# Maximum Permissible Exposure Report

## Product Information

| | | |
|---|---|---|
| EUT | : | Wanbo Projector |
| Model Number | : | T2 Max, T2 Max, T2 Max, T2,T2 Mini,T2 Pro,T2S,T2SE,T2M,WB-T2 Max,WB-T2,T2R Max,T2R,WB-T2R,T3,T3 Ultra,T6,T6 Ultra,T6 Pro,R1,R2,R3,R4,WB-TX1,W B X1,X1 Pro,X1 Max, T6R Max,F6,F8 |
| Model Declaration | : | All the same except for the model name |
| Test Model | : | T2 Max |
| Power Supply | : | DC 19V by adapter |
| Hardware version | : | WB_9255_T2M_2 |
| Software version | : | WB_FJ035FHD05 2021/11/15.15:23:13 ZVT9255BGA-userdebug 9.PPR2.180905.006.A1 TVOS.04.16.031.01.12 dev-keys |
| Sample ID | : | TZ220603315–2#&TZ220603315–4# |
| Bluetooth | | |
| Bluetooth Version | : | V5.0 |
| Operation Frequency | : | 2402 -2480 MHz |
| Channel Number | : | 79 Channels for Bluetooth BR/EDR(DSS)<br>40 Channels for BLE (DTS) |
| Modulation Technology | : | GFSK, π/4-DQPSK, 8-DPSK for Bluetooth BR/EDR (DSS)<br>GFSK for BLE (DTS) |
| Data Rates | : | Bluetooth BR/EDR (DSS): 1/2/3Mbps<br>BLE (DTS): 1Mbps |
| Antenna Type And Gain | : | Internal Antenna 1:<br>3.88dBi |
| WiFi | | |
| WLAN | : | Supported IEEE 802.11a/b/g/n |
| WLAN FCC Operation Frequency | : | IEEE 802.11b:2412-2462MHz<br>IEEE 802.11g:2412-2462MHz<br>IEEE 802.11n HT20:2412-2462MHz<br>IEEE 802.11n HT40: 2422-2452MHz |
| WLAN Channel Number | : | 11 Channels for 2412-2462MHz(IEEE 802.11b/g/n HT20)<br>7 Channels for 2422-2452MHz(IEEE 802.11n HT40) |
| WLAN Modulation Technology | : | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Antenna Type And Gain | : | Antenna 1:<br>3.88dBi (Max.), for TX/RX (WLAN 2.4G Band) |

*Note: Antenna position refer to EUT Photos.*

## 2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

## 3. Limit

### 3. 1 Refer evaluation method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

### 3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

| Frequency Range(MHz) | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density ($mW/cm^2$) | Averaging Time (minute) |
|---|---|---|---|---|
| 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 – 1500 | / | / | f/300 | 6 |
| 1500 – 100,000 | / | / | 5 | 6 |

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

| Frequency Range(MHz) | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density ($mW/cm^2$) | Averaging Time (minute) |
|---|---|---|---|---|
| Limits for Occupational/Controlled Exposure | | | | |
| 0.3 – 3.0 | 614 | 1.63 | (100) * | 30 |
| 3.0 – 30 | 824/f | 2.19/f | ($180/f^2$)* | 30 |
| 30 – 300 | 27.5 | 0.073 | 0.2 | 30 |
| 300 – 1500 | / | / | f/1500 | 30 |
| 1500 – 100,000 | / | / | 1.0 | 30 |

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

## 4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

## 5. Antenna Information

This Product can only use antennas certificated as follows provided by manufacturer;

Antenna Gain and type refer to Product information

## 6. Conducted Power

2.4G Band:
Bluetooth(BDR+EDR)

| TestMode | Antenna | Channel | Result[dBm] |
|---|---|---|---|
| DH5 | Ant1 | 2402 | 2.67 |
| | | 2441 | 2.66 |
| | | 2480 | 2.87 |
| 2DH5 | Ant1 | 2402 | 3.53 |
| | | 2441 | 3.53 |
| | | 2480 | 3.87 |
| 3DH5 | Ant1 | 2402 | 4.01 |
| | | 2441 | 4.02 |
| | | 2480 | 4.3 |

