

TEST REPORT

SCOPE OF WORK:

EMC report

Model:

AF-001, details refer to Page 7

REPORT NUMBER

190600210SHA-001/Amendment 6

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Report no. 190600210SHA-001/Amendment 6

Applicant :

Manufacturer

Factory

Summary

The equipment complies with the requirements according to the following standard(s) or Specification:

EN IEC 55014-1:2021: Electromagnetic compatibility-Requirements for household appliances, electric tools and similar apparatus Part 1: Emission

EN IEC 55014-2:2021: Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity – Product family standard

EN IEC 61000-3-2:2019+A1:2021: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current $\leq 16A$ per phase)

EN 61000-3-3:2013+A1:2019+A2:2021: Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16A$ per phase and not subject to conditional connection

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Revision History

Report No.	Version	Description	Issued Date
190600210SHA-001/Amendment 6	Rev. 01	Initial issue of report	April 10, 2023

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Mains terminal continuous disturbance voltage	Pass	
Mains terminal discontinuous disturbance voltage/click	Pass	
Continuous disturbance power	Pass	
Radiated Emission	Pass	
Harmonics	Pass	
Voltage fluctuation-Flicker	Pass	
Electrostatic Discharge (ESD)	Pass	
Radio frequency electromagnetic fields	NA	
Fast transients	Pass	
Surges	Pass	
Injected Current	Pass	
Voltage dips	Pass	

Notes:

1. NA =Not Applicable
2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.
3. Additions, Deviations and Exclusions from Standards: None.

1. GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

- Product name : Hot-air fryer
- Type/Model : AF-001, AF-002, AF-002A, AF-005, AF-005A, AF-005-1, AF-006, AF-006A, AF-006D, AF-009, AF-009A, AF-010, AF-010A, AF-012, AF-012A, AF-015, AF-015A, AF-016, AF-016A, AF-017A, AF-001B, AF-007C, AF-022, AF-005A-1
- Description of EUT : Refer to Page 8.
- Rating : 220-240V~, 50-60Hz, Class I
AF-001, AF-006, AF-006A, AF-001B, AF-007C: 1000W;
AF-015, AF-015A and AF-006D: 1200W;
AF-002, AF-002A and AF-022: 1300W;
AF-009 and AF-009A: 1400W;
AF-010, AF-010A, AF-016, AF-016A and AF-017A: 1500W;
AF-005, AF-005A, AF-005-1, AF-012, AF-012A and AF-005A-1: 1700W.
- Highest clock frequency : <15MHz
- Brand name : /
- Mains lead : 1.2m, (un)shielded, (non)detachable
- Data cable : /
- EUT type : Table-top
 Floor standing
- Sample received date : April 06, 2023
- Sample Identification No. : 0230404-41-001
- Date of test : April 06-April 07, 2023

Description of EUT:

Models covered by this report are portable Hot-air fryers for household indoor use only. It employed thermal link or non-self-resetting thermal cut out to safeguard the appliances.

Model summary:

Model	Rating (W)	Mechanical control	Electronic control	Thermal link	Non-self-resetting thermal cut out
AF-001	1000	√		√	
AF-001B	1000	√		√	
AF-002	1300	√		√	
AF-002A	1300		√	√	
AF-005	1700	√			√
AF-005A	1700		√		√
AF-005-1	1700	√			√
AF-006	1000	√		√	
AF-006A	1000		√	√	
AF-006D	1200	√		√	
AF-009	1400	√			√
AF-009A	1400		√		√
AF-010	1500	√			√
AF-010A	1500		√		√
AF-012	1700	√			√
AF-012A	1700		√		√
AF-015	1200	√		√	
AF-015A	1200		√	√	
AF-016	1500	√			√
AF-016A	1500		√		√
AF-017A	1500		√		√
AF-007C	1000		√	√	
AF-022	1300	√			√
AF-005A-1	1700		√		√

Some model characteristic as the following description:

1. AF-001 is similar to AF-006, the difference in appearance and size. AF-001 is smaller than AF-006.
2. AF-005 is same as AF-005-1, except for appearance of knob.
3. AF-006D is same as AF-015, except for appearance of upper enclosure.
4. AF-010 is same as AF-016, except for appearance. Same way as AF-010A and AF-016A.
5. AF-016A is similar to AF-017A, the difference in appearance and control PCB.
6. AF-001B is same as AF-001, except for AF-001B use non-adjustable thermostat, AF-001B use adjustable thermostat.
7. AF-007C is similar to AF-006A, the difference in appearance, power PCB and control PCB.
8. AF-022 is same as AF-010, except for appearance and motor.
9. AF-005A is same as AF-005A-1, except for power PCB and control PCB.

Amendment 6:

The original test report ref. No. 190600210SHA-001 dated on September 30, 2022 with amendment 1 dated on August 20, 2019, amendment 2 dated on August 24, 2020, amendment 3 dated on April 16, 2021, amendment 4 dated on August 16, 2021, amendment 5 dated on August 25, 2022 were modified on April 10, 2023 to include the following additions and/or changes:

- (1) Added a new model of AF-005A-1.

After technical evaluation, AF-005A-1 was chosen to test and the worst test data is listed in the report as representative. This amendment test report should be read in conjunction with the based test report.

1.2 Description of Test Facility

Name : Intertek Testing Services Shanghai

Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

Telephone : 86 21 61278200

Telefax : 86 21 54262353

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

- CNAS Accreditation Lab
Registration No. CNAS L0139
- FCC Accredited Lab
Designation Number: CN0175
- IC Registration Lab
CAB identifier.: CN0014
- VCCI Registration Lab
Registration No.: R-14243, G-10845, C-14723, T-12252
- A2LA Accreditation Lab
Certificate Number: CN0175

2. TEST SPECIFICATIONS

2.1 Normative Standards

IEC 61000-4-2:2008: Electromagnetic Compatibility (EMC) – Part 4-2: testing and measurement techniques – electrostatic discharge immunity test

IEC 61000-4-3:2006+A1:2007+A2:2010: Electromagnetic Compatibility (EMC) – Part 4-3: testing and measurement techniques – radiated, radio frequency, electromagnetic field immunity test

IEC 61000-4-4:2012: Electromagnetic Compatibility (EMC) – Part 4-4: testing and measurement techniques – electric fast transient/burst immunity test

IEC 61000-4-5:2014+A1:2017: Electromagnetic Compatibility (EMC) – Part 4-5: testing and measurement techniques – section 5: surge immunity test

IEC 61000-4-6:2013: Electromagnetic Compatibility (EMC) – Part 4-6: testing and measurement techniques – section 6: immunity to conducted disturbance, induced by radio frequency field

IEC 61000-4-11:2020: Electromagnetic Compatibility (EMC) – Part 4-11: testing and measurement techniques –voltage dips, short interruption and voltage variations immunity test

IEC 61000-4-20:2010: Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides

IEC 61000-4-22:2010: Electromagnetic compatibility (EMC) – Part 4-22: Testing and measurement techniques – Radiated emissions and immunity measurements in fully anechoic rooms (FARs)

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

2.3 Test Peripherals used

Item No	Description	Band and Model	S/No
1	-	-	-

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Mains terminal continuous disturbance voltage	22	42	NA
Mains terminal discontinuous disturbance voltage/click	22	42	NA
Continuous disturbance power	22	42	NA
Radiated Emission	NA	NA	NA
Harmonics	22	40	NA
Voltage fluctuation-Flicker	22	40	NA
Electrostatic Discharge (ESD)	23	45	101
RF electromagnetic field susceptibility	NA	NA	NA
Electric Fast Transient /Burst (EFT/B)	23	45	NA
Surge	23	45	NA
Injected Current	23	45	NA
Voltage dips and interruption	23	45	NA

Notes: NA =Not Applicable

2.5 Instrument list

Conducted Emission/Disturbance Power					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2023-07-18
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
<input checked="" type="checkbox"/>	Absorbing clamp	R&S	MDS 21	EC 2108	2023-06-04
Discontinuous Disturbance Voltage					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Click meter	AFJ	DDA55	EC 5320	2023-12-07
<input checked="" type="checkbox"/>	A.M.N.	AFJ	LS16C	EC 5320-1	2023-11-09
Harmonics / Flicker					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Three phase Harmonic-flicker system	EM TEST	DPA503N	EC 5383	2023-07-17
		EM TEST	NETWAVE-30-400	EC 5383-2	2023-07-17
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	ESD generator	TESEQ	NSG 437	EC 4792-4	2023-07-17
EFT/Surge Voltage Dips					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Conduct immunity system	EM TEST	UCS 500M6B	EC 2958	2024-03-20
<input checked="" type="checkbox"/>	Automatic transformer	EM TEST	MV2616	EC 2957	2024-03-20
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Signal generator	R&S	SML 01	EC 2338	2023-11-07
<input checked="" type="checkbox"/>	Power amplifier	AR	75A250	EC 3043-1	2023-07-17
<input checked="" type="checkbox"/>	Attenuator	EM TEST	ATT6/75	EC 3043-3	2024-02-07
<input checked="" type="checkbox"/>	CDN	Frankonia	CDN M2M316	EC 5969	2024-02-09
Test Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2024-01-10
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2024-01-10
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-23

☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2024-03-07
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2024-01-02
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5844	2024-03-07
☑	Pressure meter	YM3	Shanghai Mengde	EC 4620	2023-09-13

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Continuous disturbance voltage at telecom ports	150kHz ~ 30MHz	3.64 dB
Continuous disturbance current at telecom ports	150kHz ~ 30MHz	2.62 dB
Mains terminal discontinuous disturbance voltage/click	-	3.76 dB
Continuous disturbance power	30MHz ~ 300MHz	4.35 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB
Harmonic current emission	-	3.90%
Voltage fluctuations and flicker	-	10.34%
ESD	-	6.65%
Radiated susceptibility	-	2.38%
EFT test at main terminal	-	11.57%
EFT test at signal/telecom terminal	-	11.62%
Surge test at main terminal	-	11.57%
Injected current test at main terminal	-	1.88 dB
Injected current test at unshielded signal terminal	-	3.41 dB
Voltage dips and interruption	-	6.05%

Emission Test

3. Mains/Load/Control Terminal Continuous Disturbance Voltage

Test result: **PASS**

3.1 Terminal Voltage Limits for the frequency range 9kHz to 30MHz

3.1.1 General limits

Frequency range (MHz)	Mains ports		Auxiliary ports			
	Disturbance voltage		Disturbance voltage		Disturbance current	
	Limits dB(μV) Quasi-peak Average		Limits dB(μV) Quasi-peak Average		Limits dB(μA) Quasi-peak Average	
0.15 ~ 0.5	66 ~ 56 *	59 ~ 46 *	80	70	40 ~ 30 *	30 ~ 20 *
0.5 ~ 5.0	56	46	74	64	30	20
5.0 ~ 30	60	50	74	64		

Notes:

- * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.
- If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

