

EMC Test Report

Client Name : EcoFlow Inc.

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

Product Name : Portable Fridge

Report Date : Feb. 03, 2023

Shenzhen Anbotech Compliance Laboratory Limited



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TEST REPORT

Applicant : EcoFlow Inc.
Manufacturer : EcoFlow Inc.
Product Name : Portable Fridge
Model No. : EFBX100
Trade Mark : 
Rating(s) : Please refer to page 13

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; 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 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 Anbotech Compliance Laboratory Limited.

Date of Receipt:

Jan. 04, 2023

Date of Test:

Jan. 04 ~ 16, 2023

Prepared By:



(Ella Liang)

Approved & Authorized Signer:



(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 Fridge
Model No.	:	EFBX100
Trade Mark	:	 ECOFLOW
Test Power Supply	:	AC 230V, 50Hz for Adapter/ DC 11-60V
Test Sample No.	:	1-2-1(Normal Sample)
Adapter	:	Model: KT180A2900620M2 Input: 100-240V~50/60Hz 2.5A Output: 29.0~ 6.2A 179.8W
Remark: (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2)The rated voltage of the product is DC 11-60V, only DC 12V/ DC 58V for Solar powered, DC 12V/ DC 24V for Car charger is selected for testing.		



1.3. Product Type

<input type="checkbox"/> Category I: equipment containing no electronic control circuitry
<input type="checkbox"/> Category II: mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz
<input 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 checked="" 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

Description	Rating(s)
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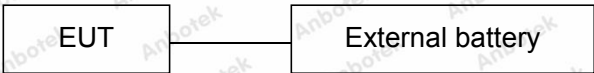
1.5. Description of Test Mode

Pretest Mode	Description
Mode 1	Adapter+Working+ice making+External battery Mode
Mode 2	Working+ice making+External battery Mode (DC 12V/ DC 58V Solar powered)
Mode 3	Working+ice making+External battery Mode (DC 12V/ DC 24V Car charger)
Mode 4	Adapter+Working+ice making Mode

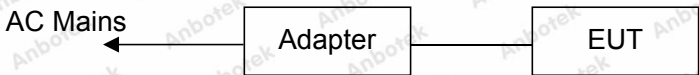
For Mode 1 Block Diagram of Test Setup



For Mode 2, Mode 3 Block Diagram of Test Setup



For Mode 4 Block Diagram of Test Setup



1.6. Test Summary

Test Items	Test Mode	Status
Power Line Conducted Emission Test	Mode 1, 4	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)	All Mode	P
Harmonic Current Test	Mode 1	P
Voltage Fluctuations & Flicker Test	Mode 1	P
Electrostatic Discharge Immunity Test	All Mode	P
RF Field Strength Immunity Test	All Mode	P
Electrical Fast Transient/Burst Immunity Test	Mode 1, 4	P
Surge Immunity Test	Mode 1, 4	P
Injected Currents Susceptibility Test	Mode 1, 4	P
Power frequency Magnetic Field Immunity Test	/	N
Voltage Dips and Interruptions Immunity Test	Mode 1, 4	P
Discontinuous Disturbances/Clicks Emission Test	Mode 1	P
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 Inducted 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.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A
3.	EMI Preamplifier	SKET Electronic	LNPA-0118G -45	SKET-PA-0 02	Oct. 13, 2022	1 Year
4.	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	N5182A	MY48180656	Oct. 13, 2022	1 Year
2.	Amplifier	Micotoop	MPA-80-100 0-250	MPA1903096	Oct. 23, 2022	1 Year
3.	Amplifier	Micotoop	MPA-1000-6 000-100	MPA1903122	Oct. 23, 2022	1 Year
4.	Log-Periodic Antenna	Schwarzbeck	VULP9118E	00992	N/A	N/A
5.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year
6.	Power Sensor	Agilent	E9301A	MY41498906	Oct. 23, 2022	1 Year
7.	Power Sensor	Agilent	E9301A	MY41498088	Oct. 23, 2022	1 Year
8.	Power Meter	Agilent	E4419B	GB40202909	Oct. 23, 2022	1 Year
9.	Electric field Probe	Narda	EP 601	811ZX10351	Oct. 23, 2022	1 Year
10.	RS Test software	EMtrace	EM 3	V1.1.7	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.	EFT-Clamp	PRIM	EFT-Clamp	/	Oct. 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

☒ Voltage Dips and Interruptions Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	CYCLE SAG Simulator	PRIMA	DRP61011A G	PR12046234	Oct. 23, 2022	1 Year

☒ Discontinuous Disturbances/Clicks Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-14-001	101782	1	2023-5-27
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	1	2023-5-27

Remark: This test item is subcontracted to TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch



1.8. 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

Rating(s):

EcoFlow Glacier

Portable Fridge/Mobiler K hlschrank

Model/Mod le/Modell: EFBX100

Refrigerant/Amount/K ltemittel/Menge: R600a/30g

Adapter Input/Output/Netzadapter Eingang/Ausgang: 100-240V~ 50/60Hz 2.5A/29V=6.2A MAX

Solar Charging Input/Solarladeeingang: 11-60V=13A MAX 240W MAX


Climate Type/Klimaklasse: SN/NT/T

Foaming Agent/D mmschaum: Cyclopentane/Cyclopentan


Noise Level/G r uschpegel: <42dB

IP Rating/IP-Bewertung: IPX5

Weight/Gewicht: 23kg





EcoFlow APP



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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.



2. Power Line Conducted Emission Test

2.1. Test Standard and Limit

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

☒ General Limits (Mains ports -Disturbance voltage)

Frequency (MHz)	Limits (dBμV)	
	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 (dBμV)	
	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 ~ 0.5	66~59	59~49
0.5 ~ 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 ~ 0.5	70~63	63~53
0.5 ~ 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)

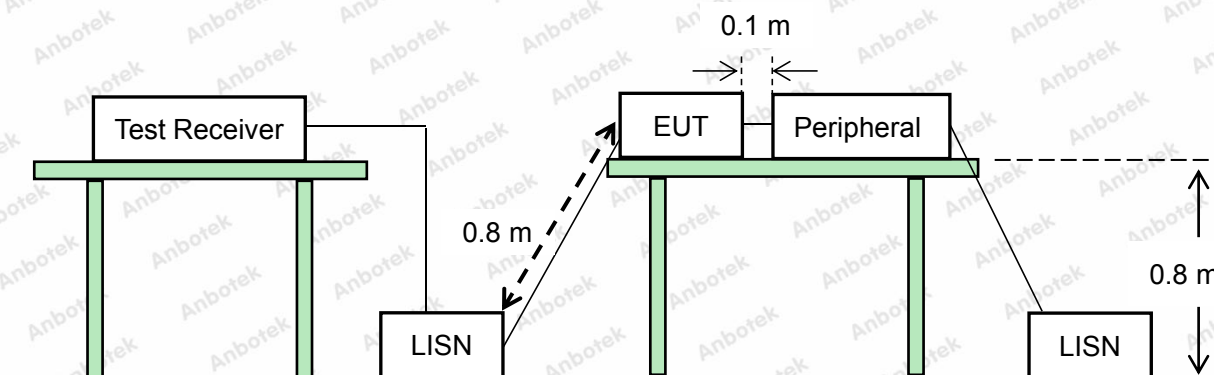
Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.5	76~69	69~59
0.5 ~ 5.0	69	59
5.0~ 30	74	64

