

TEST REPORT

Product Name : Hybrid Inverter

**Model Number : HYD 3000-EP, HYD 3680-EP,
HYD 4000-EP, HYD 4600-EP,
HYD 5000-EP, HYD 5500-EP,
HYD 6000-EP**

Prepared for : Shenzhen SOFARSOLAR Co., Ltd.
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Report Number : ES201020043E
Date of Test : October 20, 2020 to October 27, 2020
Date of Report : November 04, 2020



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TEST REPORT DESCRIPTION

Applicant : Shenzhen SOFARSOLAR Co., Ltd.
 Manufacturer : Shenzhen SOFARSOLAR Co., Ltd.
 Trademark :

EUT : Hybrid Inverter
 Model No. : HYD 3000-EP, HYD 3680-EP, HYD 4000-EP, HYD 4600-EP, HYD 5000-EP, HYD 5500-EP, HYD 6000-EP

Remark : This Report Shows that the EUT is technically complicant with The EMC (Radiation and Conduction) of SANS 211 requirements.

Measurement Procedure Used:

SANS 211:2010/CISPR 11:2015+A1:2016
 (Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement)
 IEC 61000-2-2:2002+A1:2017+A2:2018

The device described above is tested by EMTEK (SHENZHEN) 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 (SHENZHEN) 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 compliant with the SANS 211/CISPR 11 requirements.

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

Date of Test : October 20, 2020 to October 27, 2020

Prepared by : Jessie Hu
 Jessie Hu/Editor

Reviewer : Joe Xia
 Joe Xia/Supervisor

Approved & Authorized Signer : Lisa Wang
 Lisa Wang/Manager



Modified Information

Version	Report No.	Revision Date	Summary
Ver.1.0	ES201020043E	/	Original Report



1. SUMMARY OF TEST RESULT

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted Disturbance at Mains Terminals	SANS 211:2010/CISPR 11:2015+A1:2016	Class B	Pass
Voltage Distortion in Differential mode	IEC 61000-2-2:2002+A1:2017+A2:2018	Table 4	Pass
Radiated Disturbance	SANS 211:2010/CISPR 11:2015+A1:2016	Class B	Pass
Note: /			



2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	Hybrid Inverter
Model Number	:	HYD 3000-EP, HYD 3680-EP, HYD 4000-EP, HYD 4600-EP, HYD 5000-EP, HYD 5500-EP, HYD 6000-EP (Note: All the models are the same, except their output rating. We prepare HYD 6000-EP for test.)
Applicant	:	Shenzhen SOFARSOLAR Co., Ltd.
Address	:	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China
Manufacturer	:	Shenzhen SOFARSOLAR Co., Ltd.
Address	:	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China
Factory	:	Dongguan SOFAR SOLAR Co., Ltd.
Address	:	1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City
Date of Received	:	October 20, 2020
Date of Test	:	October 20, 2020 to October 27, 2020

2.2. Independent Operation Modes

- A. ON
1. PV in & Grid-connected
 2. Bat in & Grid-connected
 3. AC Charging
 4. PV Charging

2.3. Test Manner

Details of EUT Test Modes:

Test Items	Test Voltage	Function Type	Worst case
Conducted disturbance at mains Terminals	AC 230V/50Hz DC 300V Bat 48V	Mode A	Mode A.3
Voltage Distortion in Differential mode	AC 230V/50Hz DC 300V Bat 48V	Mode A	Mode A.1
Radiated emissions at frequencies up to 1 GHz	AC 230V/50Hz DC 300V Bat 48V	Mode A	Mode A.4

2.4. Description of Test Facility

Site Description

EMC Lab. : Accredited by CNAS, 2018.11.30
 The certificate is valid until 2022.10.28
 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01 (identical to ISO/IEC 17025:2017)
 The Certificate Registration Number is L2291.

Accredited by FCC
 Designation Number: CN1204
 Test Firm Registration Number: 882943

Accredited by A2LA, August 25, 2020
 The Certificate Number is 4321.01.

Accredited by Industry Canada
 The Conformity Assessment Body Identifier is CN0008

Name of Firm : EMTEK (SHENZHEN) CO., LTD.
 Site Location : Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

2.5. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 3.16dB(9k~150kHz Conduction 2#) 2.90dB(150k-30MHz Conduction 2#)
Radiated Emission Uncertainty (10m Chamber)	: 4.58dB (30M~1GHz Polarize: H) 4.54dB (30M~1GHz Polarize: V)
Uncertainty for test site temperature and humidity	: 0.6°C 4%

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1. For Power Line Conducted Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI	101045	2020/5/16	1 Year
<input checked="" type="checkbox"/>	PULSE LIMTER	Rohde & Schwarz	ESH3-Z2	100107	2020/5/17	1 Year
<input checked="" type="checkbox"/>	AMN	Rohde & Schwarz	ESH3-Z5	100191	2020/5/16	1 Year

