# FCC ID: 2BHYQ-HCBG01

**Maximum Permissible Exposure (MPE)**

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| **(A) Limits for Occupational/Controlled Exposure** | | | | |
| 0.3-3.0 | 614 | 1.63 | *100 | 6 |
| 3.0-30 | 1842/f | 4.89/f | $*900/f^2$ | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1,500 | | | f/300 | 6 |
| 1,500-100,000 | | | 5 | 6 |
| **(B) Limits for General Population/Uncontrolled Exposure** | | | | |
| 0.3-1.34 | 614 | 1.63 | *100 | 30 |
| 1.34-30 | 824/f | 2.19/f | $*180/f^2$ | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1,500 | | | f/1500 | 30 |
| 1,500-100,000 | | | 1.0 | 30 |

f = frequency in MHz * = Plane-wave equivalent power density

## MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 * P * G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

*Pd* = $\frac{30 * P * G}{377 * D^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

BT:

## Measurement Result

Operation Frequency: 2402MHz~2480MHz

Power density limited: 1mW/ $cm^2$

Antenna Type:FPC antenna

Antenna gain:4.66dBi;

R=20cm

mW=10^(dBm/10)

antenna gain Numeric=10^(dBi/10)= 10^(4.66/10)=2.92

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max | | Antenna | | Evaluation result (mW/cm2 ) | Power density (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | tune-up power | | Gain | | | |
| | | | | (dBm) | (mW) | (dBi) | Numeric | | |
| 2402 | GFSK | 0.96 | 0±1 | 1 | 1.259 | 4.66 | 2.92 | 0.0007 | 1 |
| 2440 | | 0.6 | 0±1 | 1 | 1.259 | 4.66 | 2.92 | 0.0007 | 1 |
| 2480 | | -0.31 | 0±1 | 1 | 1.259 | 4.66 | 2.92 | 0.0007 | 1 |

## Measurement Result

## 2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,

WIFI 802.11n HT40:2422-2452MHz

Power density limited: 1mW/ $cm^2$

Antenna Type: FPC antenna

WIFI antenna1/2 gain: 4.0dBi;

R=20cm

mW=10^(dBm/10)

antenna gain Numeric=10^(dBi/10)= 10^(4.0/10)=2.51

ANT1:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max | | Antenna | Evaluation result at 20cm | Power density Limits (mW/cm2) |
|---|---|---|---|---|---|---|---|---|
| | | | | tune-up power | | Gain | Power density(mW/cm2 | |
| | | | | (dBm) | (mW) | Numeric | | |
| 2412 | 802.11b | 13.99 | 14±1 | 15 | 31.62278 | 2.51 | 0.01579 | 1 |
| 2437 | | 14.41 | 14±1 | 15 | 31.62278 | 2.51 | 0.01579 | 1 |
| 2462 | | 14.05 | 14±1 | 15 | 31.62278 | 2.51 | 0.01579 | 1 |
| 2412 | 802.11g | 13.57 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2437 | | 13.74 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2462 | | 13.16 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2412 | 802.11n H20 | 13.33 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2437 | | 13.61 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2462 | | 13.08 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2422 | 802.11n H40 | 13.88 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2437 | | 13.57 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |
| 2452 | | 13.36 | 13±1 | 14 | 25.11886 | 2.51 | 0.01254 | 1 |

ANT2:

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Max tune-up power (mW) | Antenna Gain Numeric | Evaluation result at 20cm Power density(mW/cm2 | Power density Limits (mW/cm2) |
|---|---|---|---|---|---|---|---|---|
| 2412 | 802.11b | 15.24 | 15±1 | 16 | 39.81072 | 2.51 | 0.01988 | 1 |
| 2437 | | 15.45 | 15±1 | 16 | 39.81072 | 2.51 | 0.01988 | 1 |
| 2462 | | 14.09 | 15±1 | 16 | 39.81072 | 2.51 | 0.01988 | 1 |
| 2412 | 802.11g | 13.82 | 14±1 | 15 | 31.62278 | 2.51 | 0.01579 | 1 |
| 2437 | | 14.26 | 14±1 | 15 | 31.62278 | 2.51 | 0.01579 | 1 |
| 2462 | | 13.37 | 14±1 | 15 | 31.62278 | 2.51 | 0.01579 | 1 |
| 2412 | 802.11n H20 | 14 | 13.5±1 | 14.5 | 28.18383 | 2.51 | 0.01407 | 1 |
| 2437 | | 14.08 | 13.5±1 | 14.5 | 28.18383 | 2.51 | 0.01407 | 1 |
| 2462 | | 12.99 | 13.5±1 | 14.5 | 28.18383 | 2.51 | 0.01407 | 1 |
| 2422 | 802.11n H40 | 15.86 | 15±1 | 16 | 39.81072 | 2.51 | 0.01988 | 1 |
| 2437 | | 15.93 | 15±1 | 16 | 39.81072 | 2.51 | 0.01988 | 1 |
| 2452 | | 15.91 | 15±1 | 16 | 39.81072 | 2.51 | 0.01988 | 1 |

WLAN2.4G MIMO

| conducted power (dBm) | Gain (dBi) | tune up(dBm) | tune up(dBm) | EIRP (mW) | R(cm) | S ($mW/cm^2$) | MPE Limit ($mW/m^2$) | Calculation result | Conclusion |
|---|---|---|---|---|---|---|---|---|---|
| 14.17 | 4 | 14±1 | 15 | 31.623 | 20 | 0.025164 | 1 | 0.050328 | Pass |
| 14.36 | 4 | 14±1 | 15 | 31.623 | 20 | 0.025164 | 1 | | |

note: Bluetooth and WIFI2.4G cannot transmit at the same time.

**Conclusion:**

The conclusion should be 0.01988＜1 for Max Power Density, Compliance the RF Exposure requirement.
The 2.4Gwifi has the maximum Power Density value 0.050328 mW/cm2 in 2.4G MIMO transmitting mode;

**Signature:** Alex
**Date:** 2024-08-22

**NAME AND TITLE** (Please print or type): alex li/Manager

**COMPANY** (Please print or type): Shenzhen NTEK Testing Technology Co., Ltd./ 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street Bao'an District, Shenzhen P.R. China.