ACCREDITED
Test Lab
Cert 2951.01

TEST REPORT

Applicant	Shenzhen SOFARSOLAR Co., Ltd.
Address	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China.

Manufacturer or Supplier	Shenzhen SOFARSOLAR Co., Ltd.
Address	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China.
Product	PV grid-interactive inverter
Brand Name	SOFAR SOLAR
Model	SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL
Additional Model & Model Difference	SOFAR 1600TL, SOFAR 2700TL See item 2.1
Date of tests	May 08, 2014 ～ Jun. 30, 2014

The submitted sample of the above equipment has been tested according to the requirements of the following standards:

☒ **AS/NZS 61000.6.3:2012**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Breeze Jiang Project Engineer / EMC Department	Approved by Madison Luo Manager / EMC Department
	Date: Jul. 21, 2014

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
C140508N005	Original release	Jul. 10, 2014
C140508N005R1	Based on the original report C140508N005 change power supply information.	Jul. 21, 2014

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	**Test Type**	**Result**	**Remarks**
AS/NZS 61000.6.3:2012	Conducted test	PASS	Meets requirement limit Minimum passing margin is –3.00 dB at 0.36094MHz
	Radiated test (30MHz~1GHz)	PASS	Meets limits minimum passing margin is –5.08 dB at 191.02MHz

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Mains Terminal Disturbance Voltage Test	0.15MHz ~ 30MHz	+ /-2.67 dB
Radiated Disturbance Test	30MHz ~ 1000MHz	+ /-4.36 dB

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	PV Grid Inverter
MODEL NO.	SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL
ADDITIONAL MODEL	SOFAR 1600TL, SOFAR 2700TL
POWER SUPPLY	DC Input: DC 110 - 380V Max. 10A For SOFAR 1100TL; DC Input: DC 165 - 380V Max. 10A For SOFAR 1600TL ; DC Input: DC 170 - 450V Max. 13A For SOFAR 2200TL; DC Input: DC 210 - 450V Max. 13A For SOFAR 2700TL; DC Input: DC 230 - 450V Max. 13A For SOFAR 3000TL Output: AC 230V, 50/60Hz, Power: 1000W / 1500W / 2000W / 2500W / 2800W Output Voltage/Current: SOFAR 1100TL:230V/4.5A; SOFAR 1600TL:230V/7.0A; SOFAR 2200TL:230V/9.5A; SOFAR 2700TL:230V/11.5A; SOFAR 3000TL:230V/13.0A
SOFTWARE VERSION	V1.00
HARDWARE VERSION	V1.00
THE HIGHEST OPERATING FREQUENCY	Below 108MHz
DATA CABLE SUPPLIED	DC Cable: Shielded; Detachable 1.8m; AC Cable: Shielded; Detachable 1.8m

NOTE:

1. This report C140508N005R1 supersedes the previous one with the report number C140508N005 dated on Jul. 10, 2014.

2. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.

3. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4. RS485 port on the product is for client to collect data, according to client requirements, no need to test.

5. All models shell include red, blue, white and other colors. All models of DC switch and WIFI module is optional accessories, optional installation according to the need of client.

6. This is a series of PV Grid Inverter with the same as in hardware except the amount of BUS capacitor, inverter inductor, Boost and IGBT component and DC switch are different. Identical in software the output power just adjusted by software; models SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL are selected to test. full test was performed for the model SOFAR 3000TL, and partial test for the models SOFAR 1100TL, SOFAR 2200TL.

