



**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-L

REPORT NUMBER: 07U10962-1

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

Prepared by
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Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS
2290 COSMOS CT.
CARLSBAD, CA 92010, USA

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

MODEL: MC5725

SERIAL NUMBER: LV-00739

DATE TESTED: MARCH 28-30, 2007

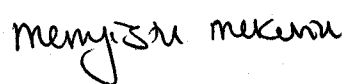
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22 SUBPART H	NO NON-COMPLIANCE NOTED
FCC PART 24 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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.

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Tested By:



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EMC SUPERVISOR
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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
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, installed in a ThinkPad X61 Tablet Series and manufactured by Sierra Wireless, Inc.

5.2. DESCRIPTION OF CLASS II CHANGE

The change filed under this application is adding a new laptop ThinkPad X61 Tablet Series.

5.3. MAXIMUM OUTPUT POWER

Part 22 (824 - 849MHz) & Part 24 (1850 - 1910MHz) Authorized Band:

Frequency Range (MHz)	Modulation	ERP Peak Power (dBm)	ERP Peak Power (mW)
824.7 - 848.31	EVDO Rev A	27.80	602.56

Frequency Range (MHz)	Modulation	EIRP Peak Power (dBm)	EIRP Peak Power (mW)
1851.25 - 1908.75	EVDO Rev A	30.70	1174.90

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an Inverted F antenna with a maximum gain of 1.76 dBi for Cellular band and 1.30 dBi for 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.

Mobile configuration, and X,Y Z position were investigated for both 850MHz and 1900MHz bands and mobile configuration was determined to be the worst case by comparing the fundamental ERP / EIRP output power

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	ThinkPad X61 Tablet Series	LV-00739	DoC
AC Adapter	Lenovo	92P1158	11S921158Z1ZBGG6BW27X	DoC
Wireless Communications Test Set	Agilent	E5515C	10092	DoC

