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报告编号 Report No: YLCLAB250310-004

检测报告

TEST REPORT

试品型号 Model:

LXS

试品名称 EUT:

LXS 控制系统

LXS Control System

委托单位 Client:

北京和利时智能技术有限公司

Beijing HollySys Intelligent Technologies Co., Ltd

杭州和利时自动化有限公司西安分公司

制造单位 Manufacturer:

Hangzhou HollySys Automation Co., Ltd. Xi'

an Branch

委托检测

检测类别 Test Category:

Commission Test

西安优来测科技有限公司

Xi'an Your Test Technology Co., Ltd



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试验结论 Test Conclusion

试品名称: LXS 控制系统

EUT: LXS Control System

试品型号 Model: LXS

序列号 Serial No.: /

委托单位: 北京和利时智能技术有限公司

Client: Beijing HollySys Intelligent Technologies Co., Ltd

制造单位: 杭州和利时自动化有限公司西安分公司

Manufacturer: Hangzhou HollySys Automation Co., Ltd. Xi' an Branch

检测项目及结果 Test items and results:

序号 No.	项目 Test item	依据标准 Standard	结果 Result
1	电源端子传导骚扰试验 Conducted Emission Test	IEC 61000-6-4:2018 EN 55011:2017 IEC 61326-1:2012 IEC 61326-3-1:2017	通过 Pass
2	网口端子传导骚扰试验 Conducted Emission Test to network port		通过 Pass
3	辐射骚扰试验 Radiation Emission Test		通过 Pass
4	静电放电抗扰度试验 Electrostatic Discharge Immunity Test	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-2:2008 IEC 61326-3-1:2017	通过 Pass
5	射频电磁场辐射抗扰度 Radiated, Radio-frequency, Electromagnetic Field Immunity Test	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-3:2020 IEC 61326-3-1:2017	通过 Pass
6	电快速瞬变脉冲群抗扰度 Electrical Fast Transient/burst Immunity Test	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-4:2012 IEC 61326-3-1:2017	通过 Pass

7	浪涌(冲击)抗扰度 Surge Immunity Test	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-5:2017 IEC 61326-3-1:2017	通过 Pass
8	射频场感应的传导骚扰抗扰度 Immunity to Conducted Disturbances, Induced by Radio-frequency Fields	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-6:2013 IEC 61326-3-1:2017	通过 Pass
9	工频磁场抗扰度 Power Frequency Magnetic Field Immunity Test	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-8:2009 IEC 61326-3-1:2017	通过 Pass
10	交流电压暂降、短时中断抗扰度 Voltage Dips, Interruptions to AC Power Port Immunity Test	IEC 61000-6-2:2016 IEC 61326-1:2012 IEC 61000-4-11:2020 IEC 61326-3-1:2017	通过 Pass
11	电源电压变化 Supply Voltage Variation Test	IEC 61131-2:2017 6.2.2.5 IEC 61326-3-1:2017	通过 Pass
12	电压变化抗扰度 Voltage Variation Immunity	IEC 61000-4-11:2020 IEC 61326-3-1:2017	通过 Pass
13	平缓停机/启动试验 Gradual Shut-down /start-up Test	IEC 61131-2:2017 6.2.2.4 IEC 61326-3-1:2017	通过 Pass
The results of IEC 61131-2:2017 6.2.2.5 and IEC 61131-2:2017 6.2.2.4 are unauthorized by CNAS.			
签字 Signature 编制 Compiled by 审核 Reviewed by 批准 Approved by		日期 Data 2025.5.8 2025.5.8 2025.5.8	职位 Position 试验工程师 Test Engineer 检测组组长 Test Team Leader 实验室主任 Lab Manager
			

试品信息

Information of Equipment Under Test

1. 试品信息 Information of Equipment Under Test

样品名称 EUT	LXS 控制系统 LXS Control System	样品型号 Model	LXS
样品编号 Sample No.	YLCLAB250310-004	序列号 Serial	/
工作电压 Working Voltage	AC 230V	工作电流 Working Current	1.5A
尺寸 Size	/	重量 Weight	/kg
结构特点 Structural Characteristics	☒ 台式设备 ☐ 落地式设备 ☐ 其它 Desktop Device Floor Standing Device Other		

2. 试品组成 Composition of EUT

No. 序号	Name 名称	Model 型号	Manufacturer 生产厂家	Version 版本	Quantity 数量
1	controller 控制器	LX- CU500	Hollysys 和利时	B02	1
2	controller 控制器	LX- CU510	Hollysys 和利时	A01	1
3	controller 控制器	LX- CU511	Hollysys 和利时	A01	1
4	Safety logic module 安全逻辑模块	LX- LG901	Hollysys 和利时	A02	4
5	Safety power board 安全电源板	LX- PM901	Hollysys 和利时	A	6
6	Safety isolation protection module 安全隔离保护模块	LX- AUX901	Hollysys 和利时	A	3

7	6-channel safety current type analog input module 6 通道安全电流型模拟量输入模块	LX- AI906	Hollysys 和利时	A01	3
8	6-channel safety voltage type analog input module 6 通道安全电压型模拟量输入模块	LX- AI907	Hollysys 和利时	A01	3
9	4-channel safety thermocouple input module 4 通道安全热电偶型输入模块	LX- TC901	Hollysys 和利时	A01	3
10	4-Channel Safety RTD Input Module 4 通道安全热电阻型输入模块	LX- RTD901	Hollysys 和利时	A01	3
11	4-Channel Safety Digital Input Module 4 通道安全数字量输入模块	LX- DI906	Hollysys 和利时	A01	6
12	8-Channel Safety Digital Input Module 8 通道安全数字量输入模块	LX- DI907	Hollysys 和利时	A01	3
13	4-Channel Safety Digital Output Module 4 通道安全数字量输出模块	LX- DO906	Hollysys 和利时	A01	3
14	Safety Power Relay Module 安全电源中继模块	LX- PM903	Hollysys 和利时	A	3
15	Start coupler module 始端耦合器	LX- IM001	Hollysys 和利时	B01	3
16	End coupler module 末端耦合器	LX- IM002	Hollysys 和利时	A01	3

17	4-channel voltage-current analog output module 4 通道电压电流型输出模块	LX- A0003	Hollysys 和利时	A02	9
18	2-channel relay-type safety digital output module 2 通道继电器型安全数字量输出 模块	LX- D0908	Hollysys 和利时	A	3
19	2-channel safety digital output module (2A) 2 通道安全数字量输出模块 (2A)	LX- D0907	Hollysys 和利时	A01	3
20	24V power module 24V 电源模块	PIC240. 241C	PLUS 普尔世	C	1
21	24V power module 24V 电源模块	PROMAX 240W 24V 10A	Weidmuller 魏德米勒	/	2
22	Non-safety related configuration tools 非安全相关配置工具	FA- AutoThi nk	Hollysys 和利时	3.2.3Pa tch1	/
23	Safety related configuration software 安全相关配置软件	FA- AutoThi nk- safety	Hollysys 和利时	3.2.3	/

3. 工作模式及合格判据 Test Mode and Pass Criteria

序号 No.	模式名称 Mode	模式描述 Description of the Modes	试验合格判据 Test Pass Criteria
1	额定工作 Rated Work	整机系统在额 定电压下正常 工作。 The entire system operates normally at rated voltage.	A 判据 Criterion A 功能 Function 1、The state of indicators is normal; 2、The function of acquisition and output is normal;

			1、指示灯正常。 2、信号采集、信号输出功能正常。 性能 Performance 1. There is no physical damage to the module during and after the test; 2. During the test, IEC, the controller module, operated normally, communicated with I/O module normally, and uploaded data in AT was correct, without wrong data input or output; 3. During the test, there was no abnormal communication between each module and the upper computer; 4. During the test, the channel output of DO module moved without error, and the acquisition value of DI module did not abnormal jump; 5. The acquisition accuracy of AI modules in the test meets 0.3%F.S; 6. The acquisition accuracy of TC modules in the test meets 0.1%F.S; RTD module acquisition accuracy meets: $< \pm 0.5\text{ }^{\circ}\text{C}$ (Pt sensors, 3-wire)、$< \pm 0.9\text{ }^{\circ}\text{C}$ (Ni sensors)、$< 1\text{ }^{\circ}\text{C}$ (Pt sensors, 2-wire); 7. EtherCAT communication is normal; 8. IO module has no abnormal alarm during the test; 9. During the test, the power module has no fault indication, and AT has no cause IO module loses power, resulting in offline event recording;
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			10. During the experiment, the switch has no fault indication, and AT has no offline event record of the controller; 1、试验过程中和试验后模块无物理损坏。 2、试验过程中控制器模块 IEC 运算正常, 与 I/O 模块的通讯正常, AT 中上传数据正确, 没有错误数据输入、输出。 3、试验过程中各个模块与上位机所建立的通讯无异常。 4、试验过程中 DO 模块通道输出无误动, DI 模块采集值无异常跳变。 5、试验过程中 AI 模块采集精度满 0.3%F.S。 6、试验过程中 TC 模块采集精度满 0.1%F.S. RTD 模块采集精度满足: $< \pm 0.5^{\circ}\text{C}$ (Pt sensors, 3-wire)、$< \pm 0.9^{\circ}\text{C}$ (Ni sensors)、$< 1^{\circ}\text{C}$ (Pt sensors, 2-wire)。 7、EtherCAT 通讯正常。 8、试验过程中 IO 模块无异常报警。 9、试验过程中电源模块无故障指示, AT 无因 IO 模块失电导致离线事件记录。 10、试验过程中交换机无故障指示, AT 无控制器离线事件记录。 B 判据 Criterion B 功能 Function 1 Flickering of indicators during the test is permissible, and the state of indicators is normal after the test; 2 The function of acquisition and output is normal;
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			1、试验中指示灯可闪烁,试验后指示灯状态正常。 2、信号采集、信号输出功能正常。 性能 Performance 1. There is no physical damage to the module during and after the test; 2. The controller module is allowed to fail during the test. After the test, the controller module IEC operates normally, and the communication with I/O module is normal; 3. Abnormalities are allowed in the communication during the test, and there are no abnormalities in the communication after the test; 4. During the test, the channel output of DO module moved without error, and the acquisition value of DI module did not abnormal jump; 5. During the test, the allowed accuracy of AI and AO exceeds the range, and after the test, the automatic recovery channel accuracy of AO and AI modules meets 0.3%F.S; 6. During the test, the allowed accuracy of TC and RTD exceeds the range, and after the test, the automatic recovery channel accuracy of TC modules meets 0.1%F.S;RTD module acquisition accuracy meets:$< \pm 0.5^{\circ}\text{C}$ (Pt sensors, 3-wire)、$< \pm 0.9^{\circ}\text{C}$ (Ni
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		sensors)、$< 1\text{ }^{\circ}\text{C}$ (Pt sensors, 2-wire); 7.Communication interruption was allowed for EtherCAT during the test, and EtherCAT communication returned to normal after the experiment; 8.IO module is allowed to alarm during the test, and the alarm will return to normal after the test; 9.Abnormal communication was allowed to occur in industrial switch during the test, and there was no abnormal communication after the test; 10.The switch failed was allowed to occur during the experiment. After the test, the function of the device under test returned to normal; 1、试验过程中和试验后模块无物理损坏。 2、试验过程中控制器模块允许性能下降,试验后控制器模块恢复正常,IEC 运算正常,与 I/O 模块的通讯正常,AT 中上传数据正确,没有错误数据输入、输出。 3、试验过程中通讯出现中断,试验后通讯恢复正常。 4、试验过程中 DO 模块通道输出无误动,DI 模块采集值无异常跳变。 5、试验过程中 AI 允许精度超出范围,试验后 AI 模块自动恢复通道精度满足 $0.3\%F.S.$ 6、试验过程中 TC、RTD 允许精度超出范围,试验后 TC 模块自动恢复通道精度满足 $0.1\%F.S.$; RTD
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		模块采集精度满足: $< \pm 0.5^{\circ}\text{C}$ (Pt sensors, 3-wire)、$< \pm 0.9^{\circ}\text{C}$ (Ni sensors)、$< 1^{\circ}\text{C}$ (Pt sensors, 2-wire)。 7、试验过程中 EtherCAT 允许出现通讯中断, 实验后 EtherCAT 通讯恢复正常。 8、试验过程中 IO 模块允许出现报警, 试验后报警恢复正常。 9、试验过程中允许通讯异常, 试验结束后无通讯异常。 10、实验过程中允许交换机出现故障指示, 试验后受试设备功能恢复正常。 C 判据 Criterion C 功能 Function During the test, the function is allowed to decrease, and after the test, it is reset: 1. The indicator light is normal; 2. The signal acquisition and output function is normal; 试验中允许功能下降, 试验后经过复位: 1、指示灯正常; 2、信号采集、信号输出功能正常。 性能 Performance 1. There is no physical damage to the module during and after the test; 2. During the test, the controller module fails to recover automatically. After the test, after the device is manually restarted or the power is turned off/on, the IEC module of the controller module operates normally, and the communication with I/O module is normal; 3. During the test, the communication fails to
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			recover automatically. After the test, the communication is not abnormal after the device is manually restarted or the power is turned off/started; 4. During the test, DO and DI module channels jump or the module goes offline, which cannot be automatically restored. After the test, the tested equipment can be manually restarted or the power can be turned off/turned on to return to normal; 5. During the test, the accuracy and stability of AI modules are beyond the range. After the test, after manual restart or power off/on, the channel acquisition accuracy of AI modules meets 0.3%F.S; 6. During the test, the allowed accuracy of TC and RTD exceeds the range, and after the test, the automatic recovery channel accuracy of TC modules meets 0.1%F.S; RTD module acquisition accuracy meets: $< \pm 0.5^{\circ}\text{C}$ (Pt sensors, 3-wire)、$< \pm 0.9^{\circ}\text{C}$ (Nisensors)、$< 1^{\circ}\text{C}$ (Pt sensors, 2-wire); 7. EtherCAT communication anomalies are allowed during the test. After the test, after manual restart or power off/on of the tested device, EtherCAT communication does not occur An exception; 8. During the test, IO module appears alarm or off-line. After the test, after manual restart or power off/on of the tested device, the alarm is
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			restored to normal or the module does not appear off-line fault; 9.The power module fails during the test. After the test, the function of the tested equipment will return to normal after manual restart or power off/on; 10.The switch failed during the experiment. After the test, the function of the device under test returned to normal after manual restart or power off/on; 1、试验过程中和试验后模块无物理损坏。 2、试验过程中控制器模块出现故障,不能自动恢复,试验后,受试设备在手动重启或电源关断/开启后,控制器模块 IEC 运算正常,与 I/O 模块的通讯正常,AT 中上传数据正确,没有错误数据输入、输出。 3、试验过程中通讯出现故障,不能自动恢复,试验后,受试设备在手动重启或电源关断/开启后,通讯无异常。 4、试验过程中 DO、DI 模块通道出现跳变或模块离线,不能自动恢复,受试设备试验后手动重启或电源关断/开启后恢复正常。 5、试验过程中 AI 模块精度、稳定度超出范围,试验后在手动重启或电源关断/开启后,AI 模块通道采集精度满足 0.3%F.S。 6、试验过程中 TC、RTD 允许精度超出范围,受试设备在手动重启或电源关断/开启后,TC 模块自动恢复通道精度满足 0.1%F.S,RTD 精度满足: $< \pm 0.5^{\circ}\text{C}$ (Pt sensors, 3-wire)、$< \pm 0.9^{\circ}\text{C}$ (Ni
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		sensors)、$<1^{\circ}\text{C}$ (Pt sensors, 2-wire)。 7、试验过程中 EtherCAT 允许出现通讯异常, 试验后, 受试设备在手动重启或电源关断/开启后, EtherCAT 通讯无异常。 8、试验过程中 IO 模块出现报警或离线, 试验后, 受试设备在手动重启或电源关断/开启后, 报警恢复正常或模块未出现离线故障。 9、试验过程中电源模块出现故障, 试验后, 受试设备在手动重启或电源关断/开启后, 功能恢复正常。 10、实验过程中交换机出现故障, 试验后, 受试设备在手动重启或电源关断/开启后, 功能恢复正常。 DS 判据 Criterion DS 性能 Performance a) The functions of the EUT intended for use in safety applications 1) are not affected outside their specification, or 2) may be affected temporarily or permanently (even by destruction of components), if the EUT reacts to a disturbance in a way that a detectable and defined state (or states) of the EUT is(are) maintained, or achieved within a stated time. b) The functions not intended for use in safety applications may be disturbed temporarily or permanently. NOTE 1 It is possible for the defined state to be outside normal operating limits.
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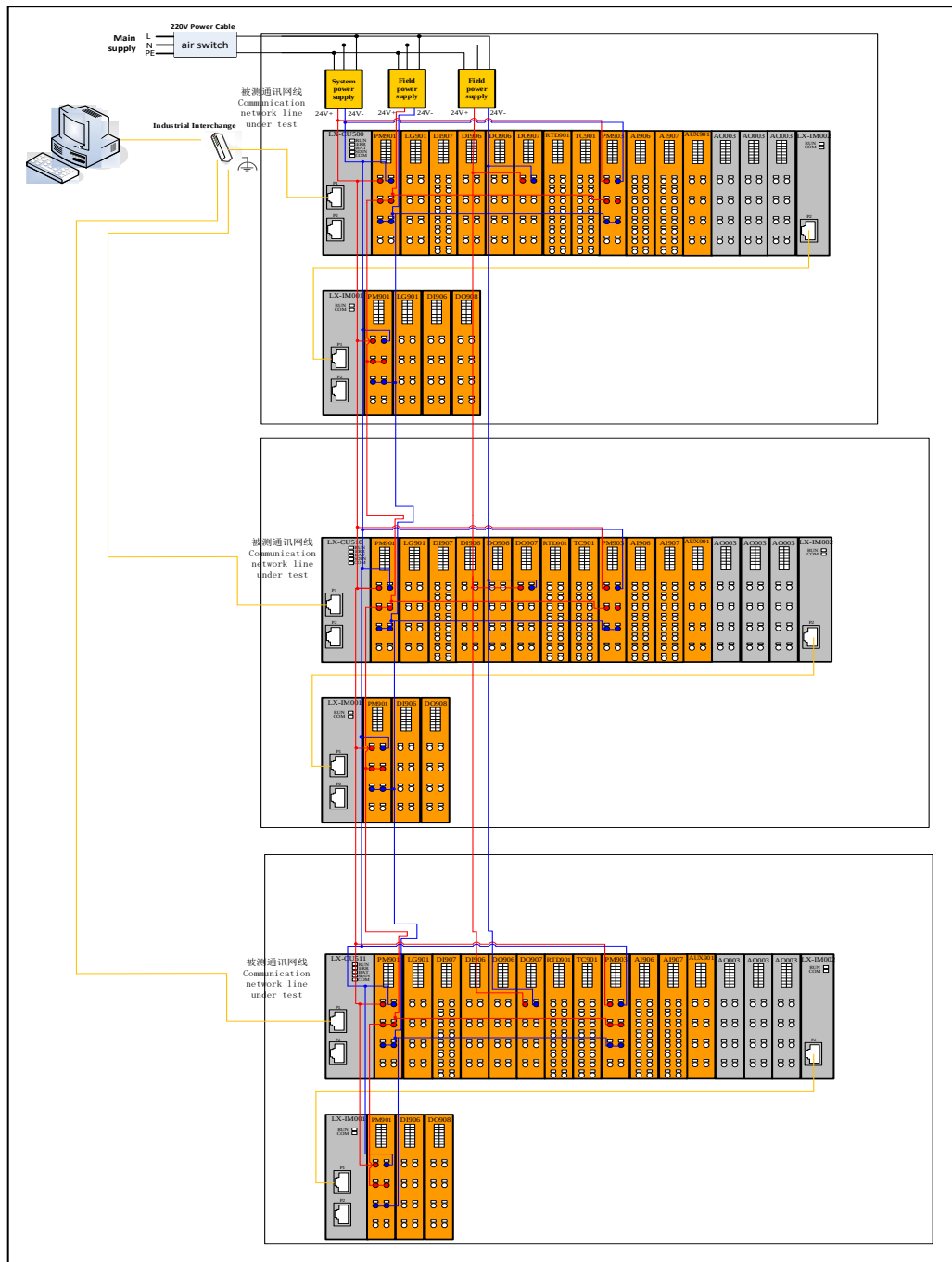
			NOTE 2 Generalized performance criteria A, B and C as defined in generic EMC standards and also more precise performance criteria as defined in EMC product or product family standards were specifically not developed for use in functional safety applications. However, performance criterion A is always acceptable. In this test, For the performance criterion DS: 1. There may be electrical fault in the module or system during and after the test. 2. If there is no fault of the system and modules, the system and modules need to meet the specifications as below: During the test, the IEC calculation and the controller module operate normally. The communication module operate snormally, and reported data in AT is correct. During the test, the output channels of DO module operate normally, and the acquisition value of DI module is correct, the AO module channel signal is normal. The acquisition accuracy of AI modules in the test meets 0.3%F.S requirement. EtherCAT communication is normal. I/O module has no abnormal alarm during the test. During the test, the power module has no fault indication, and AT has no offline
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			event recording of IO modules. During the test, the switch has no fault indication, and AT has no offline event recording of the controller. 3.If there are faults in the system and modules, the system and modules need to meet the specification as below: The input module and controller need to be fail-safe, the quality bit will be faulty. The output modules need to be fail-safe, the output is 0. IO BUS needs to be fail-safe, and the messages will be discarded and report the fault to AT. Safe BUS needs to be fail-safe, and the messages will be discarded and report the fault to AT. Power modules have no 24V output. a) EUT 功能预计用于安全应用 1)被测设备的安全应用功能在其规范之外不会被影响, 或者 2)施加干扰时 EUT 能在规定时间内维持或达到事先规定的可检测的一个或多个状态, 那么其安全应用功能可以暂时或永久性地受影响, 甚至器件的损坏也是允许的。因而规定的状态超出正常运行限值或其它可检测的情况是有可能的。 b)非安全应用功能可能会暂时性或永久性地被骚扰。非安全相关元件的损坏是允许的。 备注 1: 定义的状态可能超出正常操作限制
--	--	--	---

			备注 2: 通用 EMC 标准中定义的通用性能标准 A、B 和 C, 以及 EMC 产品或产品系列标准中定义更精确的性能标准, 都不是专门为功能安全应用而开发的。但是, 性能标准 A 总是可以接受的。 在本测试中, 对于性能标准 DS: 1. 测试期间和之后, 模块或系统可能存在电气故障。 2. 如果系统和模块没有故障, 则系统和模块需要满足以下规格: 在测试过程中, IEC 计算和控制器模块正常运行。通信模块工作正常, AT 上报数据正确, DO 模块的输出通道运行正常, DI 模块的采集值正确, AO 模块通道信号正常, AI 模块的采集精度满足 0.3%F.S 要求。EtherCAT 通信正常。IO 模块在测试过程中没有异常报警。 测试期间, 电源模块没有故障指示, AT 没有 IO 模块的离线事件记录。开关没有故障指示, AT 没有控制器的离线事件记录。 3. 如果系统和模块出现故障, 系统和模块需要符合以下规格: 输入模块和控制器需要具有故障安全功能, 质量位将出现故障。输出模块需要具有故障安全功能, 输出为 0。IO 总线需要具有故障安全功能, 消息将被丢弃并向 AT 报告故障。 安全总线需要具有故障安全功能, 消息将被丢弃并向 AT 报告故障。电源模块没有 24V 输出。
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4. 试品线缆信息 Cable Information					
序号 No.	名称 Name	长度 (m) Length (m)	是否屏蔽 Shielded or not	数量 Quantities	用途 Usage
1	系统交流电源线 System AC Power Cable	2m	NO 否	1	设备供电电源 EUT Power
2	现场交流电源线 Field AC Power Cable	2m	NO 否	1	设备供电电源 EUT Power
3	D0907 通道输出信 号线 D0907 channel output signal line	2m	NO 否	1	设备 IO 接口 EUT IO Interface
4	D0907 现场电源输 入信号线 D0907 field power input signal line	2m	NO 否	1	设备供电电源 EUT Power
5	CU500 网线 CU500 Network Cable	3m	YES 是	1	设备与上位机互联 Connected EUT and Upper Computer
6	CU 510 网线 CU510 Network Cable	3m	YES 是	1	设备与上位机互联 Connected EUT and Upper Computer
7	CU511 网线 CU511 Network Cable	3m	YES 是	1	设备与上位机互联 Connected EUT and Upper Computer

5. 工作连接图 Working Connection Diagram



6. 陪试设备信息 Information of Auxiliary Equipment						
序号 No.	名称 Name	型号 Model	序列号 Serial No.	生产厂家 Manufactu rer	精度 Precision	用途 Usage
1	PC 主机	DELL- VOSTRO 5560	/	戴尔 DELL	/	监控模块状态 Monitoring module status
2	直流阻性负载 DC resistive load	100W 12R	/	/	/	D0908 阻性负载 D0908 resistive load
3	插装精密金属膜 固定电阻器 Plug in precision metal film resistors	RJ711	/	七一八友 晟电子 718 YOUSHENG ELECTRONI CS	0.01%;1/ 4W;± 25ppm/°C	提供模拟量信号 Provide analog signals
4	精密热电偶 Precision thermistor	K 型	/	上海念飞 机电 Shanghai Nianfei Electric	±0.5°C	提供模拟量信号 Provide analog signals
5	24V 电源模块 24V power module	PROMAX 480W24 V20A	/	魏德米勒 Weidmulle r	/	D0908 负载电源 D0908 load power supply
6	继电器 (带座) Relay (units)	MY2N- J- 24VDC	/	欧姆龙 Omron	/	DI 信号输入、DO 信 号输出 DI signal input, DO signal output
7	交换机 Switch	Opal8- 8T-LV- LV	/	东土科技 Kyland	/	通讯数据交换 Communication data exchange
8	导轨 Rail	DIN35	/	和利时 Hollysys	/	固定模块 Fixed module
送样人 Sender		费沂东 Fei yidong		接收日期 Date of receipt		2025-04-10
联系人 Associate		费沂东 Fei yidong		联系方式 Contact details		18309220043

