



FCC CFR47 PART 22 SUBPART H  
FCC CFR47 PART 24 SUBPART E  
INDUSTRY CANADA RSS-132 ISSUE 2  
INDUSTRY CANADA RSS-133 ISSUE 5  
CLASS II PERMISSIVE CHANGE

CERTIFICATION TEST REPORT  
FOR

DUAL- BAND CDMA (1XRTT) MODULE  
MODEL NUMBER: GTM-2

FCC ID: N7NGTM2  
IC: 2417C-GTM2

REPORT NUMBER: 11U14089-1, REVISION A

ISSUE DATE: JANUARY 03, 2012

*Prepared for*

SIERRA WIRELESS INC. - YW  
13811 WIRELESS WAY  
RICHMOND, BRITISH COLUMBIA V6V3A4, CANADA

*Prepared by*

COMPLIANCE CERTIFICATION SERVICES (UL CCS  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888

**NVLAP**<sup>®</sup>

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Revision History

Rev.	Date	Issue	Revised By
---	10/18/11	Initial Issue	T. Chan
---	01/03/12	Corrected Typo on Page 21 Regarding the EIRP Reading on High Channel	T. Chan

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SIERRA WIRELESS INC. - YW  
13811 WIRELESS WAY  
RICHMOND, BRITISH COLUMBIA V6V3A4, CANADA

**EUT DESCRIPTION:** DUAL- BAND CDMA (1XRTT) MODULE

**MODEL:** GTM-2

**SERIAL NUMBER:** MEIDx0414

**DATE TESTED:** OCTOBER 12-14, 2011

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22H & 24E	Pass
IC RSS-132 ISSUE 2 & RSS-133 ISSUE 5	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:



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THU CHAN  
ENGINEERING MANAGER  
UL CCS

Tested By:



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CHIN PANG  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, FCC CFR Part 24, RSS-132 Issue 2 and RSS-133 Issue 5.

## 3. FACILITIES AND ACCREDITATION

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

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dB<sub>BuV</sub>/m) = Measured Voltage (dB<sub>BuV</sub>) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

$$36.5 \text{ dB}_B uV + 18.7 \text{ dB}/m + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dB}_B uV/m$$

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 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 CDMA (1XRTT) Radio Module that is manufactured by Sierra Wireless.

#### GENERAL INFORMATION

Power Requirements	12 VDC/1.2A AC Adapter
List of frequencies generated or used by the EUT	32KHz & 19.2MHz

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has an average conducted output powers as follows:

Part 22 Cellular Band

Frequency range (MHz)	Modulation	Conducted		ERP	
		dBm	mW	dBm	mW
824.7 – 848.31	1xRTT	24.30	269.15	29.67	926.8

Part 24 PCS Band

Frequency range (MHz)	Modulation	Conducted		EIRP	
		dBm	mW	dBm	mW
1851.25 – 1908.75	1xRTT	24.25	266.1	29.88	972.7

### 5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is to change antenna connection-antenna detect and ESD.

### 5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a monopole external antenna, with a maximum gain of 8.2 and 7.15dBi for Cell and PCS bands respectively.

### 5.5. SOFTWARE AND FIRMWARE

The EUT is linked with 8960 Agilent Wireless Communication Test Set.

## 5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

Based on the investigation results, the highest peak power is the worst-case scenario for all measurements.

Worst-case modes:

- Cellular & PCS Bands:
  - CDMA 1xRTT

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PCS, 1xRTT Modulation

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)	Conducted Avg Power (dBm)	Conducted Avg Power (mW)
Low	1851.25	29.70	933.25	24.69	294.44
Middle	1880.00	29.58	907.82	24.56	285.76
High	1908.75	29.01	796.16	24.28	267.92

### I/O CABLES (Conducted Setup)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Un-shielded	2.0m	N/A
2	DC	1	DC	Un-shielded	2.0m	N/A
3	DCM	1	36pins	Un-shielded	0.2m	N/A
4	DCM	1	7 pins	Un-shielded	0.5m	N/A
5	Antenna Port	1	Directional Coupler	Un-shielded	0.10m	N/A
6	USB	1	USB	Un-shielded	2.0m	N/A
7	SMA	1	SMA	Shielded	0.8m	N/A

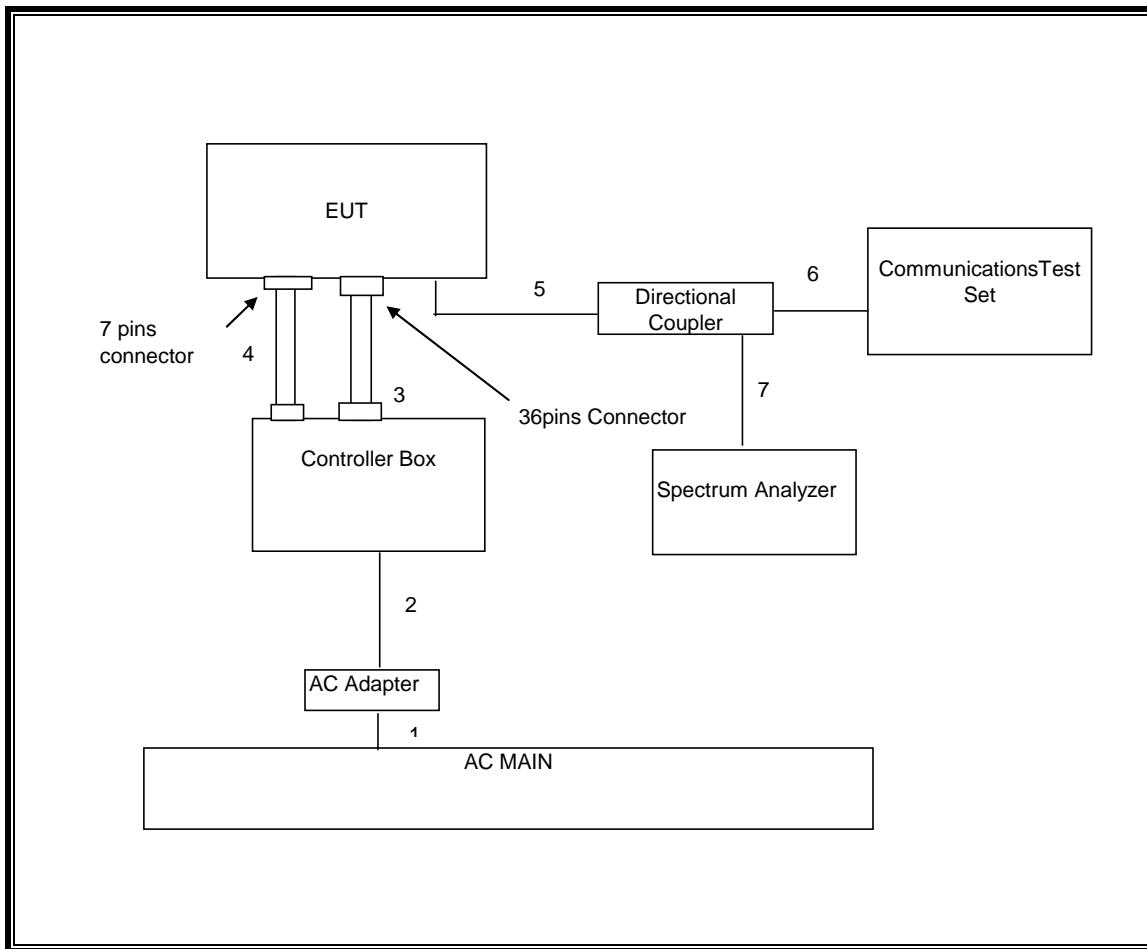
### I/O CABLES (Radiated Setup)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Un-shielded	2.0m	N/A
2	DC	1	DC	Un-shielded	2.0m	N/A
3	DCM	1	36pins	Un-shielded	0.2m	N/A
4	DCM	1	7 pins	Un-shielded	0.5m	N/A
5	Antenna Port	1	Antenna	Un-shielded	0.3m	N/A