Ratings .....:	SOFAR 1100TL	SOFAR 1600TL	SOFAR 2200TL	SOFAR 2700TL	SOFAR 3000TL
MPP DC voltage range [V] ..... :	110-380	165-380	170-450	210-450	230-450
Input DC voltage range [V]..... :	90-400, max. 450		100-480, max. 500		
Input DC current [A] ..... :	10		13		
Output AC voltage [V]..... :	230V, 50Hz				
Output AC current [A]..... :	4,5	7,0	9,5	11,5	13,0
Output power [W] ..... :	1000	1500	2000	2500	2800

7. Model Difference:

Difference:	SOFAR 3000TL	SOFAR 2700TL	SOFAR 2200TL	SOFAR 1600TL	SOFAR 1100TL
Boost inductor	1.9mH	1.9mH	1.9mH	2.6mH	2.6mH
Input sampling resistor (RP105,RP108 /RP189,RP109)	200ohm / 7.5Kohm	200ohm / 7.5Kohm	200ohm / 7.5Kohm	220ohm / 10Kohm	220ohm / 10Kohm
Bus capacitor	3pcs	3pcs	3pcs	2pcs	2pcs
Inverter inductor	1.3mH	1.5mH	2.1mH	2.3mH	3.4mH
Output sampling resistor (RP118, RP119, RC18 /RP120, RP121,RC22)	2Kohm,100ohm,100ohm	2Kohm,100ohm,100ohm	1.0Kohm,330ohm,330ohm	1.0Kohm,200ohm,100ohm	499ohm,200ohm,200ohm

2.2 DESCRIPTION OF TEST MODES

The EUT was tested under the following modes' the final worst mode were marked in boldface and recorded in this report.

◆ For Conducted Emission Test

Test Mode	TEST VOLTAGE	Model
Full Load	DC 380V	SOFAR 2200TL
Full Load	DC 380V	SOFAR 1100TL
Full Load	DC 230V	**SOFAR 3000TL**
Full Load	**DC 360V**	
Full Load	DC 450V	

◆ For Radiated Emission Test

Test Mode	TEST VOLTAGE	Model
Full Load	DC 380V	SOFAR 2200TL
Full Load	DC 380V	SOFAR 1100TL
Full Load	DC 230V	**SOFAR 3000TL**
Full Load	**DC 360V**	
Full Load	DC 450V	

2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	DC Source	Chroma	62150H-1000S	62150EF00488	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 2.0m, DC Line: Unshielded, Detachable 2.0m;

3 EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: AS/NZS 61000.6.3

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	100340	May 17,14	May 16,15
Triple-loop Antenna	EVERFINE	LLA-2	809002	Oct. 12,13	Oct. 11,14
Artificial Mains Network	Rohde&Schwarz	ESH2-Z5	100071	May 13,14	May 12,15
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.

2. The test was performed in shielding room 843.

3.1.3 TEST PROCEDURE

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line artificial mains network (AMN). Other support units were connected to the power mains through another AMN. The two AMNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

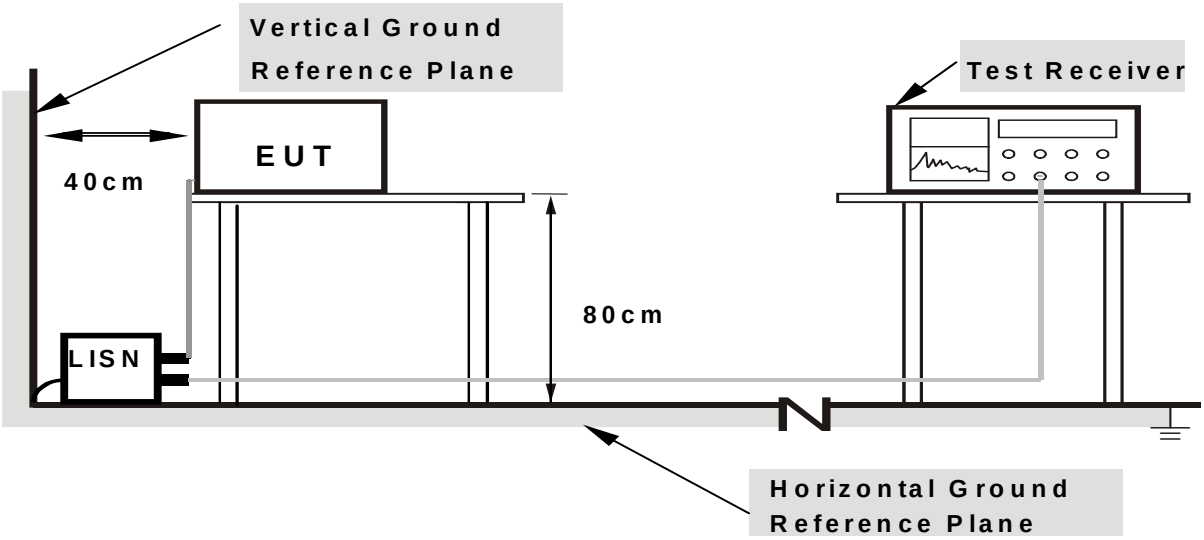
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

