Technical Compliance Statement

Ref. No.: ACWE-RC170084(C1W1702021)

For the following equipment

Applicant	:	**Jiangsu Goodwe Power Supply Technology Co.,Ltd.**
Manufacturer	:	**Jiangsu Goodwe Power Supply Technology Co.,Ltd.**
Product	:	**PV Inverter**
Model Number	:	**(1)GW3048-EM (2)GW3648-EM (3)GW5048-EM**
Brand	:	**GOODWE**

We, **AUDIX Technology (Wujiang) Co., Ltd. EMC Dept.** hereby certify that the above product has been tested by us with the listed standards and found in compliance with the council EMC directive 2014/30/EU. The test data & results are issued on the EMC test report No. **ACWE-E1703006**.

Emission: EN 61000-6-3:2007+A1:2011+AC:2012; EN 61000-6-4:2007+A1:2011
EN 61000-3-12:2011+AC:2013 and EN 61000-3-11:2000
Immunity:EN 61000-6-1:2007; EN 61000-6-2:2005
(IEC 61000-4-2:2008, IEC 61000-4-3:2006+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)

Mar.28, 2017

Ken Lu/ Assistant General Manager
AUDIX Technology (Wujiang) Co., Ltd. EMC Dept.

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.

EMC TEST REPORT
For

Jiangsu Goodwe Power Supply Technology Co.,Ltd.

PV Inverter

Model No. :(1)GW3048-EM (2)GW3648-EM (3)GW5048-EM

Brand : GOODWE

Prepared for

Jiangsu Goodwe Power Supply Technology Co.,Ltd.
No.189 Kun Lun Shan Road, Suzhou New District, Jiangsu, China

Prepared by

Audix Technology (Wujiang) Co., Ltd. EMC Dept.
No.1289 Jiangxing East Road, the Eastern Part of Wujiang Economic Development Zone
Jiangsu China 215200

Tel.: +86-512-63403993
Fax: +86-512-63403339

Report Number	:	ACWE-E1703006
Date of Test	:	Feb.23~Mar.08,2017
Date of Report	:	Mar.22, 2017

TABLE OF CONTENTS

Description Page

TEST REPORT VERIFICATION

Applicant	:	Jiangsu Goodwe Power Supply Technology Co.,Ltd.
Manufacturer	:	Jiangsu Goodwe Power Supply Technology Co.,Ltd.
EUT Description	:	PV Inverter
(A) Model No.	:	(1)GW3048-EM (2)GW3648-EM (3)GW5048-EM
(B) Brand	:	GOODWE
(C) Test Voltage	:	230Vac /50Hz

Applicable standards:

Emission: **EN 61000-6-3:2007+A1:2011+AC:2012; EN 61000-6-4:2007+A1:2011**
EN 61000-3-12:2011+AC:2013 and EN 61000-3-11:2000
Immunity: **EN 61000-6-1:2007; EN 61000-6-2:2005**
(IEC 61000-4-2:2008, IEC 61000-4-3:2006+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 Audix Technology (Wujiang) Co., Ltd. EMC Dept. to determine the Maximum emission levels emanating from the device, its ensured severity levels, and performance criterion. This test report contains the measurement results, and Audix Technology (Wujiang) Co., Ltd. EMC Dept. assumes full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT is technically compliance with the requirements of EN 61000-6-1、-2、-3、-4, EN61000-3-11、-12.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Audix Technology (Wujiang) Co., Ltd. EMC Dept.

Date of Test：Feb.23~Mar.08,2017 Date of Report：Mar.22, 2017

Prepared by : Emma Hu
(Emma Hu/Assistant Administrator)

Reviewer : Danny Sun
(Danny Sun /Deputy Manager)

Approved & Authorized Signer : Ken Lu
(Ken Lu/ Assistant General Manager)

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT has been tested according to the applicable standards and test results are referred as below.

EMISSION (EN 61000-6-3:2007+A1:2011+AC:2012& EN 61000-6-4:2007+A1:2011)				
Description of Test Item	**Standard**	**Limits**	**Results**	**Remark**
Conducted disturbance at main terminal	EN 61000-6-3:2007 +A1:2011+AC:2012& EN 61000-6-4:2007+A1:2011	Table 2	PASS	Minimum passing margin is 3.0 dB at 0.24MHz
Radiated disturbance	EN 61000-6-3:2007 +A1:2011+AC:2012& EN 61000-6-4:2007+A1:2011	Table 1	PASS	Minimum passing margin is 0.93 dB at 30.54MHz
Harmonic current emissions	EN 61000-3-12:2011+A1:2013	Rsec 33	PASS	Meets the requirement
Voltage fluctuations & flicker	EN 61000-3-11:2000	P_{st}=1 dc(%)=3.3% dMax.(%)=4% Tmax>3.3%≤ 500ms	PASS	Meets the requirement

IMMUNITY (EN 61000-6-2:2005; EN 61000-6-1:2007)				
Description of Test Item	**Basic Standard**	**Results**	**Performance Criteria**	**Observation Criteria**
Electrostatic discharge (ESD)	IEC 61000-4-2:2008	PASS	B	A
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2006+A2:2010	PASS	A	A
Electrical fast transient (EFT)	IEC 61000-4-4:2012	PASS	B	A
Surge	IEC 61000-4-5:2014	PASS	B	A
Radio-frequency, Continuous conducted disturbance	IEC 61000-4-6:2013	PASS	A	A
Power frequency magnetic field	IEC 61000-4-8:2009	PASS	A	A
Voltage dips, 100% reduction	IEC 61000-4-11:2004	B	PASS	B
Voltage dips, 30% reduction		C	PASS	B
Voltage interruptions		C	PASS	B
Note : Due to the EUT doesn't have telecommunication port; this test item of the telecommunication terminal is not applicable for it.				

1.2 Description of Performance Criteria

The variety and the diversity of the apparatus within the scope of this standard makes it difficult to define precise criteria for the evaluation of the immunity test results.

If, as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe, the apparatus shall be deemed to have failed the test.

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 for each test as specified in Tables 1 to 4.

1.2.1 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.

1.2.2 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.

1.2.3 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.

2 GENERAL INFORMATION

2.1 Description of Device (EUT)

Product : PV Inverter

Model Number : (1)GW3048-EM (2)GW3648-EM (3)GW5048-EM
Remark:

EM series				
Reference Position	GW5048-EM	GW3648-EM	GW3048-EM	Comment
D204	60A/600V	60A/600V	NC	Boost Diode
Q205	40A/600V	40A/600V	NC	Boost IGBT
C1119,C1124,C1118,C1123	4.7nF/400V	4.7nF/400V	NC	Capacitor
C1122	0.22uF/1000V	0.22uF/1000V	NC	Capacitor
L1101	0.52mH	0.52mH	NC	Common Choke
C1121	12uF/700V	12uF/700V	NC	PV Capacitor
HCT1101	15A	15A	NC	Current Transducer
	0.818mH	0.818mH	NC	Boost choke
CN1103,CN1104,CN1105	M4 11.1*9.2*15.5	M4 11.1*9.2*15.5	NC	TERMINAL

Test Model : GW5048-EM

Brand : GOODWE

Applicant : Jiangsu Goodwe Power Supply Technology Co.,Ltd.
No.189 Kun Lun Shan Road, Suzhou New District, Jiangsu, China

Manufacturer : Jiangsu Goodwe Power Supply Technology Co.,Ltd.
No.189 Kun Lun Shan Road, Suzhou New District, Jiangsu, China

I/O Ports : (1) RS485 port*1
(2) BMS port*1
(3) METER port *1
(4) DRED port*1

Date of Receipt of Sample : Feb.15, 2017

Date of Test : Feb.23~Mar.08,2017

2.2 EUT's specifications under test

GOODWE

Jiangsu GoodWe Power Supply Technology Co.,LTD

EM Series

Model		GW3048-EM	GW3648-EM	GW5048-EM
Solar	Max. allowed PV Power(W)	3900	4600	6500
	Nominal DC Power(W)	3300	4000	5500
	Max. DC voltage (V)	550		
	MPPT voltage range (V)	100~500		
	Start feeding voltage (V)*	125		
	Max. DC current (A)	11	11/11	
	No. of DC connectors	1	2(can parallel)	
	No. of MPPTs	1	2	
	DC connector	MC4/ Phoenix/ Amphenol(Optional)		
Battery	Battery Type	Lead-acid or Li-Ion		
	Norminal Voltage(V)	48		
	Max Charge Current (A)**	50		
	Max Discharge Current (A)	50 (configurable)		
	Battery capacity (Ah)***	>=100 (depending requirement)		
	Charging curve	3-stage adaptive with maintenance		
	Max Charge voltage (V)	60 (configurable)		
	Battery temperature compensation	included(Li-Ion)		
	Battery voltage sense	integrated		
	Current shunt	integrated		
AC Output Data (On-grid)	Norminal AC power(VA)	3000	3680	5000
	Max. AC power(VA)	3000	3680	5000
	Max. AC current(A)	13.6	16	22.8
	Norminal AC output	50/60Hz; 230Vac		
	AC output range	45~55Hz/55~65Hz; 180~270Vac		
	THDi	<3%		
	Power factor	0.8 leading~0.8 lagging		
	Grid connection	Single phase		
AC Output Data (Back-up)	AC output (Back-up)	230Vac ±2%, 50Hz (60Hz Optional)±0.2%, THDv<3%(linear load),Single phase		
	Max. AC current(A)	10		
	Norminal AC power(VA)	2300		
	Peak power(VA)*****	3500, 10sec		

2.3 The key Components List

Critical Components LIST					
Object/part no.	Manufacturer/trade mark	Type/model	Technical data	Standard	Mark(s) of conformity [1]
Boost Choke	Goodwe	141-10064	180°C	--	Test with appliance
Boost Choke	Goodwe	141-10067	180°C	--	Test with appliance
Inverter Choke	GoodWe	141-10057	180°C	--	Test with appliance
DC/DC Transformer	GoodWe	140-00007	155°C	--	Test with appliance
Power Board:					
C201, C205, C301, C302, C312, C313	Epcos	B81123-C1472-M%	4.7nF/250Vac, 100°C	UL60384-14	UL E97863
	JYH CHUNG ELECTRONICS CO LTD	JD	4.7nF/400VAC, 85°C	UL60384-14	UL E187963
	VISHAY	VY1 Series	4.7nF/500VAC Y1, 85°C	IEC/EN60384-14	VDE 40012673
	WALSIN	AH	4.7nF/400VAC -25℃ /125℃	IEC/UL60384-14	VDE40001804, UL E146544
Bus Cap EC200~ EC205	NICHINON	LGN2L471MELBSH	470uF/550VDC, -25℃/105℃		Test with appliance
SPS &Comm Optocouplers U101, U104, U501, U601, U602, U603	VISHAY	SFH615A-3X009SM	Ext. Dcr.≥7mm, 100°C. voltage:1131V, transient voltage:8000V. PD test voltage 2121V.	UL1577	UL E52744
	Everlight	EL354N	Ext. Dcr.≥8.1mm, 100 C. voltage:1060V, transient voltage:8000V. PD test voltage 1988V	EN 60747-5-5:2011-11	VDE 132249
SPS Transformer T500	GoodWe	140-40026	130°C	--	Test with appliance
Current Sensor TX400	GoodWe	140-20000	15A,150mA, CLASSB	--	Test with appliance
DRI Transformer TX402	GoodWe	140-40021	130°C	--	Test with appliance
BATTERY SPS SWITCH Transformer TX100	GoodWe	140-40019	130°C	--	Test with appliance
Inverter fast MOS Q200, Q201, Q202, Q203, Q204, Q205, Q210, Q211, Q400, Q403	Various	Various	500V~1000V, 30-75A	--	Test with appliance
Inverter fast MOS Q401, Q402, Q404, Q405	Various	Various	500V~1000V, 30-75A	--	Test with appliance
Inverter fast MOS Q300, Q301, Q302, Q303	Various	Various	60~150V,150~300A	--	Test with appliance
HCT400	LEM	HXN 15-P	15A,4V	--	Test with appliance
	VAC	T60404-N4646-X400	25A, 25mA	--	Test with appliance
	TAMURA	L18P015D15	15A,4V	--	Test with appliance

In/Output Board:					
C1006, C1007, C1008, C1009,C1022, C1023, C1024,-C1026, C1105, C1106, C1110, C1111, C1118, C1119, C1123, C1124	EPCOS	B81123-C1472-M%	4.7nF/250Vac, 100°C	UL60384-14	UL E97863
	JYH CHUNG ELECTRONICS CO LTD	JD	4.7nF/400VAC, 85°C	UL60384-14	UL E187963
	VISHAY	VY1 Series	4.7nF/500VAC Y1, 85°C	IEC/EN60384-14	VDE 40012673
	WALSIN	AH	4.7nF/400VAC -25℃ /125℃	IEC/UL60384-14	VDE40001804, UL:E146544
C1011, C1021, C1032, C1042,C1010,C1025	EPCOS	B81123-C1472-M%	1nF/250Vac, 100°C	UL60384-14	UL E97863
	JYH CHUNG ELECTRONICS CO LTD	JD	1nF/400VAC, 85°C	UL60384-14	UL E187963
	VISHAY	VY1 Series	1nF/500VAC Y1, 85°C	IEC/EN60384-14	VDE 40012673
	WALSIN	AH	1nF/400VAC -25℃ /125℃	IEC/UL60384-14	VDE40001804, UL:E146544
X Capacitors C1019, C1041	FARAD ELECTRONICS CO., LTD.	PXK	2.2uF/275Vac, 110°C	UL60384-14	UL E247953
	FARA	MKP62	2.2uF/275VAC,110℃	UL60384-14	UL E247953
	EPCOS	B32923C3225M	2.2uF/305Vac, 110°C	UL1414	UL E97863
	FARA	C4B	2.2Uf/350VAC，40℃～+110℃	UL60384-14	ENEC SE/0366-6
C1017	EPCOS	B32923C3225M	1uF/305Vac, 110°C	UL60384-14	UL E97863
	FARA	C4B	1uF/350VAC，40℃～+110℃	UL60384-14	UL E247953
HCT1100, HCT1101	LEM	HXN 15-P	15A,4V	--	Test with appliance
	TAMURA	L18P015D15	15A,4V	--	Test with appliance
HCT1001	LEM	HXN 15-P	25A,4V	--	Test with appliance
	TAMURA	L18P015D15	25A,4V	--	Test with appliance
HCT1000	LEM	CASR 25-NP	25A, 0.625V	--	Test with appliance
	VAC	T60404-N4646-X661	25A, 0.625V	--	Test with appliance
RY1000, RY1001, RY1002, RY1003, RY1004, RY1005, RY1006, RY1007	Tyco	PCFN-112H2MG	Coil: 12Vdc contact: 277Vac 26A	UL 508	UL E58304
	panasonic	ALFG2PF12 1	Coil: 12Vdc contact: 250Vac 33A	IEC/EN 61810-1 UL508	VDE 40023067 UL E43028
	Fujitsu	FTR-K3AB012W-WG	Coil: 12Vdc contact: 277Vac 25A	UL508	UL E63614
	Fujitsu	FTR-K3AB012W-PV	Coil: 12Vdc contact: 250Vac 32A，85°C	UL508	UL E63614

2.4 Operating Condition of EUT

2.4.1 Set up the EUT as showed each respective block diagram of test setup.

2.4.2 Turn on all equipment.

2.4.3 Adjust the output of the DC power supply which made the EUT working in PV On-Grid Full Load 、PV On-Grid Half Load 、Battery On-Grid and AC Charge for EMI test, 10% load for EMS test.

2.4.4 Two Battery connector connet to PV Inverter. PV input connet to DC Sourse, BMS/NTC connet to Battery to working normally. In order to collect the battery information.

2.5 Tested Supporting System Details

2.5.1 DC Power Supply

Manufacturer	:	TopCon
Model Number	:	TC.P.32.1000.400.PV.HMI
Serial Number	:	1442CC348
Input Power	:	3*400Vac,48-62Hz,3*60A
Output	:	0-32KW,0-1000Vdc,0-40A

2.6 Description of Test Facility

Name of Firm : **Audix Technology (Wujiang) Co., Ltd. EMC Dept.**

Site Location : No. 1289 Jiangxing East Road, the Eastern Part of Wujiang Economic Development Zone Jiangsu China 215200

Test Facilities : **No.1 10m Semi-anechoic Chamber**

No. 2 Conducted Shielding Enclosure

The Complex Immunity Test Room

RS&CS Test Room

NVLAP Lab Code : 200786-0
Valid until on Sep. 30, 2017
(NVLAP is a signatory member of ILAC MRA)
Remark: This report shall not be imply endorsement, certification or approval by NVLAP, NIST, or any agency of the U.S. Federal Government.

2.7 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
No. 2 Conducted Shielding Enclosure		
Conducted Disturbance Measurement	150kHz~30MHz	± 2.65dB
At 10m Semi-Anechoic Chamber		
Radiated Disturbance Measurement (Distance**:** 10m)	30MHz~1000MHz	± 3.65dB (Horizontal)
		± 3.74dB (Vertical)
Radiated Disturbance Measurement (Distance**:** 3m)	1GHz~6GHz	± 4.73dB

Remark：Uncertainty = $ku_c(y)$

3 CONDUCTED DISTURBANCE MEASUREMENT

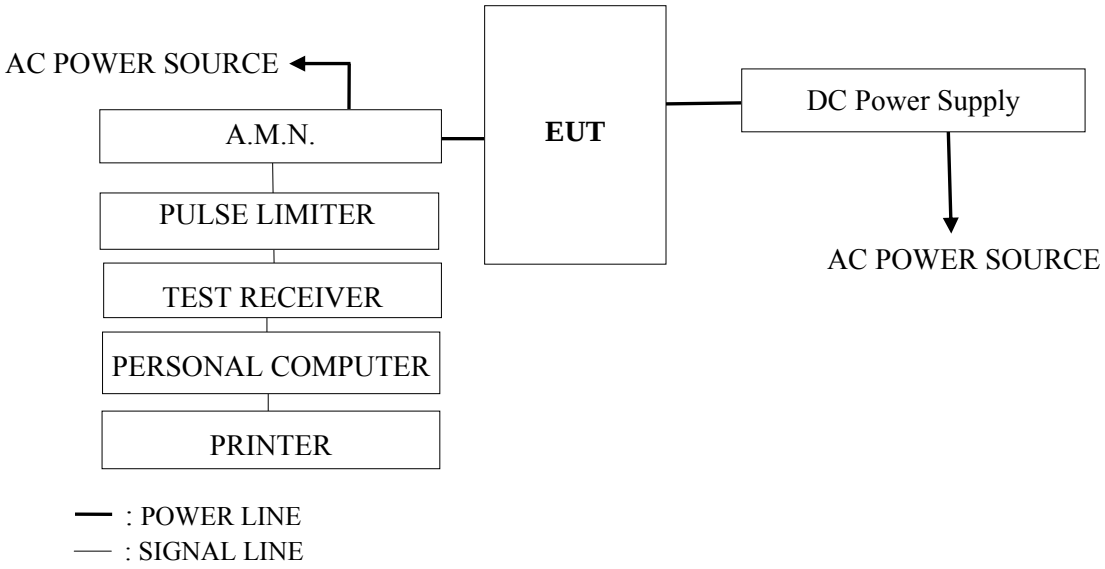
3.1 Test Equipment

The following test equipment was used during the conducted emission measurement：

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R & S	ESCI	100839	2017-01-05	2018-01-04
2.	A.M.N	R & S	ESH2-Z5	100153	2016-05-15	2017-05-14
3.	L.I.S.N.	Kyoritsu	KNW-407	8-1793-4	2016-07-03	2017-07-02
4.	Pulse Limiter	R&S	ESH3-Z2	100605	2017-01-05	2018-01-04
5.	50Ω Terminator	Tektronis	MS4630B	001-con	2017-01-04	2018-01-03
6.	RF Cable	Shen Xuan	SX-ROS400	Cable 59/1+Switch	2017-01-05	2018-01-04
7.	Software	Audix/e3(6.7.0313)				

3.2 Block Diagram of Test Setup

3.2.1 Block Diagram of Test Setup for AC mains Port



3.3 Limits for Conducted Disturbance Voltage

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level	Average Level
EN61000-6-3		
0.15MHz ~ 0.5MHz	66 ~ 56 dBμV	56 ~ 46 dBμV
0.5MHz ~ 5MHz	56 dBμV	46 dBμV
5MHz ~ 30MHz	60 dBμV	50 dBμV
EN61000-6-4		
0.15MHz~0.5MHz	79 dBμV	66 dBμV
0.5MHz~30MHz	73 dBμV	60 dBμV

Remark 1. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.
2. The lower limit applies at the band edges.
3. The limit of EN 61000-6-3 is more rigorous than EN 61000-6-4, if the test result satisfy EN 61000-6-3 request, regards as simultaneously meets EN 61000-6-4 requirement.

3.4 Test Procedure

The measuring process is according to EN 61000-6-3:2007+A1:2011+AC:2012 & EN 61000-6-4:2007+A1:2011 and laboratory internal procedure TKC-301-004.

In the conducted emission measurement, the EUT and all peripheral devices were set up on a non-metallic table which was 0.8 meter height above the ground plane, and 0.4 meter far away from the vertical plane. The mains cable of the EUT connected to one Artificial Main Network (AMN). All other unit of the EUT and AE connected to a second Line Impedance Stabilization Network (L.I.S.N.). The telecommunication cable connected to the AE through a Impedance Stabilization Network (ISN) which terminated a 50Ω resistor. For the measurement, the A.M.N measuring port was terminated by a 50Ω measuring equipment and the second L.I.S.N measuring port was terminated by a 50Ω terminator. All measurements were done between the phase lead and the reference ground, and between the neutral lead and the reference ground. All cables or wires placement were verified to find out the maximum emission.

The bandwidth of measuring receiver was set at 9 kHz.

The required frequency band (0.15 MHz ~ 30 MHz) was pre-scanned with peak detector, the final measurement was measured with quasi-peak detector and average detector.

The emission level is calculated automatically by the test system which uses the following equation:

Emission level (dBμV) = Reading (dBμV) + A.M.N /I.S.N factor (dB) + Cable loss (dB).
(Cable loss includes pulses limiter loss)

3.5 Measurement Results

PASSED.

EUT with the following test modes were performed during this section testing and all the test results are listed in next pages.

Test Date：Mar.01, 2017 Temperature：19.8℃ Humidity：54%

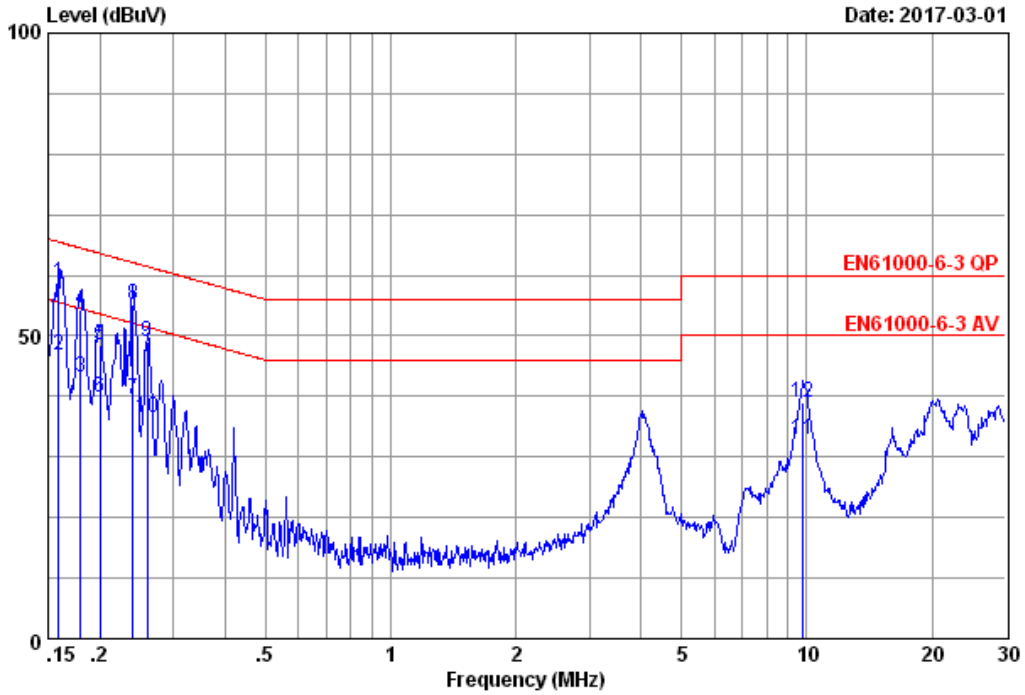
Item	Test Condition	Reference Test Data No.	
		Line1	Line2
1.	PV On-Grid Full Load	#1	#2
2.	PV On-Grid Half Load	#4	**※# 3**
3.	Battery On-Grid Load	#5	#6
4.	AC Charge	#9	#10

NOTE 1 - '※'means the worst test mode**.**

NOTE 2 - The worst emission is detected at 0.24 MHz with emission level of 59.13 dB (μV) (limit is 62.13 dB (μV)) with QP detector, when the Line of the EUT is connected to A.M.N.

