

# MEASUREMENT REPORT

## FCC PART 24 & 27 LTE

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**FCC ID:** 2AC6AC71

**APPLICANT:** Shenzhen Chainway Information Technology Co., Ltd.

**Application Type:** Certification

**Product:** Mobile Data Terminal

**Model No.:** C71


**Brand Name:** CHAINWAY

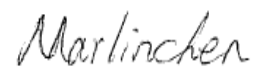
**FCC Classification:** PCS Licensed Transmitter Held to Ear (PCE)

**FCC Rule Part(s):** Part 2, Part 24 Subpart E, Part 27 Subpart L,  
Part 27 Subpart M

**Test Procedure(s):** ANSI/TIA-603-E-2016, KDB 971168 D01v03  
KDB 412172 D01v01r01

**Test Date:** October 31 ~ November 30, 2017

Reviewed By :   
( Kevin Guo )

Approved By :   
( Marlin Chen )



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

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## Revision History

| Report No.   | Version | Description    | Issue Date | Note  |
|--------------|---------|----------------|------------|-------|
| 1710RSU02707 | Rev. 01 | Initial report | 12-07-2017 | Valid |
|              |         |                |            |       |

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## §2.1033 General Information

|                                |   |
|--------------------------------|---|
| <b>Applicant:</b>              | Shenzhen Chainway Information Technology Co., Ltd.  |
| <b>Applicant Address:</b>      | 9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen, China                                    |
| <b>Manufacturer:</b>           | Shenzhen Chainway Information Technology Co., Ltd.  |
| <b>Manufacturer Address:</b>   | 9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen, China                                    |
| <b>Test Site:</b>              | MRT Technology (Suzhou) Co., Ltd  |
| <b>Test Site Address:</b>      | D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China  |
| <b>MRT Registration No.:</b>   | 893164  |
| <b>MRT designation No.:</b>    | CN1166  |
| <b>FCC Rule Part(s):</b>       | Part 2, Part 24 Subpart E, Part 27 Subpart L & M  |
| <b>Test Device Serial No.:</b> | N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering |
| <b>FCC Classification:</b>     | PCS Licensed Transmitter Held to Ear (PCE)  |

### Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



## 1. INTRODUCTION

### 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

### 1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

|                           |  |
|---------------------------|--|
| Product Name:             | Mobile Data Terminal   |
| Model No.:                | C71  |
| Brand Name:               | CHAINWAY   |
| Hardware Version:         | C70SEA_mb_v12  |
| Software Version:         | C71A_MT6735_V1.1_AM_GITDOOFOC3   |
| Wi-Fi Specification:      | 802.11a/b/g/n  |
| Bluetooth Version         | V4.0 single mode   |
| GSM Operation Band (s):   | GSM 850 / 900 / 1800 / 1900  |
| WCDMA Operation Band (s): | Band II / IV / V   |
| LTE Operation Band (s):   | FDD Band 2 / 4 / 7 / 12 / 17   |
| NFC:                      | 13.56MHz   |
| GPS:                      | 1575.42MHz   |
| <b>Components</b>         |  |
| Adapter                   | Model No.: GME 10D-050200FUu<br>Input Power: 100 - 240V ~ 50/60Hz, Max. 0.28A<br>Output Power: 5VDC 2.0A |

### 2.2. Product Specification Subjective to this Report

|                    |  |
|--------------------|--|
| Tx Frequency Range | LTE Band 2: 1850.7MHz ~ 1909.3MHz<br>LTE Band 4: 1710.7MHz ~ 1754.3MHz<br>LTE Band 7: 2502.5MHz ~ 2567.5MHz<br>LTE Band 12: 699.7MHz ~ 715.3MHz<br>LTE Band 17: 706.5MHz ~ 713.5MHz  |
| Rx Frequency Range | LTE Band 2: 1930.7MHz ~ 1989.3MHz<br>LTE Band 4: 2110.7MHz ~ 2154.3MHz<br>LTE Band 7: 2622.5MHz ~ 2687.5MHz<br>LTE Band 12: 729.0MHz ~ 745.9MHz<br>LTE Band 17: 734.0MHz ~ 745.9MHz  |
| Bandwidth          | LTE Band 2: 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz<br>LTE Band 4: 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz<br>LTE Band 7: 5MHz / 10MHz / 15MHz / 20MHz<br>LTE Band 12: 1.4MHz / 3MHz / 5MHz / 10MHz<br>LTE Band 17: 5MHz / 10MHz |
| Type of Modulation | QPSK / 16-QAM  |

### 2.3. Description of Available Antennas

| Antenna Type                      | Frequency Band   | Max Peak Gain (dBi) |
|-----------------------------------|------------------|---------------------|
| <b>GPS Internal Antenna</b>       |                  |                     |
| PIFA                              | 1575.42MHz       | 0.92                |
| <b>2G Internal Antenna</b>        |                  |                     |
| PIFA                              | GSM850           | -0.72               |
|                                   | GSM1900          | -0.29               |
| <b>3G Internal Antenna</b>        |                  |                     |
| PIFA                              | WCDMA Band II    | 0.40                |
|                                   | WCDMA Band IV    | 0.30                |
|                                   | WCDMA Band V     | 0.21                |
| <b>4G Internal Antenna</b>        |                  |                     |
| PIFA                              | FDD-LTE Band 2   | -0.76               |
|                                   | FDD-LTE Band 4   | -0.52               |
|                                   | FDD-LTE Band 7   | -0.43               |
|                                   | FDD-LTE Band 12  | -0.28               |
|                                   | FDD-LTE Band 17  | -0.72               |
| <b>Wi-Fi Internal Antenna</b>     |                  |                     |
| PIFA                              | 2400 ~ 2483.5MHz | 0.44                |
|                                   | 5150 ~ 5250MHz   | 0.49                |
|                                   | 5250 ~ 5350MHz   | 0.52                |
|                                   | 5725 ~ 5850MHz   | 0.50                |
| <b>Bluetooth Internal Antenna</b> |                  |                     |
| PIFA                              | 2400 ~ 2483.5MHz | 0.50                |
| <b>NFC Internal Antenna</b>       |                  |                     |
| PIFA                              | 13.56MHz         | 1.10                |



## 2.4. Device Capabilities

This device contains the following capabilities:

GSM 850/900/1800/1900, WCDMA Band II/IV/V, LTE FDD Band 2/4/7/12/17, 2.4GHz WLAN (DTS), 5GHz WLAN (UNII), Bluetooth (v4.0 single mode), NFC

## 2.5. Test Configuration

The **Mobile Data Terminal** was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01v03. See section 3.0 of this report for a description of the radiated and antenna port conducted emissions tests.

## 2.6. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

## 2.7. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

### **3. DESCRIPTION OF TEST**

#### **3.1. Evaluation Procedure**

The measurement procedures described in the “Land Mobile FM or PM - Communications Equipment - Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168) were used in the measurement of the **Mobile Data Terminal**.

**Deviation from measurement procedure.....None**

#### **3.2. Occupied Bandwidth**

##### **§2.1049**

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The spectrum analyzers’ “occupied bandwidth” measurement function was used to record the occupied bandwidth in accordance with KDB 971168.

#### **3.3. Spurious and Harmonic Emissions at Antenna Terminal**

##### **§2.1051 §24.238(a) §27.53(g) §27.53(h) §27.53(m)**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. On any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz or greater for Part 24 and Part 27. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

### 3.4. Radiated Power and Radiated Spurious Emissions

#### §2.1053 §24.232(c) §24.238(a) § 27.50(c.10) (d.4)(h.2) § 27.53(g) (h) (m)

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurement and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 80cm high PVC support structure is placed on top of the turntable.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss} \text{ [dB]} + \text{antenna gain} \text{ [dBd/dBi]}$$

Where,  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to  $P_g \text{ [dBm]} - \text{cable loss} \text{ [dB]}$ .

The calculated  $P_d$  levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of  $43 + 10 \cdot \log_{10}(\text{Power [Watts]})$ .

#### 4. TEST EQUIPMENT CALIBRATION DATE

##### Radiated Emissions - AC2

| Instrument                          | Manufacturer | Type No.    | Asset No.   | Cali. Interval | Cali. Due Date |
|-------------------------------------|--------------|-------------|-------------|----------------|----------------|
| MXE EMI Receiver                    | Agilent      | N9038A      | MRTSUE06125 | 1 year         | 2018/08/18     |
| EMI Test Receiver                   | R&S          | ESR7        | MRTSUE06001 | 1 year         | 2018/08/18     |
| Radio Communication Tester          | R&S          | CMU 200     | MRTSUE06009 | 1 year         | 2018/10/27     |
| Wideband Radio Communication Tester | R&S          | CMW 500     | MRTSUE06243 | 1 year         | 2018/02/14     |
| Preamplifier                        | Schwarzbeck  | BBV 9721    | MRTSUE06121 | 1 year         | 2018/04/15     |
| Loop Antenna                        | Schwarzbeck  | FMZB1519    | MRTSUE06025 | 1 year         | 2018/11/21     |
| Bilog Period Antenna                | Schwarzbeck  | VULB9162    | MRTSUE06022 | 1 year         | 2018/10/21     |
| Broad-Band Horn Antenna             | Schwarzbeck  | BBHA9120D   | MRTSUE06171 | 1 year         | 2018/11/18     |
| Broadband Horn Antenna              | Schwarzbeck  | BBHA9170    | MRTSUE06024 | 1 year         | 2018/01/04     |
| Digital Thermometer & Hygrometer    | Minggao      | ETH529      | MRTSUE06170 | 1 year         | 2017/11/30     |
| Anechoic Chamber                    | RIKEN        | Chamber-AC2 | MRTSUE06213 | 1 year         | 2018/05/10     |

##### Conducted Test Equipment - TR3

| Instrument                                  | Manufacturer | Type No.  | Asset No.   | Cali. Interval | Cali. Due Date |
|---|--------------|-----------|-------------|----------------|----------------|
| Spectrum Analyzer                           | Agilent      | N9020A    | MRTSUE06106 | 1 year         | 2018/04/25     |
| Radio Communication Tester                  | R&S          | CMU 200   | MRTSUE06009 | 1 year         | 2018/10/27     |
| Wideband Radio Communication Tester         | R&S          | CMW 500   | MRTSUE06243 | 1 year         | 2018/02/14     |
| DC Power Supply                             | GWINSTEK     | DPS-3303C | MRTSUE06064 | N/A            | N/A            |
| Programmable Temperature & Humidity Chamber | BAOYT        | BYH-1500L | MRTSUE06051 | 1 year         | 2017/12/06     |
| Temperature/Humidity Meter                  | Yuhuaze      | HTC-2     | MRTSUE06180 | 1 year         | 2017/12/20     |

| Software | Version | Function          |
|----------|---------|-------------------|
| e3       | V8.3.5  | EMI Test Software |

## 5. SAMPLE CALCULATIONS

### **QPSK Emission Designator**

Emission Designator = 250KGXW

LTE BW = 250 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

### **16-QAM Emission Designator**

Emission Designator = 250KG7W

LTE BW = 250 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

### **Spurious Radiated Emission**

Example: Mid. CHLTE Mode 2<sup>nd</sup> Harmonic (1564 MHz)

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0dBm.

