



**FCC CFR47 PART 22H AND 24E  
&  
INDUSTRY CANADA RSS-132 AND RSS-133**

**CERTIFICATION TEST REPORT**

**FOR  
PCA, EVDO MINI-PCI EXPRESS CARD CDMA MODEM**

**MODEL NUMBER: MC5728V**

**FCC ID: N7N-MC5728**

**IC ID: 2417C-MC5728**

**REPORT NUMBER: 08U12326-1, Revision B  
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*Prepared for*

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**NVLAP LAB CODE 200065-0**

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B	02/23/09	Added MPE Section	T. Chan

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SIERRA WIRELESS INC  
2290 COSMOS COURT  
CARLSBAD, CA. 92009, UNITED STATES.

**EUT DESCRIPTION:** PCA, EVDO MINI-PCI EXPRESS CARD CDMA MODEM

**MODEL:** MC5728V

**SERIAL NUMBER:** P8929580124A2-10

**DATE TESTED:** JANUARY 14-21, 2009

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22 H and 24E	PASS
IC RSS-132 ISSUE 2 and RSS-133 ISSUE 4	PASS

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All expressions of Pass/Fail in this report are opinions expressed by CCS based on interpretations of the test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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EMC MANAGER  
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COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with RSS-GEN, RSS-132, RSS-133, ANSI/TIA 603C-2004, FCC CFR 47 Part 2, and FCC CFR 47 Part 22 and 24

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/Standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a dual band, 800/1900MHz, PCA EVDO Mini-PCI Express Card CDMA Modem. The module manufactured by Sierra Wireless, Inc

### 5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a dipole antenna with a maximum gain of 0dBi for Cellular band PCS bands.

## 6. TEST SUMMARY

### 6.1. LIST OF TEST ITEMS

Description of test	Rule part		Results
	FCC	IC	
1. RF Power Output	§2.1046	RSS-132, 4.4; RSS-133, 6.4;	Complies
2. Occupied Bandwidth	§2.1049	RSS-Gen, 4.6	--
3. Block Edge (Band Edge)	§22.359, §24.238	RSS-132, 4.5; RSS-133, 6.5	Complies
4. Out of Band Emissions	§2.1051, §22.917, §24.238	RSS-132, 4.5; RSS-133, 6.5	Complies
5. Frequency Stability	§2.1055, §22.355, §24.235	RSS-132, 4.3; RSS-133, 6.3	Complies
6. Radiated Power (ERP & EIRP)	§2.1046, §22.913, §24.232	RSS-132; 4.4, RSS-133, 6.4	Complies
7. Field Strength of Spurious Radiation	§2.1053, §22.917, §24.238	RSS-132, 4.5; RSS-233, 6.5	Complies
8. Receiver Spurious Emissions (IC only)	n/a	RSS-132, 4.6; RSS-133, 6.6, RSS-Gen	Complies

### 6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum output power as follows:

#### Part 22 Cellular Band

Frequency range (MHz)	Modulation	Conducted		ERP	
		dBm	mW	dBm	mW
824.7 – 848.31	1xRTT (RC3, +SCH)	29.15	822.2	27.6	575.4
824.7 – 848.31	EV-DO - REV A	29.82	959.4	27.7	588.8

#### Part 24 PCS Band

Frequency range (MHz)	Modulation	Conducted		EIRP	
		dBm	mW	dBm	mW
1851.25 – 1908.8	1xRTT (RC3, +SCH)	28.6	722.8	27.6	575.4
1851.25 – 1908.8	EV-DO - REV A	29.1	814.7	27.9	616.6

## 7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	03/03/09
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	02/11/09
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/09
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	08/05/09
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	09/19/09
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	09/19/09
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/09
Communications Test Set	Agilent / HP	E5515C	C01086	06/16/09
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/09
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	05/13/09
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02689	CNR
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Directional Coupler, 18 GHz	Krytar	1817	N02656	CNR
Signal Generator, 20 GHz	Agilent / HP	83732B	C00774	07/03/09
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121C DB4	C00993	06/28/09



## 7.1. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	Serial Number
Communications Test set	Agilent	E5515C	8/18/1927
Directional Coupler	Krytar	1817	N02687
EUT AC Adapter	ELPAC	FW1805	32692
Test Fixture	Sierra Wireless	CCA-00000511-0001	NA

### I/O CABLES (CONDUCTED TEST)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	2m	NA
2	DC	1	DC	Un-shielded	2m	NA
3	RF In/Out	1	Directional Coupler	Un-shielded	0.5m	NA
4	RF In/Out	1	Spectrum Analyser	Un-shielded	None	NA
5	RF In/Out	1	Communications Test Set	Un-shielded	0.5m	NA

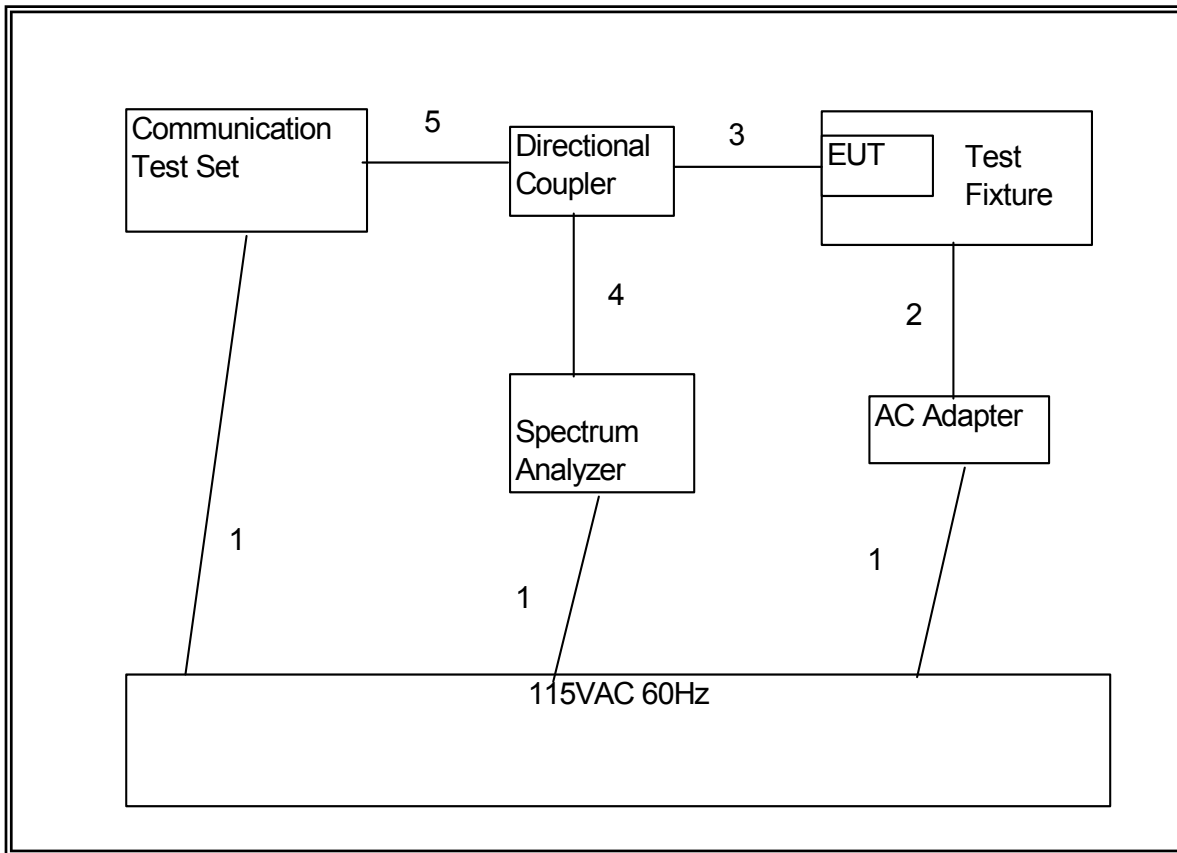
### I/O CABLES (RADIATED TEST)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	2m	NA
2	DC	1	US 115V	Un-shielded	2m	NA
3	Antenna Port	1	Dipole	Un-shielded	2m	NA
4	RF In/Out	1	Communications Test Set	Un-shielded	3m	NA

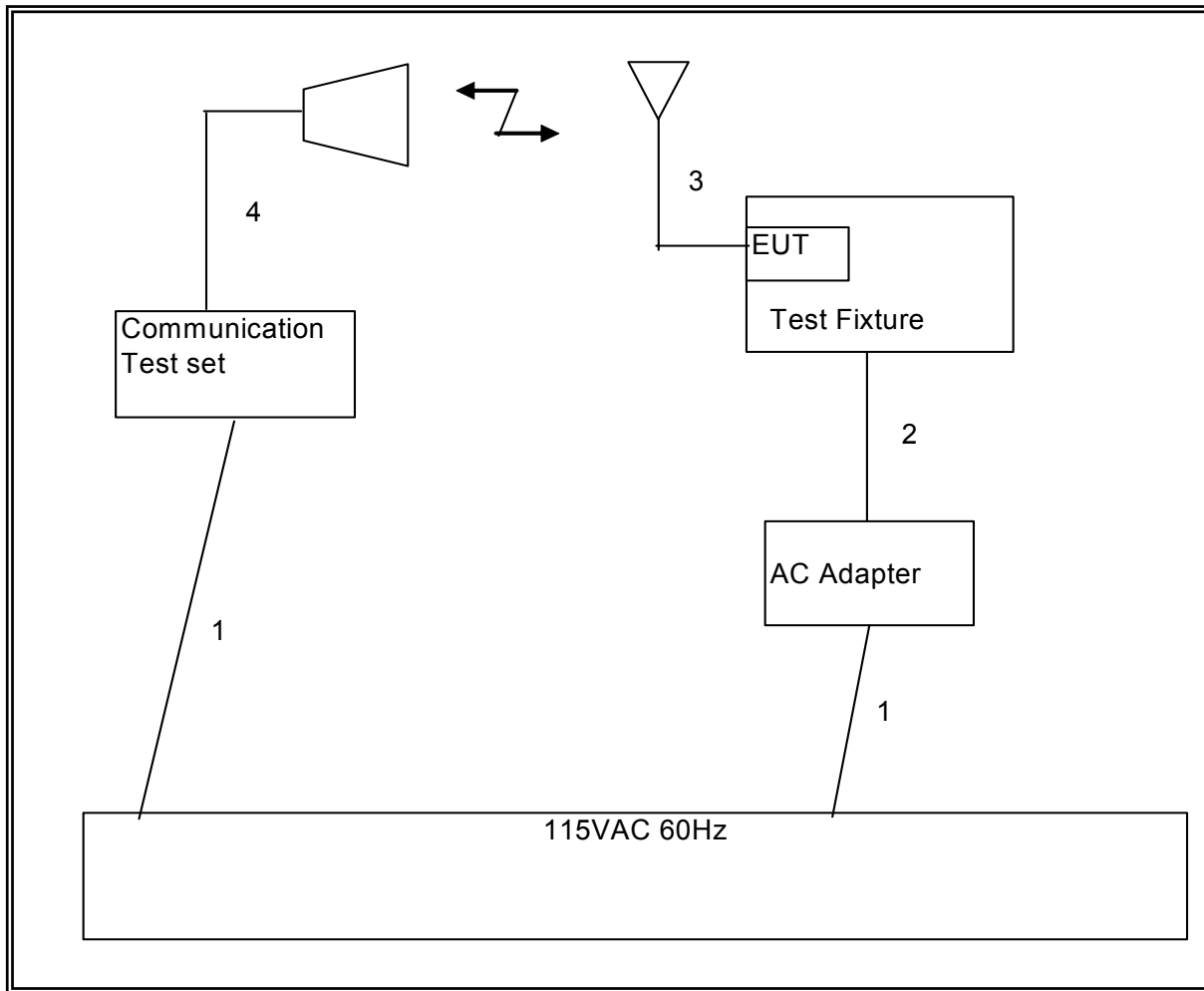
### TEST SETUP

The EUT is a stand-alone device. The Wireless Communication test set exercised the EUT.

**SETUP DIAGRAM FOR CONDUCTED TESTS**



**SETUP DIAGRAM FOR RADIATED TESTS**



## 8. RF POWER OUTPUT VERIFICATION

Maximum output power is verified on the Low, Middle and High channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E for 1xRTT, section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rel. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A

### 8.1. RF POWER OUTPUT FOR 1xRTT

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

<u>Application</u>	<u>Rev, License</u>
CDMA2000 Mobile Test	B.13.08, L

- Call Setup > Shift & Preset
- Cell Info > Cell Parameters > System ID (SID) > 8  
    > Network ID (NID) > 65535
- Protocol Rev > 6 (IS-2000-0)
- Radio Config (RC) > Please see following table or details
- FCH Service Option (SO) Setup > Please see following table or details
- Traffic Data Rate > Full
- TDSO SCH Info > F-SCH Parameters > F-SCH Data Rate > 153.6 kbps  
    > R-SCH Parameters > R-SCH Data Rate > 153.6 kbps
- Rvs Power Ctrl > Active bits
  - Rvs Power Ctrl > All Up bits (Maximum TxPout)
  -

**RF Power Output Results for 1XRTT**

1xRTT - Cell Band							
Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)					
		Ch. 1013/824.7MHz		Ch. 384/836.52MHz		Ch. 777/848.31MHz	
		Average	Peak	Average	Peak	Average	Peak
RC1 (Fwd1, Rvs1)	1 (Voice)						
	2 (Loopback)	24.65	28.90	24.86	28.71	24.40	28.20
	3 (Voice)						
	55 (Loopback)	24.75	29.10	24.86	28.99	24.50	28.60
	68 (Voice)						
RC2 (Fwd2, Rvs2)	9 (Loopback)	24.65	28.92	24.85	29.02	24.45	28.66
	17 (Voice)						
	55 (Loopback)	24.70	29.01	24.80	29.04	24.63	28.78
	32768 (Voice)						
RC3 (Fwd3, Rvs3)	1 (Voice)						
	2 (Loopback)	24.70	28.67	24.80	28.76	24.45	28.29
	3 (Voice)						
	55 (Loopback)	24.70	28.69	24.86	28.67	24.45	28.23
	32 (+ F-SCH)	24.68	28.65	24.88	28.64	24.50	28.36
	32 (+ SCH)	24.90	29.15	24.90	29.05	24.50	28.65
RC4 (Fwd4, Rvs3)	1 (Voice)						
	2 (Loopback)	24.68	28.75	24.85	28.68	24.43	28.34
	3 (Voice)						
	55 (Loopback)	24.70	28.61	24.82	28.75	24.43	28.18
	32 (+ F-SCH)	24.70	28.71	24.85	28.69	24.50	28.28
	32 (+ SCH)	24.85	28.84	24.87	28.75	24.45	28.18
RC5 (Fwd5, Rvs4)	9 (Loopback)	24.65	28.70	24.75	28.73	24.51	28.32
	17 (Voice)						
	55 (Loopback)	24.65	28.79	24.75	28.72	24.43	28.23
	32768 (Voice)						

**RF Power Output Results for 1XRTT**

1xRTT – PCS Band							
Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)					
		Ch. 25/1851.25MHz		Ch. 600/1880MHz		Ch. 1175/1908.75 MHz	
		Average	Peak	Average	Peak	Average	Peak
RC1 (Fwd1, Rvs1)	1 (Voice)						
	2 (Loopback)	24.20	27.80	24.55	28.18	24.65	28.35
	3 (Voice)						
	55 (Loopback)	24.20	28.00	24.56	28.57	24.65	28.48
	68 (Voice)						
RC2 (Fwd2, Rvs2)	9 (Loopback)	24.20	28.05	24.63	28.43	24.65	28.41
	17 (Voice)						
	55 (Loopback)	24.20	28.02	24.53	28.48	24.70	28.35
	32768 (Voice)						
RC3 (Fwd3, Rvs3)	1 (Voice)						
	2 (Loopback)	24.30	27.95	24.62	28.22	24.63	28.27
	3 (Voice)						
	55 (Loopback)	24.20	27.85	24.60	28.26	24.64	28.25
	32 (+ F-SCH)	24.40	27.98	24.65	28.17	24.72	28.23
	32 (+ SCH)	24.40	28.10	24.67	28.59	24.74	28.49
RC4 (Fwd4, Rvs3)	1 (Voice)						
	2 (Loopback)	24.30	27.92	24.4	28.07	24.65	28.20
	3 (Voice)						
	55 (Loopback)	24.20	27.84	24.52	28.21	24.67	28.28
	32 (+ F-SCH)	24.40	28.06	24.58	28.39	24.63	28.33
	32 (+ SCH)	24.30	27.88	24.55	28.32	24.65	28.48
RC5 (Fwd5, Rvs4)	9 (Loopback)	24.30	27.98	24.50	28.16	24.60	28.25
	17 (Voice)						
	55 (Loopback)	24.20	27.83	24.62	28.13	24.63	28.22
	32768 (Voice)						

## 8.2. RF POWER OUTPUT FOR EVDO REV 0

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

<u>Application</u>	<u>Rev, License</u>
1xEV-DO Terminal Test	A.09.13

### EVDO Release 0 - RTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > RTAP
  - RTAP Rate > 153.6 kbps
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press "Start Data Connection" when "Session Open" appear in "Active Cell"
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

### EVDO Release 0 - FTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > FTAP (default)
  - FTAP Rate > 307.2 kbps (2 Slot, QPSK)
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press "Start Data Connection" when "Session Open" appear in "Active Cell"
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

### RF Power Output for EV-DO Rel 0

#### Cell Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70	24.76	28.03
		384	836.52	24.80	29.01
		777	848.31	24.42	28.54

#### PCS Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	24.20	28.00
		600	1880.00	24.50	28.47
		1175	1908.75	24.80	28.37

### 8.3. RF POWER OUTPUT FOR EVDO REV A

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

<u>Application</u>	<u>Rev, License</u>
1xEV-DO Terminal Test	A.09.13

#### EVDO Release A – RETAP

- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- R-Data Pkt Size > 4096
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
- > PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

#### EVDO Release A - FETAP

- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- F-Traffic Format > 4 (1024, 2,128) Canonical (307.2k, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
- > PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

#### **RF Power Output Results for EV-DO Rev A**

##### Cell Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.70	25.00	29.81
		384	836.52	<b>25.07</b>	29.82
		777	848.31	24.70	29.22

##### PCS Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25	24.30	28.71
		600	1880.00	24.77	29.11
		1175	1908.75	24.90	28.98



## 9. WORST-CASE CONFIGURATION AND MODE

Based on the following investigation results, see Section 6. RF POWER OUTPUT VERIFICATION. The highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst case modes:

- For Cellular and PCS band: 1xRTT RC3, 32(+SCH)
- For Cellular and PCS band: EVDO-Rev A

The worst-case configuration has been evaluated on EUT with antenna @ Y-position for both 850MHz and 1900MHz bands by comparing the fundamental ERP / EIRP output power.

