

# FCC PART 15C TEST REPORT FOR CERTIFICATION

## On Behalf of

Shenzhen KingChuang Smart Navi Technology Co.,Ltd.

Robot Vacuum Cleaner

Model Number: SL68

Additional Model: SL40

FCC ID: 2BA3GKFTYRM24

|              |                                                                     |
|--------------|---------------------------------------------------------------------|
| Applicant :  | Shenzhen KingChuang Smart Navi Technology Co.,Ltd.                  |
| Address:     | Building 10, Furong Industrial Zone, 177 Furong Avenue,             |
|              | Xinqiao Street, Baoan District, Shenzhen, China                     |
|              |                                                                     |
| Prepared By: | EST Technology Co., Ltd.                                            |
|              | Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China |
|              | Tel: 86-769-83081888-808                                            |

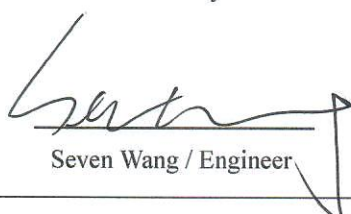
|                 |                         |
|-----------------|-------------------------|
| Report Number:  | ESTE-R2309159           |
| Date of Test:   | Aug. 07, ~Sep. 21, 2023 |
| Date of Report: | Sep. 25, 2023           |

# TABLE OF CONTENTS

| Description                                 | Page |
|---------------------------------------------|------|
| TEST REPORT VERIFICATION.....               | 3    |
| 1. GENERAL INFORMATION.....                 | 5    |
| 1.1. Description of Device (EUT) .....      | 5    |
| 1.2. Antenna Information .....              | 5    |
| 1.3. Information of RF Cable .....          | 5    |
| 2. SUMMARY OF TEST .....                    | 6    |
| 2.1. Summary of test result.....            | 6    |
| 2.2. Test Facilities .....                  | 7    |
| 2.3. Measurement uncertainty .....          | 8    |
| 2.4. Assistant equipment used for test..... | 8    |
| 2.5. Block Diagram .....                    | 8    |
| 2.6. Test Mode.....                         | 9    |
| 2.7. Power Setting of Test Software .....   | 9    |
| 2.8. Duty Cycle.....                        | 10   |
| 2.9. Channel List .....                     | 11   |
| 2.10. Test Equipment List .....             | 12   |
| 3. 6DB BANDWIDTH.....                       | 14   |
| 3.1. Limit .....                            | 14   |
| 3.2. Test Setup.....                        | 14   |
| 3.3. Spectrum Analyzer Setting.....         | 14   |
| 3.4. Test Procedure .....                   | 14   |
| 3.5. Test Result.....                       | 14   |
| 4. MAXIMUM PEAK OUTPUT POWER.....           | 15   |
| 4.1. Limit .....                            | 15   |
| 4.2. Test Setup.....                        | 15   |
| 4.3. Spectrum Analyzer Setting.....         | 15   |
| 4.4. Test Procedure .....                   | 15   |
| 4.5. Test Result.....                       | 15   |
| 5. POWER SPECTRAL DENSITY .....             | 16   |
| 5.1. Limit .....                            | 16   |
| 5.2. Test Setup.....                        | 16   |
| 5.3. Spectrum Analyzer Setting.....         | 16   |
| 5.4. Test Procedure .....                   | 16   |
| 5.5. Test Result.....                       | 16   |
| 6. CONDUCTED BAND EDGE .....                | 17   |
| 6.1. Limit .....                            | 17   |
| 6.2. Test Setup.....                        | 17   |
| 6.3. Spectrum Analyzer Setting.....         | 17   |
| 6.4. Test Procedure .....                   | 17   |
| 6.5. Test Result.....                       | 17   |
| 7. CONDUCTED SPURIOUS EMISSIONS .....       | 18   |
| 7.1. Limit .....                            | 18   |
| 7.2. Test Setup.....                        | 18   |

|       |                                                 |    |
|-------|-------------------------------------------------|----|
| 7.3.  | Spectrum Analyzer Setting.....                  | 18 |
| 7.4.  | Test Procedure.....                             | 18 |
| 7.5.  | Test Result.....                                | 18 |
| 8.    | RADIATED SPURIOUS EMISSIONS AND BAND EDGE ..... | 19 |
| 8.1.  | Limit .....                                     | 19 |
| 8.2.  | Test Setup.....                                 | 20 |
| 8.3.  | Spectrum Analyzer Setting.....                  | 21 |
| 8.4.  | Test Procedure.....                             | 22 |
| 8.5.  | Test Result.....                                | 23 |
| 9.    | AC POWER LINE CONDUCTED EMISSIONS .....         | 35 |
| 9.1.  | Limit .....                                     | 35 |
| 9.2.  | Test Setup.....                                 | 35 |
| 9.3.  | Spectrum Analyzer Setting.....                  | 35 |
| 9.4.  | Test Procedure.....                             | 35 |
| 9.5.  | Test Result.....                                | 36 |
| 10.   | ANTENNA REQUIREMENTS .....                      | 38 |
| 10.1. | Limit .....                                     | 38 |
| 10.2. | Test Result.....                                | 38 |
| 11.   | APPENDIX .....                                  | 39 |
| 12.   | TEST SETUP PHOTO .....                          | 51 |
| 13.   | EUT PHOTO.....                                  | 53 |

## EST Technology Co., Ltd.

|                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>Applicant:</b>                                                                                                                                                                                        | Shenzhen KingChuang Smart Navi Technology Co.,Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                   |                         |
| <b>Address:</b>                                                                                                                                                                                          | Building 10, Furong Industrial Zone, 177 Furong Avenue,<br>Xinqiao Street, Baoan District, Shenzhen, China                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                   |                         |
| <b>Manufacturer:</b>                                                                                                                                                                                     | Shenzhen KingChuang Smart Navi Technology Co.,Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                   |                         |
| <b>Address:</b>                                                                                                                                                                                          | Building 10, Furong Industrial Zone, 177 Furong Avenue,<br>Xinqiao Street, Baoan District, Shenzhen, China                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                   |                         |
| <b>Factory:</b>                                                                                                                                                                                          | Shenzhen KingChuang Smart Navi Technology Co.,Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                   |                         |
| <b>Address:</b>                                                                                                                                                                                          | Building 10, Furong Industrial Zone, 177 Furong Avenue,<br>Xinqiao Street, Baoan District, Shenzhen, China                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                   |                         |
| <b>E.U.T:</b>                                                                                                                                                                                            | Robot Vacuum Cleaner                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                   |                         |
| <b>Model Number:</b>                                                                                                                                                                                     | SL68                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                   |                         |
| <b>Additional Model:</b>                                                                                                                                                                                 | SL40<br>Note: They are identical except model name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                   |                         |
| <b>Power Supply:</b>                                                                                                                                                                                     | DC 14.4V From Battery<br>DC 19V From Adapter Input AC 100-240V, 50/60Hz<br>AC 100-240V, 50/60Hz for collecting dust bucket                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                   |                         |
| <b>Trade Name:</b>                                                                                                                                                                                       | -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Serial No.:</b>                                                                                                                                                | -----                   |
| <b>Date of Receipt:</b>                                                                                                                                                                                  | Aug. 07, 2023                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Date of Test:</b>                                                                                                                                              | Aug. 07, ~Sep. 21, 2023 |
| <b>Test Specification:</b>                                                                                                                                                                               | FCC Part 15 Subpart C (15.247)<br>ANSI C63.10:2013<br>FCC KDB 558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                   |                         |
| <b>Test Result:</b>                                                                                                                                                                                      | <p>The device described above is tested by EST Technology Co., Ltd. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements.</p> <p>This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd.</p> |                                                                                                                                                                   |                         |
| <b>Prepared by:</b>                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Reviewed by:</b>                                                                                                                                               |                         |
| <br>Emily Cai / Assistant                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <br>Seven Wang / Engineer                                                      |                         |
|                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Date:</b> Sep. 25, 2023<br><b>Approved by:</b><br><br>Iceman Hu / Manager |                         |
| <b>Other Aspects:</b>                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                         |
| None.                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                         |
| <i>Abbreviations: OK/P=passed    fail/F=failed    n.a/N=not applicable    E.U.T=equipment under tested</i>                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                         |
| <i>This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                         |

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

|                         |   |                      |
|-------------------------|---|----------------------|
| Product Name            | : | Robot Vacuum Cleaner |
| Model Number            | : | SL68                 |
| Software Version        | : | N/A                  |
| Hardware Version        | : | N/A                  |
| Operation frequency     | : | 2402MHz~2480MHz      |
| Number of channel       | : | 40                   |
| Max Output Power (PEAK) | : | -1.04dBm             |
| Modulation Type         | : | GFSK                 |
| Sample Type             | : | Prototype production |

Note: For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

### 1.2. Antenna Information

| Ant No. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|---------|-------|------------|--------------|-----------|------------|
| 1       | -     | -          | Internal     | -         | 4.5        |

Note: This information is provided by the applicant.

### 1.3. Information of RF Cable

| Cable Loss(dB)                                                                                                                                                                               | Provided by                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 1.0                                                                                                                                                                                          | Shenzhen KingChuang Smart Navi Technology Co.,Ltd. |
| Note: 1.The customer declared the loss value of the RF Cable, and the test results of this report only apply to the sample as received.<br>2. This information is provided by the applicant. |                                                    |

## 2. SUMMARY OF TEST

### 2.1. Summary of test result

| No. | Description of Test Item                  | FCC Standard Section          | Results |
|-----|-------------------------------------------|-------------------------------|---------|
| 1   | 6dB Bandwidth                             | 15.247(a)(2)                  | PASS    |
| 2   | Maximum Peak Output Power                 | 15.247(b)(3)                  | PASS    |
| 3   | Power Spectral Density                    | 15.247(e)                     | PASS    |
| 4   | Conducted Band Edge                       | 15.247(d)                     | PASS    |
| 5   | Conducted Spurious Emissions              | 15.247(d)                     | PASS    |
| 6   | Radiated Spurious Emissions and Band Edge | 15.205<br>15.209<br>15.247(d) | PASS    |
| 7   | AC Power Line Conducted Emissions         | 15.207                        | PASS    |
| 8   | Antenna Requirement                       | 15.203                        | PASS    |

Note:“N/A” denotes test is not applicable in this test report.

## 2.2. Test Facilities

EMC Lab : Certificated by CNAS, CHINA  
Registration No.: L5288  
This Certificate is valid until: November 12, 2023

Certificated by FCC, USA  
Designation Number: CN1215  
This Certificate is valid until: January 31, 2024

Certificated by A2LA, USA  
Registration No.: 4366.01  
This Certificate is valid until: January 31, 2024

Certificated by Industry Canada  
CAB identifier No.: CN0035  
This Certificate is valid until: January 31, 2024

Certificated by VCCI, Japan  
Registration No.: C-14103; T-20073; R-13663;  
R-20103; G-20097  
Date of registration: Apr. 20, 2020  
This Certificate is valid until: Apr. 19, 2026

Certificated by TUV Rheinland, Germany  
Registration No.: UA 50413872 0001  
Date of registration: July 31, 2018

Certificated by Intertek  
Registration No.: 2011-RTL-L2-64  
Date of registration: November 08, 2018

Name of Firm : EST Technology Co., Ltd.

Site Location : Chilingxiang, Qishantou, Santun, Houjie, Dongguan,  
Guangdong, China

### 2.3. Measurement uncertainty

| Test Item                                               | Uncertainty                       |
|---------------------------------------------------------|-----------------------------------|
| Uncertainty for Conduction emission test                | $\pm 3.48\text{dB}$               |
| Uncertainty for spurious emissions test (Below 30MHz)   | $\pm 1.62\text{ dB}$              |
| Uncertainty for spurious emissions test (30MHz-1GHz)    | $\pm 4.60\text{ dB(Polarize: H)}$ |
|                                                         | $\pm 4.68\text{ dB(Polarize: V)}$ |
| Uncertainty for spurious emissions test (1GHz to 25GHz) | $\pm 4.96\text{dB}$               |
| Uncertainty for radio frequency                         | $7 \times 10^{-8}$                |
| Uncertainty for conducted RF Power                      | 1.08dB                            |
| Uncertainty for Power density test                      | 0.26dB                            |

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

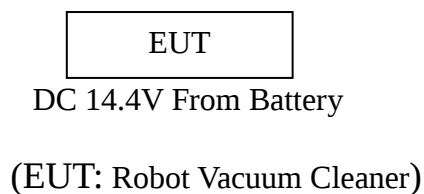
### 2.4. Assistant equipment used for test

| Item | Equipment | Brand | Model Name/Type No. | FCC ID | Series No. |
|------|-----------|-------|---------------------|--------|------------|
| -    | -         | -     | -                   | -      | -          |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
| -    | -             | -            | -      | -    |

### 2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was beset into BLE test mode by software before test.



## 2.6. Test Mode

The test mode was selected for the final test as listed below.

| Test Item                               | Modulation Type | Test Channel    |
|-----------------------------------------|-----------------|-----------------|
| 6dB Bandwidth                           | GFSK            | Low/Middle/High |
| Maximum Peak Output Power               | GFSK            | Low/Middle/High |
| Power Spectral Density                  | GFSK            | Low/Middle/High |
| Conducted Band Edge                     | GFSK            | Low/ High       |
| Conducted Spurious Emissions            | GFSK            | Low/Middle/High |
| Radiated Spurious Emissions(Below 1GHz) | GFSK            | Low/Middle/High |
| Radiated Spurious Emissions(Above 1GHz) | GFSK            | Low/Middle/High |
| Radiated Band Edge                      | GFSK            | Low/High        |
| AC Power Line Conducted Emissions       | GFSK            | Low/Middle/High |

Note:In radiated measurement,the EUT had been pre-scan on the positioned of each 3 axis(X,Y,Z), the worst case was found when positioned on **X-plane**.

## 2.7. Power Setting of Test Software

| Software Name   | CMD  |      |      |
|-----------------|------|------|------|
| Frequency(MHz)  | 2402 | 2440 | 2480 |
| GFSK 1M Setting | 0x18 | 0x18 | 0x18 |

Note: This information is provided by the applicant.

