



## **MC8790 Test Report**

FCC Part 22, 24 / IC RSS 132, 133

FOR

FCC and IC Certifications

**IC: 2417C-MC8790**  
**FCC ID: N7NMC8790**

Prepared by  
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### 1 Introduction and Purpose

This document provides the MC8790 wireless modem test data for the FCC and Industry Canada certifications. The tests included in this report are limited to all conducted tests required. The radiated tests were performed at an external test facility.

### 2 Test Summary

| FCC RULE                               | DESCRIPTION OF TEST                           | RESULT   | PAGE              |
|--|---|----------|-------------------|
| 2.1046                                 | RF Power Output                               | Complies | 5                 |
| 2.1049                                 | Occupied Bandwidth                            | Complies | 14                |
| 2.1051, 22.901(d)<br>22.917, 24.238(a) | Out of Band Emissions at Antenna<br>Terminals | Complies | 24                |
| FCC Part 22H/24E                       | Block Edge Requirements                       | Complies | 62                |
| 2.1053                                 | Field Strength of Spurious Radiation          | Complies | See CCS<br>Report |
| 2.1055                                 | Frequency Stability versus Temperature        | Complies | 69                |
| 2.1055                                 | Frequency Stability versus Voltage            | Complies | 74                |

The tests described in this report were performed by Mr. Hari Shankar Shukla at:

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### 3 Description of Equipment Under Test

The Sierra Wireless Inc. model MC8790 is a multi-band wireless modem operating on the GSM/GPRS/EDGE/UMTS network. In the US and Canada, only cellular and PCS bands are used for GSM/GPRS/UMTS operation, so this test report only contains data for these two bands (850MHz and 1900MHz).

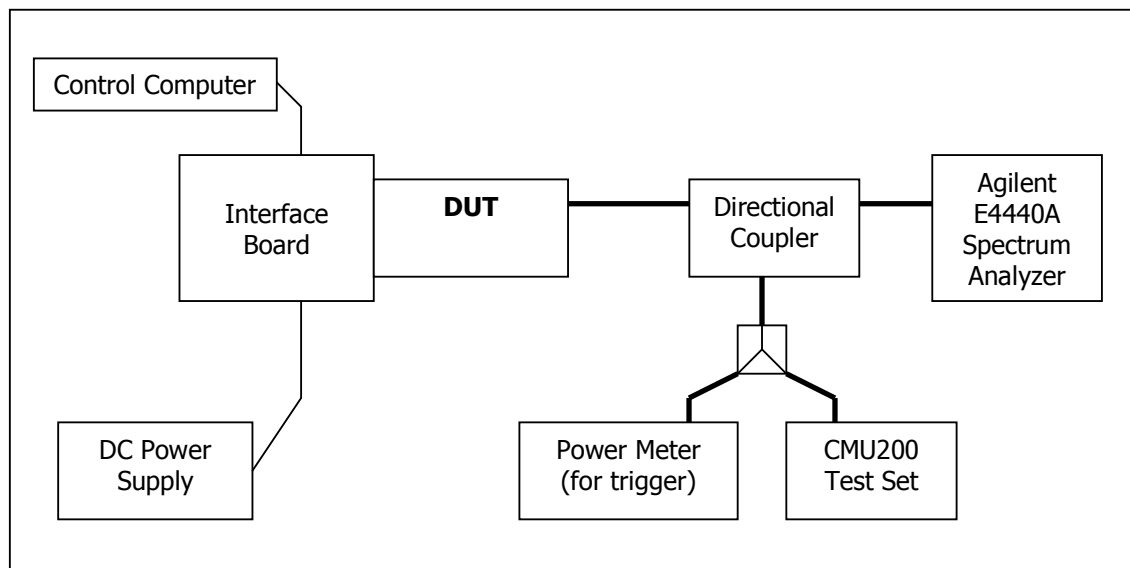
### 4 RF Power Output

FCC 2.1046

#### 4.1 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMU200 Test Set and configured to operate at maximum power in a call. The power was measured using the spectrum analyzer at three equally spaced operating frequencies for each band. The RBW was set to 300 KHz for the GSM and EDGE measurements, and 5MHz for the WCDMA measurements. The spectrum analyzer was set to measure the RF output power with the cable and coupler losses accounted for.

#### Test Setup



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### 4.2 Test Equipment

#### Instrument List

| EQUIPMENT           | MANUFACTURER    | MODEL NO.  | SERIAL NO. | CAL. DATE         |
|---------------------|-----------------|------------|------------|-------------------|
| Control Computer    | TC              | Generic PC | 100488     | N/A               |
| Wireless Test Set   | Rohde & Schwarz | CMU200     | 111682     | November 18, 2008 |
| Spectrum Analyzer   | Agilent         | PSA E4440A | US41421268 | March 11, 2008    |
| DC Power Supply     | HP              | E3631A     | 3530A      | N/A               |
| Interface Board     | Shop built      | Minnow     | N/A        | N/A               |
| Directional Coupler | Mini-Circuits   | ZA3PD-2    | N/A        | N/A               |

### 4.3 Test Results GSM/EDGE

| Frequency (MHz) | Channel | Power (dBm) |            |
|-----------------|---------|-------------|------------|
|                 |         | GMSK Mode   | 8-PSK Mode |
| 824.2           | 128     | 31.83       | 27.11      |
| 836.6           | 190     | 31.79       | 27.05      |
| 848.8           | 251     | 31.50       | 26.77      |
| 1850.2          | 512     | 28.71       | 25.87      |
| 1880.0          | 661     | 28.63       | 25.81      |
| 1909.8          | 810     | 28.59       | 25.79      |

### 4.4 Test Results UMTS

#### 4.4.1 Test 1: RF Output Power Results for WCDMA R99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V7.5.0 specification. The MC8790 supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

The test was performed according to section 5.2 of the 3GPP TS34.121-1 V7.5.

| Frequency (MHz) | Channel | WCDMA R99       |                  |
|-----------------|---------|-----------------|------------------|
|                 |         | RMS Power (dBm) | Peak Power (dBm) |
| 826.4           | 4132    | 22.76           | 26.21            |
| 836.4           | 4182    | 23.09           | 26.52            |
| 846.6           | 4233    | 22.80           | 26.29            |
| 1852.4          | 9262    | 23.31           | 26.58            |
| 1880.0          | 9400    | 23.23           | 26.47            |
| 1907.6          | 9538    | 23.12           | 26.45            |

Note: The results above reflect max power with all up bits.

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### 4.4.2 Test 2: RF Output Power Results for HSDPA Rel6

The MC8790 supports Category 8 FDD HS-DSCH physical layer. As stated in the 3GPP TS25.306 V7.3.0 Table 5.1a, the details of Category 8 are as follows:

- Maximum of 10 E-DSCH received codes
- Minimum 1 inter-TTI interval
- Maximum 14411bits in an E-DSCH transport block received within an E-DSCH TTI
- Total number of soft channel bits is 134400
- Support of QPSK and 16QAM

A detailed list of all settings used is included at the end of this report in section 6.0

The following Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements for Power Class 3 were met according to table 5.2AA.5 and achieved through the outlined test procedure in section 5.2AA.4.2. All UE channels and power ratio's are set according to table C10.1.4 in the 3GPP TS34.121-1 V7.5.0 specification. A summary of these settings are illustrated below:

| Subtest | Mode  | Call Type | RMC (kbps) | HSDPA FRC    | Power Class 3 Max Limit dBm | $\beta_c/\beta_d$ | $\beta_{hs}$ | CM (db) | MPR (db) |
|---------|-------|-----------|------------|--------------|-----------------------------|-------------------|--------------|---------|----------|
| 1       | HSDPA | PS        | 12.2       | H-Set 1 QPSK | 24 (+1.7/-3.7 db)           | 2 /15             | 4/15         | 0.0     | 0.0      |
| 2       | HSDPA | PS        | 12.2       | H-Set 1 QPSK | 24 (+1.7/-3.7 db)           | 12 /15            | 24/15        | 1.0     | 0.0      |
| 3       | HSDPA | PS        | 12.2       | H-Set 1 QPSK | 23.5 (+2.2/-3.7 db)         | 15 /8             | 30/15        | 1.5     | 0.5      |
| 4       | HSDPA | PS        | 12.2       | H-Set 1 QPSK | 23.5 (+2.2/-3.7 db)         | 15 /4             | 30/15        | 1.5     | 0.5      |

#### 4.4.2.1 Sub-Test 1

$\beta_c=2/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=4/15$

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.48       | 25.76 |
| 836.4           | 4182    | 22.74       | 26.03 |
| 846.6           | 4233    | 22.45       | 25.88 |
| 1852.4          | 9262    | 22.82       | 26.17 |
| 1880.0          | 9400    | 22.77       | 26.01 |
| 1907.6          | 9538    | 22.80       | 26.06 |

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4.4.2.2 *Sub-Test 2*

$\beta_c=12/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=24/15$

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.43       | 25.49 |
| 836.4           | 4182    | 22.67       | 25.82 |
| 846.6           | 4233    | 22.49       | 25.48 |
| 1852.4          | 9262    | 22.88       | 25.89 |
| 1880.0          | 9400    | 22.68       | 25.97 |
| 1907.6          | 9538    | 22.45       | 25.91 |

4.4.2.3 *Sub-Test 3*

$\beta_c=15/15$ ,  $\beta_d=15/8$ ,  $\beta_{hs}=30/15$

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.34       | 25.71 |
| 836.4           | 4182    | 22.65       | 25.86 |
| 846.6           | 4233    | 22.27       | 25.52 |
| 1852.4          | 9262    | 22.67       | 26.03 |
| 1880.0          | 9400    | 22.75       | 26.11 |
| 1907.6          | 9538    | 22.54       | 25.86 |

4.4.2.4 *Sub-Test 4*

$\beta_c=15/15$ ,  $\beta_d=4/15$ ,  $\beta_{hs}=30/15$

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.42       | 25.65 |
| 836.4           | 4182    | 22.69       | 25.77 |
| 846.6           | 4233    | 21.60       | 25.69 |
| 1852.4          | 9262    | 22.71       | 26.12 |
| 1880.0          | 9400    | 22.58       | 25.99 |
| 1907.6          | 9538    | 22.61       | 25.96 |

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### 4.4.3 Test 3: RF Output Power Results for HSPA (HSDPA & HSUPA) Rel6

The MC8790 supports Category 5 FDD E-DCH physical layer. As stated in the 3GPP TS25.306 V7.3.0 Table 5.1g, the details of Category 5 are as follows:

- Maximum of 2 E-DCH transmitted codes
- Minimum spreading factor of SF2
- Support for only 10 ms TTI E-DCH
- Maximum 20000 bits in an E-DCH transport block within a 10 ms E-DCH TTI
- Data rate of 2 Mbps
- Support of QPSK only

A detailed list of all settings used is included at the end of this report in section 6.0

The following 5 Sub-Tests were completed according to the test requirements outlined in section 5.2B of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements were met according to table 5.2B.5 and achieved through the outlined test procedure in section 5.2B.4.2. All UE channels and power ratio's are set according to table C11.1.3 in the 3GPP TS34.121-1 V7.5.0 specification. A summary of these settings are illustrated below:

| Subtest | Mode | Call Type | RMC (kbps) | HSDPA FRC    | Power Class 3 Max Limit dBm | $\beta_c/\beta_d$ | $\beta_{hs}$ | $\beta_{ed}$ | CM (db) | MPR (db) |
|---------|------|-----------|------------|--------------|-----------------------------|-------------------|--------------|--------------|---------|----------|
| 1       | HSPA | PS        | 12.2       | H-Set 1 QPSK | 24 (+1.7/-5.2 db)           | 11 /15            | 22/15        | 209/225      | 1.0     | 0.0      |
| 2       | HSPA | PS        | 12.2       | H-Set 1 QPSK | 22 (+3.7/-5.2 db)           | 6 /15             | 12/15        | 12/15        | 3.0     | 2.0      |
| 3       | HSPA | PS        | 12.2       | H-Set 1 QPSK | 23 (+2.7/-5.2 db)           | 15 /15            | 30/15        | 30/15        | 2.0     | 1.0      |
| 4       | HSPA | PS        | 12.2       | H-Set 1 QPSK | 22 (+1.7/-5.2 db)           | 15 /9             | 4/15         | 2/15         | 3.0     | 2.0      |
| 5       | HSPA | PS        | 12.2       | H-Set 1 QPSK | 24 (+1.7/-5.2 db)           | 15/15             | 30/15        | 24/15        | 1.0     | 0.0      |

#### 4.4.3.1 Sub-Test 1:

$\beta_c=11/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=22/15$ ,  $\beta_{ec}=209/225$ ,  $\beta_{ed}=1039/225$ , AG=20, 1xSF4, E-TFCI=75.

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.37       | 25.66 |
| 836.4           | 4182    | 22.63       | 25.97 |
| 846.6           | 4233    | 22.41       | 25.78 |
| 1852.4          | 9262    | 22.86       | 26.27 |
| 1880.0          | 9400    | 22.61       | 26.13 |
| 1907.6          | 9538    | 22.78       | 25.98 |

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4.4.3.2 *Sub-Test 2:*

$\beta_c=6/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=12/15$ ,  $\beta_{ec}=12/15$ ,  $\beta_{ed}=94/75$ , AG=12, 1xSF4, E-TFCI=67.

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.01       | 25.77 |
| 836.4           | 4182    | 22.46       | 25.92 |
| 846.6           | 4233    | 22.11       | 25.69 |
| 1852.4          | 9262    | 22.63       | 26.19 |
| 1880.0          | 9400    | 22.66       | 26.21 |
| 1907.6          | 9538    | 22.46       | 26.02 |

4.4.3.3 *Sub-Test 3:*

$\beta_c=15/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=30/15$ ,  $\beta_{ec}=30/15$ ,  $\beta_{ed}=47/15$ , AG=15, 2xSF4. E-TFCI=92,  
Note: # of Reference E-TFCI=2.

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.18       | 25.62 |
| 836.4           | 4182    | 22.33       | 25.84 |
| 846.6           | 4233    | 22.11       | 25.67 |
| 1852.4          | 9262    | 22.65       | 26.12 |
| 1880.0          | 9400    | 22.60       | 26.00 |
| 1907.6          | 9538    | 22.53       | 25.96 |

4.4.3.4 *Sub-Test 4:*

$\beta_c=2/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=4/15$ ,  $\beta_{ec}=2/15$ ,  $\beta_{ed}=56/75$ , AG=17, 1xSF4, E-TFCI=71.

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 22.09       | 25.51 |
| 836.4           | 4182    | 22.25       | 25.70 |
| 846.6           | 4233    | 22.11       | 25.59 |
| 1852.4          | 9262    | 22.69       | 26.15 |
| 1880.0          | 9400    | 22.51       | 25.93 |
| 1907.6          | 9538    | 22.72       | 26.08 |

4.4.3.5 *Sub-Test 5:*

$\beta_c=15/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=30/15$ ,  $\beta_{ec}=24/15$ ,  $\beta_{ed}=134/15$ , AG=21, 1xSF4, E-TFCI=81.

| Frequency (MHz) | Channel | Power (dBm) |       |
|-----------------|---------|-------------|-------|
|                 |         | RMS         | Peak  |
| 826.4           | 4132    | 21.99       | 25.53 |
| 836.4           | 4182    | 22.21       | 25.77 |
| 846.6           | 4233    | 22.05       | 25.61 |
| 1852.4          | 9262    | 22.71       | 26.26 |
| 1880.0          | 9400    | 22.64       | 26.07 |
| 1907.6          | 9538    | 22.65       | 26.00 |

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### *4.5 Test Settings for UMTS Mode on CMU200*

#### UE Power Control Settings

Maximum allowable UE-Power = 24.0 dBm

UL Target Power = 24.0 dBm

#### Node B Settings

Primary Scrambling Code = 9

Output Channel Power = -51.7 dBm

OCNS = Off

Total Output Power (Ior+Ioc) = -51.7 dBm

#### RMC Settings

Reference Channel Type: 12.2 kbps Downlink/Uplink

DL DTCH Transport Format: 12.2 kbps

DL Resources in Use: 100 %

UL CRC (Sym. Loop Mode 2): Off

Test Mode: Loop Mode 2

Channel Data Source DTCH: PRBS9

#### Voice Settings

Voice Source: Echo

Loopback Type: Off

#### Adaptive Multirate Settings

Active Code Set: Selection A

Codec Mode: 12.2 kbps

#### Signaling RAB Settings

SRB Cell DCH: 3.4 kbps

#### BS Down Link Physical Channels Settings

Ior = -51.7 dBm

P-CPICH = -3.3 dB

P-SCH = -8.3 dB

S-SCH = -8.3 dB

P-CCPCH = -5.3 dB

S-CCPCH = -5.3 dB

S-CCPCH Channel Code = 2

PICH = -8.3 dB

PICH Channel Code = 3

AICH = -8.3 dB

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AICH Channel Code = 6  
DPDCH = -10.3 dB  
DPDCH Channel Code = 96  
Power Offset (DPCCH/DPDCH) = 0.0 dB  
DL DPCH Timing Offset = 0  
Secondary Scrambling Code = 0  
Secondary Scrambling Code (HSDPA) = 0  
HSDPA Channels = On

### TPC Settings

Algorithm = 2  
TPC Step Size = 1dB  
TPC Pattern Setup = Set 1 (All 1, after linked to get maximum power)

### **HSDPA Mode Settings:**

#### Node B Settings

Primary Scrambling Code = 9  
Output Channel Power = -86 dBm  
OCNS = Off  
Total Output Power (Ior+Ioc) = -86 dBm

### Network Settings

Packet Switched Domain = ON

### HSDPA Test Mode Settings

Radiobearer Setup = RMC 12.2 kbps + HSPDA  
RMC Test Loop = Loop Mode 1 RLC TM

### HSDPA HS-DSCH

CQI Feedback Cycle = 4ms  
CQI Repetition Factor = 2  
ACK/NACK Repetition Factor = 3  
UE Category = 8  
Channel Configuration Type = FRC  
H-Set Selection = H-Set 1 QPSK  
RV Coding Sequence {0,2,5,6}

HSDPA Gain Factors are set according to each specific sub-test in table C.10.1.4 of 3GPP TS 34.121.

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### HSPA Mode Settings:

#### UE Power Control Settings

Maximum allowable UE-Power = 24.0 dBm

UL Target Power: Set according to each specific sub-test in table 5.2B.5 of 3GPP TS 34.121 less 5db for starting point.

#### UE Packet Data Gain Factors

Bc and Bd: \*

$\Delta\text{ACK}, \Delta\text{NACK}, \Delta\text{CQI}=8$

### HSUPA

E-DCH Physical Layer Category = 5

E-TFCI Table Index = 1

Minimum Set E-TFCI = 1\*

Maximum Channelisation Code: 1xSF4 or 2xSF4\*

Initial Service Grant: \*

#### UE Gain Factors

$\Delta\text{E-DPCCH}$ : \*

Number of Reference E-TFCIs: \*\*

Reference E-TFCI's: \*\*

E-TFCI Power offsets: \*\*

#### Node B Settings

Primary Scrambling Code = 9

Output Channel Power = -86 dBm

OCNS = Off

Total Output Power (Ior+Ioc) = -86 dBm

#### Paket Switched

DCH Type: HSUPA Test Mode

Data Rate: HSDPA/HSUPA

#### HSDPA Test Mode Settings

Radiobearer Setup = RMC 12.2kbps + HSDPA

RMC Test Loop = Loop Mode 1 RLC TM

#### HSDPA HS-DSCH

CQI Feedback Cycle = 4ms

CQI Repetition Factor = 2

ACK/NACK Repetition Factor = 3

UE Category = 8

Channel Configuration Type = FRC

H-Set Selection = H-Set 1 QPSK

RV Coding Sequence {0,2,5,6}

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HSUPA Test Mode Settings

Radiobearer Setup = SRB 3.4 + HSPA

HSUPA Settings

TTI mode: 10ms

E-AGCH

Pattern Length: 1

AG Value: \*

Downlink Physical Channels

HSUPA Channels: On

E-AGCH: -6.0db

E-AGCH Chan. Code: 6

E-RGCH/E-HICH: -5.0db

E-RGCH Active: Off

E-RGCH/E-HICH Chan. Code: 6

\*Set according to each specific sub-test in table C.11.1.3 of 3GPP TS 34.121.

\*\* Set according to each specific sub-test in table 5.2B.2/3 of 3GPP TS 34.121.

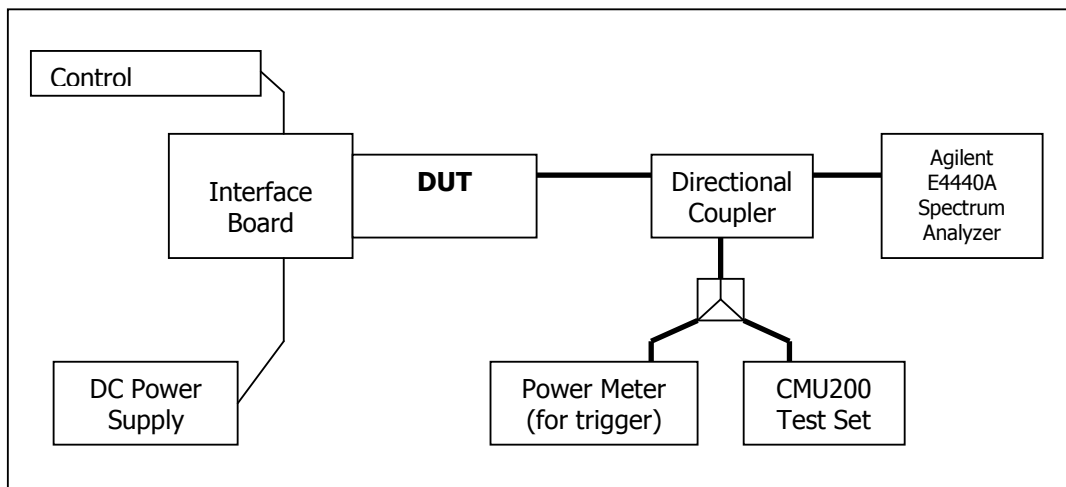
## 5 Occupied Bandwidth

FCC 2.1049

### 5.1 Test Procedure

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth (defined as the 99% Power Bandwidth) was measured with the spectrum analyzer at the 3 frequencies in each band. The -26dB bandwidth was also measured and recorded.

#### Test Setup



### 5.2 Test Results

The performance of the GSM 850 MHz Cellular band is shown in plots 5.3.1 to 5.3.6.

Performance of the GSM 1900 MHz PCS band is shown in plots 5.3.7 to 5.3.12.

Performance of the UMTS 850 Cellular band is shown in plots 5.3.13 to 5.3.15

Performance of the UMTS 1900 PCS band is shown in plots 5.3.16 to 5.3.18

| Frequency (MHz) | Channel | 99% Occupied Bandwidth (kHz) |            | -26dBc Occupied Bandwidth (kHz) |            |
|-----------------|---------|------------------------------|------------|---------------------------------|------------|
|                 |         | GMSK Mode                    | 8-PSK Mode | GMSK Mode                       | 8-PSK Mode |
| 824.2           | 128     | 245.4                        | 239.4      | 313.3                           | 309.5      |
| 836.6           | 190     | 242.6                        | 240.1      | 275.6                           | 310.0      |
| 848.8           | 251     | 242.6                        | 237.5      | 288.2                           | 314.6      |
| 1850.2          | 512     | 246.5                        | 236.1      | 292.3                           | 301.9      |
| 1880.0          | 661     | 246.4                        | 241.5      | 293.1                           | 308.6      |
| 1909.8          | 810     | 246.0                        | 243.1      | 294.8                           | 309.5      |
| Frequency (MHz) | Channel | 99% Occupied Bandwidth (MHz) |            | -26dBc Occupied Bandwidth (MHz) |            |
| 826.4           | 4132    | 4.1686                       |            | 4.5970                          |            |
| 836.4           | 4182    | 4.1649                       |            | 4.6170                          |            |
| 846.6           | 4233    | 4.1502                       |            | 4.6270                          |            |
| 1852.4          | 9262    | 4.1846                       |            | 4.6360                          |            |
| 1880.0          | 9400    | 4.1787                       |            | 4.6240                          |            |
| 1907.6          | 9538    | 4.1603                       |            | 4.6190                          |            |

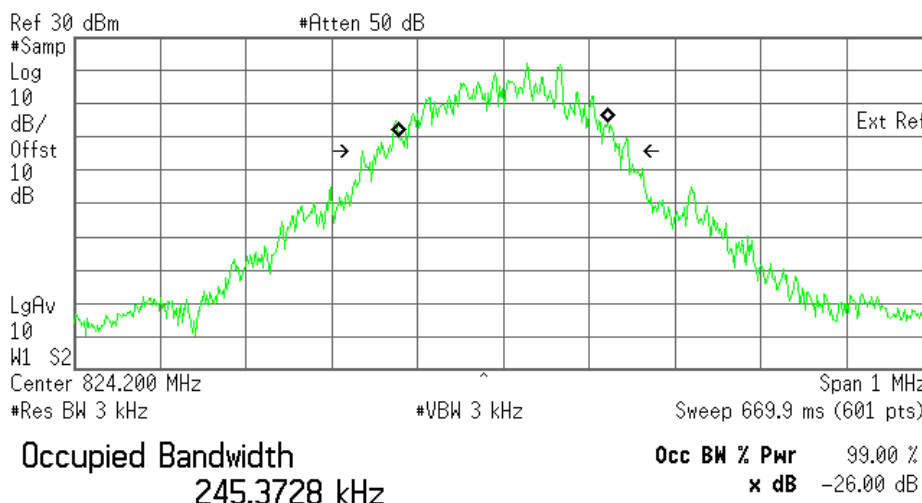
# SIERRA WIRELESS, INC.

## 5.3 Test Plots

### 5.3.1) GMSK Occupied Bandwidth, Cellular Low channel, 824.2 MHz, 99% bandwidth

Agilent 15:43:41 Nov 26, 2007

L

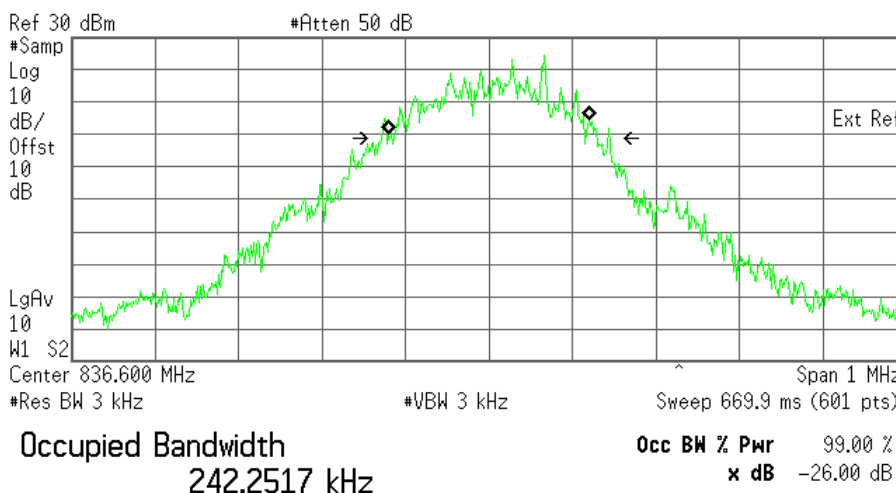


Transmit Freq Error -158.629 Hz  
 x dB Bandwidth 313.345 kHz\*

### 5.3.2) GMSK Occupied Bandwidth, Middle channel, 836.6 MHz, 99% bandwidth

Agilent 15:34:40 Nov 26, 2007

L



Transmit Freq Error 257.654 Hz  
 x dB Bandwidth 275.624 kHz\*

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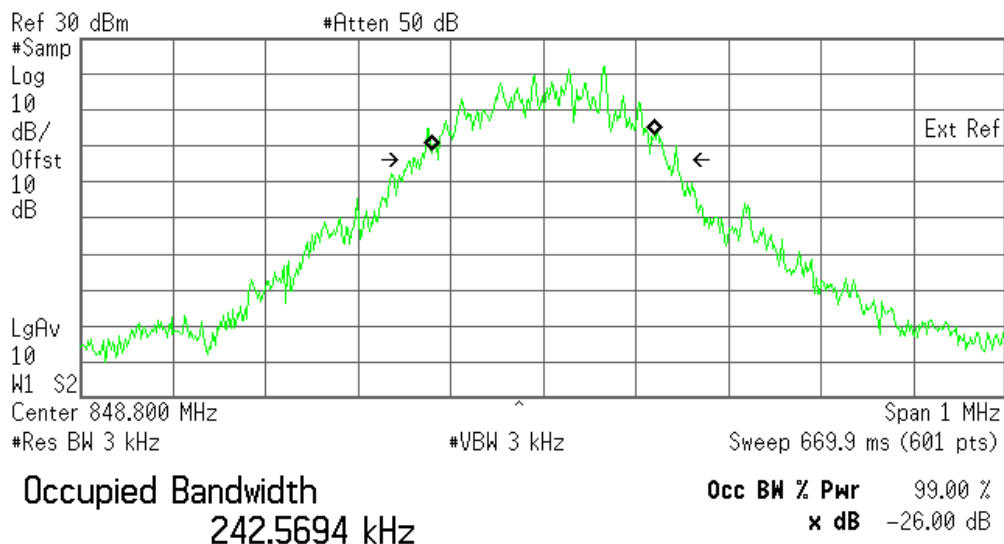
The contents of this page are subject to the confidentiality information on page one.

