

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 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	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%
								TOTAL	0.06%

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 ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

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 ²	mW/cm ²			
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%
								TOTAL	0.10%

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/cm² to mW/m² by dividing by 10

(W→mW = .001) × (/cm²→/m² = 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