



**SGS-CSTC Standards Technical Services Co., Ltd.  
Guangzhou Branch**

198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technological  
Development District, Guangzhou, China 510663  
Telephone: +86 (0) 20 82155555  
Fax: +86 (0) 20 82075059  
Email: ee.guangzhou@sgs.com

Report No.: GZEM160800600601  
Page: 1 of 47

# TEST REPORT

The following sample(s) was/were submitted and identified on behalf of the client as:

<b>Application No.:</b>	GZEM1608006006HS
<b>Applicant:</b>	Foshan shunde sansheng electrical manufacture co., ltd
<b>Manufacturer:</b>	The same as applicant
<b>Factory:</b>	The same as applicant
<b>Product Description:</b>	UPRIGHT DISPLAY COOLER
<b>Model No.:</b>	SS-P180FA, SS-P180WA, SS-P198FA, SS-P198WA, SS-P228FA, SS-P228WA, SS-P238FA, SS-P238WA, SS-P288FA, SS-P288WA, SS-P328FA, SS-P328WA, SS-P338FA, SS-P338WA, SS-P360FA, SS-P360WA, SS-P380FA, SS-P380WA, SS-P390FA, SS-P390WA, SS-P390FB, SS-P390WB, SS-P400FA, SS-P400WA, SS-P430FA, SS-P430WA. ♣
♣	Please refer to section 3 of this report for further details.
<b>Standards:</b>	EN 55014-1:2006+A1:2009+A2:2011, EN 55014-2:2015, EN 61000-3-2:2014, EN 61000-3-3:2013.
<b>Date of Receipt:</b>	2016-08-26
<b>Date of Test:</b>	2016-11-11 to 2016-11-12
<b>Date of Issue:</b>	2016-12-01
<b>Test Result:</b>	<b>Pass*</b>

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above. The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EU Declaration of Conformity and compliance with all relevant EU Directives.



The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.


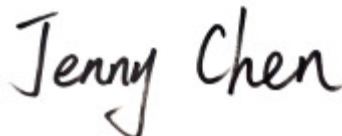

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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## 2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2016-12-01		Original

Authorized for issue by:				
Tested By		 (Owen Huang) / Project Engineer		2016-11-11 to 2016-11-12 Date
Prepared By		 (Jenny Chen) / Clerk		2016-11-22 Date
Checked By		 (Cherie Luo) / Reviewer		2016-11-22 Date



### 3 Test Summary

Electromagnetic Interference (EMI)				
Test	Test Requirement	Test Method	Class / Severity	Result
Conducted Emission on AC (150k to 30MHz)	EN 55014-1:2006 +A1:2009+A2:2011	EN 55014-1:2006 +A1:2009+A2:2011	Table 1 Columns 2&3	PASS
Disturbance Power (30MHz to 300MHz)	EN 55014-1:2006 +A1:2009+A2:2011	EN 55014-1:2006 +A1:2009+A2:2011	Table 2a, Table 2b Columns 2&3 ♀	PASS
Discontinuous Interference on AC (150kHz to 30MHz)	EN 55014-1:2006 +A1:2009+A2:2011	EN 55014-1:2006 +A1:2009+A2:2011	Clause 4.2 of EN 55014-1	PASS
Harmonic Emission on AC	EN 61000-3-2:2014	EN 61000-3-2:2014	Class A	PASS
Flicker Emission on AC	EN 61000-3-3:2013	EN 61000-3-3:2013	Clause 5 of EN 61000-3-3	PASS
Electromagnetic Susceptibility(EMS) <sup>1)</sup>				
Test	Test Requirement	Test Method	Class / Severity	Result
Electrostatic Discharge (ESD)	EN 55014-2:2015	EN 61000-4-2:2009	Contact ±4 kV Air ±8 kV	PASS
Electrical Fast Transients (EFT) on AC	EN 55014-2:2015	EN 61000-4-4:2012	AC ± 1.0kV	PASS
Surge Immunity on AC	EN 55014-2:2015	EN 61000-4-5:2014	±1kV D.M. † ±2kV C.M. ‡	PASS
Injected Currents on AC (150kHz to 230MHz)	EN 55014-2:2015	EN 61000-4-6:2014	3V r.m.s (emf), 80% 1kHz Amp. Mod.	PASS
Voltage Dips and Interruptions on AC	EN 55014-2:2015	EN 61000-4-11:2004	0 % U <sub>T</sub> * for 0.5per 40 % U <sub>T</sub> * for 10per 70 % U <sub>T</sub> * for 25per	PASS
<b>Remark</b>				
<b>EUT:</b> In this whole report EUT means Equipment Under Test.				
<sup>1)</sup> : The EUT belongs to <b>Category II apparatus of EN 55014-2:2015.</b>				
* U <sub>T</sub> is the nominal supply voltage.				
† D.M. – Differential Mode.				
‡ C.M. – Common Mode.				
♀ Disturbance Power test is applied to the EUT only since:				
1) All the measurement result are lower than the applicable limits (Table 2a) minus the corresponding margin (Table 2b); or the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector.				
2) No clock frequency or oscillator frequency of the EUT is more than or equal to 30 MHz.				
Please refer to section 7.2 of this test report for more details.				



\* Model No.: SS-P180FA, SS-P180WA, SS-P198FA, SS-P198WA, SS-P228FA, SS-P228WA, SS-P238FA, SS-P238WA, SS-P288FA, SS-P288WA, SS-P328FA, SS-P328WA, SS-P338FA, SS-P338WA, SS-P360FA, SS-P360WA, SS-P380FA, SS-P380WA, SS-P390FA, SS-P390WA, SS-P390FB, SS-P390WB, SS-P400FA, SS-P400WA, SS-P430FA, SS-P430WA.

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference being the appearance and cubage.

Therefore only one model **SS-P390FA** was tested in this report.



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## 5 General Information

### 5.1 Client Information

Applicant: Foshan shunde sansheng electrical manufacture co., ltd  
Address of Applicant: 22 Xinhui Road, Shunde Science & Technology Industrial Park, Wusha, Daliang, Shunde, Foshan, Guangdong China  
Manufacturer: The same as applicant  
Address of Manufacturer: The same as address of applicant  
Factory: The same as applicant  
Address of Factory: The same as address of applicant

### 5.2 General Description of E.U.T.

Product Description: UPRIGHT DISPLAY COOLER  
Model No.: SS-P390FA

### 5.3 Details of E.U.T.

Rated Supply: AC 220-240V 50Hz  
Power Cable: 1.6m x 3 wires unshielded AC mains cable.

### 5.4 Description of Support Units

The EUT has been tested as an independent unit.

### 5.5 Deviation from Standards

All Immunity tests to EN 55014-2 were performed in accordance with EN 61000-4-x and not IEC 61000-4-x. (x=2, 4, 5, 6, 11).

### 5.6 General Test Climate During Testing

Temperature: 15-30 °C Humidity: 30-70 %RH Atmospheric Pressure: 860-1060 mbar

### 5.7 Abnormalities from Standard Conditions

None

### 5.8 Monitoring of EUT for All Immunity Test

Audio: N/A  
Visual: Monitor the LED lighting of the EUT.

### 5.9 Test Location

All tests were performed at:  
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,  
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,  
Guangzhou, China 510663  
Tel: +86 20 82155555 Fax: +86 20 82075059  
No tests were sub-contracted.



## 5.10 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

SGS-CSTC Standards Technical Services 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. Registration 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IEC 60384-1:2006-10 and Rules of procedure IEC 60384-1:2006-10, and the relevant IEC 60384-1:2006-10 CB-Scheme Operational documents.



## 6 Equipment List

Conducted Emission						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m <sup>3</sup>	N/A	N/A	N/A
EMC0118	Two-line v-netwok	R&S	ENV216	100359	2016-01-25	2017-01-24
EMC0102	LISN	SCHAFFNER CHASE	MN2050D/1	1421	2016-09-20	2017-09-19
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2015-12-19	2016-12-18
EMC0107	Coaxial Cable	SGS	2m	N/A	2016-07-24	2018-07-23
EMC0106	Voltage Probe	SGS	N/A	N/A	2016-04-05	2018-04-04
EMC0120	8 Line ISN	Fischer Custom Communications	FCC-TLISN-T8- 02	20550	2016-09-20	2017-09-19
EMC0121	4 Line ISN	Fischer Custom Communications	FCC-TLISN-T4- 02	20549	2016-09-20	2017-09-19
EMC0122	2 Line ISN	Fischer Custom Communications	FCC-TLISN-T2- 02	20548	2016-09-20	2017-09-19
EMC2047	CDN	Elektronik- Feinmechanik	L-801:AF2	2793	2015-09-19	2018-09-18
EMC2048	CDN	Elektronik- Feinmechanik	L-801:M2/M3	2738	2015-09-25	2018-09-24
EMC2062	6dB Attenuator	HP	8491A	24487	2016-04-05	2018-04-04
EMC0167	Conical metal housing	SGS-EMC	N/A	N/A	2016-04-19	2018-04-18

Disturbance Power						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m <sup>3</sup>	N/A	N/A	N/A
EMC2040	Absorbing Clamp	Beijing Dazhe Co. Ltd.	ZN23201	N/A	2016-01-28	2017-01-27
EMC0303	7m Coaxial Cable	SGS	7m	N/A	2015-06-30	2017-06-29
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2015-12-19	2016-12-18
EMC2062	6dB Attenuator	HP	8491A	24487	2016-04-05	2018-04-04
EMC0305	Slide Bar Controller	HD-GmbH	HD50	050/490	N/A	N/A
EMC0103	Slide Bar RP	HD-GmbH	KMS560	560/392	N/A	N/A

