

**Test Report of FCC CFR 47 Part 15 Subpart B  
On Behalf of**

**AOK Displays Manufacturing Co., Ltd**

6th floor, Sanding Commerce buiding, Yangmei, Bantian, Longgang, Shenzhen

|                 |   |
|-----------------|---|
| Product Name:   | <b>IR Thermometer</b>   |
| Model/Type No.: | <b>CTD2020</b>  |
| Prepared By:    | <b>Shenzhen Hongcai Testing Technology Co., Ltd.</b><br>Building B, Tianji Industrial Park, Floor 1&2&3 No.30-9 Laiyin Road,<br>Xinsheng Community, Longgang Street, Longgang District, Shenzhen,<br>Guangdong, China.<br>Tel: 0755-84616666<br>Service Tel: 400-0066-989 |
| Report Number:  | WTH20H07047799E   |
| Tested Date:    | July 06~21, 2020  |
| Issued Date:    | July 22, 2020   |
| Tested By:      | Macy Xie/ <i>Macy Xie</i>   |

Reviewed By:

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Jerry Zhao  
EMC Technical Manager

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## 1- GENERAL INFORMATION

### 1.1 Product Description for Equipment under Test (EUT)

#### Client Information

|                          |   |
|--------------------------|---|
| Applicant:               | AOK Displays Manufacturing Co., Ltd                                       |
| Address of applicant:    | 6th floor, Sanding Commerce buiding, Yangmei, Bantian, Longgang, Shenzhen |
| Manufacturer:            | AOK Displays Manufacturing Co., Ltd                                       |
| Address of Manufacturer: | 6th floor, Sanding Commerce buiding, Yangmei, Bantian, Longgang, Shenzhen |

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

|                 |   |
|-----------------|---|
| EUT Name:       | IR Thermometer  |
| Trade Mark:     | N/A   |
| Test Model No.: | CTD2020   |
| Power Supply:   | Input: DC 12 V, 0.03A, 0.36W, 60Hz  |
| Product Class:  | <input type="checkbox"/> Class A, apply to Class A limits<br><input checked="" type="checkbox"/> Class B, apply to Class B limits |

Remark: \* The test data gathered are from the production sample provided by the manufacturer.  
*WTH20H07047799E is produced on the basis of WTH20H07042941E*

## 1.2 Test Standards

The following Declaration of Conformity report of EUT is prepared in accordance with FCC PART15 Subpart B

This test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2014.

The tests were performed in order to determine compliance with FCC Part 15, Subpart B, section 15.107 and section 15.109 rules.

The objective of the manufacturer is to demonstrate compliance with the described standards above.

## 1.3 Test Summary

Table 1:

| Standard       | Test Items                            | Status                              |
|----------------|---------------------------------------|-------------------------------------|
| Section 15.107 | Conducted Emission (150KHz to 30MHz)  | <input checked="" type="checkbox"/> |
| Section 15.109 | Radiation Emission (30MHz to 1000MHz) | <input checked="" type="checkbox"/> |

Note:  Indicates that the test is applicable,  Indicates that the test is not applicable

## 1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 - 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. Radiated testing was performed at an antenna to EUT distance 3 meters.

## 2- SYSTEM TEST CONFIGURATION

### 2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

### 2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software offered by manufacture, can let the EUT being normal operation.

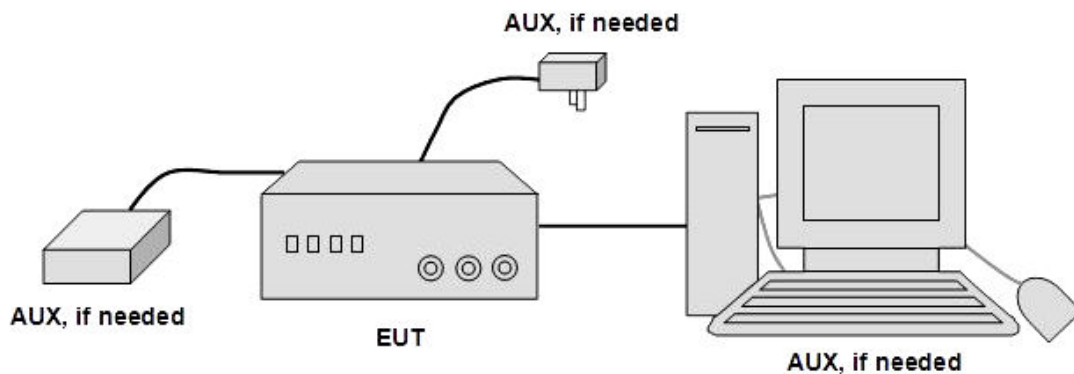
### 2.3 Equipment Modifications

The EUT tested was not modified by HCT.

### 2.4 Basic Configuration of Test System and General Test Procedures

**Conducted Emissions:** The EUT is placed on the table, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

**Radiated Emissions:** The EUT is a placed on as turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2014.



## 2.5 General Description of Test Auxiliary

| EUT Cable List and Details |            |                     |                        |
|----------------------------|------------|---------------------|------------------------|
| Cable Description          | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| /                          | /          | /                   | /                      |
| /                          | /          | /                   | /                      |

| Special Cable List and Details |            |                     |                        |
|--------------------------------|------------|---------------------|------------------------|
| Cable Description              | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| /                              | /          | /                   | /                      |
| /                              | /          | /                   | /                      |

| Auxiliary Equipment List and Details |              |       |               |
|--------------------------------------|--------------|-------|---------------|
| Description                          | Manufacturer | Model | Serial Number |
| /                                    | /            | /     | /             |
| /                                    | /            | /     | /             |