The gain of the substituted antenna is 8.1dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564MHz. So 6.1 dB is added to the signal generator reading of -30.9dBm yielding -24.80dBm. The fundamental EIRP was 25.50dBm so this harmonic was 25.50dBm - (-24.80).

## 6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

|  |
|--|
| <b>AC Conducted Emission Measurement - SR2</b>   |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ ):<br>150kHz~30MHz: 3.46dB                        |
| <b>Radiated Emission Measurement - AC2</b>   |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ ):<br>9kHz ~ 1GHz: 4.18dB<br>1GHz ~ 25GHz: 4.76dB |

## 7. TEST RESULT

### 7.1. Summary

**Company Name:** Shenzhen Chainway Information Technology Co., Ltd.  
**FCC ID:** 2AC6AC71  
**FCC Classification:** PCS Licensed Transmitter Held to Ear (PCE)  
**Mode(s):** LTE

| FCC Part Section(s)                      | Test Description  | Test Limit  | Test Condition | Test Result | Reference   |
|--|---|---|----------------|-------------|-------------|
| 2.1049                                   | Occupied bandwidth  | N/A   | Conducted      | Pass        | Section 7.2 |
| 2.1051 & 24.238(a) & 27.53(g) & 27.53(h) | Band Edge / Conducted Spurious Emissions (Band 2 & 4 & 12 & 17) | $> 43 + \log_{10} (P[\text{Watts}])$ at Band Edge and for all out-of-band emissions |                | Pass        | Section 7.3 |
| 27.53(m)(4)                              | Band Edge / Conducted Spurious Emissions (Band 7)               | $> 55 + \log_{10} (P[\text{Watts}])$ at Band Edge and for all out-of-band emissions |                | Pass        | Section 7.4 |
| 24.232(d)                                | Peak-Average Ratio  | $< 13$ dB   |                | Pass        | Section 7.5 |
| 2.1046                                   | Transmitter Conducted Output Power                              | N/A   |                | Section 7.6 | Pass        |
| 27.50(c)(10)                             | Effective Radiated Power (Band 12 & 17)                         | $< 3$ Watts max. ERP  |                |             | Pass        |
| 24.232(c), 27.50(h)(2)                   | Equivalent Isotropic Radiated Power (Band 2 & 7)                | $< 2$ Watts max. EIRP   |                |             | Pass        |
| 27.50(d)(4)                              | Equivalent Isotropic Radiated Power (Band 4)                    | $< 1$ Watts max. EIRP   |                |             | Pass        |
| 2.1055 & 24.235 & 27.54                  | Frequency Stability   | fundamental emissions stay within authorized frequency block (Part 24, 27)          |                |             | Pass        |
| 2.1053, 24.238(a), 27.53(g), 27.53(h)    | Undesirable Emissions (Band 2 & 4 & 12 & 17)                    | $> 43 + \log_{10} (P[\text{Watts}])$ for all out-of-band emissions                  | Radiated       | Pass        | Section 7.7 |
| 2.1053, 27.53(m)(4)                      | Undesirable Emissions (Band 7)                                  | $> 55 + \log_{10} (P[\text{Watts}])$ for all out-of-band emissions                  |                |             |             |

**Notes:**

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. The analyzer plots shown in Section 7.2, 7.3, 7.4, 7.5 were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3. All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulation in exploratory test. Subsequently, only the worst case data are reported.





**7.2.5. Test Result**

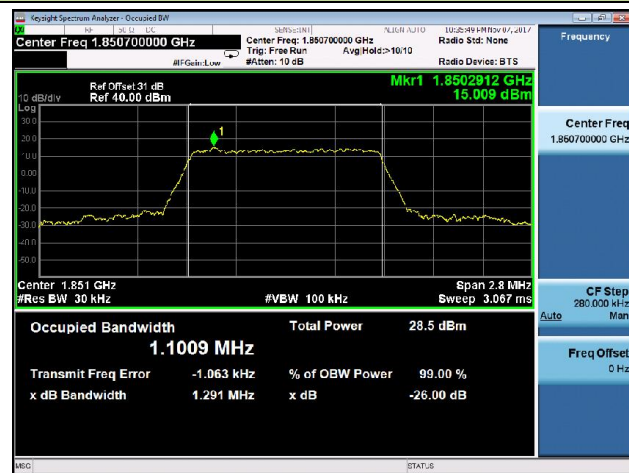
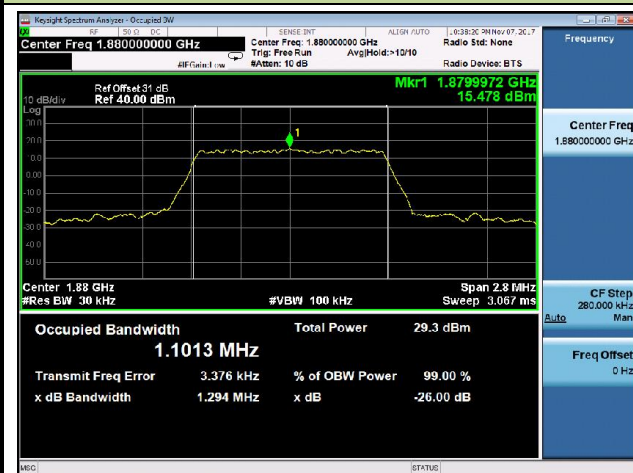
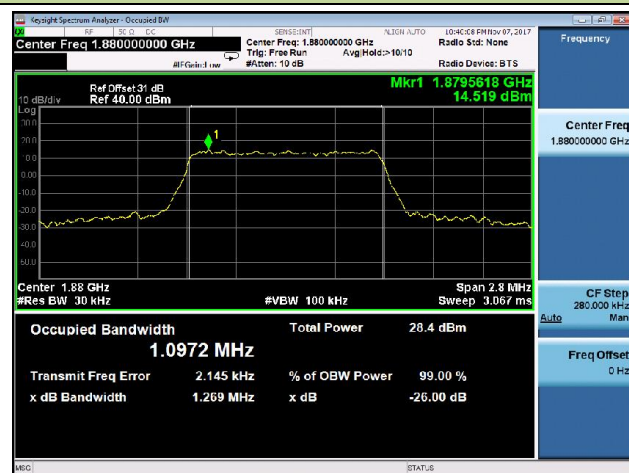
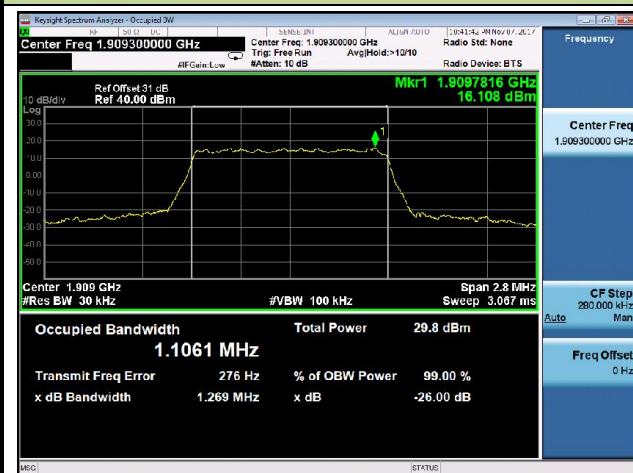
|               |                      |                   |            |
|---------------|----------------------|-------------------|------------|
| Product       | Mobile Data Terminal | Temperature       | 25°C       |
| Test Engineer | Milo Li              | Relative Humidity | 52%        |
| Test Site     | TR3                  | Test Date         | 2017/11/07 |

