



## 8. 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>	N Wireless Router
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <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 diversity</b>	<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
<b>Max. output power</b>	IEEE 802.11b mode: 21.86 dBm (153.46 mW) IEEE 802.11g mode: 23.49 dBm (223.36 mW) draft 802.11n Standard-20 MHz Channel mode: 18.95 dBm (78.52 mW) draft 802.11n Wide-40 MHz Channel mode: 15.89 dBm (38.82 mW)
<b>Antenna gain (Max)</b>	1.8 dBi (Numeric gain: 1.51) Antenna Calculation for CDD Mode: 1.8 dBi + 10 log (2) = 4.81 dBi (Numeric gain: 3.03)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

#### **Remark:**

1. The maximum output power is 23.49dBm (223.36mW) at 2437MHz (with 3.03 numeric antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.

#### TEST RESULTS

No non-compliance noted.

**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:

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

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

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 / cm<sup>2</sup>

**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 / cm<sup>2</sup>



**IEEE 802.11b mode:**

EUT output power = 153.46 mW

Numeric Antenna gain = 3.03

→ Power density = 0.0925 mW / cm<sup>2</sup>

**IEEE 802.11g mode:**

EUT output power = 223.36 mW

Numeric Antenna gain = 3.03

→ Power density = 0.1347 mW / cm<sup>2</sup>

**draft 802.11n Standard-20 MHz Channel mode:**

EUT output power = 78.52 mW

Numeric Antenna gain = 1.51

→ Power density = 0.0236 mW / cm<sup>2</sup>

**draft 802.11n Wide-40 MHz Channel mode:**

EUT output power = 38.82mW

Numeric Antenna gain = 1.51

→ Power density = 0.0117 mW / cm<sup>2</sup>

*(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.)*