

MPE Evaluation

FCC

Maximum exposure limits from CFR 47, FCC Part 1.1310:

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 Exposure				
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
300-1,500			f/300	6
1,500-100,000			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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

Table 2 – Power Density Calculations, FCC

Occupational/Controlled	
General Population/uncontrolled	1

Transmitter	Frequency	Antenna Gain	Power EIRP	Power (conducted) +10% for tolerance	Power Density	Limit at specified distance	% of limit	Highest	Total
	MHz	numerical	mW	mW	mW/cm ²	mW/cm ²			
2	905.6	1	39.45	43.395	0.0086	0.6037	0.0143	1	1.431%
2	915.0	1	36.64	40.304	0.0080	0.6100	0.0132		
2	924.4	1	22.65	24.915	0.0050	0.6163	0.0080		
								TOTAL	1.43%

Distance	20	cm
----------	----	----

PASS?	YES
-------	-----

Note: The user’s manual will stipulate that a 20cm distance from the user is to be maintained.

*Antenna gain was unknown so EIRP measurements were used. Antenna gain was set to 1

The power density is calculated as shown below:

$$S = (P \times G) / (4 \times \pi \times d^2) - \text{used to calculate exposure at 20 cm}$$

$$d = \sqrt{(S / (P \times G) \times 4 \times \pi)} - \text{used to calculate minimum distance to meet limits}$$

- S= power density
- P = transmitter conducted power (in mW)
- G = antenna numeric gain
- D = distance to radiation center (20 cm)

IC / ISED

Using RSS-102, Issue 5, Section 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{(0.6834)}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). In these cases, the information contained in the RF exposure

Table 1 - Power Density Calculations, IC/ISED

Transmitter	Frequency	Antenna Gain	Power EIRP	Power (conducted) +10% for tolerance	Exemption Limit	% of exemption limit	Compliant
	MHz	numerical	mW	mW	mW	%	
1	905.6	1	39.45	43.395	1374.2	3.16	YES
1	915.0	1	36.64	40.304	1240.0	3.25	YES
1	924.4	1	22.65	24.915	1393.6	1.79	YES

*Antenna gain was unknown so EIRP measurements were used and gain was set to 0.