3 Measurements and results

For Part 24/22/90 we use the substitution method (TIA/EIA 603).

3.1 iDEN/TETRA

3.1.1 RF Exposure

FCC:	FCC §1.1307, §2.1091
IC:	RSS-131 §5.5

MPE calculation

These equations are generally accurate in the far field of an antenna but will over predict power density in the near field, where they could be used for making a "worst case" prediction.

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

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 = power gain of the antenna in the direction of interest relative to the isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units e.g. cm)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
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.

Antenna gain worst case calculations: ($S4\pi R^2 / P$)

Downlink:
Maximum peak output power at antenna input terminal (dBm): 15.58
Maximum peak output power at antenna input terminal (mW): 36.14
Prediction distance (cm): 20
Prediction frequency (MHz): 858
MPE limit for uncontrolled exposure at predication frequency (mW/cm): 0.573
Maximum Antenna Gain (numeric): 79.7
Antenna Gain, typical (dBi): 19.0

Upnlink:
Maximum peak output power at antenna input terminal (dBm): 15.83
Maximum peak output power at antenna input terminal (mW): 38.28
Prediction distance (cm): 20
Prediction frequency (MHz): 1880.00
MPE limit for uncontrolled exposure at predication frequency (mW/cm): 0.573
Maximum Antenna Gain (numeric): 75.2
Antenna Gain, typical (dBi): 18.8

Test result:

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 0.573 mW/cm². The maximum allowed antenna gain for a distance of 20 cm is 18.8 dBi .