## 7.5 RADIO FREQUENCY EXPOSURE

## LIMIT

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 §15.247(i) and §1.1307(b)(1) of this chapter.

**EUT Specification**

| | |
|---|---|
| **EUT** | Wireless USB Adapter |
| **Frequency band (Operating)** | ☒ WLAN: 2.412GHz ~ 2.462GHz<br>☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br>☐ WLAN: 5.745GHz ~ 5.825GHz<br>☐ Others |
| **Device category** | ☐ Portable (<20cm separation)<br>☒ Mobile (>20cm separation)<br>☐ Others |
| **Exposure classification** | ☐ Occupational/Controlled exposure (S = 5mW/cm2)<br>☒ General Population/Uncontrolled exposure (S=1mW/cm2) |
| **Antenna diversity** | ☒ Single antenna<br>☐ Multiple antennas<br>☐ Tx diversity<br>☐ Rx diversity<br>☒ Tx/Rx diversity |
| **Max. output power** | 13.69 dBm (23.388mW) |
| **Antenna gain (Max)** | 0 dBi (Numeric gain: 1) |
| **Evaluation applied** | ☒ MPE Evaluation<br>☐ SAR Evaluation |

***Remark:***

1. *The maximum output power is 13.69(23.388mW) at 2437MHz (with 1 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 minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.*

## TEST RESULTS

*No non-compliance noted.*

**Calculation**

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

*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:

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

Changing to units of mW and cm, using:

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

*d (cm) =100 * d (m)*

Yields

$$d = 100 \times \sqrt{\frac{30 \times (P/1000) \times G}{3770 \times S}} = 0.282 \times \sqrt{\frac{P \times G}{S}}$$

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

Substituting the logarithmic form of power and gain using:

*P (mW) = 10 ^ (P (dBm) / 10) and*

*G (numeric) = 10 ^ (G (dBi) / 10)*

Yields

$$d = 0.282 \times \frac{10^{(P+G)/20}}{\sqrt{20}}$$ ***Equation 1***

*Where d = MPE safe distance in cm*
*P = Power in dBm*
*G = Antenna Gain in dBi*
*S = Power Density Limit in mW / cm^2*

**Maximum Permissible Exposure (2.4 GHz Band)**

EUT output power = 23.388mW

Antenna Gain = 1(Numeric gain)

S = 1.0 mW / cm^2 from 1.1310 Table 1

Substituting these parameters into the above Equation 1:

*→ MPE Safe Distance =1.377082cm*

*(For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.)*