ETSI EN 301 489-1 & 3 TEST REPORT
for

Acrox Technologies Co,.Ltd

2.4G Optical Mouse

Model Number: G3O

Prepared for : Acrox Technologies Co,.Ltd
4F., No.89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.

Prepared By : EST Technology Co., Ltd.
Santun(guantai Road), Houjie Town,DongGuan City,GuangDong, China.

Report Number	:	EST-R1206005
Date of Test	:	May.25-June.11, 2012
Date of Report	:	June.11, 2012

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Test Report Verification

Applicant: **Address:**	Acrox Technologies Co., Ltd. 4F., No.89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.		
Manufacturer: **Address:**	Acrox Technologies Co., Ltd. 4F., No.89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.		
Factory: **Address:**	Acrox Technologies Co., Ltd. Hsinmin Industria,Changan Town, Dongguan City, Guangdong, China		
E.U.T:	2.4G Optical Mouse		
Model Number:	G3O		
Power Supply:	DC 3V		
Test Voltage:	DC 3V		
Trade Name:	ASBIS / ACROX	**Serial No.:**	------
Date of Receipt:	May.22.2012	Date of Test:	May.22.2012~June.11.2012
Test Specification:	**ETSI EN301 489-1 V1.8.1 :2008** **ETSI EN301 489-3 V1.4.1 :2002**		
Test Result:	The device described above is tested by EST Technology Co., Ltd.. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the ETSI EN 301 489-1/-3 requirements **Date:** June.11,12		

Prepared by:	Tested by:	Approved by:
Amy / Assistant	Tony.Tang/ Engineer	IcemanHu / Manager

Other Aspects:
None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.

1.SUMMARY OF MEASUREMENTS AND RESULTS

1.1. Standard description

ETSI EN 301 489 -1 V1.8.1 (2008): Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

ETSI EN 301 489-3 V1.4.1 (2002): Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 3: S Specific conditions for Short-Range Devices (SRD)operating on frequencies between 9 kHz and 40 GHz

1.2. Compliance with ETSI EN301 489-1 & ETSI EN301 489-3

CLAUSE	TEST PARAMETER	APPLICATION	RESULTS
EMC emission			
8.2	Radiated emission	Enclosure of ancillary equipment	**PASS**
8.3	Conducted emission	DC power input/output port	**N/A**
8.4	Conducted emission	AC mains input/output port	**N/A**
8.5	Harmonic Current Emissions	AC mains input port	**N/A**
8.6	Voltage Fluctuation & Flicker	AC mains input port	**N/A**
8.7	Conducted emission	Telecommunication port	**N/A**
Immunity			
9.2	RF electromagnetic field	Enclosure	**PASS**
9.3	Electrostatic Discharge	Enclosure	**PASS**
9.4	Fast transients common mode	Signal,telecommunication and control ports,DC and AC power ports	**N/A**
9.5	RF Common mode	Signal,telecommunication and control ports,DC and AC power ports	**N/A**
9.6	Transients and Surges	DC power input ports for vehicular use	**N/A**
9.7	Voltage dips and interruptions	AC mains power input ports	**N/A**
9.8	Surges,line to line and line to ground	AC mains power input ports, telecommunication ports	**N/A**
N/A is an abbreviation for Not Applicable.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	2.4G Optical Mouse
Model Number	:	G3O
Operation frequency	:	2403~2480MHz
Antenna and Gain	:	Integrated PCB antenna, -5.83dBi gain
Applicant	:	Acrox Technologies Co., Ltd. 4F., No.89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.
Manufacturer	:	Acrox Technologies Co., Ltd. 4F., No.89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.
Factory	:	Acrox Technologies Co., Ltd. Hsinmin Industria,Changan Town, Dongguan City, Guangdong, China
Sample Type	:	Prototype production

2.2. Test Facilities

EMC Lab : Certificated by CNAL, CHINA
Registration No.: L5288
Date of registration: October 28, 2011

Certificated by FCC, USA
Registration No.: 989591
Date of registration: December 07, 2010

Certificated by Industry Canada
Registration No.: 144350
Date of registration: December 16, 2010

Certificated by VCCI, Japan
Registration No.: R-3663 & C-4103
Date of registration: July 25, 2011

Certificated by TUV Rheinland, Germany
Registration No.: UA 50195514 0001
Date of registration: January 07, 2011

Certificated by TUV/PS, Shenzhen
Registration No.: SCN1017
Date of registration: January 27, 2011

Certificated by Intertek ETL SEMKO
Registration No.: 2011-RTL-L1-18
Date of registration: April 28, 2011

Certificated by Nemko, Hong Kong
Registration No.: 175193
Date of registration: May 4, 2011

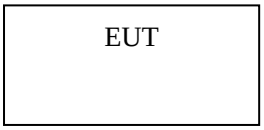
Name of Firm : EST Technology Co., Ltd.

Site Location : San Tun Management Zone, Houjie District, Dongguan, Guangdong, China

