



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	Digital Audio Player
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.150GHz ~ 5.250GHz <input type="checkbox"/> WLAN: 5.725GHz ~ 5.850GHz <input checked="" type="checkbox"/> Bluetooth: <u>2.402GHz ~ 2.480 GHz</u>
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure ($S = 5\text{mW}/\text{cm}^2$) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ($S=1\text{mW}/\text{cm}^2$)
Antenna diversity	<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
Max. output power	802.11b: 21.75dBm(148.93mW) 802.11g: 25.49dBm(354.38mW) 802.11n HT20: 25.28dBm(337.51mW) GFSK: -4.97 dBm (0.318 mW) $\pi/4$ -DQPSK: -2.70dBm (0.537 mW) 8DPSK: -2.65 dBm(0.543 mW)
Antenna gain (Max)	WIFI: 4.44 dBi BT: 1.87dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
Remark: 1. The maximum output power is <u>25.49 dBm (354.38 mW) at 2412MHz (with numeric 4.44 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 $1.0 \text{ mW}/\text{cm}^2$ 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

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

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

**Maximum Permissible Exposure**

Modulation Mode	Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
802.11b	2412-2462	21.75	4.44	20	0.083	1
802.11g	2412-2462	25.49	4.44	20	0.196	1
802.11n HT20	2412-2462	25.28	4.44	20	0.187	1
GFSK	2402-2480	-4.97	1.87	20	0.000097	1
$\pi/4$ -DQPSK	2402-2480	-2.70	1.87	20	0.000164	1
8DPSK	2402-2480	-2.65	1.87	20	0.000166	1

NOTE:

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

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

CPD = Calculation power density

LPD = Limit of power density