

Uni-Trend Technology (China) Co., Ltd

TEST REPORT

SCOPE OF WORK

EMC TESTING–UT503PV

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TEST REPORT

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Manufacturing Site : Same as applicant
Intertek Report No: 231211156GZU-003

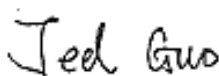
Test standards

ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)

Sample Description

Product : PV Insulation Tester
Model No. : UT503PV
Electrical Rating : Powered: 6 x 1.5V LR6 AA
Serial No. : Not Labeled
Date Received : 11 December 2023
Date Test : 11 December 2023 to 02 April 2024
Conducted

Prepared and Checked By



Jed Guo

Project Engineer

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Team Leader

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China

TEST REPORT

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TEST REPORT

1. TEST RESULTS SUMMARY

Test Item	Standard		Result
	ETSI EN 301 489-17	ETSI EN 301 489-1	
Continuous conducted disturbance voltage	7.1	8.4	N/A
Radiated disturbance	7.1	8.2	N/A
Harmonic of current	7.1	8.5	N/A
Flicker	7.1	8.6	N/A
ESD immunity	7.2	9.3	Pass
Radiated EM field immunity	7.2	9.2	Pass
EFT immunity	7.2	9.4	N/A
Surge immunity	7.2	9.8	N/A
Inject current immunity	7.2	9.5	N/A
Voltage dips and interruption immunity	7.2	9.7	N/A

Remark:

1. The symbol "N/A" in above table means Not Applicable.
2. When determining the test results, measurement uncertainty of tests has been considered.

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2. EMC RESULTS CONCLUSION

RE: EMC Testing Pursuant to Radio Equipment Directive 2014/53/EU Performed on the PV Insulation Tester, Model: UT503PV.

We tested the PV Insulation Tester, Model: UT503PV to determine if it was in compliance with the relevant EN standards as marked on the Test Results Summary. We found that the unit met the requirements of ETSI EN 301 489-1, ETSI EN 301 489-17 standards when tested as received. The worst case's test data was presented in this test report.

The production units are required to conform to the initial sample as received when the units are placed on the market.

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3. LABORATORY MEASUREMENTS

Configuration Information

Support Equipment:	N/A
Rated Voltage and frequency under test:	6 x 1.5V
Condition of Environment:	Temperature: 22~28°C Relative Humidity:35~60% Atmosphere Pressure:86~106kPa

Notes:

1. The EMI measurements had been made in the operating mode produced the largest emission in the frequency band being investigated consistent with normal applications. An attempt had been made to maximize the emission by varying the configuration of the EUT.
2. The EMS measurements had been made in the frequency bands being investigated, with the EUT in the most susceptible operating mode consistent with normal applications. The configuration of the test sample had been varied to achieve maximum susceptibility.
3. Test Location:
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch
All tests were performed at:
Room101/301/401/102/202/302/402/502/602/702/802, No. 7-2, Caipin Road, Huangpu District, Guangzhou, Guangdong, China
Except Radiated Disturbance and Radiated Susceptibility were performed at:
Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China

4. Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conducted Emission (9 kHz-150 kHz)	2.54 dB
2	Conducted Emission (150 kHz-30 MHz)	2.51 dB
3	Disturbance Power (30 MHz-300 MHz)	3.13 dB
4	Radiated Emission (9 kHz-30 MHz)	4.15 dB
5	Radiated Emission (30 MHz-1 GHz)	4.62 dB
6	Radiated Emission (1 GHz-6 GHz)	4.67 dB
7	Radiated Emission (6 GHz-18 GHz)	4.76 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty is calculated in accordance with CISPR16-4-2:2011+A1:2014+A2:2018.

The measurement uncertainty is given with a confidence of 95%, k=2.

Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

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4. EQUIPMENT USED DURING TEST

Electrostatic Discharge (1)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM077-04	ESD Simulator	NSG437	TESEQ	1Y
SA047-176	Digital Temperature-Humidity Recorder	RS210	YIJIE	1Y

Radiated Susceptibility

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM030-04	3m Semi-Anechoic Chamber	9×6×6 m ³	ETS LINDGREN	1Y
EM031-01	Signal generator	SMB100A	R&S	1Y
EM086-11	Power meter	NRP2	R&S	1Y
EM086-11-01	Power sensor	NRP-Z91	R&S	1Y
EM046-01	Power Amplifier	80RF1000-300	MILMEGA	1Y
EM046-03	Power Amplifier	AS0860-75-45	MILMEGA	1Y
EM061-05	Log. - Per. Broadband Antenna	VULP 9118 E	SCHWARZBECK	2Y
EM061-07	Stacked Log.-Per. Broadband Antenna	STLP 9149	SCHWARZBECK	2Y
EM034-01	Open Switch and Control Platform	OSP120/1505.3009K12	R&S	1Y
EM045-01-01	EMC32 software (RE/RS)	V10.01.00	R&S	1Y
SA047-118	Digital Temperature-Humidity Recorder	RS210	YIJIE	1Y

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Detail of the equipment calibration due date:

Equipment No.	Cal. Due date (DD-MM-YYYY)
Electrostatic Discharge (1)	
EM077-04	20/08/2024
SA047-176	04/01/2025
Radiated Susceptibility	
EM030-04	10/04/2024
EM031-01	17/03/2025
EM086-11	12/11/2024
EM086-11-01	12/11/2024
EM046-01	03/03/2025
EM046-03	04/09/2024
EM061-05	09/10/2025
EM061-07	09/10/2025
EM034-01	/
EM045-01-01	/
SA047-118	16/07/2024

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5. EMI TEST

5.1 Continuous Conducted Disturbance Voltage Test

N/A

5.2 Radiated Disturbance

N/A

6. EMS TEST

Performance Criteria of ETSI EN 301 489-17, subclause 6.2 table 1.

Criteria	During Test	After Test
A	Shall operate as intended. (See note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.

NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.

performance criteria A for immunity test with phenomena of continuous nature;
 performance criteria B for immunity test with phenomena of transient nature;
 Performance criteria C for immunity test with power interruptions exceeding a certain time.

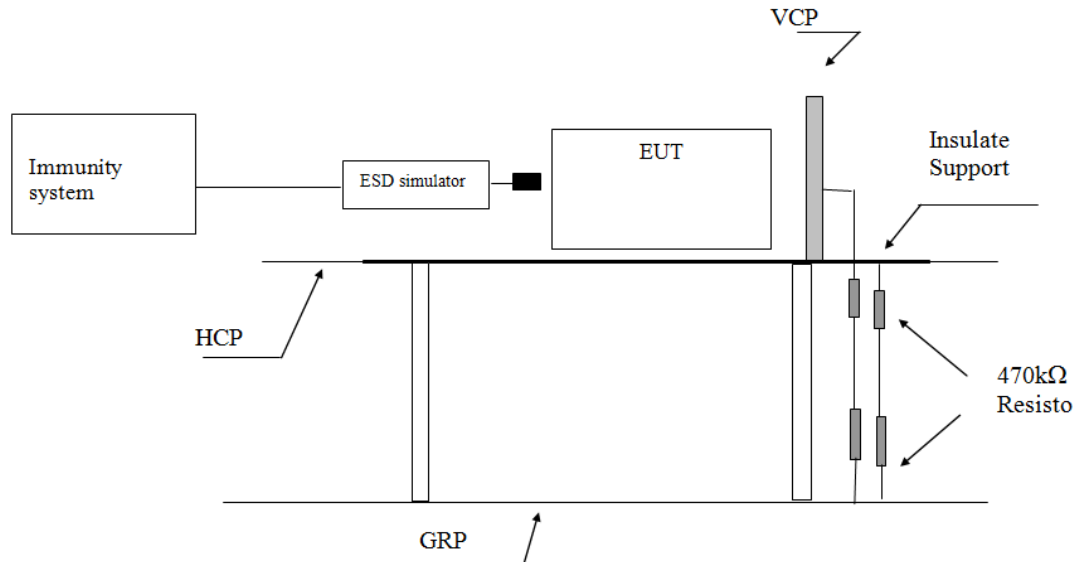
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6.1 Electrostatic Discharge Immunity

