

# TEST REPORT

Report No.: BCTC2406815022E

Applicant: Beijing Yihongtai Technology Development Co., Ltd.

Product Name: DC/DC CONVERTER

Test Model: WHD100-24S12

Tested Date: 2024-06-12 to 2024-06-18

Issued Date: 2024-07-24

**Shenzhen BCTC Technology Co., Ltd.**



Product Name: DC/DC CONVERTER

Trademark: 

Model/Type Reference: WHD100-24S12, WHD75-24S24, WHD100-48S48, WHD80-48S20, WHD50-48S08, WHD50-48S05

Prepared For: Beijing Yihongtai Technology Development Co., Ltd.

Address: Building 9, No. 1 Gaolizhang Road, Haidian District, Beijing, China

Manufacturer: Beijing Yihongtai Technology Development Co., Ltd.

Address: Building 9, No. 1 Gaolizhang Road, Haidian District, Beijing, China

Prepared By: Shenzhen BCTC Technology Co., Ltd.

Address: 101M., Unit 1, Building 1, Pengyuan, No. 18, Lilang Road, Shanglilang Community, Nanwan Street, Longgang District, Shenzhen, Guangdong, China

Sample Received Date: 2024-06-12

Sample Tested Date: 2024-06-12 to 2024-06-18

Report No.: BCTC2406815022E

Test Standards: EN 55032:2015/A1:2020, EN 55035:2017/A11:2020

Test Results: PASS

Tested by:

*Sisi Yuan*

Sisi Yuan/ Project Handler

Approved by:

*Sewen Guo*

Sewen Guo/Reviewer

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1. Version

Report No.	Issue Date	Description	Approved
BCTC2406815022E	2024-07-24	Original	Valid

TECHNICAL  
STANDARD  
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## 2. Test Summary

The Product has been tested according to the following specifications:

EMISSION		
Standard	Test Item	Test result
EN 55032	Conducted emissions from the AC mains power ports	N/A <sup>3</sup>
EN 55032	Asymmetric mode conducted emissions	N/A <sup>3</sup>
EN 55032	Conducted differential voltage emissions	N/A <sup>3</sup>
EN 55032	Radiated emissions	Pass
EN IEC 61000-3-2	Harmonic current emission(H)	N/A <sup>3</sup>
EN 61000-3-3	Voltage fluctuations & flicker(F)	N/A <sup>3</sup>

IMMUNITY (EN 55035)		
Standard	Test Item	Test result
EN 55035	Electrostatic discharge (ESD)	Pass
EN 55035	Continuous RF electromagnetic field disturbances(RS)	Pass <sup>#</sup>
EN 55035	Electrical fast transients/burst (EFT)	N/A <sup>3</sup>
EN 55035	Surges	N/A <sup>3</sup>
EN 55035	Continuous induced RF disturbances (CS)	N/A <sup>3</sup>
EN 55035	Broadband impulse noise disturbances, repetitive	N/A <sup>3</sup>
EN 55035	Broadband impulse noise disturbances, isolated	N/A <sup>3</sup>
EN 55035	Power frequency magnetic field (PFMF)	N/A <sup>2</sup>
EN 55035	Voltage dips and interruptions (DIPS)	N/A <sup>3</sup>

Remark:

N/A is an abbreviation for not applicable.

1. “#” indicates the testing item(s) was (were) fulfilled by Shenzhen BCTC Testing Co., Ltd.
2. The Product doesn't contain any device susceptible to magnetic fields.
3. The EUT is powered by the DC only, the test item is not applicable

### 3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

	Value (dB)
Disturbance voltages (9KHz-150KHz)	3.50
Disturbance voltages (150KHz-30MHz)	3.20
Radiated disturbance (30MHz-200MHz)	4.60
Radiated disturbance (200MHz-1000MHz)	5.20
Radiated disturbance (1GHz -6GHz)	5.30
Radiated disturbance (6GHz -18GHz)	5.50

## 4. Product Information and Test Setup

### 4.1 Product Information

<b>Ratings:</b>	Input: DC 24V,100W,14.5A,MAX Output: DC 12V/8.33A
<b>The highest frequency of the internal sources of the EUT:</b>	<input checked="" type="checkbox"/> less than 108 MHz, the measurement shall only be made up to 1 GHz. <input type="checkbox"/> between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. <input type="checkbox"/> between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. <input type="checkbox"/> above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.
<b>Model differences:</b>	The following models of our production units are identical in circuit and electrical, mechanical and physical construction; The difference is only in appearance color and model name. We finally have WHD100-24S12 as the test model.

### 4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

### 4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Data Cable	Power Cord
1.	Battery	---	57069	---	---	---

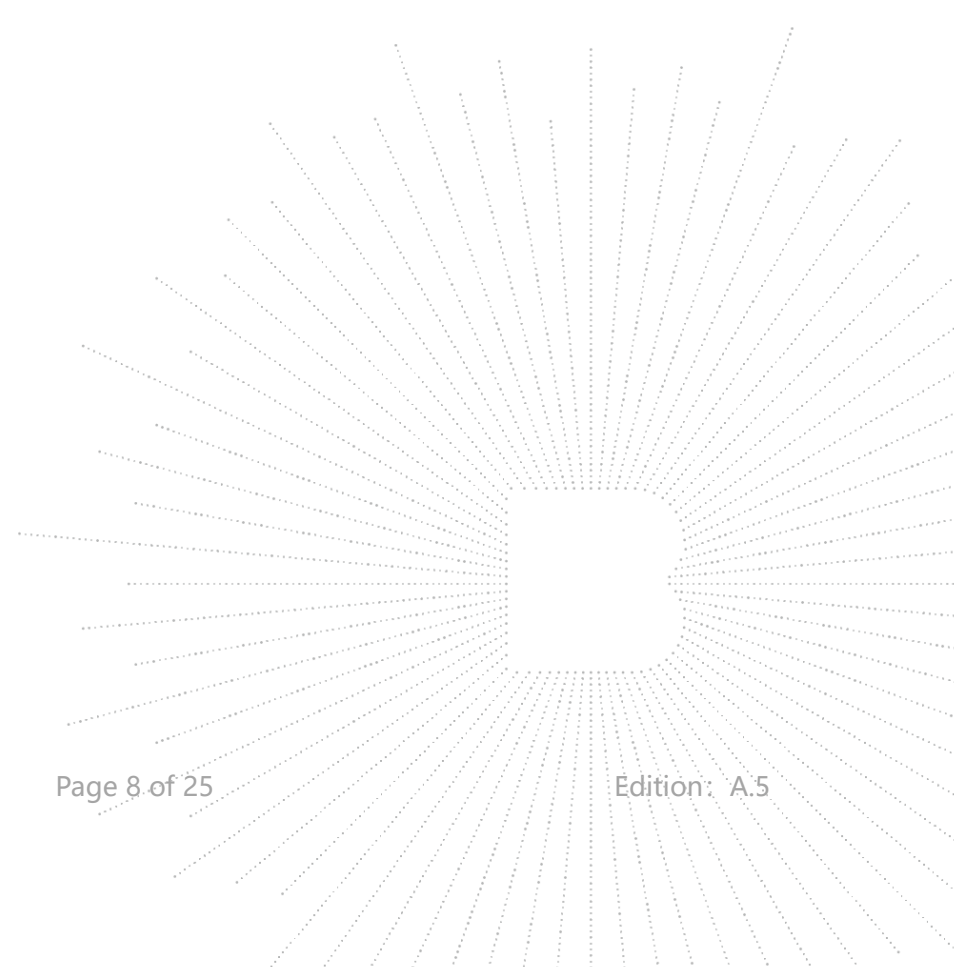
#### Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

