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TESTING  
CNAS 12291

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**EMTEK**  
Access to the World

## Certificate of Conformity

NO.: ES171011996E


The following product has been tested by us with the listed standards and found in conformity with the council EMC directive 2014/30/EU. It is possible to use CE marking to demonstrate the conformity with this EMC Directive.

**Applicant** : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.

**Address** : 1st East & 3rd Floor of Building A, Building B, Jiayu Industrial Park, #28, GuangHui Road, LongTeng Community, Shiyan Street, Baoan District, Shenzhen, P.R. China

**Manufacturer** : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.

**Address** : 1st East & 3rd Floor of Building A, Building B, Jiayu Industrial Park, #28, GuangHui Road, LongTeng Community, Shiyan Street, Baoan District, Shenzhen, P.R. China

**Trade Mark** : 

**EUT** : Master Box

**M/N** : GMB10022

**Test Standards** : EN 61000-6-3:2007+A1:2011+ AC:2012,  
EN 61000-6-1: 2007



  
(Manager)  
October 17, 2017  


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

Ver.1.0

# EMC TEST REPORT For

SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.

Master Box

Model No.: GMB10022

Prepared for : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY  
CO., LTD.

Address : 1st East & 3rd Floor of Building A, Building B, Jiayu  
Industrial Park, #28, GuangHui Road, LongTeng  
Community, Shiyuan Street, Baoan District, Shenzhen, P.R.  
China

Prepared by : EMTEK (SHENZHEN) CO., LTD.

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Report Number : ES171011996E

Date of Test : October 11, 2017 to October 16, 2017

Date of Report : October 17, 2017

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中国认可  
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检测  
TESTING  
CNAS L2291

## TEST REPORT DESCRIPTION

Applicant : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.  
 Manufacturer : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.  
 Trademark :   
 EUT : Master Box  
 Model No. : GMB10022  
 Power Supply : Max voltage : DC 60V

**Measurement Procedure Used:**

EN 61000-6-3:2007+A1:2011+ AC:2012  
 EN 61000-6-1:2007  
 (IEC61000-4-2:2008, IEC61000-4-3:2006+A1:2007+A2:2010, IEC 61000-4-4:2012,  
 IEC61000-4-5:2014, IEC61000-4-6:2013, IEC 61000-4-8:2009)


The device described above is tested by EMTEK (SHENZHEN) CO., LTD. To determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (SHENZHEN) CO., LTD. Is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 61000-6-4 and EN 61000-6-2 requirements.

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

Date of Test : October 11, 2017 to October 16, 2017

Prepared by :   
 Bunny Zhang/Editor

Reviewer :   
 Jessie Hu/Supervisor

Approved & Authorized Signer :   
 Lisa Wang/Manager

### Modified Information

Version	Report No.	Revision Date	Summary
Ver.1.0	ES171011996E	/	Original Report

## 1. SUMMARY OF TEST RESULT

<b>EMISSION</b>			
Description of Test Item	Standard	Limits	Results
Radiated Disturbance	EN 61000-6-3:2007+A1:2011 + AC:2012	--	Pass
<b>IMMUNITY (EN 61000-6-1:2007)</b>			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC61000-4-2:2008	B	Pass
Radio-Frequency, Continuous Radiated Disturbance	IEC61000-4-3:2006+A1:2007+A2:2010	A	Pass
EFT/B Immunity	IEC 61000-4-4:2012	B	Pass
Surge Immunity	IEC61000-4-5:2014	B	Pass
Conducted RF Immunity	IEC61000-4-6:2013	A	Pass
Power Frequency Magnetic Field	IEC 61000-4-8:2009	A	Pass
Note: N/A is an abbreviation for Not Applicable.			

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

EUT	:	Master Box
Model Number	:	GMB10022
Test Voltage	:	DC 60V
Applicant	:	SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.
Address	:	1st East & 3rd Floor of Building A, Building B, Jiayu Industrial Park, #28, GuangHui Road, LongTeng Community, Shiyuan Street, Baoan District, Shenzhen, P.R. China
Manufacturer	:	SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.
Address	:	1st East & 3rd Floor of Building A, Building B, Jiayu Industrial Park, #28, GuangHui Road, LongTeng Community, Shiyuan Street, Baoan District, Shenzhen, P.R. China
Date of Received	:	October 11, 2017
Date of Test	:	October 11, 2017 to October 16, 2017

### 2.2. Description of Test Facility

Site Description	:	Accredited by CNAS, 2016.10.24 The certificate is valid until 2022.10.28 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005) The Certificate Registration Number is L2291.
EMC Lab.	:	Accredited by TUV Rheinland Shenzhen 2016.5.19 The Laboratory has been assessed according to the requirements ISO/IEC 17025.
	:	Accredited by FCC Designation Number: CN1204 Test Firm Registration Number: 882943
	:	Accredited by Industry Canada, November 24, 2015 The Certificate Registration Number is 4480A.
Name of Firm	:	EMTEK (SHENZHEN) CO., LTD.
Site Location	:	Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China



### 2.3. Description of Support Device

N/A

### 2.4. Measurement Uncertainty

Test Item	Uncertainty
Radiated Emission Uncertainty (3m Chamber)	: 3.78dB (30M~1GHz Polarize: H) 4.27dB (30M~1GHz Polarize: V)
Uncertainty for C/S Test	: 1.45(Using CDN Test)
Uncertainty for R/S Test	: 2.10dB(80MHz-200MHz) 1.76dB(200MHz-1000MHz)
Uncertainty for test site temperature and humidity	: 0.6°C 4%

### 3. MEASURING DEVICE AND TEST EQUIPMENT

#### 3.1. For 3m Radiated Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI3	1166.5950K03-101384Bw	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	Pre-Amplifier	LUNAR-EM	LNA30M3G-25	J10100000070	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	141	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	Cable	H+B	NmSm-05-C15 051 0.5M	N/A	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Cable	H+B	NmSm-2-C152 02 2M	N/A	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Cable	H+B	NmNm-7-C157 01 7M	N/A	May 21, 2017	1 Year

#### 3.2. For Electrostatic Discharge Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	ESD Tester	TESEQ AG	NSG 438A	130	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Impulse Module	TESEQ AG	IN NSG 438A A 4380-150pF/3 30Ohm	403-550/1712	May 21, 2017	1 Year

#### 3.3. For RF Strength Susceptibility Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Signal Generator	Agilent	N5181A	MY50145187	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Field Strength Meter	DARE	RSS1006A	10I00037SO2 2	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	50ohm Diode Power Sensor	BOONTON	51011EMC	36164	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	80RF1000-17 5	1059345	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS0102-55	1018770	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS1860-50	1059346	May 20, 2017	1 Year
<input checked="" type="checkbox"/>	Log.-Per. Antenna	SCHWARZBE CK	VULP 9118E	811	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Broad-Band Horn Antenna	SCHWARZBE CK	STLP 9149	9149-227	May 21, 2017	1 Year
<input checked="" type="checkbox"/>	Multi-function interface system	DARE	CTR1009B	12I00250SNO 72	N/A	N/A
<input checked="" type="checkbox"/>	Automatic switch group	DARE	RSW1004A	N/A	N/A	N/A

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

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Burst Tester	HAEFELY	PEFT4010	080981-16	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Coupling Clamp	HAEFELY	IP-4A	147147	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Three phase CDN	Teseq	CDN 163	202	May 21, 2017	1 Year

### 3.5. For Surge Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Surge Controller	HAEFELY	Psurge 8000	174031	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 100	174124	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Coupling Decoupling Filter	HAEFELY	PCD 130	172181	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Coupling Module	HAEFELY	PCD122	174354	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Surge Impulse Module	HAEFELY	PIM 120	174435	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Coupling Module	HAEFELY	PCD 126A	174387	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 110	174391	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 150	178707	May 21, 2017	1Year

### 3.6. For Injected Current Susceptibility Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Simulator	EMTEST	CWS500C	0900-12	May 21, 2017	1Year
<input checked="" type="checkbox"/>	CDN	EMTEST	CDN-M2	5100100100	May 21, 2017	1Year
<input checked="" type="checkbox"/>	CDN	EMTEST	CDN-M3	0900-11	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Injection Clamp	EMTEST	F-2031-23MM	368	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Attenuator	EMTEST	ATT6	0010222A	May 21, 2017	1Year
<input checked="" type="checkbox"/>	Three phase CDN	Teseq	CDN M332S	32655	May 21, 2017	1 Year

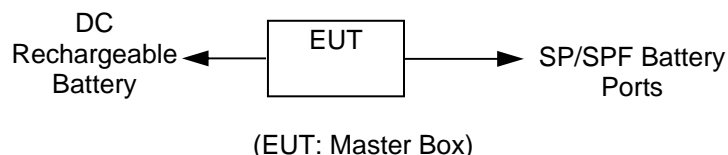
### 3.7. For Magnetic Field Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Magnetic Field Tester	HAEFELY	MAG100	250040.1	May 20, 2017	1Year

