

RF Exposure

The equipment under test (EUT) is a EZ-BBell with 2.4G Wi-Fi function operating in 2412-2462MHz for 802.11b/g/n-HT20/n-HT40, 11 channels with 5MHz channel spacing and Sub-GHz function operating in 433.95MHz. The EUT is powered by 5V=2A (Internal Li-ion battery:3.7V=,6400mAh,23.68Wh). For more detail information pls. refer to the user manual.

MPE evaluation for 2.4G Wi-Fi function

2.4GHz Wi-Fi:

Antenna Type: Integral Antenna (LDS)

Antenna Gain: 2.38dBi Max.

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

The normal radiated output power (e.i.r.p) is: 21.38dBm (tolerance: +/-4dB).

The normal conducted output power is 19.0dBm (tolerance: +/-4dB).

The maximum conducted output power for the EUT is 22.9dBm in the frequency 2.462GHz 802.11g mode which is within the production variation.

The minimum conducted output power for the EUT is 15.9dBm in the frequency 2.412GHz 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 = 21.38dBm+4dB= 25.38dBm = 199.5mW

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 source-based time averaged maximum radiated power 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.

MPE evaluation for Sub-GHz function

433.95MHz:

Antenna Type: Integral Antenna (LDS)

Antenna Gain: -3.72dBi Max.

Modulation Type: OOK

The normal radiated output power (e.i.r.p) is: -7.0dBm (tolerance: +/-2dB).

The normal conducted output power is -3.28dBm (tolerance: +/-2dB).

The Maximum peak radiated emission for the EUT is 87.7 dBμV/m at 3m in the frequency 433.95MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = -7.5 dBm

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 conducted output power = -3.28dBm+2dB=-1.28dBm = 0.745mW

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 885.258mW for general population and uncontrolled exposure in the 0.43395GHz frequency range according to FCC Part 1.1307. As The source-based time averaged maximum conducted output power 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.

Simultaneous Transmission MPE Evaluation

For Simultaneous transmitting of 2.4GHz Wi-Fi and 433.95MHz Sub-GHz, according to KDB 447498 and FCC Part 1.1307.

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $199.5/3060 + 0.745/885.258 = 0.066 < 1$

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.”