Basic Standard :	EN 61000-4-2: 2009
Port :	Enclosure
Required Performance Criterion :	Criteria B
Level :	± 2.0, ± 4.0, ±8.0 kV (Air Discharge) ±4.0 kV (Contact Discharge) ±4.0 kV (Indirect Contact Discharge)
Temperature :	23.2°C
Relative Humidity :	58.4 %
No. of Discharge(s) :	Minimum of 10 Discharges per Each Polarity
Time Between Each Discharge :	1 second
Test Mode :	Normal link & EUT Standby
Test Setup :	Table-top
Test of Post-installation :	N/A

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6.1.1 Block Diagram of Test Setup



Note: HCP means Horizontal Coupling Plane,

VCP means Vertical Coupling Plane

GRP means Ground Reference Plane

6.1.2 Test Setup and Procedure

The EUT was put on a 0.8m high wooden table 0.1m high for floor standing equipment standing on the ground reference plane (GRP) 3m by 2m in size, made by iron 1.0 mm thick.

A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thickness as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end.

The distance between EUT and any of the other metallic surface excepted the GRP, HCP & VCP was greater than 1m.

The EUT was arranged and connected according to its functional requirements.

Direct static electricity discharges were applied only to those points and surface which were accessible to personnel during normal usage.

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On each preselected points 10 times of each polarity single discharge were applied. The time interval between successive single discharges was at least 1s.

The ESD generator was held perpendicular to the surface to which the discharge was applied. The discharge return cable of the generator was kept at a distance of 0.2m whilst the discharge was being applied. During the contact discharges, the tip of the discharge electrode was touched the EUT before the discharge switch was operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.

Indirect discharge was conducted to objects placed near the EUT, simulated by applying the discharges of the ESD generator to a coupling plane, in the contact discharge mode.

After each discharge, the ESD generator was removed from the EUT, the generator was then retriggered for a new single discharge. For ungrounded product, a grounded carbon fibre brush with bleeder resistors (2×470 kΩ) in the grounding cable was used after each discharge to remove remnant electrostatic voltage.

For air discharge, a minimum of 10 single air discharges were applied to the selected test point for each such area.

6.1.3 Test Result

Direct Application of ESD

Direct Contact Discharge

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Points
4	20	N/A	Accessible metal parts of the EUT Conductive substrate with coating which is not declared to be insulating

Direct Air Discharge

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Points
2, 4, 8	20	Pass	All accessible points where contact discharge cannot be applied such as Displays, Indicators light, Keyboard, Button, Switch, Knob, Air gap, Slots, Hole and so on

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Indirect Application of ESD

Horizontal Coupling Plane under the EUT

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Point
4	20	Pass	At the front edge of each HCP opposite the centre point of each unit of the EUT

Vertical Coupling Plane beside the EUT

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Point
4	20	Pass	The centre of the vertical edge of the coupling plane