Click						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC2049	Click Meter	AFJ	CL55C	55049840042	2016-07-04	2017-07-03
EMC0206	Coaxial Cable	N/A	1.5m	N/A	2016-09-20	2018-09-19
EMC0203	LISN	AFJ	LS16-OPT001	16019831056	2016-01-25	2017-01-24





Harmonics / Flicker test						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0608	AC Power Source	California	50001iX	56627	2016-04-05	2017-04-04
EMC0607	Power Analyzer	California	PACS	72400	2016-04-05	2017-04-04

Electrostatic Discharge						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC2071	ESD Simulator	TESEQ AG	NSG 435	6739	2016-01-28	2017-01-27
EMC0804	ESD Ground Plane	SGS	3m x 3m	N/A	N/A	N/A
EMC0078	Temperature, & Humidity	Shanghai Meteorological Instrument factory Co., Ltd.	ZJ1-2B	709131	2016-08-18	2017-08-17

EFT, Surge, Voltage dips and Interruption						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC2059	Modular Impulse Surge Generator	EMC PARTNER	MIG0603EN	259	2016-01-25	2017-01-24
EMC2060	High speed signal Surge CDN	EMC PARTNER	CDN-UTP	CDN-UTP0089	2016-01-25	2017-01-24
EMC2072	EMC Immunity Test System	TESEQ AG	NSG 3060 CDN3061 INA 6502 CIB CND3425	1580 1466 222	2016-01-25	2017-01-24
EMC2012	Oscilloscope	Tektronix	TDS 744A	N/A	2015-12-19	2016-12-18

Conducted Immunity						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC1101	Signal Generator	Rohde & Schwarz	SMY01	825675/016	2016-07-13	2017-07-12
EMC1102	Amplifier 0.15-230MHz	SCHAFFNER	GRF5048	1003	2016-07-04	2017-07-03
EMC1103	Power Meter	Rohde & Schwarz	NRVS	825770/079	2015-12-19	2016-12-18
EMC0071	URV5-Z2 Insert. Unit	R&S	URV5-Z2	100309	2016-01-25	2017-01-24
EMC1105	Dual Directional coupler	Werlatone Inc.	C1795	6635	2016-07-04	2017-07-03
EMC2012	Oscilloscope	Tektronix	TDS 744A	N/A	2015-12-19	2016-12-18
EMC2048	CDN	Elektronik-Feinmechanik	L-801:M2/M3	2738	2015-09-25	2018-09-24
EMC1107	CDN M2	Schaffner Chase	CDN-M2-16	9863	2014-11-23	2017-11-23
EMC1116	Current Probe	Schaffner Chase	CIP9136	1155	2014-11-18	2017-11-17
EMC1117	Current Probe	Schaffner Chase	CSP8445	18	2014-11-15	2017-11-14



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**Guangzhou Branch**

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General used equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2016-09-01	2017-08-31
EMC0007	DMM	Fluke	73	70671122	2016-08-22	2017-08-21

## 7 Electromagnetic Interference Test Results

### 7.1 Conducted Emissions on Mains Terminals, 150 kHz to 30MHz

Test Requirement: EN 55014-1  
Test Method: EN 55014-1  
Test Date: 2016-11-11  
Test voltage: AC 230V 50Hz  
Frequency Range: 150KHz to 30MHz  
Detector: Peak for pre-scan  
Quasi-Peak and Average for final measurement  
(9 kHz resolution bandwidth)

Limit:

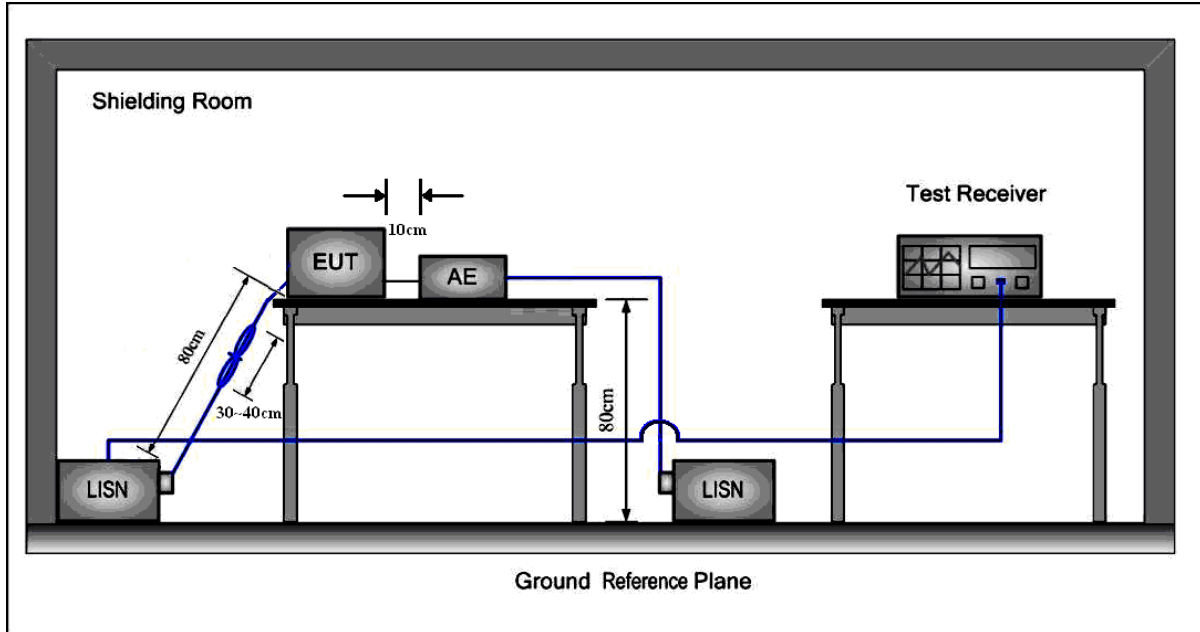
Frequency range MHz	At mains terminals dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	59 to 46
0.50 to 5	56	46
5 to 30	60	50
Note1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		
Note2: The lower limit is applicable at the transition frequency.		

#### 7.1.1 E.U.T. Operation

Test the EUT in cooling mode with the temperature at the middle range.

A pre-test at 160KHz shall be made over a range of 0.9 to 1.1 times the rated voltage in order to check the level of disturbance varies considerably with the supply voltage, compliance test at AC 230V as no worse case was found.

## 7.1.2 Test Setup and Procedure



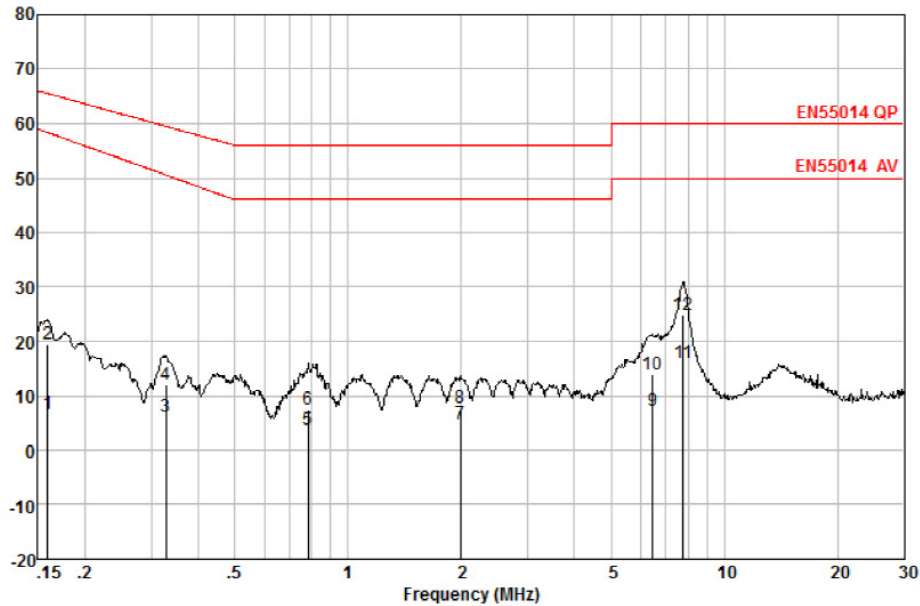
1. The mains terminal disturbance voltage was measured with the EUT in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50\Omega/50\mu\text{H} + 5\Omega$  linear impedance. The power cables of all other units of the EUT were 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. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
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. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN was placed 0.8m from the boundary of the unit under test and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance was between the closest points of the LISN and the EUT. The mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m. All other units of the EUT and associated equipment were at least 0.8m from the LISN.

