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 (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (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 : Monopole Antenna

For Single Chain:
Max Conducted Power for IEEE 802.11n (20MHz): 17.04dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	0	1	17.04	50.5825	**0.0101**

For Two Chain:
Max Conducted Power for IEEE 802.11n (20MHz) port A: 16.61dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	0	1	16.61	45.8142	**0.0091**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 14.76dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	0	1	14.76	29.9226	**0.0060**

IEEE 802.11n (20MHz) port A + port B Power Density = 0.0091 + 0.0060 = 0.0151 (mW/cm2)

For Single Chain:
Max Conducted Power for IEEE 802.11n (40MHz): 17.23dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	C	0	1	17.23	52.8445	**0.0105**

For Two Chain:
Max Conducted Power for IEEE 802.11n (40MHz) port A: 17.23dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	0	1	17.23	52.8445	**0.0105**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 15.23dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	0	1	15.23	33.3426	**0.0066**

IEEE 802.11n (40MHz) port A + port B Power Density = 0.0105 + 0.0066 = 0.0171 (mW/cm2)

For Single Chain:
Max Conducted Power for IEEE 802.11n (20MHz): 16.23dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	0	1	16.23	41.9759	**0.0084**

For Two Chain:
Max Conducted Power for IEEE 802.11n (20MHz) port A: 16.32dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	0	1	16.32	42.8549	**0.0085**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 15.78dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	0	1	15.78	37.8443	**0.0075**

IEEE 802.11n (20MHz) port A + port B Power Density = 0.0085 + 0.0075 = 0.0160 (mW/cm2)

For Single Chain:
Max Conducted Power for IEEE 802.11n (40MHz) port A: 16.05dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	0	1	16.05	40.2717	**0.0080**

For Two Chain:
Max Conducted Power for IEEE 802.11n (40MHz) port A: 16.45dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	0	1	16.45	44.1570	**0.0088**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 16.95dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	0	1	16.95	49.5450	**0.0099**

IEEE 82.11n (40MHz) port A + port B Power Density = 0.0088+ 0.0099 = 0.0187 (mW/cm2)