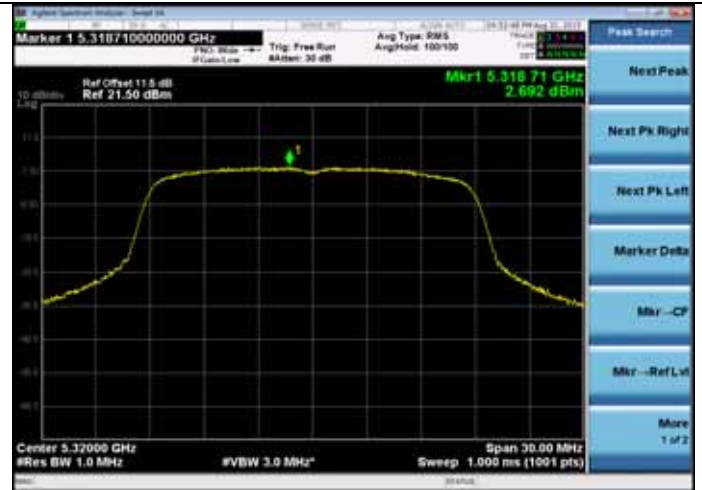
5300MHz



5310MHz

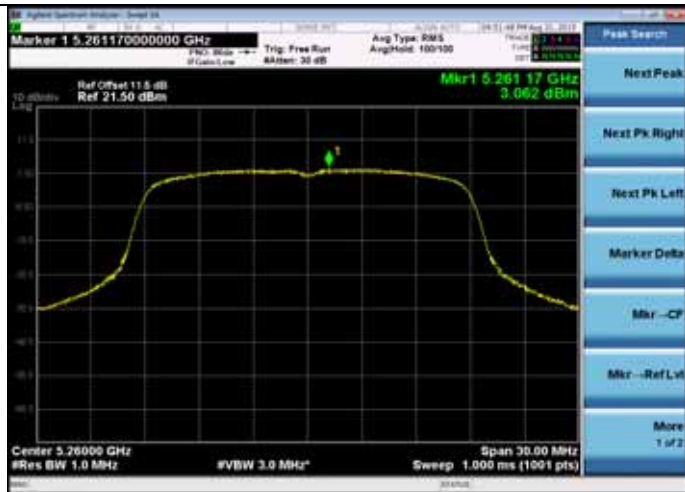


5320MHz



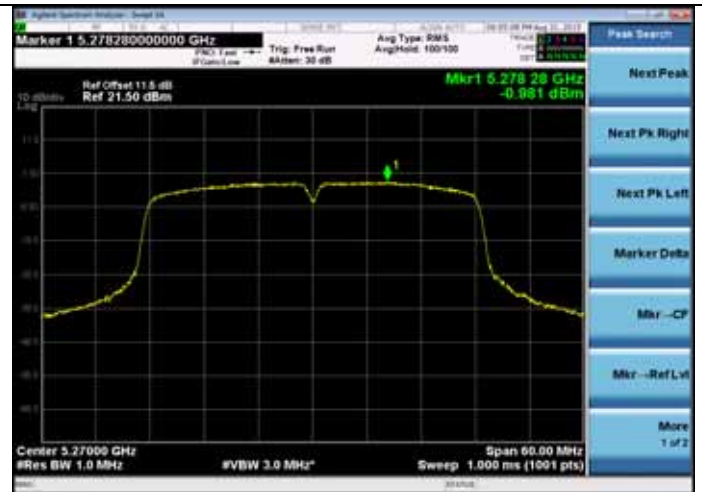
### 11ac VHT20

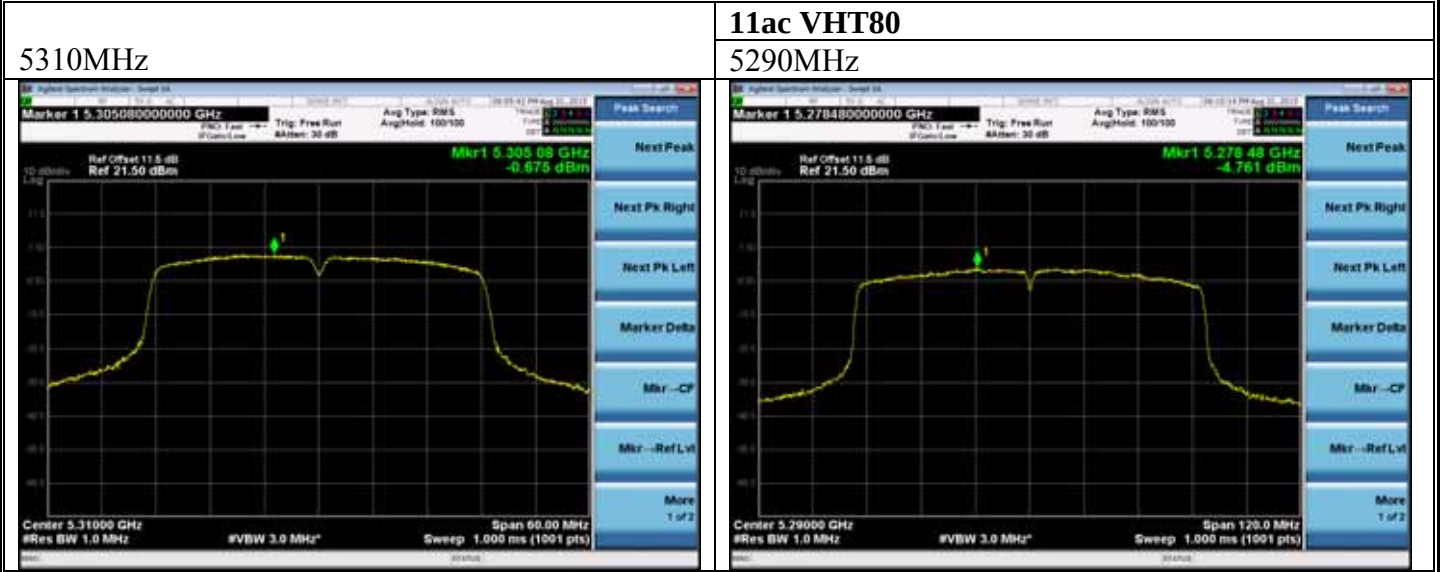
5260MHz



### 11ac VHT40

5270MHz





5260-5320MHz Band:

