| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report No.:* | **50332228 002** | **Auftrags-Nr.:** *Order No.:* | 168141149 | Seite 1 von *19* *Page 1 of 19* |
| **Kunden-Referenz-Nr.:** *Client reference No.:* | N/A | **Auftragsdatum:** *Order date:* | 20.11.2019 | |
| **Auftraggeber:** *Client:* | **Beijing AIQI Technology Co., LTD.** Room.D1204A, The 11th floor, Block D, No.9 Shangdi 3rd St., Haidian District, Beijing, 100085, China | | | |
| **Prüfgegenstand:** *Test item:* | ONEMARS Hexapod Battle Robot | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type No.:* | OMSLR24AIQI | | | |
| **Auftrags-Inhalt:** *Order content:* | FCC approval | | | |
| **Prüfgrundlage:** *Test specification:* | CFR47 FCC Part 15: Subpart C Section 15.249<br>CFR47 FCC Part 15: Subpart C Section 15.207<br>CFR47 FCC Part 15: Subpart C Section 15.209<br>CFR47 FCC Part 15: Subpart B Section 15.107<br>CFR47 FCC Part 15: Subpart B Section 15.109 | | | |

| | | |
|---|---|---|
| **Wareneingangsdatum:** *Date of receipt:* | 29.11.2019 | Please refer to photo documents |
| **Prüfmuster-Nr.:** *Test sample No.:* | A00103401416-001 to 002 | |
| **Prüfzeitraum:** *Testing period:* | 02.12.2019 - 03.01.2020 | |
| **Ort der Prüfung:** *Place of testing:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüfergebnis*:** *Test result*:* | Pass | |

| **geprüft von /** *tested by:* | | | **kontrolliert von /** *reviewed by:* | | |
|---|---|---|---|---|---|
| 23.03.2020 | Jonathan Li / Project Manager | | 23.03.2020 | Winnie Hou / Technical Certifier | |
| **Datum** *Date* | **Name/Stellung** *Name/Position* | **Unterschrift** *Signature* | **Datum** *Date* | **Name/Stellung** *Name/Position* | **Unterschrift** *Signature* |

**Sonstiges /** *Other:*

FCC ID: 2ALJ6-OMSLR24AIQI

| | |
|---|---|
| **Zustand des Prüfgegenstandes bei Anlieferung:** *Condition of the test item at delivery:* | Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged:* |

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhalt |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| Legend: | 1 = very good | 2 = good | 3 = satisfactory | 4 = sufficient | 5 = poor |
| | P(ass) = passed a.m. test specifications(s) | | F(ail) = failed a.m. test specifications(s) | N/A = not applicable | N/T = not tested |

