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 § 1.1307(b) of this chapter.

EUT Specification

EUT	Indoor Air Quality Monitor
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.15GHz ~ 5.25GHz ☐ WLAN: 5.25GHz ~ 5.35GHz ☐ WLAN: 5.47GHz ~ 5.725GHz ☐ WLAN: 5.725GHz ~ 5.85GHz ☐ Bluetooth: 2.402GHz ~ 2.480GHz ☐ 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. Average Output power	WIFI:2.412-2.462GHz IEEE 802.11b mode: 15.32dBm IEEE 802.11g mode: 10.81dBm IEEE 802.11n HT20 mode: 11.99dBm
Antenna gain (Max)	PCB antenna Gain: 1.82 dBi
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:

1. *The maximum output power is 15.32dBm (34.041mW) at 2412MHz (with 1.521 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 $E = \dfrac{\sqrt{30 \times P \times G}}{d}$ & $S = \dfrac{E^2}{3770}$

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

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

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

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 / cm²*

For WLAN:

Modulation Mode	Frequency band (MHz)	Max. tune up power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
IEEE802.11b		16	1.82	20	0.0120	1
IEEE802.11g	2412-2462	11	1.82	20	0.0038	1
IEEE802.11 n(20MHz)		12	1.82	20	0.0048	1

Note:

Only WLAN can transmit, the formula of calculated the MPE is:
CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1
CPD = Calculation power density
LPD = Limit of power density
WLAN =0.0126mW/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.)