

# EMC Measurement and Test Report

For

**Senix Electronics Technology Limited**

**4/F, Block 15-2, Chuangye Industrial Area, Shapuwei, SongGang**

**Street, Baoan District, Shenzhen, China**

<b>Test Standards:</b>	<u>EN 55032:2015</u> <u>EN 55024:2010+A1:2015</u>
<b>Product Description:</b>	<u>Wired keyboard</u>
<b>Tested Model:</b>	<u>KB05</u>
<b>Report No.:</b>	<u>STR17108261E</u>
<b>Tested Date:</b>	<u>2017-10-26 to 2017-10-30</u>
<b>Issued Date:</b>	<u>2017-10-30</u>
<b>Tested By:</b>	<u>June Zheng / Engineer</u> 
<b>Reviewed By:</b>	<u>Silin Chen / EMC Manager</u> 
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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## 1. GENERAL INFORMATION

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

#### Client Information

Applicant: Senix Electronics Technology Limited  
Address of applicant: 4/F, Block 15-2, Chuangye Industrial Area,  
Shapuwei, SongGang Street, Baoan District,  
Shenzhen, China

Manufacturer: Senix Electronics Technology Limited  
Address of manufacturer: 4/F, Block 15-2, Chuangye Industrial Area,  
Shapuwei, SongGang Street, Baoan District,  
Shenzhen, China

General Description of EUT	
Product Name:	Wired keyboard
Trade Name:	/
Model No.:	KB05
Adding Model(s):	KB06, KB07, NK3300, NK3200, NK3100, NK2020-SME, NK2010-SME, NK1700-ME, NK1600-ME, NK1500-ME, NK1300-ME, NK1800-ME, NK1400-ME
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model KB05, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Rated Voltage:	5V
Rated Current:	100mA
Rated Power:	/
Power Adaptor Model:	/
Highest Internal Frequency:	Below 108MHz
Classification of Equipment:	Class B

## 1.2 Test Standards

The following report is prepared on behalf of the Senix Electronics Technology Limited in accordance with EN55032, Electromagnetic compatibility of multimedia equipment - Emission requirements, and EN55024, Immunity characteristics Limits and methods of measurement.

The objective of the manufacturer is to demonstrate compliance with the standards EN55032, and EN55024 for multimedia equipment.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with the standards EN55032, and EN55024 for Information Technology Equipment, and all related testing and measurement techniques intentional standards.

## 1.4 Test Facility

### **FCC – Registration No.: 125990**

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 125990.

### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

## 1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	Working	/

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
Power Line	2.0	Shielded	With Core

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
Host	Dell	Vostro 3902	/
Display	Samsung	LSZZPUHKF/XF	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
HDMI Line	1.0	Shielded	Without Core
Power Line	1.5	Shielded	Without Core

## 1.6 Performance Criteria for EMS

All the test data has been collected, reduced, and analyzed within this report in accordance with Immunity requires the following as specific performance criteria:

- A. The apparatus shall continue to operate as intended during and after the test. The manufacturer specifies some minimum performance level. The performance level may be specified by the manufacturer as a permissible loss of performance.
- B. The apparatus shall continue to operate as intended after the test. This indicates that the EUT does not need to function at normal performance levels during the test, but must recover. Again some minimal performance is defined by the manufacture. No change in operating state or loss or data is permitted.
- C. Temporary loss of function is allowed. Operation of the EUT may stop as long as it is either automatically reset or can be manually restored by operation of the controls.

## 1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1068	Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1066	EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11
SEMT-1003	AC LISN	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1060	DC LISN	Schwarz beck	NNBM8126D	279	2017-06-12	2018-06-11
SEMT-1061	DC LISN	Schwarz beck	NNBM8126D	280	2017-06-12	2018-06-11
SEMT-1085	8-WIRE LISN	Schwarz beck	8158	CAT3-8158-0059	2017-06-12	2018-06-11
SEMT-1086	8-WIRE LISN	Schwarz beck	8158	CAT5-8158-0117	2017-06-12	2018-06-11
SEMT-1005	Clamp	Schwarz beck	MDS21	3809	2017-06-12	2018-06-11
SEMT-1014	Loop Antenna	EVERFINE	LLA-2	711001	2017-06-08	2018-06-07
SEMT-1071	VDH Test Head	AFJ	VDH 30	SC022Z	2017-06-12	2018-06-11
SEMT-1057	Power Source	California Instrument	5001IX-CTS-400	25965	2017-06-12	2018-06-11
SEMT-1027	ESD Generator	TESQ AG	NSG 437	161	2017-08-15	2018-08-14
SEMT-1055	Signal Generator	HP	8648A	3642U01277	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1067	Amplifier	Agilent	8447D	2944A10179	2017-06-12	2018-06-11
SEMT-1024	Transient 2000	EMC PARTNER	TRA2000	863	2017-06-12	2018-06-11
SEMT-1045	CS Immunity Tester	EMTEST	CWS500	0900-03	2017-06-12	2018-06-11

## 2. SUMMARY OF TEST RESULTS

Standards	Description of Test Item	Result
EN55032	Conducted Emission	Compliant
	Radiated Emission	Compliant
EN61000-3-2	Harmonic Current Emission	N/A
EN61000-3-3	Voltage Fluctuation and Flicker	N/A
EN55024	Electrostatic Discharge Immunity in accordance with IEC 61000-4-2	Compliant
	Continuous Radiated Disturbances Immunity in accordance with IEC 61000-4-3	Compliant
	Electrical Fast Transient/Burst Immunity in accordance with IEC 61000-4-4	Compliant
	Surges Immunity in accordance with IEC 61000-4-5	Compliant
	Continuous Conducted Disturbances Immunity in accordance with IEC 61000-4-6	Compliant
	Power-frequency Magnetic Fields Immunity in accordance with IEC 61000-4-8	N/A
	Voltage Dips/Interruptions Immunity in accordance with IEC 61000-4-11	N/A

