

# FCC REPORT

## FCC Class II Permissive Change

**Applicant Name:**  
SAMSUNG Electronics Co., Ltd.

**Date of Issue:**  
January 30, 2019

**Address:**  
129, Samsung-ro, Yeongtong-gu, Suwon-si,  
Gyeonggi-do, 16677, Rep. of Korea

**Location of test lab:**  
HCT CO., LTD.,  
74, Seoicheon-ro 578beon-gil, Majang-myeon,  
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

**Report No.:** HCT-RF-1901-FC032

**FCC ID:** A3LMTP02P-41A

**APPLICANT:** SAMSUNG Electronics Co.,Ltd.

**Model:** MTP02P-41A  
**EUT Type:** MMU(MTP02P)  
**Frequency Ranges:** 2 496 MHz ~ 2 690 MHz  
**Tx Output Power:** 80 W (2.5 W x 32 port)

**Emission Designator:**

| Mode            | Emission Designator |                          |
|-----------------|---------------------|--------------------------|
|                 | QPSK (G7D)          | 16QAM/64QAM/256QAM (W7D) |
| 5G NR 60 MHz BW | 57M8G7D             | 58M0W7D                  |

**Date of Test:** January 19, 2019 ~ January 30, 2019

**FCC Rule Part(s):** CFR 47 Part 2, Part 27

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.



**Report prepared by : Kyung Soo Kang**  
**Engineer of telecommunication testing center**



**Approved by : Jong Seok Lee**  
**Manager of telecommunication testing center**

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## Version

| TEST REPORT NO.   | DATE             | DESCRIPTION             |
|-------------------|------------------|-------------------------|
| HCT-RF-1901-FC032 | January 30, 2019 | - First Approval Report |
|                   |                  |                         |
|                   |                  |                         |

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## 1. GENERAL INFORMATION

### 1.1. APPLICANT INFORMATION

|                 |                                                                               |
|-----------------|-------------------------------------------------------------------------------|
| Company Name    | Samsung Electronics Co., Ltd.                                                 |
| Company Address | 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,<br>Rep. of Korea |

### 1.2. PRODUCT INFORMATION

|                       |                                                                                                                                                                                                                         |                          |  |      |                     |  |            |                          |                 |         |         |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--|------|---------------------|--|------------|--------------------------|-----------------|---------|---------|
| EUT Type              | MMU(MTP02P)                                                                                                                                                                                                             |                          |  |      |                     |  |            |                          |                 |         |         |
| Power Supply          | -48 VDC, 27 A                                                                                                                                                                                                           |                          |  |      |                     |  |            |                          |                 |         |         |
| Emission Designator   | <table><tr><td rowspan="2">Mode</td><td colspan="2">Emission Designator</td></tr><tr><td>QPSK (G7D)</td><td>16QAM/64QAM/256QAM (W7D)</td></tr><tr><td>5G NR 60 MHz BW</td><td>57M8G7D</td><td>58M0W7D</td></tr></table> |                          |  | Mode | Emission Designator |  | QPSK (G7D) | 16QAM/64QAM/256QAM (W7D) | 5G NR 60 MHz BW | 57M8G7D | 58M0W7D |
| Mode                  | Emission Designator                                                                                                                                                                                                     |                          |  |      |                     |  |            |                          |                 |         |         |
|                       | QPSK (G7D)                                                                                                                                                                                                              | 16QAM/64QAM/256QAM (W7D) |  |      |                     |  |            |                          |                 |         |         |
| 5G NR 60 MHz BW       | 57M8G7D                                                                                                                                                                                                                 | 58M0W7D                  |  |      |                     |  |            |                          |                 |         |         |
| Frequency Range       | 2 496 MHz ~ 2 690 MHz                                                                                                                                                                                                   |                          |  |      |                     |  |            |                          |                 |         |         |
| Tx Output Power       | 80 W (2.5 W x 32 port)                                                                                                                                                                                                  |                          |  |      |                     |  |            |                          |                 |         |         |
| Channel Bandwidths    | 60 MHz                                                                                                                                                                                                                  |                          |  |      |                     |  |            |                          |                 |         |         |
| Modulation Type       | QPSK, 16QAM, 64QAM, 256QAM                                                                                                                                                                                              |                          |  |      |                     |  |            |                          |                 |         |         |
| Antenna Specification | Service Beam Gain: 23 ± 0.5 dBi (16 Tx maximum gain condition)                                                                                                                                                          |                          |  |      |                     |  |            |                          |                 |         |         |

### 1.3. TEST INFORMATION

|                       |                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------|
| FCC Rule Parts        | CFR 47 Part 2, Part 27                                                                                       |
| Measurement standards | ANSI C63.26-2015, KDB 662911 D01 v02r01                                                                      |
| Place of Test         | HCT CO., LTD.<br>74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do,<br>17383, Rep. of KOREA |

## **2. FACILITIES AND ACCREDITATIONS**

### **2.1. FACILITIES**

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 (Version: 2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661).

### **2.2. EQUIPMENT**

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 3. TEST SPECIFICATIONS

#### 3.1. STANDARDS

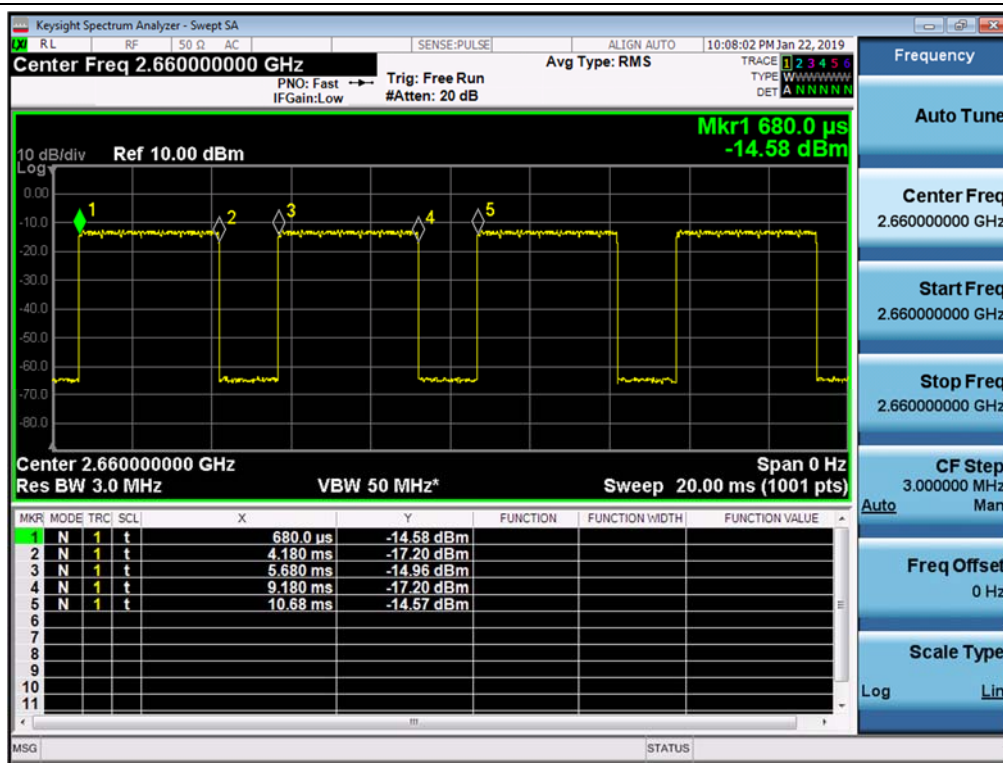
The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 27

| Description                  | Reference          | Results   |
|------------------------------|--------------------|-----------|
| RF Output Power              | §2.1046, §27.50(h) | Compliant |
| Occupied Bandwidth           | §2.1049            | Compliant |
| Unwanted Conducted Emissions | §2.1051, §27.53(m) | Compliant |
| Radiated Emissions           | §2.1053, §27.53    | Compliant |
| Frequency Stability          | §2.1055, §27.54    | Compliant |

### 3.2. MODE OF OPERATION DURING THE TEST

- The EUT was operated in a manner representative of the typical usage of the equipment.
- During all testing, system components were manipulated within the confines of typical usage to maximize each emission.
- All LTE modulation types (QPSK, 16QAM, 64QAM, 256QAM) supported by the EUT have been tested.
- Unwanted conducted emissions were performed on one port with a maximum output power level.
- The dummy loads were connected to the RF output ports for radiated spurious emission testing.
- Because of the EUT using LTE-TDD technology, it cannot be configured to transmit continuously and measurement instrument cannot be configured to measure only during active transmissions. So we perform the measurement using duty cycle method.

Measurement Result of MTP02P-41A Transmit On/Off Timing



- The EUT duty cycle is calculated according to ANSI C63.26 - 5.2.4.3.4.

$$\text{Duty Cycle} = \text{On-time} / \text{Transmitter period} = 3.5 / 5 = 0.7$$

$$\text{Duty Correction} = 10 \log (1/\text{duty cycle}) = 10 \log (1/0.7) = 1.549 \text{ dB}$$

This duty correction factor is applied to output power measurement and unwanted conducted emissions.

- The tests results in plots are already including the actual value of loss for the attenuator and cable combination. Please check correction factors below table.
- The factor table contains additional 1.2 dB correction for test jig provide by applicant.

#### ■ Correction Factor for In-Band Measurement

| Port | Factor (dB) |           |           |           |           |           |           |           |
|------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|      | 2 400 MHz   | 2 450 MHz | 2 500 MHz | 2 550 MHz | 2 600 MHz | 2 650 MHz | 2 700 MHz | 2 750 MHz |
| 0    | 33.634      | 33.759    | 33.73     | 33.799    | 33.813    | 33.858    | 33.904    | 33.922    |
| 1    | 33.459      | 33.56     | 33.492    | 33.66     | 33.725    | 33.654    | 33.772    | 33.804    |
| 2    | 33.441      | 33.489    | 33.468    | 33.623    | 33.62     | 33.632    | 33.753    | 33.743    |
| 3    | 33.453      | 33.603    | 33.489    | 33.687    | 33.724    | 33.659    | 33.787    | 33.793    |
| 4    | 33.521      | 33.59     | 33.549    | 33.664    | 33.676    | 33.703    | 33.75     | 33.896    |
| 5    | 33.43       | 33.527    | 33.496    | 33.607    | 33.73     | 33.647    | 33.745    | 33.911    |
| 6    | 33.448      | 33.505    | 33.495    | 33.622    | 33.611    | 33.662    | 33.754    | 33.734    |
| 7    | 33.451      | 33.501    | 33.488    | 33.624    | 33.631    | 33.66     | 33.758    | 33.746    |
| 8    | 33.683      | 33.733    | 33.701    | 33.815    | 33.936    | 33.856    | 33.904    | 34.036    |
| 9    | 33.43       | 33.575    | 33.551    | 33.651    | 33.798    | 33.664    | 33.685    | 33.817    |
| 10   | 33.408      | 33.495    | 33.442    | 33.613    | 33.734    | 33.584    | 33.704    | 33.818    |
| 11   | 33.422      | 33.604    | 33.499    | 33.657    | 33.789    | 33.613    | 33.676    | 33.746    |
| 12   | 33.514      | 33.562    | 33.537    | 33.728    | 33.807    | 33.701    | 33.756    | 33.858    |
| 13   | 33.432      | 33.557    | 33.496    | 33.644    | 33.795    | 33.627    | 33.695    | 33.845    |
| 14   | 33.428      | 33.507    | 33.439    | 33.646    | 33.732    | 33.591    | 33.718    | 33.743    |
| 15   | 33.385      | 33.441    | 33.42     | 33.576    | 33.633    | 33.57     | 33.704    | 33.698    |
| 16   | 33.524      | 33.583    | 33.557    | 33.7      | 33.699    | 33.715    | 33.781    | 33.909    |
| 17   | 33.408      | 33.497    | 33.432    | 33.633    | 33.681    | 33.625    | 33.729    | 33.802    |
| 18   | 33.472      | 33.559    | 33.489    | 33.72     | 33.731    | 33.684    | 33.837    | 33.813    |
| 19   | 33.527      | 33.588    | 33.58     | 33.643    | 33.582    | 33.705    | 33.752    | 33.864    |
| 20   | 33.695      | 33.72     | 33.697    | 33.784    | 33.775    | 33.819    | 33.884    | 34.026    |
| 21   | 33.519      | 33.508    | 33.482    | 33.746    | 33.587    | 33.661    | 33.829    | 33.773    |
| 22   | 33.468      | 33.553    | 33.484    | 33.696    | 33.72     | 33.673    | 33.803    | 33.845    |
| 23   | 33.482      | 33.511    | 33.501    | 33.681    | 33.653    | 33.696    | 33.814    | 33.753    |
| 24   | 33.285      | 33.305    | 33.292    | 33.385    | 33.55     | 33.407    | 33.501    | 33.515    |
| 25   | 33.472      | 33.563    | 33.483    | 33.692    | 33.765    | 33.641    | 33.789    | 33.785    |
| 26   | 33.481      | 33.531    | 33.487    | 33.687    | 33.68     | 33.67     | 33.77     | 33.738    |
| 27   | 33.481      | 33.589    | 33.473    | 33.728    | 33.761    | 33.631    | 33.772    | 33.773    |
| 28   | 33.331      | 33.435    | 33.348    | 33.486    | 33.51     | 33.499    | 33.586    | 33.65     |

| Port | Factor (dB) |           |           |           |           |           |           |           |
|------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|      | 2 400 MHz   | 2 450 MHz | 2 500 MHz | 2 550 MHz | 2 600 MHz | 2 650 MHz | 2 700 MHz | 2 750 MHz |
| 29   | 33.452      | 33.629    | 33.512    | 33.66     | 33.787    | 33.638    | 33.707    | 33.774    |
| 30   | 33.618      | 33.781    | 33.707    | 33.812    | 33.935    | 33.804    | 33.861    | 33.915    |
| 31   | 33.477      | 33.515    | 33.492    | 33.65     | 33.618    | 33.668    | 33.73     | 33.699    |

■ Correction Factor for Out-of-Band Measurement

| Frequency (MHz) | Factor (dB) | Frequency (MHz) | Factor (dB) | Frequency (MHz) | Factor (dB) | Frequency (MHz) | Factor (dB) |
|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| 50              | 30.62       | 1 000           | 31.75       | 11 000          | 34.40       | 21 000          | 38.42       |
| 100             | 31.15       | 2 000           | 31.00       | 12 000          | 33.85       | 22 000          | 38.13       |
| 200             | 30.63       | 3 000           | 31.76       | 13 000          | 36.71       | 23 000          | 39.31       |
| 300             | 30.64       | 4 000           | 32.32       | 14 000          | 35.66       | 24 000          | 40.94       |
| 400             | 30.70       | 5 000           | 33.02       | 15 000          | 36.23       | 25 000          | 43.30       |
| 500             | 30.85       | 6 000           | 33.38       | 16 000          | 35.44       | 26 000          | 44.34       |
| 600             | 31.21       | 7 000           | 33.61       | 17 000          | 35.71       | 26 500          | 42.95       |
| 700             | 31.39       | 8 000           | 34.34       | 18 000          | 36.13       |                 |             |
| 800             | 31.50       | 9 000           | 35.02       | 19 000          | 36.69       |                 |             |
| 900             | 31.61       | 10 000          | 34.62       | 20 000          | 37.91       |                 |             |

### 3.3. MAXIMUM MEASUREMENT UNCERTAINTY

The value of the measurement uncertainty for the measurement of each parameter.

