

# FCC TEST REPORT

## FCC ID: OXGAL69-TX

Product : Garden Laser Projector

Model Name : AL69-TX

Brand : 

Report No. : PT800351160503E-FC01

### Prepared for

Willis Electric Co., Ltd.  
No.504-1, Chung-Hua Road, Sec.4,  
Hsin Chu, Taiwan

### Prepared by

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Dongcheng District, Dongguan, Guangdong, China

## TEST RESULT CERTIFICATION

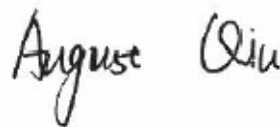
Applicant's name : Willis Electric Co., Ltd.  
Address : No.504-1, Chung-Hua Road, Sec.4, Hsin Chu, Taiwan  
Manufacture's name : Kupoint (DongGuan) Electric Co., Ltd  
Address : Huai De Industrial Humen Town Dong Guan City Guang Dong Provience  
Product name : Garden Laser Projector  
Model name : AL69-TX  
Standards : FCC CFR47 Part 15 Section 15.231  
Test procedure : ANSI C63.10:2013  
Test Date : May. 03, 2016 - June. 02, 2016  
Date of Issue : June. 03, 2016  
Test Result : Pass

This device described above has been tested by PTS, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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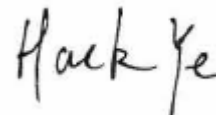
Testing Engineer

August Qiu



Technical Manager

Hack Ye



Authorized Signatory

Chris Du



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## 2 Test Summary

| Test Items               | Test Requirement                 | Result |
|--------------------------|----------------------------------|--------|
| Radiated Emission        | 15.231(a)<br>15.209<br>15.205(a) | PASS   |
| Periodic Operation       | 15.35(c)                         | PASS   |
| Outside of Band Emission | 15.231(a)<br>15.205<br>15.209    | PASS   |

Remark:

N/A: Not Applicable

### 3 General Information

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

Product Name : Garden Laser Projector

Model Name : AL69-TX

Model Description : N/A

Operation Frequency: : 433.92MHz

Antenna installation: : Integrated Antenna

Antenna Gain: : 0dBi

Type of Modulation : ASK

The lowest oscillator : 433.92MHz

Power supply : DC 3V power by battery

#### 3.2 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.

| Modulation | Test mode                    | Low channel | Middle channel | High channel |
|------------|------------------------------|-------------|----------------|--------------|
| ASK        | continuously<br>Transmitting | 433.92MHz   | \              | \            |

## 4 Equipment During Test

### 4.1 Equipments List

| Radiated Emissions |                           |                 |            |            |                  |                  |                    |
|--------------------|---------------------------|-----------------|------------|------------|------------------|------------------|--------------------|
| Item               | Kind of Equipment         | Manufacturer    | Type No.   | Serial No. | Last calibration | Calibrated until | Calibration period |
| 1                  | EMI Test Receiver         | Rohde & Schwarz | ESCI       | 101417     | July 15, 2015    | July 14, 2016    | 1 year             |
| 2                  | EMC Analyzer (9k~26.5GHz) | Agilent         | E4407B     | MY45109572 | Aug.04, 2015     | Aug.03, 2016     | 1 year             |
| 3                  | Trilog Broadband Antenna  | SCHWARZB ECK    | VULB9160   | 9160-3355  | July 15, 2015    | July 14, 2016    | 1 year             |
| 4                  | Amplifier                 | EM              | EM-30180   | 060538     | July 15, 2015    | July 14, 2016    | 1 year             |
| 5                  | Horn Antenna              | SCHWARZB ECK    | BBHA9120 D | 9120D-1246 | July 15, 2015    | July 14, 2016    | 1 year             |
| 6                  | Coaxial Cable(below 1GHz) | LARGE           | CALB1      | -          | July 15, 2015    | July 14, 2016    | 1 year             |
| 7                  | Coaxial Cable(above 1GHz) | LARGE           | CALB2      | -          | July 15, 2015    | July 14, 2016    | 1 year             |

### 4.2 Measurement Uncertainty

| Parameter                          | Uncertainty              |
|------------------------------------|--------------------------|
| RF output power, conducted         | ±1.0dB                   |
| Power Spectral Density, conducted  | ±2.2dB                   |
| Radio Frequency                    | ± 1 x 10 <sup>-6</sup>   |
| Bandwidth                          | ± 1.5 x 10 <sup>-6</sup> |
| Time                               | ±2%                      |
| Duty Cycle                         | ±2%                      |
| Temperature                        | ±1°C                     |
| Humidity                           | ±5%                      |
| DC and low frequency voltages      | ±3%                      |
| Conducted Emissions (150kHz~30MHz) | ±3.64dB                  |
| Radiated Emission(30MHz~1GHz)      | ±5.03dB                  |
| Radiated Emission(1GHz~25GHz)      | ±4.74dB                  |

