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	Wireless-N ADSL2+ Gateway
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: 23.90 dBm (245.47 mW) IEEE 802.11g mode: 22.80 dBm (190.55 mW) draft 802.11n Standard-20 MHz Channel mode: 22.39 dBm (173.38 mW) draft 802.11n Wide-40 MHz Channel mode: 18.97 dBm (78.89 mW)
Antenna gain (Max)	MIMO Mode: Wha Yu: 2.9 dBi for TX / RX (Numeric gain: 1.95) GALTRONICS: 2.1 dBi for TX / RX (Numeric gain: 1.62) CDD Mode: Wha Yu: 2.9dBi + 10 log (2) = 5.91 dBi (Numeric gain: 3.89) GALTRONICS: 2.1dBi + 10 log (2) = 5.11 dBi (Numeric gain: 3.24)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:

1. *The maximum output power is 22.39dBm (173.38mW) at 2462MHz (with 3.89 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/cm2 even if the calculation indicates that the power density would be larger.*

TEST RESULTS

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:

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

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

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

Where *d = Distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

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^2

IEEE 802.11b mode:

EUT output power = 245.47 mW

Numeric Antenna gain = 3.89

→ *Power density = 0.1900 mW / cm^2*

IEEE 802.11g mode:

EUT output power = 190.55 mW

Numeric Antenna gain = 3.89

→ *Power density = 0.1475 mW / cm^2*

draft 802.11n Standard-20 MHz Channel mode:

EUT output power = 173.38 mW

Numeric Antenna gain = 1.95

→ *Power density = 0.0673 mW / cm^2*

draft 802.11n Wide-40 MHz Channel mode:

EUT output power = 78.89 mW

Numeric Antenna gain = 1.95

→ *Power density = 0.0306 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.)