Coverage factor  $k = 2$ , Confidence levels of 95 %

| Description                  | Condition         | Uncertainty               |
|------------------------------|-------------------|---------------------------|
| RF Output Power              | -                 | $\pm 0.72$ dB             |
| Occupied Bandwidth           | OBW $\leq 20$ MHz | $\pm 52$ kHz              |
| Unwanted Conducted Emissions | -                 | $\pm 1.08$ dB             |
| Radiated Emissions           | $f \leq 1$ GHz    | $\pm 4.80$ dB             |
|                              | $f > 1$ GHz       | $\pm 6.07$ dB             |
| Frequency Stability          | -                 | $\pm 1.22 \times 10^{-6}$ |

### 3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

|                    |                        |
|--------------------|------------------------|
| Temperature :      | +15 °C to +35 °C       |
| Relative humidity: | 30 % to 60 %           |
| Air pressure       | 860 mbar to 1 060 mbar |

## 4. TEST EQUIPMENTS

| Manufacturer           | Model / Equipment                              | Calibration Date | Calibration Interval | Serial No.     |
|------------------------|------------------------------------------------|------------------|----------------------|----------------|
| Agilent                | N9020A / Spectrum Analyzer                     | 04/24/2018       | Annual               | US46220219     |
| Agilent                | N9020A / Spectrum Analyzer                     | 07/06/2018       | Annual               | MY51110020     |
| Agilent                | N9030A / Spectrum Analyzer                     | 07/31/2018       | Annual               | MY51110068     |
| KEYSIGHT               | N9030B /Spectrum Analyzer                      | 08/29/2018       | Annual               | MY55480167     |
| AGILENT                | 8498A / Coaxial Attenuator                     | 02/19/2018       | Annual               | 51162          |
| AGILENT                | 6674A / DC Power Supply                        | 08/02/2018       | Annual               | 3501A00901     |
| KIKUSUI                | PWR800L / DC Power Supply                      | 02/27/2018       | Annual               | RE001149       |
| Rohde&Schwarz          | SMB100A / RF Signal Generator                  | 07/19/2018       | Annual               | 177633         |
| KEITHLEY               | S46 / Switch System                            | N/A              | N/A                  | 1088024        |
| KEITHLEY               | S46 / Switch System                            | N/A              | N/A                  | 1088025        |
| NANGYEUL CO., LTD.     | NY-THR18750 / Temperature and Humidity Chamber | 10/30/2018       | Annual               | NY-2009012201A |
| Innco system           | CO3000 / Controller(Antenna mast)              | N/A              | N/A                  | CO3000-4p      |
| Innco system           | MA4640/800-XP-EP / Antenna Position Tower      | N/A              | N/A                  | N/A            |
| Emco                   | 2090 / Controller                              | N/A              | N/A                  | 060520         |
| Ets                    | Turn Table                                     | N/A              | N/A                  | N/A            |
| Rohde & Schwarz        | Loop Antenna                                   | 08/23/2018       | Biennial             | 1513-175       |
| Schwarzbeck            | VULB 9168 / Hybrid Antenna                     | 08/31/2018       | Biennial             | 9168-0895      |
| Schwarzbeck            | BBHA 9120D / Horn Antenna                      | 06/30/2017       | Biennial             | 9120D-1300     |
| Rohde & Schwarz        | FSP / Spectrum Analyzer                        | 09/19/2018       | Annual               | 836650/016     |
| Wainwright Instruments | WHKX10-900-1000-15000-40SS                     | 07/20/2018       | Annual               | 5              |
| CERNEX                 | CBLU1183540 / Power Amplifier                  | 07/10/2018       | Annual               | 22964          |

## 5. RF OUTPUT POWER

### FCC Rules

#### Test Requirements:

#### § 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

#### § 27.50 Power limits and duty cycle.

(h) The following power limits shall apply in the BRS and EBS:

(1) Main, booster and base stations.

(i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

(ii) If a main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern, the maximum EIRP in dBW in a given direction shall be determined by the following formula:  $EIRP = 33 \text{ dBW} + 10 \log(X/Y) \text{ dBW} + 10 \log(360/\text{beamwidth}) \text{ dBW}$ , where X is the actual channel width in MHz, Y is either (i) 6 MHz if prior to transition or the station is in the MBS following transition or (ii) 5.5 MHz if the station is in the LBS and UBS following transition, and beamwidth is the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points.

**Test Procedures:**

The measurement is performed in accordance with Section 5.2.4.4.2 of ANSI C63.26.

- a) Set span to  $2 \times$  to  $3 \times$  the OBW.
- b) Set RBW = 1% to 5% of the OBW.
- c) Set VBW  $\geq 3 \times$  RBW.
- d) Set number of measurement points in sweep  $\geq 2 \times$  span / RBW.
- e) Sweep time:
  - 1) Set = auto-couple, or
  - 2) Set  $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$  for single sweep (automation-compatible) measurement.
- f) Detector = power averaging (rms).
- g) Set sweep trigger to "free run."
- h) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function with band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- j) Add  $10 \log (1/\text{duty cycle})$  to the measured power level to compute the average power during continuous transmission.

**Note:**

- 1) Test was performed with test jig provided by applicant.
- 2) The conducted emission level is measured at each antenna port and then summed mathematically to determine the total emission level from the device.
- 3) Maximum ERP is sufficient level to pass the limit.
- 4) Sum data is in a tolerance of specification provided from manufacturer.

*RF Output power tolerance:  $\pm 1$  dB (each port)*

*Maximum output power for one port: 3.147 W (33.98 dBm + 1 dB)*

*Maximum output sum power:  $3.147 \text{ W} \times 32 = 100.704 \text{ W}$*

*Measured sum maximum power: 92.842 W*

*The measured value is lower than the specification value.*

**Test Results:**
**60 MHz Bandwidth**

| Port   | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|--------|------------|---------|-----------------|-----------------------|-------|
|        |            |         |                 | (dBm)                 | (W)   |
| Port 0 | QPSK       | Low     | 2426.00         | 34.09                 | 2.564 |
|        |            | Middle  | 2593.00         | 34.46                 | 2.793 |
|        |            | High    | 2660.00         | 33.77                 | 2.382 |
|        | 16QAM      | Low     | 2426.00         | 33.98                 | 2.500 |
|        |            | Middle  | 2593.00         | 34.16                 | 2.606 |
|        |            | High    | 2660.00         | 33.91                 | 2.460 |
|        | 64QAM      | Low     | 2426.00         | 33.73                 | 2.360 |
|        |            | Middle  | 2593.00         | 34.34                 | 2.716 |
|        |            | High    | 2660.00         | 33.68                 | 2.333 |
|        | 256QAM     | Low     | 2426.00         | 34.59                 | 2.877 |
|        |            | Middle  | 2593.00         | 34.77                 | 2.999 |
|        |            | High    | 2660.00         | 33.74                 | 2.366 |
| Port 1 | QPSK       | Low     | 2426.00         | 34.01                 | 2.518 |
|        |            | Middle  | 2593.00         | 34.66                 | 2.924 |
|        |            | High    | 2660.00         | 33.55                 | 2.265 |
|        | 16QAM      | Low     | 2426.00         | 33.95                 | 2.483 |
|        |            | Middle  | 2593.00         | 34.33                 | 2.710 |
|        |            | High    | 2660.00         | 34.24                 | 2.655 |
|        | 64QAM      | Low     | 2426.00         | 33.94                 | 2.477 |
|        |            | Middle  | 2593.00         | 34.19                 | 2.624 |
|        |            | High    | 2660.00         | 33.62                 | 2.301 |
|        | 256QAM     | Low     | 2426.00         | 34.51                 | 2.825 |
|        |            | Middle  | 2593.00         | 34.95                 | 3.126 |
|        |            | High    | 2660.00         | 34.00                 | 2.512 |
| Port 2 | QPSK       | Low     | 2426.00         | 33.89                 | 2.449 |
|        |            | Middle  | 2593.00         | 34.14                 | 2.594 |
|        |            | High    | 2660.00         | 33.57                 | 2.275 |
|        | 16QAM      | Low     | 2426.00         | 33.85                 | 2.427 |
|        |            | Middle  | 2593.00         | 33.95                 | 2.483 |
|        |            | High    | 2660.00         | 33.90                 | 2.455 |

| Port   | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|--------|------------|---------|-----------------|-----------------------|-------|
|        |            |         |                 | (dBm)                 | (W)   |
|        | 64QAM      | Low     | 2426.00         | 33.68                 | 2.333 |
|        |            | Middle  | 2593.00         | 33.82                 | 2.410 |
|        |            | High    | 2660.00         | 33.22                 | 2.099 |
|        | 256QAM     | Low     | 2426.00         | 34.44                 | 2.780 |
|        |            | Middle  | 2593.00         | 34.02                 | 2.523 |
|        |            | High    | 2660.00         | 33.75                 | 2.371 |
| Port 3 | QPSK       | Low     | 2426.00         | 33.63                 | 2.307 |
|        |            | Middle  | 2593.00         | 34.36                 | 2.729 |
|        |            | High    | 2660.00         | 33.43                 | 2.203 |
|        | 16QAM      | Low     | 2426.00         | 33.90                 | 2.455 |
|        |            | Middle  | 2593.00         | 34.47                 | 2.799 |
|        |            | High    | 2660.00         | 33.77                 | 2.382 |
|        | 64QAM      | Low     | 2426.00         | 33.70                 | 2.344 |
|        |            | Middle  | 2593.00         | 34.11                 | 2.576 |
|        |            | High    | 2660.00         | 33.66                 | 2.323 |
|        | 256QAM     | Low     | 2426.00         | 34.25                 | 2.661 |
|        |            | Middle  | 2593.00         | 34.60                 | 2.884 |
|        |            | High    | 2660.00         | 33.67                 | 2.328 |
| Port 4 | QPSK       | Low     | 2426.00         | 33.64                 | 2.312 |
|        |            | Middle  | 2593.00         | 33.94                 | 2.477 |
|        |            | High    | 2660.00         | 33.62                 | 2.301 |
|        | 16QAM      | Low     | 2426.00         | 33.86                 | 2.432 |
|        |            | Middle  | 2593.00         | 34.12                 | 2.582 |
|        |            | High    | 2660.00         | 33.60                 | 2.291 |
|        | 64QAM      | Low     | 2426.00         | 33.54                 | 2.259 |
|        |            | Middle  | 2593.00         | 33.67                 | 2.328 |
|        |            | High    | 2660.00         | 33.69                 | 2.339 |
|        | 256QAM     | Low     | 2426.00         | 34.38                 | 2.742 |
|        |            | Middle  | 2593.00         | 34.79                 | 3.013 |
|        |            | High    | 2660.00         | 33.99                 | 2.506 |
| Port 5 | QPSK       | Low     | 2426.00         | 33.73                 | 2.360 |
|        |            | Middle  | 2593.00         | 33.94                 | 2.477 |