## 2.8. Duty Cycle

Refer to section 11: Appendix A

Note:

1. If duty cycle  $< 98\%$ , the conducted average output power and average power spectral density should be add duty factor.
2. If duty cycle  $\geq 98\%$ , the EUT is consider to be transmitting continuously, the conducted average output power and average power spectral density no need to add duty factor (consider to be zero).
3. The conducted peak output power and peak power spectral density no need to consider duty factor.
4. The on-time time is transmission duration (T).

## 2.9. Channel List

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|
| 0           | 2402            | 1           | 2404            |
| 2           | 2406            | 3           | 2408            |
| 4           | 2410            | 5           | 2412            |
| 6           | 2414            | 7           | 2416            |
| 8           | 2418            | 9           | 2420            |
| 10          | 2422            | 11          | 2424            |
| 12          | 2426            | 13          | 2428            |
| 14          | 2430            | 15          | 2432            |
| 16          | 2434            | 17          | 2436            |
| 18          | 2438            | 19          | 2440            |
| 20          | 2442            | 21          | 2444            |
| 22          | 2446            | 23          | 2448            |
| 24          | 2450            | 25          | 2452            |
| 26          | 2454            | 27          | 2456            |
| 28          | 2458            | 29          | 2460            |
| 30          | 2462            | 31          | 2464            |
| 32          | 2466            | 33          | 2468            |
| 34          | 2470            | 35          | 2472            |
| 36          | 2474            | 37          | 2476            |
| 38          | 2478            | 39          | 2480            |

## 2.10. Test Equipment List

| For conducted emission test |                 |              |            |                  |            |           |
|-----------------------------|-----------------|--------------|------------|------------------|------------|-----------|
| Equipment                   | Manufacturer    | Model No.    | Serial No. | Calibration Body | Last Cal.  | Next Cal. |
| EMI Test Receiver           | Rohde & Schwarz | ESHS30       | EST-E001   | LISAI            | June 12,23 | 1 Year    |
| Artificial Mains Network    | Rohde & Schwarz | ENV216       | EST-E002   | LISAI            | June 12,23 | 1 Year    |
| Pulse Limiter               | Rohde & Schwarz | ESH3-Z2      | EST-E078   | LISAI            | June 12,23 | 1 Year    |
| Test Software               | Audix           | e3-6.111221a | N/A        | N/A              | N/A        | N/A       |

| For radiated emission test(9kHz-30MHz) |                 |              |            |                  |            |           |
|----------------------------------------|-----------------|--------------|------------|------------------|------------|-----------|
| Equipment                              | Manufacturer    | Model No.    | Serial No. | Calibration Body | Last Cal.  | Next Cal. |
| EMI Test Receiver                      | Rohde & Schwarz | ESR7         | EST-E047   | LISAI            | June 12,23 | 1 Year    |
| Active Loop Antenna                    | SCHWARZB ECK    | FMZB 1519B   | EST-E054   | LISAI            | June 12,23 | 1 Year    |
| Test Software                          | Audix           | e3-6.111221a | N/A        | N/A              | N/A        | N/A       |
| 9kHz-30MHz Cable                       | N/A             | EST-001      | N/A        | N/A              | N/A        | N/A       |

| For radiated emissions test (30MHz-1000MHz) |                 |              |            |                  |            |           |
|---------------------------------------------|-----------------|--------------|------------|------------------|------------|-----------|
| Equipment                                   | Manufacturer    | Model No.    | Serial No. | Calibration Body | Last Cal.  | Next Cal. |
| EMI Test Receiver                           | Rohde & Schwarz | ESR7         | EST-E047   | LISAI            | June 12,23 | 1 Year    |
| Bilog Antenna                               | Teseq           | CBL 6111D    | EST-E034   | LISAI            | June 12,23 | 1 Year    |
| Test Software                               | Audix           | e3-6.111221a | N/A        | N/A              | N/A        | N/A       |
| 30-1000MHz Cable                            | N/A             | EST-002      | N/A        | N/A              | N/A        | N/A       |

| For radiated emission test(Above 1000MHz) |                |                  |            |                  |            |           |
|-------------------------------------------|----------------|------------------|------------|------------------|------------|-----------|
| Equipment                                 | Manufacturer   | Model No.        | Serial No. | Calibration Body | Last Cal.  | Next Cal. |
| Horn Antenna                              | SCHWARZB ECK   | BBHA9120D        | EST-E144   | LISAI            | June 12,23 | 1 Year    |
| Horn Antenna                              | Com-Power      | AHA-840          | EST-E133   | LISAI            | June 12,23 | 1 Year    |
| Low Noise Amplifier                       | RF             | TRLA-01018 0G45N | EST-E142   | LISAI            | June 12,23 | 1 Year    |
| Spectrum Analyzer                         | Rohde &Schwarz | FSV40            | EST-E069   | LISAI            | June 12,23 | 1 Year    |
| Test Software                             | Audix          | e3-6.111221a     | N/A        | N/A              | N/A        | N/A       |
| Above 1GHz Cable                          | N/A            | EST-003          | N/A        | N/A              | N/A        | N/A       |

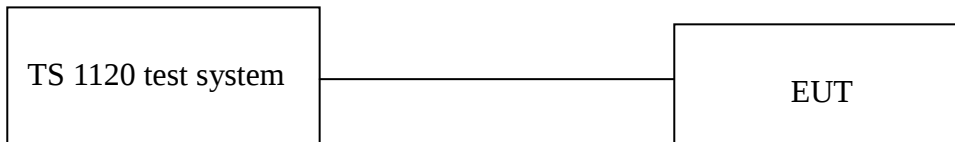
| For connect EUT antenna terminal test |              |           |            |                  |            |           |
|---------------------------------------|--------------|-----------|------------|------------------|------------|-----------|
| Equipment                             | Manufacturer | Model No. | Serial No. | Calibration Body | Last Cal.  | Next Cal. |
| TS 1120                               | Tonscend     | /         | /          | /                | /          | /         |
| Test Software                         | Tonscend     | TS1120-3  | 3.3.38     | /                | /          | /         |
| RF Control Unit                       | Tonscend     | JS0806-2  | EST-E134   | LISAI            | June 12,23 | 1 Year    |
| Signal and Spectrum Analyzer          | Keysight     | N9010B    | EST-E141   | LISAI            | June 12,23 | 1 Year    |

### 3. 6dB BANDWIDTH

#### 3.1. Limit

Systems using digital modulation techniques operate in the 2400-2483.5 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.2. Test Setup



#### 3.3. Spectrum Analyzer Setting

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 100KHz   |
| VBW                 | 300KHz   |
| Span                | 3MHz     |
| Sweep Time          | Auto     |
| Detector            | Peak     |
| Trace Mode          | Max Hold |

#### 3.4. Test Procedure

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 3.3.
- Set the EUT transmit continuously with maximum output power.
- Allow trace to stabilize, use the ndB down function to measure 6dB Bandwidth.
- Repeat above procedures until all channels were measured.
- Record the results in the test report.

#### 3.5. Test Result

Refer to section 11: Appendix B

## 4. MAXIMUM PEAK OUTPUT POWER

### 4.1. Limit

For systems using digital modulation in 2400-2483.5 MHz, the maximum peak output power is 1 Watt(30dBm).

### 4.2. Test Setup



### 4.3. Spectrum Analyzer Setting

| Spectrum Parameters | Setting                |
|---------------------|------------------------|
| RBW                 | $\geq$ DTS Bandwidth   |
| VBW                 | 3*RBW                  |
| Span                | $\geq$ 3*DTS Bandwidth |
| Sweep Time          | Auto                   |
| Detector            | Peak                   |
| Trace Mode          | Max Hold               |

### 4.4. Test Procedure

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 4.3.
- Set the EUT transmit continuously with maximum output power.
- Allow trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission.
- Repeat above procedures until all channels were measured.
- Record the results in the test report.

### 4.5. Test Result

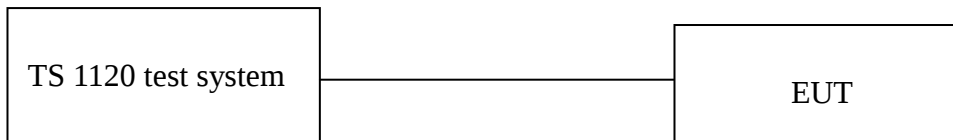
Refer to section 11: Appendix C

## 5. POWER SPECTRAL DENSITY

### 5.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.2. Test Setup



### 5.3. Spectrum Analyzer Setting

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 3KHz     |
| VBW                 | 10KHz    |
| Span                | 2MHz     |
| Sweep Time          | Auto     |
| Detector            | Peak     |
| Trace Mode          | Max Hold |

### 5.4. Test Procedure

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 5.3.
- Set the EUT transmit continuously with maximum output power.
- Allow trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission.
- Repeat above procedures until all channels were measured.
- Record the results in the test report.

### 5.5. Test Result

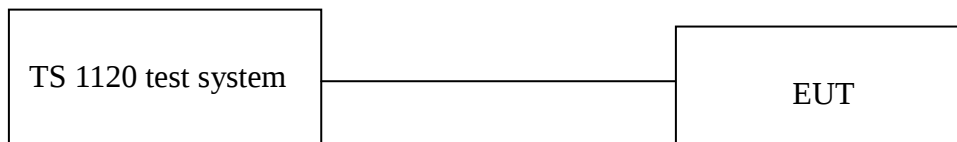
Refer to section 11: Appendix D

## 6. CONDUCTED BAND EDGE

### 6.1. Limit

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 6.2. Test Setup



### 6.3. Spectrum Analyzer Setting

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 100KHz   |
| VBW                 | 300KHz   |
| Span                | 100MHz   |
| Sweep Time          | Auto     |
| Detector            | Peak     |
| Trace Mode          | Max Hold |

### 6.4. Test Procedure

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 6.3.
- Set the EUT transmit continuously with maximum output power.
- Allow trace to stabilize, use the marker function to mark the highest emission level outside the authorized band.
- Repeat above procedures until all channels were measured.
- Record the results in the test report.

### 6.5. Test Result

Refer to section 11: Appendix E & F

## 7. CONDUCTED SPURIOUS EMISSIONS

### 7.1. Limit

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 7.2. Test Setup



### 7.3. Spectrum Analyzer Setting

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 100KHz   |
| VBW                 | 300KHz   |
| Start frequency     | 30MHz    |
| Stop frequency      | 26.5GHz  |
| Sweep Time          | Auto     |
| Detector            | Peak     |
| Trace Mode          | Max Hold |

### 7.4. Test Procedure

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 7.3.
- Set the EUT transmit continuously with maximum output power.
- Allow trace to stabilize, use the marker function to mark the highest emission level outside the authorized band.
- Repeat above procedures until all channels were measured.
- Record the results in the test report.

### 7.5. Test Result

Refer to section 11: Appendix E & G

## 8. RADIATED SPURIOUS EMISSIONS AND BAND EDGE

### 8.1. Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

#### 15.205 Restricted frequency band

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |

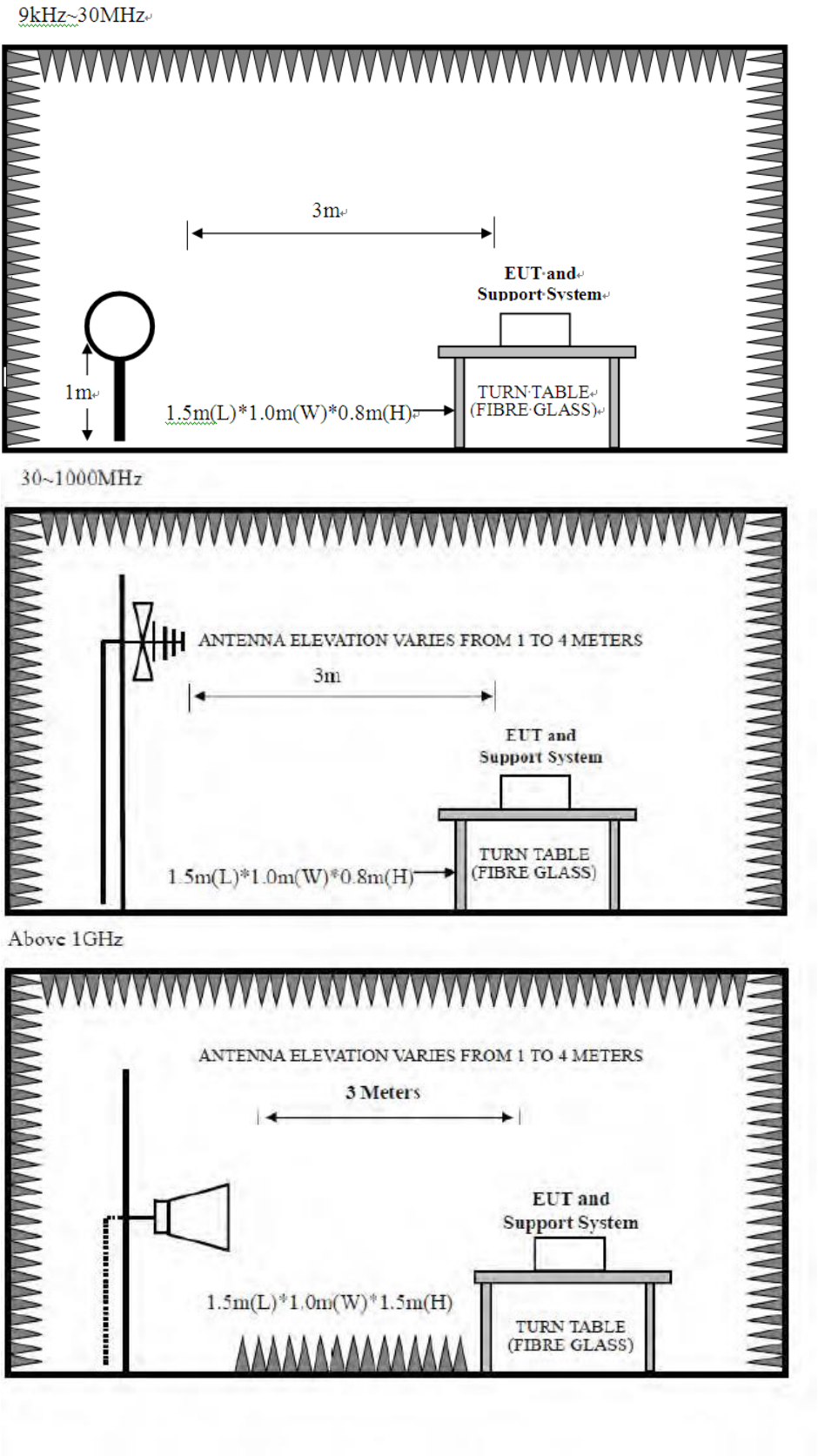
#### 15.209 Limit

| Frequency (MHz) | Field Strength( $\mu$ V/m) | Distance(m) |
|-----------------|----------------------------|-------------|
| 0.009-0.490     | 2400/F(kHz)                | 300         |
| 0.490-1.705     | 24000/F(kHz)               | 30          |
| 1.705-30        | 30                         | 30          |
| 30-88           | 100                        | 3           |
| 88-216          | 150                        | 3           |
| 216-960         | 200                        | 3           |
| Above 960       | 500                        | 3           |