2.3. Tested Supporting System Details

N/A

2.4. EUT Configuration and operation conditions for test.



(EUT: 2.4G Optical Mouse***)***

3.RADIATED EMISSION TEST

3.1. Test Equipment

3.1.1. For frequency range 30MHz~1GHz (At Anechoic Chamber)

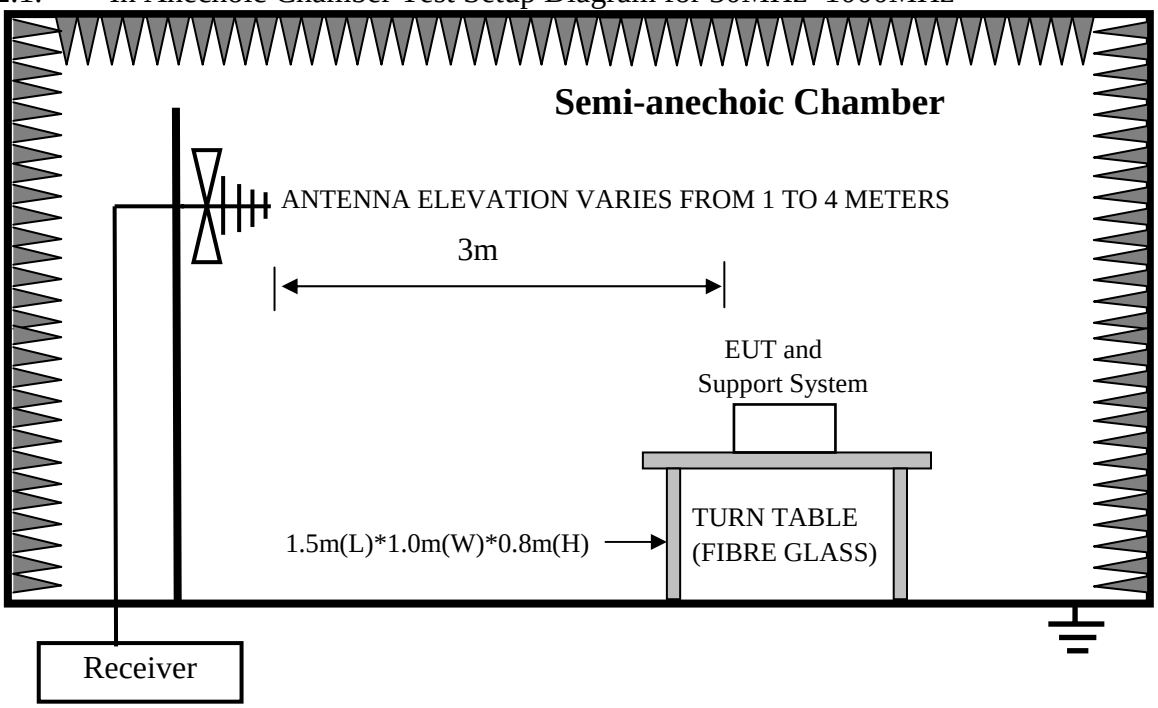
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESVS10	100004	May,30,12	1 Year
Spectrum Analyzer	Agilent	E4411B	MY50140697	May,30,12	1 Year
Bilog Antenna	Teseq	CBL 6111D	25872	Nov 08,11	1.5 Year
Signal Amplifier	Agilent	310N	187037	Aug.25,11	1 Year

3.1.2. For frequency range 1GHz~6GHz (At Anechoic Chamber)

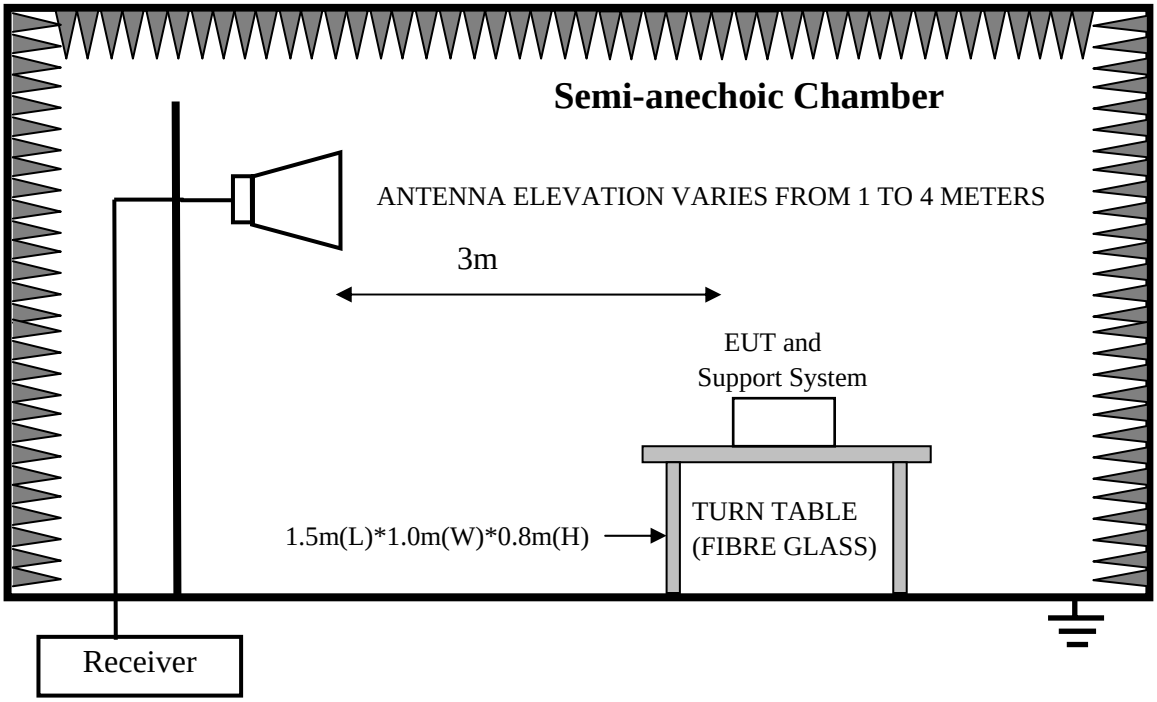
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal
Spectrum Analyzer	Agilent	E4446A	US44300459	May.08, 12	1 Year
Horn Antenna	EMCO	3115	9607-4877	May.08, 12	1.5 Year
Amplifier	Agilent	8449B	3008A02495	Nov.06, 11	1 Year
RF Cable	Hubersuhner	SUCOFLEX102	28620/2	May.08, 12	1 Year
RF Cable	Hubersuhner	SUCOFLEX102	271471/4	May.08, 12	1 Year
RF Cable	Hubersuhner	SUCOFLEX102	29086/2	May.08, 12	1 Year

3.2. Block Diagram of Test Setup

3.2.1. In Anechoic Chamber Test Setup Diagram for 30MHz~1000MHz



3.2.2. In Anechoic Chamber Test Setup Diagram for 1-6GHz



3.3. Operating Condition of EUT

Let EUT work in on

3.4. Test Procedure

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all the interface cables were changed according to EN 301489 on Radiated Disturbance test.

The bandwidth setting on the test receiver (R&S TEST RECEIVER ESCI) is 120 kHz.

The resolution bandwidth of the Agilent Spectrum Analyzer E4446A was set at 1MHz. (For above 1GHz)

The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values.

The frequency range from 1GHz to 6GHz was checked with peak and average detector, measurement distance is 3m in 10m chamber.

3.5. Test Results

PASS.

Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

3.6. TEST DATA

30MHz-1GHz

EST Technology

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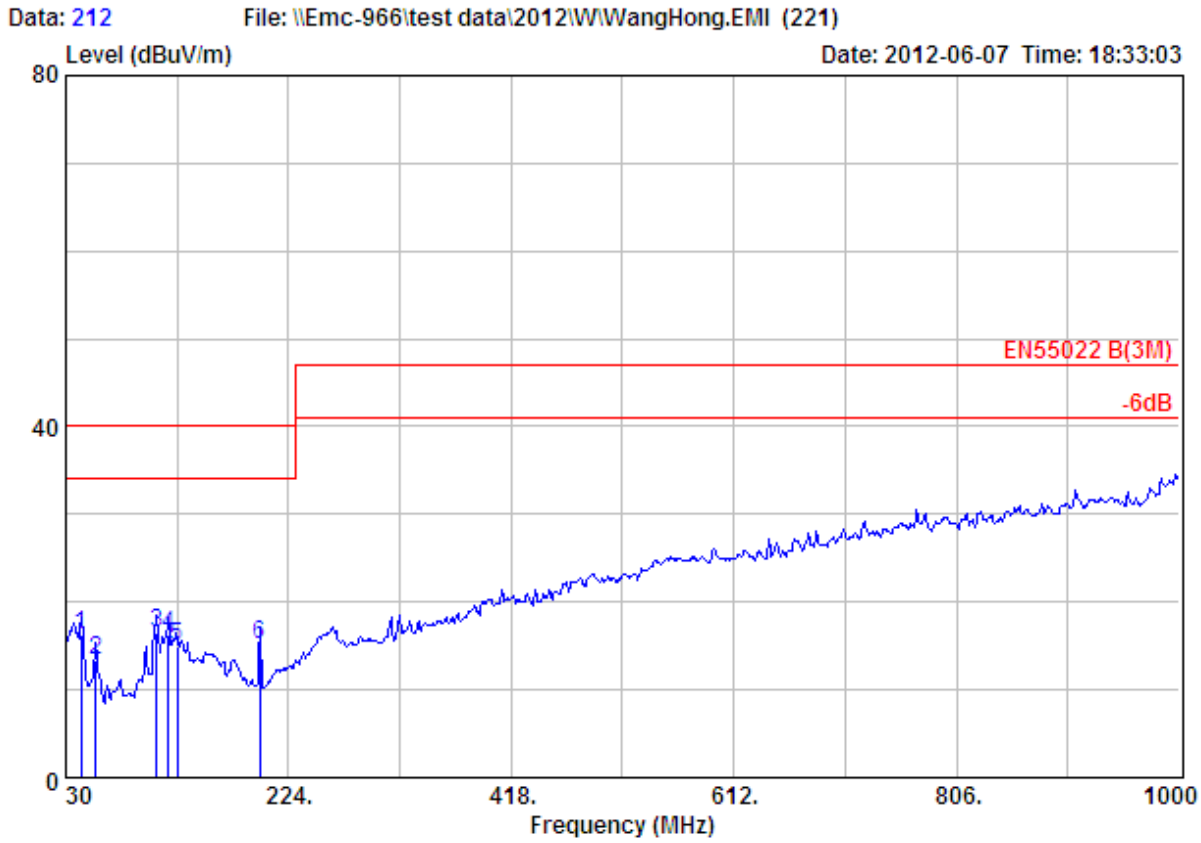
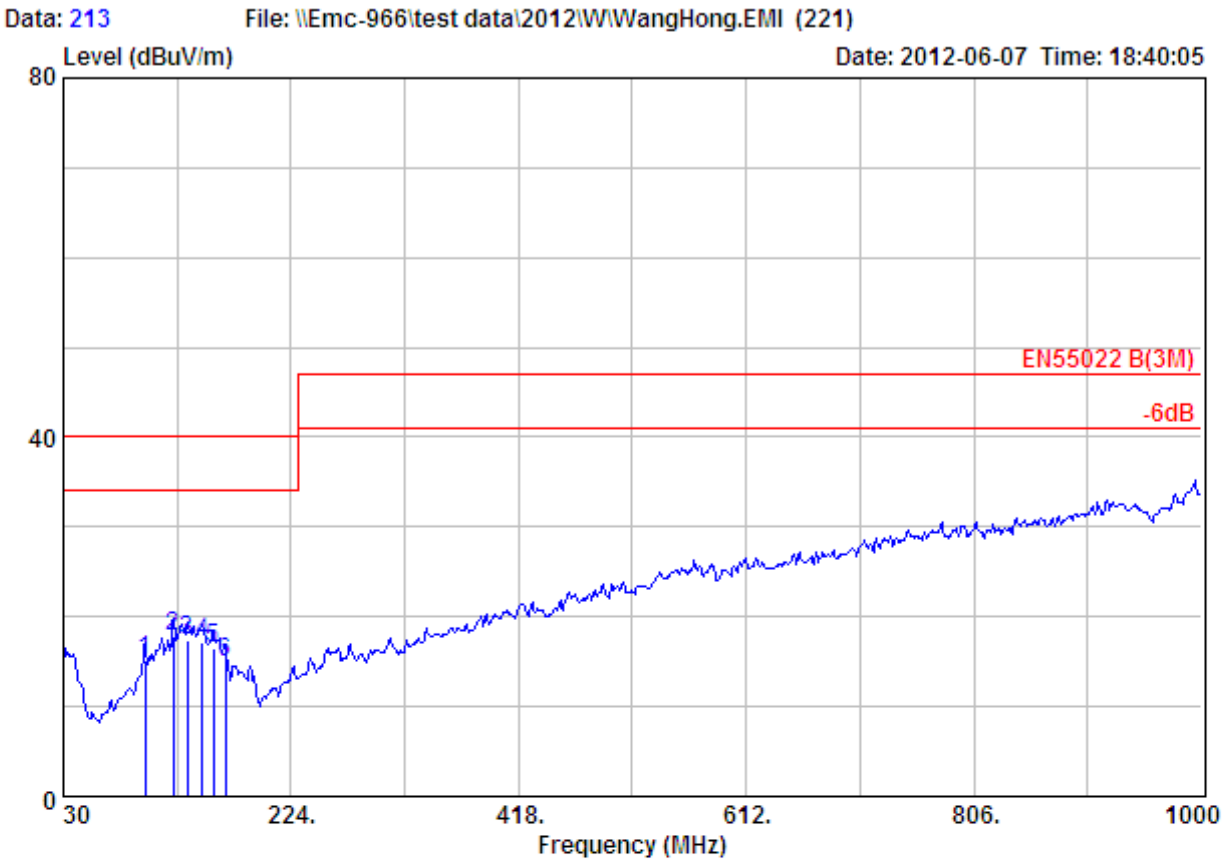



```
Site no       : 3m Chamber                    Data no  :212
Dis. / Ant.   : 3m   27137                    Ant./Pol.:VERTICAL
Limit         : EN55022 B(3M)
Env. / Ins.   : Temp:25.6';Humi:56%;Press:101.52kPa
Engineer      : Tony
EUT           : 2.4G Optical Mouse
Power         : DC 3V
M/N           : G3O
Test Mode     : On
```