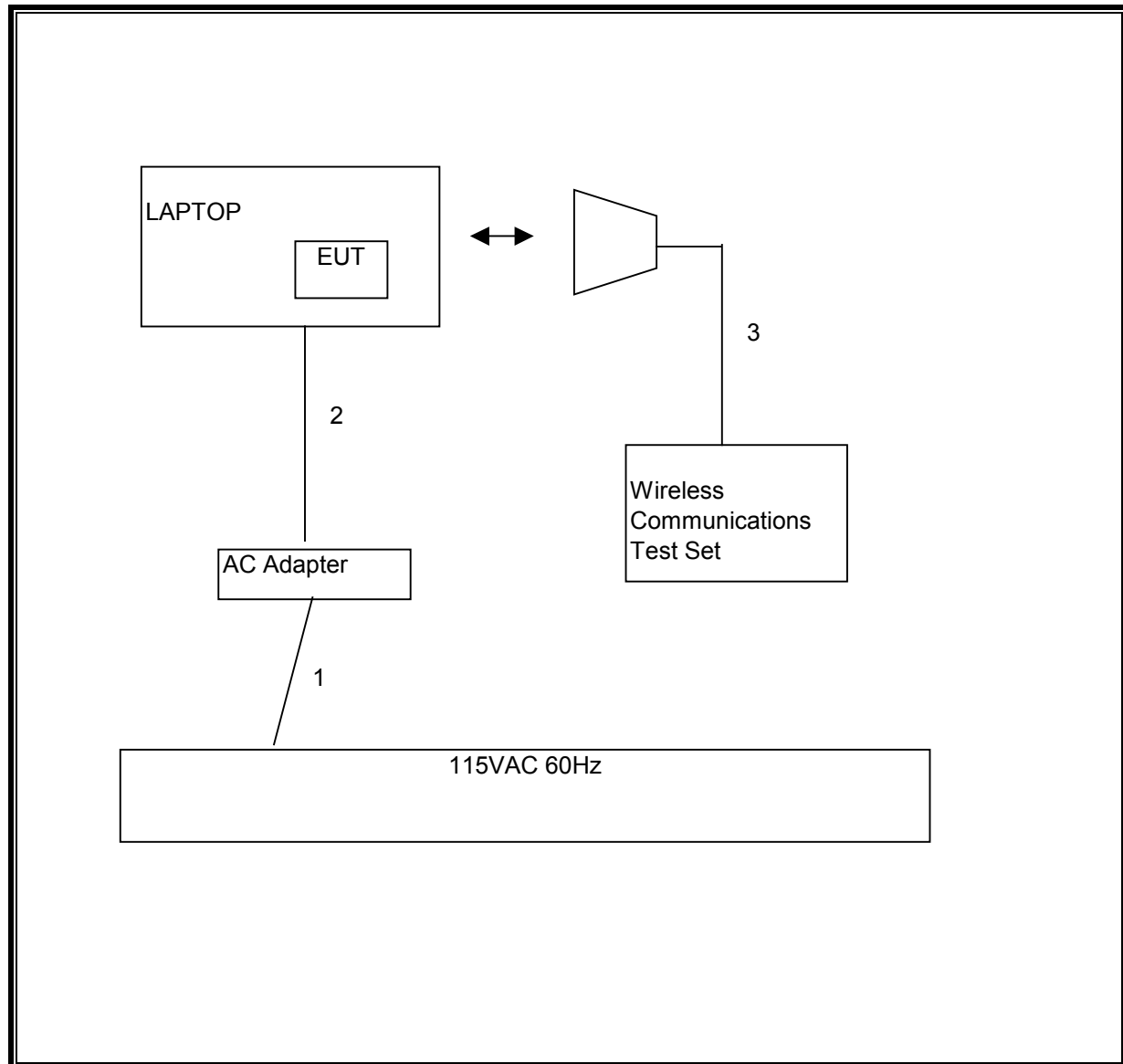
I/O CABLES

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	SMA	Un-shielded	1m	NA

TEST SETUP

The EUT is installed inside a Lenovo ThinkPad X61 Tablet Series laptop during the tests. The Wireless Communication test set exercised the EUT.

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	Serial Number	Cal Due
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	08/13/07
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	1/23/08
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY43360112	05/03/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	04/22/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	04/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00369	08/17/07
Wireless Communications Test Set	Agilent	E5515C	10092	10/19/07
2.7GHz HPF	MicroTronic	HPM13194	2	CNR
1.5GHz HPF	MicroTronic	HPM13195	1	CNR
Signal Generator 2 -40 GHz	R & S	SMP04	DE 34210	06/02/07
Signal Generator 1024 MHz	R & S	SMY01	DE 12311	05/11/07

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

No non-compliance noted.

800MHz CELL CDMA Modulation

Channel	Frequency (MHz)	ERP Peak Power (dBm)	ERP Peak Power (mW)
Low	824.7	26.20	416.87
Middle	836.5	27.80	602.56
High	848.3	26.00	398.11

1900MHz PCS Modulation

Channel	Frequency (MHz)	EIRP Peak Power (dBm)	EIRP Peak Power (mW)
Low	1851.25	30.70	1174.90
Middle	1880.00	28.70	741.31
High	1908.75	29.70	933.25

NOTE: RBW=VBW=3MHz

Cellular Output Power (ERP)**High Frequency Substitution Measurement
Compliance Certification Services, Fremont 5m Chamber Site**

Company: Sierra Wireless
Project #: 07U10962
Date: 03/28/2007
Test Engineer: Mengistu Mekuria
Configuration: EUT Alone
Mode: Tx, EV-DO, REV A

Test Equipment:

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

f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
824.70	100.3	V	26.7	0.5	0.0	26.2	38.5	-12.3	
824.70	96.4	H	21.1	0.5	0.0	20.6	38.5	-17.9	
836.52	101.4	V	28.4	0.6	0.0	27.8	38.5	-10.7	
836.52	97.8	H	22.7	0.6	0.0	22.1	38.5	-16.4	
848.31	99.9	V	26.7	0.7	0.0	26.0	38.5	-12.4	
848.31	95.5	H	20.0	0.7	0.0	19.3	38.5	-19.1	

Rev. 1.24.7

PCS Output Power (EIRP)

High Frequency Fundamental Measurement

Compliance Certification Services, Morgan Hill 5m Chamber Site

Company: Sierra Wireless
Project #: 07U10962
Date: 03/28.2007
Test Engineer: Mengistu Mekuria
Configuration: EUT Alone
Mode: Tx, EV-DO, REV A

Test Equipment:

Receiving: Horn T73, and 12ft S/N: 197209005 (Setup this one for testing EUT)
Substitution: Horn T60 Substitution, 4ft SMA Cable Warehouse S/N: 177081002

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
1.851	92.5	V	19.1	0.9	8.3	26.5	33.0	-6.5	
1.851	97.2	H	23.3	0.9	8.3	30.7	33.0	-2.3	
1.880	92.7	V	18.4	0.9	8.3	25.8	33.0	-7.2	
1.880	96.0	H	21.2	0.9	8.3	28.7	33.0	-4.3	
1.909	90.1	V	16.7	0.9	8.4	24.2	33.0	-8.8	
1.909	95.0	H	22.2	0.9	8.4	29.7	33.0	-3.4	

Rev. 1.24.7

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

No non-compliance noted.

