

FCC EMC Test Report



(Verification of Conformity)

For

Electromagnetic Interference

Of

Product : Power Inverter

Trade Name : N/A

Model Number : ZB-2000-S, NC-(150-6000)-M,
NC-(150-6000)-MC, NC-(150-6000)-S,
NC-(150-6000)-SC, ZB-(150-6000)-M,
ZB-(150-6000)-MC, ZB-(150-6000)-S,
ZB-(150-6000)-SC

Prepared for

Ningbo Zonbo Electrical Co., Ltd.

Tanjialing Village, Lanjiang Street, Yuyao City, Zhejiang Province, China

Prepared by

Shenzhen NTEK Testing Technology Co., Ltd.

1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street,
Bao'an District, Shenzhen P.R. China

Tel.: +86-0755-61156588 Fax.: +86-0755-61156599

Website: www.ntek.org.cn

TEST RESULT CERTIFICATION

Applicant's name : Ningbo Zonbo Electrical Co., Ltd.
Address : Tanjialing Village, Lanjiang Street, Yuyao City, Zhejiang
 Province, China
Manufacturer's Name : Ningbo Zonbo Electrical Co., Ltd.
Address : Tanjialing Village, Lanjiang Street, Yuyao City, Zhejiang
 Province, China
Product description
Product name : Power Inverter
 ZB-2000-S, NC-(150-6000)-M, NC-(150-6000)-MC,
Model and/or type reference : NC-(150-6000)-S, NC-(150-6000)-SC, ZB-(150-6000)-M,
 ZB-(150-6000)-MC, ZB-(150-6000)-S, ZB-(150-6000)-SC
 FCC Part15B:2013
Standards : ANSI C63.4:2009

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with Part 15 of FCC Rules. And it is applicable only to the tested sample identified in the report.

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Date of Test :
Date (s) of performance of tests : 29 Mar. 2013 ~02 Apr. 2013
Date of Issue : 02 Apr. 2013
Test Result : **Pass**

Testing Engineer : Eric Wang
 (Eric Wang)

Technical Manager : Jim He
 (Jim He)

Authorized Signatory : Brown Lu
 (Brown Lu)

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1. TEST SUMMARY

Test procedures according to the technical standards:

| EMC Emission | | | | |
|--------------------------------------|--------------------|---------|----------|--------|
| Standard | Test Item | Limit | Judgment | Remark |
| FCC Part15B:2013 ANSI C63.4: 2009 | Conducted Emission | Class B | N/A | |
| | Radiated Emission | Class B | PASS | |

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report
- (2) For client's request and manual description, the test will not be executed.

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC Registration Number:238937; IC Registration Number:9270A-1

CNAS Registration Number:L5516

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

A. Conducted Measurement :

| Test Site | Method | Measurement Frequency Range | U , (dB) | NOTE |
|-----------|--------|-----------------------------|----------|------|
| NTEKC01 | ANSI | 150 KHz ~ 30MHz | 3.2 | |

B. Radiated Measurement :

| Test Site | Method | Measurement Frequency Range | U , (dB) | NOTE |
|-----------|--------|-----------------------------|----------|------|
| NTEKA01 | ANSI | 30MHz ~ 1000MHz | 4.7 | |
| | | 1GHz ~6GHz | 5.0 | |

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| | | |
|--|--|-----|
| Equipment | Power Inverter | |
| Model Name | ZB-2000-S | |
| Serial No | NC-(150-6000)-M, NC-(150-6000)-MC, NC-(150-6000)-S, NC-(150-6000)-SC, ZB-(150-6000)-M, ZB-(150-6000)-MC, ZB-(150-6000)-S, ZB-(150-6000)-SC | |
| Model Difference | All models are identical except model names and power. | |
| Product Description | The EUT is a Power Inverter. | |
| | Operating frequency: | N/A |
| | Connecting I/O port: | N/A |
| Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual. | | |
| Power Source | AC Voltage | |
| Power Rating | Input: 12V/24V/48V--- | |
| | Output: 100-120V~ | |

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

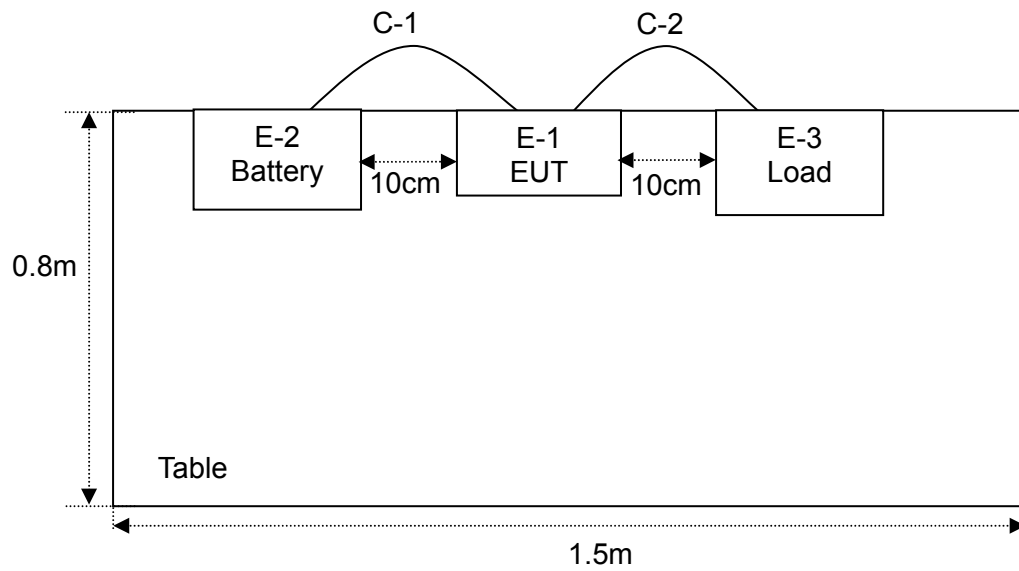
| Pretest Mode | Description |
|--------------|-------------|
| Mode 1 | Running |