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

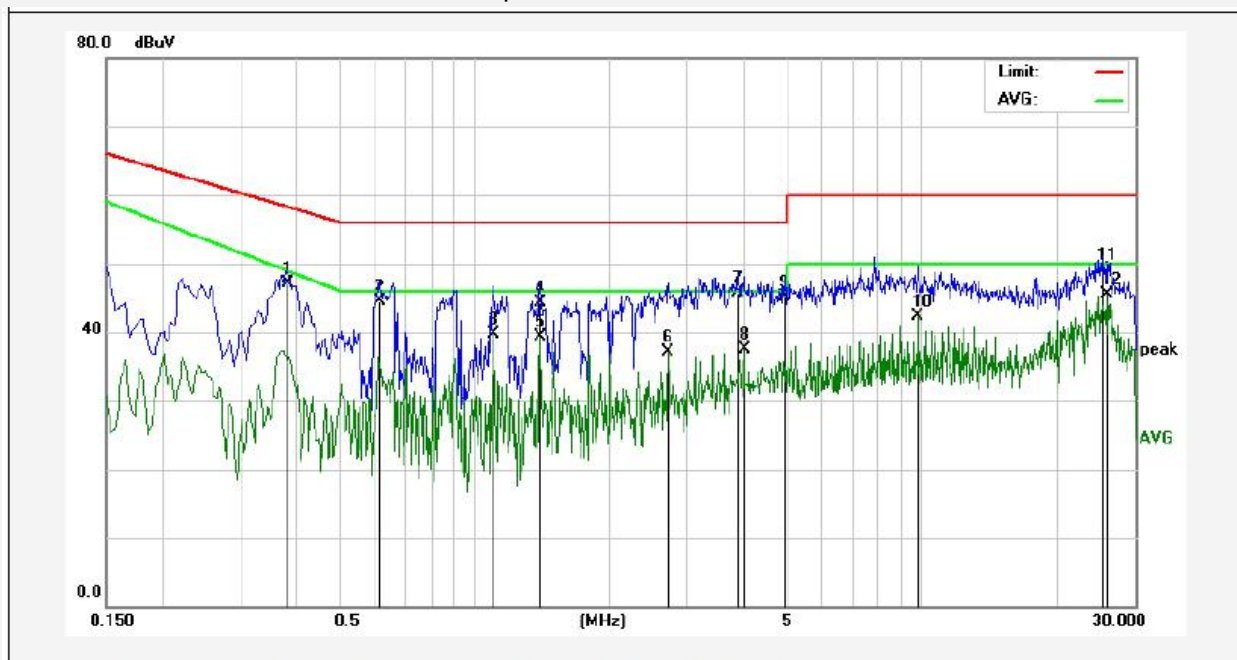
During the test, pre-scan all modes, only the worst case is recorded in the report.

The test curves are shown in the following pages.



Power Line Conducted Test Data

Test Site: 1# Shielded Room
Test Mode: Mode 1
Test Specification: AC 230V, 50Hz for adapter
Comment: Live Line
Temp.: 22.1°C Hum.: 51%



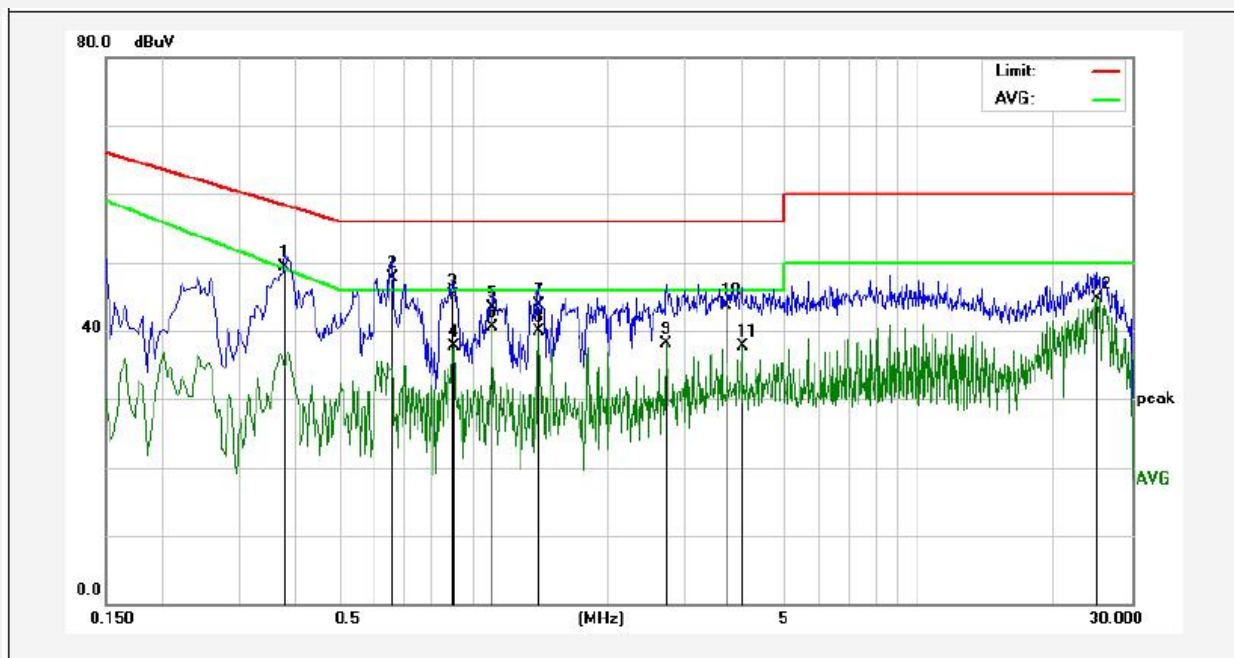
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.3820	37.39	9.76	47.15	58.23	-11.08	QP	
2	0.6140	34.60	9.85	44.45	56.00	-11.55	QP	
3	1.1060	29.95	9.85	39.80	46.00	-6.20	AVG	
4	1.4060	34.40	9.85	44.25	56.00	-11.75	QP	
5	1.4060	29.45	9.85	39.30	46.00	-6.70	AVG	
6	2.7139	27.24	9.92	37.16	46.00	-8.84	AVG	
7	3.8900	35.77	9.87	45.64	56.00	-10.36	QP	
8	4.0180	27.66	9.84	37.50	46.00	-8.50	AVG	
9	4.9260	35.26	9.77	45.03	56.00	-10.97	QP	
10	9.8460	32.39	9.82	42.21	50.00	-7.79	AVG	
11	25.3220	39.08	10.10	49.18	60.00	-10.82	QP	
12	25.9260	35.37	10.13	45.50	50.00	-4.50	AVG	

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



Power Line Conducted Test Data

Test Site: 1# Shielded Room
Test Mode: Mode 1
Test Specification: AC 230V, 50Hz for Adapter
Comment: Neutral Line
Temp.: 22.1℃ Hum.: 51%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.3780	39.62	9.76	49.38	58.32	-8.94	QP	
2	0.6580	37.81	9.83	47.64	56.00	-8.36	QP	
3	0.9020	35.19	9.84	45.03	56.00	-10.97	QP	
4	0.9060	27.92	9.84	37.76	46.00	-8.24	AVG	
5	1.1060	33.52	9.85	43.37	56.00	-12.63	QP	
6	1.1060	30.65	9.85	40.50	46.00	-5.50	AVG	
7	1.4060	33.77	9.85	43.62	56.00	-12.38	QP	
8	1.4060	30.11	9.85	39.96	46.00	-6.04	AVG	
9	2.7139	28.11	9.92	38.03	46.00	-7.97	AVG	
10	3.7180	33.86	9.88	43.74	56.00	-12.26	QP	
11	4.0180	27.85	9.84	37.69	46.00	-8.31	AVG	
12	25.1180	34.63	10.09	44.72	50.00	-5.28	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
---------------	----------------

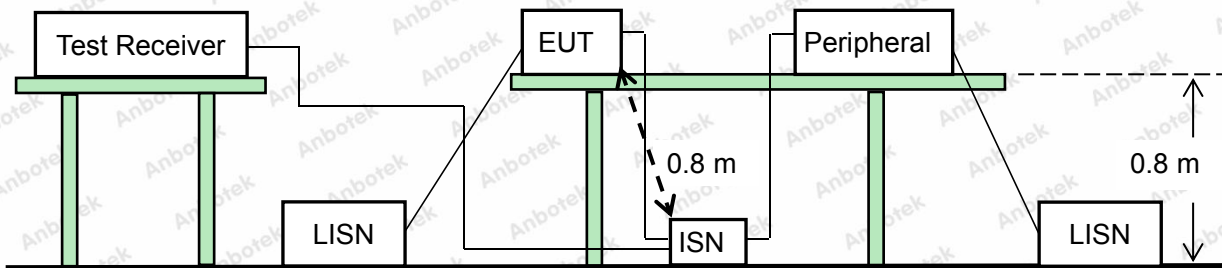
Limits for asymmetric mode conducted emissions

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

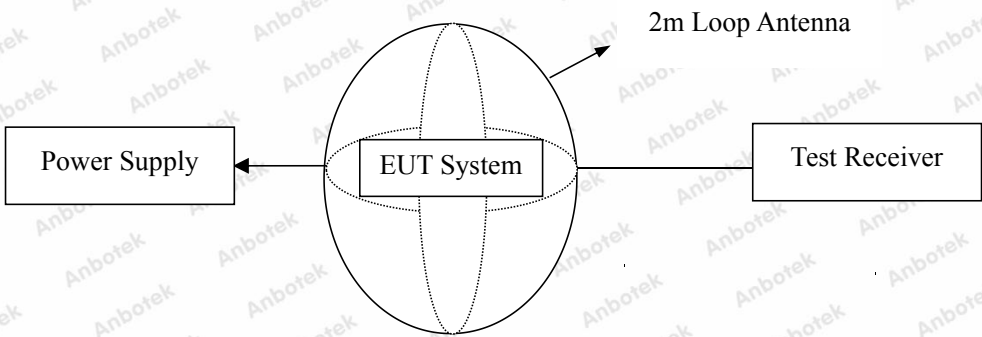
Test Standard	EN IEC 55014-1
---------------	----------------