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 1 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



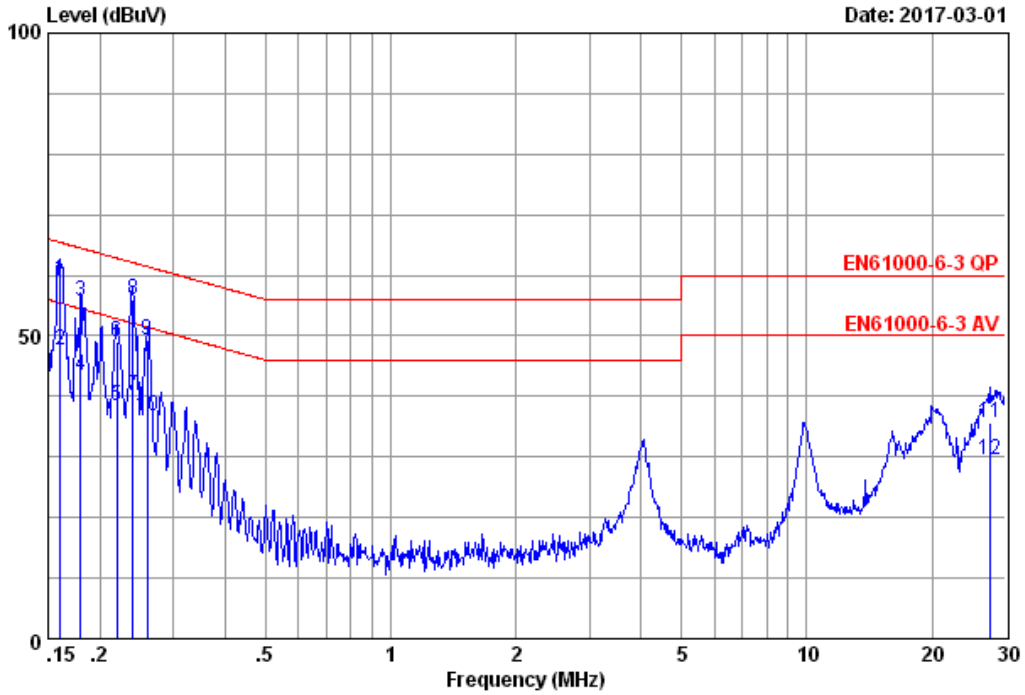
Site no. : No.2 Conducted shielding Enclosure
AMN/LISN : NNLK8129-1702-N Phase : NEUTRAL
Limit : EN61000-6-3 QP
Env. / Ins. : 19.8*C&54%/ESCI Engineer : KM.Tong
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230V/50Hz
Test mode : PV On-Grid Full load
Memo :

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.08	0.02	9.93	48.80	58.83	65.52	6.69	QP
2	0.16	0.08	0.02	9.93	36.90	46.93	55.52	8.59	Average
3	0.18	0.08	0.02	9.93	33.20	43.23	54.50	11.27	Average
4	0.18	0.08	0.02	9.93	44.20	54.23	64.50	10.27	QP
5	0.20	0.08	0.02	9.93	38.50	48.53	63.62	15.09	QP
6	0.20	0.08	0.02	9.93	29.90	39.93	53.62	13.69	Average
7	0.24	0.08	0.02	9.93	29.40	39.43	52.08	12.65	Average
8	0.24	0.08	0.02	9.93	45.20	55.23	62.08	6.85	QP
9	0.26	0.08	0.02	9.93	38.90	48.93	61.42	12.49	QP
10	0.26	0.08	0.02	9.93	26.50	36.53	51.42	14.89	Average
11	9.79	0.33	0.12	9.91	22.61	32.97	50.00	17.03	Average
12	9.79	0.33	0.12	9.91	28.50	38.86	60.00	21.14	QP

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 2 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



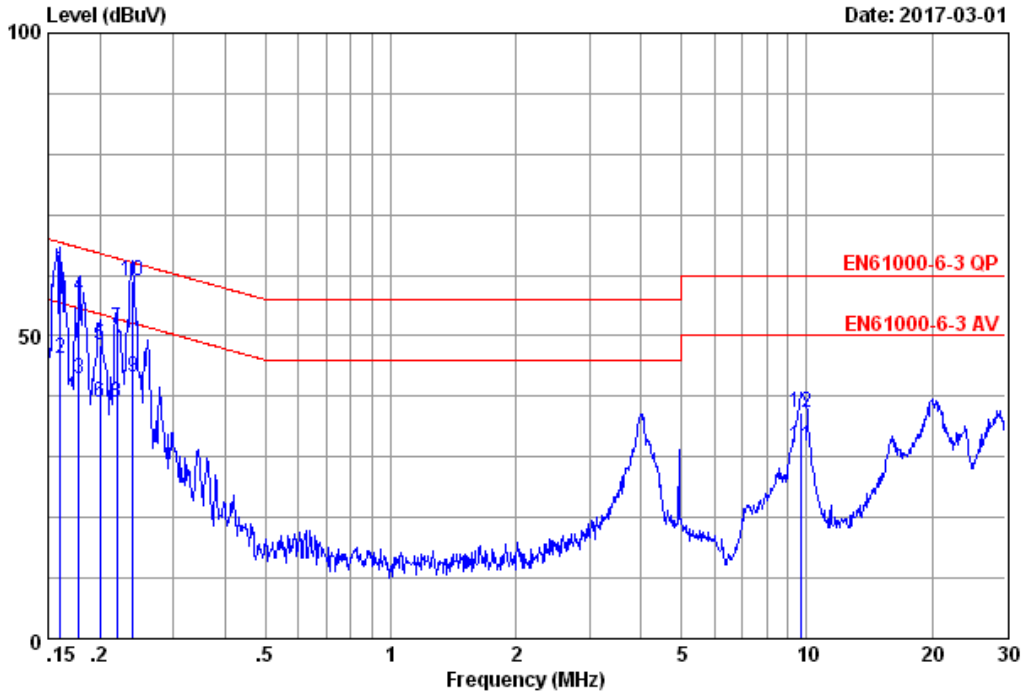
Site no. : No.2 Conducted shielding Enclosure
AMN/LISN : NNLK8129-1702-L1 Phase : LINE
Limit : EN61000-6-3 QP
Env. / Ins. : 19.8*C&54%/ESCI Engineer : KM.Tong
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230V/50Hz
Test mode : PV On-Grid Full load
Memo :

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.09	0.02	9.93	49.39	59.43	65.43	6.00	QP
2	0.16	0.09	0.02	9.93	37.59	47.63	55.43	7.80	Average
3	0.18	0.08	0.02	9.93	45.70	55.73	64.50	8.77	QP
4	0.18	0.08	0.02	9.93	33.50	43.53	54.50	10.97	Average
5	0.22	0.08	0.02	9.93	28.40	38.43	52.83	14.40	Average
6	0.22	0.08	0.02	9.93	39.00	49.03	62.83	13.80	QP
7	0.24	0.08	0.02	9.93	30.10	40.13	52.08	11.95	Average
8	0.24	0.08	0.02	9.93	46.00	56.03	62.08	6.05	QP
9	0.26	0.08	0.02	9.93	39.40	49.43	61.42	11.99	QP
10	0.26	0.08	0.02	9.93	26.70	36.73	51.42	14.69	Average
11	27.71	0.65	0.21	9.90	24.90	35.66	60.00	24.34	QP
12	27.71	0.65	0.21	9.90	18.90	29.66	50.00	20.34	Average

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 4 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



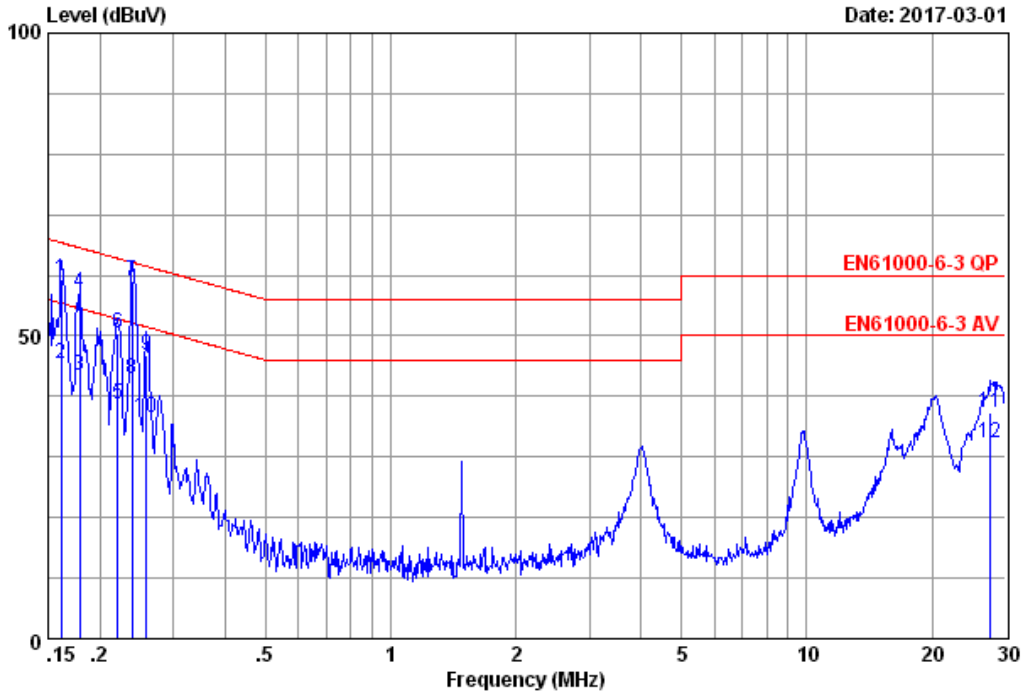
Site no. : No.2 Conducted shielding Enclosure
AMN/LISN : NNLK8129-1702-N Phase : NEUTRAL
Limit : EN61000-6-3 QP
Env. / Ins. : 19.8*C&54%/ESCI Engineer : KM.Tong
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230V/50Hz
Test mode : PV On-Grid Half load
Memo :

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.08	0.02	9.93	50.80	60.83	65.43	4.60	QP
2	0.16	0.08	0.02	9.93	36.30	46.33	55.43	9.10	Average
3	0.18	0.08	0.02	9.93	33.00	43.03	54.59	11.56	Average
4	0.18	0.08	0.02	9.93	46.50	56.53	64.59	8.06	QP
5	0.20	0.08	0.02	9.93	38.50	48.53	63.62	15.09	QP
6	0.20	0.08	0.02	9.93	29.00	39.03	53.62	14.59	Average
7	0.22	0.08	0.02	9.93	41.20	51.23	62.83	11.60	QP
8	0.22	0.08	0.02	9.93	29.00	39.03	52.83	13.80	Average
9	0.24	0.08	0.02	9.93	33.20	43.23	52.08	8.85	Average
10	0.24	0.08	0.02	9.93	49.00	59.03	62.08	3.05	QP
11	9.65	0.33	0.12	9.91	21.30	31.66	50.00	18.34	Average
12	9.65	0.33	0.12	9.91	27.00	37.36	60.00	22.64	QP

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 3 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



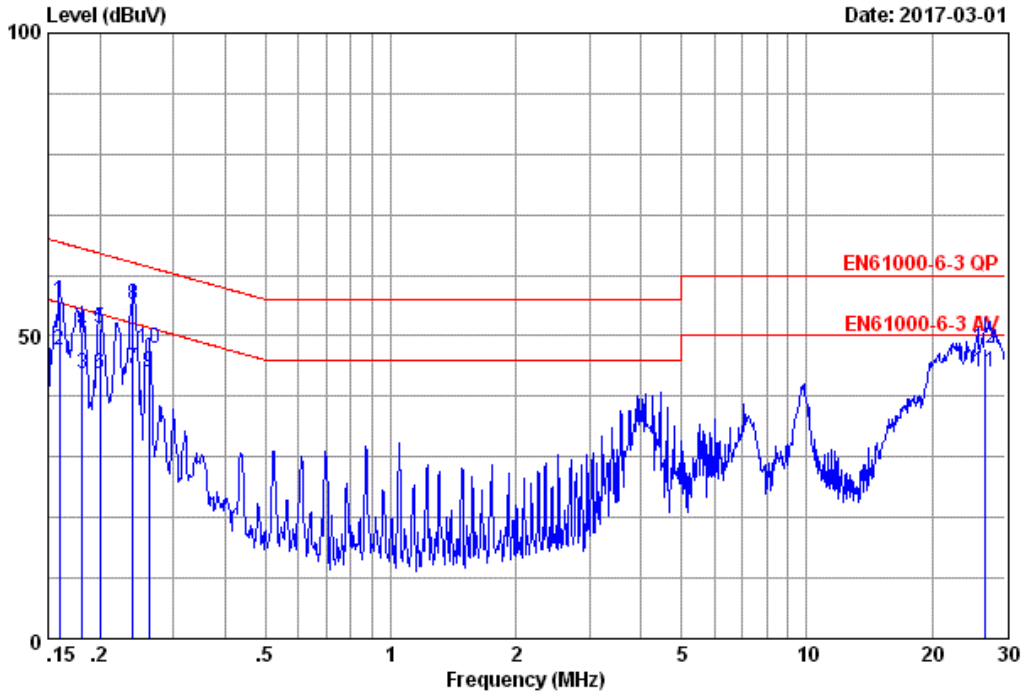

```
Site no.      : No.2 Conducted shielding Enclosure
AMN/LISN      : NNLK8129-1702-L1                    Phase    : LINE
Limit         : EN61000-6-3 QP
Env. / Ins.   : 19.8*C&54%/ESCI                     Engineer : KM.Tong
EUT           : PV Inverter
M/N           : GW5048-EM
Power Rating  : 230V/50Hz
Test mode     : PV On-Grid Half load
Memo          :
```

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.09	0.02	9.93	49.19	59.23	65.38	6.15	QP
2	0.16	0.09	0.02	9.93	35.39	45.43	55.38	9.95	Average
3	0.18	0.08	0.02	9.93	33.50	43.53	54.55	11.02	Average
4	0.18	0.08	0.02	9.93	47.20	57.23	64.55	7.32	QP
5	0.22	0.08	0.02	9.93	28.60	38.63	52.79	14.16	Average
6	0.22	0.08	0.02	9.93	40.50	50.53	62.79	12.26	QP
7	0.24	0.08	0.02	9.93	49.10	59.13	62.13	3.00	QP
8	0.24	0.08	0.02	9.93	33.00	43.03	52.13	9.10	Average
9	0.26	0.08	0.02	9.93	36.80	46.83	61.47	14.64	QP
10	0.26	0.08	0.02	9.93	26.40	36.43	51.47	15.04	Average
11	27.71	0.65	0.21	9.90	26.50	37.26	60.00	22.74	QP
12	27.71	0.65	0.21	9.90	21.50	32.26	50.00	17.74	Average

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 5 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



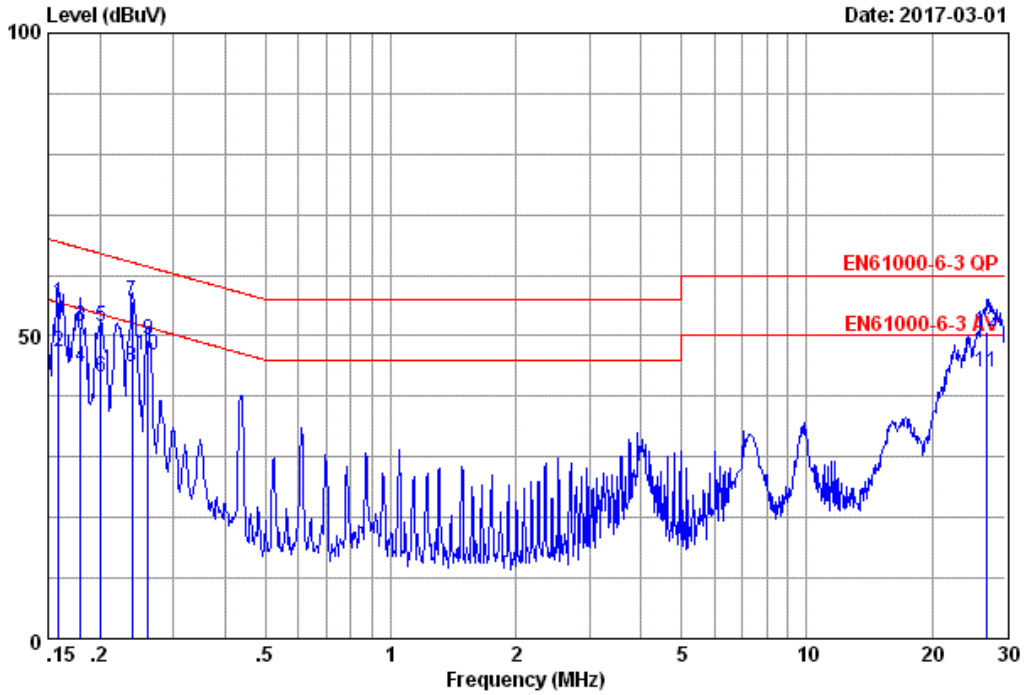
Site no. : No.2 Conducted shielding Enclosure
AMN/LISN : NNLK8129-1702-N Phase : NEUTRAL
Limit : EN61000-6-3 QP
Env. / Ins. : 19.8*C&54%/ESCI Engineer : KM.Tong
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230V/50Hz
Test mode : Battery On-Grid
Memo :

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.08	0.02	9.93	45.70	55.73	65.47	9.74	QP
2	0.16	0.08	0.02	9.93	37.60	47.63	55.47	7.84	Average
3	0.18	0.08	0.02	9.93	33.70	43.73	54.42	10.69	Average
4	0.18	0.08	0.02	9.93	40.70	50.73	64.42	13.69	QP
5	0.20	0.08	0.02	9.93	41.30	51.33	63.62	12.29	QP
6	0.20	0.08	0.02	9.93	33.70	43.73	53.62	9.89	Average
7	0.24	0.08	0.02	9.93	34.50	44.53	52.08	7.55	Average
8	0.24	0.08	0.02	9.93	45.10	55.13	62.08	6.95	QP
9	0.26	0.08	0.02	9.93	33.90	43.93	51.38	7.45	Average
10	0.26	0.08	0.02	9.93	37.80	47.83	61.38	13.55	QP
11	26.70	0.38	0.21	9.90	33.60	44.09	50.00	5.91	Average
12	26.70	0.38	0.21	9.90	37.30	47.79	60.00	12.21	QP

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 6 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



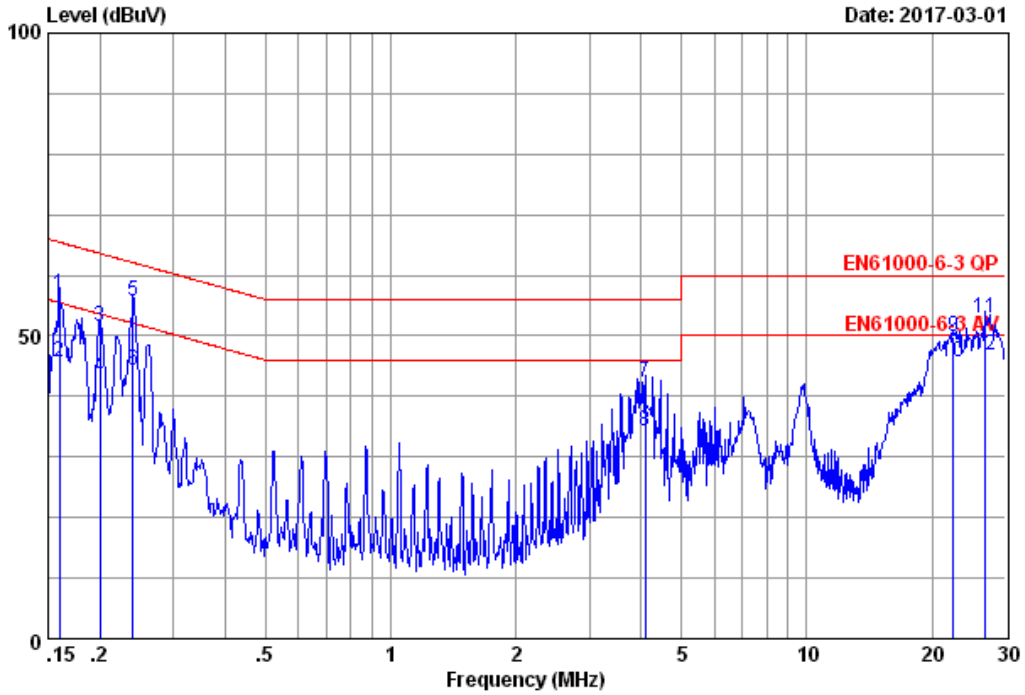
Site no. : No.2 Conducted shielding Enclosure
AMN/LISN : NNLK8129-1702-L1 Phase : LINE
Limit : EN61000-6-3 QP
Env. / Ins. : 19.8*C&54%/ESCI Engineer : KM.Tong
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230V/50Hz
Test mode : Battery On-Grid
Memo :

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.09	0.02	9.93	45.50	55.54	65.52	9.98	QP
2	0.16	0.09	0.02	9.93	37.30	47.34	55.52	8.18	Average
3	0.18	0.08	0.02	9.93	41.50	51.53	64.50	12.97	QP
4	0.18	0.08	0.02	9.93	34.70	44.73	54.50	9.77	Average
5	0.20	0.08	0.02	9.93	41.50	51.53	63.58	12.05	QP
6	0.20	0.08	0.02	9.93	33.10	43.13	53.58	10.45	Average
7	0.24	0.08	0.02	9.93	45.70	55.73	62.13	6.40	QP
8	0.24	0.08	0.02	9.93	34.70	44.73	52.13	7.40	Average
9	0.26	0.08	0.02	9.93	39.40	49.43	61.38	11.95	QP
10	0.26	0.08	0.02	9.93	36.80	46.83	51.38	4.55	Average
11	26.98	0.66	0.21	9.90	33.20	43.97	50.00	6.03	Average
12	26.98	0.66	0.21	9.90	39.90	50.67	60.00	9.33	QP

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 9 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)



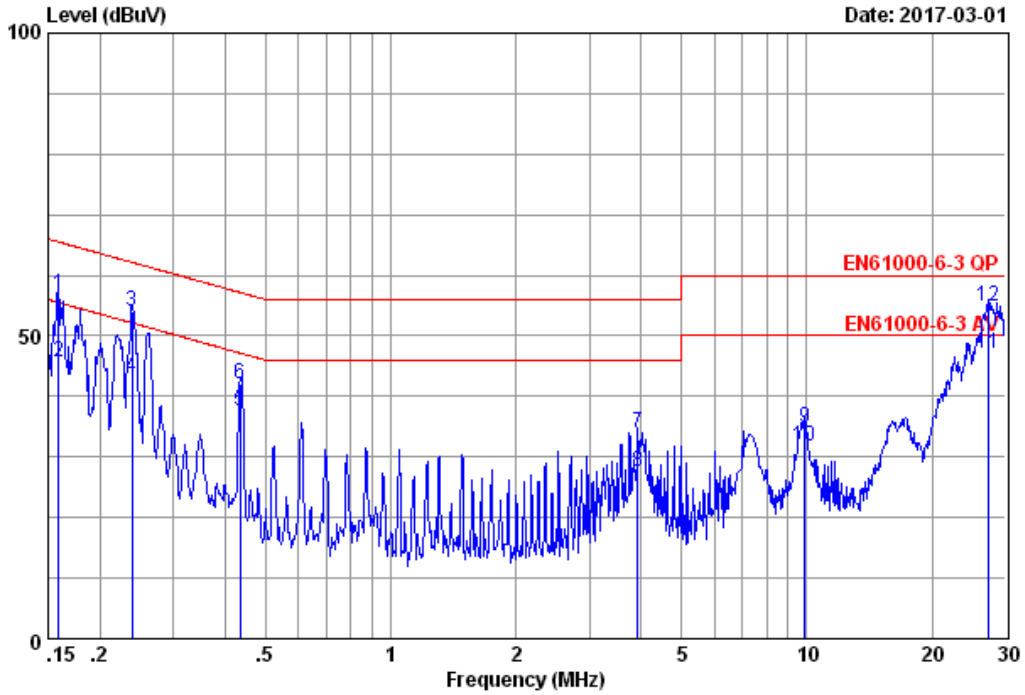
Site no. : No.2 Conducted shielding Enclosure
AMN/LISN : NNLK8129-1702-N Phase : NEUTRAL
Limit : EN61000-6-3 QP
Env. / Ins. : 19.8*C&54%/ESCI Engineer : KM.Tong
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230V/50Hz
Test mode : AC Charge
Memo :

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.08	0.02	9.93	46.89	56.92	65.47	8.55	QP
2	0.16	0.08	0.02	9.93	35.64	45.67	55.47	9.80	Average
3	0.20	0.08	0.02	9.93	41.52	51.55	63.62	12.07	QP
4	0.20	0.08	0.02	9.93	33.28	43.31	53.62	10.31	Average
5	0.24	0.08	0.02	9.93	45.57	55.60	62.08	6.48	QP
6	0.24	0.08	0.02	9.93	34.25	44.28	52.08	7.80	Average
7	4.09	0.16	0.08	9.92	32.25	42.41	56.00	13.59	QP
8	4.09	0.16	0.08	9.92	24.15	34.31	46.00	11.69	Average
9	22.54	0.49	0.19	9.90	39.20	49.78	60.00	10.22	QP
10	22.54	0.49	0.19	9.90	35.14	45.72	50.00	4.28	Average
11	26.70	0.38	0.21	9.90	42.48	52.97	60.00	7.03	QP
12	26.70	0.38	0.21	9.90	36.25	46.74	50.00	3.26	Average

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

Audix Technology (Wu Jiang) Co.,Ltd
No.1289,Jiang Xing East Road,The Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel : (0512)63403993 Fax:(0512)63403339

Data: 10 File: E:\Test data & Report\2017 Test Data\Report\02\C1W1702021.EM6 (11)




```
Site no.      : No.2 Conducted shielding Enclosure
AMN/LISN      : NNLK8129-1702-L1                    Phase    : LINE
Limit         : EN61000-6-3 QP
Env. / Ins.   : 19.8*C&54%/ESCI                     Engineer : KM.Tong
EUT           : PV Inverter
M/N           : GW5048-EM
Power Rating  : 230V/50Hz
Test mode     : AC Charge
Memo          :
```

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Aux (dB)	Emission Reading (dBuV)	Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.16	0.09	0.02	9.93	46.78	56.82	65.52	8.70	QP
2	0.16	0.09	0.02	9.93	35.64	45.68	55.52	9.84	Average
3	0.24	0.08	0.02	9.93	43.97	54.00	62.13	8.13	QP
4	0.24	0.08	0.02	9.93	33.26	43.29	52.13	8.84	Average
5	0.44	0.07	0.03	9.93	27.64	37.67	47.15	9.48	Average
6	0.44	0.07	0.03	9.93	32.15	42.18	57.15	14.97	QP
7	3.92	0.16	0.08	9.92	23.77	33.93	56.00	22.07	QP
8	3.92	0.16	0.08	9.92	17.32	27.48	46.00	18.52	Average
9	9.91	0.36	0.12	9.91	24.35	34.74	60.00	25.26	QP
10	9.91	0.36	0.12	9.91	21.26	31.65	50.00	18.35	Average
11	27.27	0.66	0.21	9.90	36.25	47.02	50.00	2.98	Average
12	27.27	0.66	0.21	9.90	44.08	54.85	60.00	5.15	QP

1.Emission Level= AMN factor + Cable loss+ Pulse Att+ Reading .

