



CE EMC TEST REPORT

Product: SPEAKER

Model: CS2800U

Report No.: HTT180506234ER

Issued Date: May.21,2018

Issued for:

**HUIZHOU CITY DEAR ELECTRONIC CO.,LTD
NO.518,XIAOJINKOU TOWN,HUIZHOU AVENUE,HUIZHOU CITY,CHINA.**

Issued By:

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1 TEST CERTIFICATION

Product:	SPEAKER
Model:	CS2800U
Applicant:	HUIZHOU CITY DEAR ELECTRONIC CO.,LTD NO.518,XIAOJINKOU TOWN,HUIZHOU AVENUE,HUIZHOU CITY,CHINA.
Factory:	HUIZHOU CITY DEAR ELECTRONIC CO.,LTD NO.518,XIAOJINKOU TOWN,HUIZHOU AVENUE,HUIZHOU CITY,CHINA.
Trade Mark:	N/A
Tested:	May.16,2018~May.21,2018
Applicable Standards:	EN 55032:2015+AC:2016 EN 61000-3-2:2014 EN 61000-3-3:2013 EN 55020:2007+A11:2011+A12:2016

Deviation from Applicable Standard
None

The above equipment has been tested by Shenzhen HTT Technology Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By: Jack Chen **Date:** May.21,2018

Check By: Ervin Xu **Date:** May.21,2018

Approved By: Kevin Yang **Date:** May.21,2018
(Kevin Yang)



**2 TEST RESULT SUMMARY**

EMISSION			
Standard	Item	Result	Remarks
EN 55032:2015+AC:2016	Conducted (Main Port)	N/A	Meet Class B limit
	Radiated	Pass	Meet Class B limit
EN 61000-3-2:2014	Harmonic current emissions	N/A	Meets the requirements
EN 61000-3-3:2013	Voltage fluctuations & flicker	N/A	Meets the requirements

IMMUNITY 【EN 55020:2007+A11:2011+A12:2016】			
Standard	Item	Result	Remarks
EN 61000-4-2:2009	ESD	Pass	Meets the requirements of Performance Criterion B
EN 61000-4-4: 2012	EFT	Pass	Meets the requirements of Performance Criterion B
EN 55020:2007+A11:2011+A12:2016	Immunity Against Input Interference (S1)	N/A	Meets the requirements
EN 55020:2007+A11:2011+A12:2016	Immunity Against RFI Voltage (S2a)	N/A	Meets the requirements
EN 55020:2007+A11:2011+A12:2016	Immunity Against RFI Current (S2b)	N/A	Meets the requirements
EN 55020:2007+A11:2011+A12:2016	Immunity Against Radiated RFI (S3)	N/A	Meets the requirements
EN 55020:2007+A11:2011+A12:2016	Screening Effectiveness (S4)	N/A	Meets the requirements
EN 55020:2007+A11:2011+A12:2016	Keyed Carrier (S5)	N/A	Meets the requirements
EN 55020:2007+A11:2011+A12:2016	Immunity Against Radiated RFI For Large EUT (S6)	N/A	Meets the requirements

- Note:**
1. The test result judgment is decided by the limit of test standard
 2. The information of measurement uncertainty is available upon the customer's request.

**3 EUT DESCRIPTION**

Product	SPEAKER
Model	CS2800U
Trade Mark	N/A
Applicant	HUIZHOU CITY DEAR ELECTRONIC CO.,LTD
Housing material	Plastics and metals
EUT Type	<input checked="" type="checkbox"/> Engineering Sample. <input type="checkbox"/> Product Sample, <input type="checkbox"/> Mass Product Sample.
Serial Number	N/A
Power Rating	USB input
Data Line	N/A

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
N/A	N/A	N/A

Model list and Models difference

No.	Model Number	Tested With
1	CS2800U	<input checked="" type="checkbox"/>
Other Model	CS2800UL	<input type="checkbox"/>

NOTE: CS2800U is tested model, other models are derivative models, The models are identical in circuit , only different on the model names, size, So the test data of CS2800U can represent the remaining models.



