

# Robosen Robotics (ShenZhen) Co., Ltd.

## TEST REPORT

### SCOPE OF WORK

FCC TESTING-K1JD

### REPORT NUMBER

221121049SZN-001

### ISSUE DATE

22 December 2022

### [REVISED DATE]

[-----]

### PAGES

34

### DOCUMENT CONTROL NUMBER

FCC ID 247\_b

© 2017 INTERTEK



**Robosen Robotics (ShenZhen) Co., Ltd.**

Application  
For  
Certification

**FCC ID: 2ATNWK1ZNJD****Robosen AI Base Lite****Model: K1JD****2.4GHz Transceiver**

Report No.: 221121049SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-21]

**Prepared and Checked by:****Approved by:****Mandy Chen**  
**Engineer**

---

**Ryan Chen**  
**Project Engineer**  
**Date: 22 December 2022**

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

**Intertek Testing Services Shenzhen Ltd. Longhua Branch**

101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China.

Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

## MEASUREMENT/TECHNICAL REPORT

This report concerns (check one)      Original Grant ☒ Class II Change ☐

Equipment Type: DTS - Part 15 Digital Transmission Systems

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?      Yes ☐      No ☒

If yes, defer until: \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37?      Yes ☐      No ☒

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-21 Edition] provision.

Report prepared by:

Mandy Chen  
Intertek Testing Services Shenzhen Ltd. Longhua Branch  
101, 201, Building B, No. 308 Wuhe Avenue,  
Zhangkengjing Community, GuanHu Subdistrict, LongHua  
District, Shenzhen, P.R. China.  
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6661

## Table of Contents

|             |                                                        |           |
|-------------|--------------------------------------------------------|-----------|
| <b>1.0</b>  | <b><u>Summary of Test results</u></b>                  | <b>4</b>  |
| <b>2.0</b>  | <b><u>General Description</u></b>                      | <b>5</b>  |
| 2.1         | Product Description                                    | 5         |
| 2.2         | Related Submittal(s) Grants                            | 5         |
| 2.3         | Test Methodology                                       | 5         |
| 2.4         | Test Facility                                          | 5         |
| <b>3.0</b>  | <b><u>System Test Configuration</u></b>                | <b>6</b>  |
| 3.1         | Justification                                          | 6         |
| 3.2         | EUT Exercising Software                                | 6         |
| 3.3         | Special Accessories                                    | 6         |
| 3.4         | Measurement Uncertainty                                | 7         |
| 3.5         | Equipment Modification                                 | 7         |
| 3.6         | Support Equipment List and Description                 | 7         |
| <b>4.0</b>  | <b><u>Measurement Results</u></b>                      | <b>8</b>  |
| 4.1         | Maximum Conducted Output Power at Antenna Terminals    | 8         |
| 4.2         | Minimum 6 dB RF Bandwidth                              | 9         |
| 4.3         | Maximum Power Density Reading                          | 11        |
| 4.4         | Out of Band Conducted Emissions                        | 13        |
| 4.5         | Out of Band Radiated Emissions                         | 19        |
| 4.6         | Transmitter Radiated Emissions in Restricted Bands     | 20        |
| 4.7         | Field Strength Calculation                             | 21        |
| 4.8         | Radiated Spurious Emission                             | 22        |
| 4.9         | Conducted Emission                                     | 28        |
| 4.10        | Radiated Emissions from Digital Section of Transceiver | 31        |
| 4.11        | Transmitter Duty Cycle Calculation and Measurements    | 32        |
| <b>5.0</b>  | <b><u>Equipment Photographs</u></b>                    | <b>33</b> |
| <b>6.0</b>  | <b><u>Product Labelling</u></b>                        | <b>33</b> |
| <b>7.0</b>  | <b><u>Technical Specifications</u></b>                 | <b>33</b> |
| <b>8.0</b>  | <b><u>Instruction Manual</u></b>                       | <b>33</b> |
| <b>9.0</b>  | <b><u>Confidentiality Request</u></b>                  | <b>33</b> |
| <b>10.0</b> | <b><u>Discussion of Pulse Desensitization</u></b>      | <b>33</b> |
| <b>11.0</b> | <b><u>Test Equipment List</u></b>                      | <b>34</b> |

## 1.0 Summary of Test results

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Address: A3703, Bldg 11, Shenzhen Bay ECO-Tech Park, No.16, Gaoxin South Science and Tech Rd., Nanshan Dist. Shenzhen, Guangdong, China

Manufacturer: Robosen Robotics (ShenZhen) Co., Ltd.

Address: A3703, Bldg 11, Shenzhen Bay ECO-Tech Park, No.16, Gaoxin South Science and Tech Rd., Nanshan Dist. Shenzhen, Guangdong, China

**Model: K1JD**

**FCC ID: 2ATNWK1ZNJD**

| TEST ITEM                              | REFERENCE                        | RESULTS             |
|----------------------------------------|----------------------------------|---------------------|
| Max. Output power                      | 15.247(b)(3)                     | Pass                |
| 6 dB Bandwidth                         | 15.247(a)(2)                     | Pass                |
| Max. Power Density                     | 15.247(e)                        | Pass                |
| Out of Band Antenna Conducted Emission | 15.247(d)                        | Pass                |
| Radiated Emission in Restricted Bands  | 15.247(d), 15.209,<br>FCC 15.205 | Pass                |
| AC Conducted Emission                  | 15.207                           | Pass                |
| Antenna Requirement                    | 15.203                           | Pass<br>(See Notes) |

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

## 2.0 General Description

### 2.1 Product Description

The Equipment Under Test (EUT) is a Robosen AI Base Lite with Bluetooth 4.2 BLE function operating in 2402-2480MHz and Wi-Fi function operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing and 2422-2452MHz for 802.11n-HT40, 7 channels with 5MHz channel spacing. The EUT is powered by DC 12V from adapter. For more detail information pls. refer to the user manual.

Type of Modulation: GFSK

Antenna Type: Integral Antenna

Antenna Gain: 0.18dBi Max

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

### 2.2 Related Submittal(s) Grants

This is an application for certification of transceiver for the Robosen AI Base Lite which has Bluetooth function and Wi-Fi 2.4GHz Transmitter Function. Wi-Fi 2.4GHz Function were reported in the certification report: 221121049SZN-002. Other digital functions were reported in the verification report: 221121049SZN-003.

### 2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013) and KDB 558074 D01 v05r02. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

### 2.4 Test Facility

The Semi-anechoic chamber and shielded room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

### 3.0 System Test Configuration

#### 3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by DC 12V from adapter during the test. Simultaneous transmission has been tested and only the worst data was reported in this report.

For maximizing emissions, the EUT was rotated through 360°, the EUT was placed on the styrene turntable with 0.8m up to 1GHz and 1.5 m above 1GHz. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

The EUT and transmitting antenna was centered on the turntable.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

#### 3.2 EUT Exercising Software

The EUT exercise program command(provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:

During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Test Software: Windows PowerShell

#### 3.3 Special Accessories

No special accessory attached.

### 3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

| Measurement Uncertainty           | Uncertainty |
|-----------------------------------|-------------|
| Channel Bandwidth                 | ±3.46%      |
| RF Output Power                   | ±0.31dB     |
| Power Density                     | ±3.0dB      |
| Conducted Unwanted Emission       | ±0.55dB     |
| Spurious emission (Above 18GHz)   | ±5.3dB      |
| Spurious emission (6GHz to 18GHz) | ±5.1dB      |
| Radiated emission (1GHz to 6GHz)  | ±4.8dB      |
| Radiated emission (Up to 1GHz)    | ±4.8dB      |
| AC Conducted emission             | ±3.6 dB     |
| Temperature                       | ±1°C        |
| Humidity                          | ±5%         |

### 3.5 Equipment Modification

Any modifications installed previous to testing by Robosen Robotics (ShenZhen) Co., Ltd. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

### 3.6 Support Equipment List and Description

| Description        | Manufacturer                    | Model No.                                                                            |
|--------------------|---------------------------------|--------------------------------------------------------------------------------------|
| Charging Cable     | N/A<br>(provided by Client)     | Unshielded, Length 34.5cm                                                            |
| AC/DC ADAPTER      | N/A<br>(provided by Client)     | Model: KA1801A-1201500US<br>Input: 100-240V~ 50/60Hz 0.55A Max<br>Output: 12V/1500mA |
| INTERSTELLAR SCOUT | ROBOSEN<br>(provided by Client) | Model: K1                                                                            |

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.0 Measurement Results

##### 4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

The antenna power of the EUT was connected to the input of a broadband peak RF power meter. The power meter has a video bandwidth that is greater than DTS bandwidth and utilize a fast-responding diode detector. Power was read directly at the EUT antenna terminals with cable loss added.

