

RF Exposure

The equipment under test (EUT) is a WS137K4 with Bluetooth (dual-mode) function operating in 2402-2480MHz, 2.4G Wi-Fi function operating in 2412-2462MHz, 5G Wi-Fi function operating in 5150MHz~5250 MHz, 5250MHz~5350MHz, 5470MHz-5725MHZ, 5725MHz~5850MHz. The EUT is powered by DC 5.0V, 1.0A. For more detail information pls. refer to the user manual.

EDR

Antenna Type: Internal antenna.

Antenna Gain: 0.68dBi.

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

The nominal conducted output power specified: 6.5dBm (Tolerance: +/-2dB).

The maximum conducted output power for the EUT is 8.27dBm in the frequency 2480MHz which is within the production variation.

The minimum conducted output power for the EUT is 4.96dBm in the frequency 2402MHz 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 V06 and OET 65, the simple calculation as below:

The source-based time averaged maximum radiated power = 8.5dBm + 0.68dBi = 9.18dBm
= 8.28mW

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:
= $8.28\text{mW} / 4\pi R^2$
= $0.0016\text{mW}/\text{cm}^2$
< $1\text{mW}/\text{cm}^2$

The MPE limit is $1.0\text{mW}/\text{cm}^2$ 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.

BLE

Antenna Type: Internal antenna.

Antenna Gain: 0.68dBi.

The nominal conducted output power specified: 5dBm (Tolerance: +/-2dB).

The maximum conducted output power for the EUT is 6.53dBm in the frequency 2402MHz which is within the production variation.

The minimum conducted output power for the EUT is 4.84dBm in the frequency 2480MHz 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 V06 and OET 65, the simple calculation is as below:

The source-based time averaged maximum radiated power = 7dBm+0.68dBi = 7.68dBm = 5.86mW

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:
= $5.86\text{mW} / 4\pi R^2$
= 0.0012 mW/cm²
<1mW/cm²

The MPE limit is 1.0 mW/cm² for general population and uncontrolled exposure in the WIFI 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.

2.4GHz Wi-Fi:

Antenna Type: Internal Antenna.

Antenna1 Gain: 0.34dBi. Antenna2 Gain: 0.68dBi. MIMO:3.52dBi

Modulation Type: BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, CCK, DQPSK, DBPSK and DSSS.

The nominal conducted output power specified: 16dBm (Tolerance: +/-3dB).

The maximum conducted output power for the EUT is 18.8dBm in the frequency 2462MHz (IEEE 802.11N20MIMO) which is within the production variation.

The minimum conducted output power for the EUT is 14.5dBm in the frequency 2437MHz (IEEE 802.11N20MIMO ANT1) 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 V06 and OET 65, the simple calculation is as below:

The source-based time averaged maximum radiated power = 19dBm +3.52dBi = 22.52dBm
= 178.65mW

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:
= $178.65\text{mW} / 4\pi R^2$
= 0.0355 mW/cm²
<1mW/cm²

The MPE limit is 1.0 mW/cm² for general population and uncontrolled exposure in the WIFI 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

5GHz Wi-Fi:

Antenna Type: Internal Antenna.

Antenna1 Gain: 0.79dBi. Antenna2 Gain: 2.232dBi. MIMO: 4.6dBi.

Modulation Type: OFDM and OFDMA.

The nominal conducted output power specified: 6dBm (Tolerance: +/-12dB).

The maximum conducted output power for the EUT is 17.93dBm in the frequency 5825MHz (IEEE 802.11A ANT2) which is within the production variation.

The minimum conducted output power for the EUT is -5.88dBm in the frequency 5690MHz_UNII-3 (IEEE 802.11 AC80 MIMO ANT1) 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 V06 and OET 65, the simple calculation is as below:

The source-based time averaged maximum radiated power = 18dBm + 4.6dBi = 22.6dBm
= 181.97mW

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:
= $181.97\text{mW} / 4\pi R^2$
= $0.0362\text{mW}/\text{cm}^2$
< $1\text{mW}/\text{cm}^2$

The MPE limit is $1.0\text{mW}/\text{cm}^2$ for general population and uncontrolled exposure in the WIFI 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

For Simultaneous transmitting of 2.4GHz Wi-Fi 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 = $0.0355/1 + 0.0016/1 = 0.0372 < 1$

For Simultaneous transmitting of 5GHz Wi-Fi 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 = $0.0362/1 + 0.0016/1 = 0.0378 < 1$

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.”