EUROFINS TESTING TECHNOLOGY (SHENZHEN) CO., LTD.

CE-EMC
TEST- REPORT

TEST REPORT NUMBER: EFSN14040316E-E01

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2 General Information

2.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter "Description of test item" and are not transferable to any other test items.

Eurofins Testing Technology (Shenzhen) Co., Ltd. is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

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Operator:

2014-4-18		Rocky Mao	
Date	Eurofins	Name	Signature

Technical responsibility for area of testing:

2014-4-18		Tom Tian	
Date	Eurofins	Name	Signature

2.2 Testing laboratory

Eurofins Testing Technology (Shenzhen) Co., Ltd.
3A, F1.6, Tianfa Building, Tian'an Cyber Park, Futian District, Shenzhen City, GD, PRC 518040
Telephone : +86-755-83585700
Fax : +86-755-83585701

Test location, where different:

Name : Shenzhen SEM.Test Technology Co., Ltd.
Address : 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian'er Road, Block 70, Bao'an District, Shenzhen, Guangdong, China
Telephone : +86-755-3366 3308
Fax : +86-755-3366 3309
All items were performed and tested by Rocky Mao at Shenzhen SEM.Test Technology Co., Ltd.

2.3 Details of approval holder

Name : Gembird Europe B.V.
Address : Wittevrouwen 56, 1358CD Almere, The Netherlands

Telephone : ./.
Fax : ./.

2.4 Application details

Date of receipt of application : 2014-4-10
Date of receipt of test item : 2014-4-10
Date of test : 2014-4-11 to 2014-4-16

2.5 Test item

Description of test product : Wire G-Laser mouse
Type identification : M8.2 6key G-Laser
Brand Name : ./.
Serial number : ./.
Ratings : dc 5V by PC
Additional information : ./.

Manufacturer:
(if applicable)

Name : ./.
Address : ./.

2.6 Test standards

Technical standard :

EN 55022:2010

EN 55024:2010

3 Technical test

3.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

or

The deviations as specified were ascertained in the course of the tests performed. ☐

3.2 Test environment

Temperature	: 20	...	25°C
Relative humidity content	: 30	...	60%
Air pressure	: 100	...	103kPa

3.3 Description of test mode

Normal Mode: Connect mouse to PC, Power on it and make sure it works normally during testing.

3.4 Test equipment utilized

Equipment Name	Manufactory	Model	Serial No.	Cal Due date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2015-03-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2015-03-27
L.I.S.N	SCHWARZBECK	NSLK8126	8126-224	2015-03-27
L.I.S.N	EMCO	3825/2	11967C	/
Clamp	SCHWARZBECK	MDS21	3809	2015-03-27
Spectrum Analyzer	Rohde & Schwarz	FSEA20	DE25181	/
Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-03-27
Amplifier	Agilent	8447F	3113A06717	2015-03-27
RF Switch	EM	EMSW18	SW060023	/
Positioning Controller	C&C	CC-C-1F	/	/
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2015-02-24
Horn Antenna	SCHWARZBECK	BBHX9120	9120	/
Loop Antenna	SCHWARZBECK	HFRA 5150	9453	/
Triple-Loop Antenna	EVERFINE	LLA-2	711001	2015-03-27
Coaxial Cable	SCHWARZBECK	AK9513	9513-10	/
Spectrum Analyzer	Agilent	E4402B	US41192821	2015-03-27
RF Limiter	Agilent	11867A	MY42241803	/
RMS/PEAK Voltmeter	Rohde & Schwarz	URE3	826135/008	/
INDUSTRIAL CONTROLLER	Rohde & Schwarz	PSP7	826033001	/
Attenuator	ATTEN	ATS100-4-20	/	/
Attenuator	ATTEN	ATS002-4-20	/	/
Attenuator	ATTEN	ATS010-4-30	/	/
ESD Generator	NOISEKEN	ESS-200AX	H467644	/

Transient 2000	EMC Partner	TRA2000	863	2015-03-27
Couple Clamp	EMC Partner	CN-EFT1000	513	2015-03-27
CDN	FRANKONIA	M2+M3	A3011104	/
ESD Generator	TESQ AG	NSG 437	161	2015-03-27
Semi-Anechoic Chamber	SAEMC	966	/	/
Shielding Room	SAEMC	743	/	/
Shielding Room	SAEMC	443(TRIPLE LOOP ROOM)	/	/
Shielding Room	SAEMC	443(CONTROL ROOM)	/	/
Power Divider	Weinschel	1506A	PM204	2015-03-27
Impedance Matching PADS	Weinschel	9070-50/75	/	/
Impedance Matching PADS	Weinschel	9070-50/75	/	/
Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2015-03-27
RF Current Probe	FCC	F-33-4	091684	2015-03-27
Attenuator	ATTEN	ATS010-4-10	/	/
GSM Tester	Rohde & Schwarz	CMU200	112012	2015-03-27
Coaxial Cable	SEM.Test	1M0RFC	AMP-SW	/
Coaxial Cable	SEM.Test	2M0RFC	966-AMP	/
Coaxial Cable	SCHWARZBECK	5M0RFC	CLAMP	/
Coaxial Cable	SEM.Test	2M4RFC	LISN	/
Coaxial Cable	SEM.Test	1M0RFC	SW-ESVB	/
Coaxial Cable	SEM.Test	0M4RFC	SW-FSP	/
EMI Test Software	Shurple	EZ-EMC-RA	SEM-V3A1	/
Horn Antenna	ETS	3117	00086197	2015-02-24
Pre-amplifier	Compliance Direction	PAP-1G18	24002	2015-03-27
Coaxial Cable	Agilent	LL142-07-07-10M	08050035	/

CS Immunity Tester	EMTEST	CWS500	0900-03	2015-03-27
Attenuator	EMTEST	MA-5100/6BF2	1009	2015-03-27
CDN	Luthi	L-801M2/M3	2665	2015-03-27
RF Limiter	ATTEN	AT-BSF-2400~2500	/	/
RF Limiter	ATTEN	AT-BSF-0136~0174	/	/
RF Limiter	ATTEN	AT-BSF-0400~0500	/	/
RF Limiter	ATTEN	AT-BSF-0820~0920	/	/
RF Limiter	ATTEN	AT-BSF-1710~1910	/	/
Coaxial Load	ATTEN	ATF010-2	/	/
Combine Power	ATTEN	ATGF50-2.5-20	11300100205702	/
Signal Generator	HP	8648A	3642U01277	/
Digital Power Analyzer	California Instrument	CTS	72831	/
Power Source	California Instrument	5001IX-CTS-400	60077	2015-03-27
Cell Site Test Set	HP	8921A	3524A02414	2015-03-27
Coaxial Attenuator	ATTEN	ATS002-4-6	/	/

3.5 Test results

☒ 1st test ☐ test after modification ☐ production test

Test case	Sub clause	Required	Test passed	Test failed
Radiated emission(1)	Clause 6 of EN 55022	☒	☒	☐
Conducted emission	Clause 5 of EN 55022	☐	☐	☐
Harmonics current emission	EN 61000-3-2	☐	☐	☐
Voltage changes, voltage fluctuations and flicker	EN 61000-3-3	☐	☐	☐
Electrostatic discharge	Clause 4.2.1 of EN 55024	☒	☒	☐
Electrical fast transients(EFT)	Clause 4.2.2 of EN 55024	☒	☒	☐
Continuous radio frequency disturbances	Clause 4.2.3.2 of EN 55024	☒	☒	☐
Continuous conducted disturbances	Clause 4.2.3.3 of EN 55024	☒	☒	☐
Power-frequency magnetic fields	Clause 4.2.4 of EN 55024	☐	☐	☐
Surges	Clause 4.2.5 of EN 55024	☐	☐	☐
Voltage dips and interruptions	Clause 4.2.6 of EN 55024	☐	☐	☐

Note 1: The highest frequency of the internal sources of this EUT is less than 108 MHz, the radiated emission measurement shall only be made up to 1 GHz.

