

# EMC Test Report

Client Name : EcoFlow Inc.  
Address : Plant A202, Founder Technology Industrial Park, Shiyan  
Sub-district, Bao'an District Shenzhen, Guangdong  
518000 China  
Product Name : Portable Power Station  
Date : Jun. 28, 2022



**Shenzhen Anbotech Compliance Laboratory Limited**

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## TEST REPORT

Applicant : EcoFlow Inc.  
Manufacturer : EcoFlow Inc.  
Product Name : Portable Power Station  
Model No. : EFD330-EB  
Trade Mark : ECOFLOW  
Rating(s) : Capacity: 1024Wh, 51.2V  
Extra Battery Port Input: 51.2V==Max 1024W  
Extra Battery Port Output: 51.2V==Max 2048W

Test Standard(s) : **EN 55032: 2015+A11: 2020;**  
**EN IEC 61000-3-2:2019+A1:2021;**  
**EN 61000-3-3:2013+A2:2021;**  
**EN 55035: 2017+A11:2020;**  
**(IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4;**  
**IEC 61000-4-5; IEC 61000-4-6; IEC 61000-4-11)**

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 55032, EN IEC 61000-3-2, EN 61000-3-3, EN 55035 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Receipt: Jun. 08, 2022

Date of Test: Jun. 08~Jun. 24, 2022

Prepared By:

*Yee Huang*

(Yee Huang)

Approved & Authorized Signer:

*KingKong Jin*

(KingKong Jin)



## 1. General Information

### 1.1. Client Information

Applicant	:	EcoFlow Inc.
Address	:	Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao' an District Shenzhen, Guangdong 518000 China
Manufacturer	:	EcoFlow Inc.
Address	:	Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao' an District Shenzhen, Guangdong 518000 China

### 1.2. Description of Device (EUT)

Product Name	:	Portable Power Station
Model No.	:	EFD330-EB
Trade Mark	:	ECOFLOW
Test Power Supply	:	AC 230V, 50Hz / DC 51.2V
Test Sample No.	:	1-1-1
Product Description	:	N/A
<b>Remark:</b> (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

### 1.3. Auxiliary Equipment Used During Test

N.A	:	
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## 1.4. Description of Test Modes

Pretest Modes	Descriptions
Mode 1	Charging
Mode 2	Discharging

For Mode 1 Block Diagram of Test Setup



For Mode 2 Block Diagram of Test Setup



## 1.5. Test Summary

Test Items	Test Modes	Status
Power Line Conducted Emission Test (150KHz To 30MHz)	Mode 1	P
Radiated Emission Test (30MHz To 1000MHz)	All Mode	P
Harmonic Current Test	Mode 1	P
Voltage Fluctuations and Flicker Test	Mode 1	P
Electrostatic Discharge immunity Test	All Mode	P
RF Field Strength susceptibility Test	All Mode	P
Electrical Fast Transient/Burst Immunity Test	Mode 1	P
Surge Immunity Test	Mode 1	P
Injected Currents Susceptibility Test	Mode 1	P
Magnetic Field Susceptibility Test	/	N
Voltage Dips and Interruptions Test	Mode 1	P
P) Indicates "PASS". N) Indicates "Not applicable".		



**1.6. Test Equipment List****Conducted Emission Measurement**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Oct. 22, 2021	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040D T001	Jul. 05, 2021	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2021	1 Year
5.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

**Radiated Emission Measurement**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
2.	Pre-amplifier	Schwarzbeck	BBV-9745	9745-075	Oct. 22, 2021	1 Year
3.	Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	01109	Oct. 22, 2021	2 Year
4.	Software Name EZ-EMC	Ferrari Technology	EMEC-3A1	N/A	N/A	N/A

**Harmonic and Flicker Measurement**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Programmable AC Power source	IVYTECH	APS-5005A	632734	Oct. 22, 2021	1 Year
2.	Harmonic and Flicker Analyzer	EMC-PARTNER	HMONICS 1000-1P	164	Oct. 22, 2021	1 Year
3.	Harmonics-1000	N/A	Ed.3.0+4.0	N.A	N/A	N/A

**Electrostatic Discharge Measurement**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	emtest	ESD NX30.1	11936	Mar. 25, 2022	1 Year

## Electrical Fast Transient/Burst Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Generator	TESEQ	NSG 3060	1480	Oct. 22, 2021	1 Year
2.	CDN	TESEQ	CDN 3061	1408	Oct. 22, 2021	1 Year
3.	EFT-Clamp	PRIMA	EFT-Clamp	/	Oct. 22, 2021	1 Year

## R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	Agilent	N5182A	MY4818065 6	Oct. 22, 2021	1 Year
2.	Amplifier	Micotoop	MPA-80-100 0-250	MPA190309 6	Oct. 22, 2021	1 Year
3.	Amplifier	Micotoop	MPA-1000-6 000-100	MPA190312 2	Oct. 22, 2021	1 Year
4.	Log-Periodic Antenna	Schwarzbeck	VULP9118E	00992	N/A	N/A
5.	Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
6.	Power Sensor	Agilent	E9301A	MY4149890 6	Oct. 22, 2021	1 Year
7.	Power Sensor	Agilent	E9301A	MY4149808 8	Oct. 22, 2021	1 Year
8.	Power Meter	Agilent	E4419B	GB4020290 9	Oct. 22, 2021	1 Year
9.	Electric field Probe	Narda	EP 601	811ZX10351	Oct. 22, 2021	1 Year
10.	RS Test software	EMtrace	EM 3	V1.1.7	N/A	N/A

## Surge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Combined Wave Lightning Surge Simulator	3Ctest	CCS600	ES3771702	Jul. 05, 2021	1 Year
2.	Three Phase Power Coupling Network	3Ctest	SEPN69100 T	ES0801757	Jul. 05, 2021	1 Year
3.	Telecom port surge generator	PMI	TW101	190411	May 13, 2022	1 Year





## Injected Currents Susceptibility Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	C/S Conducted Immunity Test System	FRANKONIA	CIT-10	126A1196/2012	Oct. 22, 2021	1 Year
2.	CDN	FRANKONIA	CDN - M2+ M3	A2210178/2012	Oct. 22, 2021	1 Year
3.	6dB Attenuator	FRANKONIA	DAM 26W	1172202	Oct. 22, 2021	1 Year
4.	CIT-10	FRANKONIA	Version1.1.7	N/A	N/A	N/A
5.	EM-Clamp	FRANKONIA	EMCL-20	18101728-0103	May 17,2022	1 Year

## Voltage Dips and Interruptions Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	CYCLE SAG Simulator	PRIMA	DRP61011A G	PR12046234	Oct. 22, 2021	1 Year

**1.7. Description of Test Facility**

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

**FCC-Registration No.: 184111**

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

**ISED-Registration No.: 8058A**

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

**Test Location**

Shenzhen Anbotech Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518128



**1.8. EMS Performance Criteria**

- ✓ A: Normal performance within the specification limits
- ✓ B: Temporary degradation or loss of function or performance which is self-recoverable
- ✓ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
- ✓ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.



## 2. Power Line Conducted Emission Test

### 2.1. Test Standard and Limit

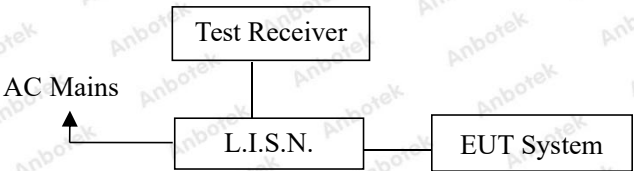
Test Standard	EN 55032
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Limits for conducted emissions

Test Limit	Frequency (MHz)	At mains terminals (dBμV)	
		Quasi-peak Level	Average Level
	0.15 ~ 0.50	79 *	66 *
	0.50 ~ 30.00	73	60

**Remark:** (1) The lower limit shall apply at the transition frequencies.  
(2) The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

### 2.2. Test Setup



### 2.3. EUT Configuration on Measurement

The following equipments are installed on conducted emission measurement to meet EN 55032 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 2.4. Operating Condition of EUT

- 2.4.1. Setup the EUT as shown in Section 2.2.
- 2.4.2. Turn on the power of all equipments.
- 2.4.3. Let the EUT work in test mode and measure it.



## 2.5. Test Procedure

The EUT is put on the plane 0.8 m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network(L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the EN55032 regulations during conducted emission measurement.

The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 9kHz in 150kHz~30MHz.

The frequency range from 150kHz to 30MHz is investigated for AC mains.

All the test results are listed in Section 2.6.

