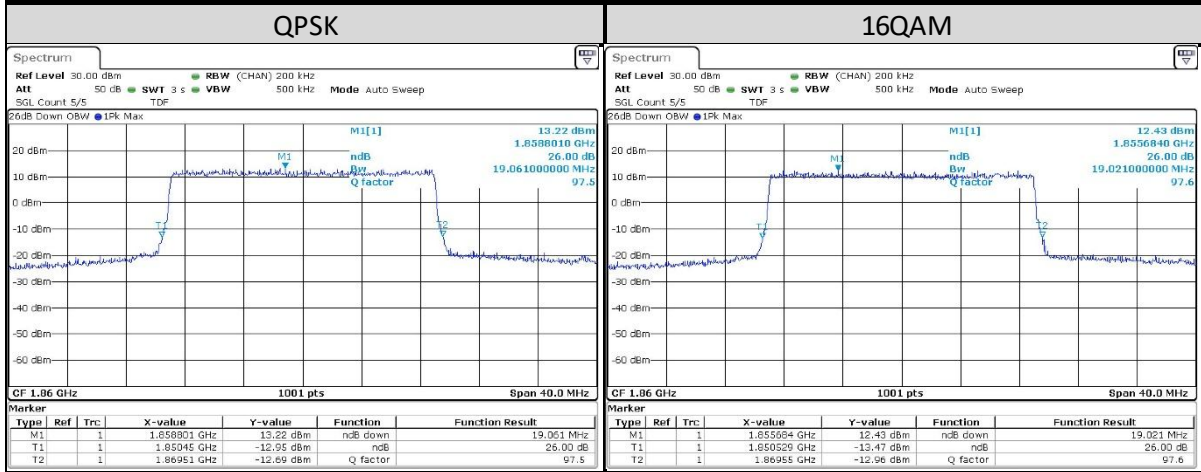


| LTE Band/BW/RB Size/RB Offset | Channel Number | Tx Frequency | -26 dBc Bandwidth (MHz) |                  |
|-------------------------------|----------------|--------------|-------------------------|------------------|
|                               |                |              | QPSK Modulation         | 16QAM Modulation |
| <b>Band 2/20MHz/100/0</b>     | Low CH 18700   | 1860 MHz     | <b>19.061</b>           | <b>19.021</b>    |
|                               | Mid CH 18900   | 1880 MHz     | 18.981                  | 18.941           |
|                               | High CH 19100  | 1900 MHz     | 18.861                  | 18.861           |

Spectrum Plot of Worst Value

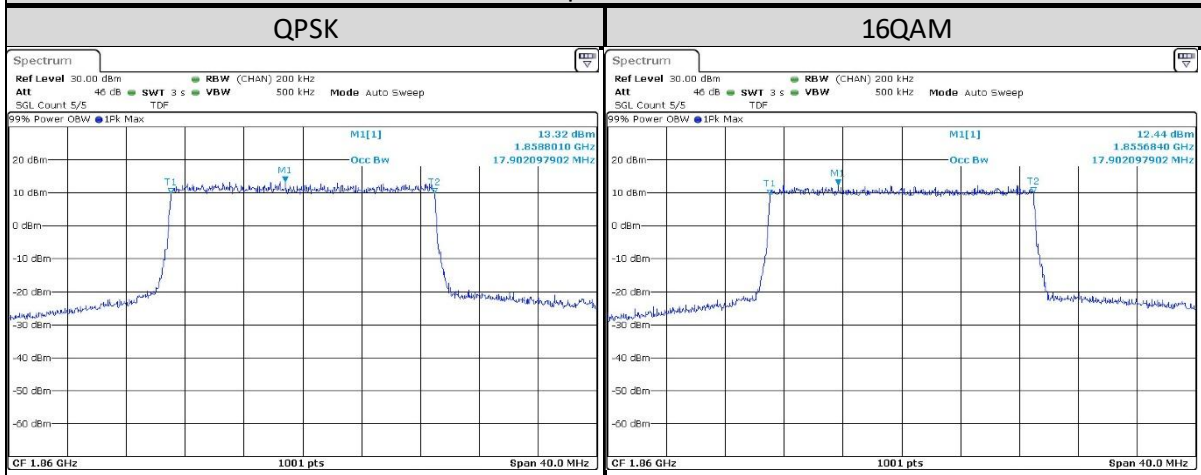
-26 dBc Bandwidth



| LTE Band/BW/RB Size/RB Offset | Channel Number | Tx Frequency | 99% Occupied Bandwidth (MHz) |                  |
|-------------------------------|----------------|--------------|------------------------------|------------------|
|                               |                |              | QPSK Modulation              | 16QAM Modulation |
| <b>Band 2/20MHz/100/0</b>     | Low CH 18700   | 1860 MHz     | <b>17.902</b>                | <b>17.902</b>    |
|                               | Mid CH 18900   | 1880 MHz     | 17.862                       | 17.862           |
|                               | High CH 19100  | 1900 MHz     | 17.822                       | 17.822           |

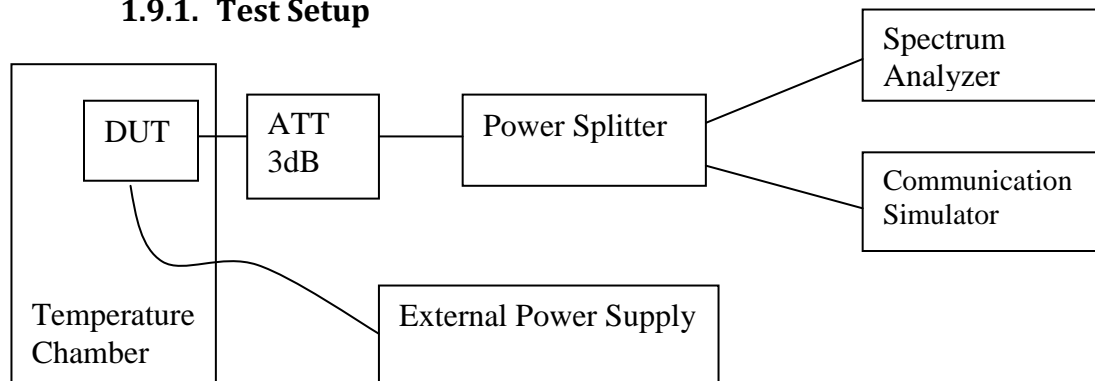
Spectrum Plot of Worst Value

99% Occupied Bandwidth



## 1.9. Frequency Stability

### 1.9.1. Test Setup



- 1) The DUT is placed in the temperature chamber and DUT is power up by external power supply to control the DC input voltage.
- 2) The temperature chamber could control the temperature and humidity and external power supply could control the test voltage range from minimum to maximum operating voltage.
- 3) Measured frequency error from the communication simulator by vary below step :
  - i. Vary temperature of the temperature chamber from -30 ~ 60 deg C (10 deg C / Step) and set external supply voltage constant at nominal voltage.
  - ii. Vary external supply voltage from minimum to maximum operation voltage support by DUT and set temperature chamber constant at room temp.
- 4) All the measurement was done at mid channel for each band.

### 1.9.2. Test Limit

FCC: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

ISED: The carrier frequency shall not depart from the reference frequency, in excess of  $\pm 2.5$  ppm for mobile stations and  $\pm 1.0$  ppm for base stations.

### 1.9.3. Frequency Stability – LTE Band 2 (1850 -1910 MHz)

| Band          | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|---------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|               |                  | Channel Bandwidth: 1.4 MHz     |                       |                 |                       |
|               |                  | Low Channel                    |                       | High Channel    |                       |
|               |                  | 1850.7MHz                      |                       | 1909.3MHz       |                       |
|               |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| LTE Band<br>2 | 60               | 1850.70002                     | 0.010636              | 1909.299989     | -0.005672             |
|               | 50               | 1850.699988                    | -0.006215             | 1909.299986     | -0.007148             |
|               | 40               | 1850.700012                    | 0.006516              | 1909.299993     | -0.003761             |
|               | 30               | 1850.700017                    | 0.009167              | 1909.299993     | -0.003439             |
|               | 20               | 1850.700013                    | 0.007103              | 1909.299972     | -0.014677             |
|               | 10               | 1850.699993                    | -0.004027             | 1909.300029     | 0.014932              |
|               | 0                | 1850.700009                    | 0.004754              | 1909.299992     | -0.004098             |
|               | -10              | 1850.700058                    | 0.031127              | 1909.299989     | -0.005657             |
|               | -20              | 1850.700008                    | 0.00429               | 1909.299989     | -0.005552             |
|               | -30              | 1850.700008                    | 0.004398              | 1909.299991     | -0.00454              |

| Band          | Voltage<br>(V) | Frequency Error VS Voltage |                       |                 |                       |
|---------------|----------------|----------------------------|-----------------------|-----------------|-----------------------|
|               |                | Channel Bandwidth: 1.4 MHz |                       |                 |                       |
|               |                | Low Channel                |                       | High Channel    |                       |
|               |                | 1850.7MHz                  |                       | 1909.3MHz       |                       |
|               |                | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| LTE Band<br>2 | 9              | 1850.700555                | 0.011517              | 1909.300888     | -0.005926             |
|               | 7.5            | 1850.700215                | 0.003061              | 1909.300821     | -0.005597             |
|               | 6              | 1850.700025                | 0.013666              | 1909.300044     | 0.00535               |

| Band          | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|---------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|               |                  | Channel Bandwidth: 3 MHz       |                       |                 |                       |
|               |                  | Low Channel                    |                       | High Channel    |                       |
|               |                  | 1851.5MHz                      |                       | 1908.5MHz       |                       |
| LTE Band<br>2 |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 60               | 1851.500009                    | 0.00496               | 1908.500009     | 0.004632              |
|               | 50               | 1851.500012                    | 0.006359              | 1908.500009     | 0.004917              |
|               | 40               | 1851.500009                    | 0.004698              | 1908.500007     | 0.003875              |
|               | 30               | 1851.500008                    | 0.004443              | 1908.500009     | 0.004632              |
|               | 20               | 1851.500008                    | 0.00418               | 1908.500009     | 0.004722              |
|               | 10               | 1851.500015                    | 0.008082              | 1908.500009     | 0.004632              |
|               | 0                | 1851.50001                     | 0.005602              | 1908.500008     | 0.004407              |
|               | -10              | 1851.500015                    | 0.008259              | 1908.50001      | 0.004984              |
|               | -20              | 1851.500013                    | 0.006907              | 1908.500011     | 0.005652              |
| -30           | 1851.500009      | 0.005122                       | 1908.500009           | 0.004865        |                       |