4 Emission Test

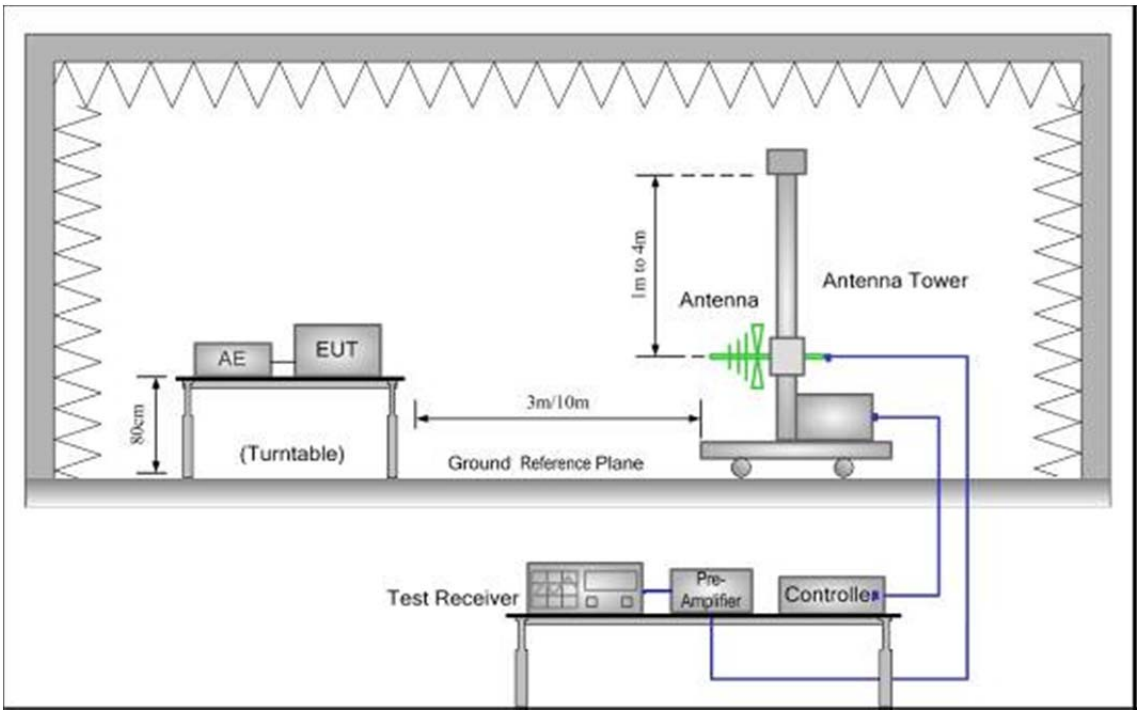
4.1 Radiated emission

This clause lays down the general requirements for the measurement of Radiated disturbance produced at the space of apparatus.

4.1.1 Limits

Frequency range	Quasi-peak limits at 10m	Quasi-peak limits at 3m
MHz	dB (μV/m)	dB (μV/m)
30 to 230	30	40
230 to 1000	37	47
At transitional frequencies the lower limit applies.		

4.1.2 Measurement procedure



1. The radiated emissions test was conducted in a semi-anechoic chamber. The EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

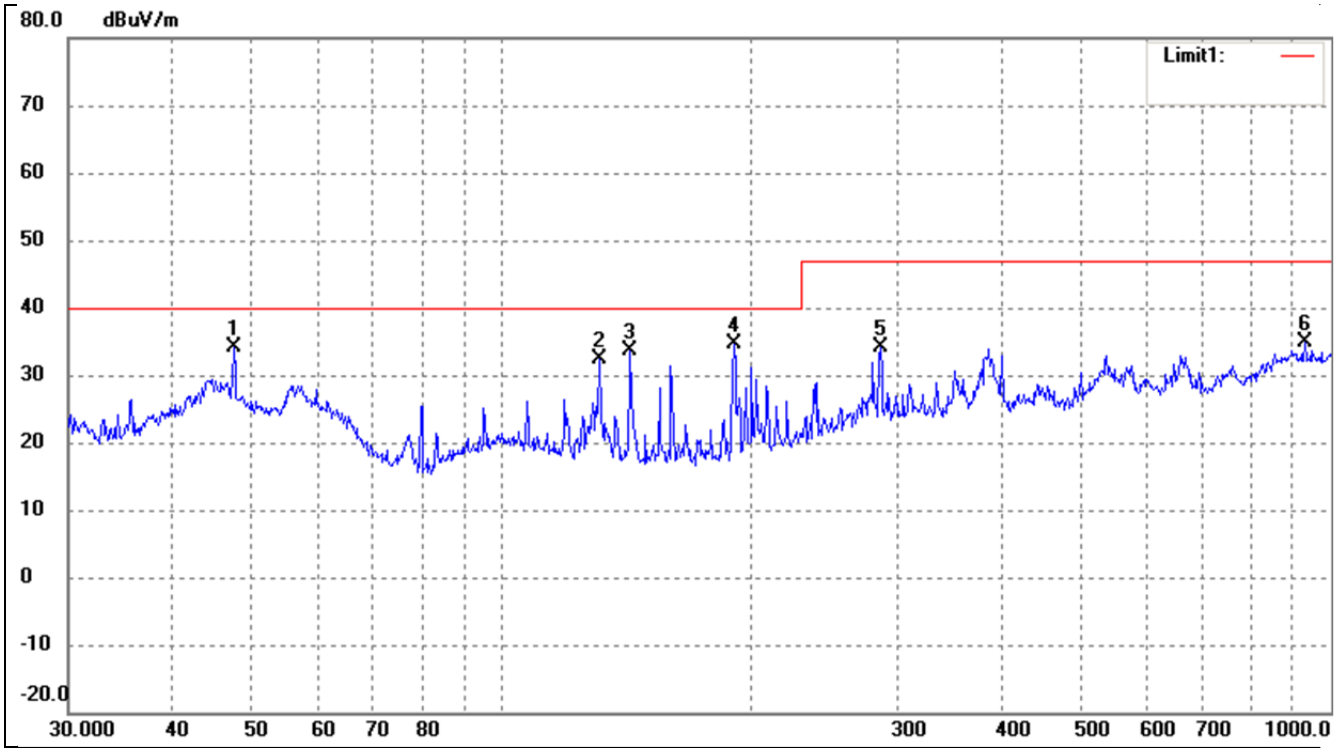
2. The frequencies of maximum emission were determined in the final radiated emissions measurement, the physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization. Test was performed on subcontractor.