4 RADIATED DISTURBANCE MEASUREMENT

4.1 Test Equipment

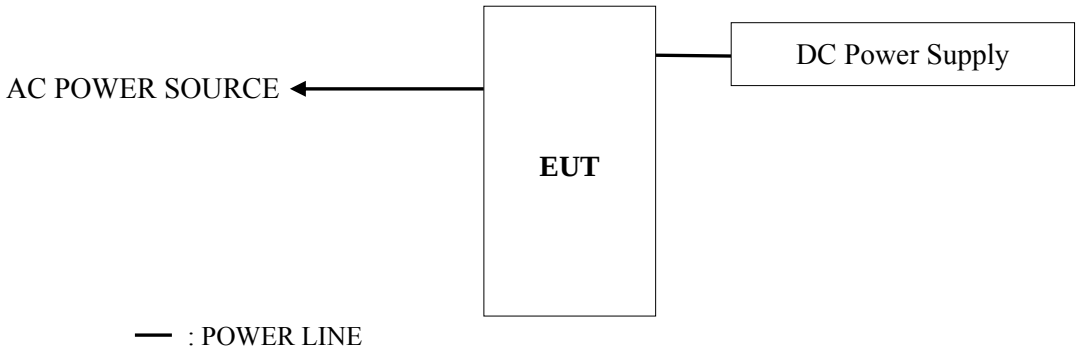
The following test equipment was used during the radiated emission measurement：

(At 10m Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E7405A	MY45107028	2017-01-04	2018-01-03
2.	Pre-Amplifier	Chengyi dianzi	EMC9135	980374	2017-01-04	2018-01-03
3.	Pre-Amplifier	Chengyi dianzi	EMC9135	980373	2017-01-04	2018-01-03
4.	Bi-log Antenna (Horizontal)	Schwarzbeck	VULB 9168	703	2016-07-20	2017-07-19
5.	Bi-log Antenna (Vertical)	Schwarzbeck	VULB 9168	704	2016-07-20	2017-07-19
6.	Test Receiver	R&S	ESCI	100839	2017-01-04	2018-01-03
7.	Microwave amplifier	Agilent	8449B	3008A02234	2017-01-04	2018-01-03
8.	RF Cable	shengxuan	CSRH	50/2	2017-01-04	2018-01-03
9.	RF Cable	shengxuan	CSRH	59/2	2017-01-04	2018-01-03
10.	RF Cable	shengxuan	CSRH	50/1	2017-01-04	2018-01-03
11.	RF Cable	shengxuan	CSRH	59/4	2017-01-04	2018-01-03
12.	Software	Audix /e3 (6.7.0313)				

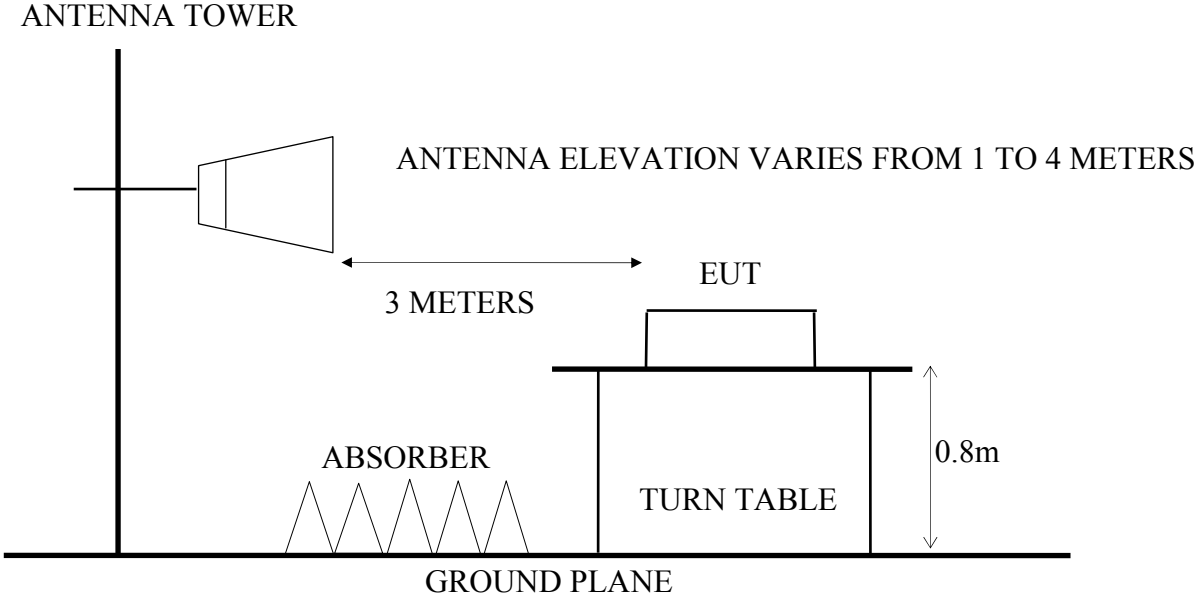
4.2 Block Diagram of Test Setup

4.2.1 Block Diagram of connection between EUT and simulators



4.2.2 No. 1 10m m Semi-Anechoic Chamber Setup Diagram (Test distance: 10m)

For 30MHz~1GHz



4.3 Limits for Radiated Disturbance

4.3.1 Limits for Radiated Disturbance (30MHz~1GHz)

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMITS (dBμV/m)
EN61000-6-3		
30 ~ 230	10	30
230 ~ 1000	10	37
EN61000-6-4		
30 ~ 230	10	40
230 ~ 1000	10	47

Note： (1) The tighter limit shall apply at the edge 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 E.U.T.
(3) The limit of EN 61000-6-3 is more rigorous than EN 61000-6-4, if the test result satisfy EN 61000-6-3 request, regards as simultaneously meets EN 61000-6-4 requirement.

4.3.2 Limits for Radiated Disturbance (1GHz~6GHz)

FREQUENCY (GHz)	DISTANCE (Meters)	AVERAGE LIMITE (dBμV/m)	PEAK LIMITE (dBμV/m)
1~ 3	3	50	70
3~ 6	3	54	74

Note： (1) The lower limit applies at the transition frequency.

4.4 Test Procedure

The measuring process is according to EN 61000-6-3:2007+A1:2011+AC:2012 & EN 61000-6-4:2007+A1:2011 and laboratory internal procedure TKC-301-001.

In the radiated disturbance measurement, the EUT and all simulators were set up on a non-metallic turn table which was 0.8 meter above the ground plane. Measurement distance between EUT and receiving antennas was set at 10 meters at 30MHz~1GHz and 3 meters at 1GHz~6GHz. The measurement distance is the shortest horizontal distance between an imaginary circular periphery which consists of EUT periphery and cables and the reference point of the antenna. During the radiated measurement, the EUT was rotated 360° and receiving antennas were moved from 1 ~ 4 meters for finding maximum emission. Two receiving antennas were used for both horizontal and vertical polarization detection for 30MHz~1GHz.

The bandwidth of measuring receiver (or spectrum analyzer) was set to:

RBW (120 kHz), VBW (300 kHz) for QP detector below 1GHz
RBW (1 MHz), VBW (1MHz) for Peak detector above 1GHz
RBW (1 MHz), VBW (10 Hz) for Average detector above 1GHz

which is defined against CISPR16-1-1 section.

The required frequency band (30MHz ~ 6GHz) was pre-scanned with peak detector; all final measurements were measured with quasi-peak detector below 1GHz, measured with average detector and peak detector above 1GHz.

The emission level is calculated automatically by the test system which uses the following equation:

1. For 30MHz-1GHz measurement:
   Emission Level (dBμV/m) = Reading (dBμV)+Antenna Factor (dB/m)+Cable Loss (dB)

In chapter 7.6.6.1 the standard EN 55016-2-3 requires to include the values of w in the test report: "w: The dimension of the line tangent to the EUT formed by Θ_{3dB} at the measurement distance *d*. Equation (10) shall be used to calculate w for each actual antenna and measurement distance used. The values of w shall be included in the test report. This calculation may be based on the manufacturer-provided receive-antenna beamwidth specifications:
$w=2 \times d \times \tan(0{,}5 \times \Theta_{3dB})$

Frequency	3115 Horn	
GHz	Θ_{3dB}	d=3m
	(°)	w (M)
1.00	66	3.90
2.00	54	3.06
4.00	50	2.80
6.00	34	1.83

The values of w. are greater than chapter 7.6.6.1 of Table 2, the minimum dimension of w. (Wmin) requirements.

4.5 Measurement Results

PASSED.

4.5.1 For 30MHz~1GHz frequency range

The details of test modes and reference test data are as follows：

Test Date: Feb.23, 2017 Temperature: 22.2℃ Humidity: 61%

Item	Test Condition	Reference Test Data No.	
		Horizontal	Vertical
1.	PV On-Grid Full Load	# 1	**※# 2**
2.	PV On-Grid Half Load	# 3	# 4
3.	Battery On-Grid	#7	#8
4.	AC Charge	**※#9**	#10

NOTE 1 - '※'means the worst test mode**.**

NOTE 2 - 0° was the table front facing the antenna. Degree is calculated from 0° clockwise facing the antenna.

NOTE 3 - The worst emission at horizontal polarization was detected at 94.97 MHz with emission level of 78.57 dBμV/m (limit is 30.00 dBμV/m), when the antenna was 4.0 m height and the turntable was at 236°. The worst emission at vertical polarization was detected at 30.54 MHz with emission level of 29.07 dBμV/m (limit is 30.00 dBμV/m), when the antenna was 1.0 m height and the turntable was at 158°.

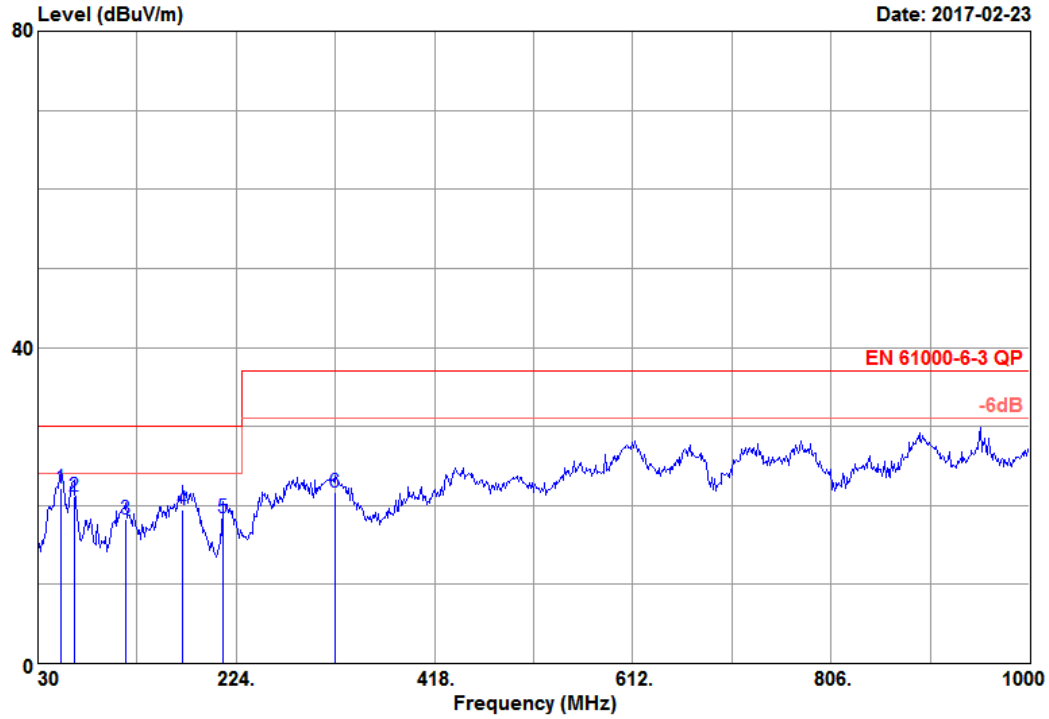
For above

4.5.2 For above 1GHz frequency range:

Due to the EUT's highest frequency generated and is less than 108MHz, therefore the above 1GHz frequency is no need to measure.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 1 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(704)-160720-H
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : PV On-Grid Full load
Memo :
:

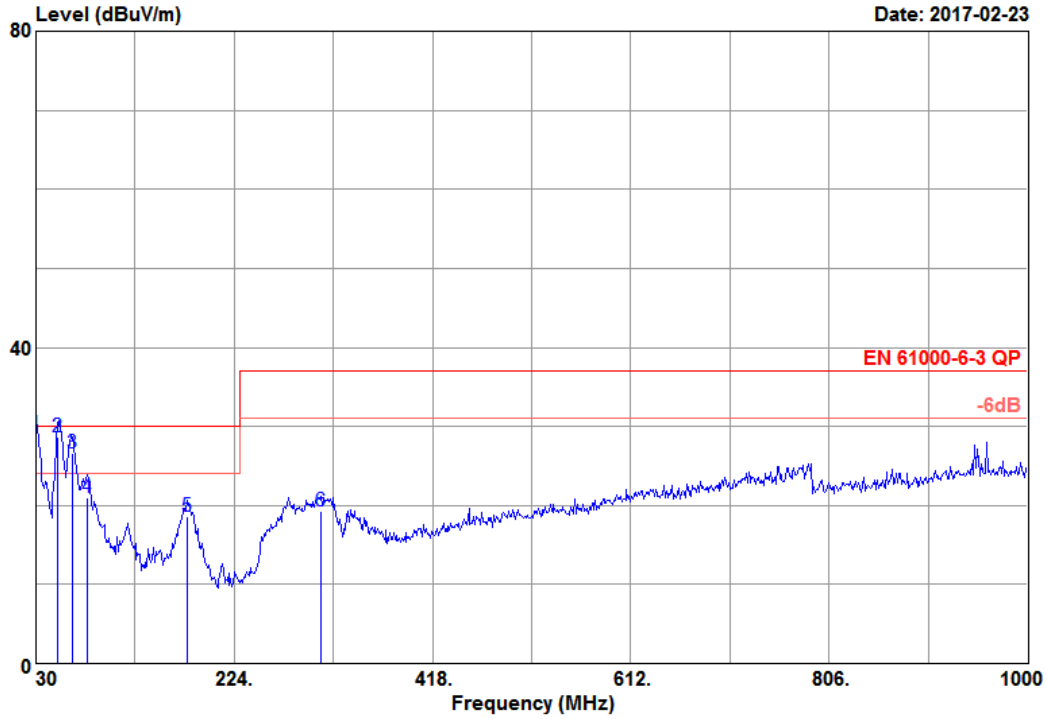
Ant. pol. : HORIZONTAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	52.23	19.59	0.86	1.76	22.21	30.00	7.79	QP
2	65.10	18.24	0.95	1.97	21.16	30.00	8.84	QP
3	115.41	16.55	1.25	0.48	18.28	30.00	11.72	QP
4	171.57	18.52	1.51	-0.58	19.45	30.00	10.55	QP
5	211.35	15.60	1.69	1.11	18.40	30.00	11.60	QP
6	320.16	19.77	2.10	-0.13	21.74	37.00	15.26	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 2 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-V
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : PV On-Grid Full load
Memo :
:

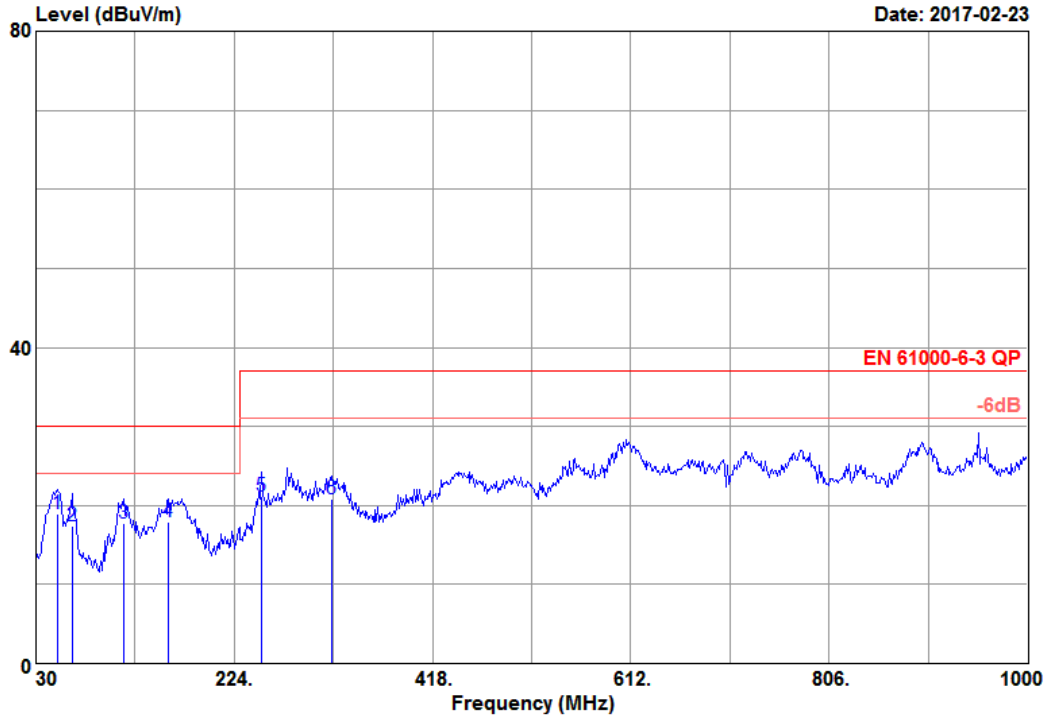
Ant. pol. : VERTICAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	30.54	18.21	0.56	10.30	29.07	30.00	0.93	QP
2	51.44	19.58	0.70	8.40	28.68	30.00	1.32	QP
3	65.32	18.20	0.76	7.70	26.66	30.00	3.34	QP
4	80.31	14.98	0.83	5.12	20.93	30.00	9.07	QP
5	177.42	18.00	1.24	-0.65	18.59	30.00	11.41	QP
6	308.46	19.36	1.66	-1.79	19.23	37.00	17.77	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 3 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(704)-160720-H
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : PV On-Grid Half load
Memo :
:

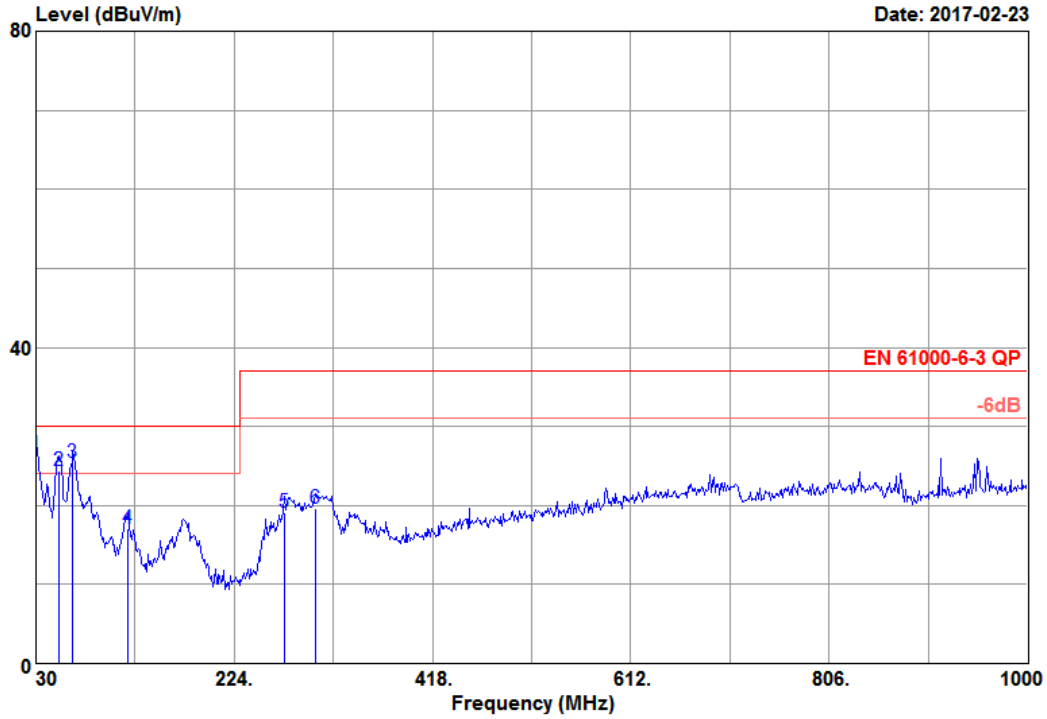
Ant. pol. : HORIZONTAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	51.06	19.61	0.86	-1.53	18.94	30.00	11.06	QP
2	65.10	18.24	0.95	-1.71	17.48	30.00	12.52	QP
3	115.41	16.55	1.25	-0.06	17.74	30.00	12.26	QP
4	159.87	19.29	1.46	-2.86	17.89	30.00	12.11	QP
5	251.13	17.55	1.84	1.77	21.16	37.00	15.84	QP
6	318.99	19.74	2.10	-1.10	20.74	37.00	16.26	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 4 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-V
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : PV On-Grid Half load
Memo :
:

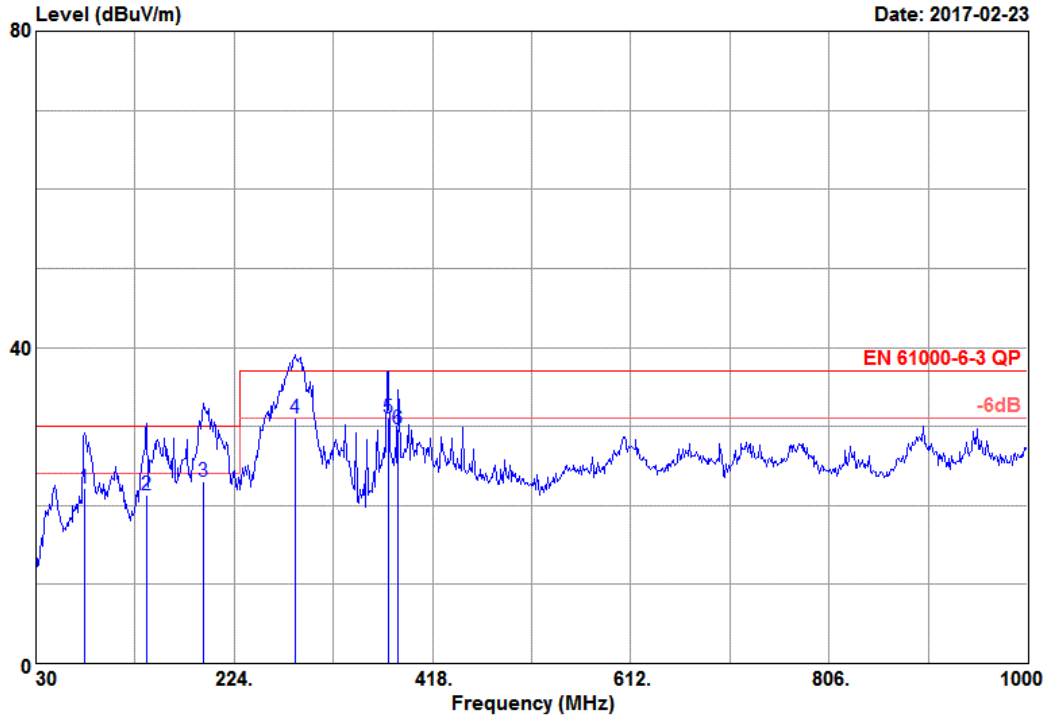
Ant. pol. : VERTICAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	30.52	18.21	0.56	7.60	26.37	30.00	3.63	QP
2	52.23	19.55	0.71	4.09	24.35	30.00	5.65	QP
3	65.68	18.07	0.77	6.60	25.44	30.00	4.56	QP
4	120.09	17.22	1.02	-1.24	17.00	30.00	13.00	QP
5	273.36	18.41	1.56	-0.80	19.17	37.00	17.83	QP
6	303.78	19.24	1.65	-1.34	19.55	37.00	17.45	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 7 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-H
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : Battery On-Grid
Memo :
:

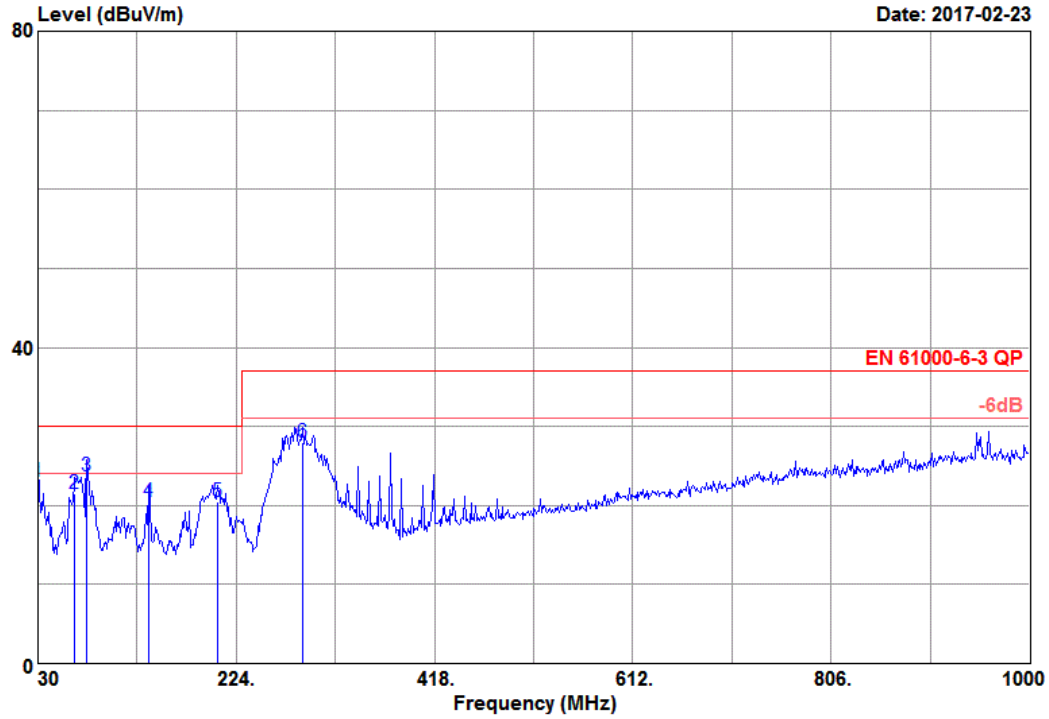
Ant. pol. : HORIZONTAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	77.97	15.64	0.82	5.75	22.21	30.00	7.79	QP
2	138.81	18.56	1.09	1.68	21.33	30.00	8.67	QP
3	193.74	15.94	1.31	5.70	22.95	30.00	7.05	QP
4	283.89	18.81	1.59	10.66	31.06	37.00	5.94	QP
5	375.15	20.79	1.84	8.48	31.11	37.00	5.89	QP
6	384.51	21.05	1.87	6.76	29.68	37.00	7.32	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 8 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-V
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : Battery On-Grid
Memo :
:

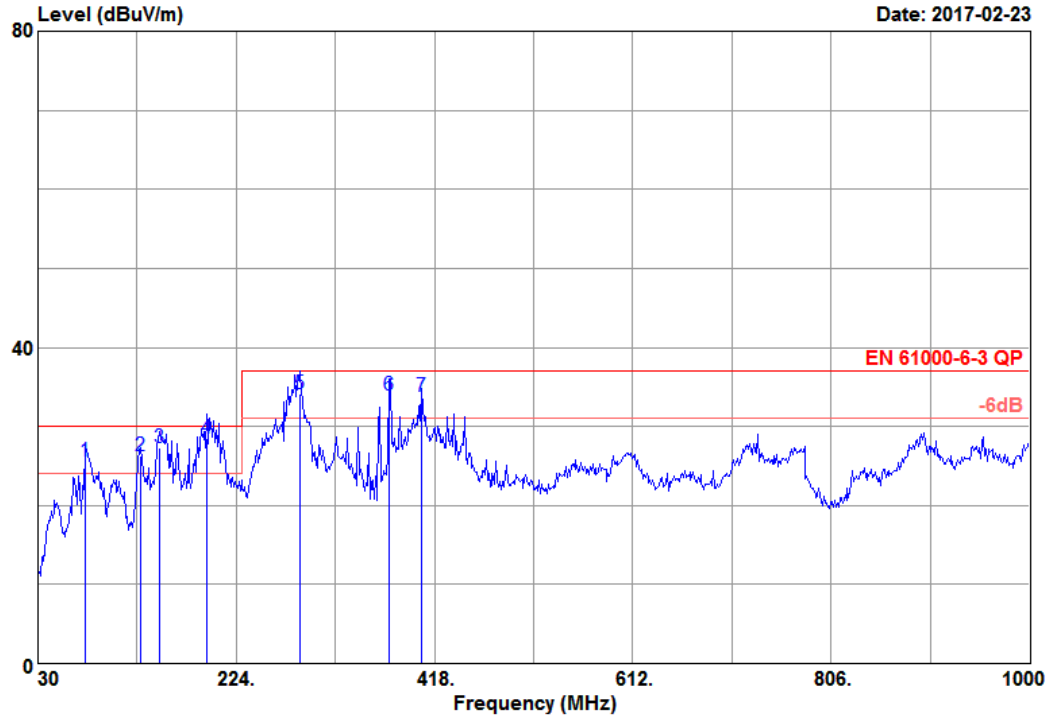
Ant. pol. : VERTICAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	30.00	18.22	0.55	4.31	23.08	30.00	6.92	QP
2	66.27	18.07	0.77	2.72	21.56	30.00	8.44	QP
3	77.97	15.64	0.82	7.27	23.73	30.00	6.27	QP
4	138.81	18.56	1.09	0.84	20.49	30.00	9.51	QP
5	205.50	15.48	1.35	3.65	20.48	30.00	9.52	QP
6	288.57	18.93	1.61	7.39	27.93	37.00	9.07	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 9 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-H
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : AC Charge
Memo :
:

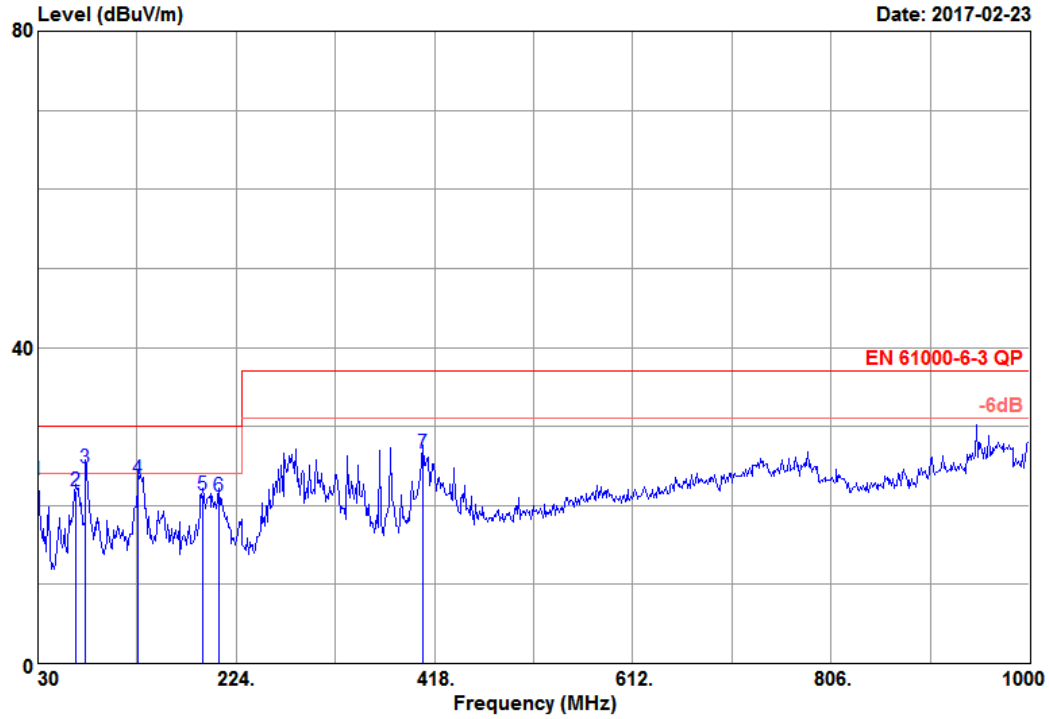
Ant. pol. : HORIZONTAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	76.80	15.83	0.81	8.89	25.53	30.00	4.47	QP
2	130.62	17.96	1.06	7.28	26.30	30.00	3.70	QP
3	149.34	19.12	1.13	7.08	27.33	30.00	2.67	QP
4	194.97	15.84	1.31	11.42	28.57	30.00	1.43	QP
5	286.23	18.86	1.60	13.62	34.08	37.00	2.92	QP
6	373.98	20.76	1.84	11.38	33.98	37.00	3.02	QP
7	405.57	21.46	1.92	10.35	33.73	37.00	3.27	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Audix Technology(Wujiang)Co.,Ltd.
No.1289,Jiang Xing Eest Road,Eastern Part of WuJiang
Economic Development Zone,JiangSu,China
Tel:0512-63403993 Fax:0512-63403339

Data: 10 File: G:\TEST DATA\2017\Report\2\C1W1702021.EM6 (10)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-V
Limit : EN 61000-6-3 QP
Env. / Ins. : 22.2*C 61%/ESCI
EUT : PV Inverter
M/N : GW5048-EM
Power Rating : 230Vac/50Hz
Test Mode : AC Charge
Memo :
:

Ant. pol. : VERTICAL
Engineer : Frank

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	30.00	18.22	0.55	4.38	23.15	30.00	6.85	QP
2	67.44	17.73	0.78	3.26	21.77	30.00	8.23	QP
3	76.80	15.83	0.81	8.11	24.75	30.00	5.25	QP
4	128.28	17.71	1.05	4.58	23.34	30.00	6.66	QP
5	191.46	16.37	1.30	3.58	21.25	30.00	8.75	QP
6	206.67	15.47	1.35	4.37	21.19	30.00	8.81	QP
7	406.74	21.47	1.93	3.25	26.65	37.00	10.35	QP

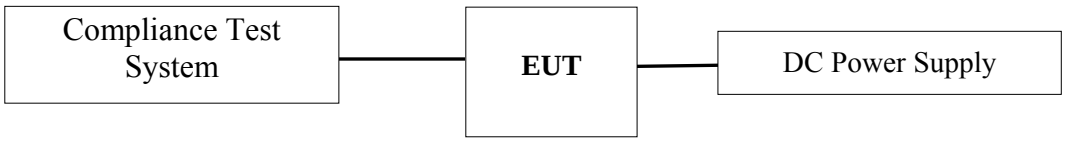
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

5 POWER HARMONICS AND FLICKER MEASUREMENT

5.1 Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	AC power source	TESEQ	NSG1007-45-3PI	1236A00705	2015-09-17	2017-09-16
2.	Signal Conditioning Unit	TESEQ	CCN1000-3	1236A00705	2015-09-17	2017-09-16
3.	Threephase Impedance network	TESEQ	INA2196	1236A00705	2015-09-17	2017-09-16

5.2 Block Diagram of Test Setup



— : POWER LINE

5.3 Test Standard

EN 61000-3-11:2000 and EN 61000-3-12:2011+AC:2013

5.4 Test Procedure

The measuring process is according to EN 61000-3-11:2000
& EN 61000-3-12:2011+AC:2013 and laboratory internal procedure TKC-301-011&-012.

5.5 Test Results

PASSED.

EUT with the following test modes were measured during this section testing and all the test results are listed in next page.

Test Date: Mar.06, 2017 Temperature: 18.4℃ Humidity: 48%

Item	Model	Test Condition
1	GW5048-EM	Full Load

Teseq Profline
4542 Luterbach, Switzerland

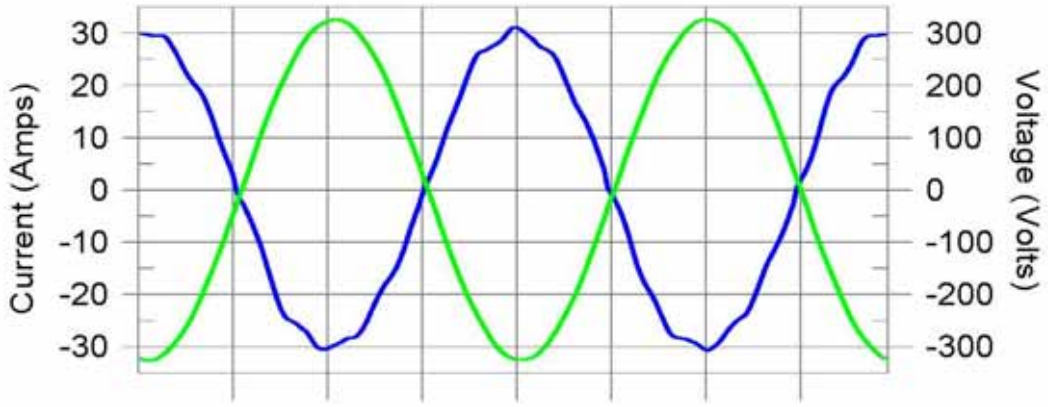
3/21/2017
5:49 PM

Harmonics – Per EN/IEC61000-3-12, Ed. 2.0(Run time)

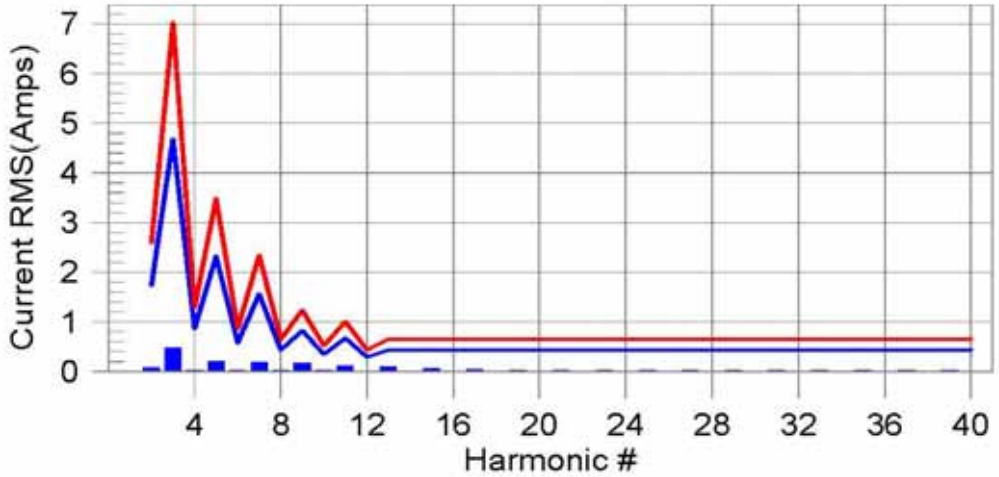
EUT: PV Inverter **Tested by: Puck**
Test category: Table:2, Rsce=33, **Test Margin: 100**
Test date: 2017/3/6 **Start time: 15:45:07** **End time: 15:50:20**
Test duration (min): 5 **Data file name: WIN2106_H-000013.cts_data**
Comment: M/N:GW5048-EM Test Mode:Full Load
Customer: JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD.

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class 2 limit line **European Limits**



Test result: Pass Worst harmonics H13-14.8% of 150% limit, H13-20% of 100% limit.

Teseq AG Win2106 V2.14.0

Page 1 of 4

Teseq Profline
4542 Luterbach, Switzerland

3/21/2017
5:49 PM

Current Test Result Summary (Run time)

EUT: PV Inverter **Tested by: Puck**
Test category: Table:2, Rsce=33, **Test Margin: 100**
Test date: 2017/3/6 **Start time: 15:45:07** **End time: 15:50:20**
Test duration (min): 5 **Data file name: WIN2106_H-000013.cts_data**
Comment: M/N:GW5048-EM Test Mode:Full Load
Customer: JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD.

Test Result: Pass **Measured Iref: 21.677(Amps)** **Source: Normal**
THC/Iref (%): 2.2 **Limit (%): 23.0** **PWHC/Iref (%): 0.0** **PWHC Limit (%): 23.0**

Highest parameter values during test:

V_RMS (Volts):	230.24	Frequency (Hz):	50.00
I_Peak (Amps):	31.263	I_RMS (Amps):	21.700
I_Fund (Amps):	21.661(avg)	Crest Factor:	1.442
Power (Watts):	-4981	Power Factor:	-0.996

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.080	1.734	4.6	0.094	2.601	3.6	Pass
3	0.474	4.682	10.1	0.494	7.023	7.0	Pass
4	0.013	0.867	1.5	0.022	1.301	1.7	Pass
5	0.209	2.319	9.0	0.215	3.479	6.2	Pass
6	0.026	0.578	4.5	0.033	0.867	3.8	Pass
7	0.177	1.561	11.3	0.182	2.341	7.8	Pass
8	0.013	0.434	3.0	0.019	0.650	3.0	Pass
9	0.159	0.824	19.3	0.166	1.236	13.5	Pass
10	0.024	0.347	7.0	0.032	0.520	6.1	Pass
11	0.119	0.672	17.6	0.124	1.008	12.3	Pass
12	0.012	0.289	4.2	0.016	0.434	3.7	Pass
13	0.087	0.434	20.0	0.096	0.650	14.8	Pass
14	0.008	N/A	N/A	0.011	N/A	N/A	N/A
15	0.052	N/A	N/A	0.055	N/A	N/A	N/A
16	0.008	N/A	N/A	0.013	N/A	N/A	N/A
17	0.043	N/A	N/A	0.047	N/A	N/A	N/A
18	0.009	N/A	N/A	0.011	N/A	N/A	N/A
19	0.031	N/A	N/A	0.034	N/A	N/A	N/A
20	0.010	N/A	N/A	0.012	N/A	N/A	N/A
21	0.030	N/A	N/A	0.032	N/A	N/A	N/A
22	0.007	N/A	N/A	0.010	N/A	N/A	N/A
23	0.027	N/A	N/A	0.030	N/A	N/A	N/A
24	0.009	N/A	N/A	0.010	N/A	N/A	N/A
25	0.024	N/A	N/A	0.026	N/A	N/A	N/A
26	0.006	N/A	N/A	0.010	N/A	N/A	N/A
27	0.023	N/A	N/A	0.025	N/A	N/A	N/A
28	0.010	N/A	N/A	0.011	N/A	N/A	N/A
29	0.023	N/A	N/A	0.024	N/A	N/A	N/A
30	0.008	N/A	N/A	0.010	N/A	N/A	N/A
31	0.021	N/A	N/A	0.023	N/A	N/A	N/A
32	0.007	N/A	N/A	0.009	N/A	N/A	N/A
33	0.017	N/A	N/A	0.018	N/A	N/A	N/A
34	0.007	N/A	N/A	0.010	N/A	N/A	N/A
35	0.017	N/A	N/A	0.018	N/A	N/A	N/A
36	0.007	N/A	N/A	0.009	N/A	N/A	N/A
37	0.015	N/A	N/A	0.016	N/A	N/A	N/A
38	0.007	N/A	N/A	0.010	N/A	N/A	N/A
39	0.014	N/A	N/A	0.015	N/A	N/A	N/A
40	0.007	N/A	N/A	0.010	N/A	N/A	N/A

Note: Rated I-ref was applied for this test. I-ref was 0.000 Amps.

Teseq Profline
4542 Luterbach, Switzerland

3/21/2017
5:49 PM

Voltage Source Verification Data (Run time)

EUT: PV Inverter **Tested by: Puck**
Test category: Table:2, Rsce=33, **Test Margin: 100**
Test date: 2017/3/6 **Start time: 15:45:07** **End time: 15:50:20**
Test duration (min): 5 **Data file name: WIN2106_H-000013.cts_data**
Comment: M/N:GW5048-EM Test Mode:Full Load
Customer: JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD.