3.2. For Voltage Distortion in Differential mode Measurement

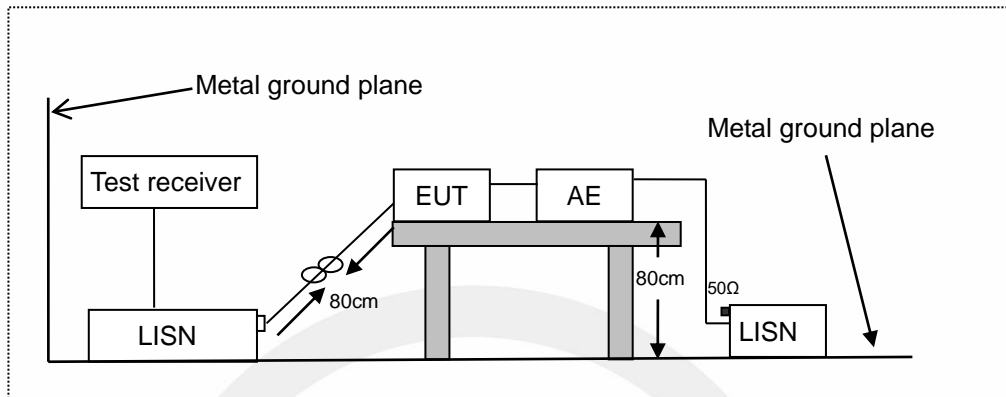
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI	101045	2020/5/16	1 Year
<input checked="" type="checkbox"/>	PULSE LIMTER	Rohde & Schwarz	ESH3-Z2	100107	2020/5/17	1 Year
<input checked="" type="checkbox"/>	AMN	Rohde & Schwarz	ESH3-Z5	100191	2020/5/16	1 Year

3.3. For Radiated Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	661	2019/9/22	2 Year
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	660	2019/7/14	2 Year
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESR3	101707	2020/5/16	1 Year
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESR3	101706	2020/5/16	1 Year
<input checked="" type="checkbox"/>	Pre-Amplifier	Lunar EM	LNA10M1G-40	J101113112600 1	2020/5/16	1 Year
<input checked="" type="checkbox"/>	Pre-Amplifier	Lunar EM	LNA10M1G-40	J101113112600 2	2020/5/17	1 Year

4. POWER LINE CONDUCTED EMISSION MEASUREMENT

4.1. Block Diagram of Test Setup



LISN: Artificial Mains Network
AE: Associated equipment
EUT: Equipment under test

4.2. Measuring Standard

SANS 211/CISPR 11

4.3. Power Line Conducted Emission Limits (Group 1 Class B)

Disturbance voltage limits for class B group 1 equipment measured on a test site (a.c. mains power port)

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66	56
	Decreasing linearly with logarithm of frequency to 56	Decreasing linearly with logarithm of frequency to 46
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: At the transition frequency, the more stringent limit shall apply.

4.4. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided 50ohm-coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the SANS 211/CISPR 11 regulations during conducted emission measurement.

The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 9kHz in 150kHz~30MHz and 200Hz in 9kHz~150kHz.

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

Test results were obtained from the following equation:

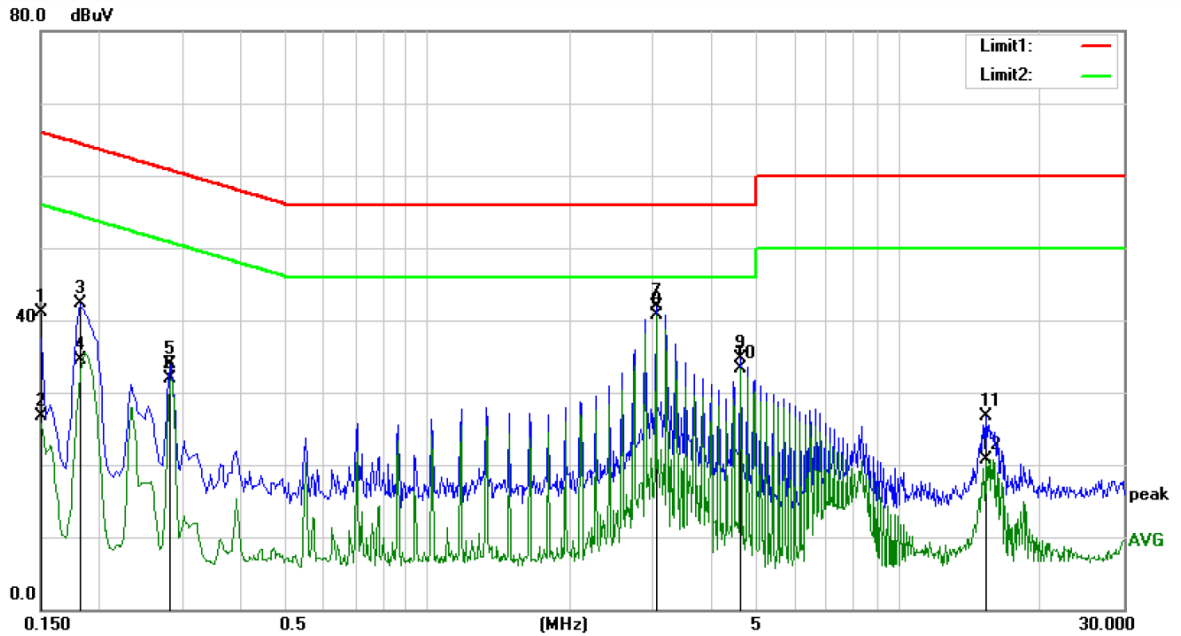
Emission Level (dB μ V) = AMN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)

Margin (dB) = Emission Level (dB μ V) - Limit (dB μ V)

4.5. Measuring Results

PASS.

