

TEST REPORT

Product Name : Angle Meter
Model Number : LM320D, LM320E, LM320F

Prepared for : UNI-TREND TECHNOLOGY (CHINA) CO.,LTD.
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Report Number : EDG2501030092E00101R
Date(s) of Tests : January 03, 2025 to February 10, 2025
Date of issue : February 11, 2025



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TEST REPORT DESCRIPTION

Applicant : UNI-TREND TECHNOLOGY (CHINA) CO.,LTD.
 Manufacturer : UNI-TREND TECHNOLOGY (CHINA) CO.,LTD.
 Factory : UNI-TREND TECHNOLOGY (CHINA) CO.,LTD.
 Brand Name : UNI-T
 EUT : Angle Meter
 Model Number : LM320D, LM320E, LM320F
 Rating : Powered by 3.7V 1000mAh Li-ion battery, 5Vdc from USB

Measurement Procedure Used:

EN IEC 61326-1: 2021
 EN IEC 61326-2-2: 2021

(IEC 61000-4-2: 2008, IEC61000-4-3: 2020, IEC 61000-4-4: 2012,
 IEC 61000-4-5: 2014+AMD1: 2017, IEC 61000-4-6:2013/COR1:2015, IEC 61000-4-11: 2020)

The device described above is tested by EMTEK (DONGGUAN) CO. and EMTEK (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (DONGGUAN) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN IEC 61326-1 and EN IEC 61326-2-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (DONGGUAN) CO., LTD.

Date of Test : January 03, 2025 to February 10, 2025

Prepared by : Galen Xiao
 Galen Xiao /Editor

Reviewer : Warren Deng
 Warren Deng /Supervisor

Approved & Authorized Signer : Sam Iv /Manager

Modified Information

Version	Report No.	Revision Date	Summary
	EDG2501030092E00101R	/	Original Report



1. DESCRIPTION OF STANDARDS AND RESULTS (EUT)

EMISSION				
Description of Test Item		Standard	Limits	Results
Conducted Emissions -	a.c. mains power port	EN IEC 61326-1	Class B	Pass
Conducted Emissions -	d.c. power port		Class B	N/A
Radiated emissions at frequencies up to 1 GHz			Class B	Pass
Harmonic Current Emissions		EN IEC 61000-3-2	Class A	N/A
Voltage Fluctuation and Flicker		EN 61000-3-3	Section 5	Pass
IMMUNITY (EN IEC 61326-1: 2021)				
Description of Test Item		Basic Standard	Performance Criteria	Results
Electrostatic Discharge	Enclosure ports	IEC 61000-4-2:2008	B	Pass
Electromagnetic field	Enclosure ports	IEC 61000-4-3:2020	A	Pass
Burst	AC power ports	IEC 61000-4-4:2012	B	Pass
	I/O Signal/control ports		B	Pass
	DC power ports		B	N/A
Surge	AC power ports	IEC 61000-4-5: 2014+AMD1: 2017	B	Pass
	I/O Signal/control ports		B	Pass
	DC power ports		B	N/A
Conducted RF	AC power ports	IEC 61000-4-6:2013/COR 1:2015	A	Pass
	I/O Signal/control ports		A	Pass
	DC power ports		A	N/A
Power frequency magnetic field	Enclosure ports	IEC 61000-4-8:2009	A	N/A
Voltage dips and Short interruptions	AC mains power ports	IEC 61000-4-11:2020	B,C	Pass
Note: N/A is an abbreviation for Not Applicable.				

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT : Angle Meter

Model Number : LM320D, LM320E, LM320F
(Note: These models have similar circuits and schematic diagrams, except the numbers of laser lines; LM320F was selected for full test.)

Test Voltage : AC-DC power supply input AC 230V 50Hz, DC 3.7V from battery

Date of Received : January 03, 2025

Date of Test : January 03, 2025 to February 10, 2025

2.2. Independent Operation Modes

- A. Charging
- B. Testing

2.3. Test Manner

Test Items	Test Voltage	Operation Modes	Worst case
Conducted Emissions - a.c. mains power port	AC 230V 50Hz	Mode A	/
Radiated emissions at frequencies up to 1 GHz	AC 230V 50Hz DC 3.7V from battery	Mode A&B	Mode B
Voltage Fluctuation and Flicker	AC 230V 50Hz	Mode A	/
Electrostatic Discharge	AC 230V 50Hz DC 3.7V from battery	Mode A&B	/
Electromagnetic field	AC 230V 50Hz DC 3.7V from battery	Mode A&B	/
Burst	AC 230V 50Hz	Mode A	/
Surge	AC 230V 50Hz	Mode A	/
Conducted RF	AC 230V 50Hz	Mode A	/
Voltage dips and Short interruptions	AC 230V 50Hz	Mode A	/

2.4. Description of Support Device

AC-DC power supply : Provide by EMTEK

2.5. Description of Test Facility

Site Description
EMC Lab. : Accredited by CNAS, 2024.07.06
The certificate is valid until 2030.07.05
The Laboratory has been assessed and proved to be in compliance with
CNAS/CL01:2018
The Certificate Registration Number is L3150
Name of Firm : EMTEK(DONGGUAN) CO., LTD.
Site Location : Room 111&112, Building 8, -1&2/F, Office Building 2, Zone A, Zhongda Marine
Biotechnology Research and Development Base, No.9, Xincheng Avenue,
Songshan Lake High-Tech Industrial Development Zone, Dongguan,
Guangdong, China

2.6. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 2.08dB(9K-150KHz) 2.42dB(150K-30MHz)
Radiated Emission Uncertainty (3m Chamber)	: 3.32dB (30M~1GHz Polarize: H) 3.24dB (30M~1GHz Polarize: V) 4.46dB (1~6GHz) 4.96dB (6~18GHz)
Uncertainty for Flicker test	: 0.514%
Uncertainty for Harmonic test	: 3.6%
Uncertainty for C/S Test	: 0.20dB(Using CDN Test)
Uncertainty for R/S Test	: 2.10dB(80MHz-200MHz) 1.76dB(200MHz-1000MHz)
Uncertainty for test site temperature and humidity	: 0.6℃ 4%

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1. For Conducted Emissions At the AC Mains Power Ports

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde&Schwarz	ESCI	100137	2024/4/29	1 Year
2.	AMN	Rohde&Schwarz	ENV216	101209	2024/4/28	1 Year
3.	Test Software	Farad	Ver.CON-03A1	--	N/A	N/A

3.2. For Radiated Emission Measurement (3m)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde&Schwarz	ESCI	101415	2024/4/28	1 Year
2.	Bi-log Hybrid Antenna	Schwarzbeck	VULB9163	141	2024/5/5	1 Year
3.	Pre-Amplifier	HP	8447F	OPTH64	2024/4/28	1 Year
4.	Test Software	Farad	Ver.RA-03A1	--	N/A	N/A

3.3. For Harmonic Current / Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	AC variable frequency power supply	Teseq	100-CTS-230-TE SQ	1804A03259	2024/4/28	1 Year
2.	Harmonic current and voltage fluctuation analyzer	Teseq	5001IX-CTS-400-SCH	1805A03008	2024/4/28	1 Year

3.4. For Electrostatic Discharge Immunity

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	TESEQ	NSG 437	409	2024/5/7	1 Year

3.5. For Continuous RF Electromagnetic Field Disturbances Immunity

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Power Amplifier	MILMEGA	AS0102-55	1018770	2024/5/10	1 Year
2.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236	2024/5/10	1 Year
3.	RF Power Meter. Dual Channel	BOONTON	4232A	10539	2024/5/10	1 Year
4.	Log.-Per. Antenna	SCHWARZBECK	STLP 9129-7/16	3050	N/A	N/A
5.	Signal Generator	Agilent	N5181A	MY50145187	2024/5/10	1 Year
6.	Broad-Band Horn	SCHWARZBECK	STLP 9149	9149-227	N/A	N/A

	Antenna					
7.	Field Strength Meter	DARE	RSS1006A	10I00037SNO 22	2024/5/10	1 Year
8.	Multi-function interface system	DARE	CTR1009B	12I00250SNO 72	N/A	N/A
9.	Automatic switch group	DARE	RSW1004A	N/A	N/A	N/A
10.	Power Amplifier	MILMEGA	AS1860-50	1059346	2024/5/10	1 Year
11.	Power Amplifier	Vectawave	VBA 1000-600C	133627	2024/10/22	1 Year
12.	Directional Coupler	BONN	BDC 0810-50/1500	2229689	2024/10/22	1 Year

3.6. For Burst Immunity

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMS comprehensive tester	HTEC	HCOMPACT7	190305	2024/4/29	1 Year
2.	Capacitive Coupling Clamp	EMTEST	HFK	0605-10	2024/4/29	1 Year

3.7. For Surges Immunity

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMS comprehensive tester	HTEC	HCOMPACT7	190305	2024/4/29	1 Year

3.8. For Continuous Induced RF Disturbances Immunity

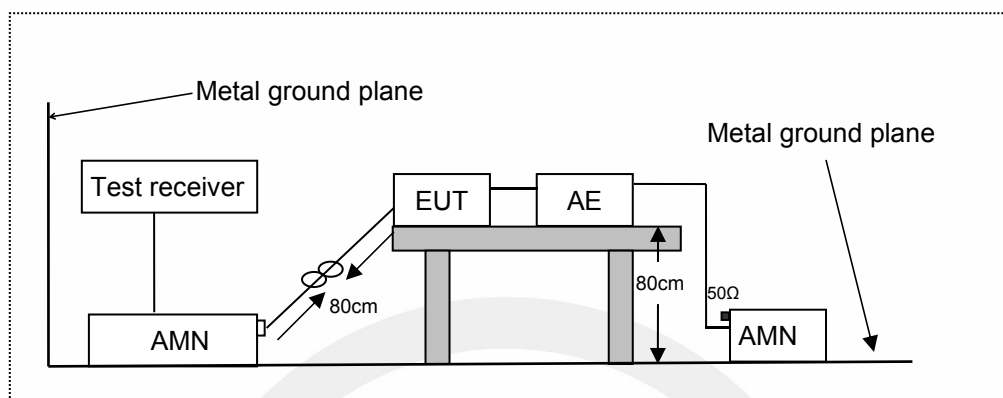
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal generator	Rohde& Schwarz	SMB100A	103042	2024/4/28	1 Year
2.	Single channel power meter	Rohde& Schwarz	NRVS	101761	2024/4/28	1 Year
3.	6 db attenuator	AR-WORLDWIDE	6dB/50FH-006-10 0	324011	2024/4/28	1 Year
4.	CDN	SKET	CDN M2+M3	204303	2024/4/28	1 Year
5.	Power amplifier	BONN Elektronik	BSA 1515-25	97483	2024/4/28	1 Year
6.	EM Injection Clamp	EMTEST	F-2031-23MM	368	2024/5/12	1Year

3.9. For Voltage dips and Short interruptions Immunity

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMS comprehensive tester	HTEC	HCOMPACT7	190305	2024/4/29	1 Year
2.	Dips module	HTEC	HV1P16T	190302	2024/4/29	1 Year

4. CONDUCTED EMISSIONS - A.C. MAINS POWER PORT

4.1. Block Diagram of Test Setup



AMN: Artificial Mains Network

AE: Associated equipment

EUT: Equipment under test

4.2. Limits

EN IEC 61326-1:2021 Class B

Frequency range MHz	Coupling device	Detector type / bandwidth	Class B limits dB(μV)
0.15 to 0.5	AMN	Quasi Peak / 9 kHz	66 to 56
0.5 to 5			56
5 to 30			60
0.15 to 0.5	AMN	Average / 9 kHz	56 to 46
0.5 to 5			46
5 to 30			50

4.3. Test Procedure

The EUT was placed on a desk 0.8 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the power mains through a artificial mains network (AMN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle

no longer than 0.4 m, so that its length is shortened to 1 m.

