



# FCC TEST REPORT

**Test report  
On Behalf of  
Magnetitech Co., Ltd.  
For  
Smart Lock  
Model No.: HV2,HV1  
FCC ID: 2A5DC-HV2**

**Prepared For :** Magnetitech Co., Ltd.  
Room 505, 5/F, Tianxin automobile life hall, 46 Meilin Road, Meilin street, Futian District, Shenzhen, China

**Prepared By :** Shenzhen HUAKE Testing Technology Co., Ltd.  
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**Date of Test:** Feb. 24, 2022 ~Mar. 02, 2022

**Date of Report:** Mar. 02, 2022

**Report Number:** HK2202240679-2E

**TEST RESULT CERTIFICATION****Applicant's name** .....: Magnetitech Co., Ltd.**Address** .....: Room 505, 5/F, Tianxin automobile life hall, 46 Meilin Road,  
Meilin street, Futian District, Shenzhen, China**Manufacture's Name** .....: Magnetitech Co., Ltd.**Address** .....: Room 505, 5/F, Tianxin automobile life hall, 46 Meilin Road,  
Meilin street, Futian District, Shenzhen, China**Product description****Trade Mark:** N/A**Product name** .....: Smart Lock**Model and/or type reference** ..: HV2,HV1**Standards** .....: FCC Rules and Regulations Part 15 Subpart C Section 15.225  
ANSI C63.10: 2013

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**Date of Test** .....:**Date (s) of performance of tests** .....: Feb. 24, 2022 ~Mar. 02, 2022**Date of Issue** .....: Mar. 02, 2022**Test Result** .....: **Pass****Testing Engineer** :

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(Gary Qian)**Technical Manager** :

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(Eden Hu)**Authorized Signatory** :

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(Jason Zhou)



## TABLE OF CONTENTS

|                                                       |           |
|-------------------------------------------------------|-----------|
| <b>1. TEST RESULT SUMMARY .....</b>                   | <b>5</b>  |
| 1.1. INFORMATION OF THE TEST LABORATORY .....         | 5         |
| 1.2. MEASUREMENT UNCERTAINTY .....                    | 5         |
| <b>2. EUT DESCRIPTION .....</b>                       | <b>6</b>  |
| <b>3. GENERA INFORMATION .....</b>                    | <b>7</b>  |
| 3.1. TEST ENVIRONMENT AND MODE .....                  | 7         |
| 3.2. DESCRIPTION OF SUPPORT UNITS .....               | 7         |
| <b>4. TEST RESULTS AND MEASUREMENT DATA .....</b>     | <b>8</b>  |
| 4.1. ANTENNA REQUIREMENT .....                        | 8         |
| 4.2. CONDUCTED EMISSION .....                         | 9         |
| 4.3. RADIATED EMISSION MEASUREMENT .....              | 12        |
| 4.4. OCCUPIED BANDWIDTH .....                         | 18        |
| 4.5. FREQUENCY STABILITY .....                        | 20        |
| <b>5. APPENDIX A: PHOTOGRAPHS OF TEST SETUP .....</b> | <b>22</b> |
| <b>6. APPENDIX B: PHOTOS OF THE EUT .....</b>         | <b>24</b> |



**\*\* Modified History \*\***

| Revision     | Description                 | Issued Data   | Remark     |
|--------------|-----------------------------|---------------|------------|
| Revision 1.0 | Initial Test Report Release | Mar. 02, 2022 | Jason Zhou |
|              |                             |               |            |
|              |                             |               |            |



## 1. TEST RESULT SUMMARY

| Requirement                              | CFR 47 Section                       | Result |
|------------------------------------------|--------------------------------------|--------|
| Conduction Emission,<br>0.15MHz to 30MHz | §15.207                              | PASS   |
| Radiation Emission                       | §15.225, §15.205, §15.209,<br>§15.35 | PASS   |
| Occupied Bandwidth                       | § 15.215                             | PASS   |
| Antenna requirement                      | § 15.203                             | PASS   |
| Frequency stability                      | § 15.225                             | PASS   |

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 1.1. INFORMATION OF THE TEST LABORATORY

Shenzhen HUAKE Testing Technology Co., Ltd.

Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization:

A2LA Accreditation Code is 4781.01.

FCC Designation Number is CN1229.

Canada IC CAB identifier is CN0045.

CNAS Registration Number is L9589.

### 1.2. MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.71dB, k=2

Radiated emission expanded uncertainty(9kHz-30MHz) = 3.90dB, k=2

Radiated emission expanded uncertainty(30MHz-1000MHz) = 3.90dB, k=2

Radiated emission expanded uncertainty(Above 1GHz) = 4.28dB, k=2





## 2. EUT DESCRIPTION

|                      |                                                                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment:           | Smart Lock                                                                                                                                                     |
| Model Name:          | HV2                                                                                                                                                            |
| Series Model:        | HV1                                                                                                                                                            |
| Model Difference:    | All model's the function, software and electric circuit are the same, only with a product color, appearance and model named different. Test sample model: HV2. |
| FCC ID:              | <b>2A5DC-HV2</b>                                                                                                                                               |
| Antenna Type:        | PCB Antenna                                                                                                                                                    |
| Antenna Gain:        | 0dBi                                                                                                                                                           |
| Operation frequency: | 13.56MHz                                                                                                                                                       |
| Modulation Type:     | ASK                                                                                                                                                            |
| Power Source:        | DC 6V from battery or DC 5V from USB                                                                                                                           |
| Power Rating:        | DC 6V from battery or DC 5V from USB                                                                                                                           |



