

EMC Test Report

Client Name : EcoFlow Inc.

Client Address : Plant A202, Founder Technology Industrial
Park, Shiyao Sub-district, Bao'an District
Shenzhen, Guangdong 518000 China

Product Name : Portable Air Conditioner Extra Battery

Report Date : Feb. 27, 2023

Shenzhen Anbotech Compliance Laboratory Limited



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TEST REPORT

Applicant : EcoFlow Inc.
Manufacturer : EcoFlow Inc.
Product Name : Portable Air Conditioner Extra Battery
Test Model No. : EFKT210-EB
Reference Model :
No. : N.A.

Trade Mark :



Rating(s) : See Chapter 1.10 for Rating

Test Standard(s) : EN IEC 55014-1: 2021;
EN IEC 61000-3-2: 2019+A1:2021;
EN 61000-3-3: 2013+A1:2019+A2:2021;
EN IEC 55014-2: 2021;
(IEC 61000-4-2; IEC 61000-4-3;
IEC 61000-4-4; IEC 61000-4-5; IEC 61000-4-6)

The device described above is tested by Shenzhen Anbotek 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 Anbotek 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 IEC 55014-1, EN IEC 61000-3-2, EN 61000-3-3, EN IEC 55014-2 requirements.

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

Date of Receipt:

Jan. 31, 2023

Date of Test:

Jan. 31~Feb. 24, 2023

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
Factory	:	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 Air Conditioner Extra Battery
Test Model No.	:	EFKT210-EB
Reference Model No.	:	N.A.
Trade Mark	:	 
Test Power Supply	:	DC 59V via Air Conditioner / DC 50.4V
Test Sample No.	:	1-1-1
Product Description	:	N/A
Remark: (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		



1.3. Product Type

<input type="checkbox"/> Category I: equipment containing no electronic control circuitry
<input checked="" type="checkbox"/> Category II: mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz
<input checked="" type="checkbox"/> Category III: battery operated equipment not included in Category I
<input type="checkbox"/> 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
<input type="checkbox"/> Category V: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz

1.4. Auxiliary Equipment Used During Test

N/A	
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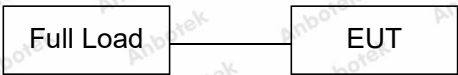
1.5. Description of Test Modes

Pretest Modes	Descriptions
Mode 1	Charging
Mode 2	Discharging (DC out+USB-A out +USB-C out)

For Mode 1 Block Diagram of Test Setup



For Mode 2 Block Diagram of Test Setup



1.6. Test Summary

Test Items	Test Modes	Status
Power Line Conducted Emission Test	Mode 1	P
Asymmetric Mode Conducted Emission at Telecom Port	/	N
Magnetic Field Inducted Current	/	N
Disturbance Power (30MHz-300MHz)	/	N
Magnetic Field Strength (9KHz-30MHz)	/	N
Radiated Emission Test (Below 1 GHz)	All Mode	P
Radiated Emission Test (Above 1GHz)	/	N
Harmonic Current Test	/	N
Voltage Fluctuations & Flicker Test	/	N
Electrostatic Discharge Immunity Test	All Mode	P
RF Field Strength Immunity Test	All Mode	P
Electrical Fast Transient/Burst Immunity Test	/	N
Surge Immunity Test	/	N
Injected Currents Susceptibility Test	/	N
P) Indicates "PASS". F) Indicates "Fail". N) Indicates "Not applicable".		



1.7. Test Equipment List☒ Power Line Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Oct. 23, 2022	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040D T001	Jul. 05, 2022	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
5.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

☐ Asymmetric Mode Conducted Emission at Telecom Port

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ISN	Schwarzbeck	NTFM 8158	#172	Oct. 13, 2022	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A
5.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040D T001	Jul. 05, 2022	1 Year

☐ Magnetic Field Induced Current

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
2.	Triple-Loop Antenna(2M)	EVERFINE	LLA-2	905003	Oct. 23, 2022	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A



☐ Disturbance Power (30MHz-300MHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Absorbing Clamp	TESEQ	MDS 21B	58885	Oct. 23, 2022	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

☐ Magnetic Field Strength (9KHz-30MHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
2.	Pre-amplifier	Schwarzbeck	BBV-9745	9745-075	Oct. 23, 2022	1 Year
3.	Loop Antenna (9K-30M)	Schwarzbeck	FMZB1519B	00053	Oct. 23, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	EMEC-3A1	N/A	N/A	N/A

☒ Radiated Emission Test (Below 1 GHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
2.	Pre-amplifier	SONOMA	310N	186860	Oct. 23, 2022	1 Year
3.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 23, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A



☐ Radiated Emission Test (Above 1GHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
2.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 23, 2022	1 Year
3.	Pre-amplifier	SONOMA	310N	186860	Oct. 23, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A
5.	EMI Preamplifier	SKET Electronic	LNPA-0118G-45	SKET-PA-002	Oct. 13, 2022	1 Year
6.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year

☐ Harmonic Current and Flicker Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Programmable AC Power source	IVYTECH	APS-5005A	632734	Oct. 23, 2022	1 Year
2.	Harmonic and Flicker Analyzer	EMC-PARTNER	HMONICS 1000-1P	164	Oct. 23, 2022	1 Year
3.	Harmonics-1000	N/A	Ed.3.0+4.0	N.A	N/A	N/A

☒ Electrostatic Discharge Immunity Test

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



☒ RF Field Strength Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	Agilent	N5181A	MY5014310 7	Apr. 20, 2022	1 Year
2.	Power Meter	Agilent	E4417A	MY4510138 4	May 14, 2022	1 Year
3.	Amplifier	Micotop	MPA-80-100 0-600	MPA211031 8	Apr. 20, 2022	1 Year
4.	Amplifier	Micotop	MPA-1000-6 000-100	MPA211032 7	Apr. 20, 2022	1 Year
5.	Log.-Per.-Antenna	Schwarzbeck	VULP 9118E	01012	N/A	N/A
6.	Microwave Log.-Per. Antenna	Schwarzbeck	STLP 9149	00788	N/A	N/A
7.	Power Sensor	KEYSIGHT	E9323A	US40410647	Apr. 20, 2022	1 Year
8.	Power Sensor	KEYSIGHT	E9323A	MY5310000 7	Apr. 20, 2022	1 Year
9.	Electric field Probe	Narda S.T.S /PMM	EP 601	811ZX10351	Apr. 29, 2022	1 Year
10.	Software	EMtrace	EM 3	/	N/A	N/A

☐ Electrical Fast Transient/Burst Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Generator	TESEQ	NSG 3060	1480	Oct. 23, 2022	1 Year
2.	CDN	TESEQ	CDN 3061	1408	Oct. 23, 2022	1 Year
3.	EFT-Clamp	PRIMA	EFT-Clamp	/	Oct. 13, 2022	1 Year

☐ Surge Immunity Test

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



☐ Injected Currents Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	C/S Conducted Immunity Test System	FRANKONIA	CIT-10	126A1196/2012	Oct. 23, 2022	1 Year
2.	CDN	FRANKONIA	CDN - M2+ M3	A2210178/2012	Oct. 23, 2022	1 Year
3.	6dB Attenuator	FRANKONIA	DAM 26W	1172202	Oct. 23, 2022	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

1.8. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek 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 Anbotek 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 Anbotek Compliance Laboratory Limited.

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



1.9. EMS Performance Criteria

Performance 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.

Performance 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), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance 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.



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1.10. Rating

Rating:

Capacity: 1159Wh 50.4V 23Ah

Power/Maximale Eingangsleistung: 857W MAX

OutputPower/Maximale Ausgangsleistung: 830W Max

Limit Voltage/Ladeschlussspannung: 59V

USB-AOutput/USB-AAusgang/USB-A: 5/9/12V --- 2.4/2/1.5A 18W MAX

USB-COutput/USB-CAusgang/USB-A: 5/9/12/15/20V-5A 100W MAX

Temperature/Temperaturbeim Entladen: -20-50°C

Temperature/Temperaturbeim Laden: 0-45°C



2. Power Line Conducted Emission Test

2.1. Test Standard and Limit

Test Standard:	EN IEC 55014-1
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☒ **General Limits (Mains ports -Disturbance voltage)**

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.5	66~56	59~46
0.5 ~ 5.0	56	46
5.0~ 30	60	50

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.

☐ **Disturbance voltage limits for the AC mains port of equipment with active IPT functions
(Appliances which are 100 V rated and without an earth connection)**

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.009 ~ 0.05	122	-
0.05 ~ 0.15	102~92	-
0.15 ~ 0.50	72~62	62~52
0.50 ~ 5.00	56	46
5.00 ~30.00	60	50

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 0.05MHz to 0.50MHz.



- ☐ **Disturbance voltage limits for the AC mains port of equipment with active IPT functions
(All other appliances)**

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.009 ~ 0.05	110	-
0.05 ~ 0.15	90~80	-
0.15 ~ 0.50	66~56	56~46
0.50 ~ 5.00	56	46
5.00 ~30.00	60	50

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.

- ☐ **General Limits (Auxiliary ports -Disturbance voltage)**

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.5	80	70
0.5 ~ 30	74	64

Remark: The lower limit shall apply at the transition frequencies.

- ☐ **General Limits (Auxiliary ports -Disturbance current)**

Frequency (MHz)	Limits (dB μ A)	
	Quasi-peak Level	Average Level
0.15 ~ 0.5	40~30	30~20
0.5 ~ 30	30	20

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.



☐ Limits for the mains port of motor operated tools ($P \leq 700W$ -Disturbance voltage)

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.35	66~59	59~49
0.35 ~ 5.0	59	49
5.0~ 30	64	54

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.
(3)P=rated power of the motor only.

☐ Limits for the mains port of motor operated tools ($700W < P \leq 1000W$ -Disturbance voltage)

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.35	70~63	63~53
0.35 ~ 5.0	63	53
5.0~ 30	68	58

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.
(3)P=rated power of the motor only.

