



## APPENDIX I

## RADIO FREQUENCY EXPOSURE

### LIMIT

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.

### EUT Specification

<b>EUT</b>	802.11bgn WLAN module
<b>Model</b>	AP-WM1022WU
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz <input type="checkbox"/> 802.11n HT40: 2.422GHz ~ 2.452GHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure ( $S = 5\text{mW/cm}^2$ ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ( $S=1\text{mW/cm}^2$ )
<b>Antenna Specification</b>	2.4GHz: Antenna Gain : 2.40 dBi (Numeric gain 1.74)
<b>Maximum Average output power</b>	IEEE 802.11b Mode: 18.84 dBm (76.560 mW) IEEE 802.11g Mode: 13.51 dBm (22.439 mW) IEEE 802.11n HT 20 Mode: 13.34 dBm (21.577 mW) IEEE 802.11n HT 40 Mode: 12.80 dBm (19.055 mW)
<b>Maximum Tune up Power</b>	IEEE 802.11b Mode: 19.00 dBm (79.433 mW) IEEE 802.11g Mode: 16.00 dBm (39.811 mW) IEEE 802.11n HT 20 Mode: 15.00 dBm (31.623 mW) IEEE 802.11n HT 40 Mode: 15.00 dBm (31.623 mW)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A



## Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2014/12/19	Initial Issue	ALL	Becca Chen



## **TEST RESULTS**

**No non-compliance noted.**

### **Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

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

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

**Maximum Permissible Exposure**

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where  $P = \text{Power in mW}$

$G = \text{Numeric antenna gain}$

$S = \text{Power density in mW / cm}^2$

**IEEE 802.11b mode:**

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
1	2412	79.433	1.74	20	0.0275	1

**IEEE 802.11g mode:**

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	39.811	1.74	20	0.0138	1

**IEEE 802.11n HT20 mode:**

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	31.623	1.74	20	0.0109	1

**IEEE 802.11n HT40 mode:**

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	31.623	1.74	20	0.0109	1