

# RF Exposure evaluation

**Product Name** : Keyboard  
**Brand Name** : N/A  
**Model** : X9RBWACKEYCB  
**Series Model** : K559  
**FCCID** : 2BKUK-X9RBWACKEYCB  
**Applicant** : **Mace Group Inc(Macally)**  
**Address** : 8620 Rochester Ave, Rancho Cucamonga, CA91730, USA  
**Manufacturer** : **Shenzhen Maxin Industry Co.,Ltd**  
**Address** : Building 303, No.2, Fenda Hi-Tech Park, Zhoushi Road, Shiyan,  
Bao'an, Shenzhen, China  
**Standard(s)** : 47CFR §1.1310, 47CFR §2.1093  
KDB447498 D01 General RF Exposure Guidance v06  
**Date of Receipt** : June 24, 2025  
**Date of Test** : June 24, 2025~June 27, 2025  
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**Issued By:** **Dongguan Yaxu (AiT) Technology Limited**

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Note: This device has been tested and found to comply with the standard(s) listed, this test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory. This report shall not be reproduced except in full, without the written approval of Dongguan Yaxu (AiT) Technology Limited. If there is a need to alter or revise this document, the right belongs to Dongguan Yaxu (AiT) Technology Limited, and it should give a prior written notice of the revision document. This test report must not be used by the client to claim product endorsement.

**Dongguan Yaxu (AiT) Technology Limited**

No.22, Jinqianling 3rd Street, Jitigang, Huangjiang, Dongguan, Guangdong, China.



**Report Revise Record**

| Report Version | Issued Date   | Notes           |
|----------------|---------------|-----------------|
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# 1 GENERAL INFORMATION

## 1.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

|                     |         |
|---------------------|---------|
| Normal Temperature: | 25°C    |
| Relative Humidity:  | 55 %    |
| Air Pressure:       | 101 kPa |

## 1.2 General Description of EUT

|                                                                                                                                                                                          |                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Product Name:                                                                                                                                                                            | Keyboard                                              |
| Model/Type reference:                                                                                                                                                                    | X9RBWACKEYCB                                          |
| Serial Model:                                                                                                                                                                            | K559                                                  |
| Power Supply:                                                                                                                                                                            | DC 3.7V from battery or DC 5.0V from external circuit |
| Hardware version.:                                                                                                                                                                       | N/A                                                   |
| Software version.:                                                                                                                                                                       | N/A                                                   |
| Test sample(s) ID:                                                                                                                                                                       | AiTDG-250624021-1                                     |
| <b>BT:</b>                                                                                                                                                                               |                                                       |
| Operation frequency:                                                                                                                                                                     | 2402MHz-2480MHz                                       |
| Channel Number:                                                                                                                                                                          | 40 channels                                           |
| Channel separation:                                                                                                                                                                      | 2MHz                                                  |
| Modulation Technology:                                                                                                                                                                   | GFSK                                                  |
| Antenna Type:                                                                                                                                                                            | PCB Antenna                                           |
| Antenna gain:                                                                                                                                                                            | -0.58dBi                                              |
| <b>2.4G SRD:</b>                                                                                                                                                                         |                                                       |
| Operation frequency:                                                                                                                                                                     | 2402MHz-2480MHz                                       |
| Channel Number:                                                                                                                                                                          | 40 channels                                           |
| Modulation Technology:                                                                                                                                                                   | GFSK                                                  |
| Antenna Type:                                                                                                                                                                            | PCB Antenna                                           |
| Antenna gain:                                                                                                                                                                            | -0.58dBi                                              |
| <b>Remark:</b> The above DUT's information was declared by manufacturer. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual. |                                                       |

## 1.3 Test Facility

### **Test Laboratory:**

**Dongguan Yaxu (AiT) Technology Limited**

No.22, Jinqianling 3rd Street, Jitigang, Huangjiang, Dongguan, Guangdong, China

The test facility is recognized, certified or accredited by the following organizations:

### **CNAS- Registration No: L6177**

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2017 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on April 18, 2022

### **FCC-Registration No.: 703111 Designation Number: CN1313**

Dongguan Yaxu (AiT) Technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

### **IC —Registration No.: 6819A CAB identifier: CN0122**

The 3m Semi-anechoic chamber of Dongguan Yaxu (AiT) Technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 6819A

