

FCC TEST REPORT  
for  
JOYWAY INDUSTRIAL LIMITED

315MHz Wireless Timer Switch  
Model No.: AE810-C

Prepared for : JOYWAY INDUSTRIAL LIMITED  
Address : Flat E,7/F., Phase 4, Kwun Tong Industrial Centre, 436-446  
Kwun Tong Road, Kowloon, Hong Kong, China

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited  
Address : 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road,  
Nanshan District, Shenzhen, Guangdong, China  
Tel: (86) 755-26066544  
Fax: (86) 755-26014772

Report Number : R0116081068I  
Date of Test : Nov. 15~Dec. 11, 2016  
Date of Report : Dec. 12, 2016

## TABLE OF CONTENTS

Description

Page

Test Report

|                                                                     |           |
|---------------------------------------------------------------------|-----------|
| <b>1. GENERAL INFORMATION.....</b>                                  | <b>5</b>  |
| 1.1. Description of Device (EUT).....                               | 5         |
| 1.2. Description of Test Facility.....                              | 6         |
| 1.3. Description of Test Facility.....                              | 6         |
| 1.4. Measurement Uncertainty.....                                   | 6         |
| 1.5. Test Summary.....                                              | 7         |
| <b>2. MEASURING DEVICE AND TEST EQUIPMENT.....</b>                  | <b>8</b>  |
| <b>3. Conducted Emission Test.....</b>                              | <b>9</b>  |
| 3.1. Block Diagram of Test Setup.....                               | 9         |
| 3.2. Power Line Conducted Emission Measurement Limits (15.207)..... | 9         |
| 3.3. Configuration of EUT on Measurement.....                       | 9         |
| 3.4. Operating Condition of EUT.....                                | 9         |
| 3.5. Test Procedure.....                                            | 10        |
| 3.6. Test equipment.....                                            | 10        |
| 3.7. Power Line Conducted Emission Measurement Results.....         | 10        |
| <b>4. Test Procedure.....</b>                                       | <b>15</b> |
| <b>5. Radiation Interference.....</b>                               | <b>16</b> |
| 5.1. Requirements (15.231):.....                                    | 16        |
| 5.2. Test Procedure.....                                            | 16        |
| 5.3. Test Results.....                                              | 16        |
| <b>6. 20dB Bandwidth.....</b>                                       | <b>19</b> |
| 6.1. Requirements (15.231):.....                                    | 19        |
| 6.2. EUT Setup.....                                                 | 19        |
| 6.3. Test Results.....                                              | 19        |
| <b>7. DEACTIVATION TIME.....</b>                                    | <b>21</b> |
| 7.1. EUT Setup.....                                                 | 21        |
| 7.2. Test Procedure.....                                            | 21        |
| 7.3. Requirements & Result.....                                     | 21        |
| <b>8. Antenna Application.....</b>                                  | <b>25</b> |
| 8.1. Antenna Requirement.....                                       | 25        |
| 8.2. Result.....                                                    | 25        |
| <b>9. TEST PHOTO.....</b>                                           | <b>26</b> |

|                                                   |           |
|---------------------------------------------------|-----------|
| 9.1. Photo of Conducted Emission Measurement..... | 26        |
| 9.2. Photo of Radiation Emission Test.....        | 26        |
| <b>APPENDIX I (EXTERNAL PHOTOS).....</b>          | <b>28</b> |
| <b>APPENDIX II (INTERNAL PHOTOS).....</b>         | <b>32</b> |

Anbotek

## TEST REPORT

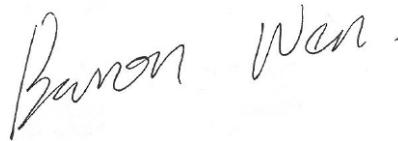
Applicant : JOYWAY INDUSTRIAL LIMITED  
Manufacturer : Huizhou Heng Jia Technology Co., LTD  
EUT : 315MHz Wireless Timer Switch  
Model No. : AE810-C  
Serial No. : N.A.  
Trade Mark : N.A.  
Rating : DC 5V, 500mA via (With DC 3.7V, 60mAh Li-ion Battery Inside)

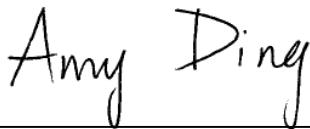
Measurement Procedure Used:  
FCC Part15 Subpart C 2016, Paragraph 15.231

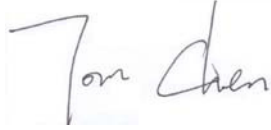
The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited

Date of Test : Nov. 15~Dec. 11, 2016

Prepared by :   
(Tested Engineer / Baron Wen)

Reviewer :   
(Project Manager / Amy Ding)

Approved & Authorized Signer :   
(Manager / Tom Chen)

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

EUT : 315MHz Wireless Timer Switch

Model Number : AE810-C

Test Power Supply : AC 120V, 60Hz for adapter/  
AC 240V, 60Hz for adapter/  
DC 3.7V Battery Inside

Frequency : 315MHz

Antenna Type : Spring Loaded Antenna

Antenna Gain : 0.5 dBi

Applicant : JOYWAY INDUSTRIAL LIMITED  
Address : Flat E,7/F., Phase 4, Kwun Tong Industrial Centre, 436-446 Kwun Tong Road, Kowloon, Hong Kong, China

Manufacturer : Huizhou Heng Jia Technology Co., LTD  
Address : Huawanda Industrial Park, 54 Community, Huitai Industrial Zone, Huizhou, Guangdong, China

Factory : Huizhou Heng Jia Technology Co., LTD  
Address : Huawanda Industrial Park, 54 Community, Huitai Industrial Zone, Huizhou, Guangdong, China

Date of receiver : Nov. 15, 2016

Date of Test : Nov. 15~Dec. 11, 2016

## 1.2. Description of Test Facility

Adapter : Manufacturer: ZTE  
M/N: STC-A2050I1000USBA-C  
S/N: 201202102100876  
Input: 100-240V~50/60Hz 0.3A  
Output: DC 5V, 1000mA

## 1.3. Description of Test Facility

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

### **FCC-Registration No.: 752021**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

### **IC-Registration No.: 8058A-1**

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, Jun. 13, 2016.

### **Test Location**

All Emissions tests were performed at  
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC  
Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong,  
China

## 1.4. Measurement Uncertainty

Radiation Uncertainty : Ur = 4.1 dB (Horizontal)  
Ur = 4.3 dB (Vertical)  
Conduction Uncertainty : Uc = 3.4dB

### 1.5. Test Summary

For the EUT described above. The standards used were FCC Part 15 Subpart C Section 15.231 for Emissions

#### Tests Carried Out Under FCC Part 15 Subpart C

| Standard                               | Test Items                                 | Status | Application                  |
|----------------------------------------|--------------------------------------------|--------|------------------------------|
| Part 15<br>Subpart C<br>Section 15.231 | Disturbance Voltage at The Mains Terminals | x      | N/A, without AC power supply |
|                                        | Conducted Emission Test                    | √      |                              |
|                                        | Radiation Emission                         | √      |                              |
|                                        | 20dB Bandwidth                             | √      |                              |
|                                        | Duty Cycle                                 | √      |                              |

- √ Indicates that the test is applicable.  
x Indicates that the test is not applicable.

## 2. MEASURING DEVICE AND TEST EQUIPMENT

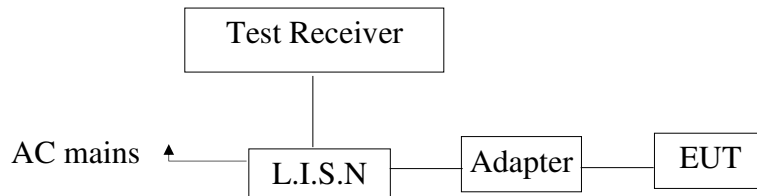
The following test equipments were used during test:

| Item | Equipment                      | Manufacturer            | Model No.    | Serial No.    | Last Cal.     | Cal. Interval |
|------|--------------------------------|-------------------------|--------------|---------------|---------------|---------------|
| 1.   | Spectrum Analysis              | Agilent                 | E4407B       | US39390582    | Jul. 12, 2016 | 1 Year        |
| 2.   | Preamplifier                   | Instruments corporation | EMC011830    | 980100        | Jun. 17, 2016 | 1 Year        |
| 3.   | EMI Test Receiver              | Rohde & Schwarz         | ESPI         | 101604        | Jun. 17, 2016 | 1 Year        |
| 4.   | Double Ridged Horn Antenna     | Instruments corporation | GTH-0118     | 351600        | May 06, 2016  | 1 Year        |
| 5.   | Bilog Broadband Antenna        | Schwarzbeck             | VULB9163     | VULB 9163-289 | May 06, 2016  | 1 Year        |
| 6.   | Pre-amplifier                  | SONOMA                  | 310N         | 186860        | Jun. 17, 2016 | 1 Year        |
| 7.   | EMI Test Software EZ-EMC       | SHURPLE                 | N/A          | N/A           | N/A           | N/A           |
| 8    | Power Sensor                   | Agilent                 | KFSW150502   | 15I00041SN045 | Jun. 17, 2016 | 1 Year        |
| 9    | MXA Spectrum Analysis          | Agilent                 | N9020A       | MY51170037    | Jun. 17, 2016 | 1 Year        |
| 10   | MXG RF Vector Signal Generator | Agilent                 | N5182A       | MY48180656    | Jun. 17, 2016 | 1 Year        |
| 11   | Signal Generator               | Agilent                 | E4421B       | MY41000743    | Jun. 17, 2016 | 1 Year        |
| 12   | DC Power supply                | IV                      | IV-8080      | YQSB0096      | Jun. 17, 2016 | 1 Year        |
| 13   | TEMP&HUMI PROGRAMMABLE CHAMBER | Bell Group              | BE-THK-150M8 | SE-0137       | Jun. 17, 2016 | 1 Year        |

