

# TEST REPORT

**Reference No.**..... : WTS18S11127947W  
**FCC ID**..... : 2AL7Q-GD-10T  
**Applicant**..... : ShenZhen EBELONG Technology Co., Ltd  
**Address**..... : ShenZhen Wisdom Innovation Center Suite A.607, Qianjin 2nd Road,  
: Baoan District, ShenZhen, GuangDong, China  
**Manufacturer**..... : ShenZhen EBELONG Technology Co., Ltd  
**Address**..... : ShenZhen Wisdom Innovation Center Suite A.607, Qianjin 2nd Road,  
: Baoan District, ShenZhen, GuangDong, China  
**Product**..... : Wireless Switch Transmitter  
**Model(s)**..... : GD-10T, ES2154, ES2254, ES2354, ES2187,  
: ES2287, ES2387, ES2165, ES2265, ES2365,  
: ES2111, ES2211, ES2311  
**Standards**..... : FCC CFR47 Part 15 Section 15.231: 2018  
**Date of Receipt sample**.... : 2018-11-02  
**Date of Test**..... : 2018-11-02 to 2018-11-06  
**Date of Issue**..... : 2018-11-06  
**Test Result**..... : **Pass**

**Remarks:**

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

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Photo Zhong / Manager

# 1 Laboratories Introduction

**Waltek Services (Shenzhen) Co., Ltd** is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), ISED (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

## 1.1 Test Facility

### A. Accreditations for Conformity Assessment (International)

| Country/Region                                                      | Scope Covered By | Scope              | Note |
|---------------------------------------------------------------------|------------------|--------------------|------|
| USA                                                                 | ISO/IEC 17025    | FCC ID \ DOC \ VOC | 1    |
| Canada                                                              |                  | IC ID \ VOC        | 2    |
| Japan                                                               |                  | MIC-T \ MIC-R      | -    |
| Europe                                                              |                  | EMCD \ RED         | -    |
| Taiwan                                                              |                  | NCC                | -    |
| Hong Kong                                                           |                  | OFCA               | -    |
| Australia                                                           |                  | RCM                | -    |
| India                                                               |                  | WPC                | -    |
| Thailand                                                            |                  | NTC                | -    |
| Singapore                                                           |                  | IDA                | -    |
| Note:                                                               |                  |                    |      |
| 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. |                  |                    |      |
| 2. ISED Canada Registration No.: 7760A                              |                  |                    |      |

### B.TCBs and Notify Bodies Recognized Testing Laboratory.

| Recognized Testing Laboratory of ...      | Notify body number |
|-------------------------------------------|--------------------|
| TUV Rheinland                             | Optional.          |
| Intertek                                  |                    |
| TUV SUD                                   |                    |
| SGS                                       |                    |
| Phoenix Testlab GmbH                      | 0700               |
| Element Materials Technology Warwick Ltd. | 0891               |
| Timco Engineering, Inc.                   | 1177               |
| Eurofins Product Service GmbH             | 0681               |

## 2 Revision History

| Test report No. | Date of Receipt sample | Date of Test             | Date of Issue | Purpose  | Comment | Approved |
|-----------------|------------------------|--------------------------|---------------|----------|---------|----------|
| WTS18S11127947W | 2018-11-02             | 2018-11-02 to 2018-11-06 | 2018-11-06    | original | -       | Valid    |

### 3 Test Summary

| Test Items                                                        | Test Requirement                 | Result |
|-------------------------------------------------------------------|----------------------------------|--------|
| Radiated Spurious Emissions                                       | 15.205(a)<br>15.209<br>15.231(a) | PASS   |
| Periodic Operation                                                | 15.231(a)                        | PASS   |
| Emission Bandwidth                                                | 15.231(c)                        | PASS   |
| Antenna Requirement                                               | 15.203                           | PASS   |
| Maximum Permissible Exposure<br>(Exposure of Humans to RF Fields) | 1.1307(b)(1)                     | PASS   |

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## 5 General Information

### 5.1 General Description of E.U.T

|                       |                                                                                                                           |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------|
| Product:              | Wireless Switch Transmitter                                                                                               |
| Model(s):             | GD-10T, ES2154, ES2254, ES2354, ES2187, ES2287, ES2387, ES2165, ES2265, ES2365, ES2111, ES2211, ES2311                    |
| Model descriptions:   | Only the colors, number of the buttons are different, the others are all the same, the model GD-10T is the tested sample. |
| Type of Modulation:   | FSK                                                                                                                       |
| Frequency Range:      | 433.32 MHz                                                                                                                |
| Antenna installation: | Integrated Antenna                                                                                                        |

### 5.2 Details of E.U.T

|            |     |
|------------|-----|
| Rating(s): | N/A |
|------------|-----|

### 5.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

| Test mode    | Lower channel | Middle channel | Upper channel |
|--------------|---------------|----------------|---------------|
| Transmitting | /             | 433.32MHz      | /             |