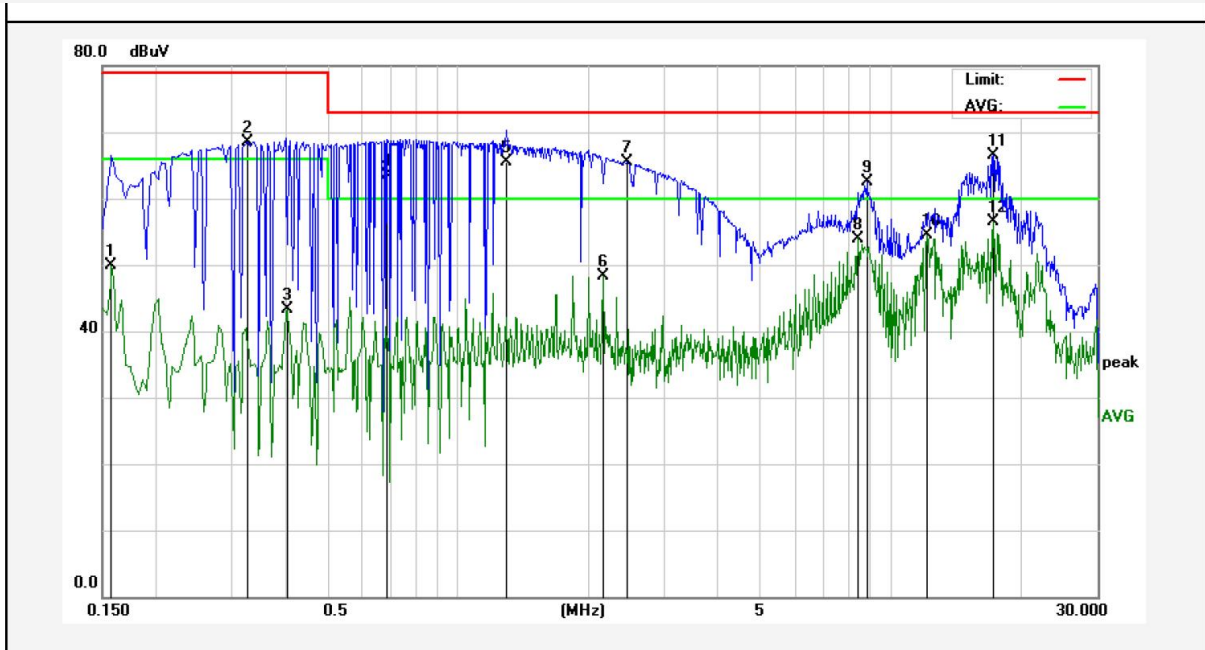
## 2.6. Test Results

**PASS**

The test curves are shown in the following pages.

## Conducted Emission Test Data

Test Site: 1# Shielded Room  
Test Specification: AC 230V, 50Hz  
Comment: Live Line  
Temp.: 22.8°C Hum.: 51%

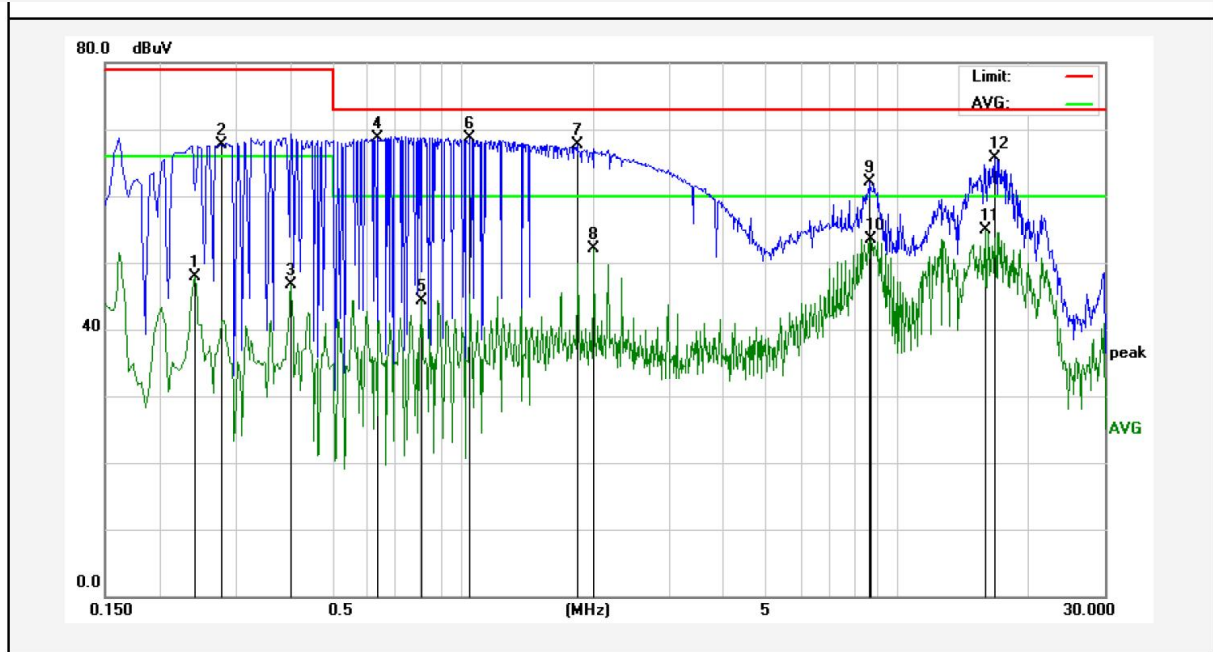


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1580	40.17	9.70	49.87	66.00	-16.13	AVG	
2	0.3260	58.77	9.72	68.49	79.00	-10.51	QP	
3	0.4020	33.62	9.71	43.33	66.00	-22.67	AVG	
4	0.6860	53.82	9.75	63.57	73.00	-9.43	QP	
5	1.2940	55.81	9.73	65.54	73.00	-7.46	QP	
6	2.1619	38.62	9.72	48.34	60.00	-11.66	AVG	
7	2.4500	55.73	9.72	65.45	73.00	-7.55	QP	
8	8.4018	44.19	9.81	54.00	60.00	-6.00	AVG	
9	8.8058	52.75	9.82	62.57	73.00	-10.43	QP	
10	12.0818	44.52	9.90	54.42	60.00	-5.58	AVG	
11	17.2859	56.47	10.05	66.52	73.00	-6.48	QP	
12	17.2859	46.43	10.05	56.48	60.00	-3.52	AVG	

**Note:** Result=Reading+Factor Over Limit=Result-Limit

## Conducted Emission Test Data

Test Site: 1# Shielded Room  
Test Specification: AC 230V, 50Hz  
Comment: Neutral Line  
Temp.: 22.8°C Hum.: 51%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.2419	38.11	9.71	47.82	66.00	-18.18	AVG	
2	0.2779	57.94	9.72	67.66	79.00	-11.34	QP	
3	0.4020	36.99	9.71	46.70	66.00	-19.30	AVG	
4	0.6380	58.91	9.75	68.66	73.00	-4.34	QP	
5	0.8059	34.63	9.75	44.38	60.00	-15.62	AVG	
6	1.0420	59.05	9.74	68.79	73.00	-4.21	QP	
7	1.8380	57.94	9.72	67.66	73.00	-5.34	QP	
8	2.0019	42.38	9.72	52.10	60.00	-7.90	AVG	
9	8.6458	52.33	9.82	62.15	73.00	-10.85	QP	
10	8.7258	43.68	9.82	53.50	60.00	-6.50	AVG	
11	16.0018	44.82	10.02	54.84	60.00	-5.16	AVG	
12	16.8059	55.72	10.04	65.76	73.00	-7.24	QP	