4.1.3 Measurement uncertainty

Ulab(cond) = 4.5dB at 95% level of confidence, k=2

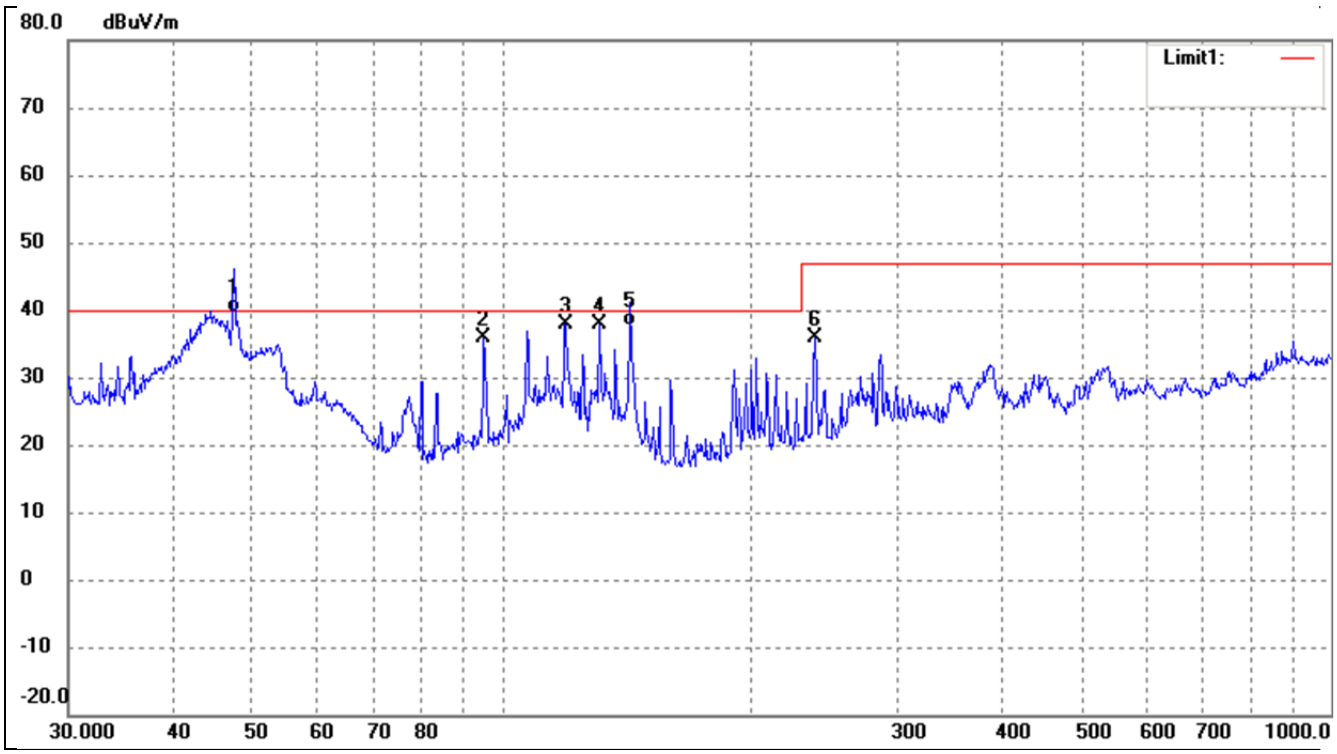
4.1.4 Results

Job No.:	**re**	**Polarization:**	**Horizontal**
Standard:	**EN55022**	**Power Source:**	**DC 5V**
Test item:	**Radiation Test**	**Date:**	**14/04/16/**
Temp.(℃)/Hum.(%RH):	**22℃/54%RH**	**Time:**	**14/27/24**
EUT:		**Test By:**	**Rocky**
Model:	**Mouse**	**Distance:**	**3m**
Mode:			
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Detector
1	47.4918	27.50	6.51	34.01	40.00	-5.99			peak
2	131.2965	29.39	3.11	32.50	40.00	-7.50			peak
3	142.8244	31.30	2.43	33.73	40.00	-6.27			peak
4*	190.4050	31.34	3.23	34.57	40.00	-5.43			peak
5	285.9778	25.55	8.64	34.19	47.00	-12.81			peak
6	929.0082	18.62	16.36	34.98	47.00	-12.02			peak

Job No.:	**re**	**Polarization:**	**Vertical**
Standard:	**EN55022**	**Power Source:**	**DC 5V**
Test item:	**Radiation Test**	**Date:**	**14/04/16/**
Temp.(℃)/Hum.(%RH):	**22℃/54%RH**	**Time:**	**14/29/36**
EUT:		**Test By:**	**Rocky**
Model:	**Mouse**	**Distance:**	**3m**
Mode:			
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Detector
1*	47.4918	32.50	7.01	39.51	40.00	-0.49	230	100	QP
2	95.0930	31.02	4.89	35.91	40.00	-4.09			peak
3	119.4361	33.80	4.08	37.88	40.00	-2.12			peak
4	131.2965	34.69	3.11	37.80	40.00	-2.20			peak
5	142.8244	35.27	2.43	37.70	40.00	-2.30	360	100	QP
6	238.3102	29.61	6.23	35.84	47.00	-11.16			peak

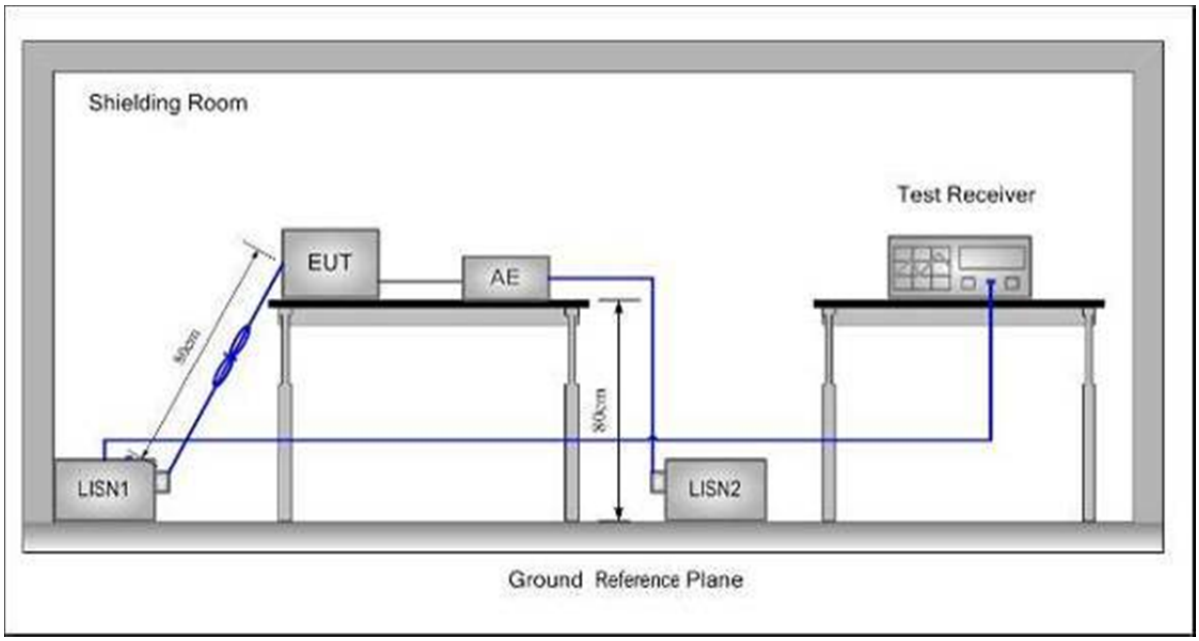
4.2 Conducted Emission

This clause lays down the general requirements for the measurement of disturbance voltage produced at the terminals of apparatus.