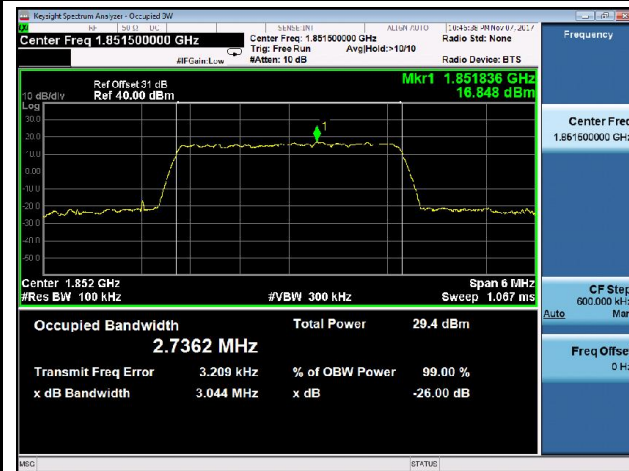
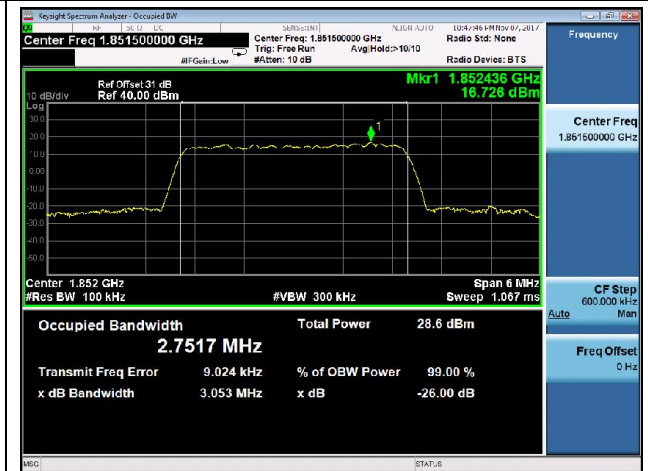
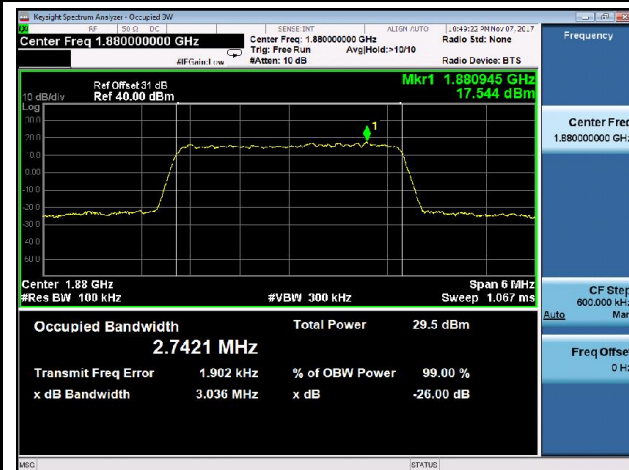
| LTE Band 2 99% Occupied Bandwidth (MHz)  |        |        |      |        |      |        |       |        |       |        |       |        |
|--|--------|--------|------|--------|------|--------|-------|--------|-------|--------|-------|--------|
| BW                                       | 1.4MHz |        | 3MHz |        | 5MHz |        | 10MHz |        | 15MHz |        | 20MHz |        |
| Mod.                                     | QPSK   | 16-QAM | QPSK | 16-QAM | QPSK | 16-QAM | QPSK  | 16-QAM | QPSK  | 16-QAM | QPSK  | 16-QAM |
| Low CH                                   | 1.10   | 1.10   | 2.74 | 2.75   | 4.54 | 4.52   | 9.02  | 9.04   | 13.50 | 13.49  | 17.96 | 18.00  |
| Mid. CH                                  | 1.10   | 1.10   | 2.74 | 2.73   | 4.52 | 4.54   | 9.05  | 9.05   | 13.46 | 13.50  | 17.96 | 17.98  |
| High CH                                  | 1.11   | 1.10   | 2.74 | 2.73   | 4.52 | 4.55   | 9.06  | 9.04   | 13.48 | 13.49  | 17.98 | 17.95  |
| LTE Band 4 99% Occupied Bandwidth (MHz)  |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                   | 1.10   | 1.10   | 2.74 | 2.75   | 4.53 | 4.52   | 9.06  | 9.06   | 13.51 | 13.49  | 17.97 | 18.01  |
| Mid. CH                                  | 1.10   | 1.10   | 2.74 | 2.73   | 4.52 | 4.54   | 9.03  | 9.04   | 13.46 | 13.50  | 17.97 | 17.98  |
| High CH                                  | 1.11   | 1.10   | 2.74 | 2.73   | 4.51 | 4.55   | 9.07  | 9.05   | 13.49 | 13.50  | 17.99 | 17.96  |
| LTE Band 7 99% Occupied Bandwidth (MHz)  |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                   | -      | -      | -    | -      | 4.53 | 4.52   | 9.06  | 9.07   | 13.51 | 13.51  | 17.97 | 18.02  |
| Mid. CH                                  | -      | -      | -    | -      | 4.52 | 4.54   | 9.02  | 9.05   | 13.46 | 13.50  | 17.97 | 17.98  |
| High CH                                  | -      | -      | -    | -      | 4.52 | 4.55   | 9.07  | 9.05   | 13.49 | 13.49  | 17.90 | 17.95  |
| LTE Band 12 99% Occupied Bandwidth (MHz) |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                   | 1.10   | 1.11   | 2.75 | 2.77   | 4.55 | 4.53   | 9.11  | 9.09   | -     | -      | -     | -      |
| Mid. CH                                  | 1.10   | 1.10   | 2.74 | 2.73   | 4.53 | 4.52   | 9.03  | 9.05   | -     | -      | -     | -      |
| High CH                                  | 1.11   | 1.10   | 2.74 | 2.74   | 4.53 | 4.56   | 9.05  | 9.04   | -     | -      | -     | -      |
| LTE Band 17 99% Occupied Bandwidth (MHz) |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                   | -      | -      | -    | -      | 4.54 | 4.52   | 9.02  | 9.03   | -     | -      | -     | -      |
| Mid. CH                                  | -      | -      | -    | -      | 4.52 | 4.54   | 9.04  | 9.04   | -     | -      | -     | -      |
| High CH                                  | -      | -      | -    | -      | 4.53 | 4.57   | 9.06  | 9.05   | -     | -      | -     | -      |

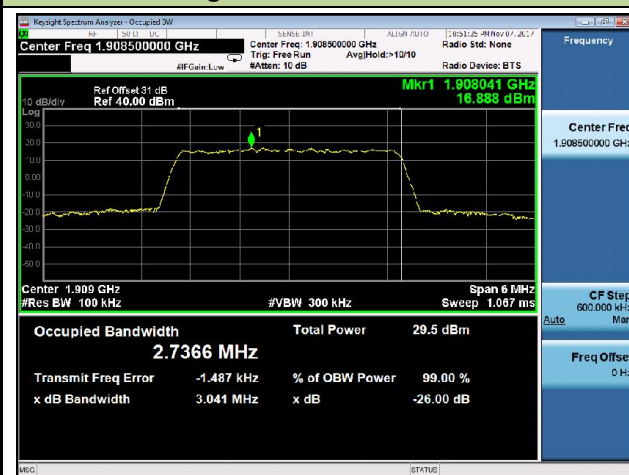
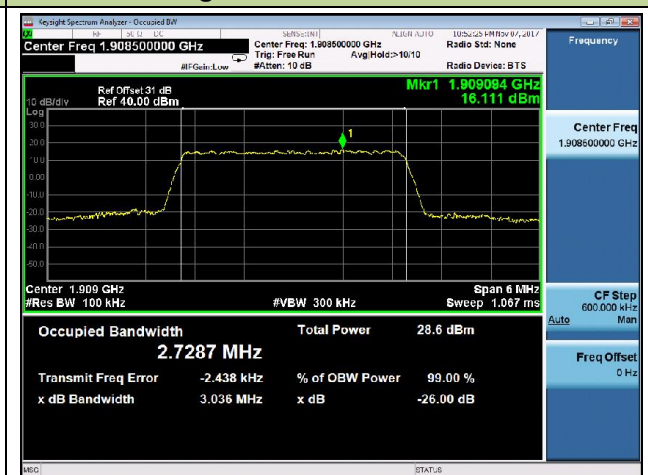


| LTE Band 2 26dB Occupied Bandwidth (MHz)  |        |        |      |        |      |        |       |        |       |        |       |        |
|---|--------|--------|------|--------|------|--------|-------|--------|-------|--------|-------|--------|
| BW  | 1.4MHz |        | 3MHz |        | 5MHz |        | 10MHz |        | 15MHz |        | 20MHz |        |
| Mod.                                      | QPSK   | 16-QAM | QPSK | 16-QAM | QPSK | 16-QAM | QPSK  | 16-QAM | QPSK  | 16-QAM | QPSK  | 16-QAM |
| Low CH                                    | 1.27   | 1.29   | 3.04 | 3.05   | 5.07 | 5.07   | 10.19 | 10.09  | 14.93 | 14.85  | 19.51 | 19.59  |
| Mid. CH                                   | 1.29   | 1.27   | 3.04 | 3.05   | 5.09 | 5.08   | 11.00 | 10.11  | 14.84 | 14.84  | 19.61 | 19.75  |
| High CH                                   | 1.27   | 1.27   | 3.04 | 3.04   | 5.08 | 5.09   | 10.19 | 10.11  | 14.97 | 14.88  | 19.79 | 19.64  |
| LTE Band 4 26dB Occupied Bandwidth (MHz)  |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                    | 1.27   | 1.29   | 3.06 | 3.06   | 5.08 | 5.07   | 10.24 | 10.07  | 14.97 | 14.87  | 19.56 | 19.63  |
| Mid. CH                                   | 1.29   | 1.26   | 3.03 | 3.04   | 5.14 | 5.08   | 10.11 | 10.10  | 14.89 | 14.87  | 19.57 | 19.68  |
| High CH                                   | 1.27   | 1.27   | 3.05 | 3.05   | 5.07 | 5.11   | 10.19 | 10.14  | 15.00 | 14.93  | 19.80 | 19.61  |
| LTE Band 7 26dB Occupied Bandwidth (MHz)  |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                    | -      | -      | -    | -      | 5.08 | 5.07   | 10.22 | 10.10  | 14.91 | 14.85  | 19.57 | 19.68  |
| Mid. CH                                   | -      | -      | -    | -      | 5.10 | 5.06   | 10.10 | 10.10  | 14.87 | 14.84  | 19.57 | 19.80  |
| High CH                                   | -      | -      | -    | -      | 5.07 | 5.10   | 10.19 | 10.13  | 14.96 | 14.83  | 19.76 | 19.62  |
| LTE Band 12 26dB Occupied Bandwidth (MHz) |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                    | 1.31   | 1.29   | 3.07 | 3.08   | 5.09 | 5.09   | 10.28 | 10.13  | -     | -      | -     | -      |
| Mid. CH                                   | 1.29   | 1.26   | 3.03 | 3.04   | 5.07 | 5.07   | 10.15 | 10.07  | -     | -      | -     | -      |
| High CH                                   | 1.27   | 1.27   | 3.05 | 3.06   | 5.11 | 5.07   | 10.13 | 10.10  | -     | -      | -     | -      |
| LTE Band 17 26dB Occupied Bandwidth (MHz) |        |        |      |        |      |        |       |        |       |        |       |        |
| Low CH                                    | -      | -      | -    | -      | 5.07 | 5.07   | 10.04 | 10.13  | -     | -      | -     | -      |
| Mid. CH                                   | -      | -      | -    | -      | 5.09 | 5.06   | 10.20 | 10.02  | -     | -      | -     | -      |
| High CH                                   | -      | -      | -    | -      | 5.13 | 5.11   | 10.21 | 10.10  | -     | -      | -     | -      |