| For Conducted Test | |
|--------------------|-------------|
| Final Test Mode | Description |
| Mode 1 | N/A |

| For Radiated Test | |
|-------------------|-------------|
| Final Test Mode | Description |
| Mode 1 | Running |

2.3 DESCRIPTION OF TEST SETUP

Mode:



2.4 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

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

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Note |
|------|----------------|-----------|----------------|------------|------|
| E-1 | Power Inverter | N/A | ZB-2000-S | N/A | EUT |
| E-2 | Battery | N/A | N/A | N/A | |
| E-3 | Load | N/A | N/A | N/A | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
| C-1 | NO | NO | 45cm | |
| C-2 | NO | NO | 200cm | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” means “shielded” “with core”; “NO” means “unshielded” “without core”.

2.5 MEASUREMENT INSTRUMENTS LIST

2.5.1 CONDUCTED TEST SITE

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-----------------------|--------------|------------|------------|------------------|
| 1 | LISN | R&S | ENV216 | 101313 | Jul. 06, 2013 |
| 2 | LISN | SCHWARZBECK | NNLK 8129 | 8129245 | Dec. 25, 2013 |
| 3 | Pulse Limiter | SCHWARZBECK | VTSD 9561F | 9716 | Dec. 25, 2013 |
| 4 | 50Ω Switch | ANRITSU CORP | MP59B | 6200983704 | Jul. 06, 2013 |
| 5 | Test Cable | N/A | C01 | N/A | Jul. 06, 2013 |
| 6 | Test Cable | N/A | C02 | N/A | Jul. 06, 2013 |
| 7 | Test Cable | N/A | C03 | N/A | Jul. 06, 2013 |
| 8 | EMI Test Receiver | R&S | ESCI | 101160 | Jul. 06, 2013 |
| 9 | Passive Voltage Probe | ESH2-Z3 | R&S | 100196 | Jul. 06, 2013 |
| 10 | Triple-Loop Antenna | EVERFINE | LIA-2 | 11020003 | Jul. 06, 2013 |
| 11 | Absorbing Clamp | R&S | MDS-21 | 100423 | Jul. 08, 2013 |

2.5.2 RADIATED TEST SITE

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|-----------------|------------|------------------|
| 1 | Bilog Antenna | TESEQ | CBL6111D | 31216 | Jul. 06, 2013 |
| 2 | Test Cable | N/A | R-01 | N/A | Jul. 06, 2013 |
| 3 | Test Cable | N/A | R-02 | N/A | Jul. 06, 2013 |
| 4 | EMI Test Receiver | R&S | ESCI-7 | 101318 | Jul. 06, 2013 |
| 5 | Antenna Mast | EM | SC100_1 | N/A | N/A |
| 6 | Turn Table | EM | SC100 | 060531 | N/A |
| 7 | 50Ω Switch | Anritsu Corp | MP59B | 6200983705 | Jul. 06, 2013 |
| 8 | Spectrum Analyzer | Aglient | E4407B | MY45108040 | Jul. 06. 2013 |
| 9 | Horn Antenna | EM | EM-AH-1018 0 | 2011071402 | Jul. 06. 2013 |
| 10 | Amplifier | EM | EM-30180 | 060538 | Jul. 06. 2013 |

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

| FREQUENCY (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|-----------------|----------------|---------|----------------|-----------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 -0.5 | 79.00 | 66.00 | 66 - 56 * | 56 - 46 * |
| 0.50 -5.0 | 73.00 | 60.00 | 56.00 | 46.00 |
| 5.0 -30.0 | 73.00 | 60.00 | 60.00 | 50.00 |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