ANT 1

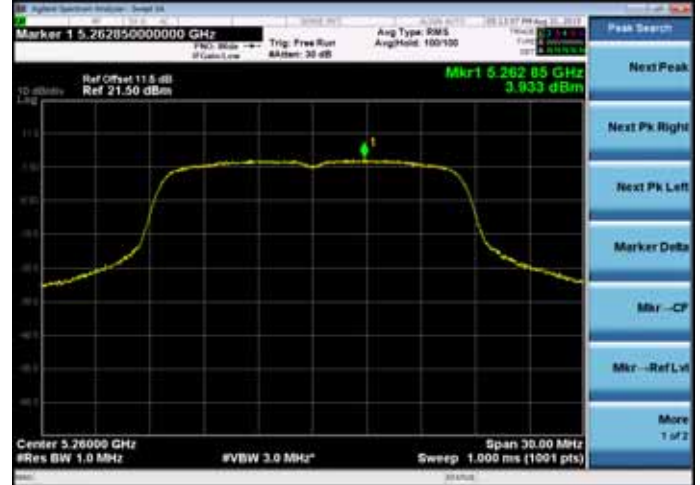
11a

5260MHz

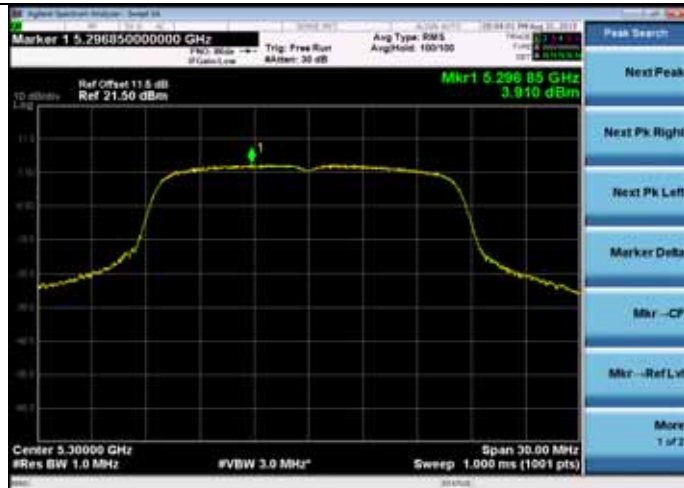


11n HT20

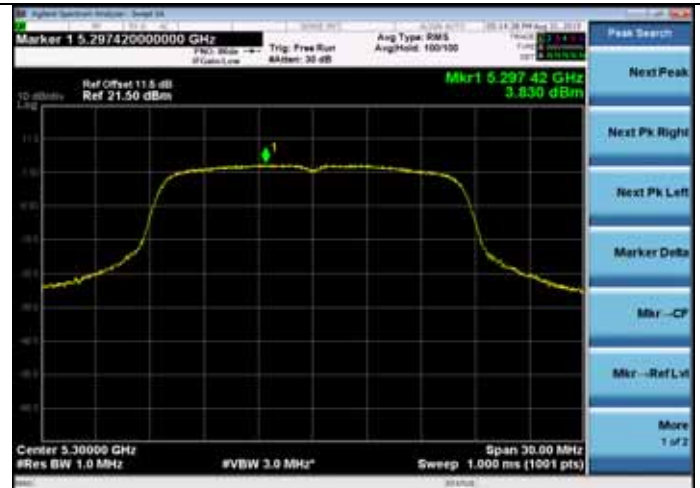
5260MHz



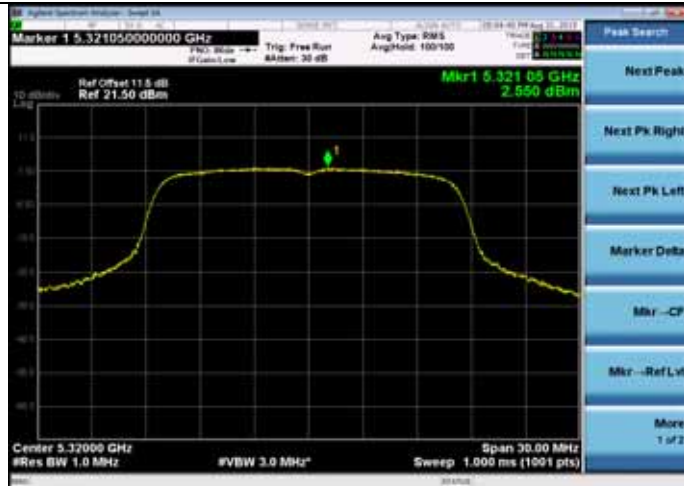
5300MHz



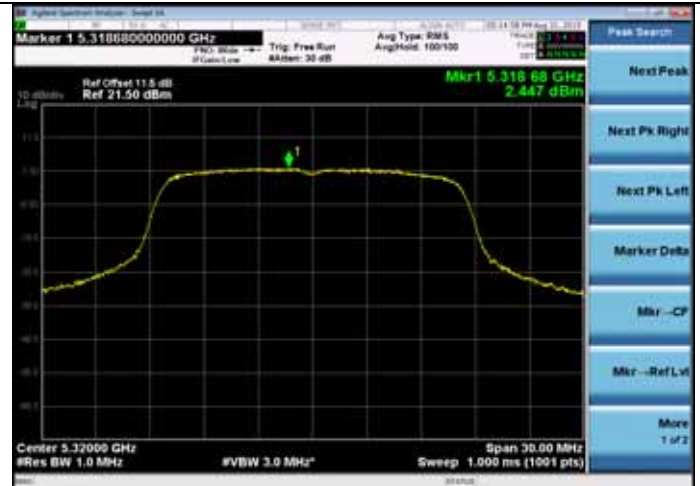
5300MHz



5320MHz

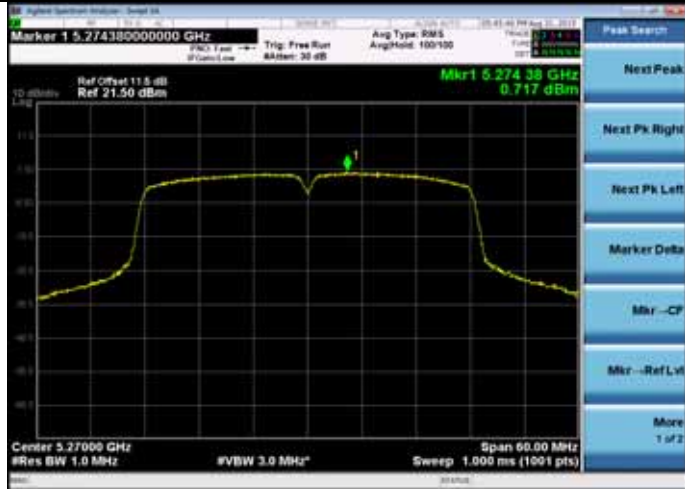


5320MHz

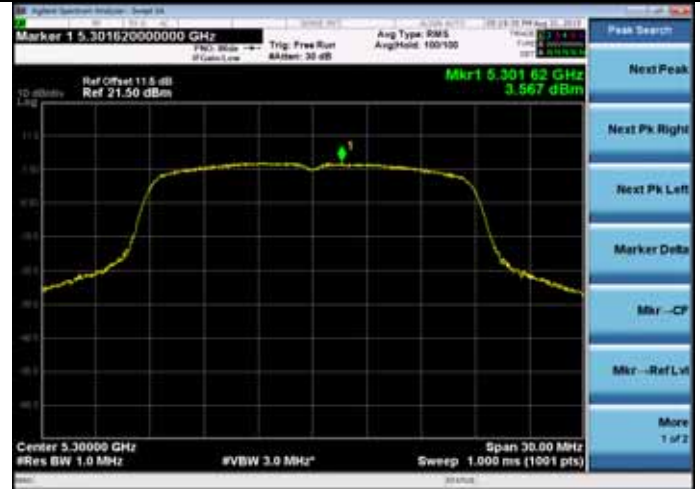


## 11n HT40

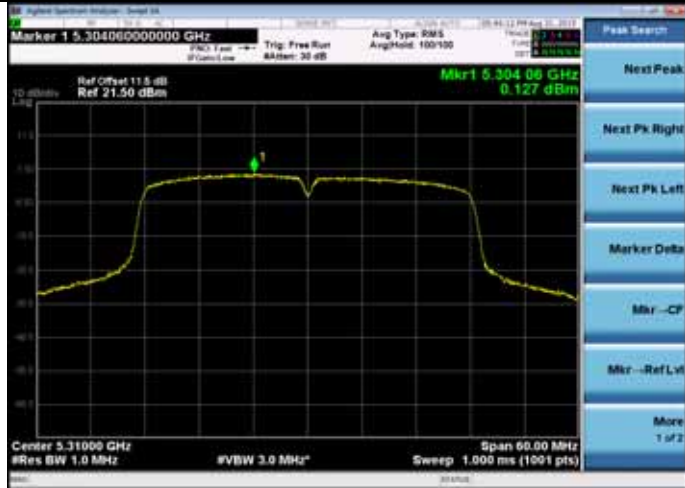
5270MHz



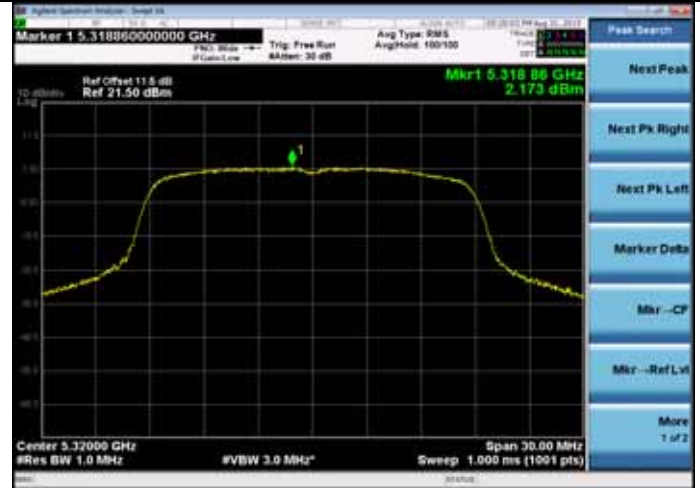
5300MHz



5310MHz



5320MHz



## 11ac VHT20

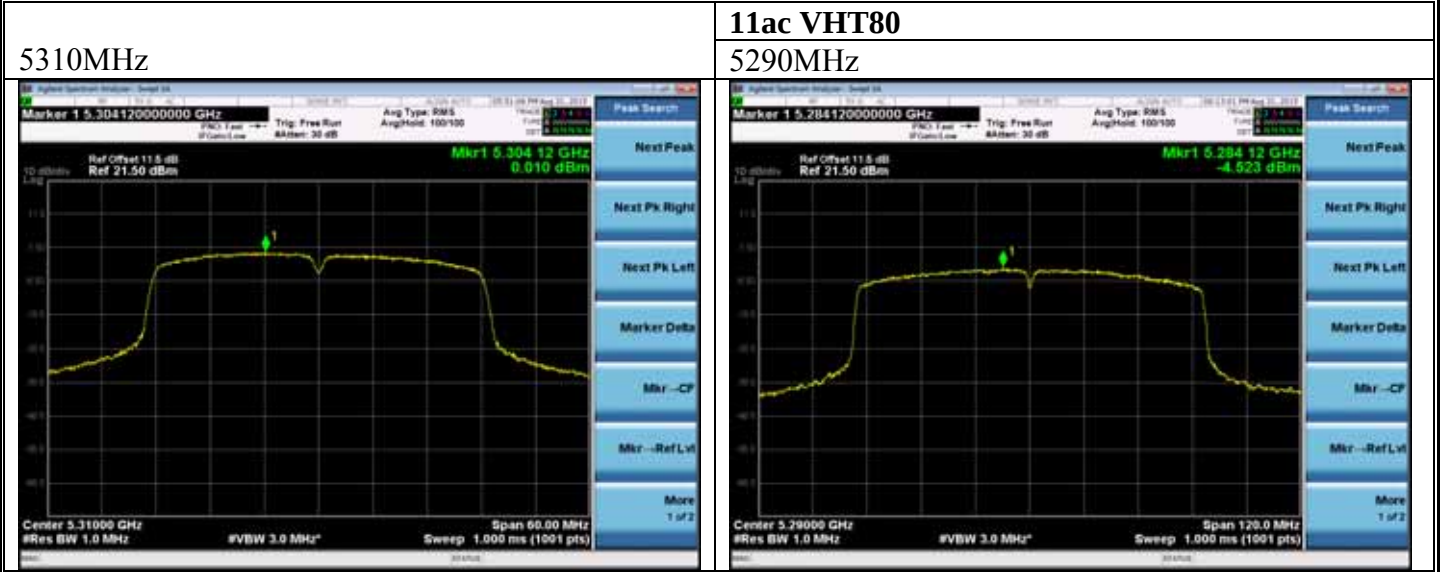
5260MHz



## 11ac VHT40

5270MHz





5500-5700MHz Band:

ANT 0

11a

5500MHz

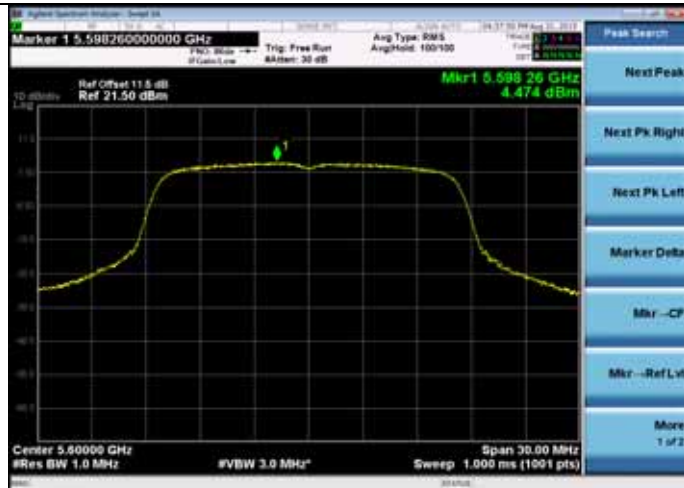


11n HT20

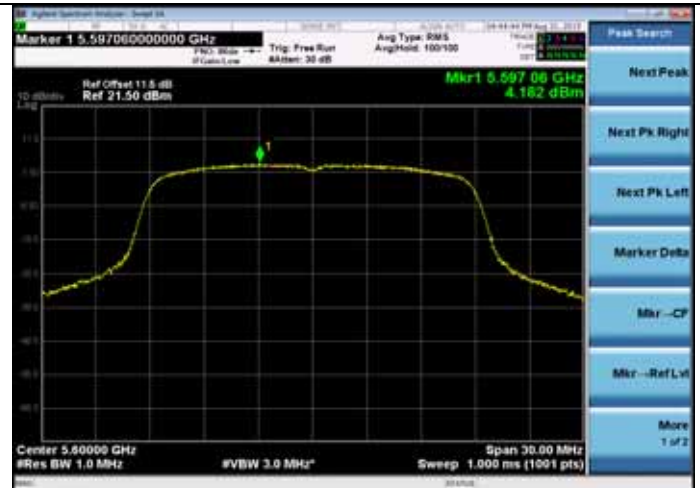
5500MHz



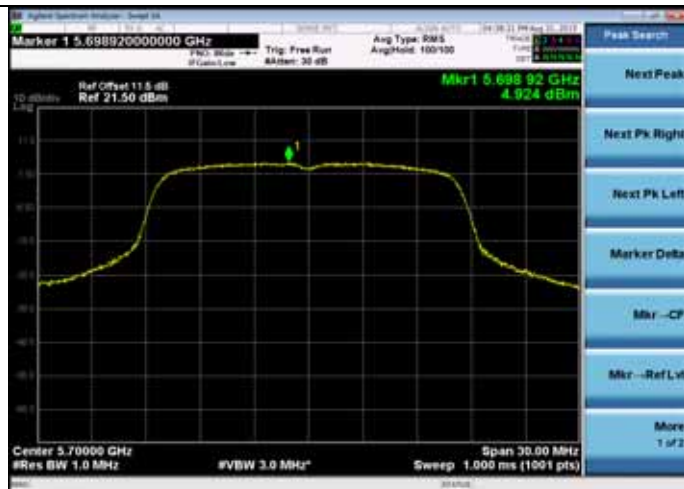
5600MHz



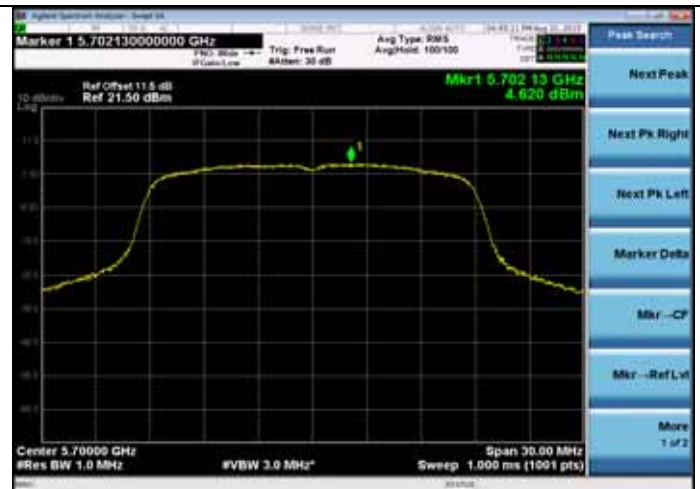
5600MHz



5700MHz



5700MHz



### 11n HT40

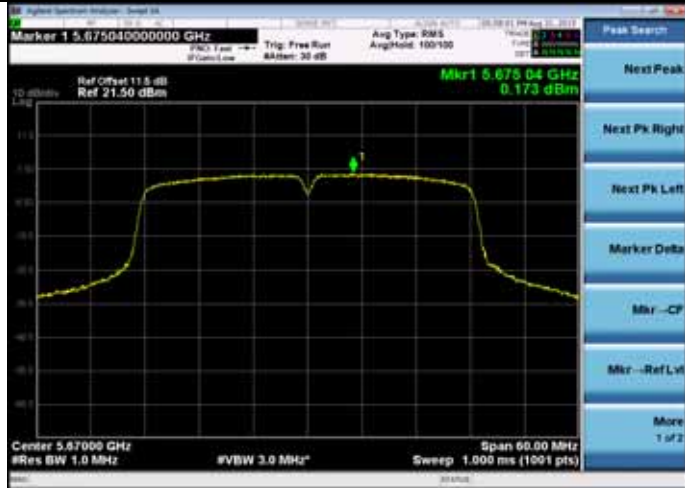
5510MHz



5600MHz



5670MHz



5700MHz



### 11ac VHT20

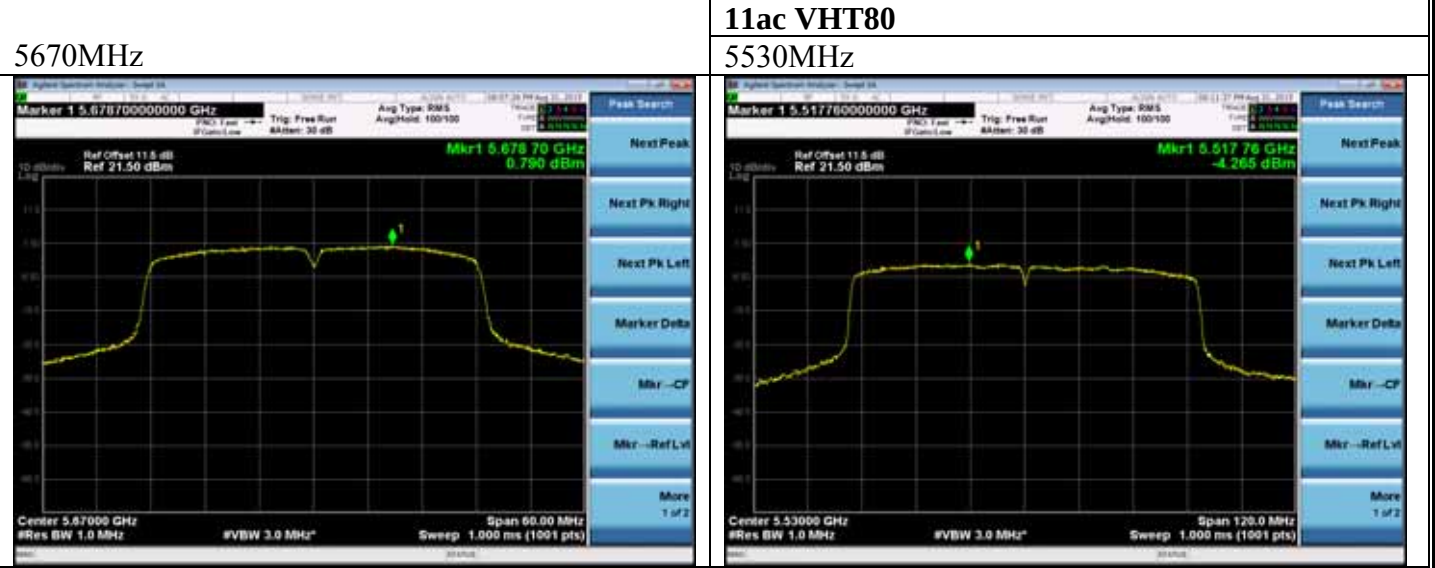
5500MHz



### 11ac VHT40

5510MHz



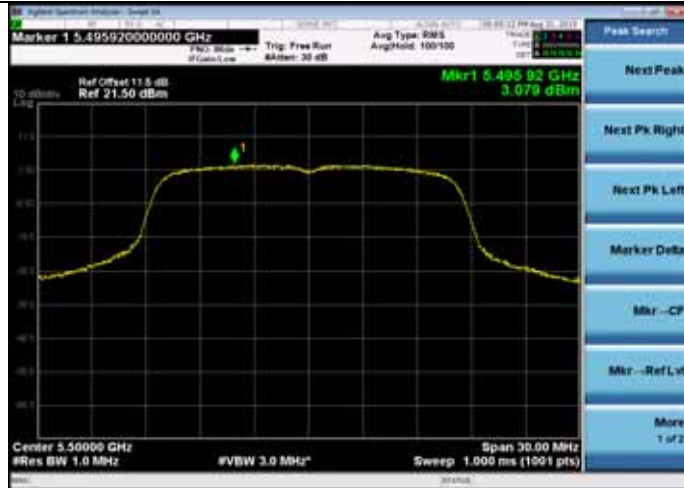


5500-5700MHz Band:

ANT 1

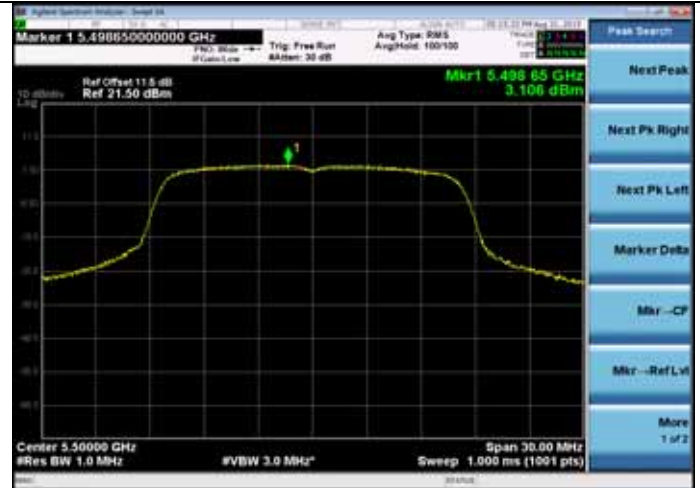
11a

5500MHz

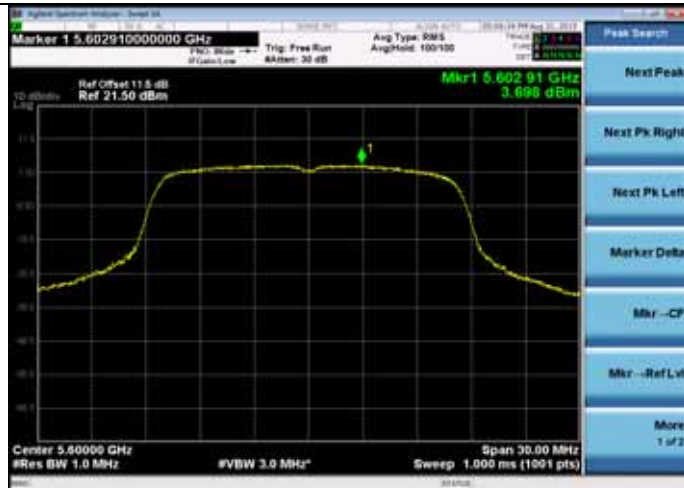


11n HT20

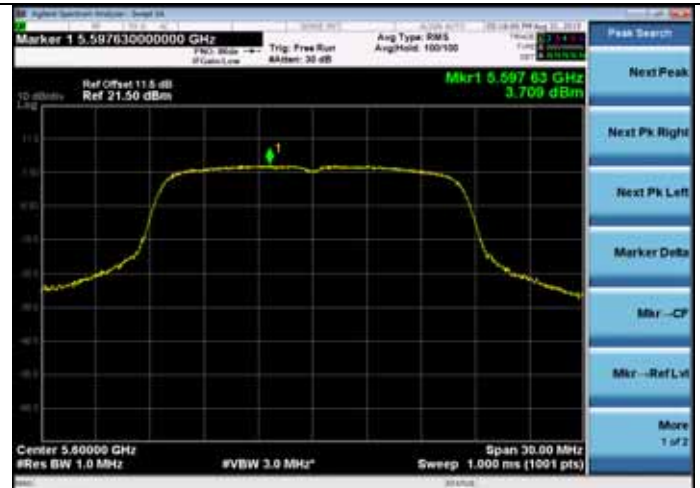
5500MHz



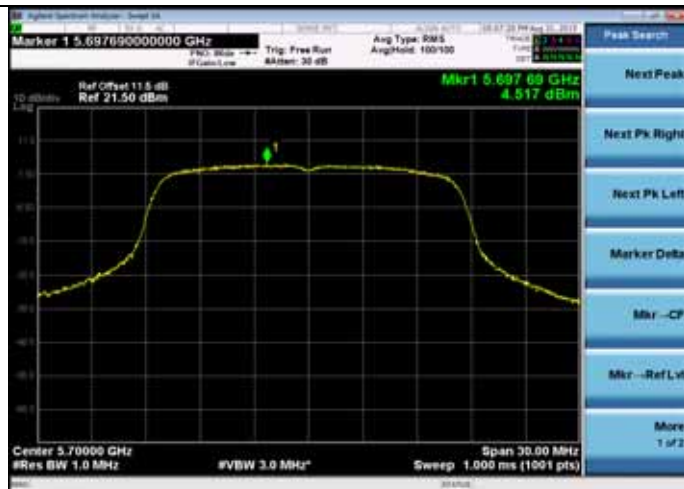
5600MHz



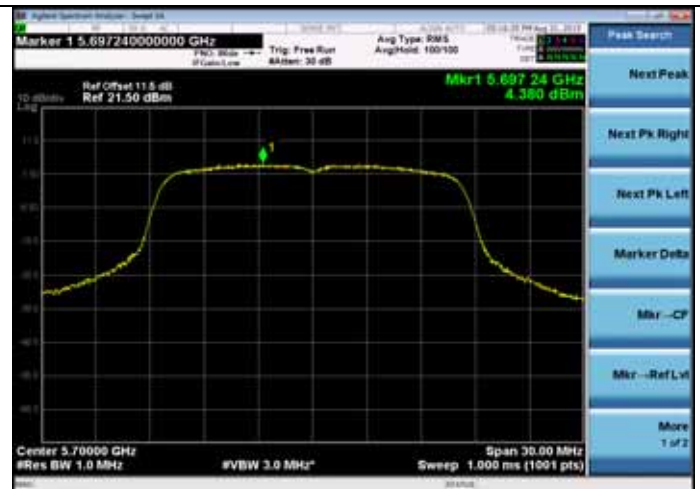
5600MHz



5700MHz



5700MHz

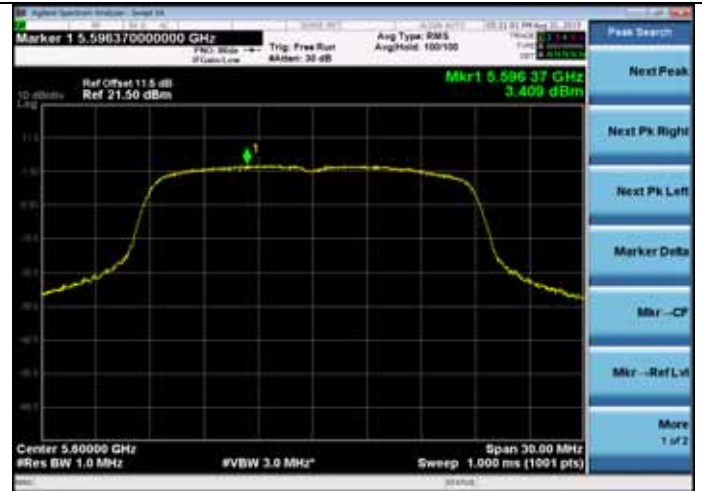


### 11n HT40

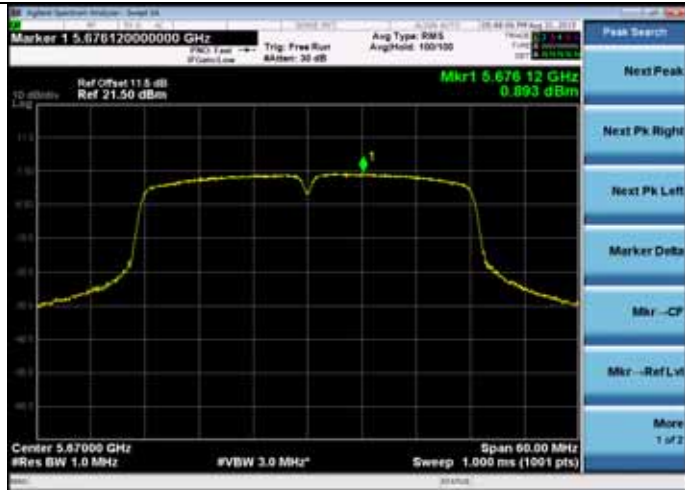
5510MHz



5600MHz



5670MHz

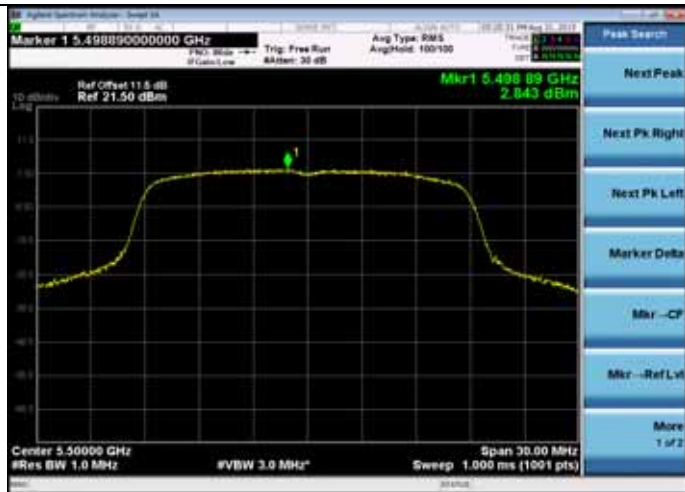


5700MHz



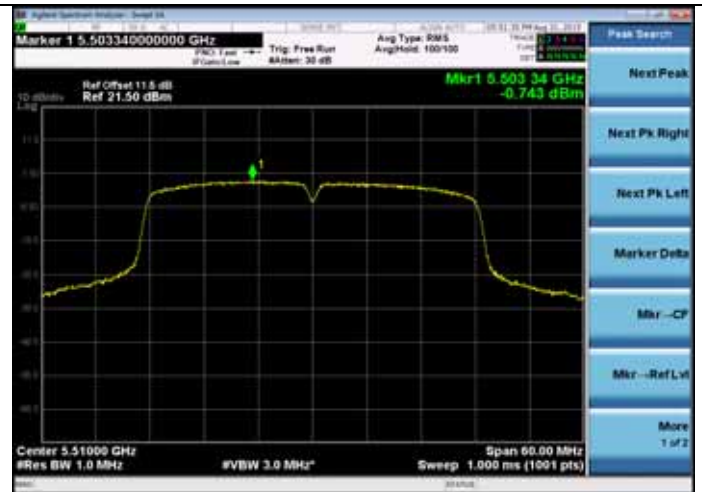
### 11ac VHT20

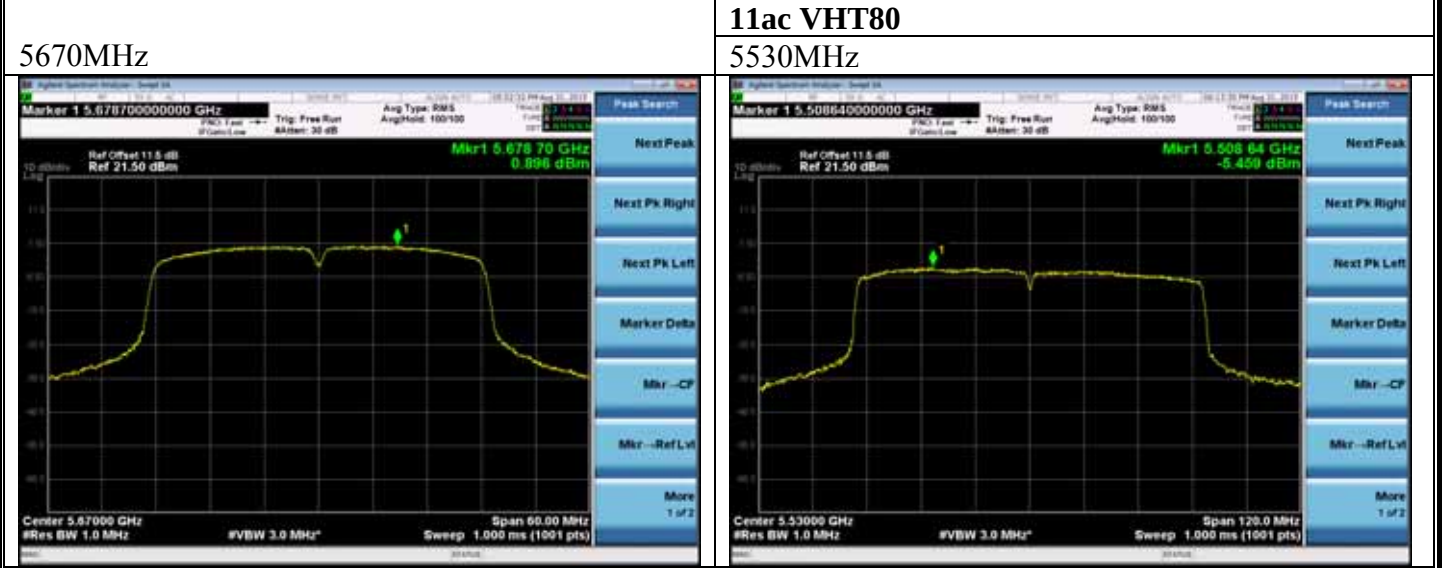
5500MHz



### 11ac VHT40

5510MHz



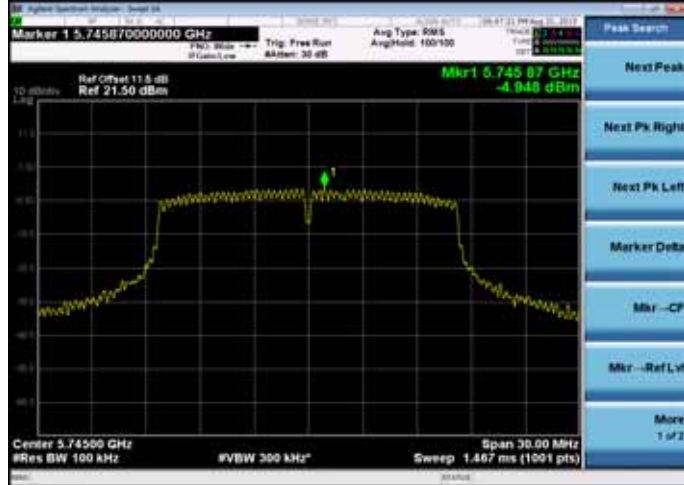


5745-5825MHz Band:

ANT 0

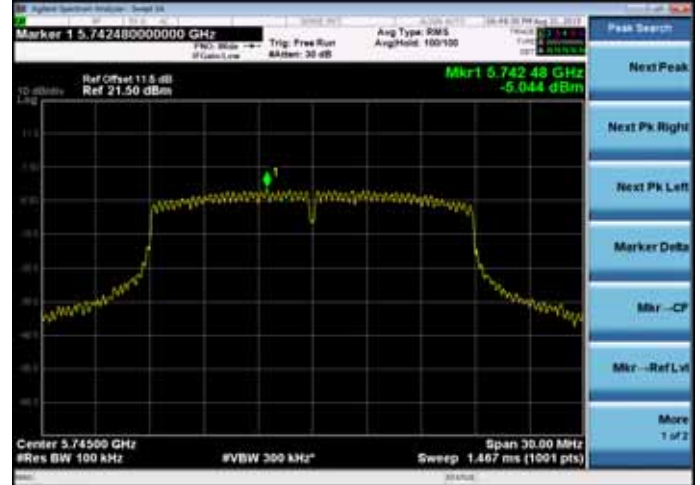
11a

5745MHz

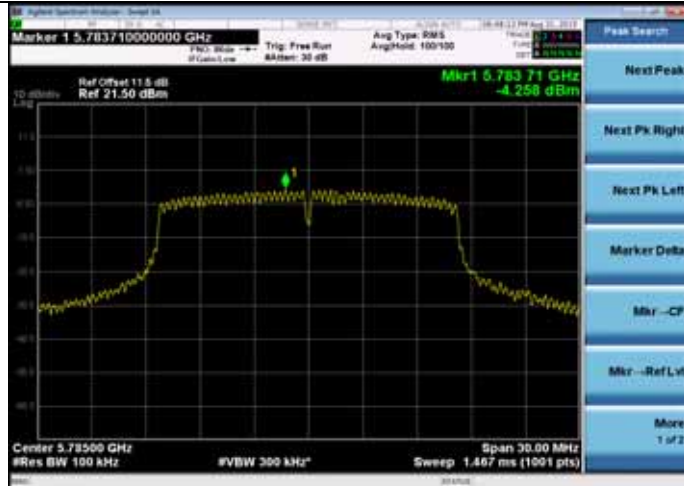


11n HT20

5745MHz



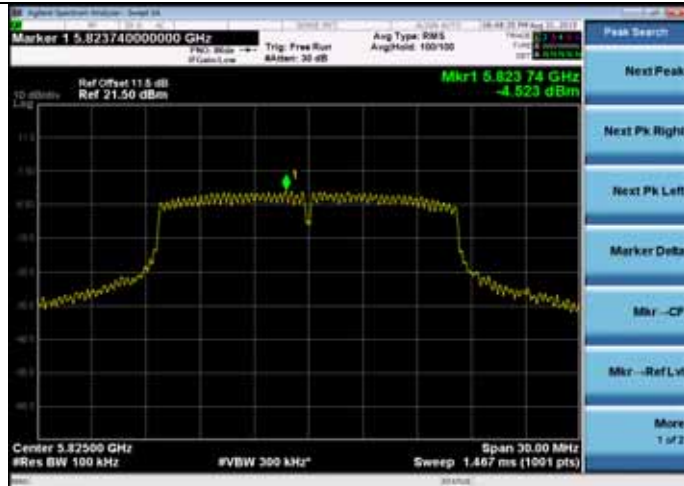
5785MHz



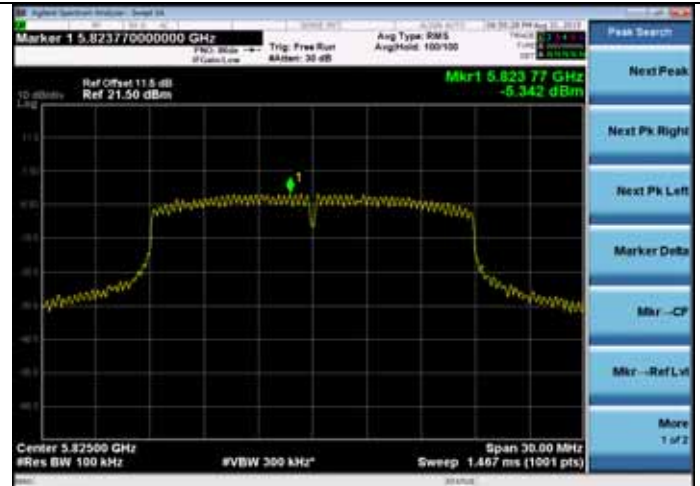
5785MHz



5825MHz

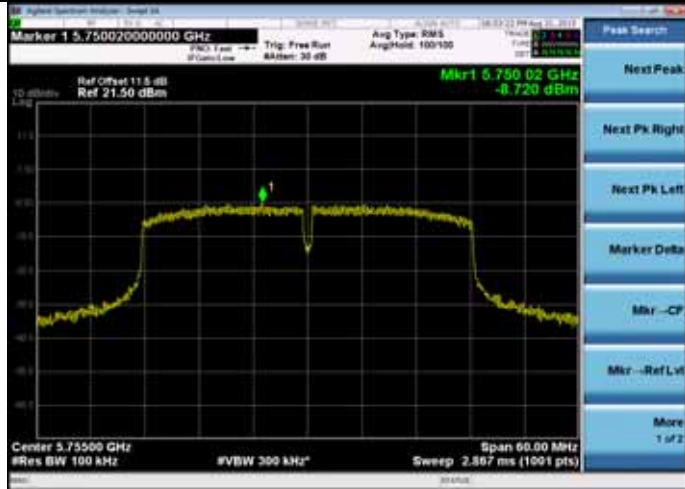


5825MHz

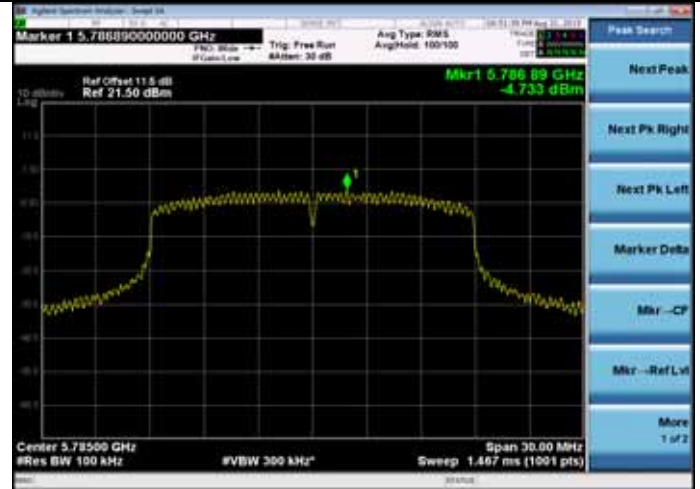


### 11n HT40

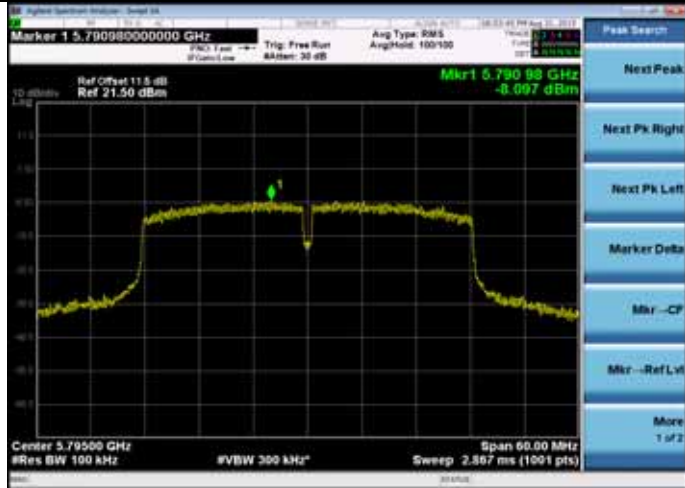
5755MHz



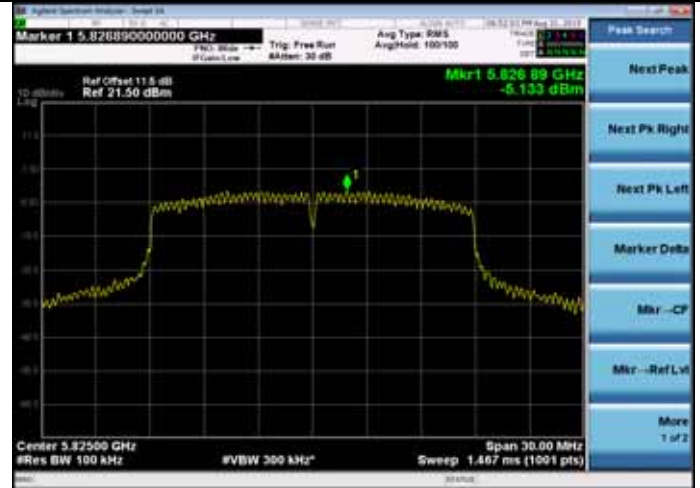
5785MHz



5795MHz

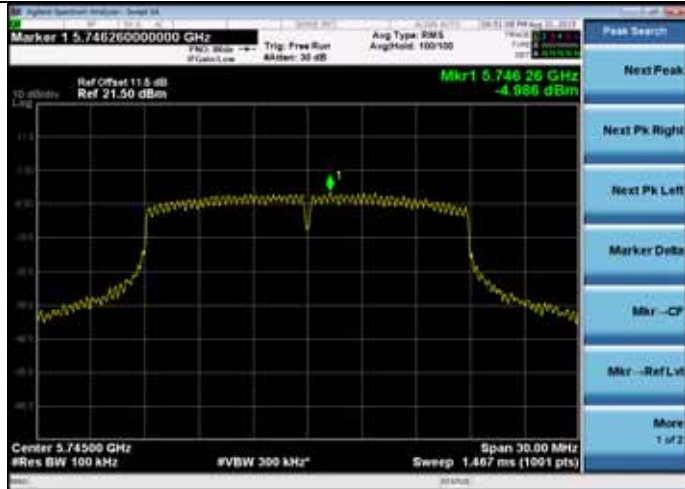


5825MHz



### 11ac VHT20

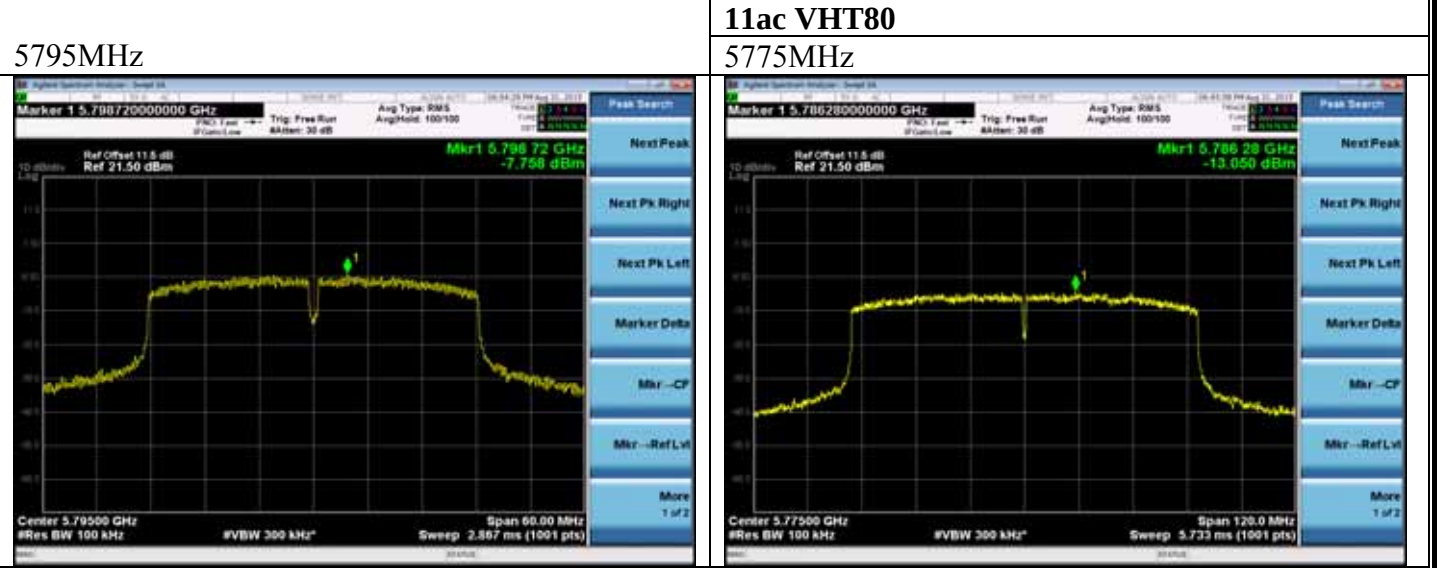
5745MHz



### 11ac VHT40

5755MHz



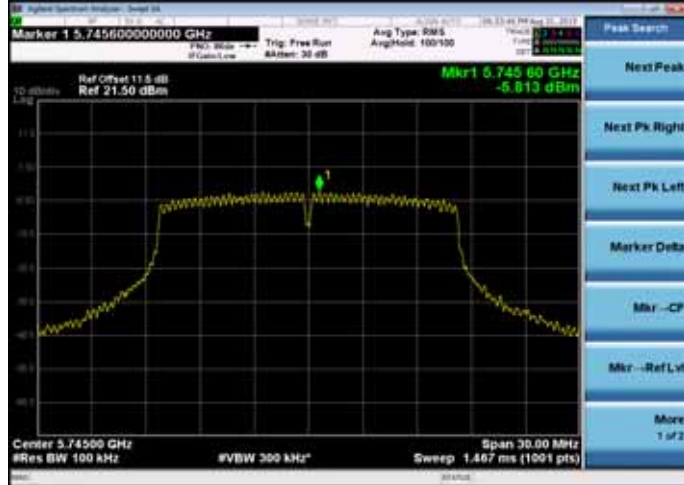


5745-5825MHz Band:

ANT 1

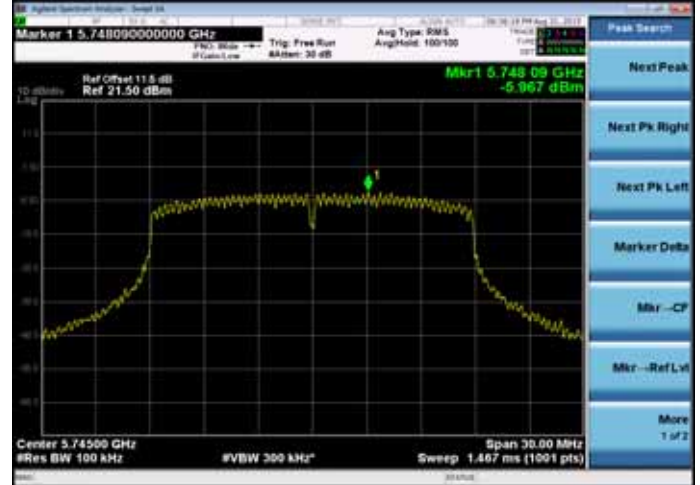
11a

5745MHz

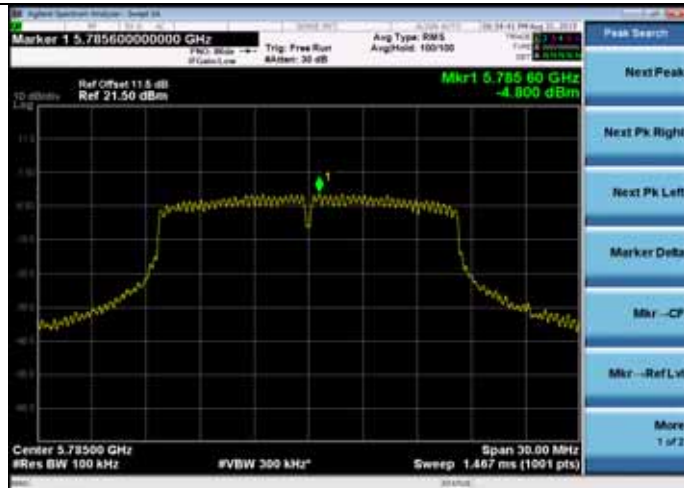


11n HT20

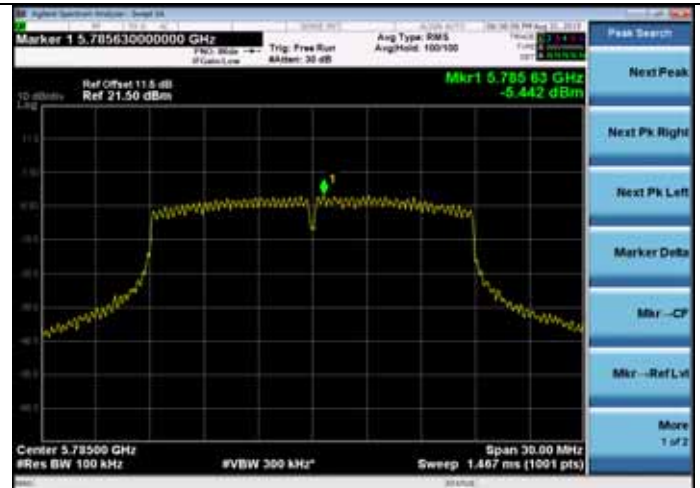
5745MHz



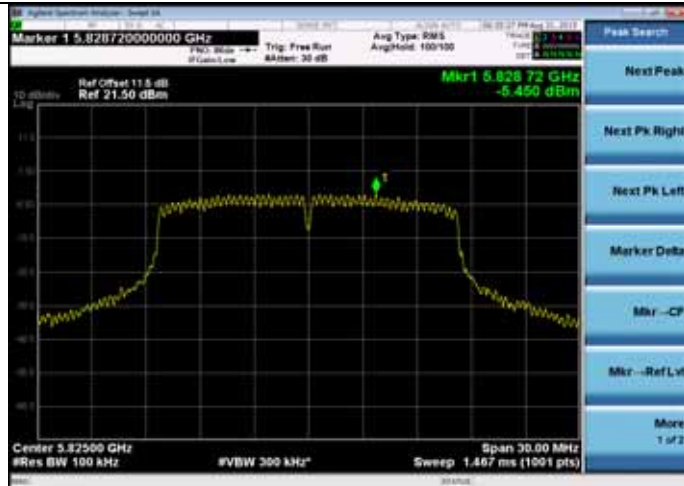
5785MHz



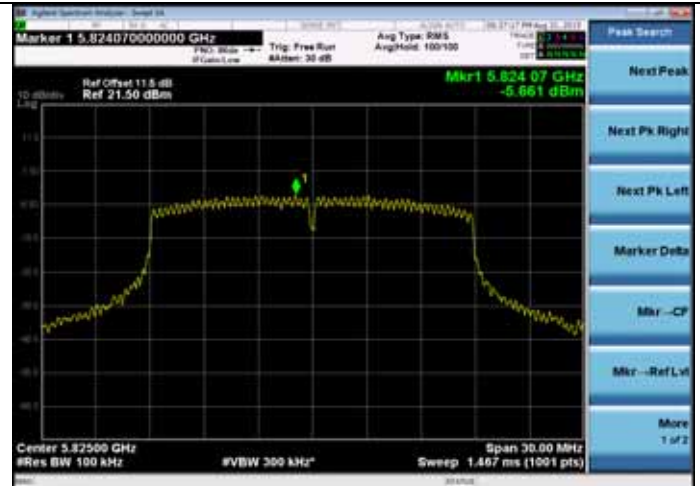
5785MHz



5825MHz

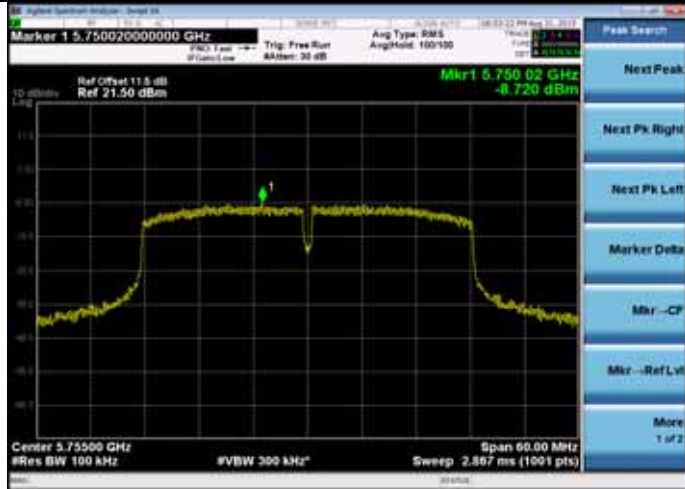


5825MHz

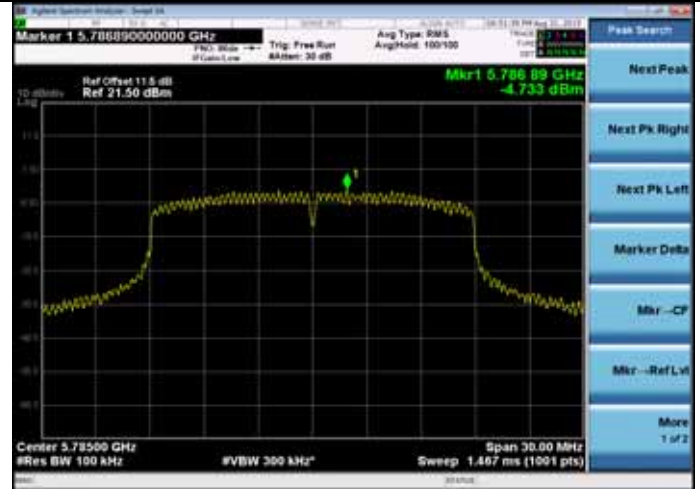


### 11n HT40

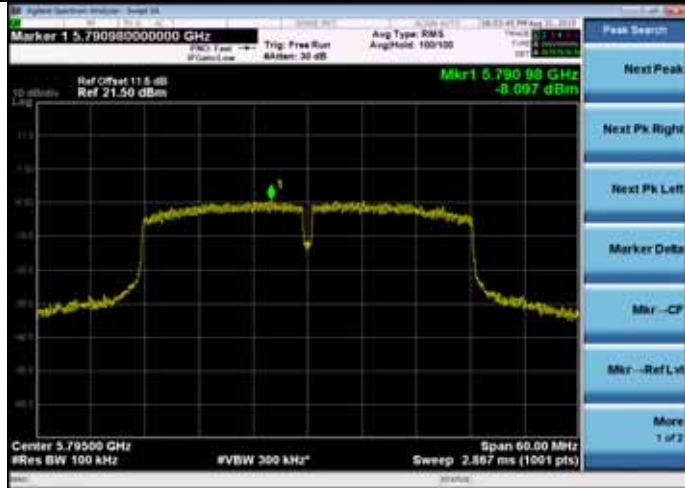
5755MHz



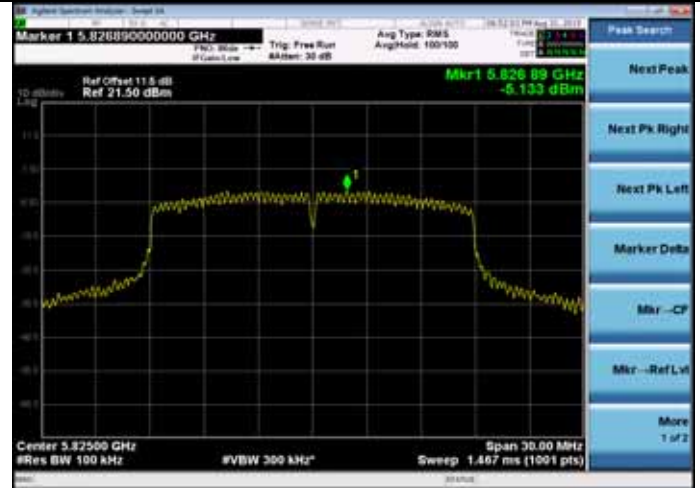
5785MHz



5795MHz

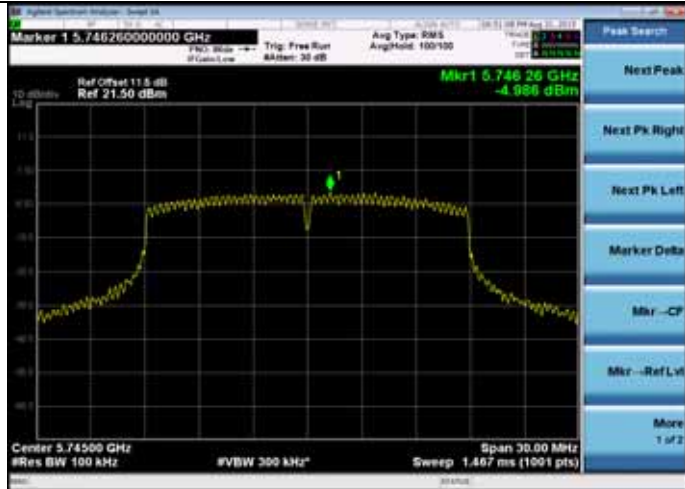


5825MHz



### 11ac VHT20

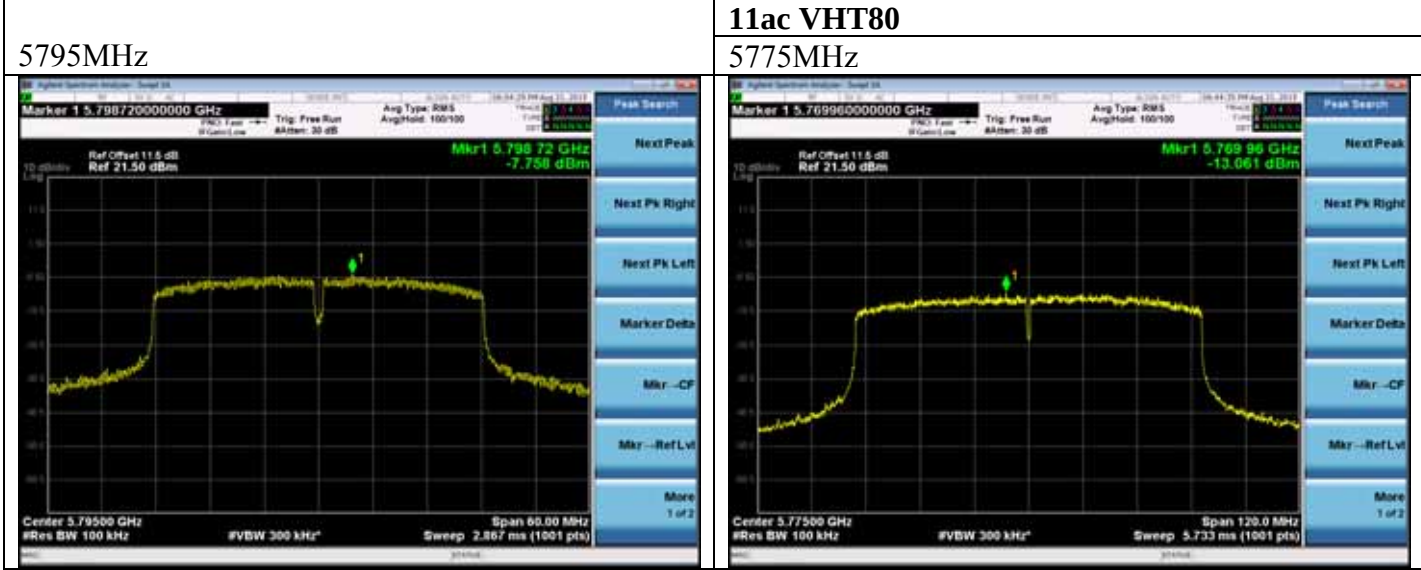
5745MHz



### 11ac VHT40

5755MHz





## 9. FREQUENCY STABILITY MEASUREMENT

### 9.1. Test Equipment

| Item | Equipment           | Manufacturer | Model No.   | Serial No. | Last Cal. | Cal. Interval |
|------|---------------------|--------------|-------------|------------|-----------|---------------|
| 1.   | PXA Signal Analyzer | Agilent      | N9030A      | MY51380221 | Oct.18,15 | 1 Year        |
| 2.   | Amplifier           | Agilent      | 8449B       | 3008A02495 | Apr.28,15 | 1 Year        |
| 3.   | Horn Antenna        | ETS          | 3115        | 9510-4877  | Oct.15,15 | 1 Year        |
| 4.   | HF Cable            | Hubersuhner  | Sucoflex104 | 274094/4   | Apr.28,15 | 1 Year        |

### 9.2. Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emissions is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or  $\pm 20\text{ppm}$

### 9.3. Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer. EUT have transmitted absence of modulation signal and fixed channelise. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.  $f_c$  is declaring of channel frequency. Then the frequency error formula is  $(f_c - f)/f_c \times 10^6 \text{ ppm}$  and the limit is less than  $\pm 20\text{ppm}$  The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
2. Extreme temperature rule is  $-30^\circ\text{C} \sim 50^\circ\text{C}$ .

### 9.4. Test Result

|                                         |                            |                                     |
|-----------------------------------------|----------------------------|-------------------------------------|
| EUT: Notebook                           |                            |                                     |
| M/N: RZ09-0168                          |                            |                                     |
| Test Site: RF Site                      | Date: 2015-8-21            | Test Engineer: Alice yang           |
| Temperature: $25 \pm 0.6^\circ\text{C}$ | Humidity: $53.7 \pm 3.0\%$ | Pressure: $101.1 \pm 1.0\text{kpa}$ |

**Frequency Stability vs.Voltage:**

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC108V                | 25             | CH36  | 5180.025                | 5180                      | 4.82            | ±20            |
|                       |                | CH38  | 5190.048                | 5190                      | 9.25            | ±20            |
|                       |                | CH40  | 5200.025                | 5200                      | 4.81            | ±20            |
|                       |                | CH42  | 5210.00                 | 5210                      | 0               | ±20            |
|                       |                | CH46  | 5230.020                | 5230                      | 3.82            | ±20            |
|                       |                | CH48  | 5240.025                | 5240                      | 4.77            | ±20            |
|                       |                | CH52  | 5260.025                | 5260                      | 4.75            | ±20            |
|                       |                | CH54  | 5270.00                 | 5270                      | 0               | ±20            |
|                       |                | CH58  | 5290.025                | 5290                      | 4.73            | ±20            |
|                       |                | CH60  | 5300.042                | 5300                      | 7.92            | ±20            |
|                       |                | CH62  | 5310.025                | 5310                      | 4.71            | ±20            |
|                       |                | CH64  | 5320.00                 | 5320                      | 0               | ±20            |
|                       |                | CH100 | 5500.025                | 5500                      | 4.55            | ±20            |
|                       |                | CH102 | 5510.030                | 5510                      | 5.44            | ±20            |
|                       |                | CH106 | 5530.025                | 5530                      | 4.52            | ±20            |
|                       |                | CH120 | 5600.00                 | 5600                      | 0               | ±20            |
|                       |                | CH134 | 5670.025                | 5670                      | 4.41            | ±20            |
|                       |                | CH140 | 5700.045                | 5700                      | 7.89            | ±20            |
|                       |                | CH149 | 5745.00                 | 5745                      | 0               | ±20            |
|                       |                | CH151 | 5755.025                | 5755                      | 4.34            | ±20            |
|                       |                | CH155 | 5775.00                 | 5775                      | 0               | ±20            |
|                       |                | CH157 | 5785.030                | 5785                      | 5.19            | ±20            |
|                       |                | CH159 | 5795.030                | 5795                      | 5.18            | ±20            |
|                       |                | CH165 | 5825.025                | 5825                      | 4.29            | ±20            |

**Conclusion: PASS**

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 25             | CH36  | 5180.035                | 5180                      | 6.76            | ±20            |
|                       |                | CH38  | 5190.052                | 5190                      | 10.02           | ±20            |
|                       |                | CH40  | 5200.048                | 5200                      | 9.23            | ±20            |
|                       |                | CH42  | 5210.050                | 5210                      | 9.60            | ±20            |
|                       |                | CH46  | 5230.025                | 5230                      | 4.78            | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.045                | 5270                      | 8.54            | ±20            |
|                       |                | CH58  | 5290.030                | 5290                      | 5.67            | ±20            |
|                       |                | CH60  | 5300.045                | 5300                      | 8.49            | ±20            |
|                       |                | CH62  | 5310.030                | 5310                      | 5.65            | ±20            |
|                       |                | CH64  | 5320.025                | 5320                      | 4.70            | ±20            |
|                       |                | CH100 | 5500.030                | 5500                      | 5.45            | ±20            |
|                       |                | CH102 | 5510.045                | 5510                      | 8.17            | ±20            |