### 3. GENERAL INFORMATION

#### 3.1. TEST ENVIRONMENT AND MODE

| Operating Environment:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Temperature:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 24.0 °C                                                 |
| Humidity:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 54 % RH                                                 |
| Atmospheric Pressure:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1010 mbar                                               |
| Test Mode:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                         |
| Operation mode:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Keep the EUT in continuous transmitting with modulation |
| The sample was placed (0.8m below 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. |                                                         |

| Per-test mode.                                                                                                                                                                                                        |       |       |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|
| We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows: |       |       |       |
| Axis                                                                                                                                                                                                                  | X     | Y     | Z     |
| Field Strength(dBuV/m)                                                                                                                                                                                                | 63.15 | 65.58 | 62.76 |
| Final Test Mode:                                                                                                                                                                                                      |       |       |       |
| According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup”:<br>Y axis (see the test setup photo)                                                                                |       |       |       |

#### 3.2. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|-----------|-----------|------------|--------|------------|
| /         | /         | /          | /      | /          |

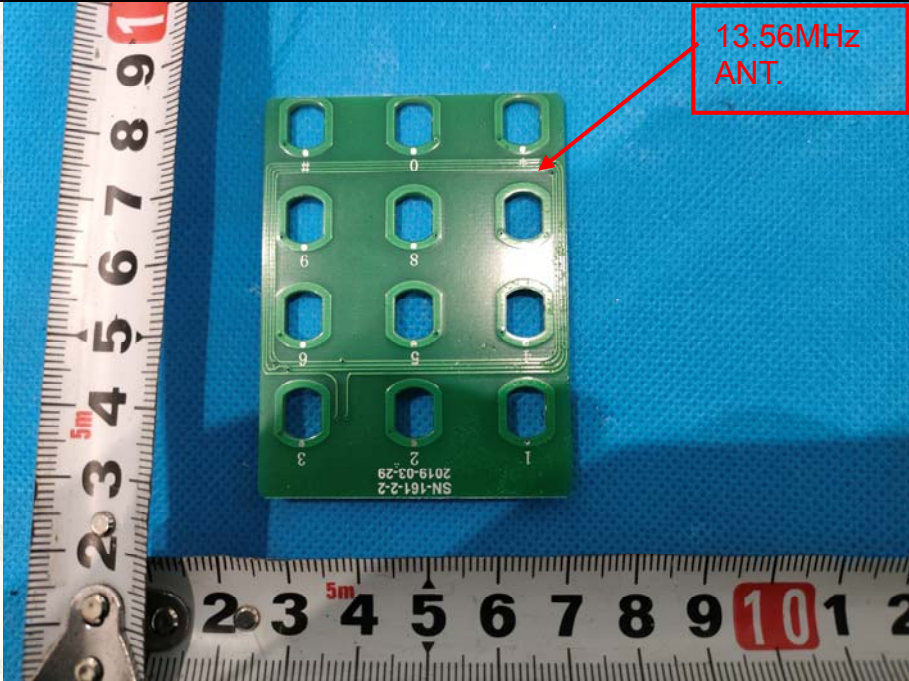
**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



## 4. TEST RESULTS AND MEASUREMENT DATA

### 4.1. ANTENNA REQUIREMENT

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | FCC Part15 C Section 15.203 |
| <b>15.203 requirement:</b><br>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, 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. |                             |
| <b>E.U.T Antenna:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PCB Antenna                 |
| The antenna used in this product is a PCB Antenna, which permanently attached. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 0dBi.                                                                                                                                                                                                                                                                                         |                             |
|                                                                                                                                                                                                                                                                                                                                                                                               |                             |





## 4.2. CONDUCTED EMISSION

### 4.2.1. Conducted Power Line Emission Limit

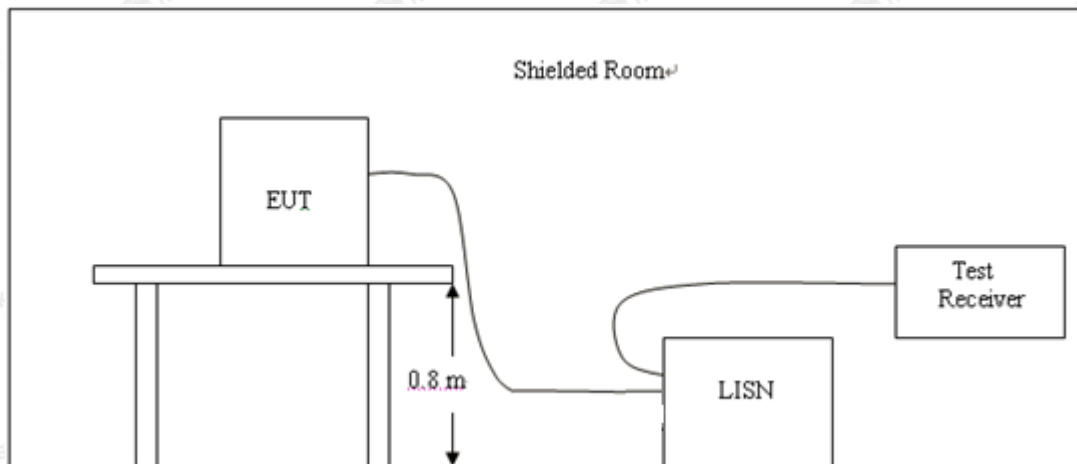
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following.

| Frequency<br>(MHz) | Maximum RF Line Voltage (dBμV) |      |         |        |
|--------------------|--------------------------------|------|---------|--------|
|                    | CLASS A                        |      | CLASS B |        |
|                    | Q.P.                           | Ave. | Q.P.    | Ave.   |
| 0.15 - 0.50        | 79                             | 66   | 66-56*  | 56-46* |
| 0.50 - 5.00        | 73                             | 60   | 56      | 46     |
| 5.00 - 30.0        | 73                             | 60   | 60      | 50     |

\* Decreasing linearly with the logarithm of the frequency.