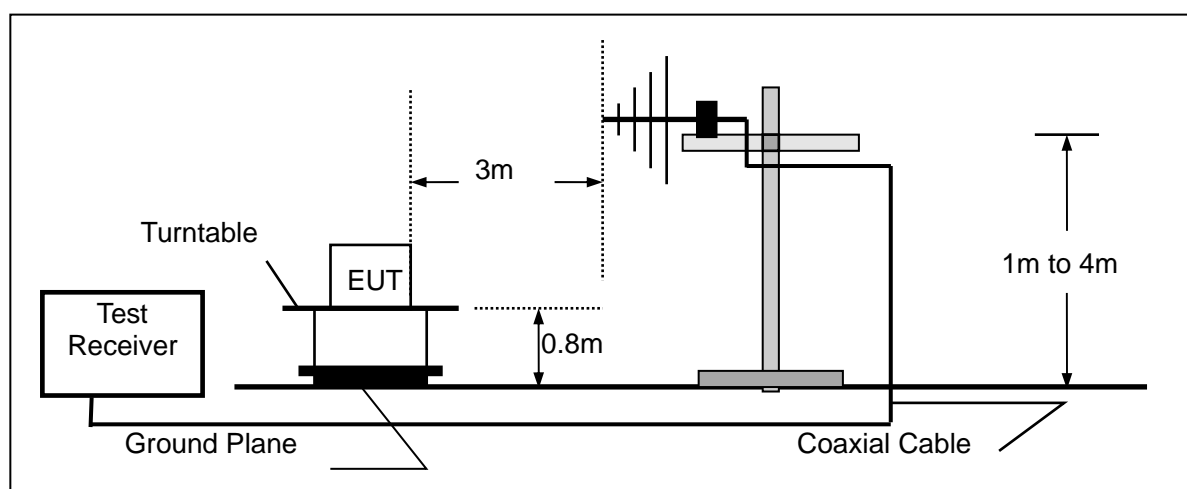
## 4. RADIATED EMISSION MEASUREMENT

### 4.1. Block Diagram of Test Setup

#### 4.1.1. Block diagram of EUT System



#### 4.1.2. Block diagram of test setup (In chamber)



(EUT: Master Box)

### 4.2. Measuring Standard

EN 61000-6-3:2007+A1:2011+ AC:2012

### 4.3. Radiated Emission Limits

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB $\mu$ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.  
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

#### 4.4. EUT Configuration on Measurement

The EN 61000-6-4 regulations test method must be used to find the maximum emission during radiated emission measurement.

EUT : Master Box  
Model Number : GMB10022

#### 4.5. Operating Condition of EUT

4.5.1. Setup the EUT as shown on Section 4.1.

4.5.2. Turn on the power of all equipment.

4.5.3. Let the EUT work in measuring mode (ON) and measure it.

#### 4.6. Test Procedure

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

The bandwidth of the Receiver is set at 120kHz.

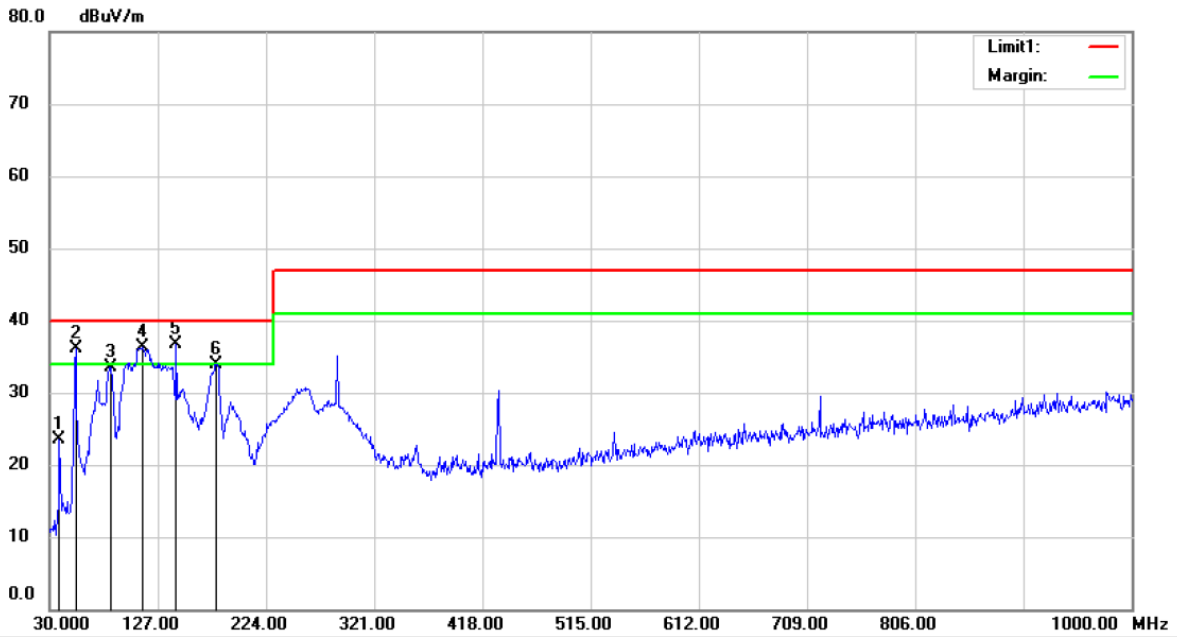
All the modes were tested and the data of the worsted mode(ON) are attached in the following pages.

#### 4.7. Measuring Results

**PASS.**

The frequency range from 30MHz to 1000MHz is investigated.

Please see the attached pages.



Site 3m Chamber #1

Polarization: *Horizontal*

Temperature: 22 C

Limit: (RE)EN61000-6-3

Power: DC 60V

Humidity: 50 %

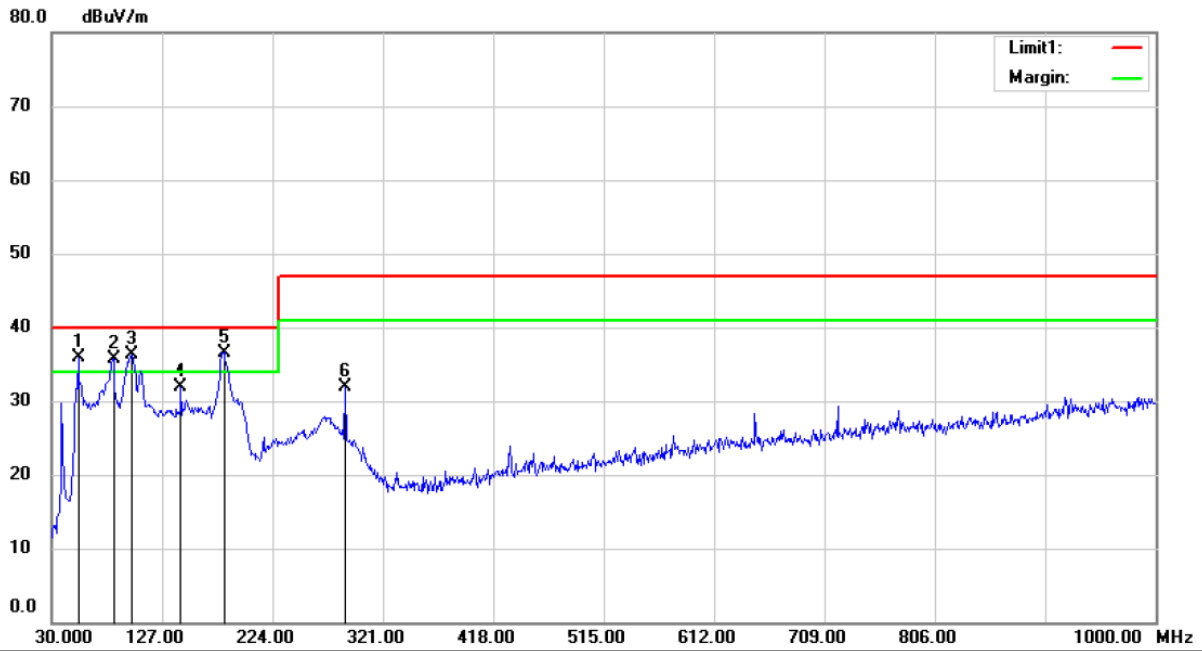
Mode: ON

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		38.7300	36.21	-12.78	23.43	40.00	-16.57	QP		
2	!	53.2800	47.43	-11.40	36.03	40.00	-3.97	QP		
3		84.3200	50.19	-16.65	33.54	40.00	-6.46	QP		
4	!	113.4200	49.74	-13.52	36.22	40.00	-3.78	QP		
5	*	143.4900	53.01	-16.21	36.80	40.00	-3.20	QP		
6		179.3800	48.30	-14.38	33.92	40.00	-6.08	QP		

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

Operator: ZHL



Site 3m Chamber #1

Polarization: *Vertical*

Temperature: 22 C

Limit: (RE)EN61000-6-3

Power: DC 60V

Humidity: 50 %

Mode: ON

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	!	53.2800	47.40	-11.40	36.00	40.00	-4.00	QP		
2	!	84.3200	52.40	-16.65	35.75	40.00	-4.25	QP		
3	!	100.8100	49.39	-13.06	36.33	40.00	-3.67	QP		
4		143.4900	48.20	-16.21	31.99	40.00	-8.01	QP		
5	*	181.3200	50.82	-14.22	36.60	40.00	-3.40	QP		
6		288.0200	41.00	-9.15	31.85	47.00	-15.15	QP		

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

Operator: ZHL

## 5. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

### Performance Level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level by its manufacturer or the requestor of the test, or the agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

1. Based on the used product standard
2. Based on the declaration of the manufacturer, requestor or purchaser

#### Criterion A:

Definition: normal performance within limits specified by the manufacturer, requestor and purchaser.