N/A: not applicable

### 3. Conducted Emission

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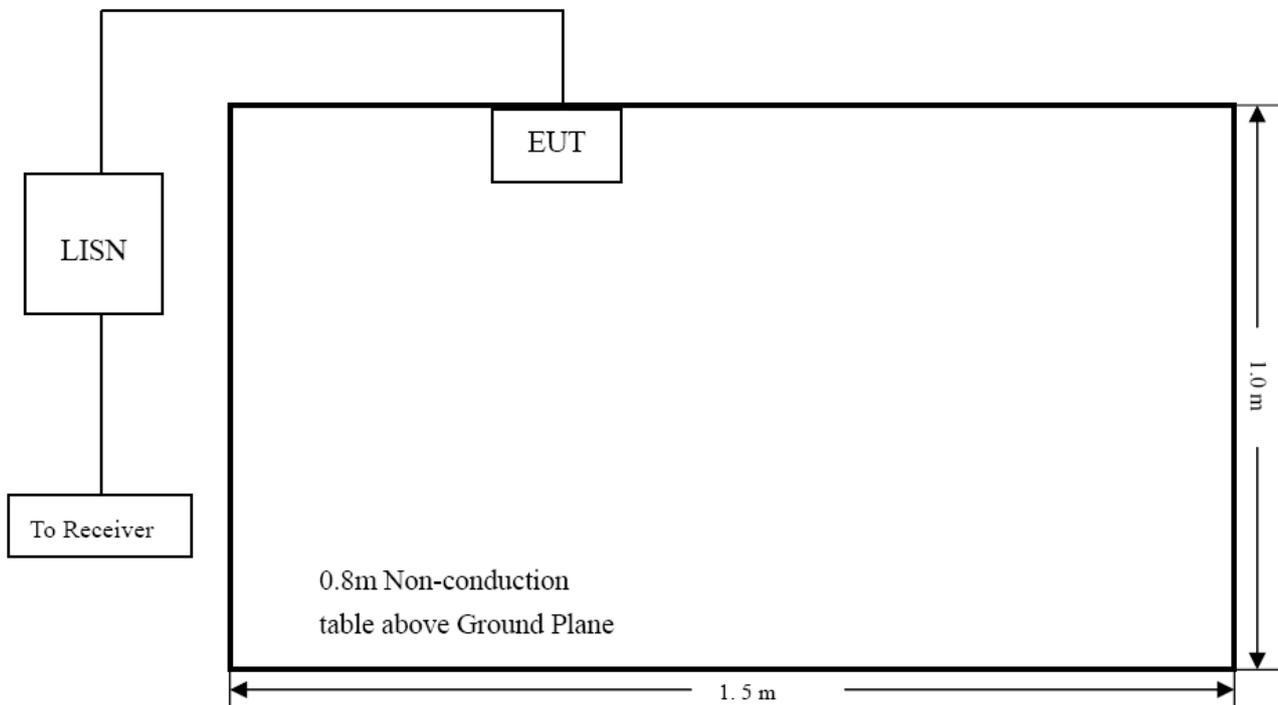
#### 3.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is  $\pm 2.88$  dB.

#### 3.2 Test Procedure

Test is conducting under the description of EN55032 Annex A.3.5.

#### 3.3 Basic Test Setup Block Diagram



### 3.4 Environmental Conditions

Temperature:	22 ° C
Relative Humidity:	55 %
ATM Pressure:	1015 mbar

### 3.5 Summary of Test Results/Plots

According to the data in section 3.6, the EUT complied with the EN55032 Conducted margin for a Class B device, with the *worst* margin reading of:

**-9.46 dB at 13.5060 MHz in the Neutral mode, QP detector, 0.15-30MHz**

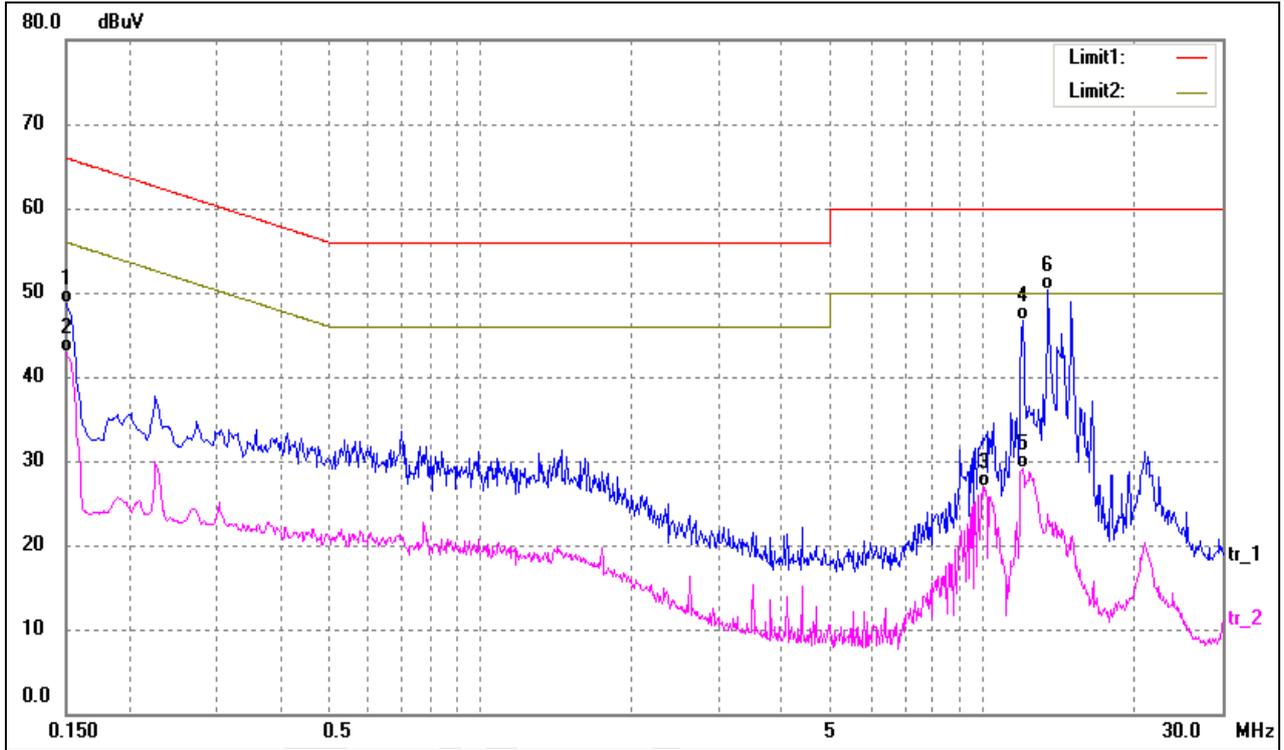
### 3.6 Conducted Emissions Test Data

EMC TEST

**Plot of Conducted Emissions Test Data**

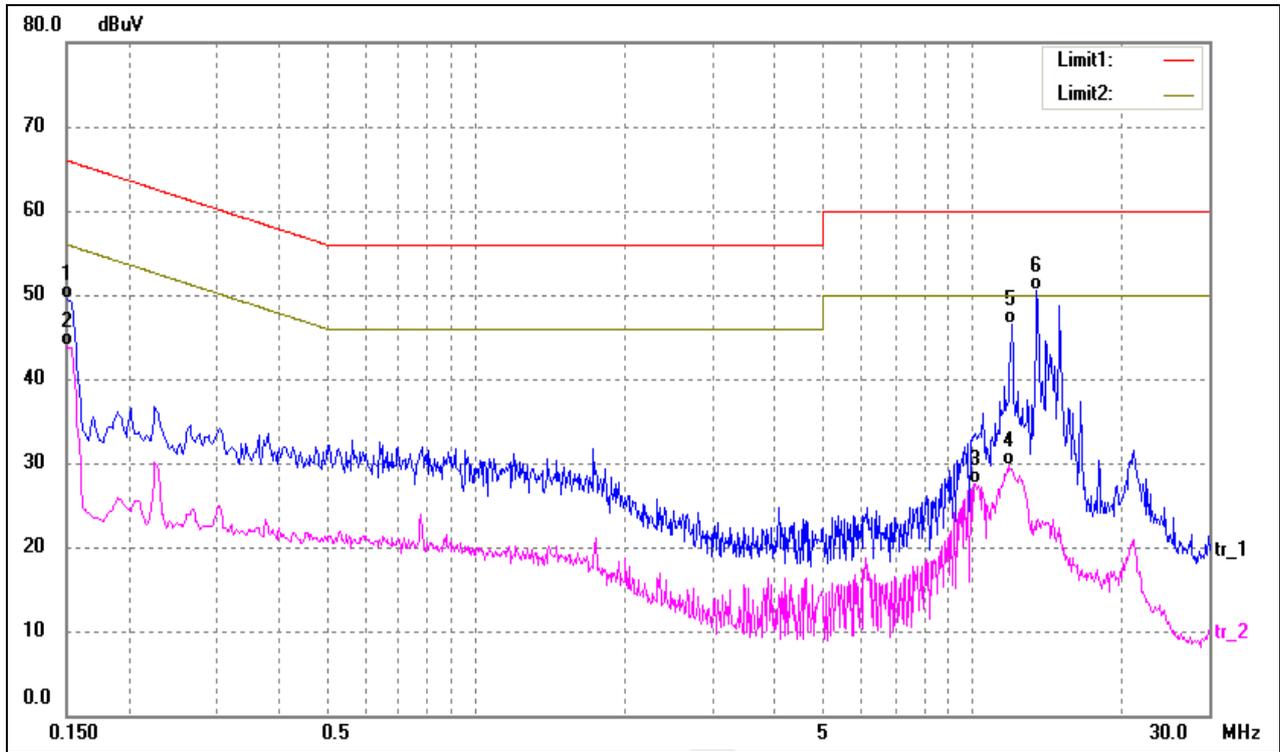
EUT: *Wired keyboard*  
 Tested Model: *KB05*  
 Operating Condition: *TM1*  
 Comment: *AC 230V/50Hz*

Test Specification: *Line*



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	38.80	9.85	48.65	66.00	-17.35	QP
2	0.1500	33.09	9.85	42.94	56.00	-13.06	AVG
3	10.0740	17.36	9.52	26.88	50.00	-23.12	AVG
4	12.0180	37.18	9.56	46.74	60.00	-13.26	QP
5	12.0180	19.55	9.56	29.11	50.00	-20.89	AVG
6*	13.5020	40.75	9.58	50.33	60.00	-9.67	QP

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	39.73	9.85	49.58	66.00	-16.42	QP
2	0.1500	33.99	9.85	43.84	56.00	-12.16	AVG
3	10.1540	18.00	9.52	27.52	50.00	-22.48	AVG
4	11.8220	20.20	9.55	29.75	50.00	-20.25	AVG
5	11.9980	37.00	9.56	46.56	60.00	-13.44	QP
6*	13.5060	40.96	9.58	50.54	60.00	-9.46	QP

