

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

Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5180	10.35	10.839	23.98
5220	<b>10.78</b>	<b>11.697</b>	23.98
5240	10.35	10.839	23.98

### MPE Prediction (802.11a 5150~5250)

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	<b>10.78</b>	(dBm)
Maximum average output power at antenna input	11.967405	(mW)
Duty cycle:	<b>98.2</b>	(%)
Maximum Pav :	11.751992	(mW)
Antenna gain (Maximum):	<b>3.71</b>	(dBi)
Antenna gain (linear):	2.3496328	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5220</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0054962	(mW/cm <sup>2</sup> )

## Measurement Result

The predicted power density level at 20 cm is 0.0055mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1mW/cm<sup>2</sup> at 5220MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5180	12.08	16.157	23.26
5220	<b>13.55</b>	<b>22.623</b>	23.26
5240	11.35	13.562	23.26

### MPE Prediction (802.11n HT20 5150~5250)

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	<b>13.55</b>	(dBm)
Maximum average output power at antenna input	22.646443	(mW)
Duty cycle:	<b>96.7</b>	(%)
Maximum Pav :	21.89911	(mW)
Antenna gain (Maximum):	<b>6.72</b>	(dBi)
Antenna gain (linear):	4.6989411	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5220</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0204822	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0205mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1mW/cm<sup>2</sup> at 5220MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5190	11.59	14.413	23.26
5230	<b>11.66</b>	<b>14.648</b>	23.26

### MPE Prediction (802.11n HT40 5150~5250)

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	<b>11.66</b>	(dBm)
Maximum average output power at antenna input	14.655478	(mW)
Duty cycle:	<b>78.7</b>	(%)
Maximum Pav :	11.533862	(mW)
Antenna gain (Maximum):	<b>6.72</b>	(dBi)
Antenna gain (linear):	4.6989411	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5230</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0107876	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0108mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1mW/cm<sup>2</sup> at 5230MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5745	8.75	7.499	30
5785	9.20	8.318	30
5825	<b>10.21</b>	<b>10.495</b>	30

### MPE Prediction (802.11a 5725~5850)

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	10.21	(dBm)
Maximum average output power at antenna input	10.495424	(mW)
Duty cycle:	98.2	(%)
Maximum Pav :	10.306507	(mW)
Antenna gain (Maximum):	5.02	(dBi)
Antenna gain (linear):	3.1768741	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5825	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0065172	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0065mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1mW/cm<sup>2</sup> at 5825MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5745	10.29	10.685	27.97
5785	10.34	10.822	27.97
5825	<b>11.33</b>	<b>13.951</b>	27.97

### MPE Prediction (802.11n HT20 5725~5850)

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	<b>11.33</b>	(dBm)
Maximum average output power at antenna input	13.583134	(mW)
Duty cycle:	<b>96.7</b>	(%)
Maximum Pav :	13.134891	(mW)
Antenna gain (Maximum):	<b>8.03</b>	(dBi)
Antenna gain (linear):	6.3533093	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5825</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0166103	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0166mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1mW/cm<sup>2</sup> at 5825MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5755	10.05	10.127	27.97
5795	<b>10.38</b>	<b>10.910</b>	27.97

### MPE Prediction (802.11n HT40 5725~5850)

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	<b>10.38</b>	(dBm)
Maximum average output power at antenna input	10.914403	(mW)
Duty cycle:	<b>78.7</b>	(%)
Maximum Pav :	8.5896354	(mW)
Antenna gain (Maximum):	<b>8.03</b>	(dBi)
Antenna gain (linear):	6.3533093	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	<b>5795</b>	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0108624	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.0109mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1mW/cm<sup>2</sup> at 5795MHz.

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