EMC
TEST REPORT

for

Product: 3D printing pen
Model:SL-200,SL-300,SL-800
Report No.: PTC22061302104E-CK01

Issued for

Zhuhai Sunlu Industrial Co.，Ltd
No.38 Yongtian Road,Trade Logistics Centre Phase Two,Qianshan, Xiangzhou District,Zhuhai,Guangdong,China.

Issued by

Precise Testing & Certification (Guangdong) Co., Ltd.
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China.
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1. TEST CERTIFICATION

Product:	3D printing pen
Model:	SL-200,SL-300,SL-800
Applicant :	Zhuhai Sunlu Industrial Co.，Ltd
Address:	No.38 Yongtian Road,Trade Logistics Centre Phase Two,Qianshan, Xiangzhou District,Zhuhai,Guangdong,China.
Manufacturer:	Zhuhai Sunlu Industrial Co.，Ltd
Address:	No.38 Yongtian Road,Trade Logistics Centre Phase Two,Qianshan, Xiangzhou District,Zhuhai,Guangdong,China.
Test Date:	June 16, 2022 to June 24, 2022
Issued Date:	June 24, 2022
Test Voltage:	AC 240V/50Hz
Applicable Standards:	AS/NZS CISPR 14.1:2021

The above equipment has been tested by Precise Testing & Certification (Guangdong) Co., Ltd. and found compliance with the requirements in the technical standards mentioned above. The test results presented in this report only relate to the product/system tested. The Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Test Engineer.

Abel Yu / Engineer

Technical Manager.

Ronnie Liu / Manager

2. TEST SUMMARY

EMISSION			
Standard	**Item**	**Result**	**Remarks**
AS/NZS CISPR 14.1:2021	Conducted (Main Port)	PASS	Complied with limit
	Disturbance Power	N/A	N/A
	Radiated Emission	PASS	Complied with limit

3. TEST SITE

3.1. TEST FACILITY

Precise Testing & Certification (Guangdong) Co., Ltd.

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China.

☆ CNAS Registration No.: CNAS L5772

☆ FCC Registration No.: 790290

☆ A2LA Certificate No.: 4408.01

☆ IC Registration No.: 12191A-1

3.2. Measurement Uncertainty

Parameter	Uncertainty
Temperature	±1° C
Humidity	±5%
DC and Low Frequency Voltages	±3%
Conducted Emission(150KHz-30MHz)	±3.60dB
Radiated Emission(30MHz-1GHz)	±4.76dB
Radiated Emission (1GHz-18GHz)	±4.44dB

Note 1: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.3. LIST OF TEST AND MEASUREMENT INSTRUMENTS

3.3.1. For conducted emission at the mains terminals test

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 22, 2022
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	Aug. 22, 2022
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	Aug. 22, 2022

3.3.2. For disturbance power test

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 22, 2022
Absorbing Clamp	LUTHI	MDS 21B	P1407131815	Aug. 24, 2022
Test S/W	Emtek	e3/1.0.0.0		

3.3.3. For radiated emission test (30MHz-1GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 22, 2022
Bilog Antenna	SCHWARZBECK	VULB 9160	9160-3355	Aug. 19, 2022
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	Aug. 22, 2022
Test S/W	Emtek	e3/1.0.0.0		

4. EUT DESCRIPTION

Product	3D printing pen
Model	SL-200,SL-300,SL-800
Supplied Voltage	DC 5±0.25V 2A
Power	10W

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
AC Port	1	☐
DC Port	1	☒

Models Difference

The circuit board is the same as the motor, different in appearance and color.

5. TEST METHODOLOGY

5.1. TEST MODE

The EUT was tested together with the thereinafter additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The following test mode(s) were assessed.

Test Items		Test Mode
Emission	Conducted Emission	Working
	Disturbance Power	N/A
	Radiated Emission	Working

5.2. EUT SYSTEM OPERATION

1. Set up EUT with the support equipment.
2. Make sure the EUT work normally during the test.

6. SETUP OF EQUIPMENT UNDER TEST

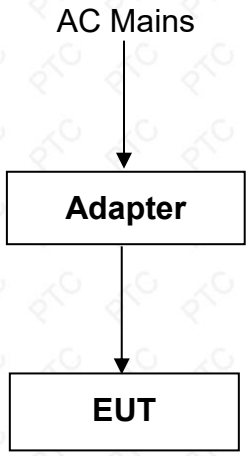
6.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1.	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

6.2. CONFIGURATION OF SYSTEM UNDER TEST



(EUT: 3D printing pen)

7. EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

Household appliances and equipment causing similar disturbances and regulation controls incorporation semiconductor devices

FREQUENCY	At mains terminals		At load terminals and additional terminals	
(MHz)	Quasi-peak dBμV	Average dBμV	Quasi-peak dBμV	Average dBμV
0.15 - 0.5	66-56	59-46	80	70
0.5 - 5.0	56	46	74	64
5.0 - 30.0	60	50	74	64

Mains terminals of tools

FREQUENCY	Rated motor power not exceeding 700W		Rated motor power above 700W and not exceeding 1000W		Rated motor power above 1000W	
(MHz)	Quasi-peak dBμV	Average dBμV	Quasi-peak dBμV	Average dBμV	Quasi-peak dBμV	Average dBμV
0.15 - 0.35	66-59	59-49	70-63	63-53	79-69	69-59
0.35 - 5.0	59	49	63	53	69	59
5.0 - 30.0	64	54	68	58	74	64

Note: 1) The lower limit shall apply at the transition frequencies.
2) Decreasing linearly with the logarithm of the frequency.