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

### 4.2.2. Test Setup



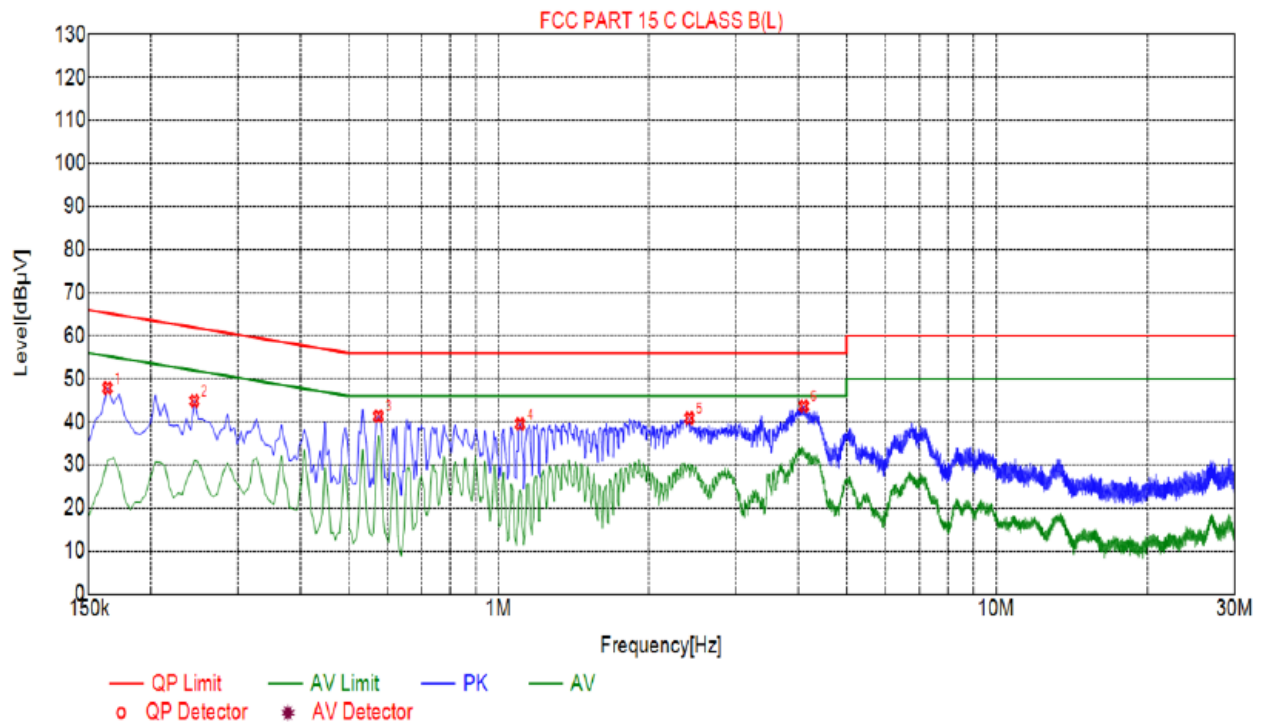
### 4.2.3. Test Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.



#### 4.2.4. Test Result

Test Specification: Line



#### Suspected List

| NO. | Freq. [MHz] | Level [dBμV] | Factor [dB] | Limit [dBμV] | Margin [dB] | Reading [dBμV] | Detector | Type |
|-----|-------------|--------------|-------------|--------------|-------------|----------------|----------|------|
| 1   | 0.1635      | 47.87        | 19.98       | 65.28        | 17.41       | 27.89          | PK       | L    |
| 2   | 0.2445      | 44.86        | 20.03       | 61.94        | 17.08       | 24.83          | PK       | L    |
| 3   | 0.5730      | 41.28        | 20.05       | 56.00        | 14.72       | 21.23          | PK       | L    |
| 4   | 1.1040      | 39.47        | 20.07       | 56.00        | 16.53       | 19.40          | PK       | L    |
| 5   | 2.4180      | 40.84        | 20.18       | 56.00        | 15.16       | 20.66          | PK       | L    |
| 6   | 4.1055      | 43.61        | 20.25       | 56.00        | 12.39       | 23.36          | PK       | L    |