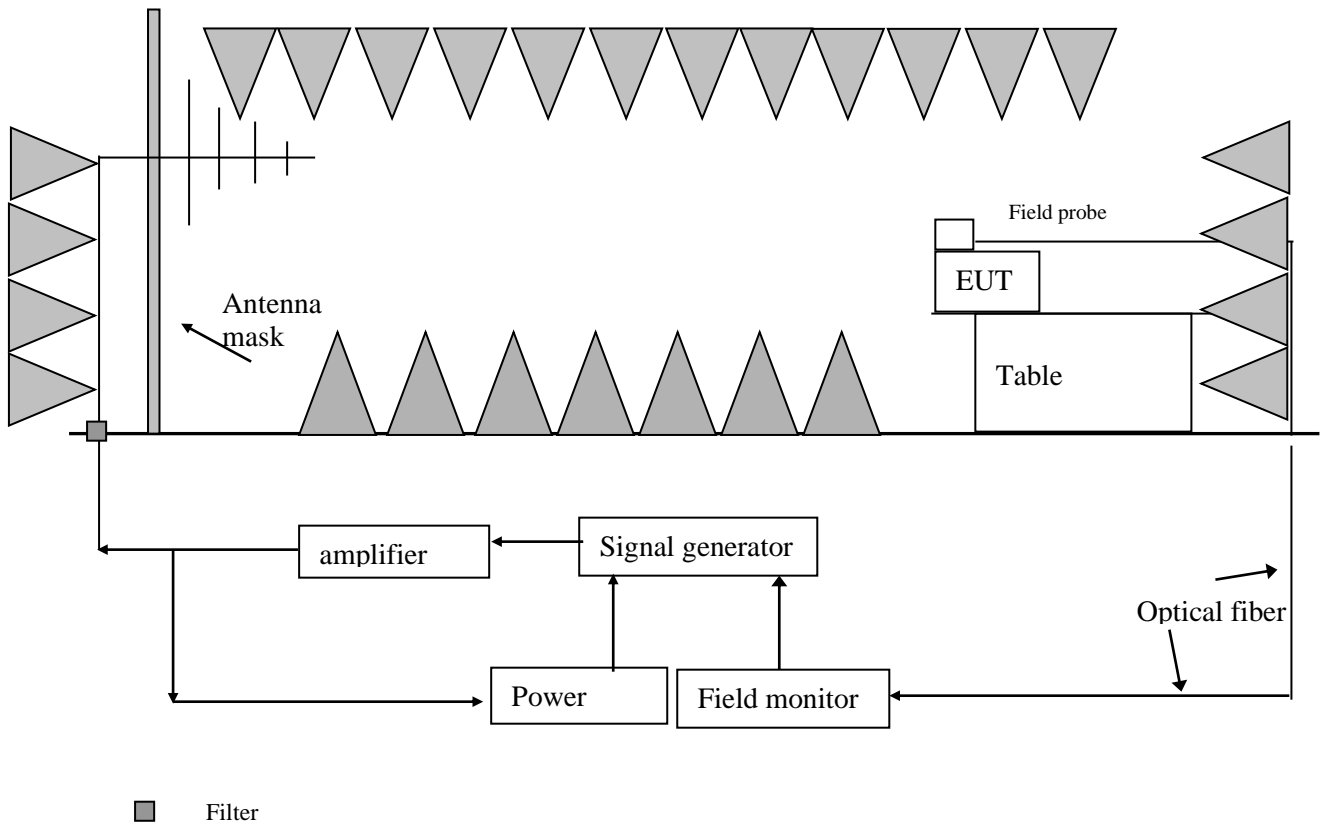
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6.2 Radiated Electromagnetic Field Immunity

Basic Standard :	EN 61000-4-3: 2006 + A1: 2008 + A2: 2010
Port :	Enclosure
Required Performance Criterion :	Criteria A
Level :	3.0 V/m (rms)
Test Modulation :	1kHz, 80% AM
Frequency :	80 MHz to 6000 MHz
Dwell Time :	3s
Frequency Step :	1%
Temperature :	22.0°C
Relative Humidity :	50 %
Test Facility :	Full Anechoic Chamber
Antenna Polarization :	Horizontal and Vertical
Type of Antenna :	Log-periodic / Horn
Test Distance :	3m
Test Mode :	Normal link & EUT Standby
Test Setup :	Table-top

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6.1.4 Block Diagram of Test Setup



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6.1.5 Test Setup and Procedure

The test was conducted in an fully anechoic chamber to maintain a uniform field of sufficient dimensions with respect to the EUT, and also in order to comply with various national and international laws prohibiting interference to radio communications.