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**5.3.3) GMSK Occupied Bandwidth, High channel, 848.8 MHz, 99% bandwidth**

\* Agilent 15:39:26 Nov 26, 2007

L

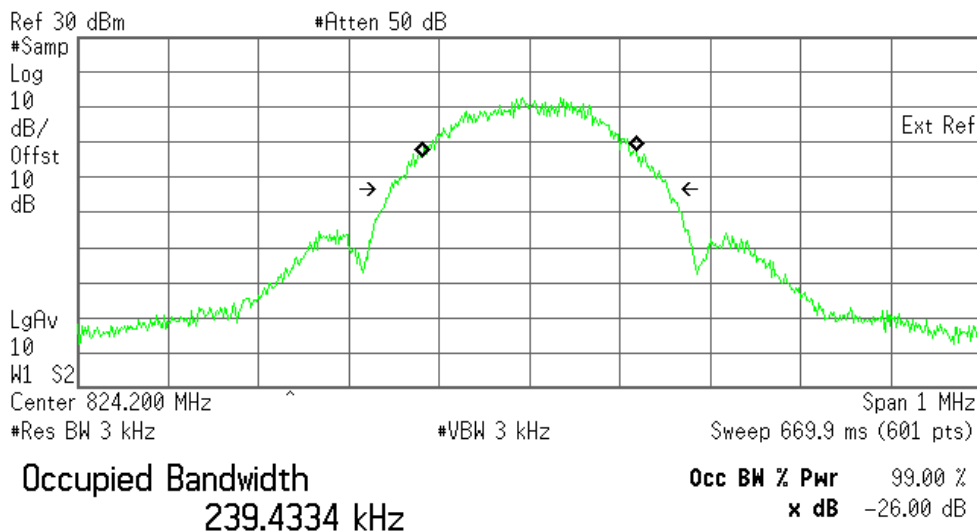


**Transmit Freq Error** 291.743 Hz  
**x dB Bandwidth** 288.182 kHz\*

**5.3.4) 8-PSK Occupied Bandwidth, Cellular Low channel, 824.2 MHz, 99% bandwidth**

\* Agilent 17:15:08 Nov 26, 2007

L



**Transmit Freq Error** 67.274 Hz  
**x dB Bandwidth** 309.526 kHz\*

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The contents of this page are subject to the confidentiality information on page one.

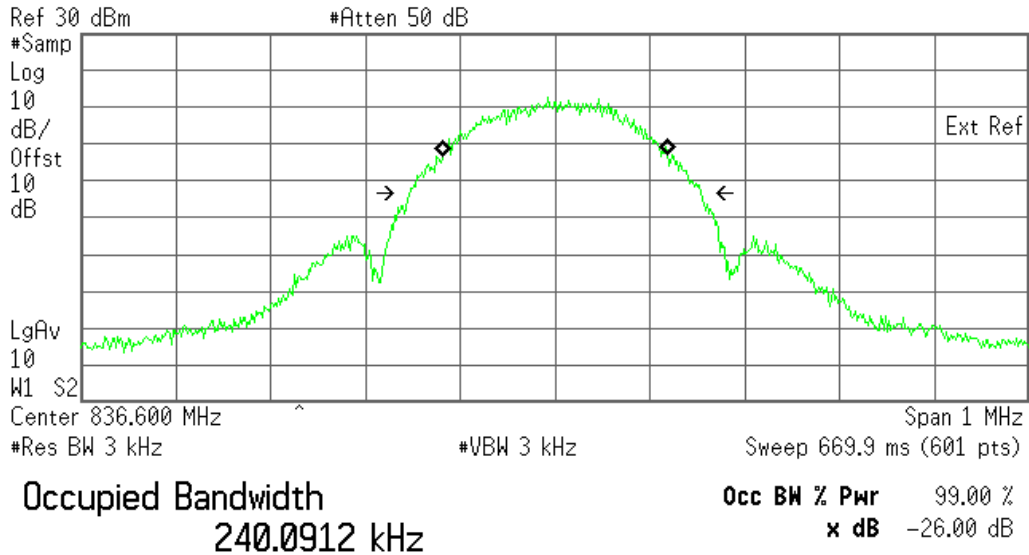


**SIERRA WIRELESS, INC.**

**5.3.5) 8-PSK Occupied Bandwidth, Middle channel, 836.6 MHz, 99% bandwidth**

\* Agilent 17:22:05 Nov 26, 2007

L

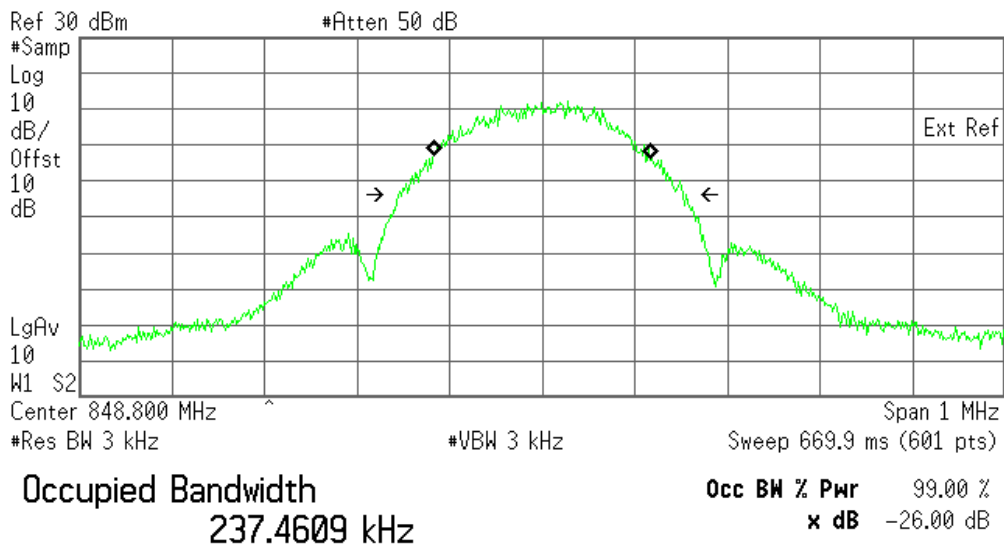


**Transmit Freq Error** 16.439 Hz  
**x dB Bandwidth** 309.958 kHz\*

**5.3.6) 8-PSK Occupied Bandwidth, High channel, 848.8 MHz, 99% bandwidth**

\* Agilent 17:32:34 Nov 26, 2007

L



**Transmit Freq Error** 195.704 Hz  
**x dB Bandwidth** 314.572 kHz\*

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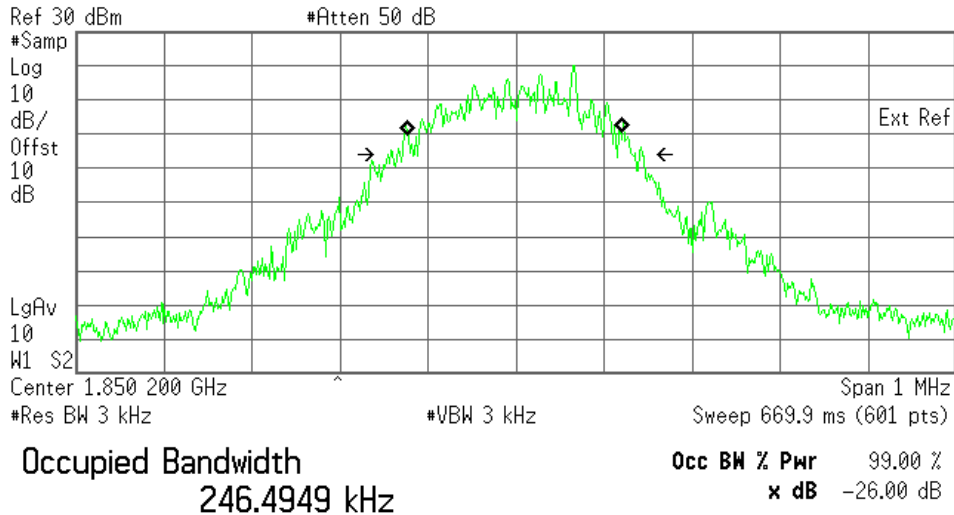
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**5.3.7) GSMK Occupied Bandwidth, PCS Low channel, 1850.2 MHz, 99% bandwidth**

\* Agilent 15:51:15 Nov 26, 2007

L

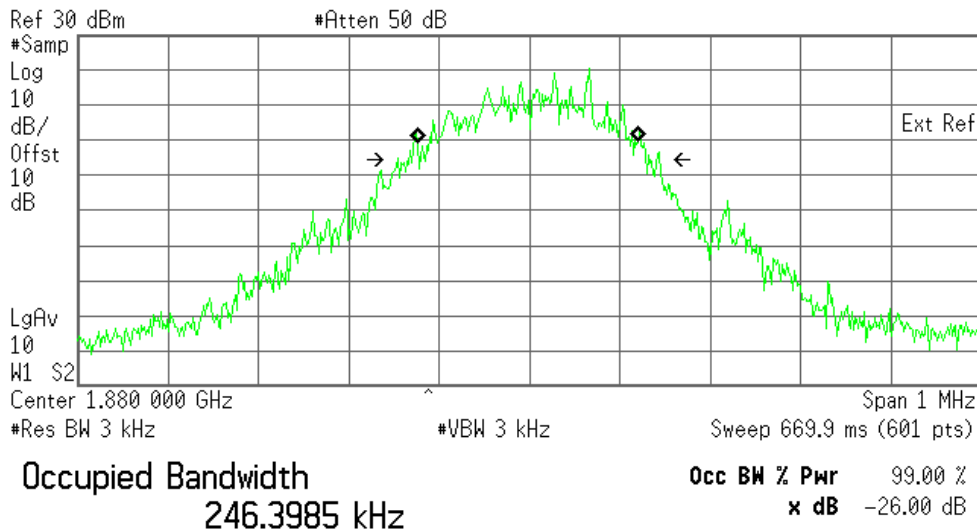


**Transmit Freq Error** -1.022 kHz  
**x dB Bandwidth** 292.278 kHz\*

**5.3.8) GSMK Occupied Bandwidth, PCS Middle channel, 1880.0 MHz, 99% bandwidth**

\* Agilent 15:55:37 Nov 26, 2007

L



**Transmit Freq Error** -1.886 kHz  
**x dB Bandwidth** 293.063 kHz\*

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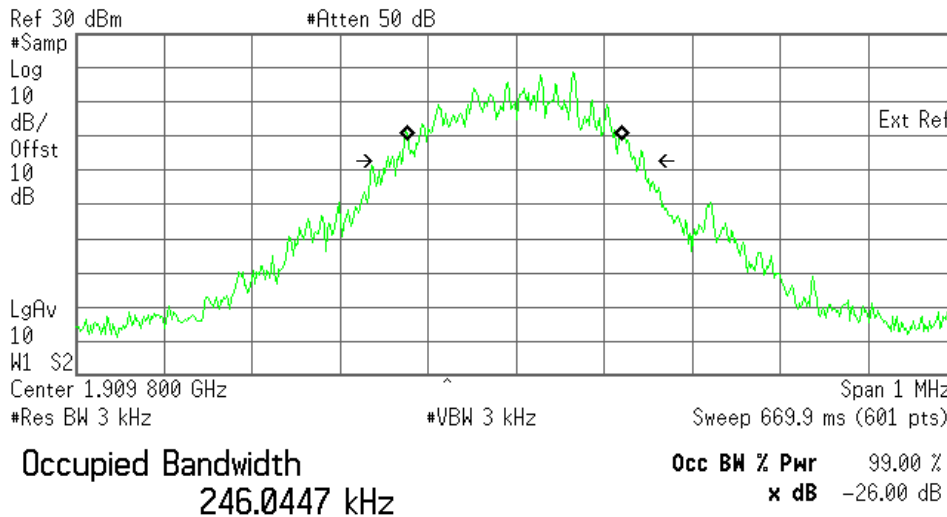
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### 5.3.9) GMSK Occupied Bandwidth, PCS High channel, 1909.8 MHz, 99% bandwidth

Agilent 16:32:54 Nov 26, 2007

L

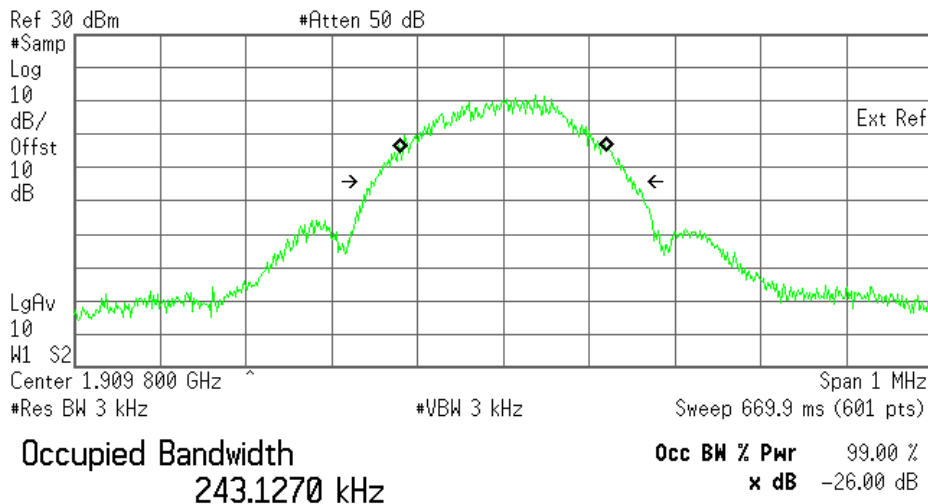


**Transmit Freq Error** -1.240 kHz  
**x dB Bandwidth** 294.816 kHz\*

### 5.3.10) 8-PSK Occupied Bandwidth, PCS Low channel, 1850.2 MHz, 99% bandwidth

Agilent 16:38:56 Nov 26, 2007

L



**Transmit Freq Error** 164.324 Hz  
**x dB Bandwidth** 309.501 kHz\*

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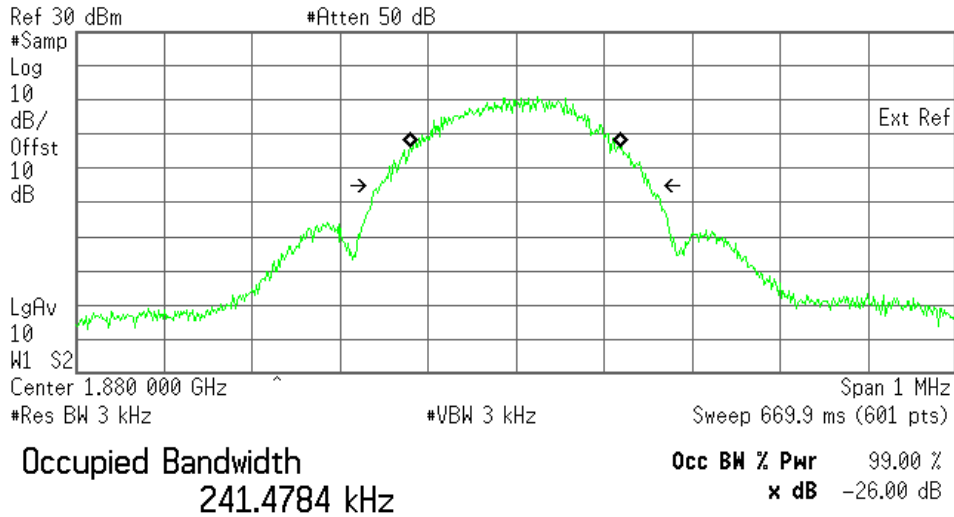
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**5.3.11) 8-PSK Occupied Bandwidth, PCS Middle channel, 1880.0 MHz, 99% bandwidth**

Agilent 16:45:49 Nov 26, 2007

L

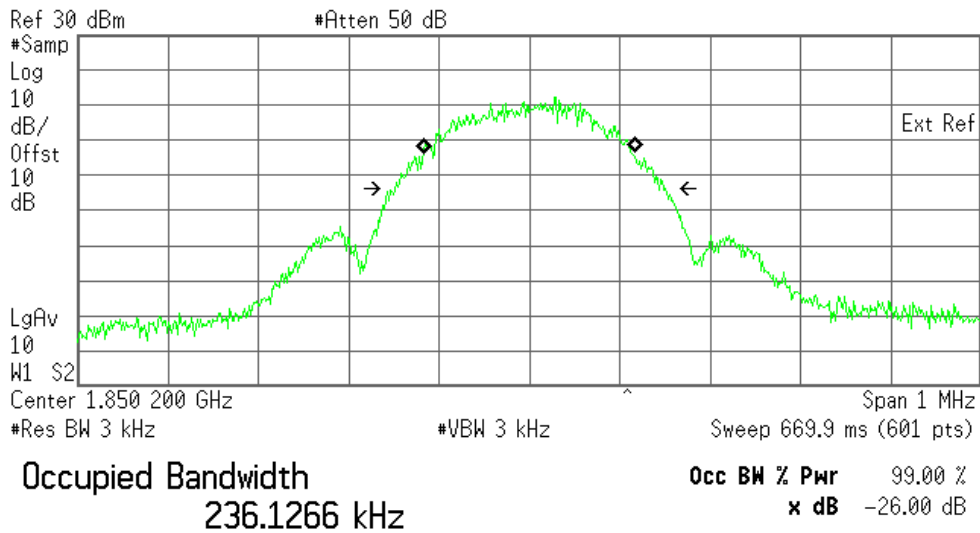


**Transmit Freq Error** -179.972 Hz  
**x dB Bandwidth** 308.569 kHz\*

**5.3.12) 8-PSK Occupied Bandwidth, PCS High channel, 1909.8 MHz, 99% bandwidth**

Agilent 16:53:47 Nov 26, 2007

L



**Transmit Freq Error** -501.237 Hz  
**x dB Bandwidth** 301.855 kHz\*

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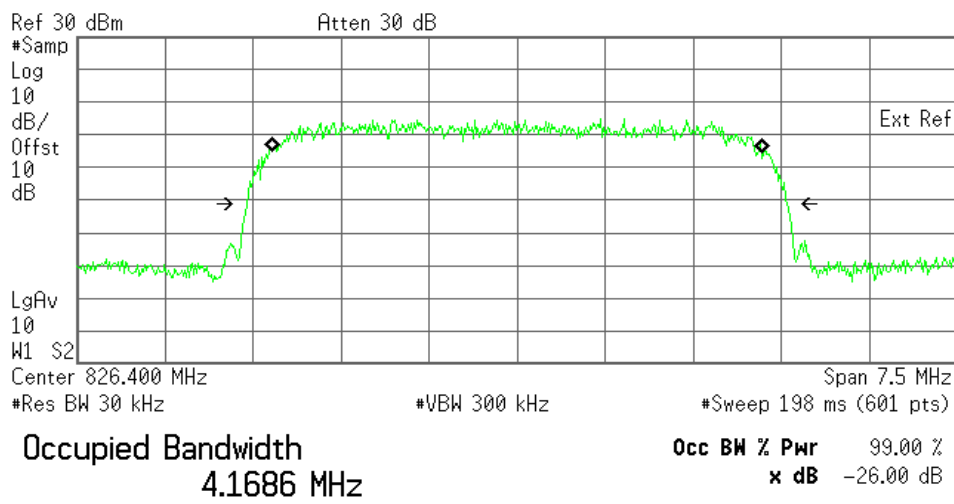
The contents of this page are subject to the confidentiality information on page one.

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**5.3.13) WCDMA Occupied Bandwidth, Cellular Low channel, 826.4 MHz, 99% bandwidth**

\* Agilent 13:57:42 Nov 26, 2007

L

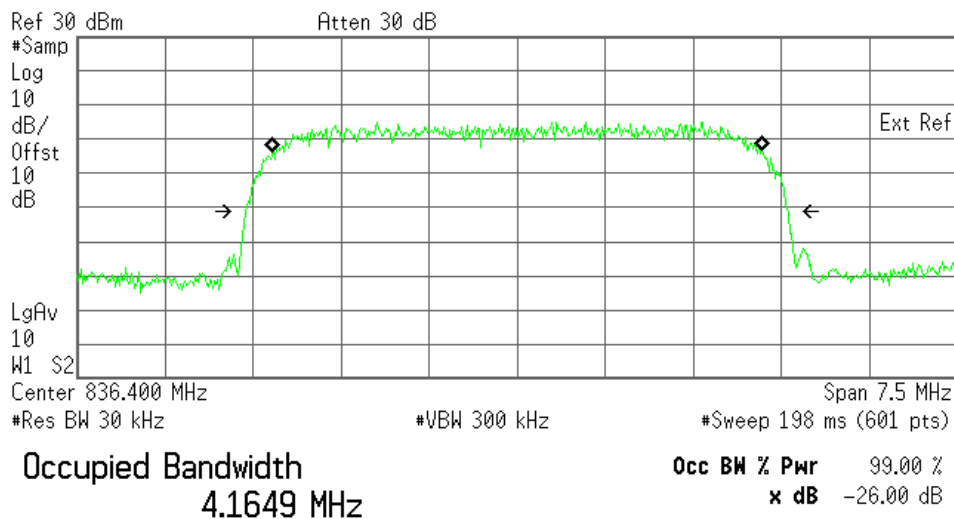


**Transmit Freq Error**      -1.192 kHz  
**x dB Bandwidth**            4.597 MHz\*

**5.3.14) WCDMA Occupied Bandwidth, Cellular Middle channel, 836.4 MHz, 99% bandwidth**

\* Agilent 13:58:42 Nov 26, 2007

L



**Transmit Freq Error**      563.524 Hz  
**x dB Bandwidth**            4.617 MHz\*

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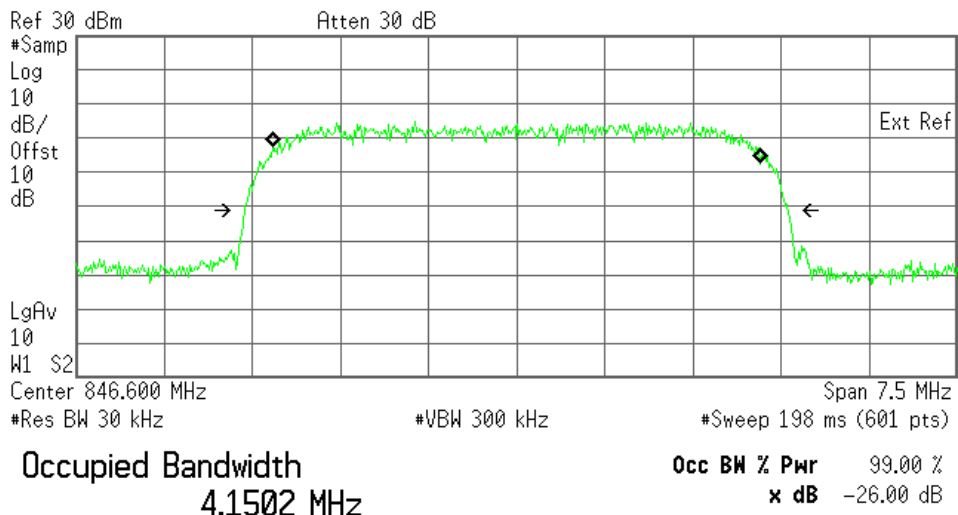
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**5.3.15) WCDMA Occupied Bandwidth, Cellular High channel, 846.6 MHz, 99% bandwidth**

Agilent 14:00:02 Nov 26, 2007

L

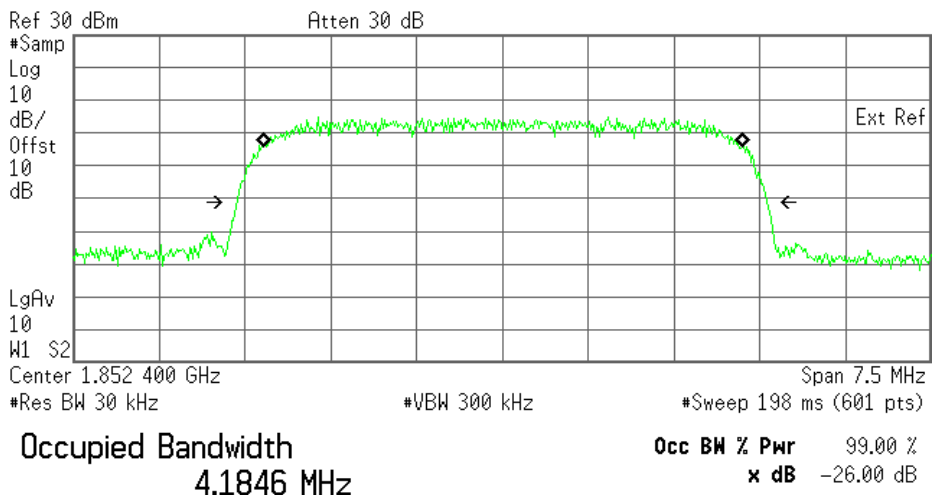


**Transmit Freq Error**      -1.421 kHz  
**x dB Bandwidth**      4.627 MHz\*

**5.3.16) WCDMA Occupied Bandwidth, PCS Low channel, 1852.4 MHz, 99% bandwidth**

Agilent 13:54:38 Nov 26, 2007

L



**Transmit Freq Error**      1.658 kHz  
**x dB Bandwidth**      4.636 MHz\*

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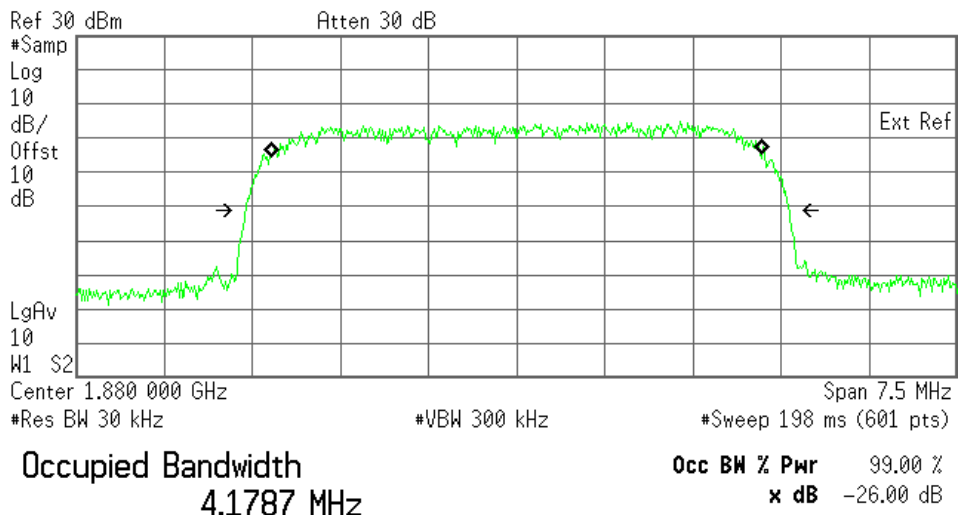
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**5.3.17) WCDMA Occupied Bandwidth, PCS Middle channel, 1880 MHz, 99% bandwidth**

Agilent 13:56:23 Nov 26, 2007

L

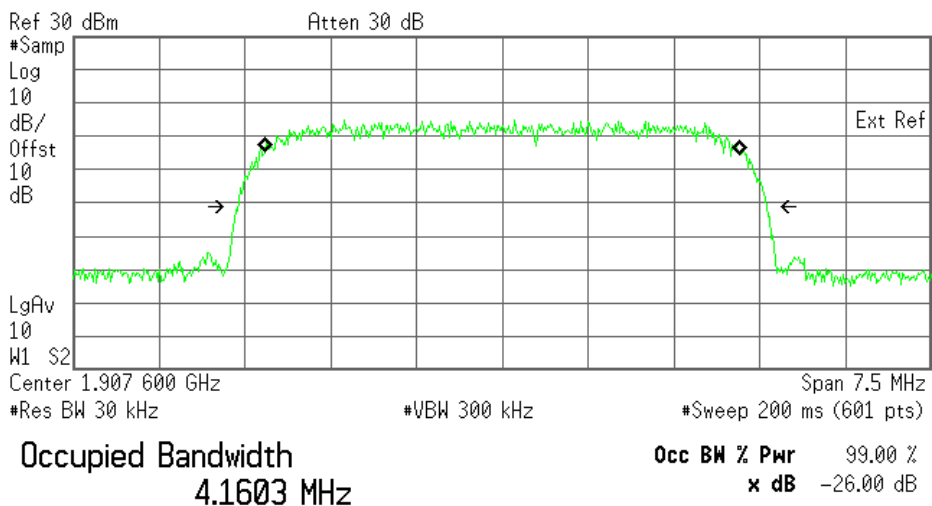


**Transmit Freq Error** 753.172 Hz  
**x dB Bandwidth** 4.624 MHz\*

**5.3.18) WCDMA Occupied Bandwidth, PCS High channel, 1907.6 MHz, 99% bandwidth**

Agilent 13:47:34 Nov 26, 2007

L



**Transmit Freq Error** 462.593 Hz  
**x dB Bandwidth** 4.619 MHz\*

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## SIERRA WIRELESS, INC.

### 6 Out of Band Emissions at Antenna Terminals

FCC 22.901(d), 22.917, 24.238(a)

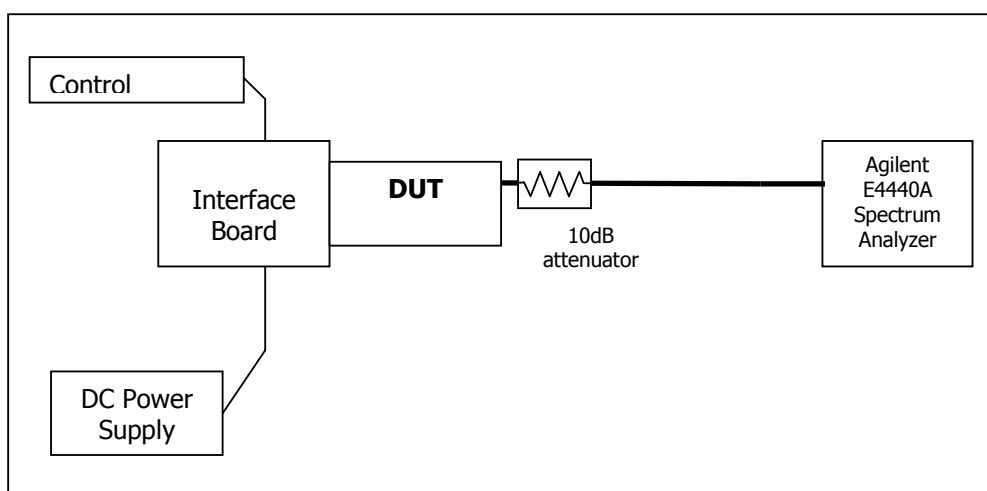
#### Out of Band Emissions:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency outside the frequency band by at least  $(43 + 10 \log P)$  dB, in this case, -13dBm.