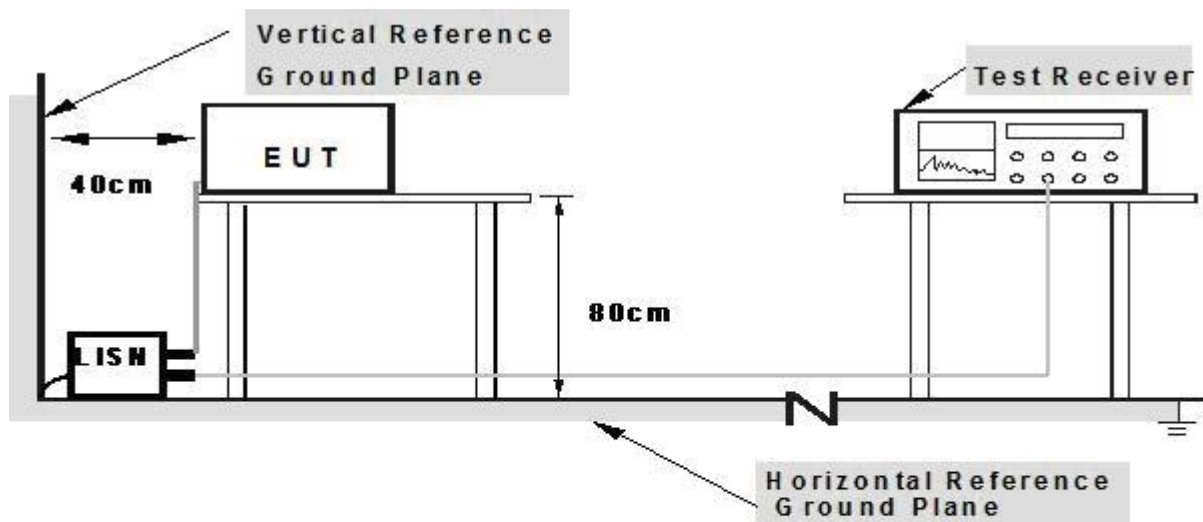
The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---------------------|----------|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.1.5 TEST RESULTS

| | | | |
|----------------|----------------|---------------------|-----------|
| EUT : | Power Inverter | Model Name. : | ZB-2000-S |
| Temperature : | 26 °C | Relative Humidity : | 54% |
| Pressure : | 1010hPa | Test Date : | N/A |
| Test Mode : | N/A | Phase : | N/A |
| Test Voltage : | N/A | | |

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

| FREQUENCY (MHz) | Class A (at 10m) | Class B (at 3m) |
|-----------------|------------------|-----------------|
| | dBuV/m | dBuV/m |
| 30 ~ 88 | 39.0 | 40.0 |
| 88 ~ 216 | 43.5 | 43.5 |
| 216 ~ 960 | 46.5 | 46.0 |
| Above 960 | 49.5 | 54.0 |

Notes:

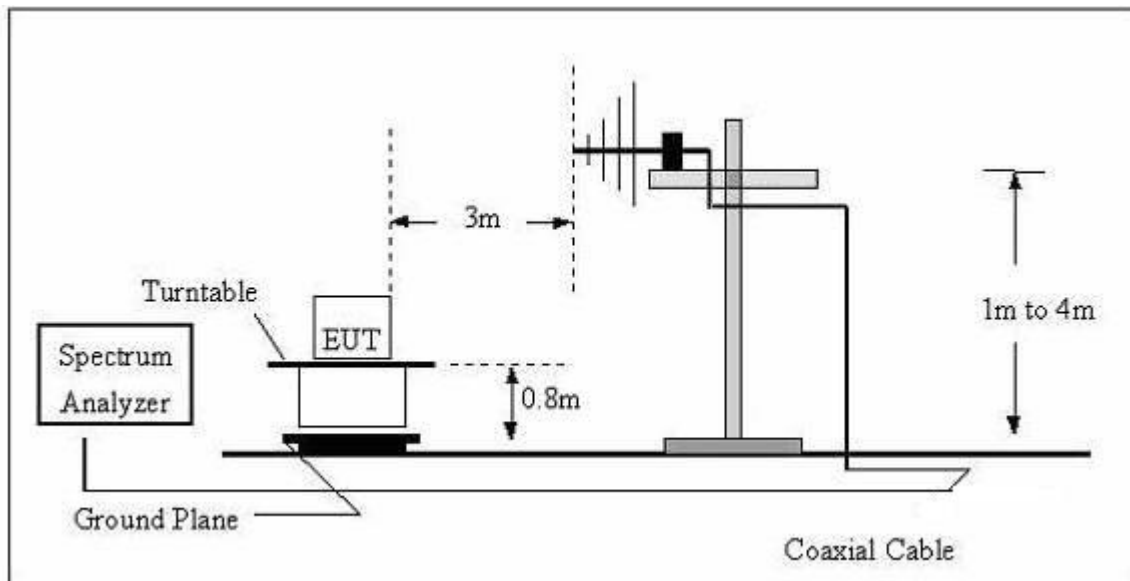
- (1) The limit for radiated test was performed according to as following:
FCC PART 15B /ICES-003.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.2.2 TEST PROCEDURE

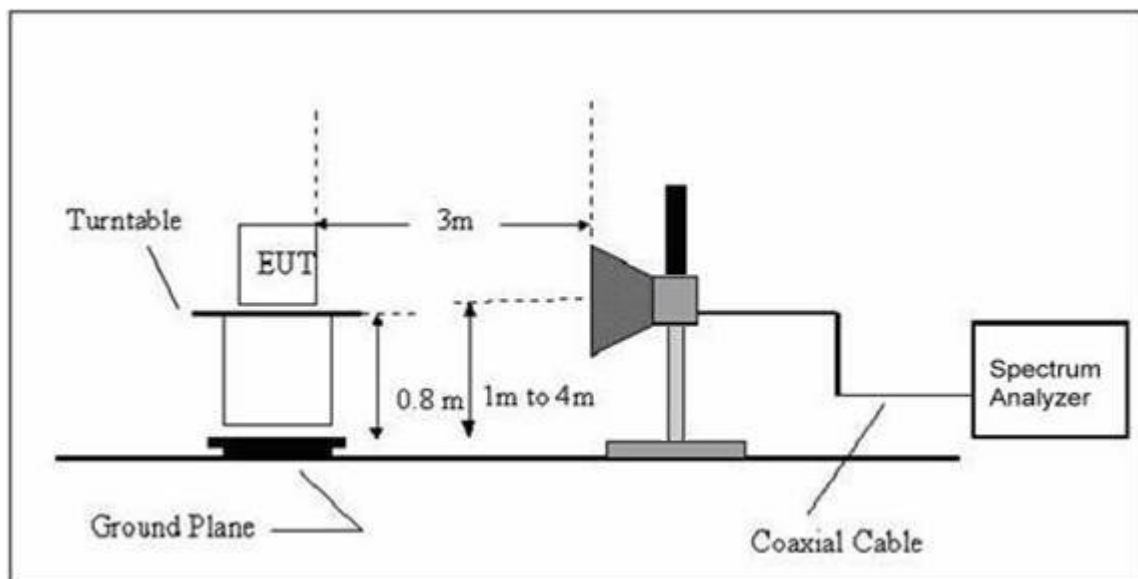
- a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.3 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1GHz