## 5 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(%))

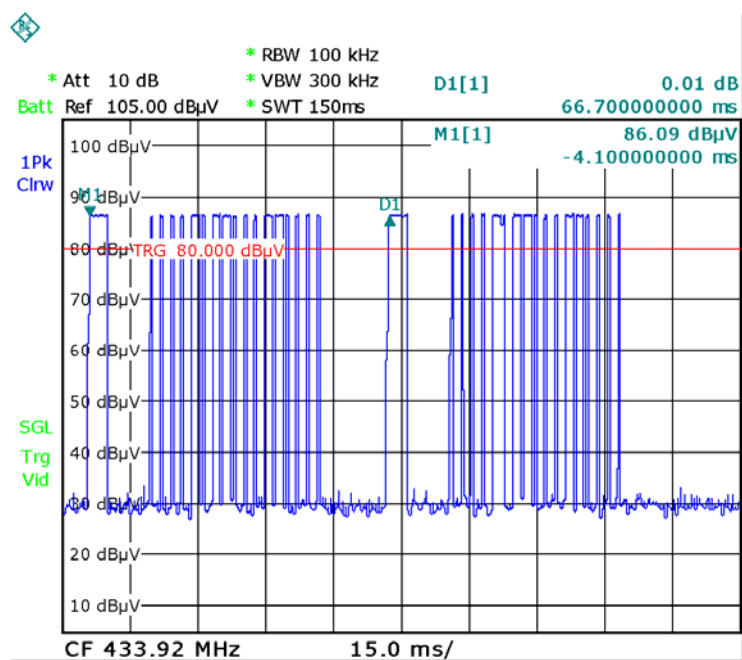
|                                                                                                                      |                          |
|----------------------------------------------------------------------------------------------------------------------|--------------------------|
| Total transmission time(ms)                                                                                          | 4.08+12*0.6+5*1.74=19.98 |
| Length of a complete transmission period(ms)                                                                         | 66.70                    |
| Duty Cycle(%)                                                                                                        | 29.96                    |
| Duty Cycle Correction Factor(dB)                                                                                     | -10.47                   |
| Pulse Desensitization Correction Factor                                                                              |                          |
| Pulse Width(PW)= 19.98ms 2/PW=2/19.98ms=0.1001kHz;<br>RBW(100kHz)>2/PW (0.1001kHz);<br>Therefore PDCF is not needed. |                          |

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

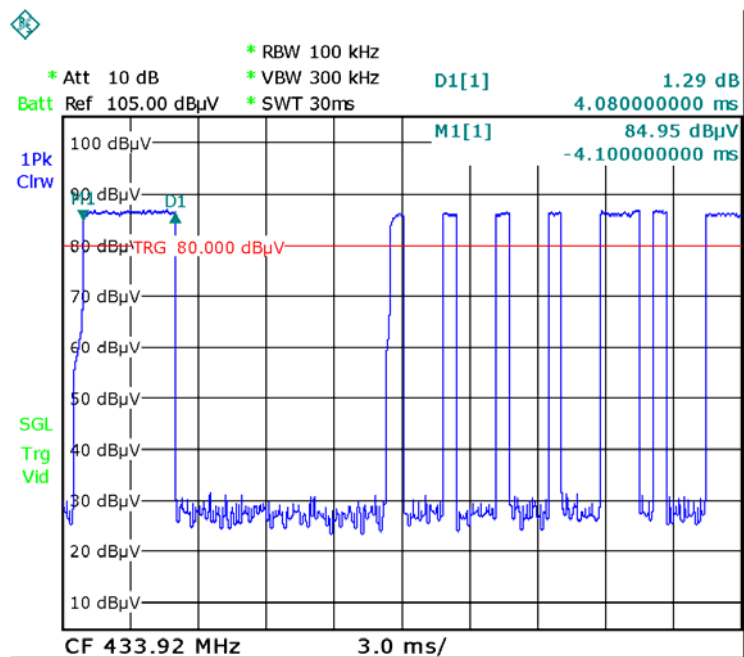
Length of a complete pulse train:

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.

