

## 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	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:

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

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

S= power density

P = transmitter conducted power (in mW)

G = antenna numeric gain

D = distance to radiation center (20 cm)

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 <sup>2</sup>	mW/cm <sup>2</sup>			
1	905.6	1.259	3.74	4.114	0.000937	0.603733	0.16%	1	0.16%
1	915	1.259	3.62	3.982	0.000907	0.610000	0.15%		
1	924.4	1.259	2.54	2.794	0.000637	0.616267	0.10%		
								<b>TOTAL</b>	<b>0.16%</b>

Distance	20	cm
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PASS?	YES
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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 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

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 <sup>2</sup>	mW/cm <sup>2</sup>			
1	905.6	1.259	3.74	4.114	0.000937	0.137417	0.68%	1	0.68%
1	915	1.259	3.62	3.982	0.000907	0.138391	0.66%		
1	924.4	1.259	2.54	2.794	0.000637	0.139361	0.46%		
								<b>TOTAL</b>	<b>0.68%</b>

Distance	20	cm
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PASS?	YES
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The limit was converted from W/cm<sup>2</sup> to mW/m<sup>2</sup> by dividing by 10

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

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