For antennas with gains of 0.18 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

| GFSK                 |                                 |                 |
|----------------------|---------------------------------|-----------------|
| Frequency (MHz)      | Output in dBm<br>(Peak Reading) | Output in mWatt |
| Low Channel: 2402    | 5.93                            | 3.92            |
| Middle Channel: 2440 | 6.38                            | 4.35            |
| High Channel: 2480   | 6.54                            | 4.51            |

Cable loss: 1 dB    External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 6.54dBm

EUT max. E.I.R.P = 6.54dBm + 0.18dBi = 6.72dBm = 4.70mW

For RF Exposure, the information is saved with filename: RF exposure.pdf.

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

## 4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):

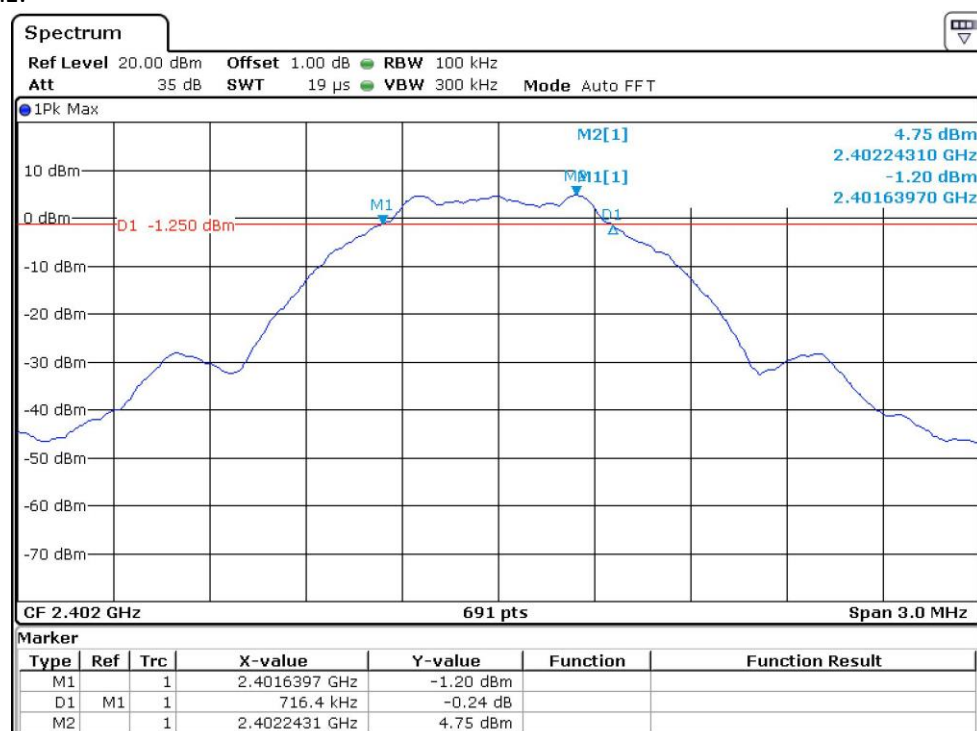
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01 v05r02. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

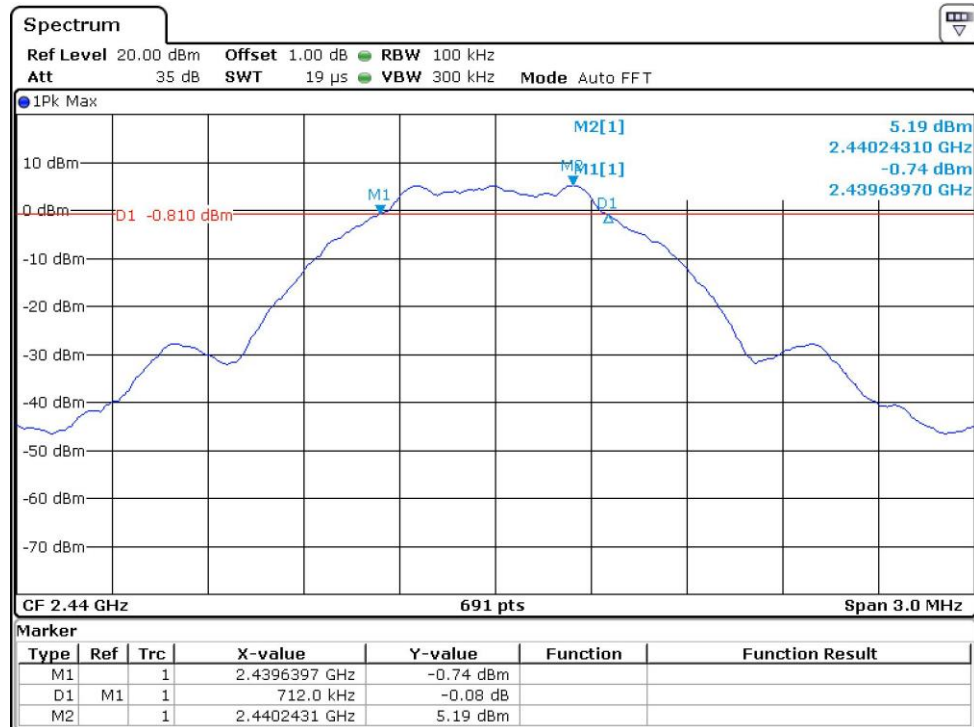
| GFSK            |                      |
|-----------------|----------------------|
| Frequency (MHz) | 6 dB Bandwidth (MHz) |
| 2402            | 0.716                |
| 2440            | 0.712                |
| 2480            | 0.708                |

The test plots are attached as below.

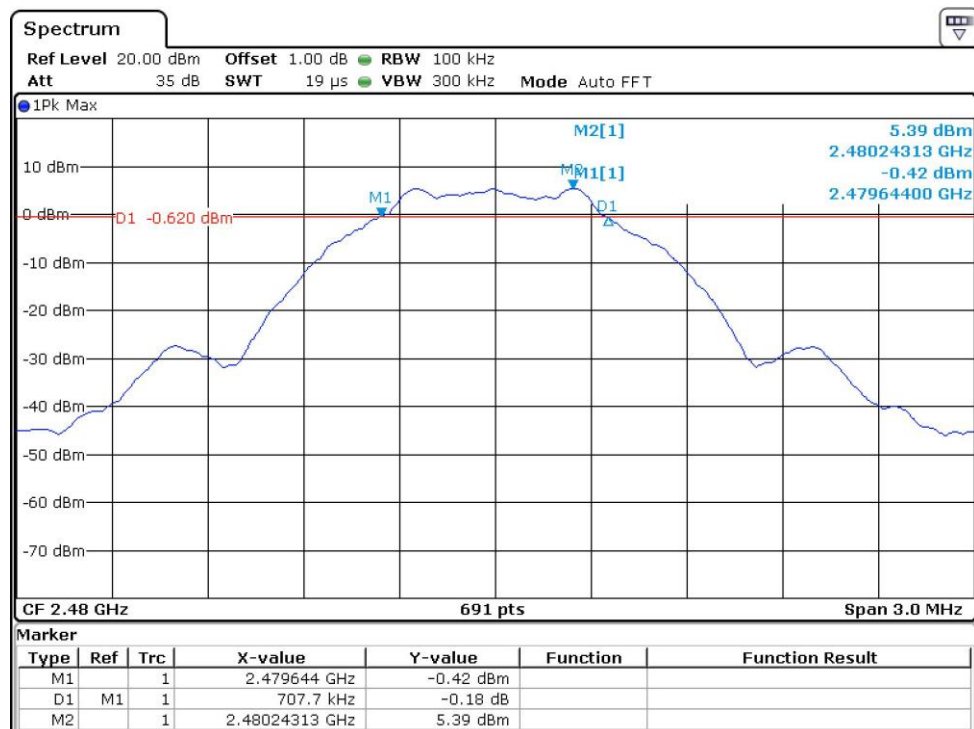
2402MHz:



2440MHz:



2480MHz:



Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05r02.