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 ($700W < P \leq 1000W$)**

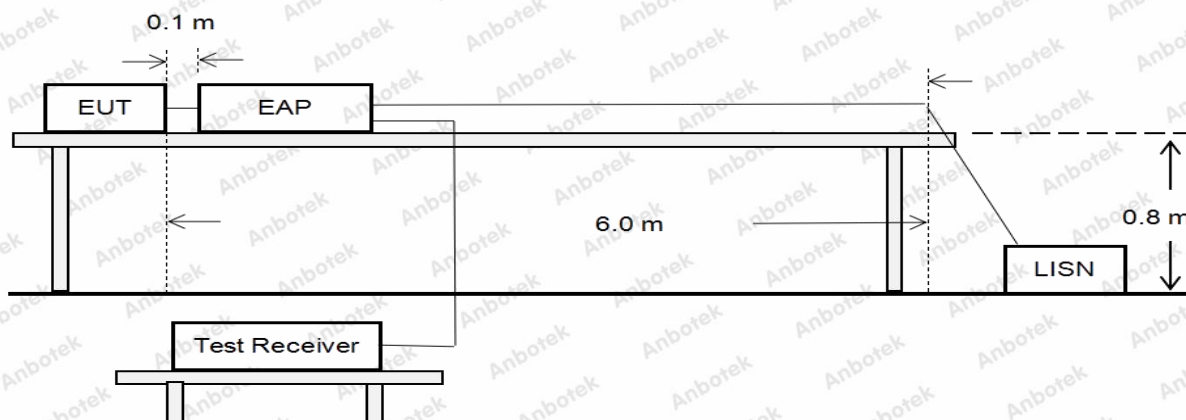
Frequency (MHz)	Limits (dBpW)	
	Quasi-peak Level	Average Level
30 ~ 300	49~59	39~49
Remark: (1) Increasing linearly with the frequency. (2)P=rated power of the motor only.		

☐ **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)

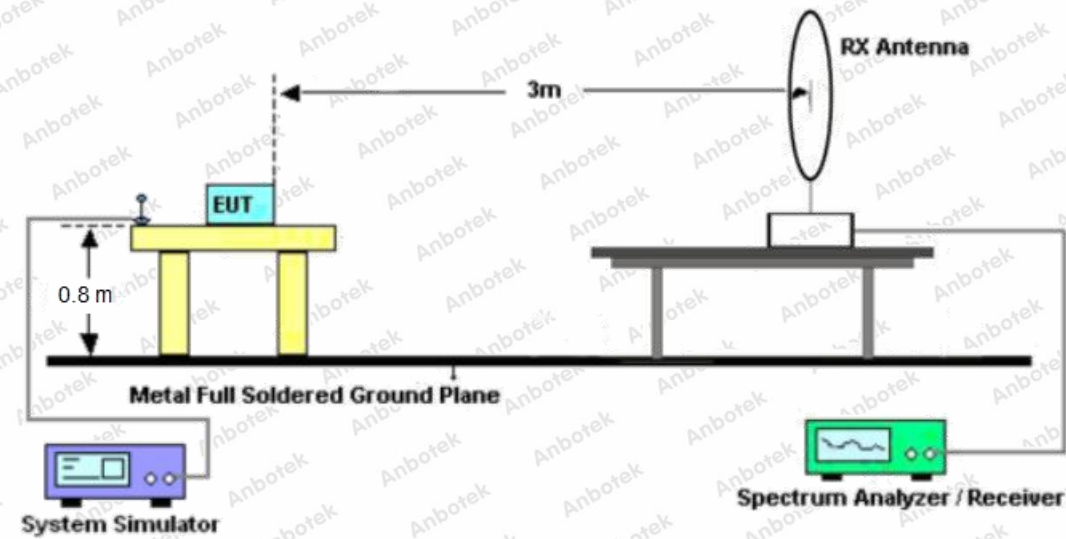
6.1. Test Standard and Limit

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

Magnetic field st rength 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

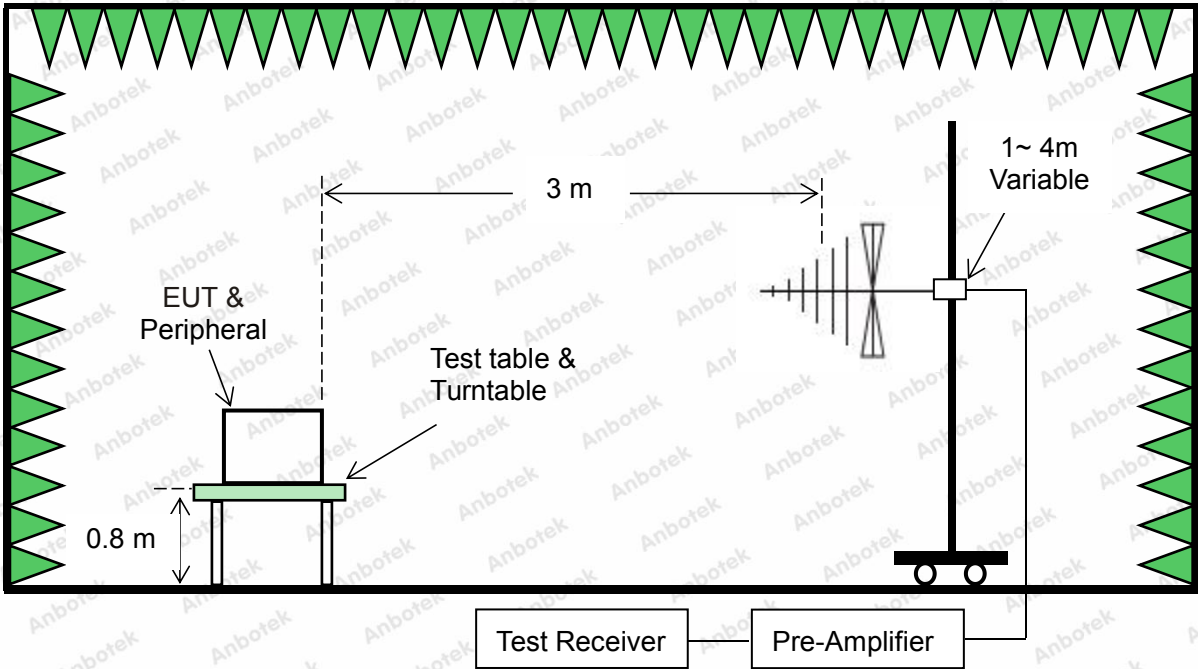
Test Standard	EN IEC 55014-1
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Limit for radiated emissions at frequencies up to 1 GHz

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

During the test, pre-scan all modes, only the worst case is recorded in the report.

The test curves are shown in the following pages.



Test item:	Radiation Test	Polarization:	Horizontal
Standard:	(RE)EN IEC 55014-1	Power Source:	AC 230V, 50Hz for adapter
Frequency Range:	30MHz ~ 1000MHz	Temp.(°C)/Hum.(%RH):	22.5(°C)/50%RH
Distance:	3m	Test Mode:	Mode 1



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	41.4215	46.69	-15.79	30.90	40.00	-9.10	QP			
2	53.8818	47.64	-17.21	30.43	40.00	-9.57	QP			
3	65.5727	49.82	-19.66	30.16	40.00	-9.84	QP			
4	84.4054	54.34	-22.12	32.22	40.00	-7.78	QP			
5	145.3506	54.82	-22.95	31.87	40.00	-8.13	QP			
6	167.8243	54.41	-23.69	30.72	40.00	-9.28	QP			

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



Test item:	Radiation Test	Polarization:	Vertical
Standard:	(RE)EN IEC 55014-1	Power Source:	AC 230V, 50Hz for adapter
Frequency Range:	30MHz ~ 1000MHz	Temp.(°C)/Hum.(%RH):	22.5(°C)/50%RH
Distance:	3m	Test Mode:	Mode 1



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	41.1320	48.69	-14.66	34.03	40.00	-5.97	QP			
2	43.8119	47.72	-14.94	32.78	40.00	-7.22	QP			
3	53.1313	50.32	-16.93	33.39	40.00	-6.61	QP			
4	63.3132	51.96	-18.71	33.25	40.00	-6.75	QP			
5	71.0803	53.12	-19.95	33.17	40.00	-6.83	QP			
6	84.1100	50.88	-18.68	32.20	40.00	-7.80	QP			