#### 4.4 Test Mode

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test item	Test Mode	Test Voltage
Radiated emissions(30MHz-1GHz) Class B	Working	DC 24V
Electrostatic discharge (ESD) B <input checked="" type="checkbox"/> Air Discharge: $\pm 8\text{kV}$ <input checked="" type="checkbox"/> Contact Discharge: $\pm 4\text{kV}$ <input checked="" type="checkbox"/> HCP & VCP: $\pm 4\text{kV}$ 10 times each point	Working	DC 24V
Continuous RF electromagnetic field disturbances(RS) A 80MHz-1000MHz, 1800MHz, 2600MHz,3500MHz,5000MHz 3V/m,80% AM Front, Rear, Left, Right H/V	Working	DC 24V



## 5. Test Facility and Test Instrument Used

### 5.1 Test Facility

All measurement facilities used to collect the measurement data are located:

Shenzhen BCTC Technology Co., Ltd.

Address: 101M., Unit 1, Building 1, Pengyuan, No. 18, Lilang Road, Shanglilang Community, Nanwan Street, Longgang District, Shenzhen, Guangdong, China.

Shenzhen BCTC Testing Co., Ltd.

Address: 1-2/F., Building B, Pengzhou Industrial Park, No. 158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China.

The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

### 5.2 Test Instrument Used

Radiated disturbance					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Broadband antenna	SCHWHRZBECK	VULB9168	227	Sep. 21, 2023	Sep. 20, 2024
Receiver	R&S	ESR	1316	Sep. 21, 2023	Sep. 20, 2024
Preamplifier	SCHWHRZBECK	BBV9745	370	Sep. 21, 2023	Sep. 20, 2024
Horn antenna	SCHWARZBECK	BBHA 9120 D	2792	Sep. 19, 2023	Sep. 18, 2024
Preamplifier	EMC INSTRUMENTS CORPORATION	EMC0518A45SEE	EMT-SZ2 233	Sep. 6, 2023	Sep. 5, 2024
RF cable 3#	/	9M	18038626	Sep. 21, 2023	Sep. 20, 2024
RF cable 4#	SKET	5M	#10	Sep. 21, 2023	Sep. 20, 2024
RF cable 5#	/	10M	/	Sep. 21, 2023	Sep. 20, 2024
RF cable 6#	/	3M	/	Sep. 21, 2023	Sep. 20, 2024
Software	EZ-EMC	Ver.FA-03A2	/	/	/

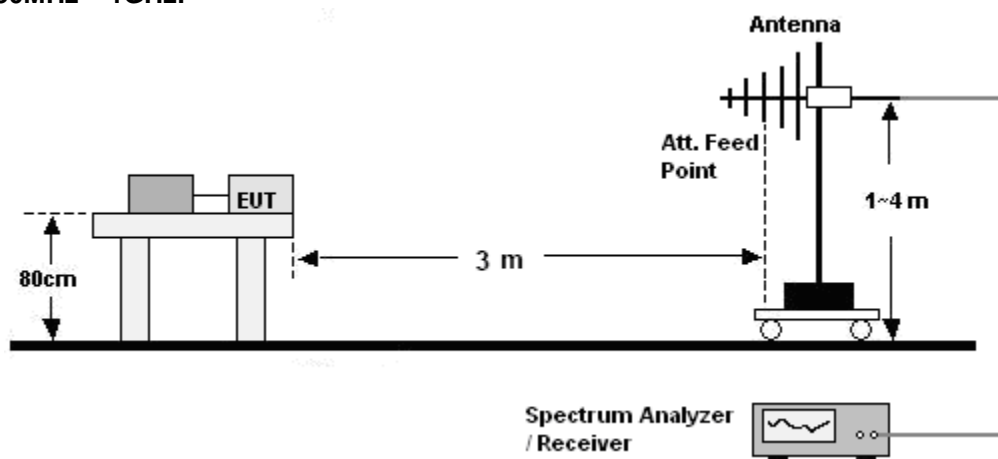
Electrostatic discharge Test					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Electrostatic discharge generator	3C TEST	EDS 30V	ES0121614	Sep. 11, 2023	Sep. 10, 2024

Continuous RF Electromagnetic Field Disturbances Test (Shenzhen BCTC Testing Co., Ltd.)					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Power meter	Keysight	E4419	A00065	May 16, 2024	May 15, 2025
Power sensor	Keysight	E9300A	US39211659	May 16, 2024	May 15, 2025
Power sensor	Keysight	E9300A	US39211305	May 16, 2024	May 15, 2025
Amplifier	SKET	HAP_801000-250W	21201805013	May 16, 2024	May 15, 2025
Amplifier	SKET	HAP_0103-75W	21201805014	May 16, 2024	May 15, 2025
Amplifier	SKET	HAP_0306-50W	21201805015	May 16, 2024	May 15, 2025
Stacked double Log.-Per. Antenna	Schwarzbeck	STLP 9129	00077	\	\
Field Probe	Narda	EP-601	611WX80256	May 16, 2024	May 15, 2025
Signal Generator	Agilent	N5181A	MY50143748	May 16, 2024	May 15, 2025
Software	SKET	EMC-S	1.2.0.18	\	\