## 6 Equipment Used during Test

### 6.1 Equipments List

| 3m Semi-anechoic Chamber for Radiation Emissions      |                            |                      |              |            |                       |                      |
|-------------------------------------------------------|----------------------------|----------------------|--------------|------------|-----------------------|----------------------|
| Item                                                  | Equipment                  | Manufacturer         | Model No.    | Serial No. | Last Calibration Date | Calibration Due Date |
| 1                                                     | Spectrum Analyzer          | R&S                  | FSP          | 100091     | 2018.04.20            | 2019.04.19           |
| 2                                                     | Amplifier                  | Agilent              | 8447D        | 2944A10178 | 2018.01.10            | 2019.01.09           |
| 3                                                     | Trilog Broadband Antenna   | SCHWARZBECK          | VULB9163     | 336        | 2018.05.18            | 2019.05.17           |
| 4                                                     | Coaxial Cable (below 1GHz) | Top                  | TYPE16(13M)  | -          | 2018.10.15            | 2019.10.14           |
| 5                                                     | Broad-band Horn Antenna    | SCHWARZBECK          | BBHA 9120 D  | 667        | 2018.05.18            | 2019.05.17           |
| 6                                                     | Broad-band Horn Antenna    | SCHWARZBECK          | BBHA 9170    | 335        | 2018.10.24            | 2019.10.23           |
| 7                                                     | Broadband Preamplifier     | COMPLIANCE DIRECTION | PAP-1G18     | 2004       | 2018.04.07            | 2019.04.06           |
| 8                                                     | Coaxial Cable (above 1GHz) | Top                  | 1GHz-18GHz   | EW02014-7  | 2018.04.07            | 2019.04.06           |
| 9                                                     | Signal Generator           | R&S                  | SMP22        | 100102     | 2018.09.15            | 2019.09.14           |
| 3m Semi-anechoic Chamber for Radiation Emissions(TDK) |                            |                      |              |            |                       |                      |
| Item                                                  | Equipment                  | Manufacturer         | Model No.    | Serial No  | Last Calibration Date | Calibration Due Date |
| 1                                                     | Test Receiver              | R&S                  | ESCI         | 101296     | 2018.04.20            | 2019.04.19           |
| 2                                                     | Trilog Broadband Antenna   | SCHWARZBECK          | VULB9160     | 9160-3325  | 2018.04.19            | 2019.04.18           |
| 3                                                     | Amplifier                  | ANRITSU              | MH648A       | M43381     | 2018.04.20            | 2019.04.19           |
| 4                                                     | Cable                      | HUBER+SUHNER         | CBL2         | 525178     | 2018.04.20            | 2019.04.19           |
| 5                                                     | Active Loop Antenna        | Com-Power Corp.      | AL-130R      | 10160007   | 2018.04.17            | 2019.04.16           |
| RF Conducted Testing                                  |                            |                      |              |            |                       |                      |
| Item                                                  | Equipment                  | Manufacturer         | Model No.    | Serial No. | Last Calibration Date | Calibration Due Date |
| 1                                                     | EMI Test Receiver          | R&S                  | ESCI         | 100947     | 2018.09.15            | 2019.09.14           |
| 2                                                     | LISN                       | R&S                  | ENV216       | 100115     | 2018.09.15            | 2019.09.14           |
| 3                                                     | Cable                      | Top                  | TYPE16(3.5M) | -          | 2018.09.15            | 2019.09.14           |

## 6.2 Measurement Uncertainty

| Test Item                                                                                                                                      | Frequency Range | Uncertainty          | Note |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|------|
| Conducted Emissions                                                                                                                            | 150kHz~30MHz    | $\pm 3.64\text{dB}$  | (1)  |
| Radiated Spurious Emissions                                                                                                                    | 30MHz~1000MHz   | $\pm 5.03\text{dB}$  | (1)  |
|                                                                                                                                                | 1000M~5000MHz   | $\pm 5.47\text{ dB}$ | (1)  |
| (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$ . |                 |                      |      |

## 6.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

## 7 Radiated Spurious Emissions

Test Requirement: FCC Part15 Paragraph 15.231(a)

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (uV/m) | Field Strength of Fundamental (dBuV/m) | Field Strength of Spurious Emission (uV/m) | Field Strength of Spurious Emission (dBuV/m) |
|-----------------------------|--------------------------------------|----------------------------------------|--------------------------------------------|----------------------------------------------|
| 44.66-40.70                 | 2250                                 | 67                                     | 225                                        | 47                                           |
| 70-130                      | 1250                                 | 62                                     | 125                                        | 42                                           |
| 130-174                     | 1250 to 3750                         | 62 to 71.48                            | 125 to 375                                 | 42 to 51.48                                  |
| 174-260                     | 3750                                 | 71.48                                  | 375                                        | 51.48                                        |
| 260-470                     | 3750 to 12500                        | 71.48 to 81.94                         | 375 to 1250                                | 51.48 to 61.94                               |
| Above 470                   | 12500                                | 81.94                                  | 1250                                       | 61.94                                        |
| aa** linear interpolations  |                                      |                                        |                                            |                                              |

### 7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

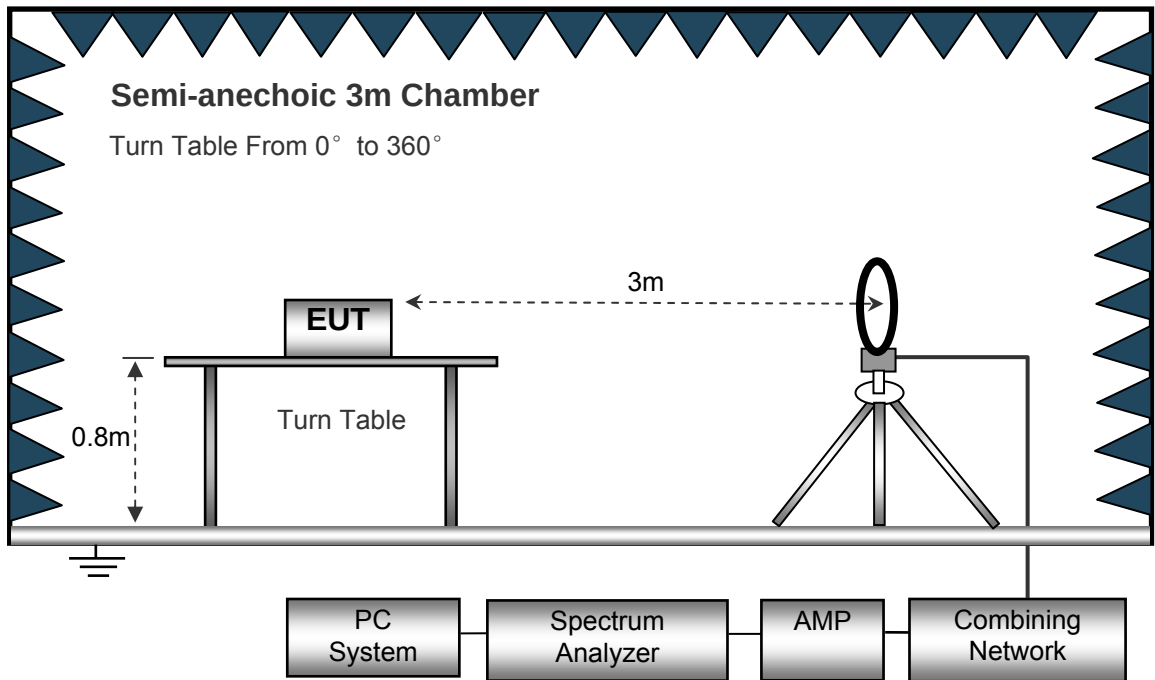
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