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



8. Radiated Emission Test (Above 1GHz)

8.1. Test Standard and Limit

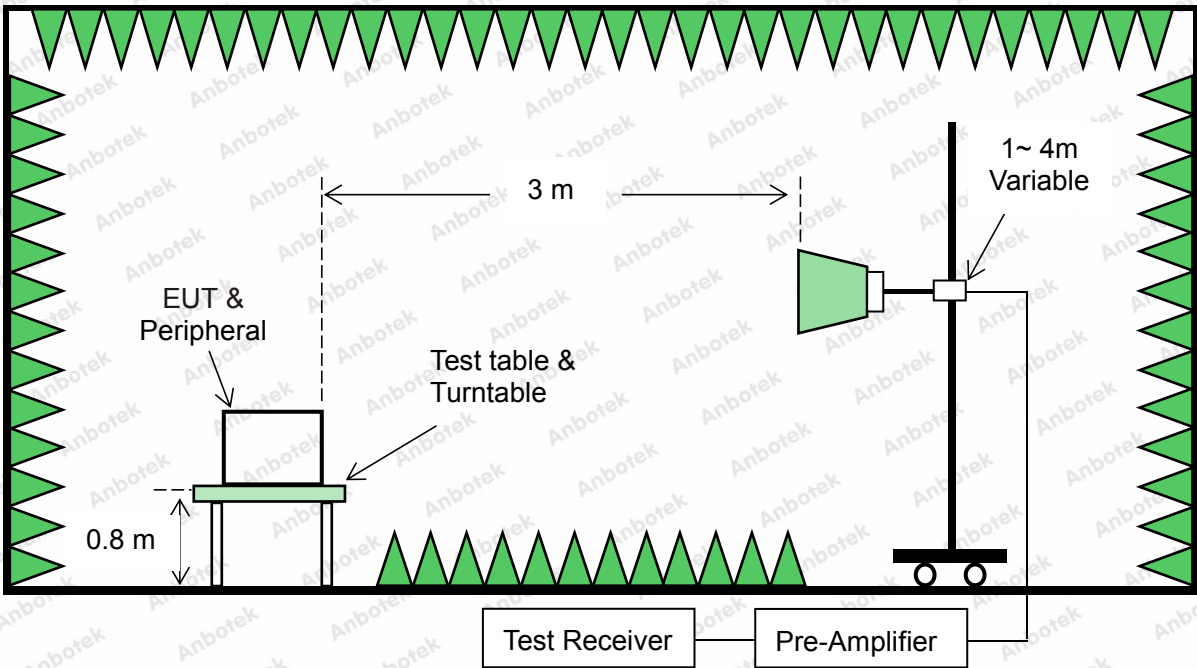
Test Standard	EN IEC 55014-1
---------------	----------------

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

PASS

During the test, pre-scan all modes, only the worst case is recorded in the report.

The test curves are shown in the following pages.



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Test Results (1GHz~6GHz)

Test Mode:		Mode 1					
Power Source:		AC 230V, 50Hz for adapter					
Temp.(°C)/Hum.(%RH):		22.5°C/50%RH					
Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Detector
1369.68	46.52	-2.99	43.53	70.00	-26.47	H	PEAK
2017.97	48.47	-3.36	45.11	70.00	-24.89	H	PEAK
1933.69	54.71	-4.34	50.37	70.00	-19.63	H	PEAK
4014.13	47.48	-4.71	42.77	74.00	-31.23	H	PEAK
4671.01	46.87	-4.52	42.34	74.00	-31.66	H	PEAK
5116.83	50.29	-5.23	45.07	74.00	-28.93	H	PEAK
1369.68	40.34	-2.99	37.35	50.00	-12.65	H	AVG
2017.97	41.75	-3.36	38.38	50.00	-11.62	H	AVG
1933.69	41.89	-4.34	37.55	50.00	-12.45	H	AVG
4014.13	39.04	-4.71	34.33	54.00	-19.67	H	AVG
4671.01	40.08	-4.52	35.56	54.00	-18.44	H	AVG
5116.83	41.20	-5.23	35.97	54.00	-18.03	H	AVG
1315.04	52.72	-2.42	50.30	70.00	-19.70	V	PEAK
2039.97	46.30	-2.73	43.57	70.00	-26.43	V	PEAK
2243.91	49.19	-3.62	45.57	70.00	-24.43	V	PEAK
4050.16	45.82	-4.72	41.10	74.00	-32.90	V	PEAK
4412.71	55.49	-4.76	50.72	74.00	-23.28	V	PEAK
4832.56	52.36	-5.62	46.74	74.00	-27.26	V	PEAK
1315.04	40.50	-2.42	38.08	50.00	-11.92	V	AVG
2039.97	43.59	-2.73	40.85	50.00	-9.15	V	AVG
2243.91	37.94	-3.62	34.32	50.00	-15.68	V	AVG
4050.16	40.52	-4.72	35.79	54.00	-18.21	V	AVG
4412.71	39.01	-4.76	34.25	54.00	-19.75	V	AVG
4832.56	39.80	-5.62	34.19	54.00	-19.81	V	AVG
Remark:							
1. Level =Read Level + Factor; Over Limit=Level-Limit							

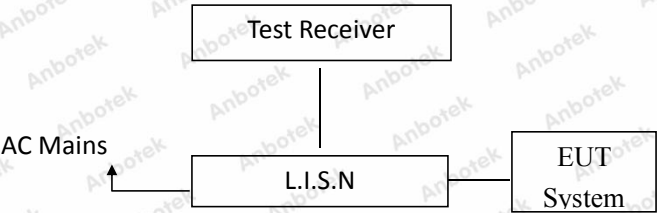


9. Discontinuous Disturbances/Clicks Emission Test

9.1. Test Standard and Limit

Test Standard	EN IEC 55014-1
Test Limit	<p>The limits for discontinuous disturbances identified as clicks are based on quasi-peak disturbance voltage measurements on the mains port. These limits only apply in the frequency range 150 kHz to 30 MHz.</p> <p>The click limit L_q is calculated by increasing the relevant quasi-peak limit L for continuous disturbances.</p> $L_q(\text{dB}) = \begin{cases} L + 44 \text{ [dB]} & N < 0.2 \\ L + 20 \lg\left(\frac{30}{N}\right) \text{ [dB]}, & 0.2 \leq N < 30 \\ L \text{ [dB]} & N \geq 30 \end{cases}$

9.2. Test Setup



9.3. 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 EN 55014-1 regulations during conducted emission measurement.