☐ Limits for the mains port of motor operated tools ($P > 1000W$ -Disturbance voltage)

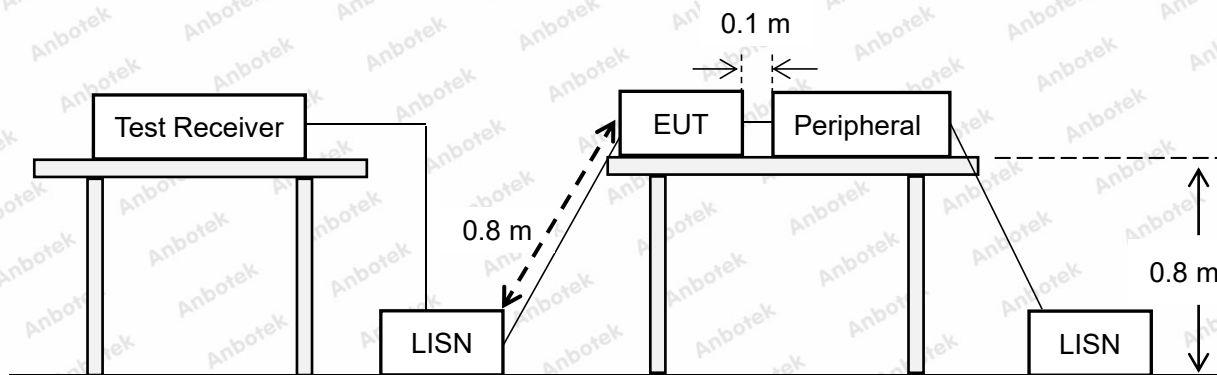
Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.35	76~69	69~59
0.35 ~ 5.0	69	59
5.0~ 30	74	64

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.
(3)P=rated power of the motor only.



2.2. Test Setup



2.3. Test Procedure

The table-top EUT is placed on a non-conductive table 0.8 m above the horizontal ground reference plane, and the back of the EUT is 0.4 m away from the vertical ground reference plane, and at least 0.8 m from any other metal surface or ground plane. The floor-standing EUT is placed on an insulating support 0.1 m above the horizontal ground reference plate, at least 0.8 m away from other metal objects.

Connect EUT to the power mains through an LISN. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the center into a bundle no longer than 0.4 m, so that its length is shortened to 1 m. All the peripherals are connecting to the other LISN (Handheld devices shall be tested with a simulated hand) .

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest disturbance with respect to the limit was found by investigating disturbances at a number of significant frequencies. The probable frequency of maximum disturbance had been found and that the associated cable and EUT configuration and mode of operation had been identified.

Set the test-receiver to quasi peak detect function and average detect function, and to measure the conducted emissions values.

2.4. Test Results

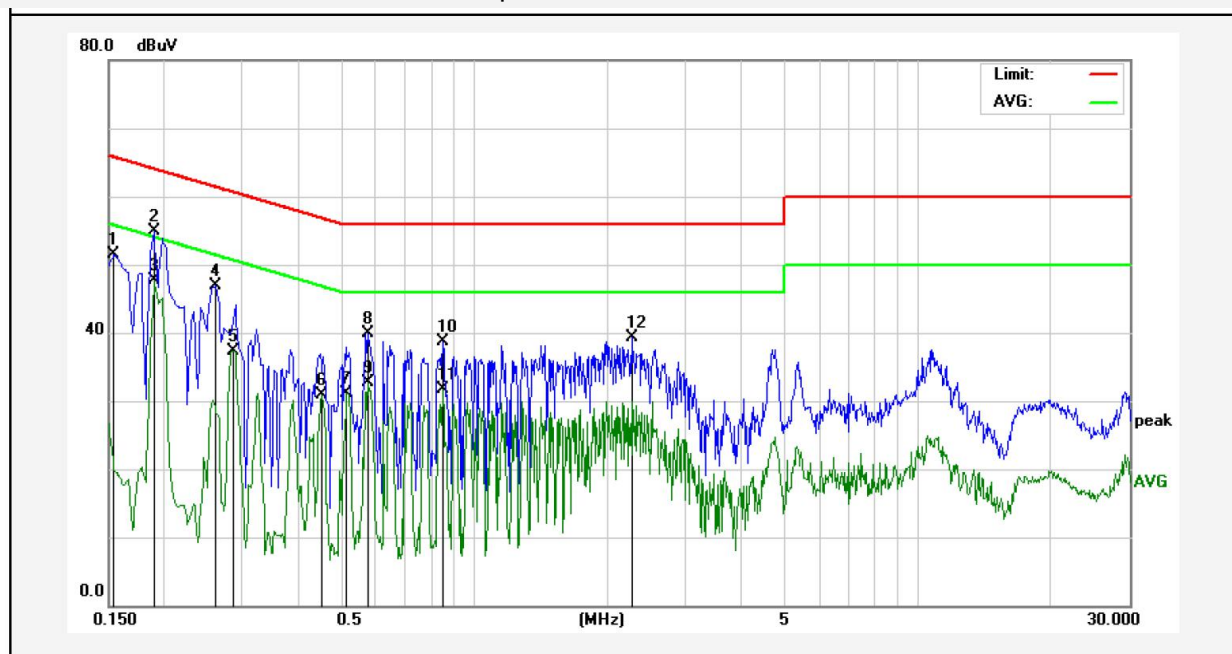
PASS

The test curves are shown in the following pages.



Power Line Conducted Test Data

Test Site: 1# Shielded Room
Test Specification: DC 59V via Air Conditioner
Comment: Live Line
Temp.: 23.9℃ Hum.: 45%



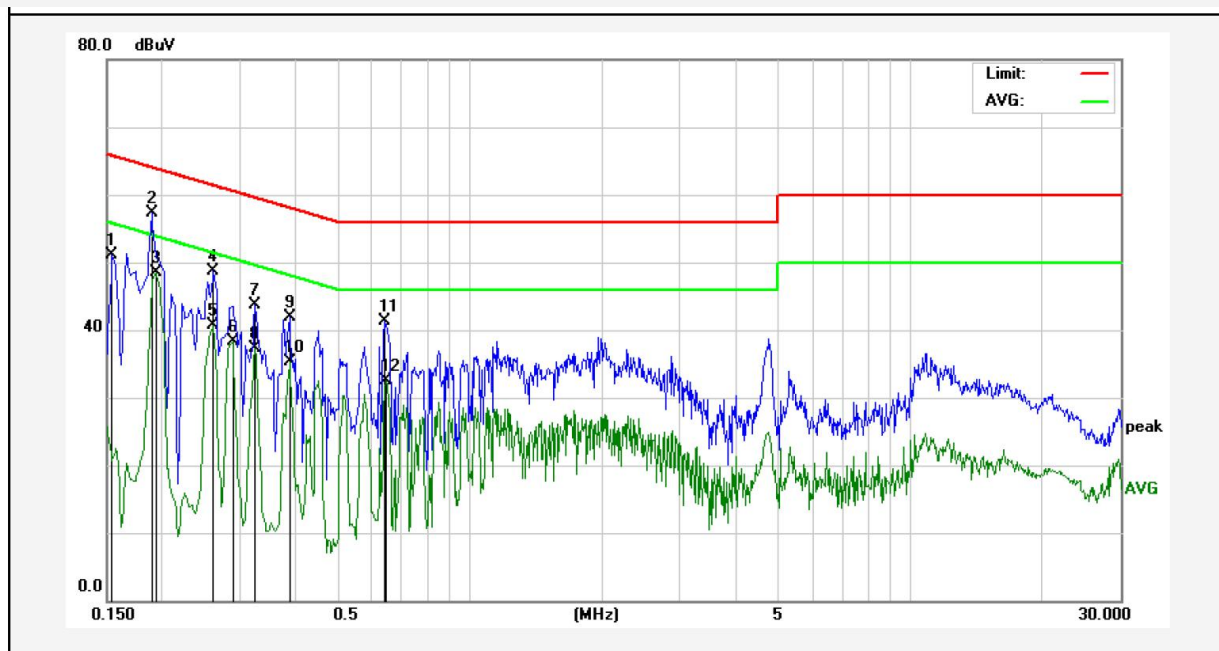
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	41.90	9.59	51.49	65.78	-14.29	QP	
2	0.1900	45.29	9.58	54.87	64.03	-9.16	QP	
3	0.1900	38.09	9.58	47.67	54.03	-6.36	AVG	
4	0.2620	37.17	9.68	46.85	61.36	-14.51	QP	
5	0.2860	27.65	9.73	37.38	50.64	-13.26	AVG	
6	0.4540	21.03	9.81	30.84	46.80	-15.96	AVG	
7	0.5180	21.30	9.84	31.14	46.00	-14.86	AVG	
8	0.5780	30.15	9.85	40.00	56.00	-16.00	QP	
9	0.5780	22.80	9.85	32.65	46.00	-13.35	AVG	
10	0.8500	28.92	9.85	38.77	56.00	-17.23	QP	
11	0.8500	21.91	9.85	31.76	46.00	-14.24	AVG	
12	2.2659	29.38	9.87	39.25	56.00	-16.75	QP	

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



Power Line Conducted Test Data

Test Site: 1# Shielded Room
Test Specification: DC 59V via Air Conditioner
Comment: Neutral Line
Temp.: 23.9℃ Hum.: 45%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	41.59	9.59	51.18	65.78	-14.60	QP	
2	0.1900	47.80	9.58	57.38	64.03	-6.65	QP	
3	0.1940	38.94	9.57	48.51	53.86	-5.35	AVG	
4	0.2620	39.00	9.68	48.68	61.36	-12.68	QP	
5	0.2620	31.04	9.68	40.72	51.36	-10.64	AVG	
6	0.2900	28.56	9.74	38.30	50.52	-12.22	AVG	
7	0.3260	33.93	9.76	43.69	59.55	-15.86	QP	
8	0.3260	27.54	9.76	37.30	49.55	-12.25	AVG	
9	0.3899	32.20	9.76	41.96	58.06	-16.10	QP	
10	0.3899	25.53	9.76	35.29	48.06	-12.77	AVG	
11	0.6419	31.40	9.84	41.24	56.00	-14.76	QP	
12	0.6460	22.60	9.84	32.44	46.00	-13.56	AVG	

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



3. Asymmetric Mode Conducted Emission at Telecom Port

3.1. Test Standard and Limit

Test Standard	EN IEC 55014-1
---------------	----------------

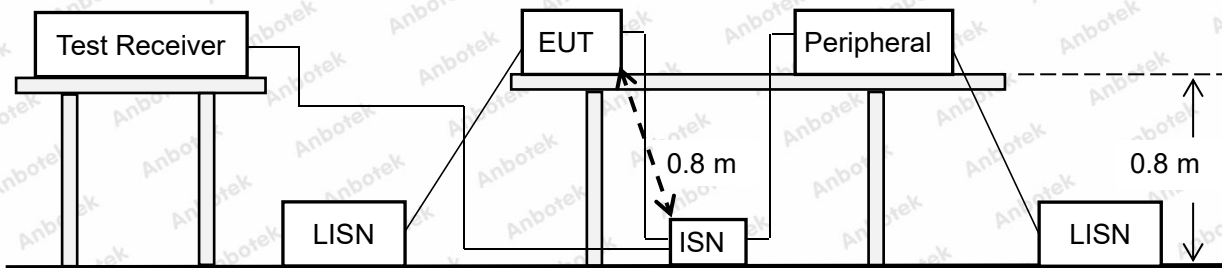
Limits for asymmetric mode conducted emissions

Frequency (MHz)	Limits (dBμV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	84.0 ~ 74.0 *	74.0 ~ 64.0 *
0.50 ~ 30.00	74.0	64.0

Remark:

The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

3.2. Test Setup



3.3. Test Procedure

The table-top EUT is placed on a non-conductive table 0.8 m above the horizontal ground reference plane, and the back of the EUT is 0.4 m away from the vertical ground reference plane, and at least 0.8 m from any other metal surface or ground plane. The floor-standing EUT is placed on an insulating support 0.1 m above the horizontal ground reference plane, at least 0.8 m away from other metal objects.

