

RF Exposure

The Equipment Under Test (EUT) is a Monochrome Laser Printer with 2.4G Wi-Fi function operating at 2412-2462MHz for 802.11b/g/n HT20 and 2422-2452MHz for 802.11n HT40, Bluetooth function operating at 2402-2480MHz. The EUT is powered by AC120V/60Hz. For more detailed features description, please refer to the user's manual.

2.4GHz Wi-Fi:

Modulation Type: BPSK, QPSK, 16QAM, 64QAM for OFDM; CCK, DQPSK, DBPSK for DSSS.

Antenna Type: Integral Antenna.

Antenna Gain: 3.55dBi (Max.)

The nominal conducted output power specified: 20.0dBm (Tolerance: ± 3 dB).

The maximum conducted output power for the EUT is 20.51dBm in the frequency 2462MHz (IEEE 802.11g) which is within the production variation.

The minimum conducted output power for the EUT is 17.34dBm in the frequency 2422MHz (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 as below:

The source-based time averaged maximum radiated power = 23.00dBm + 3.55dBi = 26.55dBm = 451.86mW

Bluetooth:

Modulation Type: GFSK

Antenna Type: Integral antenna

Antenna Gain: 3.55dBi (Max.)

Bluetooth Version: 4.2 BLE (Single Mode)

The nominal radiated output power specified: 6.0 dBm (± 2 dB).

According to the KDB 447498:

The maximum peak radiated emission for the EUT is 102.9dB μ V/m at 3m in the frequency 2440MHz.

The EIRP = $[(FS * D)^2 / 30]$ mW = 7.67dBm which is within the production variation.

The minimum peak radiated emission for the EUT is 100.4dB μ V/m at 3m in the frequency 2402MHz.

The EIRP = $[(FS * D)^2 / 30]$ mW = 5.17dBm 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 = 8dBm = 6.31mW

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

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

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.

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 = $501.19/3060 + 3.16/3060 = 0.1497 < 1$

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.”