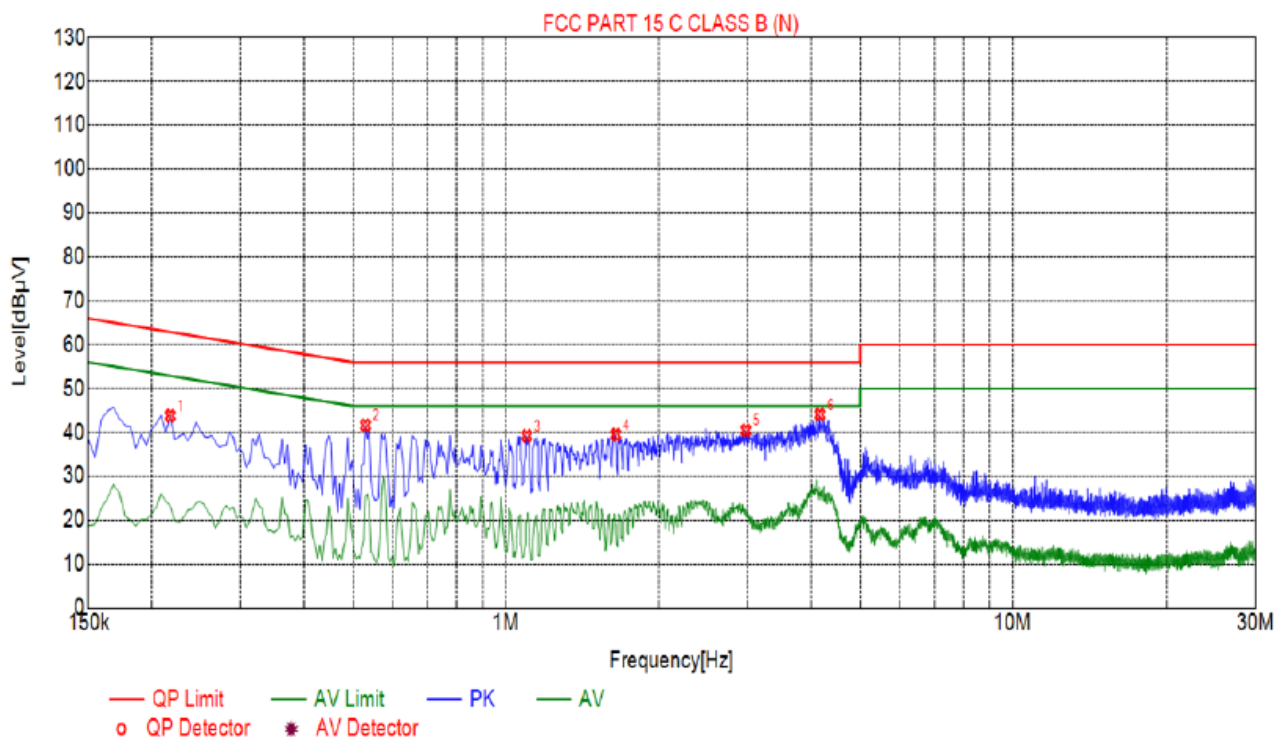
Remark: Margin = Limit – Level

Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor



Test Specification: Neutral



## Suspected List

| NO. | Freq. [MHz] | Level [dBμV] | Factor [dB] | Limit [dBμV] | Margin [dB] | Reading [dBμV] | Detector | Type |
|-----|-------------|--------------|-------------|--------------|-------------|----------------|----------|------|
| 1   | 0.2175      | 43.80        | 20.05       | 62.91        | 19.11       | 23.75          | PK       | N    |
| 2   | 0.5280      | 41.61        | 20.04       | 56.00        | 14.39       | 21.57          | PK       | N    |
| 3   | 1.0995      | 39.21        | 20.07       | 56.00        | 16.79       | 19.14          | PK       | N    |
| 4   | 1.6485      | 39.47        | 20.12       | 56.00        | 16.53       | 19.35          | PK       | N    |
| 5   | 2.9760      | 40.47        | 20.22       | 56.00        | 15.53       | 20.25          | PK       | N    |
| 6   | 4.1640      | 44.10        | 20.25       | 56.00        | 11.90       | 23.85          | PK       | N    |

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor



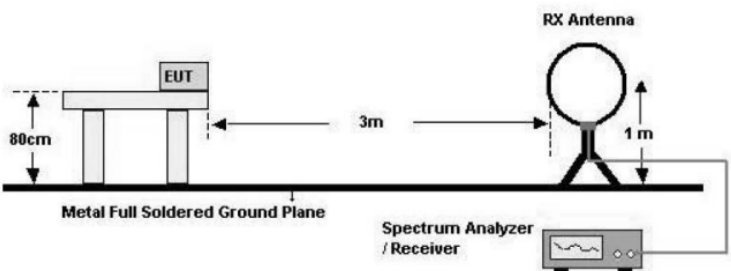
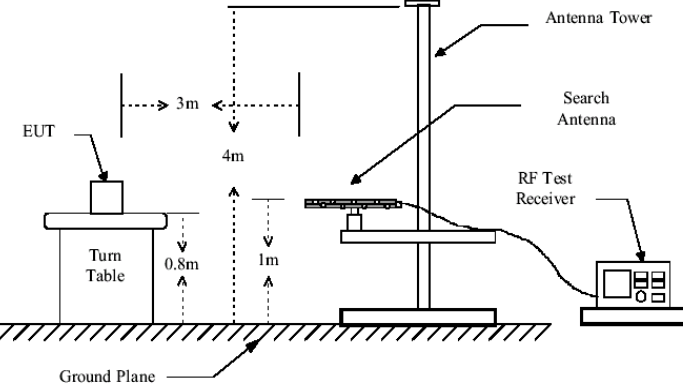
### 4.3. RADIATED EMISSION MEASUREMENT

#### 4.3.1. Test Specification

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                           |            |        |        |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------|--------|--------|------------------|
| <b>Test Requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FCC Part15 C Section 15.225(a) and 15.209 |            |        |        |                  |
| <b>Test Method:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ANSI C63.10:2013                          |            |        |        |                  |
| <b>Frequency Range:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 9 kHz to 1 GHz                            |            |        |        |                  |
| <b>Measurement Distance:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3 m                                       |            |        |        |                  |
| <b>Antenna Polarization:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Horizontal & Vertical                     |            |        |        |                  |
| <b>Receiver Setup:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Frequency                                 | Detector   | RBW    | VBW    | Remark           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 9kHz- 150kHz                              | Quasi-peak | 200Hz  | 1kHz   | Quasi-peak Value |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 150kHz- 30MHz                             | Quasi-peak | 9kHz   | 30kHz  | Quasi-peak Value |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 30MHz-1GHz                                | Quasi-peak | 120KHz | 300KHz | Quasi-peak Value |
| <ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber in below 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li><li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li><li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li></ol> |                                           |            |        |        |                  |





|               |                                                                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Test setup:   | <p>For radiated emissions</p> <p>Below 30 MHz</p>  |
|               | <p>30MHz to 1GHz</p>                              |
|               |                                                                                                                                      |
| Test Mode:    | Transmitting Mode                                                                                                                    |
| Test results: | PASS                                                                                                                                 |

#### 4.3.2. Limit

- The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.