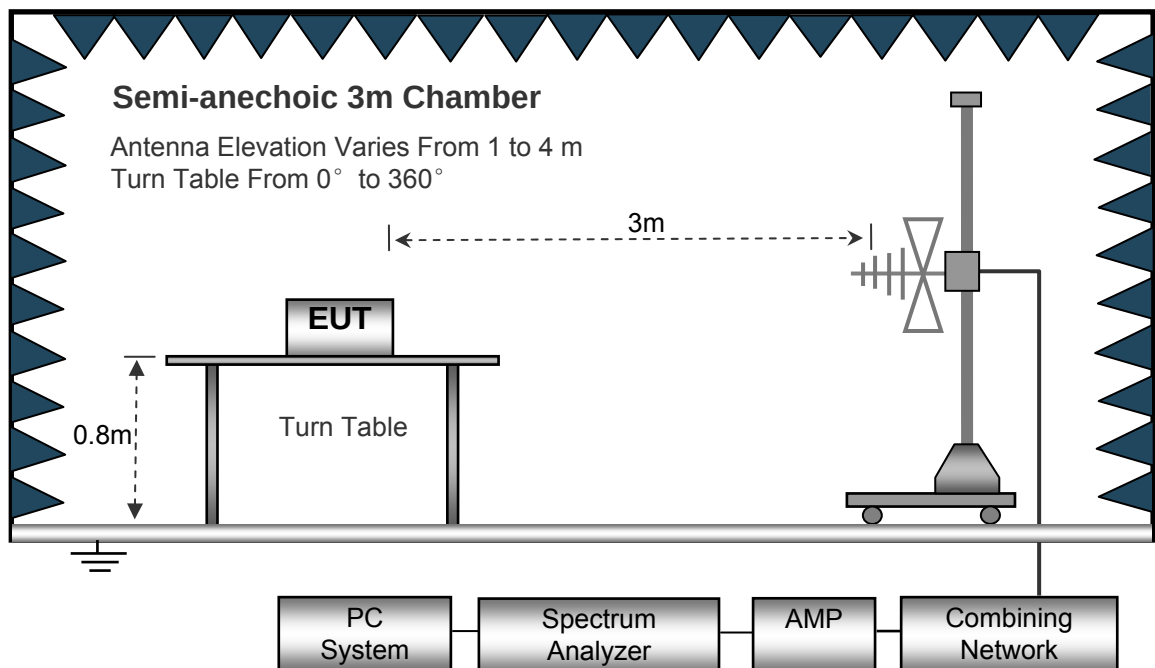
## 7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

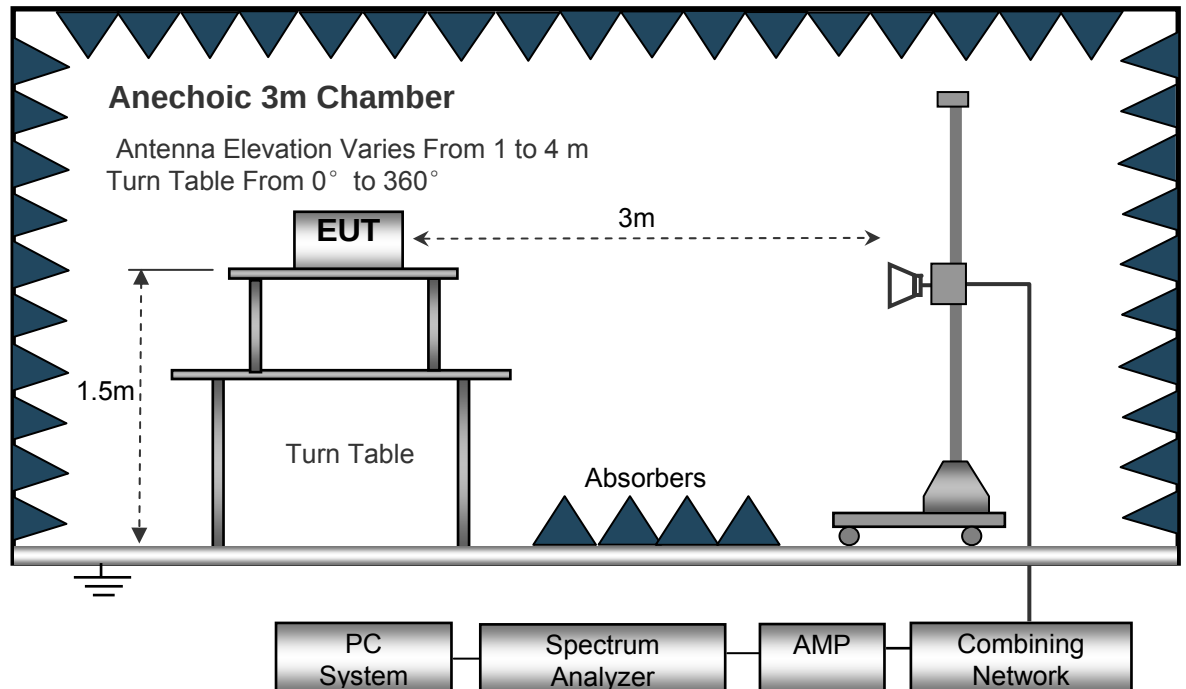
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



### 7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed .....Auto  
 IF Bandwidth.....10kHz  
 Video Bandwidth.....10kHz  
 Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed .....Auto  
 Detector .....PK  
 Resolution Bandwidth.....100kHz  
 Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed .....Auto  
 Detector .....PK  
 Resolution Bandwidth.....1MHz  
 Video Bandwidth.....3MHz

## 7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above 1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

## 7.5 Summary of Test Results

**Test Frequency: 9KHz~ 30MHz**

The measurements were more than 20 dB below the limit and not reported.

