

# RF TEST REPORT



Report No.: FCC\_SL17110601-SPC-013  
Supersede Report No.:

|                                                                                                                                      |                            |                   |  |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------|--|
| Applicant                                                                                                                            | SpiderCloud Wireless, Inc. |                   |  |
| Product Name                                                                                                                         | SpiderCloud Radio Node     |                   |  |
| Model No.                                                                                                                            | SCRN-320-0446              |                   |  |
| Test Standard                                                                                                                        | 47CFR Part 24/27           |                   |  |
| Test Method                                                                                                                          | TIA-603-D: 2010            |                   |  |
| FCC ID                                                                                                                               | Y47RN320B446               |                   |  |
| Date of test                                                                                                                         | 01/18/2017 - 11/22/2017    |                   |  |
| Issue Date                                                                                                                           | 11/22/2017                 |                   |  |
| Test Result                                                                                                                          | <u>Pass</u> Fail           |                   |  |
| Equipment complied with the specification                                                                                            | [ x ]                      |                   |  |
| Equipment did not comply with the specification                                                                                      | [   ]                      |                   |  |
|                                                                                                                                      |                            |                   |  |
| Gary Chou                                                                                                                            |                            |                   |  |
| Gary Chou                                                                                                                            |                            | Chen Ge           |  |
| Test Engineer                                                                                                                        |                            | Engineer Reviewer |  |
| This test report may be reproduced in full only<br>Test result presented in this test report is applicable to the tested sample only |                            |                   |  |

Issued By:  
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### Accreditations for Conformity Assessment

| Country/Region | Accreditation Body     | Scope                              |
|----------------|------------------------|------------------------------------|
| USA            | FCC, A2LA              | EMC , RF/Wireless , Telecom        |
| Canada         | IC, A2LA, NIST         | EMC, RF/Wireless , Telecom         |
| Taiwan         | BSMI , NCC , NIST      | EMC, RF, Telecom , Safety          |
| Hong Kong      | OFTA , NIST            | RF/Wireless , Telecom              |
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| Japan          | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom          |
| Mexico         | NOM, COFETEL, Caniety  | Safety, EMC , RF/Wireless, Telecom |
| Europe         | A2LA, NIST             | EMC, RF, Telecom , Safety          |
| Israel         | MOC, NIST              | EMC, RF, Telecom, Safety           |

### Accreditations for Product Certifications

| Country   | Accreditation Body | Scope                 |
|-----------|--------------------|-----------------------|
| USA       | FCC TCB, NIST      | EMC , RF , Telecom    |
| Canada    | IC FCB , NIST      | EMC , RF , Telecom    |
| Singapore | iDA, NIST          | EMC , RF , Telecom    |
| EU        | NB                 | EMC & R&TTE Directive |
| Japan     | MIC (RCB 208)      | RF , Telecom          |
| HongKong  | OFTA (US002)       | RF , Telecom          |

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## 1 Report Revision History

| Report No.             | Report Version | Description | Issue Date |
|------------------------|----------------|-------------|------------|
| FCC_SL17110601-SPC-013 | None           | Original    | 11/08/2017 |
|                        |                |             |            |
|                        |                |             |            |
|                        |                |             |            |
|                        |                |             |            |
|                        |                |             |            |

## 2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: SpiderCloud Wireless, Inc.  
Product: SpiderCloud Radio Node  
Model: SCRN-320-0446

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1<sup>st</sup> page.

## 3 Customer information

|                      |                                                      |
|----------------------|------------------------------------------------------|
| Applicant Name       | SpiderCloud Wireless                                 |
| Applicant Address    | 475 Sycamore Dr, Milpitas, CA, 95035, USA            |
| Manufacturer Name    | Flextronics International USA, Inc                   |
| Manufacturer Address | 927 Gibraltar Dr., Bldg. 6, Milpitas, CA, 95035, USA |

## 4 Test site information

|                      |                                             |
|----------------------|---------------------------------------------|
| Lab performing tests | SIEMIC Laboratories                         |
| Lab Address          | 775 Montague Expressway, Milpitas, CA 95035 |
| FCC Test Site No.    | 881796                                      |
| IC Test Site No.     | 4842D-2                                     |
| VCCI Test Site No.   | A0133                                       |

## 5 Modification

| Index | Item | Description | Note |
|-------|------|-------------|------|
| -     | -    | -           | -    |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |

## 6 EUT Information

### 6.1 EUT Description

|                           |                                                                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Product Name              | SpiderCloud Radio Node                                                                                                           |
| Model No.                 | SCRN-320-0446                                                                                                                    |
| Trade Name                | SpiderCloud                                                                                                                      |
| Serial No.                | 16298X25436                                                                                                                      |
| Input Power               | 56VDC (PoE)                                                                                                                      |
| Power Adapter Manu/Model  | PHIHONG/POE36U-1AT-R                                                                                                             |
| Power Adapter SN          | N/A                                                                                                                              |
| Date of EUT received      | 01/13/2017                                                                                                                       |
| Equipment Class/ Category | PCB, TNB                                                                                                                         |
| Operating Frequencies     | LTE: TX (2110 MHz to 2155 MHz), LTE: RX (1710 MHz to 1755 MHz)<br>LTE: TX (2110 MHz to 2200 MHz), LTE: RX (1710 MHz to 1780 MHz) |
| Port/Connectors           | PoE, Ethernet                                                                                                                    |
| Remark                    | NONE                                                                                                                             |

## 6.2 Radio Description

| Item                       | LTE                                                                    |
|----------------------------|------------------------------------------------------------------------|
| Operating Band /Radio Type | LTE Band 4                                                             |
| Bandwidth                  | 5MHz, 10MHz, 15MHz, 20MHz                                              |
| Modulation                 | QPSK/16QAM/64QAM                                                       |
| Antenna Type               | Internal Omni-directional antenna<br>External Omni-directional antenna |
| Antenna Gain               | 3dBi                                                                   |
| Frequency TX(MHz)          | TX: 2110 MHz to 2155 MHz<br>RX: 1710 MHz to 1755 MHz                   |

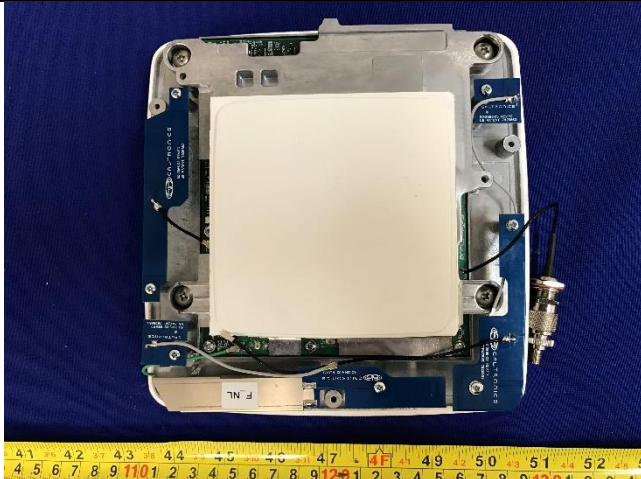
| LTE                                                                    |
|------------------------------------------------------------------------|
| LTE Band 66                                                            |
| 5MHz, 10MHz, 15MHz, 20MHz                                              |
| QPSK/16QAM/64QAM                                                       |
| Internal Omni-directional antenna<br>External Omni-directional antenna |
| 3dBi                                                                   |
| TX: 2110 MHz to 2200 MHz<br>RX: 1710 MHz to 1780 MHz                   |

### 6.3 EUT test modes/configuration Description

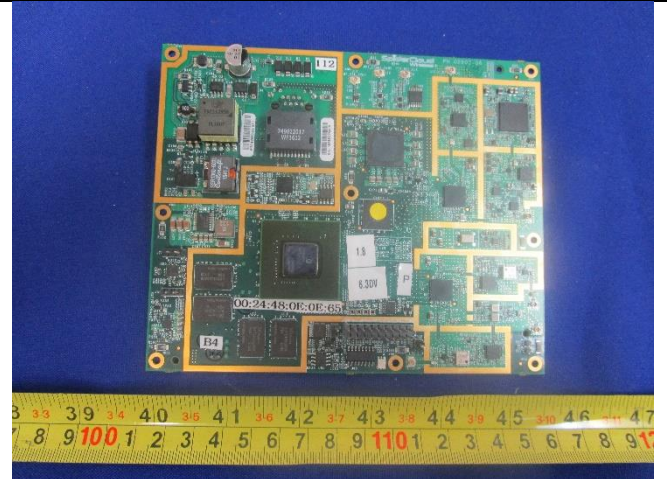
#### Test mode

| Final Test Mode    |                                                | Note |
|--------------------|------------------------------------------------|------|
| Final_test_mode_1  | Continuous transmission, 5MHz, QPSK, Low CH    | LTE  |
| Final_test_mode_2  | Continuous transmission, 5MHz, QPSK, Mid CH    | LTE  |
| Final_test_mode_3  | Continuous transmission, 5MHz, QPSK, High CH   | LTE  |
| Final_test_mode_4  | Continuous transmission, 5MHz, 64QAM, Low CH   | LTE  |
| Final_test_mode_5  | Continuous transmission, 5MHz, 64QAM, Mid CH   | LTE  |
| Final_test_mode_5  | Continuous transmission, 5MHz, 64QAM, High CH  | LTE  |
| Final_test_mode_7  | Continuous transmission, 10MHz, QPSK, Low CH   | LTE  |
| Final_test_mode_8  | Continuous transmission, 10MHz, QPSK, Mid CH   | LTE  |
| Final_test_mode_9  | Continuous transmission, 10MHz, QPSK, High CH  | LTE  |
| Final_test_mode_10 | Continuous transmission, 10MHz, 64QAM, Low CH  | LTE  |
| Final_test_mode_11 | Continuous transmission, 10MHz, 64QAM, Mid CH  | LTE  |
| Final_test_mode_12 | Continuous transmission, 10MHz, 64QAM, High CH | LTE  |
| Final_test_mode_13 | Continuous transmission, 15MHz, QPSK, Low CH   | LTE  |
| Final_test_mode_14 | Continuous transmission, 15MHz, QPSK, Mid CH   | LTE  |
| Final_test_mode_15 | Continuous transmission, 15MHz, QPSK, High CH  | LTE  |
| Final_test_mode_16 | Continuous transmission, 15MHz, 64QAM, Low CH  | LTE  |
| Final_test_mode_17 | Continuous transmission, 15MHz, 64QAM, Mid CH  | LTE  |
| Final_test_mode_18 | Continuous transmission, 15MHz, 64QAM, High CH | LTE  |
| Final_test_mode_19 | Continuous transmission, 20MHz, QPSK, Low CH   | LTE  |
| Final_test_mode_20 | Continuous transmission, 20MHz, QPSK, Mid CH   | LTE  |
| Final_test_mode_21 | Continuous transmission, 20MHz, QPSK, High CH  | LTE  |
| Final_test_mode_22 | Continuous transmission, 20MHz, 64QAM, Low CH  | LTE  |
| Final_test_mode_23 | Continuous transmission, 20MHz, 64QAM, Mid CH  | LTE  |
| Final_test_mode_24 | Continuous transmission, 20MHz, 64QAM, High CH | LTE  |
| Remark: N/A.       |                                                |      |

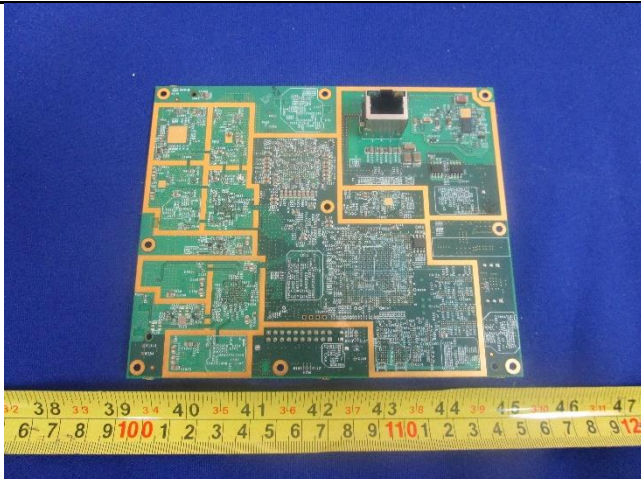
## 6.4 EUT Photos



**EUT - Open Case View**



**Main PCB - Top View**



**Main PCB - Bottom View**

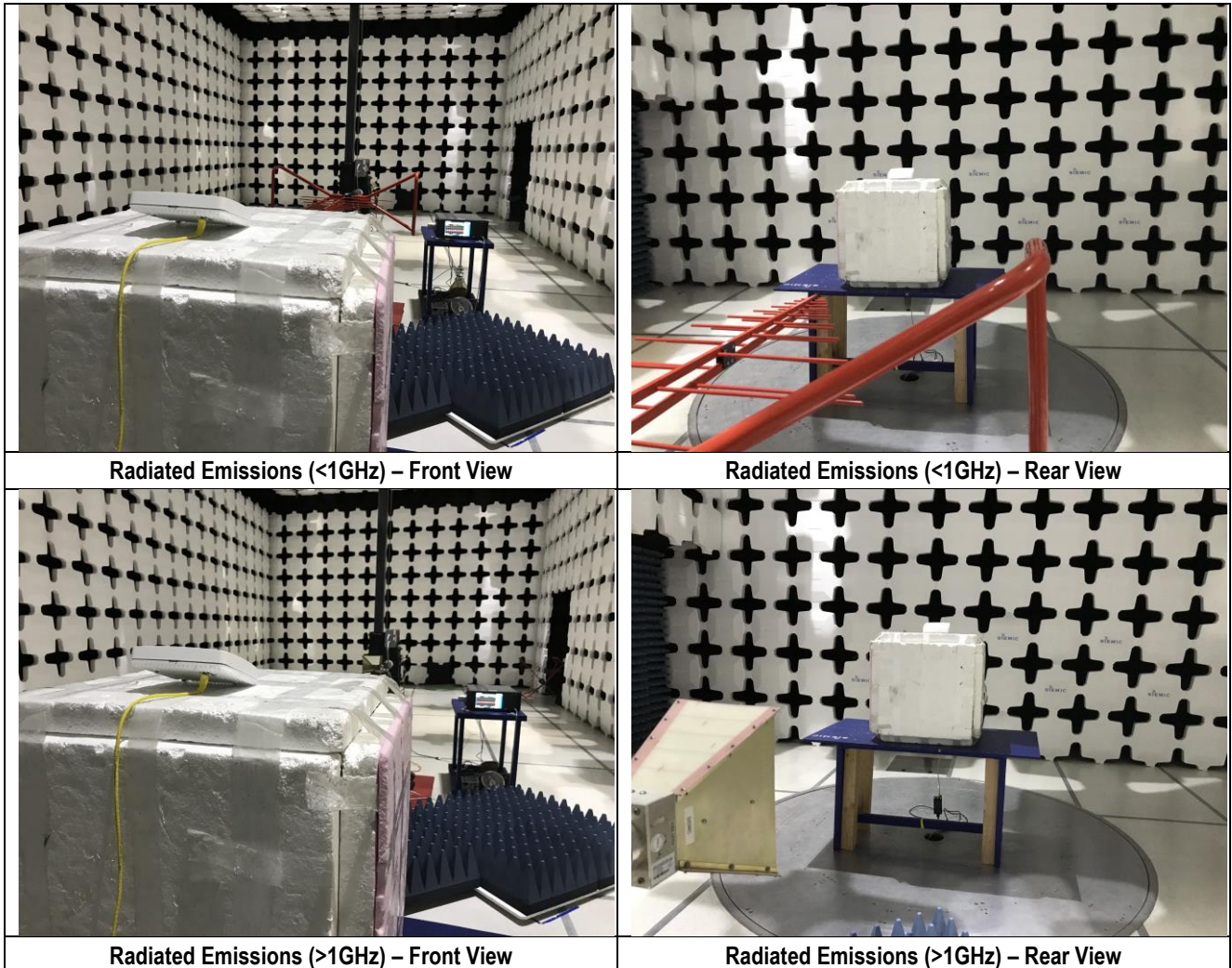


**Internal antenna 1**



**Internal antenna 2**

## 6.5 EUT Test Setup Photos



Note: The spurious emission in different EUT orientation was investigated, including the EUT standing up position and the laying down position. The EUT orientation shown in above setup photo is the worst case position.

## 7 Supporting Equipment/Software and cabling Description

### 7.1 Supporting Equipment

| Item | Supporting Equipment Description | Model        | Serial Number | Manufacturer | Note |
|------|----------------------------------|--------------|---------------|--------------|------|
| 1    | 10MHz Clock                      | OX200-SC     | 141871594391  | Metric Test  | -    |
| 2    | POE                              | POE36U-1AT-R | N/A           | PHIHONG      | -    |
|      |                                  |              |               |              | -    |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |
|      |                                  |              |               |              |      |

### 7.2 Cabling Description

| Name | Connection Start |          | Connection Stop |          | Length / shielding Info |            | Note |
|------|------------------|----------|-----------------|----------|-------------------------|------------|------|
|      | From             | I/O Port | To              | I/O Port | Length (m)              | Shielding  |      |
| RJ45 | EUT              | RJ45     | POE             | RJ45     | 2                       | Unshielded | -    |
| RJ45 | POE              | RJ45     | Laptop          | RJ45     | 3                       | Unshielded | -    |

### 7.3 Test Software Description

| Test Item  | Software      | Description                                                   |
|------------|---------------|---------------------------------------------------------------|
| RF testing | TMciDvtClient | Enable EUT continuous TX mode and change to different channel |
|            |               |                                                               |
|            |               |                                                               |
|            |               |                                                               |
|            |               |                                                               |

## 8 Test Summary

| Test Item                                      | Test standard                                                                                                                                                                                                                                                                                                                                          |                         | Test Method/Procedure |                 | Pass / Fail                                                              |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------|-----------------|--------------------------------------------------------------------------|
| E.R.P/ E.I.R.P                                 | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR27.50              | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Occupied Bandwidth                             | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR27.53              | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Peak-Average Ratio                             | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR27.50              | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Spurious and harmonic Emission at antenna port | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR2.1051, 47CFR27.53 | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Band Edge                                      | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR2.1053, 47CFR27.53 | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Radiated spurious and harmonic emission        | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR2.1053, 47CFR27.53 | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Frequency stability                            | FCC                                                                                                                                                                                                                                                                                                                                                    | 47CFR2.1053, 47CFR27.53 | FCC                   | TIA-603-D: 2010 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Remark                                         | <ol style="list-style-type: none"> <li>All measurement uncertainties do not take into consideration for all presented test results.</li> <li>The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.</li> </ol> |                         |                       |                 |                                                                          |

## 9 Measurement Uncertainty

### 9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| LISN Insertion Loss               | 0.40       | Normal                   | 2        | 1                       | 0.20                 |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| Mismatch LISN - Receiver          | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| LISN Impedance                    | 2.5        | Triangular               | 2.449    | 1                       | 1.0208248            |
| Combined Standard Uncertainty     |            |                          |          |                         | 1.928133             |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>3.856266</b>      |

The total derived measurement uncertainty is +/- 3.86 dB.

### 9.2 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| Antenna Factor                    | 0.65       | Normal                   | 2        | 1                       | 0.325                |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| Mismatch Filter - Receiver        | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| NSA Calibration                   | 4.0        | U-Shape                  | 1.414    | 1                       | 2.8288543            |
| Combined Standard Uncertainty     |            |                          |          |                         | 3.0059131            |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>6.0118262</b>     |

The total derived measurement uncertainty is +/- 6.00 dB.

