Appendix A. 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/ cm²)	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/ cm²)	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

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad\qquad \text{Power Density:} \quad Pd \text{ (W/m²)} = \frac{E^2}{377}$$

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

Antenna Type : Dipole Antenna
Max Conducted Power for IEEE 802.11n (20MHz) port A: 18.87dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	3	1.584893	18.87	77.0903	**0.0306**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 14.85dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	3	1.584893	14.85	30.5492	**0.0121**

IEEE 802.11n (20MHz) port A + port B Power Density = 0.0306 + 0.0121 = 0.0427 (mW/cm2)

Max Conducted Power for IEEE 802.11n (40MHz) port A: 17.98dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	3	1.584893	17.98	62.8058	**0.0249**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 14.28dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	3	1.584893	14.28	26.7917	**0.0106**

IEEE 802.11n (40MHz) port A + port B Power Density = 0.0249 + 0.0106 = 0.0355 (mW/cm2)

Max Conducted Power for IEEE 802.11n (20MHz) port A: 19.78dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	3	1.584893	19.78	95.0605	**0.0378**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 16.78dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	3	1.584893	16.78	47.6431	**0.0189**

IEEE 802.11n (20MHz) port A + port B Power Density = 0.0378 + 0.0189 = 0.0567 (mW/cm2)

Max Conducted Power for IEEE 802.11n (40MHz) port A: 19.62dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	3	1.584893	19.62	91.6220	**0.0364**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 17.14dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	3	1.584893	17.14	51.7607	**0.0206**

IEEE 82.11n (40MHz) port A + port B Power Density = 0.0364 + 0.0206 = 0.0570 (mW/cm2)