### 3. Conducted Emission Test

#### 3.1. Block Diagram of Test Setup

##### 3.1.1. Block diagram of connection between the EUT and simulators



#### 3.2. Power Line Conducted Emission Measurement Limits (15.207)

| Frequency<br>MHz | Limits dB(μV)    |               |
|------------------|------------------|---------------|
|                  | Quasi-peak Level | Average Level |
| 0.15 ~ 0.50      | 66 ~ 56*         | 56 ~ 46*      |
| 0.50 ~ 5.00      | 56               | 46            |
| 5.00 ~ 30.00     | 60               | 50            |

Notes: 1. \*Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

#### 3.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

#### 3.4. Operating Condition of EUT

3.4.1. Setup the EUT and simulator as shown as Section 3.1.

3.4.2. Turn on the power of all equipment.

3.4.3. Let the EUT work in test mode (On) and measure it.

### 3.5. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test results are reported on Section 3.6.

### 3.6. Test equipment

| Item | Equipment          | Manufacturer         | Model No. | Serial No. | Last Cal.     | Cal. Interval |
|------|--------------------|----------------------|-----------|------------|---------------|---------------|
| 1.   | Two-Line V-network | Rohde & Schwarz      | ENV216    | 100055     | Jul. 19, 2016 | 1 Year        |
| 2.   | EMI Test Receiver  | Rohde & Schwarz      | ESCI      | 100627     | Jun. 17, 2016 | 1 Year        |
| 3.   | RF Switching Unit  | Compliance Direction | RSU-M2    | 38303      | Jun. 17, 2016 | 1 Year        |

### 3.7. Power Line Conducted Emission Measurement Results

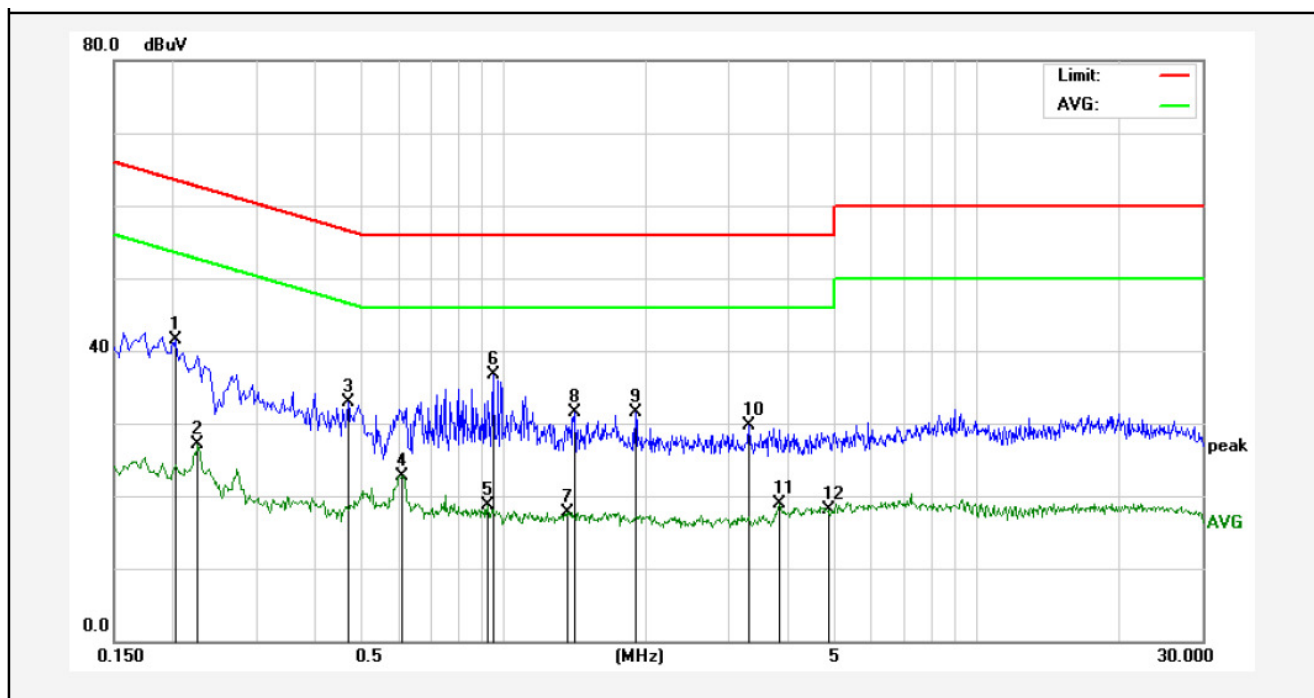
**PASS.**

The frequency range from 150KHz to 30 MHz is investigated.

Please refer the following pages.

**CONDUCTED EMISSION TEST DATA**

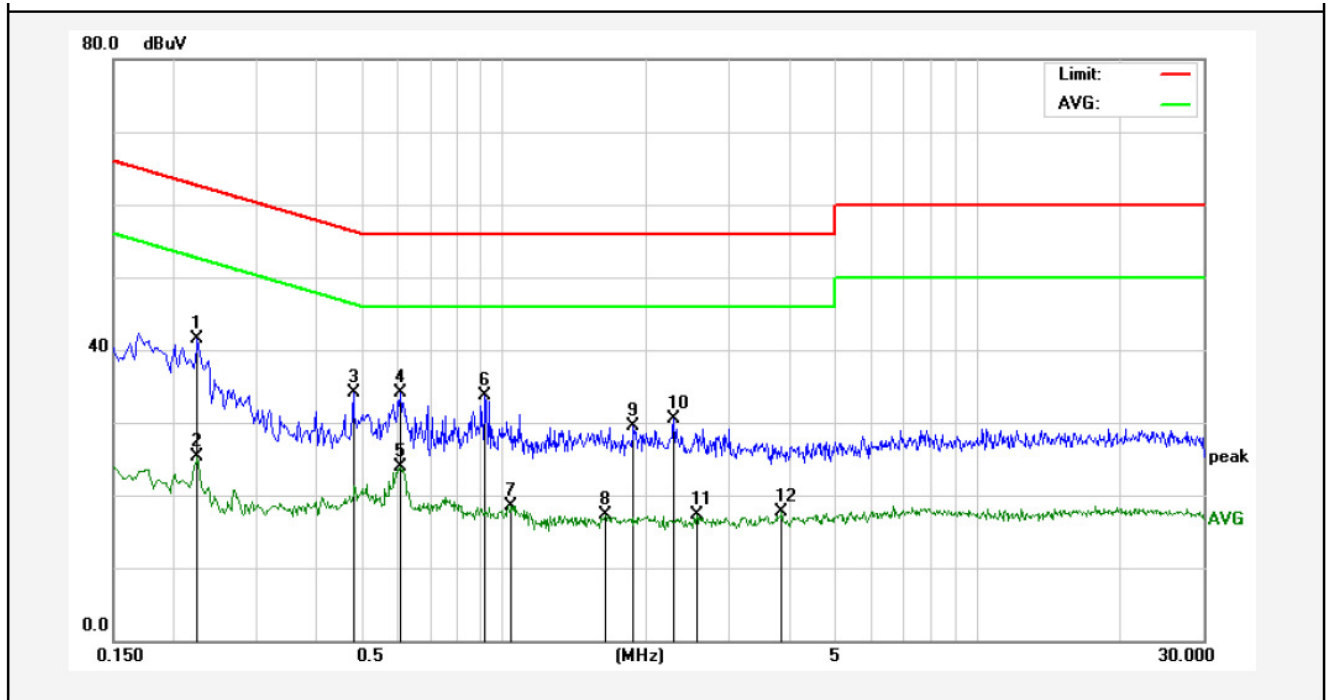
Test Site: 1# Shielded Room  
Operating Condition: On  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Live Line  
Tem.:24°C Hum.:49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.2020      | 21.53          | 19.90       | 41.43         | 63.52      | -22.09          | QP       |        |
| 2   | 0.2260      | 7.20           | 19.89       | 27.09         | 52.59      | -25.50          | AVG      |        |
| 3   | 0.4699      | 12.99          | 19.97       | 32.96         | 56.52      | -23.56          | QP       |        |
| 4   | 0.6099      | 2.78           | 20.01       | 22.79         | 46.00      | -23.21          | AVG      |        |
| 5   | 0.9260      | -1.48          | 20.10       | 18.62         | 46.00      | -27.38          | AVG      |        |
| 6   | 0.9499      | 16.63          | 20.11       | 36.74         | 56.00      | -19.26          | QP       |        |
| 7   | 1.3660      | -2.38          | 20.13       | 17.75         | 46.00      | -28.25          | AVG      |        |
| 8   | 1.4139      | 11.37          | 20.13       | 31.50         | 56.00      | -24.50          | QP       |        |
| 9   | 1.9019      | 11.36          | 20.14       | 31.50         | 56.00      | -24.50          | QP       |        |
| 10  | 3.3060      | 9.48           | 20.17       | 29.65         | 56.00      | -26.35          | QP       |        |
| 11  | 3.8260      | -1.34          | 20.18       | 18.84         | 46.00      | -27.16          | AVG      |        |
| 12  | 4.8658      | -2.13          | 20.20       | 18.07         | 46.00      | -27.93          | AVG      |        |

