RF Exposure Compliance Requirements
Integra Telemetry Radio Modem

Description of Compliance:

The Integra-TR radio is intended for use in the Industrial Monitoring and Control and SCADA markets and will be mounted with a fixed RTU (Remote Terminal Unit). FCC CFR 47 Part 2.1091 requires a minimum separation of 20 cm to be classified as a mobile. The IntegraTR will be professionally installed in such a way that a minimum separation distance as listed in the table below will be maintained between the radiating structure and any person to be classified as a mobile. A typical installation would be with the antenna mounted on a tower. The nominal factory set power is 5.00 Watts (37.00 dBm), but the MPE is calculated for maximum allowed to be within the production specification of 6.00 Watts (37.78 dBm). **Note: It is the responsibility of the user to guarantee compliance with the FCC MPE regulations when operating this device in a way other than described above.**

Antenna Gain vs. Recommended Safety Distance

	Antenna Gain		
	5 dBi	10 dBi	15 dBi
Min Safety Distance (max power)	72.1 cm	128.3 cm	228.1 cm

The calculation for the more stringent specification, a General Population/Uncontrolled Mobile device according to Section 2.1091(b) and Section 1.1310 Note 2 is shown below:

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 (mins)
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 (MHz)/1500 (MHz)	30
1500-100000	---	---	1.0	30

Environmental Specification: $f(MHz)/(150\ W/m^2)$

$440.0\ MHz/(150\ MHz\ W/m^2) = 2.93\ W/m^2$ (worst case)

$S = (PG)/(4\pi R^2)$ (OET Bulletin 65)

Where:

S = Power Density (mW/cm^2)
P = Power input to the antenna (mW)
G = Power Gain of the antenna in the direction of interest relative to an isotropic radiator
R = Distance to the center of radiation of the antenna (cm)

Distance Calculation for 5dBi antenna:

$R = \sqrt{((PG)/(4\pi S))}$

Antenna Gain: 5.0 dBi $10^{(5\ dBi/10)} = 3.16$
Power input to the Antenna: 37.78 dBm = $10^{(37dBm/10)}$ = 6000 mW

$R = \sqrt{((6000mW*3.16)/(4\pi*0.29\ mW/cm^2))}$ = 72.1 cm (Minimum Distance)

Distance Calculation for 10dBi antenna:

$R = \sqrt{((PG)/(4\pi S))}$

Antenna Gain: 10.0 dBi $10^{(10\ dBi/10)} = 10$
Power input to the Antenna: 37.78 dBm = $10^{(37dBm/10)}$ = 6000 mW

$R = \sqrt{((6000mW*10)/(4\pi*0.29\ mW/cm^2))}$ = 128.3 cm (Minimum Distance)

Distance Calculation for 15dBi antenna:

$R = \sqrt{((PG)/(4\pi S))}$

Antenna Gain: 15.0 dBi $10^{(15dBi/10)} = 31.6$
Power input to the Antenna: 37.78 dBm = $10^{(37dBm/10)}$ = 6000 mW

$R = \sqrt{((6000mW*31.6)/(4\pi*0.29\ mW/cm^2))}$ = 228.1 cm (Minimum Distance)