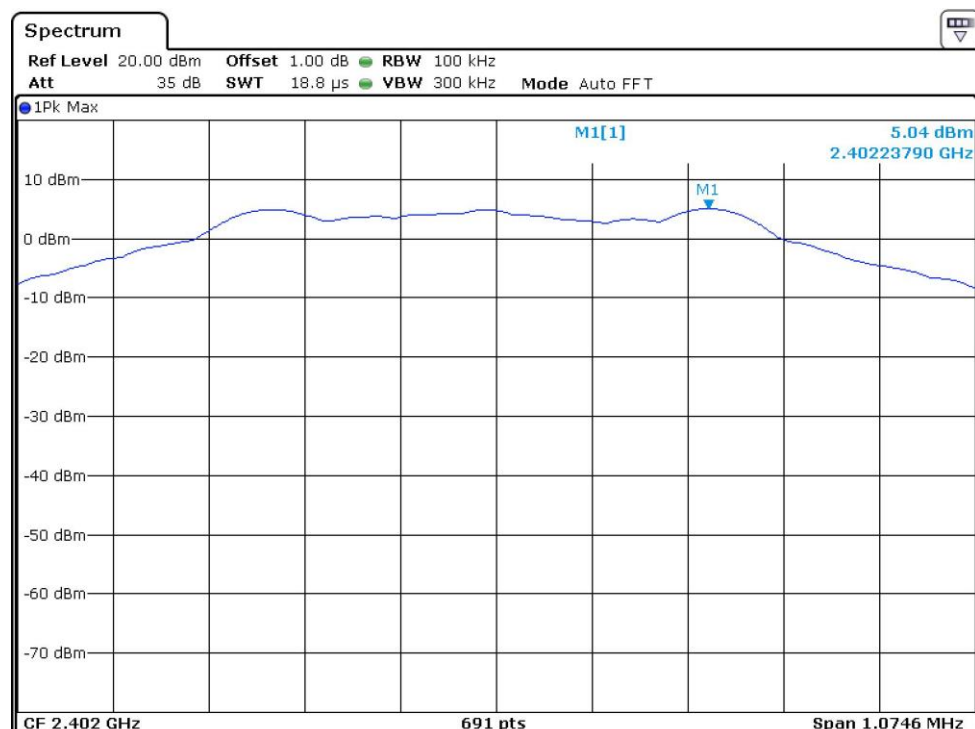
Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/3 kHz.

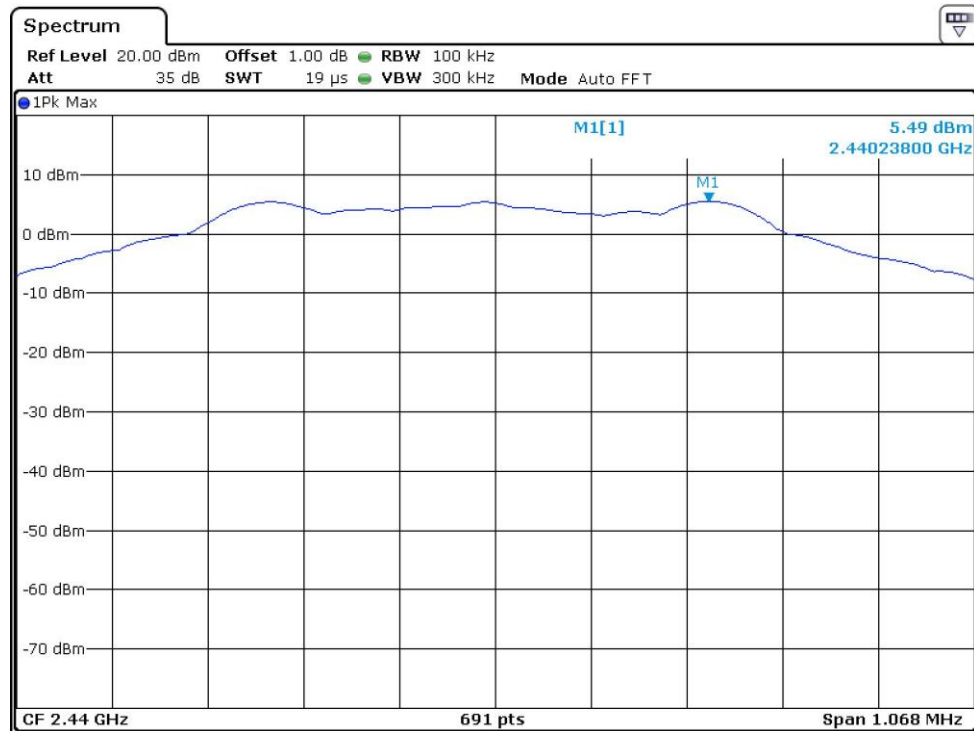
| GFSK            |                               |
|-----------------|-------------------------------|
| Frequency (MHz) | Power Density with RBW 100KHz |
| 2402            | 5.04                          |
| 2440            | 5.49                          |
| 2480            | 5.66                          |

The test plots are attached as below.

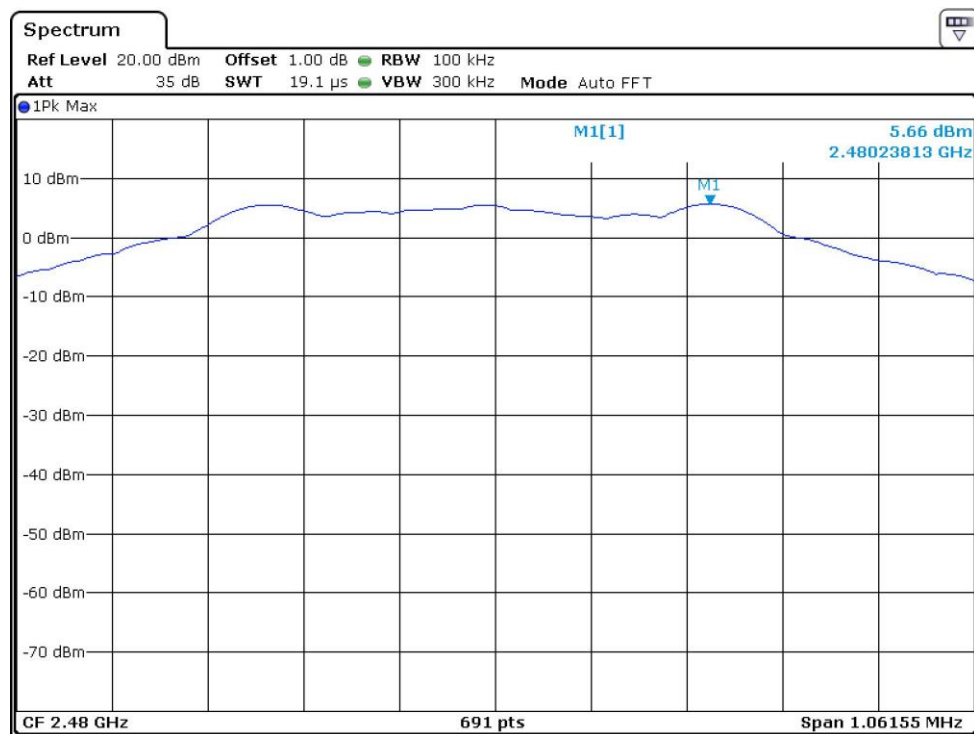
2402MHz:



2440MHz:



2480MHz:



Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

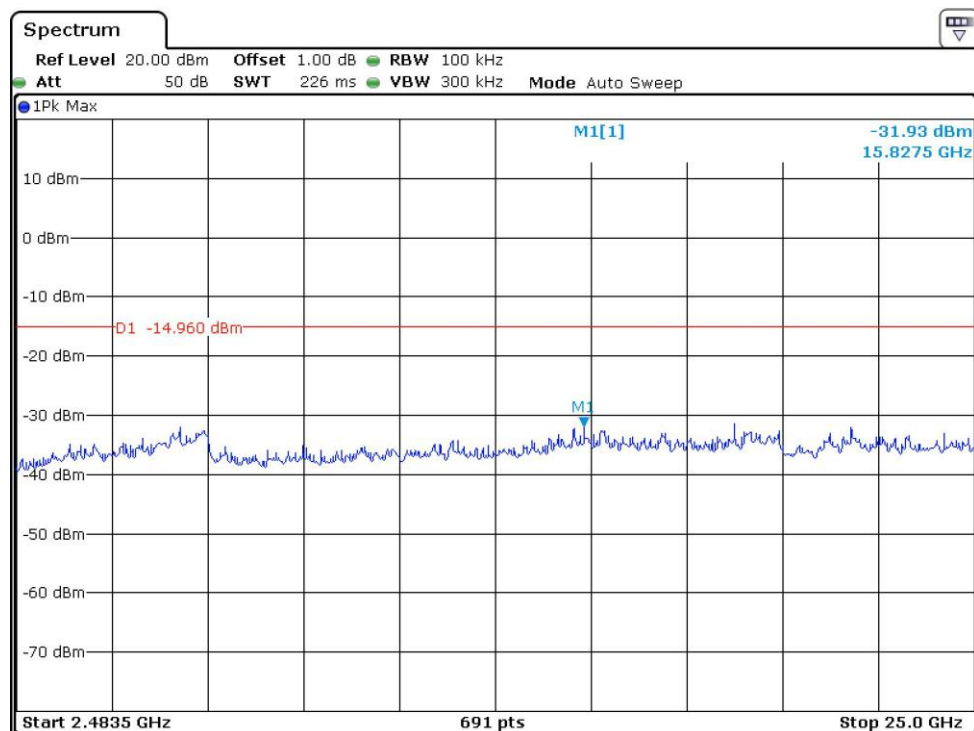
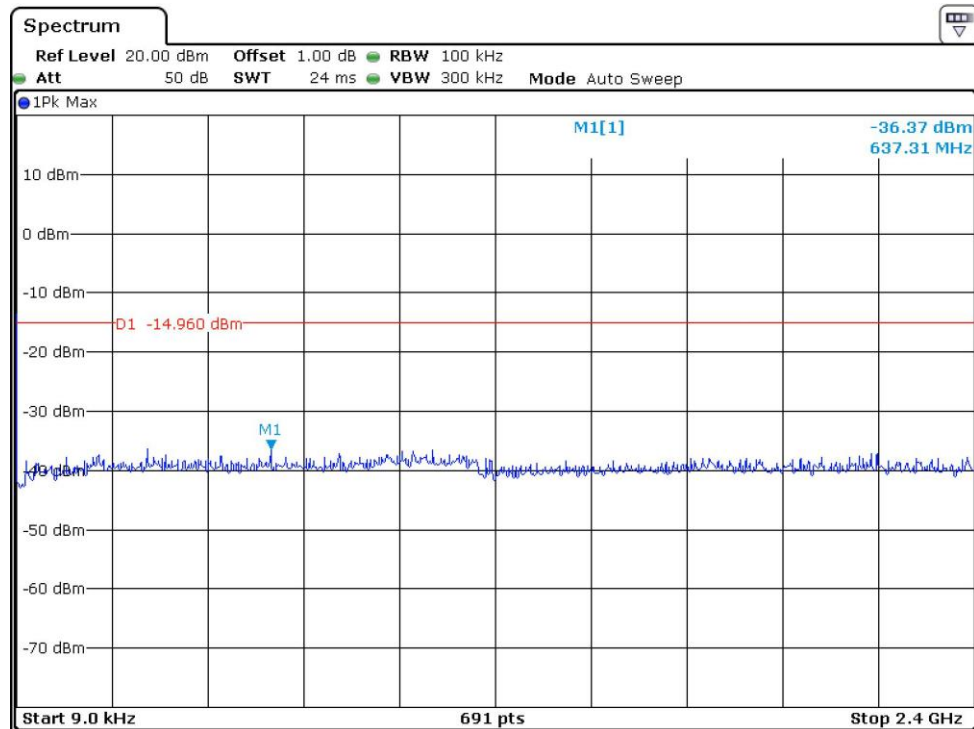
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. The Measurement Procedure was set according to the FCC KDB 558074 D01 v05r02.

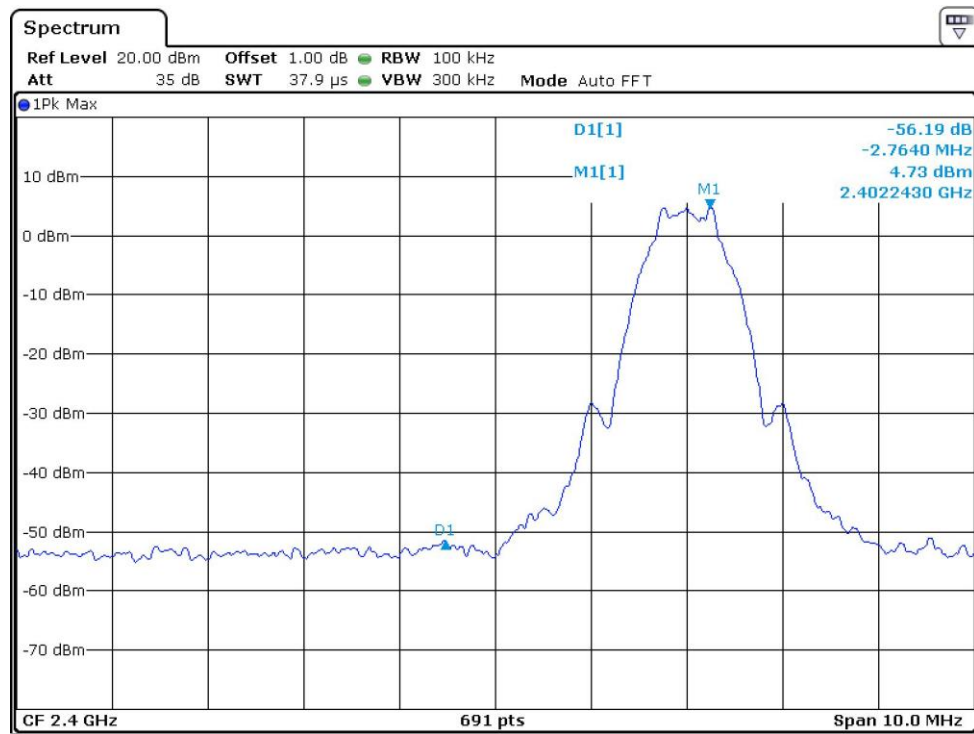
The type of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

