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Report No.: SHEM151100433301
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1 Cover Page

TEST REPORT

Application No.:	SHEM1511004333HS
Applicant:	Ruiian Roco Sanitaryware Co., Ltd
Equipment under Test (EUT)	
NOTE: The following sample(s) was/were submitted and identified by the client as.	
Product Name:	Hand Dryer
Model No.(EUT):	MDF-8858
Add Model No.:	MDF-8850, MDF-8801, MDF-8887, MDF-8838
Standards:	EN 55014-1:2006+A1:2009+A2:2011, EN 55014-2:2015 EN 61000-3-2:2014, EN 61000-3-3:2013.
Date of Receipt:	November 26, 2015
Date of Test:	December 03, 2015 to December 04, 2015
Date of Issue:	August 11, 2016
Test Result:	Pass*

* 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 EC Declaration of Conformity and compliance with all relevant EU Directives.



Parlam Zhan
E&E Section Manager
SGS-CSTC (Shanghai) Co., Ltd.

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 Test Summary

ELECTROMAGNETIC INTERFERENCE (EMI)			
Test	Test Requirement	Test Method	Result
Conducted Emission on AC, 150kHz to 30MHz	EN 55014-1:2006+ A1:2009+A2:2011	EN 55014-1:2006+ A1:2009+A2:2011	PASS
Disturbance Power, 30MHz to 300MHz	EN 55014-1:2006+ A1:2009+A2:2011	EN 55014-1:2006+ A1:2009+A2:2011	PASS*
Discontinuous Interference on AC 150kHz - 30MHz	EN 55014-1:2006+ A1:2009+A2:2011	EN 55014-1:2006+ A1:2009+A2:2011	N/A**
Harmonic Emission on AC, 100Hz to 2kHz	EN 61000-3-2:2014	EN 61000-3-2:2014	PASS
Flicker Emission on AC	EN 61000-3-3:2013	EN 61000-3-3:2013	PASS
Electromagnetic Susceptibility(EMS)			
Test	Test Requirement	Test Method	Result
ESD	EN 55014-2:1997+ A1:2001+A2:2008	EN 61000-4-2:2009	PASS
Electrical Fast Transients (EFT) on AC	EN 55014-2:1997+ A1:2001+A2:2008	EN 61000-4-4:2012	PASS
Surge Immunity on AC	EN 55014-2:1997+ A1:2001+A2:2008	EN 61000-4-5:2014	PASS
Injected Currents on AC, 150kHz to 230MHz	EN 55014-2:1997+ A1:2001+A2:2008	EN 61000-4-6:2014	PASS
Voltage Dips and Interruptions on AC	EN 55014-2:1997+ A1:2001+A2:2008	EN 61000-4-11:2004	PASS
Remark :			
<p>* Disturbance Power 30MHz-300MHz was applied to the EUT first and then Radiated Emission 300MHz-1GHz was conducted since below condition was not fulfilled: All emission readings from the equipment under test shall be lower than the applicable limits (Table 2a) reduced by the margin (Table 2b); the maximum clock frequency shall be less than 30 MHz. Please refer to section 7.2 of this test report for more details.</p> <p>N/A Not applicable</p>			
<p>Note1:** please refer to Section 7.3 of this report for details.</p> <p>Note2: There are 5 models mentioned in this report, and they are the similar in electrical and electronic characters. Only the model MDF-8858 was tested since their differences were the model number, trade name and appearance.</p> <p>Note3: Only one mode was shown as the test setup photos since all modes were same for the test setup.</p>			

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4 General Information

4.1 Client Information

Applicant: Ruian Roco Sanitaryware Co., Ltd
Address of Applicant: 19, Changxin Road, Xinfang Industrial Zone, Tangxia Town, Ruian, Wenzhou, 325204 Zhejiang, China
Manufacturer: Ruian Roco Sanitaryware Co., Ltd
Address of Manufacturer: 19, Changxin Road, Xinfang Industrial Zone, Tangxia Town, Ruian, Wenzhou, 325204 Zhejiang, China
Factory: Ruian Roco Sanitaryware Co., Ltd
Address of Factory: 19, Changxin Road, Xinfang Industrial Zone, Tangxia Town, Ruian, Wenzhou, 325204 Zhejiang, China

4.2 Details of E.U.T.

Power Supply: AC 220-240V, 50/60Hz
Test voltage: AC 230V, 50Hz
Cable Type: 0.8m Length (3 wires) for AC cable
Rated Power: 1200W

4.3 E.U.T Operation Mode

Functions/Modes: Running & Heating mode, Standby mode
Running & Heating mode: Keep EUT running and heating continuously.
Standby mode: Keep EUT Standby.
Remark: Pre-test all operating modes then choose the worst result.

4.4 E.U.T Operation Environment

Temperature Range: 20-25°C
Humidity Range: 30-60% RH
Atmospheric Pressure Range: 100-105kPa

4.5 Description of Support Units

The EUT has been tested independently.

4.6 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).

4.7 Abnormalities from Standard Conditions

None.

4.8 Modification/Retest Record

None.

4.9 Monitoring of EUT for All Immunity Test

Audio: None.

Visual: Working Status of the EUT.

4.10 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

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No tests were sub-contracted.

4.11 Test Facility

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2017-07-14.

- **FCC – Registration No.: 402683**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2017-09-16.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1. Expiry Date: 2017-06-18.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868,C-4336,T-2221,G-830 respectively. Date of Expiry: 2017-11-16.

4.12 Measurement Uncertainty

According to CISPR 16-4-2.

Test Item	Frequency Range	Measurement Uncertainty	U _{cispr}
Conducted Emission at mains port using AMN	9kHz-150kHz	3.2 dB	3.8 dB
Conducted Emission at mains port using AMN	150kHz-30MHz	3.0 dB	3.4 dB
Conducted Emission at mains port using VP	9kHz-30MHz	1.9 dB	3.9 dB
Conducted Emission at telecommunication port using AAN	150kHz-30MHz	2.4 dB	5.0 dB
Radiated Emission	30MHz-1000MHz	4.4 dB	6.3 dB
Radiated Emission	1GHz-18GHz	4.6 dB	5.2 dB (1GHz-6GHz)
			5.5 dB (6GHz-18GHz)
Disturbance Power	30MHz-300MHz	3.5 dB	4.5 dB
Remark: AMN – Artificial Mains Network VP – Voltage Probe ANN – Asymmetric Artificial Network			

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

5 Equipment list

Conducted Emission

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	EML test receiver	Rohde & Schwarz	ESCS30	100086	2015-01-22	2016-01-21
2	Line impedance stabilization network	SCHWARZBECK	NSLK8127	8127-490	2015-01-22	2016-01-21
3	Line impedance stabilization network	EMCO	3816/2	00034161	2015-01-22	2016-01-21

Disturbance Power

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	EML test receiver	Rohde & Schwarz	ESCS30	100086	2015-01-22	2016-01-21
2	6dB Attenuator	HUAXIANG	TS2-6dB	11051002	2014-12-27	2015-12-26
3	Absorbing clamp	LUTHI	MDS-21	3583	2015-03-12	2016-03-11

Clicks

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	Click analyzer	SCHAFFNER	DIA1512D	100/05/428	2015-01-22	2016-01-21

Harmonic & Flicker

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	Single phase harmonics & flicker analyzer	EM test	DPA500	V0507100125	2015-01-22	2016-01-21
2	AC SOURCE 6KVA	EM test	ACS500	V0507100126	2015-01-22	2016-01-21

Electrostatic Discharge Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	Electrostatic Discharge Simulator	TESEQ	NSG 437	468	2015-08-25	2016-08-24

EFT Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	EMS test machine	EMC Partner	TRA3000 F-S-D-V	1229	2015-01-04	2016-01-03

Surge Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	EMS test machine	EMC Partner	TRA3000 F-S-D-V	1229	2015-01-04	2016-01-03

Conducted Immunity Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	signal generator	Rohde & Schwarz	SMY01	101394	2015-01-22	2016-01-21
2	PAMP Conducted RF test system	HAEFFLY	PAMP250	151708	2015-01-22	2016-01-21
3	CDN impedance and K-factor	LUTHI	L-801 M1	2116	/	/
4	CDN impedance and K-factor	LUTHI	L-801 M2/M3	2117	2015-01-22	2016-01-21

Voltage dips and Interruption Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	EMS test machine	EMC Partner	TRA3000 F-S-D-V	1229	2015-01-04	2016-01-03

General Equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal.Due date
1	Digital pressure meter	YONGZHI	DYM3-01	101012	2015-04-13	2016-04-12
2	Temperature & humidity recorder	ShangHai weather meter work	ZJ 1-2B	84320600 803136, F3040201 53,20101 201FS10 0A6K,201 106117	2015-08-03	2016-08-02
3	Digital Multimeter	FLUKE	17B	19720439	2015-01-22	2016-01-21
4	Autoformer regulator	Guangzhou bao de	TDGC2-5K VA-	/	/	/
5	CLAMP METER	FLUKE	316	250303097 1	2015-01-22	2016-01-21

6 Electromagnetic Interference Test Results

6.1 Conducted Emissions on Mains Terminals

Test Frequency: 150 kHz to 30MHz
 Detector: Quasi-Peak and Average at frequency with maximum peak
 (9kHz 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.