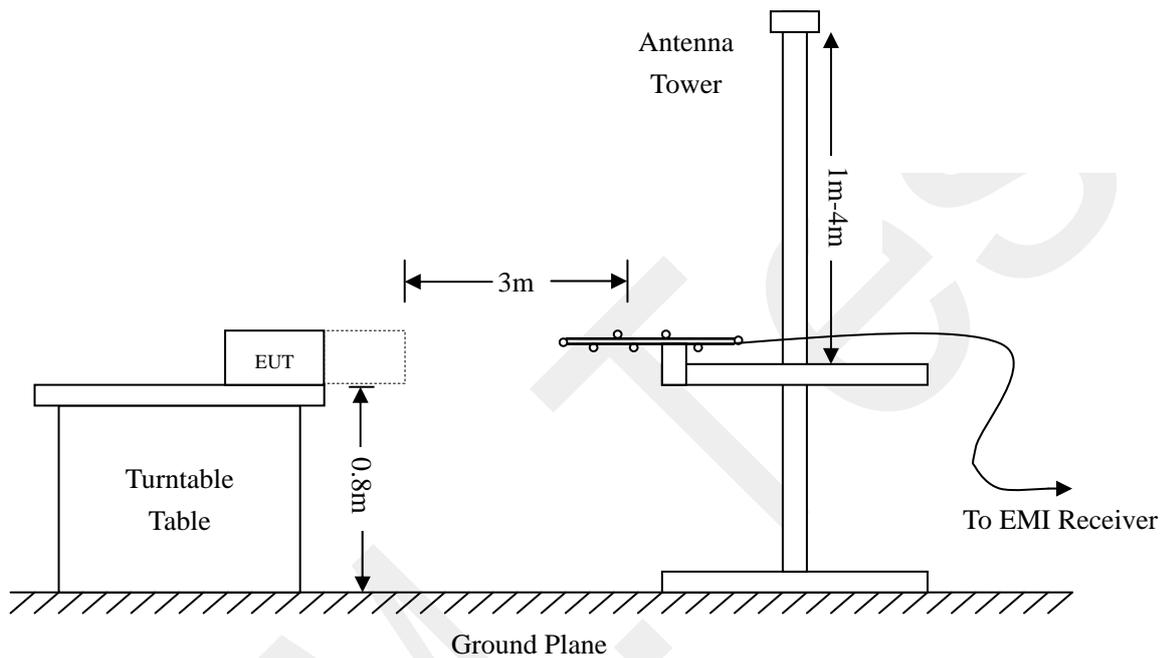
## 4. Radiated Emission

### 4.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any radiation emissions measurement is  $\pm 5.10$  dB.

### 4.2 Test Procedure

Test is conducting under the description of EN55032 Annex C.2.2.4



### 4.3 Corrected Amplitude & Margin Calculation

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

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

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of  $-6\text{dB}\mu\text{V}$  means the emission is  $6\text{dB}\mu\text{V}$  below the maximum limit for Class B device. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{EN55032 Class B Limit}$$

### 4.4 Environmental Conditions

Temperature:	23° C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

### 4.5 Summary of Test Results/Plots

According to the data in section 4.5, the EUT complied with the EN55032 Class B standards, and had the worst margin is:

**-7.56 dB at 31.3992 MHz in the Vertical polarization, 30 MHz to 1 GHz, 3Meters**

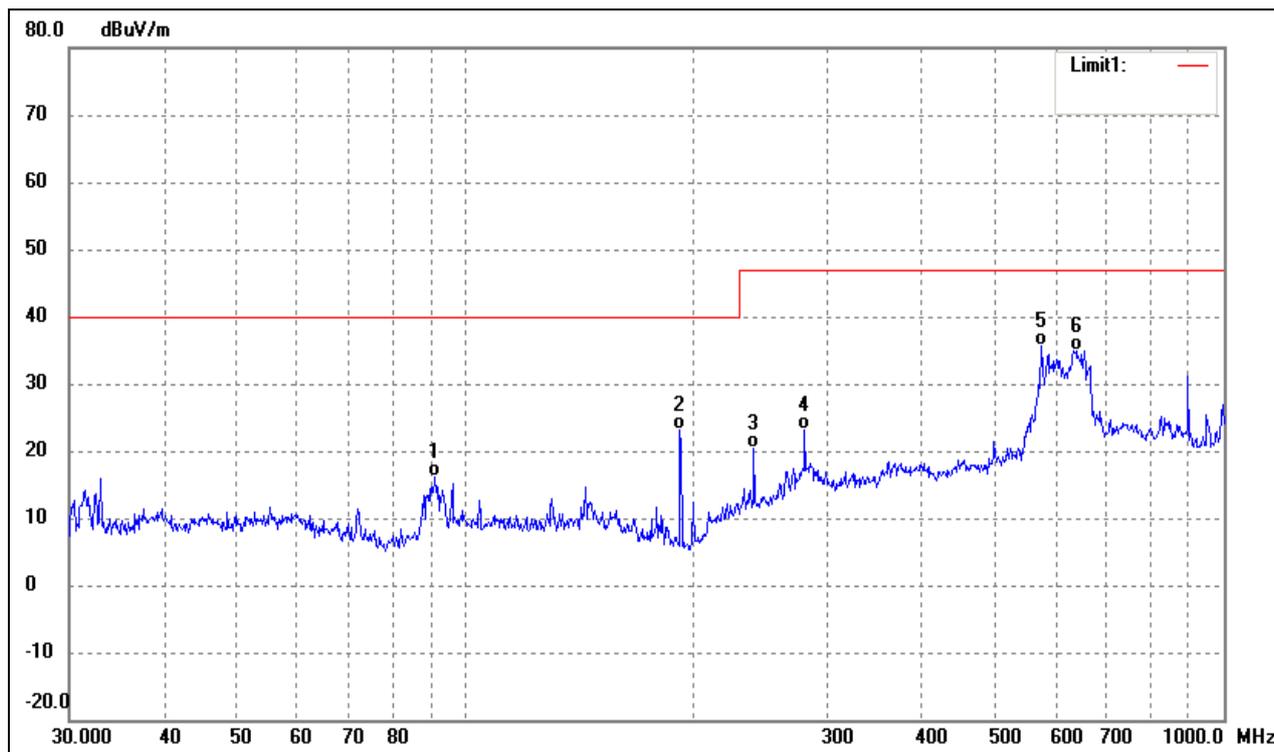
**Plot of Radiated Emissions Test Data**

