# EMC Test Report

| | | |
|---|---|---|
| Client Name | : | Shen Zhen JHC Technology Development Co., LTD |
| Address | : | B, 3rd Fl, A Block Junxiangda Bldg., No.9 Zhongshanyuan Rd. West, Tongle Village, Nanshan District, Shenzhen City, China, 518052 |
| Product Name | : | Fanless In-Vehicle Computer |
| Date | : | Jan. 15, 2020 |

## Shenzhen Anbotek Compliance Laboratory Limited

# Contents

# TEST REPORT

| | | |
|---|---|---|
| Applicant | : | Shen Zhen JHC Technology Development Co., LTD |
| Manufacturer | : | Shen Zhen JHC Technology Development Co., LTD |
| Product Name | : | Fanless In-Vehicle Computer |
| Model No. | : | SIGM-2650/S002, SIGM-2650/S001, SIGM-2650/S003,SIGM-2650/S004, SIGM-2650/T001, SIGM-2650/T002, SIGM-2650/T003, SIGM-2650/T004 |
| Trade Mark | : | JHCTECH |
| Rating(s) | : | DC 48-110V, 1A |
| **Test Standard(s)** | **:** | **EN 50155: 2017; EN 50121-3-2: 2016; (IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-5; IEC 61000-4-6; IEC 61000-4-8)** |

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 50121-3-2 ande EN 50155 requirements.

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

Date of Receipt: Dec. 11, 2019

Date of Test: Dec. 11~19, 2019

Prepared By: Winnie Huang

(Engineer / Winnie Huang)

Reviewer: Well Wang

(Supervisor / Well Wang)

Approved & Authorized Signer: Tom Chen

(Manager / Tom Chen)

# 1. General Information

## 1.1. Client Information

| | | |
|---|---|---|
| Applicant | : | Shen Zhen JHC Technology Development Co., LTD |
| Address | : | B, 3rd Fl, A Block Junxiangda Bldg., No.9 Zhongshanyuan Rd. West, Tongle Village, Nanshan District, Shenzhen City, China, 518052 |
| Manufacturer | : | Shen Zhen JHC Technology Development Co., LTD |
| Address | : | B, 3rd Fl, A Block Junxiangda Bldg., No.9 Zhongshanyuan Rd. West, Tongle Village, Nanshan District, Shenzhen City, China, 518052 |
| Factory | : | Shen Zhen JHC Technology Development Co., LTD |
| Address | : | B, 3rd Fl, A Block Junxiangda Bldg., No.9 Zhongshanyuan Rd. West, Tongle Village, Nanshan District, Shenzhen City, China, 518052 |

## 1.2. Description of Device (EUT)

| | | | |
|---|---|---|---|
| Product Name | : | Fanless In-Vehicle Computer | |
| Model No. | : | SIGM-2650/S002, SIGM-2650/S001, SIGM-2650/S003,SIGM-2650/S004, SIGM-2650/T001, SIGM-2650/T002, SIGM-2650/T003, SIGM-2650/T004 (Note: All samples are the same except the model number & S series belongs to full function, T series simplifies interface, so we prepare "SIGM-2650-S002" for test only.) | |
| Trade Mark | : | JHCTECH | |
| Test Power Supply | : | DC 110V | |
| Test Sample No. | : | 1-1-1 | |
| Product Description | : | Adapter: | N/A |
| **Remark:** (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. | | | |

## 1.3. Auxiliary Equipment Used During Test

| | | |
|---|---|---|
| N/A | : | |


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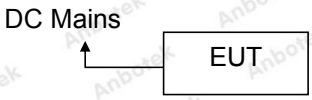
Hotline 400-003-0500 www.anbotek.com

## 1.4. Description of Test Mode

| Pretest Mode | Description |
|---|---|
| Mode 1 | ON |

For Mode 1 Block Diagram of Test Setup




## 1.5. Test Summary

| Test Items | Test Mode | Status |
|---|---|---|
| Power Line Conducted Emission Test (150KHz To 30MHz) | Mode 1 | P |
| Radiated Emission Test (30MHz To 6GHz) | Mode 1 | P |
| Electrostatic Discharge immunity Test | Mode 1 | P |
| RF Field Strength susceptibility Test | Mode 1 | P |
| Electrical Fast Transient/Burst Immunity Test | Mode 1 | P |
| Surge Immunity Test | Mode 1 | P |
| Injected Currents Susceptibility Test | Mode 1 | P |
| Magnetic Field Susceptibility Test | / | N |
| Voltage Dips and Interruptions Test | / | N |
| P) Indicates “PASS”.<br>N) Indicates “Not applicable”. | | |

## 1.6. Test Equipment List

Conducted Emission Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | L.I.S.N. Artificial Mains Network | Rohde & Schwarz | ENV216 | 100055 | Nov. 04, 2019 | 1 Year |
| 2. | L.I.S.N. Artificial Mains Network | Schwarzbeck | NSLK 8127 | 8127386 | Nov. 04, 2019 | 1 Year |
| 3. | EMI Test Receiver | Rohde & Schwarz | ESCI | 100627 | Nov. 04, 2019 | 1 Year |
| 4. | RF Switching Unit | Compliance Direction | RSU-M2 | 38303 | Nov. 04, 2019 | 1 Year |
| 5. | Software Name EZ-EMC | Ferrari Technology | ANB-03A | N/A | N/A | N/A |

Radiated Emission Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | EMI Test Receiver | Rohde & Schwarz | ESR26 | 101481 | Nov. 04, 2019 | 1 Year |
| 2. | Bilog Broadband Antenna | Schwarzbeck | VULB9163 | VULB 9163-289 | Nov. 01, 2019 | 1 Year |
| 3. | Pre-amplifier | SONOMA | 310N | 186860 | Nov. 04, 2019 | 1 Year |
| 4. | Software Name EZ-EMC | Ferrari Technology | ANB-03A | N/A | N/A | N/A |
| 5. | Preamplifier | SKET Electronic | BK1G18G30D | KD17503 | Nov. 04, 2019 | 1 Year |
| 6. | Double Ridged Horn Antenna | Instruments corporation | GTH-0118 | 351600 | Nov. 01, 2019 | 1 Year |

Electrostatic Discharge Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | ESD Simulators | 3Ctest | EDS-30T | ES0131505 | Nov. 06, 2019 | 1 Year |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R/S Immunity Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Signal Generator | Agilent | N5182A | MY48180656 | Nov. 04, 2019 | 1 Year |
| 2 | Amplifier | Micotoop | MPA-80-1000-250 | MPA1903096 | N/A | N/A |
| 3 | Amplifier | Micotoop | MPA-1000-6000-100 | MPA1903122 | N/A | N/A |
| 4 | Log-Periodic Antenna | Schwarzbeck | VULP9118E | 00992 | Aug. 17, 2018 | 3 Year |
| 5 | Horn Antenna | Instruments corporation | GTH-0118 | 351600 | Nov. 01, 2019 | 1 Year |
| 6 | Power Sensor | Agilent | E9301A | MY41498906 | Nov. 04, 2019 | 1 Year |
| 7 | Power Sensor | Agilent | E9301A | MY41498088 | Nov. 04, 2019 | 1 Year |
| 8 | Power Meter | Agilent | E4419B | GB40202909 | Nov. 04, 2019 | 1 Year |
| 9 | Field Probe | ETS-Lindgren | HI-6006 | 00212747 | Apr. 20, 2017 | 3 Year |
| 10 | software | EMtrace | EM 3 | N/A | N/A | N/A |

Electrical Fast Transient/Burst Immunity Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1.1 | EFT Burst Simulator | PRIMA | EFT61004B | PR10114282 | Nov. 04, 2019 | 1 Year |
| 1.2 | EFT-Clamp | PRIMA | EFT-Clamp | / | Nov. 04, 2019 | 1 Year |
| 2.1 | EFT Burst Simulator | TESEQ | NSG 3060 | 1480 | Nov. 04, 2019 | 1 Year |
| 2.2 | CDN | TESEQ | CDN 3061 | 1408 | Nov. 04, 2019 | 1 Year |

Surge Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Surge Generator | TESEQ | NSG 3060 | 1480 | Nov. 04, 2019 | 1 Year |
| 2. | CDN | TESEQ | CDN 3061 | 1408 | Nov. 04, 2019 | 1 Year |
| 3. | Telecom port surge generator | PMI | TW101 | 190411 | Apr.17,2019 | 1 Year |

Injected Currents Susceptibility Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | C/S Conducted Immunity Test System | FRANKONIA | CIT-10 | 126A1196/2012 | Nov. 04, 2019 | 1 Year |
| 2. | CDN | FRANKONIA | CDN - M2+ M3 | A2210178/2012 | Nov. 04, 2019 | 1 Year |
| 3. | 6dB Attenuator | FRANKONIA | DAM 26W | 1172202 | Nov. 04, 2019 | 1 Year |
| 4. | CIT-10 | FRANKONIA | Version1.1.7 | N/A | N.A | N/A |
| 5. | EM-Clamp | FRANKONIA | EMCL-20 | 18101728-0103 | May.19,2019 | 1 Year |

