



EMC TEST REPORT

For

Shenzhen WELLAUTO Technology CO.,LTD

AU7 5XXE-BUS Module

Test Model: AU7 523E-1NL22-ECT

Additional Models : AU7 523E-1BL22-ECT, AU7 523E-1BL22-PNT,
AU7 523E-1NL22-EIP, AU7 523E-1NL22-CCL, AU7 523E-1NL22-CL2,
AU7 521E-1BL22-TCP, AU7 522E-1BL22-TCP, AU7 523E-1BL22-TCP

Prepared for : Shenzhen WELLAUTO Technology CO.,LTD
Address : The Room 402, 405, Building C, Fenda High-tech Park, Xixiang
Hangcheng Street, Bao'an District, Shenzhen city, China

Prepared by : Shenzhen Southern LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : August 13, 2023
Number of tested samples : 1
Serial number : Prototype
Date of Test : August 13, 2023 - August 31, 2023
Date of Report : August 31, 2023



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**EMC TEST REPORT****EN IEC 61000-6-4:2019**

EMC - Part 6-4: Generic standards - Emission standard for industrial environments

EN IEC 61000-6-2:2019

EMC - Part 6-2: Generic standards - Immunity standard for residential, commercial and light-industrial environments

Report Number..... : LCSB073123033E**Date of Issue..... : August 31, 2023****Testing Laboratory Name..... : Shenzhen Southern LCS Compliance Testing Laboratory Ltd.****Address..... : 101-201, No.39 Building, Xialang Industrial Zone, Heshuikou Community, Matian Street, Guangming District, Shenzhen, China.****Testing Procedure..... : Full application of Harmonised standards ☒
Partial application of Harmonised standards ☐
Other standard testing method ☐****Applicant's Name..... : Shenzhen WELLAUTO Technology CO.,LTD****Address..... : The Room 402, 405, Building C, Fenda High-tech Park, Xixiang Hangcheng Street, Bao'an District, Shenzhen city, China.****Test Specification:****Standard..... : EN IEC 61000-6-4:2019
EN IEC 61000-6-2:2019****Test Report Form No..... : SLCSEMC-2.3****TRF Originator..... : Shenzhen Southern LCS Compliance Testing Laboratory Ltd.****Master TRF..... : Dated 2016-08****Shenzhen Southern LCS Compliance Testing Laboratory Ltd. All rights reserved.**

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Equipment Under Test..... : AU7 5XXE-BUS Module**Trademark..... : WELLAUTO****Test Model/Type..... : AU7 523E-1NL22-ECT****Rating..... : DC 24V****Results : PASS****Compiled by:**

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Supervised by:

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EMC - TEST REPORT

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Applicant.....: Shenzhen WELLAUTO Technology CO.,LTD
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The applicant and manufacturer information, product name, model, trademark and other information in this report are all provided by the applicant, and this laboratory is not responsible for verifying its authenticity.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



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ENVIRONMENTAL CONDITIONS

The climatic conditions during the test are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. the climatic conditions during the test were in the following Limits:

Ambient temperature	15°C - 35°C
Relative Humidity air	30% - 60%
Atmospheric pressure	86 kPa - 106 kPa

Climate values will be recorded and recorded separately if specifically required in the base standard or application product/product series standard.

POSSIBLE TEST CASE VERDICTS

Test cases does not apply to test object	N/A
Test object does meet requirement	P(Pass) / PASS
Test object does not meet requirement	F(Fail) / FAIL
Not measured	N/M

DEFINITION OF SYMBOLS USED IN THIS TEST REPORT

<input checked="" type="checkbox"/> Indicate that the conditions, standards or equipment listed is applicable to this report / test / EUT.
<input type="checkbox"/> Indicate that the conditions, standards or equipment listed is not applicable to this report / test / EUT.

REVISION HISTORY

Revision	Issue Date	Revision Content	Revised by
000	August 31, 2023	Initial Issue	-

Remark:
000) : “---”





TABLE OF CONTENTS

1. GENERAL INFORMATION	6
1.1. General Description of The Item(s)	6
1.2. Operating Mode(s) Used of Tests	7
1.3. Support / Auxiliary Equipment For The EUT	7
1.4. Description of Test Facility	7
2. STATEMENT OF THE MEASUREMENT UNCERTAINTY	8
3. MEASURING DEVICES AND TEST EQUIPMENT	9
4. VERDICT SUMMARY SECTION	10
4.1. Standard(s)	10
4.2. Overview of Results	11
5. EMISSION TESTS	12
5.1. Radiated Disturbance	12
6. IMMUNITY TESTS	14
6.1. Performance Criteria	14
6.2. Electrostatic Discharge	15
6.3. Radio-Frequency Electromagnetic Fields	16
6.4. Power Frequency Magnetic Field	17
ANNEX A - TEST RESULTS	18
ANNEX B - TEST PHOTOS	23
ANNEX C - EXTERNAL AND INTERNAL PHOTOS OF THE EUT	23





1. GENERAL INFORMATION

1.1. GENERAL DESCRIPTION OF THE ITEM(S)

Equipment Under Test	AU7 5XXE-BUS Module
Test Model/Type	AU7 523E-1NL22-ECT
Additional Models/Type	AU7 523E-1BL22-ECT, AU7 523E-1BL22-PNT, AU7 523E-1NL22-EIP, AU7 523E-1NL22-CCL, AU7 523E-1NL22-CL2, AU7 521E-1BL22-TCP, AU7 522E-1BL22-TCP, AU7 523E-1BL22-TCP
Description of Model difference	All models have similar appearance and structure except model name and performance are different.
Rating	DC 24V
Highest internal frequency (Fx)	≤ 108 MHz





1.2. OPERATING MODE(S) USED OF TESTS

During the tests, the following operating mode(s) has(have) been used.

Operating Mode	Operating Mode description	Used for testing	
		Emission	Immunity
1	Normal operation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Bluetooth	<input type="checkbox"/>	<input type="checkbox"/>
3	HDMI	<input type="checkbox"/>	<input type="checkbox"/>
4	Full load	<input type="checkbox"/>	<input type="checkbox"/>

1.3. SUPPORT / AUXILIARY EQUIPMENT FOR THE EUT

EUT has been tested using the following auxiliary equipment :

Auxeq	Model/Type	Manufacturer	Supplied by
--			

1.4. DESCRIPTION OF TEST FACILITY

Test Location 1	Shenzhen Southern LCS Compliance Testing Laboratory Ltd. 101-201, No.39 Building,Xialang Industrial Zone, Heshuikou Community, Matian Street, Guangming District, Shenzhen, China. CNAS Registration Number is L10160.
Test Location 2	Shenzhen LCS Compliance Testing Laboratory Ltd. 101, 201 Building A and 301 Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, Guangdong, China. NVLAP Accreditation Code is 600167-0. CNAS Registration Number is L4595.
Date of receipt of test item	August 13, 2023
Date(s) of performance of test	August 13, 2023 - August 31, 2023

Note: Radio-Frequency Electromagnetic Field (RS) Test Subcontract to Shenzhen LCS Compliance Testing Laboratory Ltd for Testing.