3.1.4 DEVIATION FROM TEST STANDARD

No deviation

3.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.6 EUT OPERATING CONDITIONS

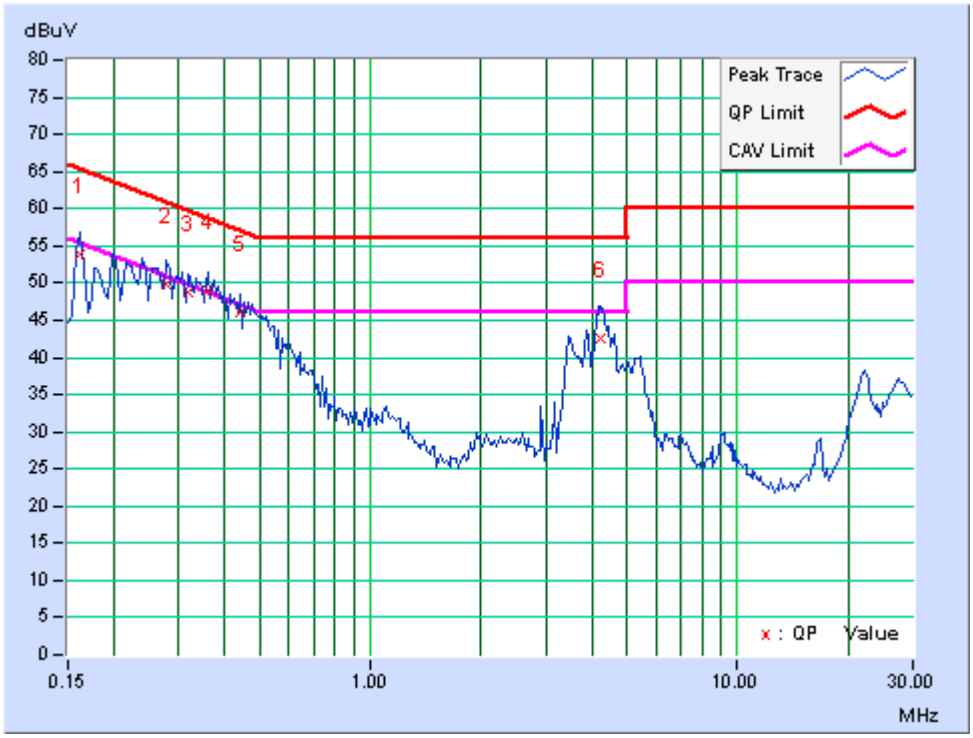
a. Turned on the power of all equipment.
b. EUT was operated according to the type description in manufacturer's specifications or the User's Manual.

3.1.7 TEST RESULTS

TEST MODE	SOFAR 3000TL	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 360V	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	23 deg. C, 42% RH	**TESTED BY**: Heise	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	5.20	48.57	45.49	53.77	50.69	65.38	55.38	-11.60	-4.68
2	0.27891	9.16	40.76	37.52	49.92	46.68	60.85	50.85	-10.93	-4.17
3	0.31797	9.23	39.58	36.34	48.81	45.57	59.76	49.76	-10.95	-4.19
4	**0.36094**	**9.32**	**39.63**	**36.39**	**48.95**	**45.71**	**58.71**	**48.71**	**-9.76**	**-3.00**
5	0.43906	9.47	36.61	34.20	46.08	43.67	57.08	47.08	-11.00	-3.41
6	4.25000	10.01	32.52	25.58	42.53	35.59	56.00	46.00	-13.47	-10.41

