



Report No. SET2014-14172

# EMC TEST REPORT

**Report No.:** SET2014-14172

**Product:** Wireless Mouse

**Model No. :** MS-295OR

**Trade Name:** /

**Brand Name:** /

**Applicant:** Shenzhen Tianjie Electronic Co.,Ltd

**Issued by:** CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

**Lab Location:** Electronic Testing Building, Shahe Road, Xili, Nanshan District,  
Shenzhen, 518055, P. R. China

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**查询码: U6Y7DYRX**



## Test Report

**Product** ..... Wireless Mouse  
**Model No.** ..... MS-295OR  
**Applicant**..... Shenzhen Tianjie Electronic Co.,Ltd  
**Applicant Address** ..... Address: Bld 18,3rd industry area,Xitian town,Gongming street,  
Guangming new district, Shenzhen,Guangdong,China.  
**Manufacturer** ..... Shenzhen Tianjie Electronic Co.,Ltd  
**Manufacturer Address**... Address: Bld 18,3rd industry area,Xitian town,Gongming street,  
Guangming new district, Shenzhen,Guangdong,China..  
**Test Standards** ..... ETSI EN 301 489-1 V1.9.2 (2011-09)  
ETSI EN 301 489-3 V1.6.1 (2013-08)

**Test Result**..... Pass

**Tested by** .....

*Xiaolong Zhang*



2014.12.17

Xiaolong Zhang Test Engineer

**Reviewed by** .....

*Shuangwen Zhang*

2014.12.17

Shuangwen Zhang Senior Engineer

**Approved by** .....

*Wu Lian*

2014.12.17

Wu Li'an Manager



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## 1 General Information

### 1.1 Description of EUT

**Product:** Wireless Mouse  
**Model No.:** MS-295OR  
**Hardware Version:** /  
**Software Version:** /  
**Brand Name:** /  
**Receive:** 5V --- 25mA, 150mW  
**Transmitter:** 1.5V --- 8mA, 50mW

#### NOTE:

*Note 1:* The EUT is a Wireless Mouse; It could support the following operating mode and frequency band: 2.4GHz.

*Note 2:* The EUT have the following typical setups during the test:

Setup1: EUT+Notebook;

*Note 3:* Please refer to ANNEX I for the photographs of the EUT. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.

### 1.2 Objective

Perform ElectroMagnetic Interference (EMI) and ElectroMagnetic Susceptibility (EMS) tests for CE Marking.

### 1.3 Facility

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

### 1.4 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C



- Relative Humidity: 30-60 %
- Atmospheric Pressure: 86-106 kPa

## 1.5 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

- Uncertainty of Conducted Emission,  $U_c = 3.6 \text{ dB}$  ( $k=2$ )
- Uncertainty of Radiated Emission,  $U_c = 4.5 \text{ dB}$  ( $k=2$ )

## 1.6 Test Standards and Results

The objective of the report is to perform testing according to following standards for CE marking:

| No. | Identify                              | Document Title  |
|-----|---------------------------------------|---|
| 1   | ETSI EN 301 489-1<br>V1.9.2 (2011-09) | Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements  |
| 2   | ETSI EN 301 489-3<br>V1.6.1 (2013-08) | Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz |

The EUT has been tested according to the following specifications:

| No                             | Test Standard | Test specifications                                     | Result             |
|--------------------------------|---------------|---|--------------------|
| <b>EN301 489-1/-3 Emission</b> |               |   |                    |
| 1                              | EN55022       | Radiated emission below 1GHz                            | Pass               |
| 2                              | EN55022       | Radiated emission above 1GHz                            | Pass               |
| 3                              | EN55022       | Conducted emission at DC power input/output port        | N.A                |
| 4                              | EN55022       | Conducted emission at AC mains input/output port        | N.A                |
| 5                              | EN55022       | Conducted emission at telecommunication port            | N.A. <sup>1)</sup> |
| 6                              | EN61000-3-2   | Harmonic current emissions at AC mains input port       | N.A. <sup>2)</sup> |
| 7                              | EN61000-3-3   | Voltage fluctuations and flicker at AC mains input port | N.A                |

**EN301 489-1/-3 Immunity**

|    |              |   |      |
|----|--------------|---|------|
| 8  | EN61000-4-2  | Electrostatic discharge                 | Pass |
| 9  | EN61000-4-3  | RF electromagnetic field                | Pass |
| 10 | EN61000-4-4  | Fast transients common mode             | N.A  |
| 11 | EN61000-4-5  | Surges, line to line and line to ground | N.A  |
| 12 | EN61000-4-6  | RF common mode 0.15 MHz to 80 MHz       | N.A  |
| 13 | EN61000-4-11 | Voltage dips and interruptions          | N.A  |

**Note:**

1. N.A means the abbreviation for Not Applicable.

**1.7 Test Peripherals**

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

| Description | Manufacturer | Model | Calibration Due. Date | Serial No. |
|-------------|--------------|-------|-----------------------|------------|
| Notebook    | Lenovo       | T420i | /                     | /          |

