

# 1 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

## 1.1 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 <sup>2</sup> )	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 <sup>2</sup> )	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

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## 1.2 Maximum Permissible Exposure (MPE) Evaluation

Max. Rated Avg. Power + Max. Tolerance ( $\pm 0.02\text{dBm}$ ): 15 dBm

Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)
2412	14.82	30.34	1000
2437	14.85	30.55	1000
2462	<b>14.98</b>	31.48	1000

### MPE Prediction (802.11b 2412~2462)

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 average output power at antenna input	15.00	(dBm)
Maximum average output power at antenna input	31.622777	(mW)
Duty cycle:	100	(%)
Maximum Pav :	31.622777	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0155221	(mW/cm <sup>2</sup> )

## Measurement Result

The predicted power density level at 20 cm is 0.016 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2462MHz.

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### 1.3 Maximum Permissible Exposure (MPE) Evaluation

Max. Rated Avg. Power + Max. Tolerance ( $\pm 0.02\text{dBm}$ ): 13 dBm

Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)
2412	12.98	19.86	1000
2437	12.74	18.79	1000
2462	12.96	19.77	1000

#### MPE Prediction (802.11g 2412~2462)

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 average output power at antenna input	13.00	(dBm)
Maximum average output power at antenna input	19.952623	(mW)
Duty cycle:	100	(%)
Maximum Pav :	19.952623	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0097938	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.010 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2412MHz.

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#### 1.4 Maximum Permissible Exposure (MPE) Evaluation

Max. Rated Avg. Power + Max. Tolerance ( $\pm 0.02\text{dBm}$ ): 12 dBm

Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)
2412	11.98	15.78	1000
2437	11.74	14.93	1000
2462	11.98	15.78	1000

#### MPE Prediction (802.11n\_HT20 2412~2462)

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 average output power at antenna input	12.00	(dBm)
Maximum average output power at antenna input	15.848932	(mW)
Duty cycle:	100	(%)
Maximum Pav :	15.848932	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0077795	(mW/cm <sup>2</sup> )

#### Measurement Result

The predicted power density level at 20 cm is 0.008 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2412MHz.

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## 1.5 Maximum Permissible Exposure (MPE) Evaluation

Max. Rated Avg. Power + Max. Tolerance ( $\pm 0.01\text{dBm}$ ): 12 dBm

Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)
2422	11.99	15.81	1000
2437	11.72	14.86	1000
2452	11.84	15.28	1000

### MPE Prediction (802.11n\_HT40 2422~2452)

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 average output power at antenna input	12.00	(dBm)
Maximum average output power at antenna input	15.848932	(mW)
Duty cycle:	100	(%)
Maximum Pav :	15.848932	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2422	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0077795	(mW/cm <sup>2</sup> )

## Measurement Result

The predicted power density level at 20 cm is 0.008 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2422MHz.

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