Test Result: Pass **Source qualification: Normal**
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed. 2.0 & IEC/EN61000-4-7 Ed. 2.1

Highest parameter values during test:

Voltage (Vrms):	230.24	Frequency (Hz):	50.00
I_Peak (Amps):	31.263	I_RMS (Amps):	21.700
I_Fund (Amps):	21.661(avg)	Crest Factor:	1.442
Power (Watts):	-4981	Power Factor:	-0.996

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.106	0.921	11.48	OK
3	0.129	2.877	4.48	OK
4	0.030	0.921	3.21	OK
5	0.092	3.453	2.68	OK
6	0.017	0.921	1.81	OK
7	0.176	2.878	6.12	OK
8	0.023	0.921	2.54	OK
9	0.208	1.381	15.03	OK
10	0.027	0.921	2.97	OK
11	0.202	1.611	12.51	OK
12	0.023	0.691	3.35	OK
13	0.178	1.381	12.92	OK
14	0.020	0.691	2.92	OK
15	0.141	0.691	20.45	OK
16	0.017	0.691	2.42	OK
17	0.122	0.691	17.61	OK
18	0.022	0.691	3.20	OK
19	0.106	0.691	15.34	OK
20	0.026	0.691	3.73	OK
21	0.087	0.691	12.64	OK
22	0.034	0.691	4.90	OK
23	0.084	0.691	12.22	OK
24	0.038	0.691	5.53	OK
25	0.061	0.691	8.77	OK
26	0.033	0.691	4.73	OK
27	0.047	0.691	6.81	OK
28	0.042	0.691	6.01	OK
29	0.036	0.691	5.26	OK
30	0.040	0.691	5.79	OK
31	0.022	0.691	3.18	OK
32	0.029	0.691	4.20	OK
33	0.015	0.691	2.14	OK
34	0.017	0.691	2.45	OK
35	0.019	0.691	2.72	OK
36	0.018	0.691	2.64	OK
37	0.040	0.691	5.75	OK
38	0.032	0.691	4.69	OK
39	0.052	0.691	7.58	OK
	0.042	0.691	6.15	OK

Teseq Profline
4542 Luterbach, Switzerland

3/21/2017
5:49 PM

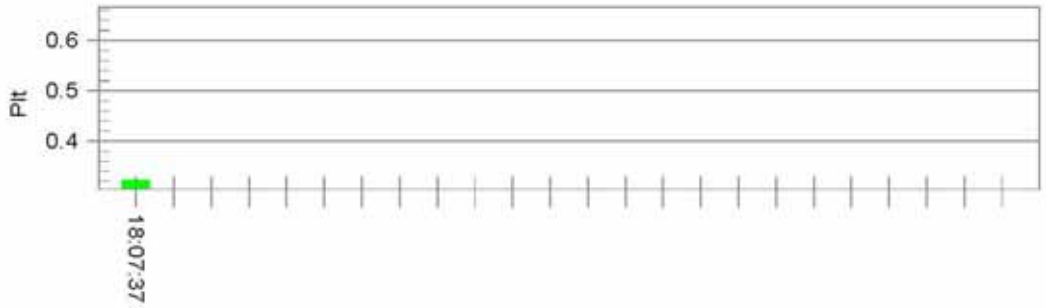
Flicker Test Summary Per EN/IEC61000-3-11, Ed. 1.0(Run time) per EN/IEC61000-3-11IEC61000-3-11 Ed. 1.0 (2000)

EUT: PV Inverter **Tested by: Puck**
Test category: All parameters **Test Margin: 100**
Test date: 2017/3/6 **Start time: 16:07:17** **End time: 18:08:50**
Test duration (min): 120 **Data file name: WIN2106_F-000015.cts_data**
Comment: M/N:GW5048-EM Test Mode:Full Load
Customer: JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD.
Z-test = (0.400 + j 0.250 Ohm)

Test Result: Pass
Status: Test Completed

Pst and limit line

Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 229.60

T-max (mS):	**0.0**	**Test limit (mS):**	**500.0**	**Pass**

Teseq AG Win2106 V2.14.0

Page 1 of 2

Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.34**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.328**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.321**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.321
Calculated dc(%): 0.000
Calculated Pst : 0.328
Calculated Plt : 0.322

The maximum permissible system impedance Zsys:

Z = 1.150 Ohm + j 0.719 Ohm (1.150 Ohm + 2287 ?H)

Teseq Profline
4542 Luterbach, Switzerland

3/21/2017
5:50 PM

Flicker Test Summary Per EN/IEC61000-3-11, Ed. 1.0(Run time) per EN/IEC61000-3-11IEC61000-3-11 Ed. 1.0 (2000)

EUT: PV Inverter **Tested by: Puck**
Test category: dt, dmax, dc and Pst **Test Margin: 100**
Test date: 2017/3/6 **Start time: 15:53:47** **End time: 16:04:15**
Test duration (min): 10 **Data file name: WIN2106_F-000014.cts_data**
Comment: M/N:GW5048-EM Test Mode:Full Load
Customer: JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD.
Z-test = (0.400 + j 0.250 Ohm)

Test Result: Pass
Status: Test Completed

Pst and limit line

Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt): 230.37

T-max (mS):	**0.0**	**Test limit (mS):**	**500.0**	**Pass**

Teseq AG Win2106 V2.14.0

Page 1 of 2

Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.33**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.320**	**Test limit:**	**1.000**	**Pass**

Calculated dmax(%): 0.000
Calculated dc(%): 0.000
Calculated Pst : 0.320

The maximum permissible system impedance Zsys:

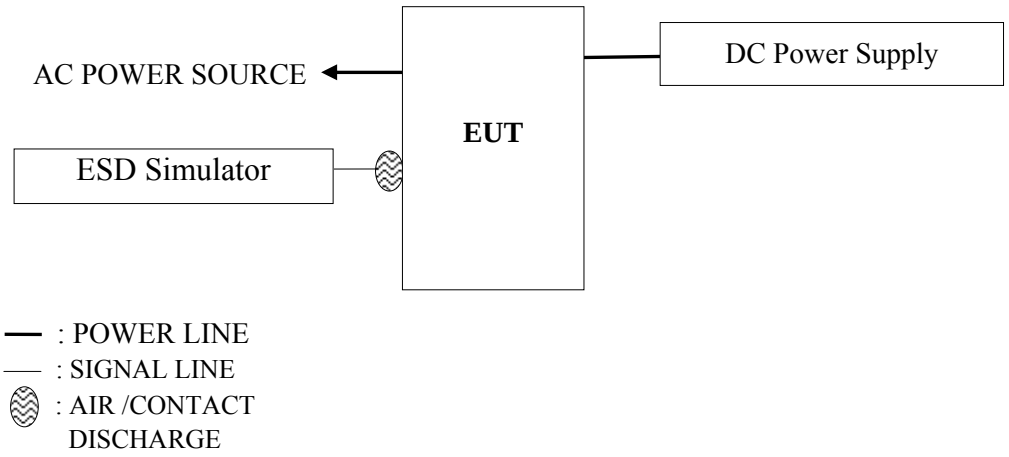
Z = 2.208 Ohm + j 1.380 Ohm (2.208 Ohm + 4393 ?H)

6 ELECTROSTATIC DISCHARGE IMMUNITY TEST

6.1 Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	ESD SIMULATOR	NoiseKen	ESS-2000	ESS07X7519	2016-07-03	2017-07-02

6.2 Block Diagram of Test Setup



6.3 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-2:2008】

6.4 Severity Levels and Performance Criterion

6.4.1 Severity level

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X	Special	Special

Test Level **:** Contact Discharge: ±4kV, Air Discharge: ±8kV

6.4.2 Performance criterion：B

6.5 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1 (IEC 61000-4-2:2008) and laboratory internal procedure TKC-301-015.

6.5.1 Air Discharge：

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible until contact the EUT. After each discharge, the ESD generator discharge electrode shall be removed from the EUT. The generator is then ret rigged for a new single discharge and repeated 10 discharges each at positive and negative polarity for each reselected test point. This procedure shall be repeated until all the air discharge completed.

6.5.2 Contact Discharge：

All the procedure shall be same as 6.5.1. Except that the tip of the discharge electrode shall touch the EUT conductive surfaces & repeated 10 discharges each at positive and negative polarity for each test point before the discharge switch is operated.

6.5.3 Indirect discharge for horizontal coupling plane：

At least 10 discharges each at positive and negative polarity shall be applied to the horizontal coupling plane, at points on each side of the EUT. The ESD generator positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

6.5.4 Indirect discharge for vertical coupling plane：

At least 10 discharges each at positive and negative polarity shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m×0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

6.5.5 For above tests, the voltage was increased from the minimum to the selected test level.

6.6 Test Results

PASSED. (Complied with Criterion A)

EUT was tested with the following test mode and all the test results are listed in next page.

Note: Because the power of the EUT is out of the range of the test equipment, so we choose 10% load to test for EMS items.

Electrostatic Discharge Immunity Test Results

Applicant	Jiangsu Goodwe Power Supply Technology Co.,LTD	Date of Test	2017.03.07				
EUT	PV Inverter	Power Rating	AC: 230V ;50Hz				
Model No.	GW5048-EM	Temp.	17.8℃	Humidity	42%	Pressure	101KPa
Test Mode	10% Load						
Working Condition	Operating	Results	**PASS**				

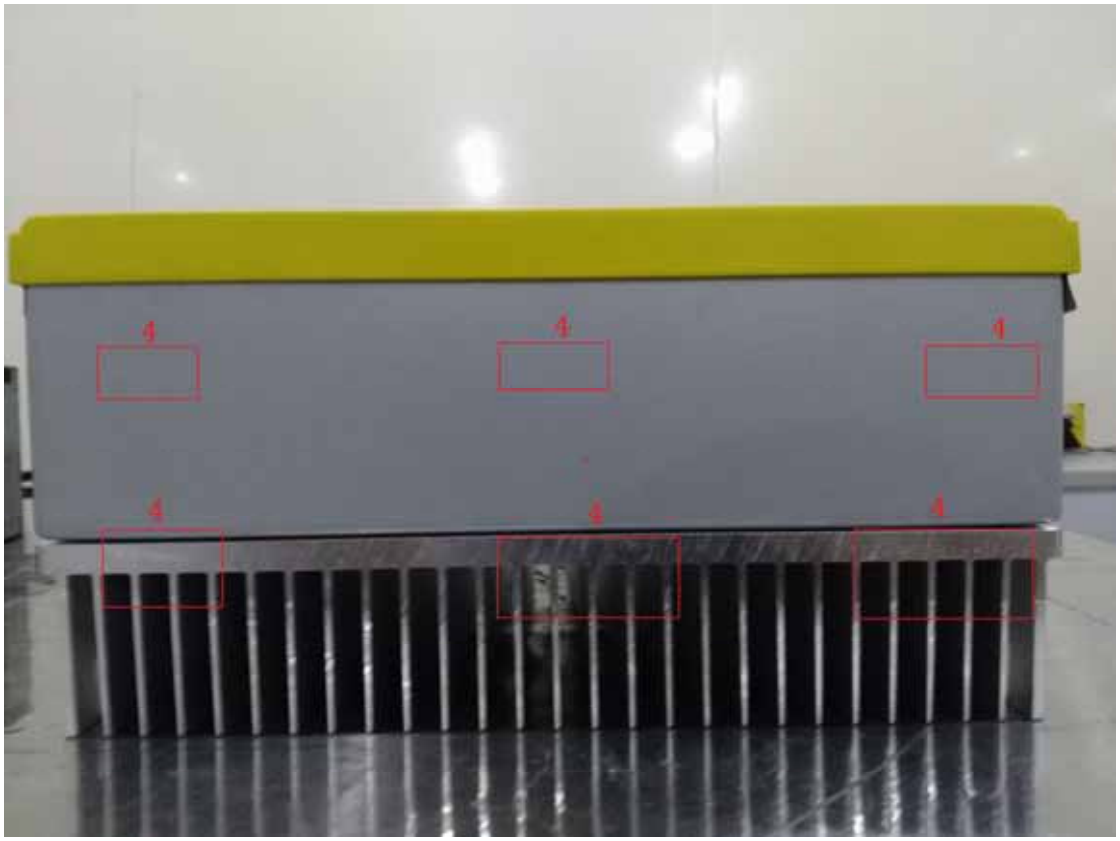
Item	Amount of Discharges	Discharge Voltage	Performance Criterion
Contact Discharge	2150	+2kV,+4kV -2kV,-4kV	A
Air Discharge	400	+2kV,+4kV,+8kV -2kV,-4kV, -8kV	A
Indirect Discharge (HCP)	50	+2kV,+4kV -2kV,-4kV	A
Indirect Discharge (VCP Front)	50	+2kV,+4kV -2kV,-4kV	A
Indirect Discharge (VCP Left)	50	+2kV,+4kV -2kV,-4kV	A
Indirect Discharge (VCP Back)	50	+2kV,+4kV -2kV,-4kV	A
Indirect Discharge (VCP Right)	50	+2kV,+4kV -2kV,-4kV	A

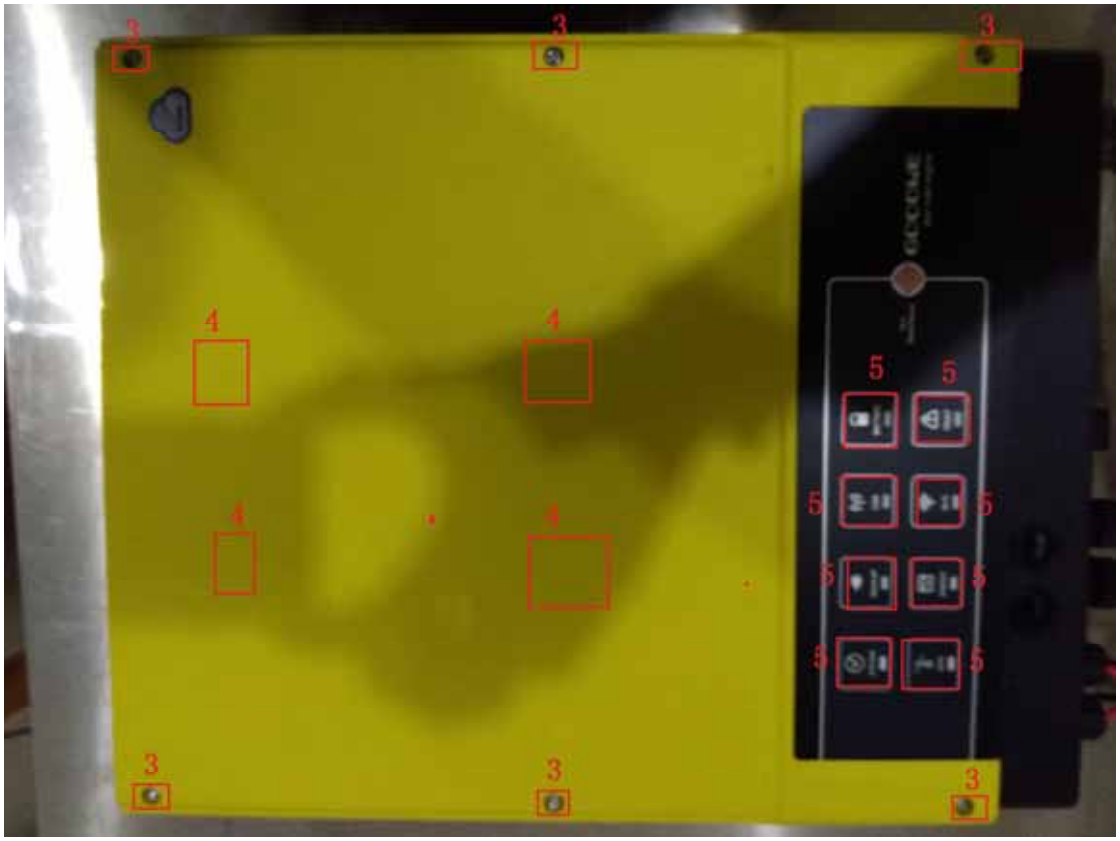
Measurement Points						
	1.	Rotary knob	Air Discharge	2.	ON-GRID	Air Discharge
	3.	Screw X19	Contact Discharge	4.	Cover X23	Contact Discharge
	5.	Button X8	Air Discharge	6.	PV1 X2	Air Discharge
	7.	PV2 X2	Air Discharge	8.	BATTERY X2	Air Discharge
	9.	BMS	Air Discharge	10.	METER	Contact Discharge
	11.	DRED	Air Discharge	12.	RS485	Air Discharge
	13.	BACK UP	Air Discharge			

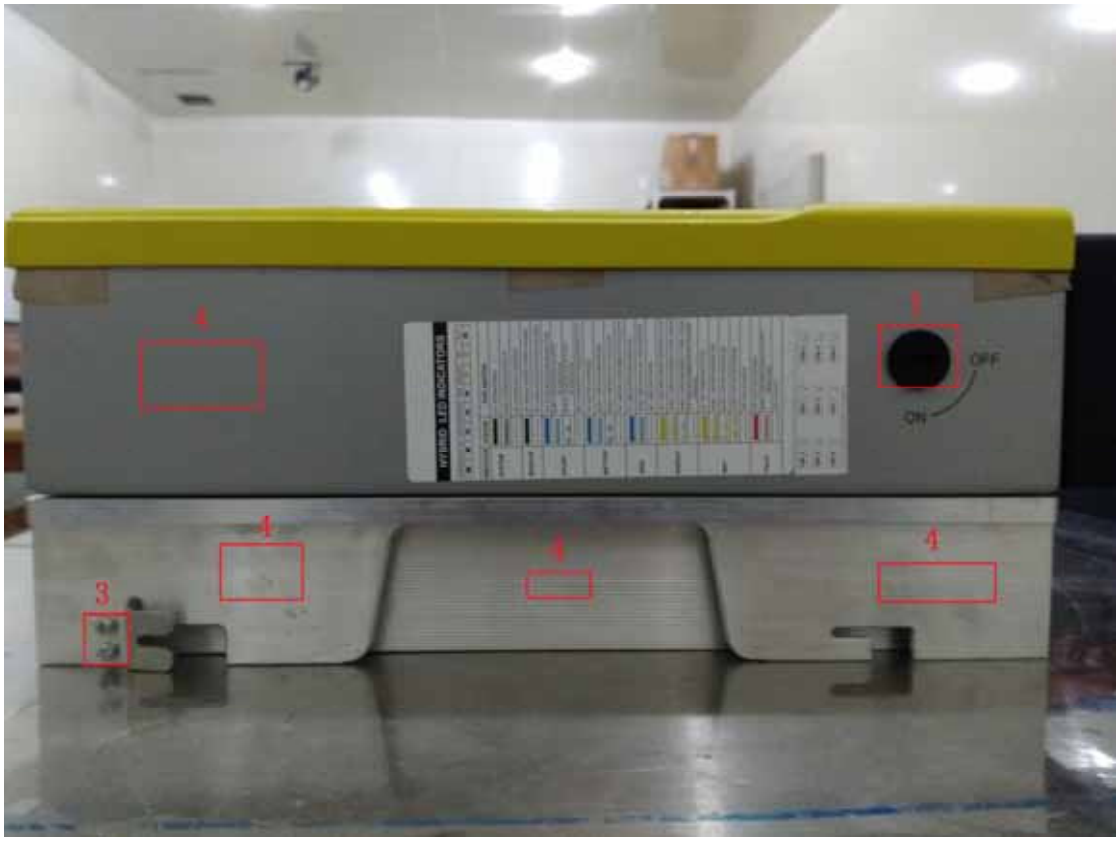
Note:

Engineer : Puck

Photos of Discharge Points:




3
3
3
4
4
4
4
5
5
5
5
5
5
3
3
3


4
1
OFF
ON
4
4
4
3


6
7
PV2
8
BATTERY
3
3
3
3
3
3
3
3
9
10
11
12
BACK-UP
ON-GRID
13
2
3
4
4
4

7 RF FIELD STRENGTH IMMUNITY TEST

7.1 Test Equipment

Frequency Range: 80-1000MHz

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Signal Generator	Agilent	8648C	3847M01438	2017-01-04	2018-01-03
2.	Power Sensor	Agilent	8481D	MY41093045	2017-01-04	2018-01-03
3.	Power Amplifier	AR	KAW 2180	10088-2	NCR	NCR
4.	Dual Channel EPM Series Power Meter	Agilent	E4419B	MY45100928	2017-01-04	2018-01-03
5.	Log-Periodic Antenna	AR	AT1080	0323131	NCR	NCR
6.	Direction Coupler	AR	DC6180A	322333	2016-07-03	2017-07-02
7.	Test Software	Audix/i2(4.110314)				

NCR: Non-Calibration Requirement

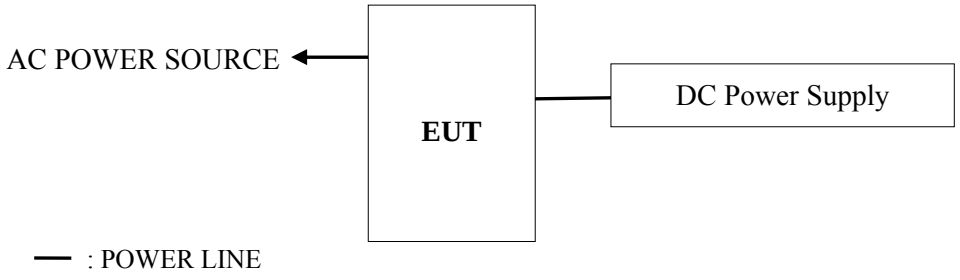
Frequency Range: 1.4-2.7GHz

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Signal Generator	Agilent	8648C	3847M01438	2017-01-04	2018-01-03
2.	LINEAR POWER AMPLIFIER	MILMEGA	AS0104-200-200	1016528	NCR	NCR
3.	Power Sensor	Agilent	8481D	MY41093045	2017-01-04	2018-01-03
4.	Dual Channel EPM Series Power Meter	Agilent	E4419B	MY45100928	2017-01-04	2018-01-03
5.	Horn Antenna	AR	AT4002A	322311	NCR	NCR
6.	Direction Coupler	AR	DC7144A	322193	2016-07-03	2017-07-02
7.	Test Software	Audix/i2(4.110314)				

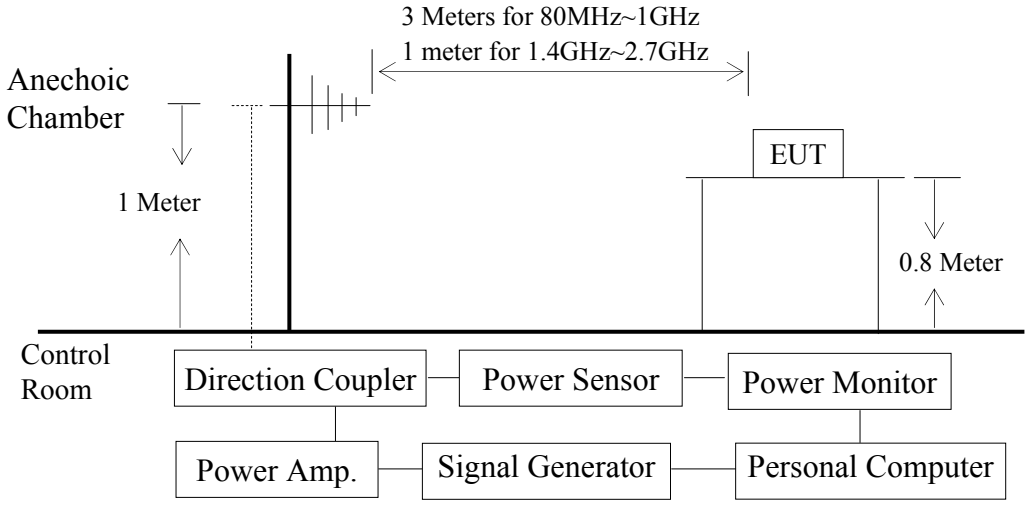
NCR: Non-Calibration Requirement

7.2 Block Diagram of Test Setup

7.2.1 Block Diagram of connection between EUT and simulators.



7.2.2 R/S Test Setup



7.3 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-3:2006+A2:2010】

7.4 Severity Levels and Performance Criterion

7.4.1 Severity level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

Test Level：3; Field strength: 10/3/1 V/m

7.4.2 Performance criterion：**A**

7.5 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1 (IEC 61000-4-3:2006+A2:2010) and laboratory internal procedure TKC-301-016.

The field sensor is placed on the EUT table (0.8 meter above the ground) which is 3 meters for frequency range 80MHz-1GHz and 1meter for frequency range 1GHz-2.7GHz away from the transmitting antenna. Through the signal generator, power amplifier and transmitting antenna to produce a uniformity field strength (10/3/1V/m measured by field sensor) around the EUT table from frequency range 80MHz-1000MHz,1GHz-2.7GHz and records the signal generator‘s output level at the same time for whole measured frequency range. Then, put EUT and its simulators on the EUT turn table and keep them 3 meters away from the transmitting antenna which is mounted on an antenna tower and fixes at 1 meter height above the ground. Using the recorded signal generator’s output level to measure the EUT from frequency range 80MHz-1000MHz, 1GHz-2.7GHz and both horizontal & vertical polarization of antenna must be set and measured. Each of the four sides of EUT must be faced this transmitting antenna and measures individually.

In this report, chose the most sensible side to measure that is right side to face transmitting antenna.

A CCD camera was put inside the chamber and through its display to monitor the EUT operational situation to judge the EUT performance criterion during measurement.

All the scanning conditions are as follows：

Condition of Test	Remarks
1. Fielded Strength	10/3/1 V/m
2. Amplitude Modulated	1kHz, 80%AM
3. Scanning Frequency	80 – 2700MHz
4. Step Size	1% increments
5. The Rate of Sweep	0.0015 decade/s
6. Dwell Time	3 sec.

7.6 Test Results

PASSED. (Complied with Criterion A)

EUT was tested with the following test mode and all the test results are listed in next page.