**1.8 List of Equipments Used**

| Description                   | Manufacturer  | Model No.          | Calibration Due. Date | Serial No. |
|-------------------------------|---------------|--------------------|-----------------------|------------|
| Radiated Emissions below 1GHz |               |                    |                       |            |
| EMI Test Receiver             | ROHDE&SCHWARZ | ESIB7              | Jun.10, 2015          | A0501375   |
| Broadband Ant.                | CHASE         | CBL6111A           | Jun.10, 2015          | A9704202   |
| 3M Anechoic Chamber           | Albatross     | SAC-3MAC<br>9*6*6m | Mar.8, 2015           | A0412372   |
| Radiated Emissions above 1GHz |               |                    |                       |            |



|                                    |                    |                           |              |            |
|------------------------------------|--------------------|---------------------------|--------------|------------|
| EMI Test Receiver                  | ROHDE&SCHWARZ      | ESIB26                    | Jun.10, 2015 | A0304218   |
| 5M Anechoic Chamber                | Albatross          | SAC-5MAC<br>12.8x6.8x6.4m | Mar.9, 2015  | A0304210   |
| EMI Horn Ant.                      | ROHDE&SCHWARZ      | HF906                     | Jun.10, 2015 | A0304225   |
| Electrostatic discharge            |                    |                           |              |            |
| ESD Test System                    | EM TEST            | ESD30N                    | Dec.14, 2015 | A130301203 |
| RF electromagnetic field           |                    |                           |              |            |
| Signal Generator                   | ROHDE&SCHWARZ      | SMR27                     | Aug.15, 2015 | A0304261   |
| Power Meter                        | ROHDE&SCHWARZ      | NVRS                      | Jun.10, 2015 | A0306319   |
| EMS Antenna                        | Amplifier Research | AT1080                    | Jun.10, 2015 | A0304249   |
| Microwave Horn<br>Antenna          | Amplifier Research | AT4002A                   | Jul.28, 2015 | A0304250   |
| Power Amplifier<br>(80MHz~1000MHz) | Amplifier Research | AR 150W1000               | Jun.10, 2015 | A0304247   |
| Power Amplifier<br>(1GHz~4.2GHz)   | Amplifier Research | AR 25S1G4AM1              | Jun.10, 2015 | A0304248   |

**Note:** Equipments above have been calibrated and are in the period of validation.



## 2 Emission Test

### 2.1 EUT Setup and Operation

- 1.The EUT was powered by battery.
- 2.Please refer to Note 2 about the typical setups of EUT .
- 3.All test modes have been tested, only the worst case is recorded in this report.

### 2.2 Radiated emission below 1GHz

#### 2.2.1 Limits of radiated emission below 1GHz at 3m measurement distance

| Frequency range (MHz) | Quasi peak limits(dB $\mu$ V/m) |
|-----------------------|---------------------------------|
| 30 – 230              | 40                              |
| 230 - 1000            | 47                              |

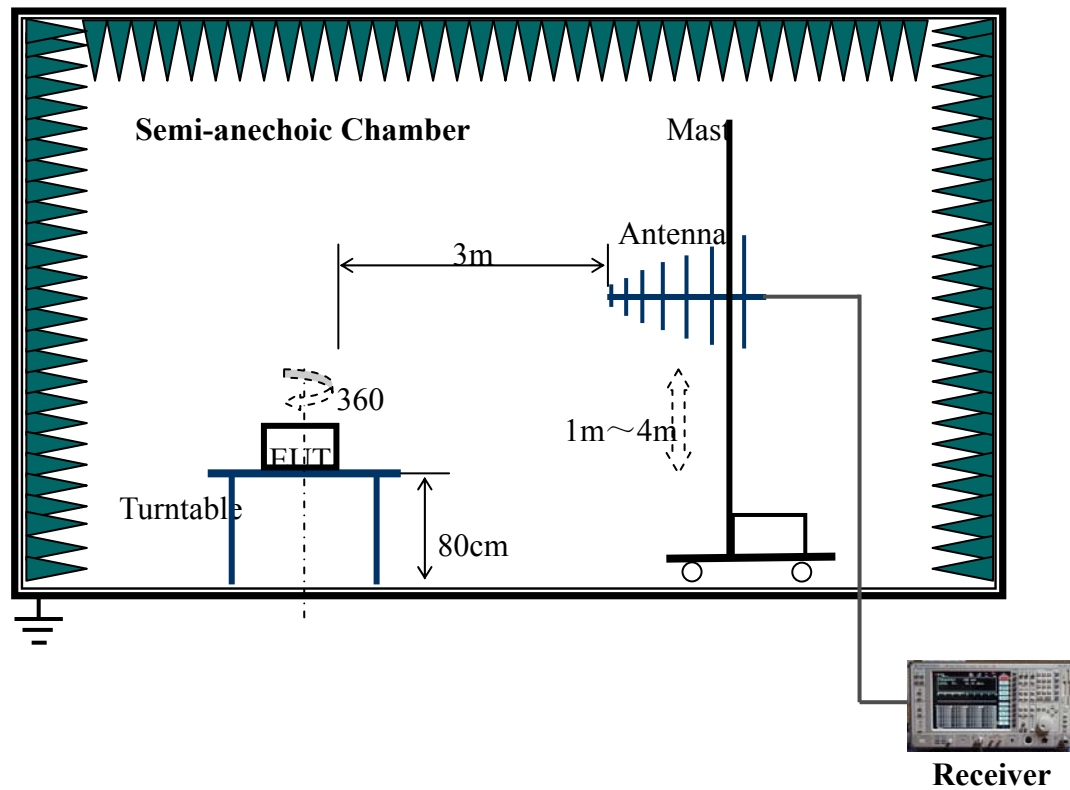
**Note:**

- (1) The lower limit shall apply at the transition frequency.
- (2) Additional provisions may be required for cases where interference occurs.

#### 2.2.2 Test Procedure

- a. The EUT was placed on the top of an insulating table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from 1 to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the heights from 1 to 4 meters and the ratable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detector Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10dB margin would be retested one by one using the quasi-peak method.