#### **6.1 Test Procedure**

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10<sup>th</sup> harmonic. The EUT was scanned for spurious emissions from 1MHz to 20GHz with sufficient bandwidth and video resolution. Data plots are included. The measurement cable path loss at 20GHz (including an attenuator) was 10dB. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

#### **Test Setup**



#### **6.2 Test Equipment**

| EQUIPMENT           | MANUFACTURER    | MODEL NO.  | SERIAL NO. | CAL. DATE         |
|---------------------|-----------------|------------|------------|-------------------|
| Control Computer    | TC              | Generic PC | 100488     | N/A               |
| Wireless Test Set   | Rohde & Schwarz | CMU200     | 111682     | November 18, 2008 |
| Spectrum Analyzer   | Agilent         | PSA E4440A | US41421268 | March 11, 2008    |
| DC Power Supply     | HP              | E3631A     | 3530A      | N/A               |
| Interface Board     | Shop built      | Minnow     | N/A        | N/A               |
| Directional Coupler | Mini-Circuits   | ZA3PD-2    | N/A        | N/A               |

#### **6.3 Test Results**

Refer to the following plots.

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**SIERRA WIRELESS, INC.**

• **Cellular Band**

| <b>Plot Number</b> | <b>Description</b>                    |
|--------------------|---------------------------------------|
| 6.4.1 – 6.4.3      | GMSK Mode, Low channel, 824.20 MHz    |
| 6.4.4 – 6.4.6      | GMSK Mode, Middle Channel, 836.6 MHz  |
| 6.4.7 – 6.4.9      | GMSK Mode, High Channel, 848.8 MHz    |
| 6.4.10 – 6.4.12    | 8-PSK Mode, Low channel, 824.20 MHz   |
| 6.4.13 – 6.4.15    | 8-PSK Mode, Middle Channel, 836.6 MHz |
| 6.4.16 – 6.4.18    | 8-PSK Mode, High Channel, 848.8 MHz   |

• **PCS Band**

| <b>Plot Number</b> | <b>Description</b>                     |
|--------------------|--|
| 6.4.19 – 6.4.21    | GMSK Mode, Low Channel, 1850.2 MHz     |
| 6.4.22 – 6.4.24    | GMSK Mode, Middle Channel, 1880.0 MHz  |
| 6.4.25 – 6.4.27    | GMSK Mode, High Channel, 1909.8 MHz    |
| 6.4.28 – 6.4.30    | 8-PSK, Mode, Low Channel, 1850.2 MHz   |
| 6.4.31 – 6.4.33    | 8-PSK Mode, Middle Channel, 1880.0 MHz |
| 6.4.34 – 6.4.36    | 8-PSK Mode, High Channel, 1909.8 MHz   |

• **UMTS Cellular Band**

| <b>Plot Number</b> | <b>Description</b>                    |
|--------------------|---------------------------------------|
| 6.4.37 – 6.4.39    | WCDMA Mode, Low Channel, 826.4 MHz    |
| 6.4.40 – 6.4.42    | WCDMA Mode, Middle Channel, 836.4 MHz |
| 6.4.43 – 6.4.45    | WCDMA Mode, High Channel, 846.6 MHz   |

• **UMTS PCS Band**

| <b>Plot Number</b> | <b>Description</b>                     |
|--------------------|--|
| 6.4.46 – 6.4.48    | WCDMA Mode, Low Channel, 1852.4 MHz    |
| 6.4.49 – 6.4.51    | WCDMA Mode, Middle Channel, 1880.0 MHz |
| 6.4.52 – 6.4.54    | WCDMA Mode, High Channel, 1907.6 MHz   |

These plots show that the conducted emission limits requirements are met.

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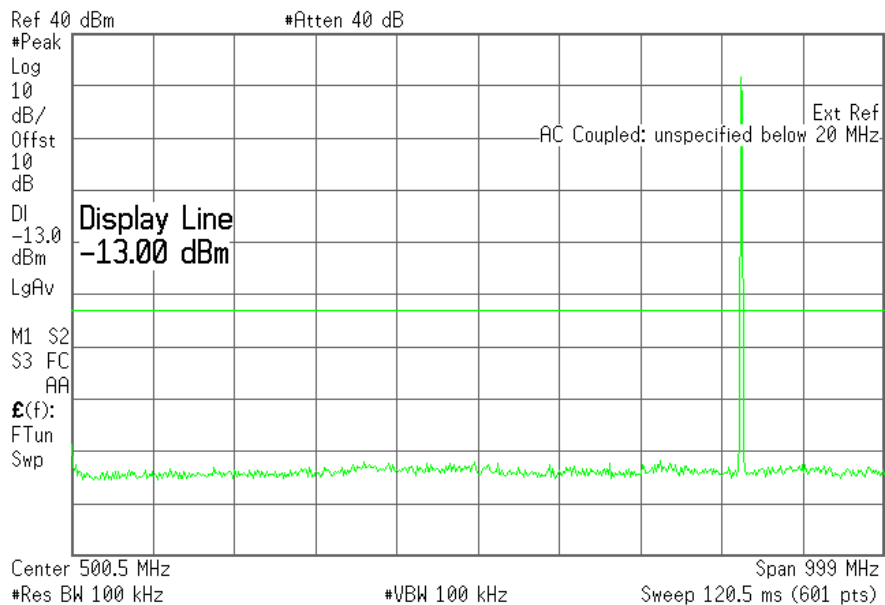
## 6.4 Test Plots

### Plot 6.4.1) Out of Band Emissions at Antenna Terminals

GMSK, Low channel, 824.200 MHz, 1 MHz to 1 GHz

Agilent 11:22:05 Nov 27, 2007

L

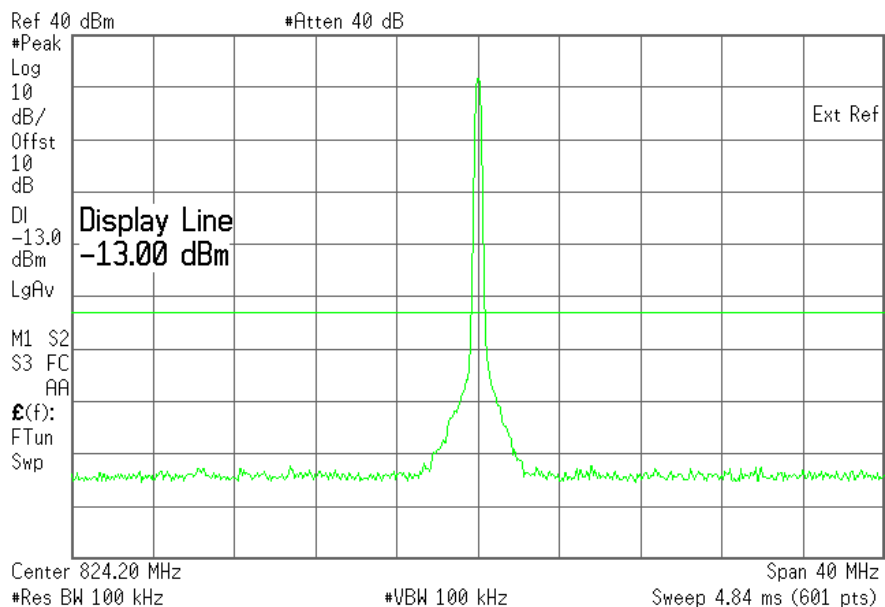


### Plot 6.4.2) Out of Band Emissions at Antenna Terminals

GMSK, Low channel, 824.200 MHz, TX signal +/- 20 MHz

Agilent 11:21:08 Nov 27, 2007

L



**The strong emission shown in each case is the carrier signal.**

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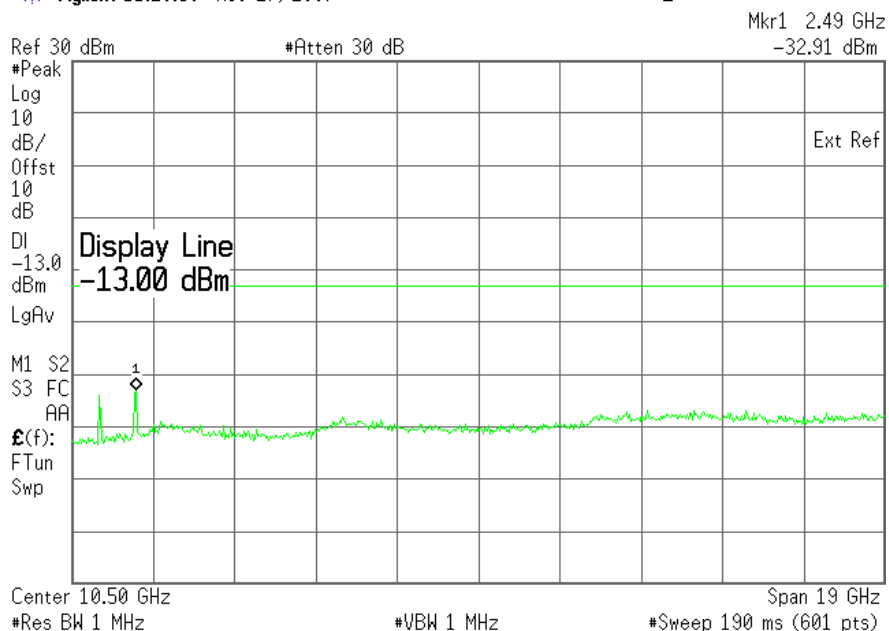
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## SIERRA WIRELESS, INC.

### Plot 6.4.3) Out of Band Emissions at Antenna Terminals

GMSK, Low channel, 824.200 MHz, 1 GHz to 20 GHz

Agilent 11:26:59 Nov 27, 2007



| Cellular Harmonics for Ch. 128 (824.2 MHz) | Level (dBm)                     |
|--|---------------------------------|
| <b>Second</b>                              | <b>-33.84 dBm</b>               |
| <b>Third</b>                               | <b>-32.91 dBm</b>               |
| <b>All others</b>                          | <b>&lt; -35 dBm up to 20GHz</b> |

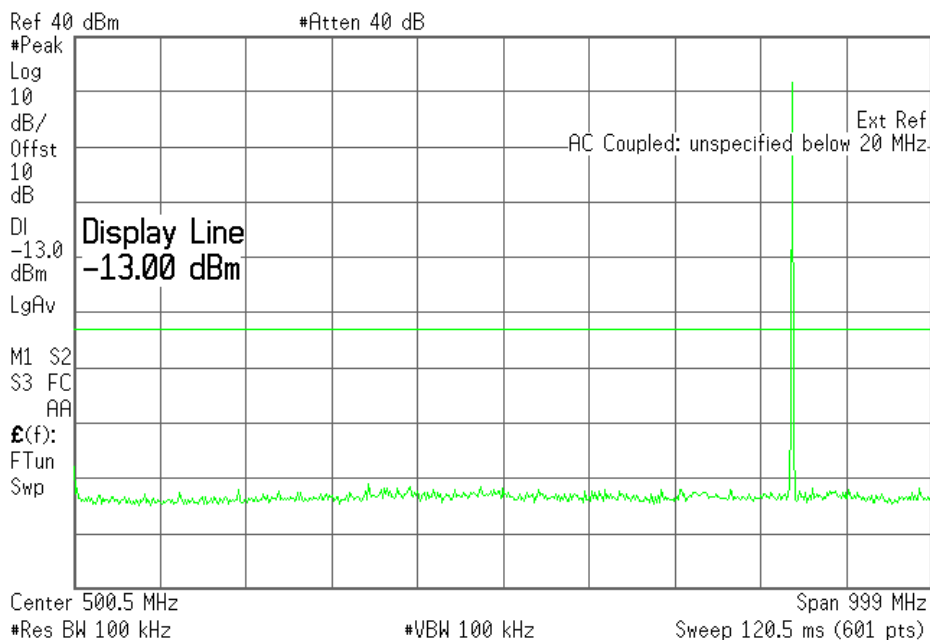
# SIERRA WIRELESS, INC.

## Plot 6.4.4) Out of Band Emissions at Antenna Terminals

GMSK, Mid Channel, 836.6 MHz, 1 MHz to 1 GHz

Agilent 11:37:02 Nov 27, 2007

L

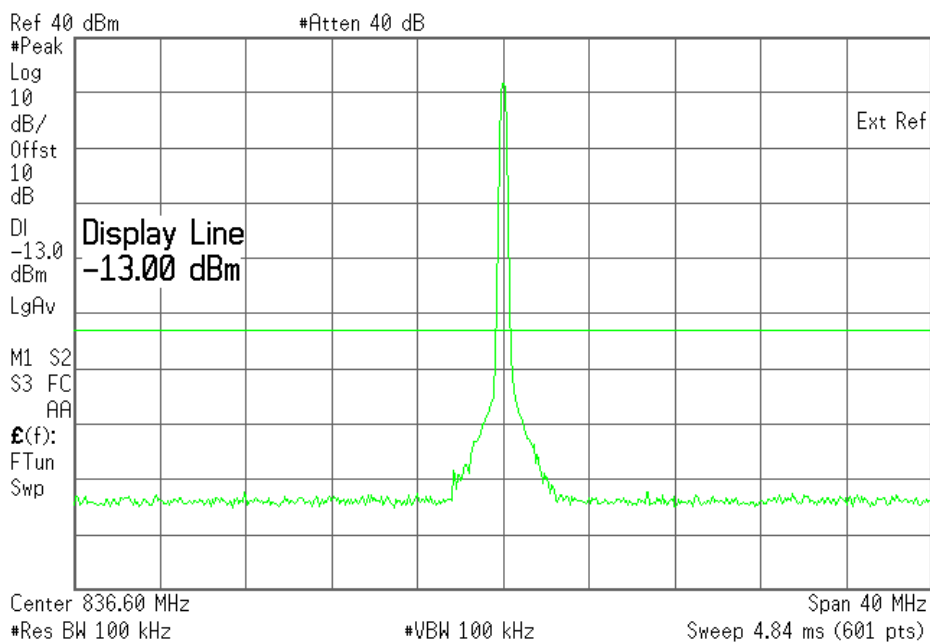


## Plot 6.4.5) Out of Band Emissions at Antenna Terminals

GMSK, Mid Channel, 836.6 MHz, TX signal +/- 20 MHz

Agilent 11:35:09 Nov 27, 2007

L



The strong emission shown in each case is the carrier signal.

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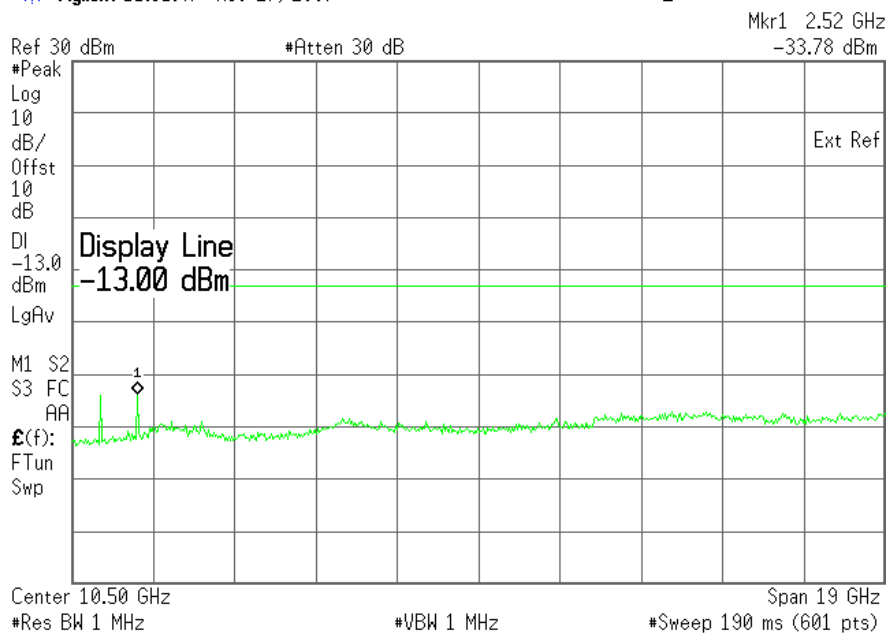
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**Plot 6.4.6) Out of Band Emissions at Antenna Terminals**

GMSK, Mid Channel, 836.6 MHz, 1 GHz to 20 GHz

\* Agilent 11:31:47 Nov 27, 2007



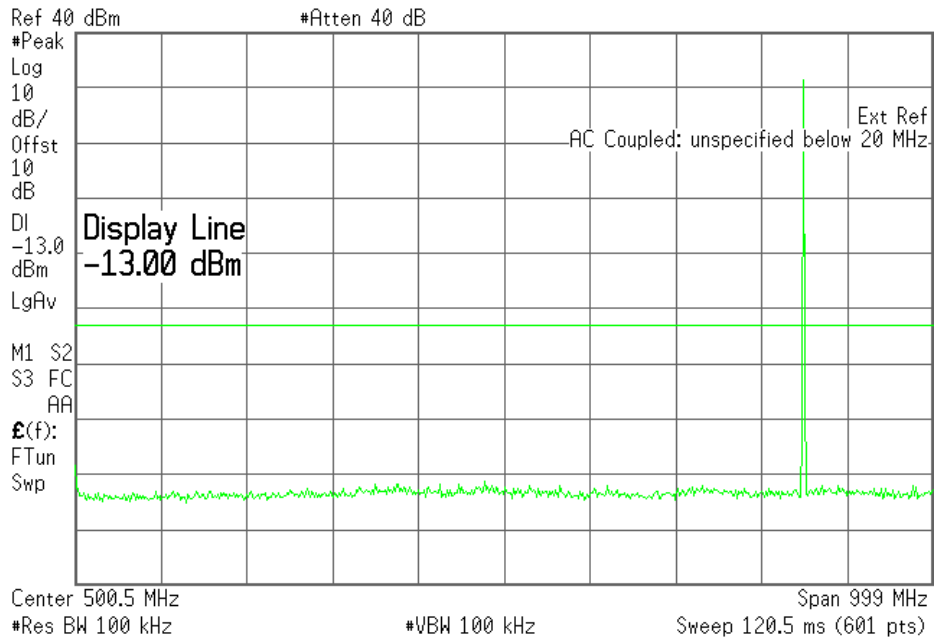
| Cellular Harmonics for Ch. 190 (836.6 MHz) | Level (dBm)           |
|--|-----------------------|
| Second                                     | -33.93 dBm            |
| Third                                      | -33.78 dBm            |
| All others                                 | < -35 dBm up to 20GHz |

SIERRA WIRELESS, INC.

**Plot 6.4.7) Out of Band Emissions at Antenna Terminals**

GMSK, High Channel, 848.8 MHz, 1 MHz to 1 GHz

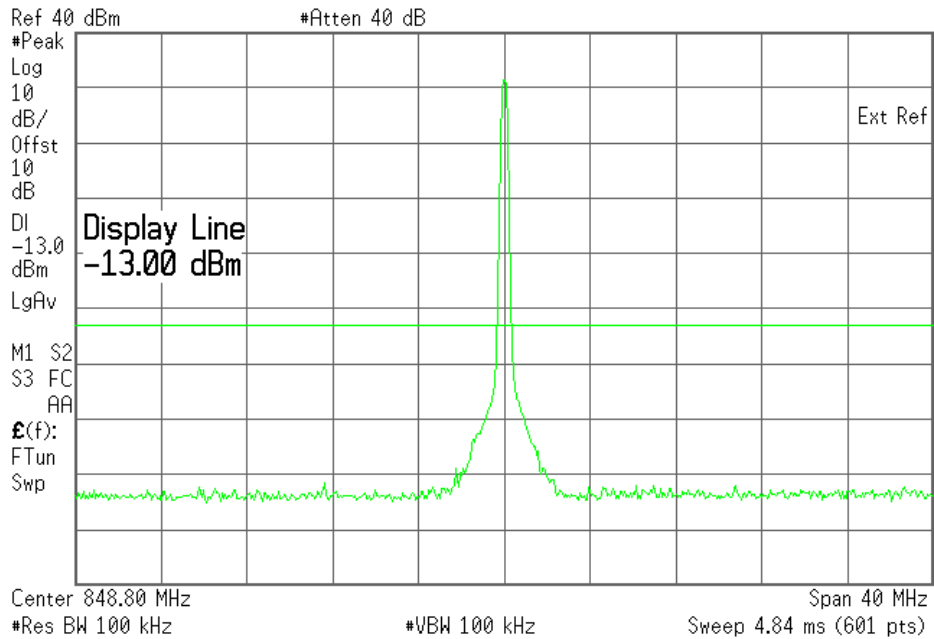
\* Agilent 11:40:08 Nov 27, 2007      L



**Plot 6.4.8) Out of Band Emissions at Antenna Terminals**

GMSK, High Channel, 848.8 MHz, TX signal +/- 20 MHz

\* Agilent 11:41:45 Nov 27, 2007      L



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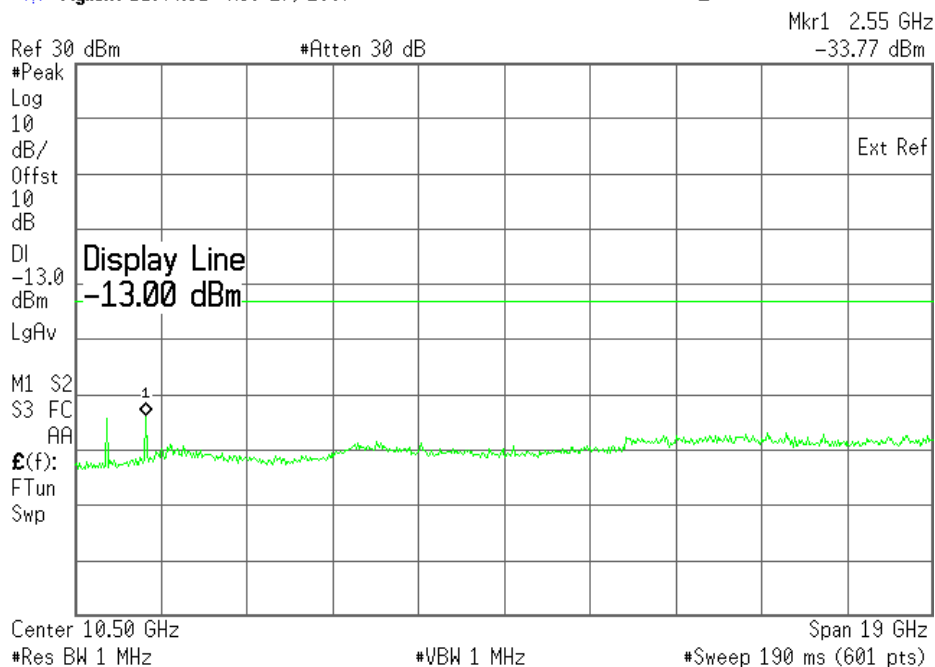
## SIERRA WIRELESS, INC.

### Plot 6.4.9) Out of Band Emissions at Antenna Terminals

GMSK, High Channel, 848.8 MHz, 1 GHz to 20 GHz

Agilent 11:44:31 Nov 27, 2007

L



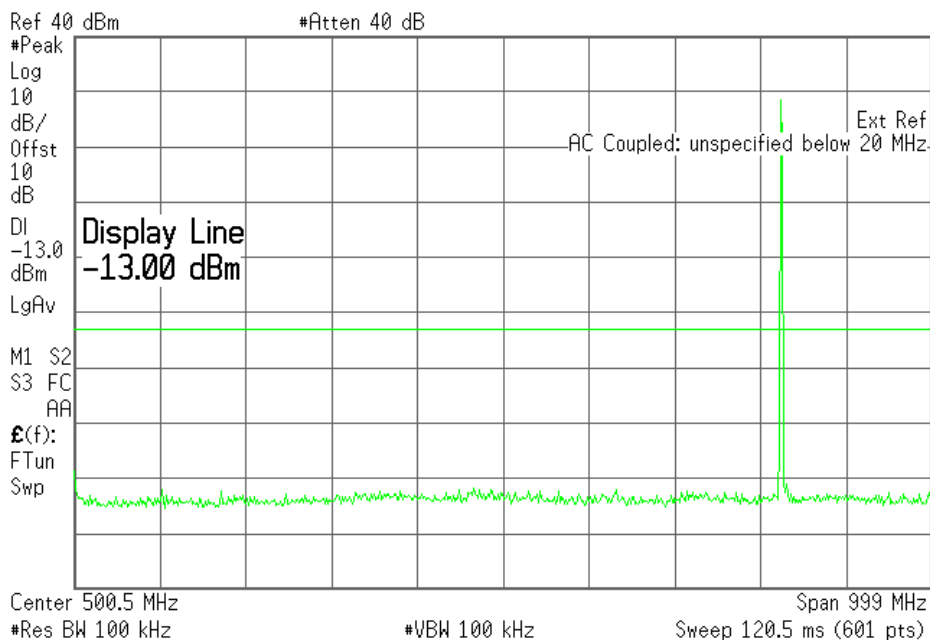
| Cellular Harmonics for Ch. 251 (848.8 MHz) | Level (dBm)           |
|--|-----------------------|
| Second                                     | -34.30 dBm            |
| Third                                      | -33.77 dBm            |
| All others                                 | < -35 dBm up to 20GHz |

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**Plot 6.4.10) Out of Band Emissions at Antenna Terminals**

8-PSK, Low channel, 824.200 MHz, 1 MHz to 1 GHz

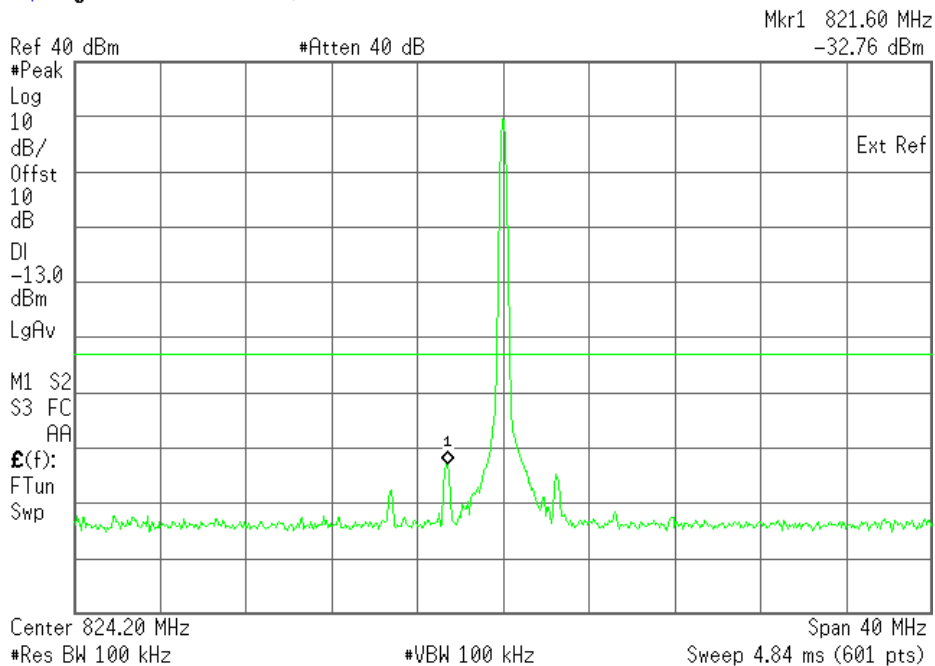
\* Agilent 11:52:26 Nov 27, 2007 L



**Plot 6.4.11) Out of Band Emissions at Antenna Terminals**

8-PSK, Low channel, 824.200 MHz, TX signal +/- 20 MHz

\* Agilent 11:51:29 Nov 27, 2007 L



**The strong emission shown in each case is the carrier signal.**

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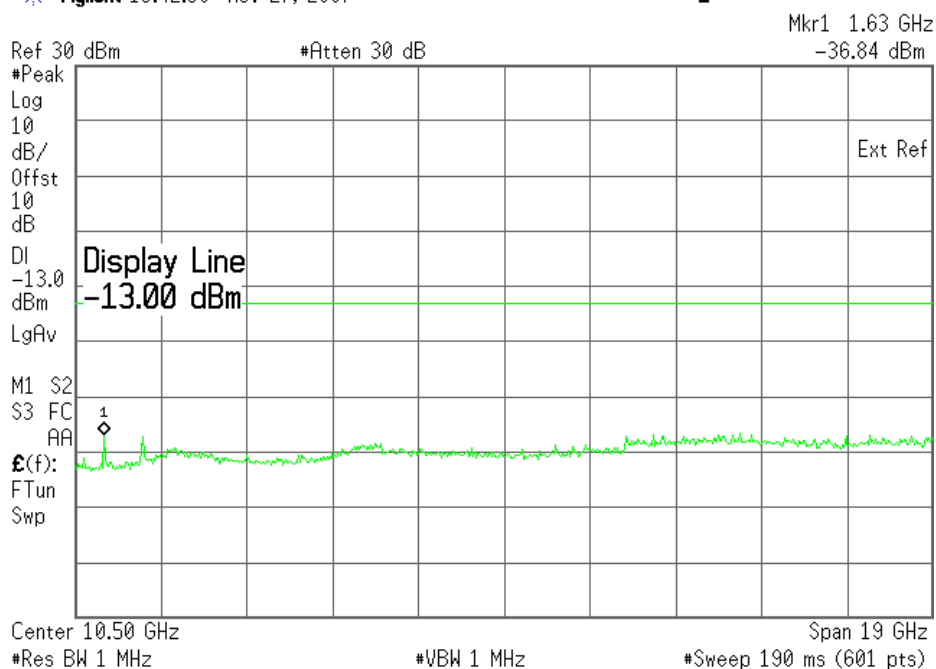


**SIERRA WIRELESS, INC.**

**Plot 6.4.12) Out of Band Emissions at Antenna Terminals**

8-PSK, Low channel, 824.200 MHz, 1 GHz to 20 GHz

Agilent 13:42:30 Nov 27, 2007



| Cellular Harmonics for Ch. 128 (824.2 MHz) | Level (dBm)           |
|--|-----------------------|
| Second                                     | -36.84dBm             |
| Third                                      | -37.12 dBm            |
| All others                                 | < -35 dBm up to 20GHz |