## 10. CONDUCTED TEST RESULTS

### 10.1. OCCUPIED BANDWIDTH

#### RULE PART(S)

FCC: §2.1049  
 IC: RSS-Gen, 4.6

#### LIMITS

For reporting purposes only

#### 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 was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

#### MODES TESTED

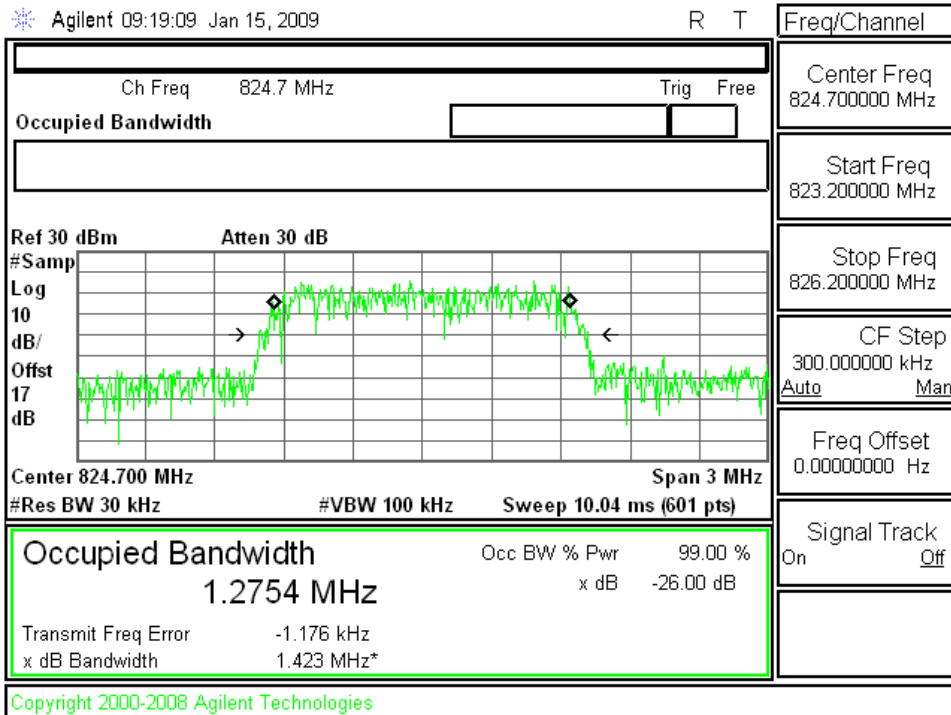
- 1xRTT – RC3, 32(+SCH)
- EV-DO - REV A

#### RESULTS

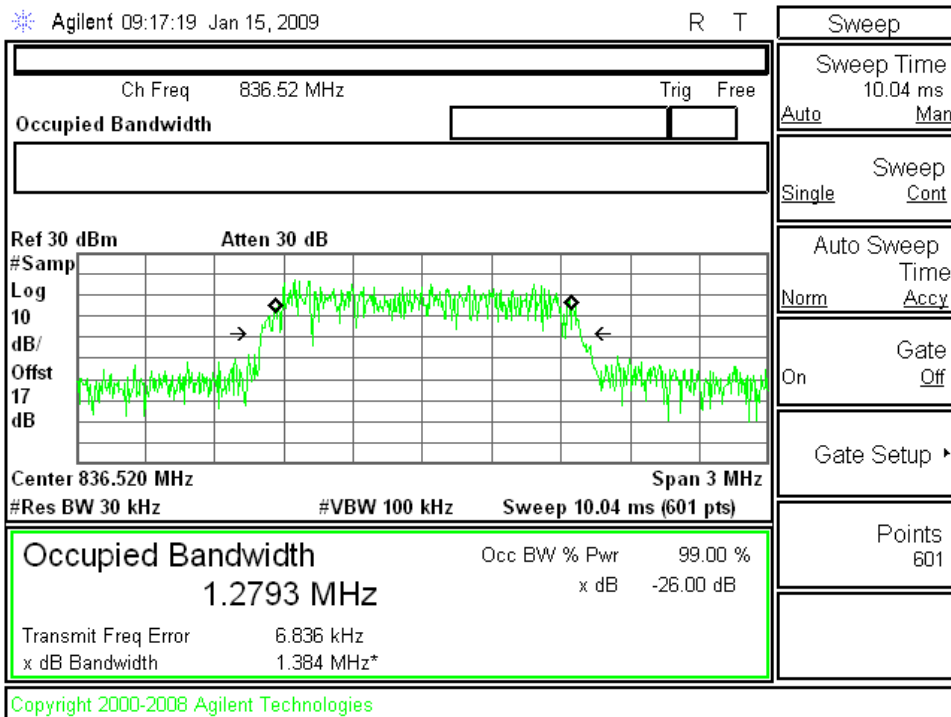
Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW MHz)
Cellular	1xRTT	1013	824.70	1.2754	1.423
		384	836.52	1.2793	1.376
		777	848.31	1.2816	1.405
	EV-DO REV A	1013	824.70	1.2884	1.405
		384	836.52	1.2796	1.389
		777	848.31	1.2836	1.400
PCS	1xRTT	25	1851.25	1.2733	1.390
		600	1880.0	1.2855	1.406
		1175	1908.75	1.2745	1.411
	EV-DO REV A	25	1851.25	1.2834	1.474
		600	1880.0	1.2939	1.438
		1175	1908.75	1.2957	1.476