4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the thereafter additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The following test mode(s) were scanned during the preliminary test:

Pre-Test Mode		
Emission	Conducted Emission	Mode : Working
	Radiated Emission	Mode : Working

After the preliminary scan, the following test mode was found to produce the highest emission level.

The Worst Test Mode		
Emission	Conducted Emission	Mode : Working
	Radiated Emission	Mode : Working

4.2. EUT SYSTEM OPERATION

1. Set up EUT with the support equipments.
2. Make sure the EUT work normally during the test.



5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	PC	dx2700	CNG7140T7P	N/A	HP	Unshielded 1.4m	Unshielded 1.6m
2	Monitor	HPL1706V	CND74535YZ	N/A	HP	Unshielded 1.2m	Unshielded 1.6m
3	Keyboard	SK-2880	435302-AA1	N/A	HP	Unshielded 1.2m	N/A
4	Mouse	N/A	N/A	N/A	HP	Unshielded 1.2m	N/A

Note:

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST

N/A



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at HTT Lab.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 32. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC
	TIMCO
Japan	VCCI
Canada	INDUSTRY CANADA
Germany	TUV
	EMCC

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty	
Conducted emissions	150kHz~30MHz	+/- 3.59dB	
Radiated emissions	Horizontal	30MHz ~ 200MHz	+/- 4.77dB
		200MHz ~1000MHz	+/- 4.93dB
	Vertical	30MHz ~ 200MHz	+/- 5.04dB
		200MHz ~1000MHz	+/- 4.93dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



7 EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission Shielding Room Test Site (843)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100005	06/09/2018
LISN	AFJ	LS16	16010222119	06/09/2018
LISN(EUT)	Mestec	AN3016	04/10040	06/09/2018

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R = No Calibration Request.



7.1.3. TEST PROCEDURES

Procedure of Preliminary Test

The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN55032 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

All I/O cables were positioned to simulate typical actual usage as per EN55032.

The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in Item 3.1 were scanned during the preliminary test.

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

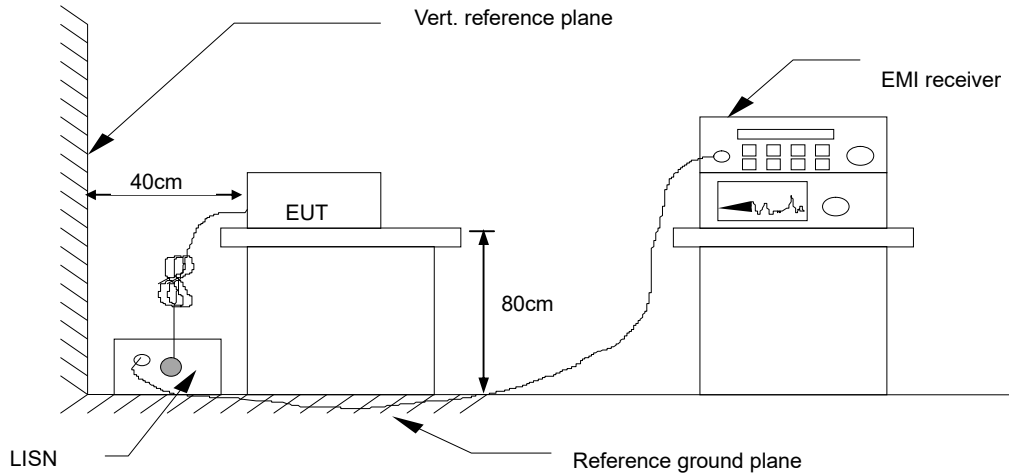
EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.



7.1.4. TEST SETUP



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

7.1.5. TEST RESULTS

6dB Bandwidth	10 KHz	Environmental Conditions	26°C, 55% RH
Test Mode	Working	Detector Function	Peak / Quasi-peak/AV
Test Result	N/A	Test By	Jack Chen

NOTE:

L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

“---” denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.