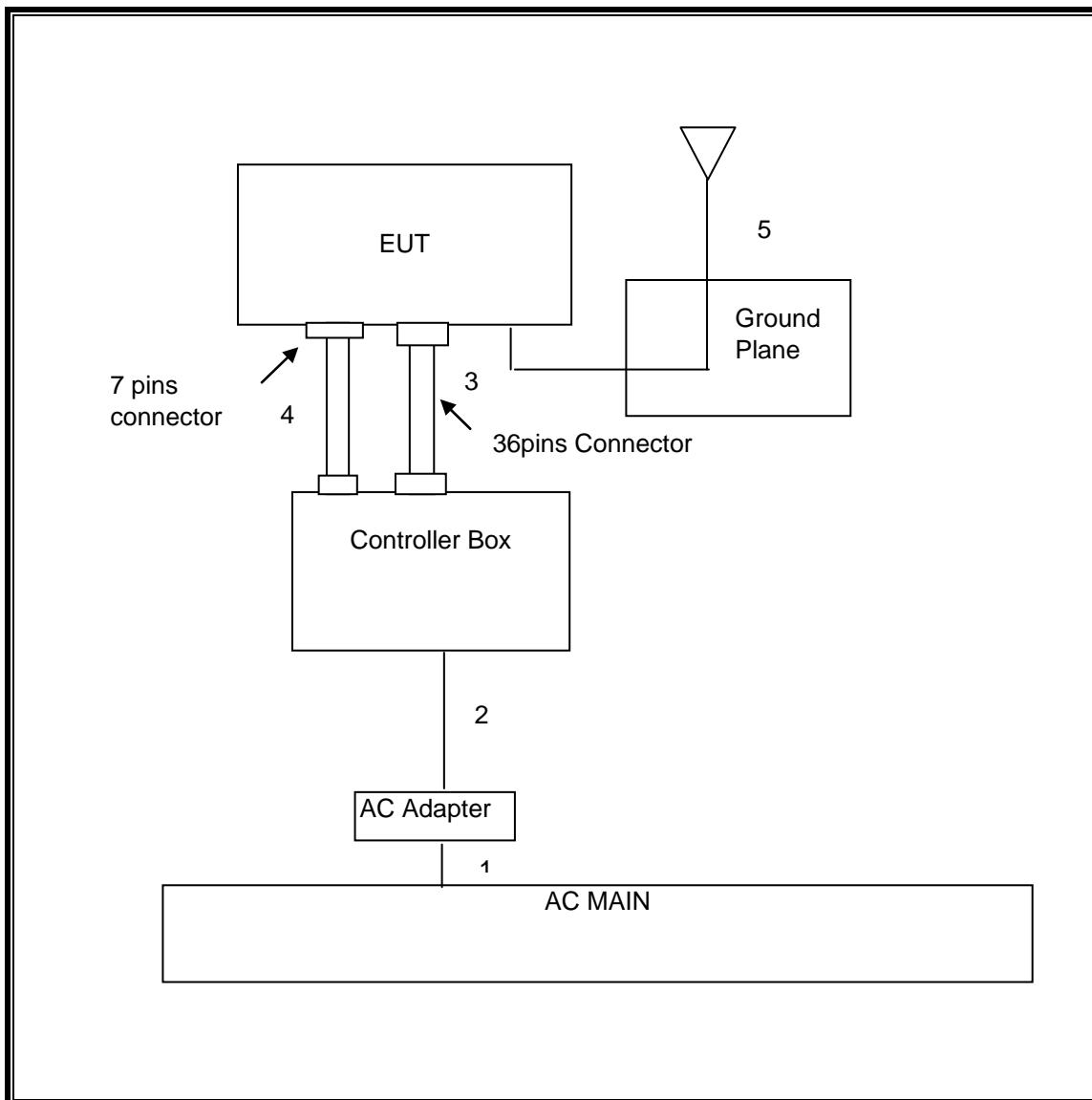
### TEST SETUP

The EUT is attached to the test board that is connected to an AC Adapter and Laptop during the test. A wireless link was established between the EUT and the communications test set.

**SETUP DIAGRAM FOR CONDUCTED TESTS**



**SETUP DIAGRAM FOR RADIATED TESTS**



## 6. 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, 26.5 GHz	Agilent / HP	E4440A	C01178	08/15/12
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	07/06/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/12/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/27/12
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/12
Antenna, Horn, 18 GHz	EMCO	3115	C00943	06/29/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/16/12
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	11/10/11
Directional Coupler, 18 GHz	Krytar	1817	N02656	CNR
Communications Test Set	Agilent / HP	E5515C	C01086	06/17/12
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	04/20/12
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02688	CNR
Signal Generator, 20 GHz	Agilent / HP	E4438C	N/A	06/09/12
Antenna, Tuned Dipole 400~1000	ETS	3121C DB4	C00993	07/16/12

## 7. CONDUCTED TEST RESULTS

### 7.1. RF POWER OUTPUT

#### LIMIT

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

24.232(b) & RSS133 § 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 The maximum ERP shall be 6.3 Watts for mobile stations.

#### TEST PROCEDURE

RSS-132, RSS-133, & ANSI / TIA / EIA 603C Clause 2.2.17

#### RESULTS

##### CELL, 1xRTT Modulation

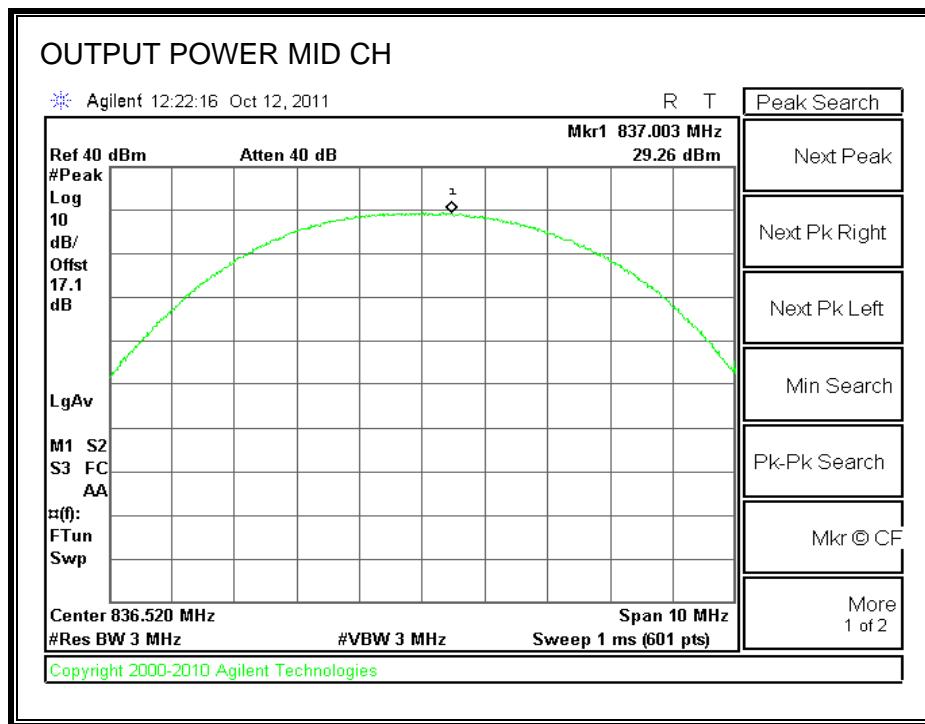
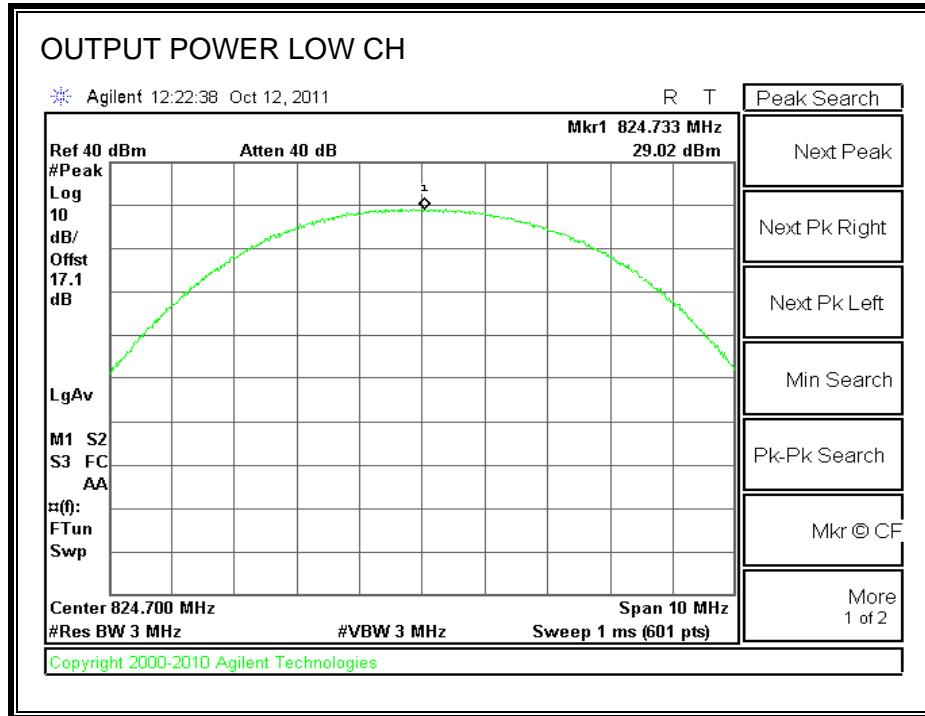
Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)	Conducted Avg Power (dBm)	Conducted Avg Power (mW)
Low	824.70	29.02	797.99	24.30	269.15
Middle	836.52	29.26	843.33	24.25	266.07
High	848.31	28.89	774.46	24.23	264.85

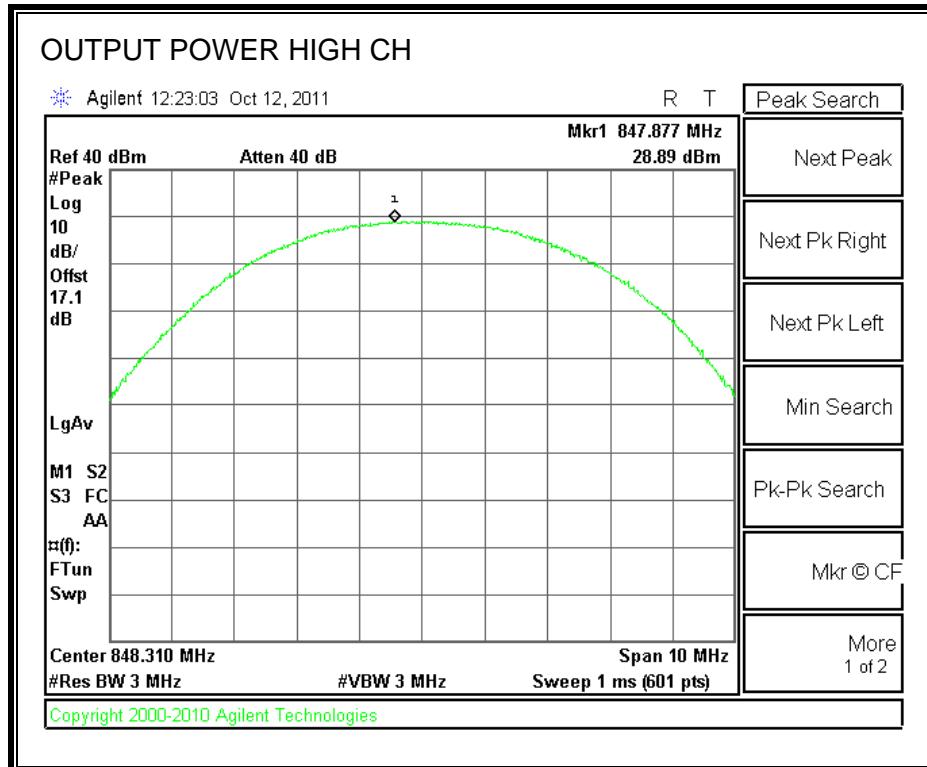
##### PCS, 1xRTT Modulation

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)	Conducted Avg Power (dBm)	Conducted Avg Power (mW)
Low	1851.25	28.94	783.43	24.25	266.07
Middle	1880.00	29.36	862.98	24.20	263.03
High	1908.75	29.15	822.24	24.15	260.02

