



# FCC TEST REPORT

## FCC ID: 2AT7B-T5

|                                                                                                                               |   |                      |
|-------------------------------------------------------------------------------------------------------------------------------|---|----------------------|
| Product Name                                                                                                                  | : | Wireless Presenter   |
| Model Name                                                                                                                    | : | T5                   |
| Brand Name                                                                                                                    | : | N/A                  |
| Report No.                                                                                                                    | : | PTC19092401201E-FC01 |
| <b>Prepared for</b>                                                                                                           |   |                      |
| Shenzhen TYX Technology Co., Ltd.                                                                                             |   |                      |
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| <b>Prepared by</b>                                                                                                            |   |                      |
| Dongguan Precise Testing & Certification Co., Ltd.                                                                            |   |                      |
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## 1 TEST RESULT CERTIFICATION

Applicant's name : Shenzhen TYX Technology Co., Ltd.  
Address : 2F, Building 11, TianFuAn Industria Area, Lezhujiao, Xixiang, Baoan, Shenzhen, 518102 China  
Manufacture's name : Shenzhen TYX Technology Co., Ltd.  
Address : 2F, Building 11, TianFuAn Industria Area, Lezhujiao, Xixiang, Baoan, Shenzhen, 518102 China  
Product name : Wireless Presenter  
Model name : T5  
Brand Name : N/A  
Standards : FCC CFR47 Part 15 Section 15.249  
Test procedure : ANSI C63.10:2013  
Test Date : Oct. 09, 2019 to Oct. 21, 2019  
Date of Issue : Oct.22, 2019  
Test Result : Pass

This device described above has been tested by PTC, 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

A handwritten signature in black ink, appearing to read 'August Qiu'.

Authorized Signatory

Chris Du

A handwritten signature in black ink, appearing to read 'Chris Du'.



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## 2 Test Summary

| Test Items                              | Test Requirement           | Result |
|-----------------------------------------|----------------------------|--------|
| AC Power Conducted Emission             | 15.207                     | PASS   |
| 20dB Bandwidth                          | 15.215(C)                  | PASS   |
| Band edge                               | 15.249(d)                  | PASS   |
| Field Strength of Fundamental Emissions | 15.249(a)                  | PASS   |
| Radiated Spurious Emissions             | 15.205(a)<br>15.249(a) (d) | PASS   |
| Antenna Requirement                     | 15.203                     | PASS   |

Remark:

N/A: Not Applicable



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### **3 TEST FACILITY**

Dongguan Precise Testing & Certification Co., Ltd.

Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong,  
China, Dongguan, 523129

China

FCC Registration Number: 371540

IC Registration Number: 12191A-1



## 4 General Information

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

|                     |                          |
|---------------------|--------------------------|
| Product Name        | : Wireless Presenter     |
| Model Name          | : T5                     |
| Operating frequency | : 2.402-2.480GHZ         |
| Numbers of Channel  | : 16                     |
| Antenna Type:       | : PCB Print Antenna      |
| Antenna Gain:       | : 0dBi                   |
| Type of Modulation  | : GFSK                   |
| Power supply        | : DC3.7V Lion-on Battery |

## 4.2 Test Mode

Channel List:

| Channel List |                 |         |                 |         |                 |
|--------------|-----------------|---------|-----------------|---------|-----------------|
| Channel      | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 01           | 2402            | 07      | 2436            | 13      | 2463            |
| 02           | 2407            | 08      | 2440            | 14      | 2466            |
| 03           | 2414            | 09      | 2441            | 15      | 2473            |
| 04           | 2419            | 10      | 2445            | 16      | 2480            |
| 05           | 2422            | 11      | 2453            | ----    | ----            |
| 06           | 2426            | 12      | 2459            | ----    | ----            |

The 3 channels of lower, middle and higher were chosen for test.

| Channel | Frequency(MHz) |
|---------|----------------|
| 01      | 2402           |
| 08      | 2440           |
| 16      | 2480           |

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| For All Mode | Description | Modulation Type |
|--------------|-------------|-----------------|
| Mode 1       | CH01        | GFSK            |
| Mode 2       | CH08        |                 |
| Mode 3       | CH16        |                 |
| Mode 4       | Link mode   |                 |





## 5 Equipment During Test

### 5.1 Equipments List

#### RF Conducted Test

| Name of Equipment           | Manufacturer | Model   | Serial No. | Calibration Due |
|-----------------------------|--------------|---------|------------|-----------------|
| MXG Signal Analyzer         | Agilent      | N9020A  | MY56070279 | Sept. 28, 20    |
| MIMO4TX-1                   | /            | MIMO4TX | TW5451101  | Sept. 28, 20    |
| MXG Vector Signal Generator | Agilent      | N5182A  | MY50143410 | Sept. 28, 20    |
| MXG Analog Signal Generator | KEYSIGHT     | N5181B  | MY53050432 | Sept. 28, 20    |

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

#### Radiated Emissions

| Name of Equipment            | Manufacturer  | Model    | Serial No. | Calibration Due |
|------------------------------|---------------|----------|------------|-----------------|
| EMI Test Receiver            | Rohde&Schwarz | ESCI     | 101417     | Sept. 28, 20    |
| Bilog Antenna                | SCHWARZBECK   | VULB9160 | 9160-3355  | Sept. 28, 20    |
| Preamplifier (low frequency) | SCHWARZBECK   | BBV 9475 | 9745-0013  | Sept. 28, 20    |
| Spectrum Analyzer            | Agilent       | E4407B   | MY45109572 | Sept. 28, 20    |
| Horn Antenna                 | SCHWARZBECK   | 9120D    | 9120D-1246 | Sept. 28, 20    |
| LOW NOISE AMPLIFIER          | ZHINAN        | ZN3380C  | 15002      | Sept. 28, 20    |

#### Conducted Emissions

| Name of Equipment        | Manufacturer  | Model  | Serial No. | Calibration Due |
|--------------------------|---------------|--------|------------|-----------------|
| EMI Test Receiver        | Rohde&Schwarz | ESCI   | 101417     | Sept. 28, 20    |
| Artificial Mains Network | Rohde&Schwarz | L2-16B | 000WX31025 | Sept. 28, 20    |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101342     | Sept. 28, 20    |



## 5.2 Measurement Uncertainty

| Parameter                                                                                       | Uncertainty              |
|-------------------------------------------------------------------------------------------------|--------------------------|
| RF output power, conducted                                                                      | $\pm 1.0\text{dB}$       |
| Power Spectral Density, conducted                                                               | $\pm 2.2\text{dB}$       |
| Radio Frequency                                                                                 | $\pm 1 \times 10^{-6}$   |
| Bandwidth                                                                                       | $\pm 1.5 \times 10^{-6}$ |
| Time                                                                                            | $\pm 2\%$                |
| Duty Cycle                                                                                      | $\pm 2\%$                |
| Temperature                                                                                     | $\pm 1^\circ\text{C}$    |
| Humidity                                                                                        | $\pm 5\%$                |
| DC and low frequency voltages                                                                   | $\pm 3\%$                |
| Conducted Emissions (150kHz~30MHz)                                                              | $\pm 3.64\text{dB}$      |
| Radiated Emission(30MHz~1GHz)                                                                   | $\pm 5.03\text{dB}$      |
| Radiated Emission(1GHz~25GHz)                                                                   | $\pm 4.74\text{dB}$      |
| Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95% |                          |



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### 5.3 Description of Support Units

| Equipment | Model No.                                                                | Series No. |
|-----------|--------------------------------------------------------------------------|------------|
| Adapter   | NSA12UH-050200<br>Input: AC 100-240V, 50/60Hz, 0.5A<br>Output: DC 5V, 2A | N/A        |

## 6 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207  
 Test Method: : ANSI C63.10:2013  
 Test Result: : PASS  
 Frequency Range: : 150kHz to 30MHz  
 Class/Severity: : Class B  
 Detector: : Peak for pre-scan (9kHz Resolution Bandwidth)

