

## RF EXPOSURE

### 1. Regulation

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissible Exposure: RF exposure is calculated.

Frequency Range	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 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1	30

f=frequency in MHz, \*= plane-wave equivalent power density

### MPE (Maximum Permissible Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad (\Rightarrow R = \sqrt{PG/4\pi S})$$

S = power density [mW/cm<sup>2</sup>]

P = Power input to antenna [mW]

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 [cm]

### 2. RF Exposure Compliance Issue

The information should be included in the user's manual:

This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

## MPE Calculations : WLAN 802.11b

- Frequency Range : 2 412 MHz ~ 2 462 MHz
- Measured RF Output Power (Avg.) : 13.58 dBm
- Target Power & Tolerance 13.50 dBm &  $\pm$  2.00 dB  
( Maximum : 15.50 dBm & Minimum : 11.50 dBm )
- Maximum Peak Antenna Gain : 4.00 dBi
- Maximum Output Power for the Calculation : 15.50 dBm

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the  
The MPE calculation for this exposure is shown below.

<ul style="list-style-type: none"> <li>- EIRP = P + G</li> <li>= <u>15.50</u> dBm + <u>4.00</u> dBi</li> <li>= <u>19.50</u> dBm</li> <li>= <u>89.13</u> mW</li> </ul>	<ul style="list-style-type: none"> <li>- NOTE</li> <li>P : Max tuneup Power (dBm)</li> <li>G : Maximum Peak Antenna Gain (dBi)</li> </ul>
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### Power Density at the specific separation

<ul style="list-style-type: none"> <li>- S = EIRP / (4 X R<sup>2</sup>π)</li> <li>= 89.13 / ( 4 X 20<sup>2</sup> X π )</li> <li>= <u>0.017 731</u> mW/cm<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>- NOTE</li> <li>S : Maximum Power Density (mW/cm<sup>2</sup>)</li> <li>EIRP : Equivalent Isotropic Radiated Power (mW)</li> <li>R : Distance to the center of the radiation of the antenna ( <u>20</u> cm )</li> </ul>
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## MPE Calculations : WLAN 802.11g

- Frequency Range : 2 412 MHz ~ 2 462 MHz
- Measured RF Output Power (Avg.) : 11.67 dBm
- Target Power & Tolerance 11.50 dBm &  $\pm$  2.00 dB  
( Maximum : 13.50 dBm & Minimum : 9.50 dBm )
- Maximum Peak Antenna Gain : 4.00 dBi
- Maximum Output Power for the Calculation : 13.50 dBm

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the  
The MPE calculation for this exposure is shown below.

<ul style="list-style-type: none"> <li>- EIRP = P + G</li> <li>= <u>13.50</u> dBm + <u>4.00</u> dBi</li> <li>= <u>17.50</u> dBm</li> <li>= <u>56.23</u> mW</li> </ul>	<ul style="list-style-type: none"> <li>- NOTE</li> <li>P : Max tuneup Power (dBm)</li> <li>G : Maximum Peak Antenna Gain (dBi)</li> </ul>
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### Power Density at the specific separation

<ul style="list-style-type: none"> <li>- S = EIRP / (4 X R<sup>2</sup>π)</li> <li>= 56.23 / ( 4 X 20<sup>2</sup> X π )</li> <li>= <u>0.011 187</u> mW/cm<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>- NOTE</li> <li>S : Maximum Power Density (mW/cm<sup>2</sup>)</li> <li>EIRP : Equivalent Isotropic Radiated Power (mW)</li> <li>R : Distance to the center of the radiation of the antenna ( <u>20</u> cm )</li> </ul>
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## MPE Calculations : WLAN 802.11n\_HT20

- Frequency Range : 2 412 MHz ~ 2 462 MHz
- Measured RF Output Power (Avg.) : 11.58 dBm
- Target Power & Tolerance 11.50 dBm &  $\pm$  2.00 dB  
( Maximum : 13.50 dBm & Minimum : 9.50 dBm )
- Maximum Peak Antenna Gain : 4.00 dBi
- Maximum Output Power for the Calculation : 13.50 dBm

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the  
The MPE calculation for this exposure is shown below.

<ul style="list-style-type: none"> <li>- EIRP = P + G</li> <li>= <u>13.50</u> dBm + <u>4.00</u> dBi</li> <li>= <u>17.50</u> dBm</li> <li>= <u>56.23</u> mW</li> </ul>	<ul style="list-style-type: none"> <li>- NOTE</li> <li>P : Max tuneup Power (dBm)</li> <li>G : Maximum Peak Antenna Gain (dBi)</li> </ul>
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### Power Density at the specific separation

<ul style="list-style-type: none"> <li>- S = EIRP / (4 X R<sup>2</sup>π)</li> <li>= 56.23 / ( 4 X 20<sup>2</sup> X π )</li> <li>= <u>0.011 187</u> mW/cm<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>- NOTE</li> <li>S : Maximum Power Density (mW/cm<sup>2</sup>)</li> <li>EIRP : Equivalent Isotropic Radiated Power (mW)</li> <li>R : Distance to the center of the radiation of the antenna ( <u>20</u> cm )</li> </ul>
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