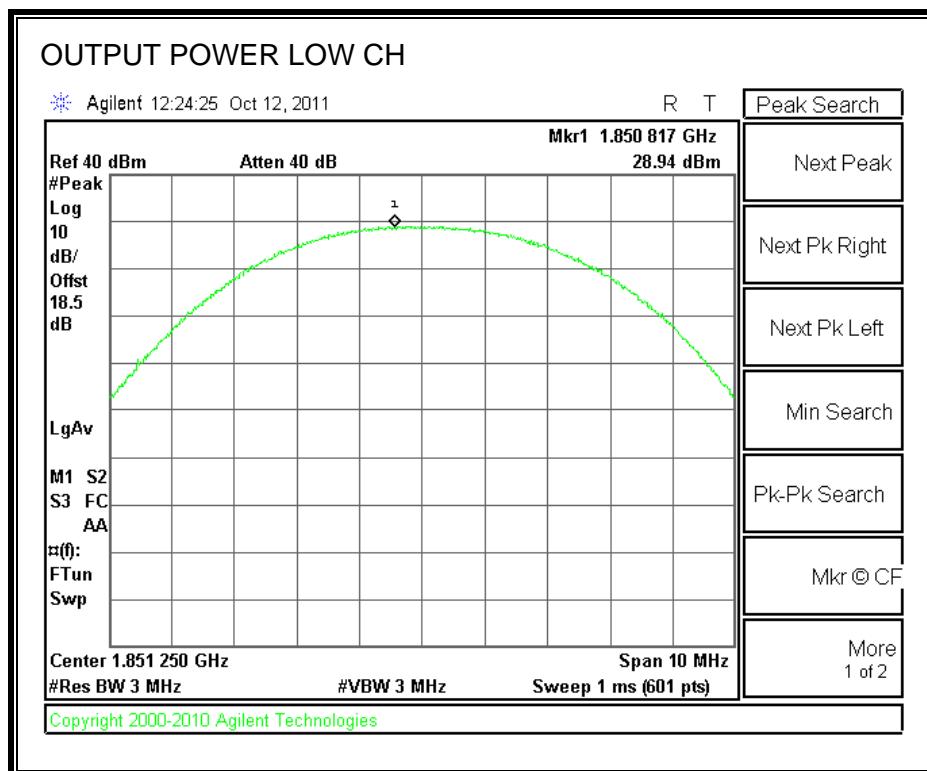
NOTE: Peak power reading at spectrum analyzer with RBW=VBW=3MHz, and average power with average power meter.

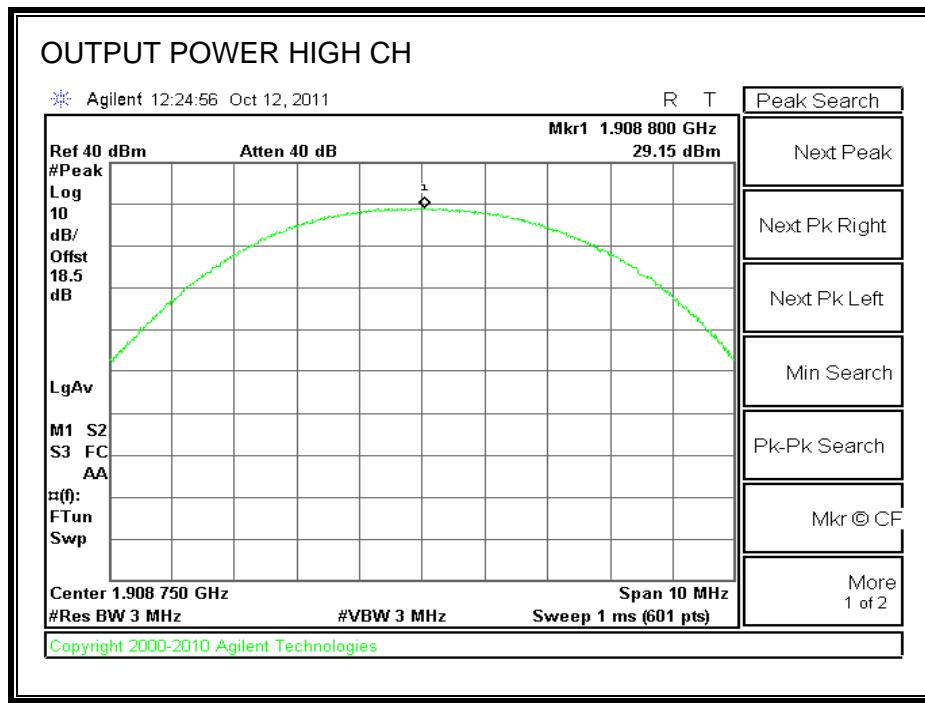
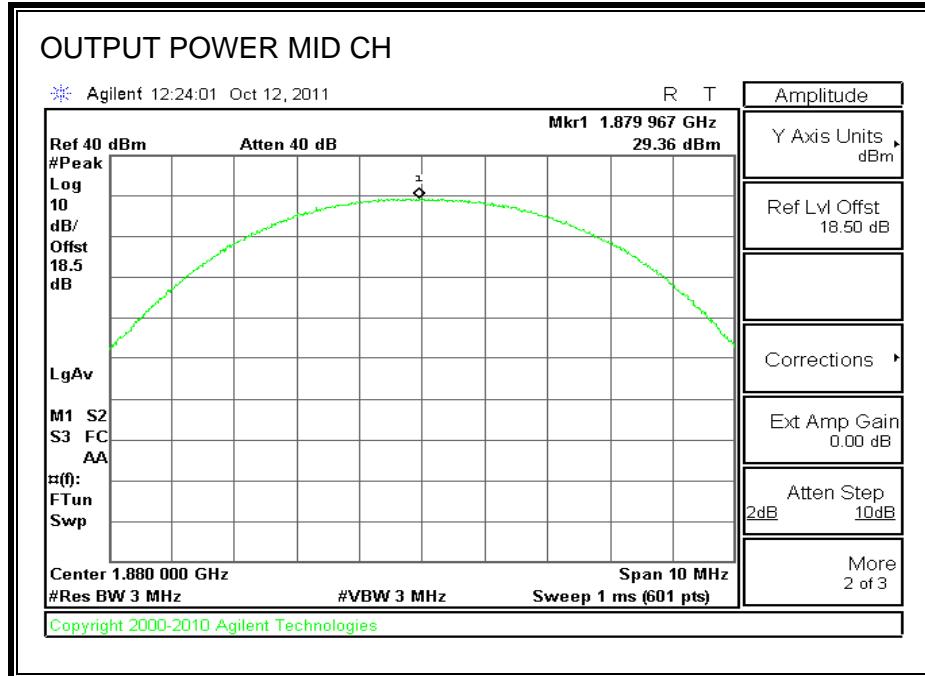
## CELL PEAK POWER, 1xRTT MODULATION





## PCS PEAK POWER, 1xRTT MODULATION





## 7.2. SPURIOUS EMISSION AT ANTENNA TERMINAL

### LIMIT

§22.917 (e) and §24.238 (a), 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

ANSI / TIA / EIA 603 Clause 3.2.13 & FCC 22.917 (h)