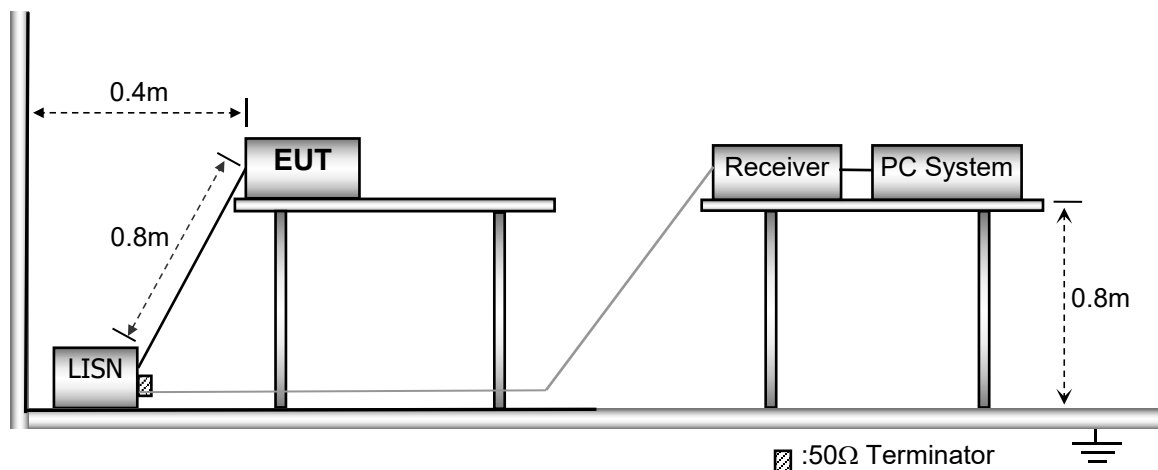
### 6.1 E.U.T. Operation

Operating Environment :

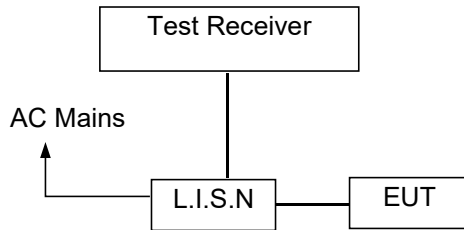
Temperature: : 25.5 °C  
 Humidity: : 51 % RH  
 Atmospheric Pressure: : 101.2kPa  
 EUT Operation : : Refer to section 3.3  
 Test Voltage : : AC 120V/60Hz

### 6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



### 6.3 Test SET-UP (Block Diagram of Configuration)



### 6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

### 6.5 Conducted Emission Limit

#### Conducted Emission

| Frequency(MHz) | Quasi-peak | Average |
|----------------|------------|---------|
| 0.15-0.5       | 66-56      | 56-46   |
| 0.5-5.0        | 56         | 46      |
| 5.0-30.0       | 60         | 50      |

#### Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 6.6 Measurement Description

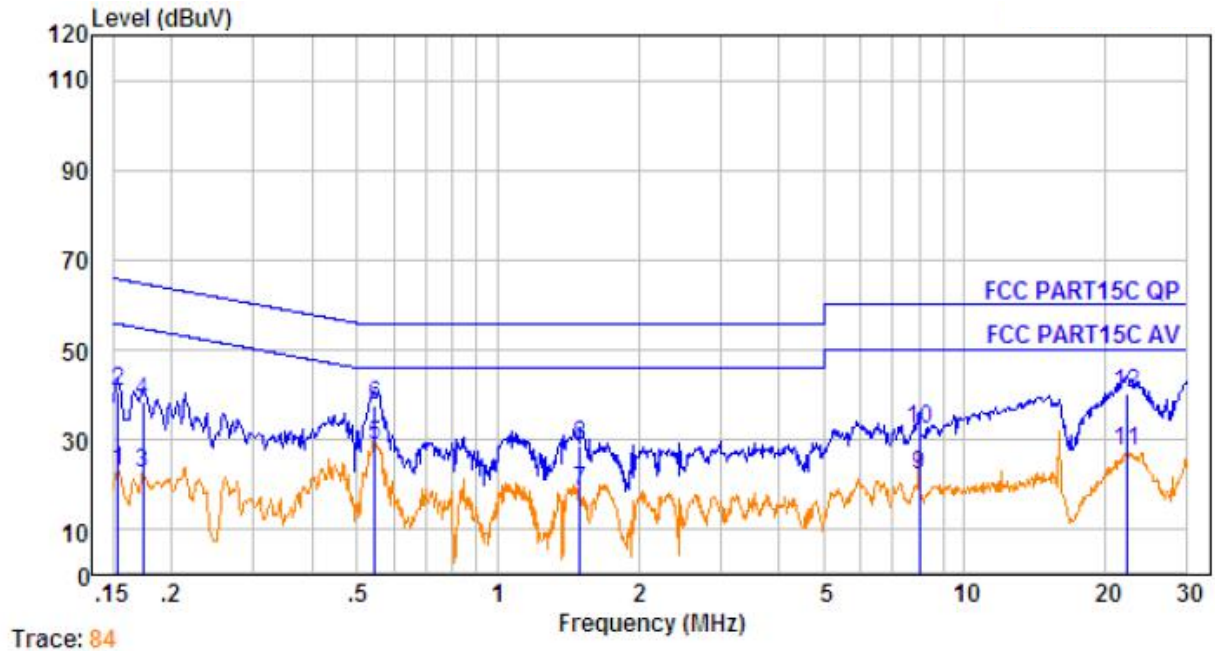
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

### 6.7 Conducted Emission Test Result

Pass

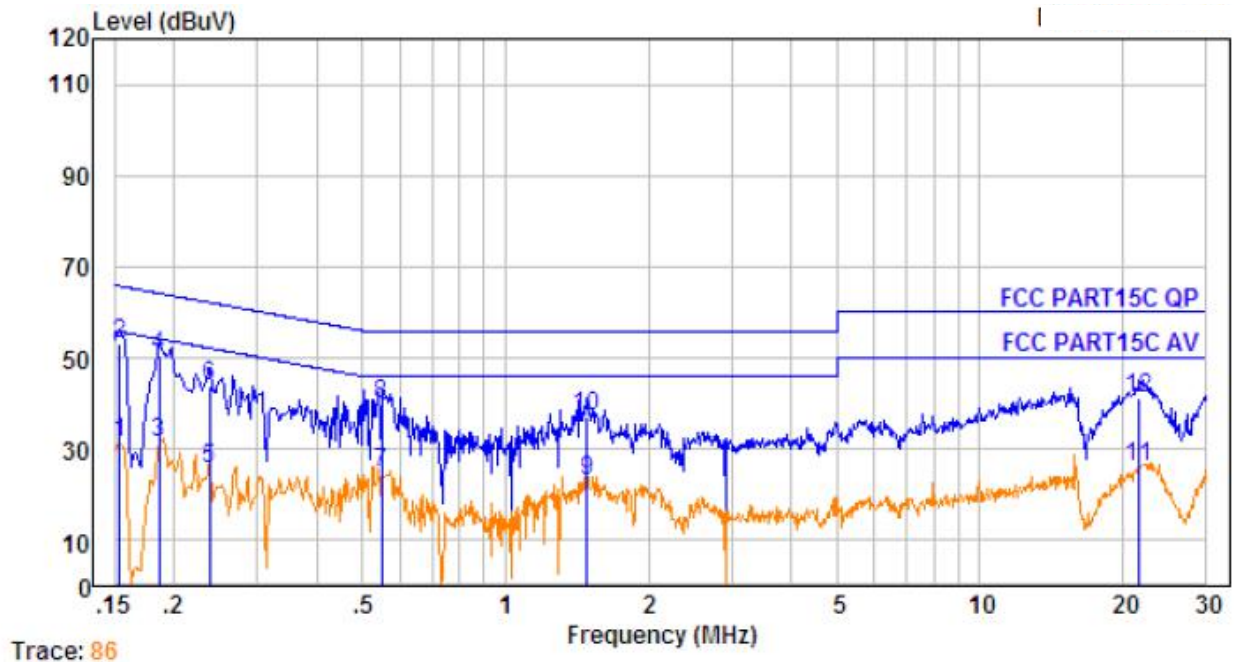
Please find the following pages.

