

6.6. EXPOSURE OF HUMANS TO RADIO FREQUENCY FIELDS [§ 2.1091]

The following criteria shall be used to evaluate the environmental impact of human exposure to RF radiation:

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

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/f ²)	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/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

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.

Calculation Method of RF Safety Distance:

$$S = PG/4\pi r^2 = EIRP/4\pi r^2 \implies r = \sqrt{PG/4\pi S} = \sqrt{EIRP/4\pi S}$$

Where:

P: power input to the antenna in mW

EIRP: Equivalent (effective) isotropic radiated power.

S: power density mW/cm²

G: numeric gain of antenna relative to isotropic radiator

r: distance to center of radiation in cm

MPE Evaluation

Antenna Gain Limit specified by Manufacturer: 9 dBi

Frequency (MHz)	Measured RF Conducted (Watts)	Calculated Peak EIRP (Watts)	Calculated Average EIRP with 50% duty cycle (Watts)	Laboratory's Recommended Minimum RF Safety Distance r (metres)	Manufacturer's Minimum RF Safety Distance (metres)
156.050	24.9	197.8	98.9	2.0	3
157.425	24.8	197.0	98.5	2.0	3

Note 1: RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\pi S)^{1/2} = (EIRP/4\pi S)^{1/2}$
 $S = 0.2 \text{ mW/cm}^2$ (specified limits for general population/uncontrolled exposure)

$$r = [EIRP / 4\pi S]^{1/2} = [197,800 / (4\pi(0.2))]^{1/2} \approx 281 \text{ cm} \approx 2.8 \text{ m}; \text{ for 50\% duty cycle } r=1.98\text{m}$$

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	Manufacturer's Specification for compliance with FCC Rules
Minimum calculated separation distance between antenna and persons required: 2.0 meters	Icom requires the radio operator to meet the FCC Requirements for Radio Frequency Exposure. An omnidirectional antenna with gain not greater than 9 dBi must be mounted a minimum of 5 meters (measured from the lowest point of the antenna) vertically above the main deck and all possible personnel. This is the minimum safe separation distance estimated to meet all RF exposure compliance requirements. This 5 meter distance is based on the FCC Safe Maximum Permissible Exposure (MPE) distance of 3 meters added to the height of an adult (2 meters) and is appropriate for all vessels

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All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)