



**FCC CFR47 PART 22 SUBPART H
AND PART 24 SUBPART E
CLASS II PERMISSIVE CHANGE
CERTIFICATION TEST REPORT**

FOR

PCA, EVDO REV. A, MINI-PCI EXPRESS CARD CDMA MODEM

MODEL NUMBER: MC5725

FCC ID: N7N-MC5725

REPORT NUMBER: 08U11794-1

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Prepared for
**SIERRA WIRELESS
2290 COSMOS CT.
CARLSBAD, CA 92010, USA**

Prepared by
**COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
FREMONT, CA 94538, USA
TEL: (510) 771-1000
FAX: (510) 661-0888**



NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	05/14/08	Initial Issue	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS
2290 COSMOS CT.
CARLSBAD, CA, 92010 U.S.A.

EUT DESCRIPTION: PCA, EVDO REV. A, MINI-PCI EXPRESS CARD CDMA MODEM

MODEL: MC5725

SERIAL NUMBER: X490657008110-10

DATE TESTED: APRIL 27 & 28, 2007

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22 SUBPART H	PASS
FCC PART 24 SUBPART E	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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services 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:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

CHIN PANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603C (2004), ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and FCC CFR 47 Part 22H and 24E.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

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. 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
Radiated Emission, Above 2000 MHz	+/- 4.3 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 REV. A, Mini-PCI Express Card CDMA Modem, and the module is manufactured by Sierra Wireless, Inc.

5.2. DESCRIPTION OF CLASS II CHANGE

Update Processor Chip. The main MSM Processor is moving to a smaller chip form factor (from 100mm to 65mm process

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

824 to 849 MHz Authorized Band

Frequency Range (MHz)	Modulation	Conducted Average Power (dBm)	Conducted Average Power (mW)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
Low CH - 824.7	1 x EVDO, Rev A	24.95	312.61	29.74	941.89
Mid CH - 836.5		25.11	324.34	29.92	981.75
High CH - 848.3		25.12	325.09	29.85	966.05

1850 to 1910 MHz Authorized Band

Frequency Range (MHz)	Modulation	Conducted Average Power (dBm)	Conducted Average Power (mW)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
Low CH - 1851.25	1 x EVDO, Rev A	25.1	323.59	29.26	843.33
Mid CH - 1880		25.25	334.97	29.57	905.73
High CH - 1908.75		24.85	305.49	28.51	709.58

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

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

5.5. SOFTWARE AND FIRMWARE

The EUT is linked with Agilent Communication Test Set.

5.6. WORST-CASE CONFIGURATION AND MODE

PROCEDURE USED TO ESTABLISH TEST SIGNAL

3G-CDMA2000 1xEV-DO Revision A (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.06.06, L

FETAP

- Call Setup > Shift & Preset
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- FTAP Rate > 307.2 kbps (2 Slot, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 0
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Rvs Power Ctrl > All Up bits (to get the maximum power)

RETAP

- Call Setup > Shift & Preset
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- F-Traffic Format > 4 (1024, 2, 128) Canonical (307.2k, QPSK)
- R-Data Pkt Size > 4096 (for PCS band), 12288 (for Cellular band)
- 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)

EV-DO REV A Worst Case Data

Based on the above results from the different modulations, EV-DO, REV A Protocol RETAP to be the worst-case scenario for all measurements.

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at mid channel for Cell band and low channel for PCS band.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

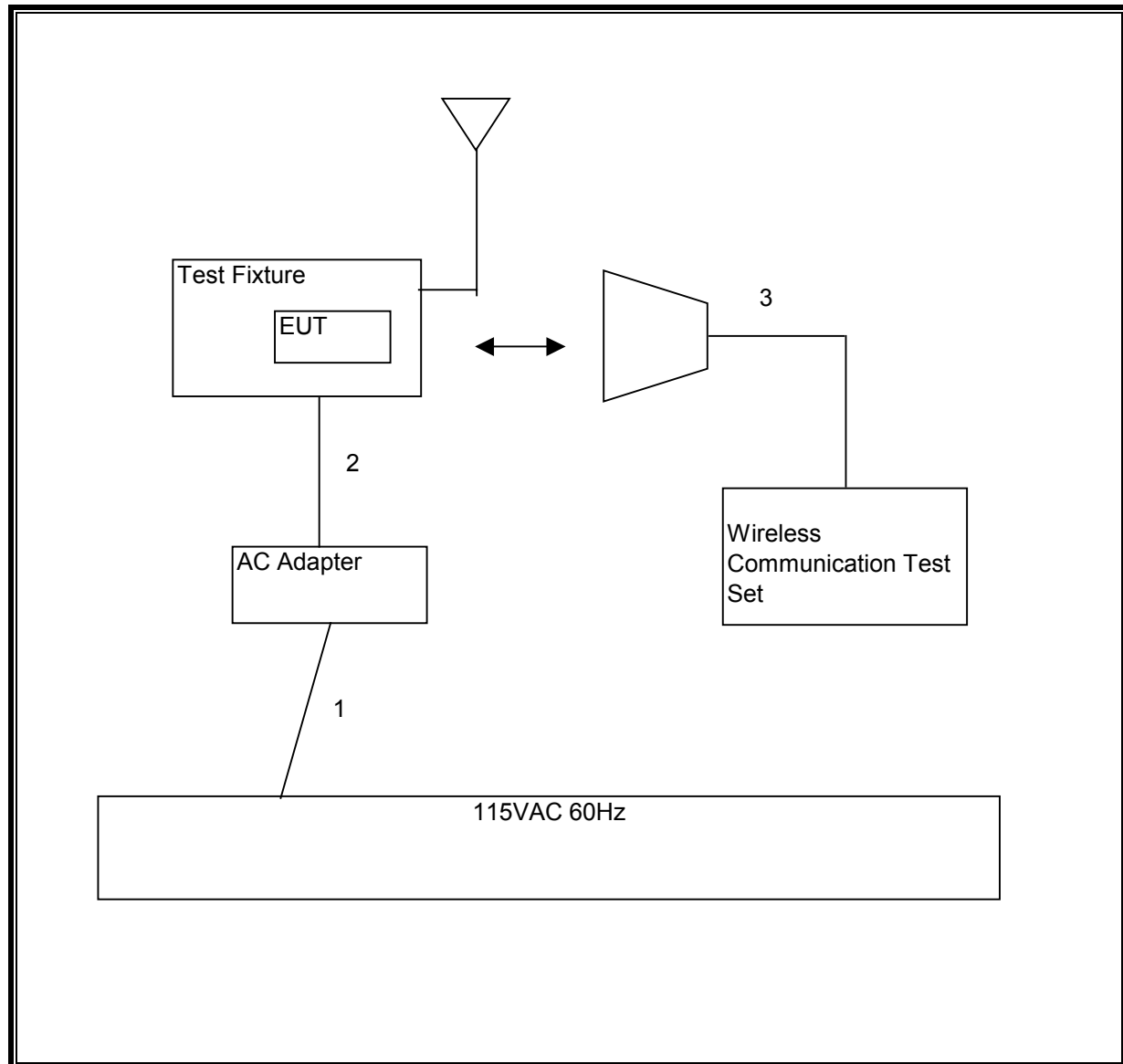
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Elpac Power System	FW1805	32169	NA
Laptop	Lenovo	Thinkpad X61S	LV-01418	DoC
AC Adapter	Lenovo	92P1156	11S92P1156Z1ZBGF6A60	DoC
Wireless Communications	Agilent	E5515C	10092	DoC

I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2 m	NA
2	DC	1	DC	Un-shielded	2m	Ferrite on DC end
3	RF In/Out	1	Horn	Un-shielded	1m	NA

TEST SETUP

The EUT is installed in a Test Kit during the tests, The EUT is linked with Agilent Communication Test Set.