## 1.7. Description of Test Facility

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

**FCC-Registration No.: 184111**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, September 27, 2019.

**ISED-Registration No.: 8058A-1**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

**Test Location**

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

## 1.8. EMS Performance Criteria

√ A: Normal performance within the specification limits
√ B: Temporary degradation or loss of function or performance which is self-recoverable
√ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
√ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

# 2. Power Line Conducted Emission Test

## 2.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | EN 50155 (EN 50121-3-2) |

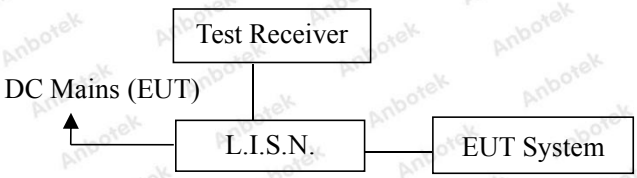
Limits for conducted emissions

| Test Limit | Frequency (MHz) | At mains terminals (dBμV) |
|---|---|---|
| | | Quasi-peak Level |
| | 0.15 ~ 0.50 | 99 |
| | 0.50 ~ 30.00 | 93 |

**Remark:** (1) The lower limit shall apply at the transition frequencies.

(2) This requirement refers to the industrial limit values but considering they have been defined to protect radio and TV sets and as the objective is not the same here, the applicable limit for railway applications have been relaxed by 20 dB to be more representative of potential problems. This product may cause radio interference in which

## 2.2. Test Setup




## 2.3. EUT Configuration on Measurement

The following equipments are installed on conducted emission measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 2.4. Operating Condition of EUT

2.4.1. Setup the EUT as shown in Section 2.2.

2.4.2. Turn on the power of all equipments.

2.4.3. Let the EUT work in test mode and measure it.

## 2.5. Test Procedure

The EUT is put on the plane 0.8 m high above the ground by insulating support and connected to the DC mains through Line Impedance Stability Network(L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of DC line are investigated to find out the maximum conducted emission according to the EN 50121-3-2 regulations during conducted emission measurement.

The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 9kHz in 150kHz~30MHz.

The frequency range from 150kHz to 30MHz is investigated for DC mains.

All the test results are listed in Section 2.6.

## 2.6. Test Results

**PASS**

The test curves are shown in the following pages.

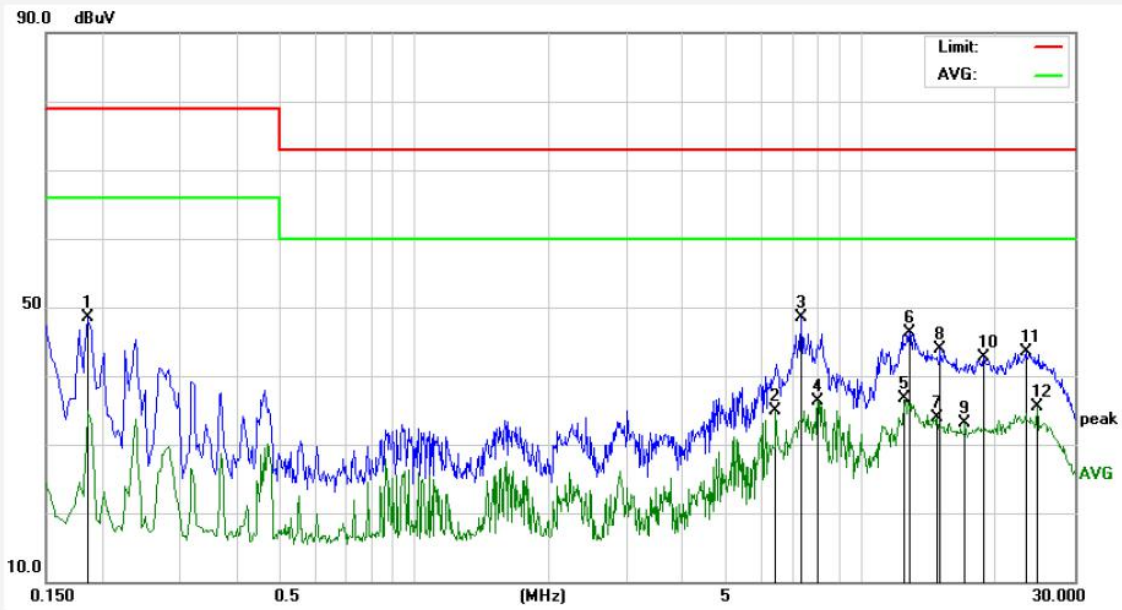
## Conducted Emission Test Data

Test Site: 1# Shielded Room

Test Specification: DC 110V

Comment: Positive

Temp.: 24.6℃ Hum.: 48%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1859 | 28.68 | 19.90 | 48.58 | 79.00 | -30.42 | QP | |
| 2 | 6.4419 | 14.67 | 20.24 | 34.91 | 60.00 | -25.09 | AVG | |
| 3 | 7.3498 | 28.15 | 20.27 | 48.42 | 73.00 | -24.58 | QP | |
| 4 | 8.0017 | 15.99 | 20.29 | 36.28 | 60.00 | -23.72 | AVG | |
| 5 | 12.5616 | 16.32 | 20.30 | 36.62 | 60.00 | -23.38 | AVG | |
| 6 | 12.8459 | 26.02 | 20.29 | 46.31 | 73.00 | -26.69 | QP | |
| 7 | 14.7698 | 13.57 | 20.26 | 33.83 | 60.00 | -26.17 | AVG | |
| 8 | 15.0099 | 23.57 | 20.26 | 43.83 | 73.00 | -29.17 | QP | |
| 9 | 17.0699 | 12.72 | 20.29 | 33.01 | 60.00 | -26.99 | AVG | |
| 10 | 18.7819 | 22.37 | 20.32 | 42.69 | 73.00 | -30.31 | QP | |
| 11 | 23.2978 | 23.28 | 20.30 | 43.58 | 73.00 | -29.42 | QP | |
| 12 | 24.6858 | 15.15 | 20.28 | 35.43 | 60.00 | -24.57 | AVG | |

**Note: Result=Reading+Factor Over Limit=Result-Limit**

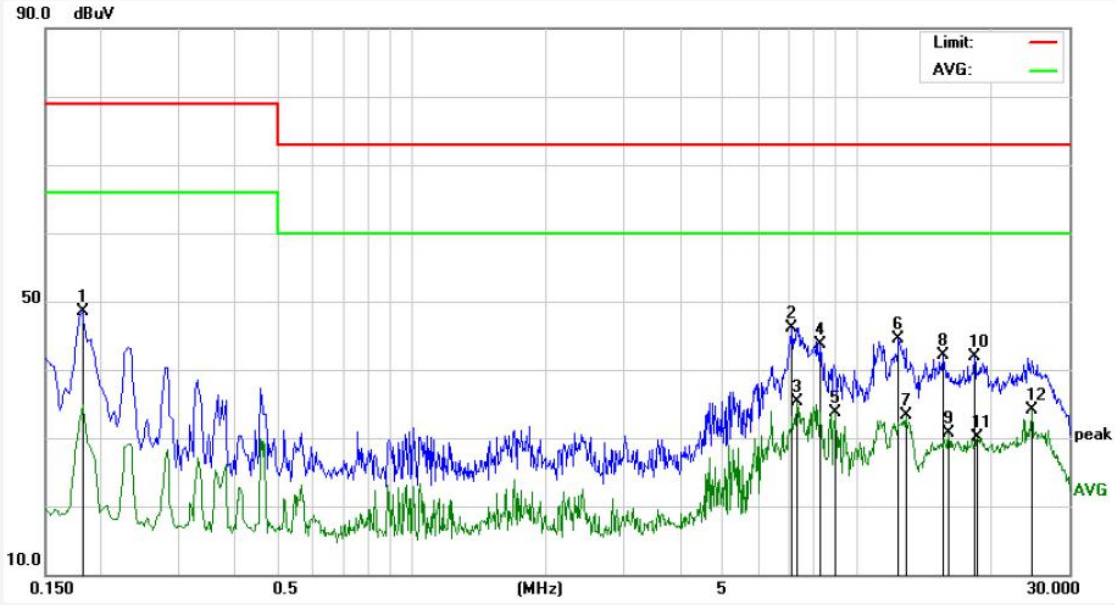
## Conducted Emission Test Data

Test Site: 1# Shielded Room

Test Specification: DC 110V

Comment: Negative

Temp.: 24.6℃ Hum.: 48%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1819 | 28.69 | 19.90 | 48.59 | 79.00 | -30.41 | QP | |
| 2 | 7.1740 | 25.78 | 20.26 | 46.04 | 73.00 | -26.96 | QP | |
| 3 | 7.3498 | 14.94 | 20.27 | 35.21 | 60.00 | -24.79 | AVG | |
| 4 | 8.2380 | 23.44 | 20.29 | 43.73 | 73.00 | -29.27 | QP | |
| 5 | 8.9496 | 13.44 | 20.31 | 33.75 | 60.00 | -26.25 | AVG | |
| 6 | 12.4300 | 24.28 | 20.30 | 44.58 | 73.00 | -28.42 | QP | |
| 7 | 12.8619 | 13.00 | 20.29 | 33.29 | 60.00 | -26.71 | AVG | |
| 8 | 15.5860 | 21.87 | 20.27 | 42.14 | 73.00 | -30.86 | QP | |
| 9 | 16.1259 | 10.46 | 20.28 | 30.74 | 60.00 | -29.26 | AVG | |
| 10 | 18.3580 | 21.61 | 20.31 | 41.92 | 73.00 | -31.08 | QP | |
| 11 | 18.6339 | 9.74 | 20.32 | 30.06 | 60.00 | -29.94 | AVG | |
| 12 | 24.7099 | 13.90 | 20.28 | 34.18 | 60.00 | -25.82 | AVG | |