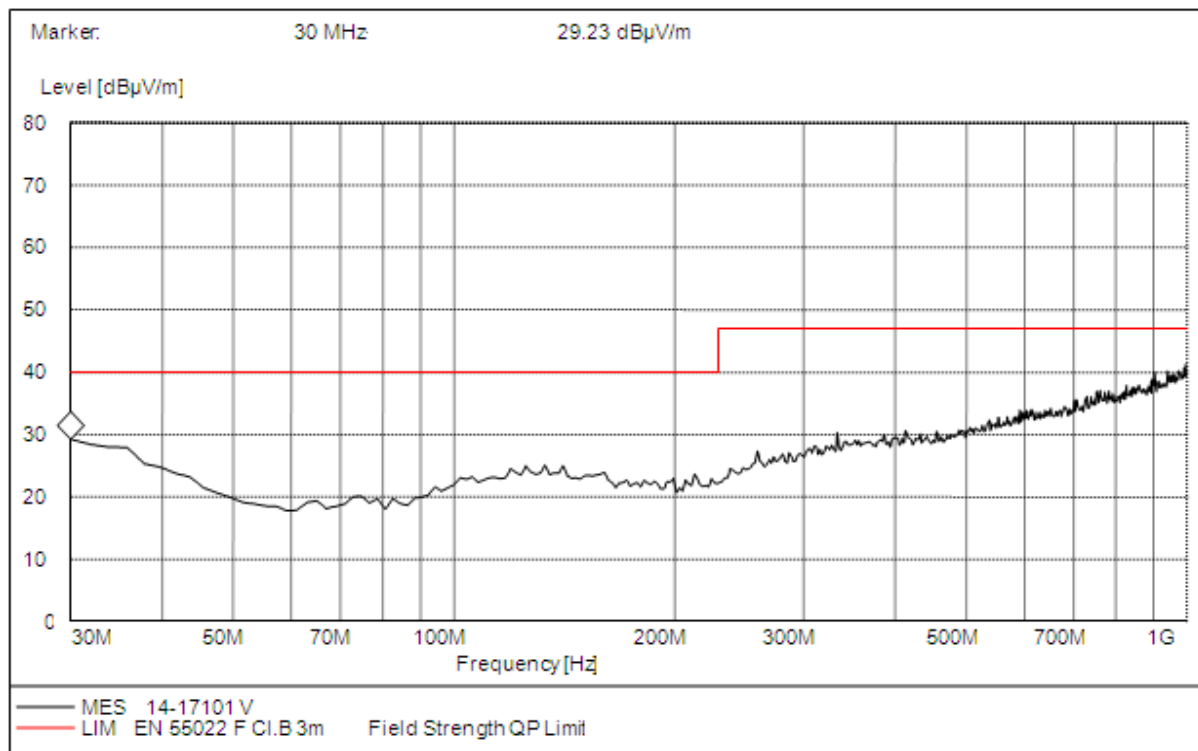
### 2.2.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

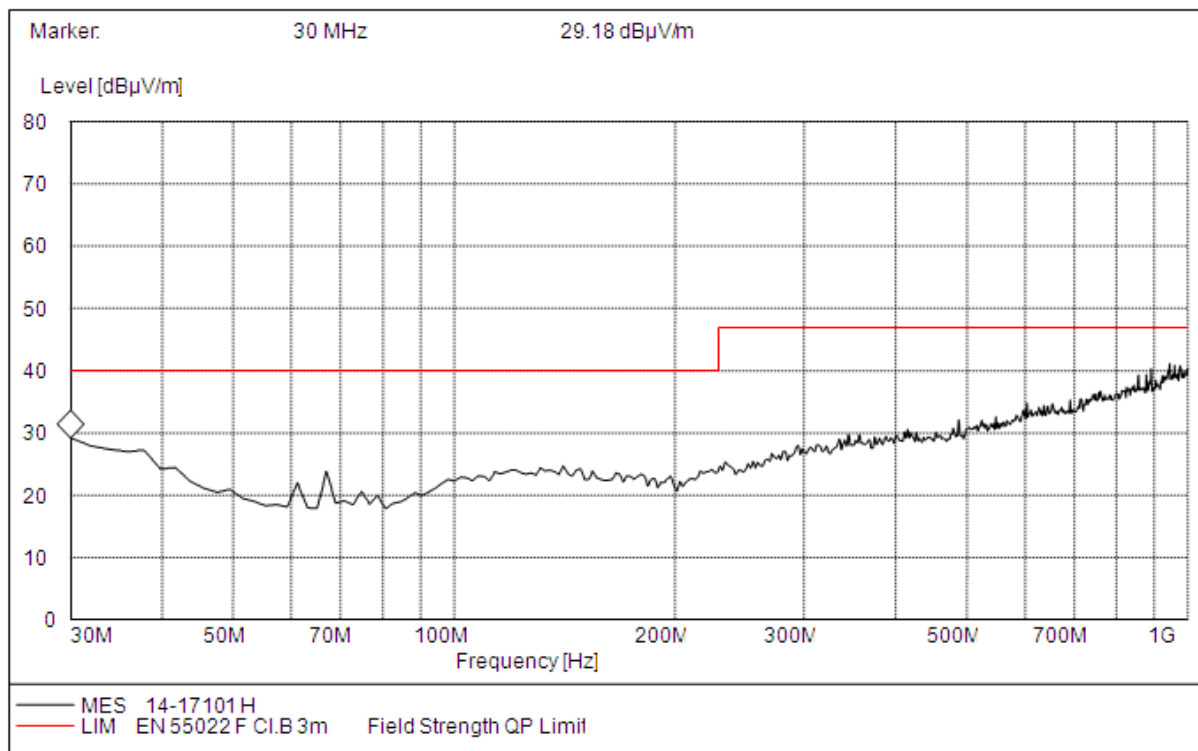
### 2.2.4 Test Result

## a. Radiation disturbances, antenna polarization: Setup 1, Vertical



| No. | Frequency (MHz) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | QP Limits (dB V/m) | Emission Level (dB V/m) |
|-----|-----------------|----------------------|---------------------|----------------------|--------------------|-------------------------|
| 1   | 30.00           | V                    | 100                 | 180                  | 40                 | 28.49                   |
| 2   | 951.15          | V                    | 200                 | 180                  | 47                 | 39.16                   |