**Test Frequency : 30MHz ~ 6GHz**

| Frequency | Receiver Reading (PK) | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude (PK) | FCC Part 15.231/15.209/205 |        |
|-----------|-----------------------|------------------|------------|-------|------------------|--------------------------|----------------------------|--------|
|           |                       |                  | Height     | Polar |                  |                          | Limit                      | Margin |
| (MHz)     | (dBμV)                | Degree           | (m)        | (H/V) | (dB/m)           | (dBμV/m)                 | (dBμV/m)                   | (dB)   |
| 433.32    | 89.36                 | 156              | 1.5        | H     | -7.26            | 82.10                    | 100.81                     | -18.71 |
| 433.32    | 75.85                 | 208              | 1.8        | V     | -7.26            | 68.59                    | 100.81                     | -32.22 |
| 866.64    | 42.81                 | 255              | 1.4        | H     | 0.04             | 42.85                    | 80.81                      | -37.96 |
| 866.64    | 41.29                 | 44               | 1.4        | V     | 0.04             | 41.33                    | 80.81                      | -39.48 |
| 1299.96   | 49.42                 | 95               | 1.2        | H     | -16.75           | 32.67                    | 80.81                      | -48.14 |
| 1299.96   | 52.36                 | 235              | 1.7        | V     | -16.75           | 35.61                    | 80.81                      | -45.20 |
| 1733.28   | 45.77                 | 150              | 2.0        | H     | -15.03           | 30.75                    | 80.81                      | -50.06 |
| 1733.28   | 47.02                 | 274              | 1.9        | V     | -15.03           | 31.99                    | 80.81                      | -48.82 |

**AV = Peak +20Log<sub>10</sub>(duty cycle) =PK+(-21.45) [refer to section 9 for more detail]**

| Frequency | PK       | RX Antenna Polar | Duty cycle Factor | Calculated AV | FCC Part 15.231/209/205 |        |
|-----------|----------|------------------|-------------------|---------------|-------------------------|--------|
|           |          |                  |                   |               | Limit                   | Margin |
| (MHz)     | (dBμV/m) | (H/V)            | (dB)              | (dBμV/m)      | (dBμV/m)                | (dB)   |
| 433.32    | 82.10    | H                | -21.45            | 60.65         | 80.81                   | -20.16 |
| 433.32    | 68.59    | V                | -21.45            | 47.14         | 80.81                   | -33.67 |
| 866.64    | 42.85    | H                | -21.45            | 21.40         | 60.81                   | -39.41 |
| 866.64    | 41.33    | V                | -21.45            | 19.88         | 60.81                   | -40.93 |
| 1299.96   | 32.67    | H                | -21.45            | 11.22         | 60.81                   | -49.59 |
| 1299.96   | 35.61    | V                | -21.45            | 14.16         | 60.81                   | -46.65 |
| 1733.28   | 30.75    | H                | -21.45            | 9.30          | 60.81                   | -51.51 |
| 1733.28   | 31.99    | V                | -21.45            | 10.54         | 60.81                   | -50.27 |

## 8 Periodic Operation

The duty cycle was determined by the following equation:

To calculate the actual field intensity, The duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train \* %

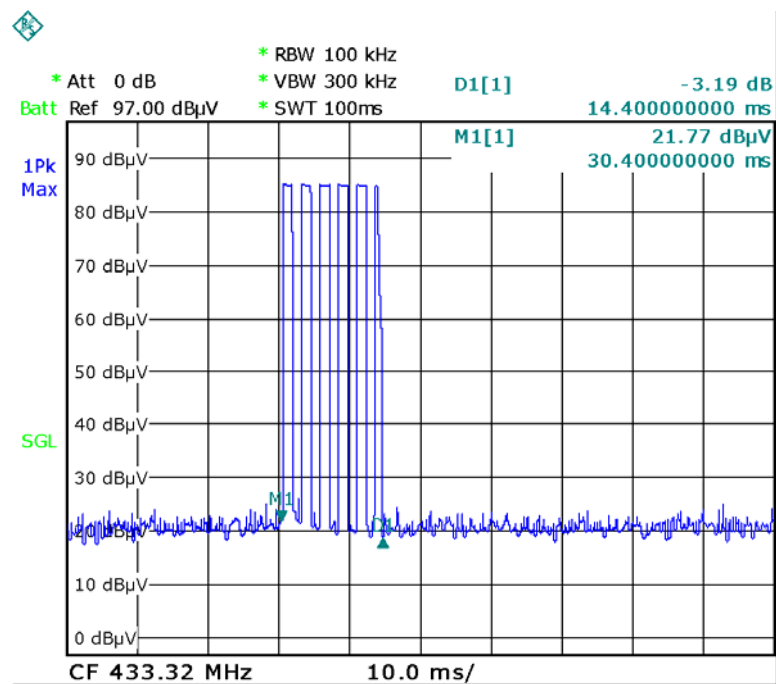
Duty Cycle Correction Factor(dB)=20 \* Log<sub>10</sub>(Duty Cycle(%))

