

RF EXPOSURE

Reference: CFR 47 FCC Part 1.1310
RSS-102. Issue 5

Limits: 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

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Calculations:

Table 2 - Calculations according to CFR 47, Part 1.1310, Table 1(B)

Occupational/Controlled	0
General Population/uncontrolled	1

Transmitter	Frequency	Antenna Gain	Power (conducted)	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			
1	2407	1.58	3.0000	3.3000	0.00104	1.00	0.1038%	1	0.1038%
1	2440	1.58	3.0000	3.3000	0.00104	1.00	0.1038%		
1	2480	1.58	3.0000	3.3000	0.00104	1.00	0.1038%		
								TOTAL	0.1038%

Distance	20	cm
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PASS?	YES
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Antenna gain was taken from manufacturer's data sheet. Stated to be 2 dBi peak. 2 dBi = 1.58 numeric

Power measurements were rounded to the nearest mW.

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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 3 - Calculation according to Industry Canada RSS-102, Table 6

Transmitter	Frequency	Antenna Gain	Power conducted	Power (EIRP)	Power (conducted) +10% for tolerance	Exemption Limit	Compliant
	MHz	numerical	mW	mW	mW	mW	
1	2407	1.58	3	4.74	5.21	2680	YES
1	2440	1.58	3	4.74	5.21	2705	YES
1	2480	1.58	3	4.74	5.21	2736	YES

Notes: The minimum separation distance was defined as the closest point from the transmitting antenna to any part of the body or extremity of a user or bystander.

The limit was converted from W/cm^2 to mW/m^2 by dividing by 10

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$(W \rightarrow mW = .001) \times (/cm^2 \rightarrow /m^2 = 100) = 0.1 = /10$

The power density is calculated as shown below:

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

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

$$1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

S= power density

P = transmitter conducted power (in mW)

G = antenna numeric gain

D = distance to radiation center

Antenna gain was taken from manufacturer's data sheet. Stated to be 2 dBi peak. 2 dBi = 1.58 numeric