

# **EMC TEST REPORT**

Report No.:	SET2018-03483		
Product:	PV Grid Inverter		
Model No:	OG-50K-FM, OG-60K-FM		
Applicant:	Magnizon Power Systems FZE		
Address:	LOB11, Office 132, Jebel Ali Free Zone, Dubai, United Arab Emirates		
Issued by:	CCIC Southern Electronic Product Testing (Shenzhen)CO., Ltd.		
Lab location:	Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China		
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## Report

Product:	PV Grid Inverter		
Model No:	OG-50K-FM, OG-60K-FM		
Brand Name:			
Applicant	Magnizon Power Systems FZE		
Applicant Address:	LOB11, Office 132, Jebel Ali Free Zone, Dubai, United Arab Emirates		
Manufacturer	Magnizon Power Systems FZE		
Manufacturer Address:	LOB11, Office 132, Jebel Ali Free Zone, Dubai, United Arab Emirates		
Test Standards:	EN 61000-6-2:2005 Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments EN 61000-6-4-2007+A1:2011 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments		
Test Result:	PASS		
Tested by	Jiang Haibiao Mar. 30, 2018		
Tested by:	Jing Haibiao Mar. 30, 2018 Signature, Date		
Tested by: Reviewed by:	Mar. 30, 2018		
	Signature, Date		
	Signature, Date Lu - Tongshou Mar. 30, 2018		
Reviewed by:	Signature, Date Mar. 30, 2018 Signature, Date Signature, Date		
Reviewed by:	Mar. 30, 2018   Signature, Date   Lu - Tongshow   Mar. 30, 2018   Signature, Date   Signature, Date   Mar. 30, 2018		
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## **1** General Information

#### **1.1 Description of EUT**

Product:PV Grid inverterModel No.:OG-60K-FMBrand Name:----Serial No.:/DC. Max. Input Voltage: 1100Vd.cDC. Input Voltage Range: 200-1100Vd.cDC. Max. Input Current: 33/33/33/ARating:AC. Rated Output Voltage: 3N ~380Va.c.AC. Rated Output Frequency: 50/60 HzAC. Rated Output Current: 92AAC. Rated Output Power: 60kW

Accessories: /

#### NOTE:

- 1. The highest internal frequency of the EUT is less than 108 M Hz. For more detailed features description about the EUT, please refer to User's Manual.
- 2. OG-50K-FM and OG-60K-FM structure completely consistent, difference only lies in the rated output power is different. According to the differences, all tests were performed on model OG-60K-FM and the test results should also represent the other models.

#### **1.2 Objective**

Perform Electro Magnetic Interference (EMI) and Electro Magnetic Susceptibility (EMS) tests for CE Marking.

#### **1.3 Environmental Conditions**

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

#### **1.4 Measurement Uncertainty**

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

- Uncertainty of Conducted Emission,  $Uc = \pm 3.6 dB$ 

- Uncertainty of Radiated Emission,  $Uc = \pm 5.0 dB$ 



## 1.5 Test Standards and Results

The EUT has been tested according to the following specifications:

EMISSION				
Standard	Test Type	Result		
EN 61000-6-4-2007+A1:2011	Mains terminal disturbance voltage	PASS		
EN 01000-0-4-200/+A1.2011	Radiated disturbance	PASS		
IM	MUNITY (EN61000-6-2:2005)			
Basic Standard	Test Type	Result		
IEC 61000-4-2	Electrostatic discharge immunity	PASS		
IEC 61000-4-3	Radiated, radio frequency electromagnetic field immunity	PASS		
IEC 61000-4-4	Electrical fast transient/burst immunity	PASS		
IEC 61000-4-5	Surge immunity	PASS		
IEC 61000-4-6	Immunity to conducted disturbances induced by RF fields	PASS		
IEC 61000-4-8	Power frequency magnetic field immunity	PASS		
IEC 61000-4-11	Voltage dips and short interruptions immunity	N/A		

NOTE: The latest versions of basic standards are applied.