**Note:** Result=Reading+Factor Over Limit=Result-Limit



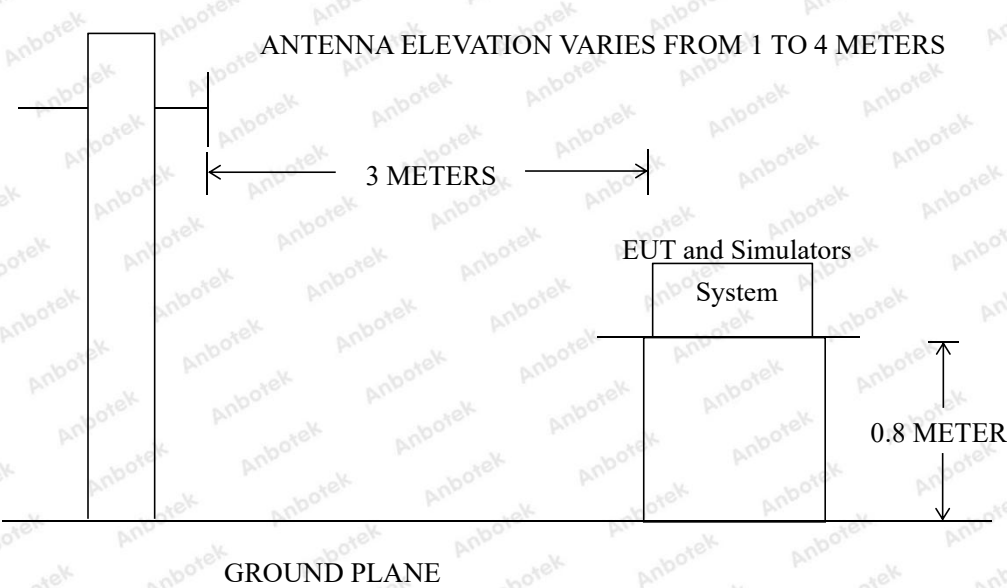
3. Radiated Emission Test

3.1. Test Standard and Limit

Test Standard	EN 55032
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Radiated Emission Test Limit			
Test Limit	Frequency (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
	30 ~ 230	3	50
	230 ~ 1000	3	57
<b>Remark:</b> (1)The smaller limit shall apply at the combination point between two frequency bands. (2) Distance r efers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT. (3) 3M Limit=10M Limit+k    k=20log(D1/D2)=10 3M Limit=10M Limit +10 (D1= 10M     D2=3M)			

3.2. Test Setup



3.3. EUT Configuration on Measurement

The EN 55032 regulations test method must be used to find the maximum emission during radiated emission measurement.

### **3.4. Operating Condition of EUT**

3.4.1. Setup the EUT as shown in Section 3.2.

3.4.2. Turn on the power of all equipments.

3.4.3. Let the EUT work in test mode and measure it.

### **3.5. Test Procedure**

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in 9\*6\*6 Chamber.

The test results are listed in Section 3.6.

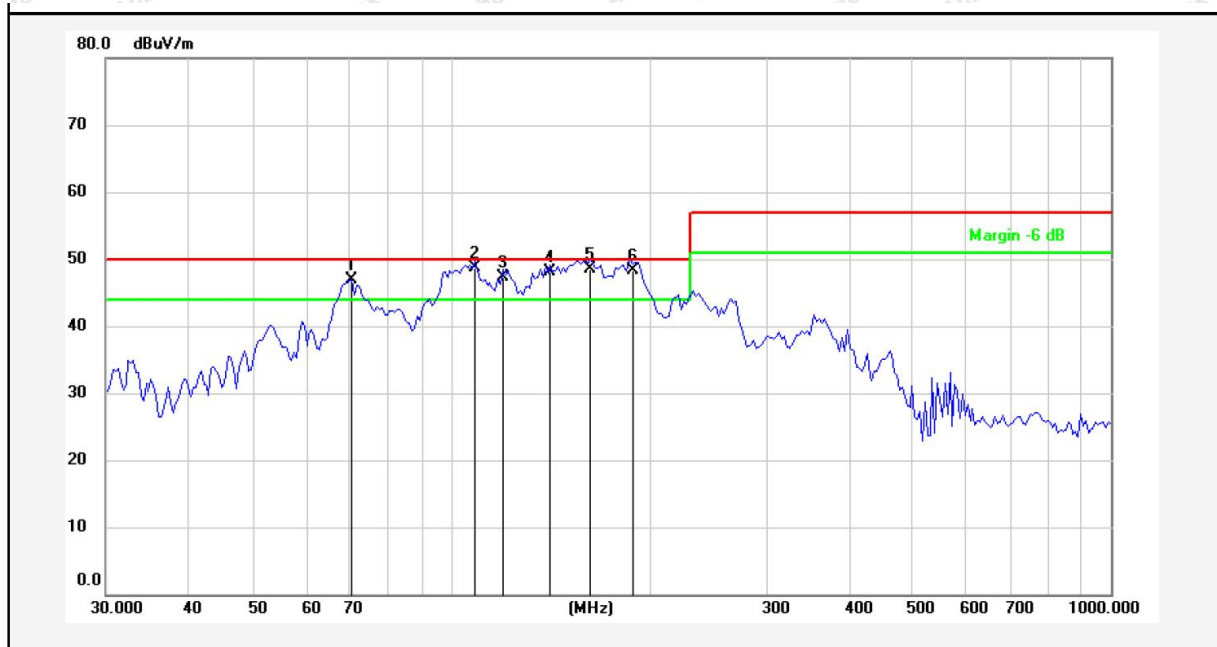
### **3.6. Test Results**

#### **PASS**

The frequency range from 30MHz to 1000MHz is investigated.

The test curves are shown in the following pages.

**Test item:** Radiation Test **Polarization:** Horizontal  
**Standard:** (RE)EN55032 **Power Source:** AC 230V, 50Hz  
**Distance:** 3m **Temp.(°C)/Hum.(%RH):** 23.3( °C)/52%RH  
**Test Mode:** Charging

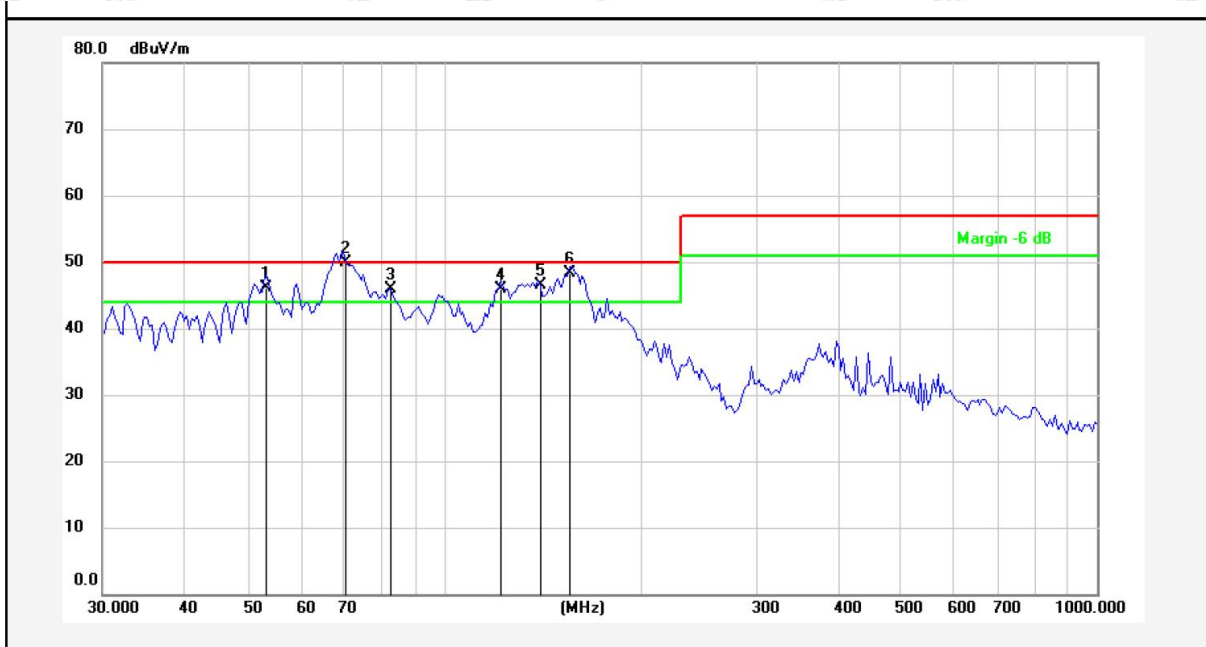


No.	Freq. (MHz)	Reading (dBuV)	Factor ( )	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	70.8315	68.65	-21.66	46.99	50.00	-3.01	QP			
2	108.8375	66.86	-18.10	48.76	50.00	-1.24	QP			
3	119.8556	66.80	-19.54	47.26	50.00	-2.74	QP			
4	141.5777	69.44	-21.32	48.12	50.00	-1.88	QP			
5	162.8959	68.91	-20.35	48.56	50.00	-1.44	QP			
6	187.4241	67.17	-18.92	48.25	50.00	-1.75	QP			