RF Field Strength Immunity Test Results

Applicant	JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD	Date of Test	2017.03.06		
EUT	PV Inverter	Power Rating	AC:230V;50Hz		
Model No.	GW5048-EM	Temp.	19.9℃	Humidity	61%
Test Mode	10% Load				
Working Condition	Operating	Results	**PASS**		

Frequency Range (MHz)	E.U.T. Position (Angle)	Ant. Polarity (Hor. or Ver.)	Field Strength (V/m)	Performance Criterion	Remark
80~1000	0	H	3	A	
80~1000	90	H	3	A	
80~1000	180	H	3	A	
80~1000	270	H	3	A	
80~1000	0	V	3	A	
80~1000	90	V	3	A	
80~1000	180	V	3	A	
80~1000	270	V	3	A	

Note :
EN61000-6-1
Modulation Condition: 80% AM(1KHz)

Engineer : Puck

RF Field Strength Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.06*		
EUT	*PV Inverter*	*Power Rating*	*AC:230V;50Hz*		
Model No.	*GW5048-EM*	*Temp.*	*19.9℃*	*Humidity*	*61 %*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	***PASS***	

Frequency Range (MHz)	*E.U.T. Position (Angle)*	*Ant. Polarity (Hor. or Ver.)*	*Field Strength (V/m)*	*Performance Criterion*	*Remark*
1400-2000	*0*	*H*	*3*	*A*	
1400-2000	*90*	*H*	*3*	*A*	
1400-2000	*180*	*H*	*3*	*A*	
1400-2000	*270*	*H*	*3*	*A*	
1400-2000	*0*	*V*	*3*	*A*	
1400-2000	*90*	*V*	*3*	*A*	
1400-2000	*180*	*V*	*3*	*A*	
1400-2000	*270*	*V*	*3*	*A*	

Note :
EN61000-6-1
Modulation Condition: 80% AM(1KHz)

Engineer :Puck

RF Field Strength Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.06*		
EUT	*PV Inverter*	*Power Rating*	*AC:230V;50Hz*		
Model No.	*GW5048-EM*	*Temp.*	*19.9℃*	*Humidity*	*61 %*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	***PASS***	

Frequency Range (MHz)	*E.U.T. Position (Angle)*	*Ant. Polarity (Hor. or Ver.)*	*Field Strength (V/m)*	*Performance Criterion*	*Remark*
2000-2700	*0*	*H*	*1*	*A*	
2000-2700	*90*	*H*	*1*	*A*	
2000-2700	*180*	*H*	*1*	*A*	
2000-2700	*270*	*H*	*1*	*A*	
2000-2700	*0*	*V*	*1*	*A*	
2000-2700	*90*	*V*	*1*	*A*	
2000-2700	*180*	*V*	*1*	*A*	
2000-2700	*270*	*V*	*1*	*A*	

Note :
EN61000-6-1
Modulation Condition: 80% AM(1KHz)

Engineer :Puck

RF Field Strength Immunity Test Results

Applicant	JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD	Date of Test	2017.03.06		
EUT	PV Inverter	Power Rating	AC:230V;50Hz		
Model No.	GW5048-EM	Temp.	19.9℃	Humidity	61%
Test Mode	10% Load				
Working Condition	Operating	Results	**PASS**		

Frequency Range (MHz)	E.U.T. Position (Angle)	Ant. Polarity (Hor. or Ver.)	Field Strength (V/m)	Performance Criterion	Remark
80~1000	0	H	10	A	
80~1000	90	H	10	A	
80~1000	180	H	10	A	
80~1000	270	H	10	A	
80~1000	0	V	10	A	
80~1000	90	V	10	A	
80~1000	180	V	10	A	
80~1000	270	V	10	A	

Note :
EN61000-6-2
Modulation Condition: 80% AM(1KHz)

Engineer : Puck

RF Field Strength Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.06*		
EUT	*PV Inverter*	*Power Rating*	*AC:230V;50Hz*		
Model No.	*GW5048-EM*	*Temp.*	*19.9℃*	*Humidity*	*61 %*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	***PASS***	

Frequency Range (MHz)	*E.U.T. Position (Angle)*	*Ant. Polarity (Hor. or Ver.)*	*Field Strength (V/m)*	*Performance Criterion*	*Remark*
1400-2000	*0*	*H*	*3*	*A*	
1400-2000	*90*	*H*	*3*	*A*	
1400-2000	*180*	*H*	*3*	*A*	
1400-2000	*270*	*H*	*3*	*A*	
1400-2000	*0*	*V*	*3*	*A*	
1400-2000	*90*	*V*	*3*	*A*	
1400-2000	*180*	*V*	*3*	*A*	
1400-2000	*270*	*V*	*3*	*A*	

Note :
EN61000-6-2
Modulation Condition: 80% AM(1KHz)

Engineer :Puck

RF Field Strength Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.06*		
EUT	*PV Inverter*	*Power Rating*	*AC:230V;50Hz*		
Model No.	*GW5048-EM*	*Temp.*	*19.9℃*	*Humidity*	*61 %*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	***PASS***	

Frequency Range (MHz)	*E.U.T. Position (Angle)*	*Ant. Polarity (Hor. or Ver.)*	*Field Strength (V/m)*	*Performance Criterion*	*Remark*
2000-2700	*0*	*H*	*1*	*A*	
2000-2700	*90*	*H*	*1*	*A*	
2000-2700	*180*	*H*	*1*	*A*	
2000-2700	*270*	*H*	*1*	*A*	
2000-2700	*0*	*V*	*1*	*A*	
2000-2700	*90*	*V*	*1*	*A*	
2000-2700	*180*	*V*	*1*	*A*	
2000-2700	*270*	*V*	*1*	*A*	

Note :
EN61000-6-2
Modulation Condition: 80% AM(1KHz)

Engineer :Puck

8 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

8.1 Test Equipment

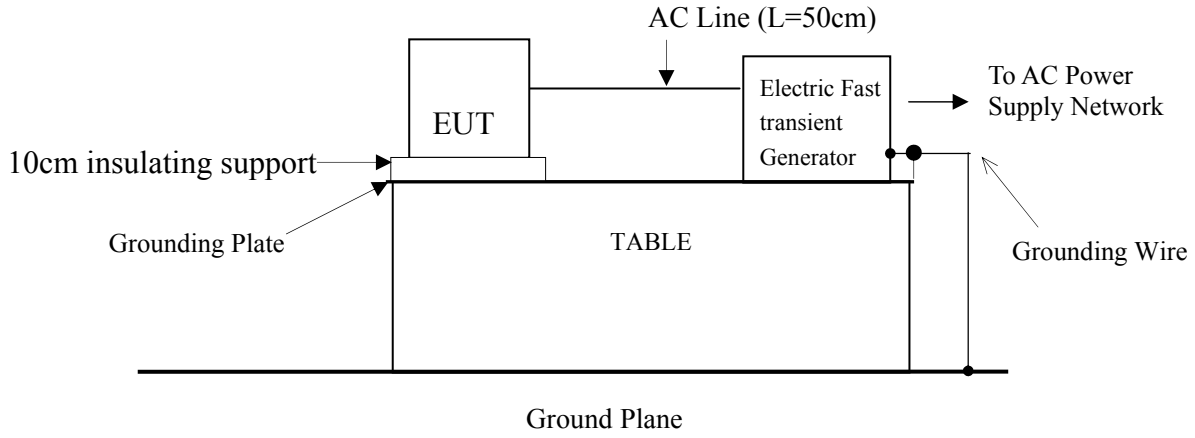
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Electric Fast transient Generator	3C TEST	EFT-4003G	EC0471226	2016-07-03	2017-07-02

8.2 Block Diagram of Test Setup

8.2.1 Block Diagram of connection between EUT and simulators.

Same as section 7.2.1.

8.2.2 EFT Test Setup



Remark: Combination wave generator and decoupling networks are included in test.

8.3 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-4:2012】

8.4 Severity Levels and Performance Criterion

8.4.1 Severity levels

Open circuit output test voltage and repetition rate of the impulses				
Level	On power port, PE		On I/O (input/output) signal, data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1.	0.5	5 or 100	0.25	5 or 100
2.	1	5 or 100	0.5	5 or 100
3.	2	5 or 100	1	5 or 100
4.	4	5 or 100	2	5 or 100
X[a]	Special	Special	Special	Special
Note 1 : Use of 5kHz repetition rates is traditional; however, 100kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types. Note 2 : With some products, there may be no clear distinction between power ports and I/O ports, in which case it is up to product committees to make this determination for test purposes.				
[a] "X" is an open level. The level has to be specified in the dedicated equipment specification.				

Test Level: 3, 5/50 Tr/Th ns, 5KHz

8.4.2 Performance criterion：**B**

8.5 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1.
(IEC 61000-4-4:2012) and laboratory internal procedure TKC-301-017.

The EUT and its simulators shall be placed 0.1m high above the ground reference plane which was a min. 1m*1m metallic sheet with 0.65mm minimum thickness. 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.

8.5.1 For AC Mains port

The EUT was powered by coupling network of the EFT generator. The distance between coupling devices and the EUT shall be (0.5-0/+0.1)m for table-top equipment, and (1.0±0.1)m for floor standing equipment. The cable between the EUT and the coupling device, if detachable, shall be as short as possible to comply with this requirement. If the manufacturer provides a cable exceeding the distance between the coupling device and the point of entry of the EUT, the excess of this cable shall be bundled and situated at a distance of 0.1m above the ground reference plane.

8.5.2 For telecommunication port

This test is for the length of the interconnecting cables is more than 3m.The I/O interface cable of the EUT is connected to its simulator through a capacitive coupling clamp. The capacitive coupling clamp is impressed with burst noise for 1min and indirectly couples burst to I/O interface cable.

8.6 Test Results

PASSED. (Complied with Criterion A)

EUT was tested with the following test mode and all the test results are listed in next page.

Electrical Fast Transient / Burst Immunity Test Results

Applicant	JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.LTD.	Date of Test	2017.03.08		
EUT	PV Inverter	Power Rating	AC: 230 V ; 50 Hz		
Model No.	GW5048-EM	Temp.	20.4 ℃	Humidity	50%
Test Mode	10% Load				
Working Condition	Operating		Results	PASS	

Inject Place: Power Supply Line					Inject Place: I/O Cable				
Inject Line	Voltage (kV)	Inject Time(s)	Inject Method	Performance Criterion	Inject Line	Voltage (kV)	Inject Time(s)	Inject Method	Performance Criterion
L1	+0.5,+1.0,+2.0	60	Direct	A	I/O	+0.25,+0.5	60	Clamp	N/A
L1	-0.5,-1.0,-2.0	60	Direct	A	I/O	-0.25,-0.5	60	Clamp	N/A
L2	+0.5,+1.0,+2.0	60	Direct	A					
L2	-0.5,-1.0,-2.0	60	Direct	A					
PE	+0.5,+1.0,+2.0	60	Direct	A					
PE	-0.5,-1.0,-2.0	60	Direct	A					
L1,L2	+0.5,+1.0,+2.0	60	Direct	A					
L1,L2	-0.5,-1.0,-2.0	60	Direct	A					
L1,PE	+0.5,+1.0,+2.0	60	Direct	A					
L1,PE	-0.5,-1.0,-2.0	60	Direct	A					
L2,PE	+0.5,+1.0,+2.0	60	Direct	A					
L2,PE	-0.5,-1.0,-2.0	60	Direct	A					
L1,L2,PE	+0.5,+1.0,+2.0	60	Direct	A					
L1,L2,PE	-0.5,-1.0,-2.0	60	Direct	A					

Note :

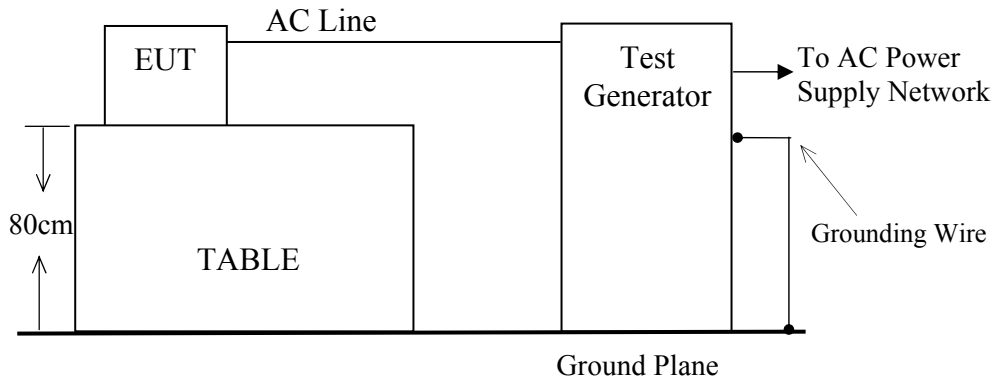
Engineer : Puck

9 SURGE IMMUNITY TEST

9.1 Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Surge Generator	3C TEST	SG-5010G	EC5531208	2016-07-03	2017-07-02

9.1.1 Test Setup



Remark: Test generator includes control center、surge combination and coupler.

9.2 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-5:2014】

9.3 Severity Levels and Performance Criterion

9.3.1 Test Levels

Level	Open-circuit test Voltage +/- 10%, kV
1.	0.5
2.	1.0
3.	2.0
4.	4.0
X	Special

Test Level：line to earth - ± 2kV, line to line - ± 1kV, 1.2/50 (8/20) Tr/Thμs.

9.3.2 Performance Criterion: **B**

9.4 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1 (IEC 61000-4-5:2014) and laboratory internal procedure TKC-301-018.

9.4.1 Set up the EUT and test generator as shown on section 4.2.

9.4.2 For line to line coupling mode, provided a 0.5/1kV 1.2/50 μs voltage surge (at open-circuit condition) and 8/20 μs current surge to EUT selected points.

9.4.3 At least 5 positive and 5 negative (polarity) tests with a Maximum 1/min repetition rate were conducted during test.

9.4.4 Different phase angles were done individually.

9.4.5 Repeat procedure 9.4.2. to 9.4.3. except the open-circuit test voltages 0.5kV/1kV/2kV for line to earth coupling mode test.

9.4.6 Record the EUT Operating situation during compliance test and decide the EUT immunity criterion for above each test.

9.5 Test Results

PASSED. (Complied with Criterion A).

EUT was tested with the following test mode and all the test results are listed in next page.

Surge Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.LTD.*	*Date of Test*	*2017.03.08*		
EUT	*PV Inverter*	*Power Rating*	*AC: 230 V ; 50 Hz*		
Model No.	*GW5048-EM*	*Temp.*	*20.4℃*	*Humidity*	*50%*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	*PASS*	

Input and Output AC Power Port

Location	*Polarity*	*Phase Angle*	*No of Pulse*	*Pulse Voltage*	*Performance Criterion*
L-N	+	*0*	*5*	*0.5kV, 1.0kV*	*A*
	+	*90*	*5*	*0.5kV, 1.0kV*	*A*
	+	*180*	*5*	*0.5kV, 1.0kV*	*A*
	+	*270*	*5*	*0.5kV ,1.0kV*	*A*
	−	*0*	*5*	*0.5kV ,1.0kV*	*A*
	−	*90*	*5*	*0.5kV , 1.0kV*	*A*
	−	*180*	*5*	*0.5kV , 1.0kV*	*A*
	−	*270*	*5*	*0.5kV , 1.0kV*	*A*
L-PE	+	*0*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*90*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*180*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*270*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*0*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*90*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*180*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*270*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
N-PE	+	*0*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*90*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*180*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*270*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*0*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*90*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*180*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*270*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
L, N-PE	+	*0*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*90*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*180*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	+	*270*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*0*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*90*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*180*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*
	−	*270*	*5*	*0.5kV, 1.0kV , 2.0kV*	*A*

Note :	
	Engineer: Puck

10 CONDUCTED DISTURBANCE IMMUNITY TEST

10.1 Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Signal Generator	Agilent	8648C	3847M01438	2017-01-04	2018-01-03
2.	Power Amplifier	AR	KAW 2180	10088-2	NCR	NCR
3.	Attenuator	ShanghaiHuaxiang	DTS150	6092701	2017-01-04	2018-01-03
4.	CDN-M2	FCC	FCC-801-M3-25A	06041	2017-01-04	2018-01-03
5.	CDN-M3	FCC	FCC-801-M3-25A	06042	2017-01-04	2018-01-03
6.	Decoupling Network	FCC	F-203I-23MM-DCN	196	2017-01-04	2018-01-03
7.	EM Injection Clamp	FCC	F-203I-03MM	503	2017-01-04	2018-01-03
8.	Software	Audix/i2(4.110314)				

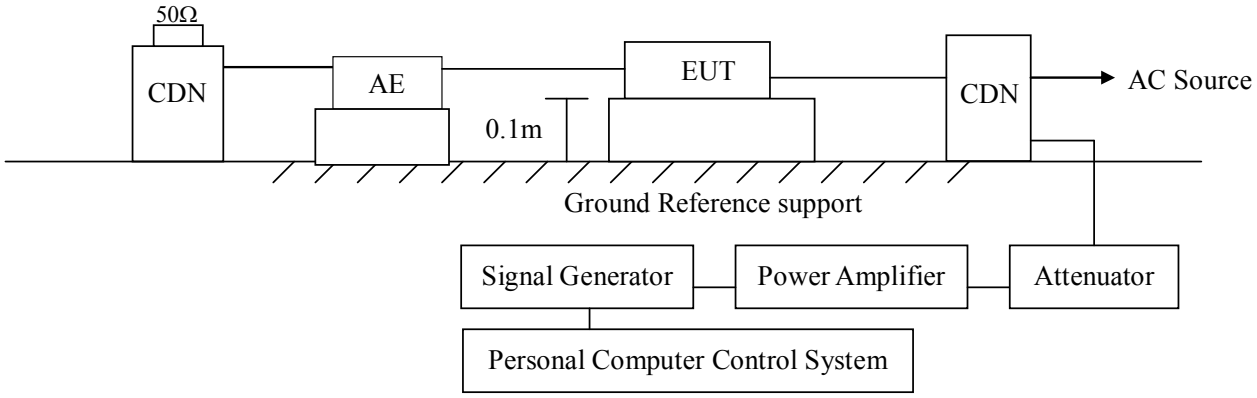
NCR: Non-Calibration Requirement.

10.2 Block Diagram of Test Setup

10.2.1 Block Diagram of connection between EUT and simulators.

Same as Section 7.2.1.

10.2.2 Common Mode Test Setup



10.3 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-6:2013】

10.4 Severity Levels and Performance Criterion

10.4.1 Severity levels

Frequency range 0.15MHz - 80MHz		
Level	Voltage level (e.m.f.)	
	U_0 dB(μV)	U_0 V
1.	120	1
2.	130	3
3.	140	10
X[a]	Special	
[a] X is an open level.		

Test Level：0.15-80MHz, 3~10 V, 80%AM (1kHz)

10.4.2 Performance criterion：**A**

10.5 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1 (IEC 61000-4-6:2013) and laboratory internal procedure TKC-301-019.

For AC Mains port

10.5.1 Set up the EUT, CDN and test generators as shown on section 10.2.2.

10.5.2 The EUT and supporting equipment were placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) was placed on the ground plane making contact with it at about 0.1-0.3m from EUT. Cables between CDN and EUT were as short as possible.

10.5.3 The disturbance signal described below was injected to EUT through CDN.

10.5.4 The EUT operates within its operational mode(s) under intended climatic conditions after power on.

10.5.5 The frequency range was swept from 150 kHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave.

10.5.6 The rate of sweep shall not exceed 1.5*10^3decades/s. Where the frequency was swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

10.5.7 Recording the EUT Operating situation during compliance testing and decide the EUT immunity criterion.

For Telecommunication Port

10.5.8 Set up the EUT, EM Injection Clamp and test generators as shown on section 10.2.3.

10.5.9 The EUT and supporting equipment were placed on an insulating support 0.1m high above a ground reference plane. EM Injection Clamp (coupling and decoupling device) was placed on the ground plane making contact with it at about 0.1-0.3m from EUT. Cables between CDN and EUT were as short as possible.

10.5.10 The CDN was placed on between AE and EUT, the EUT and AE of power through CDN, CDN terminated with 50Ω at the RF disturbance input port.

10.5.11 The disturbance signal described below was injected to EUT though EM Injection Clamp.

10.5.12 Repeat above procedure from 10.5.9 to 10.5.11.

10.6 Test Results

PASSED. (Complied with Criterion A)

EUT was tested with the following test mode and all the test results are listed in next page.

Inject Currents Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.06*		
EUT	*PV Inverter*	*Power Rating*	*AC:230V;50Hz*		
Model No.	*GW5048-EM*	*Temp.*	*19.9℃*	*Humidity*	*61 %*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	***PASS***	

Frequency Range (MHz)	*Inject Position*	*Strength*	*Performance Criterion*	*Remark*
0.15MHz~80MHz	*Main*	*3V*	*A*	*Power*
0.15MHz~230MHz	*N/A*	*3V*	*N/A*	
0.15MHz~80MHz	*I/O*	*3V*	*N/A*	
0.15MHz~230MHz	*I/O*	*3V*	*N/A*	

Note :
EN61000-6-1
Modulation Condition: 80% AM(1KHz)

Engineer : Puck

Inject Currents Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.06*		
EUT	*PV Inverter*	*Power Rating*	*AC:230V;50Hz*		
Model No.	*GW5048-EM*	*Temp.*	*19.9℃*	*Humidity*	*61%*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	***PASS***	

Frequency Range (MHz)	*Inject Position*	*Strength*	*Performance Criterion*	*Remark*
0.15MHz~80MHz	*Main*	*10V*	*A*	*Power*
0.15MHz~230MHz	*N/A*	*10V*	*N/A*	
0.15MHz~80MHz	*I/O*	*10V*	*N/A*	
0.15MHz~230MHz	*I/O*	*10V*	*N/A*	

Note :
EN61000-6-2
Modulation Condition: 80% AM(1KHz)

Engineer : Puck

11 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

11.1 Test Equipment

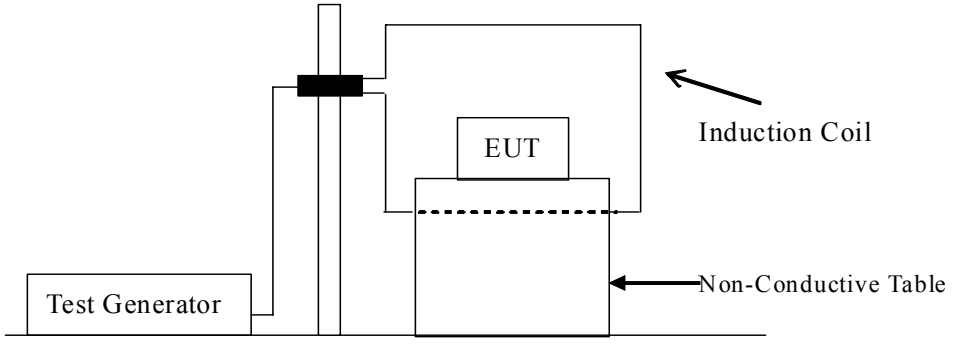
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	PFM	3C TEST	PFMF-6108G	EC0881205	2016-07-03	2017-07-02

11.2 Block Diagram of Test Setup

11.2.1 Block Diagram of connection between EUT and simulators.

Same as section 7.2.1.

11.2.2 Test Setup



11.3 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-8:2009】

11.4 Severity Levels and Performance Criterion

11.4.1 Severity level

Level	Magnetic Field Strength Continuous Field A/m
1.	1
2.	3
3.	10
4.	30
5.	100
X	Special

Test Level: 50/60Hz, 3/30A/m

11.4.2 Performance criterion：A

11.5 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1 (IEC 61000-4-8:2009) and laboratory internal procedure TKC-301-020.

The EUT was placed on 1m high table that above the ground reference plane which is the min. size 1m x 1m and 0.65mm thickness metallic. And subjected to the test magnetic field by using the induction coil of standard dimensions (1m x 1m). The induction coil rotated by 90 degrees in order to expose the EUT to the test field with different orientations. All cables of EUT exposed to magnetic field for 1m of their length.

11.6 Test Results

PASSED. (Complied with Criterion A)

EUT was tested with the following test mode and all the test results are listed in next page.