### 7.1.3 Measurement Data

Live Line:

Peak Scan:

Level (dB $\mu$ V)



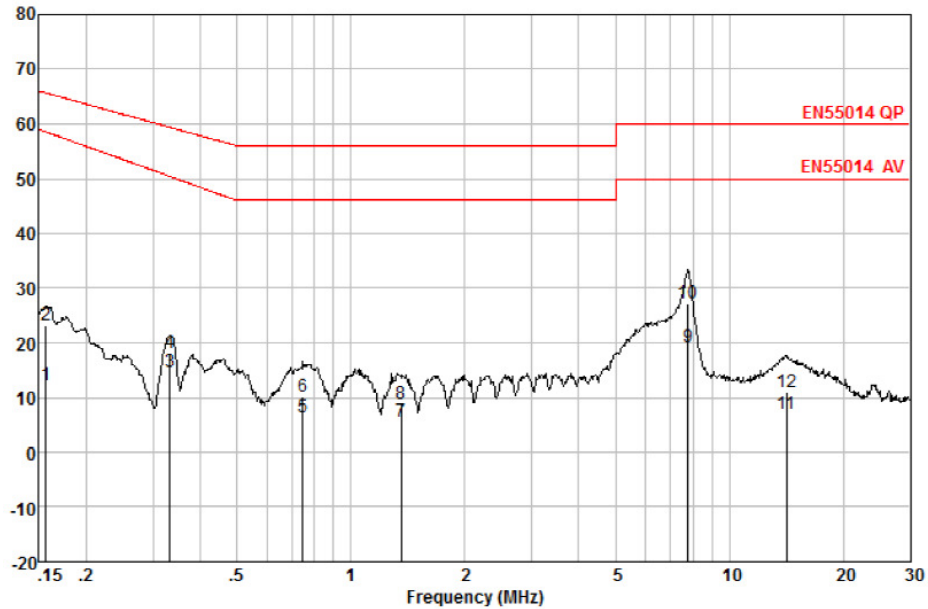
Quasi-peak and Average measurement:

Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
MHz	dB $\mu$ V	dB	dB	dB $\mu$ V	dB $\mu$ V	dB	
0.159	6.48	0.21	0.00	6.69	58.37	-51.68	Average
0.159	19.25	0.21	0.00	19.46	65.52	-46.06	QP
0.329	5.86	0.21	0.00	6.07	50.53	-44.46	Average
0.329	11.83	0.21	0.00	12.04	59.49	-47.45	QP
0.783	3.39	0.22	0.01	3.62	46.00	-42.38	Average
0.783	7.26	0.22	0.01	7.49	56.00	-48.51	QP
1.991	4.52	0.24	0.05	4.81	46.00	-41.19	Average
1.991	7.55	0.24	0.05	7.84	56.00	-48.16	QP
6.454	6.49	0.41	0.20	7.10	50.00	-42.90	Average
6.454	13.28	0.41	0.20	13.89	60.00	-46.11	QP
7.769	15.43	0.48	0.20	16.11	50.00	-33.89	Average
7.769	24.14	0.48	0.20	24.82	60.00	-35.18	QP

**Level = Read Level + LISN Factor + Cable Loss.**



Neutral Line  
Peak Scan:  
Level (dBμV)



Quasi-peak and Average measurement:

Freq MHz	Read Level dBμV	LISN Factor dB	Cable Loss dB	Level dBμV	Limit Line dBμV	Over Limit dB	Remark
0.156	11.66	0.62	0.10	12.38	58.54	-46.16	Average
0.156	22.43	0.62	0.10	23.15	65.65	-42.50	QP
0.332	13.93	0.64	0.00	14.57	50.42	-35.85	Average
0.332	17.39	0.64	0.00	18.03	59.40	-41.37	QP
0.747	5.69	0.68	0.01	6.38	46.00	-39.62	Average
0.747	9.54	0.68	0.01	10.23	56.00	-45.77	QP
1.359	4.95	0.70	0.03	5.68	46.00	-40.32	Average
1.359	8.04	0.70	0.03	8.77	56.00	-47.23	QP
7.769	18.16	0.83	0.20	19.19	50.00	-30.81	Average
7.769	26.24	0.83	0.20	27.27	60.00	-32.73	QP
14.138	5.67	1.07	0.30	7.04	50.00	-42.96	Average
14.138	9.66	1.07	0.30	11.03	60.00	-48.97	QP

**Level = Read Level + LISN Factor + Cable Loss.**



## 7.2 Disturbance Power Test, 30MHz to 300MHz

Test Requirement: EN 55014-1  
Test Method: EN 55014-1  
Test Date: 2016-11-11  
Test voltage: AC 230V 50Hz  
Frequency Range: 30MHz to 300MHz  
Detector: Peak for pre-scan  
Quasi-Peak and Average at frequency with maximum peak  
(120kHz resolution bandwidth)

Limit:

Table 2a Columns 2&3

Frequency range MHz	At mains terminals (dB (pW))	
	Quasi-peak	Average
30 to 300	45 to 55	35 to 45
Note1: The limit increases linearly with the frequency in the range 30 MHz to 300 MHz.		

Table 2b Columns 2&3

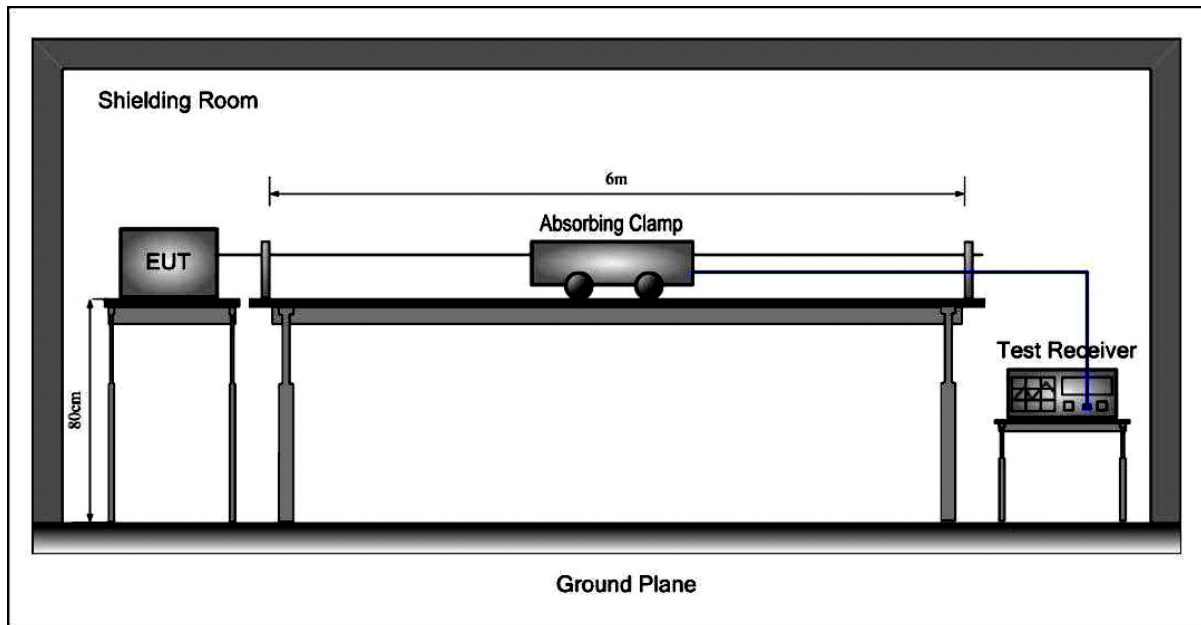
Frequency range MHz	Margin (dB)	
	Quasi-peak	Average
200 to 300	0 to 10 dB	--
<p>NOTE 1: Appliances are deemed to comply in the frequency range from 300 MHz to 1 000 MHz if both of the following conditions ( 1) and 2)) are fulfilled:</p> <p>1) All the measurement result are lower than the applicable limits (Table 2a) minus the corresponding margin (Table 2b); or the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector.</p> <p>2) No clock frequency or oscillator frequency of the EUT is more than or equal to 30 MHz.</p> <p>NOTE 2: The measured result at a particular frequency shall be less than the relevant limit minus the corresponding margin (at that frequency).</p>		

### 7.2.1 E.U.T. Operation

Test the EUT in cooling mode with the temperature at the middle range.

A pre-test at 50MHz shall be made over a range of 0.9 to 1.1 times the rated voltage in order to check the level of disturbance varies considerably with the supply voltage, compliance test at AC 230V as no worse case was found.

## 7.2.2 Test Setup



1. The disturbance power was measured with the EUT in a shielded room.
2. The distance between the clamp test set-up (the appliance, the lead to be measured and the absorbing clamp) and any other conductive objects (including persons, walls and ceiling, but excluding the floor) shall be at least 0.8m. The appliance to be tested shall be placed on a non-metallic support table parallel to the floor. The height of the table shall be  $0.1\text{m} \pm 0.025\text{m}$  for appliances primarily intended to be positioned on the floor in normal use, and  $0.8\text{m} \pm 0.05\text{m}$  for other appliances.
3. Auxiliary leads normally extendible by the user, for instance with a loose end or leads fitted with a (by the user) easily replaceable plug or socket on one or both ends, shall in accordance with 6.2.3 be extended to a length of about 6 m. Any plug or socket which will not pass through the absorbing clamp due to its size shall be removed (see 6.2.3).
4. If the auxiliary lead is permanently fixed to the appliance and to the auxiliary apparatus and:
  - is shorter than 0.25m, measurement are not to be made on these leads.
  - is longer than 0.25m but shorter than twice the length of the absorbing clamp, it shall be extended to twice the length of the absorbing clamp.
  - is longer than twice the length of the absorbing clamp, measurements shall be made using the original lead.
5. The absorbing clamp was moved along the lead to obtain maximum disturbance.