2. STATEMENT OF THE MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. the reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. the measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods - Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. the manufacturer has the sole responsibility of continued compliance of the device.

Measurement	Uncertainty (U_{lab})
Radiated disturbance (30MHz - 200MHz)	± 4.66 dB
Radiated disturbance (200MHz - 1GHz)	± 4.64 dB

Supplementary information:

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.





3. MEASURING DEVICES AND TEST EQUIPMENT

RADIATED DISTURBANCE						
Item	Test equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2021-05-28	2024-05-29
2	EMI Test Receiver	R&S	ESCI3	101010	2023-04-26	2024-04-25
3	Log-periodic Antenna	SCHWARZBECK	VULB9163	5094	2022-05-08	2025-05-07
4	EMI Test Software	EZ	EZ_EMG	N/A	/	/
5	Controller system	SKET	SKC1000	N/A	/	/

ELECTROSTATIC DISCHARGE						
Item	Test equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	ESD Simulator	TESEQ	NSG 437	1615	2023-03-20	2024-03-19

POWER FREQUENCY MAGNETIC FIELD						
Item	Test equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Frequency Mag-Field Generator System	HTEC	HPFMF100	100-2400	2023-04-26	2024-04-25

RADIO-FREQUENCY ELECTROMAGNETIC FIELDS						
Item	Test equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	MXG Vector Signal Generator	Agilent	E4438C	MY42081396 (6G)	2023-06-06	2024-06-05
2	RF POWER AMPLIFIER	SKET	HAP_0306G-50 W	/	2023-06-06	2024-06-05
3	RF POWER AMPLIFIER	OPHIR	5225R	1052	2023-06-06	2024-06-05
4	RF POWER AMPLIFIER	OPHIR	5273F	1019	2023-06-06	2024-06-05
5	Stacked Broadband Log Periodic Antenna	SCHWARZBECK	STLP 9128	9128ES-145	NCR	NCR
6	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBECK	STLP 9149	9149-484	NCR	NCR





4. VERDICT SUMMARY SECTION

This chapter present an overview of the standards and results. Refer the next chapter for details of measured test results and applied test levels.

4.1. STANDARD(S)

EN IEC 61000-6-4:2019 - Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.

EN IEC 61000-6-2:2019 - Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments.



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4.2. OVERVIEW OF RESULTS

EMISSION TESTS - EN IEC 61000-6-4		
Requirement - Test case	Limit	Verdict
Conducted Disturbance - AC mains ports / DC power port	Table 4, Table A.1	N/A
Conducted Disturbance - Wired ports	Table 5	N/A
Assessment of the enclosure port	---	---
Radiated Disturbance in the frequency range 30 MHz to 1 GHz	Table 3	PASS
Radiated Disturbance in the frequency range Above 1 GHz	Table 3	N/A
IMMUNITY TESTS - EN IEC 61000-6-2		
Requirement - Test case	Basic Standard(s)	Verdict
Electrostatic Discharge	IEC/EN 61000-4-2	PASS
Radio-Frequency Electromagnetic Fields	IEC/EN 61000-4-3	PASS
Electrical Fast Transient / Burst	IEC/EN 61000-4-4	N/A
Surge	IEC/EN 61000-4-5	N/A
Radio-Frequency Common Mode	IEC/EN 61000-4-6	N/A
Power Frequency Magnetic Field	IEC/EN 61000-4-8	PASS
Voltage Dips and Short Interruptions	IEC/EN 61000-4-11	N/A

Supplementary information : ---





5. EMISSION TESTS

5.1. RADIATED DISTURBANCE

Standard	EN IEC 61000-6-4:2019
Basic Standard(s)	CISPR 16-2-3
Test method	Semi Anechoic Chamber (SAC)

SAC Radiated disturbance limit in the frequency range 30 MHz - 1000 MHz

Frequency range [MHz]	Limit: Quasi-peak [dB(μV/m)]		IF BW
	3 m distance	10 m distance	
30 - 230	50	40	120 KHz
230 - 1000	57	47	
1) At the transition frequency, the lower limit applies.			

Radiated disturbance limit in the frequency range 1 GHz - 6 GHz

Frequency range [MHz]	Limit (3 m distance)		IF BW
	Peak [dB(μV/m)]	Average [dB(μV/m)]	
1000 - 3000	76	56	1MHz
3000 - 6000	80	60	

Required highest frequency for radiated measurement

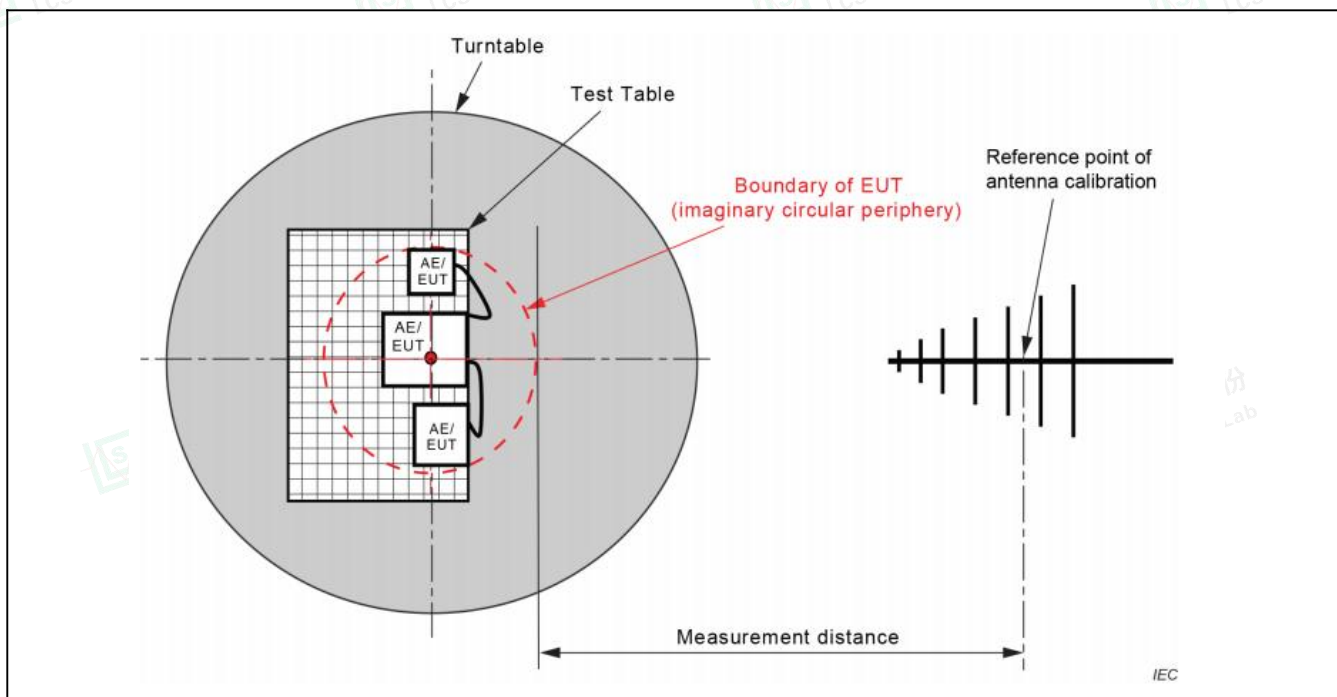
Highest internal frequency (Fx)	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz

- 1) F_x is highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.





Test configuration



Test Procedure Description

The radiated disturbance test was conducted in a 3m Semi Anechoic Chamber and conforming to CISPR 16-2-3. 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 3 meters away from the receiving antenna, which is mounted on an antenna tower. the antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Log-periodic antenna or horn antenna is used as a receiving antenna. both horizontal and vertical polarization of the antenna is set on test.

Test Results refer to Annex A.1



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6. IMMUNITY TESTS

6.1. PERFORMANCE CRITERIA

Standard	EN IEC 61000-6-2:2019
----------	-----------------------

Performance criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion C: Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.

Examples of ports		Tests and performance criteria							
		ESD	RS	PFMF	EFT	CS	Surge	Dips	Interruption
<input checked="" type="checkbox"/>	Enclosure port	B	A	A	---	---	---	---	---
<input type="checkbox"/>	Signal / control ports ¹	---	---	---	B	A	B	---	---
<input type="checkbox"/>	DC Input / Output power ports ¹	---	---	---	B	A	B	---	---
<input type="checkbox"/>	AC Input / Output power ports	---	---	---	B	A	B	B&C	C
Supplementary information: 1) Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m.									





Electrostatic discharge (ESD) is the result of accumulated static electricity from a person or object, for example, walking on a synthetic carpet. ESD can indirectly affect the operation of equipment or damage its electronic components through direct discharge or coupling. both effects were simulated during the test. contact discharge is the preferred test method. twenty discharges (10 with positive and 10 with negative polarity) shall be applied on each accessible metallic part of the enclosure (terminals are excluded). air discharges shall be used where contact discharges cannot be applied. discharges shall be applied on the horizontal or vertical coupling planes.taken into consideration when selecting test points, paying particular attention to keyboards, dialling pads, power switches, mice, drive slots, card slots, the areas around communication ports, etc.

Standard	EN IEC 61000-6-2:2019							
Basic standard	EN 61000-4-2							
Port under test	Enclosure							
Contact discharge	<input checked="" type="checkbox"/>	± 2 kV	<input checked="" type="checkbox"/>	± 4 kV	<input type="checkbox"/>	±8 kV	<input type="checkbox"/>	kV
Air discharge	<input checked="" type="checkbox"/>	± 2 kV	<input checked="" type="checkbox"/>	± 4 kV	<input checked="" type="checkbox"/>	±8 kV	<input type="checkbox"/>	kV
Number of discharges	≥ 10 per polarity with ≥ 1 sec interval							

The diagram illustrates the typical layout of a test site for EMC testing. It shows a non-conducting table with a horizontal coupling plane (HCP) of 1.6 m x 0.8 m. A VCP (Vertical Coupling Plane) of 0.5 m x 0.5 m is positioned on the table. The EUT (Equipment Under Test) is placed on an insulating support. A power supply is connected to the EUT. A protective conductor is connected to the EUT. The diagram also shows the typical position for direct discharge to EUT and typical position for indirect discharge to HCP. The ground reference plane (GRP) is indicated. Various cables and connectors are shown, including 470 kΩ resistors and 0.1 m cables. The diagram is labeled with 'LCS Testing Lab' and 'IEC 2209:08'.



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6.3. RADIO-FREQUENCY ELECTROMAGNETIC FIELDS

During the test it is verified if the EUT has sufficient immunity against radiated electromagnetic fields.

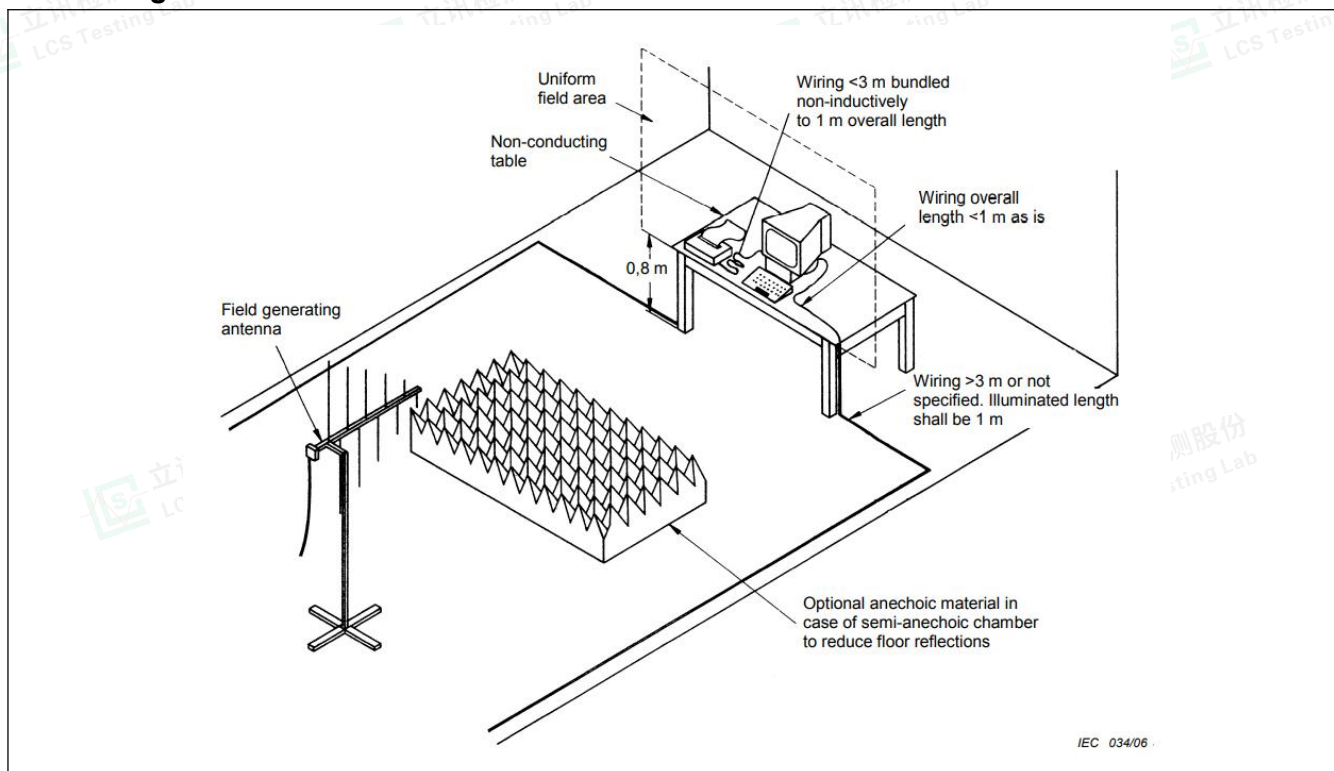
The test was carried out in a half-wave anechoic chamber with absorbent material attached to a reflective ground plate. Before the test, the test field strength needs to be calibrated. during the calibration, the corresponding relationship between the target field strength and the forward power applied to the transmitting antenna is established. during the test, except for EUT, the indoor layout is consistent with the calibration.