Freq. = Emission frequency in MHz

Reading level(dBuV) = Receiver reading

Corr. Factor (dB) = Anttenuator factor + Cable loss

Level (dBuV) = Reading level(dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

Margin (dB) = Level (dBuV) – Limits (dBuV)

Q.P.=Quasi-Peak

**7.2. RADIATED EMISSION MEASUREMENT****7.2.1. LIMITS**

FREQUENCY (MHz)	dBuV/m (At 3m)
	Limit
30 ~ 230	40
230 ~ 1000	47

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

7.2.2. TEST INSTRUMENTS

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100005	06/09/2018
Spectrum Analyzer	R&S	FSU	100114	06/09/2018
Pre Amplifier	H.P.	HP8447E	2945A02715	06/09/2018
Bilog Antenna	SUNOL Sciences	JB3	A021907	06/09/2018
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	06/09/2018
System-Controller	CCS	N/A	N/A	N.C.R
Turn Table	CCS	N/A	N/A	N.C.R
Antenna Tower	CCS	N/A	N/A	N.C.R

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R = No Calibration Request.



7.2.3. TEST PROCEDURE

Procedure of Preliminary Test

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per EN55032.

All I/O cables were positioned to simulate typical usage as per EN55032.

Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.

The antenna was placed at 3 meter away from the EUT as stated in EN 55032. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in Item 3.1 were scanned during the preliminary test:

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

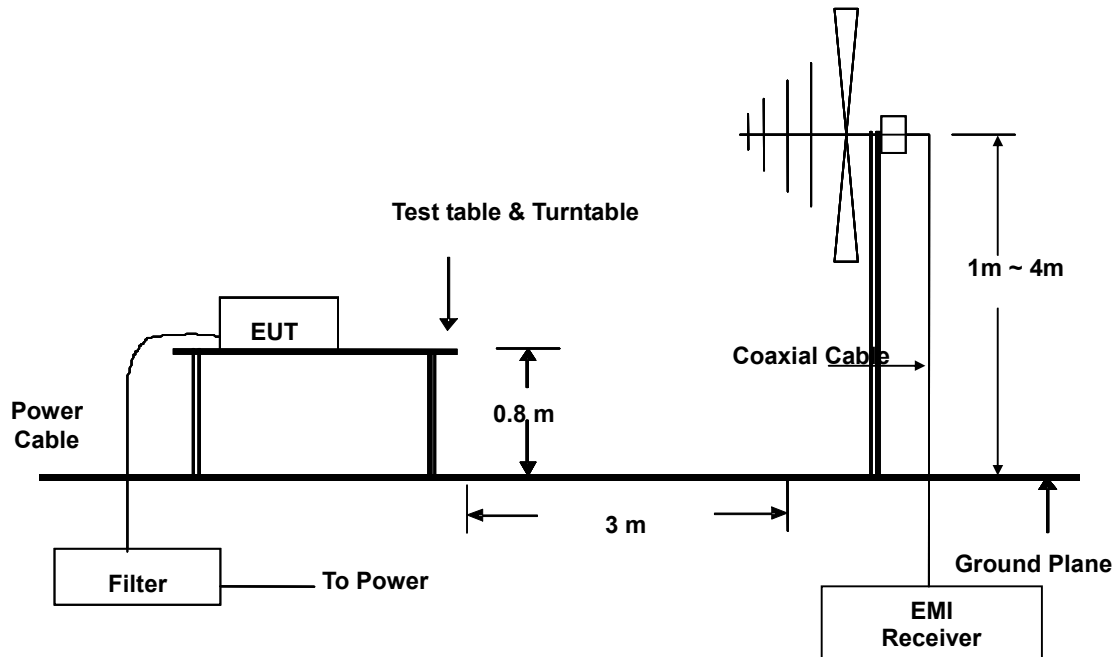
EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.

The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

The test data of the worst-case condition(s) was recorded.

