

## MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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### 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

### MPE Calculation Method

$$S = (P \cdot G) / (4 \cdot \pi \cdot R^2)$$

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)

## MPE Calculation Result

Maximum peak output power at antenna input terminal: 11.6413(mW)

Prediction distance: 20 (cm)

Prediction frequency: 2412 (MHz)

Antenna gain (typical): 3 (dBi)

Antenna gain (numeric): 2 (numeric)

The worst case is power density at prediction frequency at 20cm: 0.004632 (mw/cm<sup>2</sup>)

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

$$0.004632 \text{ (mw/cm}^2\text{)} < 1 \text{ (mw/cm}^2\text{)}$$

And:

## RF Output Power

Tx frequency range: 2412~2462MHz

Antenna-to-tissue separation: 20 cm

Maximum Output Power: 13.66dBm(23.2274mW)

Maximum Duty Factor: 100%

$$60/f(\text{GHz}) \text{ mW} = 24.37 \text{ mW}$$

Source-based time-averaged conducted output power is 23.2274 mW =< 60/f

So the transmitter is comply the RF exposure requirements and the SAR in not required.