3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

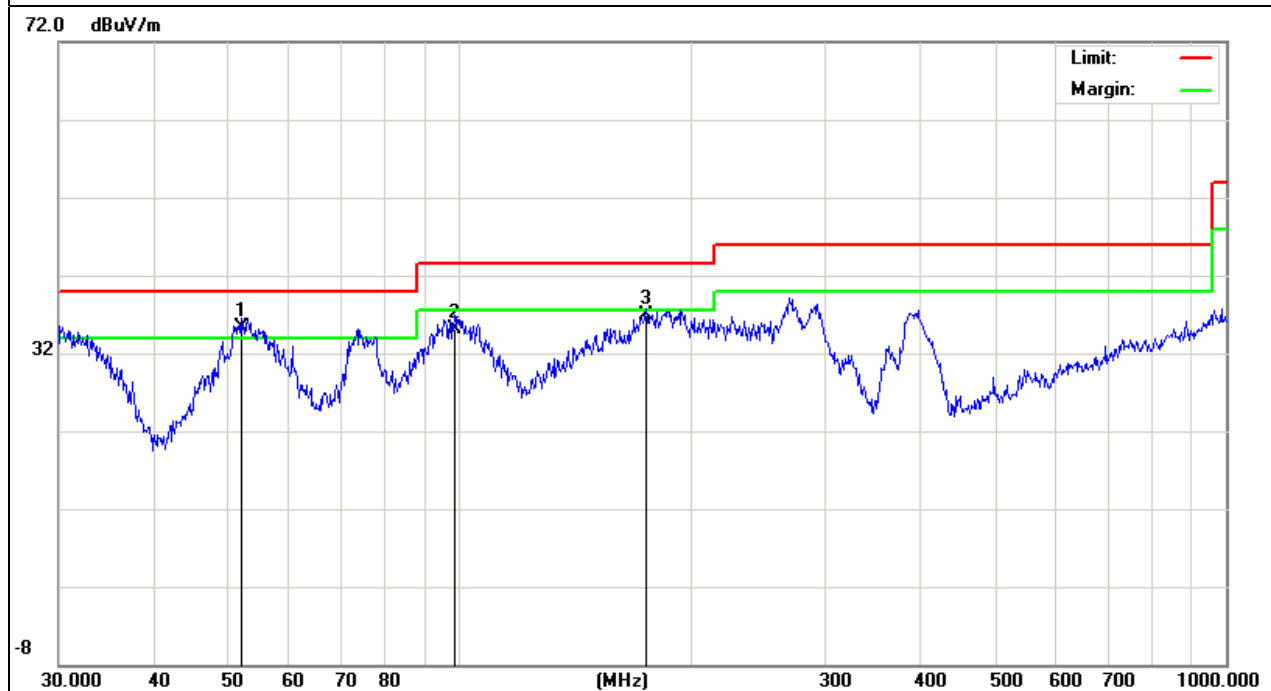
3.2.5 TEST RESULTS

| | | | |
|---------------|----------------|---------------------|------------|
| EUT : | Power Inverter | Model Name : | ZB-2000-S |
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Test Date : | 2013-04-02 |
| Test Mode : | Running | Polarization : | Horizontal |
| Test Power : | DC 12V | | |

| Freq. (MHz) | Reading (dBuV) | Factor (dBuV) | Measurement (dBuV) | Limit (dBuV) | Over (dB) | Detector |
|----------------|-------------------|------------------|-----------------------|-----------------|--------------|----------|
| 51.8430 | 27.86 | 7.43 | 35.29 | 40.00 | -4.71 | QP |
| 98.4865 | 24.65 | 10.45 | 35.10 | 43.50 | -8.40 | QP |
| 175.0367 | 26.80 | 10.08 | 36.88 | 43.50 | -6.62 | QP |

Remark:

Factor = Antenna Factor + Cable Loss.

