

# BTI Wireless

## ENGINEERING TEST REPORT FOR

**800MHz 40W Remote Transmitting Unit  
Model: mBSC0800-040-RUC11**

### Tested To The Following Standards:

FCC Part 22H

Report No.: 94690-7

Date of issue: August 19, 2013

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

## TABLE OF CONTENTS

|                                                                   |    |
|-------------------------------------------------------------------|----|
| Administrative Information .....                                  | 3  |
| Test Report Information .....                                     | 3  |
| Report Authorization .....                                        | 3  |
| Test Facility Information .....                                   | 4  |
| Software Versions .....                                           | 4  |
| Site Registration & Accreditation Information .....               | 4  |
| Summary of Results .....                                          | 5  |
| Conditions During Testing .....                                   | 5  |
| Equipment Under Test .....                                        | 6  |
| Peripheral Devices .....                                          | 6  |
| FCC Part 22H .....                                                | 7  |
| 2.1046 / 22.913(a) - RF Power Output .....                        | 7  |
| 2.1049(l) Bandwidth Limitations .....                             | 29 |
| 2.1051 / 22.917(a) - Spurious Emissions at Antenna Terminal ..... | 40 |
| 2.1053 / 22.917(a) - Field Strength of Spurious Radiation .....   | 44 |
| Bandedge .....                                                    | 48 |
| Intermodulation .....                                             | 53 |
| Out of Band Rejection .....                                       | 57 |
| Supplemental Information .....                                    | 59 |
| Measurement Uncertainty .....                                     | 59 |
| Emissions Test Details .....                                      | 59 |

## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

BTI Wireless  
6185 Phyllis Drive Unit D  
Cypress, CA 90630

Representative: Winston Abrian

**REPORT PREPARED BY:**

Dianne Dudley  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 94690

**DATE OF EQUIPMENT RECEIPT:**

July 22, 2013

**DATE(S) OF TESTING:**

July 22-29, 2013

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

A handwritten signature in black ink that reads "Steve Behm".

**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
*CKC Laboratories, Inc.*

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

## Software Versions

| CKC Laboratories Proprietary Software | Version |
|---------------------------------------|---------|
| EMITest Emissions                     | 5.00.14 |
| Immunity                              | 5.00.07 |

## Site Registration & Accreditation Information

| Location | CB #   | TAIWAN         | CANADA  | FCC   | JAPAN  |
|----------|--------|----------------|---------|-------|--------|
| Brea A   | US0060 | SL2-IN-E-1146R | 3082D-1 | 90473 | A-0147 |

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 22H

| Description                            | Test Procedure/Method             | Results |
|----------------------------------------|-----------------------------------|---------|
| RF Power Output                        | 2.1046/22.913(a)                  | Pass    |
| Occupied Bandwidth                     | FCC Part 22H / FCC Part 2.1049(I) | Pass    |
| Spurious Emissions at Antenna Terminal | 2.1051 / 22.917(a)                | Pass    |
| Field Strength of Spurious Radiation   | 2.1053 / 22.917(a)                | Pass    |
| Bandedge                               | FCC Part 22H                      | Pass    |
| Intermodulation                        | FCC Part 22H                      | Pass    |
| Out of Band Rejection                  | FCC Part 22H                      | Pass    |

## Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

| Summary of Conditions |
|-----------------------|
| None                  |

## EQUIPMENT UNDER TEST (EUT)

### EQUIPMENT UNDER TEST

#### 800MHz 40W Remote Transmitting Unit

Manuf: BTI Wireless

Model: mBSC0800-040-RUSSF02

Serial: 08001310001

### PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

#### ESG Vector Signal Generator

Manuf: Agilent

Model: 4438C

Serial: MY45092055

#### Power Sensor

Manuf: Agilent

Model: E4412A

Serial: MY41502826

#### ESG Vector Signal Generator

Manuf: Agilent

Model: 4433B

Serial: US40052164 / US40031692

#### Power Meter

Manuf: HP

Model: EPM-441A

Serial: UGB37170458

## FCC PART 22H

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) requirements for licensed devices.

### 2.1046 / 22.913(a) - RF Power Output

#### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **BTI Wireless**  
 Specification: **22.913(a) RF Output Power**  
 Work Order #: **94690** Date: 7/24/2013  
 Test Type: **Conducted Emissions** Time: 14:18:15  
 Equipment: **800MHz 40W remote transmitting unit** Sequence#: 1  
 Manufacturer: BTI Wireless Tested By: E. Wong  
 Model: mBSC0800-040-RUC11 110V 60Hz  
 S/N: 08001310001

#### Test Equipment:

| ID | Asset #  | Description       | Model  | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------|------------------|--------------|
| T1 | AN02869  | Spectrum Analyzer | E4440A | 2/6/2013         | 2/6/2015     |
| T2 | ANP06153 | Cable             | 16301  | 10/27/2011       | 10/27/2013   |

#### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #            | S/N         |
|--------------------------------------|--------------|--------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUC11 | 08001310001 |

#### Support Devices:

| Function                    | Manufacturer | Model # | S/N        |
|-----------------------------|--------------|---------|------------|
| ESG Vector Signal Generator | Agilent      | 4433B   | US40052164 |

**Test Conditions / Notes:**

The EUT is placed on the test bench. Tx In is connected to an ESG Signal generator, ANT is connected to a spectrum analyzer and attenuator. RX out port is terminated to 50 ohm load. The evaluation is performed at the antenna port using Channel power function of the spectrum analyzer.

Freq: 869-894MHz

Signal protocol: LTE-TM1.1 1.4MHz, 5MHz, 20MHz

The RF output power was measured automatic level control threshold setting (ALCTH) as listed in the result table for RF Output power of 40W, 20W, 10W

21°C, 47% Relative Humidity.

The EUT is a RF amplifier operating the 869-894MHz band under part 22. The manufacture does not provide an antenna for sale with the product; hence EIRP is not measured nor calculated. The Automatic Level Control Threshold of each individual unit is to be programed to produce conducted RF output power as rated at the time of deployment.

The end user of this product is to exercise proper engineering judgment to select the appropriate antenna to comply with the EIRP limitation set forth

*22.913 (a) Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.*

**40W**

| Modulation | ALCTH | Power (dBm)  | Power (W)    |
|------------|-------|--------------|--------------|
| LTE 1.4MHz |       |              |              |
| 870MHz     | 1824  | 46.00        | 39.81        |
| 881.5MHz   | 1824  | <b>46.04</b> | <b>40.18</b> |
| 893MHz     | 1824  | 45.50        | 35.48        |
| LTE 5MHz   |       |              |              |
| 871.75MHz  | 1680  | 45.97        | 39.54        |
| 881.5MHz   | 1680  | 46.01        | 39.90        |
| 891.25MHz  | 1680  | 45.79        | 37.93        |
| LTE 20MHz  |       |              |              |
| 879.75MHz  | 1616  | 46.01        | 39.90        |
| 881.5MHz   | 1616  | 45.99        | 39.72        |
| 883.25MHz  | 1616  | 45.93        | 39.17        |

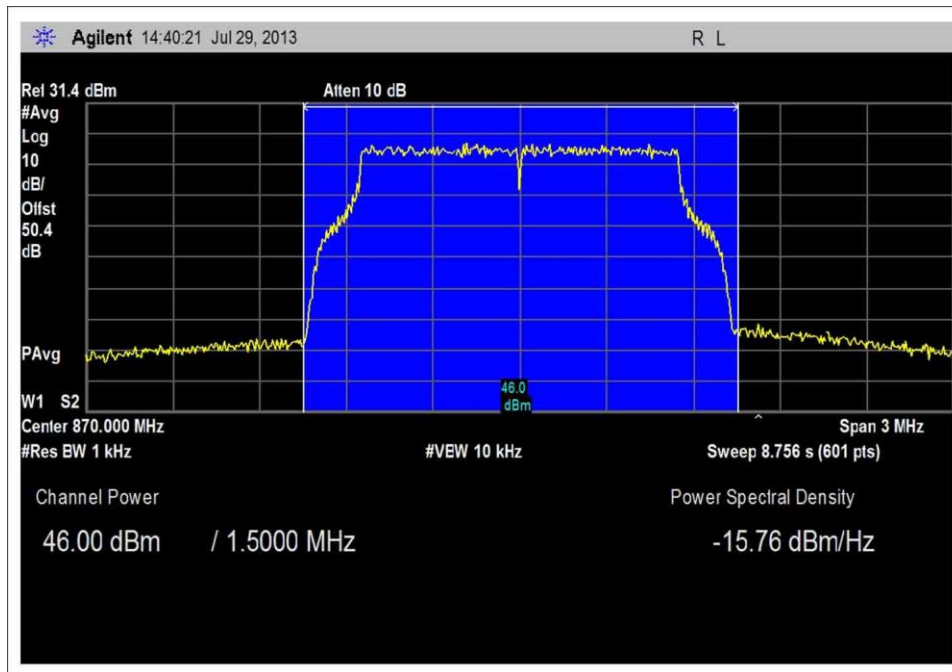


## 20W

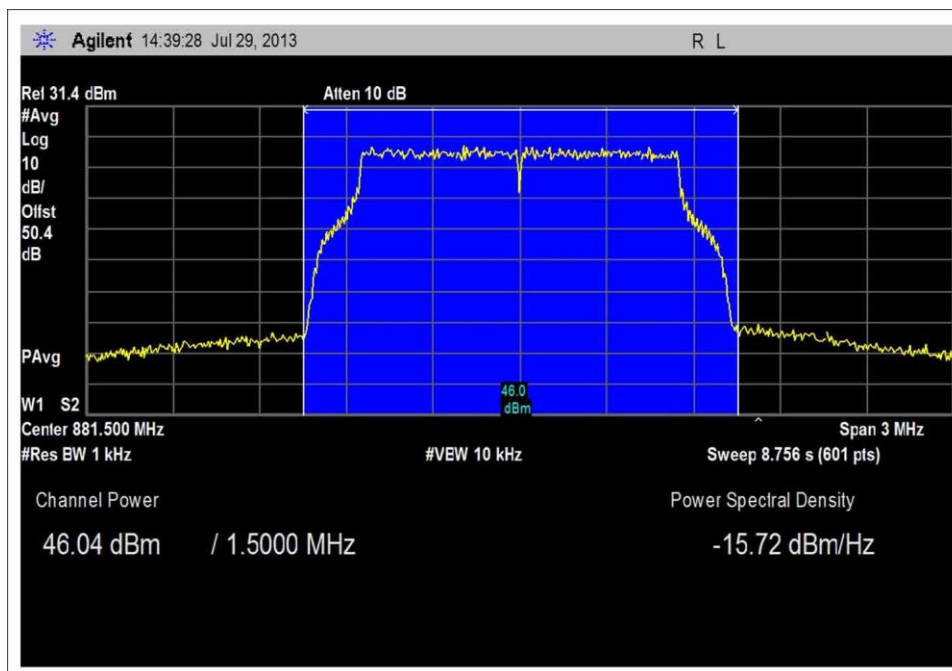
| Modulation | ALCTH | Power (dBm)  | Power (W)    |
|------------|-------|--------------|--------------|
| LTE 1.4MHz |       |              |              |
| 870MHz     | 1288  | 42.88        | 19.41        |
| 881.5MHz   | 1288  | 42.99        | 19.91        |
| 893MHz     | 1288  | 42.68        | 18.54        |
| LTE 5MHz   |       |              |              |
| 871.75MHz  | 1176  | 42.97        | 19.82        |
| 881.5MHz   | 1176  | 43.00        | 19.95        |
| 891.25MHz  | 1176  | 42.83        | 19.19        |
| LTE 20MHz  |       |              |              |
| 879.75MHz  | 1144  | 42.99        | 19.91        |
| 881.5MHz   | 1144  | 43.01        | 20.00        |
| 883.25MHz  | 1144  | <b>43.02</b> | <b>20.04</b> |

## 10W

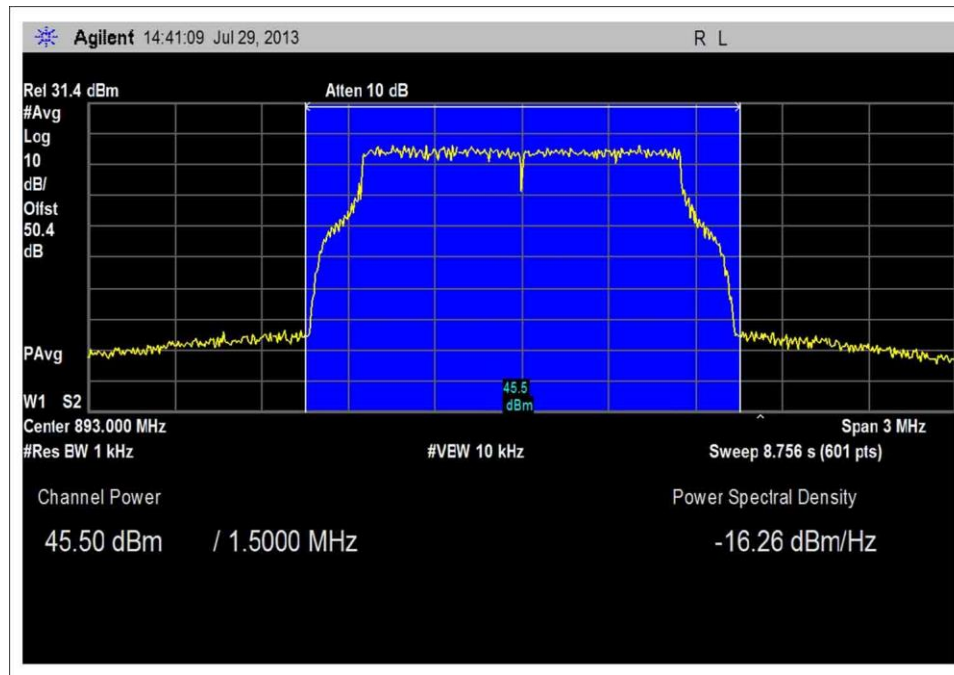
| Modulation | ALCTH | Power (dBm)  | Power (W)    |
|------------|-------|--------------|--------------|
| LTE 1.4MHz |       |              |              |
| 870MHz     | 872   | 39.98        | 9.95         |
| 881.5MHz   | 872   | <b>40.04</b> | <b>10.09</b> |
| 893MHz     | 872   | 39.77        | 9.48         |
| LTE 5MHz   |       |              |              |
| 871.75MHz  | 816   | 40.03        | 10.07        |
| 881.5MHz   | 816   | 39.97        | 9.93         |
| 891.25MHz  | 816   | 39.76        | 9.46         |
| LTE 20MHz  |       |              |              |
| 879.75MHz  | 792   | 39.99        | 9.98         |
| 881.5MHz   | 792   | 39.97        | 9.93         |
| 883.25MHz  | 792   | 39.95        | 9.89         |



