

## 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

### 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

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## 802.11a Max. output power

### 802.11a\_Aux1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	13.95	24.831	23.98	PASS
44	5220	MCS0	13.93	24.717	23.98	PASS
48	5240	MCS0	13.69	23.388	23.98	PASS

## MPE Prediction (802.11a 5150~5250)

Average output power at antenna input terminal:	13.95	(dBm)
Average output power at antenna input terminal:	24.831331	(mW)
Duty cycle:	97.46	(%)
Maximum Pav :	24.200615	(mW)
Peak Antenna gain (Maximum):	4.5	(dBi)
Peak Antenna gain (linear):	2.8183829	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5180	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.014	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.014 mW/cm<sup>2</sup>.

This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5180MHz.

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## 802.11n\_HT20M Max. output power

### 802.11n\_HT20\_MIMO

CH	Frequency (MHz)	Data Rate	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS8	11.04	11.33	14.20	26.289	22.47	PASS
44	5220	MCS8	10.56	11.52	14.08	25.567	22.47	PASS
48	5240	MCS8	10.86	11.4	14.15	25.994	22.47	PASS

## MPE Prediction (802.11n\_HT20 5150~5250)

MIMO gain=  $G+(10 \log N)= 4.5+3.01=7.51\text{dBm}$

Average output power at antenna input terminal:	14.20	(dBm)
Average output power at antenna input terminal:	26.30268	(mW)
Duty cycle:	94.53	(%)
Maximum Pav :	24.863923	(mW)
Peak Antenna gain (Maximum):	7.51	(dBi)
Peak Antenna gain (linear):	5.6363766	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5180	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.028	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.028 mW/cm<sup>2</sup>.

This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5180MHz.

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## 802.11n\_HT40M Max. output power

### 802.11n\_HT40\_MIMO

CH	Frequency (MHz)	Data Rate	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS8	11.91	11.48	14.71	29.584	22.47	PASS
46	5230	MCS8	11.51	12.29	<b>14.93</b>	<b>31.101</b>	22.47	PASS

## MPE Prediction (802.11n\_HT40 5150~5250)

MIMO gain=  $G+(10 \log N)= 4.5+3.01= 7.51\text{dBm}$

Average output power at antenna input terminal:	<b>14.93</b>	(dBm)
Average output power at antenna input terminal:	31.117163	(mW)
Duty cycle:	<b>90</b>	(%)
Maximum Pav :	28.005447	(mW)
Peak Antenna gain (Maximum):	<b>7.51</b>	(dBi)
Peak Antenna gain (linear):	5.6363766	(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)	0.031	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.031 mW/cm<sup>2</sup>.

This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5230MHz.

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