

## 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

<b>EUT</b>	YVR.1117		
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.15GHz ~ 5.25GHz <input type="checkbox"/> WLAN: 5.25GHz ~ 5.35GHz <input type="checkbox"/> WLAN: 5.47GHz ~ 5.725GHz <input type="checkbox"/> WLAN: 5.725GHz ~ 5.85GHz <input checked="" type="checkbox"/> Bluetooth: 2.402GHz ~ 2.480GHz <input type="checkbox"/> Others		
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others		
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )		
<b>Antenna diversity</b>	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity		
<b>Max. Average Output power</b>	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		
<b>Antenna gain (Max)</b>		Gain(dBi)	
		2.4G	Band I
	Antenna 1	2.77	1.29
	Antenna 2	1.22	1.04
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A		
<b>Remark:</b>			
<ol style="list-style-type: none"> <li>The maximum output power is 13.44dBm (22.080mW) at 2412MHz (with 1.892 numeric antenna gain.)</li> <li>DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.</li> <li>For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.</li> </ol>			

**TEST RESULTS**

No non-compliance noted.

**Calculation**

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

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:

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

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 / cm<sup>2</sup>

**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 / cm<sup>2</sup>

**For WLAN:**

Modulation Mode	Frequency band (MHz)	Max. tune up power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
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  $1.0 \text{mW/cm}^2$  even if the calculation indicates that the power density would be larger.)

**END OF REPORT**