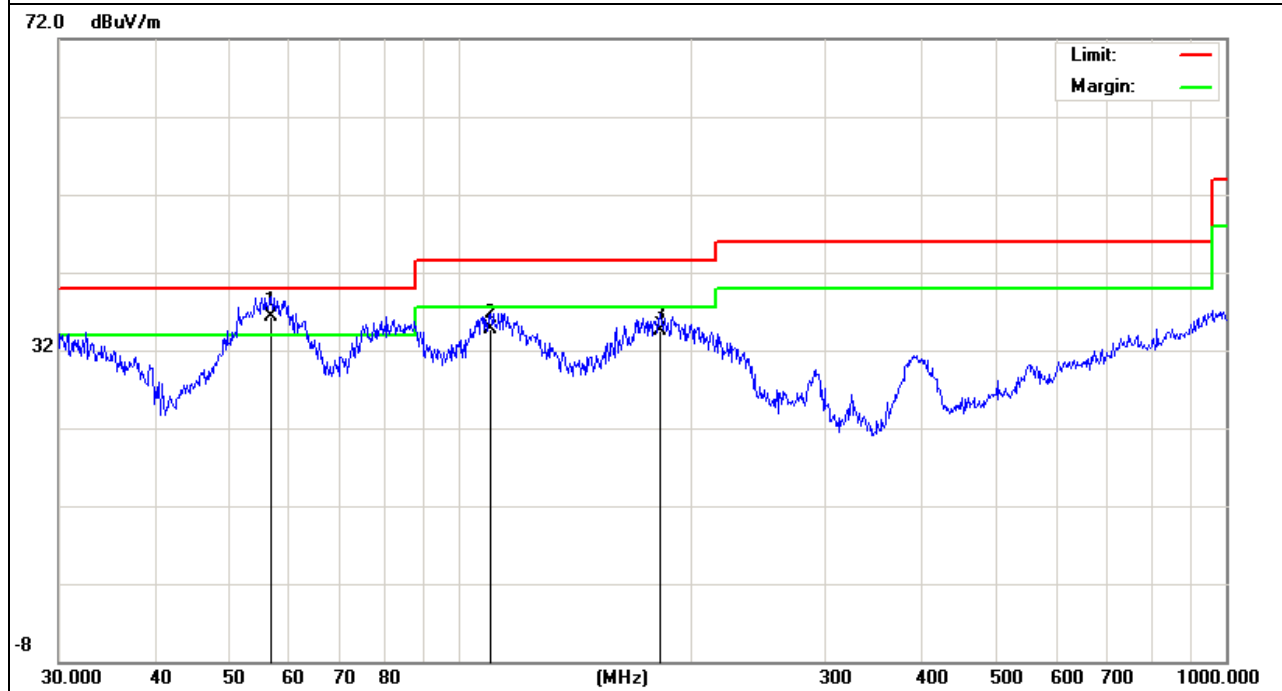


| | | | |
|---------------|----------------|---------------------|------------|
| EUT : | Power Inverter | Model Name : | ZB-2000-S |
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Test Date : | 2013-04-02 |
| Test Mode : | Running | Polarization : | Vertical |
| Test Power : | DC 12V | | |

| Freq. (MHz) | Reading (dBuV) | Factor (dBuV) | Measurement (dBuV) | Limit (dBuV) | Over (dB) | Detector |
|----------------|-------------------|------------------|-----------------------|-----------------|--------------|----------|
| 56.7916 | 30.55 | 5.83 | 36.38 | 40.00 | -3.62 | QP |
| 109.7960 | 23.19 | 11.61 | 34.80 | 43.50 | -8.70 | QP |
| 182.5592 | 24.73 | 9.87 | 34.60 | 43.50 | -8.90 | QP |

Remark:

Factor = Antenna Factor + Cable Loss.

