



APPENDIX I RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.407(f), U-NII devices are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

EUT Specification

EUT	Dual-Band Wireless-N ADSL2+ Modem Router with Gigabit				
Frequency band (Operating)	<input type="checkbox"/> WLAN: 2412 MHz ~ 2462 MHz <input checked="" type="checkbox"/> WLAN: 5150 MHz ~ 5250 MHz <input type="checkbox"/> WLAN: 5725 MHz ~ 5850 MHz				
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others: _____				
Exposure classification	General Population/Uncontrolled exposure ($S=1mW/cm^2$)				
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity				
Max. output power		Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mw)
		IEEE 802.11a	5180 – 5220	13.68	23.3346
		draft 802.11n Standard-20 MHz	5180 – 5220	14.97	31.4051
		draft 802.11n Standard-40 MHz	5190	10.38	10.9144
Antenna gain (Max)	4.6 dBi (Numeric gain: 2.88)				
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A				
Remark:					
1. The maximum output power is <u>14.97dBm (31.4051mW)</u> at <u>5180MHz</u> (with 2.88 numeric antenna gain.)					
2. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is $1.0 mW/cm^2$ even if the calculation indicates that the power density would be larger.					

TEST RESULTS

No non-compliance noted.

Remark: This device is a portable device, and according with 1. FCC Rule KDB # 447498 (1) (c): The power is > 60/f(GHz), therefore please see the SAR test report. 2. IC Rule: The power is >10 mW, then SAR evaluation is required, therefore please refer to the appendix A-B RF Technical Brief Cover Sheet.

**Calculation**

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

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

$$S = \frac{30 \times P \times G}{3770d^2}$$

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

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

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:

Yields

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

Where P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²



IEEE 802.11a:

EUT output power = 23.33 mW

Numeric Antenna gain = 2.88

→ Power density = 0.01337 mW / cm²

draft 802.11n Standard-20 MHz Channel mode:

EUT output power = 31.40 mW

Numeric Antenna gain = 2.88

→ Power density = 0.01799mW / cm²

draft 802.11n Wide-40 MHz Channel mode:

EUT output power = 10.91 mW

Numeric Antenna gain = 2.88

→ Power density = 0.00625mW / cm²

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)