|                       |                | CH106 | 5530.030                | 5530                      | 5.42            | ±20            |
|                       |                | CH120 | 5600.025                | 5600                      | 4.46            | ±20            |
|                       |                | CH134 | 5670.045                | 5670                      | 7.94            | ±20            |
|                       |                | CH140 | 5700.050                | 5700                      | 8.77            | ±20            |
|                       |                | CH149 | 5745.040                | 5745                      | 6.96            | ±20            |
|                       |                | CH151 | 5755.035                | 5755                      | 6.08            | ±20            |
|                       |                | CH155 | 5775.035                | 5775                      | 6.06            | ±20            |
|                       |                | CH157 | 5785.045                | 5785                      | 7.78            | ±20            |
|                       |                | CH159 | 5795.035                | 5795                      | 6.04            | ±20            |
|                       |                | CH165 | 5825.040                | 5825                      | 6.87            | ±20            |

Conclusion: PASS

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC132V                | 25             | CH36  | 5180.040                | 5180                      | 7.72            | ±20            |
|                       |                | CH38  | 5190.045                | 5190                      | 8.67            | ±20            |
|                       |                | CH40  | 5200.050                | 5200                      | 9.62            | ±20            |
|                       |                | CH42  | 5210.065                | 5210                      | 12.48           | ±20            |
|                       |                | CH46  | 5230.075                | 5230                      | 14.34           | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.080                | 5270                      | 15.18           | ±20            |
|                       |                | CH58  | 5290.075                | 5290                      | 14.17           | ±20            |
|                       |                | CH60  | 5300.060                | 5300                      | 11.32           | ±20            |
|                       |                | CH62  | 5310.040                | 5310                      | 7.53            | ±20            |
|                       |                | CH64  | 5320.048                | 5320                      | 9.02            | ±20            |
|                       |                | CH100 | 5500.045                | 5500                      | 8.18            | ±20            |
|                       |                | CH102 | 5510.050                | 5510                      | 9.07            | ±20            |
|                       |                | CH106 | 5530.060                | 5530                      | 10.85           | ±20            |
|                       |                | CH120 | 5600.030                | 5600                      | 5.35            | ±20            |
|                       |                | CH134 | 5670.050                | 5670                      | 8.82            | ±20            |
|                       |                | CH140 | 5700.060                | 5700                      | 10.53           | ±20            |
|                       |                | CH149 | 5745.050                | 5745                      | 8.70            | ±20            |
|                       |                | CH151 | 5755.050                | 5755                      | 8.69            | ±20            |
|                       |                | CH155 | 5775.065                | 5775                      | 11.25           | ±20            |
|                       |                | CH157 | 5785.050                | 5785                      | 8.64            | ±20            |
|                       |                | CH159 | 5795.040                | 5795                      | 6.90            | ±20            |
|                       |                | CH165 | 5825.050                | 5825                      | 8.58            | ±20            |

Conclusion: PASS

**Frequency Stability vs.Temperature:**

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | -10°C          | CH36  | 5180.050                | 5180                      | 9.65            | ±20            |
|                       |                | CH38  | 5190.075                | 5190                      | 14.45           | ±20            |
|                       |                | CH40  | 5200.030                | 5200                      | 5.77            | ±20            |
|                       |                | CH42  | 5210.012                | 5210                      | 2.30            | ±20            |
|                       |                | CH46  | 5230.030                | 5230                      | 5.74            | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.025                | 5260                      | 4.75            | ±20            |
|                       |                | CH54  | 5270.020                | 5270                      | 3.80            | ±20            |
|                       |                | CH58  | 5290.025                | 5290                      | 4.73            | ±20            |
|                       |                | CH60  | 5300.042                | 5300                      | 7.92            | ±20            |
|                       |                | CH62  | 5310.025                | 5310                      | 4.71            | ±20            |
|                       |                | CH64  | 5320.050                | 5320                      | 9.40            | ±20            |
|                       |                | CH100 | 5500.015                | 5500                      | 2.73            | ±20            |
|                       |                | CH102 | 5510.030                | 5510                      | 5.44            | ±20            |
|                       |                | CH106 | 5530.025                | 5530                      | 4.52            | ±20            |
|                       |                | CH120 | 5600.012                | 5600                      | 2.14            | ±20            |
|                       |                | CH134 | 5670.025                | 5670                      | 4.41            | ±20            |
|                       |                | CH140 | 5700.030                | 5700                      | 5.26            | ±20            |
|                       |                | CH149 | 5745.00                 | 5745                      | 0               | ±20            |
|                       |                | CH151 | 5755.025                | 5755                      | 4.34            | ±20            |
|                       |                | CH155 | 5775.025                | 5775                      | 4.33            | ±20            |
|                       |                | CH157 | 5785.025                | 5785                      | 4.32            | ±20            |
|                       |                | CH159 | 5795.048                | 5795                      | 8.28            | ±20            |
|                       |                | CH165 | 5825.030                | 5825                      | 5.15            | ±20            |

