

INTERTEK TESTING SERVICES

RF Exposure

The Equipment Under Test (EUT) is a Dash Camera which has Bluetooth and WiFi functions. The EUT can be powered by DC 5.0V, 1.5A through Micro USB port. 5G Wi-Fi and Bluetooth share an Integral antenna to transmit and receive, but they can't transmit at the same time. For more detailed features description, please refer to the user's manual.

MPE evaluation for BT function

Bluetooth Version: 4.2 BLE

Antenna Type: Integral antenna.

Antenna Gain: 1.7dBi.

Modulation Type: GFSK

The nominal conducted output power specified: 3dBm (+/-3dB).

The maximum conducted output power for the EUT is 4.03dBm in the frequency 2402MHz which is within the production variation.

The minimum conducted output power for the EUT is 3.76dBm in the frequency 2440MHz which is within the production variation.

According to FCC Part 2.1091, this unlicensed transmitting device 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:

The source-based time averaged maximum radiated power = 7.7dBm = 5.9mW

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 2.4GHz band can be calculated according to OET 65 as follows:

$$= 5.9\text{mW} / 4\pi R^2$$

$$= 0.0012 \text{ mW/cm}^2$$

$$< 1\text{mW/cm}^2$$

The MPE limit is 1.0 mW/cm² 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.

MPE evaluation for 2.4GHz WIFI function

2.4GHz WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: -0.1dBi.

Modulation Type: BPSK, QPSK, 16QAM, 64QAM, CCK, DQPSK, DBPSK and DSSS.

The nominal conducted output power specified: 20dBm (Tolerance: +/-4dB).

The maximum conducted output power for the EUT is 23.37dBm in the frequency 2437MHz(IEEE 802.11n-HT40) which is within the production variation.

The minimum conducted output power for the EUT is 17.52dBm in the frequency 2462MHz(IEEE 802.11b) which is within the production variation.

According to FCC Part 2.1091, this unlicensed transmitting device 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:

The source-based time averaged maximum radiated power = $20 + 4 - 0.1 = 23.9\text{dBm} = 245.5\text{mW}$

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 2.4GHz WIFI band can be calculated according to OET 65 as follow:

$$= 245.5 / 4\pi R^2$$

$$= 0.0489 \text{ mW/cm}^2$$

$$< 1 \text{ mW/cm}^2$$

The MPE limit is 1.0 mW/cm^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.

INTERTEK TESTING SERVICES

MPE evaluation for 5GHz WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: 2.7dBi.

Modulation Type: BPSK, QPSK, 16QAM, 64QAM and OFDM.

The nominal conducted output power specified: 12dBm (Tolerance: +/-4dB).

The maximum conducted output power for the EUT is 14.10dBm in the frequency 5745MHz(IEEE 802.11ac-HT20) which is within the production variation.

The minimum conducted output power for the EUT is 9.06dBm in the frequency 5795MHz(IEEE 802.11ac-HT40) which is within the production variation.

The source-based time averaged maximum radiated power = $12+4+2.7= 18.7\text{dBm}$
= 74.1mW

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 5GHz WIFI band can be calculated according to OET 65 as follow:

$$= 74.1\text{mW} / 4\pi R^2$$

$$= 0.0147 \text{ mW/cm}^2$$

$$<1\text{mW/cm}^2$$

The MPE limit is 1.0 mW/cm^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.

INTERTEK TESTING SERVICES

Simultaneous Transmission MPE Evaluation

For Simultaneous transmitting of 2.4GHz WiFi and 5GHz WiFi, According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.0489/1 + 0.0147/1 = 0.0636 < 1$

For Simultaneous transmitting of 2.4GHz WiFi and Bluetooth, According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.0489/1 + 0.0012/1 = 0.0501 < 1$

Since the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in the device is ≤ 1.0 , the EUT is considered to satisfy MPE compliance for simultaneous transmission operations.

The following RF exposure statement or similar sentence 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.”