



APPENDIX L
: MAXIMUM PERMISSIBLE EXPOSURE



Maximum Permissible Exposure

1.1 Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device

(A) Limits for Occupational / Controlled Exposure

Frequency range(MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density(S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3 ~ 3.0	614	1.63	(100)*	6
3.0~30	1842/f	4.89/f	(900/f)*	6
30~300	61.4	0.163	1.0	6
300 ~ 1,500	-	-	f/300	6
1,500 ~ 100,000	-	-	5.0	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency range(MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density(S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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

Note: f=frequency in MHz; *Plane-wave equivalent power density

1.2 MAXIMUM PERMISSIBLE EXPOSURE Prediction

$$E(V / m) = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd(W / m^2) = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Max Average output Power at antenna input terminal(W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.



1.3 Calculated Result and Limit

Antenna type: PCB Pattern antenna

Antenna gain: 2.93 dBi

Evaluation distance: 20 cm

IEEE 802.11b

Frequency (MHz)	2412	2437	2462
Antenna gain (dBi)	2.91		
Antenna gain (numeric)	1.95		
Average output power (dBm)	2.88	2.75	3.14
Tune- up + Tolence (dBm)	3 ± 1	3 ± 1	3 ± 1
Maximum tune up tolence Average output power (mW)	2.512	2.512	2.512
Power density (S) (mW/cm ²)	0.001	0.001	0.001
Limit of Power density (S) (mW/cm ²)	1.0	1.0	1.0

IEEE 802.11g

Frequency (MHz)	2412	2437	2462
Antenna gain (dBi)	2.91		
Antenna gain (numeric)	1.95		
Average output power (dBm)	3.58	3.61	3.83
Tune- up + Tolence (dBm)	3 ± 1	3 ± 1	3 ± 1
Maximum tune up tolence Average output power (mW)	2.512	2.512	2.512
Power density (S) (mW/cm ²)	0.001	0.001	0.001
Limit of Power density (S) (mW/cm ²)	1.0	1.0	1.0

IEEE 802.11n

Frequency (MHz)	2412	2437	2462
Antenna gain (dBi)	2.91		
Antenna gain (numeric)	1.95		
Average output power (dBm)	3.38	3.46	3.68
Tune- up + Tolence (dBm)	3 ± 1	3 ± 1	3 ± 1
Maximum tune up tolence Average output power (mW)	2.512	2.512	2.512
Power density (S) (mW/cm ²)	0.001	0.001	0.001
Limit of Power density (S) (mW/cm ²)	1.0	1.0	1.0

Note:

- 1) The power densities at a distance of 20 cm are below the uncontrolled exposure limits of 1.0 mW/cm².