6.1.1 E.U.T. Operation

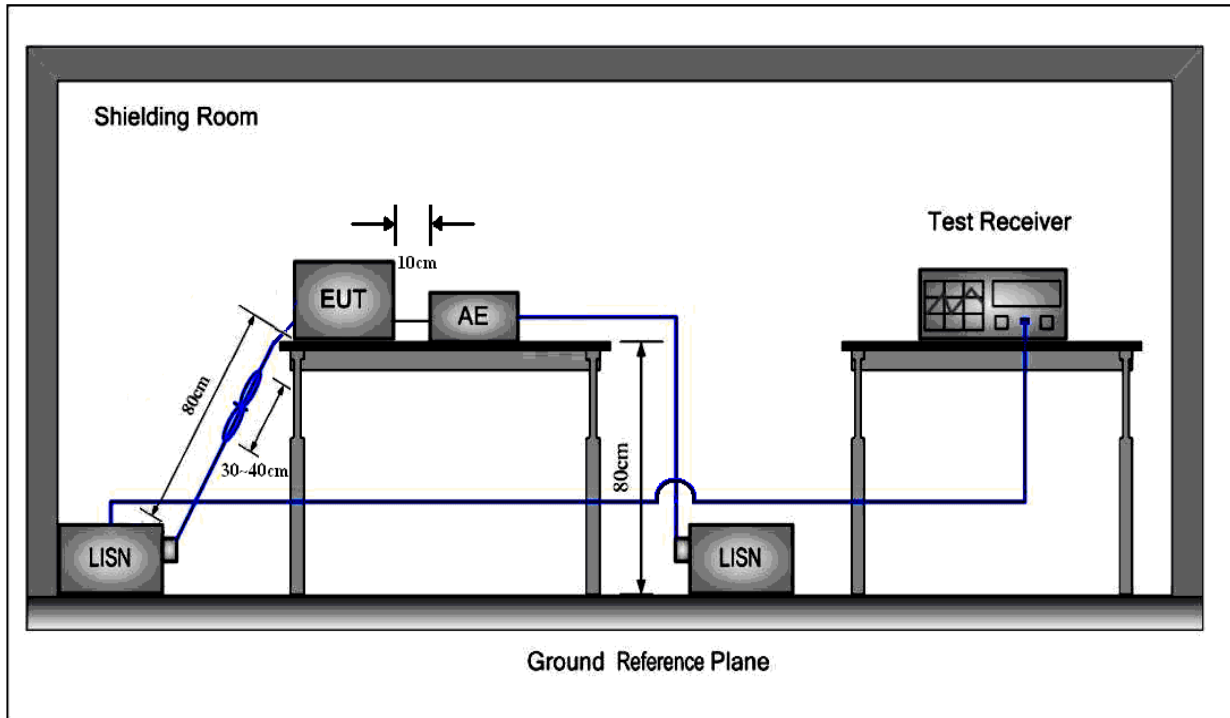
Test mode: Running & Heating mode

Note: 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 230V 50Hz as no worse case was found.

Pre-scan was performed with peak detected on all ports, Quasi-peak & average measurements were performed at the frequencies at which maximum peak emission level were detected.

Please see the attached Quasi-peak and Average test results.

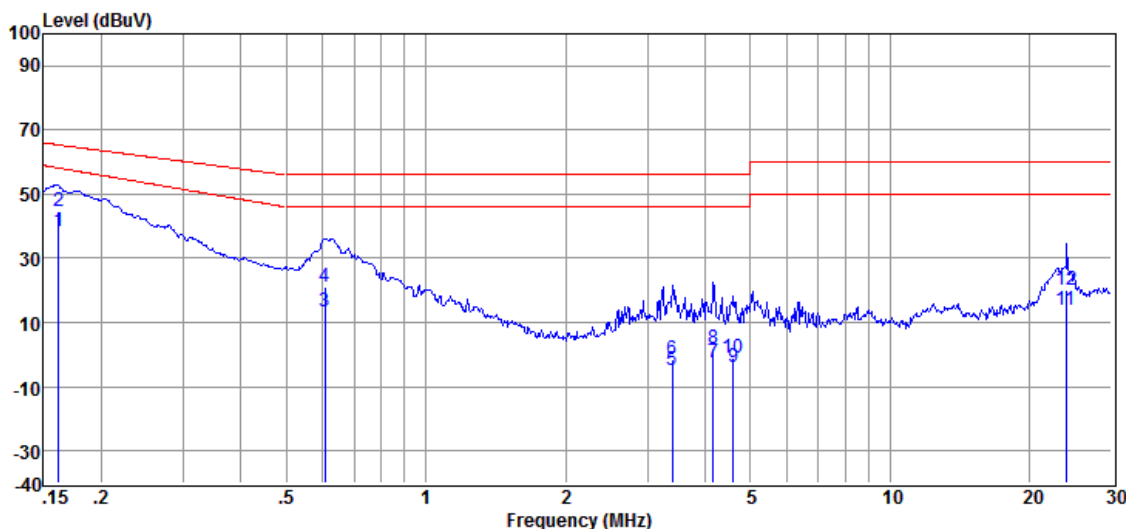
6.1.2 Test Setup and Procedure



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.

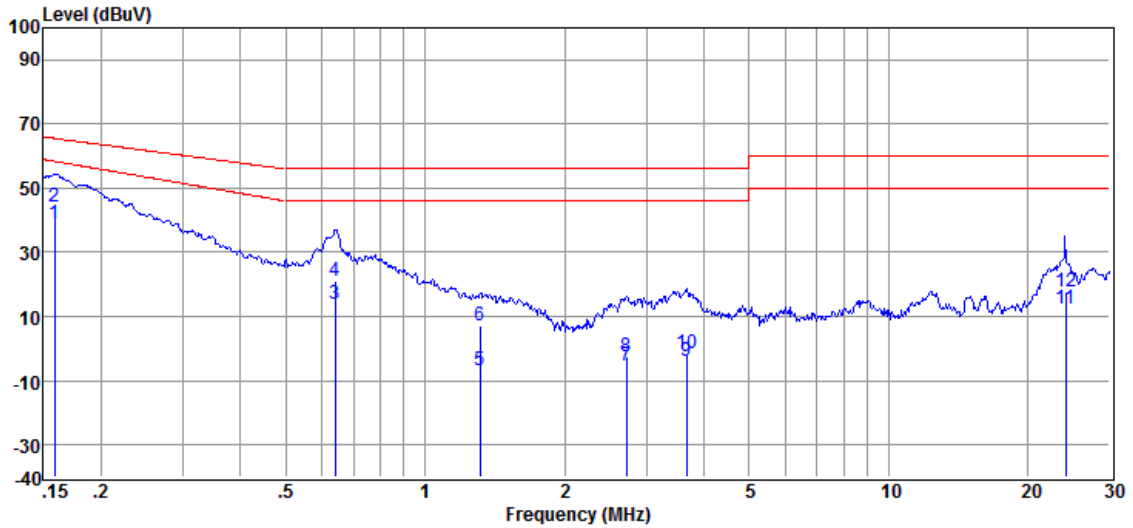
6.1.3 Measurement Data

Live Line:



Item	Freq.	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB)	(dB)	(dBμV)	(dBμV)	(dB)	
1	0.162	28.17	0.31	9.86	38.34	58.20	-19.86	Average
2	0.162	34.39	0.31	9.86	44.56	65.38	-20.82	QP
3	0.606	3.54	0.23	9.86	13.63	46.00	-32.37	Average
4	0.606	11.06	0.23	9.86	21.15	56.00	-34.85	QP
5	3.396	-15.34	0.38	9.88	-5.08	46.00	-51.08	Average
6	3.396	-11.95	0.38	9.88	-1.69	56.00	-57.69	QP
7	4.164	-12.59	0.38	9.89	-2.32	46.00	-48.32	Average
8	4.164	-8.63	0.38	9.89	1.64	56.00	-54.36	QP
9	4.599	-14.28	0.39	9.90	-3.99	46.00	-49.99	Average
10	4.599	-11.44	0.39	9.90	-1.15	56.00	-57.15	QP
11	23.964	3.32	0.41	9.98	13.71	50.00	-36.29	Average
12	23.964	9.70	0.41	9.98	20.09	60.00	-39.91	QP