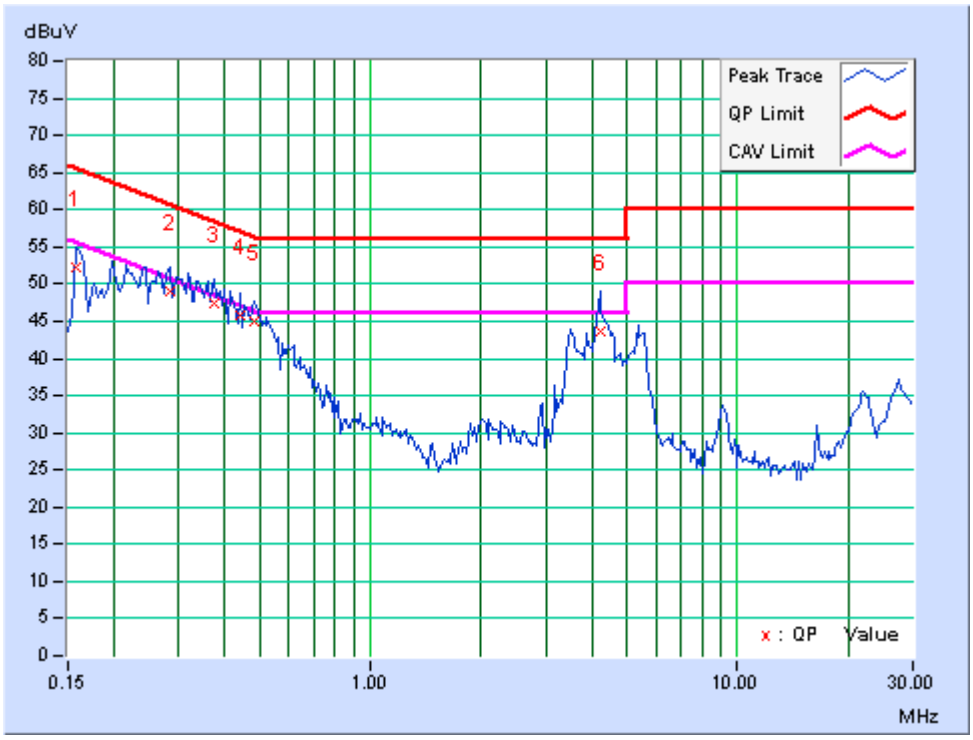
REMARKS: The emission levels of other frequencies were very low against the limit.



TEST MODE	SOFAR 3000TL Grid Mode	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 360V	**PHASE**	Neutral (N)
ENVIRONMENTAL CONDITIONS	23 deg. C, 42% RH	**TESTED BY**: Heise	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	4.85	47.50	43.90	52.35	48.75	65.58	55.58	-13.22	-6.82
2	0.28281	9.19	39.88	36.67	49.07	45.86	60.73	50.73	-11.67	-4.88
3	0.37656	9.35	38.15	35.11	47.50	44.46	58.35	48.35	-10.85	-3.89
4	0.43906	9.46	36.24	33.89	45.70	43.35	57.08	47.08	-11.38	-3.73
5	0.48203	9.54	35.42	33.03	44.96	42.57	56.30	46.30	-11.35	-3.74
6	4.22266	10.05	33.58	25.62	43.63	35.67	56.00	46.00	-12.37	-10.33

REMARKS: The emission levels of other frequencies were very low against the limit.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: AS/NZS 61000.6.3
FOR FREQUENCY BELOW 1000 MHz

FREQUENCY (MHz)	Class A (at 10m) dBuV/m	Class B (at 10m) dBuV/m
30 – 230	40	30
230 – 1000	47	37

FREQUENCY RANGE OF RADIATED MEASUREMENT
(For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1 to 3	76	56	70	50
3 to 6	80	60	74	54

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.2.2 TEST INSTRUMENTS

Frequency Range 30MHz-1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	100962	Mar. 06,14	Mar. 05,15
Bilog Antenna	Teseq	CBL 6111D	27089	Jul. 27, 13	Jul. 26, 14
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-554	Dec. 03, 13	Dec. 02, 14
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-555	Dec. 03, 13	Dec. 02, 14
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Jun. 11, 13	Jun. 10, 14
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Mar. 05,14	Mar. 04, 15
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