| Band          | Voltage<br>(V) | Frequency Error VS Voltage |                       |                 |                       |
|---------------|----------------|----------------------------|-----------------------|-----------------|-----------------------|
|               |                | Channel Bandwidth: 3 MHz   |                       |                 |                       |
|               |                | Low Channel                |                       | High Channel    |                       |
|               |                | 1851.5MHz                  |                       | 1908.5MHz       |                       |
| LTE Band<br>2 |                | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 9              | 1851.500951                | 0.004868              | 1908.500036     | 0.0044                |
|               | 7.5            | 1851.500024                | 0.005238              | 1908.500411     | 0.005329              |
|               | 6              | 1851.500044                | 0.005988              | 1908.500014     | 0.004467              |

| Band          | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|---------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|               |                  | Channel Bandwidth: 5 MHz       |                       |                 |                       |
|               |                  | Low Channel                    |                       | High Channel    |                       |
|               |                  | 1852.5MHz                      |                       | 1907.5MHz       |                       |
| LTE Band<br>2 |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 60               | 1852.50001                     | 0.005282              | 1907.499994     | -0.003172             |
|               | 50               | 1852.50001                     | 0.005475              | 1907.499992     | -0.004342             |
|               | 40               | 1852.50001                     | 0.00522               | 1907.499992     | -0.004102             |
|               | 30               | 1852.500011                    | 0.005707              | 1907.499992     | -0.004207             |
|               | 20               | 1852.500015                    | 0.008093              | 1907.499992     | -0.004357             |
|               | 10               | 1852.500011                    | 0.006085              | 1907.499992     | -0.00396              |
|               | 0                | 1852.500013                    | 0.007027              | 1907.500007     | 0.003667              |
|               | -10              | 1852.500011                    | 0.005853              | 1907.499993     | -0.003915             |
|               | -20              | 1852.500009                    | 0.004896              | 1907.499992     | -0.004297             |
|               | -30              | 1852.500011                    | 0.006193              | 1907.499994     | -0.003187             |

| Band          | Voltage<br>(V) | Frequency Error VS Voltage |                       |                 |                       |
|---------------|----------------|----------------------------|-----------------------|-----------------|-----------------------|
|               |                | Channel Bandwidth: 5 MHz   |                       |                 |                       |
|               |                | Low Channel                |                       | High Channel    |                       |
|               |                | 1852.5MHz                  |                       | 1907.5MHz       |                       |
| LTE Band<br>2 |                | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 9              | 1852.500362                | 0.005544              | 1907.500142     | 0.00297               |
|               | 7.5            | 1852.500012                | 0.005753              | 1907.500215     | -0.003525             |
|               | 6              | 1852.500001                | 0.006641              | 1907.500005     | -0.003862             |

| Band          | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|---------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|               |                  | Channel Bandwidth: 10 MHz      |                       |                 |                       |
|               |                  | Low Channel                    |                       | High Channel    |                       |
|               |                  | 1855MHz                        |                       | 1905MHz         |                       |
| LTE Band<br>2 |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 60               | 1854.999993                    | -0.003964             | 1905.000009     | 0.004761              |
|               | 50               | 1854.999992                    | -0.004504             | 1905.000008     | 0.00437               |
|               | 40               | 1854.999995                    | -0.002915             | 1905.000009     | 0.004641              |
|               | 30               | 1854.999989                    | -0.005807             | 1905.000009     | 0.004798              |
|               | 20               | 1854.999987                    | -0.00691              | 1905.000008     | 0.004032              |
|               | 10               | 1854.999994                    | -0.003239             | 1905.000011     | 0.006022              |
|               | 0                | 1855.000006                    | 0.032605              | 1905.000001     | 0.005324              |
|               | -10              | 1854.999992                    | -0.00438              | 1905.000011     | 0.005662              |
|               | -20              | 1854.999993                    | -0.003979             | 1905.000011     | 0.005572              |
|               | -30              | 1854.999992                    | -0.004342             | 1905.000001     | 0.005054              |

| Band          | Voltage<br>(V) | Frequency Error VS Voltage |                       |                 |                       |
|---------------|----------------|----------------------------|-----------------------|-----------------|-----------------------|
|               |                | Channel Bandwidth: 10 MHz  |                       |                 |                       |
|               |                | Low Channel                |                       | High Channel    |                       |
|               |                | 1855MHz                    |                       | 1905MHz         |                       |
| LTE Band<br>2 |                | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 9              | 1855.001777                | -0.003663             | 1905.001453     | 0.005196              |
|               | 7.5            | 1855.000326                | -0.003578             | 1905.004444     | 0.005249              |
|               | 6              | 1855.000044                | -0.005136             | 1905.000221     | 0.004558              |

| Band          | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|---------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|               |                  | Channel Bandwidth: 15 MHz      |                       |                 |                       |
|               |                  | Low Channel                    |                       | High Channel    |                       |
|               |                  | 1857.5MHz                      |                       | 1902.5MHz       |                       |
| LTE Band<br>2 |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 60               | 1857.500007                    | 0.004028              | 1902.500006     | 0.003166              |
|               | 50               | 1857.500246                    | 0.004282              | 1902.500008     | 0.00403               |
|               | 40               | 1857.500468                    | 0.004182              | 1902.500007     | 0.003632              |
|               | 30               | 1857.500087                    | -0.006069             | 1902.500006     | 0.003406              |
|               | 20               | 1857.500008                    | 0.004236              | 1902.500008     | 0.004173              |
|               | 10               | 1857.501748                    | 0.003658              | 1902.500008     | 0.004158              |
|               | 0                | 1857.500153                    | 0.005999              | 1902.500009     | 0.004632              |
|               | -10              | 1857.50001                     | 0.005221              | 1902.500009     | 0.004527              |
|               | -20              | 1857.500006                    | 0.003011              | 1902.500057     | 0.030016              |
| -30           | 1857.500011      | 0.005861                       | 1902.500009           | 0.004549        |                       |

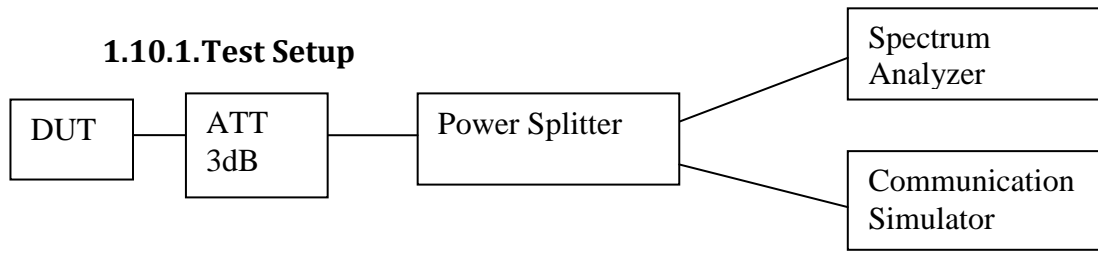
| Band          | Voltage<br>(V) | Frequency Error VS Voltage |                       |                 |                       |
|---------------|----------------|----------------------------|-----------------------|-----------------|-----------------------|
|               |                | Channel Bandwidth: 15 MHz  |                       |                 |                       |
|               |                | Low Channel                |                       | High Channel    |                       |
|               |                | 1857.5MHz                  |                       | 1902.5MHz       |                       |
| LTE Band<br>2 |                | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|               | 9              | 1857.500125                | 0.004806              | 1902.500826     | 0.004624              |
|               | 7.5            | 1857.500369                | 0.004236              | 1902.500252     | 0.004098              |
|               | 6              | 1857.500099                | 0.003727              | 1902.500004     | 0.003662              |

| Band          | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|---------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|               |                  | Channel Bandwidth: 20 MHz      |                       |                 |                       |
|               |                  | Low Channel                    |                       | High Channel    |                       |
|               |                  | 1860MHz                        |                       | 1900MHz         |                       |
|               |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| LTE Band<br>2 | 60               | 1860.000009                    | 0.004768              | 1899.999992     | -0.004314             |
|               | 50               | 1860.000125                    | 0.006084              | 1900.001253     | -0.005052             |
|               | 40               | 1860.001256                    | 0.003276              | 1900.001256     | -0.004502             |
|               | 30               | 1860.000036                    | 0.004715              | 1900.000087     | -0.004879             |
|               | 20               | 1860.004368                    | 0.005322              | 1900.000084     | -0.011384             |
|               | 10               | 1860.000521                    | 0.004699              | 1900.001458     | -0.004126             |
|               | 0                | 1860.015478                    | 0.004853              | 1900.000528     | -0.003629             |
|               | -10              | 1860.000009                    | 0.004599              | 1900.000001     | 0.005187              |
|               | -20              | 1860.000013                    | 0.006953              | 1899.999993     | -0.003539             |
|               | -30              | 1860.000011                    | 0.006084              | 1899.999993     | -0.003614             |

| Band          | Voltage<br>(V) | Frequency Error VS Voltage |                       |                 |                       |
|---------------|----------------|----------------------------|-----------------------|-----------------|-----------------------|
|               |                | Channel Bandwidth: 20 MHz  |                       |                 |                       |
|               |                | Low Channel                |                       | High Channel    |                       |
|               |                | 1860MHz                    |                       | 1900MHz         |                       |
|               |                | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| LTE Band<br>2 | 9              | 1860.002148                | 0.004899              | 1900.008521     | -0.004404             |
|               | 7.5            | 1860.002154                | 0.004861              | 1900.003215     | -0.004736             |
|               | 6              | 1860.000055                | 0.005099              | 1900.000074     | -0.004164             |



