

# TEST REPORT

Product Name : Grid-connected PV Inverter  
Model Number : X1-0.6-S-D (L), X1-0.6-S-N (L), X1-0.7-S-D (L),  
X1-0.7-S-N (L), X1-1.1-S-D (L), X1-1.1-S-N (L),  
X1-1.5-S-D (L), X1-1.5-S-N (L), X1-2.0-S-D (L),  
X1-2.0-S-N (L), X1-2.5K-S-D (L), X1-2.5K-S-N (L),  
X1-3K-S-D (L), X1-3K-S-N (L), X1-3.3K-S-D (L),  
X1-3.3K-S-N (L), X1-3.6K-S-D (L), X1-3.6K-S-N (L)

Prepared for : SOLAX POWER NETWORK TECHNOLOGY (ZHE  
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Report Number : ENB2108310092E00401R  
Date(s) of Tests : December 23, 2020 to December 30, 2020  
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APPENDIX I (Photos of EUT) (6 Pages)

## TEST REPORT DESCRIPTION

Applicant : SOLAX POWER NETWORK TECHNOLOGY (ZHE JIANG) CO., LTD.

Manufacturer : SOLAX POWER NETWORK TECHNOLOGY (ZHE JIANG) CO., LTD.

Trade Mark : 

EUT : Grid-connected PV Inverter

Model No. : X1-0.6-S-D (L), X1-0.6-S-N (L), X1-0.7-S-D (L), X1-0.7-S-N (L), X1-1.1-S-D (L), X1-1.1-S-N (L), X1-1.5-S-D (L), X1-1.5-S-N (L), X1-2.0-S-D (L), X1-2.0-S-N (L), X1-2.5K-S-D (L), X1-2.5K-S-N (L), X1-3K-S-D (L), X1-3K-S-N (L), X1-3.3K-S-D (L), X1-3.3K-S-N (L), X1-3.6K-S-D (L), X1-3.6K-S-N (L)

Power Supply : Input: DC 360V  
Output: AC 220/230/240V, 50/60Hz, 2.6-16A


### Measurement Procedure Used:


BS EN 61000-6-3:2007+A1:2011, BS EN 61000-6-4:2007+A1:2011  
BS EN 61000-3-2:2014, BS EN 61000-3-3:2013  
BS EN 61000-6-1:2007, BS EN 61000-6-2:2005  
(IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC 61000-4-4:2012, IEC 61000-4-5:2014, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004)

The device described above is tested by EMTEK (NINGBO) CO., LTD. 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 EMTEK (NINGBO) CO., LTD. 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 BS EN 61000-6-1, BS EN 61000-6-2, BS EN 61000-6-3, BS EN 61000-6-4, BS EN 61000-3-3 and BS EN 61000-3-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (NINGBO) CO., LTD.

Date of Test : December 23, 2020 to December 30, 2020

Prepared by :   
June Gao/Engineer

Reviewer :   
Ade Wang/Supervisor

Approved & Authorized Signer :   
Tony Wei/Manager



## Modified History

Version	Report No.	Revision date	Summary
Ver.1.0	ENB2108310092E00401R	/	See Note 1

Note 1: This report is issued on the basis of report No. EN201223015E. The standard is changed to BS EN 61000-6-1, BS EN 61000-6-2, BS EN 61000-6-3, BS EN 61000-6-4, BS EN 61000-3-2, BS EN 61000-3-3. The content and method of testing are the same as the standard EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, so no test involved.



# 1. SUMMARY OF TEST RESULT

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted Disturbance at Mains Terminals	BS EN 61000-6-3:2007+A1:2011	Table 2	Pass
Radiated Disturbance	BS EN 61000-6-3:2007+A1:2011	Table 1	Pass
Conducted Emissions at Low voltage AC mains port	BS EN 61000-6-4:2007+A1:2011	Table 2	Pass
Radiated Emission	BS EN 61000-6-4:2007+A1:2011	Table 1	Pass
Harmonics*	BS EN 61000-6-3:2014	Class A	Pass
Voltage fluctuation and flicker*	BS EN 61000-3-3:2013	Section 5	Pass
IMMUNITY (BS EN 61000-6-1:2007, BS EN 61000-6-2:2005)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio-Frequency, Continuous Radiated Disturbance*	IEC 61000-4-3:2006+A1:2007+A2:2010	A	Pass
EFT/B Immunity*	IEC 61000-4-4:2012	B	Pass
Surge Immunity*	IEC 61000-4-5:2014	B	Pass
Conducted RF Immunity*	IEC 61000-4-6:2013	A	Pass
Power Frequency Magnetic Field*	IEC 61000-4-8:2009	A	Pass
Voltage dips*	IEC 61000-4-11:2004	B&C	Pass
Voltage interruptions*		C	Pass
<p>Note:</p> <ol style="list-style-type: none"> <li>1. N/A is an abbreviation for Not Applicable.</li> <li>2. "*" represent the tests were carried out at: EMTEK (SHENZHEN) CO., LTD. The Certificate Registration Number is L2291, Accredited by CNAS, 2018.11.30. The certificate is valid until 2022.10.28.</li> <li>3. "*" represent the tests not within the scope of company EMTEK (NINGBO) CO., LTD.'s CNAS qualification.</li> </ol>			

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

EUT : Grid-connected PV Inverter

Model Number : X1-0.6-S-D (L), X1-0.6-S-N (L), X1-0.7-S-D (L), X1-0.7-S-N (L), X1-1.1-S-D (L), X1-1.1-S-N (L), X1-1.5-S-D (L), X1-1.5-S-N (L), X1-2.0-S-D (L), X1-2.0-S-N (L), X1-2.5K-S-D (L), X1-2.5K-S-N (L), X1-3K-S-D (L), X1-3K-S-N (L), X1-3.3K-S-D (L), X1-3.3K-S-N (L), X1-3.6K-S-D (L), X1-3.6K-S-N (L)  
(Note: All models are the same except the output power. We prepared X1-3.6K-S-D (L) for EMC tests)

Test Voltage : AC 230/50Hz

Highest frequency : Below 108MHz

Sample number : 1#

Applicant : SOLAX POWER NETWORK TECHNOLOGY (ZHE JIANG) CO., LTD.

Address : No.288 Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province 310000, P. R. China

Manufacturer : SOLAX POWER NETWORK TECHNOLOGY (ZHE JIANG) CO., LTD.

Address : No.288 Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province 310000, P. R. China

Date of Received : December 23, 2020

Date of Test : December 23, 2020 to December 30, 2020

### 2.2. Input / Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
1	AC Mains	DC	--	--	None
2	DC line	DC	Yes	Unshielded	None

\*Note: Use abbreviations:

AC= AC Power port

DC= DC Power port

N/E= Non-Electrical

A/D=Analogue/digital data port (signal/control port, antenna port, wired network port, broadcast receiver tuner port, optical fibre port)

### 2.3. Independent Operation Modes

#### A. PV-AC

Mode	PV Status	AC Voltage/Frequency/Current
A.PV-AC	PV:360V/10.3A/3.7kW	230V/50Hz/15.6A

### 2.4. Test Manner

Test Items	Test Voltage	Operation Modes	Worst case
Conducted Disturbance at Mains Terminals	AC 230/50Hz	Mode A	Mode A
Radiated Emission	AC 230/50Hz	Mode A	Mode A
Harmonics	AC 230/50Hz	Mode A	Mode A
Voltage fluctuation and flicker	AC 230/50Hz	Mode A	Mode A
Electrostatic Discharge	AC 230/50Hz	Mode A	Mode A
Radio-Frequency, Continuous Radiated Disturbance	AC 230/50Hz	Mode A	Mode A
EFT/B Immunity	AC 230/50Hz	Mode A	Mode A
Surge Immunity	AC 230/50Hz	Mode A	Mode A
Conducted RF Immunity	AC 230/50Hz	Mode A	Mode A
Power Frequency Magnetic Field	AC 230/50Hz AC 230/60Hz	Mode A	Mode A
Voltage Dips	AC 230/50Hz AC 230/60Hz	Mode A	Mode A

### 2.5. Description of Test Facility

Site Description  
EMC Lab.

: **Accredited by CNAS**

The Certificate Registration Number is L6666.

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2018 (identical to ISO/IEC 17025:2017)

**Accredited by FCC**

Designation Number: CN1302

Test Firm Registration Number: 436491

**Accredited by A2LA**

The certificate is valid until May 31, 2023

**Accredited by Industry Canada**

The Conformity Assessment Body Identifier is CN0114

Name of Firm  
Site Location

: EMTEK (NINGBO) CO., LTD.

: 1F Building 4, 1177#, Lingyun Road, National Hi-Tech Zone, Ningbo, Zhejiang, China



## 2.6. Test Software

Item	Software
Conducted Emission	: EZ-EMC (Ver. CON-03A1)
Radiated Emission	: EZ-EMC (Ver. EMEC-3A1)

## 2.7. Description of Support Device

N/A

## 2.8. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 2.08dB (9 k-150 kHz) 2.40dB (150 k-30 MHz)
Radiated Emission Uncertainty (3m Chamber)	: 4.30dB (Polarize: H) (30 MHz-1000 MHz) 4.90dB (Polarize: V) (30 MHz-1000 MHz) 3.70dB (Polarize: H) (1~18 GHz) 3.60dB (Polarize: V) (1~18 GHz)
Uncertainty for Harmonic test	: 4.16%
Uncertainty for Flicker test	: 0.43%
Uncertainty for ESD Test	: 6.00%
Uncertainty for EFT/B Test	: 3.84%
Uncertainty for Surge Test	: 0.53%
Uncertainty for C/S Test	: 1.45(Using CDN Test) 2.37(Using EM Clamp Test)
Uncertainty for DIPS Test	: 2.12%
Uncertainty for R/S Test	: 2.10dB(80 MHz-200 MHz) 2.36dB(200 MHz-1000 MHz) 2.57dB(1000 MHz-6000 MHz)

### 3. MEASURING DEVICE AND TEST EQUIPMENT

#### 3.1. For Power Line Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	101108	July 10, 2020	1 Year
2.	L.I.S.N	Rohde & Schwarz	ENV216	101193	July 10, 2020	1 Year
3.	L.I.S.N	Schwarzbeck	NSLK 8126	8126-462	July 10, 2020	1 Year
4.	Pulse Limiter	MTS-systemtechnik	IMP-136	2611115-001-0033	July 10, 2020	1 Year
5.	RF Switching unit	Compliance Direction Systems Inc.	RSU-M2	38400	July 10, 2020	1 Year

#### 3.2. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Rohde & Schwarz	ESCI	101107	July 10, 2020	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	101107	July 10, 2020	1 Year
3.	Pre-Amplifier	CD	PAP-0203	22015	July 10, 2020	1 Year
4.	Bilog Antenna	Schwarzbeck	VULB9163	9163-467	July 12, 2020	2 Year
5.	Cable	Huber + Suhner	CBL3-NN-0.5M	101216-2140500-2	July 10, 2020	1 Year
6.	Cable	Huber + Suhner	CBL3-NN-3.0M	101216-2143000-2	July 10, 2020	1 Year
7.	Cable	Huber + Suhner	CBL3-NN-9.0M	101216-2149000	July 10, 2020	1 Year

#### 3.3. For Harmonic Current / Voltage Fluctuation And Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	45KVA AC Power source	Teseq	NSG 1007-45/45KVA	1305A02873	May 17, 2020	1 Year
2.	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 17, 2020	1 Year
3.	Three phase impedance network	Teseq/Germany	INA2197/37A	1305A02873	May 17, 2020	1 Year
4.	Three phase impedance network	Teseq/Germany	INA 2196/75A	1305A02874	May 17, 2020	1 Year
5.	Proflin 2100 AC Switching Unit	Teseq/Germany	NSG2200-3	A22714	May 17, 2020	1 Year
6.	AC Power source	California Instruments	5001iX-CTS-400-413	59739	July 10, 2020	1 Year
7.	Harmonic/ flicker analyzer	California Instruments	PACS-1	72795	July 10, 2020	1 Year

### 3.4. For Electrostatic Discharge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Impulse Module	TESEQ AG	IN NSG 438A A 4380-150pF/330 Ohm	403-550/1712	May 18, 2020	1 Year
2.	Impulse Module	TESEQ AG	INA 4553-330pF/330 Ohm	403-588/1912	May 18, 2020	1 Year
3.	Impulse Module	TESEQ AG	INA 4381-150pF/2kO hm	403-564/1812	May 18, 2020	1 Year
4.	Impulse Module	TESEQ AG	INA 4382-330pF/2kO hm	403-565/1912	May 18, 2020	1 Year

### 3.5. For RF Strength Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Signal Generator	Agilent	N5181A	MY50145187	May 17, 2020	1 Year
2	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 18, 2020	1 Year
3	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	May 18, 2020	1 Year
4	Field Strength Meter	DARE	RSS1006A	10I00037SO22	May 18, 2020	1 Year
5	50ohm Diode Power Sensor	BOONTON	51011EMC	36164	May 18, 2020	1 Year
6	Power Amplifier	MILMEGA	80RF1000-175	1059345	May 17, 2020	1 Year
7	Power Amplifier	MILMEGA	AS0102-55	1018770	May 17, 2020	1 Year
8	Power Amplifier	MILMEGA	AS1860-50	1059346	May 17, 2020	1 Year
9	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	811	May 18, 2020	1 Year

### 3.6. For Electrical Fast Transient / Burst Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Burst Tester	HAEFELY	PEFT4010	080981-16	May 18, 2020	1Year
2.	Coupling Clamp	HAEFELY	IP-4A	147147	May 18, 2020	1Year
3	Three phase CDN	Teseq	CDN 163	202	May 18, 2020	1 Year

### 3.7. For Surge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Controller	HAEFELY	Psurge 8000	174031	May 18, 2020	1Year
2.	Impulse Module	HAEFELY	PIM 100	174124	May 18, 2020	1Year
3.	Coupling Decoupling Filter	HAEFELY	PCD 130	172181	May 18, 2020	1Year
4.	Coupling Module	HAEFELY	PCD122	174354	May 18, 2020	1Year
5.	Surge Impulse Module	HAEFELY	PIM 120	174435	May 18, 2020	1Year
6.	Coupling Module	HAEFELY	PCD 126A	174387	May 18, 2020	1Year
7.	Impulse Module	HAEFELY	PIM 110	174391	May 18, 2020	1Year
8.	Impulse Module	HAEFELY	PIM 150	178707	May 18, 2020	1Year

