TEST REPORT

No. **8621.SH.2112.0148R1** Date: **01.14, 2022** Page: **1 / 32**

Applicant	:	ACREL CO., LTD.
Address	:	NO.253, YULV ROAD, JIADING, SHANGHAI, CHINA

Below information submitted by the applicant:

Product Name	:	ENERGY METER (DIN-RAIL MOUNTED)
Model	:	ADL400 ADL200
Model may cover	:	/
Reference info.	:	Serial No.: ACR202012281648-1, ACR202012281648-2, ACR202012281648-3 Class of Accuracy/Maximum Permission Errors: Active class 0.5S
Manufacturer info.	:	JIANGSU ACREL ELECTRICAL MANUFACTURING. CO., LTD. NO.5, DONGMENG ROAD, NANZHA STREET, JIANGYIN CITY, JIANGSU PROVINCE
Supplier info.	:	/
Buyer info.	:	/
Country of Destination	:	/
Country of Origin	:	China
Sample Received	:	11.13, 2021
Test Period	:	11.13, 2021 – 01.12, 2022
Test Method	:	IEC 62052-11:2003 Electricity metering equipment (a.c.) — General requirements, tests and test conditions-Part 11: Metering equipment IEC 62053-22:2003 Electricity metering equipment (a.c.) — Particular requirements — Part 22:Static meters for active energy(classes 0.2S and 0.5S)
Test Result	:	We tested the samples according to the items of test standard. The test results meet the requirements of the following documents: IEC 62052-11:2003 Electricity metering equipment(a.c.) — General requirements, tests and test conditions - Part 11: Metering equipment and IEC 62053-22:2003 Electricity metering equipment(a.c.) - Particular requirements — Part 22:Static meters for active energy(classes 0.2S and 0.5S).
Test Conclusion	:	This kind of rack mounted meters were not done the dustproof and waterproof test.The meters should be installed in a closed enclosure not less than IP51 or IP54 protection level when they used.

Signed for and on behalf of
Jordan Wang, General Manager
BU Chemical Compliance
TUV THURINGEN (SHANGHAI) CO., LTD.
Location: Shanghai

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ROOM C6, FLOOR 16TH JIANGSU BUILDING, NO.526 LAOSHAN ROAD, SHANGHAI 200122, P.R.CHINA

Main instruments used in this test:

Temperature: (20.0∽24.0)°C; R. Humidity: (45∽60)%

Name	Type/specification	Number	Certificate No./ Valid to
Program control high votage testing equipment	YD9811	063	E2021-0054894 /2022-06-16
3-Phase Watt-hour Meter Calibration System	SJJ-1	1431003	E2020-0100053 /2021-11-12
Striking and hitting test-bed	CP-100	920913	E2020-0100067 /2021-U-II
EMI receiver	ESU26	100159	E2020-0107548 /2021-12-07
Immunity to conducted disturbances induced by radio frequency fields	NSG2070-1	1099	E2021-0072524 /2022-07-25
RF Immunity Test System	SML03	103221 "	E2020-0100078 /2021-11-23
ESD Simulator	ESD-30G	EC0281210	E2020-0117865 /2022-01-03
High temperature test chamber	SEG-101H	1061111190	H2020-0107576 /2021-12-01
Hot wire testing equipment	ZRS-2	127-12	H2021-0014923 /2022-03-04
Electric vibration testing system	DC-3200-36	131244	E2020-0096163 /2021-11-02
Combined conduction immunity simulator	NSG3060	1333	E2021-0007693 /2022-02-01

List of test items:

No.	Test item	Reference documents	Results
1	Appearance signs and structure	1/5	P
2	Clearance and Creepage distance	1/5.6	P
3	Impulse voltage tests	1/7.3.2	P

4	AC voltage tests	1/7.3.3	P
5	Initial start-up of the meter	2/8.3	P
6	Limits of error due to variation of the current	2/8.1	P
7	Meter constant	2/8.4	P
8	Starting	2/8.3	P
9	Test of no-load condition	2/8.3	P
10	Ambient temperature variation	2/8.2	P
11	Voltage variation	2/8.2	P
12	Frequency variation	2/8.2	P
13	Influence of harmonics	2/8.2	P
14	Continuous magnetic induction of external origin	2/8.2	P
15	Magnetic induction of external origin 0.5mT	2/8.2	P
16	Power consumption	*2/7.1*	P
17	Influence of self-heating	2/7.3	P
18	Heating	1/7.2	P
19	Influence of short-lime overcurrents	2/7.2	P
20	Voltage dips and short interruptions	1/7.1.2,2/8.1	P
21	Radio interference suppression	1/7.5.8	P
22	Fast transient burst test	1/7.5.4,2/8.2	P
23	Damped oscillatory waves immunity test	1/7.5.7,2/8.2	P
24	Test of immunity to electromagnetic RF fields	1/7.53,2/ 8.2	P
25	Test of immunity to conducted disturbances, induced by radio-frequency fields	1/7.5.5,2/ 8.2	P
26	Test of immunity to electrostatic discharges	1/7.5.2	P
27	Surge immunity test	1/7.5.6	P

28	Dry heat test	1/63.1,2/8.1	P
29	Cold test	1/63.2,2/ 8.1	P
30	Damp heat cyclic test	1/63.3,2/8.1	P
31	Vibration test	1/5.2.23,2/8.1	P
32	Shock test	1/5.2.2.2,2/8.1	P
33	Spring hammer test	1/5.2.2.1	P
34	Resistance to heat and fire	1/5.8	P
35	Reversed phase sequence	2/8.2	P
36	Voltage unbalance	2/8.2	P

In "Results', column, P- pass; F- fail; N/A- not applicable.

