TCT 通测检测
TESTING CENTRE TECHNOLOGY

# TEST REPORT

**FCC ID: 2ANST-L1**

**Product: Low-Power video doorbell**

**Model No.: L1**

**Additional Model: L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30**

**Trade Mark: N/A**

**Report No.: TCT171019E001**

**Issued Date: Oct. 23, 2017**

Issued for:

**Shenzhen EEP Industrial Co., Ltd.**
**No.11 Xinan Street,Wuhe Middle Road, Bantian Village, Buji Town, Shenzhen, China**

Issued By:

**Shenzhen Tongce Testing Lab.**
**1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China**
**TEL: +86-755-27673339**
**FAX: +86-755-27673332**

***Note:*** *This report shall not be reproduced except in full, without the written approval of Shenzhen Tongce Testing Lab. This document may be altered or revised by Shenzhen Tongce Testing Lab. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample.*

# TABLE OF CONTENTS

1. Test Certification ..... 3
2. Test Result Summary ..... 4
3. EUT Description ..... 5
4. Genera Information ..... 6
4.1. Test Environment and Mode ..... 6
4.2. Description of Support Units ..... 6
5. Facilities and Accreditations ..... 7
5.1. Facilities ..... 7
5.2. Location ..... 7
5.3. Measurement Uncertainty ..... 7
6. Test Results and Measurement Data ..... 8
6.1. Antenna Requirement ..... 8
6.2. Conducted Emission ..... 9
6.3. Radiated Emission Measurement ..... 10
6.4. Manually Activated Transmitter ..... 20
6.5. Occupied Bandwidth ..... 22
Appendix A: Photographs of Test Setup
Appendix B: Photographs of EUT

# 1. Test Certification

| | |
|---|---|
| **Product:** | Low-Power video doorbell |
| **Model No.:** | L1 |
| **Additional Model:** | L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30 |
| **Trade Mark:** | **N/A** |
| **Applicant:** | Shenzhen EEP Industrial Co., Ltd. |
| **Address:** | No.11 Xinan Street, Wuhe Middle Road, Bantian Village, Buji Town, Shenzhen, China |
| **Manufacturer:** | Shenzhen EEP Industrial Co., Ltd. |
| **Address:** | No.11 Xinan Street, Wuhe Middle Road, Bantian Village, Buji Town, Shenzhen, China |
| **Date of Test:** | Oct. 10 - 12, 2017 |
| **Applicable Standards:** | FCC CFR Title 47 Part 15 Subpart C Section 15.231 |

*The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.*

***Tested By:*** Garen **Date:** ***Oct. 12, 2016***

***Garen***

***Reviewed By:*** **Date:** ***Oct. 23, 2016***

***Approved By:*** **Date:** ***Oct. 23, 2016***

***Tomsin***

SHENZHEN TONGCE TESTING LAB TCT

# 2. Test Result Summary

| Requirement | CFR 47 Section | Result |
|---|---|---|
| Conduction Emission, 0.15MHz to 30MHz | §15.207 | PASS |
| Manually Activated Transmitter | §15.231(a) | PASS |
| Radiation Emission | §15.231(b), §15.205, §15.209, §15.35 | PASS |
| Occupied Bandwidth | §15.231(c) | 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.*

# 3. EUT Description

| | |
|---|---|
| **Product Name:** | Low-Power video doorbell |
| **Model :** | L1 |
| **Additional Model:** | L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30 |
| **Trade Mark:** | **N/A** |
| **Operation Frequency:** | 433.94MHz |
| **Modulation Technology:** | ASK |
| **Antenna Type:** | Integrated Antenna |
| **Antenna Gain:** | 3.0dBi (declare by Manufacturer) |
| **Power Supply:** | AC 100-240V, 50/60Hz<br>Or DC 3.7V 2*3.7V 18650 battery in parallel |
| **Remark:** | All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is the model name for commercial purpose. |

# 4. Genera Information

## 4.1. 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, 1.5m above 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) | 62.47 | 65.62 | 62.59 |

**Final Test Mode:**

According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup”:
Y axis (see the test setup photo)

## 4.2. 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.*

# 5. Facilities and Accreditations

## 5.1. Facilities

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

- FCC - Registration No.: 645098
  Shenzhen Tongce Testing Lab
  The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.
- IC - Registration No.: 10668A-1
  The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

## 5.2. Location

Shenzhen Tongce Testing Lab
Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China
Tel: 86-755-27673339

## 5.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

| No. | Item | MU |
|---|---|---|
| 1 | Conducted Emission | ±2.56dB |
| 2 | RF power, conducted | ±0.12dB |
| 3 | Spurious emissions, conducted | ±0.11dB |
| 4 | All emissions, radiated(<1G) | ±3.92dB |
| 5 | All emissions, radiated(>1G) | ±4.28dB |
| 6 | Temperature | ±0.1°C |
| 7 | Humidity | ±1.0% |

# 6. Test Results and Measurement Data

## 6.1. Antenna Requirement

| **Standard requirement:** | FCC Part15 C Section 15.203 /247(c) |
|---|---|
| 15.203 requirement:<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.<br>15.247(c) (1)(i) requirement:<br>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi. | |
| **E.U.T Antenna:** | |
| The antenna is integrated antenna which permanently attached, and the best case gain of the antenna is 3.0dBi. | |

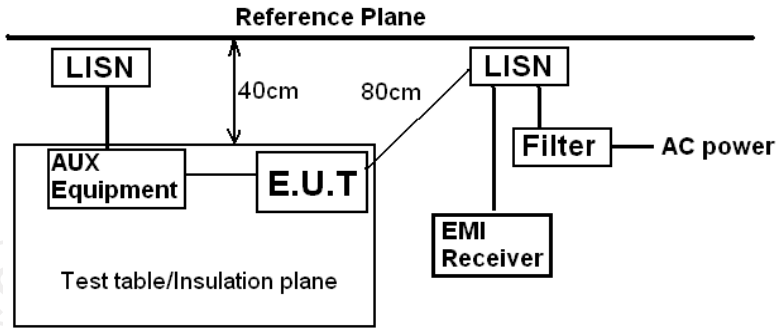
## 6.2. Conducted Emission

### 6.2.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.207 |
| **Test Method:** | ANSI C63.4:2014 |
| **Frequency Range:** | 150 kHz to 30 MHz |
| **Receiver setup:** | RBW=9 kHz, VBW=30 kHz, Sweep time=auto |
| **Limits:** | |

| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

**Test Setup:**




*Remark:*
*E.U.T: Equipment Under Test*
*LISN: Line Impedence Stabilization Network*
*Test table height=0.8m*

| | |
|---|---|
| **Test Mode:** | Transmitting Mode |
| **Test Procedure:** | 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.<br>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).<br>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement. |
| **Test Result:** | PASS |