Line -120V/60Hz:



| No. | Freq<br>MHz | Cable<br>Loss<br>dB | AMN<br>Factor<br>dB | Receiver<br>Reading<br>dBuV | Emission<br>Level<br>dBuV | Limit<br>dBuV | Over<br>Limit<br>dB | Remark  |
|-----|-------------|---------------------|---------------------|-----------------------------|---------------------------|---------------|---------------------|---------|
| 1.  | 0.154       | 0.21                | 0.17                | 22.58                       | 22.96                     | 55.78         | -32.82              | Average |
| 2.  | 0.154       | 0.21                | 0.17                | 40.58                       | 40.96                     | 65.78         | -24.82              | QP      |
| 3.  | 0.174       | 0.24                | 0.16                | 22.34                       | 22.74                     | 54.77         | -32.03              | Average |
| 4.  | 0.174       | 0.24                | 0.16                | 38.34                       | 38.74                     | 64.77         | -26.03              | QP      |
| 5.  | 0.546       | 0.43                | 0.14                | 28.21                       | 28.78                     | 46.00         | -17.22              | Average |
| 6.  | 0.546       | 0.43                | 0.14                | 37.21                       | 37.78                     | 56.00         | -18.22              | QP      |
| 7.  | 1.503       | 0.47                | 0.15                | 17.98                       | 18.60                     | 46.00         | -27.40              | Average |
| 8.  | 1.503       | 0.47                | 0.15                | 27.98                       | 28.60                     | 56.00         | -27.40              | QP      |
| 9.  | 8.020       | 0.55                | 0.13                | 21.52                       | 22.20                     | 50.00         | -27.80              | Average |
| 10. | 8.020       | 0.55                | 0.13                | 31.52                       | 32.20                     | 60.00         | -27.80              | QP      |
| 11. | 22.298      | 0.46                | 0.18                | 26.75                       | 27.39                     | 50.00         | -22.61              | Average |
| 12. | 22.298      | 0.46                | 0.18                | 39.75                       | 40.39                     | 60.00         | -19.61              | QP      |

Neutral -120V/60Hz:



| No. | Freq<br>MHz | Cable<br>Loss<br>dB | AMN<br>Factor<br>dB | Receiver<br>Reading<br>dBuV | Emission<br>Level<br>dBuV | Limit<br>dBuV | Over<br>Limit<br>dB | Remark  |
|-----|-------------|---------------------|---------------------|-----------------------------|---------------------------|---------------|---------------------|---------|
| 1.  | 0.154       | 0.21                | 0.27                | 30.79                       | 31.27                     | 55.78         | -24.51              | Average |
| 2.  | 0.154       | 0.21                | 0.27                | 52.79                       | 53.27                     | 65.78         | -12.51              | QP      |
| 3.  | 0.186       | 0.26                | 0.27                | 30.99                       | 31.52                     | 54.20         | -22.68              | Average |
| 4.  | 0.186       | 0.26                | 0.27                | 49.99                       | 50.52                     | 64.20         | -13.68              | QP      |
| 5.  | 0.238       | 0.32                | 0.27                | 25.27                       | 25.86                     | 52.17         | -26.31              | Average |
| 6.  | 0.238       | 0.32                | 0.27                | 43.27                       | 43.86                     | 62.17         | -18.31              | QP      |
| 7.  | 0.549       | 0.43                | 0.31                | 24.17                       | 24.91                     | 46.00         | -21.09              | Average |
| 8.  | 0.549       | 0.43                | 0.31                | 39.17                       | 39.91                     | 56.00         | -16.09              | QP      |
| 9.  | 1.487       | 0.47                | 0.36                | 22.36                       | 23.19                     | 46.00         | -22.81              | Average |
| 10. | 1.487       | 0.47                | 0.36                | 36.36                       | 37.19                     | 56.00         | -18.81              | QP      |
| 11. | 21.715      | 0.45                | 0.34                | 25.23                       | 26.02                     | 50.00         | -23.98              | Average |
| 12. | 21.715      | 0.45                | 0.34                | 40.23                       | 41.02                     | 60.00         | -18.98              | QP      |



## 7 Field Strength of Fundamental Emission and Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.209 & 15.249  
 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(kHz)    | 300          | 10000 * 2400/F(kHz)                         | $20\log^{(2400/F(kHz))} + 80$  |
| 0.490 ~ 1.705   | 24000/F(kHz)   | 30           | 100 * 24000/F(kHz)                          | $20\log^{(24000/F(kHz))} + 40$ |
| 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                                         | $20\log^{(500)}$               |

Note: 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

The field strength of emission from intentional radiators operated within these frequency bands shall comply with the following:

| Frequency(MHz) | Filed Strength of Fundamental(at 3m) |         | Filed Strength of Harmonics(at 3m) |         |
|----------------|--------------------------------------|---------|------------------------------------|---------|
|                | PEAK                                 | AVERAGE | PEAK                               | AVERAGE |
| 902-928        | 114                                  | 94      | 74.0                               | 54.0    |
| 2400-2483.5    | 114                                  | 94      | 74.0                               | 54.0    |
| 5725-5875      | 114                                  | 94      | 74.0                               | 54.0    |
| 24000-24250    | 128                                  | 108     | 88.0                               | 68.0    |



## 7.1 EUT Operation

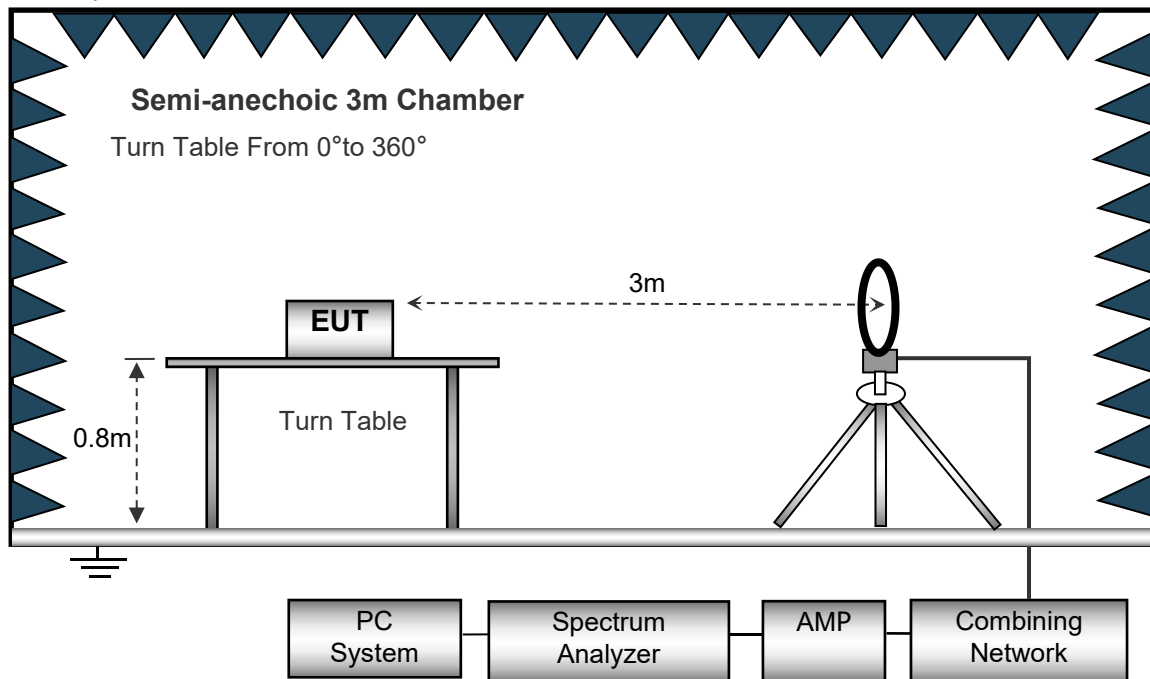
Operating Environment :

|                       |                        |
|-----------------------|------------------------|
| Temperature:          | : 23.5 °C              |
| Humidity:             | : 51.1 % RH            |
| Atmospheric Pressure: | : 101.2kPa             |
| EUT Operation :       | : Refer to section 3.3 |
| Test Voltage          | : DC 3.7V              |