Neutral Line:



Item	Freq.	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB)	(dB)	(dBμV)	(dBμV)	(dB)	
1	0.159	28.64	0.33	9.86	38.83	58.37	-19.54	Average
2	0.159	34.11	0.33	9.86	44.30	65.52	-21.22	QP
3	0.641	3.98	0.22	9.86	14.06	46.00	-31.94	Average
4	0.641	11.00	0.22	9.86	21.08	56.00	-34.92	QP
5	1.314	-17.34	0.53	9.87	-6.94	46.00	-52.94	Average
6	1.314	-3.01	0.53	9.87	7.39	56.00	-48.61	QP
7	2.722	-15.93	0.80	9.87	-5.26	46.00	-51.26	Average
8	2.722	-13.16	0.80	9.87	-2.49	56.00	-58.49	QP
9	3.669	-14.57	0.62	9.88	-4.07	46.00	-50.07	Average
10	3.669	-12.23	0.62	9.88	-1.73	56.00	-57.73	QP
11	24.073	1.78	0.47	9.98	12.23	50.00	-37.77	Average
12	24.073	7.34	0.47	9.98	17.79	60.00	-42.21	QP

Level = Read Level + LISN/ISN Factor + Cable Loss.

6.2 Disturbance Power Test

Test Frequency: 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 for household and similar appliances

Disturbance power limits for the frequency range 30 MHz to 300 MHz

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 for household and similar appliances

Margin when performing disturbance power measurement in the frequency range 30 MHz to 300 MHz

Frequency range (MHz)	Margin (dB)	
	Quasi-peak	Average
200 to 300	0 to 10 dB	-
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: 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. NOTE 2: The measured result at a particular frequency shall be less than the relevant limit minus the corresponding margin (at that frequency).		

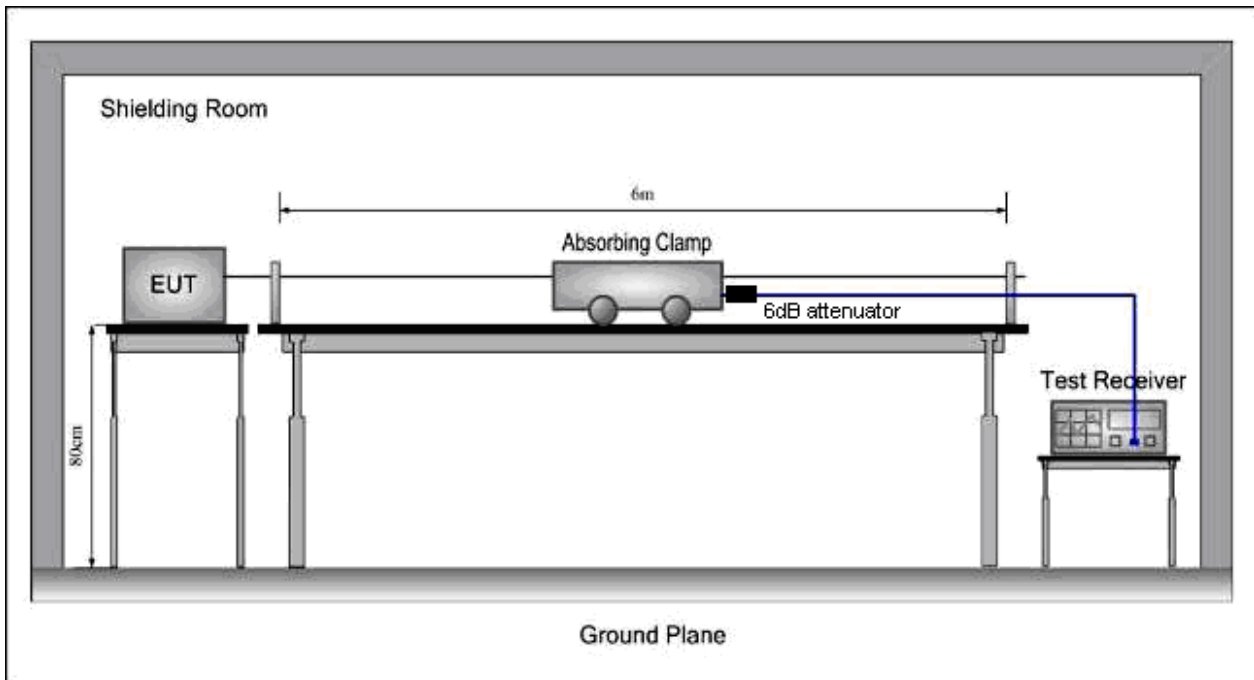
6.2.1 E.U.T. Operation

Test mode: Running & Heating mode
 Note: 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.

Pre-scan was performed with peak detected on all ports, Quasi-peak & average measurements were performed at the frequencies at which maximum peak emission level were detected.

Please see the attached Quasi-peak and Average test results.

6.2.2 Test Setup

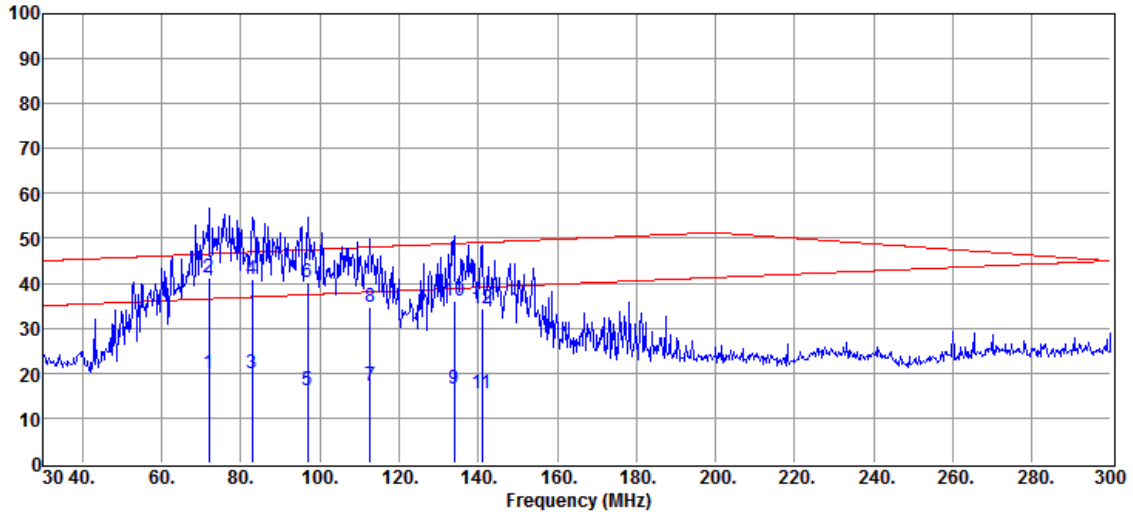


1. The disturbance power was measured with the EUT in a shielded room.
2. The distance between the clamp test set-up (the appliance, the lead to be measured and the absorbing clamp) and any other conductive objects (including persons, walls and ceiling, but excluding the floor) shall be at least 0,8 m. 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 0,25 m, measurement are not to be made on these leads;
 - is longer than 0,25 m 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.