# *Test Summary*

**5.1.1 ANTENNA REQUIREMENT**
*RESULT: Pass*

**5.1.2 FUNDAMENTAL & HARMONICS RADIATED EMISSION**
*RESULT: Pass*

**5.1.3 20DB BANDWIDTH**
*RESULT: Pass*

**5.1.4 RADIATED SPURIOUS EMISSION & BAND EDGE**
*RESULT: Pass*

**5.1.5 CONDUCTED EMISSION ON AC MAINS**
*RESULT: Pass*

**5.1.6 RADIATED EMISSION**
*RESULT: Pass*

# *Contents*

# 1 General Remarks

## 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results

# 2 Test Sites

## 2.1 Test Facilities

**TÜV Rheinland (Shenzhen) Co.**, Ltd.
No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

**TÜV Rheinland (Shenzhen) Co., Ltd.**

| **Radio Spectrum Testing (TS8997)** | | | | | |
|---|---|---|---|---|---|
| **Equip. No.** | **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| 1825795 | Signal Analyzer | R&S | FSV 40 | 101441 | 20.08.2020 |
| 1825798 | OSP | R&S | OSP 150 | 101017 | 17.12.2020 |
| 1825799 | Control PC | DELL | OptiPlex 7050 | FTJZ9P2 | N/A |
| 1825800 | Test Software | R&S | WMS32 (V10.50.10) | N/A | N/A |
| 1825801 | Power Meter | R&S | NRP2 | 107105 | 17.12.2020 |
| 1825802 | Wideband Power Sensor | R&S | NRP-Z81 | 105350 | 17.12.2020 |
| 1826431 | Shielding Room 8# | Albatross | SR8 | APC17151-SR8 | 23.07.2020 |
| **Unwanted Emission Testing (TS9975)** | | | | | |
| **Equip. No.** | **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| 1826021 | EMI Test Receiver | R&S | ESR 7 | 102021 | 19.08.2020 |
| 1826023 | Signal Analyzer | R&S | FSV 40 | 101439 | 21.08.2020 |
| 1826024 | System Controller Interface | R&S | SCI-100 | S10010038 | N/A |
| 1826025 | Filterbank | R&S | Wlan | 100759 | 21.08.2020 |
| 1826026 | OSP | R&S | OSP 120 | 102040 | N/A |
| 1826028 | Pre-amplifier | R&S | SCU08F1 | 08320031 | 20.08.2020 |
| 1826029 | Amplifier | R&S | SCU-18F | 180070 | 20.08.2020 |
| 1826030 | Amplifier | R&S | SCU40A | 100475 | 20.09.2020 |
| 1826031 | Trilog Broadband Antenna (30 MHz - 7 GHz) | Schwarzbeck | VULB 9162 | 193 | 02.09.2020 |
| 1826032 | Double-Ridged Antenna (1 -18 GHz) | ETS-LINDGREN | 3117 | 00218717 | 02.09.2020 |
| 1826033 | Wideband Ridged Horn Antenna (18-40 GHz) | Steatite | QMS-00880 | 19067 | 02.09.2020 |
| 1826034 | Active Loop | Schwarzbeck | FMZB 1513 | 302 | 01.09.2020 |

| | | | | | |
|---|---|---|---|---|---|
| | Antenna | | | | |
| 1826035 | Wideband Ridged Horn Antenna (12-18 GHz) | Steatite | QMS-00208 | 18313 | 02.09.2020 |
| 1826036 | Test software | R&S | EMC32 (V10.50.40) | N/A | N/A |
| 1826037 | Control PC | Dell | OptiPlex 7050 | 36NV9P2 | N/A |
| 1826433 | 3m Semi-Anechoic Chamber | Albatross | SAC-3m | APC17151-SAC | 06.07.2020 |
| **Conducted Emission on AC Mains** | | | | | |
| **Equip. No.** | **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| 1822625 | EMI Test Receiver | R&S | ESR3 | 102428 | 03.09.2020 |
| 1822627 | Artificial Mains Network | R&S | ENV216 | 102333 | 19.08.2020 |
| 1822629 | Attenuator | R&S | ESH2Z31 | 100300 | 19.08.2020 |
| 1825090 | EMC32 test software | R&S | EMC32(Ver.10.50.01) | N/A | N/A |
| **Radiated Emission (3m chamber)** | | | | | |
| **Equip. No.** | **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| 1822620 | 3m SAC | ETS | SAC3 | CT001632-Q1362 | 23.08.2021 |
| 1825044 | EMI Test Receiver | R&S | ESR7 | 102111 | 23.01.2020 |
| 1825004 | Horn Antenna | R&S | HF907 | 102706 | 01.09.2020 |
| 1825005 | Preamplifier | FIT | SCU-18F | 180077 | 19.08.2020 |

## 2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

## 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

| Parameter | Uncertainty |
|---|---|
| Radio Frequency | ±1 x $10^{-7}$ |
| RF Power (conducted) | ±2.5 dB |
| Radiated Emission of Transmitter, valid up to 26.5 GHz | ±6 dB |
| Radiated Emission of Receiver, valid up to 26.5 GHz | ±6 dB |
| Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz) | ± 3.70 dB / ± 3.30 dB |
| Radiated Emission (3m SAC), 30MHz to 1000MHz | ± 4.52 dB |
| Radiated Emission (3m SAC), above 1000MHz | ± 4.37 dB |
| Temperature | ±1 °C |
| Humidity | ±5 % |
| Voltage (DC) | ±1 % |
| Voltage (AC, <10kHz) | ±2 % |

## 2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangdong) Ltd. file for certification follow-up purposes.

## 2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

# 3 General Product Information

## 3.1 Product Function and Intended Use

The EUT is ONEMARS Hexapod Battle Robot operating in operating 2.4GHz wireless technology.

For details, refer to the User Manual, Technical Description and Circuit Diagram.