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

#### Criterion B:

Definition: temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention.

After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.

#### Criterion C:

Definition: temporary loss of function or degradation of performance, the correction of which requires operator intervention.

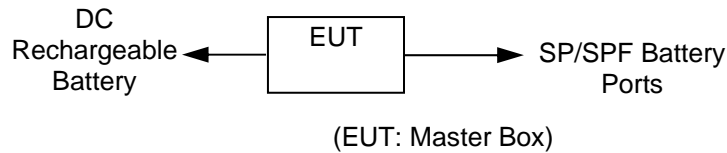
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.



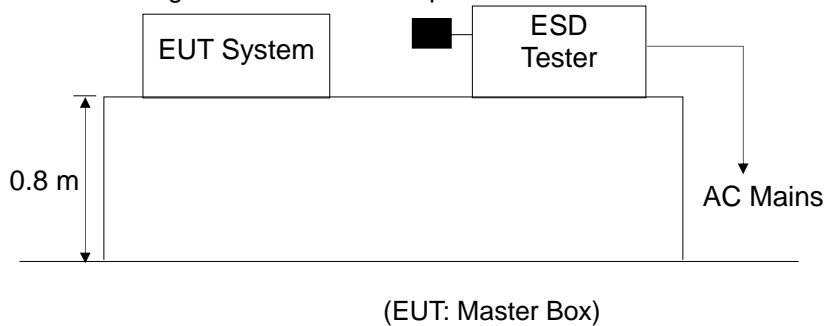
## 6. ELECTROSTATIC DISCHARGE IMMUNITY TEST

### 6.1. Block Diagram of Test Setup

#### 6.1.1. Block diagram of EUT System



#### 6.1.2. Block diagram of ESD test setup



### 6.2. Test Standard

EN 61000-6-1:2007  
(IEC61000-4-2:2008 Severity Level: 3 / Air Discharge:  $\pm 8\text{kV}$ ;  
Level: 2 / Contact Discharge:  $\pm 4\text{kV}$ )

### 6.3. Severity Levels and Performance Criterion

#### 6.3.1. Severity level

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

#### 6.3.2. Performance criterion: B

### 6.4. Operating Condition of EUT

- 6.4.1. Setup the EUT as shown on Section 6.1.
- 6.4.2. Turn on the power of all equipment.
- 6.4.3. Let the EUT work in test mode (ON) and test it.

## 6.5. Test Procedure

### 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 to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected 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 Section 6.5.1. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 6.5.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

### 6.5.4. Indirect discharge for vertical coupling plane

At least 10 singles discharge (in the most sensitive 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.

## 6.6. Test Results

**PASS.**

Please refer to the following page.

## Electrostatic Discharge Test Results

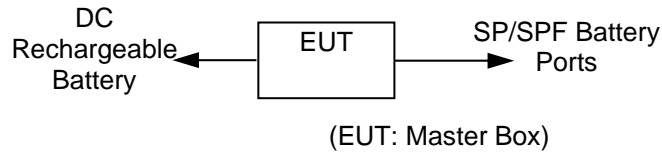
EMTEK (SHENZHEN) CO., LTD.

Applicant	: SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.		
EUT	: Master Box	Test Date	: October 12, 2017
M/N	: GMB10022	Temperature	: 22°C
Power Supply	: DC 60V	Humidity	: 50%
Air discharge	: ± 8.0kV	Test Mode	: ON
Contact discharge:	: ± 4.0kV	Criterion	: B
Location	Kind A-Air Discharge C-Contact Discharge	Result	
Metal	C	A	
Screw	C	A	
HCP of all sides	C	A	
VCP of front	C	A	
VCP of rear	C	A	
VCP of left	C	A	
VCP of right	C	A	
Note:			

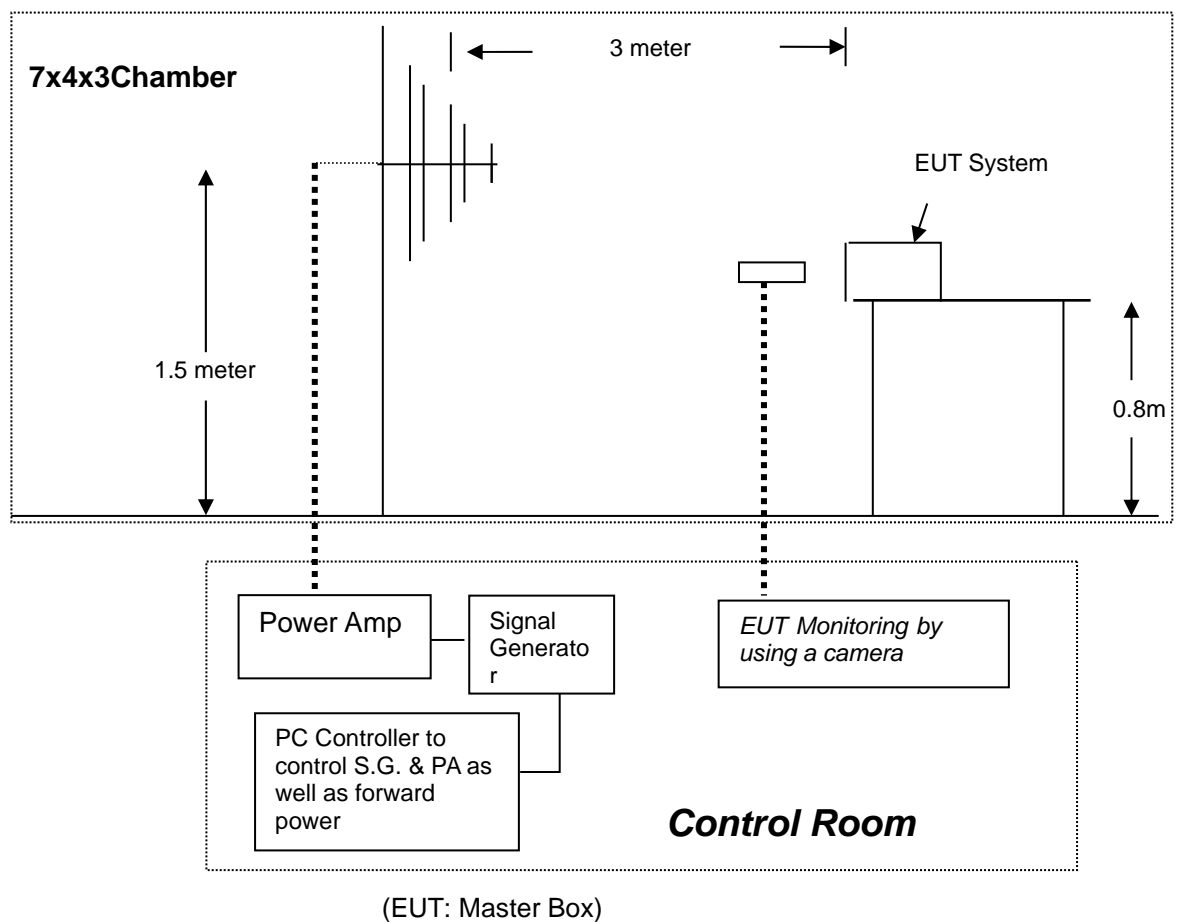
## 7. RF FIELD STRENGTH SUSCEPTIBILITY TEST

### 7.1. Block Diagram of Test Setup

#### 7.1.1. Block diagram of EUT System



#### 7.1.2. Block diagram of RS test setup



### 7.2. Test Standard

EN 61000-6-1:2007 (IEC61000-4-3:2006+A1:2007+A2:2010,  
Severity Level: 1 V/m, 3 V/m)

### 7.3. Severity Levels and Performance Criterion

#### 7.3.1. Severity Levels

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

#### 7.3.2. Performance Criterion: A

### 7.4. Operating Condition of EUT

7.4.1. Setup the EUT as shown on Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in test mode (ON) and test it.

### 7.5. Test Procedure

The EUT are placed on a table that is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna that is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor it.