### 6.2.1. Test Instruments

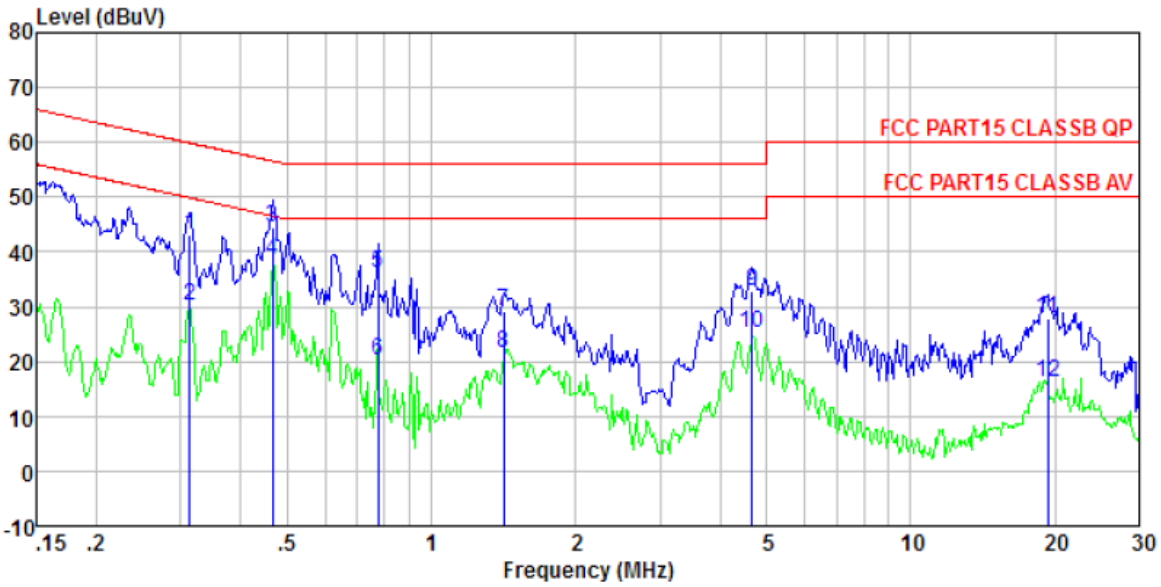
| Conducted Emission Shielding Room Test Site (843) | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Test Receiver | R&S | ESPI | 101401 | Jun. 12, 2018 |
| LISN | Schwarzbeck | NSLK 8126 | 8126453 | Sep. 27, 2018 |
| Coax cable (9KHz-30MHz) | TCT | CE-05 | N/A | Sep. 27, 2018 |
| 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).*

### 6.2.2. Test data

**Please refer to following diagram for individual**

**Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)**

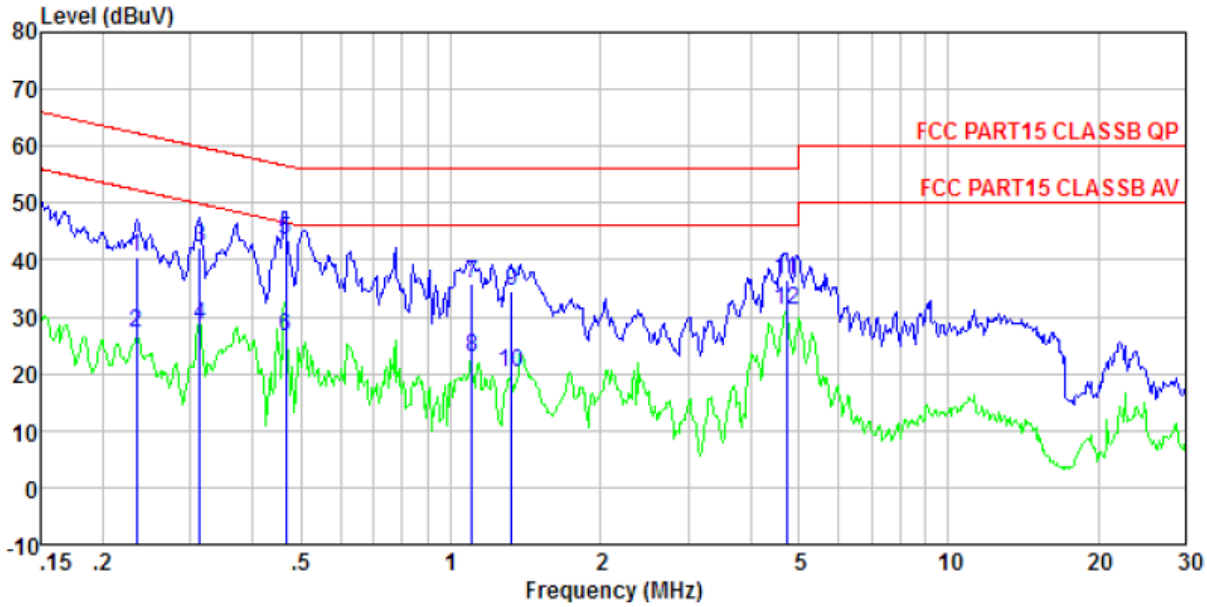



| Freq MHz | Reading level dBuV | lISN/ISN factor dB | Cable loss dB | level dBuV | Limit level dBuV | Over limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.313 | 42.51 | 0.44 | 0.10 | 43.05 | 59.88 | -16.83 | QP |
| 0.313 | 29.71 | 0.44 | 0.10 | 30.25 | 49.88 | -19.63 | Average |
| 0.466 | 44.05 | 0.39 | 0.11 | 44.55 | 56.58 | -12.03 | QP |
| 0.466 | 38.07 | 0.39 | 0.11 | 38.57 | 46.58 | -8.01 | Average |
| 0.775 | 35.65 | 0.27 | 0.13 | 36.05 | 56.00 | -19.95 | QP |
| 0.775 | 19.93 | 0.27 | 0.13 | 20.33 | 46.00 | -25.67 | Average |
| 1.418 | 28.73 | 0.22 | 0.13 | 29.08 | 56.00 | -26.92 | QP |
| 1.418 | 21.32 | 0.22 | 0.13 | 21.67 | 46.00 | -24.33 | Average |
| 4.672 | 32.45 | 0.21 | 0.15 | 32.81 | 56.00 | -23.19 | QP |
| 4.672 | 24.75 | 0.21 | 0.15 | 25.11 | 46.00 | -20.89 | Average |
| 19.326 | 27.48 | 0.29 | 0.22 | 27.99 | 60.00 | -32.01 | QP |
| 19.326 | 15.67 | 0.29 | 0.22 | 16.18 | 50.00 | -33.82 | Average |

*Notes:*

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

## Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)




| Freq MHz | Reading level dBuV | lISN/ISN factor dB | Cable loss dB | level dBuV | Limit level dBuV | Over limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.234 | 40.03 | 0.42 | 0.12 | 40.57 | 62.30 | -21.73 | QP |
| 0.234 | 26.62 | 0.42 | 0.12 | 27.16 | 52.30 | -25.14 | Average |
| 0.313 | 41.53 | 0.42 | 0.10 | 42.05 | 59.88 | -17.83 | QP |
| 0.313 | 27.95 | 0.42 | 0.10 | 28.47 | 49.88 | -21.41 | Average |
| 0.466 | 43.06 | 0.37 | 0.11 | 43.54 | 56.58 | -13.04 | QP |
| 0.466 | 26.02 | 0.37 | 0.11 | 26.50 | 46.58 | -20.08 | Average |
| 1.106 | 35.44 | 0.21 | 0.13 | 35.78 | 56.00 | -20.22 | QP |
| 1.106 | 22.48 | 0.21 | 0.13 | 22.82 | 46.00 | -23.18 | Average |
| 1.324 | 34.21 | 0.21 | 0.13 | 34.55 | 56.00 | -21.45 | QP |
| 1.324 | 19.94 | 0.21 | 0.13 | 20.28 | 46.00 | -25.72 | Average |
| 4.721 | 36.05 | 0.21 | 0.15 | 36.41 | 56.00 | -19.59 | QP |
| 4.721 | 30.68 | 0.21 | 0.15 | 31.04 | 46.00 | -14.96 | Average |