All the modes were tested and the data of the worst modes are attached the following pages.



Site Conduction #2

Phase: L1

Temperature: 25.0

Limit: (CE)CISPR 11 class B_QP

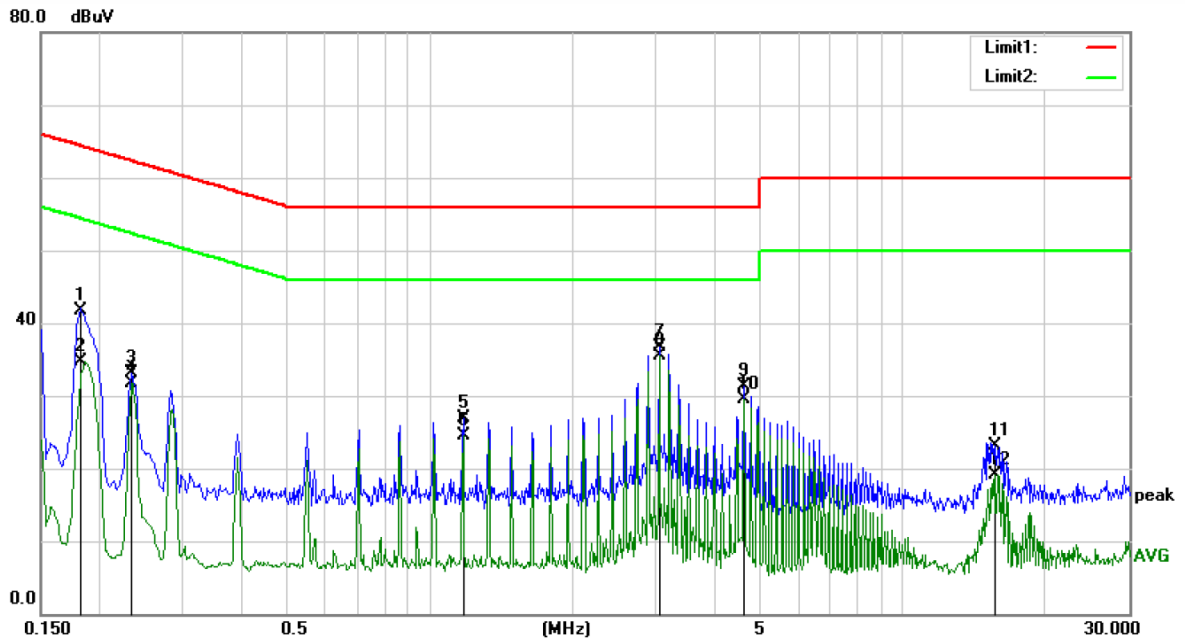
Power: AC 230V/50Hz Bat 48V Humidity: 49 %

Mode: AC Charging

sample ID:S200316105-001

Job No: 200316105GZU

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1500	30.46	10.65	41.11	66.00	-24.89	QP	
2		0.1500	15.96	10.65	26.61	56.00	-29.39	AVG	
3		0.1820	31.72	10.49	42.21	64.39	-22.18	QP	
4		0.1820	23.94	10.49	34.43	54.39	-19.96	AVG	
5		0.2820	23.58	10.39	33.97	60.76	-26.79	QP	
6		0.2820	21.57	10.39	31.96	50.76	-18.80	AVG	
7		3.0500	31.63	10.25	41.88	56.00	-14.12	QP	
8	*	3.0500	30.48	10.25	40.73	46.00	-5.27	AVG	
9		4.6100	24.31	10.30	34.61	56.00	-21.39	QP	
10		4.6100	22.95	10.30	33.25	46.00	-12.75	AVG	
11		15.2380	16.48	10.29	26.77	60.00	-33.23	QP	
12		15.2380	10.44	10.29	20.73	50.00	-29.27	AVG	

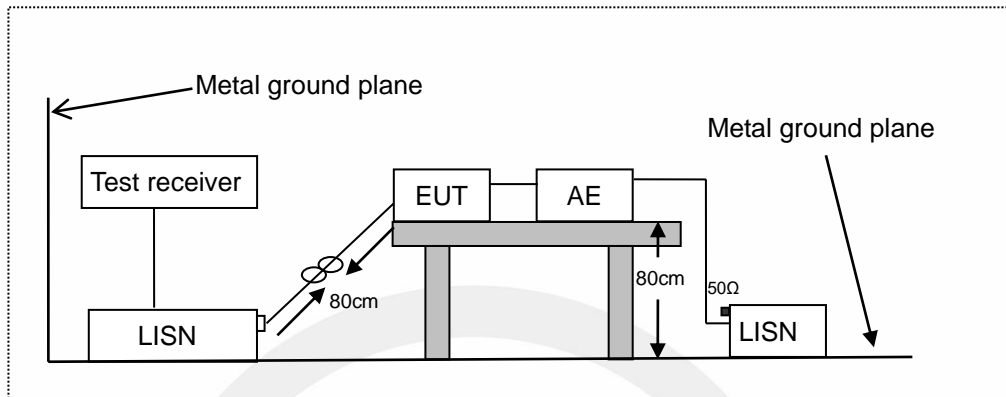


Site Conduction #2 Phase: N Temperature: 25.0
 Limit: (CE)CISPR 11 class B_QP Power: AC 230V/50Hz Bat 48V Humidity: 49 %
 Mode: AC Charging
 sample ID:S200316105-001
 Job No: 200316105GZU

