

# 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

## 1.2 Maximum Permissible Exposure (MPE) Evaluation

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
5180	<b>15.71</b>	0.0372	0.4246
5220	15.14	0.0327	0.4246
5240	12.41	0.0174	0.4246

### MPE Prediction (802.11a 5150~5350)

Prediction of MPE limit at a given distance

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

$$S = \frac{PG}{4R^2}$$

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:	<b>15.71</b>	(dBm)
Maximum peak output power at antenna input terminal:	37.23917063	(mW)
Duty cycle:	<b>96.8</b>	(%)
Maximum Pav :	36.04751717	(mW)
Antenna gain (typical):	<b>9.72</b>	(dBi)
Maximum antenna gain:	9.375620069	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5180</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0672707	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.067 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5180MHz.

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
5180	<b>18.45</b>	0.0700	0.2123
5220	17.28	0.0535	0.2123
5240	16.30	0.0427	0.2123

**MPE Prediction (802.11n\_HT20 5150~5350)**

Prediction of MPE limit at a given distance

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

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

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:	<b>18.45</b>	(dBm)
Maximum peak output power at antenna input terminal:	69.9841996	(mW)
Duty cycle:	<b>93.68</b>	(%)
Maximum Pav :	65.56119819	(mW)
Antenna gain (typical):	<b>9.72</b>	(dBi)
Maximum antenna gain:	9.375620069	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5180</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.1223481	(mW/cm <sup>2</sup> )

**Measurement Result**

The predicted power density level at 20 cm is 0.122 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5180MHz.

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
5190	13.29	0.0213	0.2123
5230	<b>16.87</b>	0.0486	0.2123

### MPE Prediction (802.11n\_HT40 5150~5350)

Prediction of MPE limit at a given distance

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

$$S = \frac{PG}{4R^2}$$

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:	16.87	(dBm)
Maximum peak output power at antenna input terminal:	48.64072057	(mW)
Duty cycle:	91.18	(%)
Maximum Pav :	44.35060901	(mW)
Antenna gain (typical):	9.72	(dBi)
Maximum antenna gain:	9.375620069	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5230	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0827656	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.083 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5230MHz.

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
5745	11.39	0.0138	0.4064
5785	10.44	0.0111	0.4064
5825	10.10	0.0102	0.4064

**MPE Prediction (802.11a 5745~5825)**

Prediction of MPE limit at a given distance

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

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

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:	11.39	(dBm)
Maximum peak output power at antenna input terminal:	13.77209469	(mW)
Duty cycle:	96.8	(%)
Maximum Pav :	13.33138766	(mW)
Antenna gain (typical):	9.91	(dBi)
Maximum antenna gain:	9.794899854	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0259912	(mW/cm <sup>2</sup> )

**Measurement Result**

The predicted power density level at 20 cm is 0.026 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5745MHz.

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
5745	15.18	0.0330	0.2032
5785	14.20	0.0263	0.2032
5825	13.46	0.0222	0.2032

### MPE Prediction (802.11n\_HT20 5745~5825)

Prediction of MPE limit at a given distance

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

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

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:	15.18	(dBm)
Maximum peak output power at antenna input terminal:	32.96097122	(mW)
Duty cycle:	93.68	(%)
Maximum Pav :	30.87783784	(mW)
Antenna gain (typical):	9.91	(dBi)
Maximum antenna gain:	9.794899854	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0602001	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.060 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5745MHz.

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
5755	13.26	0.0212	0.2032
5795	<b>15.00</b>	0.0316	0.2032

### MPE Prediction (802.11n\_HT40 5755~5795)

Prediction of MPE limit at a given distance

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

$$S = \frac{PG}{4R^2}$$

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:	15.00	(dBm)
Maximum peak output power at antenna input terminal:	31.6227766	(mW)
Duty cycle:	91.18	(%)
Maximum Pav :	28.83364771	(mW)
Antenna gain (typical):	9.91	(dBi)
Maximum antenna gain:	9.794899854	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5795	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0562147	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.056 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5795MHz.