## b. Radiation disturbances, antenna polarization: Setup 1, Horizontal



| No. | Frequency (MHz) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | QP Limits (dB V/m) | Emission Level (dB V/m) |
|-----|-----------------|----------------------|---------------------|----------------------|--------------------|-------------------------|
| 1   | 30.00           | H                    | 100                 | 180                  | 40                 | 28.44                   |
| 2   | 860.25          | H                    | 200                 | 180                  | 47                 | 38.79                   |

## 2.3 Radiated emission above 1GHz

### 2.3.1 Limits of radiated emission above 1GHz at 3m measurement distance

| Frequency range (GHz) | Average limit<br>dB( $\mu$ V/m) | Peak limit<br>dB( $\mu$ V/m) |
|-----------------------|---------------------------------|------------------------------|
| 1 - 3                 | 50                              | 70                           |
| 3 - 6                 | 54                              | 74                           |

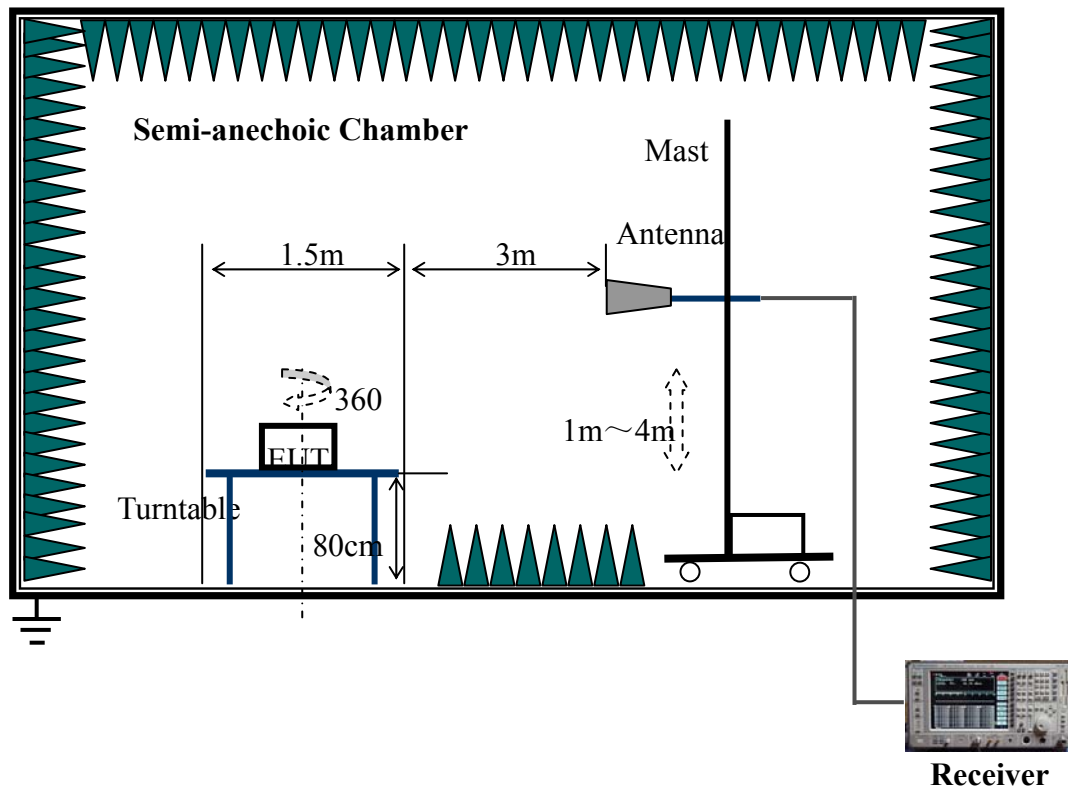
**Note:**

- (1) The lower limit shall apply at the transition frequency.
- (2) Additional provisions may be required for cases where interference occurs.

### 2.3.2 Test Procedure

- a. The EUT was placed on the top of an insulating table (made of polystyrene) 0.8 meters above the ground at a semi-anechoic chamber, and some absorbers (Model: VHP-12-NRL) were used to achieve free-space conditions. The diameter and height of the test volume were both 2.0 meters. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from 1 to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the heights from 1 to 4 meters and the ratable table was turned from 0 degree to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak & AV Detector Function and Specified Bandwidth with Maximum Hold Mode.
- f. Since the highest frequency of the internal sources of the EUT was more than 1GHz, the measurement was made up to 6GHz.

