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	802.11 b/g/n WLAN Module
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	**For Monopole Antenna** IEEE 802.11b mode: 19.72 dBm (93.76 mW) IEEE 802.11g mode: 25.79 dBm (379.31 mW) IEEE 802.11n HT 20 MHz mode: 25.74 dBm (374.97 mW) IEEE 802.11n HT 40 MHz mode: 23.92 dBm (246.60 mW) **For PIFA Antenna** IEEE 802.11b mode: 19.67 dBm (92.68 mW) IEEE 802.11g mode: 25.71 dBm (372.39 mW) IEEE 802.11n HT 20 MHz mode: 25.72 dBm (343.25 mW) IEEE 802.11n HT 40 MHz mode: 22.88 dBm (194.09 mW)
Antenna gain (Max)	For Monopole Antenna: 1.97 dBi (Numeric gain: 1.57) For PIFA Antenna: 1.05 dBi (Numeric gain: 1.27)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation ☐ N/A
Remark: *The maximum output power is 25.79 dBm (379.31 mW) at 2442MHz (with 1.57 numeric antenna gain.)*	

TEST RESULTS

No non-compliance noted.

MPE EVALUATION

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*
$\qquad\qquad\quad P$ = *Power in Watts*
$\qquad\qquad\quad G$ = *Numeric antenna gain*
$\qquad\qquad\quad d$ = *Distance in meters*
$\qquad\qquad\quad S$ = *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:

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

$\quad$ *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*
$\qquad\qquad\quad P$ = *Power in mW*
$\qquad\qquad\quad G$ = *Numeric antenna gain*
$\qquad\qquad\quad S$ = *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 $\quad P$ = *Power in mW*
$\qquad\qquad G$ = *Numeric antenna gain*
$\qquad\qquad S$ = *Power density in mW / cm^2*

For Monopole Antenna

IEEE 802.11b mode:

EUT output power = 93.76 mW

Numeric Antenna gain = 1.57

→ *Power density = 0.029293 mW / cm²*

IEEE 802.11g mode:

EUT output power = 379.31 mW

Numeric Antenna gain = 1.57

→ *Power density =0.118507 mW / cm²*

IEEE 802.11n HT 20 MHz mode:

EUT output power =374.97 mW

Numeric Antenna gain = 1.57

→ *Power density = 0.11715mW / cm²*

IEEE 802.11n HT 40 MHz mode:

EUT output power = 181.97mW

Numeric Antenna gain = 1.57

→ *Power density = 0.056853 mW / cm²*

For PIFA Antenna

IEEE 802.11b mode:

EUT output power = 92.68 mW

Numeric Antenna gain = 1.27

→ *Power density = 0.023423 mW / cm^2*

IEEE 802.11g mode:

EUT output power = 372.39 mW

Numeric Antenna gain = 1.27

→ *Power density = 0.094114 mW / cm^2*

IEEE 802.11n HT 20 MHz mode:

EUT output power = 343.25 mW

Numeric Antenna gain = 1.27

→ *Power density = 0.086749mW / cm^2*

IEEE 802.11n HT 40 MHz mode:

EUT output power = 194.09 mW

Numeric Antenna gain = 1.27

→ *Power density = 0.049052 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.)