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1825	31.29	10.49	41.78	64.37	-22.59	QP	
2		0.1825	24.23	10.49	34.72	54.37	-19.65	AVG	
3		0.2340	22.76	10.40	33.16	62.31	-29.15	QP	
4		0.2340	21.29	10.40	31.69	52.31	-20.62	AVG	
5		1.1740	16.73	10.23	26.96	56.00	-29.04	QP	
6		1.1740	14.30	10.23	24.53	46.00	-21.47	AVG	
7		3.0500	26.47	10.25	36.72	56.00	-19.28	QP	
8	*	3.0500	25.28	10.25	35.53	46.00	-10.47	AVG	
9		4.6100	21.04	10.30	31.34	56.00	-24.66	QP	
10		4.6100	19.24	10.30	29.54	46.00	-16.46	AVG	
11		15.7060	12.78	10.29	23.07	60.00	-36.93	QP	
12		15.7060	8.76	10.29	19.05	50.00	-30.95	AVG	

5. VOLTAGE DISTORTION IN DIFFERENTIAL MODE MEASUREMENT

5.1. Block Diagram of Test Setup



LISN: Artificial Mains Network
AE: Associated equipment
EUT: Equipment under test

5.2. Measuring Standard

IEC 61000-2-2:2002+A1:2017+A2:2018

5.3. Voltage Distortion in Differential mode Limits

Compatibility levels for voltage distortion in differential mode from 30 kHz to 150 kHz^a

Frequency range kHz	Compatibility levels dB(μV)
30 to 50 ^b	122 to 119 ^c
50 ^b to 150	113 to 89 ^c

^a For EMC coordination in the setting of emission limits for unsymmetrical voltage distortion, see 4.12.1.

^b At the transition frequency, the lower level applies.

^c The level decreases linearly with the logarithm of the frequency in the ranges 30 kHz to 50 kHz and 50 kHz to 150 kHz.

5.4. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided 50ohm-coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the IEC 61000-2-2 regulations during conducted emission measurement. The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 200Hz in 30kHz~150kHz.

The frequency range from 30kHz to 150kHz is investigated.

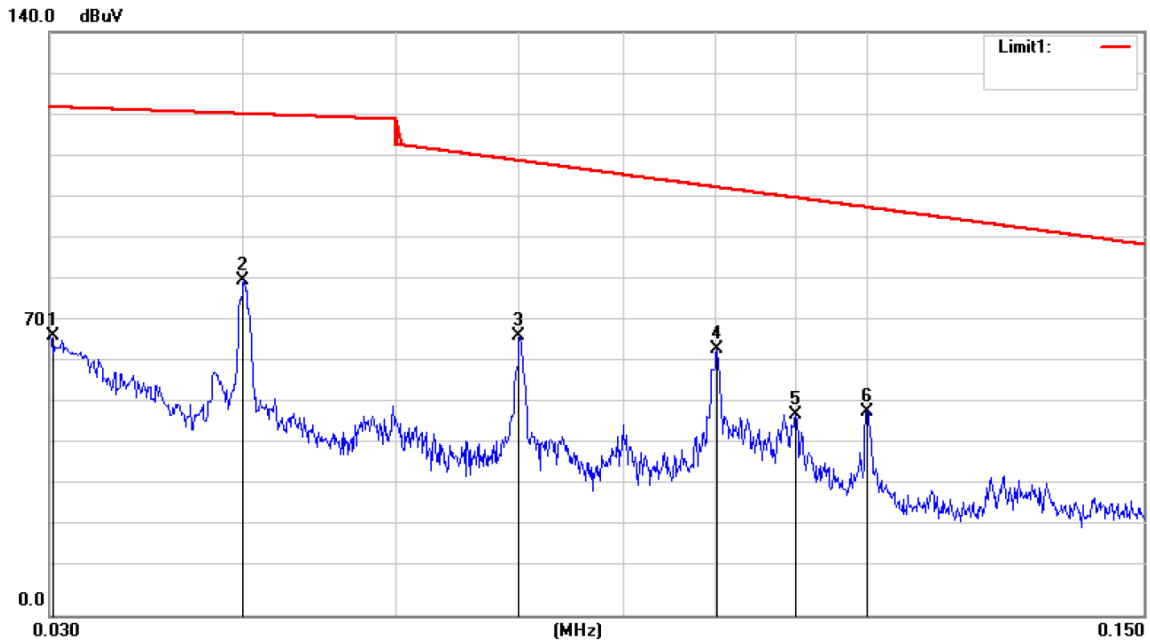
Test results were obtained from the following equation:

$$\text{Emission Level (dB}\mu\text{V)} = \text{AMN Factor (dB)} + \text{Cable Loss (dB)} + \text{Reading (dB}\mu\text{V)}$$
$$\text{Margin (dB)} = \text{Emission Level (dB}\mu\text{V)} - \text{Limit (dB}\mu\text{V)}$$

5.5. Measuring Results

PASS.