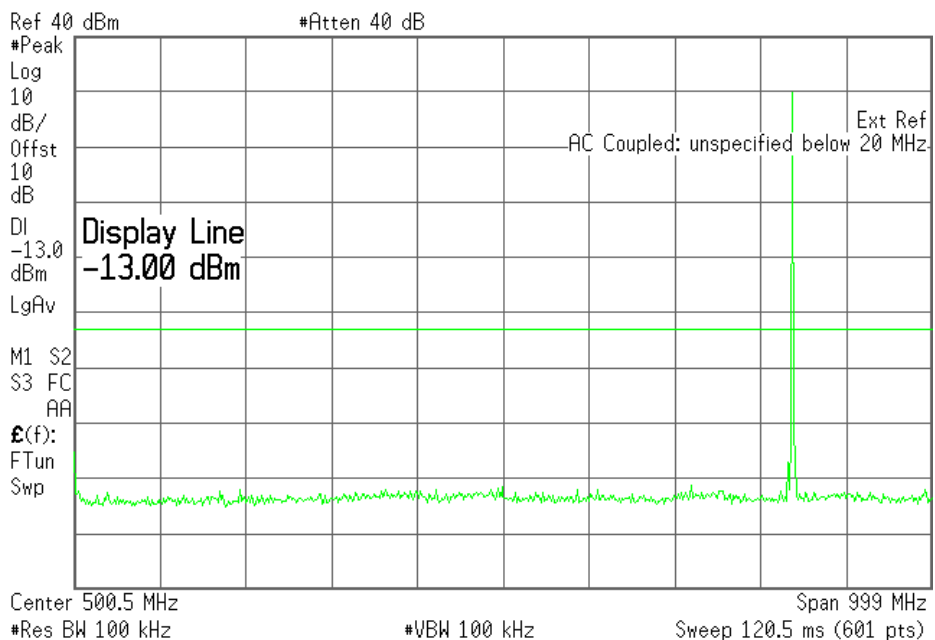
**SIERRA WIRELESS, INC.**

**Plot 6.4.13) Out of Band Emissions at Antenna Terminals**

8-PSK, Mid Channel, 836.6 MHz, 1 MHz to 1 GHz

Agilent 13:25:40 Nov 27, 2007

L



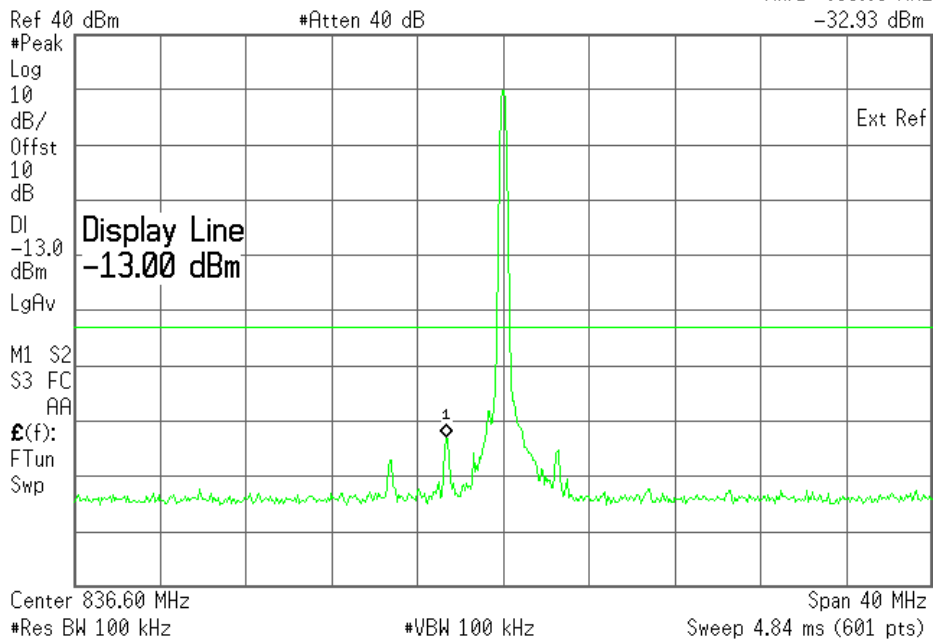
**Plot 6.4.14) Out of Band Emissions at Antenna Terminals**

8-PSK, Mid Channel, 836.6 MHz, TX signal +/- 20 MHz

Agilent 13:27:56 Nov 27, 2007

L

Mkr1 833.93 MHz  
-32.93 dBm



**The strong emission shown in each case is the carrier signal.**

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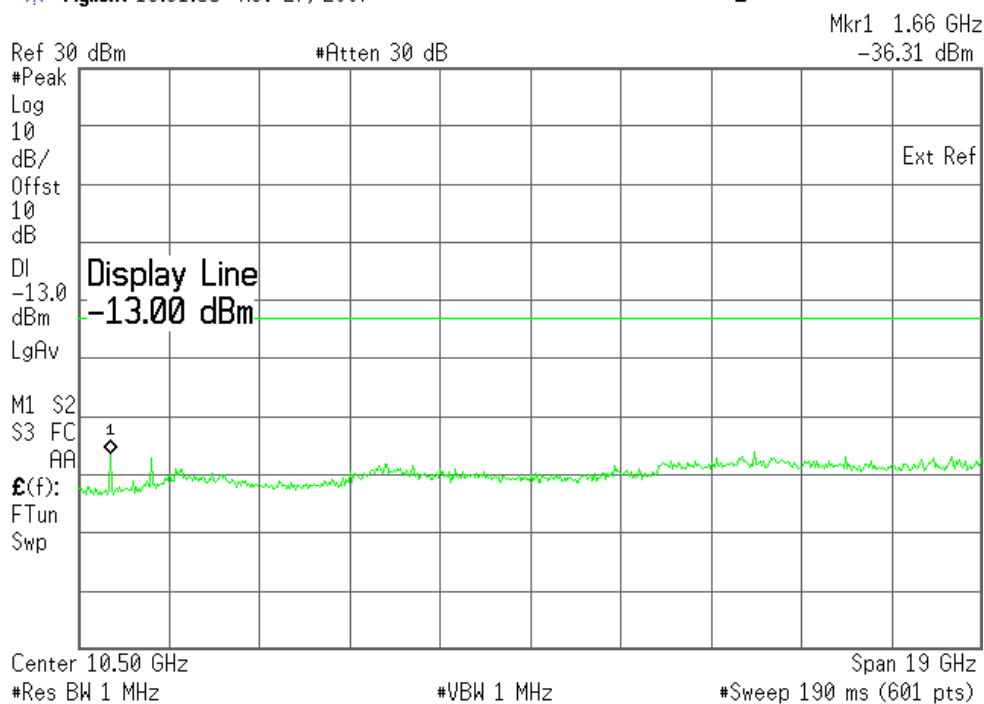
**SIERRA WIRELESS, INC.**

**Plot 6.4.15) Out of Band Emissions at Antenna Terminals**

8-PSK, Mid Channel, 836.6 MHz, 1 GHz to 20 GHz

Agilent 13:31:55 Nov 27, 2007

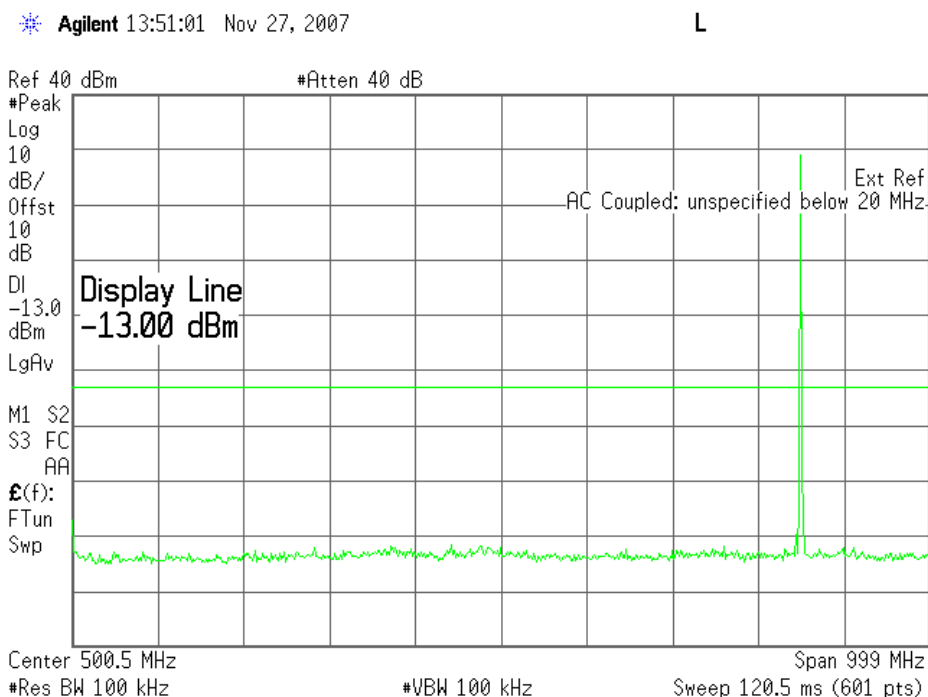
L



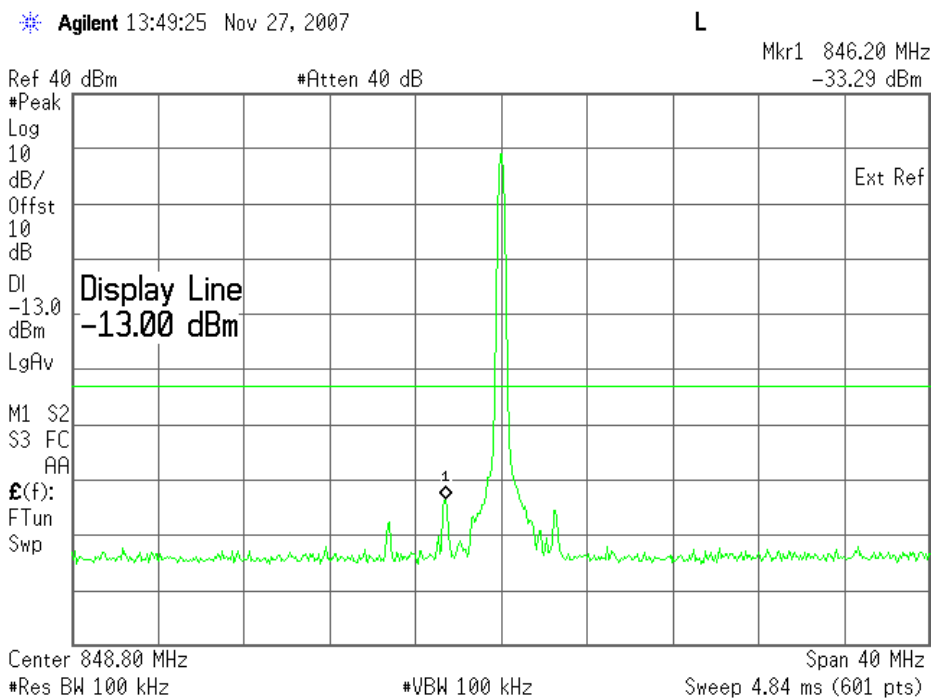
| Cellular Harmonics for Ch. 190 (836.6 MHz) | Level (dBm)           |
|--|-----------------------|
| Second                                     | -36.31 dBm            |
| Third                                      | -37.11 dBm            |
| All others                                 | < -35 dBm up to 20GHz |

**SIERRA WIRELESS, INC.**

**Plot 6.4.16) Out of Band Emissions at Antenna Terminals**  
 8-PSK, High Channel, 848.8 MHz, 1 MHz to 1 GHz



**Plot 6.4.17) Out of Band Emissions at Antenna Terminals**  
 8-PSK, High Channel, 848.8 MHz, TX signal +/- 20 MHz



**The strong emission shown in each case is the carrier signal.**

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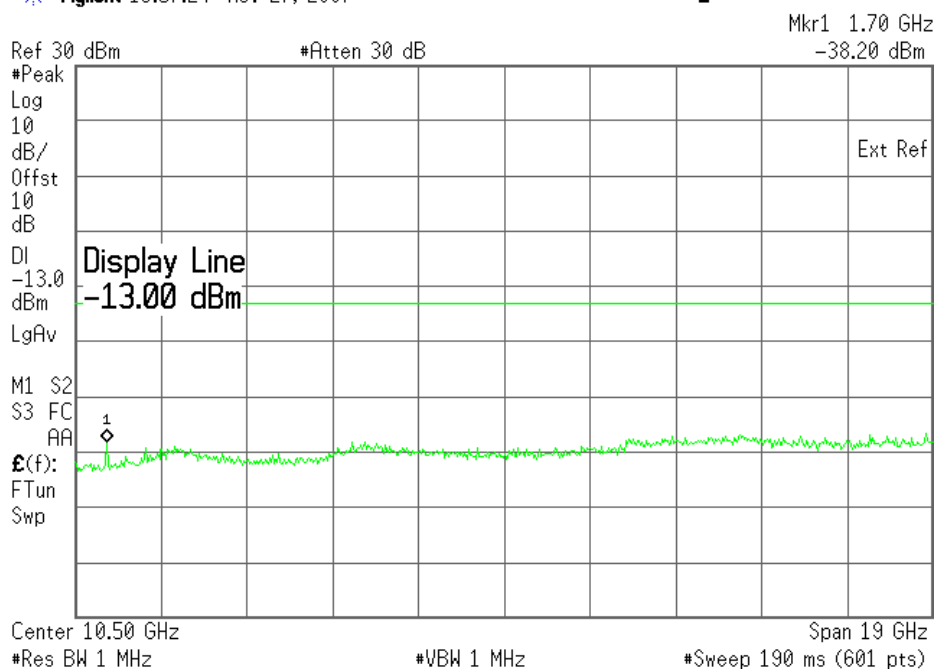
## SIERRA WIRELESS, INC.

### Plot 6.4.18) Out of Band Emissions at Antenna Terminals

8-PSK, High Channel, 848.8 MHz, 1 GHz to 20 GHz

Agilent 13:57:24 Nov 27, 2007

L



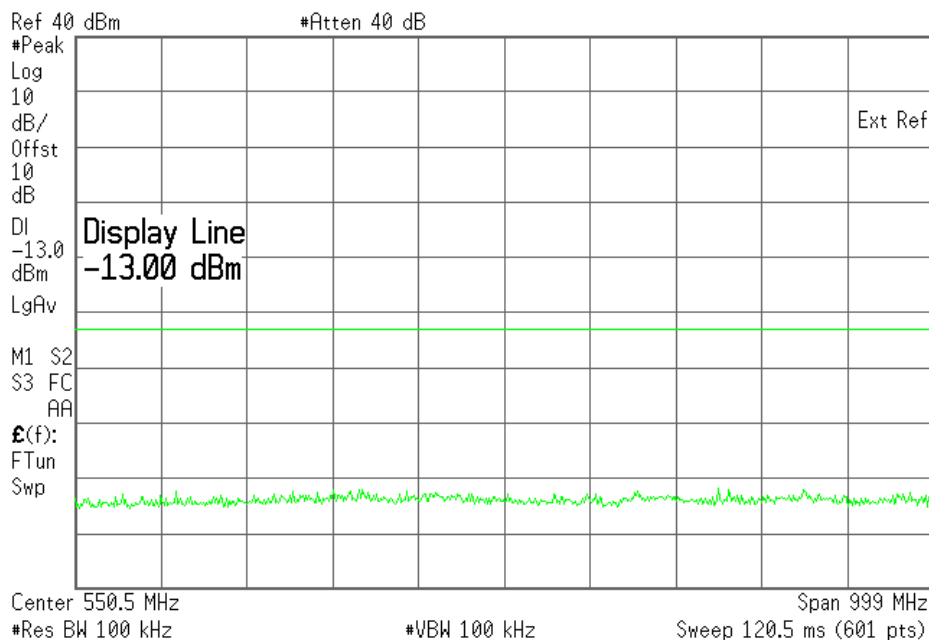
| Cellular Harmonics for Ch. 251 (848.8 MHz) | Level (dBm)                     |
|--|---------------------------------|
| <b>Second</b>                              | <b>-38.20 dBm</b>               |
| <b>Third</b>                               | <b>-38.60 dBm</b>               |
| <b>All others</b>                          | <b>&lt; -35 dBm up to 20GHz</b> |

SIERRA WIRELESS, INC.

**Plot 6.4.19) Out of Band Emissions at Antenna Terminals**

GMSK, Low channel, 1850.2 MHz, 1 MHz to 1 GHz

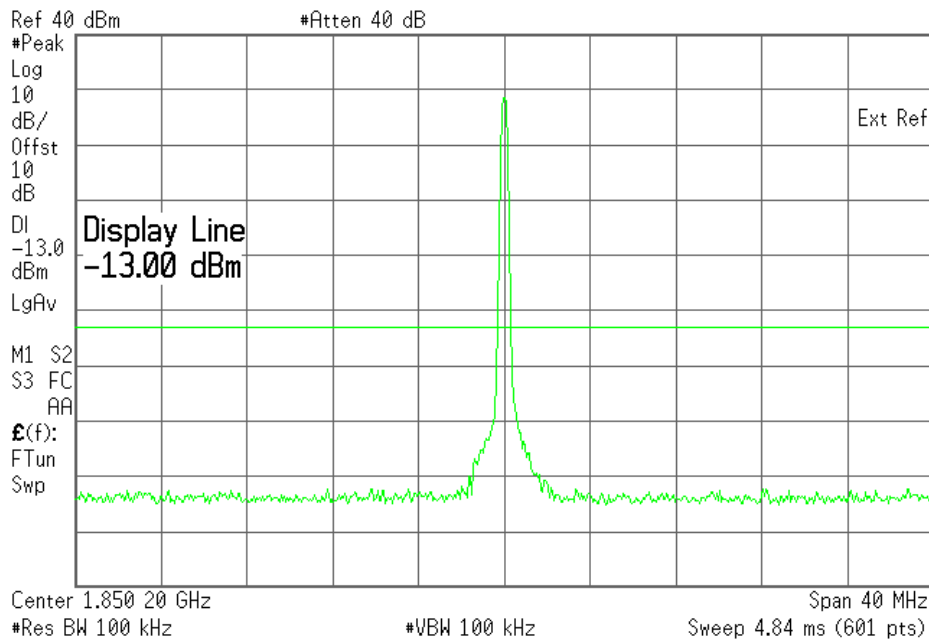
\* Agilent 14:07:01 Nov 27, 2007      L



**Plot 6.4.20) Out of Band Emissions at Antenna Terminals**

GMSK, Low channel, 1850.2 MHz, TX signal +/- 20 MHz

\* Agilent 14:08:05 Nov 27, 2007      L



**The strong emission shown is the carrier signal.**

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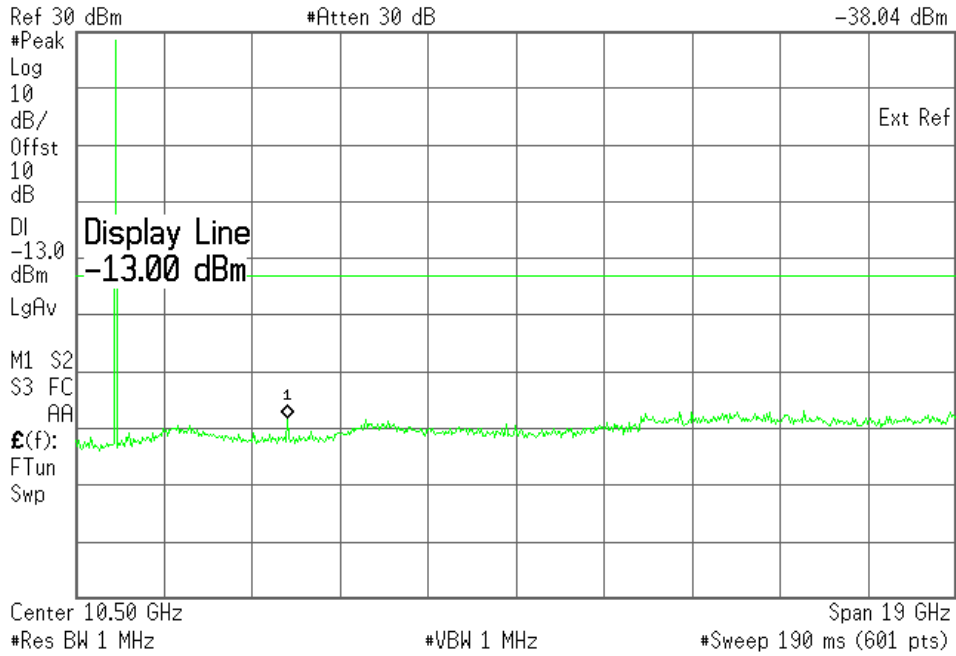
**Plot 6.4.21) Out of Band Emissions at Antenna Terminals**

GMSK, Low channel, 1850.2 MHz, 1 GHz to 20 GHz

Agilent 14:17:01 Nov 27, 2007

L

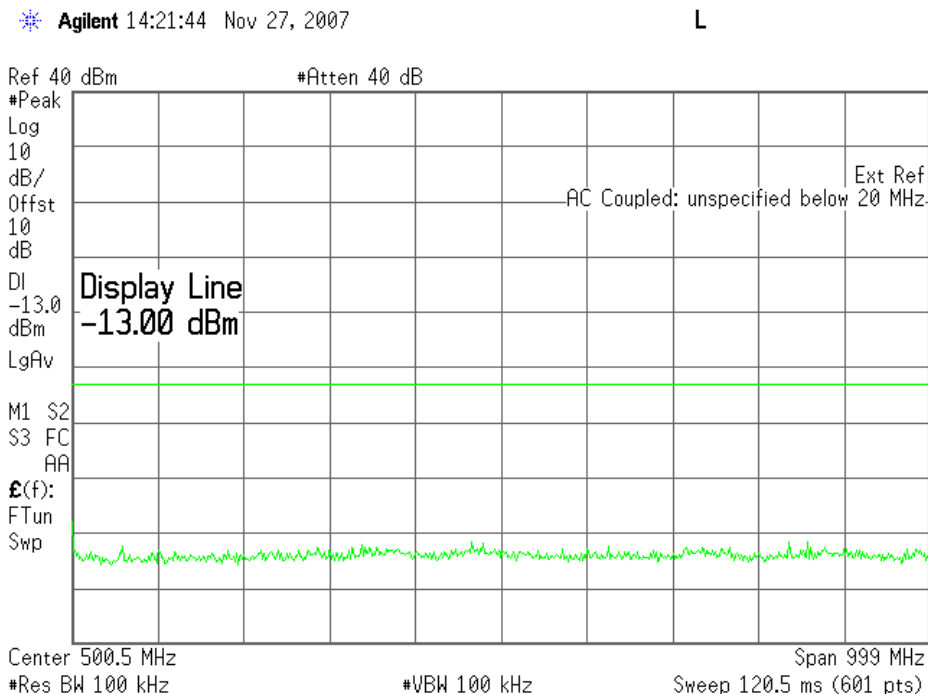
Mkr1 5.56 GHz  
-38.04 dBm



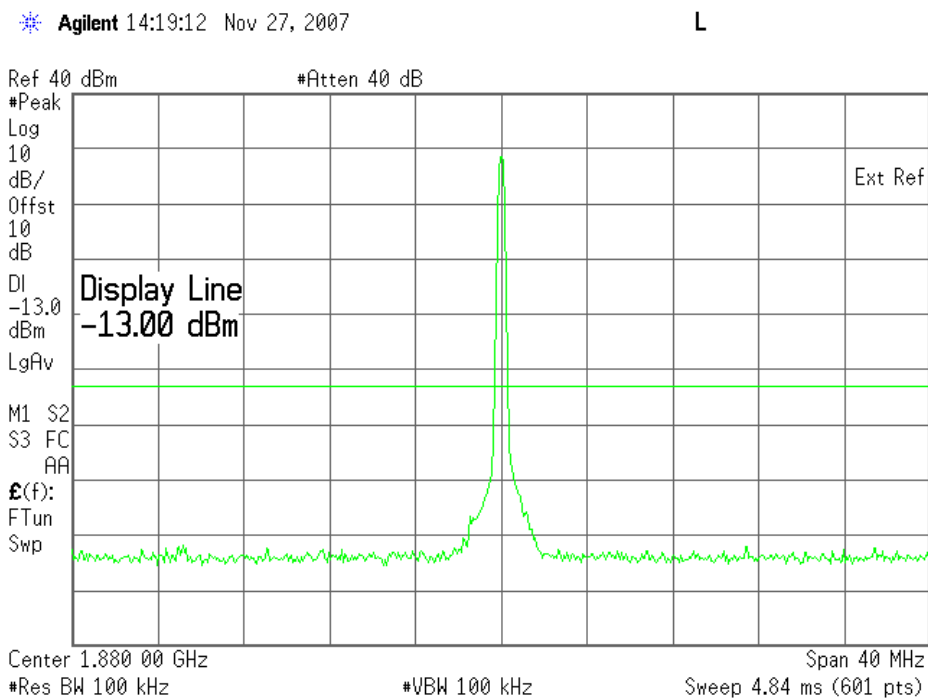
**The strong emission shown is the carrier signal.**

**SIERRA WIRELESS, INC.**

**Plot 6.4.22) Out of Band Emissions at Antenna Terminals**  
 GMSK, Middle channel, 1880.0 MHz, 1 MHz to 1 GHz



**Plot 6.4.23) Out of Band Emissions at Antenna Terminals**  
 GMSK, Middle channel, 1880.0 MHz, TX signal +/- 20 MHz



**The strong emission shown is the carrier signal.**

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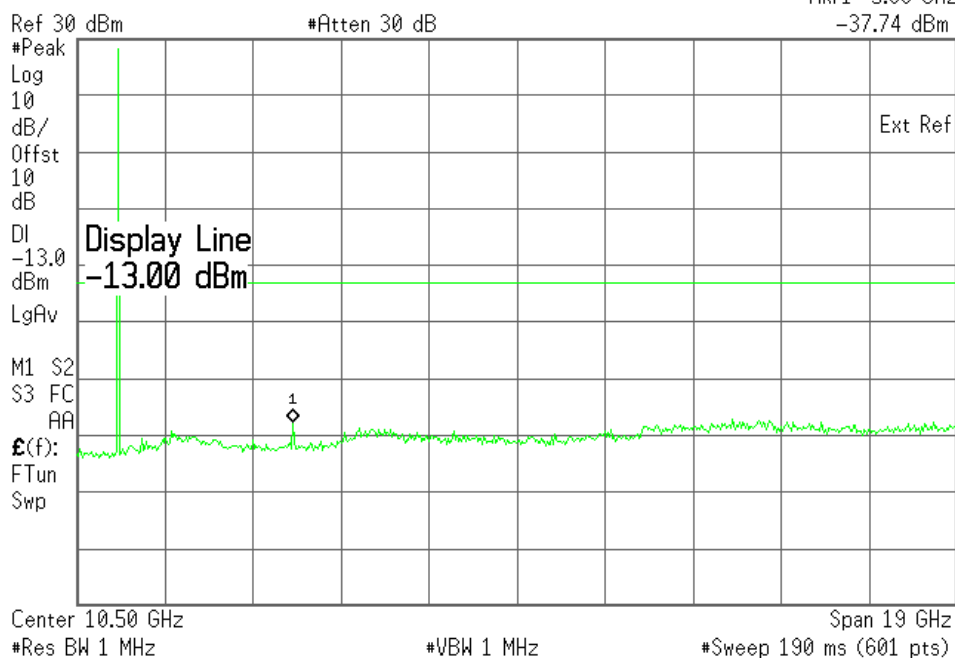
**Plot 6.4.24) Out of Band Emissions at Antenna Terminals**

GMSK, Middle channel, 1880.0 MHz, 1 GHz to 20 GHz

Agilent 14:18:04 Nov 27, 2007

L

Mkr1 5.66 GHz  
-37.74 dBm



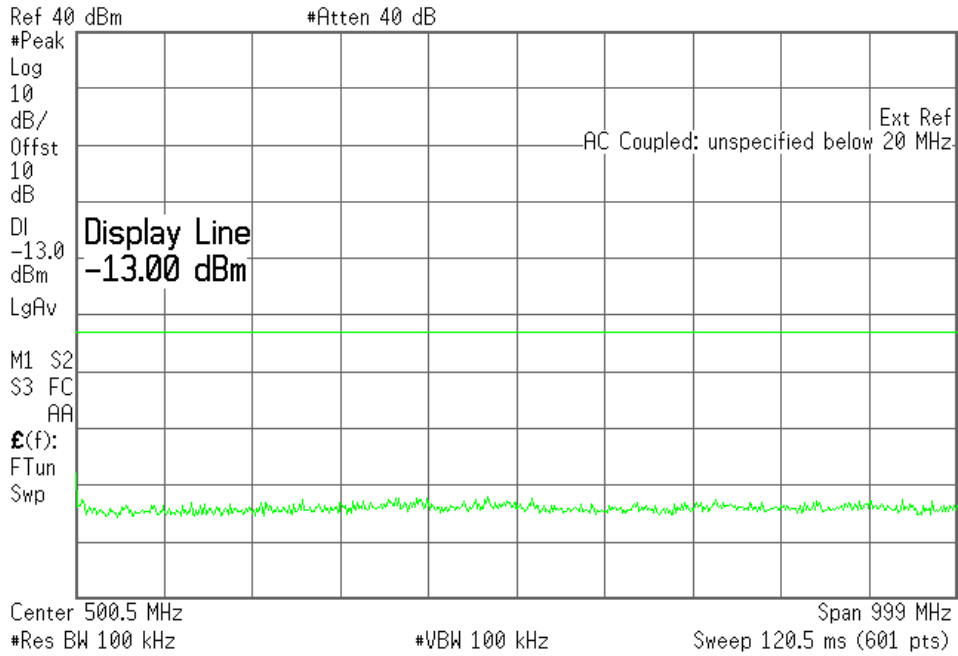
**The strong emission shown is the carrier signal.**