3.1.2 Limits for mains port of motor operated tools

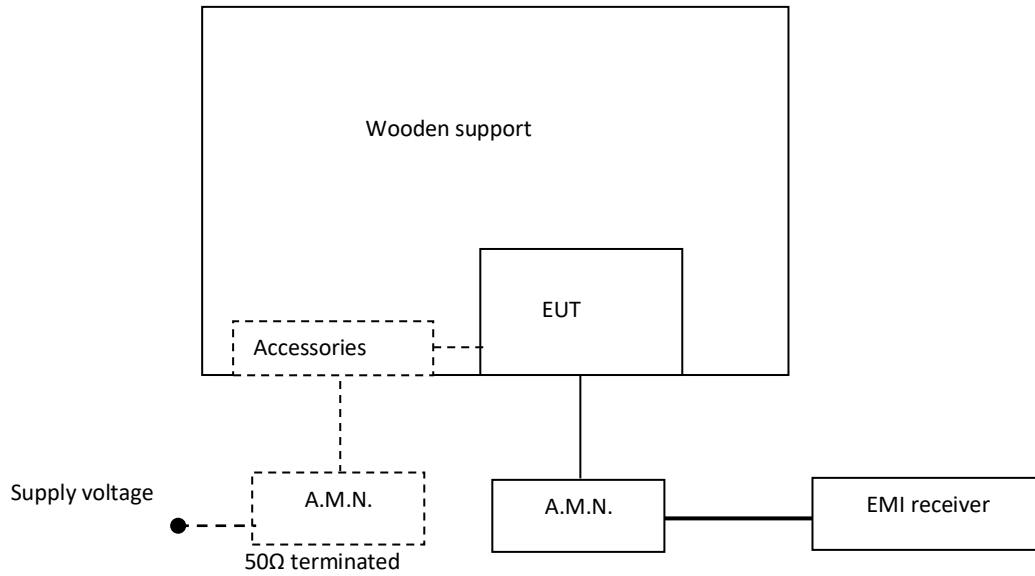
Frequency range (MHz)	P ≤ 700 W		700 W < P ≤ 1 000 W		P > 1 000 W	
	Limits dB(μV)		Limits dB(μV)		Limits dB(μV)	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.35	66 ~ 59*	59 ~ 49*	70 ~ 63*	63 ~ 53*	76 ~ 69*	69 ~ 59 *
0.35 ~ 5	59	49	63	53	69	59
5 ~ 30	64	54	68	58	74	64

Notes:

- * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.35MHz.
- If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

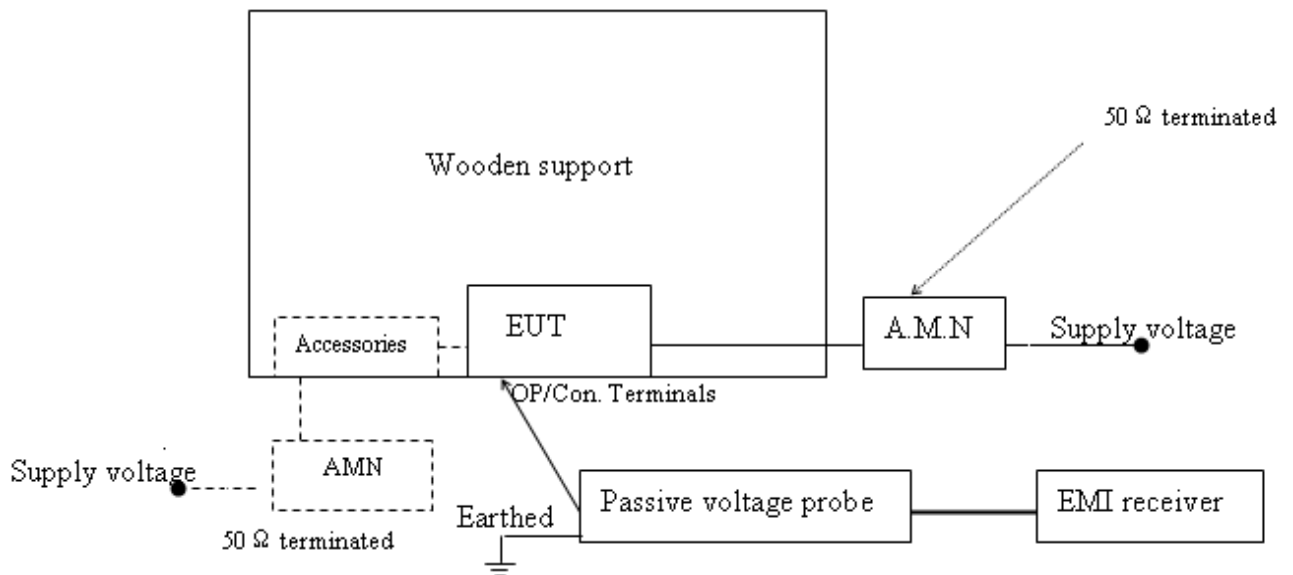
3.2 Block Diagram of Test Setup

At mains terminal



For table top equipment, wooden support is 0.8m height table.
For floor standing equipment, wooden support is 0.1m height rack.

At Associated ports



Note:
 ————— : power line
 ————— : signal line
 - - - - - : means the test setup while available

3.3 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were according to clause 5.1 of EN 55014-1 if applicable.

Detailed test procedure and arrangement was according to clause 5.2 of EN 55014-1.

Measurement methods was according to clause 5.4 of EN 55014-1.

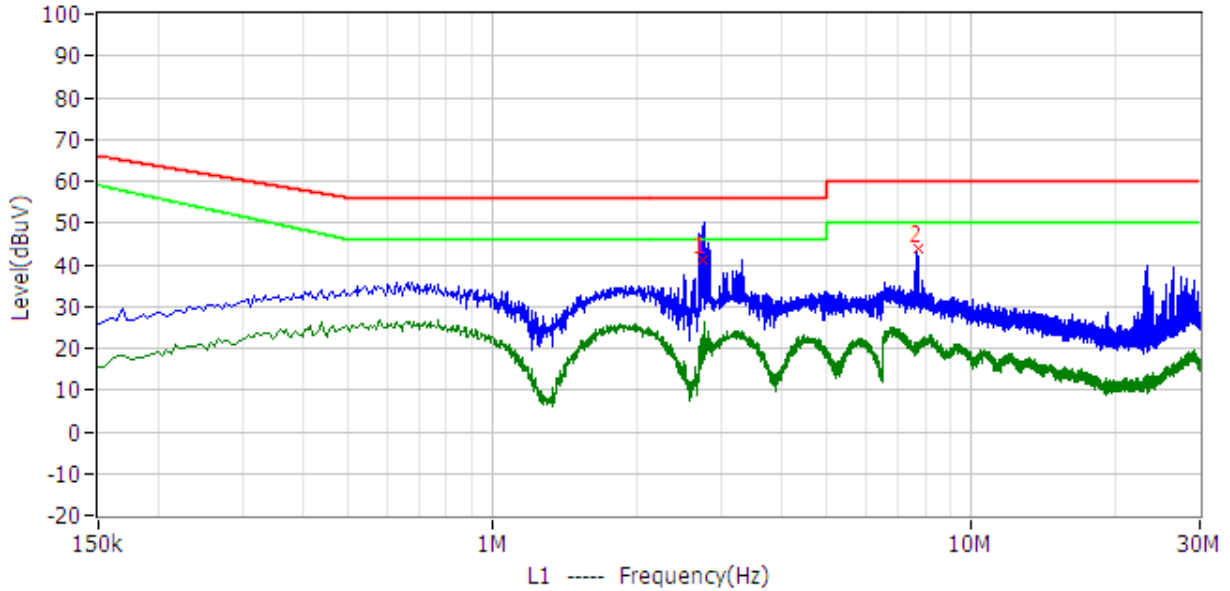
Operation conditions of EUT was according to clause 6 of EN 55014-1.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9kHz.

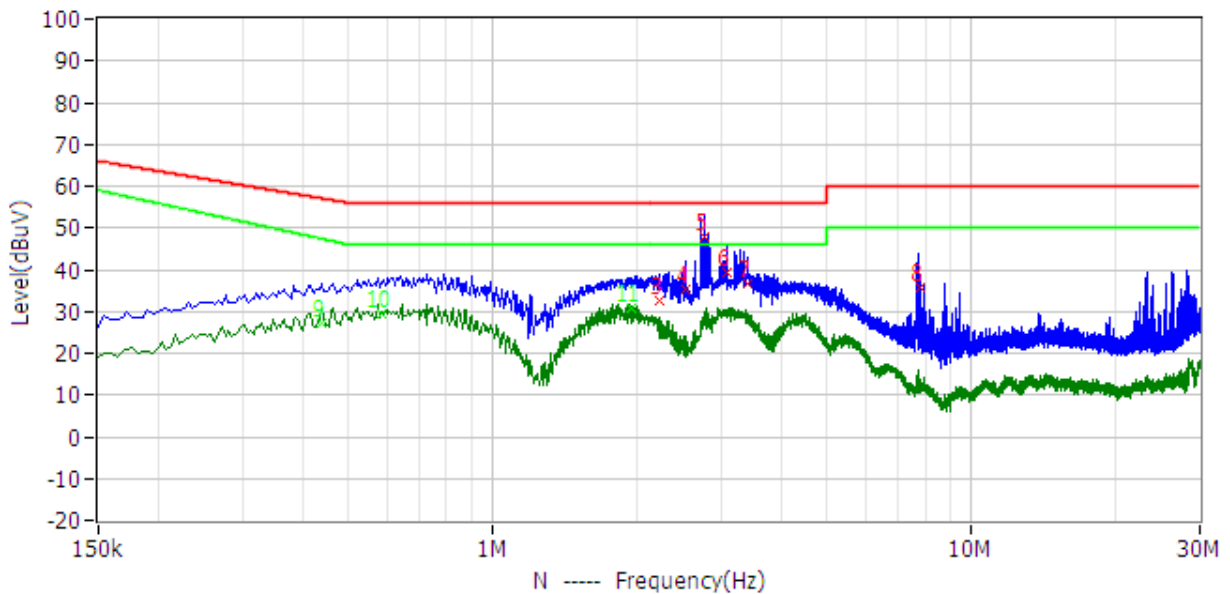
3.4 Test Protocol

For Mains ports: Pass

L-Line



N-Line



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Factor dB	Detector	Phase
1	2.756MHz	56.0	40.9	-15.1	10.3	QP	L1
2	7.733MHz	60.0	44.0	-16.0	10.5	QP	L1
3	2.234MHz	56.0	32.4	-23.6	10.4	QP	N
4	2.522MHz	56.0	35.4	-20.6	10.4	QP	N
5	2.765MHz	56.0	47.9	-8.1	10.4	QP	N
6	3.075MHz	56.0	39.5	-16.5	10.4	QP	N
7	3.399MHz	56.0	36.8	-19.2	10.4	QP	N
8	7.782MHz	60.0	35.8	-24.2	10.6	QP	N
9	438.000kHz	47.4	27.3	-20.1	10.3	CAV	N
10	586.500kHz	46.0	29.5	-16.5	10.3	CAV	N
11	1.955MHz	46.0	30.6	-15.4	10.4	CAV	N

For Associated ports: NA

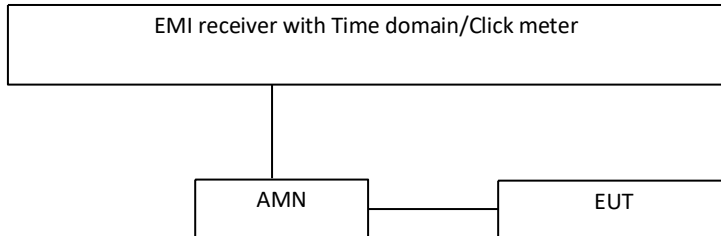
Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBμV)	Limit (dBμV)	Margin (dB)	Corrected Reading (dBμV)	Limit (dBμV)	Margin (dB)

Note: * means the emission level 20dB below the relevant limit.