**Plots for 1xRTT Mode (Cellular Band)**

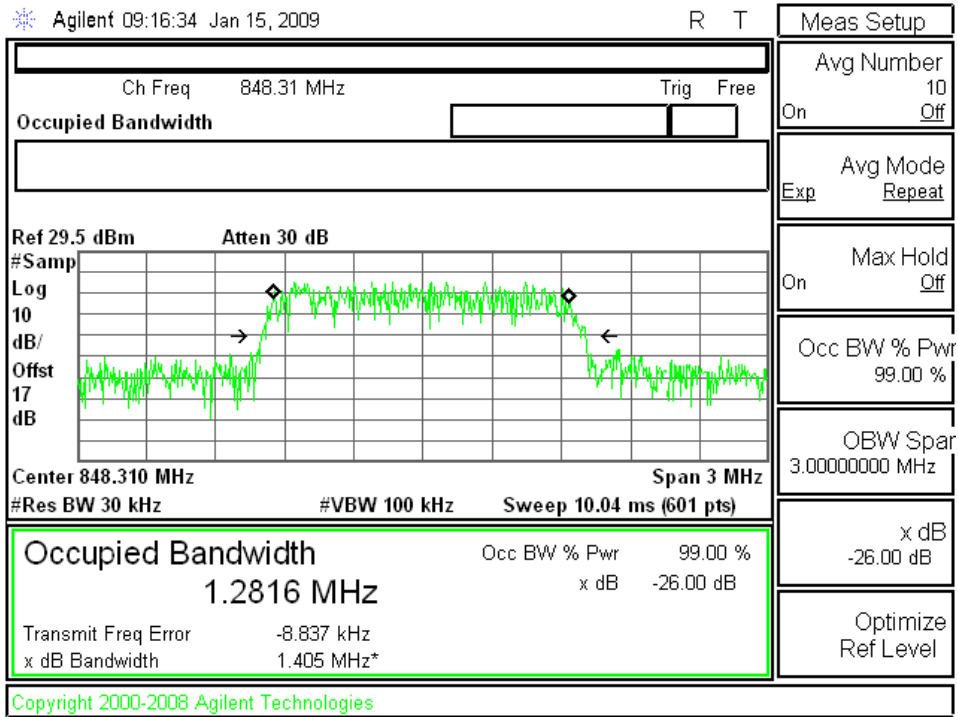
1xRTT Ch 1013



1xRTT, Ch 384

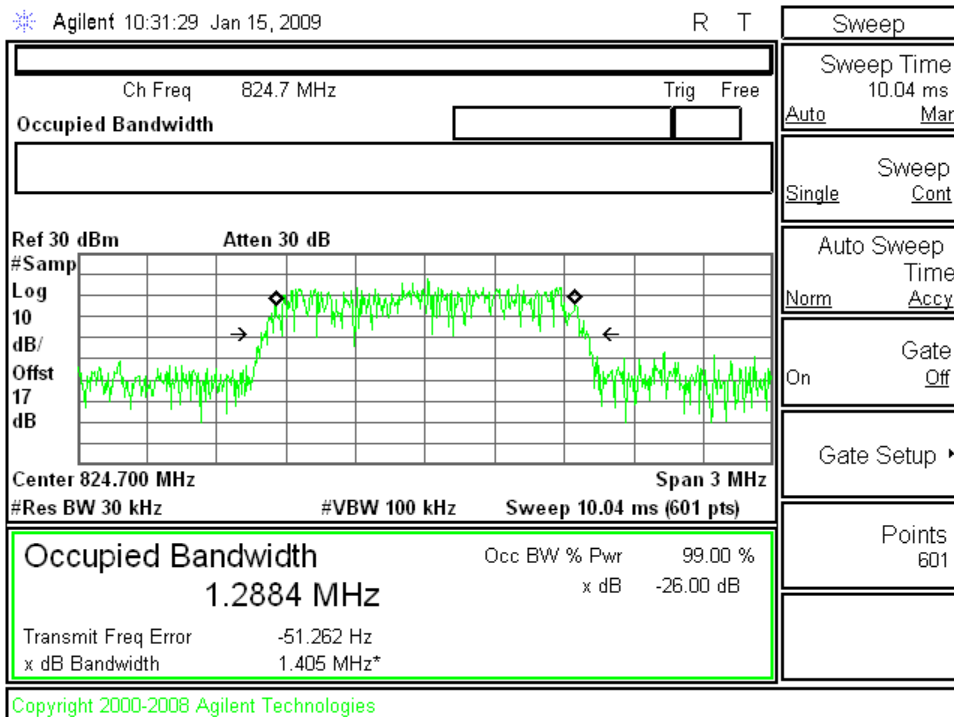


1xRTT Ch 777

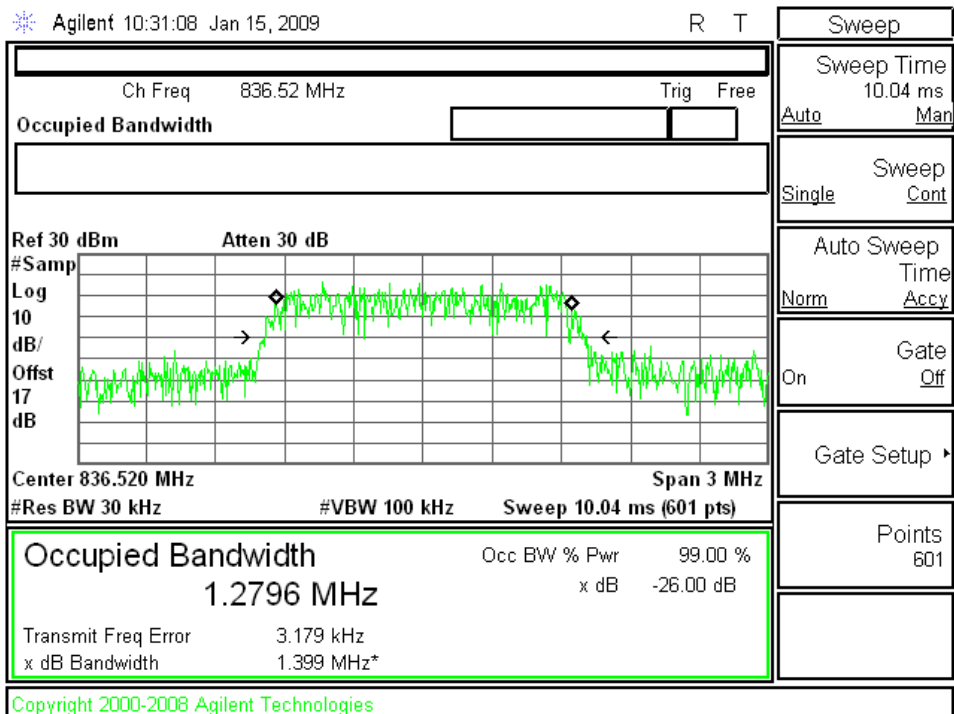


**Plots for EVDO-REV A Mode (Cellular Band)**

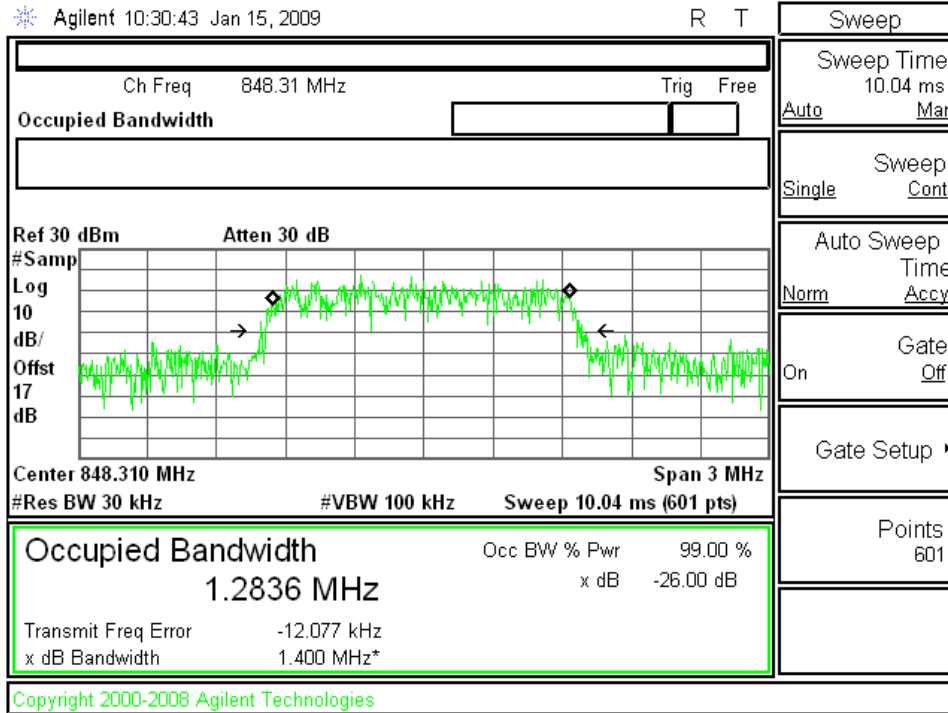
EVDO-REV A, Ch 1013



EVDO-REV A, Ch 384

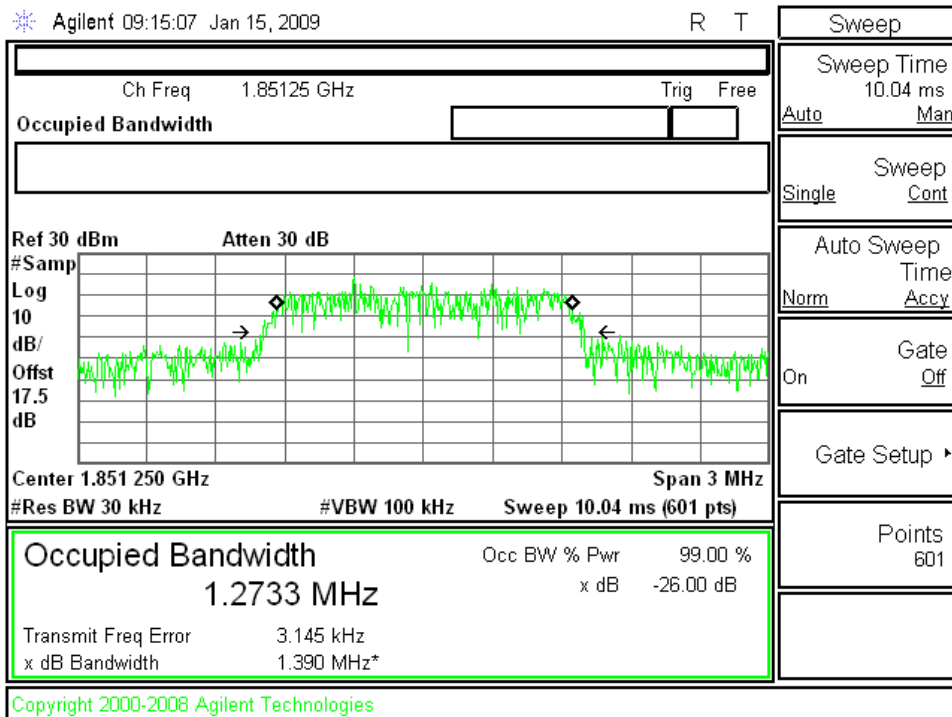


EVDO-REV A Ch 777

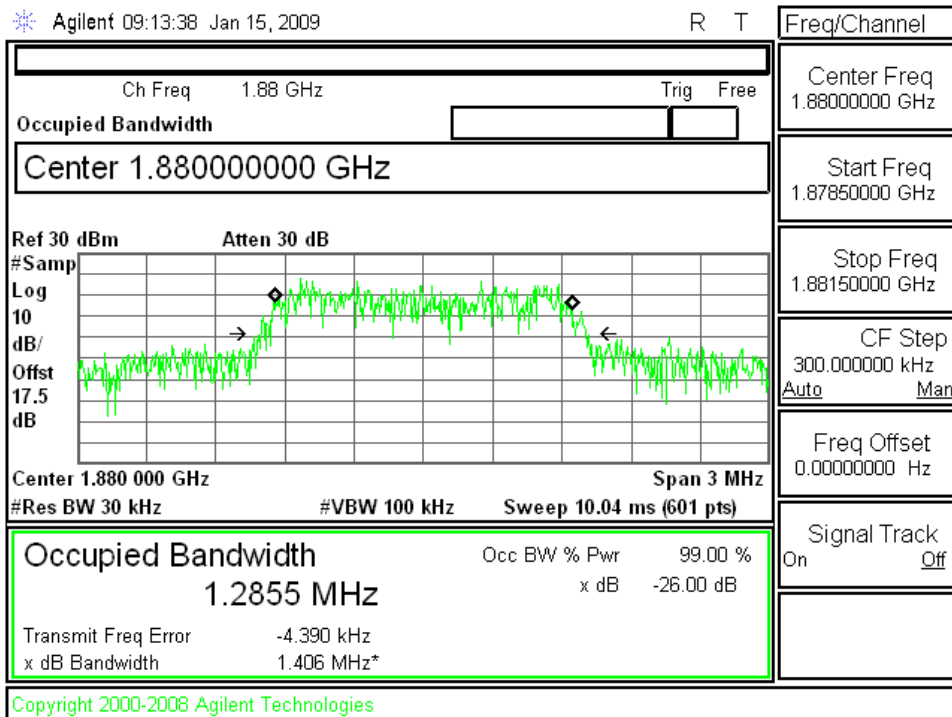


**Plots for 1xRTT Mode (PCS Band)**

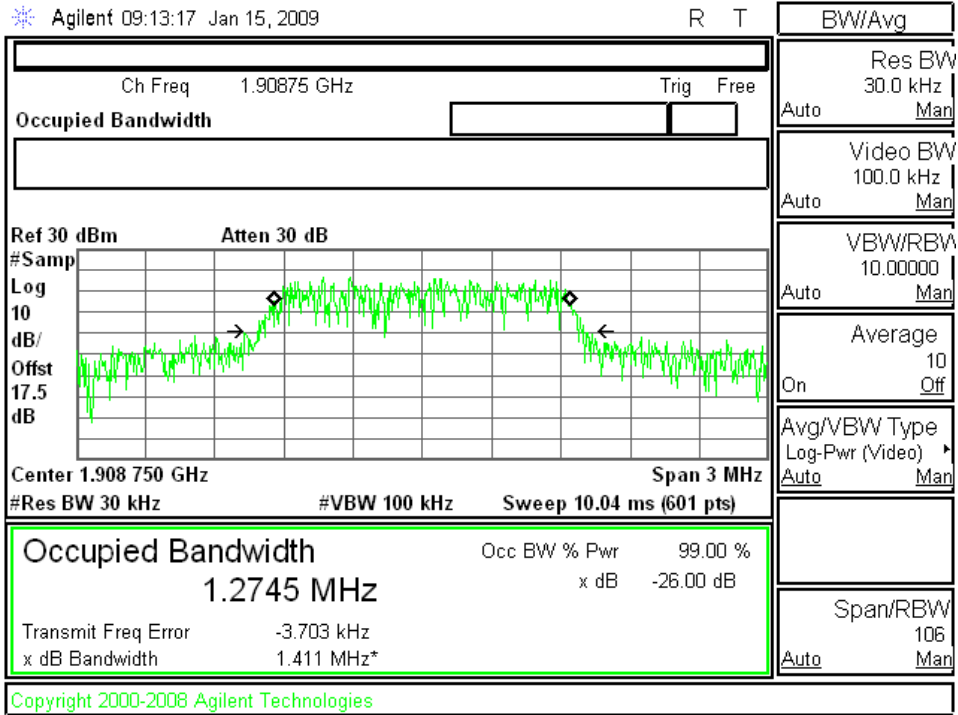
1xRTT, Ch 25



1xRTT, Ch 600



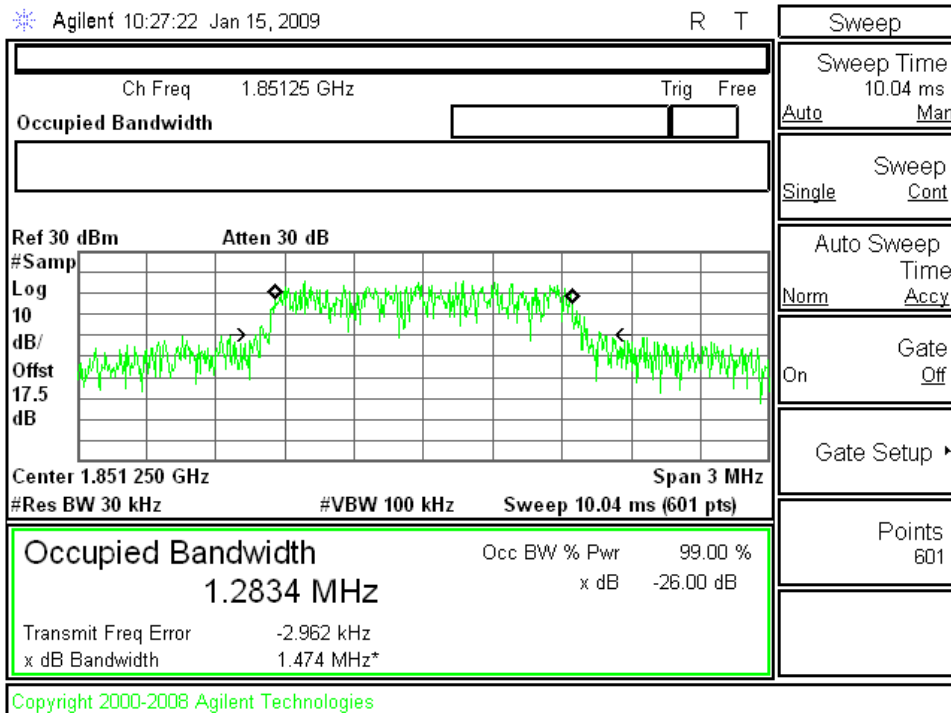
1xRTT, Ch 1175



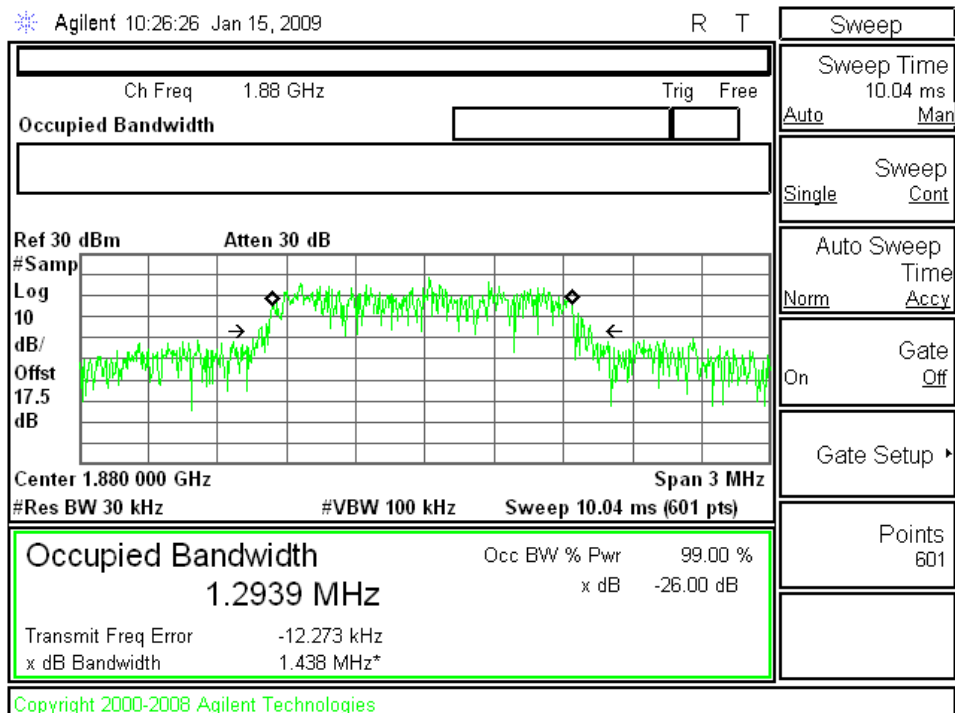


**Plots for EVDO, REV A Mode (PCS Band)**

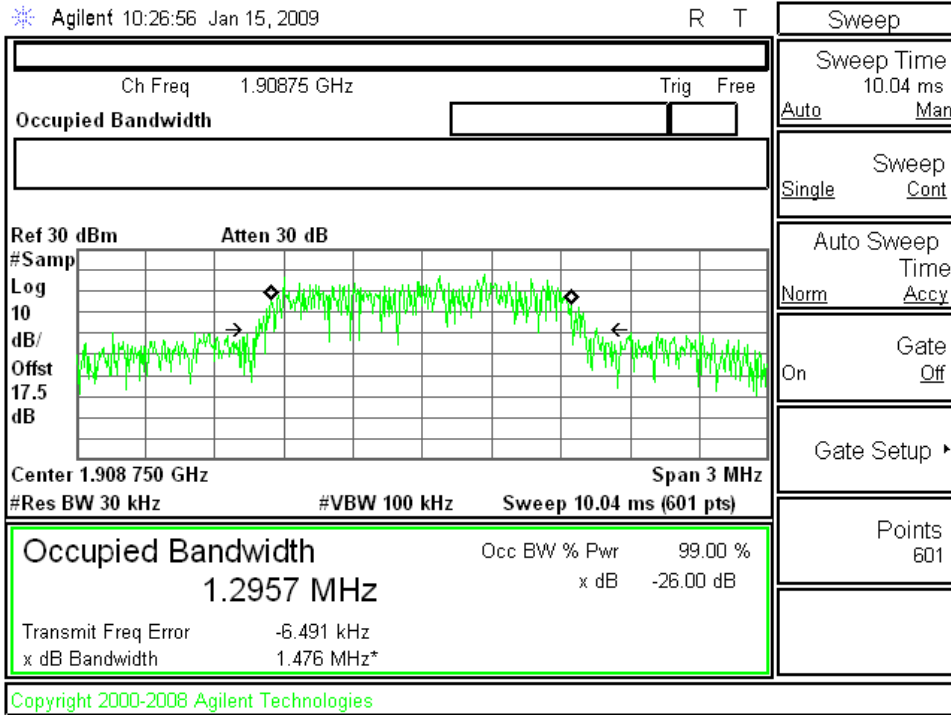
EVDO-REV A, Ch 25



EVDO-REV A, Ch 600



EVDO-REV A, Ch 1175



## **10.2. BAND EDGE**

### **RULE PART(S)**

FCC: §22.359, 24.238  
IC: RSS-132, 4.5; RSS-133, 6.5

### **LIMITS**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

### **TEST PROCEDURE**

The transmitter output was connected to a Agilent 8960 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency (824, 848, 1850, 1910MHz)
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