**SIERRA WIRELESS, INC.**

**Plot 6.4.25) Out of Band Emissions at Antenna Terminals**

GMSK, High channel, 1909.8 MHz, 1 MHz to 1 GHz

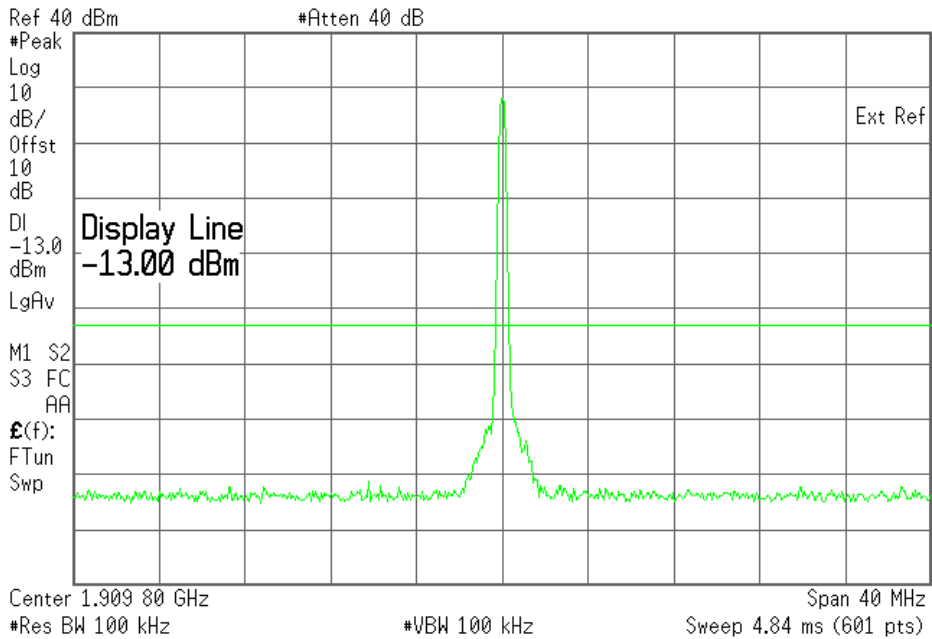
Agilent 14:22:58 Nov 27, 2007 L



**Plot 6.4.26) Out of Band Emissions at Antenna Terminals**

GMSK, High channel, 1909.8 MHz, TX signal +/- 20 MHz

Agilent 14:23:49 Nov 27, 2007 L



**The strong emission shown is the carrier signal.**

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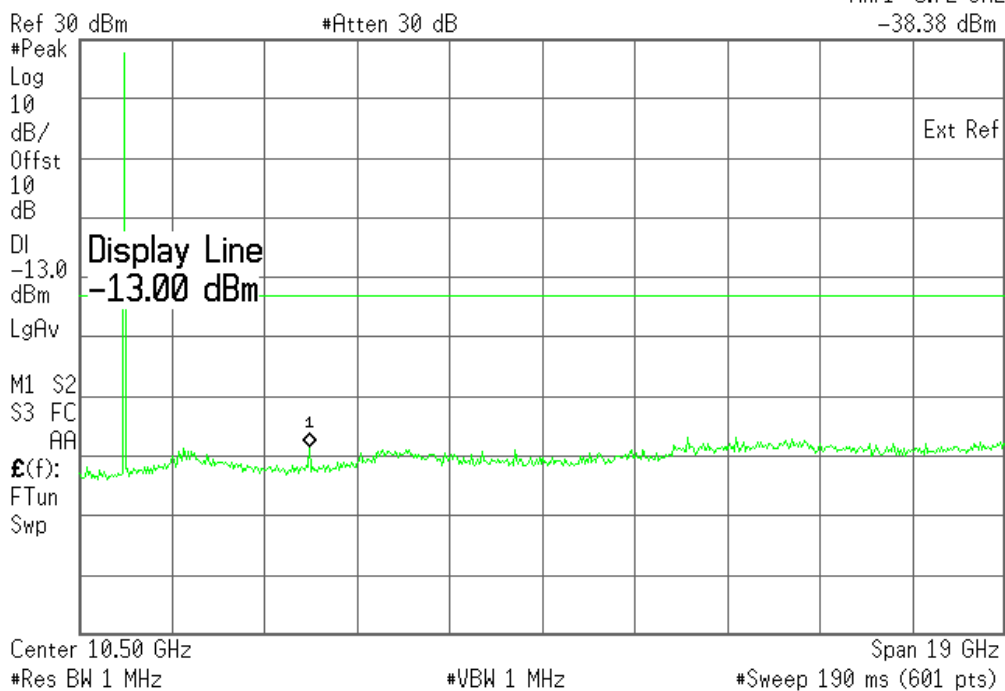
**Plot 6.4.27) Out of Band Emissions at Antenna Terminals**

GMSK, High channel, 1909.8 MHz, 1 GHz to 20 GHz

Agilent 14:25:39 Nov 27, 2007

L

Mkr1 5.72 GHz  
-38.38 dBm



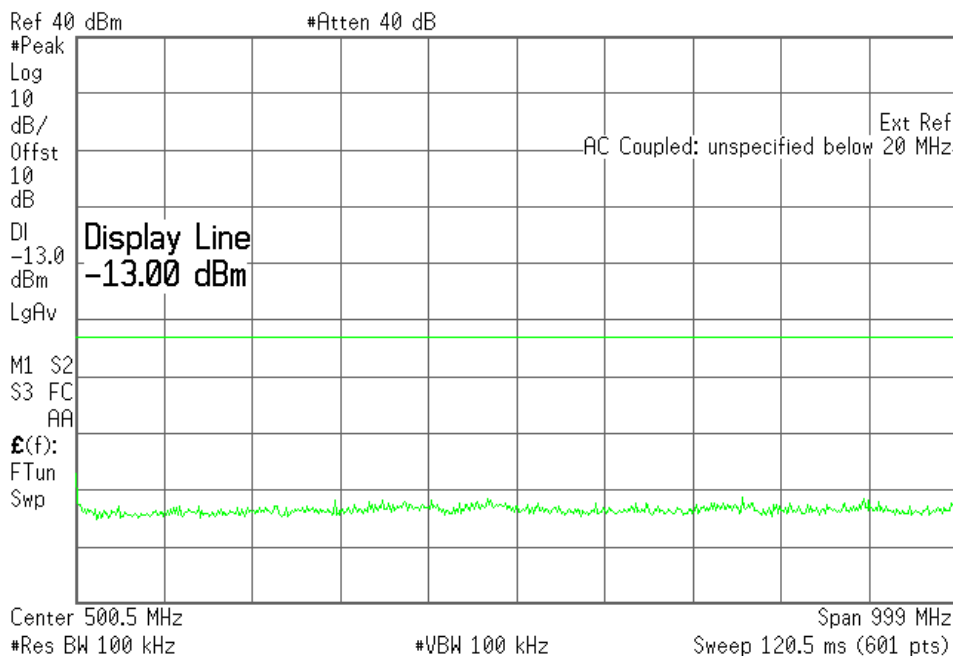
**The strong emission shown is the carrier signal.**

**SIERRA WIRELESS, INC.**

**Plot 6.4.28) Out of Band Emissions at Antenna Terminals**

8-PSK, Low channel, 1850.2 MHz, 1 MHz to 1 GHz

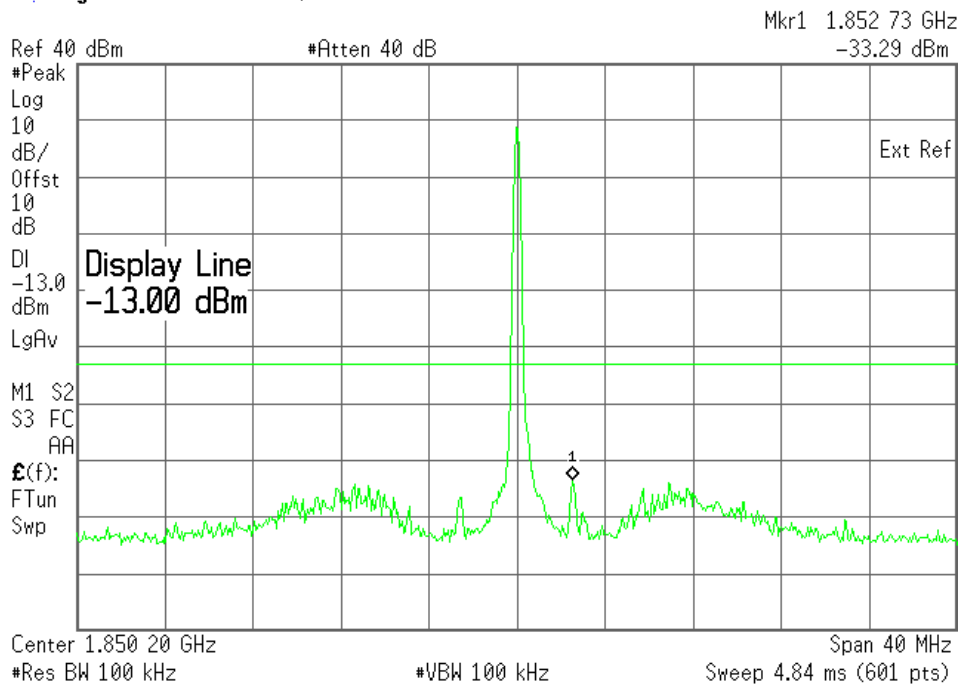
Agilent 15:27:22 Nov 27, 2007 L



**Plot 6.4.29) Out of Band Emissions at Antenna Terminals**

8-PSK, Low channel, 1850.2 MHz, TX signal +/- 20 MHz

Agilent 15:25:56 Nov 27, 2007 L



**The strong emission shown is the carrier signal.**

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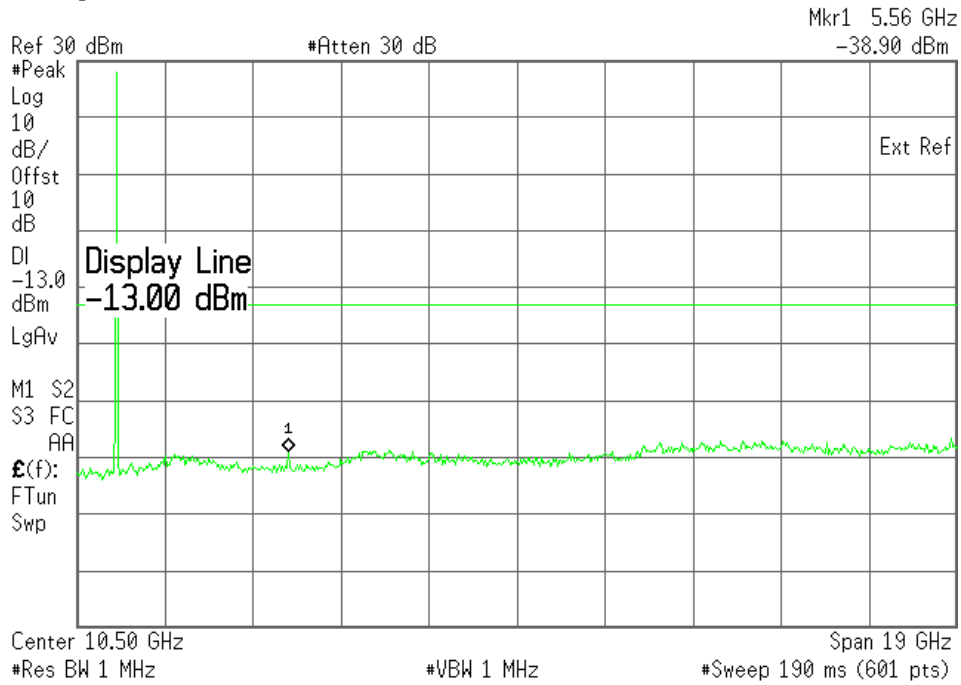
SIERRA WIRELESS, INC.

**Plot 6.4.30) Out of Band Emissions at Antenna Terminals**

8-PSK, Low channel, 1850.2 MHz, 1 GHz to 20 GHz

Agilent 15:22:55 Nov 27, 2007

L



**The strong emission shown is the carrier signal.**

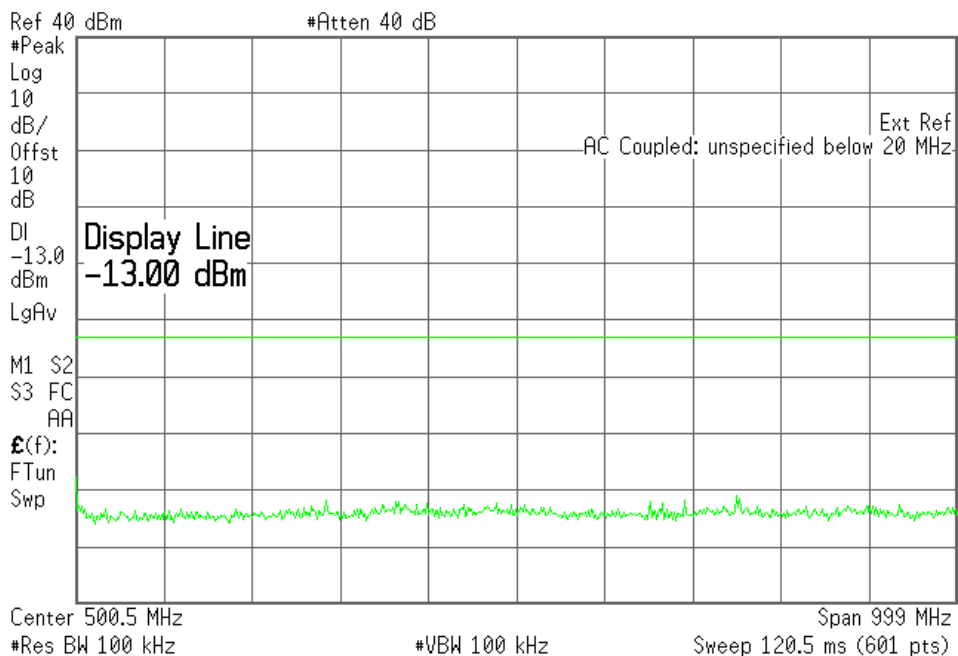
**SIERRA WIRELESS, INC.**

**Plot 6.4.31) Out of Band Emissions at Antenna Terminals**

8-PSK, Middle channel, 1880.0 MHz, 1 MHz to 1 GHz

Agilent 15:28:49 Nov 27, 2007

L



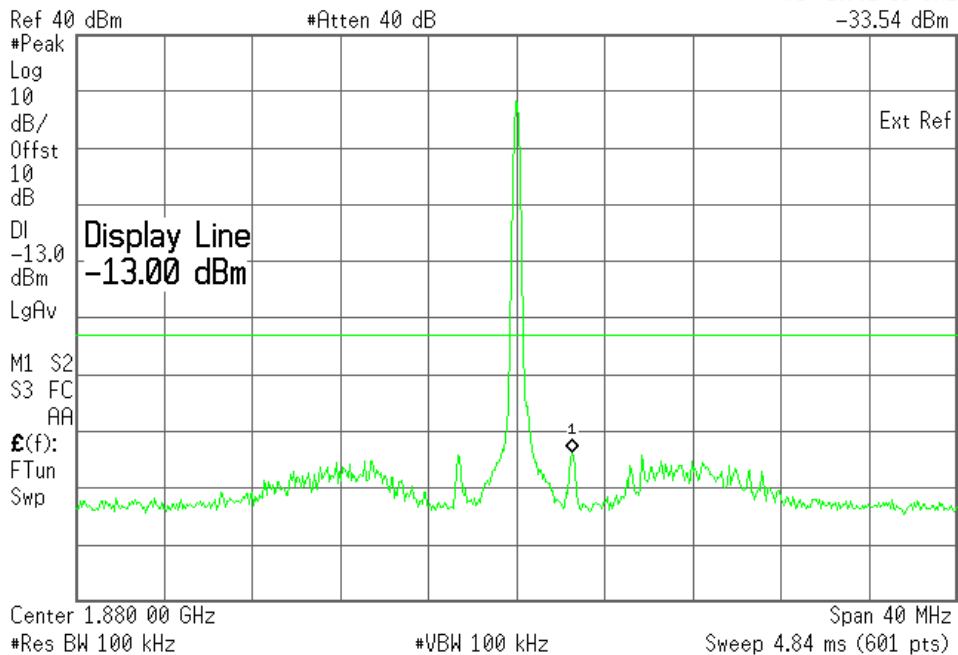
**Plot 6.4.32) Out of Band Emissions at Antenna Terminals**

8-PSK, Middle channel, 1880.0 MHz, TX signal +/- 20 MHz

Agilent 15:31:28 Nov 27, 2007

L

Mkr1 1.882 53 GHz  
-33.54 dBm



**The strong emission shown is the carrier signal.**

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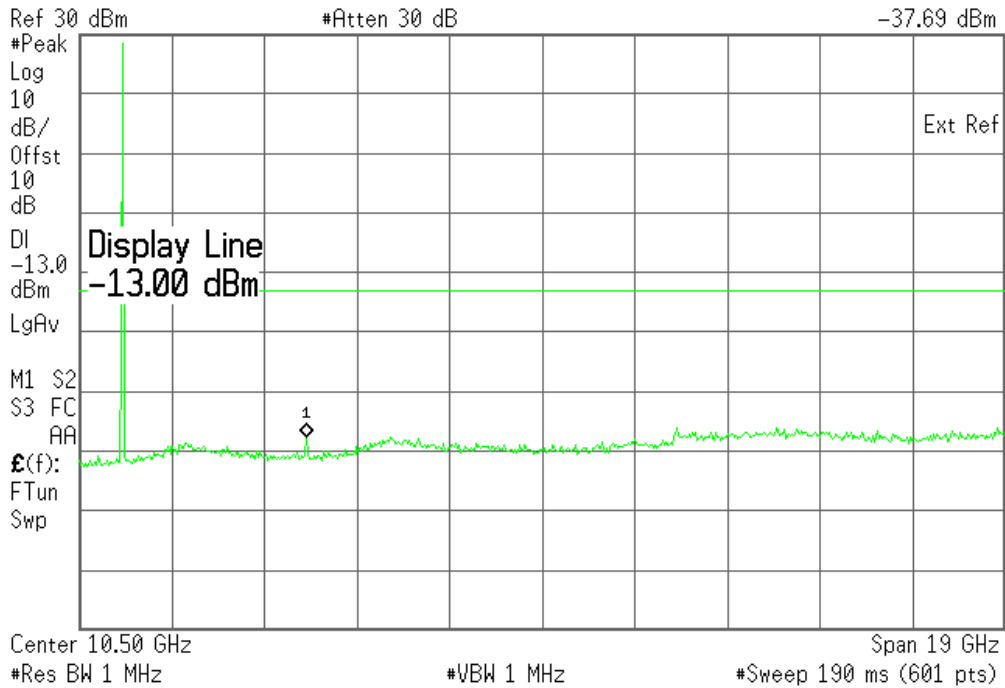
**Plot 6.4.33) Out of Band Emissions at Antenna Terminals**

8-PSK, Middle channel, 1880.0 MHz, 1 GHz to 20 GHz

Agilent 16:02:36 Nov 27, 2007

L

Mkr1 5.66 GHz  
-37.69 dBm



**The strong emission shown is the carrier signal.**

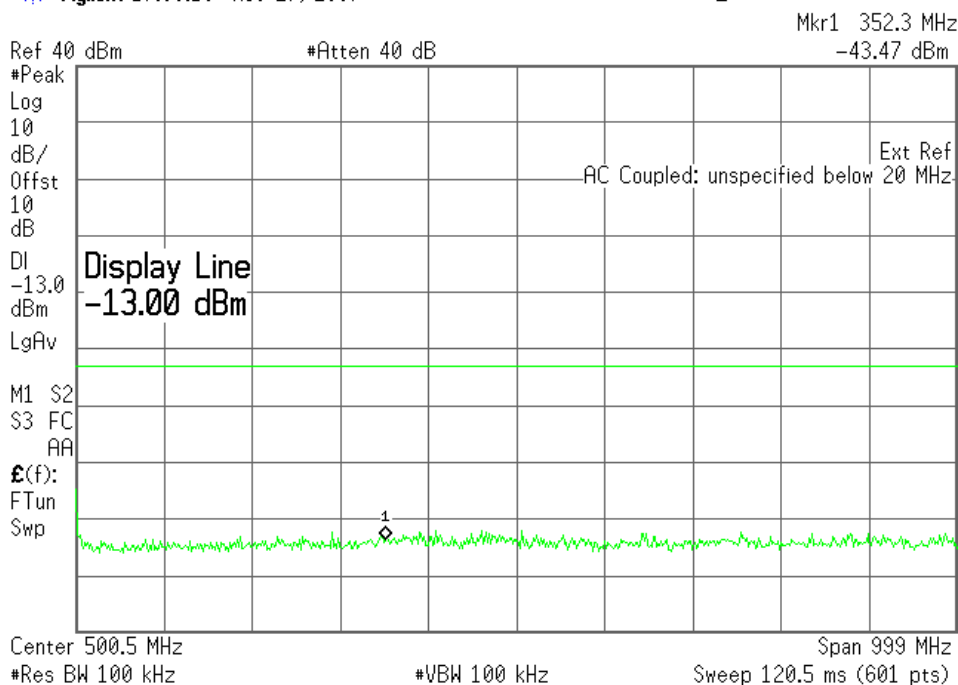
**SIERRA WIRELESS, INC.**

**Plot 6.4.34) Out of Band Emissions at Antenna Terminals**

8-PSK, High channel, 1909.8 MHz, 1 MHz to 1 GHz

Agilent 17:08:19 Nov 27, 2007

L

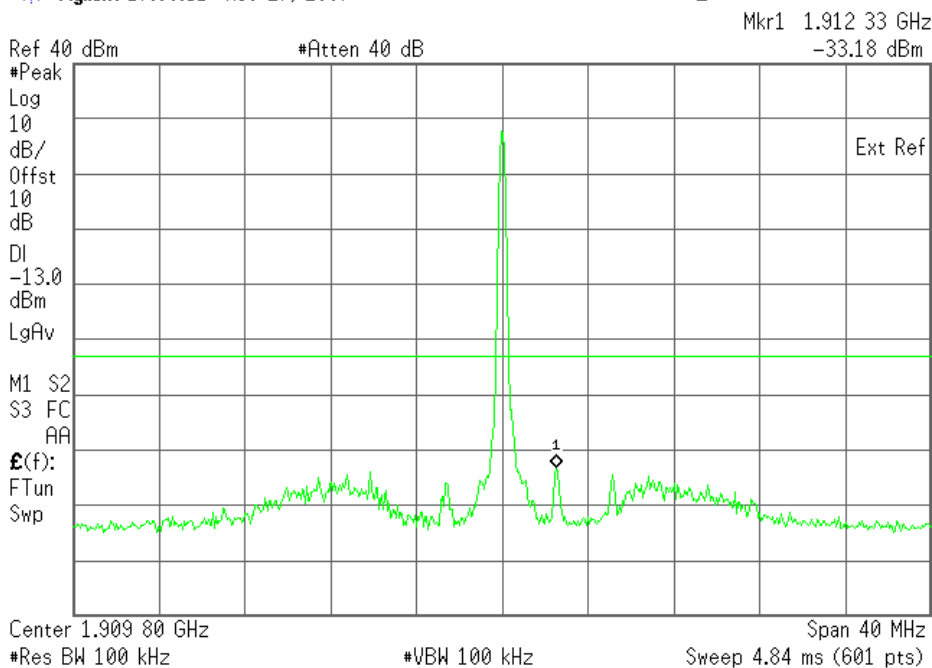


**Plot 6.4.35) Out of Band Emissions at Antenna Terminals**

8-PSK, High channel, 1909.8 MHz, TX signal +/- 20 MHz

Agilent 17:09:51 Nov 27, 2007

L



**The strong emission shown is the carrier signal.**

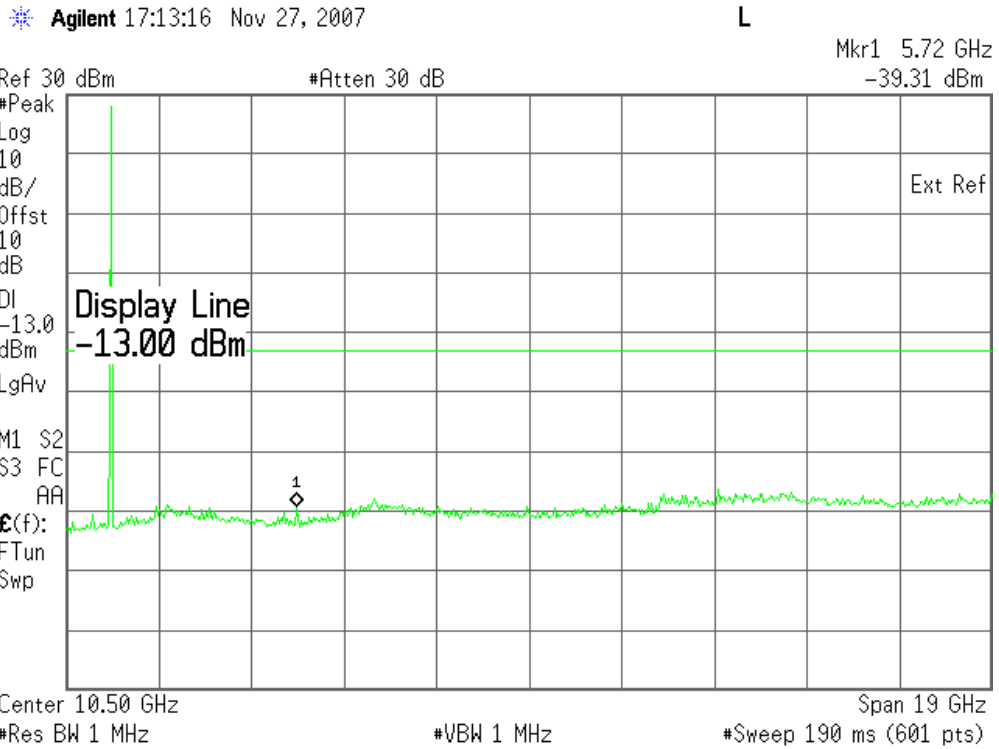
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Plot 6.4.36) Out of Band Emissions at Antenna Terminals  
8-PSK, High channel, 1909.8 MHz, 1 GHz to 20 GHz



**The strong emission shown is the carrier signal.**

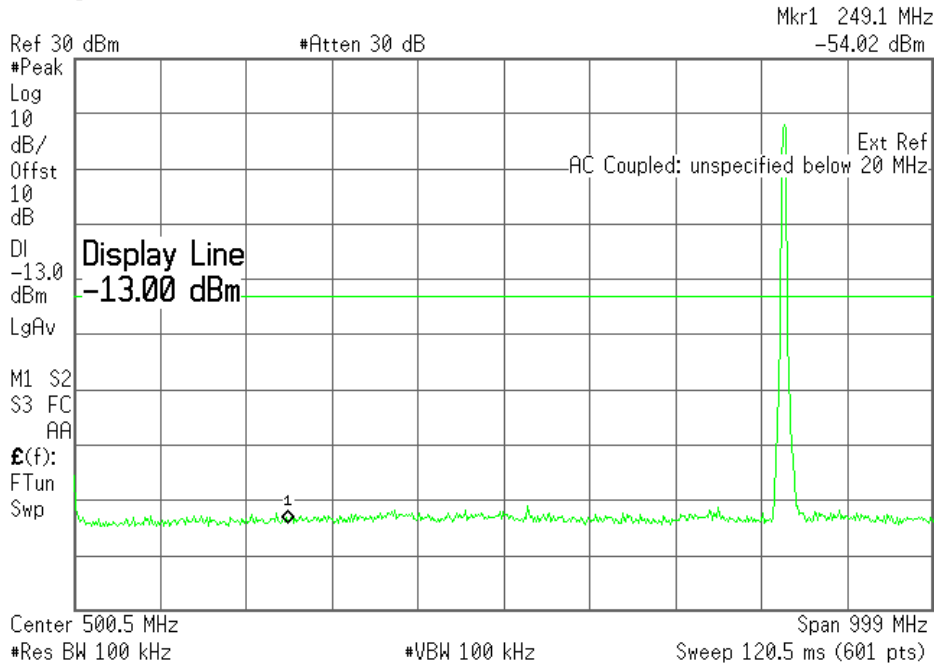
**SIERRA WIRELESS, INC.**

**Plot 6.4.37) Out of Band Emissions at Antenna Terminals**

WCDMA, Low channel, 826.4 MHz, 1 MHz to 1 GHz

Agilent 09:51:06 Nov 28, 2007

T

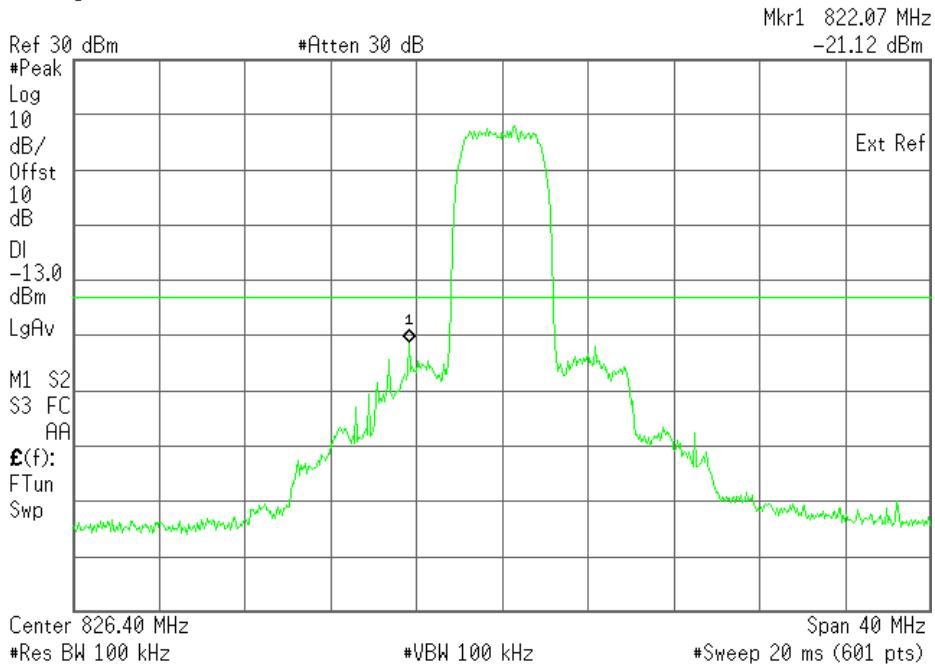


**Plot 6.4.38) Out of Band Emissions at Antenna Terminals**

WCDMA, Low channel, 826.4 MHz, TX signal +/- 20 MHz

Agilent 09:54:55 Nov 28, 2007

L



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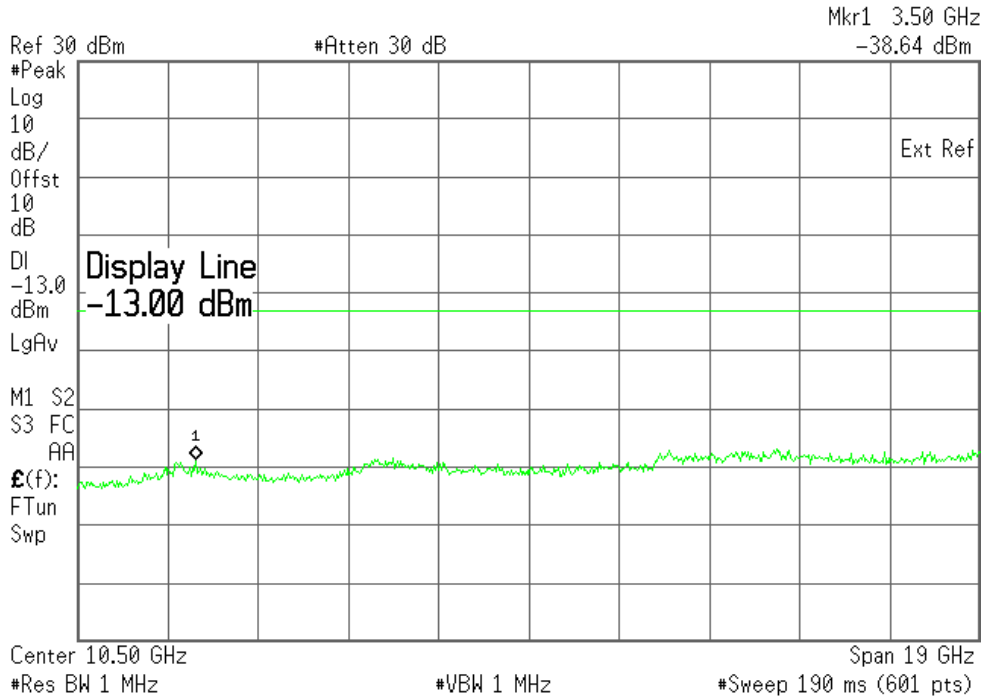
**SIERRA WIRELESS, INC.**