4.2.1 Limits

Frequency range MHz	**At mains terminals** dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 30 MHz. Note2: The lower limit is applicable at the transition frequency.		

4.2.2 Measurement procedure



1. The mains terminal disturbance voltage was measured with the EUT in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a (50 μH + 5 Ω) || 50 Ω linear impedance. The power cables of all other units of the EUT was connected to a second LISN, which was bonded to the ground reference plane in the same way as the LISN for the unit being measured.

3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

4.2.3 Measurement uncertainty

Ulab(cond) = 3.45dB at 95% level of confidence, K=2

4.2.4 Results -Measurement Data

N/A

4.3 Harmonic Current Emissions

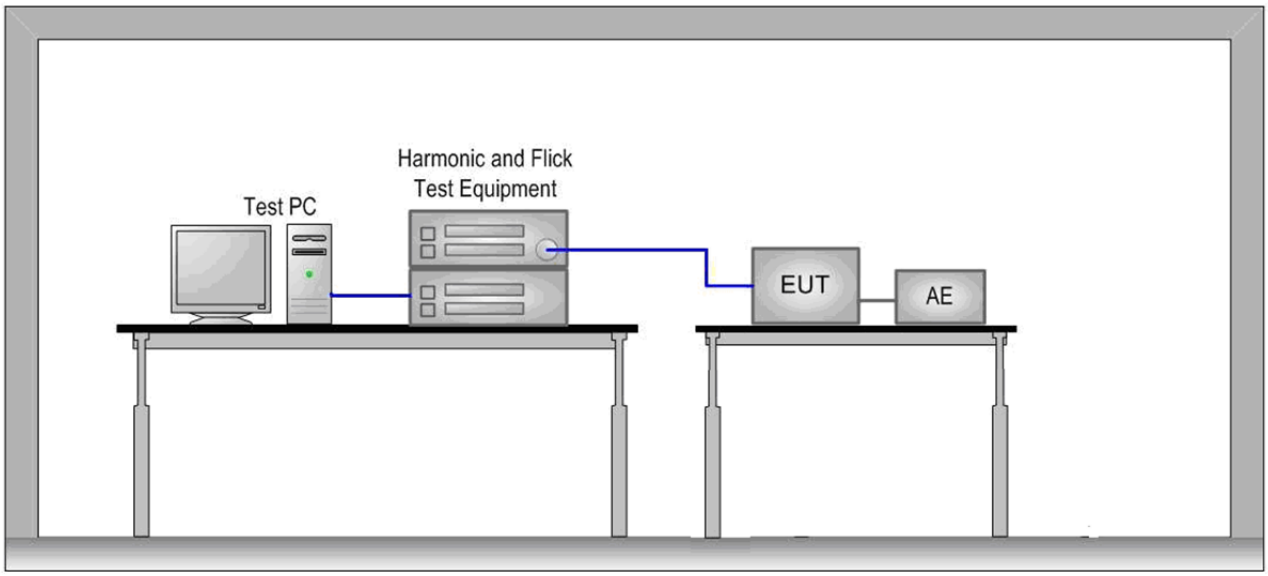
This part deals with the limitation of harmonic currents injected into the public supply system.

4.3.1 Limits

Limit for Class A equipment

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \le n \le 39$	$0,15 \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \le n \le 40$	$0,23 \frac{8}{n}$

4.3.2 Measurement procedure



The equipment under test is placed on a wooden table with a height of 0,8 m in the EMC lab. For each harmonic order, measure the 1,5 s smoothed r.m.s. harmonic current in each DFT time window and calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period. Each harmonic order, all 1.5 s smoothed r.m.s. harmonic current values and the average values for the individual harmonic currents, taken over the entire test observation period shall be less than or equal to the applicable limits.

4.3.3 Results

N/A

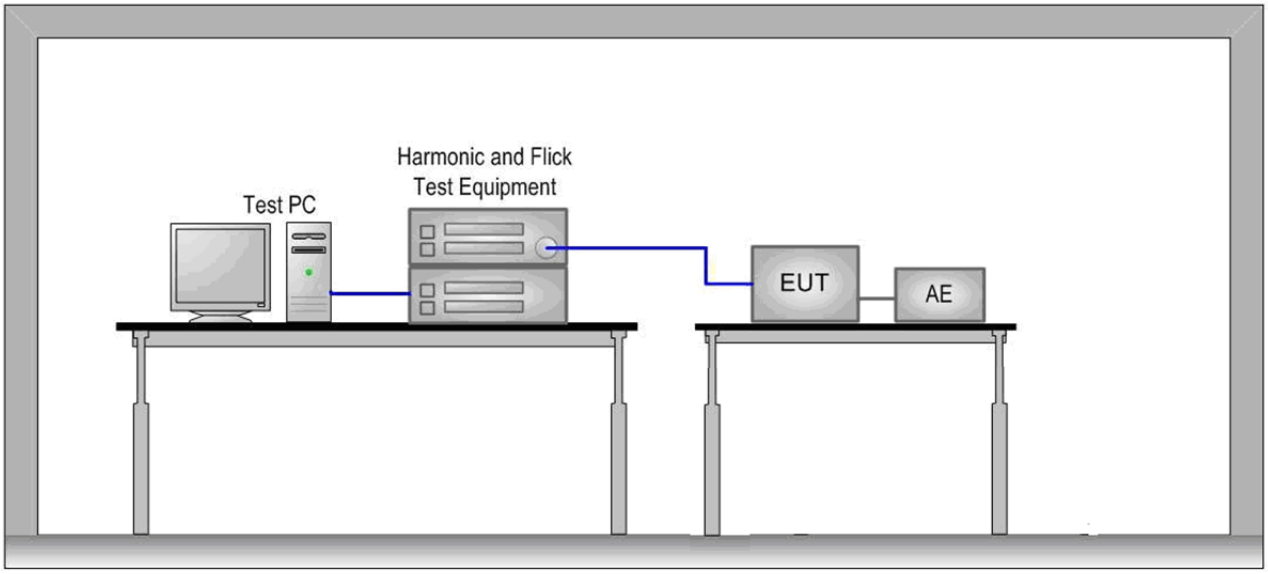
4.4 Voltage Changes, Voltage Fluctuations and Flicker

This part is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

4.4.1 Limits

Value	Limit
Pst	1,0
Plt	0,65
dt	3,3%
dc	3,3%
dmax	4,0%

4.4.2 Measurementest procedure



The equipment under test is placed on a wooden table with a height of 0,8 m in the EMC lab. The voltage fluctuations and flicker were measured at the supply terminals of the EUT. Test was performed on AC port.