 EUT: *Wired keyboard*

 Tested Model: *KB05*

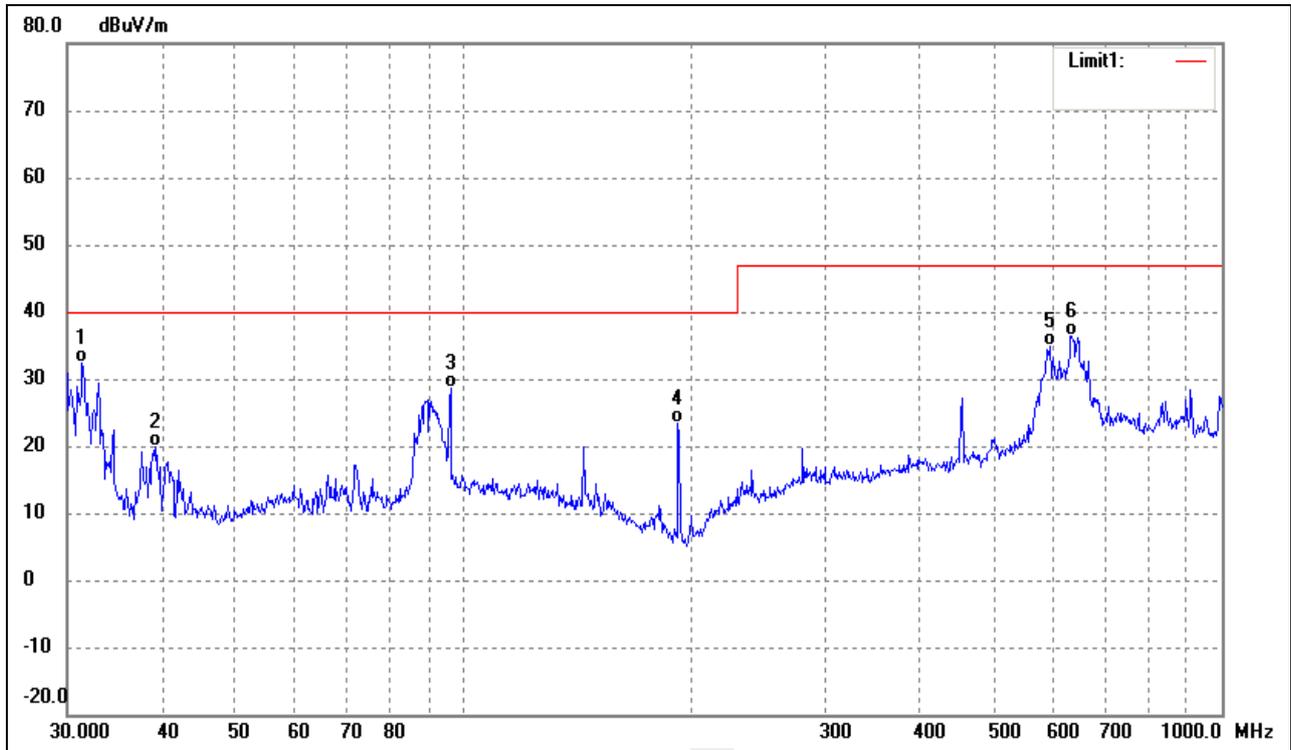
 Operating Condition: *TM1*

 Comment: *AC 230V/50Hz*

 Test Specification: *Horizontal*


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	91.1746	35.80	-19.72	16.08	40.00	-23.92	120	100	QP
2	191.7450	43.87	-20.84	23.03	40.00	-16.97	274	100	QP
3	239.9874	34.83	-14.35	20.48	47.00	-26.52	310	100	QP
4	280.0238	35.15	-12.11	23.04	47.00	-23.96	265	100	QP
5	574.6258	41.35	-5.82	35.53	47.00	-11.47	180	100	QP
6	638.3686	37.43	-2.63	34.80	47.00	-12.20	98	100	QP

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	31.3992	52.32	-19.88	32.44	40.00	-7.56	120	100	QP
2	39.2991	38.45	-18.54	19.91	40.00	-20.09	278	100	QP
3	96.0986	47.54	-18.99	28.55	40.00	-11.45	310	100	QP
4	191.7450	44.18	-20.84	23.34	40.00	-16.66	265	100	QP
5	593.0497	37.96	-3.16	34.80	47.00	-12.20	134	100	QP
6	633.9073	39.28	-2.78	36.50	47.00	-10.50	98	100	QP

## 5. Electrostatic Discharges (ESD)

### 5.1 Test Procedure

Test is conducting under the description of IEC61000-4-2.