SETUP DIAGRAM FOR 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 Date	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	5/2/2007	8/7/2008
Antenna, Horn, 18 GHz	EMCO	3115	C00945	4/15/2007	4/15/2009
Antenna, Horn 1 ~ 18 GHz	ETS	3117	35234	4/15/2007	4/15/2009
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	9/27/2007	9/27/2008
Communication Test Set	Agilent	E5515C	6B46160222	6/29/2007	6/29/2008
2.7GHz HPF	MicroTronic	HPM13194	N02689	CNR	CNR
1.5GHz HPF	MicroTronic	HPM13195	N02687	CNR	CNR
Signal Generator	R & S	SMP04	C00953	11/16/07	02/16/09
Signal Generator	R & S	SMY01	C00979	11/28/07	05/28/09
Horn	EMCO	3115	C00945	04/15/07	04/15/09
Dipole	Speag	D900V2	NA	11/16/07	11/16/08

7. LIMITS AND 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) 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.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.17

RESULTS

EVDO REV A

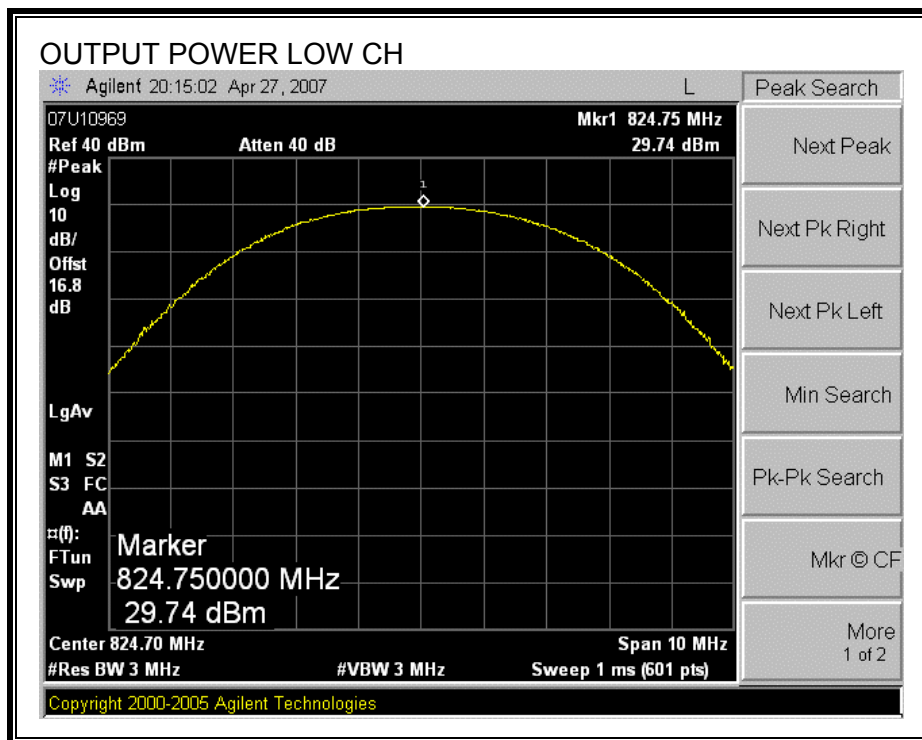
800MHz CELL CDMA Modulation

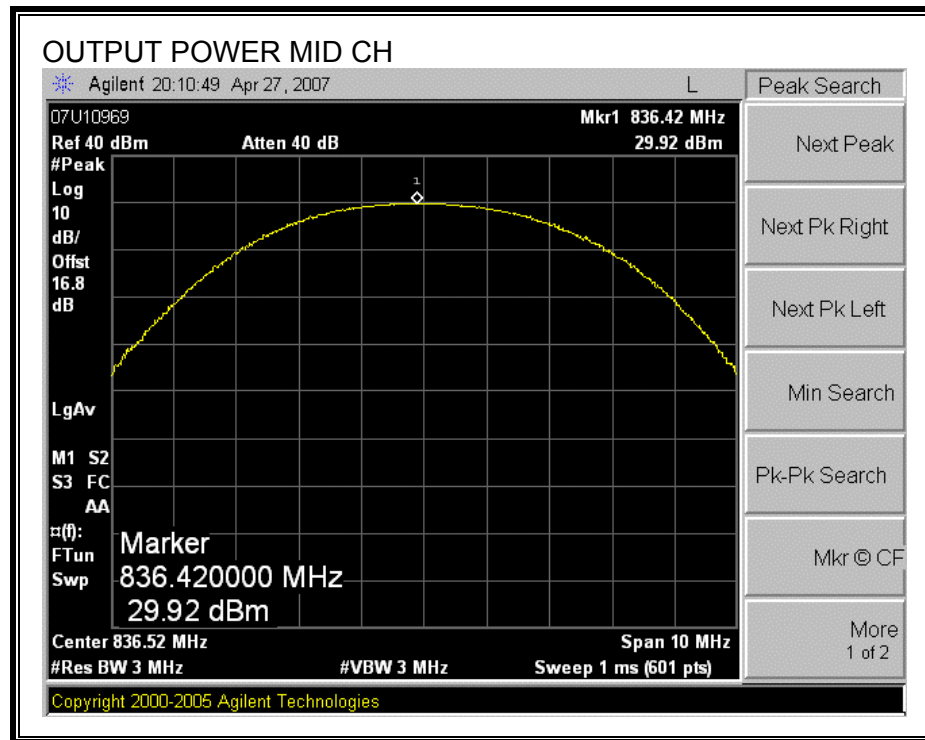
Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
Low	824.7	29.74	941.89
Middle	836.5	29.92	981.75
High	848.3	29.85	966.05

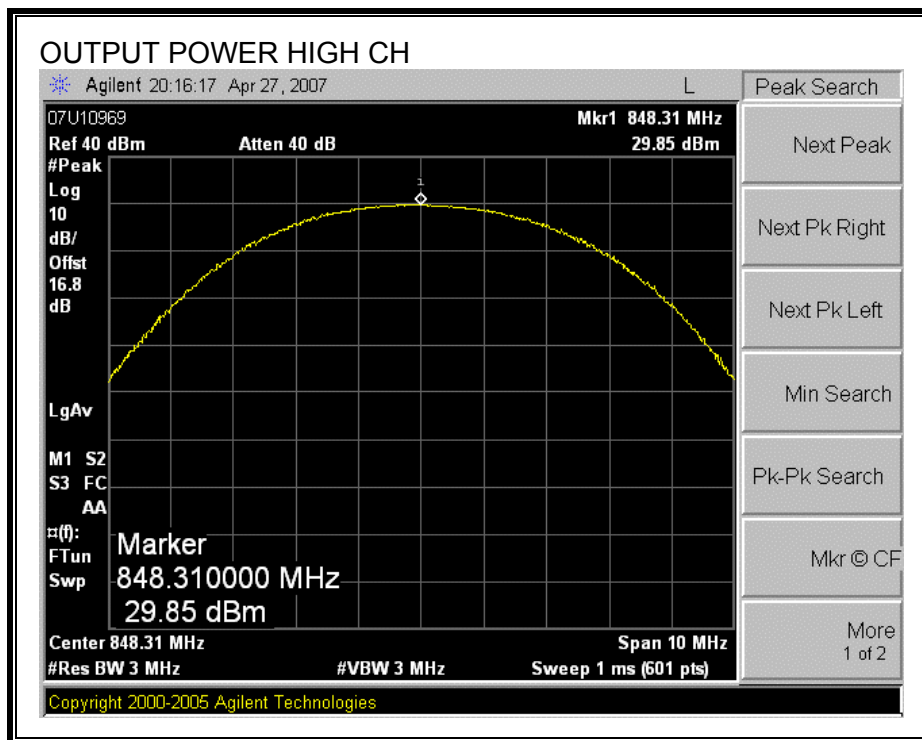
1900MHz PCS Modulation

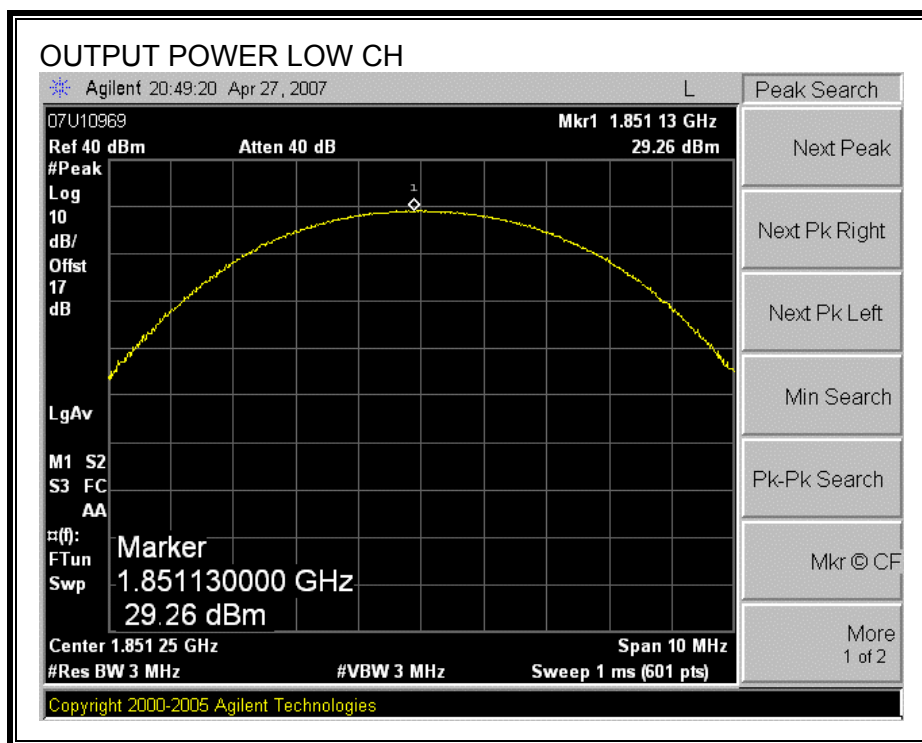
Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
Low	1851.25	29.26	843.33
Middle	1880.00	29.57	905.73
High	1908.75	28.51	709.58