## 1.6 List of Equipment Used

	1			
Description	Manufacturer	Manufacturer Model No.		Serial No.
Test Receiver	ROHDE&SCHWARZ	ESCI	Jun.05, 2018	A130901474
LISN	SCHWARZBECK	NNLK8130	Jun.05, 2018	A131001541
Broadband Ant.	SCHWARZBECK	VULB 09160	May.25,2019	A0805560
ESD Test System	EM TEST	ESD30C	Jun.12, 2018	A0712513
EFT/Surge Test	EM TEST	UCS500N7.7	Nov.02, 2018	A130201094
System	EM TEST	CNI503B9.3	Nov.02, 2018	A130201095
Signal Generator	ROHDE&SCHWARZ	SMB100A	Nov.02, 2018	A141002004
EMS Antenna	Amplifier Research	BBHA 9120 J	Mar.09, 2019	A160322002
EMS Antenna	Amplifier Research	AM 9144	Jan.20, 2019	A151002436
Power Amplifier	MILMEGA	80RF1000-1000	Mar 39, 2019	A140101634
Power Amplifier	MILMEGA	AS0104R-800/400	Mar 29, 2019	A160322001
Power Meter	Amplifier Research	E4417A	Nov.24, 2018	A140701873
Capacitive clamp	ROHDE&SCHWARZ	F2301	Aug 05, 2018	A0304258
Power Amplifier	TESEQ	NSG4070	Mar.29, 2019	A160602544
Anechoic Chamber	Albatross	EMC 19.6×11.8×8.55 (m)	Jun.28,2019	A0802520
Magnetic Field Tester	HAEFELY	MAG 100.1	Jun.04, 2018	A0103109
AC Power source	Chroma	Chroma 61860	Jan.20, 2019	A150202185

**NOTE:** Equipment above has been calibrated and is in the period of validation.



## **3** Emission Test

## **3.1 EUT Setup and Operating Conditions**

The EUT was powered by 680V DC mains and continuously operated. Environment Condition: Temperature: 24°C; Relative Humidity: 55%; Pressure:101kPa Test Date: 2017-10-25~2017-10-29 Test Engineer: Jiang Haibiao Test Site: EMC Lab

## 3.2 Mains Terminal Disturbance Voltage Measurement

	Limits (dBµV)		
Frequency range (MHz)	Quasi-peak	Average	
0.15 - 0.5	79	66	
0.5 - 5	73	60	
5-30	73	60	

#### 3.2.1 Limits of Mains Terminal Disturbance Voltage

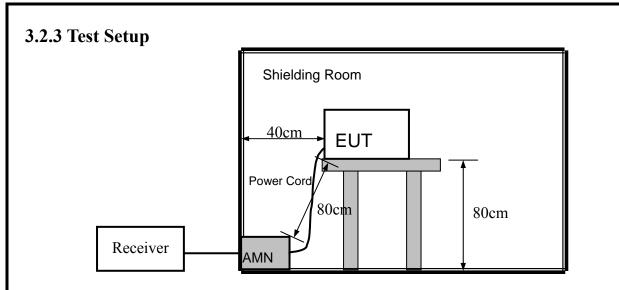
#### NOTE:

1. The lower limit shall apply at the transition frequencies.

#### **3.2.2 Test Procedure**

- a. The EUT was placed 0.4 meters from the conducting wall of shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provide  $50\Omega/50\mu$ H 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 over 10dB under the prescribed limits are not reported.





