

Environmental Evaluation for RF Exposure for the GTM-1 CDMA Module

CDMA 850 Band, Band Class 0, MS Class III (0.2W to 1.0W ERP)

Power Density limit is $f/1500$, or $S_{\text{limit}} = 824/1500 = 0.549 \text{ mW/cm}^2$.

Nominal output power: +24 dBm. Tolerance over operational extremes: $\pm 1 \text{ dB}$.

Maximum transmitter power $P = +25 \text{ dBm} = 316.2 \text{ mW}$.

Duty Factor $DF = 1.0$.

Distance from antenna, radius $r = 20 \text{ cm}$.

Per FCC 2.1091 power limit of 1.5 W ERP = 2.46 W EIRP for frequencies 1.5 GHz or below, the maximum antenna system gain is calculated as follows:

$$g_{\text{num}} = \text{EIRP [mW]} / (P * DF) = 2460 / (316.2 * 1) = 7.78.$$

$$g_{\text{dBi}} = 10 * \text{LOG}(g_{\text{num}}) = 8.91. \quad \text{Note: } 8.91 \text{ dBi} = 6.76 \text{ dBd}.$$

The maximum allowable antenna system gain in the 850 MHz band is 6.76 dBd.

For an antenna system gain of 8.91 dBi, the maximum Power Density is:

$$S = \text{EIRP} / (4 * \pi * r^2) = DF * P * g_{\text{num}} / (4 * \pi * 400) = 0.489 < .549 \text{ mW/cm}^2 \quad \checkmark$$

CDMA PCS Band, Band Class 1, MS Class II (0.2W to 1.0W ERP)

Power Density limit $S_{\text{limit}} = 1 \text{ mW/cm}^2$.

Nominal output power: +24 dBm. Tolerance over operational extremes: $\pm 1 \text{ dB}$.

Maximum transmitter power $P = +25 \text{ dBm} = 316.2 \text{ mW}$.

Duty Factor $DF = 1.0$.

Distance from antenna, radius $r = 20 \text{ cm}$.

Per FCC 24.232(b) power limit of 2W EIRP for the PCS band, the maximum antenna system gain is calculated as follows:

$$g_{\text{num}} = \text{EIRP [mW]} / (P * DF) = 2000 / (316.2 * 1) = 6.3.$$

$$g_{\text{dBi}} = 10 * \text{LOG}(g_{\text{num}}) = 8$$

The maximum allowable antenna system gain in the PCS band is 8 dBi.

For an antenna system gain of 8 dBi, the maximum Power Density is:

$$S = \text{EIRP} / (4 * \pi * r^2) = DF * P * g_{\text{num}} / (4 * \pi * 400) = 0.398 < 1 \text{ mW/cm}^2 \quad \checkmark$$