Power Frequency Magnetic Field Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.08*		
EUT	*PV Inverter*	*Power Rating*	*AC: 380 V ; 50 Hz*		
Model No.	*GW5048-EM*	*Temp.*	*20.4℃*	*Humidity*	*50%*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	*PASS*	

Power Frequency Magnetic Field	*Testing Duration*	*Coil Orientation*	*Performance Criterion*	*Remark*
50Hz,30A/m	*1 Min*	*X-axis*	*A*	
50Hz,30A/m	*1 Min*	*Y-axis*	*A*	
50Hz,30A/m	*1 Min*	*Z-axis*	*A*	

Note : *EN 61000-6-1*	
	Engineer : Puck

Power Frequency Magnetic Field Immunity Test Results

Applicant	*JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD*	*Date of Test*	*2017.03.08*		
EUT	*PV Inverter*	*Power Rating*	*AC: 380 V ; 50 Hz*		
Model No.	*GW5048-EM*	*Temp.*	*20.4℃*	*Humidity*	*50%*
Test Mode	*10% Load*				
Working Condition	*Operating*		*Results*	*PASS*	

Power Frequency Magnetic Field	*Testing Duration*	*Coil Orientation*	*Performance Criterion*	*Remark*
50Hz,3A/m	*1 S*	*X-axis*	*A*	
50Hz,3A/m	*1 S*	*Y-axis*	*A*	
50Hz,3A/m	*1 S*	*Z-axis*	*A*	

Note : *EN 61000-6-2*	
	Engineer : Puck

12 VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY TEST

12.1 Test Equipment

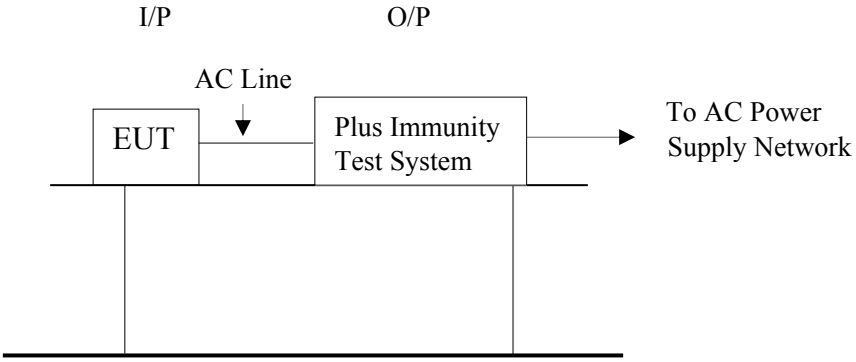
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	AC power source	TESEQ	NSG1007-45-3PI	1236A00705	2015-09-17	2017-09-16
2.	Test System Model	TESEQ AG	NSG2200-3	EK22712	2015-09-17	2017-09-16

12.2 Block Diagram of Test Setup

12.2.1 Block Diagram of connection between EUT and simulators.

Same as section 7.2.1.

12.2.2 Test Setup



12.3 Test Standard

EN 61000-6-2& EN 61000-6-1【IEC 61000-4-11:2004】

12.4 Severity Levels and Performance Criterion

12.4.1 Preferred severity levels and durations for voltage dips

Class[a]	**Test level and durations for voltage dips (t_s) (50Hz/60Hz)**				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0% during ½ cycle	0% during 1 cycle	70% during 25/30[c] cycles		
Class 3	0% during ½ cycle	0% during 1 cycle	40% during 10/12[c] cycles	70% during 25/30[c] cycles	80% during 250/300[c] cycles
Class X[b]	X	X	X	X	X

[a] Classes as per IEC 61000-2-4.
[b] To be defined by product committee. For equipment connected directly or indirectly to the public network, the levels must not be less severe than Class 2.
[c] "25/30 cycles" means "25 cycles for 50Hz test" and "30 cycles for 60Hz test".

12.4.2 Preferred severity levels and durations for short interruptions

Class[a]	**Test level and durations for short interruptions (t_s) (50Hz/60Hz)**
Class 1	Case-by-case according to the equipment requirements
Class 2	0% during 250/300[c] cycles
Class 3	80% during 250/300[c] cycles
Class X[b]	X

[a] Classes as per IEC 61000-2-4.
[b] To be defined by product committee. For equipment connected directly or indirectly to the public network, the levels must not be less severe than Class 2.
[c] "250/300 cycles" means "250 cycles for 50Hz test" and "300 cycles for 60Hz test".

Severity Level：

EN 61000-6-2& EN 61000-6-1 Voltage dips: Voltage interruptions 100% reduction: 250 period; Dips 30% reduction: 25 period; 60% reduction: 10 period; 100% reduction: 1.0period

12.4.3 Performance criterion：

1) Voltage dips 100% reduction performance criterion **B.**
2) Voltage dips 60% reduction performance criterion **C.**
3) Voltage dips 30% reduction performance criterion **C.**
4) Voltage interruption 100% reduction performance criterion **C.**

12.5 Test Procedure

The measuring process is according to EN 61000-6-2& EN 61000-6-1 (IEC 61000-4-11:2004) and laboratory internal procedure TKC-301-021.

12.5.1 Set up the EUT and test generator as shown on section 12.2.

12.5.2 The interruption was introduced at selected phase angles with specified duration. There was a 10s minimum interval between each test event.

12.5.3 After each test a full functional check was performed before the next test.

12.5.4 Repeat procedures 12.5.2. & 12.5.3. for voltage dips, only the test level and duration was changed.

12.5.5 Record any degradation of performance.

12.6 Test Results

PASSED.

(Voltage interruptions complied with criterion B, Voltage dips Complied with criterion A)

EUT was tested with the following test mode and all the test results are listed in next page.

Voltage Dips and Interruptions Immunity Test Results

Applicant	JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD	Date of Test	2017.03.06		
EUT	PV Inverter	Power Rating	AC: 230 V ; 50 Hz		
Model No.	GW5048-EM	Temp.	19.5℃	Humidity	43 %
Test Mode	10% Load				
Working Condition	Operating		Results	PASS	

Type of Test	Test Voltage	Phase Angle	% Reduction	Period	Performance Criterion
Voltage Interruption	230	0	100%	250	B
		45	100%	250	B
		90	100%	250	B
		135	100%	250	B
		180	100%	250	B
		225	100%	250	B
		270	100%	250	B
		315	100%	250	B
Voltage Dips	230	0	30%	25	B
		45	30%	25	B
		90	30%	25	B
		135	30%	25	B
		180	30%	25	B
		225	30%	25	B
		270	30%	25	B
		315	30%	25	B
	230	0	100%	0.5	B
		45	100%	0.5	B
		90	100%	0.5	B
		135	100%	0.5	B
		180	100%	0.5	B
		225	100%	0.5	B
		270	100%	0.5	B
		315	100%	0.5	B
	230	0	100%	1.0	B
		45	100%	1.0	B
		90	100%	1.0	B
		135	100%	1.0	B
		180	100%	1.0	B
		225	100%	1.0	B
		270	100%	1.0	B
		315	100%	1.0	B

Note : (1) The performance criterion "B" means the power of the EUT is turned off, and it can recover by itself during the test interval.
(2) EN 61000-6-1

Engineer : Puck

Voltage Dips and Interruptions Immunity Test Results

Applicant	JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD	Date of Test	2017.03.06		
EUT	PV Inverter	Power Rating	AC: 230 V ; 50 Hz		
Model No.	GW5048-EM	Temp.	19.5℃	Humidity	43 %
Test Mode	10% Load				
Working Condition	Operating		Results	PASS	

Type of Test	Test Voltage	Phase Angle	% Reduction	Period	Performance Criterion
Voltage Interruption	230	0	100%	250	B
		45	100%	250	B
		90	100%	250	B
		135	100%	250	B
		180	100%	250	B
		225	100%	250	B
		270	100%	250	B
		315	100%	250	B
Voltage Dips	230	0	30%	25	B
		45	30%	25	B
		90	30%	25	B
		135	30%	25	B
		180	30%	25	B
		225	30%	25	B
		270	30%	25	B
		315	30%	25	B
	230	0	100%	0.5	B
		45	100%	0.5	B
		90	100%	0.5	B
		135	100%	0.5	B
		180	100%	0.5	B
		225	100%	0.5	B
		270	100%	0.5	B
		315	100%	0.5	B
	230	0	100%	1.0	B
		45	100%	1.0	B
		90	100%	1.0	B
		135	100%	1.0	B
		180	100%	1.0	B
		225	100%	1.0	B
		270	100%	1.0	B
		315	100%	1.0	B

Note : (1) The performance criterion "B" means the power of the EUT is turned off, and it can recover by itself during the test interval.
(2) EN 61000-6-2

Engineer : Puck

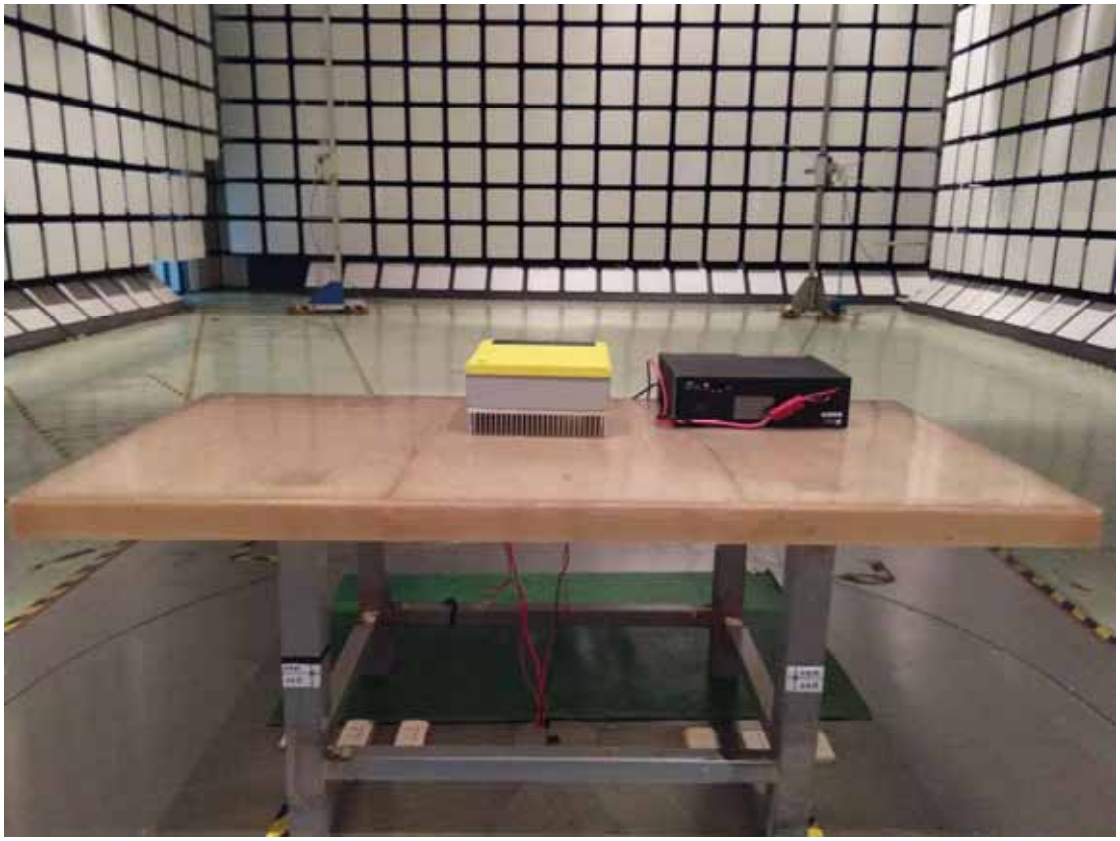
13 PHOTOGRAPHS PHOTOGRAPHS

13.1 Photos of Conducted Disturbance Measurement

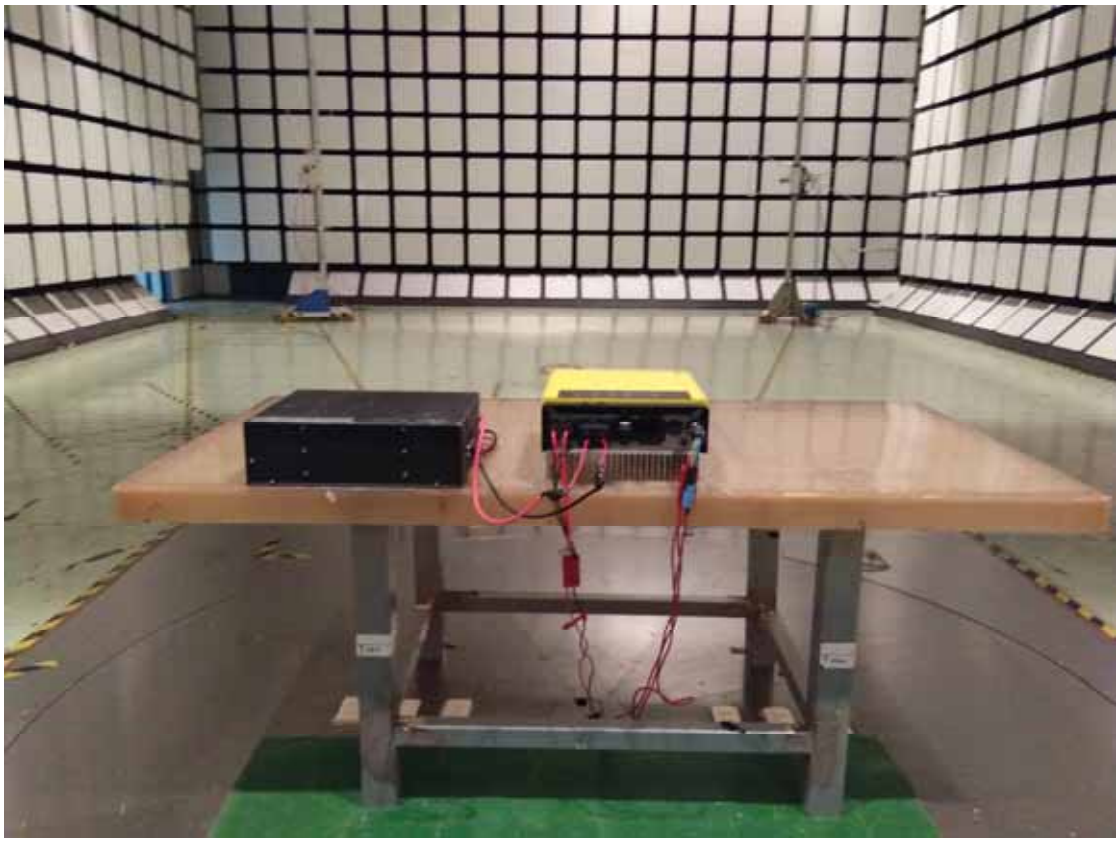
Front View of Conducted Measurement

Side View of Conducted Measurement

13.2 Photos of Radiated Disturbance Measurement



Front View of Radiated Disturbance Measurement



Back View of Radiated Disturbance Measurement

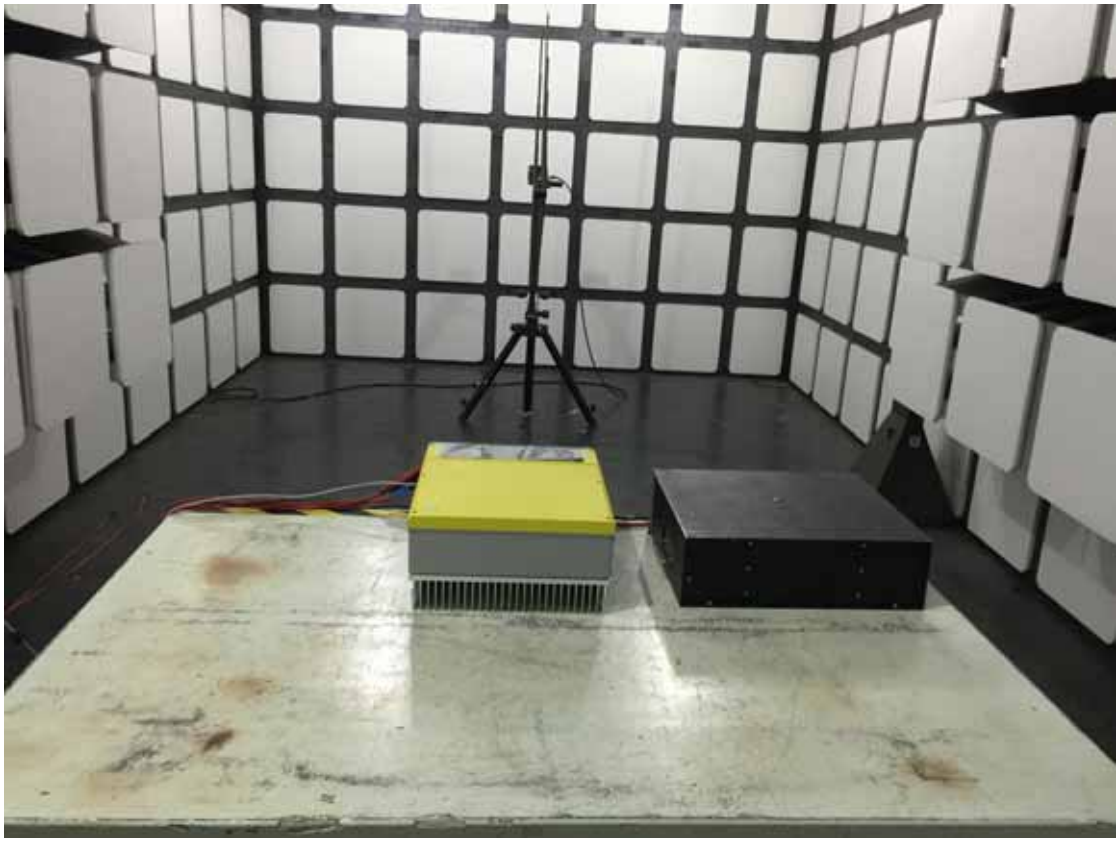
13.3 Photos of Harmonic & Flicker Measurement

13.4 Photos of Electrostatic Discharge Immunity Test

Contact & Air Discharge

VCP & HCP

13.5 Photos of RF Field Strength Immunity Test

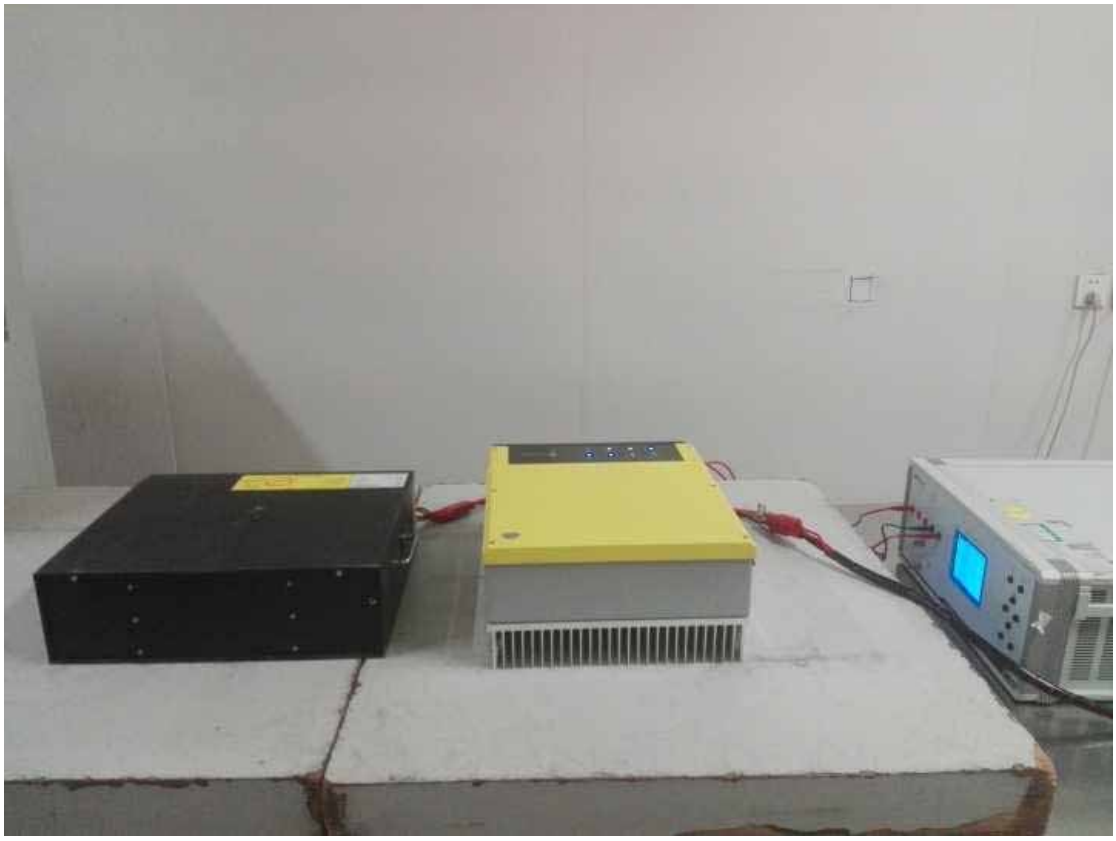


Front View of R/S Test (80MHz~1GHz)

Front View of R/S Test (Above 1GHz)

Back View of R/S Test

13.6 Photos of Electrical Fast Transient Immunity Test

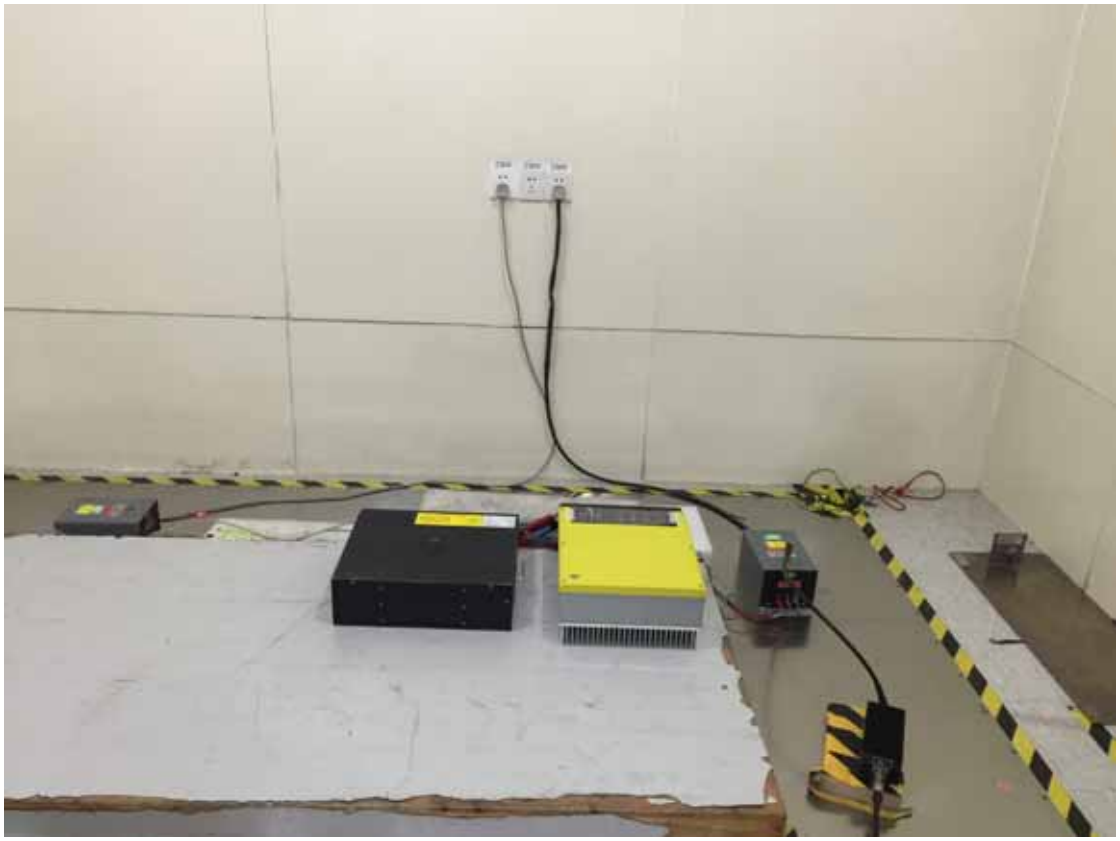


For AC Mains port

13.7 Photos of Surge Immunity Test

For AC Mains port

13.8 Photos of Conducted Disturbance Immunity Test



AC mains port

13.9 Photos of Power Frequency Magnetic Field Immunity Test

13.10 Photos of Voltage Dips and Interruptions Immunity Test

APPENDIX

Photos of EUT

Figure 1
General Appearance (Front View)

Figure 2
General Appearance (Back View)

Figure 3
General Appearance (Top View)

Figure 4
General Appearance (Left View)

Figure 5
General Appearance (Right View)

Figure 6
General Appearance (Battery Remove)

Figure 7
General Appearance (Cover Remove)

Figure 8
General Appearance (Panel Remove)