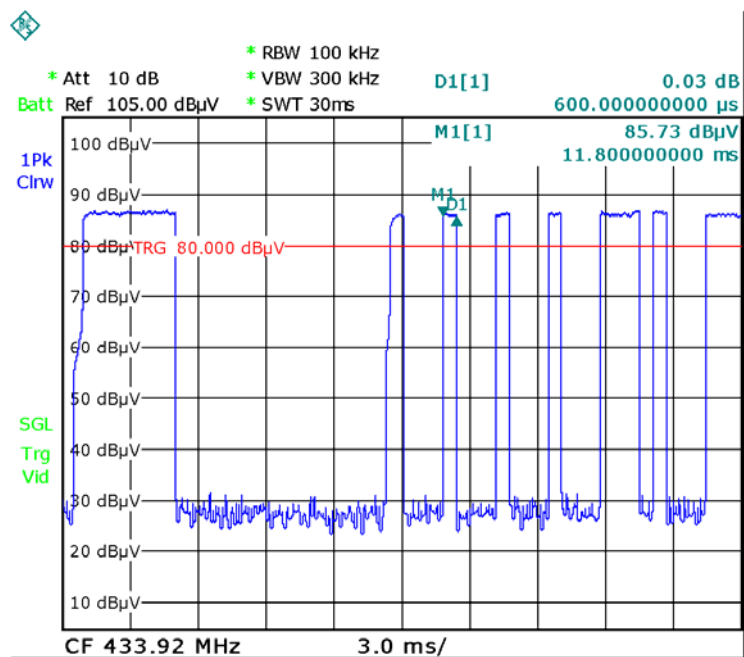
Tp



Pulse 1



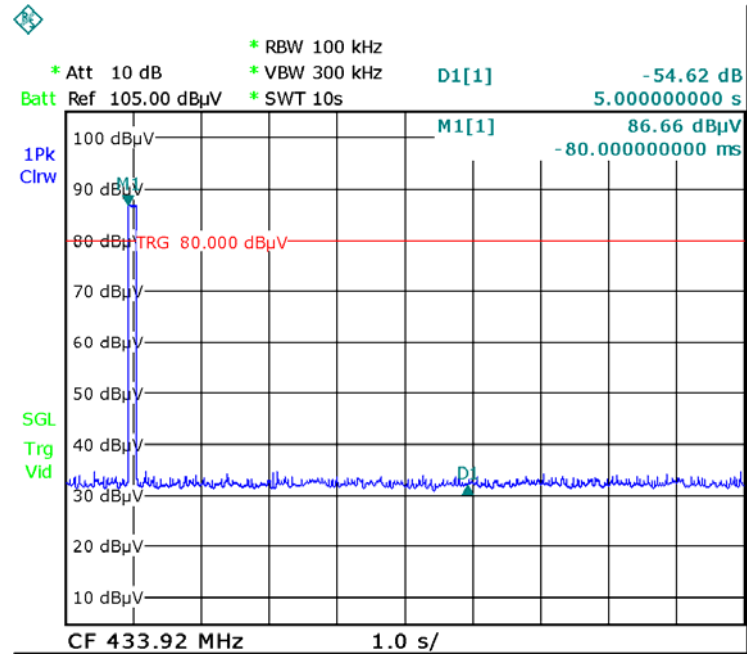
Pulse 2





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.



## 6 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.231 & 15.207 & 15.205  
 Test Method: : ANSI C63.10:2013  
 Test Result: : PASS  
 Measurement Distance: : 3m  
 Limit: : See the follow table

| Frequency (MHz) | Field Strength        |              | Field Strength Limit at 3m Measurement Dist |                                       |
|-----------------|-----------------------|--------------|---------------------------------------------|---------------------------------------|
|                 | uV/m                  | Distance (m) | uV/m                                        | dBuV/m                                |
| 0.009 ~ 0.490   | $2400/F(\text{kHz})$  | 300          | $10000 * 2400/F(\text{kHz})$                | $20\log^{(2400/F(\text{kHz}))} + 80$  |
| 0.490 ~ 1.705   | $24000/F(\text{kHz})$ | 30           | $100 * 24000/F(\text{kHz})$                 | $20\log^{(24000/F(\text{kHz}))} + 40$ |
| 1.705 ~ 30      | 30                    | 30           | $100 * 30$                                  | $20\log^{(30)} + 40$                  |
| 30 ~ 88         | 100                   | 3            | 100                                         | $20\log^{(100)}$                      |
| 88 ~ 216        | 150                   | 3            | 150                                         | $20\log^{(150)}$                      |
| 216 ~ 960       | 200                   | 3            | 200                                         | $20\log^{(200)}$                      |
| Above 960       | 500                   | 3            | 500                                         | $20\log^{(500)}$                      |

### 6.1 EUT Operation

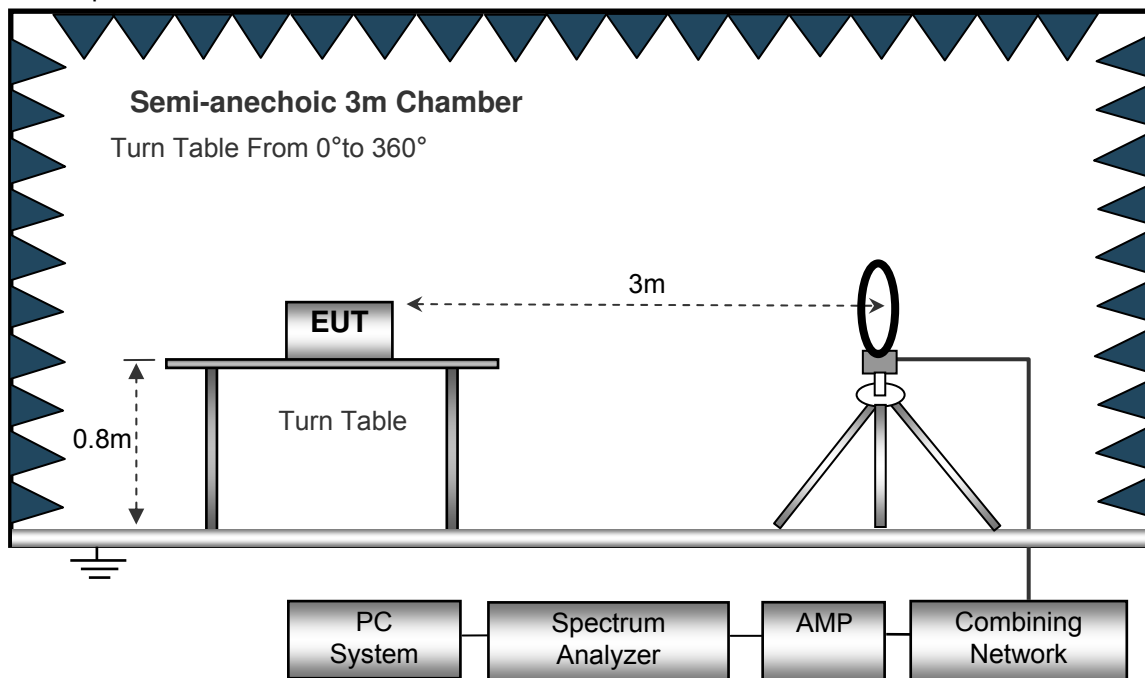
Operating Environment :