7.2.4. TEST SETUP



7.2.5 TEST RESULTS

For the actual test configuration, please refer to the related item – Photographs of the Test

Test Mode	Working	Environmental Conditions	26°C, 55% RH
6dB Bandwidth	120 KHz	Antenna Pole	Vertical / Horizontal
Antenna Distance	3m	Detector Function	Peak / Quasi-peak
Tested by	Jack Chen		

Configuration

Freq. = Emission frequency in MHz

Reading level(dBuV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBuV) = Reading level(dBuV) + Corr. Factor (dB)

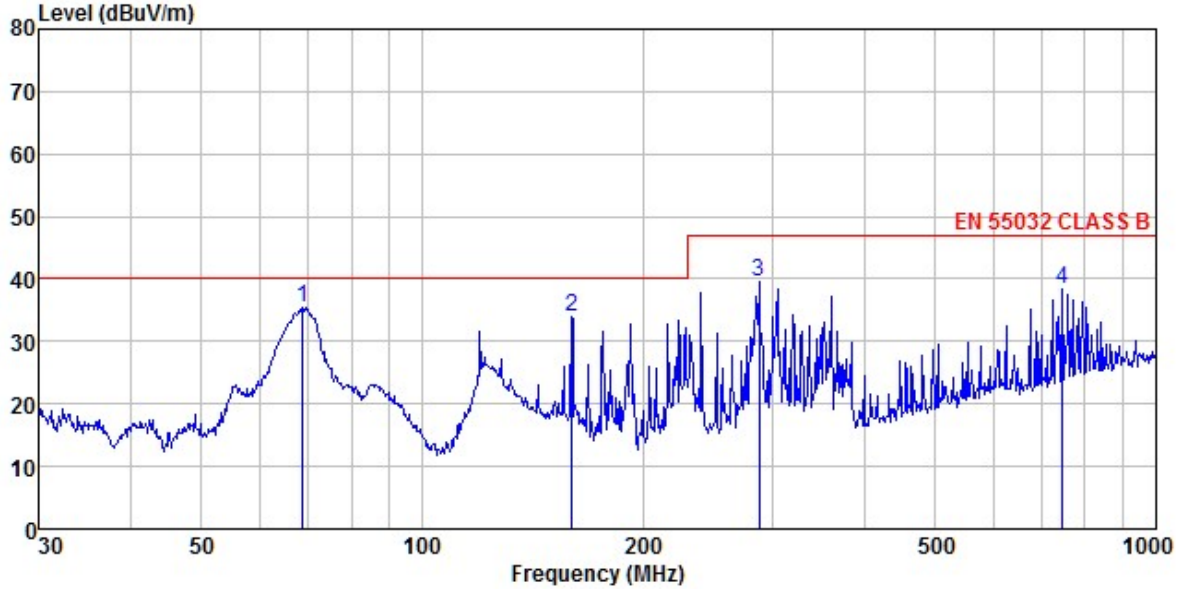
Limit (dBuV) = Limit stated in standard

Margin (dB) = Measurement (dBuV) – Limits (dBuV)