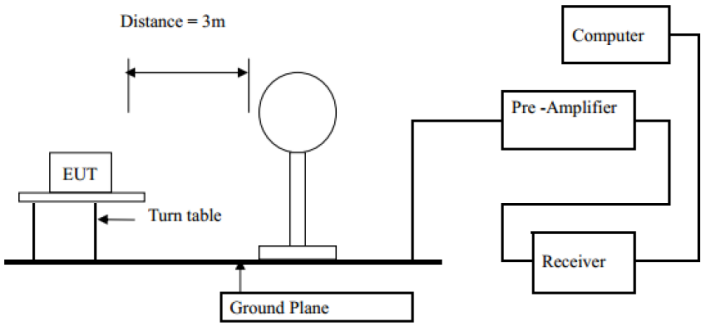
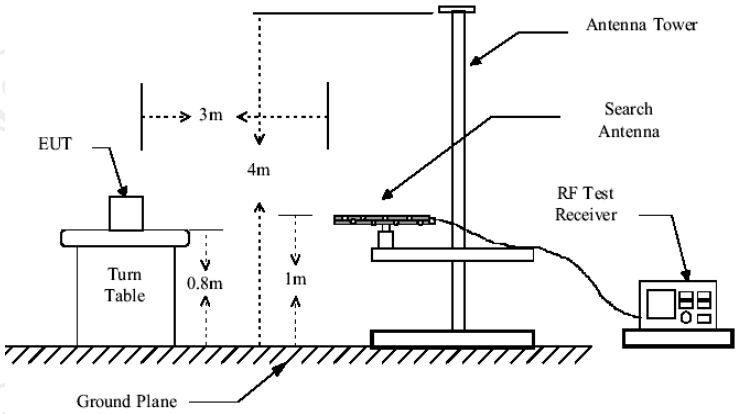
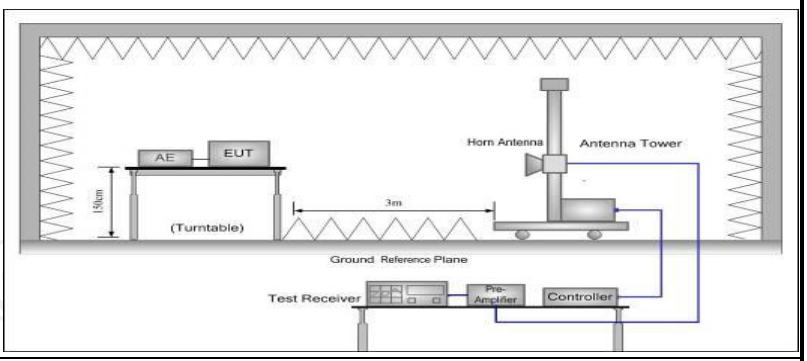
*Notes:*

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

## 6.3. Radiated Emission Measurement

### 6.3.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.231(a) and 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2014 and ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 5 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td></td><td>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, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.<br>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.<br>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.<br>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.<br>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>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.</td></tr>
</table>

| | |
|---|---|
| **Test setup:** | For radiated emissions below 30MHz<br>  <br><br>30MHz to 1GHz<br>  <br><br>Above 1GHz<br>  <br> |
| **Test Mode:** | Transmitting Mode |
| **Test results:** | PASS |

### 6.3.2. Limit

| Fundamental Frequency (MHz) | Filed Strength of Fundamental (microvolts/meter) | Filed Strength of Spurious Emission (microvolts/meter) |
|---|---|---|
| 40.66-40.70 | 2250 | 225 |
| 70-130 | 1250 | 125 |
| 130-174 | 1250 to 3750* | 125 to 375* |
| 174-260 | 3750 | 375 |
| 260-470 | 3750 to 12500* | 375 to 1250* |
| Above 470 | 12500 | 1250 |
| Horn Antenna | Schwarzbeck | BBHA 9120D |
| *Linear interpolations | | |
| [Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:<br>For the band 130-174 MHz, µV/m at 3 meters = 56.81818(F) - 6136.3636;<br>for the band 260-470 MHz, µV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.] | | |

**For EUT**

| Fundamental Frequency (MHz) | Filed Strength of Fundamental (microvolts/meter) | Filed Strength of Spurious Emission(dBµV/m) |
|---|---|---|
| 433.94 | 80.82 | 60.82 |

***Note:***

1. *Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions.*
2. *According to 15.35, on any frequency or frequencies below or equal to 1000 MHz, the limits Shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test.*
3. *According to 15.231(b), The limits on the field strength of the spurious emissions in the above table is based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits one higher field strength.*

**Frequencies in restricted band are complied to limit on Paragraph 15.209**

| Frequency Range (MHz) | Distance (m) | Field strength (dB μV/m) |
|---|---|---|
| 0.009-0.490 | 3 | 20log 2400/F (kHz) + 80 |
| 0.490-1.705 | 3 | 20log 24000/F (kHz) + 40 |
| 1.705-30 | 3 | 20log 30 + 40 |
| 30-88 | 3 | 40.0 |
| 88-216 | 3 | 43.5 |
| 216-960 | 3 | 46.0 |
| Above 960 | 3 | 54.0 |

***Note:***

1. *RF Voltage (dBuV) = 20 log RF Voltage (uV)*
2. *In the Above Table, the tighter limit applies at the band edges.*
3. *Distance refers to the distance in meters between the measuring instrument antenna and the EUT*
4. *The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.*
5. *If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula Ld1 = Ld2 * (d2/d1)*

### 6.3.3. Test Instruments

| Radiated Emission Test Site (966) | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| ESPI Test Receiver | ROHDE&SCHWARZ | ESVD | 100008 | Sep. 27, 2018 |
| Spectrum Analyzer | ROHDE&SCHWARZ | FSEM | 848597/001 | Sep. 27, 2018 |
| Pre-amplifier | EM Electronics Corporation CO.,LTD | EM30265 | 07032613 | Sep. 27, 2018 |
| Pre-amplifier | HP | 8447D | 2727A05017 | Sep. 27, 2018 |
| Loop antenna | ZHINAN | ZN30900A | 12024 | Sep. 27, 2018 |
| Broadband Antenna | Schwarzbeck | VULB9163 | 340 | Sep. 27, 2018 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 631 | Sep. 27, 2018 |
| Coax cable | TCT | N/A | N/A | Sep. 27, 2018 |
| Coax cable | TCT | N/A | N/A | Sep. 27, 2018 |
| Coax cable | TCT | N/A | N/A | Sep. 27, 2018 |
| Coax cable | TCT | N/A | N/A | Sep. 27, 2018 |
| 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).*

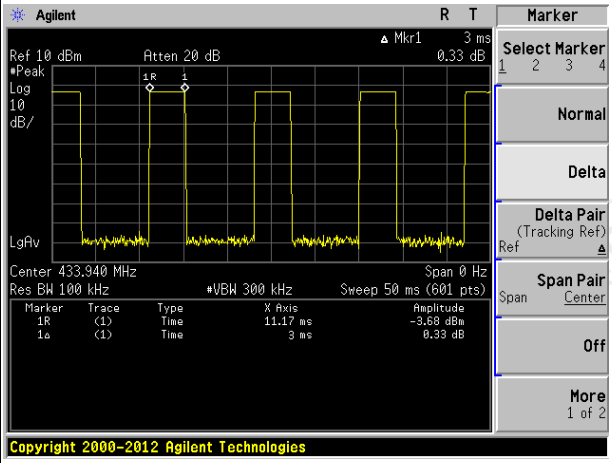
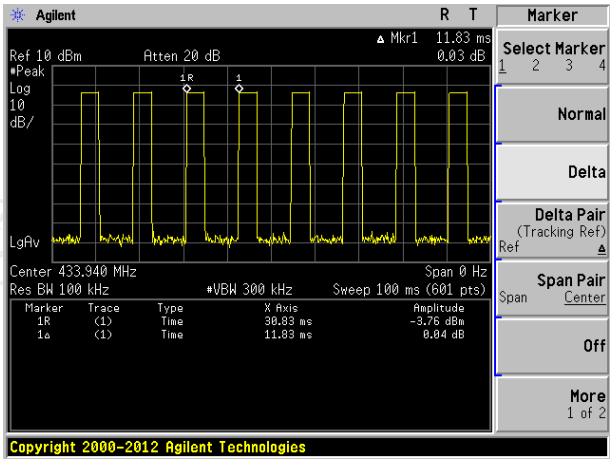
### 6.3.4. Test Data

**Duty Cycle Test Data:**

| Total time one cycle(ms) | Effective time one cycle(ms) | Duty Cycle | AV Factor(dB) |
|---|---|---|---|
| 11.83 | 3 | 0.25 | -11.92 |