Note:

- (1) Emission level dB $\mu$ V = 20 log Emission level  $\mu$ V/m.
- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

8.2. Test Setup



### 8.3. Spectrum Analyzer Setting

For 9KHz-150KHz

| Spectrum Parameters | Setting                                 |
|---------------------|-----------------------------------------|
| RBW                 | 300Hz(for Peak&AVG)/CISPR 200Hz(for QP) |
| VBW                 | 300Hz(for Peak&AVG)/CISPR 200Hz(for QP) |
| Start frequency     | 9KHz                                    |
| Stop frequency      | 150KHz                                  |
| Sweep Time          | Auto                                    |
| Detector            | PEAK/QP/AVG                             |
| Trace Mode          | Max Hold                                |

For 150KHz-30MHz

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 9KHz     |
| VBW                 | 9KHz     |
| Start frequency     | 150KHz   |
| Stop frequency      | 30MHz    |
| Sweep Time          | Auto     |
| Detector            | QP       |
| Trace Mode          | Max Hold |

For 30MHz-1GHz

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 120KHz   |
| VBW                 | 300KHz   |
| Start frequency     | 30MHz    |
| Stop frequency      | 1GHz     |
| Sweep Time          | Auto     |
| Detector            | QP       |
| Trace Mode          | Max Hold |

For Above 1GHz

| Spectrum Parameters | Setting                              |
|---------------------|--------------------------------------|
| RBW                 | 1MHz                                 |
| VBW                 | PEAK Measurement                     |
|                     | 3MHz                                 |
|                     | AVG Measurement                      |
|                     | Duty cycle $\geq 98\%$ , VBW=10Hz    |
|                     | Duty cycle $< 98\%$ , VBW $\geq 1/T$ |
| Start frequency     | 1GHz                                 |
| Stop frequency      | 25GHz                                |
| Sweep Time          | Auto                                 |
| Detector            | PEAK                                 |
| Trace Mode          | Max Hold                             |

Note :T is the on-time time of the duty cycle,when EUT transmit continuously with maximum output power,unit is seconds. reference section 2.8 for the on-time time.

## 8.4. Test Procedure

- a. EUT was placed on a turn table, which is 0.8 meter high above ground for below 1GHz test, and which is 1.5 meter high above ground for above 1GHz test.
- b. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower.
- c. Set the EUT transmit continuously with maximum output power.
- d. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
- e. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.
- f. Spectrum analyzer setting parameters in accordance with section 8.3.
- g. Repeat above procedures until all channels were measured.
- h. Record the results in the test report.

Note:

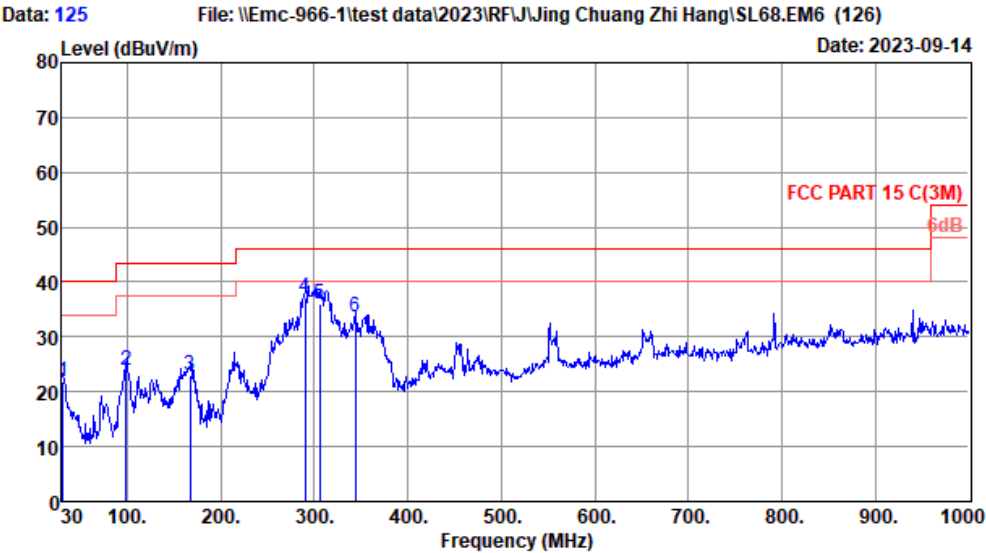
1. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
2. The frequency 2402MHz ,2440MHz and 2480MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

8.5. Test Result

Radiated Emissions Below 1GHz

EST Technology

Chilingxiang, Qishantou, Santun,  
Houjie, Dongguan, Guangdong, China  
Tel: +86-769-83081888  
Fax: +86-769-83081878



Site no. : 1# 966 Chamber Data no. : 125  
Dis. / Ant. : 3m 37062 Ant. pol. : VERTICAL  
Limit : FCC PART 15 C(3M)  
Env. / Ins. : Temp:23.9°C;Humi:53.5%;Press:101.82KPa  
Engineer : DCY  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : TX Mode

|   | Freq.<br>(MHz) | ANT<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|-------------------------|-----------------------|-------------------|-------------------------------|-------------------|----------------|--------|
| 1 | 30.97          | 18.10                   | 0.71                  | 3.09              | 21.90                         | 40.00             | 18.10          | QP     |
| 2 | 98.87          | 10.20                   | 1.40                  | 12.21             | 23.81                         | 43.50             | 19.69          | QP     |
| 3 | 166.77         | 9.20                    | 1.86                  | 11.90             | 22.96                         | 43.50             | 20.54          | QP     |
| 4 | 289.96         | 13.80                   | 2.57                  | 20.97             | 37.34                         | 46.00             | 8.66           | QP     |
| 5 | 305.48         | 13.30                   | 2.65                  | 20.19             | 36.14                         | 46.00             | 9.86           | QP     |
| 6 | 344.28         | 14.94                   | 2.82                  | 15.85             | 33.61                         | 46.00             | 12.39          | QP     |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.

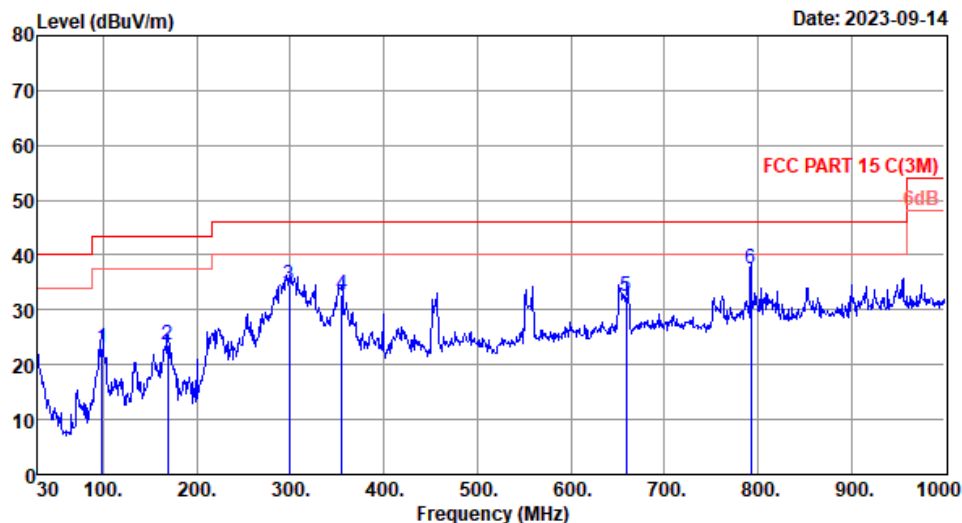
## EST Technology

Chilingxiang, Qishantou, Santun,  
Houjie, Dongguan, Guangdong, China  
Tel: +86-769-83081888  
Fax: +86-769-83081878

Data: 126

File: \\Emc-966-1\test data\2023\RFJJing Chuang Zhi Hang\SL68.EM6 (126)

Date: 2023-09-14



Site no. : 1# 966 Chamber Data no. : 126  
 Dis. / Ant. : 3m 37062 Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15 C(3M)  
 Env. / Ins. : Temp:23.9°C;Humi:53.5%;Press:101.82KPa  
 Engineer : DCY  
 EUT : Robot Vacuum Cleaner  
 Power : DC 14.4V From Battery  
 M/N : SL68  
 Test Mode : TX Mode

|   | Freq.<br>(MHz) | ANT<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|-------------------------|-----------------------|-------------------|-------------------------------|-------------------|----------------|--------|
| 1 | 98.87          | 10.20                   | 1.40                  | 11.50             | 23.10                         | 43.50             | 20.40          | QP     |
| 2 | 168.71         | 10.00                   | 1.87                  | 11.73             | 23.60                         | 43.50             | 19.90          | QP     |
| 3 | 298.69         | 14.02                   | 2.62                  | 17.77             | 34.41                         | 46.00             | 11.59          | QP     |
| 4 | 354.95         | 15.20                   | 2.86                  | 14.57             | 32.63                         | 46.00             | 13.37          | QP     |
| 5 | 659.53         | 21.30                   | 4.05                  | 7.01              | 32.36                         | 46.00             | 13.64          | QP     |
| 6 | 792.42         | 23.42                   | 4.49                  | 9.52              | 37.43                         | 46.00             | 8.57           | QP     |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. Margin= Limit - Emission Level.  
 3. The emission levels that are 20dB below the official limit are not reported.

## Note:

1. The amplitude of 9KHz to 30MHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
2. All channels had been pre-test, only the worst case was reported.

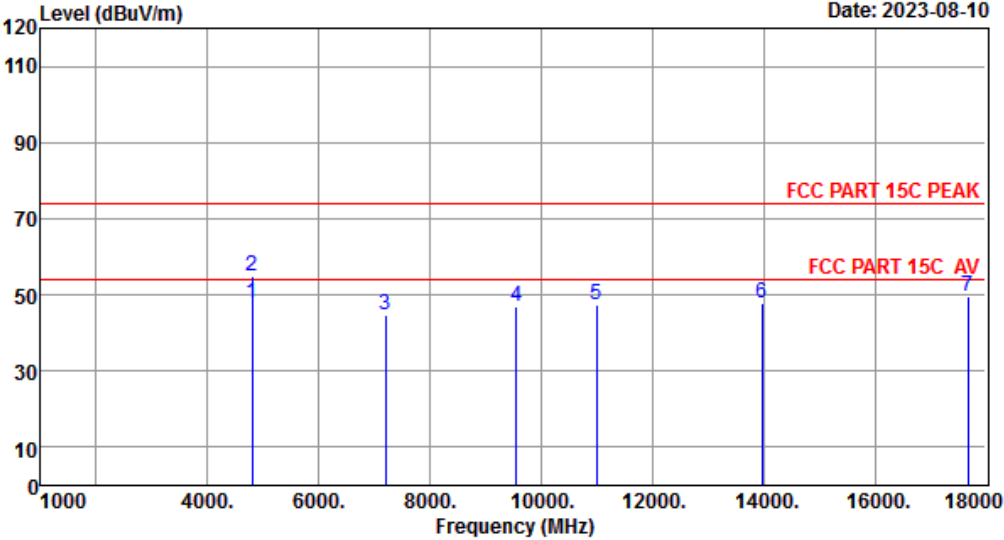


Radiated Emissions Above 1G

EST Technology

Chilingxiang, Qishantou, Santun,  
Houjie, Dongguan, Guangdong, China  
Tel: +86-769-83081888  
Fax: +86-769-83081878

Data: 73 File: \\EMC-966-1\\test data\\2023\\RF\\Jing Chuang Zhi Hang\\SL68.EM6 (92) Date: 2023-08-10



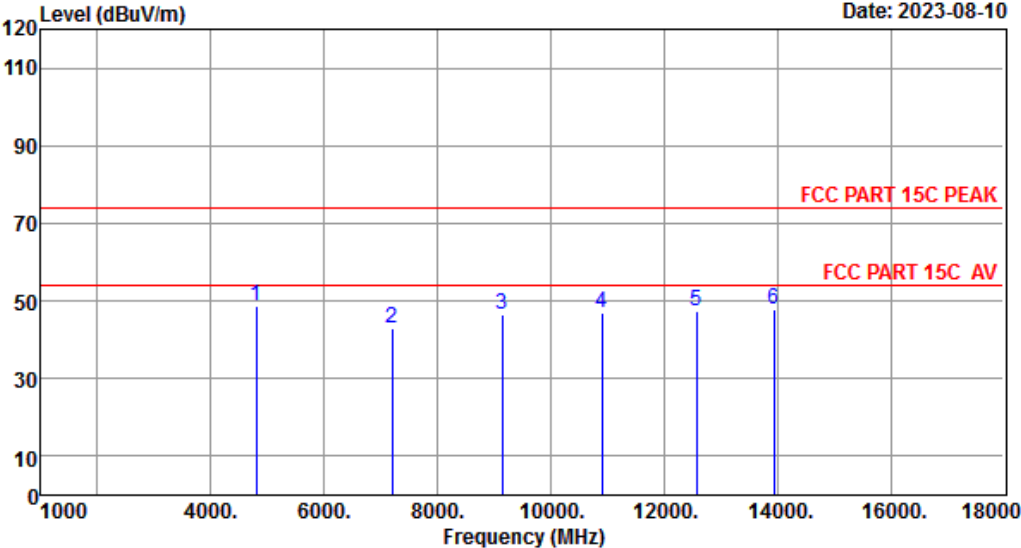
Site no. : 1# 966 Chamber Data no. : 73  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : VERTICAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8°C;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBUV) | Emission<br>Level<br>(dBUV/m) | Limits<br>(dBUV/m) | Margin<br>(dB) | Remark  |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 4804.00        | 32.39                    | 5.20                  | 0.00                  | 10.26             | 47.85                         | 54.00              | 6.15           | Average |
| 2 | 4804.00        | 32.39                    | 5.20                  | 0.00                  | 17.30             | 54.89                         | 74.00              | 19.11          | Peak    |
| 3 | 7206.00        | 36.16                    | 6.67                  | 0.00                  | 1.72              | 44.55                         | 74.00              | 29.45          | Peak    |
| 4 | 9551.00        | 38.11                    | 7.77                  | 0.00                  | 1.25              | 47.13                         | 74.00              | 26.87          | Peak    |
| 5 | 10996.00       | 38.90                    | 8.26                  | 0.00                  | 0.27              | 47.43                         | 74.00              | 26.57          | Peak    |
| 6 | 13971.00       | 39.99                    | 9.75                  | 0.00                  | -1.92             | 47.82                         | 74.00              | 26.18          | Peak    |
| 7 | 17677.00       | 40.53                    | 12.17                 | 0.00                  | -3.20             | 49.50                         | 74.00              | 24.50          | Peak    |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.