**Note: Result=Reading+Factor Over Limit=Result-Limit**

# 3. Radiated Emission Test

## 3.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | EN 50155 (EN 50121-3-2) |

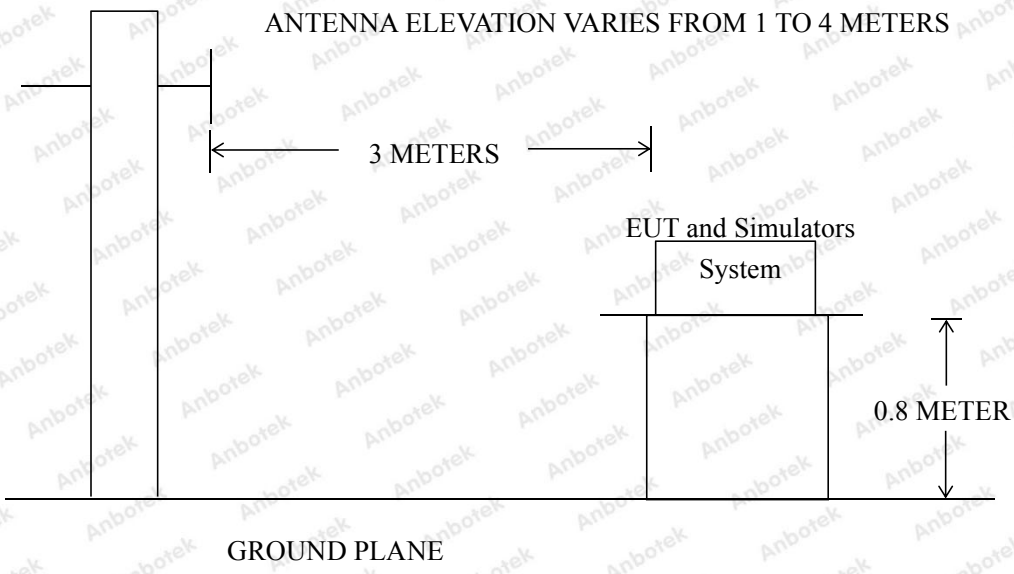
Radiated Emission Test Limit

| 30~1000MHz | | | |
|---|---|---|---|
| Test Limit | Frequency (MHz) | DISTANCE (Meters) | FIELD STRENGTHS LIMIT (dBμV/m) |
| | 30 ~ 230 | 3 | 50 |
| | 230 ~ 1000 | 3 | 57 |

| 1~6GHz | | | | |
|---|---|---|---|---|
| Test Limit | Frequency (GHz) | DISTANCE (Meters) | FIELD STRENGTHS LIMIT | |
| | | | Average (dBμV/m) | Peak (dBμV/m) |
| | 1 ~ 3 | 3 | 56 | 76 |
| | 3 ~ 6 | 3 | 60 | 80 |

**Remark:** (1)The smaller limit shall apply at the combination point between two frequency bands.
(2) Distance r efers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.
(3) 3M Limit=10M Limit+k k=20log(D1/D2)=10
3M Limit=10M Limit +10
(D1= 10M D2=3M)

## 3.2. Test Setup



### 3.3. EUT Configuration on Measurement

The EN 50155 regulations test method must be used to find the maximum emission during radiated emission measurement.

### 3.4. Operating Condition of EUT

3.4.1. Setup the EUT as shown in Section 3.2.

3.4.2. Turn on the power of all equipments.

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

### 3.5. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 10 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in 9*6*6 Chamber.

The test results are listed in Section 3.6.

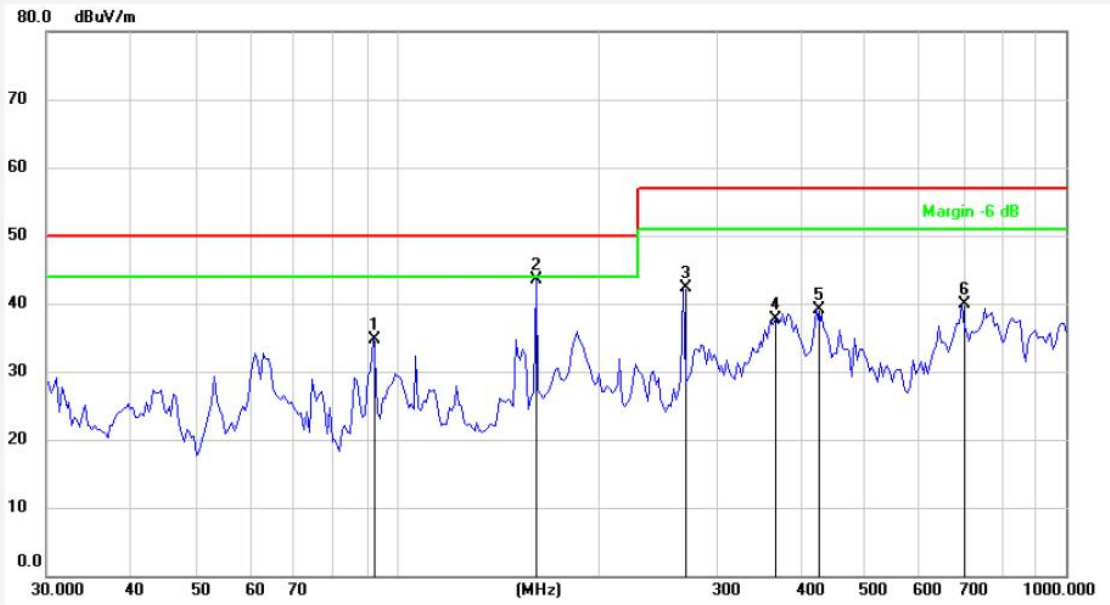
### 3.6. Test Results

**PASS**

The frequency range from 30MHz to 1000MHz is investigated.

The test curves are shown in the following pages.

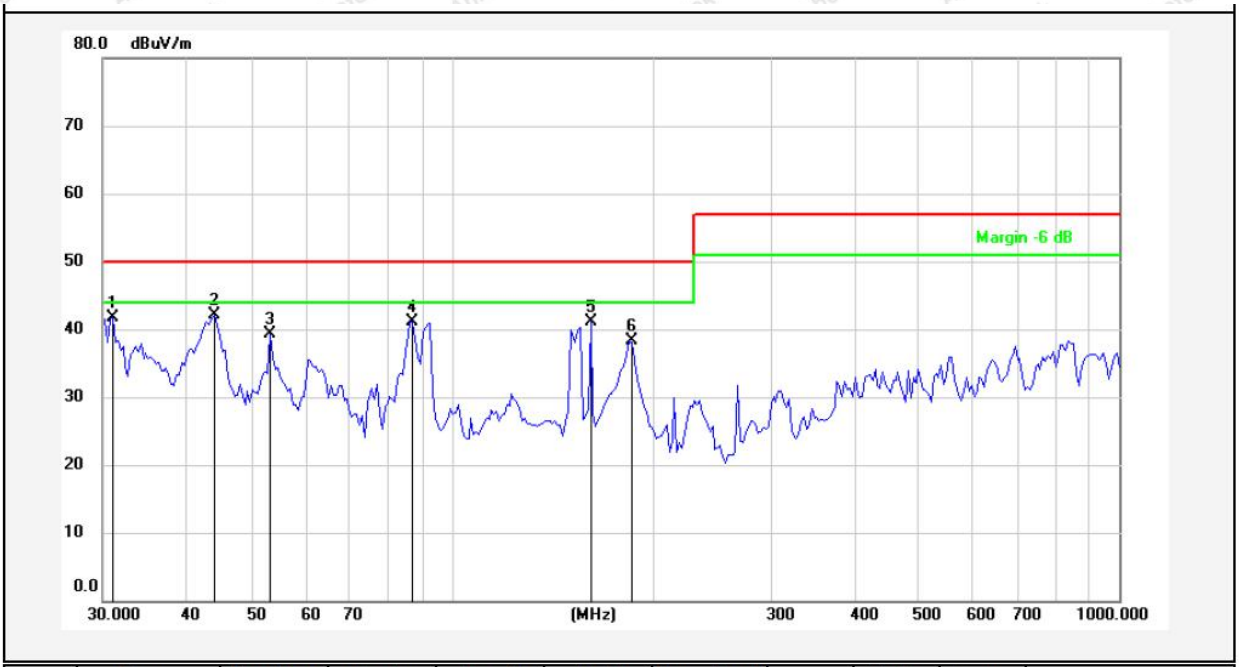
| | | | |
|---|---|---|---|
| **Test item:** | **Radiation Test** | **Polarization:** | **Horizontal** |
| **Standard:** | **(RE)EN 50121-3-2_Class A_30~1000MHz** | **Power Source:** | **DC 110V** |
| **Distance:** | **3m** | **Temp.(℃)/Hum.(%RH):** | **22.6( ℃)/57%RH** |