***Note:***

*Duty Cycle= Effective time one cycle/ Total time one cycle= 0.25*
*AV Factor = 20 log(Duty Cycle)*

| Ton time | T period |
|---|---|
|  |  |
| | |
| | |

**Field Strength of Fundamental**

| Frequency (MHz) | Emission PK (dBuV/m) | Horizontal /Vertical | Limits PK (dBuV/m) | Margin (dB) |
|---|---|---|---|---|
| 433.94 | 65.62 | H | 100.82 | -35.20 |
| 433.94 | 62.90 | V | 100.82 | -37.92 |

| Frequency (MHz) | Emission PK (dBuV/m) | AV Factor(dB) | Horizontal /Vertical | Emission AVG (dBuV/m) | Limits AV (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 433.94 | 65.62 | -11.92 | H | 53.7 | 80.82 | -27.12 |
| 433.94 | 62.90 | -11.92 | V | 50.98 | 80.82 | -29.84 |

## Harmonics and 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*



Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

**Below 1GHz**

| Quasi-peak Value Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 34.16 | 45.64 | 11.25 | 0.60 | 30.08 | 27.41 | 40.00 | -12.59 | Vertical |
| 54.07 | 39.13 | 11.93 | 0.81 | 29.97 | 21.90 | 40.00 | -18.10 | Vertical |
| 88.03 | 40.48 | 10.60 | 1.09 | 29.76 | 22.41 | 43.50 | -21.09 | Vertical |
| 142.32 | 40.63 | 7.37 | 1.52 | 29.44 | 20.08 | 43.50 | -23.42 | Vertical |
| 327.89 | 32.66 | 14.03 | 2.51 | 29.84 | 19.36 | 46.00 | -26.64 | Vertical |
| 537.59 | 36.17 | 18.19 | 3.47 | 29.30 | 28.53 | 46.00 | -17.47 | Vertical |
| 32.29 | 30.00 | 11.25 | 0.58 | 30.09 | 11.74 | 40.00 | -28.26 | Horizontal |
| 75.98 | 42.46 | 7.35 | 0.99 | 29.82 | 20.98 | 40.00 | -19.02 | Horizontal |
| 91.82 | 41.30 | 10.98 | 1.12 | 29.74 | 23.66 | 43.50 | -19.84 | Horizontal |
| 157.56 | 47.48 | 8.02 | 1.62 | 29.37 | 27.75 | 43.50 | -15.75 | Horizontal |
| 283.98 | 36.87 | 13.01 | 2.29 | 29.90 | 22.27 | 46.00 | -23.73 | Horizontal |
| 362.99 | 44.64 | 14.74 | 2.68 | 29.67 | 32.39 | 46.00 | -13.61 | Horizontal |

**Above 1GHz**

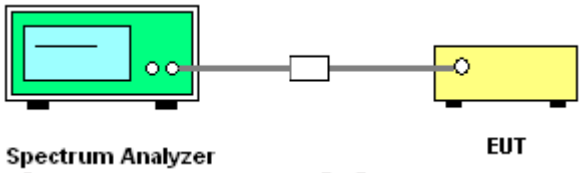
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | PK Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1370.00 | 37.88 | 25.66 | 4.59 | 33.39 | 34.74 | 74.00 | -39.26 | Vertical |
| 2355.00 | 37.19 | 27.69 | 5.34 | 34.05 | 36.17 | 74.00 | -37.83 | Vertical |
| 3415.00 | 37.44 | 28.67 | 6.80 | 32.85 | 40.06 | 74.00 | -33.94 | Vertical |
| 4150.00 | 33.67 | 30.06 | 8.01 | 32.01 | 39.73 | 74.00 | -34.27 | Vertical |
| 4695.00 | 33.19 | 31.65 | 8.51 | 32.03 | 41.32 | 74.00 | -32.68 | Vertical |
| 5645.00 | 30.52 | 32.36 | 9.72 | 32.35 | 40.25 | 74.00 | -33.75 | Vertical |
| 1430.00 | 36.62 | 25.42 | 4.64 | 33.47 | 33.21 | 74.00 | -40.79 | Horizontal |
| 2410.00 | 36.12 | 27.57 | 5.40 | 33.99 | 35.10 | 74.00 | -38.90 | Horizontal |
| 3395.00 | 37.11 | 28.60 | 6.76 | 32.87 | 39.60 | 74.00 | -34.40 | Horizontal |
| 4115.00 | 30.98 | 29.95 | 7.97 | 32.05 | 36.85 | 74.00 | -37.15 | Horizontal |
| 4635.00 | 31.41 | 31.57 | 8.46 | 32.01 | 39.43 | 74.00 | -34.57 | Horizontal |
| 5590.00 | 28.25 | 32.22 | 9.63 | 32.38 | 37.72 | 74.00 | -36.28 | Horizontal |

***Note:***

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (dBµV/m)- limit (dBµV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.*
5. *Data of measurement shown " * "in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*

## 6.4. Manually Activated Transmitter

### 6.4.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.231(a1) |
| **Test Method:** | ANSI C63.10: 2013 |
| **Limit:** | According to 15.231(a), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. |
| | 1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.<br>2. Set to the maximum power setting and enable the EUT transmit continuously.<br>3. Use the following spectrum analyzer settings.<br>VBW = 1MHz, VBW≥RBW;<br>Span = 0; Sweep Time = 5s;<br>Detector function = peak;<br>4. Measure and record the results in the test report. |
| **Test setup:** |  |
| **Test Mode:** | Transmitting Mode |
| **Test results:** | PASS |

### 6.4.2. Test Instruments

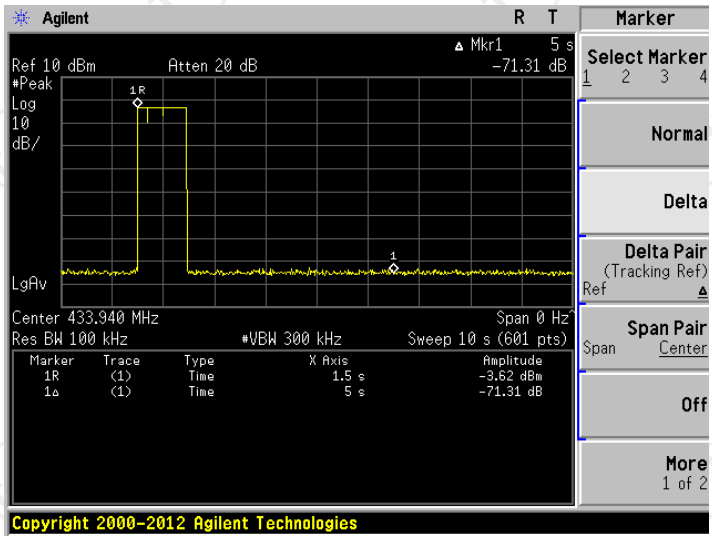
| RF Test Room | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | N9020A | MY49100060 | Sep. 27, 2018 |

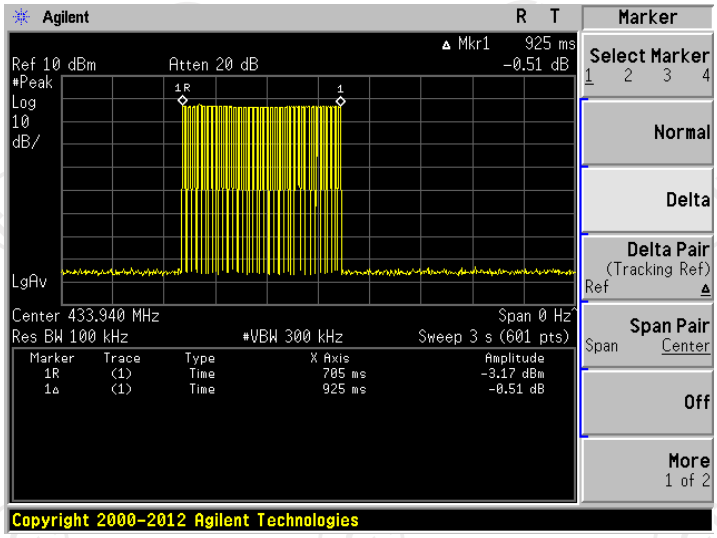
***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