### 9.3 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.0692840            |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.1050000            |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.1250000            |
| Antenna Factor                    | 0.65       | Normal                   | 2        | 1                       | 0.3250000            |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.8660508            |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.8660508            |
| Mismatch Filter - Receiver        | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| VSWR Calibration                  | 2.0        | U-Shape                  | 1.414    | 1                       | 1.4144272            |
| Combined Standard Uncertainty     |            |                          |          |                         | 4.2363               |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>8.4726</b>        |

The total derived measurement uncertainty is +/- 8.47 dB.

### 9.4 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

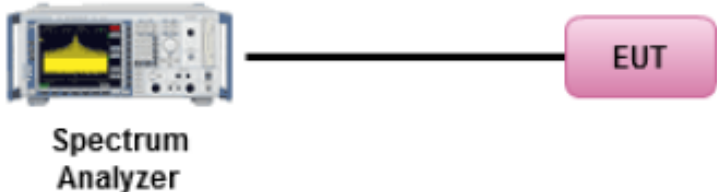
| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Reference Level                   | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Attenuator                        | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| Mismatch                          | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| Combined Standard Uncertainty     |            |                          |          |                         | 0.476087             |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>0.952174</b>      |

The total derived measurement uncertainty is +/- 0.95 dB.

## 10 Measurements, Examination and Derived Results

### 10.1 RF Output Power

Requirement(s):

| Spec           | Item                                                                                                                                                                                                                                                                                                                                   | Requirement                                                                                      | Applicable                                                                 |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 47CFR27.50     | -                                                                                                                                                                                                                                                                                                                                      | The maximum effective radiated power (ERP) of fixed and base station must not exceed 1000 Watts. | <input checked="" type="checkbox"/>                                        |
| Test Setup     |  <p>The diagram shows a Spectrum Analyzer connected via a cable to a pink box labeled EUT.</p>                                                                                                                                                       |                                                                                                  |                                                                            |
| Test Procedure | <ul style="list-style-type: none"> <li>- EUT was set for low, mid, high channel with modulated mode and highest RF output power.</li> <li>- The spectrum analyzer was connected to the antenna terminal.</li> </ul>                                                                                                                    |                                                                                                  |                                                                            |
| Test Date      | 01/13/2017 – 06/09/2017                                                                                                                                                                                                                                                                                                                | Environmental condition                                                                          | Temperature 22°C<br>Relative Humidity 48%<br>Atmospheric Pressure 1008mbar |
| Remark         | <p>For LTE mode, EUT is using 2x2 MIMO, which has 2 transmit antennas. They are correlated to each other. The directional gain is calculated per the formula at below,</p> <p>Directional gain dBi = <math>G_{max} + 10 \log_{10} N</math><br/>           The max gain of single antenna is 3 dBi. So the directional gain = 6 dBi</p> |                                                                                                  |                                                                            |
| Result         | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                 |                                                                                                  |                                                                            |

Test Data    ☒ Yes                      ☐ N/A

Test Plot    ☒ Yes (See below)              ☐ N/A

Test was done by Chen Ge at RF Test Site.

Test Data:

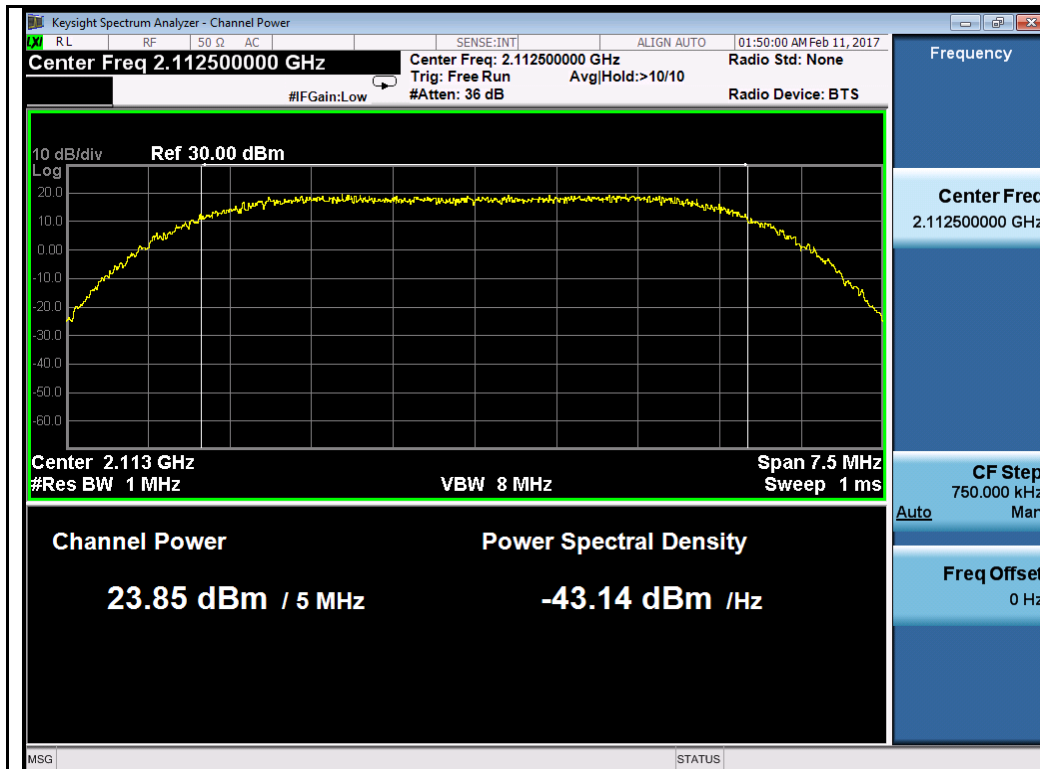
| Type            | Channel | Frequency (MHz) | Measured PW –Port 1(dBm) | Measured PW –Port 2(dBm) | Combined Power (dBm) | Antenna Gain (dBi) | E.I.R.P (dBm) |
|-----------------|---------|-----------------|--------------------------|--------------------------|----------------------|--------------------|---------------|
| 5MHz BW, QPSK   | Low     | 2112.5          | 23.85                    | 23.79                    | 26.83                | 3                  | 29.83         |
|                 | Mid     | 2132.5          | 23.47                    | 23.47                    | 26.48                | 3                  | 29.48         |
|                 | High    | 2152.5          | 23.94                    | 23.91                    | 26.94                | 3                  | 29.94         |
| 5MHz BW, 64QAM  | Low     | 2112.5          | 23.97                    | 23.86                    | 26.93                | 3                  | 29.93         |
|                 | Mid     | 2132.5          | 23.44                    | 23.48                    | 26.47                | 3                  | 29.47         |
|                 | High    | 2152.5          | 23.90                    | 23.89                    | 26.91                | 3                  | 29.91         |
| 10MHz BW, QPSK  | Low     | 2115.0          | 23.62                    | 23.63                    | 26.64                | 3                  | 29.64         |
|                 | Mid     | 2132.5          | 23.36                    | 23.38                    | 26.38                | 3                  | 29.38         |
|                 | High    | 2150.0          | 23.68                    | 23.64                    | 26.67                | 3                  | 29.67         |
| 10MHz BW, 64QAM | Low     | 2115.0          | 23.63                    | 23.61                    | 26.63                | 3                  | 29.63         |
|                 | Mid     | 2132.5          | 23.39                    | 23.42                    | 26.42                | 3                  | 29.42         |
|                 | High    | 2150.0          | 23.56                    | 23.65                    | 26.62                | 3                  | 29.62         |
| 15MHz BW, QPSK  | Low     | 2117.5          | 23.56                    | 23.53                    | 26.56                | 3                  | 29.56         |
|                 | Mid     | 2132.5          | 23.36                    | 23.36                    | 26.37                | 3                  | 29.37         |
|                 | High    | 2147.5          | 23.82                    | 23.79                    | 26.82                | 3                  | 29.82         |
| 15MHz BW, 64QAM | Low     | 2117.5          | 23.57                    | 23.54                    | 26.57                | 3                  | 29.57         |
|                 | Mid     | 2132.5          | 23.34                    | 23.42                    | 26.39                | 3                  | 29.39         |
|                 | High    | 2147.5          | 23.71                    | 23.76                    | 26.75                | 3                  | 29.75         |
| 20MHz BW, QPSK  | Low     | 2120.0          | 23.70                    | 23.62                    | 26.67                | 3                  | 29.67         |
|                 | Mid     | 2132.5          | 23.43                    | 23.45                    | 26.45                | 3                  | 29.45         |
|                 | High    | 2145.0          | 23.80                    | 23.78                    | 26.80                | 3                  | 29.80         |
| 20MHz BW, 64QAM | Low     | 2120.0          | 23.87                    | 23.86                    | 26.88                | 3                  | 29.88         |
|                 | Mid     | 2132.5          | 23.46                    | 23.45                    | 26.47                | 3                  | 29.47         |
|                 | High    | 2145.0          | 23.84                    | 23.80                    | 26.83                | 3                  | 29.83         |

Test Data for LTE band 66:

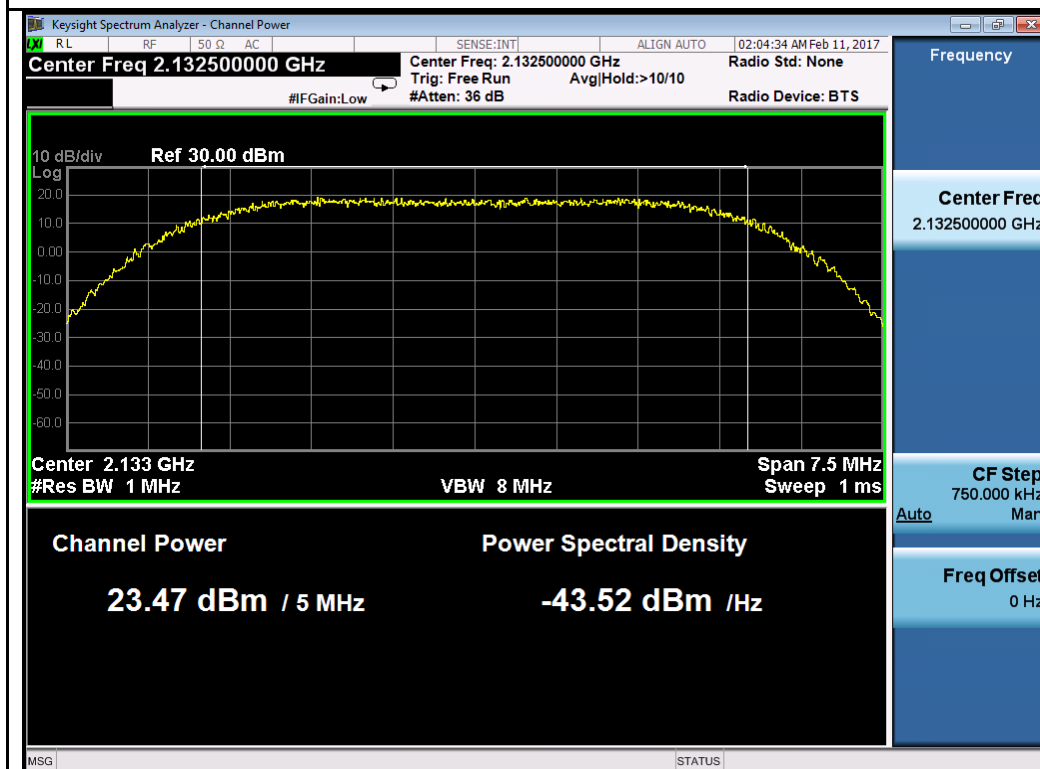
| Type            | Channel | Frequency (MHz) | Measured PW –Port 1(dBm) | Measured PW –Port 2(dBm) | Combined Power (dBm) | Antenna Gain (dBi) | E.I.R.P (dBm) |
|-----------------|---------|-----------------|--------------------------|--------------------------|----------------------|--------------------|---------------|
| 5MHz BW, QPSK   | High    | 2197.5          | 24.45                    | 24.43                    | 27.45                | 3                  | 30.45         |
| 5MHz BW, 64QAM  | High    | 2197.5          | 24.23                    | 24.57                    | 27.41                | 3                  | 30.41         |
| 10MHz BW, QPSK  | High    | 2195            | 24.45                    | 24.40                    | 27.44                | 3                  | 30.44         |
| 10MHz BW, 64QAM | High    | 2195            | 24.56                    | 24.46                    | 27.52                | 3                  | 30.52         |
| 15MHz BW, QPSK  | High    | 2192.5          | 24.28                    | 24.35                    | 27.33                | 3                  | 30.33         |
| 15MHz BW, 64QAM | High    | 2192.5          | 24.24                    | 24.42                    | 27.34                | 3                  | 30.34         |
| 20MHz BW, QPSK  | High    | 2190            | 24.22                    | 24.18                    | 27.21                | 3                  | 30.21         |
| 20MHz BW, 64QAM | High    | 2190            | 24.24                    | 24.23                    | 27.25                | 3                  | 30.25         |