All the scanning conditions are as following:

Condition of Test	Remark
1. Fielded Strength	1V/m (Severity Level 1) 3V/m (Severity Level 2) 10V/m (Severity Level 3)
2. Radiated Signal	Modulated
3. Scanning Frequency	80-2700MHz
4. Sweep time of radiated	0.0015 Decade/s
5. Dwell Time	1 Sec.

### 7.6. Test Results

**PASS.**

Please refer to the following pages.

## RF Field Strength Susceptibility Test Results

EMTEK (SHENZHEN) CO., LTD.

Applicant : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.				
EUT	: Master Box	Test Date	: October 12, 2017	
M/N	: GMB10022	Temperature	: 22°C	
Field Strength	: 3 V/m	Humidity	: 50%	
Power Supply	: DC 60V	Criterion	: A	
Test Mode	: ON	Frequency Range	: 80MHz to 1000MHz 1.4GHz to 2GHz	
Modulation: <input type="checkbox"/> None <input type="checkbox"/> Pulse <input checked="" type="checkbox"/> AM 1kHz 80%				
	Frequency Rang 1: 80~ 1000MHz	Frequency Rang 2: 1.4GHz to 2GHz		
Steps	1%			
	Horizontal	Vertical	Horizontal	Vertical
Front	A	A	A	A
Right	A	A	A	A
Rear	A	A	A	A
Left	A	A	A	A
Test Equipment: 1. Signal Generator: 2023B (AEROFLEX) 2. Power Amplifier: AS0102-55 (MILMEGA) & AP32MT215 (PRANA) 3. Log.-Per. Antenna: VULP9118E (SCHWARZBECK) 4. Broad-Band Horn Antenna: BBHA 9120L3F (SCHWARZBECK) 5. RF Power Meter. Dual Channel: 4232A (BOONTON) 6. Field Strength Meter: HI-6005 (HOLADAY)				
Note:				

## RF Field Strength Susceptibility Test Results

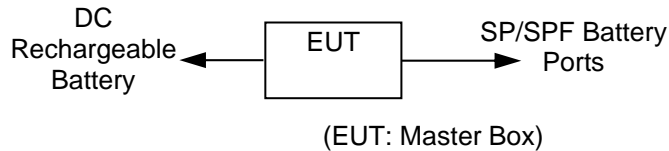
EMTEK (SHENZHEN) CO., LTD.

Applicant : SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.			
EUT : Master Box		Test Date : October 12, 2017	
M/N : GMB10022		Temperature : 22°C	
Field Strength : 1 V/m		Humidity : 50%	
Power Supply : DC 60V		Criterion : A	
Test Mode : ON		Frequency Range : 2GHz to 2.7GHz	
Modulation: <input type="checkbox"/> None <input type="checkbox"/> Pulse		<input checked="" type="checkbox"/> AM 1kHz 80%	
	Frequency Rang 1: 2GHz to 2.7GHz	Frequency Rang 2: N/A	
Steps	1%		
	Horizontal	Vertical	Vertical
Front	A	A	
Right	A	A	
Rear	A	A	
Left	A	A	
<p>Test Equipment :</p> <ol style="list-style-type: none"> <li>1. Signal Generator : N5181A (Agilent)</li> <li>2. Power Amplifier : AS0102-55 (MILMEGA) &amp; 80RF1000-175 (MILMEGA) &amp; AS1860-50 (MILMEGA)</li> <li>3. Log.-Per.Antenna: VULP9118E (SCHWARZBECK)</li> <li>4. Broad-Band Horn Antenna: STLP 9149 (Schwarzbeck)</li> <li>5. RF Power Meter. Dual Channel: 4232A (BOONTON)</li> <li>6. Field Strength Meter: RSS1006A (DARE)</li> </ol>			
Note:			

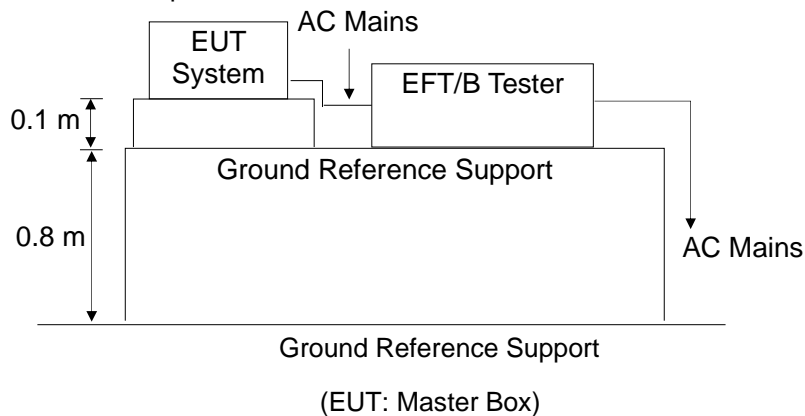
## 8. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

### 8.1. Block Diagram of Test Setup

#### 8.1.1. Block Diagram of EUT System



#### 8.1.2. EFT Test Setup



### 8.2. Test Standard

EN 61000-6-1:2007 (IEC 61000-4-4:2012, Severity Level:  
AC Line: 1kV)

### 8.3. Severity Levels and Performance Criterion

#### 8.3.1. Severity level

Level	Open Circuit Output Test Voltage $\pm 10\%$	
	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

#### 8.3.2. Performance criterion: B



## 8.4. Operating Condition of EUT

- 8.4.1. Setup the EUT as shown on Section 8.1.
- 8.4.2. Turn on the power of all equipment.
- 8.4.3. Let the EUT work in test mode (ON) and test it.

## 8.5. Test Procedure

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

### 8.5.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device that couples the EFT interference signal to DC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

### 8.5.2. For signal lines and control lines ports:

No I/O ports. It's unnecessary to test.

### 8.5.3. For DC output line ports:

It's unnecessary to test.

## 8.6. Test Results

**PASS.**

Please refer to the following page.

## Electrical Fast Transient/Burst Test Results

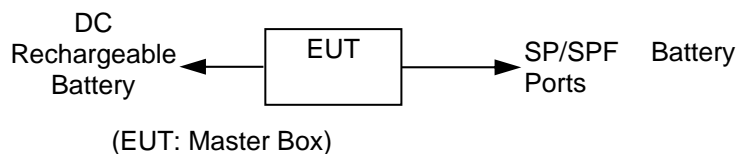
EMTEK (SHENZHEN) CO., LTD.

Standard: <input checked="" type="checkbox"/> EN 61000-4-4		Result: <input checked="" type="checkbox"/> PASS / <input type="checkbox"/> FAIL	
Applicant : <u>SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.</u>			
EUT : <u>Master Box</u>			
M/N : <u>GMB10022</u>			
Input Voltage: <u>DC 60V</u>			
Criterion : B			
Ambient Condition : <u>22 °C</u>		<u>50% RH</u>	
Operation Mode: ON			
Line : <input checked="" type="checkbox"/> A C Mains		Line : <input type="checkbox"/> Signal <input type="checkbox"/> I/O Cable	
Coupling : <input checked="" type="checkbox"/> Direct		Coupling : <input type="checkbox"/> Capacitive	
Test Time : 120s			
Line	Test Voltage	Result(+)	Result(-)
L	1kV	A	A
N	1kV	A	A
PE			
L、N	1kV	A	A
L、PE			
N、PE			
L、N、PE			
Signal Line			
DC Line			
Note:			

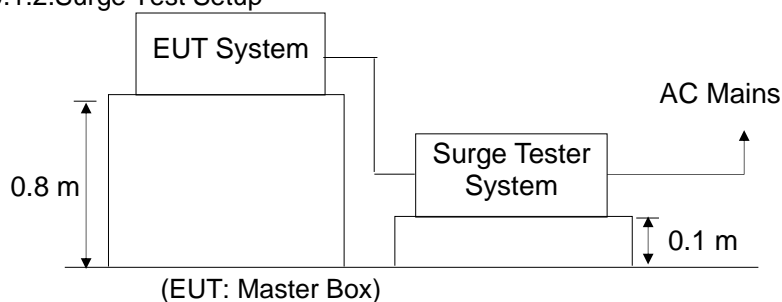
## 9. SURGE IMMUNITY TEST

### 9.1. Block Diagram of Test Setup

#### 9.1.1. Block Diagram of EUT System



#### 9.1.2. Surge Test Setup



### 9.2. Test Standard

EN 61000-6-1:2007

(IEC61000-4-5:2014, Severity Level: AC Output Power Ports:  
Line to Line: Level 2, 1.0kV; Line to earth, Level 3, 2.0kV)

### 9.3. Severity Levels and Performance Criterion

#### 9.3.1. Severity level

Severity Level	Open-Circuit Test Voltage kV
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

#### 9.3.2. Performance criterion: B

### 9.4. Operating Condition of EUT

9.4.1. Setup the EUT as shown on Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in test mode (ON) and test it.

## 9.5. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 9.1.2.
- 2) For AC Output Power Ports: For line to line coupling mode, provide a 1.0 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points. For line to Earth coupling mode, provide a 2.0 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points. 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

## 9.6. Test Results

**PASS.**

Please refer to the following page.