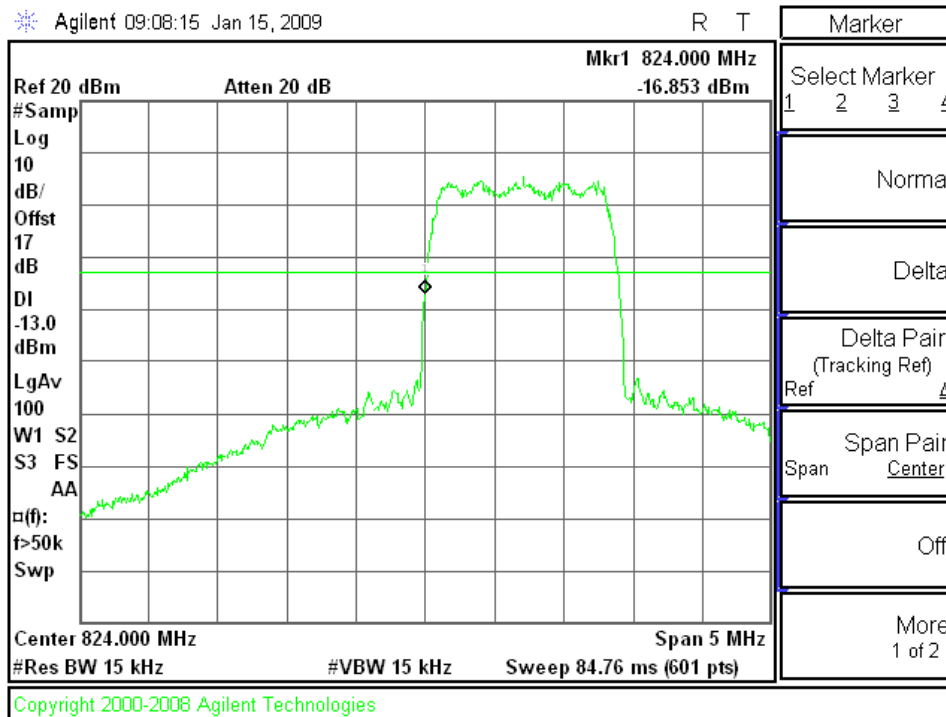
### **MODES TESTED**

- 1xRTT - RC3, 32(+SCH)
- EV-DO - REV A

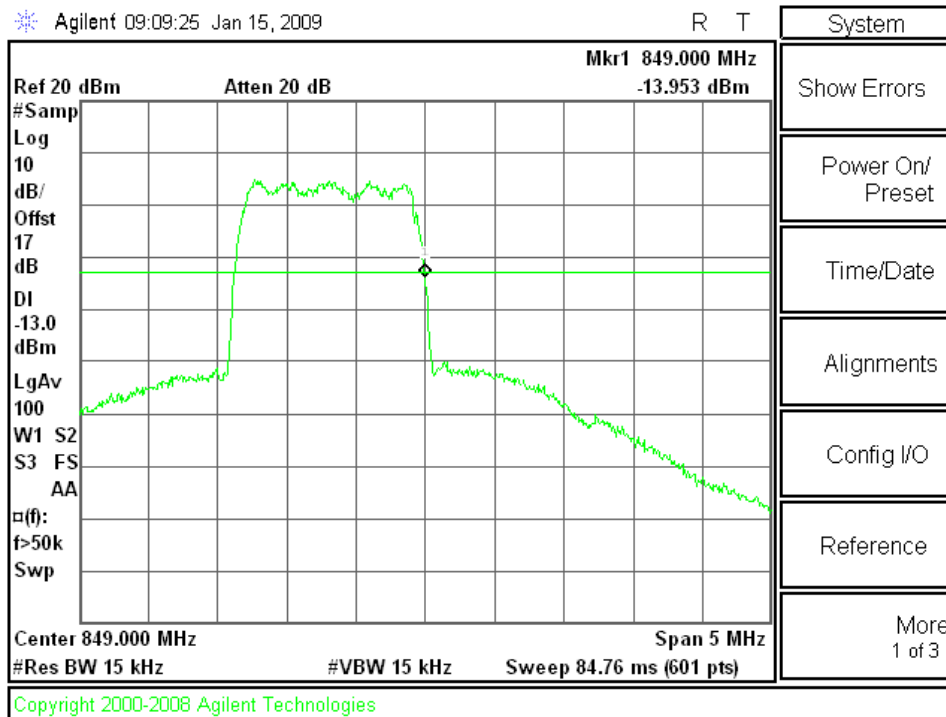
### **RESULTS**

**Plots for 1xRTT mode (Cellular Band)**

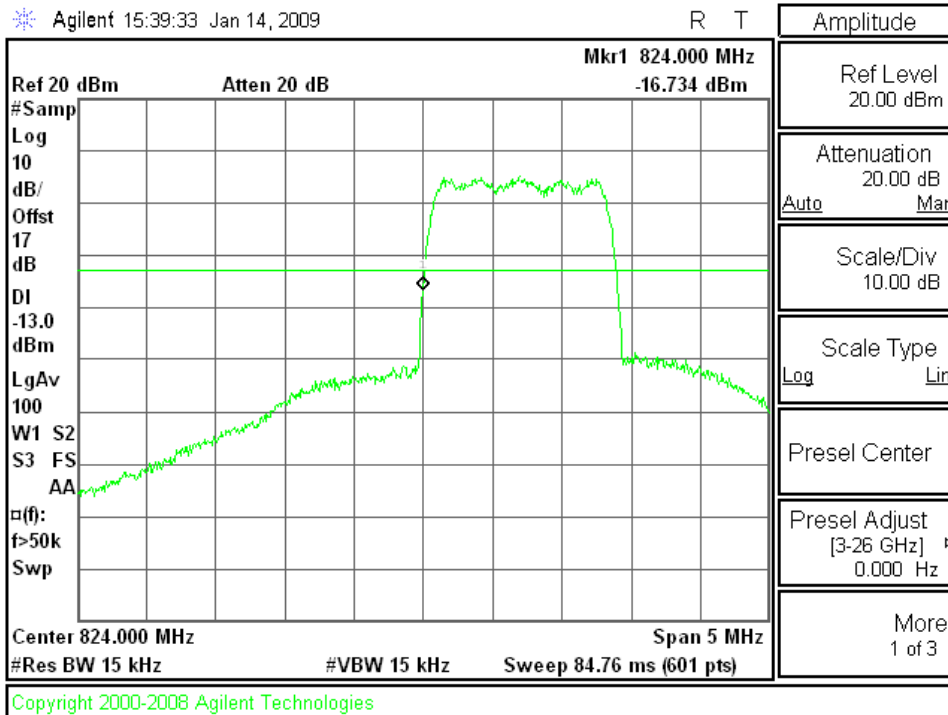
**1xRTT, Ch 1013 (824.7 MHz)**



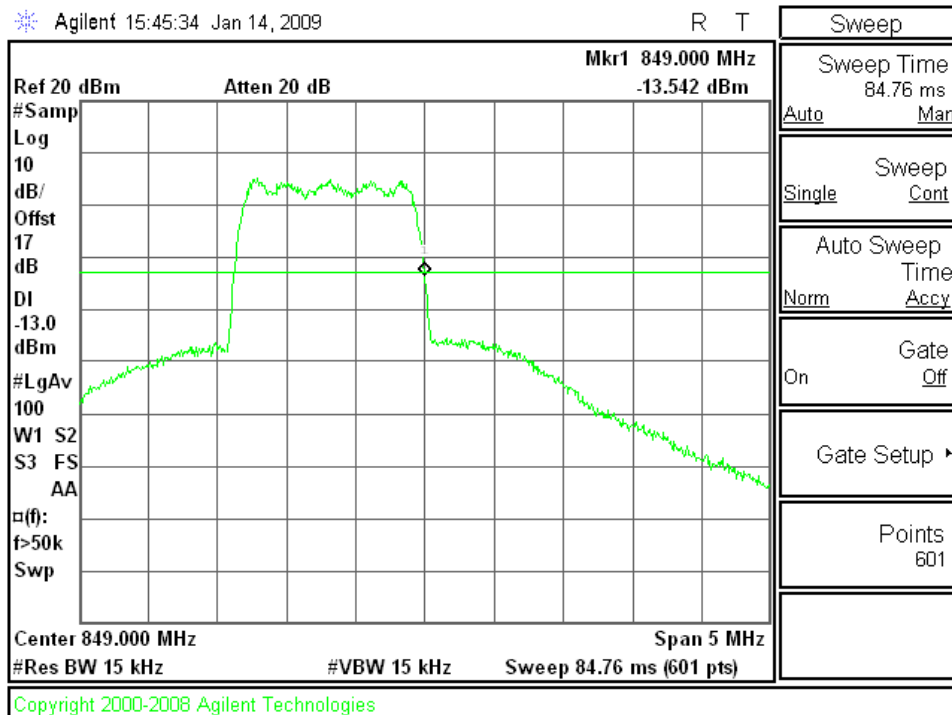
**1xRTT, Ch 777 (848.31 MHz)**



**Plots for EVDO-REV A mode (Cellular Band)**  
EVDO-REV A Ch 1013 (824.7 MHz)

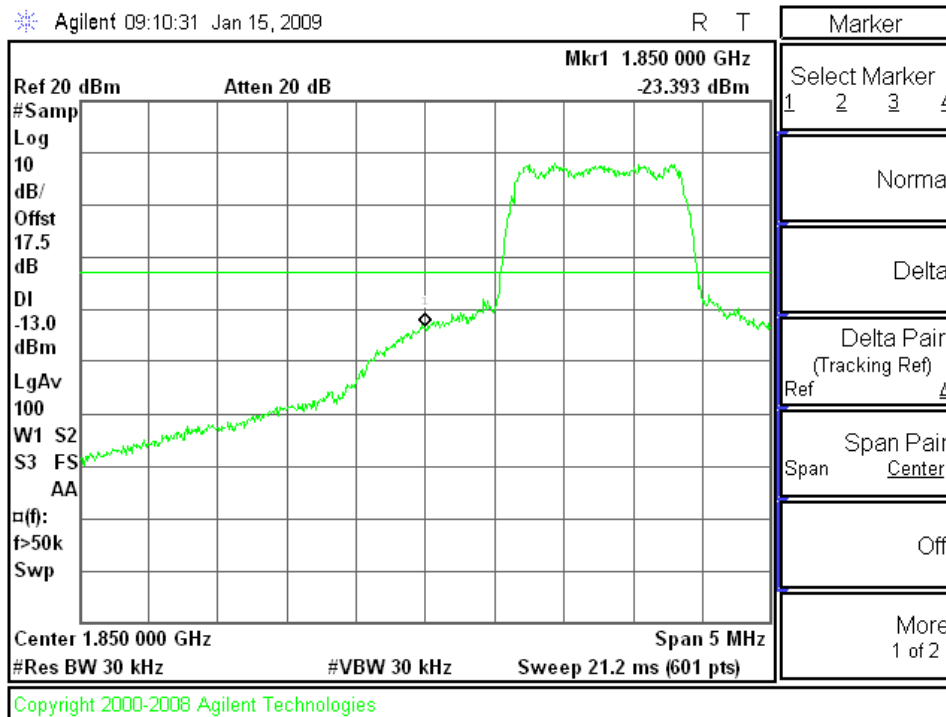


EVDO-REV A, Ch 777 (848.31 MHz)

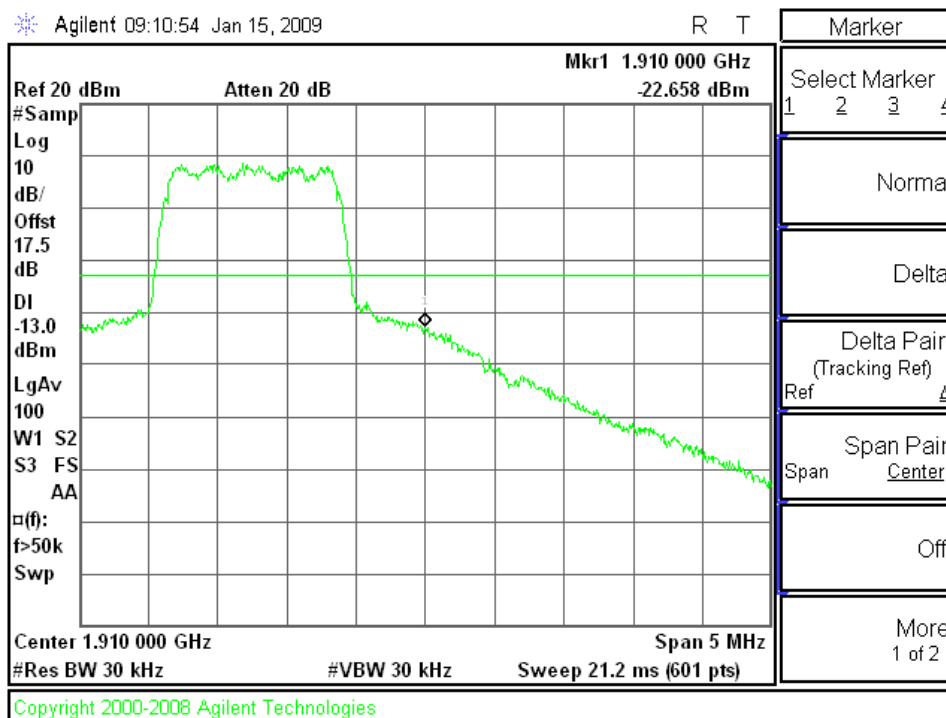


**Plots for 1xRTT mode (PCS Band)**

1xRTT, Ch 25 (1851.25 MHz)

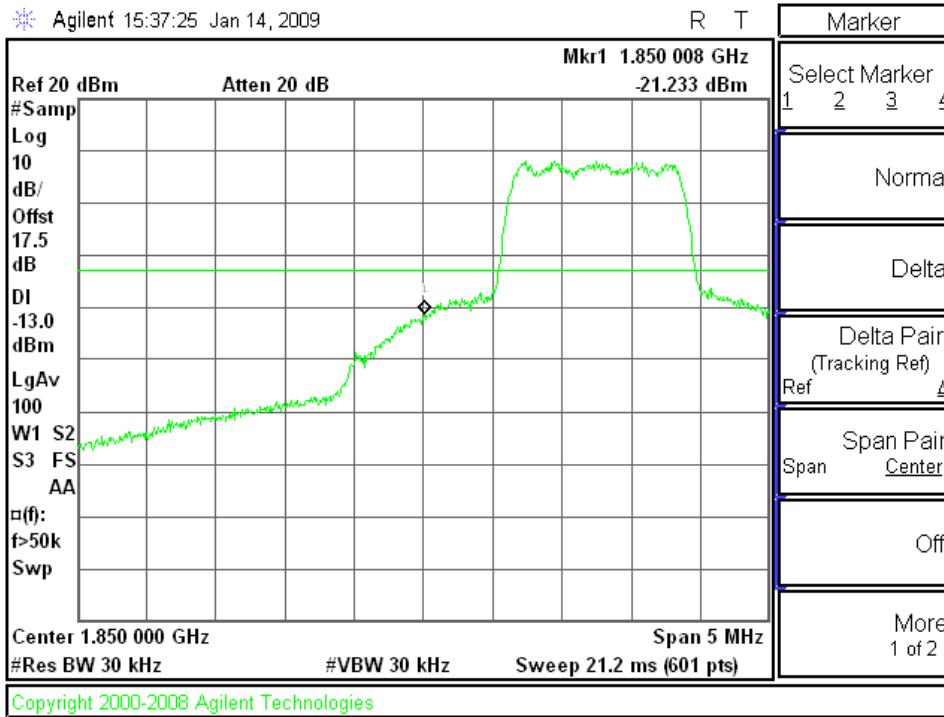


1xRTT Ch 1175 (1908.75 MHz)

