



**SL8084T Modem  
IC: 2417C-SL8084T  
FCC ID: N7NSL8084T**

**Verification Test Report**

**FOR**

**FCC and IC Certifications data leverage from  
FCC ID: N7NSL8080  
IC: 2417C-SL8080**

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## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 2 of 18
--------------------------------	---------	-----------------	--------------

### Table of Contents

1	Introduction and Purpose .....	3
2	Test Summary .....	3
3	Description of Equipment under Test .....	3
4	RF Power Output .....	4
4.1	Test Procedure .....	4
4.2	Test Equipment.....	4
4.3	Test Results GSM/EDGE (GMSK: MCS4; 8-PSK: MCS9) .....	5
4.4	Test Results UMTS.....	5
4.4.1	Test 1: RF Output Power Results for WCDMA R99.....	5
4.4.2	Test 2: RF Output Power Results for HSDPA Rel6 .....	6
4.5	Test Settings for UMTS Mode on CMU200.....	7
5	Out of Band Emissions at Antenna Terminals .....	11
5.1	Test Procedure.....	11
5.2	Test Equipment.....	11
5.3	Test Results .....	12
5.4	Test Plots.....	13

## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 3 of 18
--------------------------------	---------	-----------------	--------------

### 1 Introduction and Purpose

This document provides verification test data for the SL8084T modem intended for FCC and Industry Canada certifications leverage test data from FCC ID: N7NSL8080, IC: 2417C-SL8080.

### 2 Test Summary

FCC Rule	IC Standards	DESCRIPTION OF TEST	RESULT	PAGE
2.1046	RSS-132, 4.4 RSS-133, 6.4	RF Power Output	Complies	6
2.1051, 22.901(d) 22.917, 24.238(a)	RSS-132, 4.5 RSS-133, 6.5	Out of Band Emissions at Antenna Terminals	Complies	11

### 3 Description of Equipment under Test

The SL8084T modem, referred to as “EUT” hereafter, is a multi-band wireless modem operating on the GSM/GPRS/EDGE/UMTS networks. 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).

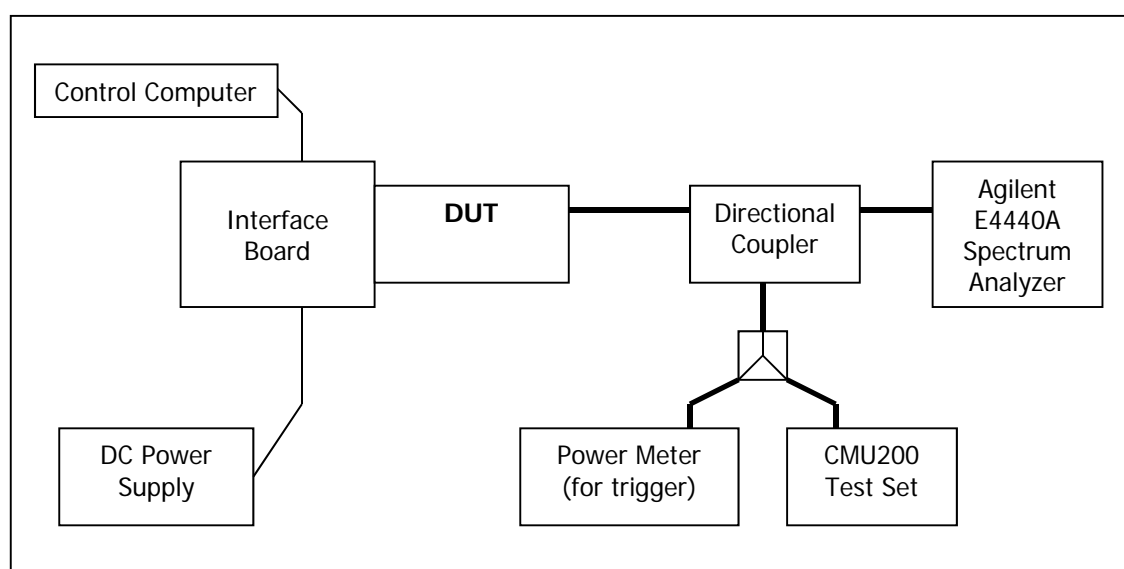
## 4 RF Power Output

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



### 4.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100974	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	107902	November 13, 2013
Spectrum Analyzer	Rohde & Schwarz	FSP	100060	November 24, 2013
DC Power Supply	HP	6632A	3145A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

# SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 5 of 18
--------------------------------	---------	-----------------	--------------

## 4.3 Test Results GSM/EDGE (GMSK: MCS4; 8-PSK: MCS9)

Frequency (MHz)	Channel	GMSK Mode							
		1 Time Slot		2Time Slots		3Time Slots		4Time Slots	
		RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)
824.2	128	32.40	32.50	32.42	32.50	GPRS Class 10 Only two TX slots		GPRS Class 10 Only two TX slots	
836.6	190	32.44	32.61	32.5	32.65				
848.8	251	32.44	32.60	32.46	32.55				
1850.2	512	29.25	29.40	29.11	29.30				
1880.0	661	29.18	29.30	28.99	29.10				
1909.8	810	29.36	29.50	29.08	29.20				

Frequency (MHz)	Channel	8-PSK Mode							
		1 Time Slot		2Time Slots		3Time Slots		4Time Slots	
		RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)
824.2	128	26.62	29.90	26.12	29.20	25.95	28.90	25.81	28.90
836.6	190	26.56	29.80	26.03	29.00	25.86	28.85	25.66	28.70
848.8	251	26.54	29.80	25.99	29.00	25.78	28.80	25.80	28.86
1850.2	512	25.27	28.80	25.17	28.50	24.94	28.00	24.96	28.10
1880.0	661	25.16	28.30	25.00	28.20	25.01	28.10	24.66	27.95
1909.8	810	25.1	28.10	25.13	28.50	24.81	27.90	24.41	27.60

## 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 EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7). RMC 12.2kps is used for this testing.

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	22.6	25.74
836.4	4182	22.6	25.8
846.6	4233	22.61	25.74

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

## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 6 of 18
--------------------------------	---------	-----------------	--------------

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

The EUT 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 4.5.

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 is 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

Note: The recommended HSDPA MPRs are implemented as per following sub-tests.

#### 4.4.2.1 Sub-Test 1

$\beta_c=2/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=4/15$ . MPR=0dB translates the min. and max. power limits to 20.3dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	Comments
		20.3dBm<Measured RMS (dBm)<25.7dBm	
826.4	4132	22.44	Pass
836.4	4182	22.52	Pass
846.6	4233	22.6	Pass

#### 4.4.2.2 Sub-Test 2

$\beta_c=12/15$ ,  $\beta_d=15/15$ ,  $\beta_{hs}=24/15$ . MPR=0dB translates the min. and max. power limits to 20.3dBm and 25.7dBm respectively.

Frequency		Power (dBm)	
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## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 7 of 18
--------------------------------	---------	-----------------	--------------

(MHz)	Channel	20.3dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	22.3	Pass
836.4	4182	22.33	Pass
846.6	4233	22.34	Pass

### 4.4.2.3 Sub-Test 3

$\beta_c=15/15$ ,  $\beta_d=15/8$ ,  $\beta_{hs}=30/15$ . MPR=0.5dB translates the min. and max. power limits to 19.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	Comments
		19.8dBm<Measured RMS (dBm)<25.7dBm	
826.4	4132	21.32	Pass
836.4	4182	21.12	Pass
846.6	4233	21.07	Pass

### 4.4.2.4 Sub-Test 4

$\beta_c=15/15$ ,  $\beta_d=4/15$ ,  $\beta_{hs}=30/15$ . MPR=0.5dB translates the min. and max. power limits to 19.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	Comments
		19.8dBm<Measured RMS (dBm)<25.7dBm	
826.4	4132	20.18	Pass
836.4	4182	20.16	Pass
846.6	4233	20.15	Pass

