

INTERTEK TESTING SERVICES

RF Exposure

The equipment under test (EUT) is a Soundbar with Bluetooth, 2.4G SRD, and Wi-Fi functions. 2.4G Wi-Fi and 5G Wi-Fi share an Integral antenna to transmit and receive, but they can't transmit at the same time. The EUT is powered by AC 100-240V~ 50/60Hz. The device will automatically discontinue transmission in case of either absence of information to transmit or operational failure. When the soundbar is absence of information to transmit or operational failure, the power supply of WIFI transmitter module will shut off, so that the EUT can't enter the work state, so as to stop transmitting the information. For more detailed features description, please refer to the user's manual.

Standalone SAR evaluation for BT function

Bluetooth Version: 5.0 BDR/EDR

Antenna Type: Integral antenna.

Antenna Gain: 4.25dBi.

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

The nominal conducted output power specified: 5.0dBm (+/-3dB)

The maximum conducted output power for the EUT is 6.03dBm in the frequency 2480MHz which is within the production variation.

The minimum conducted output power for the EUT is 4.08dBm 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 and OET 65, the simple calculation as below:

The source-based time averaged maximum radiated power = $5+3+4.25= 12.25\text{dBm} = 16.79\text{mW}$

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:

$$= 16.79\text{mW} / 4\pi R^2$$

$$= 0.003 \text{ mW/cm}^2$$

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

The MPE limit is 1.0 mW/cm^2 for general population and uncontrolled exposure in the 2.4GHz 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

Standalone SAR evaluation for WIFI function

2.4GHz Wi-Fi:

Antenna Type: Integral Antenna.

Antenna Gain: 4.25dBi.

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

The nominal conducted output power specified: 17dBm (Tolerance: +/-3dB).

The maximum conducted output power for the EUT is 18.72dBm in the frequency 2437MHz (IEEE 802.11b) which is within the production variation.

The minimum conducted output power for the EUT is 16.39dBm in the frequency 2462MHz (IEEE 802.11n-HT20) 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 is as follows:

The source-based time averaged maximum radiated power = $17 + 3 + 4.25 = 24.25\text{dBm} = 266.07\text{mW}$

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 follows:

$$= 266.07\text{mW} / 4\pi R^2$$

$$= 0.053 \text{ mW/cm}^2$$

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

The MPE limit is 1.0 mW/cm^2 for general population and uncontrolled exposure in the 2.4GHz 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 WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: 4.25dBi.

Modulation Type: BPSK, QPSK, 16QAM, 64QAM

The nominal conducted output power specified: 17dBm (Tolerance: +/-4dB).

The maximum conducted output power for the EUT is 18.65dBm in the frequency 5280MHz(IEEE 802.11n-HT20) which is within the production variation.

The minimum conducted output power for the EUT is 13.71dBm in the frequency 5775MHz(IEEE 802.11ac-HT80) which is within the production variation.

The source-based time averaged maximum radiated power = $17+4+4.25= 25.25\text{dBm} = 334.97\text{mW}$

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:

$$= 334.97\text{mW} / 4\pi R^2$$

$$= 0.067 \text{ mW/cm}^2$$

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

The MPE limit is 1.0 mW/cm^2 for general population and uncontrolled exposure in the 5GHz 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

Standalone SAR evaluation for 2.4G SRD

2.4GHz SRD:

Antenna Type: Integral Antenna.

Antenna Gain: 4.25dBi.

Modulation Type: GFSK.

The nominal conducted output power specified: -21.25dBm (Tolerance: +/-3dB)

The nominal radiated output power (e.i.r.p) specified: -17dBm (+/-3dB)

The maximum peak radiated emission for the EUT is 79.0dB μ V/m at 3m in the frequency 2479.5MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = -16.23dBm

which is within the production variation.

The minimum peak radiated emission for the EUT is 75.8dB μ V/m at 3m in the frequency 2444.5MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = -19.43dBm

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 = -14dBm = 0.04mW

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:

$$= 0.04\text{mW} / 4\pi R^2$$

$$= 0.000008 \text{ mW/cm}^2$$

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

The MPE limit is 1.0 mW/cm² for general population and uncontrolled exposure in the 2.4GHz 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 SAR Evaluation

For Simultaneous transmitting of Bluetooth, 2.4G SRD and 2.4GHz Wi-Fi, According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.003/1 + 0.000008/1 + 0.053/1 = 0.056008 < 1$

For Simultaneous transmitting of Bluetooth, 2.4G SRD and 5GHz Wi-Fi, According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.003/1 + 0.000008/1 + 0.067/1 = 0.070008 < 1$

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.”