4. Mains terminal discontinuous disturbance voltage/click

Test result: PASS

4.1 Block Diagram of Test Setup



4.2 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were according to clause 5.1 of EN 55014-1 if applicable.

Detailed test procedure and arrangement was according to clause 5.2 of EN 55014-1.

Measurement methods was according to clause 5.4 of EN 55014-1.

Operation conditions of EUT was according to clause 6 of EN 55014-1.

0.15MHz, 0.5MHz, 1.4MHz and 30MHz were spot checked, and upper quartile methods used during measurement.

The final judgment of test result was according to figure 6 of EN 55014-1.

4.3 Test Protocol

Frequency (MHz)	0.15	0.5	1.4	30.0
Permitted limit for continuous interference (dB μ V)	66.0	56.0	56.0	60.0
Counted click number	40	30	20	0
Observed time (min)	100	100	100	100
Click duration (ms)	<10	<10	<10	-
Click rate N	<5	<5	<5	<5
Factor	-	-	-	-
Permitted limits for clicks (dB μ v)	-	-	-	-
Counted clicks exceeding the limits	-	-	-	-
Test result	Pass	Pass	Pass	Pass
Any other descriptions: The click rated is less than 5, all caused clicks have a duration less than 10ms, so, it complied the standard without further test.				

5. Continuous disturbance power

Test result: **PASS**

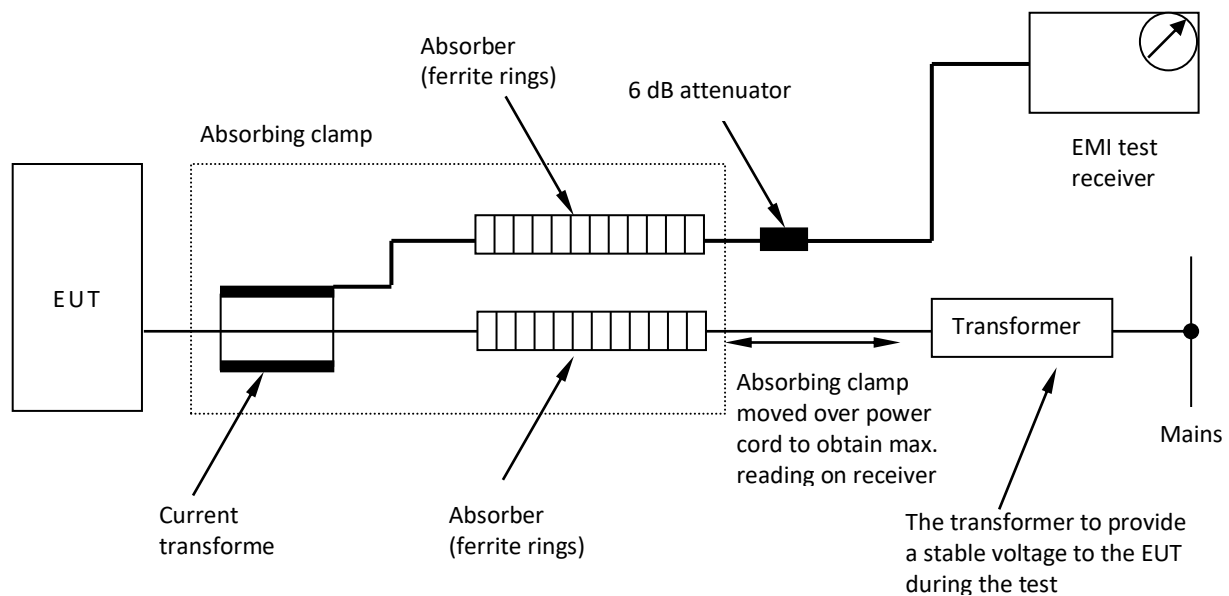
5.1 Continuous disturbance power limit

Frequency range (MHz)	General		$P \leq 700 \text{ W}$		$700 \text{ W} < P \leq 1\,000 \text{ W}$		$P > 1\,000 \text{ W}$	
	Limits dB(pW)		Limits dB(pW)		Limits dB(pW)		Limits dB(pW)	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
30 ~ 300	45 ~ 55*	35 ~ 45*	45 ~ 55*	35 ~ 45*	49 ~ 59*	39 ~ 49*	55 ~ 65*	45 ~ 55*

Notes:

- * means the limit decreasing linearly with the logarithm of the frequency in the range 30MHz to 300MHz.
- If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

5.2 Block diagram of test set up



5.3 Test Procedure

Measurement was performed in shielded room, and instruments used were according to clause 5.1 of EN 55014-1 if applicable.

Detailed test procedure and arrangement was according to clause 5.3 of EN 55014-1.

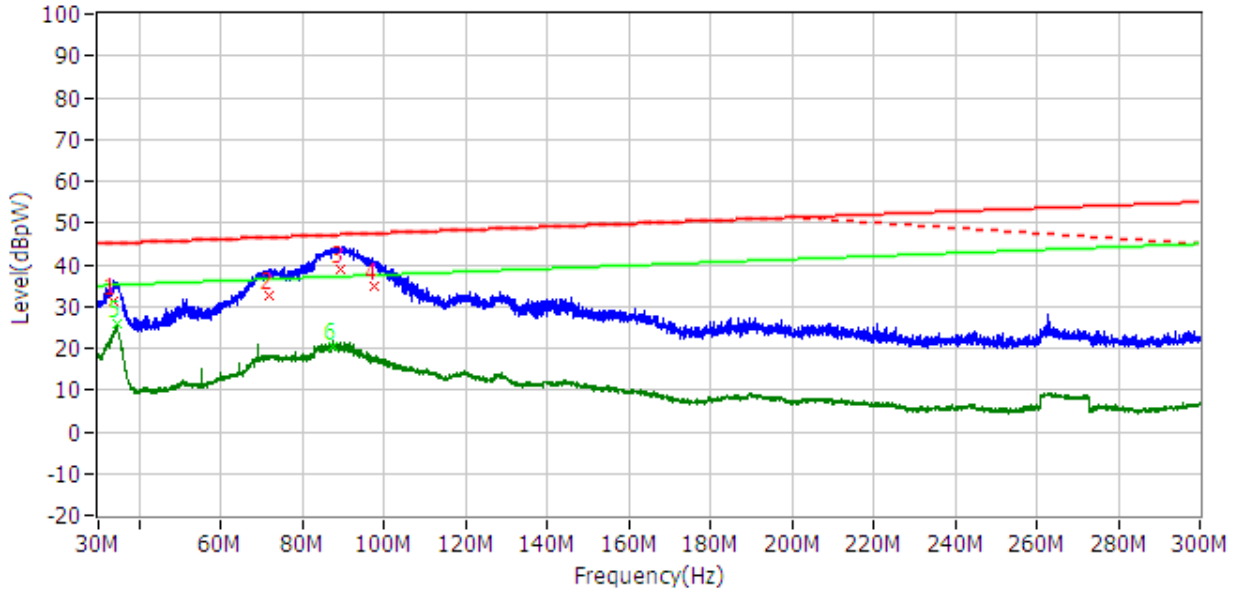
Measurement methods was according to clause 5.4 of EN 55014-1.

Operation conditions of EUT was according to clause 6 of EN 55014-1.

Frequency range 30MHz – 300MHz was checked and EMI receiver measurement bandwidth was set to 120kHz.

5.4 Test Protocol

For Mains ports: Pass



No.	Frequency	Limit dBpW	Level dBpW	Delta dB	Factor dB	Detector
1	33.840MHz	45.1	31.1	-14.0	10.0	QP
2	72.000MHz	46.6	32.7	-13.9	10.0	QP
3	89.460MHz	47.2	38.7	-8.5	9.3	QP
4	97.800MHz	47.5	34.8	-12.7	8.3	QP
5	34.500MHz	35.2	26.0	-9.2	9.9	CAV
6	87.420MHz	37.1	20.5	-16.6	9.4	CAV

For Associated ports: NA

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBpW)	Limit (dBpW)	Margin (dB)	Corrected Reading (dBpW)	Limit (dBpW)	Margin (dB)

Note: * means the emission level 20dB below the relevant limit.

6. Radiated emission

Test result: **PASS**

- As for in the disturbance power test all emission readings from the EUT are lower than the applicable limits (Table 7) reduced by the margin (Table 8) and the maximum clock frequency is less than 30MHz, the EUT is deemed to comply with the Radiated Emission requirement without test.

6.1 Limit

- Radiated emission limit from frequency range 30MHz – 1000MHz

Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 3m	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 10m
30 ~ 230	40	30
230 ~ 1000	47	37

Notes:

- For the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.
- The gray rows are selected items.

- Radiated emission limit from frequency range 1GHz – 6GHz

Frequency (MHz)	Permitted limit in dB μ V/m (Average) of Measurement Distance 3m	Permitted limit in dB μ V/m (Peak) of Measurement Distance 3m
1000 ~ 3000	50	70
3000 ~ 6000	54	74

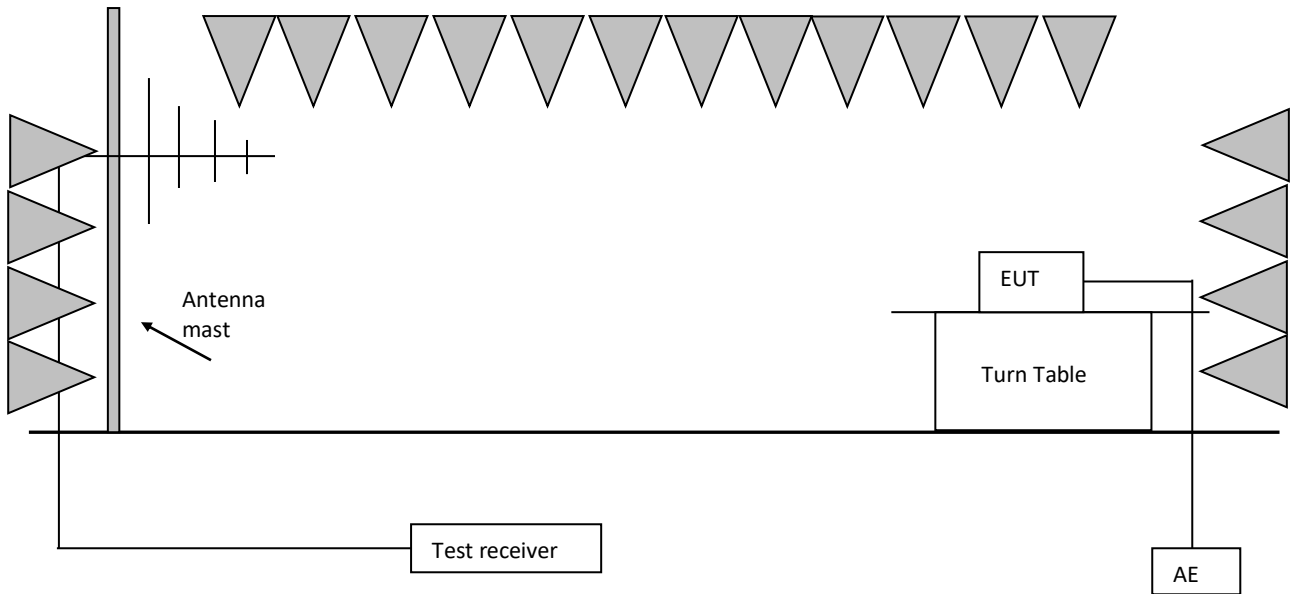
Notes:

- For the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.
- The gray rows are selected items.