**Plot 6.4.39) Out of Band Emissions at Antenna Terminals**

WCDMA, Low channel, 826.4 MHz, 1 GHz to 20 GHz

Agilent 09:57:42 Nov 28, 2007

L



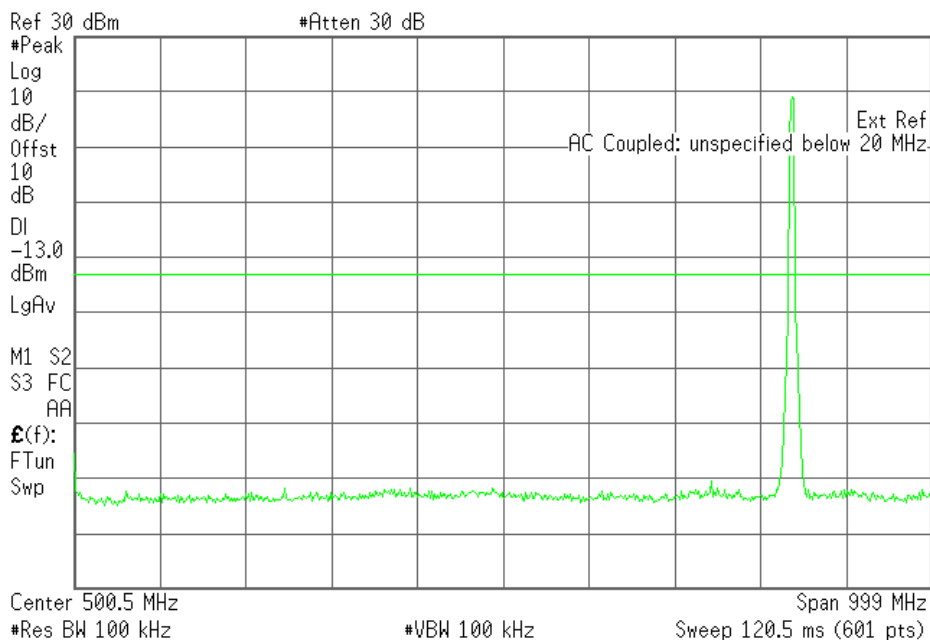
| Cellular Harmonics for Ch. 4132 (826.4 MHz) | Level (dBm)           |
|---|-----------------------|
| Second                                      | --                    |
| Third                                       | --                    |
| All others                                  | < -35 dBm up to 20GHz |

**SIERRA WIRELESS, INC.**

**Plot 6.4.40) Out of Band Emissions at Antenna Terminals**

WCDMA, Middle channel, 836.4 MHz, 1 MHz to 1 GHz

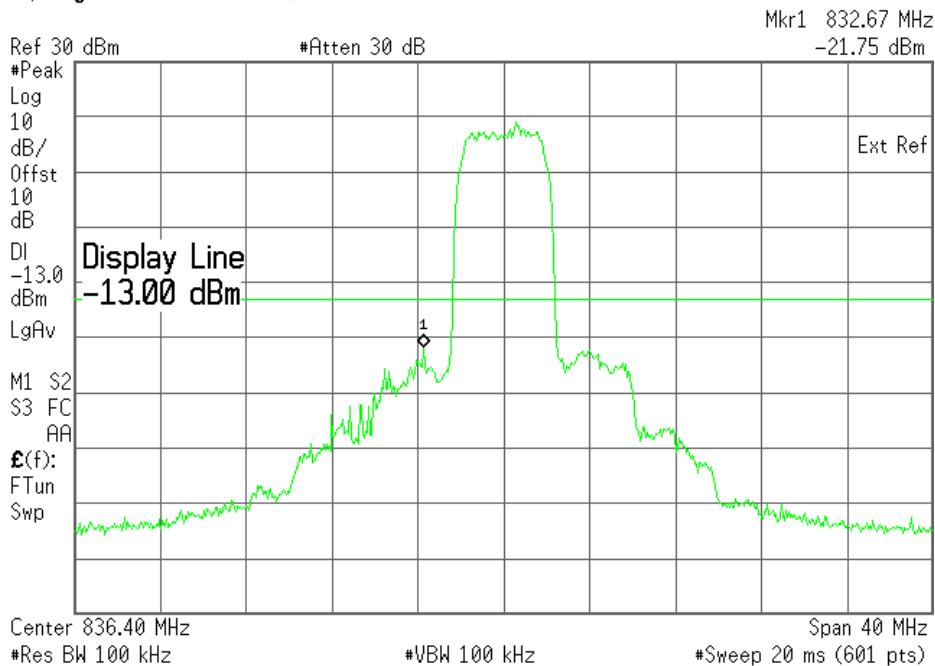
\* Agilent 10:08:13 Nov 28, 2007 L



**Plot 6.4.41) Out of Band Emissions at Antenna Terminals**

WCDMA, Middle channel, 836.4 MHz, TX signal +/- 20 MHz

\* Agilent 10:04:46 Nov 28, 2007 L



**The strong emission shown in each case is the carrier signal.**

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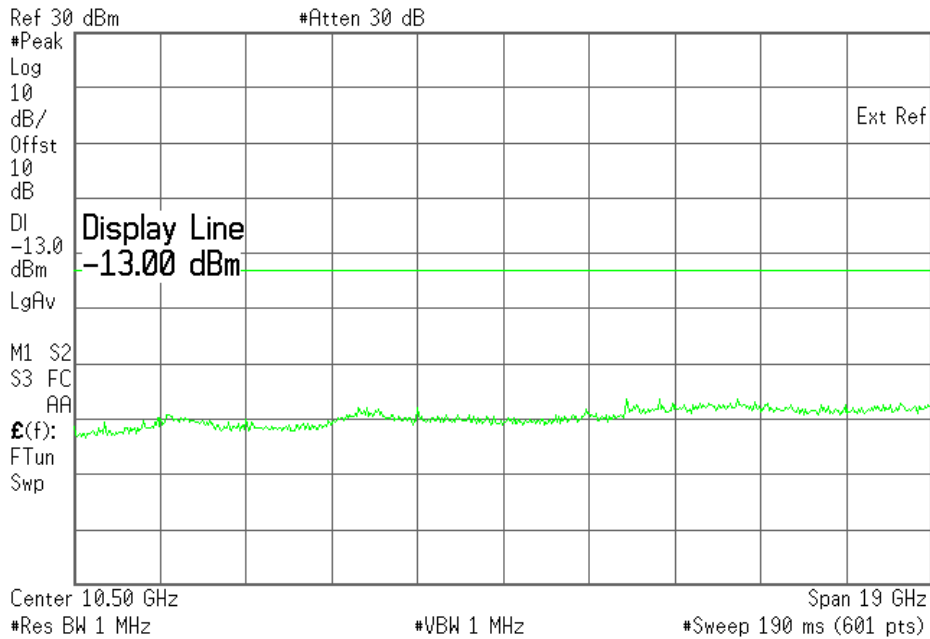
The contents of this page are subject to the confidentiality information on page one.

**SIERRA WIRELESS, INC.**

**Plot 6.4.42) Out of Band Emissions at Antenna Terminals**

WCDMA, Middle channel, 836.4 MHz, 1 GHz to 20 GHz

Agilent 10:02:32 Nov 28, 2007 L



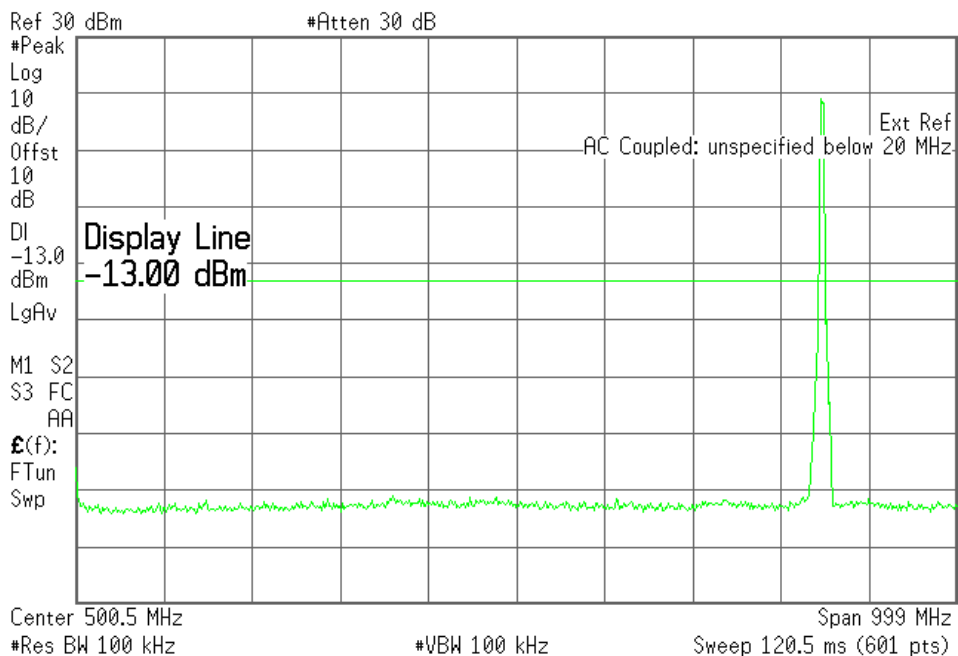
| Cellular Harmonics for Ch. 4182 (836.4 MHz) | Level (dBm)           |
|---|-----------------------|
| Second                                      | --                    |
| Third                                       | --                    |
| All others                                  | < -35 dBm up to 20GHz |

**SIERRA WIRELESS, INC.**

**Plot 6.4.43) Out of Band Emissions at Antenna Terminals**

WCDMA, High Channel, 846.6 MHz, 1 MHz to 1 GHz

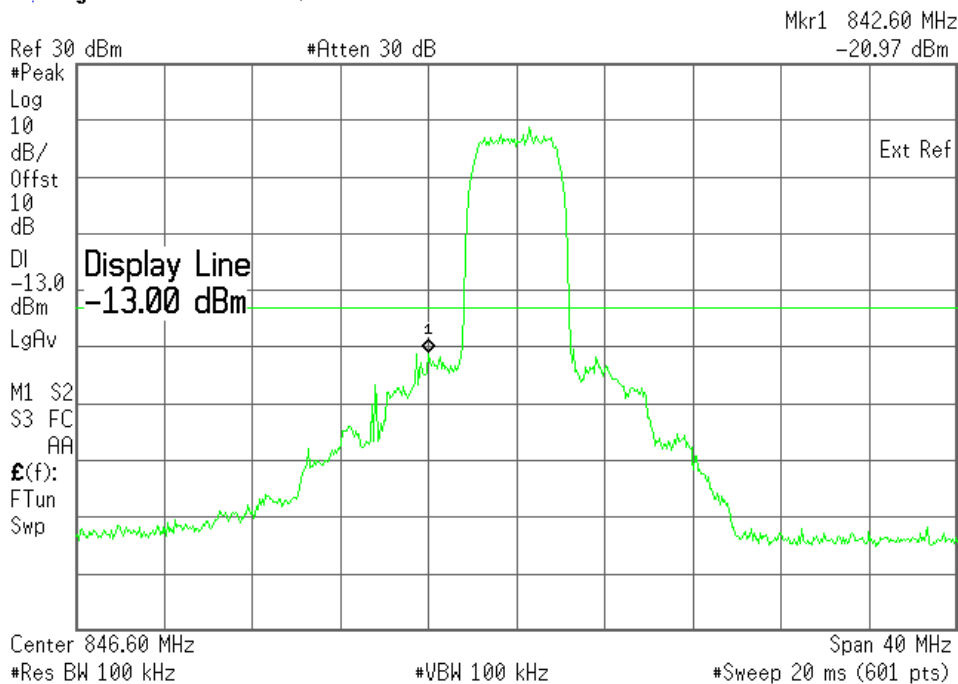
Agilent 10:12:44 Nov 28, 2007 L



**Plot 6.4.44) Out of Band Emissions at Antenna Terminals**

WCDMA, High Channel, 846.6 MHz, TX signal +/- 20 MHz

Agilent 10:14:25 Nov 28, 2007 L



**The strong emission shown in each case is the carrier signal.**

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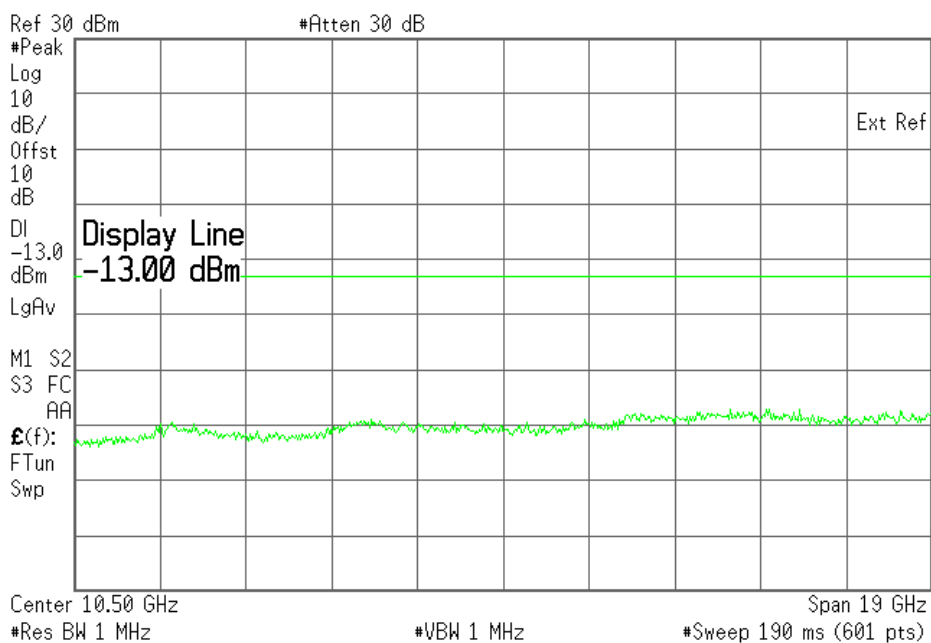
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**Plot 6.4.45) Out of Band Emissions at Antenna Terminals**  
WCDMA, High Channel, 846.6 MHz, 1 GHz to 20 GHz

Agilent 10:15:58 Nov 28, 2007

L



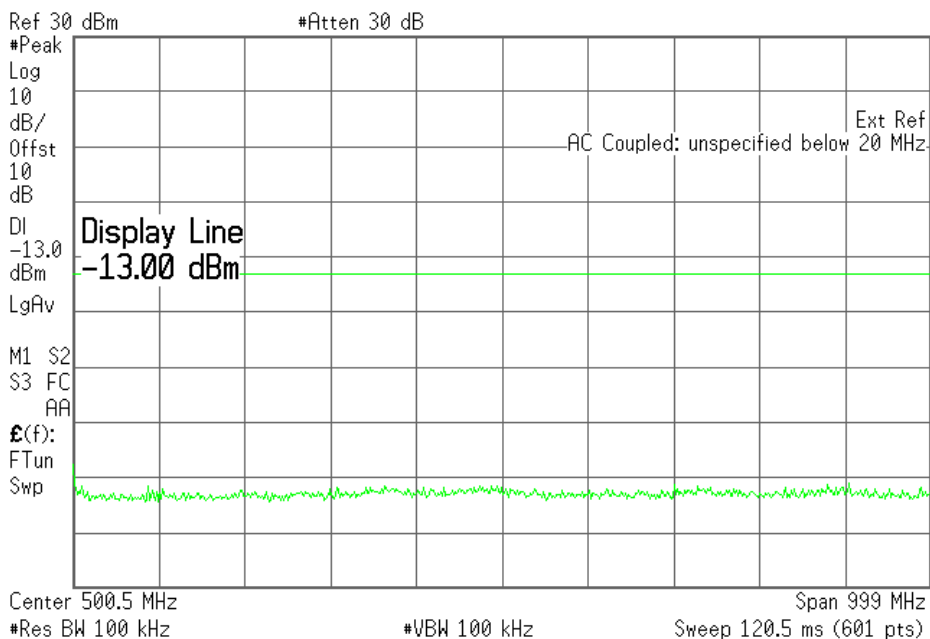
| <b>Cellular Harmonics for Ch. 4233 (846.6 MHz)</b> | <b>Level (dBm)</b>              |
|--|---------------------------------|
| <b>Second</b>                                      | --                              |
| <b>Third</b>                                       | --                              |
| <b>All others</b>                                  | <b>&lt; -35 dBm up to 20GHz</b> |

**SIERRA WIRELESS, INC.**

**Plot 6.4.46) Out of Band Emissions at Antenna Terminals**  
WCDMA, Low channel, 1852.4 MHz, 1 MHz to 1 GHz

\* Agilent 10:23:06 Nov 28, 2007

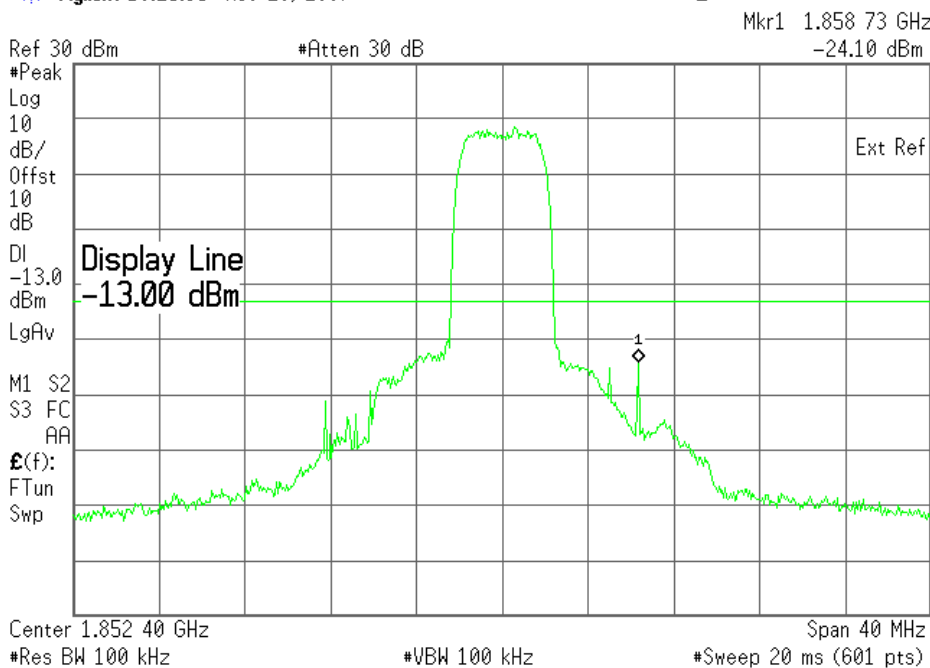
L



**Plot 6.4.47) Out of Band Emissions at Antenna Terminals**  
WCDMA, Low channel, 1852.4 MHz, TX signal +/- 20 MHz

\* Agilent 10:25:35 Nov 28, 2007

L



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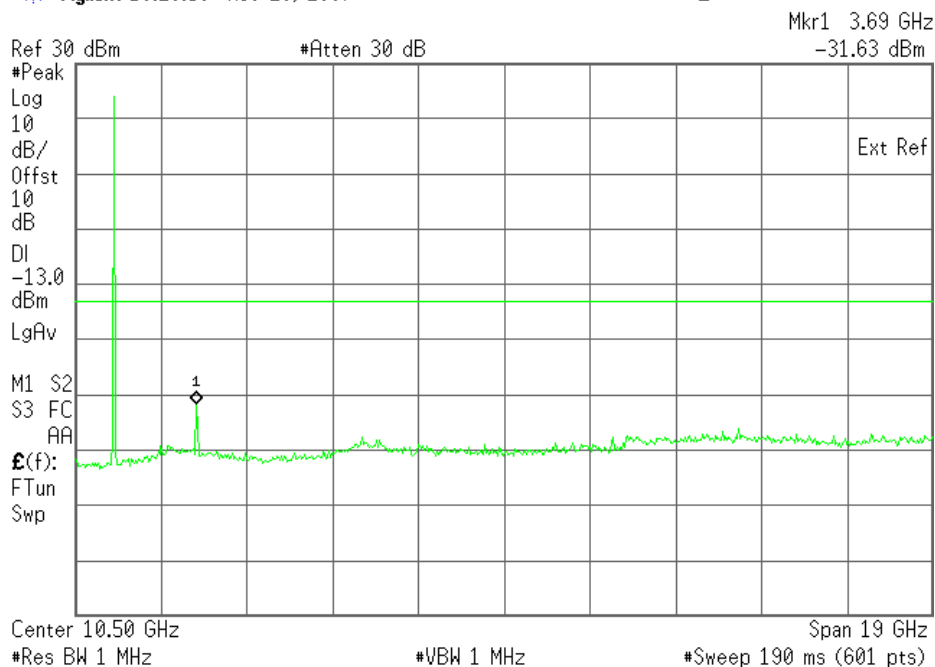
**SIERRA WIRELESS, INC.**

**Plot 6.4.48) Out of Band Emissions at Antenna Terminals**

WCDMA, Low channel, 1852.4 MHz, 1 GHz to 20 GHz

\* Agilent 10:28:50 Nov 28, 2007

L



**The strong emission shown is the carrier signal.**

| PCS Harmonics for Ch. 9262 (1852.4 MHz) | Level (dBm)           |
|---|-----------------------|
| Second                                  | - 31.63 dBm           |
| Third                                   | --                    |
| All others                              | < -35 dBm up to 20GHz |

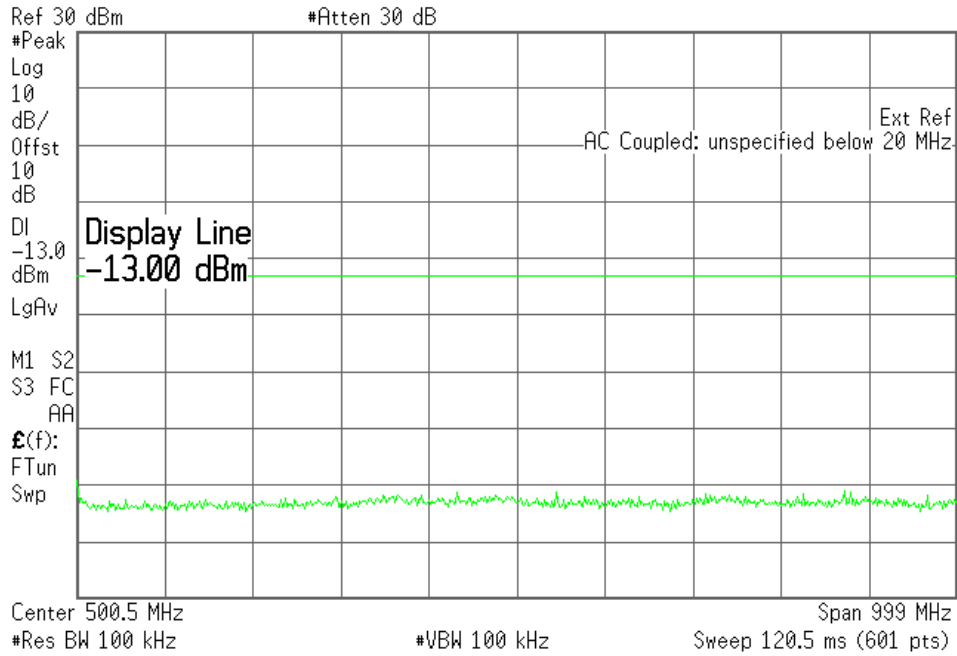
SIERRA WIRELESS, INC.