试品照片 EUT PHOTO

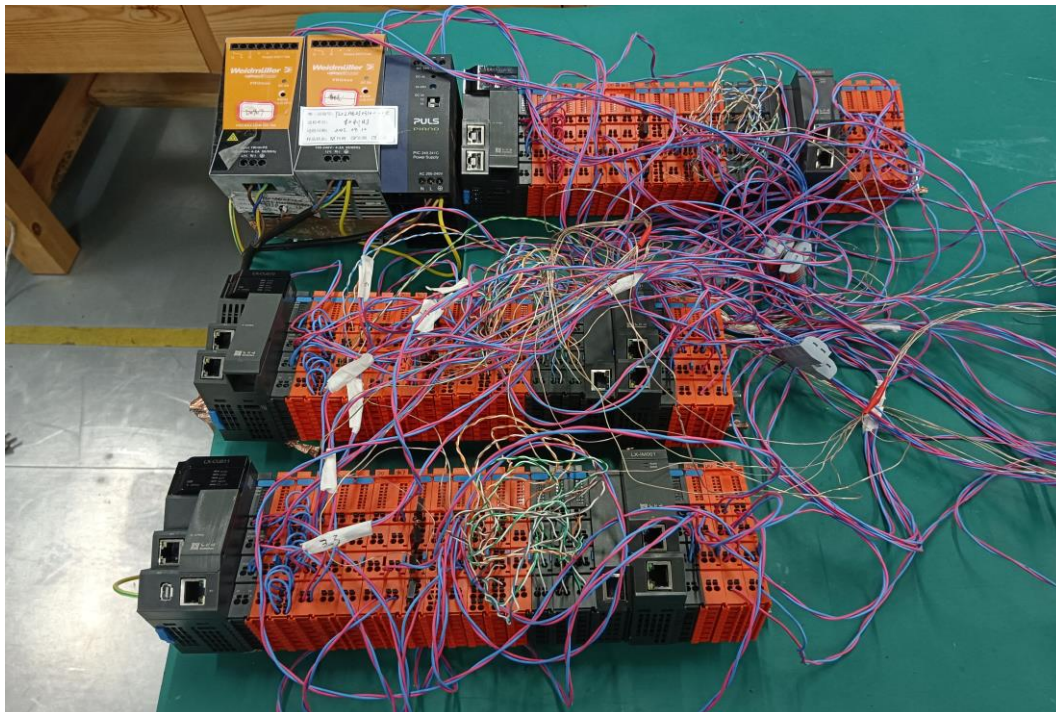


图 1 试品整体图 EUT Overall picture

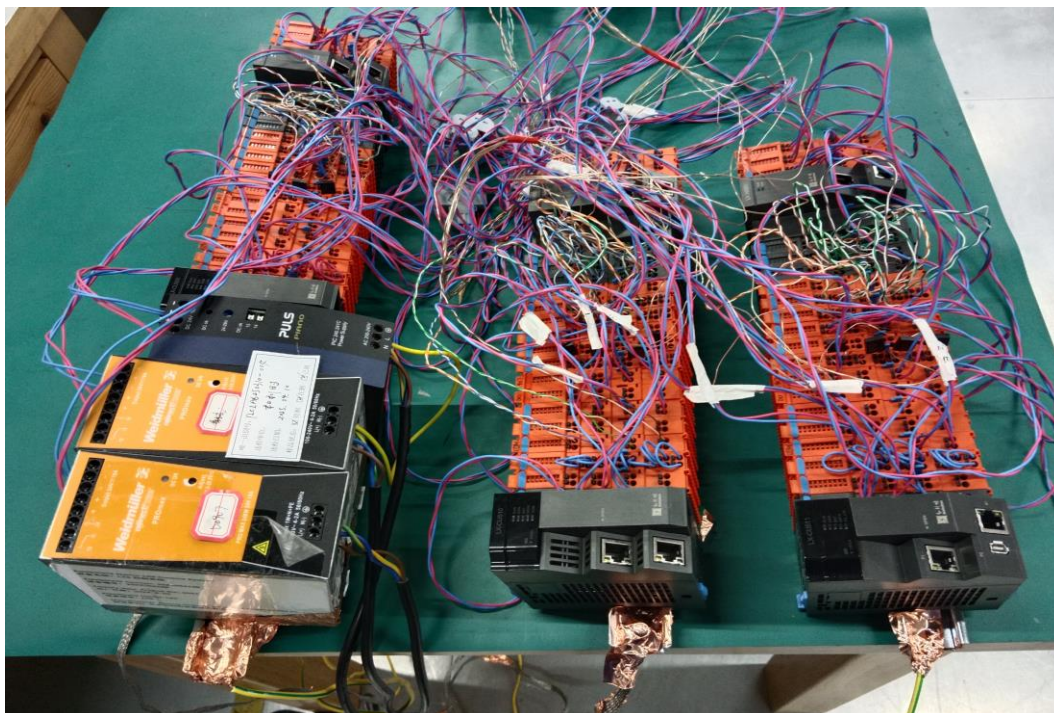


图 2 试品侧面图 EUT side picture

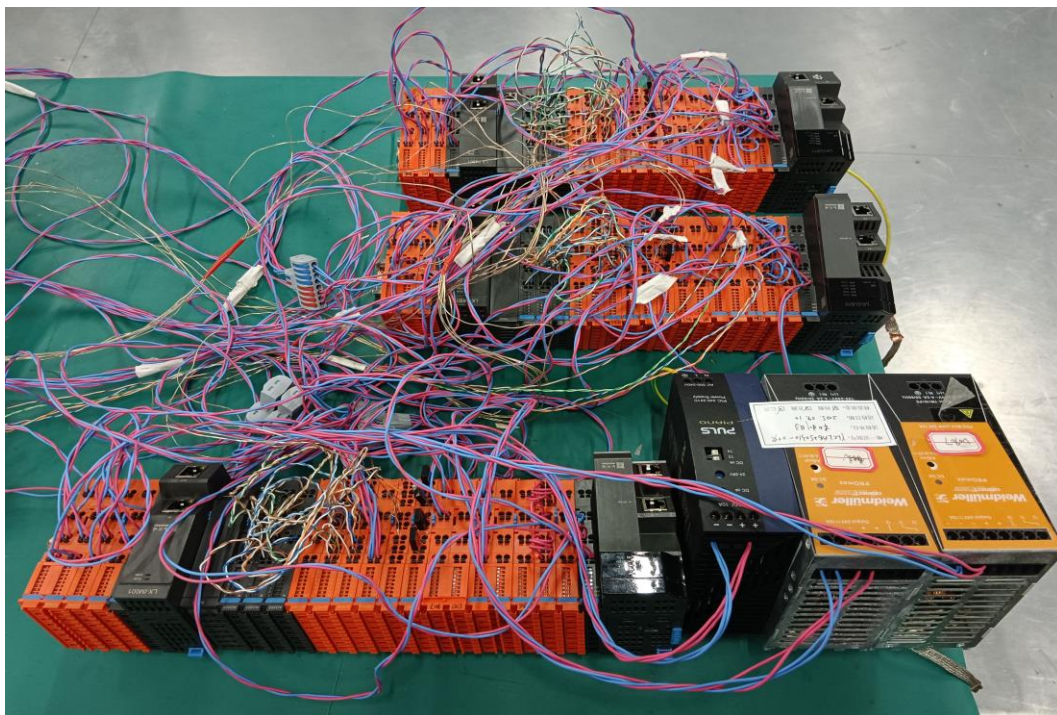


图 3 试品背面图 EUT the back picture

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电源端子传导骚扰试验 Conducted Emission Test to Power Port					
试验日期 Test Date: 2025-04-14					
环境条件 Test Environment	温度 Temperature t=21.5℃ 相对湿度 Relative Humidity RH=46.7% 大气压力 Atmospheric Pressure P=97.31kPa				
1. 试验标准 Test Standard					
IEC 61000-6-4:2018、EN 55011:2017、IEC 61326-1:2012、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment Name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
接收机 Receiver	N9038A	MY53290026	2XB240819125 000-0008	Keysight	2025-08-26
人工电源网络 Artificial Mains Network	EM5040B	E165040228	1XA221228360 83-0005	知用 Cybertek	2025-12-30
3. 试验限值 Limit					
频率 (MHz) Frequency range (MHz)	准峰值限值 (dB μV) Quasi-peak limit (dB μV)			平均值限值 (dB μV) Average (dB μV)	
0.15~0.5	79			66	
0.5~30	73			60	
4. 工作模式 Test Mode					
额定工作 Rated Work					
5. 试验现象 Test Phenomena					
☒ 正常 Normal ☐ 其它 Other[]					
6. 试验结论 Test Result					
☒ 通过 Pass ☐ 未通过 Fail					

7. 试验数据 Test Data

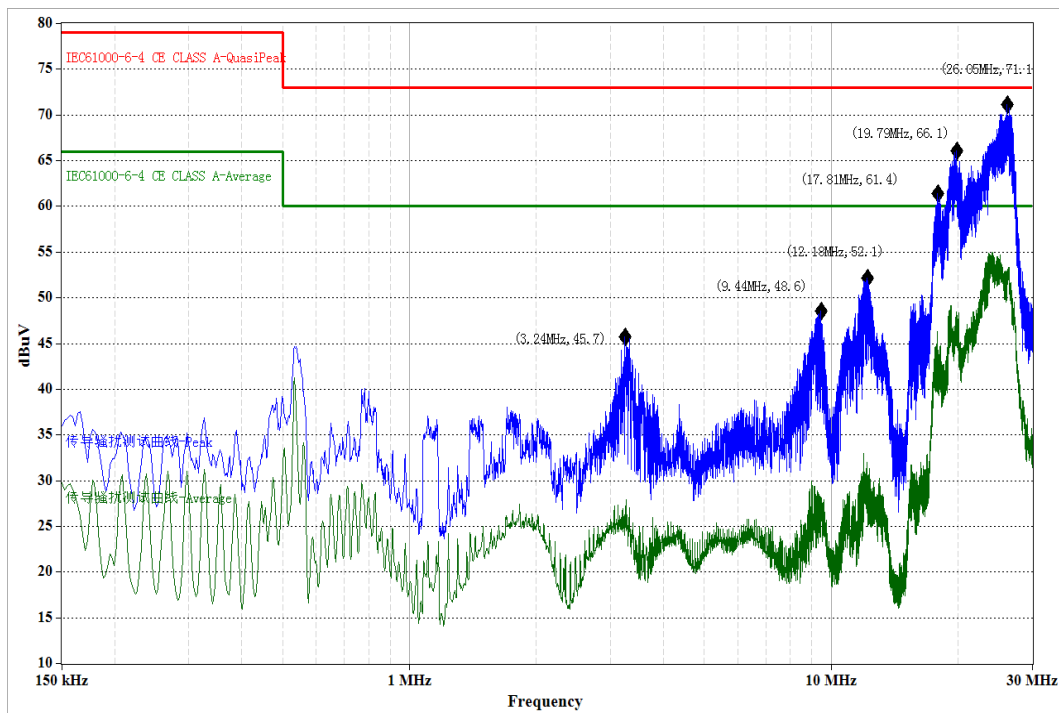


图 4 0.15MHz~30MHz 电源端子传导骚扰系统交流电源 L 线试验曲线

Fig. 4 Spectral Diagram, Conducted Emission, 0.15M Hz~30MHz, System Power port, L line.

表 1 0.15MHz~30MHz 电源端子传导骚扰系统交流电源 L 线试验数据

Table. 1 Data of Conducted Emission, 0.15M Hz~30MHz, System Power port, L line

频率 (MHz)	峰值 dBuV	准峰值 dBuV	平均值 dBuV	准峰值 限值 dBuV	平均值 限值 dBuV	准峰值 裕量 dB	平均值 裕量 dB
3.24	45.69	39.42	28.42	73	60	33.58	31.58
9.44	48.57	39.51	28.51	73	60	33.49	31.49
12.18	52.13	47.36	30.36	73	60	25.64	29.64
17.81	61.37	52.00	37.61	73	60	21.00	22.39
19.79	66.11	57.35	46.11	73	60	15.65	13.89
26.05	71.10	63.17	53.53	73	60	9.83	6.47

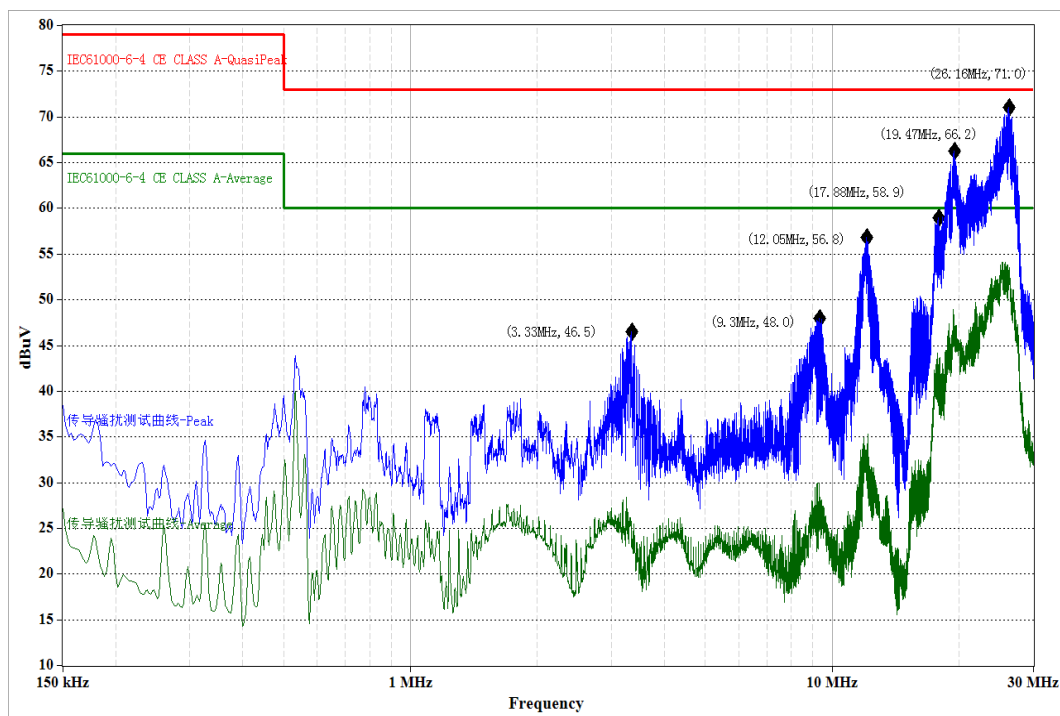


图 5 0.15MHz~30MHz 电源端子传导骚扰系统交流电源 N 线试验曲线

Fig. 5 Spectral Diagram, Conducted Emission, 0.15M Hz~30MHz, System Power port, N line.

表 2 0.15MHz~30MHz 电源端子传导骚扰系统交流电源 N 线试验数据

Table. 2 Data of Conducted Emission, 0.15M Hz~30MHz, System Power port, N line

频率 (MHz)	峰值 dBuV	准峰值 dBuV	平均值 dBuV	准峰值 限值 dBuV	平均值 限值 dBuV	准峰值 裕量 dB	平均值 裕量 dB
3.33	46.53	39.24	27.22	73	60	33.76	32.78
9.30	47.99	39.76	25.49	73	60	33.24	34.51
12.05	56.79	49.19	31.36	73	60	23.81	28.64
17.88	58.94	51.36	39.90	73	60	21.64	20.10
19.47	66.24	57.66	46.20	73	60	15.34	13.80
26.16	71.02	62.28	50.04	73	60	10.72	9.96

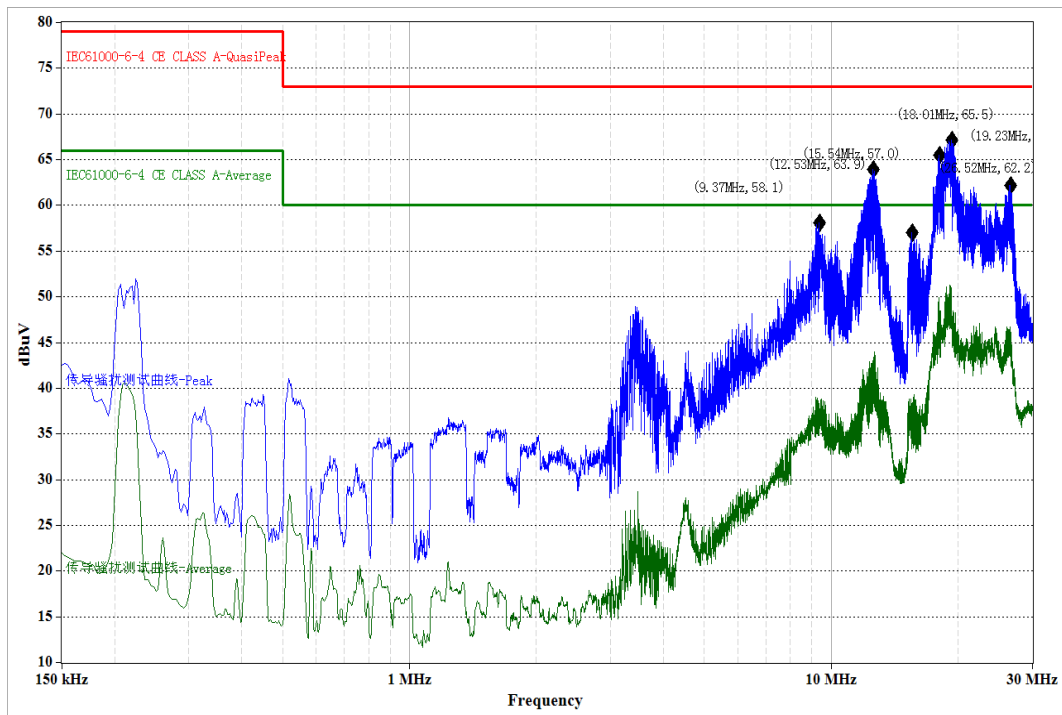


图 6 0.15MHz~30MHz 电源端子传导骚扰现场交流电源 L 线试验曲线

Fig. 6 Spectral Diagram, Conducted Emission, 0.15M Hz~30MHz, Field Power port, L line.

表 3 0.15MHz~30MHz 电源端子传导骚扰现场交流电源 L 线试验数据

Table. 3 Data of Conducted Emission, 0.15M Hz~30MHz, Field Power port, L line

频率 (MHz)	峰值 dBuV	准峰值 dBuV	平均值 dBuV	准峰值 限值 dBuV	平均值 限值 dBuV	准峰值 裕量 dB	平均值 裕量 dB
9.37	58.08	49.42	37.48	73	60	23.58	22.52
12.53	63.91	50.08	36.61	73	60	22.92	23.39
15.54	57.05	40.59	32.91	73	60	32.41	27.09
18.01	65.48	44.91	37.72	73	60	28.09	22.28
19.23	67.15	51.84	41.78	73	60	21.16	18.22
26.52	62.21	47.91	39.99	73	60	25.09	20.01

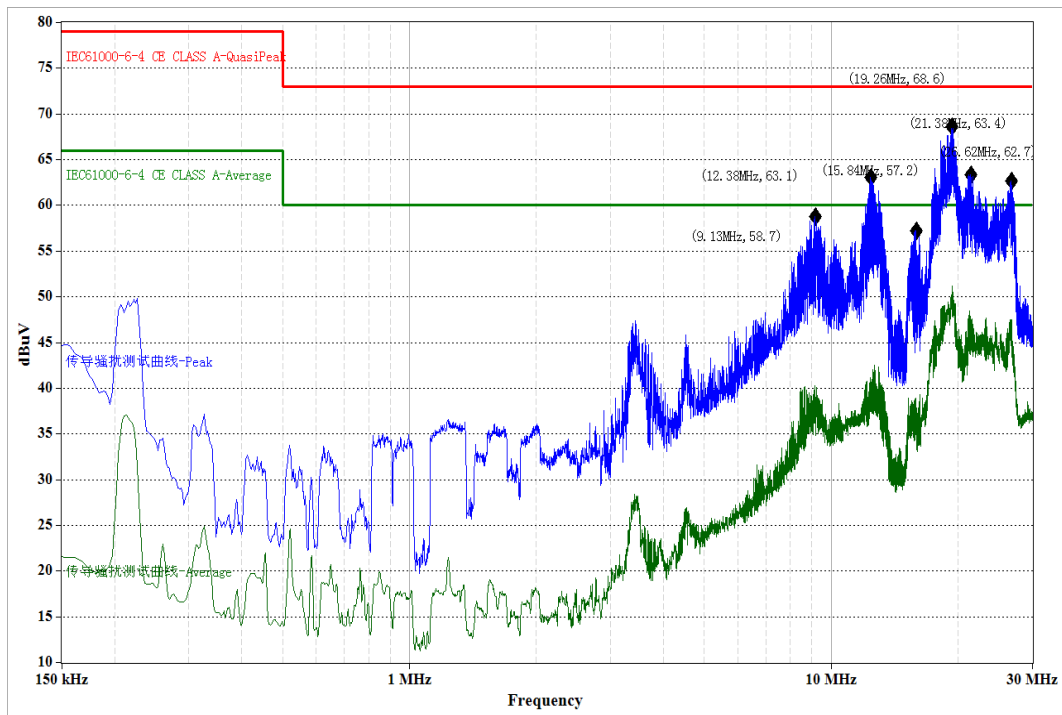


图 7 0.15MHz~30MHz 电源端子传导骚扰现场交流电源 N 线试验曲线

Fig. 7 Spectral Diagram, Conducted Emission, 0.15M Hz~30MHz, Field Power port, N line.

表 4 0.15MHz~30MHz 电源端子传导骚扰现场交流电源 N 线试验数据

Table. 4 Data of Conducted Emission, 0.15M Hz~30MHz, Field Power port, N line

频率 (MHz)	峰值 dBuV	准峰值 dBuV	平均值 dBuV	准峰值 限值 dBuV	平均值 限值 dBuV	准峰值 裕量 dB	平均值 裕量 dB
9.13	58.74	48.57	39.53	73	60	24.43	20.47
12.38	63.10	56.40	39.40	73	60	16.60	20.60
15.84	57.22	46.30	35.75	73	60	26.70	24.25
19.26	68.65	59.41	48.84	73	60	13.59	11.16
21.38	63.38	54.96	46.41	73	60	18.04	13.59
26.62	62.71	53.51	42.70	73	60	19.49	17.30

主检工程师
Principal赵鹏飞
Zhao Pengfei副检工程师
Verifier曹胜利
Cao Shengli

8. 试验布置图 Test Layout

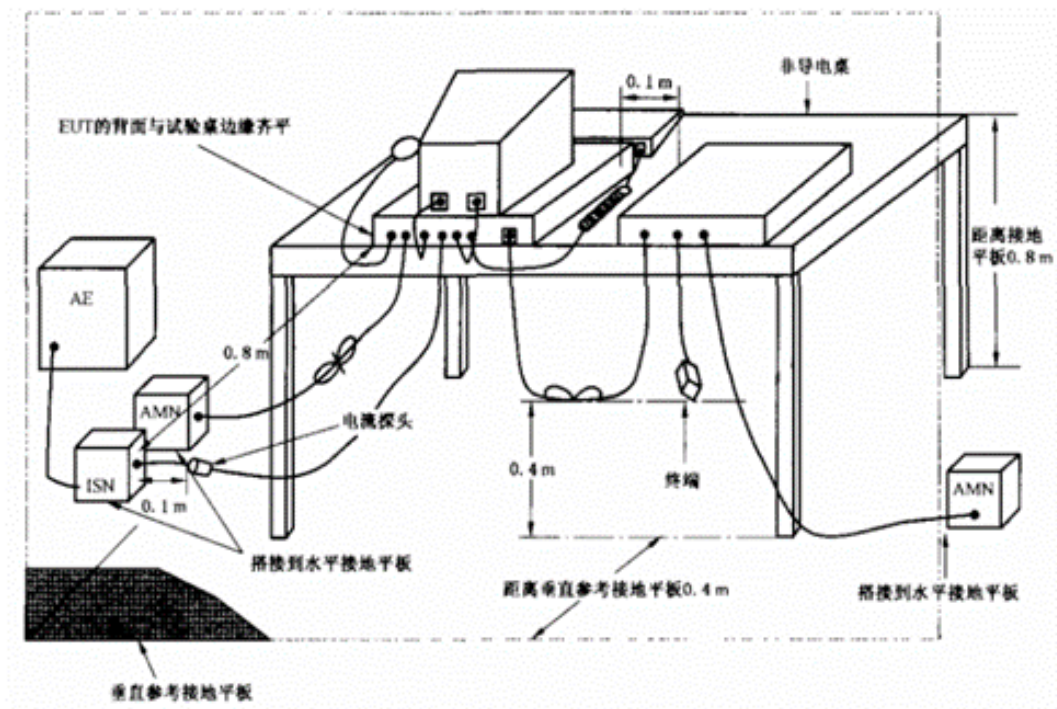


图 8 电源端子传导骚扰试验布置示意图

Fig. 8 Layout of Conducted Emission to Power Port

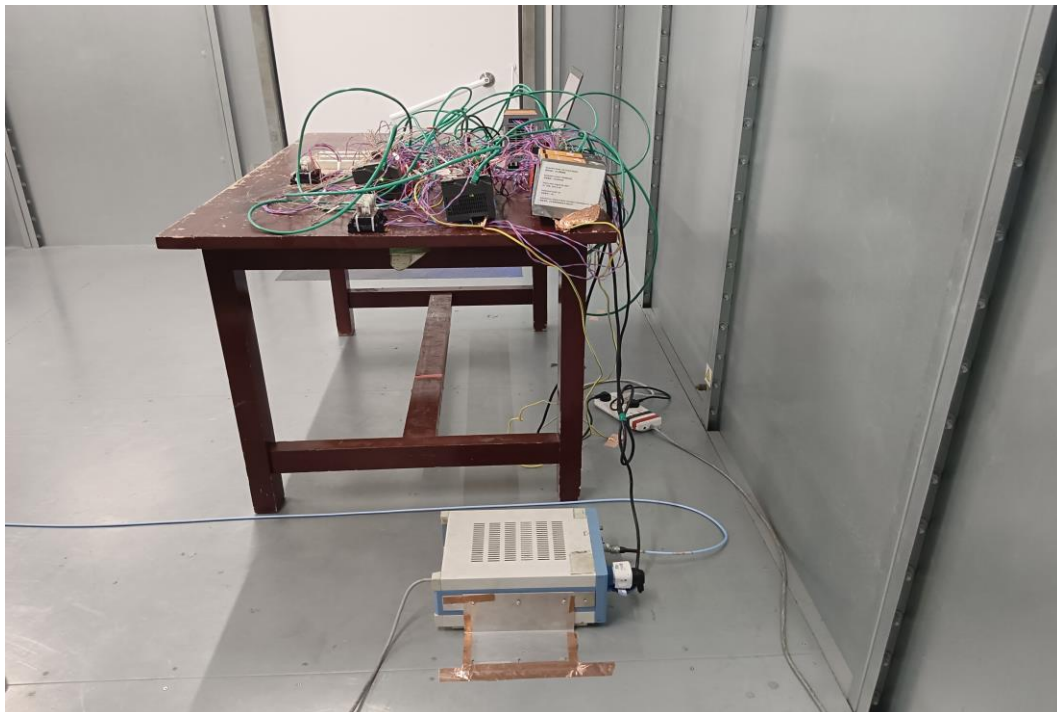


图 9 电源端子传导骚扰试验布置图

Fig. 9 Photograph of Conducted Emission to Power Port

网口端子传导骚扰试验

Conducted Emission Test to Network Port

试验日期 Test Date: 2025-04-14

环境条件 Test Environment	温度 Temperature t=21.5℃ 相对湿度 Relative Humidity RH=46.7% 大气压力 Atmospheric Pressure P=97.31kPa
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1. 试验标准 Test Standard

IEC 61000-6-4:2018、EN 55011:2017、IEC 61326-1:2012、IEC 61326-3-1:2017

2. 试验设备 Test Equipment

设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
接收机 Receiver	N9038A	MY53290026	2XB24081912 5000-0008	Keysight	2025-08-26
电流探头 Current Probe	9215-1N	219057-4	CNJZ2400152 93	SOLAR	2025-08-26

3. 试验限值 Limit

频率 (MHz) Frequency range (MHz)	准峰值限值 (dB μA) Quasi-peak limit (dB μA)	平均值限值 (dB μA) Average (dB μA)
0.15~0.5	53~43	40~30
0.5~30	43	30

4. 被测模式 Test Mode

额定工作 Rated Work

5. 试验现象 Test Phenomena

☒正常 Normal ☐其它 Other[]

6. 试验结论 Test Result

☒通过 Pass ☐未通过 Fail

7. 试验数据 Test Data

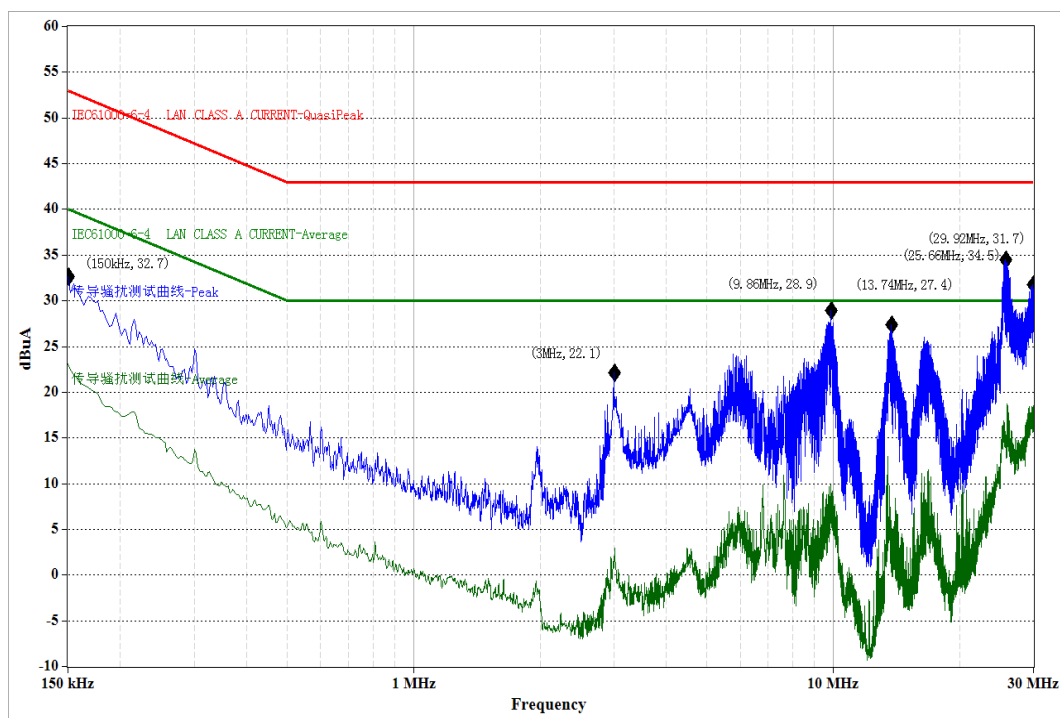


图 10 0.15MHz~30MHz CU500 网线传导骚扰试验曲线

Fig. 10 Spectral Diagram, Conducted Emission, 0.15MHz~30MHz, CU500 network line.