4.4.3 Results

N/A

Eurofins Testing Technology (Shenzhen) Co., Ltd.
3A, F1.6, Tianfa Building, Tian'an Cyber Park, Futian District, Shenzhen City, GD, PRC 518040

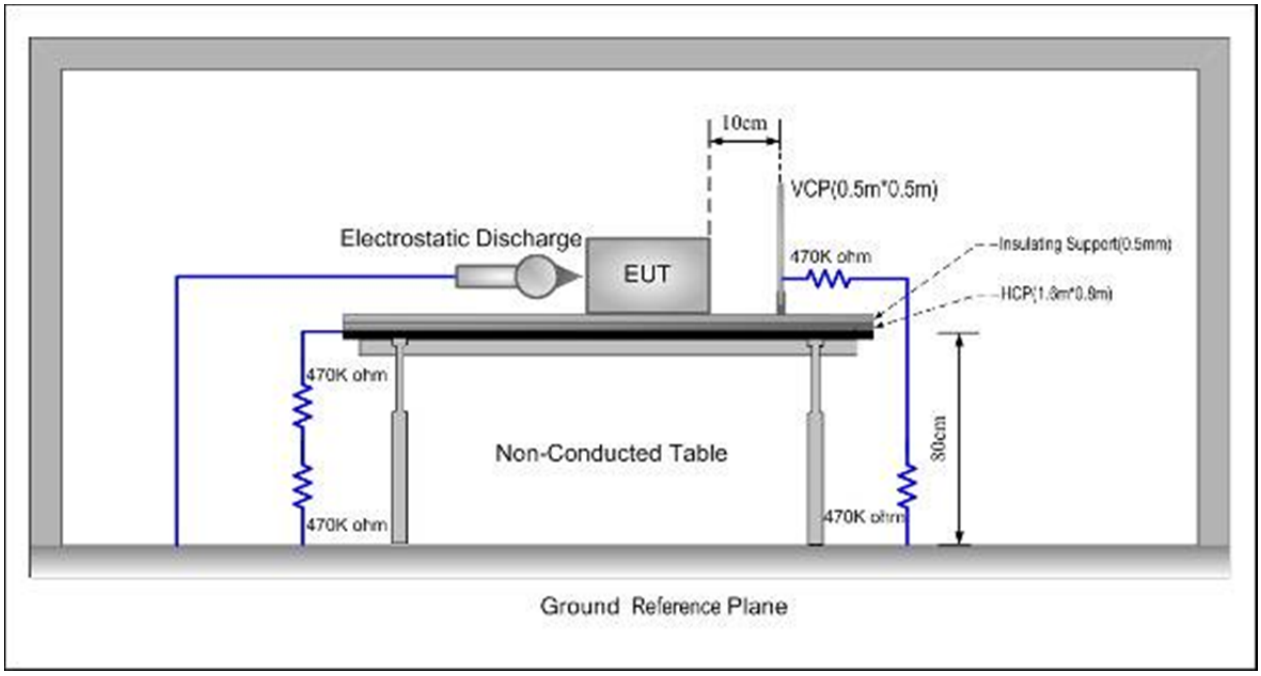
5 Immunity Test

5.1 Performance Criteria Description in Clause 7 of EN 55024

Criterion A:	The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus 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, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
Criterion B:	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
Criterion C:	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

5.2 ESD

5.2.1 Test Procedures



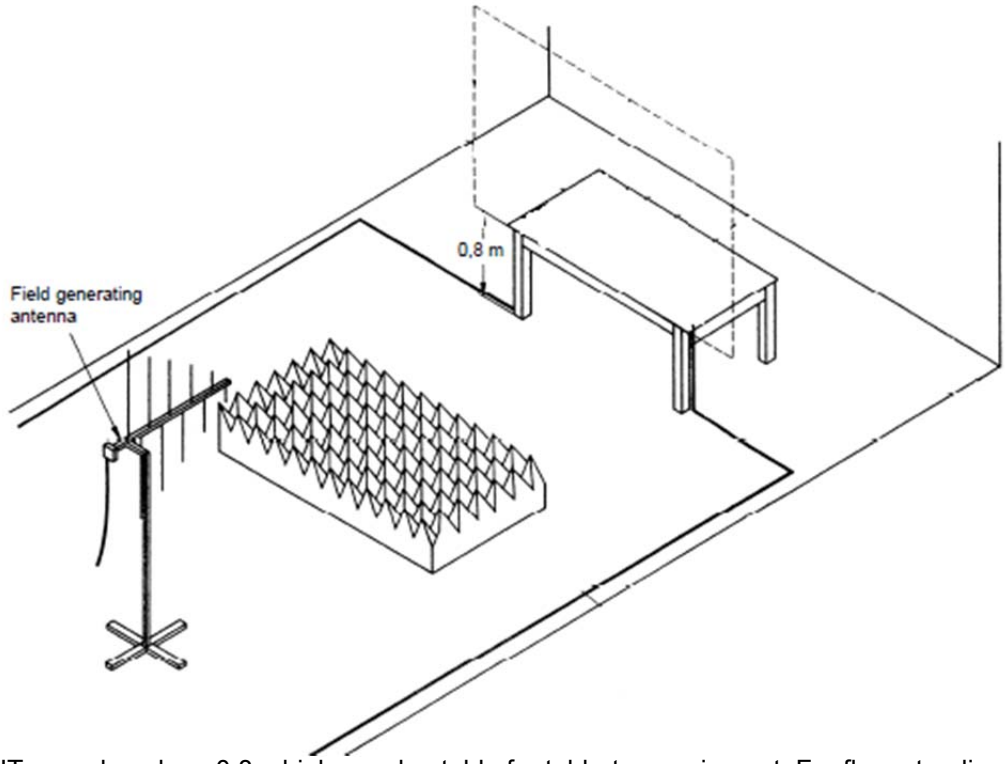
1. Contact discharge was applied only to conductive surfaces of the EUT. Air discharge was applied only to non-conducted surfaces of the EUT.
2. The EUT was put on a 0.8m high wooden table for table-top equipment or 0.1m high for floor standing equipment standing on the ground reference plane (GRP).
3. A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size while HCP were constructed from the same material type and thickness as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end. The distance between EUT and any of the other metallic surface excepted the GRP, HCP and VCP was greater than 1m.
4. During the contact discharges, the tip of the discharge electrode was touch the EUT before the discharge switch is operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the ESD generator was removed from the EUT, the generator is then retriggered for a new single discharge. For ungrounded product, a discharge cable with two resistances were used after each discharge to remove remnant electrostatic voltage. 10 times of each polarity single discharge were applied to HCP and VCP.

5.2.2 Results

Test point	Table (T) Floor (F)	Contact (C) Air (A)	Voltage (kV)	Number of discharge	Polarity (+ / -)	Opinion
Air contact	T	A	±2, ±4, ±8	Mini 20/point	+ / -	B
Direct contact	T	C	±2, ±4	Mini 20/point	+ / -	B
HCP	T	C	±2, ±4	Mini 20/point	+ / -	B
VCP	T	C	±2, ±4	Mini 20/point	+ / -	B

5.3 Continuous radiated disturbances

5.3.1 Measurement procedure



1. The EUT was placed on 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP. The tests normally shall be performed with the generating antenna facing each of four sides of the EUT. When equipment can be used in different orientations (e.g. vertical or horizontal) the test shall be performed on all possible sides of the EUT.