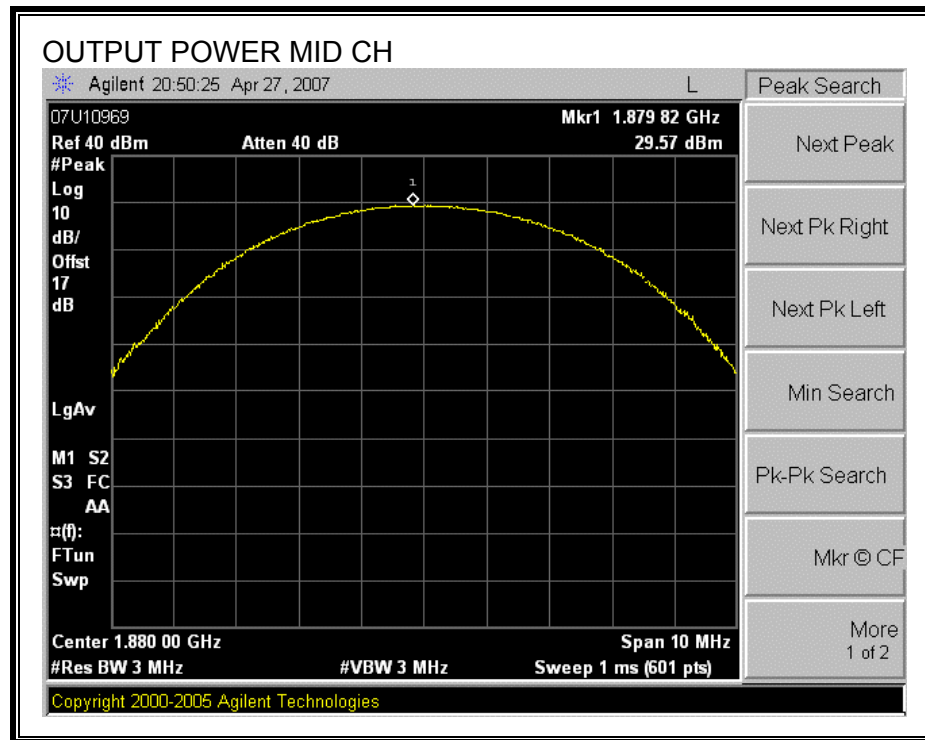
NOTE: RBW=VBW=3MHz

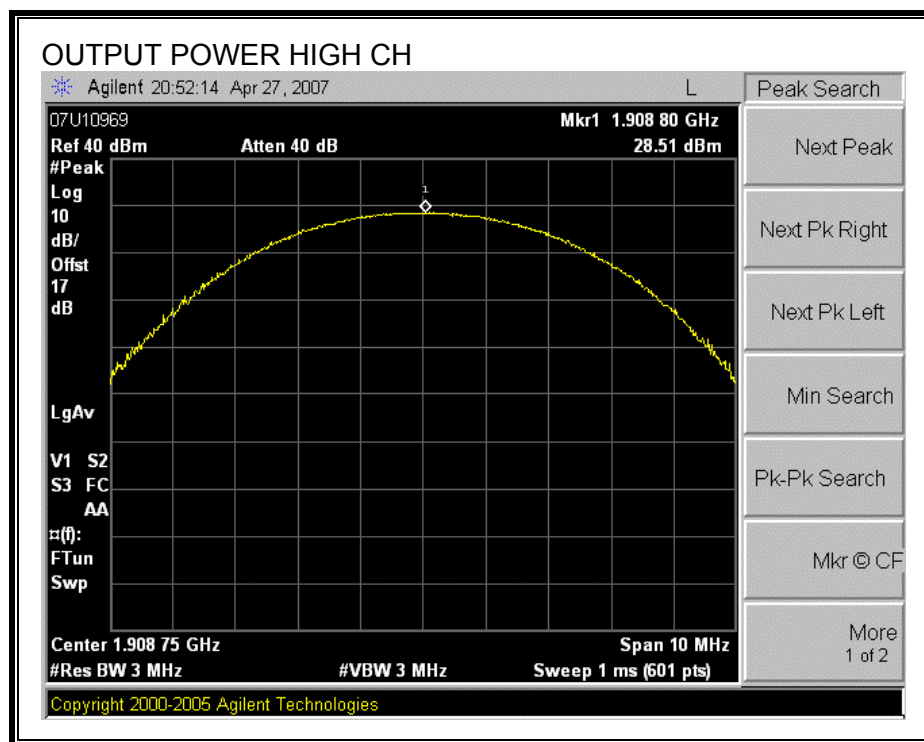
EVDO REV A**800MHz CELLULAR (RF CONDUCTED OUTPUT POWER)**