表 5 0.15MHz~30MHz 网口端子传导骚扰 CU500 网线试验数据

Table 5 Data of Conducted Emission, 0.15MHz~30MHz, CU500 network line.

频率 Frequency (MHz)	峰值 Peak (dB μ A)	准峰值 Quasi- peak (dB μ A)	平均值 Average (dB μ A)	准峰值限 值 Quasi- peak limit (dB μ A)	平均值限 值 Average limit (dB μ A)	准峰值裕 量 Quasi- peak Margin dB	平均值裕 量 Average Margin dB
0.15	32.68	38.27	32.56	53	40	14.73	7.44
3.00	22.09	14.89	1.36	43	30	28.11	28.64
9.86	28.91	19.50	9.51	43	30	23.50	20.49
13.74	27.36	15.96	3.39	43	30	27.04	26.61
25.66	34.46	23.08	14.19	43	30	19.92	15.81
29.92	31.74	23.03	16.40	43	30	19.97	13.60

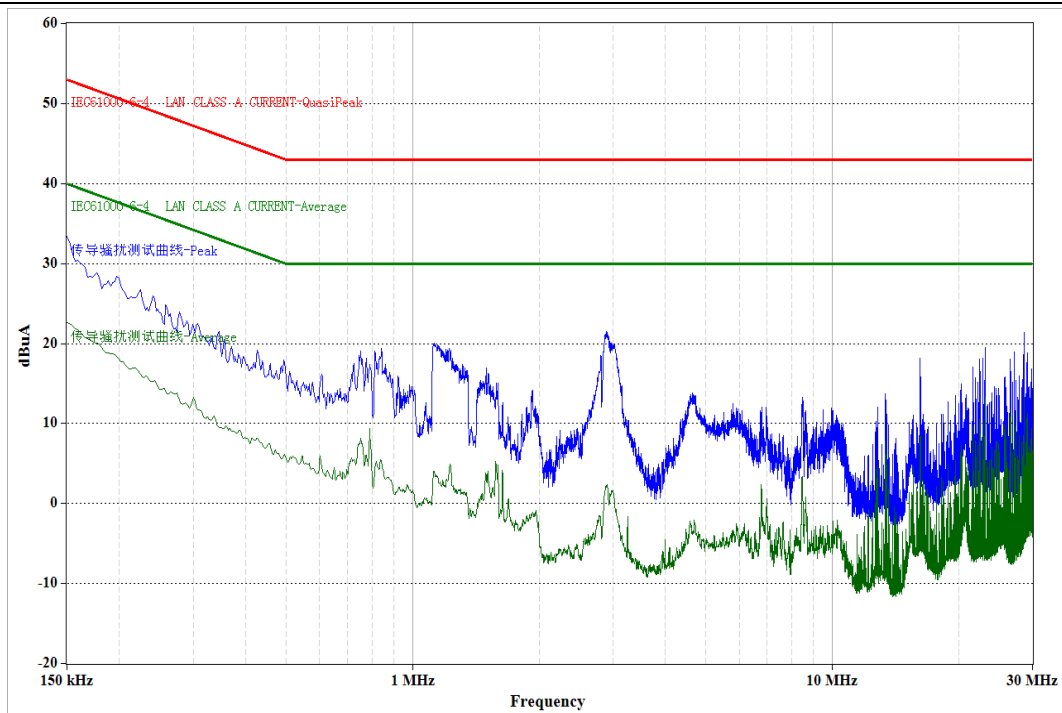


图 11 0.15MHz~30MHz CU510 网线传导骚扰试验曲线

Fig. 11 Spectral Diagram, Conducted Emission, 0.15MHz~30MHz, CU510 network line.

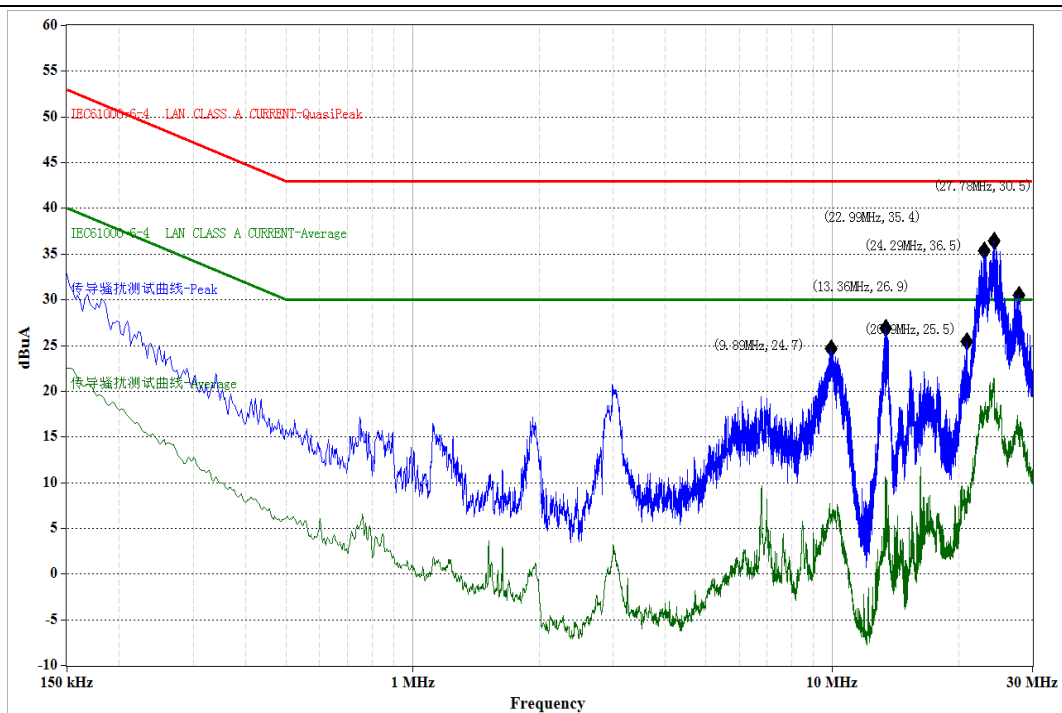


图 12 0.15MHz~30MHz CU511 网线传导骚扰试验曲线

Fig. 12 Spectral Diagram, Conducted Emission, 0.15MHz~30MHz, CU511 network line.

表 6 0.15MHz~30MHz 网口端子传导骚扰 CU511 网线试验数据

Table 6 Data of Conducted Emission, 0.15MHz~30MHz, CU511 network line.

频率 Frequency (MHz)	峰值 Peak (dB μ A)	准峰值 Quasi- peak (dB μ A)	平均值 Average (dB μ A)	准峰值限 值 Quasi- peak limit (dB μ A)	平均值限 值 Average limit (dB μ A)	准峰值裕 量 Quasi- peak Margin dB	平均值裕 量 Average Margin dB
9.89	24.70	20.02	8.64	43	30	22.98	21.36
13.36	26.88	17.95	7.08	43	30	25.05	22.92
20.90	25.46	16.51	7.36	43	30	26.49	22.64
22.99	35.39	27.99	19.87	43	30	15.01	10.13
24.29	36.46	28.78	19.47	43	30	14.22	10.53
27.78	30.49	24.15	17.40	43	30	18.85	12.60

主检工程师
Principal赵鹏飞
Zhao Pengfei副检工程师
Verifier曹胜利
Cao Shengli

辐射骚扰试验 Radiation Emission Test										
试验日期 Test Data: 2025-04-14										
环境条件 Test Environment	温度 Temperature t=21.4℃ 相对湿度 Relative Humidity RH=48.6% 大气压力 Atmospheric Pressure P=97.37kPa									
1. 试验标准 Test Standard										
IEC 61000-6-4:2018、EN 55011:2017、IEC 61326-1:2012、IEC 61326-3-1:2017										
2. 试验设备 Test Equipment										
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate					
接收机 Receiver	N9038A	MY53290026	2XB240819125 000-0008	Keysight	2025-08-26					
复合天线 Composite Antenna	3142E	00217553	EMCF20230941 2	ETS	2026-09-24					
双脊喇叭天线 Double Ridge Horn Antenna	BBHA 9120 D	02618	1XA240711137 09-0006	Schwarzbeck	2025-09-13					
低噪声放大器 Low noise amplifier	YLCPreA- 1G18-40	YLCPreA- 2017-09-002	CNJZ24001974 9	YLC	2025-10-28					
3. 试验限值 Limit										
频率 Frequency range (MHz)	准峰值限值 Quasi-peak limit (dBuV/m)		峰值限值 peak limit (dBuV/m)	平均值限值 Average (dBuV/m)						
30~230	50		/	/						
230~1000	57		/	/						
1000~3000	/		76	56						
3000~6000	/		80	60						
4. 被测模式 Test Mode										
额定工作 Rated Work										
5. 试验现象 Test Phenomena										
☒ 正常 Normal ☐ 其它 Other[]										
6. 试验结论 Test Result										
☒ 通过 Pass ☐ 未通过 Fail										

7. 试验数据 Test Data

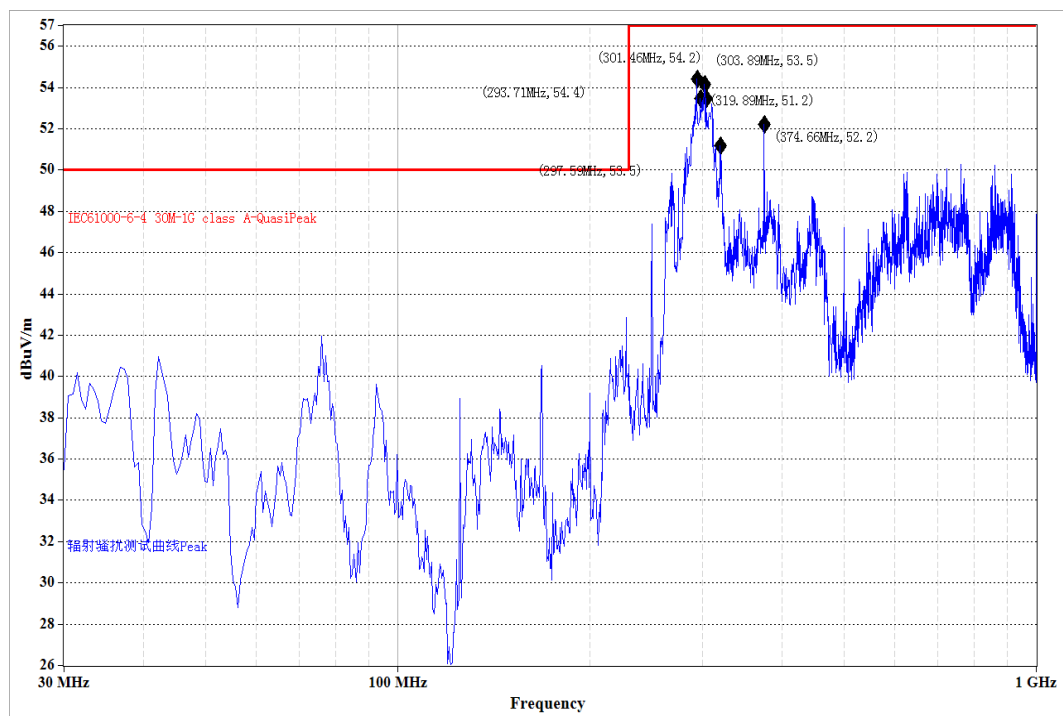


图 15 30MHz~1GHz 辐射骚扰垂直极化试验曲线

Fig.15 Spectral diagram, 30MHz~1GHz Radiation Emission Test, Vertical polarization

表 7 30MHz~1GHz 辐射骚扰垂直极化试验曲线数据

Table 7 Data of 30MHz~1GHz Radiation Emission Test, Vertical polarization

频率 MHz	峰值测量 值 dBuV/m	准峰值测量 值 dBuV/m	准峰值限 值 dBuV/m	准峰值裕 量 dB	转台角 度 (°)	天线高 度 (cm)
293.71	54.42	50.15	57	6.85	139.4	200
297.59	53.48	49.48	57	7.52	111.3	99.9
301.46	54.15	51.71	57	5.29	126.8	200
302.54	53.48	51.04	57	5.96	143	196.4
319.89	51.18	47.99	57	9.01	123.2	200
374.66	52.22	43.09	57	13.91	217.4	200

扩展不确定度 expanded uncertainty $U=4.8\text{dB}$, $k=2$

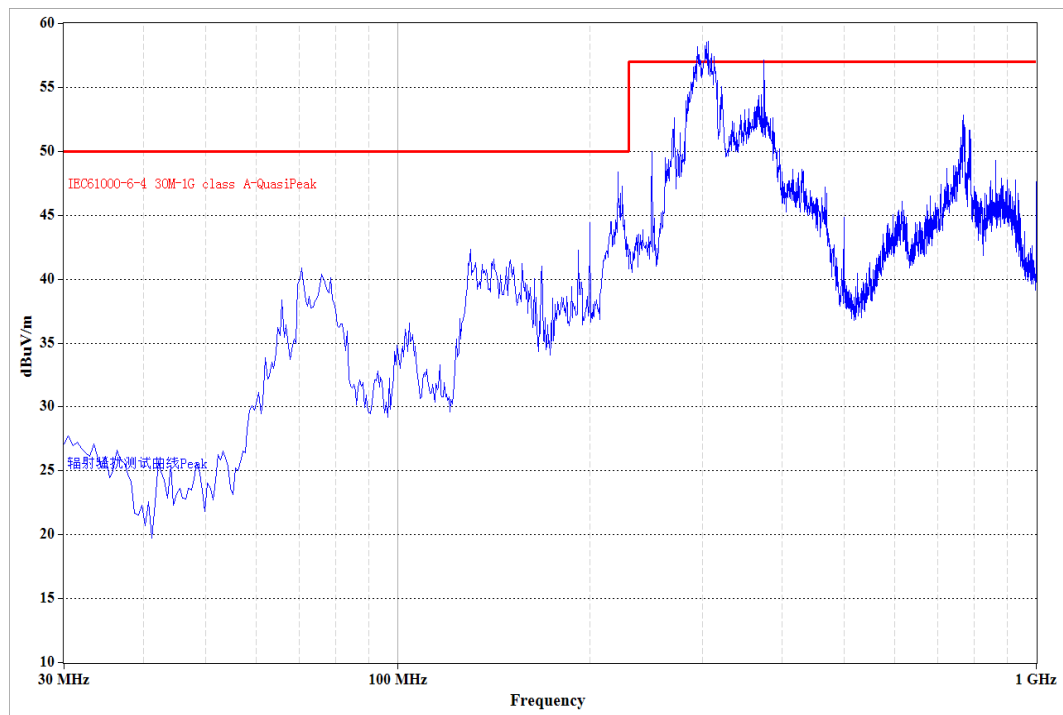


图 16 30MHz~1GHz 辐射骚扰水平极化试验曲线

Fig.16 Spectral diagram, 30MHz~1GHz Radiation Emission Test, Horizontal polarization

表 8 30MHz~1GHz 辐射骚扰水平极化试验曲线数据

Table 8 Data of 30MHz~1GHz Radiation Emission Test, Horizontal polarization

频率 MHz	峰值测量 值 dBuV/m	准峰值测量 值 dBuV/m	准峰值限 值 dBuV/m	准峰值裕 量 dB	转台角度 (°)	天线高度 (cm)
295.16	58.22	54.95	57	2.05	54	99.9
302.92	58.27	55.49	57	1.51	71.9	99.9
306.31	58.58	54.17	57	2.83	22.6	99.9
304.86	58.55	54.48	57	2.52	7.4	99.9
309.71	57.66	54.20	57	2.80	266.3	99.9
375.04	57.18	53.58	57	3.42	62	119.9

扩展不确定度 expanded uncertainty U=4.8dB, k=2

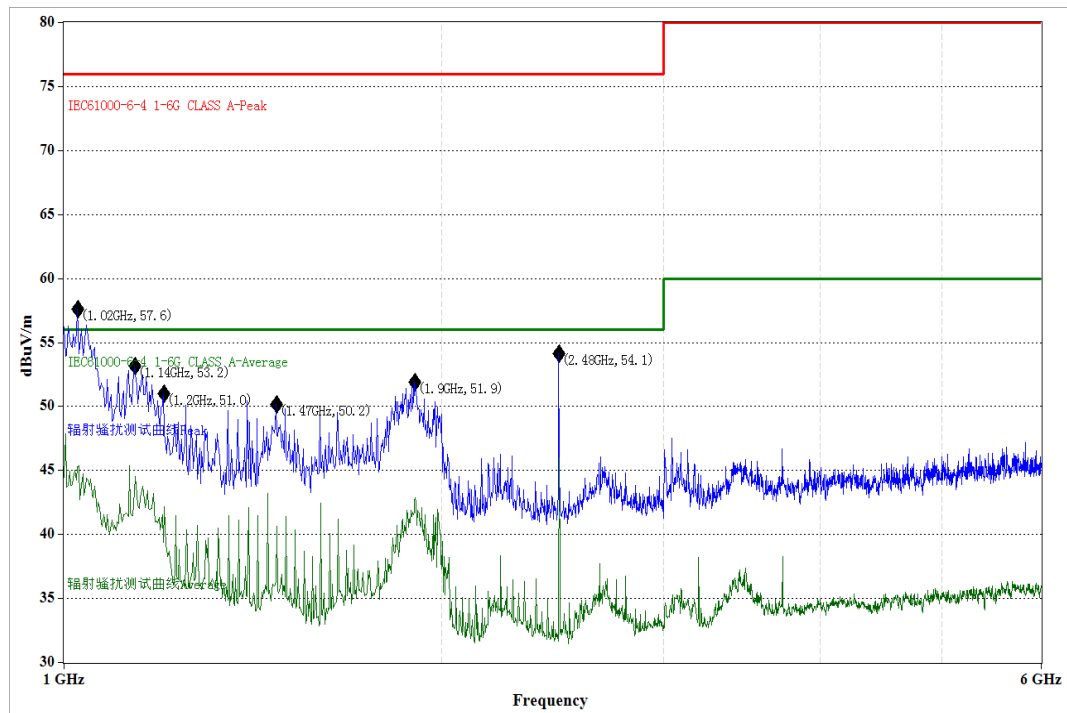


图 17 1GHz~6GHz 辐射骚扰垂直极化试验曲线

Fig.17 Spectral diagram, 1GHz~6GHz Radiation Emission Test, Vertical polarization

表 9 1GHz~6GHz 辐射骚扰垂直极化试验曲线数据

Table 9 Data of 1GHz~6GHz Radiation Emission Test, Vertical polarization

频率 (MHz)	峰值 dBuV/m	平均值 dBuV/m	峰值 限值 dBuV/m	平均值 限值 dBuV/m	峰值 裕量 dB	平均值 裕量 dB	转台角 度(°)	天线高 度(cm)
1024.99	58.86	43.86	76	56	17.14	12.14	89.2	99.9
1127.44	51.21	38.87	76	56	24.79	17.13	142.9	99.9
1199.90	53.00	40.96	76	56	23.00	15.04	146.5	99.9
1474.76	51.74	40.60	76	56	24.26	15.40	360.1	121.4
1899.55	51.94	39.47	76	56	24.06	16.53	151.6	199.9
2476.76	43.17	30.16	76	56	32.83	25.84	3.9	99.9

扩展不确定度 expanded uncertainty U=4.8dB, k=2

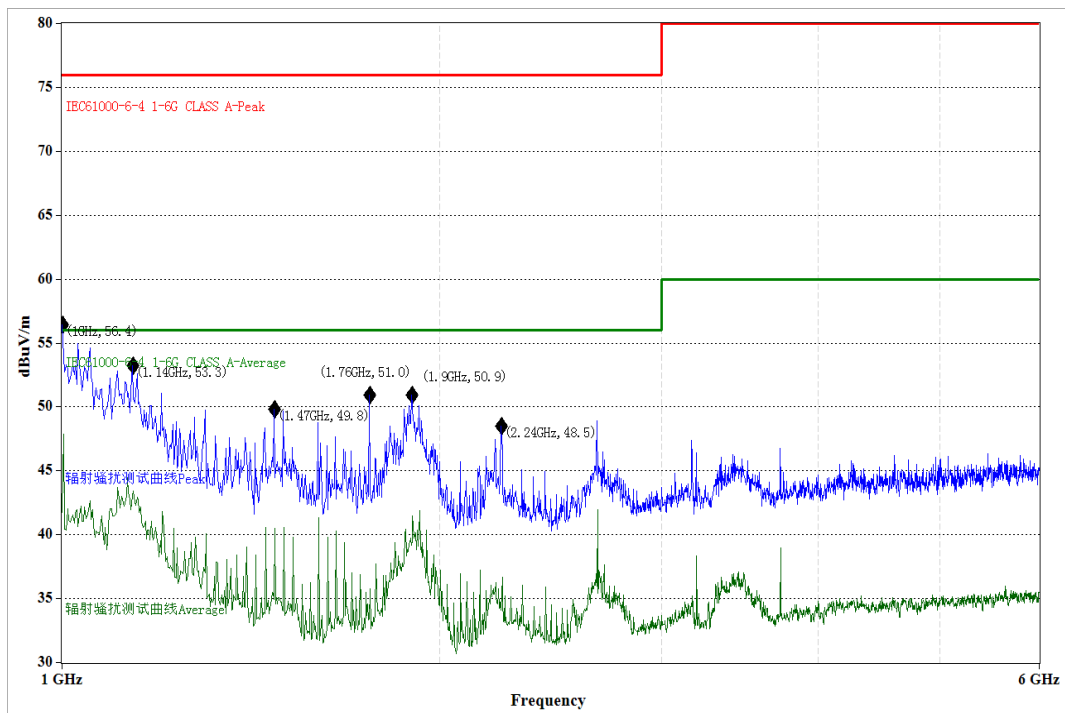


图 18 1GHz~6GHz 辐射骚扰水平极化试验图

Fig.18 Spectral diagram, 1GHz~6GHz Radiation Emission Test, Horizontal polarization

表 10 1GHz~6GHz 辐射骚扰水平极化试验曲线数据

Table 10 Data of 1GHz~6GHz Radiation Emission Test, Horizontal polarization

频率 (MHz)	峰值 dBuV/m	平均值 dBuV/m	峰值 限值 dBuV/m	平均值 限值 dBuV/m	峰值 裕量 dB	平均值 裕量 dB	转台角 度(°)	天线高 度(cm)
1000.00	55.69	45.23	76	56	20.31	10.77	60.5	200
1136.35	55.31	43.61	76	56	20.69	12.39	131.1	119.9
1757.12	42.63	29.12	76	56	33.37	26.88	258.6	200
1925.45	50.90	38.93	76	56	25.10	17.07	141.8	200
1897.05	51.08	37.53	76	56	24.92	18.47	123.2	200
2236.88	48.89	33.47	76	56	27.11	22.53	353.4	99.9