**Note:** Result=Reading+Factor Over Limit=Result-Limit



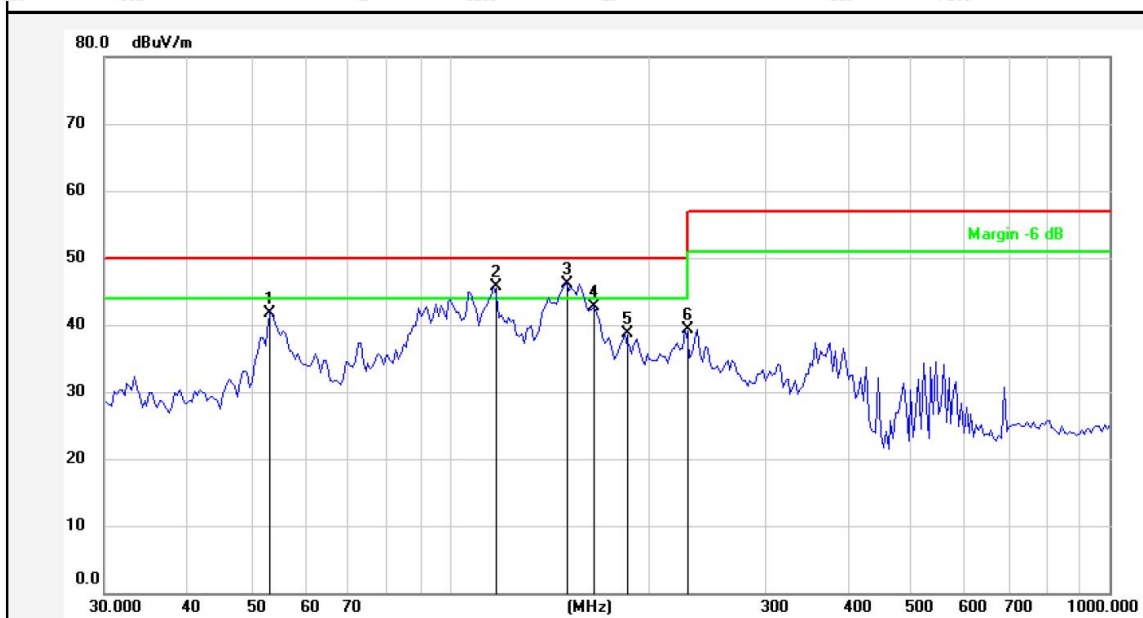
**Test item:** Radiation Test      **Polarization:** Vertical  
**Standard:** (RE)EN55032      **Power Source:** AC 230V, 50Hz  
**Distance:** 3m      **Temp.(°C)/Hum.(%RH):** 23.3( °C)/52%RH  
**Test Mode:** Charging



No.	Freq. (MHz)	Reading (dBuV)	Factor (°)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	53.5052	63.56	-17.36	46.20	50.00	-3.80	QP			
2	70.4632	71.50	-21.65	49.85	50.00	-0.15	QP			
3	82.2146	66.90	-20.94	45.96	50.00	-4.04	QP			
4	121.9755	65.78	-19.81	45.97	50.00	-4.03	QP			
5	139.1172	67.85	-21.32	46.53	50.00	-3.47	QP			
6	155.9101	69.14	-20.77	48.37	50.00	-1.63	QP			

**Note:** Result=Reading+Factor      Over Limit=Result-Limit

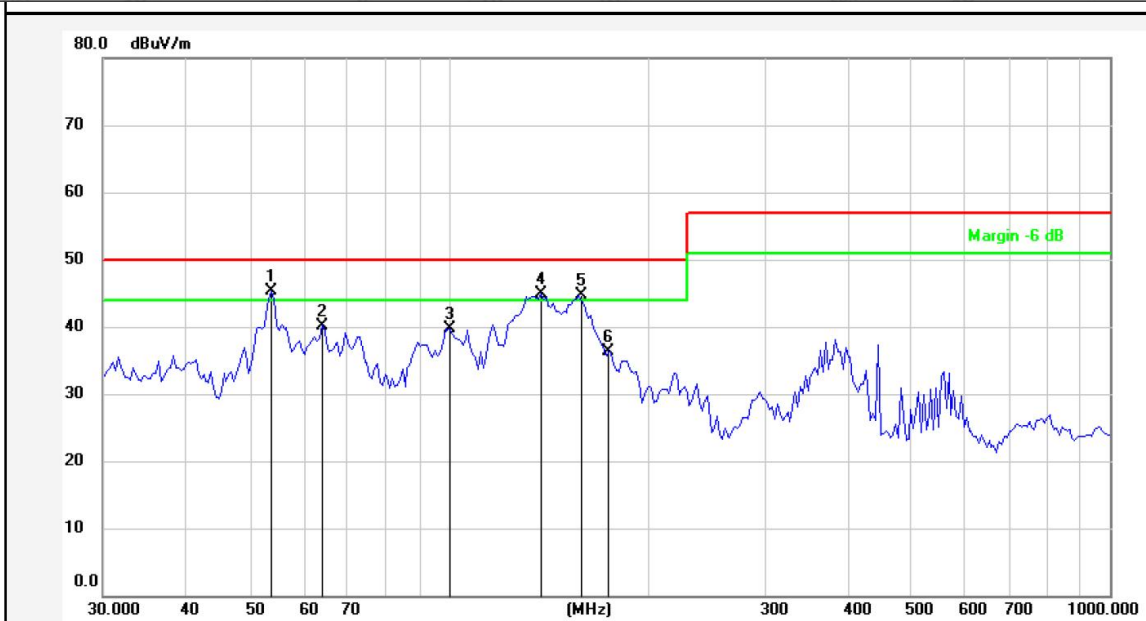
**Test item:** Radiation Test      **Polarization:** Horizontal  
**Standard:** (RE)EN55032      **Power Source:** DC 51.2V  
**Distance:** 3m      **Temp.(°C)/Hum.(%RH):** 23.3( °C)/52%RH  
**Test Mode:** Discharging



No.	Freq. (MHz)	Reading (dBuV)	Factor ( )	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	53.5052	58.99	-17.36	41.63	50.00	-8.37	QP			
2	116.7446	64.89	-19.13	45.76	50.00	-4.24	QP			
3	149.2239	67.33	-21.14	46.19	50.00	-3.81	QP			
4	165.7771	62.83	-20.19	42.64	50.00	-7.36	QP			
5	184.1667	57.82	-19.11	38.71	50.00	-11.29	QP			
6	227.2918	56.40	-17.03	39.37	50.00	-10.63	QP			

**Note:** Result=Reading+Factor      Over Limit=Result-Limit

**Test item:** Radiation Test **Polarization:** Vertical  
**Standard:** (RE)EN55032 **Power Source:** DC 51.2V  
**Distance:** 3m **Temp.(°C)/Hum.(%RH):** 23.3( °C)/52%RH  
**Test Mode:** Discharging



No.	Freq. (MHz)	Reading (dBuV)	Factor (°)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	53.9763	62.61	-17.38	45.23	50.00	-4.77	QP			
2	64.3202	59.61	-19.41	40.20	50.00	-9.80	QP			
3	100.5806	56.83	-17.03	39.80	50.00	-10.20	QP			
4	137.9028	66.05	-21.24	44.81	50.00	-5.19	QP			
5	157.2829	65.41	-20.69	44.72	50.00	-5.28	QP			
6	174.7301	55.89	-19.66	36.23	50.00	-13.77	QP			