Temperature: : 23.5 °C  
 Humidity: : 51.1 % RH  
 Atmospheric Pressure: : 101.2kPa  
 EUT Operation : : Refer to section 3.3

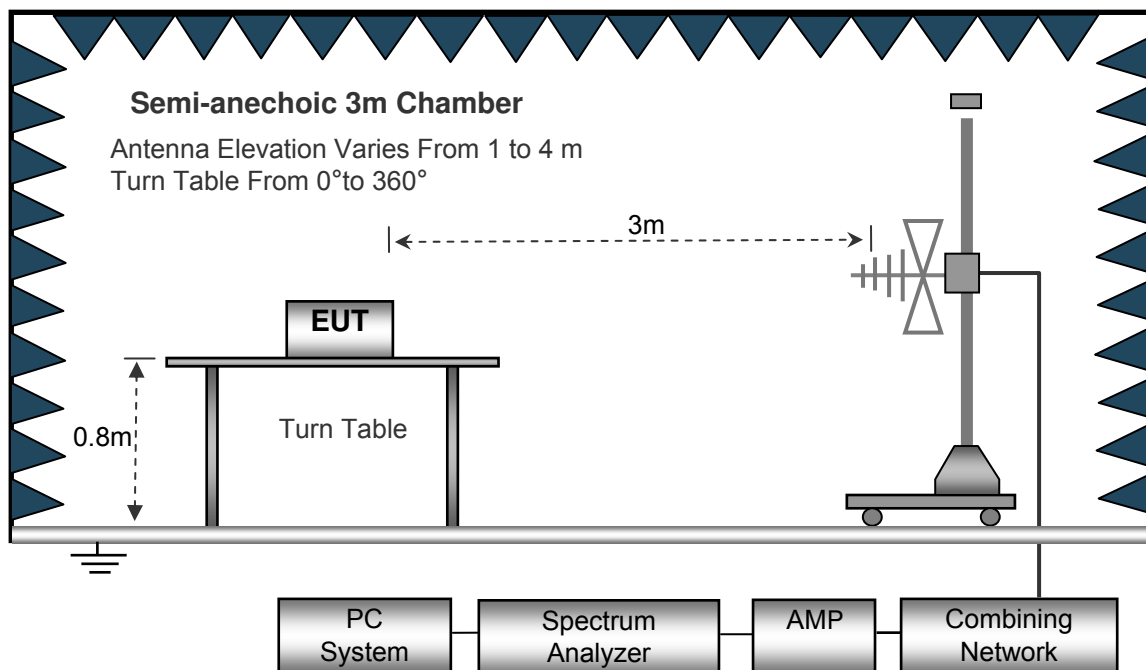
## 6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

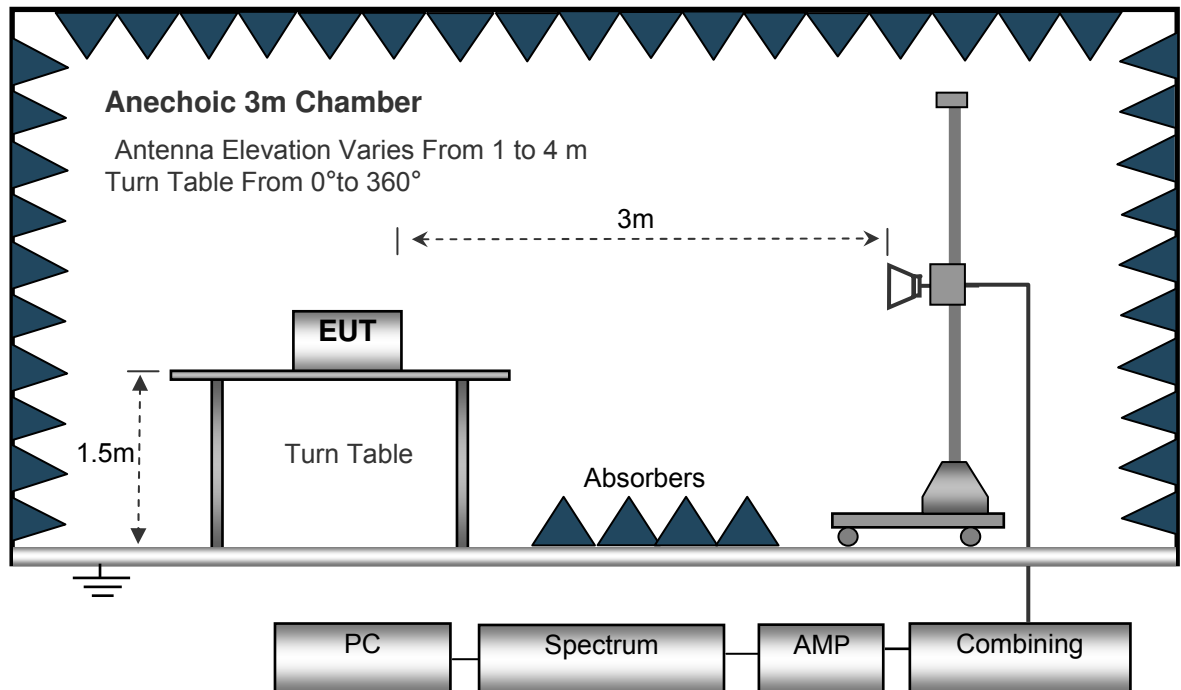
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



### 6.3 Spectrum Analyzer Setup

Below 30MHz

|                      |       |
|----------------------|-------|
| IF Bandwidth         | 10kHz |
| Resolution Bandwidth | 10kHz |
| Video Bandwidth      | 10kHz |