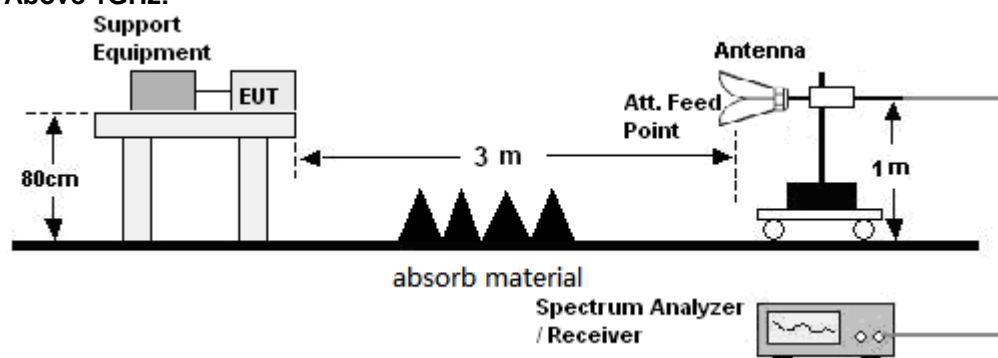
## 6. Radiated Emissions test

### 6.1 Block Diagram Of Test Setup

30MHz ~ 1GHz:



Above 1GHz:



### 6.2 Limits

Limits for radiated disturbance of Class B MME

Frequency (MHz)	Quasi-peak limits at 3m dB( $\mu$ V/m)	
30-230	40	
230-1000	47	
Frequency (GHz)	limit above 1G at 3m dB( $\mu$ V/m)	
	Average	peak
1-6	54	74

**Note:** The lower limit shall apply at the transition frequencies.

### 6.3 Test Procedure

#### 30MHz ~ 1GHz:

- a. The Product was placed on the nonconductive turntable 0.8m above the ground in a semi anechoic chamber.
- b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

#### Above 1GHz:

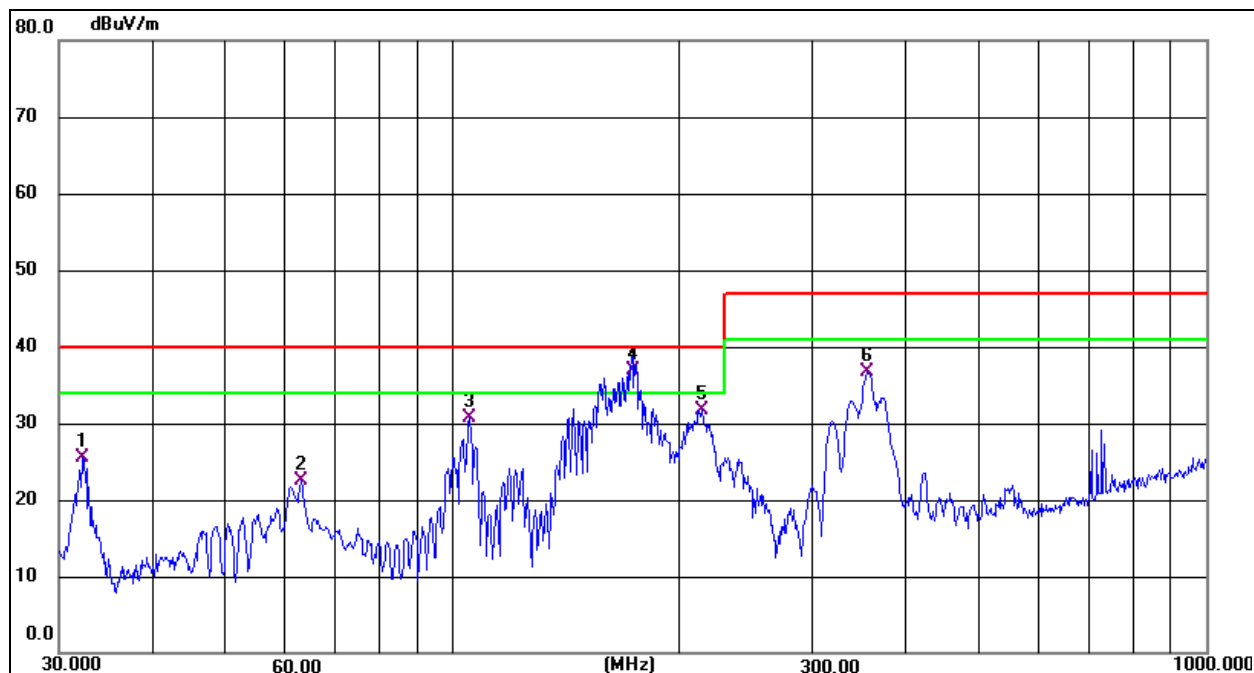
- a. The Product was placed on the non-conductive turntable 0.8 m above the ground in a full anechoic chamber..
- b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

#### Above 1GHz

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

## 6.4 Test Results

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Phase:	Horizontal
Test Voltage :	DC 24V	Test Mode:	Working