## Surge Immunity Test Results

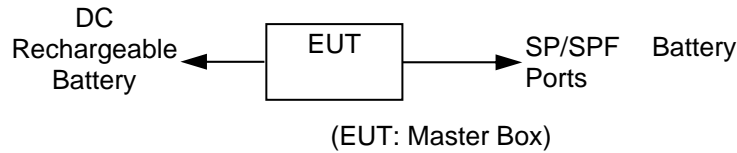
EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.</u>					
EUT : <u>Master Box</u>			Test Date : <u>October 12, 2017</u>		
M/N : <u>GMB10022</u>			Temperature : <u>22°C</u>		
Power Supply : <u>DC 60V</u>			Humidity : <u>50%</u>		
Test Mode : <u>ON</u>			Criterion : <u>B</u>		
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result
L-N	+	0°, 90°, 180°, 270°	5	1.0	A
	-	0°, 90°, 180°, 270°	5	1.0	A
Remark:					

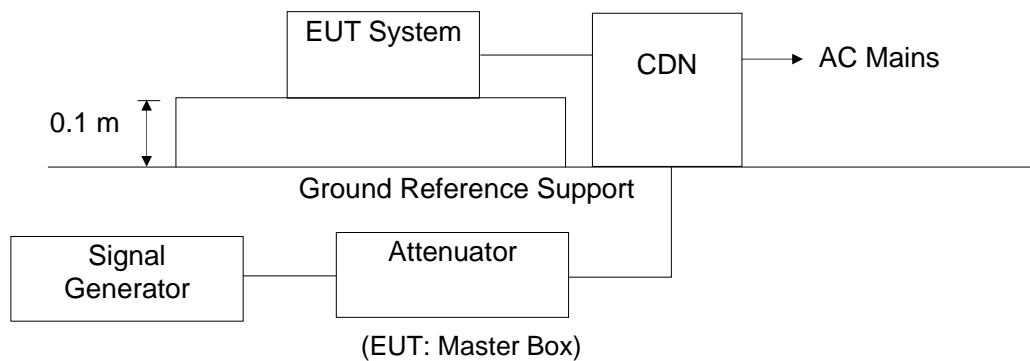
## 10. INJECTED CURRENTS SUSCEPTIBILITY TEST

### 10.1. Block Diagram of Test Setup

#### 10.1.1. Block Diagram of EUT System



#### 10.1.2. Block Diagram of Test Setup



### 10.2. Test Standard

EN 61000-6-1:2007

(IEC61000-4-6:2013, Severity Level: Level 3, 10V (r.m.s.), 0.15MHz ~ 80MHz)

### 10.3. Severity Levels and Performance Criterion

#### 10.3.1. Severity level

Level	Field Strength V
1	1
2	3
3	10
X	Special

#### 10.3.2. Performance criterion: A

### 10.4. Operating Condition of EUT

10.4.1. Setup the EUT as shown on Section 10.1.

10.4.2. Turn on the power of all equipment.

10.4.3. Let the EUT work in test mode (ON) and test it.

## 10.5. Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 10.1.2.
- 2) Let the EUT work in test mode and measure it.
- 3) The EUT are placed on an insulating support 0.8m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The EUT are placed on an insulating support 0.8m high above a ground reference plane. EM-Clamp is placed on the ground plane about 0.3m from EUT.
- 5) The disturbance signal described below is injected to EUT through CDN.
- 6) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 7) The frequency range is swept from 150kHz to 80MHz using 10V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.
- 8) The rate of sweep shall not exceed  $1.5 \cdot 10^{-3}$  decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 9) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

## 10.6. Test Results

**PASS.**

Please refer to the following page.

## Injected Currents Susceptibility Test Results

EMTEK (SHENZHEN) CO., LTD.

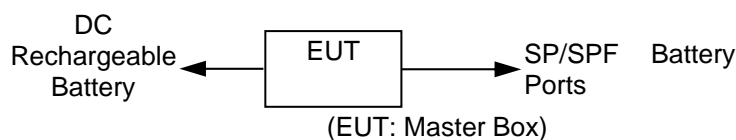
Applicant : <u>SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.</u>				
EUT : <u>Master Box</u>		Test Date: <u>October 12, 2017</u>		
M/N : <u>GMB10022</u>		Temperature : <u>22°C</u>		
Power Supply : <u>DC 60V</u>		Humidity : <u>58%</u>		
Test Engineer : <u>WL</u>				
Test Mode: ON				
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
0.15 ~ 80	AC Output Power Ports	10V	A	A
Test Mode : <u>N/A</u>				
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
Remark : 1. Modulation Signal:1kHz 80% AM Measurement Equipment : Simulator: CWS 500 (SWITZERLAND EMTEST) CDN : <input checked="" type="checkbox"/> CDN-M2 (SWITZERLAND EMTEST) <input type="checkbox"/> CDN-M4 (SWITZERLAND EMTEST) <input type="checkbox"/> EM-Clamp (SWITZERLAND EMTEST)		Note:		



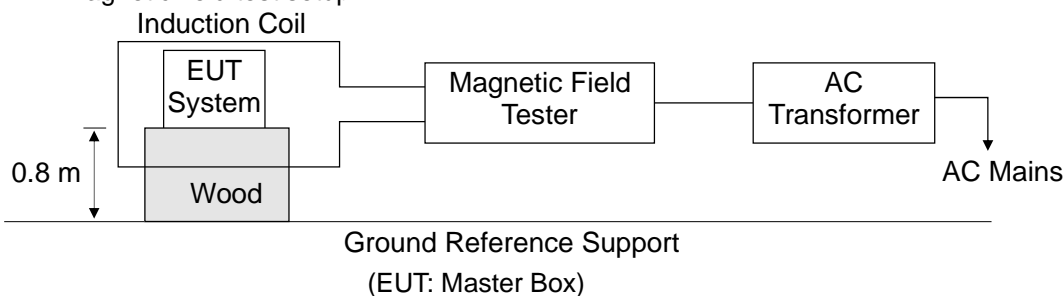
## 11. MAGNETIC FIELD SUSCEPTIBILITY TEST

### 11.1. Block Diagram of Test Setup

#### 11.1.1. Block diagram of EUT System



#### 11.1.2. Magnetic field test setup



### 11.2. Test Standard

EN 61000-6-1:2007

(IEC 61000-4-8:2009, Severity Level: Level 2, 3 A/m)

### 11.3. Severity Levels and Performance Criterion

#### 11.3.1. Severity Levels

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

#### 11.3.2. Performance Criterion: A

### 11.4. Operating Condition of EUT

11.4.1. Setup the EUT as shown on Section 11.1.

11.4.2. Turn on the power of all equipment.

11.4.3. Let the EUT work in test mode (ON) and test it.

### 11.5. Test Procedure

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

### 11.6. Test Results

**PASS.**

Please refer to the following page.

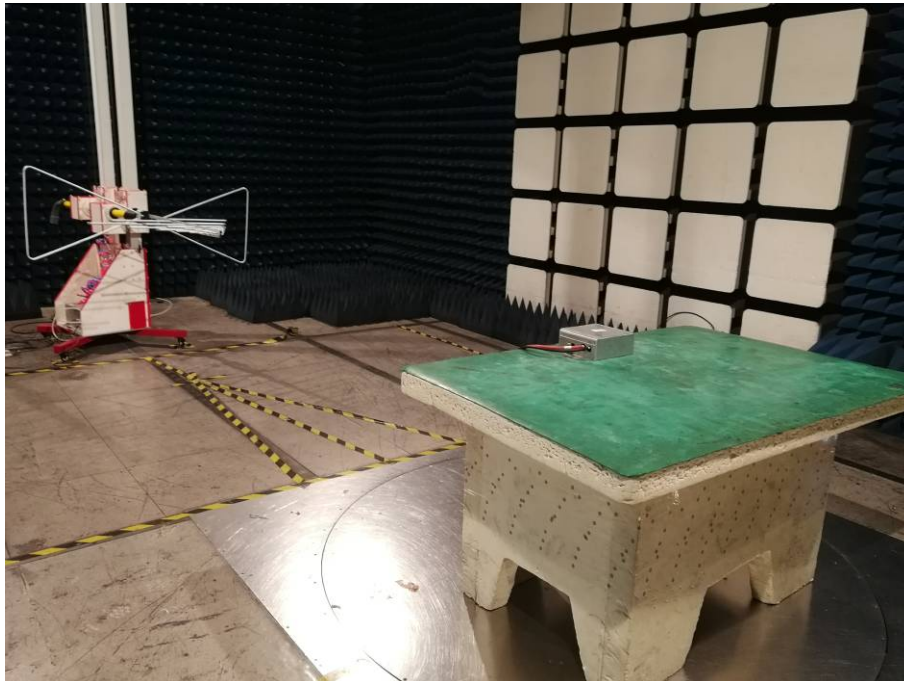
## Magnetic Field Immunity Test Results

EMTEK (SHENZHEN) CO., LTD.