**LTE Band 2 99% & 26dB Occupied Bandwidth**
**Low CH / 1.4MHz / QPSK**

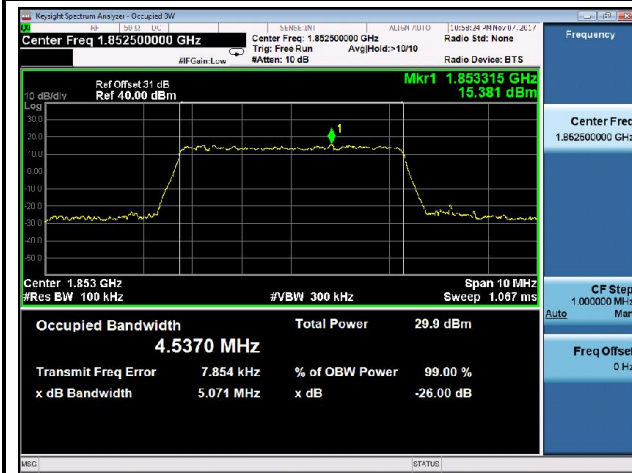
**Low CH / 1.4MHz / 16-QAM**

**Mid. CH / 1.4MHz / QPSK**

**Mid. CH / 1.4MHz / 16-QAM**

**High CH / 1.4MHz / QPSK**

**High CH / 1.4MHz / 16-QAM**


**LTE Band 2 99% & 26dB Occupied Bandwidth**
**Low CH / 3MHz / QPSK**

**Low CH / 3MHz / 16-QAM**

**Mid. CH / 3MHz / QPSK**

**Mid. CH / 3MHz / 16-QAM**

**High CH / 3MHz / QPSK**

**High CH / 3MHz / 16-QAM**


### LTE Band 2 99% & 26dB Occupied Bandwidth

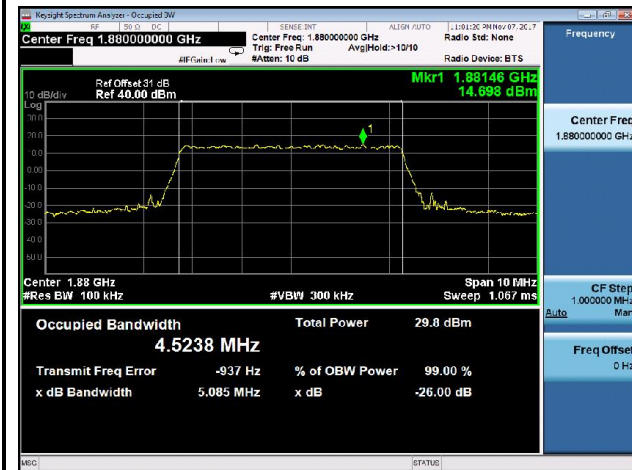
#### Low CH / 5MHz / QPSK



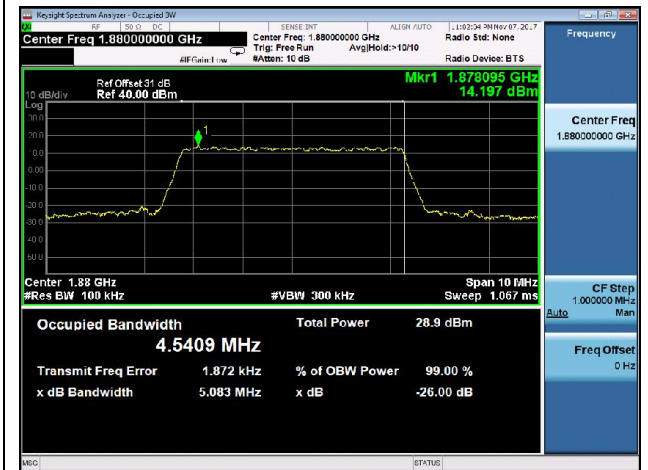
#### Low CH / 5MHz / 16-QAM



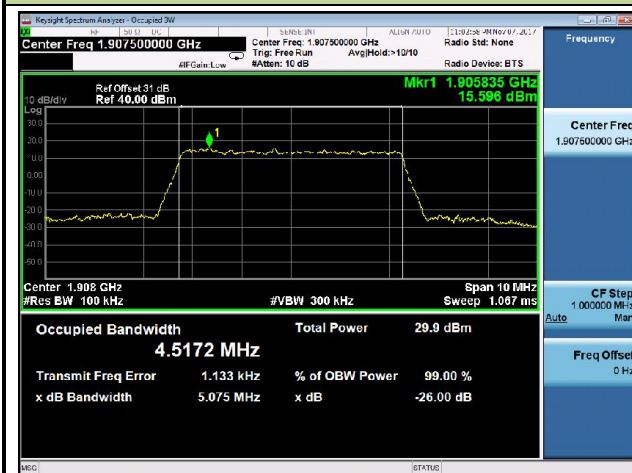
#### Mid. CH / 5MHz / QPSK



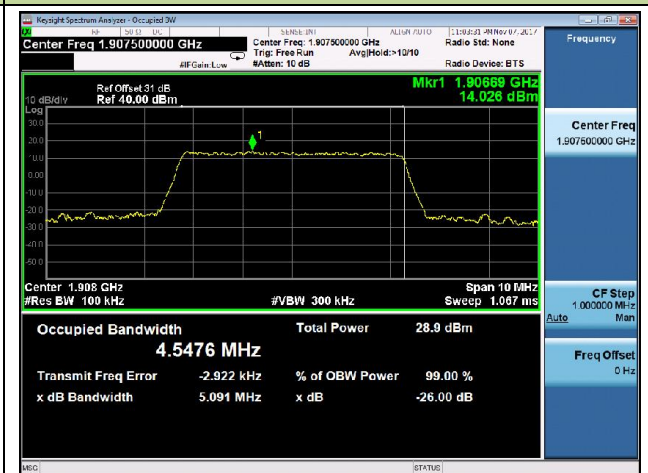