### 2.3.3 Test Setup



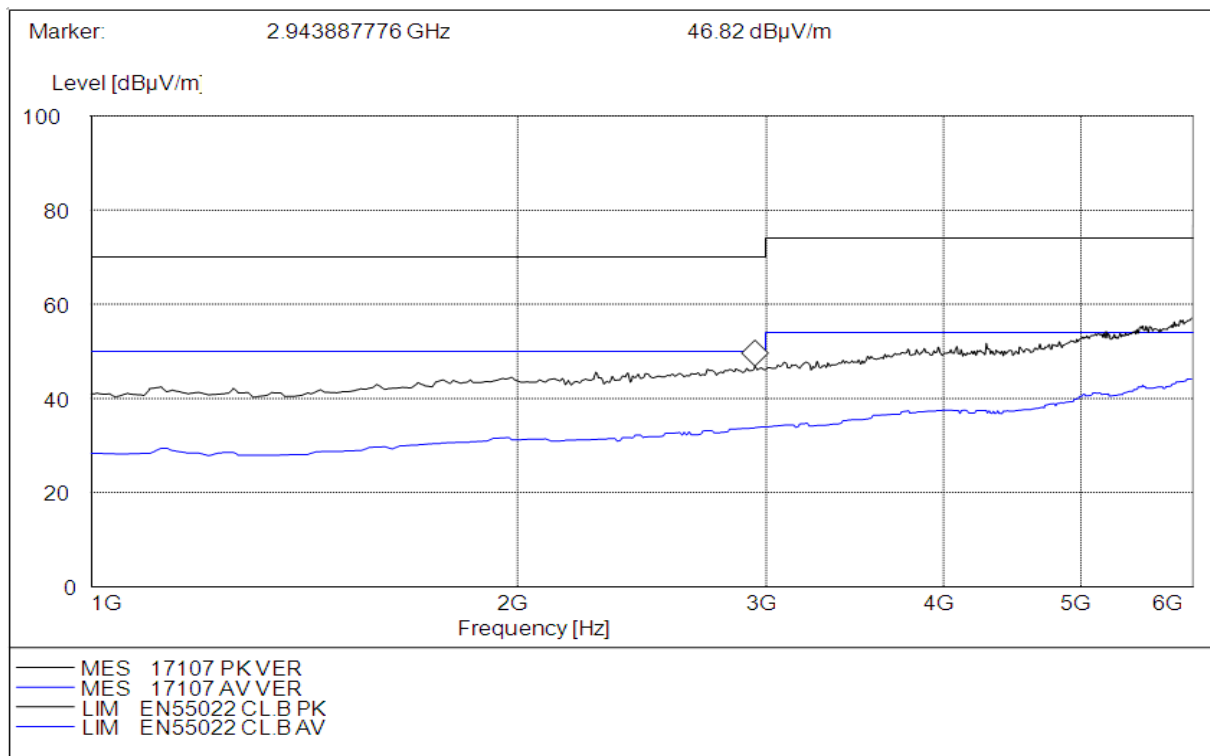
For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

## 2.3.4 Test Result

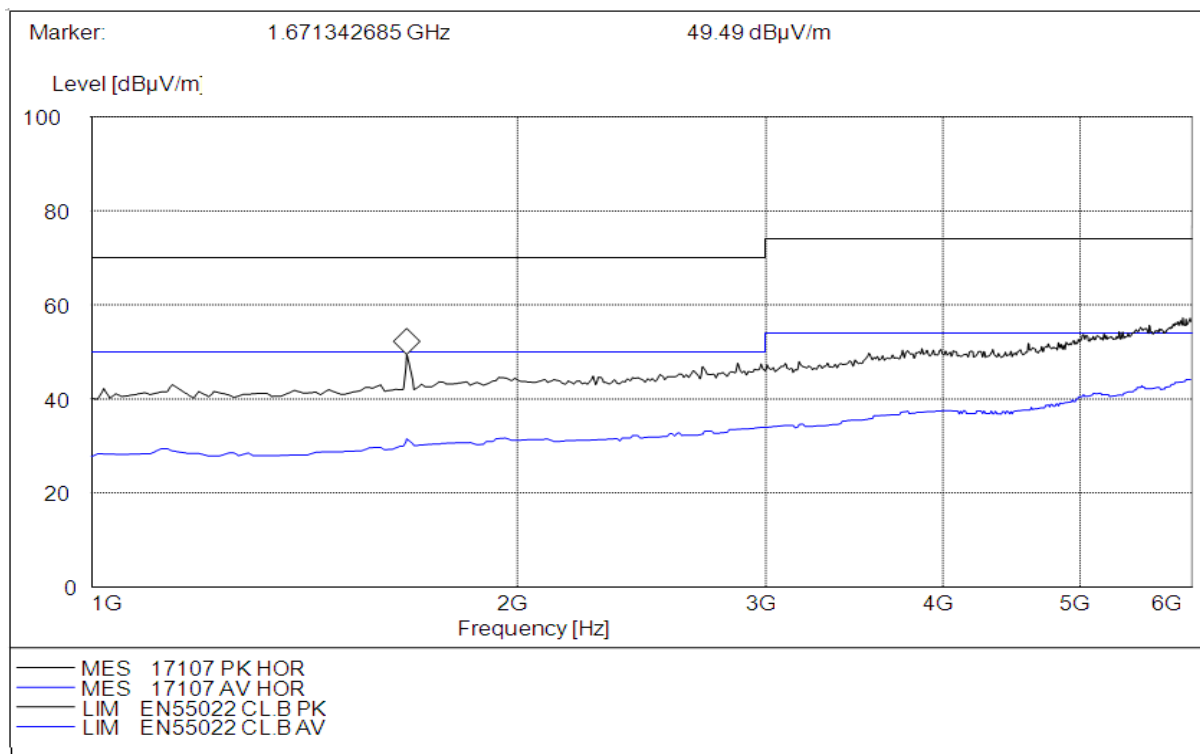
### Setup 1

| Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | Average     |                 |                | Peak        |                 |                |
|----------------------|---------------------|----------------------|-------------|-----------------|----------------|-------------|-----------------|----------------|
|                      |                     |                      | Freq. (MHz) | Limits (dBμV/m) | Level (dBμV/m) | Freq. (MHz) | Limits (dBμV/m) | Level (dBμV/m) |
| Horizontal           | 100~400             | 0~360                | 1000~3000   | 50              | <40            | 1000~3000   | 70              | <50            |
| Horizontal           | 100~400             | 0~360                | 3000~6000   | 54              | <48            | 3000~6000   | 74              | <60            |
| Vertical             | 100~400             | 0~360                | 1000~3000   | 50              | <40            | 1000~3000   | 70              | <50            |
| Vertical             | 100~400             | 0~360                | 3000~6000   | 54              | <48            | 3000~6000   | 74              | <60            |

#### a. Radiation disturbances, antenna polarization: Setup 1, Vertical



## b. Radiation disturbances, antenna polarization: Setup 1, Horizontal





### 3 Immunity Test

#### 3.1 EUT Setup and Operating Conditions

- 1.The EUT was powered by battery.
- 2.Please refer to Note 2 about the typical setups of EUT .
- 3.All test modes have been tested, only the worst cases are recorded in this report.