All the support units are connecting to the other AMN.

The AMN provides 50 ohm coupling impedance for the measuring instrument.

The CISPR states that the AMN with 50 ohm and 50 microhenry should be used.

Both sides of AC line were checked for maximum conducted interference.

The frequency range from 150 kHz to 30 MHz was sweep.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

Test results were obtained from the following equation:

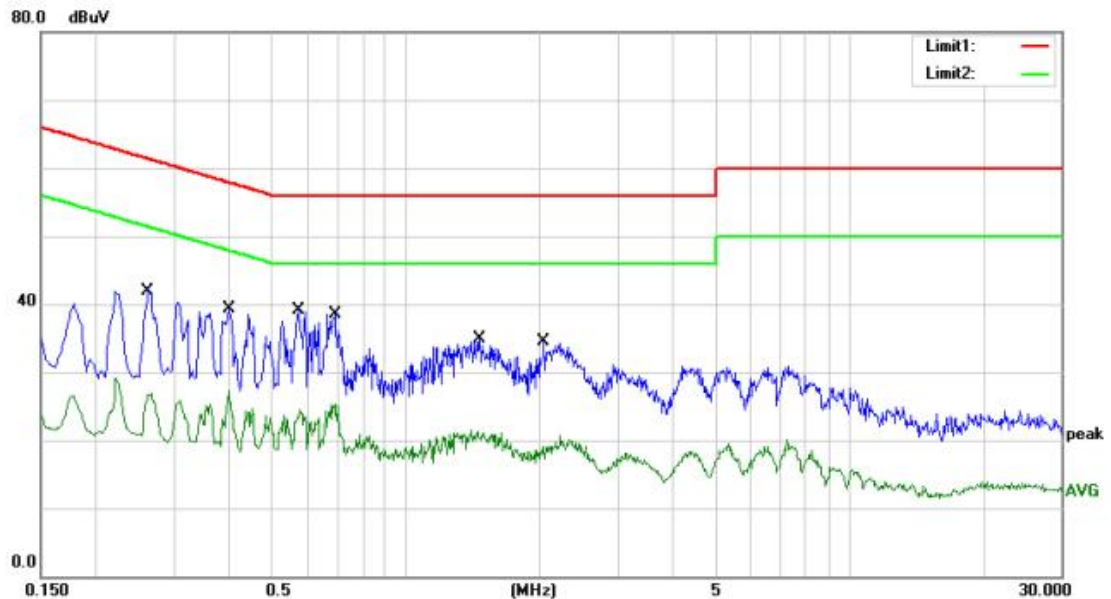
Emission Level (dBμV) = AMN Factor (dB) + Cable Loss (dB) + Reading (dBμV)

Margin (dB) = Emission Level (dBμV) - Limit (dBμV)

4.4. Measuring Results

PASS.

All the modes were tested and the worst data are attached the following pages.



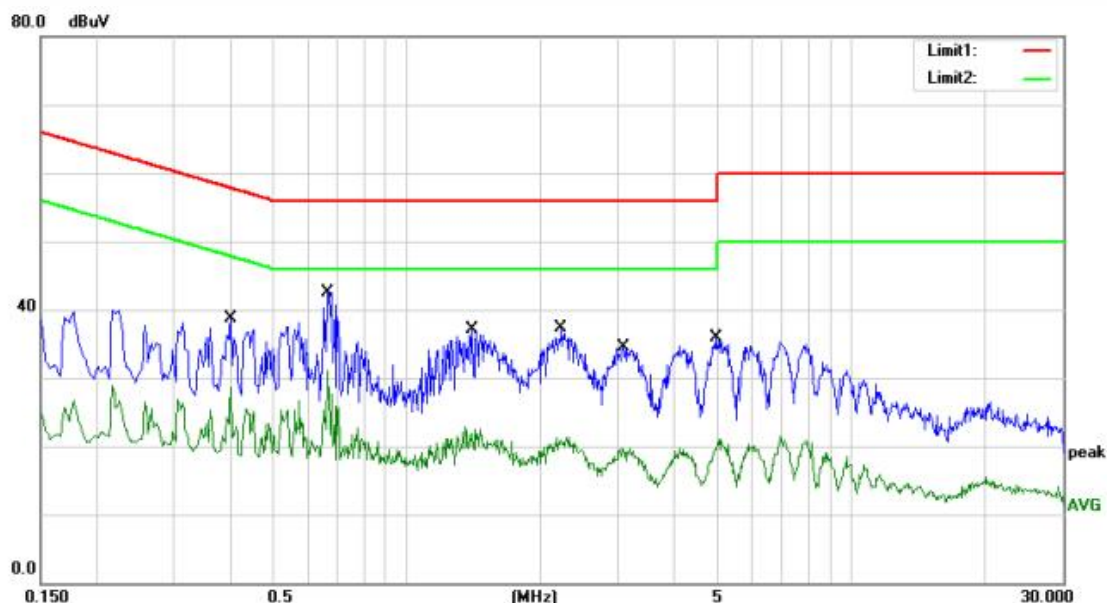
Site site #1 Phase: **L1** Temperature: 22.5
 Limit: EN IEC 61326-1_QP (CE) Power: AC 230V 50Hz Humidity: 61 %
 Mode: Charging
 Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV	dB	dBuV	dBuV	dB		
1		0.2620	24.86	17.08	41.94	61.37	-19.43	QP	
2		0.2620	9.82	17.08	26.90	51.37	-24.47	AVG	
3		0.3980	22.20	17.03	39.23	57.90	-18.67	QP	
4		0.3980	10.21	17.03	27.24	47.90	-20.66	AVG	
5	*	0.5740	22.05	17.07	39.12	56.00	-16.88	QP	
6		0.5740	7.36	17.07	24.43	46.00	-21.57	AVG	
7		0.6900	21.50	17.02	38.52	56.00	-17.48	QP	
8		0.6900	8.37	17.02	25.39	46.00	-20.61	AVG	
9		1.4660	17.77	17.07	34.84	56.00	-21.16	QP	
10		1.4660	4.46	17.07	21.53	46.00	-24.47	AVG	
11		2.0460	17.35	17.11	34.46	56.00	-21.54	QP	
12		2.0460	3.66	17.11	20.77	46.00	-25.23	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator:

Remark:

1. Measurement (dB μ V) = AMN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)
2. Over (dB) = Measurement (dB μ V) - Limit (dB μ V)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.4020	21.77	17.03	38.80	57.81	-19.01	QP	
2		0.4020	11.75	17.03	28.78	47.81	-19.03	AVG	
3	*	0.6620	25.57	17.03	42.60	56.00	-13.40	QP	
4		0.6620	14.12	17.03	31.15	46.00	-14.85	AVG	
5		1.4060	20.07	17.06	37.13	56.00	-18.87	QP	
6		1.4060	5.80	17.06	22.86	46.00	-23.14	AVG	
7		2.2300	20.12	17.09	37.21	56.00	-18.79	QP	
8		2.2300	4.30	17.09	21.39	46.00	-24.61	AVG	
9		3.0860	17.42	17.02	34.44	56.00	-21.56	QP	
10		3.0860	2.76	17.02	19.78	46.00	-26.22	AVG	
11		4.9740	18.90	16.95	35.85	56.00	-20.15	QP	
12		4.9740	4.09	16.95	21.04	46.00	-24.96	AVG	

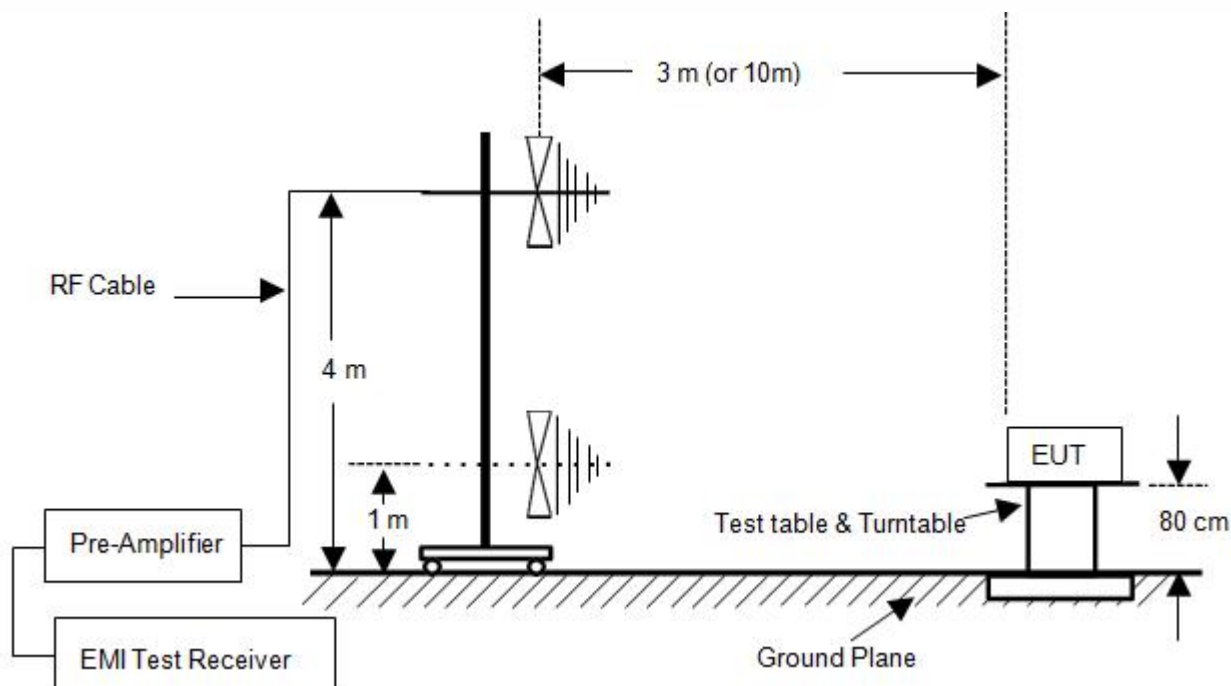
*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator:

Remark:

1. Measurement (dB μ V) = AMN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)
2. Over (dB) = Measurement (dB μ V) - Limit (dB μ V)

5. RADIATED EMISSION MEASUREMENT (UP TO 1GHz)

5.1. Block Diagram of Test Setup



5.2. Radiated Limit

EN IEC 61326-1:2021 Class B

Frequency range MHz	Measurement			Class B limits dB(μV/m)
	Facility	Distance (m)	Detector type / bandwidth	
30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	40
230 to 1 000				47
30 to 230	OATS/SAC	3		50
230 to 1 000				57

5.3. Test Procedure

The EUT was placed on a non-conductive table whose total height equaled 80cm. All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The EUT was set 3 meters (or 10 meters) away from the receiving antenna that was mounted on a

non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

The bandwidth of the Receiver is set at 120 kHz.