Results of test and additional explanation (continued page)

No.	Test Item	Technical Standard Requirement	Test Result			Conclusion	Remark
			ACR20201 2281648-1	ACR20201 2281648-2	ACR20201 2281648-3		
1	Appearance signs and structure	Case,window .terminals-terminal block(s)-Protective earth terminal ,terminal covers, insulating encased meter of protective class II,resistance to heat and fire protection against penetration of dust and water,display of measured values,output device, marking of	All requirements are met.	/	/	pass	
2	Clearance and Creepage distance	Minimum clearance≥5.5 mm	/	11.75mm	/	pass	
		Minimum creepage distance≥6.3mm	/	13.79mm	/	pass	

3	Impulse voltage tests	Impulse waveform: 1.2/50 impulse specified in IEC60060-1; test voltage: 6kV.The EUT should be tested according to Item 7.3.2 of IEC62052-11 .During this test no flashover, disruptive discharge or puncture shall occur.	/	All requirements are met.	/	pass	
4	AC voltage tests	Between, on the one hand, all the current and voltage circuits as well as the auxiliar) circuits whose reference voltage is over 40V, connected together, and, on the other hand, earth. Test voltage:4kV; test time: 1 min. During this test no flashover, disruptive discharge or puncture shall occur.	/	All requirements are met.	/	pass	
		Between circuits not intended to be connected together in service. lest voltage:2kV; test time: 1 min. During this test no flashover, disruptive discharge or puncture shall occur.	/	All requirements are met	/	pass	
5	Initial start-up of the meter	The meter shall be functional within 5s after the reference voltage is applied to the meter terminals.	All requirements are met.	/	/	pass	
6	Limits of error due to variation of the current	balanced loads $0.01I_n \le I < 0.05I_n$(cos φ=1.0) $0.02I_n \le I < 0.1I_n$(cos φ=0.5L,0.8C) -1.0%≤Percentage error(PE)≤+1.0%	-0.92%	/	/	pass	
		balanced loads $0.05In \le I \le I_{max}$(cos φ=1.0) $0.1In \le I \le I_{max}$(cos φ=0.5L,0.8C) -0.5%≤Percentage error(PE)≤+0.5%	-0.22%	/	/	pass	

		unbalanced loads 0.05In≤I≤I_{max}(cos φ=1.0) -0.6%≤Percentage error(PE)≤+0.6%	-0.26%	/	/	pass	
		unbalanced loads 0.1In≤I≤I_{max}(cos φ=0.5L) -1.0%≤Percentage error(PE)≤+1.0%	-0.45%	/	/	pass	
		The difference between the percentage error when the meter is carrying a single-phase load and a balanced polyphase load shall not exceed 1.0%.	0.04%	/	/	pass	
7	Meter constant	The relation between the test output and the indication in the display shall comply with the marking on the name-plate.	Ail requirements are met.	/	/	pass	
8	Starting	The meter shall start and continue to register.	All requirements are met.	/	/	pass	
9	Test of no-load condition	When the voltage is applied with no current flowing in the current circuit, the test output of the meter shall not produce more than one pulse. For this test the current circuit shall be opcn-circuit and a voltage of 115% of the reference voltage shall be applied to the voltage circuits.	All requirements are met	/	/	pass	
10	Ambient temperature variation	Variation in PE ≤0.03% (cos φ=1.0)	0.017%/℃	/	/	pass	
		Variation in PE ≤0.05% (cos φ=0.5L)	0.016%/℃	/	/	pass	
11	Voltage variation	Variation in PE≤0.4%	0.04%	/	/	pass	
		Limit range of operation(0.0∽1.15)(4, After test, the meter shall show no damage or change of the	All requirements are met.	/	/	pass	

		1.15U_n and 0.8Un: Variation in PE≤1.2%	0.06%	/	/	pass	
12	Frequency variation	Variation in PE≤0.2%	0.04%	/	/	pass	
13	Influence of harmonics						
(1)	Harmonic components in the current and Voltage	Variation in PE≤0.5%	0.03%	/	/	pass	
(2)	Sub-harmonics in the a.c. current circuit	Variation in PE≤1.5%	0.42%	/	/	pass	
14	Continuous magnetic induction of external origin	Variation in PE≤2.0%	0.02%	/	/	pass	
15	Magnetic induction of external origin 0.5mT	Variation in PE≤1.0%	0.42%	/	/	pass	
16	Power consumption						
(1)	Voltage circuit(VA)	≤10VA	0.4VA	/	/	pass	
(2)	Voltage circuit(W)	≤2W	0.3W	/	/	pass	
(3)	Current circuit(VA)	≤1.0VA	0.05VA	/	/	pass	
17	Influence of self-heating	Variation in PE≤0.2% (cos φ=1.0)	0.08%	/	/	pass	
		Variation in PE≤0.2% (cos φ=0.5L)	0.11%	/	/	pass	

18	Heating	The temperature rise of the externa! surface shall not exceed 25K, with an ambient temperature of 40℃.	17.3K	/	/	pass	
		After the test, the meter shall show no damage and shall comply with the dielectric strength tests.	All requirements are met	/	/	pass	
19	Influence of short-time overcurrents	Short-time overcurrcnts shall not damage the meter. The meter shall perform correctly when back to its initial working condition.	All requirements are met.	/	/	pass	
		Variation in PE≤0.05%	0.01%	/	/	pass	

20	Voltage dips and short interruptions	The test shall be carried out under the following conditions: -voltage and auxiliary circuits energized with reference voltage; -without any current in the current circuits. a) voltage interruptions of△U=100% -interruption time: 1s; -number of interruptions 3; -restoring time between interruptions: 50ms. b) voltage interruptions of △U=100% -interruption time: one cycle at rated frequency; -number of interruptions: 1; c) voltage dips of △U=50% -dip time: 1min; -number of dips: 1. Voltage dips and short inlerruplions shall not produce a change in the register of more than 0.00396kWh and the test output shall not produce a signal equivalent of more than 0.00396kWh.	/	All requirement are met.	/	pass (refer to appendix 2)	
		When the voltage is restored, the meter shall not have suffered degradation of its metrological characteristics. -0.5%≤Percentage error(PE)≤+0.5%	/	+0.02%	/	pass	

21	Radio interference suppression						
(1)	Conducted emission test	The test shall be carried out according to CISPR 22,under the following conditions: •for class B equipment; •tested as table-top equipment; •for connection to the voltage circuits, an unshielded cable length of 1 m to each connector shall be used; • meter in operating condition: -voltage and auxiliary circuits energized with reference voltage; -with a current between 0.1 I_b and 0,2 $I_{b\ resp}$. 0,1 I_n and 0,2 I_n(drawn by linear load and connected by unshielded cable length of 1m) (0.15∽≤0.50)MHz QP≤ (66∽56)dBμV (0.50∽≤5.0)MHz QP≤ 56dBμV (5.0∽≤30)MHz QP≤ 60dBμV (0.15∽≤0.50)MHz AV≤ (56∽46)dBμV	/	Ail requirements are met.	/	pass (refer to appendix 3)	

(2)	Radiated emission test	The test shall be carried out according to CISPR 22,under the following conditions: •for class B equipment; •tested as table-top equipment; •for connection to the voltage circuits, an unshielded cable length of 1 m to each connector shall be used; •meter in operating condition: -voltage and auxiliary circuits energized with reference voltage; -with a current between 0,1 $/_b$ and 0,2 $I_{b\ resp}$. 0,1 $/_n$ and 0,2 (drawn by linear load and connected by unshielded cable length of 1 m). measuring distance: 10 m; antenna elevation range(1 ∽4)m; antenna polarization direction: vertical horizontal; turntable angle range:0~360° . (30∽≤230)MHz QP≤30dBμV/m (230∽≤1000)MHz QP≤37dBμV/	/	All requirements are met.	/	pass (refer to appendix 4)	