Frequency Range Above1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	ETS-Lindgren	3117	00062558	Oct. 18,12	Oct. 17,14
EMI Test Receiver	Rohde&Schwarz	ESCI	100962	Mar. 06,14	Mar. 05,15
Spectrum Analyzer	Rohde&Schwarz	FSV40	101003	Apr. 09,14	Apr. 08,15
Pre-Amplifier (100MHz-26.5GHz)	EMCI	EMC 012645	980077	Nov. 07,13	Nov. 06,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,13	Nov. 03,14
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.

2. The test was performed in Chamber 10m.

3.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
4. Margin value = Emission level – Limit value.

<Frequency Range above 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna can be varied from one meter-to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

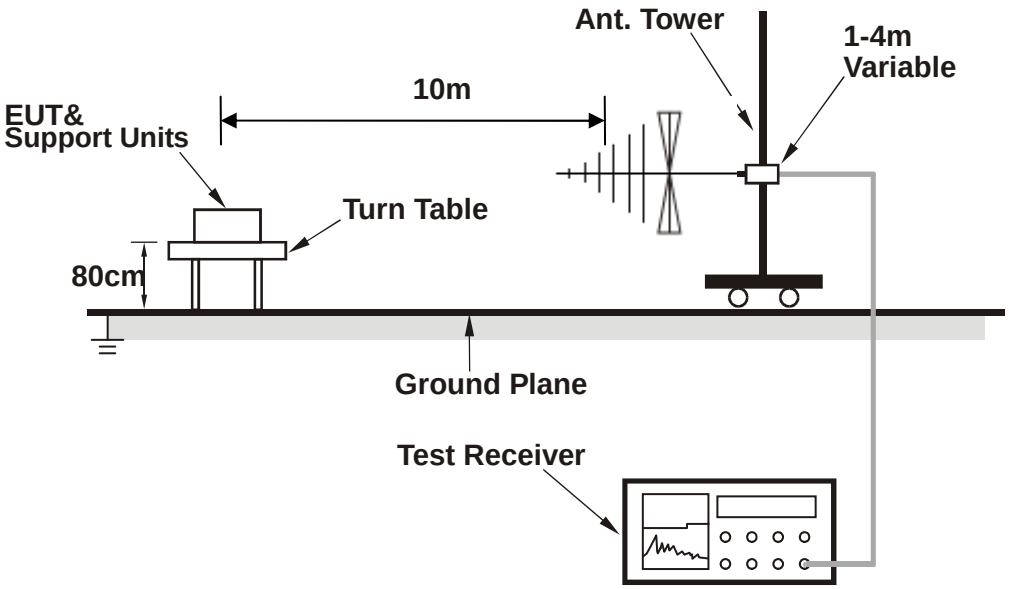
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.