| No. | Freq. (MHz) | Reading (dBuV) | Factor () | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 92.1388 | 57.83 | -23.18 | 34.65 | 50.00 | -15.35 | peak | | | |
| 2 | 161.4738 | 67.22 | -23.70 | 43.52 | 50.00 | -6.48 | peak | | | |
| 3 | 268.4853 | 63.29 | -20.91 | 42.38 | 57.00 | -14.62 | peak | | | |
| 4 | 368.1116 | 54.15 | -16.37 | 37.78 | 57.00 | -19.22 | peak | | | |
| 5 | 423.5403 | 54.54 | -15.48 | 39.06 | 57.00 | -17.94 | peak | | | |
| 6 | 698.0796 | 51.28 | -11.45 | 39.83 | 57.00 | -17.17 | peak | | | |

**Note:** **Result=Reading+Factor Over Limit=Result-Limit**

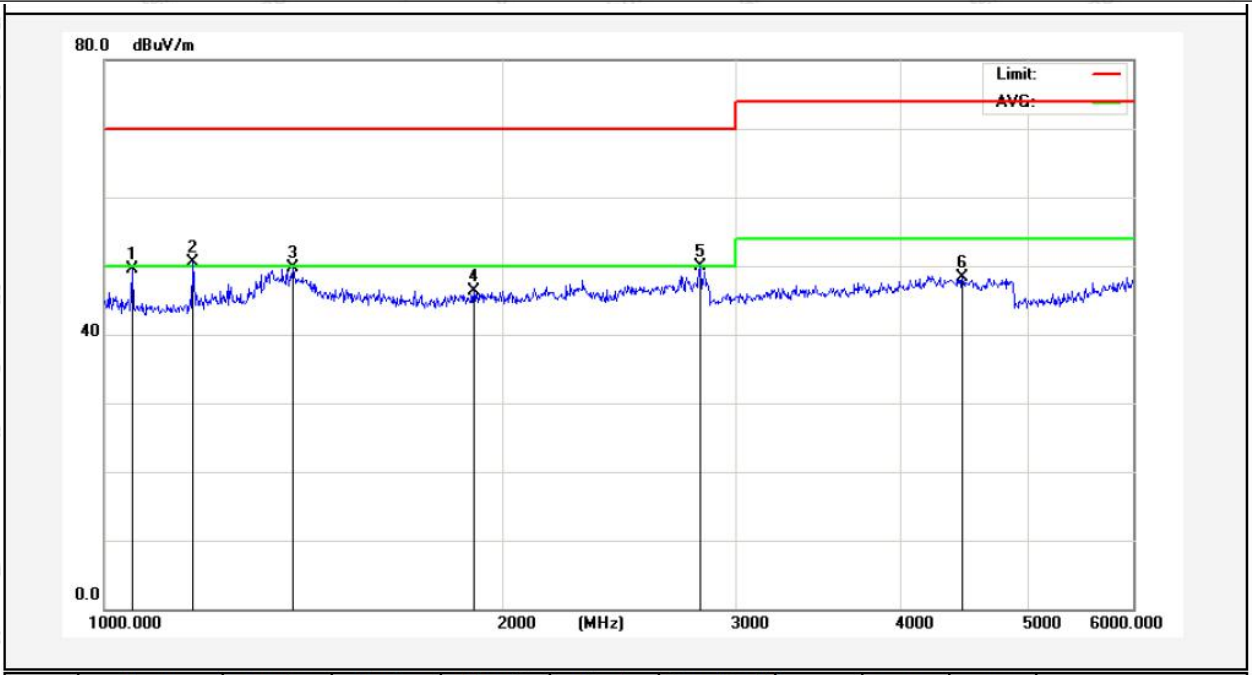
| | | | |
|---|---|---|---|
| **Test item:** | **Radiation Test** | **Polarization:** | **Vertical** |
| **Standard:** | **(RE)EN 50121-3-2_Class A_30~1000MHz** | **Power Source:** | **DC 110V** |
| **Distance:** | **3m** | **Temp.(℃)/Hum.(%RH):** | **22.6( ℃)/57%RH** |




| No. | Freq. (MHz) | Reading (dBuV) | Factor () | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31.0701 | 58.48 | -16.82 | 41.66 | 50.00 | -8.34 | peak | | | |
| 2 | 44.1200 | 57.65 | -15.60 | 42.05 | 50.00 | -7.95 | peak | | | |
| 3 | 53.5052 | 55.43 | -16.06 | 39.37 | 50.00 | -10.63 | peak | | | |
| 4 | 87.4175 | 59.45 | -18.34 | 41.11 | 50.00 | -8.89 | peak | | | |
| 5 | 161.4738 | 60.97 | -19.85 | 41.12 | 50.00 | -8.88 | peak | | | |
| 6 | 184.1667 | 56.68 | -18.40 | 38.28 | 50.00 | -11.72 | peak | | | |

**Note: Result=Reading+Factor Over Limit=Result-Limit**

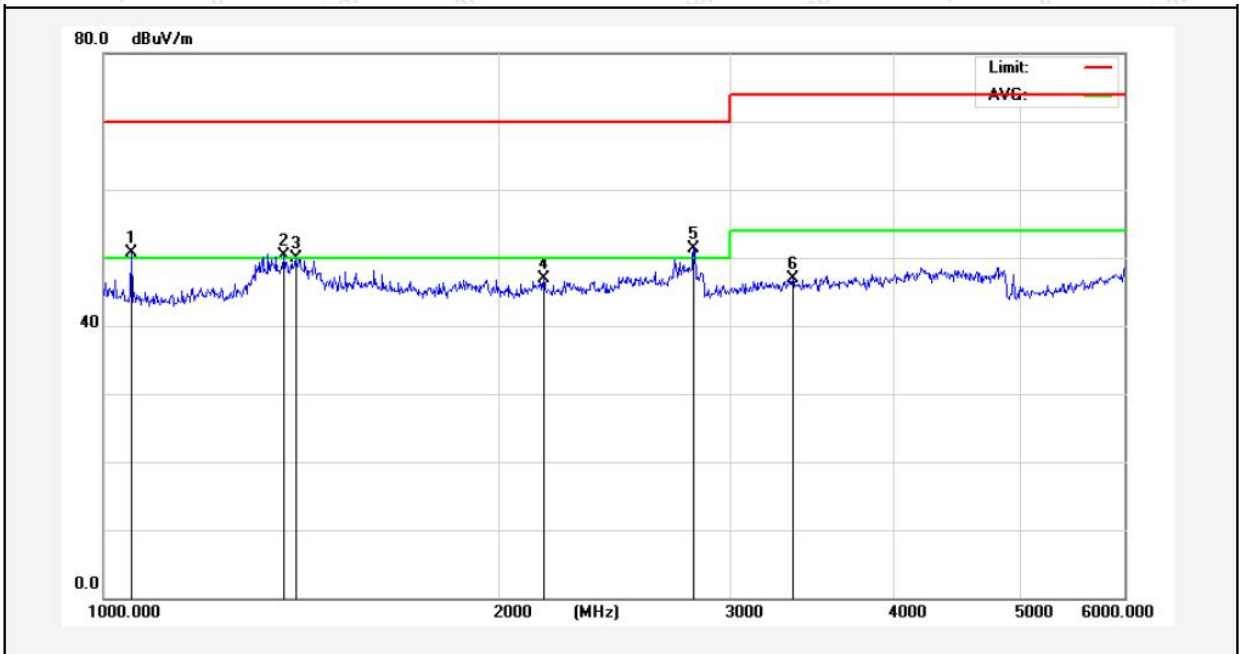
| | | | |
|---|---|---|---|
| **Test item:** | **Radiation Test** | **Polarization:** | **Horizontal** |
| **Standard:** | **(RE)EN 50121-3-2_Class A_1-6GHz** | **Power Source:** | **DC 110V** |
| **Distance:** | **3m** | **Temp.(℃)/Hum.(%RH):** | **23( ℃)/54%RH** |




