

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 ($S = 5\text{mW/cm}^2$) ☒ General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$)		
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 <u>13.44dBm (22.080mW) at 2412MHz (with 1.892 numeric antenna gain.)</u> 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 $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

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:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

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

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/cm ²)	Limit (mW/cm ²)
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/cm ²)	Limit (mW/cm ²)
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:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Bluetooth+ WLAN = $0.0030 + 0.0084 = 0.0114 \text{ mW/cm}^2$

(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.)

END OF REPORT