30MHz ~ 1GHz

|                      |          |
|----------------------|----------|
| Detector             | : PK     |
| Resolution Bandwidth | : 100kHz |
| Video Bandwidth      | : 300kHz |
| Detector             | : QP     |
| Resolution Bandwidth | : 120kHz |
| Video Bandwidth      | : 300kHz |

Above 1GHz

|                      |        |
|----------------------|--------|
| Detector             | : PK   |
| Resolution Bandwidth | : 1MHz |
| Video Bandwidth      | : 3MHz |

## **6.4 Test Procedure**

1. The EUT is placed on a turntable, which is 0.8m or 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.



## 6.5 Summary of Test Results

### Test Frequency: Below 30MHz

The lowest oscillator is 433.92MHz, the test is not applicable

### Test Frequency: 30MHz ~ 5GHz

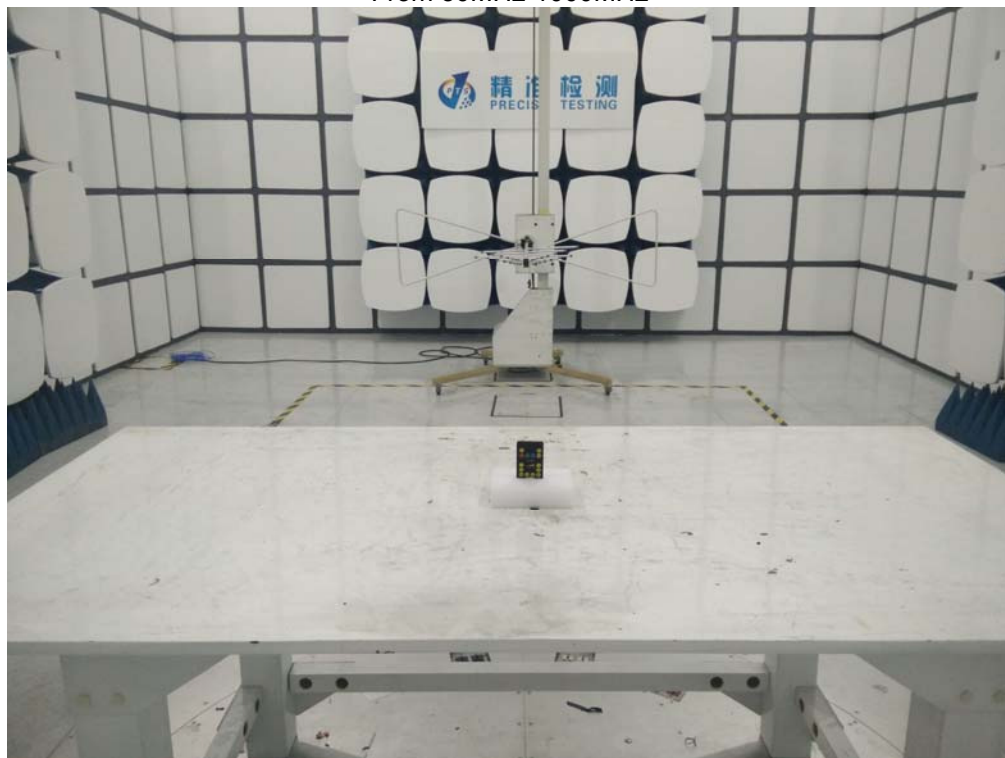
| Frequency | Reading | Detector     | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.231/209/205 |        |
|-----------|---------|--------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|           |         |              |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)     | (dBμV)  | (PK/QP/Av e) | Degree           | (m)        | (H/V) | (dB/m)           | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 188.32    | 46.79   | QP           | 254              | 1.2        | H     | -16.93           | 29.86               | 43.5                    | -13.64 |
| 188.32    | 42.33   | QP           | 354              | 1.9        | V     | -16.93           | 25.40               | 43.5                    | -18.10 |
| 433.92    | 82.59   | PK           | 135              | 1.9        | H     | -13.56           | 69.03               | 100.83                  | -31.80 |
| 433.92    | 77.36   | PK           | 251              | 1.0        | V     | -13.56           | 63.80               | 100.83                  | -37.03 |
| 867.84    | 67.38   | PK           | 184              | 2.0        | H     | -6.74            | 60.64               | 80.83                   | -20.19 |
| 867.84    | 60.37   | PK           | 270              | 1.3        | V     | -6.74            | 53.63               | 80.83                   | -27.20 |
| 1301.76   | 59.92   | PK           | 171              | 1.1        | H     | -12.31           | 47.61               | 74                      | -26.39 |
| 1301.76   | 55.99   | PK           | 15               | 2.2        | V     | -12.31           | 43.68               | 74                      | -30.32 |
| 1735.68   | 58.36   | PK           | 318              | 1.4        | H     | -15.79           | 42.57               | 74                      | -31.43 |
| 1735.68   | 55.37   | PK           | 306              | 1.4        | V     | -15.79           | 39.58               | 74                      | -34.42 |