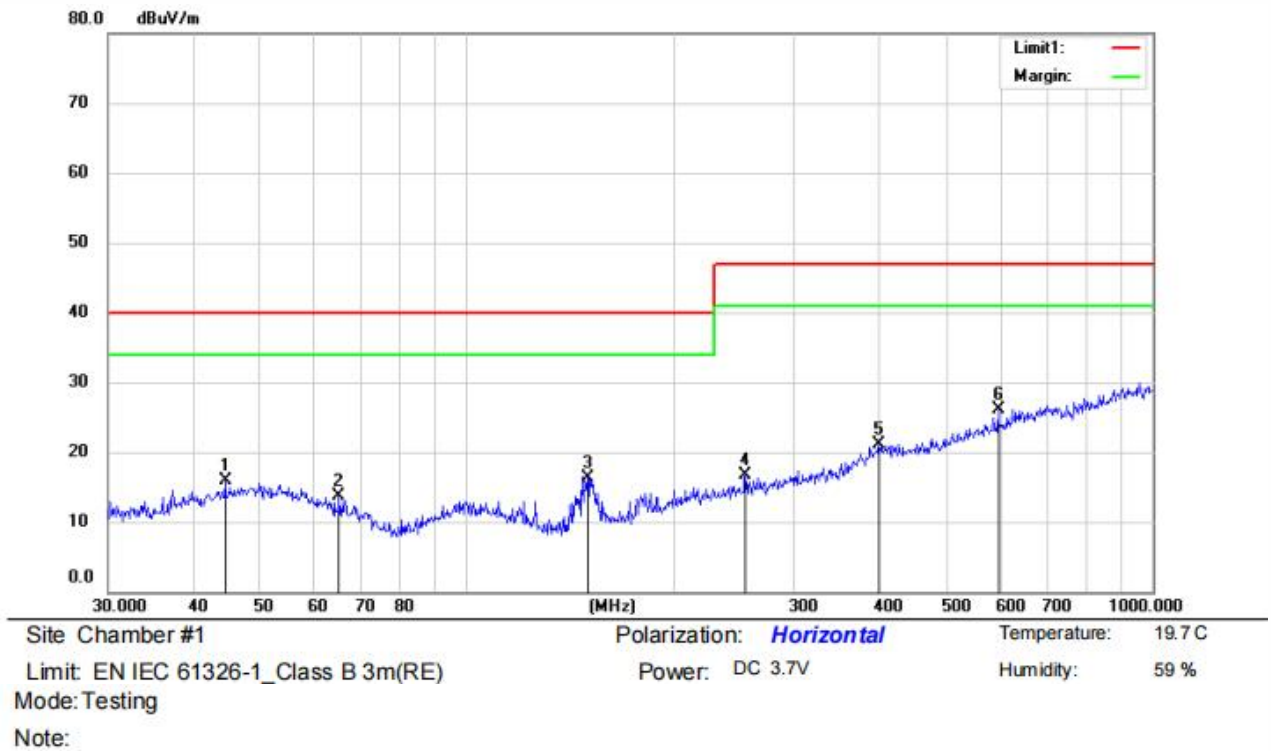
Test results were obtained from the following equation:

Emission level (dB μ V/m) = Antenna Factor - Amp Factor + Cable Loss + Reading
Margin (dB) = Emission Level (dB μ V/m) - Limit (dB μ V/m)

5.4. Measuring Results

PASS.

All the modes were tested and the worst data are attached the following pages.



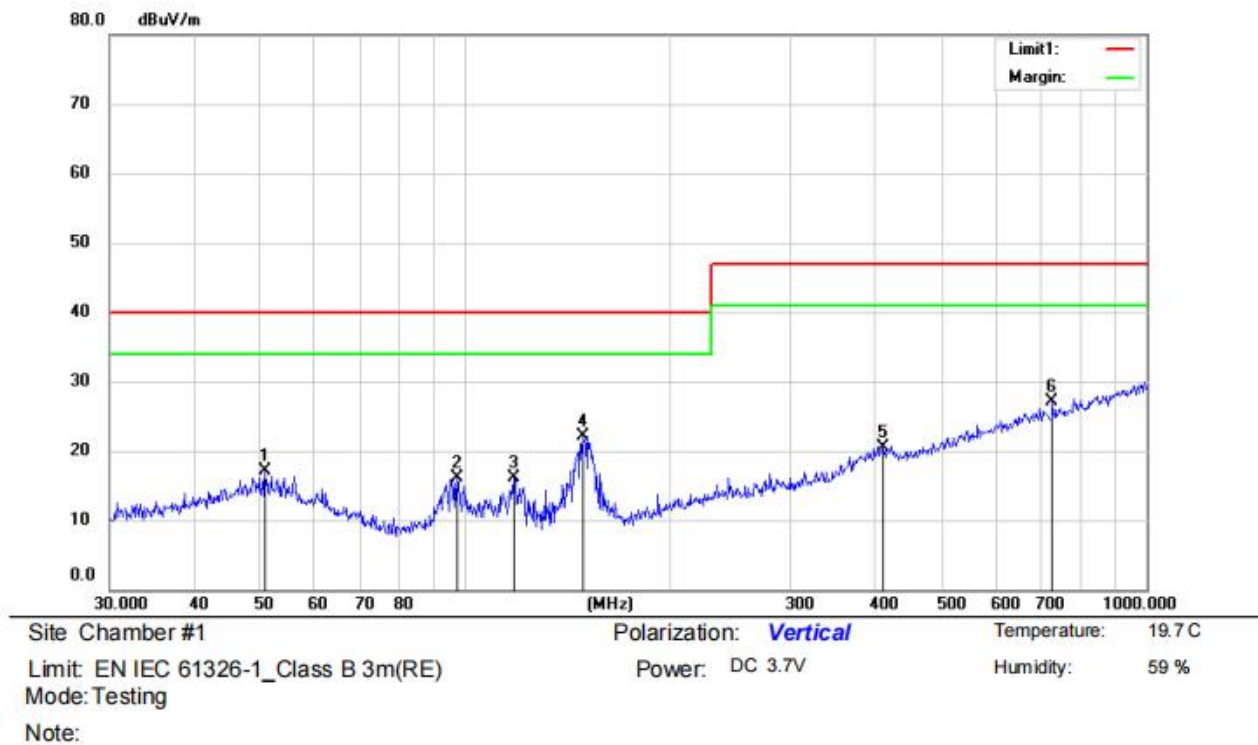
No.	Mk.	Freq.	Reading	Ant.	Pre Amp	Cable	Measure-	Limit	Over	HI	Degree	
		MHz	dBuV	Factor	Gain	loss	ment	dBuV/m	dB	Detector	cm	deg. Comment
1		44.4308	32.03	13.7	30.51	0.69	15.91	40.00	-24.09	QP		
2		65.1145	32.33	10.88	30.54	1.08	13.75	40.00	-26.25	QP		
3		150.0108	37.03	8.5	30.62	1.44	16.35	40.00	-23.65	QP		
4		254.7284	31.60	13.09	30.07	2.13	16.75	47.00	-30.25	QP		
5		399.0302	30.92	16.27	29.82	3.67	21.04	47.00	-25.96	QP		
6	*	595.1330	32.99	19.89	29.95	3.09	26.02	47.00	-20.98	QP		

*:Maximum data x:Over limit !:over margin

Operator: Ccyf

Remark:

- Measurement (dB μ V/m) = Antenna Factor(dB) -Amp Factor(dB) +Cable Loss(dB) + Reading(dB μ V/m)
- Over (dB) = Measurement (dB μ V/m) - Limit (dB μ V/m)



No.	Mk.	Freq.	Reading	Ant.	Pre Amp	Cable	Measure-	Limit	Over	HI	Degree
		MHz	dBuV	Factor	Gain	loss	ment				
				dB/m	dB	dB	dBuV/m	dBuV/m	dB	Detector	cm
1		50.7637	32.82	13.92	30.48	0.8	17.06	40.00	-22.94	QP	
2		97.1148	34.77	11.14	30.85	1.08	16.14	40.00	-23.86	QP	
3		117.7725	35.48	10.16	30.8	1.21	16.05	40.00	-23.95	QP	
4	*	148.4410	42.85	8.47	30.63	1.43	22.12	40.00	-17.88	QP	
5		410.3825	30.39	16.42	29.82	3.49	20.48	47.00	-26.52	QP	
6		726.8052	32.47	21.21	30.14	3.65	27.19	47.00	-19.81	QP	

*:Maximum data x:Over limit !:over margin

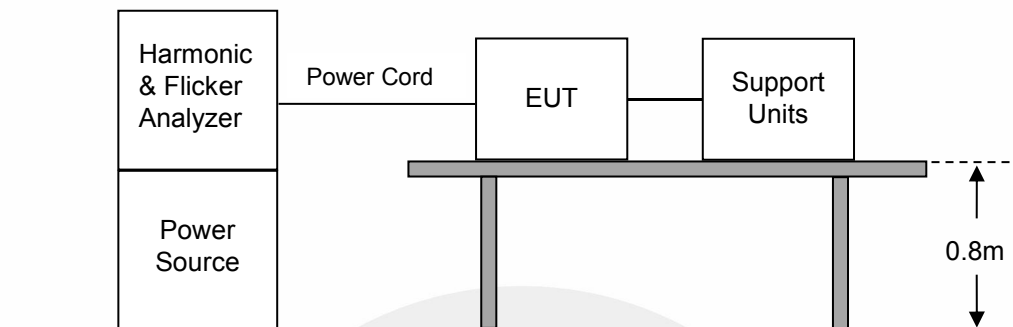
Operator: Ccyf

Remark:

1. Measurement (dB μ V/m) = Antenna Factor(dB) -Amp Factor(dB) +Cable Loss(dB) + Reading(dB μ V/m)
2. Over (dB) = Measurement (dB μ V/m) - Limit (dB μ V/m)

6. HARMONIC CURRENT EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup



6.2. Standard Limits

EN 61000-3-2, CLASS A

Harmonic current emissions evaluate the potential for the EUT to cause distortion on the AC power lines. It is applicable to electrical and electronic equipment having an input current ≤ 16 A per phase, and intended to be connected to public low-voltage distribution systems

Table 1 - Limits for Class A equipment

Harmonic order n	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \frac{0.15}{n}$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \frac{8}{n}$

6.3. Test Procedure

The measurement of harmonic currents shall be performed as follows: i. For each harmonic order, measure the 1.5 s smoothed r.m.s. harmonic current in each DFT time window as defined in EN / IEC 61000-4-7:2009. ii. Calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period Short cyclic ($T_{\text{cycle}} \leq 2.5 \text{ min}$). Because of synchronisation to meet the requirements for repeatability in 5%.