**CONDUCTED EMISSION TEST DATA**

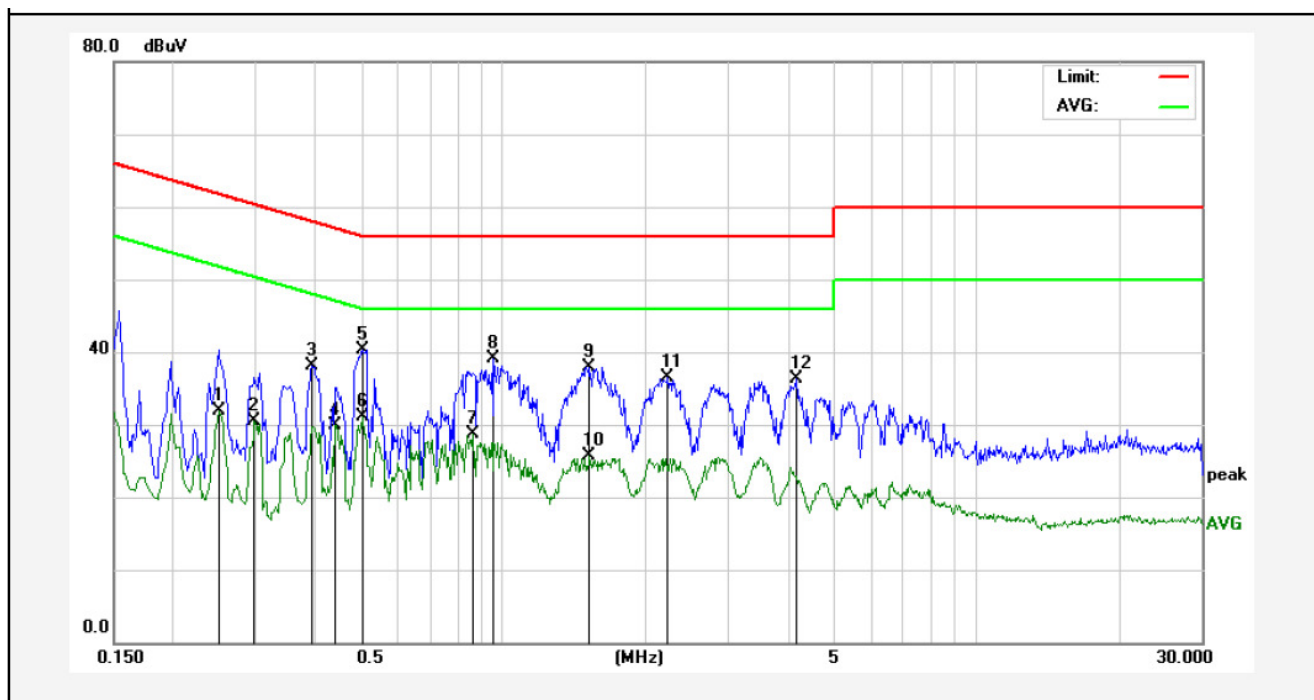
Test Site: 1# Shielded Room  
Operating Condition: On  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Neutral Line  
Tem.:24℃ Hum.:49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.2260      | 21.57          | 19.89       | 41.46         | 62.59      | -21.13          | QP       |        |
| 2   | 0.2260      | 5.47           | 19.89       | 25.36         | 52.59      | -27.23          | AVG      |        |
| 3   | 0.4819      | 14.11          | 19.97       | 34.08         | 56.31      | -22.23          | QP       |        |
| 4   | 0.6059      | 14.15          | 20.01       | 34.16         | 56.00      | -21.84          | QP       |        |
| 5   | 0.6059      | 3.93           | 20.01       | 23.94         | 46.00      | -22.06          | AVG      |        |
| 6   | 0.9140      | 13.70          | 20.10       | 33.80         | 56.00      | -22.20          | QP       |        |
| 7   | 1.0420      | -1.57          | 20.12       | 18.55         | 46.00      | -27.45          | AVG      |        |
| 8   | 1.6379      | -2.90          | 20.13       | 17.23         | 46.00      | -28.77          | AVG      |        |
| 9   | 1.8859      | 9.33           | 20.14       | 29.47         | 56.00      | -26.53          | QP       |        |
| 10  | 2.2900      | 10.44          | 20.15       | 30.59         | 56.00      | -25.41          | QP       |        |
| 11  | 2.5539      | -2.82          | 20.15       | 17.33         | 46.00      | -28.67          | AVG      |        |
| 12  | 3.8620      | -2.57          | 20.18       | 17.61         | 46.00      | -28.39          | AVG      |        |

**CONDUCTED EMISSION TEST DATA**

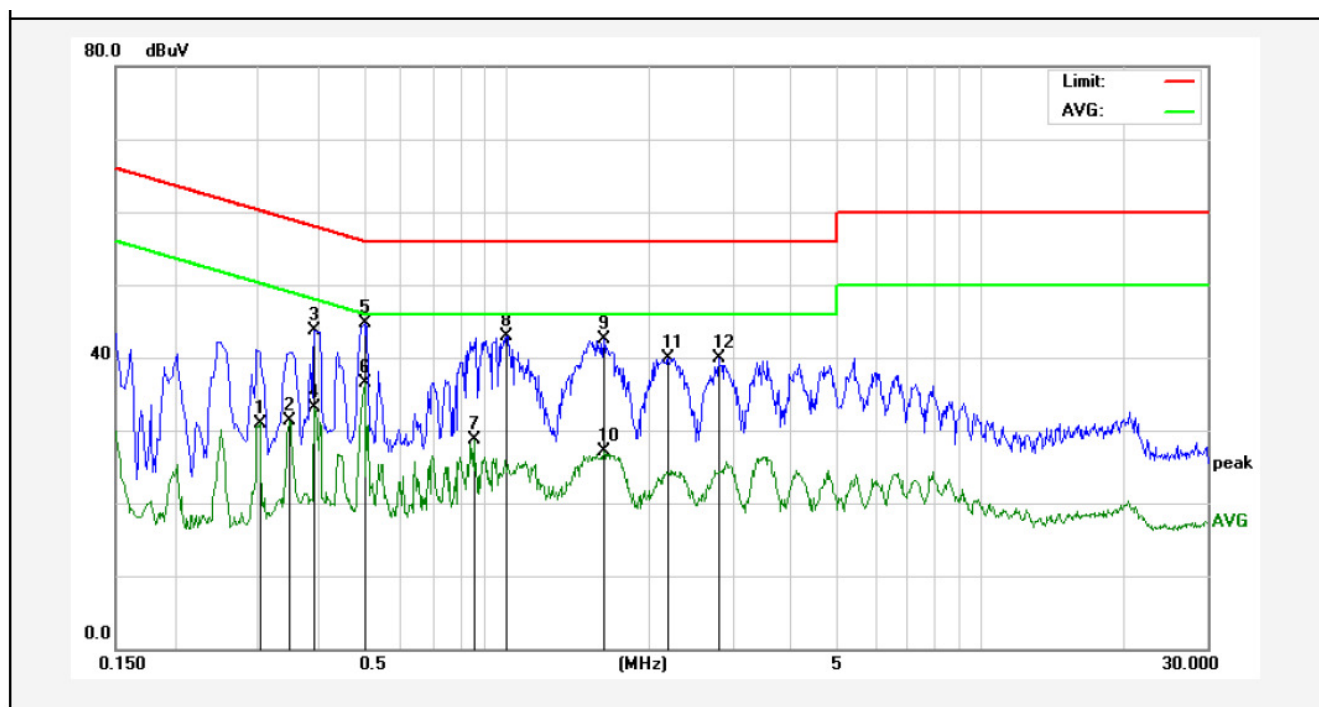
Test Site: 1# Shielded Room  
Operating Condition: On  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Live Line  
Tem.:24℃ Hum.:49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.2500      | 12.09          | 19.89       | 31.98         | 51.75      | -19.77          | AVG      |        |
| 2   | 0.2977      | 10.54          | 19.89       | 30.43         | 50.30      | -19.87          | AVG      |        |
| 3   | 0.3940      | 18.21          | 19.93       | 38.14         | 57.98      | -19.84          | QP       |        |
| 4   | 0.4420      | 9.98           | 19.95       | 29.93         | 47.02      | -17.09          | AVG      |        |
| 5   | 0.5020      | 20.35          | 19.98       | 40.33         | 56.00      | -15.67          | QP       |        |
| 6   | 0.5060      | 11.12          | 19.98       | 31.10         | 46.00      | -14.90          | AVG      |        |
| 7   | 0.8618      | 8.68           | 20.08       | 28.76         | 46.00      | -17.24          | AVG      |        |
| 8   | 0.9576      | 18.90          | 20.11       | 39.01         | 56.00      | -16.99          | QP       |        |
| 9   | 1.5140      | 17.84          | 20.13       | 37.97         | 56.00      | -18.03          | QP       |        |
| 10  | 1.5220      | 5.57           | 20.13       | 25.70         | 46.00      | -20.30          | AVG      |        |
| 11  | 2.2299      | 16.29          | 20.14       | 36.43         | 56.00      | -19.57          | QP       |        |
| 12  | 4.1577      | 16.09          | 20.18       | 36.27         | 56.00      | -19.73          | QP       |        |

**CONDUCTED EMISSION TEST DATA**

Test Site: 1# Shielded Room  
Operating Condition: On  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Neutral Line  
Tem.:24℃ Hum.:49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.3019      | 11.11          | 19.89       | 31.00         | 50.19        | -19.19          | AVG      |        |
| 2   | 0.3497      | 11.30          | 19.91       | 31.21         | 48.97        | -17.76          | AVG      |        |
| 3   | 0.3940      | 23.85          | 19.93       | 43.78         | 57.98        | -14.20          | QP       |        |
| 4   | 0.3940      | 13.20          | 19.93       | 33.13         | 47.98        | -14.85          | AVG      |        |
| 5   | 0.5020      | 24.68          | 19.98       | 44.66         | 56.00        | -11.34          | QP       |        |
| 6   | 0.5020      | 16.45          | 19.98       | 36.43         | 46.00        | -9.57           | AVG      |        |
| 7   | 0.8538      | 8.58           | 20.08       | 28.66         | 46.00        | -17.34          | AVG      |        |
| 8   | 1.0020      | 22.82          | 20.12       | 42.94         | 56.00        | -13.06          | QP       |        |
| 9   | 1.6019      | 22.41          | 20.13       | 42.54         | 56.00        | -13.46          | QP       |        |
| 10  | 1.6019      | 6.96           | 20.13       | 27.09         | 46.00        | -18.91          | AVG      |        |
| 11  | 2.1899      | 19.78          | 20.14       | 39.92         | 56.00        | -16.08          | QP       |        |
| 12  | 2.8020      | 19.68          | 20.16       | 39.84         | 56.00        | -16.16          | QP       |        |

## 4. Test Procedure

### JUSTIFICATION

ANSI C63.10 2013 section 12.1.4.1 requires that hand-held or body-worn devices shall include rotation of the EUT through three orthogonal axes to determine the attitude that maximizes the emissions. The EUT is a hand-held device. As such, preliminary tests were performed to determine the orientation that produced the highest level of emissions. This was with the DUT orientated vertically as shown in Section 7.1.