Required highest frequency for radiated electric field strength measurements

Highest clock frequency (F_x)	Highest measurement frequency
$F_x \leq 108$ MHz	1 GHz
108 MHz $< F_x \leq 500$ MHz	2 GHz
500 MHz $< F_x \leq 1$ GHz	5 GHz
$F_x > 1$ GHz	$5 \times F_x$ up to a maximum of 6 GHz

6.2 Block diagram and test set up



The measurement was applied in a semi-anechoic chamber.
Operation conditions of EUT was according to clause 6 of EN 55014-1.
Measurement was performed according to clause 10 of CISPR 32.
Setting of EUT is according to clause 5.3.4.3 of EN 55014-1.
The bandwidth setting on test receiver was 120kHz.
The frequency range from 30MHz to 6GHz was checked.

6.3 Test Protocol

Horizontal

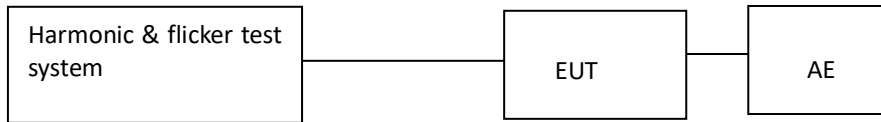
Vertical

Polarization	Frequency (MHz)	Corrected Reading (dBμV/m)	Corrected Factor (dB/m)	Limits (dBμV/m)	Margin (dBμV/m)
Horizontal					
Vertical					

7. Harmonics

Test result: **PASS**

7.1 Block Diagram of Test Setup



7.2 Test Setup and Test Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyser which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions. Measuring instrumentation according to IEC 61000-4-7:2002+A1:2008

7.3 Test Protocol

- This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit apply according to EN 61000-3-2
- The EUT is kitchen machines as listed in the scope of IEC 60335-2-14, therefore, is deemed to conform to the harmonic current limits of this standard without further testing.

Power and THD results - DS: 1

True power P:	1.649kW	Apparent power S:	1.65kVA
Reactiv power Q:	41.95var	Power factor:	1.000
THD (U):	0.001	THD (I):	0.004
Crest Factor (U):	1.414	Crest Factor (I):	1.42

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	7.055			
2	5.297E-3			PASS
3	22.234E-3			PASS
4	5.027E-3			PASS
5	6.009E-3			PASS
6	4.784E-3			PASS
7	3.053E-3			PASS
8	4.413E-3			PASS
9	5.621E-3			PASS
10	4.120E-3			PASS
11	3.579E-3			PASS
12	3.606E-3			PASS
13	3.397E-3			PASS
14	3.488E-3			PASS
15	1.459E-3			PASS
16	2.681E-3			PASS
17	4.934E-3			PASS
18	2.639E-3			PASS
19	2.903E-3			PASS
20	2.051E-3			PASS
21	1.927E-3			PASS
22	1.751E-3			PASS
23	1.062E-3			PASS
24	1.357E-3			PASS
25	3.556E-3			PASS
26	1.085E-3			PASS
27	2.268E-3			PASS
28	1.149E-3			PASS
29	1.208E-3			PASS
30	946.713E-6			PASS
31	1.167E-3			PASS
32	1.070E-3			PASS
33	2.728E-3			PASS
34	899.054E-6			PASS
35	1.552E-3			PASS
36	1.166E-3			PASS
37	1.362E-3			PASS
38	894.642E-6			PASS
39	910.522E-6			PASS
40	958.322E-6			PASS

Maximum harmonic current results

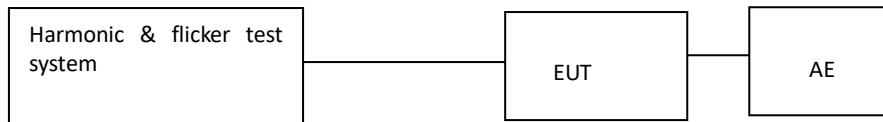
Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	7.147			
2	6.066E-3			PASS
3	24.560E-3			PASS
4	5.740E-3			PASS
5	6.806E-3			PASS
6	5.421E-3			PASS
7	3.729E-3			PASS
8	4.902E-3			PASS
9	6.126E-3			PASS
10	4.567E-3			PASS
11	3.936E-3			PASS
12	3.888E-3			PASS
13	3.923E-3			PASS
14	3.849E-3			PASS
15	2.146E-3			PASS
16	3.226E-3			PASS
17	5.269E-3			PASS
18	3.104E-3			PASS
19	3.446E-3			PASS
20	2.376E-3			PASS
21	2.399E-3			PASS
22	2.027E-3			PASS
23	1.295E-3			PASS
24	1.717E-3			PASS
25	4.131E-3			PASS
26	1.370E-3			PASS
27	2.662E-3			PASS
28	1.482E-3			PASS
29	1.681E-3			PASS
30	1.257E-3			PASS
31	1.669E-3			PASS
32	1.257E-3			PASS
33	2.969E-3			PASS
34	1.113E-3			PASS
35	1.964E-3			PASS
36	1.429E-3			PASS
37	1.886E-3			PASS
38	1.121E-3			PASS
39	1.176E-3			PASS
40	1.251E-3			PASS

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

8. Voltage Fluctuations-Flicker

Test result: **PASS**

8.1 Block Diagram of Test Setup



8.2 Test Setup and Test Procedure

8.2.1 Definition

Flicker: impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

Pst: Short-term flicker severity.

Plt: long-term flicker severity.

dc: maximum steady state voltage change during an observation period.

dmax: maximum absolute voltage change during an observation period.

d(t): time function of the relative r.m.s. voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage, except during time interval in which the voltage is a steady-state condition for at least 1s.

8.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes.

8.3 Test Protocol

The tested object operated under the operating condition specified in EN 61000-3-3
The following limits apply

- the value of Pst shall not be greater than 1,0.
- the value of Plt shall not be greater than 0,65.
- Tmax, the accumulated time value of d(t) with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms.
- the maximum relative steady-state voltage change, dc, shall not exceed 3,3 %.
- the maximum relative voltage change dmax, shall not exceed:
 - 4% without additional conditions.
 - 6 % for equipment which is:
 - switched manually, or
 - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
 - 7 % for equipment which is:
 - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
 - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.
 - for manual switch, dmax is measured in accordance with Annex B of standard, average dmax is calculated from 24 times measurement.
 - The rate power of the EUT is no greater than 75W, which is unlikely to produce significant voltage fluctuations or flicker by technical analysis and evaluation. So it is deemed to fulfil the requirements without testing.

	EUT values	Limit	Result
Pst	0.457	1.00	PASS
Plt	0.437	0.65	PASS
dc [%]	1.296	3.30	PASS
dmax [%]	1.339	4.00	PASS
dt [s]	0.000	0.50	PASS

Immunity Test

Performance criteria

The performance criteria are based on the general criteria of the standard and derived from the product specification

Criterion A: 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.

Criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (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 to persist after the test. 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.

Criterion C: 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.

Categories of apparatus

- Category I:** equipment containing no electronic control circuitry. (fulfill the relevant immunity requirements without testing)
- Category II:** mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 230 MHz), Surge, Voltage dips)
- Category III:** battery operated equipment not included in Category I. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 80 MHz), Radio frequency electromagnetic fields (80 MHz to (F) MHz), Surge)
Note: For Category III toys, the radio frequency electromagnetic fields test shall be applicable only for ride on toys.
- Category IV:** mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 80 MHz), Radio frequency electromagnetic fields (80 MHz to 1000 MHz), Surge, Voltage dips)
- Category V:** mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz. (Shall fulfill the tests: ESD, EFT, Inject current (150 kHz to 80 MHz), Radio frequency electromagnetic fields (80 MHz to 6 GHz), Surge, Voltage dips)

9. Electrostatic Discharge (ESD)

Test result: **PASS**

9.1 Severity Level and Performance Criterion

9.1.1 Test level

1a – Contact discharge		1b – Air discharge	
Level	Test voltage kV	Level	Test voltage kV
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special

Notes:

- “X” is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.
- The gray rows were the selected test level.

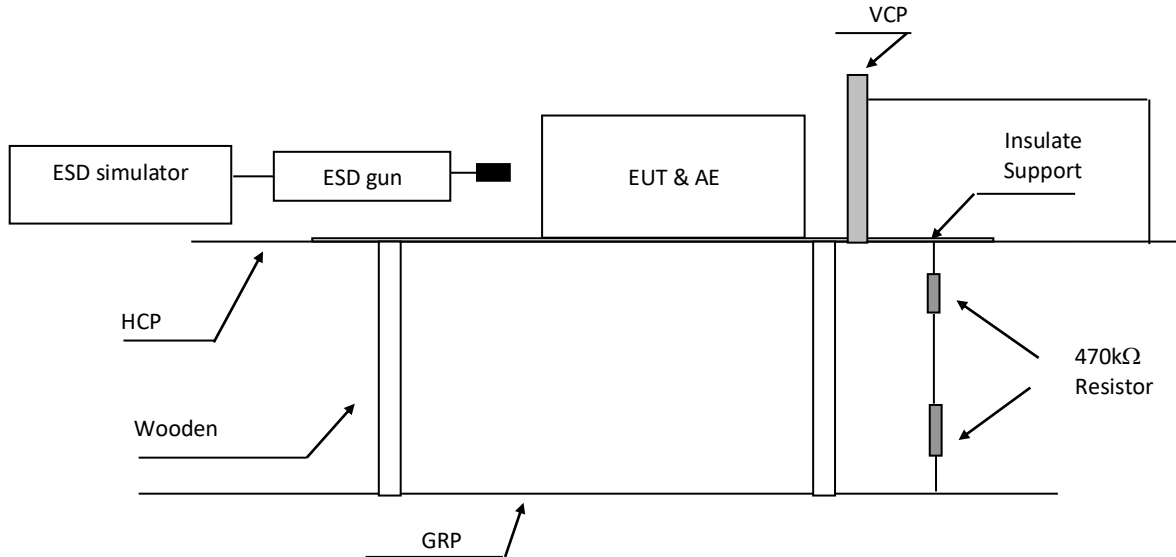
9.1.2 Performance Criterion

Performance criterion: **B/C***

*: Performance criterion C may be applied to toys not using score or data entered by the user (e.g. musical soft toys and sounding toys).