### Test Performance

Performance Criterion: B

### Environmental Conditions

Temperature:	26 °C
Relative Humidity:	55%
ATM Pressure:	1011 mbar

### 5.2 Electrostatic Discharge Immunity Test Data

Table 1: Electrostatic Discharge Immunity (Air Discharge)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
USB Port	A	A	A	A	A	A	A	A	/	/
Gap	A	A	A	A	A	A	A	A	/	/

Table 2: Electrostatic Discharge Immunity (Direct Contact)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
USB Port	A	A	A	A	/	/	/	/	/	/

Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
Front Side	A	A	A	A	/	/	/	/	/	/
Top Side	A	A	A	A	/	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/	/

Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
Front Side	A	A	A	A	/	/	/	/	/	/
Top Side	A	A	A	A	/	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/	/

Test Result: Pass

## 6. Continuous Radiated Disturbances (R/S)

### 6.1 Test Procedure

Test is conducting under the description of IEC61000-4-3.

### Test Performance

Performance Criterion: A

### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1010 mbar

### 6.2 Continuous Radiated Disturbances Test Data

Frequency step: 1% of fundamental

Dwell time: 1 second

Modulation: AM by 1kHz sine wave with 80% modulation depth

Frequency Range(MHz)	Field (V/m)	Front		Rear		Left Side		Right Side	
		VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	3	A	A	A	A	A	A	A	A

Test Result: Pass

## 7. Electrical Fast Transients (EFT)

### 7.1 Test Procedure

Test is conducting under the description of IEC61000-4-4.

### Test Performance

Performance Criterion: B

### Environmental Conditions

Temperature:	22 °C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

### 7.2 Electrical Fast Transients Test Data

EN 61000-4-4 Test Points		Test Levels (kV)							
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
Power Supply Power Port of EUT	L1	B	B	B	B	/	/	/	/
	L2	B	B	B	B	/	/	/	/
	PE	B	B	B	B	/	/	/	/
	L1+L2	B	B	B	B	/	/	/	/
	L1 + PE	B	B	B	B	/	/	/	/
	L2 + PE	B	B	B	B	/	/	/	/
	L1+L2+PE	B	B	B	B	/	/	/	/
Signal ports	/	/	/	/	/	/	/	/	

Test Result: Pass

## 8. Surges

### 8.1 Test Procedure

Test is conducting under the description of IEC 61000-4-5.

### Test Performance

Performance Criterion: B

### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

### 8.2 Surge Test Data

Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	L-N, L-PE, N-PE	A	/
2	1kV	±	L-N, L-PE, N-PE	A	/
3	2kV	±	L-N, L-PE, N-PE	A	/
4	4kV	±	L-N, L-PE, N-PE	/	/

Test Result: Pass

## 9. Continuous Conducted Disturbances (C/S)

### 9.1 Test Procedure

Test is conducting under the description of IEC 61000-4-6.

### Test Performance

Performance Criterion: A

### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

### 9.2 Continuous Conducted Disturbances Test Data

Sweep frequency range: 150kHz~80MHz

Frequency step: 1% of fundamental

Dwell time: 1 second

Level	Voltage Level (e.m.f.) $U_0$	Modulation:	Pass	Fail
1	1	AM 80%, 1kHz sinewave	/	/
2	3	AM 80%, 1kHz sinewave	A	/
3	10	AM 80%, 1kHz sinewave	/	/
X	Special	/	/	/

Test Result: Pass

## EXHIBIT 1 - PRODUCT LABELING

### Proposed CE Label Format

<p><b>Wired keyboard</b> Model: KB05 Brand: / Importer Name: XXX Importer Address: XXX Senix Electronics Technology Limited 4/F, Block 15-2, Chuangye Industrial Area, Shapuwei, SongGang Street, Baoan District, Shenzhen, China</p>	
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**Specifications:** Text is Black in color and is justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened onto the EUT or shall be affixed at a conspicuous location on the EUT. The 'CE' marking must be affixed to the EUT or to its data plate. Where this is not possible or not warranted on account of the nature of the apparatus, it must be affixed to the packaging, if any, and to the accompanying documents. The 'CE' marking is allowed less than 5 mm but must clear. If the 'CE' marking is reduced or enlarged the proportions given in the above graduated drawing must be respected. The Importer name, address and Manufacturer name and address should indicate on marking label or packaging or in a document accompanying