For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

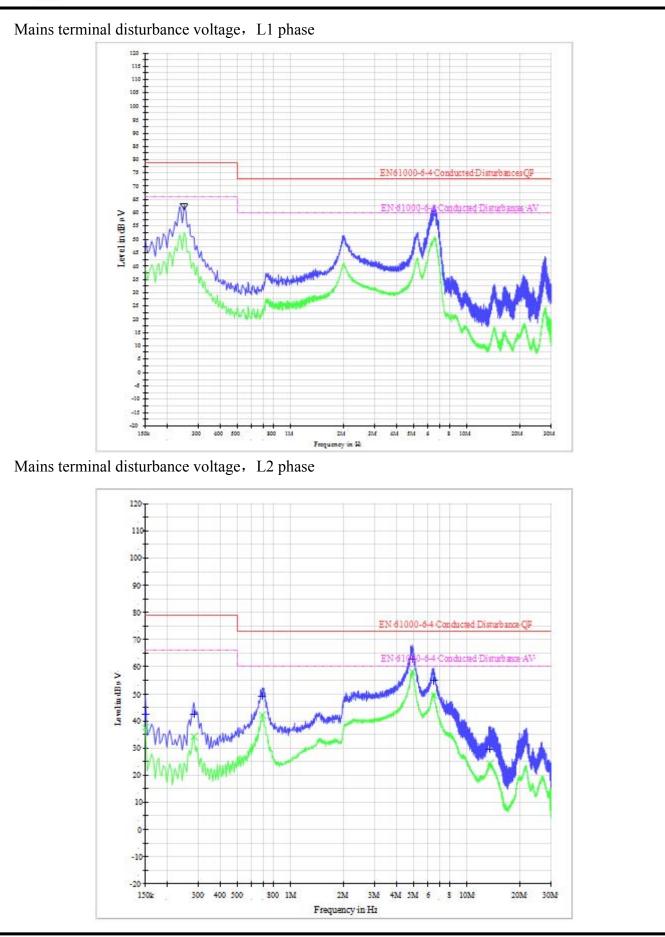
NI -		Limit Value (dBµV)		Emission Level (dBµV)	
No.	Freq. (MHz)	QP	AV	QP	AV
1	0.230	79	66	53.4	52.9
2	0.250	79	66	61.2	52.5
3	1.982	73	60	56.2	51.7
4	4.902	73	60	62.8	58.3
5	6.478	73	60	54.8	49.6
6	6.550	73	60	53.4	50.3

#### 3.2.4 Test Result

#### NOTE:

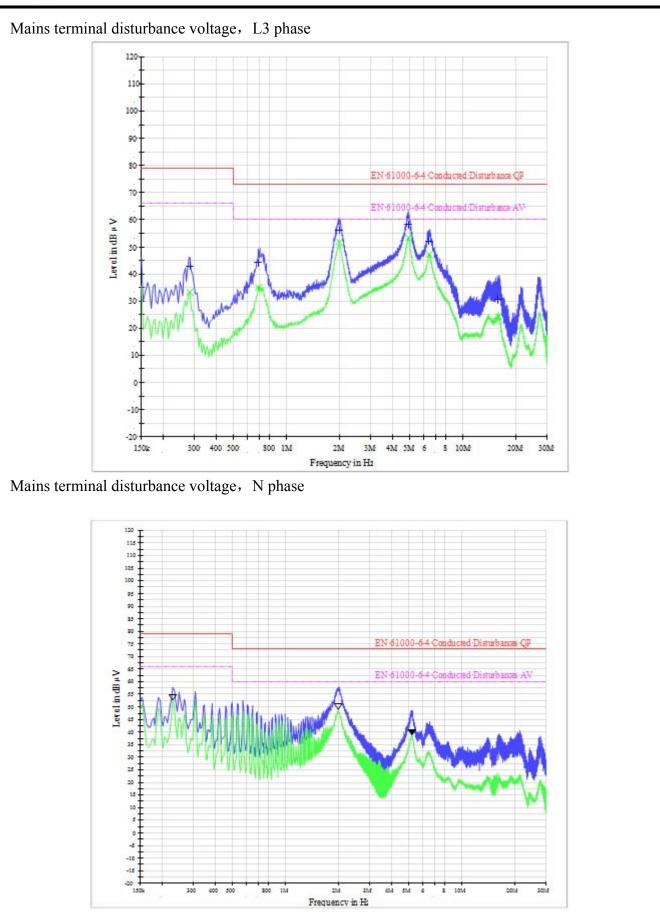
- 1. QP and AV are abbreviations of the quasi-peak and average individually.
- 2. If the emission levels measured with QP detector are lower than AV limits, there is unnecessary to measure with AV detector.
- 3. The emission levels recorded above is the larger ones of each phase.













## **3.3 Radiated Disturbance Measurement**

#### **3.3.1 Limits of Radiated Disturbance**

Frequency range (MHz)	Quasi peak limits(dBµV/m), at 10m measurement distance	
30 - 230	40	
230 - 1000	47	

#### Notes:

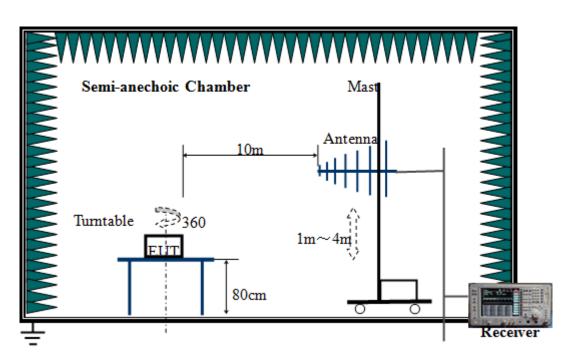
- (1) The lower limit shall apply at the transition frequency.
- (2) Additional provisions may be required for cases where interference occurs.