### 6.4.3. Test data

| Test Channel (MHz) | Manually Activated Transmitter (s) | Limit (s) | Conclusion |
|---|---|---|---|
| 433.94 | 0.925 | 5 | PASS |

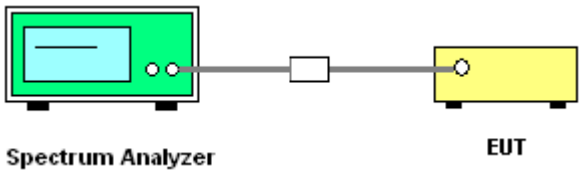
**Test plots as follows:**



## 6.5. Occupied Bandwidth

### 6.5.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.215(c) |
| **Test Method:** | ANSI C63.10: 2013 |
| **Limit:** | According to 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier. |
| | 1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.<br>2. Set to the maximum power setting and enable the EUT transmit continuously.<br>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⩾1% of the 20 dB bandwidth; VBW⩾RBW; Sweep = auto; Detector function = peak; Trace = max hold.<br>4. Measure and record the results in the test report. |
| **Test setup:** |  |
| **Test Mode:** | Transmitting Mode |
| **Test results:** | PASS |

### 6.5.2. Test Instruments

| RF Test Room | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | N9020A | MY49100060 | Sep. 27, 2018 |

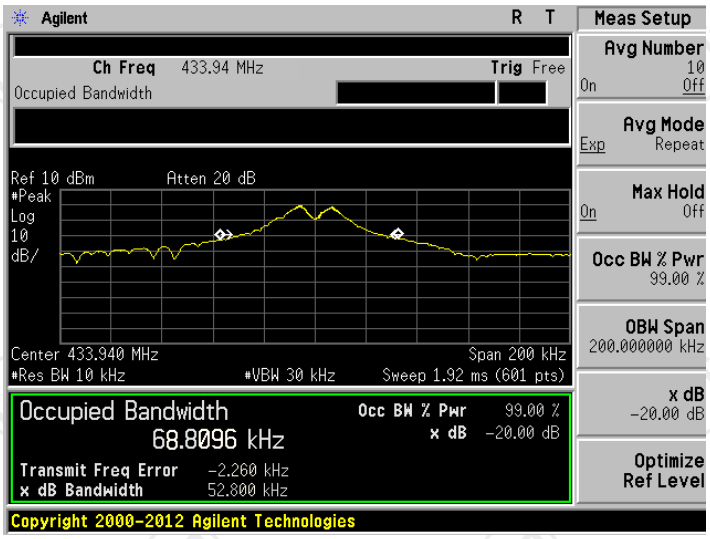
***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

### 6.5.3. Test data

| Test Channel (MHz) | 20dB Occupy Bandwidth (kHz) | Limit (kHz) | Conclusion |
|---|---|---|---|
| 433.94 | 52.8 | 1084.8 | PASS |

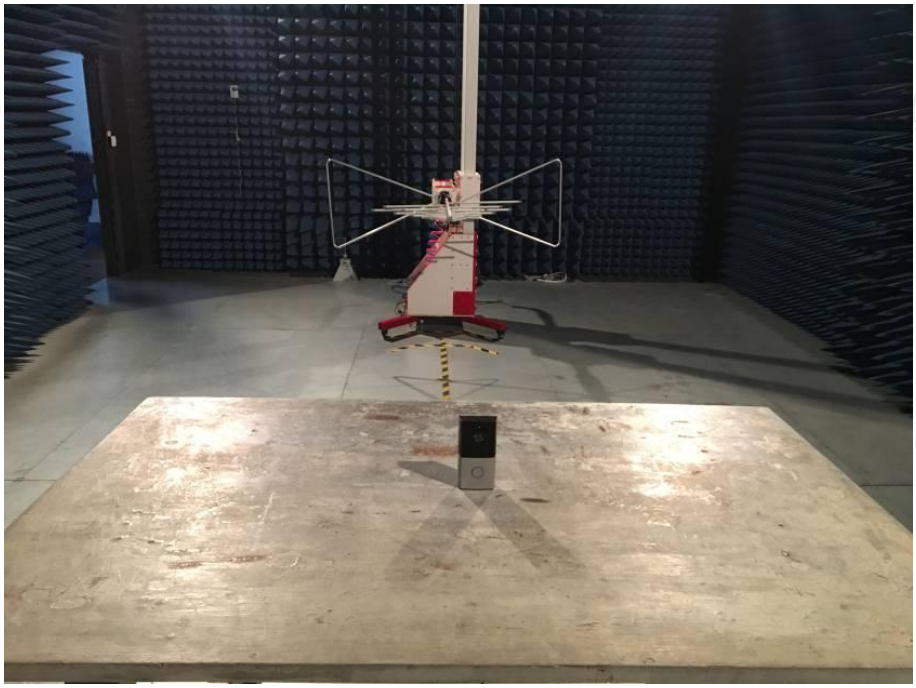
***Note:*** *Limit = 433.92MHz *0.25% = 1084.8 kHz*