#### 3.2 Performance Criteria

| Criteria | Performance criteria   |
|----------|--|
| CT/CR    | During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. |
| TT/TR    | After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended.           |

#### 3.3 Electrostatic discharge

##### 3.3.1 Test Specification

|                              |   |
|------------------------------|---|
| <b>Basic Standard:</b>       | EN 301 489-1,EN 61000-4-2                       |
| <b>Discharge Impedance</b>   | 330 $\Omega$ / 150 pF                           |
| <b>Discharge Voltage:</b>    | Air Discharge :8 kV<br>Contact Discharge : 4 kV |
| <b>Polarity:</b>             | Positive / Negative                             |
| <b>Number of Discharge:</b>  | Minimum 20 times at each test point             |
| <b>Discharge Mode:</b>       | Single discharge                                |
| <b>Discharge Period:</b>     | 1-second minimum                                |
| <b>Performance Criterion</b> | TT, TR  |

##### 3.3.2 Test Procedure

The discharges shall be applied in two ways:

- a. Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity,

at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three contact test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

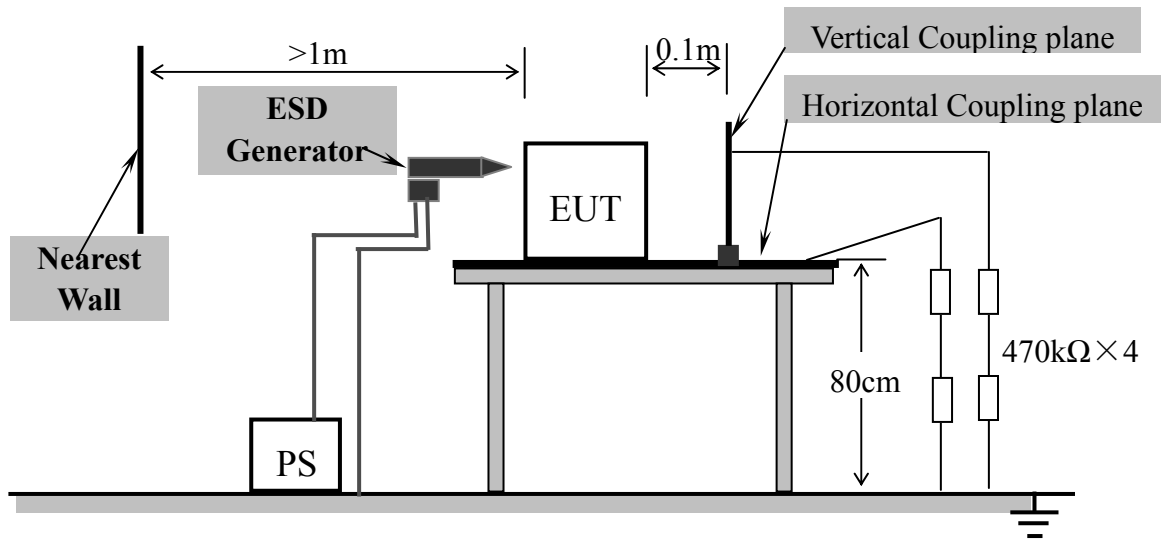
b. Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

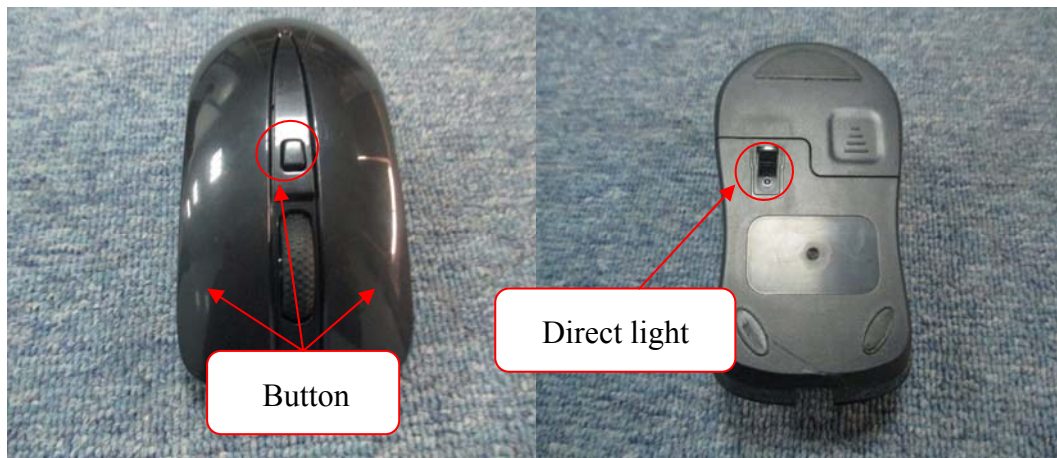
- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were completed.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.
- h. At least ten single discharges ( in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m×0.5m) was placed vertically to and 0.1 meters from the EUT.