#### **3.3.2 Test Procedure**

- a. The EUT was placed on the top of an insulating table 0.8 meters above the ground at a semi-anechoic chamber. 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 antenna is a broadband antenna, and its height is varied from 1 to 4 meter 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 the heights from 1 to 4 meters and the ratable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detector Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10dB margin would be retested one by one using the quasi-peak method.



## 3.3.3 Test Setup

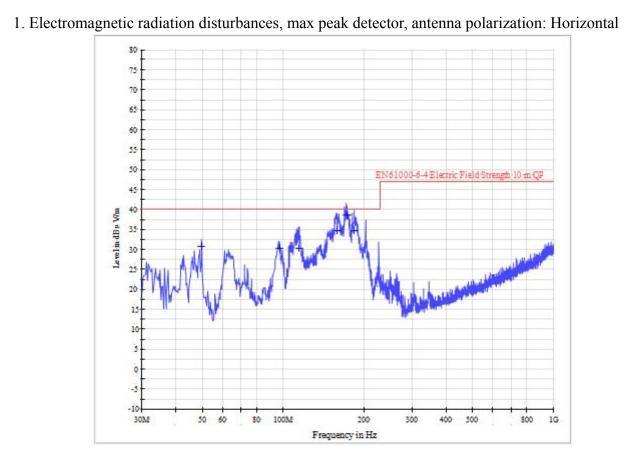


## 3.3.4 Test Result

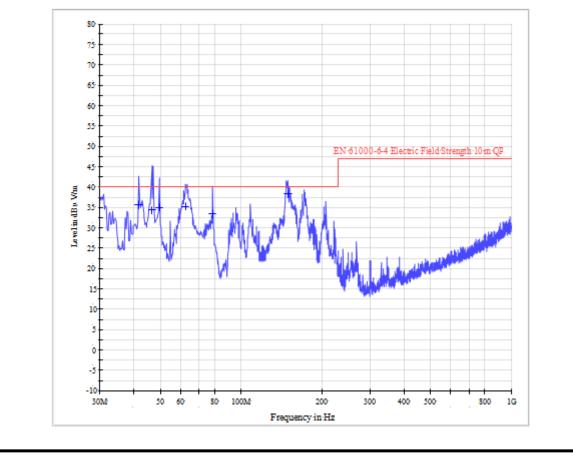
No.	Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	QP Limits (dBµV/m)	Emission Level (dBµV/m)
1	158.28	Н	400	0	40	34.7
2	172.24	Н	400	0	40	38.5
3	183.52	Н	400	0	40	34.9
4	41.88	V	100	0	40	35.6
5	61.96	V	100	0	40	35.3
6	148.96	V	100	0	40	38.4







2. Electromagnetic radiation disturbances, max peak detector, antenna polarization: Vertical







## **4** Immunity Test

## **4.1 EUT Setup and Operating Conditions**

The EUT was powered by 680V DC mains and continuously operated. Environment Condition: Temperature: 24°C; Relative Humidity: 55%; Pressure:101kPa Test Date: 2017-11-16~2017-11-17 Test Engineer: Jiang Haibiao Test Site: EMC Lab

## 4.2 Performance Criteria

Criterion A	The apparatus shall continue to operate as intended. 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.
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.
Criterion C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

## **4.3 Electrostatic Discharge Immunity Test**

## 4.3.1 Test Specification

Basic Standard:	IEC 61000-4-2
Discharge Impedance	330 Ω / 150 pF
Discharge Voltage:	Air Discharge : 8 kV
	Contact Discharge : 4kV
Polarity:	Positive / Negative
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single discharge
Discharge Period:	1-second minimum
Criterion:	В



## 4.3.2 Test Procedure

The discharges shall be applied in two ways:

a. Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three contact test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b. Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