### 3.8. For Injected Current Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Simulator	EMTEST	CWS500C	0900-12	May 18, 2020	1Year
2.	CDN	EMTEST	CDN-M2	5100100100	May 18, 2020	1Year
3.	CDN	EMTEST	CDN-M3	0900-11	May 18, 2020	1Year
4.	Injection Clamp	EMTEST	F-2031-23MM	368	May 18, 2020	1Year
5.	Attenuator	EMTEST	ATT6	0010222A	May 18, 2020	1Year
6.	Three phase CDN	Teseq	CDN M332S	32655	May 18, 2020	1 Year
7.	Three phase CDN	Teseq	CDN M432S	33670	May 18, 2020	1 Year
8.	Three phase CDN	Teseq	CDN M432-3LNS	34048	May 18, 2020	1 Year
9.	Three phase CDN	Teseq	CDN M532S	33799	May 18, 2020	1 Year

### 3.9. For Magnetic Field Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Magnetic Field Tester	HAEFELY	MAG100	250040.1	May 17, 2020	1Year

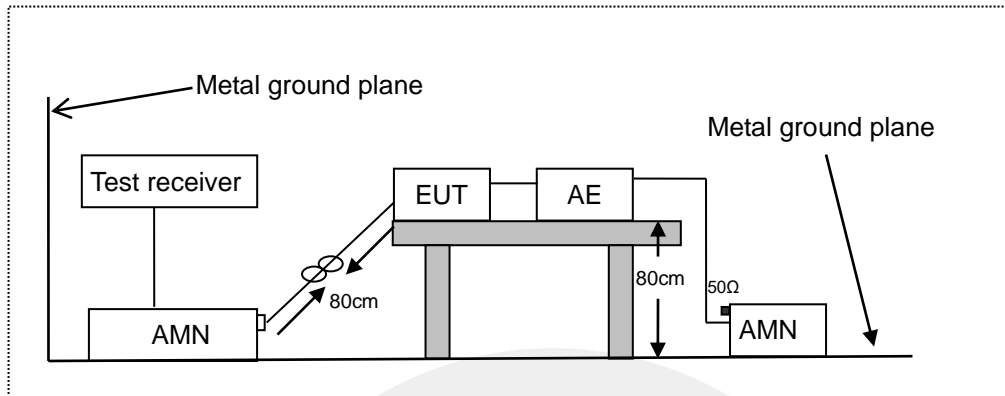
### 3.10. For Voltage Dips and Interruption Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	45KVA AC Power source	Teseq	NSG 1007-45/45KVA	1305A02873	May 17, 2020	1 Year
2.	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 17, 2020	1 Year
3.	Three phase impedance network	Teseq/Germany	INA2197/37A	1305A02873	May 17, 2020	1 Year
4.	Three phase impedance network	Teseq/Germany	INA 2196/75A	1305A02874	May 17, 2020	1 Year
5.	Proflin 2100 AC Switching Unit	Teseq/Germany	NSG2200-3	A22714	May 17, 2020	1 Year



## 4. POWER LINE CONDUCTED EMISSION MEASUREMENT

### 4.1. Block Diagram of Test Setup



AMN: Artificial mains network  
 AE: Associated equipment  
 EUT: Equipment under test

### 4.2. Measuring Standard

BS EN 61000-6-3:2007+A1:2011  
 BS EN 61000-6-4:2007+A1:2011

### 4.3. Power Line Conducted Emission Limits

For BS EN 61000-6-3 (AC mains port):

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.  
 NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

For BS EN 61000-6-3 (DC power port):

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	79	66
0.50 ~ 30.00	73	60

NOTE-The lower limit shall apply at the transition frequencies.

For BS EN 61000-6-4:

Frequency range MHz	Quasi-peak dBuV	Average dBuV
0.15 to 0.50	79	66
0.50 to 30	73	60

At transitional frequencies, the lower limit applies.

#### 4.4. Test Procedure

The EUT was placed on a desk 0.8 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the AC power port through a artificial mains network (AMN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

All the support units are connecting to the other AMN.

The AMN provides 50 ohm coupling impedance for the measuring instrument.

The CISPR states that the AMN with 50 ohm and 5 microhenry should be used.

Both sides of AC mains port were checked for maximum conducted interference.

For frequency band 9 KHz to 150 KHz, the bandwidth of the test receiver is set at 200 Hz. For frequency band 150 KHz to 30 MHz, the bandwidth is set at 9 KHz. The frequency range from 9 kHz or 150 kHz to 30 MHz is investigated.

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

Test results were obtained from the following equation:

Measurement (dB $\mu$ V) =Correct Factor (dB) + Reading (dB $\mu$ V)

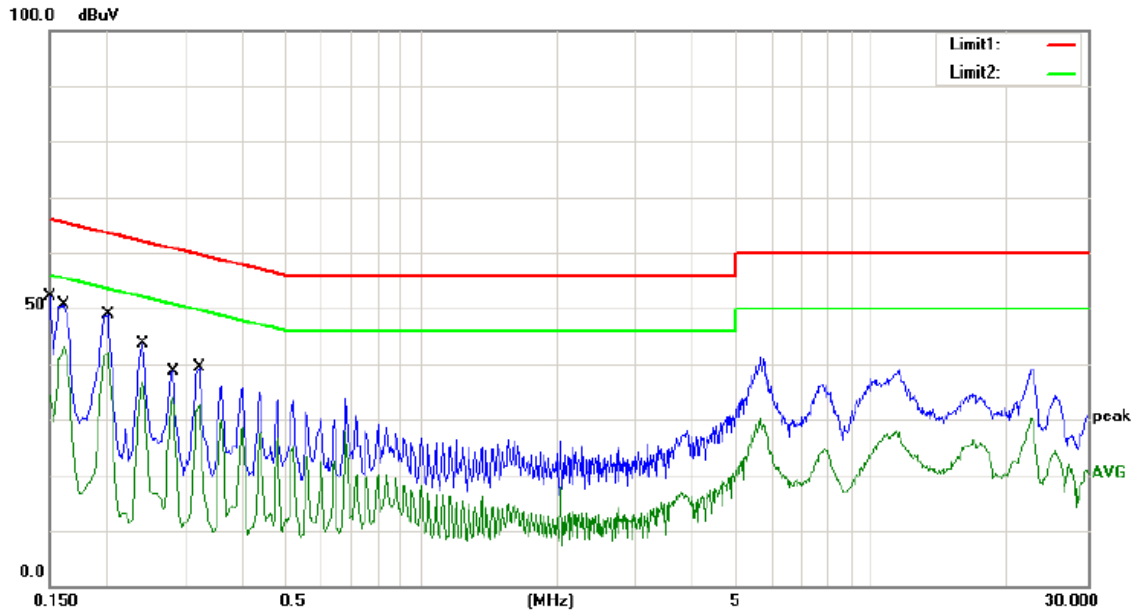
Over (dB) = Measurement (dB $\mu$ V) - Limit (dB $\mu$ V)

#### 4.5. Measuring Results

**Pass.**

Please refer to the following pages.

**Test data:**

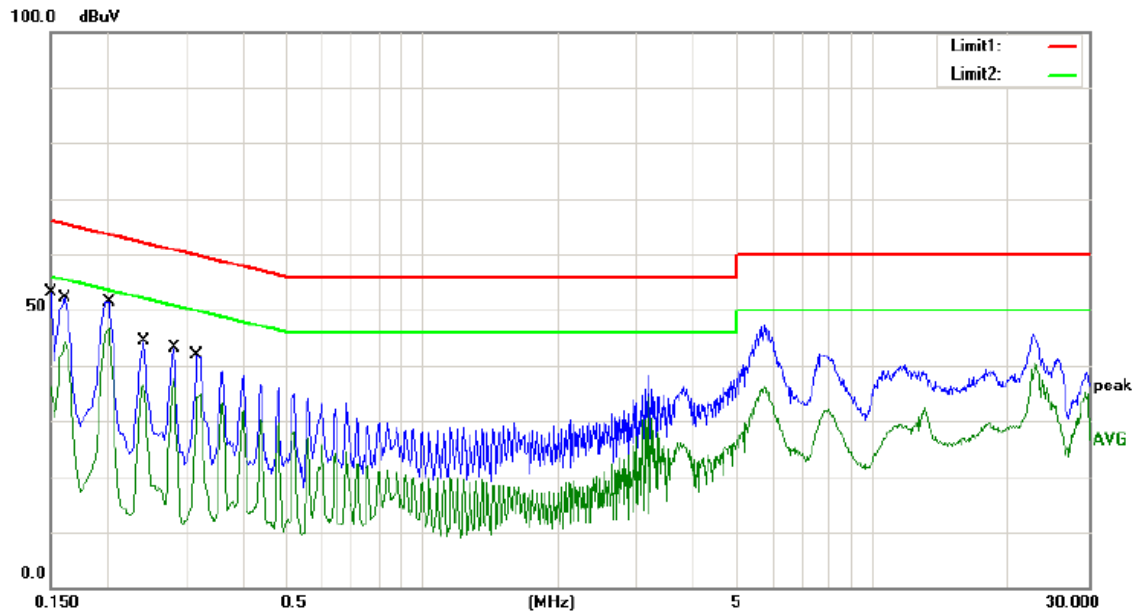


Site site #1  
 Limit: (CE)EN61000-6-3\_QP  
 Mode: PV-AC  
 Note:

Phase: **N**      Temperature: 24  
 Power: AC 230V/50Hz      Humidity: 50 %

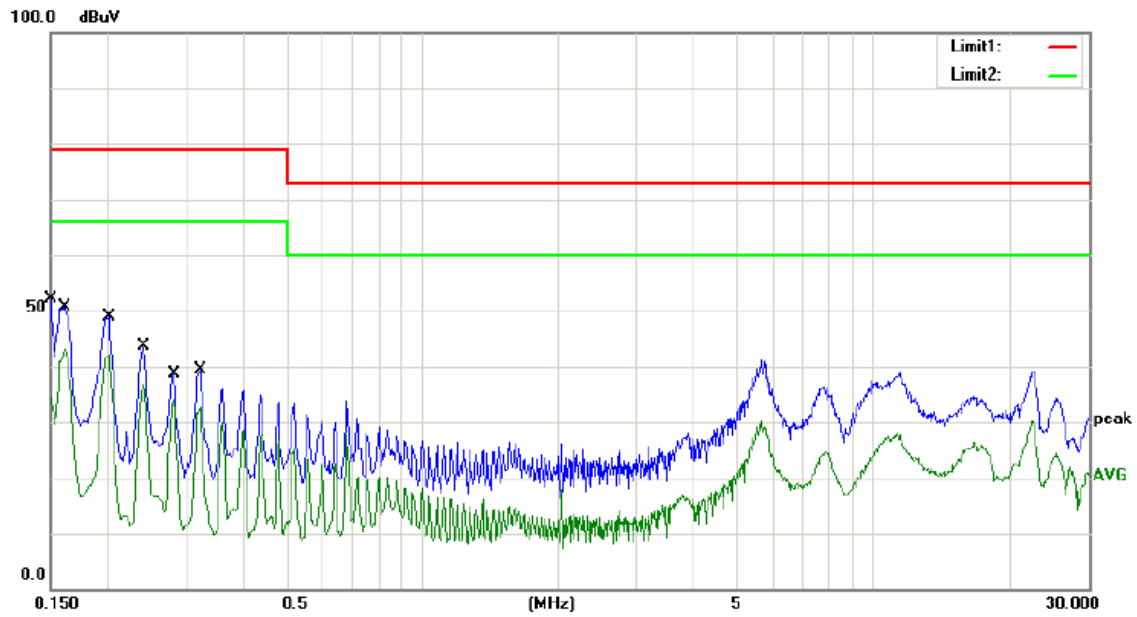
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	41.90	10.10	52.00	66.00	-14.00	QP	
2		0.1500	24.30	10.10	34.40	56.00	-21.60	AVG	
3		0.1620	40.40	10.10	50.50	65.36	-14.86	QP	
4	*	0.1620	33.00	10.10	43.10	55.36	-12.26	AVG	
5		0.2020	38.60	10.09	48.69	63.53	-14.84	QP	
6		0.2020	30.10	10.09	40.19	53.53	-13.34	AVG	
7		0.2420	33.40	10.09	43.49	62.03	-18.54	QP	
8		0.2420	26.80	10.09	36.89	52.03	-15.14	AVG	
9		0.2820	28.60	10.09	38.69	60.76	-22.07	QP	
10		0.2820	24.00	10.09	34.09	50.76	-16.67	AVG	
11		0.3220	29.20	10.08	39.28	59.66	-20.38	QP	
12		0.3220	20.20	10.08	30.28	49.66	-19.38	AVG	