6.2.3 Measurement Data

AC Mains:

Level (dBpW)



Item	Freq.	Read Level	Clamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB)	(dB)	(dBpW)	(dBpW)	(dB)	(dB)
1	71.850	12.80	5.82	1.48	20.10	36.55	-16.45	Average
2	71.850	33.95	5.82	1.48	41.25	46.55	-5.30	QP
3	82.920	11.91	6.82	1.36	20.09	36.96	-16.87	Average
4	82.920	32.65	6.82	1.36	40.83	46.96	-6.13	QP
5	96.960	7.18	7.30	1.52	16.00	37.48	-21.48	Average
6	96.960	31.29	7.30	1.52	40.11	47.48	-7.37	QP
7	112.620	8.49	7.02	1.60	17.11	38.06	-20.95	Average
8	112.620	26.10	7.02	1.60	34.72	48.06	-13.34	QP
9	133.950	8.90	5.83	1.94	16.67	38.85	-22.18	Average
10	133.950	28.43	5.83	1.94	36.20	48.85	-12.65	QP
11	140.970	7.73	5.58	2.01	15.32	39.11	-23.79	Average
12	140.970	26.78	5.58	2.01	34.37	49.11	-14.74	QP

Level = Read Level + EM Factor + Cable Loss

6.3 Discontinuous Interference

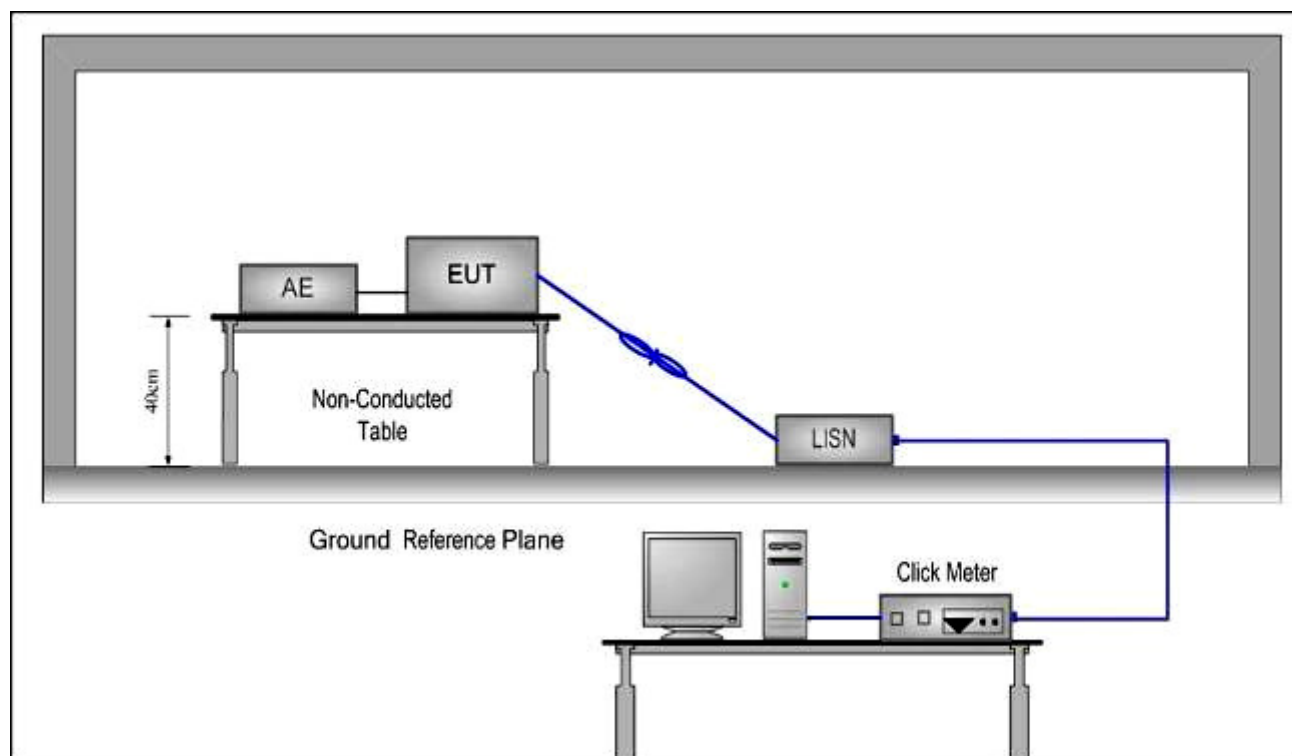
Test Frequency: 150kHz to 30MHz
 Class/Severity: Clause 4.2 of EN 55014-1
 Limit

Frequency range (MHz)	Limit (dB (μV))
0.15	66
0.5	56
1.4	56
30	60

6.3.1 E.U.T. Operation

Test mode: N/A

6.3.2 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. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
2. The 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.

6.3.3 Measurement Data

Conclusion: The EUT couldn't generate discontinuous disturbance, because it isn't thermostatically controlled appliances, automatic programme controlled machines and other electrically controlled or operated appliances.

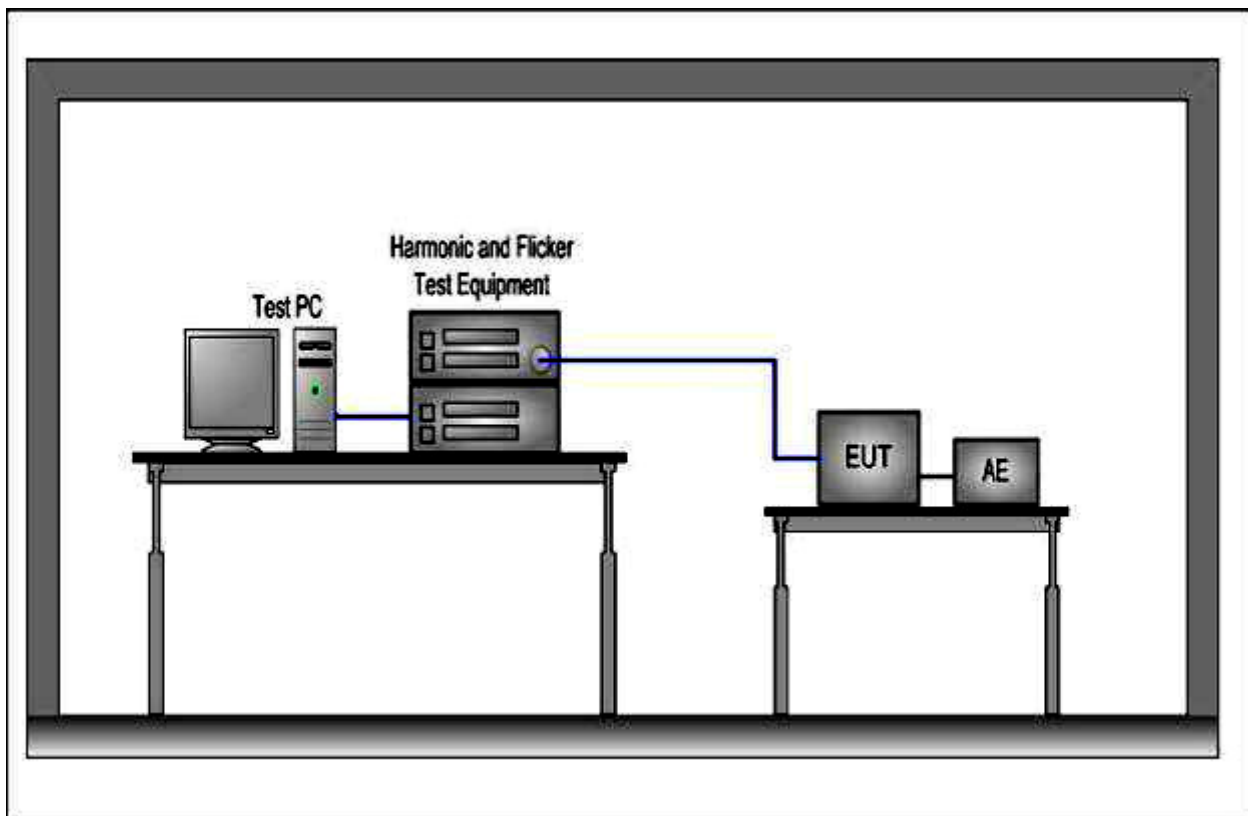
6.4 Harmonics Test Result

Measurement Time: 2.5mins
Class / Severity: Class A

6.4.1 E.U.T. Operation

Test mode: Running & Heating mode

6.4.2 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.

6.4.3 Measurement Data

Power Factor: 0.991

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	5.041			
2	32.520E-3	3.011	1.08	PASS
3	615.499E-3	26.761	2.30	PASS
4	15.119E-3	3.516	430.00E-3	PASS
5	39.459E-3	3.461	1.14	PASS
6	8.141E-3	2.714	300.00E-3	PASS
7	22.833E-3	2.965	770.00E-3	PASS
8	6.489E-3	2.821	230.00E-3	PASS
9	16.343E-3	4.086	400.00E-3	PASS
10	4.992E-3	2.713	184.00E-3	PASS
11	9.464E-3	2.868	330.00E-3	PASS
12	4.701E-3	3.066	153.33E-3	PASS
13	6.974E-3	3.321	210.00E-3	PASS
14	4.088E-3	3.111	131.43E-3	PASS
15	7.979E-3	5.319	150.00E-3	PASS
16	3.901E-3	3.392	115.00E-3	PASS
17	8.211E-3	6.204	132.35E-3	PASS
18	3.455E-3	3.380	102.22E-3	PASS
19	3.466E-3	2.927	118.42E-3	PASS
20	3.136E-3	3.409	92.00E-3	PASS
21	3.724E-3	2.317	160.71E-3	PASS
22	2.807E-3	3.356	83.64E-3	PASS
23	3.204E-3	2.184	146.74E-3	PASS
24	2.687E-3	3.505	76.66E-3	PASS
25	3.221E-3	2.386	135.00E-3	PASS
26	2.559E-3	3.617	70.77E-3	PASS
27	2.873E-3	2.298	124.99E-3	PASS
28	2.497E-3	3.800	65.71E-3	PASS
29	2.915E-3	2.505	116.39E-3	PASS
30	2.439E-3	3.977	61.33E-3	PASS
31	3.002E-3	2.758	108.87E-3	PASS
32	2.396E-3	4.166	57.50E-3	PASS
33	3.163E-3	3.093	102.27E-3	PASS
34	2.353E-3	4.348	54.12E-3	PASS
35	2.622E-3	2.719	96.44E-3	PASS
36	2.298E-3	4.497	51.11E-3	PASS
37	2.605E-3	2.856	91.21E-3	PASS
38	2.273E-3	4.695	48.42E-3	PASS
39	2.361E-3	2.729	86.53E-3	PASS
40	2.259E-3	4.912	46.00E-3	PASS