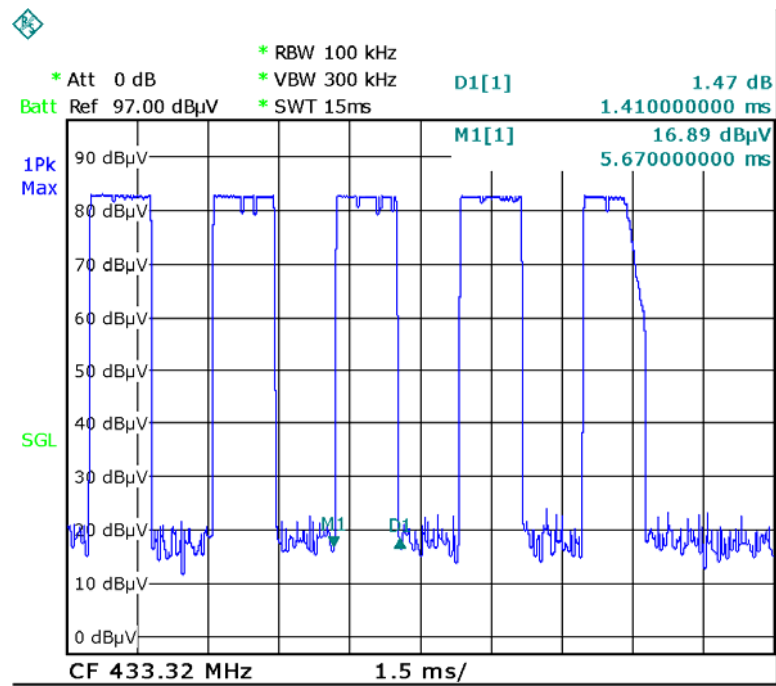
|                                              |             |
|----------------------------------------------|-------------|
| Total transmission time(ms)                  | 1.41*6=8.46 |
| Length of a complete transmission period(ms) | 100         |
| Duty Cycle(%)                                | 8.46        |
| Duty Cycle Correction Factor(dB)             | -21.45      |

Refer to the duty cycle plot (as below),This device meets the FCC requirement.

Length of a complete pulse train:

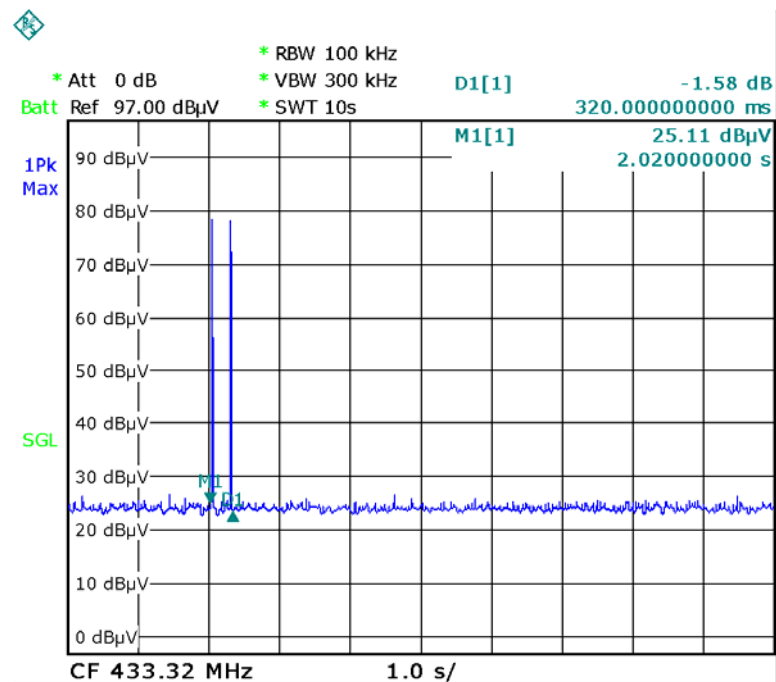
Remark: FCC part15.35(c) required that a complete pulse train is more than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.





FCC Part15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

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



## 9 Emission Bandwidth

|                   |                                                                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15.231(c)                                                                                                                                                                                                                               |
| Test Method:      | FCC Part15.231(c)                                                                                                                                                                                                                               |
| Limit             | The bandwidth of the emission shall be no wider than 0.25% of the center 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 center frequency. |

### 9.1 Test Procedure

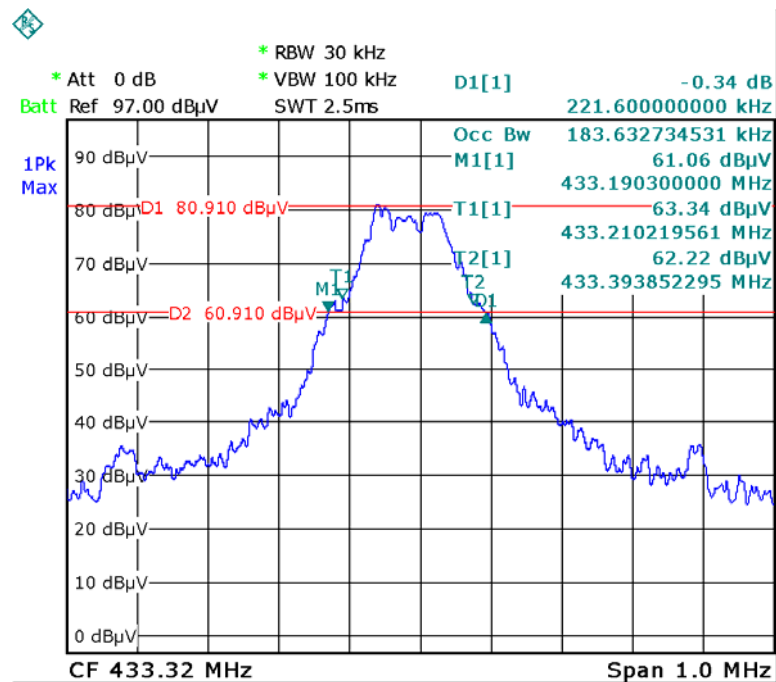
1. The transmitter output (antenna port) was connected to the spectrum analyzer. EUT and its simulators are placed on a table, let EUT working in test mode, then test it.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 30kHz RBW and 100kHz VBW. The 20 dB bandwidth was recorded.