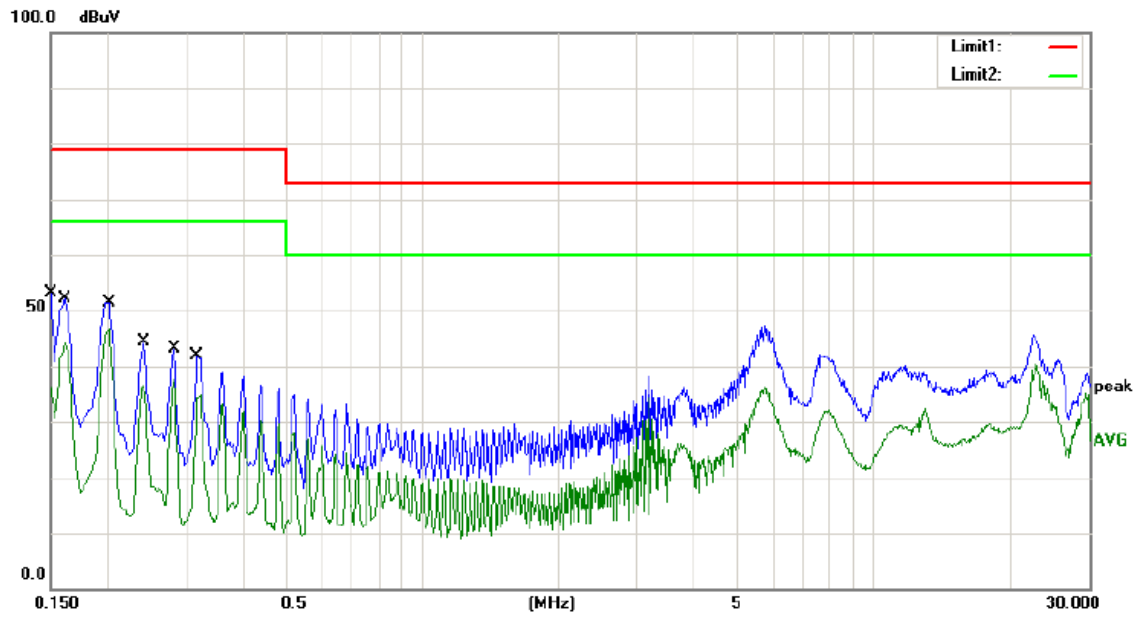
Site site #1 Phase: **L1** Temperature: 24  
 Limit: (CE)EN61000-6-3\_QP Power: AC 230V/50Hz Humidity: 50 %  
 Mode: PV-AC  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	42.90	10.10	53.00	66.00	-13.00	QP	
2		0.1500	26.00	10.10	36.10	56.00	-19.90	AVG	
3		0.1620	41.90	10.10	52.00	65.36	-13.36	QP	
4		0.1620	34.00	10.10	44.10	55.36	-11.26	AVG	
5		0.2020	41.30	10.09	51.39	63.53	-12.14	QP	
6	*	0.2020	34.50	10.09	44.59	53.53	-8.94	AVG	
7		0.2420	34.30	10.09	44.39	62.03	-17.64	QP	
8		0.2420	26.40	10.09	36.49	52.03	-15.54	AVG	
9		0.2820	33.00	10.09	43.09	60.76	-17.67	QP	
10		0.2820	27.40	10.09	37.49	50.76	-13.27	AVG	
11		0.3180	31.70	10.08	41.78	59.76	-17.98	QP	
12		0.3180	24.30	10.08	34.38	49.76	-15.38	AVG	



Site site #1 Phase: **N** Temperature: 24  
 Limit: (CE)EN61000-6-4\_QP Power: AC 230V/50Hz Humidity: 50 %  
 Mode: PV-AC  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	41.90	10.10	52.00	79.00	-27.00	QP	
2		0.1500	24.30	10.10	34.40	66.00	-31.60	AVG	
3		0.1620	40.40	10.10	50.50	79.00	-28.50	QP	
4	*	0.1620	33.00	10.10	43.10	66.00	-22.90	AVG	
5		0.2020	38.60	10.09	48.69	79.00	-30.31	QP	
6		0.2020	30.10	10.09	40.19	66.00	-25.81	AVG	
7		0.2420	33.40	10.09	43.49	79.00	-35.51	QP	
8		0.2420	26.80	10.09	36.89	66.00	-29.11	AVG	
9		0.2820	28.60	10.09	38.69	79.00	-40.31	QP	
10		0.2820	24.00	10.09	34.09	66.00	-31.91	AVG	
11		0.3220	29.20	10.08	39.28	79.00	-39.72	QP	
12		0.3220	20.20	10.08	30.28	66.00	-35.72	AVG	

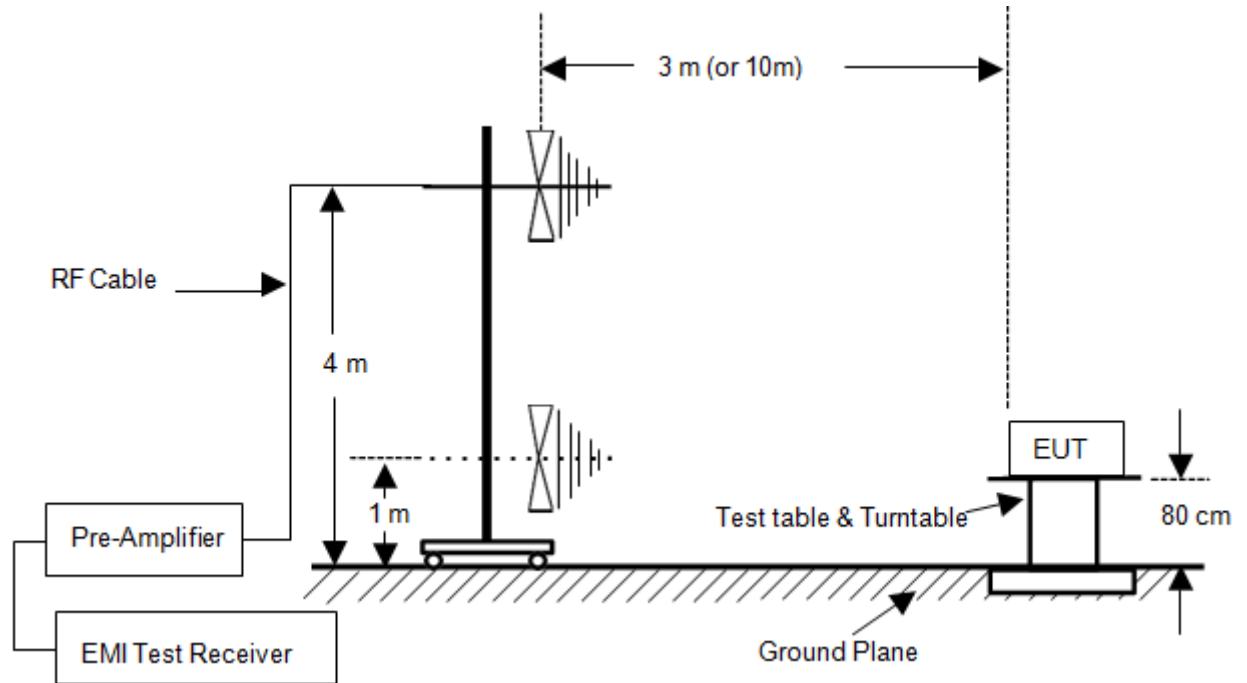


Site site #1 Phase: **L1** Temperature: 24  
 Limit: (CE)EN61000-6-4\_QP Power: AC 230V/50Hz Humidity: 50 %  
 Mode: PV-AC  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	42.90	10.10	53.00	79.00	-26.00	QP	
2		0.1500	26.00	10.10	36.10	66.00	-29.90	AVG	
3		0.1620	41.90	10.10	52.00	79.00	-27.00	QP	
4		0.1620	34.00	10.10	44.10	66.00	-21.90	AVG	
5		0.2020	41.30	10.09	51.39	79.00	-27.61	QP	
6	*	0.2020	34.50	10.09	44.59	66.00	-21.41	AVG	
7		0.2420	34.30	10.09	44.39	79.00	-34.61	QP	
8		0.2420	26.40	10.09	36.49	66.00	-29.51	AVG	
9		0.2820	33.00	10.09	43.09	79.00	-35.91	QP	
10		0.2820	27.40	10.09	37.49	66.00	-28.51	AVG	
11		0.3180	31.70	10.08	41.78	79.00	-37.22	QP	
12		0.3180	24.30	10.08	34.38	66.00	-31.62	AVG	

## 5. RADIATED EMISSION MEASUREMENT

### 5.1. Block Diagram of Test Setup



### 5.2. Measuring Standard

BS EN 61000-6-3:2007+A1:2011  
BS EN 61000-6-4:2007+A1:2011

### 5.3. Measurement Limits(For BS EN 61000-6-3)

All emanations from devices or system shall not exceed the level of field strengths specified below:

Frequency range MHz	Measurement			Limits dB(μV/m)
	Facility	Distance (m)	Detector type / bandwidth	
30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	30
230 to 1000				37
30 to 230	OATS/SAC	3		40
230 to 1000				47

At transitional frequencies, the lower limit applies.

FREQUENCY (GHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT	
		Average (dBμV/m)	Peak (dBμV/m)
1~3	3	50	70
3~6	3	54	74

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

#### 5.4. Measurement Limits(For BS EN 61000-6-4)

Frequency range MHz	Measurement			Limits dB(μV/m)
	Facility	Distance (m)	Detector type / bandwidth	
30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	40
230 to 1000				47
30 to 230	OATS/SAC	3		50
230 to 1000				57

At transitional frequencies, the lower limit applies.

Frequency range (MHz)	Measurement			Limits dB(μV/m)
	Facility	Distance (m)	Detector type/ bandwidth	
1000 to 3000	OATS/SAC	3	Average / 1 MHz	56
3000 to 6000				60
1000 to 3000			Peak / 1 MHz	76
3000 to 6000				80

#### 5.5. Test Procedure

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters or 10 meters away from the receiving antenna that is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver is set at 120 kHz. The frequency range from 30 MHz to 1000 MHz is investigated.

Test results were obtained from the following equation:

Measurement (dBμV) = Correct Factor (dB) + Reading (dBμV)

Over (dB) = Measurement (dBμV) - Limit (dBμV)

#### 5.6. Measuring Results

**Pass.**

Please refer to the following pages.

**Test data:**



Site Radiated Emission 3m #1      Polarization: **Vertical**      Temperature: 24  
 Limit: (RE) EN 61000-6-3      Power: AC 230V/50Hz      Humidity: 55 %  
 Mode: PV-AC  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	37.5478	60.48	-22.98	37.50	40.00	-2.50	QP			
2	!	39.4371	57.35	-22.25	35.10	40.00	-4.90	QP			
3	!	42.4508	57.62	-21.62	36.00	40.00	-4.00	QP			
4	!	45.8553	56.79	-20.89	35.90	40.00	-4.10	QP			
5	!	139.3613	64.02	-27.62	36.40	40.00	-3.60	QP			
6	!	169.5990	63.06	-26.66	36.40	40.00	-3.60	QP			



Site Radiated Emission 3m #1

Polarization: **Horizontal**

Temperature: 24

Limit: (RE) EN 61000-6-3

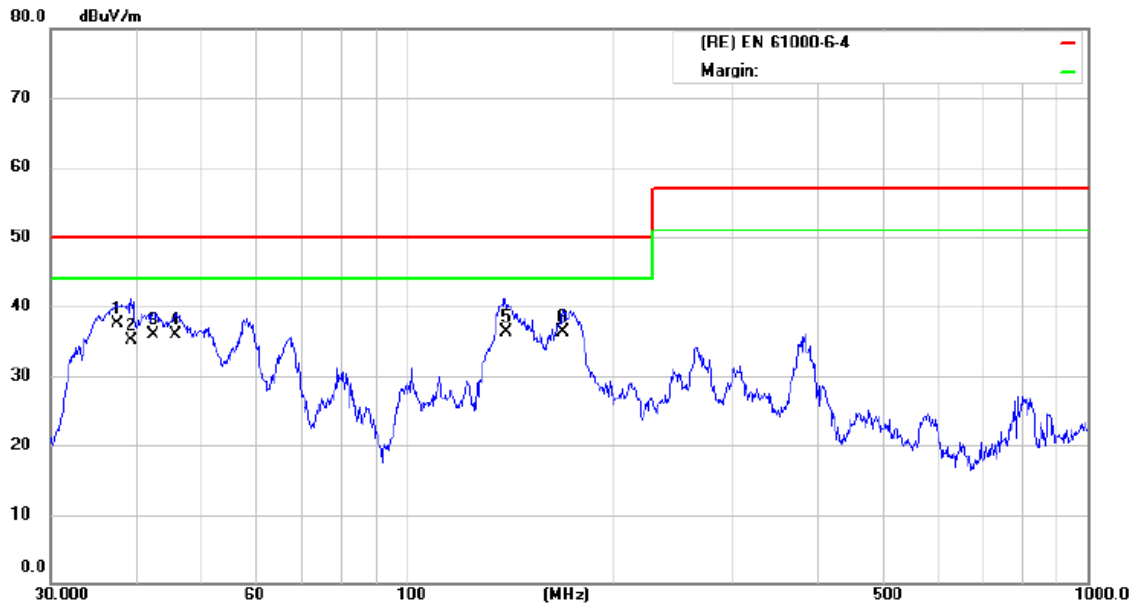
Power: AC 230V/50Hz

Humidity: 55 %

Mode: PV-AC

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		153.2003	59.52	-26.72	32.80	40.00	-7.20	QP			
2		161.4740	60.48	-26.98	33.50	40.00	-6.50	QP			
3	!	170.1948	61.32	-26.62	34.70	40.00	-5.30	QP			
4	*	175.6516	62.17	-26.17	36.00	40.00	-4.00	QP			
5		180.0164	59.21	-25.81	33.40	40.00	-6.60	QP			
6		277.0935	52.13	-20.63	31.50	47.00	-15.50	QP			



Site Radiated Emission 3m #1

Polarization: *Vertical*

Temperature: 24

Limit: (RE) EN 61000-6-4

Power: AC 230V/50Hz

Humidity: 55 %

Mode: PV-AC

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	37.5478	60.48	-22.98	37.50	50.00	-12.50	QP			
2		39.4371	57.35	-22.25	35.10	50.00	-14.90	QP			
3		42.4508	57.62	-21.62	36.00	50.00	-14.00	QP			
4		45.8553	56.79	-20.89	35.90	50.00	-14.10	QP			
5		139.3613	64.02	-27.62	36.40	50.00	-13.60	QP			
6		169.5990	63.06	-26.66	36.40	50.00	-13.60	QP			