### 1.10. Band Edge Conducted Spurious Emission

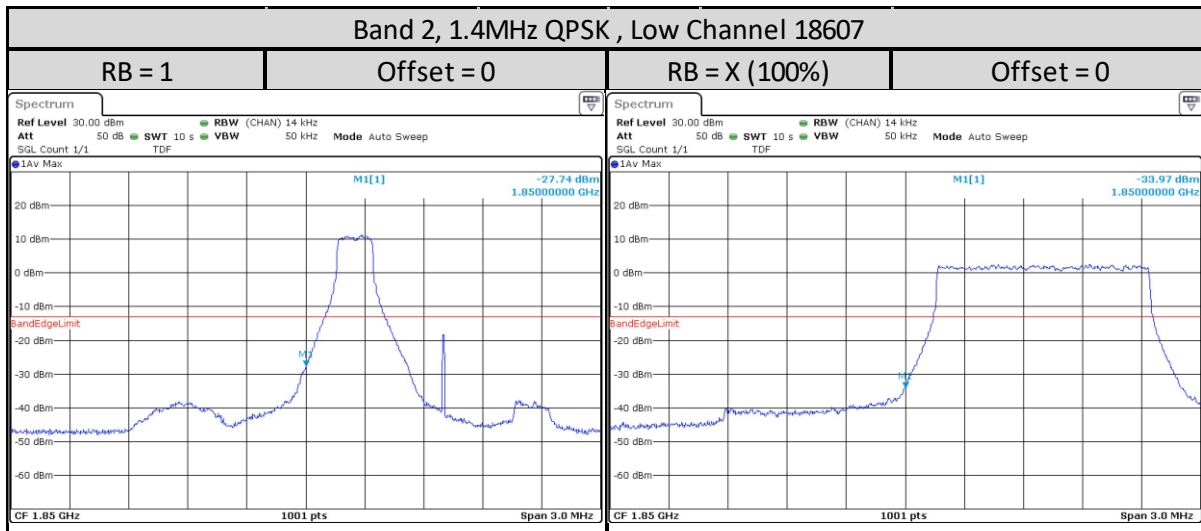


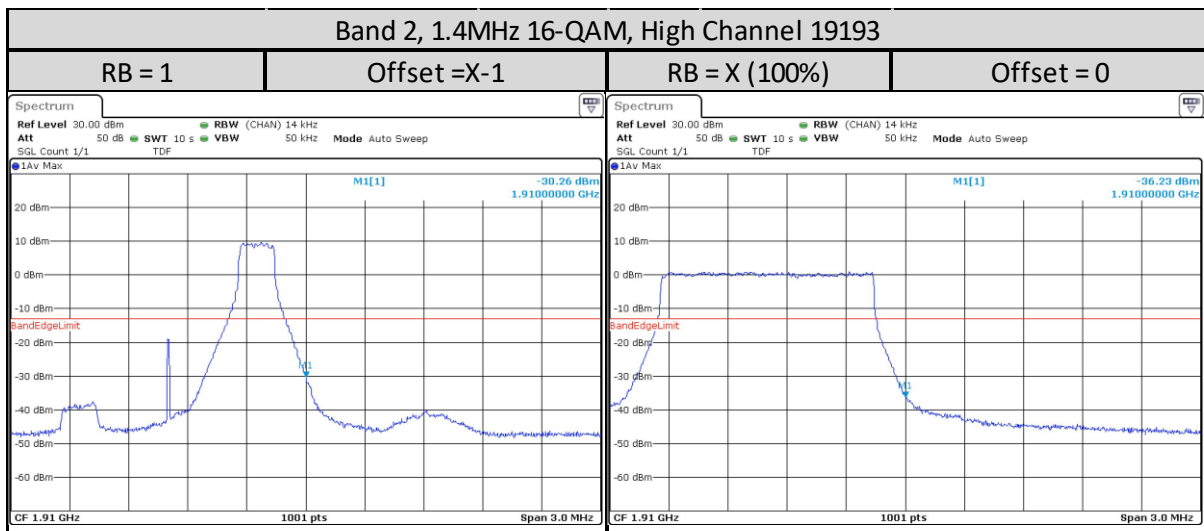
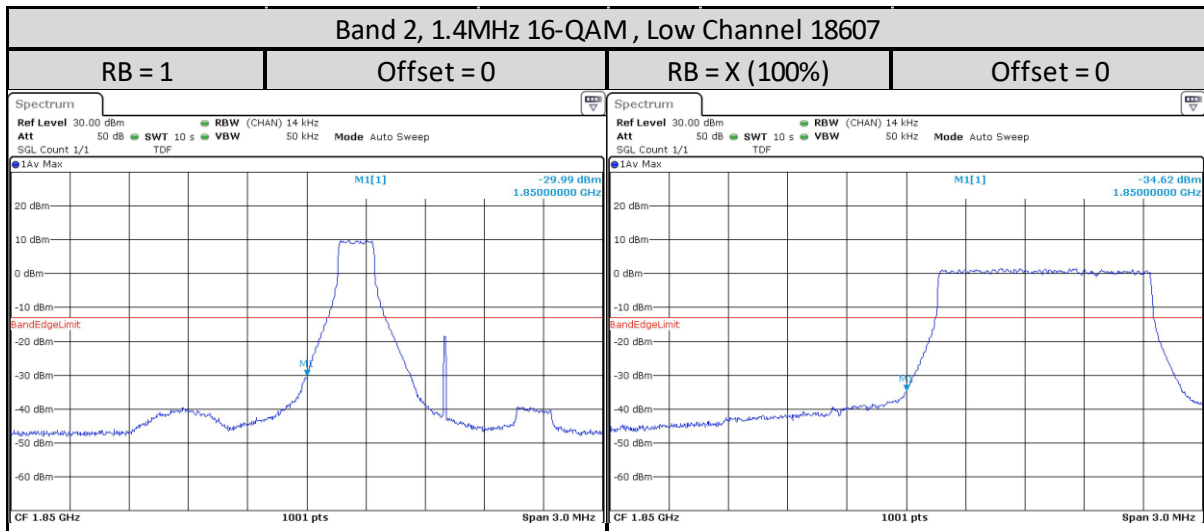
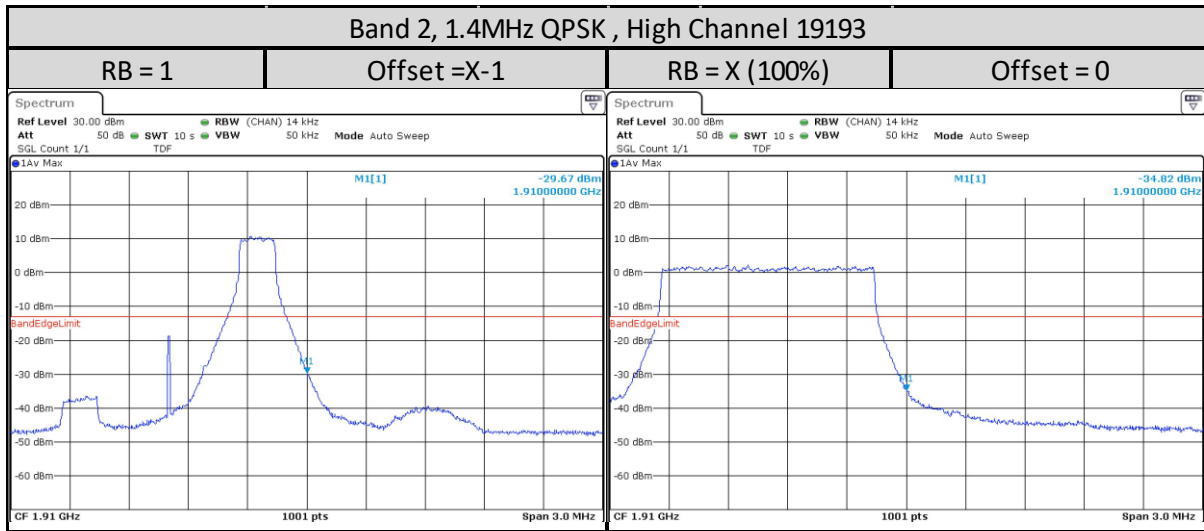
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) Set DUT to transmit maximum power through communication simulator.
- 4) The band edges of lowest and highest channels with the highest RF powers were measured.
- 5) The center frequency of spectrum is the band edge frequency, span is 3MHz, RBW is 1~3% of EBW and VBW is at least 3 times of RBW.
- 6) Record the maximum trace plot into the test report.