	Freq. (MHz)	Ant Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	43.58	10.52	1.83	3.88	16.23	40.00	23.77	QP
2	56.19	5.21	2.07	6.06	13.34	40.00	26.66	QP
3	109.54	10.44	3.09	2.97	16.50	40.00	23.50	QP
4	119.24	11.11	3.22	1.95	16.28	40.00	23.72	QP
5	127.00	11.34	3.29	0.37	15.00	40.00	25.00	QP
6	198.78	7.71	4.17	3.21	15.09	40.00	24.91	QP



Site no : 3m Chamber Data no :213
Dis. / Ant. : 3m 27137 Ant./Pol.:HORIZONTAL
Limit : EN55022 B(3M)
Env. / Ins. : Temp:25.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : 2.4G Optical Mouse
Power : DC 3V
M/N : G3O
Test Mode : On

	Freq. (MHz)	Ant Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	99.84	9.45	2.97	2.70	15.12	40.00	24.88	QP
2	124.09	11.31	3.28	3.29	17.88	40.00	22.12	QP
3	135.73	11.38	3.43	2.65	17.46	40.00	22.54	QP
4	148.34	11.00	3.60	2.65	17.25	40.00	22.75	QP
5	158.04	10.48	3.72	2.28	16.48	40.00	23.52	QP
6	167.74	9.43	3.82	1.59	14.84	40.00	25.16	QP

Above 1GHz

EST Technology

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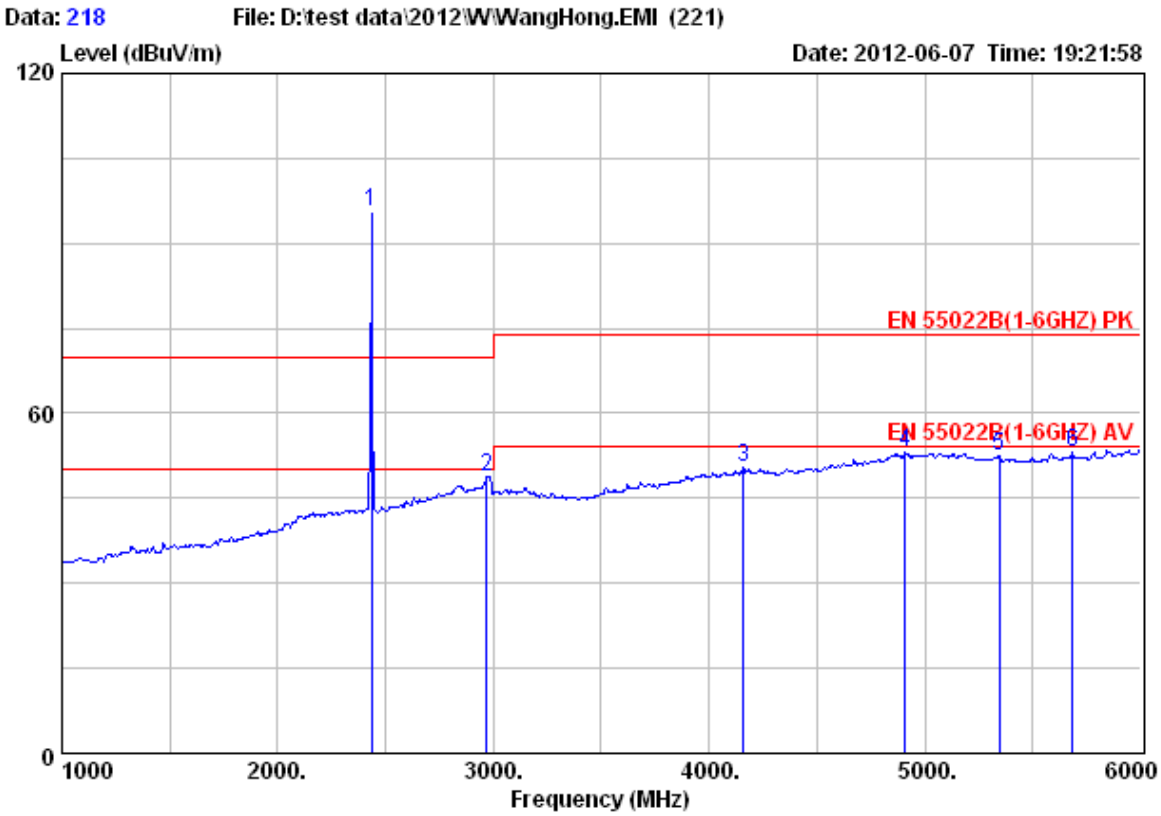
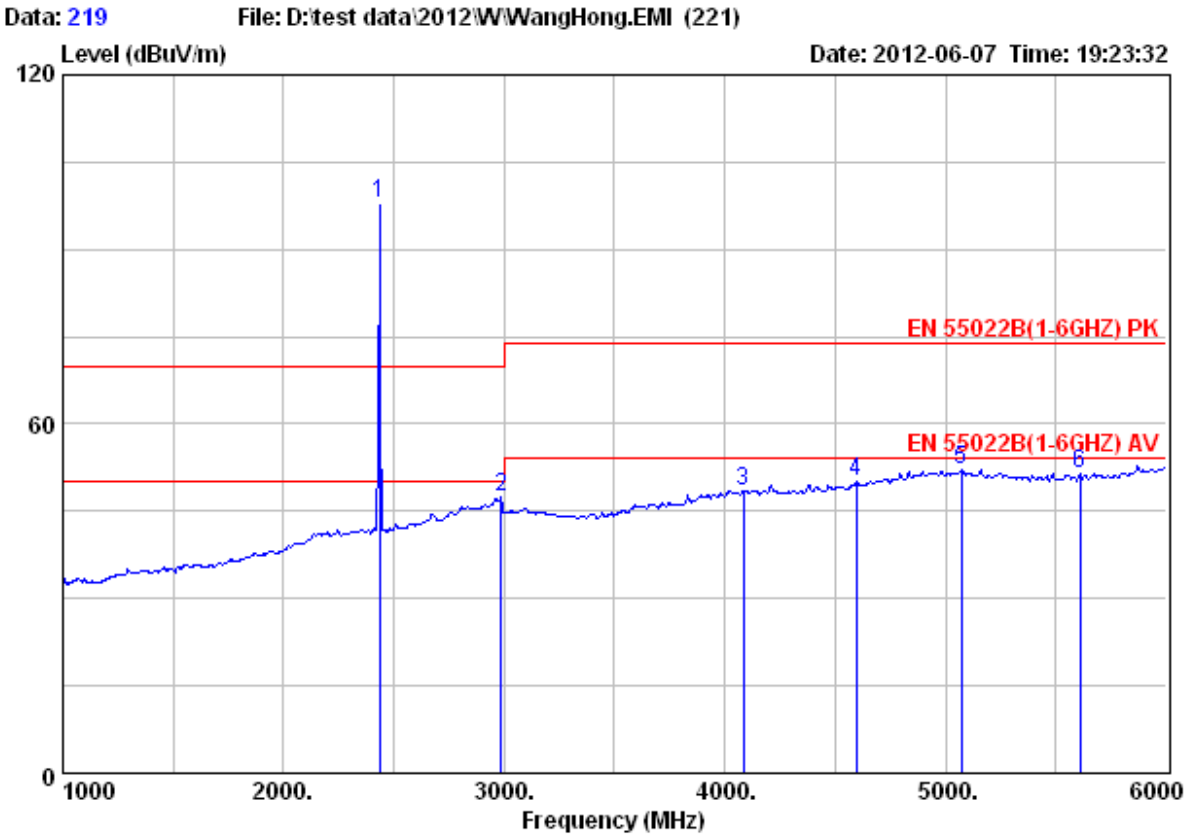


