1.9.5. RF EXPOSURE

Test Type:	Maximum Permissible Exposure
FCC Para No.:	1.1310, 2.1093
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.5.1. SPECIFICATION REQUIREMENT:

As per FCC 47CFR§1.1301; FCC OET Bulletin 65, 97-01 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" and FCC OET Bulletin 65, Supplement C, 01-01, "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", for transmitters operating in the 824-849 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to f/1500 mW/cm^2 for uncontrolled environments and f/300 mW/cm^2 for controlled environments.

The far field on-axis power flux density (W/m^2) is calculated using the following formula:

$$S = G P_T / 4\pi R^2 \quad [6]$$

Where:

S = Power density (in appropriate units, e.g. mW/cm^2)
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
P_T = Power input to the antenna (in appropriate units, e.g., mW)
R = Distance to the center of radiation of the antenna (appropriate units, e.g., cm)

It is important to note that the power gain factor, ***G***, in Equation (1) is normally ***numeric*** gain. Therefore, when power gain is expressed in logarithmic terms, i.e., dB, a conversion is required using the relation:

$$G=10^{(dB/10)} \quad [7]$$

For example, a logarithmic power gain of 14 dB is equal to a numeric gain of 25.12.

1.9.5.2. CR100 CELLULAR SIGNAL AMPLIFIER PARTICULARS

The following table shows the maximum downlink output power of the signal amplifier combined with an antenna with 9dBi gain. This is the maximum antenna gain permissible for the downlink signal as documented in the user/installation manual. The following table also shows the maximum uplink output power of the signal amplifier combined with an antenna with 18dBi gain. This is the maximum antenna gain permissible for the downlink signal as documented in the user/installation manual. The resulting radiated power density is compared to MPE limits for both uncontrolled and controlled environments.

1.9.5.3. UP LINK (824-849MHZ)

Uplink MPE Calculations

Output power of the amplifier:	0.09 W maximum	
Antenna Gain: Maximum antenna gain allowed as described in user/installation manual.	Isotropic Gain = 9 dBi Numerical Gain = 7.94	
Operational Frequency:	824-849MHz	
Minimum distance (Controlled): From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	20cm Antenna mounted in building interior	
Minimum distance (Uncontrolled): From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	20cm Antenna mounted in building interior	
Calculated RF Power Density:	0.142 mW/cm^2	
Maximum Permissible Exposure (MPE):	**Controlled** 6 min avg exposure 2.75mW/cm^2	**Uncontrolled** 30 min avg exposure 0.55mW/ cm^2

1.9.5.4. TEST RESULTS:

Complies

1.9.5.5. CALCULATIONS

$$S = G P_T / 4\pi R^2 \quad [8]$$

$S = (7.94^* .09^*10^3)/(4\pi^*20^2)$

$S = 714.6/(1600\pi)$

$S = 0.142$ mW/cm^2

1.9.5.6. DOWN LINK (869-894MHZ)

Downlink MPE Calculations

Output power of the amplifier:	0.032 W maximum	
Antenna Gain: Maximum antenna gain allowed as described in user/installation manual.	Isotropic Gain = 18 dBi Numerical Gain = 63.1	
Operational Frequency:	824-849MHz	
Minimum distance (Controlled): From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	50cm Antenna mounted on building exterior	
Minimum distance (Uncontrolled): From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	50cm Antenna mounted on building exterior	
Calculated RF Power Density:	0.064 mW/cm^2	
Maximum Permissible Exposure (MPE):	**Controlled** 6 min avg exposure 2.90mW/cm^2	**Uncontrolled** 30 min avg exposure 0.58mW/ cm^2

1.9.5.7. TEST RESULTS:

Complies

1.9.5.8. CALCULATIONS

$$S = G P_T / 4\pi R^2 \quad [9]$$

$S = (63.1^* .032^*10^3)/(4\pi^*50^2)$

$S = 2019/(10000\pi)$

$S = 0.064$ mW/cm^2