

INTERTEK TESTING SERVICES

RF Exposure

The Equipment Under Test (EUT) is a BW 2.0 GVA Soundbar which has Bluetooth and WiFi function, and WiFi operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing; 2422-2452MHz for 802.11n-HT20, 9 channels with 5MHz channel spacing; 5180 MHz - 5240 MHz for 802.11a/n/ac-HT20 with 4 channels, 5190 MHz ~ 5230 MHz for 802.11n/ac-HT40 with 2 channels and 5210 MHz for 802.11ac-HT80 with 1 channel; 5745 MHz - 5825 MHz for 802.11a/n/ac-HT20 with 5 channels, 5755 MHz ~ 5795 MHz for 802.11n/ac-HT40 with 2 channels and 5775 MHz for 802.11ac-HT80 with 1 channel. The EUT can be powered by DC 18V/2A through an adapter. For more detailed features description, please refer to the user's manual.

Standalone SAR evaluation for BT function

Bluetooth Version: 2.1+ EDR, 3.0

Antenna Type: Integral antenna.

Antenna Gain: 6.25dBi.

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

The nominal conducted output power specified: 1.75dBm (+/-3dB)

The nominal radiated output power (e.i.r.p) specified: 8dBm (+/- 3dB)

The maximum peak radiated emission for the EUT is 106.1dB μ V/m at 3m in the frequency 2402MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = 10.87dBm

which is within the production variation.

The minimum peak radiated emission for the EUT is 103.1dB μ V/m at 3m in the frequency 2480MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = 7.87dBm

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 = 11dBm = 12.6mW

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:

$$= 12.6\text{mW} / 4\pi R^2$$

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

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

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Bluetooth Version: 4.2 BLE

Antenna Type: Integral antenna.

Antenna Gain: 6.25dBi.

Modulation Type: GFSK

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

The nominal radiated output power (e.i.r.p) specified: 9.25dBm (+/- 3dB)

The maximum conducted output power for the EUT is 4.89dBm in the frequency 2402MHz which is within the production variation.

The minimum conducted output power for the EUT is 3.67dBm 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 and OET 65, the simple calculation as below:

The source-based time averaged maximum radiated power = 12.25dBm = 16.8mW

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:

$$= 16.8\text{mW} / 4\pi R^2$$

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

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

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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Standalone SAR evaluation for WIFI function

2.4GHz WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: 6.25dBi.

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

The nominal conducted output power specified: 16dBm (Tolerance: +/-4dB).

The maximum conducted output power for the EUT is 18.63dBm in the frequency 2462MHz(IEEE 802.11b) which is within the production variation.

The minimum conducted output power for the EUT is 13.82dBm in the frequency 2452MHz(IEEE 802.11n-HT40) 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 below:

The source-based time averaged maximum radiated power = $16 + 4 + 6.25 = 26.25$ dBm = 421.7mW

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:

$$= 421.7 / 4\pi R^2$$

$$= 0.084 \text{ mW/cm}^2$$

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

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5GHz WiFi:

Antenna Type: Integral Antenna.

Antenna Gain: 6.87dBi.

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

The nominal conducted output power specified: 9dBm (Tolerance: +/-4dB).

The maximum conducted output power for the EUT is 12.25dBm in the frequency 5240MHz(IEEE 802.11n-HT20) which is within the production variation.

The minimum conducted output power for the EUT is 6.40dBm in the frequency 5775MHz(IEEE 802.11ac-HT80) which is within the production variation.

The source-based time averaged maximum radiated power = $9+4+6.87= 19.87\text{dBm}$
 $= 97.1\text{mW}$

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:

$$= 97.1\text{mW} / 4\pi R^2$$

$$= 0.019 \text{ mW/cm}^2$$

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

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 SAR 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 = $0.084/1 + 0.019/1 = 0.103 < 1$

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 = $0.084/1 + 0.003/1 = 0.087 < 1$

For Simultaneous transmitting of 5GHz 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 = $0.019/1 + 0.003/1 = 0.022 < 1$

For Simultaneous transmitting of 2.4GHz WiFi, Bluetooth 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 = $0.084/1 + 0.019/1 + 0.003/1 = 0.106 < 1$

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.”