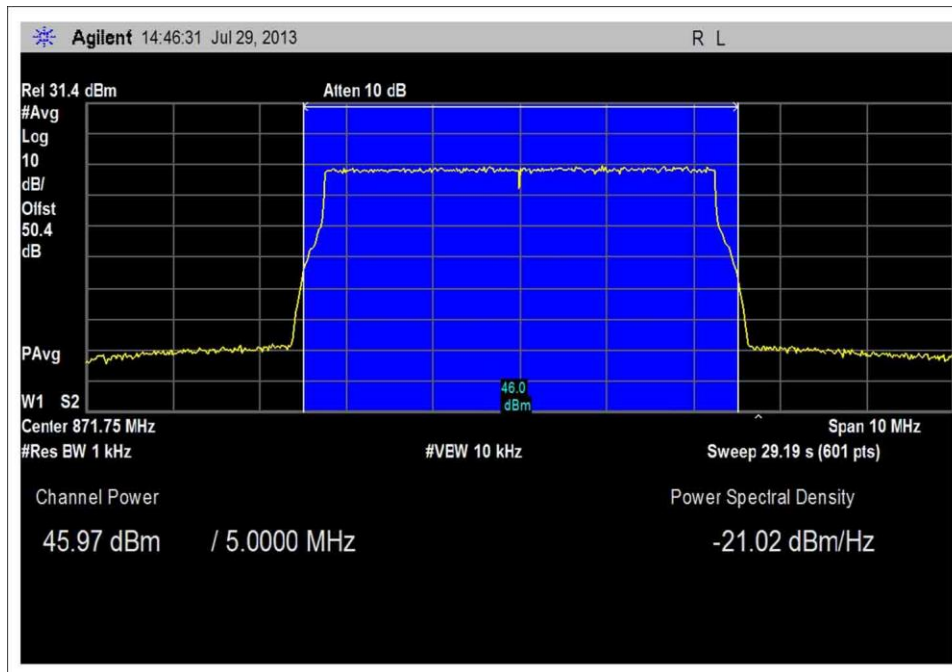
LTE 1.4MHz, Low Channel 40W



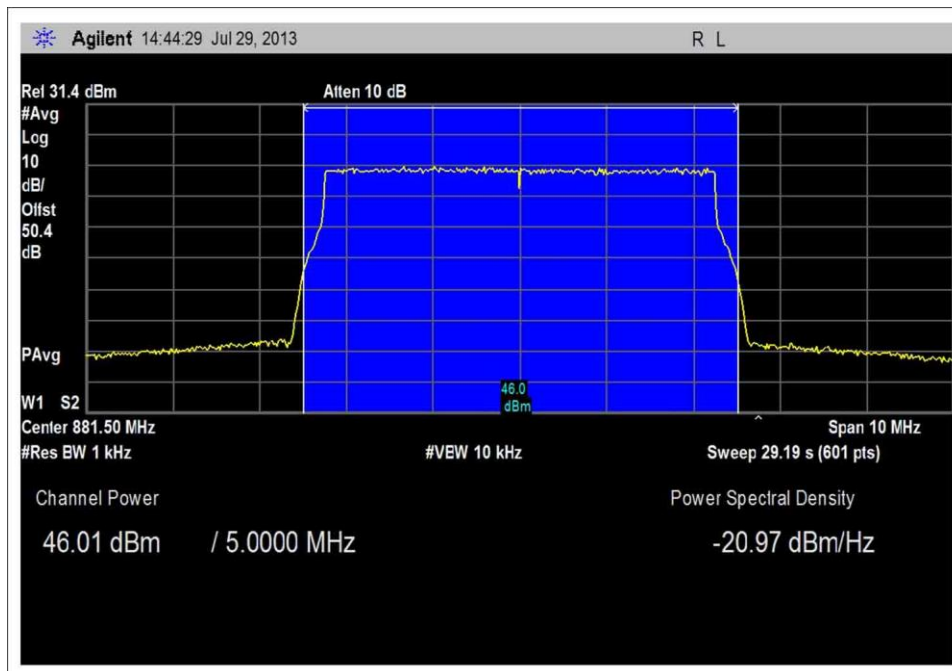
LTE 1.4MHz, Middle Channel 40W



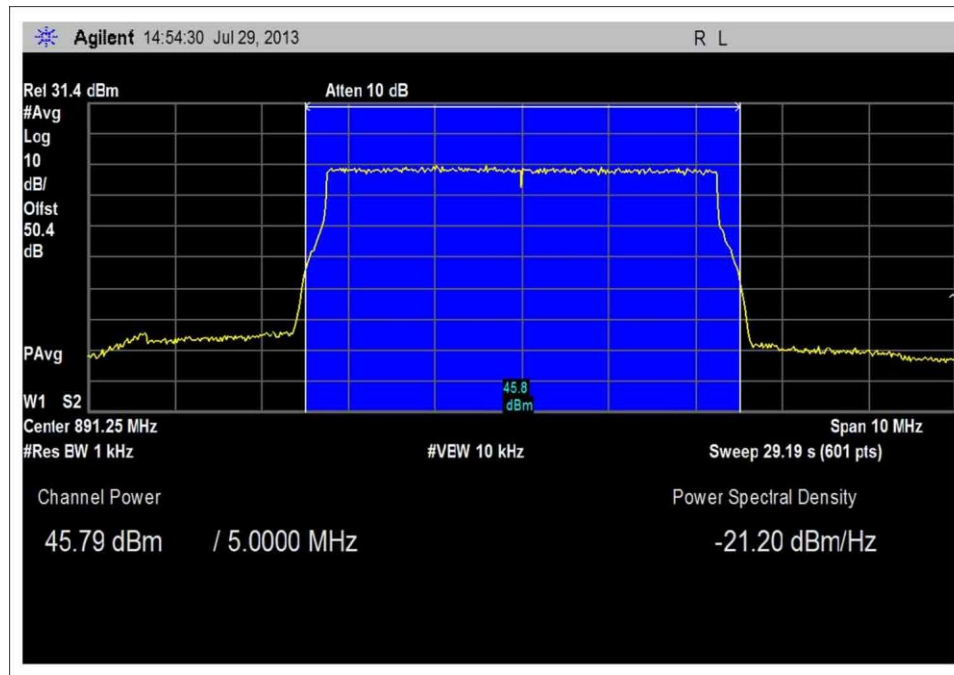
LTE 1.4MHz, High Channel 40W



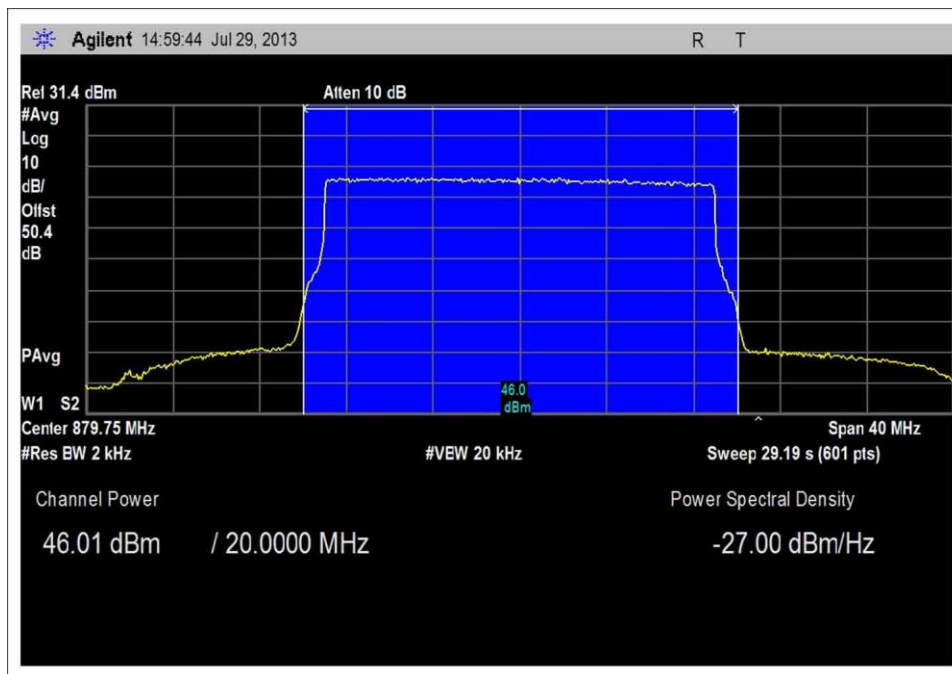
LTE 5MHz, Low Channel 40W



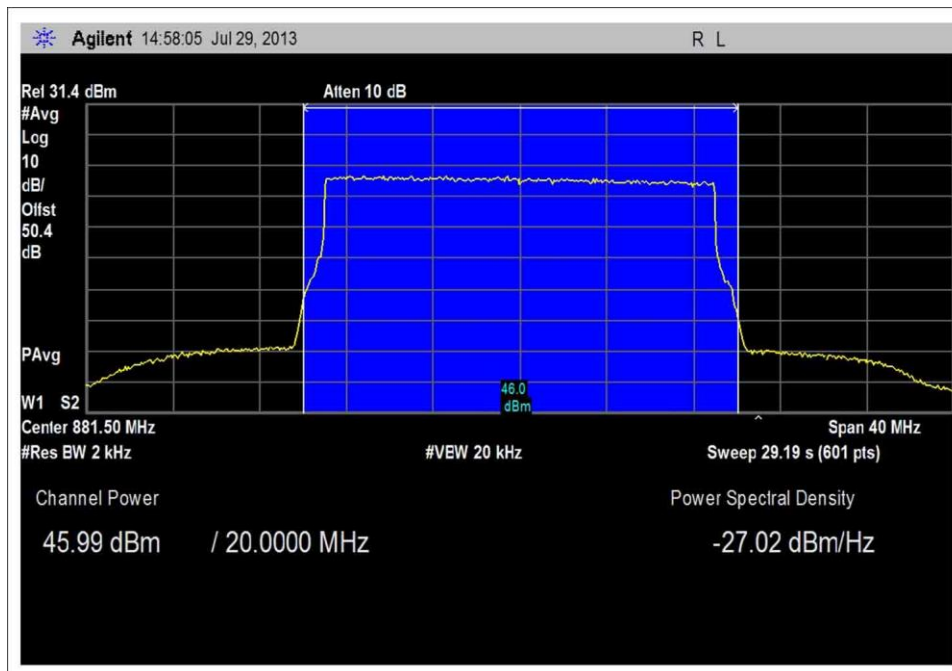
LTE 5MHz, Middle Channel 40W



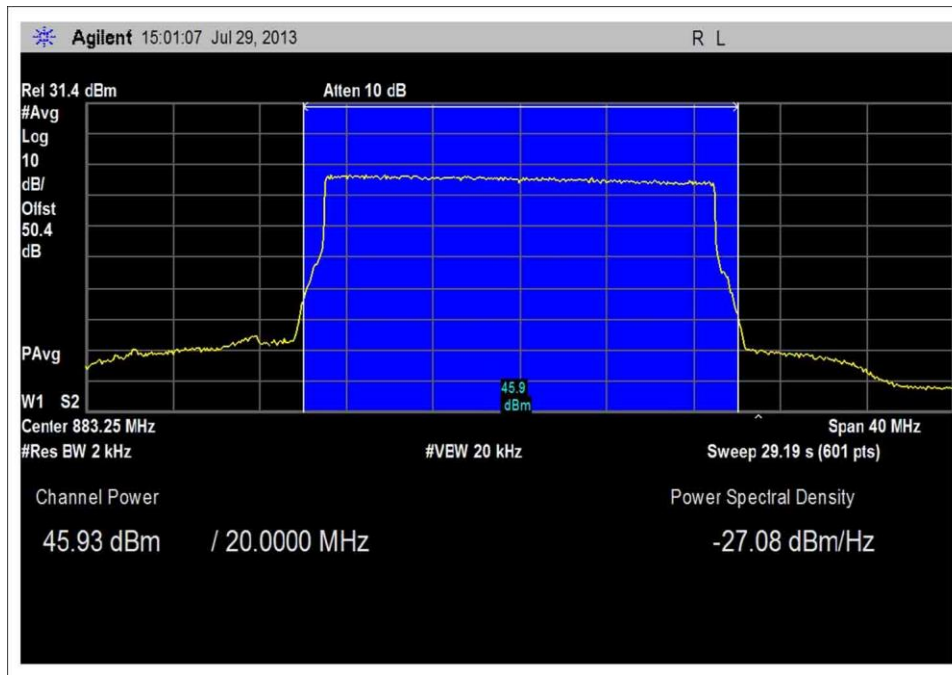
LTE 5MHz, High Channel 40W



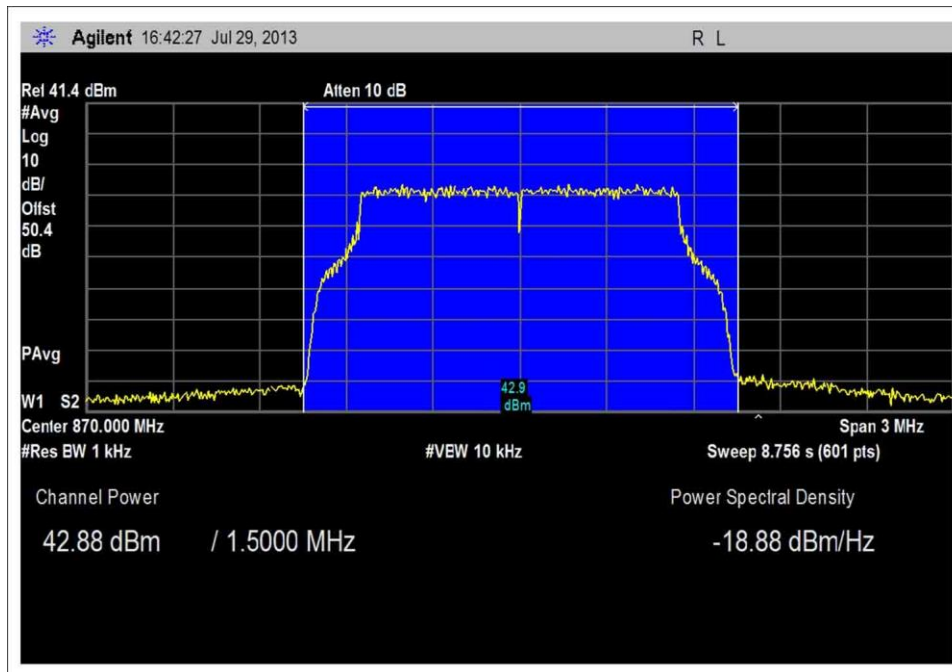
LTE 20MHz, Low Channel 40W



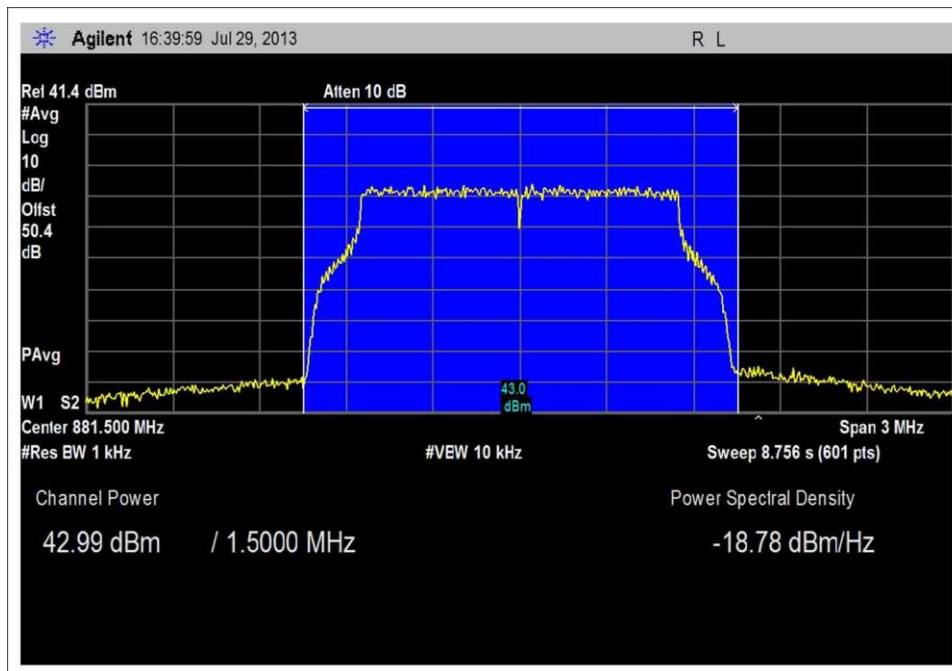
LTE 20MHz, Middle Channel 40W



LTE 20MHz, High Channel 40W

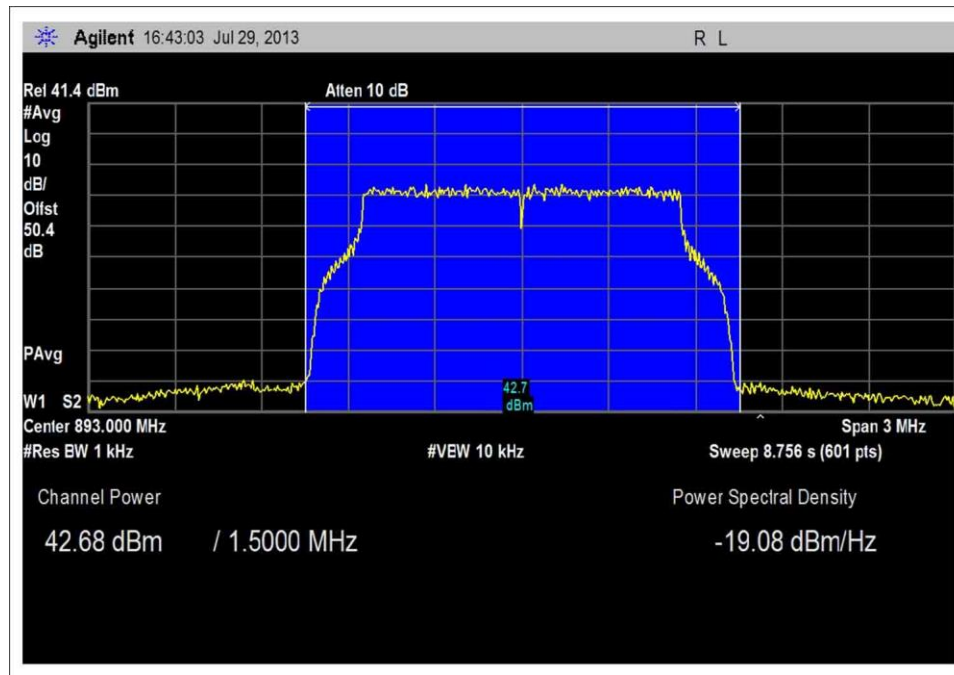


LTE 1.4MHz, Low Channel 20W

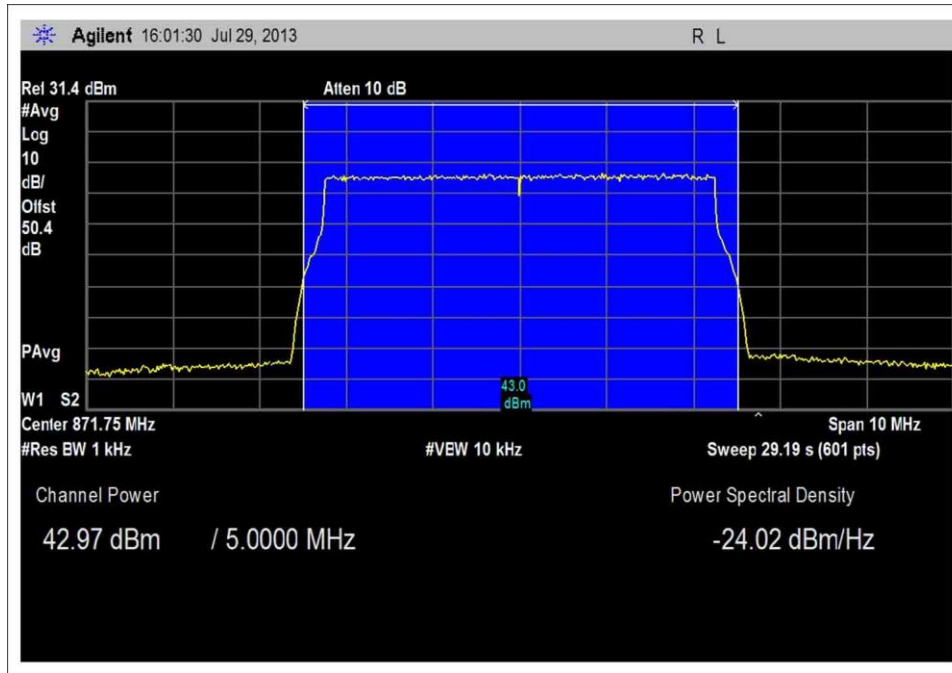


LTE 1.4MHz, Middle Channel 20W

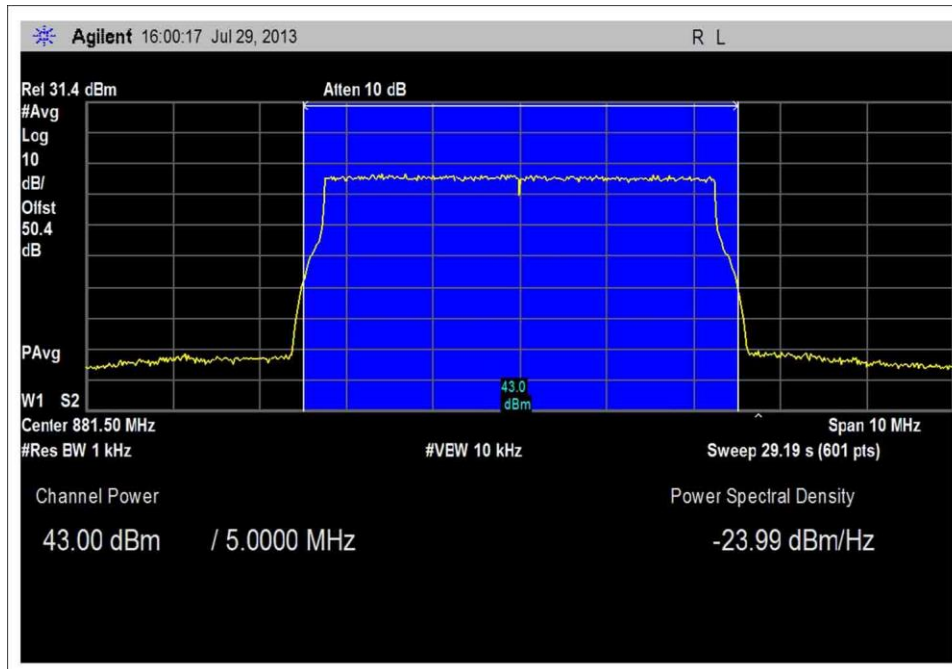




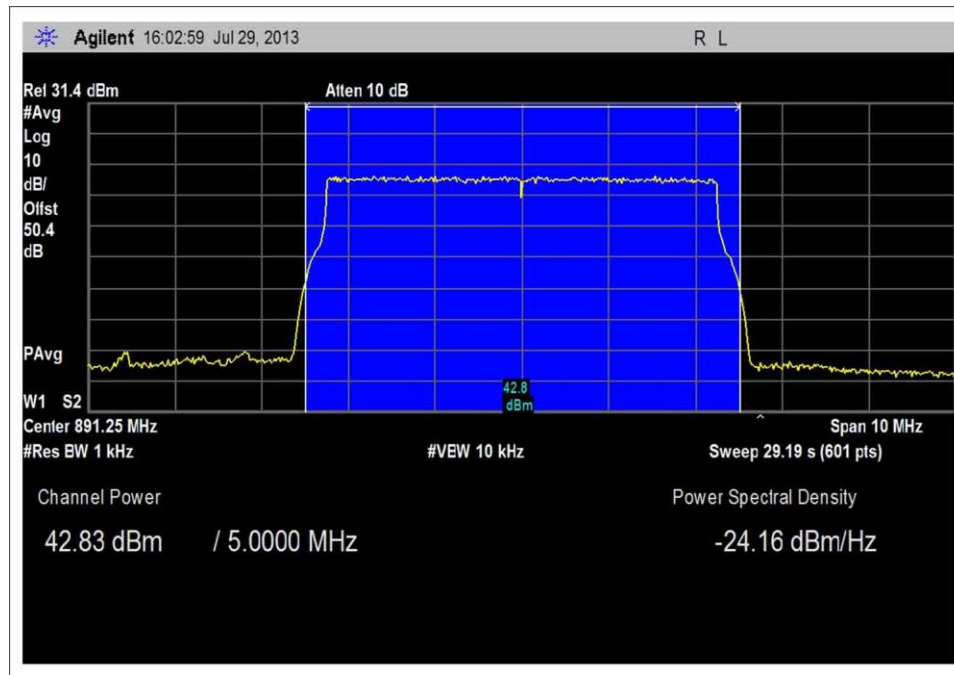
LTE 1.4MHz, High Channel 20W



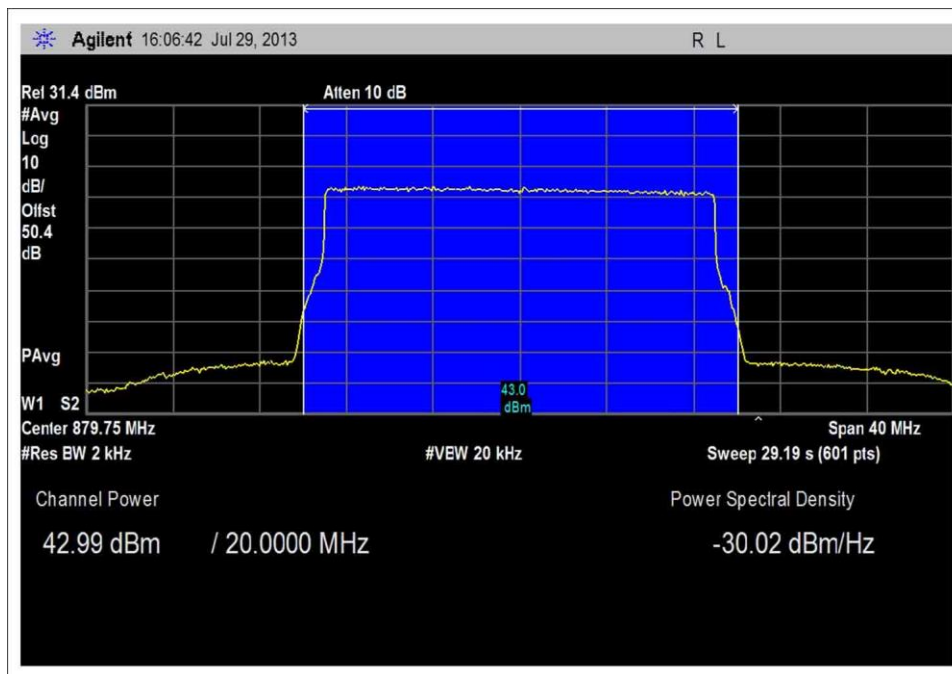
LTE 5MHz, Low Channel 20W



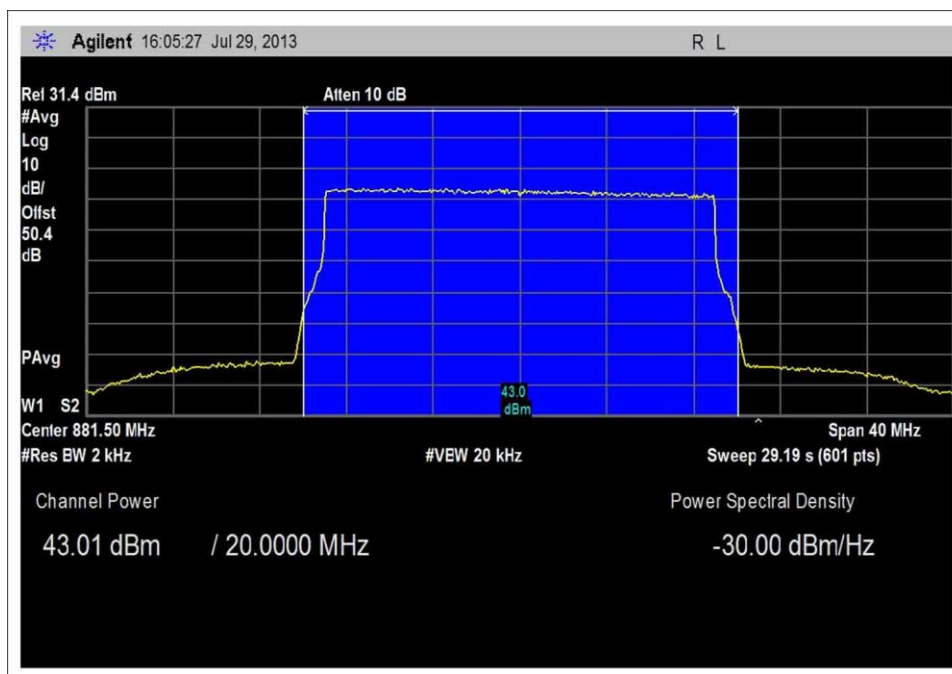
LTE 5MHz, Middle Channel 20W



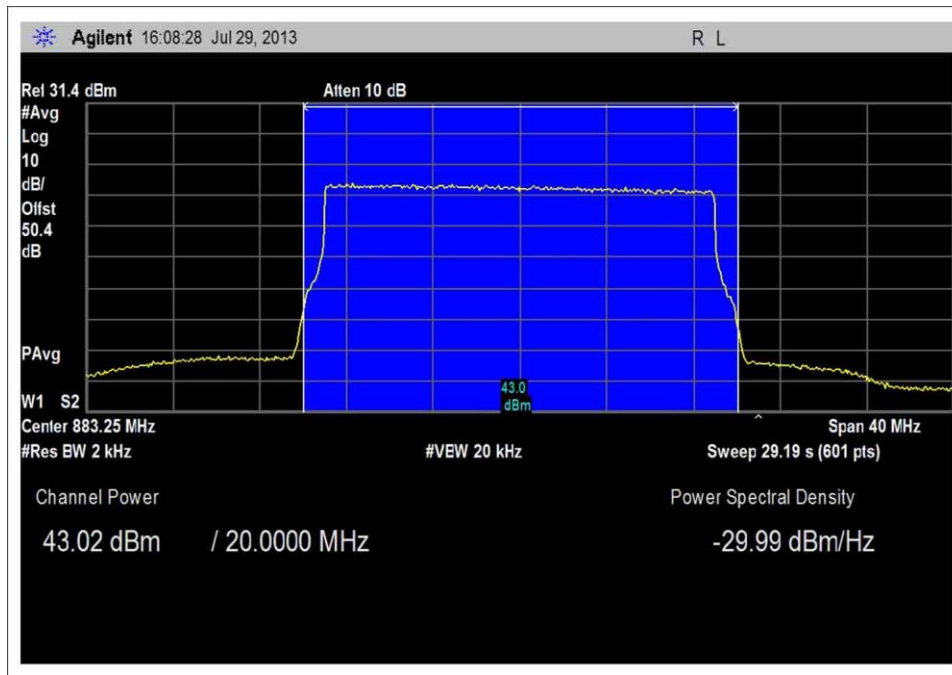
LTE 5MHz, High Channel 20W



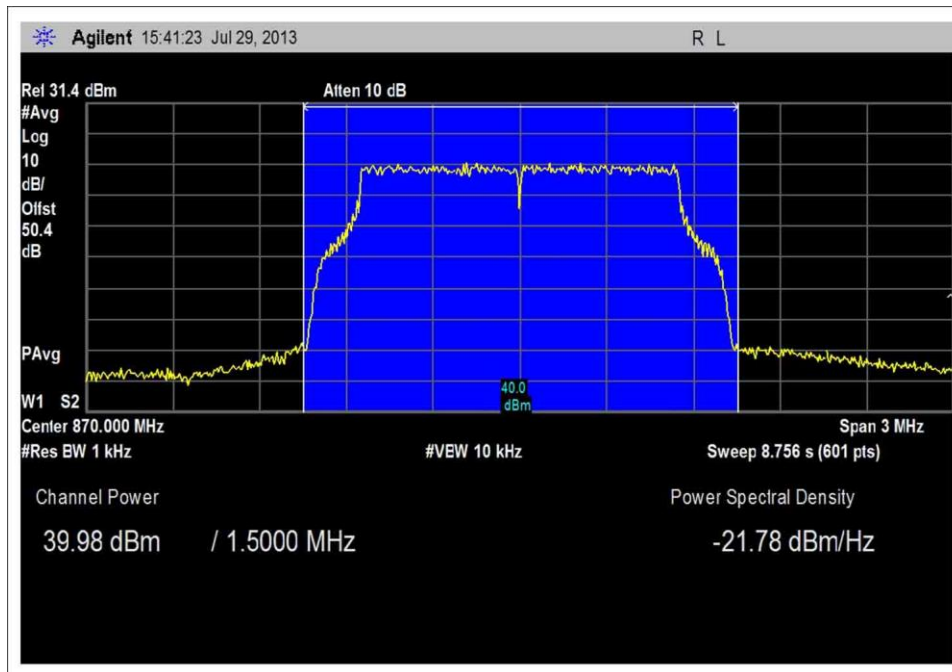
LTE 20MHz, Low Channel 20W



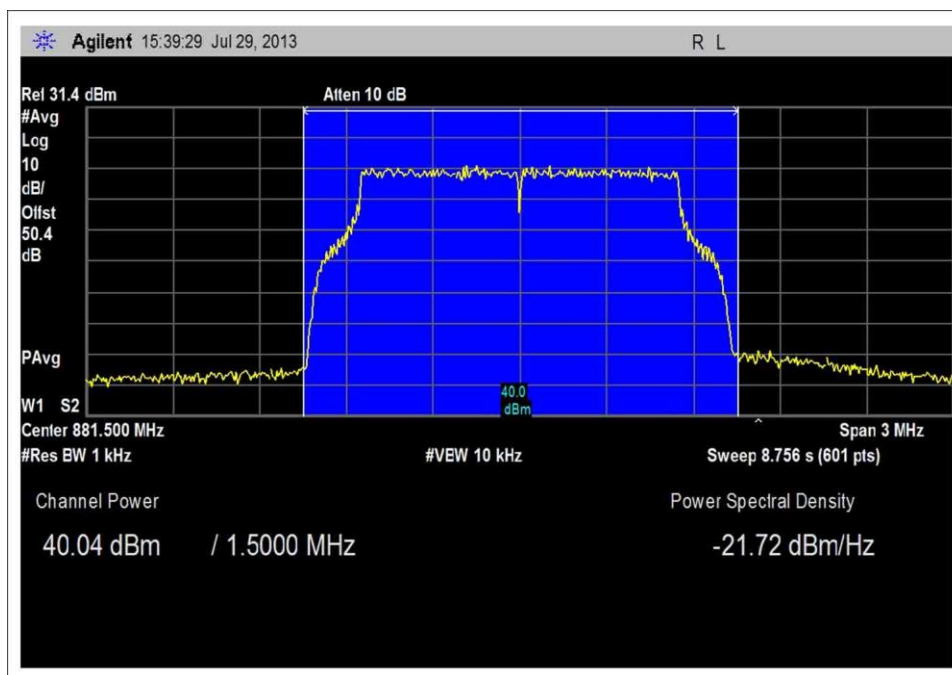