9.4. Test Results

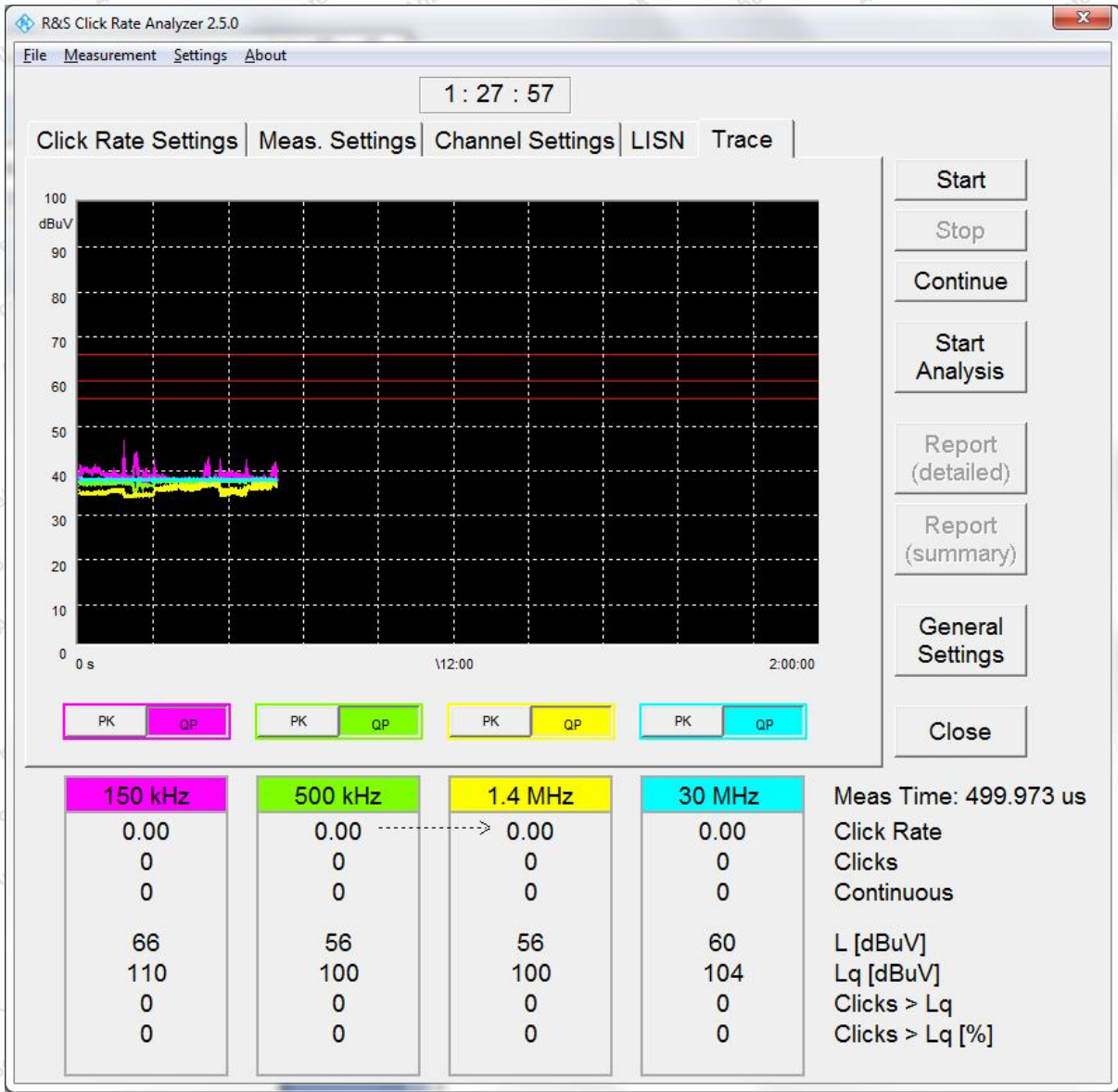
PASS

Please refer to the following page.



Discontinuous Disturbances/Clicks Emission Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	Temperature :	22.5℃
Power Supply :	AC 230V, 50Hz for Adapter	Humidity :	51.6%



Report Compact

N/A

Close

EFBX100

Print report

Operator : LEO

Op.Cond. : AC230V/50HZ

Comment : ON ICE MODE

Test Duration: 0:32:03 LISN Phase: N Attenuation [dB]: 40

Overload: No

Frequency	150 kHz	500 kHz	1.4 MHz	30 MHz
Clicks (≤ 10 ms)	0	0	0	0
Clicks (> 10 ms ≤ 20 ms)	0	0	0	0
Clicks (> 20 ms ≤ 200 ms)	0	0	0	0
Click Rate [1/min]	0.00	0.00	0.00	0.00
Continuous Disturbances	0	0	0	0
L [dBuV]	66	56	56	60
Lq [dBuV]	110	100	100	104
Clicks > Lq	0	0	0	0
Clicks > Lq [%]	0	0	0	0
Max. Allowed Nr. of Clicks > Lq	-	-	-	-
Fridge Rules	0	0	0	0
600 ms Rule used	NO	NO	NO	NO
Overall Correction	9.53	9.54	9.55	9.77
Margin for PK Detector	0	0	0	0
Result	PASSED	PASSED	PASSED	PASSED

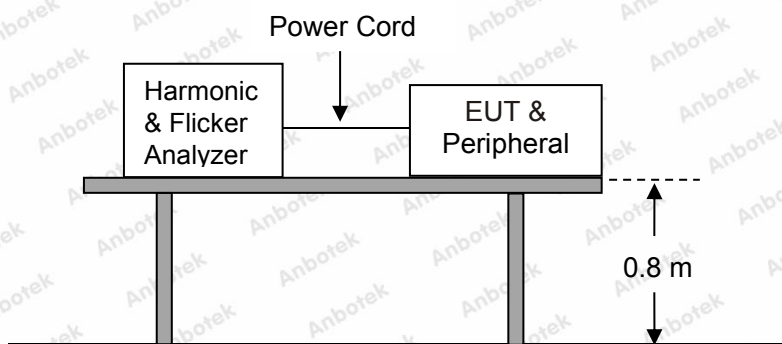


10. Harmonic Current Test

10.1. Test Standard

Test Standard:	EN IEC 61000-3-2
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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 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.

10.4. Test Results

PASS

The test curves are shown in the following pages.



The top plot shows the percentage of the maximum value for Class A (red) and Class B (blue) signals. The y-axis ranges from 0.0% to 250%. The x-axis shows time steps from 3 to 39. Class A is represented by a red dashed line at 100%, and Class B is represented by a blue dashed line at 0.0%.

The bottom plot shows the current waveforms for Class A (green) and Class B (blue) over a 20ms period. The y-axis ranges from 0.0A to 5.000A. The x-axis shows time from 0ms to 20ms. Class A is represented by a green solid line, and Class B is represented by a blue solid line.

Urms = 229.5 V P = 192.4 W THC = 0.275 A
Irms = 0.894 A pf = 0.938

Range: 5 A
V-nom: 230 V

Test completed. Result: PASSED


HAR-1000 EMC-Partner

Blue : Current , Green : Voltage , Red : Failed

Test completed, Result: PASSED

	[Hz]	[A]	[%]	[A]	[%]	[%]	[A]	[%]	[A]
1	50	0.8430		0.8487	94.980		0.8490		
2	1000.0000	0.0000	0.0018	0.2049	0.1695	0.0021	0.1978	1.0800	
3	1500.2702	11.750	0.2704	30.260	11.756	0.2704	11.756	2.3000	
4	2000.0000	0.0000	0.0006	0.0683	0.1419	0.0006	0.1419	0.4300	
5	2500.0238	2.0913	0.0238	2.6639	2.0880	0.0241	2.1148	1.1400	

Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community,
Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel: (86) 0755-26066440 Fax: (86) 0755-26014772 Email: service@anbotech.com

 Hotline
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www.anbotech.com.cn



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6	3000.0000	0.0000	0.0003	0.0342	0.1017	0.0006	0.2035	0.3000
7	3500.0168	2.1783	0.0168	1.8784	2.1798	0.0168	2.1798	0.7700
8	4000.0000	0.0000	0.0003	0.0342	0.1327	0.0006	0.2654	0.2300
9	4500.0217	5.4169	0.0217	2.4249	5.4169	0.0217	5.4169	0.4000
10	5000.0000	0.0000	0.0003	0.0342	0.1659	0.0006	0.3317	0.1840
11	5500.0162	4.8962	0.0162	1.8101	4.9013	0.0162	4.9013	0.3300
12	6000.0000	0.0000	0.0003	0.0342	0.1990	0.0006	0.3981	0.1533
13	6500.0108	5.1372	0.0107	1.1954	5.0863	0.0110	5.2316	0.2100
14	7000.0000	0.0000	0.0003	0.0342	0.2322	0.0003	0.2322	0.1314
15	7500.0105	6.9751	0.0104	1.1612	6.9173	0.0107	7.1208	0.1500
16	8000.0000	0.0000	0.0003	0.0342	0.2654	0.0003	0.2654	0.1150
17	8500.0067	5.0500	0.0067	0.7514	5.0727	0.0067	5.0727	0.1324
18	9000.0000	0.0000	0.0003	0.0342	0.2985	0.0003	0.2985	0.1022
19	9500.0000	0.0000	0.0021	0.2391	1.8039	0.0021	1.8039	0.1184
20	1000	0.0000	0.0000	0.0003	0.0342	0.0003	0.3317	0.0920
21	1050	0.0174	16.235	0.0174	1.9467	16.235	0.0174	16.235
22	1100	0.0000	0.0000	0.0006	0.0683	0.7298	0.0006	0.7298
23	1150	0.0070	7.1750	0.0070	0.7855	7.1750	0.0070	7.1750
24	1200	0.0000	0.0000	0.0009	0.1025	1.1942	0.0012	1.5922
25	1250	0.0000	0.0000	0.0046	0.5123	5.0863	0.0046	5.0863
26	1300	0.0000	0.0000	0.0003	0.0342	0.4312	0.0006	0.8625
27	1350	0.0102	12.222	0.0101	1.1270	12.085	0.0104	12.451
28	1400	0.0000	0.0000	0.0003	0.0342	0.4644	0.0006	0.9288
29	1450	0.0118	15.220	0.0119	1.3320	15.340	0.0122	15.734
30	1500	0.0000	0.0000	0.0006	0.0683	0.9951	0.0006	0.9951
31	1550	0.0000	0.0000	0.0006	0.0683	0.8409	0.0009	1.2614
32	1600	0.0000	0.0000	0.0006	0.0683	1.0615	0.0006	1.0615
33	1650	0.0000	0.0000	0.0043	0.4781	6.2663	0.0046	6.7139
34	1700	0.0000	0.0000	0.0003	0.0342	0.5639	0.0006	1.1278
35	1750	0.0107	16.592	0.0107	1.1954	16.615	0.0113	17.565
36	1800	0.0000	0.0000	0.0006	0.0683	1.1942	0.0006	1.1942
37	1850	0.0000	0.0000	0.0043	0.4781	7.0258	0.0046	7.5277
38	1900	0.0000	0.0000	0.0006	0.0683	1.2605	0.0006	1.2605
39	1950	0.0000	0.0000	0.0043	0.4781	7.4056	0.0046	7.9346
40	2000	0.0000	0.0000	0.0003	0.0342	0.6634	0.0006	1.3269