扩展不确定度 expanded uncertainty U=4.8dB, k=2

主检工程师
Principal赵鹏飞
Zhao Pengfei副检工程师
Verifier曹胜利
Cao Shengli

8. 试验布置图 Test Layout

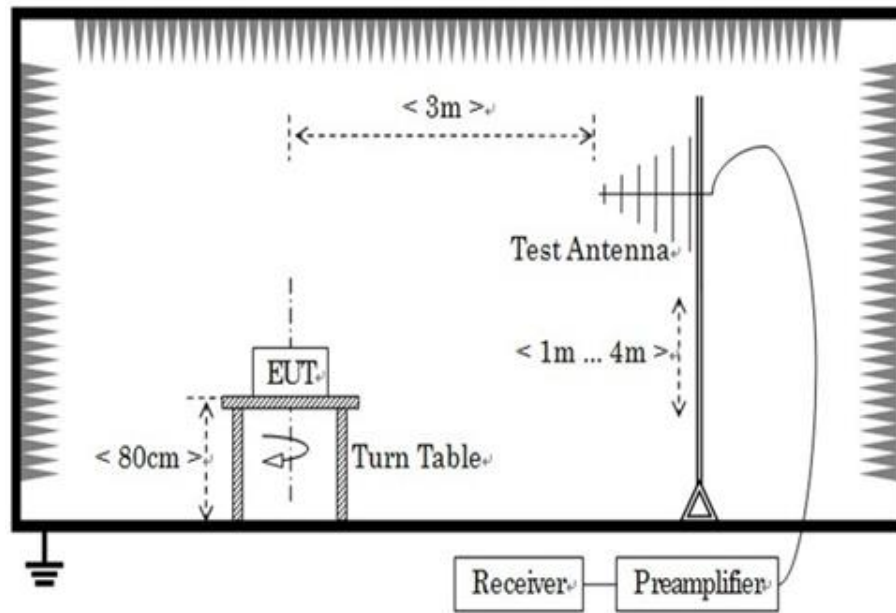


图 19 辐射骚扰试验布置示意图
Fig. 19 Layout of Radiation Emission Test

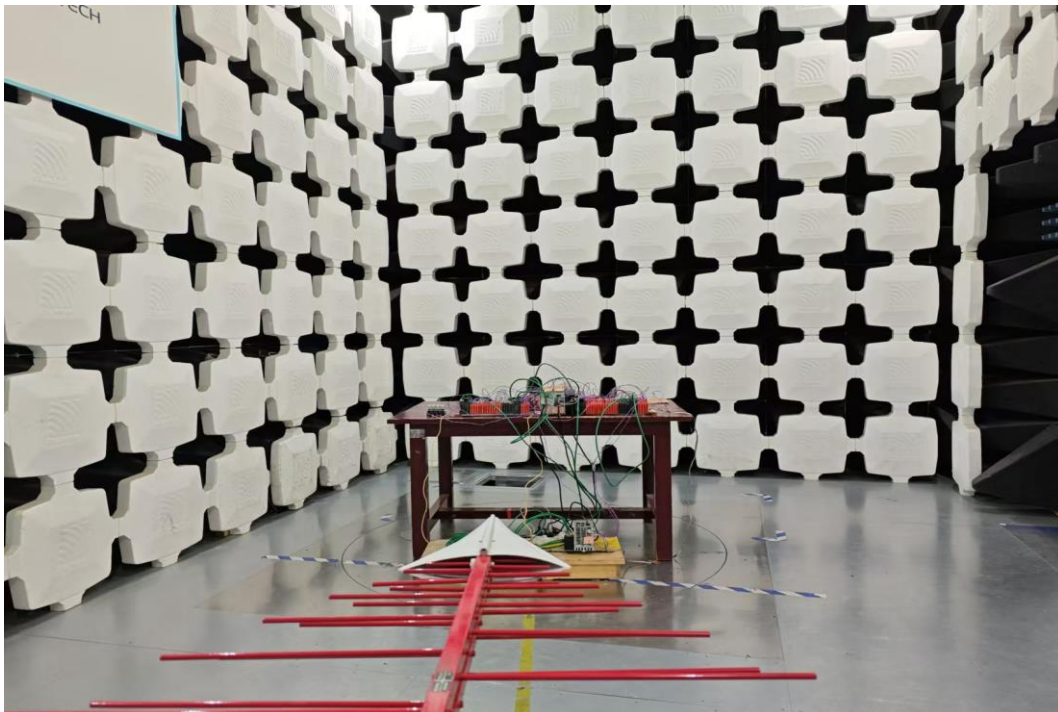


图 20 30MHz~1GHz 辐射骚扰试验布置图
Fig. 20 Photograph of 30MHz~1GHz Radiation Emission Test



图 21 1GHz~6GHz 辐射骚扰试验布置图

Fig. 21 Photograph of 1GHz~6GHz Radiation Emission Test

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静电放电抗扰度试验 Electrostatic Discharge Immunity Test					
试验日期 Test Date: 2025-04-25					
环境条件 Test Environment	温度 Temperature t=24.3℃ 相对湿度 Relative Humidity RH=40.3% 大气压力 Atmospheric Pressure P=96.84kPa				
1. 试验标准 Test Standard					
IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-2:2008、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
静电放电发生器 Electrostatic discharge generator	EDS 30T	ES0131722	CNJZ240019750	3CTEST	2025-10-28
3. 被测模式 Test Mode					
额定工作 Rated Work					
4. 静电放电施加点 Discharge Point					
接触放电施加点位 Point of Contact Discharge		空气放电施加点位 Point of Air Discharge			
网口 Network port 导轨 Rail 金属表面 Metal surface		接线孔 Wiring hole 指示灯 Pilot lamp			
5. 试验现象 Test Phenomena					
☐ 正常 Normal ☒ 其它 Other [试验过程中, 每极性 10 次单次放电, 模块离线, 试验结束后, 自动恢复上线, 工作正常, 符合判据 B。每极性 30 次单次放电, 系统离线, DO 模块无输出, 符合判据 DS。 During the experiment, for each polarity, there were 10 single discharges. The module was offline. After the experiment, it automatically returned to online mode and worked normally, meeting the B criterion. For each polarity, there were 30 single discharges. The system was offline, and the DO module had no output, meeting the DS criterion.]					

6. 试验结论 Test Result			
试验参数 Test Parameters			试验结果 Test Result
接触放电 Contact Discharge: $\pm 6\text{kV}$ 空气放电 Air Discharge: $\pm 8\text{kV}$	每极性施加 10 次单次放电 10 discharges for each point each polarity	判据 B criterion B	符合判据 B Meet criterion B
接触放电 Contact Discharge: $\pm 6\text{kV}$ 空气放电 Air Discharge: $\pm 8\text{kV}$	每极性施加 30 次单次放电 30 discharges for each point each polarity	判据 DS criterion DS	符合判据 DS Meet criterion DS
接触放电 Contact Discharge: $\pm 8\text{kV}$ (只测导轨 Rail only)	每极性施加 30 次单次放电 30 discharges for each point each polarity	判据 DS criterion DS	符合判据 A Meet criterion A
/			
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli

7. 试验布置图 Test Layout

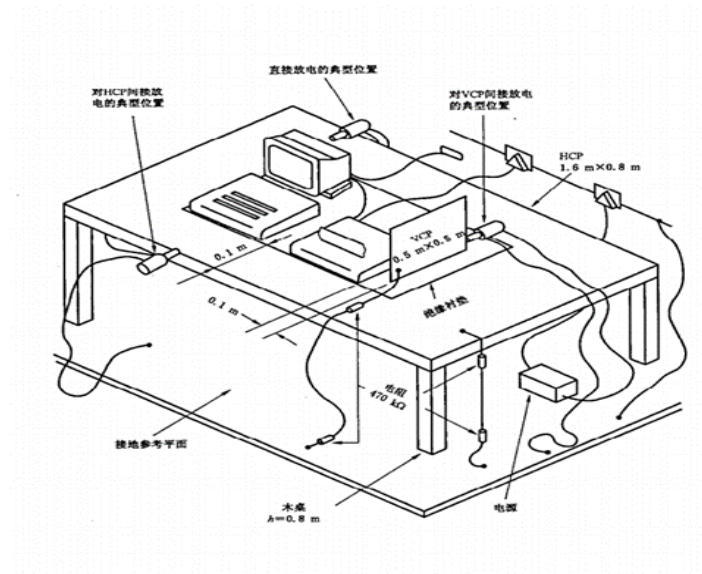


图 22 静电放电抗扰度试验布置示意图

Fig. 22 Layout of Electrostatic Discharge Immunity Test

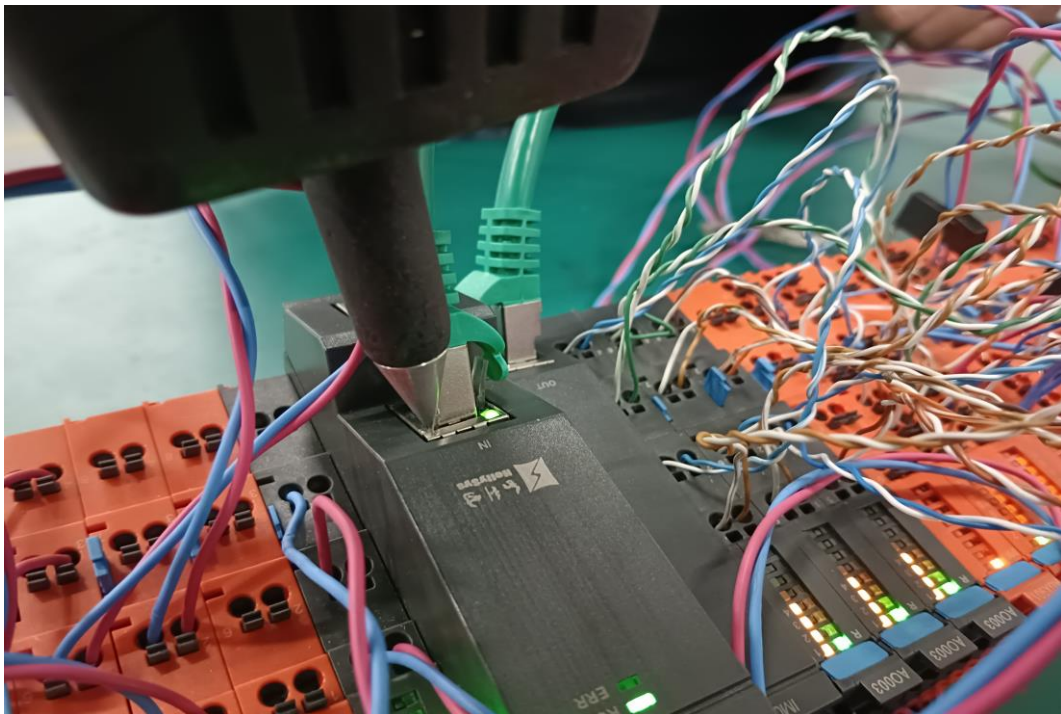


图 23 静电放电抗扰度接触放电试验图-1

Fig. 23 Photograph of Electrostatic Discharge Immunity Test, Contact Discharge -1

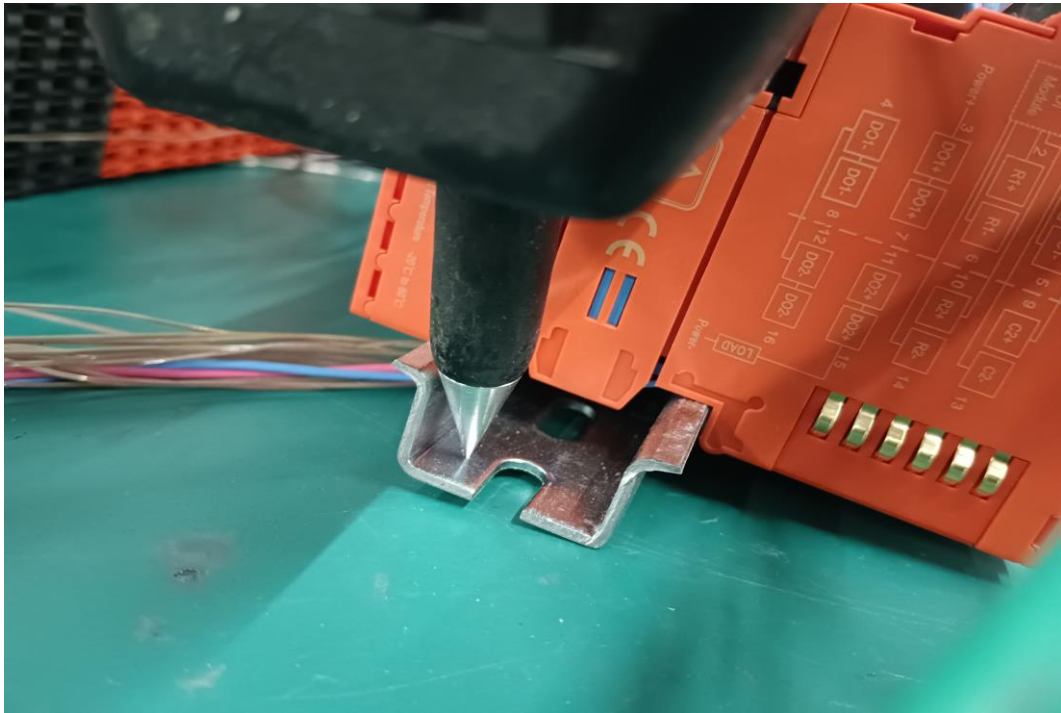


图 24 静电放电抗扰度接触放电试验图-2

Fig. 24 Photograph of Electrostatic Discharge Immunity Test, Contact Discharge -2



图 25 静电放电抗扰度接触放电试验图-3

Fig. 25 Photograph of Electrostatic Discharge Immunity Test, Contact Discharge -3



图 26 静电放电抗扰度空气放电试验图-1

Fig. 26 Photograph of Electrostatic Discharge Immunity Test, Air Discharge -1



图 27 静电放电抗扰度空气放电试验图-2

Fig. 27 Photograph of Electrostatic Discharge Immunity Test, Air Discharge -2

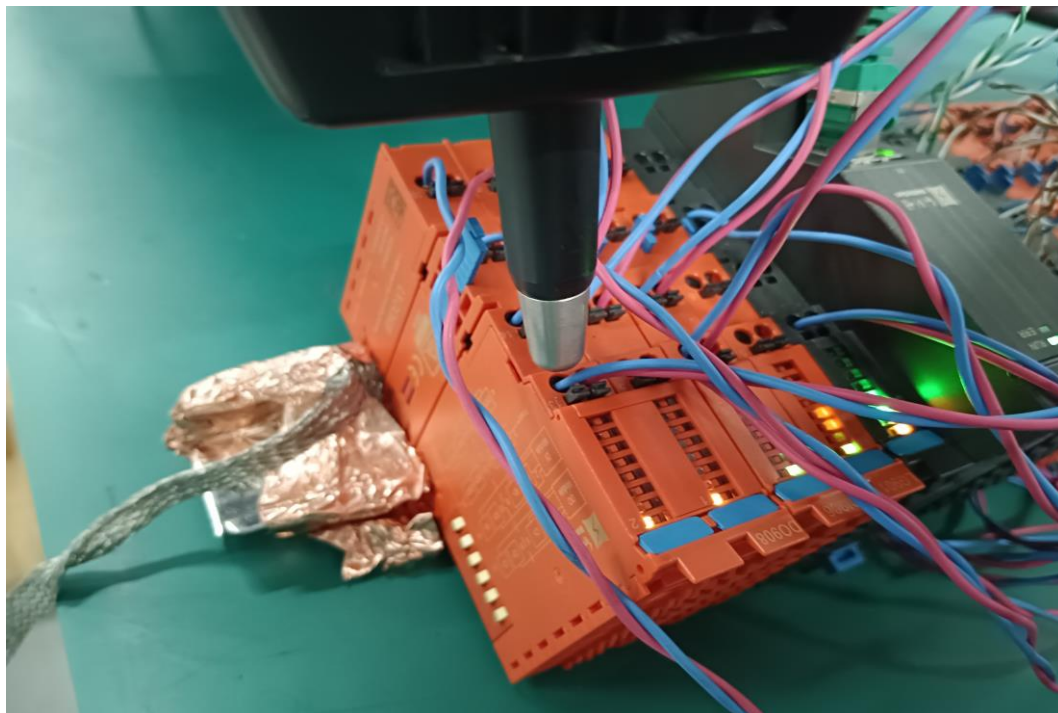


图 28 静电放电抗扰度空气放电试验图-3

Fig. 28 Photograph of Electrostatic Discharge Immunity Test, Air Discharge -3

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射频电磁场辐射抗扰度

Radiated, Radio-frequency, Electromagnetic Field Immunity Test

试验日期 Test Date: 2025-04-27

环境条件
Test Environment温度 Temperature $t=20.2^{\circ}\text{C}$
相对湿度 Relative Humidity RH=56.5%
大气压力 Atmospheric Pressure $P=96.46\text{kPa}$

1. 试验标准 Test Standard

IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-3:2020、IEC 61326-3-1:2017

2. 试验设备 Test Equipment

设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
信号源 Signal generator	SMB100A	1406.6000K03-180401-Gg	2XB23090432376-0006	R&S	2025-09-05
功率放大器 Power amplifier	NTWPA-0081020001000E	21043056	2XB240924135034-0022	RFLIGHT	2025-09-28
功率放大器 Power amplifier	NTWPA-1025250	17063175	2XB240924135034-0023	RFLIGHT	2025-09-28
功率放大器 Power amplifier	NTWPA-2060200	18013007	2XB240924135034-0024	RFLIGHT	2025-09-28
堆叠天线 Stacked Antenna	131216	STLP 9128E-7#3034	1XA240924135034-0014	TDK	2025-09-27
双脊喇叭天线 Double-ridged horn antenna	YLCANT-T-1G2.5-300	YLCANT-T-2017-09-003	1XA240924135034-0016	YLC	2025-09-27
双脊喇叭天线 Double-ridged horn antenna	YLCANT-T-2.5G6-300	YLCANT-T-2017-09-004	1XA240924135034-0017	YLC	2025-09-27
场强探头 Field Strength probe	EP-601	811ZX01054	1XA23092237856-0002	PMM	2025-09-06

3. 被测模式 Test Mode

额定工作 Rated Work

4. 试验现象 Test Phenomena

☐正常 Normal ☒其它 Other

[试验过程中, 80MHz~1GHz 20V/m, 垂直极化, 水平极化, 1.4GHz~2GHz 10V/m, 垂直极化, 水平极化, 系统离线, DO 模块无输出, 符合 DS 判据。

During the test, for the frequency range of 80 MHz to 1 GHz, with an electric field strength of 20 V/m, both vertical polarization and horizontal polarization are applied; for the frequency range of 1.4 GHz to 2 GHz, with an electric field strength of 10 V/m, both vertical polarization and horizontal polarization are applied. The system goes offline, and the DO module has no output. meeting the DS criterion.]

5. 试验结论 Test Result

试验端口 Test port	试验参数 Test parameters		试验结果 Test result
整个系统 The whole system	80MHz~1GHz, 10V/m 1GHz~6GHz, 3V/m 1kHz 正弦波 80%幅度调制。 80% amplitude modulated with a 1kHz sine wave.	判据 A criterion A	符合判据 A Meet criterion A
	80MHz~1GHz, 20V/m 1.4GHz~2GHz, 10V/m 2GHz~6GHz, 3V/m 1kHz 正弦波 80%幅度调制。 80% amplitude modulated with a 1kHz sine wave.	判据 DS Meet criterion DS	符合判据 DS Meet criterion DS

6. 试验数据

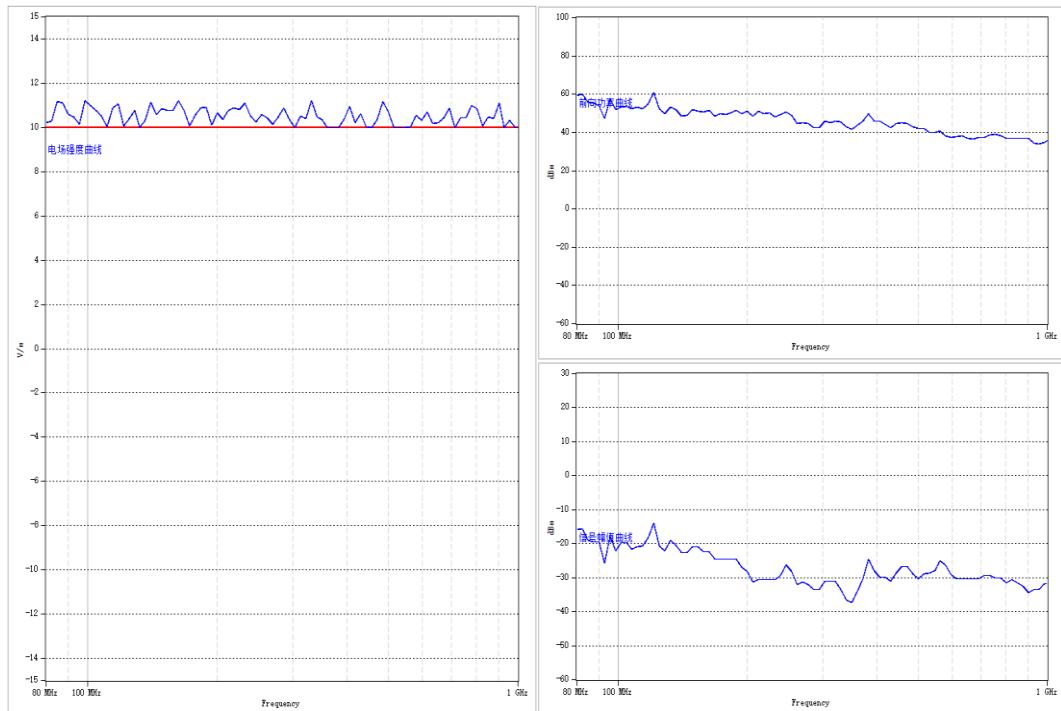


图 29 80MHz~1GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 A)

Fig.29 Spectral diagram, 80MHz~1GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion A)

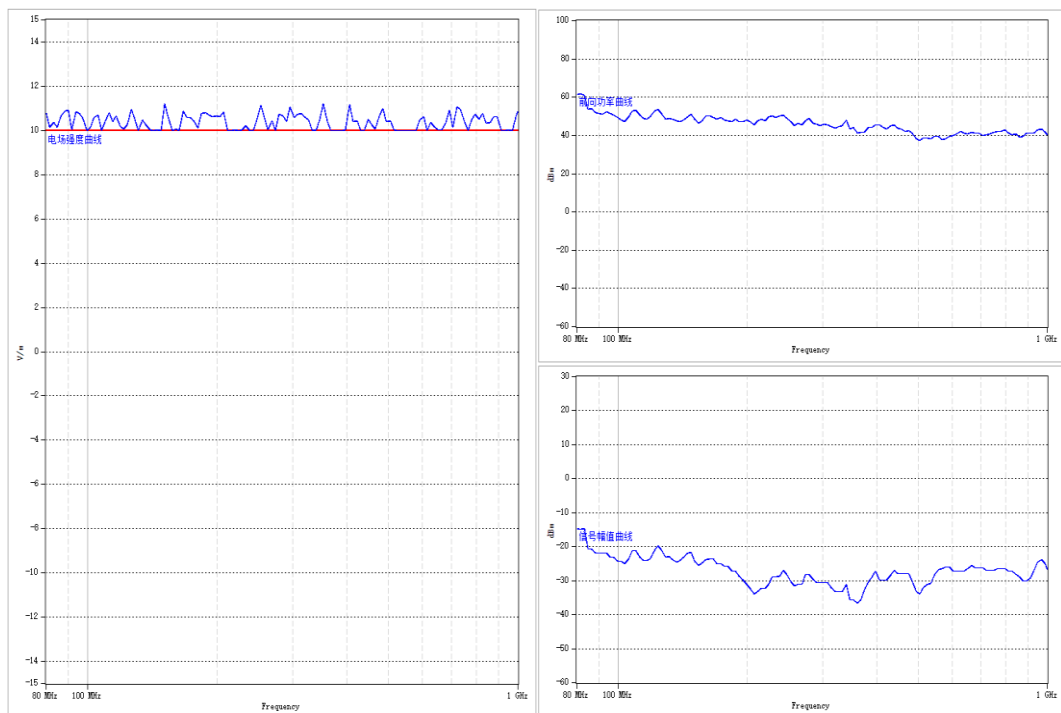


图 30 80MHz~1GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 A)

Fig.30 Spectral diagram, 80MHz~1GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion A)

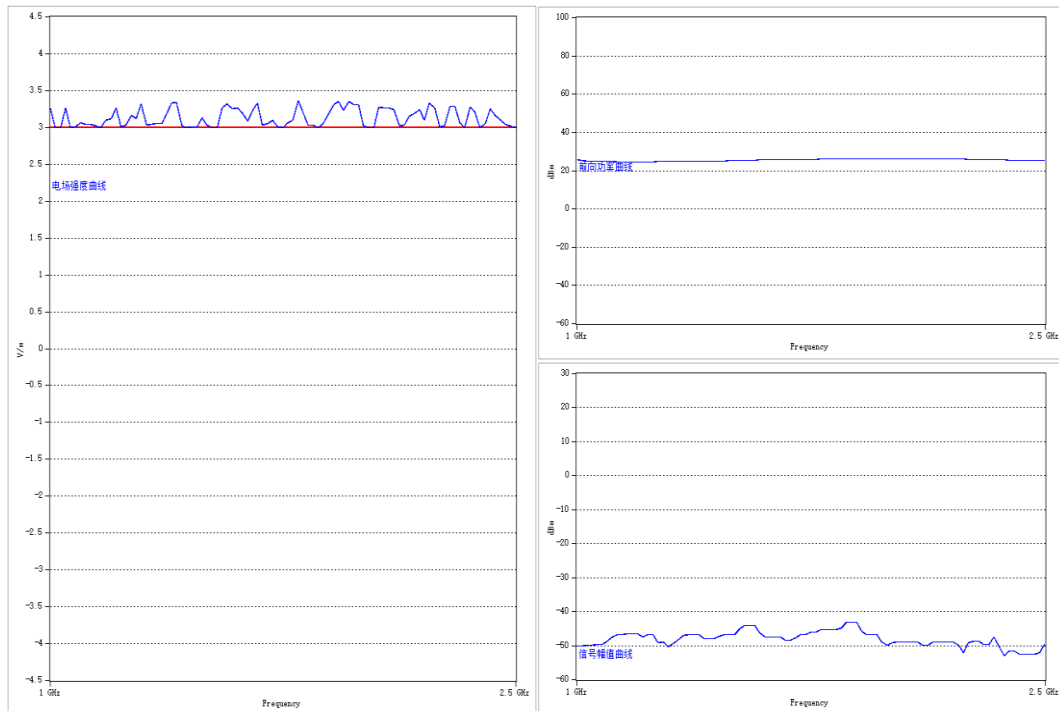


图 31 1GHz~2.5GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 A)

Fig.31 Spectral diagram, 1GHz~2.5GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion A)