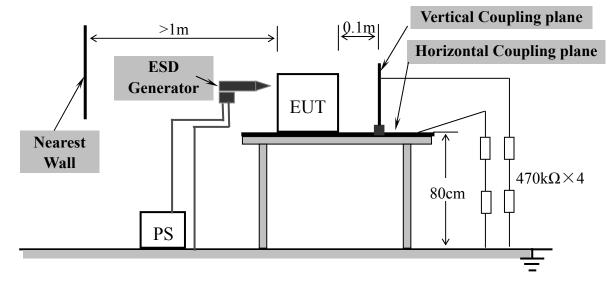
- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were completed.
- g. At least 50 single discharges (in the most sensitive polarity) were applied to the Horizontal



Coupling Plane at points on each side of the EUT. The ESD generator was positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

h. At least 50 single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions  $0.5m \times 0.5m$ ) was placed vertically to and 0.1 meters from the EUT.

#### 4.3.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

#### 4.3.4 Test Result

Test Points	Discharge Level (kV)	Discharge Mode	Observation	Comply with Criterion
Aperture of the cover	$\pm 8$	Air	Note(1)	А
Screen	$\pm 8$	Air	Note(1)	А
Button	$\pm 8$	Air	Note(1)	А
Metallic shell	$\pm 6$	Contact	Note(1)	А
НСР	$\pm 6$	Contact	Note(1)	А
VCP	$\pm 6$	Contact	Note(1)	А

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.



## 4.4 Radiated, Radio Frequency Electromagnetic Field Immunity Test

#### 4.4.1 Test Specification

Basic Standard:	IEC 61000-4-3			
Frequency Range:	80 MHz – 1000MHz 1.4GHz – 2.0GHz 2.0GHz – 2.7GHz			
Field Strength:	10V/m	3V/m	1V/m	
Modulation:	1kHz sine wave, 80%	1kHz sine wave, 80%, AM modulation		
Frequency Step:	1% of fundamental			
Polarity of Antenna	Horizontal and Vertical			
Test Distance:	3m			
Antenna Height:	1.5m			
Dwell Time:	3 seconds			
Criterion:	Α			

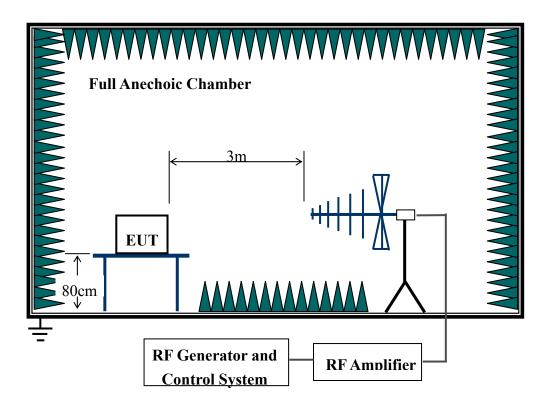
#### 4.4.2 Test Procedure

The test procedure was in accordance with IEC 61000-4-3.

- a. The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b. The frequency range is swept from 80 MHz to 1000MHz with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The field strength level was 10V/m, 3V/m and 1V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



## 4.4.3 Test Setup



## 4.4.4 Test Result

Frequency	Polarity	Azimuth	Field Strength (V/m)	Observation	Comply with Criterion
80-1000 MHz	V&H	0,90,180, 270	10	Note(1)	А
1.4-2.0GHz	V&H	0,90,180, 270	3	Note(1)	А
2.0-2.7GHz	V&H	0,90,180, 270	1	Note(1)	А

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.



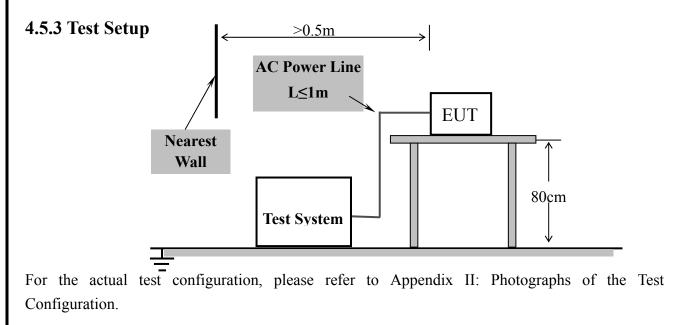
## 4.5 Electrical Fast Transient/Burst Immunity Test

#### 4.5.1 Test Specification

Deale Steaderal			
Basic Standard:	IEC 61000-4-4		
Test Voltage:	a.c. power port:2 kV		
Polarity:	Positive/Negative		
Impulse Frequency:	5kHz		
Impulse wave shape:	5/50ns		
<b>Burst Duration:</b>	15ms		
<b>Burst Period:</b>	300ms		
Test Duration:	Not less than 1 min.		
Criterion:	В		

#### 4.5.2 Test Procedure

- a. The EUT was tested with 2000 volt discharges to the AC power input leads.
- b. Both positive and negative polarity discharges were applied.
- c. The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- d. The duration time of each test sequential was 1 minute.
- e. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.