Connect EUT to the power mains through an LISN. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the center into a bundle no longer than 0.4 m, so that its length is shortened to 1 m. All the peripherals are connecting to the other LISN.



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The EUT was connected to the peripheral equipment through the ISN and linked in normal condition.

Set the test-receiver to quasi peak detect function and average detect function, and to measure the asymmetric mode conducted emission values.

3.4. Test Results

Not applicable.



4. Magnetic field induced current

4.1. Test Standard and Limit

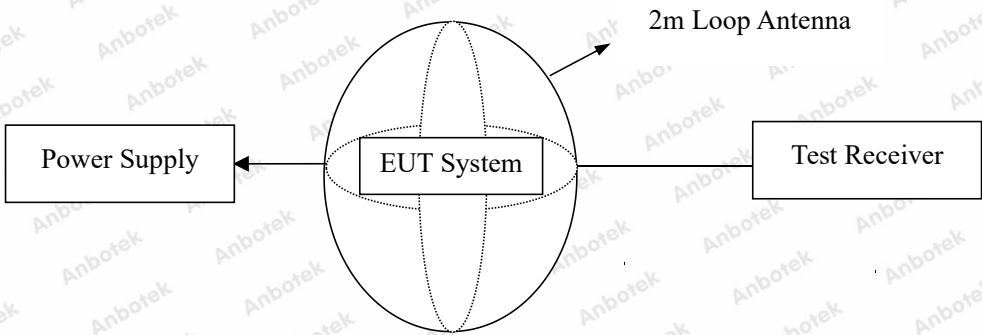
Test Standard	EN IEC 55014-1
---------------	----------------

Limits for the magnetic field induced current

Frequency (MHz)	Limits (dBμA)	
	Quasi-peak Level(Horizontal)	Quasi-peak Level(Vertical)
0.009 ~ 0.070	88	106
0.070 ~ 0.150	88~ 58 *	106~ 76 *
0.150~30.000	58~ 22 *	76~ 40 *

Remark:
The limit decreases linearly with the logarithm of the frequency in the range 0.070MHz to 30.000MHz.

4.2. Test Setup



4.3. Test Procedure

Place the test sample in the center of the three loop antenna so that each edge point of the test sample is more than 20cm away from the inner edge of the antenna. If this requirement cannot be met, please use the radiation method for testing.

Connect the tested equipment to the corresponding power supply, and connect all auxiliary equipment to the tested equipment.

4.4. Test Results

Not applicable.



5. Disturbance Power(30MHz-300MHz)

5.1. Test Standard and Limit

Test Standard	EN IEC 55014-1
---------------	----------------

☐ Disturbance power limits (General)

Frequency (MHz)	Limits (dBpW)	
	Quasi-peak Level	Average Level
30 ~ 300	45~55	35~45
Remark: (1) Increasing linearly with the frequency. (2)P=rated power of the motor only.		

☐ Disturbance power limits ($P \leq 700W$)

Frequency (MHz)	Limits (dBpW)	
	Quasi-peak Level	Average Level
30 ~ 300	45~55	35~45
Remark: (1) Increasing linearly with the frequency. (2)P=rated power of the motor only.		

☐ Disturbance power limits ($700W < P \leq 1000W$)

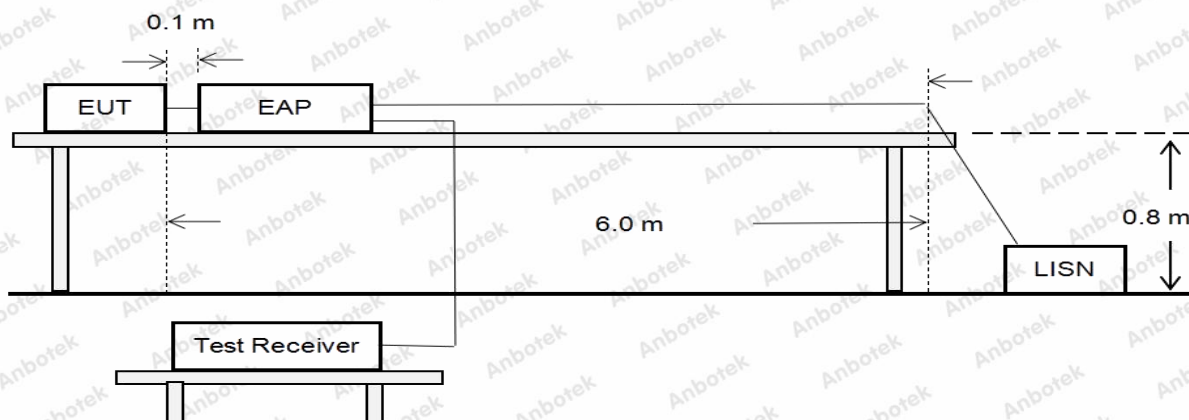
Frequency (MHz)	Limits (dBpW)	
	Quasi-peak Level	Average Level
30 ~ 300	49~59	39~49
Remark: (1) Increasing linearly with the frequency. (2)P=rated power of the motor only.		

☐ Disturbance power limits ($P > 1000W$)

Frequency (MHz)	Limits (dBpW)	
	Quasi-peak Level	Average Level
30 ~ 300	55~65	45~55
Remark: (1) Increasing linearly with the frequency. (2)P=rated power of the motor only.		



5.2. Test Setup



5.3. Test Procedure

The tabletop EUT is placed on a non-conductive workbench 0.8 m above the horizontal ground reference plane. The back of the EUT is 0.4 m away from the vertical ground reference plane and at least 0.8 m away from any other metal surface or ground plane. The floor EUT is placed on an insulated support 0.1 m above the horizontal ground reference plane, at least 0.8 m away from other metal objects.

The cable to be tested shall be clamped with electromagnetic absorption pliers, and the sample shall be placed 10cm away from the electromagnetic absorption pliers. The length of the tested cable shall be more than 6m. If the length is less than 6m, it shall be extended.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest disturbance with respect to the limit was found by investigating disturbances at a number of significant frequencies. The probable frequency of maximum disturbance had been found and that the associated cable and EUT configuration and mode of operation had been identified.

Set the test-receiver to quasi peak detect function and average detect function, and to measure the conducted emissions values.

5.4. Test Results

Not applicable.



6. Magnetic field strength (9KHz-30MHz)

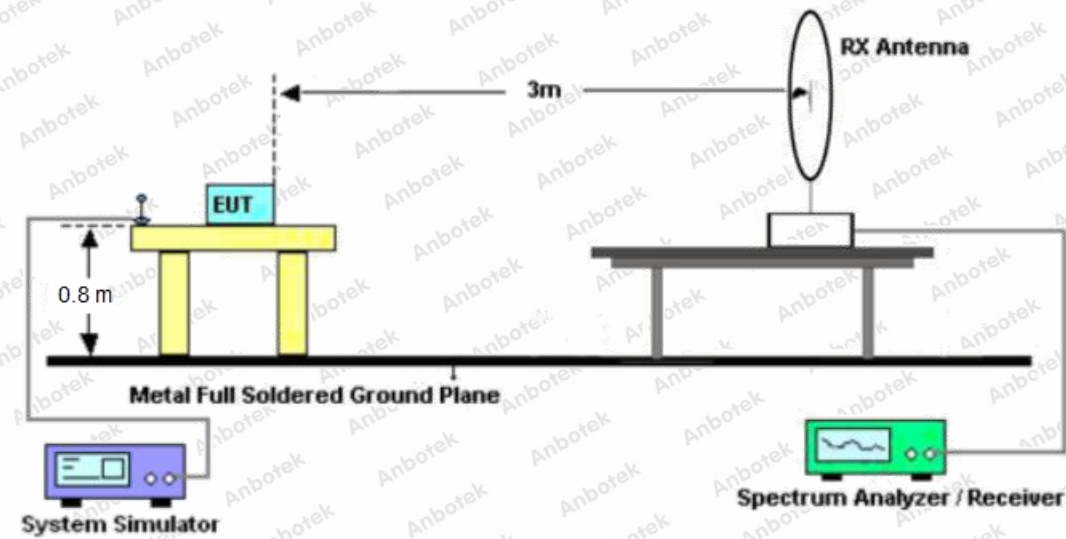
6.1. Test Standard and Limit

Test Standard	EN IEC 55014-1
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Magnetic field strength limits	
Frequency (MHz)	Limits at 3m distance (dBμA/m)
	Quasi-peak Level
0.009 ~ 0.070	69
0.070 ~ 0.150	69~ 39 *
0.150~4.000	39~ 3 *
4.000~30.000	3

Remark:
 The limit decreases linearly with the logarithm of the frequency in the range 0.070MHz to 4.000MHz.

6.2. Test Setup



6.3. Test Procedure

The table-top EUT is placed on a non-conductive table 0.8 m above the horizontal ground reference plane. The floor-standing EUT is placed on an insulating support 0.1 m above the horizontal ground reference plane.



The EUT shall be vertically above the center of the turntable, the antenna shall be 3M away from the center of the turntable, and the lower edge of the antenna shall be more than 1m away from the horizontal reference ground plane.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

In the test frequency range of 0.009mhz-0.15mhz, the analytical bandwidth of the receiver is set to 200Hz, and in the test frequency range of 0.15mhz-30mhz, the analytical bandwidth of the receiver is set to 9KHz.

6.4. Test Results

Not applicable.