Please refer to following diagram for individual

Radiated Emission Measurement

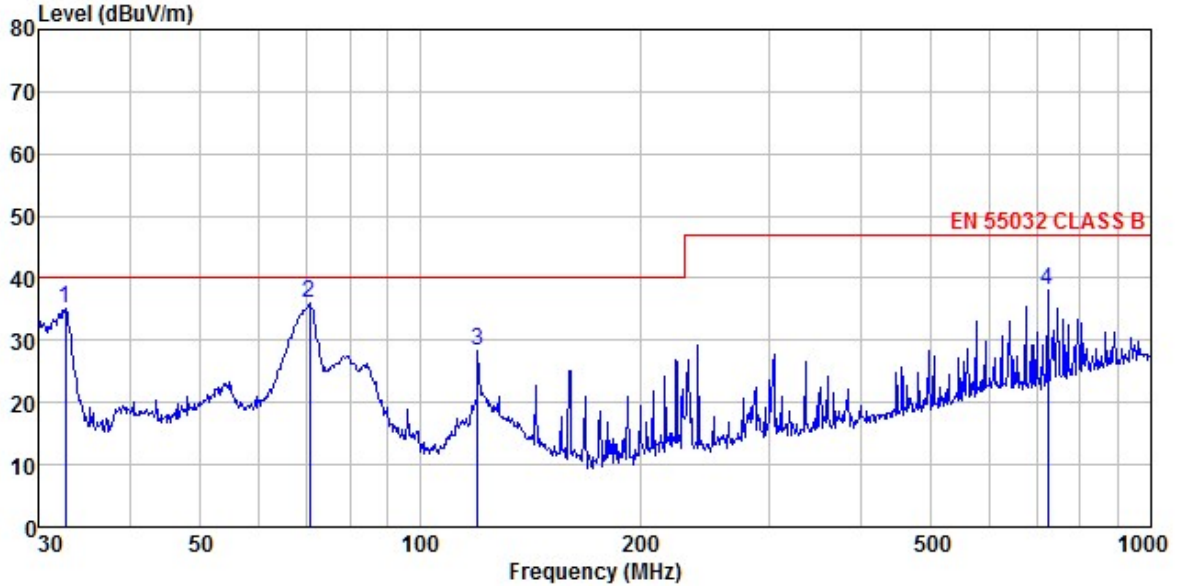


Condition : EN 55032 CLASS B 3m HORIZONTAL
 EUT :
 Test mode :
 Test Engineer:
 Remark :

	Read Freq	Antenna Level	Preamp Factor	Cable Factor	Cable Loss	Limit Level	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	68.631	62.93	7.96	36.43	0.93	35.39	40.00	-4.61 Peak
2	159.784	61.04	8.30	37.13	1.63	33.84	40.00	-6.16 Peak
3	287.990	61.49	13.27	37.41	2.31	39.66	47.00	-7.34 Peak
4	744.866	51.47	20.41	37.63	4.26	38.51	47.00	-8.49 Peak



Radiated Emission Measurement



Condition : EN 55032 CLASS B 3m VERTICAL
 EUT :
 Test mode :
 Test Engineer:
 Remark :

	Read	Antenna	Preamp	Cable	Limit	Over		
Freq	Level	Factor	Factor	Loss	Level	Line	Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	32.634	58.40	11.25	35.19	0.58	35.04	40.00	-4.96 Peak
2	70.584	63.89	7.49	36.45	0.94	35.87	40.00	-4.13 Peak
3	119.856	54.34	9.50	36.88	1.36	28.32	40.00	-11.68 Peak
4	721.726	51.37	20.03	37.63	4.17	37.94	47.00	-9.06 Peak



7.3. HARMONICS CURRENT MEASUREMENT

7.3.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment		Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd harmonics		Odd Harmonics only		
3	2.30	3	3.4	0.23
5	1.14	5	1.9	1.14
7	0.77	7	1.0	0.77
9	0.40	9	0.5	0.40
11	0.33	11	0.35	0.33
13	0.21	13	0.30	0.21
15<=n<=39	0.15x15/n	15<=n<=39	3.85/n	0.15x15/n
Even harmonics				
2	1.08			
4	0.43			
6	0.30			
8<=n<=40	0.23x8/n			

NOTE: 1. Class A and Class D are classified according to item 4.4.3.

2. According to section 7 of EN 61000-3-2, the above limits apply for all equipments with a rated power more than 75W, except for lighting equipment.

7.3.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic & Flicker Tester	California instruments	PACS-3	SB2588/01	06/09/2018
AC Power Source	California instruments	5001iX-CTS-40	SB2588	06/09/2018

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



7.3.3. TEST PROCEDURE

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under Standard Mode operating conditions for each successive harmonic component in turn.

The classification of EUT is according to section 5 of EN 61000-3-2.

