



## 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

|                                   |                                                                                                                                                                                                                                           |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT</b>                        | BT module                                                                                                                                                                                                                                 |
| <b>Frequency band (Operating)</b> | <input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz<br><input type="checkbox"/> WLAN: 5.150GHz ~ 5.250GHz<br><input type="checkbox"/> WLAN: 5.725GHz ~ 5.850GHz<br><input checked="" type="checkbox"/> Bluetooth: 2.402GHz ~ 2.480 GHz     |
| <b>Device category</b>            | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)                                                                                                                     |
| <b>Exposure classification</b>    | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )                                             |
| <b>Antenna diversity</b>          | <input checked="" type="checkbox"/> Single antenna<br><input type="checkbox"/> Multiple antennas<br><input type="checkbox"/> Tx diversity<br><input type="checkbox"/> Rx diversity<br><input checked="" type="checkbox"/> Tx/Rx diversity |
| <b>Max. output power</b>          | GFSK: -1.76dBm<br>$\pi/4$ -DQPSK: -1.26dBm<br>8DPSK: -0.79dBm                                                                                                                                                                             |
| <b>Antenna gain (Max)</b>         | 2.8 dBi                                                                                                                                                                                                                                   |
| <b>Evaluation applied</b>         | <input checked="" type="checkbox"/> MPE Evaluation*<br><input type="checkbox"/> SAR Evaluation<br><input type="checkbox"/> N/A                                                                                                            |

### **Remark:**

1. The maximum output power is -0.79 dBm (0.8.mW) at 2480MHz (with numeric 2.8 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<sup>2</sup> 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:

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

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

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 / cm<sup>2</sup>

**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) |
|-----------------|----------------------|----------------------------------|--------------------|---------------|------------------------|----------------|
| GFSK            | 2402-2480            | -1.76                            | 2.8                | 20            | 0.0001                 | 1              |
| $\pi/4$ -DQPSK  | 2402-2480            | -1.26                            | 2.8                | 20            | 0.0001                 | 1              |
| 8DPSK           | 2402-2480            | -0.79                            | 2.8                | 20            | 0.0001                 | 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