### GENERAL:

This report shall NOT be reproduced except in full without the written approval of Anbotek Compliance Laboratory Limited. The EUT was transmitting a test signal during the testing.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.10-2013 using a spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the EUT was 74.3oF with a humidity of 69%.

**FORMULA OF CONVERSION FACTORS:** The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

### Example:

Freq (MHz) METER READING + ACF = FS  
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

**ANSI STANDARD C63.10-2013 10.1.7 MEASUREMENT PROCEDURES:** The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

## 5. Radiation Interference

### 5.1. Requirements (15.231):

According to 15.231(b), the field strength of emissions from Intentional Radiators operated under this section shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental |                  | Field Strength of Spurious |               |
|-----------------------------|-------------------------------|------------------|----------------------------|---------------|
|                             | (dBuV/m)                      | (uV/m)           | (dBuV/m)                   | (uV/m)        |
| 40.66 - 40.70               | 67.04                         | 2,250            | 47.04                      | 225           |
| 70 - 130                    | 61.94                         | 1,250            | 41.94                      | 125           |
| 130 - 174                   | * 61.94 - 71.48               | * 1,250 - 3,750  | * 41.94 - 51.48            | * 125 - 375   |
| 174 - 260                   | 71.48                         | 3,750            | 51.48                      | 375           |
| 260 - 470                   | * 71.48 - 81.94               | * 3,750 - 12,500 | * 51.48 - 61.94            | * 375 - 1,250 |
| above 470                   | 81.94                         | 12,500           | 61.94                      | 1,250         |

### 5.2. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower.

The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

All readings from 30MHz to 1GHz are quasi-peak values with a resolution bandwidth of 120kHz. All reading are above 1GHz, peak & average values with a resolution bandwidth of 1MHz. The EUT is tested in 9\*6\*6 Chamber. The device is evaluated in xyz orientation.

### 5.3. Test Results

PASS.

The test data please refer the following pages. Only the worst case (x orientation).

**Data:**

**fundamental**

| Frequency | Antenna      | Reading  | Cable Loss | Ant Factor | Amplifier | Average Factor | Corrected Level | Limits   | Det  |
|-----------|--------------|----------|------------|------------|-----------|----------------|-----------------|----------|------|
| (MHz)     | Polarization | (dBuV/m) | (dB)       | (dB)       | (dB)      | (dB)           | (dBuV/m)        | (dBuV/m) | Mode |
| 315       | H            | 83.22    | 1.52       | 12.53      | 41.33     | --             | 55.94           | 95.62    | PK   |
| 315       | H            | 83.22    | 1.52       | 12.53      | 41.33     | 11.99          | 67.93           | 75.62    | AV   |
| 315       | V            | 84.59    | 1.52       | 12.53      | 41.33     | --             | 57.31           | 95.62    | PK   |
| 315       | V            | 84.59    | 1.52       | 12.53      | 41.33     | 11.99          | 69.30           | 75.62    | AV   |

**Radiated Emission**

| Frequency | Antenna      | Reading  | Cable Loss | Ant Factor | Amplifier | Corrected Level | Limits   | Margin | Det  |
|-----------|--------------|----------|------------|------------|-----------|-----------------|----------|--------|------|
| (MHz)     | Polarization | (dBuV/m) | (dB)       | (dB)       | (dB)      | (dBuV/m)        | (dBuV/m) | (dB)   | Mode |
| 136.22    | H            | 60.23    | 1.21       | 10.21      | 41.52     | 30.13           | 43.50    | -13.37 | PK   |
| 287.45    | H            | 61.58    | 1.69       | 11.25      | 40.25     | 34.27           | 46.00    | -11.73 | PK   |
| 596.69    | H            | 57.89    | 1.78       | 12.46      | 39.98     | 32.15           | 46.00    | -13.85 | PK   |
| 147.85    | V            | 59.99    | 1.04       | 10.74      | 40.05     | 31.72           | 43.50    | -11.78 | PK   |
| 239.57    | V            | 62.12    | 1.48       | 12.04      | 41.33     | 34.31           | 46.00    | -11.69 | PK   |
| 685.23    | V            | 58.74    | 1.52       | 12.55      | 38.96     | 33.85           | 46.00    | -12.15 | PK   |

### Harmonics Emissions

| Frequency | Antenna      | Reading  | Cable Loss | Ant Factor | Amplifier | Average Factor | Corrected Level | Limits   | Det  |
|-----------|--------------|----------|------------|------------|-----------|----------------|-----------------|----------|------|
| (MHz)     | Polarization | (dBuV/m) | (dB)       | (dB)       | (dB)      | (dB)           | (dBuV/m)        | (dBuV/m) | Mode |
| 630       | H            | 56.52    | 1.52       | 12.53      | 41.42     | --             | 29.15           | 75.62    | PK   |
| 630       | H            | 56.52    | 1.52       | 12.53      | 41.42     | 11.99          | 41.14           | 55.62    | AV   |
| 630       | V            | 54.33    | 1.52       | 12.53      | 41.42     | --             | 26.96           | 75.62    | PK   |
| 630       | V            | 54.33    | 1.52       | 12.53      | 41.42     | 11.99          | 38.95           | 55.62    | AV   |
| 945       | H            | 52.14    | 2.38       | 18.56      | 39.95     | --             | 33.13           | 75.62    | PK   |
| 945       | H            | 52.14    | 2.38       | 18.56      | 39.95     | 11.99          | 45.12           | 55.62    | AV   |
| 945       | V            | 50.01    | 2.38       | 18.56      | 39.95     | --             | 31.00           | 75.62    | PK   |
| 945       | V            | 50.01    | 2.38       | 18.56      | 39.95     | 11.99          | 42.99           | 55.62    | AV   |
| 1260      | H            | 49.98    | 2.85       | 21.32      | 38.30     | --             | 35.85           | 74       | PK   |
| 1260      | H            | 49.98    | 2.85       | 21.32      | 38.30     | 11.99          | 47.84           | 54       | AV   |
| 1260      | V            | 48.35    | 2.85       | 21.32      | 38.30     | --             | 34.22           | 74       | PK   |
| 1260      | V            | 48.35    | 2.85       | 21.32      | 38.30     | 11.99          | 46.21           | 54       | AV   |
| 1575      | H            | 47.63    | 3.19       | 24.05      | 38.82     | --             | 36.05           | 74       | PK   |
| 1575      | H            | 47.63    | 3.19       | 24.05      | 38.82     | 11.99          | 48.04           | 54       | AV   |
| 1575      | V            | 45.99    | 3.19       | 24.05      | 38.82     | --             | 34.41           | 74       | PK   |
| 1575      | V            | 45.99    | 3.19       | 24.05      | 38.82     | 11.99          | 46.40           | 54       | AV   |
| 1890      | H            | --       |            |            |           |                |                 | 74       | PK   |
| 1890      | H            | --       |            |            |           |                |                 | 54       | AV   |
| 1890      | V            | --       |            |            |           |                |                 | 74       | PK   |
| 1890      | V            | --       |            |            |           |                |                 | 54       | AV   |

**Remark :**

- Corrected Level = Reading + Cable Loss+Ant Factor-Amplifier+Correction Factor
- Correction Factor =  $20 \log$  (duty cycle) Pls refer to section 6.3
- AV=PK+ $20 \log$  (duty cycle)
- “ -- ” Mark indicated Background Noise Level
- Pulse Desensitization Correction Factor  
Pulse Width (PW)= 79.50ms  
 $2/PW=2/79.50=0.03\text{kHz}$   
RBW(100kHz)> 2/PW (0.03kHz)  
Therefore PDCF is not needed.

## 6. 20dB Bandwidth

### 6.1. Requirements (15.231):

In accordance with Part15.231(c), the fundamental frequency bandwidth was kept within 0.25% of the center frequency for devices operating >70MHz and <900MHz.

| Fundamental Frequency (MHz) | Limit of 20dB Bandwidth (kHz)   |
|-----------------------------|---------------------------------|
| 315                         | $315000 \times 0.0025 = 787.50$ |

### 6.2. EUT Setup

The radiated emission tests were performed in the in the 3m Semi-anechoic chamber, using the setup accordance with the ANSI C63.10-2013.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

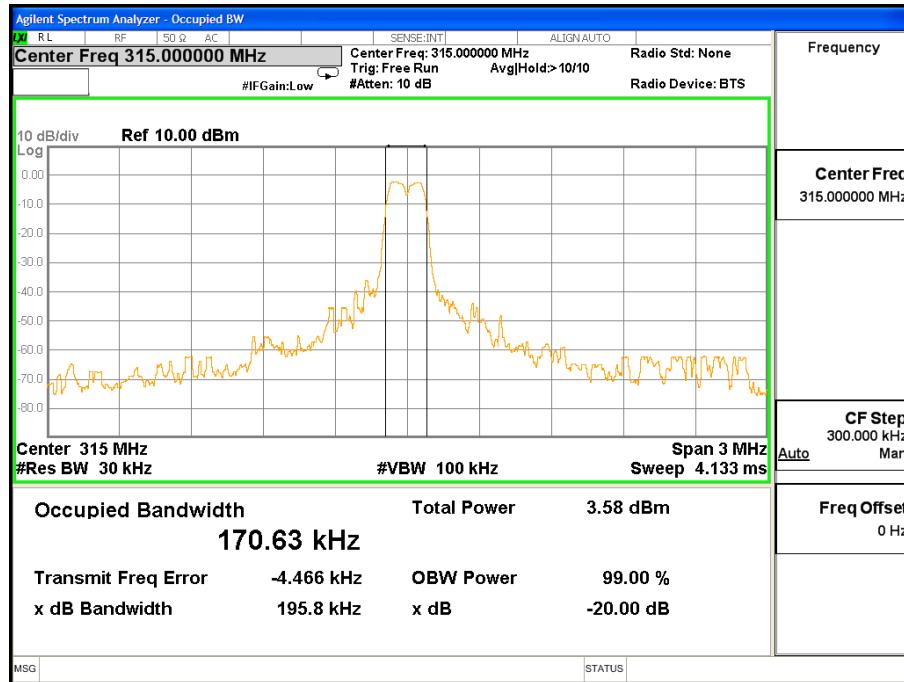
Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

### 6.3. Test Results

Pass.