The equipment is placed in the test facility on a non-conducting table 0.8m high (for floor standing EUT, is placed on a non-conducting support 0.1m height).

The EUT was placed on the uniform calibrated plane which is 3V/m EM field.

For all ports connected to EUT, manufacturer specified cable type and length was used, for those cables no specification, unshielded cable applied.

Wire is left exposed to the electromagnetic field for a distance of 1m from the EUT.

The EUT was arranged and connected according to its functional requirements

Before testing, the intensity of the established field strength have been checked by placing the field sensor at a calibration grid point, and with the field generating antenna and cables in the same positions as used for the calibration, the forward power needed to give the calibrated field strength was measured.

Spot checks was made at a number of calibration grid points over the frequency range 80MHz to 1000MHz, both polarizations was checked.

After calibration, the EUT is initially placed with one face coincident with the calibration plane.

The frequency range is swept from 80MHz to 6000MHz, with the signal 80% amplitude modulated with a 1 kHz sine-wave, pausing to adjust the r.f. signal level.

The dwell time at each frequency was 3s so as that the EUT to be exercised and be able to respond.

The step size was 1% of the fundamental with linear interpolation between calibrated points. Test was performed with the generating antenna facing each of the four sides of the EUT.

6.1.6 Test Result

Frequency (MHz)	Exposed Side	Field Strength (V/m)	Result
80 to 6000	Front	3V/m (r.m.s.)	Pass
80 to 6000	Left	3V/m (r.m.s.)	Pass
80 to 6000	Rear	3V/m (r.m.s.)	Pass
80 to 6000	Right	3V/m (r.m.s.)	Pass

Note: The exclusion band is: 2280 -2603.5MHz

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6.3 Electrical Fast Transient/Burst

N/A

6.4 Surge Immunity

N/A

6.5 Injected Current

N/A

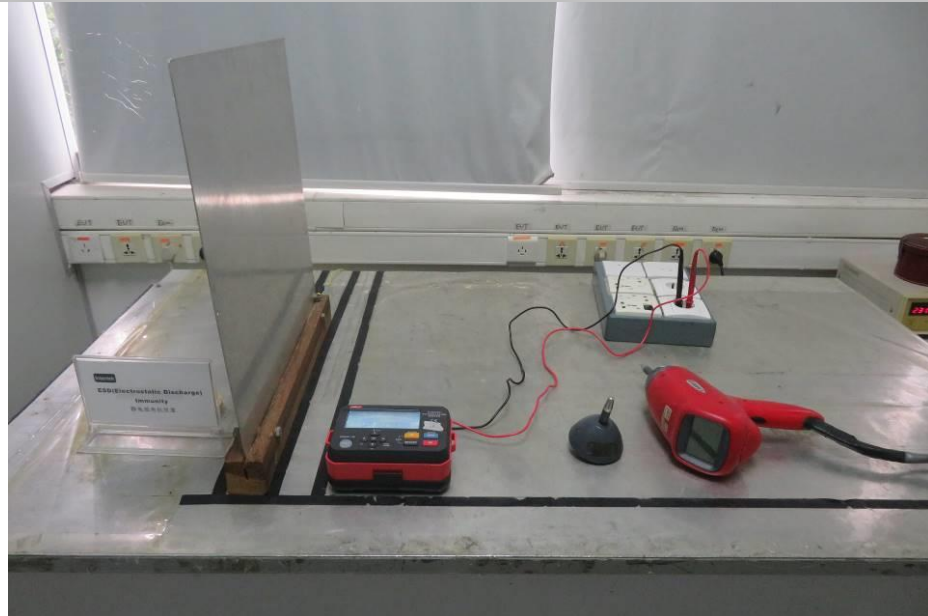
6.6 Voltage Dips and Interruptions

N/A

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7. APPENDIX I - PHOTOS OF TEST SETUP

ESD Immunity



Radiated EM field immunity



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8. APPENDIX II – PHOTOS OF EUT

Please refer to 231211156GZU-001 test report for more details.

*****End of Report*****