11 FCC §1.1307(b) & §27.52 & §2.1091 - RF EXPOSURE INFORMATION

11.1 Applicable Standard

According to FCC §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	[1] (100)	30
1.34-30	824/f	2.19/f	[1] ($180/f^2$)	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
[1] = Plane-wave equivalent power density

11.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = Antenna Gain
R = distance to the center of radiation of the antenna

Maximum average output power at antenna input terminal (dBm):	21.69
Maximum average output power at antenna input terminal (mW):	147.57
Prediction distance (cm):	20
Prediction frequency (MHz):	2132
Antenna Gain, typical (dBi):	5.0
Maximum Antenna Gain (numeric):	3.16
Power density at predication frequency and distance (mW/cm^2):	0.0928
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Result:

The outdoor antenna with 5 dBi gain should have at least 20 cm prediction distance to meet the MPE limit, the highest power density level at 20 cm is 0.0928 mW/cm^2, which is below the uncontrolled exposure limit of 1.0 mW/cm^2.

FCC §1.1307 & §2.1091 - RF EXPOSURE INFORMATION

Applicable Standard

According to §1.1307 (b)(1) and §2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
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

MPE Calculation

Predication of MPE limit at a given distance, Equation from OET 65, Edition97-01

$$S = PG/4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = the antenna gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Band	**Frequency (MHz)**	**Antenna Gain**		**Conducted Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
		(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
Cellular	881.6	5.0	3.16	20.49	111.94	20	0.0704	0.587
PCS	1960.0	5.0	3.16	21.53	142.23	20	0.0895	1.0

Result: The device meets FCC MPE limit at 20 cm distance.