MPE CALCULATION

EMBER CORPORATION

FCC ID:

TITLE: EMBER MPE CALCULATION			W66 N220 COMMERCE COURT CEDARBURG, WI 53012, USA (262)-375-4400 FAX: (262)-375-6731 email: eng@lsr.com, http://www.lsr.com	
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1.0 SCOPE

This report demonstrates the Maximum Permissible Exposure (MPE) Calculation required for an Intentional Radiator equipment authorization.

2.0 REVISION CONTROL

DATE	CHANGES	REVISION
12/05/02	ORIGINAL RELEASE	0.0

3.0 APPLICABLE DOCUMENTS

[1] "Code of Federal Regulations Title 47, Volume 1, Sec. 1.1310 Radiofrequency radiation exposure limits" ***47CFR1.1310,*** Revised as of October 1, 2001, Page 297-298.

[2] "Code of Federal Regulations Title 47, Volume 1, Sec. 2.1091 Radiofrequency radiation exposure evaluation: mobile devices." ***47CFR2.1091,*** Revised as of October 1, 2001, Page 588-589.

4.0 MAXIMUM PERMISSIBLE EXPOSURE CALCULATIONS

The effective radiated power for this worst case emission is based on the worst case conducted power and the specified directive and power gains of the antennas contained within the equipment under test. The worst case conducted power from the conducted emissions measurements is 20.0 dBm and the specified antenna gain is 0.0 dBi. The effective radiated power at the antenna aperture is:

$$P_t = 20.0 \;\; dBm \; + \; 0.0 \;\; dBi = 20.0 \, dBm \;\; EIRP$$

The expected power density at a 20 centimeter distance is:

$$W(r) = \frac{W_t}{4\pi r^2} = \frac{10^{\left(\frac{20.0\ dBm}{10}\right)} \cdot \frac{10^{-3}\ mW}{W}}{4\pi \left(20 \times 10^{-2}\ m\right)^2} = 198.9 \ \frac{mW}{m^2}$$

Re-normalizing this power density on a per square centimeter basis:

$$W(r) = 198.9 \ \frac{mW}{m^2} \cdot \frac{10^{-4}\ m^2}{cm^2} = 19.89 \ \frac{mW}{cm^2}$$

The limit for Maximum Permissible Exposure (MPE) given in Table 1 of §1.1310 is given as

$$W_{\max}(r) = \frac{f\,(MHz)}{1500 \frac{MHz - cm^2}{mW}} \;\; = \frac{902\,MHz}{1500 \frac{MHz - cm^2}{mW}} = 601.33 \frac{mW}{cm^2}$$

The base-station uses a Time-Division-Duplex Protocol where the transmitter has a maximum duty factor of 100%. Section 2.1091 allows for time averaging of the transmit power for the purposes of the MPE calculations. This fact would not reduce the average power of the constantly transmitting value:

$$W(r)=19.89\,\frac{mW}{cm^2}$$

Since:

$$W(r)=19.89\,\frac{mW}{cm^2} < W_{\max}(r)=601.33\,\frac{mW}{cm^2}$$

Therefore, the device in question meets the MPE requirmement.