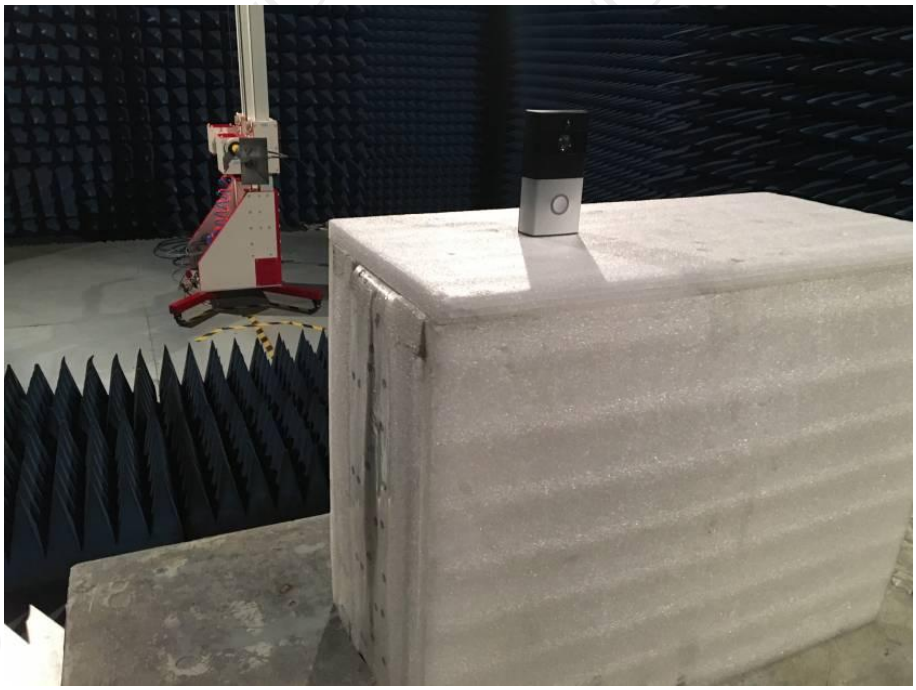
**Test plots as follows:**



# Appendix A: Photographs of Test Setup

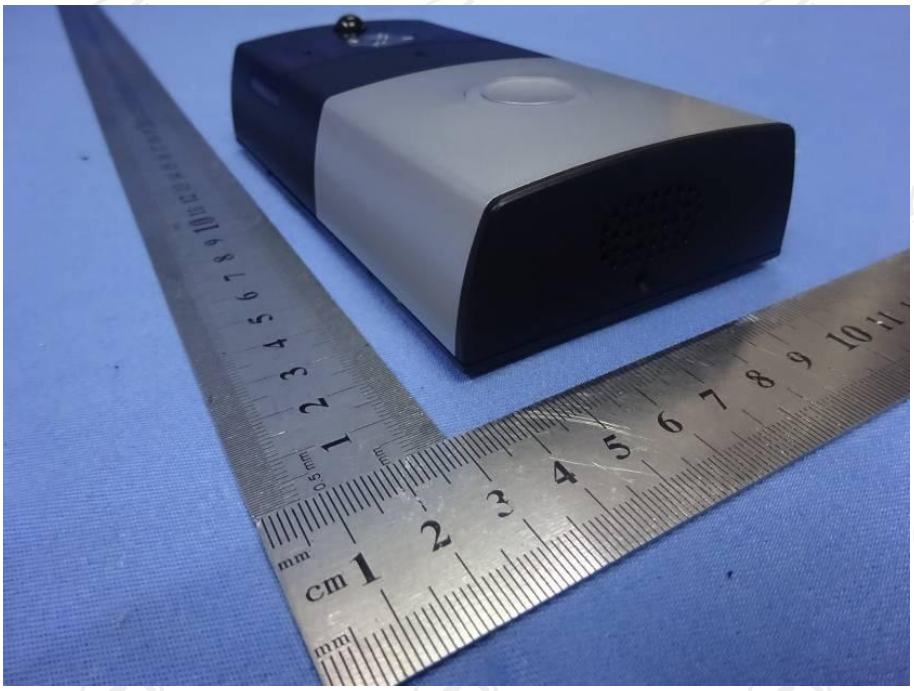
Radiated Emission

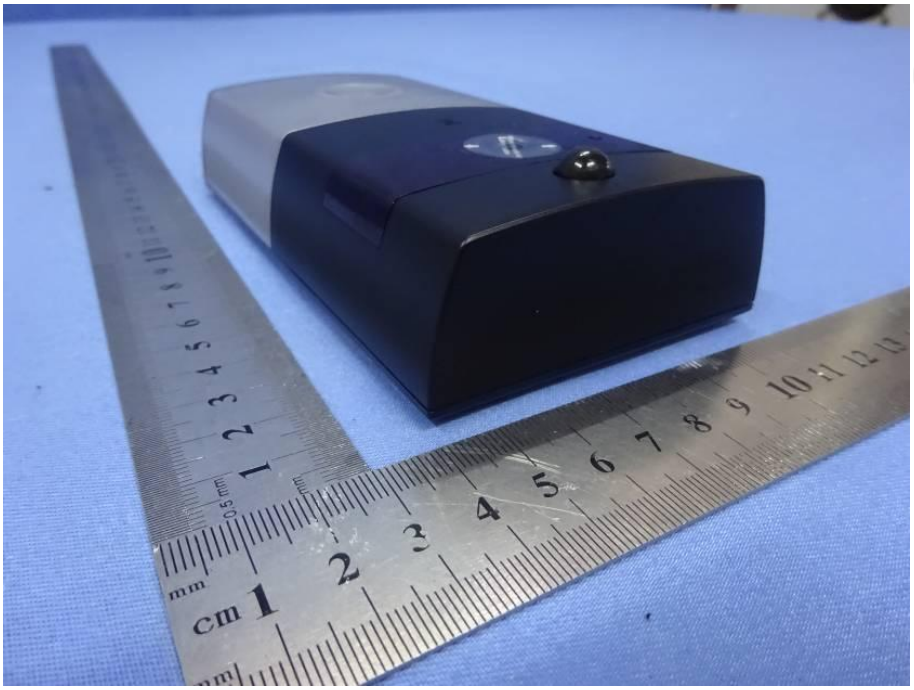




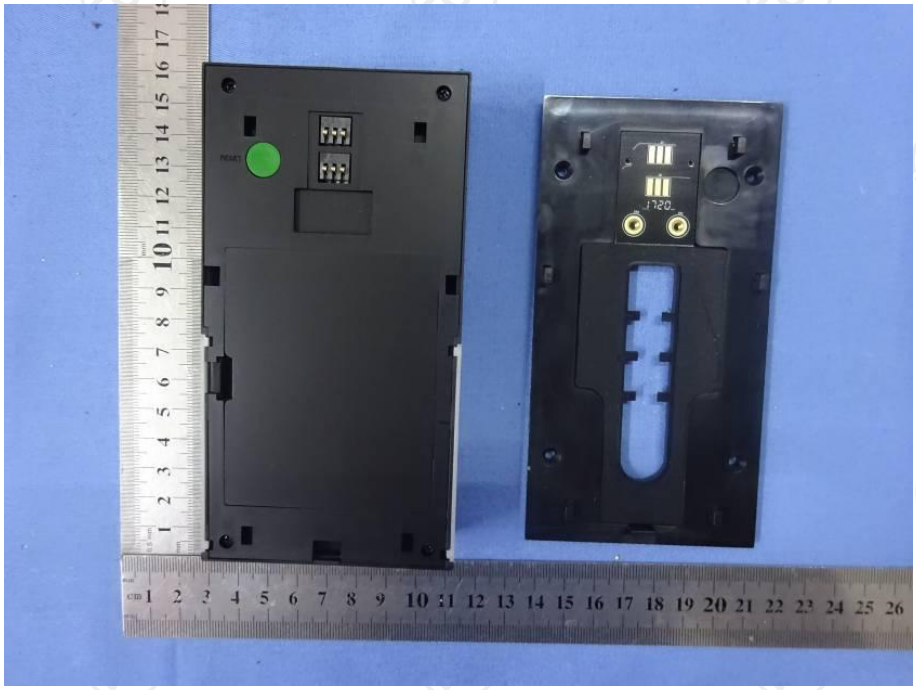
CE

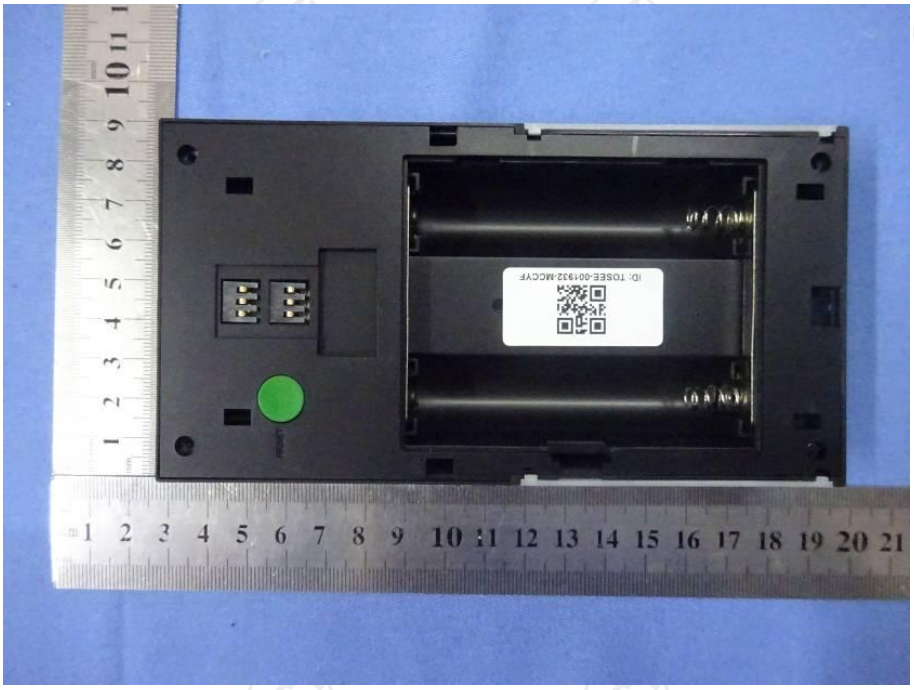
# Appendix B: Photographs of EUT
## Model: L1
## External Photos