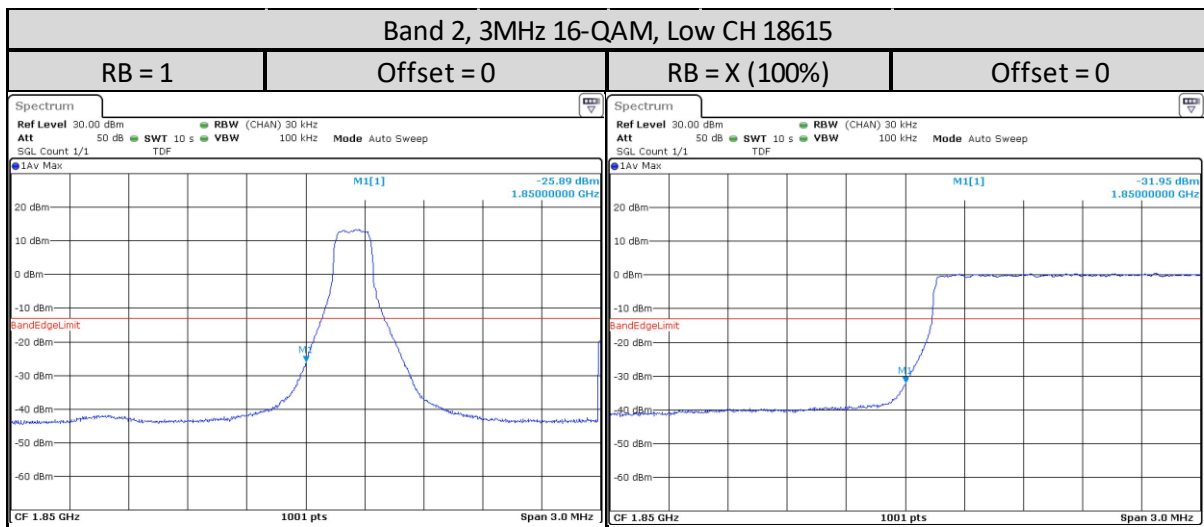
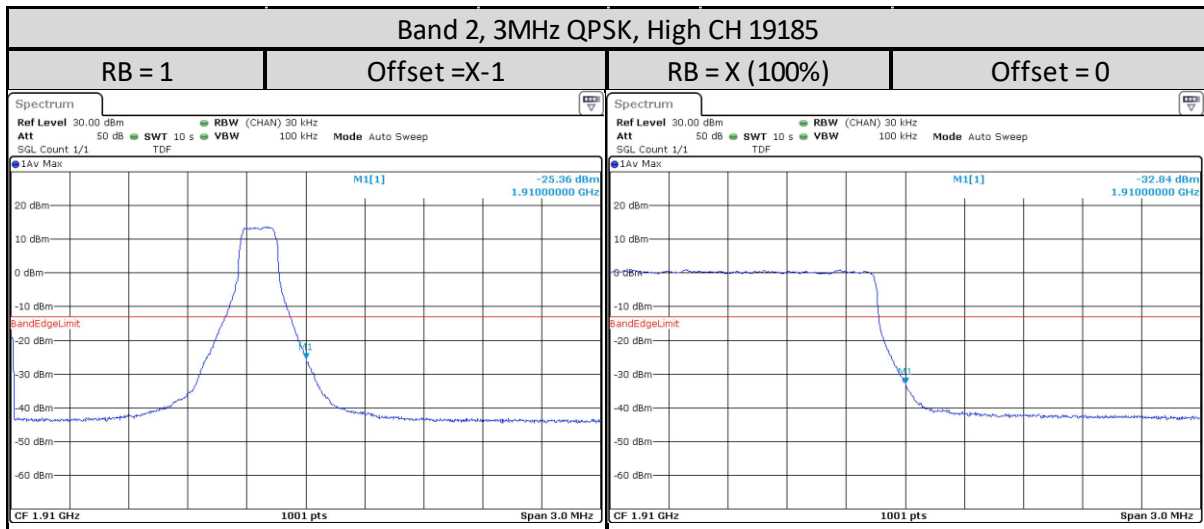
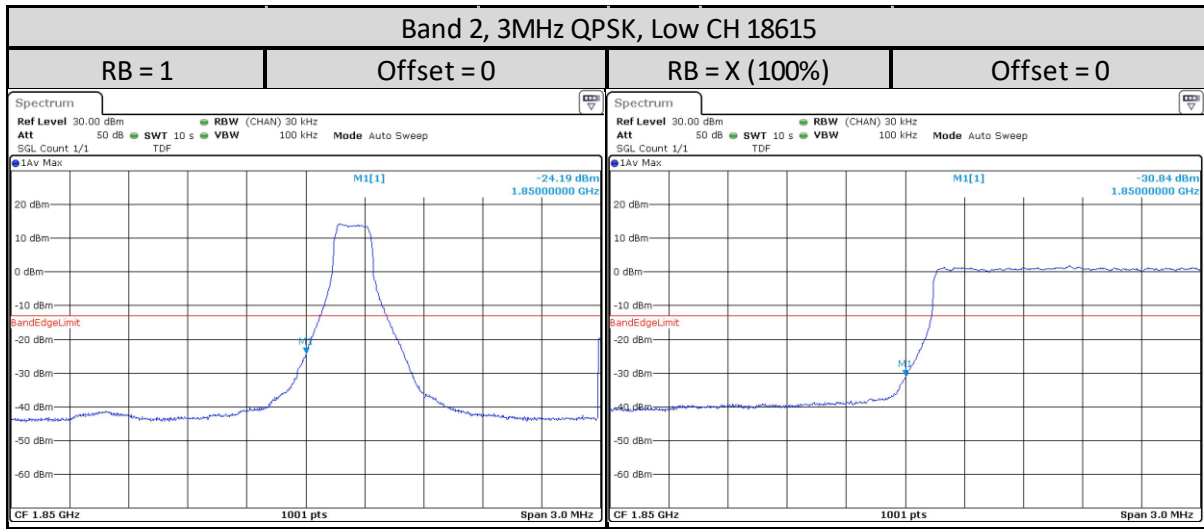
#### 1.10.2. Test Limit

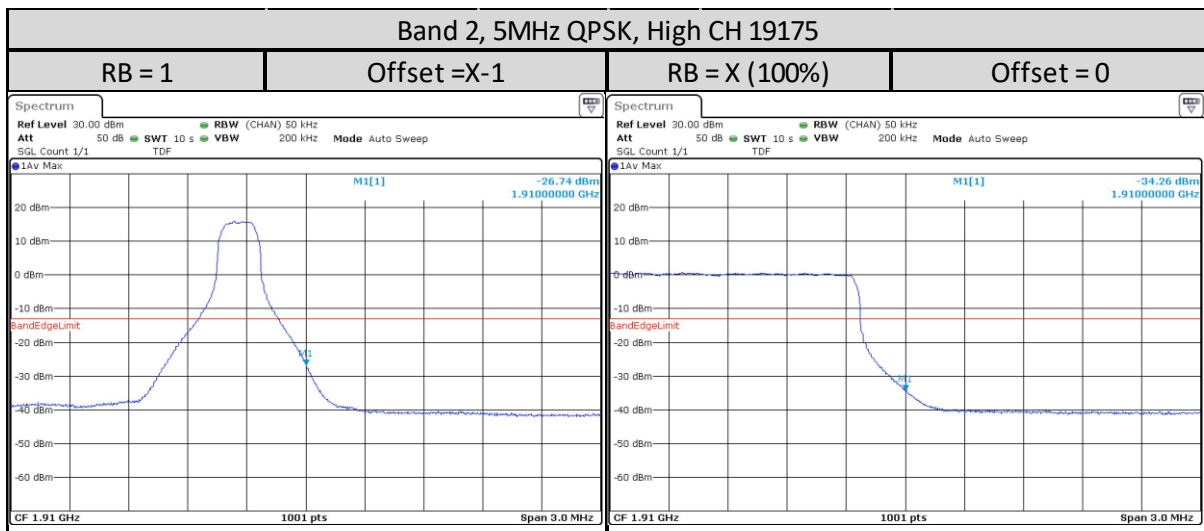
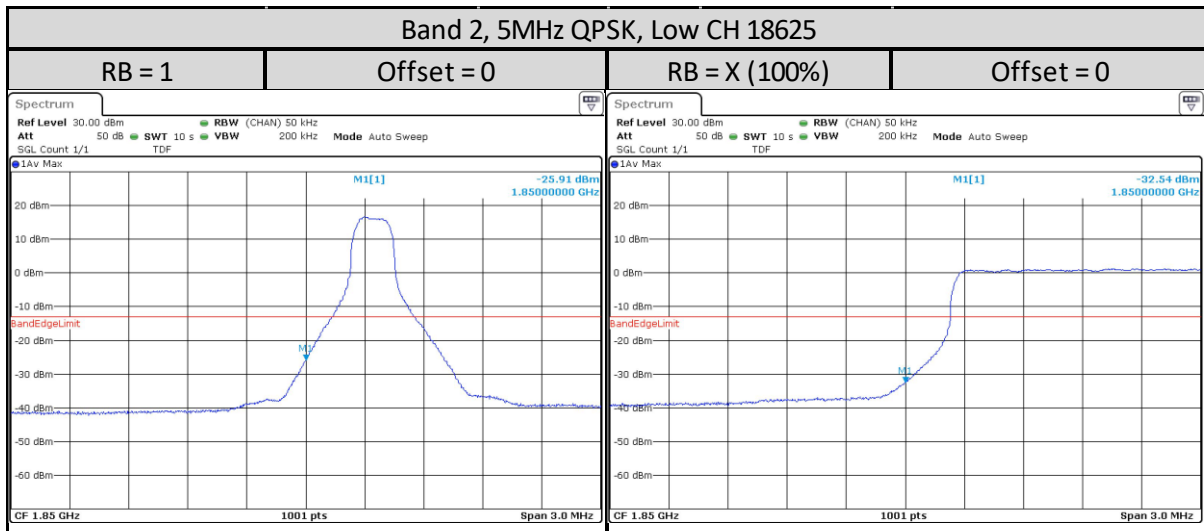
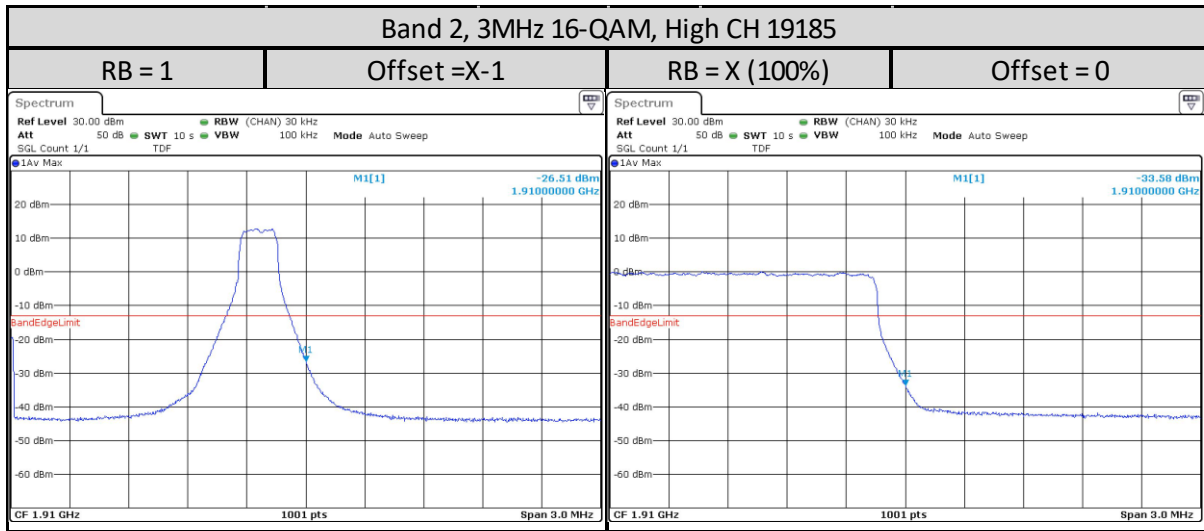
The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB. In the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