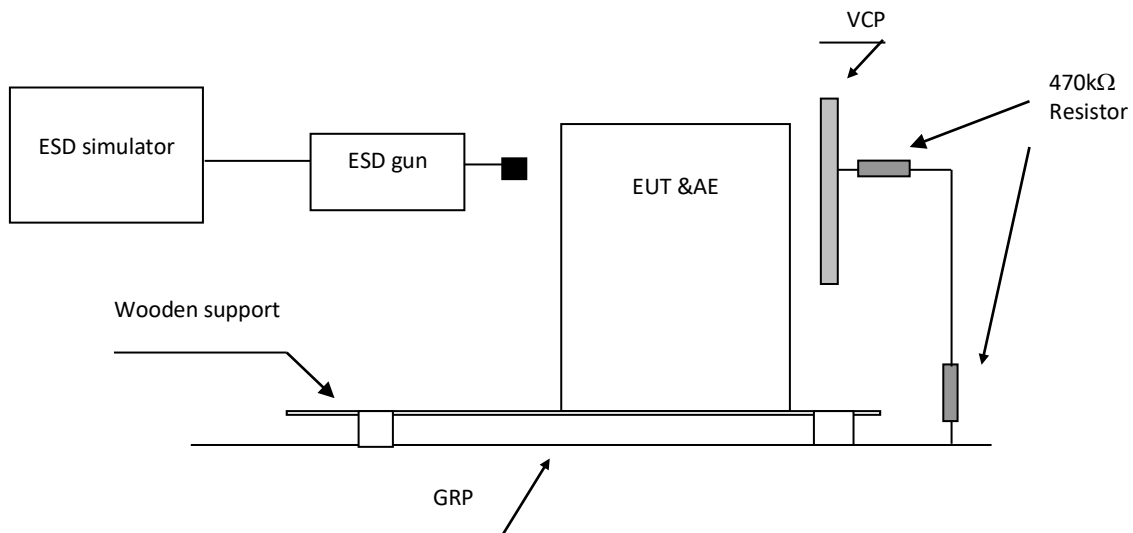
9.2 Block Diagram of Test Setup

For table-top equipment



Note: HCP means Horizontal Coupling Plane
VCP means Vertical Coupling Plane
GRP means Ground Reference Plane
Wooden support is a 0.8m height table

For floor standing equipment



Note: VCP means Vertical Coupling Plane
GRP means Ground Reference Plane
Wooden support is a 0.1m height rack

9.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-2 Clause 7.

The test method and equipment was specified by IEC 61000-4-2 with the modifications by EN 55014-2 clause 5.1.

9.4 Test Protocol

Direct discharges were applied at the following selected points:

Test point #	Test level [kV]	Air/Contact	Polarity (+/-)	Pass/Fail/NA	Comment
A	4	Contact	+/-	Pass	All touchable screws of enclosure
B	4	Contact	+/-	Pass	Accessible metal parts of the EUT
C	8	Air	+/-	Pass	Air gap of the switch, button
D	8	Air	+/-	Pass	The air in-taking opening
E	8	Air	+/-	Pass	Slots around the EUT

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

Point	Description	Point	Pass/Fail/NA
VCP f	0,1m from the front of the EUT	Edge of centre, corner on VCP	Pass
VCP b	0,1m from the back of the EUT	Edge of centre, corner on VCP	Pass
VCP r	0,1m from the right of the EUT	Edge of centre, corner on VCP	Pass
VCP l	0,1m from the left of the EUT	Edge of centre, corner on VCP	Pass

For table top equipment

Point	Description	Point	Pass/Fail/NA
HCP f	0,1m from the front of the EUT	Edge of centre, corner on HCP	Pass
HCP b	0,1m from the back of the EUT	Edge of centre, corner on HCP	Pass
HCP r	0,1m from the right side of the EUT	Edge of centre, corner on HCP	Pass
HCP l	0,1m from the left side of the EUT	Edge of centre, corner on HCP	Pass

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements.

10. Radio frequency electromagnetic fields

Test result: **NA**

10.1 Severity Level and Performance Criterion

10.1.1 Test level

Level	Test field strength V/m
1	1
2	3
3	10
X	Special

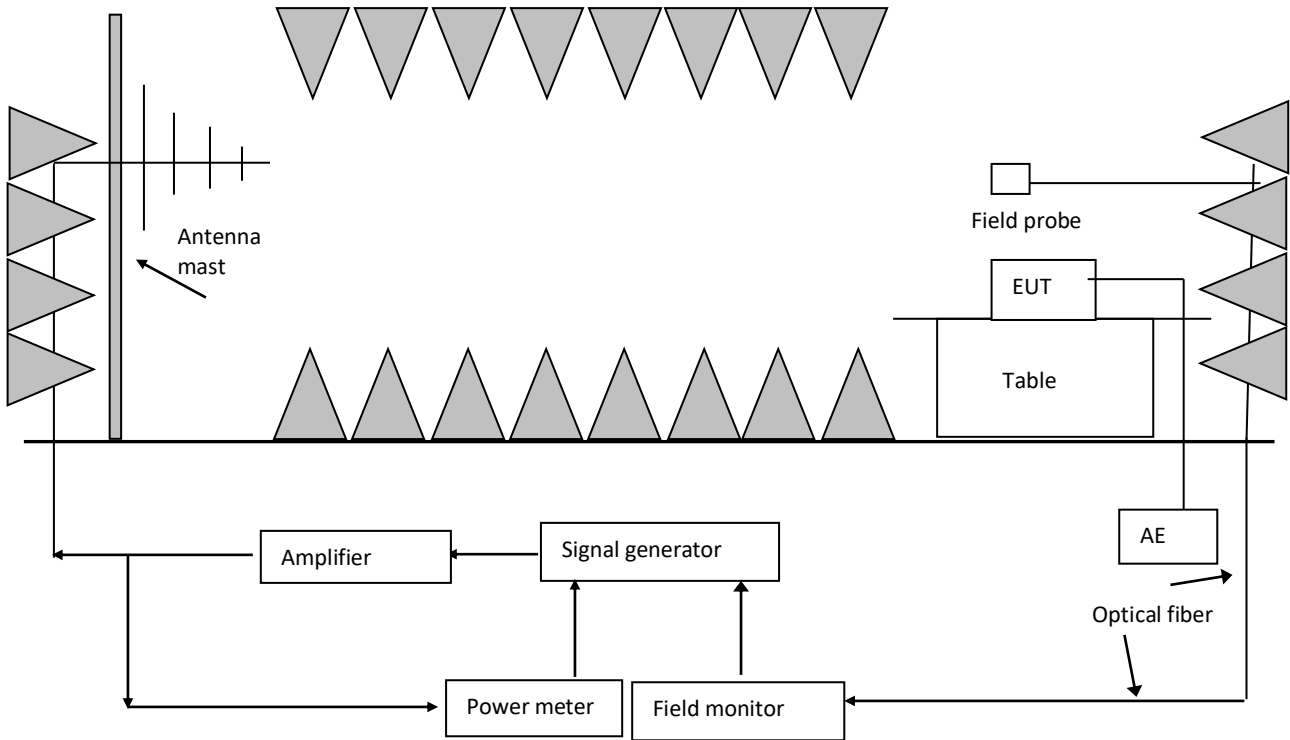
Notes:

1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

Performance criterion: **A**

10.2 Block diagram of test setup



10.3 Test Setup and Test Procedure

Measurement was performed in full-anechoic chamber.

Measurement and setting of EUT was applied according to IEC 61000-4-3 clause 7.

The test method and equipment was specified by IEC 61000-4-3 with additions and modifications by EN 55014-2 clause 5.5.

10.4 Test Protocol

Test no.:	Frequency (MHz)	Polarization	Test level V/m	Modulation	Exposed location	Pass/Fail/NA	Comment
1	80-1000	H & V	3	1kHz, 80%, SW, AM, 1% step size	All sides		-
1	1000-6000	H & V	3	1kHz, 80%, SW, AM, 1% step size	All sides		-

Observation:

Conclusion:

11. Fast transients

Test result: **PASS**

11.1 Severity Level and Performance Criterion

11.1.1 Test level

Open circuit output test voltage ($\pm 10\%$) and repetition rate of the impulses ($\pm 20\%$)				
Level	Input and output AC power ports		Input and output DC power ports Signal ports, control ports and wired network ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5	0.25	5
2	1	5	0.5	5
3	2	5	1	5
4	4	5	2	5
X	Special	Special	Special	Special

Notes :

- "X" is an open level. The level has to be specified in the dedicated equipment specification.
- The gray rows were the selected test level.