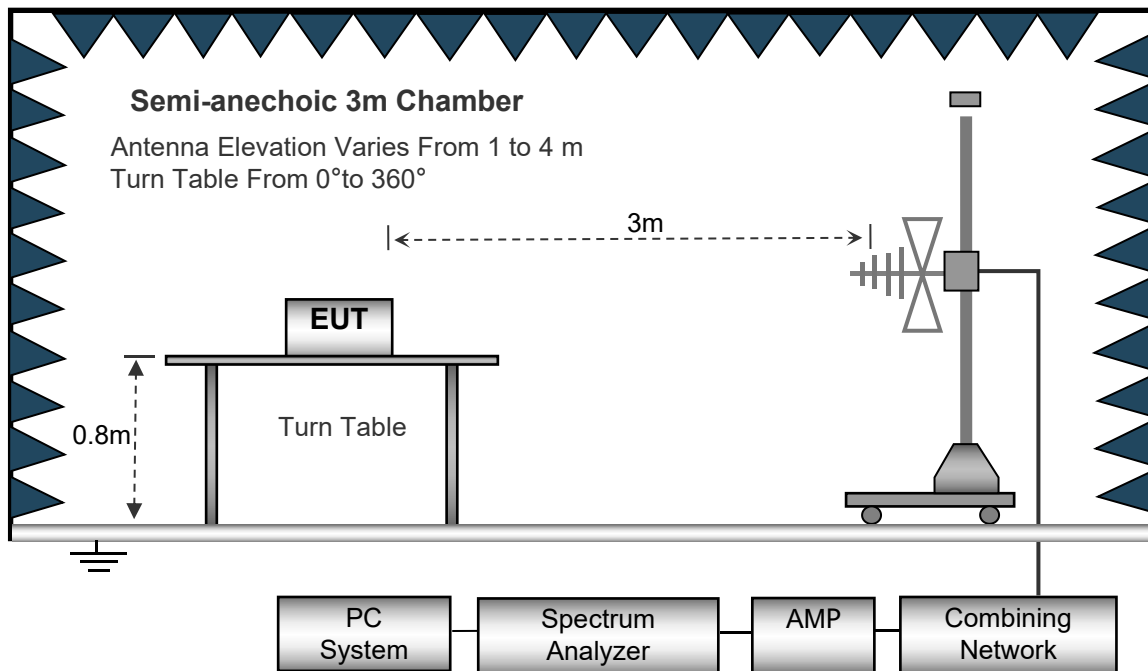
## 7.2 Test Setup

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

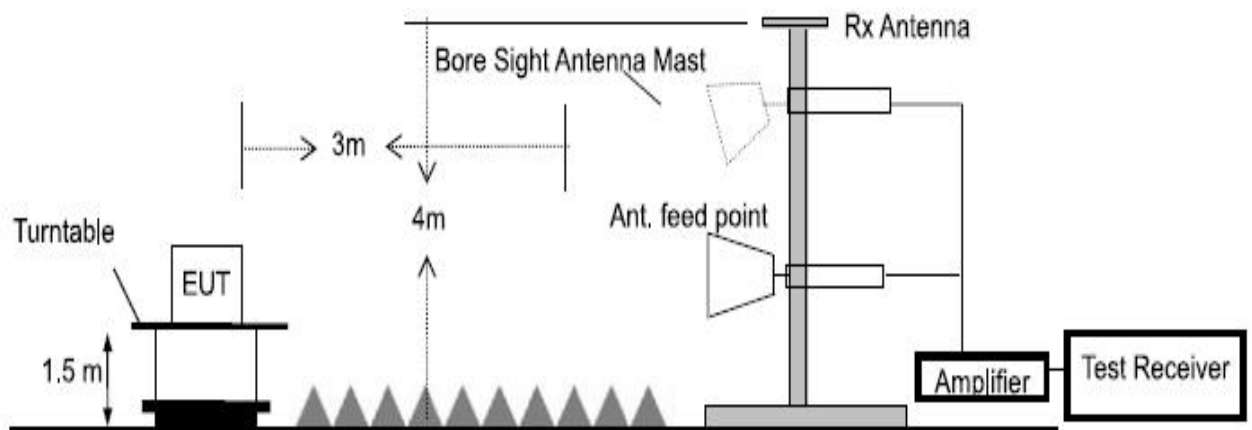
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.





### 7.3 Spectrum Analyzer Setup

| Spectrum Parameter                    | Setting                                          |
|---------------------------------------|--------------------------------------------------|
| Attenuation                           | Auto                                             |
| Start Frequency                       | 1000 MHz                                         |
| Stop Frequency                        | 10th carrier harmonic                            |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

| Receiver Parameter     | Setting                          |
|------------------------|----------------------------------|
| Attenuation            | Auto                             |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP    |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |



## 7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
  - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
  - 2) Change the antenna polarization and repeat 1) with vertical polarization.
  - 3) Make a hardcopy of the spectrum.
  - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
  - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
  - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
  - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
  - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
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: Below 30MHz**

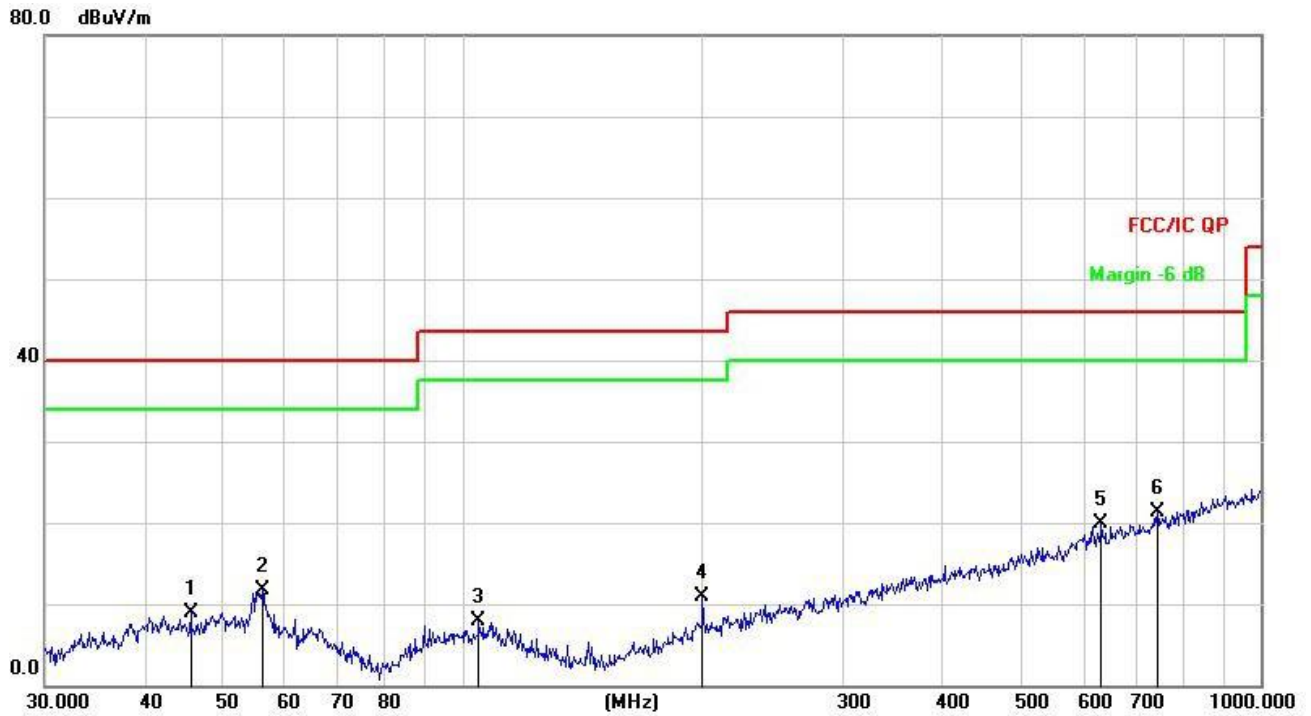
The measurements were more than 20 dB below the limit and not reported.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