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1049.567 | 47.56 | 2.02 | 49.58 | 70.00 | -20.42 | peak | | | |
| 2 | 1166.597 | 48.17 | 2.34 | 50.51 | 70.00 | -19.49 | peak | | | |
| 3 | 1388.039 | 46.67 | 2.95 | 49.62 | 70.00 | -20.38 | peak | | | |
| 4 | 1902.639 | 39.07 | 7.15 | 46.22 | 70.00 | -23.78 | peak | | | |
| 5 | 2821.952 | 39.45 | 10.43 | 49.88 | 70.00 | -20.12 | peak | | | |
| 6 | 4456.338 | 33.71 | 14.62 | 48.33 | 74.00 | -25.67 | peak | | | |

**Note:** **Result=Reading+Factor Over Limit=Result-Limit**

| | | | |
|---|---|---|---|
| **Test item:** | **Radiation Test** | **Polarization:** | **Vertical** |
| **Standard:** | **(RE)EN 50121-3-2_Class A_1-6GHz** | **Power Source:** | **DC 110V** |
| **Distance:** | **3m** | **Temp.(℃)/Hum.(%RH):** | **23( ℃)/54%RH** |




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1049.567 | 48.72 | 2.02 | 50.74 | 70.00 | -19.26 | peak | | | |
| 2 | 1370.738 | 47.39 | 2.91 | 50.30 | 70.00 | -19.70 | peak | | | |
| 3 | 1403.042 | 46.93 | 3.00 | 49.93 | 70.00 | -20.07 | peak | | | |
| 4 | 2164.628 | 38.38 | 8.52 | 46.90 | 70.00 | -23.10 | peak | | | |
| 5 | 2816.900 | 40.81 | 10.41 | 51.22 | 70.00 | -18.78 | peak | | | |
| 6 | 3351.599 | 34.98 | 11.88 | 46.86 | 74.00 | -27.14 | peak | | | |

**Note: Result=Reading+Factor Over Limit=Result-Limit**

# 4. Electrostatic Discharge Immunity Test

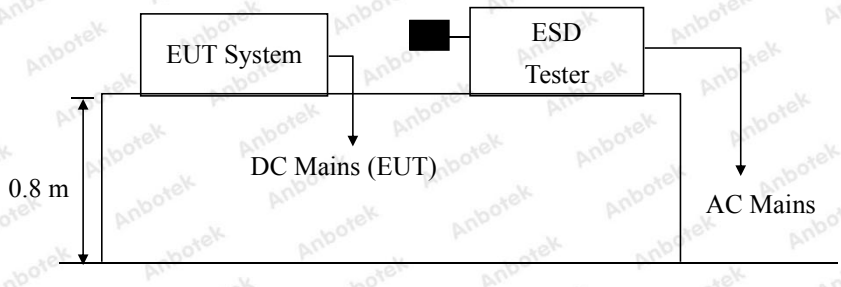
## 4.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN 50155 (IEC 61000-4-2) |
| Performance Criterion: | B |
| Severity Level: 3 / Air Discharge: ±8kV, Level: 3 / Contact Discharge: ±6kV | |

Test Level

| Level | Test Voltage Contact Discharge (kV) | Test Voltage Air Discharge (kV) |
|---|---|---|
| 1. | ±2 | ±2 |
| 2. | ±4 | ±4 |
| 3. | ±6 | ±8 |
| 4. | ±8 | ±15 |
| X. | Special | Special |

## 4.2. Test Setup




## 4.3. EUT Configuration on Measurement

The following equipments are installed on electrostatic discharge immunity measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 4.4. Operating Condition of EUT

4.4.1. Setup the EUT as shown on Section 4.2.

4.4.2. Turn on the power of all equipments.

4.4.3. After that, let the EUT work in test mode measure it.

## 4.5. Test Procedure

### 4.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

### 4.5.2. Contact Discharge:

All the procedure shall be same as Section 4.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 4.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

### 4.5.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

## 4.6. Test Results

**PASS**

Please refer to the following page.

# Electrostatic Discharge Test Results

| | | | |
|---|---|---|---|
| Air discharge : | ±8.0kV | Temperature : | 25℃ |
| Contact discharge : | ±6.0kV | Humidity : | 54% |
| Power Supply : | DC 110V | Criterion required : | B |
| Number of discharge : | 10 | Test Result: | ☒ Pass ☐ Fail |

| **Location** | | **Kind**<br>A-Air Discharge<br>C-Contact Discharge | **Result** |
|---|---|---|---|
| Slot of the EUT | 10 points | A | ☑ A ☐ B<br>☐ C ☐ D |
| Others | 8 points | A | ☑ A ☐ B<br>☐ C ☐ D |
| HCP | 4 points | C | ☑ A ☐ B<br>☐ C ☐ D |
| VCP of the front | 4 points | C | ☑ A ☐ B<br>☐ C ☐ D |
| VCP of the rear | 4 points | C | ☑ A ☐ B<br>☐ C ☐ D |
| VCP of the left | 4 points | C | ☑ A ☐ B<br>☐ C ☐ D |
| VCP of the right | 4 points | C | ☑ A ☐ B<br>☐ C ☐ D |
| | | | |
| | | | |

**Remark:** Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

# 5. RF Field Strength Susceptibility Test

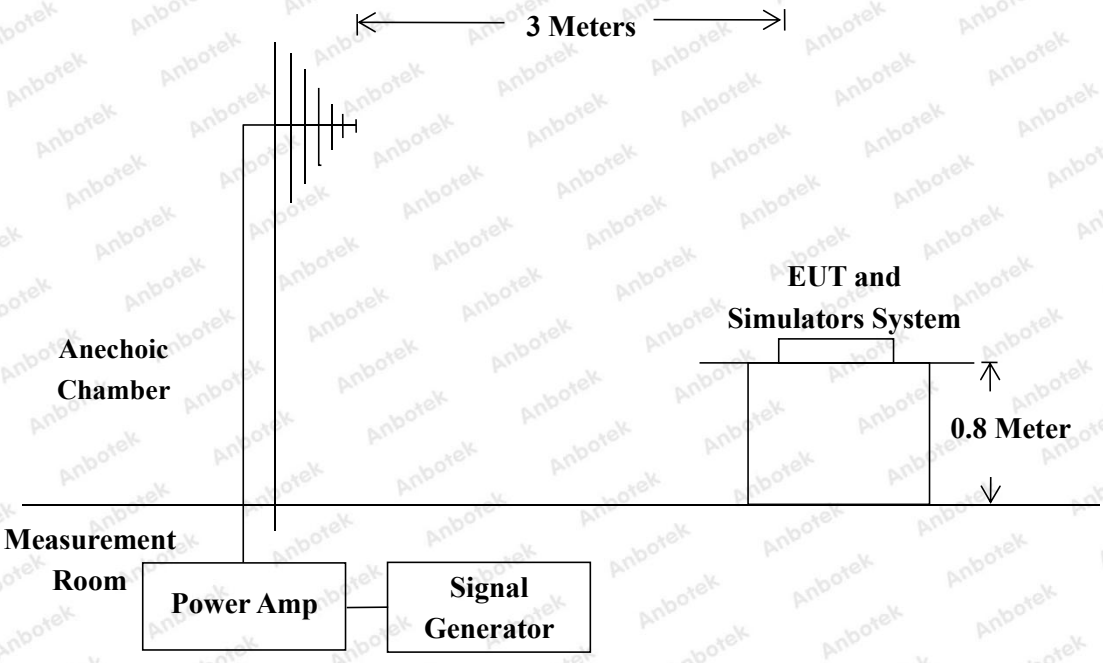
## 5.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN 50155 (IEC 61000-4-3) |
| Required Performance: | A |
| Frequency Range: | 80MHz to 1000MHz/ 1.4 to 2.0 GHz/ 2.0 to 2.7 GHz/ 5.1 to 6.0 GHz |
| Field Strength: | 10V/m & 10V/m & 5V/m & 3V/m |
| Modulation: | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step: | 1 % of preceding frequency value |
| Polarity of Antenna: | Horizontal and Vertical |
| Test Distance: | 3 m |
| Antenna Height: | 1.5 m |
| Dwell Time: | at least 0.5s |

Test Level

| Level | Field Strength V/m |
|---|---|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| X. | Special |

## 5.2. Test Setup



### 5.3. EUT Configuration on Measurement

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 5.4. Operating Condition of EUT

5.4.1. Setup the EUT as shown on Section 5.2.

5.4.2. Turn on the power of all equipments.

5.4.3. After that, let the EUT work in test mode measure it.

### 5.5. Test Procedure

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters.