#### 4.3.3. Frequencies in restricted band are complied to limit on Paragraph 15.209

| Frequency Range (MHz) | Distance (m) | Field strength (dB $\mu$ V/m) | Field strength (microvolts/meter) |
|-----------------------|--------------|-------------------------------|-----------------------------------|
| 0.009-0.490           | 300          | 20log 2400/F (kHz)            | 2400/F (kHz)                      |
| 0.490-1.705           | 30           | 20log 24000/F (kHz)           | 24000/F (kHz)                     |
| 1.705-30              | 30           | 20log 30                      | 30                                |
| 30-88                 | 3            | 40.0                          | 100**                             |
| 88-216                | 3            | 43.5                          | 150**                             |
| 216-960               | 3            | 46.0                          | 200**                             |
| Above 960             | 3            | 54.0                          | 500                               |

NOTE:

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., S 15.231 and 15.241.

#### 4.3.4. Test Instruments

| Radiated Emission Test Site (966) |                                    |            |               |                 |
|-----------------------------------|------------------------------------|------------|---------------|-----------------|
| Name of Equipment                 | Manufacturer                       | Model      | Serial Number | Calibration Due |
| ESPI Test Receiver                | ROHDE&SCHWARZ                      | ESVD       | 100008        | Dec. 09, 2021   |
| Spectrum Analyzer                 | ROHDE&SCHWARZ                      | FSEM       | 848597/001    | Dec. 09, 2021   |
| Pre-amplifier                     | EM Electronics Corporation CO.,LTD | EM30265    | 07032613      | Dec. 09, 2021   |
| Pre-amplifier                     | HP                                 | 8447D      | 2727A05017    | Dec. 09, 2021   |
| Loop antenna                      | ZHINAN                             | ZN30900A   | 12024         | Dec. 09, 2021   |
| Broadband Antenna                 | Schwarzbeck                        | VULB9163   | 340           | Dec. 09, 2021   |
| Horn Antenna                      | Schwarzbeck                        | BBHA 9120D | 631           | Dec. 09, 2021   |
| Coax cable                        | HUAK                               | N/A        | N/A           | Dec. 09, 2021   |
| Coax cable                        | HUAK                               | N/A        | N/A           | Dec. 09, 2021   |
| Coax cable                        | HUAK                               | N/A        | N/A           | Dec. 09, 2021   |
| Coax cable                        | HUAK                               | N/A        | N/A           | Dec. 09, 2021   |
| EMI Test Software                 | Shurple Technology                 | EZ-EMC     | N/A           | N/A             |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

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#### 4.3.5. Test Data

PASS

Note: this EUT was tested for all models and the worst case model (DC 5V) data was reported.

##### Field Strength of Fundamental

| Frequency (MHz) | Reading (dBuV/m) | Correction Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Polar (H/V) | Detector |
|-----------------|------------------|-------------------------|-----------------|----------------|-------------|-------------|----------|
| 13.21           | 45.57            | 15.82                   | 61.39           | 80.51          | -19.12      | H           | QP       |
| 13.21           | 45.12            | 15.82                   | 60.94           | 80.51          | -19.57      | V           | QP       |
| 13.85           | 48.31            | 15.82                   | 64.13           | 80.51          | -16.38      | H           | QP       |
| 13.85           | 47.82            | 15.82                   | 63.64           | 80.51          | -16.87      | V           | QP       |
| 13.56           | 83.59            | 12.33                   | 95.92           | 124            | -28.08      | H           | Peak     |
| 13.56           | 83.17            | 12.33                   | 95.5            | 124            | -28.5       | V           | Peak     |
| 13.45           | 52.42            | 15.82                   | 68.24           | 90.47          | -22.23      | H           | QP       |
| 13.45           | 49.13            | 15.82                   | 64.95           | 90.47          | -25.52      | V           | QP       |
| 13.62           | 49.18            | 15.82                   | 65              | 90.47          | -25.47      | H           | QP       |
| 13.62           | 46.49            | 15.82                   | 62.31           | 90.47          | -28.16      | V           | QP       |

Remark: Margin = Result - Limit

Result = Reading + Correction Factor

Correction Factor = Antenna Factor + Cable Factor

##### Spurious Emissions

##### Frequency Range (9 kHz-30MHz)

| Frequency (MHz) | Level@3m (dBμV/m) | Limit@3m (dBμV/m) |
|-----------------|-------------------|-------------------|
| --              | --                | --                |
| --              | --                | --                |
| --              | --                | --                |
| --              | --                | --                |

