RF Exposure

The equipment under test (EUT) is a 24 inch Curved Screen-P with Bluetooth 5.0 (dual-mode) function operating in 2402-2480MHz, 2.4G WIFI function operating in 2412-2462MHz and 5G WIFI function operating in 5150MHz~5250 MHz, 5250MHz~5350MHz, 5470MHz-5725MHZ, 5725MHz~5850MHz. The EUT is powered by DC 12V. For more detail information pls. refer to the user manual.

Bluetooth Version: 5.0 EDR mode.
Antenna Type: Integral antenna.
Antenna Gain: 1.2dBi.
Modulation Type: GFSK, π/4DQPSK, 8DPSK.
The nominal conducted output power specified: -1.0dBm (+/-3dB)
The nominal radiated output power (e.i.r.p) specified: 0.2dBm (+/- 3dB)

According to the KDB 447498:

The maximun peak radiated emission for the EUT is 96.9dBμV/m at 3m in the frequency 2480MHz
The EIRP = [(FS*D) ^2 / 30] mW = 1.67dBm
which is within the production variation.

The minimum peak radiated emission for the EUT is 93.7dBμV/m at 3m in the frequency 2441MHz
The EIRP = [(FS*D) ^2 / 30] mW = -1.53dBm
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 = 3.2dBm = 2.09mW

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 5.0 EDR mode can be calculated according to OET 65 as follow:
= 2.09mW/ 4πR^2
= 0.0004 mW/cm^2
<1mW/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.

Bluetooth Version: 5.0 BLE mode.
Antenna Type: Integral antenna.
Antenna Gain: 1.2dBi.
Modulation Type: GFSK.
The nominal conducted output power specified: 1.8dBm (+/-3dB)
The nominal radiated output power (e.i.r.p) specified: 3dBm (+/- 3dB)

According to the KDB 447498:

The maximun peak radiated emission for the EUT is 98.2dBμV/m at 3m in the frequency 2480MHz
The EIRP = [(FS*D) ^2 / 30] mW = 2.97dBm
which is within the production variation.

The minimum peak radiated emission for the EUT is 97.5dBμV/m at 3m in the frequency 2440MHz
The EIRP = [(FS*D) ^2 / 30] mW = 2.27dBm
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 = 6dBm = 3.98mW

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 5.0 BLE mode can be calculated according to OET 65 as follow:
= 3.98mW/ 4πR^2
= 0.0008 mW/cm^2
<1mW/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.

2.4GHz WiFi:
Antenna Type: Integral Antenna.
Antenna Gain: 1.2dBi for each antenna
Directional Gain: 4.2dBi
Modulation Type: BPSK, QPSK, 16QAM, 64QAM, CCK, DQPSK, DBPSK and DSSS.
The nominal conducted output power specified: 17dBm (Tolerance: +/-4dB).

The maximun conducted output power for the EUT is 17.90 dBm in the frequency 2462MHz(802.11 b) which is within the production variation.

The minimum conducted output power for the EUT is 13.89dBm in the frequency 2412MHz(802.11 n-HT20, SISO 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 = 25.2dBm = 332.1mW

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:
= 332.1mW/ 4πR^2
= 0.066 mW/cm^2
<1mW/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.

5GHz WiFi:
Antenna Type: Integral Antenna.
Antenna Gain: 1.6dBi for each antenna
Directional Gain: 4.6dBi
Modulation Type: BPSK, QPSK, 16QAM, 64QAM and OFDM.
The nominal conducted output power specified: 12dBm (Tolerance: +/-6dB).

The maximum conducted output power for the EUT is 16.1dBm in the frequency 5510MHz(802.11 AC40, MIMO 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 = 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 follow:
= 181.97mW/ 4πR^2
= 0.036mW/cm^2
<1mW/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.

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 = 0.066/1 + 0.036/1 = 0.102< 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 = 0.066/1 + 0.0008/1 = 0.0668 < 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 = 0.036/1 + 0.0008/1 = 0.0368< 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 = 0.066/1 + 0.036/1 + 0.0008/1 = 0.1028< 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.”