#### Mid. CH / 5MHz / 16-QAM



#### High CH / 5MHz / QPSK

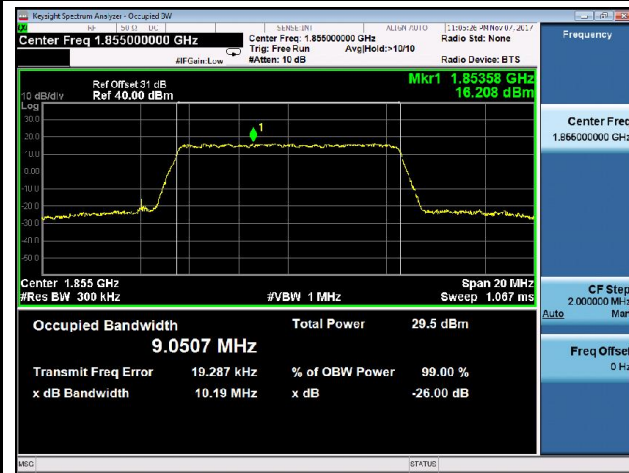


#### High CH / 5MHz / 16-QAM



### LTE Band 2 99% & 26dB Occupied Bandwidth

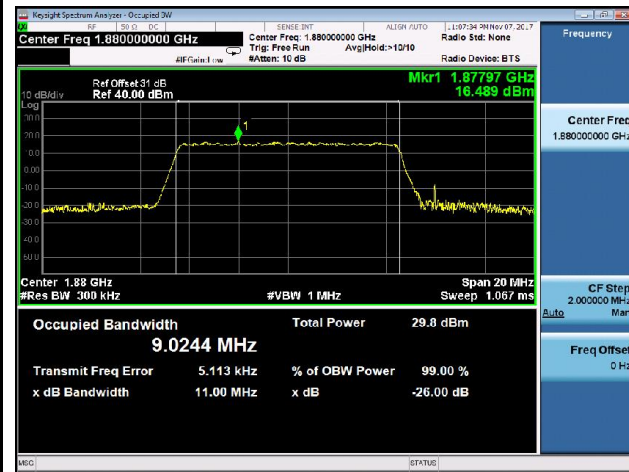
#### Low CH / 10MHz / QPSK



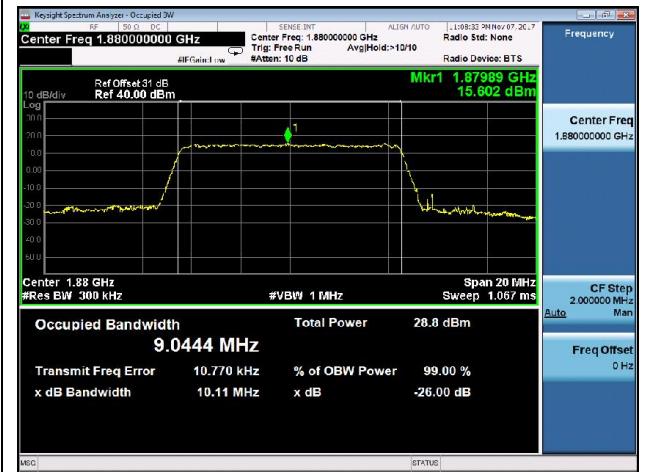
#### Low CH / 10MHz / 16-QAM



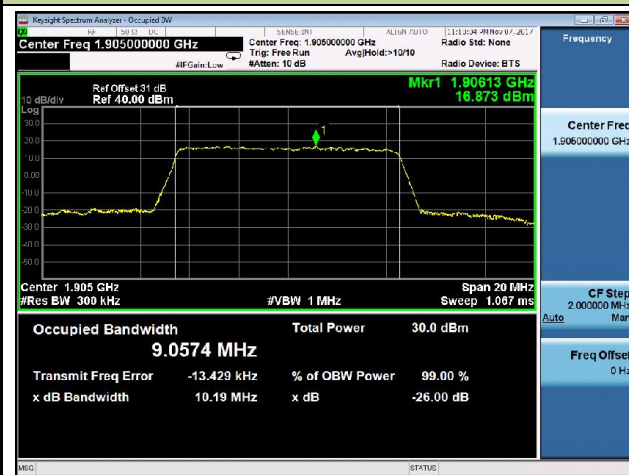
#### Mid. CH / 10MHz / QPSK



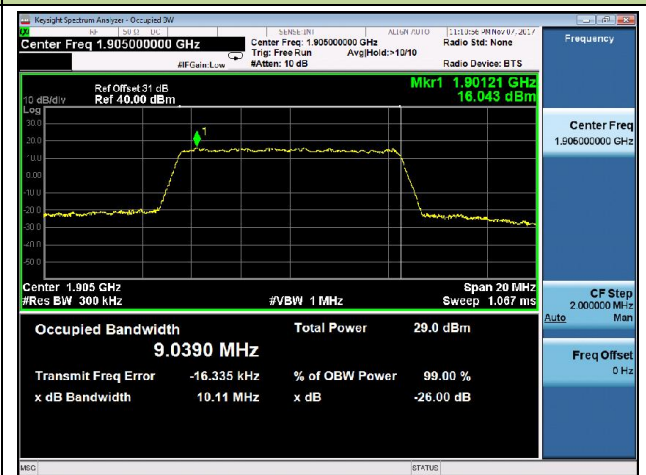
#### Mid. CH / 10MHz / 16-QAM



#### High CH / 10MHz / QPSK

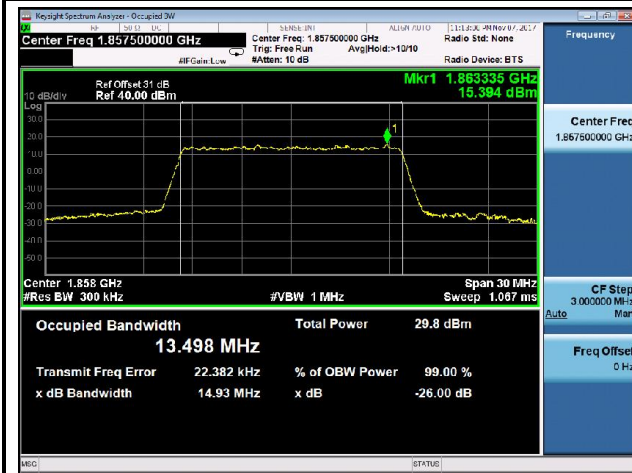


#### High CH / 10MHz / 16-QAM

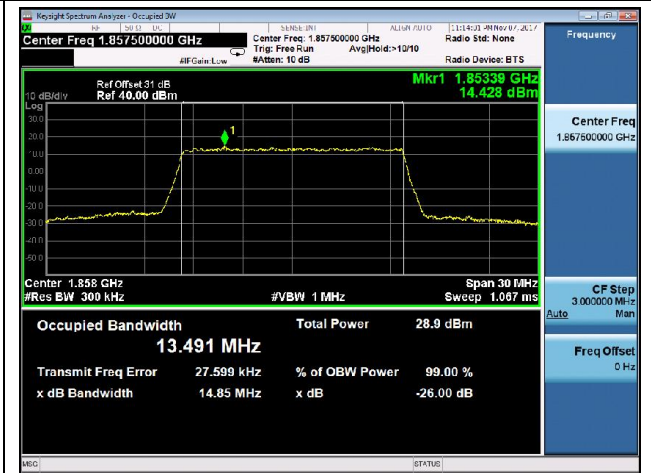


### LTE Band 2 99% & 26dB Occupied Bandwidth

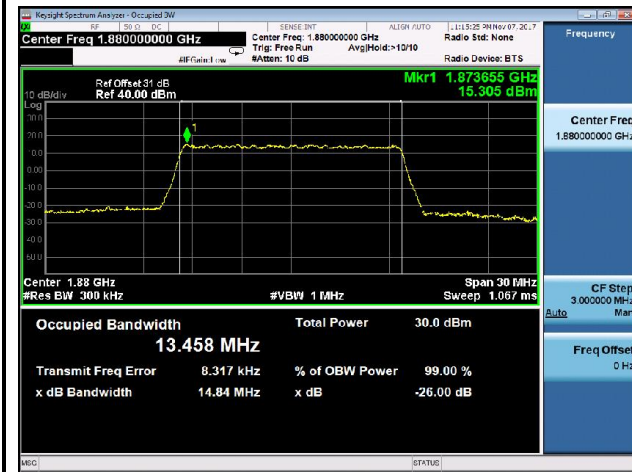
#### Low CH / 15MHz / QPSK



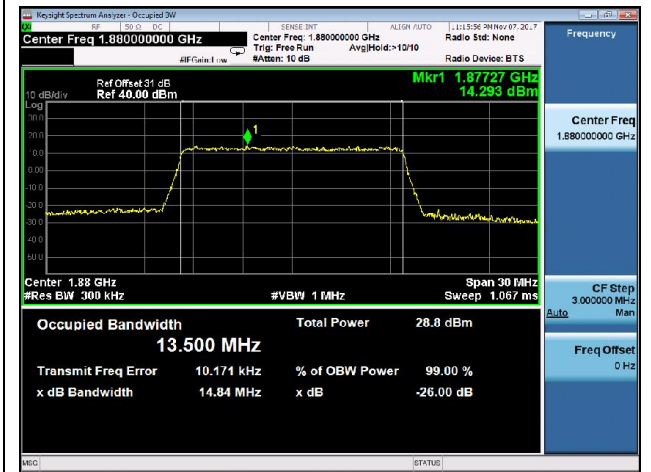
#### Low CH / 15MHz / 16-QAM



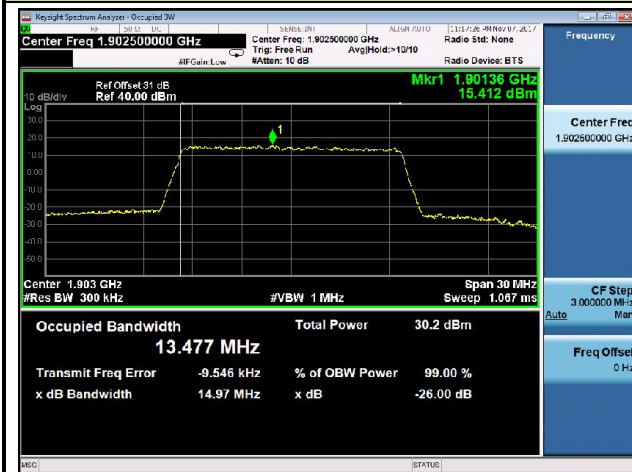