LTE 20MHz, Middle Channel 20W



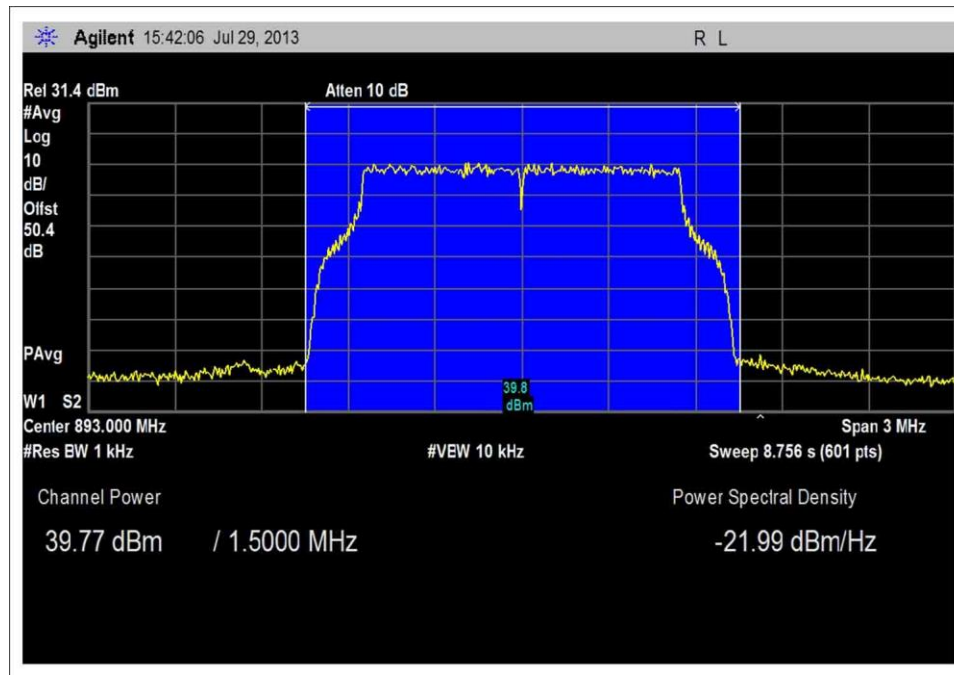
LTE 20MHz, High Channel 20W



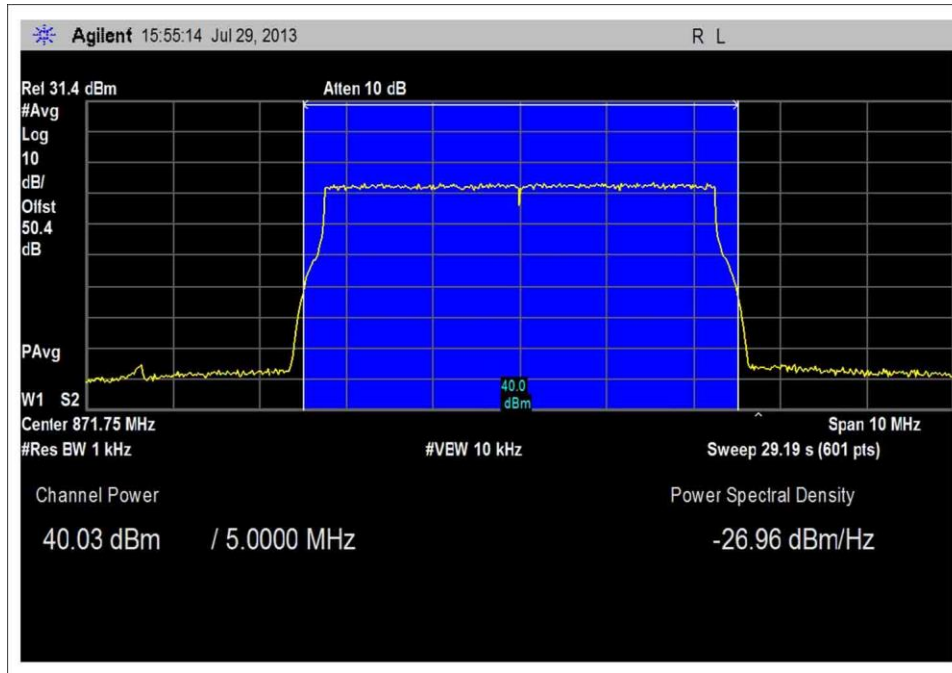
LTE 1.4MHz, Low Channel 10W



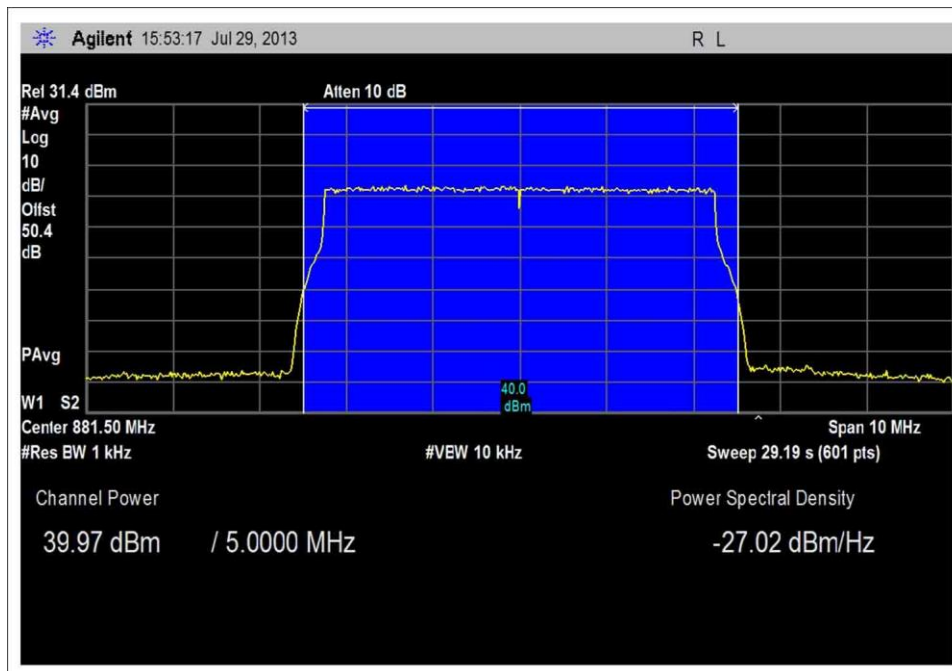
LTE 1.4MHz, Middle Channel 10W



LTE 1.4MHz, High Channel 10W

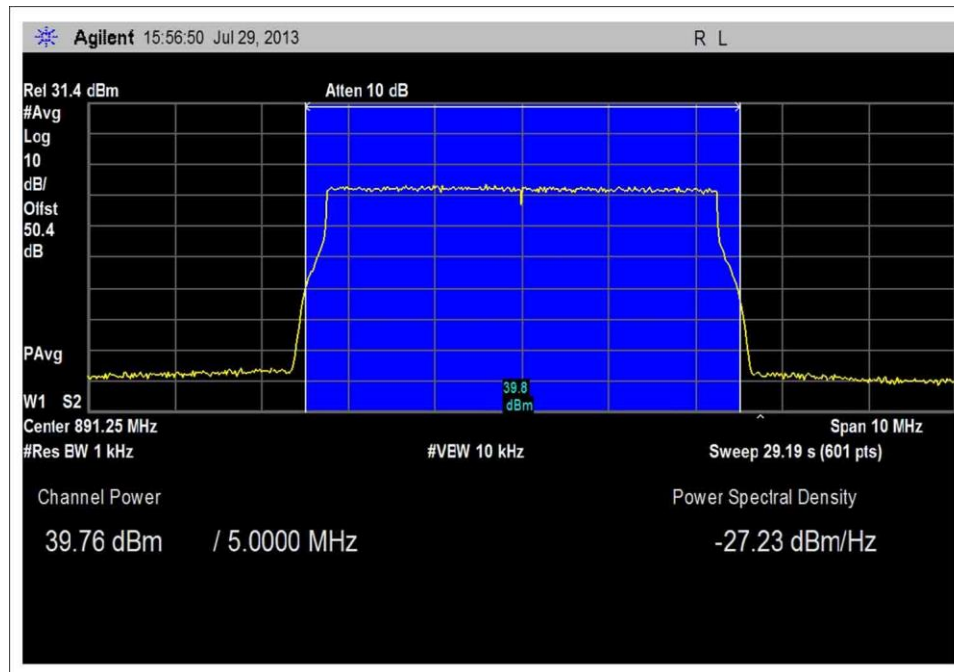


LTE 5MHz, Low Channel 10W

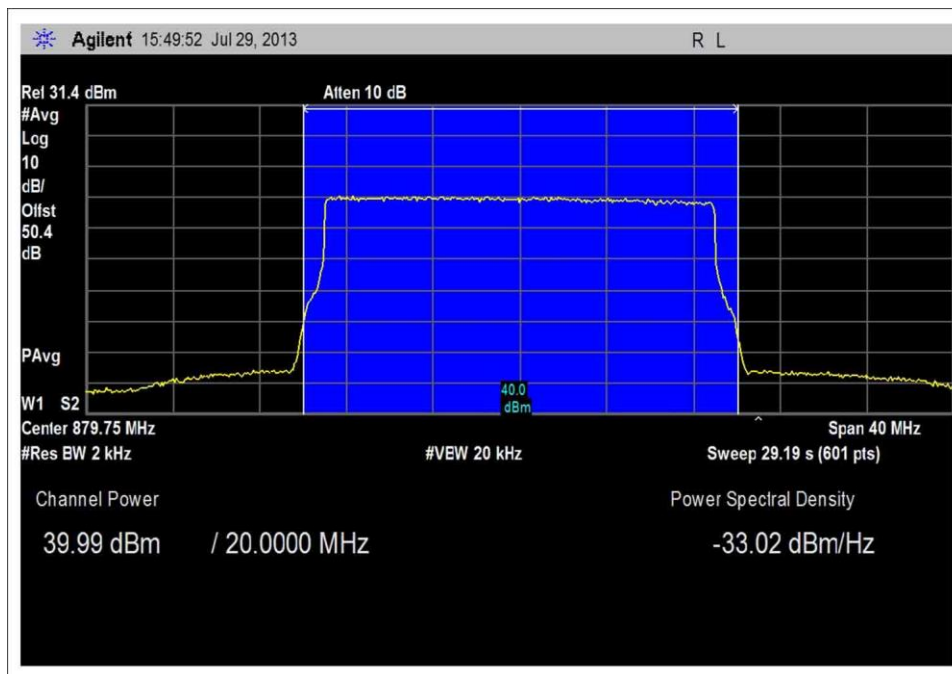


LTE 5MHz, Middle Channel 10W

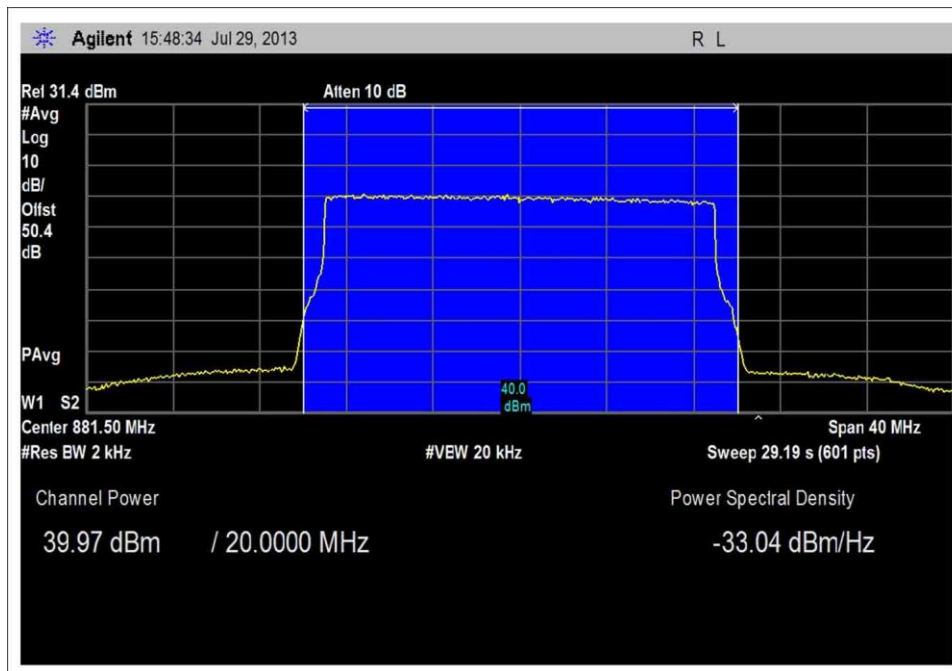




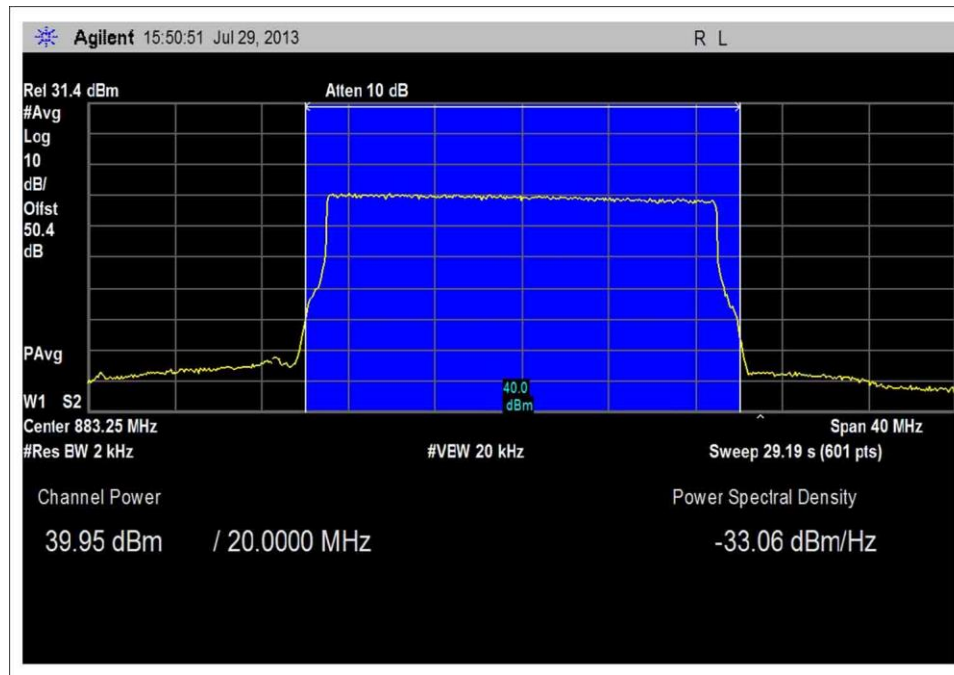
LTE 5MHz, High Channel 10W



LTE 20MHz, Low Channel 10W



LTE 20MHz, Middle Channel 10W



LTE 20MHz, High Channel 10W

**Test Setup Photos**



## 2.1049(I) Bandwidth Limitations

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **BTI Wireless**

Specification: **Occupied Bandwidth Input vs Output plot**

Work Order #: **94690** Date: 7/24/2013

Test Type: **Conducted Emissions** Time: 14:18:15

Equipment: **800MHz 40W remote transmitting unit** Sequence#: 1

Manufacturer: BTI Wireless Tested By: E. Wong

Model: mBSC0800-040-RUC11 110V 60Hz

S/N: 08001310001

#### Test Equipment:

| ID | Asset #  | Description       | Model  | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------|------------------|--------------|