## 3.2 Ratings and System Details

**Table 2: Technical Specification of EUT**

| General Information of EUT | Value |
|---|---|
| Kind of Equipment | ONEMARS Hexapod Battle Robot |
| Type Designation | OMSLR24AIQI |
| FCC ID | 2ALJ6-OMSLR24AIQI |
| Operating Voltage | DC 5.0V Charging by USB port<br>DC 4.8V via Ni-MH batteries (1.2V*4) |
| Testing Voltage | Fully charged battery |
| Operating Frequency | 2407.156~ 2475.156 MHz |
| Type of Modulation | O/QPSK, DSS |
| Channel Number | 27 channel |
| Antenna Type | Whip transparency antenna |
| Antenna number | 1 |
| Antenna Gain | -2 dBi Max |

**Table 3: RF Channel and Frequency**

| RF Channel | O/QPSK, DSS<br>Frequency (MHz) | RF Channel | O/QPSK, DSS<br>Frequency (MHz) | RF Channel | O/QPSK, DSS<br>Frequency (MHz) |
|---|---|---|---|---|---|
| 1 | **2407.156** | 10 | 2431.156 | 19 | 2459.156 |
| 2 | 2409.156 | 11 | 2433.156 | 20 | 2461.156 |
| 3 | 2411.156 | 12 | 2435.156 | 21 | 2463.156 |
| 4 | 2413.156 | 13 | 2437.156 | 22 | 2465.156 |
| 5 | 2415.156 | 14 | 2439.156 | 23 | 2467.156 |
| 6 | 2417.156 | 15 | 2441.156 | 24 | 2469.156 |
| 7 | 2419.156 | 16 | 2443.156 | 25 | 2471.156 |
| 8 | 2421.156 | 17 | **2445.156** | 26 | 2473.156 |
| 9 | 2423.156 | 18 | 2447.156 | 27 | **2475.156** |

Test frequencies are lowest channel: 2407.156 MHz, middle channel: 2445.156 MHz and highest channel: 2475.156 MHz

## 3.3 Independent Operation Modes

The basic operation modes are:

A. On, General 2.4GHz wireless transmitting mode (Low / Middle / High channel)
B. On, Normal Running mode
C. On, Charging mode
D. Off

## 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

## 3.5 Submitted Documents

- Application Form
- Operation Description
- ID Label and Location Info
- Schematics
- Block Diagram
- User Manual

# 4 Test Set-up and Operation Modes

## 4.1 Principle of Configuration Selection

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

## 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013 and ANSI C63.4: 2014.

According to clause 3.1, all tests were performed on model OMSLR24AIQI in this report.