7. Radiated Emission Test (Below 1 GHz)

7.1. Test Standard and Limit

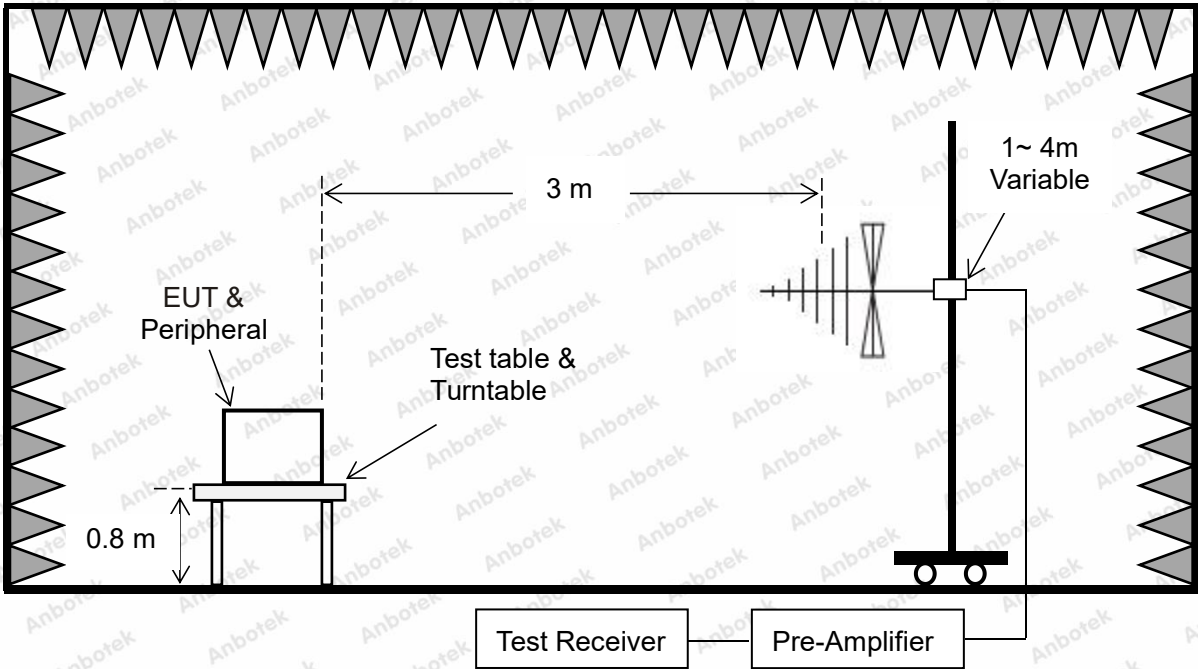
Test Standard	EN IEC 55014-1
---------------	----------------

Limit for radiated emissions at frequencies up to 1 GHz

Frequency (MHz)	Distance (Meters)	Field Strengths Limit (dBμV/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Remark: The lower limit shall apply at the transition frequencies.

7.2. Test Setup



7.3. Test Procedure

The table-top EUT is placed on a non-conductive table 0.8 m above the horizontal ground reference plane. The floor-standing EUT is placed on an insulating support 0.1 m above the horizontal ground reference plane.

The EUT was set 3 m away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 m to find out the maximum emission level.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

The bandwidth of the Receiver is set at 120 kHz.

7.4. Test Results

PASS

The test curves are shown in the following pages.



Test item: Radiation Test Polarization: Horizontal
Standard: (RE)EN IEC 55014-1 Power Source: DC 59V via Air Conditioner
Frequency Range: 30MHz ~ 1000MHz Temp.(°C)/Hum.(%RH): 22.6(°C)/56%RH
Distance: 3m Test Mode: Charging

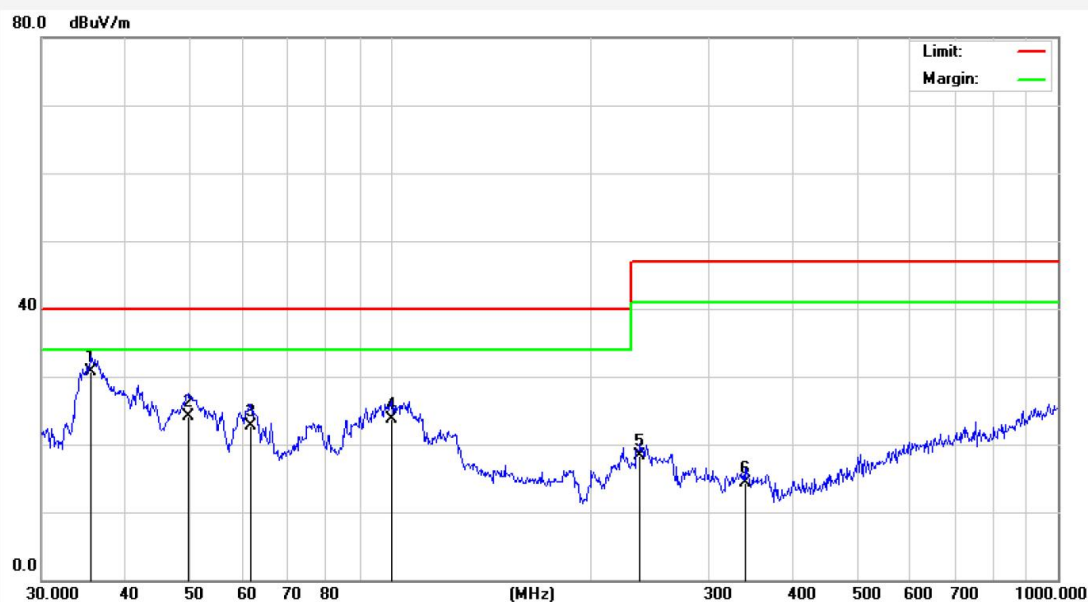


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	40.5591	41.59	-15.94	25.65	40.00	-14.35	QP			
2	50.7637	42.76	-16.05	26.71	40.00	-13.29	QP			
3	59.4405	40.66	-17.50	23.16	40.00	-16.84	QP			
4	129.0146	47.29	-22.64	24.65	40.00	-15.35	QP			
5	317.7010	34.96	-16.75	18.21	47.00	-28.79	QP			
6	750.1082	31.87	-9.23	22.64	47.00	-24.36	QP			

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



Test item: Radiation Test Polarization: Vertical
Standard: (RE)EN IEC 55014-1 Power Source: DC 59V via Air Conditioner
Frequency Range: 30MHz ~ 1000MHz Temp.(°C)/Hum.(%RH): 22.6(°C)/56%RH
Distance: 3m Test Mode: Charging

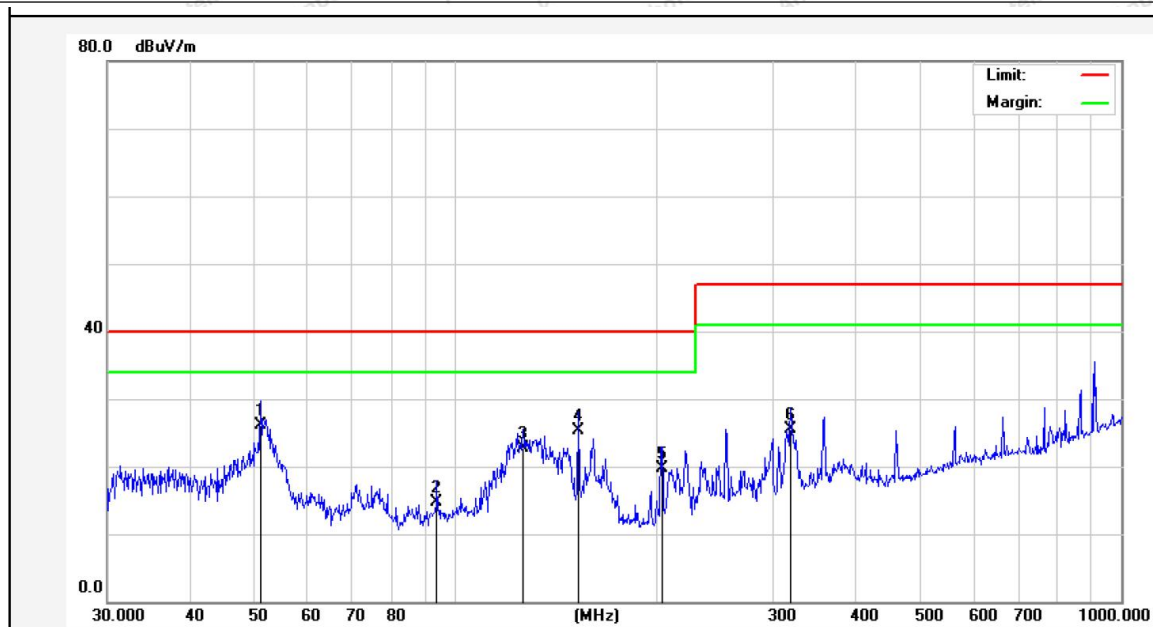


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	35.6240	47.57	-16.82	30.75	40.00	-9.25	QP			
2	49.7068	39.89	-15.73	24.16	40.00	-15.84	QP			
3	61.7781	40.84	-18.13	22.71	40.00	-17.29	QP			
4	100.5806	40.31	-16.67	23.64	40.00	-16.36	QP			
5	236.6447	36.65	-18.39	18.26	47.00	-28.74	QP			
6	339.5887	29.54	-15.27	14.27	47.00	-32.73	QP			

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



Test item: Radiation Test Polarization: Horizontal
Standard: (RE)EN IEC 55014-1 Power Source: DC 50.4V
Frequency Range: 30MHz ~ 1000MHz Temp.(°C)/Hum.(%RH): 22.6(°C)/56%RH
Distance: 3m Test Mode: Discharging