| T1 | AN02869  | Spectrum Analyzer | E4440A | 2/6/2013         | 2/6/2015     |
| T2 | ANP06153 | Cable             | 16301  | 10/27/2011       | 10/27/2013   |

#### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #            | S/N         |
|--------------------------------------|--------------|--------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUC11 | 08001310001 |

#### Support Devices:

| Function                    | Manufacturer | Model # | S/N        |
|-----------------------------|--------------|---------|------------|
| ESG Vector Signal Generator | Agilent      | 4433B   | US40052164 |

#### Test Conditions / Notes:

The EUT is placed on the test bench. Tx In is connected to an ESG Signal generator, ANT is connected to a spectrum analyzer and attenuator. RX out port is terminated to 50 ohm load.

Output waveform is recorded with a spectrum analyzer at the Antenna port of the device.

Input waveform is recorded with a spectrum analyzer at the RF out of the support ESG.

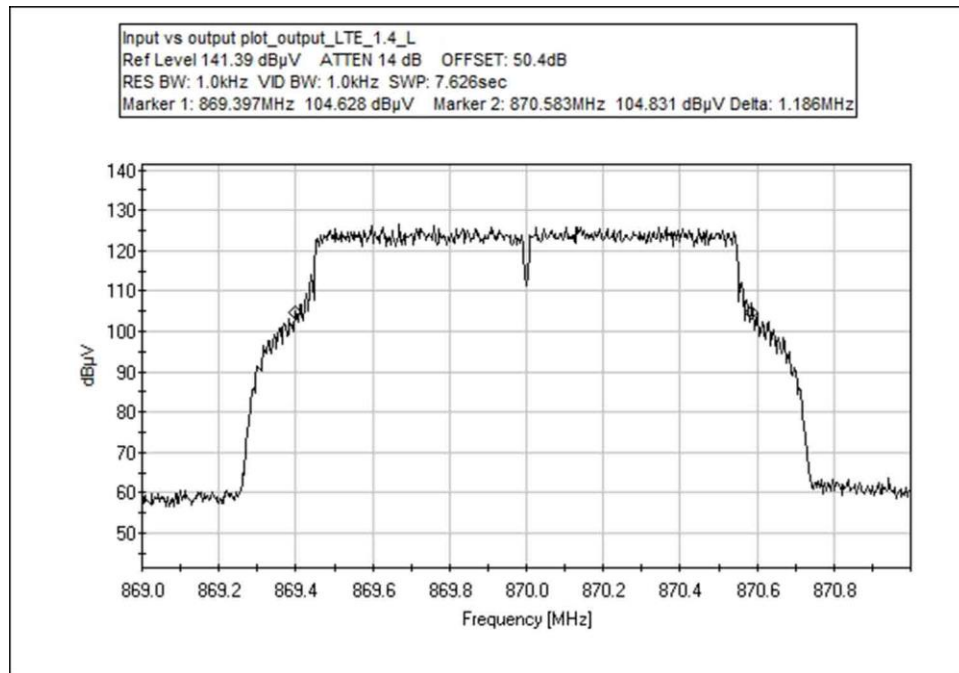
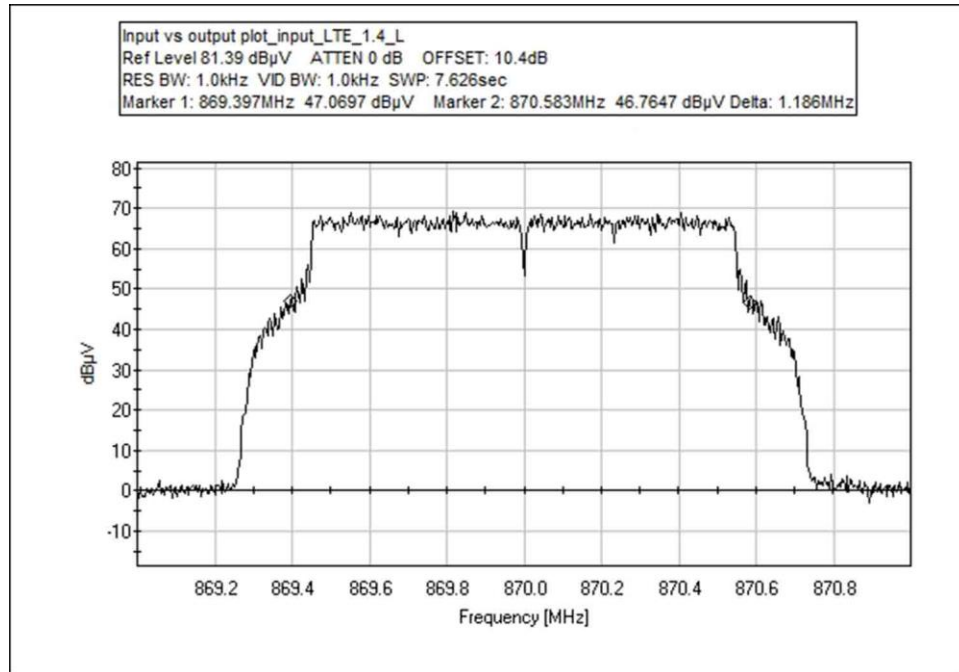
Freq: 869-894MHz