6.4. Test Results

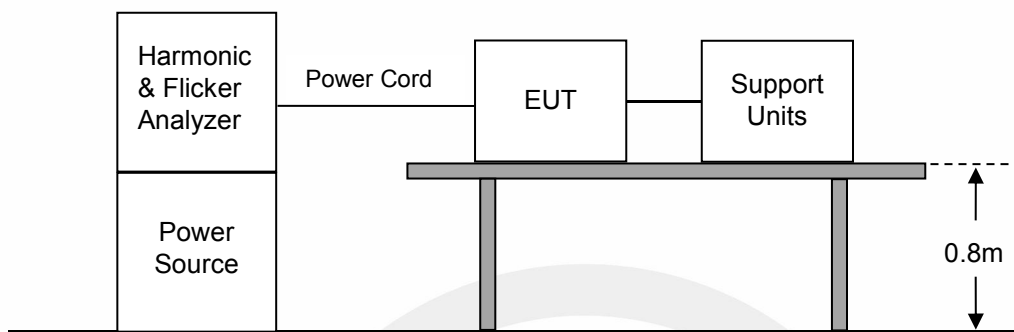
N/A .

As specified on section 7 and above figure of EN 61000-3-2, the limits are not specified for equipment with a rated power of 75W or less. The EUT meets the above condition, so it conforms to EN 61000-3-2.



7. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Standard Limits

EN 61000-3-3 Limits

The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current ≤ 16 A per phase, ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.

Voltage Fluctuation and Flicker Limits:

- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;
- the value of $d(t)$ during a voltage change shall not exceed 3.3 % for more than 500 ms;
- the relative steady-state voltage change, d_c , shall not exceed 3.3 %;
- the maximum relative voltage change, d_{max} , shall not exceed 4.0 %;

7.3. Test Procedure

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of 8% is achieved during the whole assessment procedure.

7.4. Test Results

PASS.

Please see the attached page.

Flicker Test Summary per IEC61000-3-3:2013/AMD1:2017 (Run time)

EUT: LM320F
Test category: All parameters (European limits)
Test date: 2025/2/11
Test duration (min): 10
Comment: Charging
Customer: Customer information

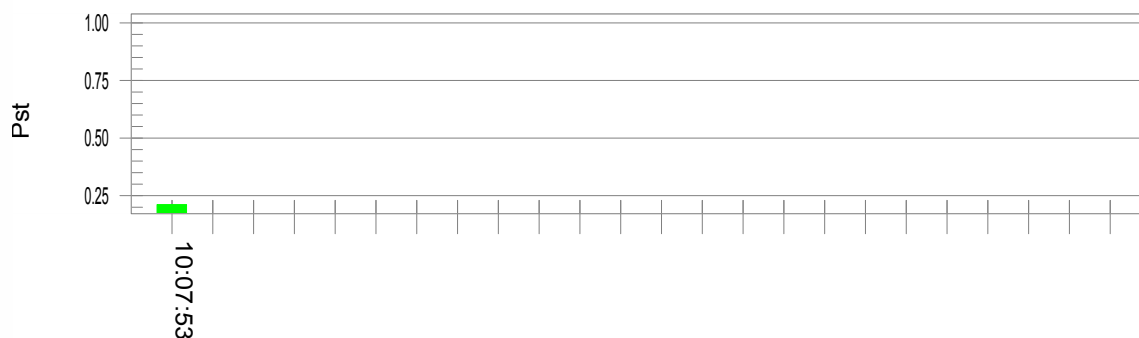
Tested by: CL
Test Margin: 100
End time: 10:07:59
Data file name: F-000096.cts_data

Test Result: Pass

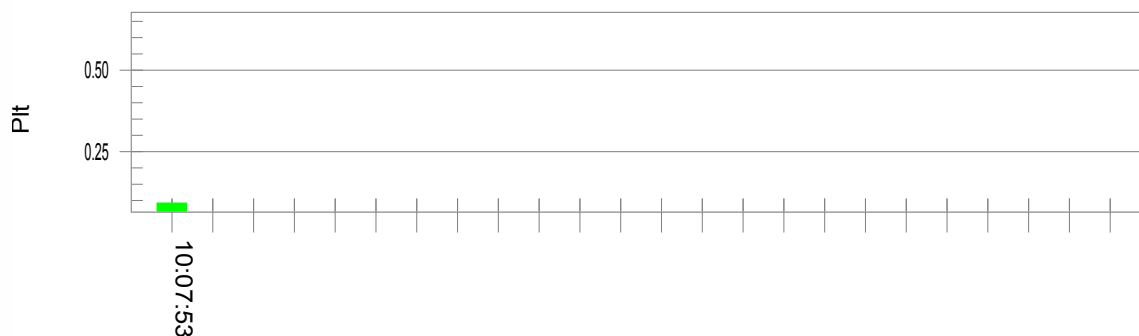
Status: Test Completed

Pst and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.79		
T-max (mS):	0	Test limit (mS):	500.0
Highest dc (%):	0.00	Test limit (%):	3.30
Highest dmax (%):	0.00	Test limit (%):	4.00
Highest Pst (10 min. period):	0.211	Test limit:	1.000

Pass
Pass
Pass
Pass

8. IMMUNITY GENERAL PERFORMANCE CRITERIA DESCRIPTION

General performance criteria are defined in EN IEC 61326-1 clause 4. These criteria shall be used during the testing of primary functions where no relevant annex is applicable.

When assessing the impact of a disturbance on a function, the assessment should take into consideration the function's performance prior to the application of the disturbance and only identify as failures those changes in performance that are a result of the disturbance.

EN IEC 61326-1:

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

Performance criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test ENIEC 61000-6-2:2019 degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

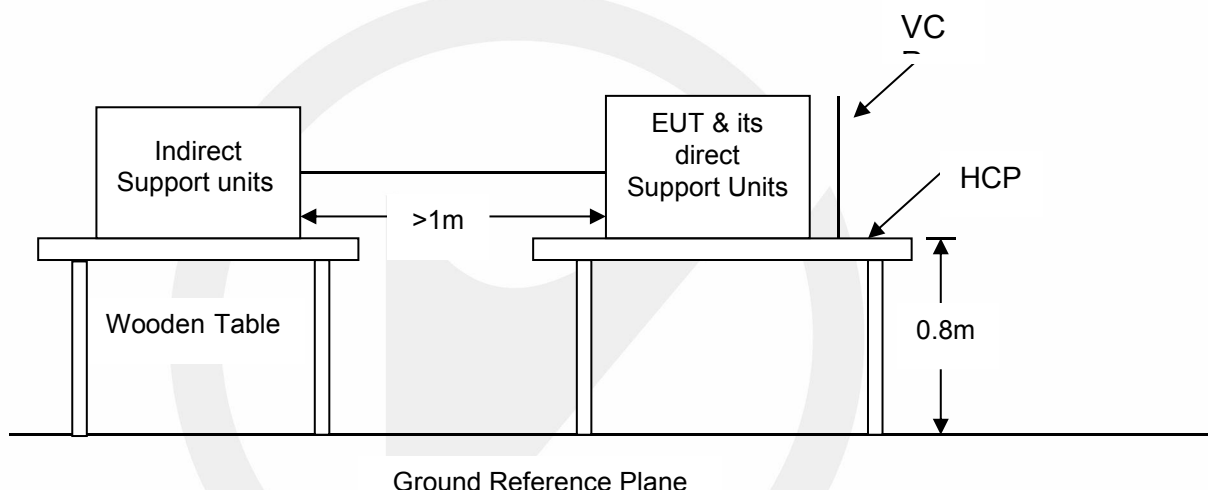
Performance criterion C: Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls. If, as a result of the application of the tests defined in this standard, the EUT becomes dangerous or unsafe, it shall be deemed to have failed the test.

9. ELECTROSTATIC DISCHARGE

9.1. Test Specification

Test standard	: EN IEC 61326-1
Basic standard	: IEC 61000-4-2
Performance criterion	: B
Test level	: $\pm 8.0\text{kV}$ (Air discharge)
	: $\pm 4.0\text{kV}$ (Contact discharge)

9.2. Block Diagram of Test Setup



9.3. Test Procedure

- In the case of air discharge testing, the climatic conditions shall be within the following ranges:
 - ambient temperature: 15°C to 35°C ;
 - relative humidity : 30% to 60%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)
- Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
 - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - The contact discharge test shall not be applied to such surfaces.
- In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

- f. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final test level should not exceed the product specification value in order to avoid damage to the equipment.
- g. The test shall be performed with both air discharge and contact discharge. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied. For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- h. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.

9.4. Test Results

PASS

Temperature : 20.8°C
Humidity : 48.7%
Atmospheric Pressure : 101kpa
Test Engineer : Chen Li
Test Date : 2025-2-07

Air Discharge:

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4; 8 kV	Gap	A	B	Pass
±2; 4; 8 kV	Non-conductive enclosure	A	B	Pass

Contact Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4kV	Conductive parts	A	B	Pass

Indirect Discharge

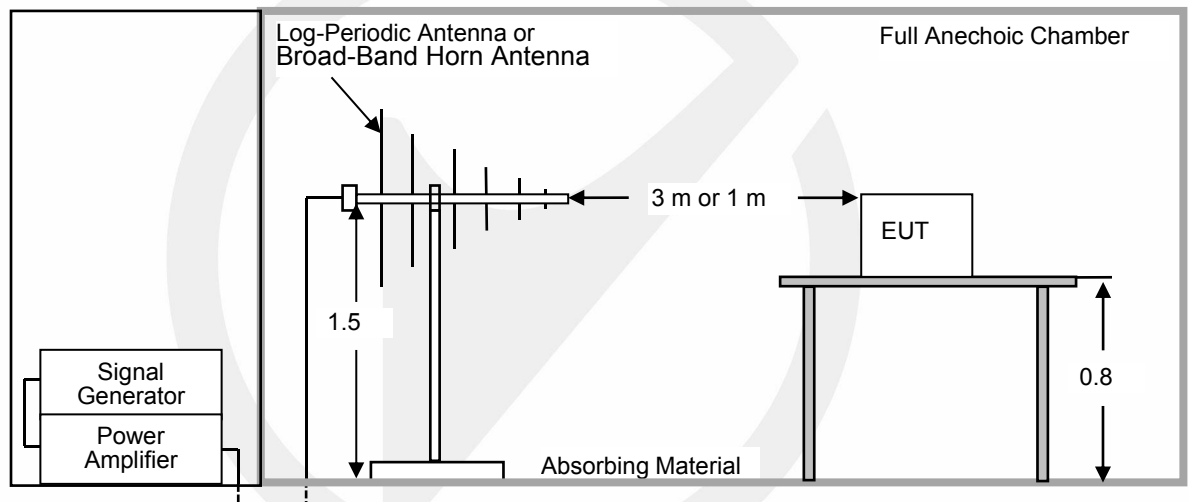
Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4 kV	HCP	A	B	Pass
±2; 4kV	VCP	A	B	Pass

10. ELECTROMAGNETIC FIELD

10.1. Test Specification

Test standard	: EN IEC 61326-1	
Basic standard	: IEC 61000-4-3	
Performance criterion	: A	
Frequency range &	: <input checked="" type="checkbox"/> 80MHz-1000MHz	3V/m
Test level	: <input checked="" type="checkbox"/> 1400MHz-6000MHz	3V/m
Modulation	: AM, 80%, 1kHz sine-wave	

10.2. Block Diagram of Test Setup



10.3. Test procedure

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

- The antenna which is enabling the complete frequency range of 80-1000 MHz is placed 3m (or 1m) away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the antenna.
- The test is performed with the antenna facing the front and back sides of the EUT with. Both vertical and horizontal polarizations from antenna are tested.