## 4.3 Special Accessories and Auxiliary Equipment

N/A

## 4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

# 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test (Below 1GHz)**

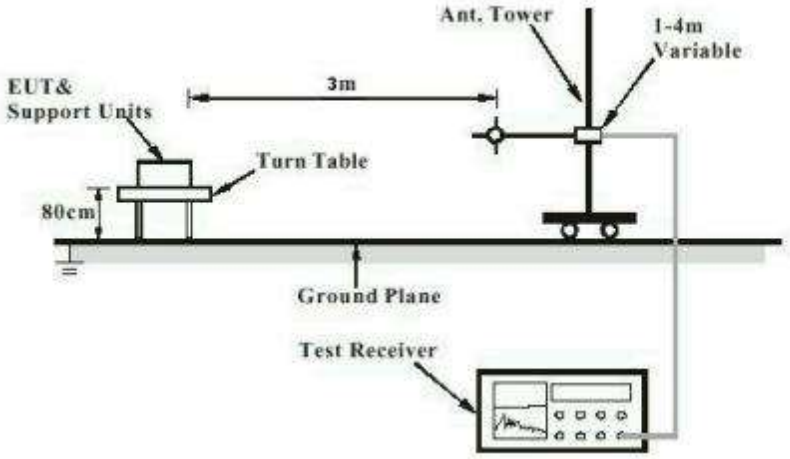



**Diagram of Measurement Configuration for Radiation Test (Above 1GHz)**

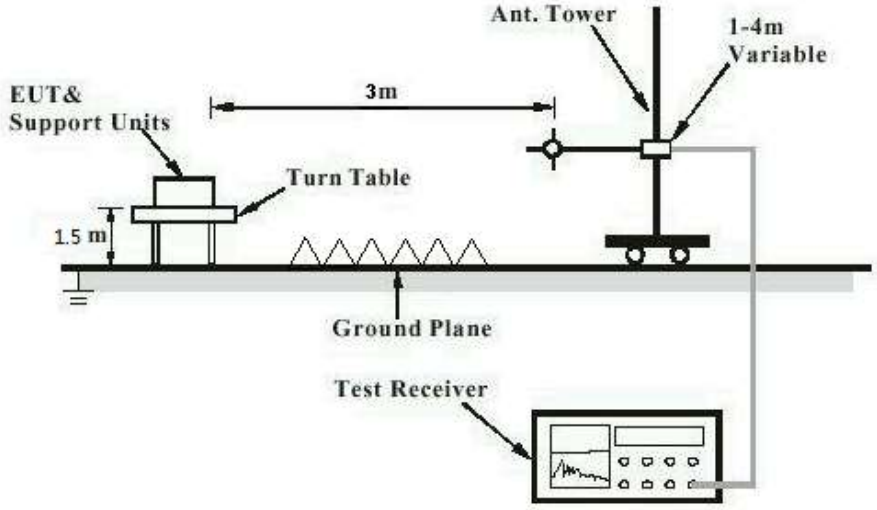


**Diagram of Measurement Configuration for Mains Conduction Measurement (Floor-standing device)**

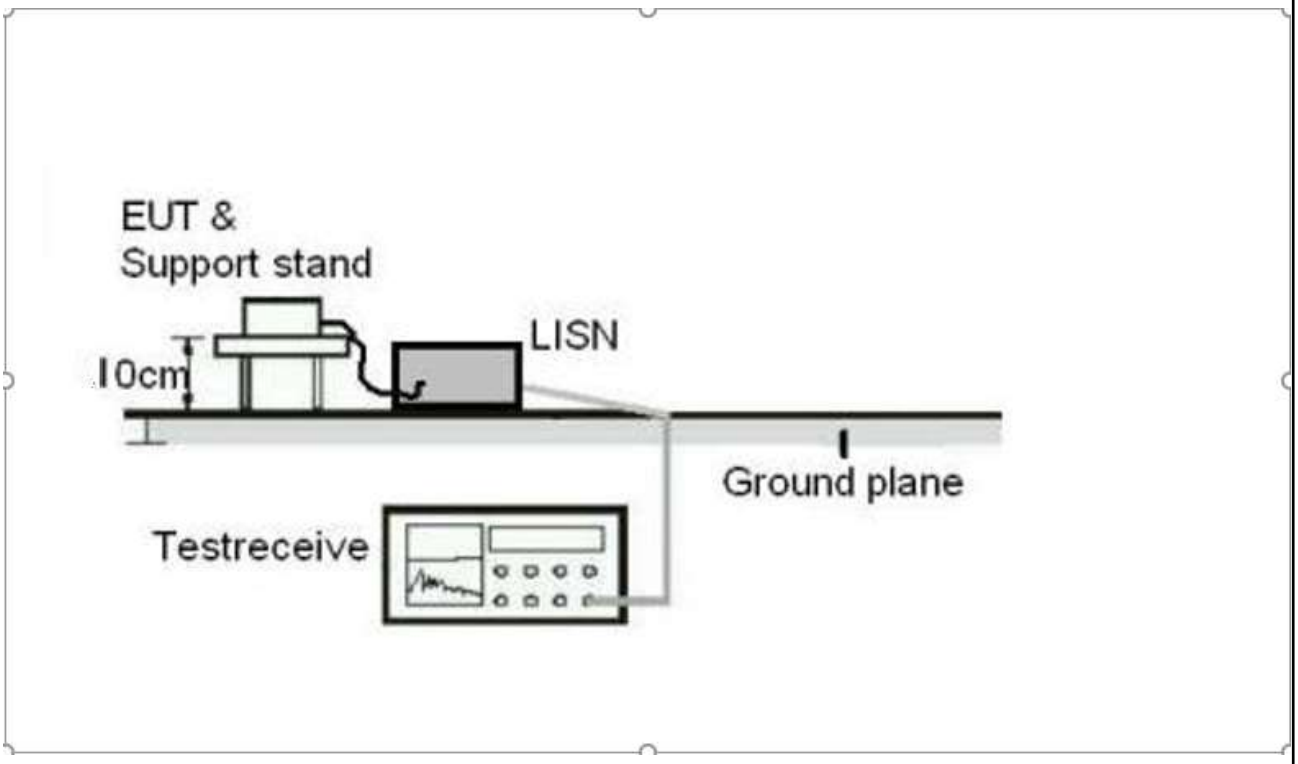
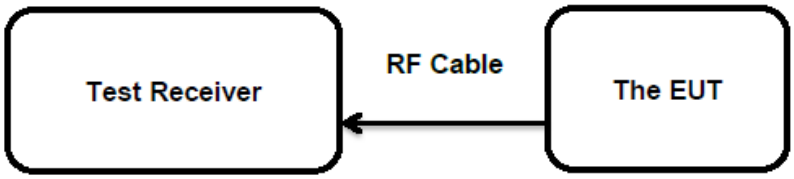