**Note:** 1. Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor.

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

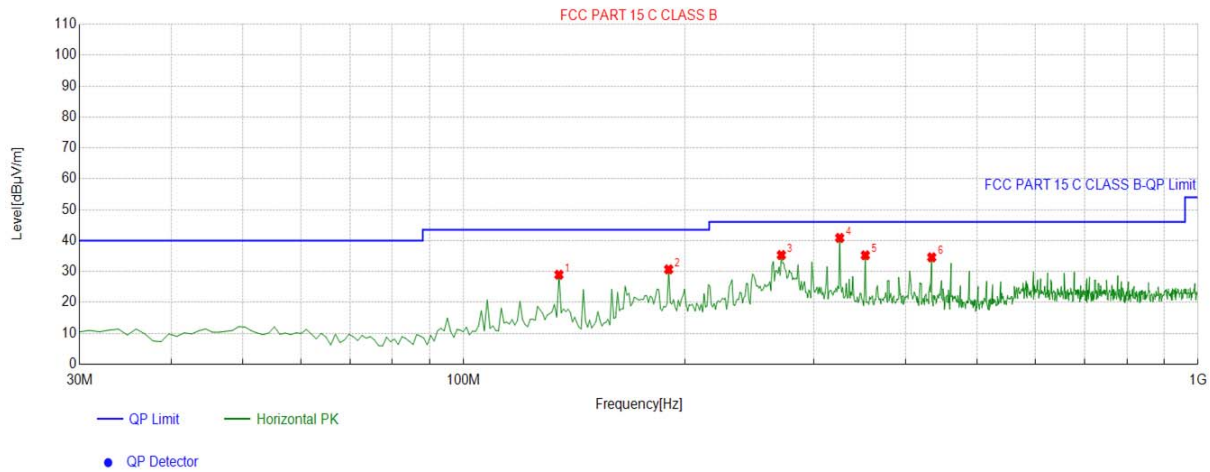
**About 30MHz-1GHz**

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Remark:

Margin = Limit – Level

Level=Test receiver reading + correction factor

**Horizontal****Suspected List**

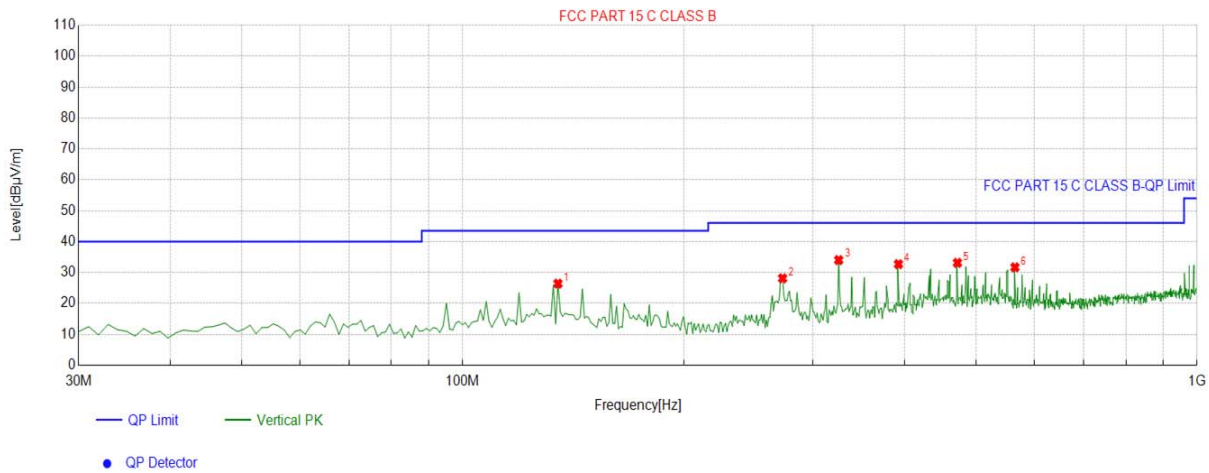
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBμV/m] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity   |
|-----|-------------|-------------|------------------|----------------|----------------|-------------|-------------|-----------|------------|
| 1   | 134.8649    | -18.87      | 47.80            | 28.93          | 43.50          | 14.57       | 100         | 21        | Horizontal |
| 2   | 190.2102    | -15.99      | 46.65            | 30.66          | 43.50          | 12.84       | 100         | 167       | Horizontal |
| 3   | 270.8008    | -13.63      | 48.93            | 35.30          | 46.00          | 10.70       | 100         | 329       | Horizontal |
| 4   | 325.1752    | -11.84      | 52.68            | 40.84          | 46.00          | 5.16        | 100         | 24        | Horizontal |
| 5   | 352.3624    | -11.61      | 46.83            | 35.22          | 46.00          | 10.78       | 100         | 155       | Horizontal |
| 6   | 433.9239    | -9.68       | 44.26            | 34.58          | 46.00          | 11.42       | 100         | 60        | Horizontal |

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor;  
Margin = Limit – Level





Antenna polarity: V



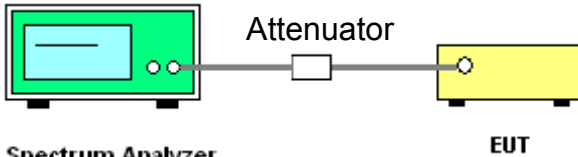
| Suspected List |             |             |                  |                |                |             |             |           |          |
|----------------|-------------|-------------|------------------|----------------|----------------|-------------|-------------|-----------|----------|
| NO.            | Freq. [MHz] | Factor [dB] | Reading [dBμV/m] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1              | 134.8649    | -18.87      | 45.26            | 26.39          | 43.50          | 17.11       | 100         | 304       | Vertical |
| 2              | 272.7427    | -13.55      | 41.64            | 28.09          | 46.00          | 17.91       | 100         | 70        | Vertical |
| 3              | 325.1752    | -11.84      | 45.84            | 34.00          | 46.00          | 12.00       | 100         | 94        | Vertical |
| 4              | 392.1722    | -10.60      | 43.28            | 32.68          | 46.00          | 13.32       | 100         | 359       | Vertical |
| 5              | 471.7918    | -8.36       | 41.47            | 33.11          | 46.00          | 12.89       | 100         | 359       | Vertical |
| 6              | 565.0050    | -6.54       | 38.19            | 31.65          | 46.00          | 14.35       | 100         | 359       | Vertical |