Standard: <input checked="" type="checkbox"/> EN 61000-4-8		Result: <input checked="" type="checkbox"/> PASS / <input type="checkbox"/> FAIL		
Applicant : <u>SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO., LTD.</u> EUT : <u>Master Box</u> M/N : <u>GMB10022</u> Input Voltage : <u>DC 60V</u> Date of Test : <u>October 12, 2017</u> Test Engineer: <u>WL</u> Ambient Condition : Temp : <u>22°C</u> Humid: <u>55%</u> Criterion: A				
Operation Mode: ON				
Test Level (A/m)	Testing Duration	Coil Orientation	Criterion	Result
3	5 mins	X	A	A
3	5 mins	Y	A	A
3	5 mins	Z	A	A
Operation Mode: N/A				
Test Level (A/m)	Testing Duration	Coil Orientation	Criterion	Result
Test Equipment	Magnetic Field Test: HEAFELY MAG 100.1			
Note:				

## 12. PHOTOGRAPHS

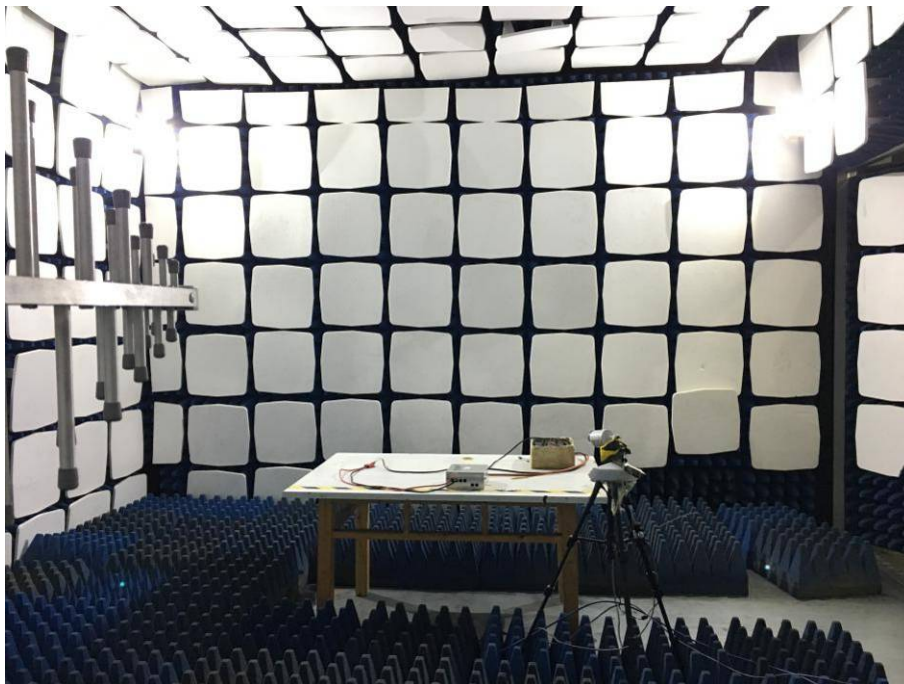
### 12.1. Photos of Radiation Emission Measurement



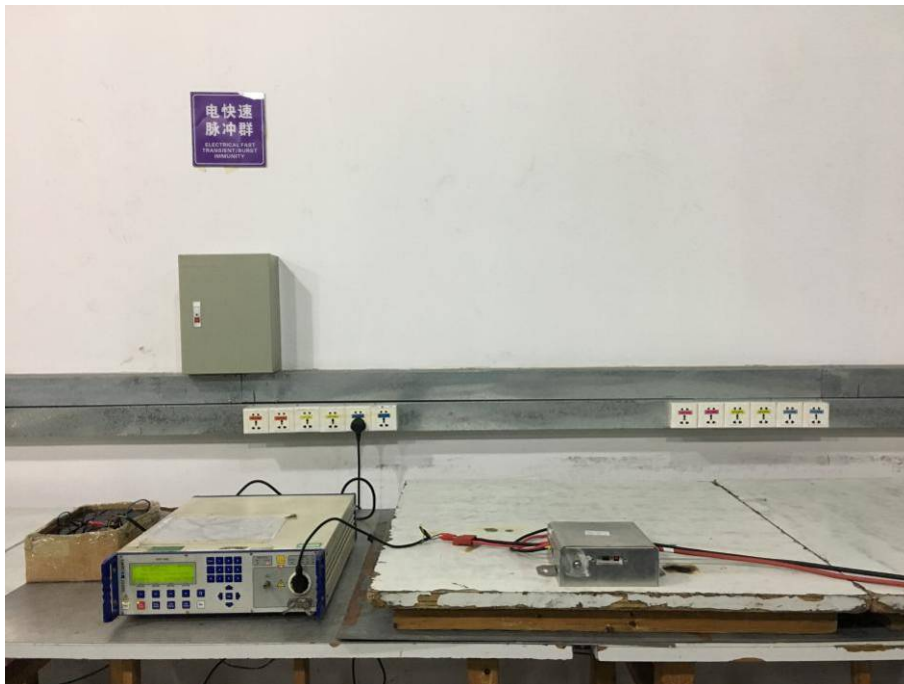
### 12.2. Photo of Electrostatic Discharge Test



### 12.3. Photo of RF Field Strength Susceptibility Test



#### 12.4. Photo of Electrical Fast Transient / Burst Immunity Test



#### 12.5. Photo of Surge Test



12.6.For Injected Current Susceptibility Test

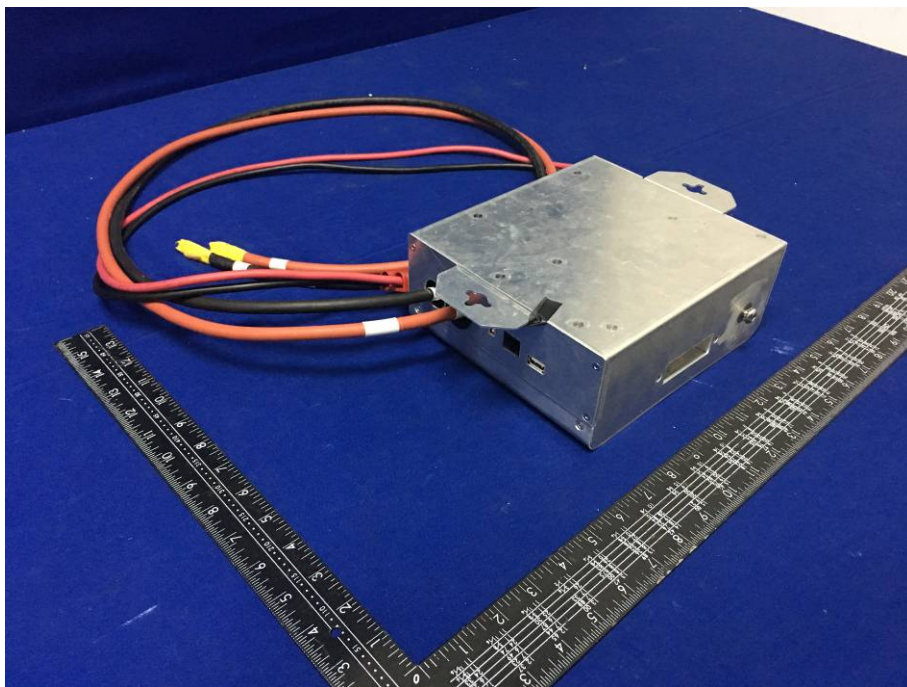
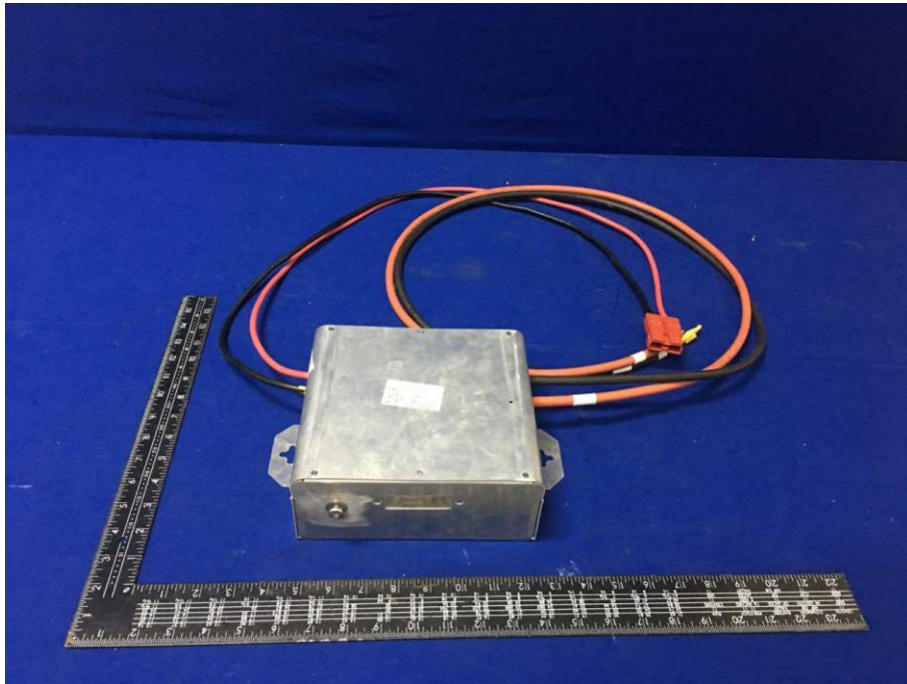