3.2.4 DEVIATION FROM TEST STANDARD

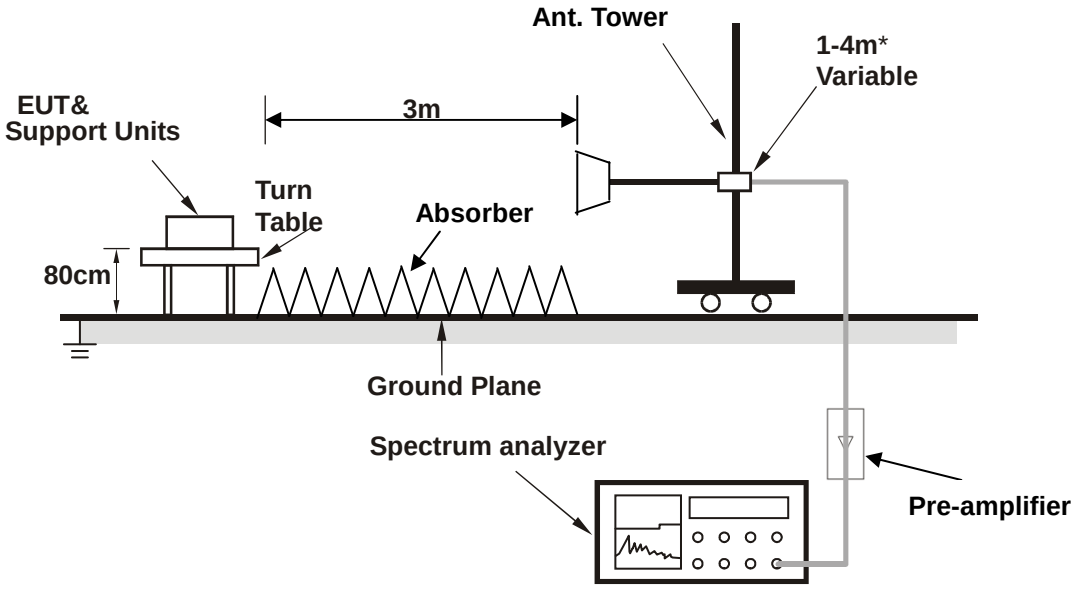
No deviation

3.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



***** : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

3.2.6 EUT OPERATING CONDITIONS

a Turned on the power of all equipment.

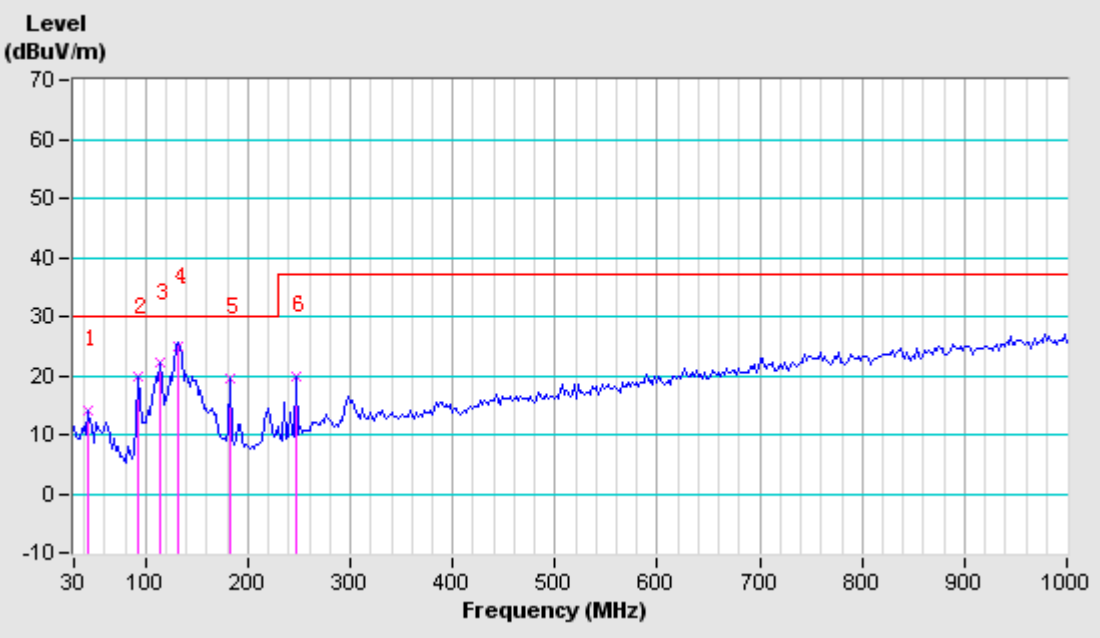
b EUT was operated according to the type description in manufacturer's specifications or the User's Manual.

