

INTERTEK TESTING SERVICES

RF Exposure

The Equipment Under Test (EUT) is a Huawei STB/Huawei BOX which has Bluetooth and WiFi function. Bluetooth operating at 2402-2480MHz for classic mode and BLE mode. Simultaneous transmission between classic and BLE modes is not available. WiFi operating at 2412-2462MHz for 802.11b/g/n-HT20/n-HT40 and operating at 5150MHz~5250 MHz, 5250MHz~5350MHz, 5470MHz-5725MHz, 5725MHz~5850MHz for 802.11a/n-HT20/40/ac-HT20/40/80. The EUT can be powered by DC 12V, 1A (powered by AC/DC adapter). For more detailed features description, please refer to the user's manual.

MPE evaluation for BT function

Bluetooth Version: 4.2

Antenna Type: Integral antenna.

Antenna Gain: 0dBi.

Modulation Type: GFSK, p/4-DQPSK and 8-DPSK

The nominal conducted output power specified: 5dBm (+/-3dB).

The maximum conducted output power for the EUT is 4.81dBm in the frequency 2402MHz(BLE mode) which is within the production variation.

The minimum conducted output power for the EUT is 3.59dBm in the frequency 2480MHz(Classic mode) 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:

The source-based time averaged maximum radiated power = 8dBm = 6.3mW

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 follow:

$$= 6.3\text{mW} / 4\pi R^2$$

$$= 0.0013 \text{ mW/cm}^2$$

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

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.

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MPE evaluation for WIFI function

2.4GHz WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: ANT 1: 0dBi ; ANT 2: 0dBi; MIMO (2Tx): 3dBi

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

The nominal conducted output power specified: 20dBm (Tolerance: +/-5dB).

The maximum conducted output power for the EUT is 24.75dBm in the frequency 2437MHz(IEEE 802.11n-HT20 MIMO) which is within the production variation.

The minimum conducted output power for the EUT is 16.15dBm in the frequency 2412MHz(IEEE 802.11b ANT 1) 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:

The source-based time averaged maximum radiated power = 20+5+3= 28dBm = 630.96mW

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:

$$= 630.96 \text{ mW} / 4\pi R^2$$

$$= 0.126 \text{ mW/cm}^2$$

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

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.

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5GHz WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: ANT 1: 1dBi ; ANT 2: 1dBi; MIMO (2Tx): 4dBi.

Modulation Type: BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM.

The nominal conducted output power specified: 15dBm (Tolerance: +/-5dB).

The maximum conducted output power for the EUT is 19.20dBm in the frequency 5755MHz(IEEE 802.11n-HT40 MIMO) which is within the production variation.

The minimum conducted output power for the EUT is 10.92dBm in the frequency 5210MHz(IEEE 802.11ac-HT80 ANT 1) which is within the production variation.

The source-based time averaged maximum radiated power = $15+5+4= 24\text{dBm} = 251.2\text{mW}$

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:

$$= 251.2\text{mW} / 4\pi R^2$$

$$= 0.05 \text{ mW/cm}^2$$

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

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.

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Simultaneous Transmission Evaluation

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

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.126 / 1 + 0.0013 / 1 = 0.1273 < 1$

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

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.05 / 1 + 0.0013 / 1 = 0.0513 < 1$

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

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.126 / 1 + 0.05 / 1 + 0.0013 / 1 = 0.1773 < 1$

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.”