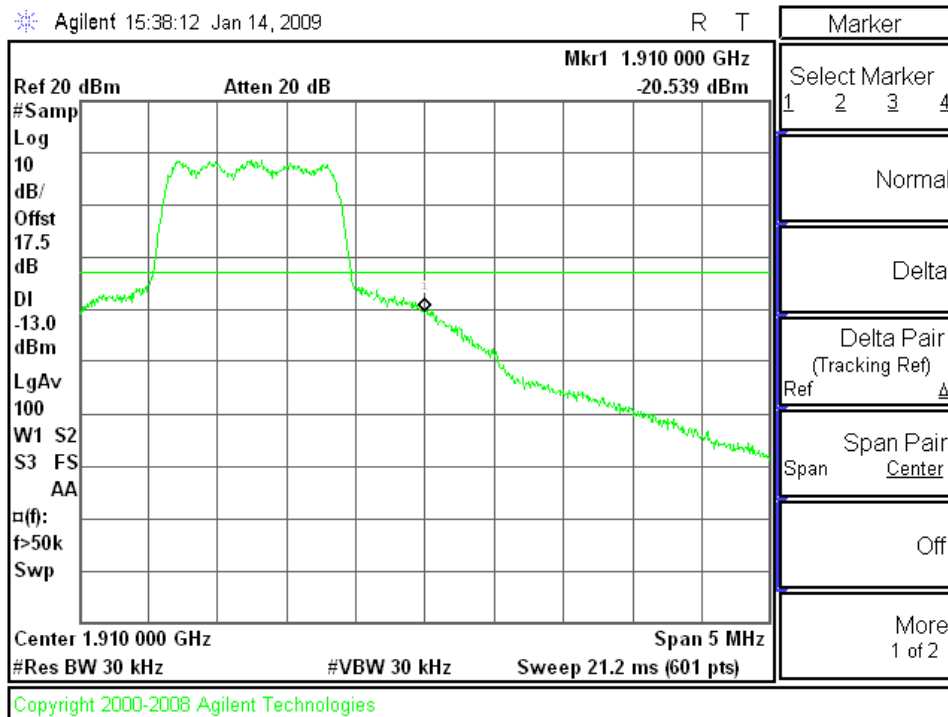


**Plots for EVDO-REV A mode (PCS Band)**

**EVDO-REV A Ch 25(1851.25 MHz)**



**EVDO-REV A Ch 1175(1908.75 MHz)**



### **10.3. OUT OF BAND EMISSIONS**

#### **RULE PART(S)**

FCC: §2.1051, §22.901, §22.917, §24.238  
IC: RSS-132, 4.5; RSS-133, 6.5

#### **LIMITS**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

#### **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 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

#### **MODES TESTED**

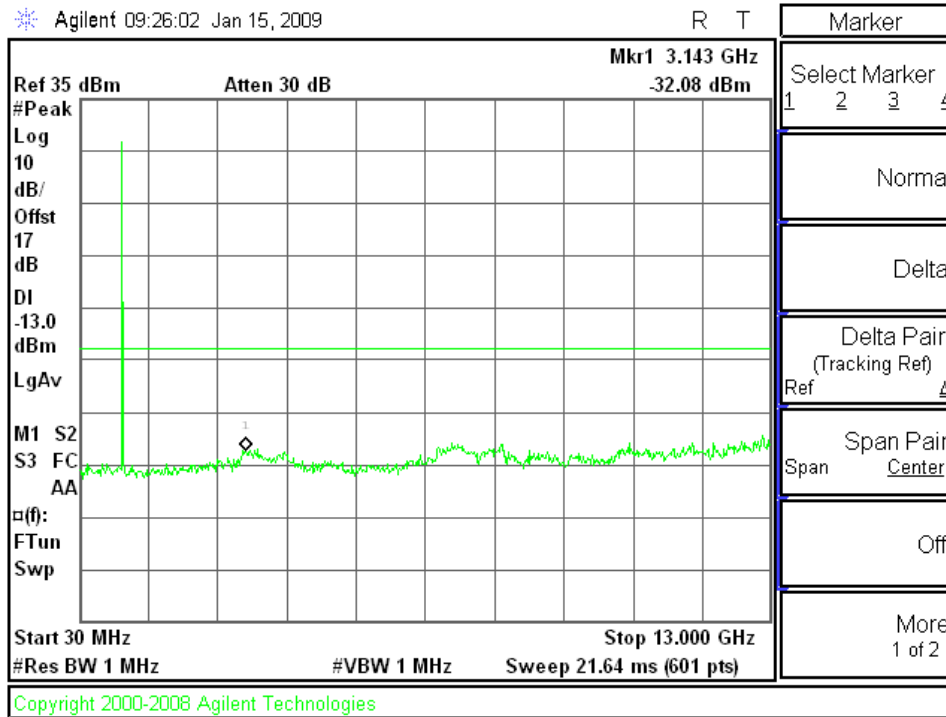
- 1xRTT – RC3, 32(+SCH)
- Ev-DO – Rev A

#### **RESULTS**

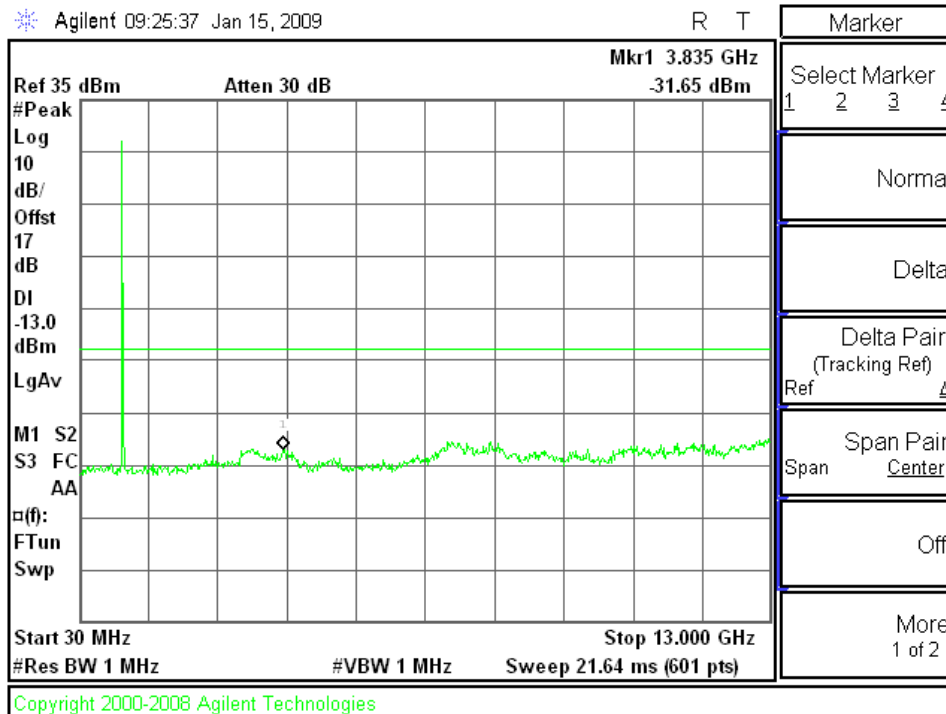


**Plots for 1xRTT Mode (Cellular Band)**

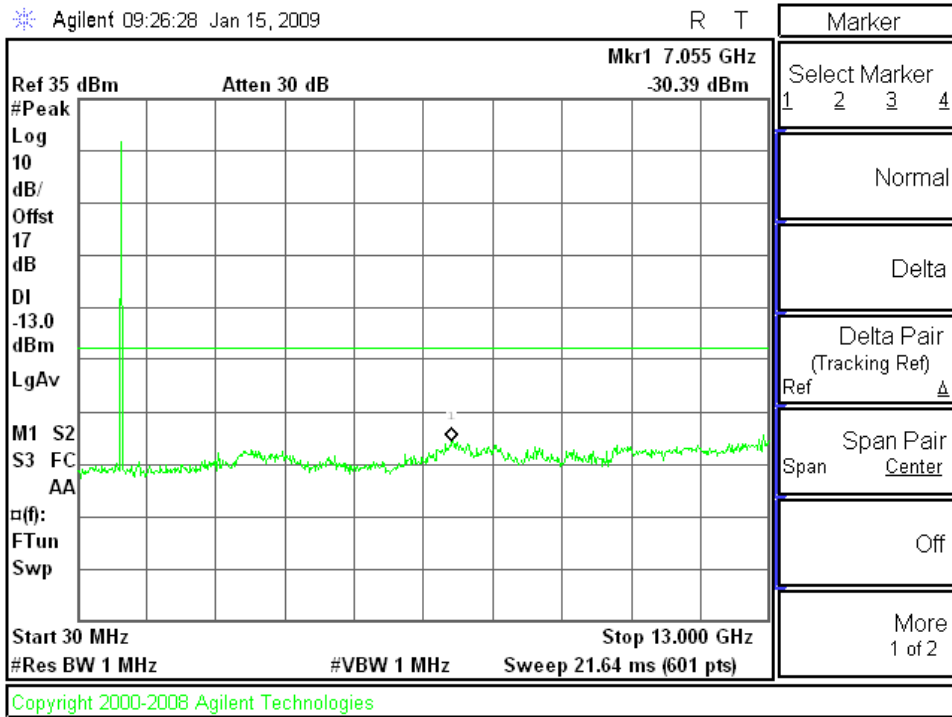
1xRTT, Ch 1013



1xRTT, Ch 384

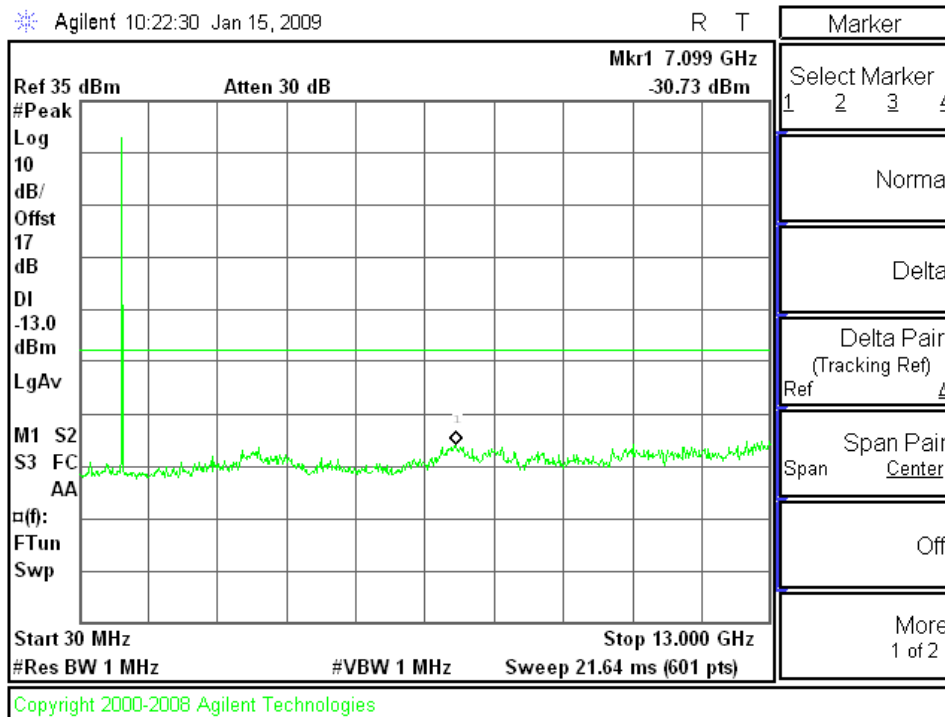


1xRTT, Ch 777

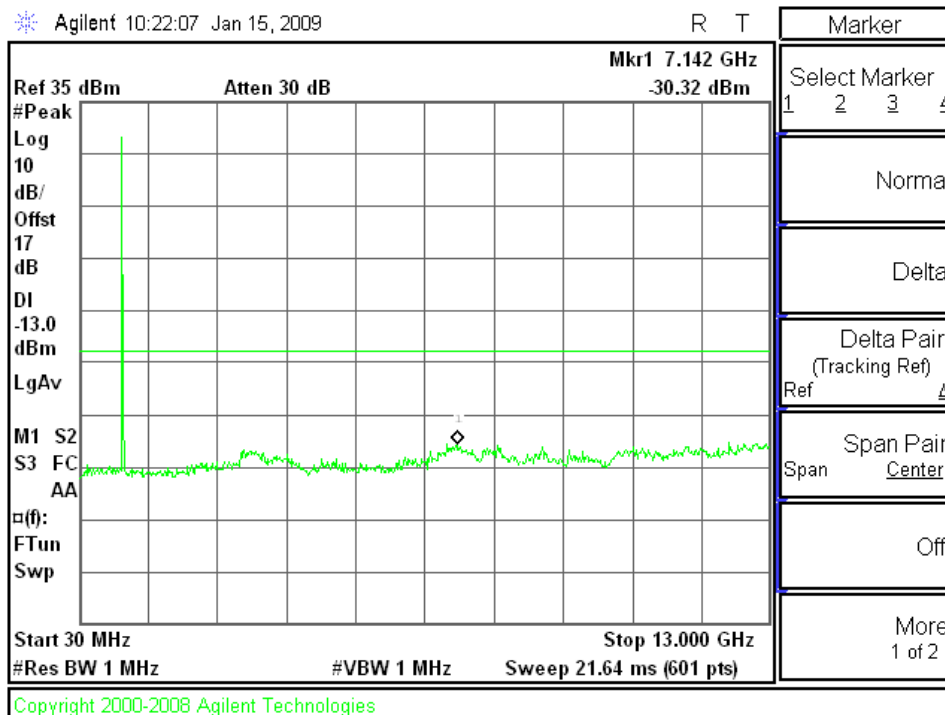


**Plots for EVDO-REV A Mode (Cellular Band)**

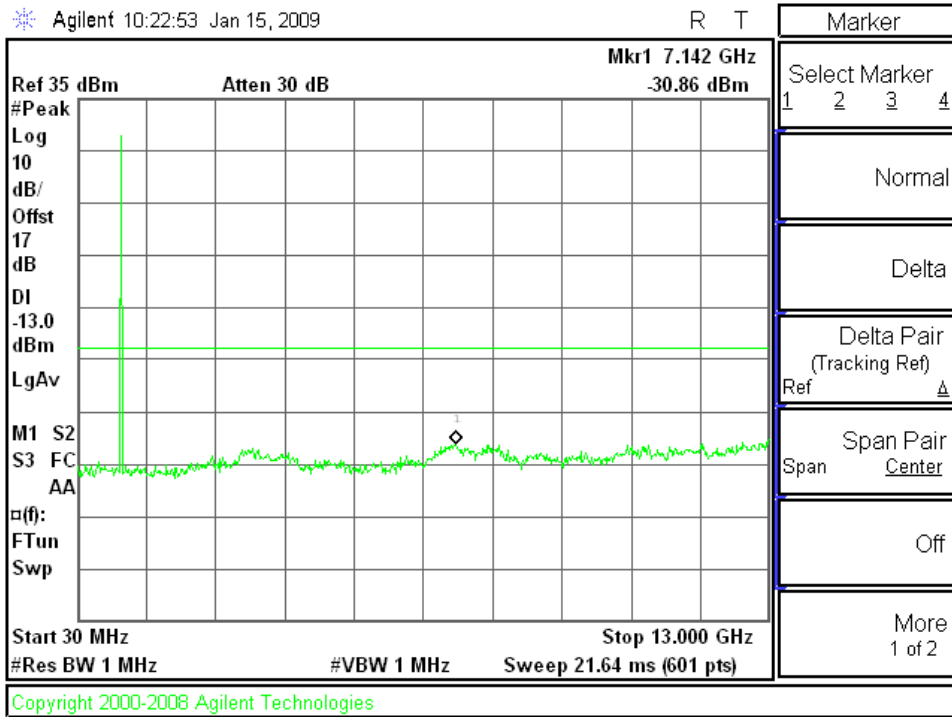
EVDO-REV A, Ch 1013



EVDO-REV A, Ch 384

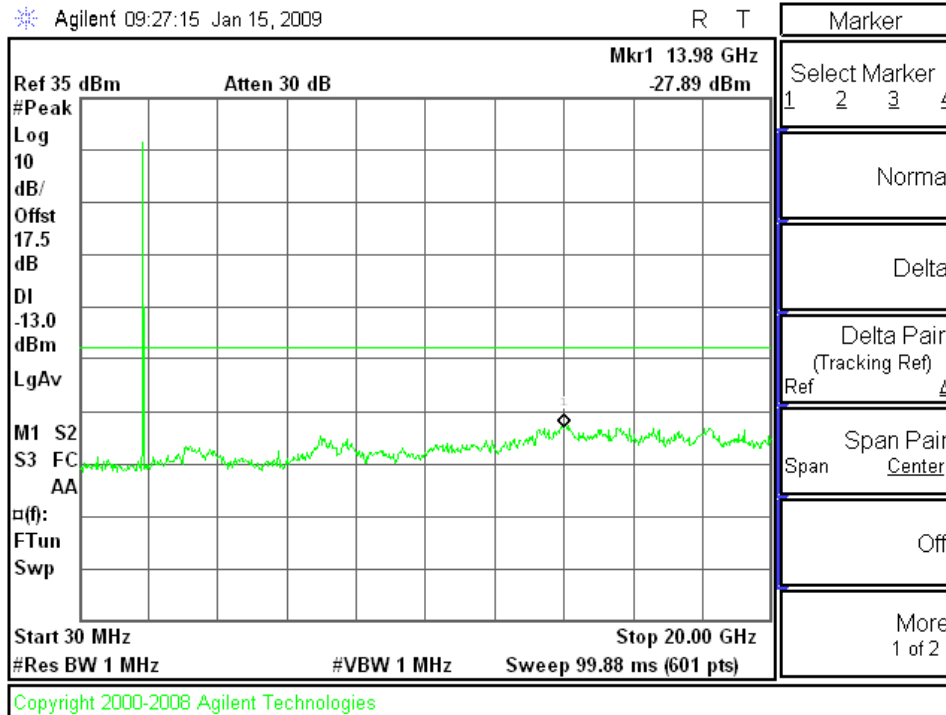


EVDO-REV A, Ch 777

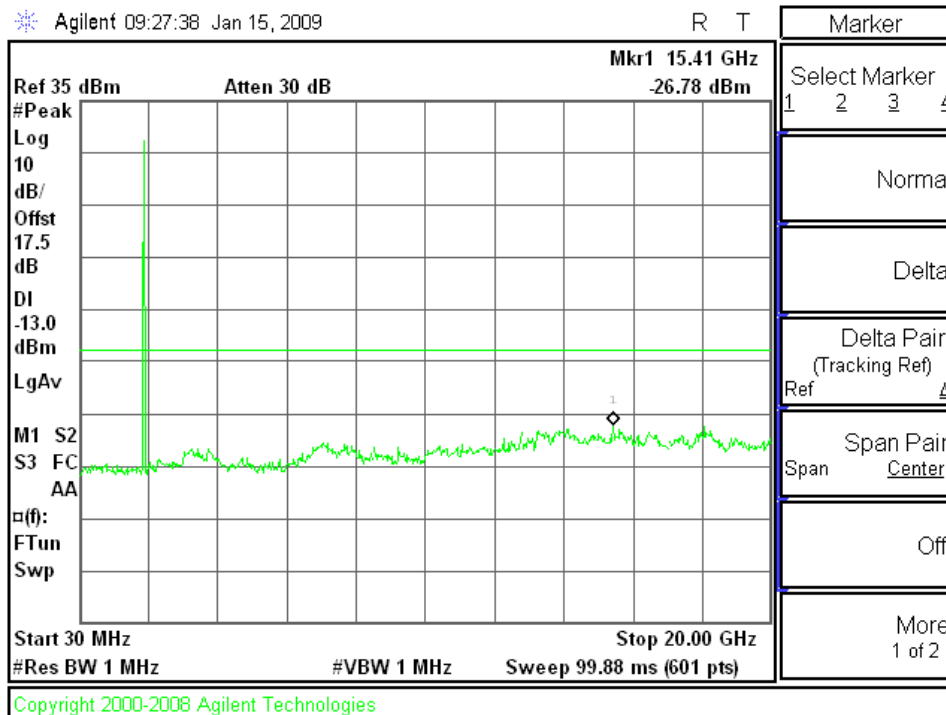


**Plots for 1xRTT Mode (PCS Band)**

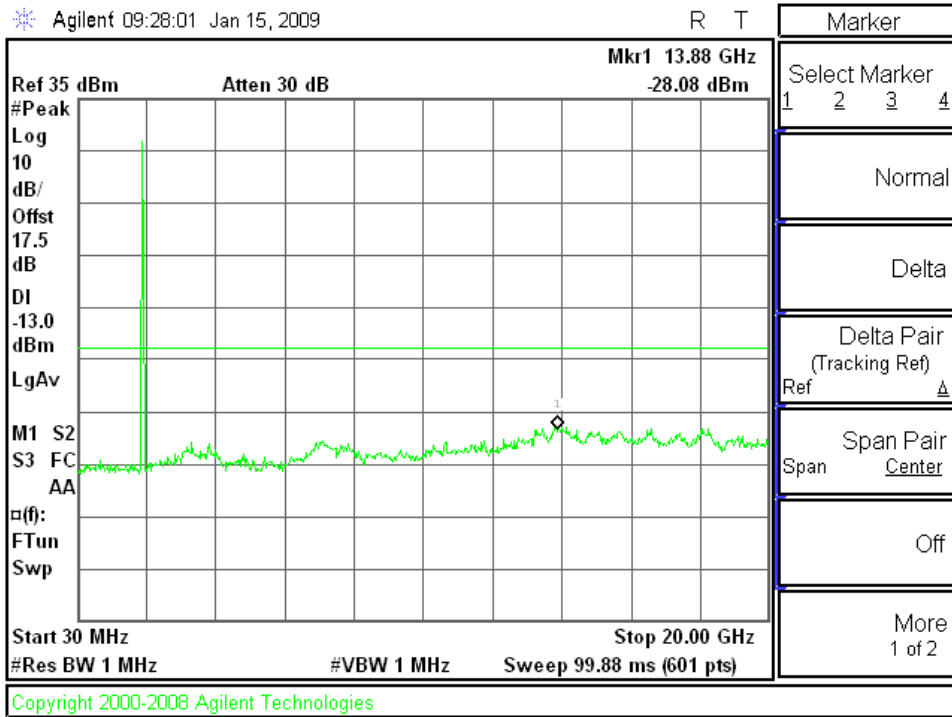
1xRTT Ch 25



1xRTT Ch 600

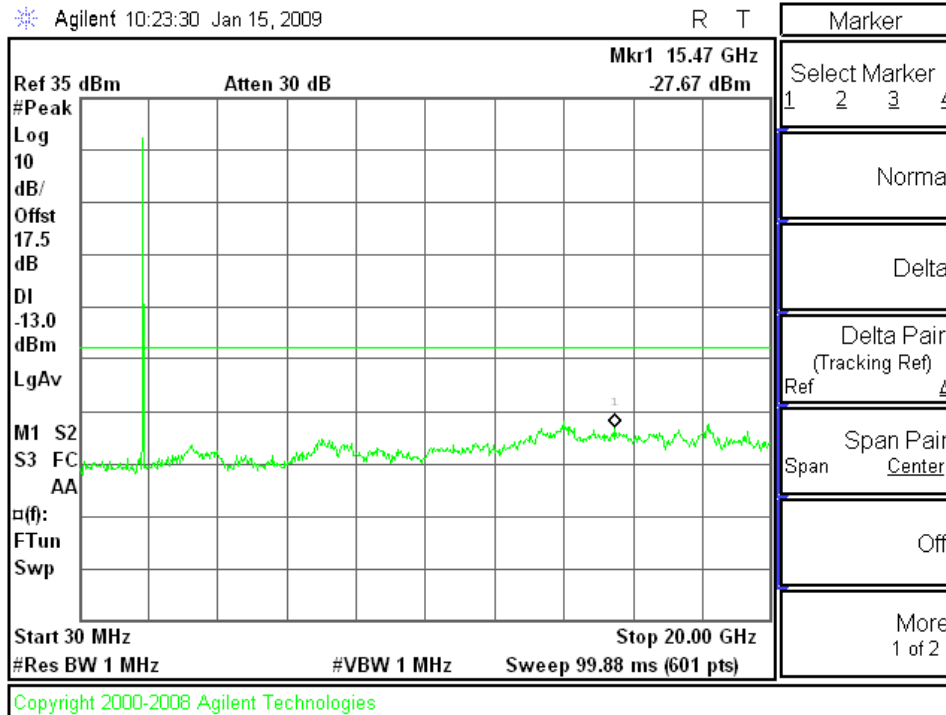


1xRTT Ch 1175

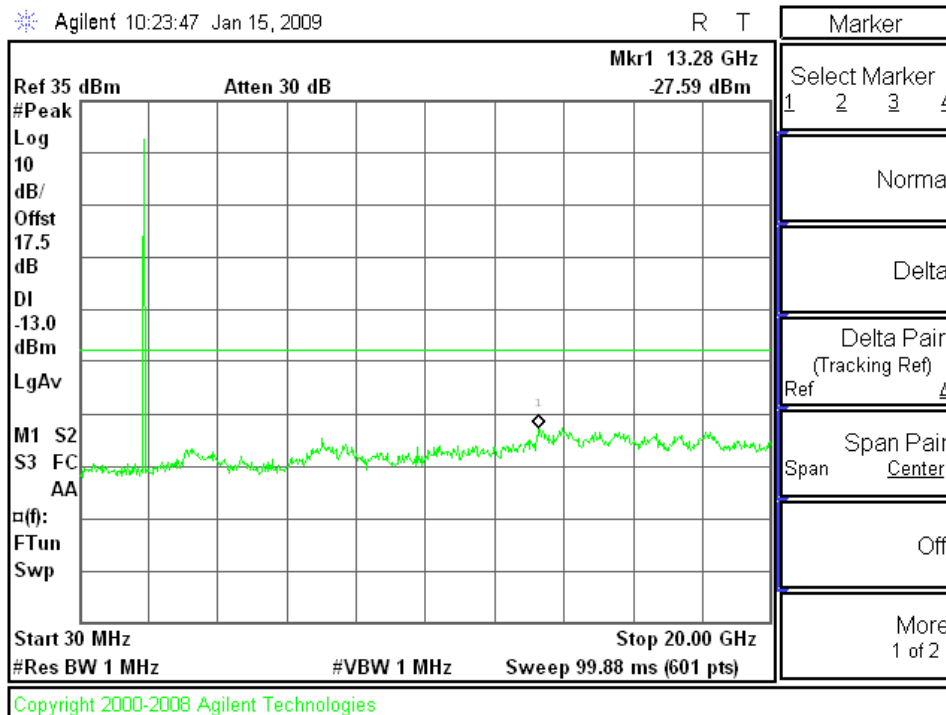


**Plots for EVDO-REV A Mode (PCS Band)**

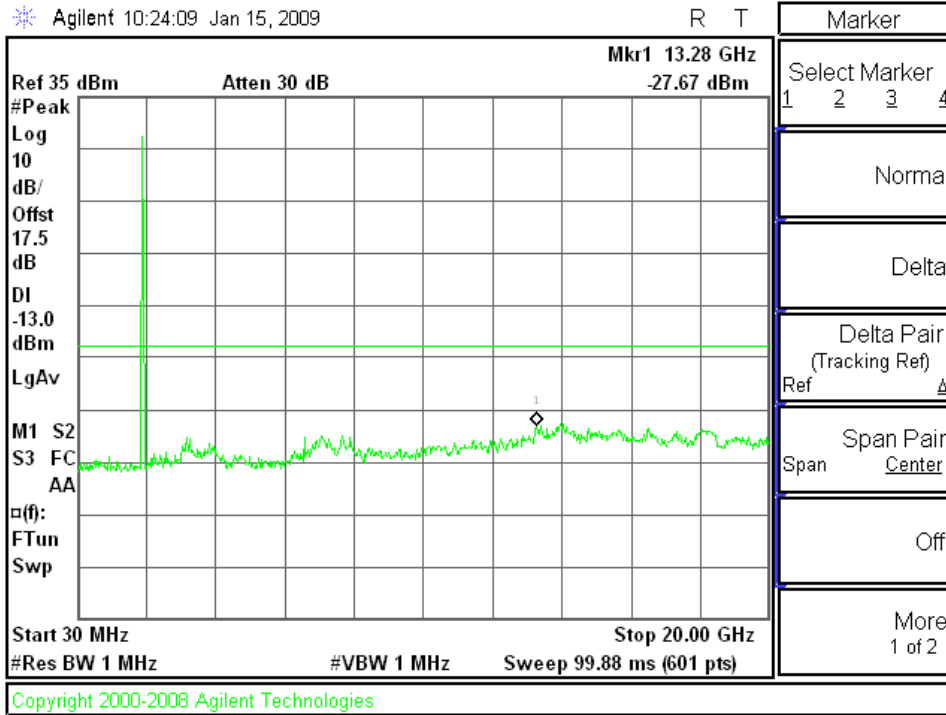
EVDO-REV A, Ch 25



EVDO-REV A, Ch 600



EVDO-REV A, Ch 1175





## 10.4. FREQUENCY STABILITY

### RULE PART(S)

FCC: §2.1055, §22.355, §24.235  
IC: RSS-132, 4.3; RSS-133, 6.3

### LIMITS

- §22.355 & RSS-132 4.3 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.
- RSS-133 6.3 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.
- §24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### TEST PROCEDURE

Use Agilent 8960 with Frequency Error measurement capability.

- Temp. =  $-20^{\circ}$  to  $+50^{\circ}\text{C}$
- Voltage = 3.7 Vdc (85% - 115%)

#### **Frequency Stability vs Temperature:**

The EUT is placed inside a temperature chamber. The temperature is set to  $20^{\circ}\text{C}$  and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until  $+50^{\circ}\text{C}$  is reached.

#### **Frequency Stability vs Voltage:**

The peak frequency error is recorded (worst-case).

### MODES TESTED

- Ev-DO – Rev A

### RESULTS

See the following pages.

**CELL, EVDO Rev A – MID CHANNEL**

Reference Frequency: Cellular Mid Channel 835.82784MHz @ 20°C				
Limit: to stay +/- 2.5 ppm = 2089.570 Hz				
DC Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.60	50	835.827834	0.007	2.5
3.60	40	835.827835	0.006	2.5
3.60	30	835.827838	0.002	2.5
<b>3.60</b>	<b>20</b>	<b>835.827840</b>	<b>0</b>	<b>2.5</b>
3.60	10	835.827837	0.004	2.5
3.60	0	835.827836	0.005	2.5
3.60	-10	835.827845	-0.006	2.5
3.60	-20	835.827846	-0.007	2.5
3.60	-30	835.827850	-0.012	2.5

Reference Frequency: Cellular Mid Channel 835.837000MHz @ 20°C				
Limit: to stay +/- 2.5 ppm = 2089.570 Hz				
DC Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
<b>100%</b>	<b>20</b>	<b>835.827840</b>	<b>0</b>	<b>2.5</b>
85%	20	835.827837	0.004	2.5
115%	20	835.827835	0.006	2.5

**PCS, EVDO-REV A – MID CHANNEL**

Reference Frequency: PCS Mid Channel 1879.306760MHz @ 20°C				
Limit: within the authorized block or +/- 2.5 ppm = 4698.267 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.60	50	1879.306751	0.005	2.5
3.60	40	1879.306751	0.005	2.5
3.60	30	1879.306752	0.004	2.5