1) 80 MHz to 1000 MHz the field strength level was 10V/m, 1.4 GHz to 2.0 GHz the field strength level was 10V/m, 2.0 GHz to 2.7 GHz the field strength level was 5V/m, 5.1 GHz to 6.0 GHz the field strength level was 3V/m.

2) The frequency range is swept from 80 MHz to 1000 MHz, 1.4 GHz to 2.0 GHz, 2.0 GHz to 2.7 GHz, 5.1 GHz to 6.0 GHz with the signal 80% amplitude modulated with a 1kHz sine wave.

3) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.

4) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 5.6. Measuring Results

**PASS**

Please refer to the following page.

# RF Field Strength Susceptibility Test Results

| | | | |
|---|---|---|---|
| Field Strength : | 20V/m | Temperature : | 25℃ |
| Criterion required : | A | Humidity : | 54% |
| Power Supply : | DC 110V | Test Result : | ☒ Pass ☐ Fail |
| Dwell Time: | 1s | | |

| Frequency Range | Antenna Polarity | R.F. Field Strength | Azimuth | Result |
|---|---|---|---|---|
| 80MHz~1000MHz | H / V | 10 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |
| 1.4GHz~2.0GHz | H / V | 10 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |
| 2.0GHz~2.7GHz | H / V | 5 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |
| 5.1GHz~6.0GHz | H / V | 3 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |

# 6. Electrical Fast Transient/Burst Immunity Test

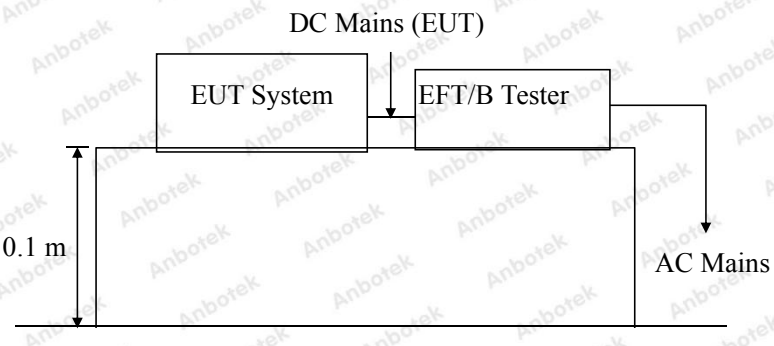
## 6.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN 50155 (IEC 61000-4-4) |
| Performance criterion: | A |
| DC Main: Severity Level 3: 2.00kV | |

Test Level

| Open Circuit Output Test Voltage ± 10% | | |
|---|---|---|
| Level | On Power Supply Lines | On I/O (Input/Output) Signal data and control lines |
| 1. | 0.50 kV | 0.25 kV |
| 2. | 1.00 kV | 0.50 kV |
| 3. | 2.00 kV | 1.00 kV |
| 4. | 4.00 kV | 2.00 kV |
| X. | Special | Special |

## 6.2. Test Setup




## 6.3. EUT Configuration on Measurement

The following equipments are installed on electrical fast transient/burst immunity measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 6.4. Operating Condition of EUT

6.4.1. Setup the EUT as shown in Section 6.2.

6.4.2. Turn on the power of all equipments.

6.4.3. Let the EUT work in test mode and measure it.

## 6.5. Test Procedure

The EUT is put on the table which is 0.1 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

### 6.5.1. For input and output DC power ports:

The EUT is connected to the Power mains by using a coupling device which couples the EFT interference signal to DC Power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

### 6.5.2. For signal lines and control lines ports:

Select tests based on product characteristics.

### 6.5.3. For DC output line ports:

Select tests based on product characteristics.

## 6.6. Test Results

**PASS**

Please refer to the following page.

# Electrical Fast Transient/Burst Test Results

| | | | |
|---|---|---|---|
| Ambient Condition : 24℃ / 55% RH | | Criterion required : A | |
| Power Supply .: DC 110V | | Test Result : ☒ Pass ☐ Fail | |
| | | | |
| Inject Line : DC Mains | Inject Method: Direct | Inject Time(s): 120 | |
| Line | Polarity | Test Voltage (kV) | Result |
| AC Line | | | |
| DC Line | ± | 2.00kV | ☑ A ☐ B ☐ C ☐ D |
| Signal Line | | | |
| | | | |

# 7. Surge Immunity Test

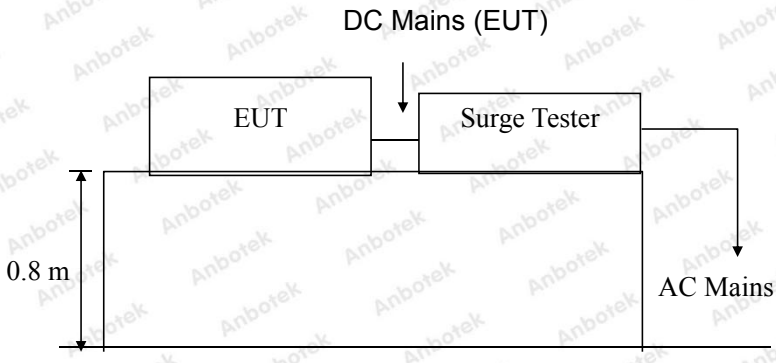
## 7.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN 50155 (IEC 61000-4-5) |
| Performance criterion: | B |
| Severity Level 2, Line to Line: 1.0kV; Severity Level 3, Line to Earth: 2.0kV | |

Test Level

| Severity Level | Open-Circuit Test Voltage (kV) |
|---|---|
| 1. | 0.5 |
| 2. | 1.0 |
| 3. | 2.0 |
| 4. | 4.0 |
| X. | Special |

## 7.2. Test Setup




## 7.3. EUT Configuration on Measurement

The following equipments are installed on surge immunity measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 7.4. Operating Condition of EUT

7.4.1. Setup the EUT as shown in Section 7.2.

7.4.2. Turn on the power of all equipments.

7.4.3. Let the EUT work in test mode and measure it.

## 7.5. Test Procedure

7.5.1. Set up the EUT and test generator as shown on Section 7.2.

7.5.2. For line to line coupling mode, provide a 1.0 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

7.5.3. For line to earth coupling mode, provide a 2.0 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

7.5.4. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

7.5.5. Different phase angles are done individually.

7.5.6. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

## 7.6. Test Results

**PASS**

Please refer to the following page.

# Surge Immunity Test Results

| | | | |
|---|---|---|---|
| Humidity : | 55% | Temperature : | 24℃ |
| Power Supply : | DC 110V | Criterion required: | A |
| Test Result : | ☒ Pass ☐ Fail | | |

| Location | Polarity | Phase Angle | Number of Pulse | Pulse Voltage (kV) | Result |
|---|---|---|---|---|---|
| Positive-Negative | ± | / | 5 | 1.0kV | ☑A ☐B ☐C ☐D |
| Positive-PE | ± | / | 5 | 2.0kV | ☑A ☐B ☐C ☐D |
| Negative-PE | ± | / | 5 | 2.0kV | ☑A ☐B ☐C ☐D |
| | | | | | |

# 8. Injected Currents Susceptibility Test

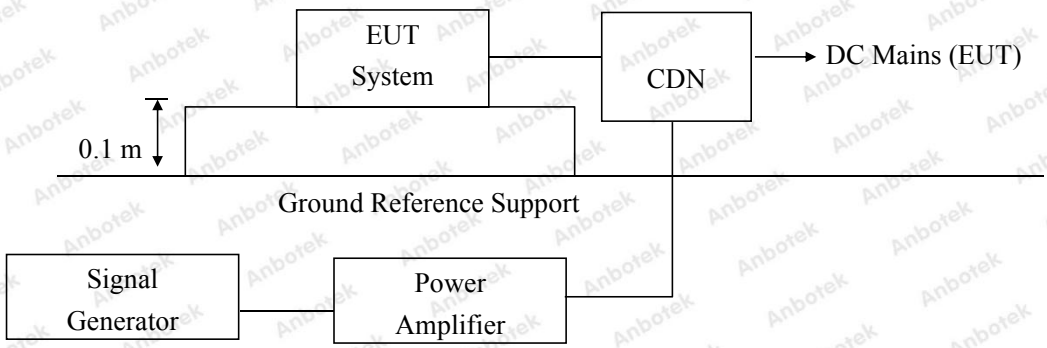
## 8.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN 50121-3-2 (IEC 61000-4-6) |
| Performance criterion: | A |
| Severity Level 3: 10V (rms), (0.15MHz ~80MHz) | |

Test Level

| Level | Field Strength V |
|---|---|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| X. | Special |

## 8.2. Test Setup




## 8.3. EUT Configuration

The following equipments are installed on currents susceptibility measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 8.4. Operating Condition of EUT

8.4.1. Setup the EUT as shown in Section 8.2.

8.4.2. Turn on the power of all equipments.

8.4.3. Let the EUT work in test mode and measure it.

## 8.5. Test Procedure

1) Set up the EUT, CDN and test generators as shown on Section 8.2.
2) Let the EUT work in test mode and measure it.
3) The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
4) The disturbance signal described below is injected to EUT through CDN.
5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
6) The frequency range is swept from 150KHz to 80MHz using 10V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
7) The rate of sweep shall not exceed 1.5*10-3decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

### 8.5.1. For signal lines and control lines ports:

Select tests based on product characteristics.

