The Nebraska Center for Excellence in Electronics
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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

The power density is calculated as shown below:

S = (P x G)/(4 x π x d^2) – used to calculate exposure at 20 cm

d = √(S/(P x G) x 4 X π) – 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)

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Table 2 – Power Density Calculations

Occupational/Controlled	
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	902.4	1.64	39.17	43.087	0.051146	0.6016	8.50%	1	8.50%
1	914.8	1.64	31.04	34.144	0.040530	0.609867	6.65%		
1	927.6	1.64	31.99	35.189	0.041770	0.6184	6.75%		
								TOTAL	8.50%

Distance	10	**cm**	**PASS?**	**YES**

Note: This equipment is not intended to be operated by hand, and instead is operated by a separate handheld remote. It is expected that a 20cm separation will be maintained at all times.

Measurements come from NCEE Labs report R20170718-26

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 MHz6 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/ƒ0.5 W (adjusted for tune-up tolerance), where ƒ 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 x 10-2 ƒ^(0.6834) W (adjusted for tune-up tolerance), where ƒ 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

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Occupational/Controlled	
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	902.4	1.64	39.17	43.087	0.051146	0.137085	37.31%	1	37.31%
1	914.8	1.64	31.04	34.144	0.040530	0.138370	29.29%		
1	927.6	1.64	31.99	35.189	0.041770	0.139690	29.90%		
								TOTAL	37.31%

Distance	10	cm	PASS?	YES

The limit was converted from W/cm^2 to mW/m^2 by dividing by 10
(W→mW = .001) × (/cm^2→/m^2 = 100) = 0.1 = /10
The power density is calculated as shown below:

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d = √(S/(P x G) x 4 X π) – used to calculate minimum distance to meet limits

1 mW/cm^2 = 10 W/m^2

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