Bluetooth(BLE)

| TestMode | Antenna | Channel | Result[dBm] |
|---|---|---|---|
| BLE_1M | Ant1 | 2402 | 2.66 |
| | | 2440 | 2.67 |
| | | 2480 | 2.92 |

WiFi 2.4GHz Band

| TestMode | Antenna | Channel | Result[dBm] |
|---|---|---|---|
| 11B | Ant1 | 2412 | 11.14 |
| | | 2437 | 11.44 |
| | | 2462 | 11.70 |
| 11G | Ant1 | 2412 | 10.96 |
| | | 2437 | 11.28 |
| | | 2462 | 11.82 |
| 11N20SISO | Ant1 | 2412 | 10.94 |
| | | 2437 | 11.33 |
| | | 2462 | 11.86 |
| 11N40SISO | Ant1 | 2422 | 11.23 |
| | | 2437 | 11.36 |
| | | 2452 | 11.77 |

## 7. Manufacturing Tolerance

Bluetooth(BDR+EDR)

| GFSK (Peak) | | | |
|---|---|---|---|
| Channel | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm) | 2.0 | 2.0 | 2.5 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |
| π/4-DQPSK (Peak) | | | |
| Channel | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm) | 3.0 | 3.0 | 3.5 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |
| 8-DPSK (Peak) | | | |
| Channel | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm) | 3.5 | 3.5 | 4.0 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |

Bluetooth(BLE)

| GFSK(1Mbps) (Peak) | | | |
|---|---|---|---|
| Channel | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm) | 2.0 | 2.0 | 2.5 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |

WiFi 2.4GHz Band – Antenna 1

| IEEE 802.11b(Average) | | | |
|---|---|---|---|
| Channel | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm) | 10.5 | 11.0 | 11.0 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |
| IEEE 802.11g (Average) | | | |
| Channel | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm) | 10.5 | 11.0 | 11.5 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |
| IEEE 802.11n HT20 (Average) | | | |
| Channel | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm) | 10.5 | 11.0 | 11.5 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |
| IEEE 802.11n HT40 (Average) | | | |
| Channel | Channel 3 | Channel 6 | Channel 9 |
| Target (dBm) | 10.5 | 11.0 | 11.5 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 |

# 8. Measurement Results

## 8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Bluetooth(BDR+EDR)

| Modulation Type | Output power | | Antenna Gain (dBi) | Antenna Gain (linear) | Duty Cycle | MPE ($mW/cm^2$) | MPE Limits ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|
| | dBm | mW | | | | | |
| GFSK | 3.5 | 2.2387 | 3.88 | 2.4434 | 100% | 0.0011 | 1.0000 |
| π/4-DQPSK | 4.5 | 2.8184 | 3.88 | 2.4434 | 100% | 0.0014 | 1.0000 |
| 8-DPSK | 5.0 | 3.1623 | 3.88 | 2.4434 | 100% | 0.0015 | 1.0000 |

Bluetooth(BLE)

| Modulation Type | Output power | | Antenna Gain (dBi) | Antenna Gain (linear) | Duty Cycle | MPE ($mW/cm^2$) | MPE Limits ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|
| | dBm | mW | | | | | |
| GFSK(1Mbps) | 3.5 | 2.2387 | 3.88 | 2.4434 | 100% | 0.0011 | 1.0000 |

WiFi 2.4GHz Band – Ant 1

| Modulation Type | Output power | | Antenna Gain (dBi) | Antenna Gain (linear) | Duty Cycle | MPE ($mW/cm^2$) | MPE Limits ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|
| | dBm | mW | | | | | |
| IEEE 802.11b | 12.0 | 15.8489 | 3.88 | 2.4434 | 100% | 0.0077 | 1.0000 |
| IEEE 802.11g | 12.5 | 17.7828 | 3.88 | 2.4434 | 100% | 0.0086 | 1.0000 |
| IEEE 802.11n HT20 | 12.5 | 17.7828 | 3.88 | 2.4434 | 100% | 0.0086 | 1.0000 |
| IEEE 802.11n HT40 | 12.5 | 17.7828 | 3.88 | 2.4434 | 100% | 0.0086 | 1.0000 |

*Remark:*
*1. Output power including tune-up tolerance;*
*2. MPE evaluate distance is 20cm from user manual provide by manufacturer;*

## 9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

----------THE END OF REPORT----------