

Appendix B. Maximum Permissible Exposure

1. 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
300-1500			F/300	6
1500-100,000			5	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)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

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

1.2. MPE Calculation Method

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

E = Electric field (V/m)

P = Peak RF output power (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

1.4. For 5GHz Band

For Antenna 1 / Mode 1:

ISM Band:

Antenna Type : Panel Antenna

Max Conducted Power for IEEE 802.11a 5MHz Ant. 1-1 + Ant. 1-2 : 20.50 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8	6.3096	20.4970	112.1241	0.140815	1	Complies

For Antenna 1 / Mode 2:

ISM Band:

Antenna Type : Panel Antenna

Max Conducted Power for IEEE 802.11a 10MHz Ant. 1-1 + Ant. 1-2 : 20.57 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8	6.3096	20.5726	114.0920	0.143287	1	Complies

For Antenna 2 / Mode 3:

ISM Band:

Antenna Type : Sector Antenna

Max Conducted Power for IEEE 802.11a 5MHz Ant. 2-1 + Ant. 2-2 : 20.50 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8	6.3096	20.4970	112.1241	0.140815	1	Complies

For Antenna 2 / Mode 4:

ISM Band:

Antenna Type : Sector Antenna

Max Conducted Power for IEEE 802.11a 10MHz Ant. 2-1 + Ant. 2-2 : 20.57 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8	6.3096	20.5726	114.0920	0.143287	1	Complies

For Antenna 3 / Mode 5:

UNII Band:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11a 5MHz Ant. 3-1 + Ant. 3-2 : 6.67 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
10	10.0000	6.6700	4.6452	0.009246	1	Complies

ISM Band:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11a 5MHz Ant. 3-1 + Ant. 3-2 : 20.50 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
10	10.0000	20.4970	112.1241	0.223177	1	Complies

For Antenna 3 / Mode 6:

UNII Band:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11a 10MHz Ant. 3-1 + Ant. 3-2 : 9.33 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
10	10.0000	9.3300	8.5704	0.017059	1	Complies

ISM Band:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11a 10MHz Ant. 3-1 + Ant. 3-2 : 20.57 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
10	10.0000	20.5726	114.0920	0.227094	1	Complies

For Antenna 4 / Mode 7:

UNII Band:

Antenna Type : Dipole Antenna

Max Conducted Power for IEEE 802.11a 5MHz Ant. 4-1 + Ant. 4-2 : 11.62 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.5	2.8184	11.6200	14.5211	0.008146	1	Complies

ISM Band:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11a 5MHz Ant. 4-1 + Ant. 4-2 : 20.50 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.5	2.8184	20.4970	112.1241	0.062900	1	Complies

For Antenna 4 / Mode 8:

UNII Band:

Antenna Type : Dipole Antenna

Max Conducted Power for IEEE 802.11a 10MHz Ant. 4-1 + Ant. 4-2 : 13.55 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.5	2.8184	13.5500	22.6464	0.012704	1	Complies

ISM Band:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11a 10MHz Ant. 4-1 + Ant. 4-2 : 20.57 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.5	2.8184	20.5726	114.0920	0.064004	1	Complies

1.5. For 2.4GHz Band

For Antenna 4 / Mode 7:

Antenna Type : Dipole Antenna

Max Conducted Power for 802.11g 5MHz Ant. 4-1 + Ant. 4-2 : 24.27 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2	1.5849	24.2717	267.4025	0.084356	1	Complies

For Antenna 4 / Mode 8:

Antenna Type : Dipole Antenna

Max Conducted Power for 802.11g 10MHz Ant. 4-1 + Ant. 4-2 : 24.41 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2	1.5849	24.4097	276.0395	0.087081	1	Complies

For Antenna 5 / Mode 9:

Antenna Type : Panel Antenna

Max Conducted Power for 802.11g 5MHz Ant. 5-1 + Ant. 5-2 : 24.27 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9	7.9433	24.2717	267.4025	0.422781	1	Complies

For Antenna 5 / Mode 10:

Antenna Type : Panel Antenna

Max Conducted Power for 802.11g 10MHz Ant. 5-1 + Ant. 5-2 : 24.41 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9	7.9433	24.4097	276.0395	0.436437	1	Complies

For Antenna 6 / Mode 11:

Antenna Type : Sector Antenna

Max Conducted Power for IEEE 802.11g 5MHz Ant. 6-1 + Ant. 6-2 : 24.27 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9	7.9433	24.2717	267.4025	0.422781	1	Complies

For Antenna 6 / Mode 12:

Antenna Type : Sector Antenna

Max Conducted Power for IEEE 802.11g 10MHz Ant. 6-1 + Ant. 6-2 : 24.41 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9	7.9433	24.4097	276.0395	0.436437	1	Complies

For Antenna 7 / Mode 13:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11g 5MHz Ant. 7-1 + Ant. 7-2 : 24.27 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
6	3.9811	24.2717	267.4025	0.211893	1	Complies

For Antenna 7 / Mode 14:

Antenna Type : Omni Antenna

Max Conducted Power for IEEE 802.11g 10MHz Ant. 7-1 + Ant. 7-2 : 24.41 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
6	3.9811	24.4097	276.0395	0.218737	1	Complies