Calculation of Individual Harmonic Limits

Shenzhen Anbotech Compliance Laboratory Limited

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Code: AB-EMC-02-c



Hotline

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Report No.: 18220WC30000202E

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Fixed Limits for Class A:

Order Limits in Ampere

	90%	100%	150%	200%
2	0.9720	1.0800	1.6200	2.1600
3	2.0701	2.3001	3.4502	4.6002
4	0.3870	0.4300	0.6450	0.8600
5	1.0261	1.1401	1.7102	2.2803
6	0.2700	0.3000	0.4500	0.6000
7	0.6930	0.7700	1.1549	1.5399
8	0.2071	0.2301	0.3452	0.4602
9	0.3601	0.4001	0.6001	0.8002
10	0.1656	0.1840	0.2760	0.3680
11	0.2969	0.3299	0.4948	0.6598
12	0.1379	0.1532	0.2298	0.3064
13	0.1890	0.2100	0.3149	0.4199
14	0.1184	0.1315	0.1973	0.2631
15	0.1351	0.1501	0.2252	0.3003
16	0.1035	0.1151	0.1726	0.2301
17	0.1192	0.1324	0.1987	0.2649
18	0.0920	0.1022	0.1534	0.2045
19	0.1066	0.1184	0.1776	0.2368
20	0.0827	0.0919	0.1378	0.1837
21 *	0.0964	0.1071	0.1607	0.2142
22	0.0753	0.0836	0.1254	0.1672
23 *	0.0882	0.0980	0.1469	0.1959
24	0.0689	0.0766	0.1149	0.1532
25 *	0.0810	0.0900	0.1350	0.1801
26	0.0637	0.0708	0.1062	0.1416
27 *	0.0750	0.0833	0.1250	0.1666
28	0.0591	0.0656	0.0984	0.1312
29 *	0.0698	0.0775	0.1163	0.1550
30	0.0552	0.0613	0.0920	0.1227
31 *	0.0654	0.0726	0.1089	0.1453
32	0.0516	0.0574	0.0861	0.1147
33 *	0.0612	0.0681	0.1021	0.1361
34	0.0486	0.0540	0.0810	0.1080
35 *	0.0580	0.0644	0.0966	0.1288
36	0.0459	0.0510	0.0764	0.1019
37 *	0.0547	0.0607	0.0911	0.1215
38	0.0437	0.0485	0.0728	0.0970

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Report No.: 18220WC30000202E
39 * 0.0519 0.0577 0.0865 0.1154
40 0.0415 0.0461 0.0691 0.0922

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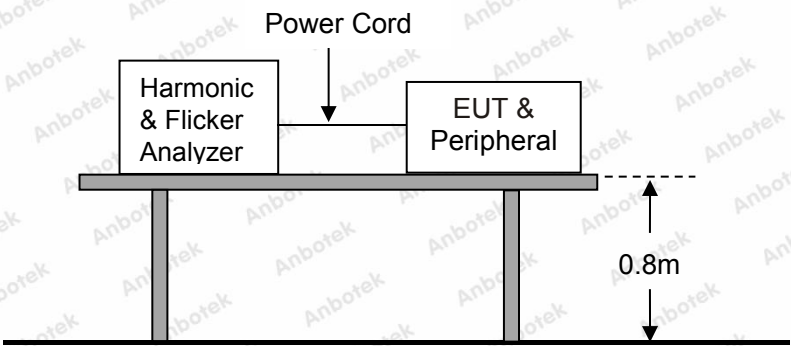


11. Voltage Fluctuations & Flicker Test

11.1. Test Standard

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

11.2. Test Setup



11.3. 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.

11.4. Test Results

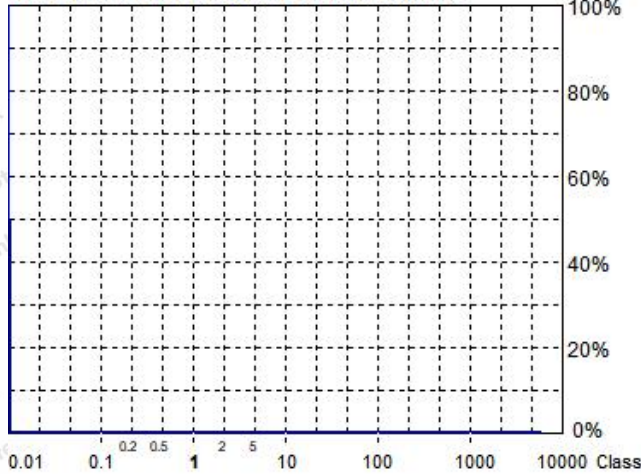
PASS

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):	0.00
Short-term Flicker (Pst):	0.07
Limit (Pst):	1.00
Long-term Flicker (Plt):	0.07
Limit (Plt):	0.65
Maximum Relative Volt. Change (dmax):	0.00%
Limit (dmax):	4.00%
Relative Steady-state Voltage Change (dc):	0.00%
Limit (dc):	3.30%
Tmax 3.30% (dt):	0.00ms
Limit (dt>Lim):	500ms

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

Urms = 229.1 V P = 192.4 W
Irms = 0.894 A pf = 0.940

Range: 5 A
V-nom: 230 V

Test completed, Result: PASSED

HAR-1000 EMC-Partner

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

Urms = 229.3V Freq = 50.013 Range: 5 A
Irms = 0.894A Ipk = 1.606A cf = 1.798
P = 192.5WS = 204.9VA pf = 0.940

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

LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00
dmax : 4.00 % dc : 3.30 %
dtLim: 3.30 % dt>Lim: 500ms

Test running, Measurement within Limits

dmax dc dt>Lim
[%] [%] [ms]
1 0.000 0.010 0.000

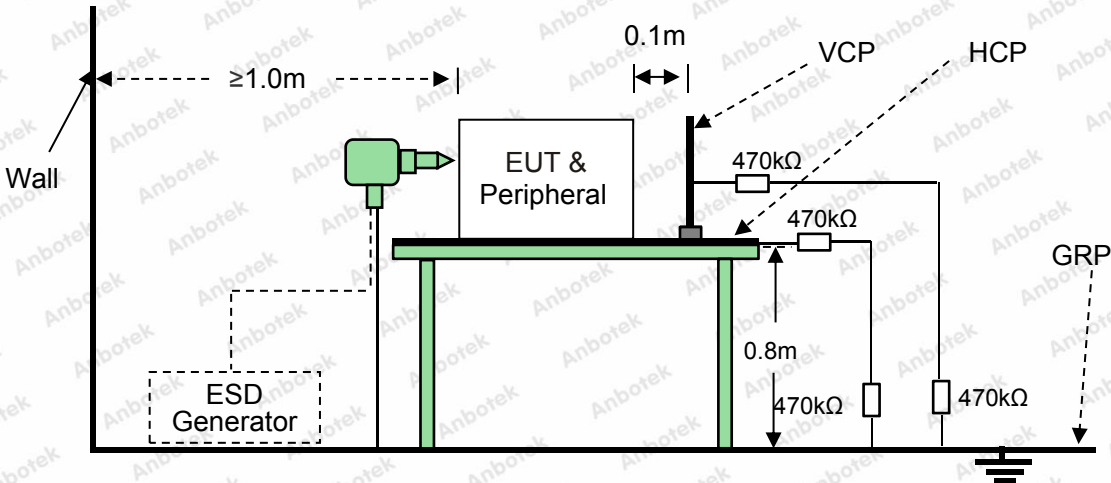


12. Electrostatic Discharge Immunity Test

12.1. Test Specification

Test Standard :	EN IEC 55014-2	
Basic standard :	IEC 61000-4-2: 2008	
Performance criteria:	B	
Test Level :	± 8kV (Air Discharge)	± 4kV (Contact Discharge)

12.2. Test Setup



12.3. Test Procedure

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

12.4. 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:	22.5℃
Power Supply:	AC 230V, 50Hz for Adapter/ DC 12V/ DC 58V/ DC24V	Humidity:	51.6%
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	6 points	A	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Screw	4 points	C	<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
Screen	4 points	A	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C
Type-C Port	2 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			