All the modes were tested and the data of the worst modes are attached the following pages.



Site Conduction #2

Phase: **L1**

Temperature: 25.0

Limit: IEC61000-2-2(30k-150k)

Power: AC 230V/50Hz DC300V

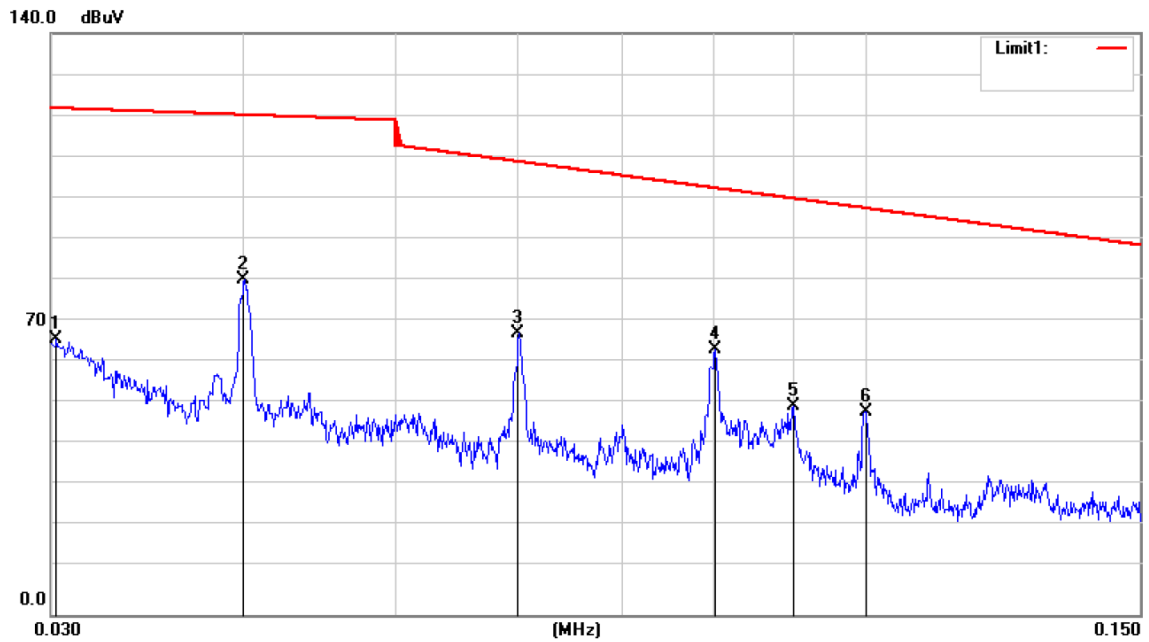
Humidity: 49 %

Mode: PV in & Grid-connected

sample ID:S200316105-001

Job No: 200316105GZU

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.0301	56.63	10.47	67.10	121.98	-54.88	QP	
2		0.0400	69.77	10.38	80.15	120.31	-40.16	QP	
3		0.0600	56.54	10.35	66.89	109.02	-42.13	QP	
4	*	0.0801	53.72	10.31	64.03	102.71	-38.68	QP	
5		0.0900	37.75	10.30	48.05	100.16	-52.11	QP	
6		0.1000	38.62	10.28	48.90	97.86	-48.96	QP	