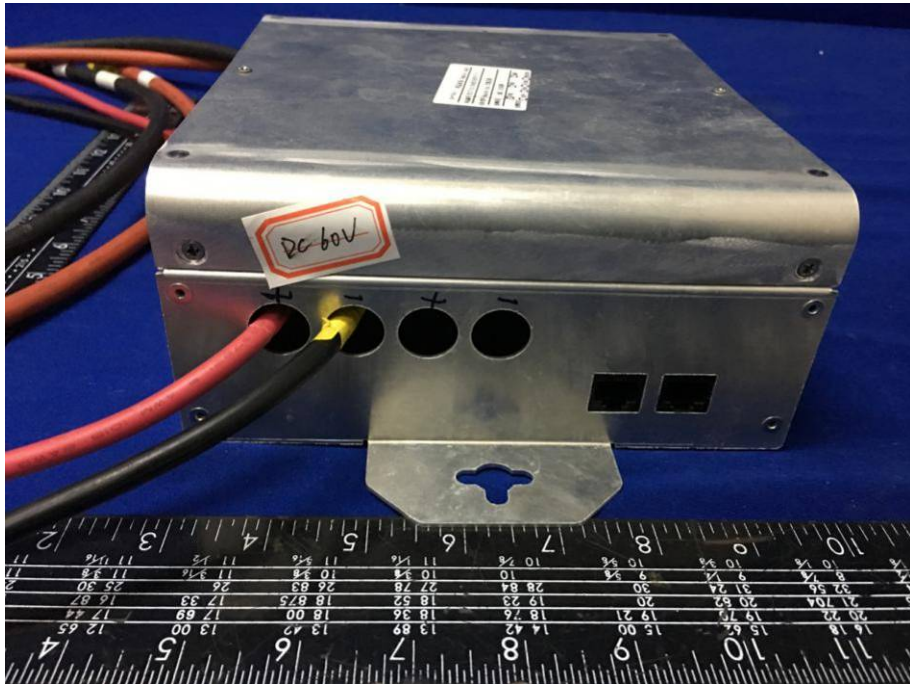
12.7.Photo of Magnetic Field Immunity Test

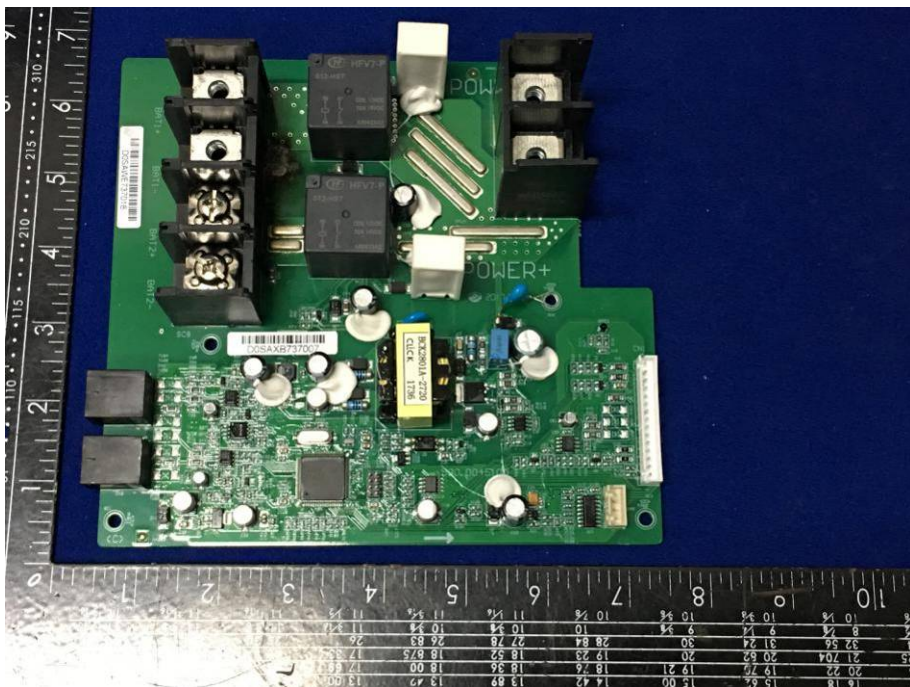
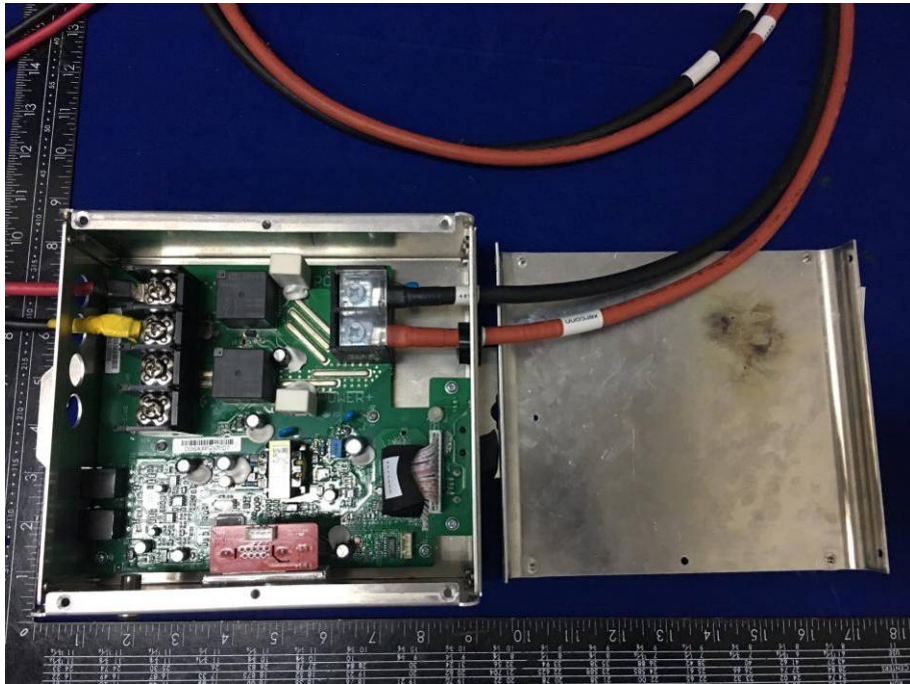


