

# 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

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2412	19.34	0.0859	1
2437	19.32	0.0855	1
2462	<b>19.36</b>	0.0863	1

### MPE Prediction (802.11 b)

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

Average output power at antenna input terminal:	19.36	(dBm)
Average output power at antenna input terminal:	86.29785478	(mW)
Duty cycle:	100	(%)
Maximum Pav :	86.29785478	(mW)
Antenna gain (Maximum):	2	(dBi)
Antenna gain (linear):	1.584893192	(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)	0.0272239	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0272 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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Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2412	14.48	0.0281	1
2437	15.92	0.0391	1
2462	<b>16.47</b>	0.0444	1

### MPE Prediction (802.11 g)

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

Average output power at antenna input terminal:	<b>16.47</b>	(dBm)
Average output power at antenna input terminal:	44.36086439	(mW)
Duty cycle:	<b>100</b>	(%)
Maximum Pav :	44.36086439	(mW)
Antenna gain (Maximum):	<b>2</b>	(dBi)
Antenna gain (linear):	1.584893192	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>2462</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0139943	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0140 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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Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2412	11.87	0.0154	1
2437	12.41	0.0174	1
2462	<b>13.05</b>	0.0202	1

### MPE Prediction (802.11n\_HT20)

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

Average output power at antenna input terminal:	<b>13.05</b>	(dBm)
Average output power at antenna input terminal:	20.18366364	(mW)
Duty cycle:	<b>100</b>	(%)
Maximum Pav :	20.18366364	(mW)
Antenna gain (Maximum):	<b>2</b>	(dBi)
Antenna gain (linear):	1.584893192	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>2462</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0063672	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0064 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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Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2422	10.33	0.0108	1
2437	10.36	0.0109	1
2452	<b>10.48</b>	0.0112	1

### MPE Prediction (802.11n\_HT40)

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

Average output power at antenna input terminal:	10.48	(dBm)
Average output power at antenna input terminal:	11.16863248	(mW)
Duty cycle:	100	(%)
Maximum Pav :	11.16863248	(mW)
Antenna gain (Maximum):	2	(dBi)
Antenna gain (linear):	1.584893192	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2452	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0035233	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0035 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2452MHz.

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