Maximum harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	5.353			
2	223.805E-3	13.815	1.62	PASS
3	653.057E-3	18.929	3.45	PASS
4	103.275E-3	16.012	645.00E-3	PASS
5	89.792E-3	5.251	1.71	PASS
6	56.838E-3	12.631	450.00E-3	PASS
7	58.358E-3	5.053	1.15	PASS
8	42.374E-3	12.282	345.00E-3	PASS
9	43.150E-3	7.192	600.00E-3	PASS
10	32.717E-3	11.854	276.00E-3	PASS
11	32.581E-3	6.582	495.00E-3	PASS
12	27.939E-3	12.148	229.99E-3	PASS
13	27.107E-3	8.605	315.00E-3	PASS
14	23.828E-3	12.087	197.15E-3	PASS
15	24.538E-3	10.906	225.00E-3	PASS
16	21.355E-3	12.380	172.50E-3	PASS
17	22.454E-3	11.310	198.52E-3	PASS
18	19.001E-3	12.392	153.33E-3	PASS
19	18.081E-3	10.179	177.63E-3	PASS
20	17.139E-3	12.419	138.00E-3	PASS
21	16.684E-3	10.382	160.71E-3	PASS
22	15.682E-3	12.500	125.46E-3	PASS
23	15.305E-3	10.430	146.74E-3	PASS
24	14.533E-3	12.638	114.99E-3	PASS
25	14.335E-3	10.619	135.00E-3	PASS
26	13.651E-3	12.859	106.16E-3	PASS
27	13.359E-3	10.688	124.99E-3	PASS
28	12.805E-3	12.991	98.57E-3	PASS
29	12.724E-3	10.932	116.39E-3	PASS
30	12.132E-3	13.188	92.00E-3	PASS
31	12.155E-3	11.165	108.87E-3	PASS
32	11.553E-3	13.395	86.25E-3	PASS
33	11.700E-3	11.440	102.27E-3	PASS
34	11.057E-3	13.621	81.18E-3	PASS
35	10.948E-3	11.353	96.44E-3	PASS
36	10.594E-3	13.818	76.66E-3	PASS
37	10.607E-3	11.628	91.21E-3	PASS
38	10.262E-3	14.130	72.63E-3	PASS
39	10.118E-3	11.693	86.53E-3	PASS
40	10.011E-3	14.508	69.00E-3	PASS

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	231.21	100.524		
2	96.70E-3	0.042	0.2	PASS
3	174.21E-3	0.076	0.9	PASS
4	17.27E-3	0.008	0.2	PASS
5	30.80E-3	0.013	0.4	PASS
6	16.37E-3	0.007	0.2	PASS
7	55.38E-3	0.024	0.3	PASS
8	16.08E-3	0.007	0.2	PASS
9	71.84E-3	0.031	0.2	PASS
10	17.74E-3	0.008	0.2	PASS
11	70.11E-3	0.030	0.1	PASS
12	22.47E-3	0.010	0.1	PASS
13	42.99E-3	0.019	0.1	PASS
14	24.40E-3	0.011	0.1	PASS
15	61.34E-3	0.027	0.1	PASS
16	18.72E-3	0.008	0.1	PASS
17	82.28E-3	0.036	0.1	PASS
18	22.59E-3	0.010	0.1	PASS
19	79.70E-3	0.035	0.1	PASS
20	21.88E-3	0.010	0.1	PASS
21	62.15E-3	0.027	0.1	PASS
22	23.19E-3	0.010	0.1	PASS
23	57.25E-3	0.025	0.1	PASS
24	26.22E-3	0.011	0.1	PASS
25	81.17E-3	0.035	0.1	PASS
26	25.30E-3	0.011	0.1	PASS
27	78.91E-3	0.034	0.1	PASS
28	32.88E-3	0.014	0.1	PASS
29	60.42E-3	0.026	0.1	PASS
30	27.44E-3	0.012	0.1	PASS
31	58.73E-3	0.026	0.1	PASS
32	31.01E-3	0.013	0.1	PASS
33	76.22E-3	0.033	0.1	PASS
34	37.83E-3	0.016	0.1	PASS
35	66.76E-3	0.029	0.1	PASS
36	37.77E-3	0.016	0.1	PASS
37	54.42E-3	0.024	0.1	PASS
38	41.82E-3	0.018	0.1	PASS
39	47.24E-3	0.021	0.1	PASS
40	30.62E-3	0.013	0.1	PASS

6.5 Flicker Test Result

Measurement Time: 10 mins
Class / Severity: Clause 5 of EN 61000-3-3

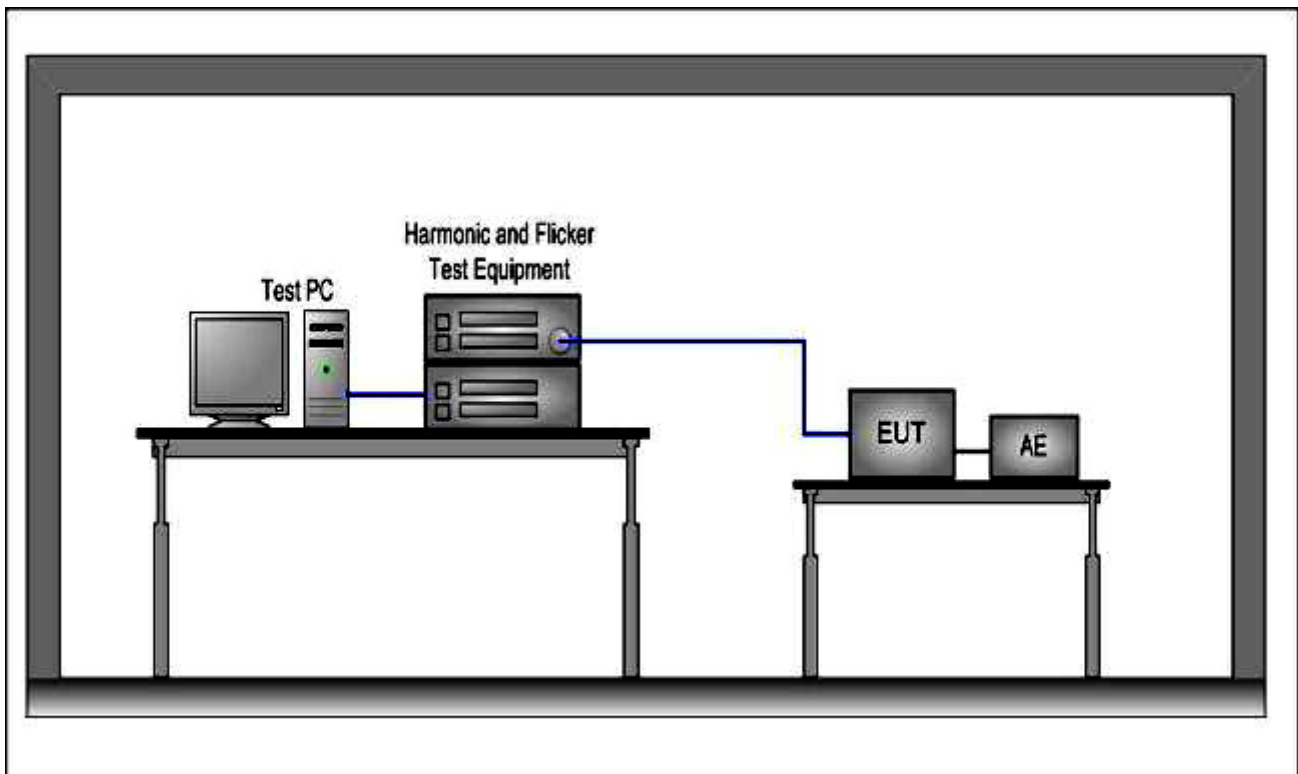
6.5.1 E.U.T. Operation

Test mode: Running & Heating mode

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.