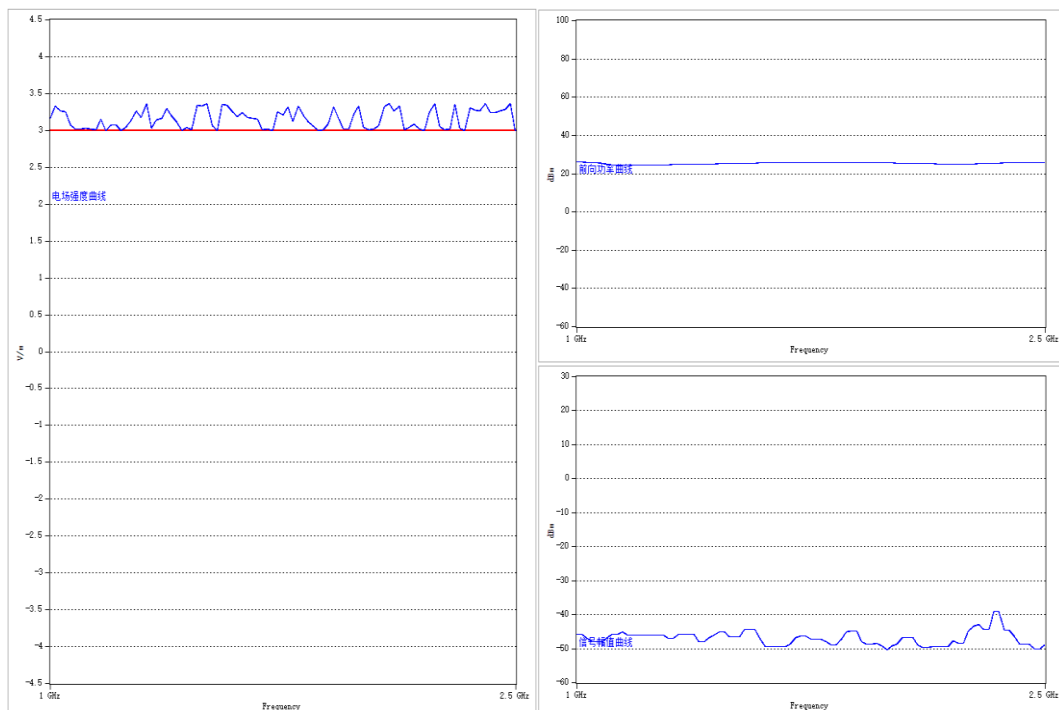


图 32 1GHz~2.5GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 A)

Fig.32 Spectral diagram, 1GHz~2.5GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion A)

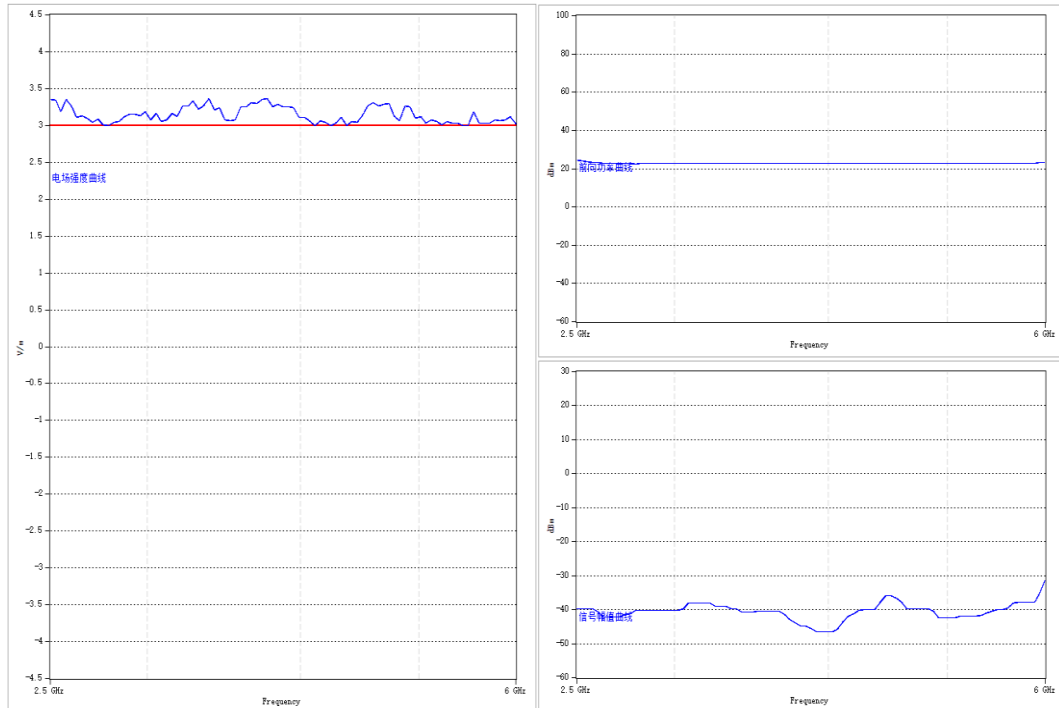


图 33 2.5GHz~6GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 A)

Fig.33 Spectral diagram, 2.5GHz~6GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion A)

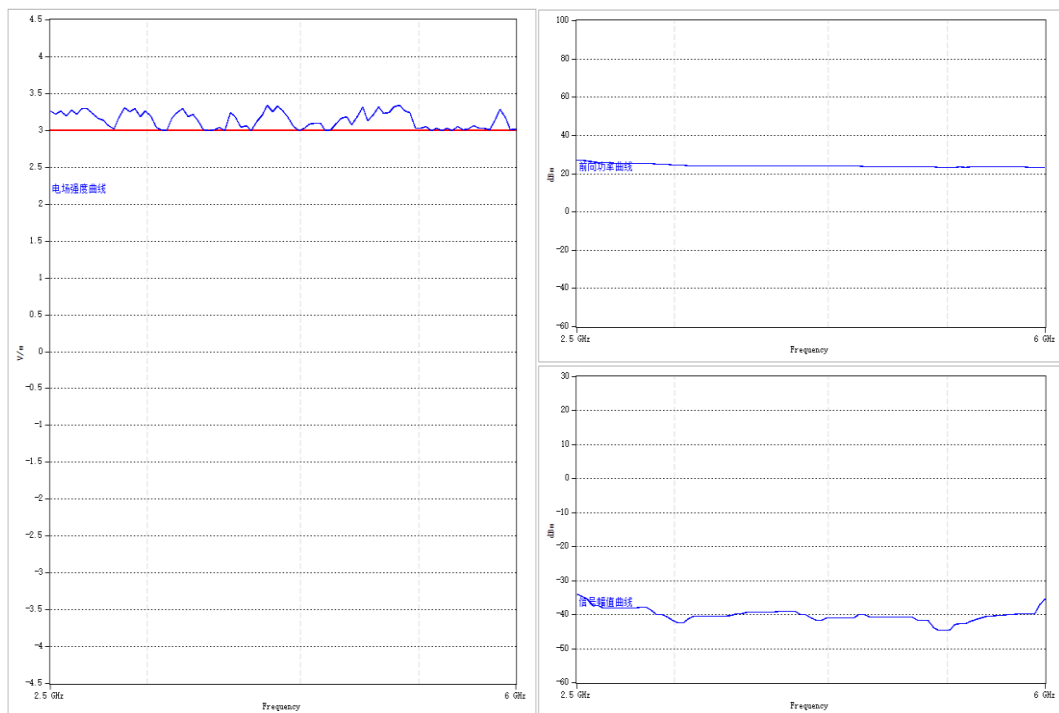


图 34 2.5GHz~6GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 A)

Fig.34 Spectral diagram, 2.5GHz~6GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion A)

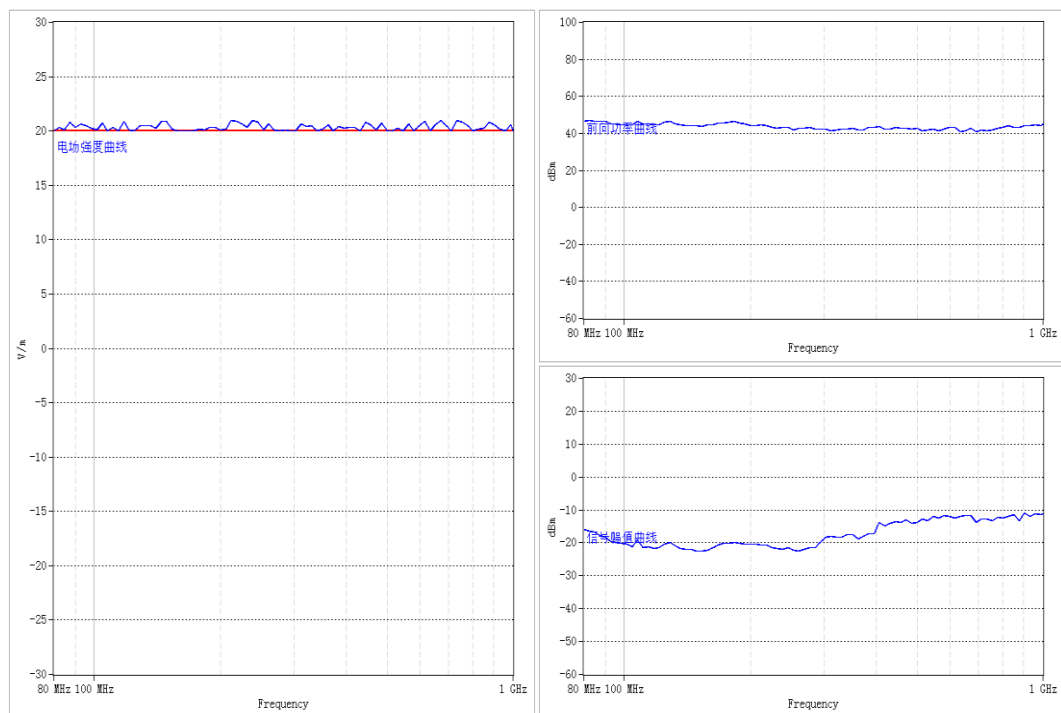


图 35 80MHz~1GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 DS)

Fig.35 Spectral diagram, 80MHz~1GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion DS)

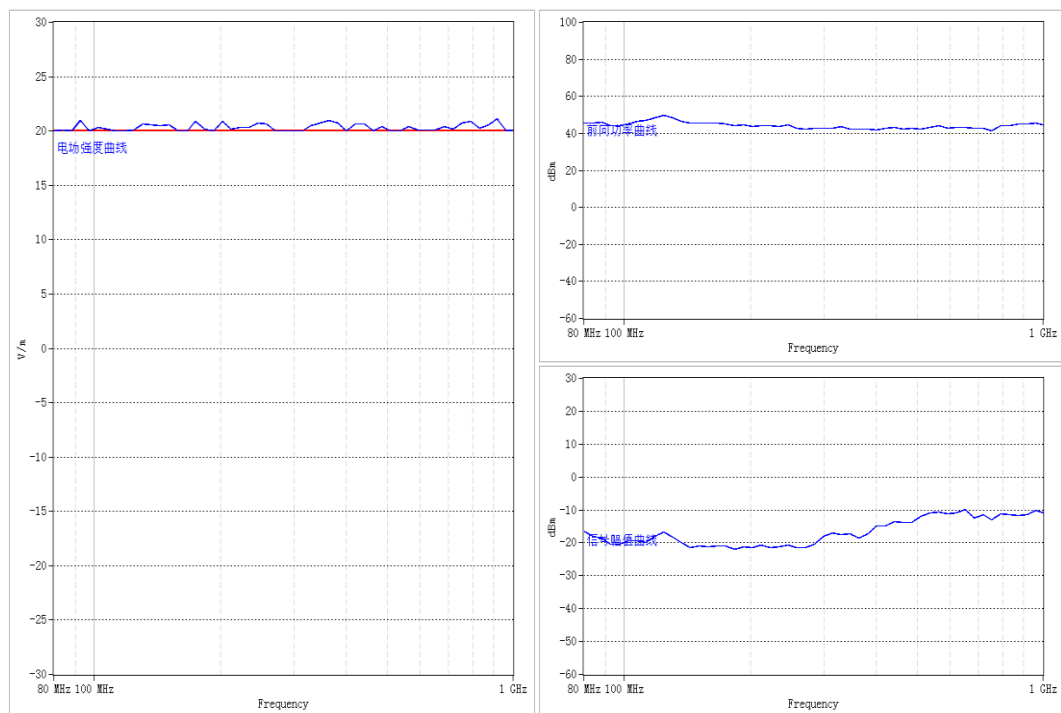


图 36 80MHz~1GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 DS)

Fig.36 Spectral diagram, 80MHz~1GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion DS)

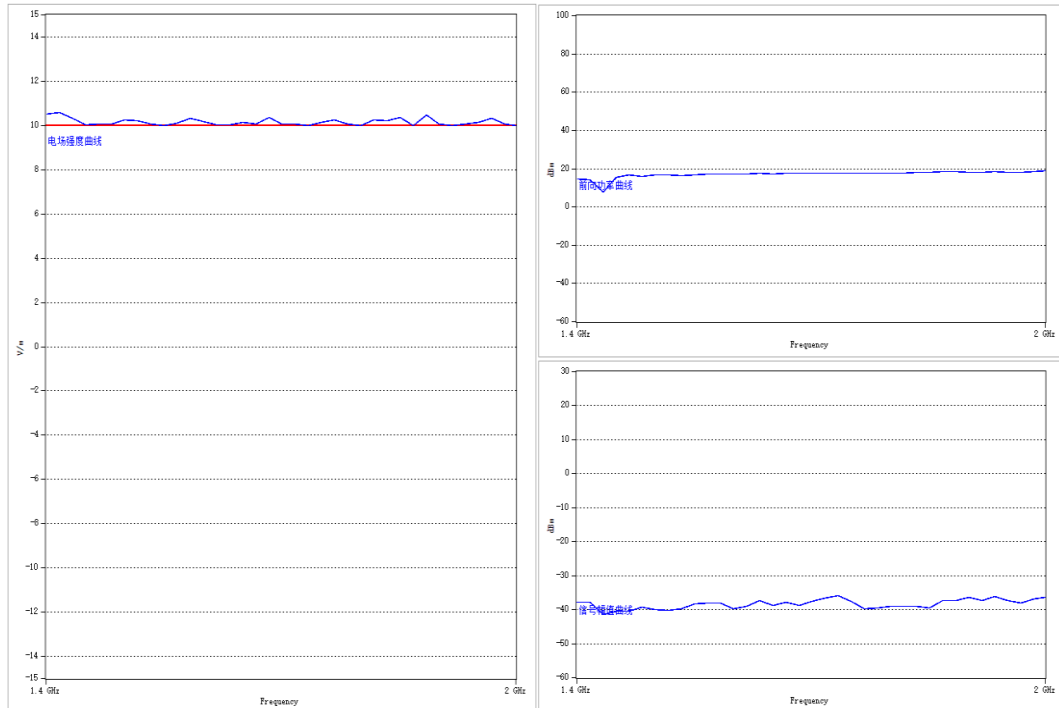


图 37 1.4GHz~2GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 DS)

Fig.37 Spectral diagram, 1.4GHz~2GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion DS)

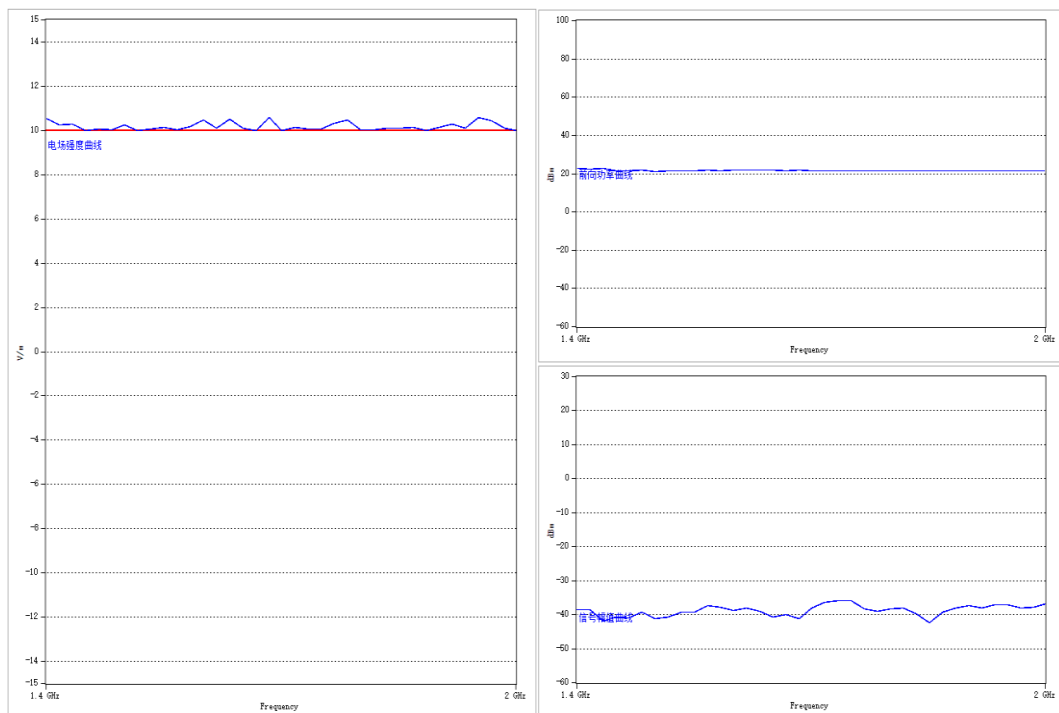


图 38 1.4GHz~2GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 DS)

Fig.38 Spectral diagram, 1.4GHz~2GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion DS)

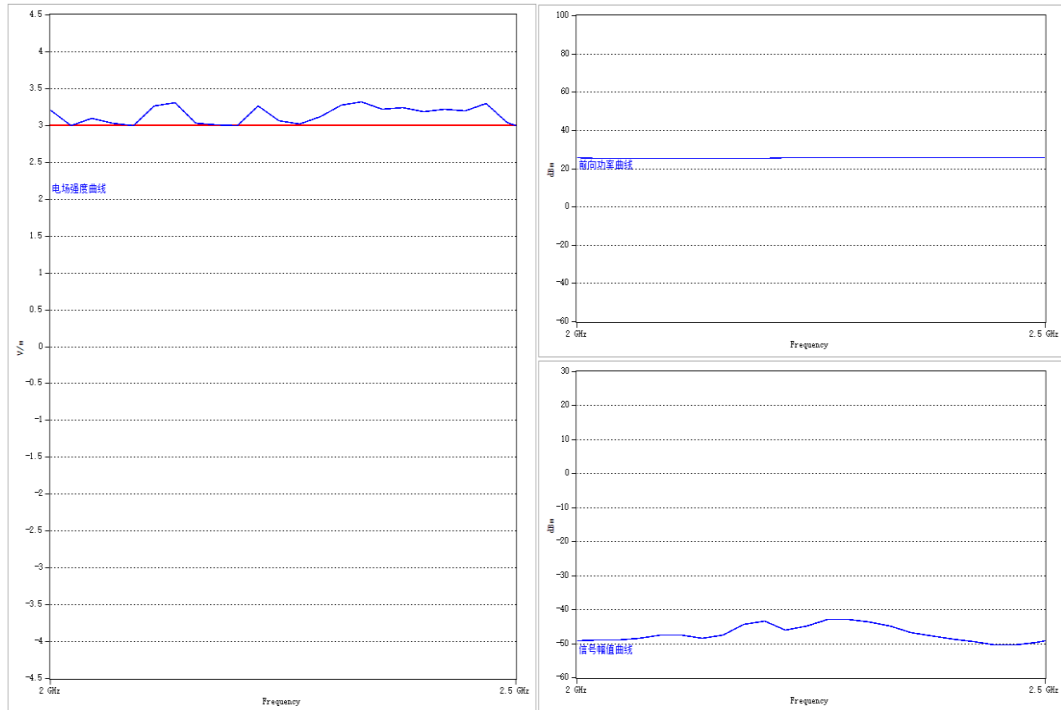


图 39 2GHz~2.5GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 DS)

Fig.39 Spectral diagram, 2GHz~2.5GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion DS)

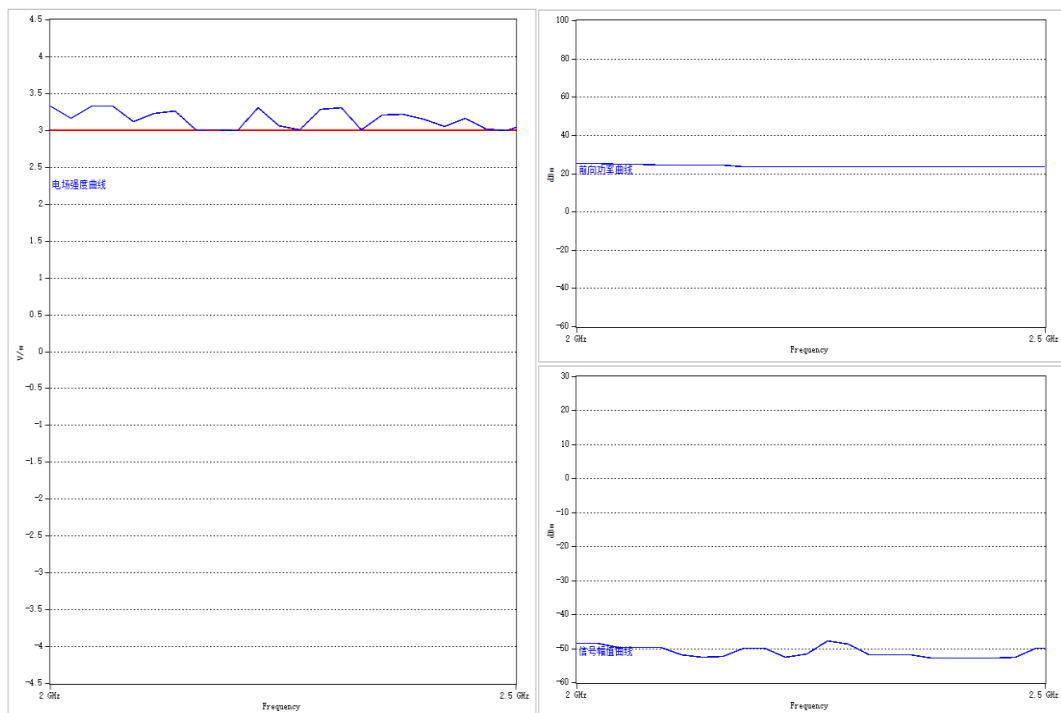


图 40 2GHz~2.5GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 DS)

Fig.40 Spectral diagram, 2GHz~2.5GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion DS)

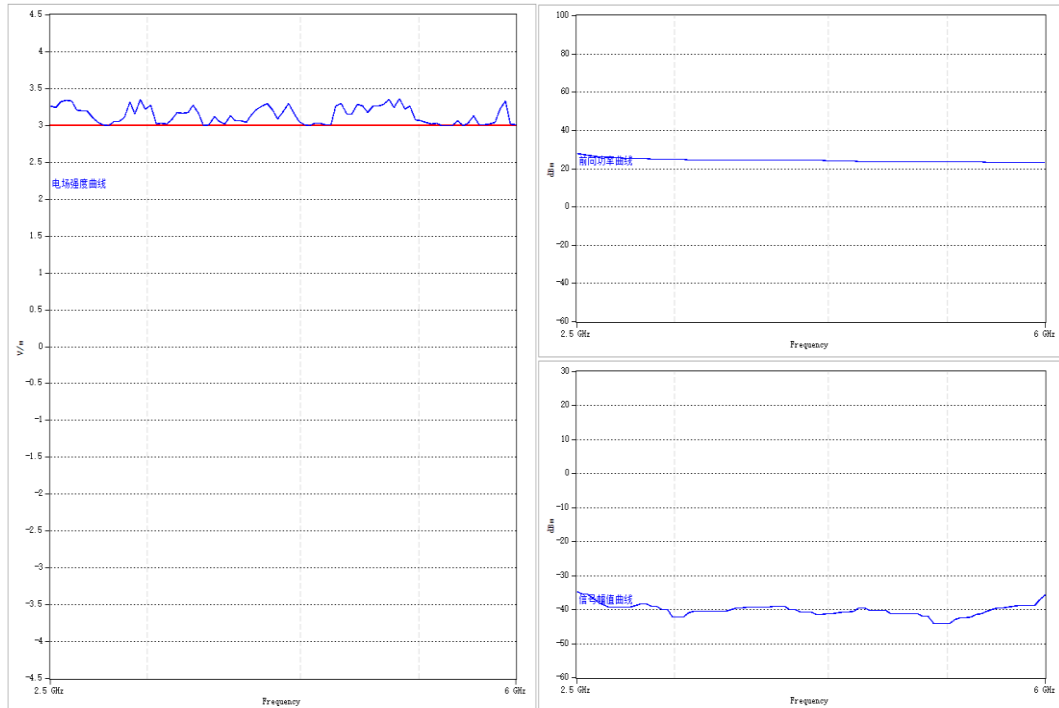


图 41 2.5GHz~6GHz 射频电磁场辐射抗扰度垂直极化试验曲线(判据 DS)

Fig.41 Spectral diagram, 2.5GHz~6GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Vertical polarization(Criterion DS)

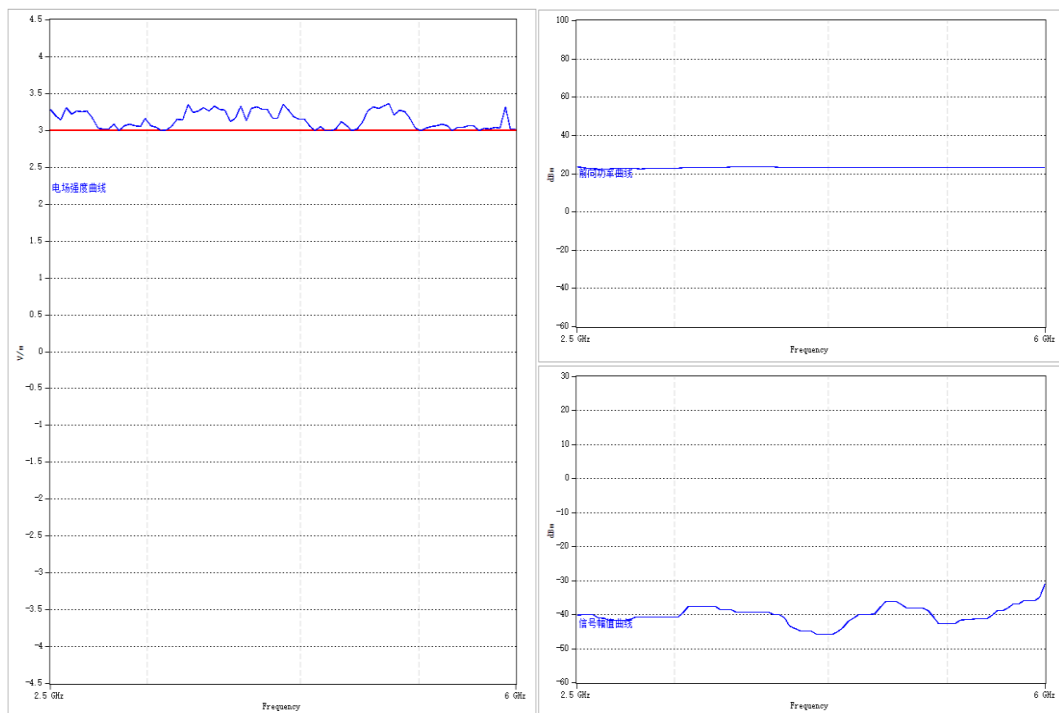


图 42 2.5GHz~6GHz 射频电磁场辐射抗扰度水平极化试验曲线(判据 DS)

Fig.42 Spectral diagram, 2.5GHz~6GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test, Horizontal polarization(Criterion DS)

主检工程师
Principal

赵鹏飞
Zhao Pengfei

副检工程师
Verifier

曹胜利
Cao Shengli

7. 试验布置图 Test Layout

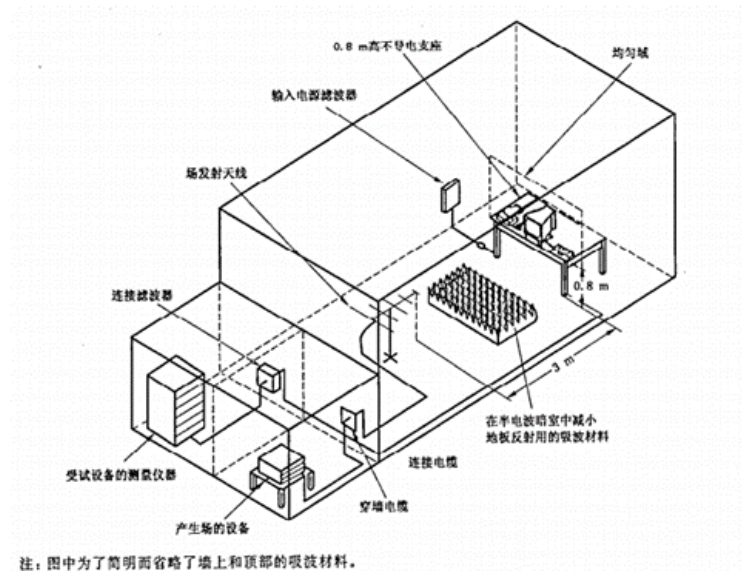


图 43 射频电磁场辐射抗扰度试验布置示意图

Fig. 43 Layout of Radiated, Radio-frequency, Electromagnetic Field Immunity Test



图 44 80MHz~1GHz 射频电磁场辐射抗扰度试验布置图

Fig. 44 Photograph of 80MHz~1GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test



图 45 1GHz~2.5GHz 射频电磁场辐射抗扰度试验布置图

Fig. 45 Photograph of 1GHz~2.5GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test



图 46 2.5GHz~6GHz 射频电磁场辐射抗扰度试验布置图

Fig. 46 Photograph of 2.5GHz~6GHz Radiated, Radio-frequency, Electromagnetic Field Immunity Test

电快速瞬变脉冲群抗扰度

Electrical Fast Transient/burst Immunity Test

试验日期 Test Date: 2025-04-17

环境条件
Test Environment温度 Temperature t=24.1℃
相对湿度 Relative Humidity RH=47.3%
大气压力 Atmospheric Pressure P=97.51kPa

1. 试验标准 Test Standard

IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-4:2012、IEC 61326-3-1:2017

2. 试验设备 Test Equipment

设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
多功能组合式抗扰度测试仪 Multi-function Combined Immunity Tester	CCS 600	ES0801750	2XB240125684 40-0001	3CTEST	2026-01-30
组合式浪涌及脉冲群耦合去耦网络 Combined surge and pulse group Coupling decoupling network	SEPN 6932T	ES3731701	2XB231219594 91-0002A	3CTEST	2025-12-27
电容耦合夹 Capacitor Coupling Clip	CCC100	ES2901739	/	3CTEST	/

3. 被测模式 Test Mode

额定工作 Rated Work

4. 试验现象 Test Phenomena

☐ 正常 Normal ☒ 其它 Other

[系统电源线±4KV 试验过程中, 上位机软件退出监视, 设备正常运行, 符合判据 B。CU500, CU510, CU511 网线, ±2KV 试验过程中, 模块离线, 符合判据 DS。

The system power cable, During the ±4KV test process, the host computer software exited the monitoring function, and the device operated normally. meeting the B criterion. For the CU500, CU510, and CU511 network cables: During the ±2KV test process, the module went offline. meeting the DS criterion.]