10.4. Test results

This test result outsourced to EMTEK(SHENZHEN) CO., LTD.

PASS

Temperature : 20.5°C
Humidity : 51.3%
Atmospheric Pressure : 101kpa
Test Engineer : CSL
Test Date : 2025-2-08

☒ 80MHz-1000MHz:

Freq. Range (MHz)	Field	Modulation	Polarity	Position (°)	Actual criterion	Required performance criterion	Result
80-1000	3V/m	AM, 80%	H / V	0, 90, 180, 270	A	A	Pass

☒ 1400MHz-6000MHz:

Freq (MHz)	Field	Modulation	Polarity	Position (°)	Actual criterion	Required performance criterion	Result
1400-6000	3V/m	AM, 80%	H / V	0, 90, 180, 270	A	A	Pass

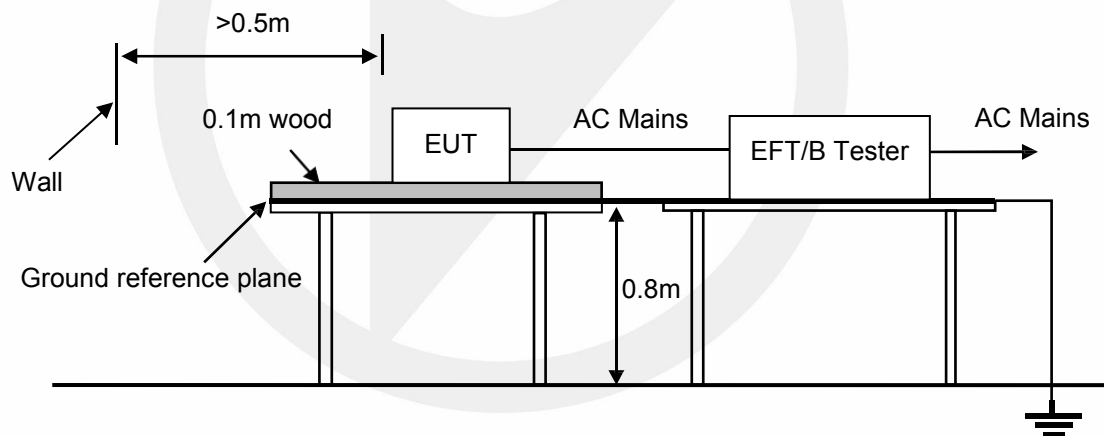
11. BURST

11.1. Test Specification

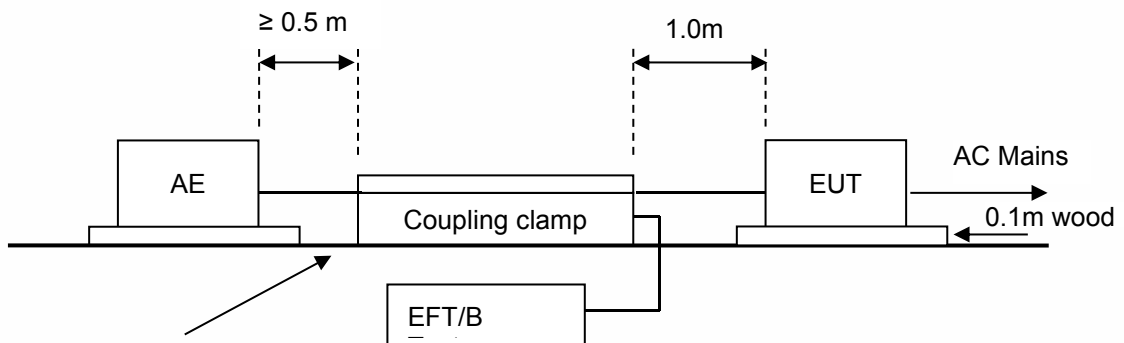
Test standard	: EN IEC 61326-1
Basic standard	: IEC 61000-4-4
Performance criterion	: B
Test level	: <input checked="" type="checkbox"/> 1.0kV, AC mains power ports <input type="checkbox"/> 1.0kV, DC power ports <input type="checkbox"/> 0.5kV, I/O Signal/control ports
Repetition frequency	: <input checked="" type="checkbox"/> 5kHz, <input type="checkbox"/> 100kHz
Tr/Th:	: 5/50ns
Burst period	: 300ms
Test time	: 120s

11.2. Block Diagram of Test Setup

AC Lines:



Signal lines:



11.3.Test Procedure

The EUT is put on the table that is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

11.4.Test Results

PASS

Temperature : 19.4C
Humidity : 49.6%
Atmospheric Pressure : 101kpa
Test Engineer : Chen Li
Test Date : 2025-2-10

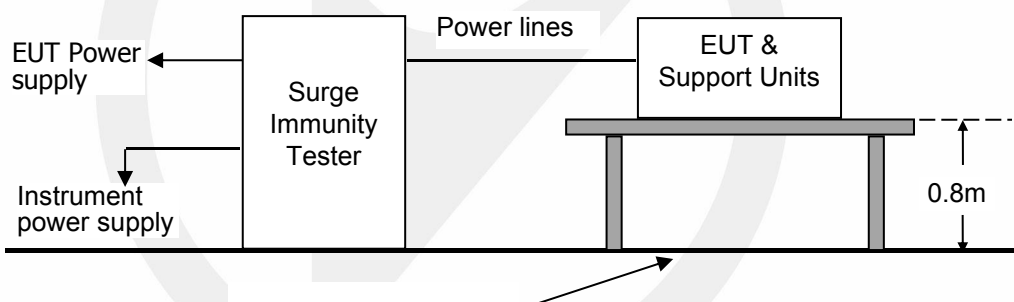
Injection Line	Voltage (kV)	Injected Method	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> AC mains power ports	± 1.0	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass
<input type="checkbox"/> DC power ports	± 1.0	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input checked="" type="checkbox"/> Capacitive coupling clamp	N/A	N/A	N/A
<input type="checkbox"/> I/O Signal/control ports	± 0.5	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input checked="" type="checkbox"/> Capacitive coupling clamp	N/A	N/A	N/A

12. SURGES

12.1. Test Specification

Test standard	: EN IEC 61326-1
Basic standard	: IEC 61000-4-5
Test level	: <input checked="" type="checkbox"/> 0.5kV, Line to Line, AC mains power ports, Criterion B <input type="checkbox"/> 1.0kV, Line to Earth, AC mains power ports, Criterion B <input type="checkbox"/> 0.5kV, Line to line, DC power ports, Criterion B <input type="checkbox"/> 1.0kV, Line to earth, DC power ports, Criterion B <input type="checkbox"/> 1.0kV, Line to earth, I/O Signal/control ports, Criterion B
Number of surges	: 5 (for each combination of parameters)
Repetition rate	: 1 minute / time
Polarity:	: Positive / Negative
Phase angle:	: 90°, 270° (Only AC mains power ports)

12.2. Block Diagram of Test Setup



12.3. Test Procedure

This test simulates a lightning event by inducing transients onto the AC/Angle Meter lines in common mode (Line to Ground) and differential mode (Line to Line). Each device was tested in a total of two surge configurations: Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10Ohm and Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.

Line to Line (L-L): Combination Wave,

Line to Neutral with 18uF, differential mode, generator floated.

2 ohm : the source impedance of the low-voltage power supply network.

12 ohm : the source impedance of the low-voltage power supply network and ground.

- If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
- The surges have to be applied line to line and line to earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
- The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan. All lower levels including the selected test level shall be satisfied.
- For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
- Testing shall be performed according to a Test Plan, which shall be included in the test report.

f. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied.

12.4. Test results

PASS

Temperature : 19.4C
 Humidity : 49.6%
 Atmospheric Pressure : 101kpa
 Test Engineer : Chen Li
 Test Date : 2025-2-10

☒ AC mains power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> Line to line	0.5	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
<input type="checkbox"/> Line to earth	1.0	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A

☐ DC power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Line to line	0.5	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A
<input type="checkbox"/> Line to earth	1.0	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A

☐ I/O Signal/control ports:

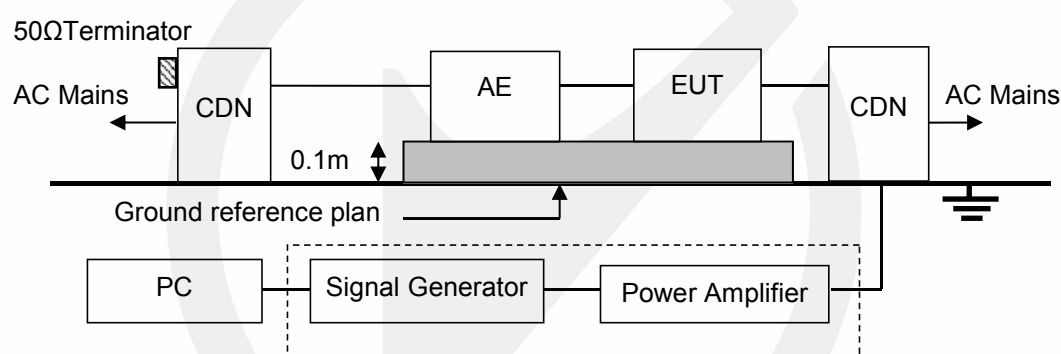
Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Line to earth	1.0	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A

13. CONDUCTED RF

13.1. Test Specification

Test standard	: EN IEC 61326-1
Basic standard	: IEC 61000-4-6
Performance criterion	: A
Frequency range & Test level	: 0.15M to 80MHz, 3V at AC power ports 0.15M to 80MHz, 3V at DC power ports 0.15M to 80MHz, 3V at I/O Signal/control ports
Modulation	: AM 80%, 1kHz sine-wave
Frequency Step	: 1% of fundamental

13.2. Block Diagram of Test Setup



13.3. Test Procedure

- The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- The EUT is placed on a 0.1m high test table, and a well grounded cable is connected to metallic plane above the test table.
- All cables/wires must be laid out on test plate (3cm in thickness), and the EUT is set up on test plate (10 cm in thickness) as shown in test setup photo, and the cables/wires must not be in mid-air, they should be touching the surface of test plate. Ensure that the EUT is properly connected to the accessory equipment.
- The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise

modes selected for susceptibility

h. Testing shall be performed according to a Test Plan, which shall be included in the test report.