## 4.5 Test Settings for UMTS Mode on CMU200

### WCDMA R99 Mode Settings:

#### 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 ( $I_{or}+I_{oc}$ ) = -51.7 dBm

#### RMC Settings

Reference Channel Type: 12.2 kbps Downlink/Uplink

DL DTCH Transport Format: 12.2 kbps

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## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 8 of 18
--------------------------------	---------	-----------------	--------------

DL Resources in Use: 100 %  
UL CRC (Sym. Loop Mode 2): Off  
Test Mode: Loop Mode 1  
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  
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

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## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 9 of 18
--------------------------------	---------	-----------------	--------------

OCNS = Off

Total Output Power ( $I_{or} + I_{oc}$ ) = -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 = 5

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.

### **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: \*

$\Delta ACK$ ,  $\Delta NACK$ ,  $\Delta CQI$ =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

$\Delta E$ -DPCCH: \*

Number of Reference E-TFCIs: \*\*

Reference E-TFCI's: \*\*

E-TFCI Power offsets: \*\*

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## SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 10 of 18
--------------------------------	---------	-----------------	---------------

### 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}

### 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 Out of Band Emissions at Antenna Terminals

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

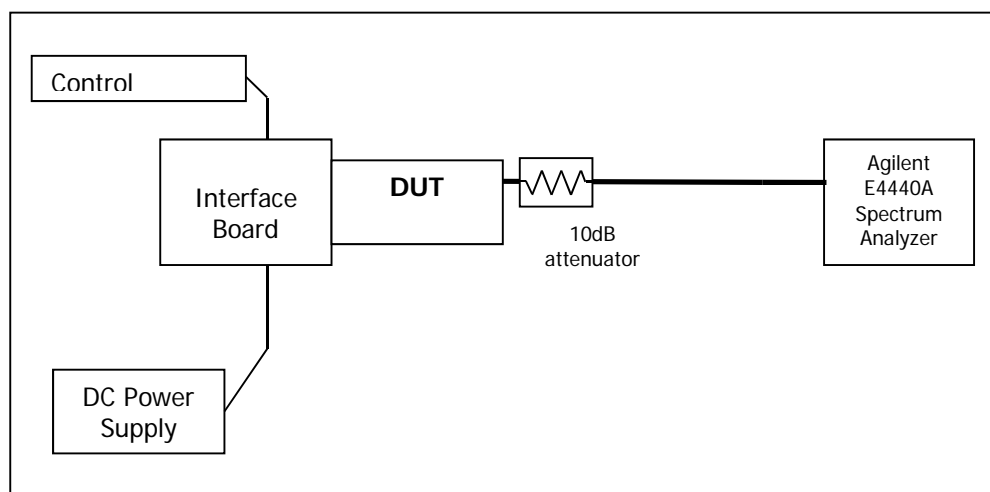
### Out of Band Emissions:

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. The out of band emission limit translates to a worst case absolute limit of -13dBm in this case.

### 5.1 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. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were captured.

### Test Setup



### 5.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100974	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	107902	November 13, 2013
Spectrum Analyzer	Rohde & Schwarz	FSP	100060	November 24, 2013
Spectrum Analyzer	Agilent	E4440A	200078	November 15, 2013
DC Power Supply	HP	6632A	3145A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

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FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 12 of 18
--------------------------------	---------	-----------------	---------------

**5.3 Test Results**

Refer to the following plots.

