RF Exposure

The Equipment Under Test (EUT) is a Module with Bluetooth and Wi-Fi function operating at 2402-2480 and 2412-2462MHz. The EUT is powered by DC 3.3V. For more detailed features description, please refer to the user's manual.

Bluetooth(EDR) function

Antenna Type: Integral Antenna
Antenna Gain: 6.04dBi
Modulation Type: GFSK, π/4-DQPSK and 8-DPSK

The normal radiated output power (e.i.r.p) is: 14.04dBm (tolerance: +/-3dB).
The normal conducted output power is 8.0dBm (tolerance: +/-3dB).

The maximum conducted output power for the EUT is 8.76dBm in the frequency 2480MHz which is within the production variation.
The minimum conducted output power for the EUT is 7.60dBm 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 = 14.04dBm+3dB= 17.04dBm = 50.6mW

At the distance (R) of 20cm to 40cm and in 0.3 GHz to 6 GHz, MPE Exclusion Threshold Level:

$$P_{\text{th}}\,(\text{mW}) = ERP_{20\text{ cm}}\,(\text{mW}) = \begin{cases} 2040f & 0.3\text{ GHz} \le f < 1.5\text{ GHz} \\ 3060 & 1.5\text{ GHz} \le f \le 6\text{ GHz} \end{cases}$$

The MPE limit is 3060mW for general population and uncontrolled exposure in the 2.4GHz frequency range according to FCC Part 1.1307. 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.
Note: EIRP is higher than ERP, thus EIRP is compared with the Exclusion Threshold.

Bluetooth(BLE) function

Antenna Type: Integral Antenna
Antenna Gain: 6.04dBi
Modulation Type: GFSK

The normal radiated output power (e.i.r.p) is: 1.0dBm (tolerance: +/-3dB).

The maximum radiated output power for the EUT is 97.0 dBμV/m (1.77dBm) in the frequency 2402MHz which is within the production variation.
The minimum radiated output power for the EUT is 95.3 dBμV/m (0.07dBm) in the frequency 2480MHz 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 = 1.0dBm+3dB= 4.0dBm = 2.5mW

At the distance (R) of 20cm to 40cm and in 0.3 GHz to 6 GHz, MPE Exclusion Threshold Level:

$$P_{\text{th}}\ (\text{mW}) = ERP_{20\ \text{cm}}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

The MPE limit is 3060mW for general population and uncontrolled exposure in the 2.4GHz frequency range according to FCC Part 1.1307. 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.
Note: EIRP is higher than ERP, thus EIRP is compared with the Exclusion Threshold.

2.4G Wi-Fi function:

Antenna Type: Integral Antenna
Antenna Gain: 6.04dBi
Modulation Type: CCK, DQPSK, DBPSK, BPSK, QPSK, 16QAM, 64QAM

The normal radiated output power (e.i.r.p) is: 20.04dBm (tolerance: +/-3dB).
The normal conducted output power is 14.0dBm (tolerance: +/-3dB).

The maximum conducted output power for the EUT is 16.50dBm in the frequency 2.462GHz 802.11n-HT20 mode which is within the production variation.
The minimum conducted output power for the EUT is 12.00dBm in the frequency 2.437GHz 802.11b 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 = 20.04dBm+3dB= 23.04dBm = 201.37mW

At the distance (R) of 20cm to 40cm and in 0.3 GHz to 6 GHz, MPE Exclusion Threshold Level:

$$P_{\text{th}}\ (\text{mW}) = ERP_{20\ \text{cm}}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

The MPE limit is 3060mW for general population and uncontrolled exposure in the 2.4GHz frequency range according to FCC Part 1.1307. 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.
Note: EIRP is higher than ERP, thus EIRP is compared with the Exclusion Threshold.

Simultaneous Transmission

For Simultaneous transmitting of Bluetooth and WIFI transmitter. According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = 50.6mW/3060 mW + 201.37mW/3060mW = 0.0823< 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.”