

FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Standard Applicable

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mw/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Test Data

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. mW/cm²)

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 (appropriate units, e.g., cm)

For 802.11b:

Maximum peak output power at antenna input terminal: 17.54 (dBm)

Maximum peak output power at antenna input terminal: 56.75 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2412 (MHz)

Antenna Gain (typical): 2.0 (dBi)

Maximum Antenna Gain: 1.585 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.01789 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm²)

$$0.01789 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

For 802.11g:

Maximum peak output power at antenna input terminal: 14.10 (dBm)

Maximum peak output power at antenna input terminal: 25.70 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2437 (MHz)

Antenna Gain (typical): 2.0 (dBi)

Maximum Antenna Gain: 1.585 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0081 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm²)

$0.0081 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$

For 802.11n 20:

Maximum peak output power at antenna input terminal: 18.35 (dBm)

Maximum peak output power at antenna input terminal: 68.39 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2412 (MHz)

Antenna Gain (typical): 2.0 (dBi)

Maximum Antenna Gain: 1.585 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.02157 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm²)

$0.02157 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$

For 802.11n 40:

Maximum peak output power at antenna input terminal: 17.07 (dBm)

Maximum peak output power at antenna input terminal: 50.93 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2412 (MHz)

Antenna Gain (typical): 2.0 (dBi)

Maximum Antenna Gain: 1.585 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.01606 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm²)

$0.001606 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$

Result:

The predicted power density level at 20 cm is 0.01789 mw/cm² for 802.11b, 0.00810 mw/cm² for 802.11g, 0.02157 mw/cm² for 802.11n20 and 0.01606 mw/cm² for 802.11n40 which is below the uncontrolled exposure limit of 1.0 mw/cm², The EUT is used at least 20 cm away from user's body. It is determined as mobile equipment and complies with the MPE limit.