22	Fast transient burst test	The test shall be carried out according to IEC 61000-4-4,under the following conditions: •tested as table-top equipment; •meter in operating condition: -voltage and auxiliary circuits energized with reference voltage; -with basic current I_b resp, rated current I_n,and cos φ resp. Sin φ) according to the value given in the relevant standard. , cable length between coupling device and EUT:1m; • the test voltage shall be applied in common mode(line to earth)to: -the voltage circuits; -the current circuits, if separated from the voltage circuits in normal operation; -the auxiliary circuits, if separated from the voltage circuits in normal operation; •test voltage on the current and voltage circuit: 4kV; •test voltage on the auxiliary[f] circuits with a reference voltage over 40V: 2kV; , duration of the test: 60s at each polarity. During the test, a temporary degradation or loss of function or performance is	/	0.46%	/	pass (refer to appendix 5)	

23	Damped oscillatory waves immunity test	The test shall be carried out according to IEC 61000-4-12,under the following conditions: •only fbr transformer operated meters; •tested as tabic top equipment; • meter in operating condition: -voltage and auxiliary circuits energized with reference voltage; -with rated current I_n and cos φ resp. Sin φ according to the value given in the relevant standard; •test voltage on voltage circuits and auxiliary circuits with a reference voltage >40V: -common mode:2.5kV; -differential mode 1.0kV; •test frequencies: -100kHz,repetition rate:40Hz; -1 MHz,repetition rate:400Hz; •test duration:60s(15 cycles with 2s on,2s off for each frequency) During the test the behavior of the equipment shall not be perturbed and the variation in error shall be less than 2.0%.	/	0.21%	/	pass (refer to appendix 6)	

24	Test of immunity to electromagnetic RF fields	The test shall be carried out according to IEC 61000-4-3,under the following conditions: •tested as table-top equipment; •cable length, exposed to the field: lm; ·frequency band:80MHz～2000MHz; ·carrier modulated with 80% AM at 1 kHz sine wave; Test with current •meter in operating condition: · voltage and auxiliary circuits energized with reference voltage; · basic current I_b resp. rated current I_n, and cos φ resp. Sin φ according to the value given in the relevant standard. •unmodulated test field strength: 10V/m. During the test, the behaviour of the equipment shall not be perturbed and the variation of error shall be less than 2.0%.	/	0.33%	/	pass (refer to appendix 7)	

	Test of immunity to electromagnetic RF fields	The test shall be carried out according to IEC 61000-4-3,under the following conditions: •tested as table-top equipment; •cable length, exposed to the field: lm; •frequency band:80MHz∽ 2000MHz; •carrier modulated with 80% AM at 1kHz sine wave; Test without any current •meter in operating condition: -voltage and auxiliary circuits energized with reference voltage; -without any current in the currents and the current terminals shall be open circuit. •unmodulated lest field strength: 30V/m. The application of the RF field shall not produce a change in the register of more than 0.00396kWh and the test output shall not produce a signal equivalent to more than 0.00396kWh. During the lest,a temporary degradation or loss of function or	/	All requirements are met.	/	pass (refer to appendix 7)	

25	Test of immunity to conducted disturbances, induced by radio-frequency fields	The test shall be carried out according to IEC 61000-4-6,under the following conditions: •tested as table-top equipment; •meter in operating condition; · voltage and auxiliary circuits energized with reference voltage; -with basic current I_b resp. rated current I_n, and cos φ resp. Sin φ according to the value given in the relevant standard: • frequency range: 150kHz to 80MHz; •voltage level: 10V. During the test, the behaviour of the equipment shall not be perturbed and variation of the error shall be less than 2.0%.	/	0.13%	/	pass (refer to appendix 8)	

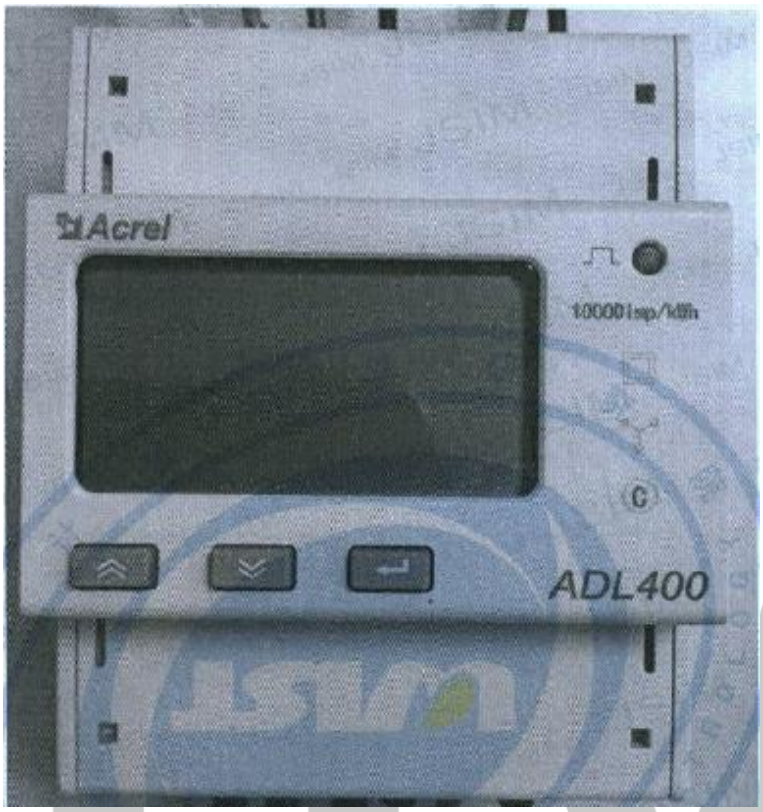
26	Test of immunity to electrostatic discharges	The test shall be carried out according to IEC61000-4-2,under the following conditions: •tested as table-top equipment; ,meter in operating condition; -voltage and auxiliary circuits energized with reference voltage; -without any current in the current circuits(open circuit); •contact discharge; •test voltage: 8kV; •number of discharges: 10(in the most sensitive polarity). If contact discharge is not applicable because no metallic parts are outside, then apply air discharge with a 15 kV test voltage. The application of the electrostatic discharge shall not produce a change in the register of more than 0.00396kWh and the test output shall not produce a signal equivalent to more than 0,00396kWh. During the test, a temporary degradation or loss of function or performance is acceptable.	/	All requirements are met.	/	pass (refer to appendix 9)	

