

FCC 47 CFR MPE REPORT

EXPRESS LUCK INDUSTRIAL (SHENZHEN) LIMITED

IEEE 802.11b/g/n/a 2T2R USB WiFi Module Integrated BT 2.1+EDR/4.2/5.0

Model Number: EL.MT7638BUN-WF

FCC ID: 2AWY6-ELMT7638BUN

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Maximum Permissible Exposure

1. Applicable Standards

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

1.1. Limits for Maximum Permissible Exposure (MPE)

(a) Limits for Occupational/Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm ²) | Averaging Times E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|---|--|
| 0.3-3.0 | 614 | 1.63 | (100)* | 6 |
| 3.0-30 | 1842/f | 4.89/f | (900/f)* | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | F/300 | 6 |
| 1500-10000 | | | 5 | 6 |

(b) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm ²) | Averaging Times E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|---|--|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | F/1500 | 30 |
| 1500-10000 | | | 1.0 | 30 |

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

1.2. MPE Calculation Method

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

E = Electric Field (V/m)

P = Peak 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

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak 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

2. Conducted Power Result

| Antenna | Mode (MHz) | Frequency (MHz) | MAX Peak output power (dBm) | MAX Peak output power (mW) | Target power (dBm) |
|---------|--------------------------|-----------------|-----------------------------|----------------------------|--------------------|
| 0 | GFSK 1M-BLE | 2402 | 9.74 | 9.4189 | 9±1 |
| 0 | GFSK 2M-BLE | 2402 | 9.83 | 9.6161 | 9±1 |
| 0 | GFSK-BT | 2402 | 9.79 | 9.5280 | 9±1 |
| 0 | 8-DPSK-BT | 2402 | 11.45 | 13.9637 | 11±1 |
| 1 | IEEE 802.11b | 2437 | 16.46 | 44.2588 | 16±1 |
| 1 | IEEE 802.11g | 2437 | 21.87 | 153.8155 | 21±1 |
| 1 | IEEE 802.11n HT20 (2.4G) | 2437 | 18.54 | 71.4496 | 18±1 |
| 1 | IEEE 802.11n HT40 (2.4G) | 2437 | 18.93 | 78.1628 | 18±1 |
| 1 | IEEE 802.11a | 5745 | 12.60 | 18.1970 | 12±1 |
| 1 | IEEE 802.11n HT20 (5G) | 5785 | 10.08 | 10.1859 | 10±1 |
| 1 | IEEE 802.11n HT40 (5G) | 5795 | 10.04 | 10.0925 | 10±1 |
| 2 | IEEE 802.11b | 2437 | 16.82 | 48.0839 | 16±1 |
| 2 | IEEE 802.11g | 2462 | 22.36 | 172.1869 | 22±1 |
| 2 | IEEE 802.11n HT20 (2.4G) | 2437 | 19.69 | 93.1108 | 19±1 |
| 2 | IEEE 802.11n HT40 (2.4G) | 2452 | 19.96 | 99.0832 | 19±1 |
| 2 | IEEE 802.11a | 5320 | 12.59 | 18.1552 | 12±1 |
| 2 | IEEE 802.11n HT20 (5G) | 5580 | 9.75 | 9.4406 | 9±1 |
| 2 | IEEE 802.11n HT40 (5G) | 5670 | 10.14 | 10.3276 | 10±1 |

3. Calculated Result and Limit

Bluetooth Antenna 0

| Mode | Target power (dBm) | Antenna gain | | Power Density (S) (mW/cm ²) | Limited of Power Density (S) (mW/cm ²) | Test Result |
|--------------|--------------------|--------------|----------|---|--|-------------|
| | | (dBi) | (Linear) | | | |
| 5G Band | | | | | | |
| GFSK 2M -BLE | 10 | 2.64 | 1.837 | 0.0037 | 1 | Complies |
| GFSK-BT | 12 | 2.64 | 1.837 | 0.0058 | 1 | Complies |