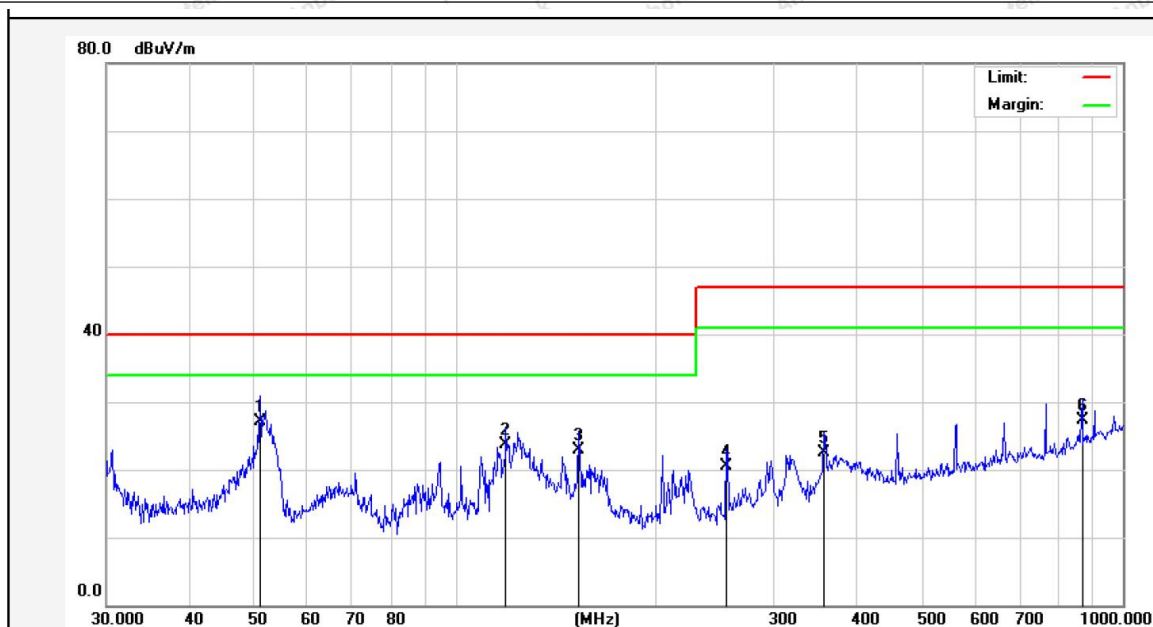


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	50.9420	42.29	-16.12	26.17	40.00	-13.83	QP			
2	93.7685	36.63	-21.90	14.73	40.00	-25.27	QP			
3	126.3285	45.80	-23.04	22.76	40.00	-17.24	QP			
4	153.2004	48.56	-23.22	25.34	40.00	-14.66	QP			
5	204.2375	41.90	-22.26	19.64	40.00	-20.36	QP			
6	318.8170	42.15	-16.72	25.43	47.00	-21.57	QP			

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



Test item: Radiation Test Polarization: Vertical
Standard: (RE)EN IEC 55014-1 Power Source: DC 50.4V
Frequency Range: 30MHz ~ 1000MHz Temp.(°C)/Hum.(%RH): 22.6(°C)/56%RH
Distance: 3m Test Mode: Discharging



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	50.9420	43.28	-16.12	27.16	40.00	-12.84	QP			
2	119.0180	43.52	-19.76	23.76	40.00	-16.24	QP			
3	152.6639	44.92	-21.98	22.94	40.00	-17.06	QP			
4	254.7281	38.24	-17.78	20.46	47.00	-26.54	QP			
5	356.6757	37.36	-14.93	22.43	47.00	-24.57	QP			
6	869.1299	34.32	-7.00	27.32	47.00	-19.68	QP			

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



8. Radiated Emission Test (Above 1GHz)

8.1. Test Standard and Limit

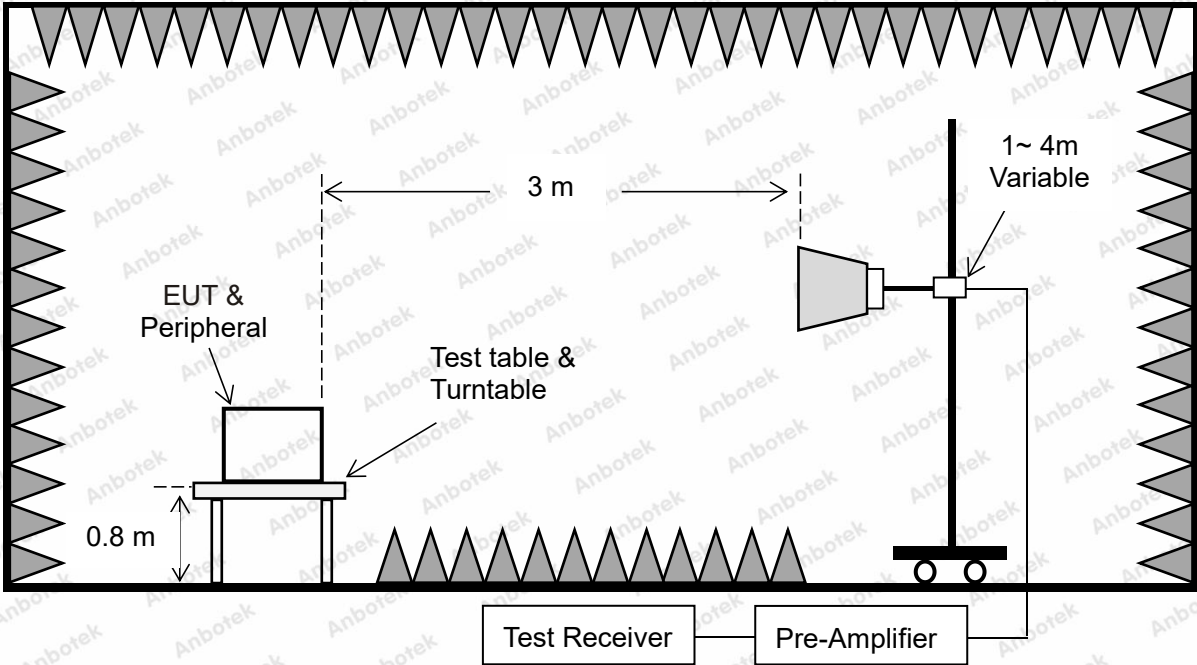
Test Standard	EN IEC 55014-1
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Limit for radiated emissions at frequencies above 1 GHz

Frequency (MHz)	Distance (Meters)	Field Strengths Limit (dBμV/m)	
		Peak	Average
1000 ~ 3000	3	70	50
3000 ~ 6000	3	74	54

Remark: The lower limit shall apply at the transition frequencies.

8.2. Test Setup



8.3. Test Procedure

The table-top EUT is placed on a non-conductive table 0.8 m above the horizontal ground reference plane. The floor-standing EUT is placed on an insulating support 0.1 m above the horizontal ground reference plane.

The EUT was set 3 m away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 m to find out the maximum emission level.



The turntable can rotate 360 degree to determine the position of the maximum emission level.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

The test receiver is set to peak and average detects function.

The bandwidth of the test receiver is set at 1MHz.

8.4. Test Results

Not applicable.

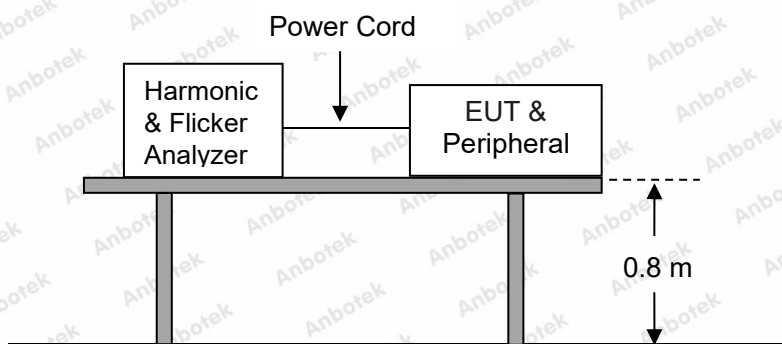


9. Harmonic Current Test

9.1. Test Standard

Test Standard:	EN IEC 61000-3-2
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9.2. Test Setup



9.3. Test Procedure

The table-top EUT is placed on the top of a wooden table 0.8 m above the ground (0.1 m for the floor-standing EUT) and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the necessary for the EUT to be exercised.

9.4. Test Results

Not applicable.

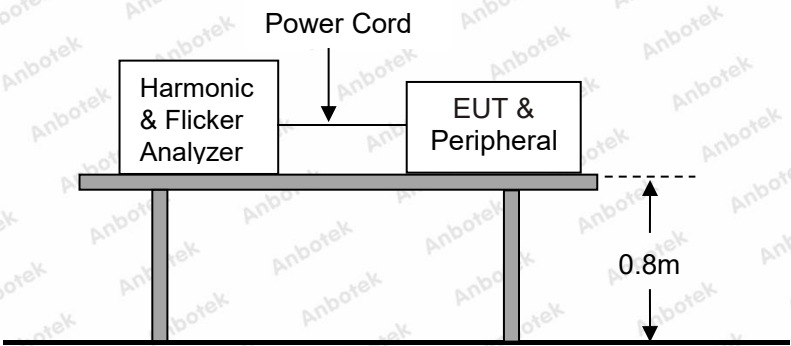


10. Voltage Fluctuations & Flicker Test

10.1. Test Standard

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

10.2. Test Setup



10.3. Test Procedure

The table-top EUT is placed on the top of a wooden table 0.8 m above the ground (0.1 m for the floor-standing EUT) and operated to produce the most unfavorable sequence of voltage changes under normal conditions during the flicker measurement. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

10.4. Test Results

Not applicable.

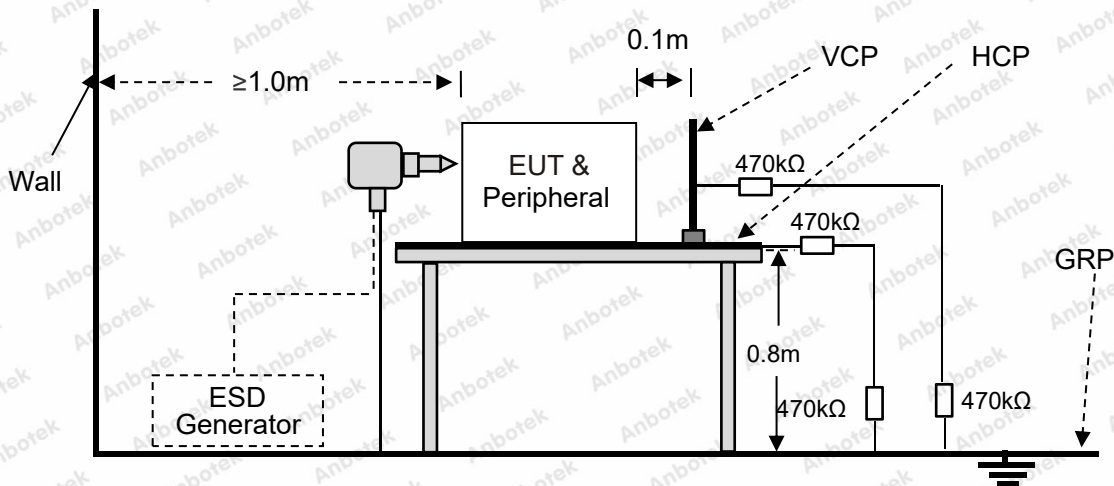


11. Electrostatic Discharge Immunity Test

11.1. Test Specification

Test Standard :	EN IEC 55014-2	
Basic standard :	IEC 61000-4-2: 2008	
Performance criteria:	B or C(Performance criterion C may be applied to toys not using score or data entered by the user)	
Test Level :	± 8kV (Air Discharge)	± 4kV (Contact Discharge)

11.2. Test Setup



11.3. Test Procedure

a. In the case of air discharge testing, the climatic conditions shall be within the following ranges:

- Ambient temperature: 15°C to 35°C;
- Relative humidity: 30% to 60%;
- Atmospheric pressure: 86 kPa (860 mbar) to 106 kPa (1060 mbar)

b. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

c. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted: - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate. - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge. - The contact discharge test shall not be applied to such surfaces.



d. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retrigged for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

e. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final test level should not exceed the product specification value in order to avoid damage to the equipment.

f. The test shall be performed with both air discharge and contact discharge. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied. For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

g. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.

