

## 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
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>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	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:

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



### 1.2 Results:

The following calculations show that the total power density from each transmitter at 20cm is less than the limit for general population / un-controlled exposure. The device meets the RF exposure limit at a 20cm separation distance as required by part 2.1091 of the FCC rules when used with an antenna not exceeding the maximum antenna gain noted in the following table.

#### Test Summary

Frequency (MHz)	Maximum Antenna Gain (dBi)	MPE @ 20cm (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Test Result
836.52	10.00	0.2066	0.5577	<b>Compliant</b>
1880	8.94	0.3960	1.0000	<b>Compliant</b>

#### Cell Band:

<b>Frequency</b>	836.52	MHz		
<b>Limit</b>	0.5577	mW/cm <sup>2</sup>		
<b>Distance</b>	20	cm		
<b>Conducted Power</b>	23.84	dBm	242.1029	mW
<b>TX Ant Gain</b>	<b>10.00</b>	dBi		
<b>EIRP</b>	33.84	dBm	2421.029	mW
<b>ERP = EIRP - 2.15</b>	31.69	dBm	1475.7065	mW
<b>Power Density</b>	<b>0.2066</b>	mW/cm <sup>2</sup>	at 20cm	

#### PCS Band:

<b>Frequency</b>	1880	MHz		
<b>Limit</b>	1.0000	mW/cm <sup>2</sup>		
<b>Distance</b>	20	cm		
<b>Power</b>	24.05	dBm	254.09727	mW
<b>TX Ant Gain</b>	<b>8.94</b>	dBi		
<b>EIRP</b>	32.99	dBm	1990.6733	mW
<b>Power Density</b>	<b>0.3960</b>	mW/cm <sup>2</sup>	at 20cm	

\*Note that for PCS band the antenna gain was limited by the radiated power limit (33dBm).