### 3- CONDUCTED EMISSION

#### 3.1 Measurement Uncertainty

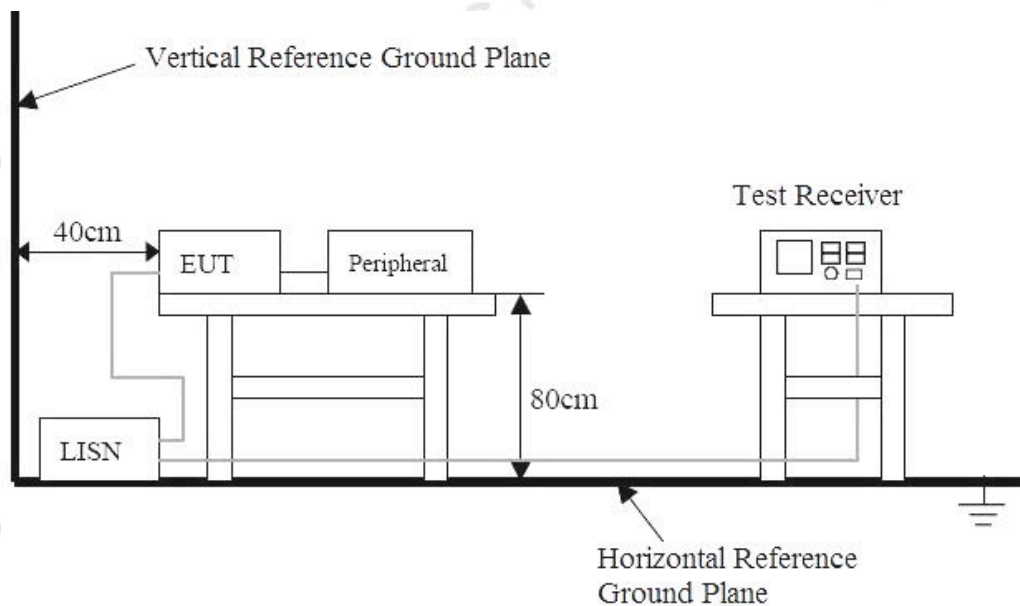
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN. The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is  $\pm 2.7$  dB.

#### 3.2 Limit of Conducted Emission

| Frequency Range (MHz) | Class B Equipment Limits |                |
|-----------------------|--------------------------|----------------|
|                       | Quasi-Peak (dBuV)        | Average (dBuV) |
| 0.150~0.500           | 66~56                    | 56~46          |
| 0.500~5.000           | 56                       | 46             |
| 5.000~30.00           | 60                       | 50             |

NOTE 1: The tighter limit shall apply at the edge between two frequency bands.

#### 3.3 EUT Setup



The setup of EUT is according with ANSI C63.4-2014 measurement procedure. The specification used was the FCC Rules and Regulations Part 15 Subpart B Section 15.107 Class B limits.

The EUT was placed center and the back edge of the test table.

The AV cables were draped along the test table and bundled to 30-40cm in the middle.

The spacing between the peripherals was 10 cm.

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.

### 3.4 Instrument Setup

The test receiver was set with the following configurations:

Test Receiver Setting:

Frequency Range.....150 KHz to 30 MHz  
 Detector.....Peak & Quasi-Peak & Average  
 Sweep Speed.....Auto  
 IF Band Width.....9 KHz

### 3.5 Test Procedure

1. During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first Artificial Mains.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.
3. All data was recorded in the peak detection mode. Quasi-peak and Average readings were only performed when an emission was found to be marginal (within -10 dB $\mu$ V of specification limits). Quasi-peak readings are distinguished with a "QP". Average readings are distinguished with a "AV".

### 3.6 Test Equipment List and Details

| No. | Instrument no. | Equipment                    | Manufacturer | Model No. | S/N              | Last Calculator | Due Calculator |
|-----|----------------|------------------------------|--------------|-----------|------------------|-----------------|----------------|
| 1   | LG/EMC-05-001  | EMI Test Receiver            | R&S          | ESCI      | 100687           | 2020-05-28      | 2021-05-27     |
| 2   | LG/EMC-05-003  | Teo Line Single Phase Module | SCHWARZBECK  | NSLK8128  | 8128247          | 2020-05-28      | 2021-05-27     |
| 3   | LG/EMC-05-002  | 10dB attenuator              | SCHWARZBECK  | 9510-F061 | 9510-F06<br>1234 | 2020-05-31      | 2021-05-30     |

### 3.7 Test Data

|                      |                   |
|----------------------|-------------------|
| Temperature:         | 22~26 ( °C )      |
| Humidity:            | 50~65 ( %RH )     |
| Barometric Pressure: | 990~1030 ( mbar ) |
| Operating Mode:      | Charge            |
| Test Result:         | Pass              |







## 4- RADIATED EMISSION

### 4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is  $\pm 4.0$  dB.

### 4.2 Limit of Radiated Emission

| Below 1GHz Class B Equipment Limits |                   |                           |
|-------------------------------------|-------------------|---------------------------|
| Frequency (MHz)                     | Distance (Meters) | Quasi-Peak (dB $\mu$ V/m) |
| 30 ~ 88                             | 3                 | 40                        |
| 88~216                              | 3                 | 43.5                      |
| 216 ~ 960                           | 3                 | 46                        |
| 960 ~ 1000                          | 3                 | 54                        |

NOTE 1 The lower limit shall apply at the transition frequency.

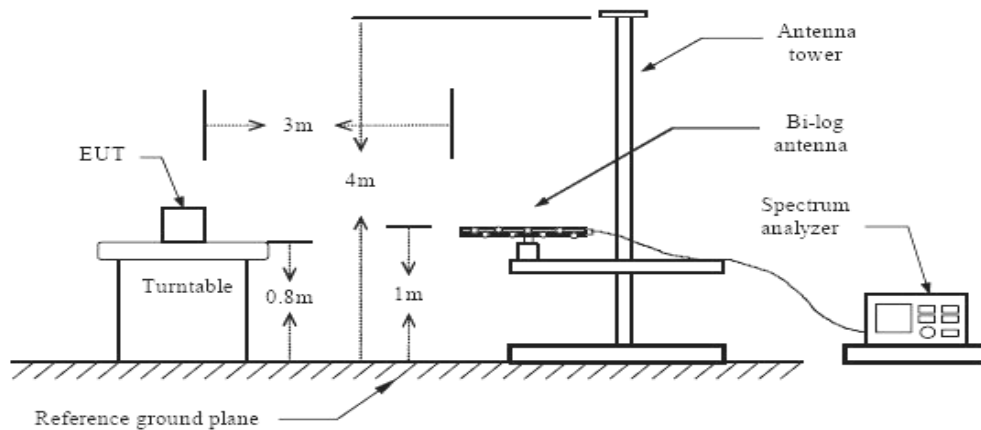
NOTE 2 Additional provisions may be required for cases where interference occurs.