6.5.2 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 Pst, $T_p = 10\text{ min}$;
 - 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.

6.5.3 Measurement Data

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.978	1.00	PASS
dc [%]	1.111	3.30	PASS
dmax [%]	1.853	7.00	PASS
Tmax [s]	0.000	0.50	PASS

7 Electromagnetic Susceptibility Test Results

7.1 Performance Criteria Description in Clause 6 of EN 55014-2

<p>Criterion A:</p>	<p>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.</p>
<p>Criterion B:</p>	<p>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.</p>
<p>Criterion C:</p>	<p>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.</p>

Test Requirement: EN 55014-2

Test Method: Hence the EUT is defined as category II of EN 55014-2 and see the below

There is need for immunity tests to be performed on this product in accordance with clause 7.2.2 of EN 55014-2(see the detail information in the Test Summary)

For further details, please refer to clause 4.2 of EN 55014-2 which states:

“Category II: transformer toys, dual supply toys, mains power motor operated appliances, tools, heating appliance and similar electric apparatus(for example-UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15MHz.

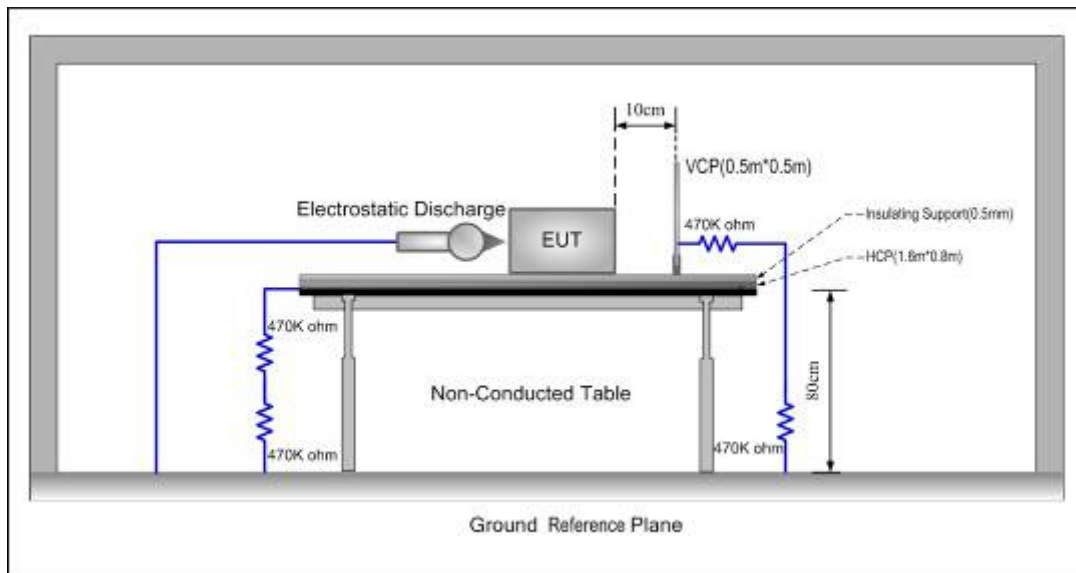
Note1 The value 15MHz is tentative and may be modified after a period of experience.

Note2 For toys, examples include educational computer, organs, track sets with electronic control units.”

7.2 ESD

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	

7.2.1 Test Setup and Procedure



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

7.2.2 Test Results

Direct Application Test Results

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

Direct Application				Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Test Mode	Contact Discharge	Air Discharge
8	+/-	1	Running & Heating mode Standby mode	N/A	A
4	+/-	2		A	N/A

Indirect Application Test Results

- Observations: Test Point:
1. All sides.

Indirect Application				Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Test Mode	Horizontal Coupling	Vertical Coupling
4	+/-	1	Running & Heating mode Standby mode	A	A

Results:

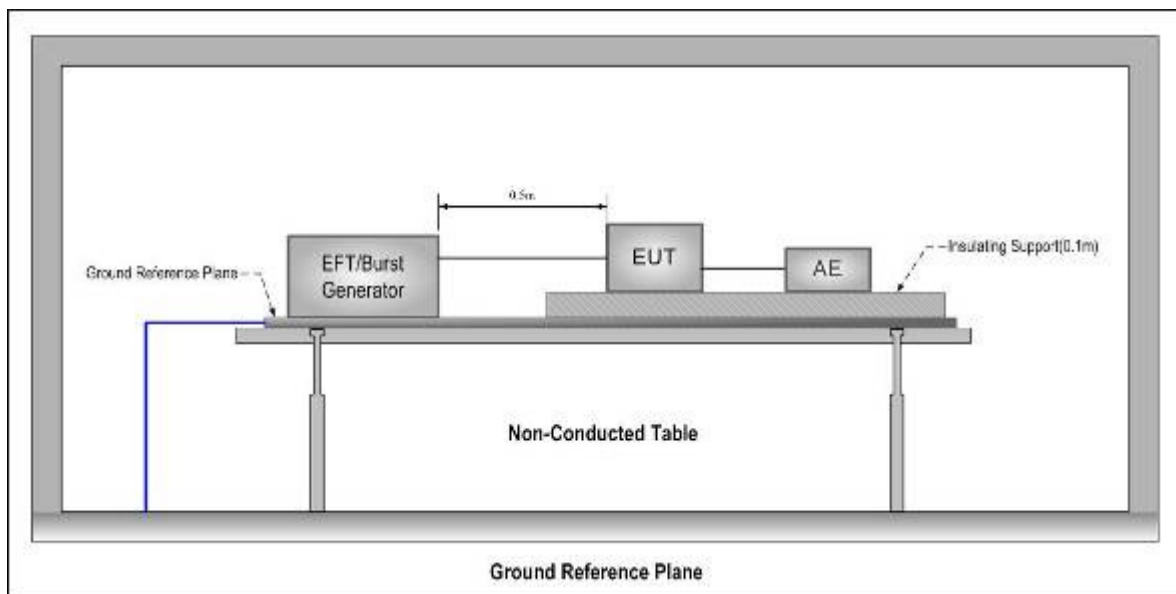
A: During test, no degradation in the performance of the EUT was observed; After test, no degradation in the performance of the EUT was observed.

N/A: Not applicable (floor mounted EUT or not requested by Standard).

7.3 Electrical Fast Transients (EFT)

Test Level:	1.0kV on AC
Polarity:	Positive & Negative
Repetition Frequency:	5kHz
Burst Duration:	300ms
Test Duration:	2 minute per level & polarity

7.3.1 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 0.1m high wooden support above the GRP.
2. The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT was placed on the insulation support 0.1m above GRP. Cables not subject to EFT was routed as far as possible from cable under test to minimize the coupling between the cables.
3. The length of signal and power cable between the EUT and EFT generator was 0.5m. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1m above the GRP.

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. If the equipment contains identical ports, only one was tested; multiconductor cables, such as a 50-pair telecommunication cable, was 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.

7.3.2 Test Results On AC Supply

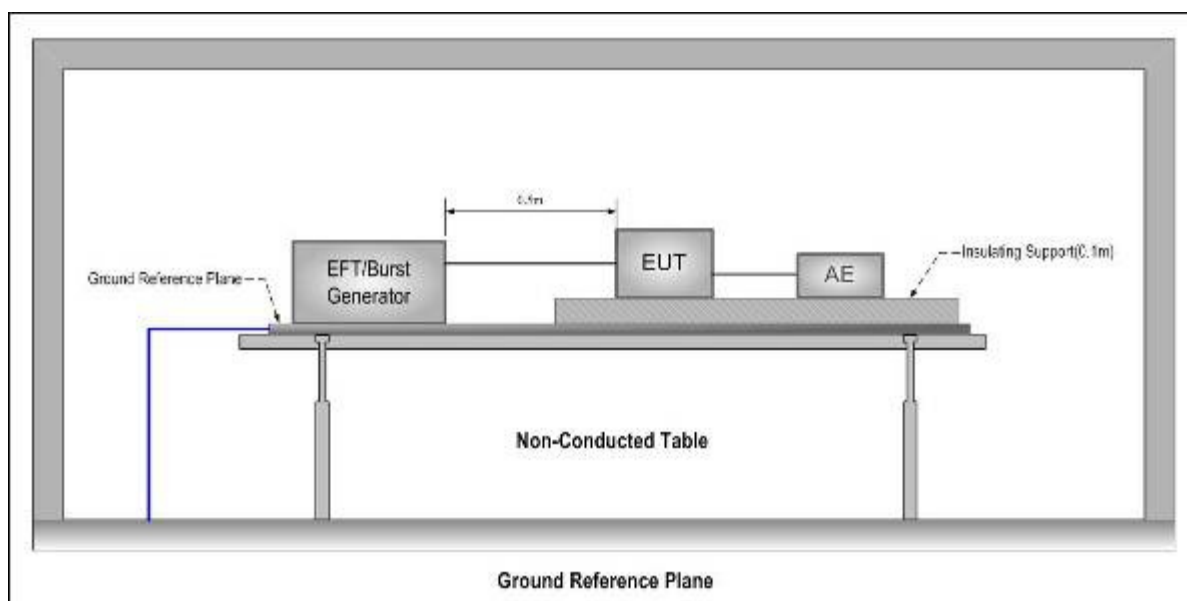
Lead under Test	Level (±kV)	Coupling Direct/Clamp	Test mode	Observations (Performance Criterion)
Live + Neutral + Earth	± 1.0	Direct	Running & Heating mode Standby mode	(A)

A: During test, no degradation in the performance of the EUT was observed; After test, no degradation in the performance of the EUT was observed.