## Test Plots for Band 4

### Chain 1:



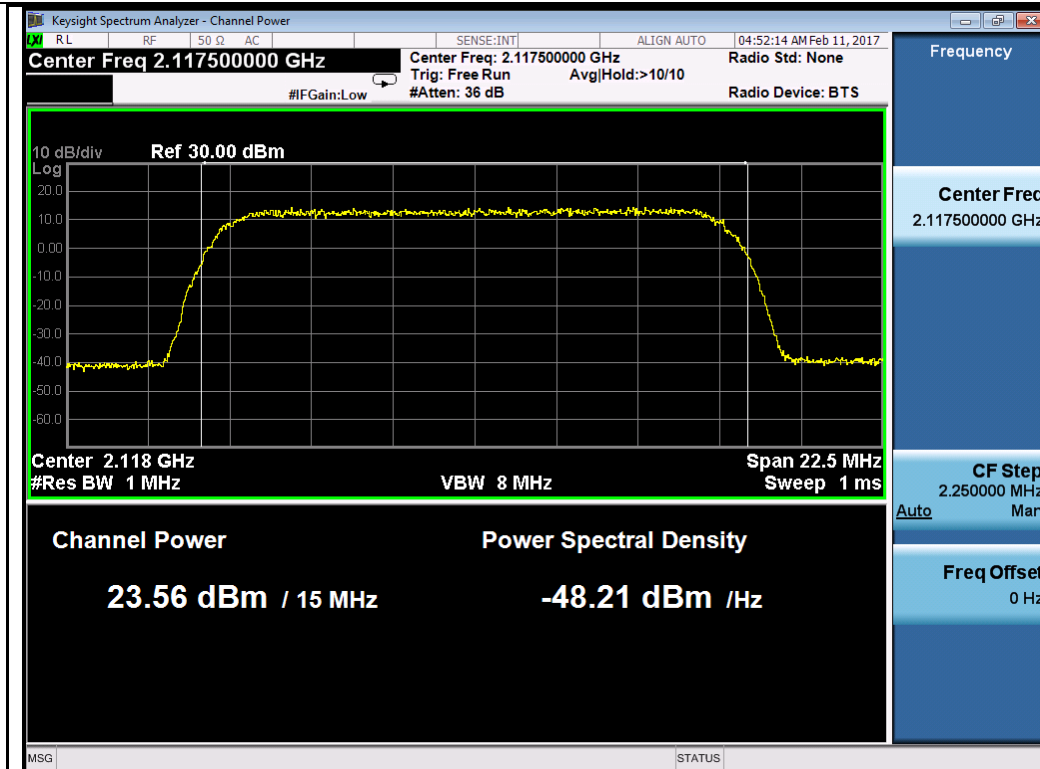
BW 5M QPSK Low



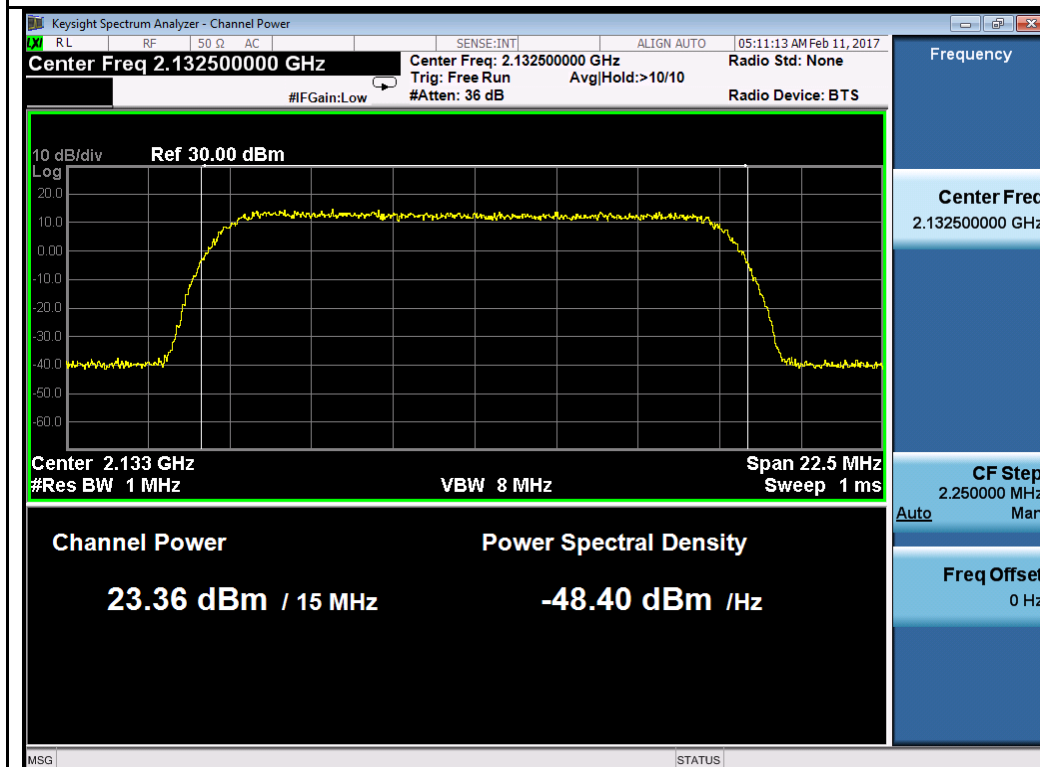
BW 5M QPSK Mid



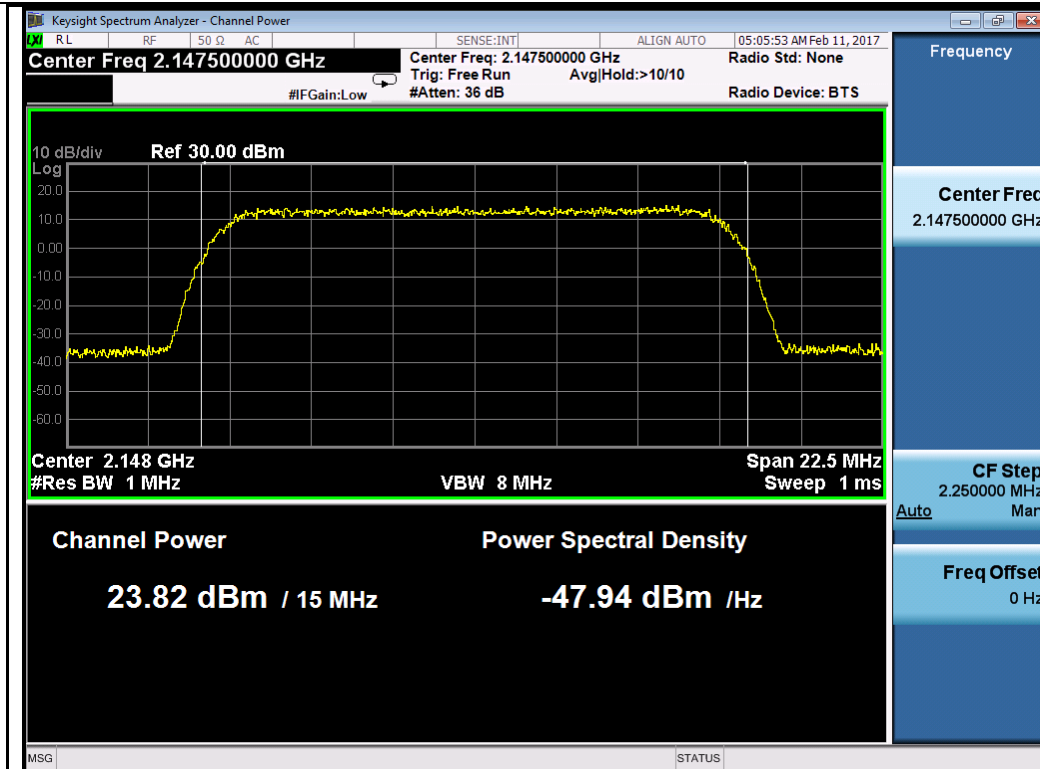




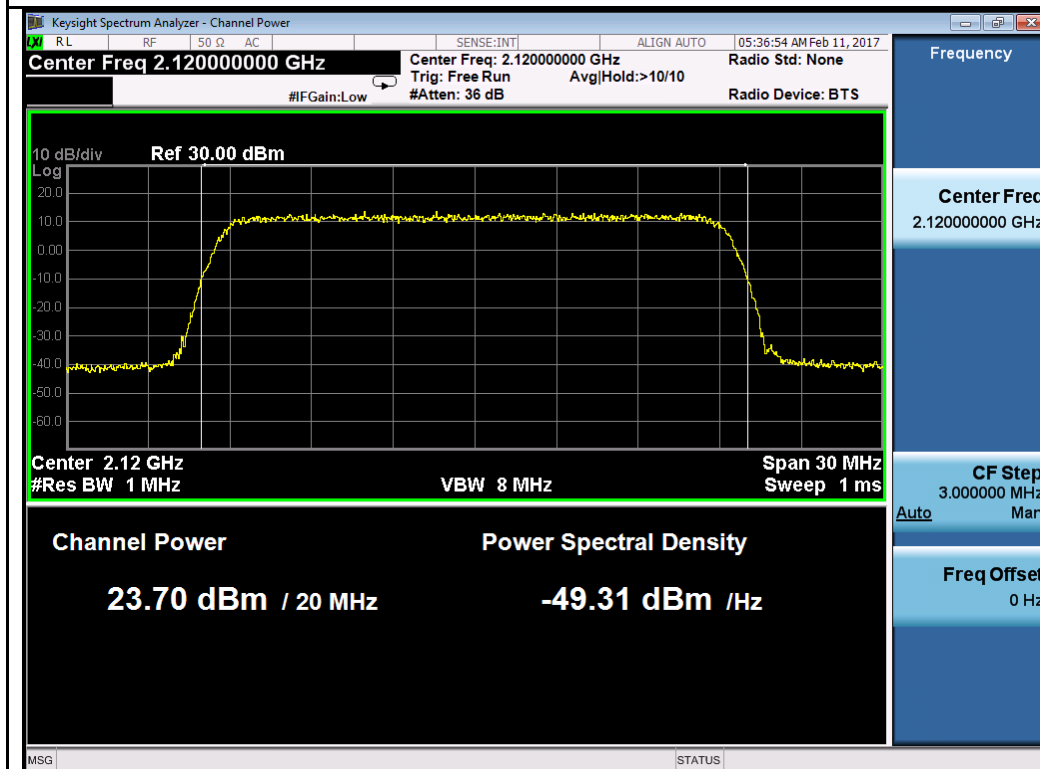
BW 15M QPSK Low



BW 15M QPSK Mid

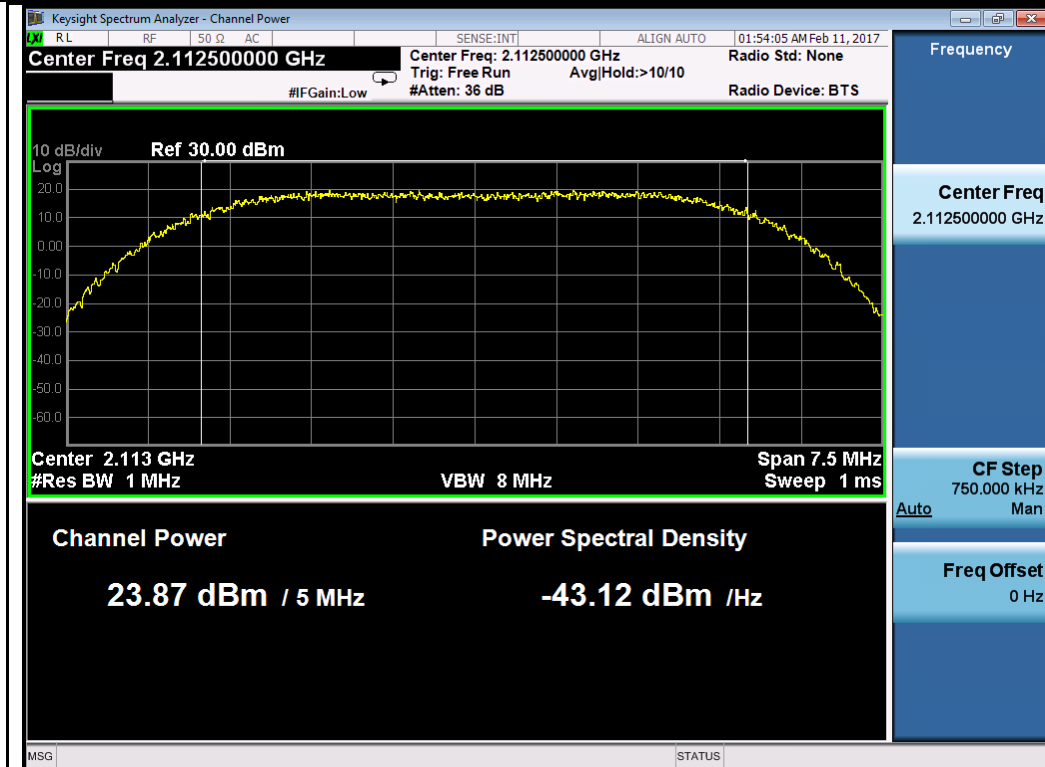


BW 15M QPSK High

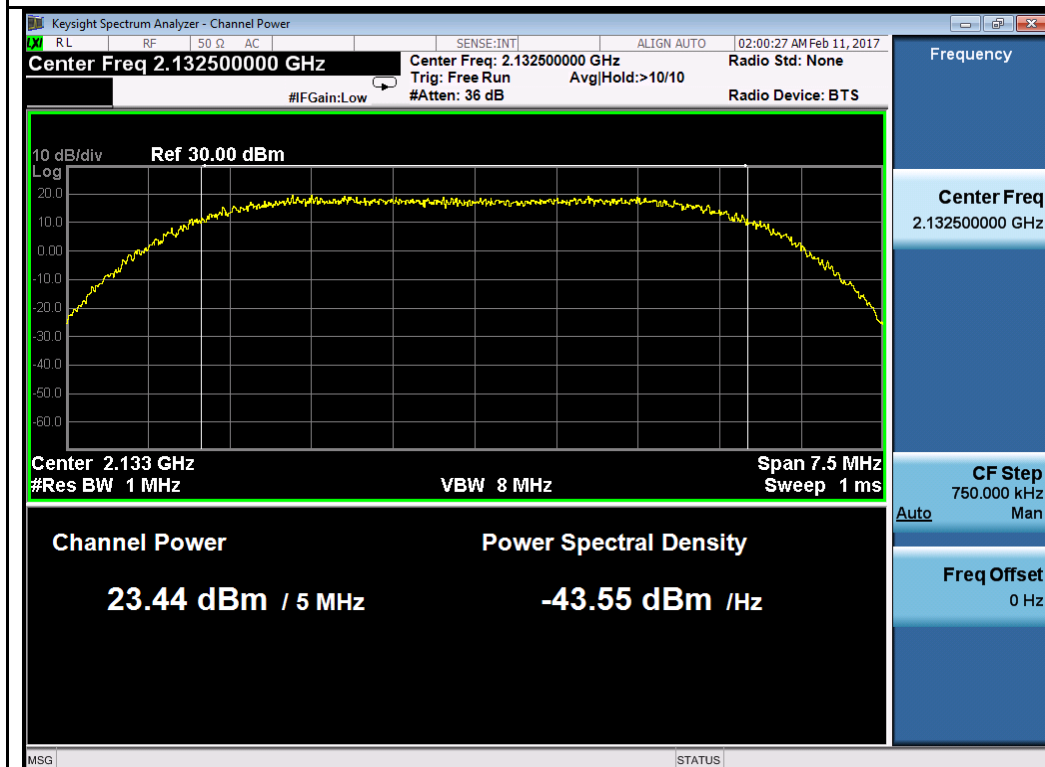


BW 20M QPSK Low

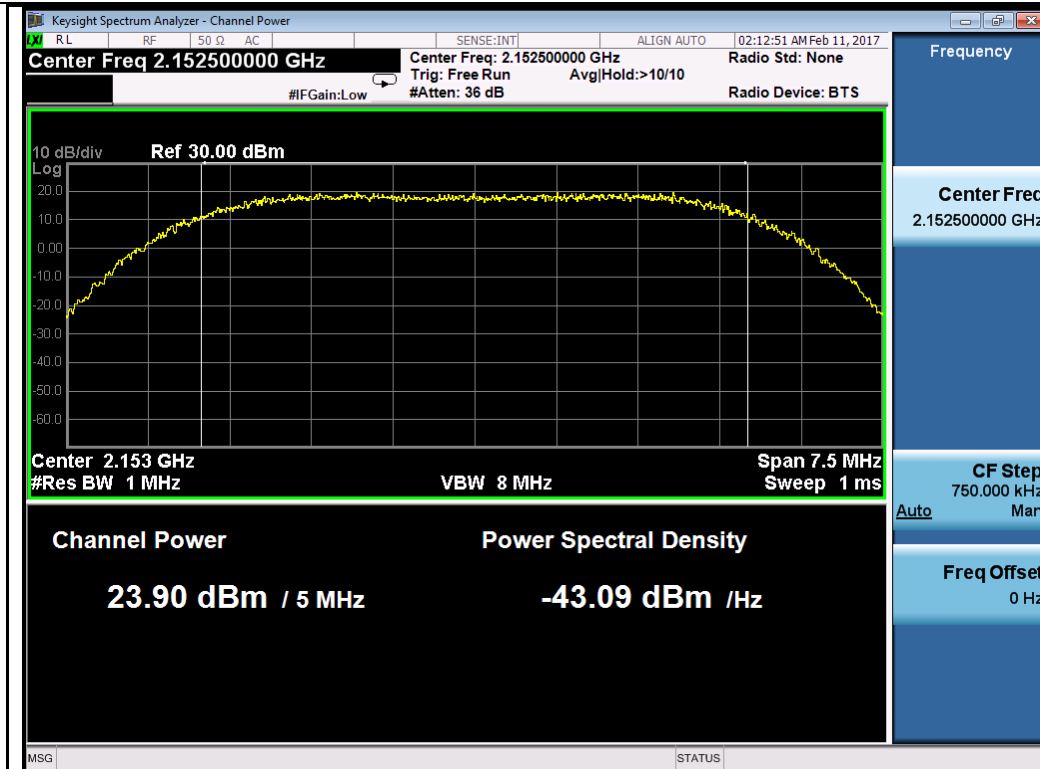