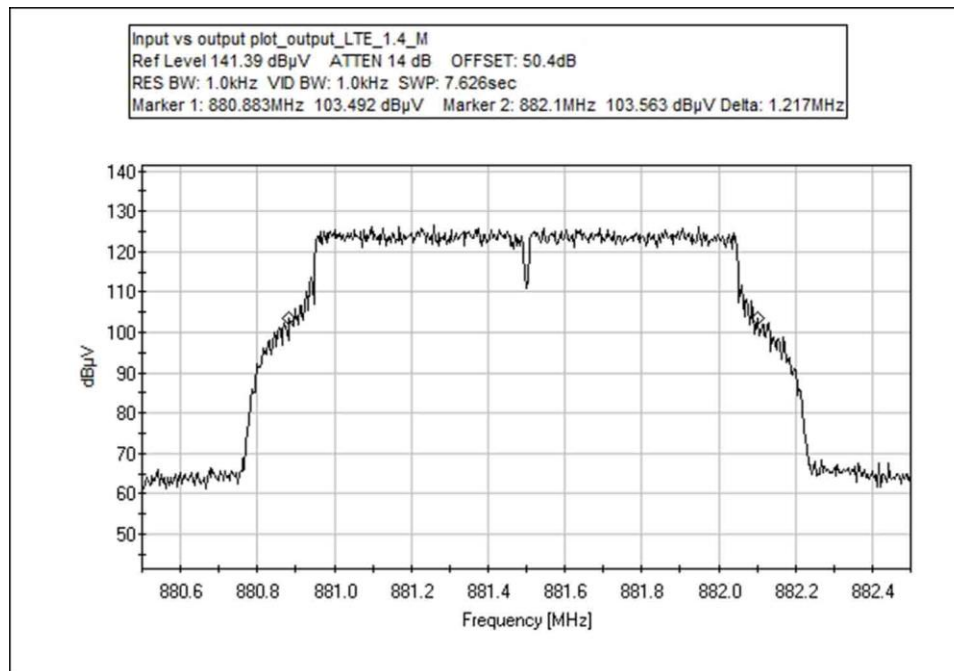
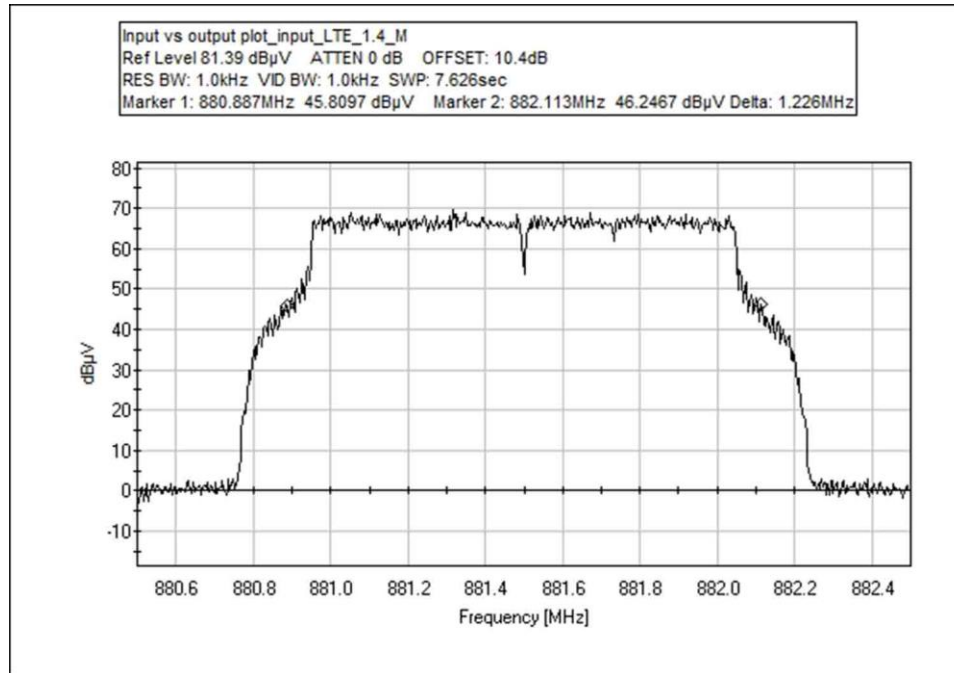
Signal protocol: LTE-TM1.1 1.4MHz, 5MHz. 20MHz

Power: 40 W

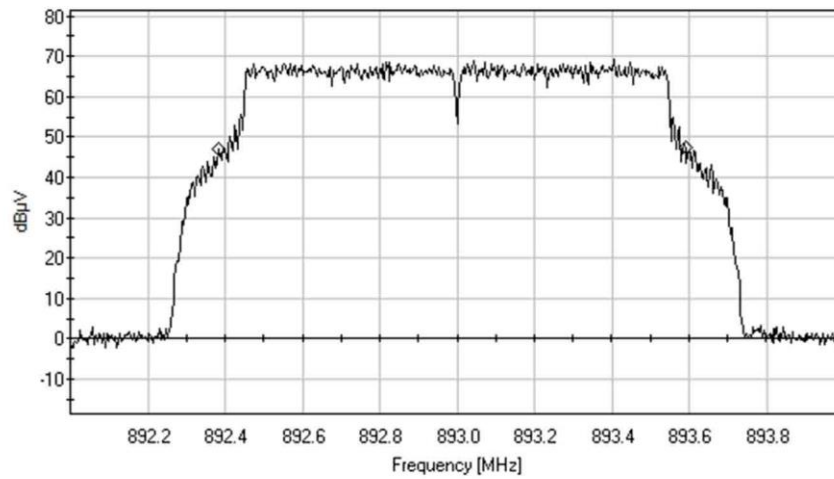
21°C, 47% Relative Humidity

### Test Data

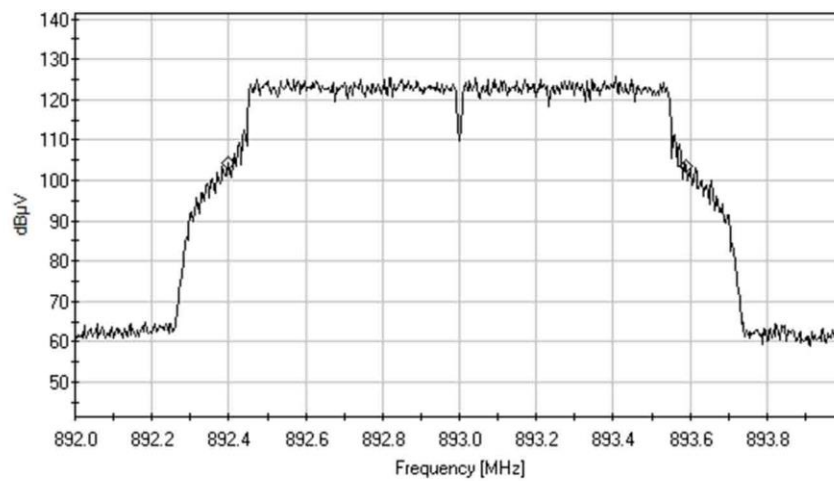




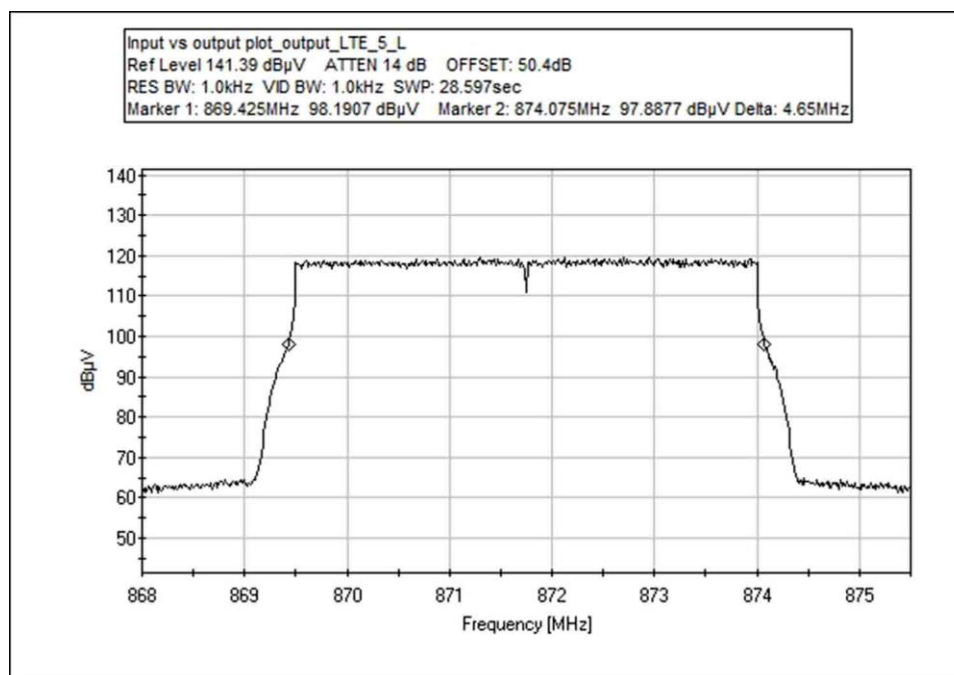
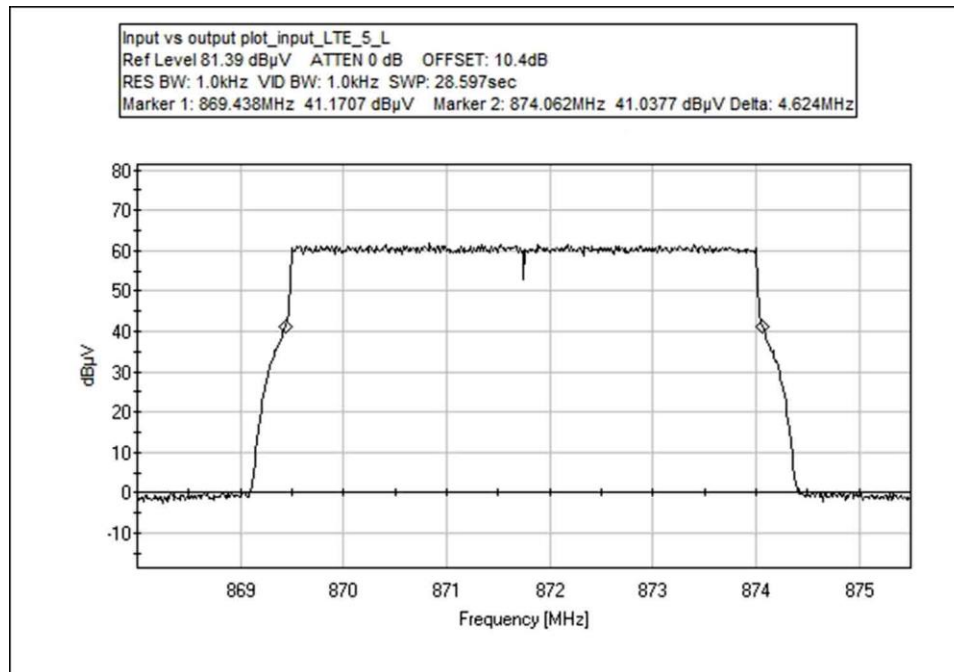
Input vs output plot\_input\_LTE\_1.4\_H  
 Ref Level 81.39 dB $\mu$ V ATTEN 0 dB OFFSET: 10.4dB  
 RES BW: 1.0kHz VID BW: 1.0kHz SWP: 7.626sec  
 Marker 1: 892.383MHz 46.8597 dB $\mu$ V Marker 2: 893.59MHz 47.2457 dB $\mu$ V Delta: 1.207MHz

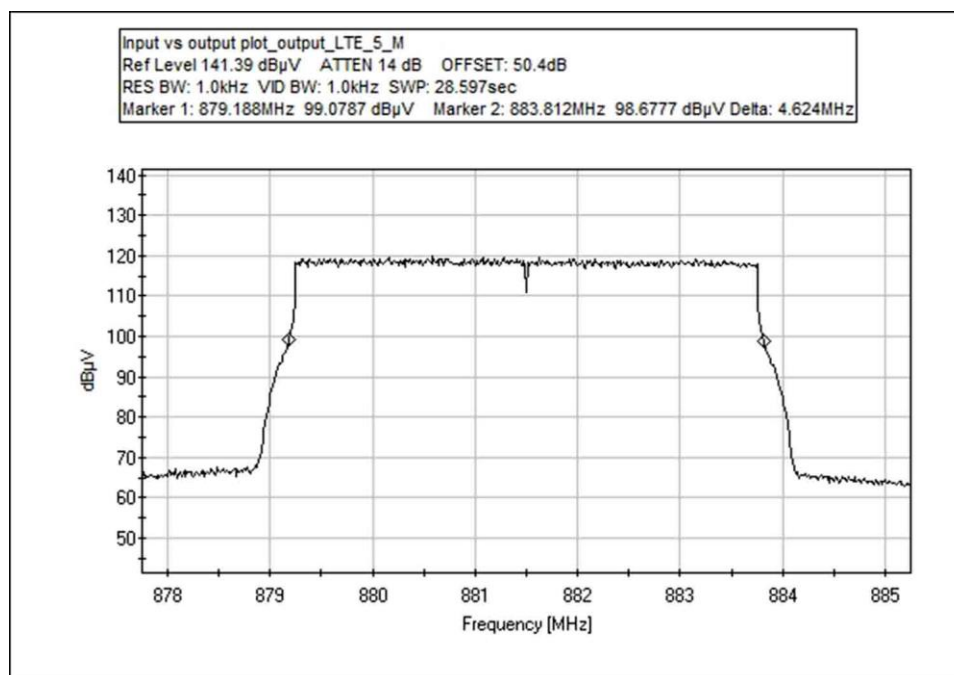
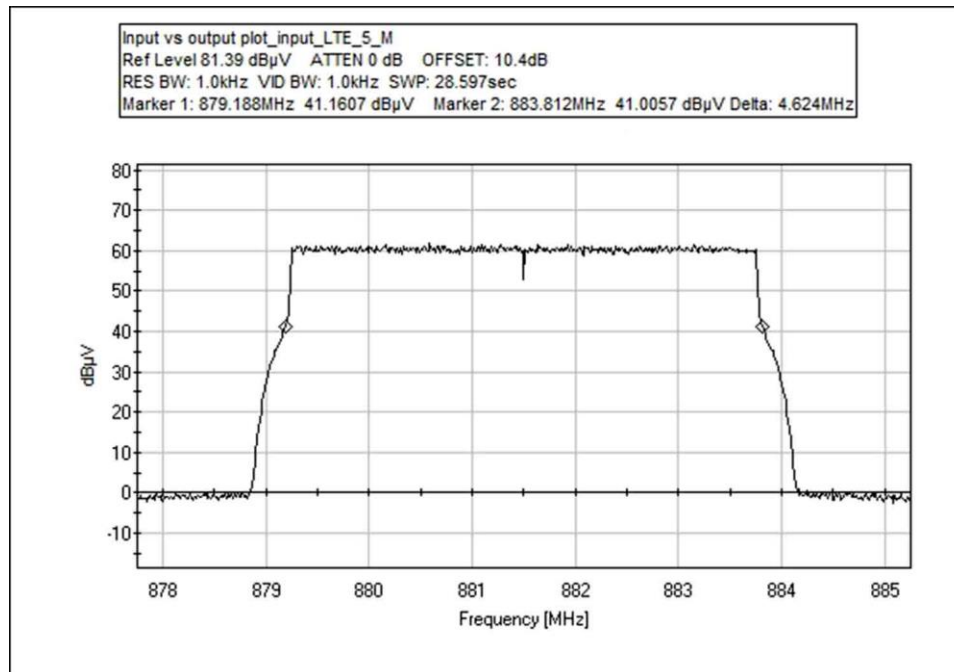


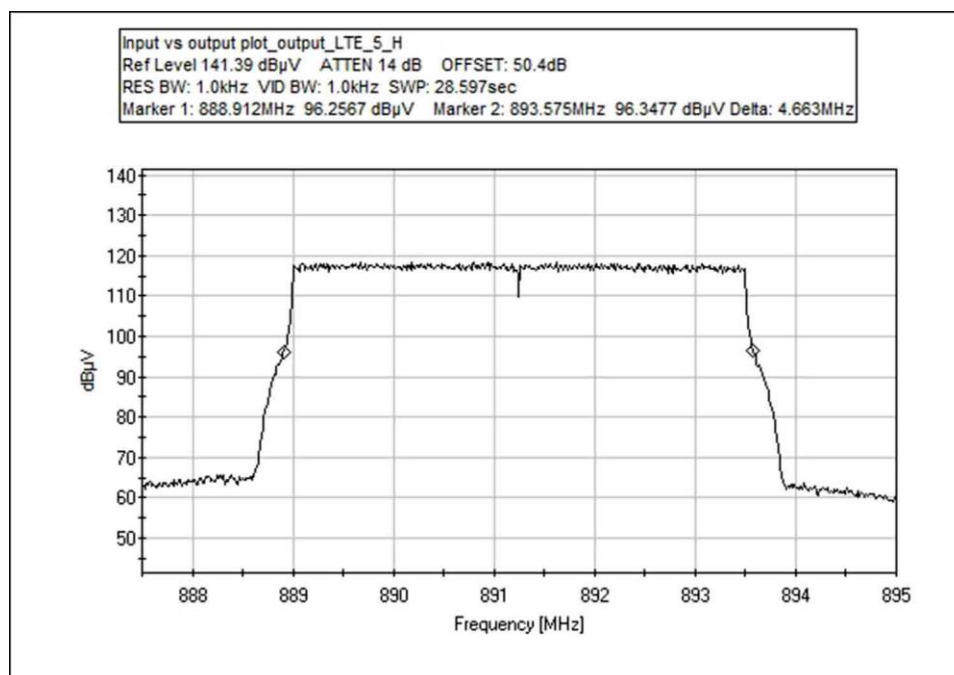
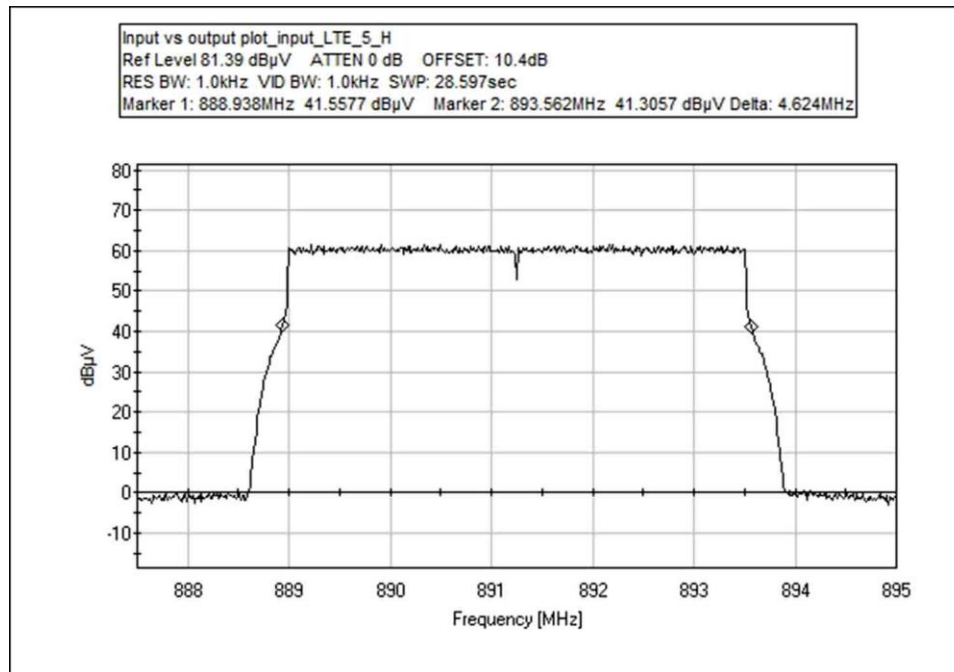
Input vs output plot\_output\_LTE\_1.4\_H  
 Ref Level 141.39 dB $\mu$ V ATTEN 14 dB OFFSET: 50.4dB  
 RES BW: 1.0kHz VID BW: 1.0kHz SWP: 7.626sec  
 Marker 1: 892.397MHz 104.226 dB $\mu$ V Marker 2: 893.59MHz 103.598 dB $\mu$ V Delta: 1.193MHz