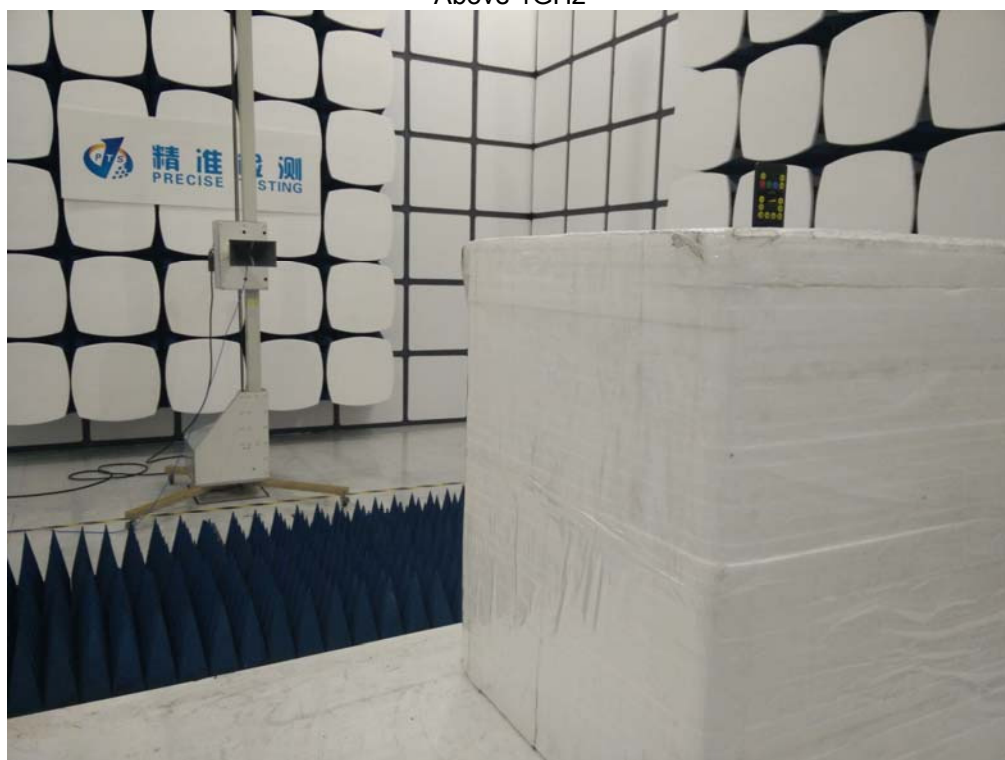
| Frequency | PK       | Turn<br>table<br>Angle | RX Antenna |       | Duty<br>cycle<br>Factor | AV       | FCC Part<br>15.231/209/205 |        |
|-----------|----------|------------------------|------------|-------|-------------------------|----------|----------------------------|--------|
|           |          |                        | Height     | Polar |                         |          | Limit                      | Margin |
| (MHz)     | (dBμV/m) | Degree                 | (m)        | (H/V) | (dB)                    | (dBμV/m) | (dBμV/m)                   | (dB)   |
| 433.92    | 69.03    | 299                    | 2.0        | H     | -10.47                  | 58.56    | 80.83                      | -22.27 |
| 433.92    | 63.80    | 217                    | 2.3        | V     | -10.47                  | 53.33    | 80.83                      | -27.50 |
| 867.84    | 60.64    | 210                    | 1.7        | H     | -10.47                  | 50.17    | 60.83                      | -10.66 |
| 867.84    | 53.63    | 327                    | 2.3        | V     | -10.47                  | 43.16    | 60.83                      | -17.67 |
| 1301.76   | 47.61    | 102                    | 1.5        | H     | -10.47                  | 37.14    | 54                         | -16.86 |
| 1301.76   | 43.68    | 339                    | 2.0        | V     | -10.47                  | 33.21    | 54                         | -20.79 |
| 1735.68   | 42.57    | 51                     | 1.6        | H     | -10.47                  | 32.10    | 54                         | -21.90 |
| 1735.68   | 39.58    | 47                     | 1.3        | V     | -10.47                  | 29.11    | 54                         | -24.89 |