5. 试验结果 Test Result

试验端口 Test Ports	电源端口 Power Port		信号端口 Signal Port			
试验等级 Test Class	3	4	3	4		
电压峰值 Applied Peak Voltage (kV)	±2	±4	±1	±2		
耦合回路 Coupling Circuit	L, N, PE, LPE, NPE, LNPE, LN (系统交流电源线 System AC Power Cable 现场交流电源线 Field AC Power Cable)		使用电容耦合夹对 CU500、CU510、CU511 网线施加干扰。 Apply interference to the CU500, CU510 and CU511 network cables using a capacitive coupling clamp.	使用电容耦合夹对 D0907 通道输出、D0907 现场电源输入信号线施加干扰。 Interference was applied to the output signal line of the D0907 channel and the input signal line of the D0907 field power supply using a capacitive coupling clamp.	使用电容耦合夹对 CU500、CU510、CU511 网线施加干扰。 Apply interference to the CU500, CU510 and CU511 network cables using a capacitive coupling clamp.	使用电容耦合夹对 D0907 通道输出、D0907 现场电源输入信号线施加干扰。 Interference was applied to the output signal line of the D0907 channel and the input signal line of the D0907 field power supply using a capacitive coupling clamp.

振荡频率 Oscillatory Frequency (kHz)	5, 100				
脉冲群持续时间 Burst Duration (ms)	15, 0.75				
脉冲群周期 Burst Period (ms)	300				
脉冲群测试 时间 Burst Test Time (min)	1	5	1	5	
判据 Criteria	判据 B criterion n B	判据 DS criterio n DS	判据 B criterion B	判据 DS criterion DS	
试验结果 Test Result	符合判据 A Meet criterio n A	符合判 据 B Meet criter ion B	符合判据 A Meet criterion A	符合判据 DS Meet criterion DS	符合判据 A Meet criterion A
主检工程师 Principal	赵鹏飞 Zhao Pengfei		副检工程师 Verifier		曹胜利 Cao Shengli

6. 试验布置图 Test Layout

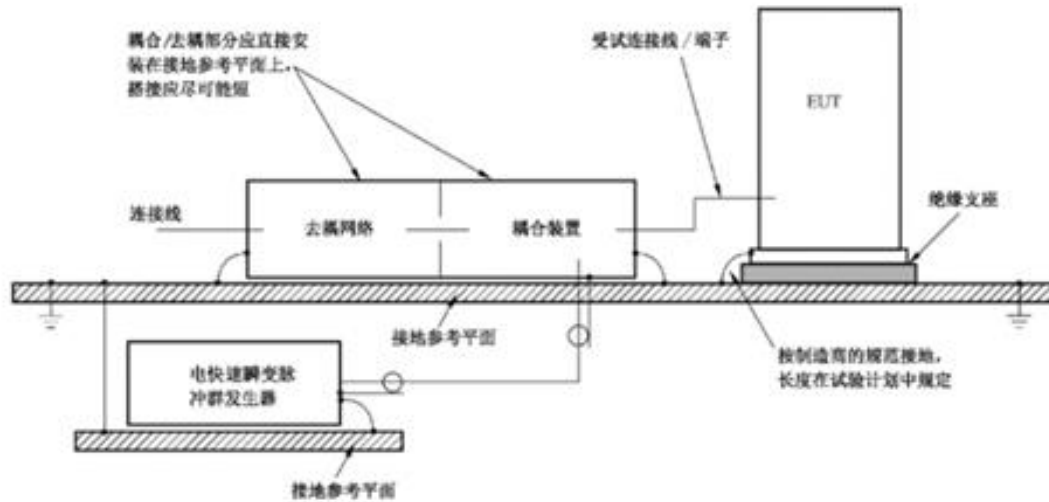


图 47 电快速瞬变脉冲群抗扰度试验布置示意图

Fig. 47 Layout of Electrical Fast Transient/burst Immunity Test



图 48 电快速瞬变脉冲群抗扰度试验布置图

Fig. 48 Photograph of Electrical Fast Transient/burst Immunity Test

浪涌(冲击)抗扰度 Surge Immunity Test					
试验日期 Test Date: 2025-04-16					
环境条件 Test Environment		温度 Temperature t=23.4℃ 相对湿度 Relative Humidity RH=46.4% 大气压力 Atmospheric Pressure P=97.39kPa			
1. 试验标准 Test Standard					
IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-5:2017、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
多功能组合式抗扰度测试仪 Multi-function combined immunity tester	CCS 600	ES0801750	2XB240125684 40-0001	3CTEST	2026-01-30
组合式浪涌及脉冲群耦合去耦网络 Combined surge and pulse group coupling decoupling network	SEPN 6932T	ES3731701	2XB231219594 91-0002A	3CTEST	2025-12-27
2路4线非屏蔽不对称通讯网络 2-channal 4-wire unshielded asymmetric communication network	ISN0624U A	PDL20120600 02	/	EMPEAK	/
3. 被测模式 Test Mode					
额定工作 Rated Work					

4. 试验现象 Test Phenomena

☐ 正常 Normal ☒ 其它 Other

[系统电源线±4KV 试验过程中, 模块离线, D0 模块无输出, 符合判据 DS。CU500, CU510, CU511 网线, ±2KV 试验过程中, 模块离线, 符合判据 DS。]

During the ±4KV test of the system power line, the module was offline and the D0 module had no output. meeting the DS criterion. For the CU500, CU510, and CU511 network cables: During the ±2KV test process, the module went offline. meeting the DS criterion.]

5. 试验结果 Test Result

试验参数 Test Parameters

试验端口 Test Port	系统交流电源线 System AC Power Cable				现场交流电源线 Field AC Power Cable			
试验等级 Test Class	1, 2, 3	4	2, 3	4	1, 2, 3	4	2, 3	4
施加电压 Applied Voltage (kV)	±0.5±1±2	±4	±0.5±1	±2	±0.5±1±2	±4	±0.5±1	±2
耦合回路 Coupling Circuit	L-PE, N-PE, LN-PE		L-N		L-PE, N-PE, LN-PE		L-N	
施加相角 Phase (°)	0, 90, 180, 270							
重复次数 Repeated Frequency	正负极性各 5 次(判据 B) Positive and negative polarity 5 times each (criterion DS) 正负极性各 15 次(判据 DS) Positive and negative polarity 15 times each (criterion DS)							
脉冲间隔 Pulse Interval (s)	60							
判据 Criteria	判据 B criterion B	判据 DS criterion DS	判据 B crite rion B	判据 DS criter ion DS	判据 B criter ion B	判据 DS criter ion DS	判据 B criter ion B	判据 DS criter ion DS
试验结果 Test Result	符合判据 A Meet criteri on A	符合判据 DS Meet criter ion DS	符合判据 A Meet criterion A					

试验端口 Test Port	信号端口 Signal Port		
试验等级 Test Class	/		
施加电压 Applied Voltage (kV)	±0.5, ±1	±2	
耦合回路 Coupling Circuit	对 CU500、CU510、CU511 网线、D0907 通道输出、D0907 现场电源输入信号线施加共模干扰。 Apply common mode interference to CU500, CU510, CU511 network cables, D0907 channel output, and D0907 on-site power input signal lines.	对 D0907 通道输出、D0907 现场电源输入信号线施加共模干扰。 Apply common mode interference to D0907 channel output, and D0907 on-site power input signal lines.	对 CU500、CU510、CU511 网线施加共模干扰。 Apply common mode interference to CU500, CU510, CU511 network cables.
施加相角 Phase (°)	/		
重复次数 Repeated Frequency	正负极性各 5 次。 Positive and negative polarity 5 times each.	正负极性各 15 次。 Positive and negative polarity 15 times each.	
脉冲间隔 Pulse Interval (s)	60		
判据 Criteria	判据 B criterion B	判据 DS criterion DS	
试验结果 Test Result	符合判据 A Meet criterion A	符合判据 A Meet criterion A	符合判据 DS Meet criterion DS
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli

6. 试验布置图 Test Layout

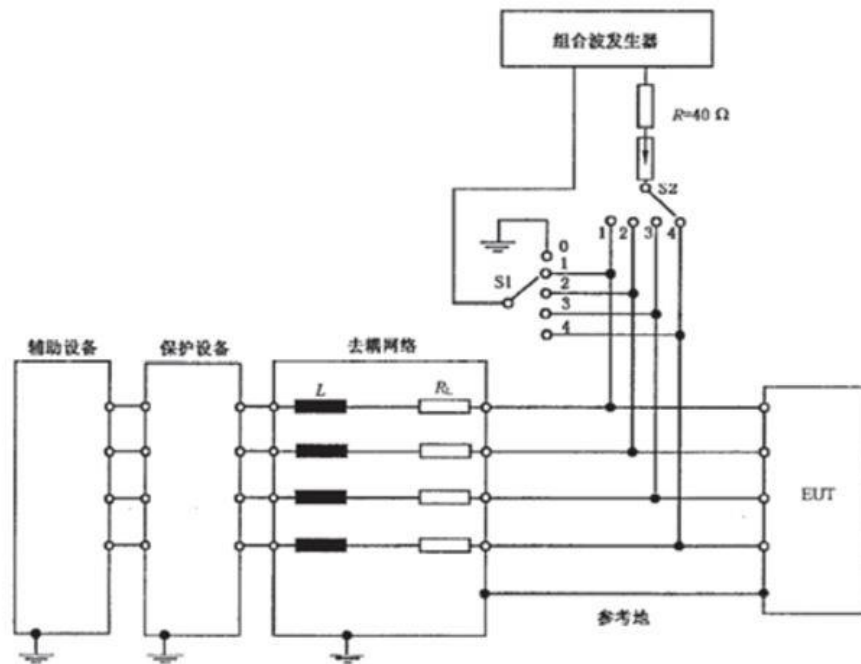


图 49 浪涌(冲击)抗扰度试验布置示意图

Fig. 49 Layout of Surge Immunity Test



图 50 浪涌(冲击)抗扰度试验布置图

Fig. 50 Photograph of Surge Immunity Test

射频场感应的传导骚扰抗扰度

Immunity to Conducted Disturbances, Induced by Radio-frequency Fields

试验日期 Test Date: 2025-04-21

环境条件
Test Environment温度 Temperature $t=21.4^{\circ}\text{C}$ 相对湿度 Relative Humidity $\text{RH}=48.3\%$ 大气压力 Atmospheric Pressure $P=97.45\text{kPa}$

1. 试验标准 Test Standard、

IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-6:2013、IEC 61326-3-1:2017

2. 试验设备 Test Equipment

设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
信号源 Signal generator	DSG815	DSG8A223300 118	2XB240924135 034-0009	RIGOL	2025-09-28
功率放大器 Power amplifier	NTWPA- 4K04200	21069040	2XB240924135 034-0046	RFLIGHT	2027-10-08
衰减器 Attenuator	DTS200- 6dB-1G	17092506	CNJZ23001440 5	SHX	2026-08-10
耦合去耦网络 M3 Coupled decoupling network M3	EM5070	E1750700015	/	Cybertek	/
电磁钳 Electromagnetic clamp	EMCL-20	18101935- 0111	/	HAEFELY	/

3. 被测模式 Test Mode

额定工作 Rated Work

4. 试验现象 Test Phenomena

☐ 正常 Normal ☒ 其它 Other

[系统电源线, 现场电源线, CU510, CU511 网线, D0907 通道输出, D0907 现场电源输入信号线 20V, 试验过程中, 模块离线, 符合判据 DS.]

System AC Power Cable, Field AC Power Cable, CU510, CU511 network cable, D0907 channel output, D0907 on-site power input signal line 20V, during the test, module offline, meet criterion DS.]

5. 试验结果 Test Result			
试验参数 Test Parameters			
被测线缆 Cable under Test	系统交流电源线 System AC Power Cable 现场交流电源线 Field AC Power Cable	CU500, CU510, CU511 网线 CU500 , CU510, CU511 Network Cable D0907 通道输出信号线 D0907 channel output signal line D0907 现场电源输入信号线 D0907 field power input signal line	
耦合方式 Coupled Mode	耦合去耦网络 M3 Coupled decoupling network M3	电磁钳 Electromagnetic clamp	
频率 Frequency range (MHz)	0.15~80	0.15~80	3.39, 6.78, 13.56, 27.12, 40.68
骚扰电压值 Field Strength (V)	10	20	20
频率步进 Frequency steps (%)	1	1	/
驻留时间 Dwell time (s)	1	1	10
调制方式 Modulation	1kHz 正弦波 80%幅度调制 80% amplitude modulated with a 1kHz sine wave		
判据 Criteria	判据 A criterion A	判据 DS criterion DS	判据 DS criterion DS
试验结果 Test Result	符合判据 A Meet criterion A	符合判据 DS Meet criterion DS	符合判据 A Meet criterion A
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli

6. 试验数据

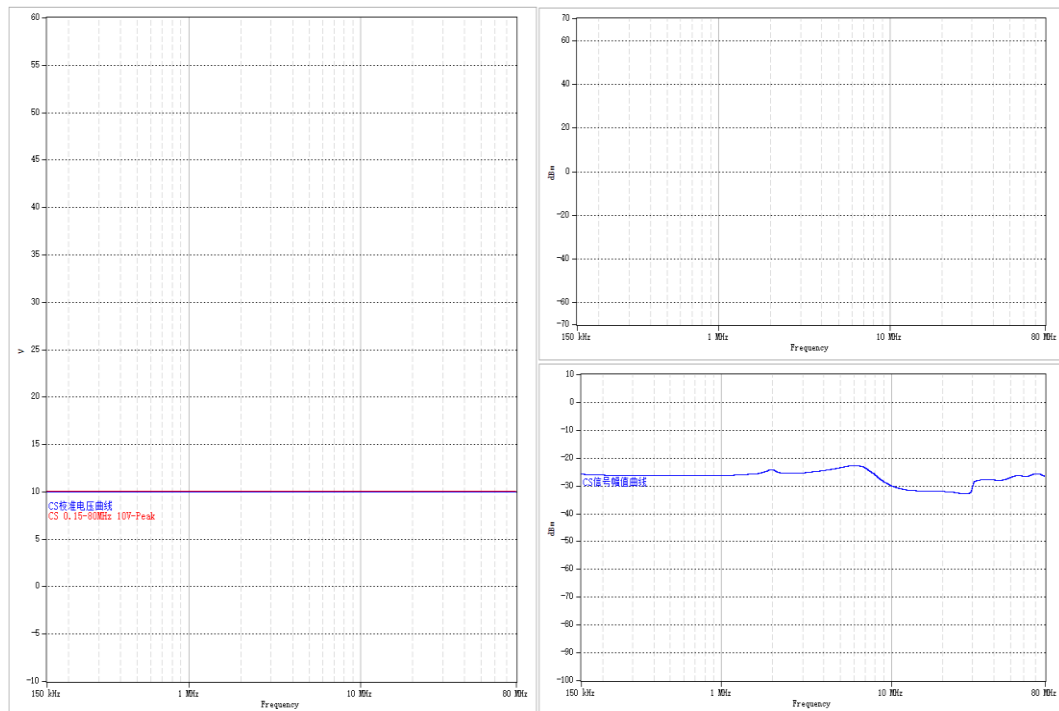


图 51 射频场感应的传导骚扰抗扰度系统交流电源线 10V 试验曲线

Fig.51 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, System AC Power Cable 10V

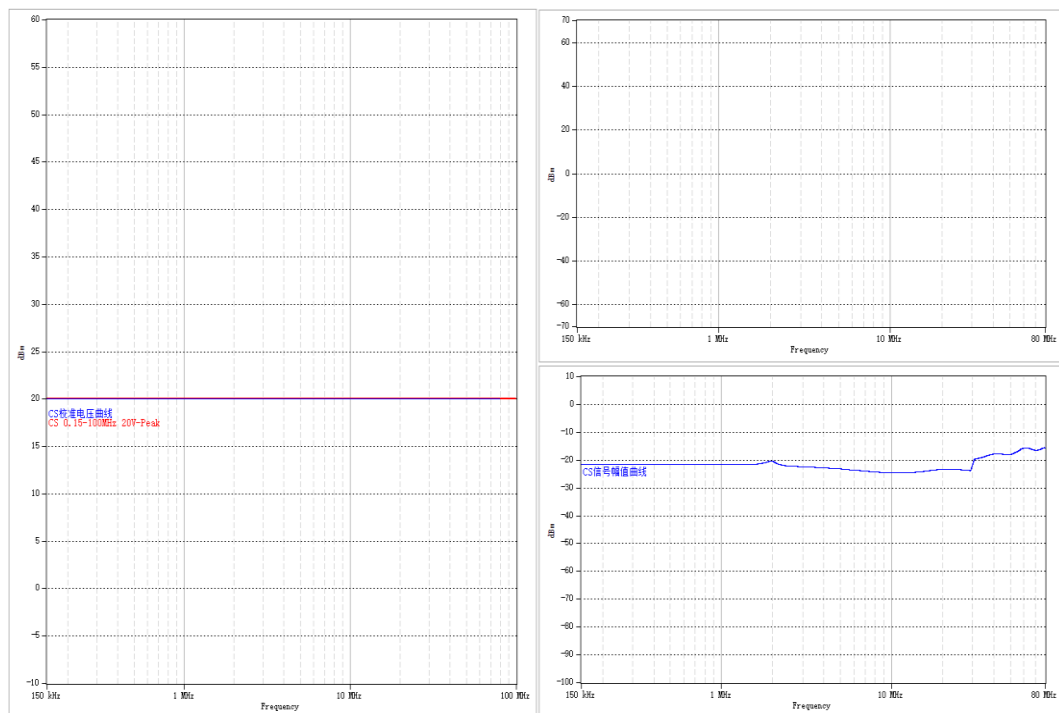


图 52 射频场感应的传导骚扰抗扰度系统交流电源线 20V 试验曲线

Fig.52 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, System AC Power Cable 20V

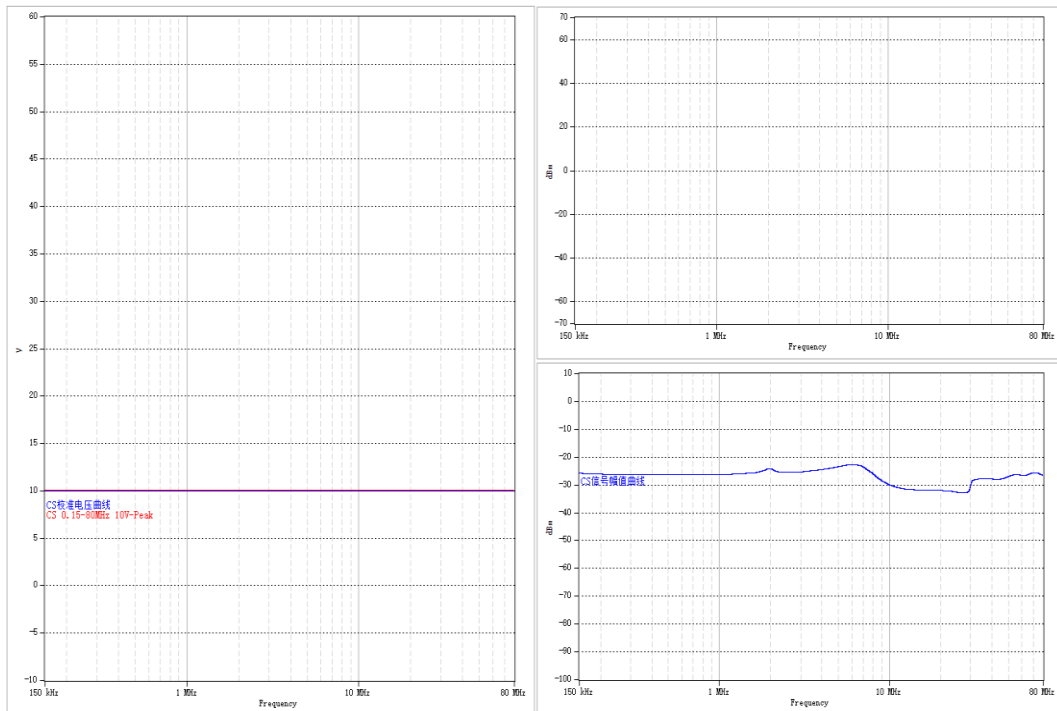


图 53 射频场感应的传导骚扰抗扰度现场交流电源线 10V 试验曲线

Fig.53 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, Field AC Power Cable 10V

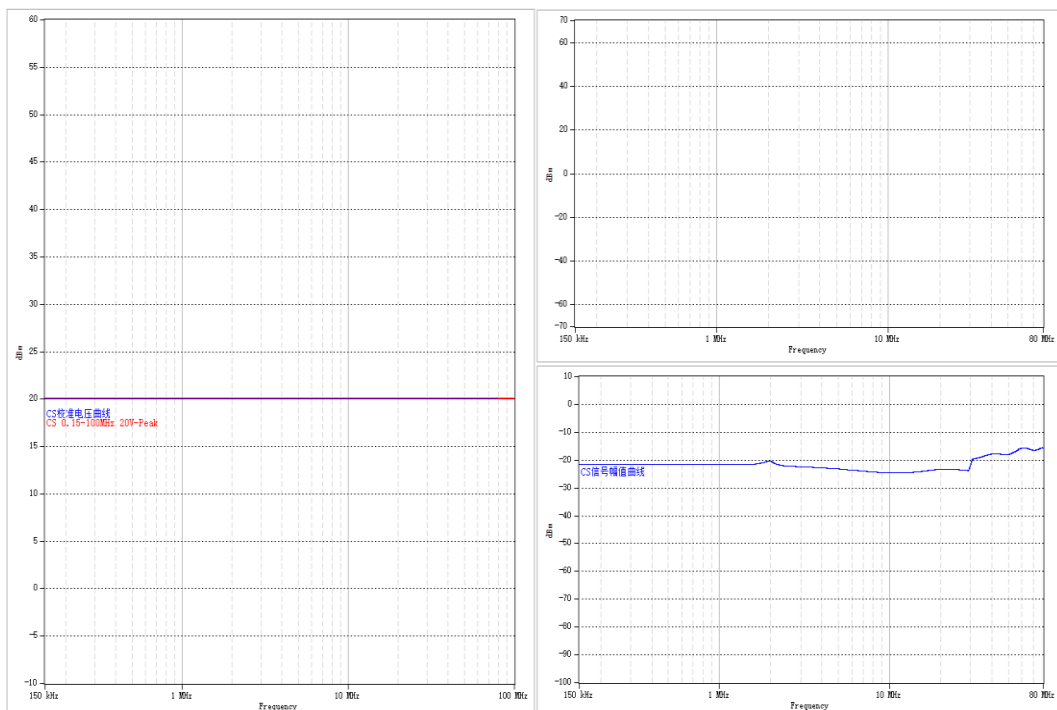


图 54 射频场感应的传导骚扰抗扰度现场交流电源线 20V 试验曲线

Fig.54 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, Field AC Power Cable 20V