| Above 1GHz Class B Equipment Limits |                   |                        |                     |
|-------------------------------------|-------------------|------------------------|---------------------|
| Frequency (GHz)                     | Distance (Meters) | Average (dB $\mu$ V/m) | Peak (dB $\mu$ V/m) |
| 1 ~ 6                               | 3                 | 54                     | 74                  |

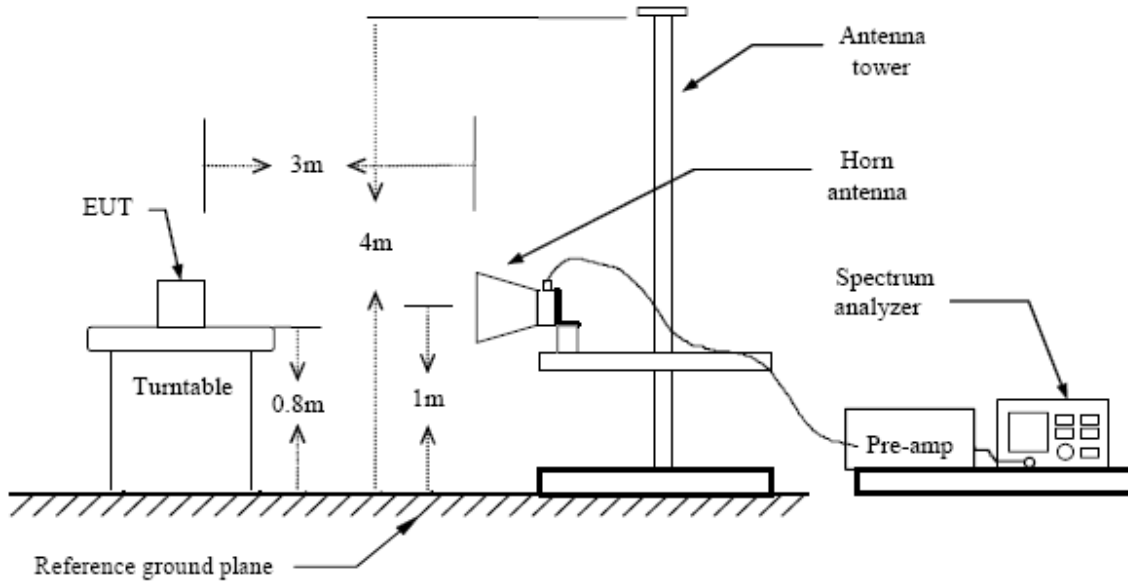
NOTE 1 The lower limit shall apply at the transition frequency.

### 4.3 EUT Setup

#### Below 1 GHz



### Above 1 GHz



The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the AANSI C63.4-2014. The specification used was the FCC Part 15 Subpart B Section 15.109 limits.

The EUT was placed on the center of the test table.

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.

#### 4.4 Test Receiver Setup

The test receiver was set with the following configurations:

Test Receiver Setting below 1000MHz:

|                        |                   |
|------------------------|-------------------|
| Detector.....          | Peak & Quasi-Peak |
| IF Band Width.....     | 120KHz            |
| Frequency Range.....   | 30MHz to 1000MHz  |
| Turntable Rotated..... | 0 to 360 degrees  |

Test Receiver Setting above 1000MHz:

|                        |                    |
|------------------------|--------------------|
| Detector.....          | Peak & Average     |
| IF Band Width.....     | 1MHz               |
| Frequency Range.....   | 1000MHz to 6000MHz |
| Turntable Rotated..... | 0 to 360 degrees   |

Antenna Position:

Height.....1m to 4m  
 Polarity.....Horizontal and Vertical

#### 4.5 Test Procedure

1. Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.
2. All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -10 dB $\mu$ V of specification limits), and are distinguished with a "QP" in the data table.

#### 4.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB $\mu$ V means the emission is 7dB $\mu$ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

#### 4.7 Test Equipment List and Details

| No. | Instrument no. | Equipment                            | Manufacturer | Model No. | S/N      | Last Calculator | Due Calculator |
|-----|----------------|--------------------------------------|--------------|-----------|----------|-----------------|----------------|
| 1   | LG/EMC-02-001  | EMI Test Receiver                    | R&S          | ESCI      | 100687   | 2020-05-28      | 2021-05-27     |
| 2   | LG/EMC-02-007  | Broadband Logarithmic Period Antenna | SCHWARZBECK  | VULB 9162 | /        | 2019-08-08      | 2021-08-07     |
| 3   | LG/EMC-02-003  | Horn Antenna                         | A.H.         | AH-118    | /        | 2019-06-27      | 2021-06-21     |
| 4   | LG/EMC-02-004  | Broadband preamplifier               | SCHWARZBECK  | BBV9718   | 9718-182 | 2020-05-31      | 2021-05-30     |
| 5   | LG/EMC-02-005  | Preamplifier                         | Agilent      | 8447D     | /        | 2020-05-28      | 2021-05-27     |