### Proposed Label Location on EUT

CE Label Location



## EXHIBIT 2 - EUT PHOTOGRAPHS

EUT View 1



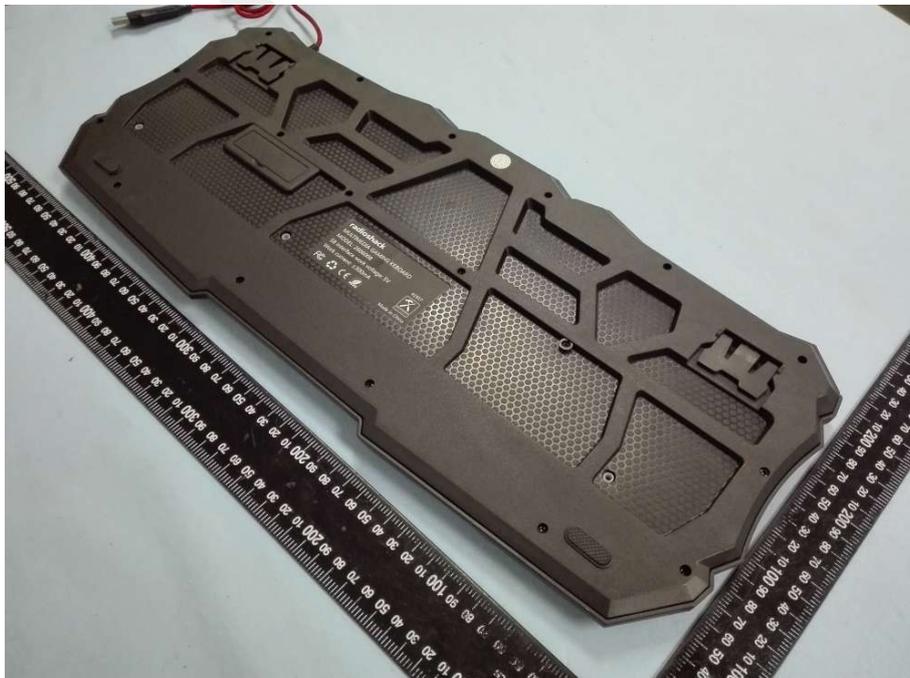
EUT View 2



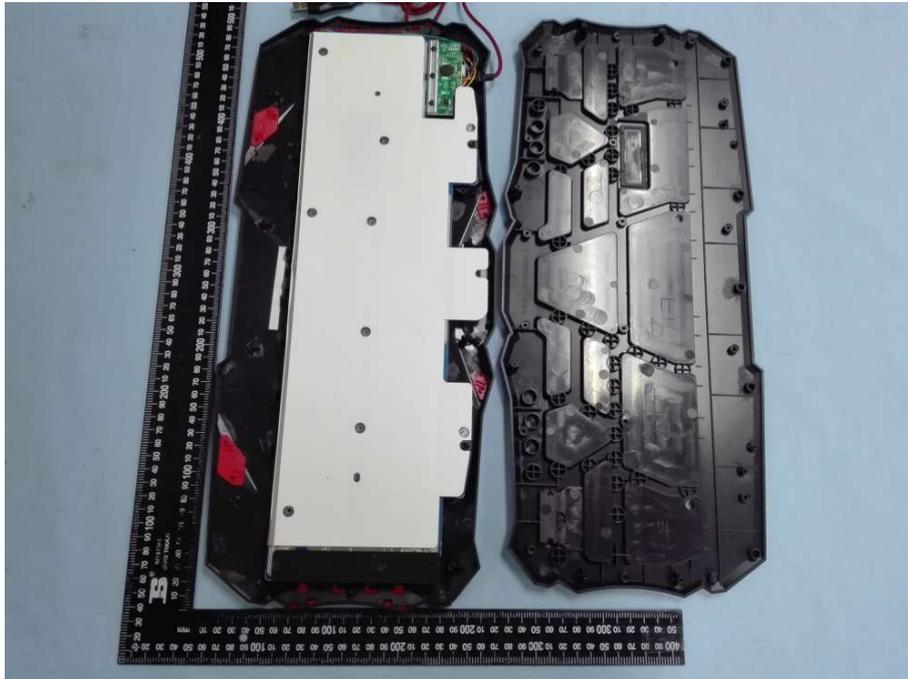
## EUT View 3



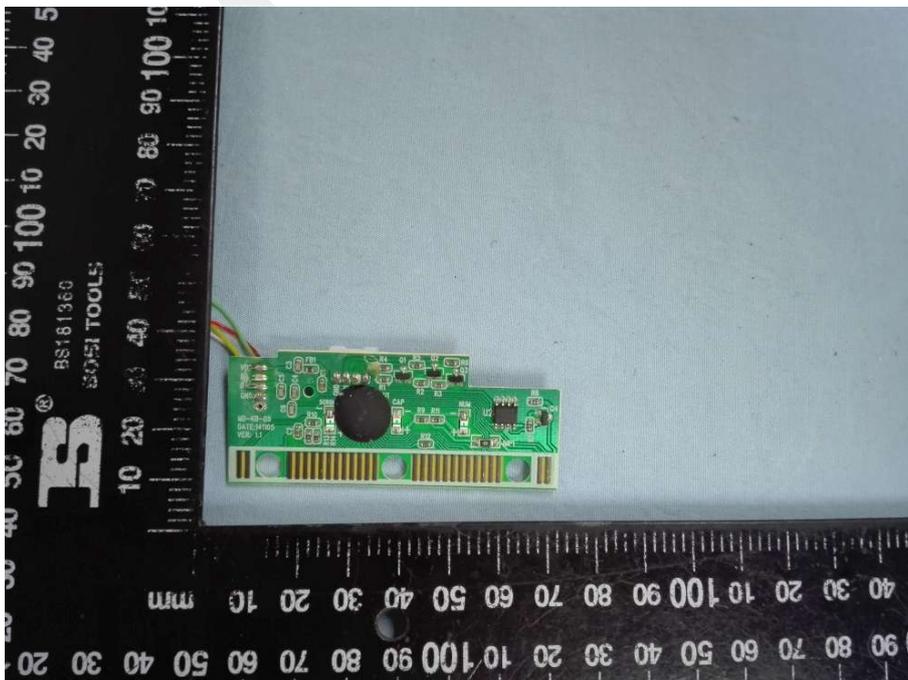
## EUT View 4



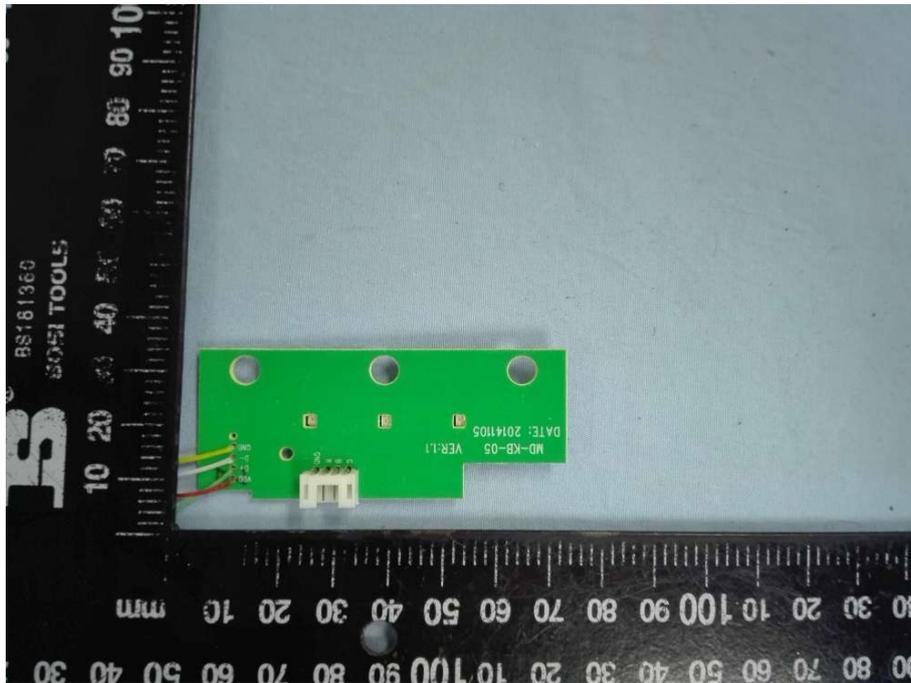
### EUT Housing and Board View 1



### Solder Board-Component View 1



## Solder Board-Component View 2



