

RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i) and §15.407(f), 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	850-035453
Frequency band (Operating)	<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 checked="" type="checkbox"/> WLAN: 5.725GHz ~ 5.85GHz <input checked="" type="checkbox"/> Bluetooth: 2.402GHz ~ 2.480GHz <input type="checkbox"/> Others
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
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 checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power	2.412-2.462GHz IEEE 802.11b mode: 18.72dBm IEEE 802.11g mode: 21.96 dBm IEEE 802.11n HT20 mode: 21.46dBm 5150 MHz~5250 MHz IEEE802.11a mode: 9.91dBm IEEE802.11an HT20 mode: 9.95dBm IEEE802.11an HT40 mode: 10.27dBm IEEE802.11ac VHT20 mode: 9.95dBm IEEE802.11ac VHT40 mode: 10.36dBm IEEE802.11ac VHT80 mode: 9.82dBm 5725MHz-5850MHz IEEE 802.11a: 9.00 dBm IEEE 802.11n HT20 MHz Channel Mode: 8.75 dBm IEEE 802.11n HT40 MHz Channel Mode: 8.92 dBm IEEE 802.11ac VHT20 MHz Channel Mode: 8.89 dBm IEEE 802.11ac VHT40 MHz Channel Mode: 8.85 dBm IEEE 802.11ac VHT 80 MHz Channel Mode: 7.62 dBm Bluetooth: 8.26 dBm
Antenna gain (Max)	Dipole antenna for 2.4GHz Gain 2.0dBi Dipole antenna for 5.25GHz Gain 5.0dBi Dipole antenna for 5.75GHz Gain 4.5dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

Remark:

- The maximum output power is 21.96dBm (157.036mW) at 2412MHz (with 1.585 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 $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

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	19.5	2.0	20	0.0891	1
IEEE802.11g		22.5	2.0	20	0.1778	1
IEEE802.11 n(20MHz)		22.5	2.0	20	0.1778	1
IEEE802.11a mode	5150~5250	10.5	5.0	20	0.0112	1
IEEE802.11an HT20 mode		10.5	5.0	20	0.0112	1
IEEE802.11an HT40 mode		10.5	5.0	20	0.0112	1
IEEE802.11ac VHT20 mode		10.5	5.0	20	0.0112	1
IEEE802.11ac VHT40 mode		10.5	5.0	20	0.0112	1
IEEE802.11ac VHT80 mode		10.5	5.0	20	0.0112	1
IEEE802.11a mode	5725~5850	9.5	4.5	20	0.0089	1
IEEE802.11an HT20 mode		9.5	4.5	20	0.0089	1
IEEE802.11an HT40 mode		9.5	4.5	20	0.0089	1
IEEE802.11ac VHT20 mode		9.5	4.5	20	0.0089	1
IEEE802.11ac VHT40 mode		9.5	4.5	20	0.0089	1
IEEE802.11ac VHT80 mode		9.5	4.5	20	0.0089	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)
1Mbps	2402-2480	8.5	2.0	20	0.0071	1
3Mbps		7.5	2.0	20	0.0056	1
BLE4.0		5.5	2.0	20	0.0035	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 2.4G=0.0071+0.1778=0.1849mW/cm²

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)