Site Radiated Emission 3m #1

Polarization: **Horizontal**

Temperature: 24

Limit: (RE) EN 61000-6-4

Power: AC 230V/50Hz

Humidity: 55 %

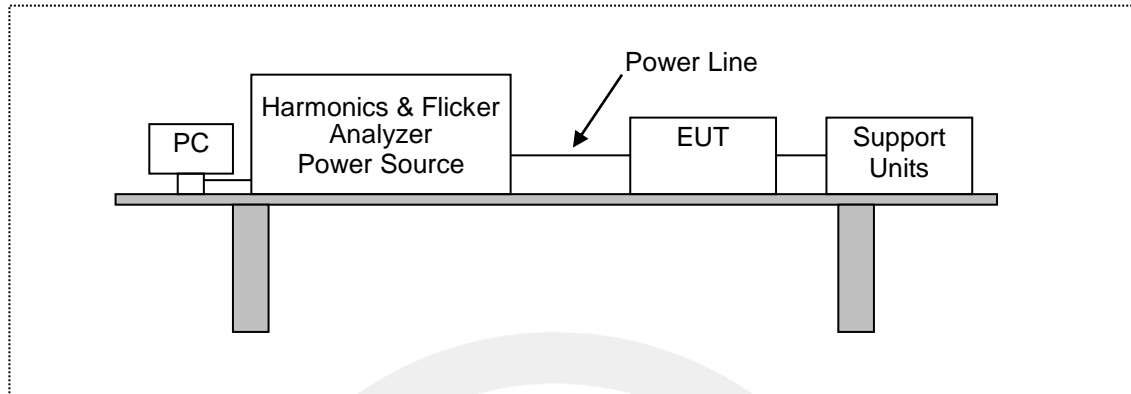
Mode: PV-AC

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		153.2003	59.52	-26.72	32.80	50.00	-17.20	QP		
2		161.4740	60.48	-26.98	33.50	50.00	-16.50	QP		
3		170.1948	61.32	-26.62	34.70	50.00	-15.30	QP		
4	*	175.6516	62.17	-26.17	36.00	50.00	-14.00	QP		
5		180.0164	59.21	-25.81	33.40	50.00	-16.60	QP		
6		277.0935	52.13	-20.63	31.50	57.00	-25.50	QP		

## 6. HARMONIC CURRENT EMISSION MEASUREMENT

### 6.1. Block Diagram of Test Setup



### 6.2. Measuring Standard

BS EN 61000-3-2:2014, Class A

### 6.3. Measurement Limits

Table 1 - Limits for Class A equipment

Harmonic order n	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \frac{0.15}{n}$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \frac{8}{n}$

### 6.4. Test Procedure

The measurement of harmonic currents shall be performed as follows: i. For each harmonic order, measure the 1.5 s smoothed r.m.s. harmonic current in each DFT time window as defined in EN / IEC 61000-4-7:2009. ii. Calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period Short cyclic (T cycle  $\leq 2.5$  min). Because of synchronisation to meet the requirements for repeatability in 5%.

## 6.5. Test Results

**Pass.**

Please refer to the following pages.

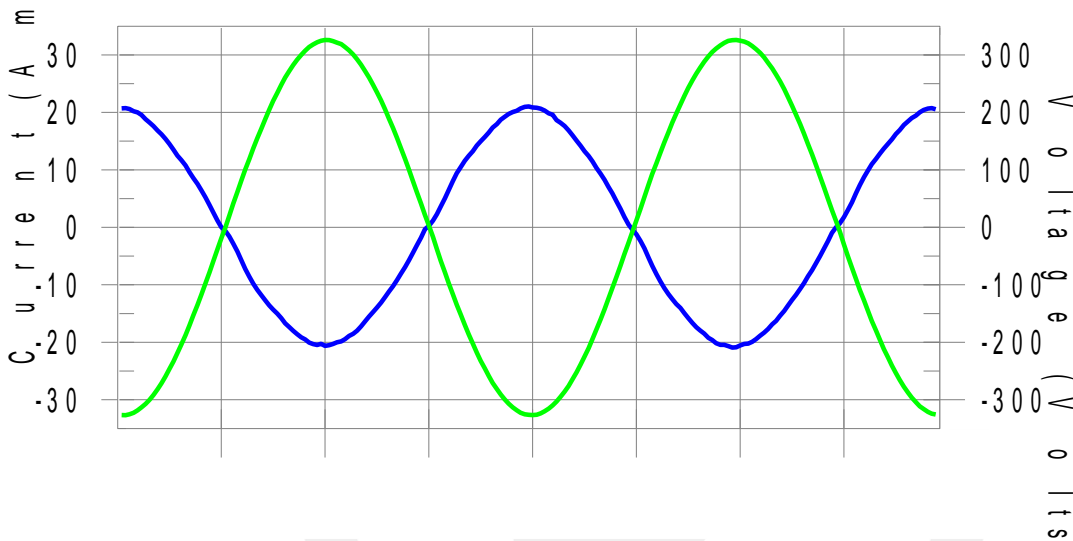


### Harmonics – Class-A per Ed. 5.0 (2018)(Run time)

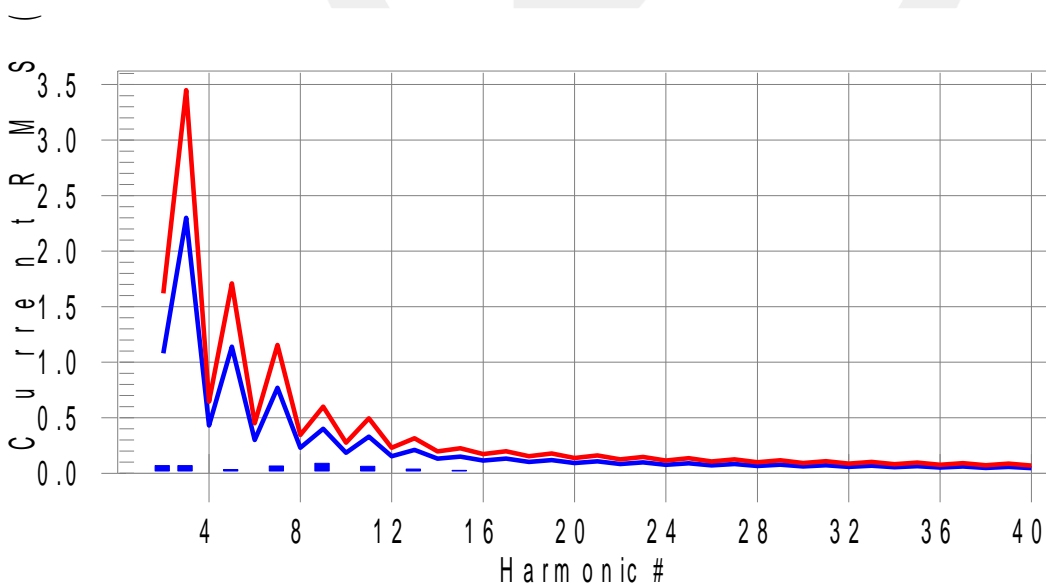
EUT: Grid-connected PV Inverter(X1-3.6K-S-D(L))      Tested by: YSQ  
 Test category: Class-A per Ed. 5.0 (2018) (European limits)      Test Margin: 100  
 Test date: 2020/12/30      Start time: 9:57:17      End time: 9:59:59  
 Test duration (min): 2.5      Data file name: WIN2105\_H-000369.cts\_data  
 Comment: PV-AC  
 Customer: Customer

Test Result: Pass      Source qualification: Normal

#### Current & voltage waveforms



#### Harmonics and Class A limit line      European Limits



**Test result: Pass      Worst harmonics H9-20.2% of 150% limit, H9-22.5% of 100% limit.**

### Current Test Result Summary (Run time)

EUT: Grid-connected PV Inverter(X1-3.6K-S-D(L))      Tested by: YSQ  
 Test category: Class-A per Ed. 5.0 (2018) (European limits)      Test Margin: 100  
 Test date: 2020/12/30      Start time: 9:57:17      End time: 9:59:59  
 Test duration (min): 2.5      Data file name: WIN2105\_H-000369.cts\_data  
 Comment: PV-AC  
 Customer: Customer

Test Result: Pass      Source qualification: Normal      POHC(A): 0.024      POHC Limit(A): 0.251  
 THC(A): 0.176      I-THD(%): 1.3

Highest parameter values during test:

V\_RMS (Volts): 230.946      Frequency(Hz): 50.00  
 I\_Peak (Amps): 21.106      I\_RMS (Amps): 13.683  
 I\_Fund (Amps): 13.082      Crest Factor: 7.875  
 Power (Watts): -3020.4      Power Factor: -1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.070	1.080	6.5	0.092	1.620	5.7	Pass
3	0.069	2.300	3.0	0.088	3.450	2.5	Pass
4	0.012	0.430	2.8	0.017	0.645	2.6	Pass
5	0.034	1.140	3.0	0.046	1.710	2.7	Pass
6	0.009	0.300	3.0	0.018	0.450	4.0	Pass
7	0.066	0.770	8.5	0.083	1.155	7.2	Pass
8	0.010	0.230	4.6	0.014	0.345	4.0	Pass
9	0.090	0.400	22.5	0.121	0.600	20.2	Pass
10	0.004	0.184	N/A	0.008	0.276	N/A	Pass
11	0.063	0.330	19.1	0.088	0.495	17.8	Pass
12	0.004	0.153	N/A	0.006	0.230	N/A	Pass
13	0.038	0.210	17.9	0.055	0.315	17.5	Pass
14	0.003	0.131	N/A	0.006	0.197	N/A	Pass
15	0.026	0.150	17.5	0.037	0.225	16.6	Pass
16	0.002	0.115	N/A	0.004	0.173	N/A	Pass
17	0.020	0.132	14.8	0.032	0.198	16.2	Pass
18	0.003	0.102	N/A	0.006	0.153	N/A	Pass
19	0.016	0.118	13.1	0.024	0.178	13.5	Pass
20	0.003	0.092	N/A	0.005	0.138	N/A	Pass
21	0.013	0.107	11.9	0.021	0.161	12.8	Pass
22	0.002	0.084	N/A	0.004	0.125	N/A	Pass
23	0.010	0.098	10.4	0.016	0.147	11.1	Pass
24	0.002	0.077	N/A	0.004	0.115	N/A	Pass
25	0.009	0.090	9.7	0.017	0.135	12.4	Pass
26	0.002	0.071	N/A	0.004	0.107	N/A	Pass
27	0.008	0.083	N/A	0.012	0.125	N/A	Pass
28	0.002	0.066	N/A	0.003	0.099	N/A	Pass
29	0.006	0.078	N/A	0.012	0.116	N/A	Pass
30	0.002	0.061	N/A	0.003	0.092	N/A	Pass
31	0.006	0.073	N/A	0.011	0.109	N/A	Pass
32	0.002	0.058	N/A	0.003	0.086	N/A	Pass
33	0.005	0.068	N/A	0.011	0.102	N/A	Pass
34	0.001	0.054	N/A	0.003	0.081	N/A	Pass
35	0.004	0.064	N/A	0.008	0.096	N/A	Pass
36	0.001	0.051	N/A	0.003	0.077	N/A	Pass
37	0.005	0.061	N/A	0.011	0.091	N/A	Pass
38	0.002	0.048	N/A	0.005	0.073	N/A	Pass
39	0.004	0.058	N/A	0.007	0.087	N/A	Pass
40	0.001	0.046	N/A	0.003	0.069	N/A	Pass

### Voltage Source Verification Data (Run time)

EUT: Grid-connected PV Inverter(X1-3.6K-S-D(L))      Tested by: YSQ  
 Test category: Class-A per Ed. 5.0 (2018) (European limits)      Test Margin: 100  
 Test date: 2020/12/30      Start time: 9:57:17      End time: 9:59:59  
 Test duration (min): 2.5      Data file name: WIN2105\_H-000369.cts\_data  
 Comment: PV-AC  
 Customer: Customer

Test Result: Pass      Source qualification: Normal  
 Measured source distortion is within the requirements of the standards  
 Measurements are compliant with IEC/EN61000-3-2 Ed. 5 & IEC/EN61000-4-7 Ed. 2.1

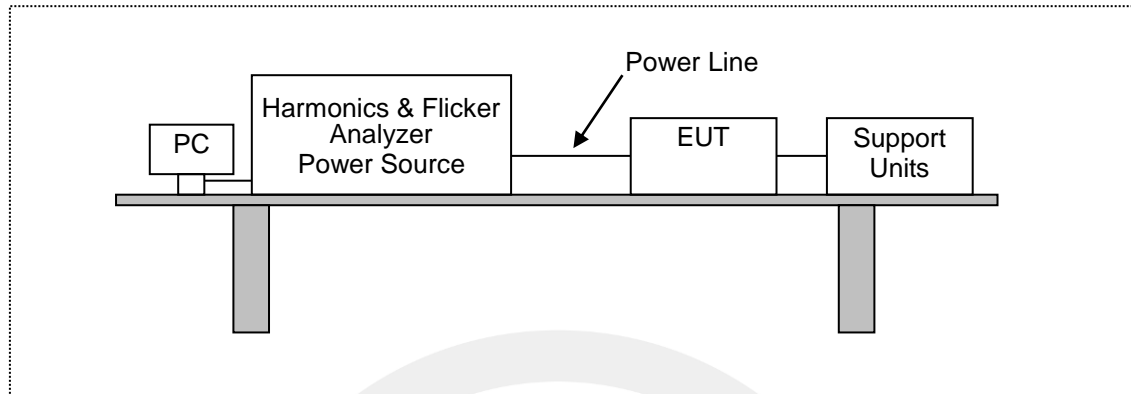
Highest parameter values during test:

Voltage (Vrms): 230.946      Frequency(Hz): 50.00  
 I\_Peak (Amps): 21.106      I\_RMS (Amps): 13.683  
 I\_Fund (Amps): 13.082      Crest Factor: 7.875  
 Power (Watts): -3020.4      Power Factor: -1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.094	0.462	20.39	OK
3	0.184	2.078	8.86	OK
4	0.037	0.461	8.02	OK
5	0.107	0.923	11.57	OK
6	0.028	0.461	6.17	OK
7	0.146	0.692	21.02	OK
8	0.029	0.461	6.31	OK
9	0.181	0.462	39.12	OK
10	0.040	0.461	8.68	OK
11	0.165	0.231	71.34	OK
12	0.041	0.231	17.71	OK
13	0.139	0.231	60.09	OK
14	0.036	0.231	15.81	OK
15	0.130	0.231	56.46	OK
16	0.036	0.231	15.75	OK
17	0.115	0.231	50.01	OK
18	0.041	0.231	17.82	OK
19	0.097	0.231	42.12	OK
20	0.044	0.231	18.91	OK
21	0.088	0.231	38.20	OK
22	0.037	0.231	15.88	OK
23	0.078	0.231	33.94	OK
24	0.042	0.231	18.10	OK
25	0.074	0.231	31.85	OK
26	0.040	0.231	17.15	OK
27	0.069	0.231	30.08	OK
28	0.033	0.231	14.29	OK
29	0.055	0.231	23.97	OK
30	0.033	0.231	14.16	OK
31	0.051	0.231	22.23	OK
32	0.032	0.231	14.00	OK
33	0.047	0.231	20.53	OK
34	0.032	0.231	14.08	OK
35	0.048	0.231	20.69	OK
36	0.029	0.231	12.40	OK
37	0.043	0.231	18.66	OK
38	0.028	0.231	12.27	OK
39	0.036	0.231	15.45	OK
40	0.031	0.231	13.60	OK

## 7. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

### 7.1. Block Diagram of Test Setup



### 7.2. Measuring Standard

BS EN 61000-3-3:2013

### 7.3. Measurement Limits

The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current  $\leq 16$  A per phase, ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.