3.2.7 TEST RESULTS

TEST MODE	SOFAR 3000TL Grid Mode	**FREQUENCY RANGE**	30-1000 MHz
TEST VOLTAGE	DC 360V	**DETECTOR FUNCTION & BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Robert	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	43.58	14.96	-0.74	14.22	30.00	-15.78	143	12
2	92.08	10.26	9.47	19.73	30.00	-10.27	400	31
3	113.42	12.35	9.75	22.10	30.00	-7.90	400	313
4	130.88	13.26	11.50	24.76	30.00	-5.24	400	122
5	183.26	12.88	6.59	19.47	30.00	-10.53	219	132
6	247.28	14.09	5.71	19.80	37.00	-17.20	100	13

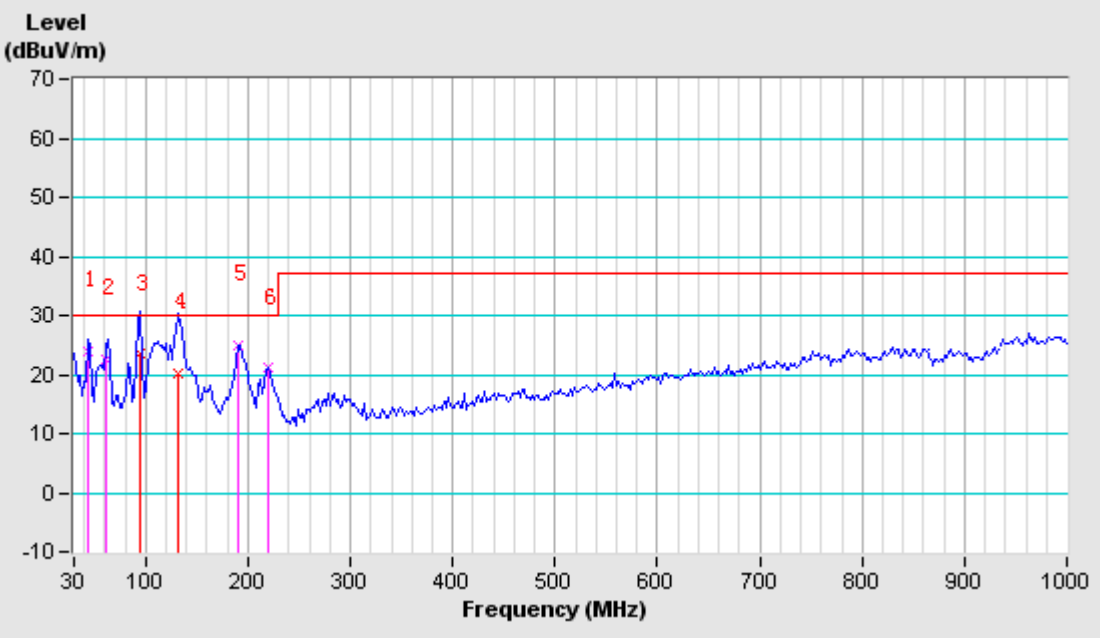
REMARKS: The emission levels of other frequencies were very low against the limit..



TEST MODE	SOFAR 3000TL Grid Mode	**FREQUENCY RANGE**	30-1000 MHz
TEST VOLTAGE	DC 360V	**DETECTOR FUNCTION & BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Robert	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	43.58	14.96	9.04	24.00	30.00	-6.00	195	129
2	61.04	13.28	9.31	22.59	30.00	-7.41	165	104
3	94.00	10.50	12.90	23.40	30.00	-6.60	100	20
4	130.88	13.26	6.84	20.10	30.00	-9.90	100	20
5	**191.02**	**12.37**	**12.55**	**24.92**	**30.00**	**-5.08**	**128**	**72**
6	220.12	12.64	8.38	21.02	30.00	-8.98	231	160