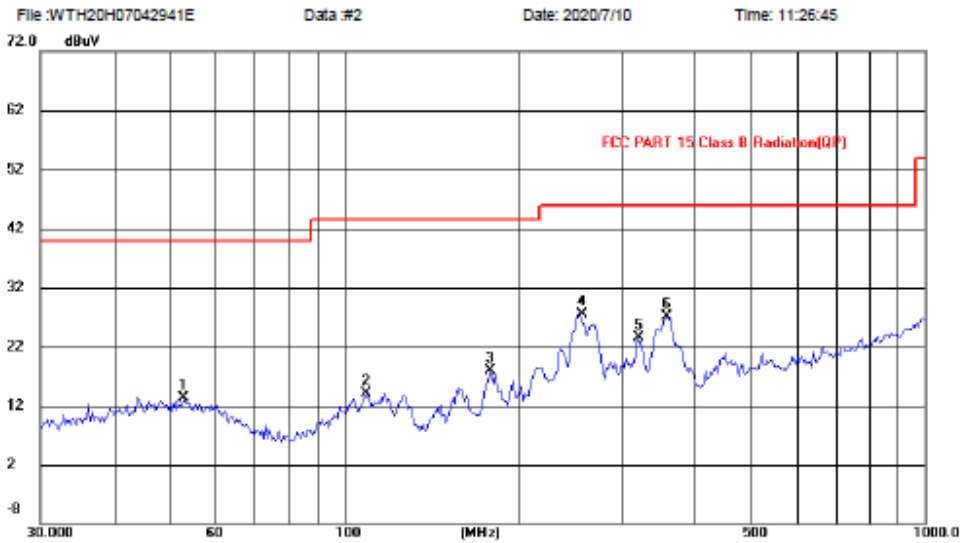
#### 4.8 Test Data

|                      |                   |
|----------------------|-------------------|
| Temperature:         | 22~26 ( °C )      |
| Humidity:            | 50~65 ( %RH )     |
| Barometric Pressure: | 990~1030 ( mbar ) |
| Operating Mode:      | Charge/Discharge  |
| Test Result:         | Pass              |

### Radiated Emission Test Data of Below 1GHz

EUT: IR Thermometer  
M/N: CTD2020  
Operating Condition: Charge  
Test Site: CHAMBER  
Operator: SX  
Test Specification: AC 120V/60Hz  
Comment: Polarization: Horizontal

#### Radiated Emission Measurement

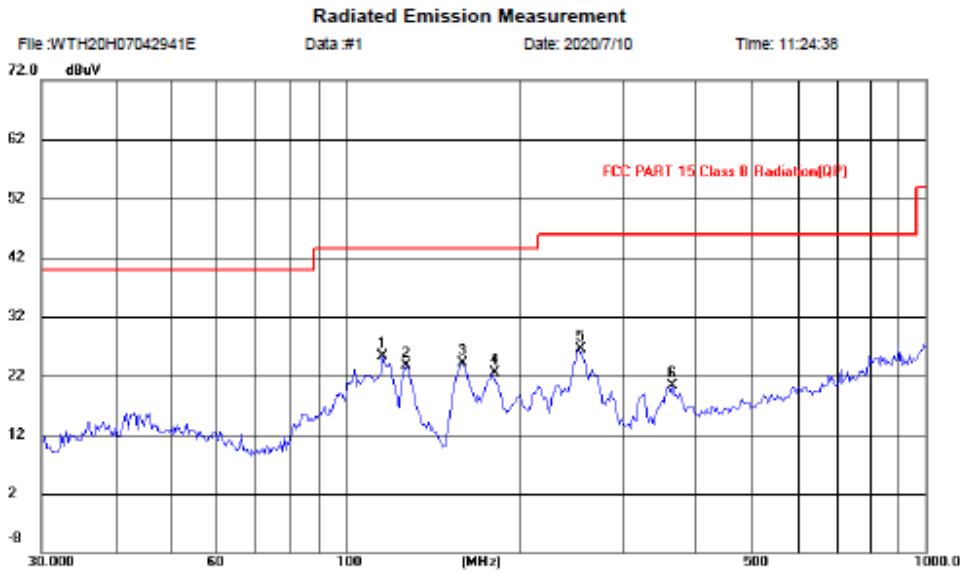


Site: Polarization: **Horizontal** Temperature:  
Limit: FCC PART 15 Class B Radiation(QP) Power: AC120/60Hz Humidity: %  
EUT: IR Thermometer  
M/N: IF-1  
Mode:  
Note:

| No. Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Margin<br>dB | Detector | Comment |
|---------|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1       | 52.9453      | 26.78                    | -13.46                  | 13.32                    | 40.00         | -26.68       | QP       |         |
| 2       | 109.0286     | 29.64                    | -15.47                  | 14.17                    | 43.50         | -29.33       | QP       |         |
| 3       | 178.1327     | 35.06                    | -17.07                  | 17.99                    | 43.50         | -25.51       | QP       |         |
| 4 *     | 254.7284     | 41.15                    | -13.72                  | 27.43                    | 46.00         | -18.57       | QP       |         |
| 5       | 321.0608     | 35.66                    | -12.19                  | 23.47                    | 46.00         | -22.53       | QP       |         |
| 6       | 359.1860     | 38.47                    | -11.35                  | 27.12                    | 46.00         | -18.88       | QP       |         |