### 3.3.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

The ESD test points





### 3.3.4 Test Results

| Test Points           | Discharge Level (kV)  | Discharge Mode | Observation | Conformance |
|-----------------------|-----------------------|----------------|-------------|-------------|
| Setup 1               |                       |                |             |             |
| Aperture of the cover | $\pm 2, \pm 4, \pm 8$ | Air            | Note(1)     | Pass        |
| Button                | $\pm 2, \pm 4, \pm 8$ | Air            | Note(1)     | Pass        |
| Direct light          | $\pm 2, \pm 4, \pm 8$ | Air            | Note(1)     | Pass        |
| HCP                   | $\pm 2, \pm 4$        | Contact        | Note(1)     | Pass        |
| VCP                   | $\pm 2, \pm 4$        | Contact        | Note(1)     | Pass        |

**NOTE:**

(1).The EUT continued to operate as intended. No degradation of performance was observed.

### 3.4 RF Electromagnetic Field

#### 3.4.1 Test Specification

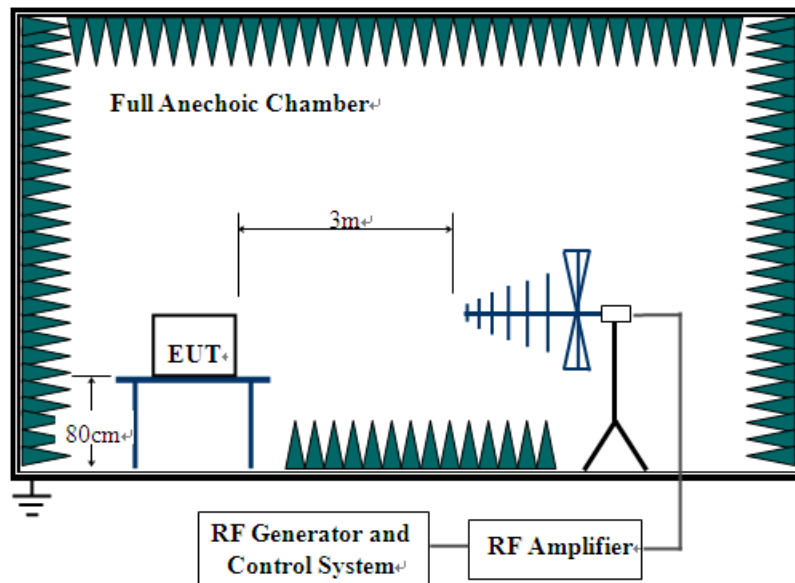
|                              |                                      |
|------------------------------|--------------------------------------|
| <b>Basic Standard:</b>       | EN 301 489-1, EN 61000-4-3           |
| <b>Frequency Range:</b>      | 80 MHz – 1000MHz, 1400 MHz – 2700MHz |
| <b>Field Strength:</b>       | 3 V/m                                |
| <b>Modulation:</b>           | 1kHz sine wave, 80%, AM modulation   |
| <b>Frequency Step:</b>       | 1% of fundamental                    |
| <b>Polarity of Antenna</b>   | Horizontal and Vertical              |
| <b>Test Distance:</b>        | 3m                                   |
| <b>Antenna Height:</b>       | 1.5m                                 |
| <b>Dwell Time:</b>           | 3 seconds                            |
| <b>Performance Criterion</b> | CT, CR                               |

#### 3.4.2 Test Procedure

The test procedure was in accordance with EN 61000-4-3.

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The frequency range is swept from 80 MHz to 1000MHz and 1400 MHz to 2700MHz with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The field strength level was 3V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 3.4.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

### 3.4.4 Test Result

| Test Mode | Polarity | Azimuth | Required Performance Criterion | Observation | Conformance |
|-----------|----------|---------|--------------------------------|-------------|-------------|
| Setup 1   | V&H      | 0       | CR/CT                          | Note(1)     | Pass        |
|           | V&H      | 90      | CR/CT                          | Note(1)     | Pass        |
|           | V&H      | 180     | CR/CT                          | Note(1)     | Pass        |
|           | V&H      | 270     | CR/CT                          | Note(1)     | Pass        |

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.



