



# 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>	WLAN 11ac USB Adapter,2T2R
<b>Model</b>	WL-8210-V1
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> Bluetooth 2.1 + EDR / 4.0: 2402 ~ 2480 MHz 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz 802.11n HT40: 2.422GHz ~ 2.452GHz 802.11a: 5150 ~ 5250MHz / 5725 ~ 5850MHz 802.11 HT20: 5150 ~ 5250MHz / 5725 ~ 5850MHz 802.11 HT40: 5150 ~ 5250MHz / 5725 ~ 5850MHz 802.11AC HT80: 5170 ~ 5330 MHz / 5490 ~ 5815 MHz <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 = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna Specification</b>	5GHz: Antenna Gain : 5.90 dBi (Numeric gain 3.89) 2.4GHz: Antenna Gain : 3.50 dBi (Numeric gain 2.24)
<b>Maximum Average output power</b>	IEEE 802.11b Mode: 7.53 dBm (5.662 mW) IEEE 802.11g Mode: 7.62 dBm (5.781 mW) IEEE 802.11n HT 20 Mode 7.69 dBm (5.875 mW) IEEE 802.11n HT 40 Mode 7.64 dBm (5.808 mW) IEEE 802.11a Mode: 7.58 dBm (5.728 mW) IEEE 802.11n HT20 Mode: 7.59 dBm (5.741 mW) IEEE 802.11n HT40 Mode: 7.86 dBm (6.109 mW) IEEE 802.11ac HT80 Mode 7.84 dBm (6.081 mW)
<b>Maximum Tune up Power</b>	IEEE 802.11b Mode: 9.00 dBm (7.943 mW) IEEE 802.11g Mode: 9.00 dBm (7.943 mW) IEEE 802.11n HT 20 Mode 9.00 dBm (7.943 mW) IEEE 802.11n HT 40 Mode 9.00 dBm (7.943 mW) IEEE 802.11a Mode: 9.00 dBm (7.943 mW) IEEE 802.11n HT20 Mode: 9.00 dBm (7.943 mW) IEEE 802.11n HT40 Mode: 9.00 dBm (7.943 mW) IEEE 802.11ac HT80 Mode 9.00 dBm (7.943 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	2014/07/08	Initial Issue	ALL	Angel 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 / 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* = Power in mW

*G* = Numeric antenna gain

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

**IEEE 802.11b mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
1	2412	79.433	2.24	20	0.0354	1

**IEEE 802.11g mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	50.119	2.24	20	0.0223	1

**IEEE 802.11n HT20 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	31.623	2.24	20	0.0141	1

**IEEE 802.11n HT40 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	31.623	2.24	20	0.0141	1

**IEEE 802.11a mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
48	5240	31.623	3.89	20	0.0245	1

**IEEE 802.11a HT20 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
38	5190	31.623	3.89	20	0.0245	1

**IEEE 802.11a HT40 mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
38	5190	31.623	3.89	20	0.0245	1

**IEEE 802.11ac HT80 Mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
42	5210	31.623	3.89	20	0.0245	1