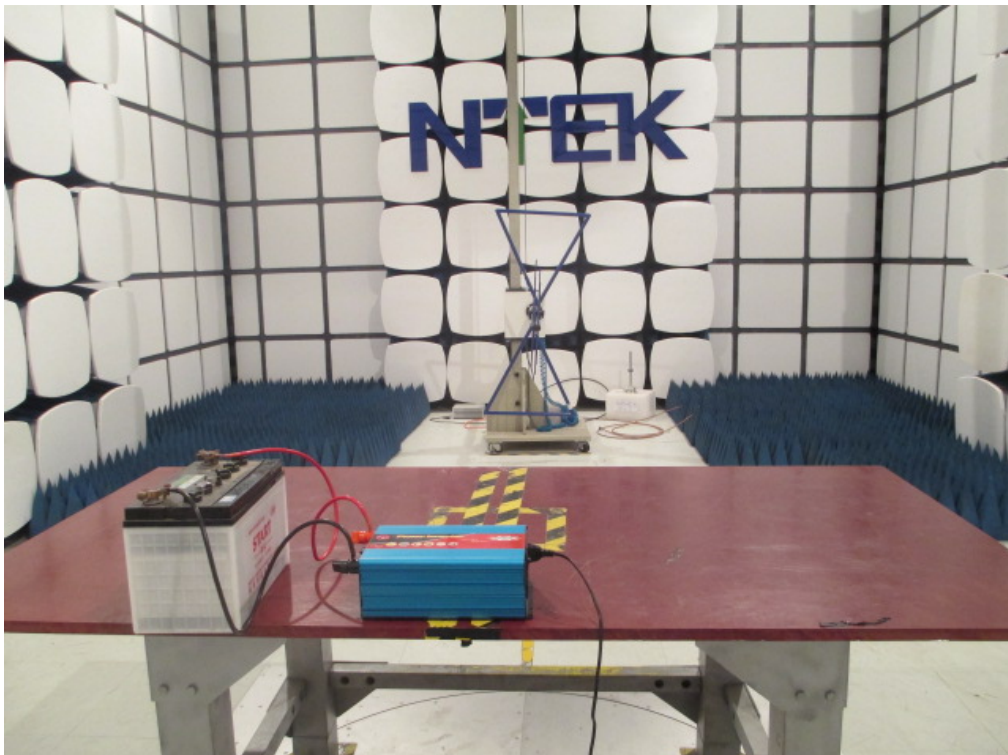
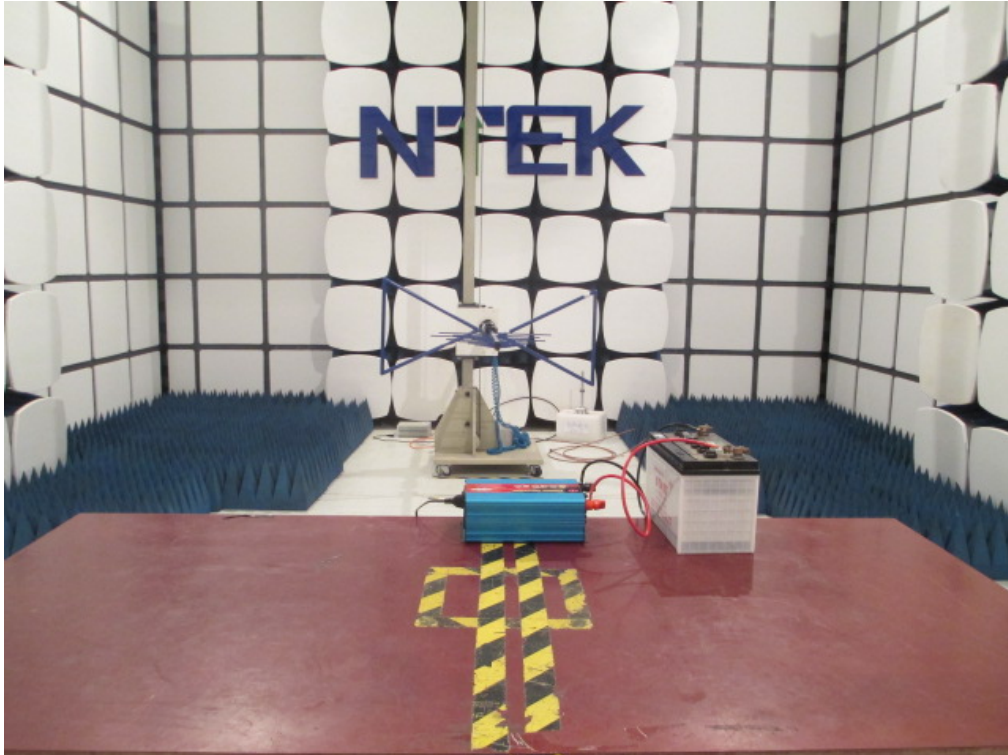


3.2.6 TEST RESULTS(Above 1GHz)

| | | | |
|---------------|----------------|---------------------|-----------|
| EUT : | Power Inverter | Model Name : | ZB-2000-S |
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Test Date : | N/A |
| Test Mode : | N/A | | |
| Test Power : | N/A | | |