7.4 Surge

Test Level:	± 1.0 kV Live to Neutral ± 2.0 kV Live and Neutral to PE
Polarity:	Positive & Negative
Generator source impedance:	2Ω Line to Neutral, 12Ω Line to Earth
Trigger Mode:	Internal
No. of surges:	5 positive at 90° , 5 negative at 270° .

7.4.1 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 0.1m high wooden support above the GRP.
2. The 1,2/50 μ 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 2 m in length.
4. The EUT was conducted 1kV Test voltage: for line to line and line to neutral and conducted 2kV Test voltage: for line to earth and neutral to earth, five positive pulses and five negative pulses each at 90° , 270° for AC power ports and five positive pulses and five negative surge pulses for DC power ports. The test levels were applied on the EUT with a 2Ω generator source impedance for power supply terminals and 40Ω output impedance for interconnection lines. The tests were done at repetition rate 1 per minute.

7.4.2 Test Results

Pulse No	Line-Line	Level (kV)	Surge Interval	Phase (deg)	Test Mode	Observation (Performance Criterion)
1-5	L-N	+1	60s	90°	Running & Heating mode Standby mode	(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)

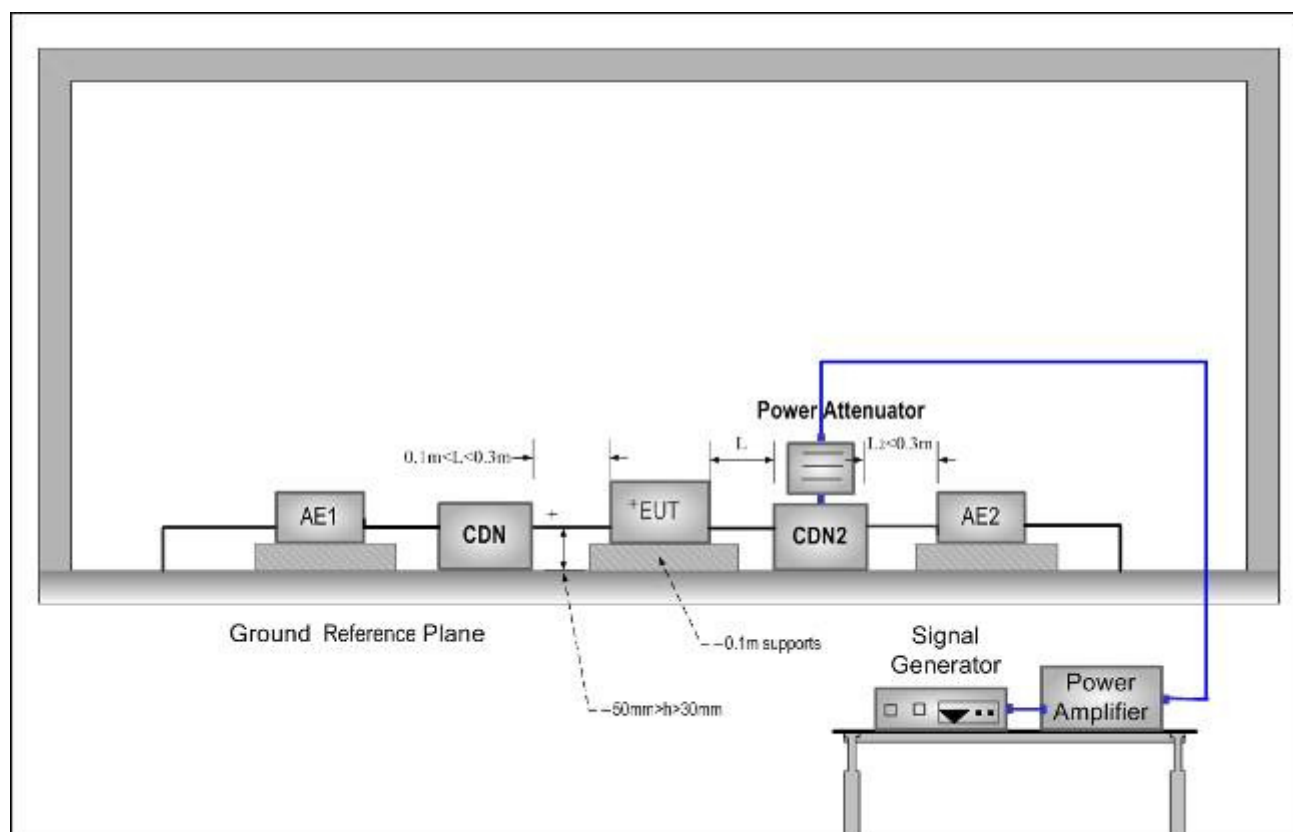
A: During test, no degradation in the performance of the EUT was observed; After test, no degradation in the performance of the EUT was observed.

7.5 Conducted Immunity

Test Frequency:	0.15 MHz to 230 MHz
Test level:	3V r.m.s (unmodulated emf into 150 Ω) on AC Ports
Modulation:	80%, 1kHz Amplitude Modulation

7.5.1 Test Setup and Procedure

For AC port



1. The EUT was placed on an insulating support of 0.1 m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.
2. The coupling and decoupling devices were required, they were located between 0,1 m and 0,3 m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.
3. Each AE, used with clamp injection, shall be placed on an insulating support 0,1 m 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 0,3 m 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 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to change coupling devices as necessary. Where the frequency

was swept incrementally, the step size do not exceed 1% of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.

7.5.2 Test Results

AC Port:

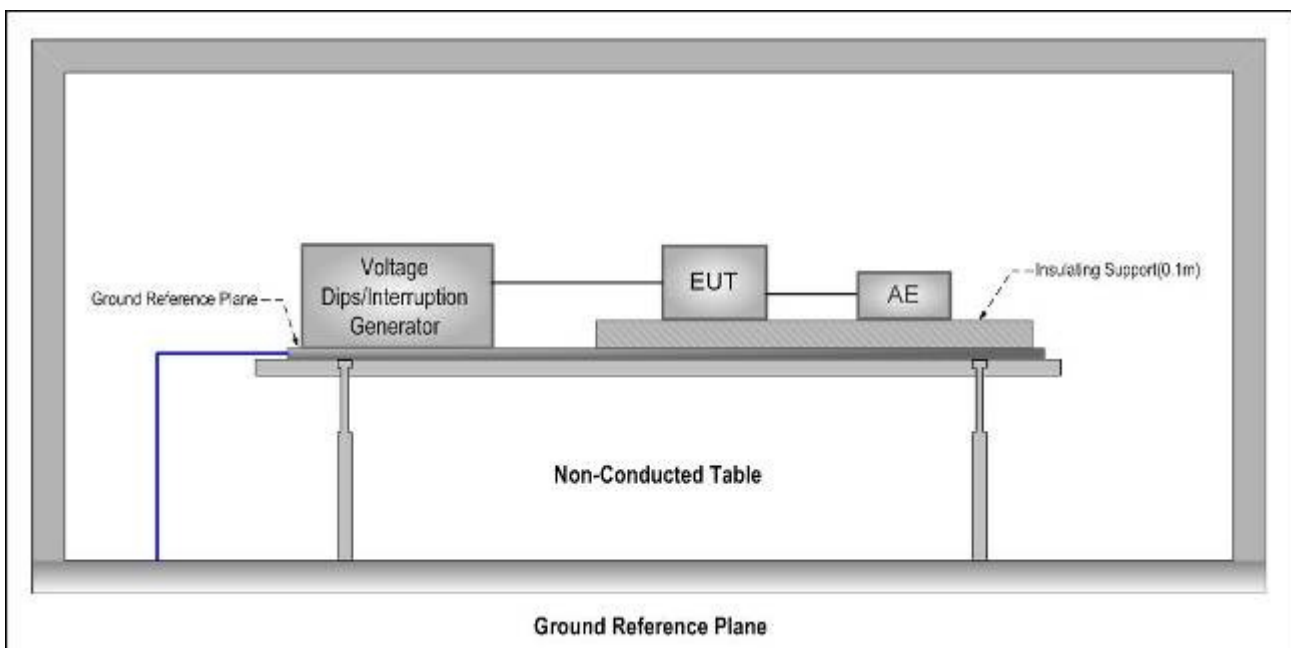
Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Test Mode	Observation (Performance Criterion)
150 kHz to 230 MHz	3 Wires Supply Cable	3V r.m.s	80%, 1 kHz Amp. Mod.	1%	3s	Running & Heating mode Standby mode	No Loss of Function (A)

A: During test, no degradation in the performance of the EUT was observed; After test, no degradation in the performance of the EUT was observed.