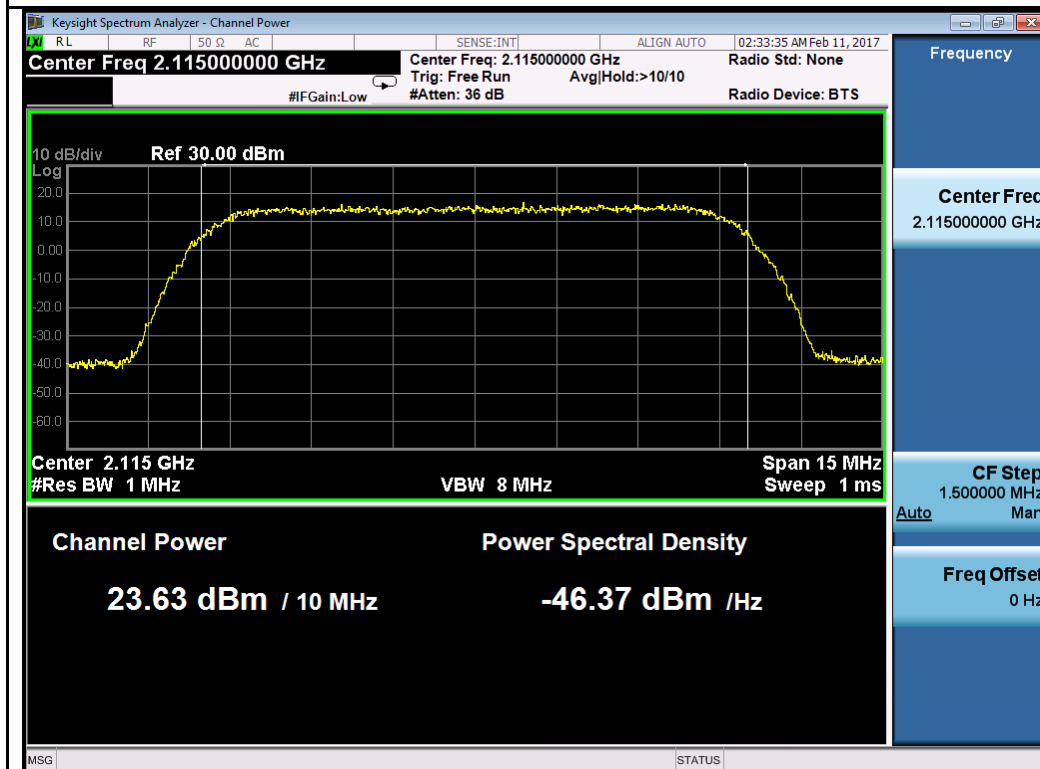
BW 5M 64QAM Low



BW 5M 64QAM Mid

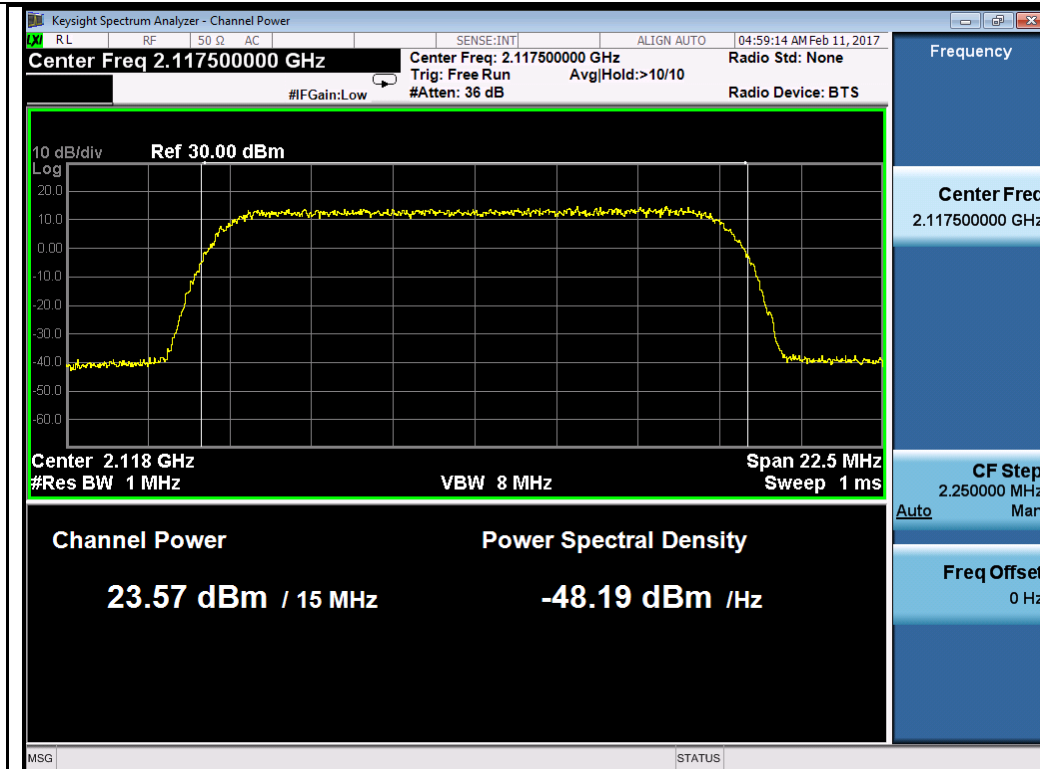


BW 5M 64QAM High

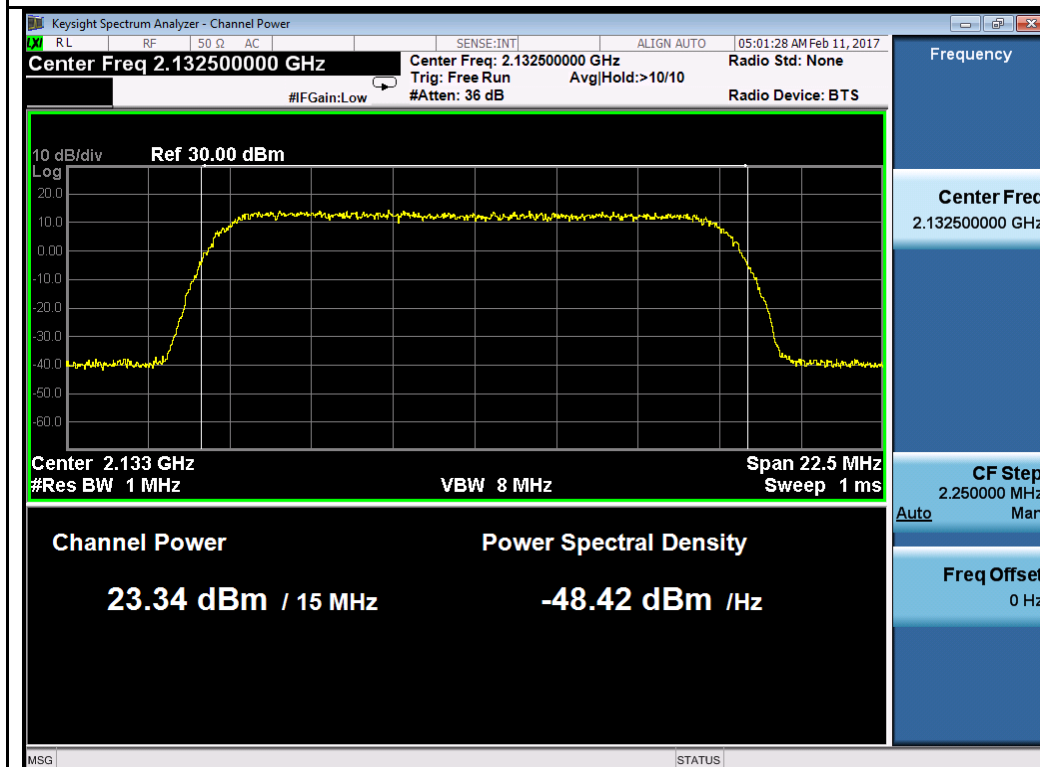


BW 10M 64QAM Low

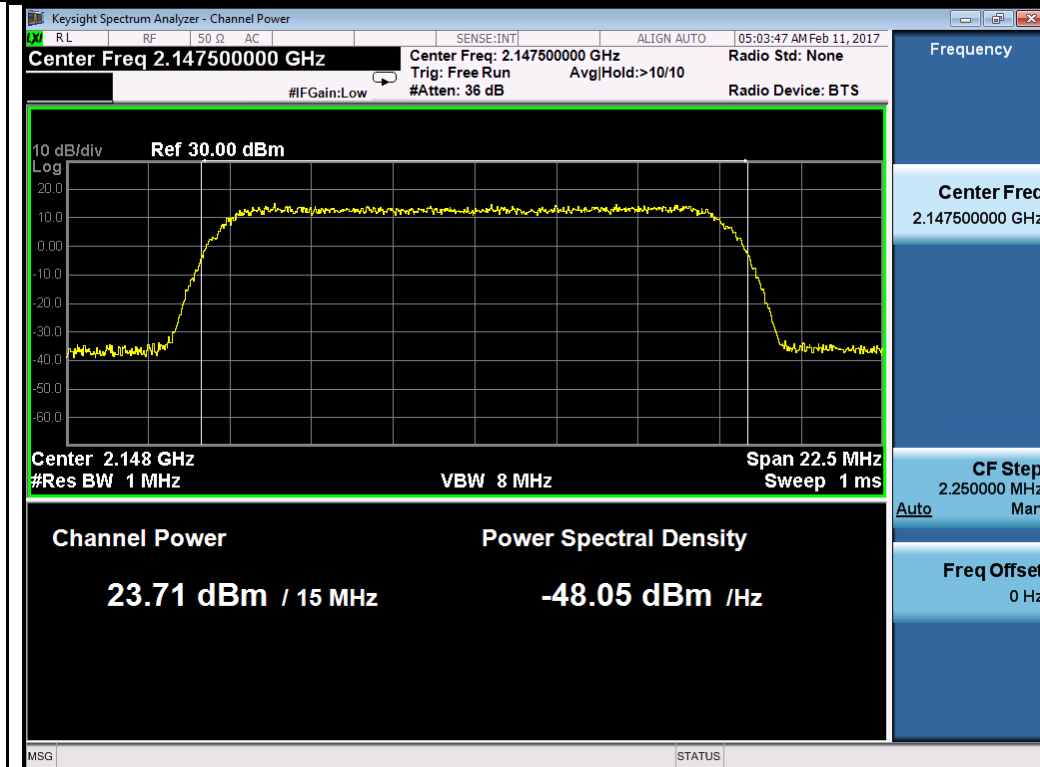




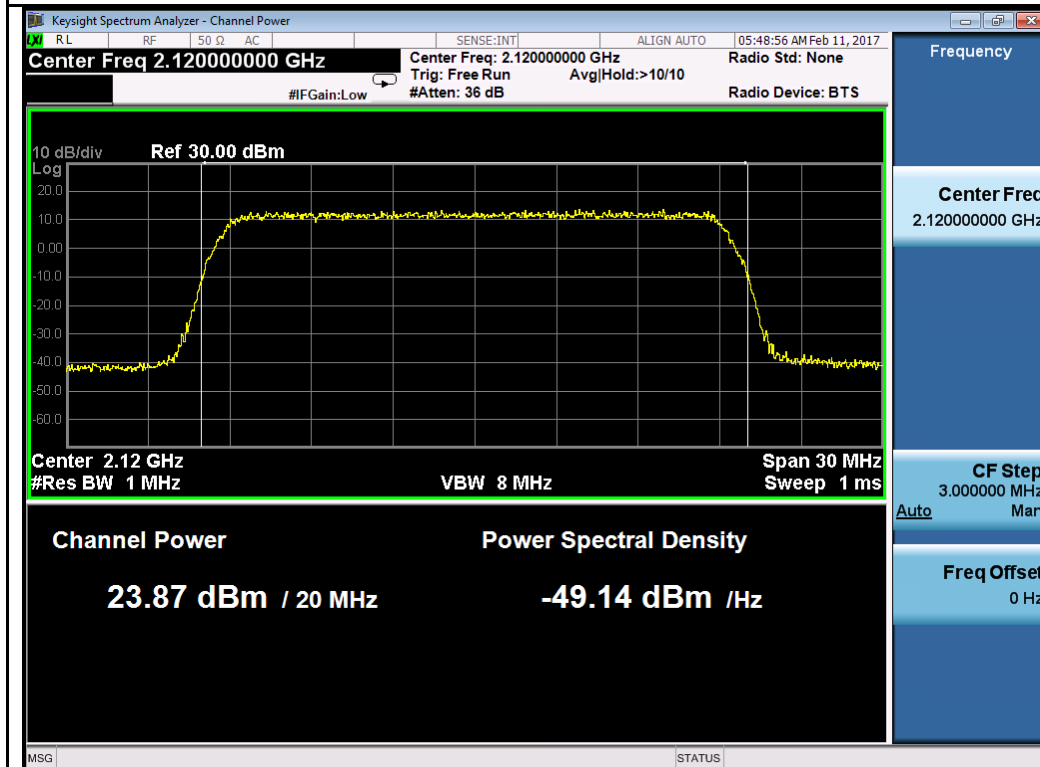
BW 15M 64QAM Low



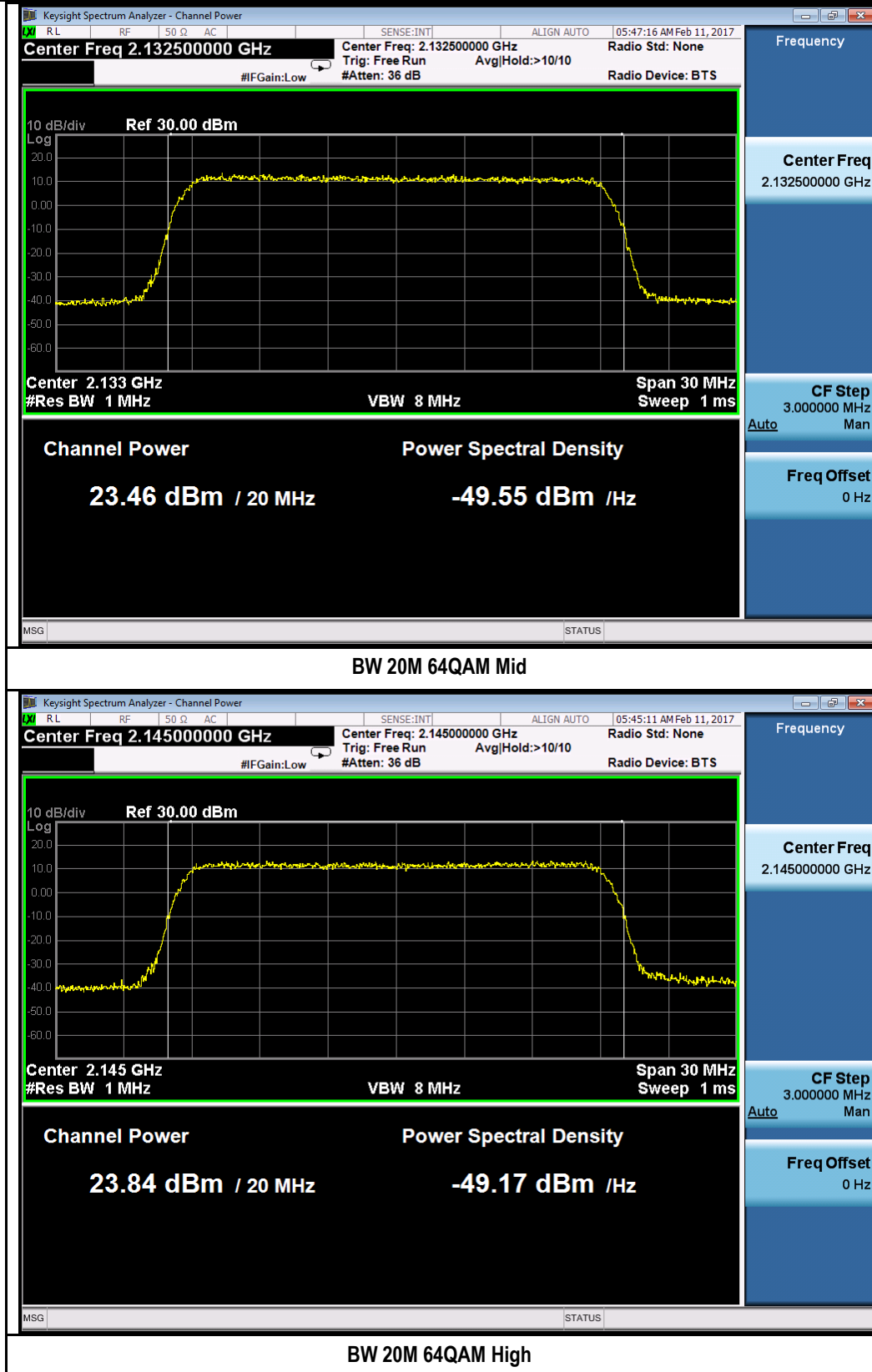
BW 15M 64QAM Mid



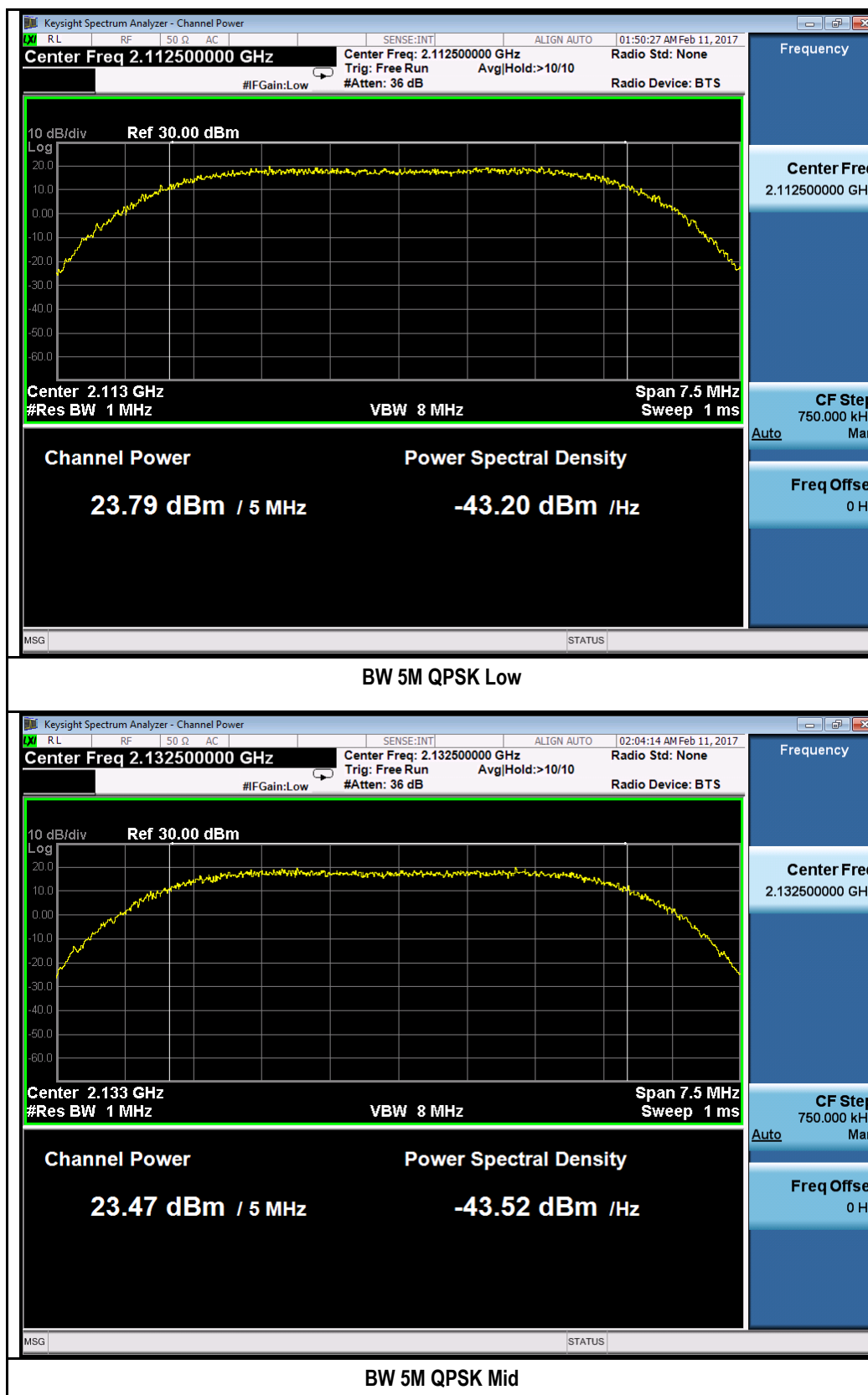
BW 15M 64QAM High

