Appendix A. RF Exposure Evaluation

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

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

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

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

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 : Chip Antenna
Max Conducted Power for 5GHz

Mobile
IEEE 802.11a

Operating Frequency (GHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5.240	20	4	2.511886	12.84	19.2309	**0.0096**

Max Conducted Power for IEEE 802.11n (20MHz) port A: 12.85 dBm

Operating Frequency (GHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5.240	20	4	2.511886	12.85	19.2752	**0.0096**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 12.75 dBm

Operating Frequency (GHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5.240	20	4	2.511886	12.75	18.8365	**0.0094**

IEEE 802.11 n (20MHz) port A + port B Power Density = 0.0096 + 0.0094 = 0.019 (mW/cm2)

Max Conducted Power for IEEE 802.11n (40MHz) port A: 12.77 dBm

Operating Frequency (GHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5.230	20	4	2.511886	12.77	18.9234	**0.0095**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 12.18 dBm

Operating Frequency (GHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5.190	20	4	2.511886	12.18	16.5196	**0.0083**

IEEE 802.11n port A + port B Power Density = 0.0095 + 0.0083 = 0.0178 (mW/cm2)