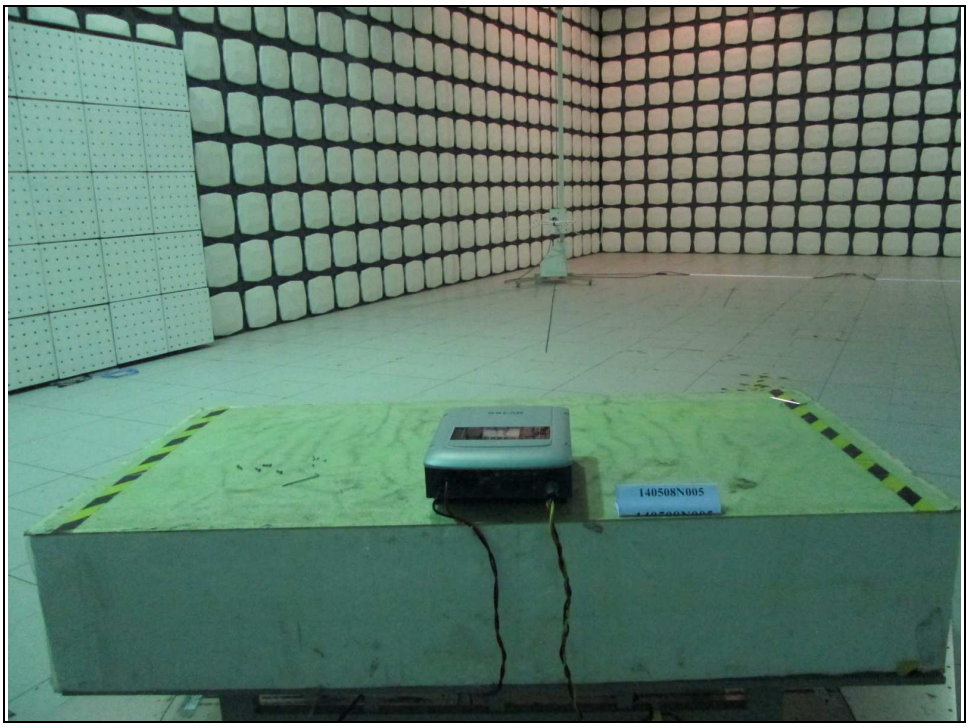
REMARKS: The emission levels of other frequencies were very low against the limit.

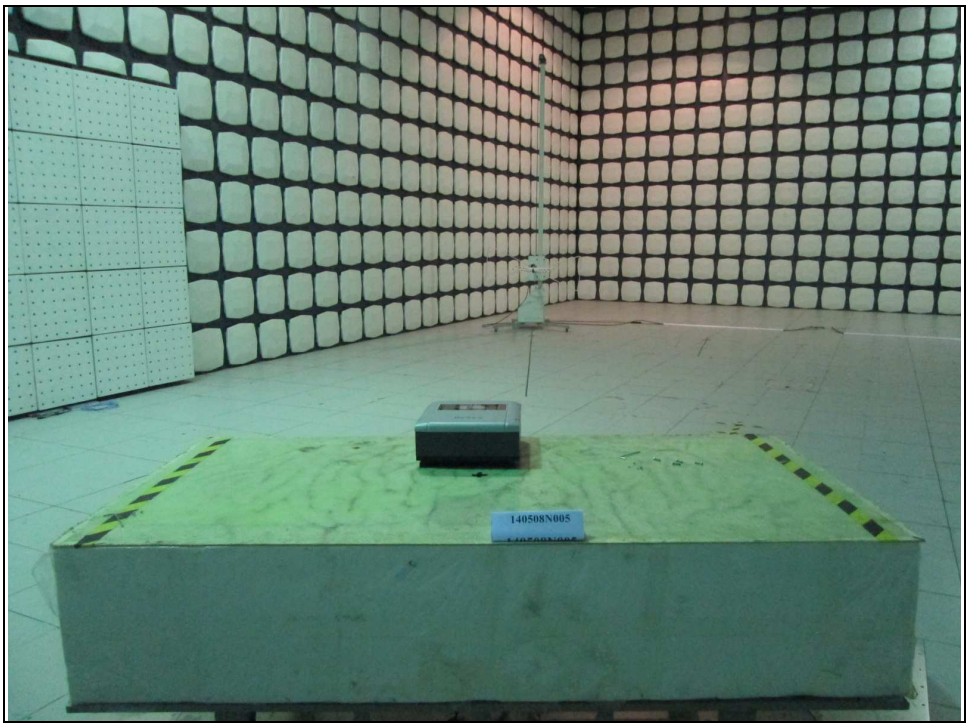


4 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST

RADIATED EMISSION TEST





5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

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