11.4. Test Results

PASS

Please refer to the following page.



Electrostatic Discharge Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	Temperature:	22.6℃
Power Supply:	DC 59V via Air Conditioner / DC 50.4V	Humidity:	50%
Location		Kind A-Air Discharge C-Contact Discharge	Result
Air discharge: ± 2.0 kV, ± 4.0 kV, ± 8.0 kV		Contact discharge: ± 4.0 kV	
Slot	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Button	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Light	4 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
USB Port	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Type-C Port	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
HCP	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
VCP of the front	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
VCP of the rear	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
VCP of the left	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
VCP of the right	4 points	C	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Note: N/A			

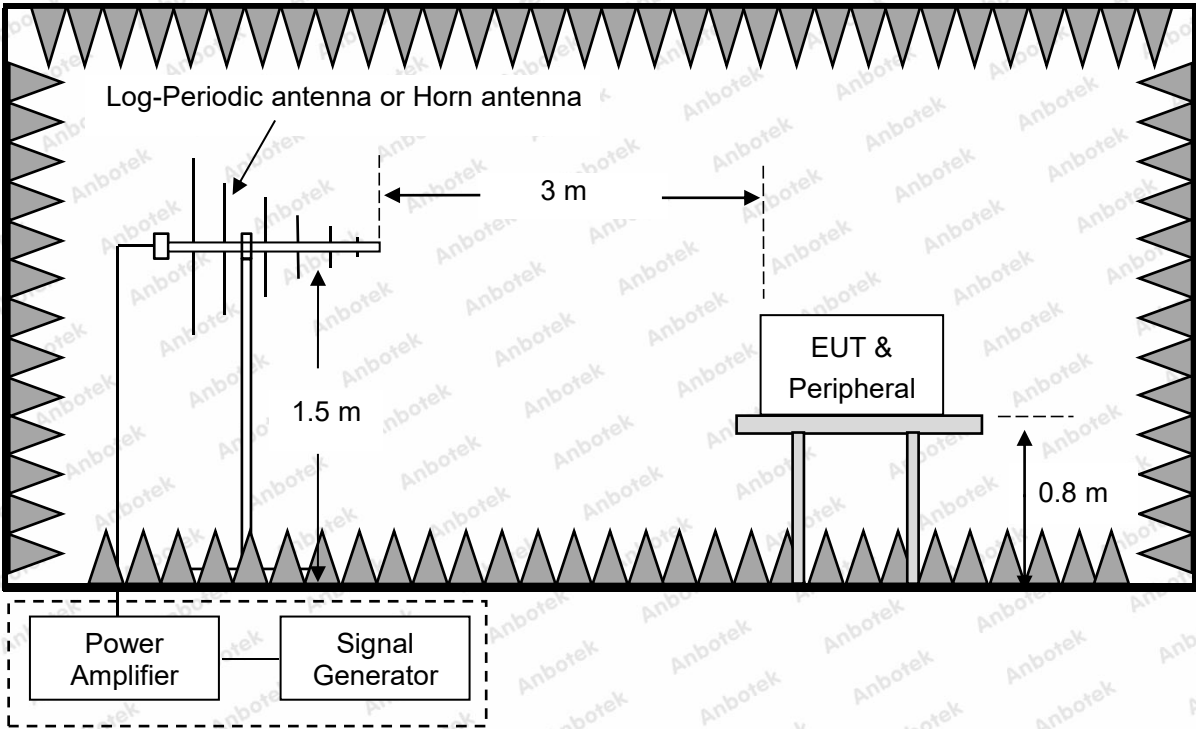


12. RF Field Strength Immunity Test

12.1. Test Specification

Test Standard:	EN IEC 55014-2	
Basic standard:	IEC 61000-4-3: 2020	
Performance criteria:	A	A
Frequency Range:	<input checked="" type="checkbox"/> 80MHz to 1000MHz	or <input type="checkbox"/> 80MHz-6GHz(Note)
Test level:	3 V/m	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	
Note: When the electronic control circuit with the highest clock frequency greater than 200 MHz is included, it is required to test 80MHz-6GHz.		

12.2. Test Setup



12.3. Test Procedure

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

a. The antenna is placed 3 m from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the antenna.

b. The test shall normally be performed with the generating antenna facing each side of the EUT. When equipment can be used in different orientations (i.e. vertical or horizontal) all sides shall be exposed to the field during the test. When technically justified, some EUTs can be tested by exposing fewer faces to the generating antenna. In other cases, as determined for example by the type and size of EUT or the frequencies of test, more than four azimuths may need to be exposed.

c. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.

d. The step size of the frequency is set to 1%. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time should not exceed 5 s at each of the frequencies during the scan.

12.4. Test Results

PASS

Please refer to the following page.



RF Field Strength Susceptibility Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		Temperature:	23.4℃	
Power Supply:	DC 59V via Air Conditioner / DC 50.4V		Humidity:	52%	
Frequency Range	Antenna Polarity	R.F. Field Strength	Dwell Time	Azimuth	Result
80 MHz ~ 1000 MHz	H / V	3 V/m	1s	Front	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
				Rear	
				Left	
				Right	
1GHz-6GHz	H / V	3 V/m	1s	Front	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
				Rear	
				Left	
				Right	
Note: N/A					



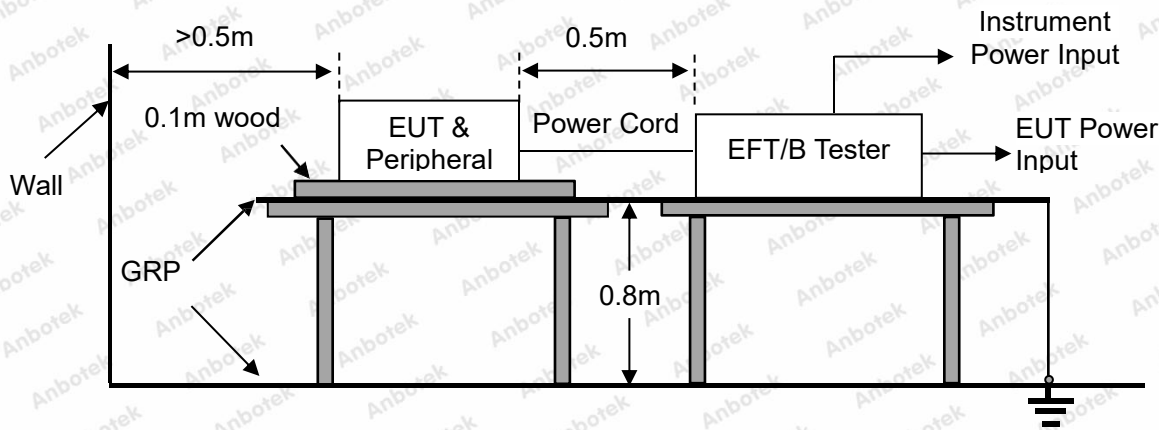
13. Electrical Fast Transient/Burst Immunity Test

13.1. Test Specification

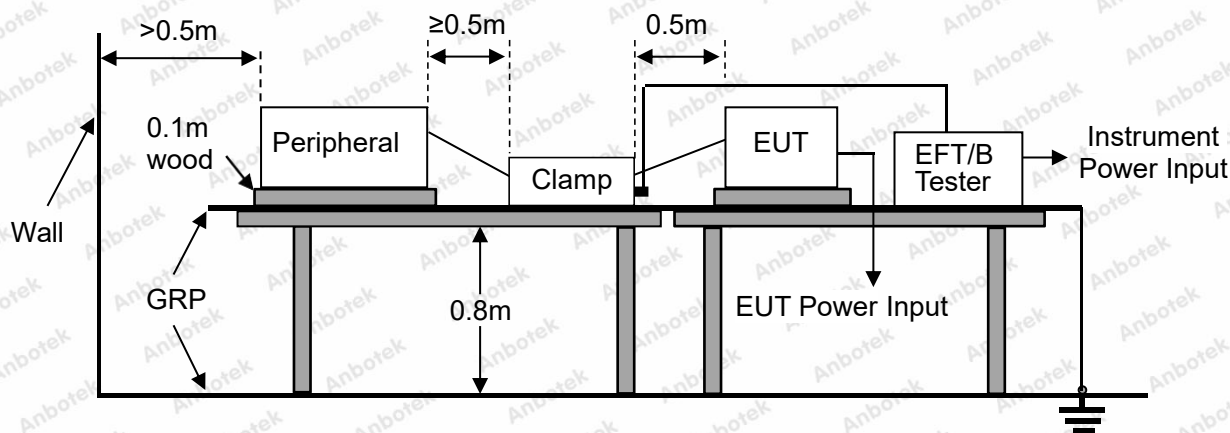
Test Standard:	EN IEC 55014-2
Basic standard:	IEC 61000-4-4: 2012
Performance criteria:	B
Test Level:	<input type="checkbox"/> 1 kV, AC mains power ports
	<input checked="" type="checkbox"/> 0.5 kV, DC network power ports
	<input type="checkbox"/> 0.5 kV, Signal ports

13.2. Test Setup

AC mains power ports and DC network power ports:



Analogue/digital data ports:



13.3. Test Procedure

The table-top EUT is placed on a table that is 0.8 m height, a ground reference plane is placed on the table, and uses 0.1 m insulation between the EUT and ground reference plane. The floor-standing EUT is placed on a ground reference plane and insulated from it by an insulating support with a thickness of 0.1 m. This reference ground plane shall project beyond the EUT by at least 0.1 m 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 0.5 m.

