



APPENDIX L
: RF EXPOSURE EVALUATION



1. RF Exposure Evaluation

Radiofrequency radiation exposure limits.

Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) 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
(ii) 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

f = frequency in MHz. * = Plane-wave equivalent power density.

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance r.



Antenna Gain: 2.94 dBi

IEEE 802.11b

Frequency (MHz)	Average Conducted Output Power (dBm)	Average Conducted Output Power (mW)	Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
2 412	15.5	35.48	20	0.017 828	1.0
2 437	15.6	36.31	20	0.021 238	1.0
2 462	14.8	30.2	20	0.017 664	1.0

IEEE 802.11g

Frequency (MHz)	Average Conducted Output Power (dBm)	Average Conducted Output Power (mW)	Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
2 412	13.2	20.89	20	0.012 218	1.0
2 437	13.2	20.89	20	0.012 218	1.0
2 462	12.5	17.78	20	0.010 399	1.0

IEEE 802.11n

Frequency (MHz)	Average Conducted Output Power (dBm)	Average Conducted Output Power (mW)	Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
2 412	13.2	20.89	20	0.012 218	1.0
2 437	13.2	20.89	20	0.012 218	1.0
2 462	12.6	18.20	20	0.010 645	1.0

※ Device must be operated at least 20cm from the user.