Please refer the following plot.

| Channel Frequency (MHz) | Measured 20dB Bandwidth(kHz) | Limit(kHz) | Result |
|-------------------------|------------------------------|------------|--------|
| 315                     | 195.8                        | 787.5      | PASS   |



## 7. DEACTIVATION TIME

### 7.1. EUT Setup

The radiated emission tests were performed in the in the 3m Semi-anechoic chamber, using the setup accordance with the ANSI C63.10-2013.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

### 7.2. Test Procedure

The EUT was placed on a turntable which is 0.8m above ground plane.

Set EUT operating in continuous transmitting mode

Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 100kHz and video bandwidth(VBW) to 300kHz, Span was set to 0Hz.

The Duty Cycle was measured and recorded.

### 7.3. Requirements & Result

**1. Regulation 15.231(a)** The provisions of this Section are restricted to periodic operation within the band 40.66 -40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted.

**Result:**

The EUT is a remote switch without audio or video transmitted.

The EUT meets the requirements of this section.

**2. Regulation 15.231(a2)** A transmitter activated automatically shall cease transmission within 5 seconds after activation.

**Result:**

The EUT doesn't have automatic transmission.

**3. Regulation 15.231(a3)** Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than one seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed one seconds per hour.

**Result:**

The EUT doesn't employ periodic transmission.

**4. Regulation 15.231(a4)** Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

**Result:**

This section is not applicable to the EUT.

**5. Regulation 15.231(a1)** A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

**Result:**

Averaging factor in dB =  $20 \log (\text{duty cycle})$

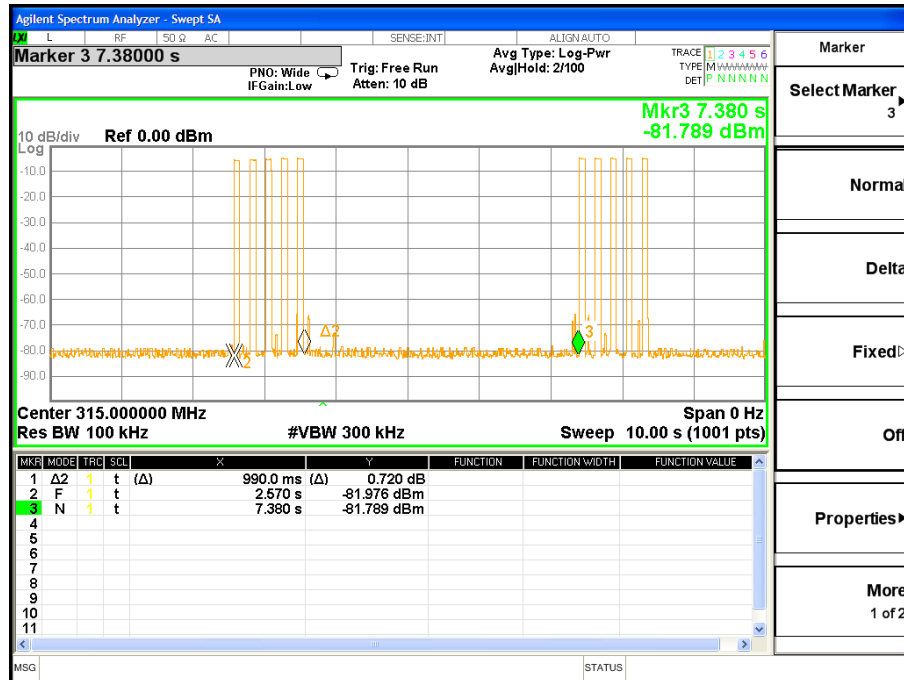
The duration of one cycle = 4810.00ms ( $T_{\text{total}}(T_{\text{on}}+T_{\text{off}}) > 100\text{ms}$  , use 100ms)

Duty Cycle =  $79.50\text{ms} \times 5 = 397.5 \text{ ms} / 100\text{ms} = 3.975$

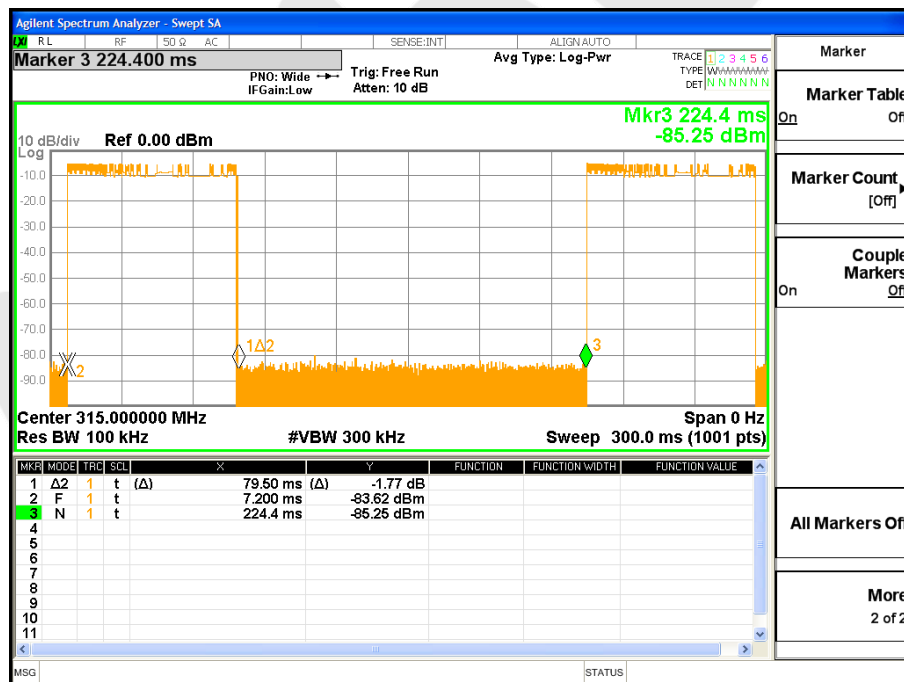
Therefore, the averaging factor is found by  $20 \log 3.975 = 11.99\text{dB}$

Please see the diagrams below.

## Time Slot

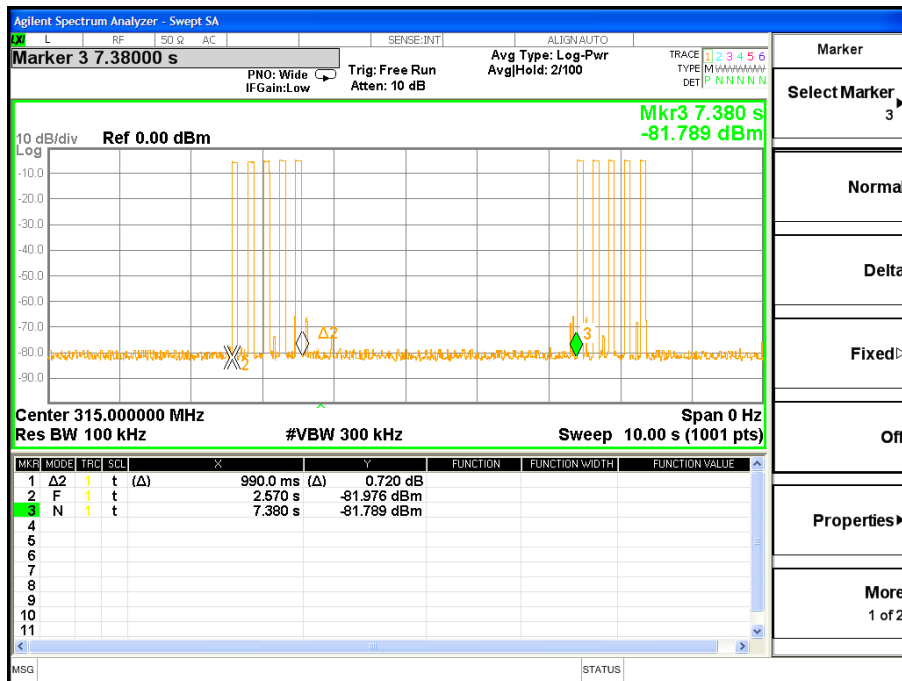


## Duty Cycle



A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

**Result:Pass**



## 8. Antenna Application

### 8.1. Antenna Requirement

The EUT'S antenna should meet the requirement of FCC part 15C section 15.203.