### **Test Frequency: 30MHz ~ 1GHz**

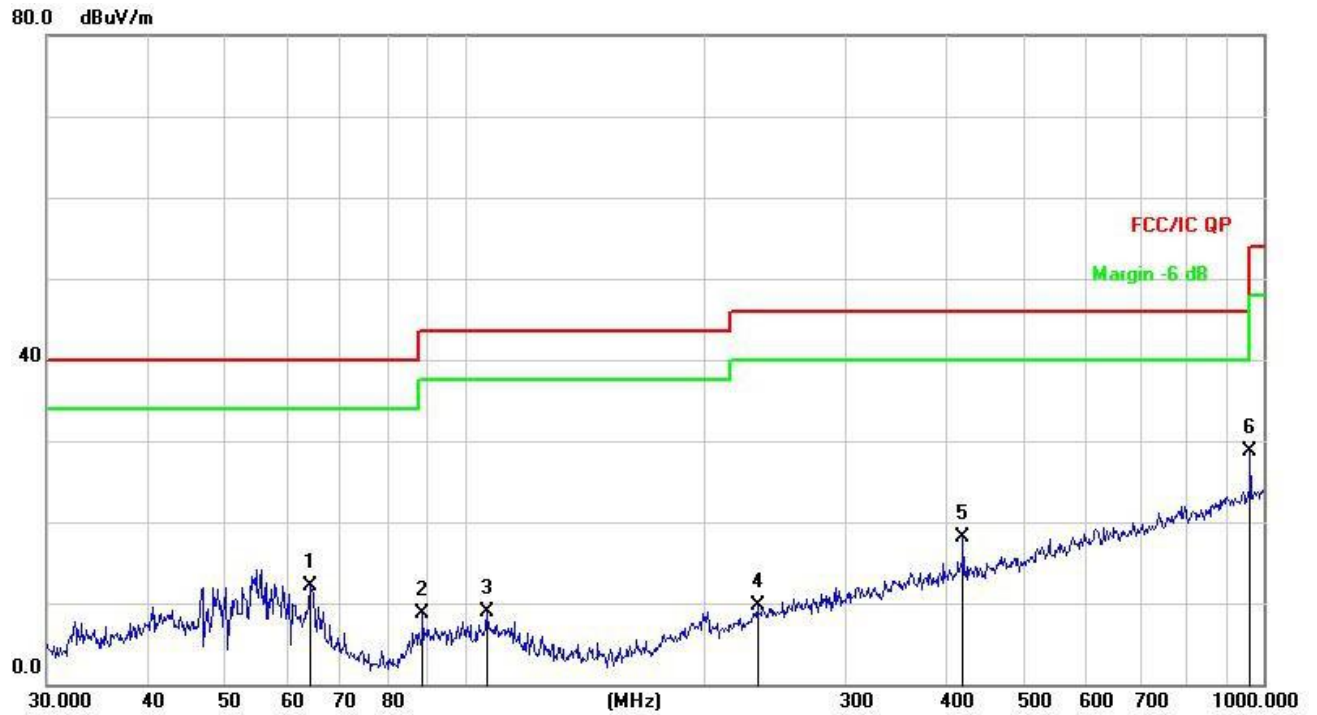
Remark: worst case is link model, only the worst data were reported.

Test plot for Horizontal: Link



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|-------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dB/m  | dB     | cm             | degree       | Comment |
| 1   |     | 45.6948  | 23.64         | -14.77         | 8.87        | 40.00 | -31.13 | QP             |              |         |
| 2   |     | 56.1974  | 27.12         | -15.43         | 11.69       | 40.00 | -28.31 | QP             |              |         |
| 3   |     | 104.9033 | 24.11         | -16.17         | 7.94        | 43.50 | -35.56 | QP             |              |         |
| 4   |     | 199.9856 | 26.50         | -15.63         | 10.87       | 43.50 | -32.63 | QP             |              |         |
| 5   |     | 631.6884 | 23.98         | -4.12          | 19.86       | 46.00 | -26.14 | QP             |              |         |
| 6   | *   | 742.2587 | 23.27         | -1.96          | 21.31       | 46.00 | -24.69 | QP             |              |         |

Test plot for Vertical: link



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|-------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dB/m  | dB     | cm             | degree       | Comment |
| 1   |     | 64.2074  | 28.85         | -16.66         | 12.19       | 40.00 | -27.81 | QP             |              |         |
| 2   |     | 88.6524  | 27.35         | -18.57         | 8.78        | 43.50 | -34.72 | QP             |              |         |
| 3   |     | 106.7587 | 25.08         | -16.27         | 8.81        | 43.50 | -34.69 | QP             |              |         |
| 4   |     | 232.5318 | 24.22         | -14.45         | 9.77        | 46.00 | -36.23 | QP             |              |         |
| 5   |     | 420.5803 | 26.87         | -8.83          | 18.04       | 46.00 | -27.96 | QP             |              |         |
| 6   | *   | 962.1623 | 27.28         | 1.43           | 28.71       | 54.00 | -25.29 | QP             |              |         |

**Above 1000MHz-10<sup>th</sup> Harmonics:**

|                              | Freq.<br>(MHz) | Receiver<br>Reading<br>(dBμV) | Detector<br>(PK/QP/Ave) | Polar<br>(H/V) | Corrected<br>Factor<br>(dB) | Emission<br>Level<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) | Result |
|------------------------------|----------------|-------------------------------|-------------------------|----------------|-----------------------------|-------------------------------|-------------------|----------------|--------|
| Lower<br>Channel<br>2402MHz  | 2402           | 86.25                         | PK                      | H              | 13.85                       | 100.10                        | 114               | -13.90         | Pass   |
|                              | 2402           | 67.96                         | Ave                     | H              | 13.85                       | 81.81                         | 94                | -12.19         | Pass   |
|                              | 4804           | 47.32                         | PK                      | H              | 19.33                       | 66.65                         | 74                | -7.35          | Pass   |
|                              | 4804           | 24.27                         | Ave                     | H              | 19.33                       | 43.60                         | 54                | -10.40         | Pass   |
|                              | 2402           | 85.37                         | PK                      | V              | 13.85                       | 99.22                         | 114               | -14.78         | Pass   |
|                              | 2402           | 67.42                         | Ave                     | V              | 13.85                       | 81.27                         | 94                | -12.73         | Pass   |
|                              | 4804           | 46.66                         | PK                      | V              | 19.33                       | 65.99                         | 74                | -8.01          | Pass   |
|                              | 4804           | 25.51                         | Ave                     | V              | 19.33                       | 44.84                         | 54                | -9.16          | Pass   |
| Middle<br>Channel<br>2440MHz | 2440           | 85.28                         | PK                      | H              | 13.94                       | 99.22                         | 114               | -14.78         | Pass   |
|                              | 2440           | 67.13                         | Ave                     | H              | 13.94                       | 81.07                         | 94                | -12.93         | Pass   |
|                              | 4880           | 45.74                         | PK                      | H              | 19.43                       | 65.17                         | 74                | -8.83          | Pass   |
|                              | 4880           | 27.55                         | Ave                     | H              | 19.43                       | 46.98                         | 54                | -7.02          | Pass   |
|                              | 2440           | 86.02                         | PK                      | V              | 13.94                       | 99.96                         | 114               | -14.04         | Pass   |
|                              | 2440           | 68.35                         | Ave                     | V              | 13.94                       | 82.29                         | 94                | -11.71         | Pass   |
|                              | 4880           | 46.06                         | PK                      | V              | 19.43                       | 65.49                         | 74                | -8.51          | Pass   |
|                              | 4880           | 26.34                         | Ave                     | V              | 19.43                       | 45.77                         | 54                | -8.23          | Pass   |
| Upper<br>Channel<br>2480MHz  | 2480           | 85.73                         | PK                      | H              | 14.02                       | 99.75                         | 114               | -14.25         | Pass   |
|                              | 2480           | 67.37                         | Ave                     | H              | 14.02                       | 81.39                         | 94                | -12.61         | Pass   |
|                              | 4960           | 43.23                         | PK                      | H              | 19.51                       | 62.74                         | 74                | -11.26         | Pass   |
|                              | 4960           | 25.76                         | Ave                     | H              | 19.51                       | 45.27                         | 54                | -8.73          | Pass   |
|                              | 2480           | 84.89                         | PK                      | V              | 14.02                       | 98.91                         | 114               | -15.09         | Pass   |
|                              | 2480           | 68.33                         | Ave                     | V              | 14.02                       | 82.35                         | 94                | -11.65         | Pass   |
|                              | 4960           | 42.52                         | PK                      | V              | 19.51                       | 62.03                         | 74                | -11.97         | Pass   |
|                              | 4960           | 25.26                         | Ave                     | V              | 19.51                       | 44.77                         | 54                | -9.23          | Pass   |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



## 8 BAND EDGE EMISSION

### 8.1 TEST PROCEDURE

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the band edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were encompassed by the span. After trace stabilization, the maximum peak was determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