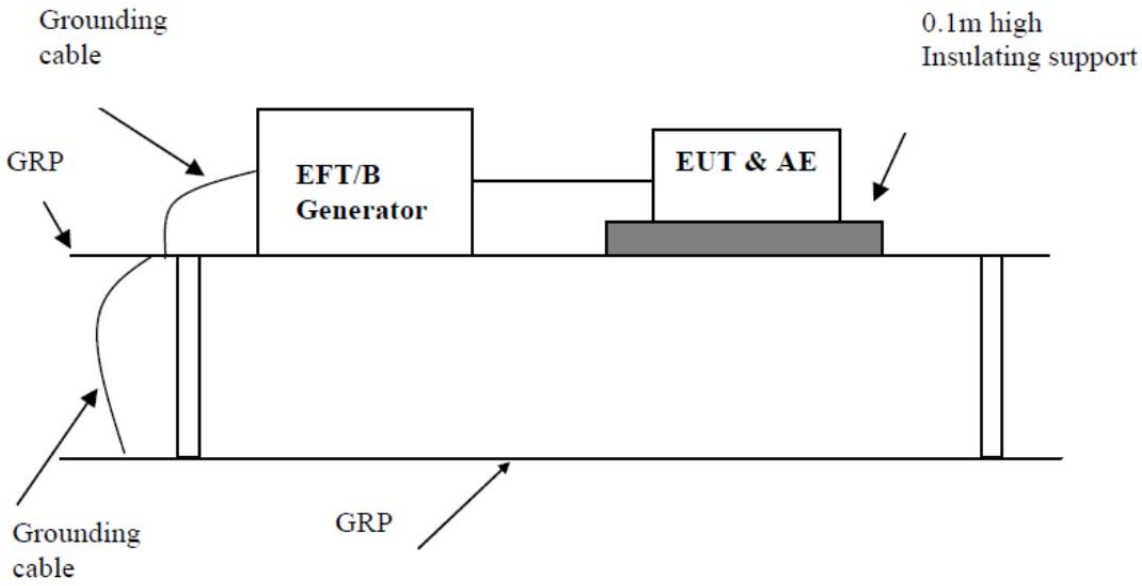
2. The tests are carried out with a field strength by 3 V/m (measured in the unmodulated field) with amplitude modulated signal by a depth of 80 % by a sinusoidal audio signal of 1 kHz. The logarithmic step was 1% and the dwell time was 3s dependent of the EUT cycle time. Test was performed on subcontractor.

5.3.2 Results

Frequency Range	Voltage(RMS)	Modulation Frequency	Opinion
80M-1GHz	3V/m	1kHz,80%,AM	A

5.4 Electrical Fast Transients

5.4.1 Measurement procedure



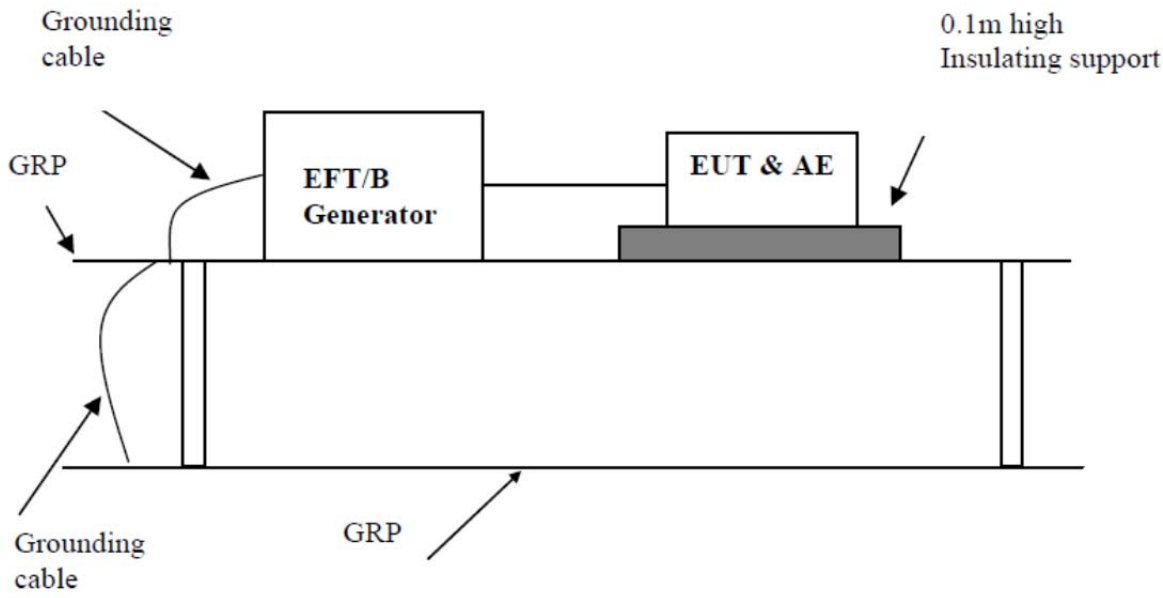
1. The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0,1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2. The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT was placed on the insulation support 0.1m above GRP. Cables not subject to EFT was routed as far as possible from cable under test to minimize the coupling between the cables.
3. The length of signal and power cable between the EUT and EFT generator was 0.5m. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1m above the GRP.

5.4.2 Results

Test port	Voltage (kV)	Polarity (+ / -)	Duration (s or min)	Waveform Tr / Th	Repetition Frequency (kHz)	Opinion
a.c. port, L	1	+/-	1 min	5/50 ns	5	B
a.c. port, N	1	+/-	1 min	5/50 ns	5	B
a.c. port, PE	1	+/-	1 min	5/50 ns	5	B
a.c. port, L+N	1	+/-	1 min	5/50 ns	5	B
a.c. port, L+PE	1	+/-	1 min	5/50 ns	5	B
a.c. port, N+PE	1	+/-	1 min	5/50 ns	5	B
a.c. port, L+N+PE	1	+/-	1 min	5/50 ns	5	B

5.5 Surge Immunity

5.5.1 Measurement procedure



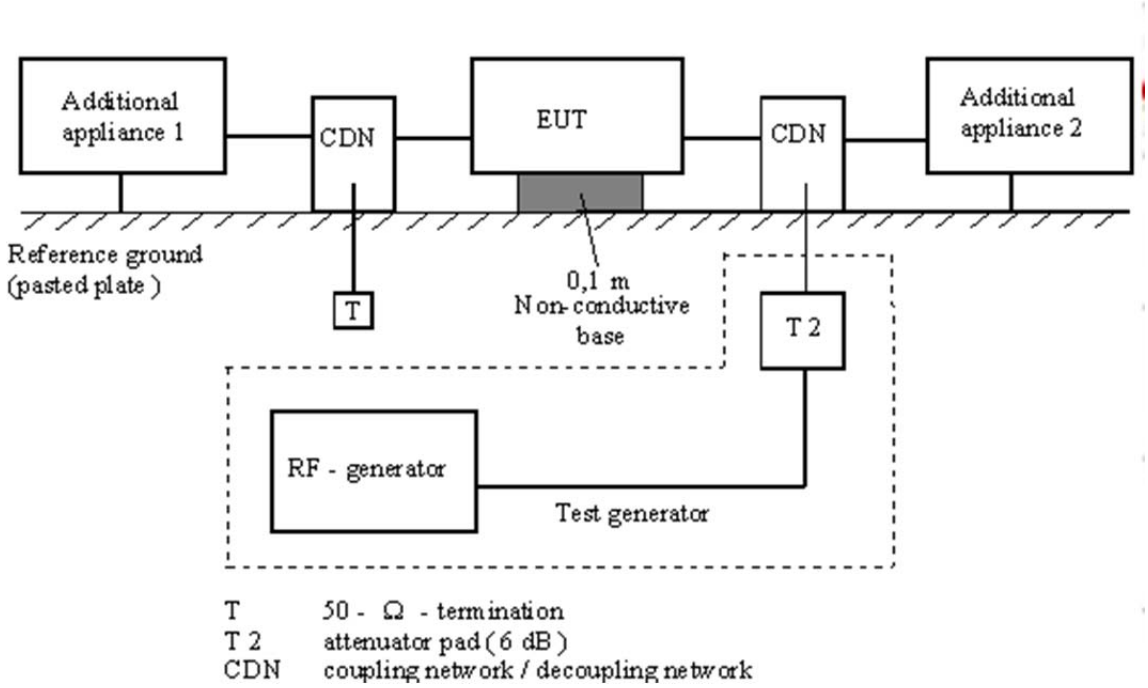
1. The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0,1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2. The 1,2/50 μs surge was to be applied to the EUT power supply terminals via the capacitive coupling network .Decoupling networks were required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines and to provide sufficient decoupling impedance to the surge wave so that the specified wave may be applied on the lines under test.
3. Test was performed on AC port. Five positive and five negative pulses each at 0º, 90º, 180º and at 270º. Time between successive pulses: 1 min.