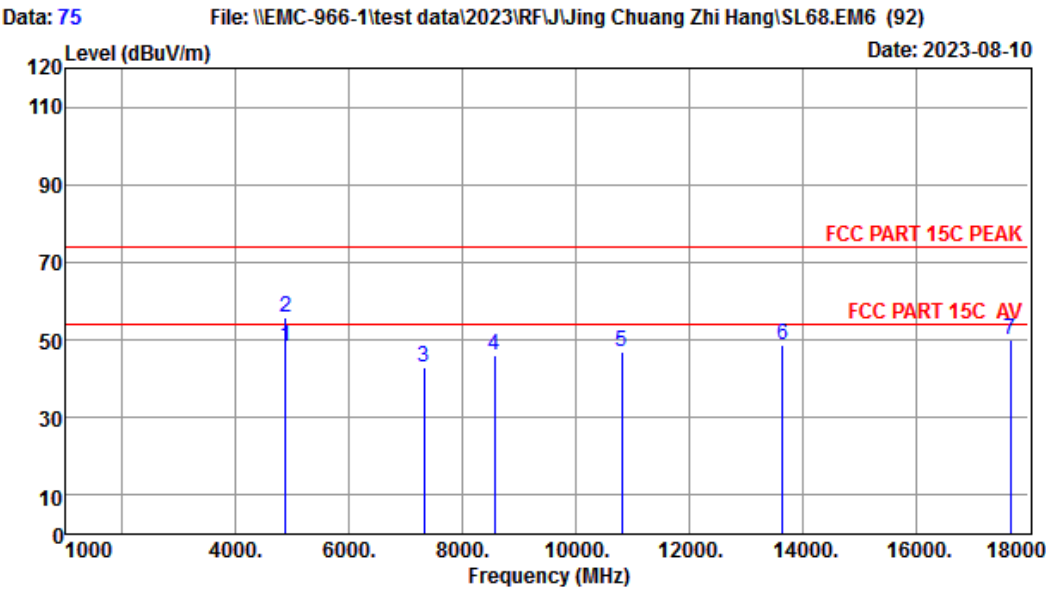
Data: 74                      File: \\EMC-966-1\\test data\\2023\\RF\\Jing Chuang Zhi Hang\\SL68.EM6 (92)                      Date: 2023-08-10



Site no. : 1# 966 Chamber                      Data no. : 74  
Dis. / Ant. : 3m BBHA9120D-2667                      Ant. pol. : HORIZONTAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8℃;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 4804.00        | 32.39                    | 5.20                  | 44.49                 | 55.70             | 48.80                         | 74.00              | 25.20          | Peak   |
| 2 | 7206.00        | 36.16                    | 6.67                  | 44.08                 | 44.04             | 42.79                         | 74.00              | 31.21          | Peak   |
| 3 | 9143.00        | 38.03                    | 7.78                  | 43.46                 | 44.04             | 46.39                         | 74.00              | 27.61          | Peak   |
| 4 | 10911.00       | 38.84                    | 8.22                  | 43.07                 | 42.93             | 46.92                         | 74.00              | 27.08          | Peak   |
| 5 | 12577.00       | 39.32                    | 9.08                  | 41.39                 | 40.32             | 47.33                         | 74.00              | 26.67          | Peak   |
| 6 | 13937.00       | 39.98                    | 9.74                  | 40.80                 | 38.83             | 47.75                         | 74.00              | 26.25          | Peak   |

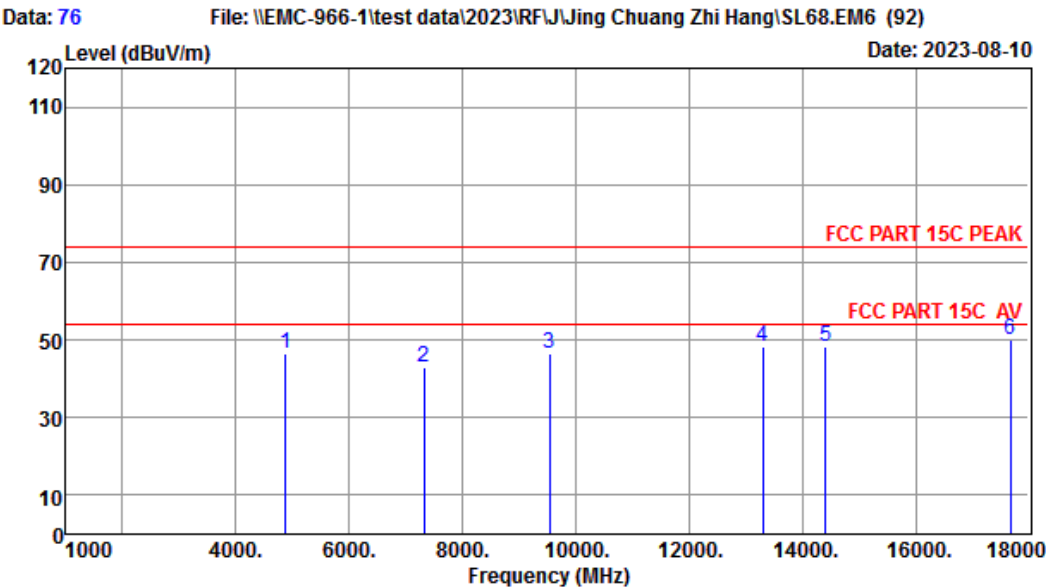
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 75  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : VERTICAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8℃;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2440MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 4880.00        | 32.55                    | 5.28                  | 44.42                 | 54.93             | 48.34                         | 54.00              | 5.66           | Average |
| 2 | 4880.00        | 32.55                    | 5.28                  | 44.42                 | 62.57             | 55.98                         | 74.00              | 18.02          | Peak    |
| 3 | 7320.00        | 36.26                    | 6.70                  | 44.07                 | 43.98             | 42.87                         | 74.00              | 31.13          | Peak    |
| 4 | 8565.00        | 37.48                    | 7.40                  | 43.66                 | 44.61             | 45.83                         | 74.00              | 28.17          | Peak    |
| 5 | 10809.00       | 38.77                    | 8.17                  | 43.15                 | 42.95             | 46.74                         | 74.00              | 27.26          | Peak    |
| 6 | 13648.00       | 39.89                    | 9.59                  | 40.80                 | 40.16             | 48.84                         | 74.00              | 25.16          | Peak    |
| 7 | 17677.00       | 40.53                    | 12.17                 | 43.18                 | 40.60             | 50.12                         | 74.00              | 23.88          | Peak    |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.

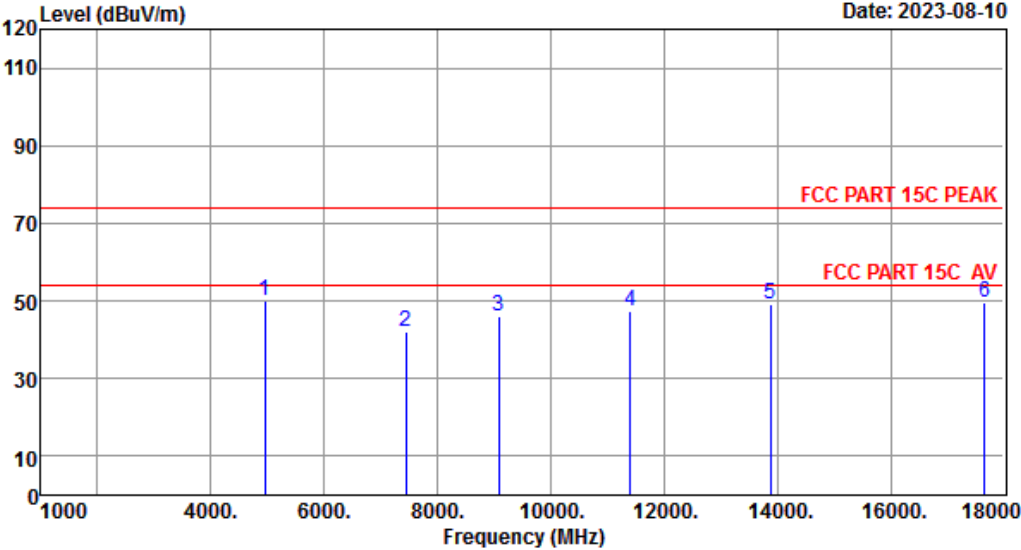


Site no. : 1# 966 Chamber Data no. : 76  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : HORIZONTAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8℃;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2440MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 4880.00        | 32.55                    | 5.28                  | 44.42                 | 53.28             | 46.69                         | 74.00              | 27.31          | Peak   |
| 2 | 7320.00        | 36.26                    | 6.70                  | 44.07                 | 44.27             | 43.16                         | 74.00              | 30.84          | Peak   |
| 3 | 9534.00        | 38.11                    | 7.77                  | 43.61                 | 44.44             | 46.71                         | 74.00              | 27.29          | Peak   |
| 4 | 13308.00       | 39.79                    | 9.42                  | 40.80                 | 39.72             | 48.13                         | 74.00              | 25.87          | Peak   |
| 5 | 14413.00       | 39.79                    | 9.97                  | 41.82                 | 40.49             | 48.43                         | 74.00              | 25.57          | Peak   |
| 6 | 17677.00       | 40.53                    | 12.17                 | 43.18                 | 40.66             | 50.18                         | 74.00              | 23.82          | Peak   |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.

Data: 77 File: \\EMC-966-1\\test data\\2023\\RF\\J\\Jing Chuang Zhi Hang\\SL68.EM6 (92) Date: 2023-08-10



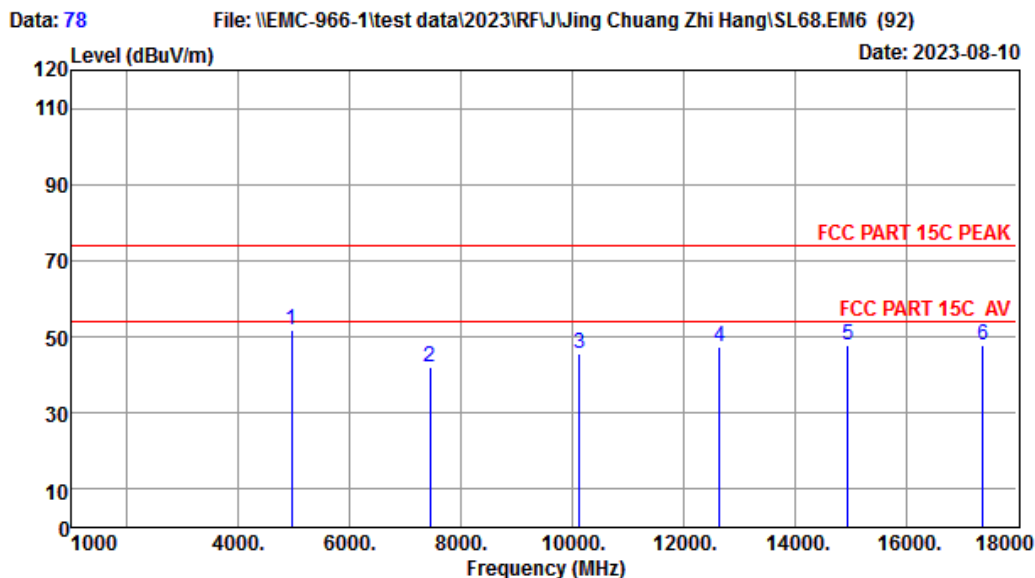
Site no. : 1# 966 Chamber Data no. : 77  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : HORIZONTAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8℃;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 4960.00        | 32.72                    | 5.37                  | 44.33                 | 56.44             | 50.20                         | 74.00              | 23.80          | Peak   |
| 2 | 7440.00        | 36.35                    | 6.74                  | 44.06                 | 42.89             | 41.92                         | 74.00              | 32.08          | Peak   |
| 3 | 9075.00        | 38.01                    | 7.78                  | 43.43                 | 43.77             | 46.13                         | 74.00              | 27.87          | Peak   |
| 4 | 11404.00       | 38.86                    | 8.49                  | 42.67                 | 42.63             | 47.31                         | 74.00              | 26.69          | Peak   |
| 5 | 13886.00       | 39.97                    | 9.71                  | 40.80                 | 40.25             | 49.13                         | 74.00              | 24.87          | Peak   |
| 6 | 17660.00       | 40.48                    | 12.15                 | 43.21                 | 40.00             | 49.42                         | 74.00              | 24.58          | Peak   |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.

