

Maximum Permissible Exposure (MPE)

Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission’s guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) | Averaging Time (minute) |
|---|-------------------------------|-------------------------------|-------------------------------------|-------------------------|
| Limits for General Population/Uncontrolled Exposure | | | | |
| 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 |
| 1500-15000 | / | / | 1.0 | 30 |

F = frequency in MHz

* = Plane-wave equipment power density

Maximum Permissible Exposure (MPE) Evaluation

802.11 b mode

Conducted Power result:

802.11b

| Cable loss = 0 | | Output Power | | Limit (dBm) |
|----------------|--------------------|--------------|-------------|----------------|
| CH | Frequency (MHz) | Detector | | |
| | | PK (dBm) | AV (dBm) | |
| 1 | 2412 | 20.68 | 17.82 | 30 |
| 6 | 2437 | 20.06 | 17.76 | |
| 11 | 2462 | 19.84 | 17.53 | |

MPE Prediction (802.11b) with the max antenna gain 4 dBi

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

| | | |
|--|-------------|-----------------------|
| Maximum peak output power at antenna input terminal: | 20.68 | (dBm) |
| Maximum peak output power at antenna input terminal: | 116.9499391 | (mW) |
| Duty cycle: | 100 | (%) |
| Maximum Pav : | 116.9499391 | (mW) |
| Antenna gain (typical): | 4 | (dBi) |
| Maximum antenna gain: | 2.511886432 | (numeric) |
| Prediction distance: | 20 | (cm) |
| Prediction frequency: | 2412 | (MHz) |
| MPE limit for uncontrolled exposure at prediction | 1 | (mW/cm ²) |
| Power density at predication frequency at 20 (cm) | 0.0584723 | (mW/cm ²) |

Measurement Result

The predicted power density level at 20 cm is 0.0585 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2412MHz.

802.11 g mode

Conducted Power result:

802.11g

| Cable loss = 0 | | Output Power | | Limit (dBm) |
|----------------|--------------------|--------------|-------------|----------------|
| CH | Frequency (MHz) | Detector | | |
| | | PK (dBm) | AV (dBm) | |
| 1 | 2412 | 23.14 | 14.7 | 30 |
| 6 | 2437 | 23.05 | 14.41 | |
| 11 | 2462 | 22.54 | 13.6 | |

MPE Prediction (802.11g) with the max antenna gain 4 dBi

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

| | | |
|--|-------------|-----------------------|
| Maximum peak output power at antenna input terminal: | 23.14 | (dBm) |
| Maximum peak output power at antenna input terminal: | 206.0629913 | (mW) |
| Duty cycle: | 100 | (%) |
| Maximum Pav : | 206.0629913 | (mW) |
| Antenna gain (typical): | 4 | (dBi) |
| Maximum antenna gain: | 2.511886432 | (numeric) |
| Prediction distance: | 20 | (cm) |
| Prediction frequency: | 2412 | (MHz) |
| MPE limit for uncontrolled exposure at prediction | 1 | (mW/cm ²) |
| Power density at predication frequency at 20 (cm) | 0.1030268 | (mW/cm ²) |

Measurement Result

The predicted power density level at 20 cm is 0.103 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2412.

802.11 N 20MHz mode

Conducted Power result:

802.11N 20MHz

| Cable loss = 0 | | Output Power | | Limit (dBm) |
|----------------|--------------------|--------------|-------------|----------------|
| CH | Frequency (MHz) | Detector | | |
| | | PK (dBm) | AV (dBm) | |
| 1 | 2412 | 22.6 | 14.31 | 30 |
| 6 | 2437 | 22.51 | 14.08 | |
| 11 | 2462 | 22.47 | 13.83 | |

MPE Prediction (802.11n_20M) with the max antenna gain 4 dBi

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

| | | |
|--|-------------|-----------------------|
| Maximum peak output power at antenna input terminal: | 22.6 | (dBm) |
| Maximum peak output power at antenna input terminal: | 181.9700859 | (mW) |
| Duty cycle: | 100 | (%) |
| Maximum Pav : | 181.9700859 | (mW) |
| Antenna gain (typical): | 4 | (dBi) |
| Maximum antenna gain: | 2.511886432 | (numeric) |
| Prediction distance: | 20 | (cm) |
| Prediction frequency: | 2412 | (MHz) |
| MPE limit for uncontrolled exposure at prediction | 1 | (mW/cm ²) |
| Power density at predication frequency at 20 (cm) | 0.0909809 | (mW/cm ²) |

Measurement Result

The predicted power density level at 20 cm is 0.091 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2412.

802.11 N 40MHz mode

Conducted Power result:

802.11N 40MHz

| Cable loss = 0 | | Output Power | | Limit (dBm) |
|----------------|--------------------|--------------|-------------|----------------|
| CH | Frequency (MHz) | Detector | | |
| | | PK (dBm) | AV (dBm) | |
| 3 | 2422 | 22.57 | 13.8 | 30 |
| 6 | 2437 | 22.59 | 13.82 | |
| 9 | 2452 | 22.61 | 13.69 | |

MPE Prediction (802.11n_40M) with the max antenna gain 4 dBi

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

| | | |
|--|-------------|-----------------------|
| Maximum peak output power at antenna input terminal: | 22.61 | (dBm) |
| Maximum peak output power at antenna input terminal: | 182.3895702 | (mW) |
| Duty cycle: | 100 | (%) |
| Maximum Pav : | 182.3895702 | (mW) |
| Antenna gain (typical): | 4 | (dBi) |
| Maximum antenna gain: | 2.511886432 | (numeric) |
| Prediction distance: | 20 | (cm) |
| Prediction frequency: | 2452 | (MHz) |
| MPE limit for uncontrolled exposure at prediction | 1 | (mW/cm ²) |
| Power density at predication frequency at 20 (cm) | 0.0911907 | (mW/cm ²) |

Measurement Result

The predicted power density level at 20 cm is 0.091 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2452.