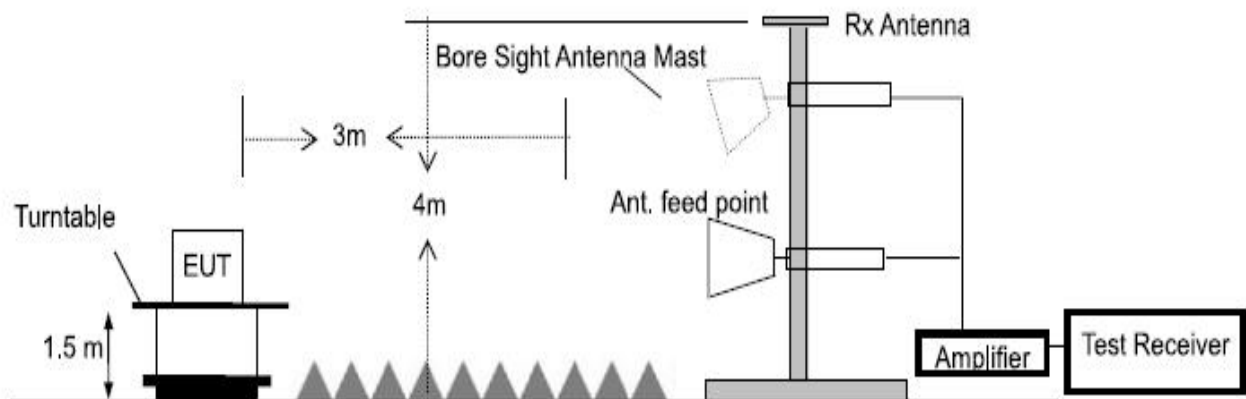
The measurements were performed at the lower end of the 2.4GHz band.

Use the following spectrum analyzer settings:

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

| EMI Test Receiver | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| RBW               | 100KHz   |
| VBW               | 300KHz   |
| Detector          | Peak     |
| Trace             | Max hold |

### 8.2 TEST SETUP



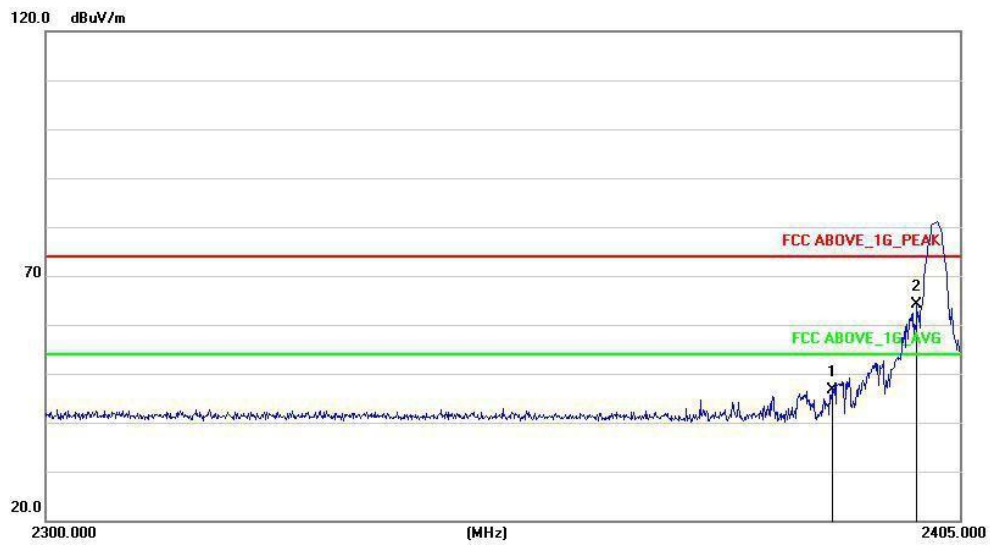


### 8.3 TEST RESULTS

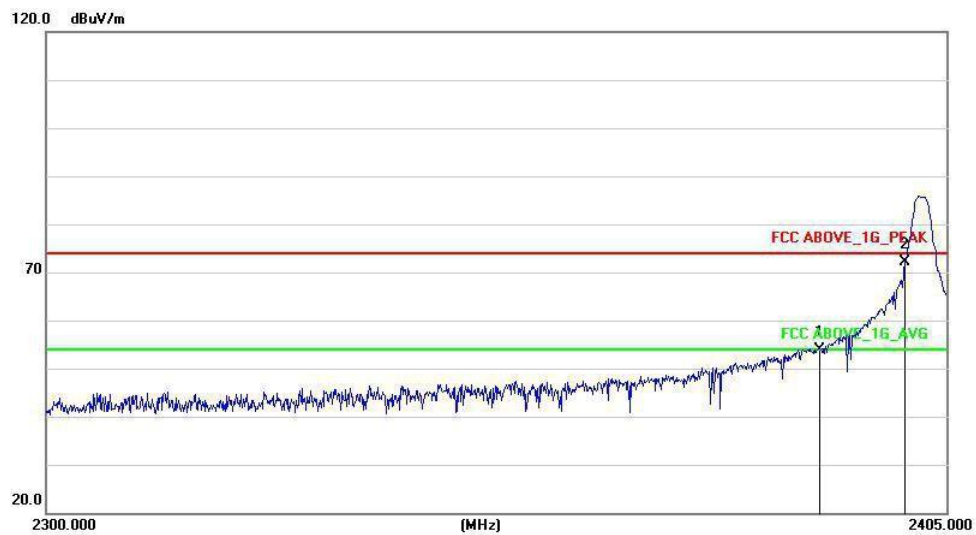
|      | Frequency<br>(MHz) | Antenna<br>polarization<br>(H/V) | Frequency<br>(MHz) | Meter<br>Reading<br>(dBμV) | Factor<br>(dB) | Emission<br>(dBuV/m) | Emission<br>(dBuV/m) | Band edge Limit<br>(dBuV/m) |       | Result |
|------|--------------------|----------------------------------|--------------------|----------------------------|----------------|----------------------|----------------------|-----------------------------|-------|--------|
|      |                    |                                  |                    |                            |                | PK                   | AV                   | PK                          | AV    |        |
| GFSK | <2400              | H                                | 2390.00            | 58.51                      | -4.71          | 53.80                | 38.78                | 74.00                       | 54.00 | Pass   |
|      | <2400              | V                                | 2390.00            | 51.22                      | -4.71          | 46.51                | 31.53                | 74.00                       | 54.00 | Pass   |
|      | <2400              | H                                | 2400.00            | 76.80                      | -4.77          | 72.03                | 57.02                | 74.00                       | 54.00 | Pass   |
|      | <2400              | V                                | 2400.00            | 68.89                      | -4.77          | 64.12                | 49.15                | 74.00                       | 54.00 | Pass   |
|      | >2483.5            | H                                | 2483.50            | 64.30                      | -5.08          | 59.22                | 44.19                | 74.00                       | 54.00 | Pass   |
|      | >2483.5            | V                                | 2483.50            | 61.02                      | -5.08          | 55.94                | 40.98                | 74.00                       | 54.00 | Pass   |
|      | >2483.5            | H                                | 2485.50            | 60.03                      | -5.08          | 54.95                | 39.97                | 74.00                       | 54.00 | Pass   |
|      | >2483.5            | V                                | 2485.50            | 57.01                      | -5.08          | 51.93                | 36.91                | 74.00                       | 54.00 | Pass   |