**Note:** Result=Reading+Factor Over Limit=Result-Limit

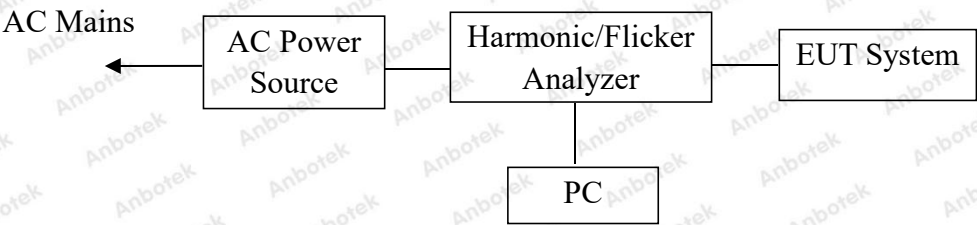


4. Harmonic Current Emission Test

4.1. Test Standard

Test Standard	EN IEC 61000-3-2
---------------	------------------

4.2. Test Setup



4.3. Operating Condition of EUT

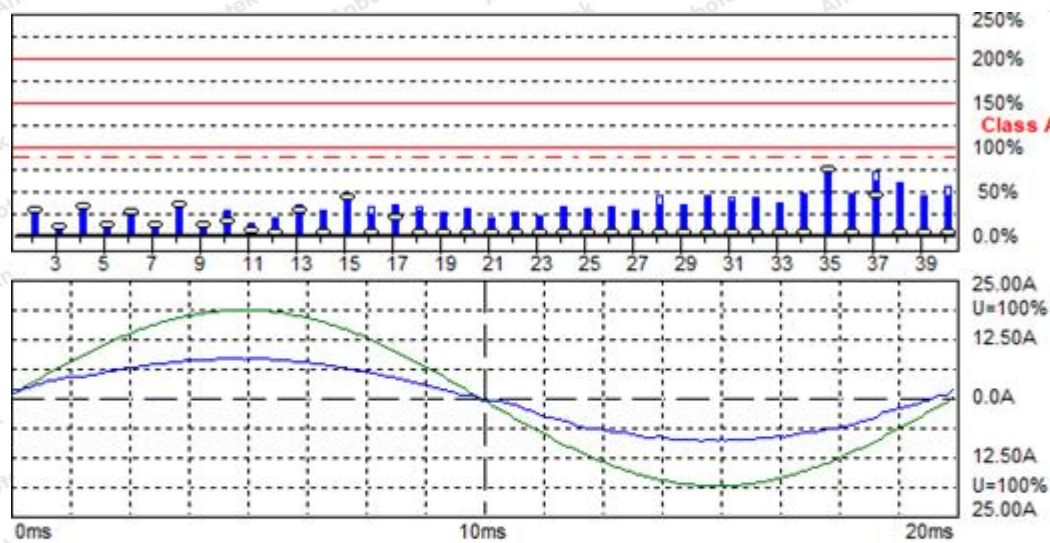
- 4.3.1. Setup the EUT as shown on Section 4.2.
- 4.3.2. Turn on the power of all equipments.
- 4.3.3. After that, let the EUT work in test mode measure it.

4.4. Test Results

**PASS**

The test curves are shown in the following pages.

Harmonic Current Test Result Summary (Run time)



Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2)

Urms =	229.9 V	P =	1424 W	THC =	0.446 A	Range:	25 A
Irms =	6.226 A	pf =	0.995	H1max =	A	V-nom:	230 V

Test aborted, Result: PASSED

HAR-1000 EMC Partner

Full Bar : Actual Values  
Empty Bar : Maximum Values  
Blue : Current , Green : Voltage , Red : Failed



## Harmonic Current Test Result Summary (Run time)

Urms = 229.9V    Freq = 49.987    Range: 25 A  
 Irms = 6.226A    Ipk = 9.399A    cf = 1.510  
 P = 1424W    S = 1431VA    pf = 0.995  
 THDi = 7.32 %    THDu = 0.20 %    Class A

Test - Time : 3min ( 100 %)

Test aborted, Result: PASSED

Order	Freq. Status [Hz]	Iavg [A]	Iavg%L [%]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax%L [%]	Limit [A]
1	50	6.1952		6.1661	99.044		6.7276		
2	100	0.2804	25.962	0.2747	4.4118	25.431	0.2991	27.692	1.0800
3	150	0.1441	6.2672	0.1663	2.6716	7.2313	0.1740	7.5631	2.3000
4	200	0.1307	30.399	0.1511	2.4265	35.131	0.1495	34.776	0.4300
5	250	0.1213	10.637	0.1450	2.3284	12.716	0.1434	12.582	1.1400
6	300	0.0695	23.159	0.0870	1.3971	28.992	0.0854	28.483	0.3000
7	350	0.0747	9.6969	0.0961	1.5441	12.484	0.0931	12.088	0.7700
8	400	0.0722	31.387	0.0839	1.3480	36.488	0.0839	36.488	0.2300
9	450	0.0307	7.6803	0.0534	0.8578	13.351	0.0519	12.970	0.4000
10	500	0.0252	13.674	0.0519	0.8333	28.196	0.0504	27.366	0.1840
11	550	0.0125	3.7916	0.0381	0.6127	11.560	0.0412	12.484	0.3300
12	600	0.0000	0.0000	0.0305	0.4902	19.903	0.0290	18.908	0.1533
13	650	0.0564	26.852	0.0519	0.8333	24.705	0.0656	31.244	0.2100
14	700	0.0000	0.0000	0.0320	0.5147	24.381	0.0351	26.703	0.1314
15	750	0.0596	39.763	0.0595	0.9559	39.673	0.0641	42.725	0.1500
16	800	0.0000	0.0000	0.0244	0.3922	21.230	0.0351	30.518	0.1150
17	850	0.0235	17.729	0.0443	0.7108	33.434	0.0427	32.281	0.1324
18	900	0.0000	0.0000	0.0275	0.4412	26.869	0.0305	29.854	0.1022
19	950	0.0000	0.0000	0.0275	0.4412	23.193	0.0275	23.193	0.1184
20	1000	0.0000	0.0000	0.0259	0.4167	28.196	0.0259	28.196	0.0920
21	1050	0.0000	0.0000	0.0168	0.2696	15.666	0.0183	17.090	0.1071
22	1100	0.0000	0.0000	0.0183	0.2941	21.893	0.0198	23.717	0.0836
23	1150	0.0000	0.0000	0.0168	0.2696	17.158	0.0198	20.277	0.0978
24	1200	0.0000	0.0000	0.0214	0.3431	27.864	0.0229	29.854	0.0767
25	1250	0.0000	0.0000	0.0244	0.3922	27.127	0.0259	28.822	0.0900
26	1300	0.0000	0.0000	0.0198	0.3186	28.030	0.0214	30.186	0.0708
27	1350	0.0000	0.0000	0.0198	0.3186	23.804	0.0229	27.466	0.0833
28	1400	0.0000	0.0000	0.0214	0.3431	32.508	0.0275	41.796	0.0657
29	1450	0.0000	0.0000	0.0229	0.3676	29.500	0.0244	31.467	0.0776
30	1500	0.0000	0.0000	0.0259	0.4167	42.293	0.0259	42.293	0.0613
31	1550	0.0000	0.0000	0.0275	0.4412	37.842	0.0290	39.944	0.0726
32	1600	0.0000	0.0000	0.0229	0.3676	39.806	0.0229	39.806	0.0575
33	1650	0.0000	0.0000	0.0244	0.3922	35.807	0.0244	35.807	0.0682
34	1700	0.0000	0.0000	0.0244	0.3922	45.113	0.0244	45.113	0.0541
35	1750	0.0451	70.153	0.0427	0.6863	66.461	0.0488	75.955	0.0643
36	1800	0.0000	0.0000	0.0229	0.3676	44.781	0.0229	44.781	0.0511
37	1850	0.0260	42.824	0.0366	0.5882	60.221	0.0427	70.258	0.0608
38	1900	0.0000	0.0000	0.0275	0.4412	56.723	0.0275	56.723	0.0484
39	1950	0.0000	0.0000	0.0229	0.3676	39.673	0.0244	42.318	0.0577
40	2000	0.0000	0.0000	0.0198	0.3186	43.123	0.0244	53.074	0.0460



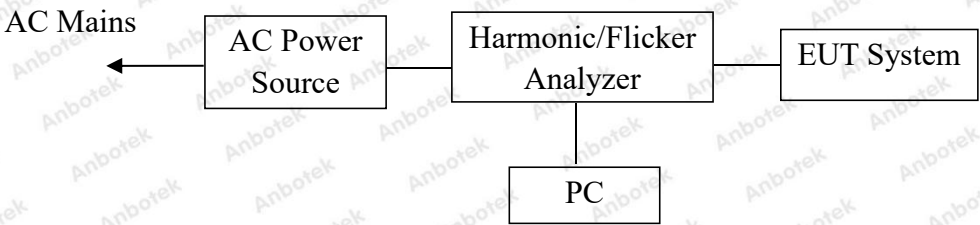


5. Voltage Fluctuations & Flicker Test

5.1. Test Standard

Test Standard	EN 61000-3-3
---------------	--------------

5.2. Test Setup



5.3. Operating Condition of EUT

- 5.3.1. Setup the EUT as shown on Section 5.2.
- 5.3.2. Turn on the power of all equipments.
- 5.3.3. After that, let the EUT work in test mode measure it.

