

INTERTEK TESTING SERVICES

RF Exposure report

The equipment under test (EUT) is a Bluetooth Alarm Clock. The EUT can be powered by AC/DC adapter (Input: AC 100-240V, 50/60Hz, 0.7A, Output: DC 5.0V, 2.5A). For more detail information pls. refer to the user manual.

Modulation Type: GFSK, $\pi/4$ DQPSK, 8DPSK

Bluetooth Version: 2.1 with EDR function and without AFH mode

Antenna Type: Integral antenna

Antenna Gain: 2.12dBi

The nominal radiated output power (e.i.r.p) specified: 0dBm (Tolerance: +/- 3dB)

The worst-case radiated emission for the EUT is 94.2dB μ V/m at 3m in the frequency

$$2.402\text{GHz} = [(FS \cdot D)^2 / 30] \text{ mW}$$

= -1.03 dBm which is within the production variation.

The minimum radiated emission for the EUT is 93.0dB μ V/m at 3m in the frequency 2.441GHz

$$= [(FS \cdot D)^2 / 30] \text{ mW}$$

= -2.23 dBm which is within the production variation.

According to FCC Part 2.1091, this unlicensed transmitting devices is categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, According to the KDB 447498 and OET 65, the simple calculation as below:

For Maximum Permissible Exposure (MPE) evaluation of the product, the maximum power density at 20 cm from this transmitter shall be less than the General Population / Uncontrolled MPE limit in OET Bulletin 65.

The maximum radiated output power = 3 dBm = 2.0mW

The source-based time averaged maximum radiated power (including the tune-up tolerance)

$$= 2.0 \cdot \text{Duty Cycle} = 1.7 \text{ mW}$$

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

$$= 1.7 \text{ mW} / 4\pi R^2$$

$$= 0.0003 \text{ mW/cm}^2$$

The MPE limit is 1.0 mWcm⁻² for general population and uncontrolled exposure in the Bluetooth frequency range according to FCC Part 1.1310. As the measured power density at 20cm from the transmitter is lower than the MPE limit, the compliance to the MPE limit can be

ensured by indicating the minimum 20cm separation between the transmitter's radiating structure and body of the user or nearby persons.

Transmitter Duty Cycle Calculation

Based on the Bluetooth Specification (BT version: 2.1 with EDR function), transmitter duty cycle is dependent of packet type (DH1, DH3 and DH5). For one period for a pseudo-random hopping through all 79 RF channels, for DH5:

One hopset consists of 5 TX slot and 1 RX slot.

Duty cycle = $5 / 6 = 0.833$

The following RF exposure statement is proposed to be included in the user manual:

“FCC RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”