- **Cellular Band**

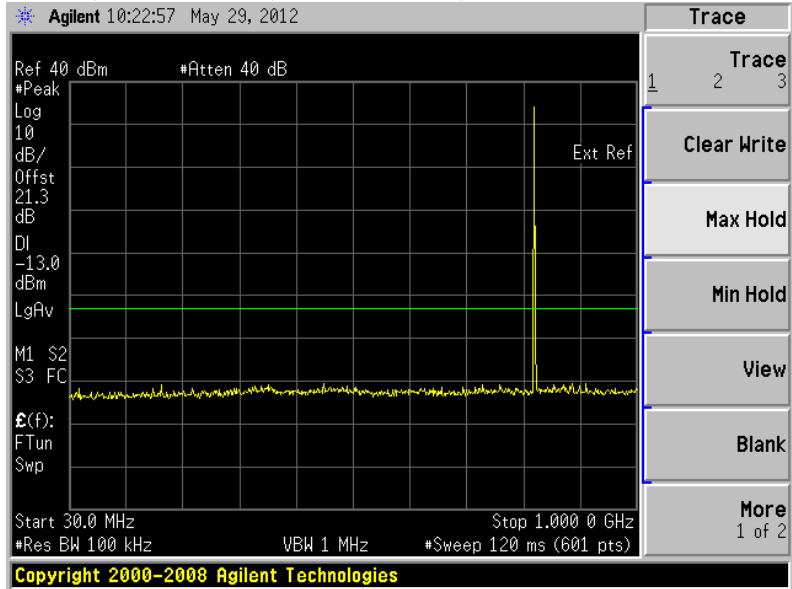
<b>Plot Number</b>	<b>Description</b>
6.4.1 – 6.4.3	GMSK Mode, Low channel, 824.20 MHz
6.4.4 – 6.4.6	GMSK Mode, Middle Channel, 836.6 MHz
6.4.7 – 6.4.9	GMSK Mode, High Channel, 848.8 MHz

The plots below show that the conducted emission limits requirements are met.

5.4 Test Plots

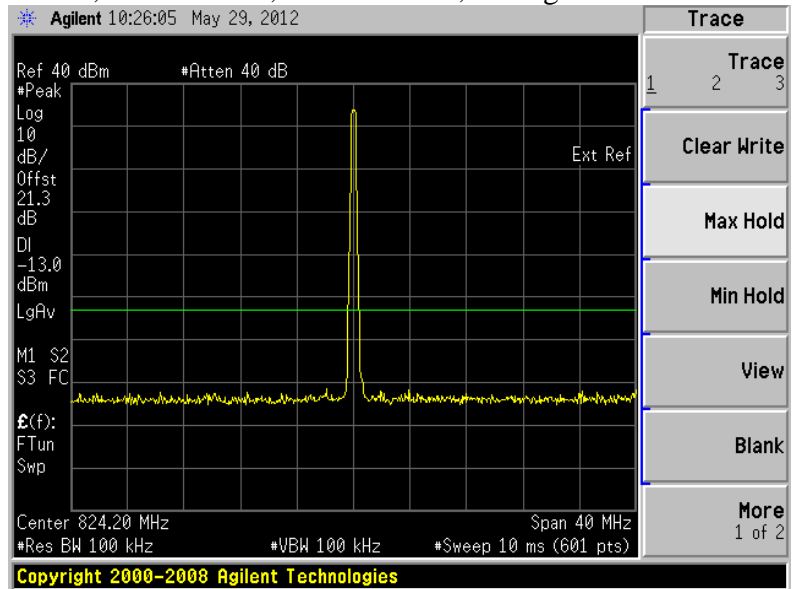
Plot 6.4.1) Out of Band Emissions at Antenna Terminals