## 4.5.4 Test Result

Test Point	Polarity	Test Level (kV)	Observation	Comply with Criterion
AC Power Port	+/-	2	Note (1)	А

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.

## 4.6 Surge Immunity Test

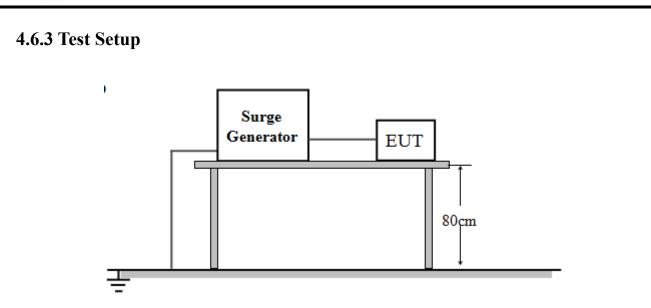
Basic Standard:	IEC 61000-4-5		
Waveform:	Voltage 1.2/50 µs; Current 8/20 µs		
Test Voltage:	a.c. power port, line to line 1kV, line to earth 2kV		
Polarity:	Positive/Negative		
Phase Angle:	$0^{\circ}$ , $90^{\circ}$ , $180^{\circ}$ , $270^{\circ}$		
<b>Repetition Rate:</b>	60sec		
Times:	5 time/each condition.		
Criterion:	В		

#### 4.6.1 Test Specification

#### 4.6.2 Test Procedure

- a. The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m×1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer).
- b. The EUT was connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- c. The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.





For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

#### 4.6.4 Test Result

Coupling Line	Polarity	Voltage (kV)	Observation	Comply with Criterion
AC power, Line-Line	+/-	1	Note (1)	А
AC power, Line-Earth	+/-	2	Note (1)	Α

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.



## 4.7 Immunity to Conducted Disturbances Induced by RF Fields

#### 4.7.1 Test Specification

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz – 80 MHz
Field Strength:	10V
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1% of fundamental
<b>Coupled Cable:</b>	AC. power line
<b>Coupling Device:</b>	CDN M5
Criterion:	Α

#### 4.7.2 Test Procedure

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. 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.
- c. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate shall not exceed  $1.5 \times 10^{-3}$  decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.
- d. 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 such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.
- e. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.



#### 4.7.3 Test Setup Power Power Supply CDN Bin wooden support RF Generator Reference Ground Plane

## 4.7.4 Test Result

Test Point	Frequency	Field Strength (Vrms)	Observation	Comply with criterion
AC power line	0.15 – 80 MHz	10	Note(1)	А

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed.

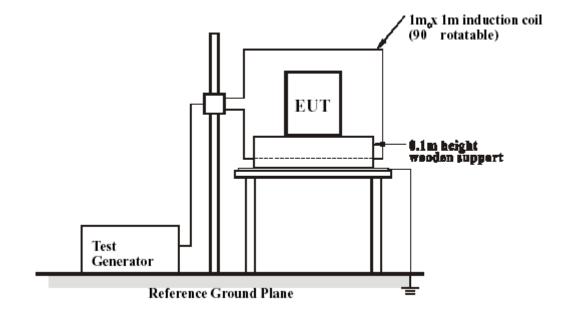


## 4.8 Power Frequency Magnetic Field Immunity Test

## 4.8.1 Test Specification

Basic Standard:	IEC 61000-4-8		
Frequency Range:	50Hz		
Field Strength:	30A/m		
<b>Observation Time:</b>	2 minutes		
Inductance Coil:	Rectangular type, 1m×1m		