#### Mid. CH / 15MHz / QPSK



#### Mid. CH / 15MHz / 16-QAM



#### High CH / 15MHz / QPSK



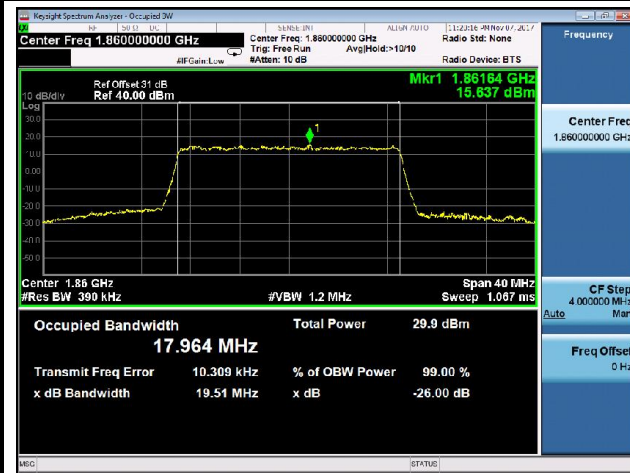
#### High CH / 15MHz / 16-QAM



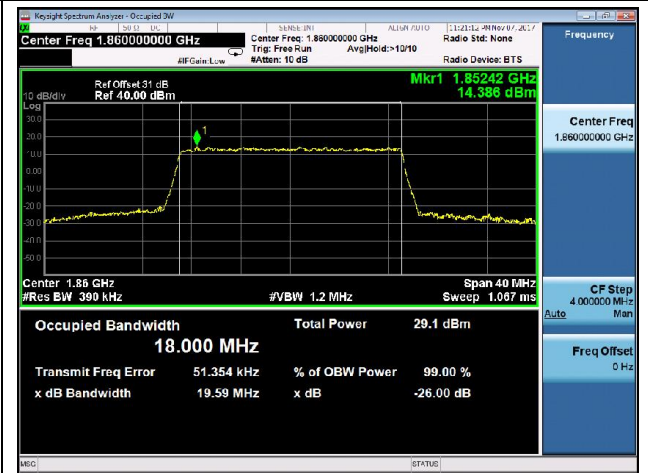


### LTE Band 2 99% & 26dB Occupied Bandwidth

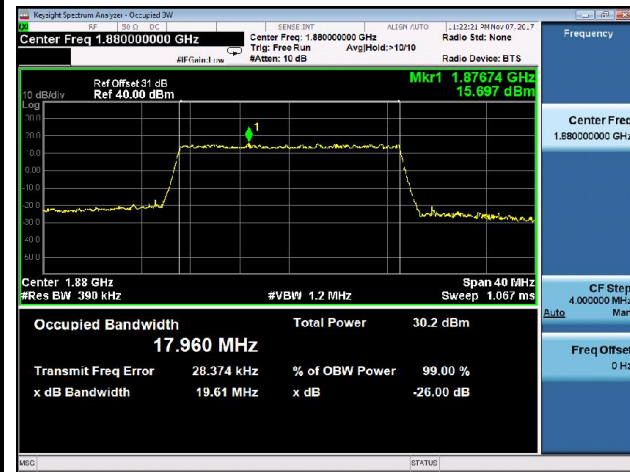
#### Low CH / 20MHz / QPSK



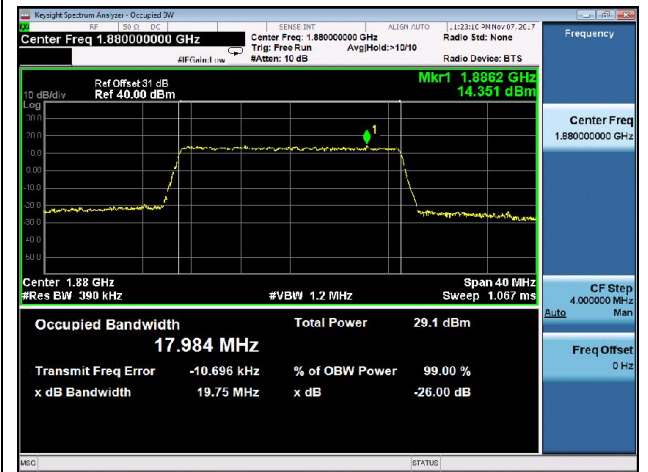
#### Low CH / 20MHz / 16-QAM



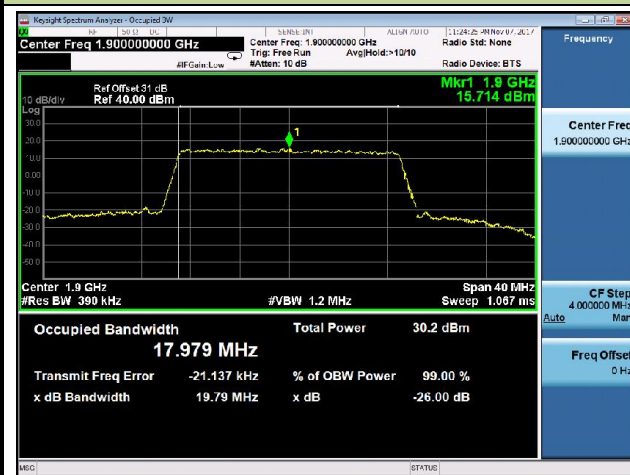
#### Mid. CH / 20MHz / QPSK



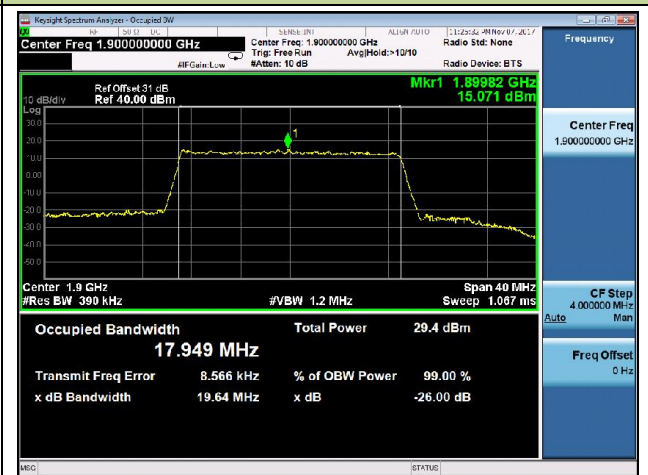
#### Mid. CH / 20MHz / 16-QAM



#### High CH / 20MHz / QPSK



#### High CH / 20MHz / 16-QAM

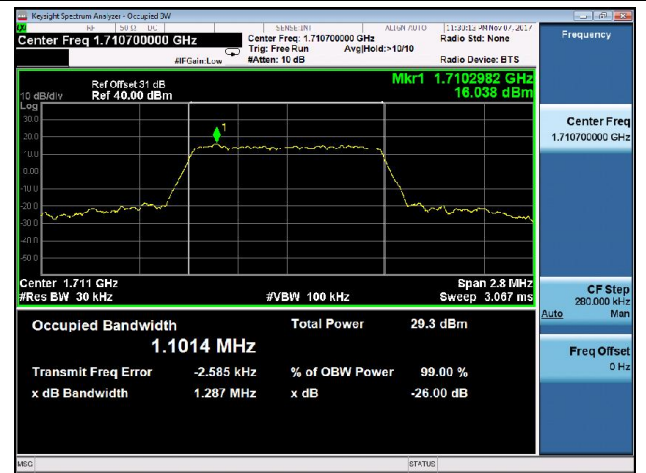


### LTE Band 4 99% & 26dB Occupied Bandwidth

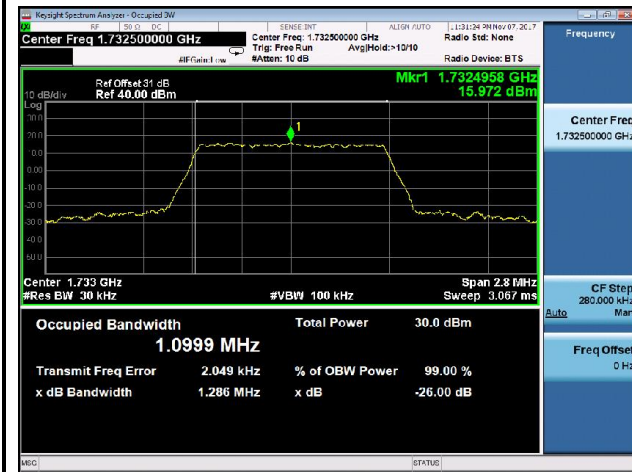
#### Low CH / 1.4MHz / QPSK



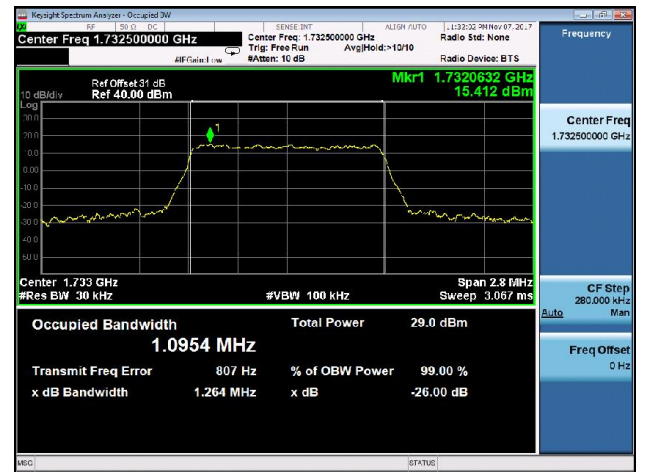