| Port   | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|--------|------------|---------|-----------------|-----------------------|-------|
|        |            |         |                 | (dBm)                 | (W)   |
|        | 16QAM      | High    | 2660.00         | 33.55                 | 2.265 |
|        |            | Low     | 2426.00         | 33.72                 | 2.355 |
|        |            | Middle  | 2593.00         | 33.88                 | 2.443 |
|        |            | High    | 2660.00         | 33.83                 | 2.415 |
|        | 64QAM      | Low     | 2426.00         | 33.26                 | 2.118 |
|        |            | Middle  | 2593.00         | 34.07                 | 2.553 |
|        |            | High    | 2660.00         | 33.42                 | 2.198 |
|        | 256QAM     | Low     | 2426.00         | 34.20                 | 2.630 |
|        |            | Middle  | 2593.00         | 34.51                 | 2.825 |
|        |            | High    | 2660.00         | 33.44                 | 2.208 |
| Port 6 | QPSK       | Low     | 2426.00         | 33.80                 | 2.399 |
|        |            | Middle  | 2593.00         | 34.65                 | 2.917 |
|        |            | High    | 2660.00         | 33.52                 | 2.249 |
|        | 16QAM      | Low     | 2426.00         | 33.76                 | 2.377 |
|        |            | Middle  | 2593.00         | 34.26                 | 2.667 |
|        |            | High    | 2660.00         | 33.58                 | 2.280 |
|        | 64QAM      | Low     | 2426.00         | 33.80                 | 2.399 |
|        |            | Middle  | 2593.00         | 34.08                 | 2.559 |
|        |            | High    | 2660.00         | 33.51                 | 2.244 |
|        | 256QAM     | Low     | 2426.00         | 34.68                 | 2.938 |
|        |            | Middle  | 2593.00         | 34.52                 | 2.831 |
|        |            | High    | 2660.00         | 33.50                 | 2.239 |
| Port 7 | QPSK       | Low     | 2426.00         | 33.97                 | 2.495 |
|        |            | Middle  | 2593.00         | 34.04                 | 2.535 |
|        |            | High    | 2660.00         | 33.76                 | 2.377 |
|        | 16QAM      | Low     | 2426.00         | 34.01                 | 2.518 |
|        |            | Middle  | 2593.00         | 34.03                 | 2.529 |
|        |            | High    | 2660.00         | 33.88                 | 2.443 |
|        | 64QAM      | Low     | 2426.00         | 33.84                 | 2.421 |
|        |            | Middle  | 2593.00         | 34.07                 | 2.553 |
|        |            | High    | 2660.00         | 33.59                 | 2.286 |
|        | 256QAM     | Low     | 2426.00         | 34.49                 | 2.812 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
| Port 8  |            | Middle  | 2593.00         | 34.73                 | 2.972 |
|         |            | High    | 2660.00         | 33.61                 | 2.296 |
|         |            | Low     | 2426.00         | 33.51                 | 2.244 |
|         | QPSK       | Middle  | 2593.00         | 34.60                 | 2.884 |
|         |            | High    | 2660.00         | 33.75                 | 2.371 |
|         |            | Low     | 2426.00         | 33.65                 | 2.317 |
|         | 16QAM      | Middle  | 2593.00         | 34.31                 | 2.698 |
|         |            | High    | 2660.00         | 34.02                 | 2.523 |
|         |            | Low     | 2426.00         | 33.64                 | 2.312 |
|         | 64QAM      | Middle  | 2593.00         | 34.39                 | 2.748 |
|         |            | High    | 2660.00         | 33.67                 | 2.328 |
|         |            | Low     | 2426.00         | 33.99                 | 2.506 |
|         | 256QAM     | Middle  | 2593.00         | 34.92                 | 3.105 |
|         |            | High    | 2660.00         | 33.96                 | 2.489 |
|         |            | Low     | 2426.00         | 33.82                 | 2.410 |
| Port 9  | QPSK       | Middle  | 2593.00         | 34.70                 | 2.951 |
|         |            | High    | 2660.00         | 34.04                 | 2.535 |
|         |            | Low     | 2426.00         | 33.70                 | 2.344 |
|         | 16QAM      | Middle  | 2593.00         | 34.44                 | 2.780 |
|         |            | High    | 2660.00         | 34.00                 | 2.512 |
|         |            | Low     | 2426.00         | 33.57                 | 2.275 |
|         | 64QAM      | Middle  | 2593.00         | 34.27                 | 2.673 |
|         |            | High    | 2660.00         | 33.71                 | 2.350 |
|         |            | Low     | 2426.00         | 34.23                 | 2.649 |
|         | 256QAM     | Middle  | 2593.00         | 34.95                 | 3.126 |
|         |            | High    | 2660.00         | 34.21                 | 2.636 |
|         |            | Low     | 2426.00         | 33.93                 | 2.472 |
| Port 10 | QPSK       | Middle  | 2593.00         | 34.48                 | 2.805 |
|         |            | High    | 2660.00         | 33.83                 | 2.415 |
|         |            | Low     | 2426.00         | 33.97                 | 2.495 |
|         | 16QAM      | Middle  | 2593.00         | 34.19                 | 2.624 |
|         |            | High    | 2660.00         | 34.14                 | 2.594 |
|         |            | Low     | 2426.00         | 33.93                 | 2.472 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
|         | 64QAM      | Low     | 2426.00         | 33.72                 | 2.355 |
|         |            | Middle  | 2593.00         | 34.09                 | 2.564 |
|         |            | High    | 2660.00         | 33.82                 | 2.410 |
|         | 256QAM     | Low     | 2426.00         | 34.09                 | 2.564 |
|         |            | Middle  | 2593.00         | 34.90                 | 3.090 |
|         |            | High    | 2660.00         | 33.66                 | 2.323 |
| Port 11 | QPSK       | Low     | 2426.00         | 33.90                 | 2.455 |
|         |            | Middle  | 2593.00         | 34.50                 | 2.818 |
|         |            | High    | 2660.00         | 33.78                 | 2.388 |
|         | 16QAM      | Low     | 2426.00         | 33.83                 | 2.415 |
|         |            | Middle  | 2593.00         | 34.40                 | 2.754 |
|         |            | High    | 2660.00         | 33.79                 | 2.393 |
|         | 64QAM      | Low     | 2426.00         | 33.81                 | 2.404 |
|         |            | Middle  | 2593.00         | 34.28                 | 2.679 |
|         |            | High    | 2660.00         | 33.51                 | 2.244 |
|         | 256QAM     | Low     | 2426.00         | 34.18                 | 2.618 |
|         |            | Middle  | 2593.00         | 34.82                 | 3.034 |
|         |            | High    | 2660.00         | 33.44                 | 2.208 |
| Port 12 | QPSK       | Low     | 2426.00         | 33.95                 | 2.483 |
|         |            | Middle  | 2593.00         | 34.34                 | 2.716 |
|         |            | High    | 2660.00         | 34.00                 | 2.512 |
|         | 16QAM      | Low     | 2426.00         | 34.08                 | 2.559 |
|         |            | Middle  | 2593.00         | 34.12                 | 2.582 |
|         |            | High    | 2660.00         | 33.40                 | 2.188 |
|         | 64QAM      | Low     | 2426.00         | 33.76                 | 2.377 |
|         |            | Middle  | 2593.00         | 34.09                 | 2.564 |
|         |            | High    | 2660.00         | 33.57                 | 2.275 |
|         | 256QAM     | Low     | 2426.00         | 34.43                 | 2.773 |
|         |            | Middle  | 2593.00         | 34.67                 | 2.931 |
|         |            | High    | 2660.00         | 33.56                 | 2.270 |
| Port 13 | QPSK       | Low     | 2426.00         | 34.04                 | 2.535 |
|         |            | Middle  | 2593.00         | 34.60                 | 2.884 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
|         | 16QAM      | High    | 2660.00         | 33.52                 | 2.249 |
|         |            | Low     | 2426.00         | 34.02                 | 2.523 |
|         |            | Middle  | 2593.00         | 34.35                 | 2.723 |
|         |            | High    | 2660.00         | 33.62                 | 2.301 |
|         | 64QAM      | Low     | 2426.00         | 33.72                 | 2.355 |
|         |            | Middle  | 2593.00         | 34.30                 | 2.692 |
|         |            | High    | 2660.00         | 33.52                 | 2.249 |
|         | 256QAM     | Low     | 2426.00         | 34.06                 | 2.547 |
|         |            | Middle  | 2593.00         | 33.48                 | 2.228 |
|         |            | High    | 2660.00         | 33.85                 | 2.427 |
| Port 14 | QPSK       | Low     | 2426.00         | 33.79                 | 2.393 |
|         |            | Middle  | 2593.00         | 34.69                 | 2.944 |
|         |            | High    | 2660.00         | 33.37                 | 2.173 |
|         | 16QAM      | Low     | 2426.00         | 34.16                 | 2.606 |
|         |            | Middle  | 2593.00         | 34.28                 | 2.679 |
|         |            | High    | 2660.00         | 33.73                 | 2.360 |
|         | 64QAM      | Low     | 2426.00         | 33.81                 | 2.404 |
|         |            | Middle  | 2593.00         | 34.16                 | 2.606 |
|         |            | High    | 2660.00         | 33.40                 | 2.188 |
|         | 256QAM     | Low     | 2426.00         | 34.29                 | 2.685 |
|         |            | Middle  | 2593.00         | 34.97                 | 3.141 |
|         |            | High    | 2660.00         | 33.56                 | 2.270 |
| Port 15 | QPSK       | Low     | 2426.00         | 34.03                 | 2.529 |
|         |            | Middle  | 2593.00         | 34.19                 | 2.624 |
|         |            | High    | 2660.00         | 33.77                 | 2.382 |
|         | 16QAM      | Low     | 2426.00         | 34.01                 | 2.518 |
|         |            | Middle  | 2593.00         | 34.23                 | 2.649 |
|         |            | High    | 2660.00         | 33.91                 | 2.460 |
|         | 64QAM      | Low     | 2426.00         | 33.99                 | 2.506 |
|         |            | Middle  | 2593.00         | 34.20                 | 2.630 |
|         |            | High    | 2660.00         | 33.32                 | 2.148 |
|         | 256QAM     | Low     | 2426.00         | 34.35                 | 2.723 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
| Port 16 |            | Middle  | 2593.00         | 34.73                 | 2.972 |
|         |            | High    | 2660.00         | 33.68                 | 2.333 |
|         |            | Low     | 2426.00         | 34.08                 | 2.559 |
|         | QPSK       | Middle  | 2593.00         | 34.25                 | 2.661 |
|         |            | High    | 2660.00         | 33.71                 | 2.350 |
|         |            | Low     | 2426.00         | 33.81                 | 2.404 |
|         | 16QAM      | Middle  | 2593.00         | 34.07                 | 2.553 |
|         |            | High    | 2660.00         | 33.47                 | 2.223 |
|         |            | Low     | 2426.00         | 33.68                 | 2.333 |
|         | 64QAM      | Middle  | 2593.00         | 34.10                 | 2.570 |
|         |            | High    | 2660.00         | 33.55                 | 2.265 |
|         |            | Low     | 2426.00         | 34.28                 | 2.679 |
|         | 256QAM     | Middle  | 2593.00         | 34.52                 | 2.831 |
|         |            | High    | 2660.00         | 33.64                 | 2.312 |
|         |            | Low     | 2426.00         | 33.98                 | 2.500 |
| Port 17 | QPSK       | Middle  | 2593.00         | 34.31                 | 2.698 |
|         |            | High    | 2660.00         | 33.84                 | 2.421 |
|         |            | Low     | 2426.00         | 34.00                 | 2.512 |
|         | 16QAM      | Middle  | 2593.00         | 34.05                 | 2.541 |
|         |            | High    | 2660.00         | 33.73                 | 2.360 |
|         |            | Low     | 2426.00         | 33.82                 | 2.410 |
|         | 64QAM      | Middle  | 2593.00         | 34.03                 | 2.529 |
|         |            | High    | 2660.00         | 33.17                 | 2.075 |
|         |            | Low     | 2426.00         | 34.40                 | 2.754 |
|         | 256QAM     | Middle  | 2593.00         | 34.87                 | 3.069 |
|         |            | High    | 2660.00         | 33.75                 | 2.371 |
|         |            | Low     | 2426.00         | 33.92                 | 2.466 |
| Port 18 | QPSK       | Middle  | 2593.00         | 34.35                 | 2.723 |
|         |            | High    | 2660.00         | 33.62                 | 2.301 |
|         |            | Low     | 2426.00         | 33.78                 | 2.388 |
|         | 16QAM      | Middle  | 2593.00         | 34.36                 | 2.729 |
|         |            | High    | 2660.00         | 33.65                 | 2.317 |
|         |            | Low     | 2426.00         | 33.92                 | 2.466 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
|         | 64QAM      | Low     | 2426.00         | 33.80                 | 2.399 |
|         |            | Middle  | 2593.00         | 33.99                 | 2.506 |
|         |            | High    | 2660.00         | 33.68                 | 2.333 |
|         | 256QAM     | Low     | 2426.00         | 34.44                 | 2.780 |
|         |            | Middle  | 2593.00         | 34.90                 | 3.090 |
|         |            | High    | 2660.00         | 34.10                 | 2.570 |
| Port 19 | QPSK       | Low     | 2426.00         | 33.76                 | 2.377 |
|         |            | Middle  | 2593.00         | 34.10                 | 2.570 |
|         |            | High    | 2660.00         | 33.83                 | 2.415 |
|         | 16QAM      | Low     | 2426.00         | 34.09                 | 2.564 |
|         |            | Middle  | 2593.00         | 34.35                 | 2.723 |
|         |            | High    | 2660.00         | 33.81                 | 2.404 |
|         | 64QAM      | Low     | 2426.00         | 33.80                 | 2.399 |
|         |            | Middle  | 2593.00         | 34.00                 | 2.512 |
|         |            | High    | 2660.00         | 33.47                 | 2.223 |
|         | 256QAM     | Low     | 2426.00         | 34.70                 | 2.951 |
|         |            | Middle  | 2593.00         | 34.82                 | 3.034 |
|         |            | High    | 2660.00         | 33.98                 | 2.500 |
| Port 20 | QPSK       | Low     | 2426.00         | 33.97                 | 2.495 |
|         |            | Middle  | 2593.00         | 34.40                 | 2.754 |
|         |            | High    | 2660.00         | 33.69                 | 2.339 |
|         | 16QAM      | Low     | 2426.00         | 33.84                 | 2.421 |
|         |            | Middle  | 2593.00         | 34.07                 | 2.553 |
|         |            | High    | 2660.00         | 33.71                 | 2.350 |
|         | 64QAM      | Low     | 2426.00         | 33.73                 | 2.360 |
|         |            | Middle  | 2593.00         | 34.20                 | 2.630 |
|         |            | High    | 2660.00         | 33.76                 | 2.377 |
|         | 256QAM     | Low     | 2426.00         | 34.19                 | 2.624 |
|         |            | Middle  | 2593.00         | 34.56                 | 2.858 |
|         |            | High    | 2660.00         | 34.32                 | 2.704 |
| Port 21 | QPSK       | Low     | 2426.00         | 34.09                 | 2.564 |
|         |            | Middle  | 2593.00         | 34.15                 | 2.600 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
|         | 16QAM      | High    | 2660.00         | 33.42                 | 2.198 |
|         |            | Low     | 2426.00         | 34.17                 | 2.612 |
|         |            | Middle  | 2593.00         | 34.03                 | 2.529 |
|         |            | High    | 2660.00         | 33.65                 | 2.317 |
|         | 64QAM      | Low     | 2426.00         | 33.99                 | 2.506 |
|         |            | Middle  | 2593.00         | 33.90                 | 2.455 |
|         |            | High    | 2660.00         | 33.22                 | 2.099 |
|         | 256QAM     | Low     | 2426.00         | 34.62                 | 2.897 |
|         |            | Middle  | 2593.00         | 34.31                 | 2.698 |
|         |            | High    | 2660.00         | 33.46                 | 2.218 |
| Port 22 | QPSK       | Low     | 2426.00         | 33.86                 | 2.432 |
|         |            | Middle  | 2593.00         | 34.23                 | 2.649 |
|         |            | High    | 2660.00         | 33.43                 | 2.203 |
|         | 16QAM      | Low     | 2426.00         | 34.03                 | 2.529 |
|         |            | Middle  | 2593.00         | 33.95                 | 2.483 |
|         |            | High    | 2660.00         | 33.44                 | 2.208 |
|         | 64QAM      | Low     | 2426.00         | 33.95                 | 2.483 |
|         |            | Middle  | 2593.00         | 34.25                 | 2.661 |
|         |            | High    | 2660.00         | 33.76                 | 2.377 |
|         | 256QAM     | Low     | 2426.00         | 34.63                 | 2.904 |
|         |            | Middle  | 2593.00         | 34.88                 | 3.076 |
|         |            | High    | 2660.00         | 33.74                 | 2.366 |
| Port 23 | QPSK       | Low     | 2426.00         | 33.98                 | 2.500 |
|         |            | Middle  | 2593.00         | 34.16                 | 2.606 |
|         |            | High    | 2660.00         | 33.63                 | 2.307 |
|         | 16QAM      | Low     | 2426.00         | 34.18                 | 2.618 |
|         |            | Middle  | 2593.00         | 34.20                 | 2.630 |
|         |            | High    | 2660.00         | 33.63                 | 2.307 |
|         | 64QAM      | Low     | 2426.00         | 34.00                 | 2.512 |
|         |            | Middle  | 2593.00         | 34.20                 | 2.630 |
|         |            | High    | 2660.00         | 33.36                 | 2.168 |
|         | 256QAM     | Low     | 2426.00         | 34.64                 | 2.911 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
| Port 24 |            | Middle  | 2593.00         | 34.62                 | 2.897 |
|         |            | High    | 2660.00         | 33.55                 | 2.265 |
|         |            | Low     | 2426.00         | 34.31                 | 2.698 |
|         | QPSK       | Middle  | 2593.00         | 34.85                 | 3.055 |
|         |            | High    | 2660.00         | 34.08                 | 2.559 |
|         |            | Low     | 2426.00         | 33.91                 | 2.460 |
|         | 16QAM      | Middle  | 2593.00         | 34.24                 | 2.655 |
|         |            | High    | 2660.00         | 33.88                 | 2.443 |
|         |            | Low     | 2426.00         | 34.04                 | 2.535 |
|         | 64QAM      | Middle  | 2593.00         | 34.38                 | 2.742 |
|         |            | High    | 2660.00         | 33.61                 | 2.296 |
|         |            | Low     | 2426.00         | 34.41                 | 2.761 |
|         | 256QAM     | Middle  | 2593.00         | 34.81                 | 3.027 |
|         |            | High    | 2660.00         | 33.61                 | 2.296 |
|         |            | Low     | 2426.00         | 33.94                 | 2.477 |
| Port 25 | QPSK       | Middle  | 2593.00         | 34.36                 | 2.729 |
|         |            | High    | 2660.00         | 33.74                 | 2.366 |
|         |            | Low     | 2426.00         | 33.89                 | 2.449 |
|         | 16QAM      | Middle  | 2593.00         | 34.31                 | 2.698 |
|         |            | High    | 2660.00         | 33.81                 | 2.404 |
|         |            | Low     | 2426.00         | 33.84                 | 2.421 |
|         | 64QAM      | Middle  | 2593.00         | 34.30                 | 2.692 |
|         |            | High    | 2660.00         | 33.72                 | 2.355 |
|         |            | Low     | 2426.00         | 34.39                 | 2.748 |
|         | 256QAM     | Middle  | 2593.00         | 34.75                 | 2.985 |
|         |            | High    | 2660.00         | 34.00                 | 2.512 |
|         |            | Low     | 2426.00         | 33.81                 | 2.404 |
| Port 26 | QPSK       | Middle  | 2593.00         | 34.28                 | 2.679 |
|         |            | High    | 2660.00         | 33.72                 | 2.355 |
|         |            | Low     | 2426.00         | 33.92                 | 2.466 |
|         | 16QAM      | Middle  | 2593.00         | 34.18                 | 2.618 |
|         |            | High    | 2660.00         | 33.47                 | 2.223 |
|         |            | Low     | 2426.00         | 33.81                 | 2.404 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
|         | 64QAM      | Low     | 2426.00         | 33.73                 | 2.360 |
|         |            | Middle  | 2593.00         | 33.84                 | 2.421 |
|         |            | High    | 2660.00         | 33.51                 | 2.244 |
|         | 256QAM     | Low     | 2426.00         | 34.10                 | 2.570 |
|         |            | Middle  | 2593.00         | 34.54                 | 2.844 |
|         |            | High    | 2660.00         | 33.61                 | 2.296 |
| Port 27 | QPSK       | Low     | 2426.00         | 33.93                 | 2.472 |
|         |            | Middle  | 2593.00         | 34.39                 | 2.748 |
|         |            | High    | 2660.00         | 33.57                 | 2.275 |
|         | 16QAM      | Low     | 2426.00         | 33.71                 | 2.350 |
|         |            | Middle  | 2593.00         | 34.03                 | 2.529 |
|         |            | High    | 2660.00         | 33.61                 | 2.296 |
|         | 64QAM      | Low     | 2426.00         | 33.84                 | 2.421 |
|         |            | Middle  | 2593.00         | 34.09                 | 2.564 |
|         |            | High    | 2660.00         | 33.40                 | 2.188 |
|         | 256QAM     | Low     | 2426.00         | 33.96                 | 2.489 |
|         |            | Middle  | 2593.00         | 34.16                 | 2.606 |
|         |            | High    | 2660.00         | 33.89                 | 2.449 |
| Port 28 | QPSK       | Low     | 2426.00         | 34.33                 | 2.710 |
|         |            | Middle  | 2593.00         | 34.75                 | 2.985 |
|         |            | High    | 2660.00         | 33.97                 | 2.495 |
|         | 16QAM      | Low     | 2426.00         | 34.06                 | 2.547 |
|         |            | Middle  | 2593.00         | 34.77                 | 2.999 |
|         |            | High    | 2660.00         | 33.91                 | 2.460 |
|         | 64QAM      | Low     | 2426.00         | 34.20                 | 2.630 |
|         |            | Middle  | 2593.00         | 34.02                 | 2.523 |
|         |            | High    | 2660.00         | 33.55                 | 2.265 |
|         | 256QAM     | Low     | 2426.00         | 34.49                 | 2.812 |
|         |            | Middle  | 2593.00         | 34.57                 | 2.864 |
|         |            | High    | 2660.00         | 33.45                 | 2.213 |
| Port 29 | QPSK       | Low     | 2426.00         | 34.34                 | 2.716 |
|         |            | Middle  | 2593.00         | 34.66                 | 2.924 |