27	Surge immunity test	The test shall be carried out according to IEC61000-4-5,under the following conditions: •meter in operating condition: -voltage and auxiliary circuits energized with reference voltage; without any current in the current circuits and the current terminals shall be open circuit; •cable length between surge generator and meter: lm; •tested in differential mode(line to line); •Phase angle: pulses to be applied at 60° and 240° relative to zero crossing of AC supply; ,test voltage on the current and voltage circuit(mains lines): 4kV. •number of tests: 5 positive and 5 negative; •repetition rate: 1/min. The application of the surge immunity test voltage shall not produce a change in the register of more than 0.00396kWh and the test output shall not produce a signal equivalent to more than 0.00396kWh. During the test, a temporary degradation or loss of function or performance is acceptable.	/	All requirements are met	/	pass (refer to appendix 10)	

28	Diy heat test	-meter in non-operating condition; -temperature: +70℃+2℃; -duration of the test:72h.					
		After the test,the meter shall show no damage or change of information and shall operate correctly.	/	/	All requirements arc met.	pass	
		-0.5%≤Percentage error(PE)≤+0.5%	/	/	+0.02%	pass	
29	Cold test	-meter in non-operating condition; -temperature: -25℃+3℃; -duration of the test:72h					
		After the test, the meter shall show no damage or change of information and shall operate correctly.	/	/	All requirements are met.	pass	
		-0.5%≤Percentage error(PE)≤+0.5%	/	/	+0.05%	pass	
30	Damp heat cyclic test	-voltage and auxiliary circuits energized with reference voltage; -without any current in the current circuits; -temperature: (25∽40)℃; -humidity: 93%±3%RH;					
		After the test, the meter shall show no damage or change of information and shall operate correctly. 24h after the end of this test, the meter shall comply with the dielectric strength tests. No trace of corrosion likely to affect the functional properties of the meter shall be apparent.	/	/	All requirements are met.	pass	
		-0.5%≤Percentage error(PE)≤+0.5%	/	/	+0.03%	pass	
31	Vibration test	-meter in non-operation condition, without the packing; -Frequency range: 10Hz to 150Hz; -Transition frequency:60Hz; -*f*<60Hz,constant amplitude of movement 0.075mm; -*f*>60Hz,constant acceleration 9.8m/s^2; -Single point control; -Number of sweep cycles per axis:10.					
		After the test, the meter shall show no damage or change of information and shall operate correctly.	/	/	All requirements are met	pass	
		-0.5%≤Percentage error(PE)≤+0.5%	/	/	+0.06%	pass	

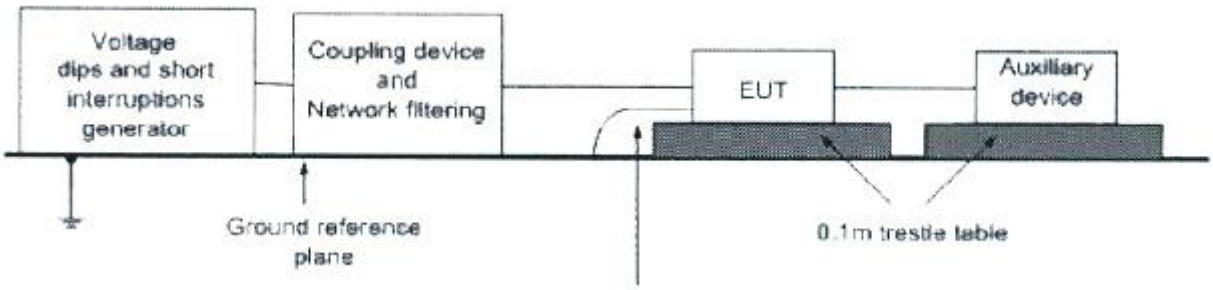
32	Shock test	-meter in non-operation condition, without the packing; -half-sine pulse; -peak acceleration: a=300m/s^2; -duration of the pulse: 18ms.					
		After the test, the meter shall show no damage or change of information and shall operate correctly.	/	/	All requirements are met.	pass	
		-0.5%≤Percentage error(PE)≤+0.5%	/	/	+0.04%	pass	
33	Spring hammer test	The spring hammer shall act on the outer surfaces of the meter cover(including windows) and on the terminal cover with a kinetic energy of 0.2J±0.02J. The meter case and terminal cover do not sustain damage which could affect the function of the meter and it is not possible to touch live parts.	/	/	All requirements are met.	pass	
34	Resistance to heat and fire	-terminal block: (960+ 10)℃ -terminal cover and meter case: (650± 10)℃; -duration of application: (30±1)s. The terminal block ,the terminal cover and the meter case shall ensure reasonable safety against spread of fire .They should not be ignited by thermal overload of live parts in contact with them.	/	/	All requirements are met.	pass	
35	Reversed phase sequence	Variation in PE≤0.1%	0.01%	/	/	pass	
36	Voltage unbalance	Variation in PE≤1.0%	0.04%	/	/	pass	

Appendix I: Sample picture



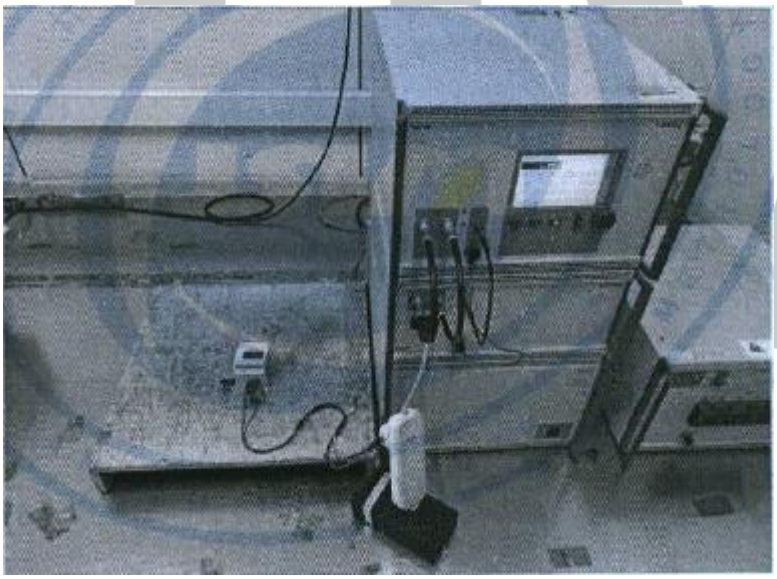
Appendix II:

1.Setup pic of voltage dips and short interruptions test



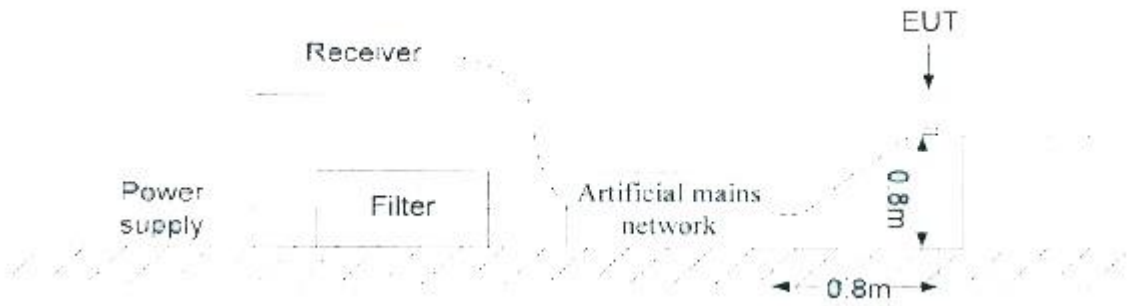
Earth connection according to manufacture's specification

2.Test pic of voltage dips and short interruptions test

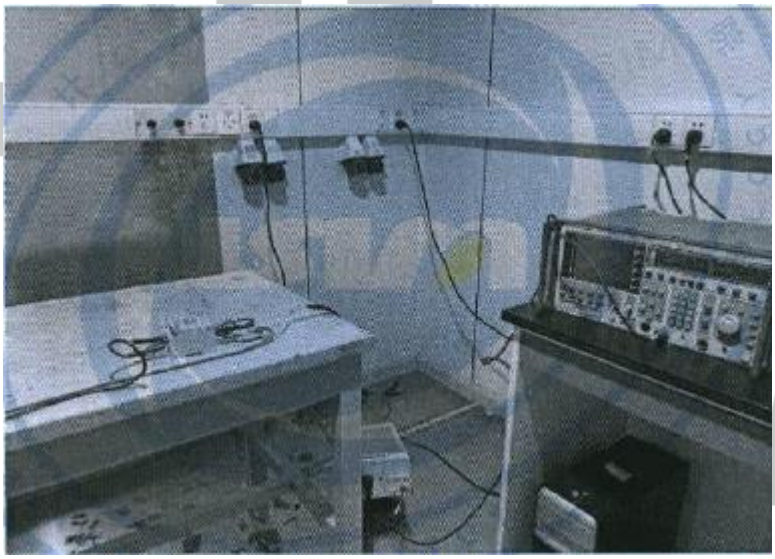


Appendix III:

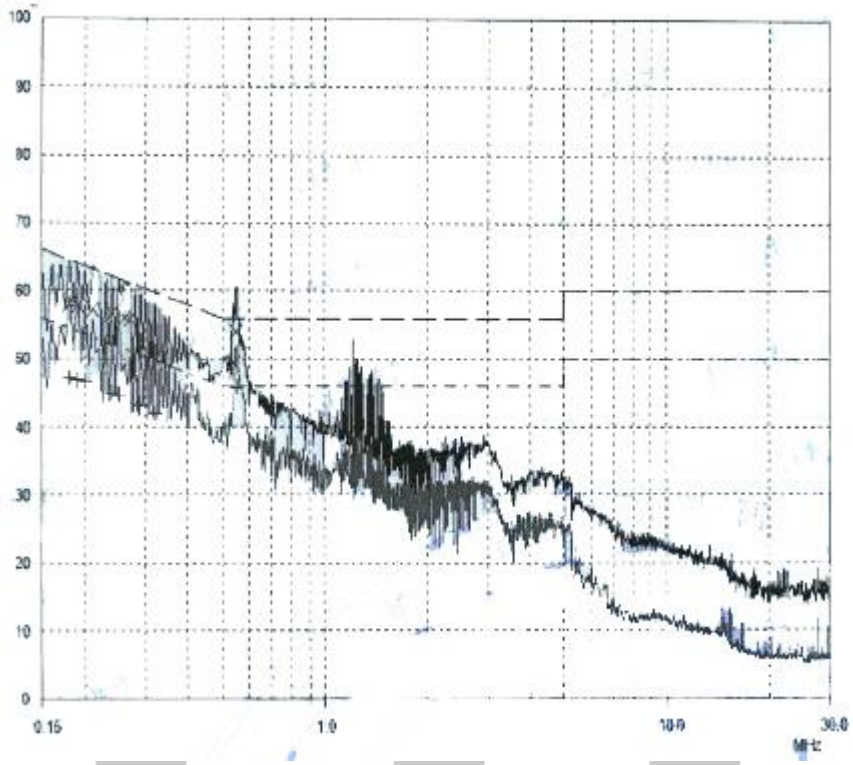
1.Setup pic of conducted emission test



2.Test pic of conducted emission test



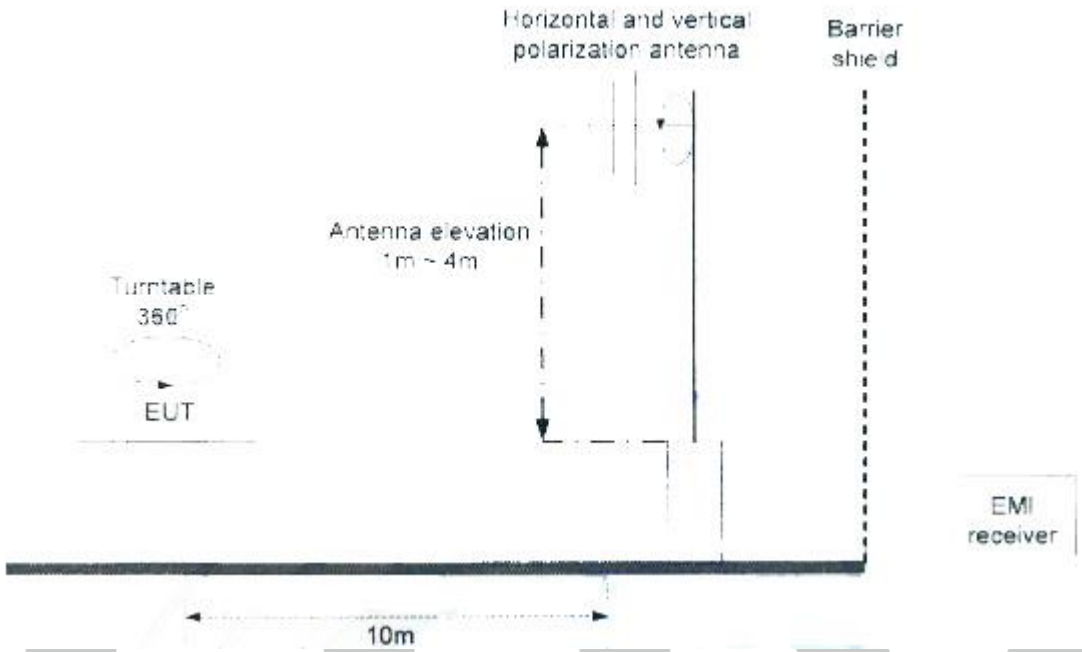
3.Curve and Results of Conducted Emission Test



