ShenZhen UFO Power Technology Co., Ltd.

TEST REPORT

SCOPE OF WORK:
EN 61000-6-3 (2014/30/EU) – EMC report

Model:
U-P51200-10B

REPORT NUMBER
2312A0886SHA-001

ISSUE DATE
2023-12-20

DOCUMENT CONTROL NUMBER
TTRF61000-6-3_V1

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TEST REPORT

Report no. 2312A0886SHA-001

Applicant	:	**ShenZhen UFO Power Technology Co., Ltd.** **D1308 Vanke Tianyu Plaza, No.7188 Longxiang Avenue, Jixiang Community, Longcheng Street, Longgang District, Shenzhen, China**
Manufacturer	:	**DongGuan UFO Digital Power Technology Co., Ltd.**
Manufacturing site	:	**No.5, XingyeRoad, Songshan Lake Park, Dongguan, Guangdong, China**

Summary

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

EN IEC 61000-6-1: 2019: Electromagnetic compatibility (EMC) - General standards – Immunity for residential, commercial and light-industrial environment
EN IEC 61000-6-2:2019: Electromagnetic compatibility (EMC)-Part 6-2: Generic standards - immunity standard for industrial environments
EN IEC 61000-6-3: 2021: General standards – Emission standard for residential, commercial and light-industrial environment
EN IEC 61000-6-4: 2019: General standards – Emission standard for residential, commercial and light-industrial environment

PREPARED BY:	**REVIEWED BY:**
Perry Li	John Jiang
Project Engineer	Reviewer

Contents

Revision History

Report No.	Version	Description	Issued Date
2312A0886SHA-001	Rev. 01	Initial issue of report	2023-12-20

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Conducted disturbance voltage at mains terminals	Pass	
Electromagnetic radiation disturbance	Pass	
Harmonic current	NA	
Voltage fluctuations and flicker	NA	
Electrostatic discharge	Pass	
Radio frequency electromagnetic field	Pass	
Fast transients	NA	
Surges	NA	
Radio frequency, common mode	NA	
Voltage dips	NA	
Power frequency magnetic field	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	:	Rechargeable Li-ion Battery
Type/Model	:	U-P51200-10B
Description of EUT	:	None.
Rating	:	Nominal Voltage: DC51.2V Rated Capacity: 200Ah Charge Voltage: DC58.4V Max. Charging Current:100A Max. Discharging Current:100A Communication mode: RS485/CAN
Brand name	:	--
EUT type	:	☒ Table-top ☐ Floor standing
Sample received date	:	2023-10-01
Sample identification number	:	-
Date of test	:	2023-10-10 to 2023-10-13
General remarks:		2312A0886SHA-001 report replaces 2310A0494SHA-001 at 2023-10-20. After evaluation, no additional tests needed compared to original 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.: CN0051 VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252 A2LA Accreditation Lab Certificate Number: 3309.02

☒

Name	:	KSIGN(Guangdong) Testing Co., Ltd.
Address	:	West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu IndustrialPark, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China
Telephone	:	86 0755 29852678
The test facility is recognized, certified, or accredited by these organizations	:	CNAS Accreditation Lab Registration No. CNAS L13261

2 TEST SPECIFICATIONS

2.1 Normative references

EN IEC 61000-6-1: 2019: Electromagnetic compatibility (EMC) – General standards- Immunity for residential, commercial and light-industrial environment.

EN IEC 61000-6-2: 2019: Electromagnetic compatibility (EMC) – General standards- Immunity for residential, commercial and light-industrial environment.

EN IEC 61000-6-3: 2021: General standards – Emission standard for residential, commercial and light-industrial environment

EN IEC 61000-6-4: 2019: General standards – Emission standard for residential, commercial and light-industrial environment

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
DC Electronic Load	ITECH	IT8514C+-	-

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Mains terminal disturbance voltage	26	55	NA
Electromagnetic radiation disturbance	25.8	58	101
Harmonic current	NA	NA	NA
Voltage fluctuations and flicker	NA	NA	NA
Electrostatic discharge	24.5	45	101
Radio frequency electromagnetic field	25	50	101
Fast transients	25.8	49	101
Surges	25.8	49	101
Radio frequency, common mode	25.8	49	101
Voltage dips	NA	NA	NA
Power frequency magnetic field	25.5	50	101

Notes: NA =Not Applicable

2.5 Instrument list

Radiated Emissions Measurement At Frequencies Between 30 MHz to 1GHz					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	19/02/2024
2	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	17/02/2024
3	Color Signal Generator	Philips	PM5418	672926	17/02/2024
4	Broadcast Television Signal Generator	R&S	SFE100	141038	17/02/2024
5	Analog Signal Generator	Agilent	8648A	3847M00445	17/02/2024
6	EMI Test Receiver	R&S	ESR	102525	17/02/2024
7	Battery Test System	RePower	RLLC-15KT-120V	030119093795/ 030119093790	19/02/2024
Conducted Differential Voltage Emissions Measurement					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	Color Signal Generator	Philips	PM5418	672926	17/02/2024
2	LISN	R&S	ENV432	1326.6105.02	17/02/2024
3	EMI Test Receiver	R&S	ESR	102524	17/02/2024
4	Manual RF Switch	JS TOYO	/	MSW-01/002	17/02/2024
5	ISN CAT6	Schwarzbeck	CAT5 8158	227	17/02/2024
Electrostatic Discharge Immunity(ESD)					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	ESD Simulator	TESEQ	NSG 437	1364	19/02/2024
Radiated, Radio-frequency, Electromagnetic Field Immunity (RS)					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	RF Switch	JS TOYO	NS 4903	1901-214	17/02/2024
2	Signal Generator	Agilent	N5181A	MY50141283	17/02/2024
3	Power Meter	Agilent	E4419	GB40202778	17/02/2024
4	Power Sensor	Agilent	E9304A	MY50390009	17/02/2024
5	Power Sensor	Agilent	E9300A	MY41498315	17/02/2024
6	Transmit Antenna	Schwarzbeck	VULP 9118 E	00996	19/02/2024
7	Transmit Antenna	Schwarzbeck	STLP 9149	00652	19/02/2024
8	Power Amplifier	Vectawave	VBA1000-150	123821	17/02/2024
9	Dual Directional Coupler	Werlatone	C5597-10	118142	17/02/2024
10	Power Amplifier	Milmega	AS0706-50	1085571	17/02/2024
Surge Immunity					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	Test Host	EMC partner	IMU4000 F-S-D	106754-2085	17/02/2024
Power Frequency Magnetic Field Immunity					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	Test Host	EMC partner	IMU4000 F-S-D	106754-2085	17/02/2024
2	Magnetic Field Coil	EMC partner	MF1000-1	1605	17/02/2024
EFT					

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Test Host	EMC partner	IMU4000 F-S-D	106754-2085	17/02/2024
2	Capacitive coupling Clamp	EMC partner	CN-EFT1000	CN-EFT1000-1771	17/02/2024
Immunity To Conducted Disturbances, Induced By Radio-frequency Fields & Broadband Impulse Noise Disturbances					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibrated until**
1	Power Amplifier	Vectawave	VBA230-80	123848	17/02/2024
2	Dual Directional Coupler	Werlatone	C5086-10	118149	17/02/2024
3	Analog Signal Generator	R&S	SML03	100813	17/02/2024
4	Power Meter	Agilent	E4419B	GB41293710	17/02/2024
5	Power Sensor	Agilent	E9304A	MY41490043	17/02/2024
6	Power Sensor	Agilent	E9300A	MY41495577	17/02/2024
7	6dB Attenuator	JS TOYO	/	/	17/02/2024
8	CDN	TESEQ	CDN M016S	53427	17/02/2024
9	CDN	TESEQ	CDN T8S	52007	17/02/2024

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.16 dB
	150kHz ~ 30MHz	3.16 dB
Radiated Emissions up to 1 GHz	30 MHz ~200 MHz 200 MHz ~1000 MHz	4.51 dB 5.01 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.74 dB
	6GHz ~ 18GHz	3.66 dB

3 Mains terminal disturbance voltage

Test result: Pass

3.1 Limits

3.1.1 Limits at the AC mains ports

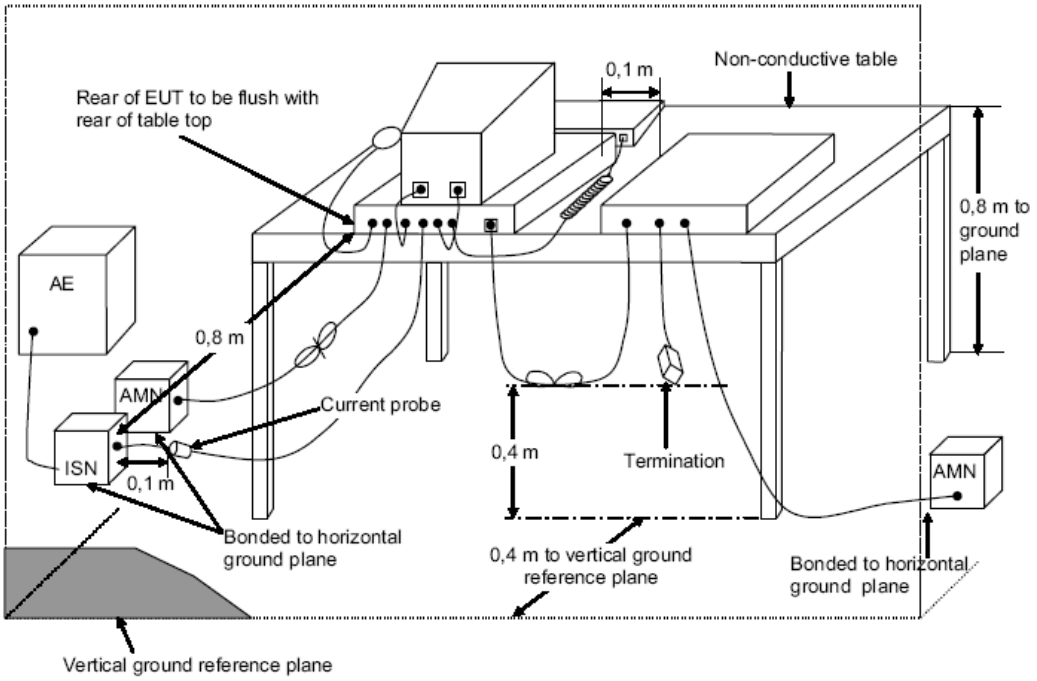
Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66-56*	56-46*
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.1.2 Limits at the DC mains ports

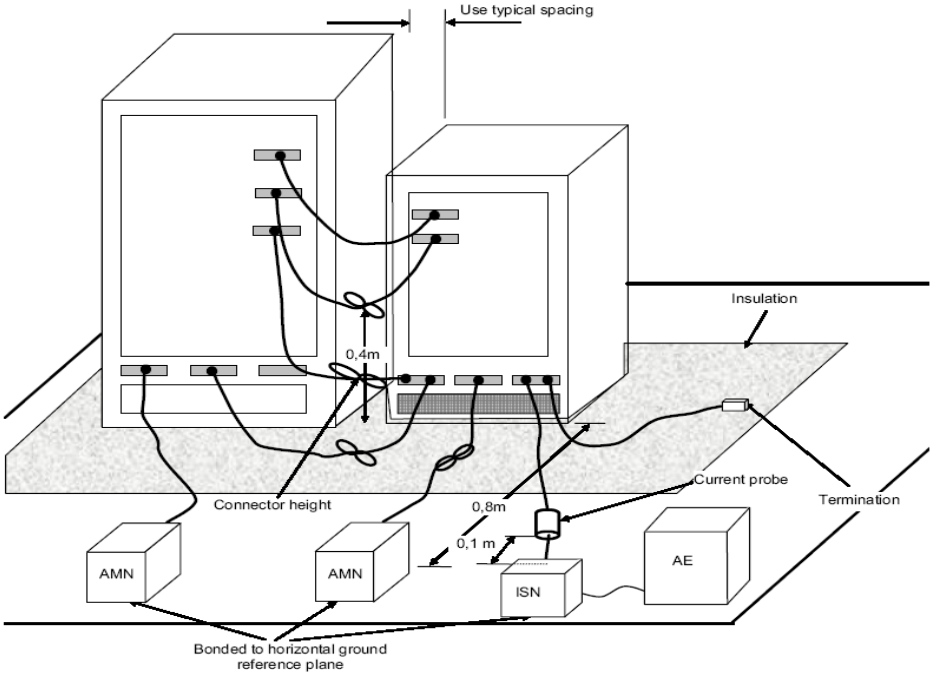
Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: 1. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.2 Test setup