Wi-Fi Antenna 1

| Mode | Target power (dBm) | Antenna gain | | Power Density (S) (mW/cm ²) | Limited of Power Density (S) (mW/cm ²) | Test Result |
|-------------------|--------------------|--------------|----------|---|--|-------------|
| | | (dBi) | (Linear) | | | |
| 2.4G Band | | | | | | |
| IEEE 802.11b | 17 | 2.64 | 1.837 | 0.0183 | 1 | Complies |
| IEEE 802.11g | 22 | 2.64 | 1.837 | 0.0579 | 1 | Complies |
| IEEE 802.11n HT20 | 19 | 2.64 | 1.837 | 0.0290 | 1 | Complies |
| IEEE 802.11n HT40 | 19 | 2.64 | 1.837 | 0.0290 | 1 | Complies |
| 5G Band | | | | | | |
| IEEE 802.11a | 13 | 3.47 | 2.223 | 0.0088 | 1 | Complies |
| IEEE 802.11n HT20 | 11 | 3.47 | 2.223 | 0.0056 | 1 | Complies |
| IEEE 802.11n HT40 | 11 | 3.47 | 2.223 | 0.0056 | 1 | Complies |

Wi-Fi Antenna 2

| Mode | Target power (dBm) | Antenna gain | | Power Density (S) (mW/cm ²) | Limited of Power Density (S) (mW/cm ²) | Test Result |
|-------------------|--------------------|--------------|----------|---|--|-------------|
| | | (dBi) | (Linear) | | | |
| 2.4G Band | | | | | | |
| IEEE 802.11b | 17 | 2.64 | 1.837 | 0.0183 | 1 | Complies |
| IEEE 802.11g | 23 | 2.64 | 1.837 | 0.0729 | 1 | Complies |
| IEEE 802.11n HT20 | 20 | 2.64 | 1.837 | 0.0365 | 1 | Complies |
| IEEE 802.11n HT40 | 20 | 2.64 | 1.837 | 0.0365 | 1 | Complies |
| 5G Band | | | | | | |
| IEEE 802.11a | 13 | 3.47 | 2.223 | 0.0088 | 1 | Complies |
| IEEE 802.11n HT20 | 10 | 3.47 | 2.223 | 0.0044 | 1 | Complies |
| IEEE 802.11n HT40 | 11 | 3.47 | 2.223 | 0.0056 | 1 | Complies |

Wi-Fi Antenna 1+2

| Mode | Power Density (S) (mW/cm ²) Antenna 1 | Power Density (S) (mW/cm ²) Antenna 2 | Power Density (S) (mW/cm ²) Total | Limited of Power Density (S) (mW/cm ²) | Test Result |
|-------------------|--|--|--|--|-------------|
| 2.4G Band | | | | | |
| IEEE 802.11n HT20 | 0.0290 | 0.0365 | 0.0655 | 1 | Complies |
| IEEE 802.11n HT40 | 0.0290 | 0.0365 | 0.0655 | 1 | Complies |
| 5G Band | | | | | |
| IEEE 802.11n HT20 | 0.0056 | 0.0044 | 0.0100 | 1 | Complies |
| IEEE 802.11n HT40 | 0.0056 | 0.0056 | 0.0112 | 1 | Complies |

Bluetooth+2.4G Wi-Fi (ANT1+ANT2)+5G Wi-Fi (ANT1+ANT2)

| MAX Power Density (S) (mW/cm ²) Bluetooth | MAX Power Density (S) (mW/cm ²) 2.4G WiFi ANT1+ANT2 | MAX Power Density (S) (mW/cm ²) 5G WiFi ANT1+ANT2 | Power Density (S) (mW/cm ²) Total | Limited of Power Density (S) (mW/cm ²) | Test Result |
|--|---|---|--|--|-------------|
| 0.0058 | 0.0655 | 0.0112 | 0.0825 | 1 | Complies |

End of Test Report