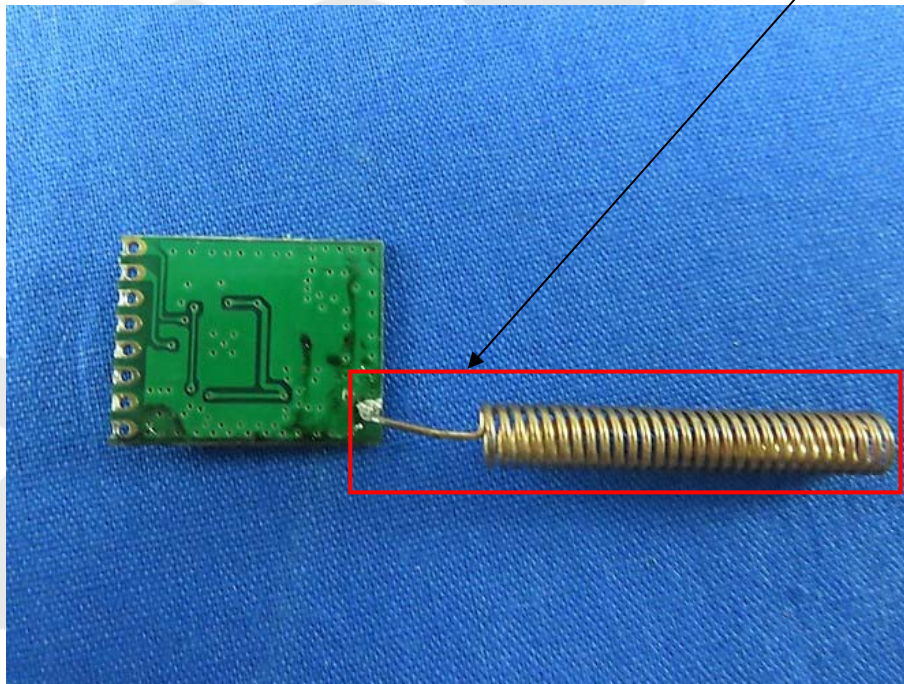
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

- 1) Antenna must be permanently attached to device.
- 2) The antenna must use a unique type of connector to attach to the device.
- 3) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.

### 8.2. Result

The EUT's antenna used a Spring Loaded Antenna, The antenna's gain is 0.5dBi and meets the requirement.