**Plot 6.4.49) Out of Band Emissions at Antenna Terminals**

WCDMA, Middle channel, 1880 MHz, 1 MHz to 1 GHz

Agilent 10:39:09 Nov 28, 2007

L

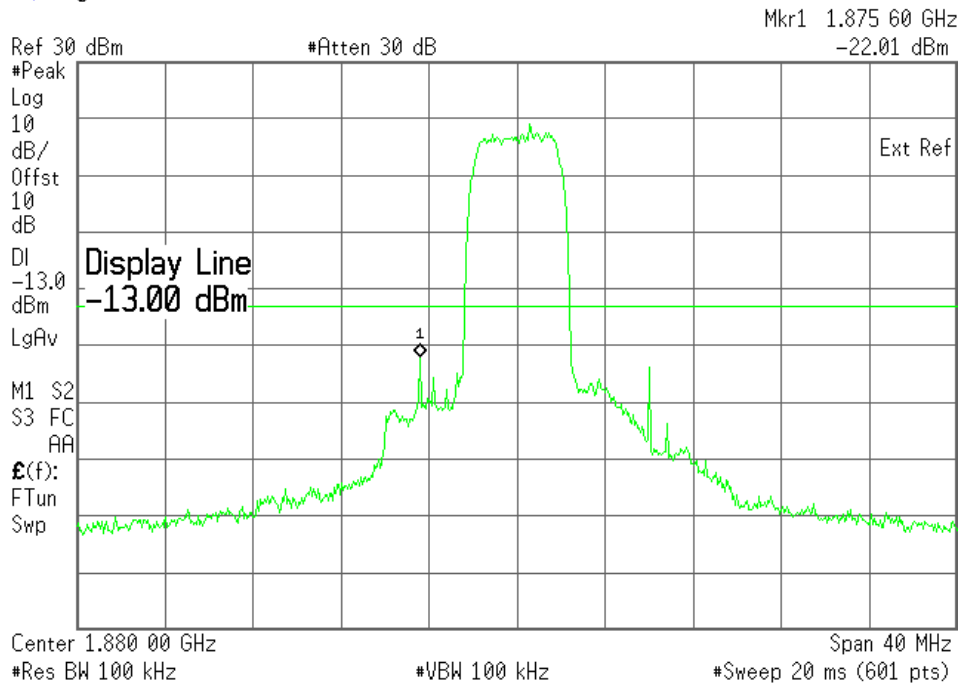


**Plot 6.4.50) Out of Band Emissions at Antenna Terminals**

WCDMA, Middle channel, 1880 MHz, TX signal +/- 20 MHz

Agilent 10:37:47 Nov 28, 2007

L



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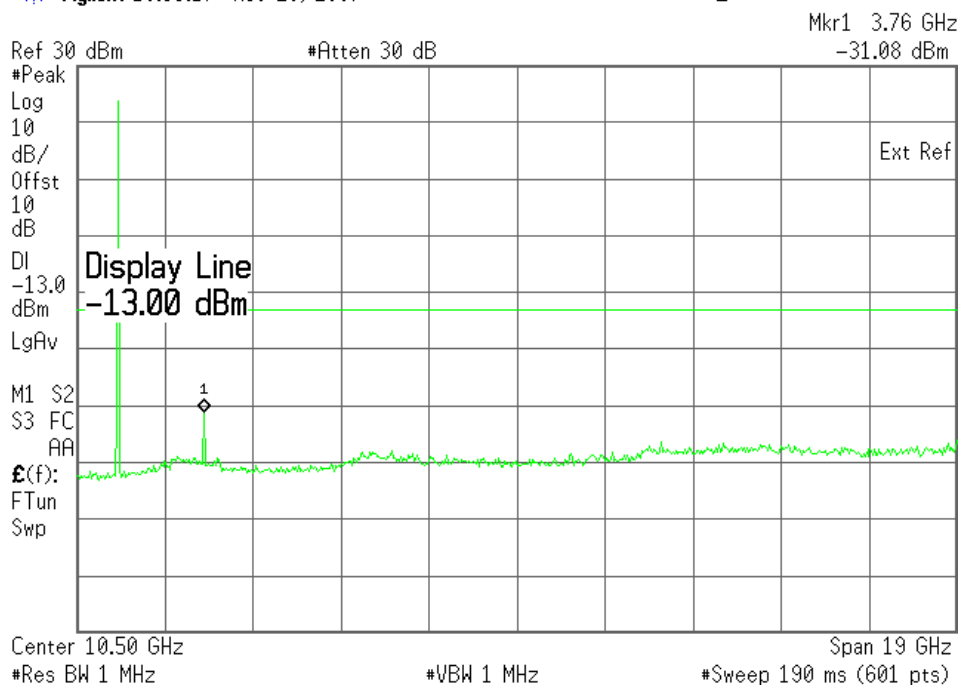
**SIERRA WIRELESS, INC.**

**Plot 6.4.51) Out of Band Emissions at Antenna Terminals**

WCDMA, Middle channel, 1880 MHz, 1 GHz to 20 GHz

\* Agilent 10:33:17 Nov 28, 2007

L



**The strong emission shown is the carrier signal.**

| PCS Harmonics for<br>Ch. 9400 (1880.0 MHz) | Level (dBm)           |
|--|-----------------------|
| Second                                     | - 31.08 dBm           |
| Third                                      | --                    |
| All others                                 | < -35 dBm up to 20GHz |

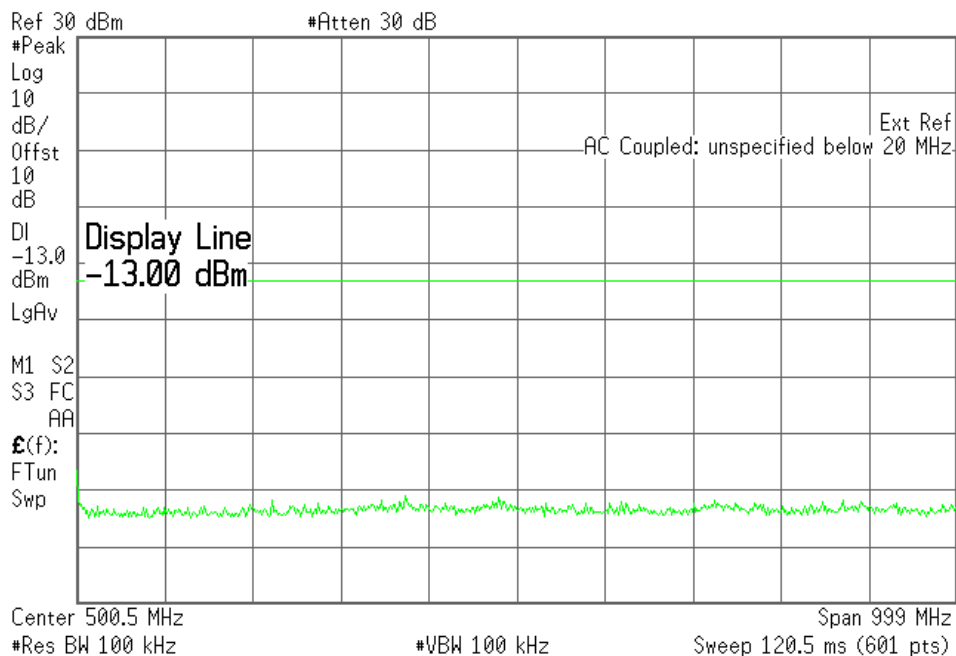
**SIERRA WIRELESS, INC.**

**Plot 6.4.52) Out of Band Emissions at Antenna Terminals**

WCDMA, High channel, 1907.6 MHz, 1 MHz to 1 GHz

\* Agilent 10:42:04 Nov 28, 2007

L

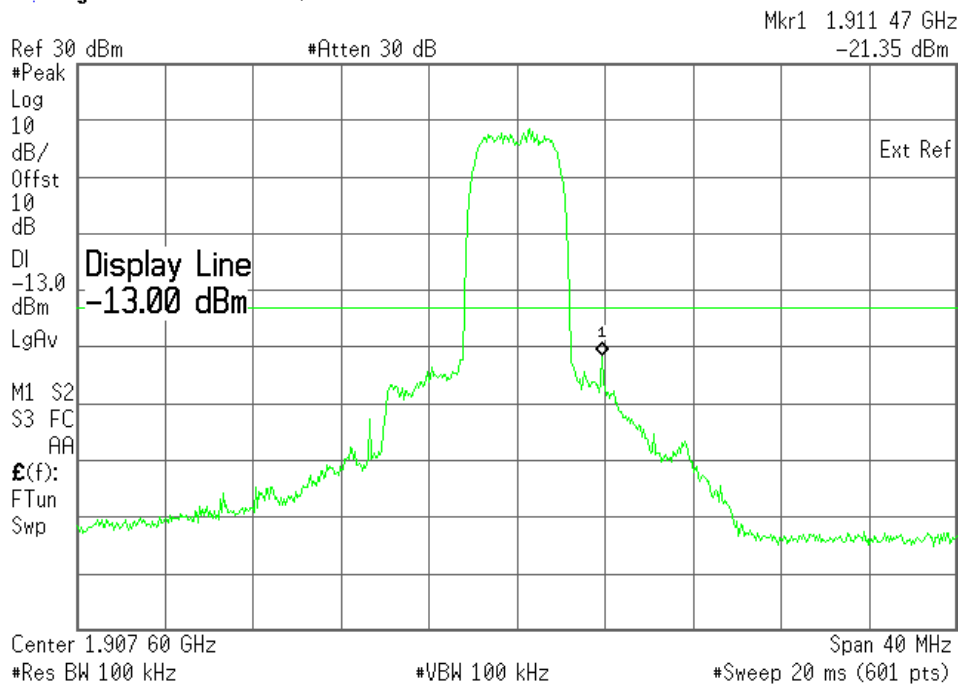


**Plot 6.4.53) Out of Band Emissions at Antenna Terminals**

WCDMA, High channel, 1907.6 MHz, TX signal +/- 20 MHz

\* Agilent 10:44:26 Nov 28, 2007

L



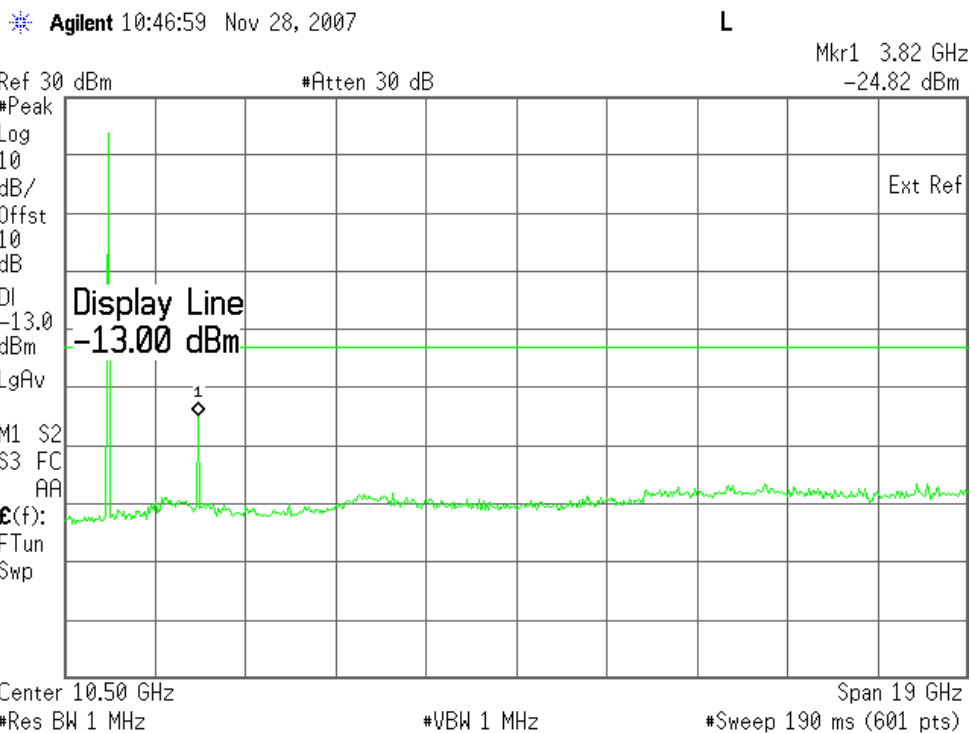
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**SIERRA WIRELESS, INC.**

**Plot 6.4.54) Out of Band Emissions at Antenna Terminals**

WCDMA, High channel, 1907.6 MHz, 1 GHz to 20 GHz



**The strong emission shown is the carrier signal.**

| PCS Harmonics for Ch. 9538 (1907.6 MHz) | Level (dBm)           |
|---|-----------------------|
| Second                                  | - 24.82 dBm           |
| Third                                   | --                    |
| All others                              | < -35 dBm up to 20GHz |

# SIERRA WIRELESS, INC.

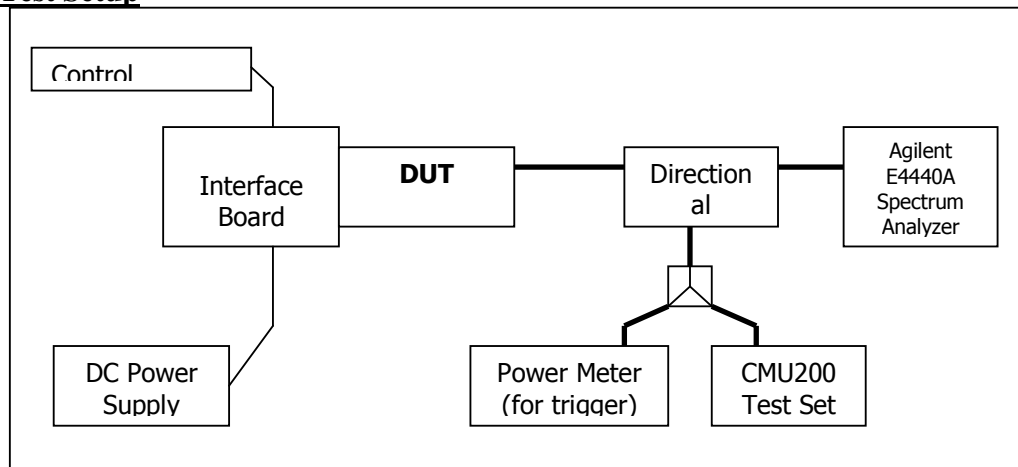
## 7 Block Edge Compliance

FCC Part 22H/24E

### 7.1 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMU200 Test Set and configured to operate at maximum power. The block edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

#### Test Setup



### 7.2 Test Equipment

#### Instrument List

| EQUIPMENT           | MANUFACTURER    | MODEL NO.  | SERIAL NO. | CAL. DATE         |
|---------------------|-----------------|------------|------------|-------------------|
| Control Computer    | TC              | Generic PC | 100488     | N/A               |
| Wireless Test Set   | Rohde & Schwarz | CMU200     | 111682     | November 18, 2008 |
| Spectrum Analyzer   | Agilent         | PSA E4440A | US41421268 | March 11, 2008    |
| DC Power Supply     | HP              | 6632A      | 3530A      | N/A               |
| Interface Board     | Shop built      | Minnow     | N/A        | N/A               |
| Directional Coupler | Mini-Circuits   | ZA3PD-2    | N/A        | N/A               |

### 7.3 Test Results

| Block Test | Frequency Boundaries (MHz)          | Channels Tested | Corresponding Plots | Result   |
|------------|-------------------------------------|-----------------|---------------------|----------|
| 1          | GMSK: Below 824 MHz, above 849 MHz  | 128, 251        | 7.4.1, 7.4.2        | Complies |
| 2          | 8PSK: Below 824 MHz, above 849 MHz  | 128, 251        | 7.4.3, 7.4.4        | Complies |
| 3          | GMSK: Below 1850MHz, above 1910MHz  | 512, 810        | 7.4.5, 7.4.6        | Complies |
| 4          | 8PSK: Below 1850MHz, above 1910MHz  | 512, 810        | 7.4.7, 7.4.8        | Complies |
| Block Test | Frequency Boundaries (MHz)          | Channels Tested | Corresponding Plots | Result   |
| 1          | WCDMA: Below 824MHz, above 849MHz   | 4132, 4233      | 7.4.9, 7.4.10       | Complies |
| 2          | WCDMA: Below 1850MHz, above 1910MHz | 9262, 9538      | 7.4.11, 7.4.12      | Complies |

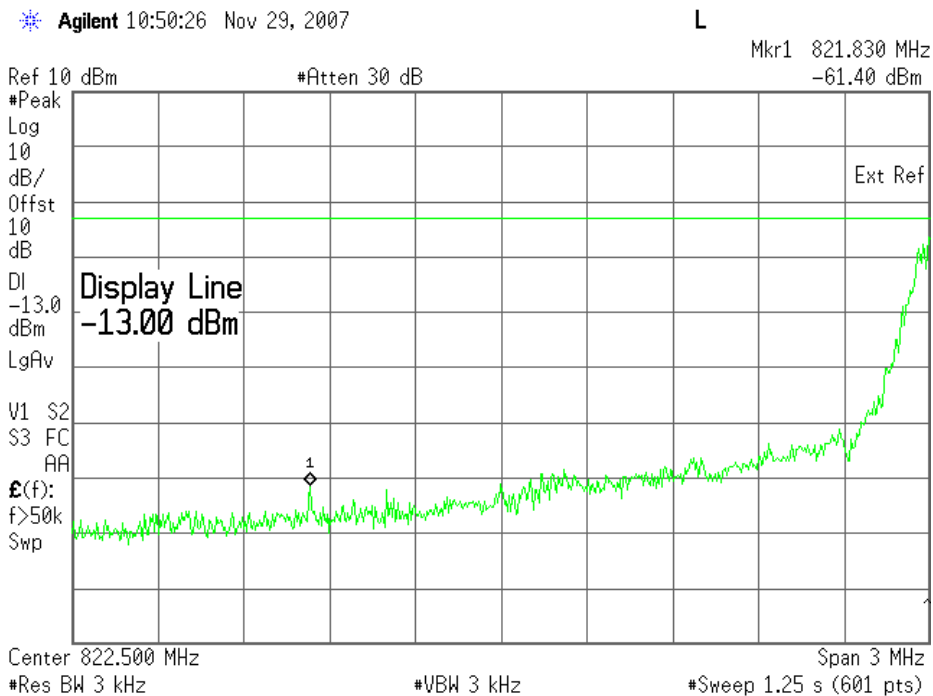
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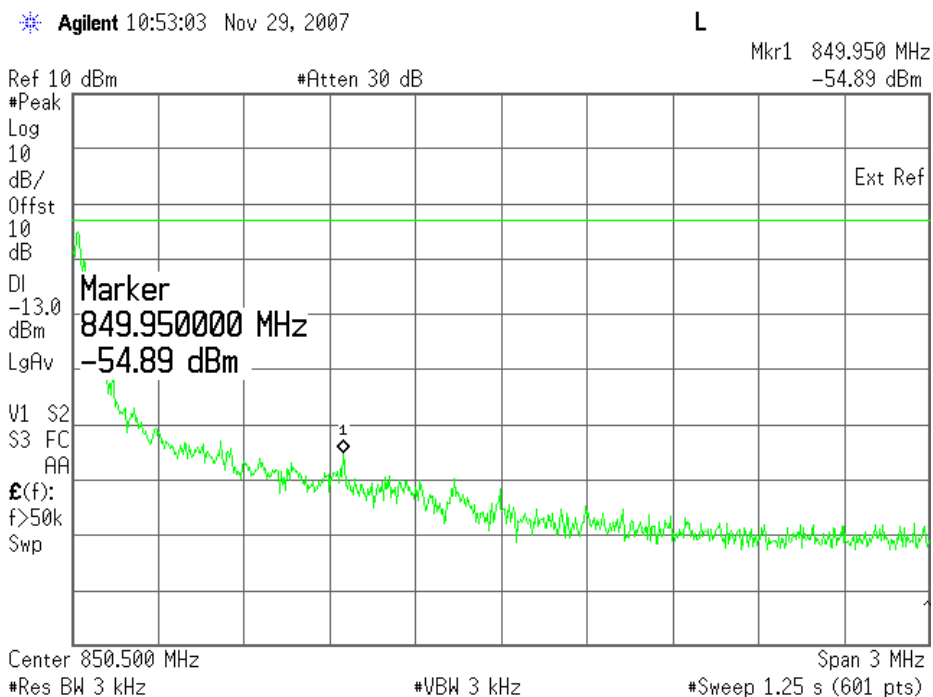
# SIERRA WIRELESS, INC.

## 7.4 Test Plots

### Plot 7.4.1) GSMK; Cellular low channel, below 824 MHz



### Plot 7.4.2) GMSK; Cellular high channel, above 849 MHz



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**Plot 7.4.3) 8-PSK; Cellular low channel, below 824 MHz**



**Plot 7.4.4) 8-PSK; Cellular high channel, above 849 MHz**



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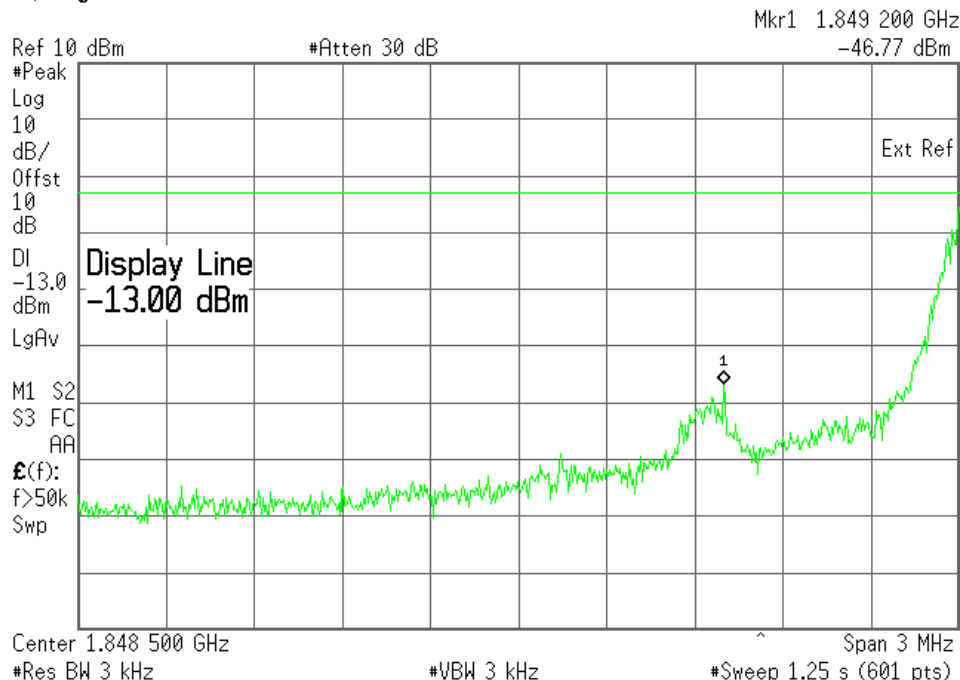


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**Plot 7.4.5) GMSK; PCS low channel, below 1850 MHz**

Agilent 11:15:55 Nov 29, 2007

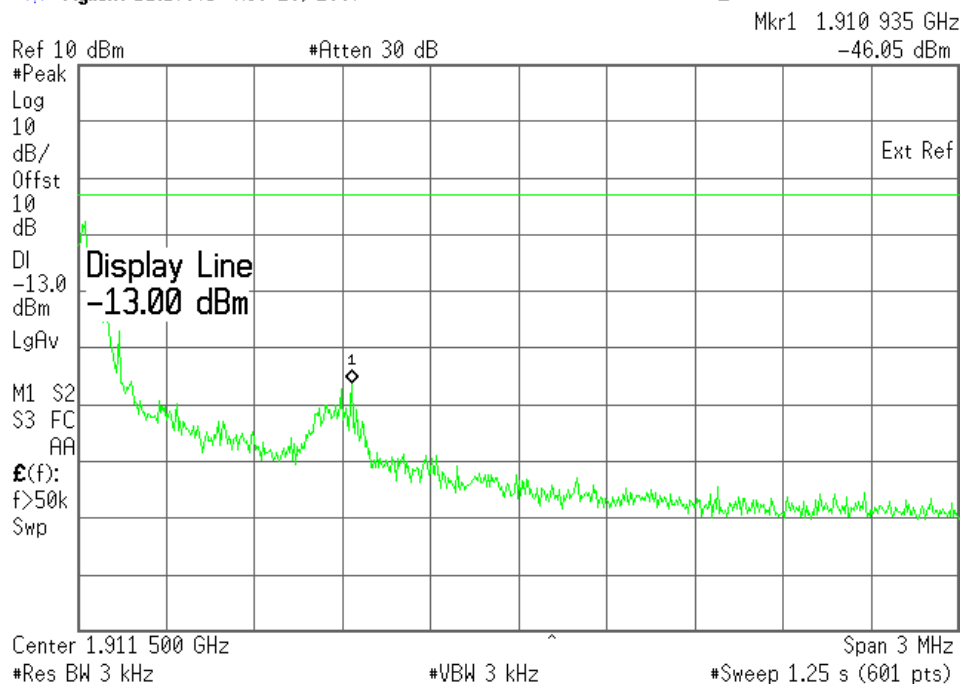
L



**Plot 7.4.6) GMSK; PCS high channel, above 1910 MHz**

Agilent 11:17:45 Nov 29, 2007

L

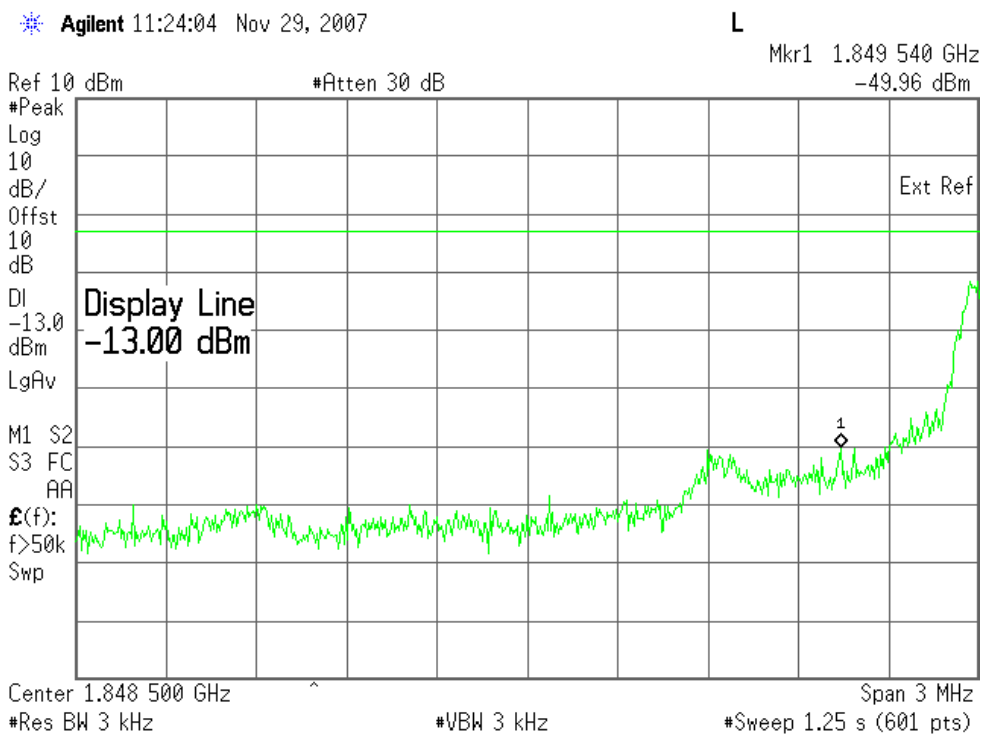


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**Plot 7.4.7) 8-PSK; PCS low channel, below 1850 MHz**



**Plot 7.4.8) 8-PSK; PCS high channel, above 1910 MHz**



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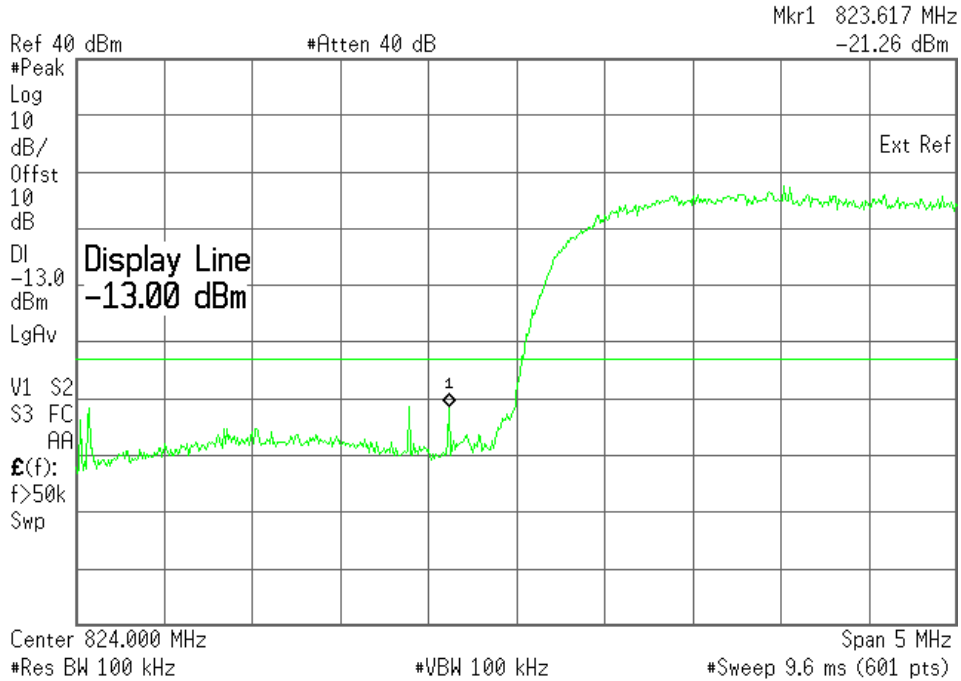
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# SIERRA WIRELESS, INC.