### Radiated Emission Test Data of Below 1GHz

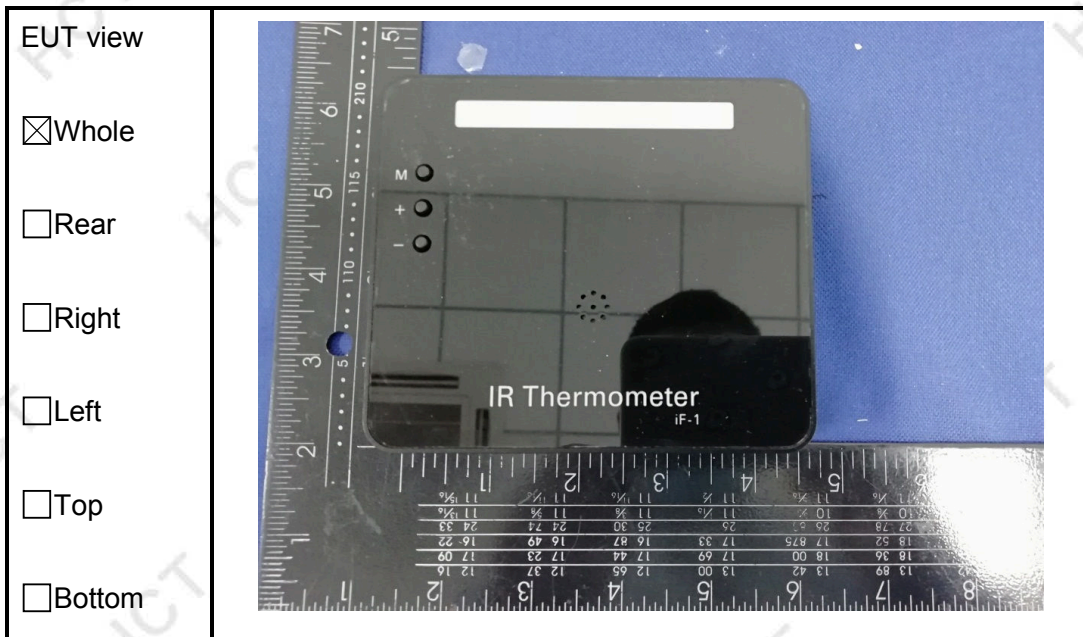
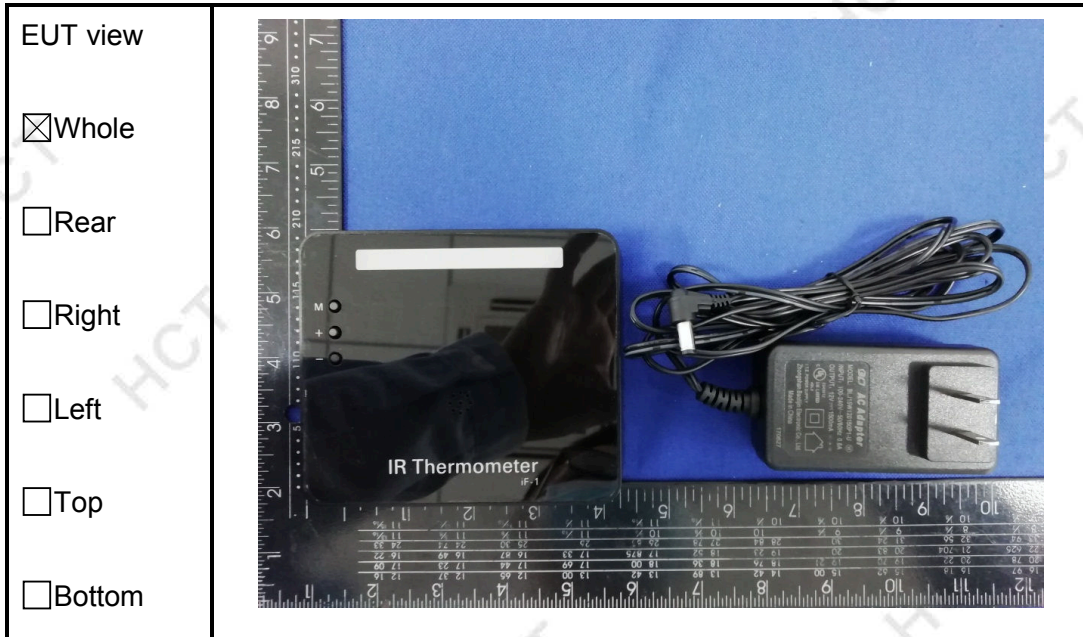
EUT: IR Thermometer  
M/N: CTD2020  
Operating Condition: Charge  
Test Site: CHAMBER  
Operator: SX  
Test Specification: AC 120V/60Hz  
Comment: Polarization: Vertical



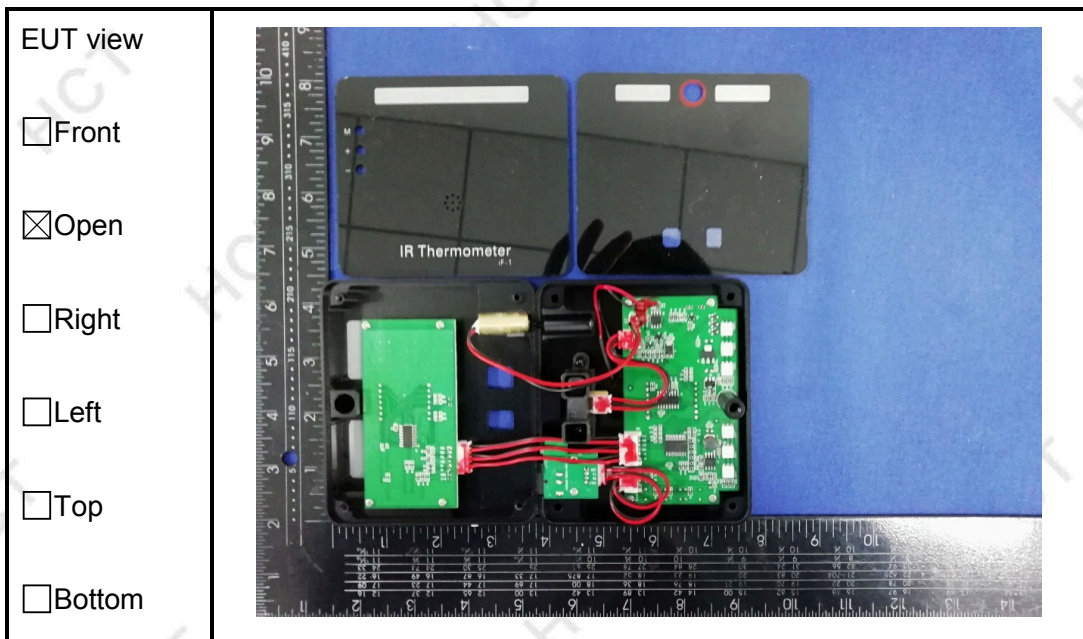
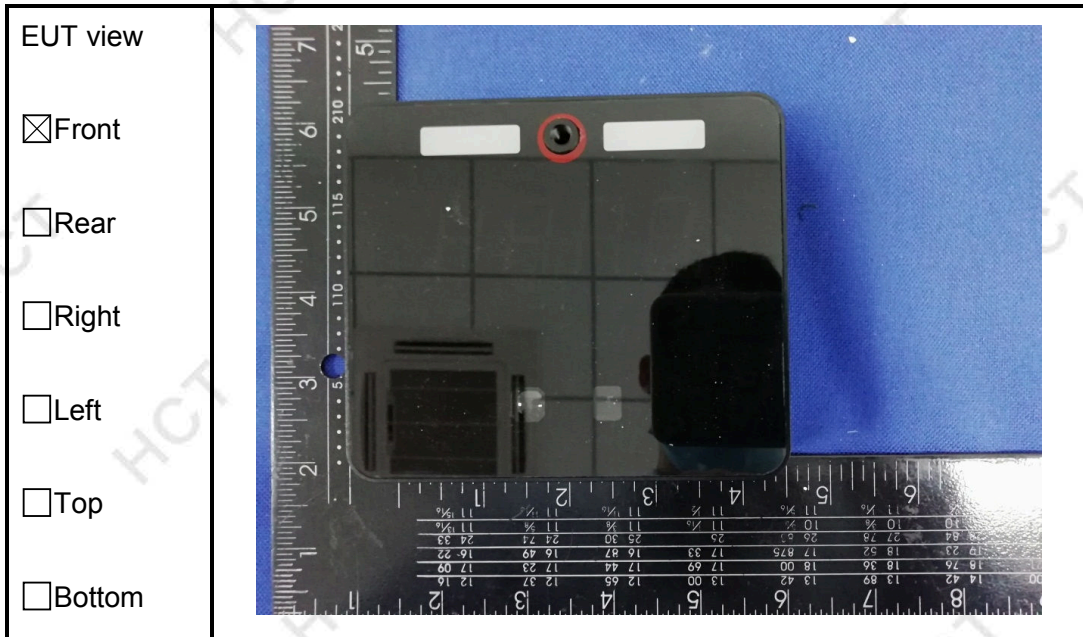
Site: Polarization: **Vertical**      Temperature:  
Limit: FCC PART 15 Class B Radiation(QP)      Power: AC120/60Hz      Humidity: %  
EUT: IR Thermometer  
M/N: IF-1  
Mode:  
Note:

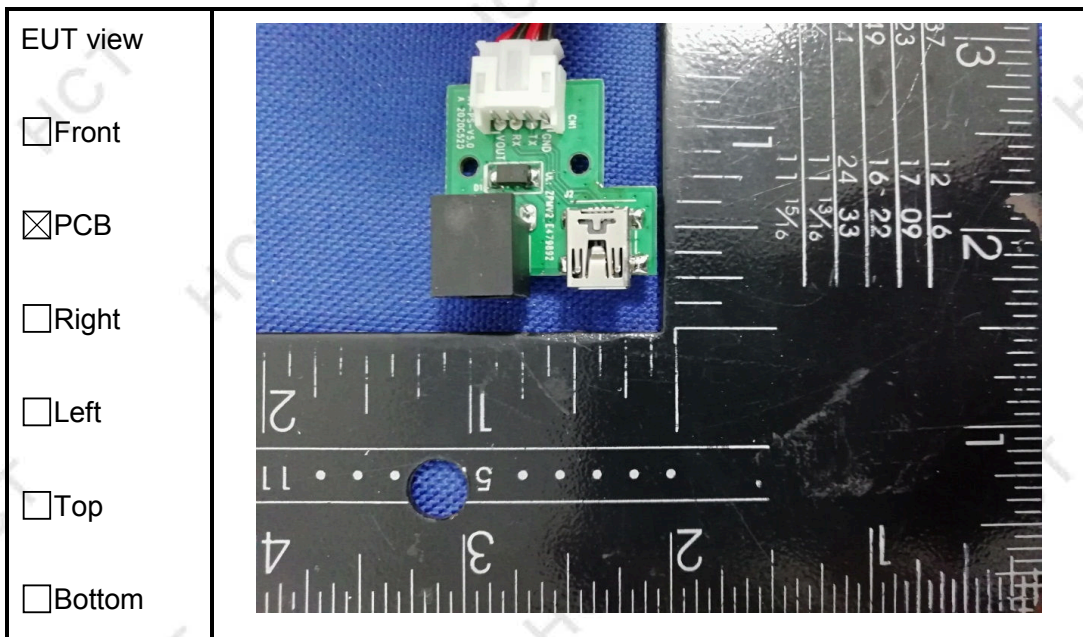
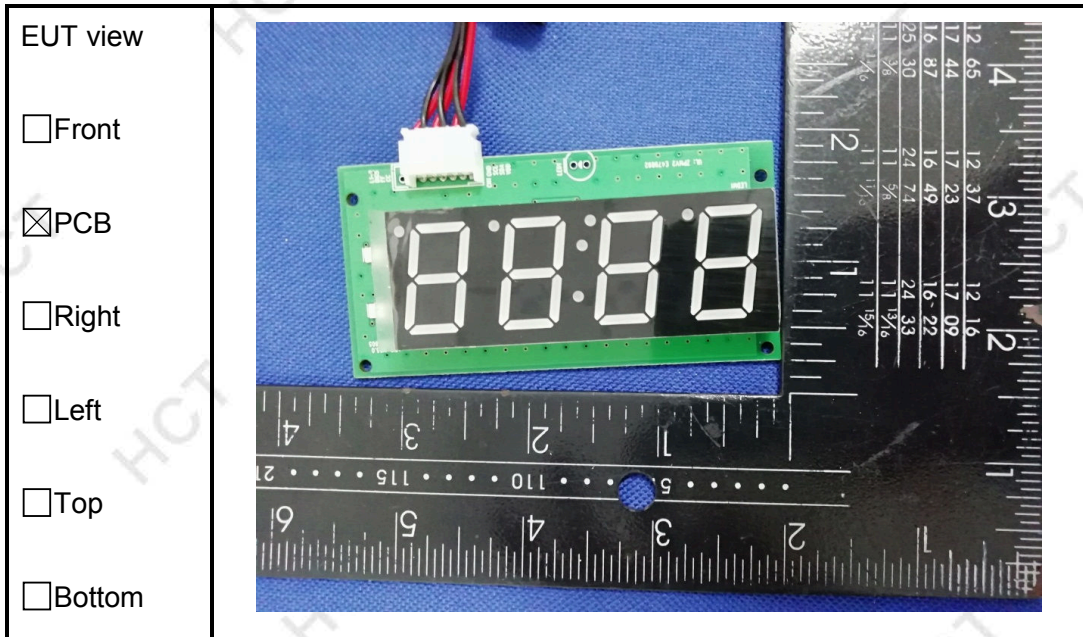
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1   | *   | 116.1321     | 42.50                    | -17.10                  | 25.40                    | 43.50         | -18.10       | QP       |         |
| 2   |     | 127.2178     | 41.66                    | -17.86                  | 23.80                    | 43.50         | -19.70       | QP       |         |
| 3   |     | 159.2251     | 42.27                    | -18.13                  | 24.14                    | 43.50         | -19.36       | QP       |         |
| 4   |     | 179.3864     | 39.25                    | -16.78                  | 22.47                    | 43.50         | -21.03       | QP       |         |
| 5   |     | 252.9482     | 40.31                    | -13.81                  | 26.50                    | 46.00         | -19.50       | QP       |         |
| 6   |     | 366.8231     | 31.87                    | -11.55                  | 20.32                    | 46.00         | -25.68       | QP       |         |