13.4. Test results

PASS

Temperature : 19.4C
Humidity : 49.6%
Atmospheric Pressure : 101kpa
Test Engineer : Chen Li
Test Date : 2025-2-10

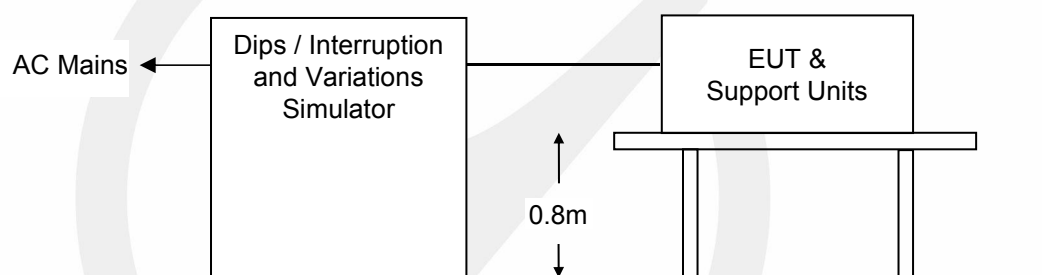
Range (MHz)	Level (V)	Injection port	Coupling type	Actual criterion	Required performance criterion	Result (Pass/Fail)
0.15-80	3	<input checked="" type="checkbox"/> AC mains power ports	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	A	A	Pass
0.15-80	3	<input type="checkbox"/> DC power ports	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	N/A	N/A	N/A
0.15--80	3	<input type="checkbox"/> I/O Signal/control ports	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	N/A	N/A	N/A

14. VOLTAGE DIPS AND SHORT INTERRUPTIONS

14.1. Test Specification

Test standard	: EN IEC 61326-1
Basic standard	: IEC 61000-4-11
Test level	: 0%, 1 period, Criterion B
	<input checked="" type="checkbox"/> 70%, 25 periods for 50Hz, Criterion C
	<input type="checkbox"/> 70%, 30 periods for 60Hz, Criterion C
	<input checked="" type="checkbox"/> 0%, 250 periods for 50Hz, Criterion C
	<input type="checkbox"/> 0%, 300 periods for 60Hz, Criterion C

14.2. Block Diagram of Test Setup



14.3. Test Procedure

- a. Where the equipment has a rated voltage the following shall apply - If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for test level specification.
 - In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range.
- b. Test Conditions
 - Select operated voltage and frequency of EUT - Test of interval : 10 sec.
 - Level and duration : Sequence of 3 dips/interrupts.
 - Voltage rise (and fall) time : 1.5 μ s.

14.4.Test results

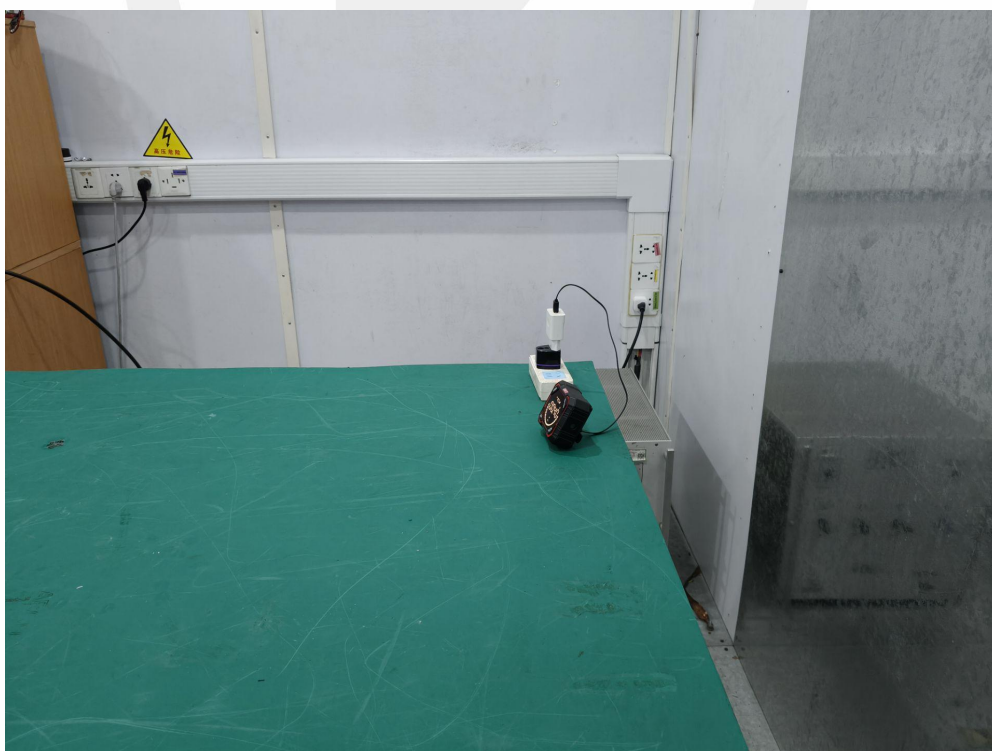
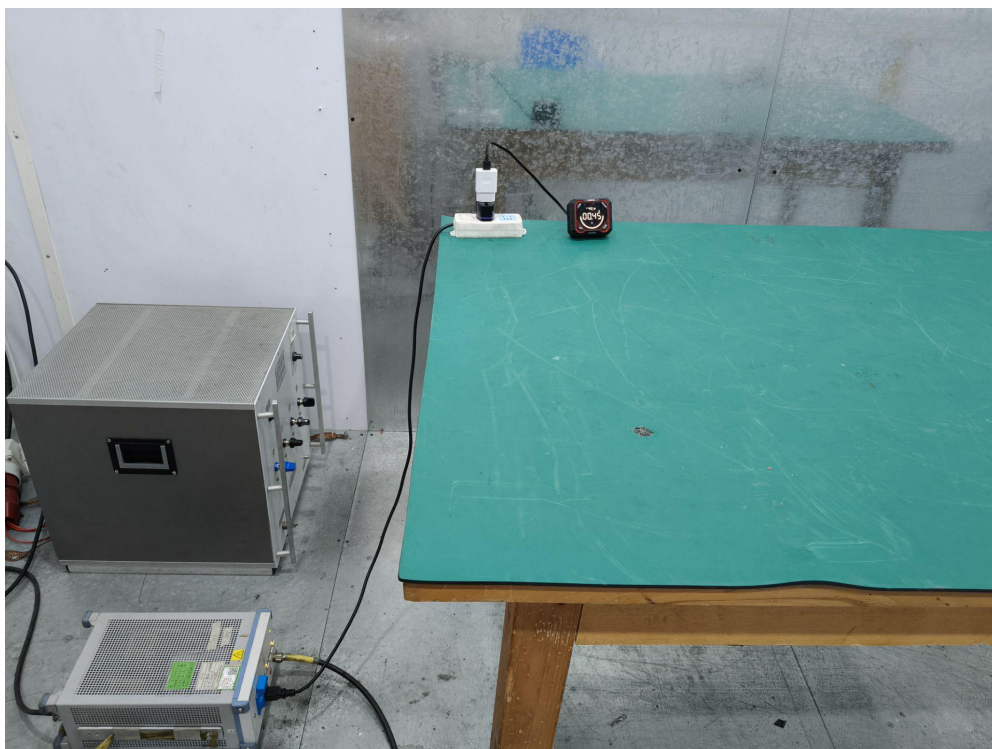
PASS

Temperature : 19.4C
Humidity : 49.6%
Atmospheric Pressure : 101kpa
Test Engineer : Chen Li
Test Date : 2025-2-10

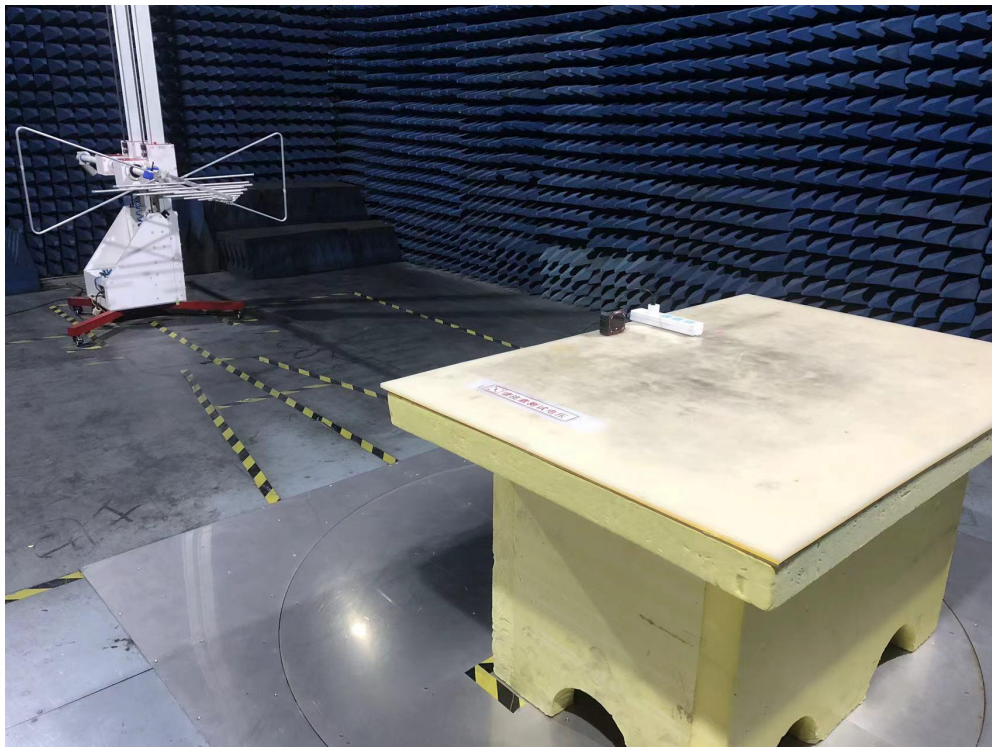
	Test Level (% UT)	Phase angle (°)	Input Voltage (V)	Freq (Hz)	Duration (periods)	Actual criterion	Required performance criterion	Result (Pass /Fail)
<input checked="" type="checkbox"/> Voltage dips	0%	0°	AC 230V	50	0.5	A	B	Pass
<input checked="" type="checkbox"/> Voltage dips	0%	0°	AC 230V	50	1	A	B	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°	AC 230V	50	25	C	B	Pass
<input checked="" type="checkbox"/> Voltage interruptions	0%	0°	AC 230V	50	250	C	C	Pass

