



# 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>	1200Mbps 802.11AC AP Router
<b>Model</b>	AC-1200R
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz 802.11n HT40: 2.422GHz ~ 2.452GHz 802.11a/n HT20: 5.180GHz ~ 5.320GHz / 5.745 ~ 5.825GHz 802.11n HT40: 5.190GHz ~ 5.310GHz / 5.755 ~ 5.795GHz 802.11ac VHT80: 5.210GHz ~ 5.290GHz / 5.775GHz <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 : 3.88 dBi (Numeric gain 2.44) 2.4GHz: Antenna Gain : 1.81 dBi (Numeric gain 1.52)
<b>Maximum Average output power</b>	IEEE 802.11b Mode: 18.66 dBm (73.451 mW) IEEE 802.11g Mode: 20.90 dBm (123.027 mW) IEEE 802.11n HT 20 Mode: 21.61 dBm (144.877 mW) IEEE 802.11n HT 40 Mode: 16.37 dBm (43.351 mW) IEEE 802.11a Mode: 20.42 dBm (110.154 mW) IEEE 802.11n HT20 Mode: 23.12 dBm (205.116 mW) IEEE 802.11n HT40 Mode: 22.66 dBm (184.502 mW) IEEE 802.11ac VHT80 Mode: 23.45 dBm (221.309 mW)



<b>Maximum Tune up Power</b>	IEEE 802.11b Mode: 19.00 dBm (79.433 mW) IEEE 802.11g Mode: 21.00 dBm (125.893 mW) IEEE 802.11n HT 20 Mode: 21.80 dBm (151.356 mW) IEEE 802.11n HT 40 Mode: 17.00 dBm (50.119 mW) IEEE 802.11a Mode: 20.60 dBm (114.815 mW) IEEE 802.11n HT20 Mode: 23.50 dBm (223.872 mW) IEEE 802.11n HT40 Mode: 23.00 dBm (199.526 mW) IEEE 802.11ac VHT80 Mode: 23.60 dBm (229.087 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	2015/5/15	Initial Issue	ALL	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 / 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	1.52	20	0.0240	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	125.893	1.52	20	0.0381	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	151.356	1.52	20	0.0458	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	50.119	1.52	20	0.0152	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)
165	5825	114.815	2.44	20	0.0557	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)
157	5785	223.872	2.44	20	0.1087	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)
159	5795	199.526	2.44	20	0.0969	1

**IEEE 802.11acVHT80:mode:**

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
155	5775	229.087	2.44	20	0.1112	1