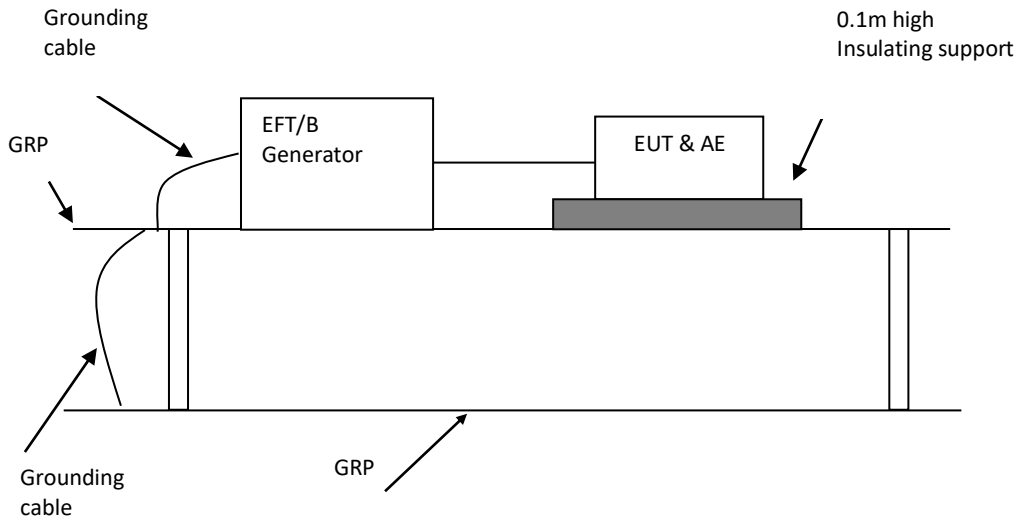
11.1.2 Performance Criterion

Performance criterion **B**

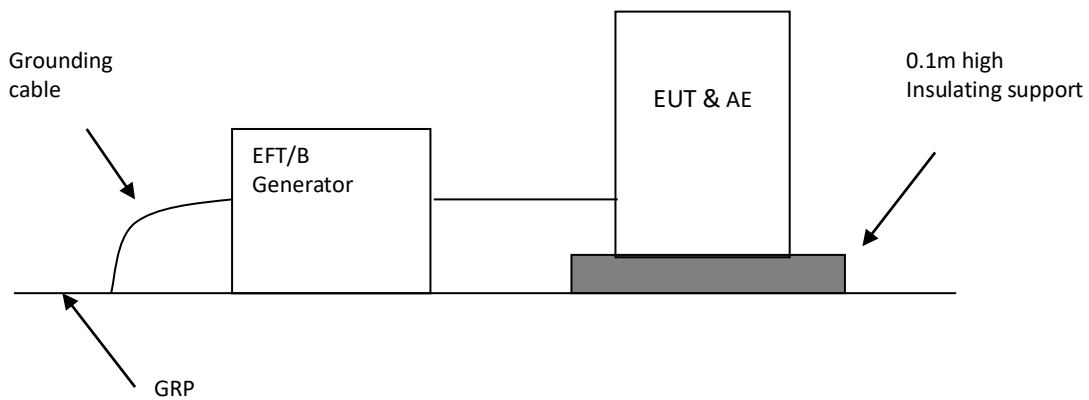
11.2 Block Diagram of Test Setup

11.2.1 Block Diagram for input a.c./d.c. power line

For table-top equipment

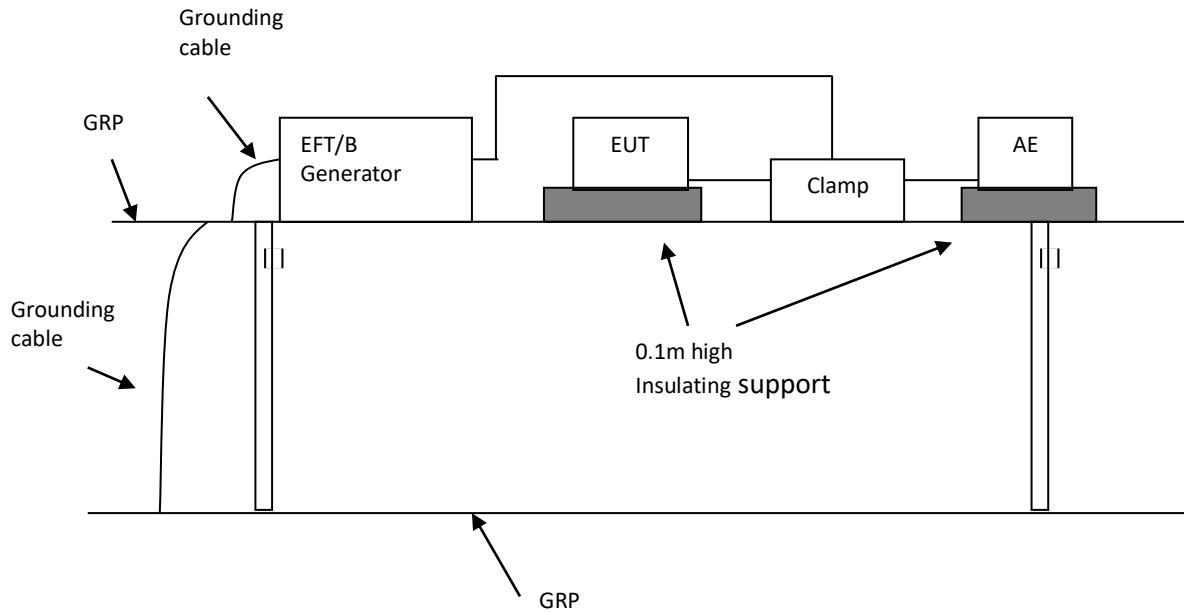


For floor standing equipment

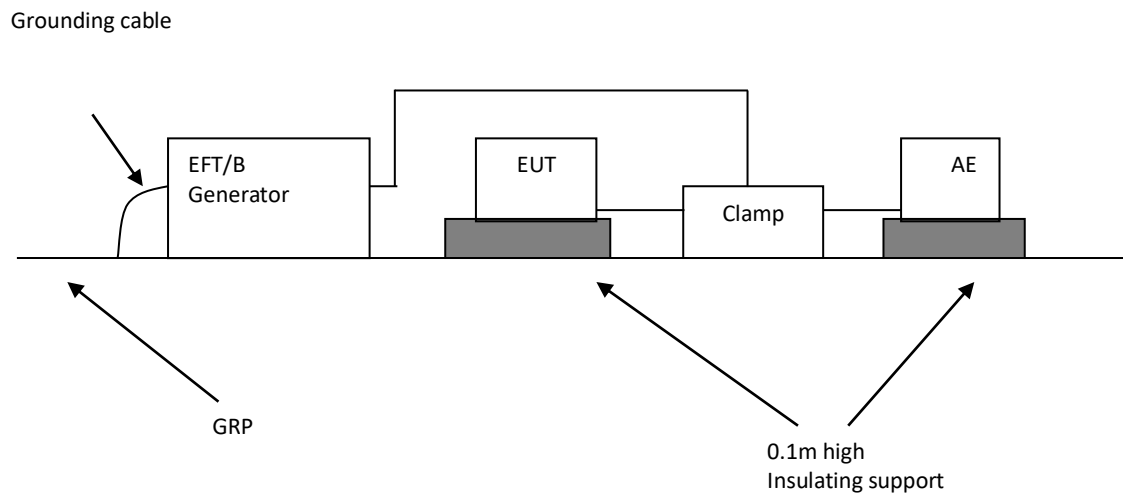


11.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

For table-top equipment



For floor standing equipment



11.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-4 clause 7.

The test method and equipment was specified by IEC 61000-4-4 with additions and modifications by EN 55014-2 clause 5.2.

11.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Repetition rate kHz	Line for test	Pass/Fail/NA
1	1	+/-	5	Input and output AC power ports	Pass
2	0.5	+/-	5	Input and output DC power ports	NA
3	0.5	+/-	5	Signal ports, control ports and wired network ports	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements.

12. Surges

Test result: PASS

12.1 Severity Level and Performance Criterion

12.1.1 Test level

Level	Open-circuit test voltage $\pm 10\%$ kV
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

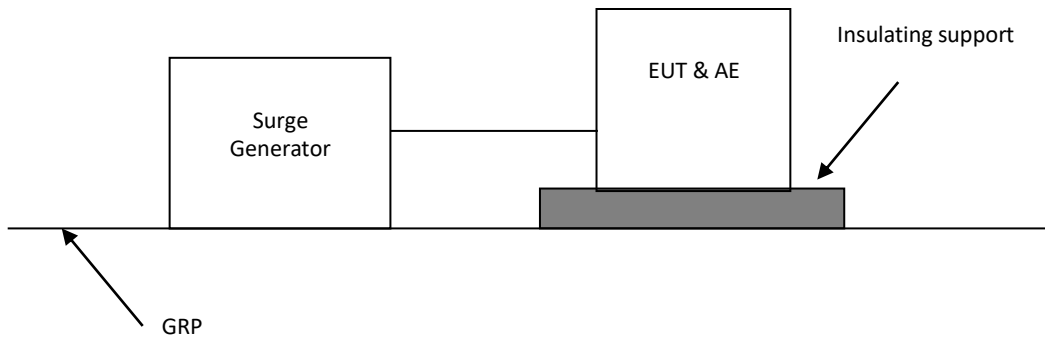
Notes:

- "X" is an open class. This level can be specified in the product Specification
- The gray rows are the selected level.

12.1.2 Performance Criterion

Performance criterion **B**

12.2 Block Diagram of Test Setup



12.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-5 clause 7.

The test method and equipment was specified by IEC 61000-4-5 with modifications by EN 55014-2 clause 5.6.

12.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Angle	Line for test	Pass/Fail/NA
1	1	+ -	90 ⁰ 270 ⁰	Input AC power ports (line to line)	Pass
2	2	+ -	90 ⁰ 270 ⁰	Input AC power ports (line to earth)	Pass
3	1	+ -	90 ⁰ 270 ⁰	Wired network ports (line-to-earth (unshielded))	NA
4	0.5	+ -	90 ⁰ 270 ⁰	Wired network ports (shield-to-earth (shielded))	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements.

13. Injected Current

Test result: **PASS**

13.1 Severity Level and Performance Criterion

13.1.1 Test level

Frequency range 150kHz – 230MHz		
Level	Voltage level (e.m.f.)	
	U_0 [dB(uV)]	U_0 (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

Notes:

- “X” is an open level.
- The gray row is the selected test level.

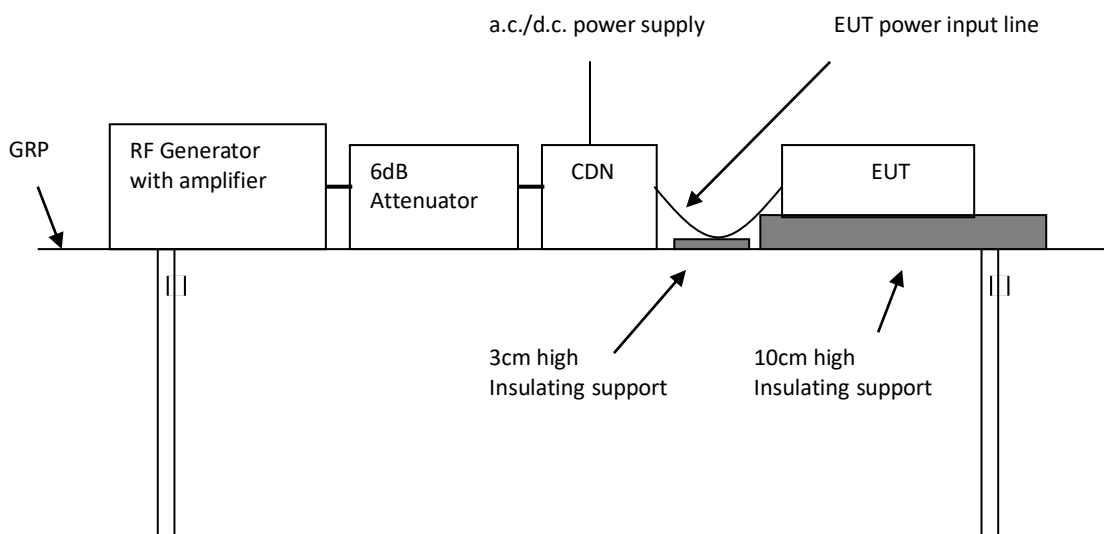
13.1.2 Performance Criterion

Performance criterion: **A**

13.2 Block Diagram of Test Setup

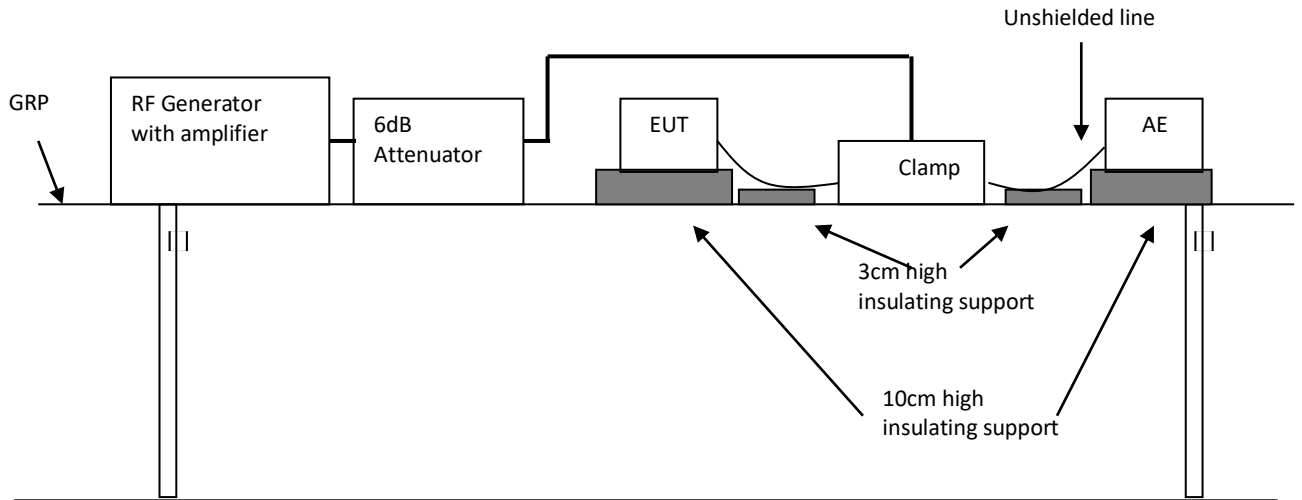
13.2.1 Block Diagram for a.c./d.c input power line