### 9.2 Test Result

| Frequency (MHz) | 20dB Bandwidth Emission(KHz) | Limit (KHz) | Result |
|-----------------|------------------------------|-------------|--------|
| 433.32          | 221.60                       | 1083.30     | Pass   |

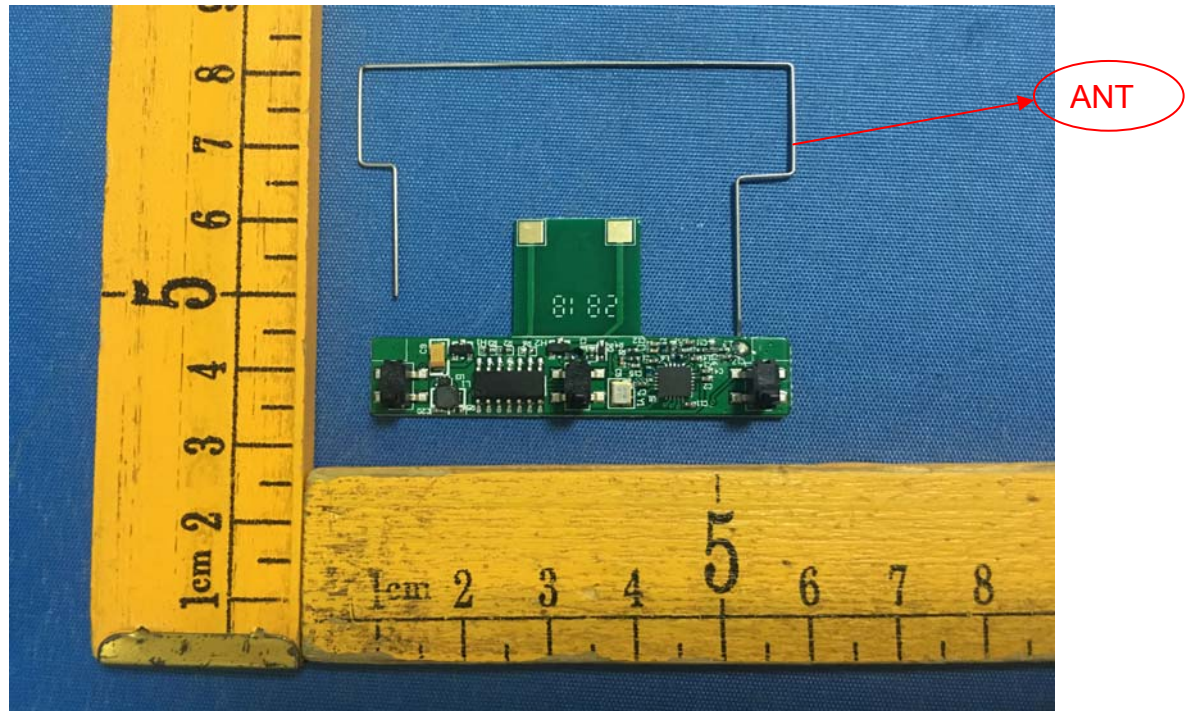
Limit=Center Frequency\*0.25%

Test Plot



## 10 Antenna Requirement

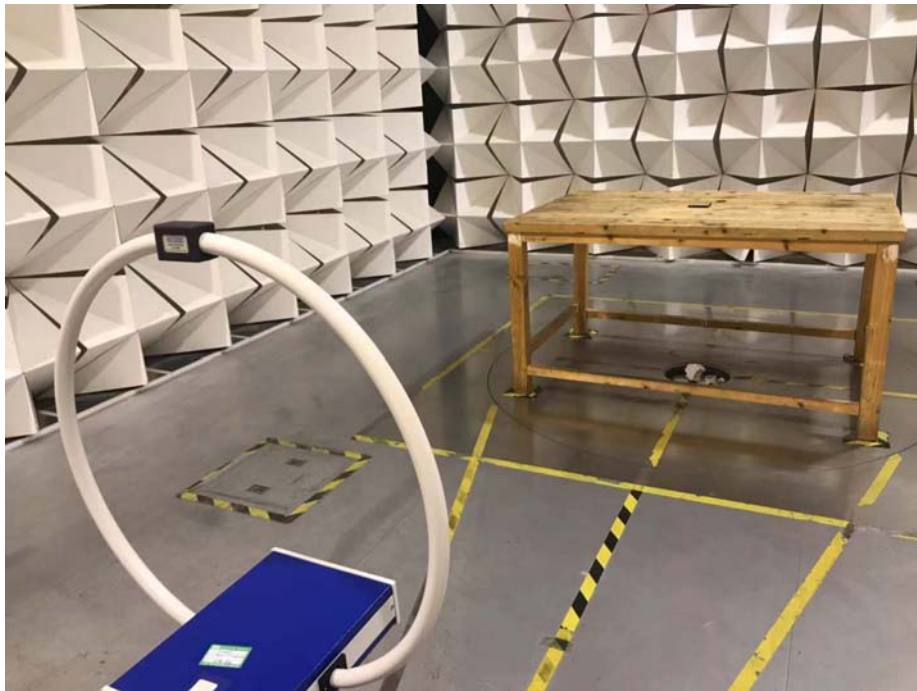
According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product use a Integrated Antenna, it only apply to this model, fulfill the requirement of this section.