15. PHOTOGRAPHS

15.1.Photos of Conducted Emissions



15.2.Photos of Radiation Emission Measurement



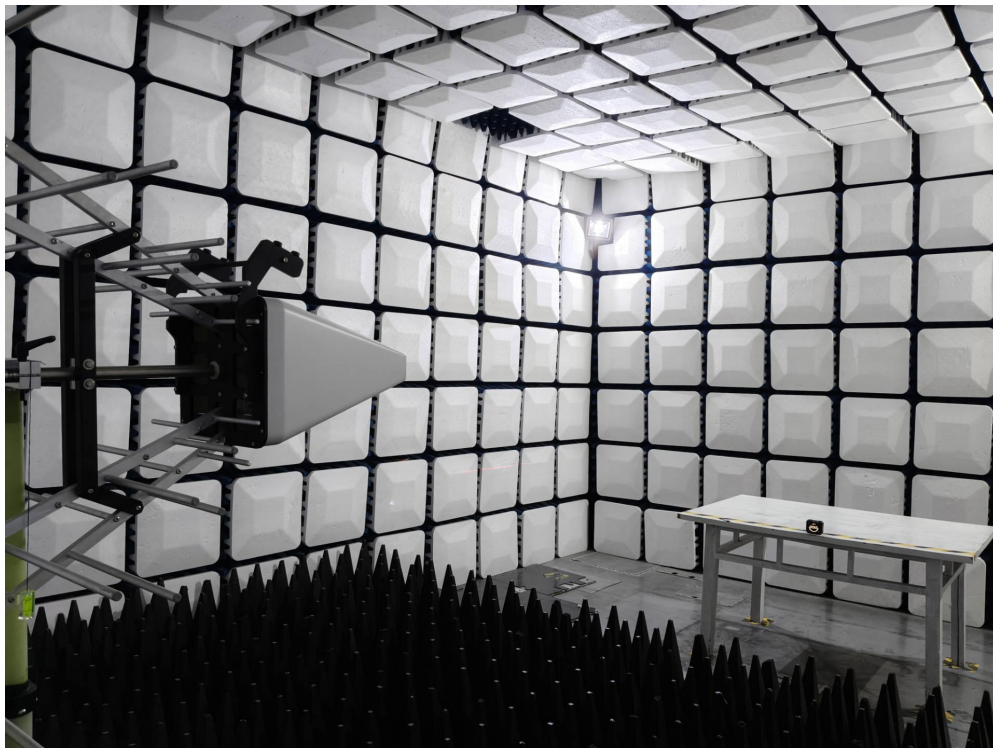
15.3.Photo of Harmonic / Flicker Measurement



