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#### **4.4 Maximum Permissible Exposure; FCC §15.247(b)(5), RSS-210 §14**

##### **4.4.1 Maximum Permissible Exposure Limits**

The EUT shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the FCC guidelines, per FCC §1.307(b)(1).

1.5GHz to 100GHz, the Limit  $S = 1\text{mW/cm}^2$  for no more than 30 minutes exposure from Table 1 of FCC §1.1310.

##### **4.4.2 Calculations for Maximum Permissible Exposure Levels**

Given:

$$E = \sqrt{(30 * p * G) / d}$$

And

$$S = E^2 / 3770$$

Where:

E = field strength in volts/meter

P = power in watts

G = numeric antenna gain

D = distance in meters

S = power density in milliwatts /  $\text{cm}^2$

Combining and rearranging the terms to express the distance as function of the variables, yields:

$$d = \sqrt{(30 * p * G) / 1000}$$

$$d(\text{cm}) = d(\text{m}) * 100$$

Yields:

$$d = 100 * \sqrt{(30 * (P / 1000) * G) / (3770 * s)}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

Where:

d = distance in cm

P = power in mW

G = numeric antenna gain

S = Power Density in  $\text{cm}^2$

Substituting the logarithmic form of power and gain using:

$$P(\text{mW}) = 10^{(P_9 \text{dBm})/10} \quad \text{and} \quad G(\text{numeric}) = 10^{(G(\text{dBi})/10)}$$

Yields:

$$d = 0.282 * 10^{((P + G) / 20)} * \sqrt{S}$$

For 802.11b/g - Where:

d=MPE distance in cm

P = Maximum measured output Power in dBm = +15.73 dBm (from table 3 above)

G = Antenna Gain in dBi 3dBi (from antenna manufacturer specification sheet for that frequency)

S = Power Density Limit in mW/cm<sup>2</sup> = 1mW/cm<sup>2</sup> (from Table 1 of FCC §1.1310).

For 802.11a - Where:

d=MPE distance in cm

P = Maximum measured output Power in dBm = +15.30 dBm (from table 3 above)

G = Antenna Gain in dBi 4.9dBi (from antenna manufacturer specification sheet for that frequency)

S = Power Density Limit in mW/cm<sup>2</sup> = 1mW/cm<sup>2</sup> (from Table 1 of FCC §1.1310).

### 1.1.1.1 Results

The minimum save distance from the EUT is 2.9 cm for no more than 30 minutes of continuous exposure.

Table 4 – MPE Distance calculation

802.11b/g			
Power Density Limit (mW/cm <sup>2</sup> )	Maximum Measured Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1	+15.73	+3	2.44

802.11a			
Power Density Limit (mW/cm <sup>2</sup> )	Maximum Measured Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1	+15.30	+4.9	<u>2.89</u>