#### Low CH / 1.4MHz / 16-QAM



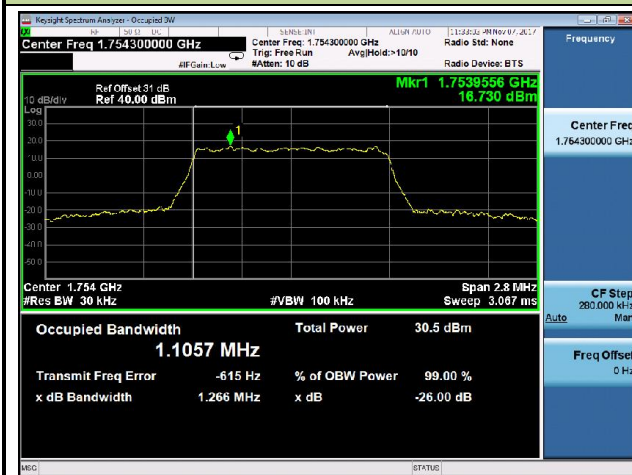
#### Mid. CH / 1.4MHz / QPSK



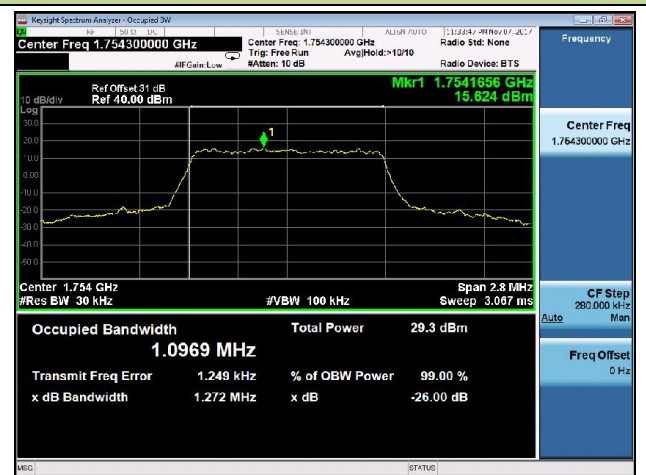
#### Mid. CH / 1.4MHz / 16-QAM



#### High CH / 1.4MHz / QPSK

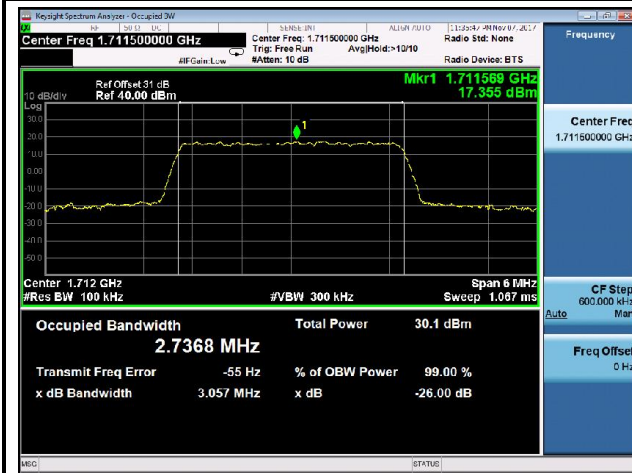


#### High CH / 1.4MHz / 16-QAM

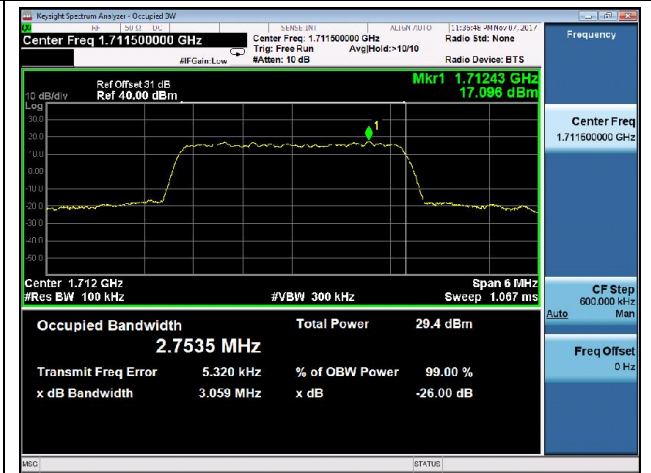


### LTE Band 4 99% & 26dB Occupied Bandwidth

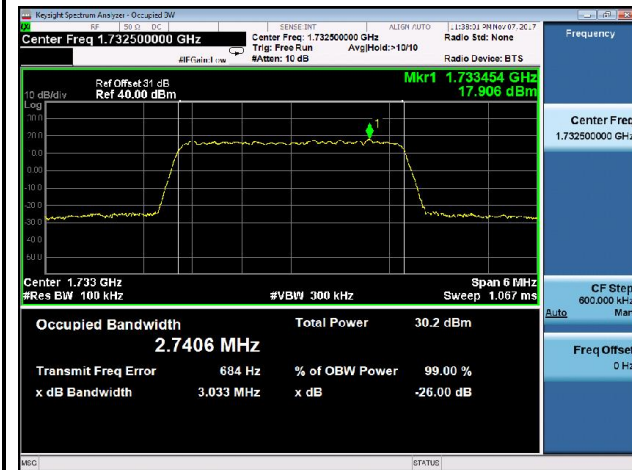
#### Low CH / 3MHz / QPSK



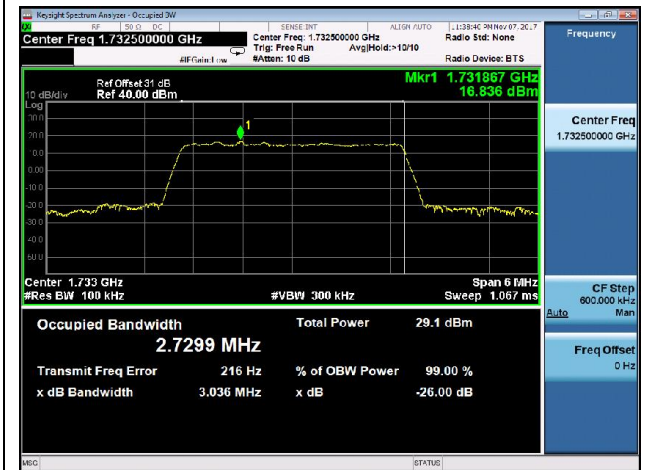
#### Low CH / 3MHz / 16-QAM



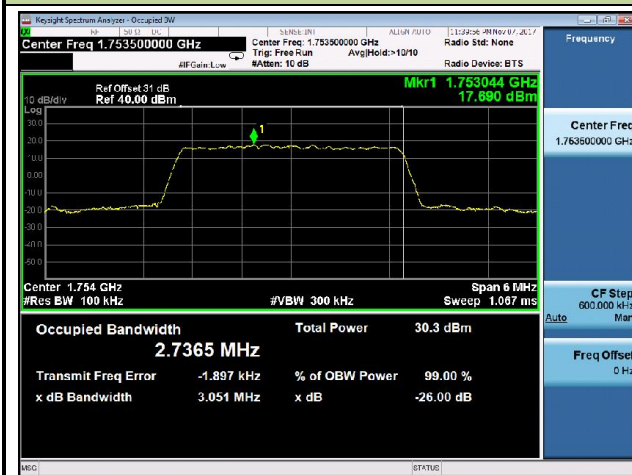
#### Mid. CH / 3MHz / QPSK



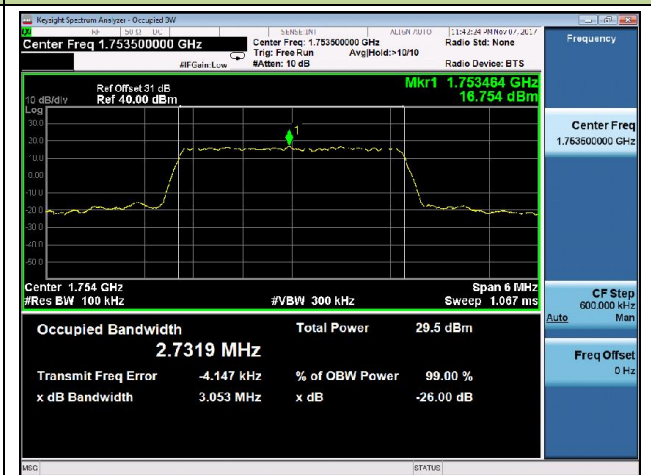
#### Mid. CH / 3MHz / 16-QAM

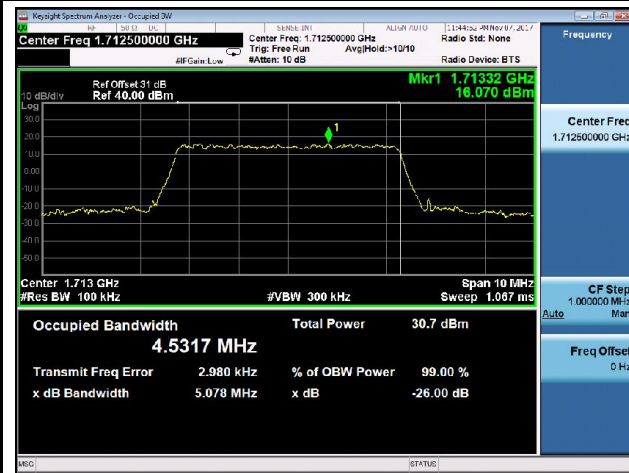


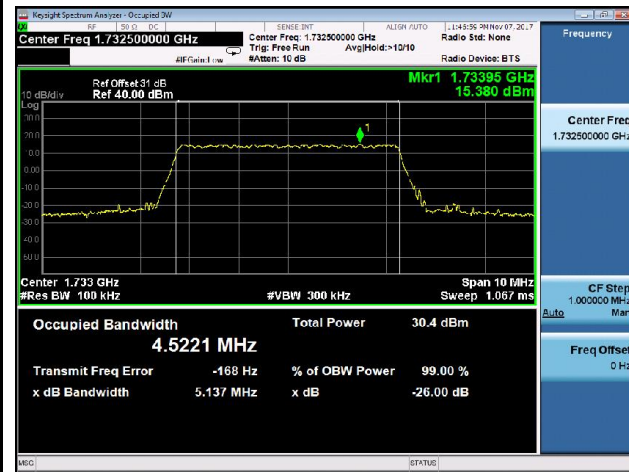
#### High CH / 3MHz / QPSK

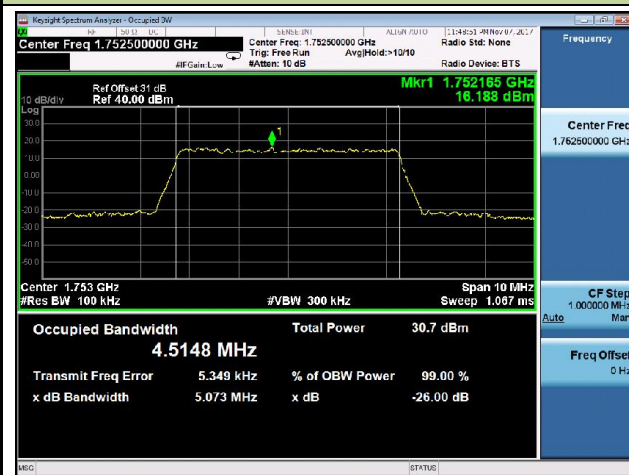
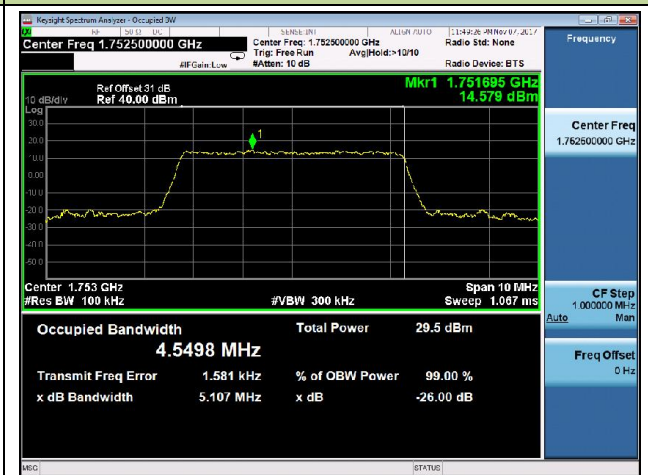