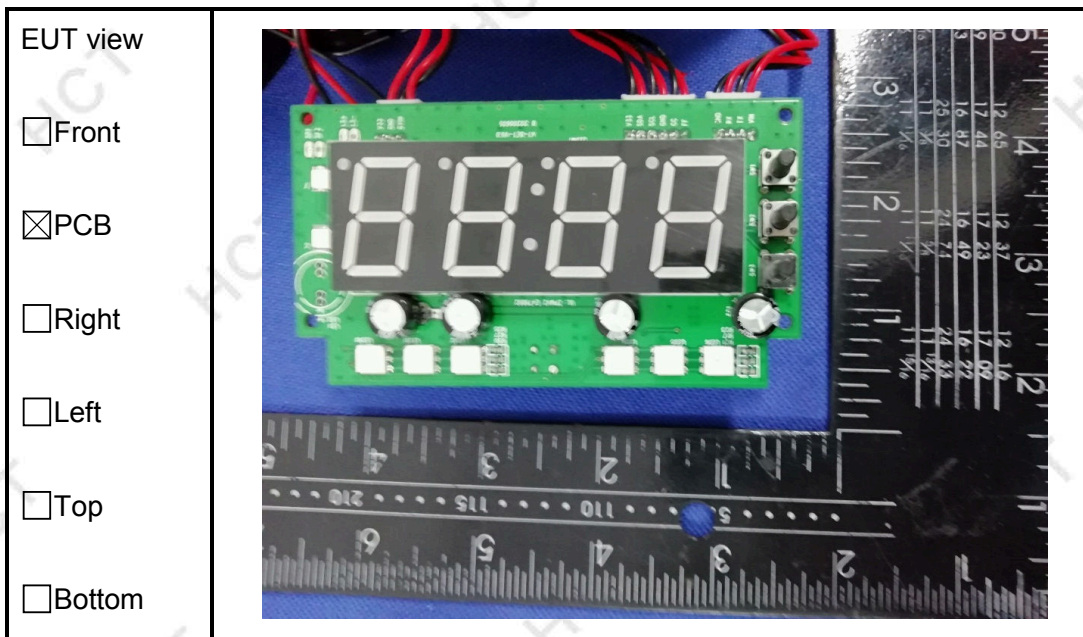
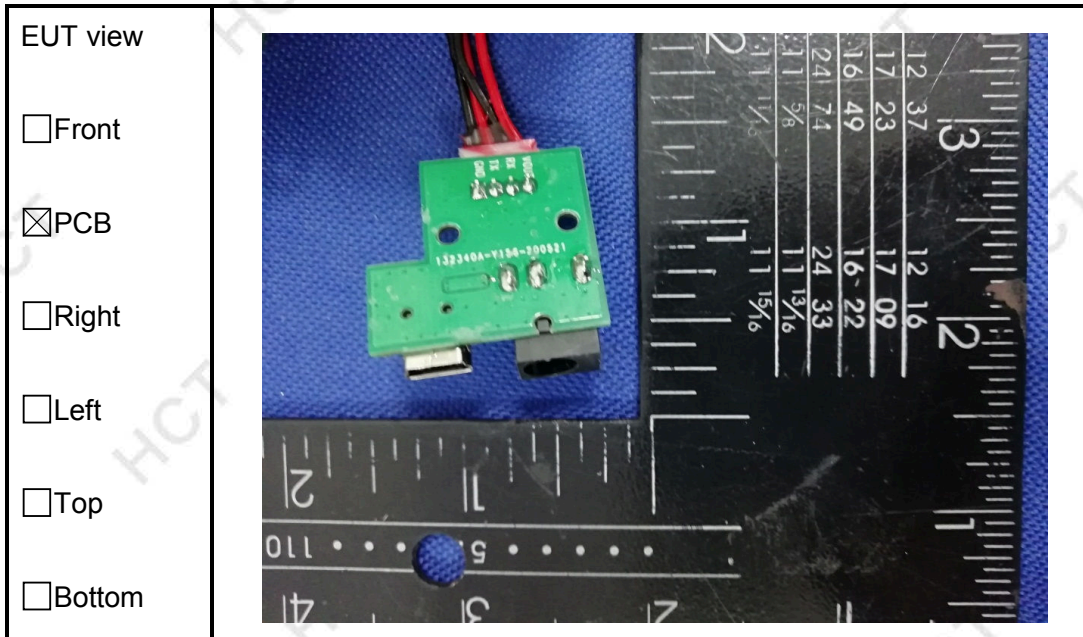
## APPENDIX A - EUT PHOTOGRAPHS