#### 4.8.2 Test Setup



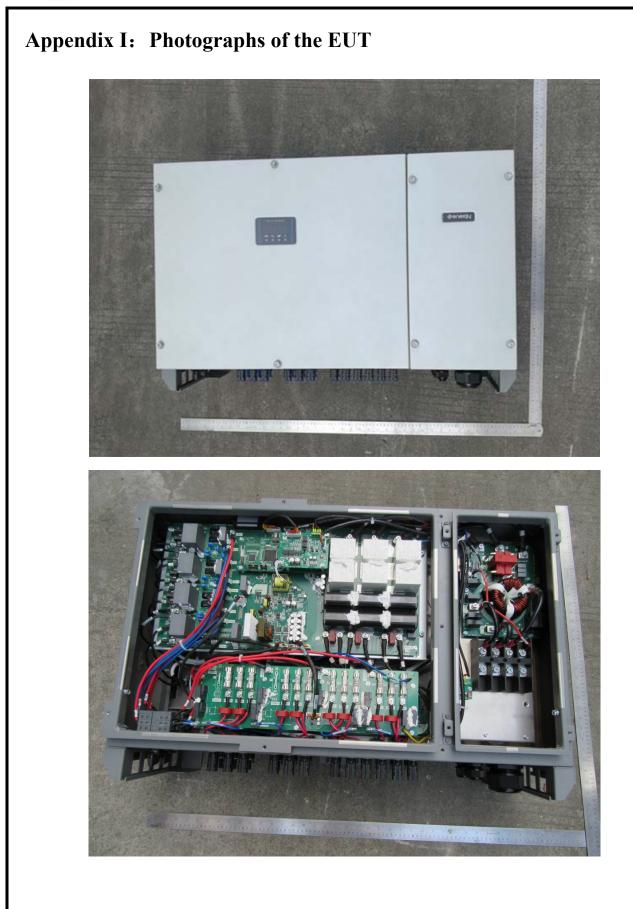
#### 4.8.3 Test Result

Direction	Field Strength(A/m)	Observation	Comply with Criterion
Х	30	Note(1)	А
Y	30	Note(1)	А
Z	30	Note(1)	А

#### NOTE:

(1). The EUT continued to operate as intended. No degradation of performance was observed