## 11 Photographs – Test Setup

### 11.1 Photograph – Radiation Spurious Emission Test Setup

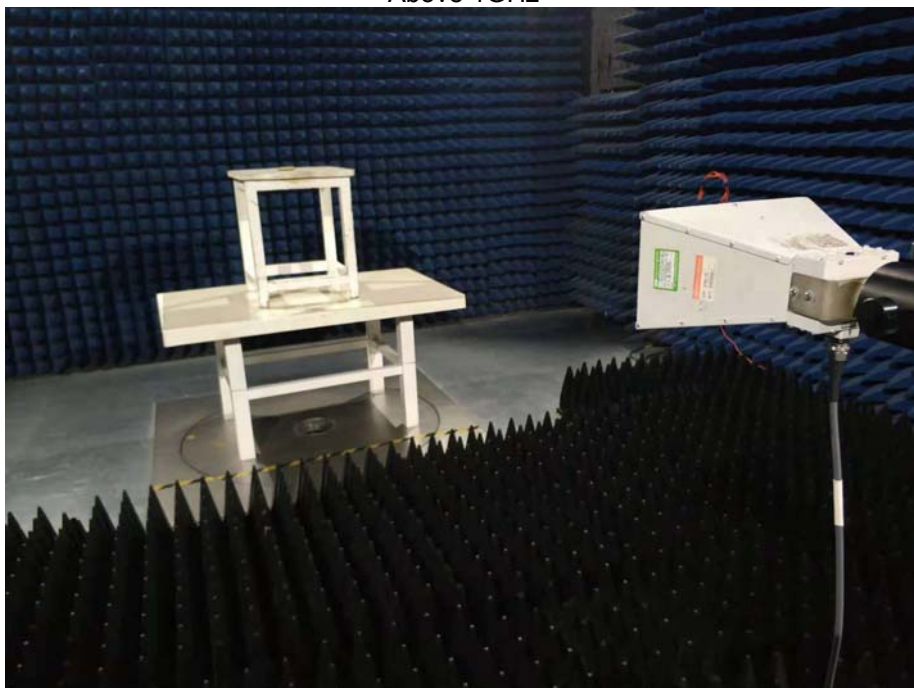
From Below 30MHz



From 30MHz to 1GHz

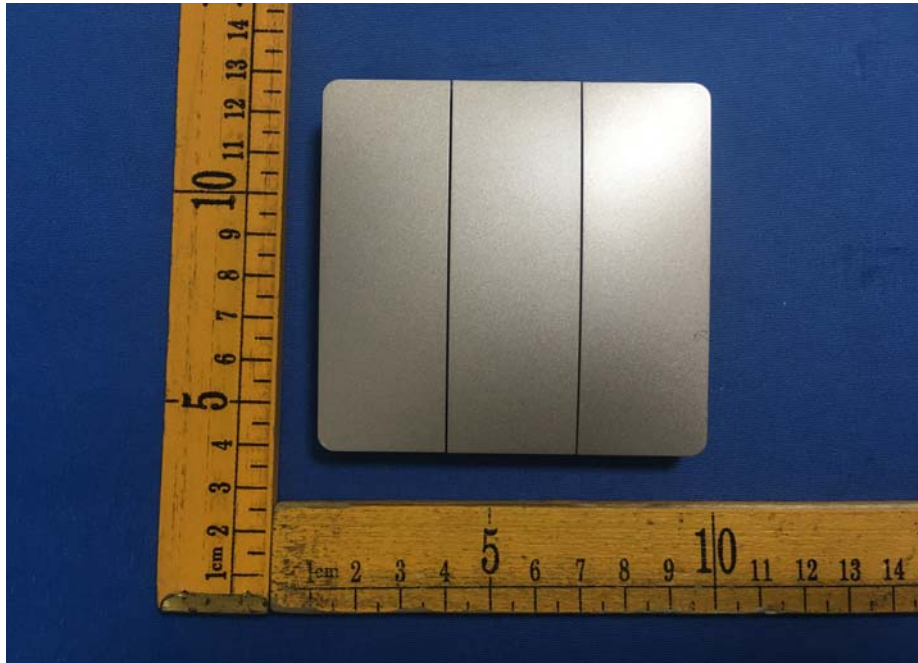


Above 1GHz