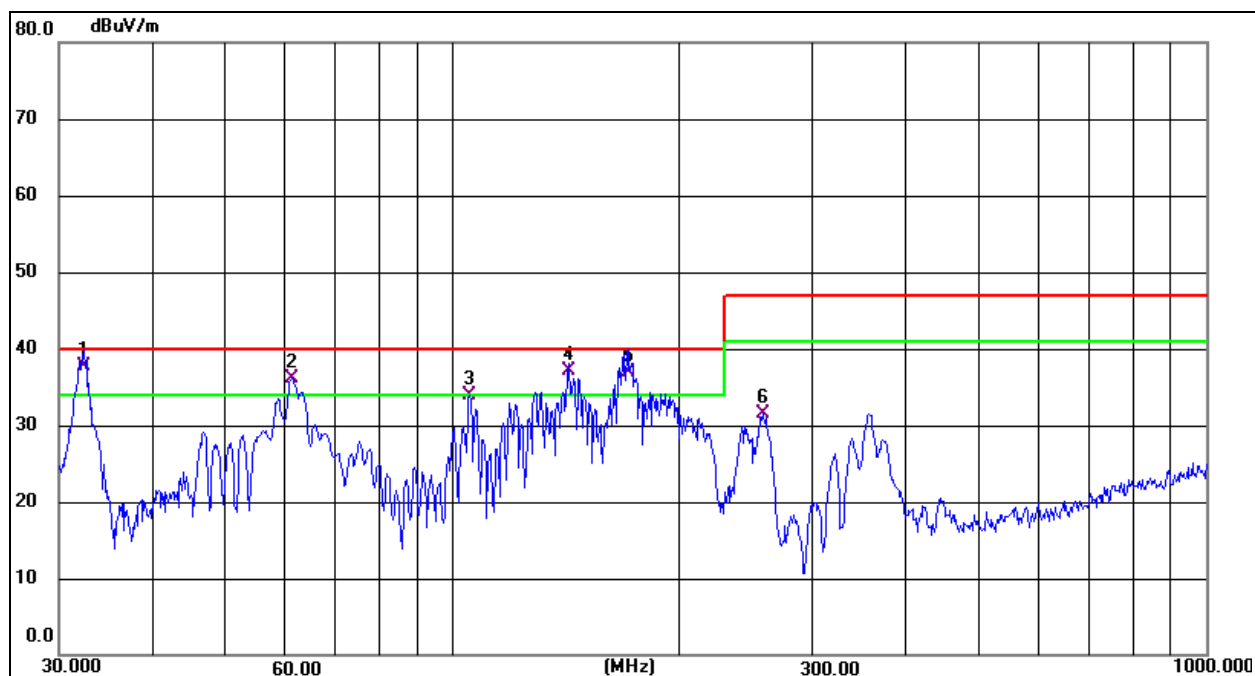


Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.1795	43.40	-17.85	25.55	40.00	-14.45	QP
2	62.8708	40.19	-17.65	22.54	40.00	-17.46	QP
3	105.2718	48.88	-18.20	30.68	40.00	-9.32	QP
4 *	173.2050	52.74	-15.84	36.90	40.00	-3.10	QP
5	213.7634	48.81	-17.03	31.78	40.00	-8.22	QP
6	354.1831	48.45	-11.80	36.65	47.00	-10.35	QP

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Phase:	Vertical
Test Voltage :	DC 24V	Test Mode:	Working



Remark:

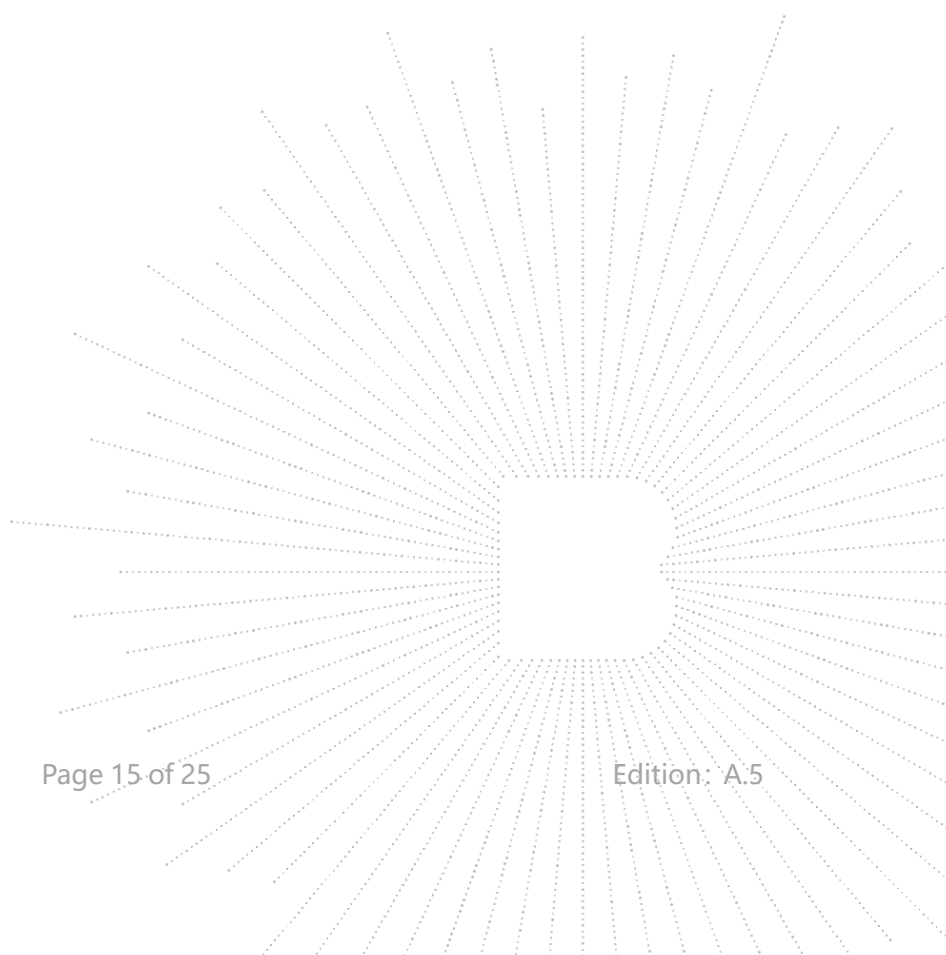
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	32.4059	55.63	-17.83	37.80	40.00	-2.20	QP
2 !	61.1316	53.41	-17.36	36.05	40.00	-3.95	QP
3	105.2718	52.04	-18.20	33.84	40.00	-6.16	QP
4 !	142.3243	52.22	-15.02	37.20	40.00	-2.80	QP
5 !	170.7926	52.59	-15.69	36.90	40.00	-3.10	QP
6	258.3264	46.78	-15.31	31.47	47.00	-15.53	QP

## 7. Immunity Test Of General the Performance Criteria

Product Standard	EN 55035:2017/A11:2020 clause 5
<b>CRITERION A</b>	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state 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.
<b>CRITERION B</b>	During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, 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), or recovery time, 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.
<b>CRITERION C</b>	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. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