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)**Cellular Harmonic Substitution Measurement**
Compliance Certification Services, Fremont Immunity Chamber

Company: Sierra Wireless Lenovo
Project #: 07U10962
Date: March 29th 2007
Test Engineer: Anoop Singh
Configuration: EUT Only
Mode: TX, CELL, EVDO Rev A

Test Equipment:

Receiving: Horn T60, Pre-amp T145, CAN SMA Cables 3 & 12 ft (Setup this one for testing EUT) S/N: 187207004 & 187308840
 Substitution: Horn T59, 6ft SMA Cable Warehouse S/N: 187215001

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Channel (824.7MHz)									
1.649	71.5	V	-35.4	0.8	7.7	-28.6	-13.0	-15.6	
2.474	68.6	V	-41.3	1.0	9.4	-32.9	-13.0	-19.9	
3.299	49.2	V	-56.5	1.2	9.7	-48.0	-13.0	-35.0	
1.649	67.9	H	-36.8	0.8	7.7	-30.0	-13.0	-17.0	
2.474	62.1	H	-41.3	1.0	9.4	-32.9	-13.0	-19.9	
3.299	47.2	H	-54.7	1.2	9.7	-46.2	-13.0	-33.2	
Mid Channel (836.52MHz)									
1.673	69.4	V	-31.1	0.8	7.7	-24.3	-13.0	-11.3	
2.510	72.9	V	-40.8	1.0	9.4	-32.4	-13.0	-19.4	
3.346	51.4	V	-59.2	1.2	9.7	-50.7	-13.0	-37.7	
1.673	68.3	H	-38.4	0.8	7.7	-31.6	-13.0	-18.6	
2.510	69.0	H	-36.0	1.0	9.4	-27.6	-13.0	-14.6	
3.346	50.3	H	-54.1	1.2	9.7	-45.6	-13.0	-32.6	
High Channel (848.31MHz)									
1.697	68.4	V	-31.2	0.8	7.8	-24.3	-13.0	-11.3	
2.545	68.7	V	-31.6	1.0	9.4	-23.2	-13.0	-10.2	
3.393	51.9	V	-61.7	1.2	9.7	-53.2	-13.0	-40.2	
1.697	69.0	H	-30.6	0.8	7.8	-23.7	-13.0	-10.7	
2.545	68.9	H	-36.8	1.0	9.4	-28.4	-13.0	-15.4	
3.393	53.6	H	-56.3	1.2	9.7	-47.8	-13.0	-34.8	

PCS Spurious & Harmonic (EIRP)

PCS Harmonic Substitution Measurement Compliance Certification Services, Fremont Immunity Chamber									
Company: Sierra Wireless Lenovo Project #: 07U10962 Date: March 29th 2007 Test Engineer: Anoop Singh Configuration: EUT Mode: TX,PCS,EVDO Rev A									
Test Equipment: Receiving: Horn T60, Pre-amp T145, SMA Cables 3 & 12 ft (Setup this one for testing EUT) S/N: 187207004 & 187308840 Substitution: Horn T59, 6ft SMA Cable Warehouse S/N: 187215001									
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Channel (1851.25MHz)									
3.703	53.8	V	-50.8	0.9	9.7	-42.0	-13.0	-29.0	
5.554	55.1	V	-47.5	1.3	11.0	-37.8	-13.0	-24.8	
7.405	57.5	V	-43.5	1.4	12.0	-32.9	-13.0	-19.9	
3.703	59.1	H	-46.8	0.9	9.7	-38.0	-13.0	-25.0	
5.554	53.8	H	-49.2	1.3	11.0	-39.5	-13.0	-26.5	
7.405	54.9	H	-45.7	1.4	12.0	-35.0	-13.0	-22.0	
Mid Channel (1880MHz)									
3.760	63.6	V	-41.2	0.9	9.7	-32.4	-13.0	-19.4	
5.640	57.1	V	-46.1	1.4	11.2	-36.3	-13.0	-23.3	
3.760	68.0	H	-36.3	0.9	9.7	-27.5	-13.0	-14.5	
5.640	57.6	H	-45.8	1.4	11.2	-36.0	-13.0	-23.0	
High Channel (1908.75MHz)									
3.818	68.6	V	-35.4	0.9	9.7	-26.6	-13.0	-13.6	
5.726	50.6	V	-52.9	1.4	11.3	-43.0	-13.0	-30.0	
3.818	71.3	H	-32.6	0.9	9.7	-23.8	-13.0	-10.8	
5.726	49.0	H	-54.6	1.4	11.3	-44.7	-13.0	-31.7	
Note: No other emissions were detected above the system noise floor.									

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	27.80	1.76	0.18
1900 MHz PCS	20.0	30.70	1.30	0.31

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.