For table top equipment



For floor standing equipment

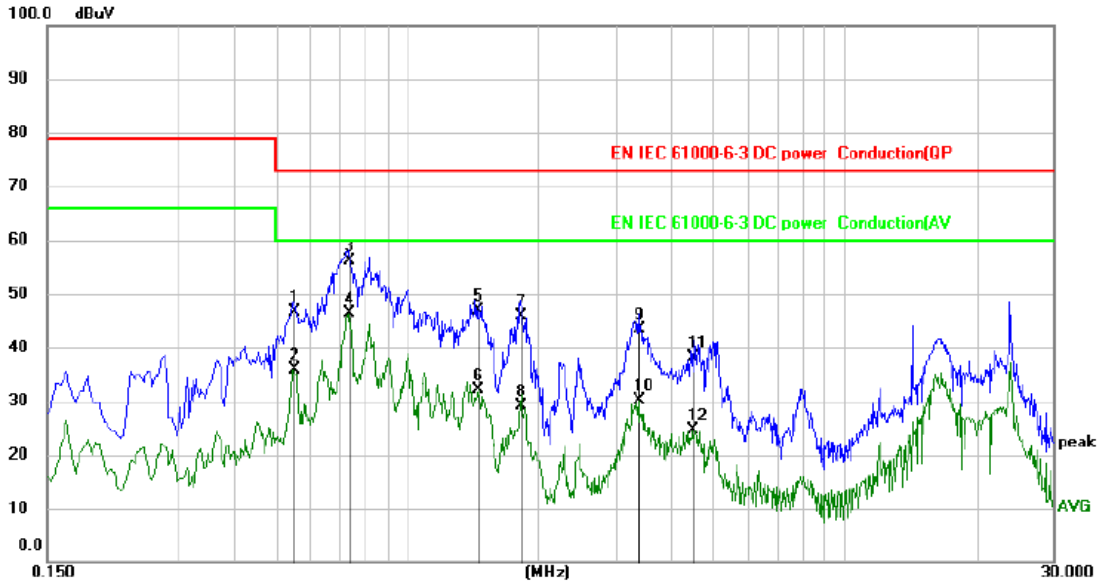


3.3 Test Procedure

Measurement was performed in shielded room, and instruments used were following CISPR 16-1-2 clause 4.3.
Detailed test procedure was following CISPR 16-2-1 clause 7.4
EUT arrangement and operation conditions were according to CISPR 16-2-1 clause 7.4.
Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

3.4 Test Result

Charging mode
L line
Test Curve:

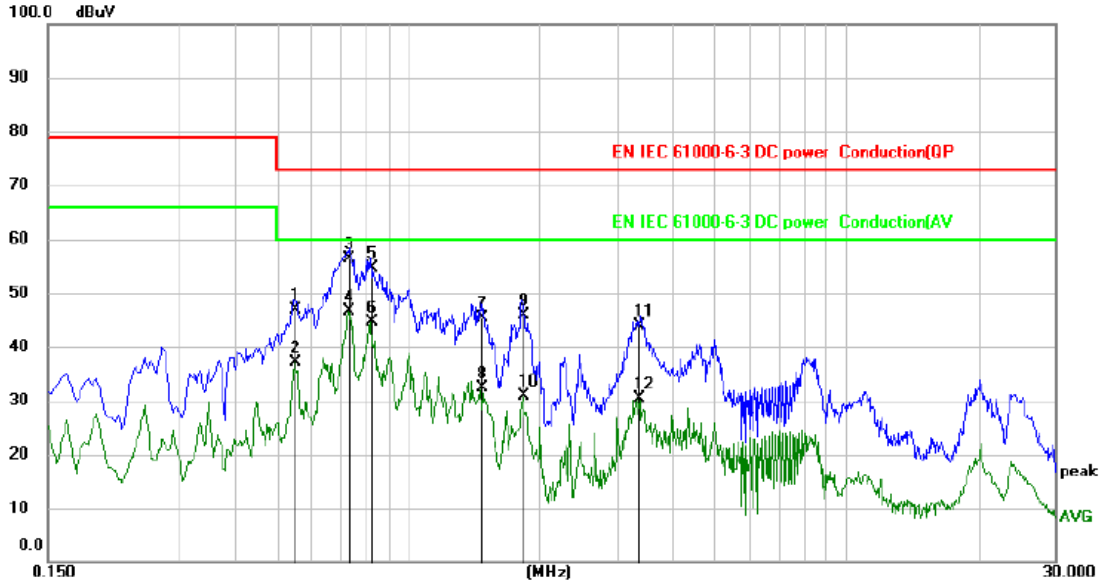


Test Data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.5500	36.18	10.45	46.63	73.00	-26.37	QP
2		0.5500	25.47	10.45	35.92	60.00	-24.08	AVG
3		0.7340	45.72	10.44	56.16	73.00	-16.84	QP
4	*	0.7340	35.85	10.44	46.29	60.00	-13.71	AVG
5		1.4540	36.47	10.48	46.95	73.00	-26.05	QP
6		1.4540	21.64	10.48	32.12	60.00	-27.88	AVG
7		1.8140	35.46	10.49	45.95	73.00	-27.05	QP
8		1.8140	18.75	10.49	29.24	60.00	-30.76	AVG
9		3.3900	32.81	10.55	43.36	73.00	-29.64	QP
10		3.3900	19.58	10.55	30.13	60.00	-29.87	AVG
11		4.4818	27.65	10.60	38.25	73.00	-34.75	QP
12		4.4818	14.15	10.60	24.75	60.00	-35.25	AVG

N line

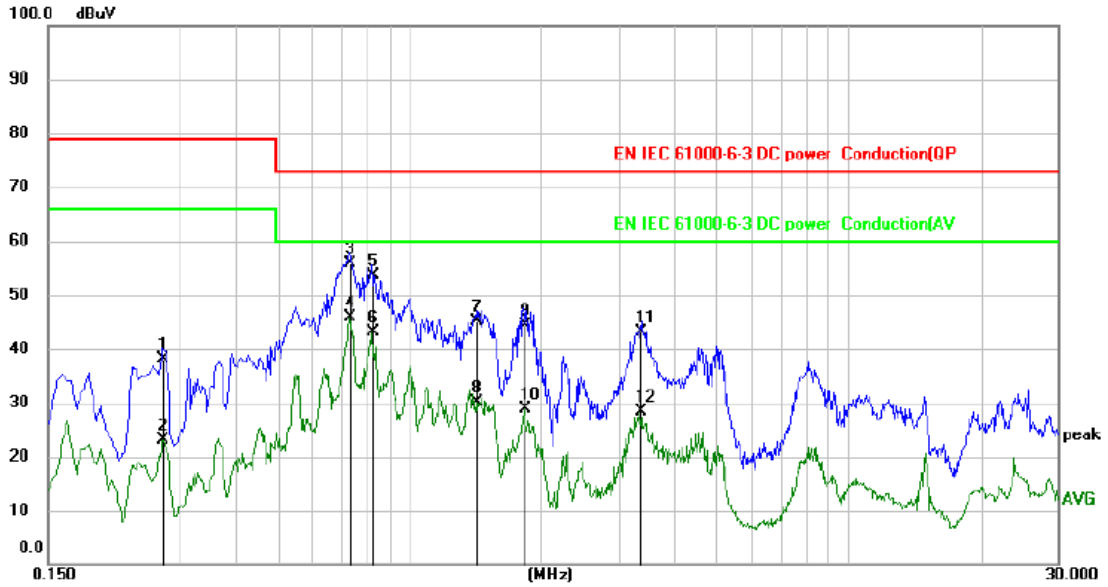
Test Curve:



Test Data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.5500	36.55	10.41	46.96	73.00	-26.04	QP
2		0.5500	26.84	10.41	37.25	60.00	-22.75	AVG
3		0.7300	45.90	10.41	56.31	73.00	-16.69	QP
4	*	0.7300	36.17	10.41	46.58	60.00	-13.42	AVG
5		0.8220	44.13	10.43	54.56	73.00	-18.44	QP
6		0.8220	34.30	10.43	44.73	60.00	-15.27	AVG
7		1.4660	34.83	10.45	45.28	73.00	-27.72	QP
8		1.4660	21.92	10.45	32.37	60.00	-27.63	AVG
9		1.8340	35.40	10.45	45.85	73.00	-27.15	QP
10		1.8340	20.45	10.45	30.90	60.00	-29.10	AVG
11		3.3580	33.30	10.51	43.81	73.00	-29.19	QP
12		3.3580	19.97	10.51	30.48	60.00	-29.52	AVG

Discharging mode:
L line
Test Curve:

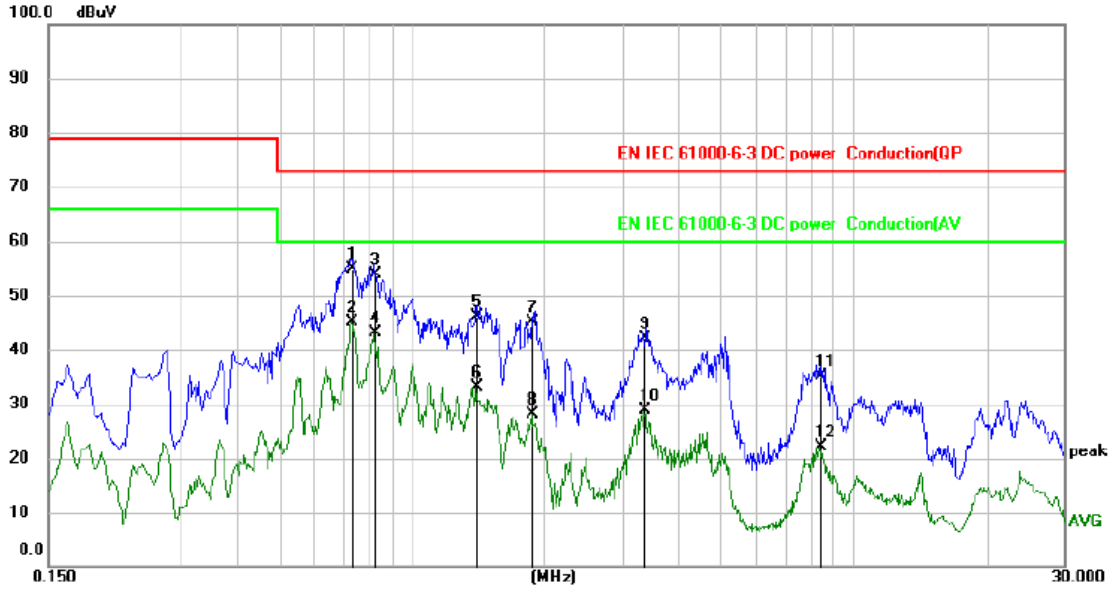


Test Data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2740	27.66	10.37	38.03	79.00	-40.97	QP
2		0.2740	12.88	10.37	23.25	66.00	-42.75	AVG
3		0.7300	45.44	10.41	55.85	73.00	-17.15	QP
4	*	0.7300	35.41	10.41	45.82	60.00	-14.18	AVG
5		0.8259	43.20	10.43	53.63	73.00	-19.37	QP
6		0.8259	32.65	10.43	43.08	60.00	-16.92	AVG
7		1.4219	34.68	10.45	45.13	73.00	-27.87	QP
8		1.4219	19.57	10.45	30.02	60.00	-29.98	AVG
9		1.8340	34.05	10.45	44.50	73.00	-28.50	QP
10		1.8340	18.52	10.45	28.97	60.00	-31.03	AVG
11		3.3540	32.51	10.51	43.02	73.00	-29.98	QP
12		3.3540	17.76	10.51	28.27	60.00	-31.73	AVG