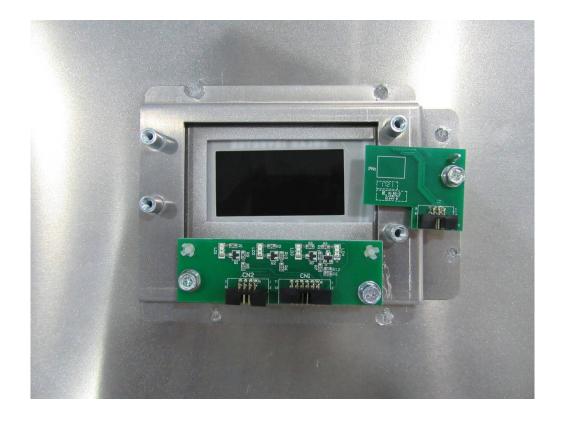






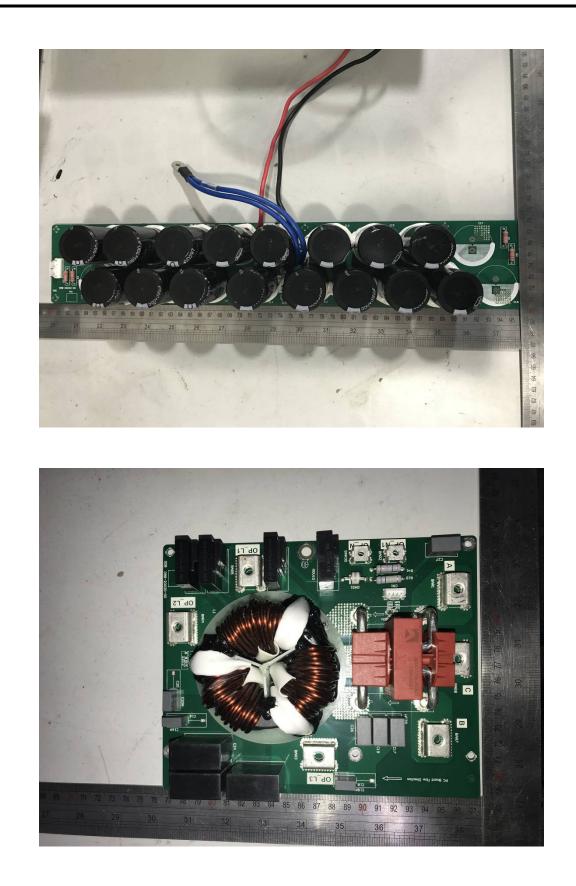








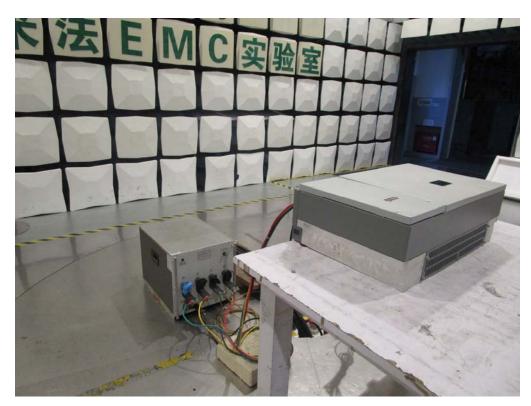




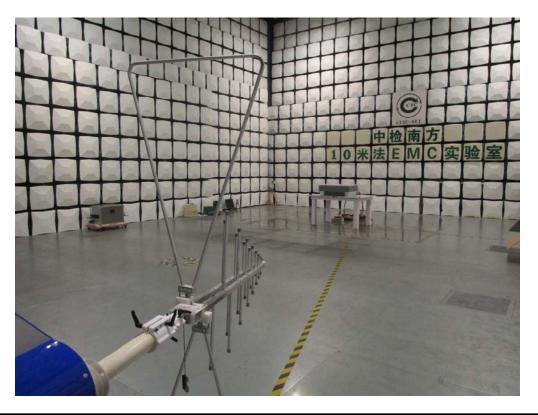


## **Appendix II: Photographs of EMC Test Configuration**

1. Mains Terminal Disturbance Voltage Measurement

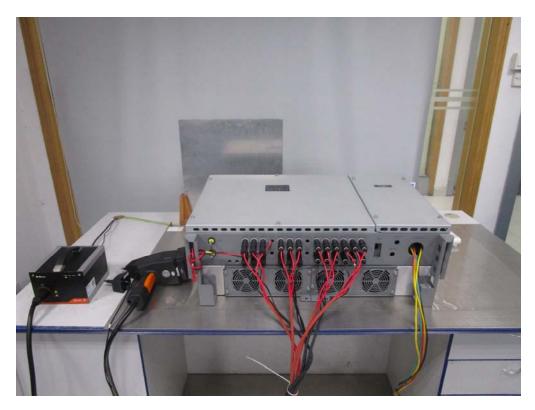


2. Radiated Field Strength Measurement





#### 3. Electrostatic Discharge Immunity Test



4. Radiated, Radio Frequency Electromagnetic Field Immunity Test



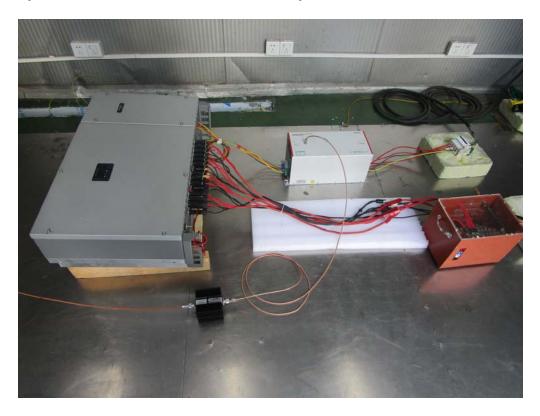




#### 5. Electrical Fast Transient/Burst Immunity Test, Surge Immunity Test



6. Immunity to Conducted Disturbances Induced by RF Fields





## 7. Power Frequency magnetic Field Immunity





# **STATEMENT**

- 1. The test report is invalid without stamp of laboratory.
- 2. The test report is invalid without signature of person(s) testing and authorizing.
- 3. The test report is invalid if erased and corrected.
- 4. Test result of the report is valid to the test samples if sampling by client.
- 5. " $\Leftrightarrow$ " item to be outside the scope of authorized by CNAS and CMA.
- 6. The test report shall not be reproduced except in full, without written approval of the laboratory.
- 7. If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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