### **A2LA-Lab Cert. No.: 6317.01**

Dongguan Yaxu (AiT) Technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

## 1.4 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Dongguan Yaxu (AiT) Technology Limited's quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Yaxu (AiT) laboratory is reported:

| Test                          | Measurement Uncertainty          | Notes |
|-------------------------------|----------------------------------|-------|
| Power Line Conducted Emission | 150KHz~30MHz $\pm 1.20\text{dB}$ | (1)   |
| Radiated Emission             | 9KHz~30Hz $\pm 3.10\text{dB}$    | (1)   |
| Radiated Emission             | 9KHz~1GHz $\pm 3.75\text{dB}$    | (1)   |
| Radiated Emission             | 1GHz~18GHz $\pm 3.88\text{dB}$   | (1)   |
| Radiated Emission             | 18GHz~40GHz $\pm 3.88\text{dB}$  | (1)   |

The report uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty Multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

## 2 Method of measurement

### 2.1 Applicable Standard

According to §1.1307(b)(1), 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 of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

FCC KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device, RF Exposure, Equipment Authorization Procedures

### 2.2 Evaluation Method and Limit

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations: "Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc."

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f} (\text{GHz})] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$$

- $f$  (GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to  $f$  in section 4.1 is applied to determine SAR test exclusion.

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

The  $[\sum \text{ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / } 1.6 \text{ W/kg}] + [\sum \text{ of MPE ratios}] \leq 1.0$ .

The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all  $\leq 0.04$ , and the  $[\sum \text{ of MPE ratios}] \leq 1.0$ .

## 2.3 Manufacturing Tolerance

### BLE (Conducted)

| Frequency (MHz)  | GFSK 1Mbps |      |      |
|------------------|------------|------|------|
|                  | 2402       | 2440 | 2480 |
| Target (dBm)     | 3.0        | 4.0  | 4.0  |
| Tolerance ± (dB) | 1.0        | 1.0  | 1.0  |
| Frequency (MHz)  | GFSK 2Mbps |      |      |
|                  | 2402       | 2440 | 2480 |
| Target (dBm)     | 3.0        | 4.0  | 4.0  |
| Tolerance ± (dB) | 1.0        | 1.0  | 1.0  |

### 2.4G SRD

| Frequency (MHz)  | GFSK |      |      |
|------------------|------|------|------|
|                  | 2402 | 2440 | 2480 |
| Target (dBm)     | 1.0  | -1.0 | -1.0 |
| Tolerance ± (dB) | 1.0  | 1.0  | 1.0  |

## 2.4 Evaluation Result

### Standalone Evaluation Results

| Band/Mode | f (GHz) | Antenna Distance (mm) | Max.RF output power (including tune-up tolerance) |      | SAR Test Exclusion Threshold | SAR Test Exclusion |
|-----------|---------|-----------------------|---------------------------------------------------|------|------------------------------|--------------------|
|           |         |                       | dBm                                               | mW   |                              |                    |
| BLE       | 2.5     | 5                     | 5.0                                               | 3.16 | 1<3                          | Yes                |
| 2.4G SRD  | 2.5     | 5                     | 2.0                                               | 1.58 | 0.50<3                       | Yes                |

According to the follow transmitter output power ( $P_t$ ) formula:

$$P_t = (E \times d)^2 / (30 \times g_t)$$

$P_t$ =transmitter output power in watts

$g_t$ =numeric gain of the transmitting antenna (unitless)

$E$ =electric field strength in V/m

$d$ =measurement distance in meters (m)

**According** to the formula described above:

2402MHz

$$E_{max} = \underline{93.79} \text{dBuV/m} = \underline{0.049} \text{V/m}, d=3\text{m}, g_t=0.581$$

$$P_t = (E \times d)^2 / (30 \times g_t) = (\underline{0.049} \times 3)^2 / (30 \times 0.581) = \underline{0.00124} \text{W} = \underline{1.234} \text{mW} = \underline{0.92} \text{dBm}$$

2440MHz

$$E_{max} = \underline{91.23} \text{dBuV/m} = \underline{0.036} \text{V/m}, d=3\text{m}, g_t=0.581$$

$$P_t = (E \times d)^2 / (30 \times g_t) = (\underline{0.036} \times 3)^2 / (30 \times 0.581) = \underline{0.00069} \text{W} = \underline{0.69} \text{mW} = \underline{-1.63} \text{dBm}$$

2480MHz

$$E_{max} = \underline{91.37} \text{dBuV/m} = \underline{0.037} \text{V/m}, d=3\text{m}, g_t=0.581$$

$$P_t = (E \times d)^2 / (30 \times g_t) = (\underline{0.037} \times 3)^2 / (30 \times 0.581) = \underline{0.00071} \text{W} = \underline{0.71} \text{mW} = \underline{-1.49} \text{dBm}$$



## 2.5 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06

\*\*\*\*\*End of Report\*\*\*\*\*