The EUT and its simulators are placed on a turn table which is 0,8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. both horizontal and vertical polarization of the antenna are set on test. each of the four sides of EUT must be faced this transmitting antenna and measured individually. in order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

Requirements

Standard	EN IEC 61000-6-2:2019			
Basic standard	EN 61000-4-3			
Port under test	Enclosure			
Frequency range	Test level	Modulation	Dwell time	Step size
80 - 1000 MHz	10 V/m	1 kHz, 80 % AM	≥ 0,5 s	≤ 1%
1400 - 6000 MHz	3 V/m	1 kHz, 80 % AM	≥ 0,5 s	≤ 1%

Test configuration



Test Results refer to Annex A.2



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6.4. POWER FREQUENCY MAGNETIC FIELD

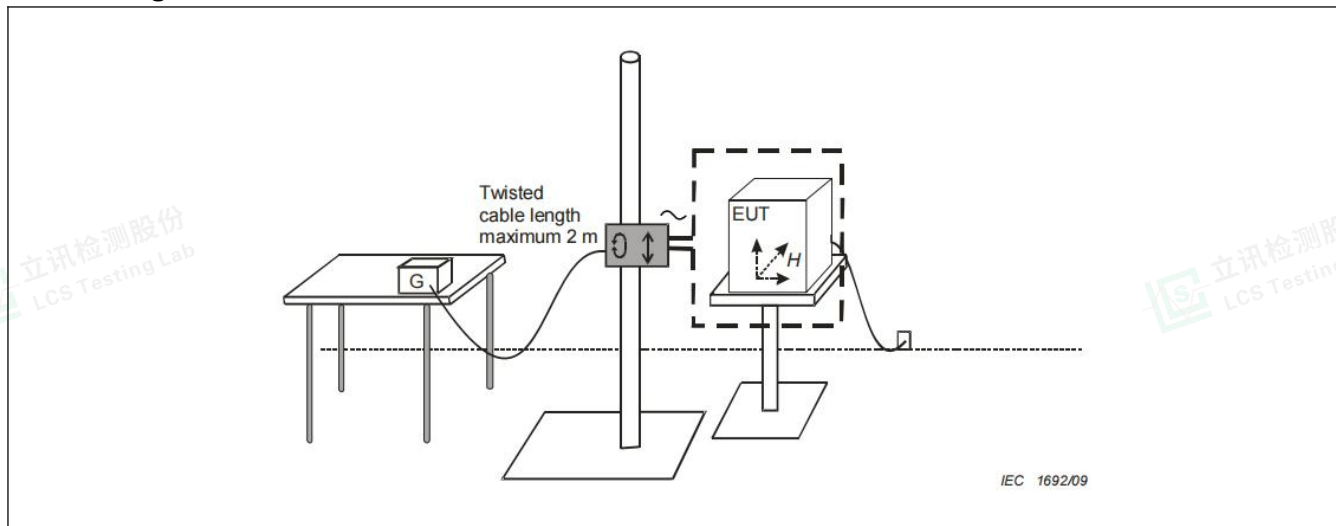
The surge immunity test simulates voltage dips and short interruptions that occur due to faults in a (public or non-public) network or in installations by sudden changes of large loads.

The EUT shall be connected to the test generator for testing using the shortest power cable specified by the EUT manufacturer and, if no cable length is specified, the shortest cable suitable for the EUT, each representative mode of operation shall be tested. For short interruptions to use 0° for one of the phases.

Requirements

Standard	EN IEC 61000-6-2:2019
Basic standard	EN 61000-4-8
Port under test	Enclosure
Field strength	30 A/m
Test frequency	50 / 60 Hz

Test configuration



Test Results refer to Annex A.2



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ANNEX A - TEST RESULTS

A.1. RADIATED DISTURBANCE TEST RESULTS

Environmental Conditions	24.0°C, 52% RH
Model	AU7 523E-1NL22-ECT
Operating mode	Mode 1 (worst case)
Test voltage	DC 24V
Test engineer	Aru Yang
Pol	Vertical

80.0 dBuV/m



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		31.9966	8.39	10.72	19.11	40.00	-20.89	QP		
2	*	39.9942	8.05	12.00	20.05	40.00	-19.95	QP		
3		176.0370	7.36	10.82	18.18	40.00	-21.82	QP		