EVDO REV A**1900MHz PCS (RF CONDUCTED OUTPUT POWER)**





7.2. SPURIOUS EMISSION AT ANTENNA TERMINAL

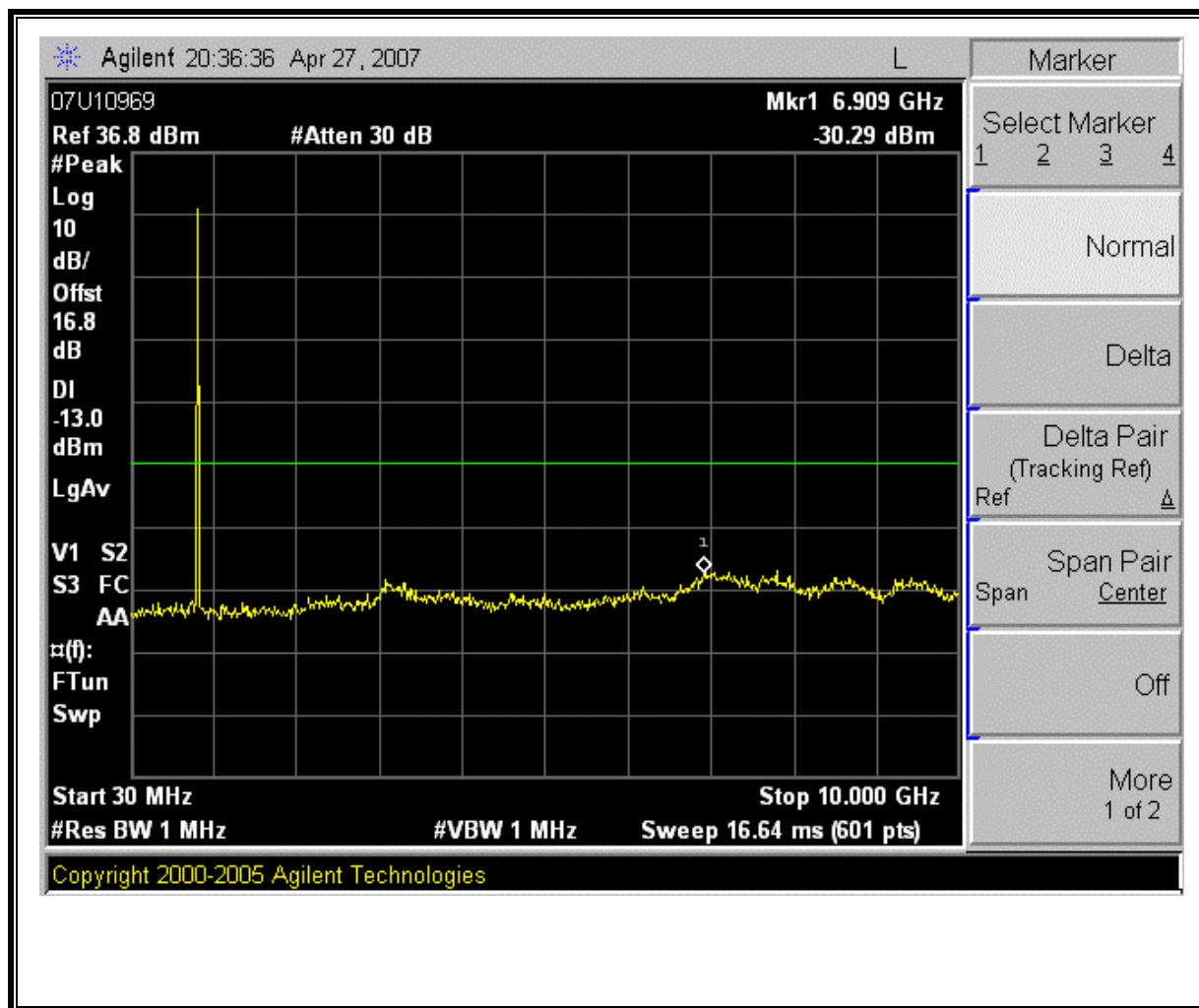
LIMIT

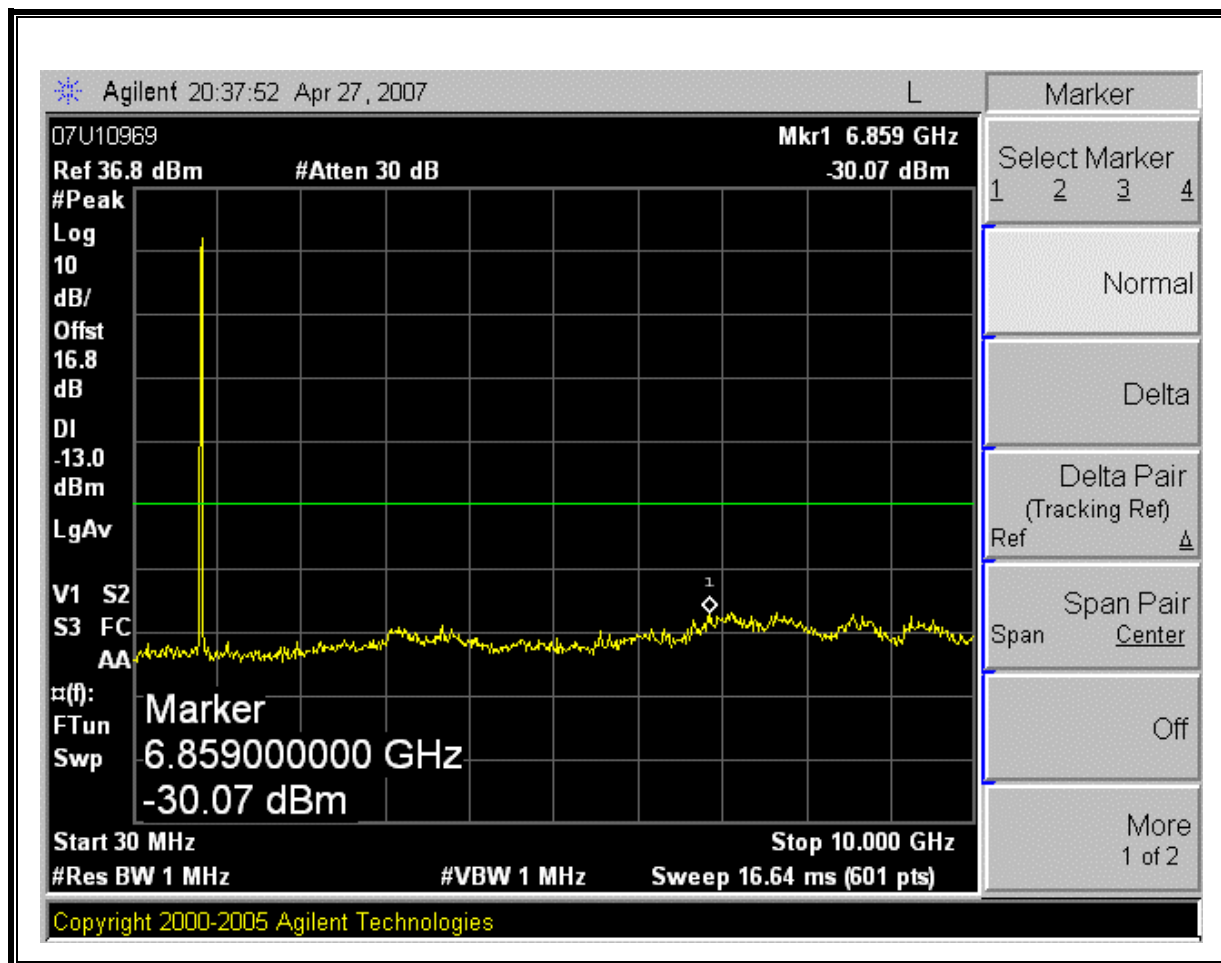
§22.917 (e) & §24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