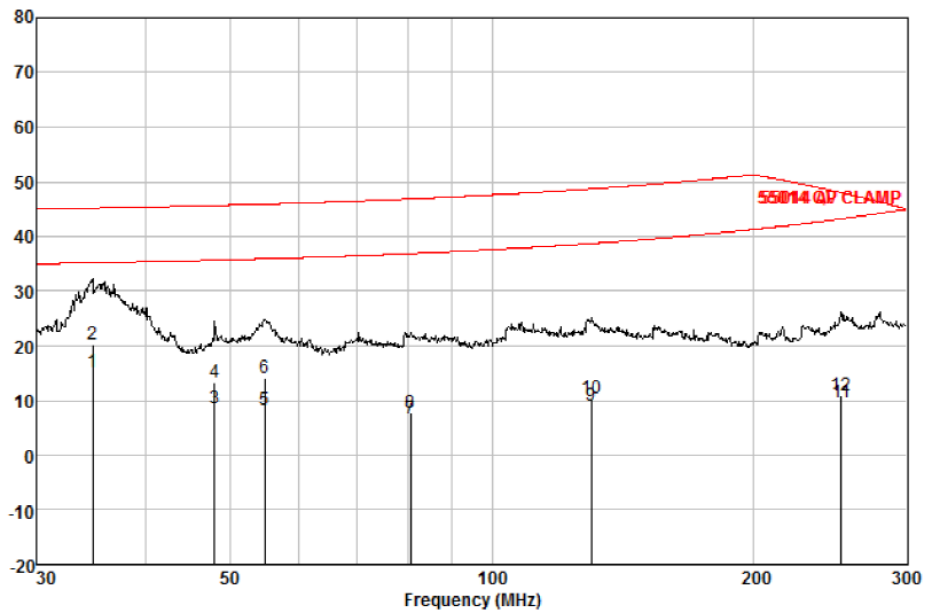


### 7.2.3 Measurement Data

AC Mains:

Peak Scan:

Level (dBpW)



Quasi-peak and Average measurement:

Frequency MHz	Read Level dBuV	Cable Loss dB	Clamp Factor dBpW/dBuV	Measured Level dBpW	Limit Line dBpW	Over limit dB	Remark
34.763	11.46	1.25	2.46	15.17	35.18	-20.01	Average
34.763	16.63	1.25	2.46	20.34	45.18	-24.84	QP
47.987	7.10	1.58	-0.10	8.58	35.67	-27.09	Average
47.987	11.89	1.58	-0.10	13.37	45.67	-32.30	QP
54.843	5.92	1.68	0.69	8.29	35.92	-27.63	Average
54.843	11.85	1.68	0.69	14.22	45.92	-31.70	QP
80.560	4.83	2.07	-0.32	6.58	36.87	-30.29	Average
80.560	6.10	2.07	-0.32	7.85	46.87	-39.02	QP
130.053	5.08	2.71	1.30	9.09	38.71	-29.62	Average
130.053	6.28	2.71	1.30	10.29	48.71	-38.42	QP
251.838	5.50	4.01	-0.02	9.49	43.22	-33.73	Average
251.838	7.01	4.01	-0.02	11.00	48.03	-37.03	QP

### 7.3 Discontinuous Interference, 150kHz to 30MHz

Test Requirement: EN 55014-1  
Test Method: EN 55014-1  
Test Date: 2016-11-11  
Test voltage: AC 230V 50Hz  
Frequency range: 150kHz, 500kHz, 1.4MHz, 30MHz.  
Class/Severity: Clause 4.2 of EN 55014-1

Limit

Provision	Limit		
	Click Rate (N)		
1	All clicks < 20 ms	90 % click < 10 ms	$N \leq 5$
2	$N \leq 0,2$	$L_q^b = L^a + 44$	Clicks <sup>c</sup> $\leq 25\%$ exceed $L_q^b$
3	$30 \geq N > 0,2$	$L_q^b = L^a + 20 \lg(30/N)$	Clicks <sup>c</sup> $\leq 25\%$ exceed $L_q^b$

<sup>a</sup> The limits L of Conducted Emissions apply also to discontinuous disturbances from all equipment which produce:

- 1) disturbances other than clicks, or
- 2) clicks with a click rate N equal to or greater than 30

<sup>b</sup> The relevant limit  $L_q$  for continuous disturbance, as given in 4.1.1 for the measurement with the quasi-peak detector, increased by a certain value determined from the click rate N (see also 4.2.2.2)  
The click limit applies to the disturbance assessed according to the upper quartile method

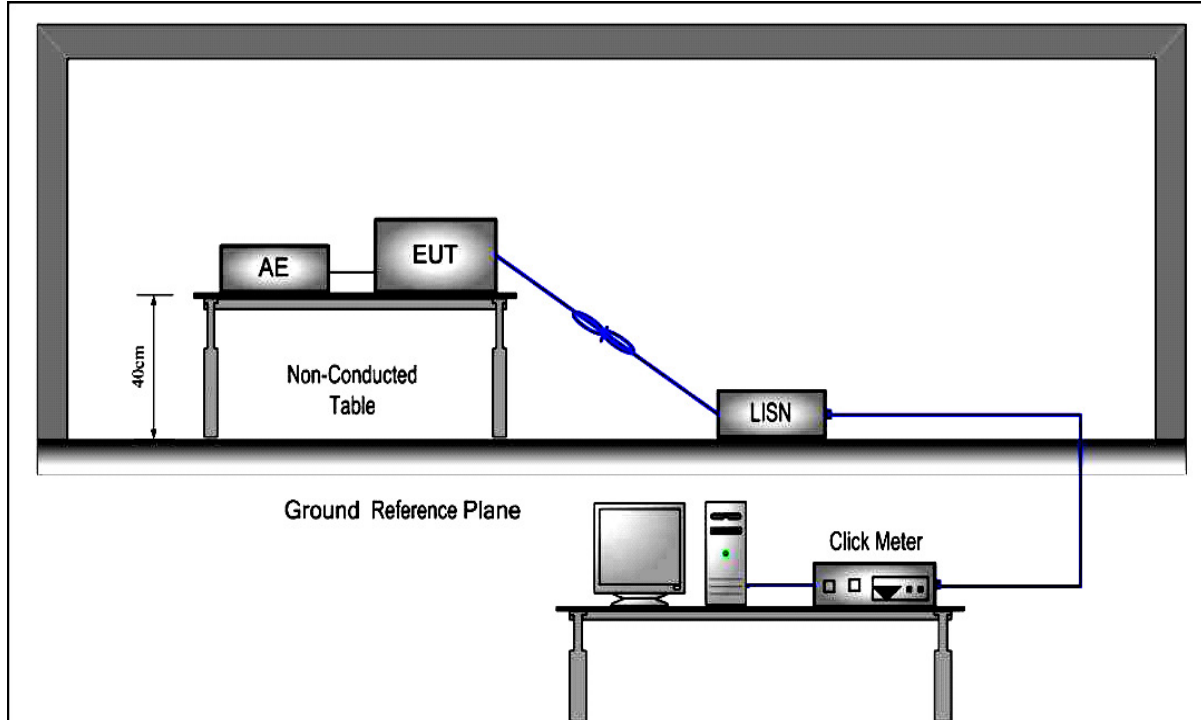
<sup>c</sup> a quarter of the number of the clicks registered during the observation time T is allowed to exceed the click limit  $L_q$

#### 7.3.1 E.U.T. Operation

Test the EUT in cooling mode with the temperature at the middle range.

A pre-test at 160KHz shall be made over a range of 0.9 to 1.1 times the rated voltage in order to check the level of disturbance varies considerably with the supply voltage, compliance test at AC 230V as no worse case was found.

### 7.3.2 Test Setup and Procedure



1. The EUT was placed on a 0.4m high non-metallic table in shielded room, the ground of shielded room used as Ground Reference Plane (GRP), and keeps a distance of at least 0.8m from any of the other metallic surface.
2. The EUT was connected to an artificial mains network and at a distance of 0.8m from it, the excess lead of EUT was bundled with a length of 0.3m to 0.4m parallel to the main lead.
3. The number of counted clicks above the permitted limit for continuous interference and their duration, spacing and rate were measured during the observation time. When relevant, a permitted(relaxed) limit for clicks were calculated and a second measurement was performed. Determination of compliance with the permitted limit according to the upper quartile method.



### 7.3.3 Measurement Data

Meas Duration	2:00:00	LISN Phase -	Attenuation [dB]	40
Overload	NO			
Frequency	150 kHz	500 kHz	1.4 MHz	30 MHz
Clicks (< 10 ms)	22	19	8	0
Clicks (10ms - 20ms)	0	0	0	0
Clicks (> 20 ms)	0	0	0	0
Click Rate [1/min] (factor f = 0.50)	0.09	0.08	0.08	0.08
Continous Disturbances	0	0	0	0
L [dBuV]	66	56	56	60
Lq [dBuV]	110	100	100	104
Clicks > Lq	0	0	0	0
Clicks > Lq [%]	0	0	0	0
Fridge Rules	0	0	0	0
600 ms Rule used	NO	NO	NO	NO
Overall Correction	.42	.32	.37	1.8
Margin for PK Detector	0	0	0	0
Result	PASSED	PASSED	PASSED	PASSED

Conclusion:

The product meets the requirements of **Provision 1**.