N line

Test Curve:



Test Data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.7300	44.57	10.41	54.98	73.00	-18.02	QP
2	*	0.7300	34.65	10.41	45.06	60.00	-14.94	AVG
3		0.8260	43.36	10.43	53.79	73.00	-19.21	QP
4		0.8260	32.76	10.43	43.19	60.00	-16.81	AVG
5		1.4020	35.56	10.45	46.01	73.00	-26.99	QP
6		1.4020	22.78	10.45	33.23	60.00	-26.77	AVG
7		1.8700	34.61	10.45	45.06	73.00	-27.94	QP
8		1.8700	17.59	10.45	28.04	60.00	-31.96	AVG
9		3.3580	31.61	10.51	42.12	73.00	-30.88	QP
10		3.3580	18.48	10.51	28.99	60.00	-31.01	AVG
11		8.4100	24.60	10.64	35.24	73.00	-37.76	QP
12		8.4100	11.54	10.64	22.18	60.00	-37.82	AVG

4 Radiated emission

Test result: PASS

4.1 Limits

Frequency range (MHz)	Limit in dBuV/m (Quasi-peak) Of measurement distance 3m	Limit in dBuV/m (Quasi-peak) Of measurement distance 10m
30-230	40	30
230-1000	47	37

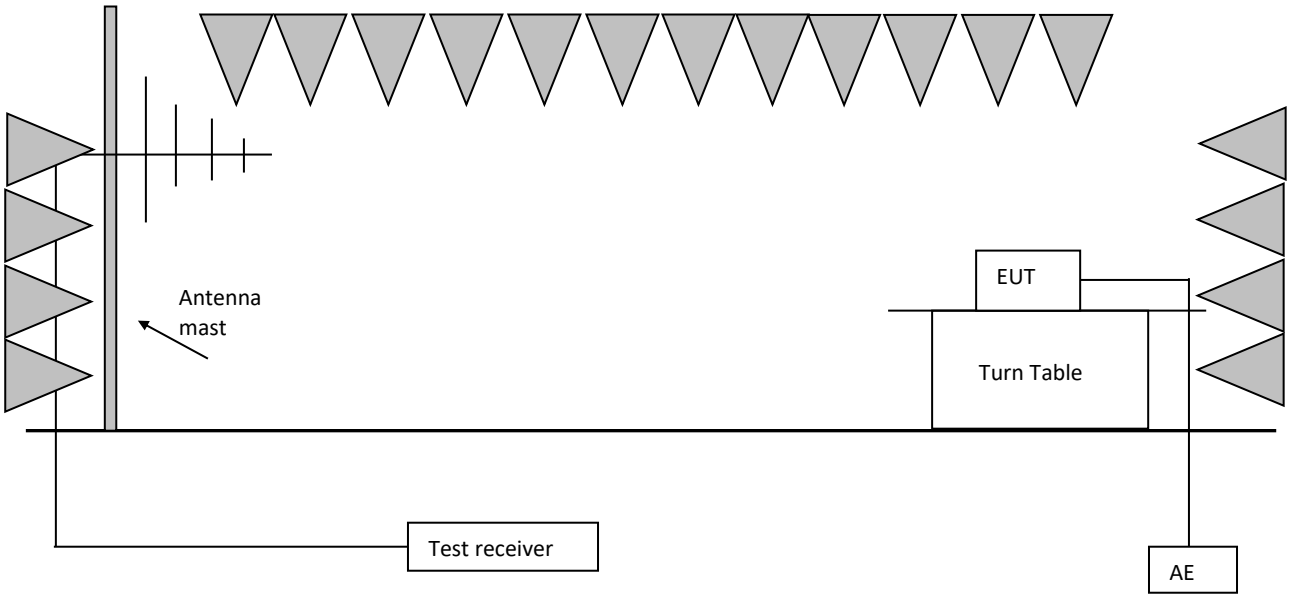
Note:
1. for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.
2. The gray rows are selected items.
3. If the internal emission source is operating at a frequency below 9kHz then measurements need only to be performed up to 230MHz.

1-6GHz:

Frequency range (GHz)	Average limit in dBuV/m Of measurement distance 3m	Peak limit in dBuV/m Of measurement distance 3m
1-3	50	70
3-6	54	74

Note:
1. for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

4.2 Block diagram of test set up



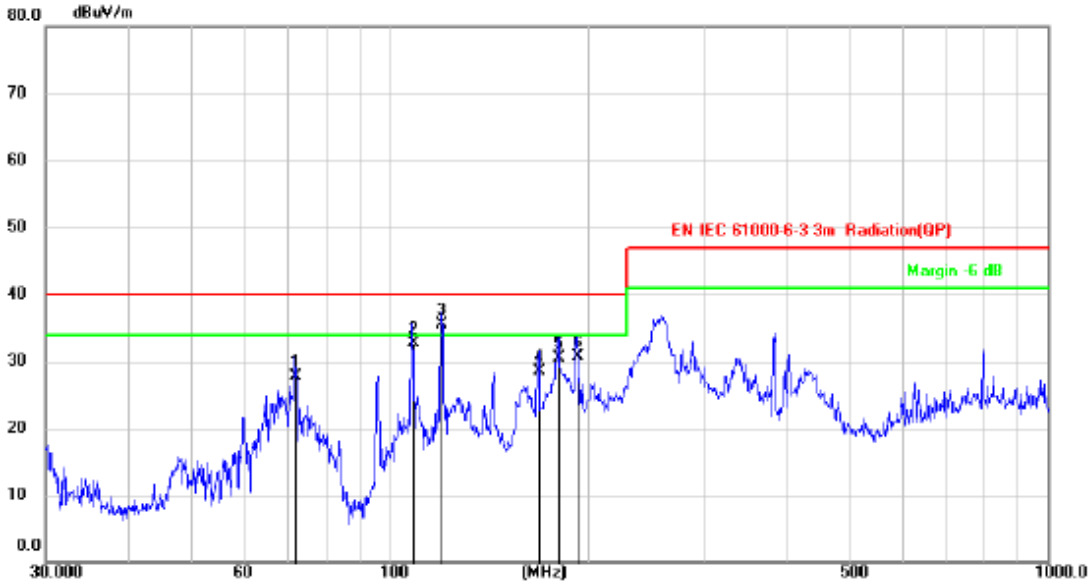
4.3 Test Procedure

The measurement was applied in a semi-anechoic chamber.
Measurement was performed according to CISPR 16-2-3.
Setting of EUT is according to CISPR 16-2-3.
The bandwidth setting on R&S Test Receiver ESI26 was 120 kHz.
The frequency range from 30MHz to 1000MHz was checked.
The bandwidth setting on R&S Test Receiver ESI26 was 1MHz.
The frequency range from 1000MHz to 6000MHz was checked.

4.4 Test Result

Charging mode
Test Curve:

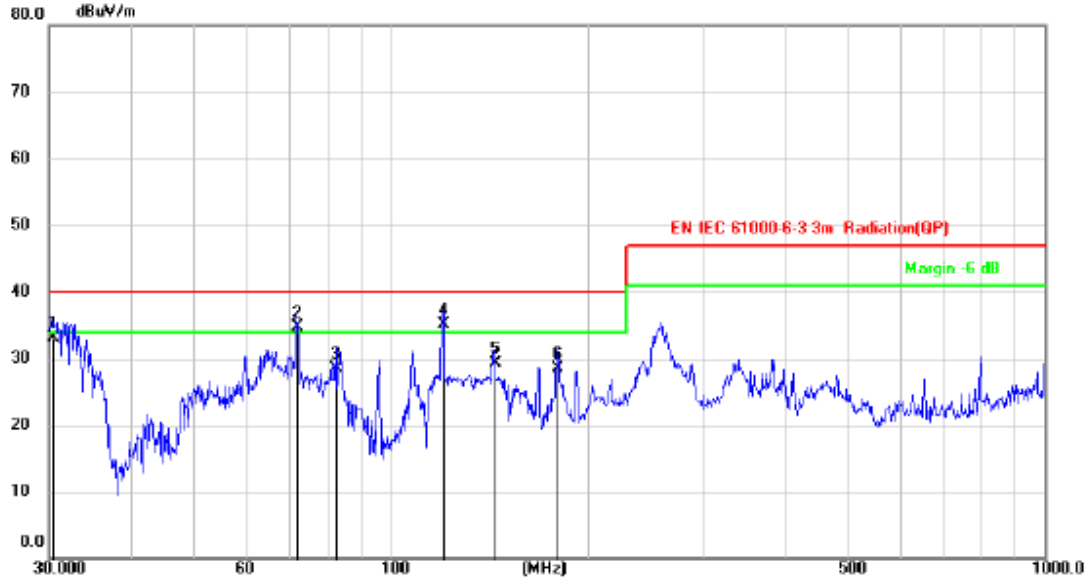
Horizontal polarization



Test Data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		71.8823	47.22	-19.49	27.73	40.00	-12.27	QP
2		108.4185	50.90	-18.26	32.64	40.00	-7.36	QP
3	*	119.7715	55.32	-19.81	35.51	40.00	-4.49	QP
4		168.5319	49.13	-20.58	28.55	40.00	-11.45	QP
5		180.4588	50.30	-19.72	30.58	40.00	-9.42	QP
6		192.6210	49.92	-19.21	30.71	40.00	-9.29	QP

Vertical polarization



Test data:

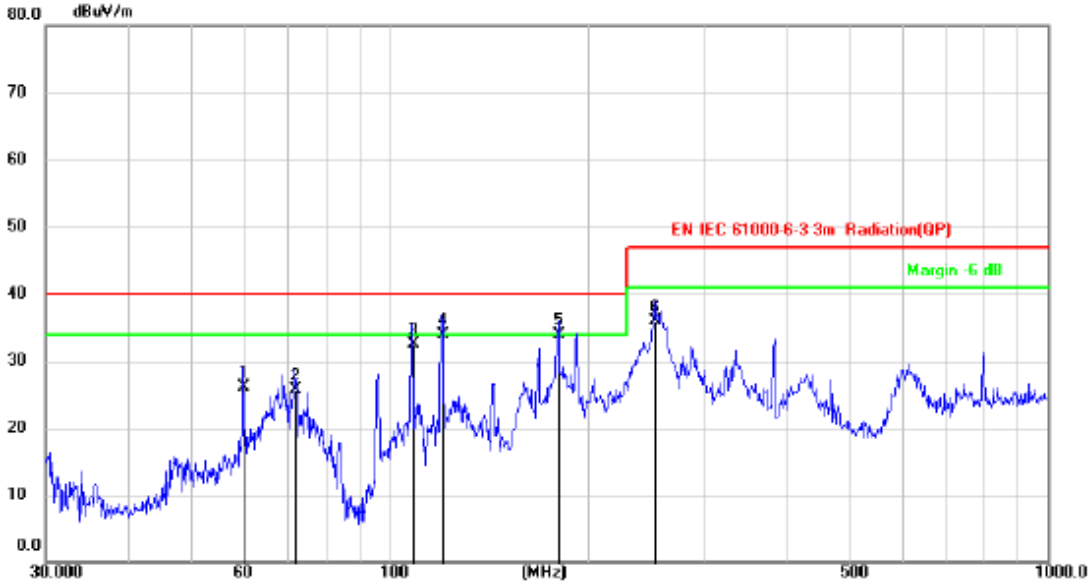
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		30.3384	51.41	-18.26	33.15	40.00	-6.85	QP
2	!	71.9579	54.13	-19.50	34.63	40.00	-5.37	QP
3		82.3588	49.26	-20.77	28.49	40.00	-11.51	QP
4	*	120.4876	54.95	-19.90	35.05	40.00	-4.95	QP
5		143.9303	50.31	-20.97	29.34	40.00	-10.66	QP
6		179.7641	48.27	-19.77	28.50	40.00	-11.50	QP