Block Diagram for a.c./d.c input power line

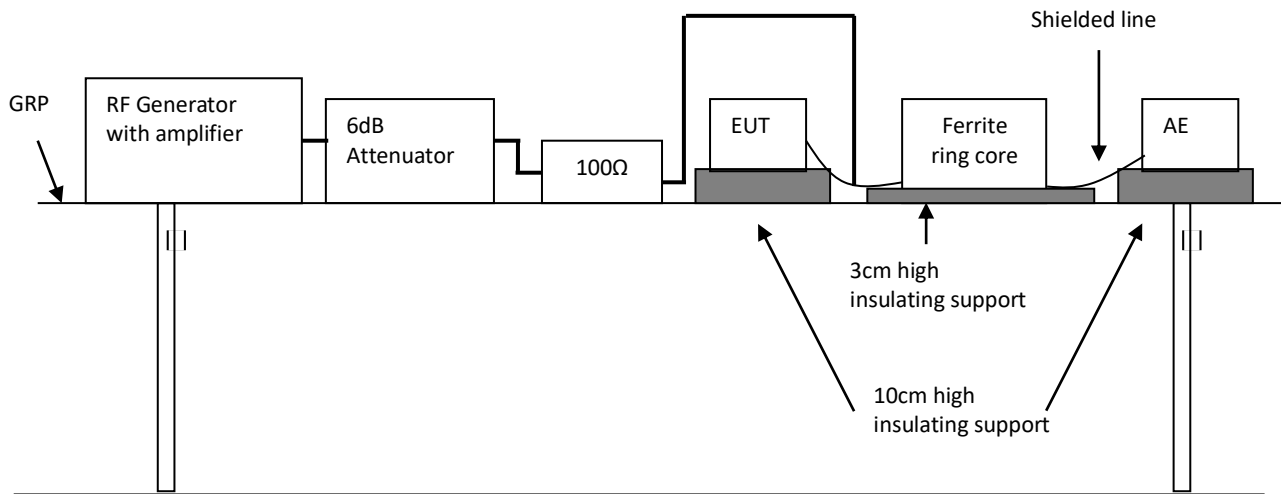


13.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

Unshielded line



Shielded line



13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-6 clause 7.

The test method and equipment was specified by IEC 61000-4-6 with additions and modifications by EN 55014-2 clause 5.3, 5.4.

13.4 Test Protocol

EUT is not required for Radio frequency electromagnetic fields

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Pass/Fail/NA
1	0.15~230	3	1kHz, 80%, SW, AM, 1% step size	Input and output AC power ports	Pass
2	0.15~230	1	1kHz, 80%, SW, AM, 1% step size	Input and output DC power ports	NA
3	0.15~230	1	1kHz, 80%, SW, AM, 1% step size	Signal ports, control ports and wired network ports	NA

For EUT test Radio frequency electromagnetic fields

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3	1kHz, 80%, SW, AM, 1% step size	Input and output AC power ports	NA
2	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	Input and output DC power ports	NA
3	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	Signal ports, control ports and wired network ports	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements.

14. Voltage Dips

Test result: **PASS**

14.1 Severity Level and Performance Criterion

14.1.1 Test level

Test level % U _T	Voltage dip % U _T	Duration (in period)	
		50Hz	60Hz
0	100	0.5 cycle	0.5 cycle
40	60	10 cycles	12 cycles
70	30	25 cycles	30 cycles

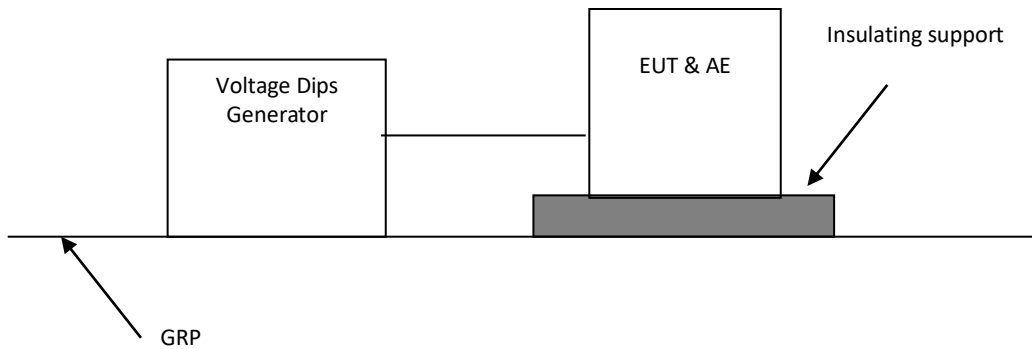
Notes:

1. "*" for 0.5 period, the test shall be made in positive and negative polarity, i.e. starting at 0° and 180°, respectively.
2. "***" means "x" is an open duration. This duration can be given in the product specification. Utilities in Europe have measured dips and short interruptions of duration between ½ a period and 3000 periods, but duration less than 50 periods are most common.
3. If the EUT is tested for voltage dips of 100%, it is generally unnecessary to test for other levels for the same durations. However, for some cases (safeguard systems or electro-mechanical devices) it is not true. The product specification or product committee shall give an indication of the applicability of this note.
4. The gray rows are selected test level.

14.1.2 Performance Criterion

Performance criterion: **C**

14.2 Block diagram of test setup



14.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-11 clause 7.

The test method and equipment was specified by IEC 61000-4-11 with additions and modifications by EN 55014-2 clause 5.7.

14.4 Test Protocol

Test no.	% U_T	Voltage dips % U_T	Duration (in periods)	Pass/Fail/NA
1	70	30%	25 cycles at 50Hz	Pass
			30 cycles at 60Hz	Pass
2	40	60%	10 cycles at 50Hz	Pass
			12 cycles at 60Hz	Pass
3	0	100%	0.5 cycle at 50Hz	Pass
			0.5 cycle at 60Hz	Pass

Observation: During test, the EUT worked unsteadily. Once the interference is removed, it recovered its normal mode at once.

Conclusion: The EUT met the requirements.

Appendix I: Photograph of equipment under test

Photo 1.

Description: Overall view of AF-005A-1

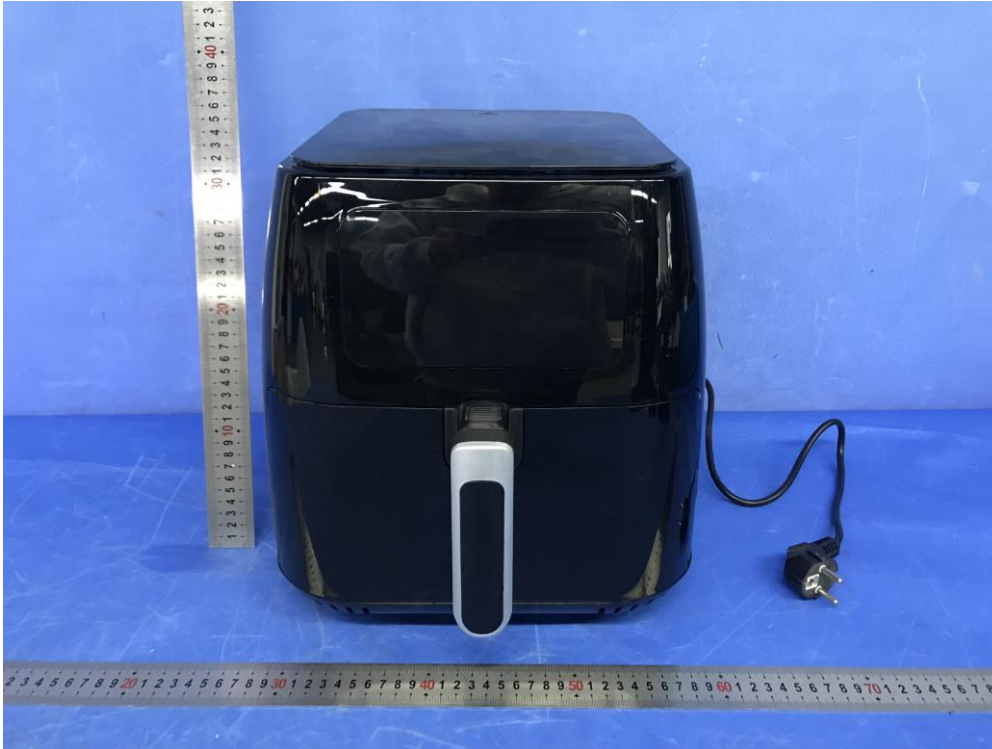


Photo 2.

Description: Overall view of AF-005A-1

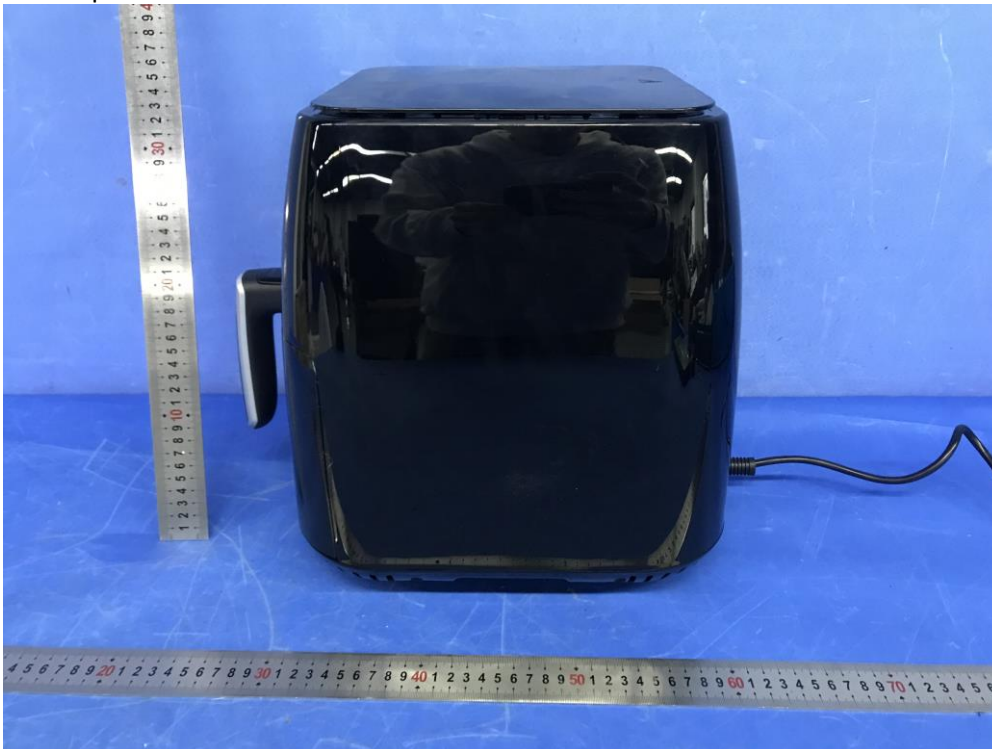


Photo 3.