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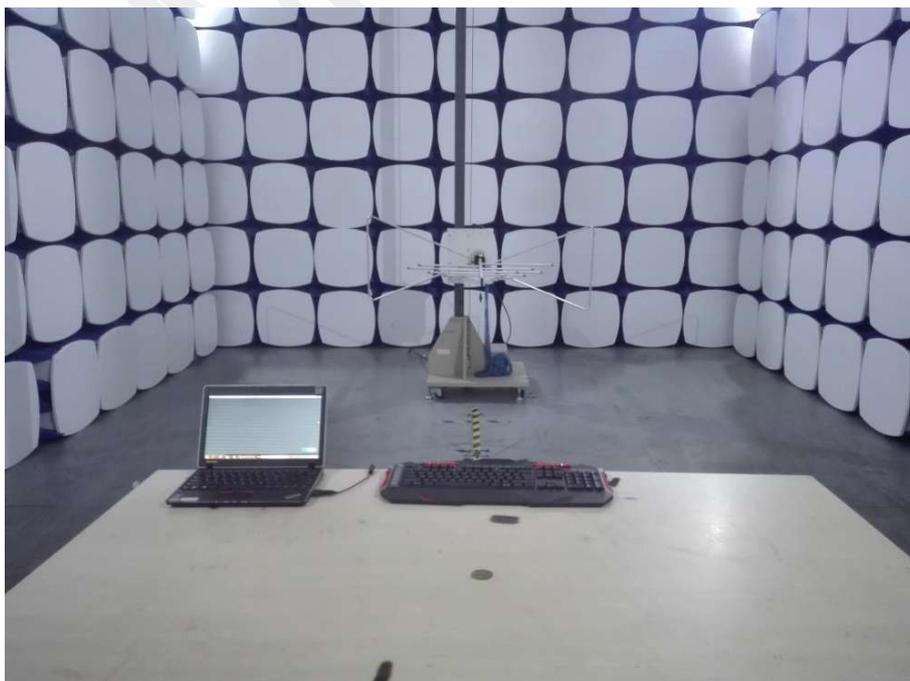
## EXHIBIT 3 - TEST SETUP PHOTOGRAPHS

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### Conduction Emission Test View



### Radiation Emission Test View

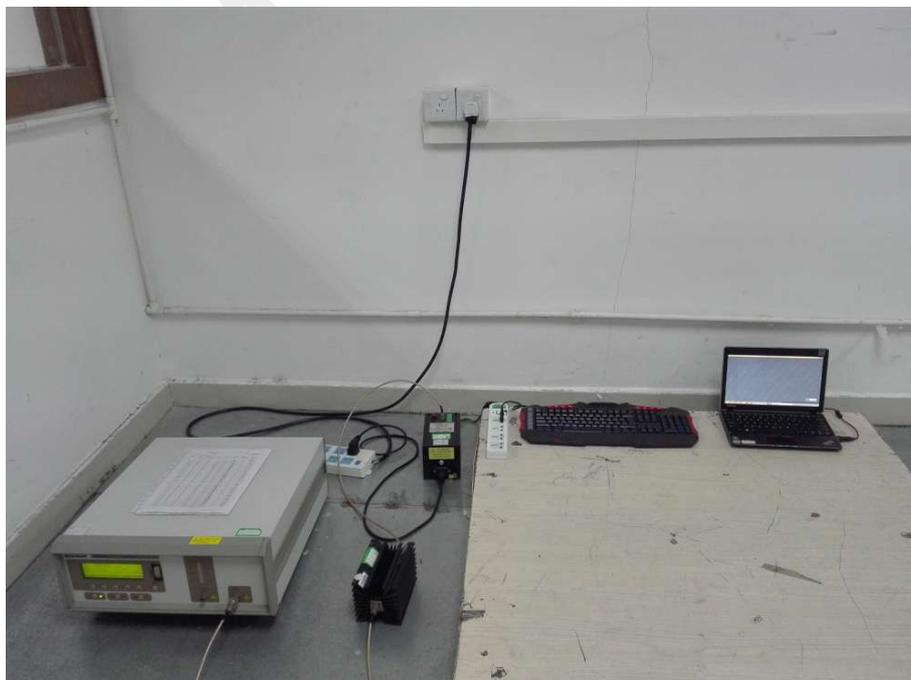


**IEC61000-4-2 Test View****IEC61000-4-3 Test View**

### IEC61000-4-4/5 Test View



### IEC61000-4-6 Test View



\*\*\*\*\* END OF REPORT \*\*\*\*\*