## 7 Test Setup

Radiated Spurious Emissions  
From 30MHz-1000MHz



Above 1GHz

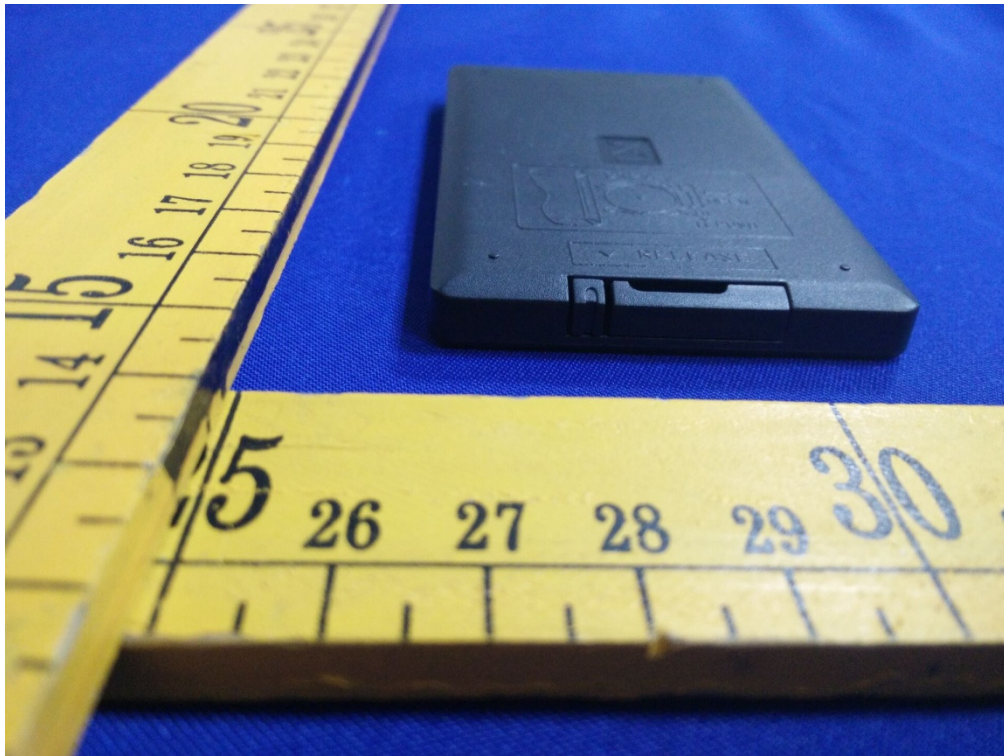


## 8 EUT Photos

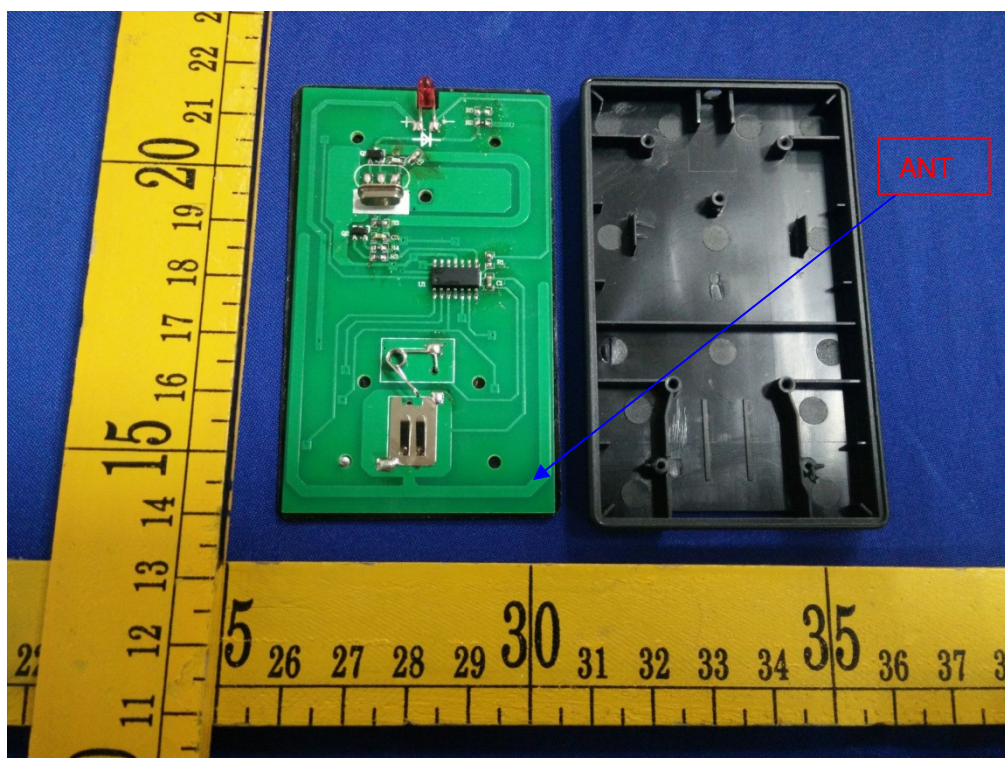