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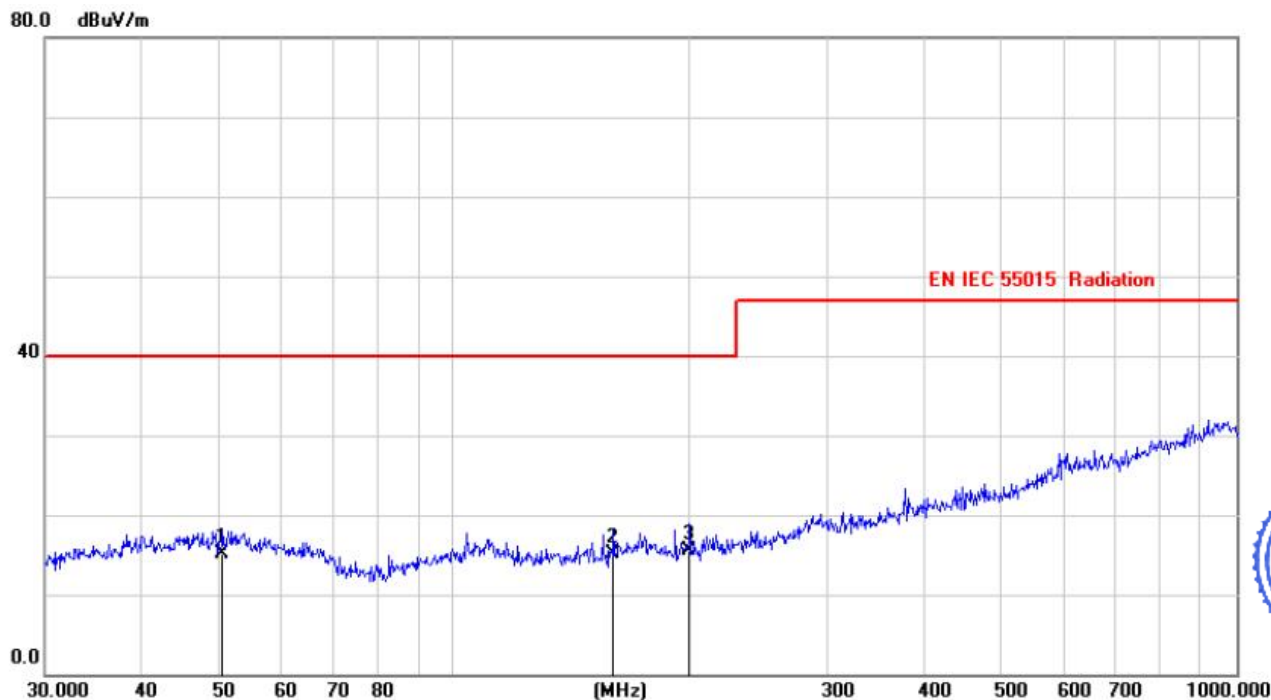
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Environmental Conditions	24.0°C, 52% RH
Model	AU7 523E-1NL22-ECT
Operating mode	Mode 1 (worst case)
Test voltage	DC 24V
Test engineer	Aru Yang
Pol	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		50.7192	2.39	12.74	15.13	40.00	-24.87	QP		
2		159.9947	4.20	10.98	15.18	40.00	-24.82	QP		
3	*	200.0732	4.44	11.12	15.56	40.00	-24.44	QP		



**RADIO-FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST RESULTS**

Standard	<input checked="" type="checkbox"/> EN IEC 61000-6-2:2019		<input checked="" type="checkbox"/> EN 61000-4-3	
EUT	AU7 5XXE-BUS Module		Temperature	24.1℃
M/N	AU7 523E-1NL22-ECT		Humidity	55%
Test Mode	Mode 1		Pressure	1008mbar
Input voltage	DC 24V		Test engineer	ARU YANG
Modulation	1 kHz, 80 % AM		Test Results	Pass
Steps	1%			
Angle of EUT	Antenna polarization	Frequency Range	Test Level	Performance Criteria
0°	Vertical Horizontal	80 - 1000 MHz	10 V/m	A
		1400 - 6000MHz	3 V/m	
90°	Vertical Horizontal	80 - 1000 MHz	10 V/m	A
		1400 - 6000MHz	3 V/m	
180°	Vertical Horizontal	80 - 1000 MHz	10 V/m	A
		1400 - 6000MHz	3 V/m	
270°	Vertical Horizontal	80 - 1000 MHz	10 V/m	A
		1400 - 6000MHz	3 V/m	

Note :



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**POWER FREQUENCY MAGNETIC FIELD TEST RESULTS**

Standard	<input checked="" type="checkbox"/> EN IEC 61000-6-2:2019		<input checked="" type="checkbox"/> EN 61000-4-8	
EUT	AU7 5XXE-BUS Module		Temperature	24.1°C
M/N	AU7 523E-1NL22-ECT		Humidity	54%
Test Mode	Mode 1		Pressure	1008mbar
Input voltage	DC 24V		Test Results	Pass
Test engineer	Aru Yang			
Axis under test	Tested Field strength	Test Frequency	Test Duration	Performance Criteria
X - axis	30 A/m	50 / 60 Hz	5 min	A
Y - axis	30 A/m	50 / 60 Hz	5 min	A
Z - axis	30 A/m	50 / 60 Hz	5 min	A



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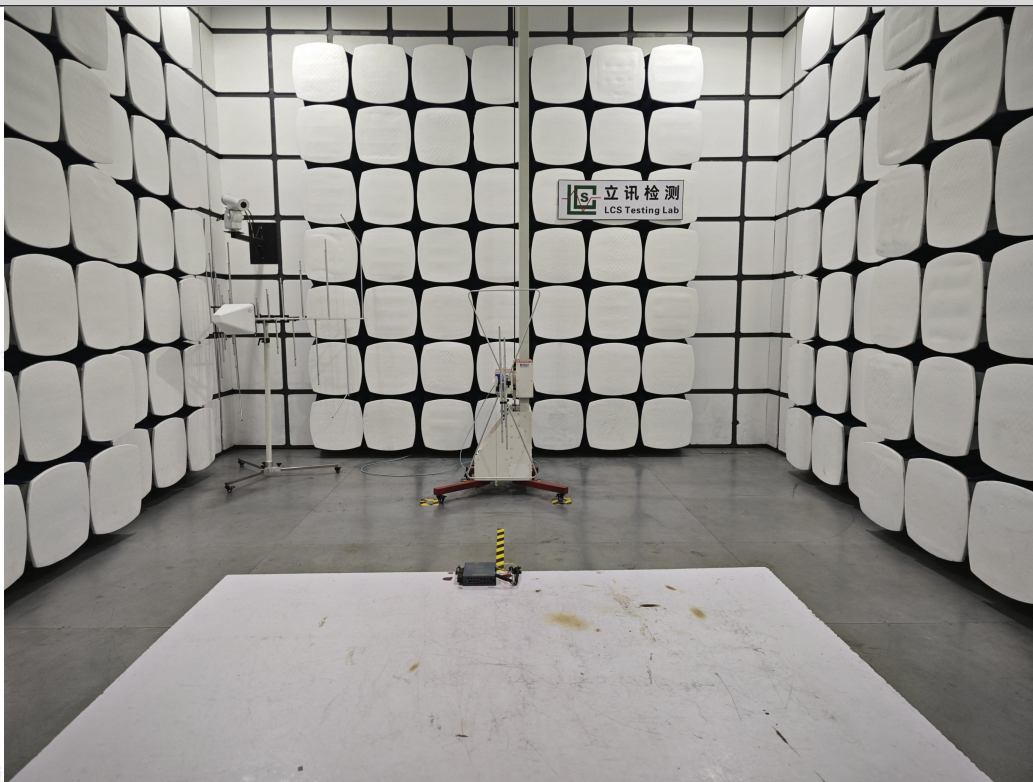
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com.