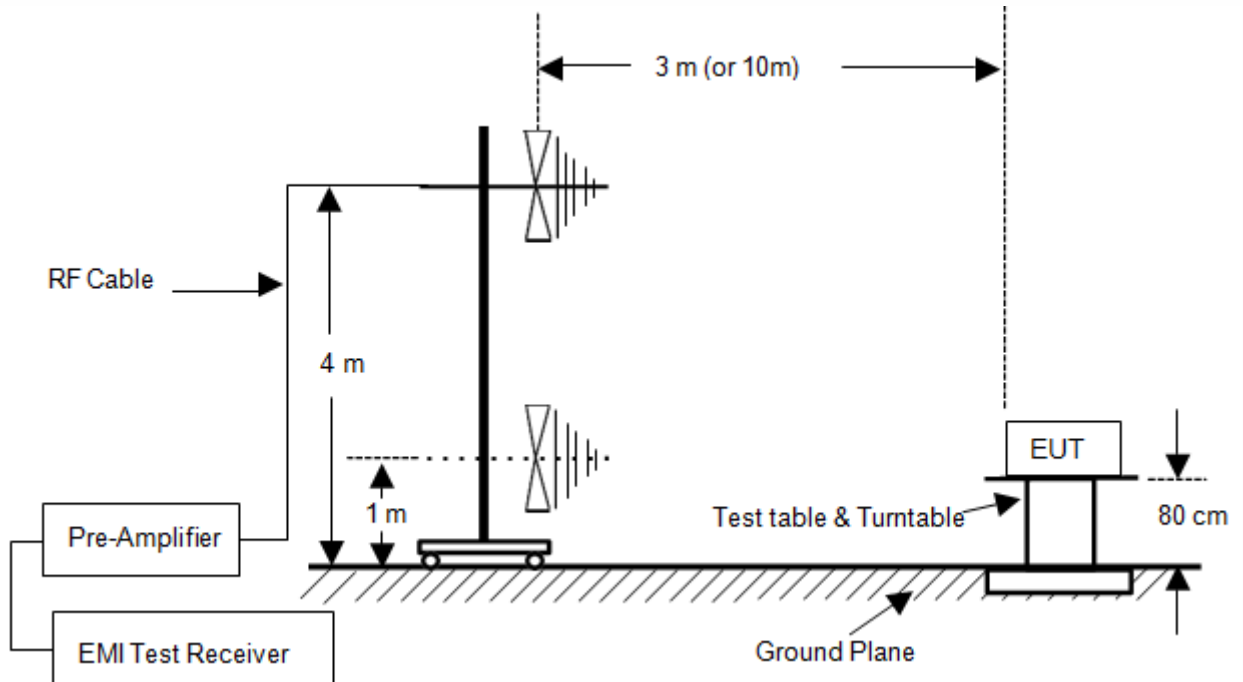


Site Conduction #2 Phase: N Temperature: 25.0
 Limit: IEC61000-2-2(30k-150k) Power: AC 230V/50Hz DC300V Humidity: 49 %
 Mode: PV in & Grid-connected
 sample ID:S200316105-001
 Job No: 200316105GZU

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.0302	55.71	10.47	66.18	121.96	-55.78	QP	
2		0.0400	70.20	10.38	80.58	120.31	-39.73	QP	
3		0.0600	57.21	10.35	67.56	109.02	-41.46	QP	
4	*	0.0801	53.50	10.31	63.81	102.71	-38.90	QP	
5		0.0900	40.06	10.30	50.36	100.16	-49.80	QP	
6		0.1000	38.50	10.28	48.78	97.86	-49.08	QP	

6. RADIATED EMISSION MEASUREMENT (UP TO 1GHz)

6.1. Block Diagram of Test Setup



6.2. Measuring Standard

SANS 211/CISPR 11

6.3. Radiated Emission Limits (Group 1 Class B)

All emanations from a Group 1 Class B device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB μ V/m)
30 ~ 230	10	30
230 ~ 1000	10	37

- 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.
 (3) Intended to be permanently installed in X-ray shielded locations, an increase in the electromagnetic radiation disturbance limits of 12 dB for tests conducted on a test site is allowed.

6.4. 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 10 meters away from the receiving antenna, which 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 120kHz.

Test results were obtained from the following equation:

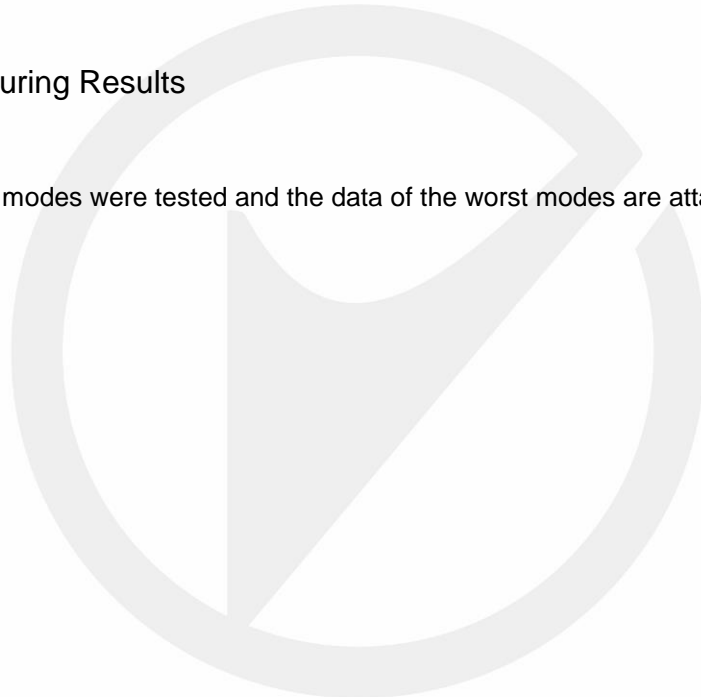
Emission level (dB μ V/m) = Antenna Factor - Amp Factor + Cable Loss + Reading