Site no. : 3m Chamber Data no. : 218
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : EN 55022B(1-6GHZ) PK
Env. / Ins. : Temp:25.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : 2.4G Optical Mouse
Power : DC 3V
M/N : G3O
Test Mode : On

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Emission Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2435.00	27.60	6.66	34.12	95.38	95.52	70.00	-25.52	Peak
2	2970.00	28.16	8.90	33.60	45.29	48.75	70.00	21.25	Peak
3	4160.00	29.90	10.73	32.06	41.90	50.47	74.00	23.53	Peak
4	4910.00	31.42	12.22	31.93	41.29	53.00	74.00	21.00	Peak
5	5345.00	31.71	12.17	32.31	40.93	52.50	74.00	21.50	Peak
6	5685.00	32.17	12.04	32.60	41.50	53.11	74.00	20.89	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 219
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
Limit : EN 55022B(1-6GHZ) PK
Env. / Ins. : Temp:25.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : 2.4G Optical Mouse
Power : DC 3V
M/N : G3O
Test Mode : On

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Emission Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2435.00	27.60	6.66	34.12	97.83	97.97	70.00	-27.97	Peak
2	2985.00	28.19	8.97	33.58	43.74	47.32	70.00	22.68	Peak
3	4085.00	29.80	10.81	32.16	40.13	48.58	74.00	25.42	Peak
4	4595.00	30.80	10.79	31.66	40.12	50.05	74.00	23.95	Peak
5	5070.00	31.58	12.51	32.11	40.10	52.08	74.00	21.92	Peak
6	5610.00	32.05	12.02	32.67	40.19	51.59	74.00	22.41	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

4. IMMUNITY PERFORMANCE CRITERIA

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level by its manufacturer or the requestor of the test, or the agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

1. Based on the used product standard
2. Based on the declaration of the manufacturer, requestor or purchaser

Criterion A: For immunity tests with phenomena of a continuous nature

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Criterion B: for immunity tests with phenomena of a transient nature

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect form the equipment if used as intended.

Criterion C: For immunity tests with power interruptions exceeding a certain time

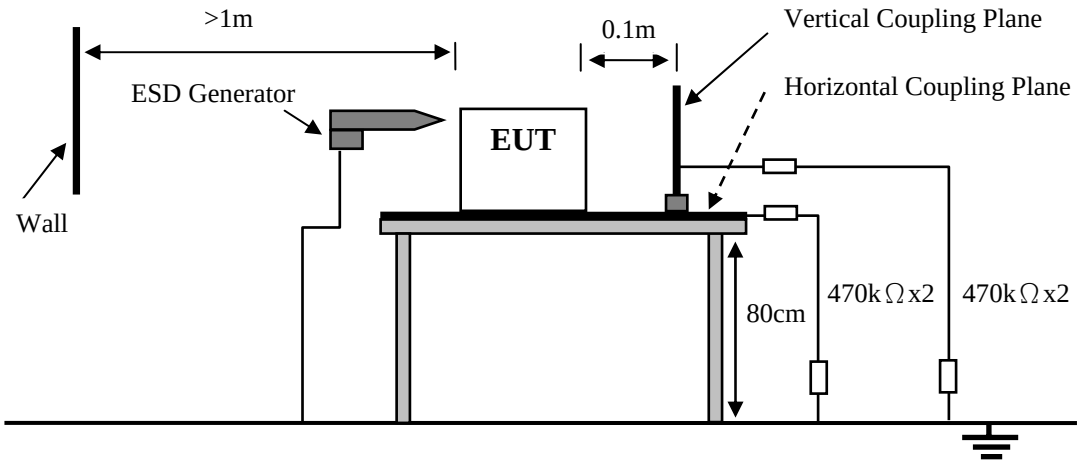
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

5.ELECTROSTATIC DISCHARGE IMMUNITY TEST

5.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	HAEFELY	ONYX16	174153	June.02,12	1 Year

5.2. Block Diagram of Test Setup



5.3. Test Levels and Performance Criteria

Severity Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)	Performance criterion
1.	2	2	B
2.	4	4	
3.	6	8	
4.	8	15	
X	Special	Special	

5.4. Operating Condition of EUT

Let EUT work in on

5.5. Test Procedure

5.5.1. Air Discharge**:**

The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This procedure was repeated until all the air discharge completed

5.5.2. Contact Discharge**:**

All the procedure was same as Section 8.7.1. except that the generator was re-triggered for a new single discharge and repeated 50 times for each pre-selected test point. The tip of the discharge electrode was touching the EUT before the discharge switch was operated.