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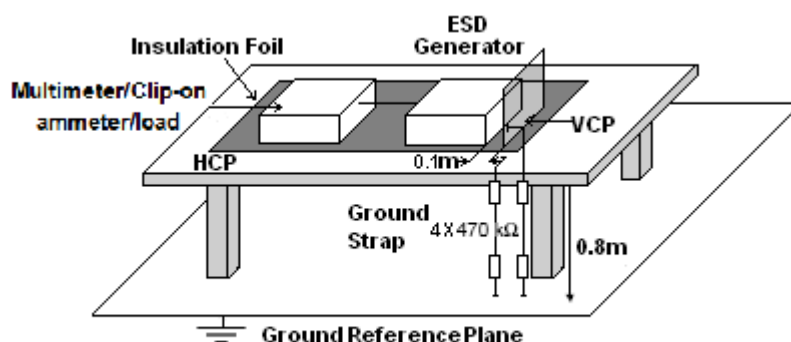


## 8. Electrostatic Discharge (ESD)

## 8.1 Test Specification

<b>Basic standard</b>	: IEC 61000-4-2
<b>Test Port</b>	: Enclosure port
<b>Discharge Impedance</b>	: 330 ohm / 150 pF
<b>Discharge Mode</b>	: Single Discharge
<b>Discharge Period</b>	: one second between each discharge

## 8.2 Block Diagram of Test Setup



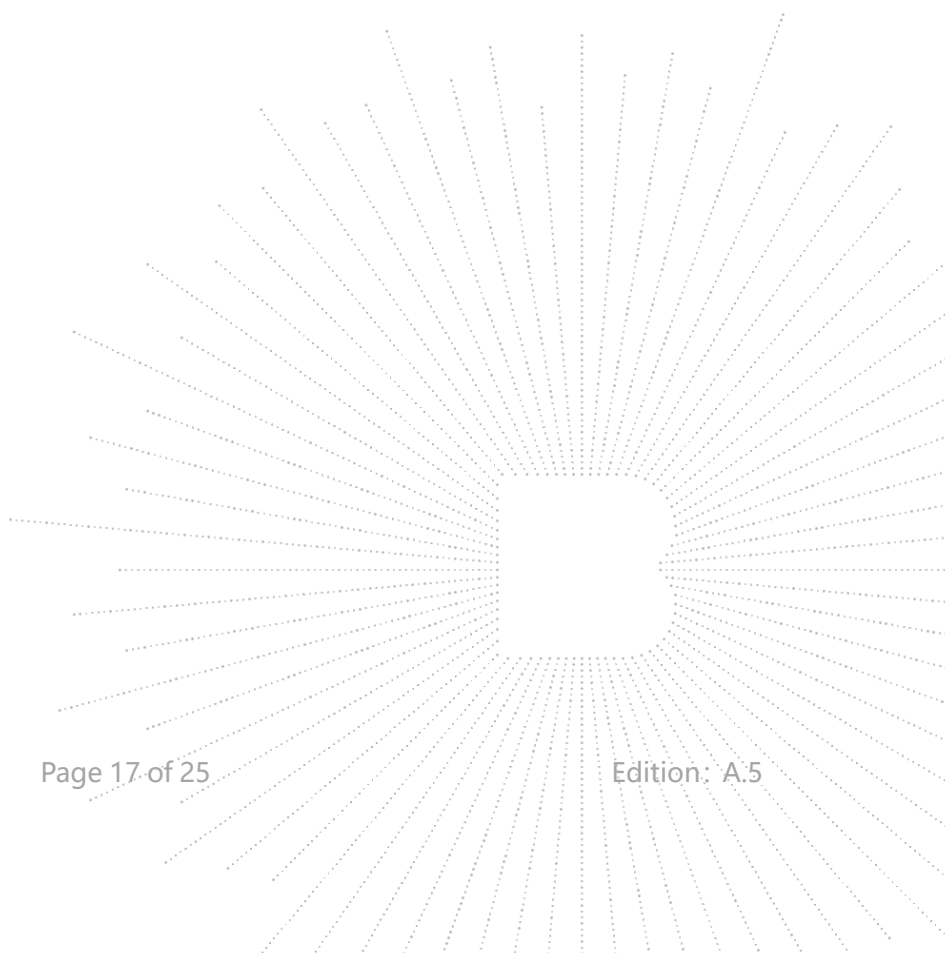
### 8.3 Test Procedure

- a. Electrostatic discharges were applied only to those points and surfaces of the Product that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the Product.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the Product as fast as possible (without causing mechanical damage) to touch the Product. After each discharge, the ESD generator was removed from the Product and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the Product were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the Product.

#### 8.4 Test Results

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Mode:	Working
Test Voltage :	DC 24V		

Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Required Level	Performance Criterion
Contact Discharge	Conductive Surfaces	4	10	B	A
	Indirect Discharge HCP	4	10	B	A
	Indirect Discharge VCP	4	10	B	A
Air Discharge	Gap and Insulating Surfaces	8	10	B	A
Note*: N/A					



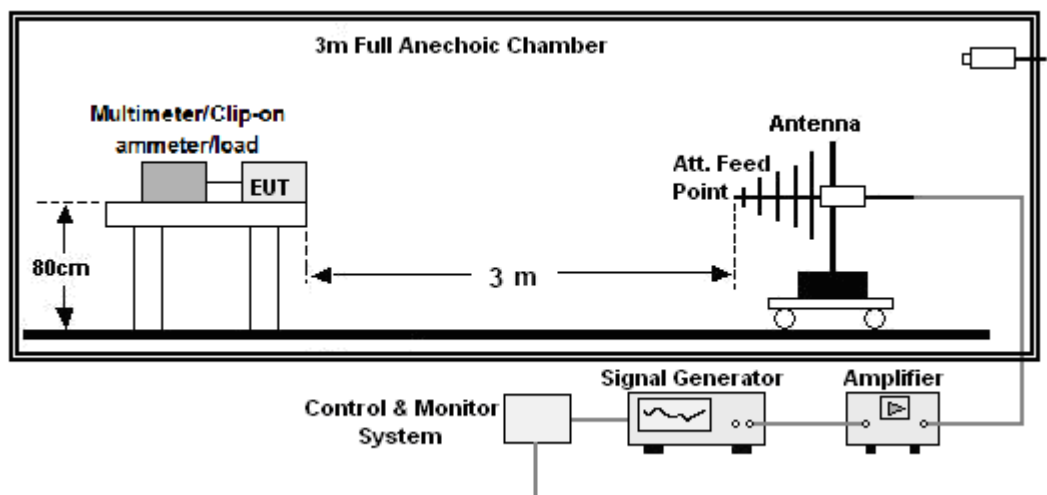
## 9. Continuous RF Electromagnetic Field Disturbances (RS)