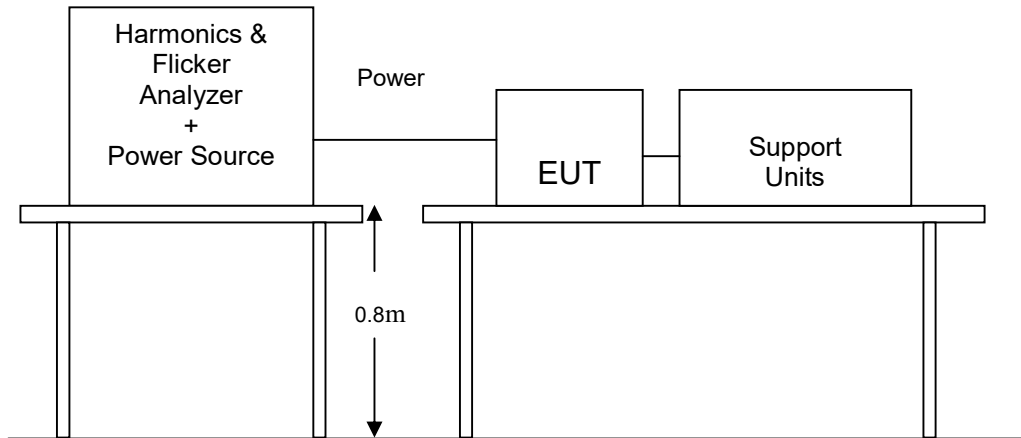
The EUT is classified as follows:

- Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
- Class B: Portable tools; Arc welding equipment which is not professional equipment.
- Class C: Lighting equipment.
- Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.



7.3.4. TEST SETUP



For the actual test configuration, please refer to the related item .

7.3.5. TEST RESULTS

POWER CONSUMPTION	Rated power exceeding 75W	Test Mode	Working
ENVIRONMENTAL CONDITIONS	24.5deg.C, 56% RH, 992 hPa	Limits	Class <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Test Result	N/A	Tested by	Jack Chen

NOTE: 1. Limits classified according to item 7.3.1.

2. There is no need for Harmonics test to be performed on this product(rated power is less than 75W) in accordance with EN 61000-3-2:2014.

For further details, please refer to Clause 7 of EN 61000-3-2:2014 which states:

“For the following categories of equipment, limits are not specified in this edition of the standard: equipment with a rated power of 75W or less, other than lighting equipment.”



7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

7.4.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.4.2. TEST INSTRUMENTS

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic & Flicker Tester	California instruments	PACS-3	SB2588/01	06/09/2018
AC Power Source	California instruments	5001iX-CTS-40	SB2588	06/09/2018

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

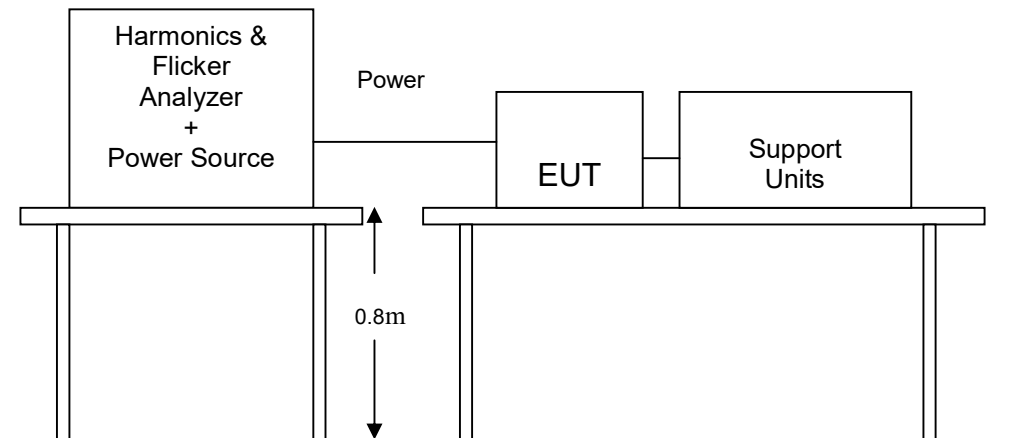
7.4.3. TEST PROCEDURE

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under Standard Mode operating conditions.