#### High CH / 3MHz / 16-QAM



**LTE Band 4 99% & 26dB Occupied Bandwidth**
**Low CH / 5MHz / QPSK**

**Low CH / 5MHz / 16-QAM**

**Mid. CH / 5MHz / QPSK**

**Mid. CH / 5MHz / 16-QAM**

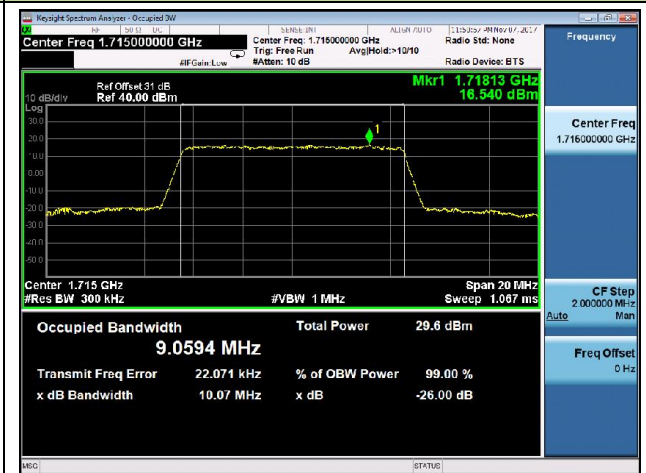
**High CH / 5MHz / QPSK**

**High CH / 5MHz / 16-QAM**


### LTE Band 4 99% & 26dB Occupied Bandwidth

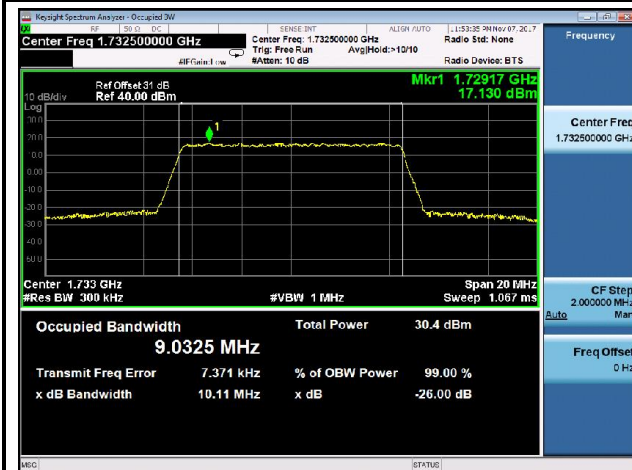
#### Low CH / 10MHz / QPSK



#### Low CH / 10MHz / 16-QAM



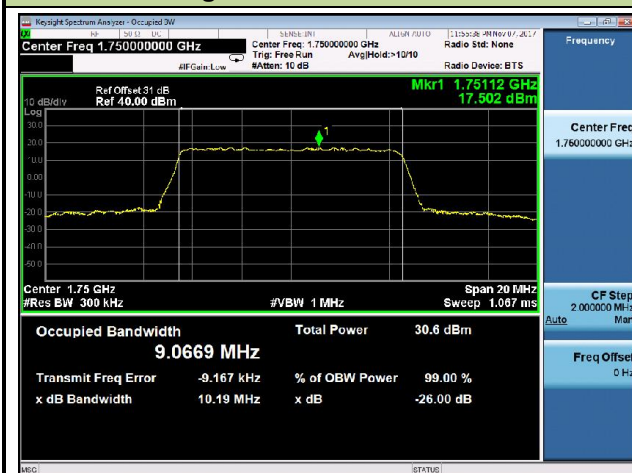
#### Mid. CH / 10MHz / QPSK



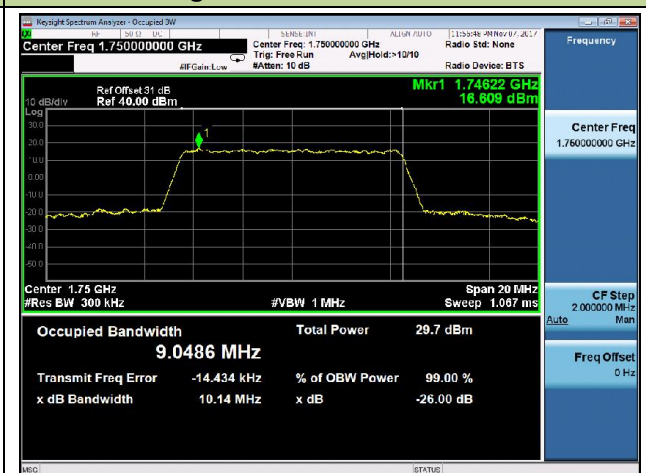
#### Mid. CH / 10MHz / 16-QAM



#### High CH / 10MHz / QPSK

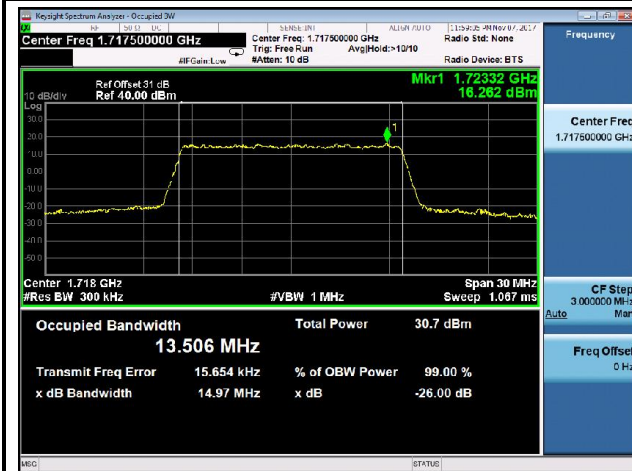


#### High CH / 10MHz / 16-QAM

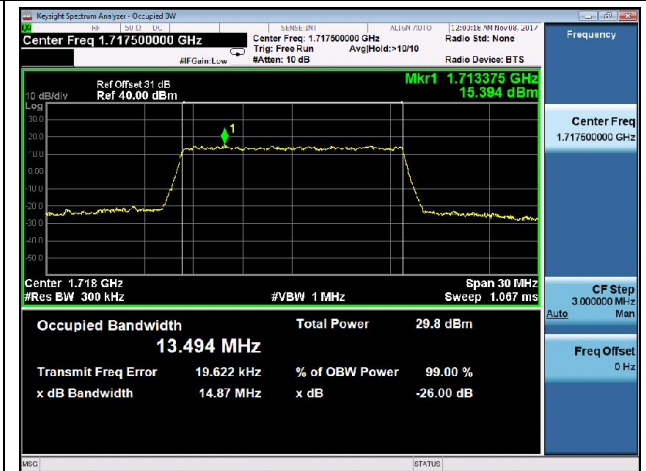


### LTE Band 4 99% & 26dB Occupied Bandwidth

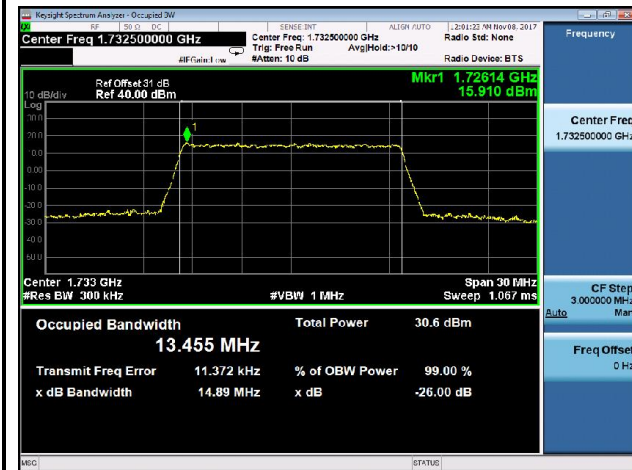
#### Low CH / 15MHz / QPSK



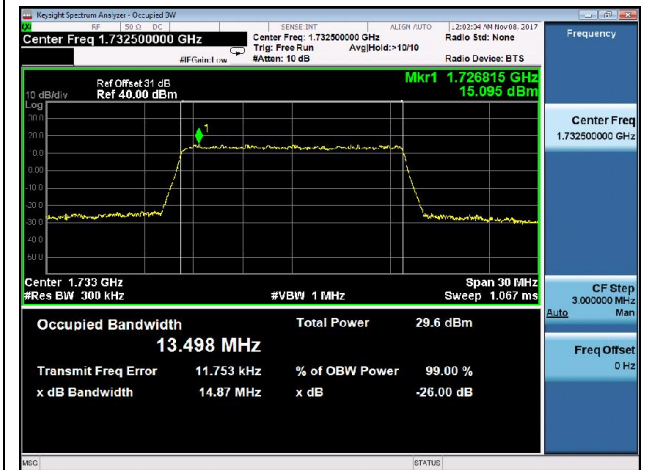
#### Low CH / 15MHz / 16-QAM



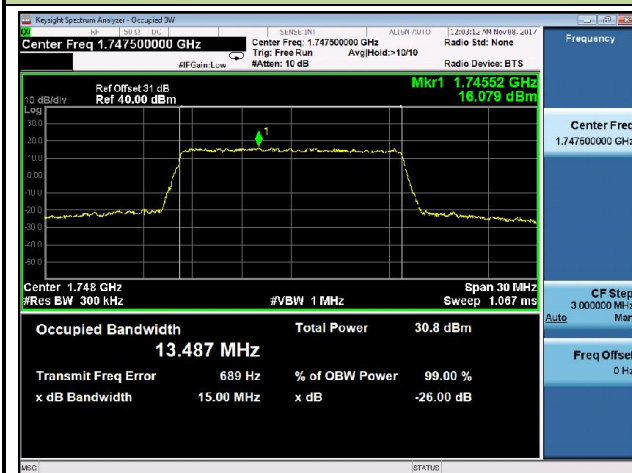
#### Mid. CH / 15MHz / QPSK



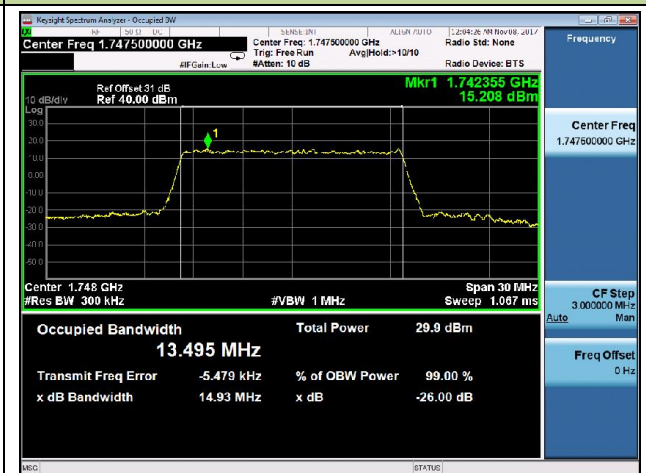
#### Mid. CH / 15MHz / 16-QAM



#### High CH / 15MHz / QPSK

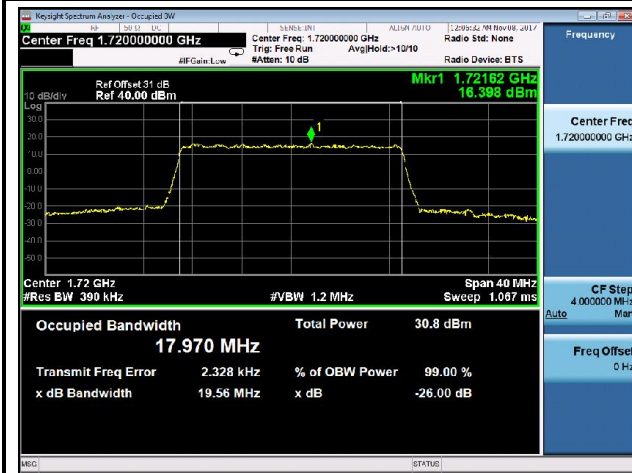


#### High CH / 15MHz / 16-QAM

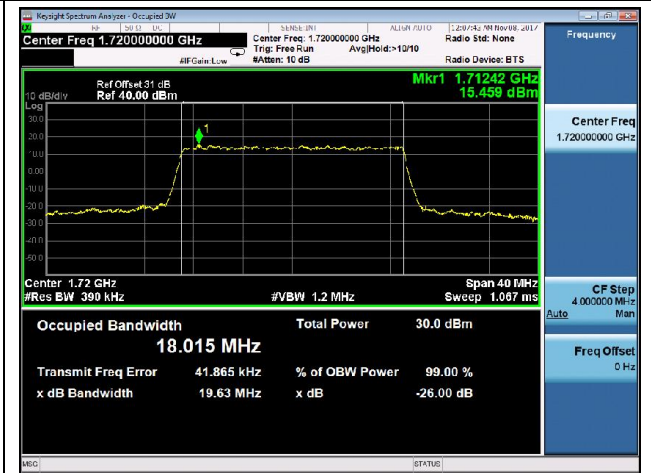


### LTE Band 4 99% & 26dB Occupied Bandwidth

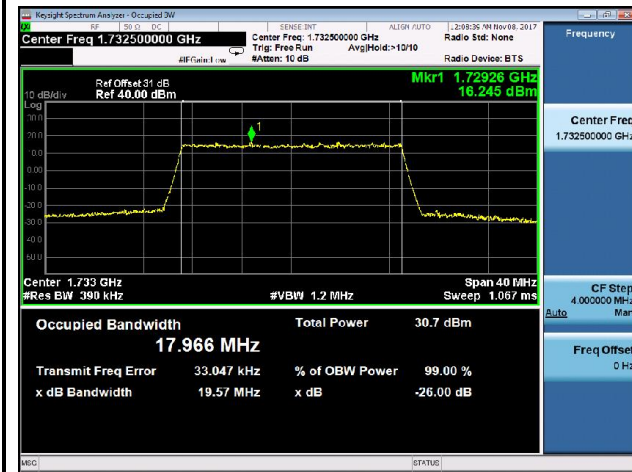
#### Low CH / 20MHz / QPSK



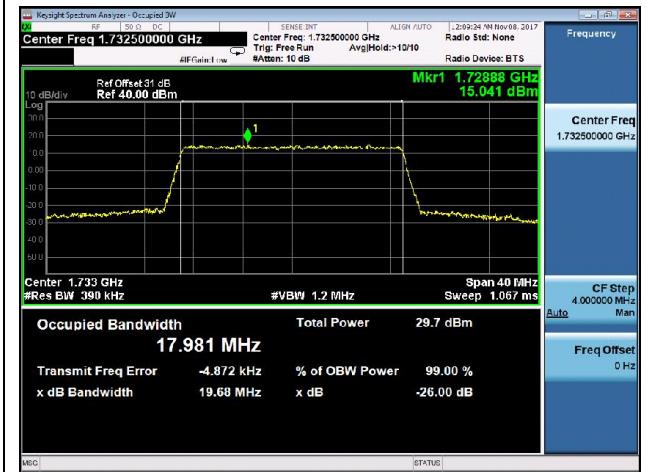
#### Low CH / 20MHz / 16-QAM



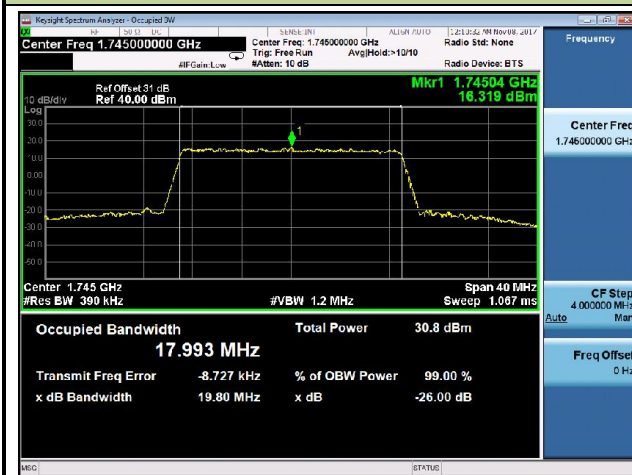
#### Mid. CH / 20MHz / QPSK



#### Mid. CH / 20MHz / 16-QAM



#### High CH / 20MHz / QPSK



#### High CH / 20MHz / 16-QAM