### 9.1 Test Specification

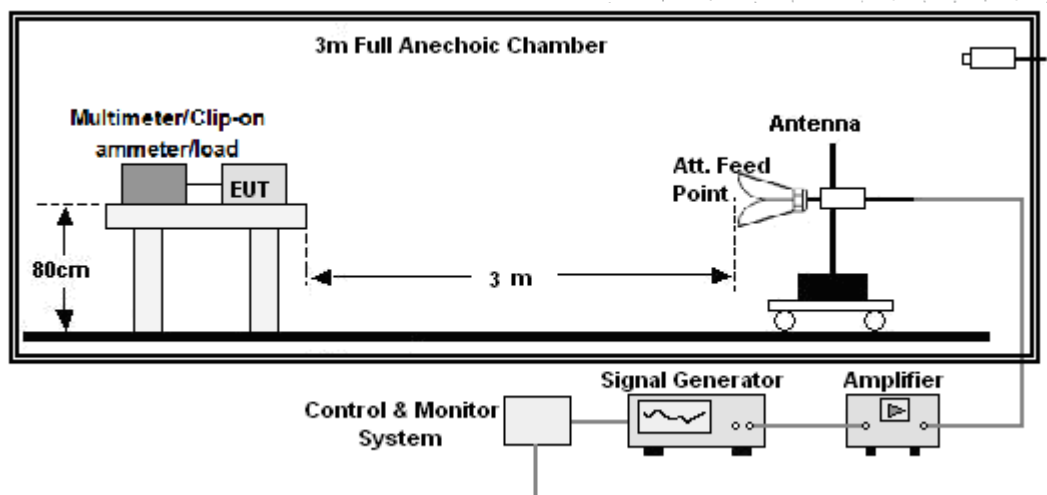
<b>Basic standard</b>	: IEC 61000-4-3
<b>Test Port</b>	: Enclosure port
<b>Step Size</b>	: 1%
<b>Modulation</b>	: 1kHz, 80% AM
<b>Dwell Time</b>	: 1 second
<b>Polarization</b>	: Horizontal & Vertical

### 9.2 Block Diagram of Test Setup

Below 1GHz:



Above 1GHz:



### 9.3 Test Procedure

- a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.
- b. The frequency range is swept from 80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave, and the step size was 1%.
- c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond, but should not exceed 5 s at each of the frequencies during the scan.
- d. The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.
- e. For Broadcast reception function: Group 2 not apply in this test.

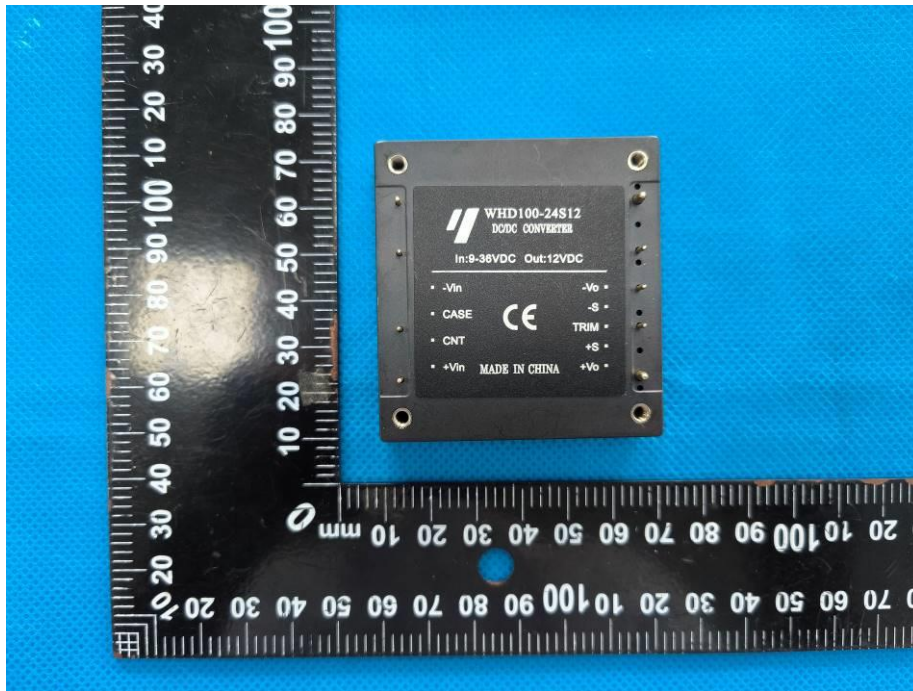
### 9.4 Test Results

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Mode:	Working
Test Voltage :	DC 24V		