### 8.5.2. For DC output line ports:

Select tests based on product characteristics.

## 8.6. Test Results

**PASS**

Please refer to the following page.


Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500 www.anbotek.com

# Injected Currents Susceptibility Test Results

| | | | |
|---|---|---|---|
| Humidity : 53% | | Temperature : 24℃ | |
| Power Supply : DC 110V | | Criterion required: A | |
| Test Result : ☒ Pass ☐ Fail | | | |
| | | | |
| Frequency Range (MHz) | Injected Position | Strength (Unmodulated) | Result |
| 0.15 ~ 80 | DC Mains | 10V | ☑ A ☐ B ☐ C ☐ D |
| | | | |

**Remark :** 1. Modulation Signal:1KHz 80% AM

# 9. Magnetic Field Susceptibility Test

## 9.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN 50155 (IEC 61000-4-8) |
| Performance Criterion: | A |
| Severity Level 4: 30A /m<br>Severity Level 4: 300A/m | |

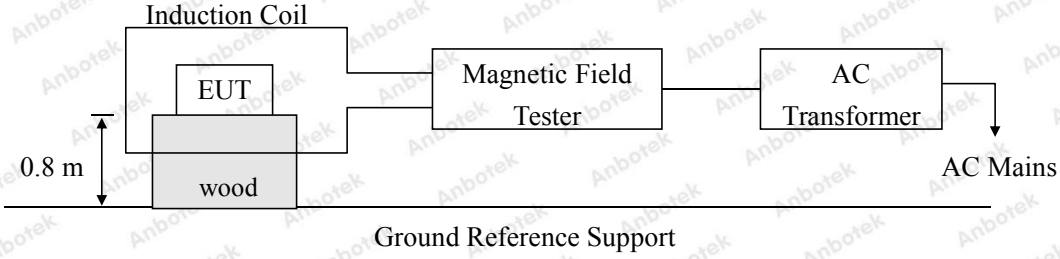
Test levels for continuous field

| Level | Field Strength A/m |
|---|---|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| 4. | 30 |
| 5. | 100 |
| X. | Special |

Test levels for short duration: 1 s to 3 s

| Level | Field Strength A/m |
|---|---|
| 1. | / |
| 2. | / |
| 3. | / |
| 4. | 300 |
| 5. | 1000 |
| X. | Special |

## 9.2. Test Setup



### 9.3. EUT Configuration on Measurement

The following equipments are installed on magnetic field susceptibility measurement to meet EN 50155 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 9.4. Operating Condition of EUT

9.4.1. Setup the EUT as shown in Section 9.2.

9.4.2. Turn on the power of all equipments.

9.4.3. Let the EUT work in test mode and measure it.

### 9.5. Test Procedure

The EUT is placed in the middle of a induction coil (1*1m), under which is a 1*1*0.1m (high)table, this small table is also placed on a larger table, 0.8 m above the ground. Both horizontal and vertical polarization of the induction coil are set on test, so that each side of the EUT is affected by the magnetic field. Also can reach the same aim by change the position of the EUT.

### 9.6. Test Results

**PASS**

Please refer to the following page.

# Magnetic Field Immunity Test Results

| | | | |
|---|---|---|---|
| Temperature : 24℃ | | Humidity : 45% | |
| Power Supply : DC 110V | | Criterion required : A | |
| Test Result : ☒ Pass ☐ Fail | | | |
| | | | |
| Test Level (A/M) | Testing Duration | Coil Orientation | Result |
| 30 | 5 mins | X | ☑ A ☐ B ☐ C ☐ D |
| 30 | 5 mins | Y | ☑ A ☐ B ☐ C ☐ D |
| 30 | 5 mins | Z | ☑ A ☐ B ☐ C ☐ D |
| | | | |
| | | | |
| Test Level (A/M) | Testing Duration | Coil Orientation | Result |
| 300 | 3s | X | ☑ A ☐ B ☐ C ☐ D |
| 300 | 3s | Y | ☑ A ☐ B ☐ C ☐ D |
| 300 | 3s | Z | ☑ A ☐ B ☐ C ☐ D |
| | | | |

# APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Power Line Conducted Emission Test

Photo of Radiated Emission Test (30~1000MHz)

Photo of Radiated Emission Test (1~6GHz)