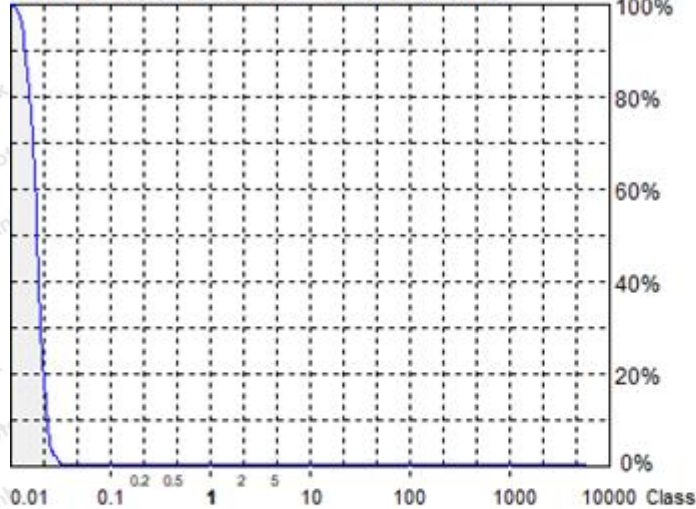
5.4. Test Results

**PASS**

The test curves are shown in the following pages.

## Flicker Test Summary (Run time)

Flicker Emission IEC 61000-4-15 for 230V/50Hz



Actual Flicker (Fli):	0.02
Short-term Flicker (Pst):	0.11
Limit (Pst):	1.00
Long-term Flicker (Plt):	0.00
Limit (Plt):	0.65
Maximum Relative Volt. Change (dmax):	0.69%
Limit (dmax):	4.00%
Relative Steady-state Voltage Change (dc):	0.06%
Limit (dc):	3.00%
Tmax 3.00% (dt):	0.00ms
Limit (dt>Lim):	200ms

Flicker Emission - IEC 61000-3-3, EN 61000-3-3

Urms =	230.3 V	P =	1357 W
Irms =	5.908 A	pf =	0.997

Range:	25 A
V-nom:	230 V

Test aborted, Result: PASSED

HAR-1000 EMC Partner

Full Bar : Actual Values

Empty Bar : Maximum Values

Circles : Average Values

Blue : Current , Green : Voltage , Red : Failed

Urms =	230.3V	Freq =	49.987	Range:	25 A
Irms =	5.908A	Ipk =	8.337A	cf =	1.411
P =	1357W	S =	1361VA	pf =	0.997

Test - Time : 10 x 1min = 10min ( 100 %)

LIN (Line Impedance Network) : No LIN

Limits :	Plt :	0.65	Pst :	1.00
	dmax :	4.00 %	dc :	3.00 %
	dtLim:	3.00 %	dt>Lim:	200ms

Test aborted, Result: PASSED

	dmax	dc	dt>Lim
	[%]	[%]	[ms]
1	0.000	0.000	0.000

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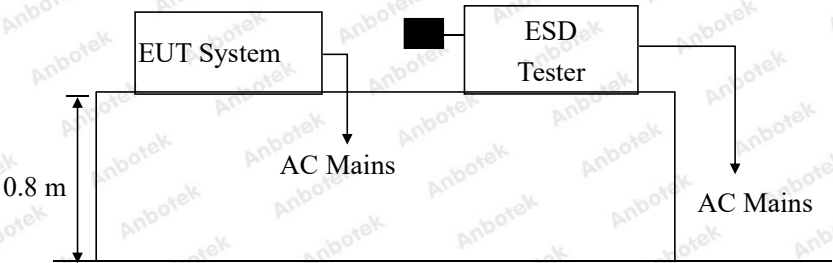
6. Electrostatic Discharge Immunity Test

6.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-2)
Performance Criterion:	B
Severity Level: 4 / Air Discharge: ±8kV, Level: 2 / Contact Discharge: ±4kV	

Test Level		
Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1.	±2	±2
2.	±4	±4
3.	±6	±8
4.	±8	±15
X.	Special	Special

6.2. Test Setup



6.3. EUT Configuration on Measurement

The following equipments are installed on electrostatic discharge immunity measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

6.4. Operating Condition of EUT

- 6.4.1. Setup the EUT as shown on Section 6.2.
- 6.4.2. Turn on the power of all equipments.
- 6.4.3. After that, let the EUT work in test mode measure it.



## 6.5. Test Procedure

### 6.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

### 6.5.2. Contact Discharge:

All the procedure shall be same as Section 6.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 6.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

### 6.5.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

## 6.6. Test Results

**PASS**

Please refer to the following page.



## Electrostatic Discharge Test Results

Air discharge :	±8.0kV	Temperature :	23.3℃
Contact discharge :	±4.0kV	Humidity :	50%
Power Supply :	AC 230V, 50Hz / DC 51.2V	Expert conclusion:	A
Number of discharge :	10	Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Location		Kind A-Air Discharge C-Contact Discharge	Result
DC Port	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Slot	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Button	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Light	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Screen	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
USB Port	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Type-C Port	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
HCP	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the front	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the rear	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the left	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
VCP of the right	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
<b>Remark:</b> Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).			

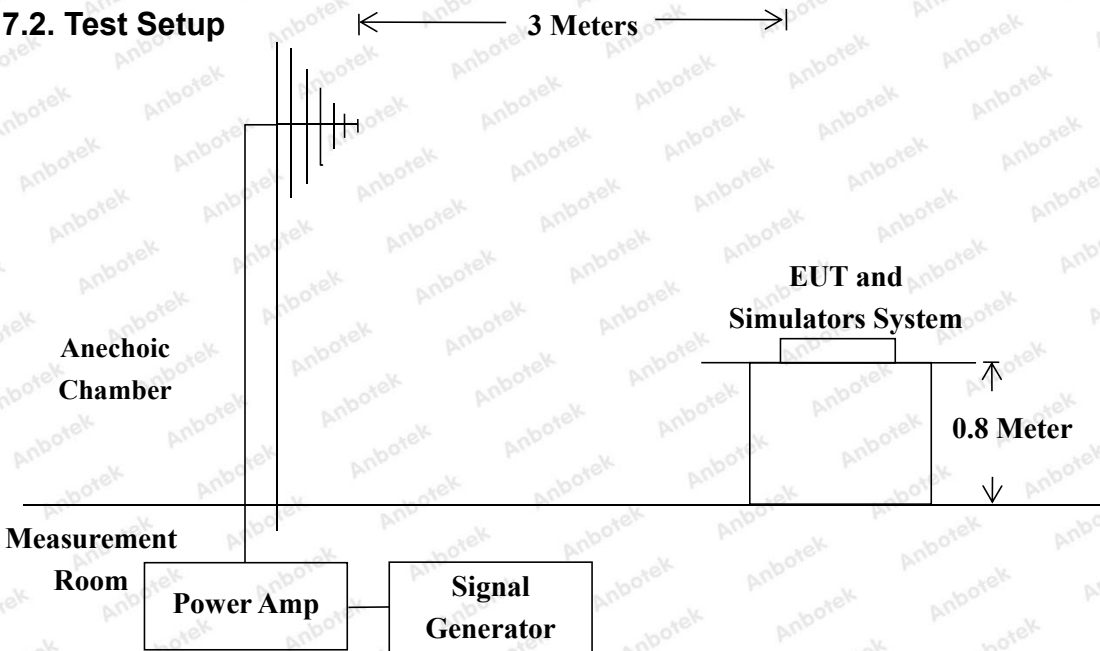
7. RF Field Strength Susceptibility Test

7.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-3)
Required Performance:	A
Frequency Range:	80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 0.5s

Test Level	
Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

7.2. Test Setup





### 7.3. EUT Configuration on Measurement

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 7.4. Operating Condition of EUT

7.4.1. Setup the EUT as shown on Section 7.2.

7.4.2. Turn on the power of all equipments.

7.4.3. After that, let the EUT work in test mode measure it.

### 7.5. Test Procedure

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters.

- 1) 80 MHz to 1000 MHz the field strength level was 3V/m, 1800MHz, 2600MHz, 3500MHz, 5000MHz the field strength level was 3V/m.
- 2) The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
- 3) The frequency range is swept from 1800MHz, 2600MHz, 3500MHz, 5000MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
- 4) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.
- 5) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 7.6. Measuring Results

**PASS**

Please refer to the following page.



