



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	Wireless-N Selectable-Band Access Point with PoE
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 5180 – 5240MHz <input type="checkbox"/> WLAN: 5260 – 5320MHz <input type="checkbox"/> WLAN: 5500 – 5580MHz <input type="checkbox"/> WLAN: 5680 – 5700MHz
Device category	<input checked="" type="checkbox"/> Portable (<20cm separation) <input type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others: _____
Exposure classification	General Population/Uncontrolled exposure ($S=1mW/cm^2$)
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
Max. output power	IEEE 802.11a mode / 5180 ~ 5240MHz: 13.13 dBm(20.55mW) IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz: 14.67dBm(29.30mW) IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz: 14.24 dBm (26.54mW)
Antenna gain (Max)	Antenna Gain: Antenna 1: 4.88 dBi Antenna 2: 4.97 dBi Antenna 3: 4.74 dBi MIMO: $10 * \text{LOG}(((10^{(4.88/20)} + 10^{(4.97/20)})^2)/2) = 7.94\text{dBi}$ (Numeric gain: 6.22)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
Remark: <i>The maximum output power is 14.67dBm (29.30mW) at 5220MHz (with 6.22 numeric antenna gain.)</i>	

TEST RESULTS

No non-compliance noted.

MPE evaluation

No non-compliance noted.



Calculation

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

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:

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

$$d (cm) = d(m) / 100$$

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 mode:

EUT output power = 20.55 mW

Numeric Antenna gain = 3.14

→ Power density = 0.0128 mW / cm²

IEEE 802.11n HT 20 MHz mode:

EUT output power = 29.30 mW

Numeric Antenna gain = 6.22

→ Power density = 0.0362 mW / cm²

IEEE 802.11n HT 40 MHz mode:

EUT output power = 26.54mW

Numeric Antenna gain = 6.22

→ Power density = 0.0328 mW / 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.)