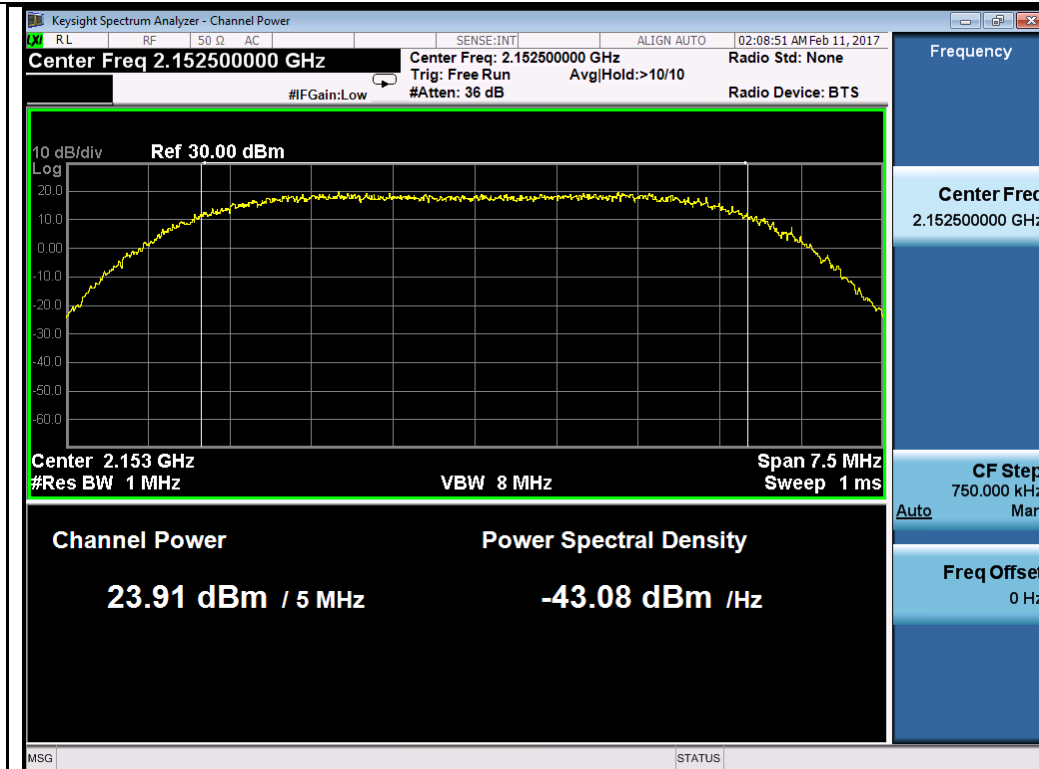


BW 20M 64QAM Low

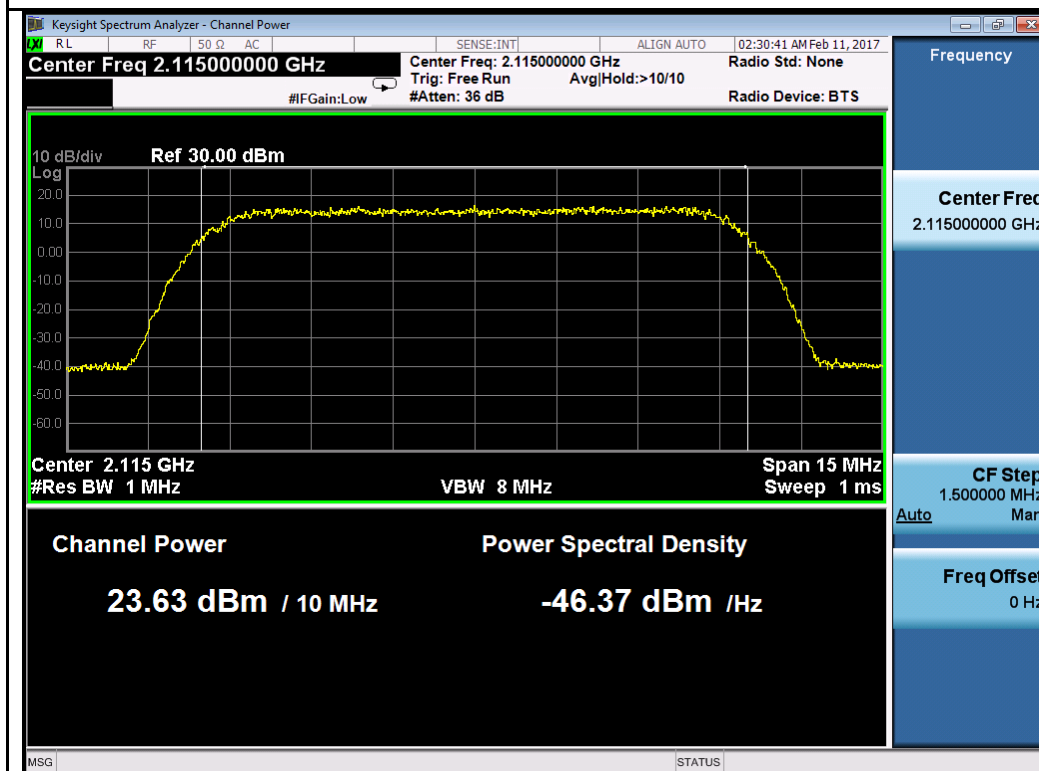


## Chain 2:



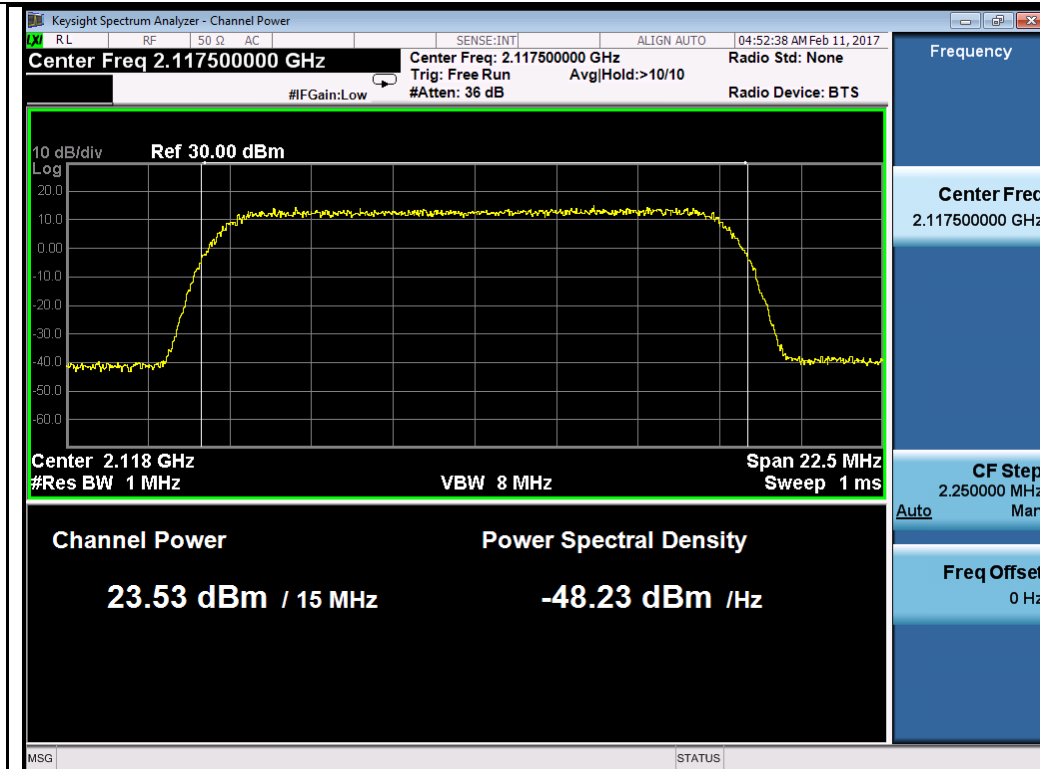


BW 5M QPSK High

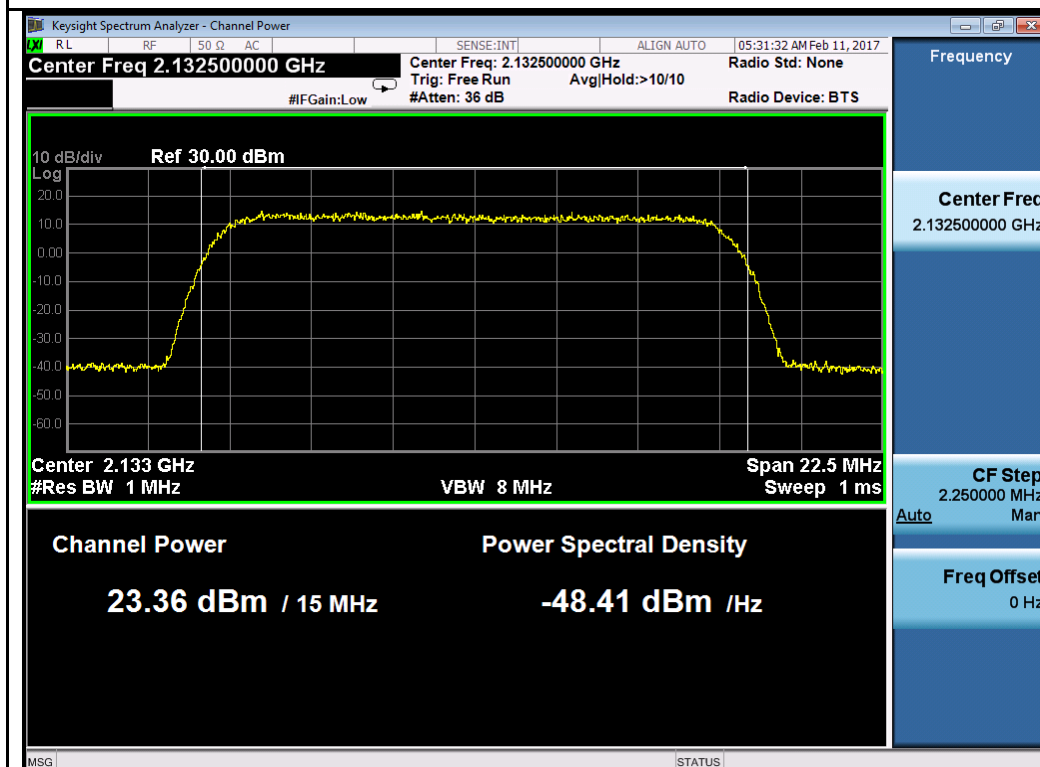


BW 10M QPSK Low

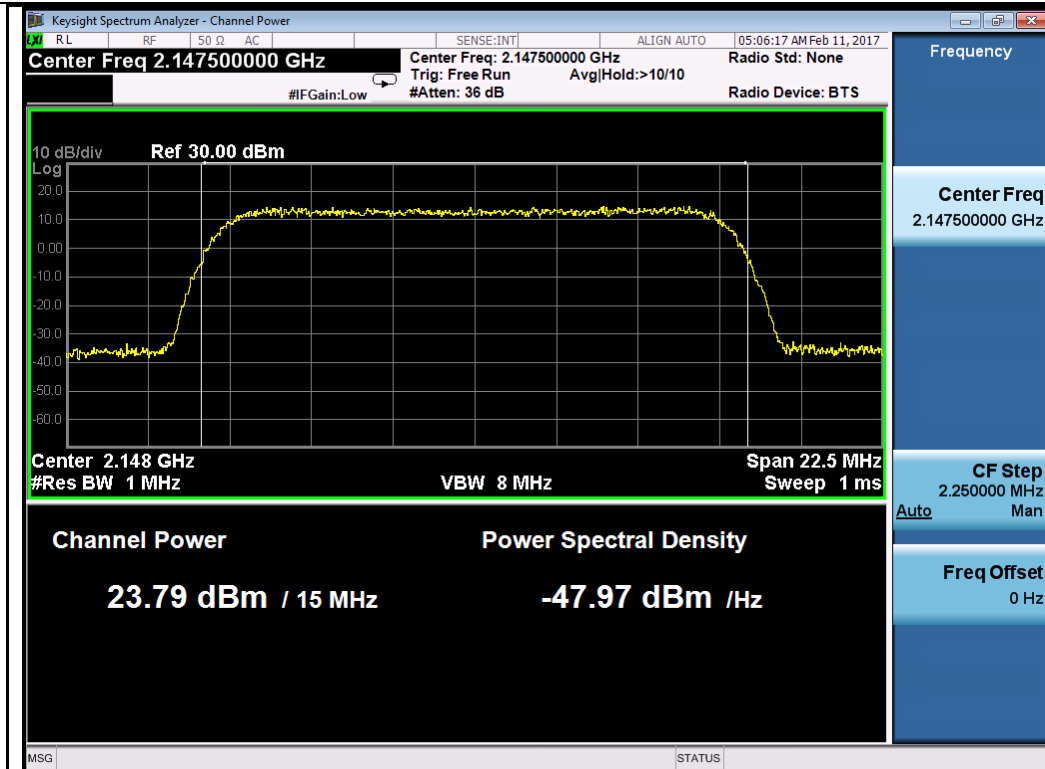




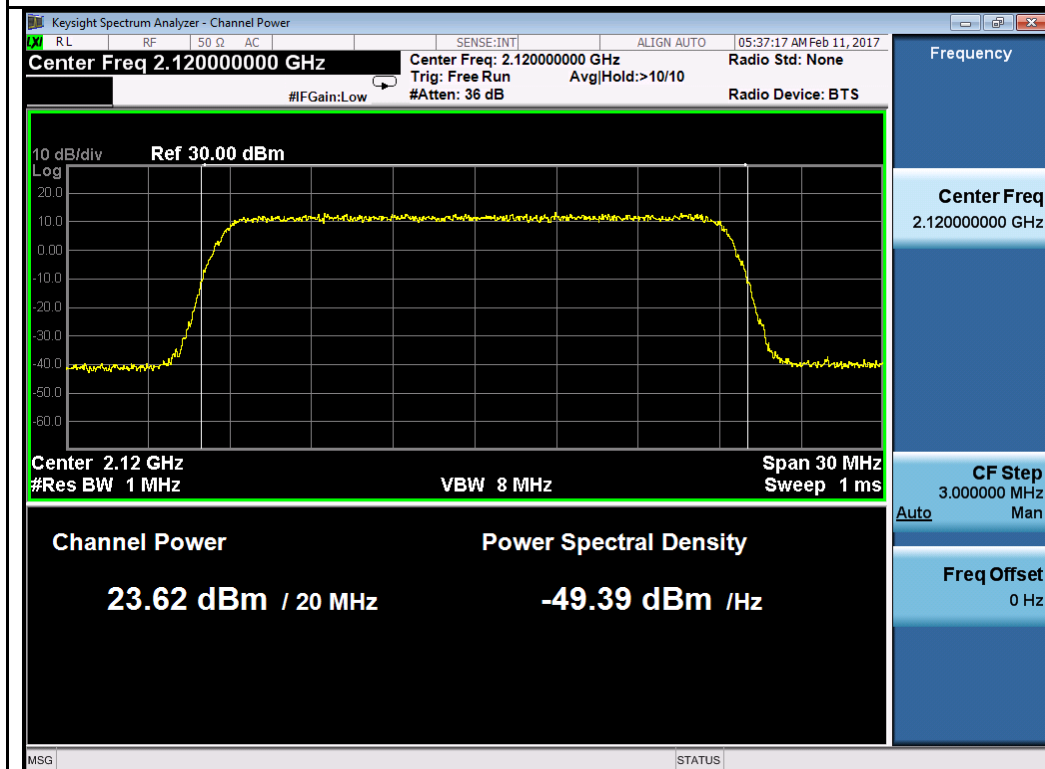
BW 15M QPSK Low



BW 15M QPSK Mid

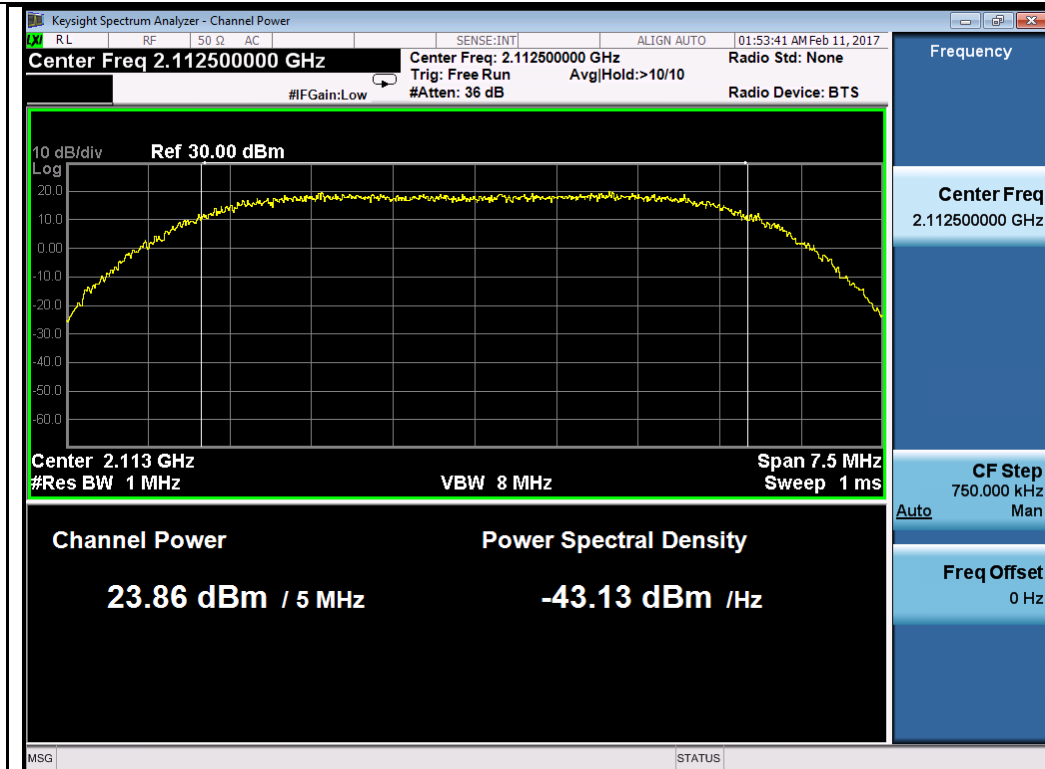


BW 15M QPSK High

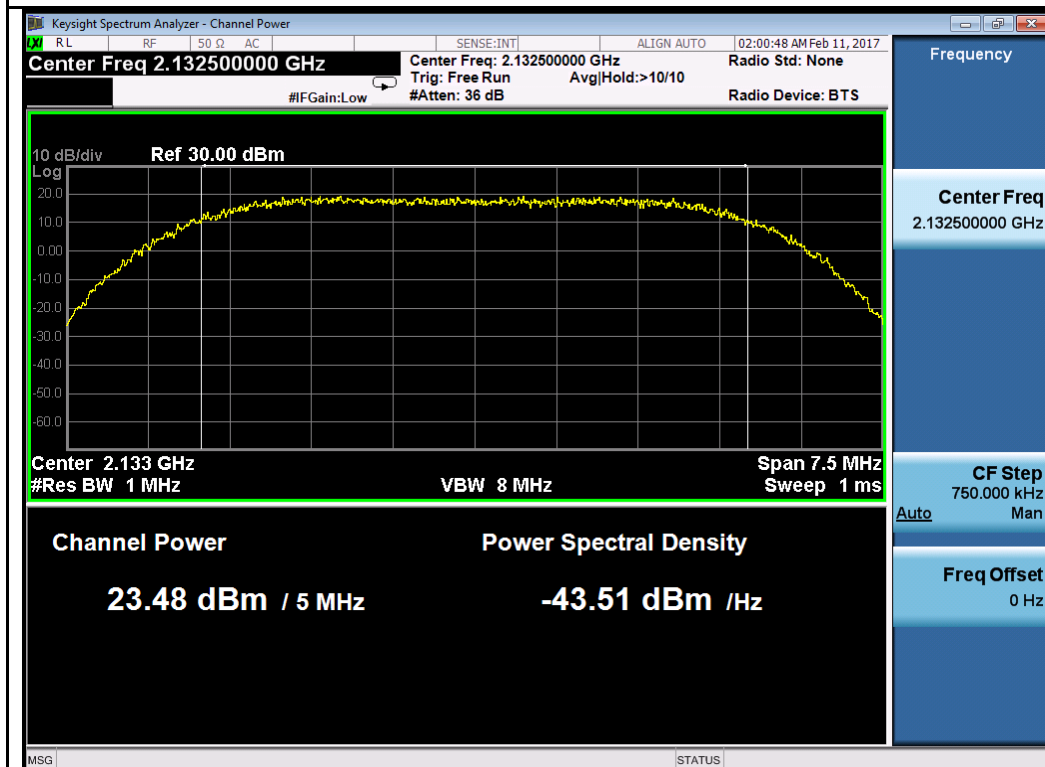