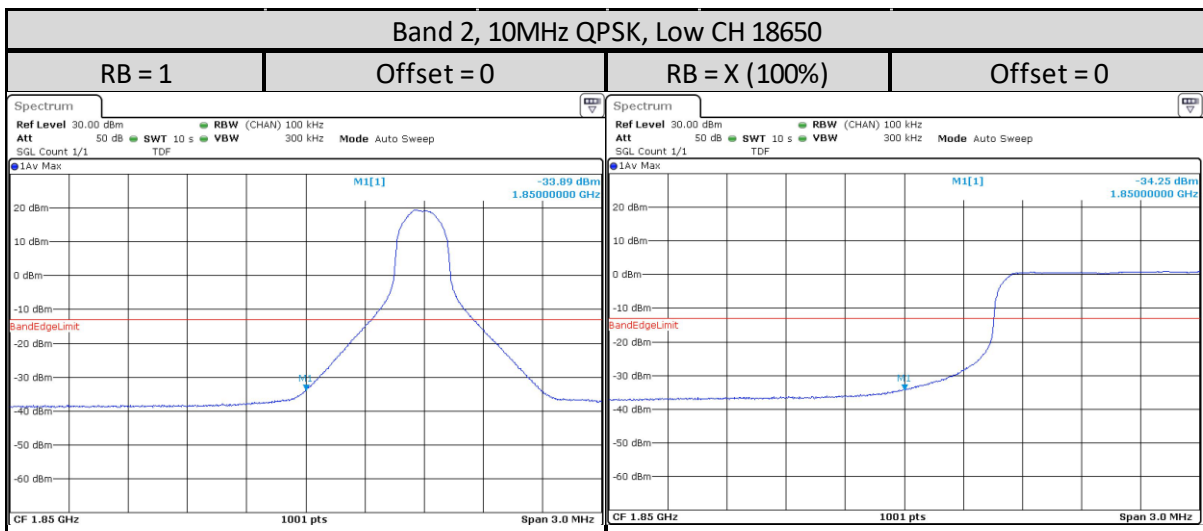
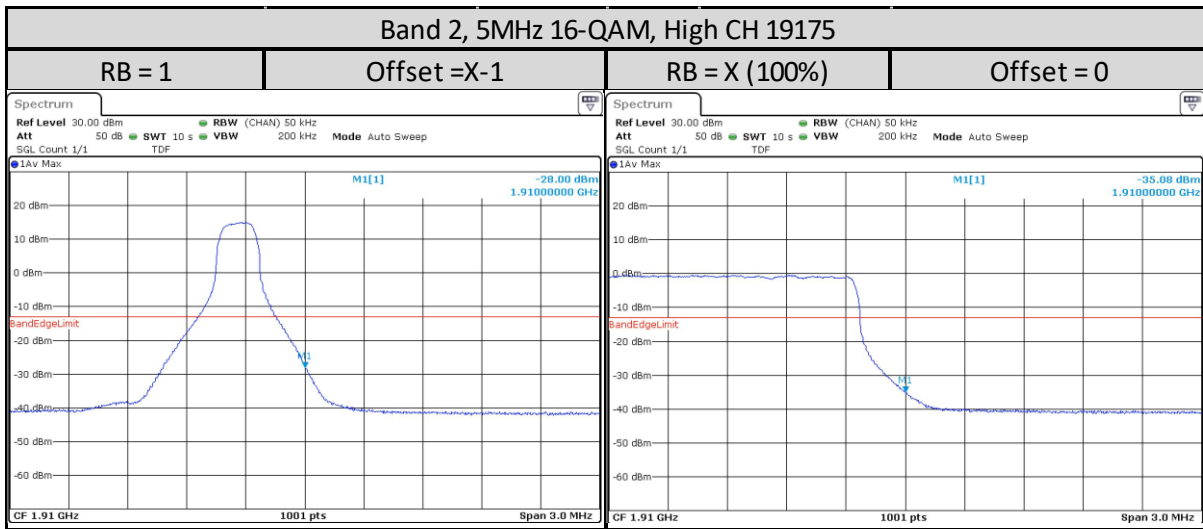
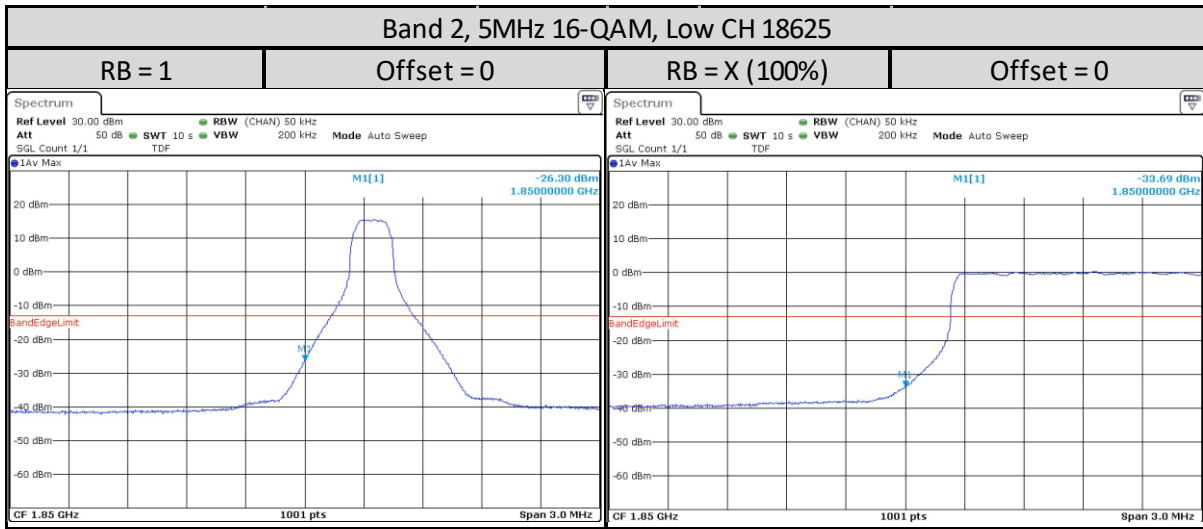
#### 1.10.3. Band Edge Conducted Spurious Emission – LTE Band 2 (1850 -1910 MHz)