<b>3.60</b>	<b>20</b>	<b>1879.30676</b>	<b>0</b>	<b>2.5</b>
3.60	10	1879.306753	0.004	2.5
3.60	0	1879.306765	-0.003	2.5
3.60	-10	1879.306768	-0.004	2.5
3.60	-20	1879.306770	-0.005	2.5
3.60	-30	1879.306772	-0.006	2.5

Reference Frequency: PCS Mid Channel 1880.0000MHz @ 20°C				
Limit: within the authorized block or +/- 2.5 ppm = 4698.267 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
<b>100%</b>	<b>20</b>	<b>1879.306760</b>	<b>0</b>	<b>2.5</b>
85%	20	1879.306754	0.003	2.5
115%	20	1879.306752	0.004	2.5

## 11. RADIATED TEST RESULTS

### 11.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232  
 IC: RSS-132; 4.4, RSS-133, 6.4

#### LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) & RSS-133 § 6.4 - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

RSS-132 4.4, SRSP503 5.1.3 - The maximum ERP shall be 6.3 Watts for mobile stations.

#### TEST PROCEDURE

ANSI / TIA / EIA 603C  
 RSS-132; RSS-133

#### MODES TESTED

- 1xRTT – RC3, 32(+SCH)
- EV-DO – Rev A

#### RESULTS for Cellular Band (ERP)

Mode	Channel	f (MHz)	ERP	
			dBm	mW
1xRTT (RC3, 32(+SCH))	1013	824.70	27.00	501.19
	384	836.52	27.60	575.44
	777	848.31	27.20	524.81
EVDO-REV A	1013	824.70	27.20	524.81
	384	836.52	27.70	588.84
	777	848.31	27.60	575.44

#### RESULTS for PCS Band (EIRP)

Mode	Channel	f (MHz)	EIRP	
			dBm	mW
1xRTT (RC3, 32(+SCH))	25	1851.25	27.40	549.54
	600	1880.00	27.60	575.44
	1175	1908.75	27.60	575.44
EVDO-REV A	25	1851.25	27.70	588.84
	600	1880.00	27.90	616.60
	1175	1908.75	27.80	602.56

**ERP for 1xRTT Mode (Cellular Band)**

Cellular Fundamental Substitution Measurement									
Compliance Certification Services, Fremont 5m Chamber									
Company: Sierra Wireless									
Project #: 08U12326									
Date: 1-19-2009									
Test Engineer: Chin Pang									
Configuration: EUT/Dipole Antenna									
Mode: Cell, 1xRTT									
<b>Test Equipment:</b>									
Receiving: Sunol T122, and 5m Chamber N-type Cable (Setup this one for testing EUT)									
Substitution: Dipole S/N: 00022117, and 4ft SMA Cable Warehouse S/N: 177081002, Thanh cable									
f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch</b>									
824.70	102.5	V	27.5	0.5	0.0	27.0	38.5	-11.4	
824.70	99.4	H	23.1	0.5	0.0	22.6	38.5	-15.8	
<b>Mid Ch</b>									
836.52	103.2	V	28.1	0.5	0.0	27.6	38.5	-10.9	
836.52	98.4	H	21.8	0.5	0.0	21.3	38.5	-17.1	
<b>High Ch</b>									
848.31	103.0	V	27.7	0.5	0.0	27.2	38.5	-11.2	
848.31	98.2	H	22.7	0.5	0.0	22.2	38.5	-16.3	
Rev. 1.24.7									

**ERP for EVDO-REV A Mode (Cellular Band)**

Cellular Fundamental Substitution Measurement									
Compliance Certification Services, Fremont 5m Chamber									
Company: Sierra Wireless									
Project #: 08U12326									
Date: 1-15-2009									
Test Engineer: Chin Pang									
Configuration: EUT/Dipole Antenna									
Mode: Cell, EV-DO Rev A									
<b>Test Equipment:</b>									
Receiving: Sunol T122, and 5m Chamber N-type Cable (Setup this one for testing EUT)									
Substitution: Dipole S/N: 00022117, and 4ft SMA Cable Warehouse S/N: 177081002, Thanh cable									
f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch</b>									
824.70	102.7	V	27.7	0.5	0.0	27.2	38.5	-11.2	
824.70	99.5	H	23.2	0.5	0.0	22.7	38.5	-15.7	
<b>Mid Ch</b>									
836.52	103.3	V	28.2	0.5	0.0	27.7	38.5	-10.8	
836.52	98.3	H	21.7	0.5	0.0	21.2	38.5	-17.2	
<b>High Ch</b>									
848.31	103.4	V	28.1	0.5	0.0	27.6	38.5	-10.8	
848.31	98.6	H	23.1	0.5	0.0	22.6	38.5	-15.9	
Rev. 1.24.7									