## 12 Photographs - Constructional Details

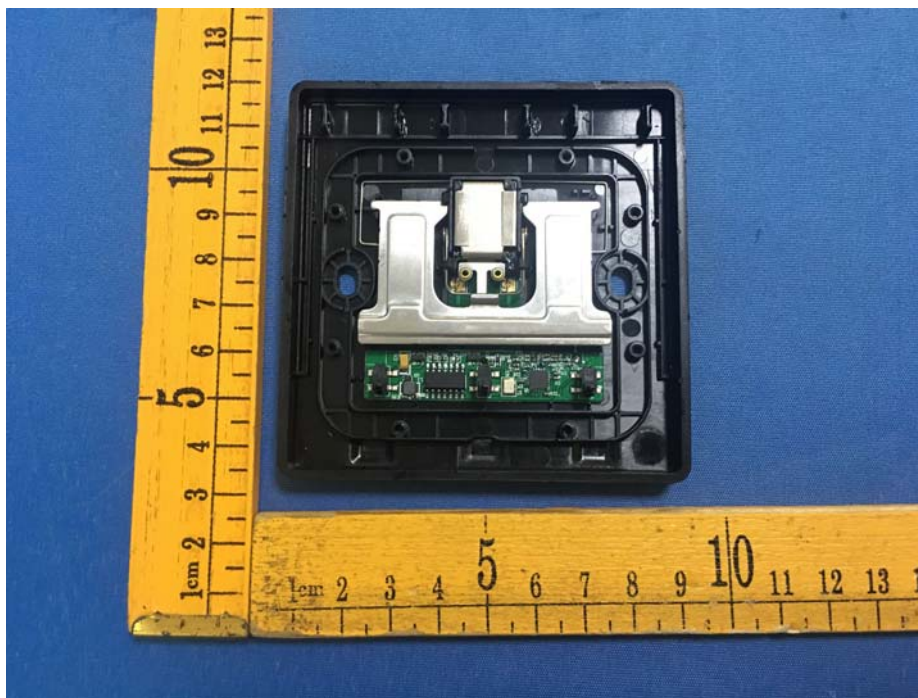
### 12.1 External Photos

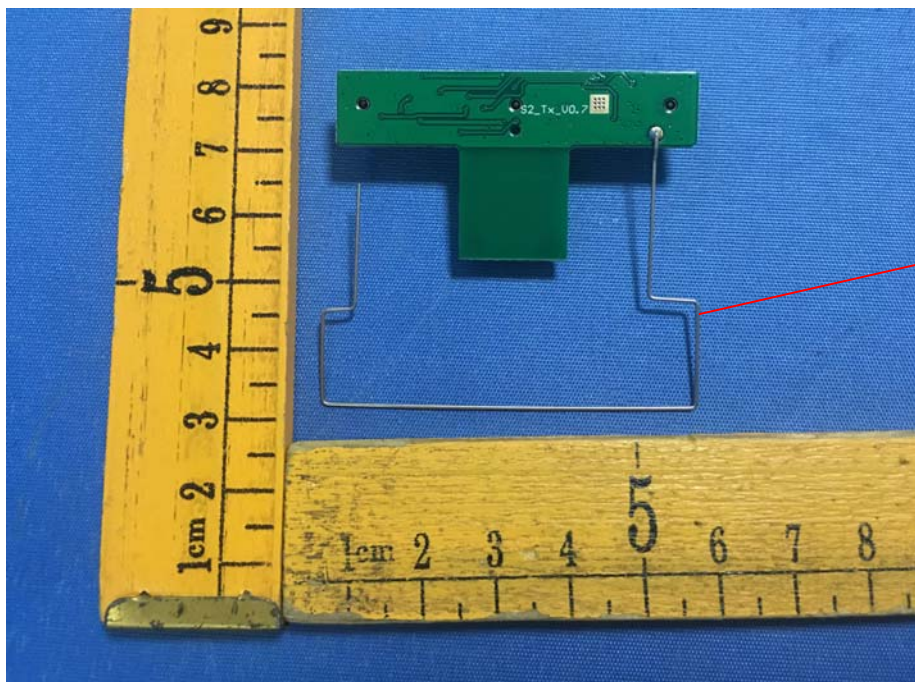
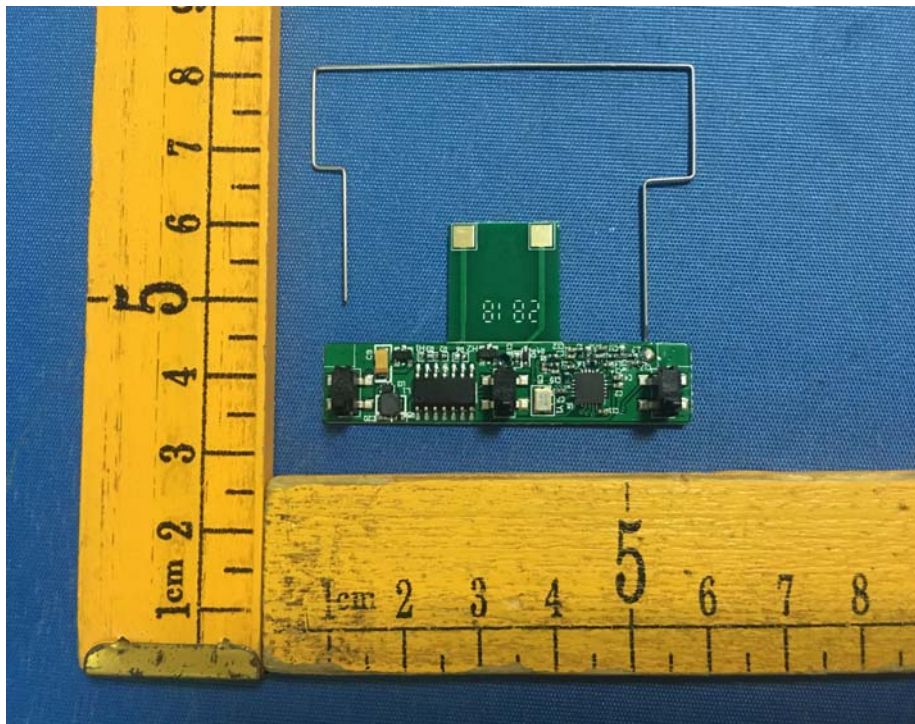


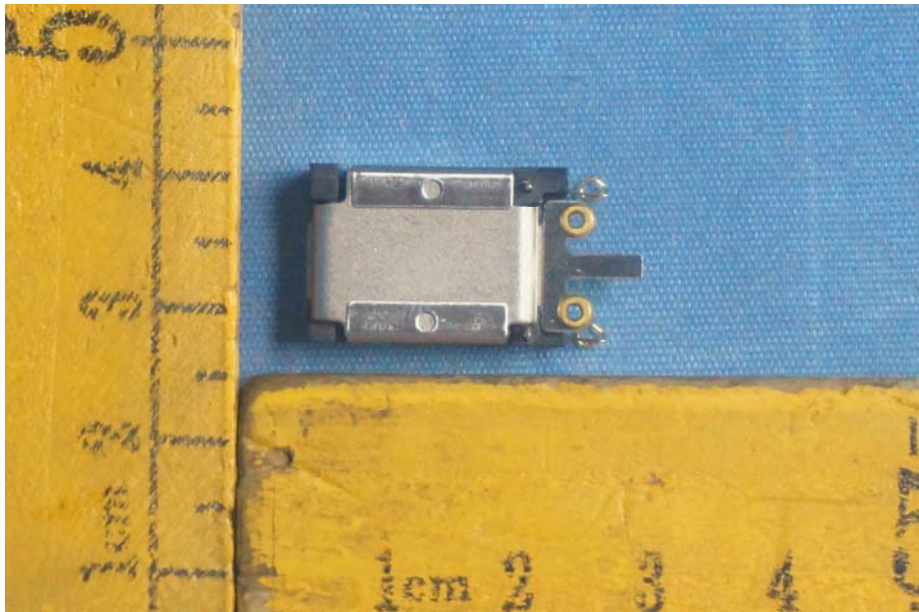




## 12.2 Internal Photos







====End of Report====