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	JA-SP2.1/ PC-SS2.1
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.725GHz ~ 5.850GHz ☒ Bluetooth: 2.402GHz ~ 2.480 GHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation)
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	GFSK: 2402MHz:1.66dBm(1.47mW) 2441MHz:1.64dBm(1.46mW) 2480MHz:1.18dBm(1.31mW) 8DPSK: 2402MHz:3.43dBm(2.20mW) 2441MHz:3.64dBm(2.31mW) 2480MHz:3.18dBm(2.08mW)
Antenna gain (Max)	1 dBi (Numeric gain:1.259)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:

1. *The maximum output power is 3.64 dBm (2.31mW) at 2441MHz (with numeric 1.259 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/cm^2 even if the calculation indicates that the power density would be larger.*

TEST RESULTS

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

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

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

Maximum Permissible Exposure

Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
2441	3.64	1.0	20	0.001	1

NOTE:

Total(Chain0+Chain1) , the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density