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

EUT	450Mbps Wireless N Gigabit Router
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)

Antenna diversity	☐ Single antenna
	☒ Multiple antennas
	   ☐ Tx diversity
	   ☐ Rx diversity
	   ☒ Tx/Rx diversity

Max. output power	IEEE 802.11b mode: 18.87 dBm(77.1 mW) IEEE 802.11g mode: 15.37 dBm(34.4 mW) draft 802.11n Standard-20 MHz Channel mode: 18.91 dBm(77.7 mW) draft 802.11n Wide-40 MHz Channel mode: 18.70 dBm(74.2 mW)
Antenna gain (Max)	Gina: IEEE 802.11b/g: 4 dBi (Numeric gain: 2.51) Gina : MIMO: 4 dBi + 10 log (3) = 8.77 dBi (Numeric gain: 7.53)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:
1. *The maximum output power is <u>18.91dBm (77.7mW) at 2462MHz (with 7.53 numeric antenna gain</u>.)*
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/cm2 even if the calculation indicates that the power density would be larger.*

TEST RESULTS

No non-compliance noted.

Calculation

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

$\quad$ Where $\quad$ *E = Field strength in Volts / meter*
$\qquad\qquad$ *P = Power in Watts*
$\qquad\qquad$ *G = Numeric antenna gain*
$\qquad\qquad$ *d = Distance in meters*
$\qquad\qquad$ *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:

$\qquad$ *P (mW) = P (W) / 1000 and*

$\qquad$ *d (cm) = d(m) / 100*

Yields

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

$\quad$ Where $\quad$ *d = Distance in cm*
$\qquad\qquad$ *P = Power in mW*
$\qquad\qquad$ *G = Numeric antenna gain*
$\qquad\qquad$ *S = Power density in mW / cm²*

Maximum Permissible Exposure

Substituting the MPE safe distance using d = 20 cm into Equation 1:

Yields

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

Where $\quad$ *P = Power in mW*
$\qquad\quad$ *G = Numeric antenna gain*
$\qquad\quad$ *S = Power density in mW / cm²*

IEEE 802.11b mode:

EUT output power = 77.1mW

Numeric Antenna gain = 2.51

→ *Power density = 0.0385 mW / cm^2*

IEEE 802.11g mode:

EUT output power = 34.4mW

Numeric Antenna gain = 2.51

→ *Power density = 0.0172 mW / cm^2*

draft 802.11n Standard-20 MHz Channel mode:

EUT output power = 77.7mW

Numeric Antenna gain = 7.53

→ *Power density = 0.1164 mW / cm^2*

draft 802.11n Wide-40 MHz Channel mode:

EUT output power = 74.2mW

Numeric Antenna gain = 7.53

→ *Power density = 0.1112 mW / cm^2*

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