| Port    | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|---------|------------|---------|-----------------|-----------------------|-------|
|         |            |         |                 | (dBm)                 | (W)   |
|         | 16QAM      | High    | 2660.00         | 33.57                 | 2.275 |
|         |            | Low     | 2426.00         | 34.05                 | 2.541 |
|         |            | Middle  | 2593.00         | 34.12                 | 2.582 |
|         |            | High    | 2660.00         | 33.62                 | 2.301 |
|         | 64QAM      | Low     | 2426.00         | 34.08                 | 2.559 |
|         |            | Middle  | 2593.00         | 34.19                 | 2.624 |
|         |            | High    | 2660.00         | 33.85                 | 2.427 |
|         | 256QAM     | Low     | 2426.00         | 34.65                 | 2.917 |
|         |            | Middle  | 2593.00         | 34.44                 | 2.780 |
|         |            | High    | 2660.00         | 33.94                 | 2.477 |
| Port 30 | QPSK       | Low     | 2426.00         | 34.06                 | 2.547 |
|         |            | Middle  | 2593.00         | 33.45                 | 2.213 |
|         |            | High    | 2660.00         | 33.73                 | 2.360 |
|         | 16QAM      | Low     | 2426.00         | 34.12                 | 2.582 |
|         |            | Middle  | 2593.00         | 34.39                 | 2.748 |
|         |            | High    | 2660.00         | 33.46                 | 2.218 |
|         | 64QAM      | Low     | 2426.00         | 33.59                 | 2.286 |
|         |            | Middle  | 2593.00         | 34.22                 | 2.642 |
|         |            | High    | 2660.00         | 33.68                 | 2.333 |
|         | 256QAM     | Low     | 2426.00         | 34.40                 | 2.754 |
|         |            | Middle  | 2593.00         | 34.69                 | 2.944 |
|         |            | High    | 2660.00         | 33.78                 | 2.388 |
| Port 31 | QPSK       | Low     | 2426.00         | 34.09                 | 2.564 |
|         |            | Middle  | 2593.00         | 34.40                 | 2.754 |
|         |            | High    | 2660.00         | 34.05                 | 2.541 |
|         | 16QAM      | Low     | 2426.00         | 34.04                 | 2.535 |
|         |            | Middle  | 2593.00         | 34.25                 | 2.661 |
|         |            | High    | 2660.00         | 33.87                 | 2.438 |
|         | 64QAM      | Low     | 2426.00         | 33.83                 | 2.415 |
|         |            | Middle  | 2593.00         | 34.06                 | 2.547 |
|         |            | High    | 2660.00         | 33.78                 | 2.388 |
|         | 256QAM     | Low     | 2426.00         | 34.34                 | 2.716 |

| Port | Modulation | Channel | Frequency (MHz) | Measured Output Power |       |
|------|------------|---------|-----------------|-----------------------|-------|
|      |            |         |                 | (dBm)                 | (W)   |
|      |            | Middle  | 2593.00         | 33.87                 | 2.438 |
|      |            | High    | 2660.00         | 33.82                 | 2.410 |

\* Because the results corrected by duty cycle are recorded, they do not match the test plot.

\* This test report only contains the worst case plot data for each port and modulation.

### Sum data of all port

| Modulation | Channel | Frequency (MHz) | Summed Output Power (W) |
|------------|---------|-----------------|-------------------------|
| QPSK       | Low     | 2426.00         | 79.408                  |
|            | Middle  | 2593.00         | 87.424                  |
|            | High    | 2660.00         | 75.102                  |
| 16QAM      | Low     | 2426.00         | 79.304                  |
|            | Middle  | 2593.00         | 84.539                  |
|            | High    | 2660.00         | 75.987                  |
| 64QAM      | Low     | 2426.00         | 76.732                  |
|            | Middle  | 2593.00         | 82.725                  |
|            | High    | 2660.00         | 72.726                  |
| 256QAM     | Low     | 2426.00         | 87.478                  |
|            | Middle  | 2593.00         | 92.842                  |
|            | High    | 2660.00         | 76.130                  |

## EIRP Calculation

| Item                         | Formula                                                                                                                                                                 | Value (dBm) |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 27.50(h)(1)(ii) Limit        | $33 \text{ dBW} + 10 \log(X/Y) \text{ dBW} + 10 \log(360/\text{beamwidth}) \text{ dBW}$<br>$= 33 \text{ dBW} + 10 \log(60/6) \text{ dBW} + 10 \log(360/14) \text{ dBW}$ | 87.102      |
| Total power of port 0 to 15  | Sum all measured power value of W units                                                                                                                                 | 46.702      |
| Sum ANT gain port 0 to 15    | Total power + Antenna gain = 46.702 dBm + 23.5 dBi                                                                                                                      | 70.202      |
| Total power of port 15 to 31 | Sum all measured power value of W units                                                                                                                                 | 46.632      |
| Sum ANT gain port 15 to 31   | Total power + Antenna gain = 46.632 dBm + 23.5 dBi                                                                                                                      | 70.132      |
| Final Calculated EIRP        | Sum port 0 to 31 (with Antenna gain)                                                                                                                                    | 73.177      |

\* EIRP Limit was described only for the worst case.

\* EIRP Calculation was performed for point of having maximum output power.

- Port 14, 256QAM, Middle channel.

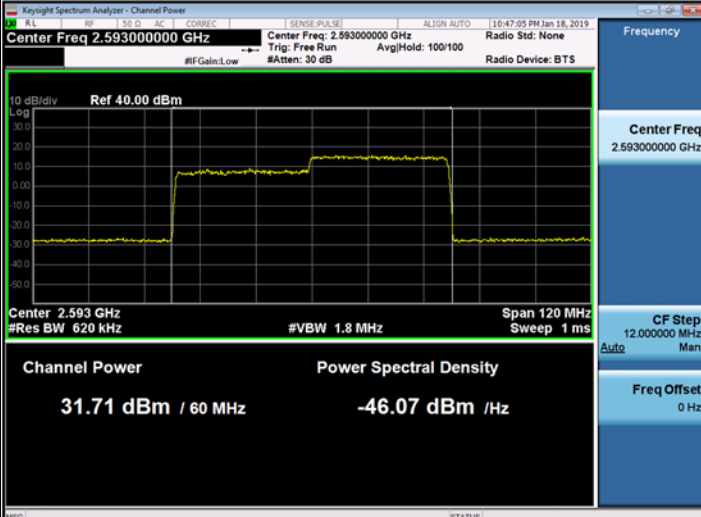
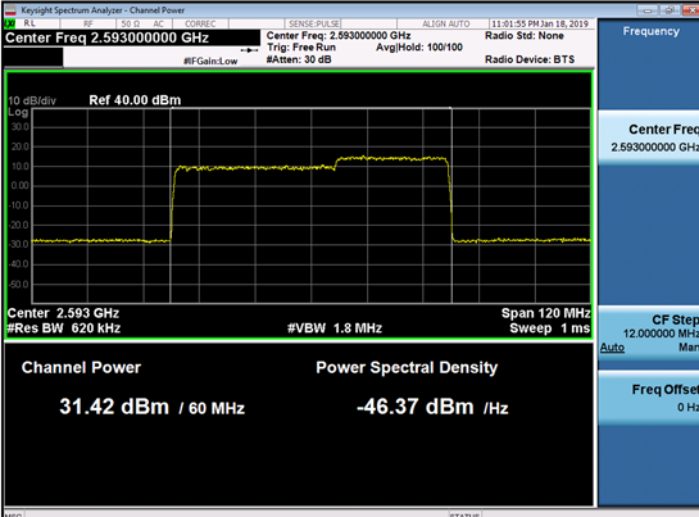
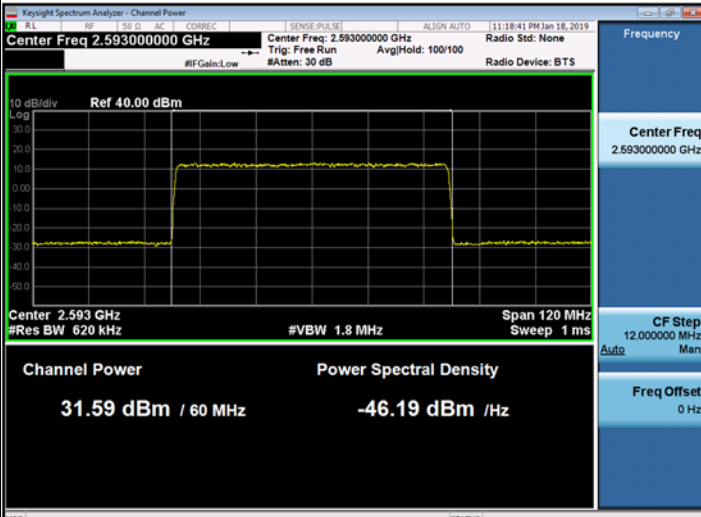
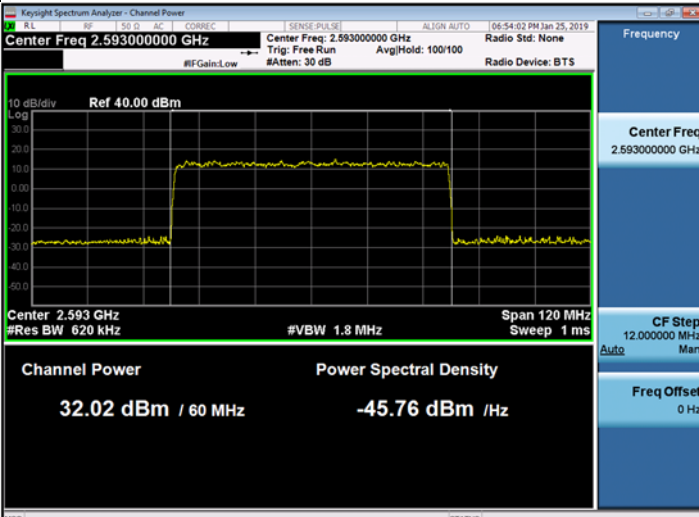
\* Antenna gain and horizontal beamwidth were quoted from manufacturer's specification