During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.



7.4.4. TEST SETUP



For the actual test configuration, please refer to the related item .

7.4.5. TEST RESULTS

OBSERVATION PERIOD (Tp)	10mins	Test Mode	Working
ENVIRONMENTAL CONDITIONS	24.5deg.C, 56% RH, 992 hPa	Tested by:	Jack Chen
Test Result	N/A		



8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 55024:2010+A1:2015	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	EN 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 1kV, Signal line: 0.5kV, Performance Criterion B
	Immunity Against Input Interference (S1)	N/A
	Immunity Against RFI Voltage (S2a)	N/A
	Immunity Against RFI Current (S2b)	N/A
	Immunity Against Radiated RFI (S3)	N/A
	Screening Effectiveness (S4)	N/A
	Keyed Carrier (S5)	N/A
	Immunity Against Radiated RFI For Large EUT (S6)	N/A



8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Criteria A:	The apparatus shell continues 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, 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.
Criteria B:	After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon 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. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, 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.
Criteria C:	Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.



8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm
Charging Capacity:	150pF
Discharge Voltage:	Air Discharge: 8 kV (Direct) Contact Discharge: 4 kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 25 times at each test point
Discharge Mode:	1 time/s
Performance Criterion:	B

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD 2000	EMC PARTNER	ESD2000	182	06/09/2018

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



8.3.3. 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 (HCP)**. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then 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:

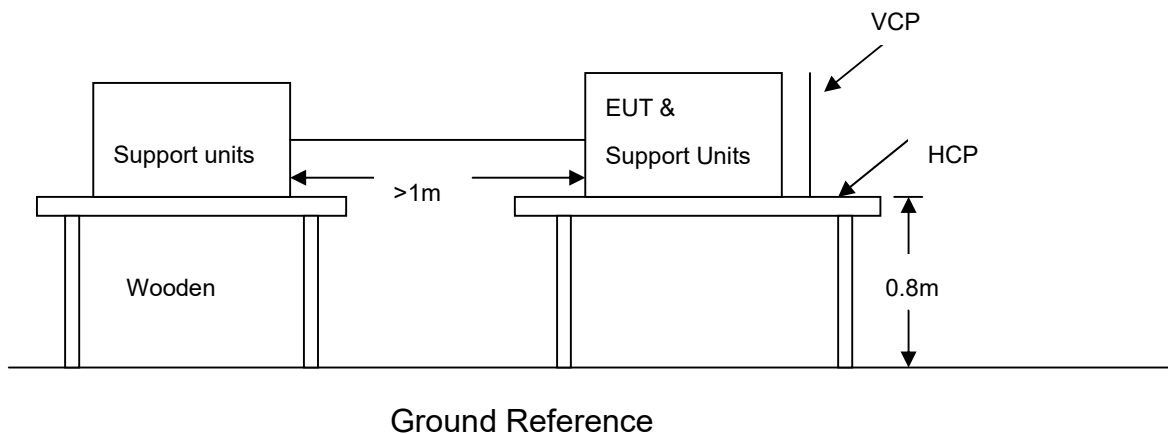
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area Running PC Systemly handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

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

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) 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 complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



8.3.4. TEST SETUP



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

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

**8.3.5. TEST RESULTS**

Temperature:	25°C	Humidity	50% RH
Pressure	996mbar	Test result	Pass
Test mode	Working	Test By	Jack Chen

Air Discharge					
Test locations	Test Levels	Results			
		± 8 kV	Pass	Fail	Performance Criterion
Slot 8Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2

Contact Discharge					
Test Points	Test Levels	Results			
		± 4 kV	Pass	Fail	Performance Criterion
Port 4Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
Metal 4Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
HCP 4Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
VCP 4Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2

- NOTE:** 1. There was no change compared with initial operation during the test.
2. The loss of function of the EUT during the test and it was recovered by itself operation after the test.