5.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges were 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.

5.5.4. Indirect discharge for vertical coupling plane

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

5.6. Test Results

PASS.

The EUT was tested and all the test results are listed in next page.

Electrostatic Discharge Test Results

Applicant	:	Acrox Technologies Co,.Ltd	Test Date	:	2012.06.08
EUT	:	2.4G Optical Mouse	Temperature	:	25℃
M/N	:	G3O	Humidity	:	56%
Test Voltage	:	DC 3V	Test Mode	:	on
Test Engineer	:	Tony	Pressure	:	105.3KPa
Required Performance	:	B	Actual Performance	:	A

Air Discharge: ±2kV ±4kV ±8kV # For Air Discharge each Point Positive 10 times and negative 10 times discharge.

Contact Discharge: ±2kV ±4kV # For Contact Discharge each point positive 25 times and negative 25 times discharge

For the time interval between successive single discharges an initial value of one second.

Discharge Voltage (kV)	Type of discharge	Dischargeable Points	Performance		Result
			Required	Observation	(Pass/Fail)
±2	Contact	1	B	A	**Pass**
±4	Contact	1	B	A	**Pass**
±2	Air	2，3，4	B	A	**Pass**
±4	Air	2，3，4	B	A	**Pass**
±8	Air	2，3，4	B	A	**Pass**
±2	HCP-Bottom	Edge of the HCP	B	A	**Pass**
±2	VCP-Front	Center of the VCP	B	A	**Pass**
±2	VCP-Left	Center of the VCP	B	A	**Pass**
±2	VCP-Back	Center of the VCP	B	A	**Pass**
±2	VCP-Right	Center of the VCP	B	A	**Pass**
±4	HCP-Bottom	Edge of the HCP	B	A	**Pass**
±4	VCP-Front	Center of the VCP	B	A	**Pass**
±4	VCP-Left	Center of the VCP	B	A	**Pass**
±4	VCP-Back	Center of the VCP	B	A	**Pass**
±4	VCP-Right	Center of the VCP	B	A	**Pass**

Discharge Points Description

1	Screw		
2	Slots		
3	Buttom		
4	Switch		

Performance: Operation as intended no loss of function during test and after test. No unintentional transmissions happened in Idle mode

Discharge was considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

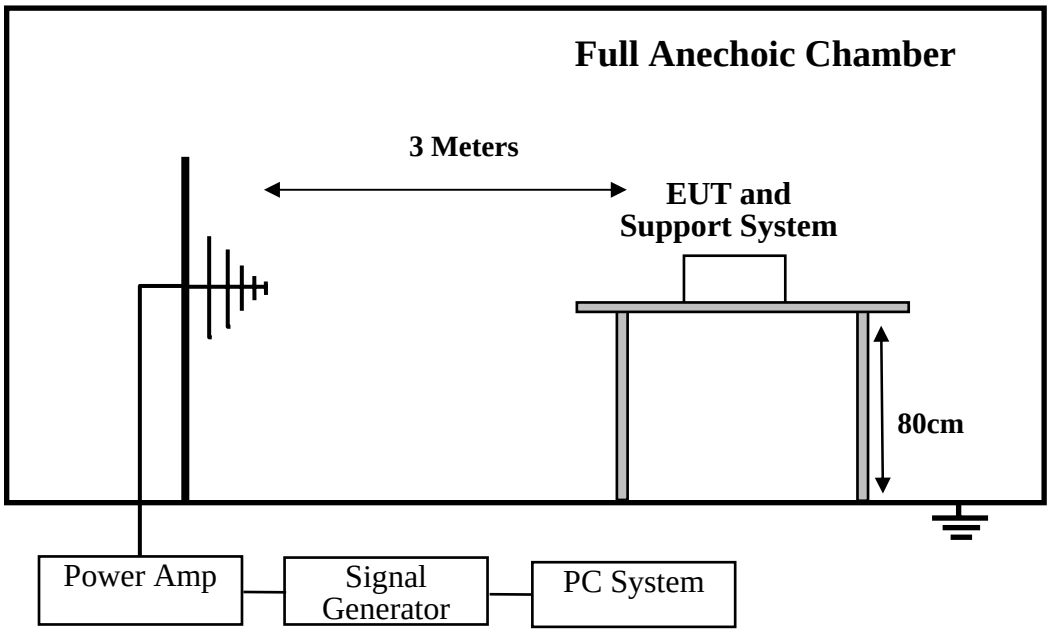
6.RF FIELD STRENGTH SUSCEPTIBILITY TEST

6.1. Test Equipment

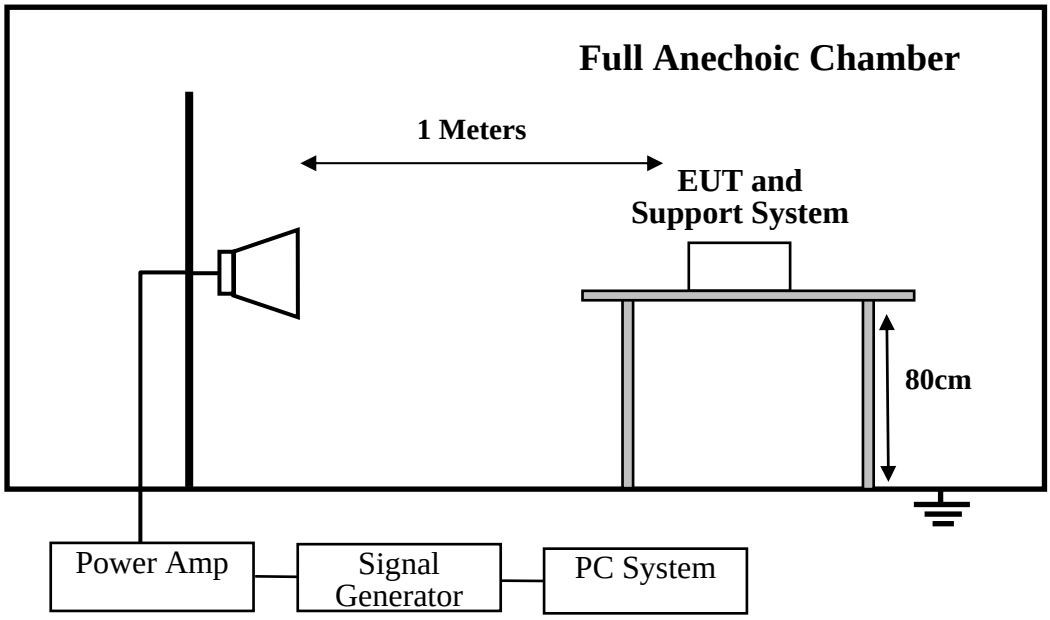
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Generator	HP	8648A	3426A01263	Apr.10,12	1 Year
Amplifier	A&R	500A100	17034	Apr.10,12	1 Year
Amplifier	A&R	100W	17028	Apr.10,12	1 Year
Isotropic Field Monitor	A&R	FM2000	16829	Apr.10,12	1 Year
Isotropic Field Probe	A&R	FP2000	16755	Apr.10,12	1 Year
Biconic Antenna	EMCO	3108	9507-2534	Apr.10,12	1 Year
Log-periodic Antenna	A&R	AT1080	16812	Apr.10,12	1 Year