**EIRP for 1xRTT Mode (PCS Band)**

High Frequency Fundamental Measurement									
Compliance Certification Services, Fremont 5m Chamber Site									
Company: Sierra Wireless									
Project #: 08U12326									
Date: 1-19-2009									
Test Engineer: Chin Pang									
Configuration: EUT/Dipole Antenna									
Mode: PCS, 1xRTT									
<u>Test Equipment:</u>									
Receiving: Horn T73, and 20ft S/N: 228076 003									
Substitution: Horn T60 Substitution, 4ft SMA Cable Warehouse S/N: 187215 001									
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch</b>									
1.851	95.0	V	19.7	0.6	8.3	27.4	33.0	-5.6	
1.851	91.6	H	15.5	0.6	8.3	23.2	33.0	-9.8	
<b>Mid Ch</b>									
1.880	95.4	V	19.9	0.6	8.3	27.6	33.0	-5.4	
1.880	92.6	H	16.7	0.6	8.3	24.4	33.0	-8.6	
<b>High Ch</b>									
1.909	95.1	V	20.0	0.7	8.4	27.6	33.0	-5.4	
1.909	93.9	H	17.6	0.7	8.4	25.3	33.0	-7.7	

Rev. 1.24.7

**EIRP for EVDO-REV A Mode (PCS Band)**

High Frequency Fundamental Measurement									
Compliance Certification Services, Fremont 5m Chamber Site									
Company: Sierra Wireless									
Project #: 08U12326									
Date: 1-15-2009									
Test Engineer: Chin Pang									
Configuration: EUT/Dipole Antenna									
Mode: PCS, EV-DO Rev A									
<u>Test Equipment:</u>									
Receiving: Horn T73, and 20ft S/N: 228076 003									
Substitution: Horn T60 Substitution, 4ft SMA Cable Warehouse S/N: 187215 001									
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch</b>									
1.851	95.3	V	20.0	0.6	8.3	27.7	33.0	-5.3	
1.851	92.0	H	15.9	0.6	8.3	23.6	33.0	-9.4	
<b>Mid Ch</b>									
1.880	95.7	V	20.2	0.6	8.3	27.9	33.0	-5.1	
1.880	92.5	H	16.6	0.6	8.3	24.3	33.0	-8.7	
<b>High Ch</b>									
1.909	95.3	V	20.2	0.7	8.4	27.8	33.0	-5.2	
1.909	93.2	H	16.9	0.7	8.4	24.6	33.0	-8.4	

Rev. 1.24.7

## **11.2. FIELD STRENGTH OF SPURIOUS RADIATION**

### **RULE PART(S)**

FCC: §2.1053, §22.917, §24.238  
IC: RSS-132, 4.5; RSS-233, 6.5

### **LIMIT**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

### **TEST PROCEDURE**

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth ( i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth ( i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

### **MODES TESTED**

- 1xRTT – RC3, 32(+SCH)
- Ev-DO – Rev A

### **RESULTS**

**1xRTT Mode (Cellular Band)**

High Frequency Substitution Measurement										
Compliance Certification Services, Fremont 5m Chamber										
Company: Sierra Wireless										
Project #: 08U12326										
Date: 1/19/2009										
Test Engineer: Chin Pang										
Configuration: EUT/Dipole Antenna										
Mode: TX, Cell, 1xRTT										
Test Equipment:										
EMCO Horn 1-18GHz T73; S/N: 6717 @3m			Horn > 18GHz			Limit FCC 22		<input checked="" type="checkbox"/> High Pass Filter		
Hi Frequency Cables <input checked="" type="checkbox"/> 3' cable 22807700 <input checked="" type="checkbox"/> 12' cable 22807600 <input checked="" type="checkbox"/> 20' cable 22897500				Pre-amplifier 1-26GHz T145 Agilent 3008A1		Pre-amplifier 26-40GHz				
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch, 824.7MHz</b>										
1.649	60.0	H	-46.8	3.1	8.0	5.8	-44.0	-13.0	-31.0	
2.474	44.5	H	-59.7	3.9	9.5	7.4	-56.2	-13.0	-43.2	
3.299	43.0	H	-57.9	4.6	9.8	7.6	-54.9	-13.0	-41.9	
1.649	62.7	V	-44.8	3.1	8.0	5.8	-42.1	-13.0	-29.1	
2.474	47.5	V	-56.9	3.9	9.5	7.4	-53.4	-13.0	-40.4	
3.299	44.3	V	-56.7	4.6	9.8	7.6	-53.7	-13.0	-40.7	
<b>Mid Ch, 836.52MHz</b>										
1.673	58.9	H	-47.8	3.1	8.0	5.9	-45.0	-13.0	-32.0	
2.510	44.9	H	-59.2	3.9	9.6	7.4	-55.7	-13.0	-42.7	
3.346	43.1	H	-57.6	4.6	9.8	7.6	-54.6	-13.0	-41.6	
1.673	60.8	V	-46.6	3.1	8.0	5.9	-43.8	-13.0	-30.8	
2.510	51.5	V	-52.8	3.9	9.6	7.4	-49.3	-13.0	-36.3	
3.346	44.5	V	-56.3	4.6	9.8	7.6	-53.3	-13.0	-40.3	
<b>High Ch, 848.31MHz</b>										
1.697	60.0	H	-46.6	3.1	8.1	5.9	-43.8	-13.0	-30.8	
2.545	45.0	H	-58.9	4.0	9.6	7.4	-55.5	-13.0	-42.5	
3.393	43.0	H	-57.4	4.7	9.7	7.6	-54.5	-13.0	-41.5	
1.697	63.0	V	-44.3	3.1	8.1	5.9	-41.5	-13.0	-28.5	
2.545	49.0	V	-55.1	4.0	9.6	7.4	-51.7	-13.0	-38.7	
3.393	45.0	V	-55.5	4.7	9.7	7.6	-52.6	-13.0	-39.6	
Rev. 12.02.08										
Note: No other emissions were detected above the system noise floor.										

**EVDO-REV A Mode (Cellular Band)**

**High Frequency Substitution Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Sierra Wireless  
 Project #: 08U12326  
 Date: 1/16/2009  
 Test Engineer: Chin Pang  
 Configuration: EUT/Dipole Antenna  
 Mode: TX, Cell, EV-DO Rev A

**Test Equipment:**

EMCO Horn 1-18GHz  
T60; S/N: 2238 @3m

Horn > 18GHz

Limit  
FCC 22

High Pass Filter

Hi Frequency Cables  
 3' cable 22807700  
 12' cable 22807600  
 20' cable 22897500

Pre-amplifier 1-26GHz  
T145 Agilent 3008A1

Pre-amplifier 26-40GHz

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch, 824.7MHz</b>										
1.649	63.5	H	-41.5	3.1	7.1	4.9	-39.6	-13.0	-26.6	
2.474	46.0	H	-57.6	3.9	9.3	7.1	-54.4	-13.0	-41.4	
3.299	42.7	H	-57.6	4.6	9.4	7.3	-54.9	-13.0	-41.9	
1.649	62.0	V	-43.7	3.1	7.1	4.9	-41.8	-13.0	-28.8	
2.474	48.6	V	-55.2	3.9	9.3	7.1	-52.0	-13.0	-39.0	
3.299	45.0	V	-55.4	4.6	9.4	7.3	-52.7	-13.0	-39.7	
<b>Mid Ch, 836.52MHz</b>										
1.673	59.0	H	-45.9	3.1	7.2	5.0	-44.0	-13.0	-31.0	
2.510	45.0	H	-58.5	3.9	9.3	7.1	-55.3	-13.0	-42.3	
3.346	43.5	H	-56.6	4.6	9.5	7.3	-53.9	-13.0	-40.9	
1.673	60.0	V	-45.6	3.1	7.2	5.0	-43.7	-13.0	-30.7	
2.510	48.0	V	-55.7	3.9	9.3	7.1	-52.5	-13.0	-39.5	
3.346	45.0	V	-55.2	4.6	9.5	7.3	-52.5	-13.0	-39.5	
<b>High Ch, 848.31MHz</b>										
1.697	65.8	H	-39.1	3.1	7.2	5.1	-37.1	-13.0	-24.1	
2.545	46.0	H	-57.3	4.0	9.3	7.1	-54.2	-13.0	-41.2	
3.393	43.0	H	-56.9	4.7	9.5	7.3	-54.3	-13.0	-41.3	
1.697	62.0	V	-43.6	3.1	7.2	5.1	-41.6	-13.0	-28.6	
2.545	50.5	V	-53.0	4.0	9.3	7.1	-49.9	-13.0	-36.9	
3.393	45.3	V	-54.7	4.7	9.5	7.3	-52.1	-13.0	-39.1	

Rev. 12.02.08  
 Note: No other emissions were detected above the system noise floor.



**1xRTT Mode (PCS Band)**

High Frequency Substitution Measurement											
Compliance Certification Services, Fremont 5m Chamber											
Company: Sierra Wireless											
Project #: 08U12326											
Date: 1/19/2009											
Test Engineer: Chin Pang											
Configuration: EUT/Dipole Antenna											
Mode: TX, PCS, 1xRTT											
Test Equipment:											
EMCO Horn 1-18GHz			Horn > 18GHz				Limit		<input checked="" type="checkbox"/> High Pass Filter		
T60; S/N: 2238 @3m							FCC 24				
Hi Frequency Cables											
<input checked="" type="checkbox"/> 3' cable 22807700			<input checked="" type="checkbox"/> 12' cable 22807600			<input checked="" type="checkbox"/> 20' cable 22897500			Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz
						T145 Agilent 3008A1					
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes	
<b>Low Ch, 1851.25MHz</b>											
3.703	47.1	H	-51.8	4.9	9.7	7.5	-47.0	-13.0	-34.0		
5.554	40.5	H	-52.7	6.3	11.0	8.9	-47.9	-13.0	-34.9		
7.405	40.0	H	-50.3	7.3	12.0	9.8	-45.6	-13.0	-32.6		
3.703	47.0	V	-52.0	4.9	9.7	7.5	-47.2	-13.0	-34.2		
5.554	42.0	V	-52.2	6.3	11.0	8.9	-47.4	-13.0	-34.4		
7.405	41.0	V	-50.1	7.3	12.0	9.8	-45.4	-13.0	-32.4		
<b>Mid Ch, 1880MHz</b>											
3.760	48.0	H	-50.7	5.0	9.7	7.5	-45.9	-13.0	-32.9		
5.640	40.6	H	-52.7	6.3	11.2	9.0	-47.9	-13.0	-34.9		
7.520	40.0	H	-50.0	7.4	12.0	9.8	-45.4	-13.0	-32.4		
3.760	49.0	V	-49.8	5.0	9.7	7.5	-45.0	-13.0	-32.0		
5.640	41.0	V	-53.3	6.3	11.2	9.0	-48.5	-13.0	-35.5		
7.520	42.0	V	-48.8	7.4	12.0	9.8	-44.2	-13.0	-31.2		
<b>High Ch, 1908.75MHz</b>											
3.818	49.5	H	-49.0	5.0	9.7	7.6	-44.3	-13.0	-31.3		
5.726	42.0	H	-51.4	6.4	11.3	9.2	-46.5	-13.0	-33.5		
7.635	41.0	H	-48.7	7.4	12.0	9.8	-44.2	-13.0	-31.2		
3.818	49.7	V	-48.9	5.0	9.7	7.6	-44.2	-13.0	-31.2		
5.726	45.0	V	-49.4	6.4	11.3	9.2	-44.5	-13.0	-31.5		
7.635	42.0	V	-48.5	7.4	12.0	9.8	-44.0	-13.0	-31.0		
Rev. 12.02.08											
Note: No other emissions were detected above the system noise floor.											

**EVDO-REV A Mode (PCS Band)**

High Frequency Substitution Measurement										
Compliance Certification Services, Fremont 5m Chamber										
Company: Sierra Wireless										
Project #: 08U12326										
Date: 1/16/2009										
Test Engineer: Chin Pang										
Configuration: EUT/Dipole Antenna										
Mode: TX, PCS, EV-DO Rev A										
Test Equipment:										
EMCO Horn 1-18GHz T60; S/N: 2238 @3m			Horn > 18GHz			Limit FCC 24		<input checked="" type="checkbox"/> High Pass Filter		
Hi Frequency Cables <input checked="" type="checkbox"/> 3' cable 22807700 <input checked="" type="checkbox"/> 12' cable 22807600 <input checked="" type="checkbox"/> 20' cable 22897500				Pre-amplifier 1-26GHz T145 Agilent 3008A1		Pre-amplifier 26-40GHz				
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
<b>Low Ch, 1851.25MHz</b>										
3.703	47.5	H	-51.4	4.9	9.7	7.5	-46.6	-13.0	-33.6	
5.554	41.3	H	-51.9	6.3	11.0	8.9	-47.1	-13.0	-34.1	
7.405	40.8	H	-49.5	7.3	12.0	9.8	-44.8	-13.0	-31.8	
3.703	48.0	V	-51.0	4.9	9.7	7.5	-46.2	-13.0	-33.2	
5.554	43.2	V	-51.0	6.3	11.0	8.9	-46.2	-13.0	-33.2	
7.405	41.6	V	-49.5	7.3	12.0	9.8	-44.8	-13.0	-31.8	
<b>Mid Ch, 1880MHz</b>										
3.760	50.0	H	-48.7	5.0	9.7	7.5	-43.9	-13.0	-30.9	
5.640	41.0	H	-52.3	6.3	11.2	9.0	-47.5	-13.0	-34.5	
7.520	40.5	H	-49.5	7.4	12.0	9.8	-44.9	-13.0	-31.9	
3.760	52.0	V	-46.8	5.0	9.7	7.5	-42.0	-13.0	-29.0	
5.640	42.0	V	-52.3	6.3	11.2	9.0	-47.5	-13.0	-34.5	
7.520	42.8	V	-48.0	7.4	12.0	9.8	-43.4	-13.0	-30.4	
<b>High Ch, 1908.75MHz</b>										
3.818	49.4	H	-49.1	5.0	9.7	7.6	-44.4	-13.0	-31.4	
5.726	43.5	H	-49.9	6.4	11.3	9.2	-45.0	-13.0	-32.0	
7.635	41.8	H	-47.9	7.4	12.0	9.8	-43.4	-13.0	-30.4	
3.818	50.0	V	-48.6	5.0	9.7	7.6	-43.9	-13.0	-30.9	
5.726	44.6	V	-49.8	6.4	11.3	9.2	-44.9	-13.0	-31.9	
7.635	42.3	V	-48.2	7.4	12.0	9.8	-43.7	-13.0	-30.7	
Rev. 12.02.08										
Note: No other emissions were detected above the system noise floor.										