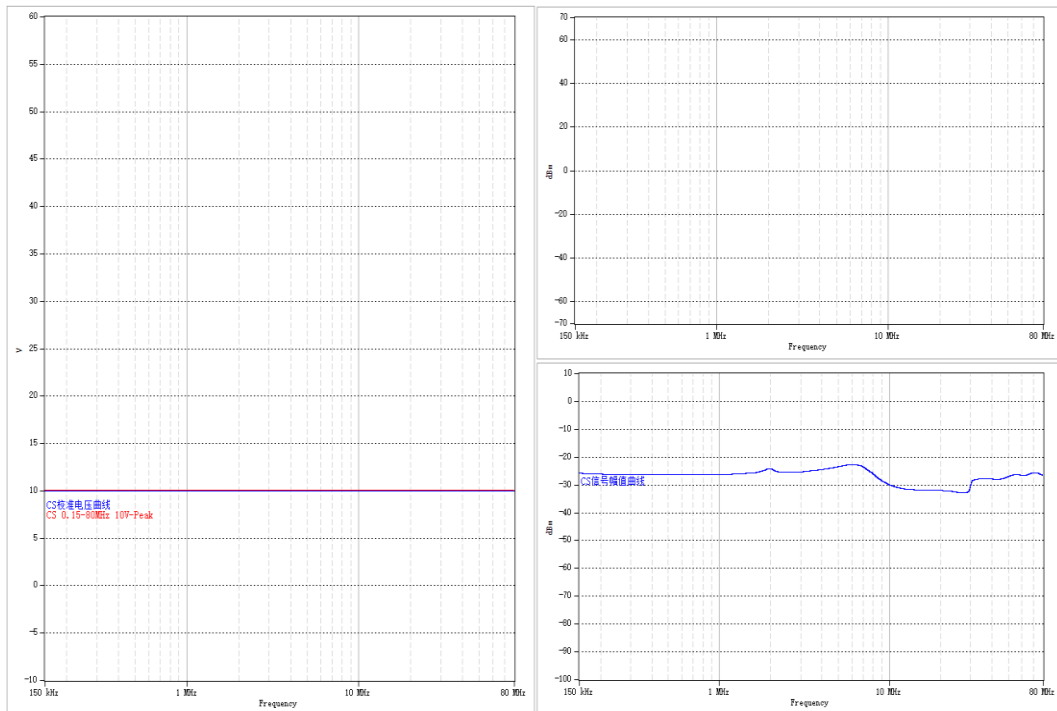


图 55 射频场感应的传导骚扰抗扰度 CU500 网线 10V 试验曲线

Fig.55 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, CU500 network cables, 10V

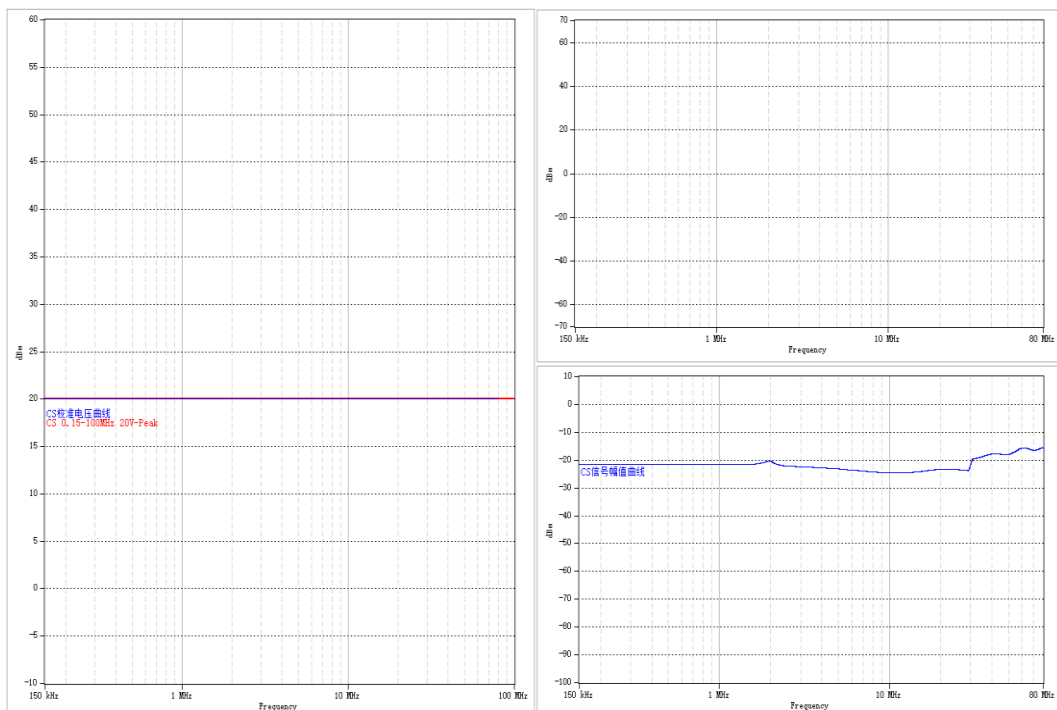


图 56 射频场感应的传导骚扰抗扰度 CU500 网线 20V 试验曲线

Fig.56 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, CU500 network cables, 20V

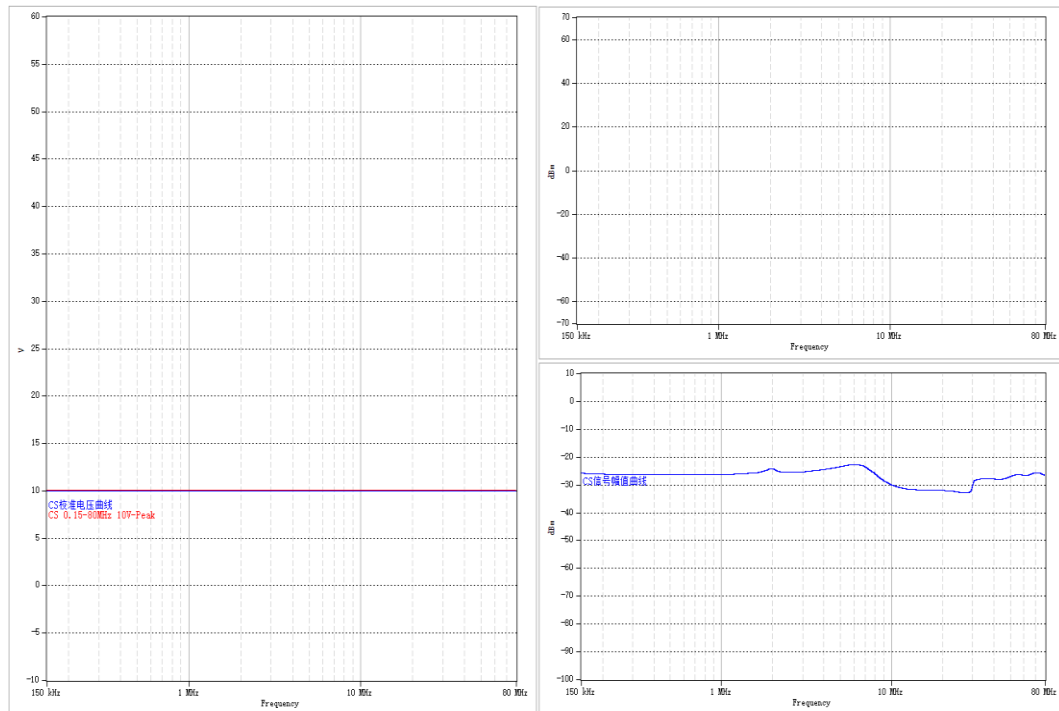


图 57 射频场感应的传导骚扰抗扰度 CU510、CU511 网线 10V 试验曲线

Fig.57 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, CU510、CU511 network cables, 10V

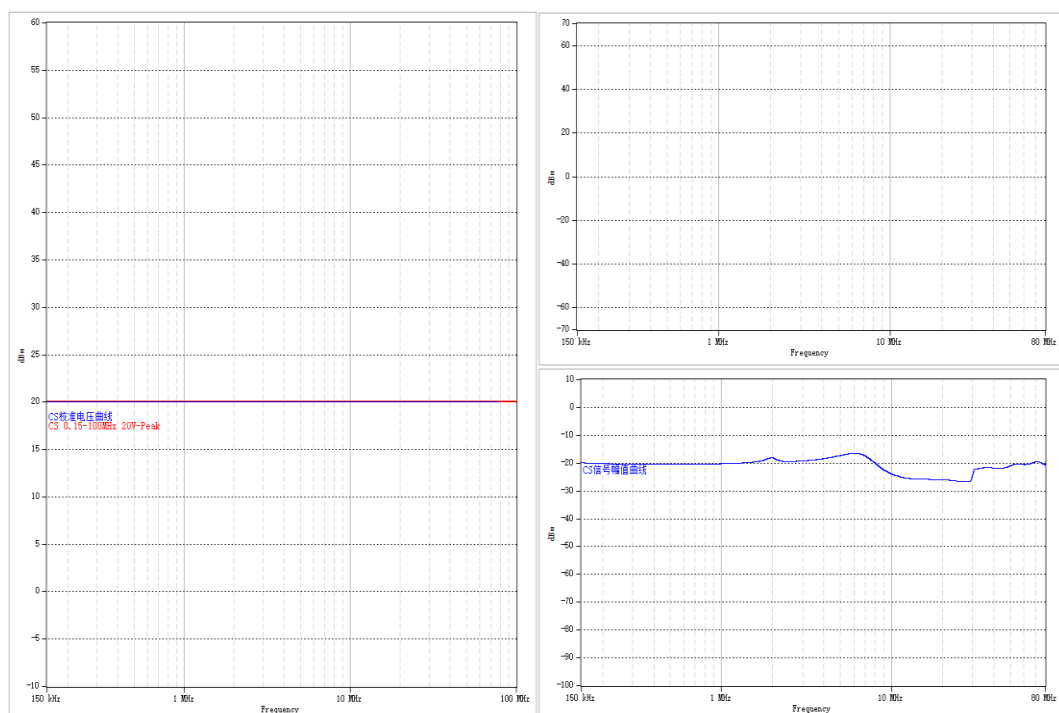


图 58 射频场感应的传导骚扰抗扰度 CU510、CU511 网线 20V 试验曲线

Fig.58 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, CU510、CU511 network cables, 20V

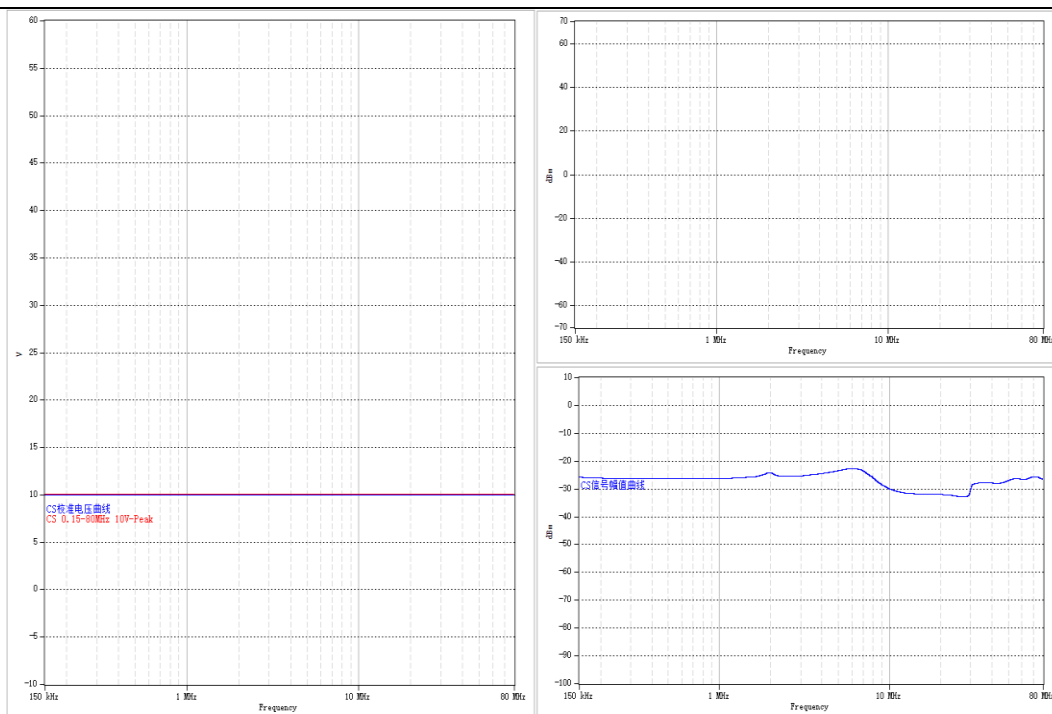


图 59 射频场感应的传导骚扰抗扰度 D0907 通道输出、现场电源输入信号线 10V 试验曲线

Fig.59 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, D0907 channel output ,D0907 field power input signal line 10V

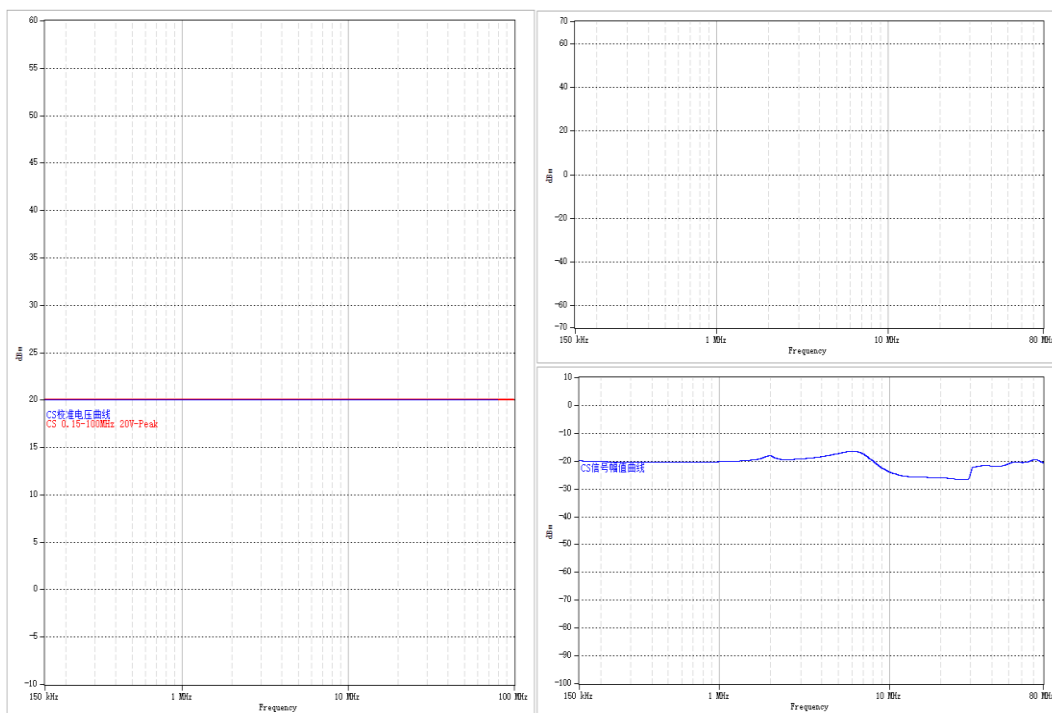


图 60 射频场感应的传导骚扰抗扰度 D0907 通道输出、现场电源输入信号线 20V 试验曲线

Fig.60 Spectral diagram, Immunity to Conducted Disturbances, Induced by Radio-frequency Fields, D0907 channel output ,D0907 field power input signal line 20V

7. 试验布置图 Test Layout

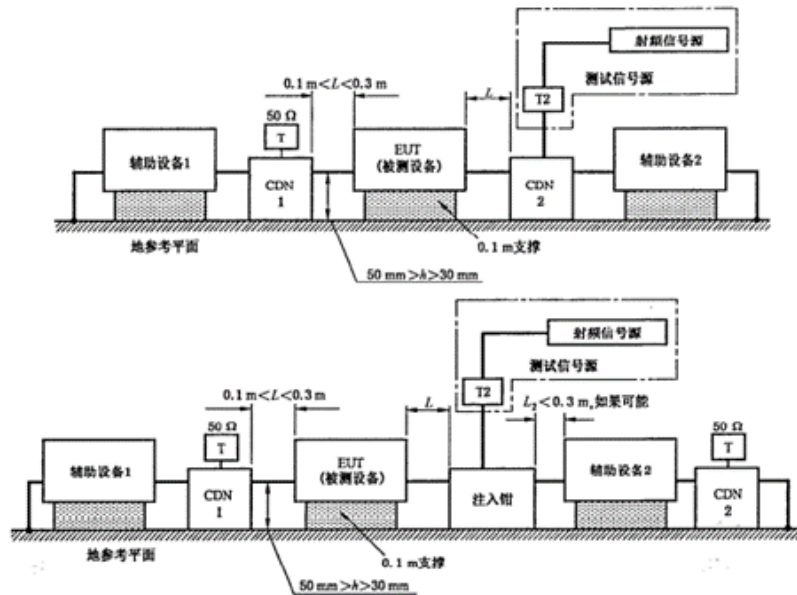


图 61 射频场感应的传导骚扰抗扰度试验布置示意图

Fig. 61 Layout of Immunity to Conducted Disturbances, Induced by Radio-frequency Fields

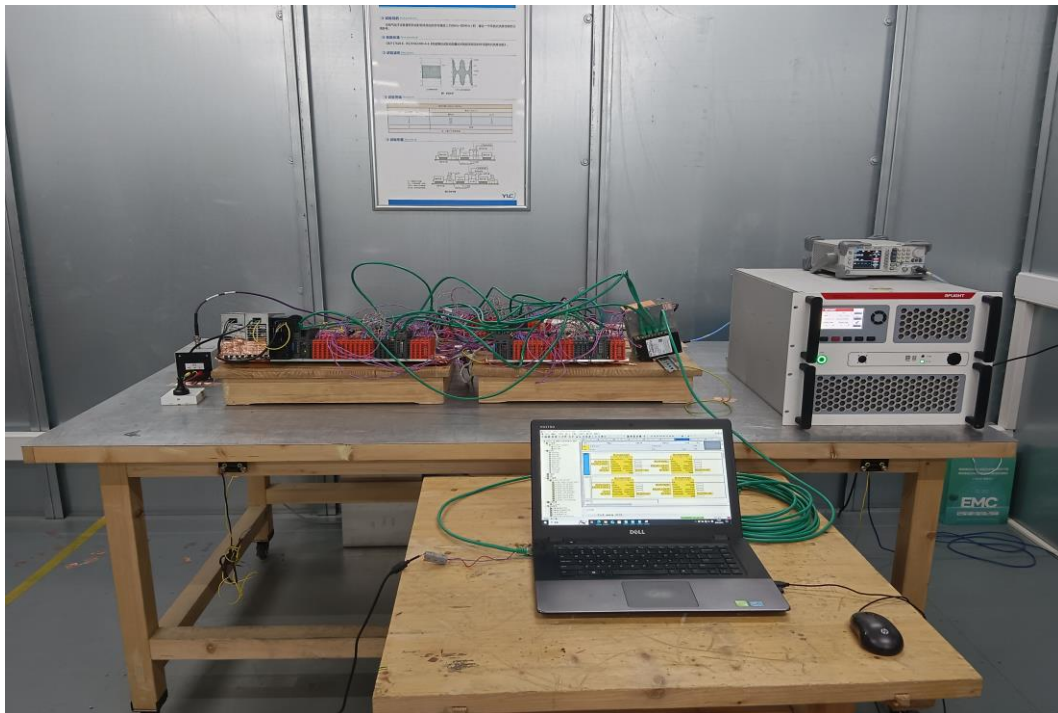


图 62 射频场感应的传导骚扰抗扰度试验布置图

Fig. 62 Photograph of Immunity to Conducted Disturbances, Induced by Radio-frequency Fields

工频磁场抗扰度 Power Frequency Magnetic Field Immunity Test					
试验日期 Test Date: 2025-04-22					
环境条件 Test Environment		温度 Temperature t=21.5℃ 相对湿度 Relative Humidity RH=48.3% 大气压力 Atmospheric Pressure P=97.61kPa			
1. 试验标准 Test Standard					
IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-8:2009、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
电源故障及工频磁场模块 Power failure and power frequency magnetic field Simulator	VMT2216SV	ES0471706	2XB231219594 91-0003A	3CTEST	2025-12-27
多功能组合式抗扰度测试仪 Multi-function combined immunity tester	CCS 600	ES0801750	2XB240125684 40-0001	3CTEST	2026-01-30
三匝磁场线圈 Three turns magnetic field coil	TCXS113	ES4631704	/	3CTEST	/

3. 被测模式 Test Mode			
额定工作 Rated Work			
4. 试验现象 Test Phenomena			
☒ 正常 Normal ☐ 其它 Other[]			
5. 试验结论 Test Result			
试验参数 Test Parameters			
试验等级 Test Class	4		
磁场类型 Magnetic field type	稳定持续 Continuous magnetic field		
试验方法 Test method	临近法 Nearest neighbor method		
磁场方向 Field orientation	X, Y, Z		
磁场强度 (A/m) Magnetic field strength (A/m)	30		
持续时间 (s) Time of duration (s)	120		
判据 Criteria	判据 A criterion A		
试验结果 Test Result	符合判据 A Meet criterion A		
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli

6. 试验布置图 Test Layout

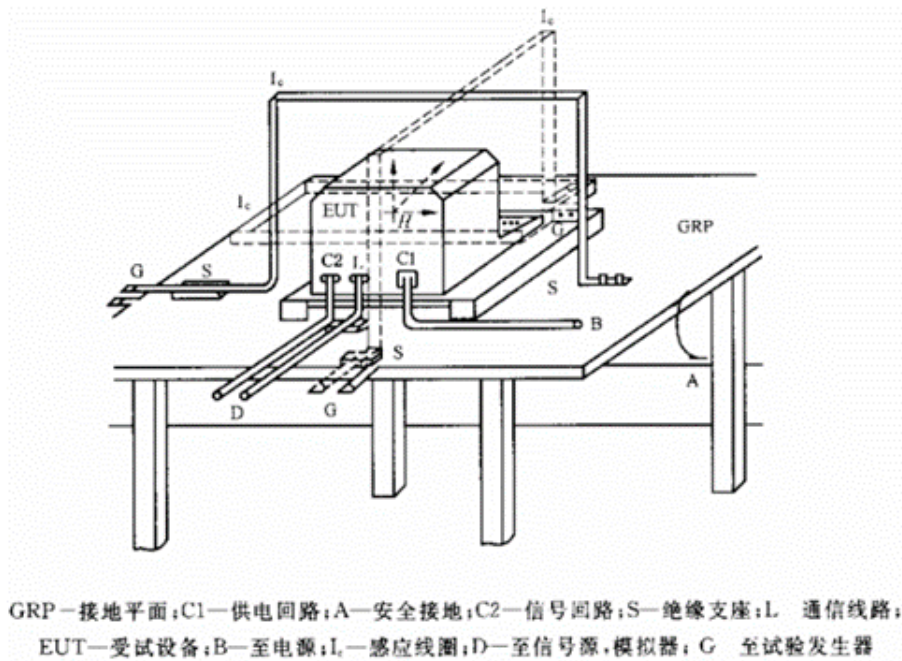


图 63 工频磁场抗扰度试验布置示意图

Fig.63 Layout of Power Frequency Magnetic Field Immunity Test

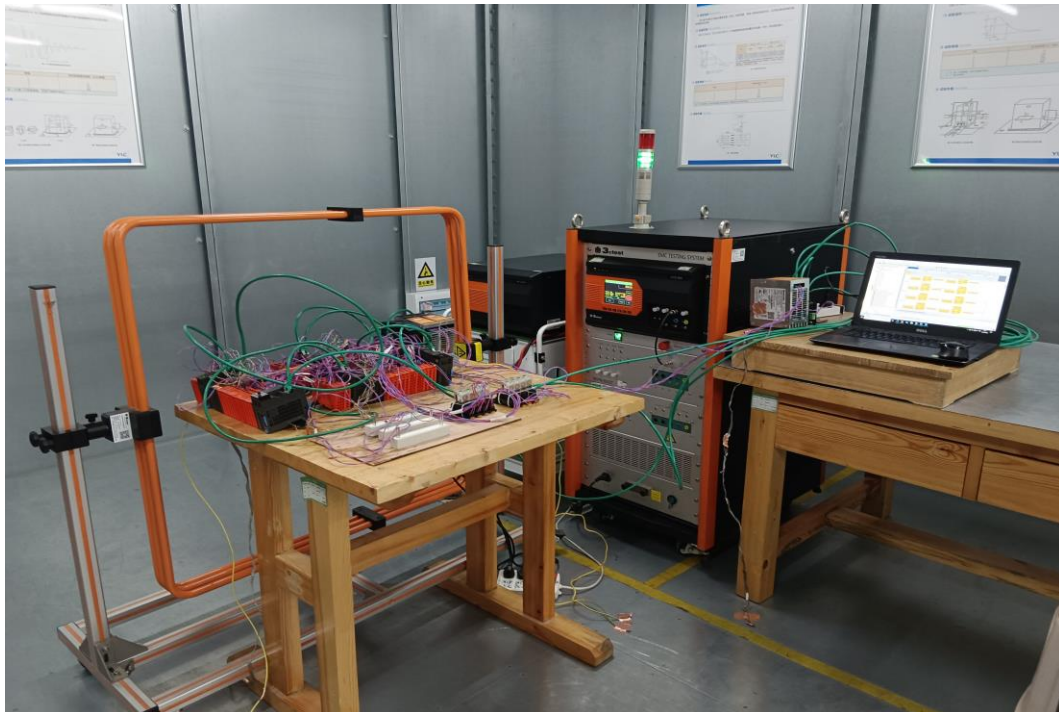


图 64 工频磁场抗扰度 X 方向试验图

Fig.64 Photograph Power Frequency Magnetic Field Immunity Test, X axial.

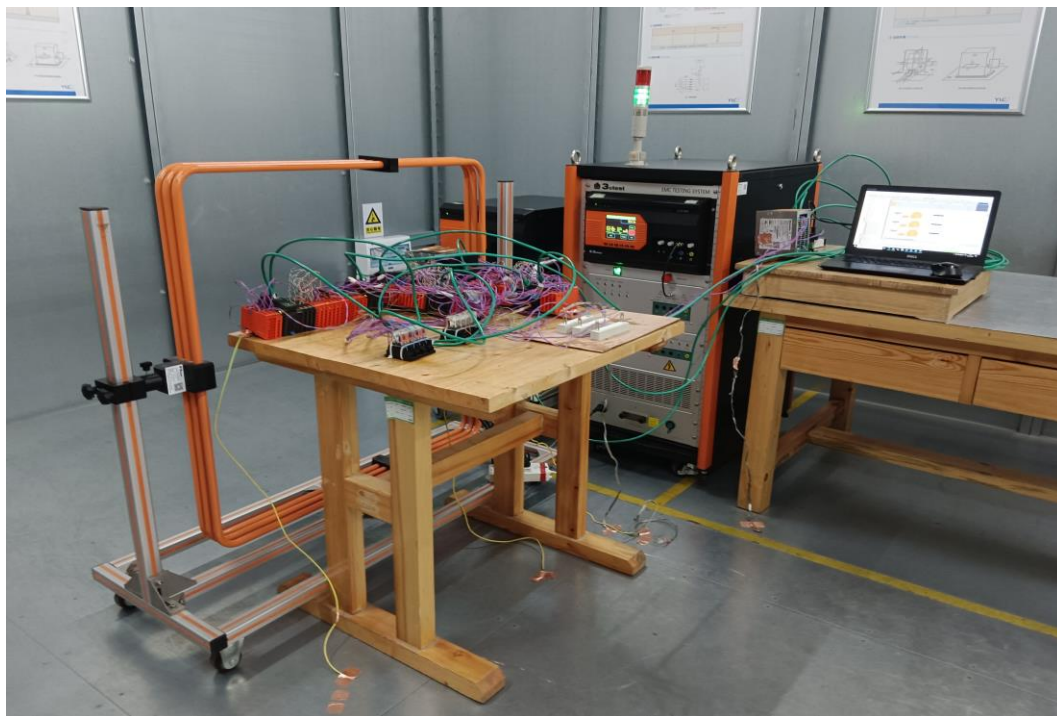


图 65 工频磁场抗扰度 Y 方向试验图

Fig.65 Photograph Power Frequency Magnetic Field Immunity Test, Y axial.