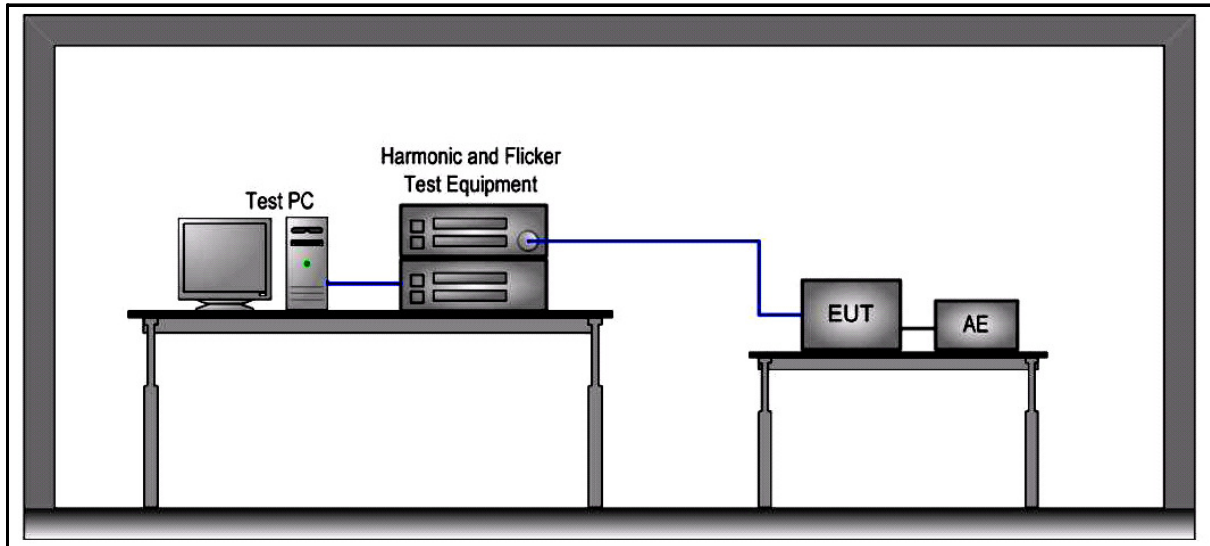
## 7.4 Harmonics Test Result

Test Requirement:	EN 61000-3-2
Test Method:	EN 61000-3-2
Test Date:	2016-11-11
Test voltage:	AC 230V 50Hz
Frequency Range:	100Hz to 2kHz
Measurement Time:	3 mins
Class / Severity:	Class A

### 7.4.1 E.U.T. Operation

Test the EUT in cooling mode with the temperature at the lowest setting.

## 7.4.2 Test Setup and Procedure



1. The EUT was tested with the equipment configured to its rated current.
2. The measurements were carried out under steady conditions. When a piece of EUT is brought into operation or is taken out of operation, manually or automatically, harmonic currents and power are not taken into account at first 10s following the switching event. EUT shall not be in standby mode for more than 10% of any observation period.
3. Harmonics of the fundamental current were measured using a digital power meter with an analogue output and frequency analyser which was integrated in the harmonic & flicker test system.
4. 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.



### 7.4.3 Measurement Data

**Harmonics – Class-A per Ed. 4.0 (Run time)**

**Current Test Result Summary (Run time)**

Test Result: Pass

Source qualification: Normal

THC(A): 0.031

I-THD(%): 2.4

POHC(A): 0.009

POHC Limit(A): 0.251

Highest parameter values during test:

V_RMS (Volts):	229.97	Frequency(Hz):	50.00
I_Peak (Amps):	1.622	I_RMS (Amps)	0.828
I_Fund (Amps):	1.277	Crest Factor:	1.265
Power (Watts):	289.4	Power Factor:	0.982

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.011	1.080	1.0	0.014	1.620	0.9	Pass
3	0.019	2.300	0.8	0.021	3.450	0.6	Pass
4	0.007	0.430	N/A	0.009	0.645	N/A	Pass
5	0.011	1.140	1.0	0.012	1.710	0.7	Pass
6	0.003	0.300	N/A	0.004	0.450	N/A	Pass
7	0.008	0.770	1.0	0.010	1.155	0.8	Pass
8	0.003	0.230	N/A	0.003	0.345	N/A	Pass
9	0.007	0.400	N/A	0.009	0.600	N/A	Pass
10	0.001	0.184	N/A	0.001	0.276	N/A	Pass
11	0.006	0.330	N/A	0.008	0.495	N/A	Pass
12	0.001	0.153	N/A	0.001	0.230	N/A	Pass
13	0.006	0.210	N/A	0.006	0.315	N/A	Pass
14	0.000	0.131	N/A	0.001	0.197	N/A	Pass
15	0.004	0.150	N/A	0.005	0.225	N/A	Pass
16	0.000	0.115	N/A	0.001	0.173	N/A	Pass
17	0.002	0.132	N/A	0.004	0.198	N/A	Pass
18	0.000	0.102	N/A	0.001	0.153	N/A	Pass
19	0.001	0.118	N/A	0.003	0.178	N/A	Pass
20	0.000	0.092	N/A	0.001	0.138	N/A	Pass
21	0.005	0.107	N/A	0.006	0.161	N/A	Pass
22	0.000	0.084	N/A	0.001	0.125	N/A	Pass
23	0.004	0.098	N/A	0.007	0.147	N/A	Pass
24	0.000	0.077	N/A	0.001	0.115	N/A	Pass
25	0.004	0.090	N/A	0.005	0.135	N/A	Pass
26	0.000	0.071	N/A	0.001	0.107	N/A	Pass
27	0.004	0.083	N/A	0.004	0.125	N/A	Pass
28	0.000	0.066	N/A	0.000	0.099	N/A	Pass
29	0.003	0.078	N/A	0.003	0.116	N/A	Pass
30	0.000	0.061	N/A	0.000	0.092	N/A	Pass
31	0.002	0.073	N/A	0.002	0.109	N/A	Pass
32	0.000	0.058	N/A	0.000	0.086	N/A	Pass
33	0.001	0.068	N/A	0.001	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.001	0.064	N/A	0.001	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.001	0.061	N/A	0.001	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.001	0.058	N/A	0.001	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass



## 7.5 Flicker Test Result

Test Requirement:	EN 61000-3-3
Test Method:	EN 61000-3-3
Test Date:	2016-11-11
Test voltage:	AC 230V 50Hz
Measurement Time:	10 mins
Class / Severity:	Clause 5 of EN 61000-3-3

### 7.5.1 E.U.T. Operation

Test the EUT in cooling mode with the temperature at the middle range.

Note: "Pst and Plt requirements shall not be applied to voltage changes caused by manual switching.

The limits shall not be applied to voltage changes associated with emergency switching or emergency interruptions."

Please also refer to Annex A (Application of limits and type test conditions) for details in EN 61000-3-3.

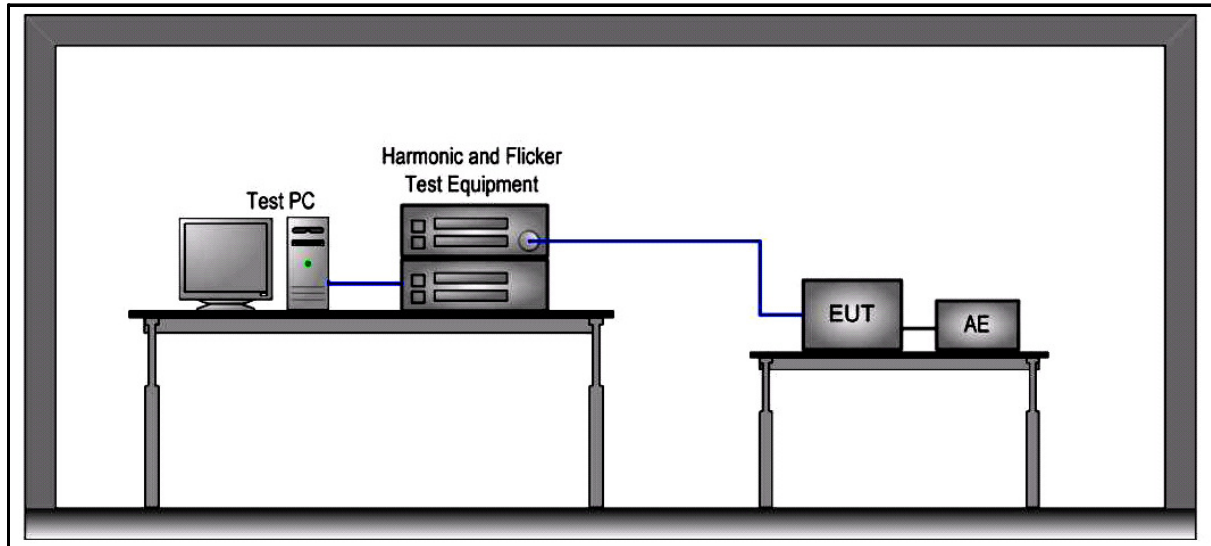
--No limits shall apply to lamps.

--Incandescent lamp luminaires with ratings less than or equal to 1 000 W and discharge lamp luminaires with ratings less than or equal to 600 W, are deemed to comply with the dmax limits in this standard and are not required to be tested.

--Ballasts are deemed to be part of luminaires and are not required to be tested.



## 7.5.2 Test Setup and Procedure



1. The test supply voltage (open-circuit voltage) was the rated voltage of the EUT. The test voltage was maintained within  $\pm 2\%$  of the nominal value. The frequency was  $50\text{ Hz} \pm 0.5\%$ .
2. The voltage fluctuations and flicker were measured at the supply terminals of the EUT.
3. The observation period,  $T_p$ , for the assessment of flicker values by flicker measurement, flicker simulation, or analytical method was:
  - for  $P_{st}$ ,  $T_p = 10\text{ min}$ .
  - for  $Plt$ ,  $T_p = 2\text{ h}$ .