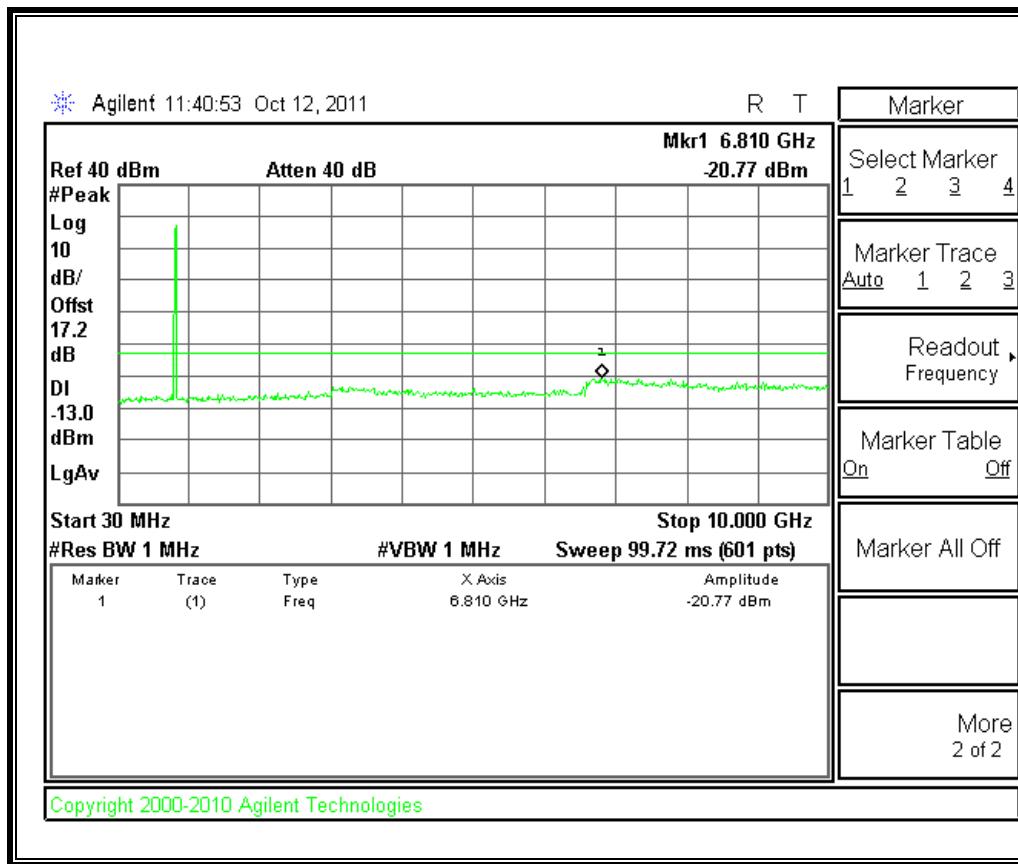
### MODES TESTED

- CDMA – 1xRTT

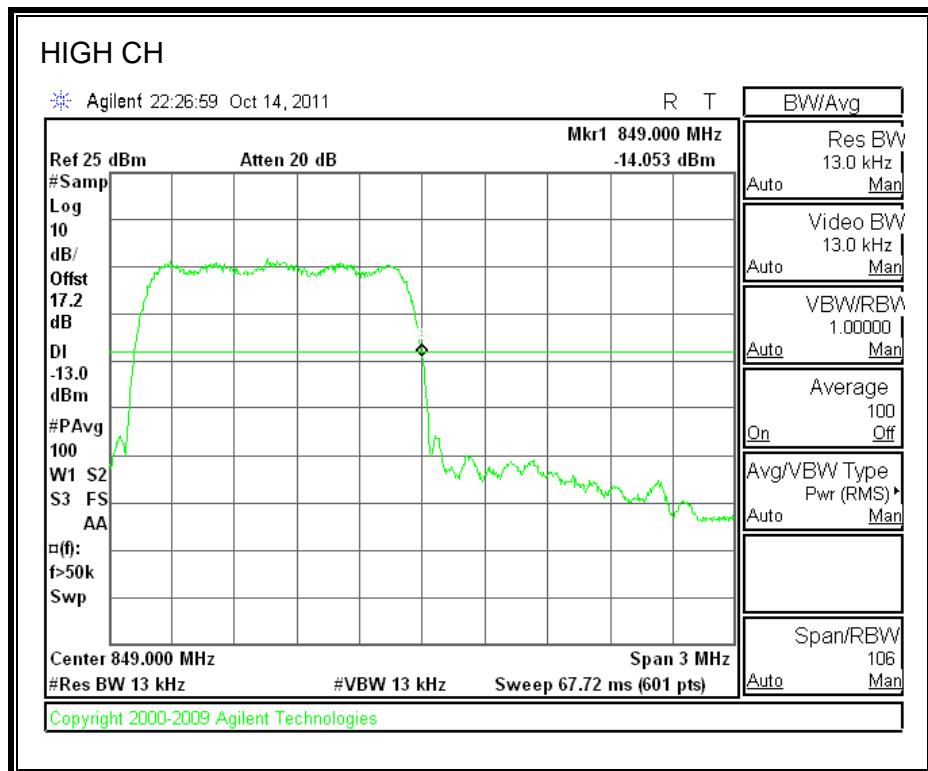
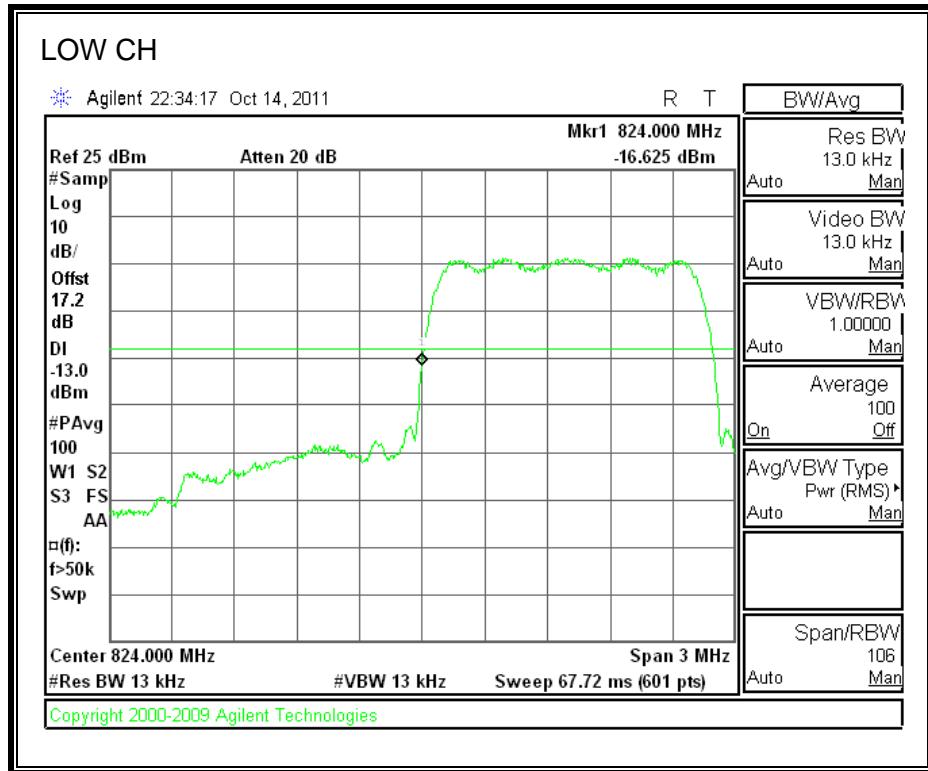
### RESULTS