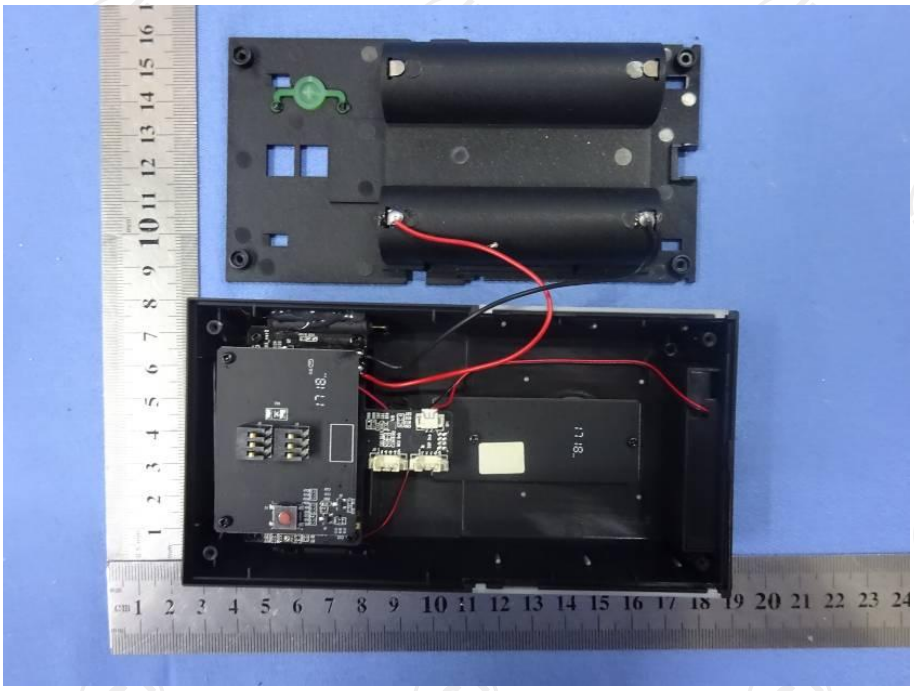


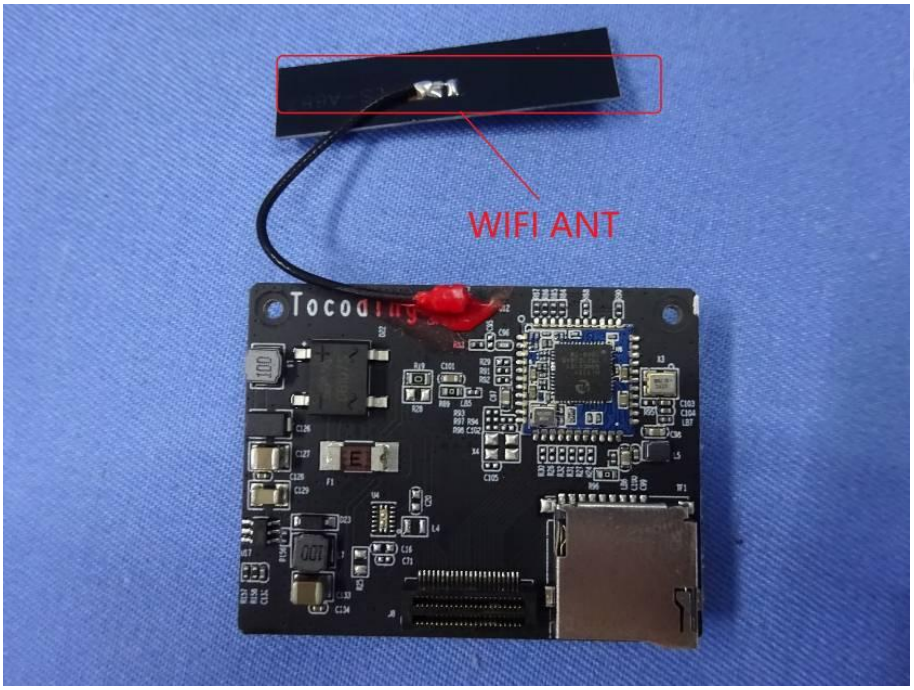


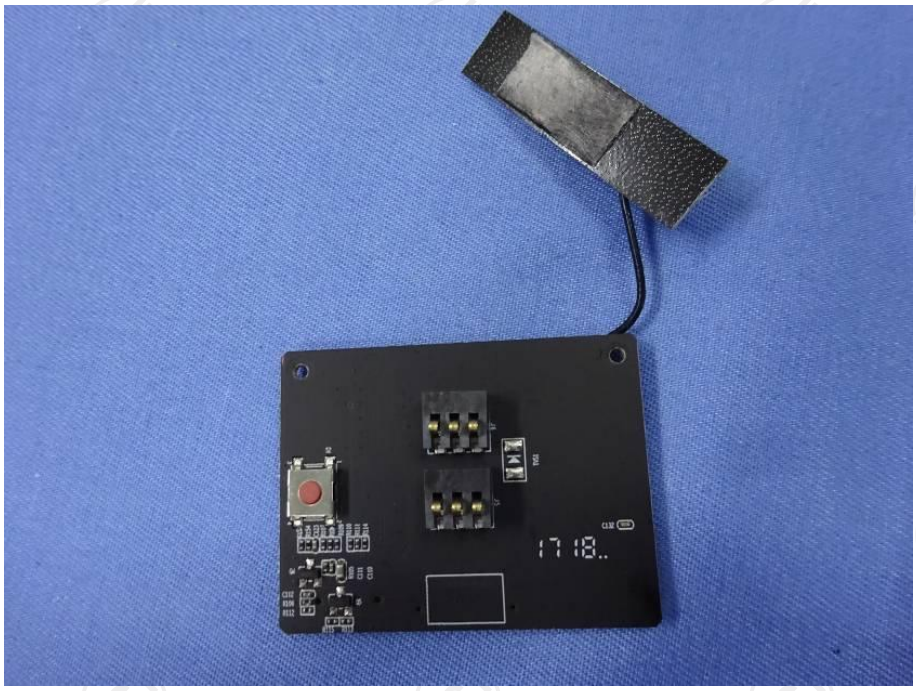
# Model: L1
# Internal Photos

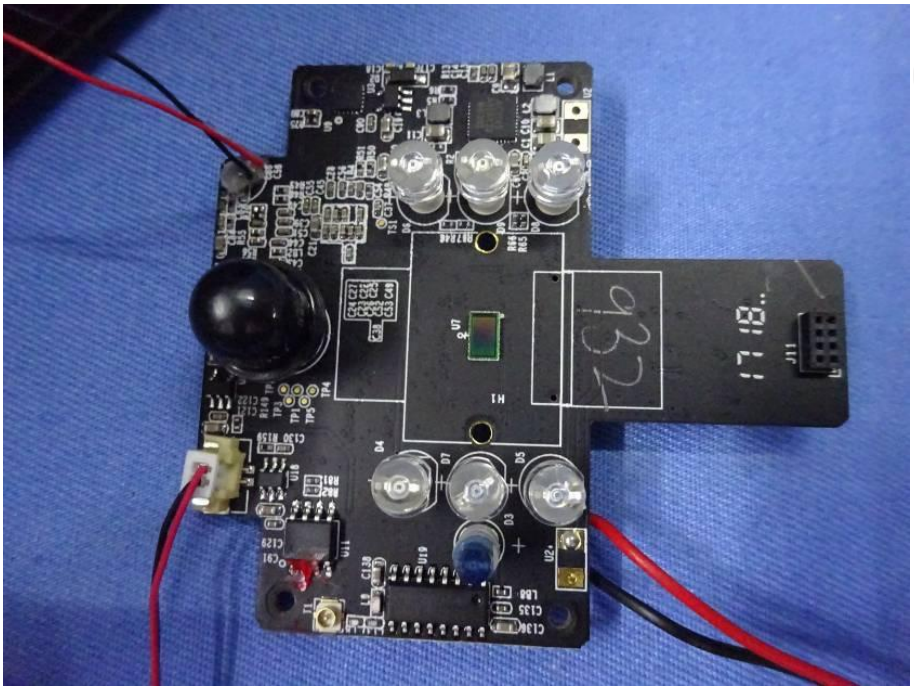


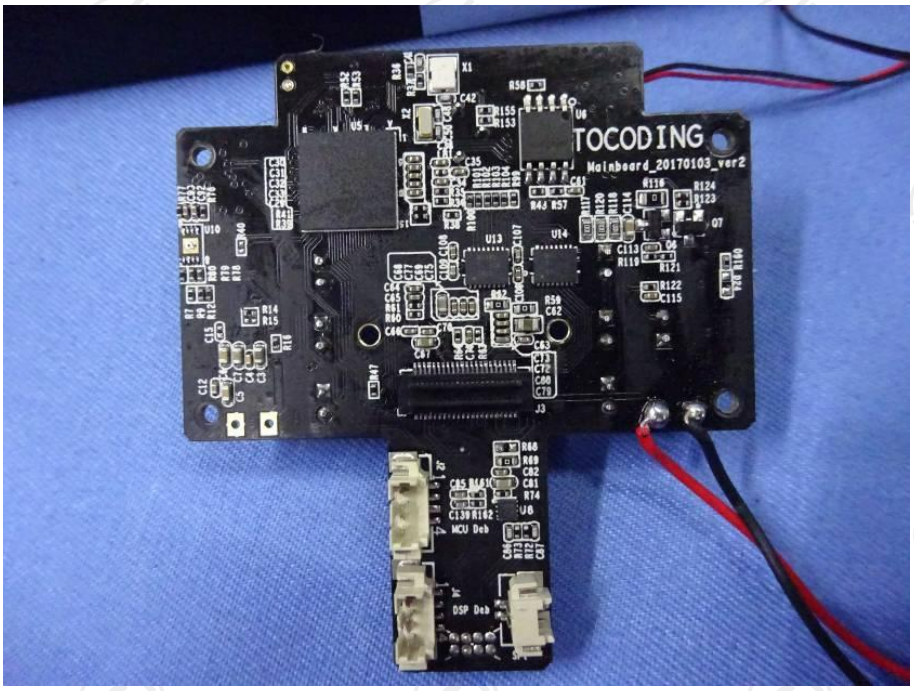