GMSK, Low channel, 824.200 MHz, 30 MHz to 1 GHz



Plot 6.4.2) Out of Band Emissions at Antenna Terminals

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



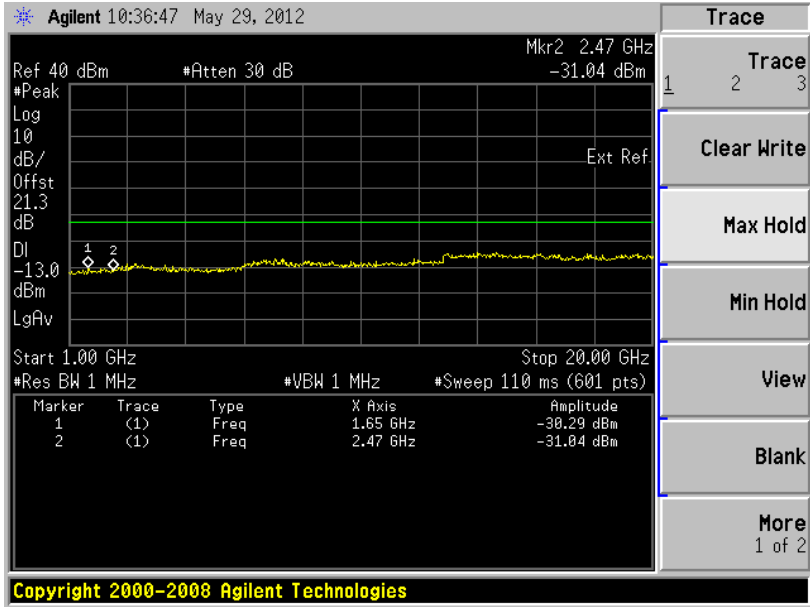
The strong emission shown in each case is the carrier signal.

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FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 14 of 18
--------------------------------	---------	-----------------	---------------

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

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



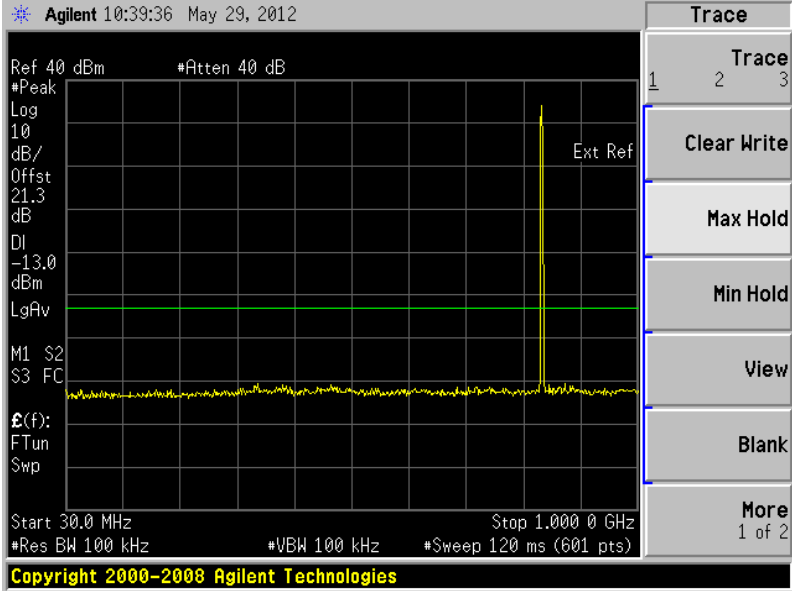
Cellular Harmonics for Ch. 128 (824.2 MHz)	Level (dBm)
Second	-30.29 dBm
Third	-31.04 dBm
Others	----

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FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 15 of 18
--------------------------------	---------	-----------------	---------------

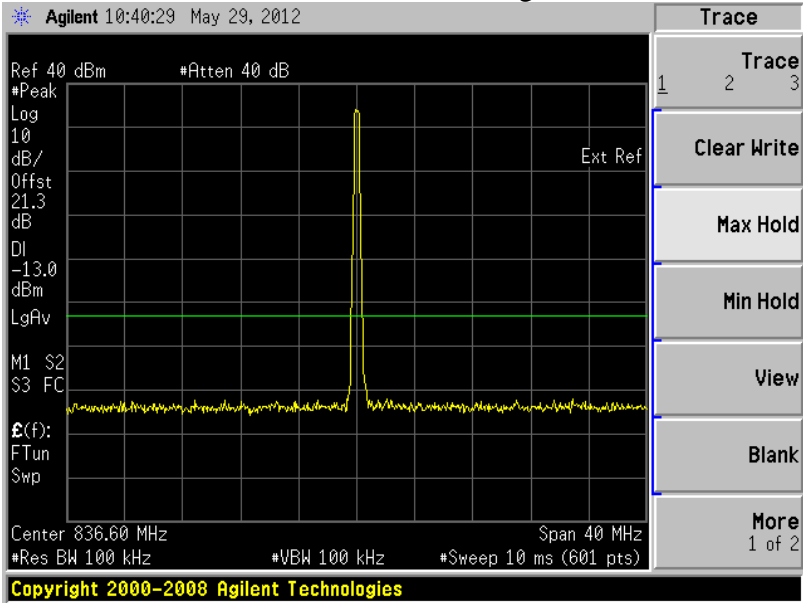
**Plot 6.4.4) Out of Band Emissions at Antenna Terminals**

