

## RF EXPOSURE

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

Description:

All measurements were peak power readings taken from test reports from accredited test labs. Antenna gains were taken from the manufacturer's specifications.

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 <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

**RF EXPOSURE**

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 <sup>2</sup>	mW/cm <sup>2</sup>			
1	2407	1.58	1.74	1.91	0.00060	1.00	0.06%		
1	2437	1.58	1.59	1.75	0.00055	1.00	0.06%		
1	2462	1.58	1.74	1.91	0.00060	1.00	0.06%	1	0.06%
								<b>TOTAL</b>	<b>0.06%</b>

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

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Table 3 - From Table 4 of RSS-102 Issue 5

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>21</sup>	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> <sup>0.5</sup>	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> <sup>0.25</sup>	0.1540/ <i>f</i> <sup>0.25</sup>	8.944/ <i>f</i> <sup>0.5</sup>	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> <sup>0.3417</sup>	0.008335 <i>f</i> <sup>0.3417</sup>	0.02619 <i>f</i> <sup>0.6834</sup>	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> <sup>1.2</sup>
150000-300000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616000/ <i>f</i> <sup>1.2</sup>
<p><b>Note:</b> <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).</p>				

Table 4 - Calculation according to Industry Canada RSS-102, Table 6

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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 <sup>2</sup>	mW/cm <sup>2</sup>			
1	2412	1.58	1.74	1.91	0.000547	0.536602	0.10%		
1	2437	1.58	1.59	1.75	0.000500	0.540397	0.09%		
1	2462	1.58	1.74	1.91	0.000547	0.544179	0.10%	1	0.10%
								<b>TOTAL</b>	<b>0.10%</b>

Distance	20	cm
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PASS?	YES
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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<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

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