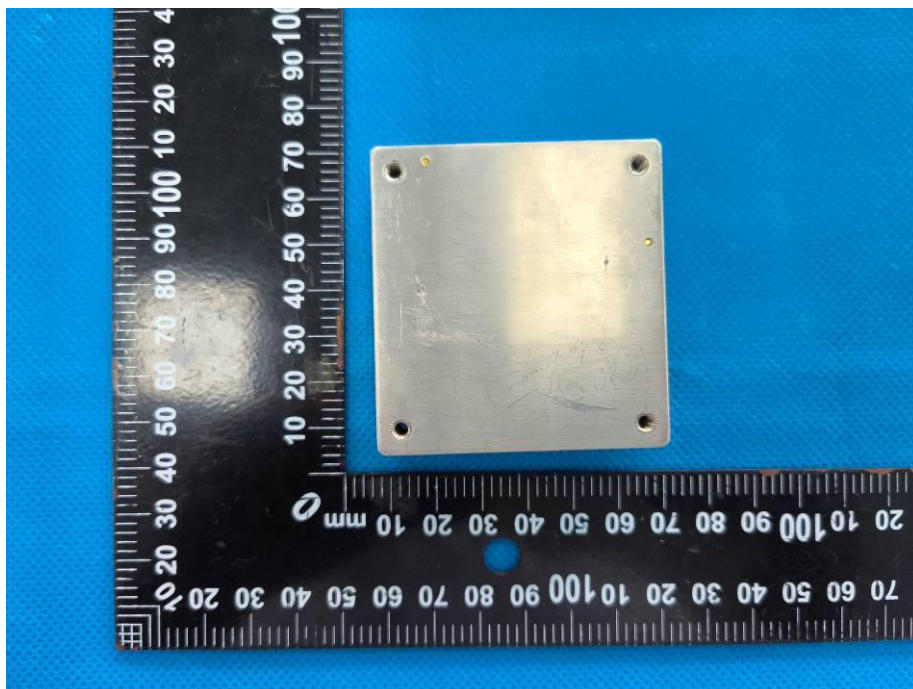
Frequency	Position	Field Strength (V/m)	Required Level	Performance Criterion
80 - 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz	Front, Right, Back, Left	3	A	A