GMSK, Mid Channel, 836.6 MHz, 30 MHz to 1 GHz



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

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



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

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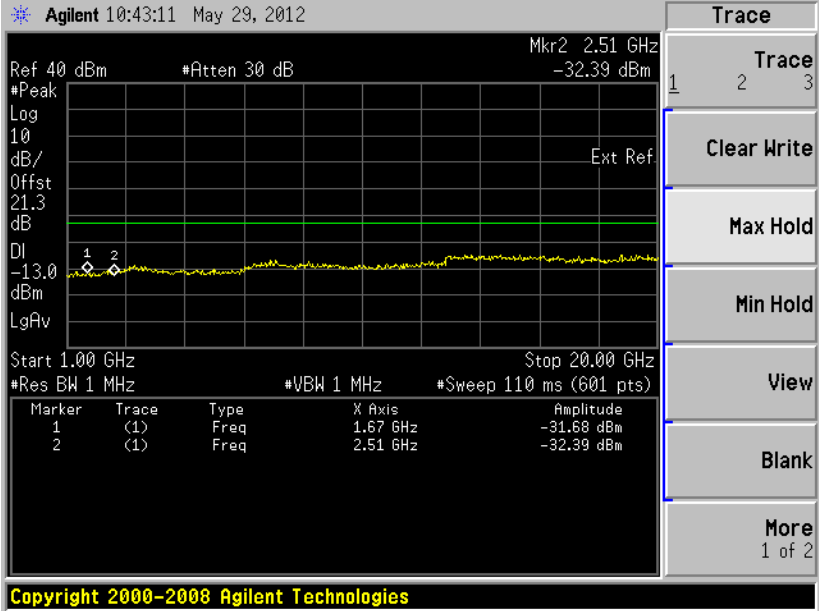
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FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 16 of 18
--------------------------------	---------	-----------------	---------------

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

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



Cellular Harmonics for Ch. 190 (836.6 MHz)	Level (dBm)
Second	-31.68 dBm
Third	-32.39 dBm
Others	----

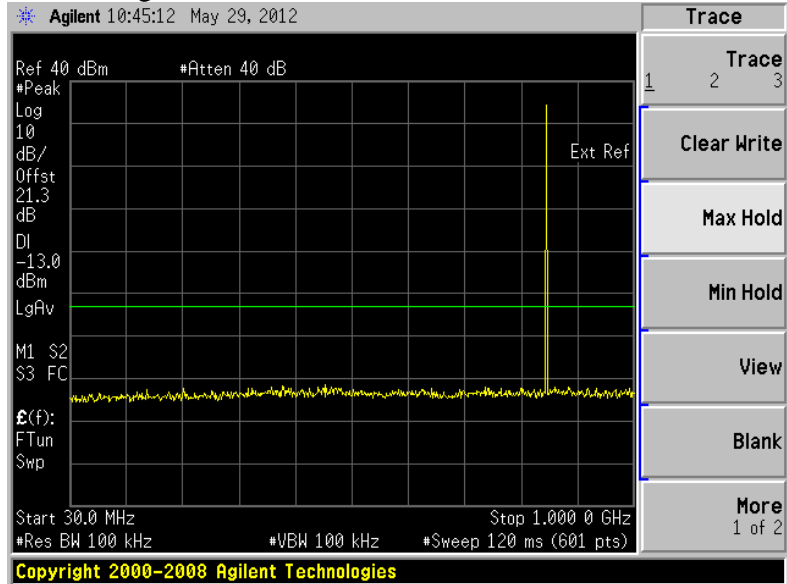


SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 17 of 18
--------------------------------	---------	-----------------	---------------