- Antenna gain (16 port) = Maximum service beam gain = 23.5 dBi

- Total horizontal plane beamwidth (maximum) = 14 °

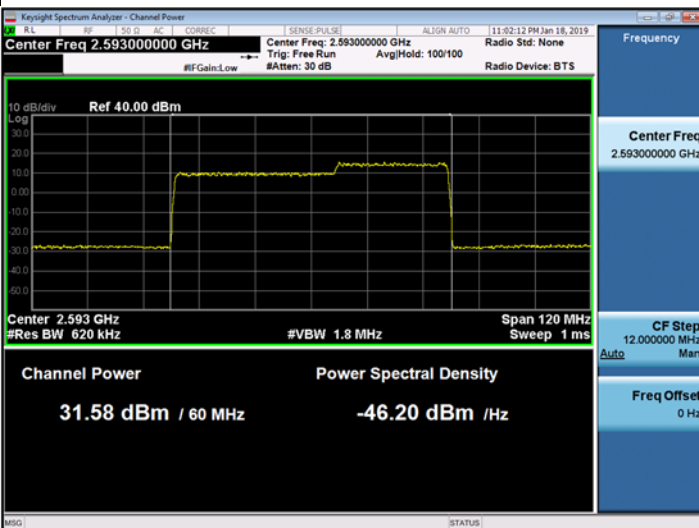
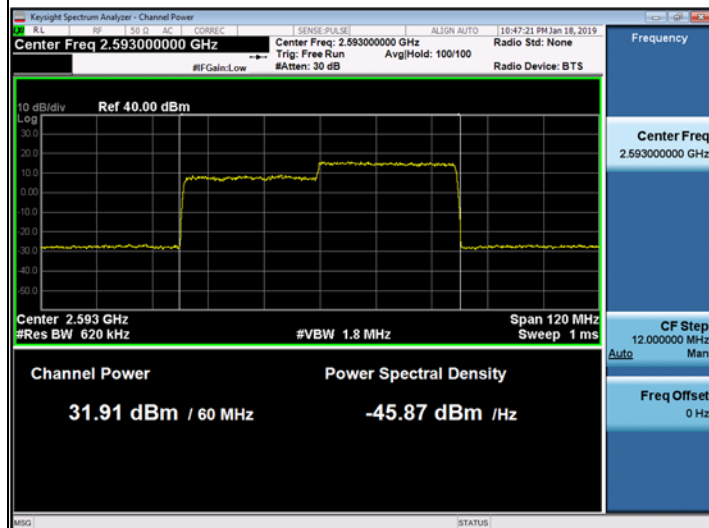
## Plots of Output Power - 60 MHz Bandwidth

### Port 0

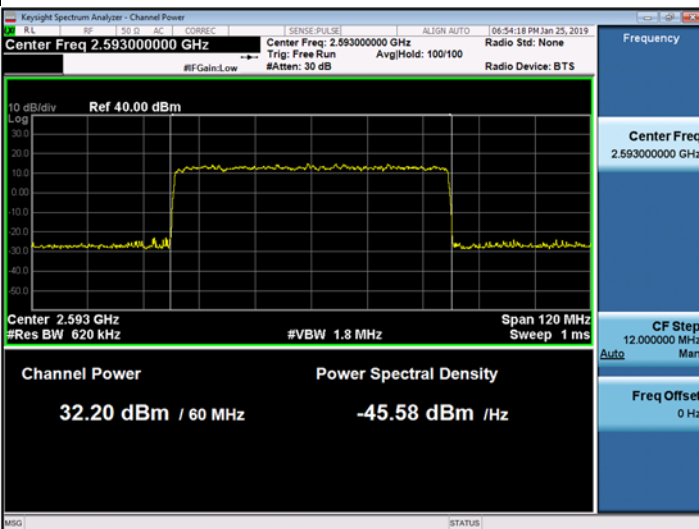
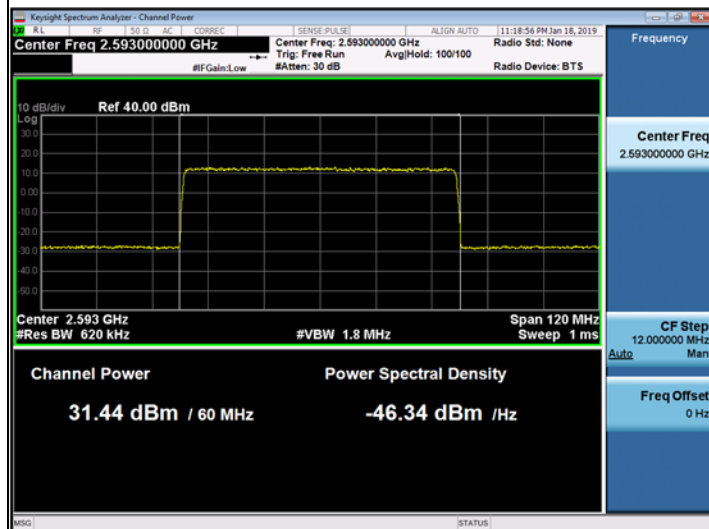
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Modulation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | QPSK   | Modulation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 16QAM  |
| Channel:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Middle | Channel:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Middle |
|  <p>Center Freq 2.593000000 GHz</p> <p>Center Freq: 2.593000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div Ref 40.00 dBm</p> <p>Center 2.593 GHz</p> <p>#Res BW 620 kHz</p> <p>#VBW 1.8 MHz</p> <p>Span 120 MHz</p> <p>Sweep 1 ms</p> <p>CF Step 12.000000 MHz</p> <p>Auto</p> <p>Man</p> <p>Freq Offset 0 Hz</p> <p>Channel Power</p> <p>Power Spectral Density</p> <p>31.71 dBm / 60 MHz</p> <p>-46.07 dBm / Hz</p>   |        |  <p>Center Freq 2.593000000 GHz</p> <p>Center Freq: 2.593000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div Ref 40.00 dBm</p> <p>Center 2.593 GHz</p> <p>#Res BW 620 kHz</p> <p>#VBW 1.8 MHz</p> <p>Span 120 MHz</p> <p>Sweep 1 ms</p> <p>CF Step 12.000000 MHz</p> <p>Auto</p> <p>Man</p> <p>Freq Offset 0 Hz</p> <p>Channel Power</p> <p>Power Spectral Density</p> <p>31.42 dBm / 60 MHz</p> <p>-46.37 dBm / Hz</p>   |        |
| Modulation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 64QAM  | Modulation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 256QAM |
| Channel:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Middle | Channel:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Middle |
|  <p>Center Freq 2.593000000 GHz</p> <p>Center Freq: 2.593000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div Ref 40.00 dBm</p> <p>Center 2.593 GHz</p> <p>#Res BW 620 kHz</p> <p>#VBW 1.8 MHz</p> <p>Span 120 MHz</p> <p>Sweep 1 ms</p> <p>CF Step 12.000000 MHz</p> <p>Auto</p> <p>Man</p> <p>Freq Offset 0 Hz</p> <p>Channel Power</p> <p>Power Spectral Density</p> <p>31.59 dBm / 60 MHz</p> <p>-46.19 dBm / Hz</p> |        |  <p>Center Freq 2.593000000 GHz</p> <p>Center Freq: 2.593000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div Ref 40.00 dBm</p> <p>Center 2.593 GHz</p> <p>#Res BW 620 kHz</p> <p>#VBW 1.8 MHz</p> <p>Span 120 MHz</p> <p>Sweep 1 ms</p> <p>CF Step 12.000000 MHz</p> <p>Auto</p> <p>Man</p> <p>Freq Offset 0 Hz</p> <p>Channel Power</p> <p>Power Spectral Density</p> <p>32.02 dBm / 60 MHz</p> <p>-45.76 dBm / Hz</p> |        |

Port 1

|             |        |             |        |
|-------------|--------|-------------|--------|
| Modulation: | QPSK   | Modulation: | 16QAM  |
| Channel:    | Middle | Channel:    | Middle |



|             |        |             |        |
|-------------|--------|-------------|--------|
| Modulation: | 64QAM  | Modulation: | 256QAM |
| Channel:    | Middle | Channel:    | Middle |



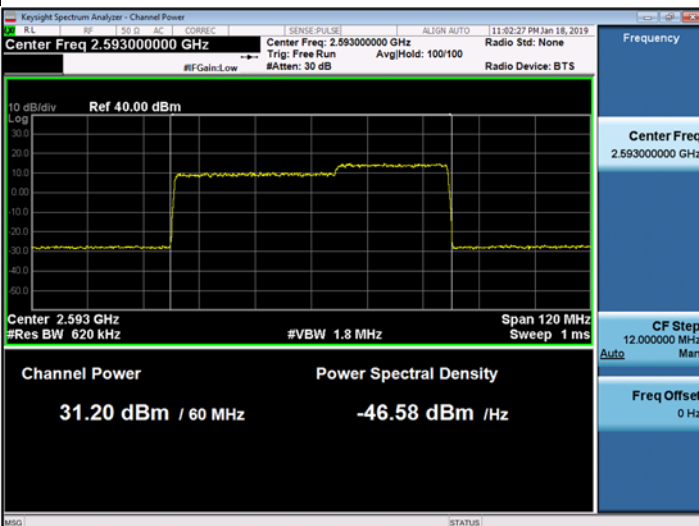
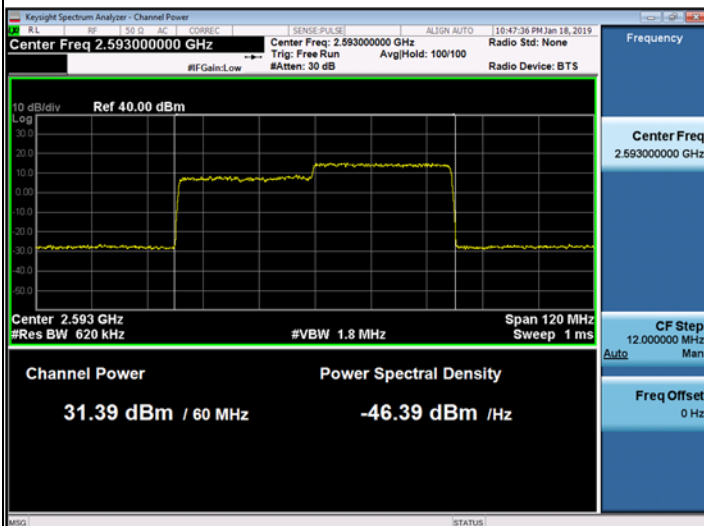
Port 2

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

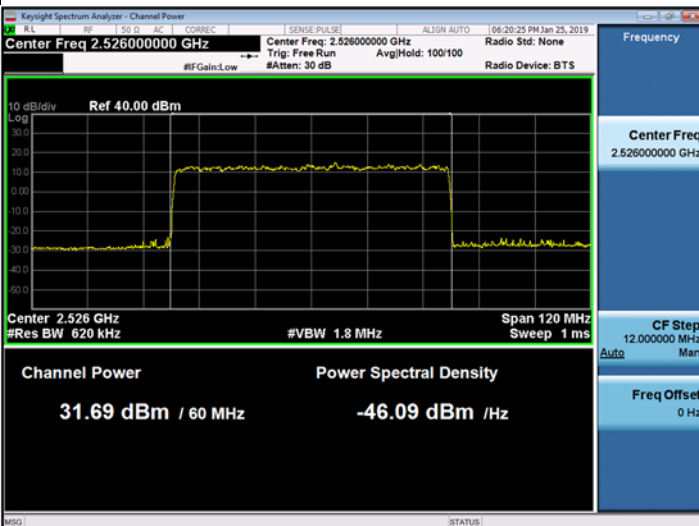
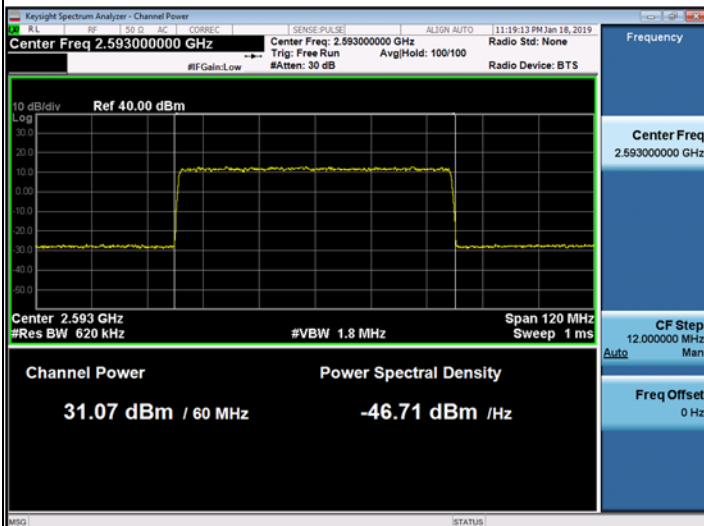


Modulation: 64QAM

Channel: Middle

Modulation: 256QAM

Channel: Low



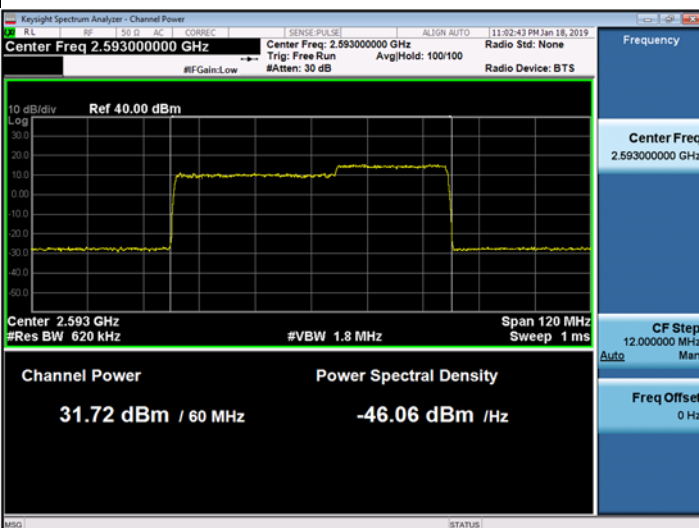
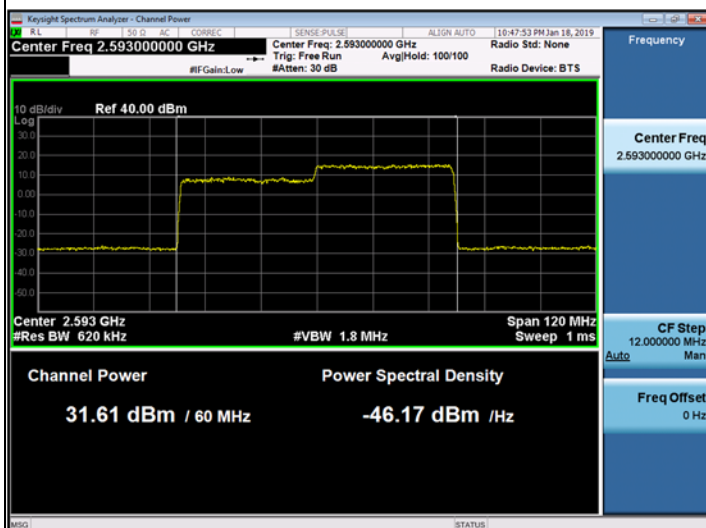
Port 3