### 2402MHz Horizontal

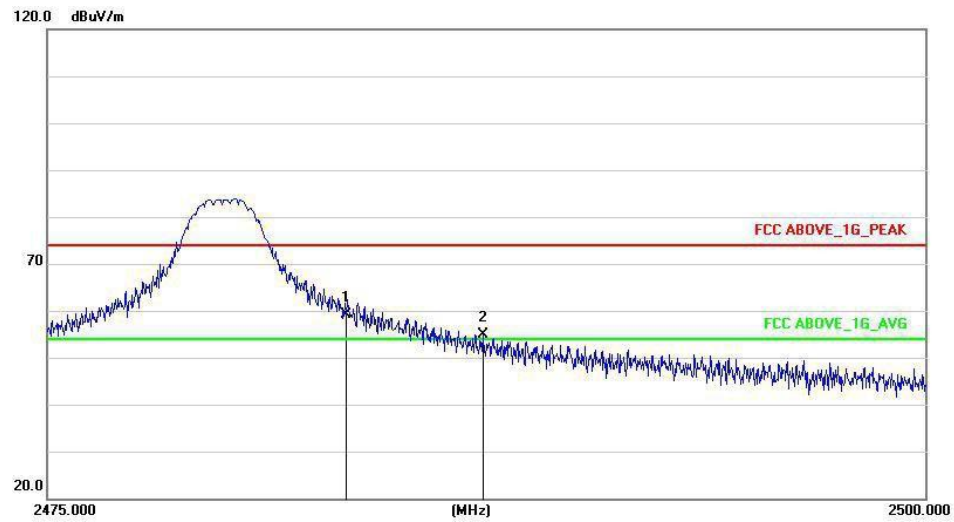


### 2402MHz Vertical

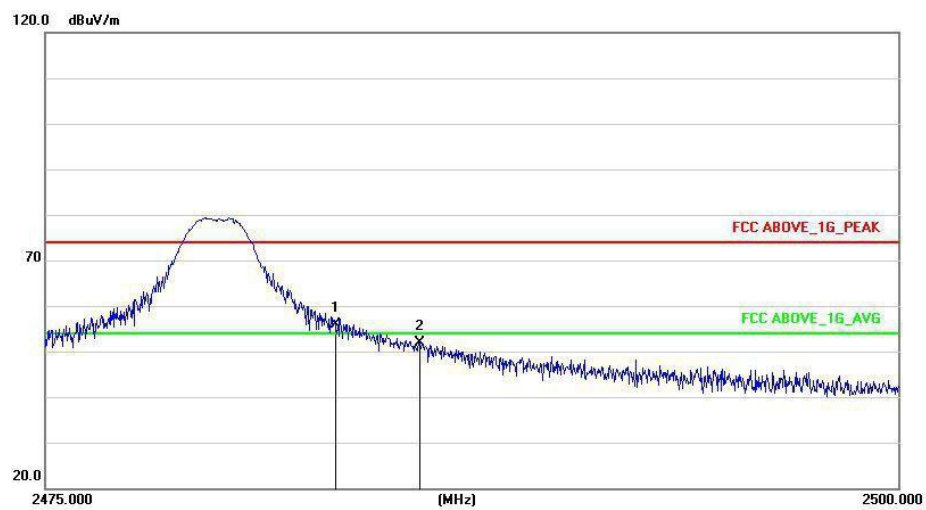




### 2480MHz Horizontal



### 2480MHz Vertical





## 9 20 dB Bandwidth Measurement

Test Requirement : FCC Part 15C Section 15.249  
Test Method : ANSI C63.10:2013  
Test Mode : Refer to section 3.3

### 9.1 Test Procedure

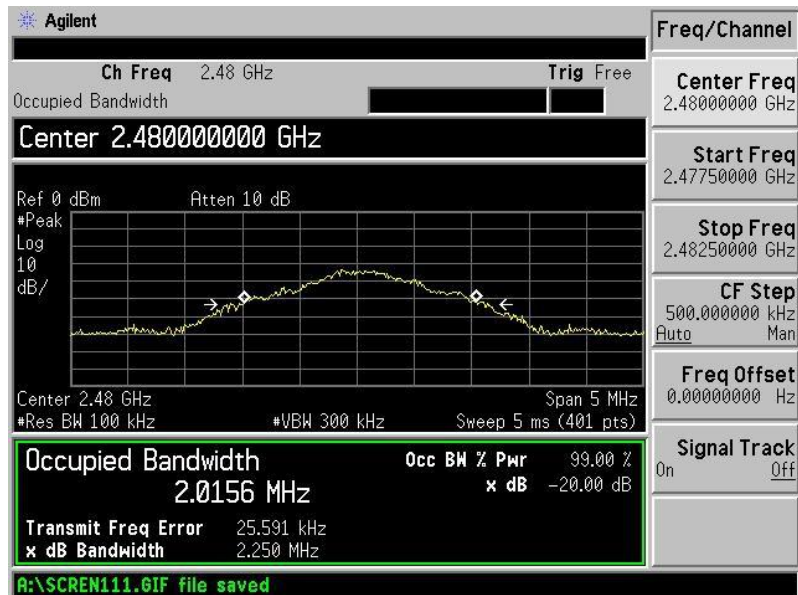
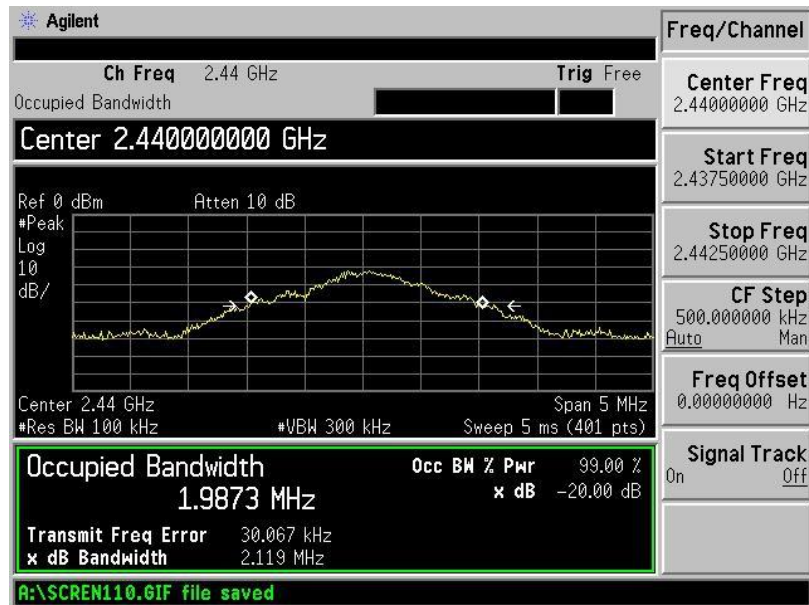
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

### 9.2 Test Result

Test Mode: CH1 / CH8 / CH16 (GFSK)

| Channel number | Channel frequency (MHz) | 20dB Down BW(kHz) | Result |
|----------------|-------------------------|-------------------|--------|
| 01             | 2402                    | 2114              | PASS   |
| 08             | 2440                    | 2119              | PASS   |
| 16             | 2480                    | 2250              | PASS   |



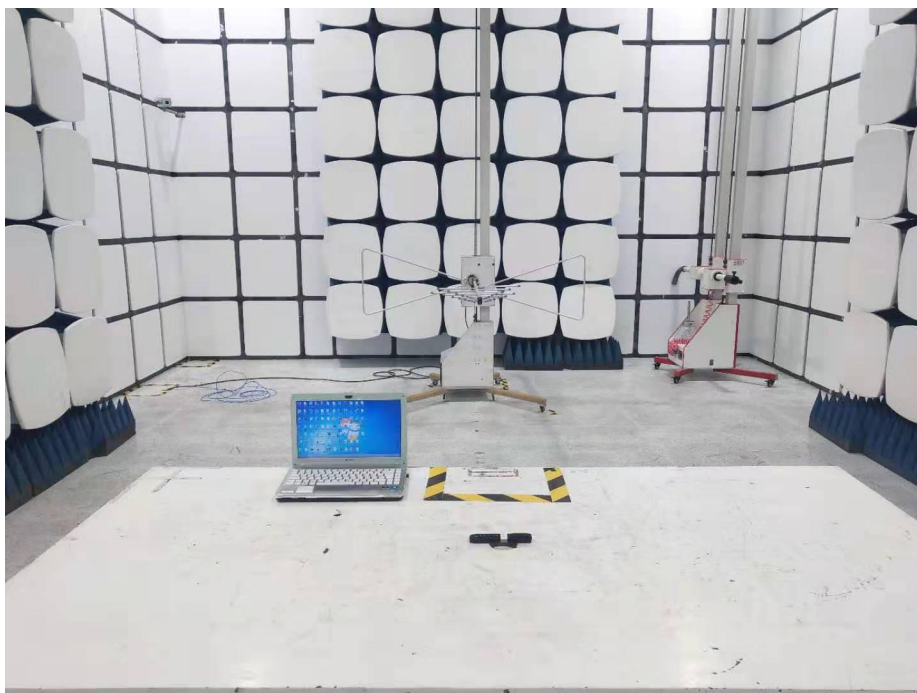
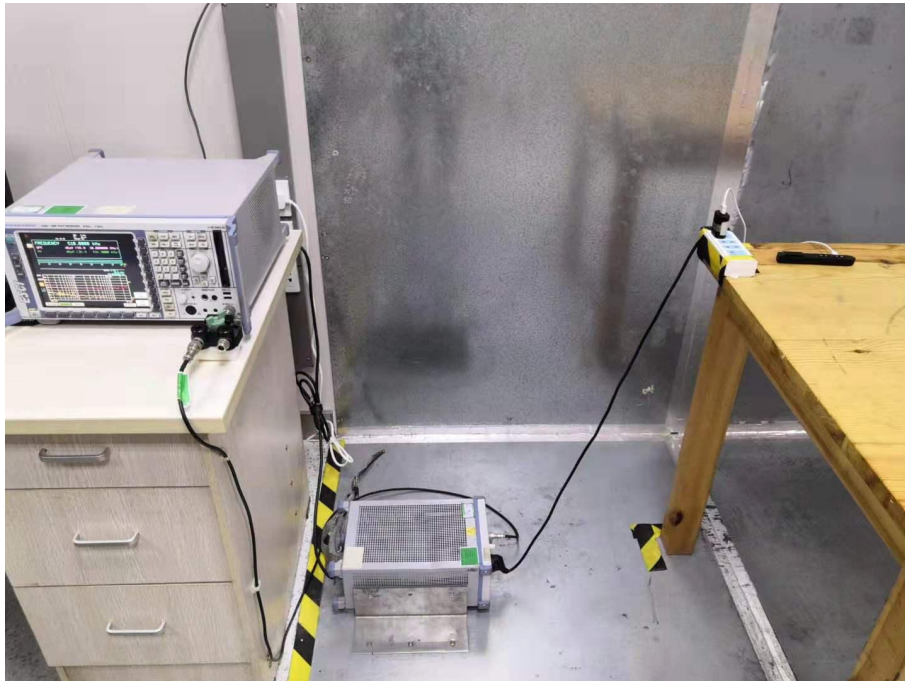