8.4. ELECTRICAL FAST TRANSIENT (EFT)

8.4.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-4
Test Voltage:	Power Line: 1 kV Signal/Control Line: 0.5 kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.
Performance criterion:	B

8.4.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC PARTNER TRANSIENT 2000	EMC PARTNER	TRA2000	881	06/09/2018

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

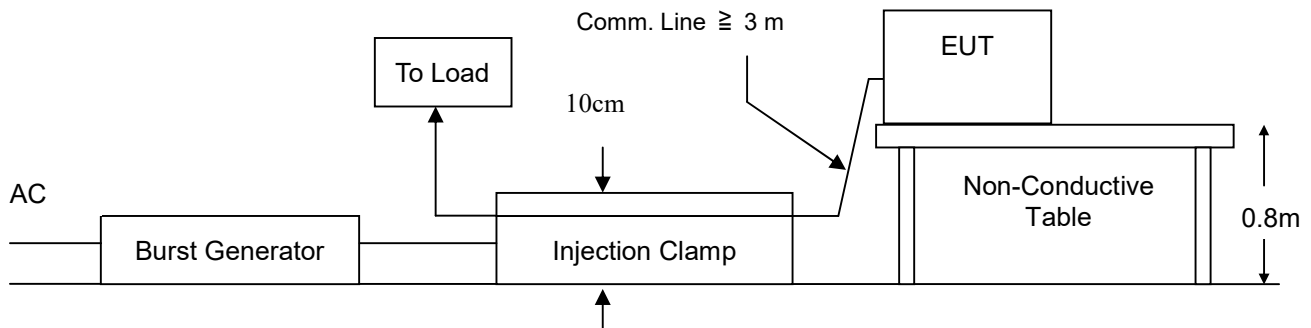
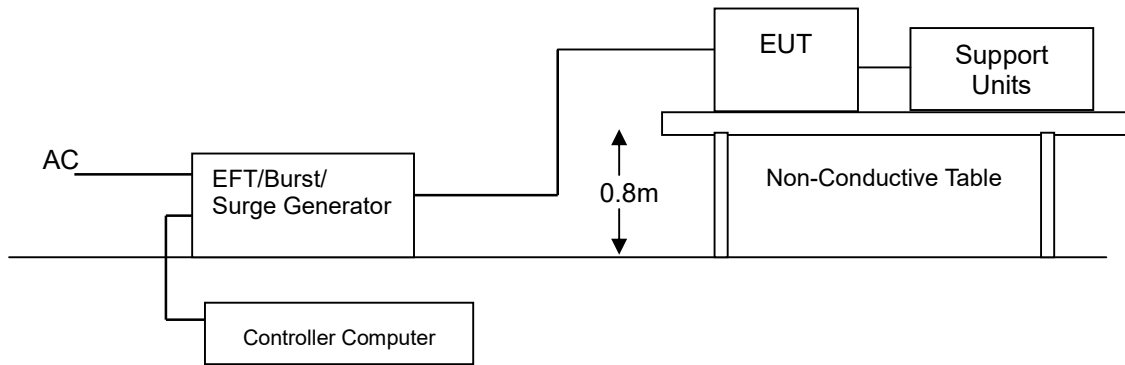
2. N.C.R.= No Calibration required

8.4.3. TEST PROCEDURE

- Both positive and negative polarity discharges were applied.
- The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.



8.4.4. TEST SETUP



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

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

**8.4.5. TEST RESULTS**

Temperature:	25°C	Humidity	50% RH
Pressure	996mbar	Test result	N/A
Test mode	Working	Test By	Jack Chen

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
N	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
L – N	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
L – PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
N – PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
L – N – PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	N/A
Signal Line	--	--	--	Note <input type="checkbox"/> 1 <input type="checkbox"/> 2	N/A

- NOTE:** 1. There was no change compared with initial operation during the test.
 2. The loss of function of the EUT during the test and it was recovered by itself operation after the test.



9 PHOTOGRAPHS OF EUT