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

Discharging mode
Test Curve:

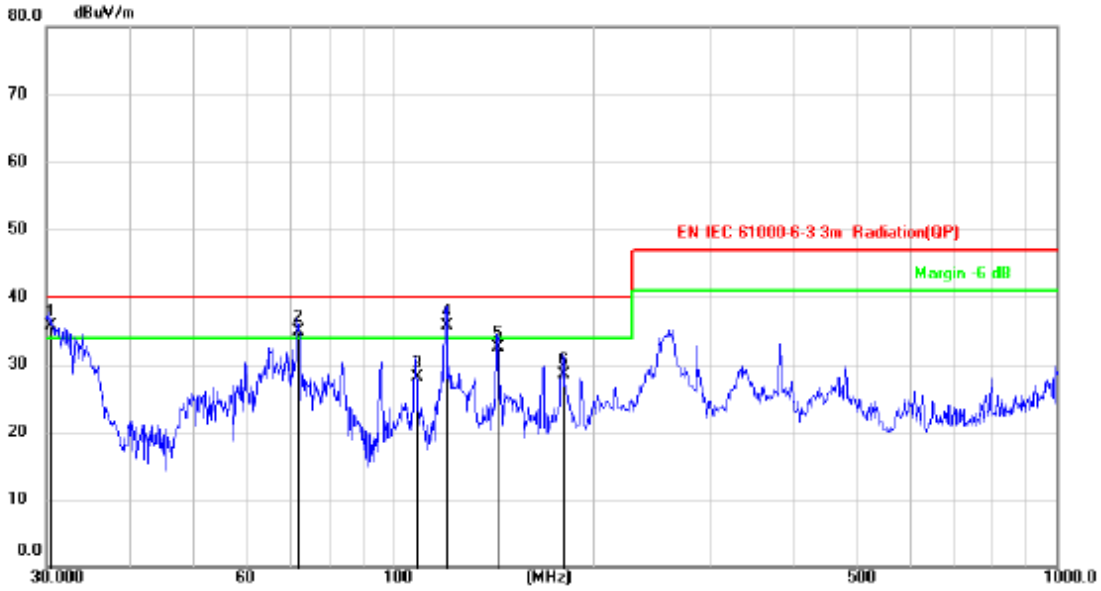
Horizontal polarization



Test Data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		59.9429	42.47	-16.43	26.04	40.00	-13.96	QP
2		71.9581	45.24	-19.50	25.74	40.00	-14.26	QP
3		108.3806	50.68	-18.26	32.42	40.00	-7.58	QP
4		119.9397	53.66	-19.83	33.83	40.00	-6.17	QP
5	*	180.7756	53.65	-19.70	33.95	40.00	-6.05	QP
6		252.9482	53.38	-17.42	35.96	47.00	-11.04	QP

Vertical polarization



Test data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	30.3598	54.00	-18.26	35.74	40.00	-4.26	QP
2	!	71.9833	54.42	-19.51	34.91	40.00	-5.09	QP
3		108.4186	46.32	-18.26	28.06	40.00	-11.94	QP
4	!	120.4032	55.51	-19.89	35.62	40.00	-4.38	QP
5		143.5272	53.51	-20.98	32.53	40.00	-7.47	QP
6		180.4589	48.14	-19.72	28.42	40.00	-11.58	QP

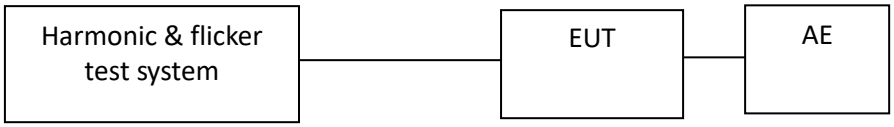
Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

5 Harmonic current emission

Test result: NA

5.1 Test Setup



5.2 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 analyzer 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

☐ This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit applies 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.

5.3 Test limit

5.3.1 Limits for equipment with input current ⩽16A per phase

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \le n \le 39$	$0{,}15\ \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \le n \le 40$	$0{,}23\ \frac{8}{n}$

5.3.2 Limits for equipment with input current ＞16A and ⩽75A per phase

☐Current emission limits for professional equipment with $I_{1max} \le 75$ A other than balanced three-phase equipment

Minimal R_{sce}	Admissible individual harmonic current I_n/I_1 [a] %						Admissible harmonic current distortion factors %	
	I_3	I_5	I_7	I_9	I_{11}	I_{13}	*THD*	*PWHD*
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥ 350	41	24	15	12	10	8	47	47
NOTE 1 The relative values of even harmonics up to order 12 must not exceed 16/n %. Even harmonics above order 12 are taken into account in *THD* and *PWHD* in the same way as odd order harmonics. NOTE 2 Linear interpolation between successive R_{sce} values are permitted.								
[a] I_1 = reference fundamental current; I_n = harmonic current component.								

☐Current emission limits for professional balanced three-phase equipment with I_{1max} ≤ 75 A

Minimal R_{sce}	Admissible individual harmonic current I_n/I_1 [a] %				Admissible harmonic current distortion factors %	
	I_5	I_7	I_{11}	I_{13}	*THD*	*PWHD*
33	10,7	7,2	3,1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥ 350	40	25	15	10	48	46
NOTE 1 The relative values of even harmonics up to order 12 must not exceed 16/n %. Even harmonics above order 12 are taken into account in *THD* and *PWHD* in the same way as odd order harmonics. NOTE 2 Linear interpolation between successive R_{sce} values are permitted.						
[a] I_1 = reference fundamental current; I_n = harmonic current component.						

☐Current emission limits for professional balanced three-phase equipment with I_{1max} ≤ 75 A under specified conditions

Minimal R_{sce}	Admissible individual harmonic current I_n/I_1 [a] %				Admissible harmonic current distortion factors %	
	I_5	I_7	I_{11}	I_{13}	*THD*	*PWHD*
33	10,7	7,2	3,1	2	13	22
≥ 120	40	25	15	10	48	46
NOTE 1 The relative values of even harmonics up to order 12 must not exceed 16/n %. Even harmonics above order 12 are taken into account in *THD* and *PWHD* in the same way as odd order harmonics. NOTE 2 Linear interpolation between successive R_{sce} values are permitted.						
[a] I_1 = reference fundamental current; I_n = harmonic current component.						

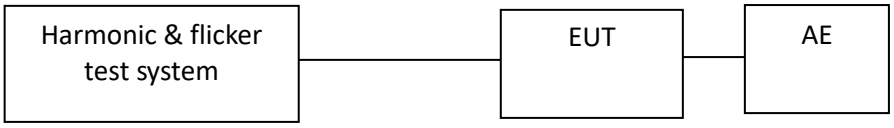
5.4 Test Result

None.

6 Voltage fluctuations and flicker

Test result: NA

6.1 Test Setup



6.2 Test Procedure

6.2.1 Definition

Flicker:	impression of unsteadiness of visual sensation induced by a lighting stimulus whose luminance or spectral distribution fluctuates with time.
Pst:	Short-term flicker indicator the flicker severity evaluated over a short period (in minutes); Pst=1 is the conventional threshold of irritability
Plt:	long-term flicker indicator; the flicker severity evaluated over a long period (a few hours) using successive Pst values.
dc:	the relative steady-state voltage change
dmax:	the maximum relative voltage change
d(t):	the value during a voltage change

6.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes according to Clause A.15 of IEC61000-3-3: 2013.

6.2.3 Test protocol

The tested object operated under the operating condition specified in IEC 61000-3-3: 1994+A1:2001
The following limits apply

-- “Plt” shall not exceed 0.65.
-- “Pst” shall not exceed 1.0.
-- “dc” shall not exceed 3.3%.
-- “dmax” shall not exceed 4/6/7%*
-- “d(t)” shall not exceed 3.3% for more than 500ms.
Notes:
* means for 4% limit, without additional conditions
6% limit, switched manually or automatically more than twice per day
7% limit, switched automatically for no more than twice per day or attended while in use.

6.3 Test Result

None

Immunity Test

Performance criteria

Criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but 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, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion C: Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.

7 Electrostatic Discharge (ESD)

Test result **PASS**

7.1 Severity Level and Performance Criterion

7.1.1 Test level

Contact discharge		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

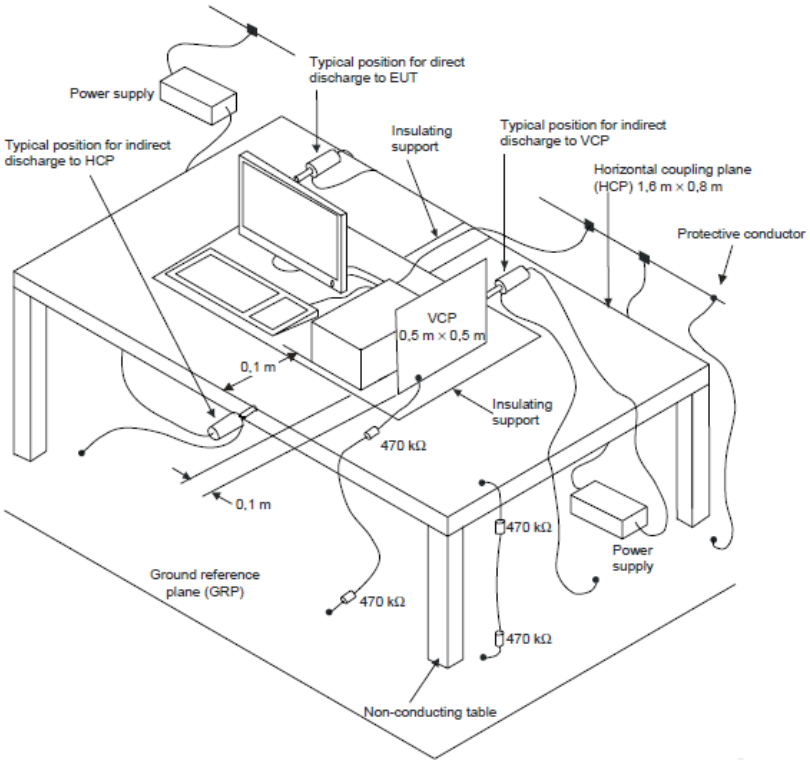
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.
2. The gray rows were the selected test level.

7.1.2 Performance Criterion

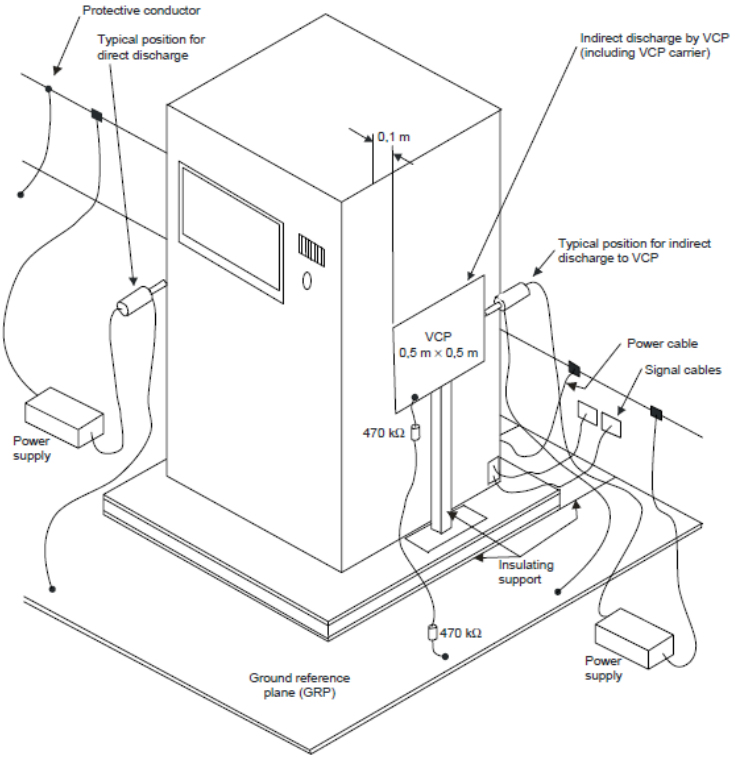
Criterion B

7.2 Test Setup

For table-top equipment



For floor standing equipment



7.3 Test Procedure

Measurement was performed in shielded room.
Measurement procedure was applied according to EN 61000-4-2 clause 8.
The test method and equipment was specified by EN 61000-4-2.