## EST Technology

Chilingxiang, Qishantou, Santun,  
Houjie, Dongguan, Guangdong, China  
Tel: +86-769-83081888  
Fax: +86-769-83081878



Site no. : 1# 966 Chamber Data no. : 78  
 Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : VERTICAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : Temp:24.8°C;Humi:53%;Press:101.52kPa  
 Engineer : QQZ  
 EUT : Robot Vacuum Cleaner  
 Power : DC 14.4V From Battery  
 M/N : SL68  
 Test Mode : GFSK 1Mbps TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 4960.00        | 32.72                    | 5.37                  | 44.33                 | 58.18             | 51.94                         | 74.00              | 22.06          | Peak   |
| 2 | 7440.00        | 36.35                    | 6.74                  | 44.06                 | 42.97             | 42.00                         | 74.00              | 32.00          | Peak   |
| 3 | 10129.00       | 38.29                    | 7.84                  | 43.69                 | 43.18             | 45.62                         | 74.00              | 28.38          | Peak   |
| 4 | 12645.00       | 39.38                    | 9.11                  | 41.30                 | 40.26             | 47.45                         | 74.00              | 26.55          | Peak   |
| 5 | 14957.00       | 39.52                    | 10.23                 | 43.17                 | 41.21             | 47.79                         | 74.00              | 26.21          | Peak   |
| 6 | 17388.00       | 39.58                    | 11.91                 | 43.62                 | 39.88             | 47.75                         | 74.00              | 26.25          | Peak   |

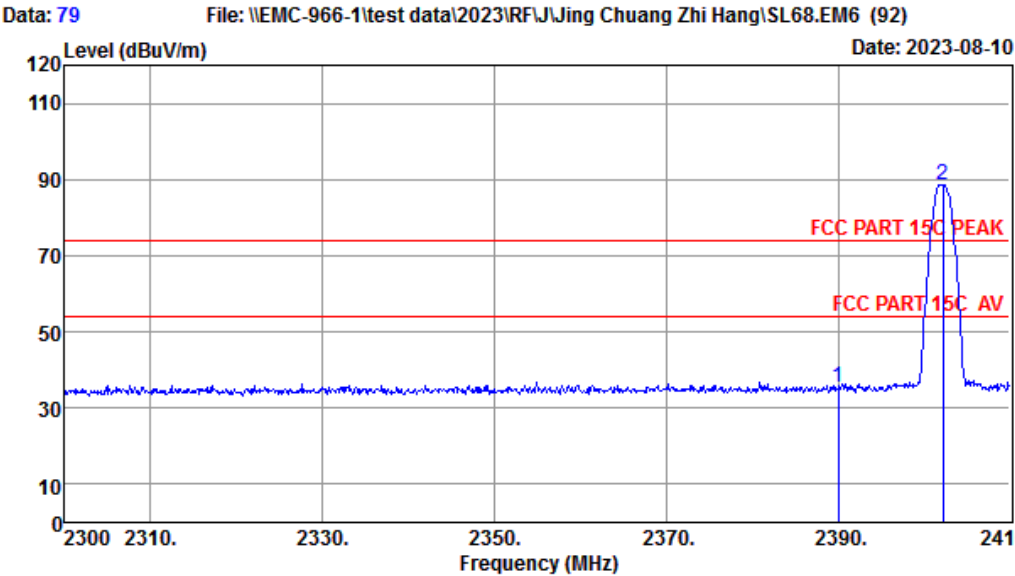
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. Margin= Limit - Emission Level.  
 3. The emission levels that are 20dB below the official limit are not reported.

Note: The amplitude of 18GHz to 25GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Radiated Band Edge

EST Technology

Chilingxiang, Qishantou, Santun,  
Houjie, Dongguan, Guangdong, China  
Tel: +86-769-83081888  
Fax: +86-769-83081878

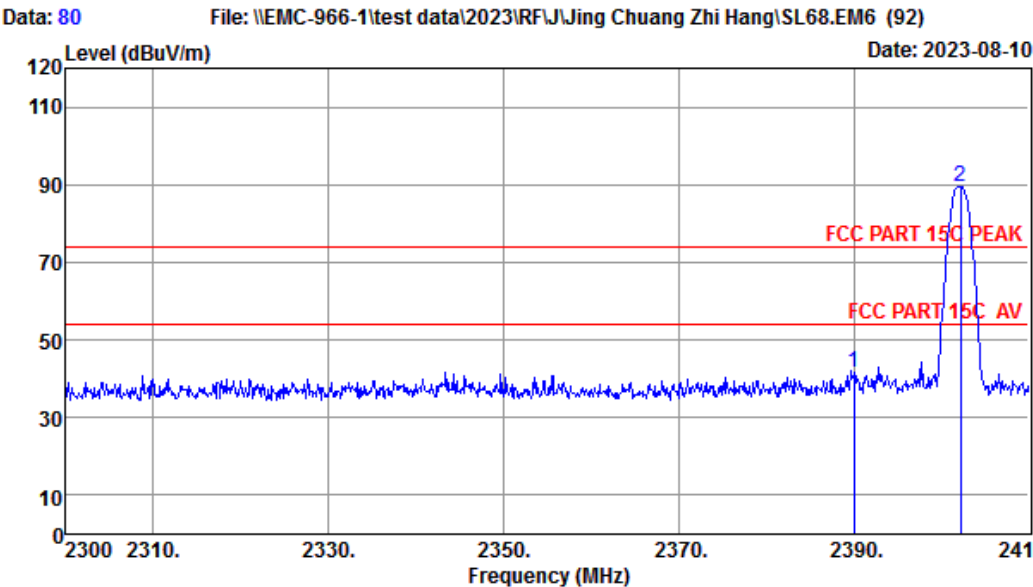


Site no. : 1# 966 Chamber Data no. : 79  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : HORIZONTAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8°C;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2390.00        | 27.43                    | 3.55                  | 45.01                 | 49.52             | 35.49                         | 74.00              | 38.51          | Peak   |
| 2 | 2402.19        | 27.47                    | 3.55                  | 45.01                 | 102.53            | 88.54                         | 74.00              | -14.54         | Peak   |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.

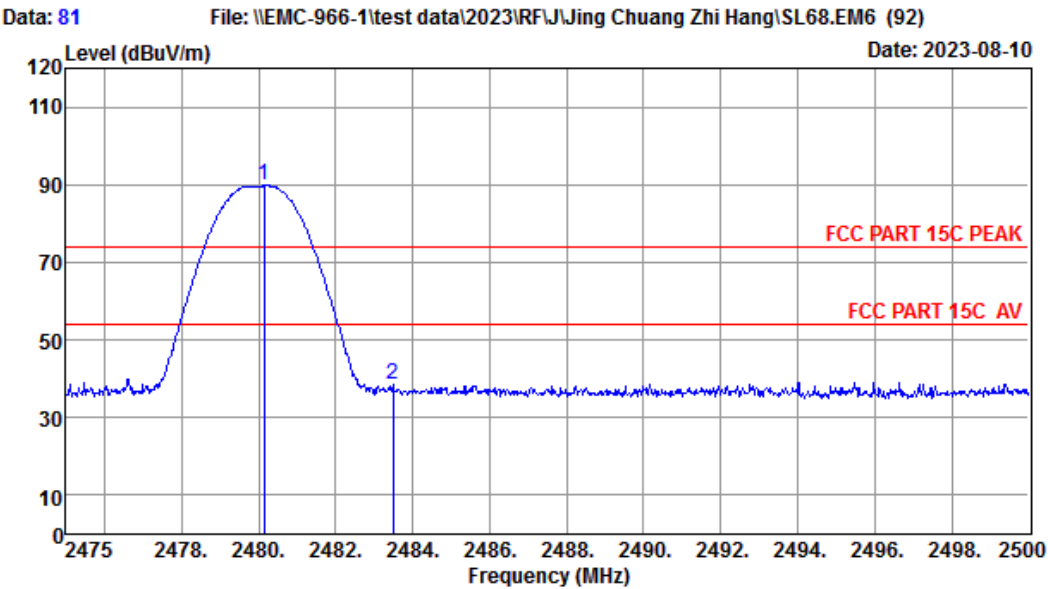




Site no. : 1# 966 Chamber Data no. : 80  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : VERTICAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8℃;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2390.00        | 27.43                    | 3.55                  | 45.01                 | 55.54             | 41.51                         | 74.00              | 32.49          | Peak   |
| 2 | 2402.19        | 27.47                    | 3.55                  | 45.01                 | 103.30            | 89.31                         | 74.00              | -15.31         | Peak   |

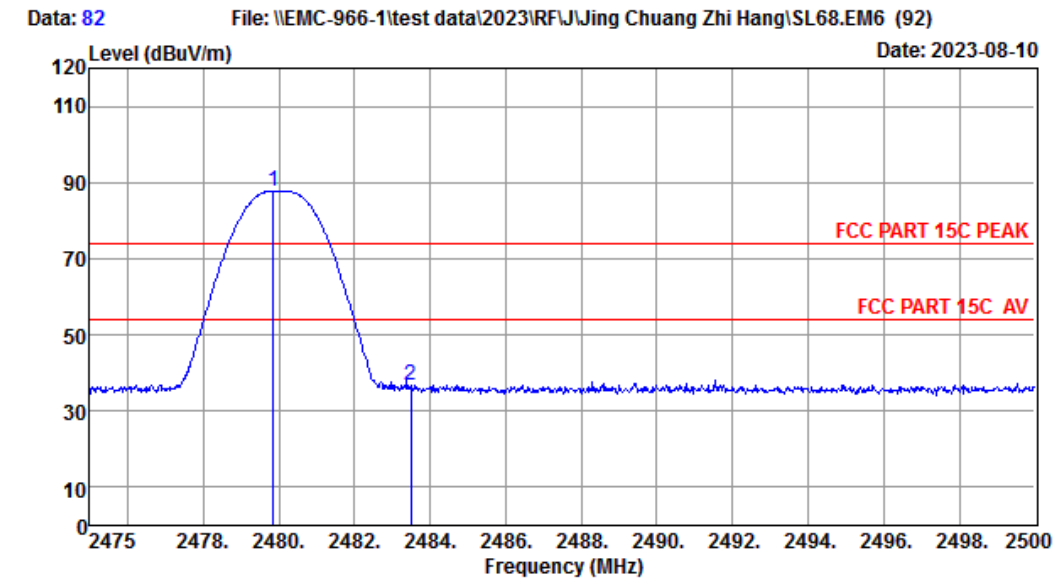
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 81  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : VERTICAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8°C;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2480.15        | 27.69                    | 3.62                  | 44.93                 | 103.31            | 89.69                         | 74.00              | -15.69         | Peak   |
| 2 | 2483.50        | 27.70                    | 3.62                  | 44.93                 | 52.11             | 38.50                         | 74.00              | 35.50          | Peak   |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 82  
Dis. / Ant. : 3m BBHA9120D-2667 Ant. pol. : HORIZONTAL  
Limit : FCC PART 15C PEAK  
Env. / Ins. : Temp:24.8°C;Humi:53%;Press:101.52kPa  
Engineer : QQZ  
EUT : Robot Vacuum Cleaner  
Power : DC 14.4V From Battery  
M/N : SL68  
Test Mode : GFSK 1Mbps TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2479.85        | 27.69                    | 3.62                  | 44.93                 | 101.28            | 87.66                         | 74.00              | -13.66         | Peak   |
| 2 | 2483.50        | 27.70                    | 3.62                  | 44.93                 | 50.45             | 36.84                         | 74.00              | 37.16          | Peak   |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
2. Margin= Limit - Emission Level.  
3. The emission levels that are 20dB below the official limit are not reported.

Note: All channels had been pre-test,only of the worst case channels were reported.

## 9. AC POWER LINE CONDUCTED EMISSIONS

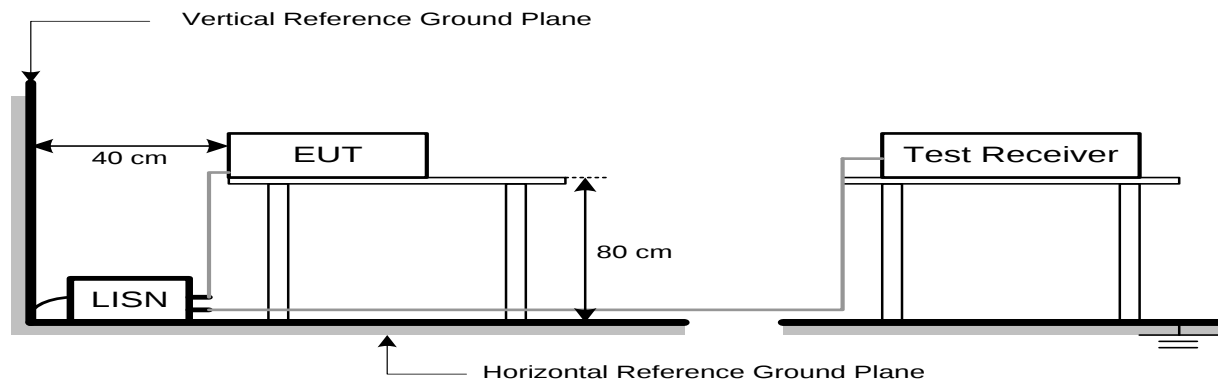
### 9.1. Limit

| Frequency |   |        | Maximum RF Line Voltage          |                               |
|-----------|---|--------|----------------------------------|-------------------------------|
|           |   |        | Quasi-Peak Level<br>dB( $\mu$ V) | Average Level<br>dB( $\mu$ V) |
| 150kHz    | ~ | 500kHz | 66 ~ 56*                         | 56 ~ 46*                      |
| 500kHz    | ~ | 5MHz   | 56                               | 46                            |
| 5MHz      | ~ | 30MHz  | 60                               | 50                            |

Note:

1. \* Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

### 9.2. Test Setup



### 9.3. Spectrum Analyzer Setting

| Spectrum Parameters | Setting  |
|---------------------|----------|
| RBW                 | 9KHz     |
| VBW                 | 9KHz     |
| Start frequency     | 150KHz   |
| Stop frequency      | 30MHz    |
| Sweep Time          | Auto     |
| Detector            | QP/AVG   |
| Trace Mode          | Max Hold |