## 10. EUT Photographs

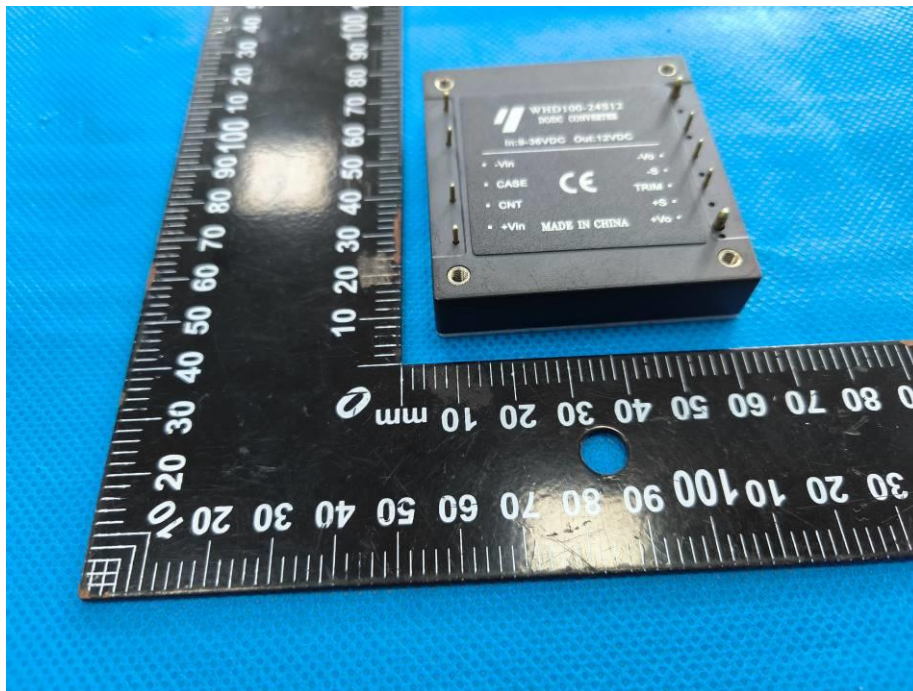
EUT Photo 1



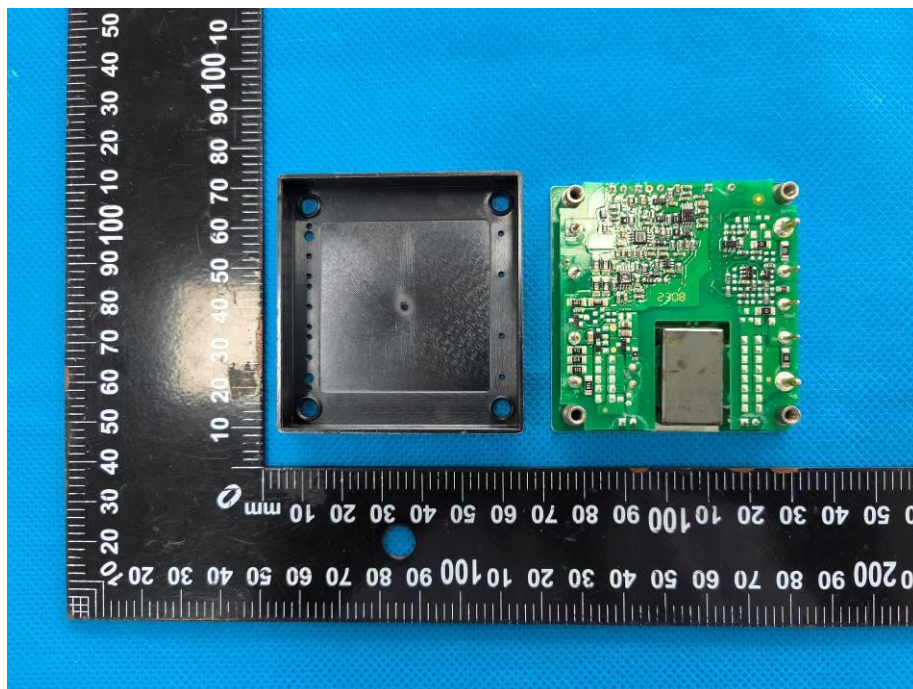
EUT Photo 2



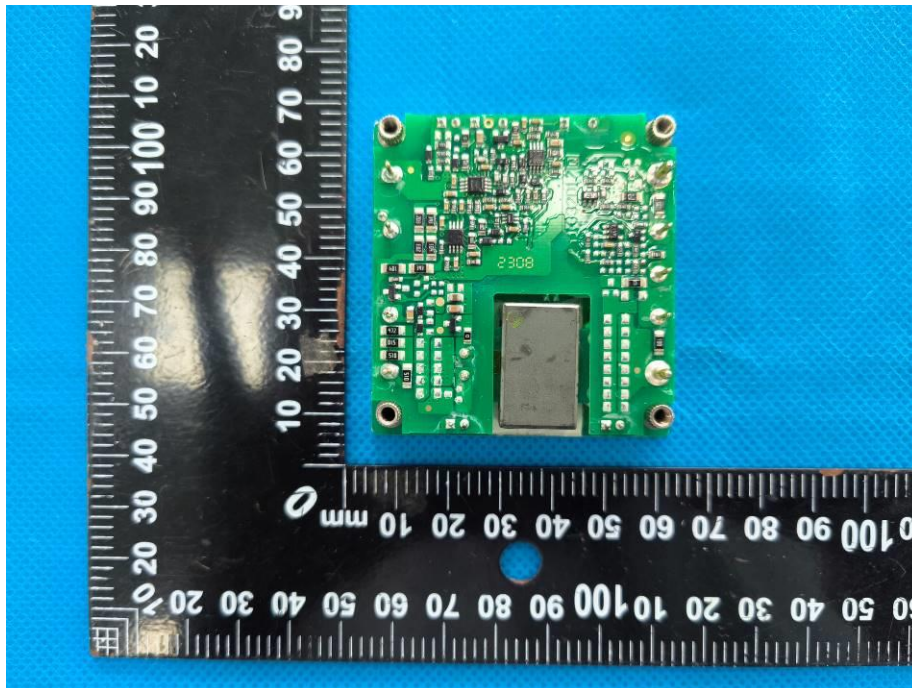
EUT Photo 3



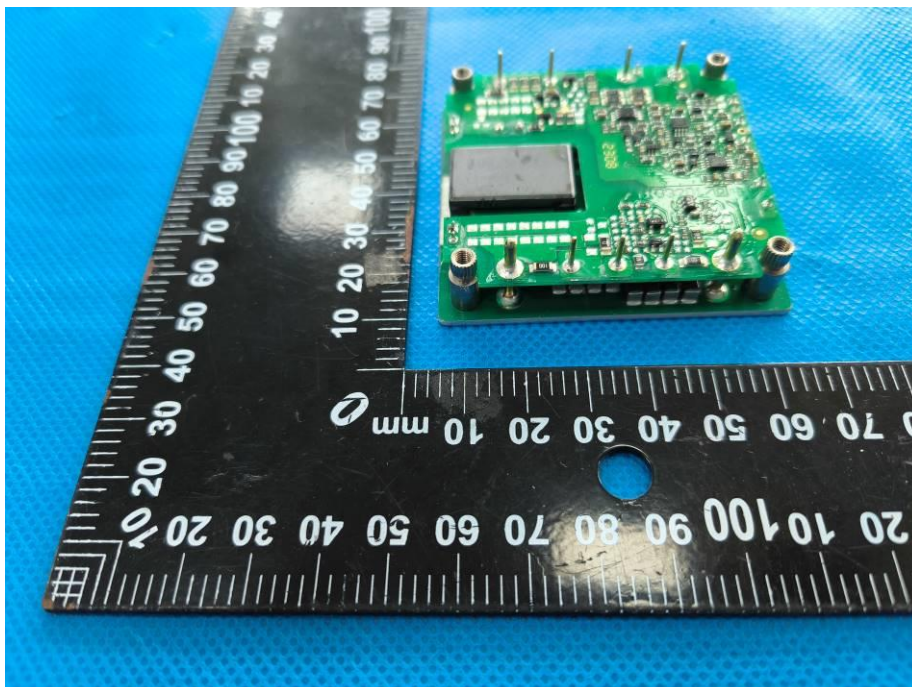
EUT Photo 4



EUT Photo 5

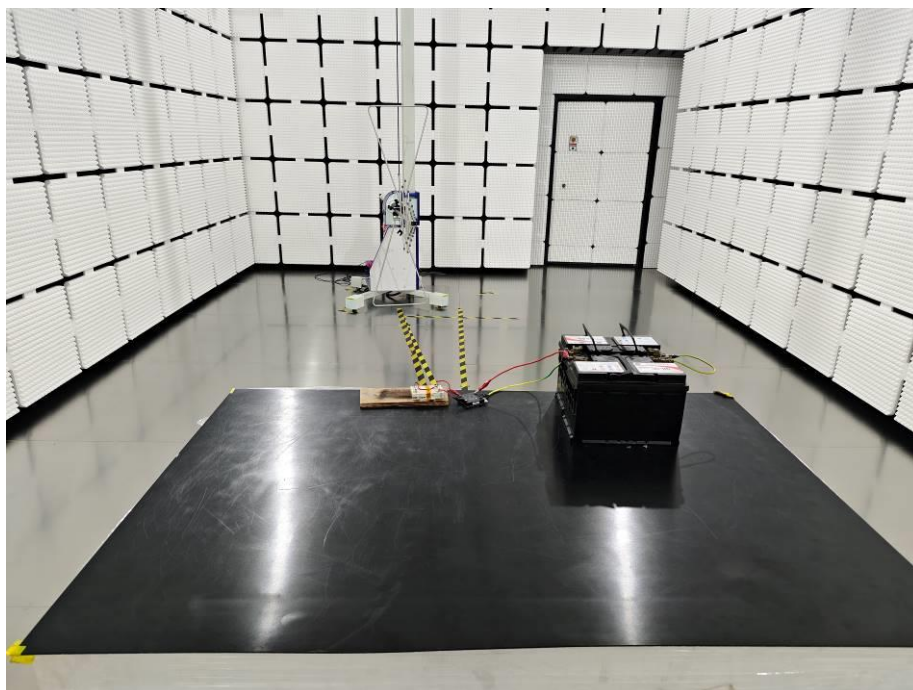


EUT Photo 6



## 11. EUT Test Setup Photographs

### Radiated Emissions



### Electrostatic Discharges



Continuous RF Electromagnetic Field Disturbances



## STATEMENT

1. The equipment lists are traceable to the national reference standards.
2. The test report can not be partially copied unless prior written approval is issued from our lab.
3. The test report is invalid without the "special seal for inspection and testing".
4. The test report is invalid without the signature of the approver.
5. The test process and test result is only related to the Unit Under Test.
6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.
7. The quality system of our laboratory is in accordance with ISO/IEC17025.
8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

101M., Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang Community, Nanwan Street, Longgang District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518116

FAX: 0755-33229357

Website: <http://www.chnbctc.com>

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\*\*\*\*\* END \*\*\*\*\*