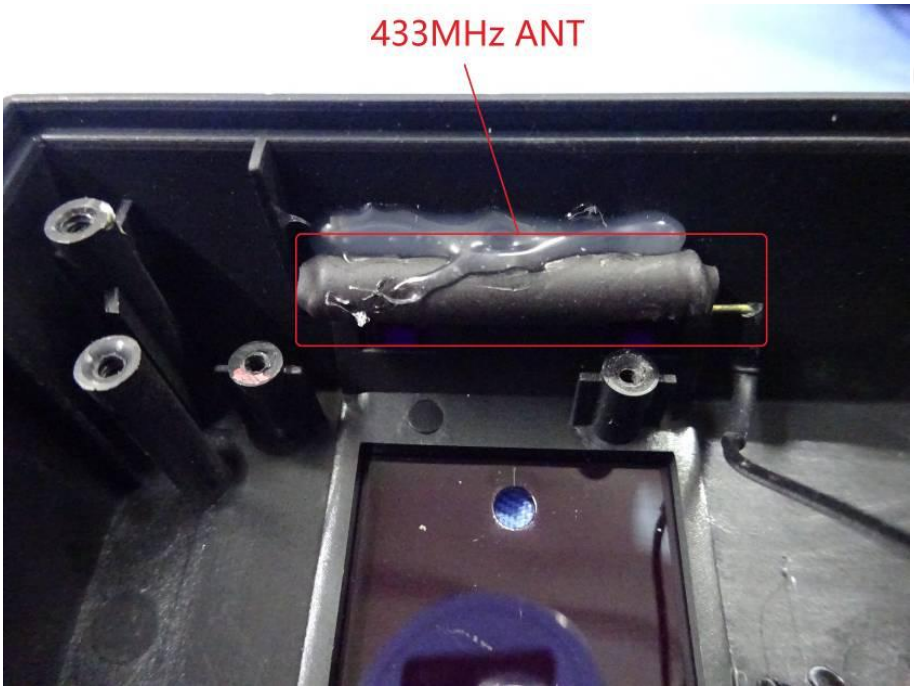


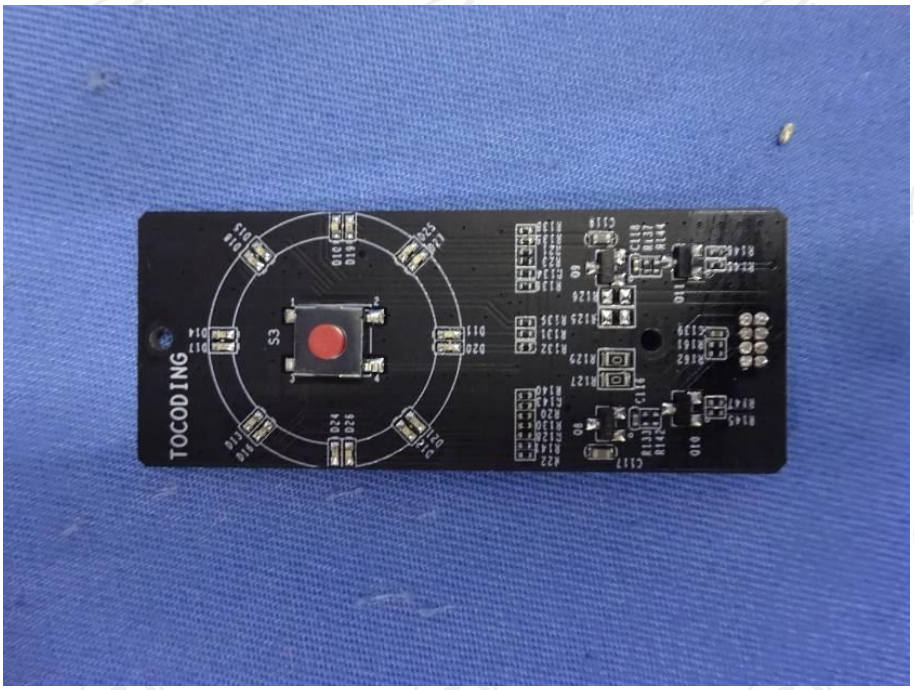

WIFI ANT

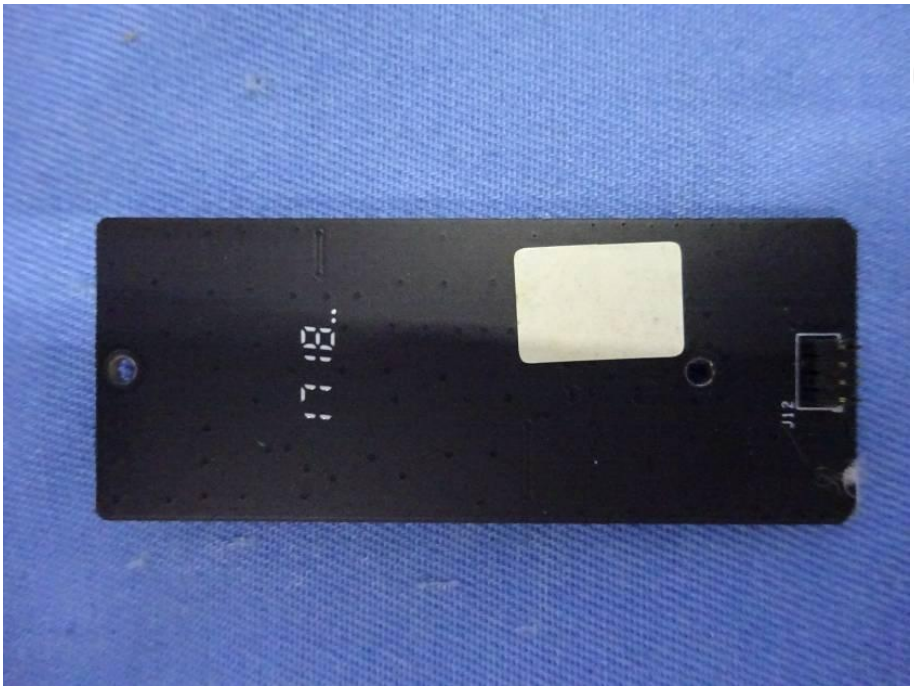





TOCODING
Mainboard_20170103_ver2


433MHz ANT




********END OF REPORT********