

## 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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### 1.1 Standard Applicable

According to § 1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

#### (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 <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> 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
1500-100000	/	/	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 <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> 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
1500-100000	/	/	1	30

Note: f = frequency in MHz: \* = Plane-wave equivalents power density

### 1.2 MPE Calculation Method

$$S = (30 \cdot P \cdot G) / (377 \cdot R^2)$$

S = power density (in appropriate units, e.g., mw/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

### 1.3 MPE Calculation Result

WIFI:

Maximum peak output power: 16.06 (dBm)

Maximum peak output power at antenna input terminal: 40.36(mW)

Prediction distance: >20(cm)

Prediction frequency: 2437 (MHz)

Antenna gain: 2 (dBi)

Directional gain: 1.58 (numeric)

The worst case is power density at prediction frequency at 5cm: 0.0127(mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

$0.0127(\text{mw}/\text{cm}^2) < 1 (\text{mw}/\text{cm}^2)$

2G

Maximum peak output power: 31.31 (dBm)

Maximum peak output power at antenna input terminal: 1352.07(mW)

Prediction distance: >20(cm)

Prediction frequency: 824.2 (MHz)

Antenna gain: 2 (dBi)

Directional gain: 1.58 (numeric)

The worst case is power density at prediction frequency at 5cm: 0.4263(mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

$0.4263(\text{mw}/\text{cm}^2) < 1 (\text{mw}/\text{cm}^2)$

3G

Maximum peak output power: 22.75 (dBm)

Maximum peak output power at antenna input terminal: 188.36(mW)

Prediction distance: >20(cm)

Prediction frequency: 846.6 (MHz)

Antenna gain: 2 (dBi)

Directional gain: 1.58 (numeric)

The worst case is power density at prediction frequency at 5cm: 0.0594(mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

$0.0594(\text{mw}/\text{cm}^2) < 1 (\text{mw}/\text{cm}^2)$

Result: Pass