The observation period included that part of the whole operation cycle in which the EUT produces the most unfavorable sequence of voltage changes.



### 7.5.3 Measurement Data

#### Flicker Test Summary per EN61000-3-3 (Run time)

**Test Result: Pass**

**Status: Test Completed**

**Parameter values recorded during the test:**

**Vrms at the end of test (Volt): 229.97**

<b>Highest dt (%):</b>	<b>1.01</b>	<b>Test limit (%):</b>	<b>N/A</b>	<b>N/A</b>
<b>T-max (mS):</b>	<b>0</b>	<b>Test limit (mS):</b>	<b>500.0</b>	<b>Pass</b>
<b>Highest dc (%):</b>	<b>0.37</b>	<b>Test limit (%):</b>	<b>3.30</b>	<b>Pass</b>
<b>Highest dmax (%):</b>	<b>0.66</b>	<b>Test limit (%):</b>	<b>4.00</b>	<b>Pass</b>



## 8 Electromagnetic Susceptibility Test Results

### 8.1 Performance Criteria Description in Clause 6 of EN 55014-2

<b>Criterion A:</b>	The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. 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 from what the user may reasonably expect from the apparatus if used as intended.
<b>Criterion B:</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 (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however. 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, then either of these may be derived from the product description and documentation and from what the user may reasonably expect from the apparatus if used as intended.
<b>Criterion C:</b>	Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

## 8.2 ESD

Test Requirement:	EN 55014-2	
Test Method:	EN 61000-4-2	
Criterion Required:	B	
Test Date:	2016-11-12	
Test voltage:	AC 230V 50Hz	
Discharge Impedance:	330 Ω / 150 pF	
Discharge Voltage:	Air Discharge:	8 kV
	Contact Discharge:	4 kV
	VCP/HCP:	4 kV
Polarity:	Positive & Negative	
Number of Discharge:	Minimum 10 times at each test point	
Discharge Mode:	Single Discharge	
Discharge Period:	1 second minimum	

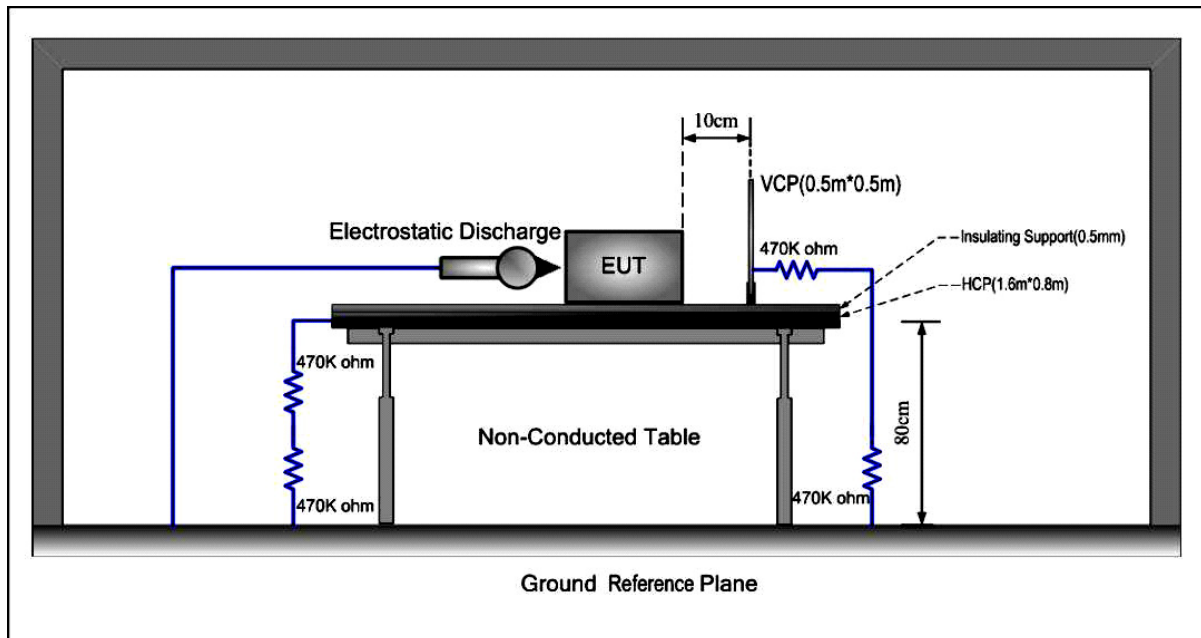
### 8.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 49% RH Atmospheric Pressure: 1018 mbar

EUT Operation: Test the EUT in cooling mode and idle mode.

### 8.2.2 Test Setup and Procedure





- Contact discharge was applied only to conductive surfaces of the EUT. Air discharge was applied only to non-conducted surfaces of the EUT.
- 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).
- 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 surfaces except the GRP, HCP and VCP was greater than 1m.
- During the contact discharges, the tip of the discharge electrode touched 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 retrigged for a new single discharge. For ungrounded product, a discharge cable with two resistances was used after each discharge to remove remnant electrostatic voltage. 10 times of each polarity single discharge were applied to HCP and VCP.

### 8.2.3 Test Results

#### Direct Application Test Results

- Observations:            Test Point:
- All insulated enclosure & seams.
  - All accessible metal parts of the enclosure.

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
8	+/-	1	N/A	A
4	+/-	2	A	N/A

#### Indirect Application Test Results

- Observations:            Test Point:
- All sides.

Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
4	+/-	1	N/A	A

#### Results:

- A: No degradation in the performance of the EUT was observed.  
N/A: Not applicable (floor mounted EUT or not requested by Standard).

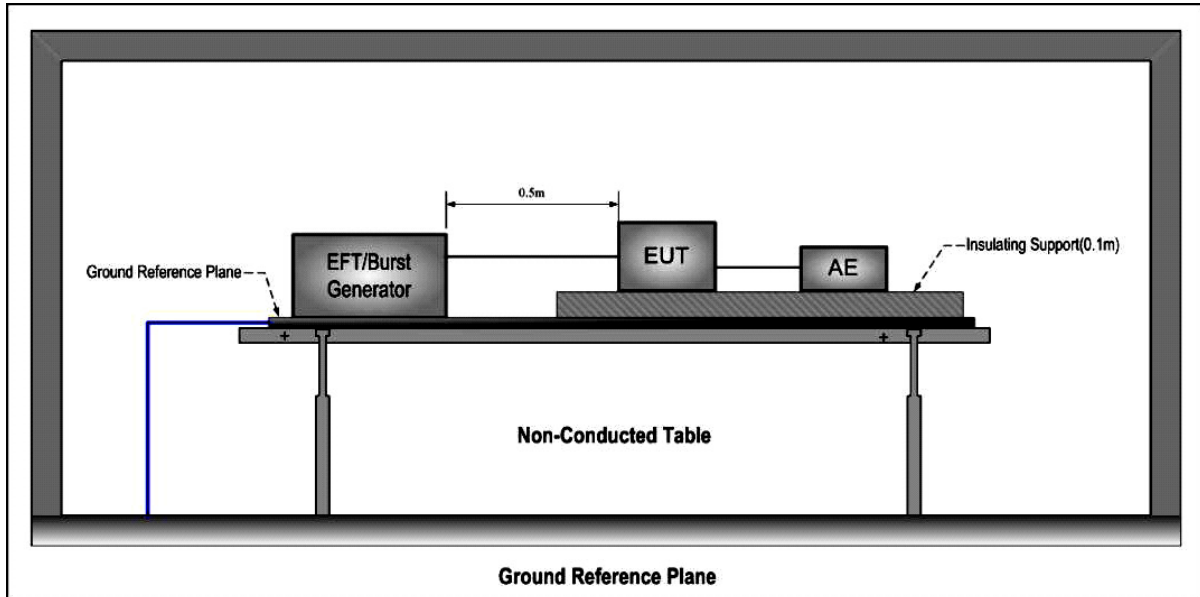
### 8.3 Electrical Fast Transients (EFT)

Test Requirement:	EN 55014-2
Test Method:	EN 61000-4-4
Criterion Required:	B
Test Date:	2016-11-12
Test voltage:	AC 230V 50Hz
Test Level:	1.0kV on AC
Polarity:	Positive & Negative
Repetition Frequency:	5kHz
Burst Duration:	300ms
Test Duration:	2 minute per level & polarity

#### 8.3.1 E.U.T. Operation

Test the EUT in cooling mode and idle mode.

#### 8.3.2 Test Setup and 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 GRP and be insulated from it by an insulating support with a thickness of 0.1 m.
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 were placed on the insulation support 0.1m above GRP. Cables not subject to EFT were routed as far as possible from cable under test to minimize the coupling between the cables.
3. The distance between any coupling devices and the EUT shall be (0,5 – 0/+0,1) m for tabletop equipment testing, and (1,0 ± 0,1) m for floor standing equipment. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be bundled and situated at a distance of 0.1m above the GRP.
4. The EUT was conducted the below specified level voltage test for line to neutral or line to neutral to earth (for clamp coupling is for the signal line), 120 seconds duration.
5. If the equipment contains identical ports, only one was tested; multi-conductor cables, such as a 50-pair telecommunication cable, were tested as a single cable. Cables did not be split or divided into groups of conductors for this test; interface ports, which were intended by the manufacturer to be connected to data cables not longer than 3 m, did not be tested.
6. The coupling Clamp was used for measurements on signal ports.