7.4 Test Result

Direct discharges were applied at the following selected points:

Test level [kV]	Air/ Contact	Polarity (+/-)	Pass/Fail/NA	Comment
2/4	Contact	+/-	Pass	Accessible metal parts of the EUT
2/4	Contact	+/-	Pass	All touchable screws of enclosure
2/4/8	Air	+/-	Pass	Air gap of the switch, button
2/4/8	Air	+/-	Pass	Slots around the EUT

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

For table-top equipment

Position	Description	Point	Pass/Fail/NA
HCP front	0,1m from the front of the EUT	Edge of centre on HCP	Pass
HCP back	0,1m from the back of the EUT	Edge of centre on HCP	Pass
HCP right	0,1m from the right side of the EUT	Edge of centre on HCP	Pass
HCP left	0,1m from the left side of the EUT	Edge of centre on HCP	Pass
VCP front	0,1m from the front of the EUT	Edge of centre on VCP	Pass
VCP back	0,1m from the back of the EUT	Edge of centre on VCP	Pass
VCP right	0,1m from the right of the EUT	Edge of centre on VCP	Pass
VCP left	0,1m from the left of the EUT	Edge of centre on VCP	Pass

For floor standing equipment

Position	Description	Point	Pass/Fail/NA
CP front	0,1m from the front of the EUT	Edge of centre on VCP	NA
CP back	0,1m from the back of the EUT	Edge of centre on VCP	NA
CP right	0,1m from the right of the EUT	Edge of centre on VCP	NA
CP left	0,1m from the left of the EUT	Edge of centre on VCP	NA

Observation: All the functions were operated as normal after the test.
Conclusion: The EUT can meet the requirement of Performance Criterion B.

8 Radio frequency electromagnetic field

Test result **PASS**

8.1 Severity Level and Performance Criterion

8.1.1 Test level

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

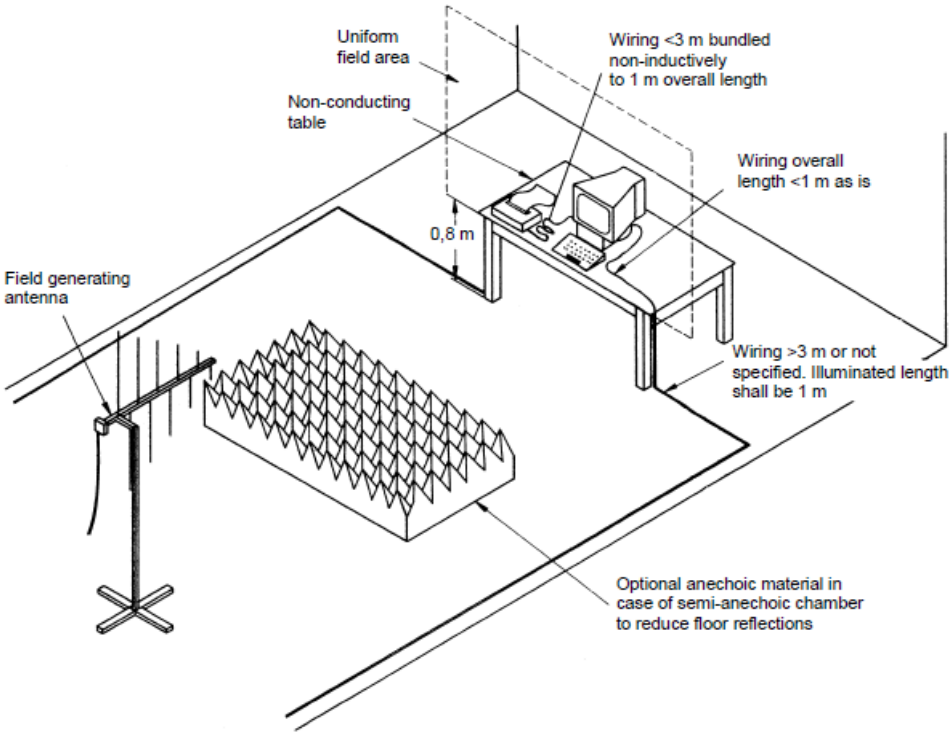
Note: 1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

8.1.2 Performance Criterion

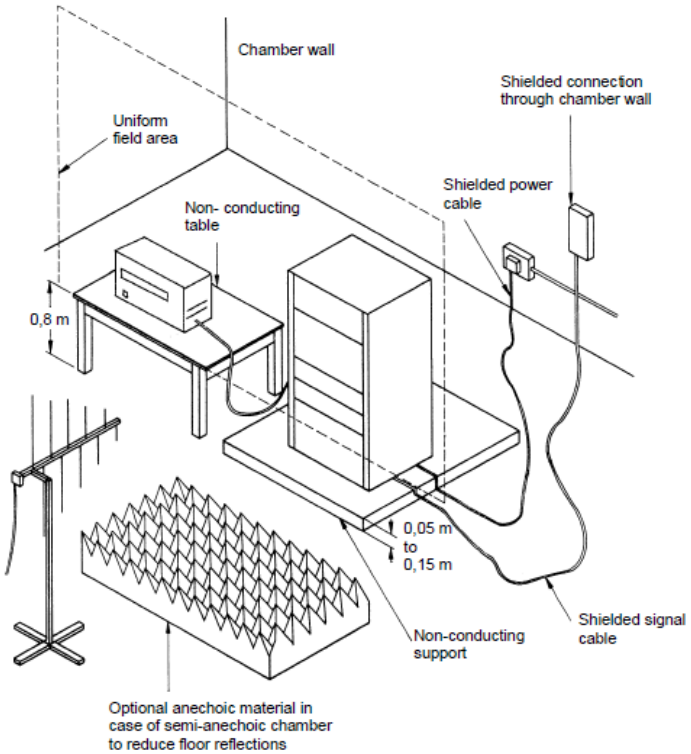
Criterion A

8.2 Test Setup

For table-top equipment



For floor standing equipment



8.3 Test Procedure

Measurement was performed in full-anechoic chamber.
Measurement procedure was applied according to EN 61000-4-3 clause 8.
The test method and equipment was specified by EN 61000-4-3.

8.4 Test Result

Test no.	Frequency (MHz)	Polarization	Test level (V/m)	Modulation	Exposed location	Pass/Fail/NA
1	80-1000	H & V	3/10	1 kHz, 80% AM 1 % increment	All sides	Pass
2	1400-6000	H & V	3	1 kHz, 80% AM 1 % increment	All sides	Pass

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT can meet the requirement of Performance Criterion A

9 Fast transients, common mode

Test result **NA**

9.1 Severity Level and Performance Criterion

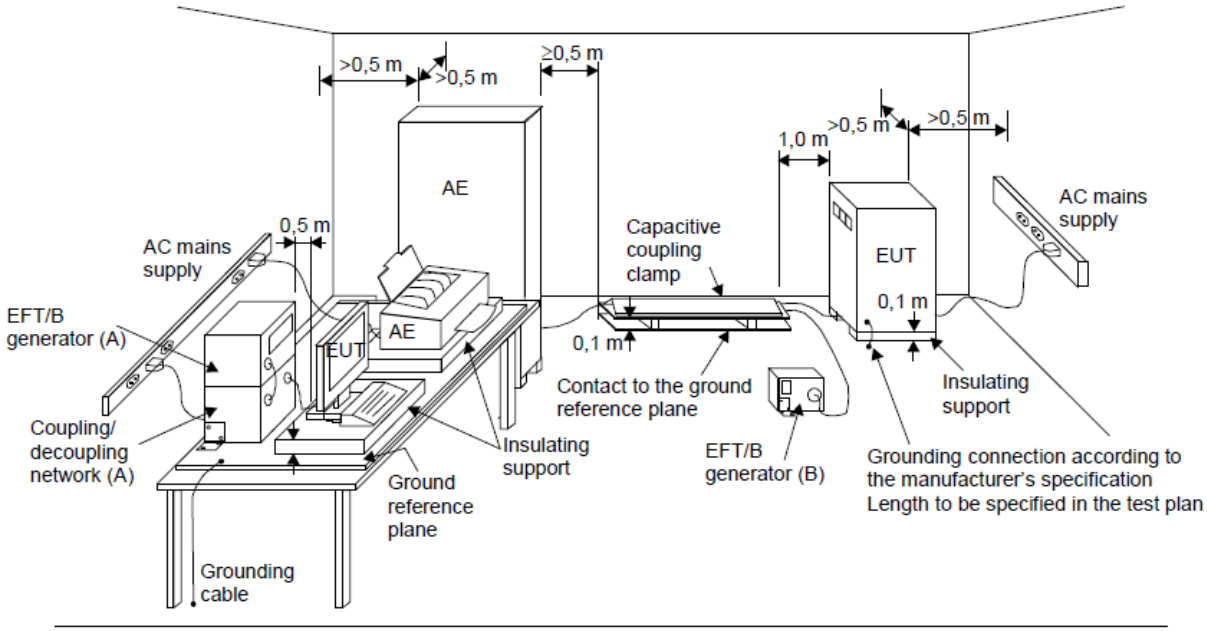
9.1.1 Test level

Open circuit output test voltage and repetition rate of the impulses				
Level	AC mains power input ports		Signal ports, DC power 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	2.5	2	5
X	Special	Special	Special	Special
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification. 2. The gray rows were the selected test level.				

9.1.2 Performance Criterion

Criterion B

9.2 Test Setup



(A) location for supply line coupling

(B) location for signal lines coupling

9.3 Test Procedure

Measurement was performed in shielded room.
Measurement procedure was applied according to EN 61000-4-4 clause 8.
The test method and equipment was specified by EN 61000-4-4.

9.4 Test Result

Test No.	Level (kV)	Polarity (+/-)	Line for test	Pass/Fail/NA
1	1/2	+/-	AC power ports	NA
2	0.5/1	+/-	Signal ports	NA
3	0.5/1	+/-	DC power ports	NA

Observation: -
Conclusion: -

10 Surges

Test result **NA**

10.1 Severity Level and Performance Criterion

10.1.1 Test level

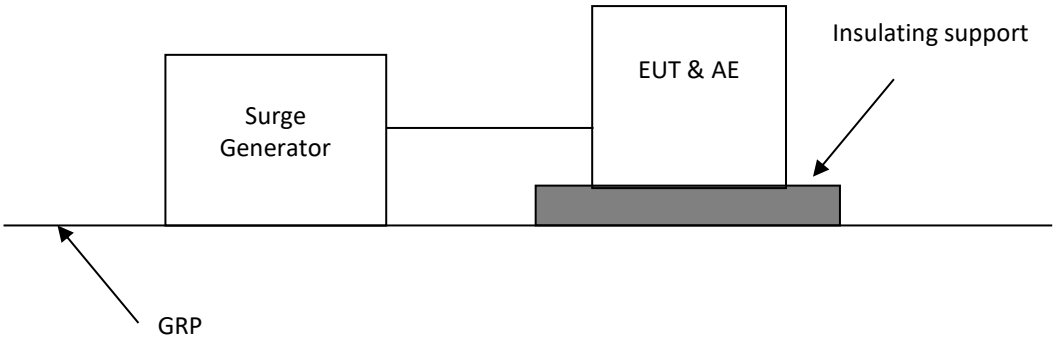
Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

Notes: 1."X" is an open class. This level can be specified in the product specification
2. The gray rows are the selected level.