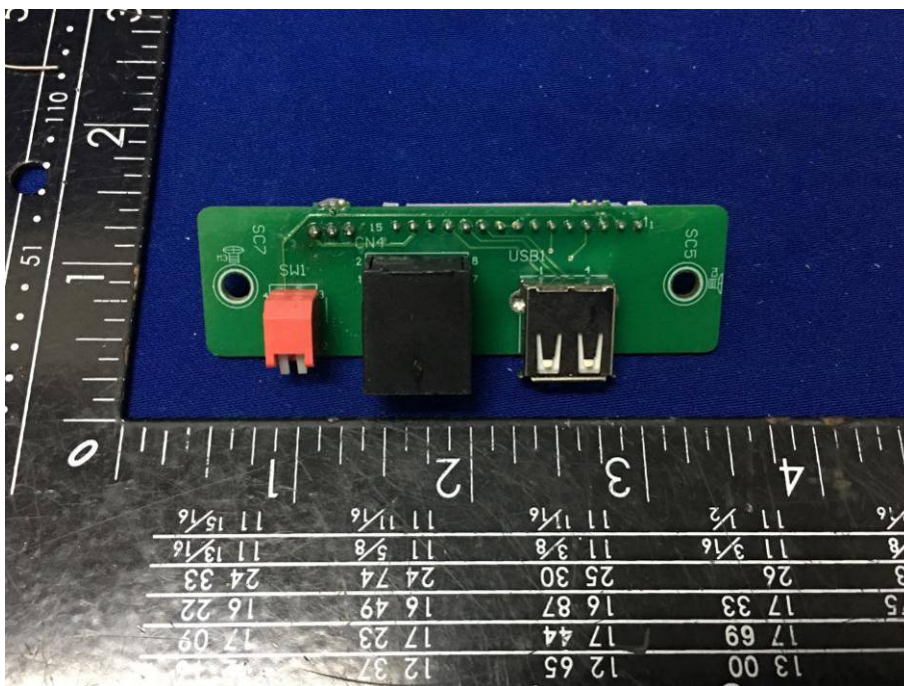
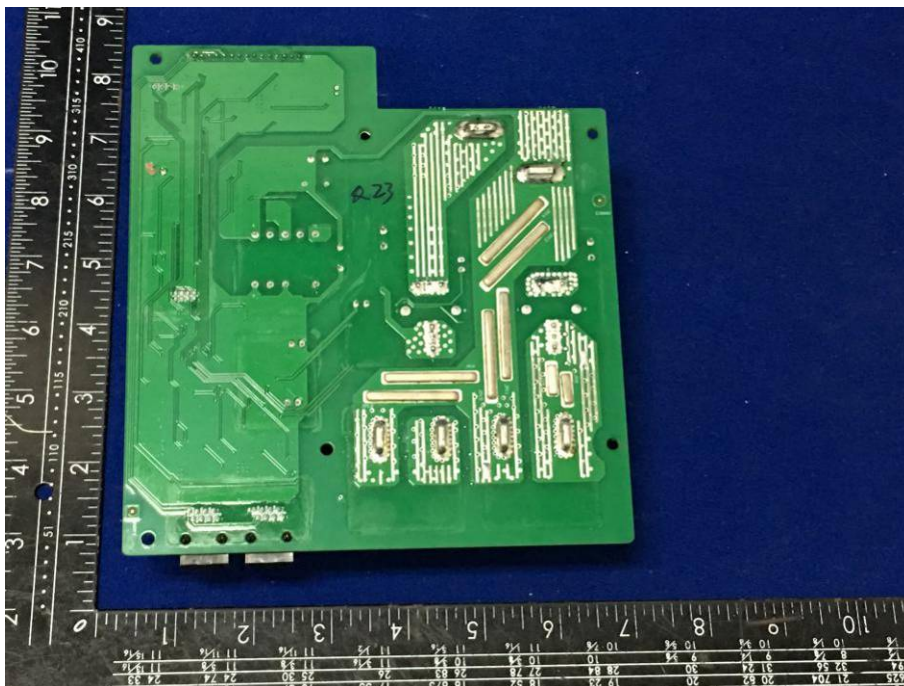
APPENDIX  
(Photos of EUT)

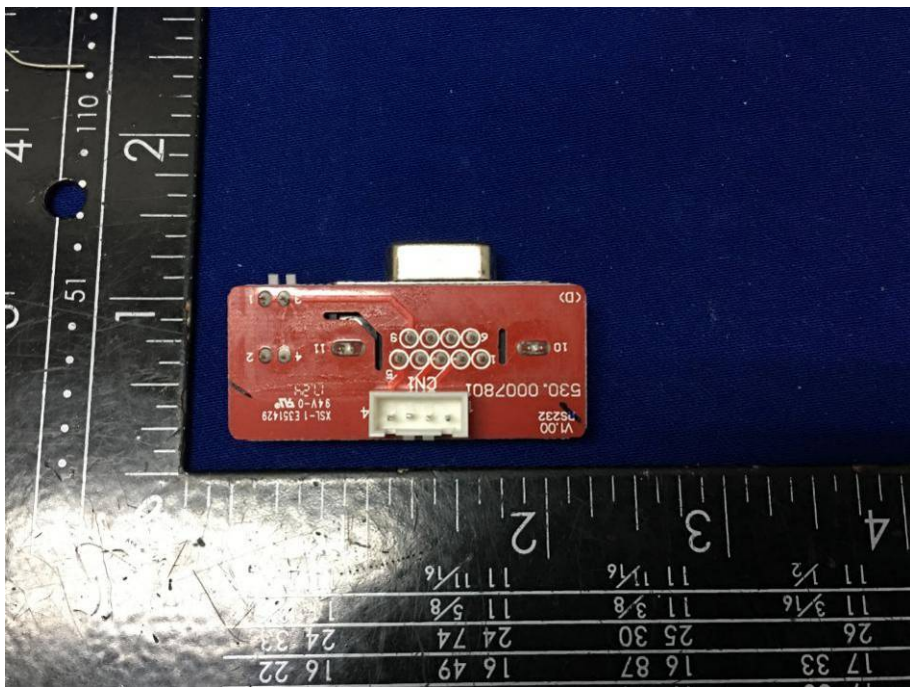
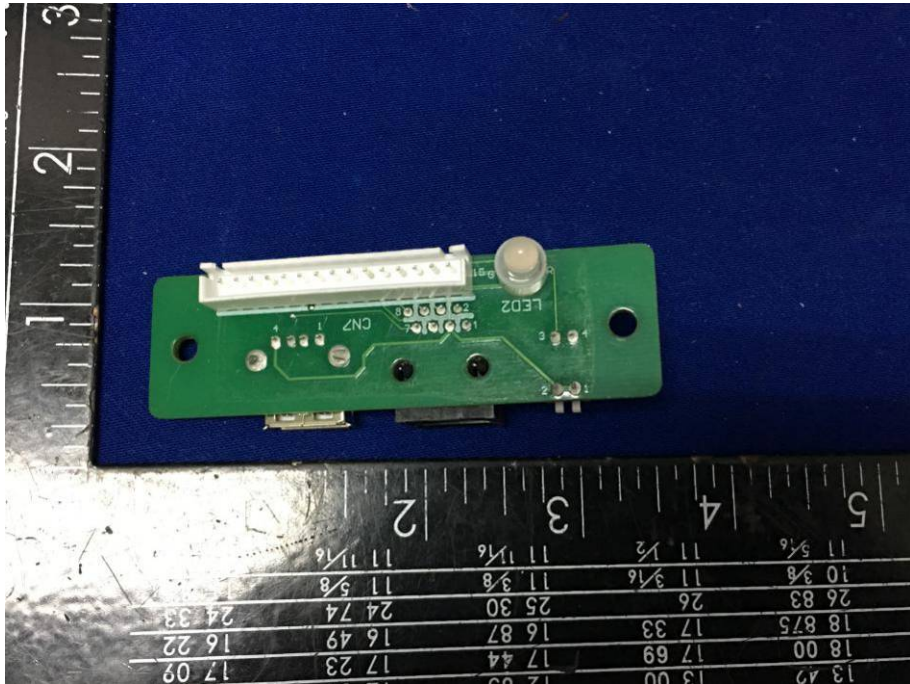


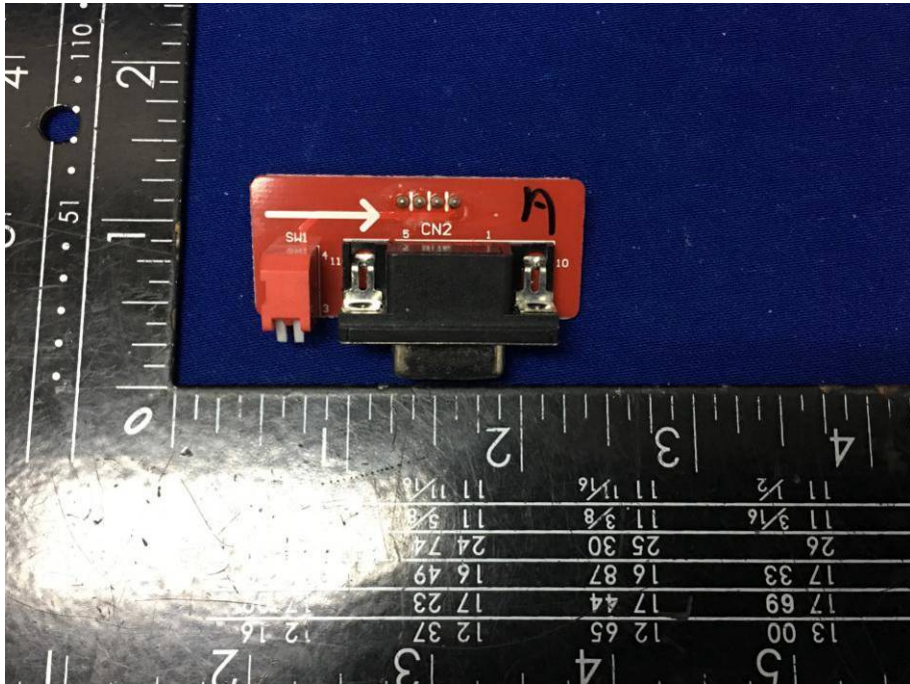












-----The end-----