BW 20M QPSK Low



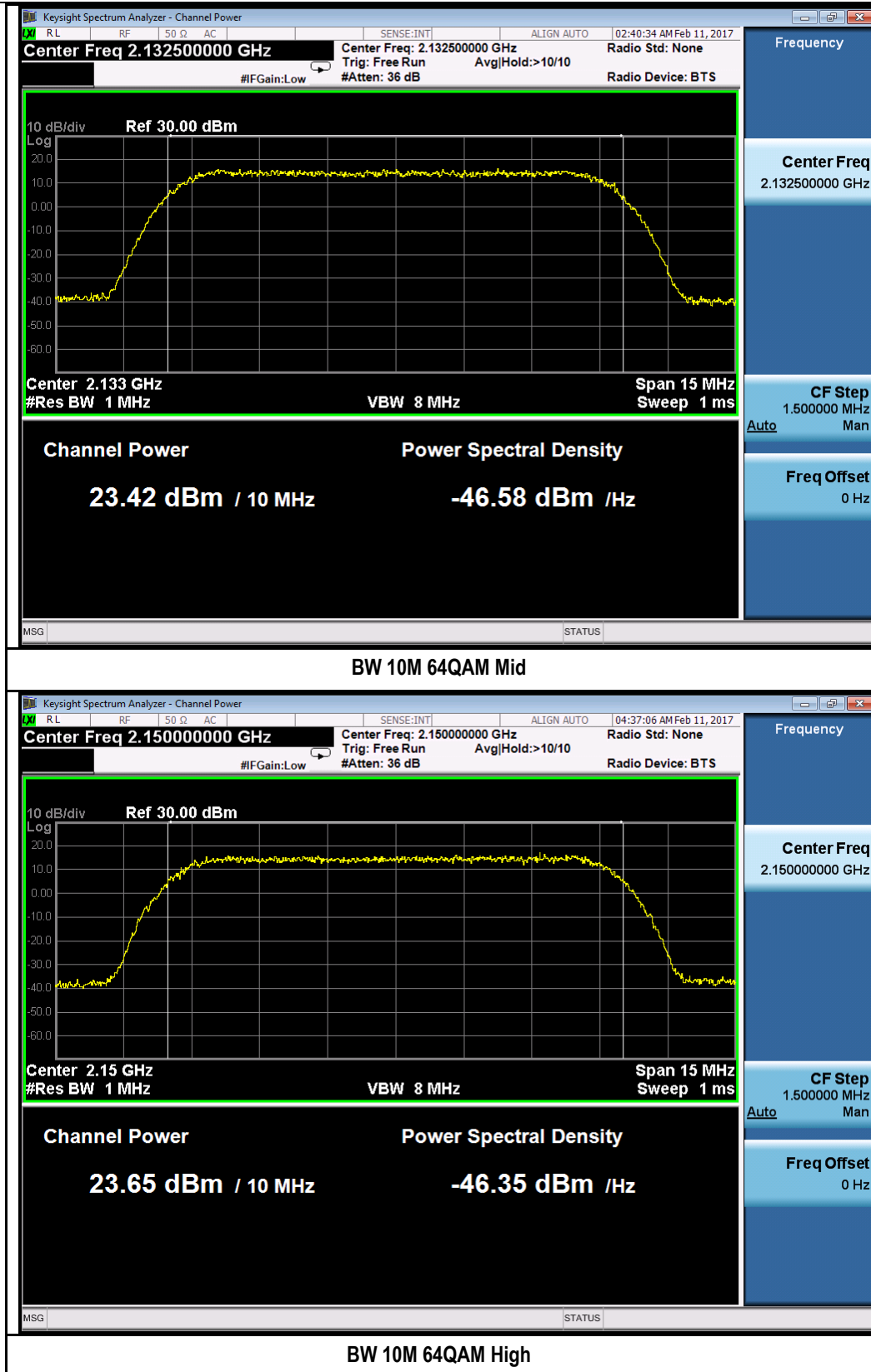


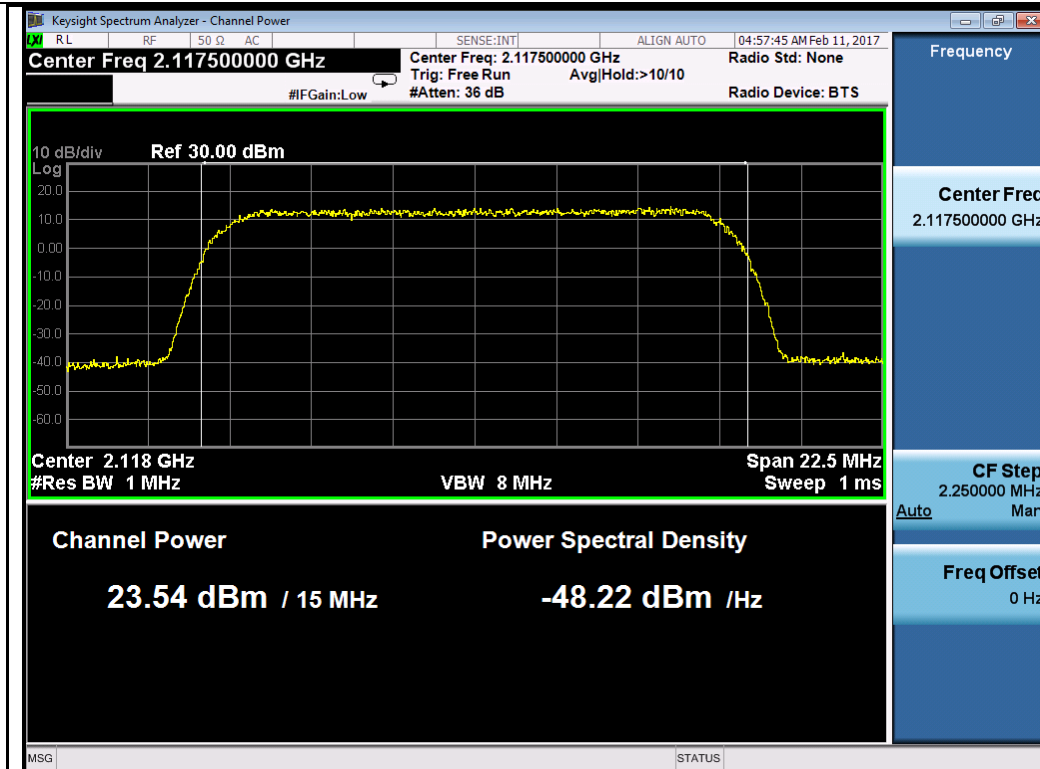
BW 5M 64QAM Low



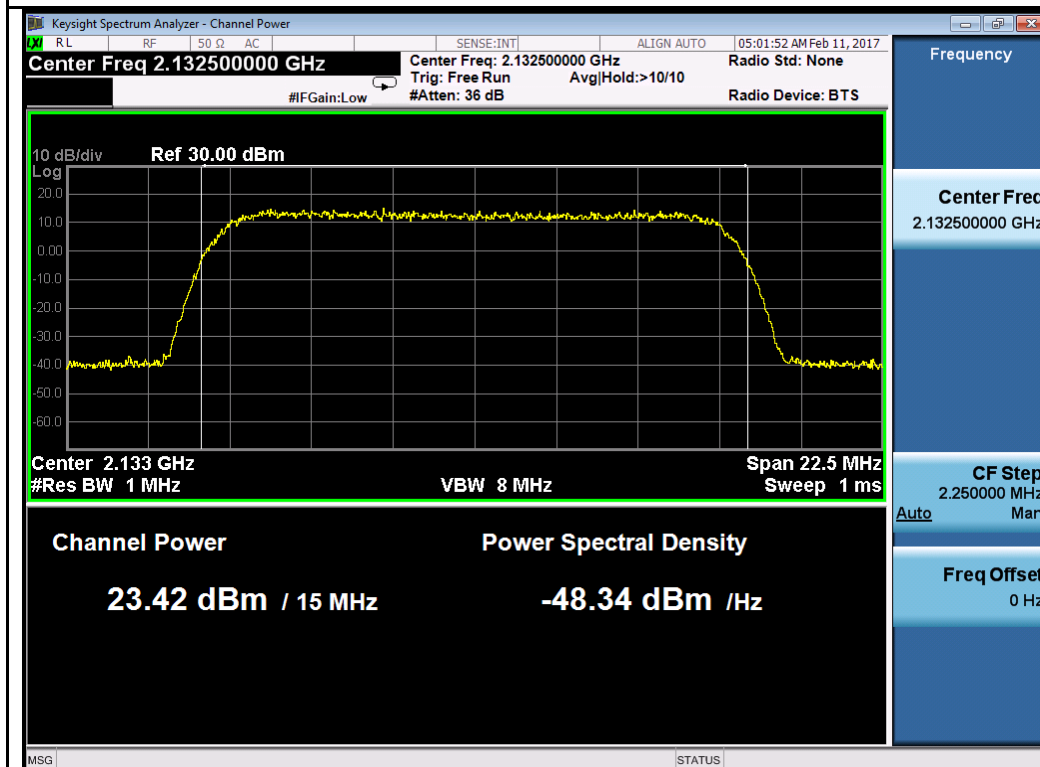
BW 5M 64QAM Mid



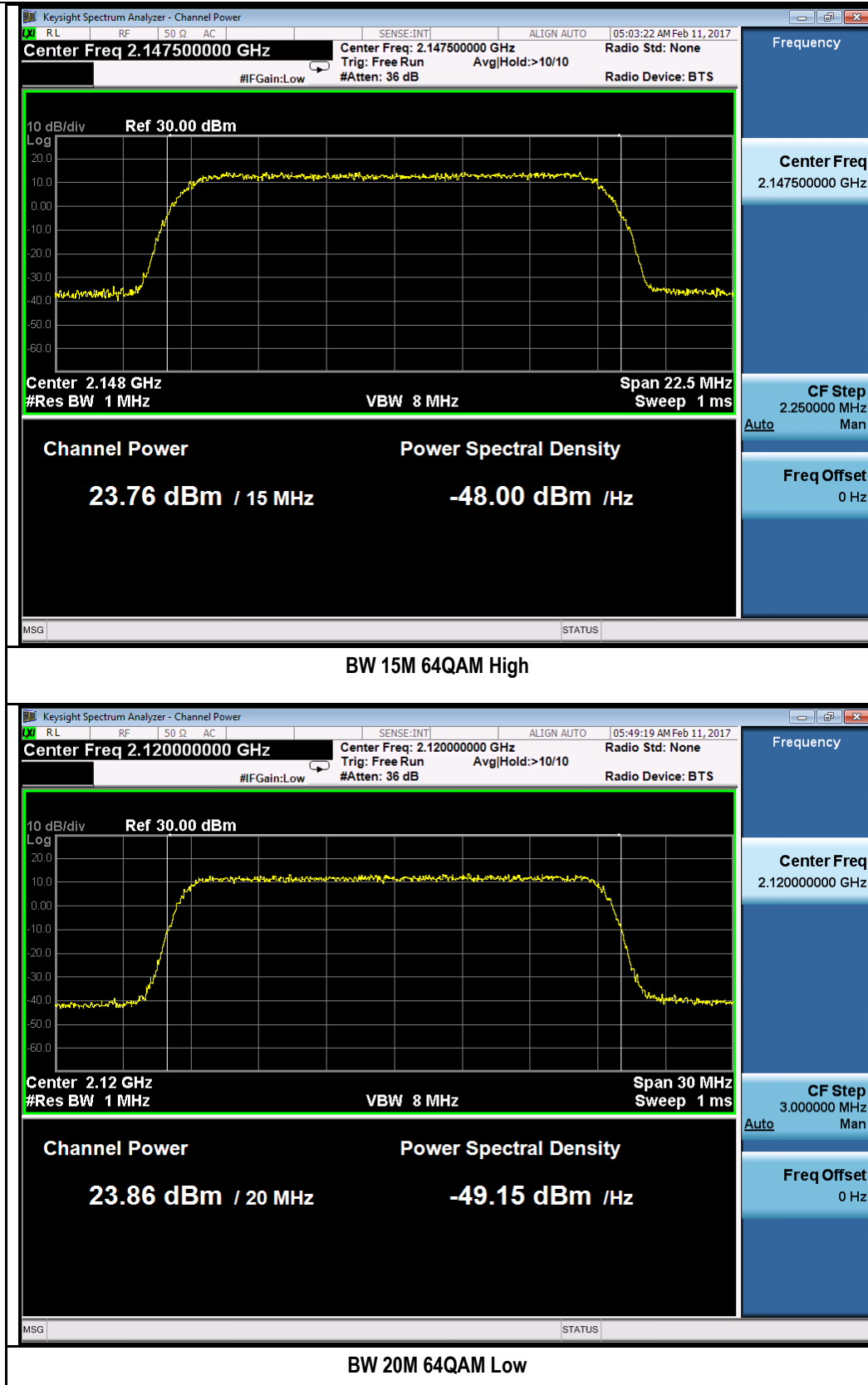


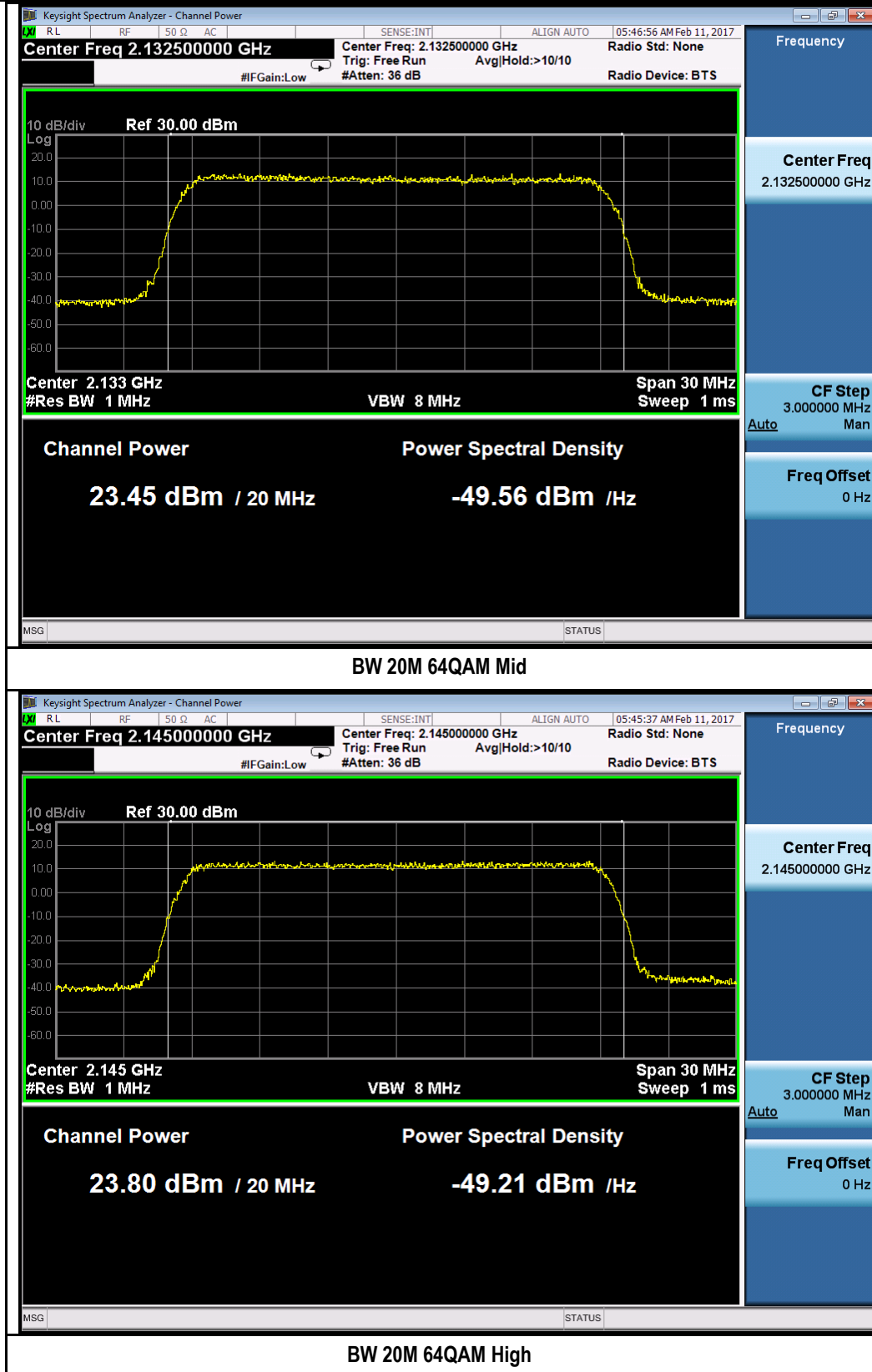


BW 15M 64QAM Low



BW 15M 64QAM Mid

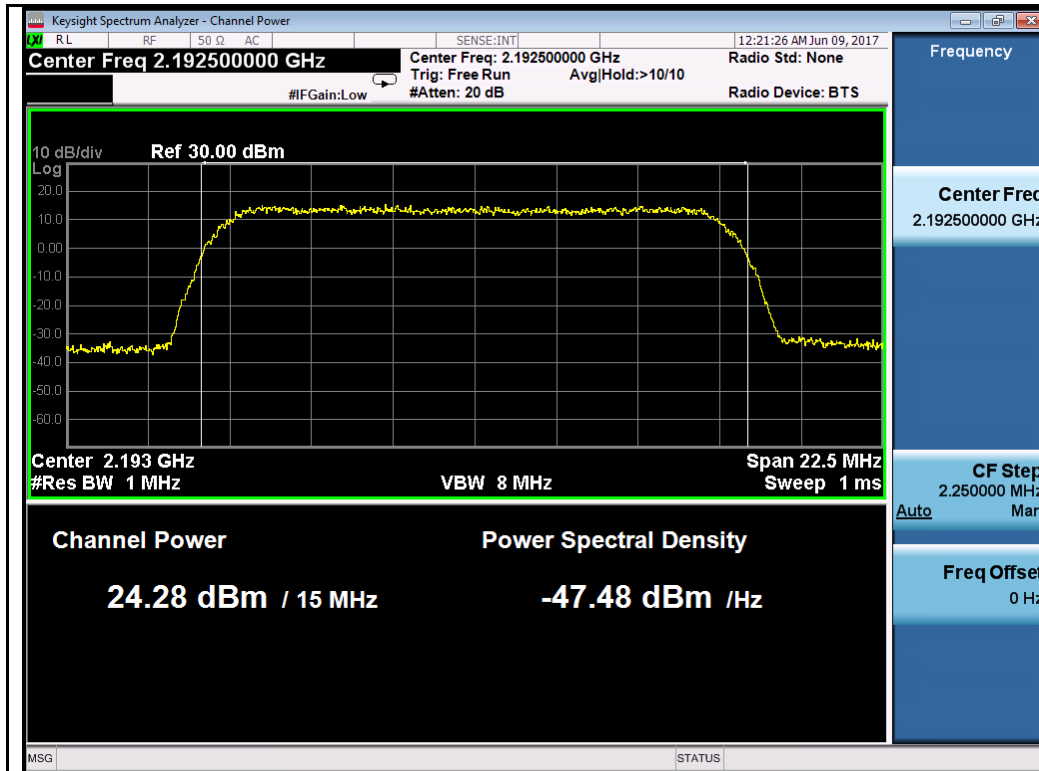




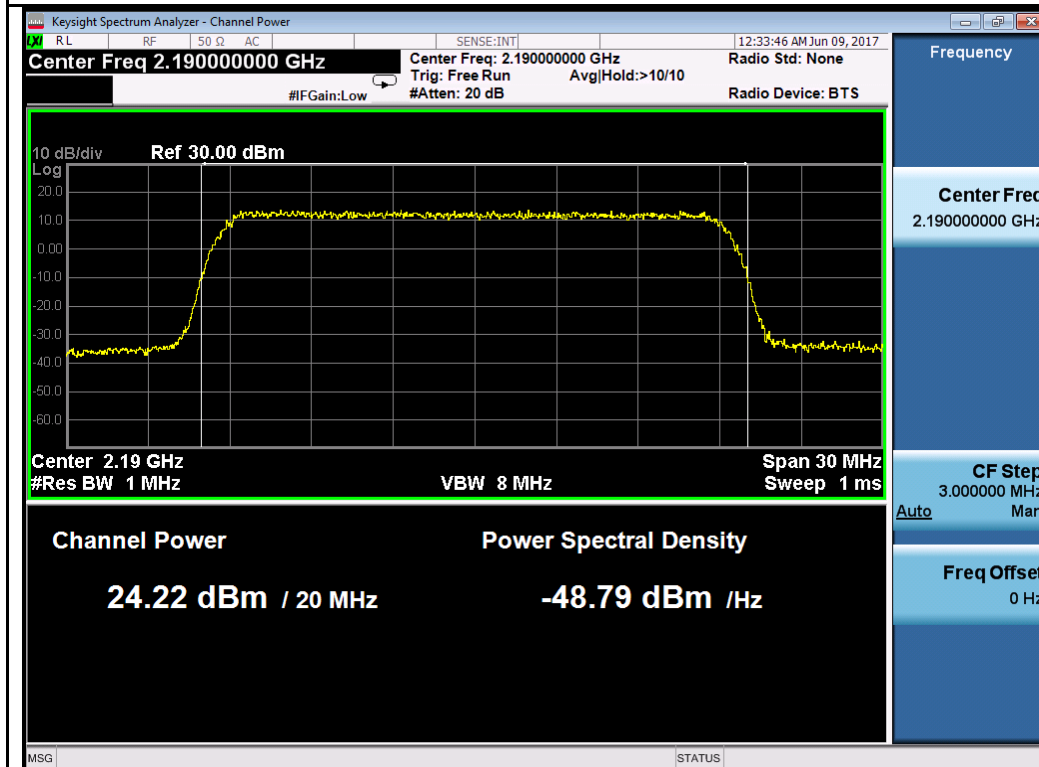
## Test Plots for LTE band 66:

Chain1:

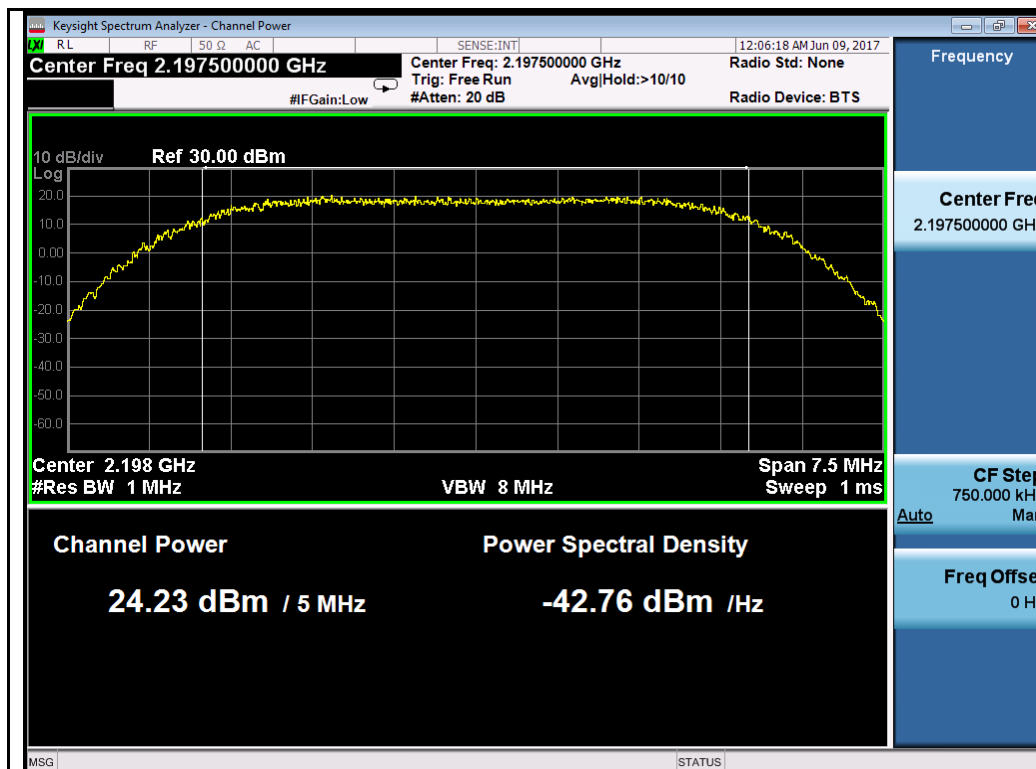




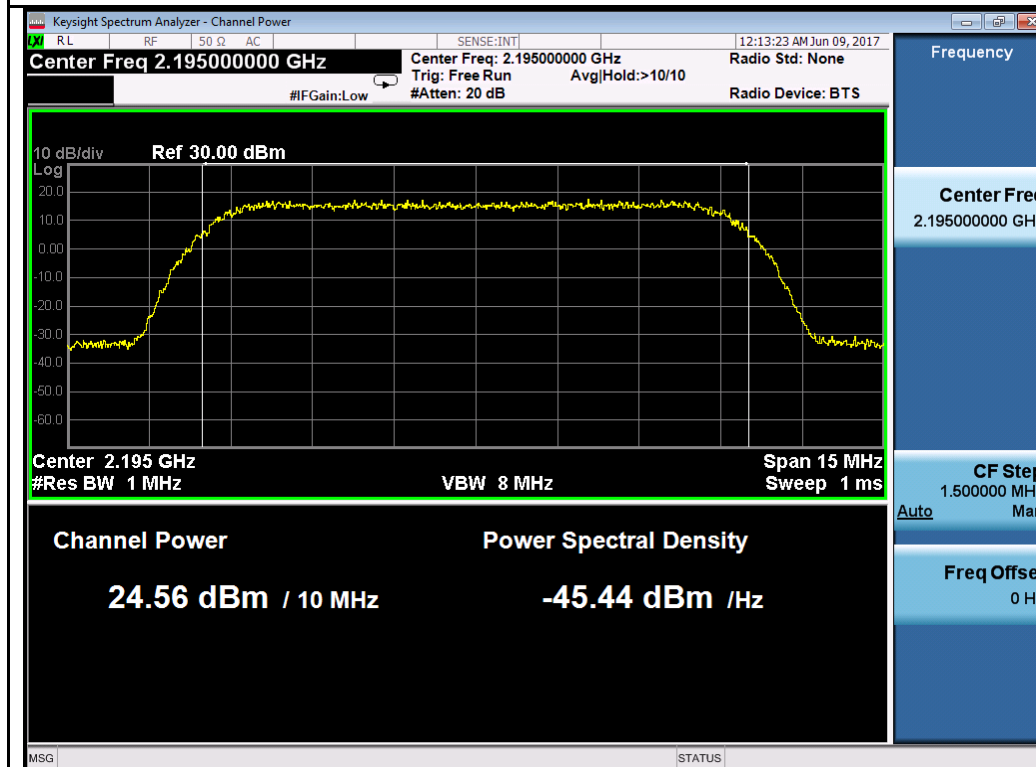
15M QPSK High



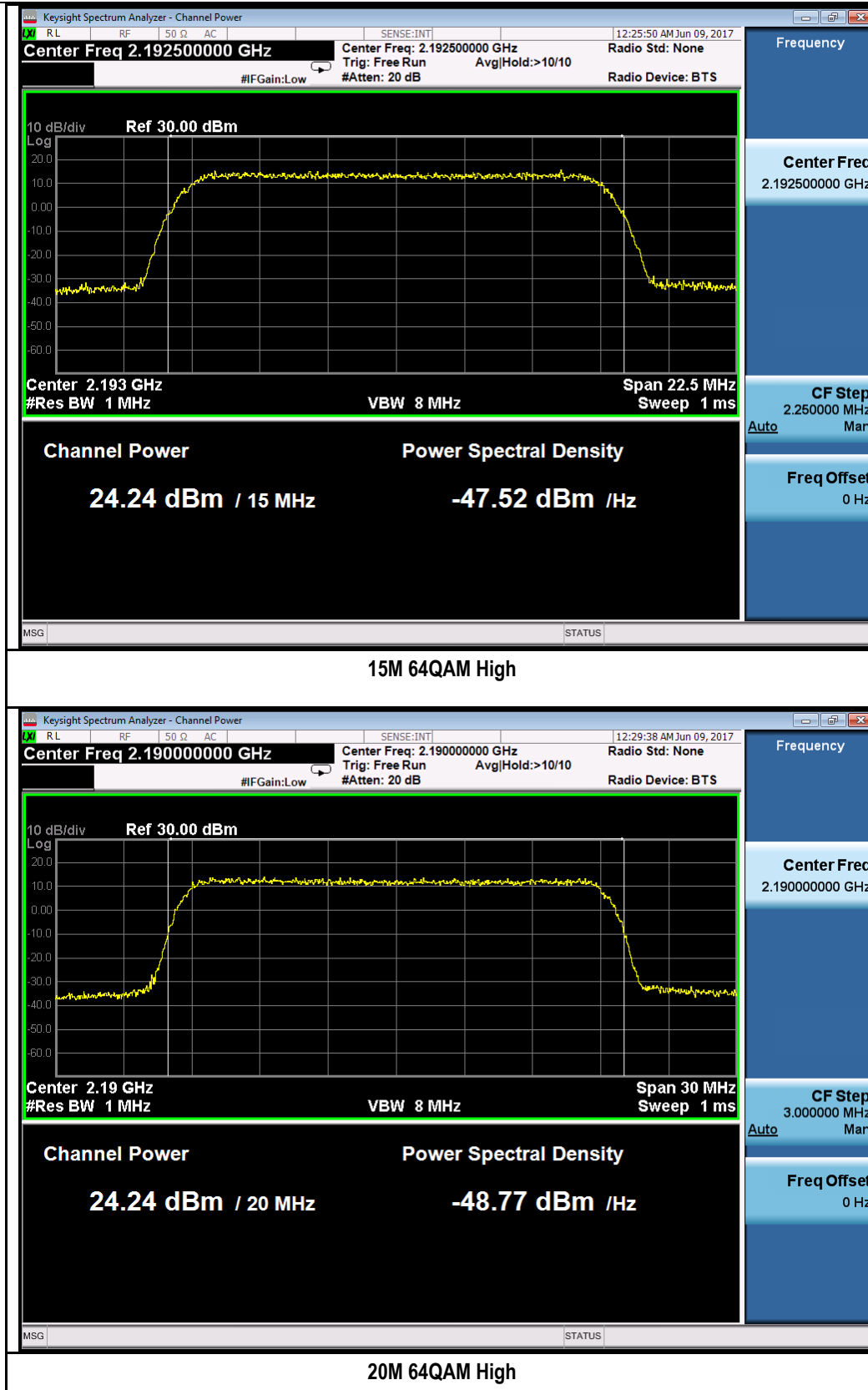
20M QPSK High



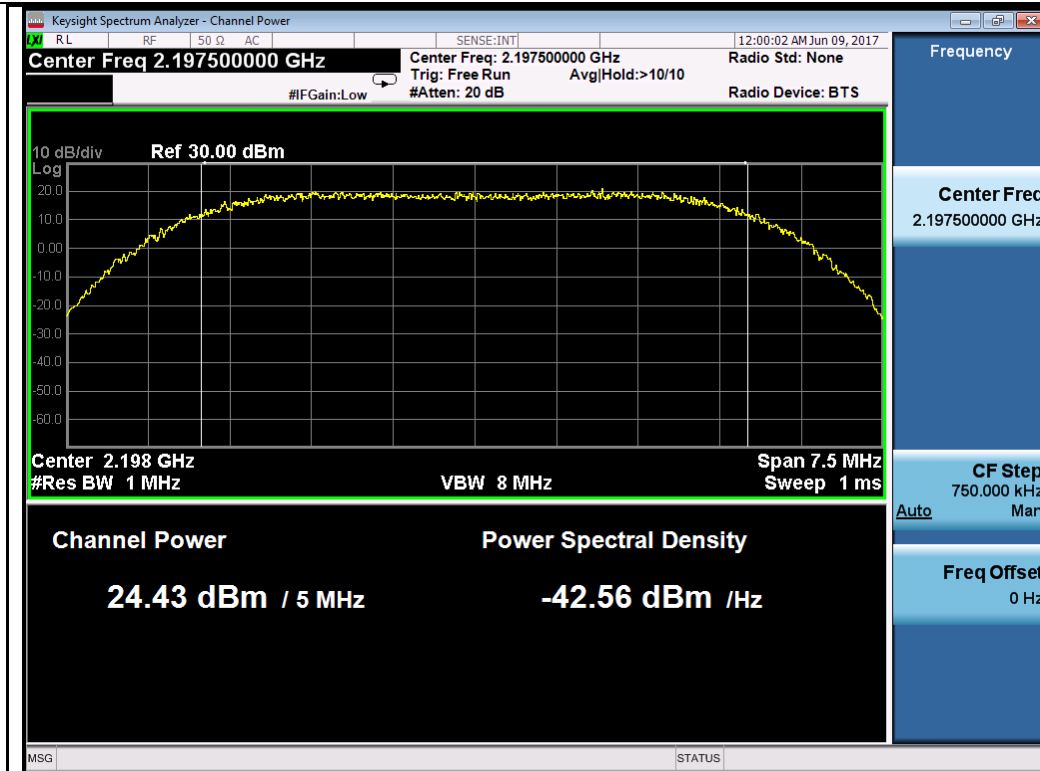
5M 64QAM High



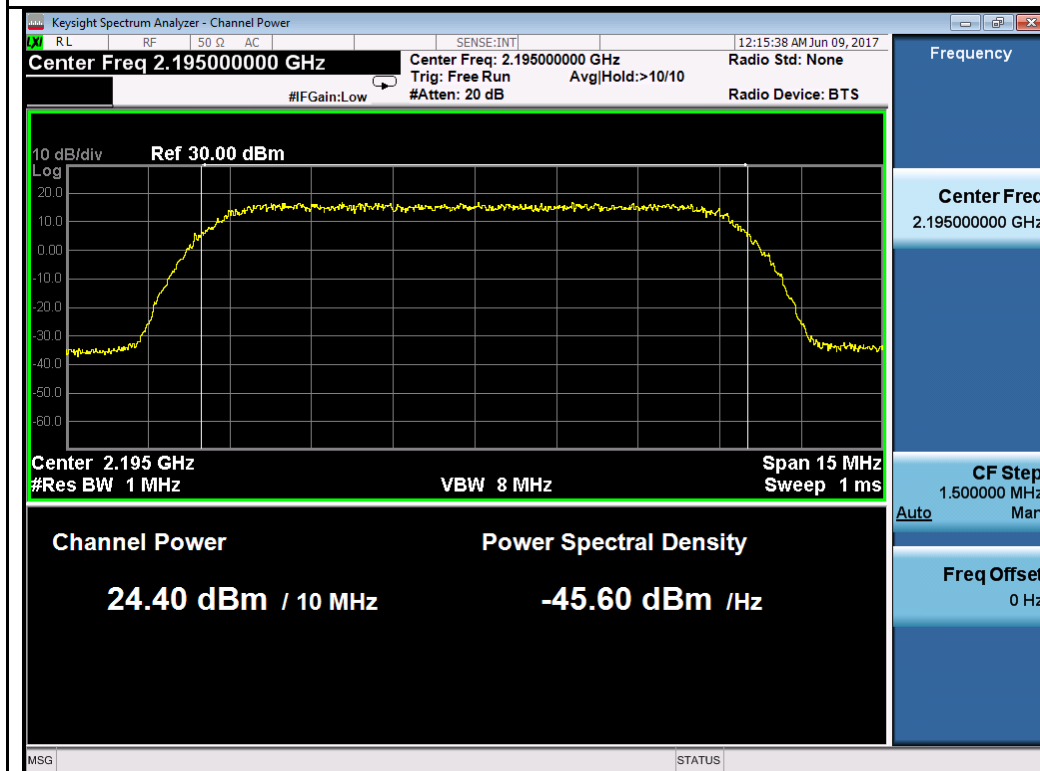
10M 64QAM High



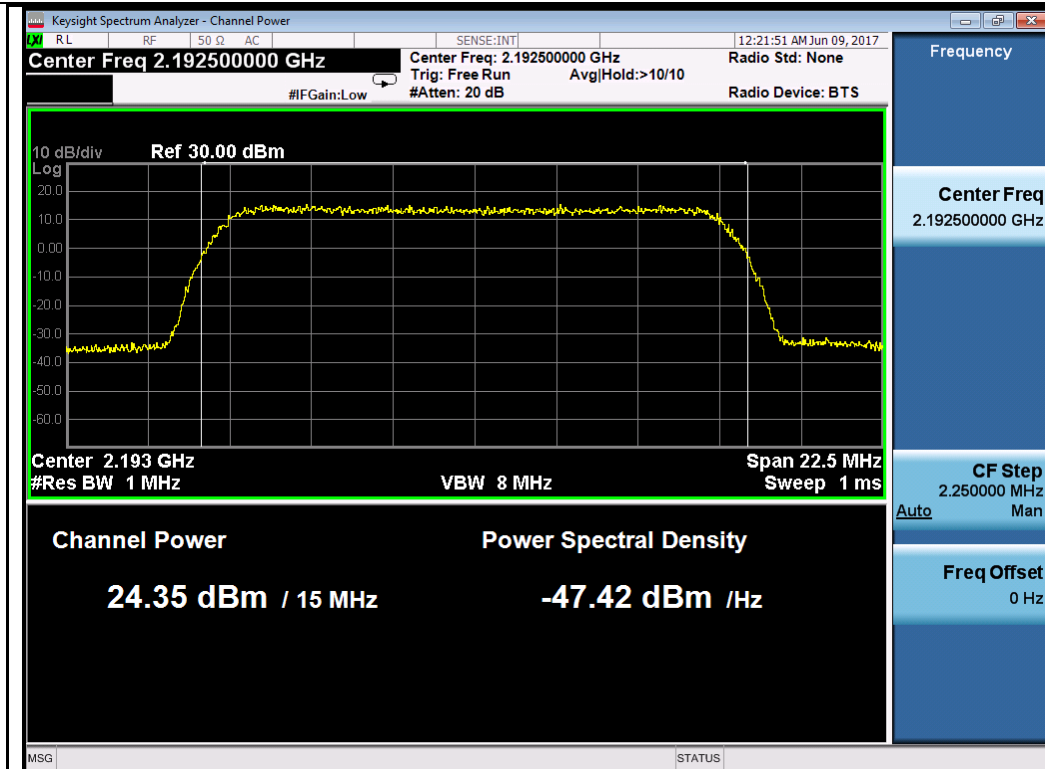
Chain2:



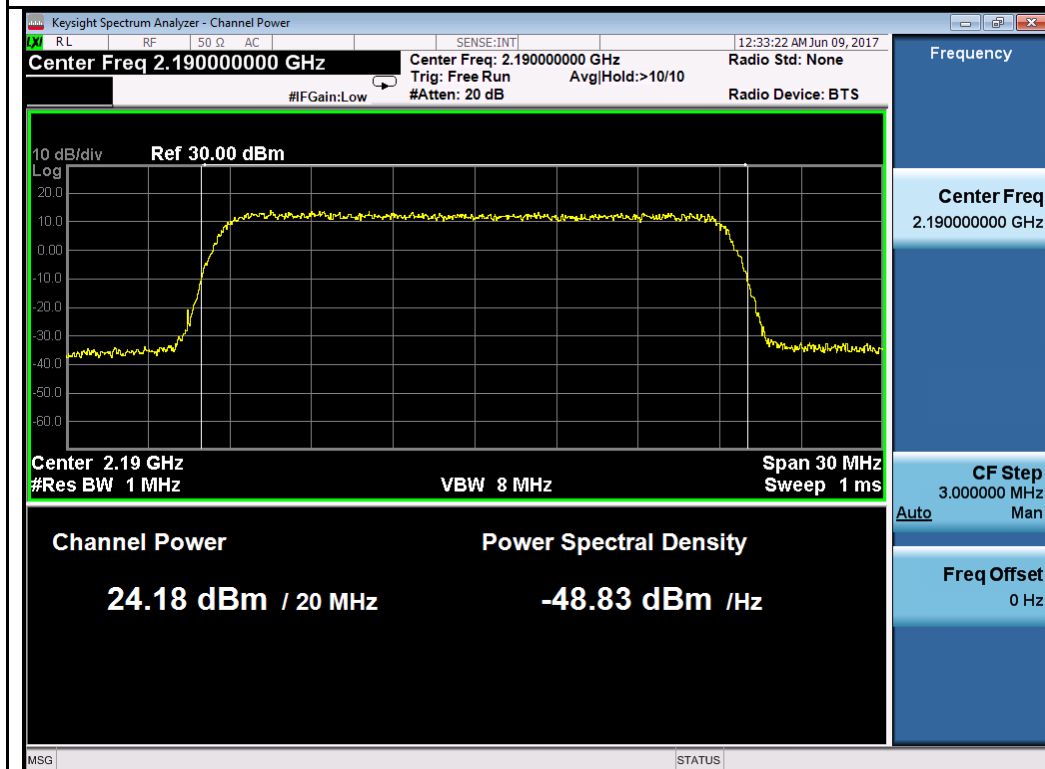
5M QPSK High



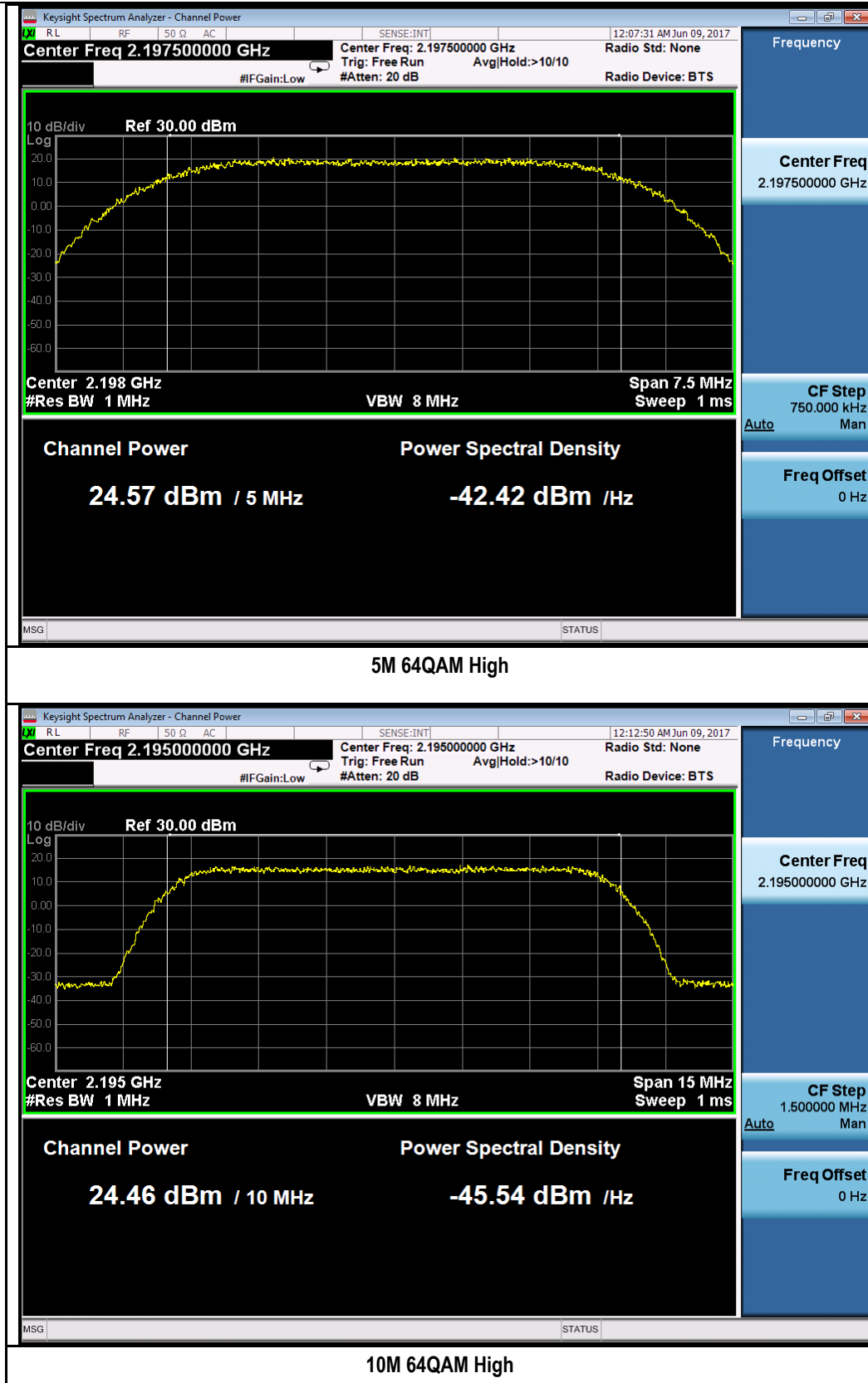
10M QPSK High

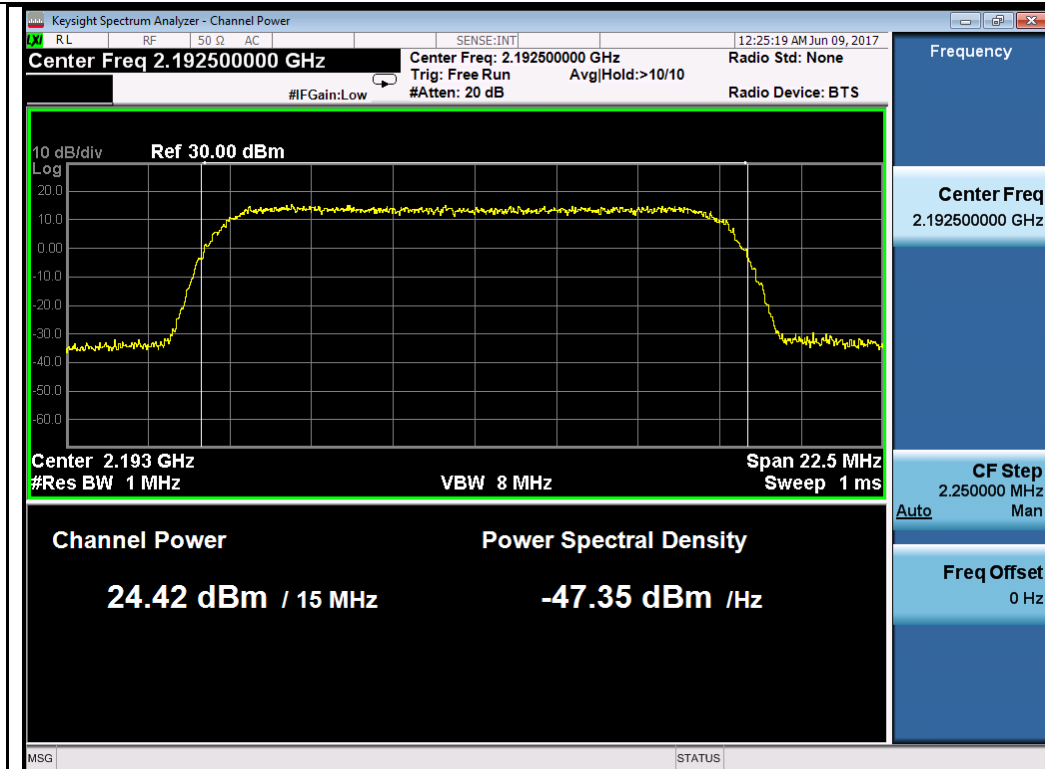


15M QPSK High

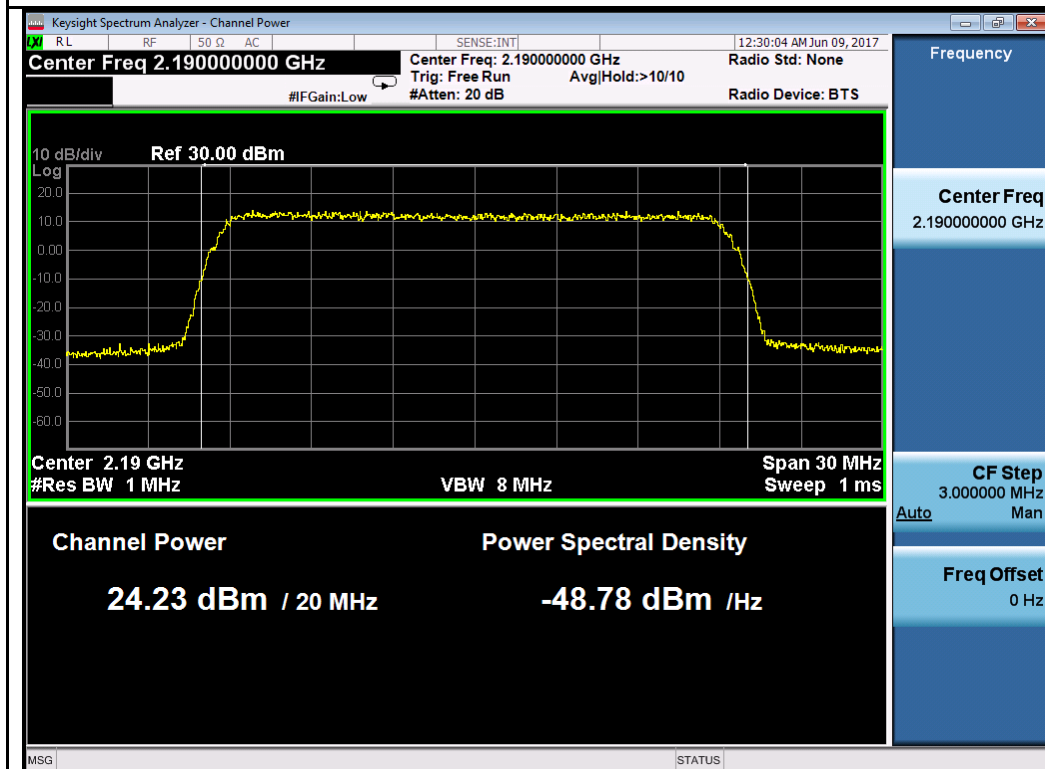


20M QPSK High





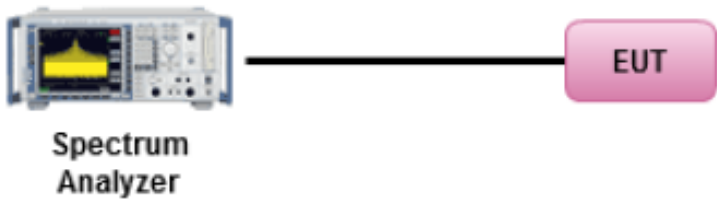
15M 64QAM High



20M 64QAM High

## 10.2 Peak-Average Ratio

### Requirement(s):

| Spec           | Item                                                                                                                                                                                                                | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Applicable                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 47CFR27.50     | (b)                                                                                                                                                                                                                 | The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission. | <input checked="" type="checkbox"/>                                        |
| Test Setup     |  <p>Spectrum Analyzer</p>                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |
| Test Procedure | <ul style="list-style-type: none"> <li>- EUT was set for low, mid, high channel with modulated mode and highest RF output power.</li> <li>- The spectrum analyzer was connected to the antenna terminal.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |
| Test Date      | 01/13/2017 – 06/09/2017                                                                                                                                                                                             | Environmental condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Temperature 23°C<br>Relative Humidity 48%<br>Atmospheric Pressure 1008mbar |
| Remark         | NONE                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |
| Result         | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |

Test Data    ☒ Yes                      ☐ N/A

Test Plot    ☒ Yes (See below)              ☐ N/A

Test was done by Chen Ge at RF Test Site.

Test Data for LTE band 4:

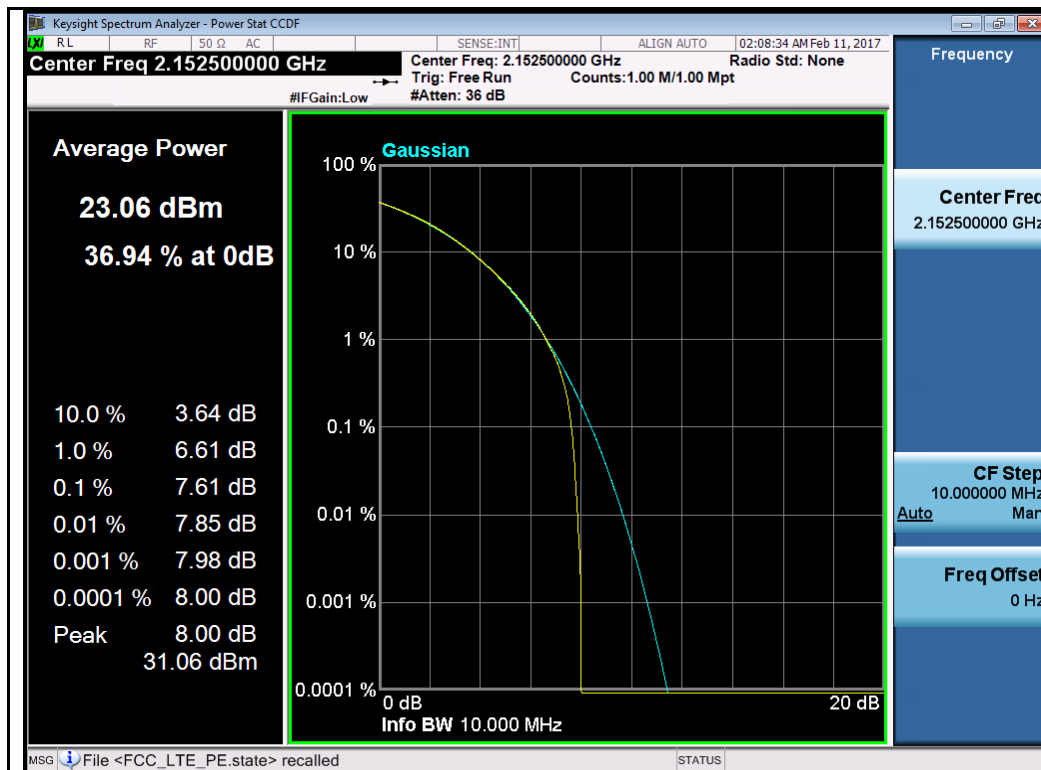
| Type            | Channel | Frequency (MHz) | Peak-Average Ratio (dB) | Peak-Average Ratio (dB) |
|-----------------|---------|-----------------|-------------------------|-------------------------|
| 5MHz BW, QPSK   | Low     | 2112.5          | 8.35                    | 13                      |
|                 | Mid     | 2132.5          | 8.15                    | 13                      |
|                 | High    | 2152.5          | 7.98                    | 13                      |
| 5MHz BW, 64QAM  | Low     | 2112.5          | 8.04                    | 13                      |
|                 | Mid     | 2132.5          | 8.05                    | 13                      |
|                 | High    | 2152.5          | 7.95                    | 13                      |
| 10MHz BW, QPSK  | Low     | 2115.0          | 7.83                    | 13                      |
|                 | Mid     | 2132.5          | 7.79                    | 13                      |
|                 | High    | 2150.0          | 7.79                    | 13                      |
| 10MHz BW, 64QAM | Low     | 2115.0          | 7.72                    | 13                      |
|                 | Mid     | 2132.5          | 7.64                    | 13                      |
|                 | High    | 2150.0          | 7.67                    | 13                      |
| 15MHz BW, QPSK  | Low     | 2117.5          | 9.24                    | 13                      |
|                 | Mid     | 2132.5          | 9.18                    | 13                      |
|                 | High    | 2147.5          | 9.27                    | 13                      |
| 15MHz BW, 64QAM | Low     | 2117.5          | 8.84                    | 13                      |
|                 | Mid     | 2132.5          | 8.43                    | 13                      |
|                 | High    | 2147.5          | 8.71                    | 13                      |
| 20MHz BW, QPSK  | Low     | 2120.0          | 9.78                    | 13                      |
|                 | Mid     | 2132.5          | 9.74                    | 13                      |
|                 | High    | 2145.0          | 9.74                    | 13                      |
| 20MHz BW, 64QAM | Low     | 2120.0          | 9.61                    | 13                      |
|                 | Mid     | 2132.5          | 9.79                    | 13                      |
|                 | High    | 2145.0          | 9.74                    | 13                      |

Test Data for LTE band 66:

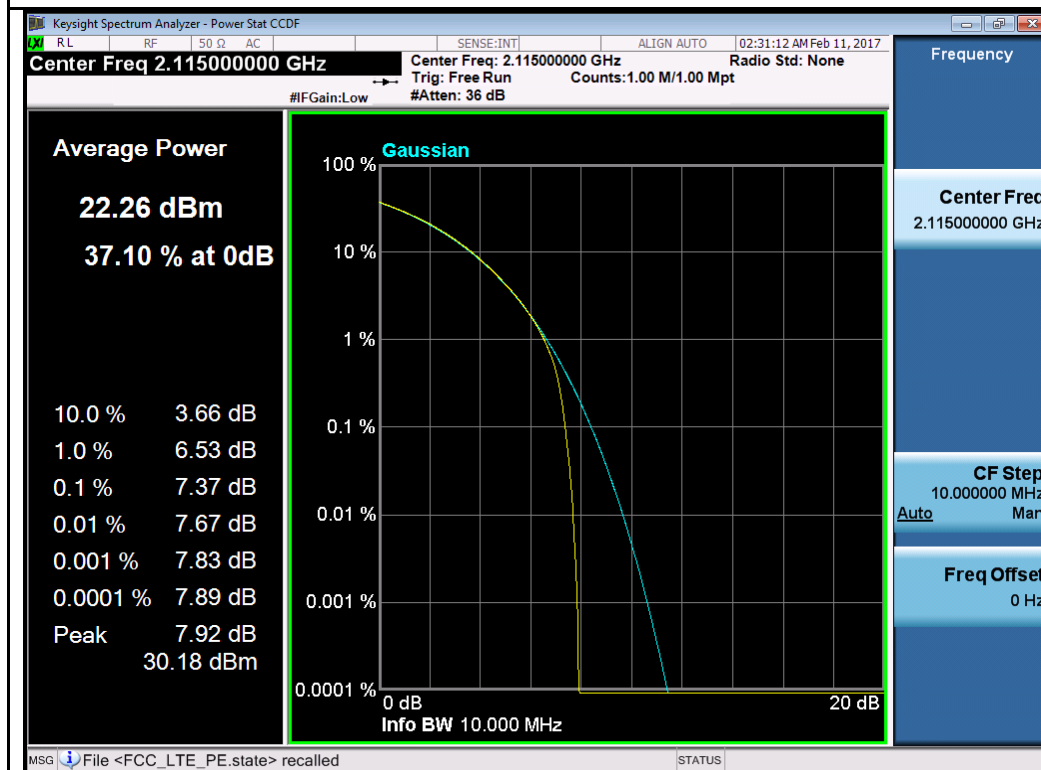
| Type            | Channel | Frequency (MHz) | Peak-Average Ratio (dB) | Peak-Average Ratio (dB) |
|-----------------|---------|-----------------|-------------------------|-------------------------|
| 5MHz BW, QPSK   | High    | 2197.5          | 8.08                    | 13                      |
| 5MHz BW, 64QAM  | High    | 2197.5          | 8.16                    | 13                      |
| 10MHz BW, QPSK  | High    | 2195            | 7.87                    | 13                      |
| 10MHz BW, 64QAM | High    | 2195            | 7.75                    | 13                      |
| 15MHz BW, QPSK  | High    | 2192.5          | 9.00                    | 13                      |
| 15MHz BW, 64QAM | High    | 2192.5          | 9.53                    | 13                      |
| 20MHz BW, QPSK  | High    | 2190            | 9.68                    | 13                      |
| 20MHz BW, 64QAM | High    | 2190            | 9.66                    | 13                      |

Test Plots for LTE band 4:



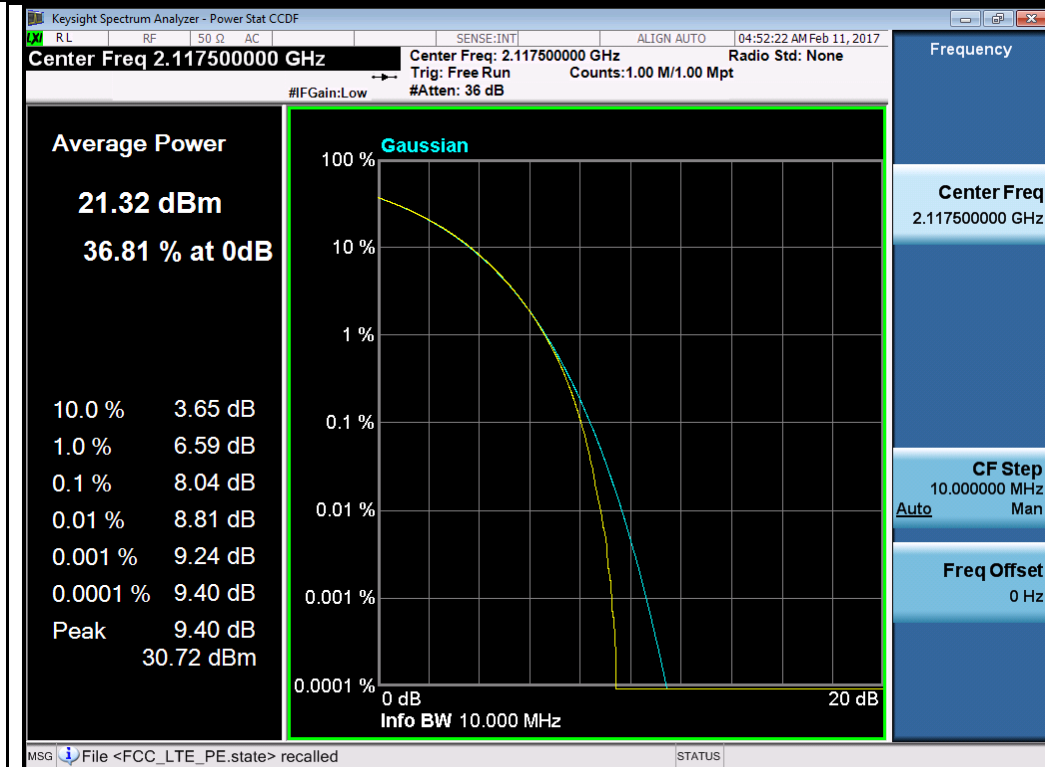


**BW 5M QPSK High**

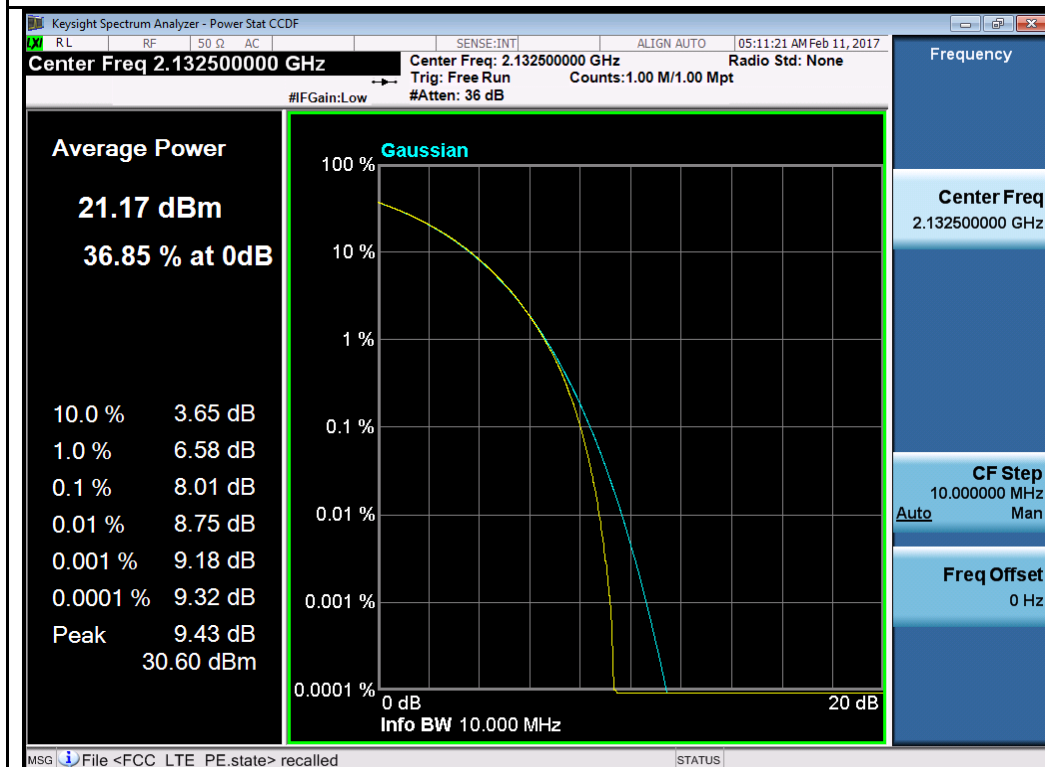


**BW 10M QPSK Low**





**BW 15M QPSK Low**



**BW 15M QPSK Mid**