10.1.2 Performance Criterion

Criterion B

10.2 Test Setup



10.3 Test Procedure

Measurement was performed in shielded room.
Measurement procedure was applied according to EN 61000-4-5 clause 8.
The test method and equipment was specified by EN 61000-4-5.

10.4 Test Result

Test No.	Level [kV]	Polarity +/-	Line for test	Pass/Fail/NA
1	0.5/1	+/-	AC mains power input port (line to line)	NA
2	0.5/1/2	+/-	AC mains power input port (line to earth)	NA
3	0.5/1	+/-	DC power ports	NA

Observation: -
Conclusion: -

11 Radio frequency, common mode

Test result **NA**

11.1 Severity Level and Performance Criterion

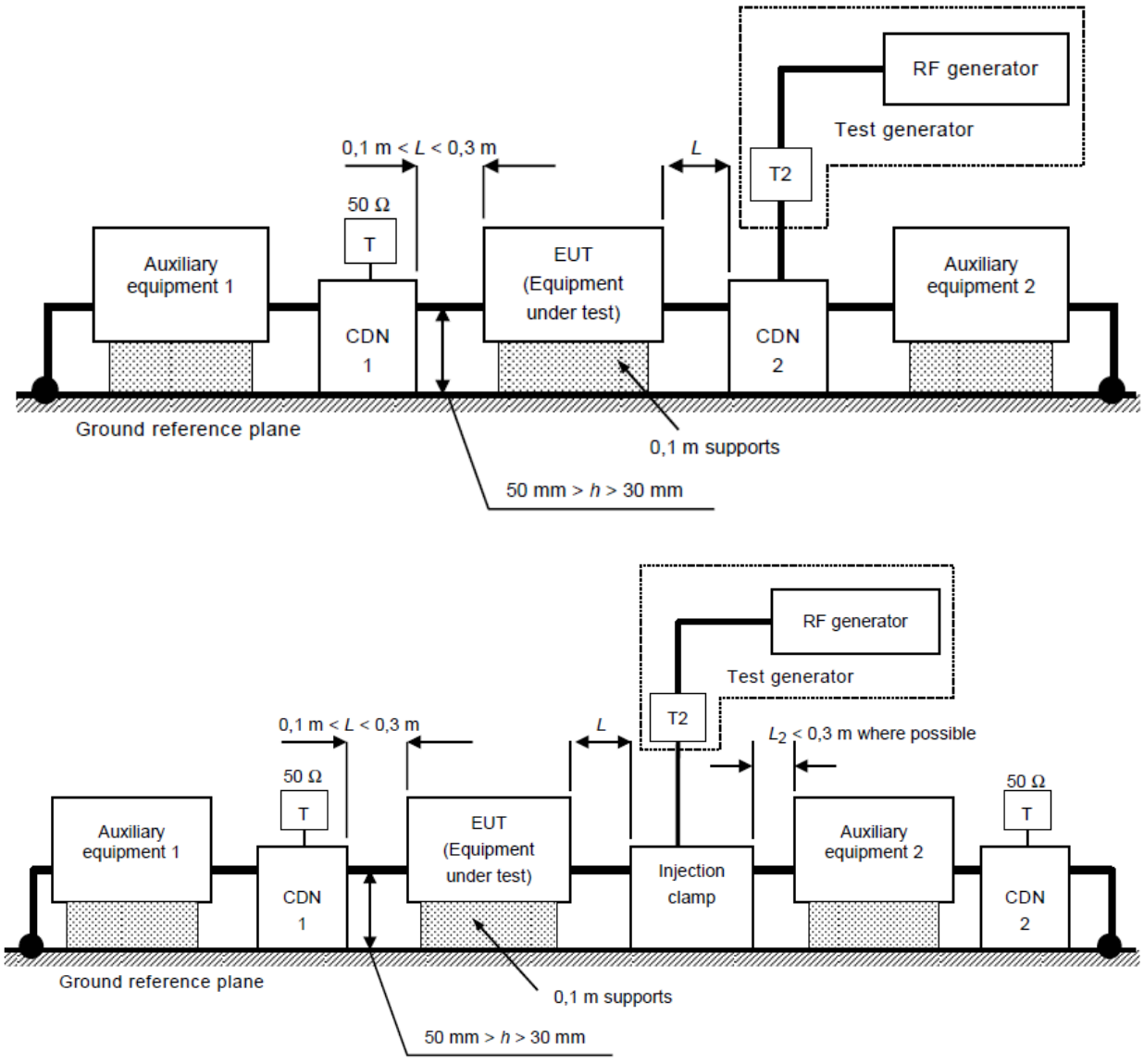
11.1.1 Test level

Frequency range 150kHz – 80MHz		
Level	Voltage level U0 (dBuV)	U0 (V)
1	120	1
2	130	3
3	140	10
X	Special	Special
Notes: 1. "X" is an open level 2. The gray row is the selected test level.		

11.1.2 Performance Criterion

Criterion A

11.2 Block Diagram of Test Setup



T	termination 50 Ω
T2	power attenuator (6 dB)
CDN	coupling and decoupling network

11.3 Test Procedure

Measurement procedure was applied according to EN 61000-4-6 clause 8.
The test method and equipment was specified by EN 61000-4-6.

11.4 Test Result

Test No.	Frequency (MHz)	Level (V)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3/10	80%, 1 kHz, AM	AC power port	NA
2	0.15~80	3/10	80%, 1 kHz, AM	signal ports	NA
3	0.15~80	3/10	80%, 1 kHz, AM	DC power ports	NA

Observation: -
Conclusion: -

12 Voltage dips

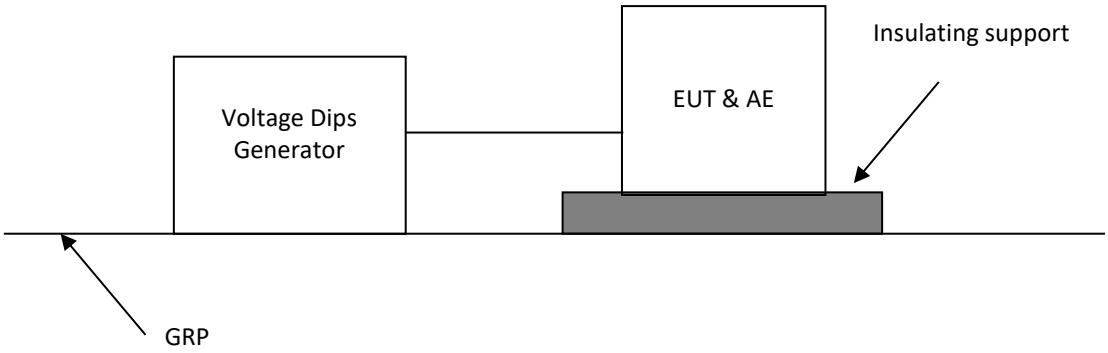
Test result **NA**

12.1 Severity Level and Performance Criterion

12.1.1 Test level

Test level Reduction (%)	Voltage level in % of rated Ut	Duration (cycles)	Performance criterion
100	0	0.5	B
		1	B
		250 (at 50Hz) 300 (at 60Hz)	C
30	70	25 (at 50Hz) 30 (at 60Hz)	C
Notes: The gray rows are selected test level.			

12.2 Test Setup



12.3 Test Procedure

Measurement was performed in shielded room.
Measurement procedure was applied according to EN 61000-4-11 clause 8.
The test method and equipment was specified by EN 61000-4-11.

12.4 Test Result

Test no.	Test level % U_T	Voltage dip and short interruptions % U_T	Duration (in periods)	Pass/ Fail	Comment
1	70	30%	25 cycles at 50Hz	NA	-
			30 cycles at 60Hz	NA	-
2	0	100%	0.5 cycle	NA	-
3	0	100%	1 cycle	NA	-
4	0	100%	250 cycles at 50Hz	NA	-
			300 cycles at 60Hz	NA	-
Note: "NA" means not applicable.					

Observation: -
Conclusion: -

13 Power Frequency Magnetic field

Test result: **Pass**

13.1 Severity Level and Performance Criterion

13.1.1 Test level

Level	Magnetic field strength A/m
1	1
2	3
3	10
4	30
5	100
X	Special

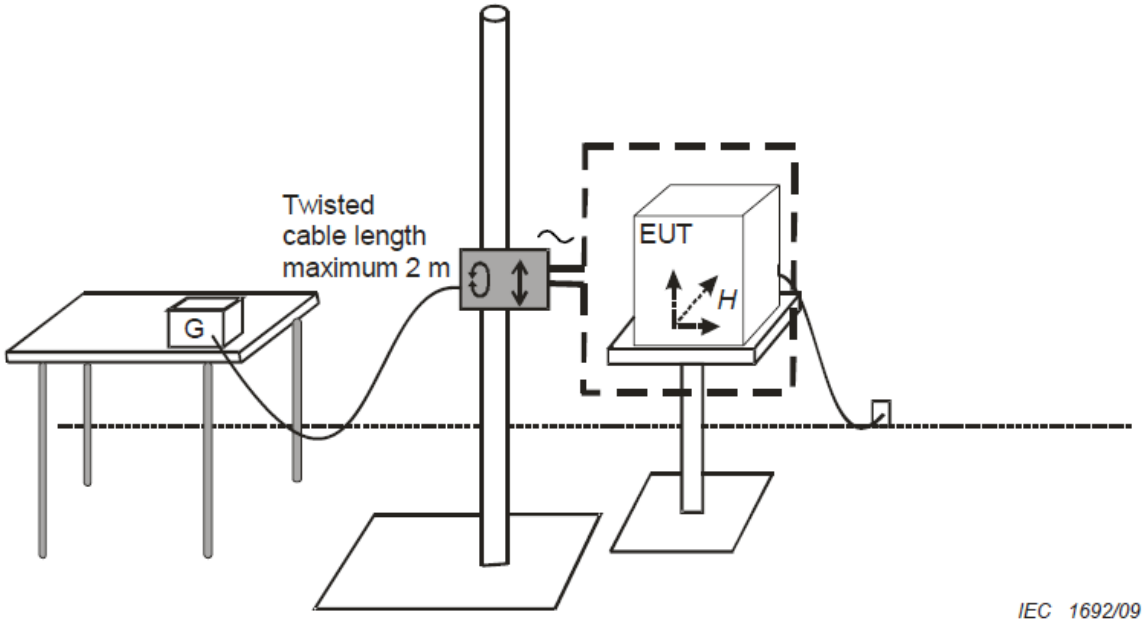
Note: 1. X is an open test level; this level may be given in the product specification.
2. The gray row is the selected test level.