5.5.2 Results

N/A

5.6 Continuous conducted disturbances

5.6.1 Measurement procedure



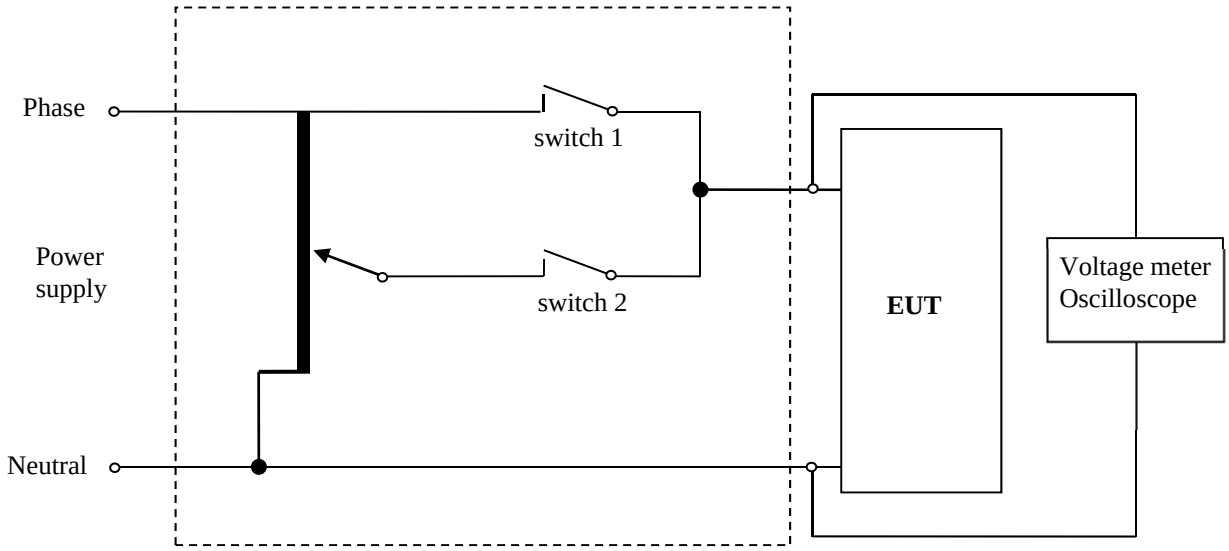
1. The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.
2. The coupling and decoupling devices were required, they were located between 0,1 m and 0,3 m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.
3. The frequency range was swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to change coupling devices as necessary. Where the frequency was swept incrementally, the step size do not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 1.0 s.

5.6.2 Results

Test port	Voltage (rms)	Modulation Frequency	Frequency Range	Opinion
a.c. ports	3V	1 kHz, 80%,AM	150 kHz - 80 MHz	A

5.7 Voltage dips and Interruption

5.7.1 Measurement procedure



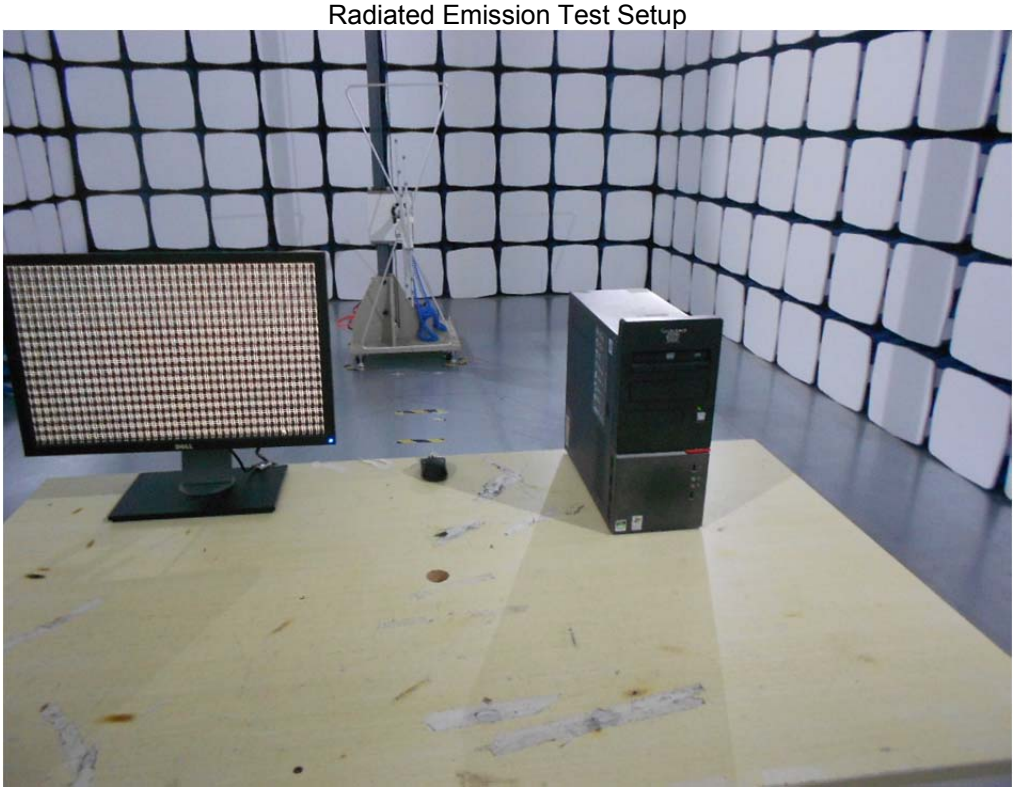
1. The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0,1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2. The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer. Voltage change shall occur at zero crossing
3. The EUT was tested for each selected combination of test level and duration with a sequence of three dips /interruptions with intervals of 10 s minimum. Each representative mode of operation was tested.