RF Field Strength Susceptibility Test Results

Field Strength :	3V/m	Temperature :	23.9℃
Expert conclusion:	A	Humidity :	53%
Power Supply :	AC 230V, 50Hz / DC 51.2V	Test Result :	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Dwell Time:	1s		

Frequency Range	Antenna Polarity	R.F. Field Strength	Azimuth	Result
80MHz~1000MHz	H / V	3 V/m (rms)	Front	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
			Rear	
			Left	
			Right	
1800MHz 2600MHz 3500MHz 5000MHz	H / V	3 V/m (rms)	Front	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
			Rear	
			Left	
			Right	

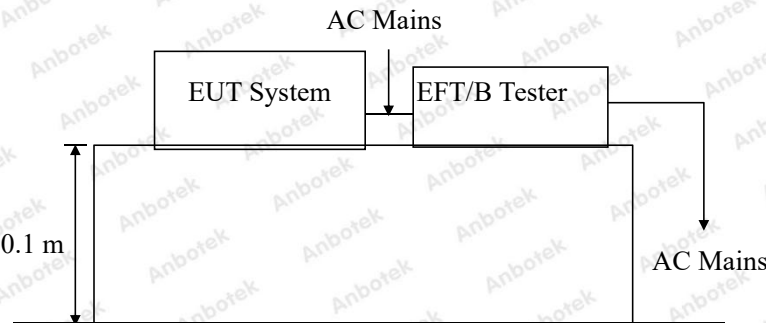
8. Electrical Fast Transient/Burst Immunity Test

8.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-4)
Performance criterion:	B
Severity Level 2: 1.00kV	

Test Level		
Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1.	0.50 kV	0.25 kV
2.	1.00 kV	0.50 kV
3.	2.00 kV	1.00 kV
4.	4.00 kV	2.00 kV
X.	Special	Special

8.2. Test Setup



8.3. EUT Configuration on Measurement

The following equipments are installed on electrical fast transient/burst immunity measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

8.4. Operating Condition of EUT

- 8.4.1. Setup the EUT as shown in Section 8.2.
- 8.4.2. Turn on the power of all equipments.
- 8.4.3. Let the EUT work in test mode and measure it.



## 8.5. Test Procedure

The EUT is put on the table which is 0.1 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

### 8.5.1. For input and output AC power ports:

The EUT is connected to the Power mains by using a coupling device which couples the EFT interference signal to AC Power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

### 8.5.2. For signal lines and control lines ports:

Select tests based on product characteristics.

### 8.5.3. For DC output line ports:

Select tests based on product characteristics.

## 8.6. Test Results

**PASS**

Please refer to the following page.

# Electrical Fast Transient/Burst Test Results

Ambient Condition : 23.3℃ / 50% RH		Expert conclusion: A	
Power Supply .: AC 230V, 50Hz		Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Inject Line : AC Mains		Inject Method: Direct	Inject Time(s): 120
Line	Polarity	Test Voltage (kV)	Result
AC Line	±	1.00kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
DC Line			
Signal Line			

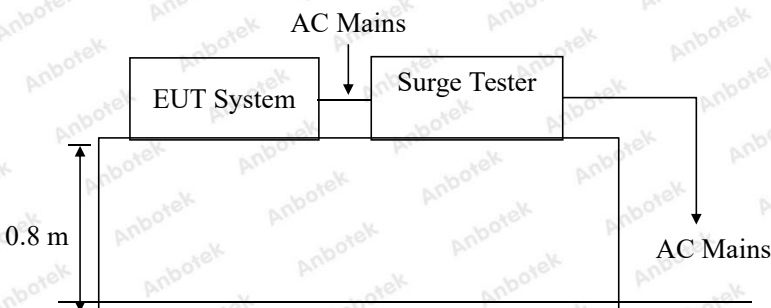
9. Surge Immunity Test

9.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-5)
Performance criterion:	B
Severity Level 2, Line to Line: 1.0kV	

Test Level	
Severity Level	Open-Circuit Test Voltage (kV)
1.	0.5
2.	1.0
3.	2.0
4.	4.0
X.	Special

9.2. Test Setup



9.3. EUT Configuration on Measurement

The following equipments are installed on surge immunity measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

9.4. Operating Condition of EUT

- 9.4.1. Setup the EUT as shown in Section 9.2.
- 9.4.2. Turn on the power of all equipments.
- 9.4.3. Let the EUT work in test mode and measure it.



## 9.5. Test Procedure

9.5.1. Set up the EUT and test generator as shown on Section 9.2.

9.5.2. For line to line coupling mode, provide a 1.0 kV 1.2/50 $\mu$ s voltage surge (at open-circuit condition) and 8/20 $\mu$ s current surge to EUT selected points.

9.5.3. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

9.5.4. Different phase angles are done individually.

9.5.5. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

## 9.6. Test Results

**PASS**

Please refer to the following page.



Surge Immunity Test Results

Humidity    :		50%		Temperature    :		23.3℃	
Power Supply    :		AC 230V, 50Hz		Expert conclusion:		A	
Test Result    :		☒ Pass    ☐ Fail					
Location		Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result	
L-N		+	☐ 0°    ☒ 90° ☐ 180°☐ 270°	5	1.0kV	☒ A    ☐ B ☐ C    ☐ D	
L-N		-	☐ 0°    ☐ 90° ☐ 180°☒ 270°	5	1.0kV	☒ A    ☐ B ☐ C    ☐ D	
L-GND							
L-GND							
N-GND							
N-GND							

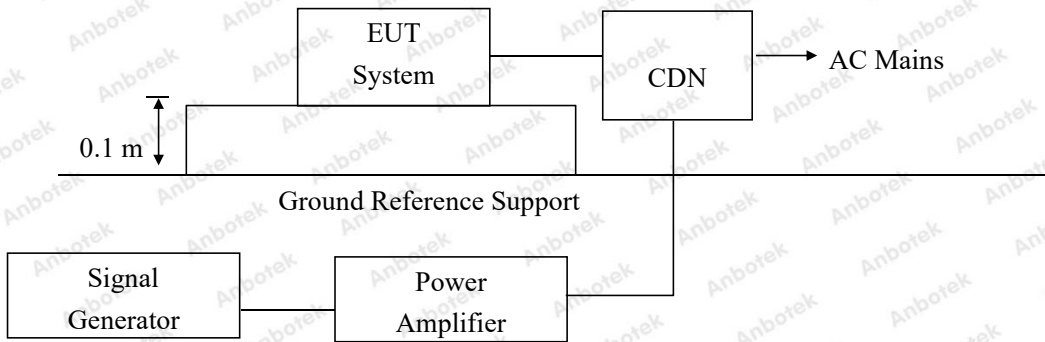
10. Injected Currents Susceptibility Test

10.1. Test Standard and Level

Test Standard	EN 55035 (IEC 61000-4-6)
Performance criterion	A

Test Level	
Level	Field Strength V
1.	1
2.	3
3.	10
X.	Special

10.2. Test Setup



10.3. EUT Configuration

The following equipments are installed on currents susceptibility measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

10.4. Operating Condition of EUT

- 10.4.1. Setup the EUT as shown in Section 10.2.
- 10.4.2. Turn on the power of all equipments.
- 10.4.3. Let the EUT work in test mode and measure it.



## 10.5. Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 10.2.
- 2) Let the EUT work in test mode and measure it.
- 3) The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150KHz to 10MHz using 3V signal level, 10MHz to 30MHz using 3V to 1V signal level, 30MHz to 80MHz using 1V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
- 7) The rate of sweep shall not exceed  $1.5 \times 10^{-3}$  decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

### 10.5.1. For signal lines and control lines ports:

Select tests based on product characteristics.

### 10.5.2. For DC output line ports:

Select tests based on product characteristics.

## 10.6. Test Results

**PASS**

Please refer to the following page.



# Injected Currents Susceptibility Test Results

Humidity : 51%		Temperature : 23.0℃	
Power Supply : AC 230V, 50Hz		Expert conclusion: A	
Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail			
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Result
0.15 ~ 10	AC Mains	3V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
10 ~ 30	AC Mains	3V to 1V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
30 ~ 80	AC Mains	1V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
<b>Remark : 1. Modulation Signal:1KHz 80% AM</b>			

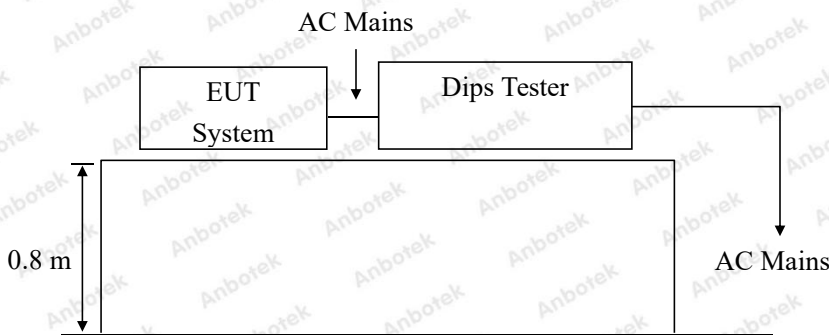
## 11. Voltage Dips And Interruptions Test

### 11.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-11)
Performance Criterion:	B&C

Test Level		
Test Level %UT	Voltage dip and short interruptions %UT	Duration (in period)
0	100	0.5
70	30	1
0	100	5
/	/	10
		25
		50
		*

### 11.2. Test Setup



### 11.3. EUT Configuration on Measurement

The following equipments are installed on voltage dips and interruptions measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 11.4. Operating Condition of EUT

- 11.4.1. Setup the EUT as shown in Section 11.2.
- 11.4.2. Turn on the power of all equipments.
- 11.4.3. Let the EUT work in test mode and measure it.