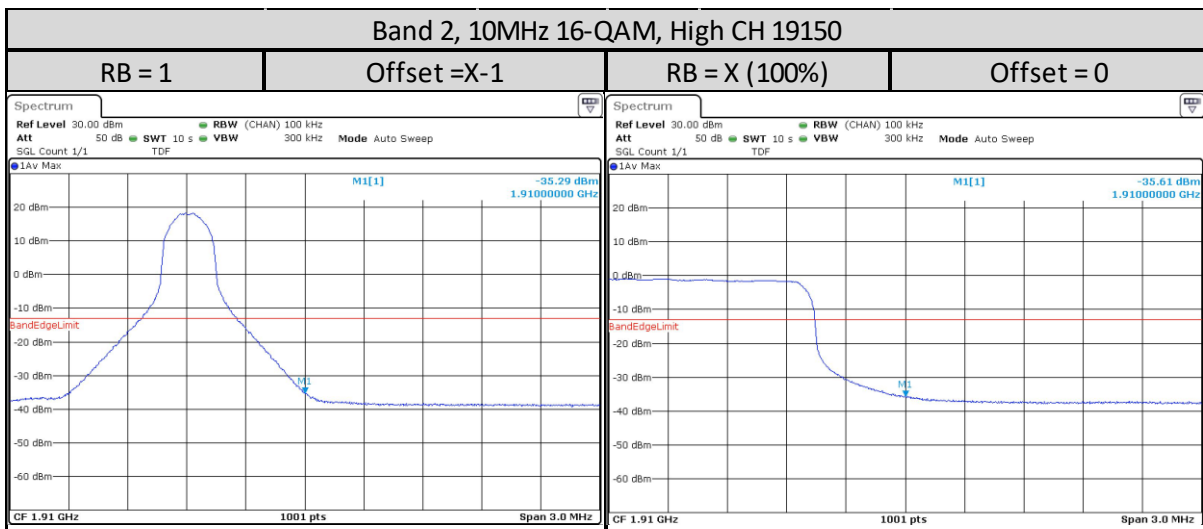
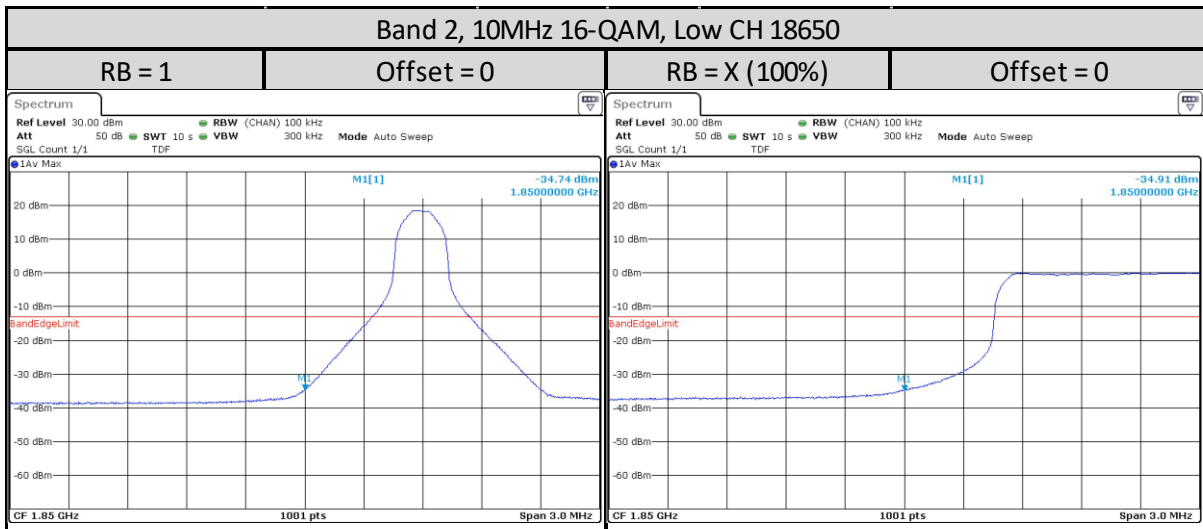
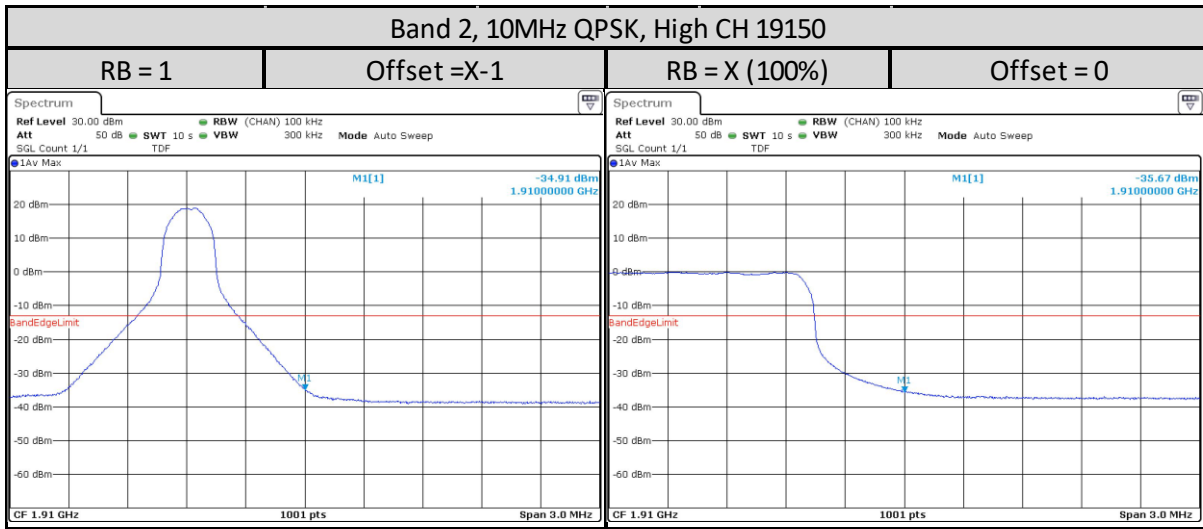


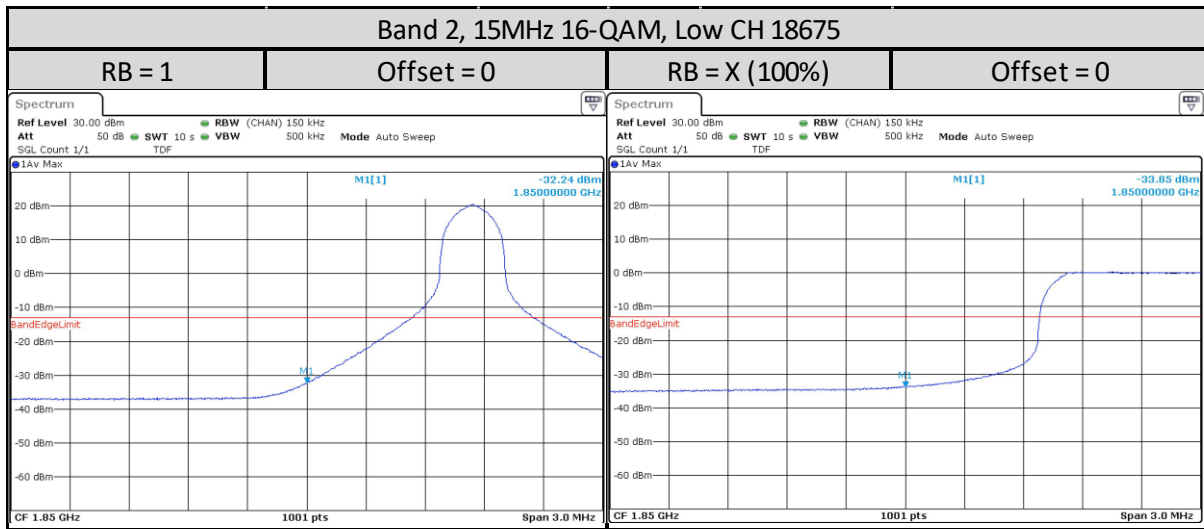
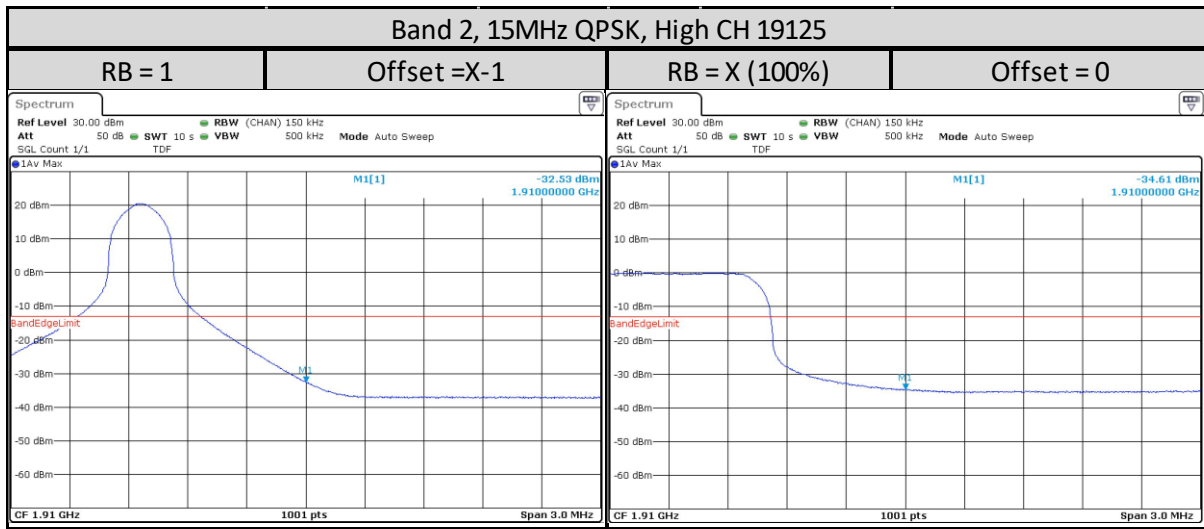
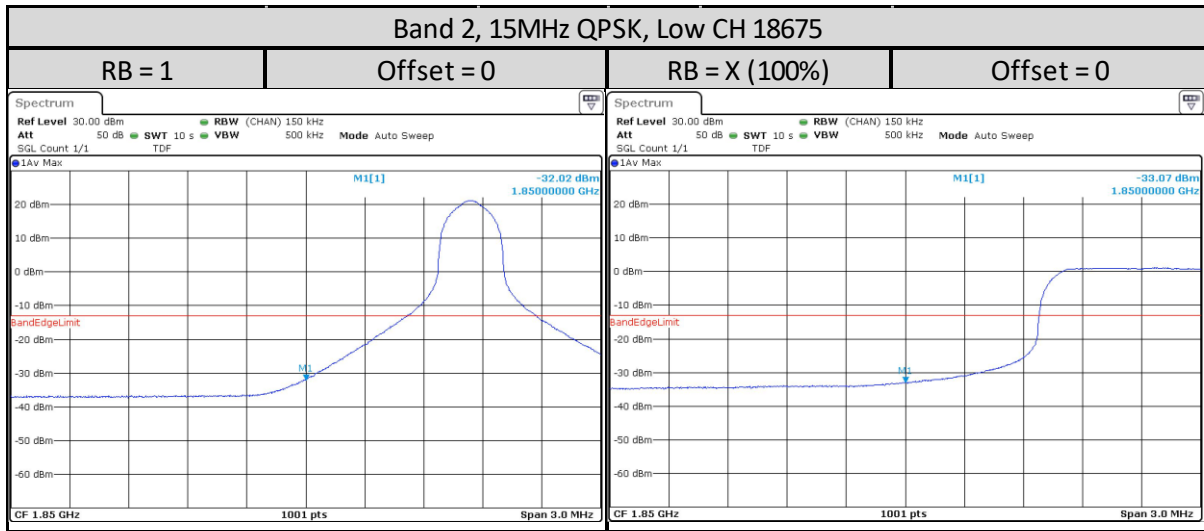