**CELL, 1xRTT MODULATION:**

**MID Channel, Out-Of-Band Emissions**

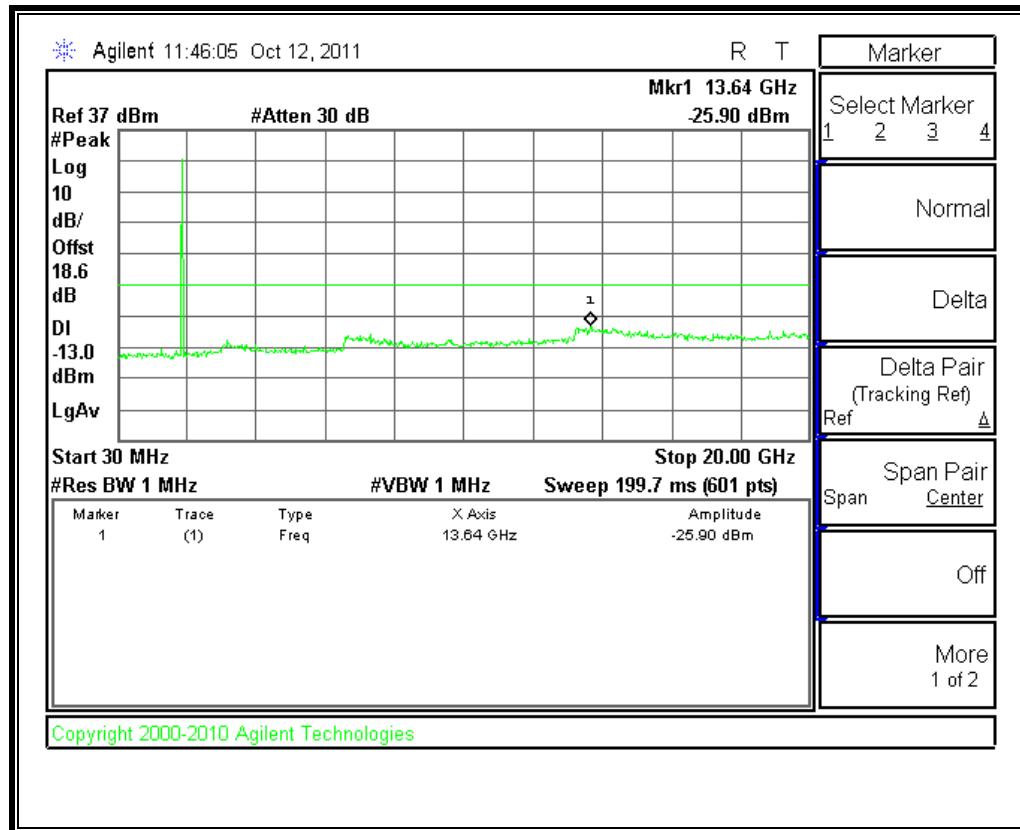


**CELL BAND, Low Channel Band Edge**

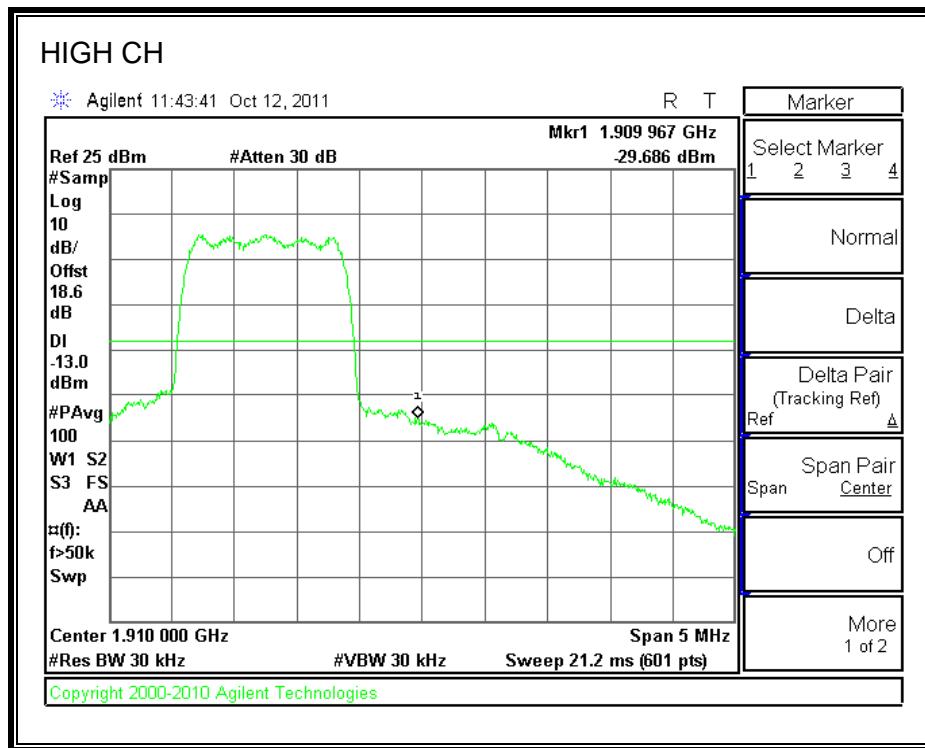
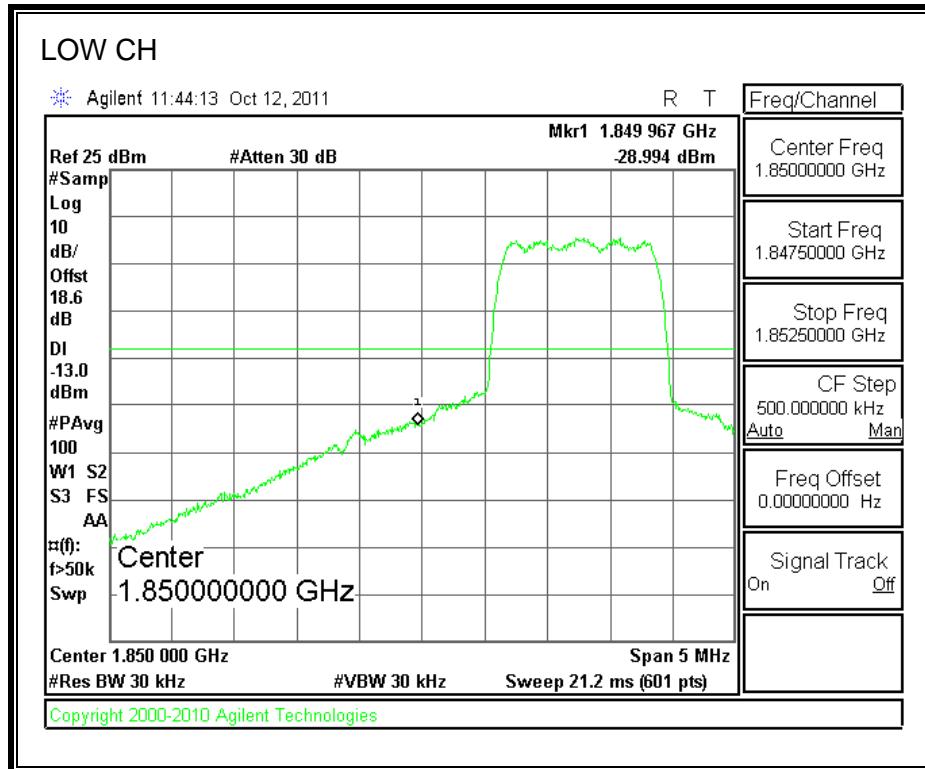


## **PCS 1xRTT MODULATION RESULTS**

### **MID Channel, Out-Of-Band Emissions**



**PCS BAND, Low Channel Band Edge**



## 8. RADIATED TEST RESULTS

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

#### LIMIT

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

24.232(b) & RSS133 § 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 The maximum ERP shall be 6.3 Watts for mobile stations.

#### TEST PROCEDURE

RSS-132, RSS-133, & ANSI / TIA / EIA 603C Clause 2.2.17

#### MODES TESTED

- CDMA – 1xRTT

#### RESULTS for Cellular Band (ERP)

Mode	Channel	f (MHz)	ERP	
			dBm	mW
1xRTT	1013	824.70	<b>29.67</b>	926.83
	384	836.52	27.81	603.95
	777	848.31	28.40	691.83

#### RESULTS for PCS Band (EIRP)

Mode	Channel	f (MHz)	EIRP	
			dBm	mW
1xRTT	512	1850.20	29.26	843.33
	661	1880.00	29.63	918.33
	810	1909.80	<b>29.88</b>	972.75

**CELL 1xRTT MODULATION**

**High Frequency Substitution Measurement  
Compliance Certification Services Chamber B**

**Company:** Sierra Wireless  
**Project #:** 11U14089  
**Date:** 10/12/11  
**Test Engineer:** Chin Pang  
**Configuration:** EUT ALONE  
**Mode:** TX, CELL BAND CDMA2000, 1xRTT

**Test Equipment:**

**Receiving:** Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)  
**Substitution:** Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.70	30.17	V	0.5	0.0	29.67	38.5	-8.8	
824.70	20.54	H	0.5	0.0	20.04	38.5	-18.4	
Mid Ch								
836.52	28.31	V	0.5	0.0	27.81	38.5	-10.6	
836.52	21.79	H	0.5	0.0	21.29	38.5	-17.2	
High Ch								
848.31	28.90	V	0.5	0.0	28.40	38.5	-10.0	
848.31	21.55	H	0.5	0.0	21.05	38.5	-17.4	

Rev. 3.17.11

## PCS 1xRTT MODULATION

<b>High Frequency Fundamental Measurement Compliance Certification Services Chamber B</b>																
<b>Company:</b>	Sierra Wireless															
<b>Project #:</b>	11U14089															
<b>Date:</b>	10/12/11															
<b>Test Engineer:</b>	Chin Pang															
<b>Configuration:</b>	EUT ALONE															
<b>Mode:</b>	TX, PCS BAND CDMA MODE															
<b>Test Equipment:</b>																
Receiving: Horn T59, and Camber B SMA Cables																
Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse																
<b>f GHz</b>	<b>SG reading (dBm)</b>	<b>Ant. Pol. (H/V)</b>	<b>Cable Loss (dB)</b>	<b>Antenna Gain (dBi)</b>	<b>EIRP (dBm)</b>	<b>Limit (dBm)</b>	<b>Delta (dB)</b>	<b>Notes</b>								
Low Ch																
1.851	22.1	V	0.85	8.01	29.26	33.0	-3.7									
1.851	14.9	H	0.85	8.01	22.06	33.0	-10.9									
Mid Ch																
1.880	22.4	V	0.85	8.13	29.63	33.0	-3.4									
1.880	15.4	H	0.85	8.13	22.72	33.0	-10.3									
High Ch																
1.909	22.6	V	0.85	8.13	29.88	33.0	-3.1									
1.909	15.6	H	0.85	8.13	22.88	33.0	-10.1									
Rev. 3.17.11																

## 8.2. 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

- CDMA – 1xRTT

### RESULTS

## CELL 1xRTT MODULATION

Compliance Certification Services Above 1GHz High Frequency Substitution Measurement									
<b>Company:</b>	Sierra Wireless								
<b>Project #:</b>	11U14089								
<b>Date:</b>	10/12/11								
<b>Test Engineer:</b>	Chin Pang								
<b>Configuration:</b>	EUT with Antenna								
<b>Mode:</b>	TX, CELL BANDCDMA2000 1xRTT MODE								
<b>Chamber</b>		<b>Pre-amplifier</b>		<b>Filter</b>		<b>Limit</b>			
5m Chamber B		T145 8449B		Filter 1		Part 22			
f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (824.7MHz)									
1.649	-15.2	V	3.0	35.5	1.0	-49.7	-13.0	-36.7	
2.474	-13.1	V	3.0	35.4	1.0	-47.5	-13.0	-34.5	
1.649	-16.8	H	3.0	35.5	1.0	-51.3	-13.0	-38.3	
2.474	-15.6	H	3.0	35.4	1.0	-50.0	-13.0	-37.0	
Mid Ch, (836.52MHz)									
1.673	-11.4	V	3.0	35.5	1.0	-45.9	-13.0	-32.9	
2.510	-14.2	V	3.0	35.4	1.0	-48.6	-13.0	-35.6	
1.673	-14.3	H	3.0	35.5	1.0	-48.9	-13.0	-35.9	
2.510	-17.3	H	3.0	35.4	1.0	-51.7	-13.0	-38.7	
High Ch, (848.31MHz)									
1.697	-10.6	V	3.0	35.5	1.0	-45.1	-13.0	-32.1	
2.545	-12.8	V	3.0	35.4	1.0	-47.3	-13.0	-34.3	
1.697	-14.3	H	3.0	35.5	1.0	-48.8	-13.0	-35.8	
2.545	-17.9	H	3.0	35.4	1.0	-52.3	-13.0	-39.3	

Rev. 03.03.09  
Note: No other emissions were detected above the system noise floor.

## PCS 1xRTT MODULATION

**Compliance Certification Services**  
**Above 1GHz High Frequency Substitution Measurement**

**Company:** Sierra Wireless  
**Project #:** 11U14089  
**Date:** 10/12/11  
**Test Engineer:** Chin Pang  
**Configuration:** EUT with Antenna  
**Mode:** TX, PCS BAND CDMA2000, 1xRTT MODE

Chamber	Pre-amplifier	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
<b>Low Ch, (1851.25MHz)</b>									
3.703	-11.4	V	3.0	35.4	1.0	45.7	-13.0	-32.7	
5.554	-11.4	V	3.0	35.4	1.0	45.8	-13.0	-32.8	
3.703	-12.0	H	3.0	35.4	1.0	46.3	-13.0	-33.3	
5.554	-12.7	H	3.0	35.4	1.0	47.1	-13.0	-34.1	
<b>Mid Ch, (1880.0MHz)</b>									
3.760	6.8	V	3.0	35.3	1.0	41.2	-13.0	28.2	
5.640	7.5	V	3.0	35.4	1.0	41.9	-13.0	28.9	
3.760	-12.5	H	3.0	35.3	1.0	46.8	-13.0	-33.8	
5.640	-11.8	H	3.0	35.4	1.0	46.3	-13.0	-33.3	
<b>High Ch, (1908.75MHz)</b>									
3.818	8.2	V	3.0	35.3	1.0	42.5	-13.0	29.5	
5.726	-5.9	V	3.0	35.4	1.0	40.4	-13.0	-27.4	
3.818	-13.9	H	3.0	35.3	1.0	48.2	-13.0	-35.2	
5.726	-11.9	H	3.0	35.4	1.0	46.3	-13.0	-33.3	

Rev. 03.03.09  
Note: No other emissions were detected above the system noise floor.