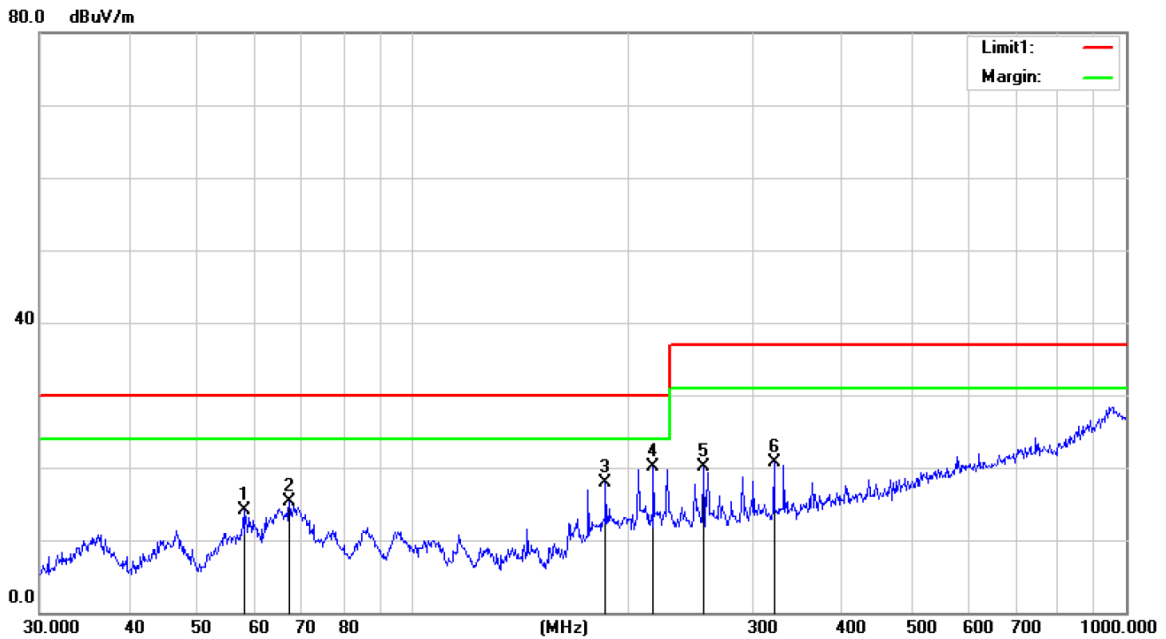
Margin (dB) = Emission Level (dB μ V/m) - Limit (dB μ V/m).

6.5. Measuring Results

PASS.

All the modes were tested and the data of the worst modes are attached the following pages



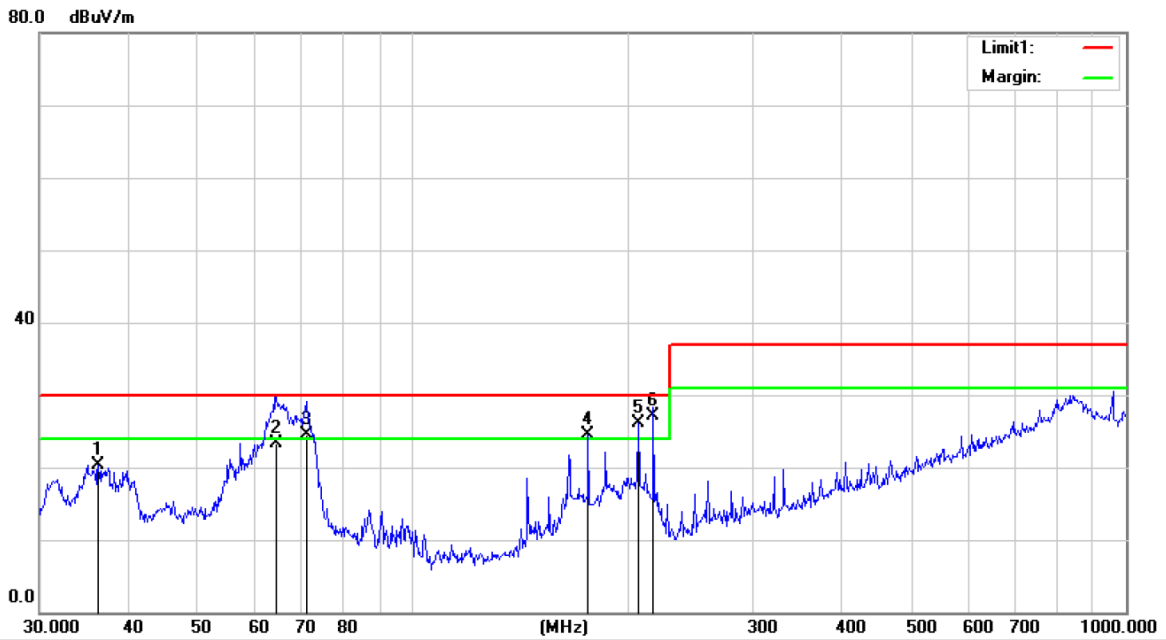


Site 10m Chamber 1# Polarization: **Horizontal** Temperature: 26
 Limit: (RE10M)CISPR 11 Class B Power: DC48V PV300V Humidity: 60 %
 Mode:PV charging
 sample ID:S200316105-001
 Job No: 200316105GZU

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	HI cm	Degree deg.	Comment
1		57.9993	44.56	11.82	43.53	1.26	14.11	30.00	-15.89	QP	185	293	
2		67.2022	47.52	10.06	43.56	1.34	15.36	30.00	-14.64	QP	400	95	
3		186.4410	48.93	10.64	43.96	2.27	17.88	30.00	-12.12	QP	400	288	
4	*	217.5443	49.47	11.86	43.76	2.51	20.08	30.00	-9.92	QP	185	263	
5		255.6231	47.81	12.78	43.22	2.78	20.15	37.00	-16.85	QP	400	89	
6		321.0608	46.08	13.82	42.4	3.24	20.74	37.00	-16.26	QP	185	259	

*:Maximum data x:Over limit !:over margin

Operator: XZC



Site: 10m Chamber 1# Polarization: **Vertical** Temperature: 26
 Limit: (RE10M)CISPR 11 Class B Power: DC48V PV300V Humidity: 60 %
 Mode: PV charging
 sample ID: S200316105-001
 Job No: 200316105GZU