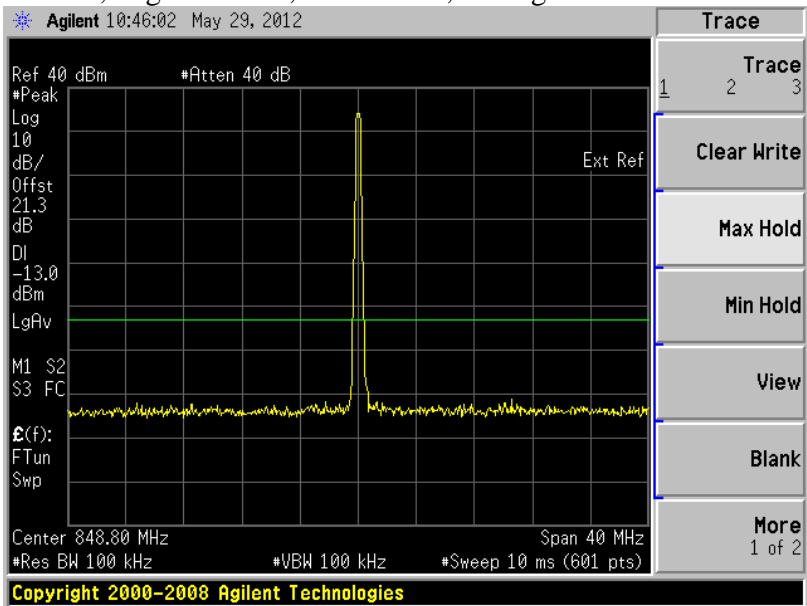
**Plot 6.4.7) Out of Band Emissions at Antenna Terminals**

GMSK, High Channel, 848.8 MHz, 30 MHz to 1 GHz



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

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



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

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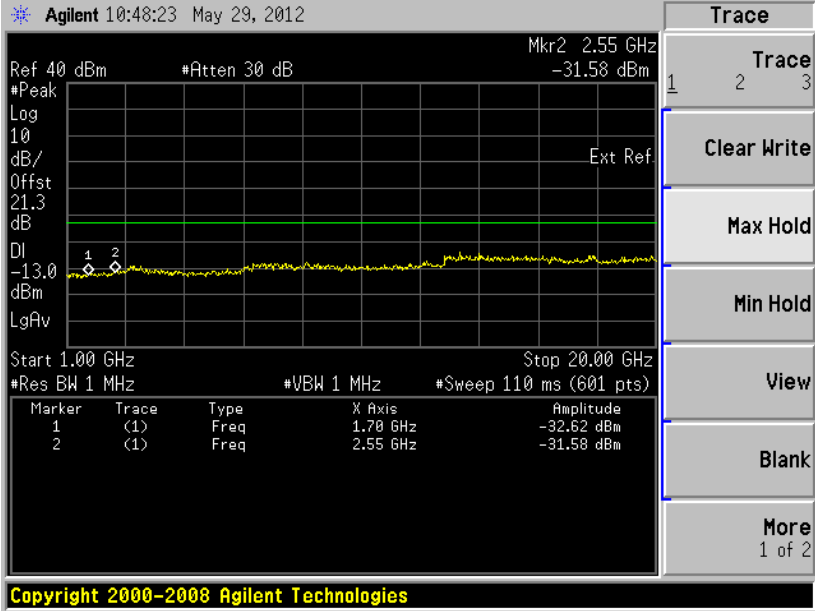
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SIERRA WIRELESS, INC.

FCC Part 22, 24 / RSS 132, 133	SL8084T	January 6, 2013	Page 18 of 18
--------------------------------	---------	-----------------	---------------

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

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



Cellular Harmonics for Ch. 251 (848.8 MHz)	Level (dBm)
Second	-32.62 dBm
Third	-31.58 dBm
Others	----