6.2. Block Diagram of Test Setup

Frequency For 80-1000MHz



Frequency For 1.4-2.7GHz



6.3. Test Severity Level and Performance Criteria

Severity Level	Test Field Strength V/m	Performance Criteria
1.	1	**A**
2.	3	
3.	10	
X.	Special	

6.4. Operating Condition of EUT

Let EUT work in normal

6.5. Test Procedure

The field sensor is placed on the EUT table (0.8 meter above the ground) which is 3 meters (for frequency range 80MHz-1GHz) and 1 meters (for 1.4GHz-2.7GHz) away from the transmitting antenna. Through the signal generator, power amplifier and transmitting antenna to produce a uniformity field strength (3V/m measured by field sensor) around the EUT table from frequency range 80MHz-1000MHz,1.4GHz-2.7GHz and records the signal generator‘s output level at the same time for whole measured frequency range. Then, put EUT and its simulators on the EUT turn table and keep them 3 meters away from the transmitting antenna which is mounted on an antenna tower and fixes at 1 meter height above the ground. Using the recorded signal generator’s output level to measure the EUT from frequency range 80MHz-1000MHz,1.4GHz-2.7GHz and both horizontal & vertical polarization of antenna must be set and measured. Each of the four sides of EUT must be faced this transmitting antenna and measures individually.

All the scanning conditions are as follows:

Test conditions	
Frequency	80MHz-1GHz, 1.4GHz—2.7GHz
Frequency increments step	1% of momentary used
Test level	3V/m (unmodulated)
Dwell time	3s
Test signal	80% amplitude modulated by 1kHz sinusoidal audio signal

6.6. Test Results

PASS.

The EUT was tested and all the test results are listed in next page.

RF Field Strength Susceptibility Test Results

Applicant	:	Acrox Technologies Co,.Ltd	Test Date	:	2012.06.08
EUT	:	2.4G Optical Mouse	Temperature	:	25℃
M/N	:	G3O	Humidity	:	56%
Test Voltage	:	DC 3V	Test Mode	:	on
Test Engineer	:	Tony	Pressure	:	105.3KPa
Required Performance	:	A	Actual Performance	:	A

Modulation: ☑ AM ☐ Pulse ☐ none 1 kHz 80%

Frequency Rang :80 MHz -1000MHz

EUT vs Antenna Position	Test antenna :Horizontal		Test antenna :Vertical		Result
	Required	Observation	Required	Observation	(Pass / Fail)
Front	A	A	A	A	Pass
Right	A	A	A	A	Pass
Rear	A	A	A	A	Pass
Left	A	A	A	A	Pass

Performance: Operation as intended no loss of function during test and after test. No unintentional transmissions happened in Idle mode

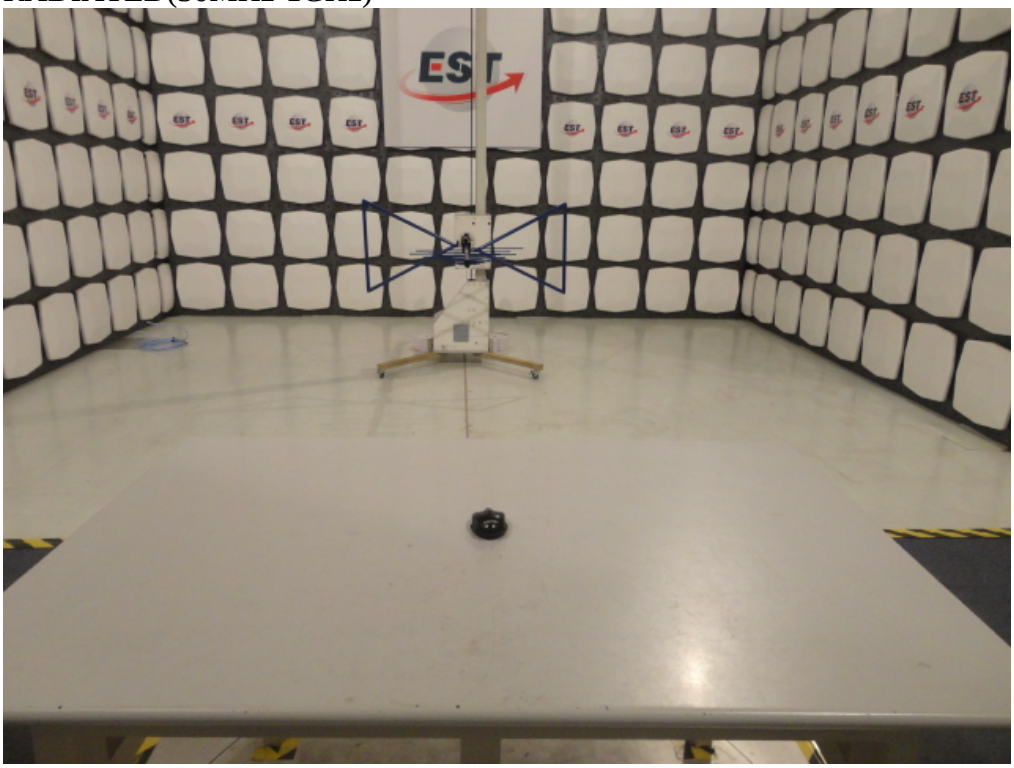
Frequency Rang : 1.4GHz—2.7GHz

EUT vs Antenna Position	Test antenna :Horizontal		Test antenna :Vertical		Result
	Required	Observation	Required	Observation	(Pass / Fail)
Front	A	A	A	A	Pass
Right	A	A	A	A	Pass
Rear	A	A	A	A	Pass
Left	A	A	A	A	Pass