Voltage Fluctuation and Flicker Limits:

- the value of  $P_{st}$  shall not be greater than 1.0;
- the value of  $P_{lt}$  shall not be greater than 0.65;
- the value of  $d(t)$  during a voltage change shall not exceed 3.3 % for more than 500 ms;
- the relative steady-state voltage change,  $d_c$ , shall not exceed 3.3 %;
- the maximum relative voltage change,  $d_{max}$ , shall not exceed 4.0 %;

### 7.4. Test Procedure

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of 8% is achieved during the whole assessment procedure.

### 7.5. Test Results

**Pass.**

Please refer to the following page.

## Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

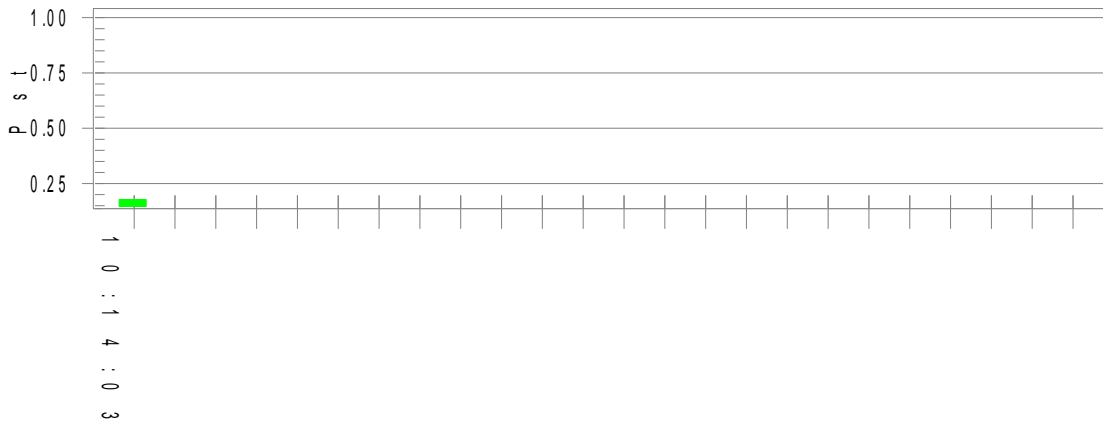
EUT: Grid-connected PV Inverter(X1-3.6K-S-D(L))	Tested by: YSQ
Test category: All parameters (European limits)	Test Margin: 100
Test date: 2020/12/30	Start time: 10:03:42
Test duration (min): 10	End time: 10:14:10
Comment: PV-AC	Data file name: WIN2105_F-000370.cts_data
Customer: Customer	

**Test Result: Pass**

**Status: Test Completed**

### Pst<sub>i</sub> and limit line

### European Limits



### Plt and limit line



### Parameter values recorded during the test:

Vrms at the end of test (Volt):	228.85		
T-max (mS):	0.0	Test limit (mS):	500.0
Highest dc (%):	0.94	Test limit (%):	3.30
Highest dmax (%):	1.08	Test limit (%):	4.00
Highest Pst (10 min. period):	0.178	Test limit:	1.000
Highest Plt (2 hr. period):	0.078	Test limit:	0.650
			Pass
			Pass
			Pass
			Pass



## 8. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on one of the following criteria:

**Performance criterion A:** The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the 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 specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

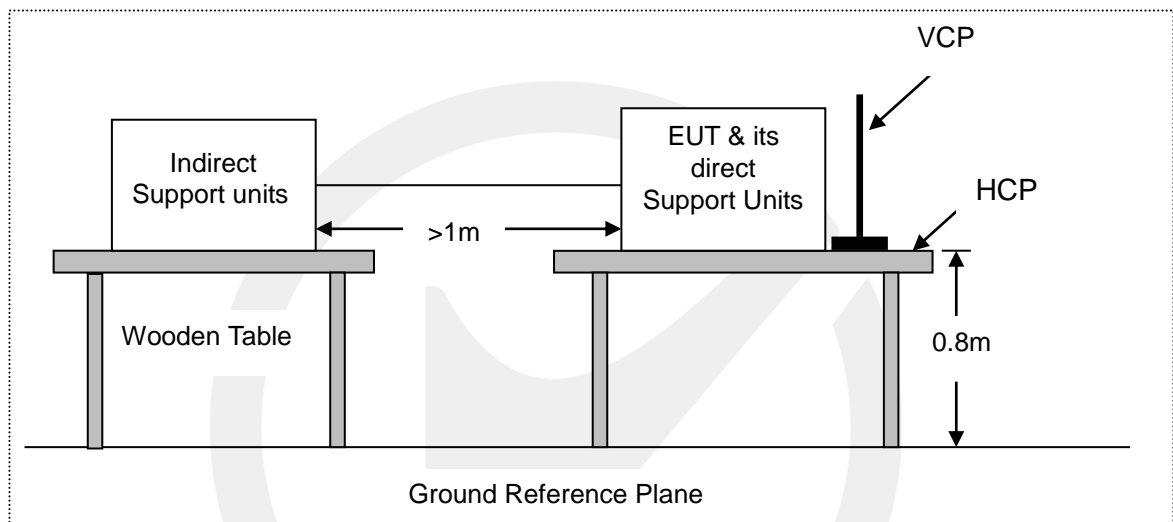
**Performance criterion C:** Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

## 9. ELECTROSTATIC DISCHARGE IMMUNITY TEST

### 9.1. Test Specification

Test standard	: BS EN 61000-6-1, BS EN 61000-6-2
Basic standard	: IEC 61000-4-2
Test level	: $\pm 8.0\text{kV}$ (Air discharge), Performance criterion B $\pm 4.0\text{kV}$ (Contact discharge) , Performance criterion B

### 9.2. Block Diagram of Test Setup



### 9.3. 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)
- Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- 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.
- 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.
- 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.

g. 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.

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

#### 9.4. Test Results

##### Pass.

Temperature : 22 °C  
 Humidity : 51 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

##### Air Discharge:

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4; 8 kV	Input port	A	B	Pass
±2; 4; 8 kV	Output port	A	B	Pass
±2; 4; 8 kV	/	/	B	/

##### Contact Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4kV	Conducted Enclosure	A	B	Pass
±2; 4kV	Screw	A	B	Pass

##### Indirect Discharge

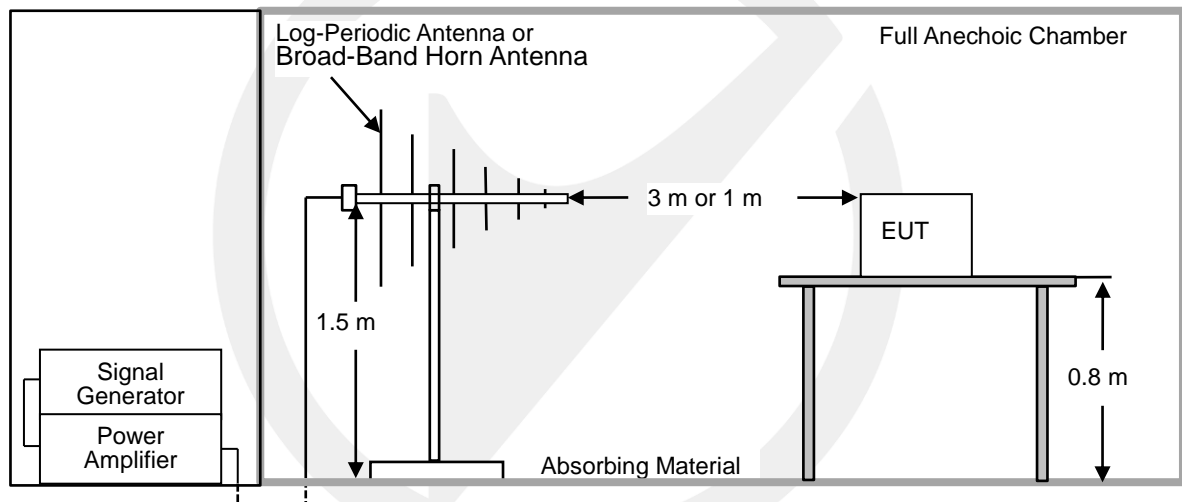
Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4kV	HCP	A	B	Pass
±2; 4kV	VCP	A	B	Pass

## 10. RADIO-FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

### 10.1. Test Specification

Test standard	: BS EN 61000-6-1, BS EN61000-6-2	
Basic standard	: IEC 61000-4-3	
Frequency range	: 80M-1000MHz(For EN 61000-6-1)	3V/m, Performance criterion A
& Test level	: 80M-1000MHz(For EN 61000-6-2)	10V/m, Performance criterion A
	1400M-2000MHz	3V/m, Performance criterion A
	2000M-2700MHz	1V/m, Performance criterion A
Modulation	: AM, 80%, 1kHz sine-wave	
Frequency Step	: 1% of fundamental	
Dwell Time	: 3 second	

### 10.2. Block Diagram of Test Setup



### 10.3. 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 which is enabling the complete frequency range of 80-1000 MHz is placed 3m (or 1m) away 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 is performed with the antenna facing the front and back sides of the EUT with. Both vertical and horizontal polarizations from antenna are tested.

### 10.4. Test results

**Pass.**

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

For BS EN 61000-6-1

Temperature : 23 °C  
 Humidity : 53 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Freq. Range (MHz)	Field	Modulation	Polarity	Position (°)	Actual criterion	Required performance criterion	Result
80-1000	3V/m	AM, 80%	H / V	0, 90,180, 270	A	A	Pass
1400-2000	3V/m				A	A	Pass
2000-2700	1V/m				A	A	Pass

For BS EN 61000-6-2

Temperature : 23 °C  
 Humidity : 53 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Freq. Range (MHz)	Field	Modulation	Polarity	Position (°)	Actual criterion	Required performance criterion	Result
80-1000	10V/m	AM, 80%	H / V	0, 90,180, 270	A	A	Pass
1400-2000	3V/m				A	A	Pass
2000-2700	1V/m				A	A	Pass

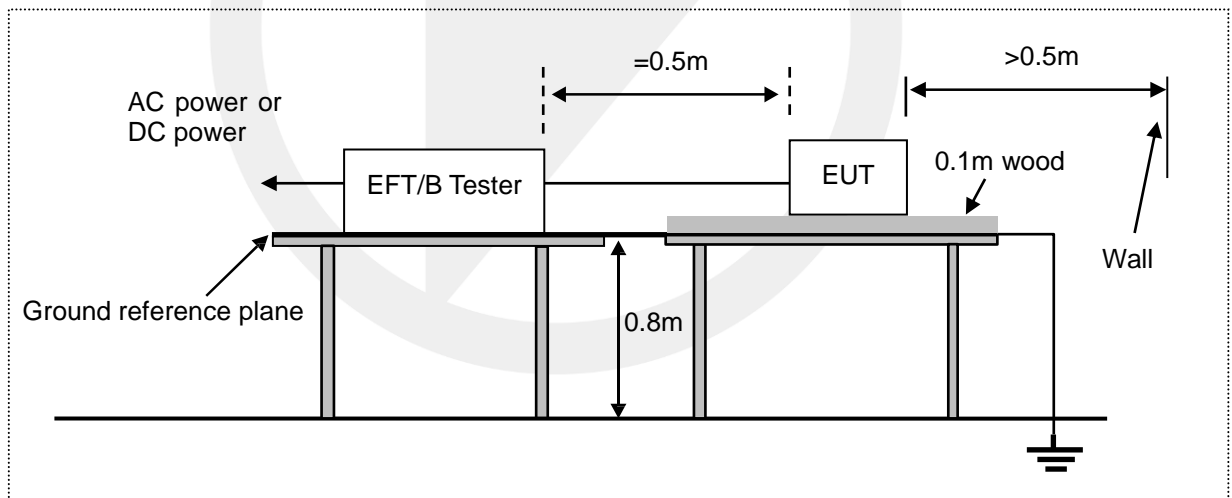
## 11. FAST TRANSIENTS/BURSTS IMMUNITY TEST

### 11.1. Test Specification

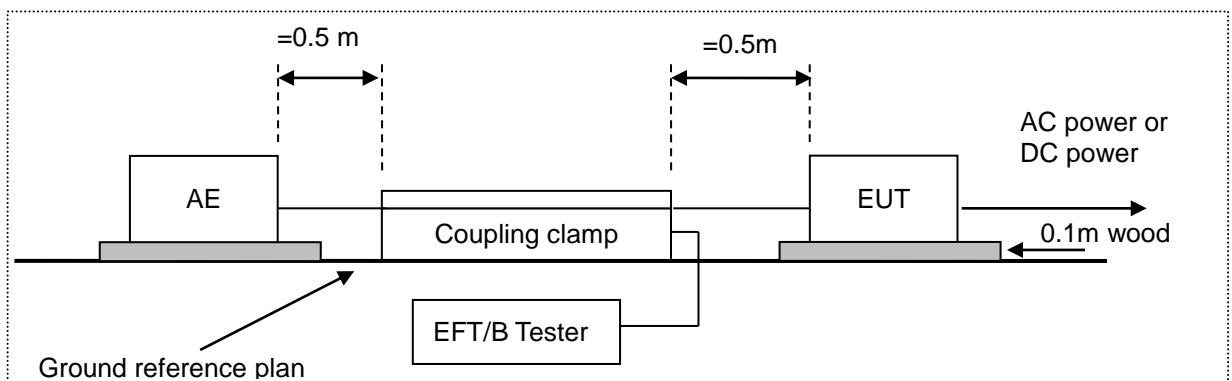
- Test standard : BS EN 61000-6-1, BS EN 61000-6-2
- Basic standard : IEC 61000-4-4
- Test level :  ±0.5kV, Signal ports, Performance criterion B (For EN 61000-6-1)  
 ±1.0kV, Signal ports, Performance criterion B (For EN 61000-6-2)  
 ±0.5kV, Input and Output DC power ports, Performance criterion B (For EN 61000-6-1)  
 ±2.0kV, Input and Output DC power ports, Performance criterion B (For EN 61000-6-2)  
 ±1kV, Input and Output AC power ports, Performance criterion B (For EN 61000-6-1)  
 ±2kV, Input and Output AC power ports, Performance criterion B (For EN 61000-6-2)
- Repetition frequency : 5kHz
- Tr/Th: : 5/50ns
- Burst period : 300ms
- Test time : : 120s