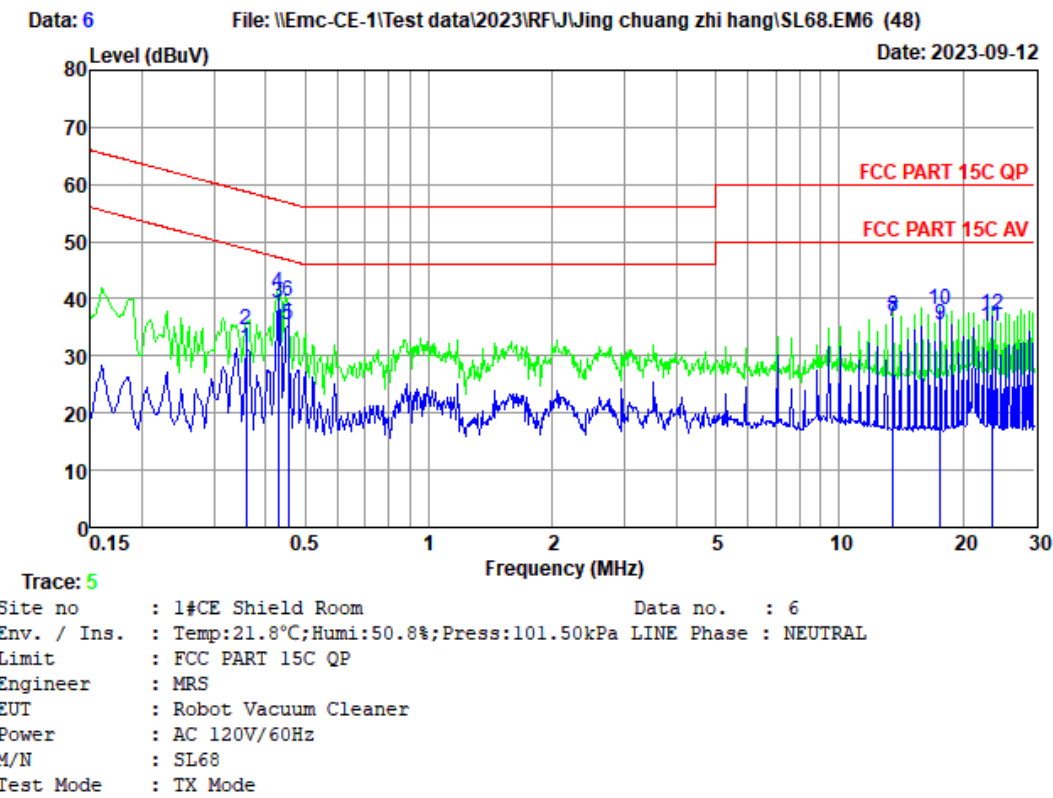
### 9.4. Test Procedure

- a. The EUT was placed on a non-metallic table, 80cm above the ground plane.
- b. The EUT Power connected to the power mains through a line impedance stabilization network.
- c. Provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs).
- d. Set the EUT transmit continuously with maximum output power.
- e. Spectrum analyzer setting parameters in accordance with section 9.3.
- f. The AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Test.
- g. Record the results in the test report.

9.5. Test Result

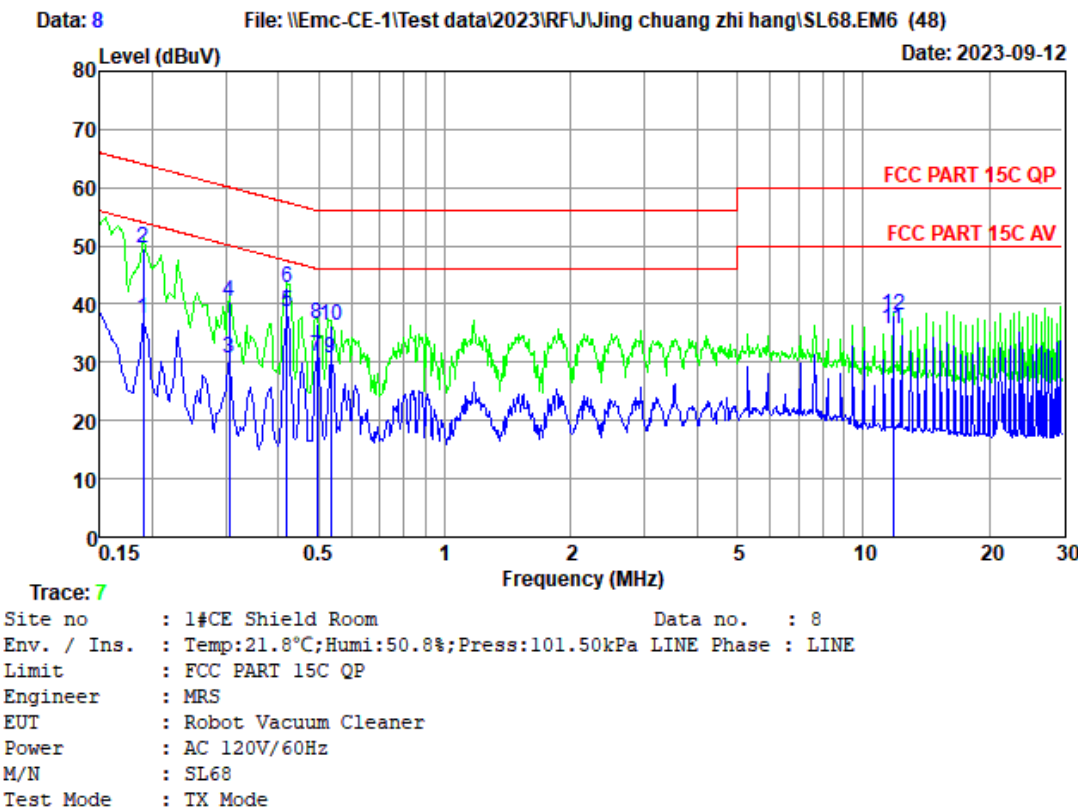
EST Technology

Chilingxiang, Qishantou, Santun,  
Houjie, Dongguan,Guangdong,China  
Tel:+86-769-83081888  
Fax:+86-769-83081878



|    | Freq.<br>(MHz) | LISN<br>Factor<br>(db) | Cable<br>Loss<br>(db) | Reading<br>dBuV | Emission<br>Level<br>(dBuv) | Limits<br>(dBuv) | Margin<br>(dB) | Remark  |
|----|----------------|------------------------|-----------------------|-----------------|-----------------------------|------------------|----------------|---------|
| 1  | 0.360          | 10.26                  | 9.92                  | 10.99           | 31.17                       | 48.74            | 17.57          | Average |
| 2  | 0.360          | 10.26                  | 9.92                  | 14.24           | 34.42                       | 58.74            | 24.32          | QP      |
| 3  | 0.431          | 10.24                  | 9.91                  | 19.16           | 39.31                       | 47.24            | 7.93           | Average |
| 4  | 0.431          | 10.24                  | 9.91                  | 20.86           | 41.01                       | 57.24            | 16.23          | QP      |
| 5  | 0.454          | 10.23                  | 9.91                  | 15.20           | 35.34                       | 46.80            | 11.46          | Average |
| 6  | 0.454          | 10.23                  | 9.91                  | 19.47           | 39.61                       | 56.80            | 17.19          | QP      |
| 7  | 13.551         | 10.11                  | 9.97                  | 15.79           | 35.87                       | 50.00            | 14.13          | Average |
| 8  | 13.551         | 10.11                  | 9.97                  | 16.88           | 36.96                       | 60.00            | 23.04          | QP      |
| 9  | 17.661         | 10.19                  | 10.04                 | 15.11           | 35.34                       | 50.00            | 14.66          | Average |
| 10 | 17.661         | 10.19                  | 10.04                 | 17.82           | 38.05                       | 60.00            | 21.95          | QP      |
| 11 | 23.511         | 10.29                  | 10.09                 | 14.65           | 35.03                       | 50.00            | 14.97          | Average |
| 12 | 23.511         | 10.29                  | 10.09                 | 16.86           | 37.24                       | 60.00            | 22.76          | QP      |

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.  
2. Margin= Limit - Emission Level.  
3. If the average limit is met when using a quasi-peak detector,  
the EUT shall be deemed to meet both limits and measurement  
with average detector is unnecessary.



|    | Freq.<br>(MHz) | LISN<br>Factor<br>(db) | Cable<br>Loss<br>(db) | Reading<br>dBuV | Emission<br>Level<br>(dBuV) | Limits<br>(dBuV) | Margin<br>(dB) | Remark  |
|----|----------------|------------------------|-----------------------|-----------------|-----------------------------|------------------|----------------|---------|
| 1  | 0.190          | 10.32                  | 9.90                  | 17.23           | 37.45                       | 54.02            | 16.57          | Average |
| 2  | 0.190          | 10.32                  | 9.90                  | 29.52           | 49.74                       | 64.02            | 14.28          | QP      |
| 3  | 0.305          | 10.21                  | 9.92                  | 10.62           | 30.75                       | 50.10            | 19.35          | Average |
| 4  | 0.305          | 10.21                  | 9.92                  | 20.24           | 40.37                       | 60.10            | 19.73          | QP      |
| 5  | 0.419          | 10.20                  | 9.91                  | 18.55           | 38.66                       | 47.46            | 8.80           | Average |
| 6  | 0.419          | 10.20                  | 9.91                  | 22.66           | 42.77                       | 57.46            | 14.69          | QP      |
| 7  | 0.494          | 10.21                  | 9.91                  | 11.00           | 31.12                       | 46.10            | 14.98          | Average |
| 8  | 0.494          | 10.21                  | 9.91                  | 16.47           | 36.59                       | 56.10            | 19.51          | QP      |
| 9  | 0.535          | 10.24                  | 9.92                  | 10.54           | 30.70                       | 46.00            | 15.30          | Average |
| 10 | 0.535          | 10.24                  | 9.92                  | 16.04           | 36.20                       | 56.00            | 19.80          | QP      |
| 11 | 11.807         | 10.44                  | 9.92                  | 15.34           | 35.70                       | 50.00            | 14.30          | Average |
| 12 | 11.807         | 10.44                  | 9.92                  | 17.76           | 38.12                       | 60.00            | 21.88          | QP      |

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.  
2. Margin= Limit - Emission Level.  
3. If the average limit is met when using a quasi-peak detector,  
the EUT shall be deemed to meet both limits and measurement  
with average detector is unnecessary.

## 10. ANTENNA REQUIREMENTS

### 10.1. Limit

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### 10.2. Test Result

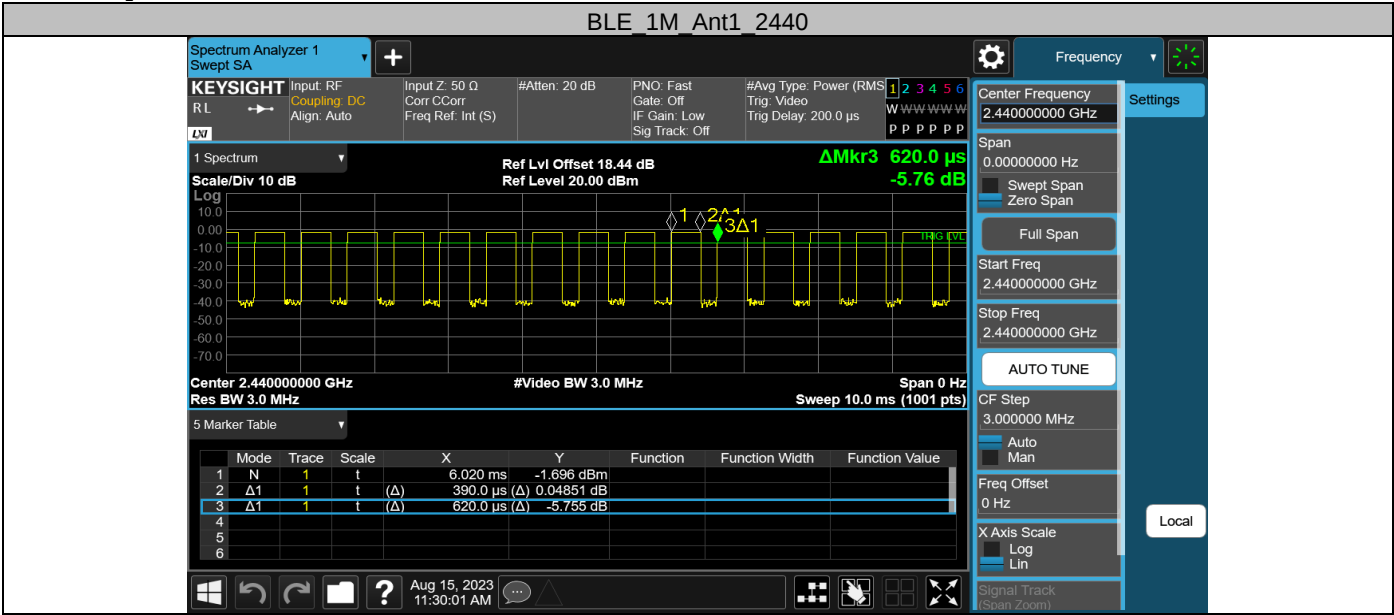
The antennas used for this product is integral antenna ,so compliance with antenna requirements. ( Please refer to the EUT photo for details)

11.APPENDIX

Appendix A: Duty Cycle  
Test Result

| Test Mode | Antenna | Frequency[MHz] | ON Time [ms] | Period [ms] | Duty Cycle [%] | Duty Cycle Factor [dB] |
|-----------|---------|----------------|--------------|-------------|----------------|------------------------|
| BLE_1M    | Ant1    | 2440           | 0.39         | 0.62        | 62.90          | 2.01                   |

Test Graphs



Appendix B: DTS Bandwidth  
Test Result

| Test Mode | Antenna | Frequency[MHz] | DTS BW<br>[MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|-----------|---------|----------------|-----------------|----------|----------|------------|---------|
| BLE_1M    | Ant1    | 2402           | 0.684           | 2401.655 | 2402.339 | 0.5        | PASS    |
|           |         | 2440           | 0.714           | 2439.646 | 2440.360 | 0.5        | PASS    |
|           |         | 2480           | 0.717           | 2479.640 | 2480.357 | 0.5        | PASS    |



