

# RF Exposure Evaluation Report

**APPLICANT** : Ningbo Lingzhu Technology CO., Ltd.  
**EQUIPMENT** : Control Panel MAX  
**MODEL NAME** : TPA10-M2U, TPA10-M2X  
**FCC ID** : 2A789-TPA10  
**STANDARD** : 47 CFR Part 2.1091

The product evaluation date was started from Jun. 06, 2023 and completed on Jun 06, 2023. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.



Approved by: Si Zhang

**Sporton International Inc. (Kunshan)**

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China**



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**Revision History**

| REPORT NO. | VERSION | DESCRIPTION              | ISSUED DATE   |
|------------|---------|--------------------------|---------------|
| FA350402   | Rev. 01 | Initial issue of report. | Aug. 18, 2023 |
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## **1. Administration Data**

### **1.1. Testing Laboratory**

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

| Testing Laboratory |                                                                                                                                                                          |                     |                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------|
| Test Firm          | Sporton International Inc. (Kunshan)                                                                                                                                     |                     |                                |
| Test Site Location | No. 1098, Pengxi North Road, Kunshan Economic Development Zone<br>Jiangsu Province 215300 People's Republic of China<br>TEL : +86-512-57900158<br>FAX : +86-512-57900958 |                     |                                |
| Test Site No.      | Sporton Site No.                                                                                                                                                         | FCC Designation No. | FCC Test Firm Registration No. |
|                    | SAR01-KS                                                                                                                                                                 | CN1257              | 314309                         |

| Applicant    |                                                                           |
|--------------|---------------------------------------------------------------------------|
| Company Name | Ningbo Lingzhu Technology CO., Ltd.                                       |
| Address      | No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC |

| Manufacturer |                                                                           |
|--------------|---------------------------------------------------------------------------|
| Company Name | Ningbo Lingzhu Technology CO., Ltd.                                       |
| Address      | No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC |

## 2. Description of Equipment Under Test (EUT)

| Product Feature & Specification         |                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------|
| EUT Type                                | Control Panel MAX                                                                                      |
| Model Name                              | TPA10-M2U, TPA10-M2X                                                                                   |
| FCC ID                                  | 2A789-TPA10                                                                                            |
| Wireless Technology and Frequency Range | WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>ZigBee: 2405 MHz ~ 2480 MHz |
| Mode                                    | WLAN 2.4GHz 802.11b/g/n HT20<br>Bluetooth BR/EDR/LE<br>ZigBee: QPSK                                    |
| Antenna Gain                            | WLAN 2.4GHz/Bluetooth: 3.91 dBi<br>BLE: 0.73 dB<br>ZigBee: 2.65 dBi                                    |
| Antenna Type                            | Bluetooth: IPEX Antenna<br>WLAN: IPEX Antenna<br>ZigBee: IPEX Antenna                                  |
| HW Version                              | V1.0                                                                                                   |
| SW Version                              | V2.X.X                                                                                                 |

**Remark:**

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. The WLAN/Bluetooth Antenna don't support Bluetooth LE mode, and BLE Antenna supports Bluetooth LE mode only.

**Comments and Explanations:**

1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.

**3. Maximum RF average output tune up power among production units****<2.4GHz WLAN >**

| Mode      |              | Maximum Average Power (dBm) |
|-----------|--------------|-----------------------------|
| 2.4GHz    | 802.11b      | 17.0                        |
|           | 802.11g      | 16.0                        |
|           | 802.11n-HT20 | 15.0                        |
|           | 802.11n-HT40 | 15.0                        |
| Bluetooth | BR/EDR       | 8.0                         |

**<Bluetooth>**

| Mode      |    | Maximum Average power(dBm) |
|-----------|----|----------------------------|
| Bluetooth | LE | 8.0                        |

**<ZigBee>**

| Mode   |        | Maximum Average power(dBm) |
|--------|--------|----------------------------|
| 2.4GHz | ZigBee | 20.0                       |

#### **4. RF Exposure Limit Introduction**

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



## **5. Radio Frequency Radiation Exposure Evaluation**

### **5.1. Standalone Power Density Calculation**

| Band        | Frequency (MHz) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum EIRP (dBm) | Average EIRP (mW) | Power Density at 20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
|-------------|-----------------|--------------------|---------------------|--------------------|-------------------|---------------------------------------------|-----------------------------|-----------------------|
| Bluetooth   | 2402.0          | 3.91               | 8.00                | 11.910             | 15.524            | 0.003                                       | 1.000                       | <b>0.003</b>          |
| 2.4GHz WLAN | 2412.0          | 3.91               | 17.00               | 20.910             | 123.310           | 0.025                                       | 1.000                       | <b>0.025</b>          |
| ZigBee      | 2405.0          | 2.65               | 20.00               | 22.650             | 184.077           | 0.037                                       | 1.000                       | <b>0.037</b>          |

**Note:**

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. Chose the maximum power to do MPE analysis.
3. Chose the maximum RF output tune up power of all antennas among same frequency BT/BLE bands and the maximum antenna gain to perform MPE calculation conservatively.

### **5.2. Collocated Power Density Calculation**

| Bluetooth Power Density / Limit | ZigBee Power Density / Limit | WLAN 2.4GHz Power Density / Limit | $\Sigma$ (Power Density / Limit) of Bluetooth + ZigBee + LoRa + WLAN 2.4GHz |
|---------------------------------|------------------------------|-----------------------------------|-----------------------------------------------------------------------------|
| 0.003                           | 0.037                        | 0.025                             | 0.065                                                                       |

**Note:**

1. According to the EUT characteristic, WLAN 2.4GHz and WLAN 5GHz cannot transmit simultaneously.
2.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for Bluetooth + ZigBee/WLAN2.4GHz, Bluetooth +ZigBee + WLAN2.4GHz.
3. Considering the WLAN/ZigBee module collocation with Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant.

## **Conclusion:**

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----