### 8.3.3 Test Results On AC Supply

Lead under Test	Level (±kV)	Coupling Direct/Clamp	Observations (Performance Criterion)
Live + Neutral + Earth	1.0	Direct	(A)

A: No loss of function.

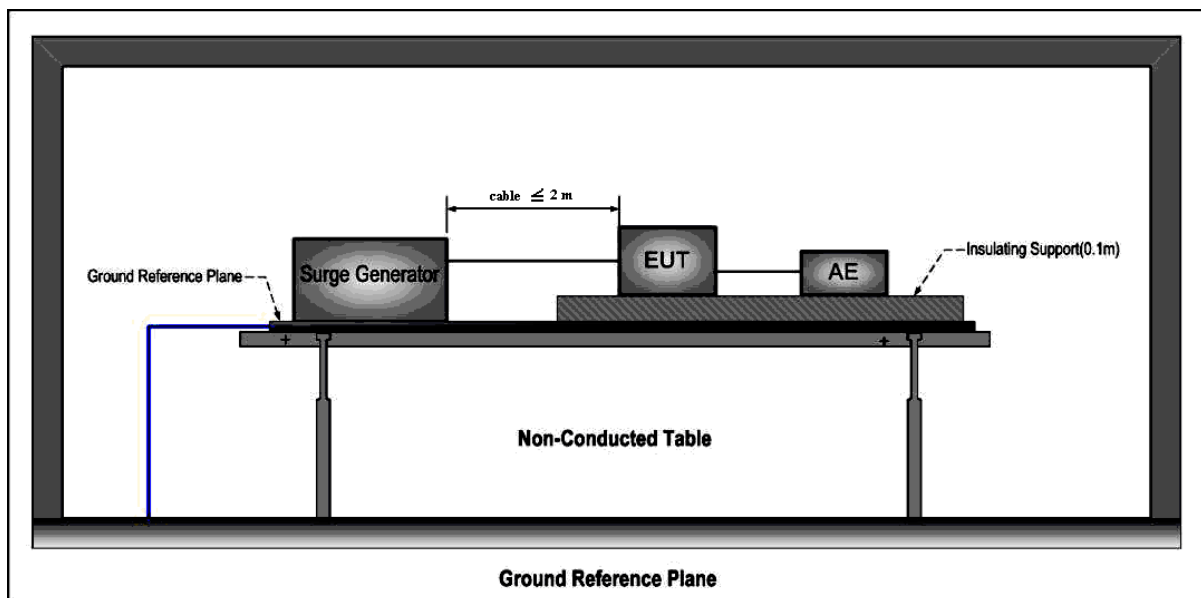
## 8.4 Surge

Test Requirement:	EN 55014-2
Test Method:	EN 61000-4-5
Criterion Required:	B
Test Date:	2016-11-12
Test voltage:	AC 230V 50Hz
Test Level:	±1kV Live to Neutral ±2kV Live, Neutral to Earth
Polarity:	Positive & Negative
Generator source impedance:	2Ω
Trigger Mode:	Internal
No. of surges:	5 positive at 90°, 5 negative at 270°.

### 8.4.1 E.U.T. Operation

Test the EUT in cooling mode and idle mode.

### 8.4.2 Test Setup and Procedure





1. The EUT was placed on a ground reference plane (GRP) insulated by an insulating support 0.1m 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  $\mu$ s 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. The power cord between the EUT and the coupling/decoupling network do not exceed 2m in length. The interconnection line between the EUT and the coupling/decoupling network shall not exceed 2m in length.
4. The EUT was conducted the below specified test voltages for line to line and line to neutral and line to earth and neutral to earth, five positive pulses at 90° and five negative pulses 270° for a.c. power ports and five positive pulses and five negative surge pulses for d.c. power ports. The test levels were applied on the EUT with a 2 $\Omega$  generator source impedance for power supply terminals and 40 $\Omega$  output impedance for interconnection lines. The tests were done at repetition rate 1 per minute.

#### 8.4.3 Test Results:

Pulse No	Line-Line	Level (kV)	Surge Interval	Phase (deg)	Observation (Performance Criterion)
1-5	L-N	+1	60s	90°	No Loss of Function (A)
6-10	L-N	-1	60s	270°	(A)
11-15	L-PE	+2	60s	90°	(A)
16-20	L-PE	-2	60s	270°	(A)
21-25	N-PE	+2	60s	90°	(A)
26-30	N-PE	-2	60s	270°	(A)

## 8.5 Conducted Immunity 0.15MHz to 230MHz

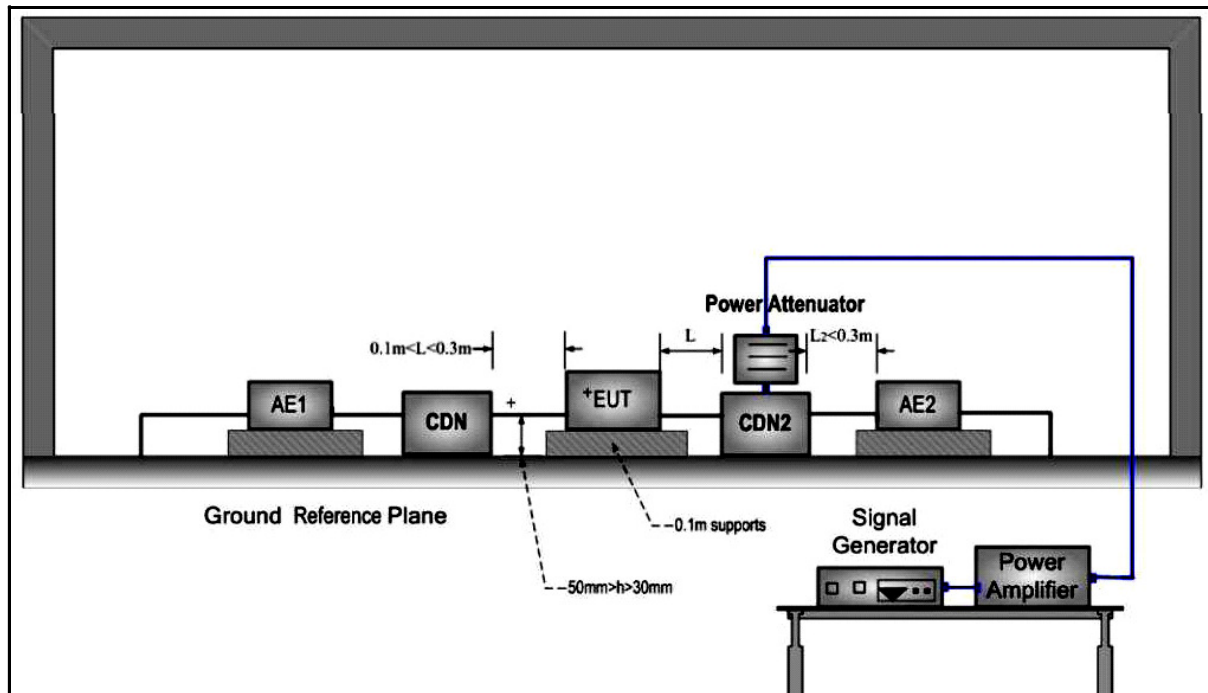
Test Requirement:	EN 55014-2
Test Method:	EN 61000-4-6
Criterion Required:	A
Test Date:	2016-11-12
Test voltage:	AC 230V 50Hz
Frequency Range:	0.15MHz to 230MHz
Test level:	3V r.m.s on AC Ports (unmodulated emf into 150 Ω)
Modulation:	80%, 1kHz Amplitude Modulation

### 8.5.1 E.U.T. Operation

Test the EUT in cooling mode and idle mode.

### 8.5.2 Test Setup and Procedure

For AC port





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 0.1m and 0.3m 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. Each AE, used with clamp injection, shall be placed on an insulating support 0.1m above the ground reference plane. A decoupling network shall be installed on each cable between the EUT and AE except the cable under test. All cables connected to each AE, other than those being connected to the EUT, shall be provided with decoupling networks. The decoupling networks connected to each AE (except those on cables between the EUT and AE) shall be applied no further than 0.3m from the AE. The cable(s) between the AE and the decoupling network (s) or in between the AE and the injection clamp shall not be bundled nor wrapped and shall be kept between 30 mm and 50 mm above the ground reference plane.
4. The frequency range was swept from 150 kHz to 230 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 0.5 s.