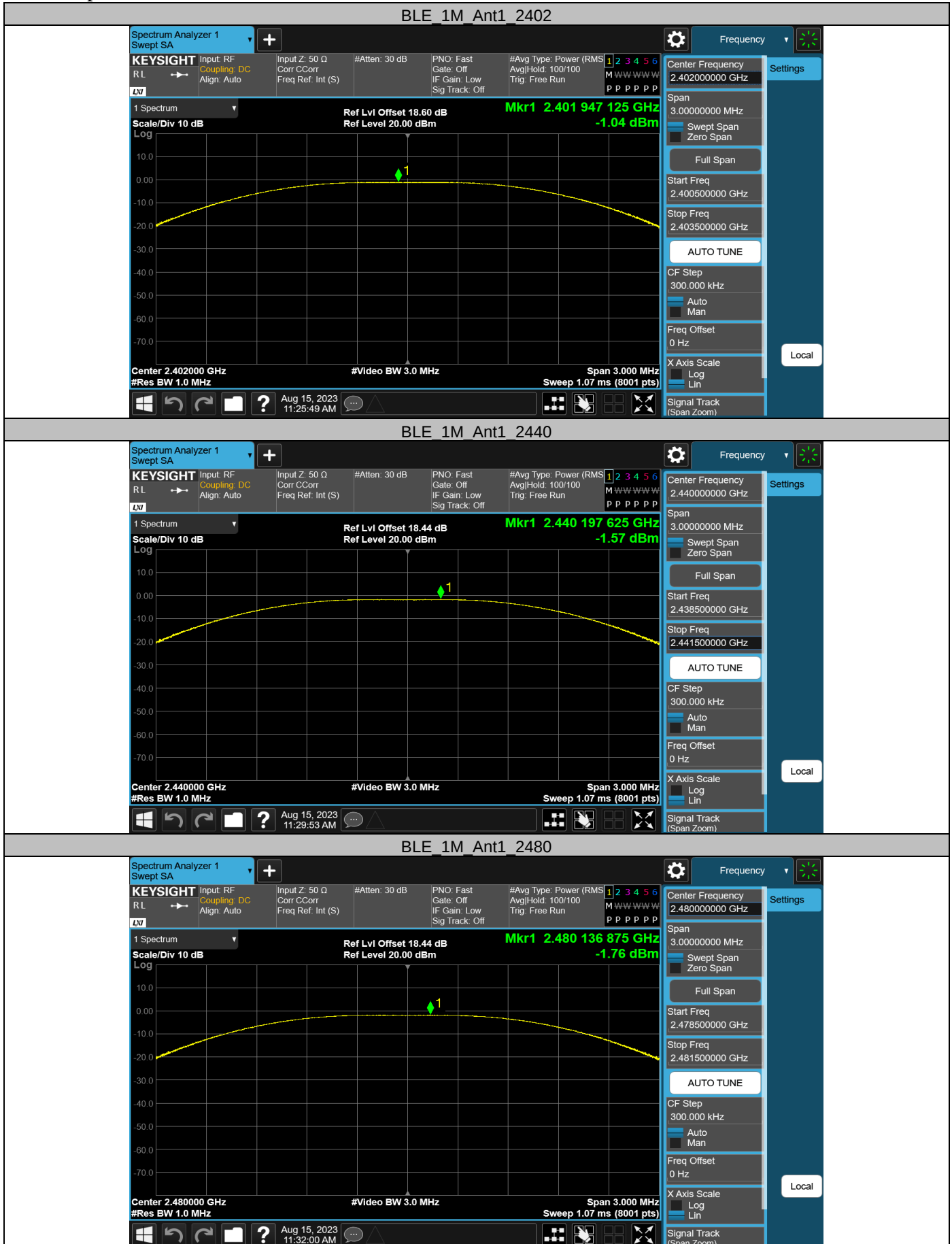
## Test Graphs



Appendix C: Maximum conducted output power  
Test Result Peak

| Test Mode | Antenna | Frequency [MHz] | Conducted Peak Power [dBm] | Conducted Limit [dBm] | Verdict |
|-----------|---------|-----------------|----------------------------|-----------------------|---------|
| BLE_1M    | Ant1    | 2402            | -1.04                      | ≤30                   | PASS    |
|           |         | 2440            | -1.57                      | ≤30                   | PASS    |
|           |         | 2480            | -1.76                      | ≤30                   | PASS    |

## Test Graphs Peak

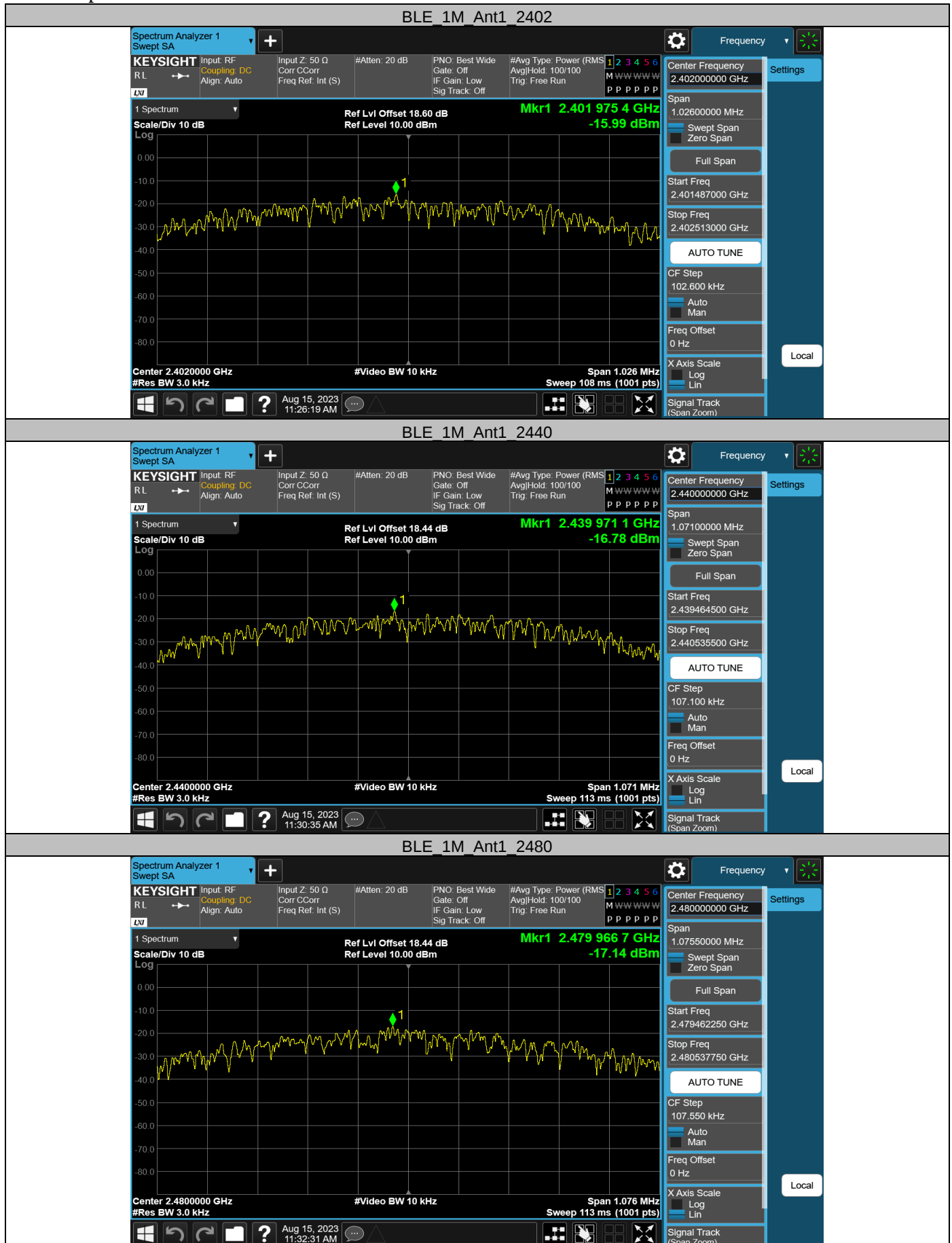


Appendix D: Maximum power spectral density  
Test Result

| Test Mode | Antenna | Frequency[MHz] | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|-----------|---------|----------------|------------------|-----------------|---------|
| BLE_1M    | Ant1    | 2402           | -15.99           | ≤8.00           | PASS    |
|           |         | 2440           | -16.78           | ≤8.00           | PASS    |
|           |         | 2480           | -17.14           | ≤8.00           | PASS    |



## Test Graphs



Appendix E: Reference level measurement  
Test Result

| Test Mode | Antenna | Freq(MHz) | Max.Point[MHz] | Result[dBm] |
|-----------|---------|-----------|----------------|-------------|
| BLE_1M    | Ant1    | 2402      | 2401.99        | -2.03       |
|           |         | 2440      | 2440.00        | -2.40       |
|           |         | 2480      | 2480.00        | -2.60       |



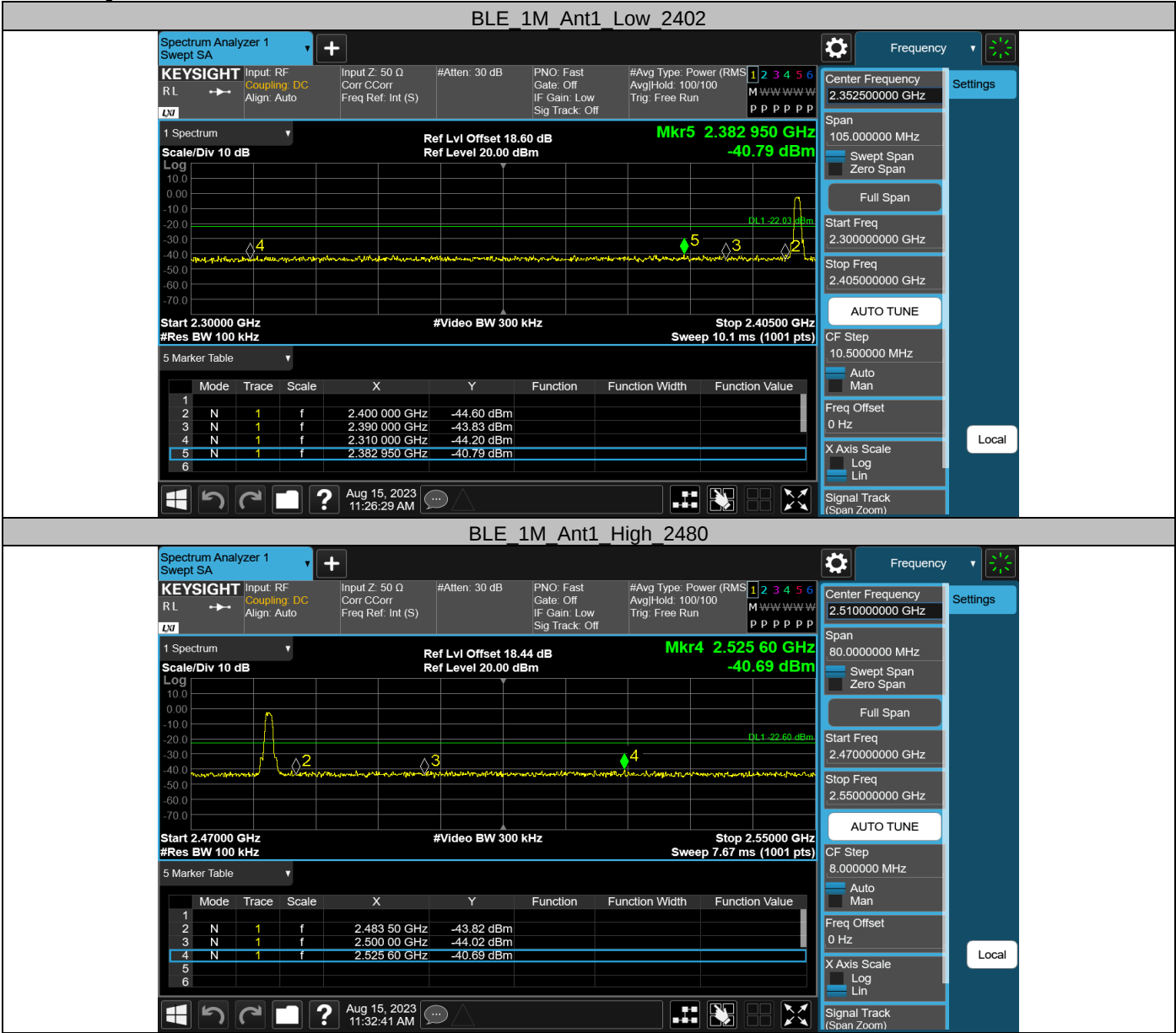
## Test Graphs



Appendix F: Band edge measurements  
Test Result

| Test Mode | Antenna | Ch Name | Frequency [MHz] | Ref Level [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|-----------|---------|---------|-----------------|-----------------|--------------|-------------|---------|
| BLE_1M    | Ant1    | Low     | 2402            | -2.03           | -40.79       | ≤-22.03     | PASS    |
|           |         | High    | 2480            | -2.60           | -40.69       | ≤-22.6      | PASS    |