**Conclusion: PASS**

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 0°C            | CH36  | 5180.040                | 5180                      | 7.72            | ±20            |
|                       |                | CH38  | 5190.035                | 5190                      | 6.74            | ±20            |
|                       |                | CH40  | 5200.025                | 5200                      | 4.81            | ±20            |
|                       |                | CH42  | 5210.045                | 5210                      | 8.64            | ±20            |
|                       |                | CH46  | 5230.025                | 5230                      | 4.78            | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.030                | 5270                      | 5.69            | ±20            |
|                       |                | CH58  | 5290.030                | 5290                      | 5.67            | ±20            |
|                       |                | CH60  | 5300.015                | 5300                      | 2.83            | ±20            |
|                       |                | CH62  | 5310.025                | 5310                      | 4.71            | ±20            |
|                       |                | CH64  | 5320.025                | 5320                      | 4.70            | ±20            |
|                       |                | CH100 | 5500.030                | 5500                      | 5.45            | ±20            |
|                       |                | CH102 | 5510.028                | 5510                      | 5.08            | ±20            |
|                       |                | CH106 | 5530.030                | 5530                      | 5.42            | ±20            |
|                       |                | CH120 | 5600.025                | 5600                      | 4.46            | ±20            |
|                       |                | CH134 | 5670.045                | 5670                      | 7.94            | ±20            |
|                       |                | CH140 | 5700.050                | 5700                      | 8.77            | ±20            |
|                       |                | CH149 | 5745.040                | 5745                      | 6.96            | ±20            |
|                       |                | CH151 | 5755.025                | 5755                      | 4.34            | ±20            |
|                       |                | CH155 | 5775.035                | 5775                      | 6.06            | ±20            |
|                       |                | CH157 | 5785.025                | 5785                      | 4.32            | ±20            |
|                       |                | CH159 | 5795.035                | 5795                      | 6.04            | ±20            |
|                       |                | CH165 | 5825.030                | 5825                      | 5.15            | ±20            |

Conclusion: PASS

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 10°C           | CH36  | 5180.025                | 5180                      | 4.83            | ±20            |
|                       |                | CH38  | 5190.032                | 5190                      | 6.17            | ±20            |
|                       |                | CH40  | 5200.042                | 5200                      | 8.08            | ±20            |
|                       |                | CH42  | 5210.042                | 5210                      | 8.06            | ±20            |
|                       |                | CH46  | 5230.050                | 5230                      | 9.56            | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.059                | 5270                      | 11.19           | ±20            |
|                       |                | CH58  | 5290.049                | 5290                      | 9.26            | ±20            |
|                       |                | CH60  | 5300.050                | 5300                      | 9.43            | ±20            |
|                       |                | CH62  | 5310.040                | 5310                      | 7.53            | ±20            |
|                       |                | CH64  | 5320.048                | 5320                      | 9.02            | ±20            |
|                       |                | CH100 | 5500.045                | 5500                      | 8.18            | ±20            |
|                       |                | CH102 | 5510.050                | 5510                      | 9.07            | ±20            |
|                       |                | CH106 | 5530.060                | 5530                      | 10.85           | ±20            |
|                       |                | CH120 | 5600.030                | 5600                      | 5.36            | ±20            |
|                       |                | CH134 | 5670.055                | 5670                      | 9.70            | ±20            |
|                       |                | CH140 | 5700.060                | 5700                      | 10.53           | ±20            |
|                       |                | CH149 | 5745.047                | 5745                      | 8.18            | ±20            |
|                       |                | CH151 | 5755.046                | 5755                      | 7.99            | ±20            |
|                       |                | CH155 | 5775.058                | 5775                      | 10.04           | ±20            |
|                       |                | CH157 | 5785.052                | 5785                      | 8.99            | ±20            |
|                       |                | CH159 | 5795.046                | 5795                      | 7.94            | ±20            |
|                       |                | CH165 | 5825.055                | 5825                      | 9.44            | ±20            |

Conclusion: PASS

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 20°C           | CH36  | 5180.045                | 5180                      | 8.69            | ±20            |
|                       |                | CH38  | 5190.042                | 5190                      | 8.09            | ±20            |
|                       |                | CH40  | 5200.025                | 5200                      | 4.81            | ±20            |
|                       |                | CH42  | 5210.040                | 5210                      | 7.68            | ±20            |
|                       |                | CH46  | 5230.054                | 5230                      | 10.33           | ±20            |
|                       |                | CH48  | 5240.038                | 5240                      | 7.25            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.030                | 5270                      | 5.69            | ±20            |
|                       |                | CH58  | 5290.030                | 5290                      | 5.67            | ±20            |
|                       |                | CH60  | 5300.015                | 5300                      | 2.83            | ±20            |
|                       |                | CH62  | 5310.025                | 5310                      | 4.71            | ±20            |
|                       |                | CH64  | 5320.029                | 5320                      | 5.45            | ±20            |
|                       |                | CH100 | 5500.030                | 5500                      | 5.45            | ±20            |
|                       |                | CH102 | 5510.023                | 5510                      | 4.17            | ±20            |
|                       |                | CH106 | 5530.038                | 5530                      | 6.87            | ±20            |
|                       |                | CH120 | 5600.026                | 5600                      | 4.64            | ±20            |
|                       |                | CH134 | 5670.048                | 5670                      | 8.47            | ±20            |
|                       |                | CH140 | 5700.045                | 5700                      | 7.89            | ±20            |
|                       |                | CH149 | 5745.048                | 5745                      | 8.36            | ±20            |
|                       |                | CH151 | 5755.026                | 5755                      | 4.52            | ±20            |
|                       |                | CH155 | 5775.052                | 5775                      | 9.00            | ±20            |
|                       |                | CH157 | 5785.035                | 5785                      | 6.05            | ±20            |
|                       |                | CH159 | 5795.039                | 5795                      | 6.73            | ±20            |
|                       |                | CH165 | 5825.036                | 5825                      | 6.18            | ±20            |

Conclusion: PASS

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 30°C           | CH36  | 5180.048                | 5180                      | 9.27            | ±20            |
|                       |                | CH38  | 5190.040                | 5190                      | 7.71            | ±20            |
|                       |                | CH40  | 5200.026                | 5200                      | 5.00            | ±20            |
|                       |                | CH42  | 5210.035                | 5210                      | 6.72            | ±20            |
|                       |                | CH46  | 5230.055                | 5230                      | 10.52           | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.030                | 5270                      | 5.69            | ±20            |
|                       |                | CH58  | 5290.032                | 5290                      | 6.05            | ±20            |
|                       |                | CH60  | 5300.018                | 5300                      | 3.40            | ±20            |
|                       |                | CH62  | 5310.025                | 5310                      | 4.71            | ±20            |
|                       |                | CH64  | 5320.030                | 5320                      | 5.64            | ±20            |
|                       |                | CH100 | 5500.035                | 5500                      | 6.36            | ±20            |
|                       |                | CH102 | 5510.023                | 5510                      | 4.17            | ±20            |
|                       |                | CH106 | 5530.035                | 5530                      | 6.33            | ±20            |
|                       |                | CH120 | 5600.028                | 5600                      | 5.00            | ±20            |
|                       |                | CH134 | 5670.048                | 5670                      | 8.47            | ±20            |
|                       |                | CH140 | 5700.042                | 5700                      | 7.37            | ±20            |
|                       |                | CH149 | 5745.050                | 5745                      | 8.70            | ±20            |
|                       |                | CH151 | 5755.026                | 5755                      | 4.52            | ±20            |
|                       |                | CH155 | 5775.045                | 5775                      | 7.79            | ±20            |
|                       |                | CH157 | 5785.035                | 5785                      | 6.05            | ±20            |
|                       |                | CH159 | 5795.045                | 5795                      | 7.77            | ±20            |
|                       |                | CH165 | 5825.030                | 5825                      | 5.15            | ±20            |

Conclusion: PASS

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 40°C           | CH36  | 5180.052                | 5180                      | 9.27            | ±20            |
|                       |                | CH38  | 5190.040                | 5190                      | 7.71            | ±20            |
|                       |                | CH40  | 5200.035                | 5200                      | 5.00            | ±20            |
|                       |                | CH42  | 5210.040                | 5210                      | 6.72            | ±20            |
|                       |                | CH46  | 5230.056                | 5230                      | 10.52           | ±20            |
|                       |                | CH48  | 5240.030                | 5240                      | 5.73            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.036                | 5270                      | 5.69            | ±20            |
|                       |                | CH58  | 5290.032                | 5290                      | 6.05            | ±20            |
|                       |                | CH60  | 5300.020                | 5300                      | 3.40            | ±20            |
|                       |                | CH62  | 5310.025                | 5310                      | 4.71            | ±20            |
|                       |                | CH64  | 5320.030                | 5320                      | 5.64            | ±20            |
|                       |                | CH100 | 5500.036                | 5500                      | 6.36            | ±20            |
|                       |                | CH102 | 5510.023                | 5510                      | 4.17            | ±20            |
|                       |                | CH106 | 5530.038                | 5530                      | 6.33            | ±20            |
|                       |                | CH120 | 5600.028                | 5600                      | 5.00            | ±20            |
|                       |                | CH134 | 5670.042                | 5670                      | 8.47            | ±20            |
|                       |                | CH140 | 5700.042                | 5700                      | 7.37            | ±20            |
|                       |                | CH149 | 5745.056                | 5745                      | 8.70            | ±20            |
|                       |                | CH151 | 5755.028                | 5755                      | 4.52            | ±20            |
|                       |                | CH155 | 5775.047                | 5775                      | 7.79            | ±20            |
|                       |                | CH157 | 5785.036                | 5785                      | 6.05            | ±20            |
|                       |                | CH159 | 5795.050                | 5795                      | 7.77            | ±20            |
|                       |                | CH165 | 5825.035                | 5825                      | 5.15            | ±20            |

Conclusion: PASS

| Test Voltage<br>( V ) | Temp<br>( °C ) | CH    | Max. Reading<br>( MHz ) | Target Frequency<br>(MHz) | Result<br>(ppm) | Limit<br>(ppm) |
|-----------------------|----------------|-------|-------------------------|---------------------------|-----------------|----------------|
| AC120V                | 50°C           | CH36  | 5180.056                | 5180                      | 10.81           | ±20            |
|                       |                | CH38  | 5190.045                | 5190                      | 8.67            | ±20            |
|                       |                | CH40  | 5200.036                | 5200                      | 6.92            | ±20            |
|                       |                | CH42  | 5210.042                | 5210                      | 8.06            | ±20            |
|                       |                | CH46  | 5230.050                | 5230                      | 9.56            | ±20            |
|                       |                | CH48  | 5240.035                | 5240                      | 6.68            | ±20            |
|                       |                | CH52  | 5260.045                | 5260                      | 8.56            | ±20            |
|                       |                | CH54  | 5270.036                | 5270                      | 6.83            | ±20            |
|                       |                | CH58  | 5290.035                | 5290                      | 6.62            | ±20            |
|                       |                | CH60  | 5300.020                | 5300                      | 3.77            | ±20            |
|                       |                | CH62  | 5310.028                | 5310                      | 5.27            | ±20            |
|                       |                | CH64  | 5320.030                | 5320                      | 5.64            | ±20            |
|                       |                | CH100 | 5500.035                | 5500                      | 6.36            | ±20            |
|                       |                | CH102 | 5510.023                | 5510                      | 4.17            | ±20            |
|                       |                | CH106 | 5530.040                | 5530                      | 7.23            | ±20            |
|                       |                | CH120 | 5600.022                | 5600                      | 3.93            | ±20            |
|                       |                | CH134 | 5670.040                | 5670                      | 7.05            | ±20            |
|                       |                | CH140 | 5700.042                | 5700                      | 7.37            | ±20            |
|                       |                | CH149 | 5745.060                | 5745                      | 10.44           | ±20            |
|                       |                | CH151 | 5755.036                | 5755                      | 6.26            | ±20            |
|                       |                | CH155 | 5775.045                | 5775                      | 7.79            | ±20            |
|                       |                | CH157 | 5785.042                | 5785                      | 7.26            | ±20            |
|                       |                | CH159 | 5795.030                | 5795                      | 5.18            | ±20            |
|                       |                | CH165 | 5825.030                | 5825                      | 5.15            | ±20            |

Conclusion: PASS

## 10. ANTENNA REQUIREMENT

### 10.1. Standard Applicable

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 15.407 (a), 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.

### 10.2. Antenna Connected Construction

The antennas used for this product are PIFA antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 3.52 dBi.

## **11. DEVIATION TO TEST SPECIFICATIONS**

[ NONE ]