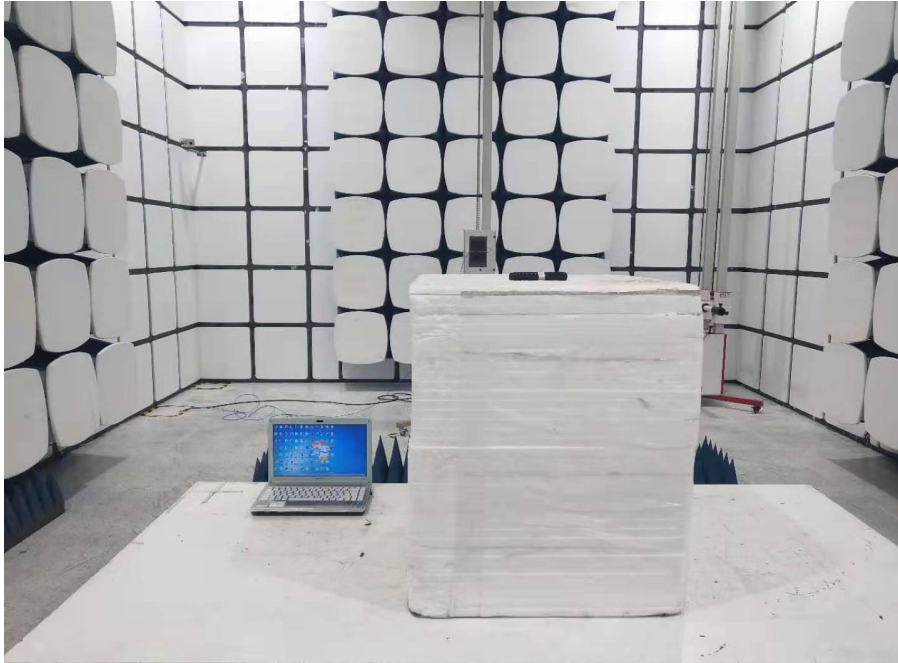
## **10 Antenna Requirement**

According to the FCC part15.203, a transmitter can only be sold or operated with antennas with which it was approved. This product has an internal PCB Antenna, it meet the requirement of this section.

## 11 TEST PHOTOS





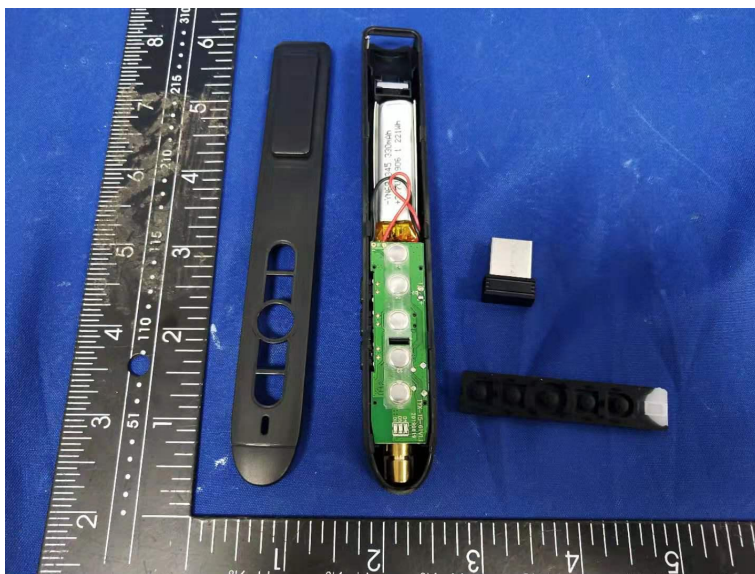


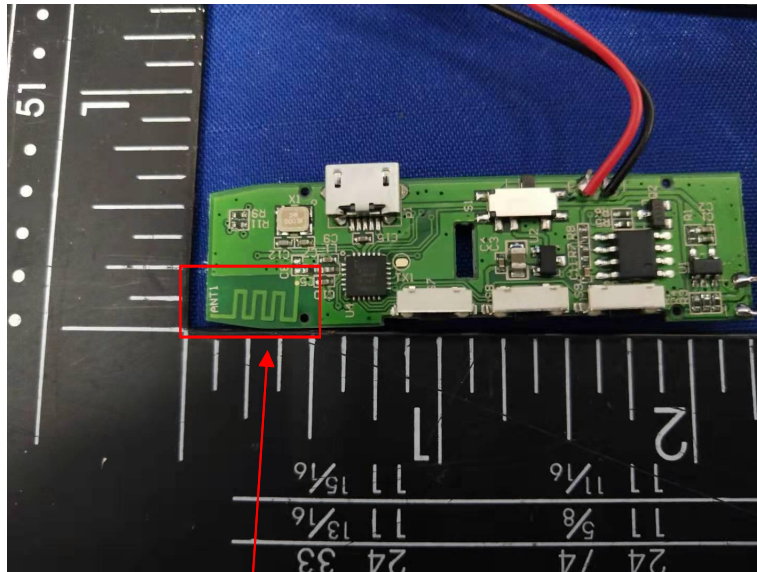
## 12 EUT PHOTOS



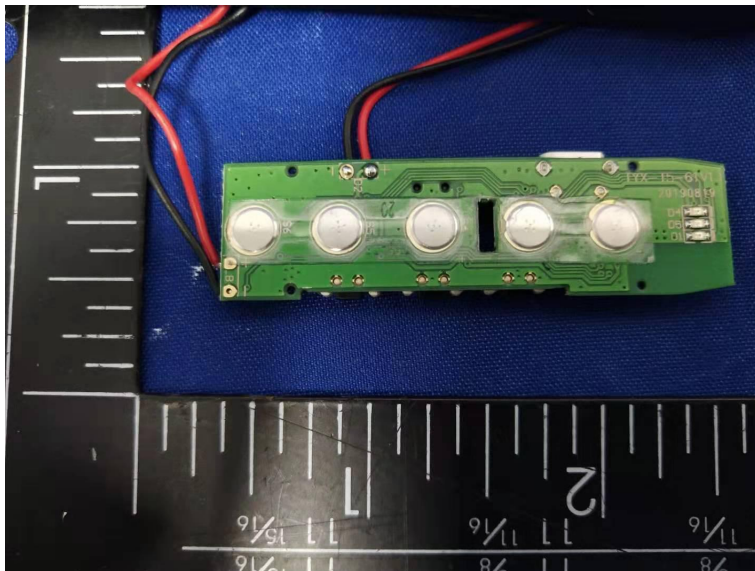








Antenna





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