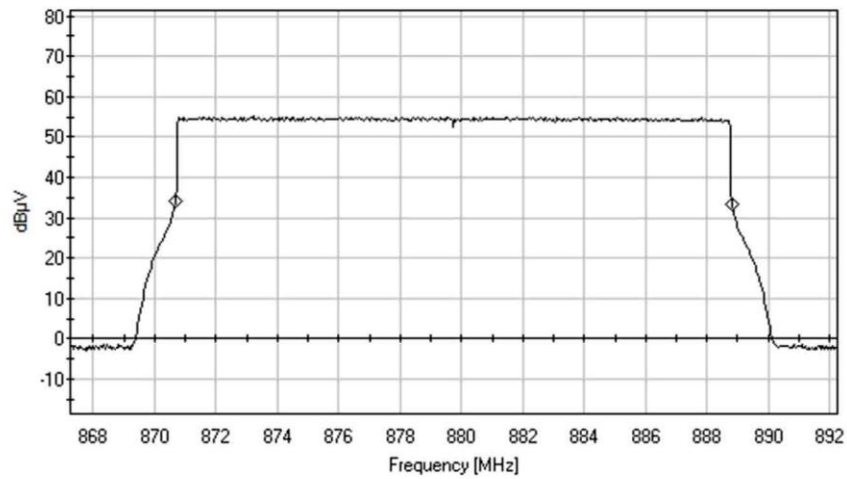




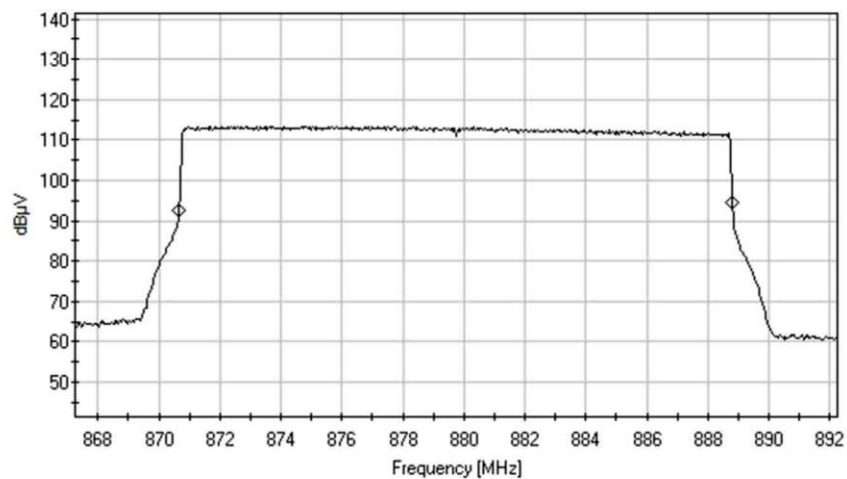


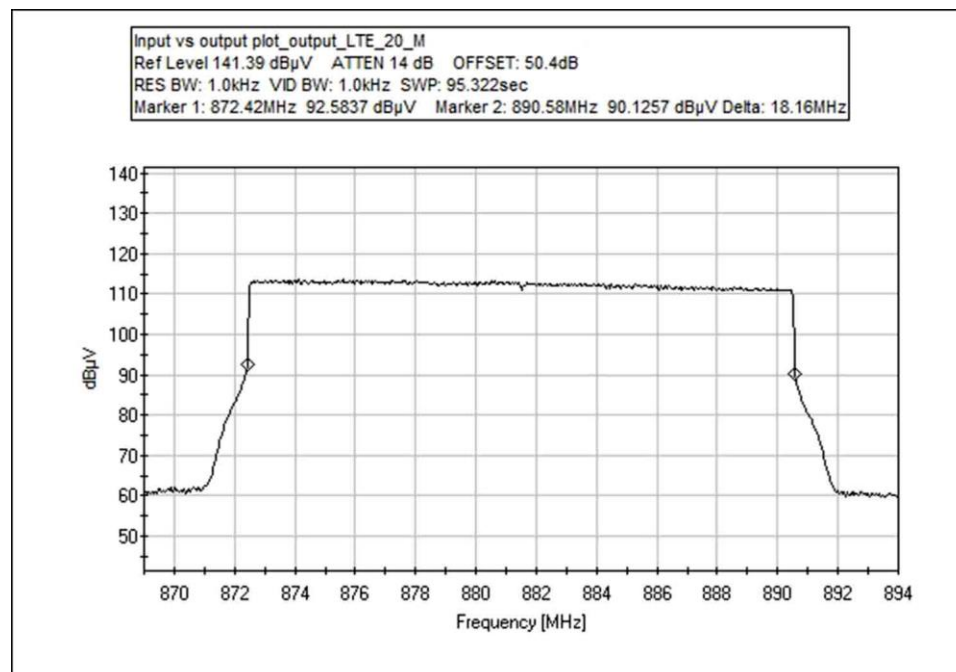
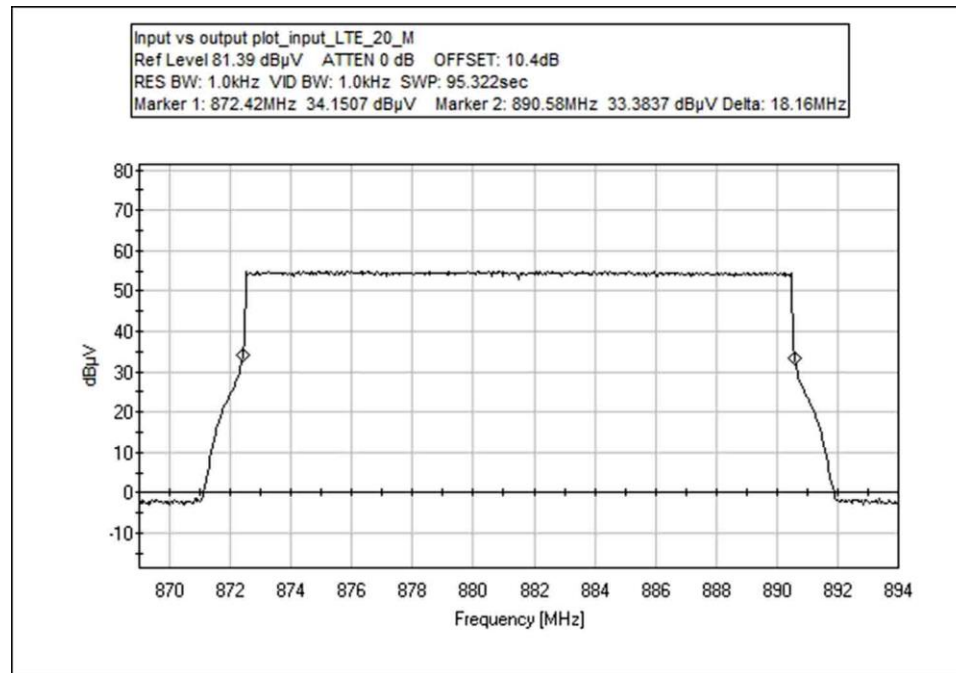


Input vs output plot\_input\_LTE\_20\_L  
 Ref Level 81.39 dB $\mu$ V ATTN 0 dB OFFSET: 10.4dB  
 RES BW: 1.0kHz VID BW: 1.0kHz SWP: 95.322sec  
 Marker 1: 870.67MHz 34.2077 dB $\mu$ V Marker 2: 888.83MHz 33.3507 dB $\mu$ V Delta: 18.16MHz

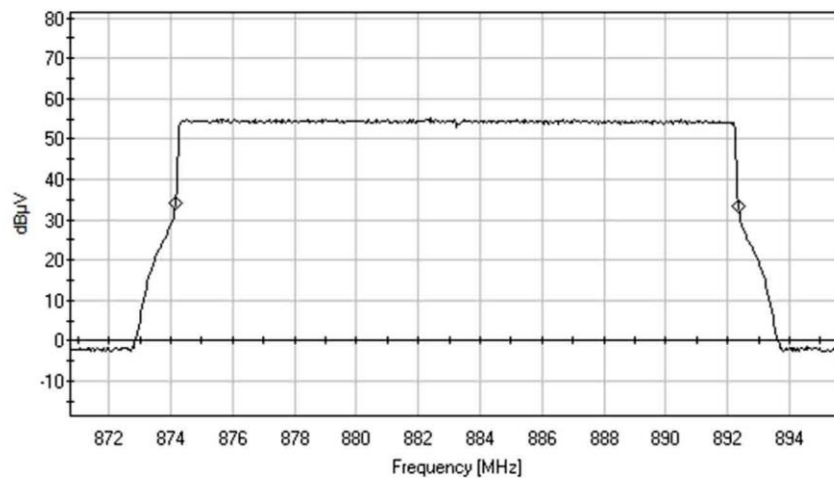


Input vs output plot\_output\_LTE\_20\_L  
 Ref Level 141.39 dB $\mu$ V ATTN 14 dB OFFSET: 50.4dB  
 RES BW: 1.0kHz VID BW: 1.0kHz SWP: 95.322sec  
 Marker 1: 870.67MHz 92.3677 dB $\mu$ V Marker 2: 888.79MHz 94.3637 dB $\mu$ V Delta: 18.12MHz

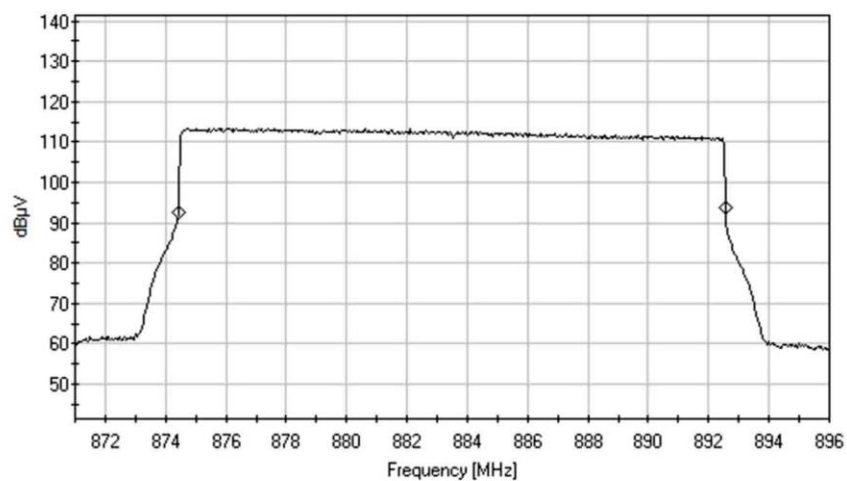




Input vs output plot\_input\_LTE\_20\_H  
 Ref Level 81.39 dB $\mu$ V ATTN 0 dB OFFSET: 10.4dB  
 RES BW: 1.0kHz VID BW: 1.0kHz SWP: 95.322sec  
 Marker 1: 874.17MHz 34.0737 dB $\mu$ V Marker 2: 892.33MHz 33.3147 dB $\mu$ V Delta: 18.16MHz



Input vs output plot\_output\_LTE\_20\_H  
 Ref Level 141.39 dB $\mu$ V ATTN 14 dB OFFSET: 50.4dB  
 RES BW: 1.0kHz VID BW: 1.0kHz SWP: 95.322sec  
 Marker 1: 874.42MHz 92.4437 dB $\mu$ V Marker 2: 892.54MHz 93.8377 dB $\mu$ V Delta: 18.12MHz



**Test Setup Photos**



## 2.1051 / 22.917(a) - Spurious Emissions at Antenna Terminal

### Test Data

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **BTI Wireless**  
 Specification: **FCC Part 22.917(a) Conducted Spurious Emission**  
 Work Order #: **94690** Date: 7/24/2013  
 Test Type: **Conducted Emissions** Time: 14:18:15  
 Equipment: **800MHz 40W remote transmitting unit** Sequence#: 1  
 Manufacturer: BTI Wireless Tested By: E. Wong  
 Model: mBSC0800-040-RUSSE02 110V 60Hz  
 S/N: 08001310001

#### Test Equipment:

| ID | Asset #  | Description       | Model       | Calibration Date | Cal Due Date |
|----|----------|-------------------|-------------|------------------|--------------|
| T1 | AN02869  | Spectrum Analyzer | E4440A      | 2/6/2013         | 2/6/2015     |
| T2 | ANP06153 | Cable             | 16301       | 10/27/2011       | 10/27/2013   |
| T3 | AN03169  | High Pass Filter  | HM1155-11SS | 9/22/2011        | 9/22/2013    |

#### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #              | S/N         |
|--------------------------------------|--------------|----------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUSSE02 | 08001310001 |

#### Support Devices:

| Function                    | Manufacturer | Model # | S/N        |
|-----------------------------|--------------|---------|------------|
| ESG Vector Signal Generator | Agilent      | 4438C   | MY45092055 |
| ESG Vector Signal Generator | Agilent      | 4433B   | US40052164 |

#### Test Conditions / Notes:

The EUT is placed on the test bench. Tx In is connected to an ESG; ANT is connected to a spectrum analyzer and attenuator. RX out port is terminated to 50 ohm load.  
 The evaluation is performed at the antenna port.  
 Freq: 869-894MHz  
 LTE-TM1.1 1.4MHz, 5MHz. 20MHz  
 Power : 40 W  
 LTE-TM1.1\_1.4MHz 870MHz, 881.5MHz. 893MHz  
 LTETM1.1\_5.0MHz 890.75MHz 881.5MHz, 890.75MHz  
 LTETM1.1\_20MHz 879.75MHz, 881.5MHz, 883.25MHz  
 Frequency range of measurement = 9 kHz- 9GHz.  
 9kHz-150 kHz; RBW=200Hz, VBW=200 Hz; 150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz; 30 MHz-1000 MHz;  
 RBW=120 kHz, VBW=120 kHz, 1000 MHz-9000 MHz; RBW=1 MHz, VBW=1 MHz.  
 71°C, 47% Relative Humidity  
 RMS detector.  
 Trace average: 100 traces.



Ext Attn: 0 dB

**Measurement Data:**

Reading listed by margin.

Test Lead: Ant Port

| #  | Freq<br>MHz      | Rdng<br>dBμV | T1<br>dB | T2<br>dB | T3<br>dB | dB | Dist<br>Table | Corr<br>dBμV/m | Spec<br>dBμV/m    | Margin<br>dB | Polar<br>Ant |
|----|------------------|--------------|----------|----------|----------|----|---------------|----------------|-------------------|--------------|--------------|
| 1  | 2617.583M        | 73.6         | +0.0     | +0.6     | +0.3     |    | +0.0          | 74.5           | 94.0<br>LTE_5_L   | -19.5        | Ant P        |
| 2  | 2645.042M        | 72.1         | +0.0     | +0.6     | +0.3     |    | +0.0          | 73.0           | 94.0<br>LTE_5_M   | -21.0        | Ant P        |
| 3  | 1740.280M        | 71.5         | +0.0     | +0.5     | +0.4     |    | +0.0          | 72.4           | 94.0<br>LTE_1.4_L | -21.6        | Ant P        |
| 4  | 2610.967M        | 71.4         | +0.0     | +0.6     | +0.3     |    | +0.0          | 72.3           | 94.0<br>LTE_5_H   | -21.7        | Ant P        |
| 5  | 1763.420M        | 71.0         | +0.0     | +0.5     | +0.4     |    | +0.0          | 71.9           | 94.0<br>LTE_1.4_M | -22.1        | Ant P        |
| 6  | 2644.267M<br>Ave | 69.7         | +0.0     | +0.6     | +0.3     |    | +0.0          | 70.6           | 94.0<br>LTE_1.4_M | -23.4        | Ant P        |
| ^  | 2644.267M        | 81.8         | +0.0     | +0.6     | +0.3     |    | +0.0          | 82.7           | 94.0<br>LTE_1.4_M | -11.3        | Ant P        |
| 8  | 1786.100M        | 69.3         | +0.0     | +0.5     | +0.4     |    | +0.0          | 70.2           | 94.0<br>LTE_1.4_H | -23.8        | Ant P        |
| 9  | 2638.200M        | 68.9         | +0.0     | +0.6     | +0.3     |    | +0.0          | 69.8           | 94.0<br>LTE_20_L  | -24.2        | Ant P        |
| 10 | 2609.750M<br>Ave | 68.6         | +0.0     | +0.6     | +0.3     |    | +0.0          | 69.5           | 94.0<br>LTE_1.4_L | -24.5        | Ant P        |
| ^  | 2609.750M        | 81.1         | +0.0     | +0.6     | +0.3     |    | +0.0          | 82.0           | 94.0<br>LTE_1.4_L | -12.0        | Ant P        |
| 12 | 1763.330M        | 68.0         | +0.0     | +0.5     | +0.4     |    | +0.0          | 68.9           | 94.0<br>LTE_5_M   | -25.1        | Ant P        |
| 13 | 2649.330M        | 67.8         | +0.0     | +0.6     | +0.3     |    | +0.0          | 68.7           | 94.0<br>LTE_20_H  | -25.3        | Ant P        |
| 14 | 2679.400M<br>Ave | 67.2         | +0.0     | +0.6     | +0.3     |    | +0.0          | 68.1           | 94.0<br>LTE_1.4_H | -25.9        | Ant P        |
| ^  | 2679.400M        | 77.7         | +0.0     | +0.6     | +0.3     |    | +0.0          | 78.6           | 94.0<br>LTE_1.4_H | -15.4        | Ant P        |
| 16 | 2645.000M        | 67.0         | +0.0     | +0.6     | +0.3     |    | +0.0          | 67.9           | 94.0<br>LTE_20_M  | -26.1        | Ant P        |
| 17 | 1743.000M        | 66.6         | +0.0     | +0.5     | +0.4     |    | +0.0          | 67.5           | 94.0<br>LTE_5_L   | -26.5        | Ant P        |
| 18 | 1740.700M        | 65.7         | +0.0     | +0.5     | +0.4     |    | +0.0          | 66.6           | 94.0<br>LTE_5_H   | -27.4        | Ant P        |
| 19 | 1767.000M        | 61.3         | +0.0     | +0.5     | +0.4     |    | +0.0          | 62.2           | 94.0<br>LTE_20_H  | -31.8        | Ant P        |
| 20 | 1767.500M        | 58.7         | +0.0     | +0.5     | +0.4     |    | +0.0          | 59.6           | 94.0<br>LTE_20_L  | -34.4        | Ant P        |
| 21 | 1765.100M        | 58.5         | +0.0     | +0.5     | +0.4     |    | +0.0          | 59.4           | 94.0<br>LTE_20_M  | -34.6        | Ant P        |

## LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

$$\text{REQUIRED ATTENUATION} = 43 + 10 \log P \text{ DB}$$

$$\text{Limit line (dBuV)} = V_{\text{dBuV}} - \text{Attenuation}$$

$$\begin{aligned} V_{\text{dBuV}} &= 20 \log \frac{V}{1 \times 10^{-6}} \\ &= 20 (\log V - \log 1 \times 10^{-6}) \\ &= 20 \log V - 20 \log 1 \times 10^{-6} \\ &= 20 \log V - 20 (-6) \\ &= 20 \log V + 120 \end{aligned}$$

$$\begin{aligned} \text{Attenuation} &= 43 + 10 \log P \\ &= 43 + 10 \log \frac{V^2}{R} \\ &= 43 + 10 (\log V^2 - \log R) \\ &= 43 + 10 (2 \log V - \log R) \\ &= 43 + 20 \log V - 10 \log R \end{aligned}$$

$$\begin{aligned} \text{Limit line} &= V_{\text{dBuV}} - \text{Attenuation} \\ &= 20 \log V + 120 - (43 + 20 \log V - 10 \log R) \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 120 - 43 + 10 \log 50 \quad \text{Note : } R = 50 \Omega \\ &= 120 - 43 + 16.897 \\ &= 94 \text{ dBuV at any power level} \end{aligned}$$

**Test Setup Photos**



## 2.1053 / 22.917(a) - Field Strength of Spurious Radiation

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **BTI Wireless**  
 Specification: **FCC Part 22.917(a) Radiated Spurious Emission**  
 Work Order #: **94690** Date: 7/29/2013  
 Test Type: **Maximized Emissions** Time: 10:28:48  
 Equipment: **800MHz 40W remote transmitting unit** Sequence#: 5  
 Manufacturer: BTI Wireless Tested By: Don Nguyen  
 Model: mBSC0800-040-RUC11  
 S/N: 08001310001

### Test Equipment:

| ID | Asset #  | Description                       | Model         | Calibration Date | Cal Due Date |
|----|----------|-----------------------------------|---------------|------------------|--------------|
|    | AN00309  | Preamp                            | 8447D         | 3/29/2012        | 3/29/2014    |
|    | AN01995  | Biconilog Antenna                 | CBL6111C      | 5/16/2012        | 5/16/2014    |
|    | ANP05050 | Cable                             | RG223/U       | 1/21/2013        | 1/21/2015    |
|    | ANP05198 | Cable-Amplitude 15 to 45degC (dB) | 8268          | 12/11/2012       | 12/11/2014   |
| T1 | AN02869  | Spectrum Analyzer                 | E4440A        | 2/6/2013         | 2/6/2015     |
|    | AN00314  | Loop Antenna                      | 6502          | 6/29/2012        | 6/29/2014    |
| T2 | AN00787  | Preamp                            | 83017A        | 5/31/2013        | 5/31/2015    |
| T3 | AN00849  | Horn Antenna                      | 3115          | 4/13/2012        | 4/13/2014    |
| T4 | ANP05421 | Cable                             | Sucoflex 104A | 2/8/2012         | 2/8/2014     |
| T5 | ANP05988 | Cable                             | LDF1-50       | 3/12/2012        | 3/12/2014    |
| T6 | ANP06153 | Cable                             | 16301         | 10/27/2011       | 10/27/2013   |

### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #            | S/N         |
|--------------------------------------|--------------|--------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUC11 | 08001310001 |

### Support Devices:

| Function                    | Manufacturer | Model #  | S/N        |
|-----------------------------|--------------|----------|------------|
| Power Meter                 | HP           | EPM-441A | GB37170458 |
| Power Sensor                | Agilent      | E4412A   | MY41502826 |
| ESG Vector Signal Generator | Agilent      | 4433B    | US40031692 |

**Test Conditions / Notes:**

The EUT is installed on an open rack to simulating final installation, and placed on the wooden table. Tx In is connected to a remotely located ESG, ANT is connected to a power meter for verification of output power level. RX out port is terminated to 50 ohm load.

Freq: 869-894MHz

Signal protocol: LTE-TM1.1 1.4MHz, 5MHz. 20MHz

Power : 40 W ( Max rated power)

This test is perform with a modulated narrow band signal

GSM 869.5MHz 881.5MHz 893.5MHz

Frequency range of measurement = 9kHz- 9GHz.

9kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz;30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,1000 MHz-9000 MHz; RBW=1 MHz, VBW=1 MHz.

21°C, 47% RH

RMS detector.

**Test Data**

Operating Frequency: 869-894MHz

Channels: GSM

Highest Measured Output

Power: 46.00 (dBm)= 40 (Watts)

Distance: 3 meters

Limit:  $43+10\log(P)= 59.02$  dBc

| Freq. (MHz) | Reference Level (dBm) | Antenna Polarity (H/V) | dBc    |
|-------------|-----------------------|------------------------|--------|
| 1,739.00    | -55.12059991          | Horiz                  | 101.12 |
| 2,608.50    | -56.32059991          | Horiz                  | 102.32 |
| 1,763.00    | -55.02059991          | Horiz                  | 101.02 |
| 2,644.50    | -56.12059991          | Horiz                  | 102.12 |
| 1,787.00    | -56.82059991          | Horiz                  | 102.82 |
| 2,680.50    | -57.22059991          | Horiz                  | 103.22 |
| 1,787.00    | -55.42059991          | Vert                   | 101.42 |
| 2,680.50    | -55.92059991          | Vert                   | 101.92 |
| 1,763.00    | -57.22059991          | Vert                   | 103.22 |
| 2,644.50    | -57.92059991          | Vert                   | 103.92 |
| 1,739.00    | -55.82059991          | Vert                   | 101.82 |
| 2,608.50    | -56.22059991          | Vert                   | 102.22 |
|             |                       |                        | PASS   |

**Test Setup Photos**







## Bandedge

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **BTI Wireless**  
 Specification: **Bandedge plot**  
 Work Order #: **94690** Date: 7/24/2013  
 Test Type: **Conducted Emissions** Time: 14:18:15  
 Equipment: **800MHz 40W remote transmitting unit** Sequence#: 1  
 Manufacturer: BTI Wireless Tested By: E. Wong  
 Model: mBSC0800-040-RUC11 110V 60Hz  
 S/N: 08001310001

#### Test Equipment:

| ID | Asset #  | Description       | Model  | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------|------------------|--------------|
| T1 | AN02869  | Spectrum Analyzer | E4440A | 2/6/2013         | 2/6/2015     |
| T2 | ANP06153 | Cable             | 16301  | 10/27/2011       | 10/27/2013   |

#### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #            | S/N         |
|--------------------------------------|--------------|--------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUC11 | 08001310001 |

#### Support Devices:

| Function                    | Manufacturer | Model # | S/N        |
|-----------------------------|--------------|---------|------------|
| ESG Vector Signal Generator | Agilent      | 4433B   | US40052164 |

#### Test Conditions / Notes:

The EUT is placed on the test bench. Tx In is connected to an ESG, ANT is connected to a spectrum analyzer and attenuator. RX out port is terminated to 50 ohm load.

The evaluation is performed at the antenna port.

Freq: 869-894MHz

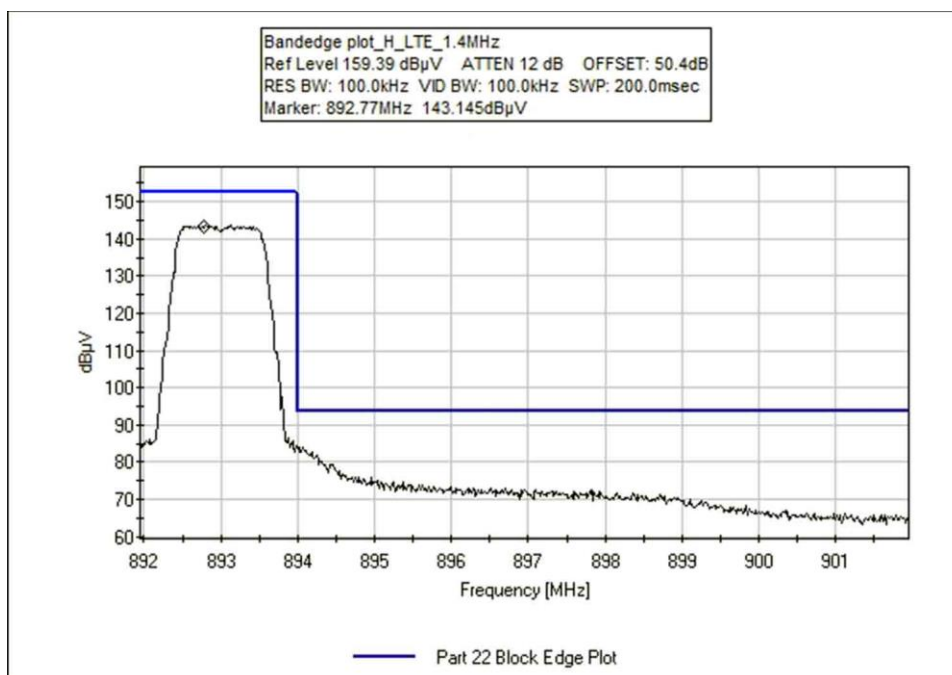
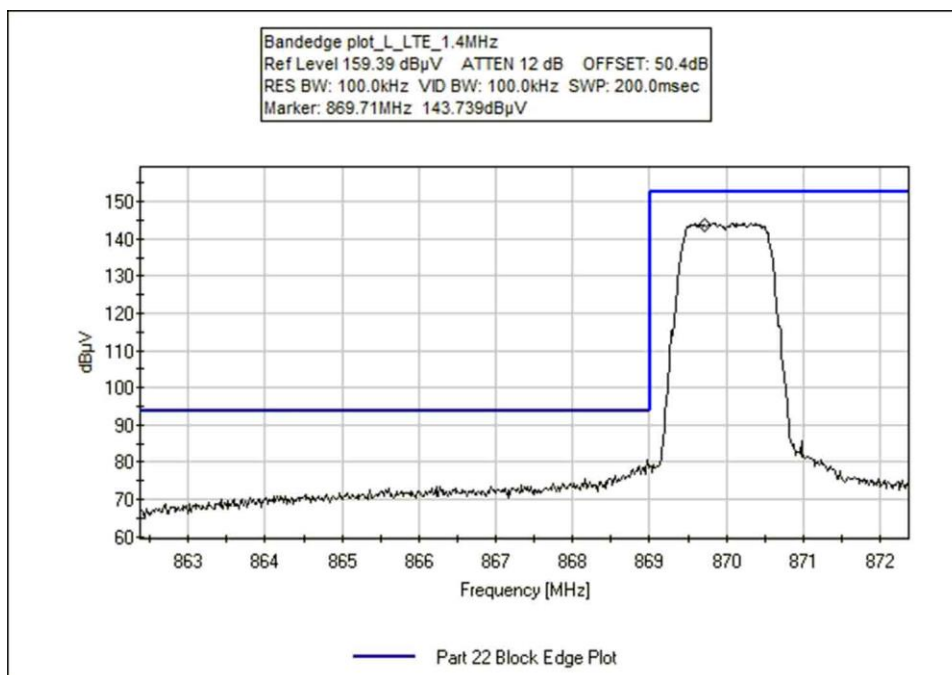
Signal protocol: LTE-TM1.1 1.4MHz, 5MHz. 20MHz

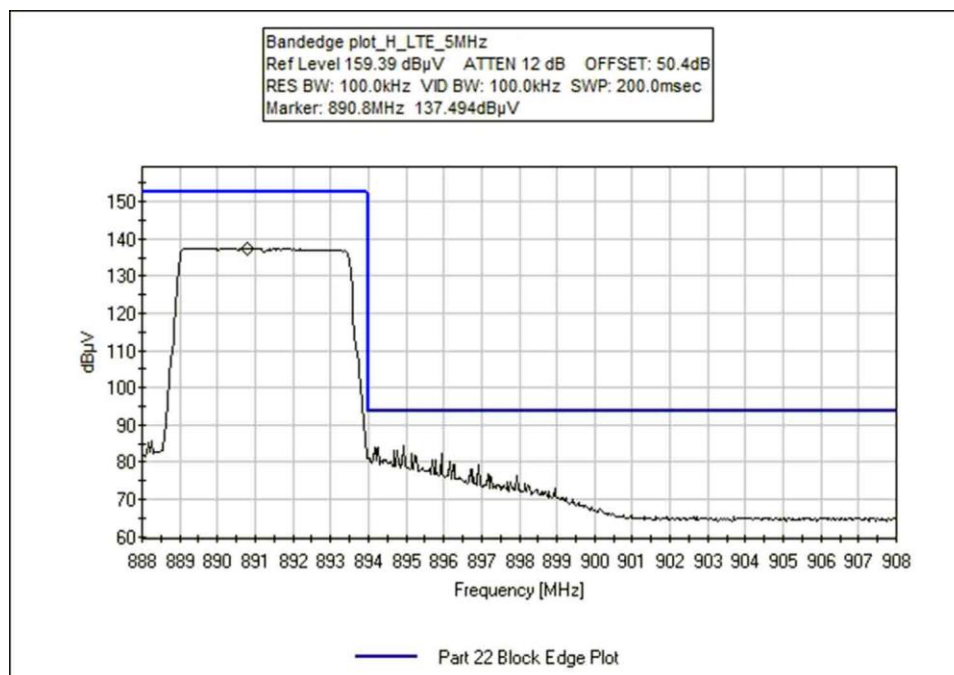
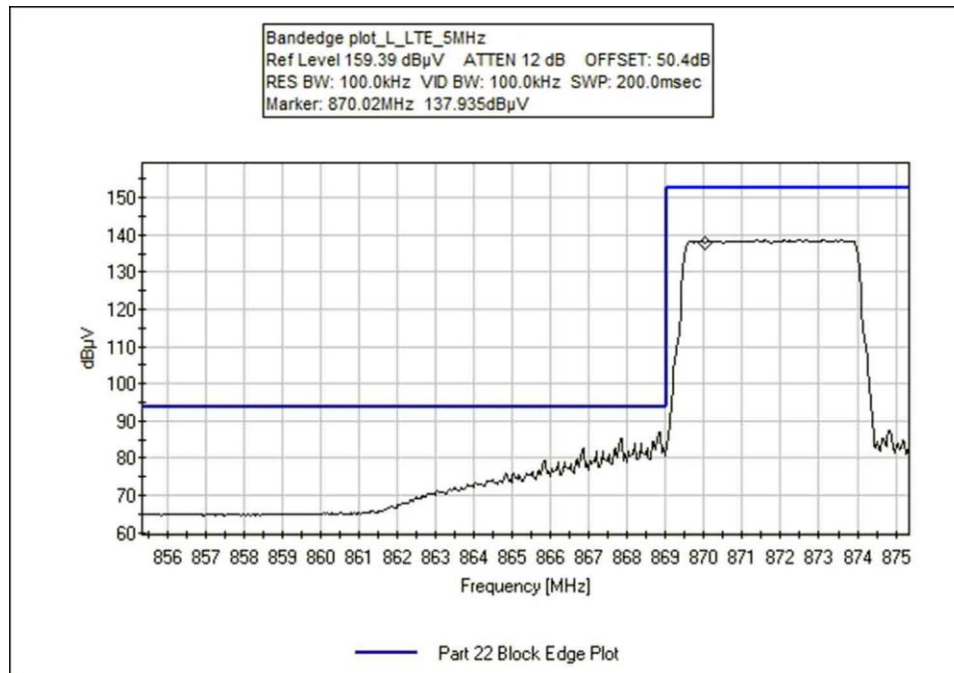
Power: 40 W