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

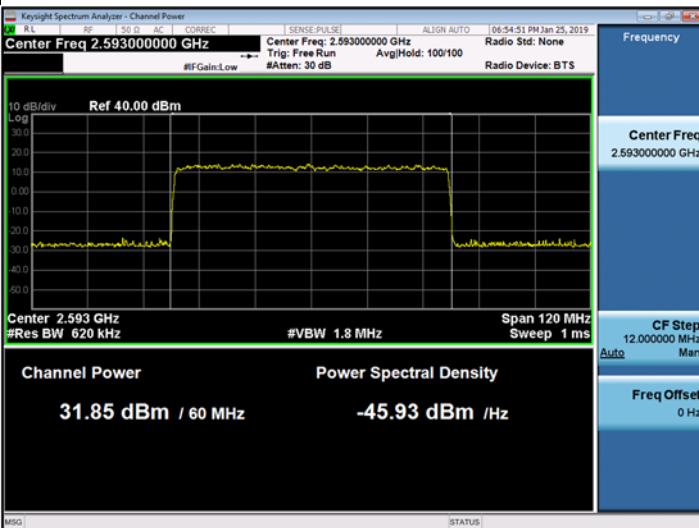
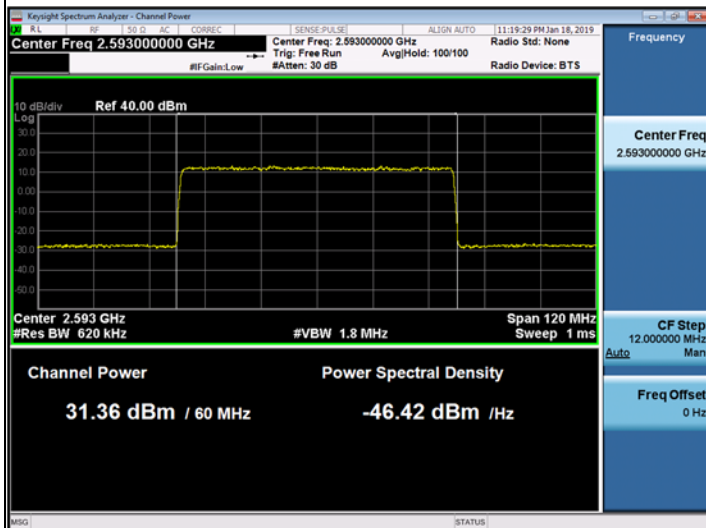


Modulation: 64QAM

Channel: Middle

Modulation: 256QAM

Channel: Middle



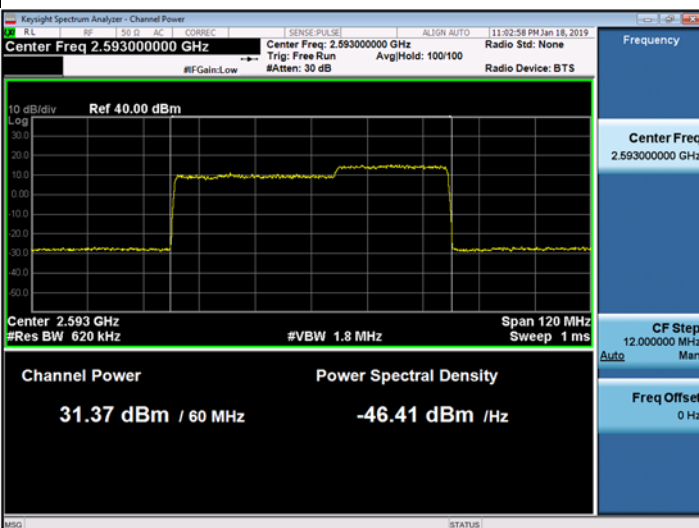
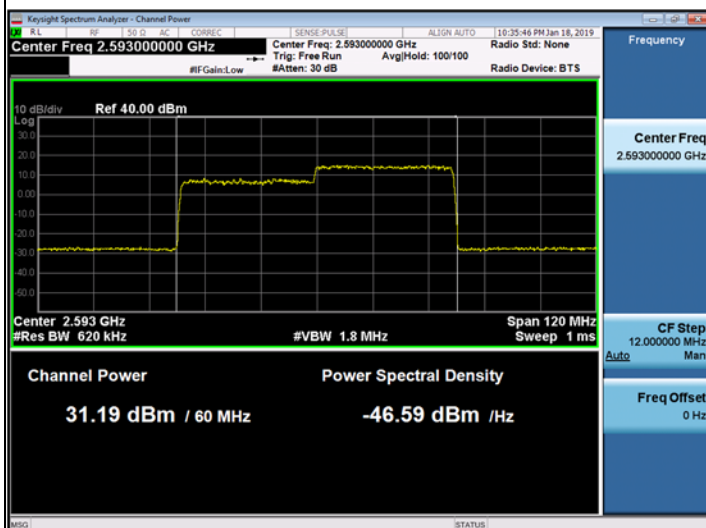
Port 4

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

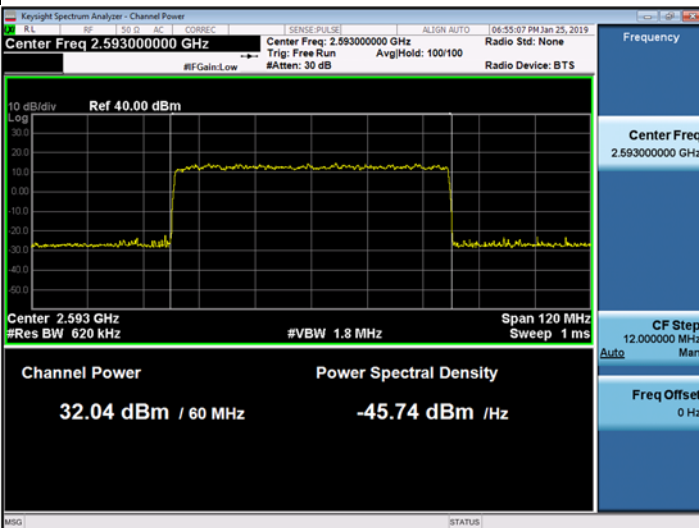
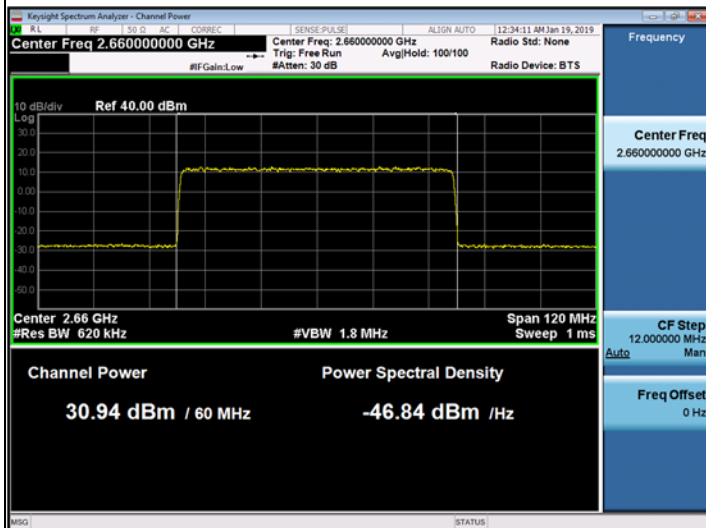


Modulation: 64QAM

Channel: High

Modulation: 256QAM

Channel: Middle



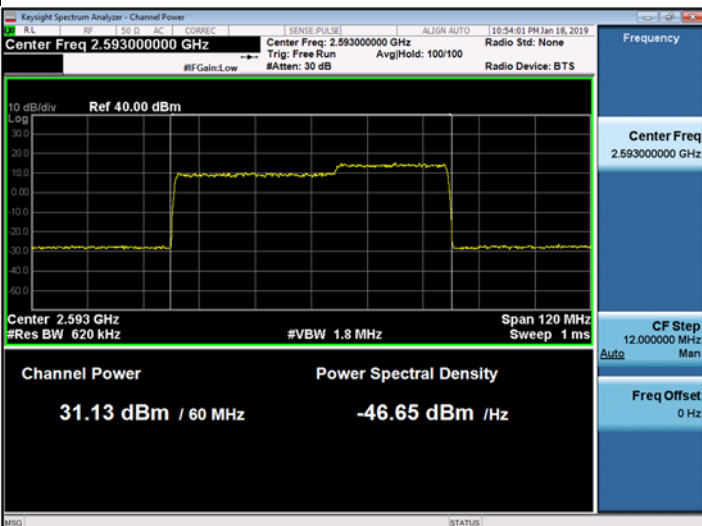
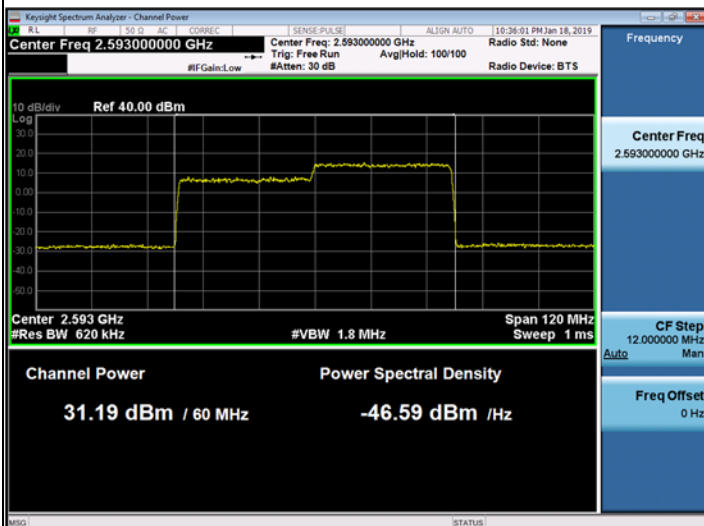
Port 5

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

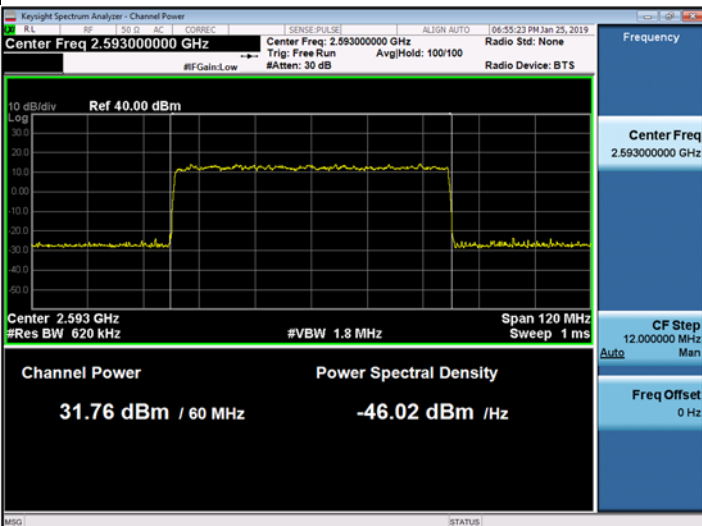
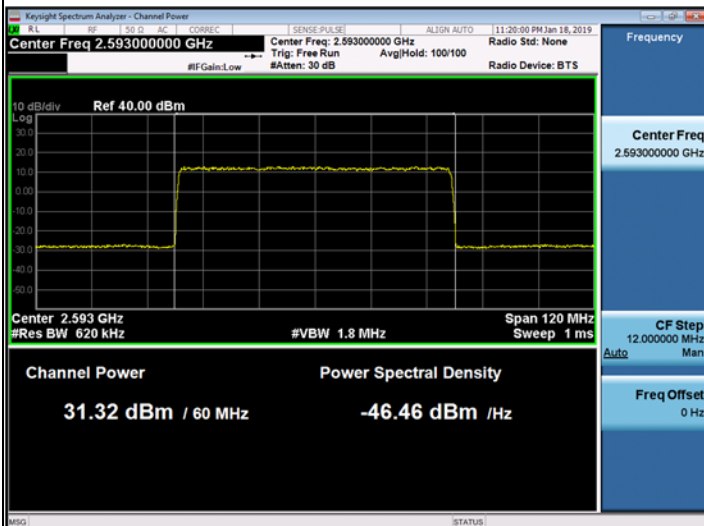


Modulation: 64QAM

Channel: Middle

Modulation: 256QAM

Channel: Middle



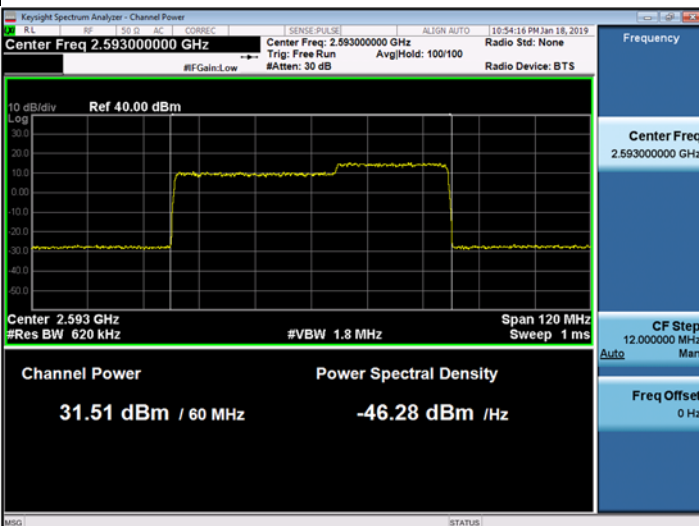
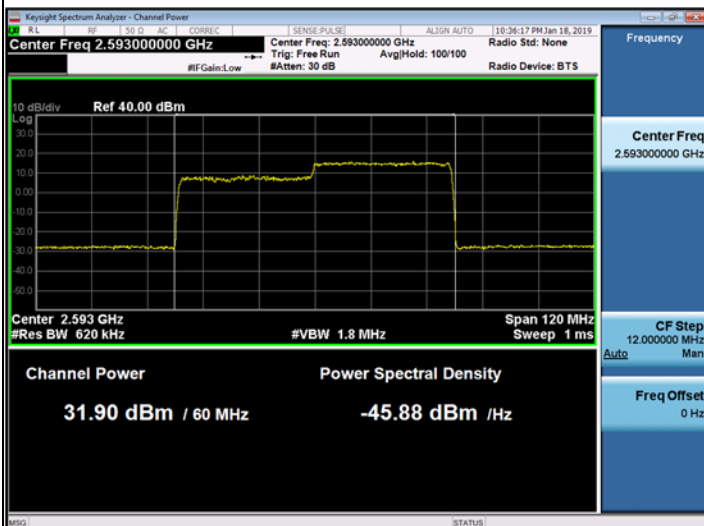
Port 6