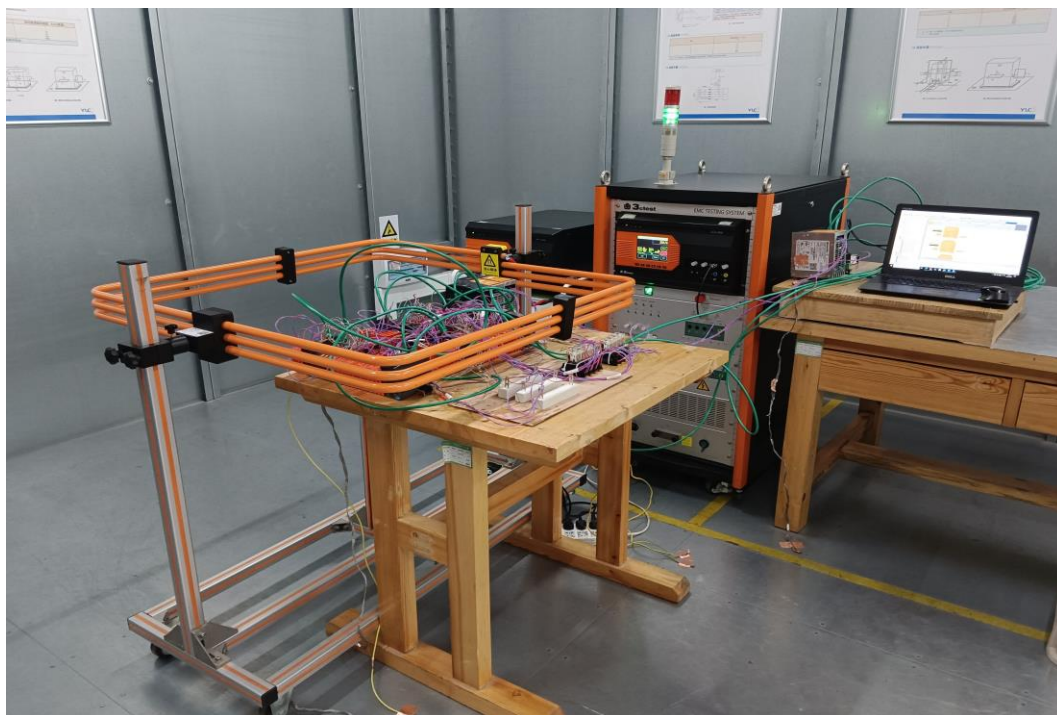


图 66 工频磁场抗扰度 Z 方向试验图

Fig.66 Photograph Power Frequency Magnetic Field Immunity Test, Z axial.

交流电压暂降、短时中断抗扰度

Voltage Dips, Interruptions to AC Power Port Immunity Test

试验日期 Test Date: 2025-04-22

环境条件
Test Environment温度 Temperature $t=21.5^{\circ}\text{C}$
相对湿度 Relative Humidity $\text{RH}=48.3\%$
大气压力 Atmospheric Pressure $P=97.61\text{kPa}$

1. 试验标准 Test Standard、

IEC 61000-6-2:2016、IEC 61326-1:2012、IEC 61000-4-11:2020、IEC 61326-3-1:2017

2. 试验设备 Test Equipment

设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
大功率交直流电源 High power AC/DC Power Supply	PCR6000L E2	ZH002335	2XB230904323 76-0013	KIKUSUI	2025-09-05

3. 被测模式 Test Mode

额定工作 Rated Work

4. 被测端口

系统交流电源线 System AC Power Cable, 现场交流电源线 Field AC Power Cable

5. 试验现象 Test Phenomena

☐ 正常 Normal ☒ 其它 Other

[试验过程中, 系统电源掉电, 模块离线, 安全 D0 模块无输出, 试验结束后, 人工手动重新上电, 工作正常, 符合 C 判据、DS 判据, 试验过程中, 现场电源掉电, 报故, 安全 D0 模块无输出, 试验结束后, 人工手动重新上电, 工作正常, 符合 C 判据、DS 判据。]

During the test, the system power supply was cut off, and the module went offline, security D0 module has no output. After the test was completed, the power was manually restored, and the system worked normally, meeting the C criterion and DS criterion. During the test, the on-site power supply was cut off, and an alarm was triggered, security D0 module has no output. After the test was completed, the power was manually restored, and the system worked normally, meeting the C criterion and DS criterion.]

6. 试验结论 Test Result					
/	电压暂降试验参数 Test Parameters of Voltage Dips			短时中断试验参数 Test Parameters of Interruptions	
工作频率 Working Frequency (Hz)	50, 60	50	60	50	60
试验等级 Test level	0% , 0%	40% , 70%	40% , 70%	0%	0%
持续时间（周期） Duration（period）	0.5, 1	10, 25	12, 30	250	300
电压变化相角 Voltage change phase angle（°）	45, 90, 135 180, 225, 270, 315			/	
试验次数（次） Test No.	3				
间隔时间 Interval time（s）	10				
判据 Criteria	判据 A criterion A	判据 C criterion C 判据 DS criterion DS			
试验结果 Test Result	符合判据 A Meet criterion A			符合判据 C Meet criterion C 符合判据 DS Meet criterion DS	
主检工程师 Principal	赵鹏飞 Zhao Pengfei		副检工程师 Verifier		曹胜利 Cao Shengli

7. 试验布置图 Test Layout

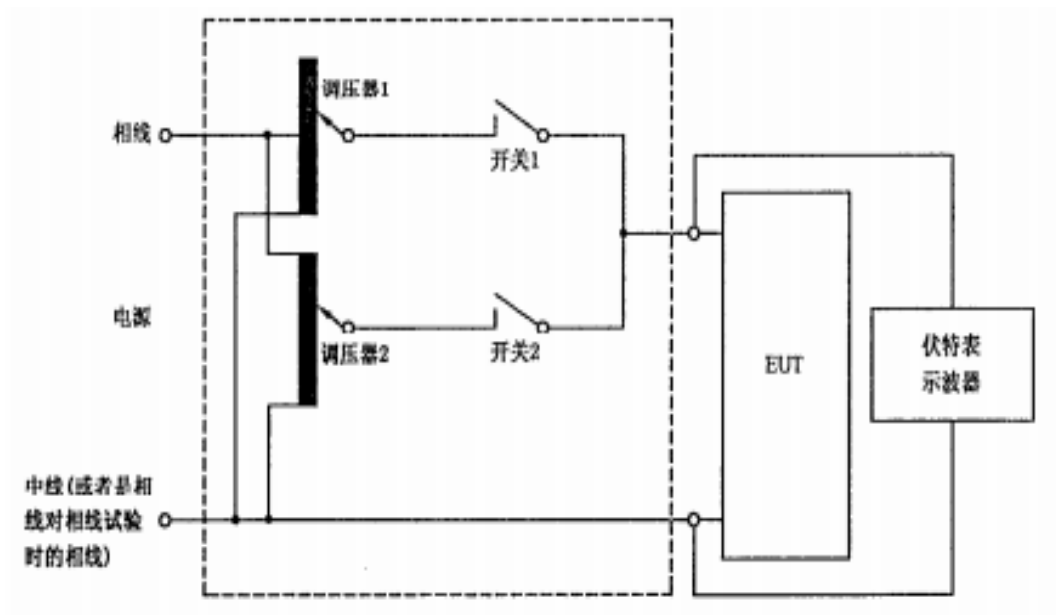


图 67 交流电压暂降、短时中断的抗扰度试验连接示意图

Fig.67 Layout of Voltage Dips, Interruptions to AC Power Port Immunity Test



图 68 交流电压暂降、短时中断的抗扰度试验布置图

Fig.68 Photograph of Voltage Dips, Interruptions to AC Power Port Immunity Test

电源电压变化 Supply Voltage Variation Test					
试验日期 Test Date: 2025-04-22					
环境条件 Test Environment		温度 Temperature t=21.5℃ 相对湿度 Relative Humidity RH=48.3% 大气压力 Atmospheric Pressure P=97.61kPa			
1. 试验标准 Test Standard					
IEC 61131-2:2017 6.2.2.5、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
大功率交直流电源 High power AC/DC Power Supply	PCR6000L E2	ZH002335	2XB2309043237 6-0013	KIKUSUI	2025-09-05
3. 被测模式 Test Mode					
额定工作 Rated Work					
4. 被测端口					
系统交流电源线 System AC Power Cable, 现场交流电源线 Field AC Power Cable					
5. 试验现象 Test Phenomena					
☐ 正常 Normal ☒ 其它 Other [试验过程中, EthereCAT 通讯异常, 电源模块输出异常, 试验后手动重启恢复正常, 符合判据 C。 Testing process, EthereCAT communication is abnormal, The power module fails during the test. After the test, the function of the tested equipment returns to normal after manual restart. Meet criterion C.]					

6. 试验结论 Test Result

试验参数
Test Parameters

/		电源电压快变化 Fast supply voltage variation	电源电压慢变化 Slow supply voltage variation
额定电压 Rated voltage (U_e)		AC230V	AC230V
最低电压 (V) Lowest voltage		0	0.9SDL _a V
在最低电压时的等待时间 (s) Waiting time at lowest voltage		0	0
两次试验的时间间隔 (s) Time interval between trials		5	5
电压减少所需时间 (s) Time required for voltage reduction		5	60
电压增加所需时间 (s) Time required for voltage increase		5	60
试验次数 (次) Number of trials(times)		3	3
判据 Criteria		判据 C criterion C	判据 C criterion C
试验结果 Test Result		符合判据 C Meet criterion C	符合判据 A Meet criterion A
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli

7. 试验布置图 Test Layout

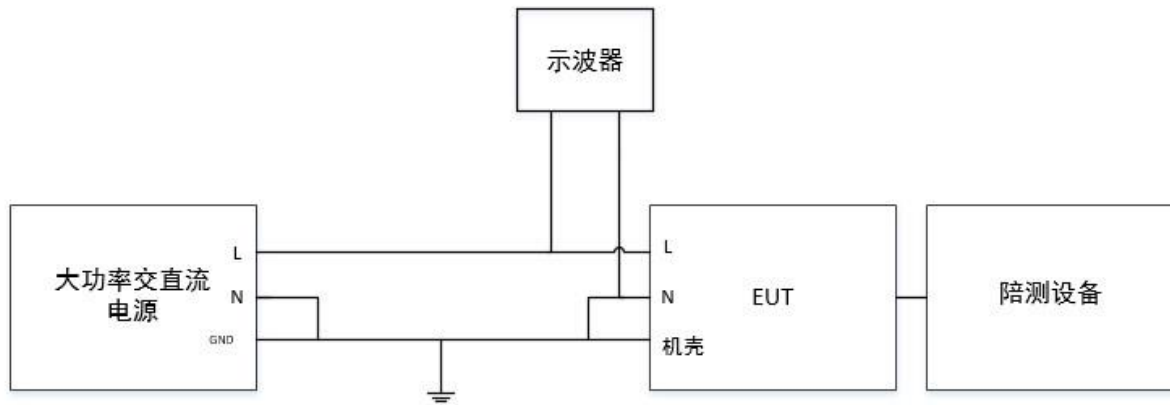


图 69 电源电压变化试验连接示意图

Fig. 69 Layout of Supply Voltage Variation Test

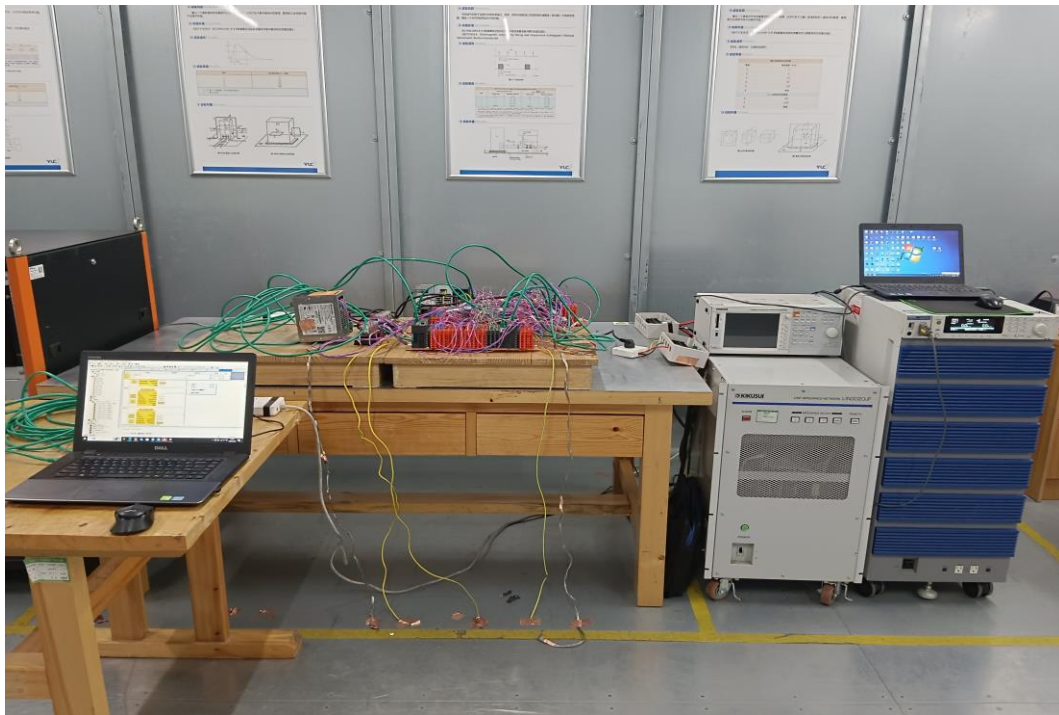


图 70 电源电压变化抗扰度试验布置图

Fig. 70 Photograph of Supply Voltage Variation Test

电压变化抗扰度 Voltage Variations to AC Power Port Immunity Test					
试验日期 Test Date: 2025-04-22					
环境条件 Test Environment		温度 Temperature t=21.5℃ 相对湿度 Relative Humidity RH=48.3% 大气压力 Atmospheric Pressure P=97.61kPa			
1. 试验标准 Test Standard					
IEC 61000-4-11:2020、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
大功率交直流电源 High power AC/DC Power Supply	PCR6000L E2	ZH002335	2XB230904323 76-0013	KIKUSUI	2025-09-05
3. 被测模式 Test Mode					
额定工作 Rated Work					
4. 被测端口					
系统交流电源线 System AC Power Cable, 现场交流电源线 Field AC Power Cable, D0907 模块现场侧 DC 24V 电源线 D0907 module filed power 24V power Cable					
5. 试验现象 Test Phenomena					
☒ 正常 Normal ☐ 其它 Other[]					
6. 试验结论 Test Result					
电压变化试验参数 Test Parameters of Voltage Variations					
工作频率 Working frequency (Hz)	额定电压 Nominal voltage (V)	工作电压 Working voltage (V)	变化后电压维持时间 Duration after variation (s)		
50	AC 200~AC 240	AC 170~AC 264	10		
/	DC 24	DC 19.2~DC 28.8	10		
判据 Criteria		判据 A criterion A			
试验结果 Test Result		符合判据 A Meet criterion A			
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli		

6. 试验布置图 Test Layout

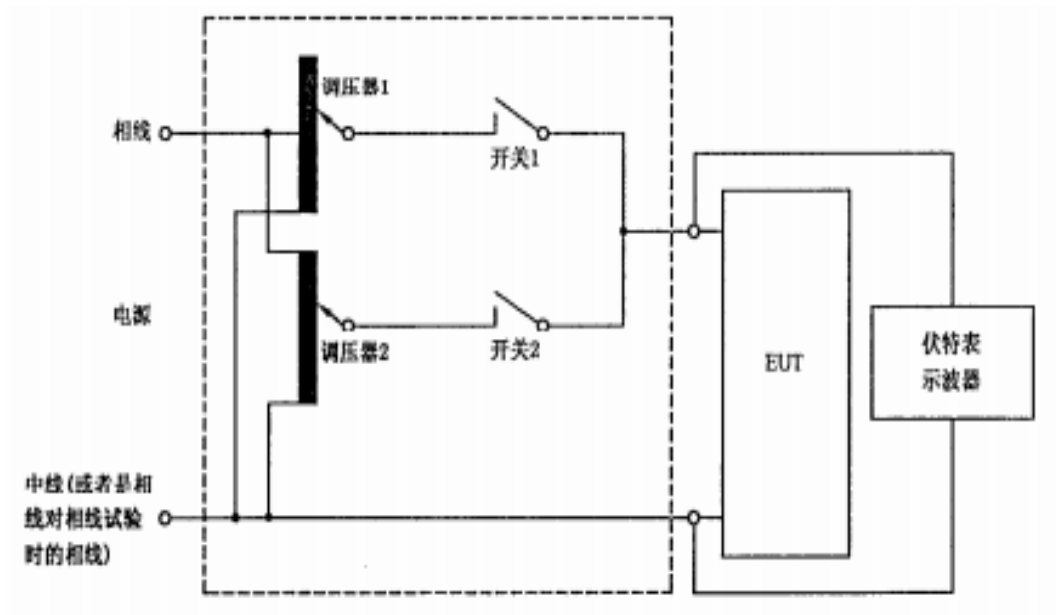


图 71 电压变化抗扰度试验连接示意图

Fig. 71 Layout of Voltage Variations Immunity Test

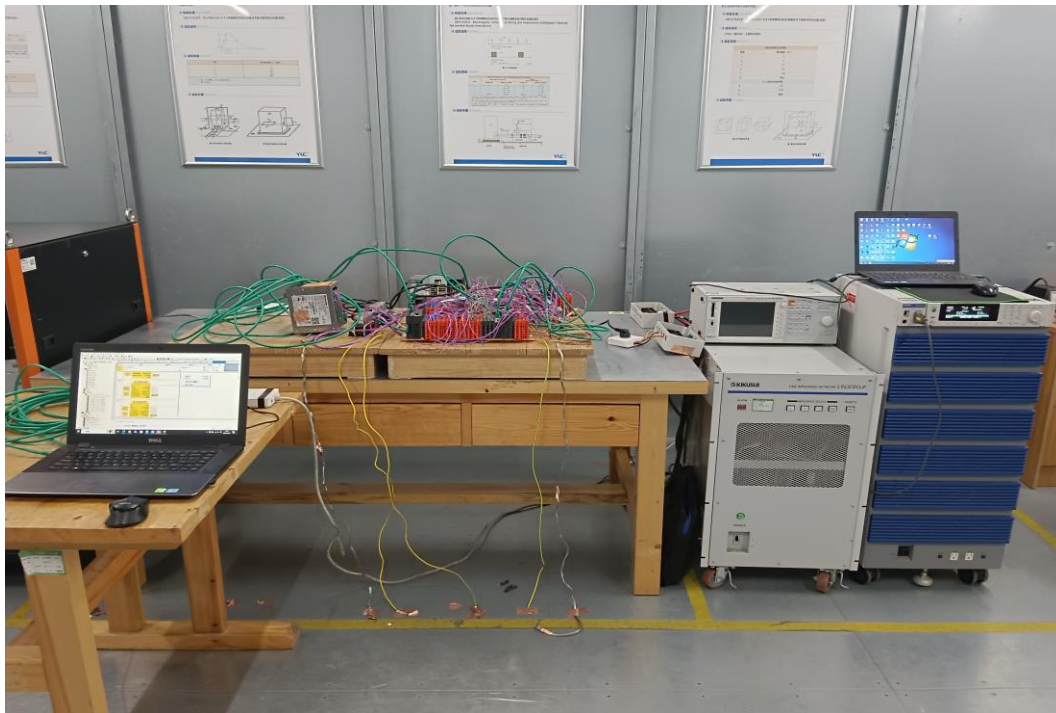


图 72 电压变化抗扰度试验布置图

Fig. 72 Photograph of Voltage Variations Immunity Test

平缓停机/启动试验 Gradual Shut-down /start-up Test					
试验日期 Test Date: 2025-04-22					
环境条件 Test Environment		温度 Temperature t=21.5℃ 相对湿度 Relative Humidity RH=48.3% 大气压力 Atmospheric Pressure P=97.61kPa			
1. 试验标准 Test Standard					
IEC 61131-2:2017 6.2.2.4、IEC 61326-3-1:2017					
2. 试验设备 Test Equipment					
设备名称 Equipment name	设备型号 Model	编号/序列号 Serial No.	校准证书编号 Certificate No.	制造商 Manufacturer	校准有效期 Validity of Calibrate
大功率交直流电源 High power AC/DC Power Supply	PCR6000LE2	ZH002335	2XB2309043237 6-0013	KIKUSUI	2025-09-05
3. 被测模式 Test Mode					
额定工作 Rated Work					
4. 被测端口					
系统交流电源线 System AC Power Cable, 现场交流电源线 Field AC Power Cable					
5. 试验现象 Test Phenomena					
☐ 正常 Normal ☒ 其它 Other [试验过程中, EthereCAT 通讯异常, 电源模块输出异常, 试验后手动重启恢复正常, 符合判据 C。 During the test, EthereCAT communication is abnormal, The power module fails during the test. After the test, the function of the tested equipment returns to normal after manual restart. Meet criterion C.]					

6. 试验结论 Test Result

试验参数
Test Parameters

额定电压 Rated voltage (U_e)	AC 230V		
最低电压 (V) Lowest voltage	0		
在最低电压时的等待时间 (s) Waiting time at lowest voltage	10		
两次试验的时间间隔 (s) Time interval between trials	10		
平缓停机下降时间 (s) Time required for gradual Shut-down	60		
平缓启动上升时间 (s) Time required for gradual start-up	60		
试验次数 (次) No. of trials	3		
判据 Criteria	判据 C criterion C		
试验结果 Test Result	符合判据 C Meet criterion C		
主检工程师 Principal	赵鹏飞 Zhao Pengfei	副检工程师 Verifier	曹胜利 Cao Shengli

7. 试验布置图 Test Layout

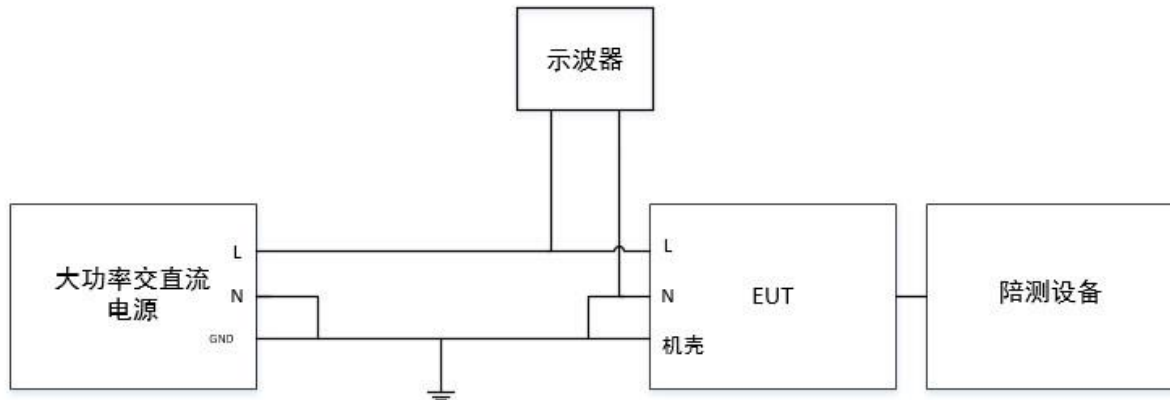


图 73 平缓停机/启动试验连接示意图

Fig. 73 Layout of Gradual Shut-down /start-up Test

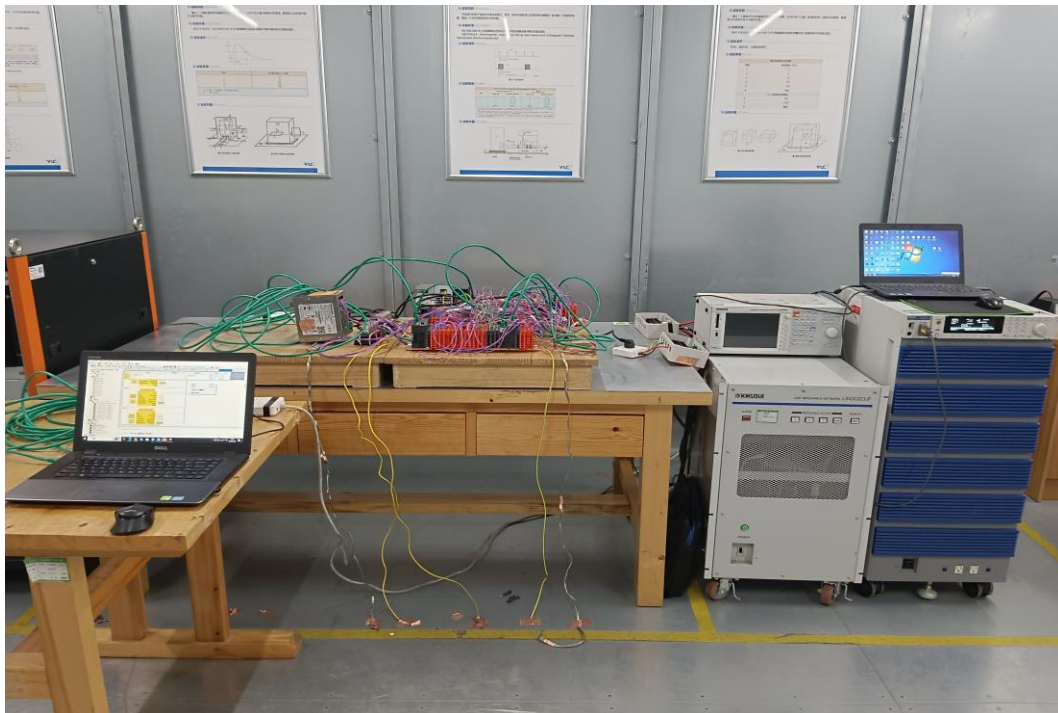


图 74 平缓停机/启动试验布置图

Fig. 74 Photograph of Gradual Shut-down /start-up Test

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