### 8.5.3 Test Results:

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Observation (Performance Criterion)
150 kHz to 230 MHz	3 Wires AC Supply Cable	3V r.m.s	80%, 1 kHz Amp. Mod.	1%	1s	No Loss of Function (A)

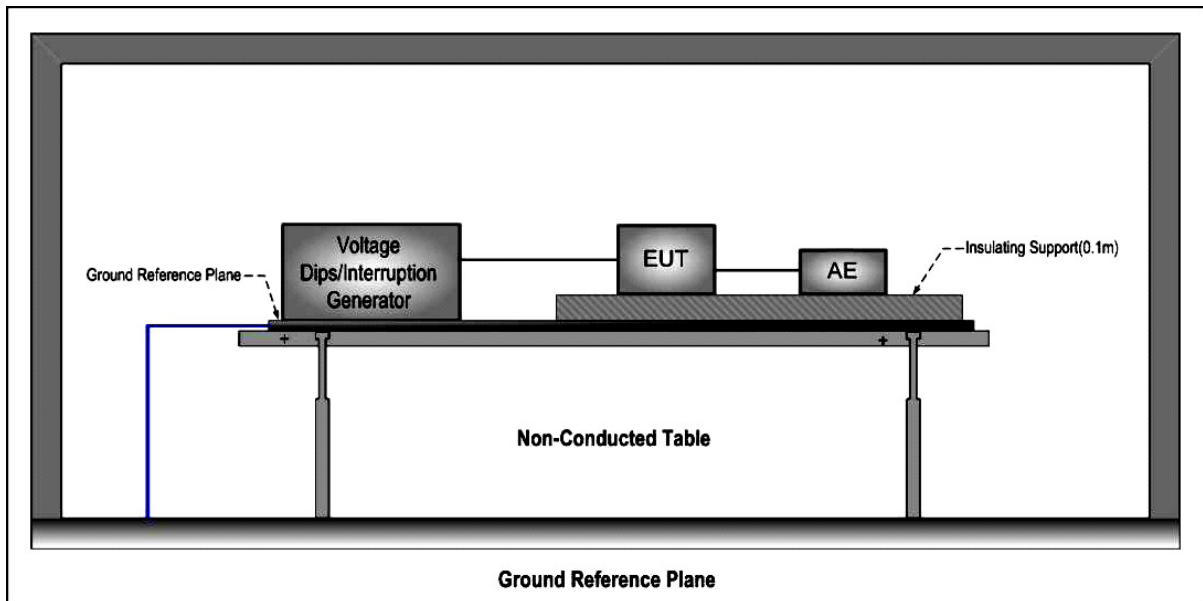
## 8.6 Voltage Dips and Interruptions

Test Requirement:	EN 55014-2
Test Method:	EN 61000-4-11
Criterion Required:	C
Test Date:	2016-11-12
Test voltage:	AC 230V 50Hz
Test Level:	0% of $U_T$ (Supply Voltage) for 0.5 Periods 40 % of $U_T$ (Supply Voltage) for 10 Periods 70 % of $U_T$ (Supply Voltage) for 25 Periods
No. of Dips / Interruptions:	3 per Level

### 8.6.1 E.U.T. Operation

Test the EUT in cooling mode and idle mode.

### 8.6.2 Test Setup and Procedure



1. The EUT was placed on a ground reference plane (GRP) insulated by an insulating support 0.1m 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.
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.
4. For EUT with more than one power cord, each power cord was tested individually.

### 8.6.3 Test Results

$U_{T=}$  AC 230V 50Hz

Test Level % $U_T$	Phase	Duration of drop out in Periods	No of drop out	Time between drop out	Observations (Performance Criterion)
0	0°	0.5	3	10s	No Loss of Function (A)
40	0°	10	3	10s	No Loss of Function (A)
70	0°	25	3	10s	No Loss of Function (A)

Remark:

$U_{T=}$  the nominal supply voltage.

## 9 Photographs

### 9.1 EUT Constructional Details











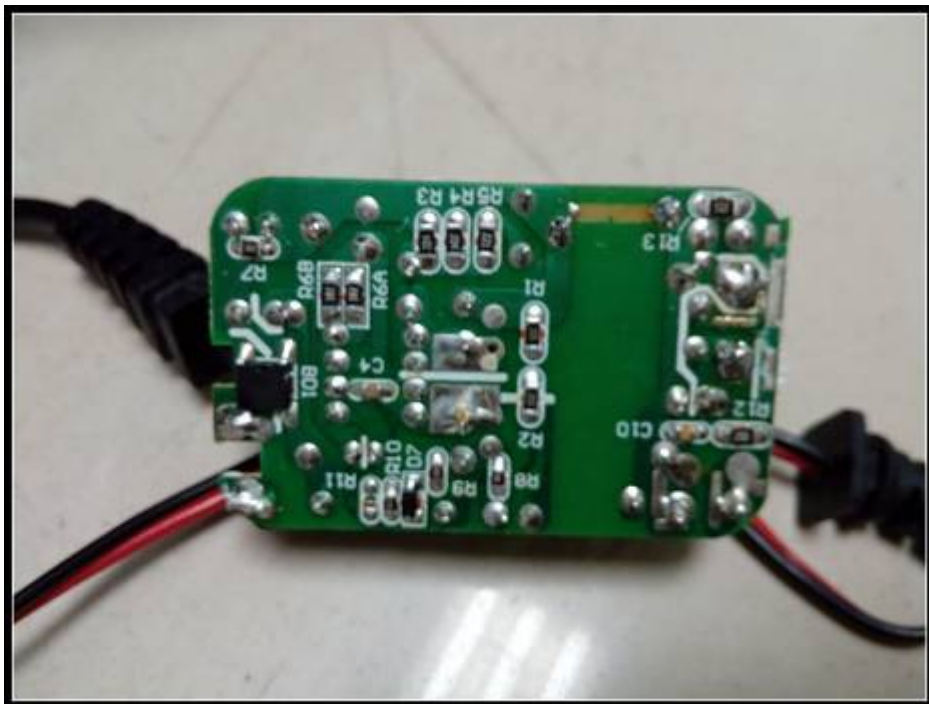
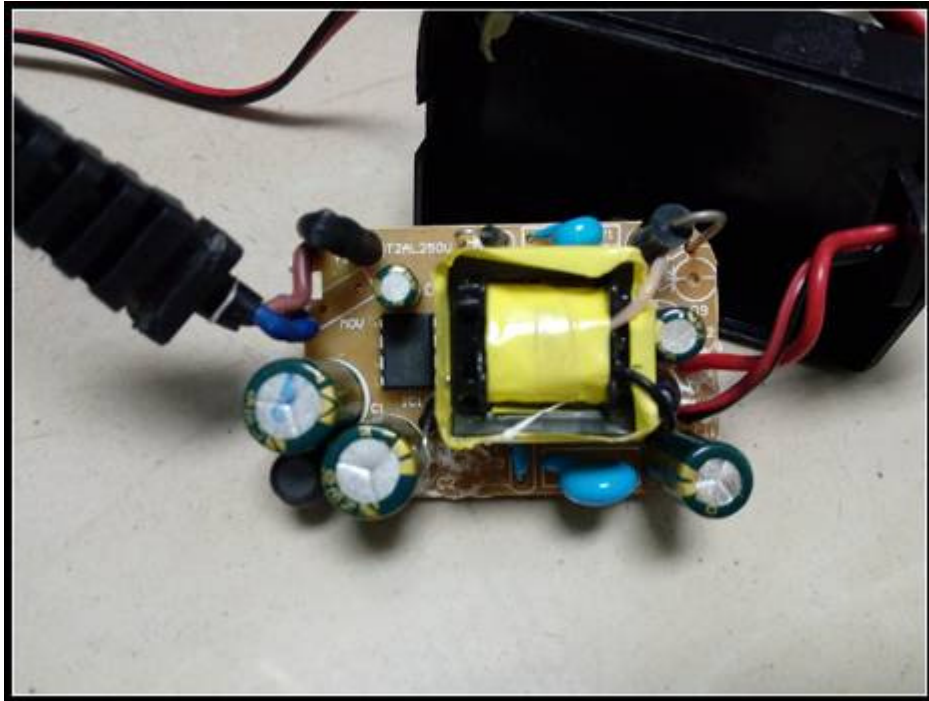


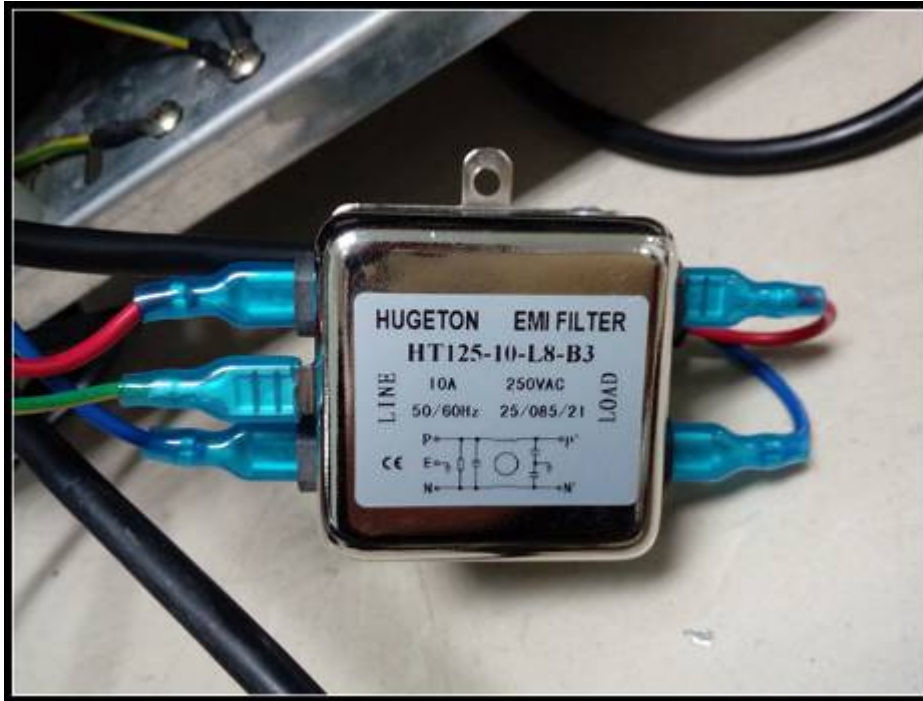












--End of Report--