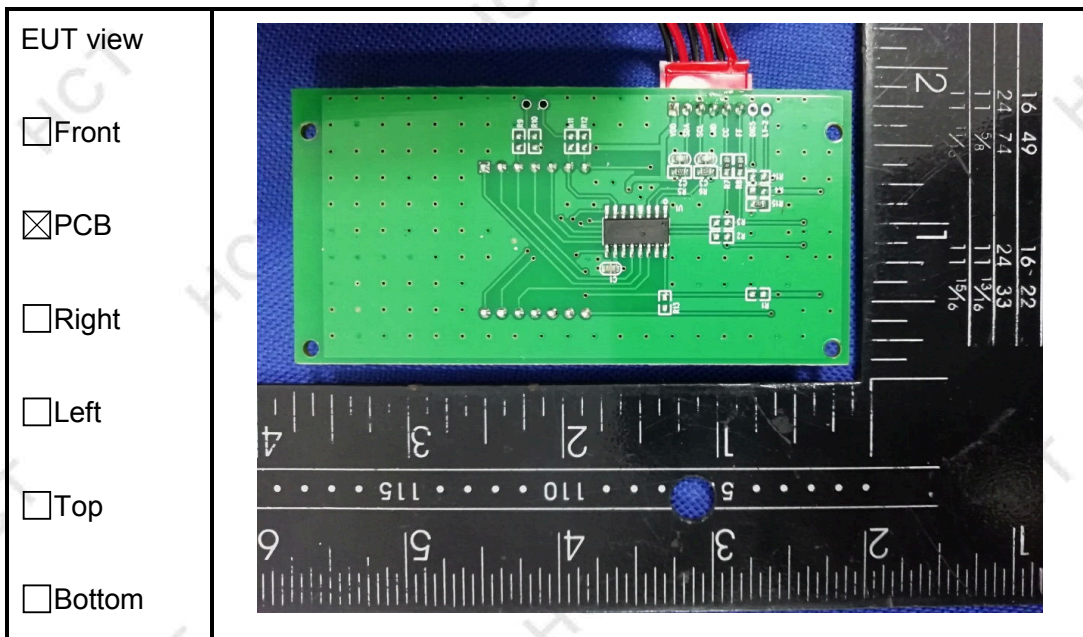
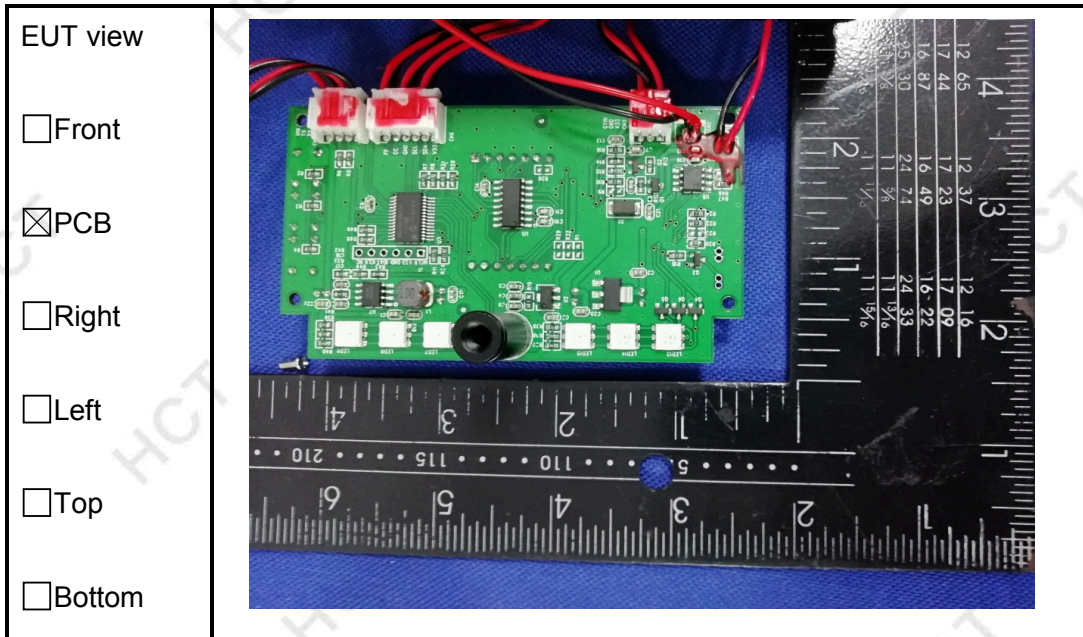


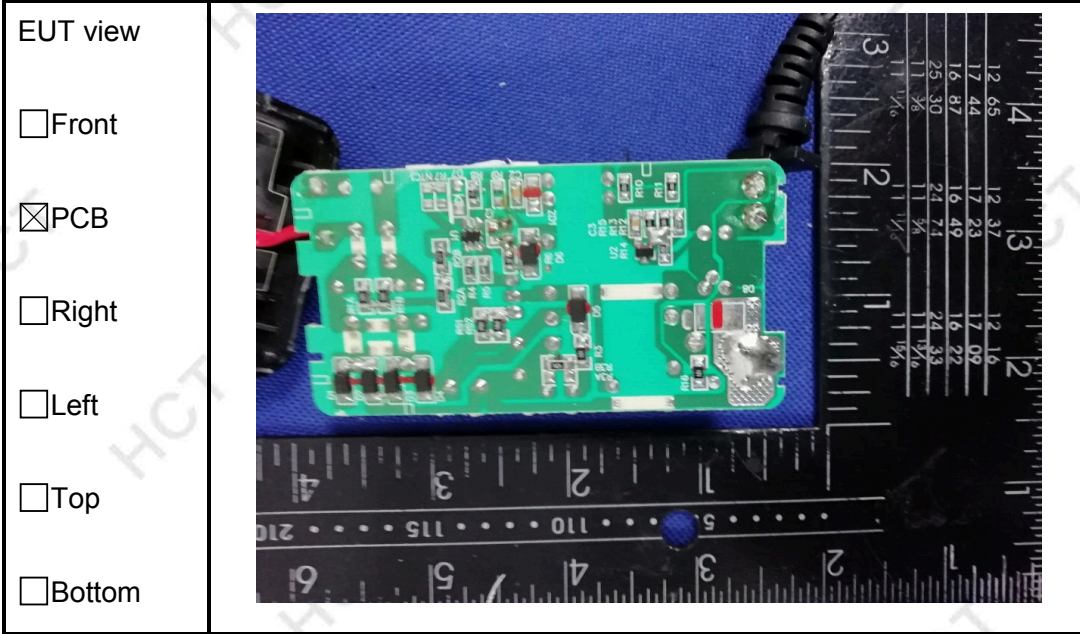












## APPENDIX B - TEST SETUP PHOTOGRAPHS

### Conducted Emission



### Radiated Disturbance of Below 1G