**Diagram of Measurement Configuration for Conducted Transmitter Measurement**



# 5 Test Results

## 5.1 Transmitter Requirement & Test Suites

### 5.1.1 Antenna Requirement

**RESULT:** **Pass**

**Test Specification**
Test standard : FCC Part 15.203

According to the manufacturer declared, the EUT has an internal antenna, the directional gain of antenna is -2 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

## 5.1.2 Fundamental & Harmonics Radiated Emission

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.249(a) |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | Refer to FCC Part 15.209(a) |
| Kind of test site | : | 3m Semi-anechoic Chamber |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | Refer to test result |
| Input voltage | : | Fully charged battery |
| Operation mode | : | A |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 24 ℃ |
| Relative humidity | : | 45 % |
| Atmospheric pressure | : | 100 kPa |

For the measurement records, refer to the appendix B.

## 5.1.3 20dB Bandwidth

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.215 |
| Basic standard | : | ANSI C63.10: 2013 |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 12.12.2019 |
| Input voltage | : | Fully charged battery |
| Operation mode | : | A |
| Ambient temperature | : | 24 ℃ |
| Relative humidity | : | 45 % |
| Atmospheric pressure | : | 100 kPa |

For the measurement records, refer to the appendix B.

## 5.1.4 Radiated Spurious Emission & Band Edge

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.249 (d) & FCC Part 15.205 |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | Refer to 15.209(a) of FCC part 15.249(d) |
| Kind of test site | : | 3m Semi-anechoic Chamber |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | Refer to test result |
| Input voltage | : | Fully charged battery |
| Operation mode | : | A |
| Ambient temperature | : | 24 ℃ |
| Relative humidity | : | 45 % |
| Atmospheric pressure | : | 100 kPa |

Remark:
Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix B.

## 5.1.5 Conducted Emission on AC Mains

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.207(a) & FCC Part 15.201(a)&FCC Part 15.107(a) |
| Basic standard | : | ANSI C63.10: 2013 & ANSI C63.4: 2014 |
| Frequency range | : | 0.15 – 30MHz |
| Limits | : | FCC Part 15.207(a) & FCC Part 15.201(a)&FCC Part 15.107(a) |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 03.01.2020 |
| Input voltage | : | DC 5.0V Charging by USB port from external AC 120V/60Hz |
| Operation mode | : | C |
| Earthing | : | Not connected |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 56 % |
| Atmospheric pressure | : | 101 kPa |

Remark：The EUT cannot transmit when charging, here FCC part 15.207 is not applicable.

For the measurement records, refer to the appendix B.

## 5.1.6 Radiated Emission

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.109(a) |
| Basic standard | : | ANSI C63.4: 2014 |
| Frequency range | : | 30 - 18000MHz |
| Classification | : | Class B |
| Limits | : | FCC Part 15.109(a) |
| Kind of test site | : | 3m Semi-anechoic Chamber |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | Refer to test result |
| Input voltage | : | DC 5.0V Charging by USB port from external AC 120V/60Hz<br>DC 4.8V via Ni-MH batteries (1.2V*4) |
| Operation mode | : | B, C |
| Earthing | : | Not connected |
| Ambient temperature | : | 24 ℃ |
| Relative humidity | : | 50 % |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B

# 6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

# 7 List of Tables