13.1.2 Performance Criterion

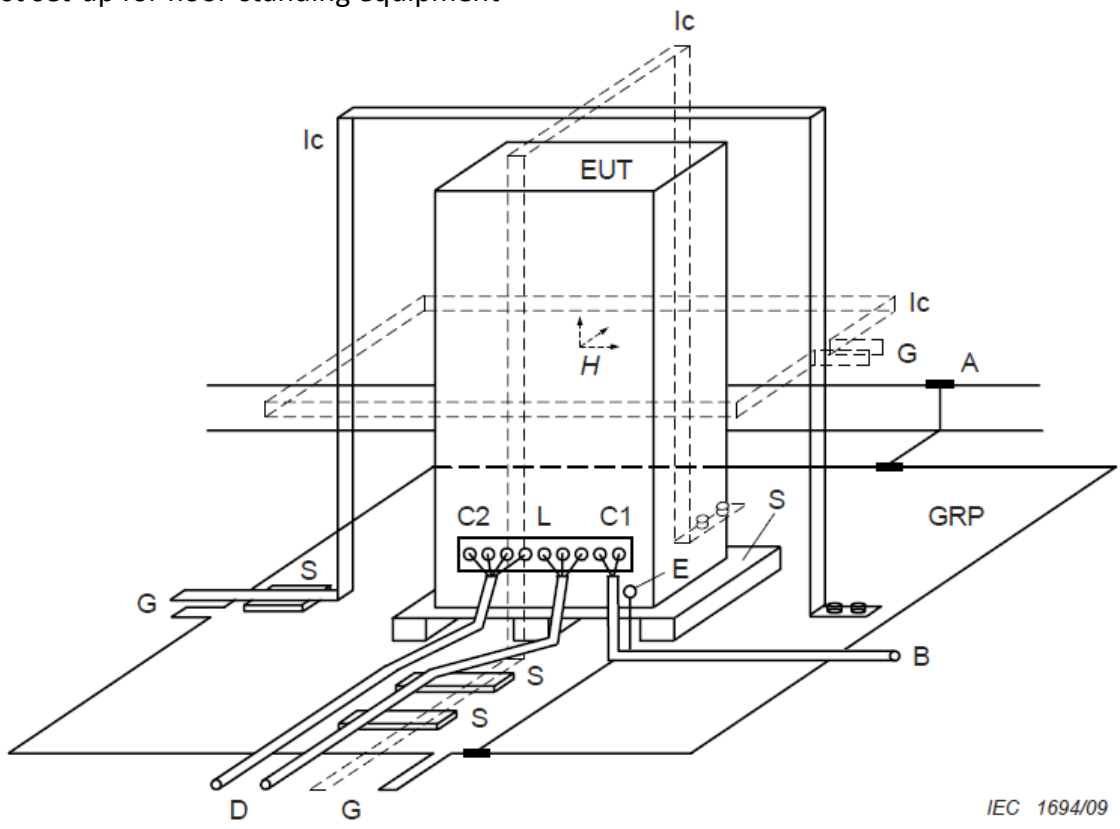
Performance criterion A

13.2 Diagram of Test Setup

Test set-up for table-top equipment



Test set-up for floor-standing equipment



13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to clause 7 of IEC 61000-4-8.
The test method and equipment was specified by IEC 61000-4-8 with the modifications by clause 8 of EN 61000-6-1.

13.4 Test Protocol

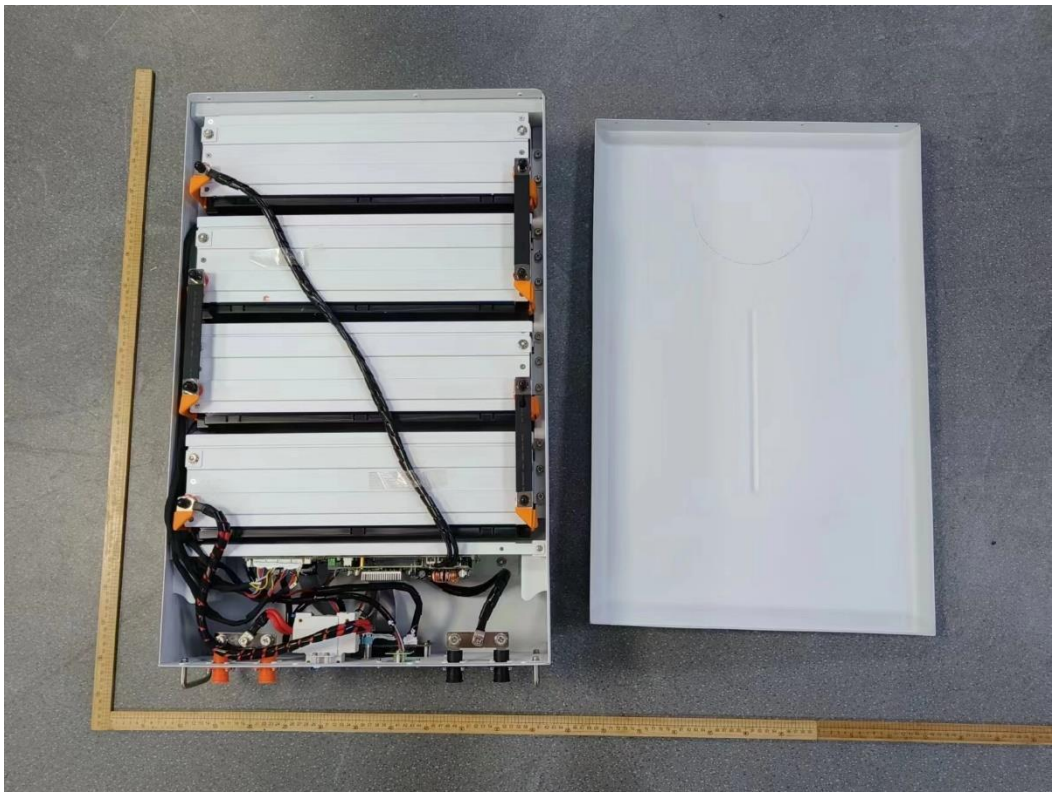
Test No.	Level A/m	Axis	Result
1	3/30	X	Pass
2	3/30	Y	Pass
3	3/30	Z	Pass

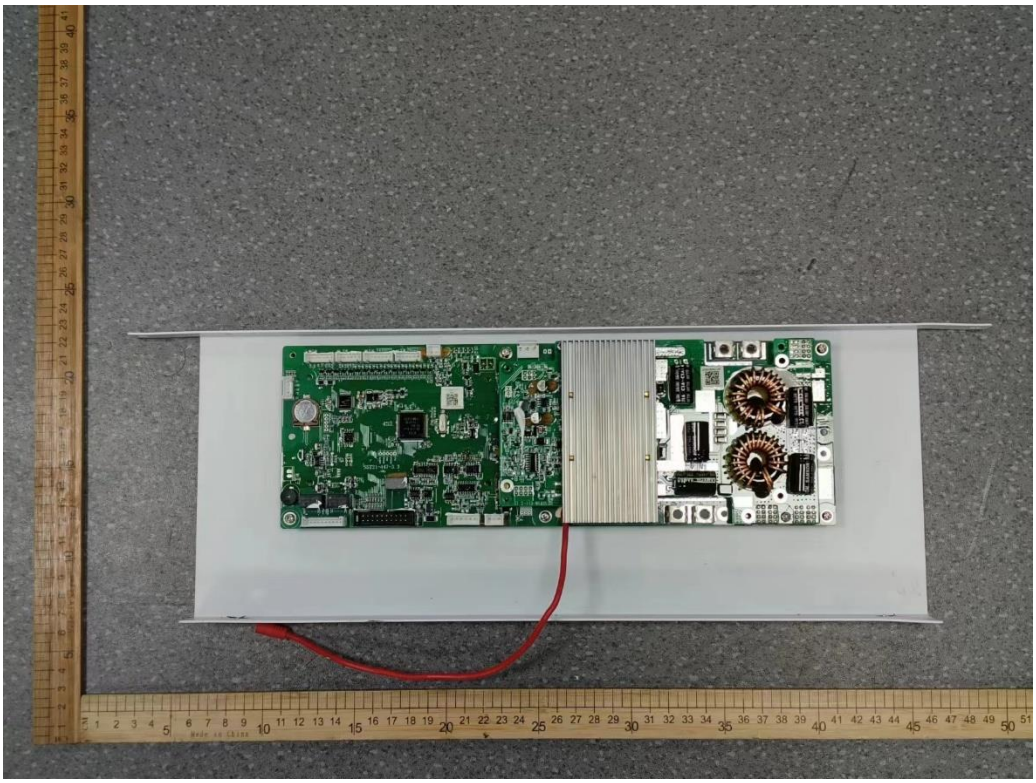
Observation: -
Conclusion: -

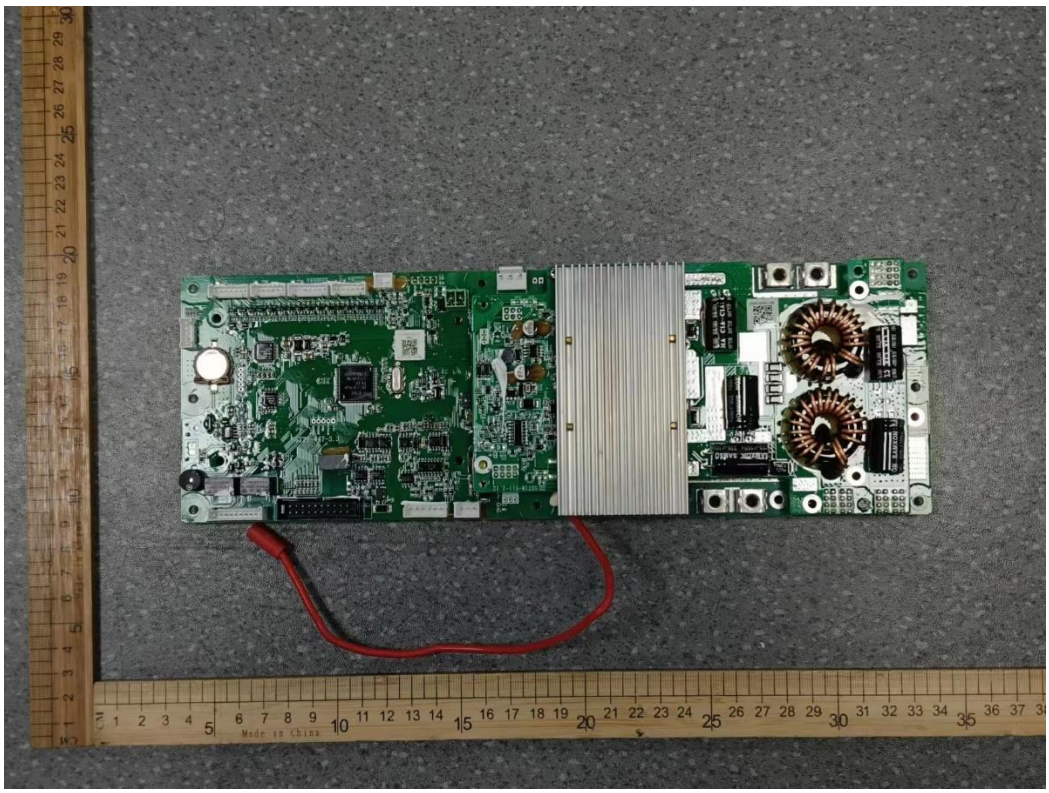
Appendix II: Photograph of equipment under test