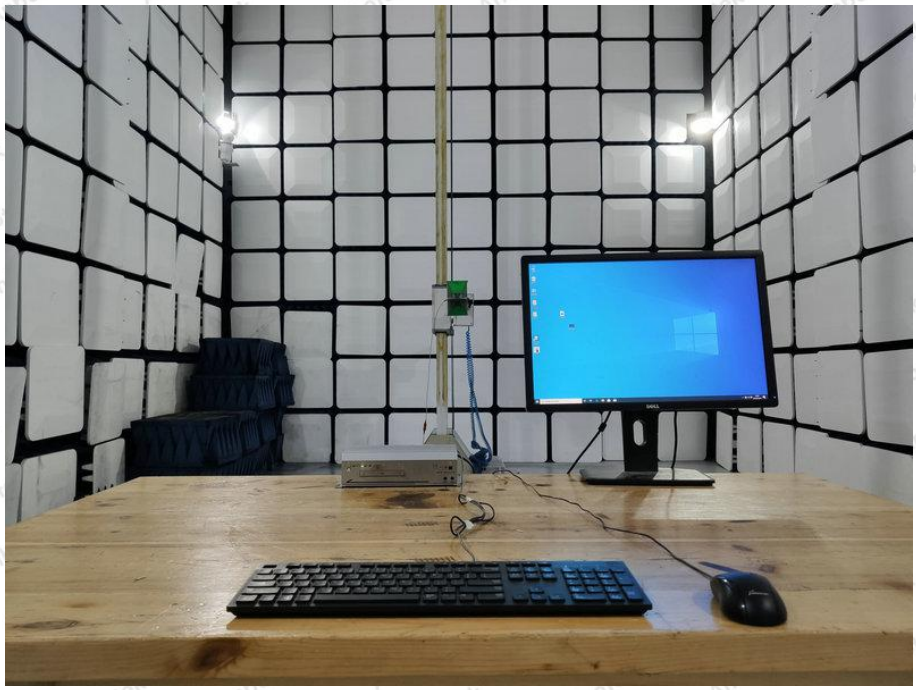


Photo of Electrostatic Discharge Immunity Test

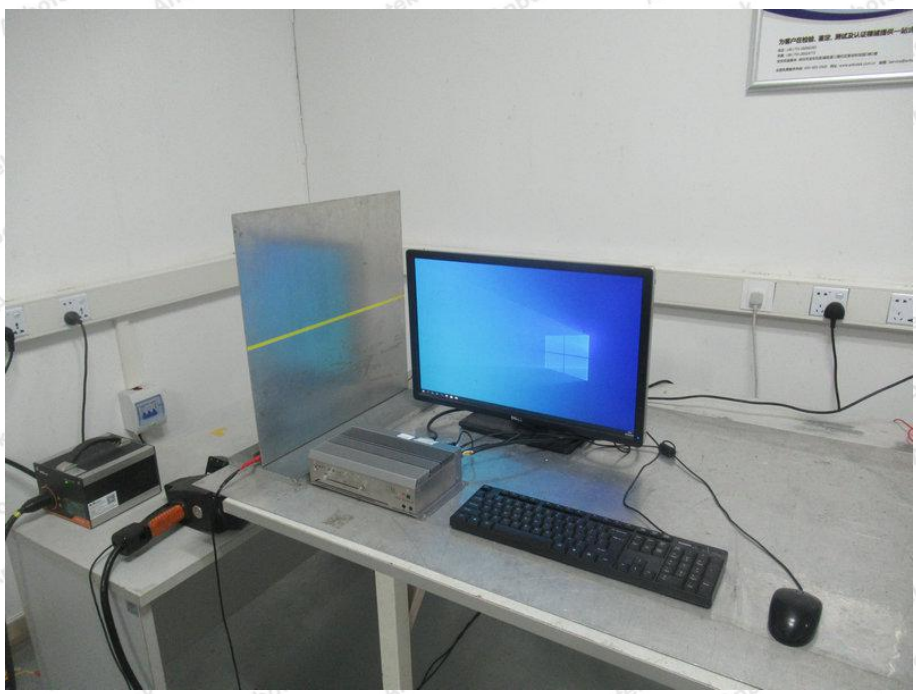


Photo of RF Field Strength susceptibility Test


Photo of Electrical Fast Transient/Burst Immunity Test

Photo of Surge Immunity Test

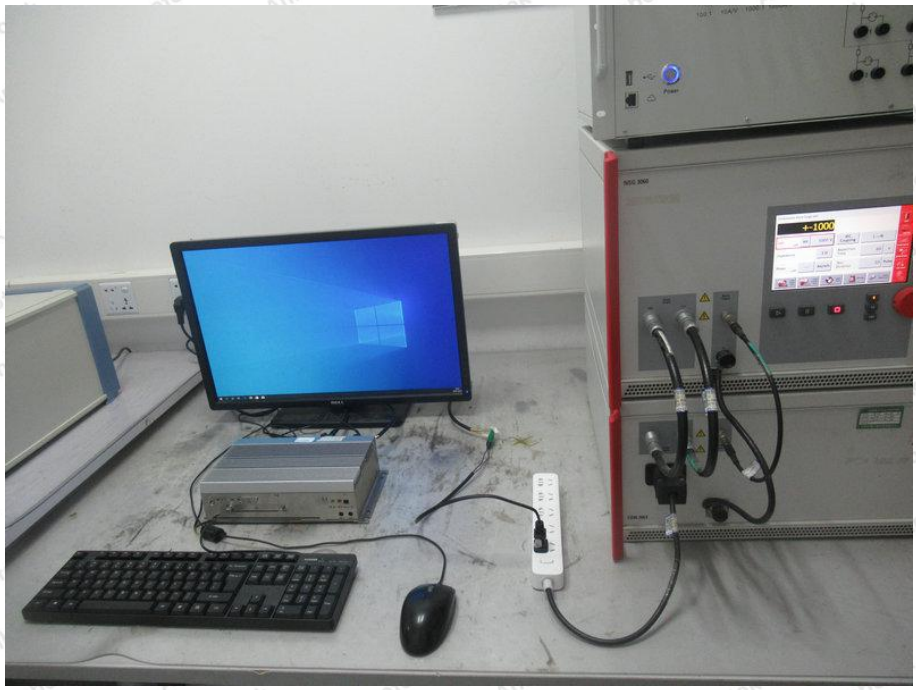
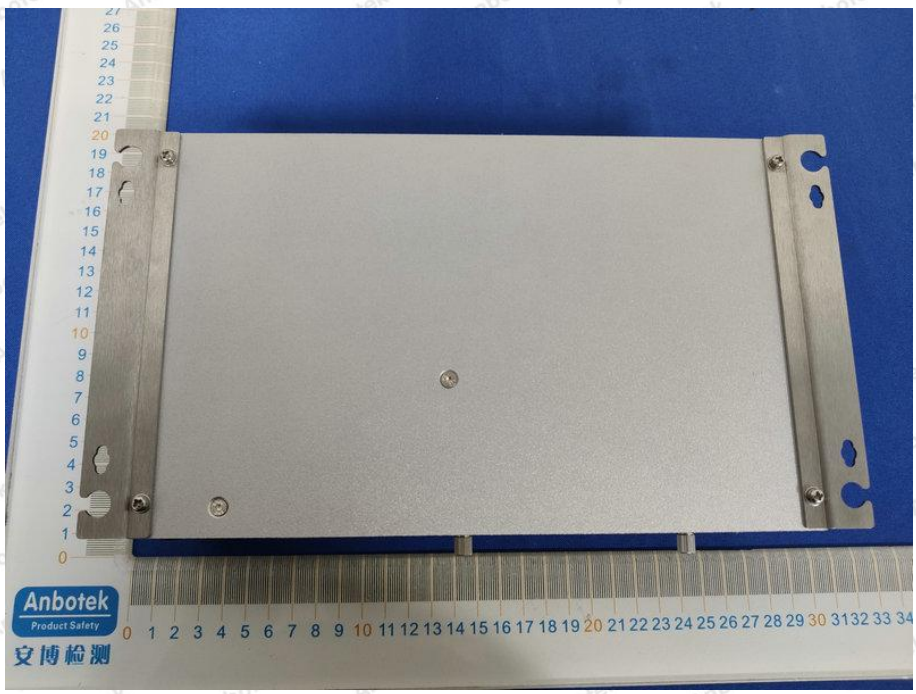
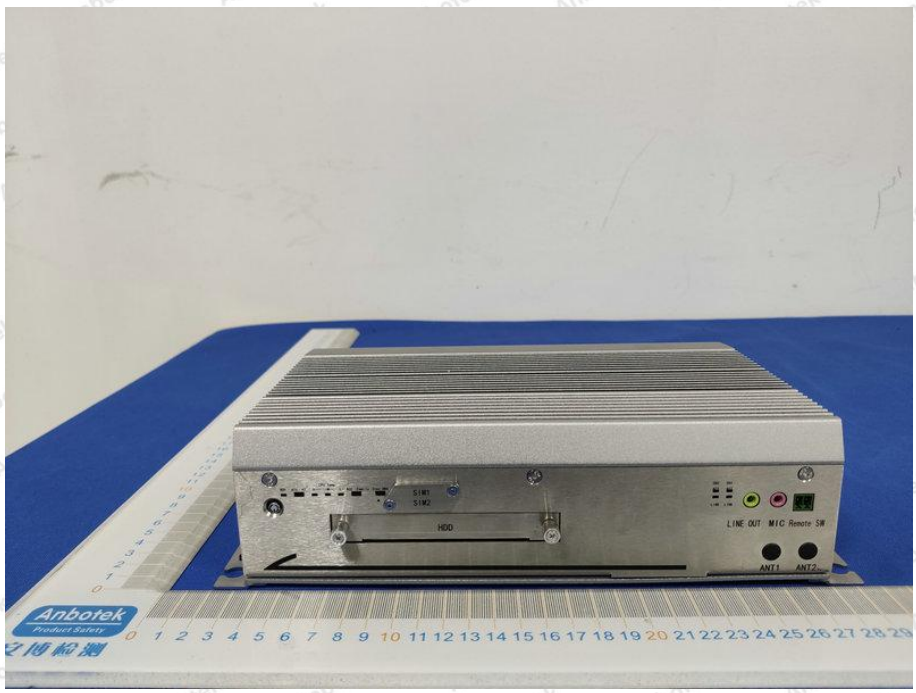


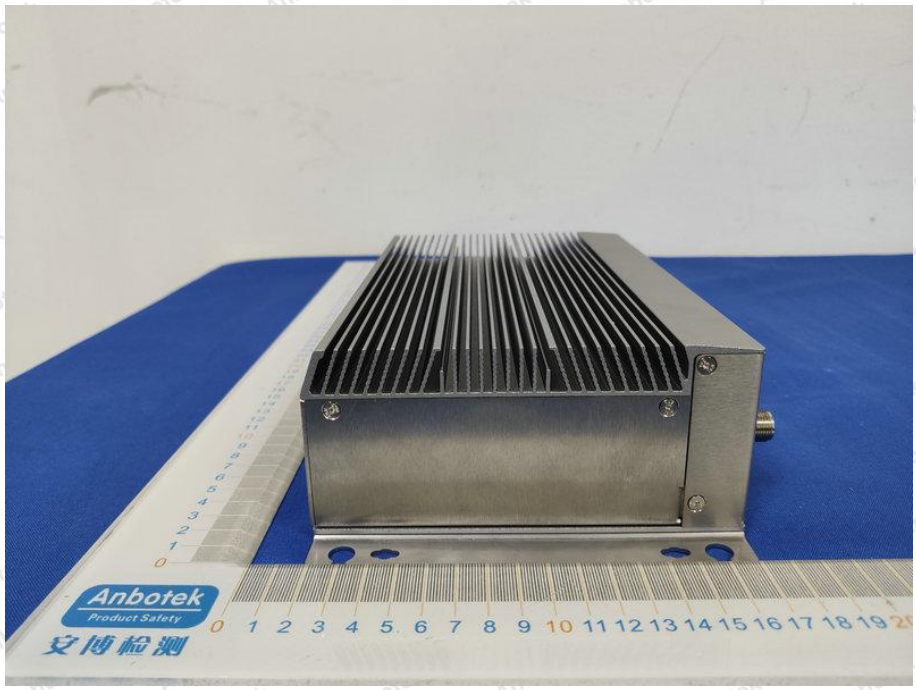
Photo of Injected currents susceptibility Test

# APPENDIX II -- EXTERNAL PHOTOGRAPH


USB
VGA
DP
Smart DP
USB
CH2
CH1
DC 48V/72V/110V
ANT4
ANT3
USB


HDD
LINE OUT
MIC
Remote SW
ANT1
ANT2


Anbotek
Product Safety
安博检测


Anbotek
Product Safety
安博检测

# CE Label

1. The CE conformity marking must consist of the initials 'CE' taking the following form:
   If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
   It must have the same height as the initials 'CE'.

---------- End of Report ----------