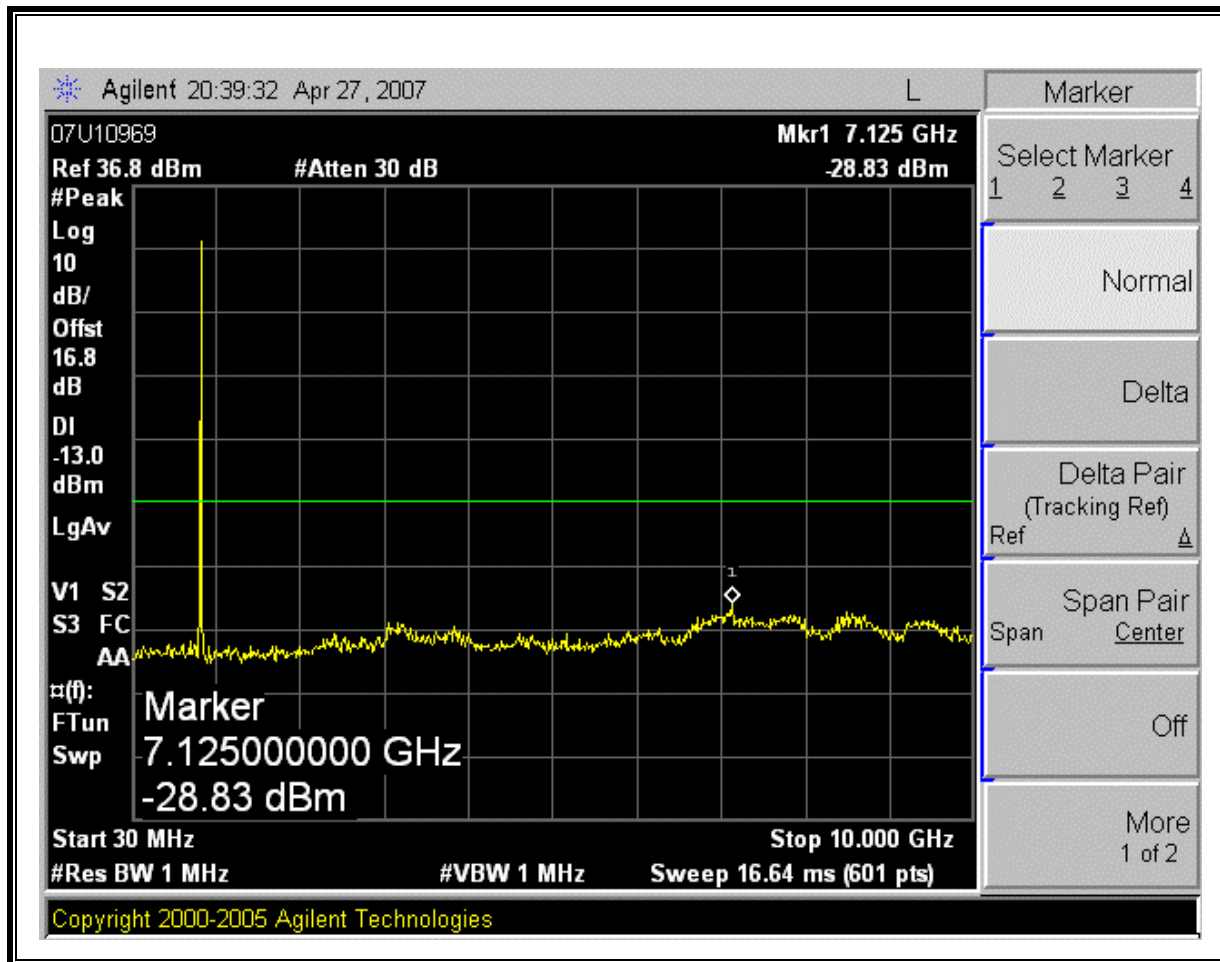
TEST PROCEDURE

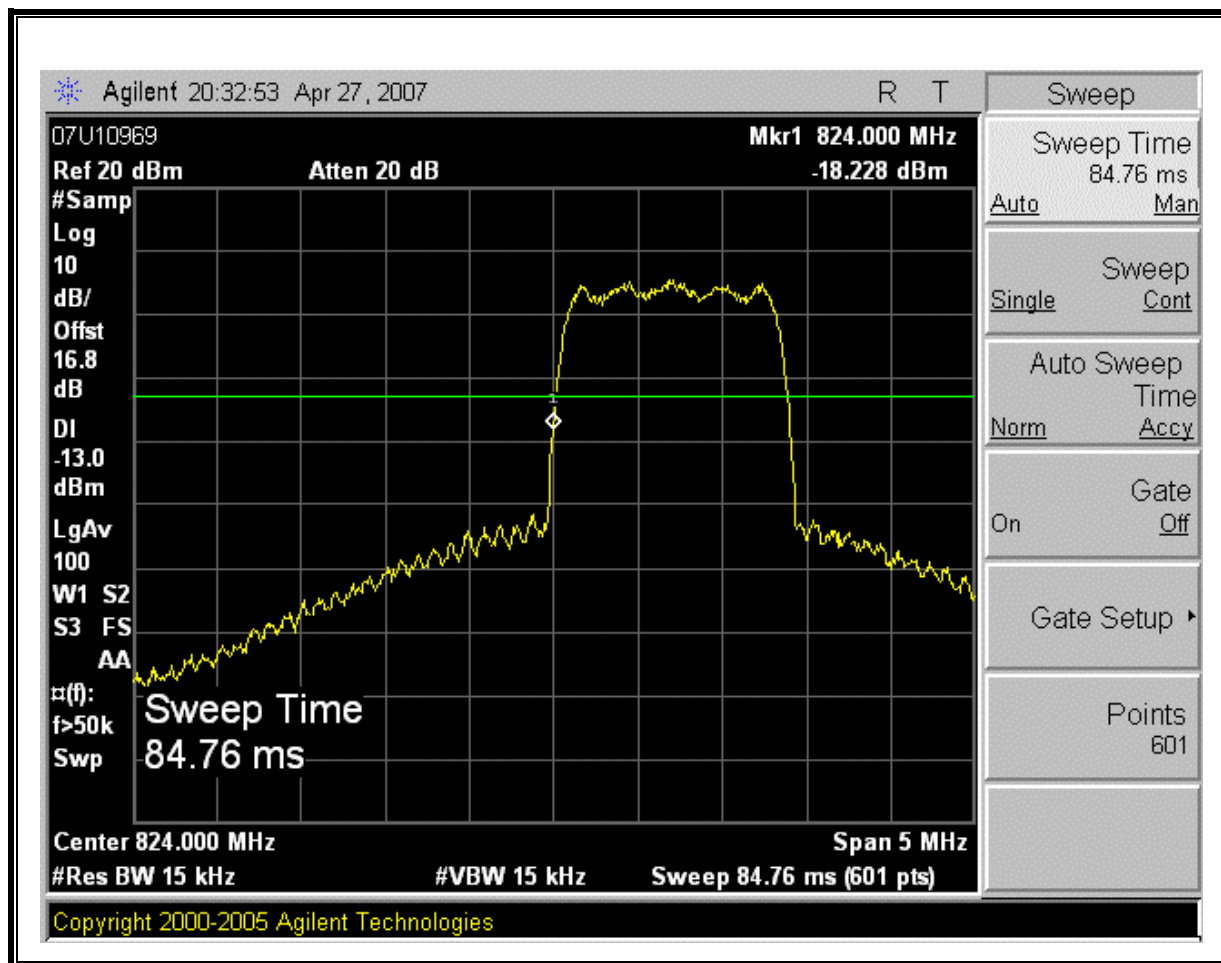
ANSI / TIA / EIA 603C Clause 2.2.12, FCC 22.917 (h), & FCC 24.238 (b)

