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	YVR.1117
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: 13.16dBm IEEE 802.11g mode: 13.44dBm IEEE 802.11n HT20 mode: 13.21dBm 5150 MHz~5250 MHz IEEE802.11a mode: 11.31dBm IEEE802.11an HT20 mode: 11.47dBm IEEE802.11an HT40 mode: 11.25dBm IEEE802.11ac VHT20 mode: 11.30dBm IEEE802.11ac VHT40 mode: 10.37dBm IEEE802.11ac VHT80 mode: 11.06dBm BLE 4.1 2402-2480:8.72dBm

Antenna gain (Max)		Gain(dBi)	
		2.4G	Band I
	Antenna 1	2.77	1.29
	Antenna 2	1.22	1.04

Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:

1. *The maximum output power is 13.44dBm (22.080mW) at 2412MHz (with 1.892 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	2412-2462	13.5	2.77	20	0.0084	1
IEEE802.11g		13.5	2.77	20	0.0084	1
IEEE802.11 n(20MHz)		13.5	2.77	20	0.0084	1
IEEE802.11a mode	5150~5250	11.5	1.29	20	0.0038	1
IEEE802.11an HT20 mode		11.5	1.29	20	0.0038	1
IEEE802.11an HT40 mode		11.5	1.29	20	0.0038	1
IEEE802.11ac VHT20 mode		11.5	1.29	20	0.0038	1
IEEE802.11ac VHT40 mode		11.0	1.29	20	0.0034	1
IEEE802.11ac VHT80 mode		11.5	1.29	20	0.0038	1

For Bluetooth:

Modulation Mode	Frequency band (MHz)	Max. tune up power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
BLE4.1	2402-2480	9.0	2.77	20	0.0030	1

Note:

All of the Bluetooth& WLAN can transmit simultaneously, the formula of calculated the MPE is:
CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1
CPD = Calculation power density
LPD = Limit of power density
Bluetooth+ WLAN =0.0030+0.0084=0.0114mW/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.)

END OF REPORT