### 11.5. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 11.2.
- 2) The interruptions is introduced at selected phase angles with specified duration.
- 3) Record any degradation of performance.

### 11.6. Test Results

**PASS**

Please refer to the following page.



# Voltage Dips and Interruptions Test Results

Temperature : 23.3℃		Humidity : 50%	
Power Supply : AC 230V, 50Hz		Expert conclusion: B&C	
Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail			
Test Level % UT	Voltage Dips & Short Interruptions % UT	Duration (in periods)	Result
0	100	0.5P	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
70	30	25P	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D
Test Level % UT	Voltage Dips & Short Interruptions % UT	Duration (in periods)	Result
0	100	250P	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D



## APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Power Line Conducted Emission Test



Photo of Radiated Emission Test

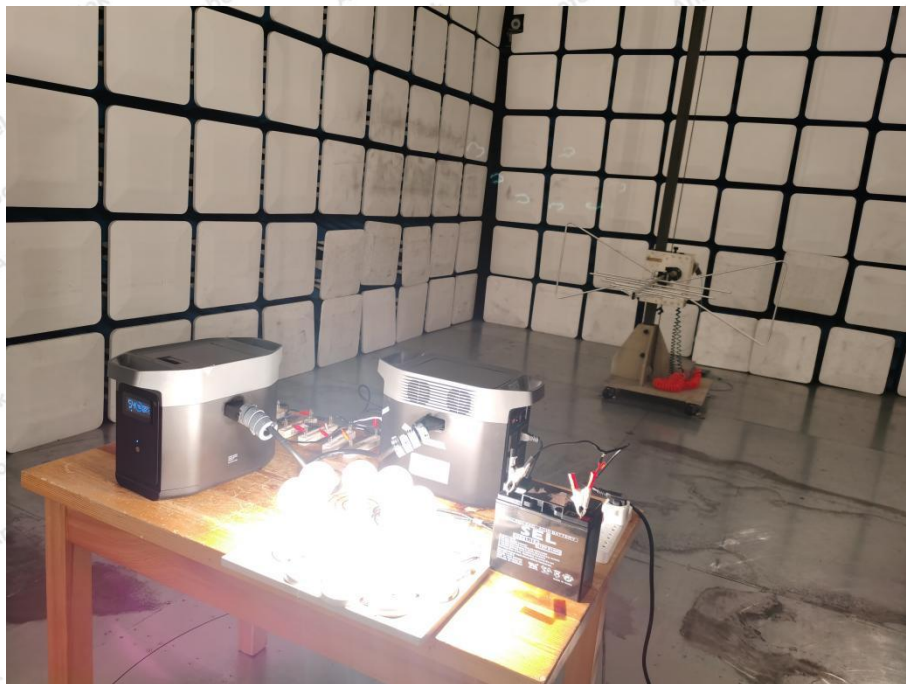




Photo of Flicker/ Harmonic Test



Photo of Electrostatic Discharge Immunity Test



Photo of RF Field Strength susceptibility Test



Photo of Electrical Fast Transient/Burst Immunity Test

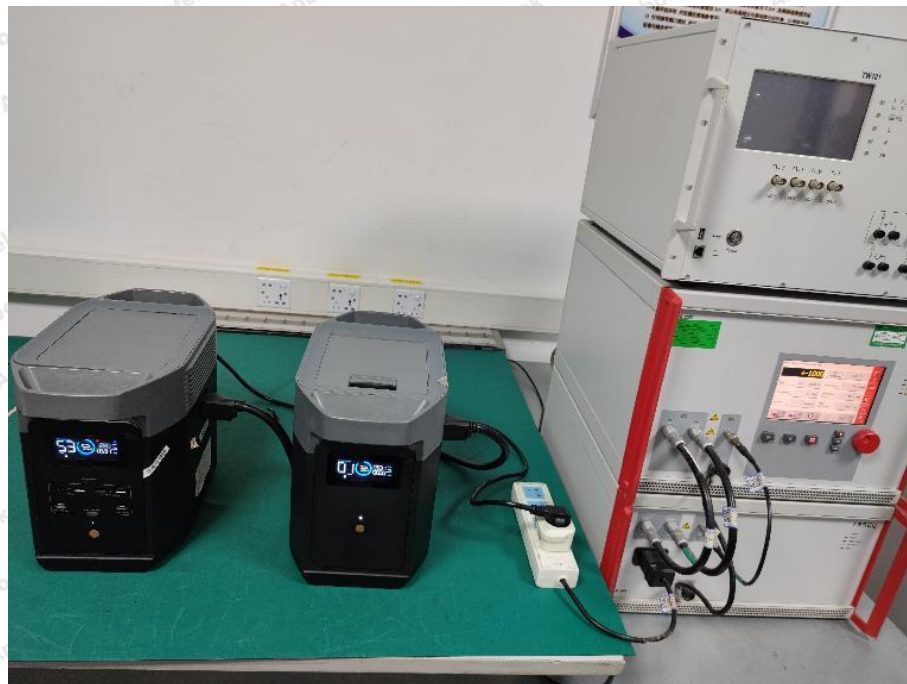




Photo of Surge Immunity Test



Photo of Injected currents susceptibility Test

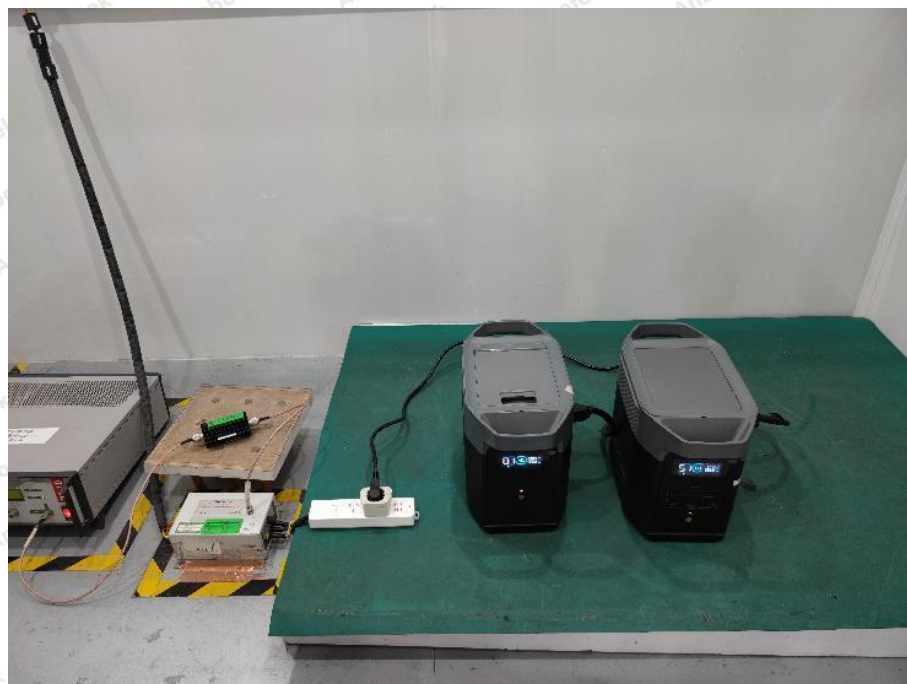




Photo of Voltage Dips and Interruptions Test



## APPENDIX II -- EXTERNAL PHOTOGRAPH











## CE Label

1. The CE conformity marking must consist of the initials 'CE' taking the following form:

If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.

2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.

3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.

4. The CE marking must be affixed visibly, legibly and indelibly.

It must have the same height as the initials 'CE'.

----- End of Report -----