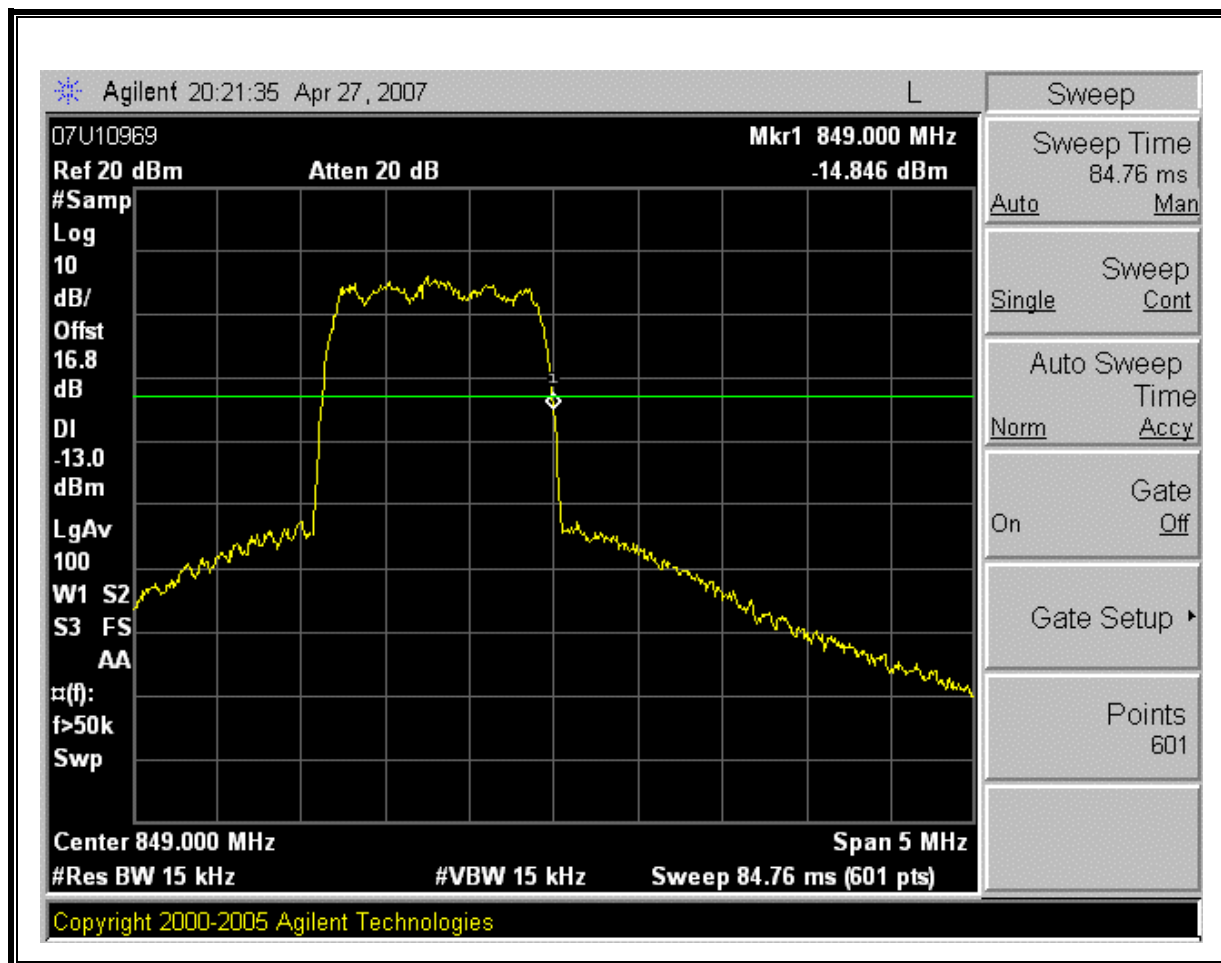
RESULTS

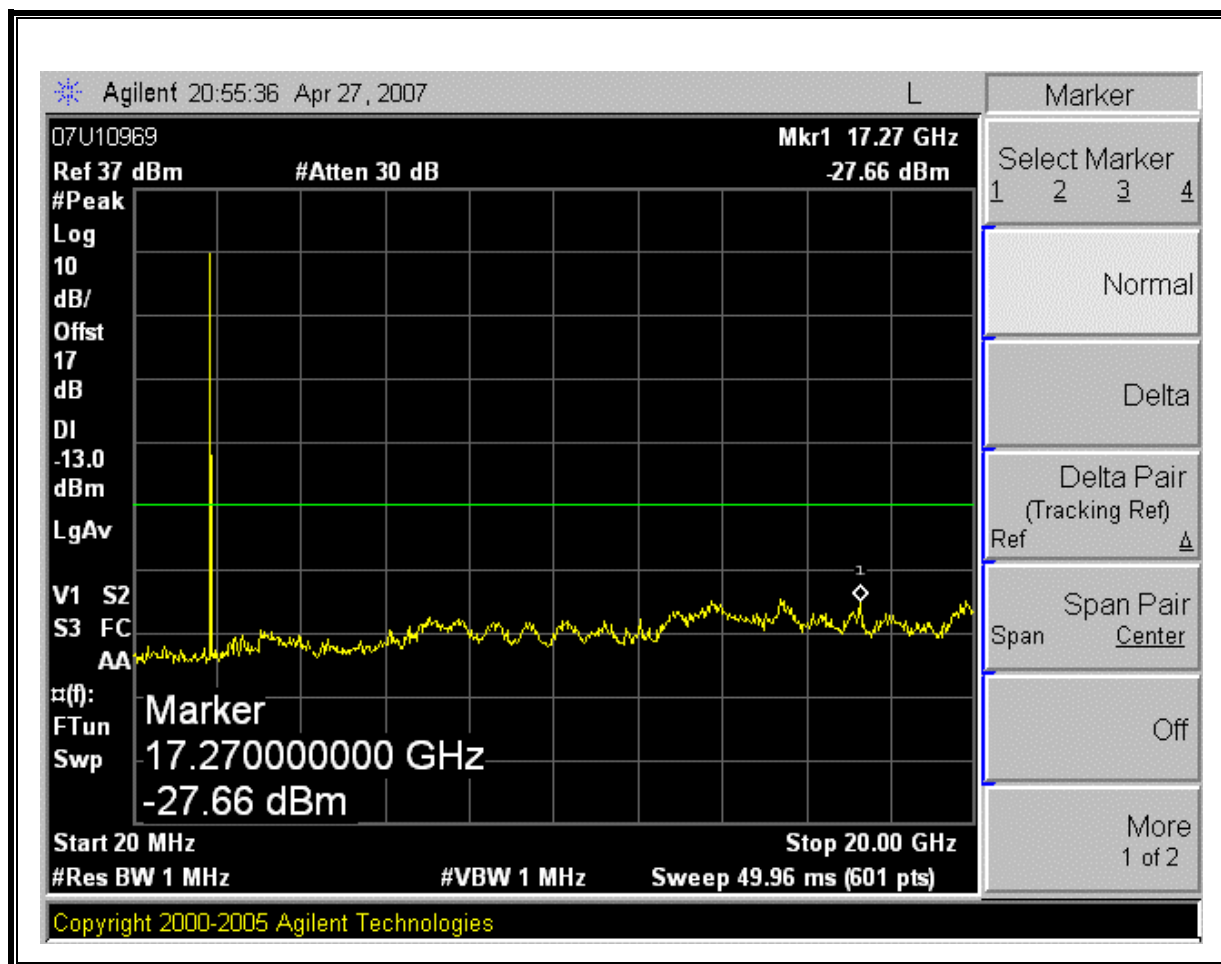
EVDO REV A**CDMA Modulation: Low Channel, Out-Of-Band Emissions**

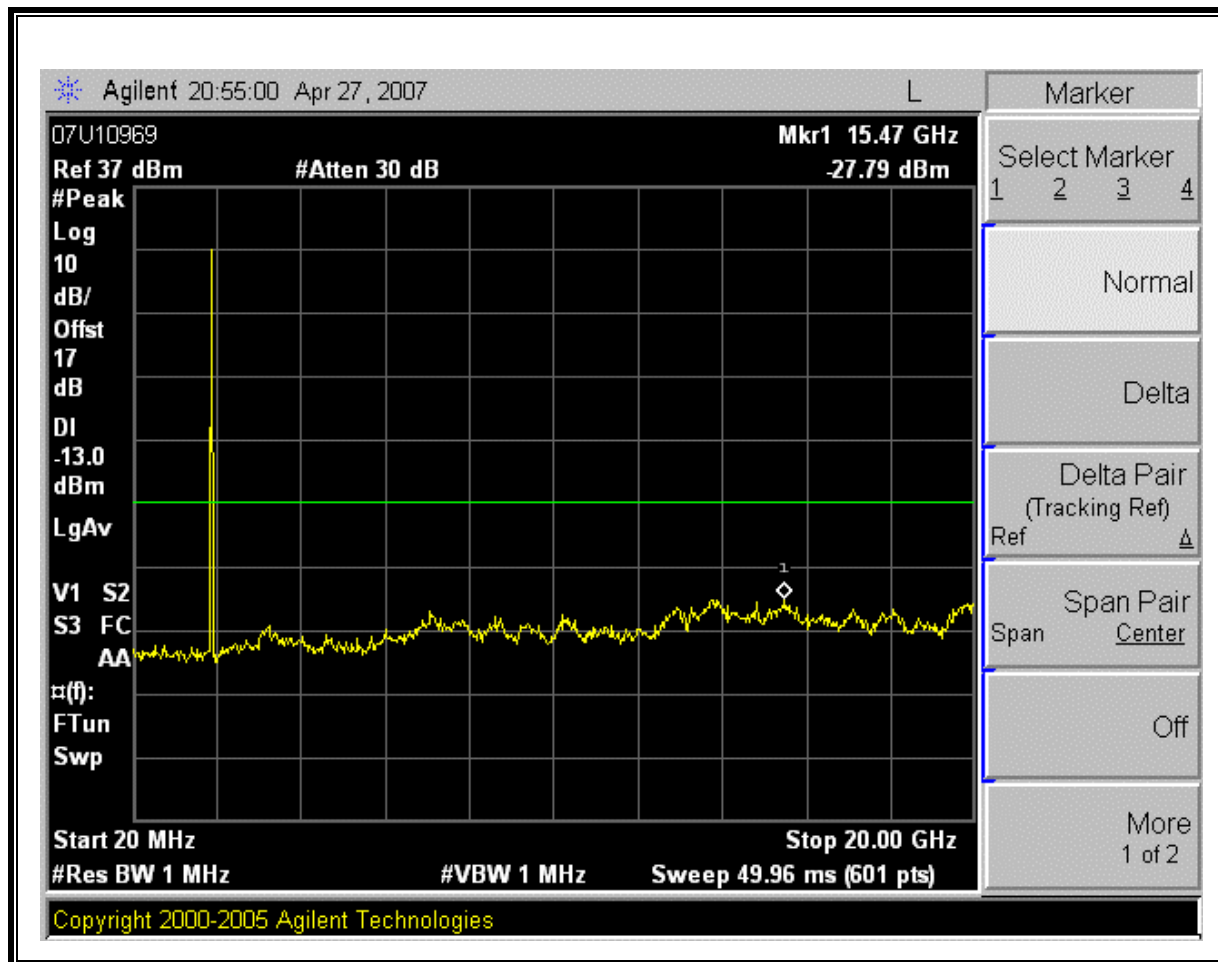
CDMA Modulation: Mid Channel, Out-Of-Band Emissions