7.6 Voltage Dips and Interruptions

Test voltage:	Refer to UT
Test Level:	For 50Hz 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

7.6.1 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 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.

7.6.2 Test Results

$U_{T=}$ AC 230V

Test Level % U_T	Phase	Duration of drop out in Periods	No of drop out	Time between drop out	Test Mode	OBSERVATIONS (PERFORMANCE CRITERION)
0	0°,180°	0.5	3	10s	Running & Heating mode Standby mode	(A)
40	0°,180°	10	3	10s		(A)
70	0°,180°	25	3	10s		(A)

Remark:

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

A: During test, no degradation in the performance of the EUT was observed; After test, no degradation in the performance of the EUT was observed.

Performance C is within the acceptable criterion for Voltage Dips and Interruption test.

8 Photographs (Test Setup For the EUT)

8.1 Conducted Emissions on Mains Terminals Test Setup



8.2 Disturbance Power Test Setup



8.3 Harmonics & Flicker Test Setup



8.4 ESD Test Setup



8.5 EFT, Surge, Voltage Dip and Interruptions Test Setup



8.6 Conducted Immunity Test Setup



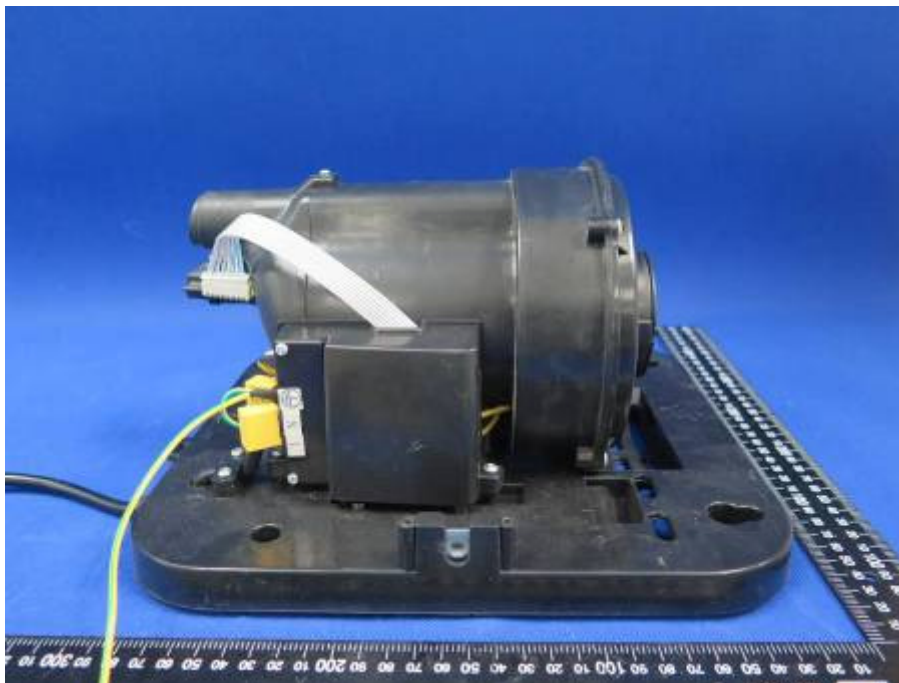
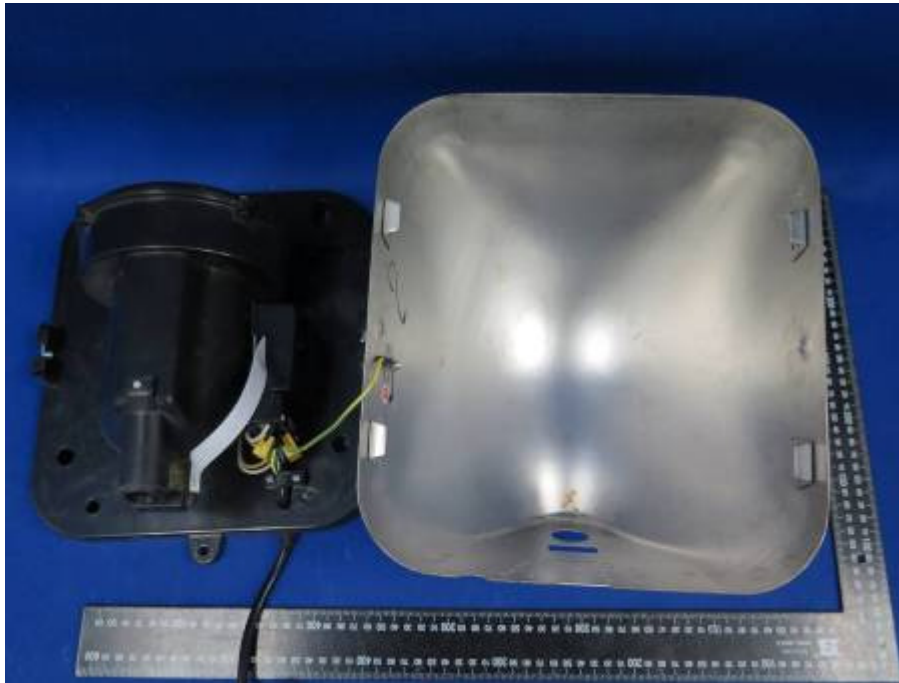
9 EUT Constructional Details

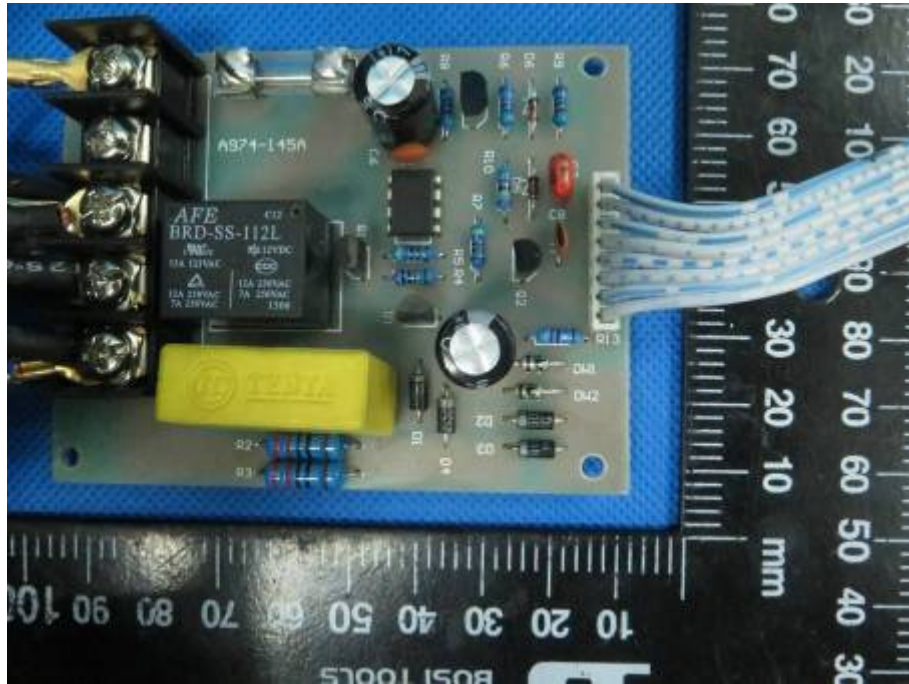
9.1 Exterior of EUT





9.2 Interior of EUT







--End of the Report--