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

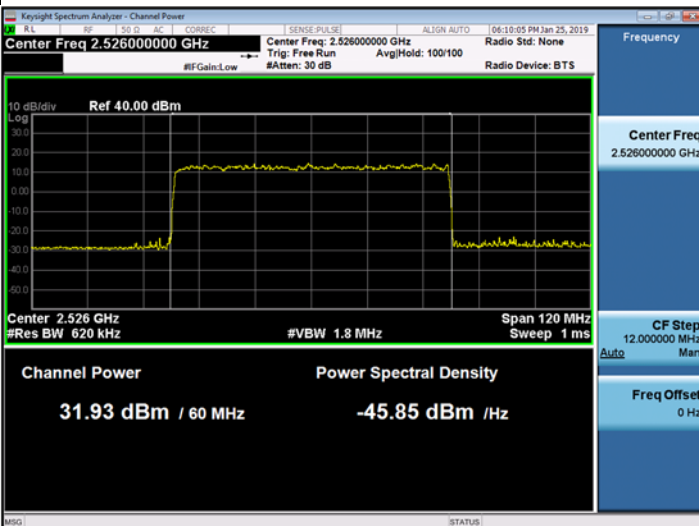
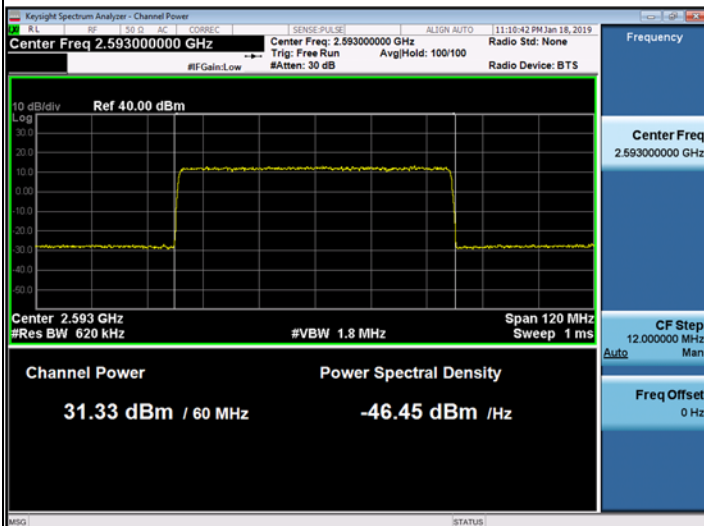


Modulation: 64QAM

Channel: Middle

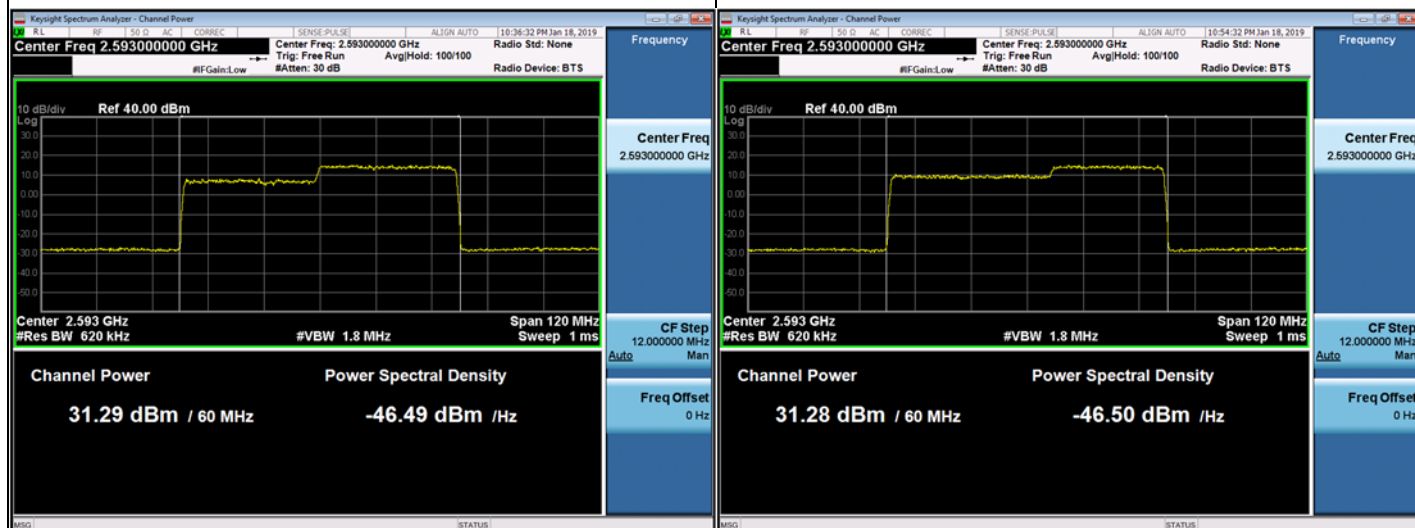
Modulation: 256QAM

Channel: Low

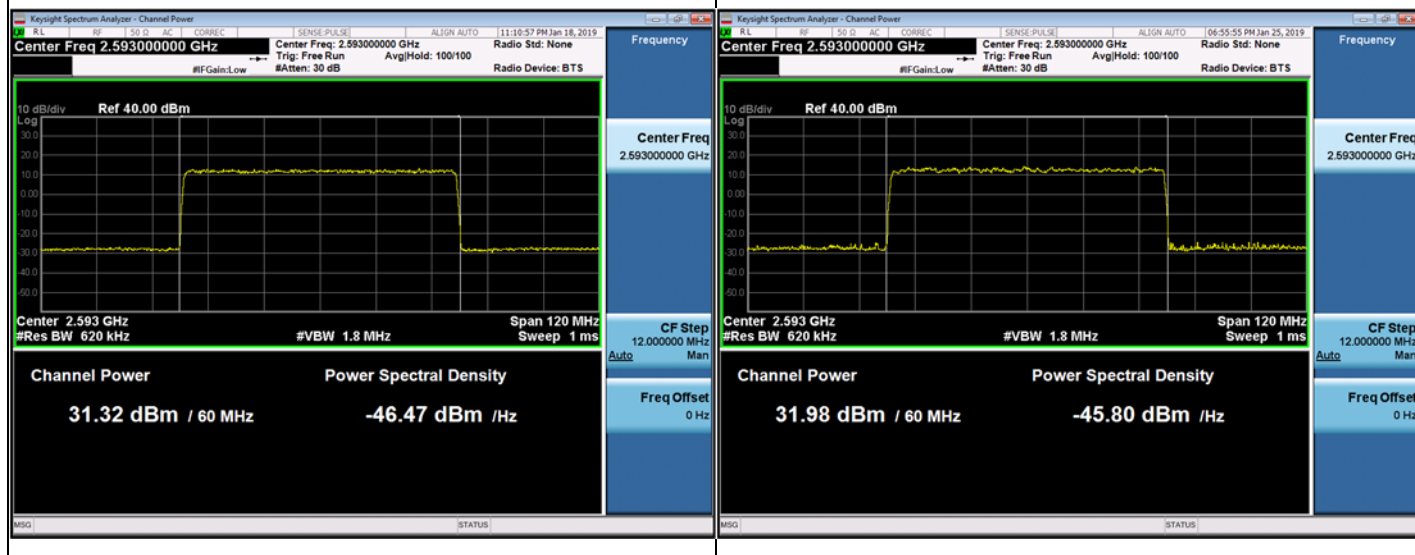


Port 7

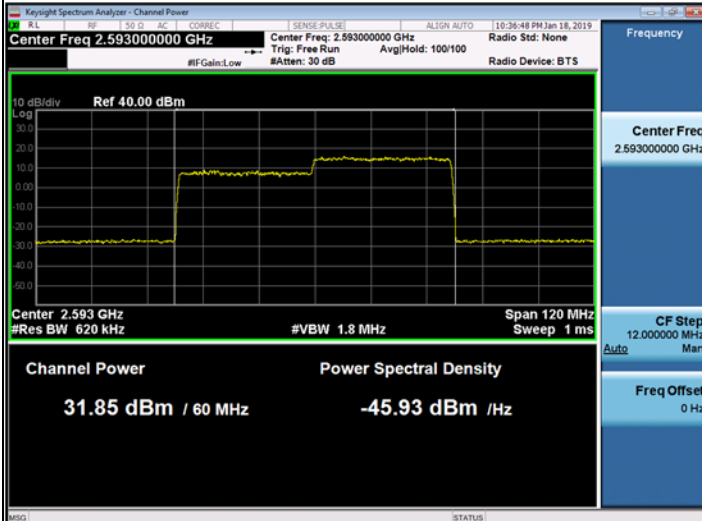
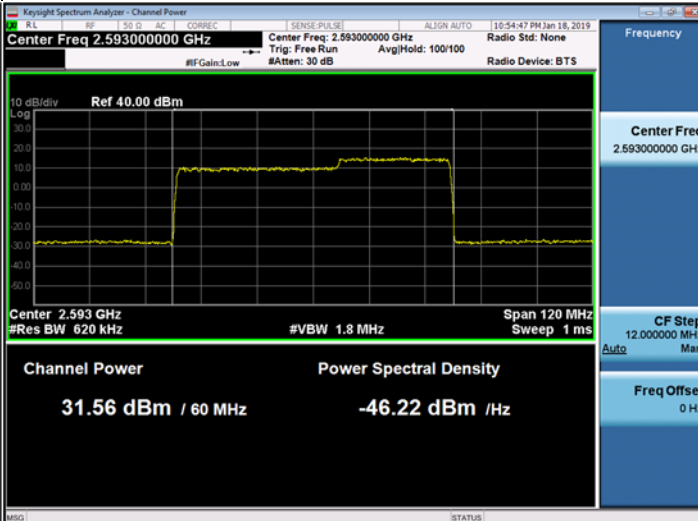
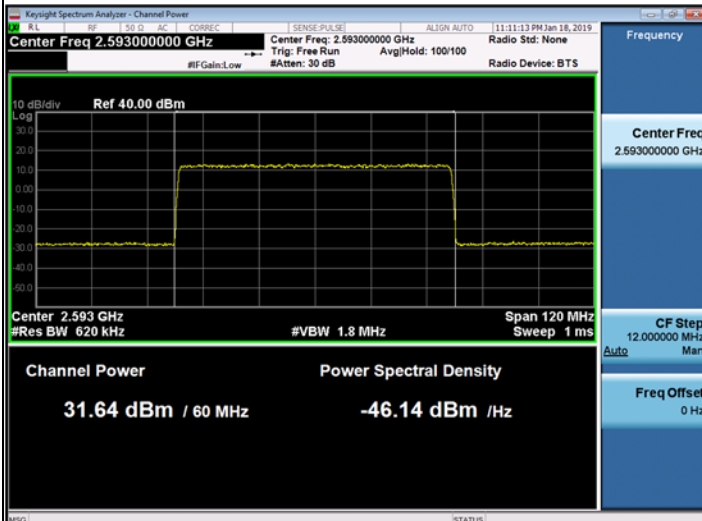
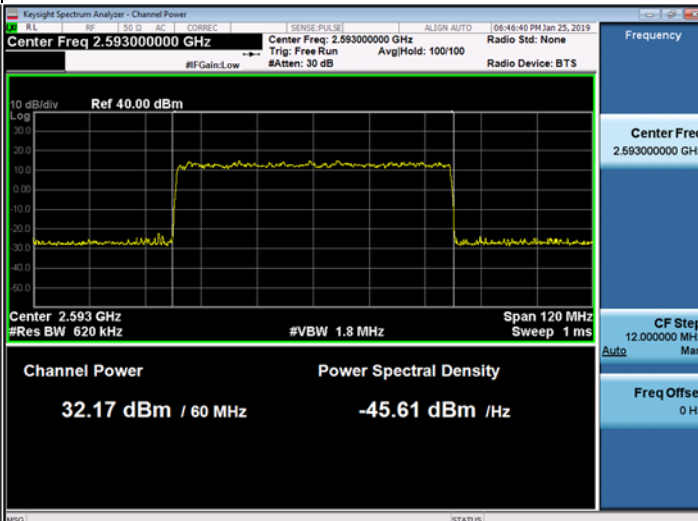
|             |        |             |        |
|-------------|--------|-------------|--------|
| Modulation: | QPSK   | Modulation: | 16QAM  |
| Channel:    | Middle | Channel:    | Middle |



|             |        |             |        |
|-------------|--------|-------------|--------|
| Modulation: | 64QAM  | Modulation: | 256QAM |
| Channel:    | Middle | Channel:    | Middle |



Port 8

|                                                                                    |  |        |  |                                                                                      |  |        |  |
|------------------------------------------------------------------------------------|--|--------|--|--------------------------------------------------------------------------------------|--|--------|--|
| Port 8                                                                             |  |        |  |                                                                                      |  |        |  |
| Modulation:                                                                        |  | QPSK   |  | Modulation:                                                                          |  | 16QAM  |  |
| Channel:                                                                           |  | Middle |  | Channel:                                                                             |  | Middle |  |
|   |  |        |  |   |  |        |  |
| Modulation:                                                                        |  | 64QAM  |  | Modulation:                                                                          |  | 256QAM |  |
| Channel:                                                                           |  | Middle |  | Channel:                                                                             |  | Middle |  |
|  |  |        |  |  |  |        |  |

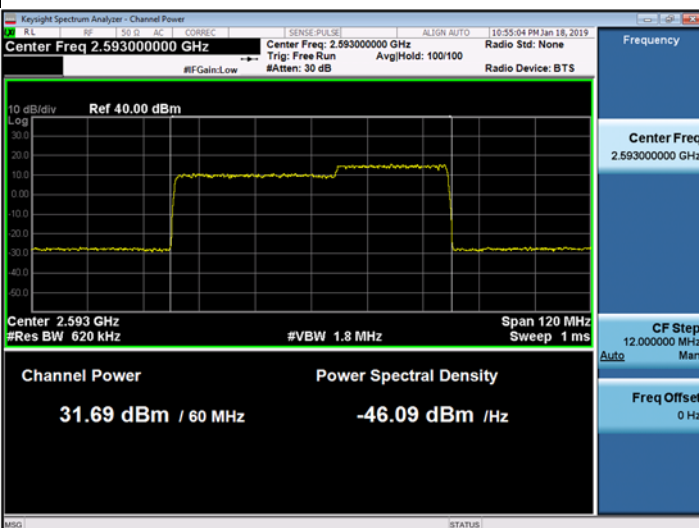
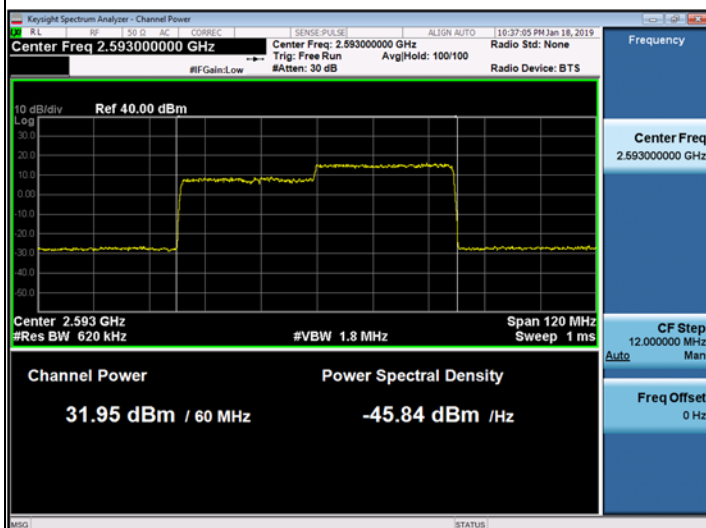
Port 9