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ANNEX B - TEST PHOTOS

B.1. Radiated Disturbance



B.2. Electrostatic Discharge



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B.3. Power Frequency Magnetic Field



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ANNEX C - EXTERNAL AND INTERNAL PHOTOS OF THE EUT

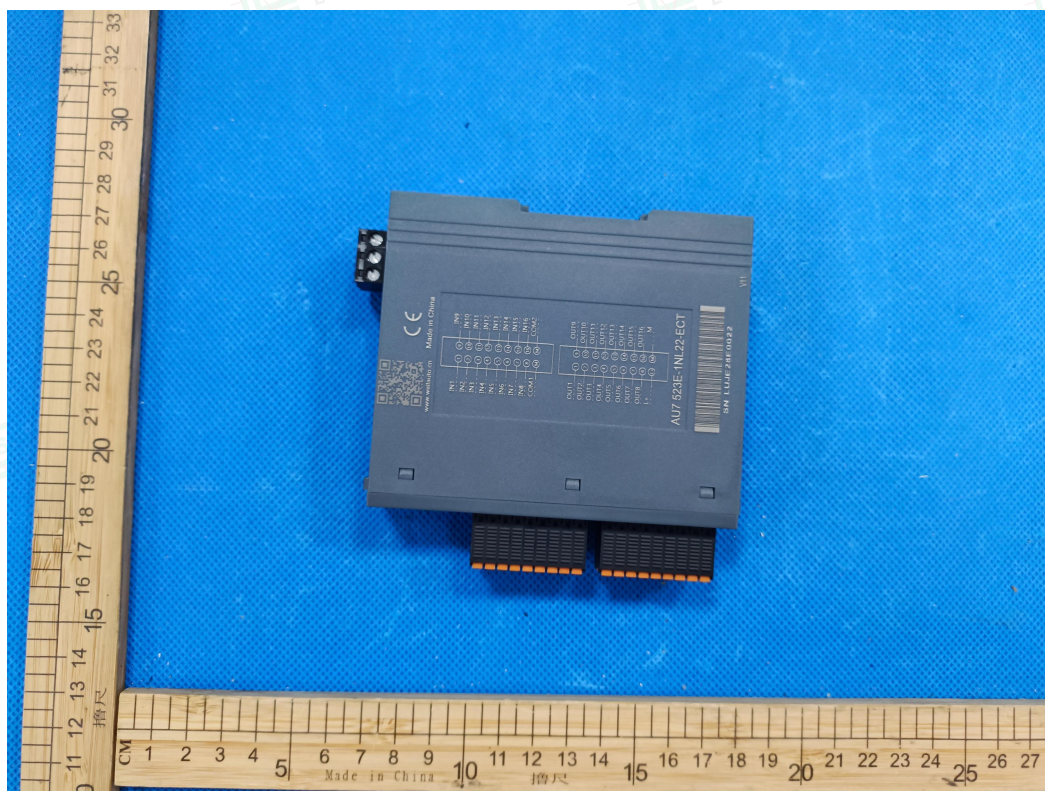


Photo.1

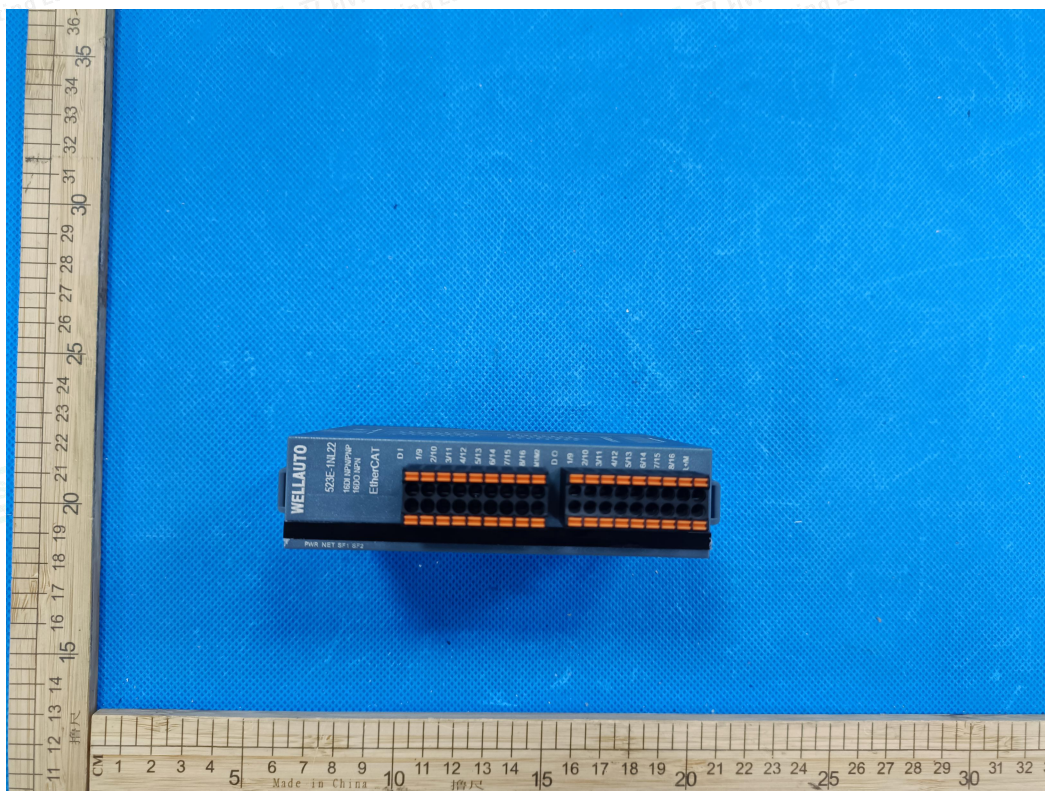


Photo.2



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Photo.3

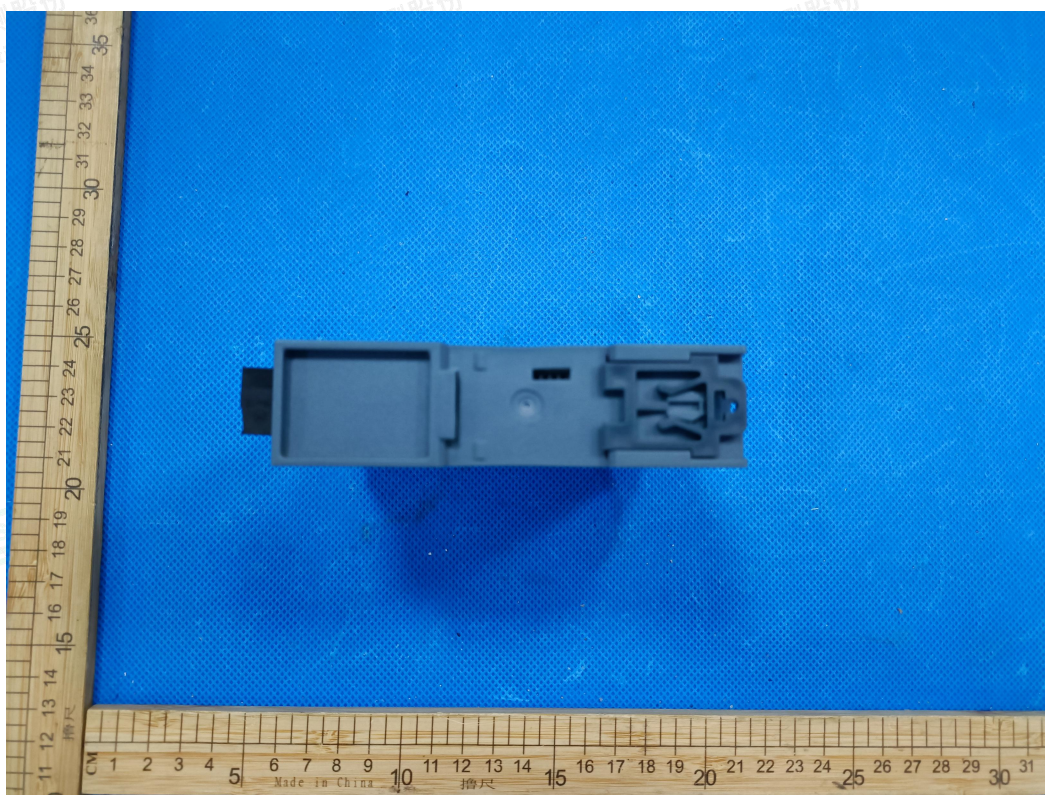


Photo.4