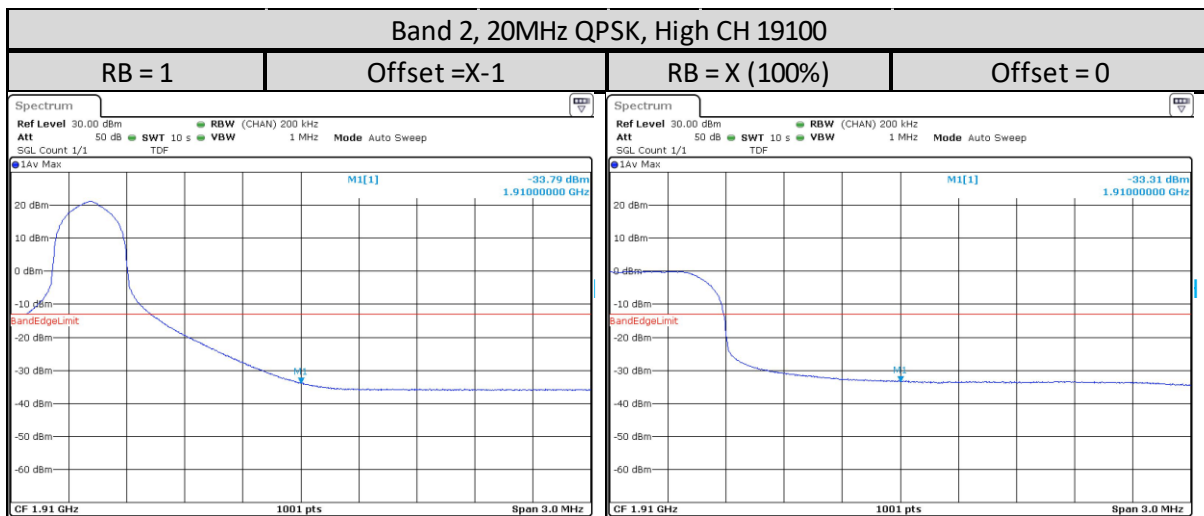
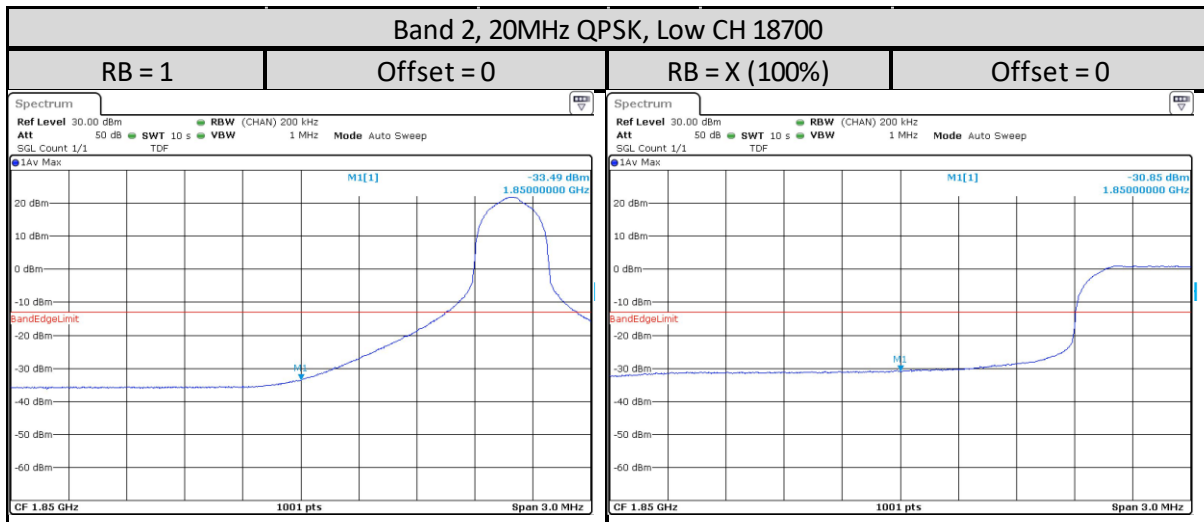
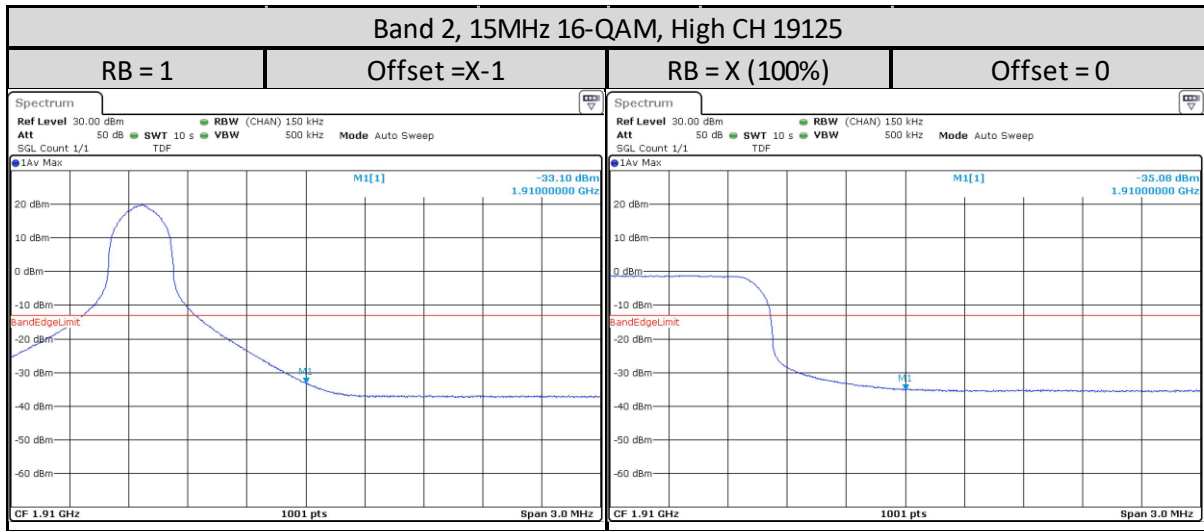




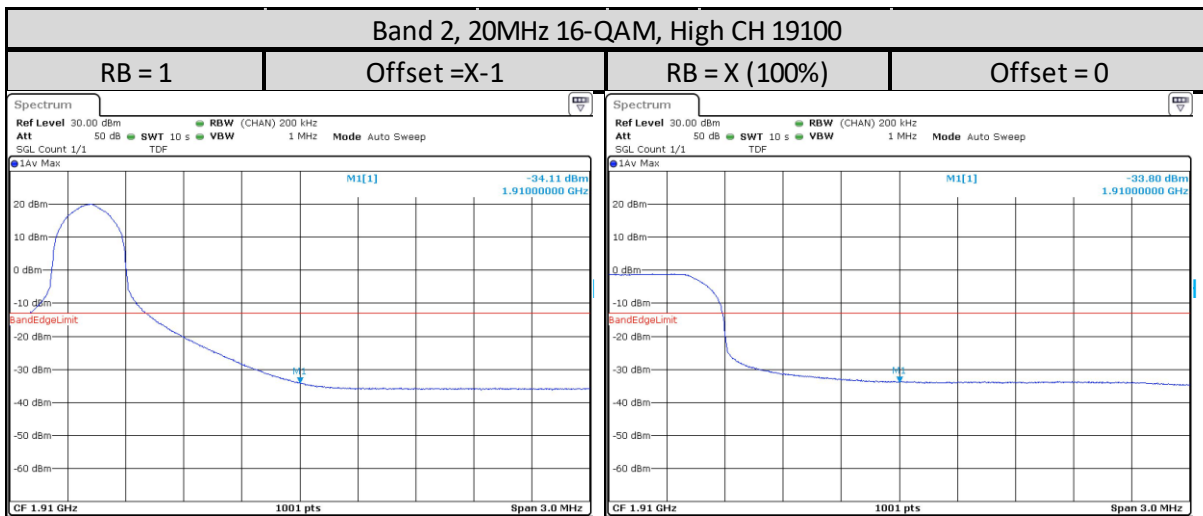
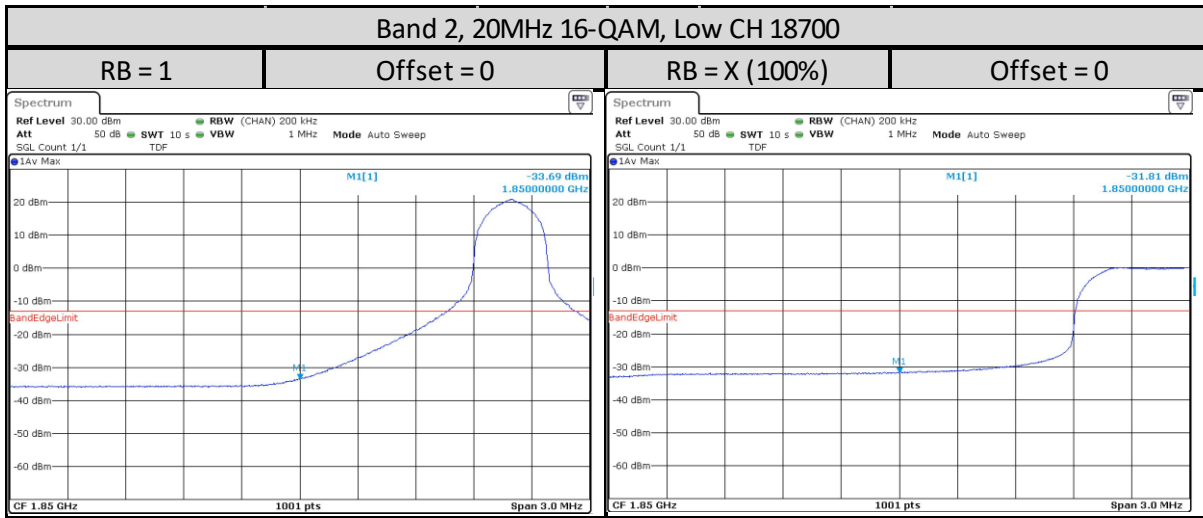