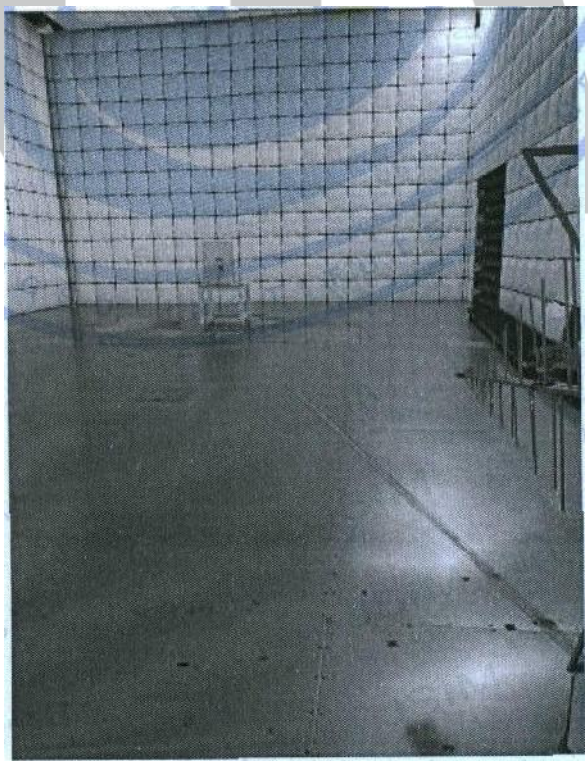
Frequency	QP Level	QP Limit	QP Delta	Phase	PE
MHz	dBµV	dBµV	dB	-	-
0.18	58.08	64.49	6.41	L1	gnd
0.19	57.71	64.04	6.33	L1	gnd
0.21	57.23	63.21	5.98	L1	gnd
0.24	56.56	62.10	5.54	L1	gnd
0.26	56.03	61.43	5.40	L1	gnd
0.27	55.74	61.12	5.38	L1	gnd
0.54	49.36	56.00	6.64	N	gnd
0.55	53.93	56.00	2.07	N	gnd
Frequency	AV Level	AV Limit	AV Delta	Phase	PE
MHz	dBµV	dBµV	dB	-	-
0.18	47.19	5449	7.30	L1	gnd
0.19	46.81	54.04	7.23	N	gnd
0.2	46.80	53.61	6.81	L1	gnd
0.24	44.83	52.10	7.27	N	gnd
0.25	44.64	51.76	7.12	N	gnd
0.29	43.23	50.52	7.29	N	gnd
0.32	42.05	49.71	7.66	L1	gnd
0,55	45.88	46.00	0.12	N	gnd

Appendix IV:

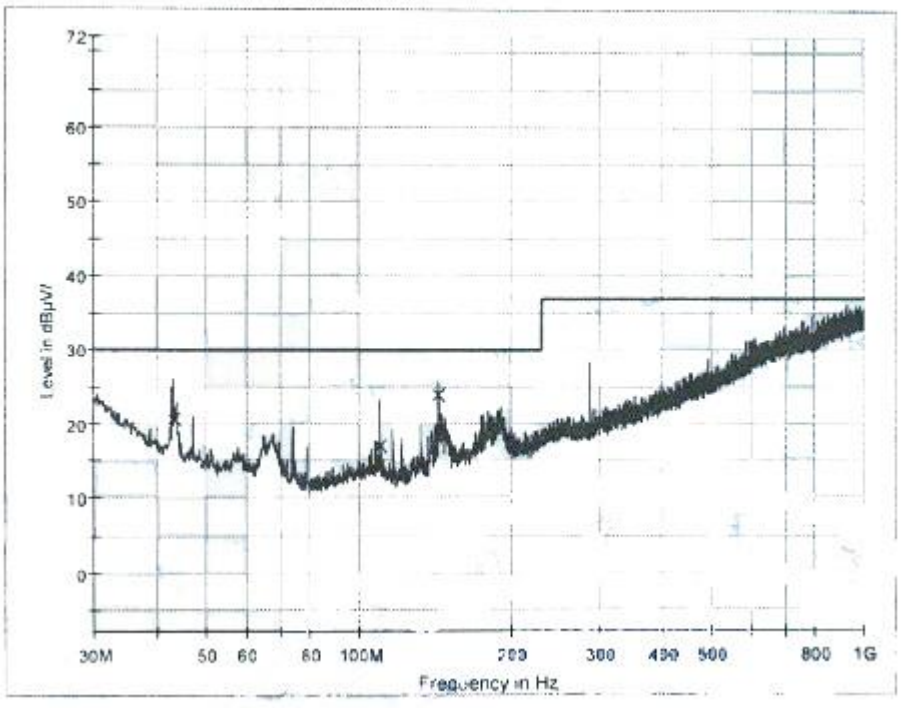
1. Setup pic of conducted emission test



2. Test pic of radiated emission test



3. Curve and Results of Radiation Emission Test

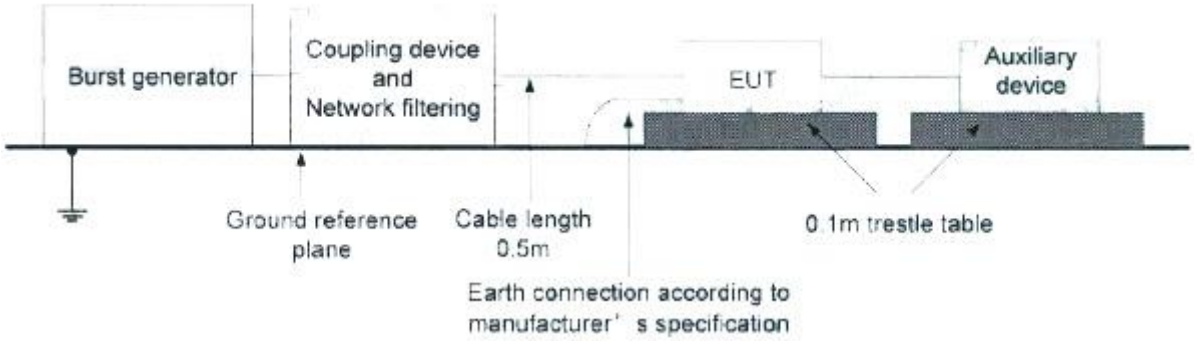


Result Table_Single

Frequency (MHz)	Quasi Peak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
43.130000	20.7	1000.0	120.000	100.0	V	0.0	11.9	
110.230000	47.0	1000.0	120.000	200.0	V	64.0	9.2	
144.000000	23.8	1000.0	120.000	100.0	V	358.0	10.0	