## Plot 7.4.9) WCDMA; Cellular low channel, below 824 MHz

Agilent 10:27:34 Nov 29, 2007

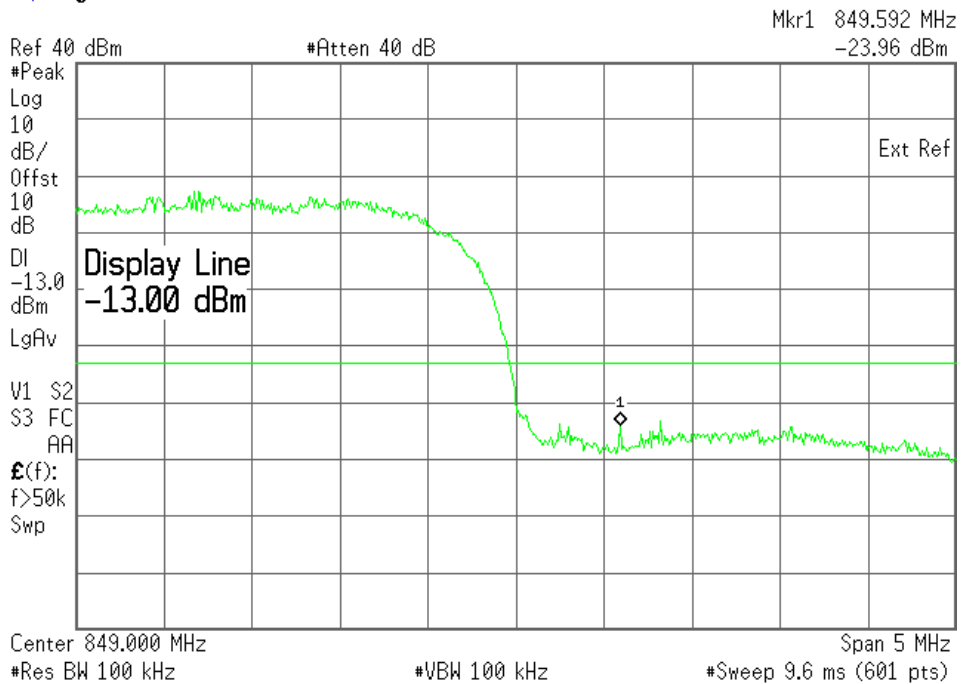
L



## Plot 7.4.10) WCDMA; Cellular high channel, above 849 MHz

Agilent 10:30:58 Nov 29, 2007

L



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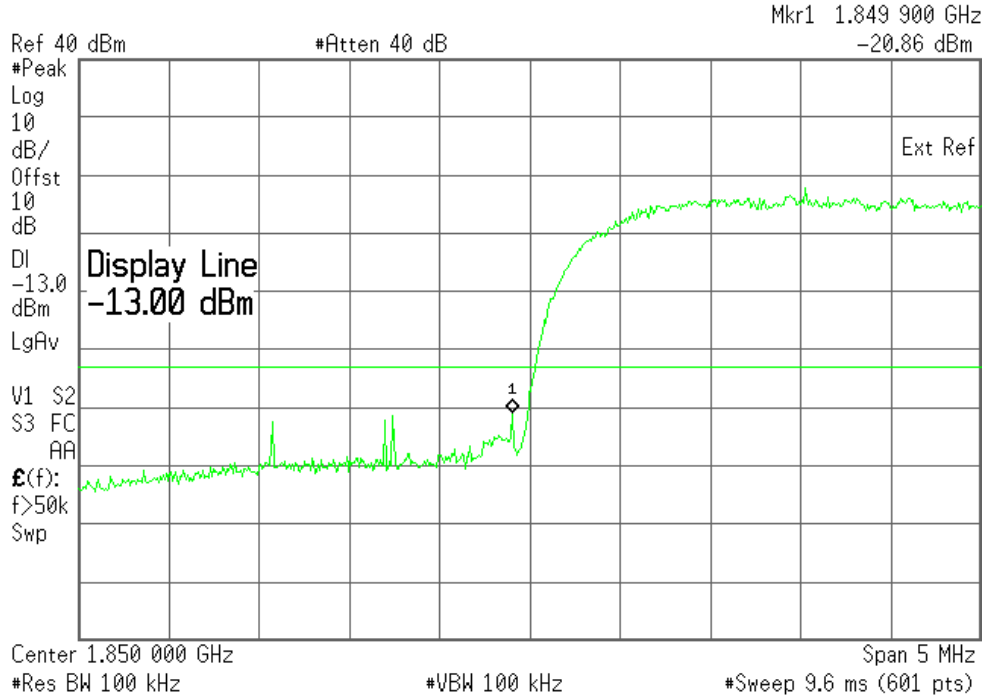
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**SIERRA WIRELESS, INC.**

**Plot 7.4.11) WCDMA; PCS low channel, below 1850 MHz**

Agilent 10:34:13 Nov 29, 2007

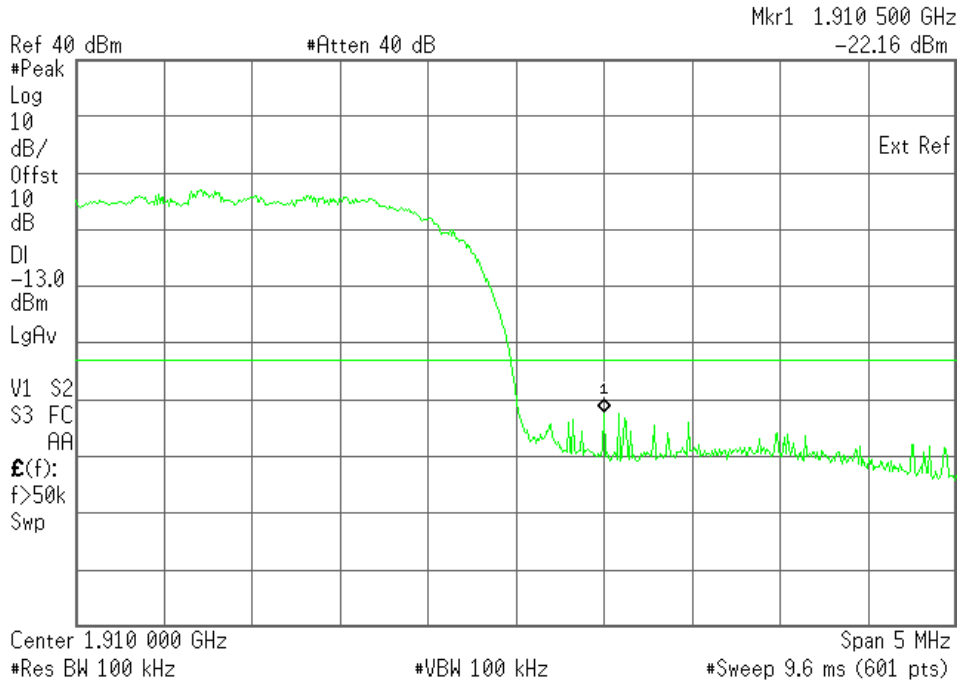
L



**Plot 7.4.12) WCDMA; PCS high channel, above 1910 MHz**

Agilent 10:39:34 Nov 29, 2007

L



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## 8 Frequency Stability Versus Temperature

### FCC 2.1055

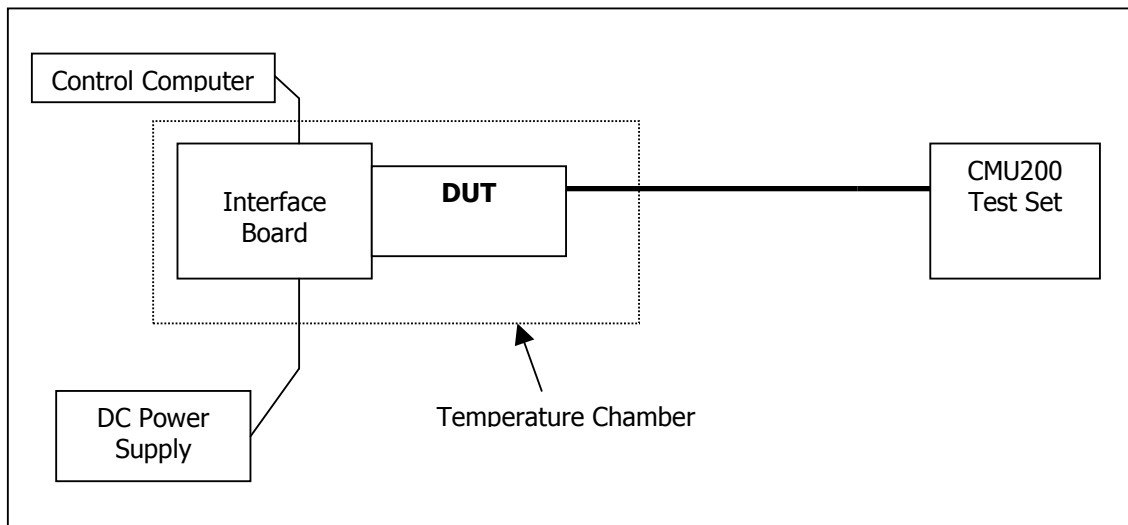
#### 8.1 Summary of Results

The MC8790 Frequency Stability versus temperature meets the requirement of being within  $\pm 0.1$ ppm of the received base station frequency.

#### 8.2 Test Procedure

The MC8790 was placed inside the temperature chamber. The transmitting frequency error is measured at 25 degrees C, then the temperature is set to +50 degrees C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is decreased by 10 degrees, allowed to stabilize and soak, then the measurement is repeated. This is repeated until -30 degrees C is completed. The process is then repeated back up to +50 degrees C. Frequency metering included internal averaging of the CMU200 to stabilize the reading. Reference power supply voltage for these tests is 3.3 volts.

#### Test Setup



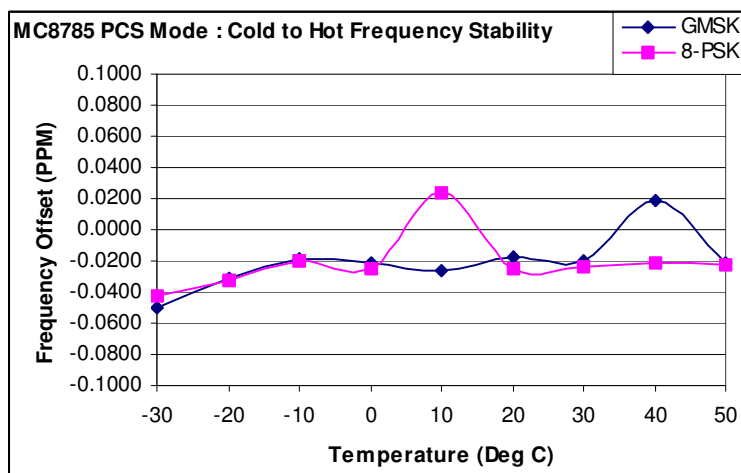
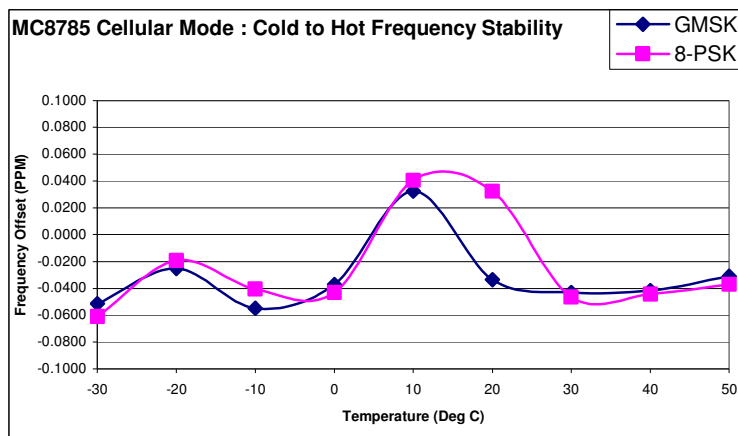
#### 8.3 Test Equipment

| EQUIPMENT           | MANUFACTURER    | MODEL NO.  | SERIAL NO. | CAL. DATE         |
|---------------------|-----------------|------------|------------|-------------------|
| Control Computer    | TC              | Generic PC | 100488     | N/A               |
| Wireless Test Set   | Rohde & Schwarz | CMU200     | 111682     | November 18, 2008 |
| Spectrum Analyzer   | Agilent         | PSA E4440A | US41421268 | March 11, 2008    |
| DC Power Supply     | HP              | 6632A      | 3530A      | N/A               |
| Interface Board     | Shop built      | Minnow     | N/A        | N/A               |
| Directional Coupler | Mini-Circuits   | ZA3PD-2    | N/A        | N/A               |

# SIERRA WIRELESS, INC.

## 8.4 Test Results

### Low to High Temperature Frequency Error

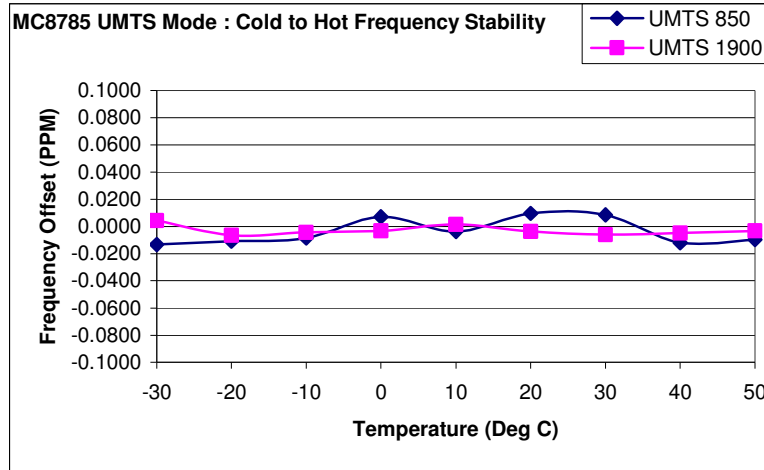


### Low to High Temperature Tabular Readings

| Temp.(C) | Cellular Mode: 824MHz to 848MHz |              |             |              | PCS Mode: 1850MHz to 1909MHz |              |             |              |
|----------|---------------------------------|--------------|-------------|--------------|------------------------------|--------------|-------------|--------------|
|          | GMSK Mode                       |              | 8-PSK Mode  |              | GMSK Mode                    |              | 8-PSK Mode  |              |
|          | Offset (Hz)                     | Offset (ppm) | Offset (Hz) | Offset (ppm) | Offset (Hz)                  | Offset (ppm) | Offset (Hz) | Offset (ppm) |
| -30      | -43                             | -0.0514      | -51         | -0.0610      | -94                          | -0.0500      | -79         | -0.0420      |
| -20      | -21                             | -0.0251      | -16         | -0.0191      | -59                          | -0.0314      | -60         | -0.0319      |
| -10      | -46                             | -0.0550      | -34         | -0.0406      | -35                          | -0.0186      | -37         | -0.0197      |
| 0        | -31                             | -0.0371      | -36         | -0.0430      | -41                          | -0.0218      | -48         | -0.0255      |
| 10       | 27                              | 0.0323       | 34          | 0.0406       | -49                          | -0.0261      | 44          | 0.0234       |
| 20       | -28                             | -0.0335      | 27          | 0.0323       | -34                          | -0.0181      | -47         | -0.0250      |
| 30       | -36                             | -0.0430      | -39         | -0.0466      | -38                          | -0.0202      | -44         | -0.0234      |
| 40       | -35                             | -0.0418      | -37         | -0.0442      | 36                           | 0.0191       | -41         | -0.0218      |
| 50       | -26                             | -0.0311      | -31         | -0.0371      | -39                          | -0.0207      | -42         | -0.0223      |

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Low to High Temperature Frequency Error

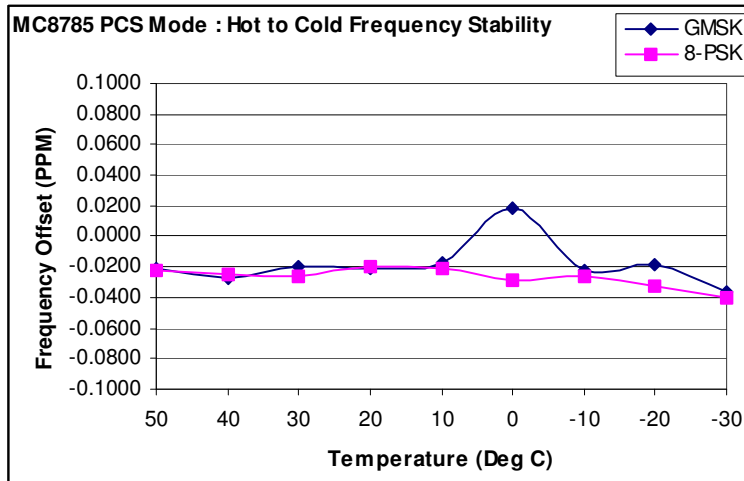
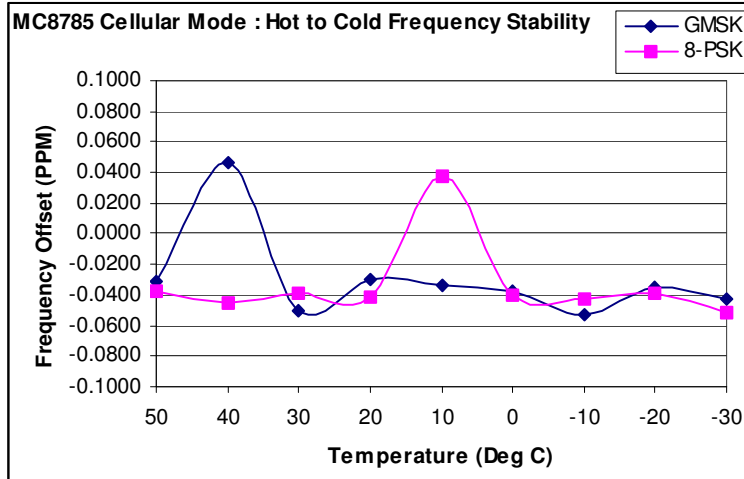


Low to High Temperature Tabular Readings

| Temp.(C) | UMTS Mode: 826MHz to 846MHz |              | UMTS Mode: 1850MHz to 1909MHz |              |
|----------|-----------------------------|--------------|-------------------------------|--------------|
|          | Offset (Hz)                 | Offset (ppm) | Offset (Hz)                   | Offset (ppm) |
| -30      | -11                         | -0.0132      | 8                             | 0.0043       |
| -20      | -9                          | -0.0108      | -12                           | -0.0064      |
| -10      | -7                          | -0.0084      | -8                            | -0.0043      |
| 0        | 6                           | 0.0072       | -6                            | -0.0032      |
| 10       | -3                          | -0.0036      | 3                             | 0.0016       |
| 20       | 8                           | 0.0096       | -7                            | -0.0037      |
| 30       | 7                           | 0.0084       | -11                           | -0.0059      |
| 40       | -10                         | -0.0120      | -9                            | -0.0048      |
| 50       | -8                          | -0.0096      | -6                            | -0.0032      |

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High to Low Temperature Frequency Error



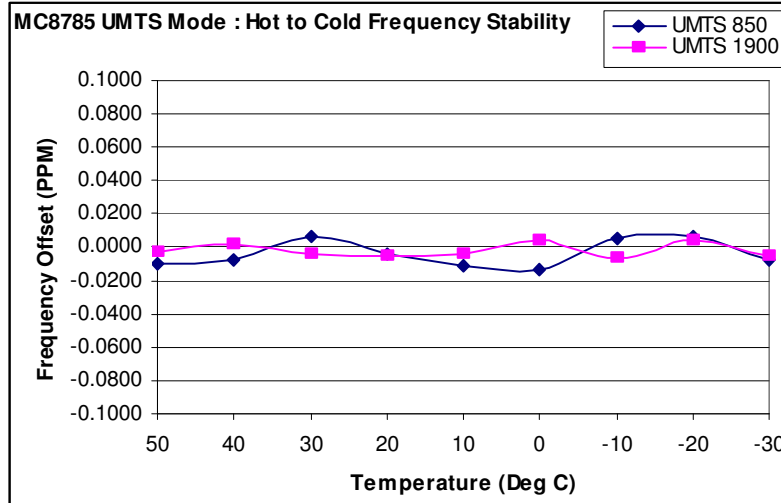
High to Low Temperature Tabular Readings

| Temp.(C) | Cellular Mode: 824MHz to 848MHz |              |             |              | PCS Mode: 1850MHz to 1909MHz |              |             |              |
|----------|---------------------------------|--------------|-------------|--------------|------------------------------|--------------|-------------|--------------|
|          | GSMK Mode                       |              | 8-PSK Mode  |              | GSMK Mode                    |              | 8-PSK Mode  |              |
|          | Offset (Hz)                     | Offset (ppm) | Offset (Hz) | Offset (ppm) | Offset (Hz)                  | Offset (ppm) | Offset (Hz) | Offset (ppm) |
| 50       | -26                             | -0.0311      | -31         | -0.0371      | -39                          | -0.0207      | -42         | -0.0223      |
| 40       | 39                              | 0.0466       | -38         | -0.0454      | -52                          | -0.0277      | -46         | -0.0245      |
| 30       | -42                             | -0.0502      | -32         | -0.0383      | -37                          | -0.0197      | -49         | -0.0261      |
| 20       | -25                             | -0.0299      | -35         | -0.0418      | -39                          | -0.0207      | -37         | -0.0197      |
| 10       | -28                             | -0.0335      | 31          | 0.0371       | -32                          | -0.0170      | -39         | -0.0207      |
| 0        | -31                             | -0.0371      | -34         | -0.0406      | 36                           | 0.0191       | -53         | -0.0282      |
| -10      | -44                             | -0.0526      | -36         | -0.0430      | -42                          | -0.0223      | -50         | -0.0266      |
| -20      | -29                             | -0.0347      | -33         | -0.0394      | -35                          | -0.0186      | -61         | -0.0324      |
| -30      | -36                             | -0.0430      | -43         | -0.0514      | -68                          | -0.0362      | -75         | -0.0399      |



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High to Low Temperature Frequency Error



High to Low Temperature Tabular Readings

| Temp.(C) | UMTS Mode: 826MHz to 846MHz |             | UMTS Mode: 1850MHz to 1909MHz |              |
|----------|-----------------------------|-------------|-------------------------------|--------------|
|          | Offset (Hz)                 | Offset (Hz) | Offset (ppm)                  | Offset (ppm) |
| 50       | -8                          | -0.0096     | -6                            | -0.0032      |
| 40       | -6                          | -0.0072     | 4                             | 0.0021       |
| 30       | 5                           | 0.0060      | -8                            | -0.0043      |
| 20       | -3                          | -0.0036     | -10                           | -0.0053      |
| 10       | -9                          | -0.0108     | -8                            | -0.0043      |
| 0        | -11                         | -0.0132     | 7                             | 0.0037       |
| -10      | 4                           | 0.0048      | -12                           | -0.0064      |
| -20      | 5                           | 0.0060      | 8                             | 0.0043       |
| -30      | -6                          | -0.0072     | -9                            | -0.0048      |

## 9 Frequency Stability Versus Voltage

### FCC 2.1055

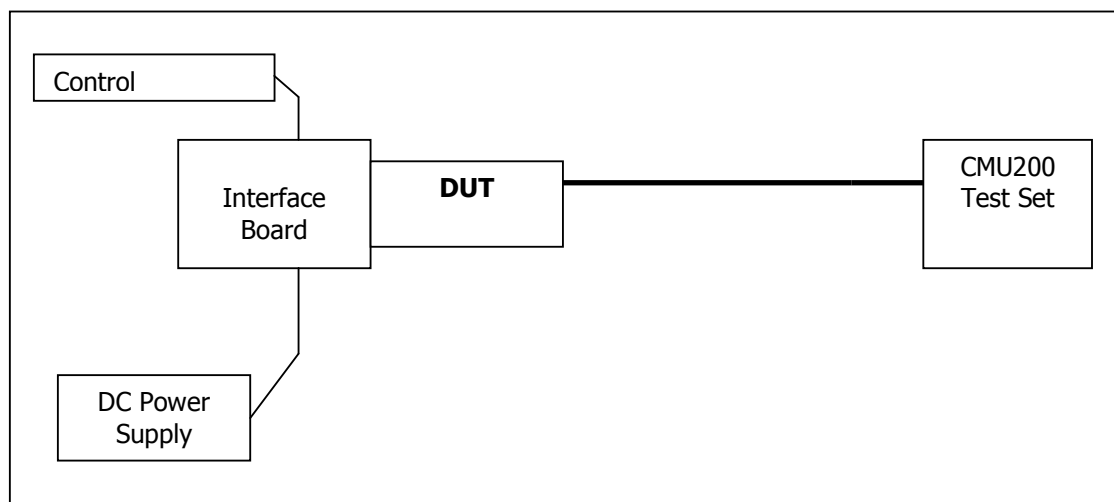
#### 9.1 Summary of Results

The EUT is specified to operate with a supply voltage of between 2.9 VDC and 3.6 VDC with a nominal voltage of 3.3 VDC. It meets the frequency stability limit of less than 0.1ppm when supply voltage varies within the specified limits. Operation is prohibited by firmware while the DC supply voltage is out of the specified range.

#### 9.2 Test Procedure

The MC8790 was connected to a DC Power Supply and a UMTS test set (CMU 200) with frequency error measurement capability. The power supply output is adjusted to the test voltage as measured at the input terminals to the module while transmitting. A voltmeter was used to confirm the terminal voltage. The peak frequency error is recorded (worst case). The test voltages are 2.9 volts to 3.6 volts.

#### Test Setup

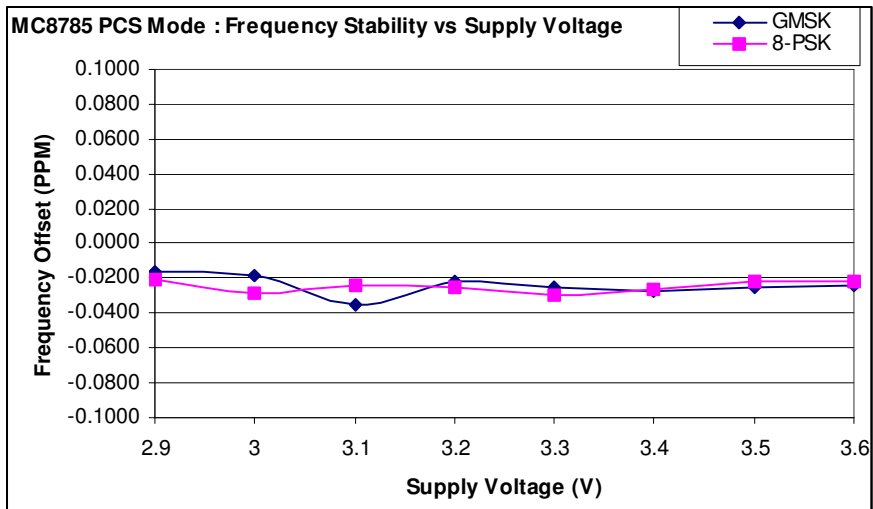
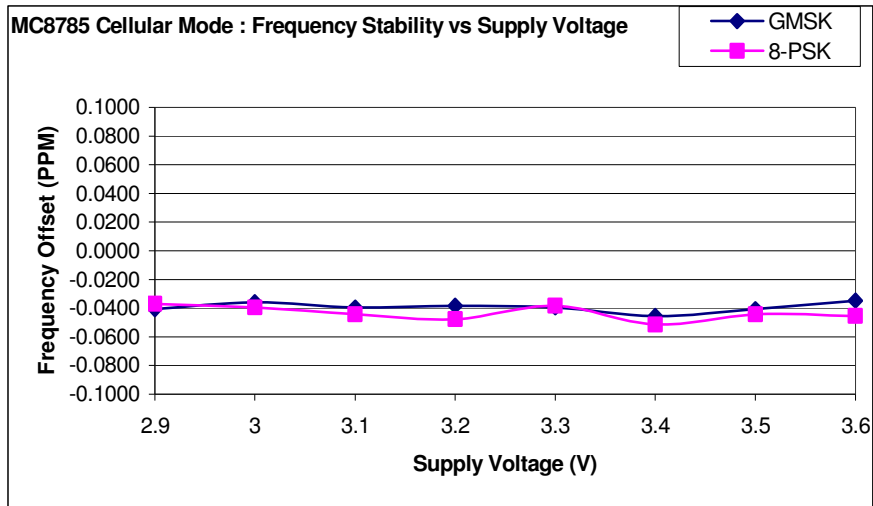


#### 9.3 Test Equipment

| EQUIPMENT           | MANUFACTURER    | MODEL NO.  | SERIAL NO. | CAL. DATE         |
|---------------------|-----------------|------------|------------|-------------------|
| Control Computer    | TC              | Generic PC | 100488     | N/A               |
| Wireless Test Set   | Rohde & Schwarz | CMU200     | 111682     | November 18, 2008 |
| Spectrum Analyzer   | Agilent         | PSA E4440A | US41421268 | March 11, 2008    |
| DC Power Supply     | HP              | 6632A      | 3530A      | N/A               |
| Interface Board     | Shop built      | Minnow     | N/A        | N/A               |
| Directional Coupler | Mini-Circuits   | ZA3PD-2    | N/A        | N/A               |

9.4 Test Results

Frequency Error Over Voltage



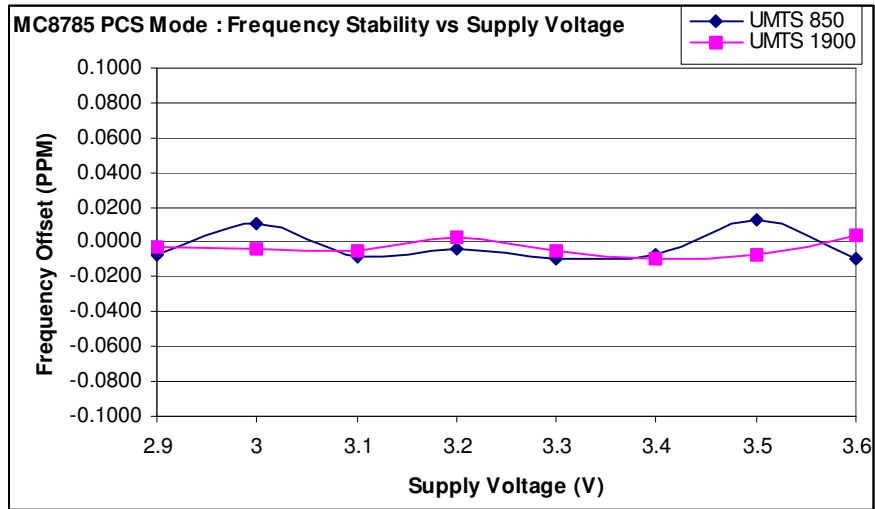
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GSM Frequency Error Over Voltage Tabular Data

| Supply<br>(V) | Cellular Mode: 824MHz to 848MHz |                 |                |                 | PCS Mode: 1850MHz to 1909MHz |                 |                |                 |
|---------------|---------------------------------|-----------------|----------------|-----------------|------------------------------|-----------------|----------------|-----------------|
|               | GMSK Mode                       |                 | 8-PSK Mode     |                 | GMSK Mode                    |                 | 8-PSK Mode     |                 |
|               | Offset<br>(Hz)                  | Offset<br>(ppm) | Offset<br>(Hz) | Offset<br>(ppm) | Offset<br>(Hz)               | Offset<br>(ppm) | Offset<br>(Hz) | Offset<br>(ppm) |
| 2.9           | -34                             | -0.0406         | -31            | -0.0371         | -31                          | -0.0165         | -39            | -0.0207         |
| 3.0           | -30                             | -0.0359         | -33            | -0.0394         | -34                          | -0.0181         | -53            | -0.0282         |
| 3.1           | -33                             | -0.0394         | -37            | -0.0442         | -67                          | -0.0356         | -45            | -0.0239         |
| 3.2           | -32                             | -0.0383         | -40            | -0.0478         | -42                          | -0.0223         | -48            | -0.0255         |
| 3.3           | -33                             | -0.0394         | -32            | -0.0383         | -48                          | -0.0255         | -55            | -0.0293         |
| 3.4           | -38                             | -0.0454         | -43            | -0.0514         | -51                          | -0.0271         | -49            | -0.0261         |
| 3.5           | -34                             | -0.0406         | -37            | -0.0442         | -47                          | -0.0250         | -41            | -0.0218         |
| 3.6           | -29                             | -0.0347         | -38            | -0.0454         | -45                          | -0.0239         | -42            | -0.0223         |

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UMTS Frequency Error Over Voltage, Tabular Data



| Supply (V) | UMTS Mode   |              |             |              |
|------------|-------------|--------------|-------------|--------------|
|            | 850MHz      |              | 1900MHz     |              |
|            | Offset (Hz) | Offset (ppm) | Offset (Hz) | Offset (ppm) |
| 2.9        | -6          | -0.0072      | -5          | -0.0027      |
| 3.0        | 9           | 0.0108       | -7          | -0.0037      |
| 3.1        | -7          | -0.0084      | -9          | -0.0048      |
| 3.2        | -3          | -0.0036      | 6           | 0.0032       |
| 3.3        | -8          | -0.0096      | -10         | -0.0053      |
| 3.4        | -6          | -0.0072      | -17         | -0.0090      |
| 3.5        | 11          | 0.0132       | -14         | -0.0074      |
| 3.6        | -8          | -0.0096      | 7           | 0.0037       |