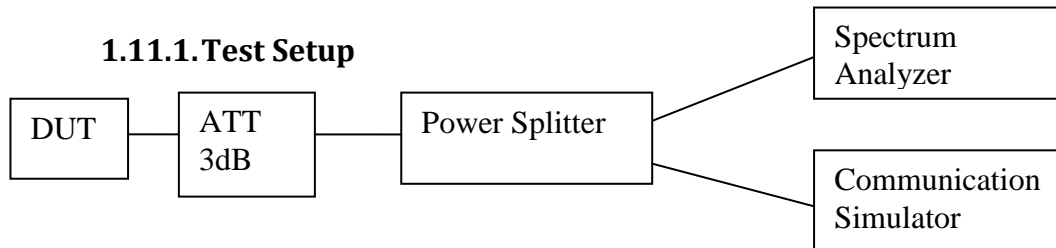






## 1.11. Conducted Spurious Emission

### 1.11.1. Test Setup



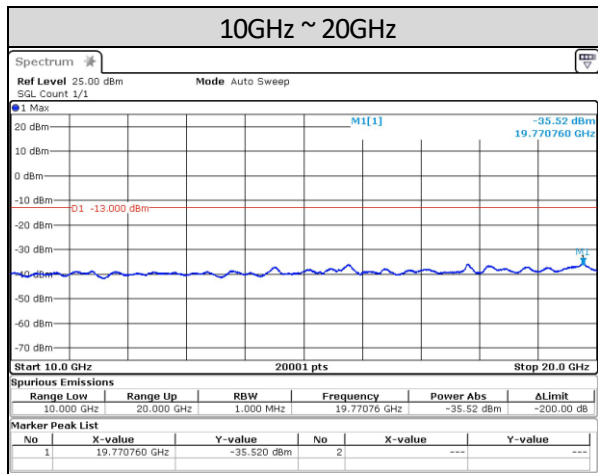
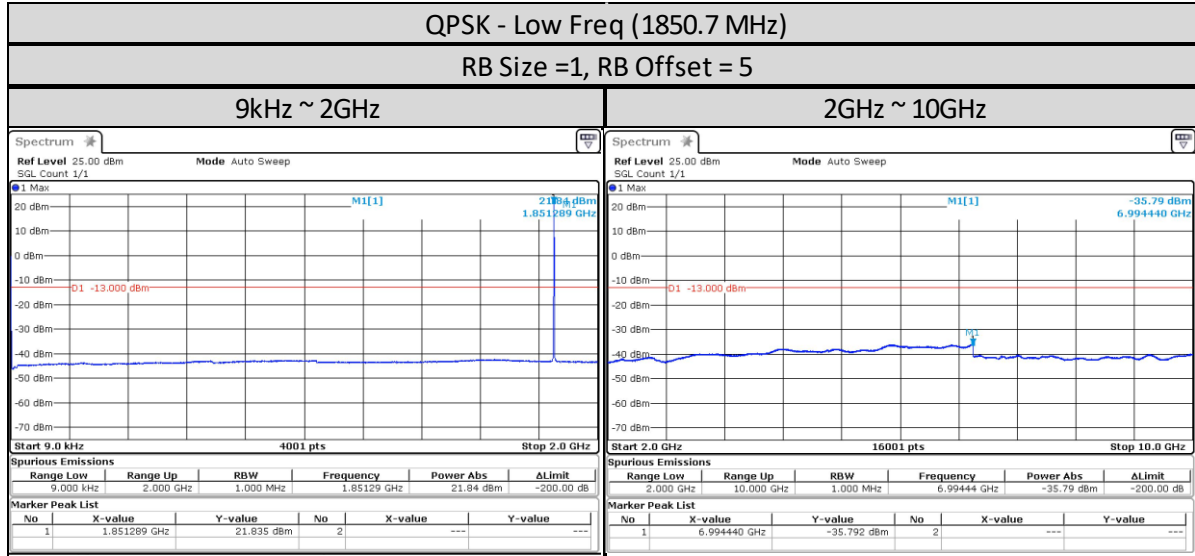
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) Set DUT to transmit maximum power through communication simulator.
- 4) Spectrum Analyzer setting, RBW = 1 MHz, VBW = 3 MHz.
- 5) The spurious emission of lowest, middle and highest channels with the highest RF powers were measured.
- 6) Record the maximum trace plot into the test report.

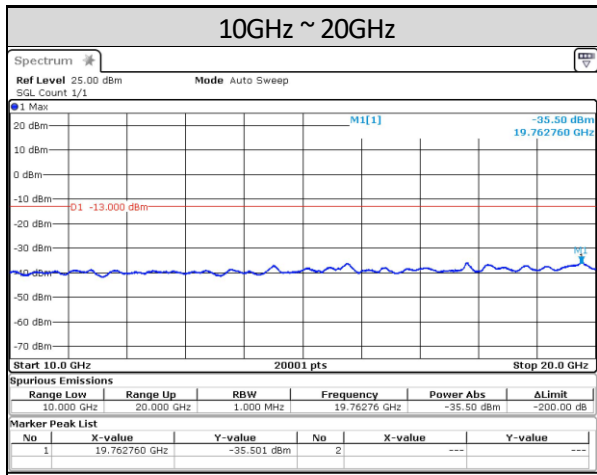
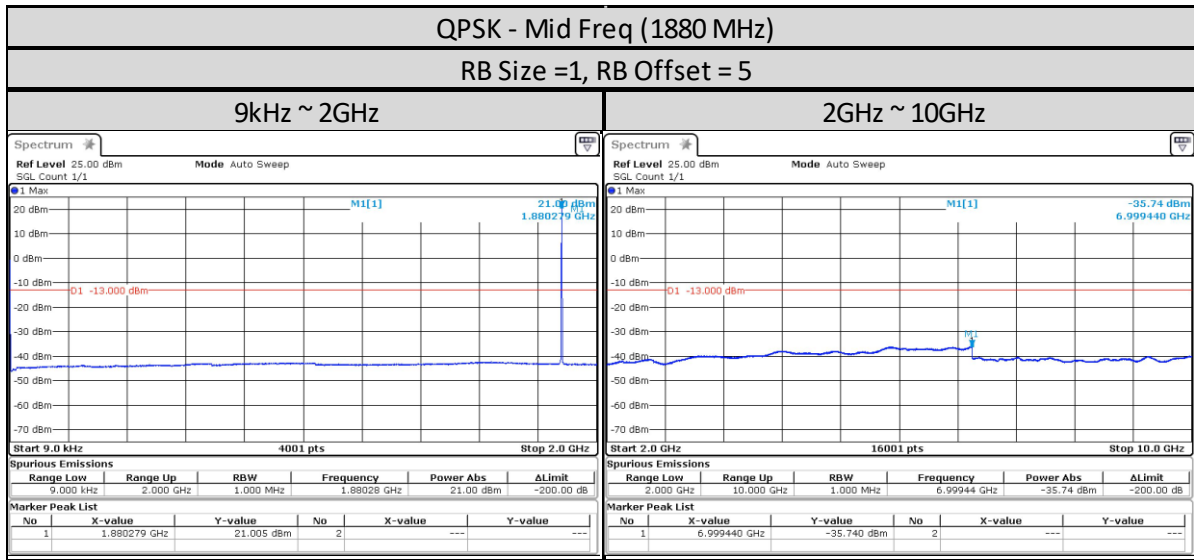
### 1.11.2. Test Limit

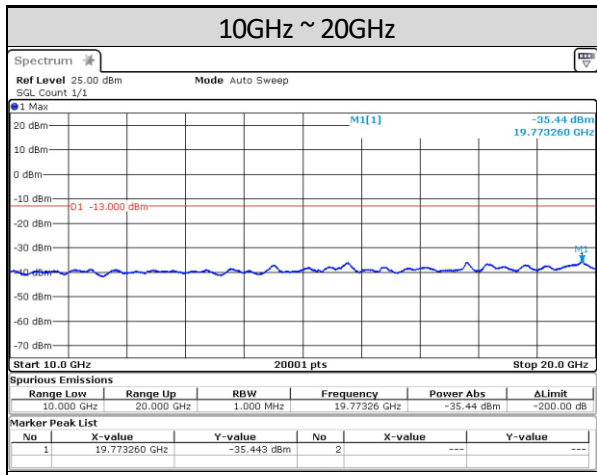
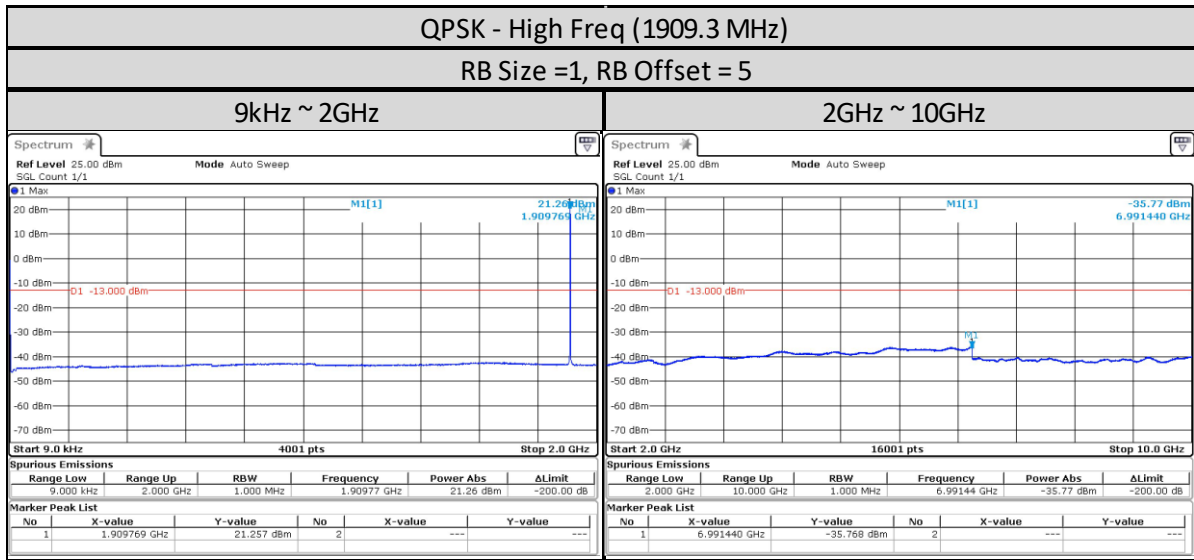
The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB. The measurement instrumentation is employing a resolution bandwidth of 1 megahertz or greater.

### 1.11.3. Conducted Spurious Emissions – LTE Band 2 (1850 -1910 MHz)

#### 1.4MHz







**3MHz**