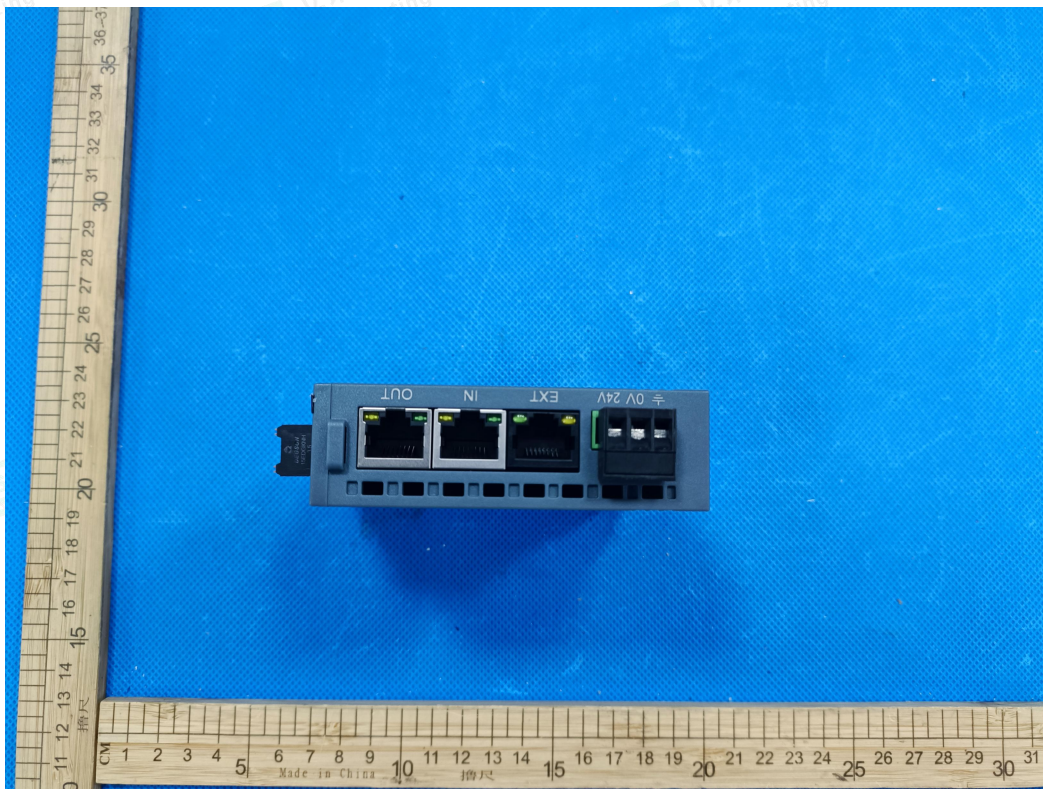


Photo.5

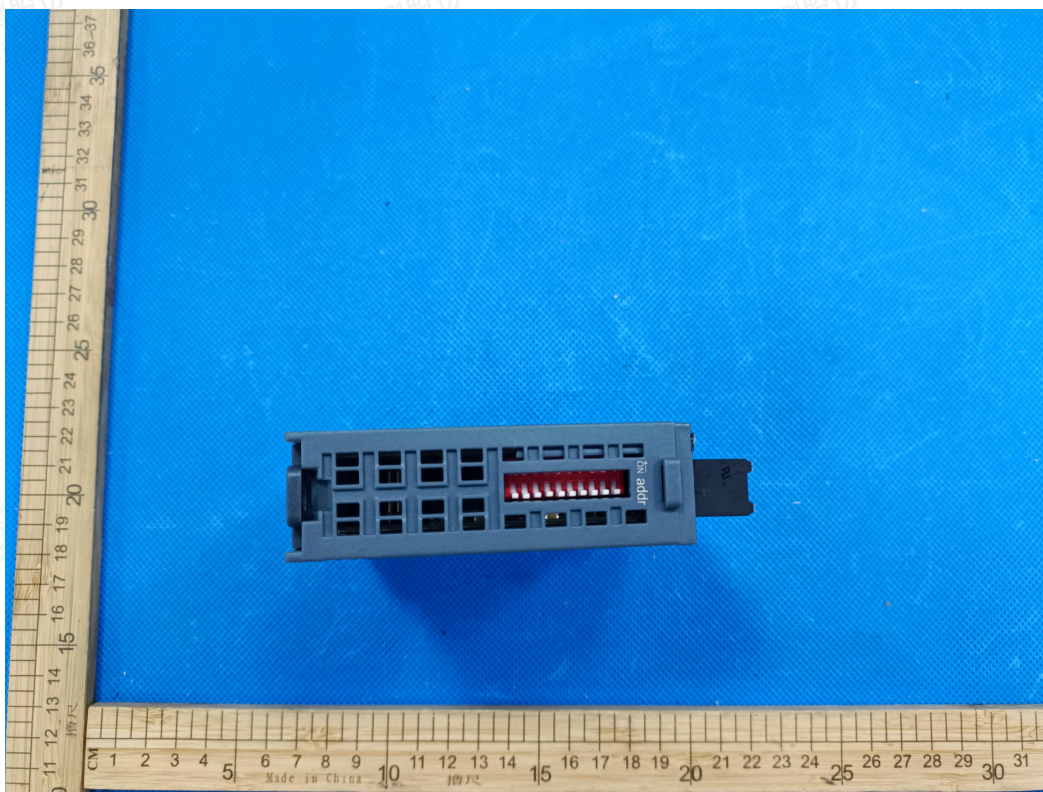


Photo.6



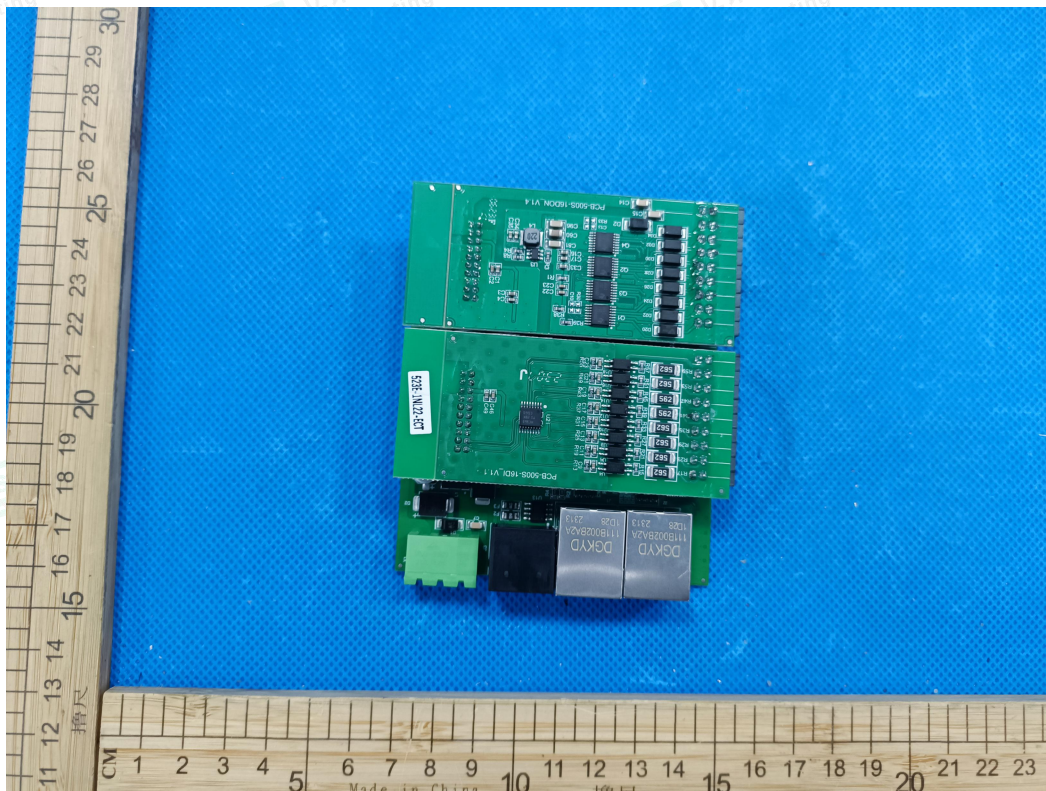


Photo.7

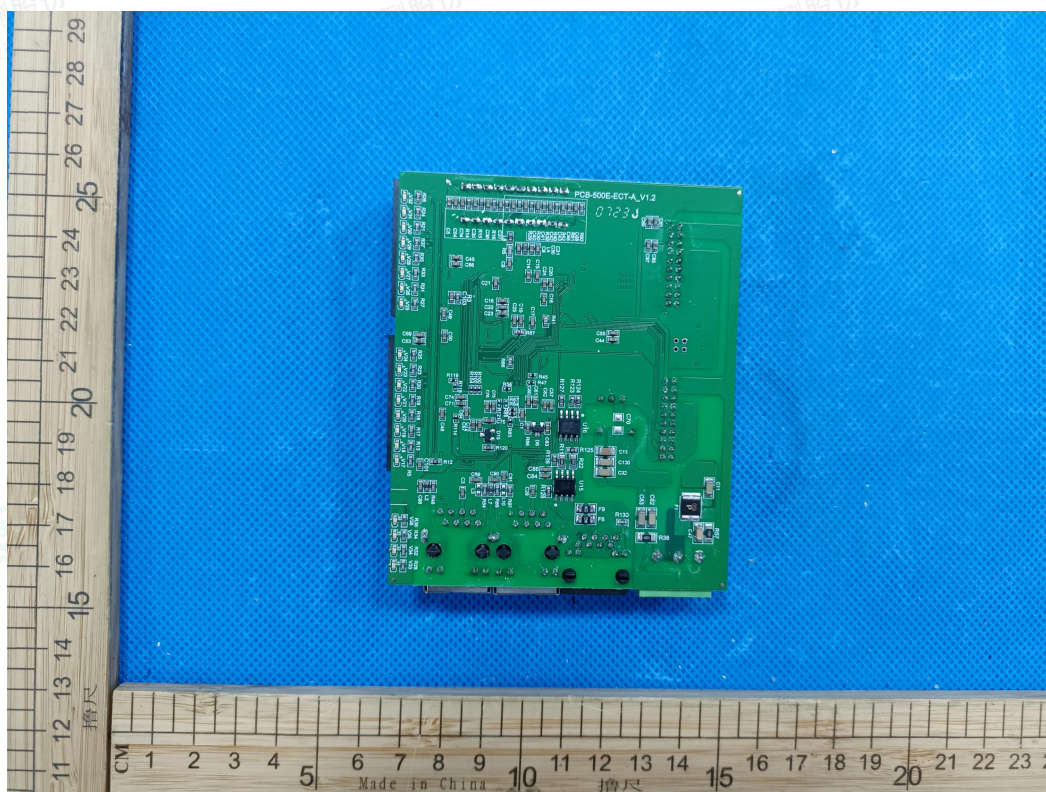


Photo.8

----- END -----



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