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor;  
Margin = Limit – Level



#### 4.4. OCCUPIED BANDWIDTH

##### 4.4.1. Test Specification

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.215(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Test Method:      | ANSI C63.10: 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Limit:            | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | <ol style="list-style-type: none"><li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li><li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li><li>3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.<br/>Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW<math>\geq</math> 1% of the 20 dB bandwidth; VBW<math>\geq</math>RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li><li>4. Measure and record the results in the test report.</li></ol> |
| Test setup:       |  <p>The diagram illustrates the test setup. A green Spectrum Analyzer is connected via a cable to a white Attenuator, which is then connected to a yellow EUT (Equipment Under Test).</p>                                                                                                                                                                                                                                                                                                                                                           |
| Test Mode:        | Transmitting Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Test results:     | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

##### 4.4.2. Test Instruments

| RF Test Room      |              |        |               |                 |
|-------------------|--------------|--------|---------------|-----------------|
| Equipment         | Manufacturer | Model  | Serial Number | Calibration Due |
| Spectrum Analyzer | Agilent      | N9020A | MY49100060    | Dec. 09, 2021   |

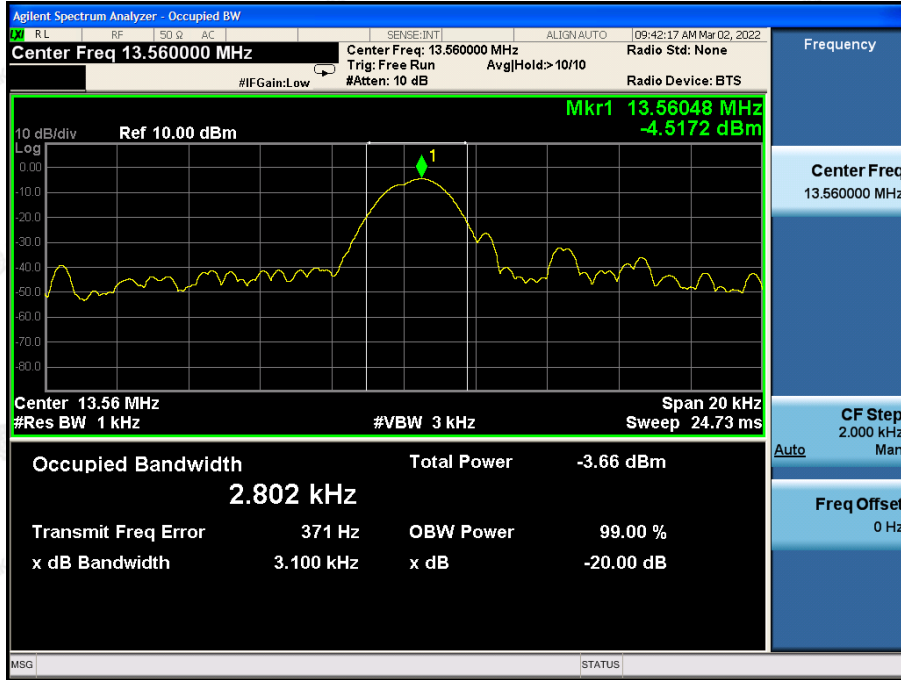
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



#### 4.4.3. Test data

| Test Channel (MHz) | 20dB Occupy Bandwidth (kHz) | Limit (kHz) | Conclusion |
|--------------------|-----------------------------|-------------|------------|
| 13.56              | 3.10                        | N/A         | PASS       |

**Test plots as follows:**




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## 4.5. FREQUENCY STABILITY

### 4.5.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part15 C Section 15.225                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Method:</b>      | ANSI C63.10: 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Limit:</b>            | +/-0.01%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          | <ol style="list-style-type: none"><li>1. The equipment under test was connected to an external DC power supply and input rated voltage.</li><li>2. RF output was connected to a spectrum analyzer.</li><li>3. The EUT was placed inside the temperature chamber.</li><li>4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.</li><li>5. Turn EUT off and set the chamber temperature to - 20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.</li><li>6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.</li></ol> |
| <b>Test setup:</b>       |  <p>Spectrum Analyzer                      EUT</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Test Mode:</b>        | Transmitting Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Test results:</b>     | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |





#### 4.5.2. Test Data

PASS

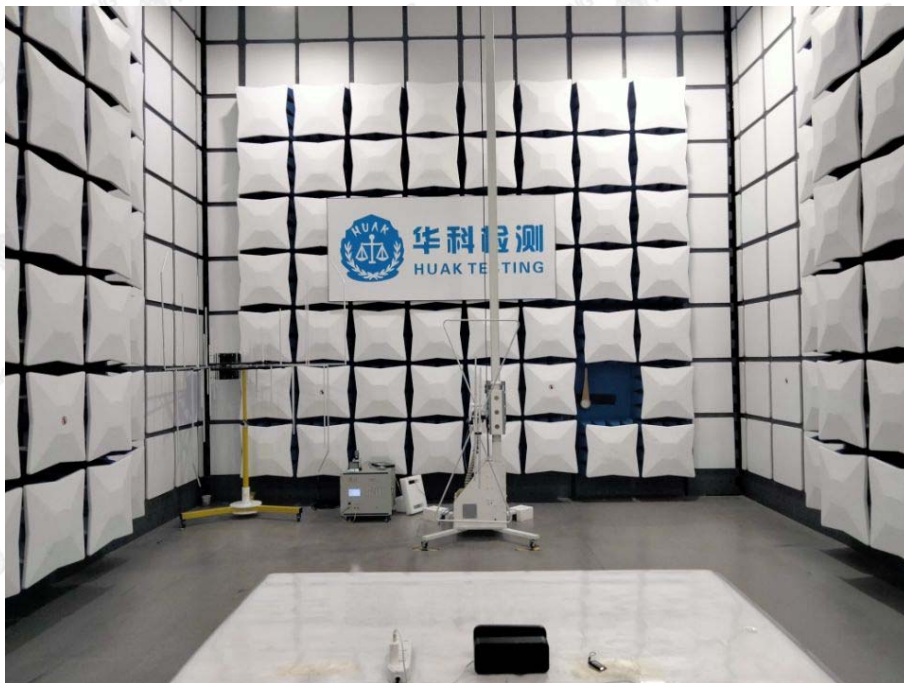
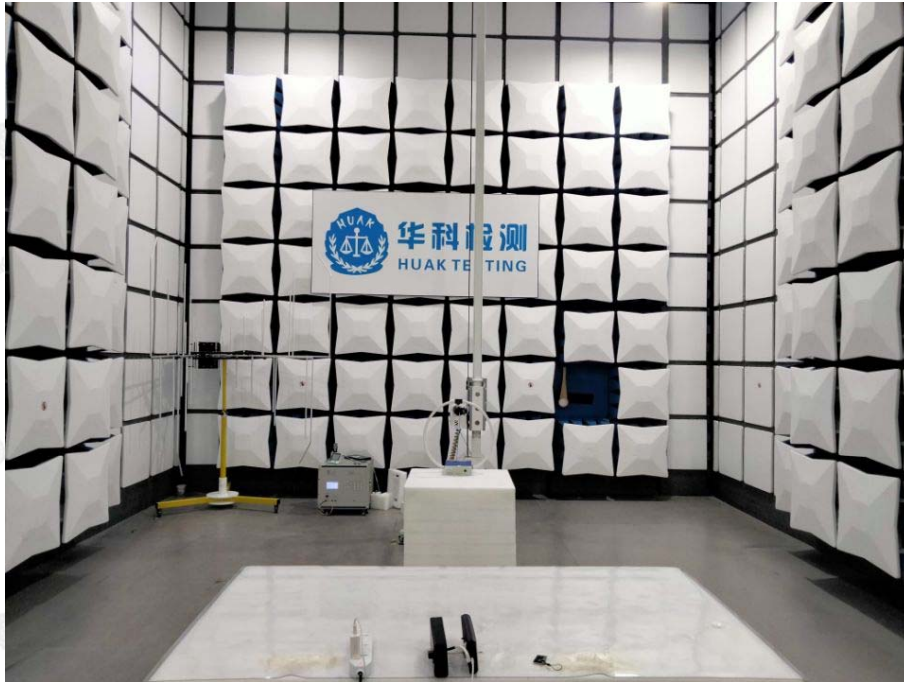
Note: this EUT was tested for all models and the worst case model (DC 5V) data was reported.

| Voltage (Vdc) | Temperature (°C) | Frequency (MHz) | Deviation (%) | Limit (%) |
|---------------|------------------|-----------------|---------------|-----------|
| 5             | -20              | 13.560072       | 0.00053%      | +/-0.01%  |
| 5             | -10              | 13.560022       | 0.00016%      |           |
| 5             | 0                | 13.559894       | -0.00078%     |           |
| 5             | 10               | 13.560062       | 0.00046%      |           |
| 5             | 20               | 13.559993       | -0.00005%     |           |
| 5             | 30               | 13.560031       | 0.00023%      |           |
| 5             | 40               | 13.559994       | -0.00004%     |           |
| 5             | 50               | 13.559905       | -0.00070%     |           |
| 4.25          | -20              | 13.560032       | 0.00024%      |           |
| 4.25          | -10              | 13.560217       | 0.00160%      |           |
| 4.25          | 0                | 13.559904       | -0.00071%     |           |
| 4.25          | 10               | 13.560425       | 0.00313%      |           |
| 4.25          | 20               | 13.560483       | 0.00356%      |           |
| 4.25          | 30               | 13.560852       | 0.00628%      |           |
| 4.25          | 40               | 13.560504       | 0.00372%      |           |
| 4.25          | 50               | 13.560585       | 0.00431%      |           |
| 5.75          | -20              | 13.559666       | -0.00246%     |           |
| 5.75          | -10              | 13.560483       | 0.00356%      |           |
| 5.75          | 0                | 13.560094       | 0.00069%      |           |
| 5.75          | 10               | 13.559844       | -0.00115%     |           |
| 5.75          | 20               | 13.560301       | 0.00222%      |           |
| 5.75          | 30               | 13.559145       | -0.00631%     |           |
| 5.75          | 40               | 13.560096       | 0.00071%      |           |
| 5.75          | 50               | 13.559764       | -0.00174%     |           |



## 5. APPENDIX A: PHOTOGRAPHS OF TEST SETUP

### Radiated Emission



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## Conducted Emission



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## 6. APPENDIX B: PHOTOS OF THE EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos.

-----End of test report-----