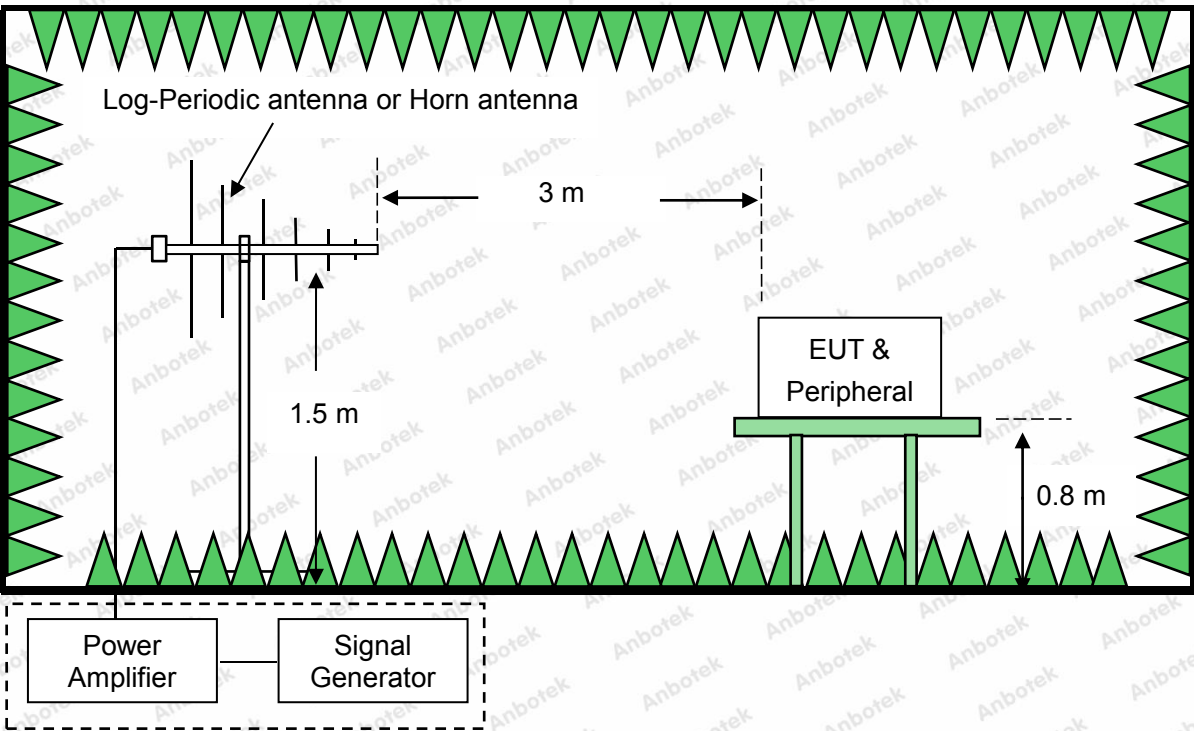


13. RF Field Strength Immunity Test

13.1. Test Specification

Test Standard:	EN IEC 55014-2
Basic standard:	IEC 61000-4-3: 2020
Performance criteria:	A
Frequency Range:	80MHz to 6000MHz
Test level:	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

13.2. Test Setup



13.3. 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.

13.4. 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:	22.5℃		
Power Supply:	AC 230V, 50Hz for Adapter/ DC 12V/ DC 58V/ DC24V	Humidity:	51.6%		
Frequency Range	Antenna Polarity	R.F. Field Strength	Dwell Time	Azimuth	Result
80 MHz ~ 6000 MHz	H / V	3 V/m	1s	Front	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
				Rear	
				Left	
				Right	
Note: N/A					



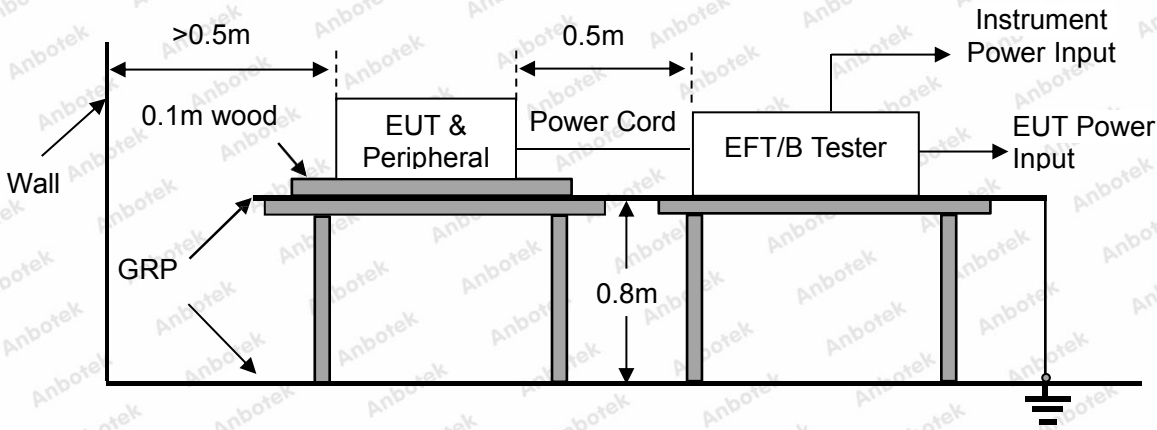
14. Electrical Fast Transient/Burst Immunity Test

14.1. Test Specification

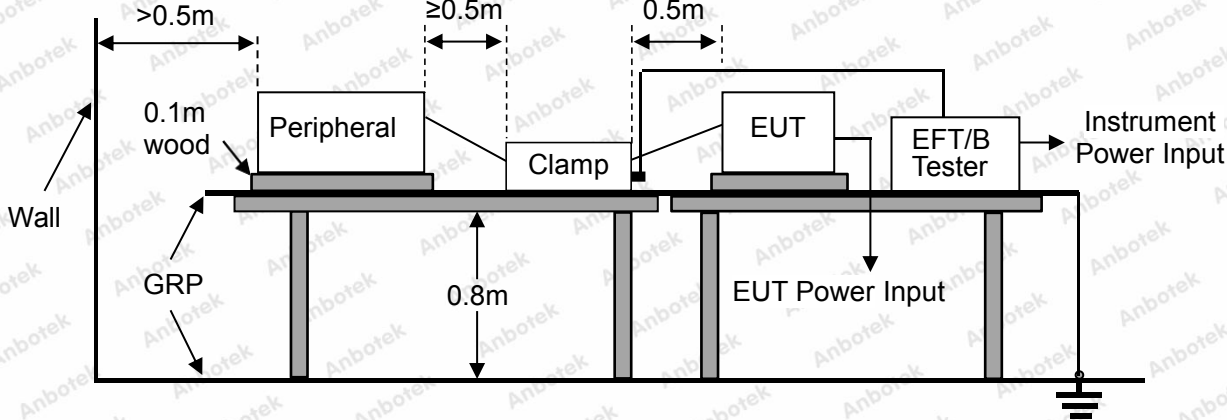
Test Standard:	EN IEC 55014-2
Basic standard:	IEC 61000-4-4: 2012
Performance criteria:	B
Test Level:	<input checked="" type="checkbox"/> 1 kV, AC mains power ports
	<input type="checkbox"/> 0.5 kV, DC network power ports
	<input type="checkbox"/> 0.5 kV, Analogue/digital data ports

14.2. Test Setup

AC mains power ports and DC network power ports:



Analogue/digital data ports:



14.3. 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.

14.4. Test Results

PASS

Please refer to the following page.



Electrical Fast Transient/Burst Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	Temperature:	22.5℃	
Power Supply:	AC 230V, 50Hz for Adapter	Humidity:	51.6%	
Ports	Polarity	Inject Time(s)	Test Voltage (kV)	Result
AC mains power ports	±	120 s	1.0 kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
DC network power ports	±	120 s	0.5 kV	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C
Signal ports	±	120 s	0.5 kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Note: N/A				

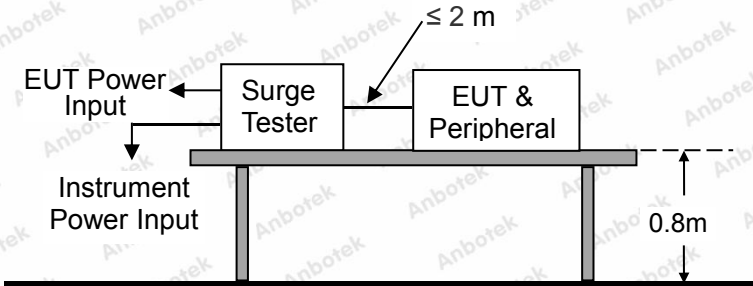


15. Surge Immunity Test

15.1. Test Specification

Test Standard:		EN IEC 55014-2
Basic standard:		IEC 61000-4-5: 2014+A1:2017
Test level	AC power port:	<input checked="" type="checkbox"/> 1 kV, Line to Line, Criterion B
		<input type="checkbox"/> 2kV, Line to Ground, Criterion B
	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°

15.2. Test Setup



15.3. 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.

