



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

EUT	802.11bgn WLAN module
Model	AP-WM1022WU
Frequency band (Operating)	<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
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure ($S = 5\text{mW/cm}^2$) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$)
Antenna Specification	2.4GHz: Antenna Gain : 2.06 dBi (Numeric gain 1.61)
Maximum Average output power	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)
Maximum Tune up Power	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)
Evaluation applied	<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	2014/12/27	Initial Issue	ALL	Kelly Cheng
01	2015/1/30	Modify Antenna Gain	1, 4	Kelly Cheng



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 / cm²

**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 ²	Limit (mW/cm2)
1	2412	79.433	1.61	20	0.0254	1

IEEE 802.11g mode:

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	39.811	1.61	20	0.0128	1

IEEE 802.11n HT20 mode:

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	31.623	1.61	20	0.0101	1

IEEE 802.11n HT40 mode:

Ch.	Freq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	31.623	1.61	20	0.0101	1