### 11.2. Block Diagram of Test Setup

Input and Output AC power or DC power ports:



Signal ports:



### 11.3. Test Procedure

The EUT is put on the table that is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

### 11.4. Test Results

**Pass.**

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

For BS EN 61000-6-1

Temperature : 23°C  
 Humidity : 53%  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Injection Line	Voltage (kV)	Injected Method	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Signal ports	<input type="checkbox"/> ± 0.5	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input checked="" type="checkbox"/> Capacitive coupling clamp	N/A	B	N/A
<input checked="" type="checkbox"/> Input and Output DC power ports	<input checked="" type="checkbox"/> ± 0.5	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass
<input checked="" type="checkbox"/> Input and Output AC power ports	<input checked="" type="checkbox"/> ± 1	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass

For BS EN 61000-6-2

Temperature : 23°C  
 Humidity : 53%  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

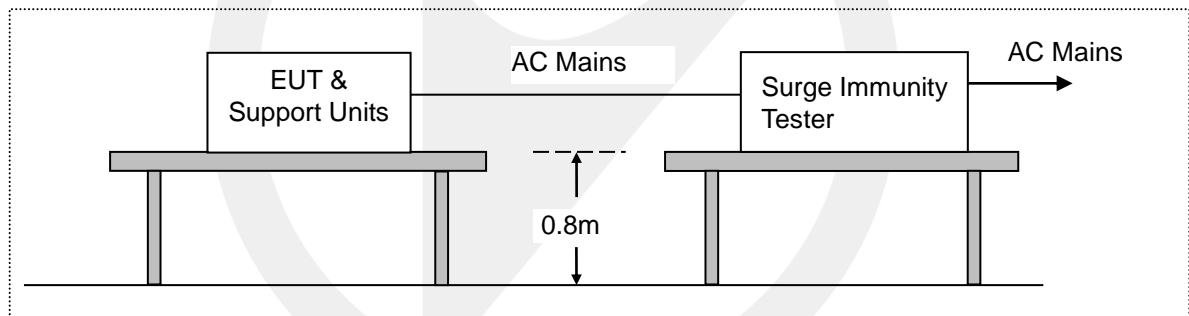
Injection Line	Voltage (kV)	Injected Method	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Signal ports	<input type="checkbox"/> ± 1.0	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input checked="" type="checkbox"/> Capacitive coupling clamp	N/A	B	N/A
<input checked="" type="checkbox"/> Input and Output DC power ports	<input checked="" type="checkbox"/> ± 2.0	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass
<input checked="" type="checkbox"/> Input and Output AC power ports	<input checked="" type="checkbox"/> ± 2.0	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass

## 12. SURGES IMMUNITY TEST

### 12.1. Test Specification

Test standard	: BS EN 61000-6-1, BS EN 61000-6-2
Basic standard	: IEC 61000-4-5
Test level	: <input checked="" type="checkbox"/> ±0.5kV, Input and Output DC power ports, line-to- line, Performance criterion B <input checked="" type="checkbox"/> ±0.5kV, Input and Output DC power ports, line-to- earth, Performance criterion B <input checked="" type="checkbox"/> ±1kV, Input and Output AC power ports, line-to- line, Performance criterion B <input checked="" type="checkbox"/> ±2kV, Input and Output AC power ports, line-to- earth, Performance criterion B <input type="checkbox"/> ±1kV, Signal ports, line-to- earth, Performance criterion B (For EN 61000-6-2)
Waveform (μs)	: 1.2/50 (8/20)
Number of surges	: 5 (for each combination of parameters)
Repetition rate	: 1 minute / time
Polarity:	: Positive / Negative
Phase angle:	: 0°, 90°, 180°, 270°

### 12.2. Block Diagram of Test Setup



### 12.3. Test Procedure

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common mode (Line to Ground) and differential mode (Line to Line). Each device was tested in a total of two surge configurations: Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10ohm and Neutral to Protective Earth with 9uF and 10ohm, common mode, generator earthed.

Line to Line (L-L): Combination Wave,

Line to Neutral with 18uF, differential mode, generator floated.

2 ohm : the source impedance of the low-voltage power supply network.

12 ohm : the source impedance of the low-voltage power supply network and ground.

The pulses are applied 0°, 90°, 180°, 270° relative to the phase angle of the a.c. line voltage to the equipment under test.

a. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).

b. The surges have to be applied line to line and line to earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

c. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan. All lower levels including the selected test level shall be satisfied.



- d. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
- e. Testing shall be performed according to a Test Plan, which shall be included in the test report.
- f. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied.

## 12.4. Test results

**Pass.**

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

Temperature : 23°C  
 Humidity : 53%  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Input and output AC power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> Line to line	1	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
<input checked="" type="checkbox"/> Line to earth	2	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass

Input and output DC power ports:

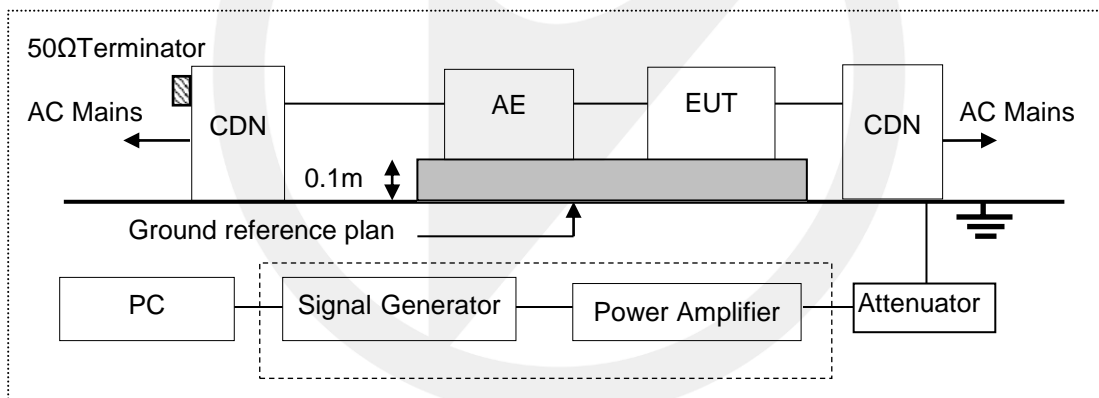
Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> Line to line	0.5	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
<input checked="" type="checkbox"/> Line to earth	0.5	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass

## 13. RADIO-FREQUENCY COMMON MODE IMMUNITY TEST

### 13.1. Test Specification

Test standard	: BS EN 61000-6-1, BS EN 61000-6-2
Basic standard	: IEC 61000-4-6
Test level	: <input type="checkbox"/> 0.15M to 80MHz, Signal ports, 3V, Performance criterion A (For EN 61000-6-1) <input checked="" type="checkbox"/> 0.15M to 80MHz, Input and Output DC power ports, 3V, Performance criterion A (For EN 61000-6-1) <input checked="" type="checkbox"/> 0.15M to 80MHz, Input and Output AC power ports, 3V, Performance criterion A (For EN 61000-6-1) <input type="checkbox"/> 0.15M to 80MHz, Signal ports, 10V, Performance criterion A (For EN 61000-6-2) <input checked="" type="checkbox"/> 0.15M to 80MHz, Input and Output DC power ports, 10V, Performance criterion A (For EN 61000-6-2) <input checked="" type="checkbox"/> 0.15M to 80MHz, Input and Output AC power ports, 10V, Performance criterion A (For EN 61000-6-2)
Modulation	: AM 80%, 1kHz sine-wave
Frequency Step	: 1% of fundamental
Dwell Time	: 3 second

### 13.2. Block Diagram of Test Setup



### 13.3. Test Procedure

- a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- b. The EUT is placed on a 0.1m high test table, and a well grounded cable is connected to metallic plane above the test table.
- c. All cables/wires must be laid out on test plate (3cm in thickness), and the EUT is set up on test plate (10 cm in thickness) as shown in test setup photo, and the cables/wires must not be in mid-air, they should be touching the surface of test plate. Ensure that the EUT is properly connected to the accessory equipment.
- d. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- e. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed  $1.5 \times 10^{-3}$  decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.

f. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.

g. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility

h. Testing shall be performed according to a Test Plan, which shall be included in the test report.

### 13.4. Test results

**Pass.**

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

For BS EN 61000-6-1

Temperature : 23 °C  
 Humidity : 53 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Injection port	Range (MHz)	Levers (V)	Coupling type	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Signal ports	0.15-80	3V	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> EM Clamp	N/A	A	N/A
<input checked="" type="checkbox"/> Input and Output DC power ports	0.15-80	3V	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp	A	A	Pass
<input checked="" type="checkbox"/> Input and Output AC power ports	0.15-80	3V	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp	A	A	Pass

For BS EN 61000-6-2

Temperature : 23 °C  
 Humidity : 53 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

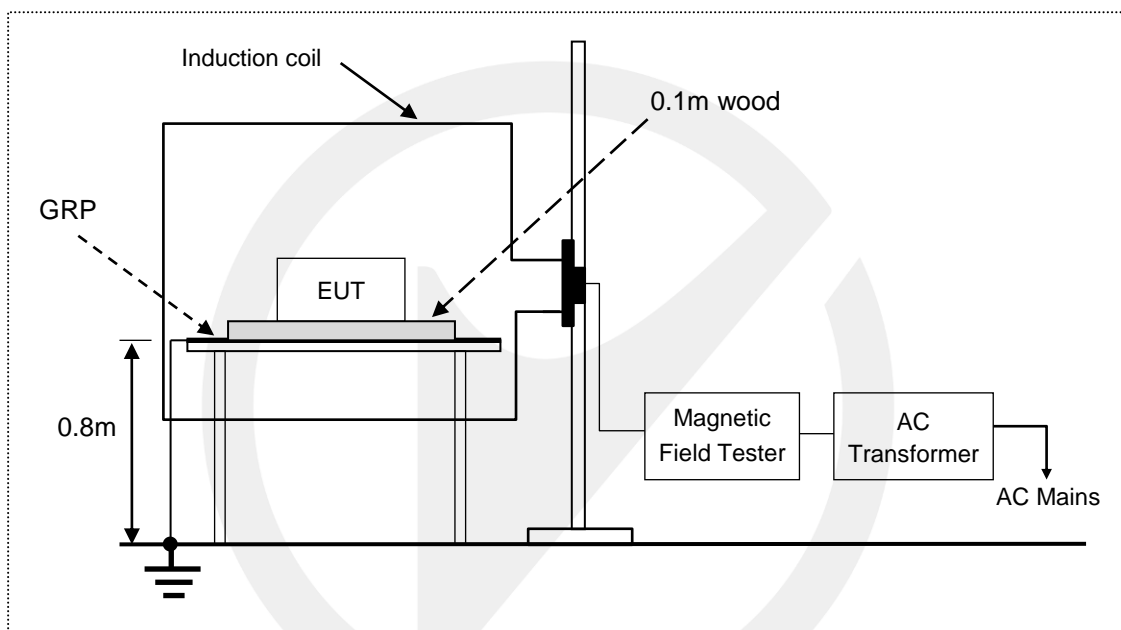
Injection port	Range (MHz)	Levers (V)	Coupling type	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Signal ports	0.15-80	10V	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> EM Clamp	N/A	A	N/A
<input checked="" type="checkbox"/> Input and Output DC power ports	0.15-80	10V	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp	A	A	Pass
<input checked="" type="checkbox"/> Input and Output AC power ports	0.15-80	10V	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp	A	A	Pass

## 14. POWER FREQUENCY MAGNETIC FIELD

### 14.1. Test Specification

Test Standard	: BS EN 61000-6-1, BS EN 61000-6-2
Basic Standard	: IEC 61000-4-8
Performance criterion	: A
Test level	: 3 A/m (For EN 61000-6-1) 30 A/m (For EN 61000-6-2)

### 14.2. Block Diagram of Test Setup



GRP: Ground reference plane  
EUT: Equipment under test

### 14.3. Test Procedure

The EUT is placed in the middle of induction coil (1\*1m), under which is a 1\*1\*0.8m (high) table above the GRP. Both horizontal and vertical polarization of the induction coil is set on test, so that each side of the EUT is affected by the magnetic field. Also can reach the same aim by change the position of the EUT.