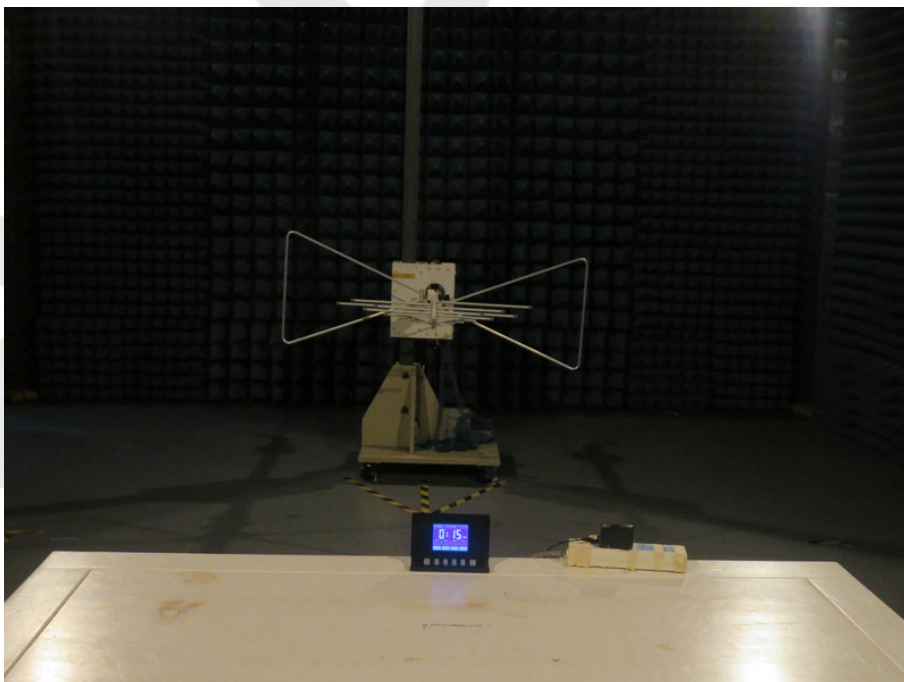


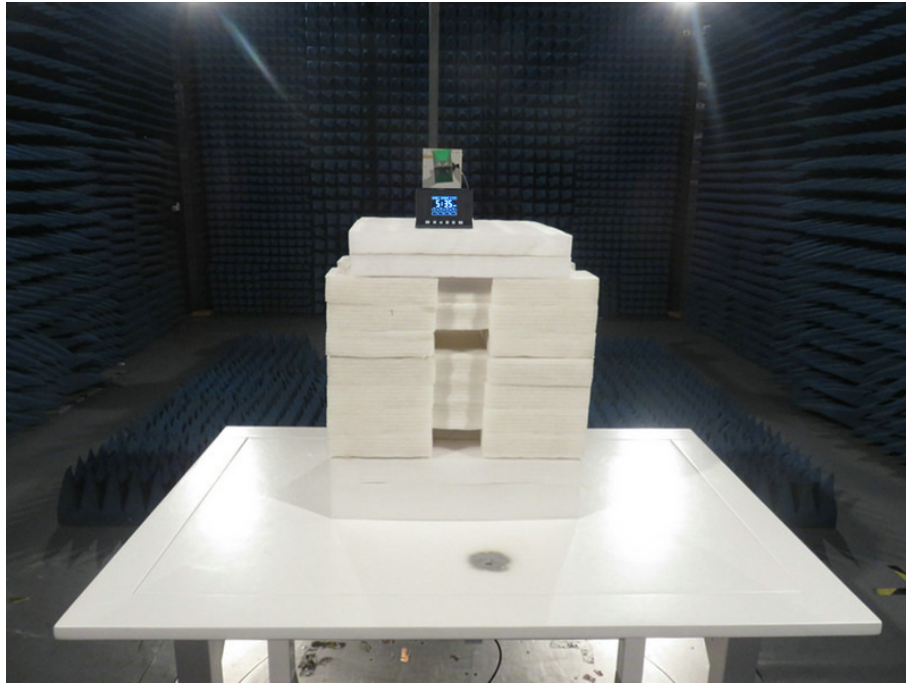
## 9. TEST PHOTO

### 9.1. Photo of Conducted Emission Measurement



### 9.2. Photo of Radiation Emission Test





## APPENDIX I (EXTERNAL PHOTOS)

1. Figure



2. Figure



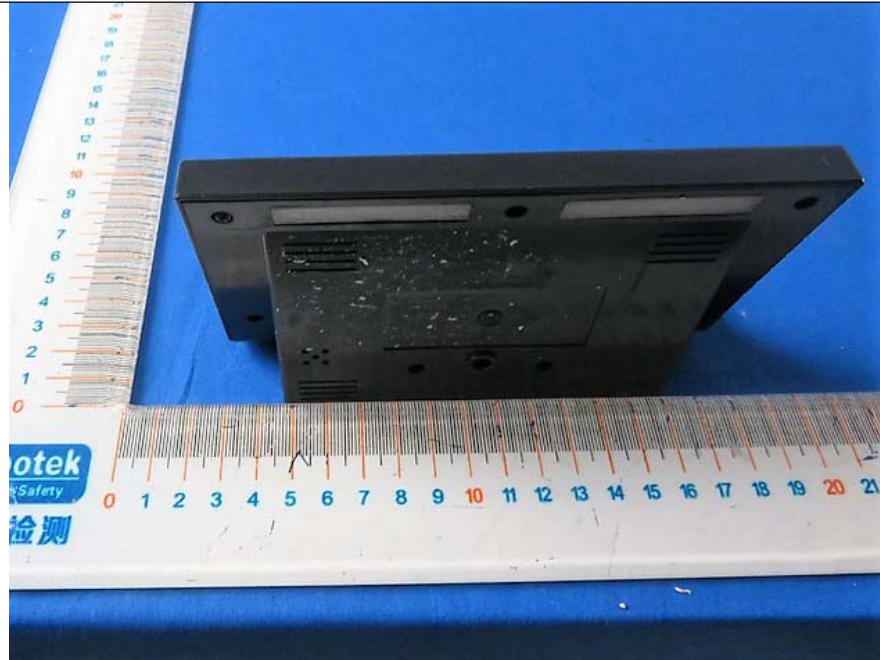
3. Figure



4. Figure



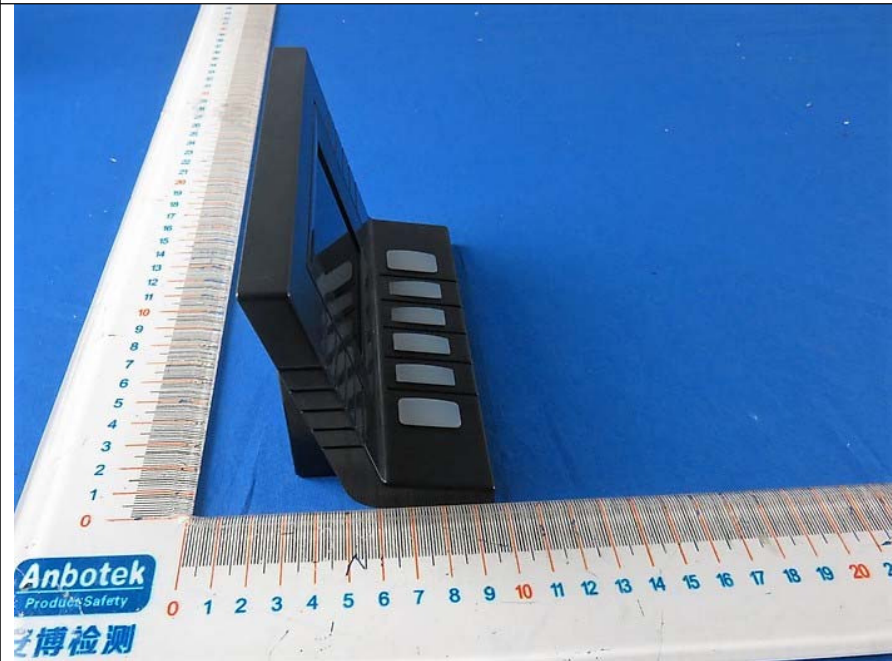
5. Figure



6. Figure



7. Figure

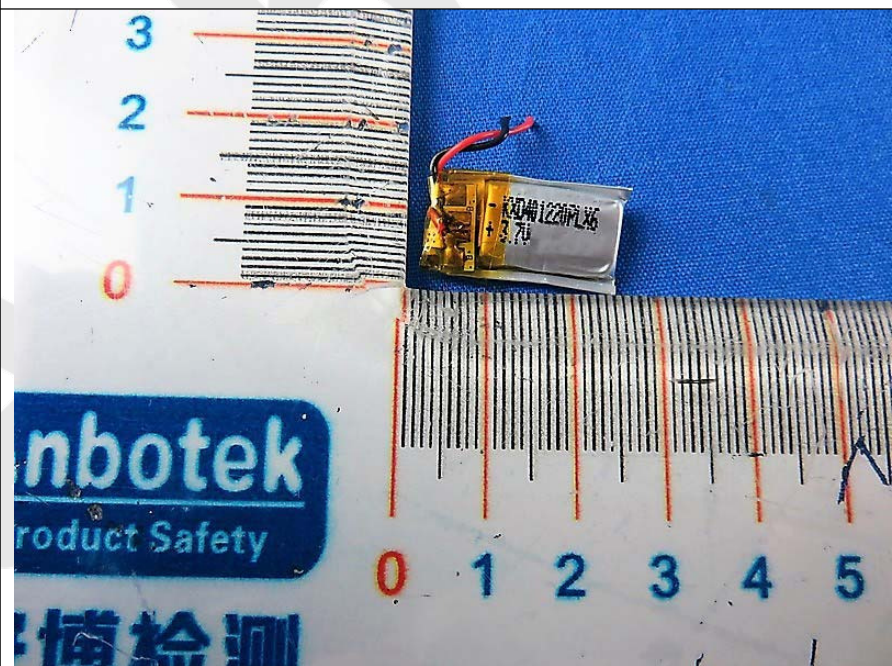


## APPENDIX II (INTERNAL PHOTOS)

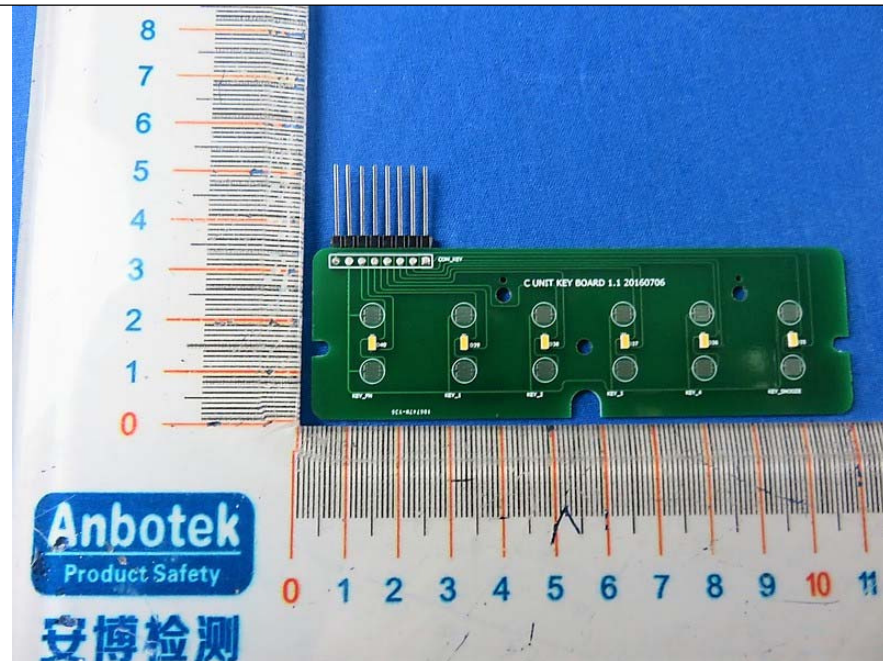