4. EUT TEST PHOTO

Radiated Measurement Photos



ATTACHMENT PHOTOGRAPHS OF EUT

Photo 1



Photo 2

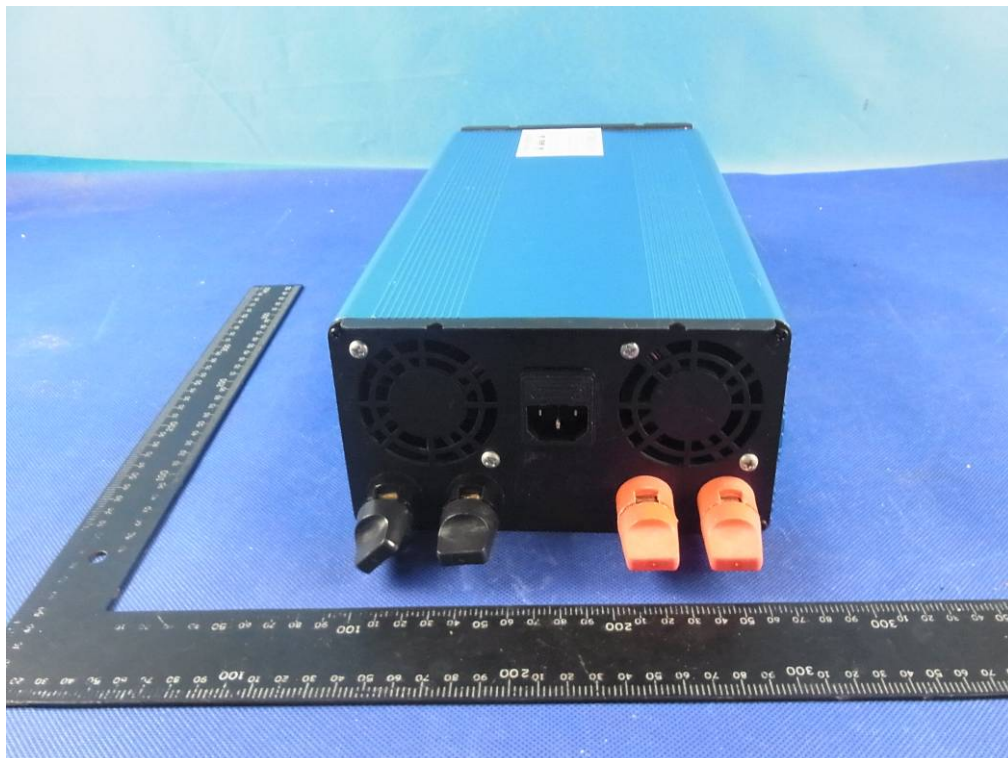


Photo 3



Photo 4



Photo 5