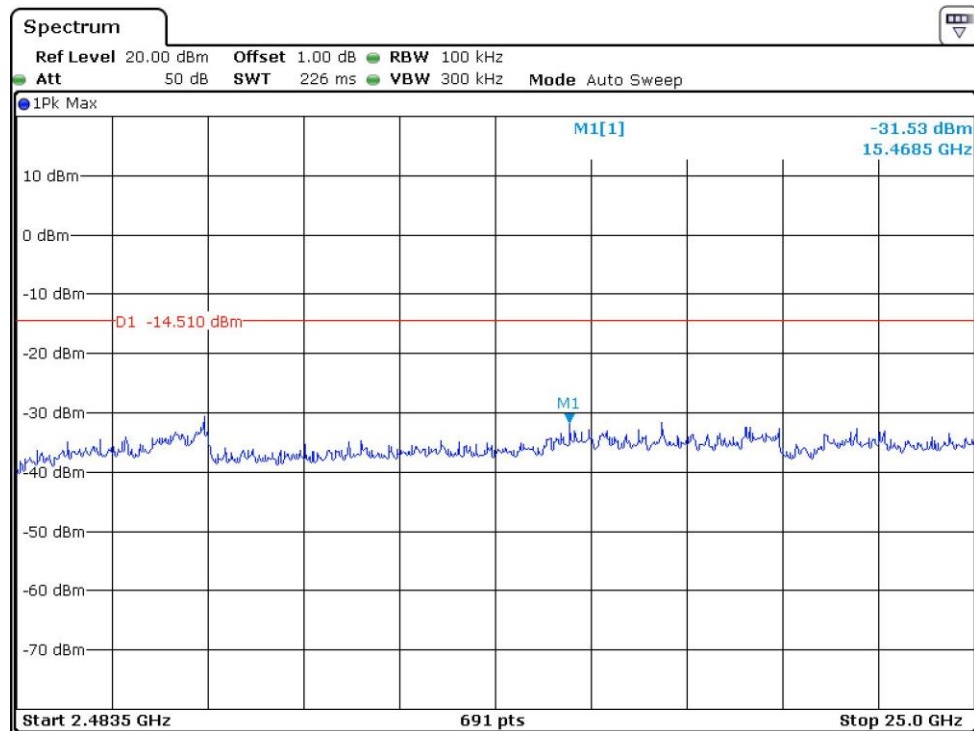
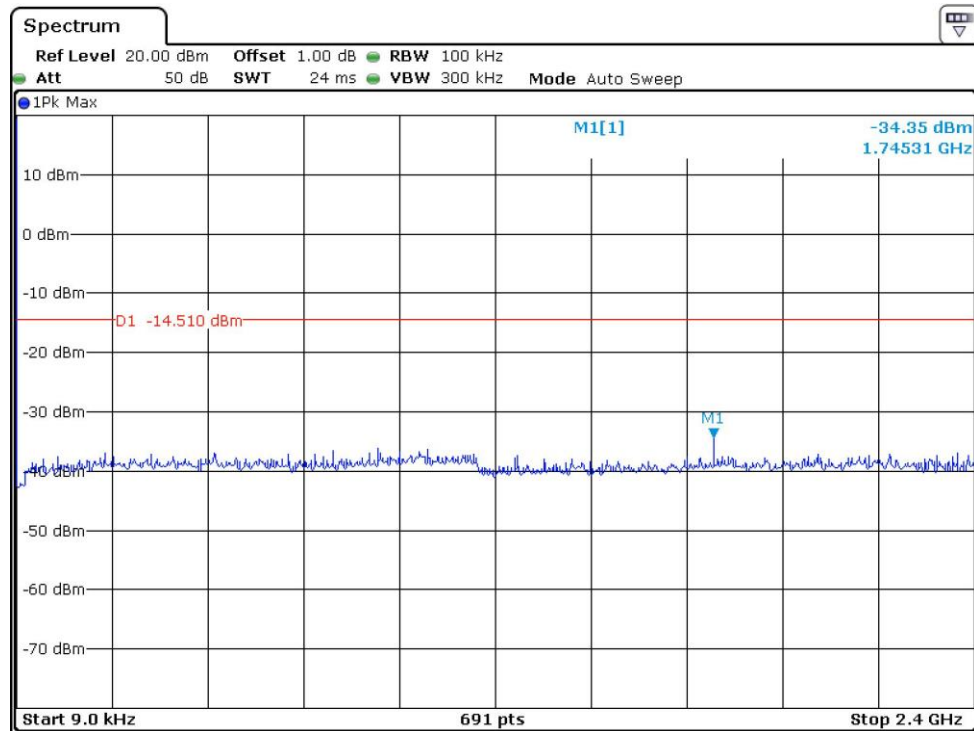
The test plots are attached as below.

2402MHz Reference Level: 5.04dBm

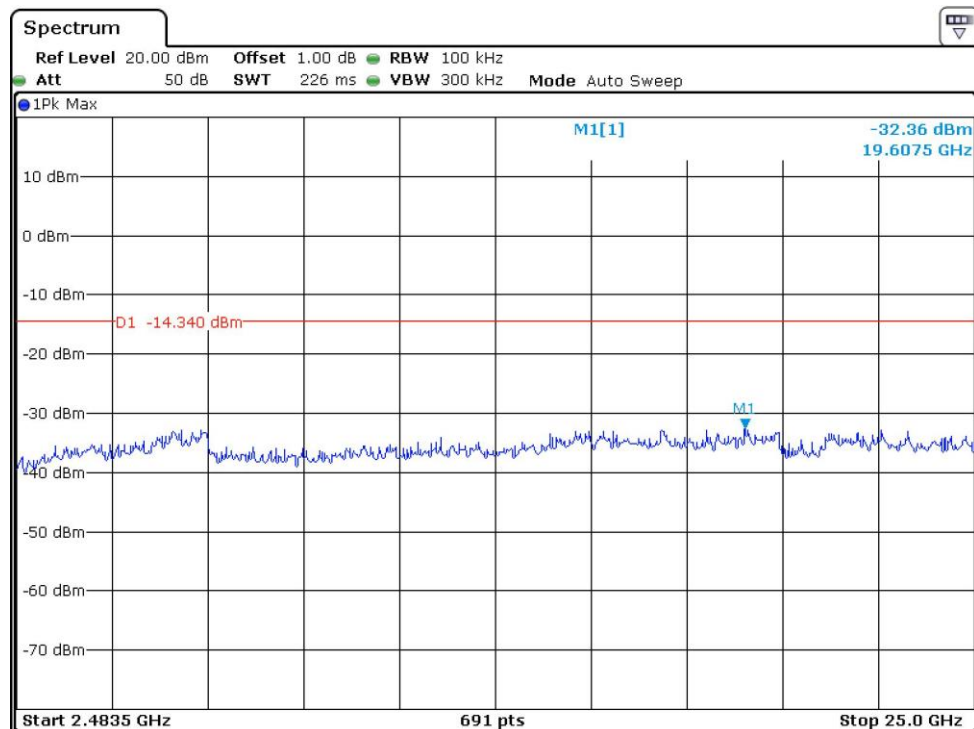
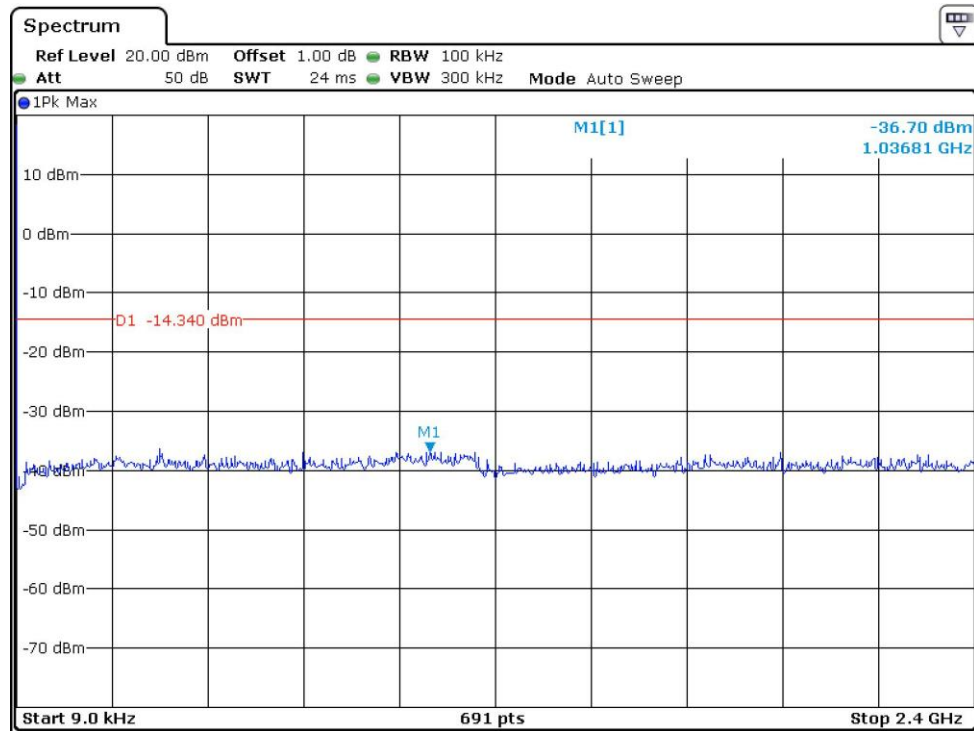