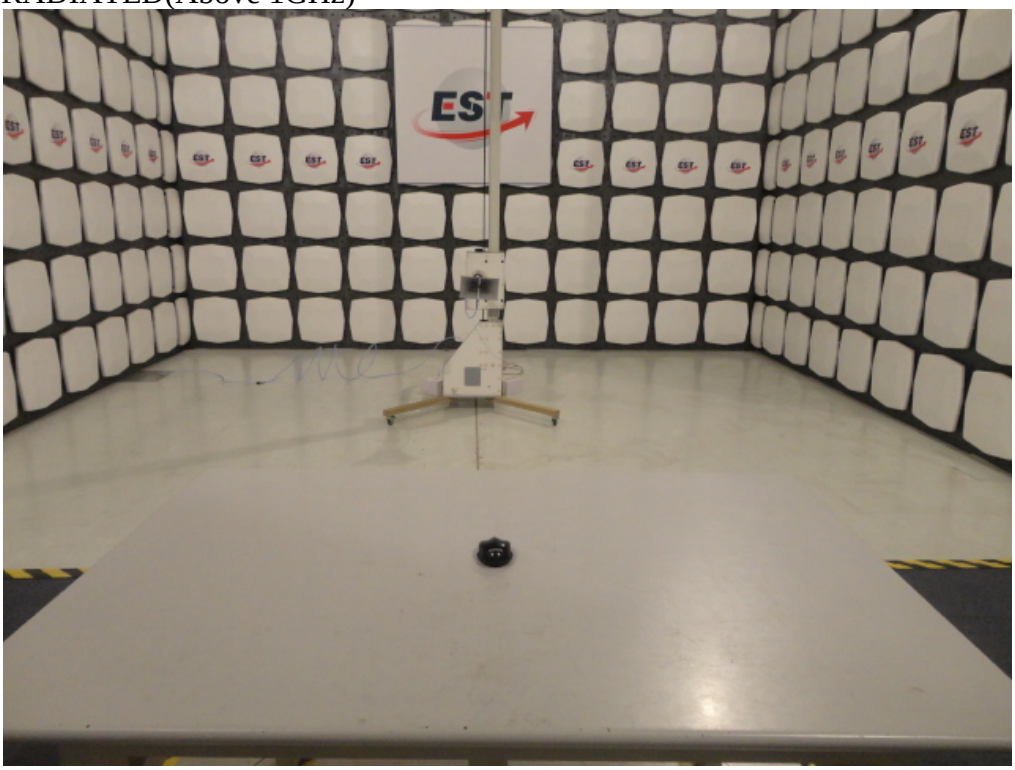
Performance: Operation as intended no loss of function during test and after test. No unintentional transmissions happened in Idle mode

7.PHOTOGRAPHS OF TEST SET-UP

RADIATED(30MHz-1GHz)



RADIATED(Above 1GHz)



Electrostatic Discharge Test

RF FIELD STRENGTH SUSCEPTIBILITY TEST

8.PHOTOS OF THE EUT

Figure 1
General Appearance of the EUT

Figure 2
General Appearance of the EUT

Figure 3
General Appearance of the EUT

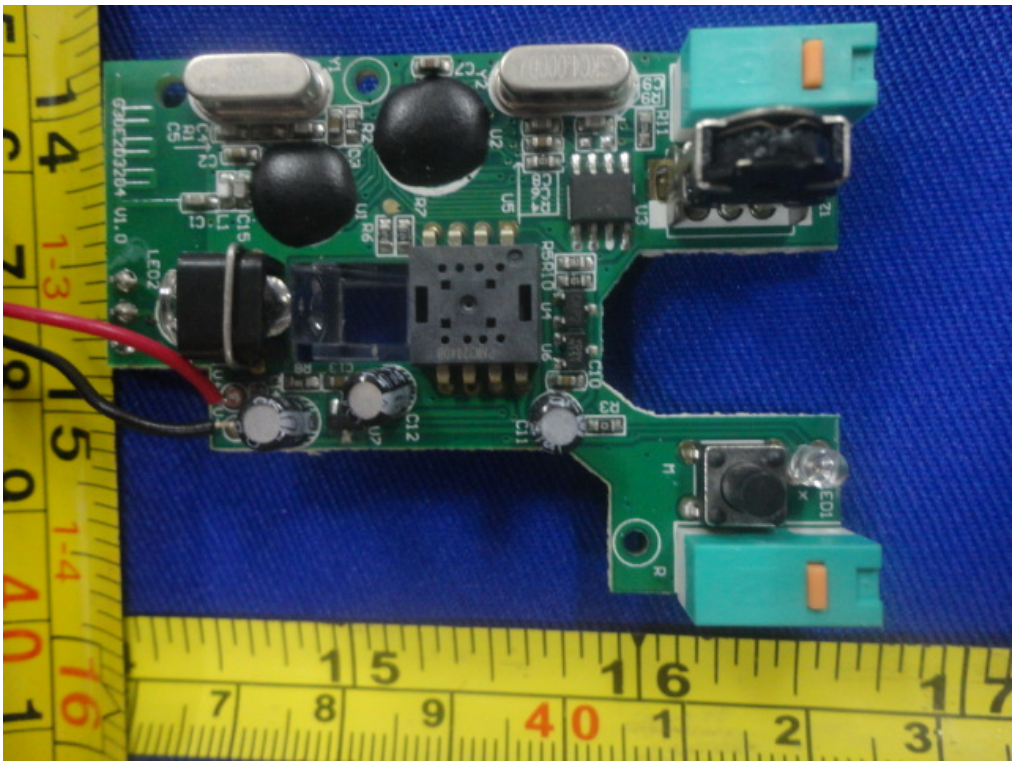


Figure 4
General Appearance of the EUT