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

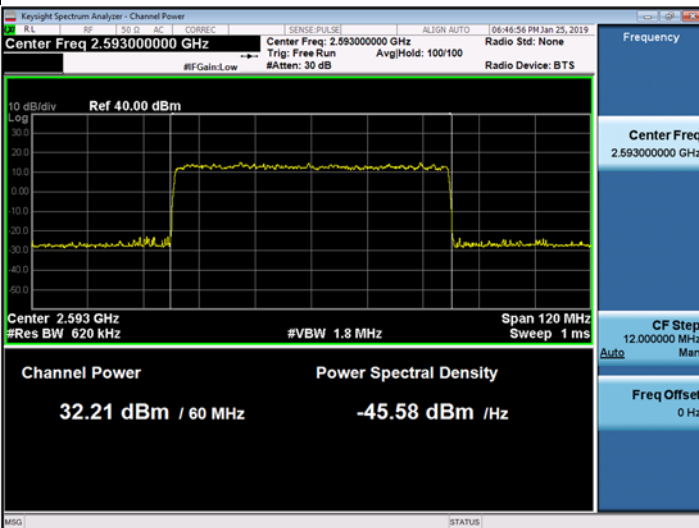
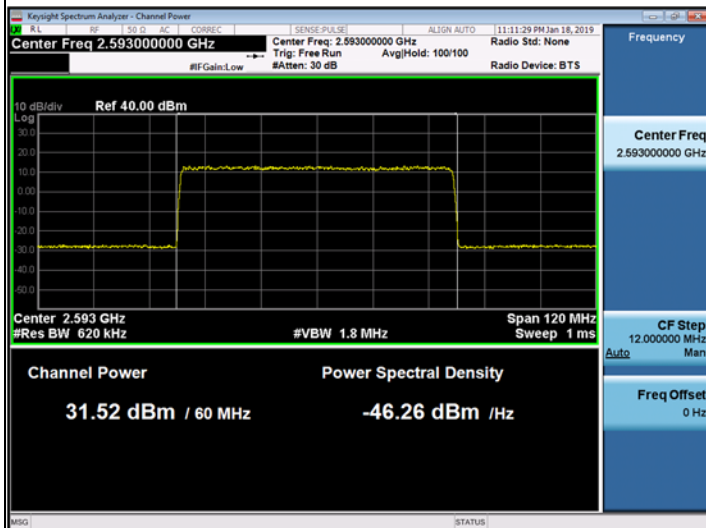


Modulation: 64QAM

Channel: Middle

Modulation: 256QAM

Channel: Middle



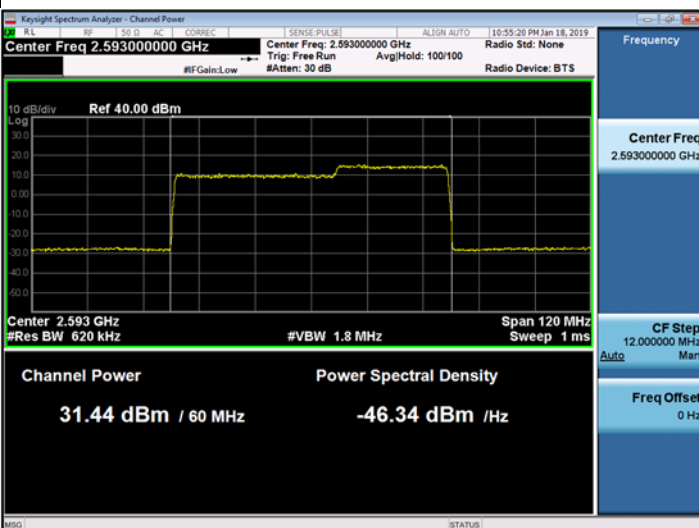
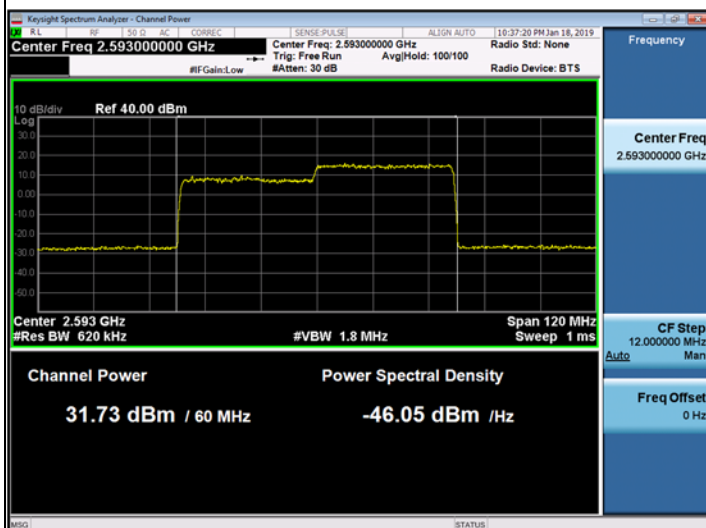
Port 10

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle

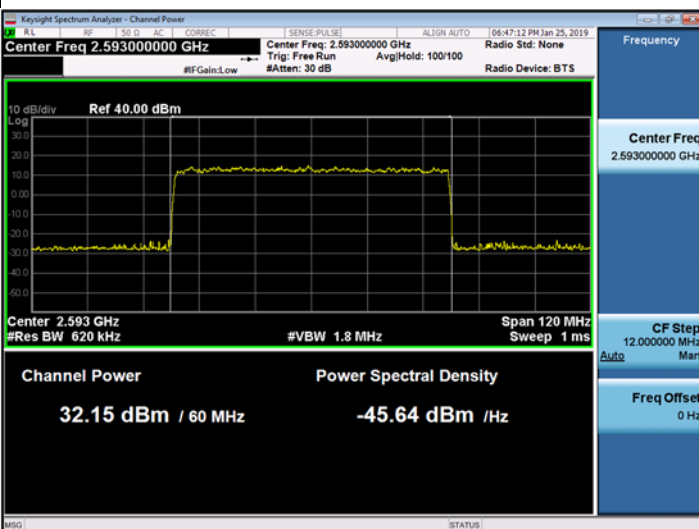
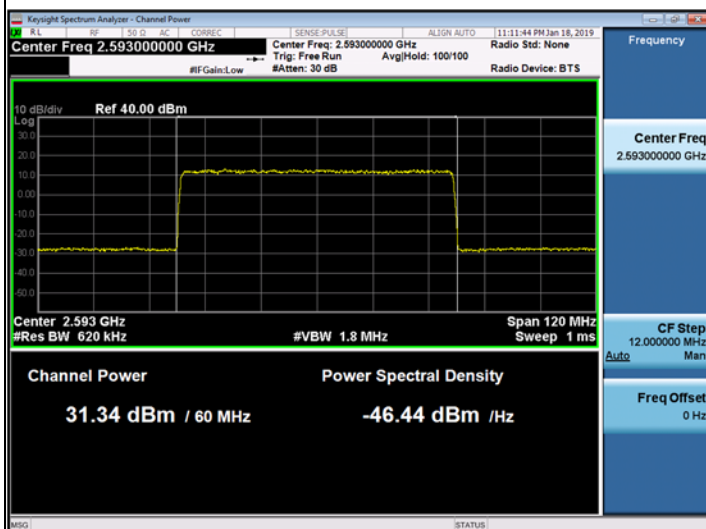


Modulation: 64QAM

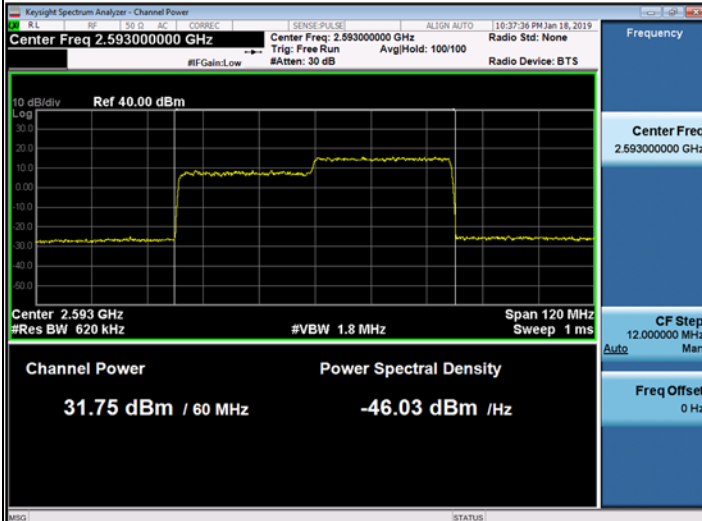
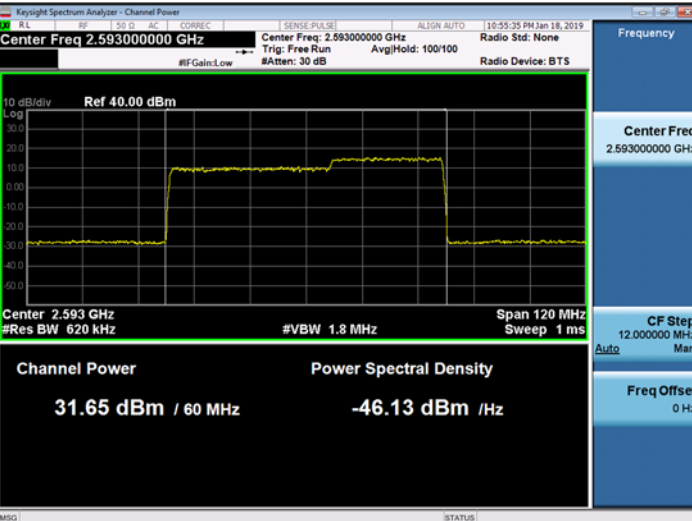
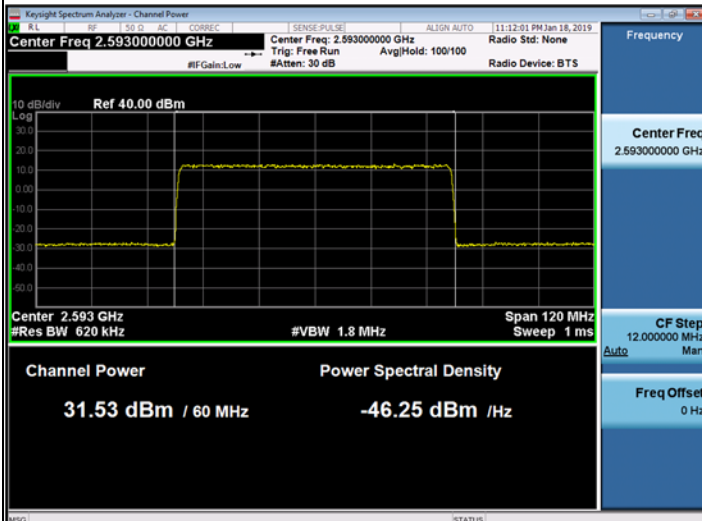
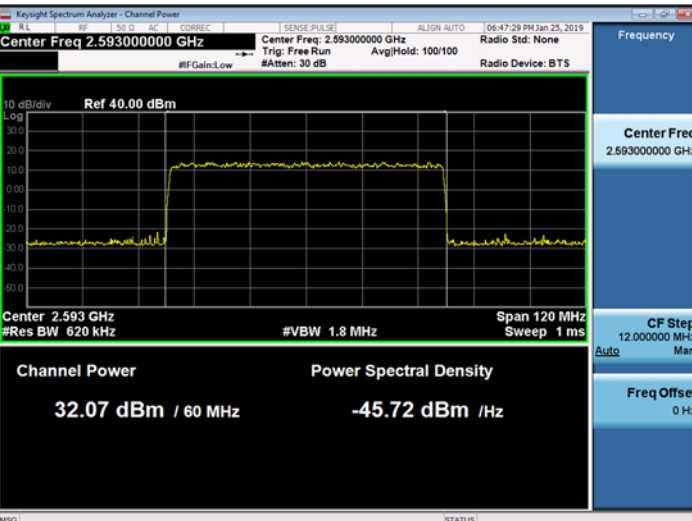
Channel: Middle

Modulation: 256QAM

Channel: Middle



Port 11

|                                                                                    |  |        |  |                                                                                      |  |        |  |
|------------------------------------------------------------------------------------|--|--------|--|--------------------------------------------------------------------------------------|--|--------|--|
| Port 11                                                                            |  |        |  |                                                                                      |  |        |  |
| Modulation:                                                                        |  | QPSK   |  | Modulation:                                                                          |  | 16QAM  |  |
| Channel:                                                                           |  | Middle |  | Channel:                                                                             |  | Middle |  |
|   |  |        |  |   |  |        |  |
| Modulation:                                                                        |  | 64QAM  |  | Modulation:                                                                          |  | 256QAM |  |
| Channel:                                                                           |  | Middle |  | Channel:                                                                             |  | Middle |  |
|  |  |        |  |  |  |        |  |

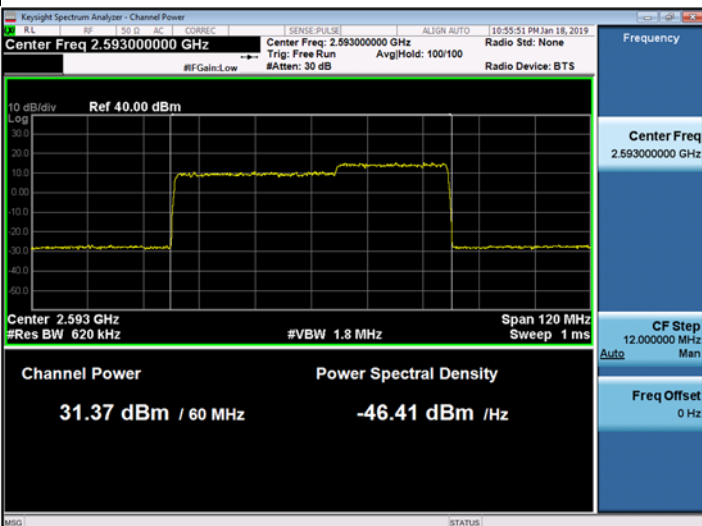
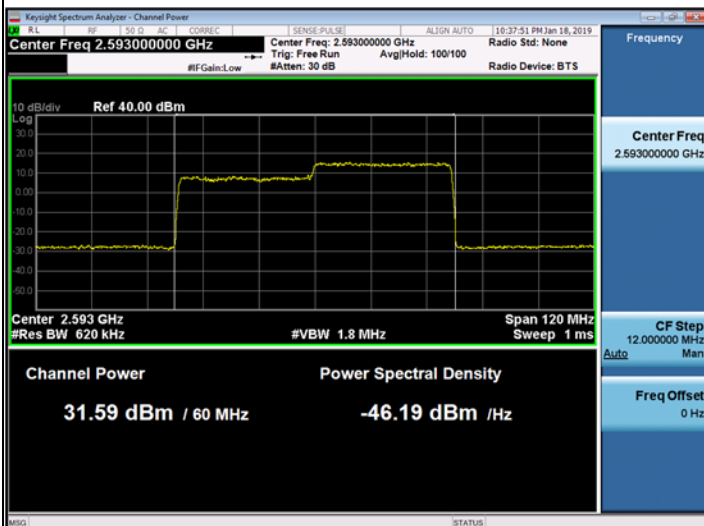
Port 12

Modulation: QPSK

Channel: Middle

Modulation: 16QAM

Channel: Middle



Modulation: 64QAM

Channel: Middle

Modulation: 256QAM

Channel: Middle