15.4. Test Results

PASS

Please refer to the following page.



Surge Immunity Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		Temperature :	22.5℃	
Power Supply :	AC 230V, 50Hz for Adapter		Humidity :	51.6%	
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result
<input checked="" type="checkbox"/> AC power port (Waveform: 1.2 us / 50 us (8 us / 20us))					
L-N	+	<input type="checkbox"/> 0° <input checked="" type="checkbox"/> 90° <input type="checkbox"/> 180° <input type="checkbox"/> 270°	5	0.5, 1kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
	-	<input type="checkbox"/> 0° <input type="checkbox"/> 90° <input type="checkbox"/> 180° <input checked="" type="checkbox"/> 270°	5	0.5, 1kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
L-GND	+	<input type="checkbox"/> 0° <input type="checkbox"/> 90° <input type="checkbox"/> 180° <input type="checkbox"/> 270°	5	0.5, 1, 2kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
	-	<input type="checkbox"/> 0° <input type="checkbox"/> 90° <input type="checkbox"/> 180° <input type="checkbox"/> 270°	5	0.5, 1, 2kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
N-GND	+	<input type="checkbox"/> 0° <input type="checkbox"/> 90° <input type="checkbox"/> 180° <input type="checkbox"/> 270°	5	0.5, 1, 2kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
	-	<input type="checkbox"/> 0° <input type="checkbox"/> 90° <input type="checkbox"/> 180° <input type="checkbox"/> 270°	5	0.5, 1, 2kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
<input type="checkbox"/> DC network power ports (Waveform: 1.2 us / 50 us (8 us / 20us))					
Line to ground	+	/	5	0.5kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
	-	/	5	0.5kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
<input type="checkbox"/> Unshielded ports or lines (Waveform: 1.2 us / 50 us (8 us / 20us))					
Lines to ground	+	/	5	0.5kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
	-	/	5	0.5kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
<input type="checkbox"/> Shielded ports or lines (Waveform: 1.2 us / 50 us (8 us / 20us))					
Shield to ground	+	/	5	0.5kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
	-	/	5	0.5kV	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Note: N/A					



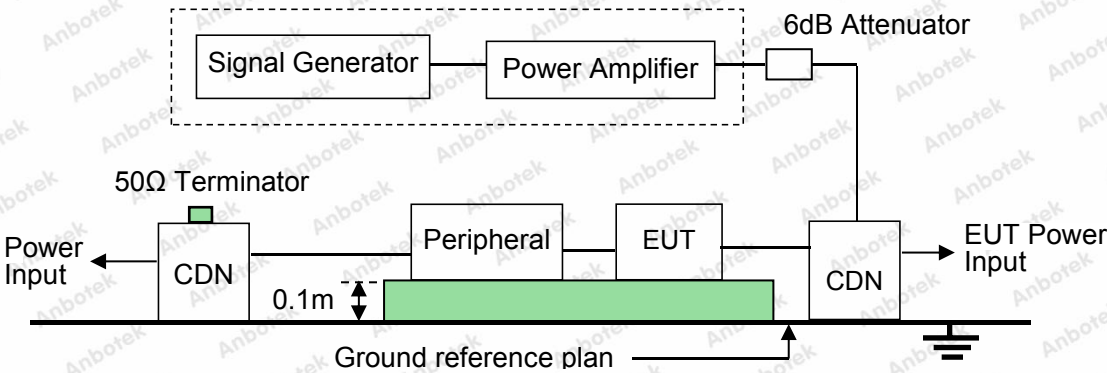
16. Injected Currents Susceptibility Test

16.1. Test Specification

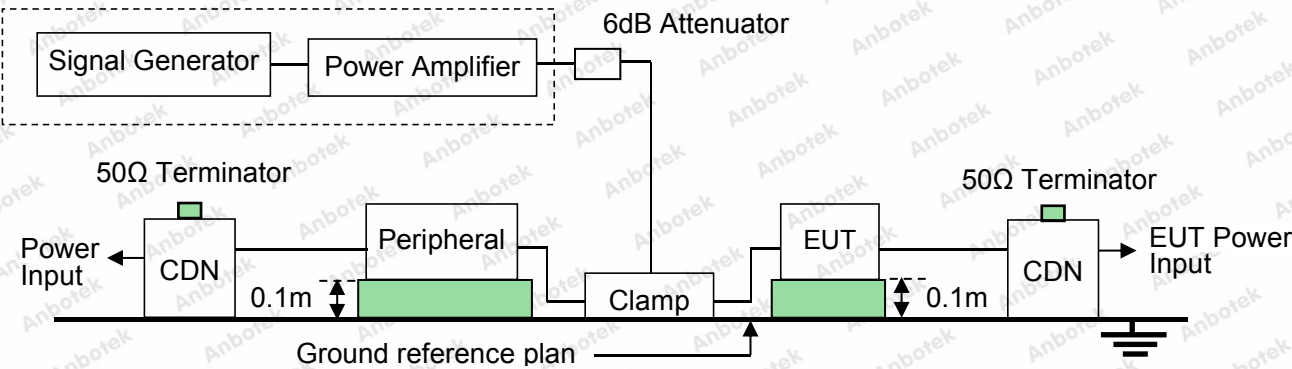
Test Standard:	EN IEC 55014-2
Basic standard:	IEC 61000-4-6: 2013
Performance criteria:	A
Frequency range:	0.15MHz-80MHz
Test level:	<input checked="" type="checkbox"/> AC power ports: 3V/m(rms, unmodulated)
	<input type="checkbox"/> DC Power Ports: 1V/m(rms, unmodulated)
	<input type="checkbox"/> Signal ports,control ports,wired network ports: 1V/m(rms, unmodulated)
Modulation:	AM 80%, 1kHz sine-wave
Frequency Step:	1% of fundamental

16.2. Test Setup

CDN injection:



Clamp injection:



16.3. 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.

16.4. Test Results**PASS**

Please refer to the following page.



Injected Currents Susceptibility Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	Temperature:	22.5℃
Power Supply:	AC 230V, 50Hz for Adapter	Humidity:	51.6%
Frequency Range (MHz)	Injected Position	Strength (Un-modulated)	Result
0.15 ~ 80	<input checked="" type="checkbox"/> AC Mains	3V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
0.15 ~ 80	<input type="checkbox"/> DC Line	1V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
0.15 ~ 80	<input type="checkbox"/> Signal Line	1V	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C
Note: N/A			

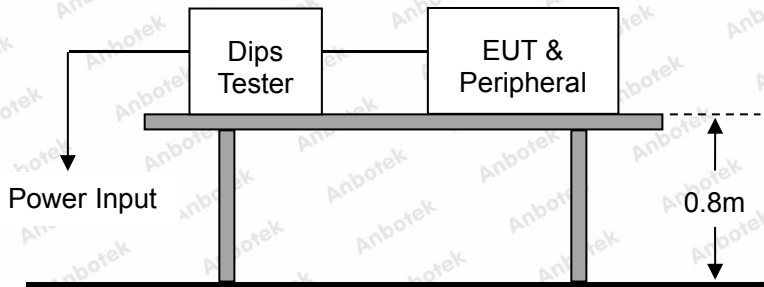


17. Voltage Dips and Interruptions Immunity Test

17.1. Test Specification

Test Standard:	EN IEC 55014-2
Basic standard:	IEC 61000-4-11: 2020
Test level:	☒ 0%, 0.5 period, Criterion C
	☒ 40%, 10 periods for 50Hz, Criteria C
	☒ 40%, 12 periods for 60Hz, Criteria C
	☒ 70%, 25 periods for 50Hz, Criteria C
	☒ 70%, 30 periods for 60Hz, Criteria C

17.2. Test Setup



17.3. Test Procedure

- a. Where the equipment has a rated voltage the following shall apply:
- If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for test level specification.
 - In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range.
- b. Test Conditions
- Select operated voltage and frequency of EUT - Test of interval: 10 sec.
 - Level and duration: Sequence of 3 dips/interrupts.
 - Voltage rise (and fall) time: 1.5 μ s.
- c. Changes to occur at 0 degree crossover point of the voltage waveform.

17.4. Test Results

PASS

Please refer to the following page.



Voltage Dips and Interruptions Test Results

Test Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	Temperature :	22.5℃
Power Supply :	AC 230V, 50Hz for Adapter	Humidity :	51.6%
Test Level % UT	Voltage Dips & Short Interruptions % UT	Duration (in periods)	Result
0	100	0.5P	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C
40	60	<input checked="" type="checkbox"/> 10P <input type="checkbox"/> 12P	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C
70	30	<input checked="" type="checkbox"/> 25P <input type="checkbox"/> 30P	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C
Note: N/A			



APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph_EMC

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal 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 -----