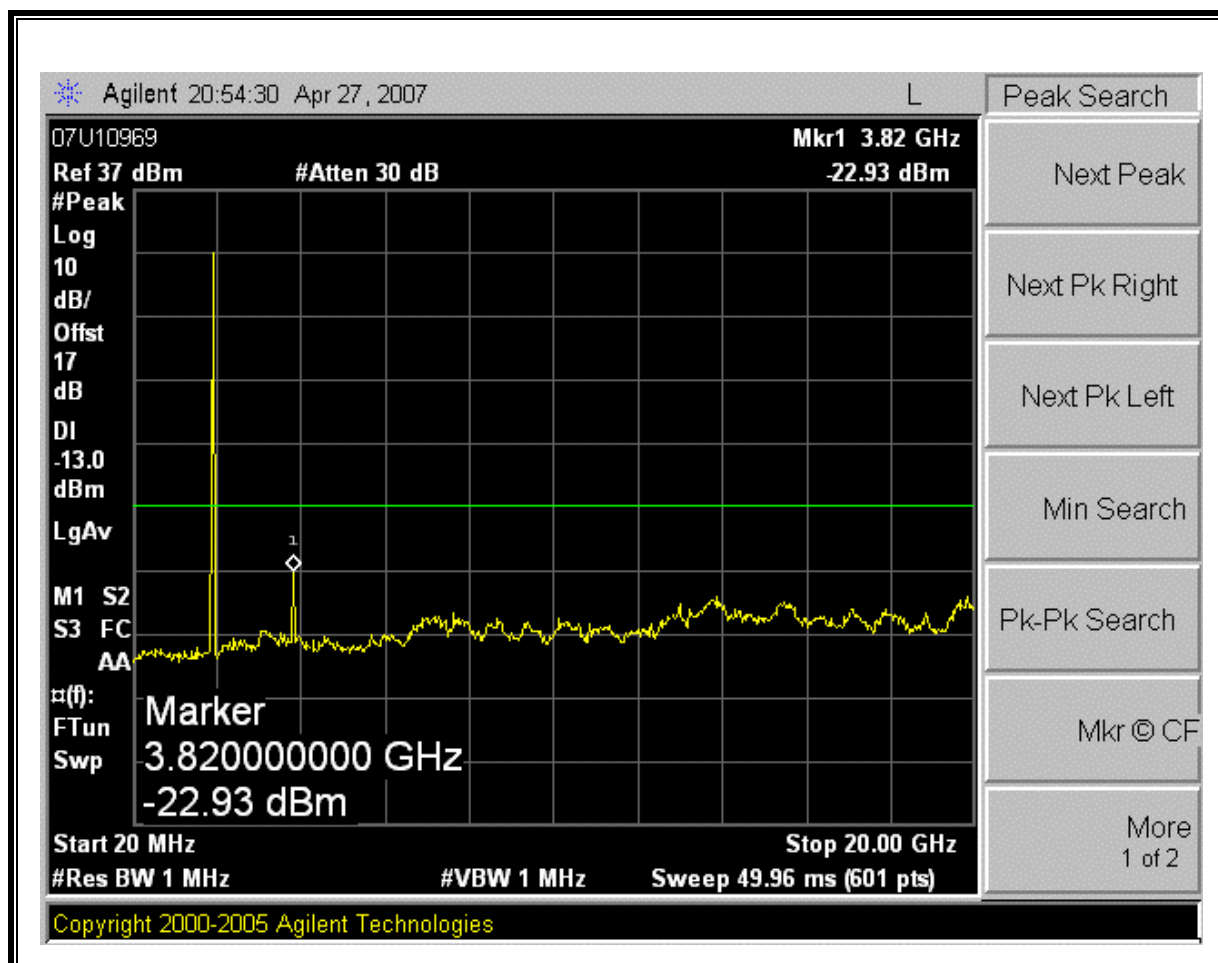
CDMA Modulation: High Channel, Out-Of-Band Emissions