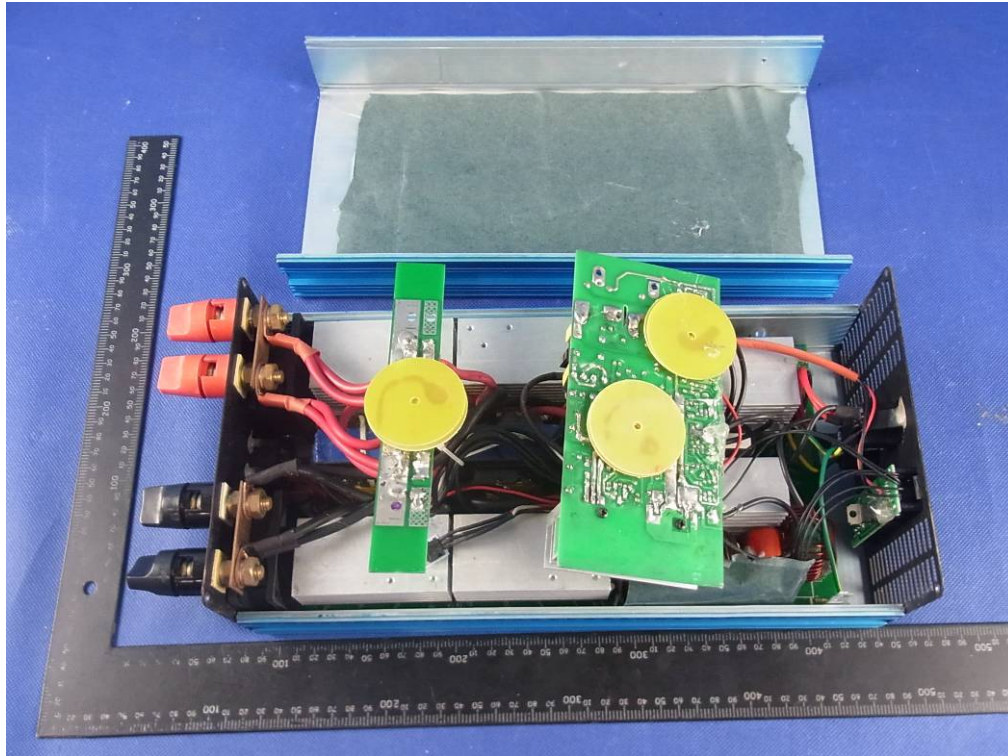


Photo 6

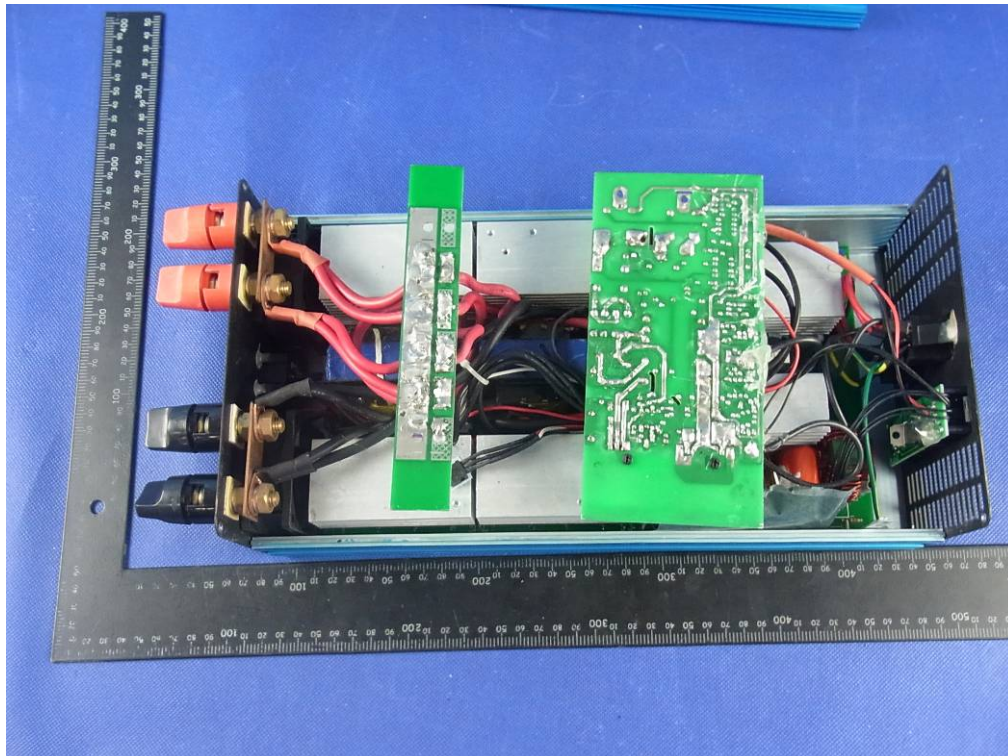


Photo 7

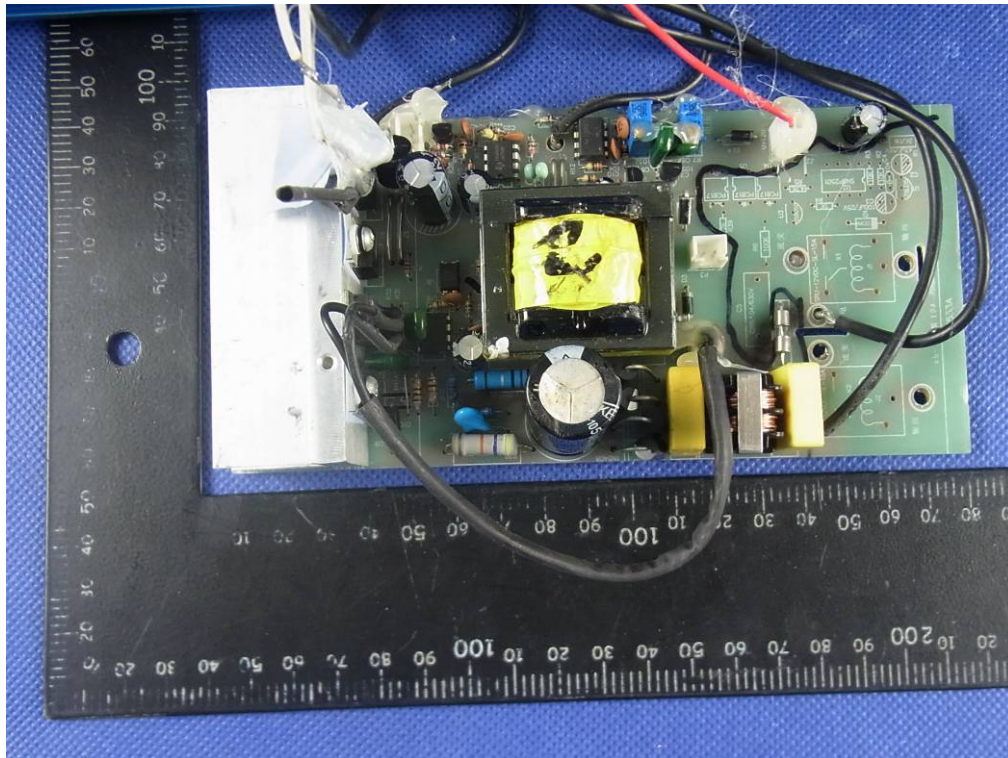


Photo 8

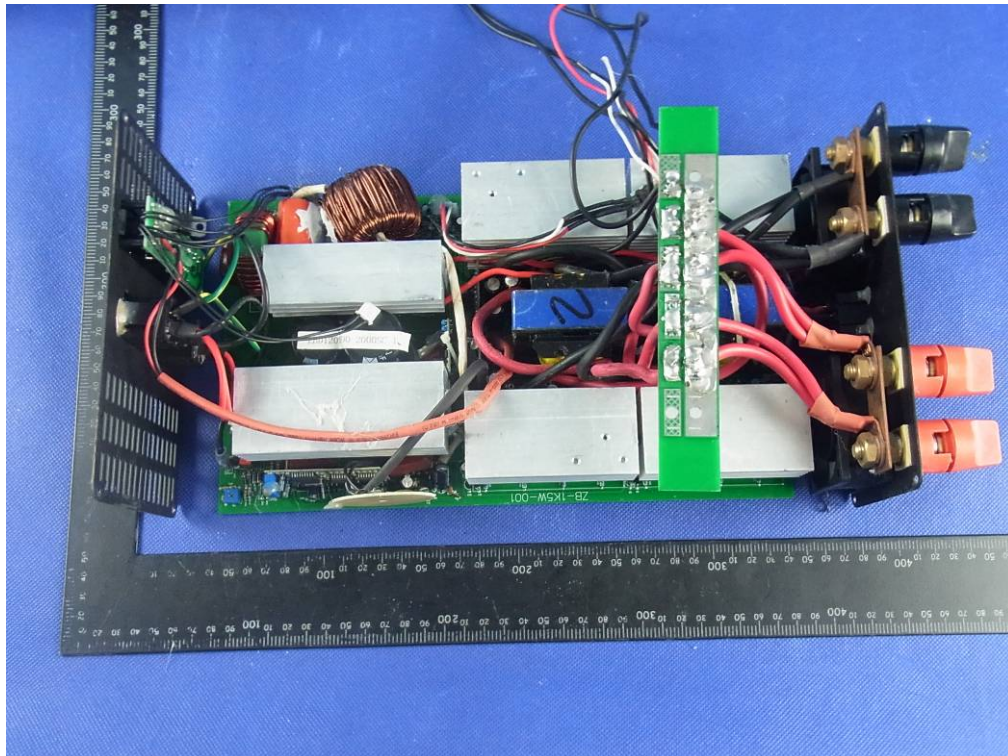


Photo 9