All cables to the EUT shall be placed on the insulation support 0.1 m above the ground reference plane. Cables not subject to electrical fast transients shall be routed as far as possible from the cable under test to minimize the coupling between the cables.

13.4. Test Results

Not applicable.

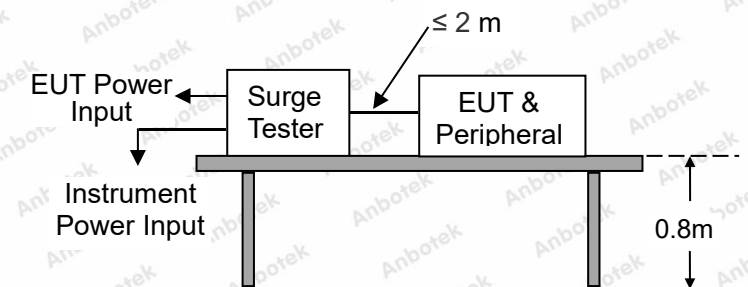


14. Surge Immunity Test

14.1. Test Specification

Test Standard:		EN IEC 55014-2
Basic standard:		IEC 61000-4-5: 2014+A1:2017
Test level	DC power port:	<input type="checkbox"/> 0.5kV, Line to Ground, Criterion B
	Shielded port or Line:	<input type="checkbox"/> 0.5kV, Shield to Ground, Criterion B
	Unshielded port or Line:	<input type="checkbox"/> 0.5kV, Line to Ground, Criterion B
Number of surges		5 (for each combination of parameters)
Repetition rate		1 minute / time
Polarity:		Positive / Negative
Phase angle:		90°, 270°

14.2. Test Setup



14.3. Test Procedure

Table-top EUT is placed on a table of 0.8 m heights above a metal ground reference plane. Floor standing EUT is placed on a ground reference plane and insulated from it by an insulating support with a thickness of 0.1 m. The length of the power cord between the EUT and the coupling/decoupling network is not more than 2 m, and the length of the interconnection line between the EUT and the coupling/decoupling network is not more than 2 m. The tests were done at repetition rate 1 per minute.

14.4. Test Results

Not applicable.



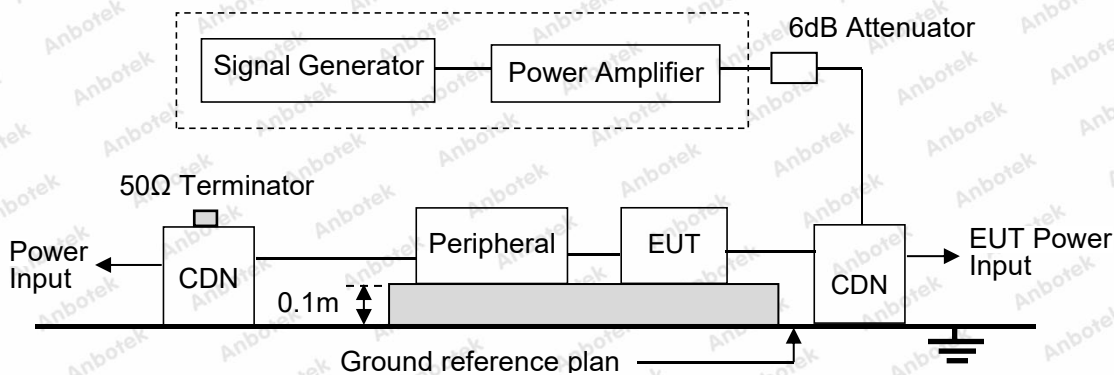
15. Injected Currents Susceptibility Test

15.1. Test Specification

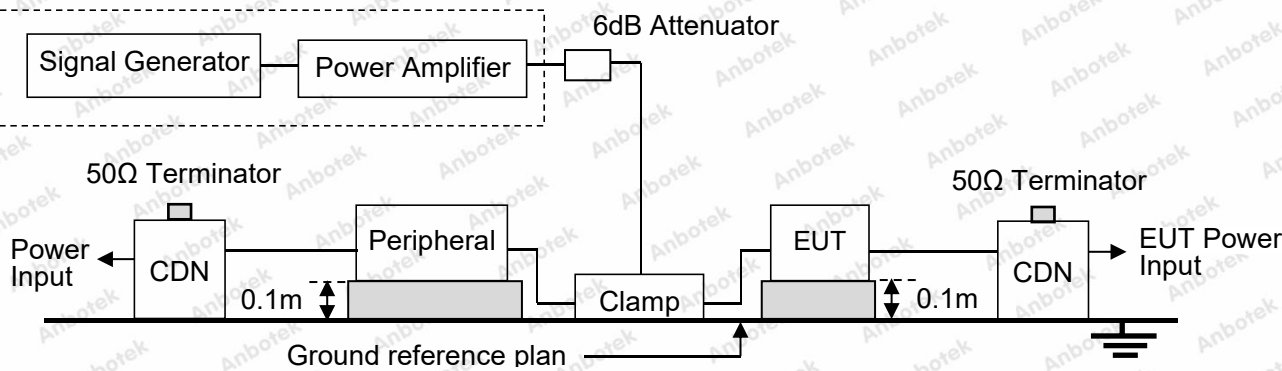
Test Standard:	EN IEC 55014-2
Basic standard:	IEC 61000-4-6: 2013
Performance criteria:	A
Frequency range:	0.15MHz to 80MHz
Test level:	1V
Modulation:	AM 80%, 1kHz sine-wave
Frequency Step:	1% of fundamental

15.2. Test Setup

CDN injection:



Clamp injection:



15.3. Test Procedure

- a. The EUT and peripheral are placed on an insulating support of 0.1 m height above a ground reference plan. The distance between EUT and CDN is 0.1 m to 0.3 m. All cables exiting the EUT are supported at a height of at least 30 mm above the ground reference plan.
- b. The frequency range is swept from 150 kHz to 80MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. The frequency range is swept incrementally. The step size was 1% of fundamental from 0.15MHz to 80MHz.
- c. The dwell time at each frequency isn't less than the time necessary for the EUT to be able to respond.

15.4. Test Results

Not applicable.



APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Power Line Conducted Emission Test

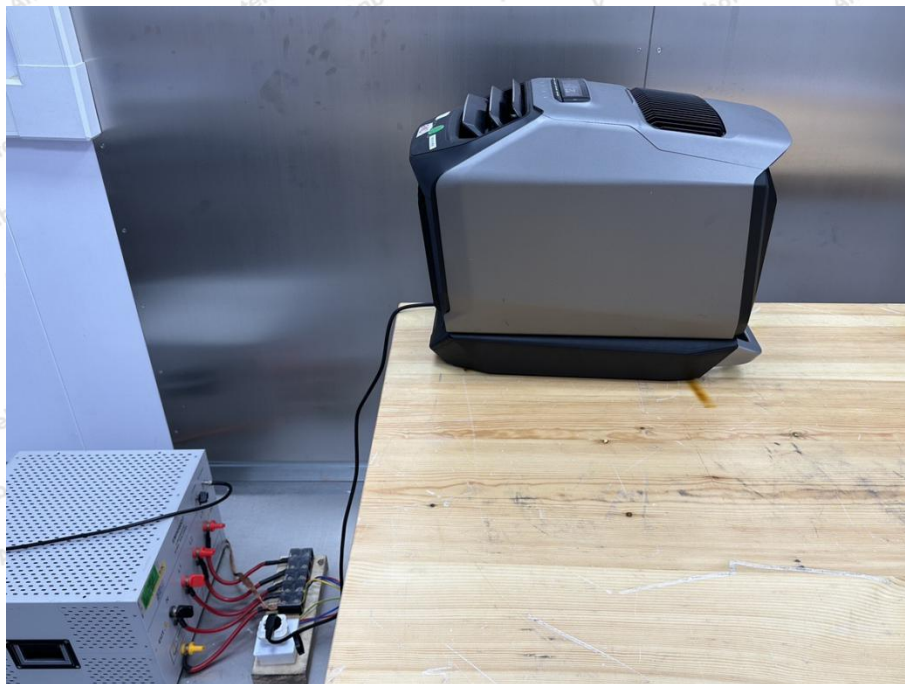


Photo of Radiated Emission Test (Below 1 GHz)