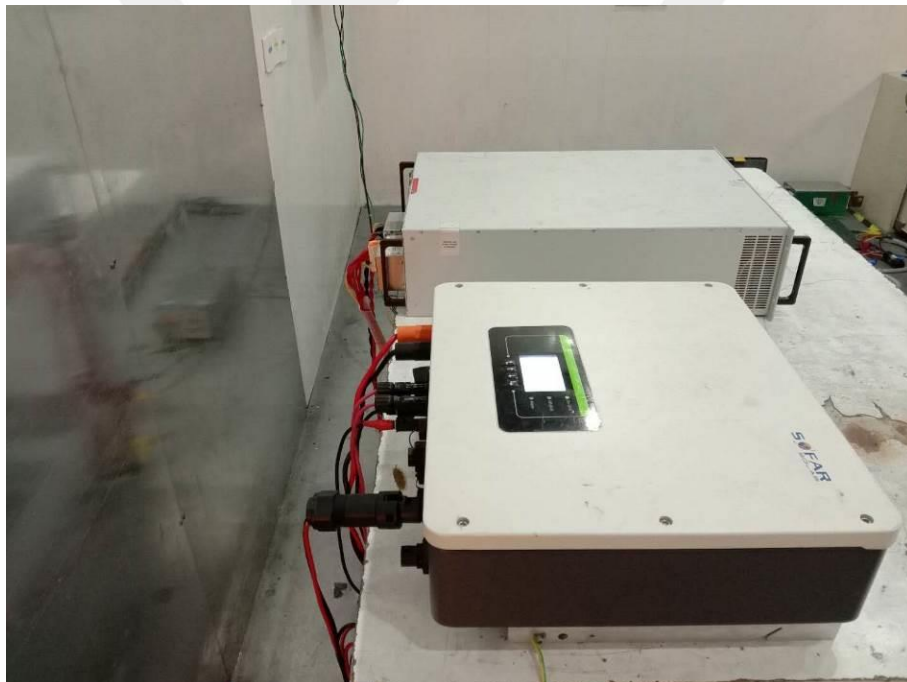
No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	HI cm	Degree deg.	Comment
1		36.2541	50.92	11.3	43.28	1.39	20.33	30.00	-9.67	QP	100	0	
2		64.4331	52.51	12.42	43.35	1.82	23.40	30.00	-6.60	QP	100	76	
3	!	71.0803	55.00	11.06	43.36	1.9	24.60	30.00	-5.40	QP	200	99	
4	!	176.2686	55.14	9.69	43.51	3.12	24.44	30.00	-5.56	QP	100	164	
5	!	207.1226	56.31	9.87	43.49	3.37	26.06	30.00	-3.94	QP	100	0	
6	*	217.5443	56.88	10.27	43.43	3.48	27.20	30.00	-2.80	QP	100	155	

*:Maximum data x:Over limit !:over margin

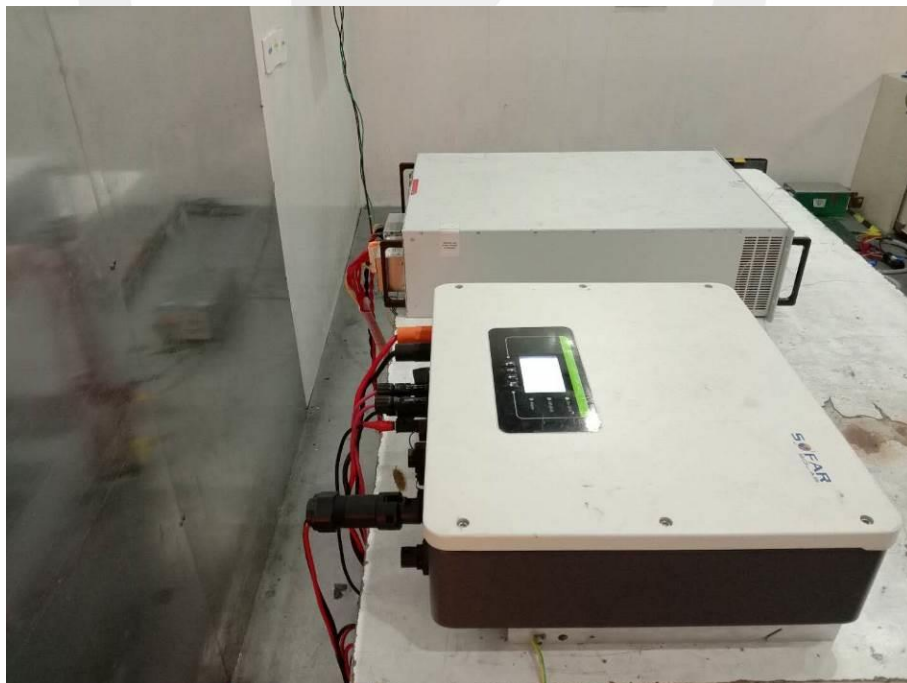
Operator: XZC

7. PHOTOGRAPHS

7.1. Photos of Conducted Emission Measurement



7.2. Photos of Voltage Distortion in Differential mode Measurement



7.3. Photos of Radiation Emission Measurement



*** End of Report ***