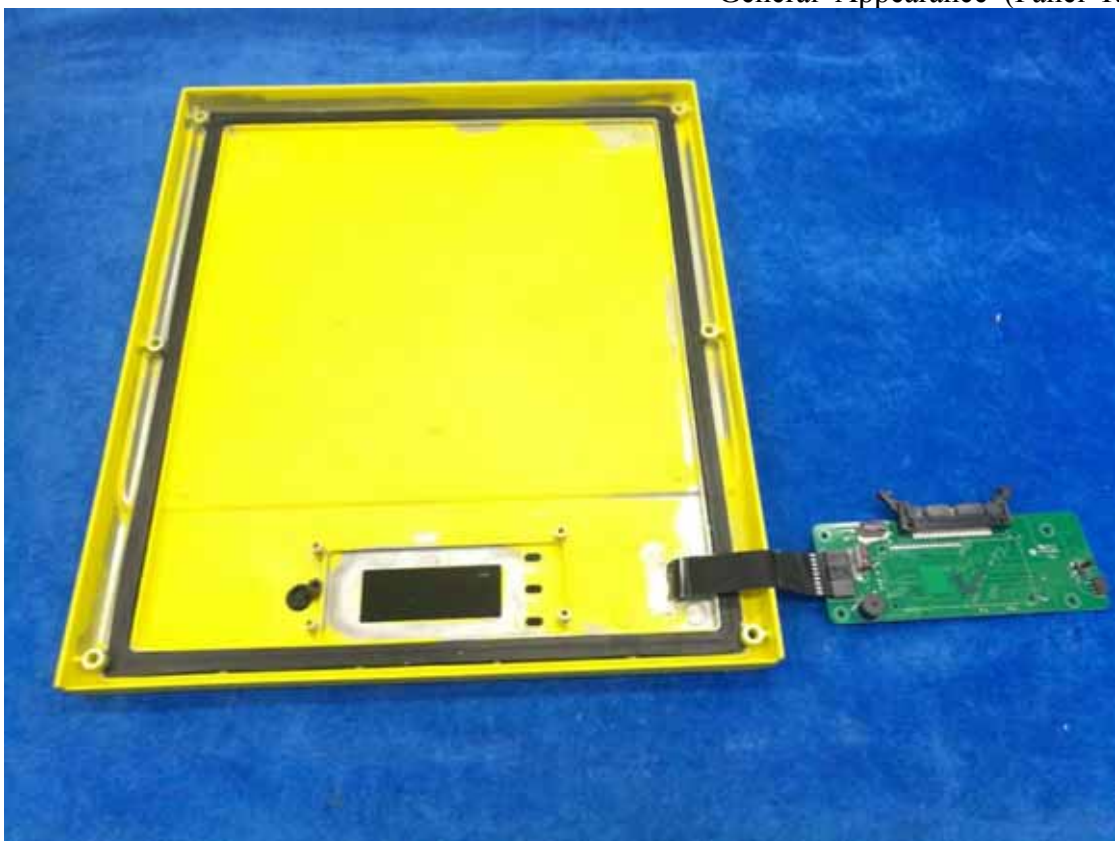


Figure 9
Panel (Front View)

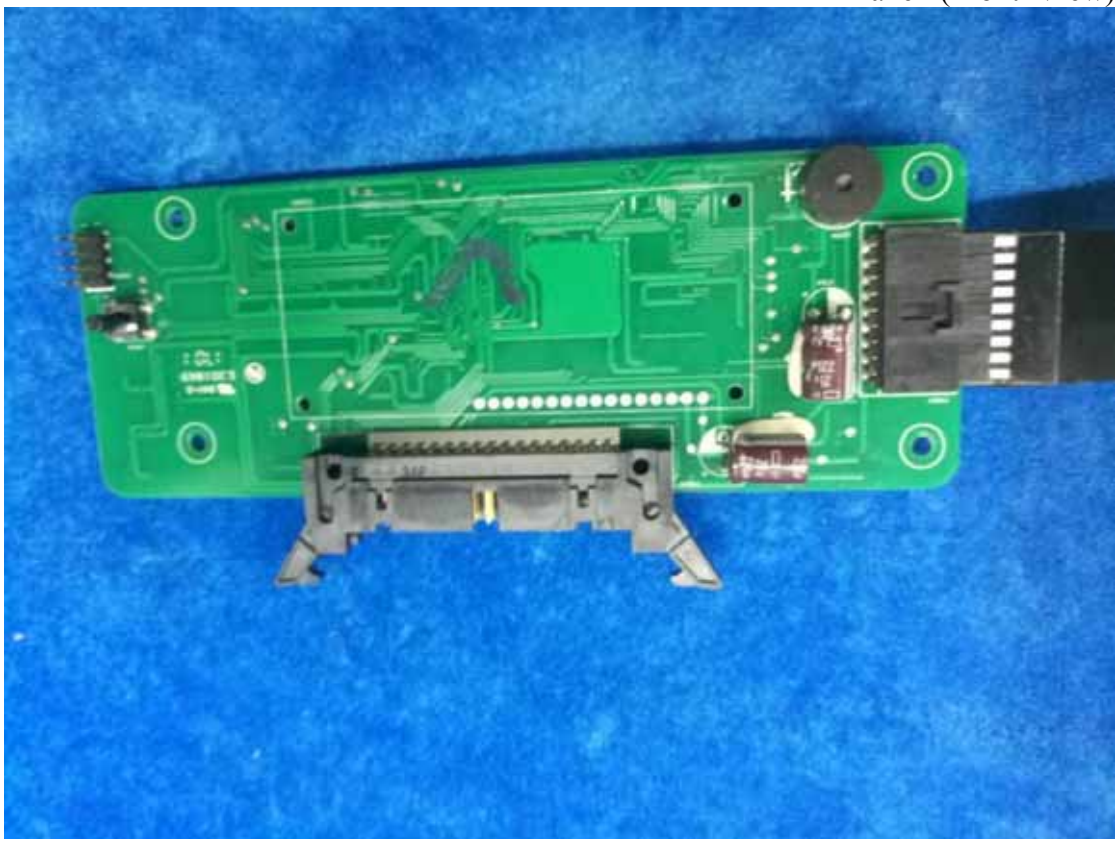


Figure 10
Panel (Back View)

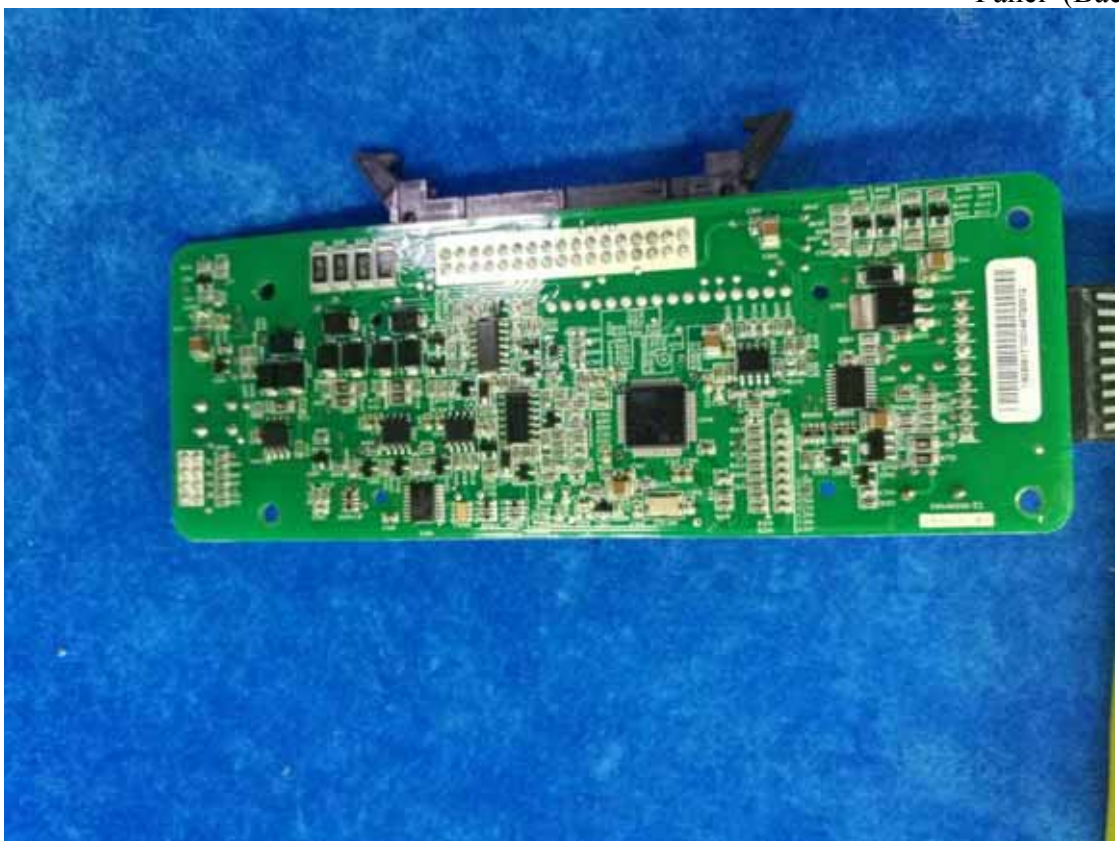


Figure 11
Panel (Crystal)

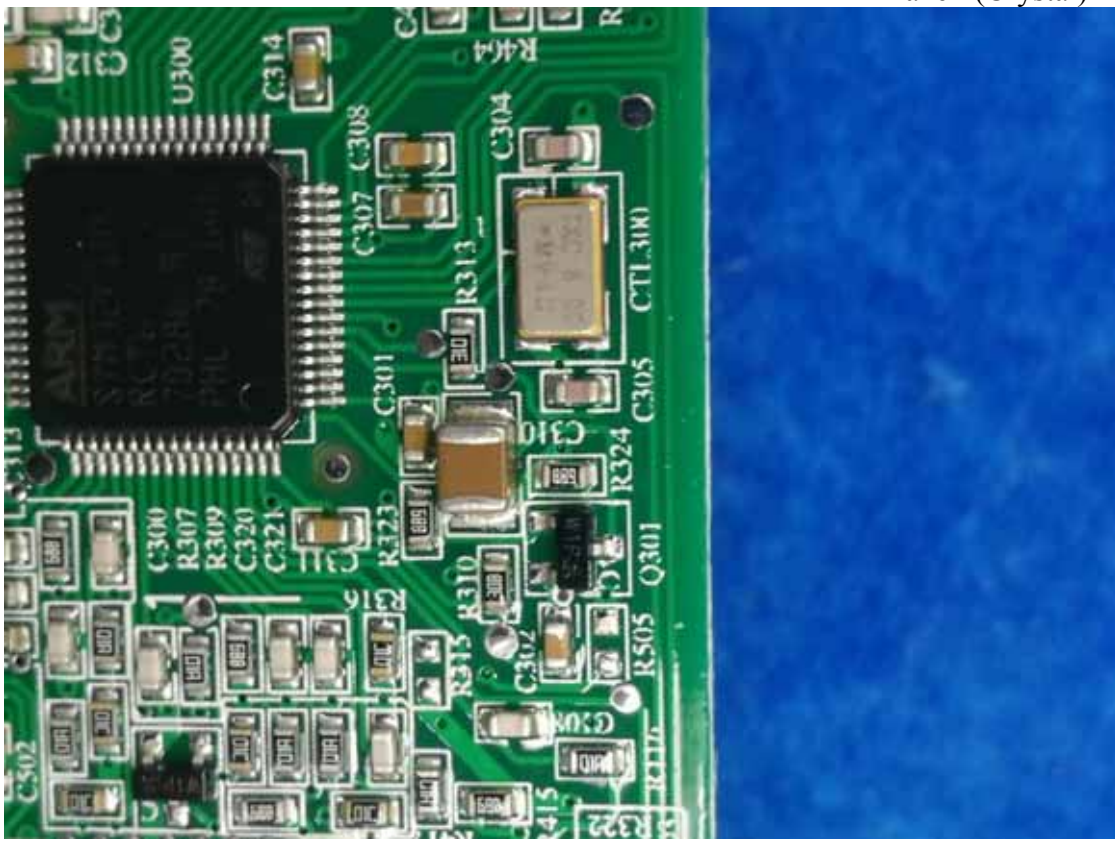


Figure 12
Internal View

Figure 13
Internal View (fan Remove)

Figure 14
PCB Board Removed

Figure 15
PCB Board (Component Side)

Figure 16
PCB Board (Solder Side)

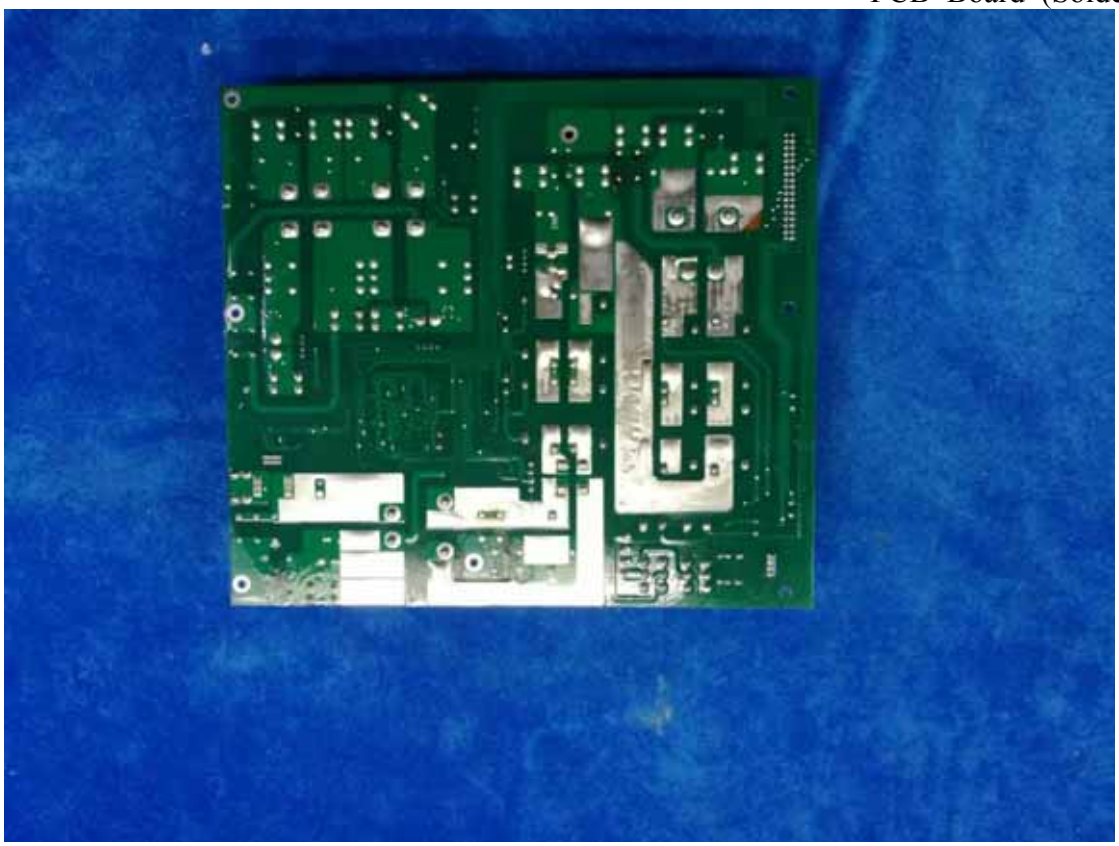


Figure 17
PCB Board Removed

Figure 18
PCB Board (Component Side)

Figure 19
PCB Board (Solder Side)

Figure 20
Internal View

Figure 21
Internal View

Figure 22
Internal View

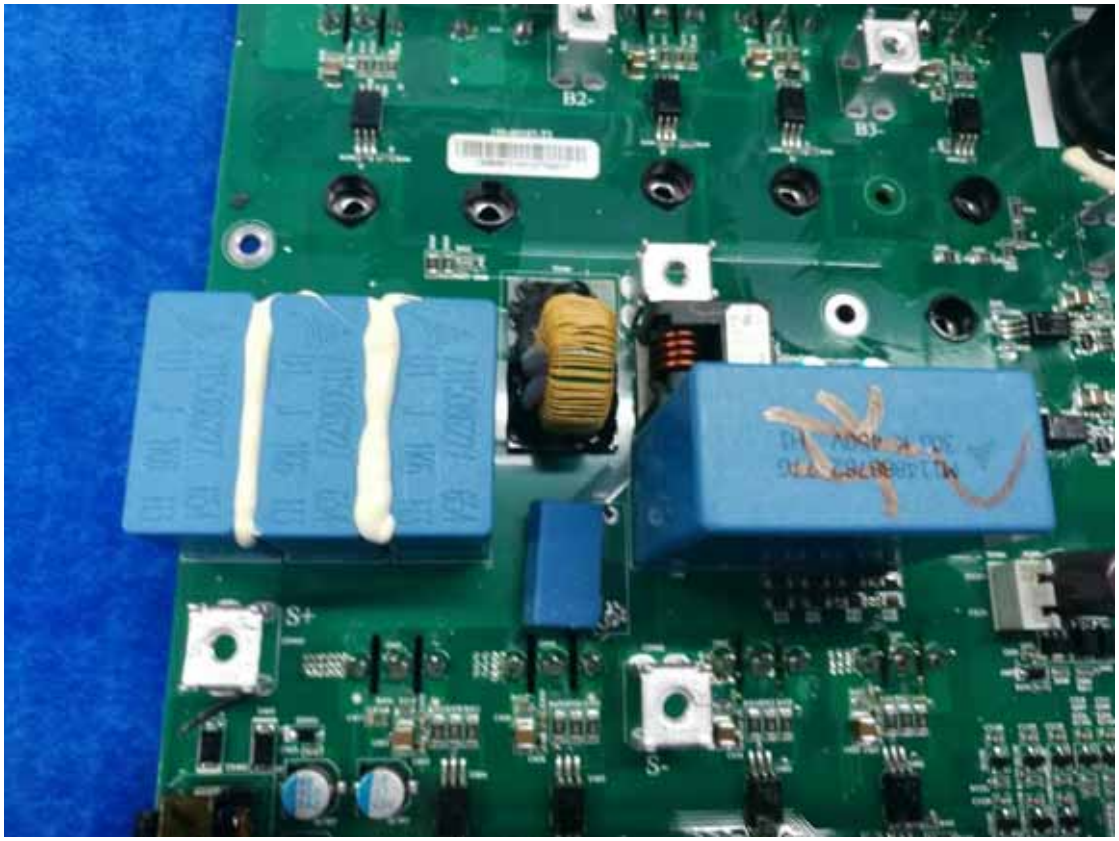


Figure 23
Internal View

Figure 24
Panel Board (Crystal Oscillator)

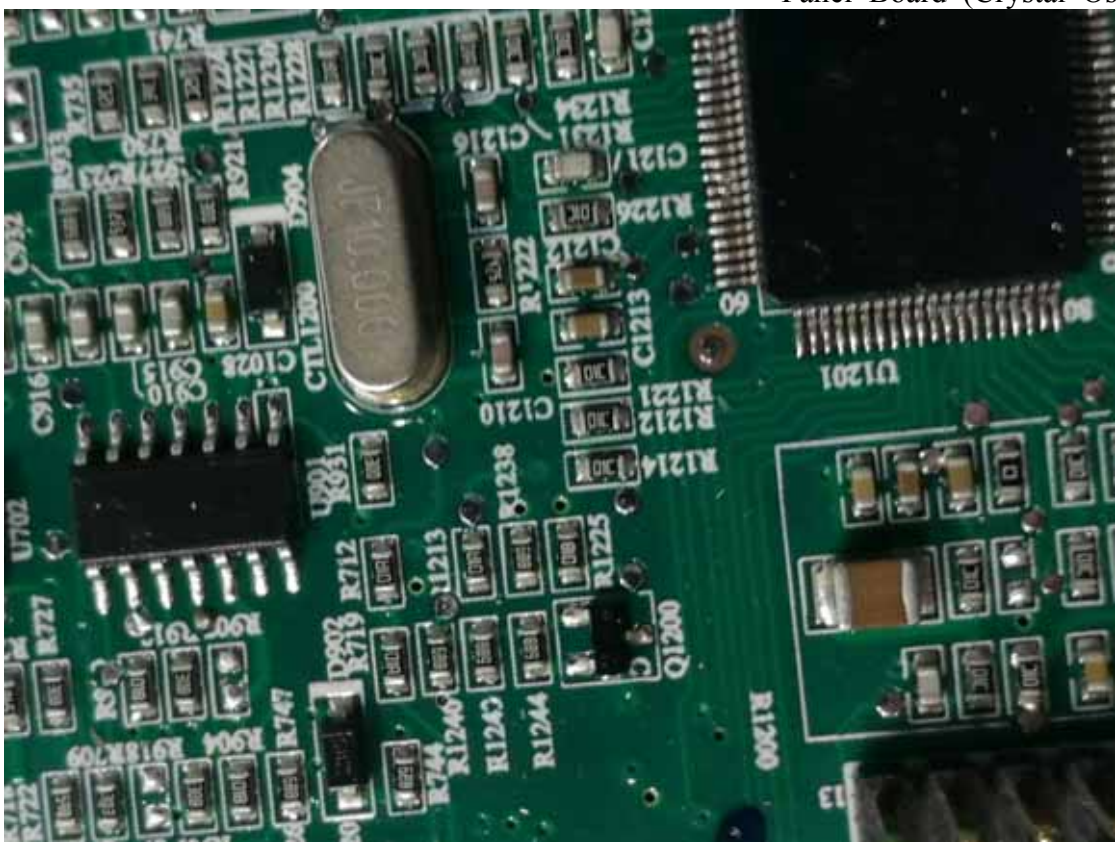


Figure 25
Panel Board (Crystal Oscillator)

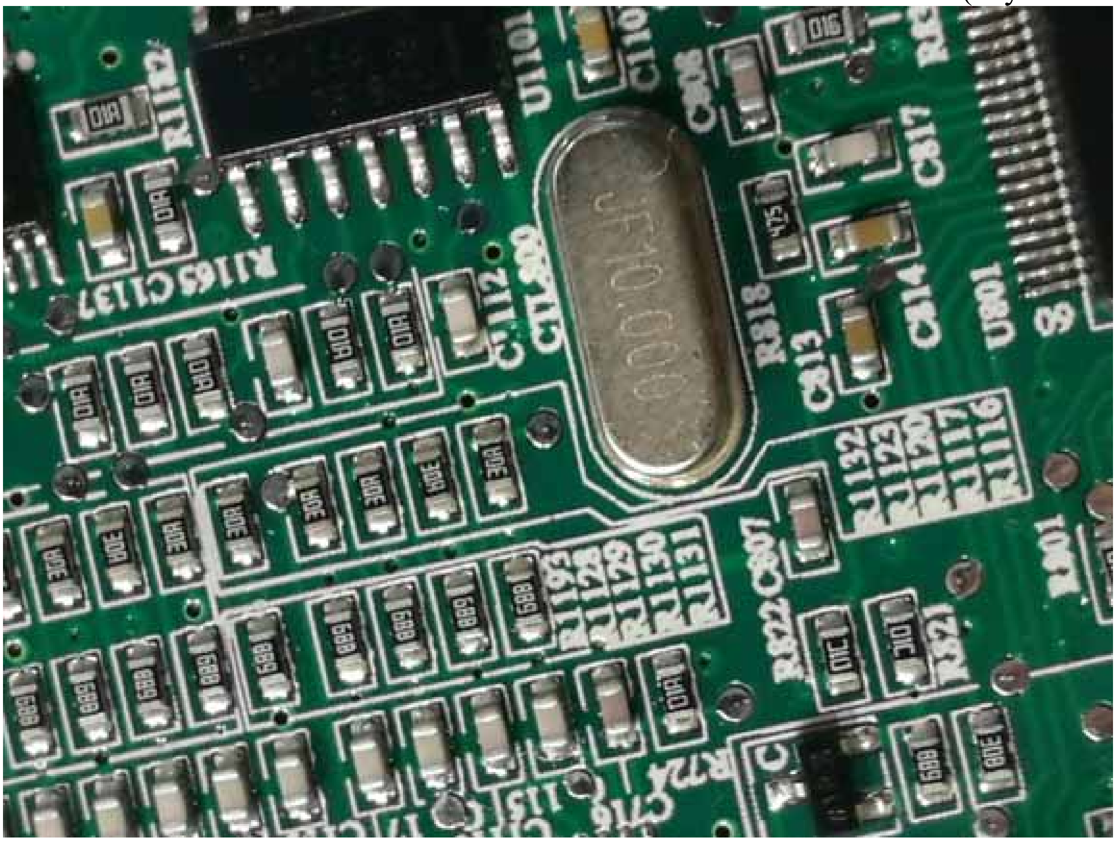


Figure 26
Internal View