Description: Internal view of AF-005A-1



Photo 4.

Description: Internal view of AF-005A-1

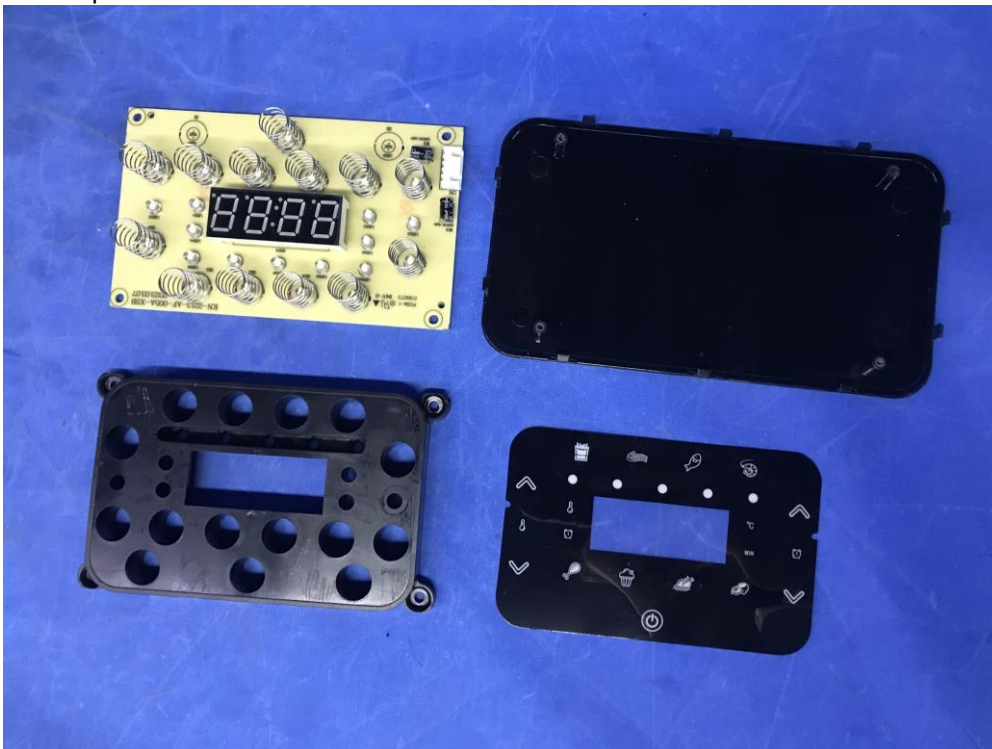


Photo 5.

Description: Control PCB Internal view of AF-005A-1



Photo 6.

Description: Control PCB view of AF-005A-1

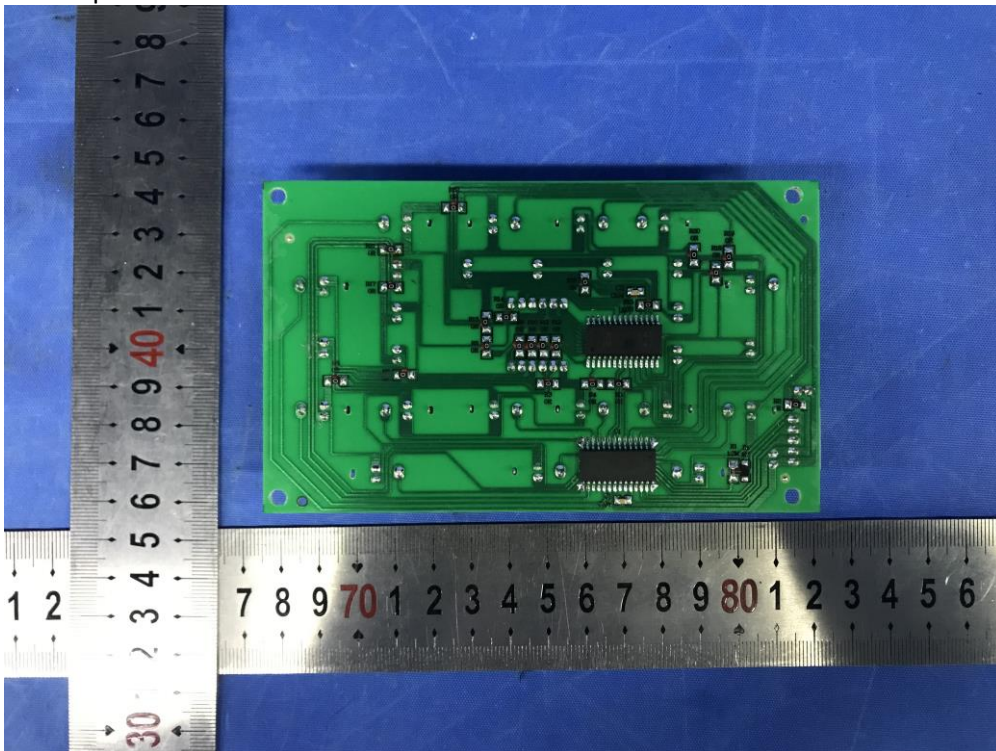


Photo 7.

Description: Power PCB view of AF-005A-1

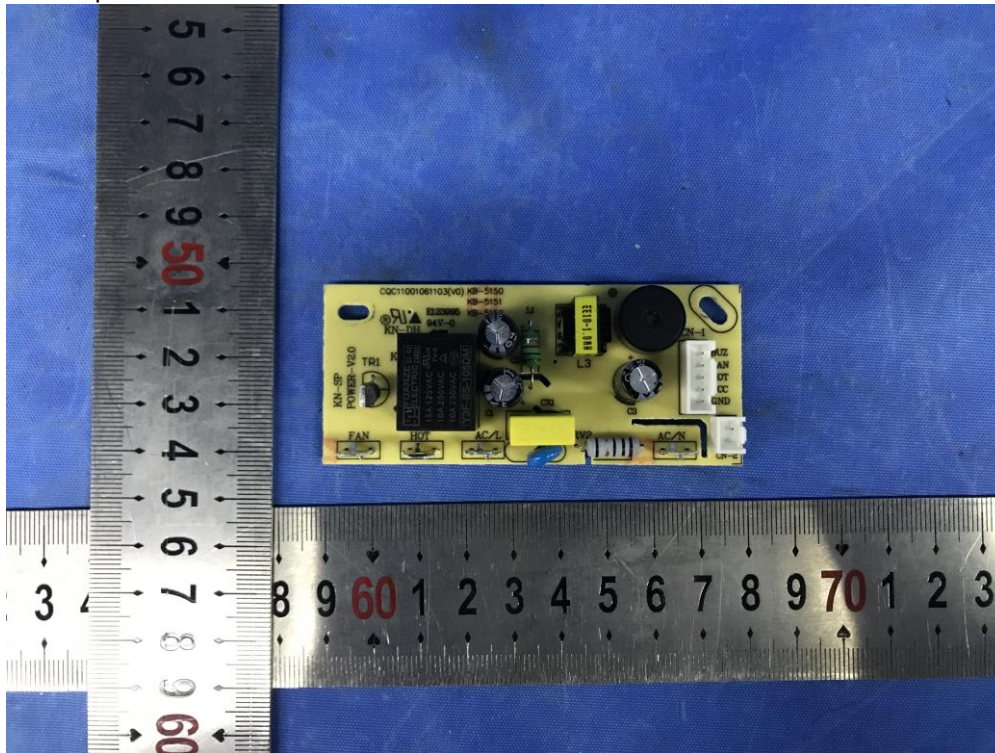
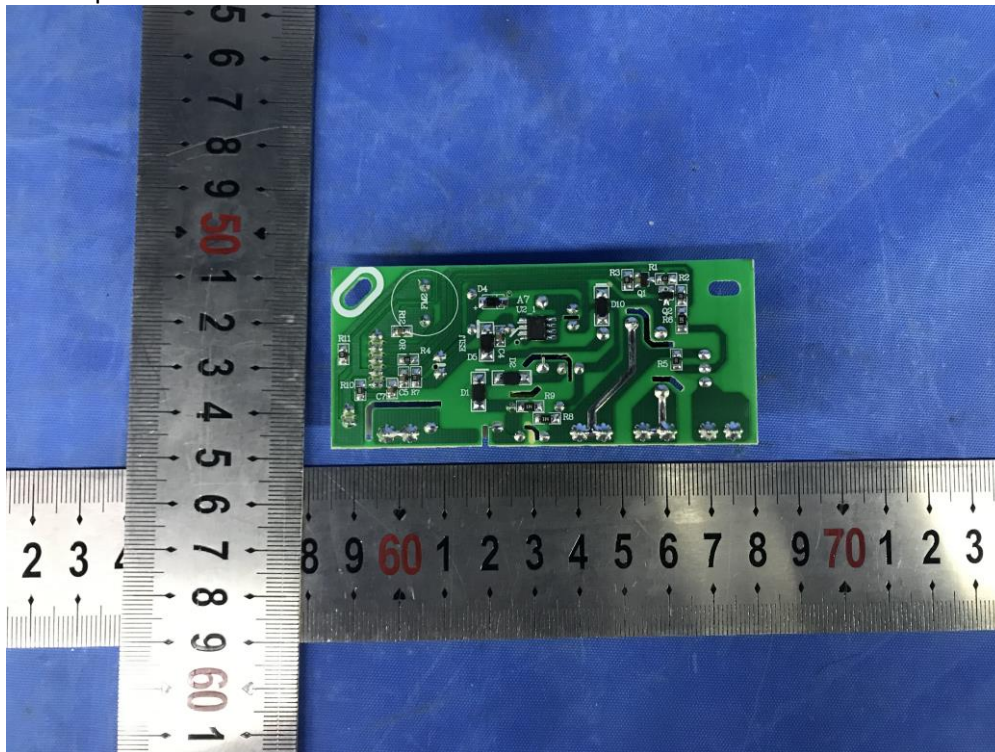


Photo 8.

Description: Power PCB view of AF-005A-1



END of the report