## Appendix I: Photographs of the EUT

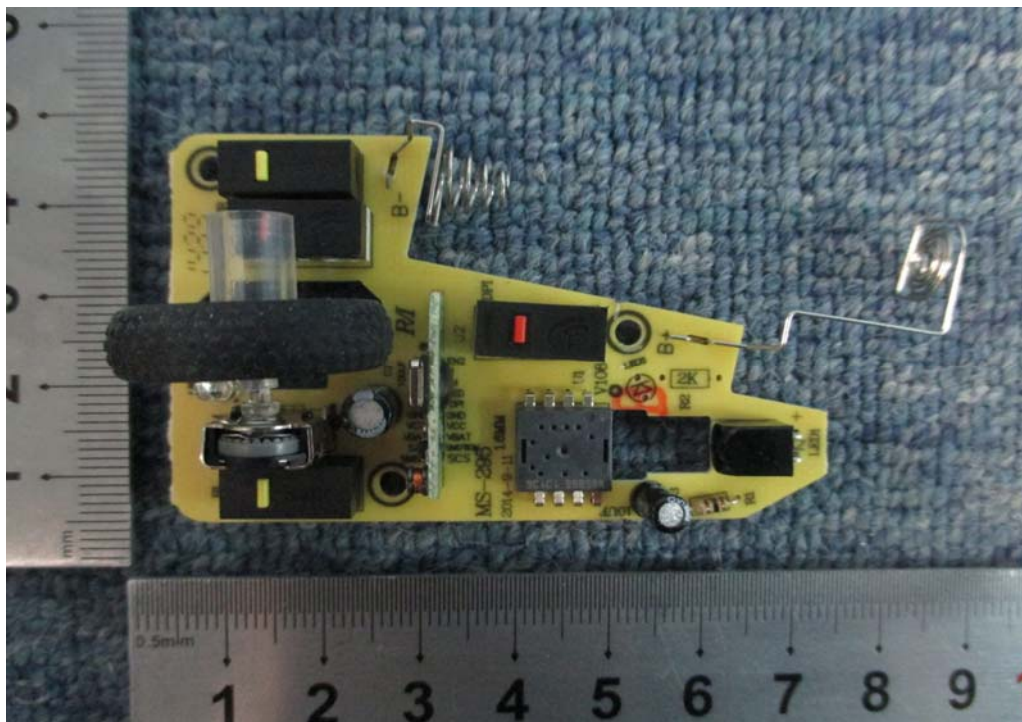
### 1. Appearance

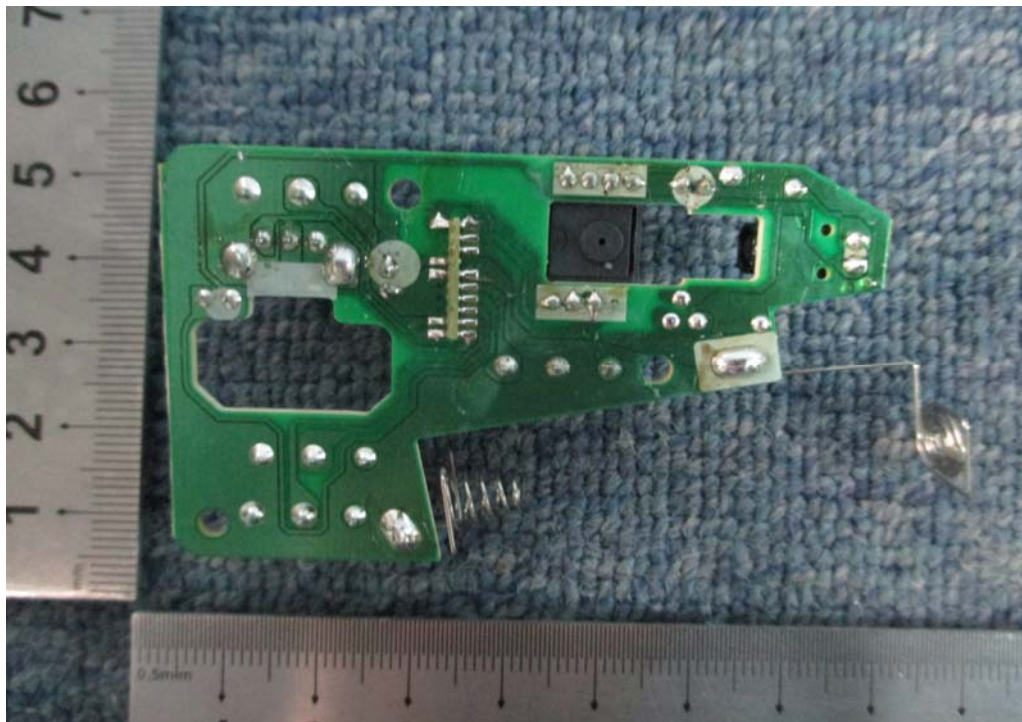






## 2. Internal picture







## Appendix II: Photographs of EMC Test Configuration

### 1. Radiated Emission Measurement below 1GHz



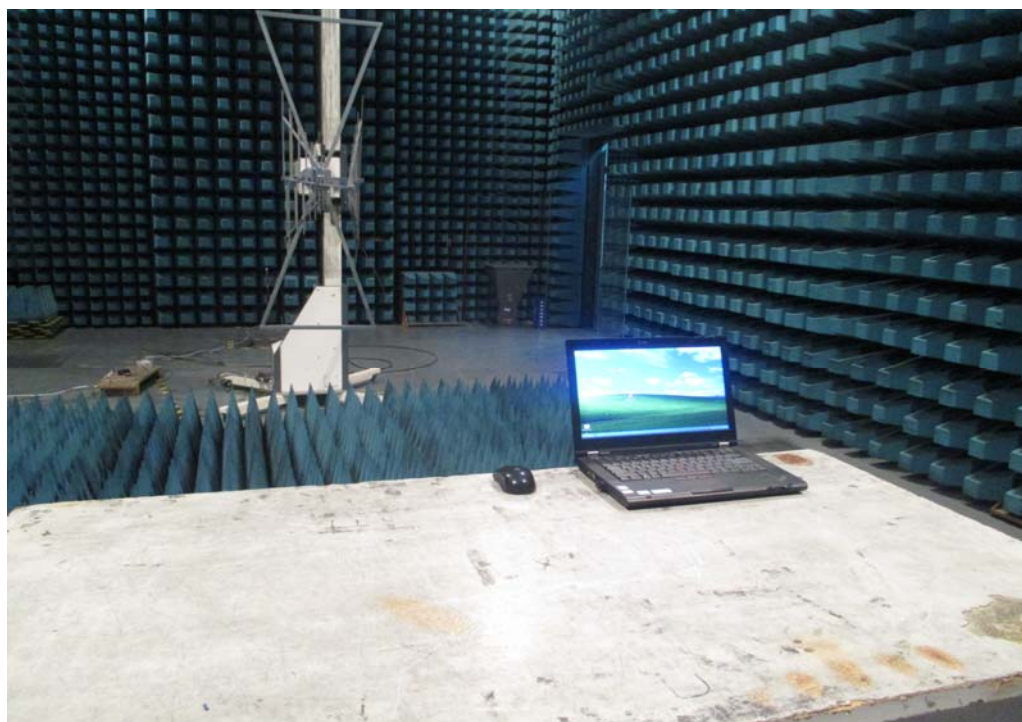
### 2. Radiated Emission Measurement above 1GHz



### 3. Electrostatic Discharge Immunity Test



### 4. RF electromagnetic field Immunity Test



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