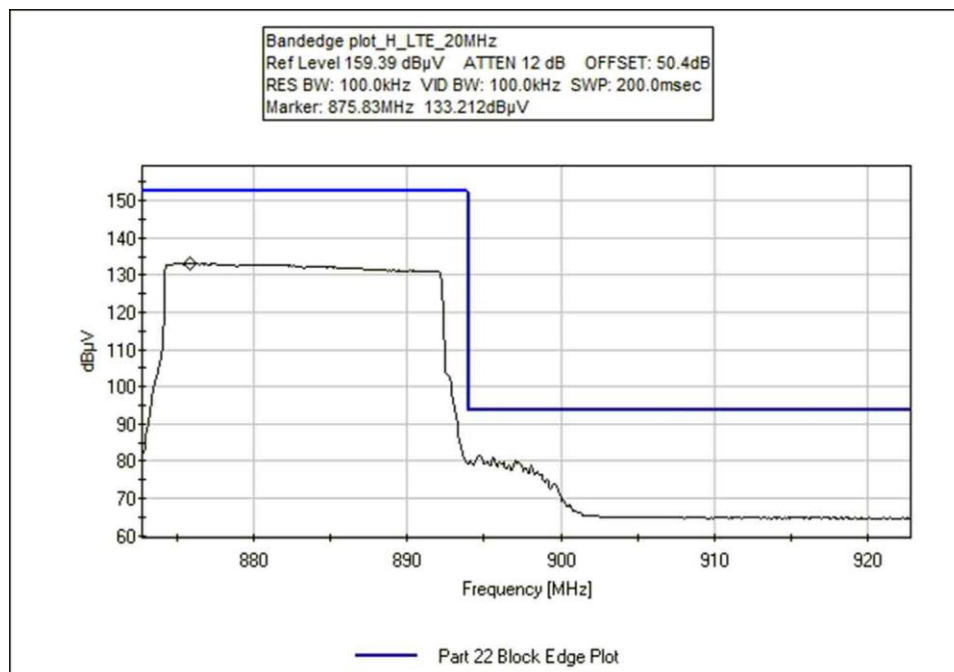
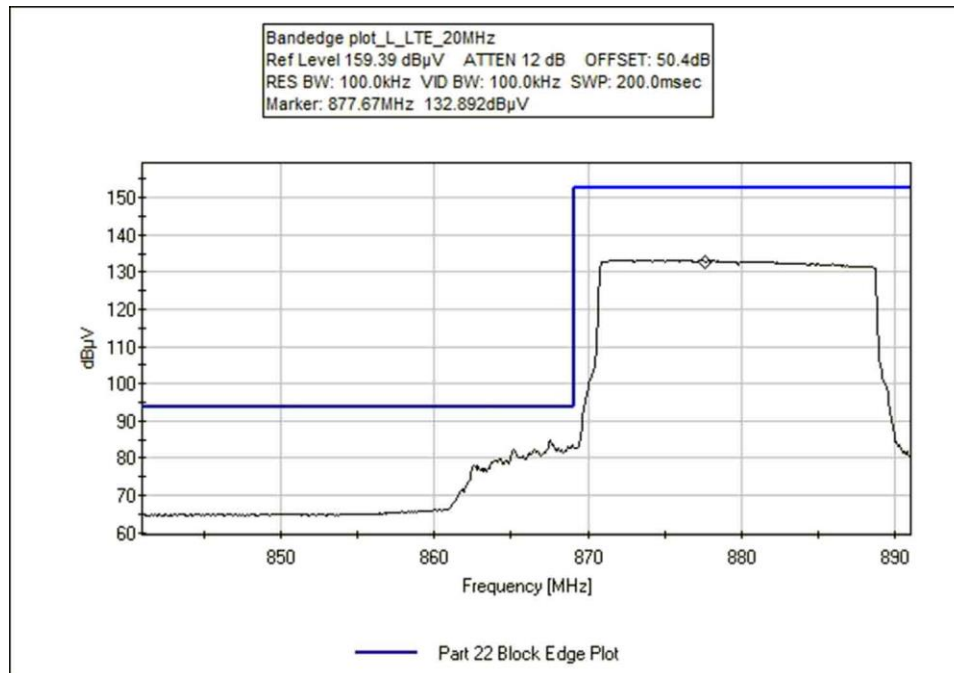
21°C, 47% Relative Humidity



### Test Data







**Test Setup Photos**



## Intermodulation

### Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • 714-993-6112

Customer: **BTI Wireless**  
 Specification: **Intermodulation**  
 Work Order #: **94690** Date: 7/24/2013  
 Test Type: **Conducted Emissions** Time: 14:18:15  
 Equipment: **800MHz 40W remote transmitting unit** Sequence#: 1  
 Manufacturer: BTI Wireless Tested By: E. Wong  
 Model: mBSC0800-040-RUC11 110V 60Hz  
 S/N: 08001310001

#### Test Equipment:

| ID | Asset #  | Description       | Model  | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------|------------------|--------------|
| T1 | AN02869  | Spectrum Analyzer | E4440A | 2/6/2013         | 2/6/2015     |
| T2 | ANP06153 | Cable             | 16301  | 10/27/2011       | 10/27/2013   |

#### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #            | S/N         |
|--------------------------------------|--------------|--------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUC11 | 08001310001 |

#### Support Devices:

| Function                    | Manufacturer | Model # | S/N        |
|-----------------------------|--------------|---------|------------|
| ESG Vector Signal Generator | Agilent      | 4433B   | US40052164 |
| ESG Vector Signal Generator | Agilent      | 4433B   | US40031692 |

#### Test Conditions / Notes:

The EUT is placed on the test bench. Tx In is connected to two ESGs via a power combiner, ANT is connected to a spectrum analyzer and attenuator. RX out port is terminated to 50 ohm load.

The evaluation is performed at the antenna port.

Freq: 869-894MHz

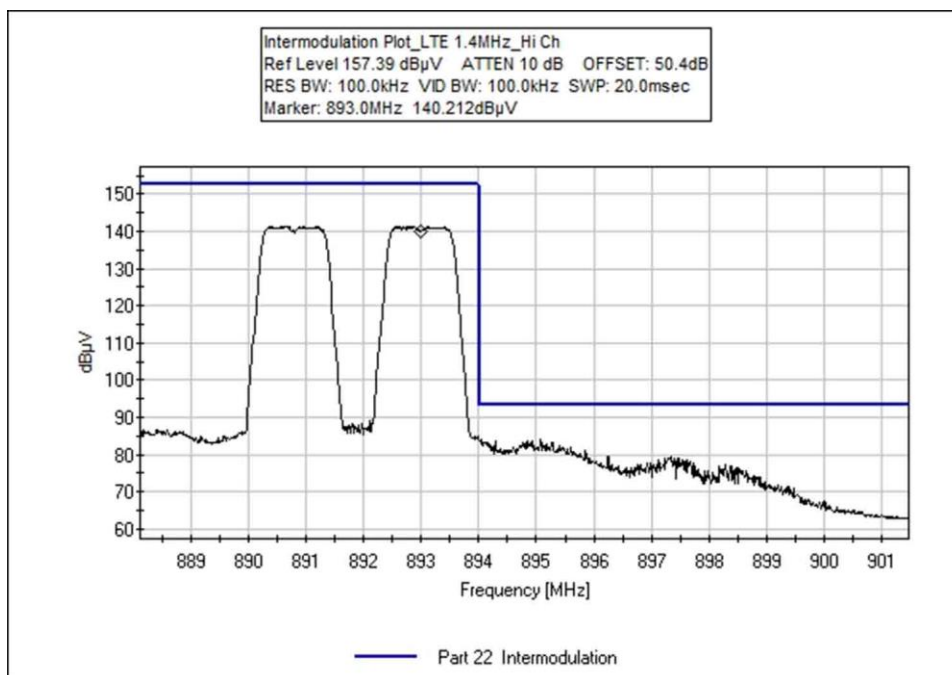
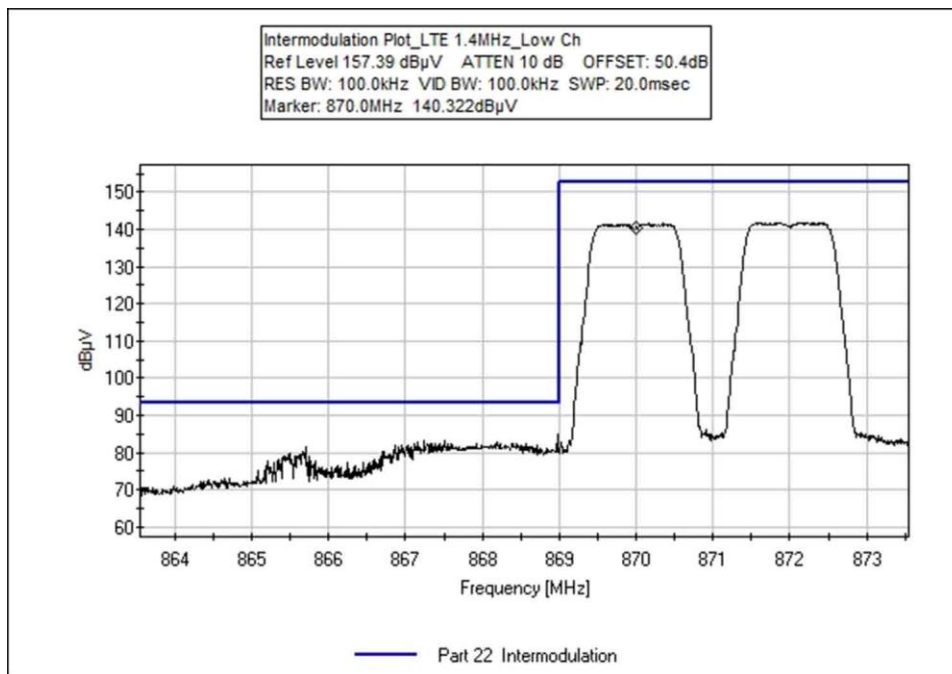
Signal protocol: LTE-TM1.1 1.4MHz, 5MHz.

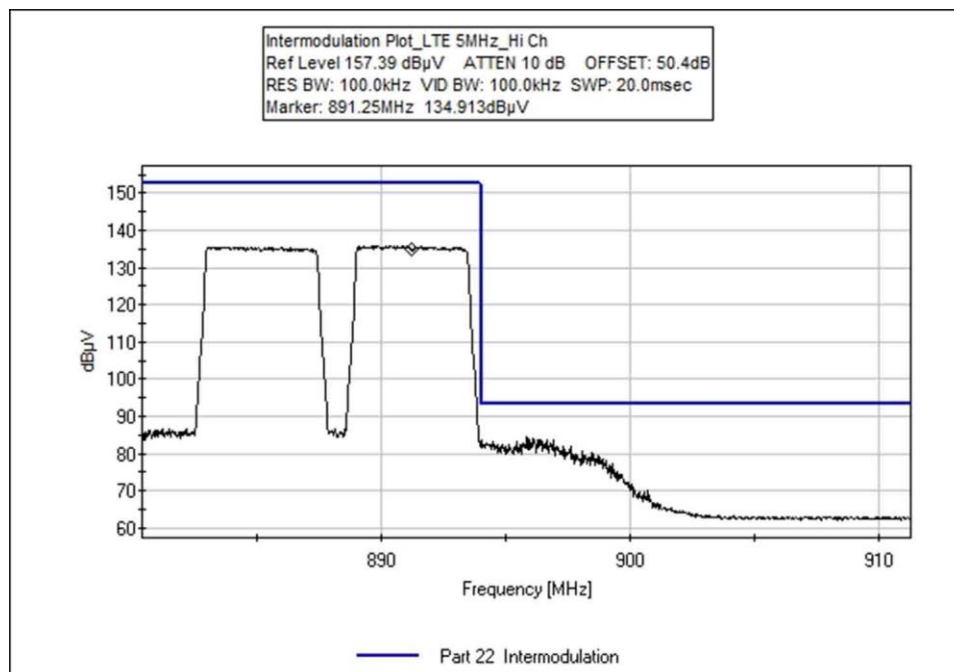
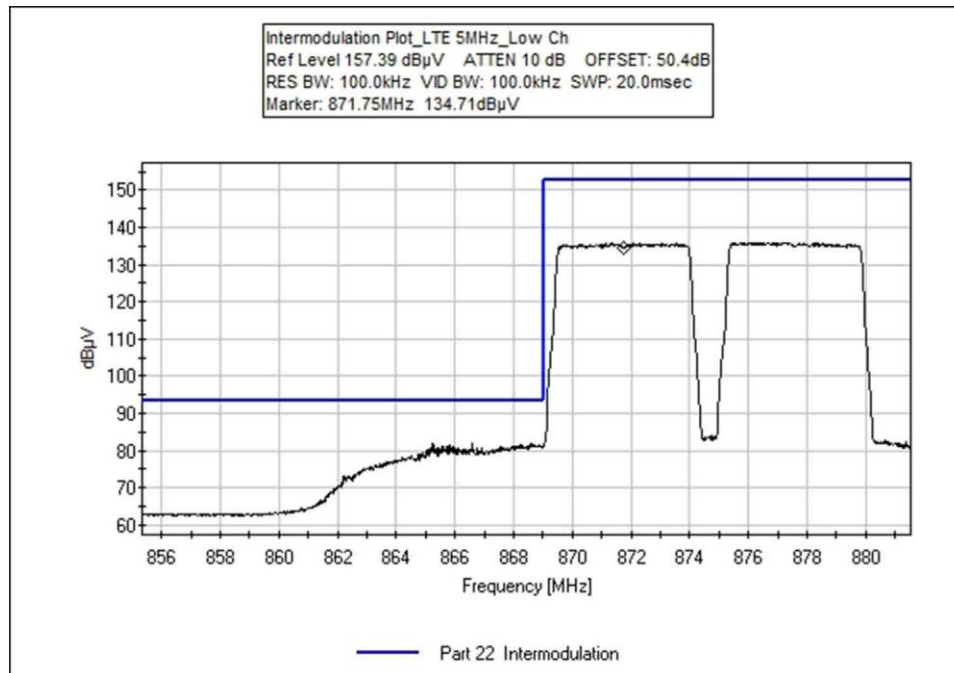
Input signal levels were set to produce maximum rated RF output power.

Power: 40 W

21°C, 47% Relative Humidity

### Test Data







**Test Setup Photos**





## Out of Band Rejection

### Test Conditions / Setup

Test Location: Brea

Customer: **BTI Wireless**

Specification: **Out of band rejection plot**

Work Order #: **94690**

Date: 7/25/2013

Test Type: **Conducted Emissions**

Time: 16:47:52

Equipment: **800MHz 40W remote transmitting unit**

Sequence#: 4

Manufacturer: BTI Wireless

Tested By: E. Wong

Model: mBSC0800-040-RUC11

110V 60Hz

S/N: 08001310001

#### Test Equipment:

| ID | Asset # | Description      | Model | Calibration Date | Cal Due Date |
|----|---------|------------------|-------|------------------|--------------|
|    | C00054  | Network Analyzer | 8753E | 9/12/08          | 9/12/10      |

#### Equipment Under Test (\* = EUT):

| Function                             | Manufacturer | Model #            | S/N         |
|--------------------------------------|--------------|--------------------|-------------|
| 800MHz 40W remote transmitting unit* | BTI Wireless | mBSC0800-040-RUC11 | 08001310001 |

#### Test Conditions / Notes:

The EUT is placed on the test bench. Tx In is connected to Port 1 of the Network Analyzer, ANT is connected Port 2 of the Network Analyzer via an attenuator. RX out port is terminated to 50 ohm load.

The evaluation is performed at the antenna port.

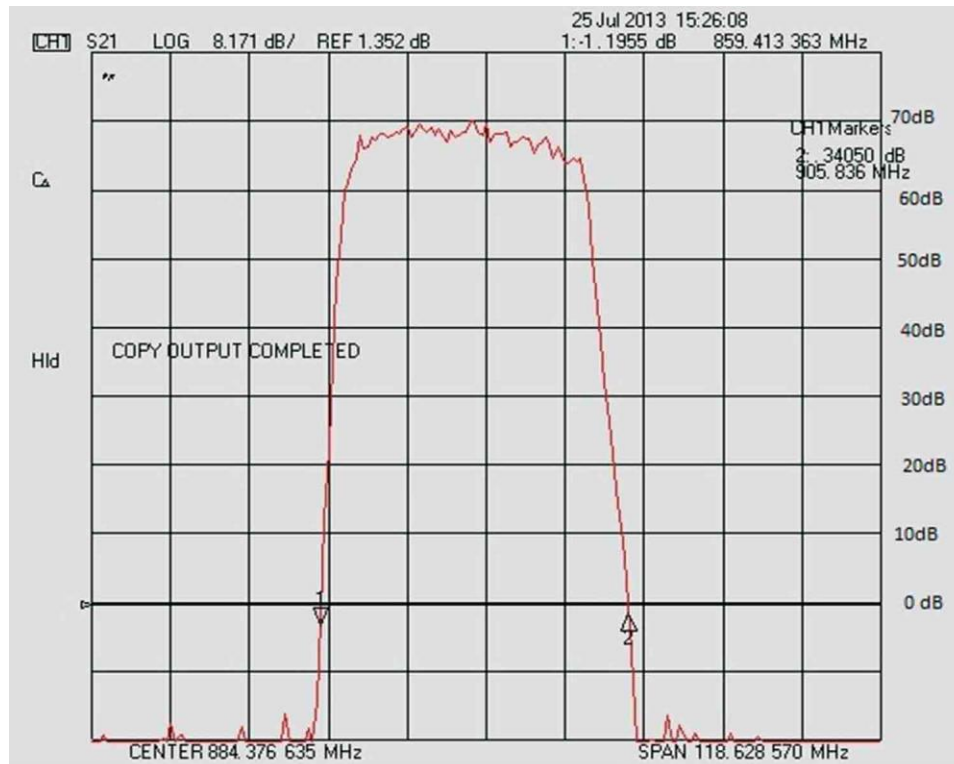
Freq: 869-894MHz

Power: 40 W

Frequency range of measurement = 824-944MHz

21°C, 47% Relative Humidity

### Test Data



### Test Setup Photos



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

| Uncertainty Value | Parameter                 |
|-------------------|---------------------------|
| 4.73 dB           | Radiated Emissions        |
| 3.34 dB           | Mains Conducted Emissions |
| 3.30 dB           | Disturbance Power         |

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ . Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB $\mu$ V/m, the spectrum analyzer reading in dB $\mu$ V was corrected by using the following formula. This reading was then compared to the applicable specification limit.

| SAMPLE CALCULATIONS |                     |          |
|---------------------|---------------------|----------|
|                     | Meter reading       | (dBμV)   |
| +                   | Antenna Factor      | (dB)     |
| +                   | Cable Loss          | (dB)     |
| -                   | Distance Correction | (dB)     |
| -                   | Preamplifier Gain   | (dB)     |
| =                   | Corrected Reading   | (dBμV/m) |

#### TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

| MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE |                     |                  |                   |
|------------------------------------------------------------|---------------------|------------------|-------------------|
| TEST                                                       | BEGINNING FREQUENCY | ENDING FREQUENCY | BANDWIDTH SETTING |
| CONDUCTED EMISSIONS                                        | 150 kHz             | 30 MHz           | 9 kHz             |
| RADIATED EMISSIONS                                         | 9 kHz               | 150 kHz          | 200 Hz            |
| RADIATED EMISSIONS                                         | 150 kHz             | 30 MHz           | 9 kHz             |
| RADIATED EMISSIONS                                         | 30 MHz              | 1000 MHz         | 120 kHz           |
| RADIATED EMISSIONS                                         | 1000 MHz            | >1 GHz           | 1 MHz             |

#### SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

##### **Peak**

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

##### **Quasi-Peak**

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

##### **Average**

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.