Appendix V:

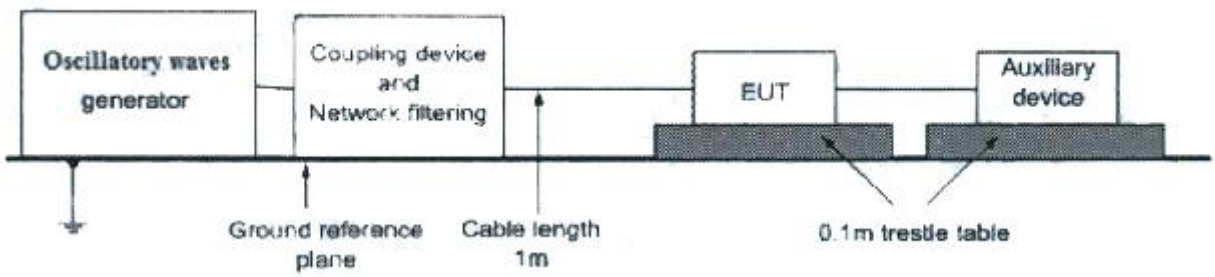
1. Setup pic of fast transient burst test



2. Test pic of fast transient burst test

Appendix VI:

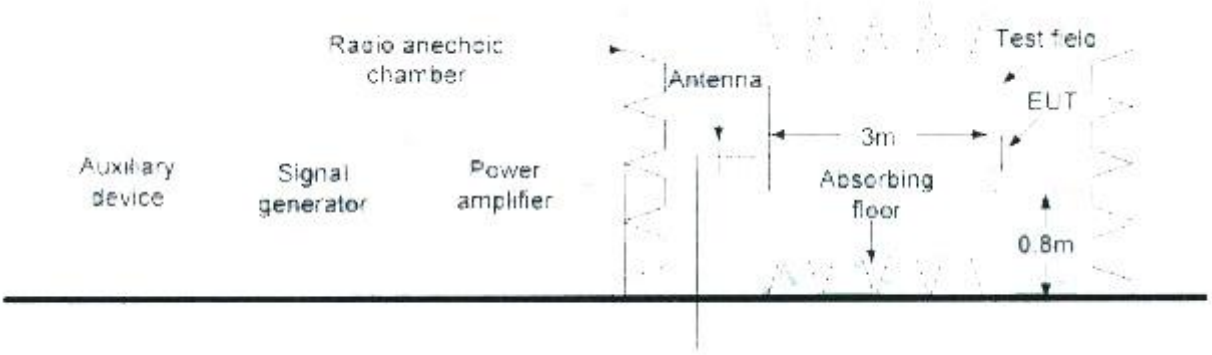
1.Setup pic of damped oscillatory waves immunity test



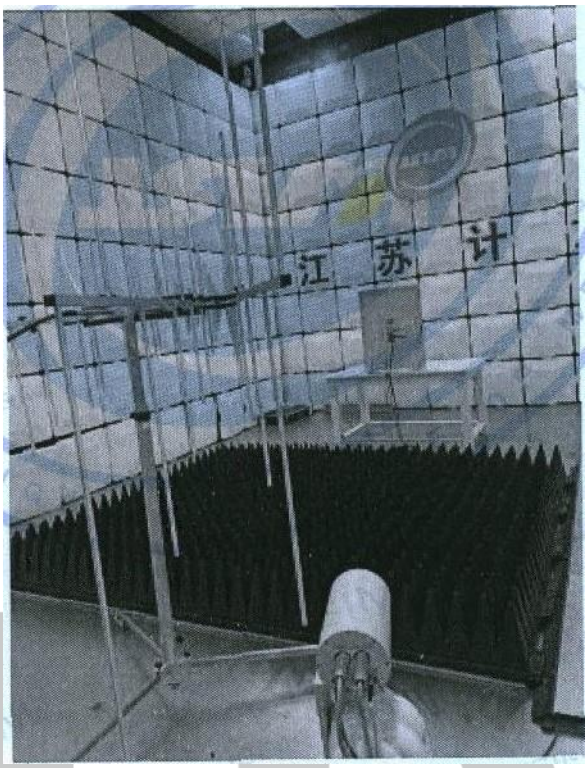
2.Test pic of damped oscillatory waves immunity test

Appendix VII:

1.Setup pie of Test of immunity to electromagnetic RF fields

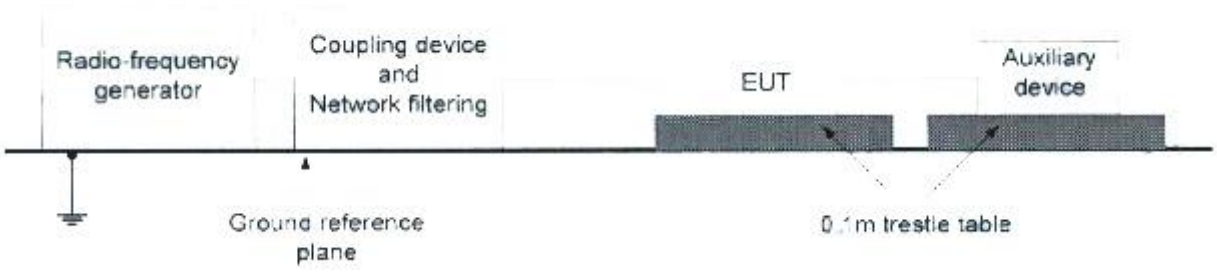


2.Test pic of Test of immunity to electromagnetic RF fields

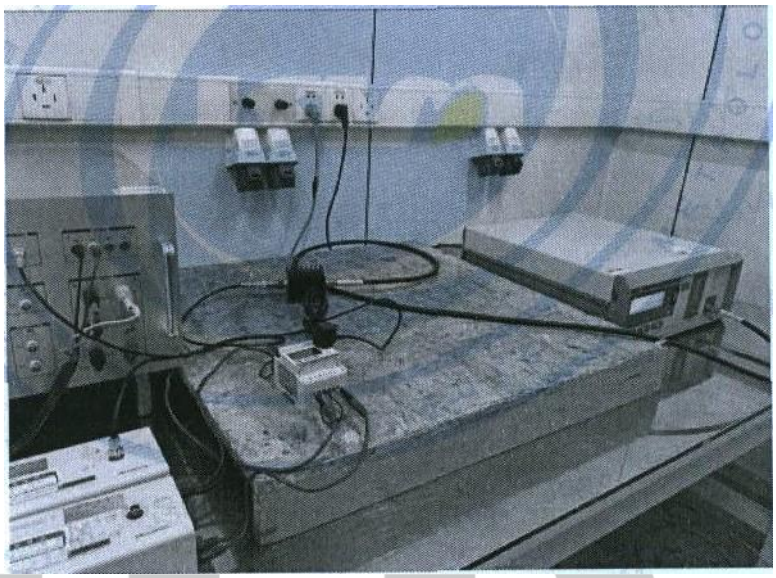


Appendix VIII:

1.Setup pie of Test of immunity to conducted disturbances, induced by radio-frequency fields

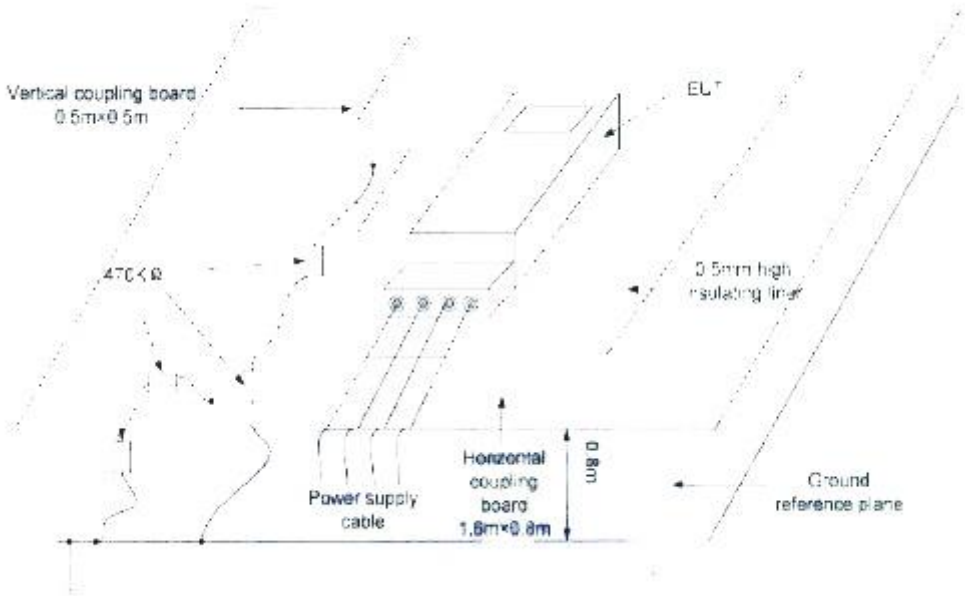


2.Test pic of Test of immunity to conducted disturbances, induced by radio-frequency fields



Appendix IX:

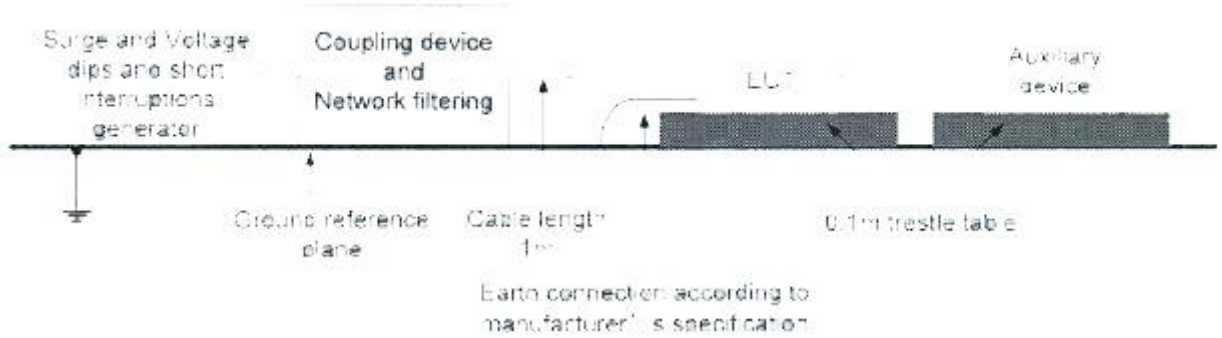
1.Setup pic of test of immunity to electrostatic discharges



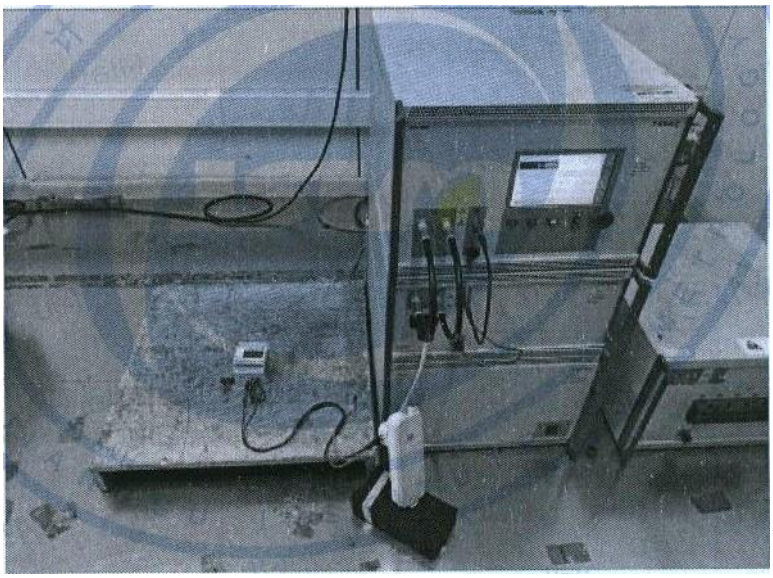
2.Test pic of test of immunity to electrostatic discharges

Appendix X:

1.Setup pic of surge immunity test



2.Test pic of surge immunity test



********** END OF REPORT**********