### 8.3. RECEIVER SPURIOUS EMISSIONS

#### LIMIT

RSS-Gen 7.2.2

Spurious Emission Limits for Receivers:

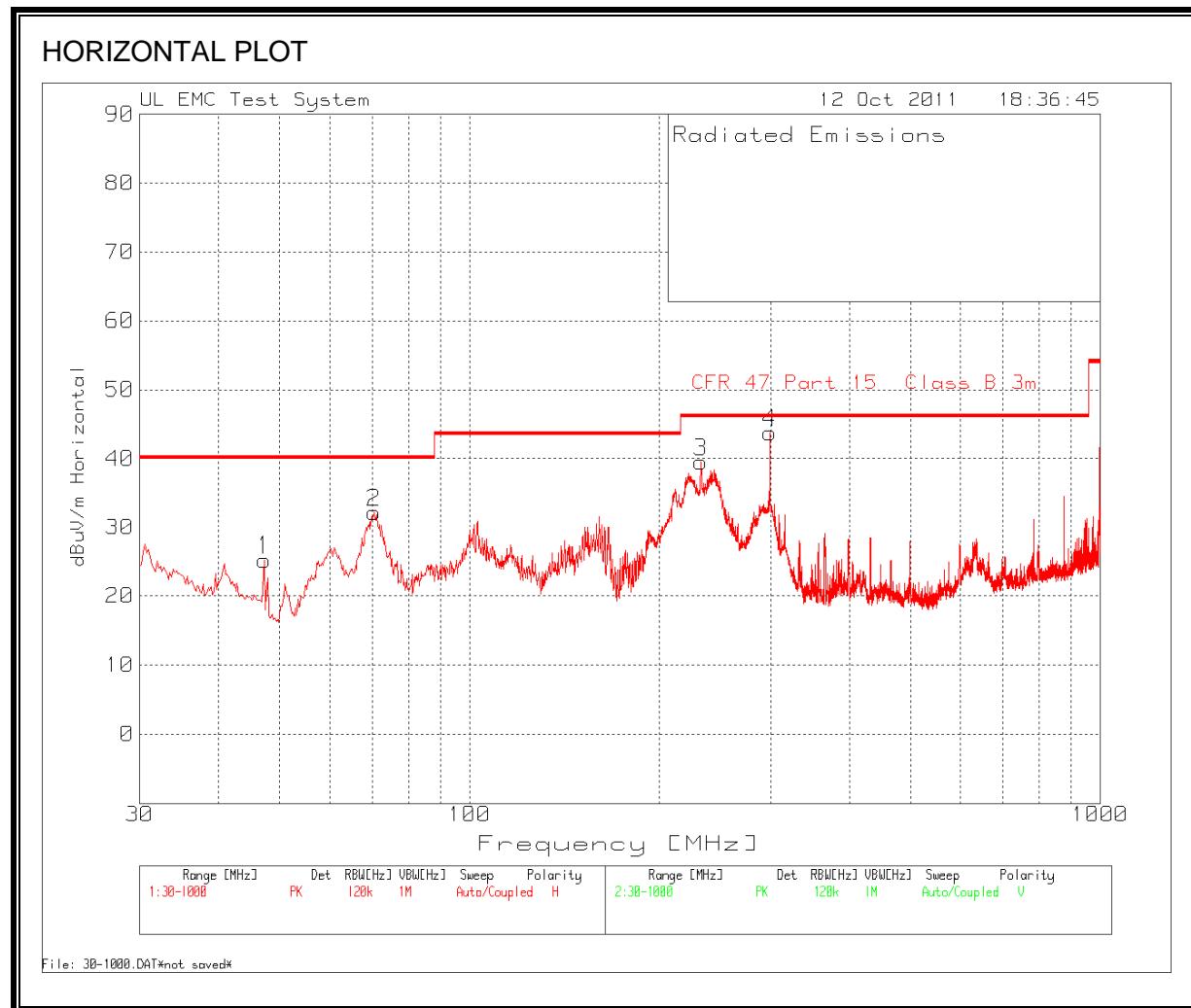
Spurious Frequency (MHz)	Field Strength (microvolts/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

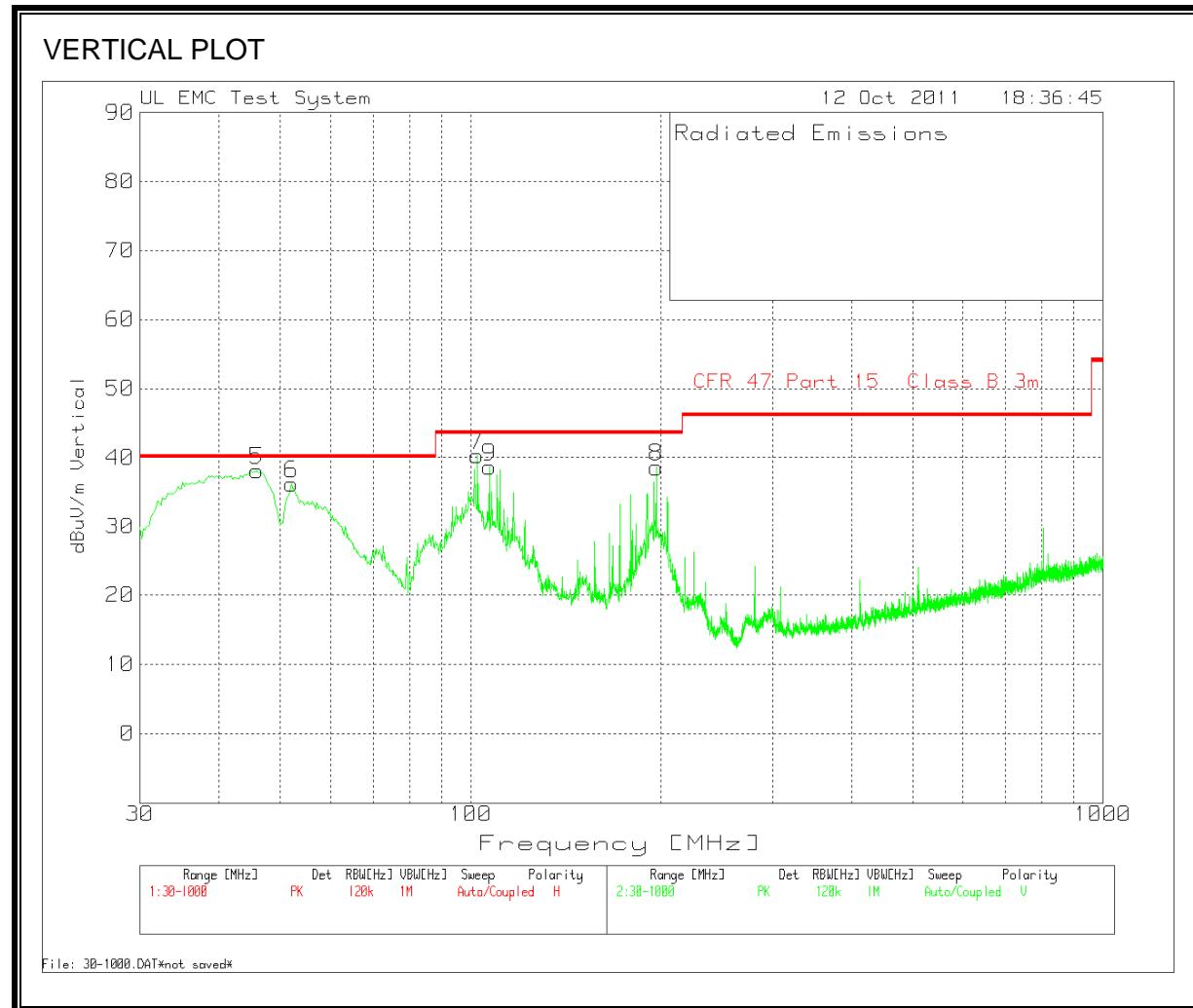
#### TEST PROCEDURE

The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (local oscillator frequency, intermediate frequency or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable and local oscillator frequencies.