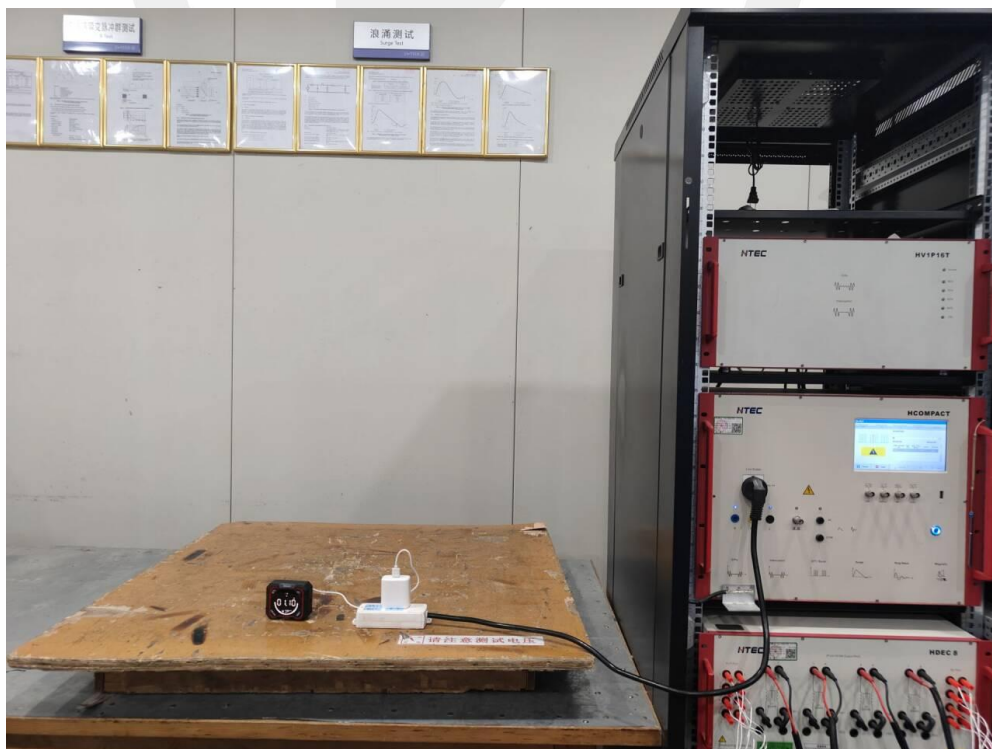
15.4.Photo of Electrostatic Discharges



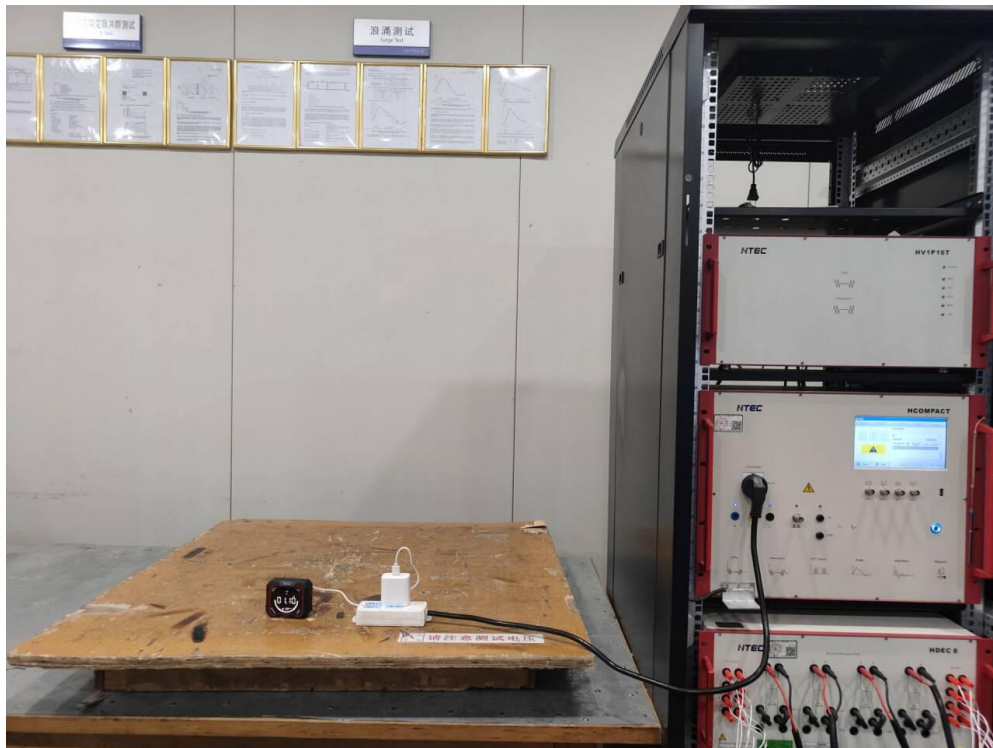
15.5.Photo of Electromagnetic field



15.6.Photo of Burst



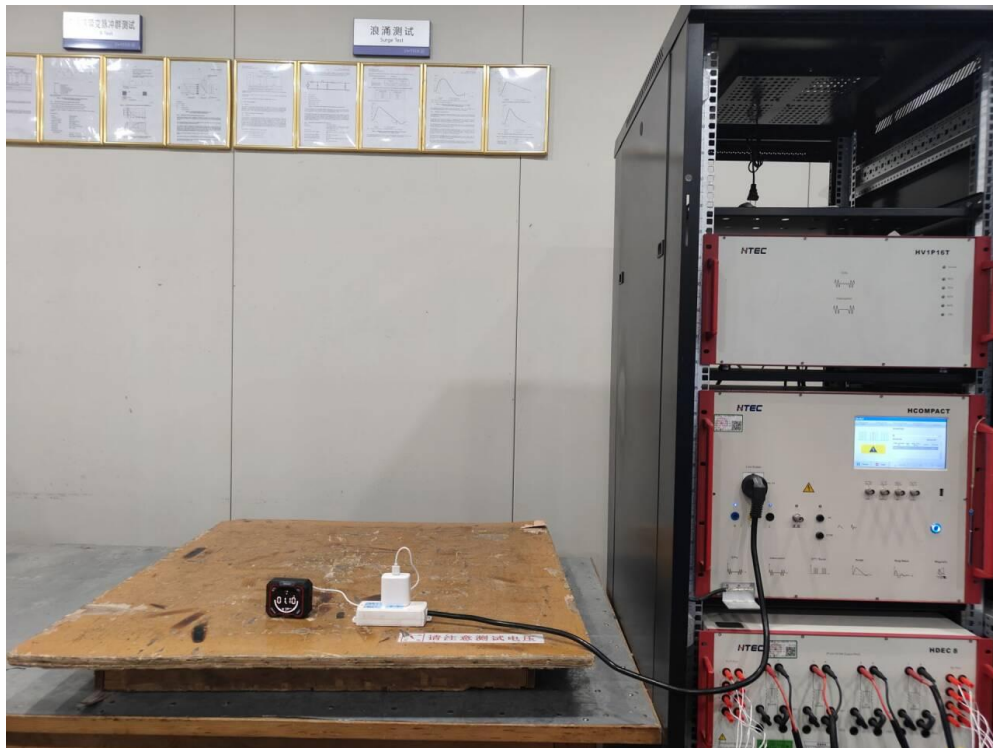
15.7.Photo of Surges



15.8.Photo of Conducted RF

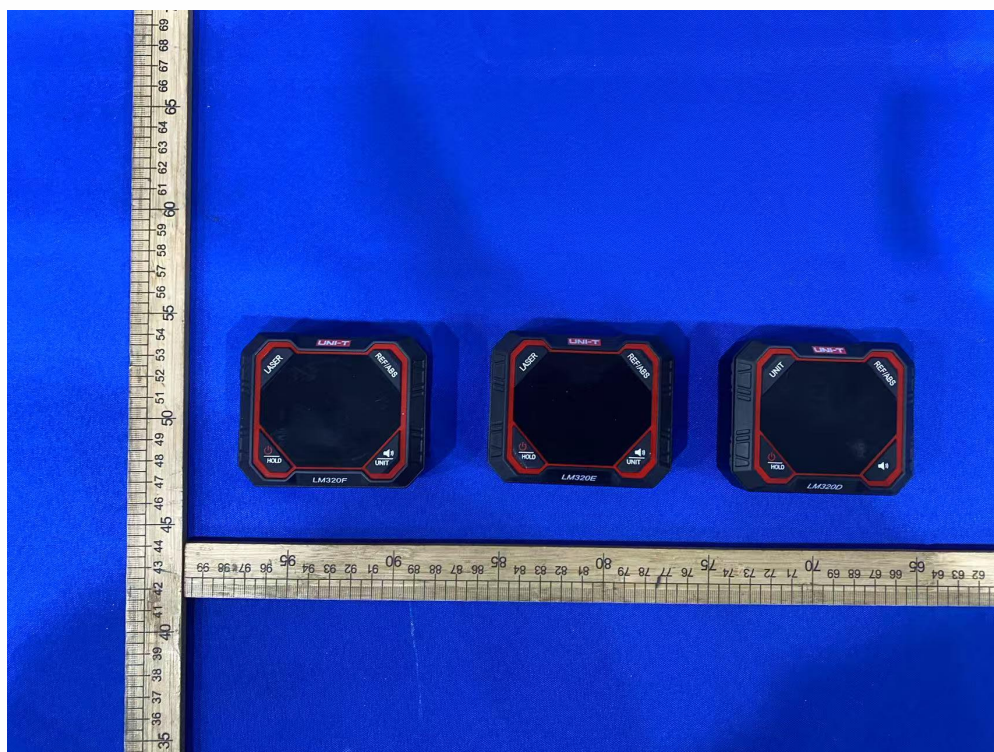


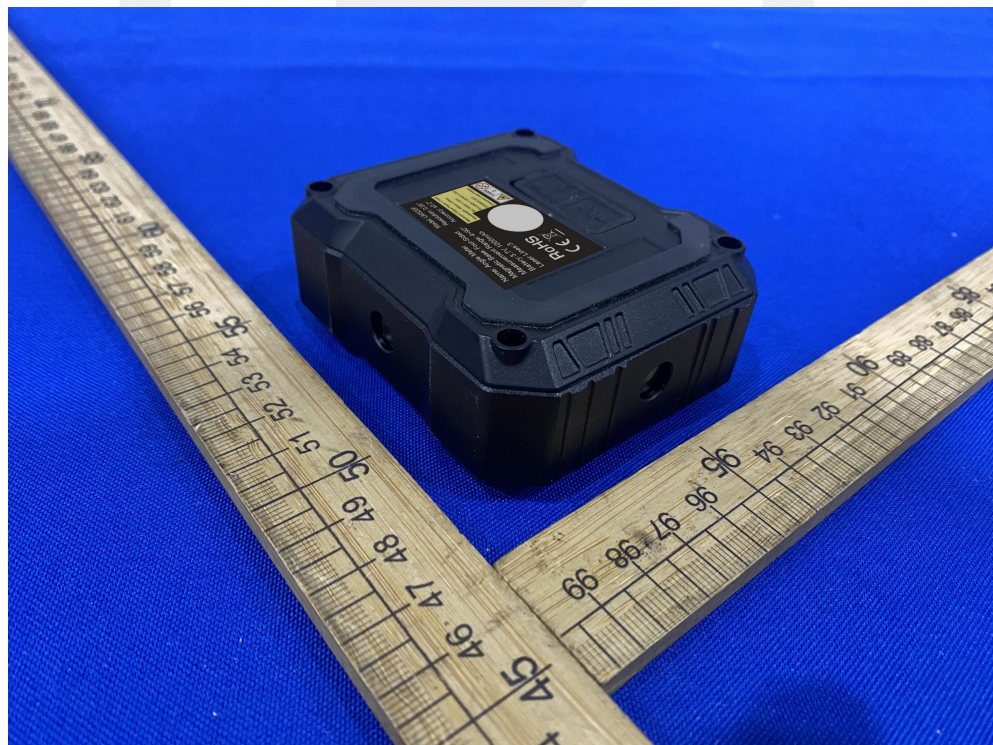
15.9.Photos of Voltage Dips and Interruption Immunity Test

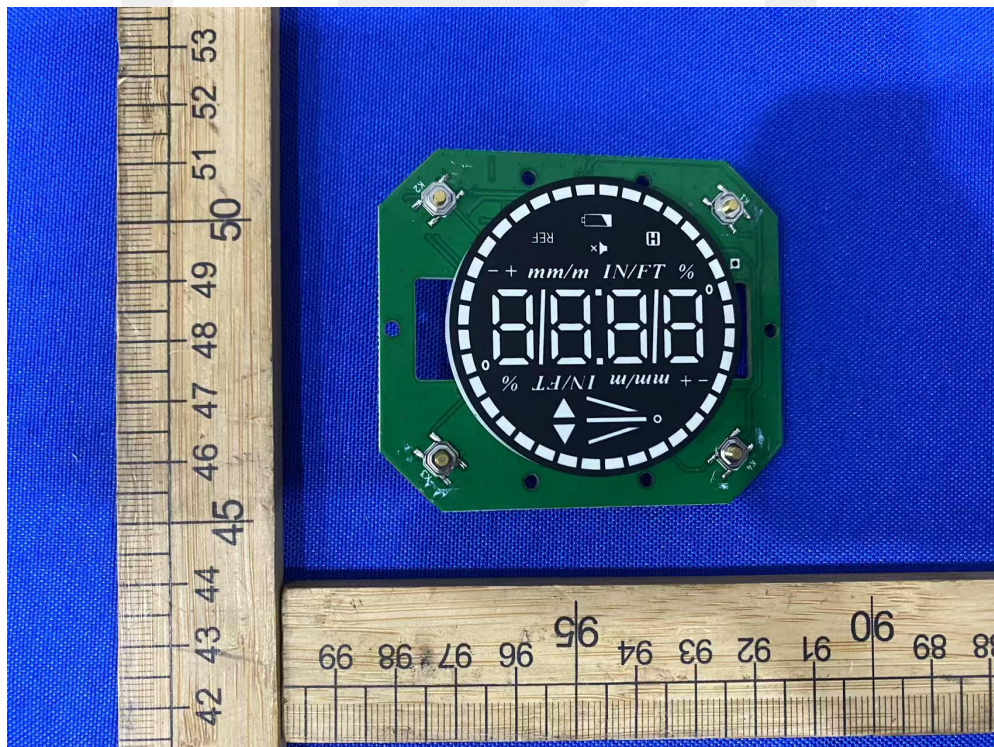
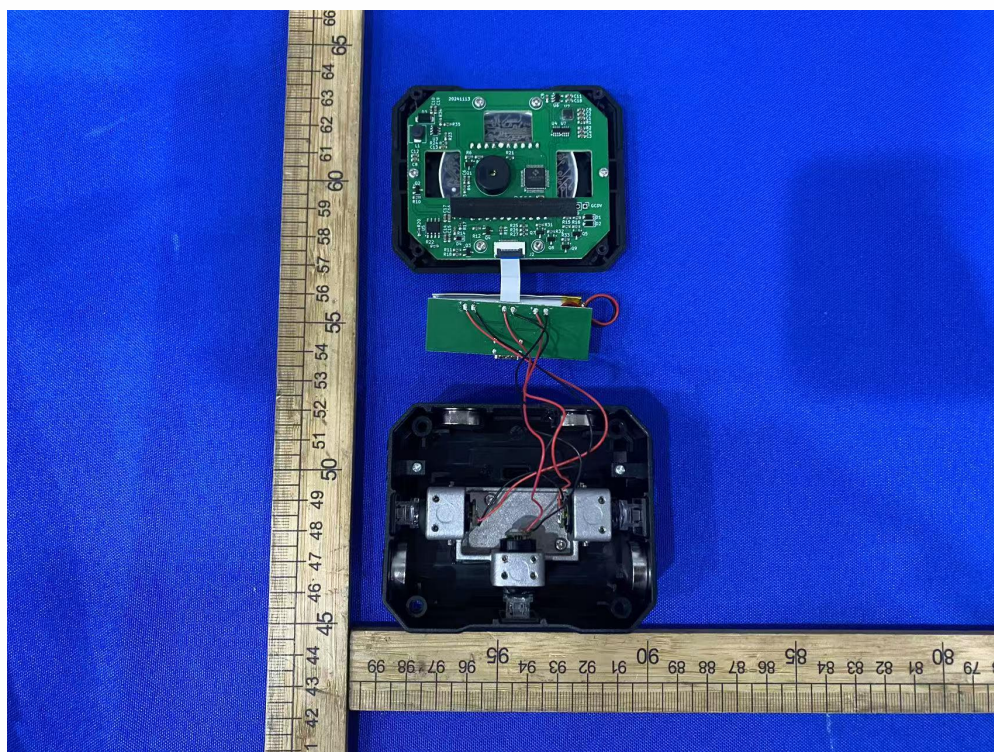


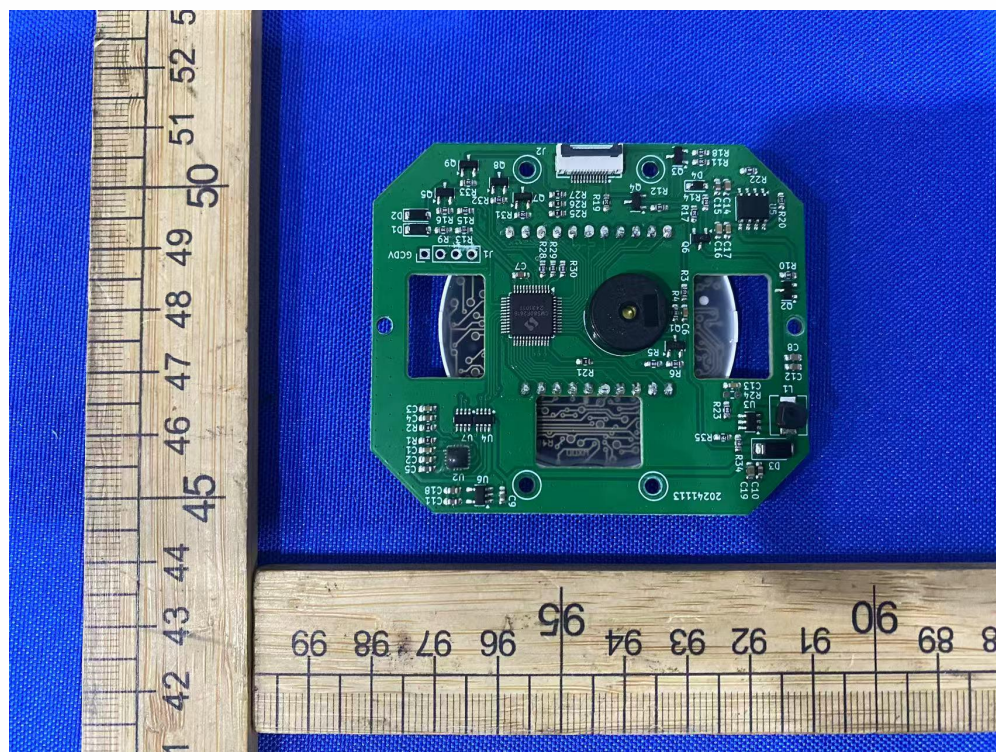


APPENDIX (PHOTOS OF EUT)









---The end---

声明 Statement

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3. 本报告的检测结果仅对送测样品有效，委托方对样品的代表性和资料的真实性负责；

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