731 Enterprise Drive
Lexington, KY 40510

Telephone: 859-226-1000
Facsimile: 859-226-1040
www.intertek-etlsemko.com

MPE Calculation

§ 1.1310: The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (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.

Part 1.1310 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
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.

1.1 Test Procedure

An MPE evaluation for was performed in order to show that the device was compliant with §2.1091. The maximum power density was calculated for each transmitter at a separation distance of 20cm.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{ConductedPower(dBm)/10}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

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1.2 Results:

The device contains a cellular transmitter which does transmit simultaneously with any other radios in the device. The following calculations show that the total power density from transmitter in each band at 20cm is less than the limit for general population / un-controlled exposure. The MPE calculations are less than the applicable limit.

CDMA Cell Band Transmitter – External Antenna:

Frequency	824	MHz		
Limit	0.5493	mW/cm^2		
Distance	20	cm		
Conducted Power	24.5	dBm	281.83829	mW
TX Ant Gain	**9.40**	dBi		
EIRP	33.90	dBm	2454.7089	mW
ERP = EIRP - 2.15	31.75	dBm	1496.2357	mW
Power Density	**0.1984**	mW/cm^2 at 20cm		

CDMA PCS Band Transmitter – External Antenna:

Frequency	1880	MHz		
Limit	1.0000	mW/cm^2		
Distance	20	cm		
Conducted Power	24.5	dBm	281.83829	mW
TX Ant Gain	**8.4**	dBi		
EIRP	32.9	dBm	1949.8446	mW
Power Density	**0.3879**	mW/cm^2 at 20cm		

CDMA Cell Band Transmitter – Internal Antenna:

Frequency	836.52	MHz		
Limit	0.5577	mW/cm^2		
Distance	20	cm		
Conducted Power	24.5	dBm	281.83829	mW
TX Ant Gain	**6.28**	dBi		
EIRP	30.78	dBm	1196.7405	mW
ERP = EIRP - 2.15	28.63	dBm	729.45751	mW
Power Density	**0.2382**	mW/cm^2 at 20cm		

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CDMA PCS Band Transmitter – Internal Antenna:

Frequency	1851.25	MHz		
Limit	1.0000	mW/cm^2		
Distance	20	cm		
Conducted Power	24.5	dBm	281.83829	mW
TX Ant Gain	**6.00**	dBi		
EIRP	30.50	dBm	1122.0185	mW
Power Density	**0.2233**	mW/cm^2 at 20cm		