### 14.4. Test Results

**Pass.**

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

For BS EN 61000-6-1

Temperature : 23 °C  
 Humidity : 53%  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Test Level (A/m)	Frequency	Testing Duration	Coil Orientation	Actual criterion	Required performance criterion	Result (Pass/Fail)
3	<input checked="" type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz	5 mins	<input checked="" type="checkbox"/> x-axis <input checked="" type="checkbox"/> y-axis <input checked="" type="checkbox"/> z-axis	A	A	Pass

For BS EN 61000-6-2

Temperature : 23 °C  
 Humidity : 53%  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

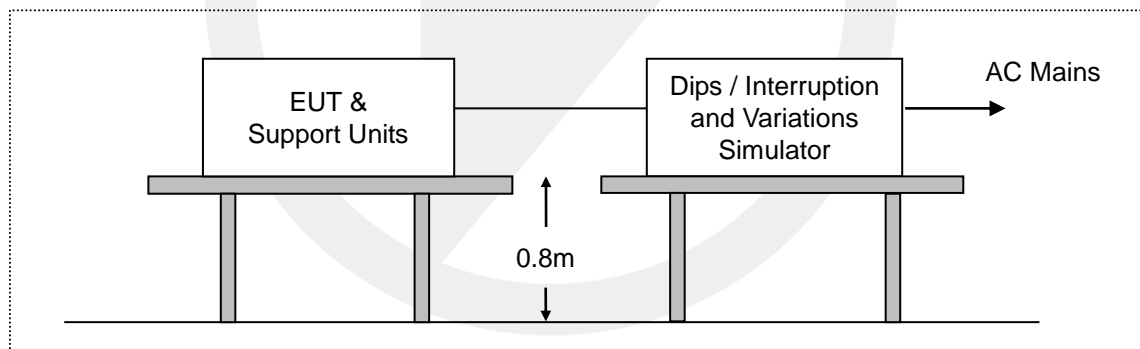
Test Level (A/m)	Frequency	Testing Duration	Coil Orientation	Actual criterion	Required performance criterion	Result (Pass/Fail)
30	<input checked="" type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz	5 mins	<input checked="" type="checkbox"/> x-axis <input checked="" type="checkbox"/> y-axis <input checked="" type="checkbox"/> z-axis	A	A	Pass

## 15. VOLTAGE DIPS AND VOLTAGE INTERRUPTIONS IMMUNITY TEST

### 15.1. Test Specification

- Test standard : BS EN 61000-6-1, BS EN 61000-6-2  
 Basic standard : IEC 61000-4-11  
 Test level : (For EN 61000-6-1)
- 0%, 0.5 periods, Criterion B
  - 0%, 1 periods, Criterion B
  - 70%, 25 periods for 50Hz, Criterion C
  - 70%, 30 periods for 60Hz, Criterion C
  - 0%, 250 periods for 50Hz, Criterion C
  - 0%, 300 periods for 60Hz, Criterion C
- (For EN 61000-6-2)
- 0%, 1 periods, Criterion B
  - 40%, 10 periods for 50Hz, Criterion C
  - 40%, 12 periods for 60Hz, Criterion C
  - 70%, 25 periods for 50Hz, Criterion C
  - 70%, 30 periods for 60Hz, Criterion C
  - 0%, 250 periods for 50Hz, Criterion C
  - 0%, 300 periods for 60Hz, Criterion C

### 15.2. Block Diagram of Test Setup



### 15.3. 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  $\mu$ s.

### 15.4. Test results

**Pass.**

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

For BS EN 61000-6-1

Temperature : 23°C  
 Humidity : 53 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Item	Test Level (% UT)	Phase angle (°)	Input Voltage (V)	Freq (Hz)	Duration (periods)	Actual criterion	Required performance criterion	Result (Pass /Fail)
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	50	0.5	A	B	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	50	1	B	B	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°, 180°	AC 230V	50	25	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°, 180°	AC 230V	60	30	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	50	250	C	C	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	60	300	C	C	Pass

For BS EN 61000-6-2

Temperature : 23°C  
 Humidity : 53 %  
 Atmospheric Pressure : 101kpa  
 Test Engineer : CSL  
 Test Date : 2020-12-30

Item	Test Level (% UT)	Phase angle (°)	Input Voltage (V)	Freq (Hz)	Duration (periods)	Actual criterion	Required performance criterion	Result (Pass /Fail)
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	50	1	A	B	Pass
<input checked="" type="checkbox"/> Voltage dips	40%	0°, 180°	AC 230V	50	10	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	40%	0°, 180°	AC 230V	60	12	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°, 180°	AC 230V	50	25	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°, 180°	AC 230V	60	30	B	C	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	50	250	C	C	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°, 180°	AC 230V	60	300	C	C	Pass

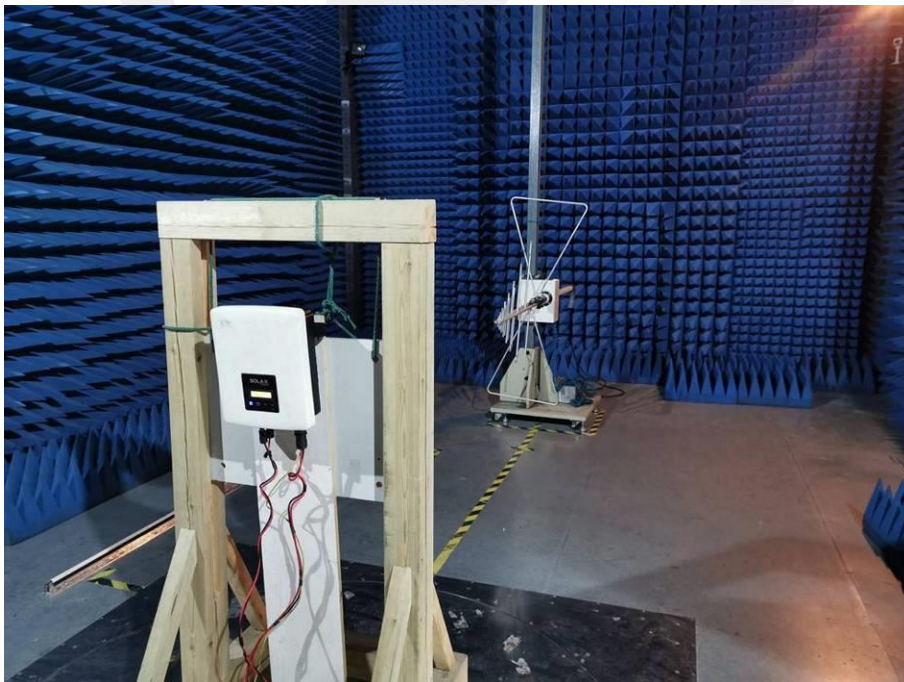


## 16. PHOTOGRAPH

### 16.1. Photo of Conducted Emission at Mains Measurement



### 16.2. Photo of Radiation Emission Measurement





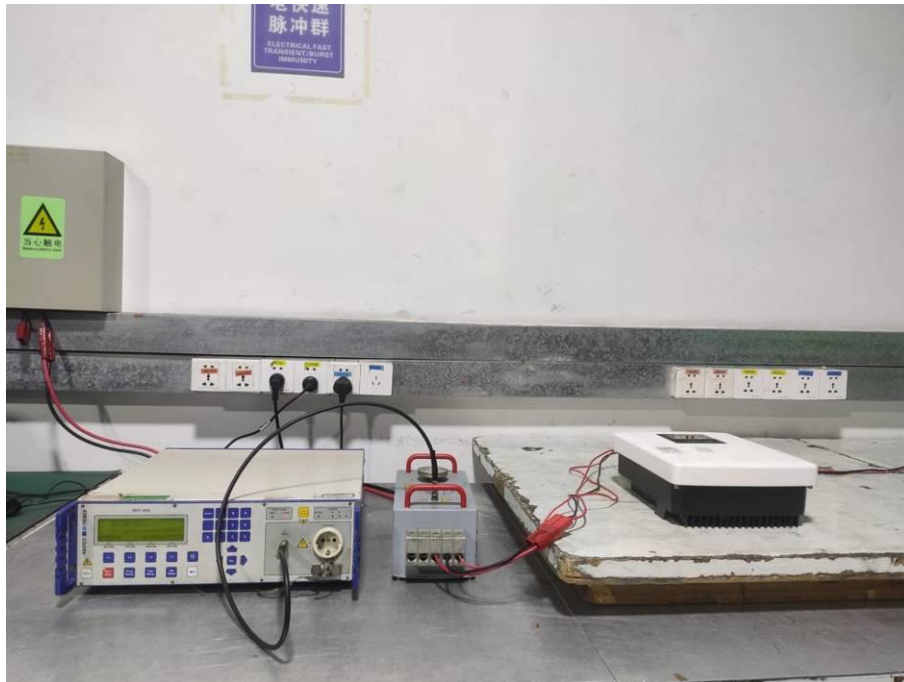
### 16.3.Photo of Harmonics and Flicker Test



### 16.4.Photo of Electrostatic Discharge Test



### 16.5. Photo of Electrical Fast Transient / Burst Test



### 16.6. Photo of Surge Test



### 16.7.Photo of Injected Currents Susceptibility Test



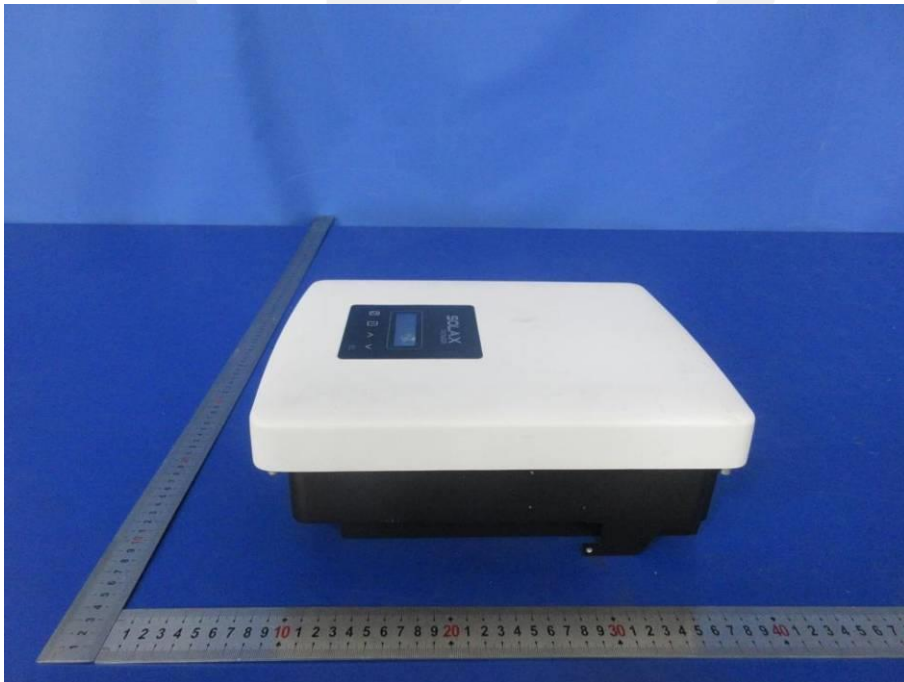
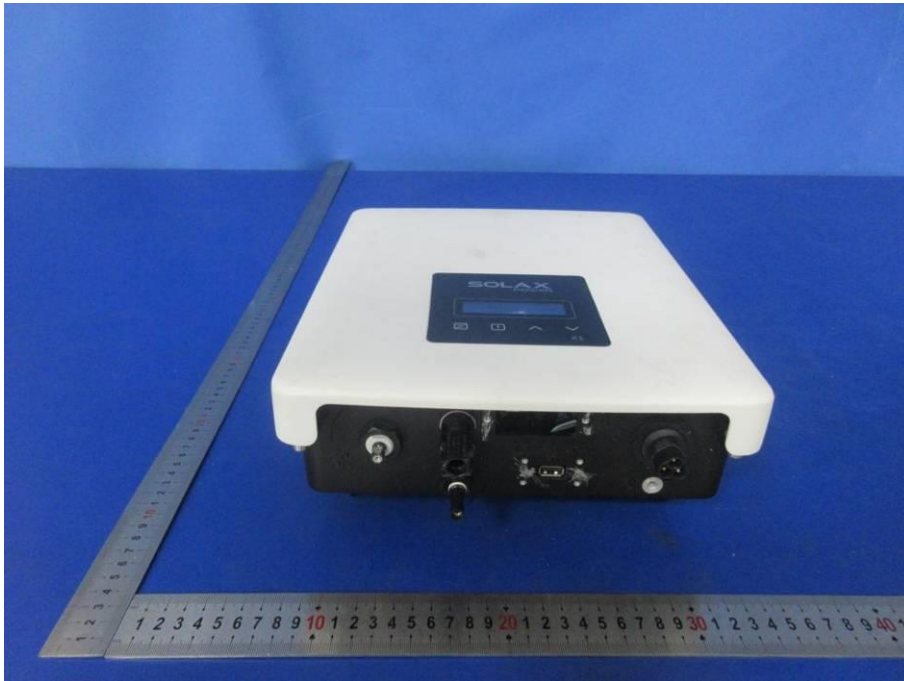
### 16.8.Photo of Voltage Dips and Interruption Immunity Test

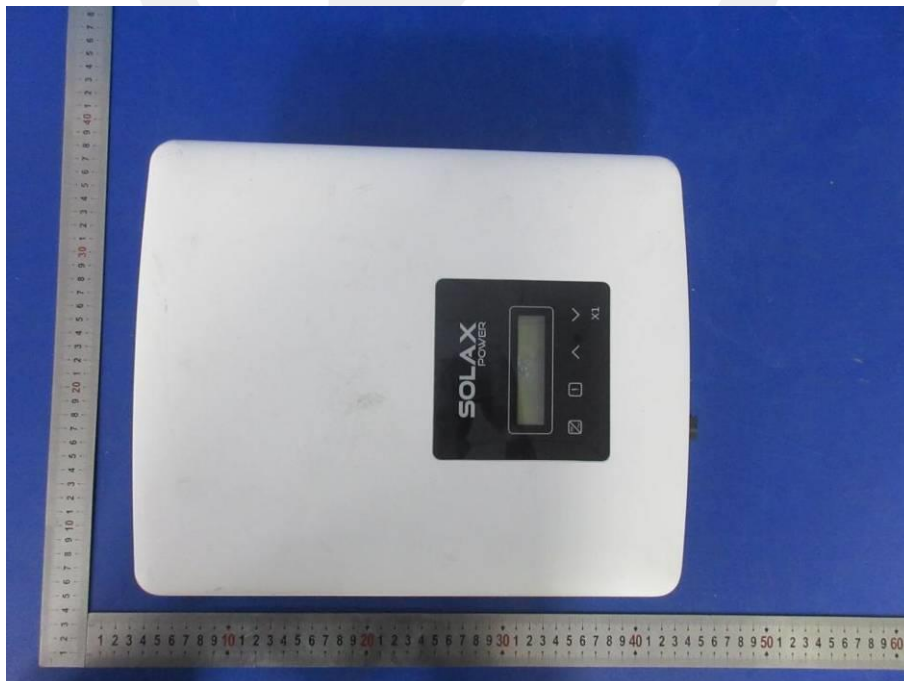
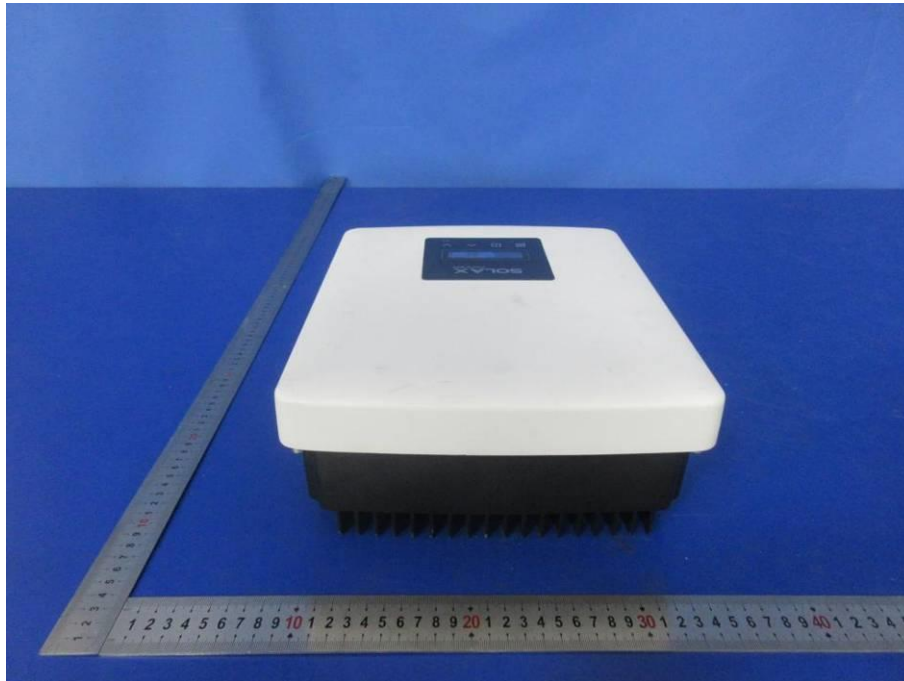