#### RESULTS

**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)**





### HORIZONTAL AND VERTICAL DATA

Range 1 30 - 1000MHz										
Frequency	Reading	Detector	Cable	TX	PreAmp	[dB]	dB	Factors	dBuV/m	Part 15B
										Margin
47.2522	43.9	PK		1	-29.4	9.7	25.2		40	-14.8
70.5136	52.25	PK		1.2	-29.4	8.2	32.25		40	-7.75
232.3741	54.32	PK		2.1	-28.8	11.9	39.52		46	-6.48
299.2506	56.6	PK		2.4	-28.5	13.3	43.8		46	-2.2
299.2037	47.37	QP		2.4	-28.5	13.3	34.57		46	-11.43
2 30 - 1000MHz										
Frequency	Reading	Detector	Cable	TX	PreAmp	[dB]	dB	Factors	dBuV/m	Part 15B
										Margin
45.8953	56	PK		1	-29.4	10.5	38.1		40	-1.9
45.8953	51.56	QP		1	-29.4	9.8	32.96		40	-7.04
52.0983	56.59	PK		1	-29.4	8	36.19		40	-3.81
51.9777	50.72	QP		1	-29.4	8	30.32		40	-9.68
102.498	57.63	PK		1.5	-29.3	10.5	40.33		43.5	-3.17
196.5128	53.87	PK		1.9	-28.9	11.7	38.57		43.5	-4.93
106.9564	55.09	PK		1.5	-29.3	11.3	38.59		43.5	-4.91

**SPURIOUS EMISSIONS ABOVE 1000 MHz (WORST-CASE CONFIGURATION)**

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

## 8.4. 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	56 to 46
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### RESULTS

## 6 WORST EMISSIONS

### AC ADAPTER

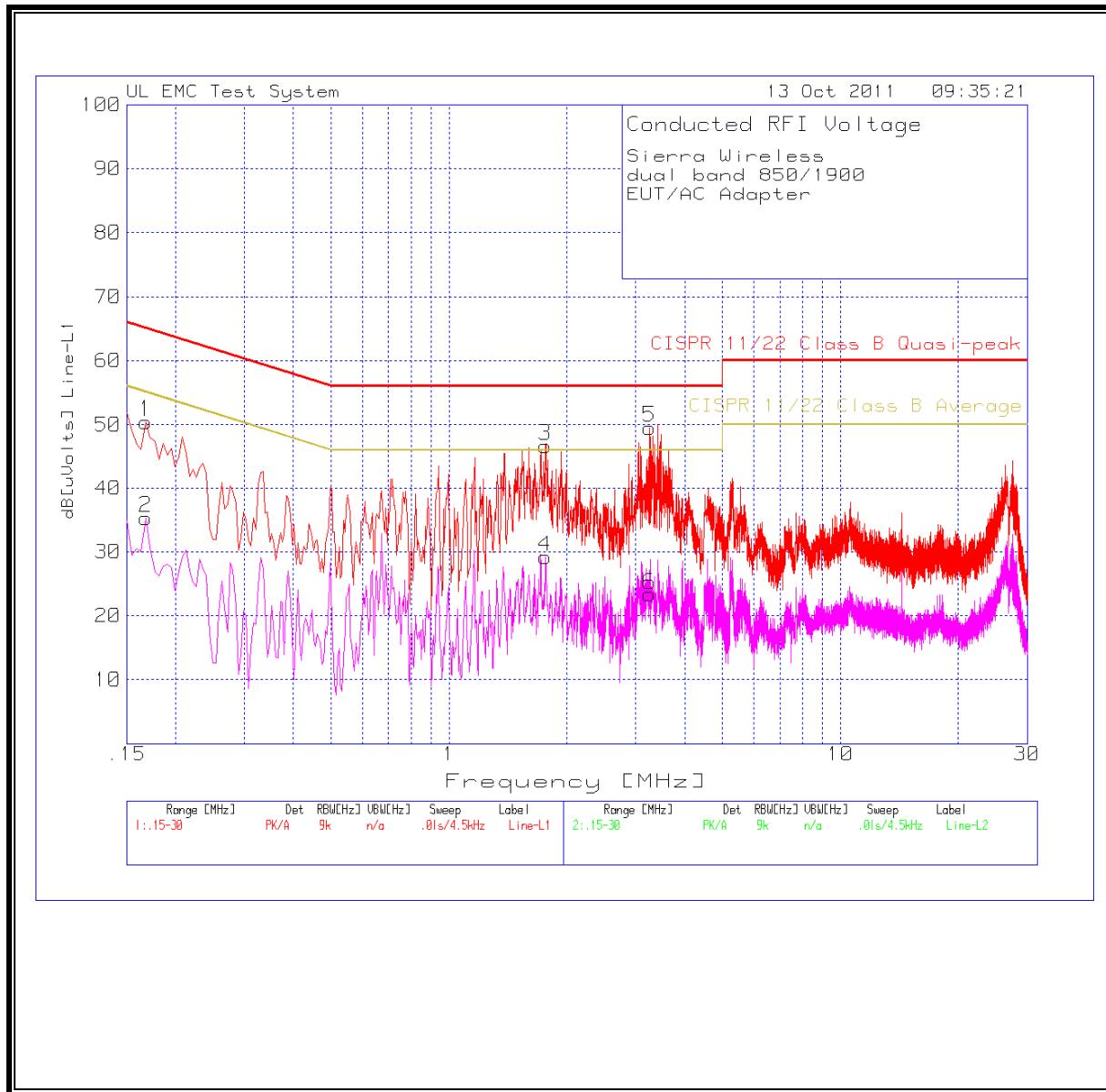
Sierra Wireless								
dual band 850/1900								
EUT/AC Adapter								
<hr/>								
Line-L1 .15 - 30MHz								
Frequency	Reading	Detector	LISN [dB]	dB[uVolts]	CISPR 22B Qp	Margin	CISPR 22B Avg	Margin
0.168	50.4	PK	0	50.4	65.1	-14.7	55.1	-4.7
0.168	35.26	Av	0	35.26	-	-	55.1	-19.84
1.7655	46.62	PK	0	46.62	56	-9.38	46	0.62
1.7655	29.14	Av	0	29.14	-	-	46	-16.86
3.255	49.51	PK	0	49.51	56	-6.49	46	3.51
3.255	23.31	Av	0	23.31	-	-	46	-22.69
<hr/>								
L2 .15 - 30MHz								
Test Frequency	Readi	Detector	LISN [dB]	dB[uVolts]	/22 Class B Qu	Margin	1/22 Class B A	Margin
0.168	49.15	PK	0	49.15	65.1	-15.95	55.1	-5.95
0.168	32.98	Av	0	32.98	-	-	55.1	-22.12
0.276	41.51	PK	0	41.51	60.9	-19.39	50.9	-9.39
0.276	21.35	Av	0	21.35	-	-	50.9	-29.55
3.255	41.77	PK	0	41.77	56	-14.23	46	-4.23
3.255	22.22	Av	0	22.22	-	-	46	-23.78

### SUPPORT LAPTOP

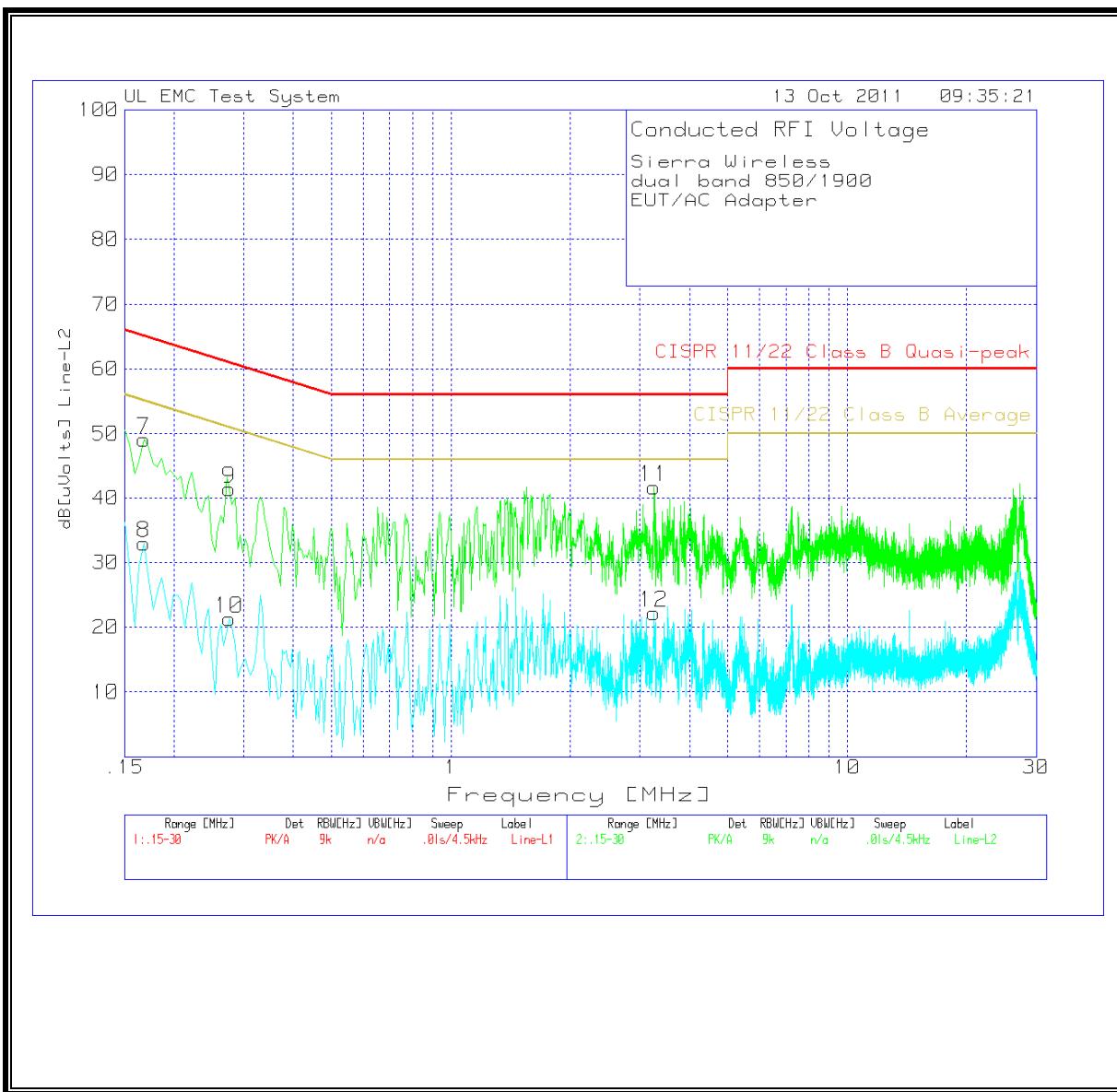
Sierra Wireless								
dual band 850/1900								
EUT/Laptop AC Adapter								
<hr/>								
Line-L1 .15 - 30MHz								
Frequency	Reading	Detector	dB[uVolts]	CISPR B QP	Margin	CISPR B Aver	Margin	
0.1725	51.59	PK	51.59	64.8	-13.21	54.8	-3.21	
0.1725	39.19	Av	39.19	-	-	54.8	-15.61	
2.0895	45.52	PK	45.52	56	-10.48	46	-0.48	
2.0895	39.17	Av	39.17	-	-	46	-6.83	
3.615	49.6	PK	49.6	56	-6.4	46	3.6	
3.615	35.51	Av	35.51	-	-	46	-10.49	
<hr/>								
Line-L2 .15 - 30MHz								
Frequency	Reading	Detector	dB[uVolts]	CISPR B QP	Margin	CISPR B Avg	Margin	
0.168	50.72	PK	50.72	65.1	-14.38	55.1	-4.38	
0.168	37.02	Av	37.02	-	-	55.1	-18.08	
0.222	41.61	PK	41.61	62.7	-21.09	52.7	-11.09	
0.222	33.03	Av	33.03	-	-	52.7	-19.67	
1.7655	40.29	PK	40.29	56	-15.71	46	-5.71	
1.7655	27.89	Av	27.89	-	-	46	-18.11	