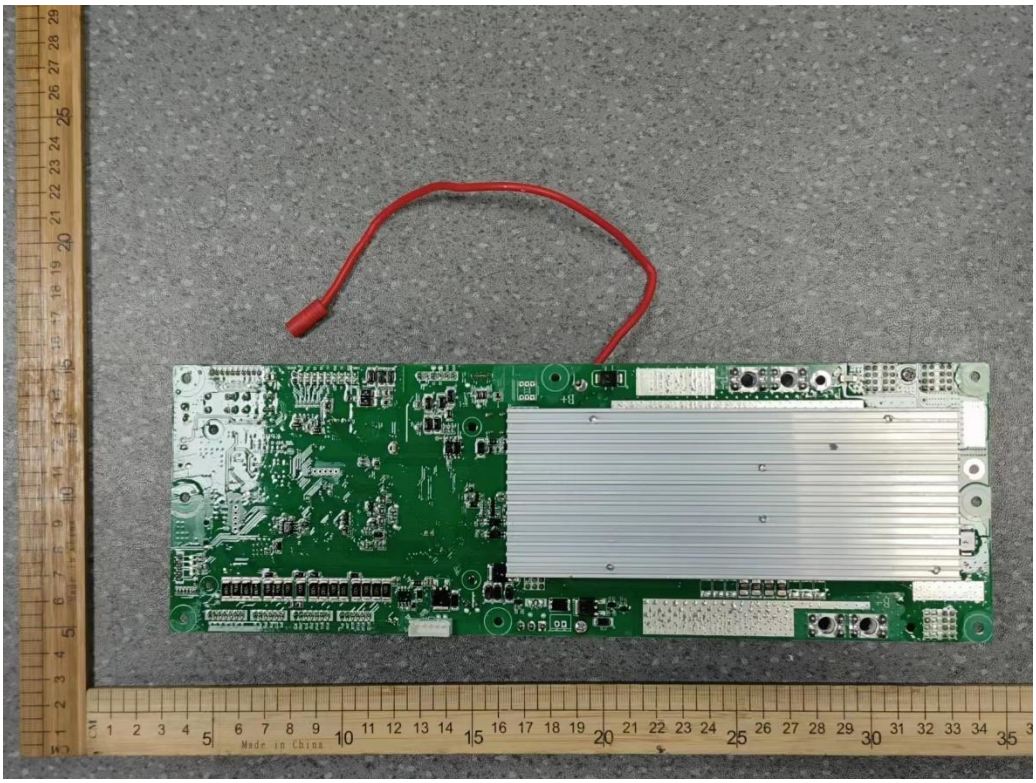

UFO POWER

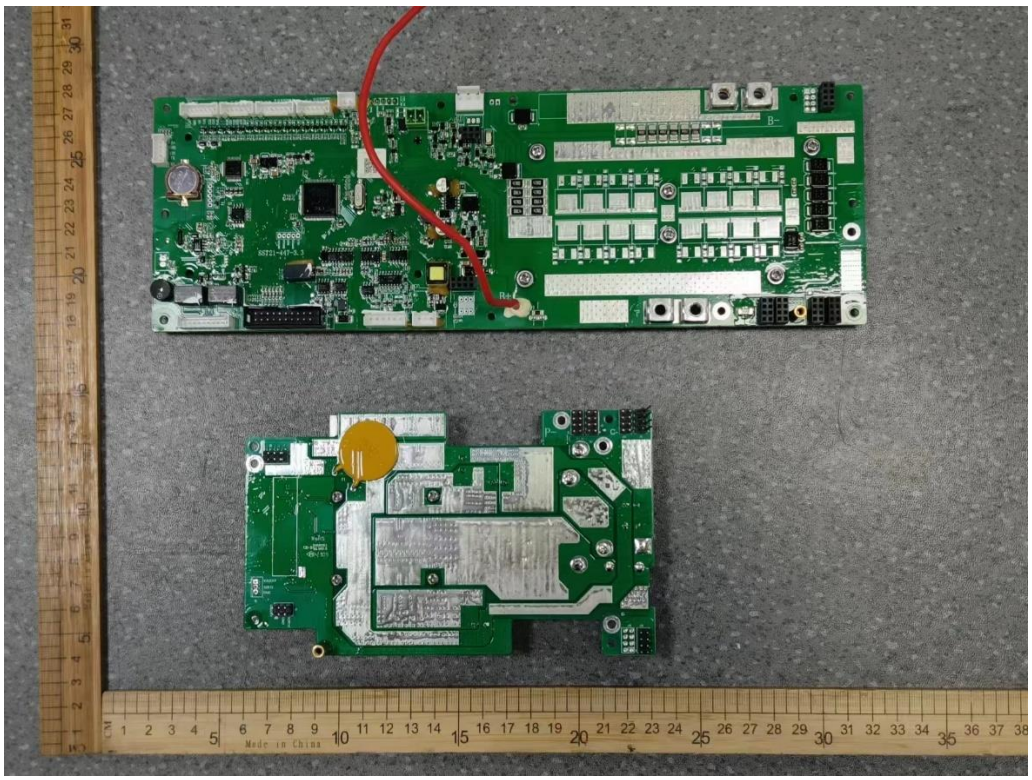

Capacity
ALM RUN
ON/OFF
RS485
RS232
CAN
RS485
DO
ADS
RST
ESI
BMS Switch

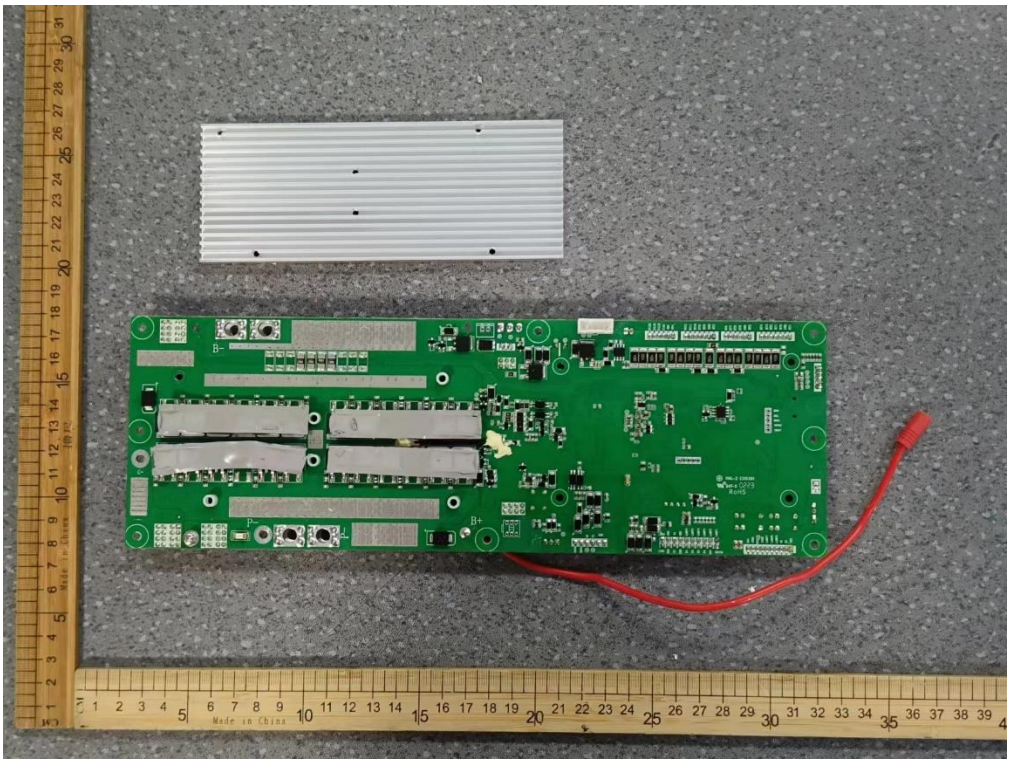


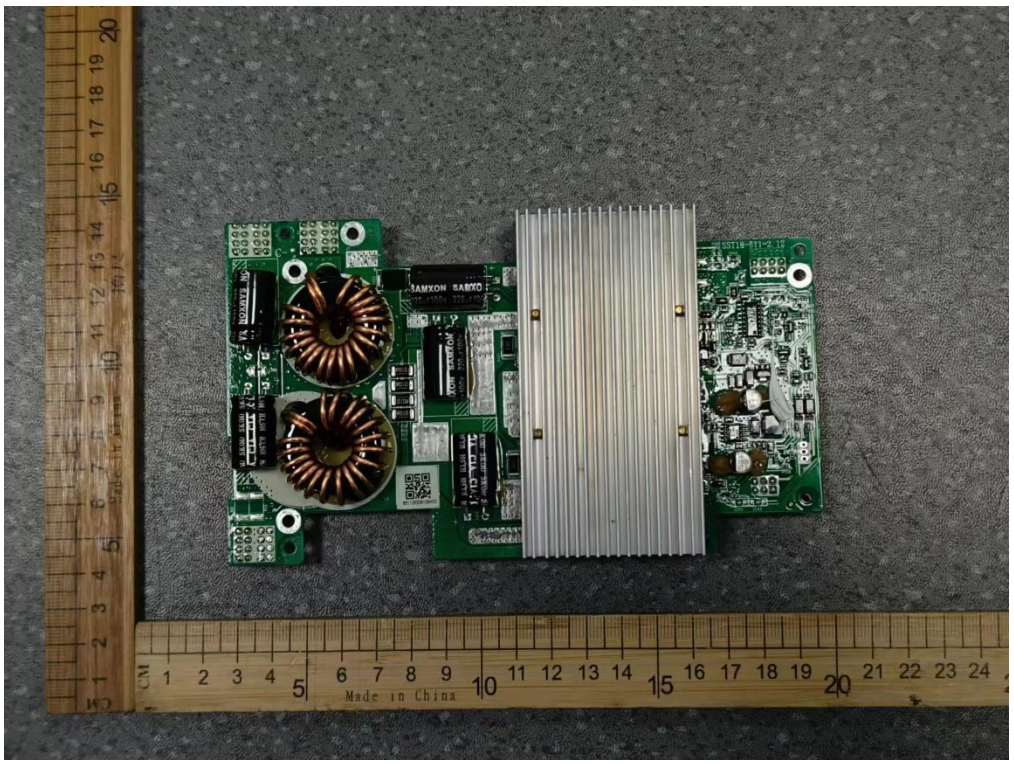


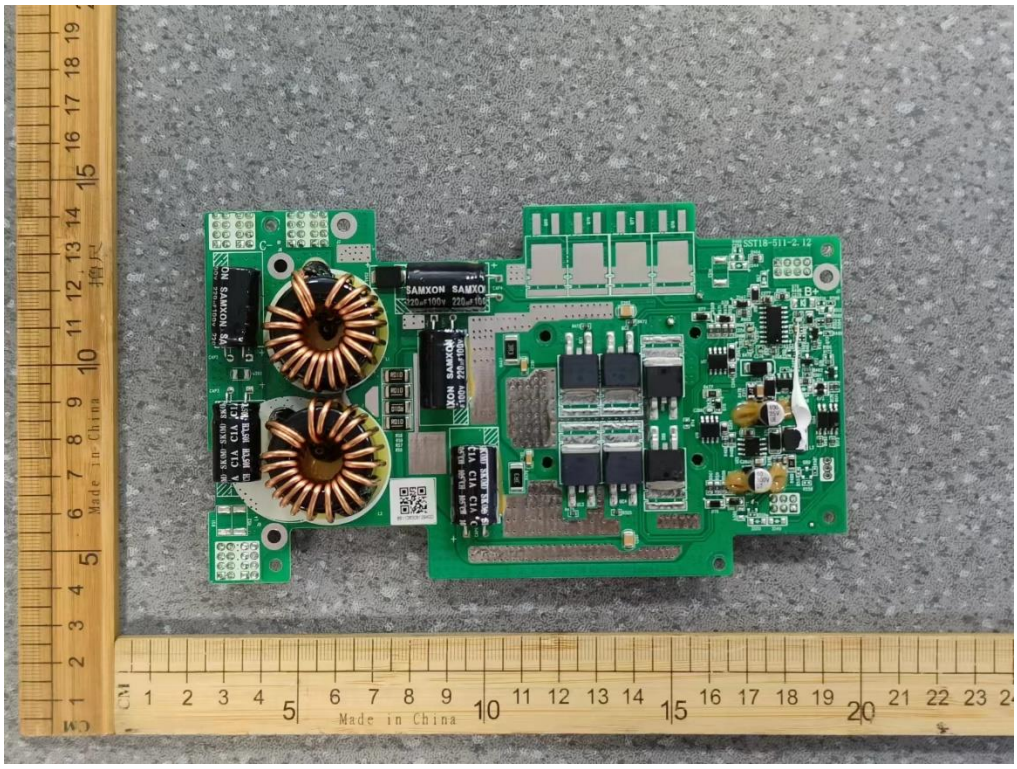












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