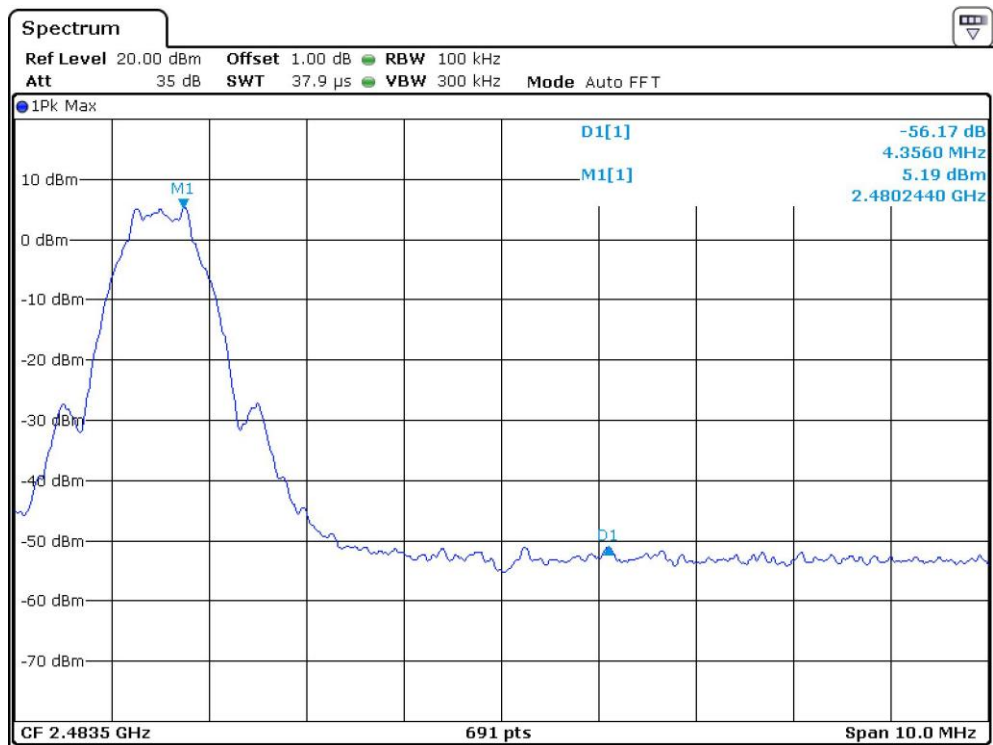


2440MHz Reference Level: 5.49dBm



2480MHz Reference Level: 5.66dBm





Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

☒ Not required, since all emissions are more than 20dB below fundamental

☐ See attached data sheet

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b) (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Simultaneous transmission has been tested and only the worst data was reported in this report.

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD$$

Where

- FS = Field Strength in dB $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB/m
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD$$

##### Example

Assume a receiver reading of 62.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 42 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V/m}$$

$$\text{Level in mV/m} = \text{Common Antilogarithm} [(42 \text{ dB}\mu\text{V/m})/20] = 125.9 \mu\text{V/m}$$

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission  
at 399.960000MHz  
is passed by 5.1dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

**TEST PERSONNEL:***Sign on file*

Mandy Chen, Engineer  
*Typed/Printed Name*

29 November 2022  
*Date*

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

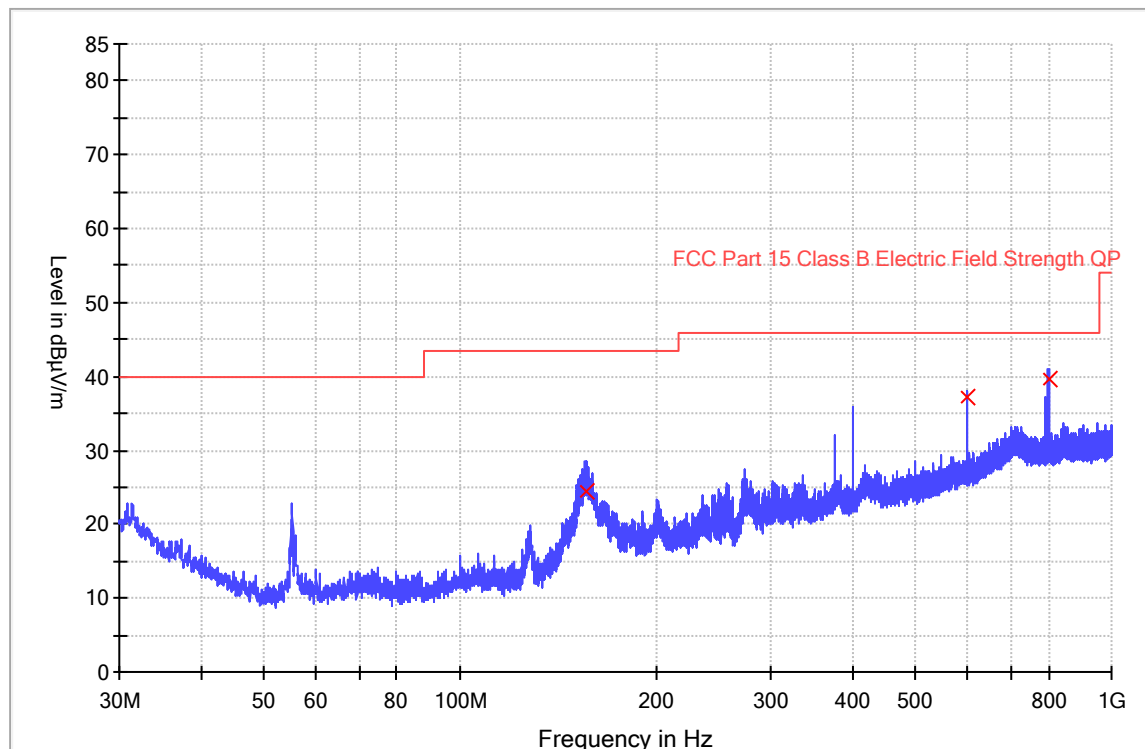
Model: K1JD

Worst Case and Operating Mode:

BT Link

ANT Polarity: Horizontal

## FCC Part 15



| Frequency (MHz) | QuasiPeak (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Corr. (dB/m) | Margin - QPK (dB) | Limit - QPK (dBμV/m) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|--------------|-------------------|----------------------|
| 155.776667      | 24.4               | 1000.0          | 120.000         | 100.0       | H            | 17.0         | 19.1              | 43.5                 |
| 600.004333      | 37.3               | 1000.0          | 120.000         | 100.0       | H            | 28.6         | 8.7               | 46.0                 |
| 800.040000      | 39.5               | 1000.0          | 120.000         | 100.0       | H            | 32.0         | 6.5               | 46.0                 |

Remark:

1. Corr. (dB/m)= Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Limit Line(dBμV/m) – Level (dBμV/m)

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

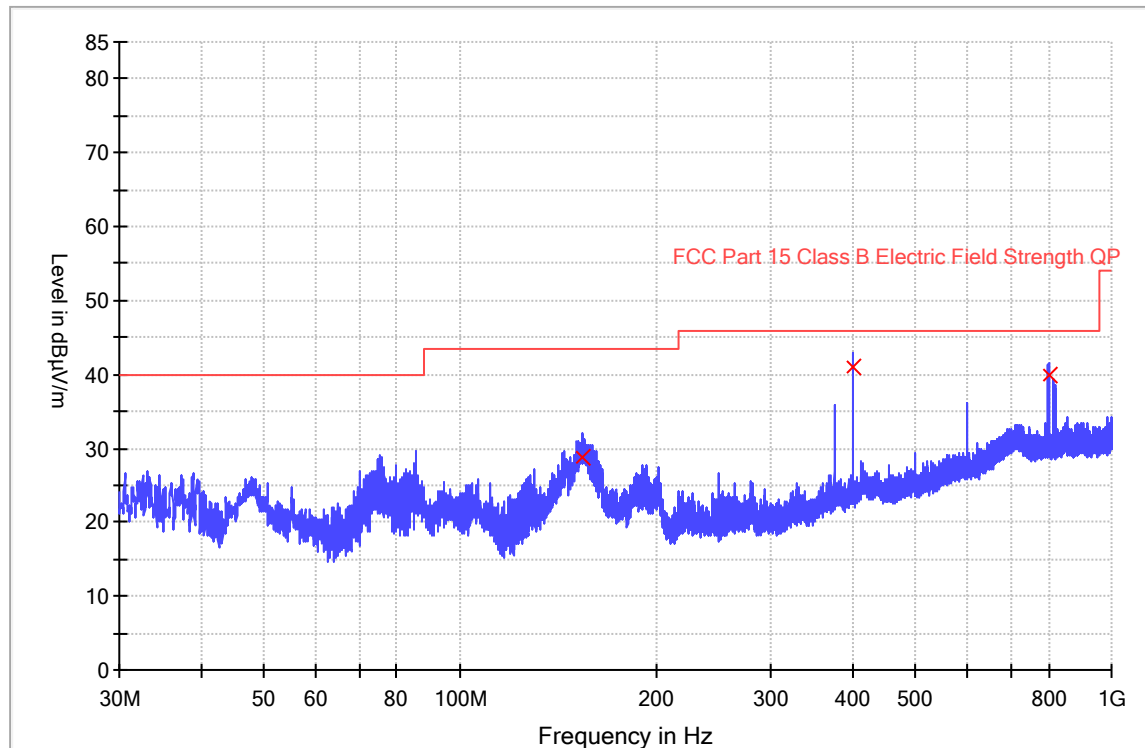
Model: K1JD

Worst Case Operating Mode:

BT Link

ANT Polarity: Vertical

## FCC Part 15



| Frequency (MHz) | QuasiPeak (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Corr. (dB/m) | Margin - QPK (dB) | Limit - QPK (dBμV/m) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|--------------|-------------------|----------------------|
| 154.063000      | 28.8               | 1000.0          | 120.000         | 100.0       | V            | 16.8         | 14.7              | 43.5                 |
| 399.960000      | 40.9               | 1000.0          | 120.000         | 100.0       | V            | 25.1         | 5.1               | 46.0                 |
| 800.018333      | 40.0               | 1000.0          | 120.000         | 100.0       | V            | 32.0         | 6.0               | 46.0                 |

### Remark:

1. Corr. (dB/m)= Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Limit Line(dBμV/m) – Level (dBμV/m)

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

Worst Case and Operating Mode:

Transmitting (2402MHz)

### Radiated Emissions (above 1GHz)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB/m) | Net at 3m (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|-----------------------|--------------------|---------------------------|-------------|
| Horizontal   | *4804.000       | 50.6           | 36.7              | 35.5                  | 49.4               | 74.0                      | -24.6       |
| Horizontal   | *7206.000       | 61.0           | 36.4              | 29.1                  | 53.7               | 74.0                      | -20.3       |
| Horizontal   | *2390.000       | 58.8           | 36.4              | 29.1                  | 51.5               | 74.0                      | -22.5       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB/m) | Net at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|-----------------------|--------------------|------------------------------|-------------|
| Horizontal   | *4804.000       | 40.1           | 36.7              | 35.5                  | 38.9               | 54.0                         | -15.1       |
| Horizontal   | *7206.000       | 49.1           | 36.4              | 29.1                  | 41.8               | 54.0                         | -12.2       |
| Horizontal   | *2390.000       | 47.9           | 36.4              | 29.1                  | 40.6               | 54.0                         | -13.4       |

- NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.
  2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
  3. Negative value in the margin column shows emission below limit.
  4. Horn antenna used for the emission over 1000MHz.
- \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

Worst Case and Operating Mode:

Transmitting (2440MHz)

### Radiated Emissions (above 1GHz)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB/m) | Net at 3m (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|-----------------------|--------------------|---------------------------|-------------|
| Horizontal   | *4880.000       | 47.1           | 36.7              | 35.5                  | 45.9               | 74.0                      | -28.1       |
| Horizontal   | *7320.000       | 50.3           | 36.1              | 37.2                  | 51.4               | 74.0                      | -22.6       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB/m) | Net at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|-----------------------|--------------------|------------------------------|-------------|
| Horizontal   | *4880.000       | 41.0           | 36.7              | 35.5                  | 39.8               | 54.0                         | -14.2       |
| Horizontal   | *7320.000       | 41.4           | 36.1              | 37.2                  | 42.5               | 54.0                         | -11.5       |

- NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
  2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
  3. Negative value in the margin column shows emission below limit.
  4. Horn antenna used for the emission over 1000MHz.
- \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

Worst Case and Operating Mode:

Transmitting (2480MHz)

### Radiated Emissions (above 1GHz)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB/m) | Net at 3m (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|-----------------------|--------------------|---------------------------|-------------|
| Horizontal   | *4960.000       | 46.3           | 36.7              | 35.5                  | 45.1               | 74.0                      | -28.9       |
| Horizontal   | *7440.000       | 48.7           | 36.1              | 37.2                  | 49.8               | 74.0                      | -24.2       |
| Horizontal   | *2483.500       | 56.9           | 36.4              | 29.1                  | 49.6               | 74.0                      | -24.4       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB/m) | Net at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|-----------------------|--------------------|------------------------------|-------------|
| Horizontal   | *4960.000       | 41.7           | 36.7              | 35.5                  | 40.5               | 54.0                         | -13.5       |
| Horizontal   | *7440.000       | 42.8           | 36.1              | 37.2                  | 43.9               | 54.0                         | -10.1       |
| Horizontal   | *2483.500       | 46.8           | 36.4              | 29.1                  | 39.5               | 54.0                         | -14.5       |

- NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
  2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
  3. Negative value in the margin column shows emission below limit.
  4. Horn antenna used for the emission over 1000MHz.
- \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.9 Conducted Emission

Worst Case Conducted Emission  
at 0.374000MHz  
is passed by 19.7dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: conducted photos.pdf.

Simultaneous transmission has been tested and only the worst data was reported in this report.

#### **TEST PERSONNEL:**

*Sign on file*

Mandy Chen, Engineer

*Typed/Printed Name*

29 November 2022

*Date*

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

Worst Case and Operating Mode: BT Link

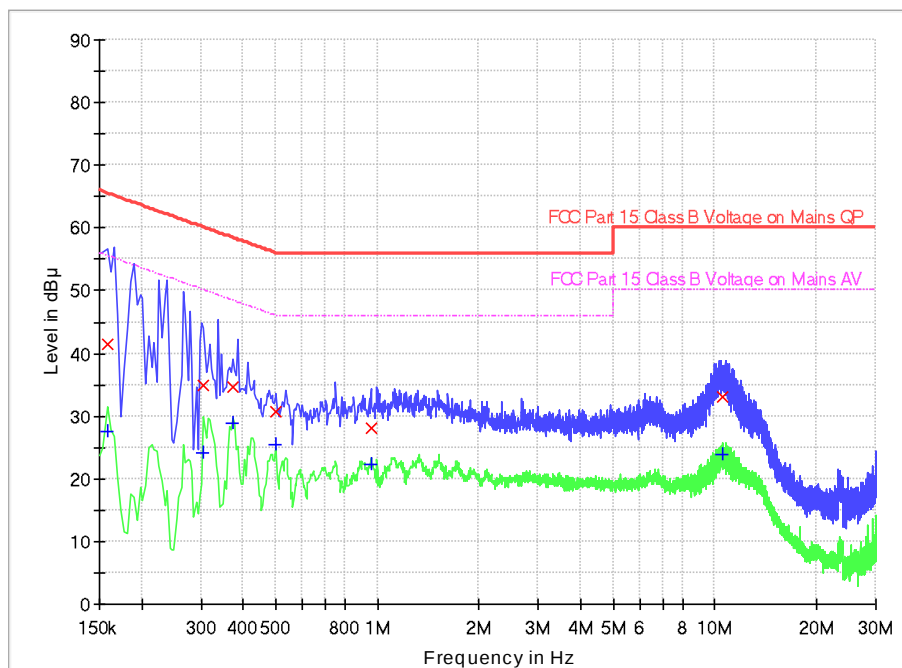
Test Voltage: AC 120V/60Hz

Phase: Live

## Graphic / Data Table

### Conducted Emissions Pursuant to FCC 15.207: Emissions Requirement

Conducted Emission Test FCC Part 15



### Result Table QP

| Frequency (MHz) | QuasiPeak (dBuV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBuV) |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|
| 0.158000        | 41.4             | 9.000           | L1   | 9.6        | 24.2        | 65.6         |
| 0.306000        | 34.9             | 9.000           | L1   | 9.6        | 25.2        | 60.1         |
| 0.374000        | 34.8             | 9.000           | L1   | 9.6        | 23.7        | 58.4         |
| 0.498000        | 30.7             | 9.000           | L1   | 9.6        | 25.3        | 56.0         |
| 0.958000        | 28.2             | 9.000           | L1   | 9.7        | 27.8        | 56.0         |
| 10.582000       | 33.1             | 9.000           | L1   | 10.0       | 26.9        | 60.0         |