### 11.3. RECEIVER SPURIOUS EMISSIONS

#### RULE PART(S)

FCC: N/A  
IC: RSS-132, 4.6; RSS-133, 6.6, RSS-Gen

#### LIMIT

RSS-Gen 6 (a) - If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Table 1 - Spurious Emission Limits for Receivers:

Spurious Frequency (MHz)	Field Strength(microvolt/m at 3 meters)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

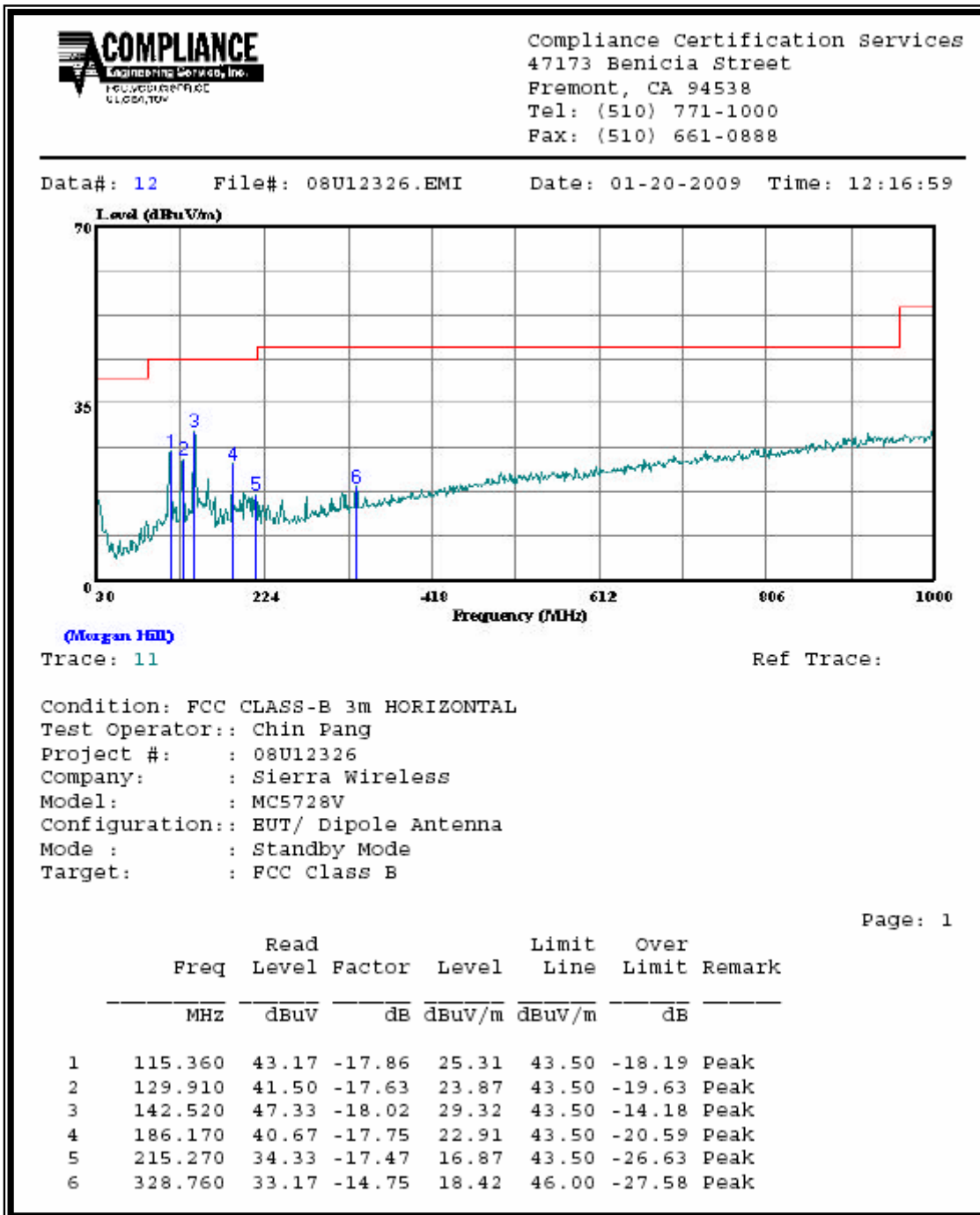
#### TEST PROCEDURE

RSS-Gen 4.10 - The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

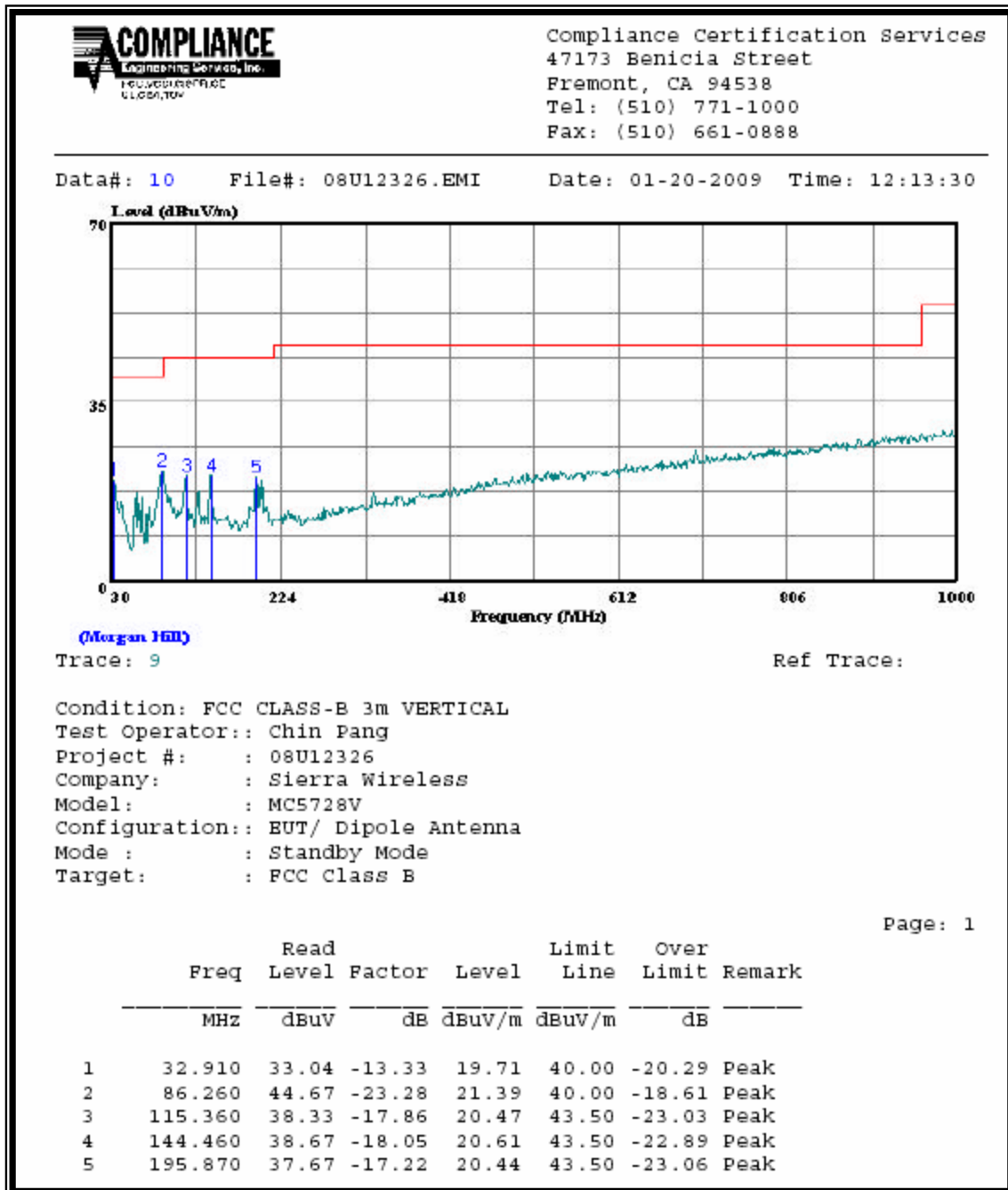
#### RESULTS

See the following pages.

**RECEIVER SPURIOUS EMISSIONS FOR 30 TO 1000 MHz, HORIZONTAL**



**RECEIVER SPURIOUS EMISSIONS FOR 30 TO 1000 MHz, VERTICAL**



**RECEIVER SPURIOUS EMISSIONS FOR ABOVE 1GHz**

Note: No emissions were found within above 1GHz of 20dB below the system noise floor.

## 11.4. POWER LINE CONDUCTED EMISSION

### LIMIT

RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

Table 2 – AC Power Lines Conducted Emission Limits

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

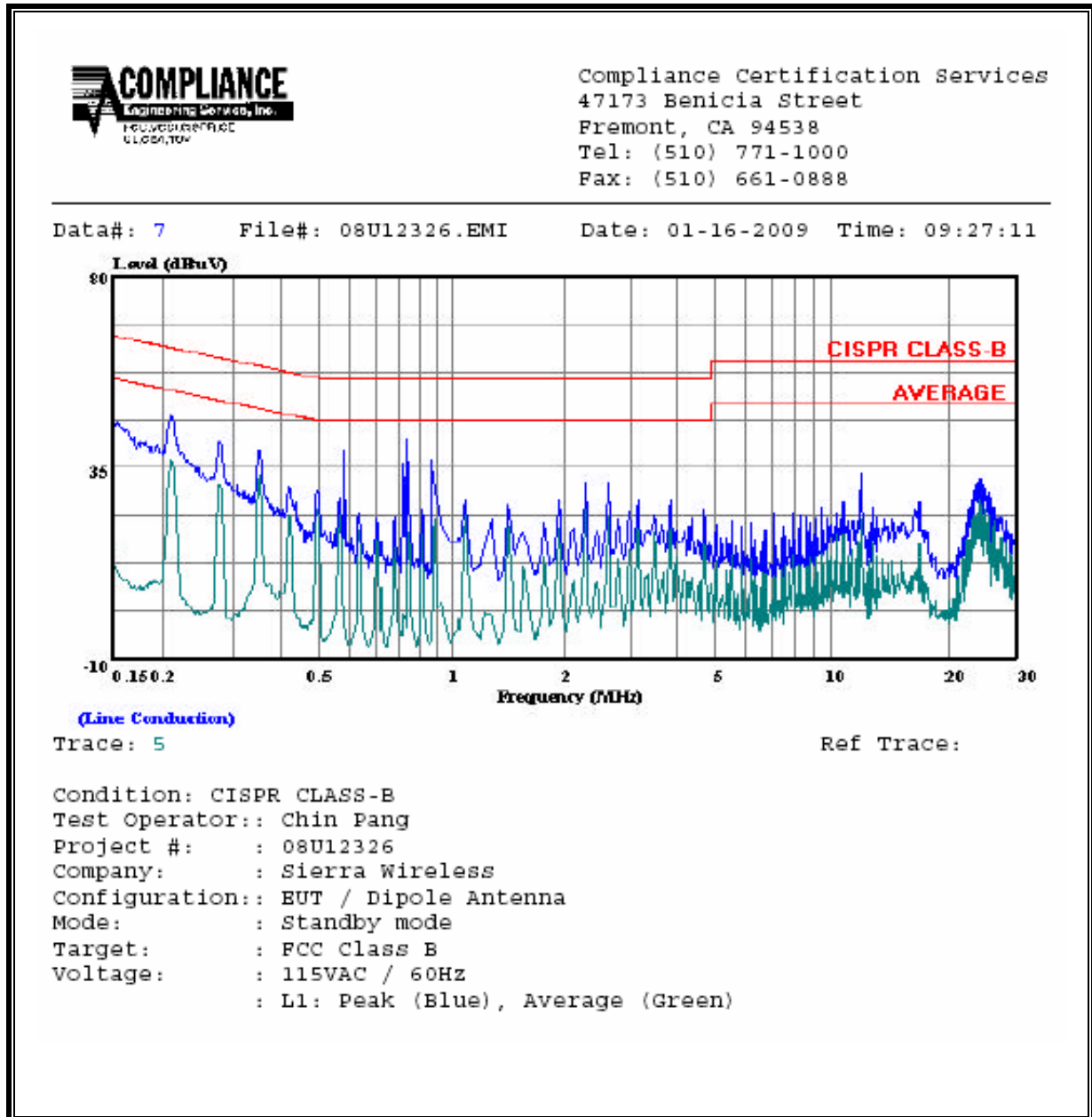
<sup>\*</sup>Decreases with the logarithm of the frequency.

### RESULTS

No non-compliance noted:

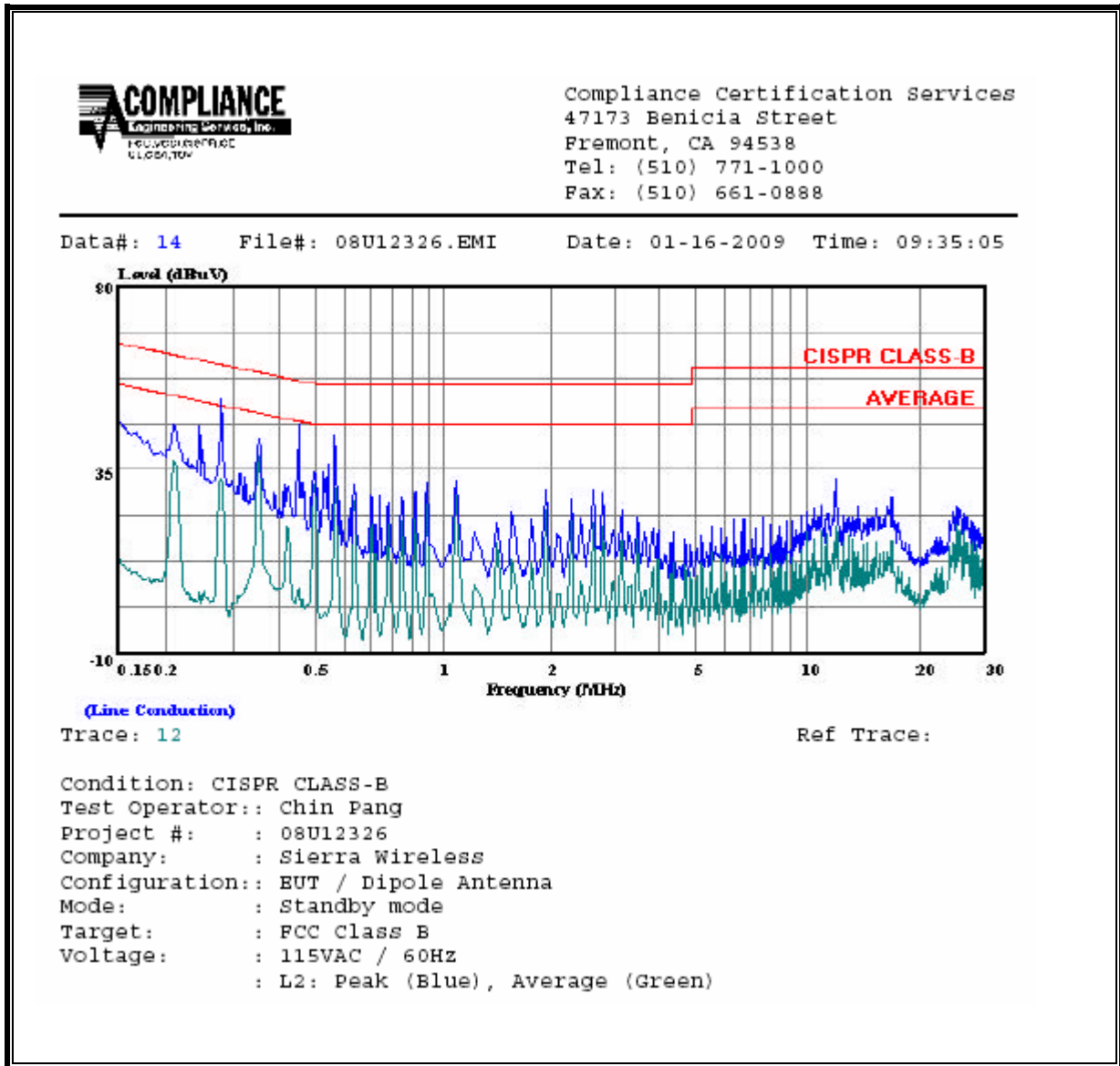
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.21	46.62	--	36.57	0.00	63.13	53.13	-16.51	-16.56	L1
0.84	41.75	--	22.81	0.00	56.00	46.00	-14.25	-23.19	L1
24.14	32.48	--	28.91	0.00	60.00	50.00	-27.52	-21.09	L1
0.21	45.36	--	37.00	0.00	63.13	53.13	-17.77	-16.13	L2
0.28	52.51	--	38.28	0.00	60.76	50.76	-8.25	-12.48	L2
12.00	32.79	--	21.38	0.00	60.00	50.00	-27.21	-28.62	L2
6 Worst Data									

**LINE 1 RESULTS**





**LINE 2 RESULTS**



## 12. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**IC RULES**

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5  
 Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> <sup>0.5</sup>	0.0042 <i>f</i> <sup>0.5</sup>	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> <sup>1.2</sup>
150 000–300 000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616 000 / <i>f</i> <sup>1.2</sup>

\* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
  2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
  3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

## CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm<sup>2</sup> is converted to units of W/m<sup>2</sup> by multiplying by a factor of 10.

**LIMITS**

From FCC §1.1310 Table 1 (B), the maximum value of  $S = 0.5498 \text{ mW/cm}^2$  (Cell) and  $S = 1.0 \text{ mW/cm}^2$  (PCS)

From IC Safety Code 6, Section 2.2 Table 5 Column 4,  $S = 5.498 \text{ mW/cm}^2$  (Cell) and  $S = 10 \text{ mW/cm}^2$  (PCS)

**RESULTS**

Band	MPE Distance (cm)	Output Power (dBm)	Max Antenna Gain (dBi)	FCC Power Density ( $\text{mW/cm}^2$ )	IC Power Density ( $\text{W/m}^2$ )
Cell	20.0	29.82	4.55	0.54	5.44
PCS	20.0	29.11	2.85	0.31	3.12