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	Bluetooth Speaker
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.150GHz ~ 5.250GHz ☐ WLAN: 5.725GHz ~ 5.850GHz ☐ Bluetooth: 2.402GHz ~ 2.480 GHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation)
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. output power	IEEE802.11b: 10.30 dBm (0.0107 W) IEEE802.11g: 13.49 dBm (0.0223 W) IEEE802.11n HT20: 12.80 dBm (0.0191 W) IEEE802.11n HT40: 12.60 dBm (0.0182 W)
Antenna gain (Max)	2.2 dBi; 1.33dBi
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A
Remark: *1. The maximum output power is 13.49 dBm (0.0107W) at 2412MHz (with numeric 0 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/cm^2 even if the calculation indicates that the power density would be larger.*	

**Note: Simultaneous transmission is not applicable for this EUT.*

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 (mW) = P (W) / 1000 and
d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***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)
IEEE802.11b	2412-2462	10.30	2.2	20	0.004	1
IEEE802.11g	2412-2462	13.49	2.2	20	0.007	1
IEEE802.11n HT20	2412-2462	12.80	2.2	20	0.006	1
IEEE802.11n HT40	2422-2452	12.60	2.2	20	0.006	1

Modulation Mode	Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
IEEE802.11b	2412-2462	10.30	1.33	20	0.004	1
IEEE802.11g	2412-2462	13.49	1.33	20	0.007	1
IEEE802.11n HT20	2412-2462	12.80	1.33	20	0.006	1
IEEE802.11n HT40	2422-2452	12.60	1.33	20	0.006	1

NOTE:

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

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density