### Result Table AV

| Frequency (MHz) | Average (dBuV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBuV) |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|
| 0.158000        | 27.6           | 9.000           | L1   | 9.6        | 28.0        | 55.6         |
| 0.306000        | 24.2           | 9.000           | L1   | 9.6        | 25.8        | 50.1         |
| 0.374000        | 28.8           | 9.000           | L1   | 9.6        | 19.7        | 48.4         |
| 0.498000        | 25.4           | 9.000           | L1   | 9.6        | 20.6        | 46.0         |
| 0.958000        | 22.4           | 9.000           | L1   | 9.7        | 23.6        | 46.0         |
| 10.582000       | 23.8           | 9.000           | L1   | 10.0       | 26.2        | 50.0         |

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

Worst Case and Operating Mode: BT Link

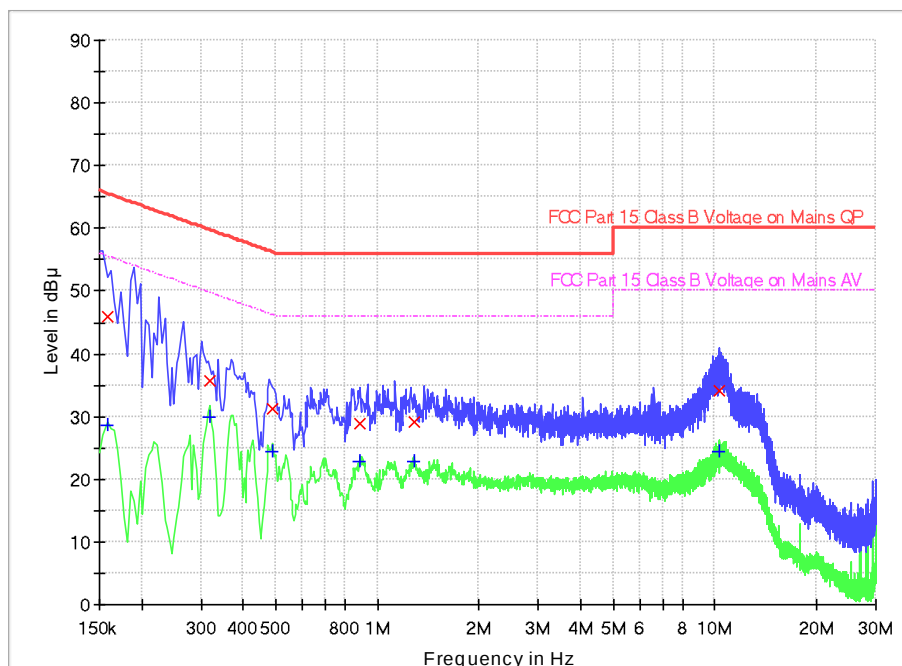
Test Voltage: AC 120V/60Hz

Phase: Neutral

## Graphic / Data Table

### Conducted Emissions Pursuant to FCC 15.207: Emissions Requirement

Conducted Emission Test FCC Part 15



### Result Table QP

| Frequency (MHz) | QuasiPeak (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|
| 0.158000        | 45.9             | 9.000           | N    | 9.6        | 19.9        | 56.2         |
| 0.318000        | 35.6             | 9.000           | N    | 9.6        | 29.3        | 56.0         |
| 0.490000        | 31.2             | 9.000           | N    | 9.7        | 25.9        | 56.0         |
| 0.890000        | 28.8             | 9.000           | N    | 9.7        | 25.9        | 56.0         |
| 1.282000        | 29.2             | 9.000           | N    | 9.7        | 24.0        | 56.0         |
| 10.338000       | 34.2             | 9.000           | N    | 10.1       | 33.3        | 60.0         |

### Result Table AV

| Frequency (MHz) | Average (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|
| 0.158000        | 28.5           | 9.000           | N    | 9.6        | 27.1        | 55.6         |
| 0.318000        | 29.8           | 9.000           | N    | 9.6        | 20.0        | 49.8         |
| 0.490000        | 24.4           | 9.000           | N    | 9.6        | 21.8        | 46.2         |
| 0.890000        | 22.8           | 9.000           | N    | 9.6        | 23.2        | 46.0         |
| 1.282000        | 22.9           | 9.000           | N    | 9.6        | 23.1        | 46.0         |
| 10.338000       | 24.4           | 9.000           | N    | 9.9        | 25.6        | 50.0         |

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

- ☐ Not required - No digital part
- ☐ Test results are attached
- ☒ Included in the separated report.

Applicant: Robosen Robotics (ShenZhen) Co., Ltd.

Date of Test: 29 November 2022

Model: K1JD

#### 4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

|   |                                                                 |
|---|-----------------------------------------------------------------|
|   | See attached spectrum analyzer chart (s) for Transmitter timing |
|   | See Transmitter timing diagram provided by manufacturer         |
| x | Not applicable, duty cycle was not used.                        |

## 5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf & internal photos.pdf.

## 6.0 Product Labeling

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

## 7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

## 8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

## 9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.

## 10.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

## 11.0 Test Equipment List

| Equipment No. | Equipment           | Manufacturer    | Model No.    | Serial No. | Cal. Date  | Due Date   |
|---------------|---------------------|-----------------|--------------|------------|------------|------------|
| SZ061-12      | BiConiLog Antenna   | ETS             | 3142E        | 00166158   | 2021-08-04 | 2024-08-04 |
| SZ185-03      | EMI Receiver        | R&S             | ESR7         | 101975     | 2021-12-20 | 2022-12-20 |
| SZ061-08      | Horn Antenna        | ETS             | 3115         | 00092346   | 2021-09-05 | 2024-09-05 |
| SZ061-06      | Active Loop Antenna | Electro-Metrics | EM-6876      | 217        | 2021-05-18 | 2023-05-18 |
| SZ056-03      | Spectrum Analyzer   | R&S             | FSP 30       | 101148     | 2022-05-16 | 2023-05-16 |
| SZ056-06      | Signal Analyzer     | R&S             | FSV 40       | 101101     | 2021-12-20 | 2022-12-20 |
| SZ181-04      | Preamplifier        | Agilent         | 8449B        | 3008A02474 | 2022-05-16 | 2023-05-16 |
| SZ188-01      | Anechoic Chamber    | ETS             | RFD-F/A-100  | 4102       | 2021-12-12 | 2024-12-12 |
| SZ062-02      | RF Cable            | RADIAL          | RG 213U      | --         | 2022-11-15 | 2023-05-15 |
| SZ062-05      | RF Cable            | RADIAL          | 0.04-26.5GHz | --         | 2022-11-15 | 2023-05-15 |
| SZ062-12      | RF Cable            | RADIAL          | 0.04-26.5GHz | --         | 2022-11-15 | 2023-05-15 |
| SZ067-04      | Notch Filter        | Micro-Tronics   | BRM50702-02  | --         | 2022-05-17 | 2023-05-17 |
| SZ185-02      | EMI Test Receiver   | R&S             | ESCI         | 100692     | 2022-07-08 | 2023-07-08 |
| SZ187-01      | Two-Line V-Network  | R&S             | ENV216       | 100072     | 2022-10-24 | 2023-10-24 |
| SZ188-03      | Shielding Room      | ETS             | RFD-100      | 4100       | 2020-01-07 | 2023-01-07 |

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