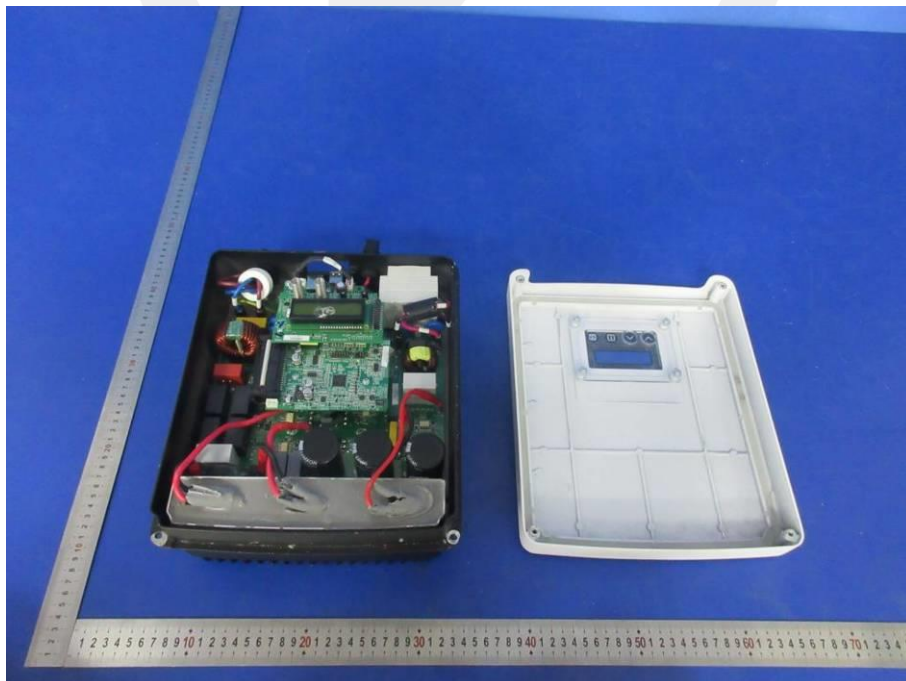


# APPENDIX I (Photo of EUT)

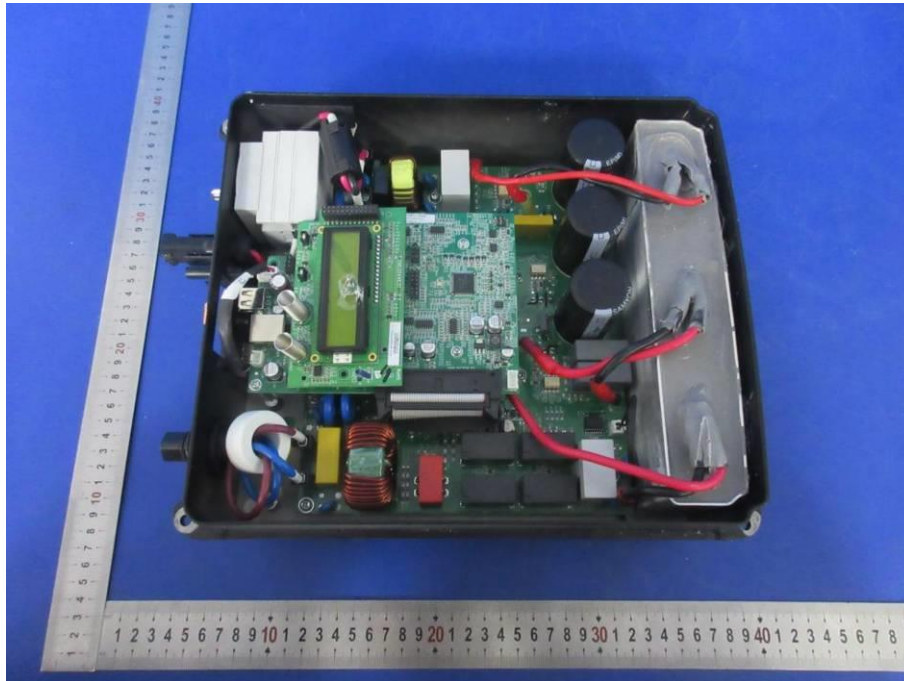




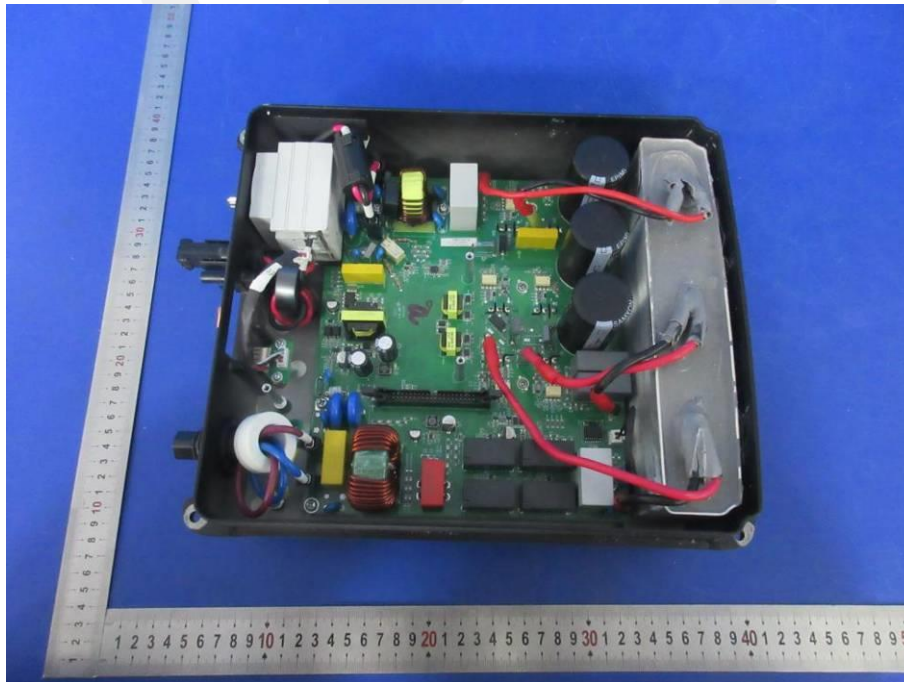
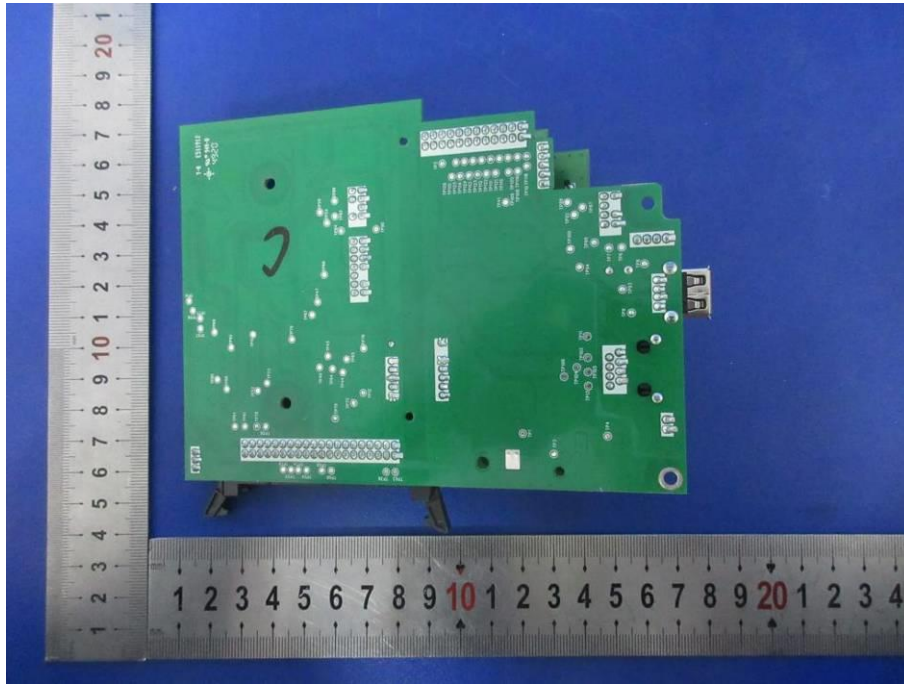


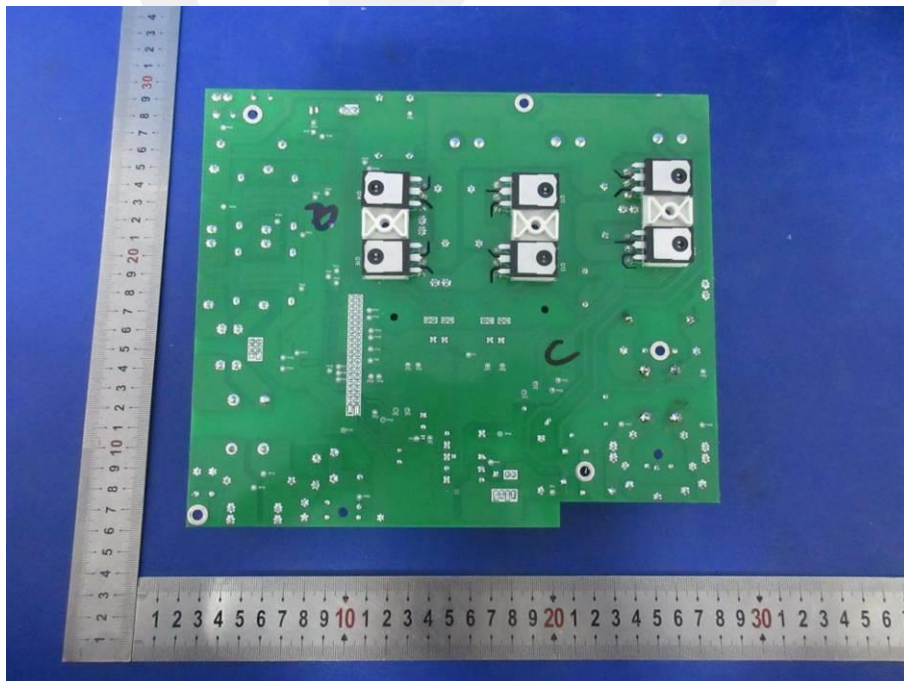
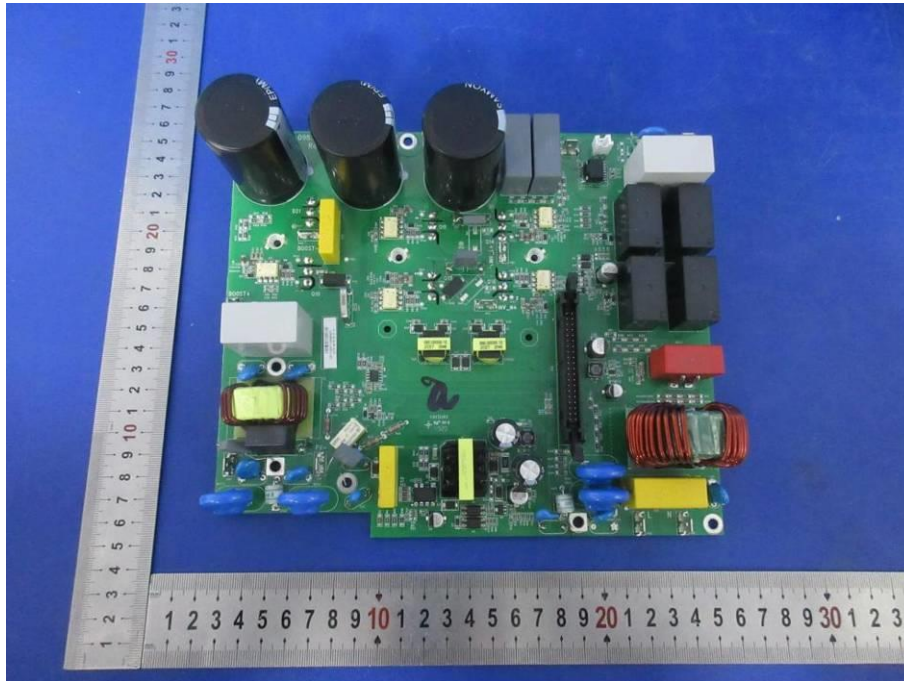












\*\*\* End of Report \*\*\*

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