1. Figure



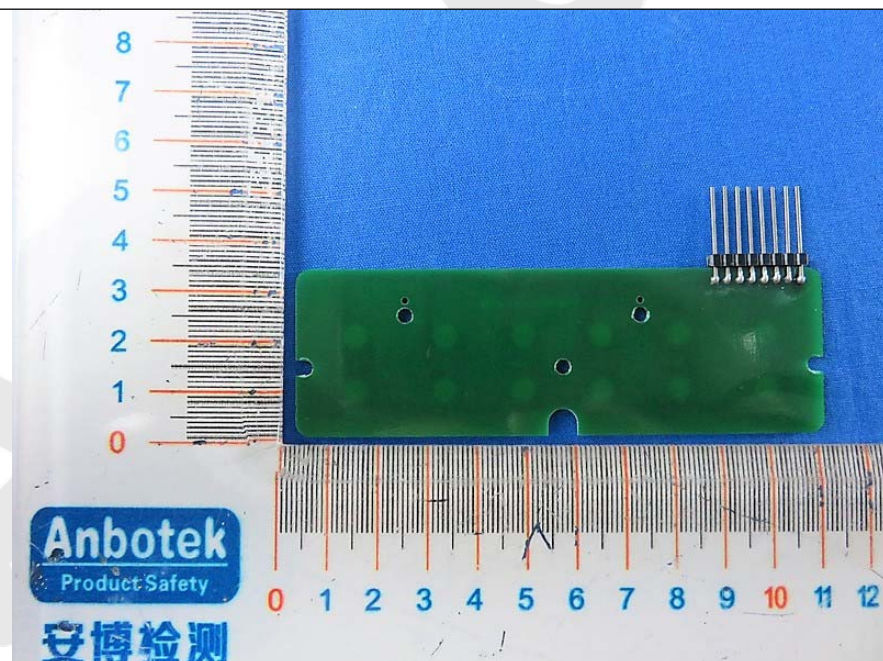
2. Figure



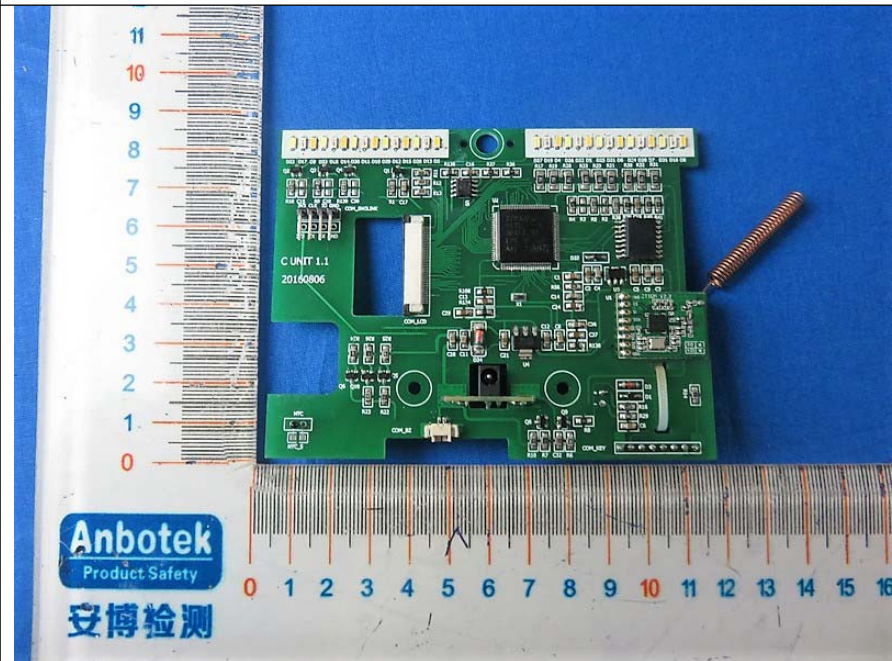
3. Figure



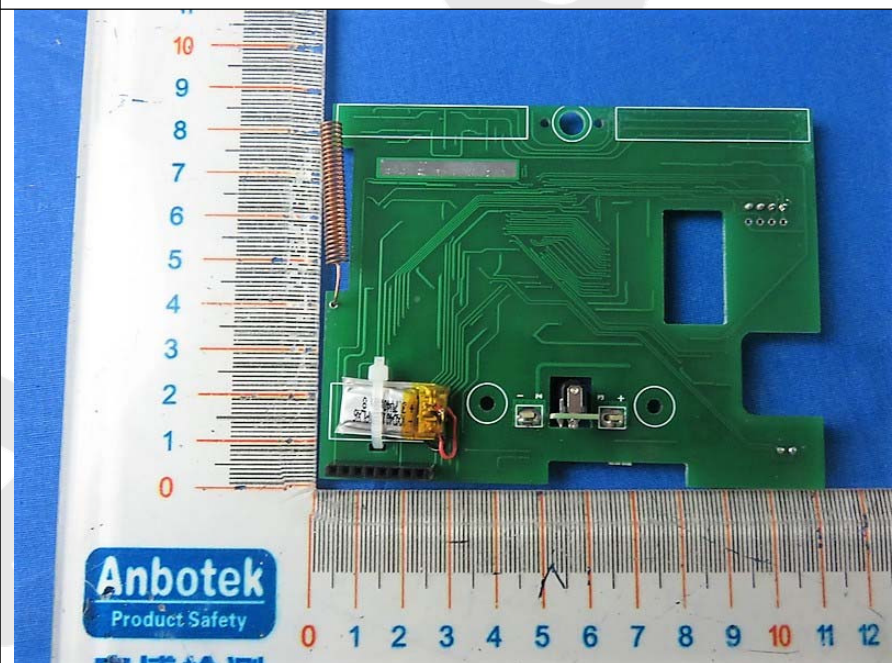
4. Figure



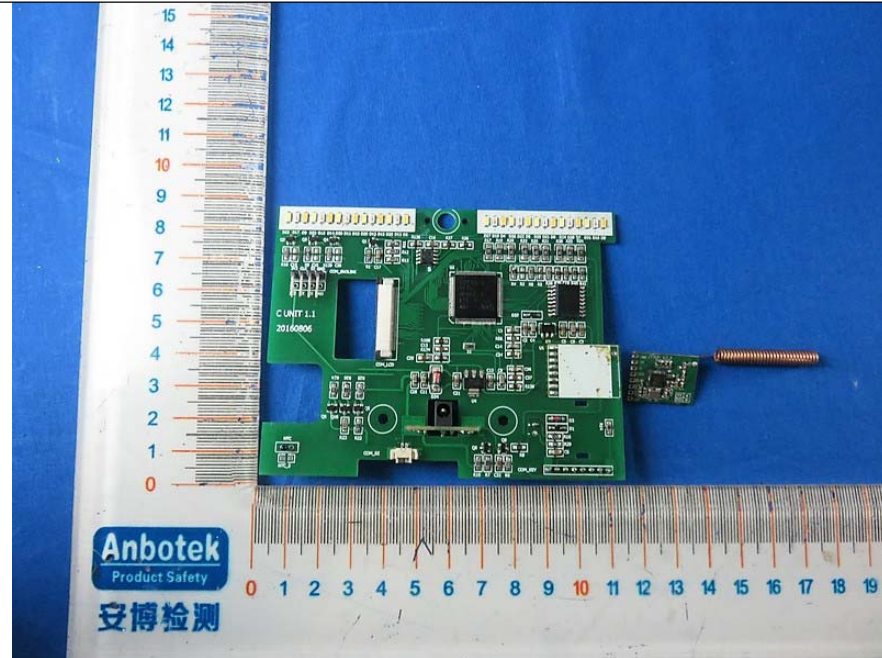
5. Figure



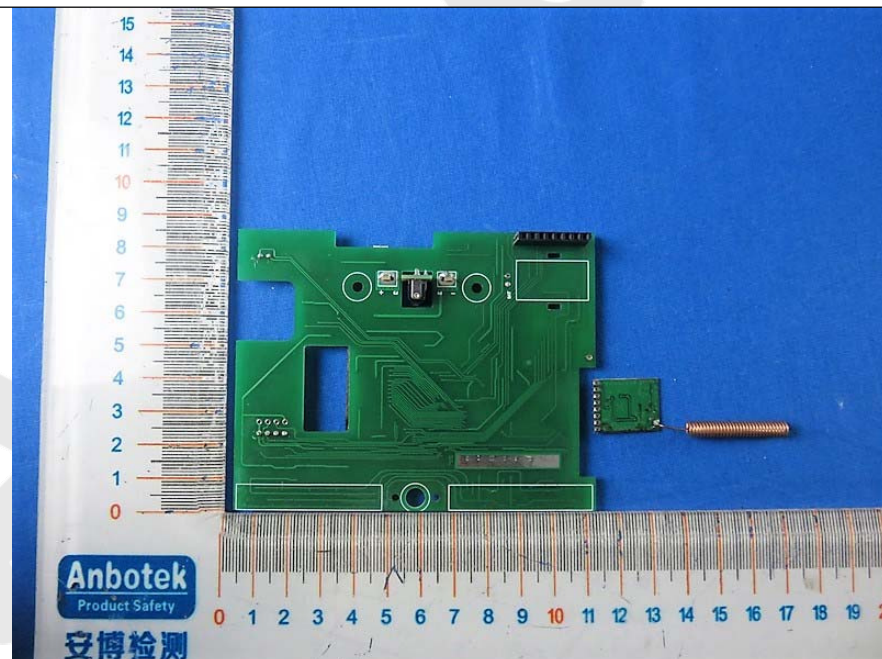
6. Figure



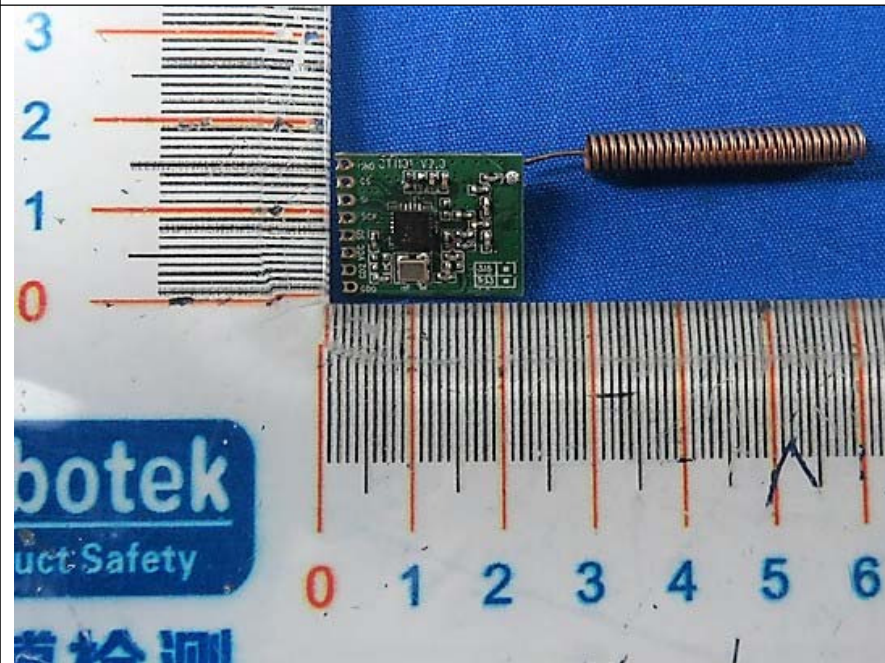
7. Figure



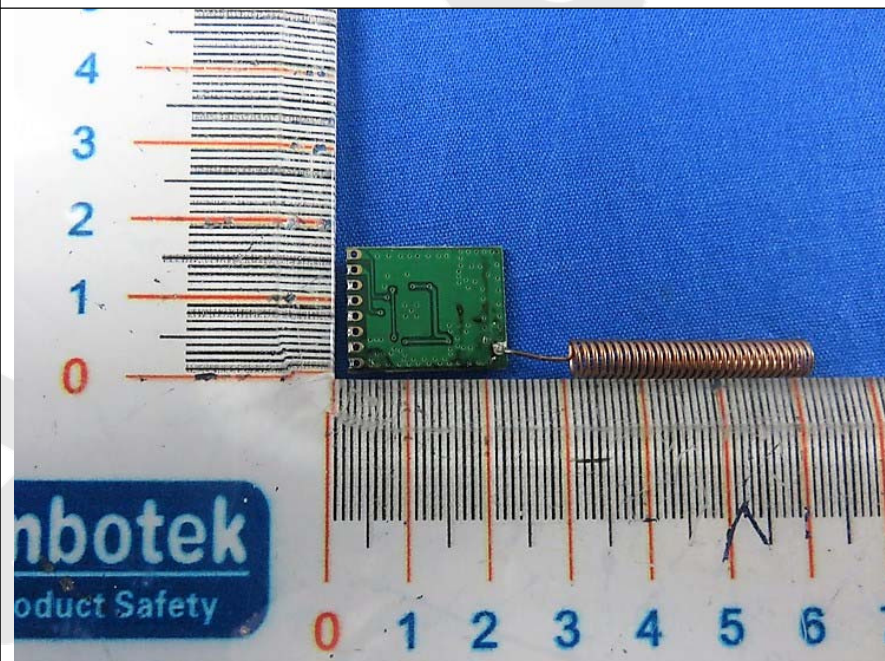
8. Figure



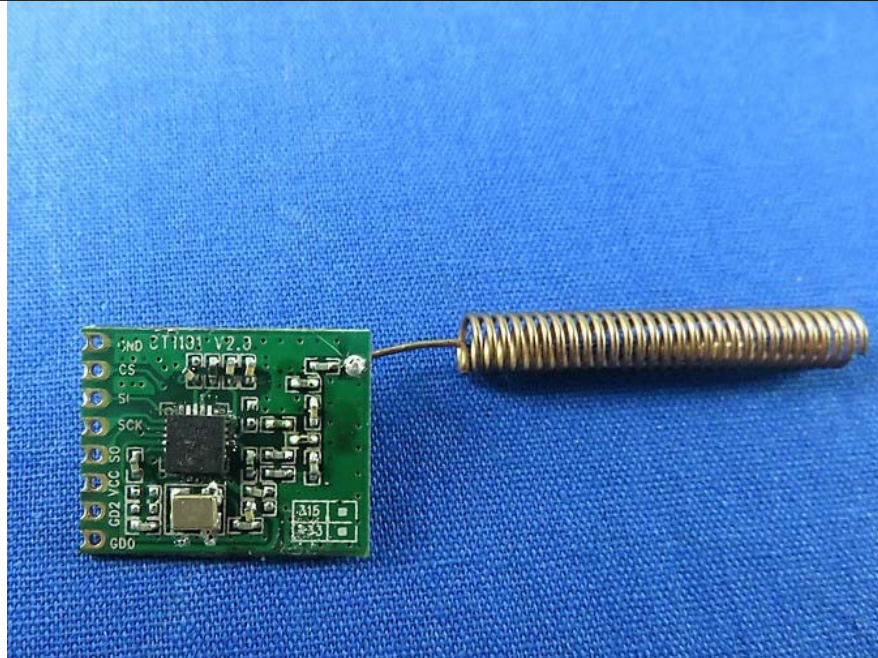
9. Figure



10. Figure



11. Figure



12. Figure