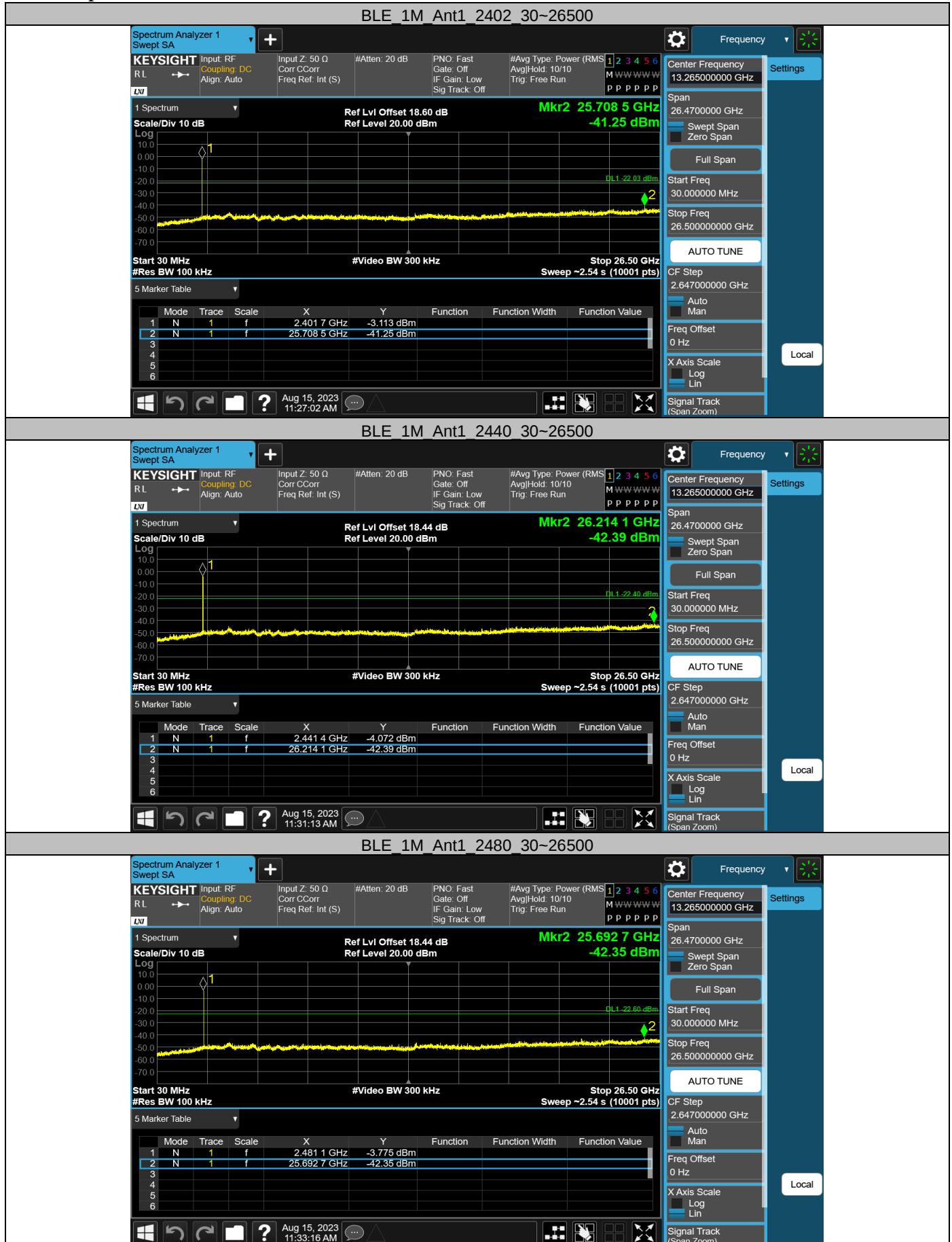
Test Graphs



## Appendix G: Conducted Spurious Emission Test Result

| Test Mode | Antenna | Frequency[MHz] | Freq Range [MHz] | Ref Level [dBm] | Result [dBm] | Limit[dBm] | Verdict |
|-----------|---------|----------------|------------------|-----------------|--------------|------------|---------|
| BLE_1M    | Ant1    | 2402           | 30~26500         | -2.03           | -41.25       | ≤-22.03    | PASS    |
|           |         | 2440           | 30~26500         | -2.40           | -42.39       | ≤-22.4     | PASS    |
|           |         | 2480           | 30~26500         | -2.60           | -42.35       | ≤-22.6     | PASS    |

## Test Graphs

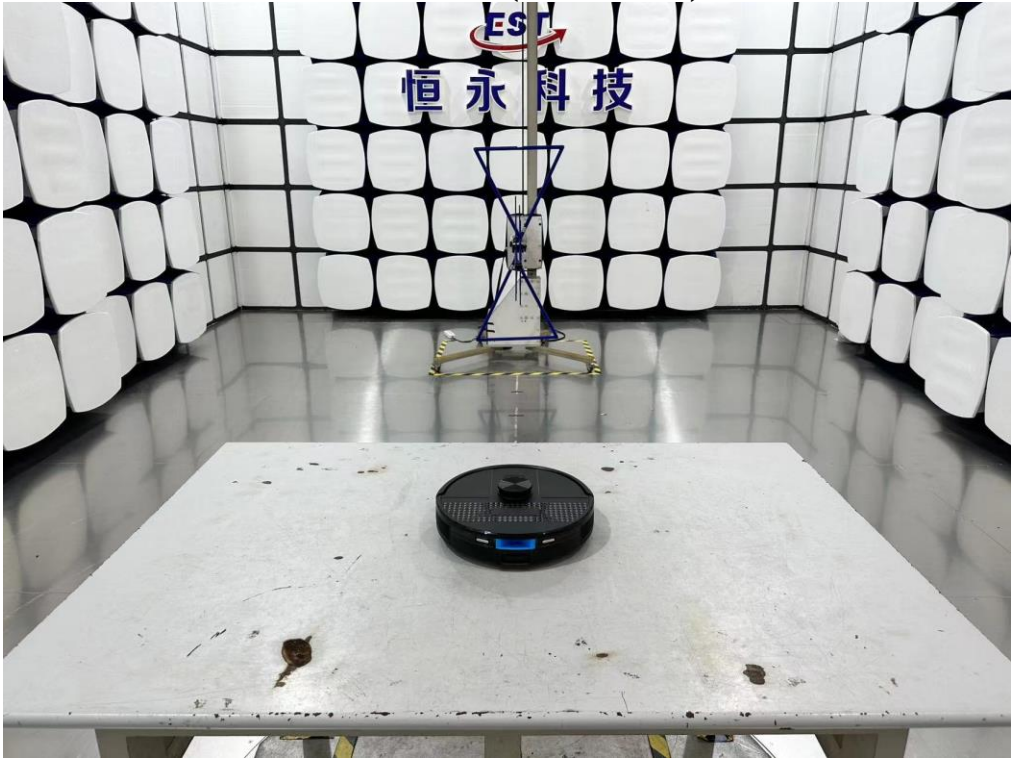


## 12. TEST SETUP PHOTO

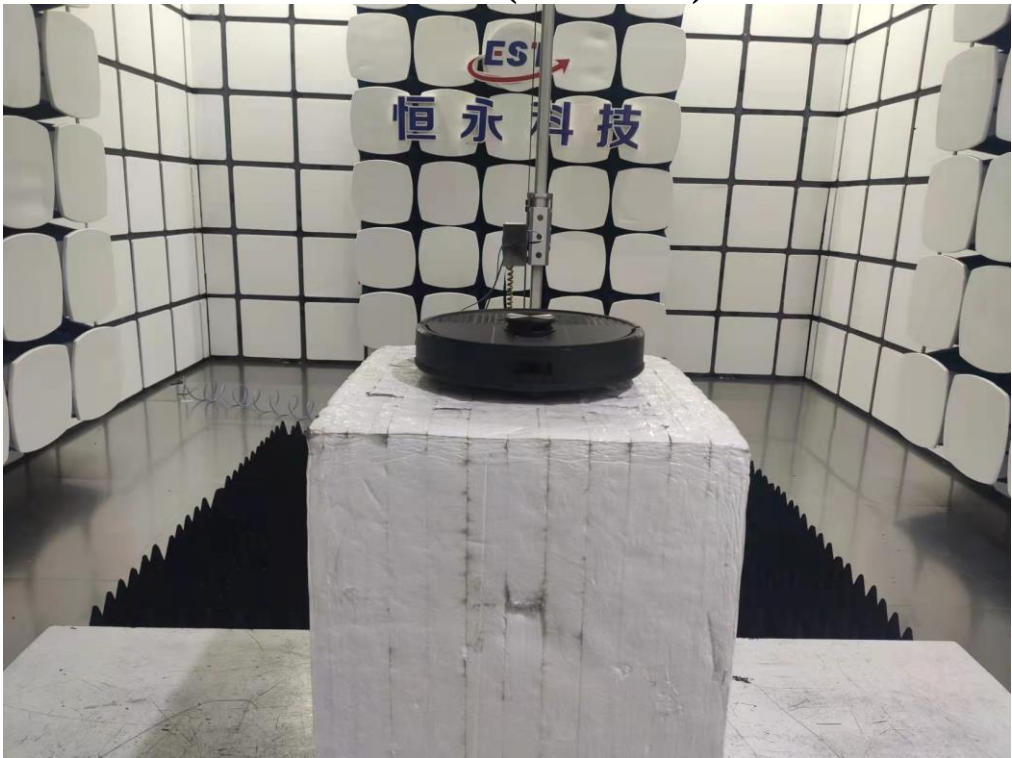
Conducted Test



Radiated Test (Below 1GHz)

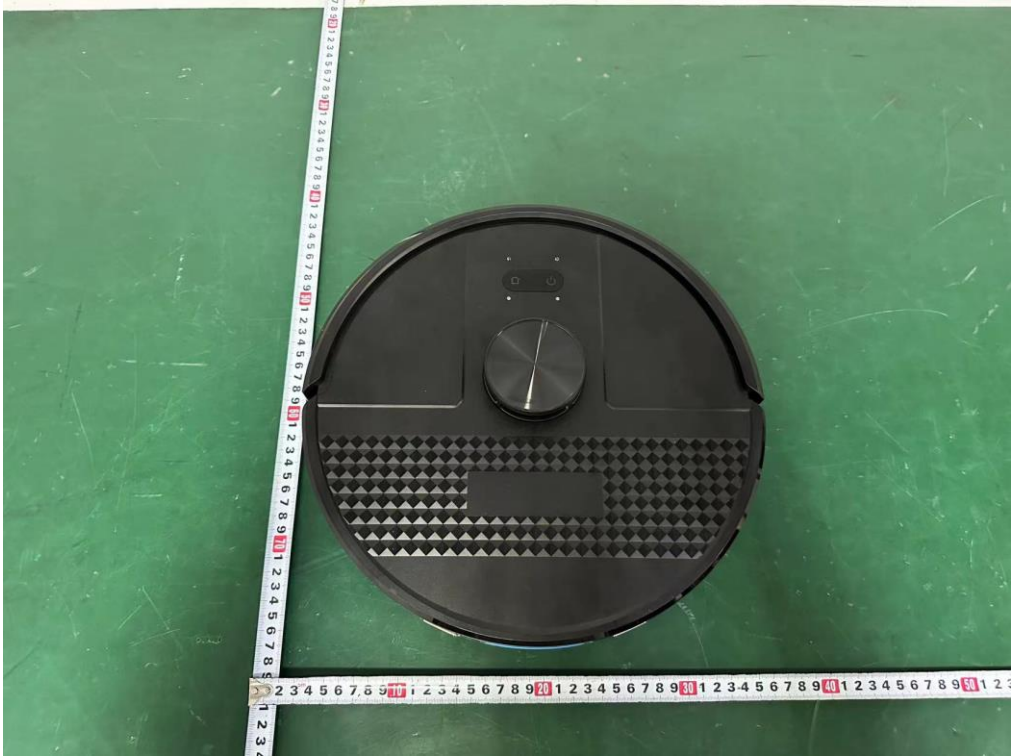


Radiated Test (Above 1GHz)



13. EUT PHOTO

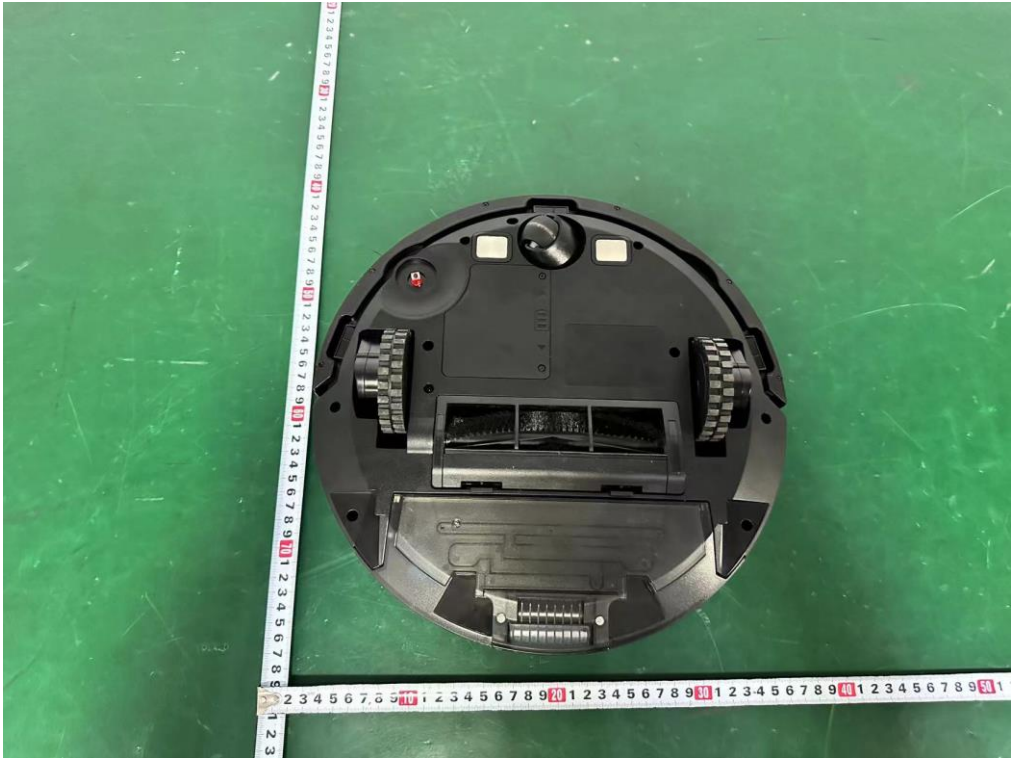
External Photos  
M/N: SL68



External Photos  
M/N: SL68



External Photos  
M/N: SL68



Internal Photos  
M/N: SL68



Internal Photos  
M/N: SL68