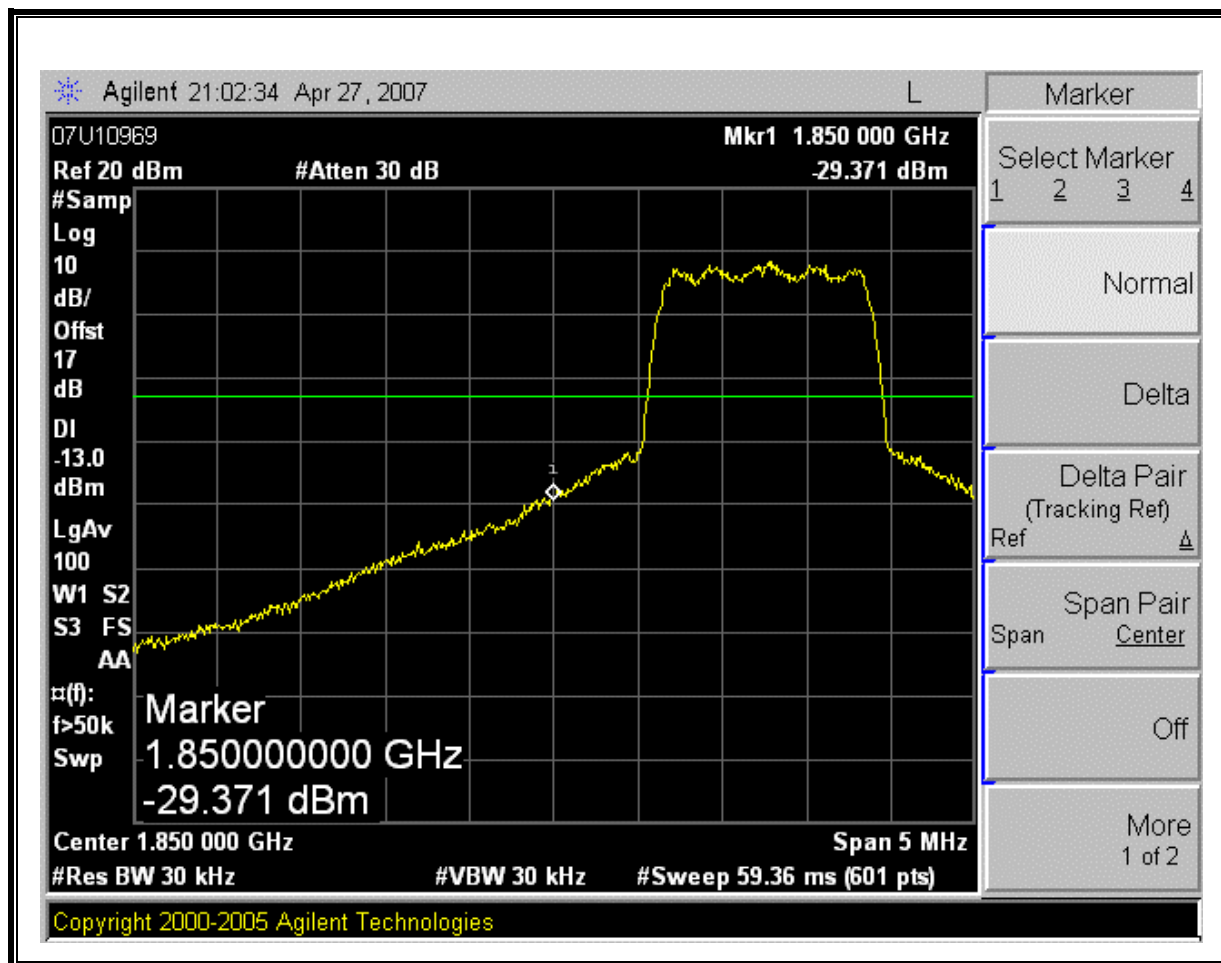
CDMA Modulation: Low Channel Band Edge

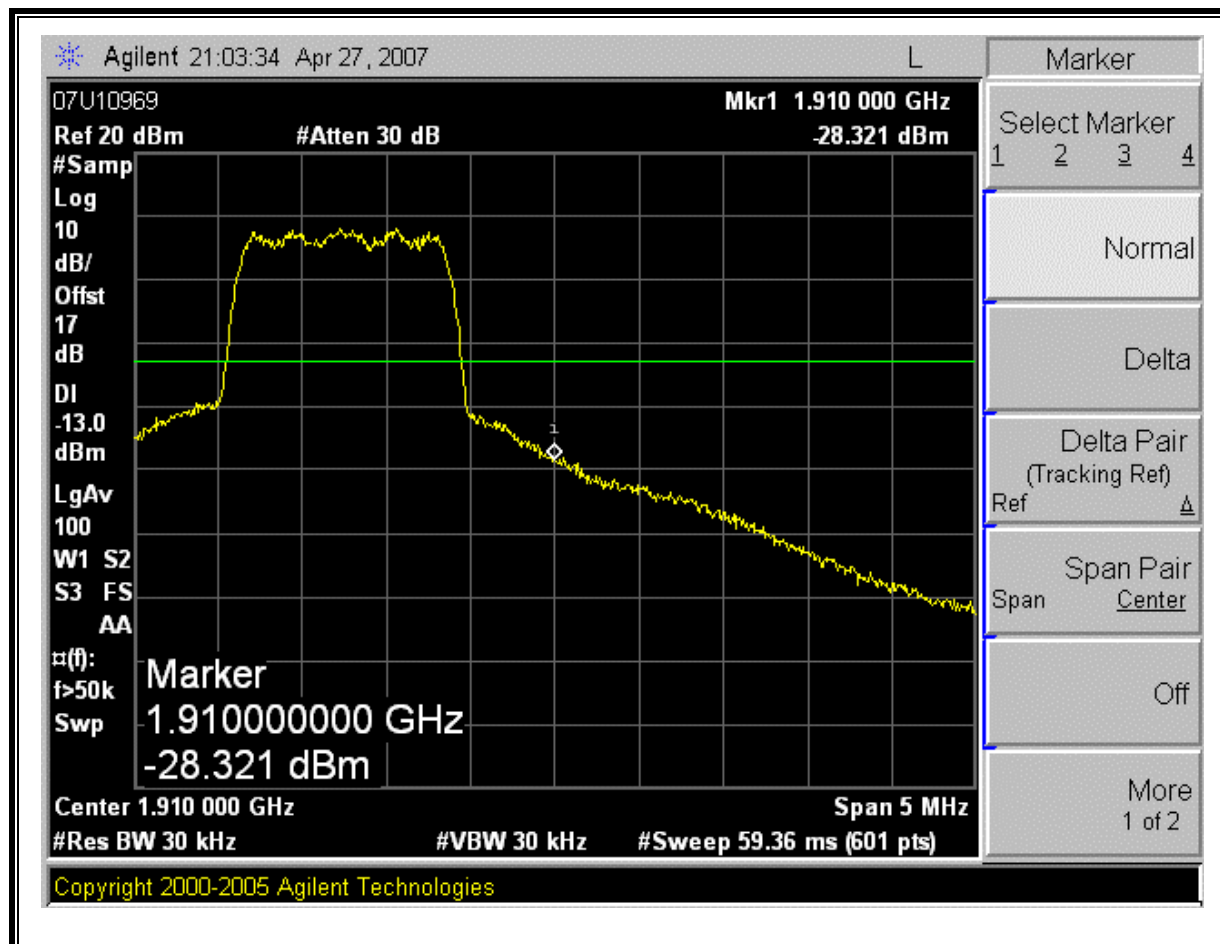
CDMA Modulation: High Channel Band Edge

PCS MODULATION RESULTS**Low Channel, Out-Of-Band Emissions**

Mid Channel, Out-Of-Band Emissions

High Channel, Out-Of-Band Emissions

Low Channel Band Edge

High Channel Band Edge

7.3. FIELD STRENGTH OF SPURIOUS RADIATION

LIMIT

§22.917 (e) and §24.238 (a) Out of band emissions. 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 603C Clause 2.2.12, FCC 22.917 (h), & FCC 24.238 (b)

RESULTS

No non-compliance noted.

Note: No emissions were found within 30-1000MHz of 20dB below the system noise.

CELL Spurious & Harmonic (ERP)

[illegible]

PCS Spurious & Harmonic (ERP)

High Frequency Substitution Measurement										
Compliance Certification Services, Fremont Sm B-Chamber										
Company: Sierra Wireless Project #: 07U10969 Date: April 28h 2007 Test Engineer: Chin Pang Configuration: DEUT installed in a test Fixture Mode: PCS band EVDO Rev A (Worst Case) Module #1										
Test Equipment:										
EMCO Horn 1-18GHz		Horn > 18GHz		Limit		☒ High Pass Filter				
T73; S/N: 6717 @3m				FCC 24						
Hi Frequency Cables: ☐ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☒ (12 ft)										
Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz						
T34 HP 8449B										
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP EIRP	Limit (dBm)	Margin (dB)	Notes
High Ch										
3.818	42.2	H	-54.5	6.0	9.7	7.5	-52.9	-13.0	-39.9	
5.726	40.2	H	-51.5	7.5	11.6	9.5	-49.5	-13.0	-36.5	
3.818	48.3	V	-48.5	6.0	9.7	7.5	-46.9	-13.0	-33.9	
5.726	42.0	V	-50.7	7.5	11.6	9.5	-48.7	-13.0	-35.7	
Rev. 5.1.6 Performed high channel worst case only per test plan requests										

7.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§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 ²)	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 ²)	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 ²)	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 ²)	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.

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 and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of Power to mW and Distance to cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S} \quad \text{Equation (1)}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), $S = 1.0 \text{ mW/cm}^2$

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)
800MHz Cellar	20.0	29.92	4.33	0.529
1900 MHz PCS	20.0	29.57	3.40	0.394

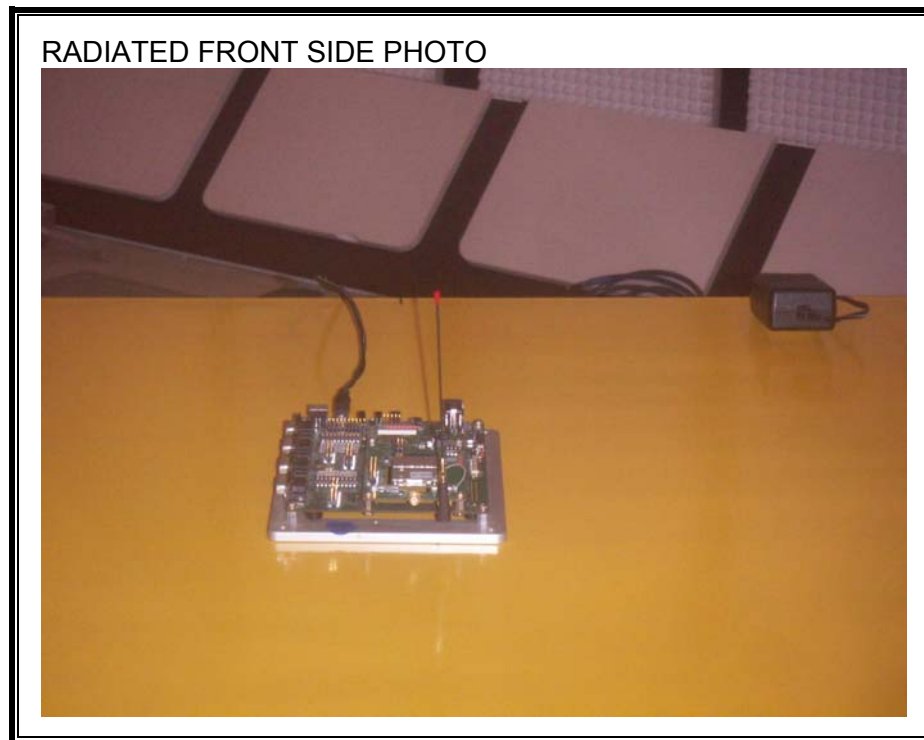
NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

8. SETUP PHOTOS

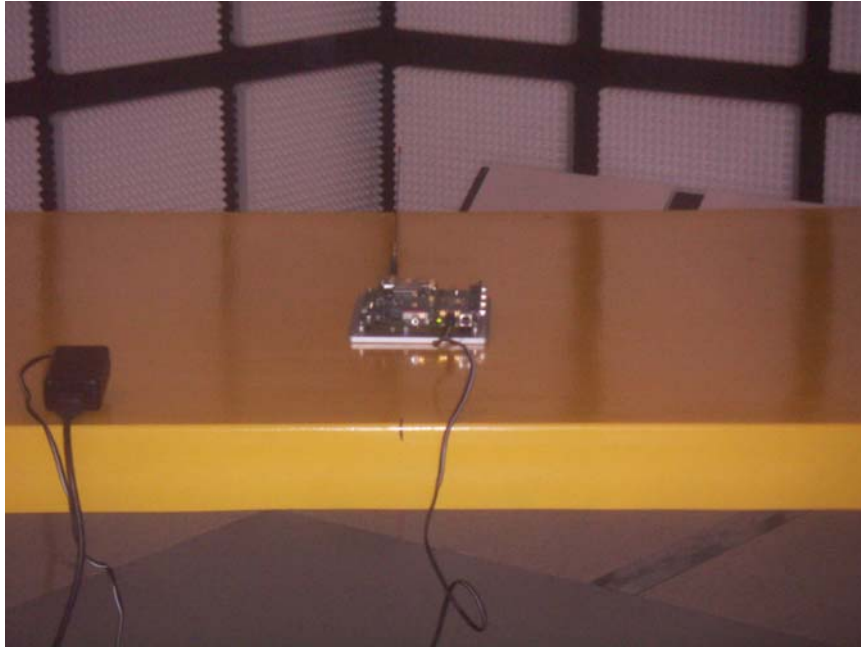
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP



RADIATED BACK SIDE PHOTO



END OF REPORT