Photo of Electrostatic Discharge Immunity Test

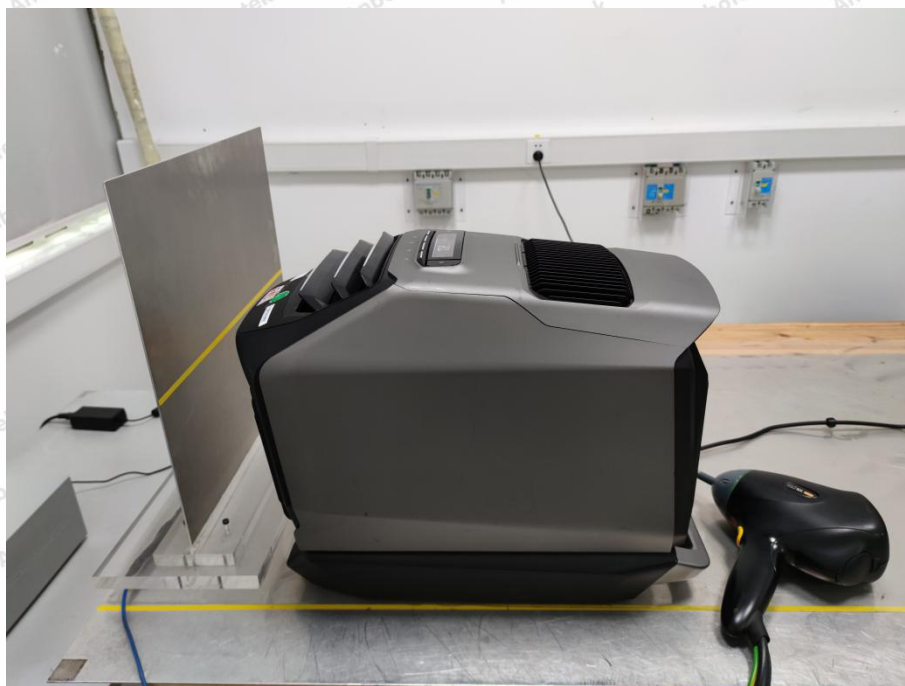
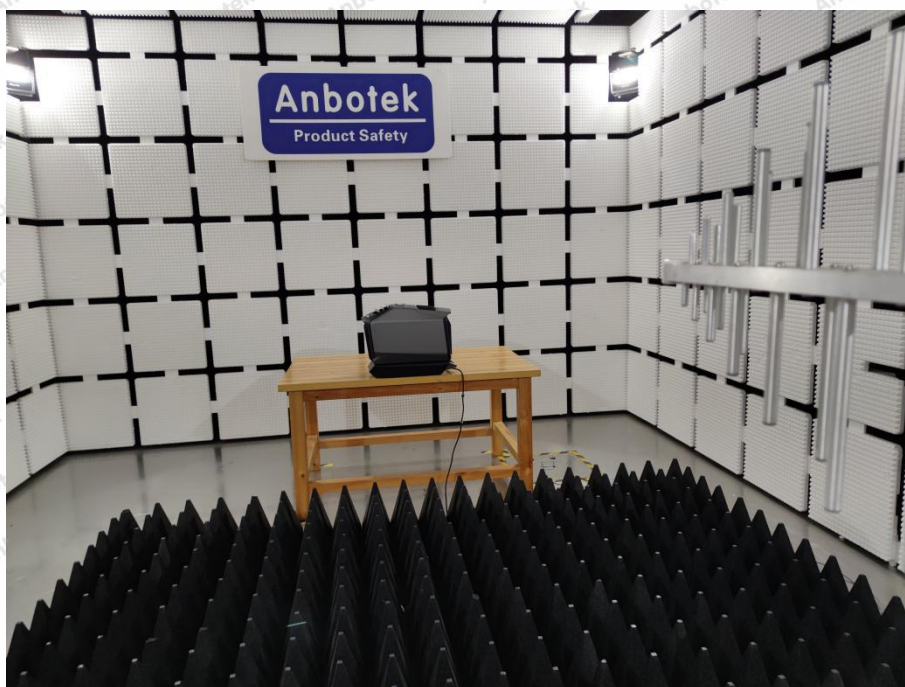


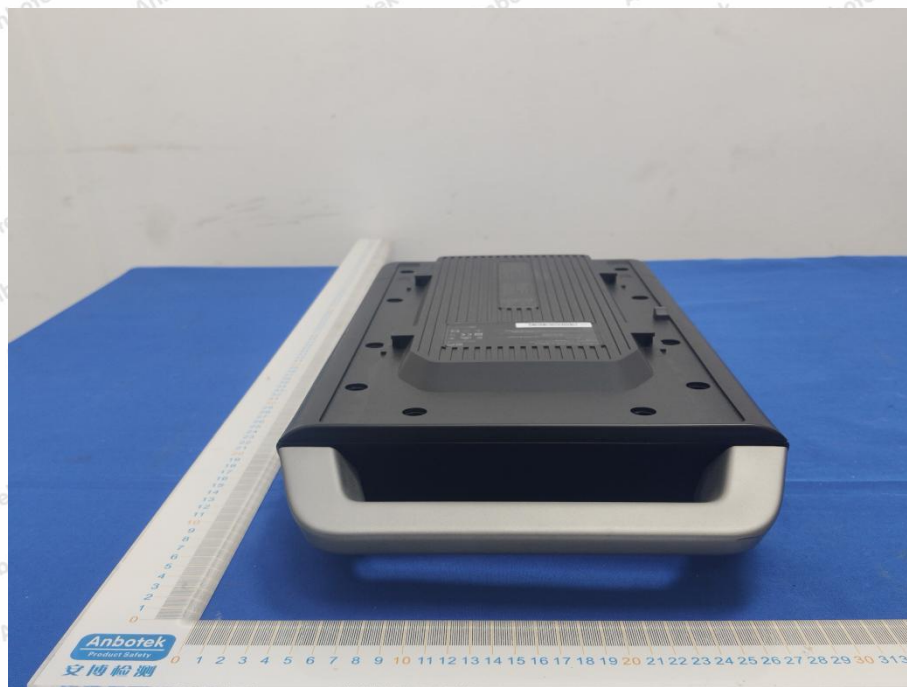
Photo of RF Field Strength Immunity Test

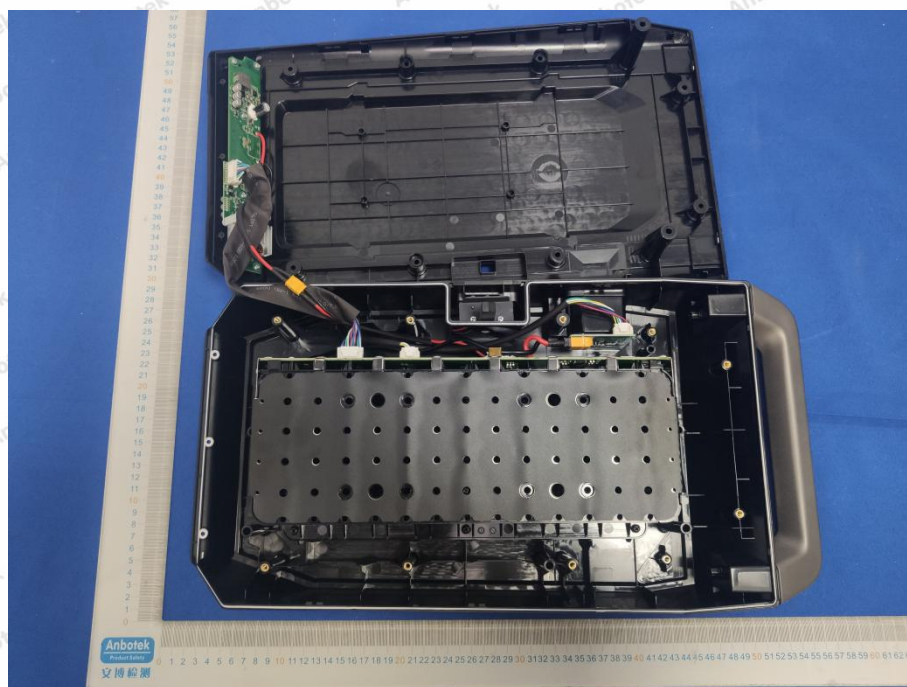


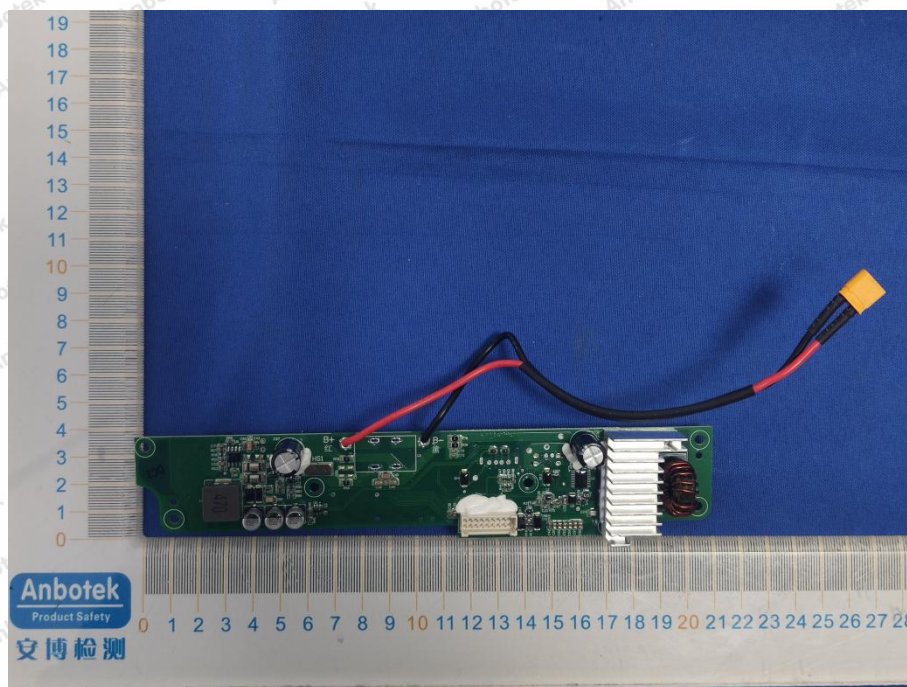
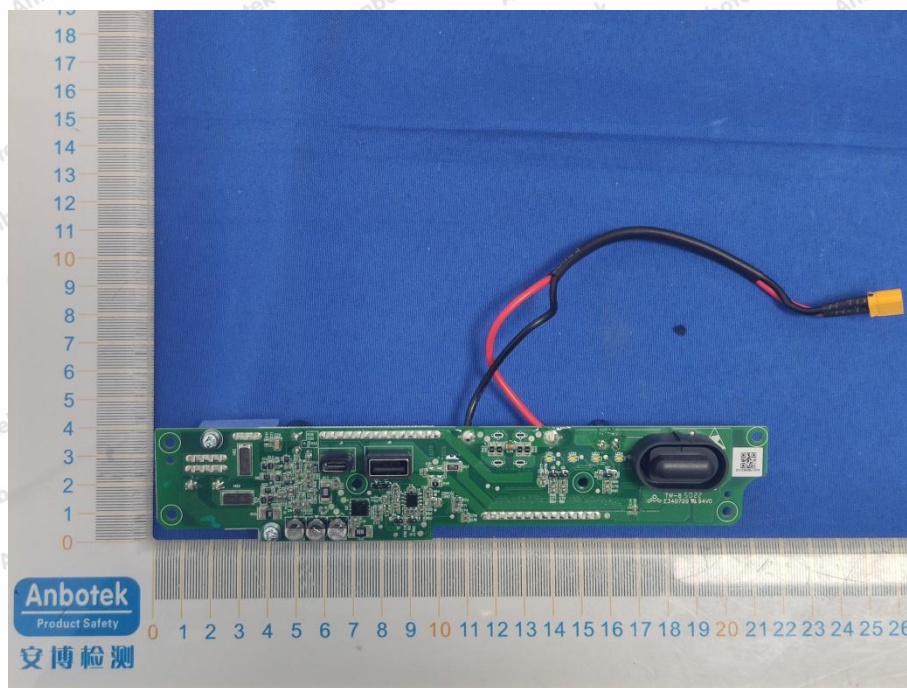
APPENDIX II -- Photo documentation











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 -----