## AC ADAPTER

### LINE 1 RESULTS

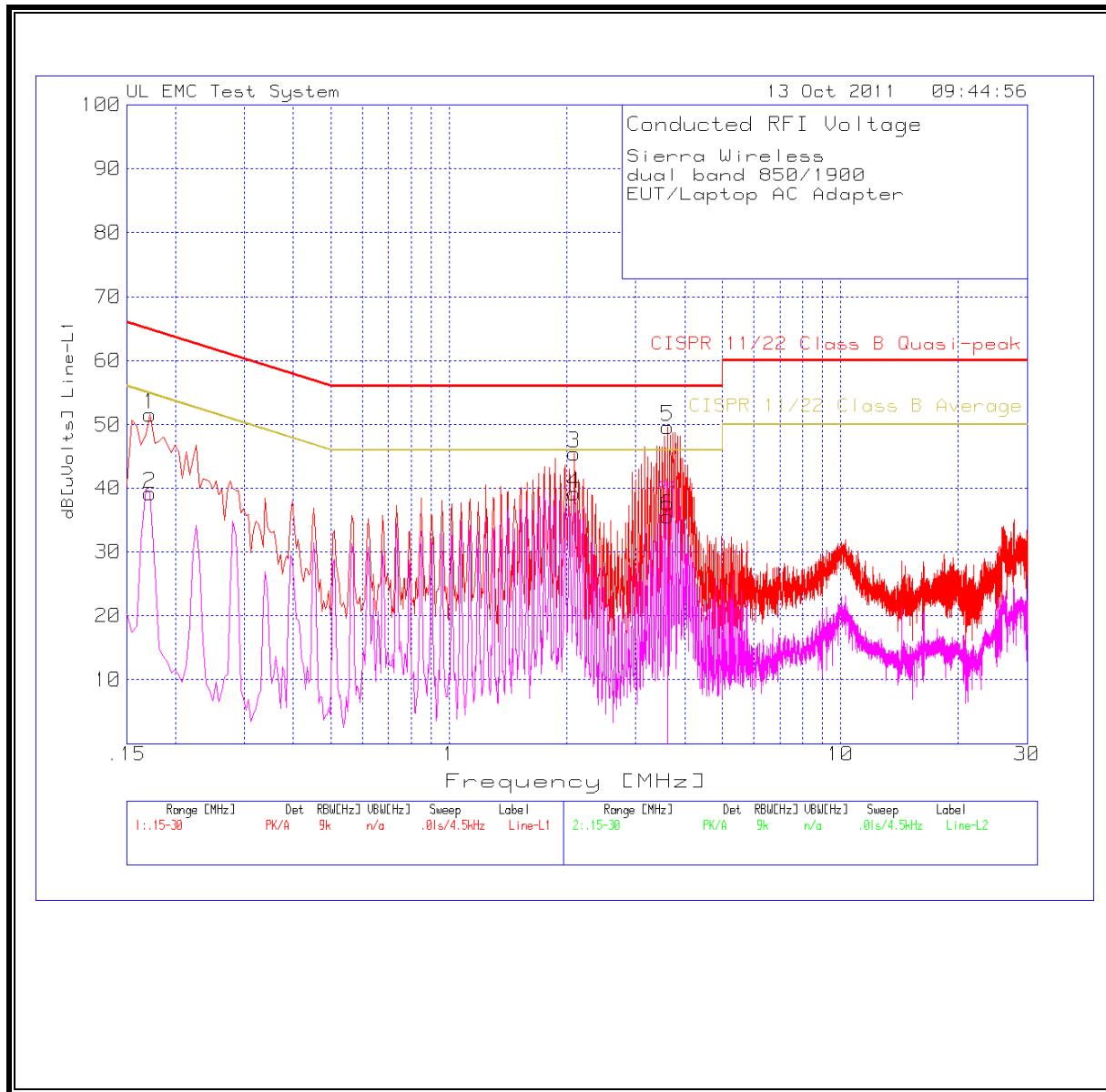


**LINE 2 RESULTS**

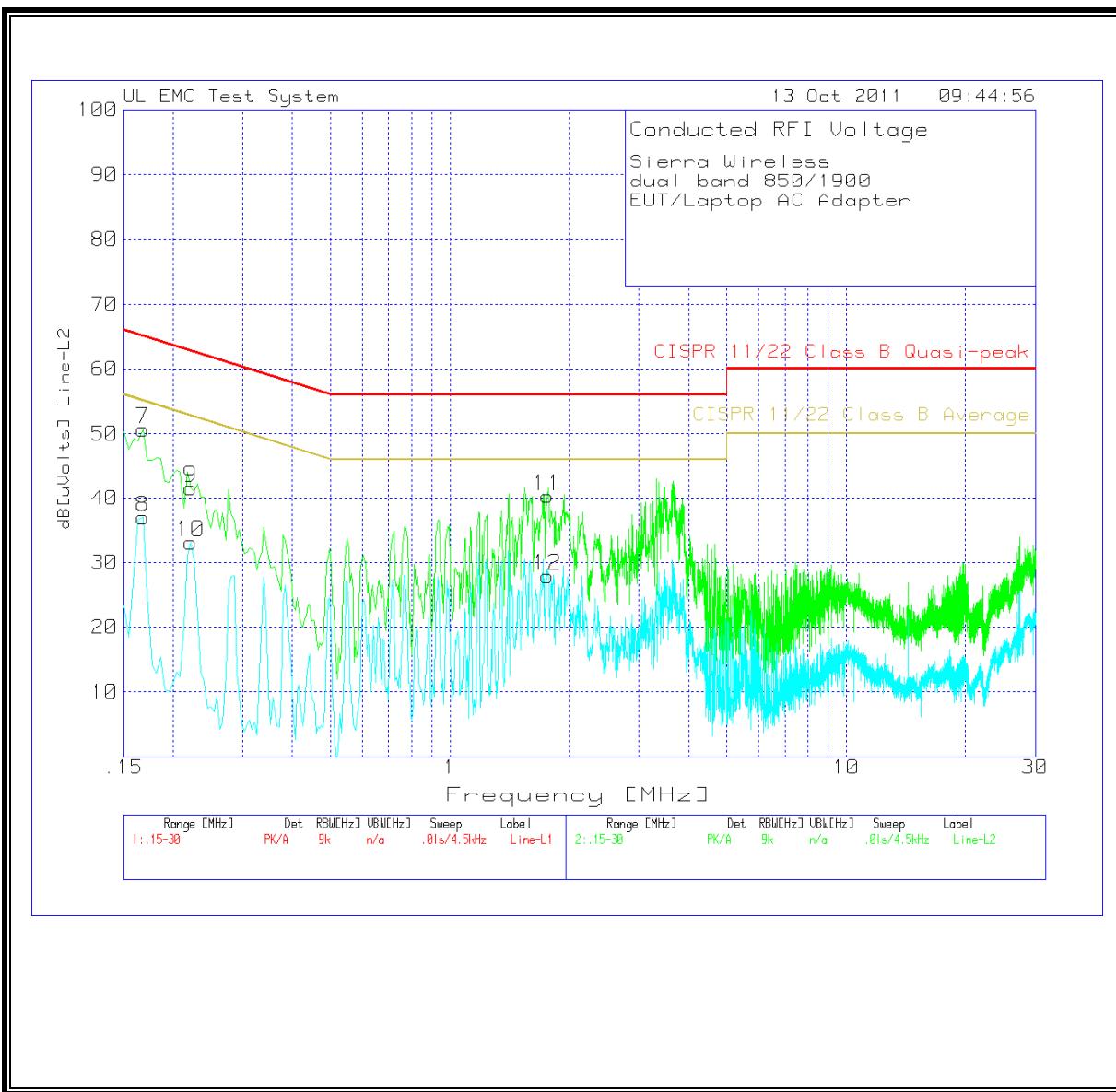


**SUPPORT LAPTOP**

**LINE 1 RESULTS**



**LINE 2 RESULTS**



## 9. 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 × 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 × 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,  $S = 5.498 \text{ W/m}^2$  (Cell) and  $S = 10 \text{ W/m}^2$  (PCS)

**RESULTS**

<b>Band</b>	<b>MPE Distance (cm)</b>	<b>Output Power (dBm)</b>	<b>Max Antenna Gain (dBi)</b>	<b>FCC Power Density (mW/cm<sup>2</sup>)</b>	<b>IC Power Density (W/m<sup>2</sup>)</b>
Cell	20.0	24.30	8.20	0.353	3.534
PCS	20.0	24.25	7.15	0.274	2.744