5.7.2 Results

N/A

6 Test Setup

Radiated Emission Test Setup



ESD Test Setup

CS Test Setup

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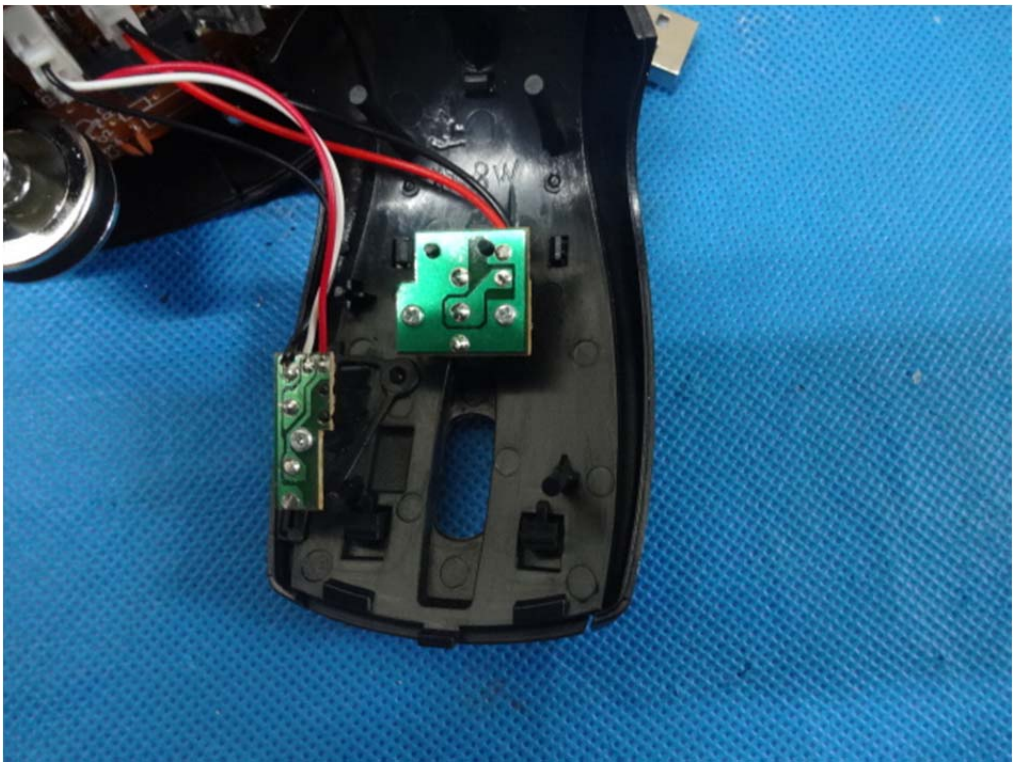
3A, F1.6, Tianfa Building, Tian'an Cyber Park, Futian District, Shenzhen City, GD, PRC 518040

7 EUT Photos

Picture 1 Overall View

Picture 2 Overall View

Picture 3 Open View



Picture 4 Internal View

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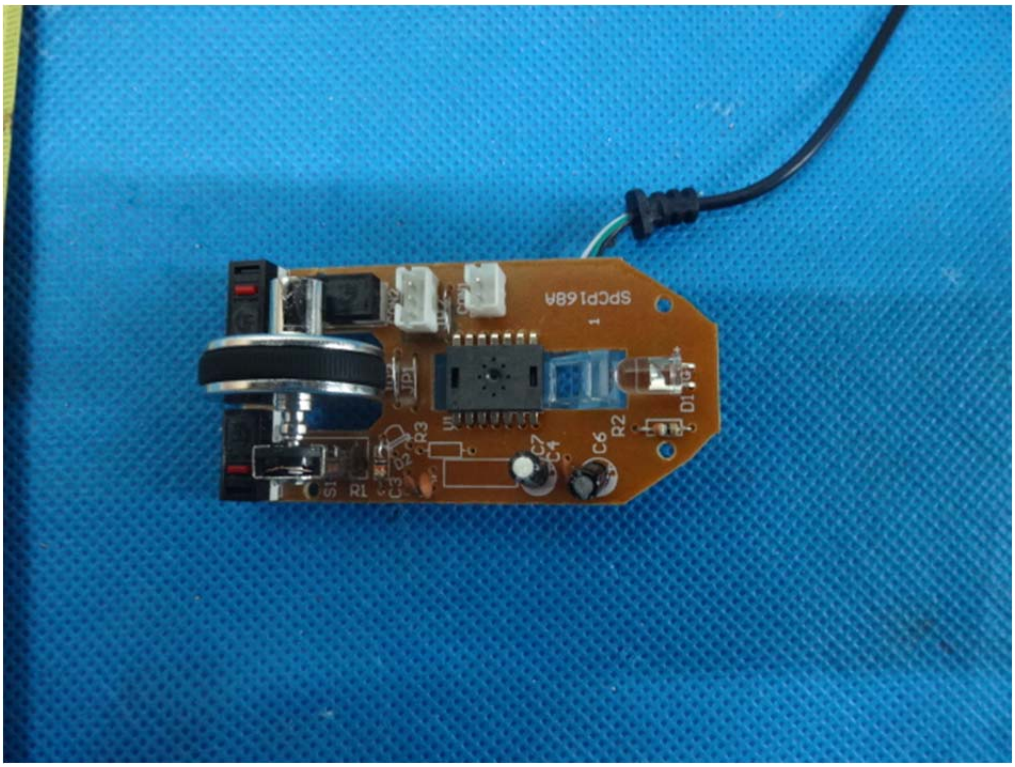
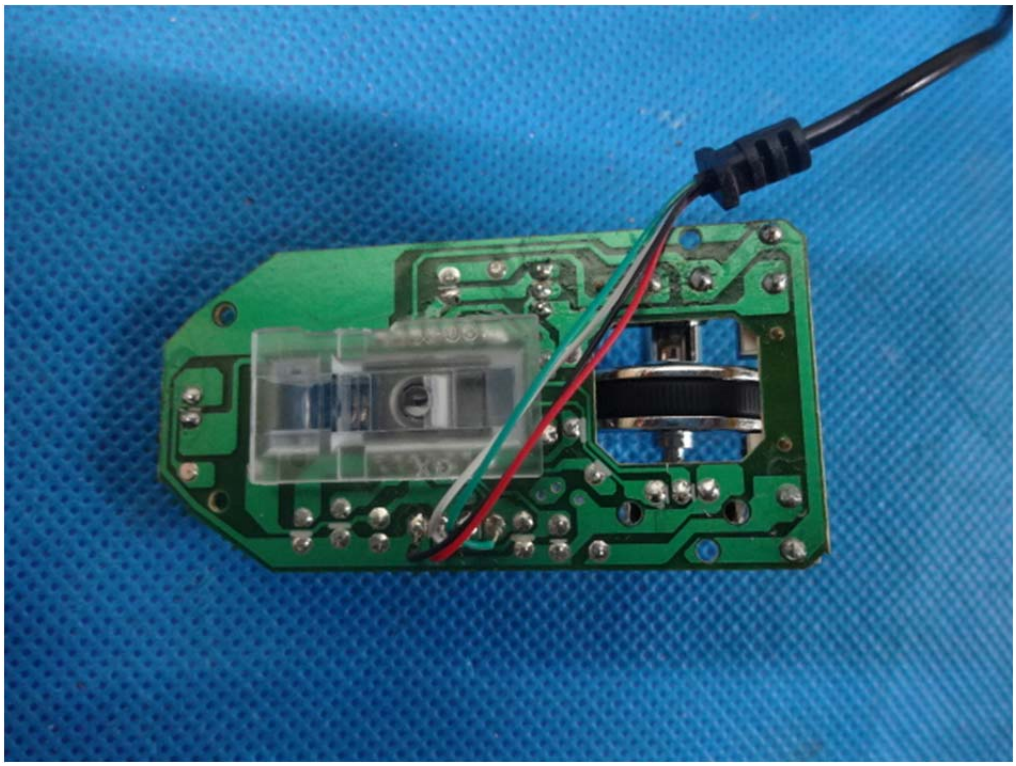


Picture 5 Internal View


Picture 6 Internal View

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