### External Photos

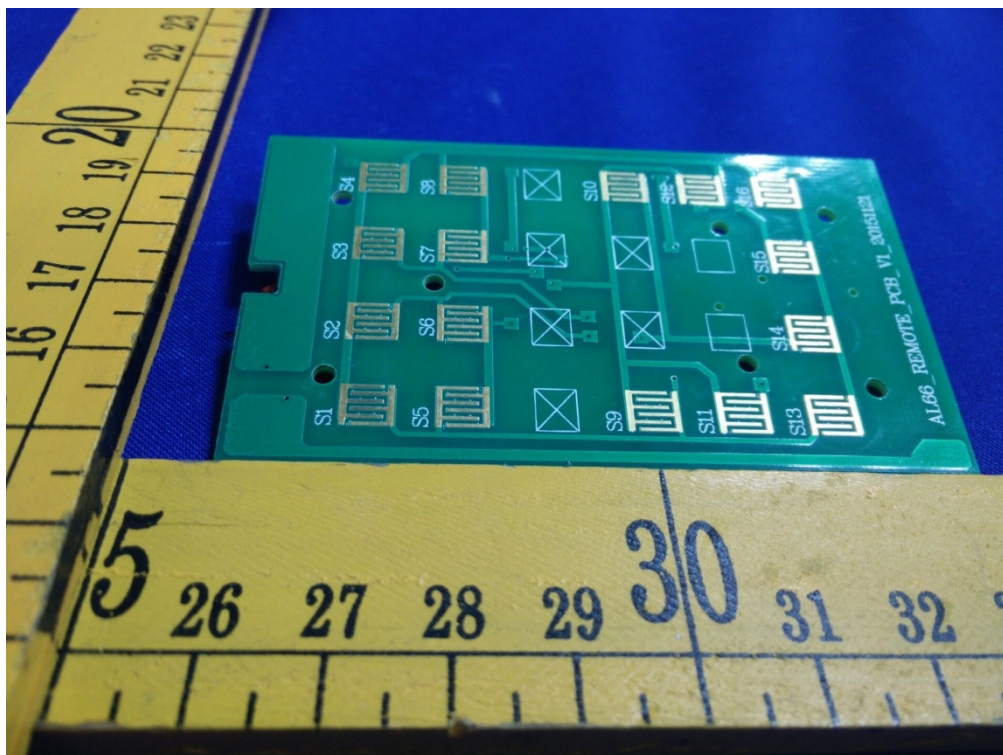
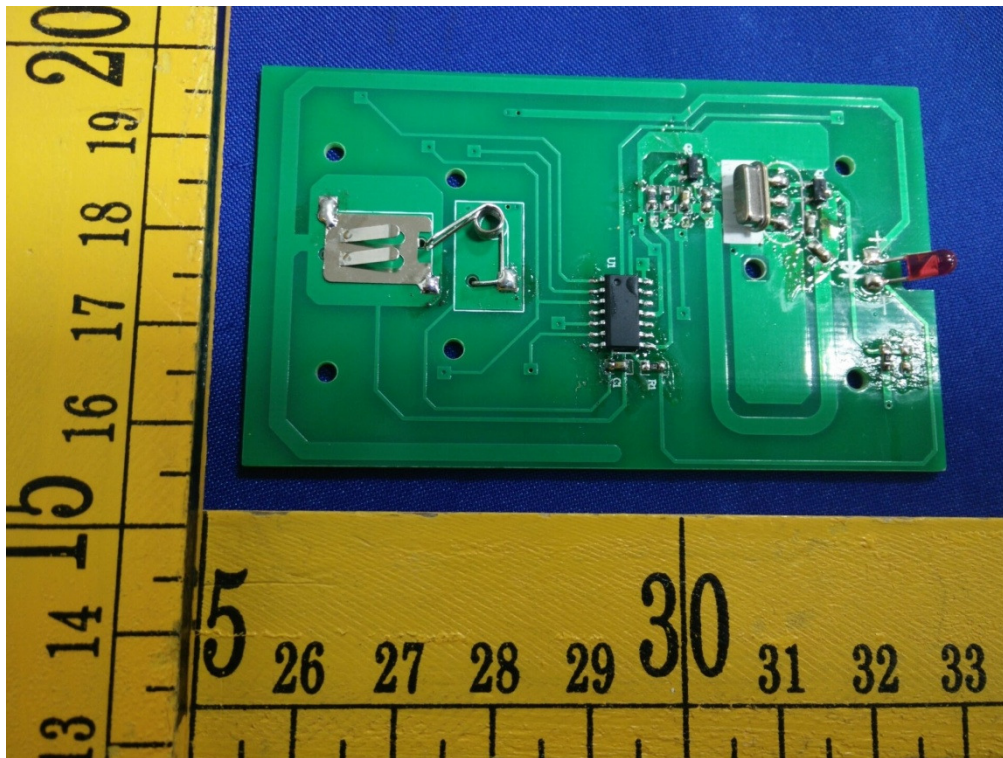


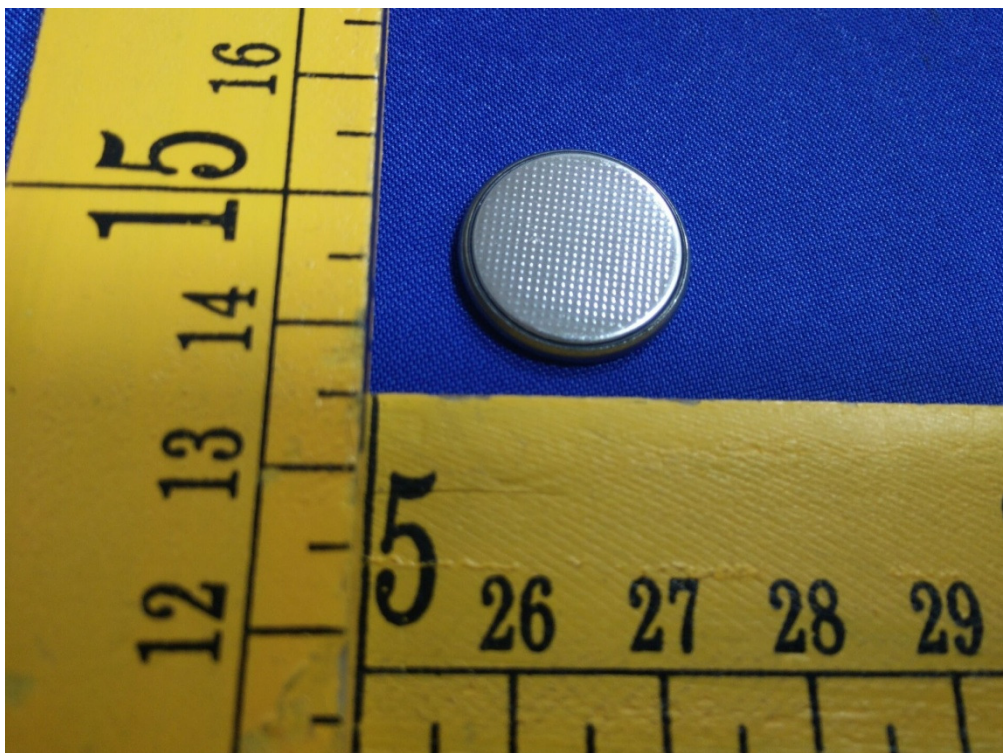




Internal Photos







\*\*\*\*\* THE END REPORT\*\*\*\*\*