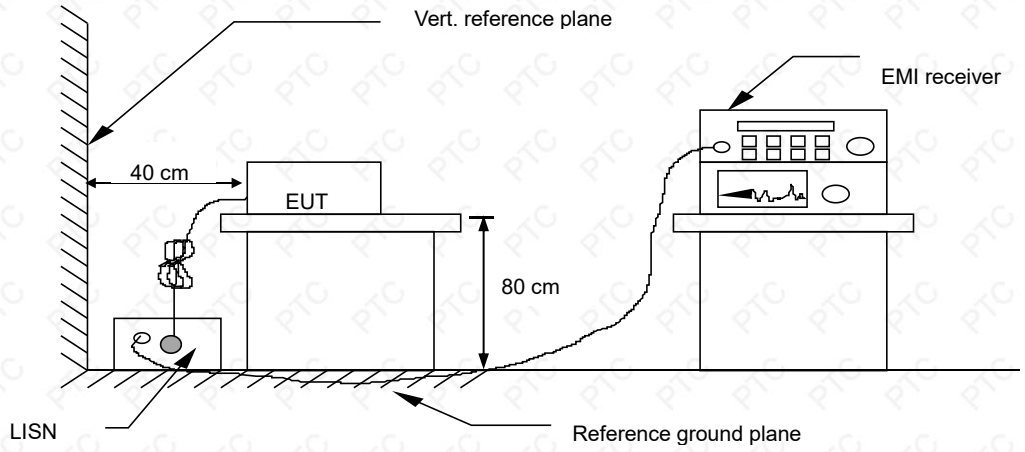
7.1.2. TEST PROCEDURES

The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane. When the EUT is floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane. The EUT should be 0.8m apart from the AMN, where the mains cable supplied by the manufacturer is longer than 0.8 m,the excess should be folded at the centre into a bundle no longer than 0.4 m, Details please refer to test setup photography.
The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

A scan was taken on both power lines, Line and Neutral, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.
Note: Test Software Name: e3, Software Version: 1.0.0.0.

7.1.3. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

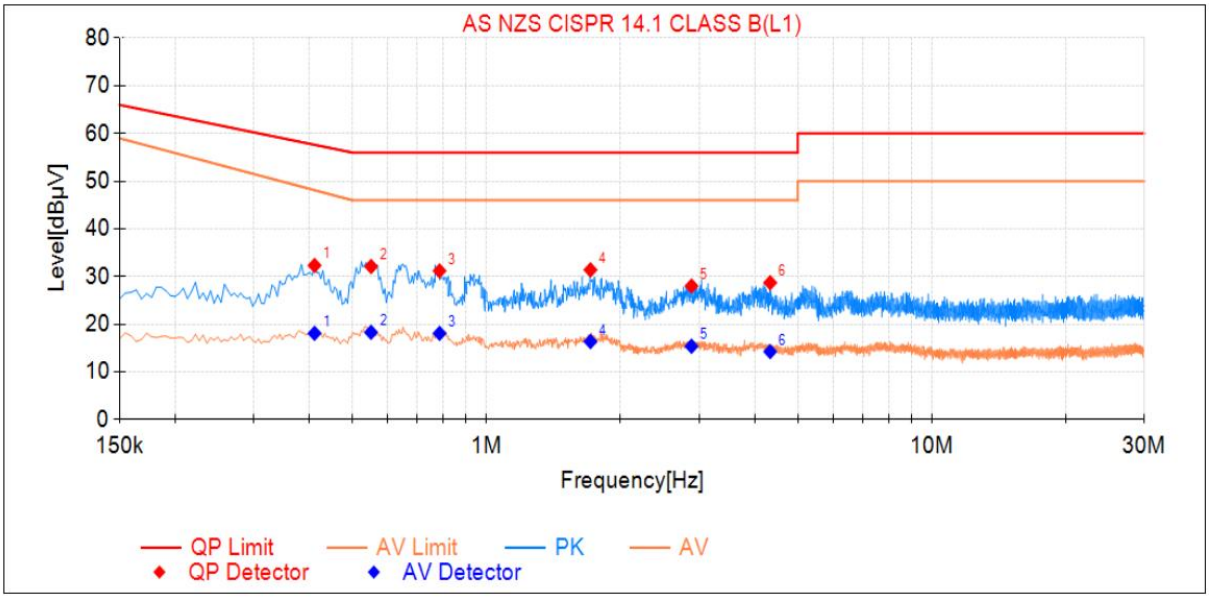
7.1.4. TEST RESULT

Product name	3D printing pen	Tested By	Mr zhou
Model	SL-200	Detector Function	Peak / Quasi-peak/AV
Test Mode	Working	6 dB Bandwidth	9 kHz
Environmental Conditions	25℃, 60 % RH, 101.5 kPa	Test Result	Pass

Note:
L = Line Line, N = Neutral Line
Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = attenuator + Cable loss
Level (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Over Limit (dB) = Level (dBμV) – Limit (dBμV)
QP = Quasi-Peak AV = Average

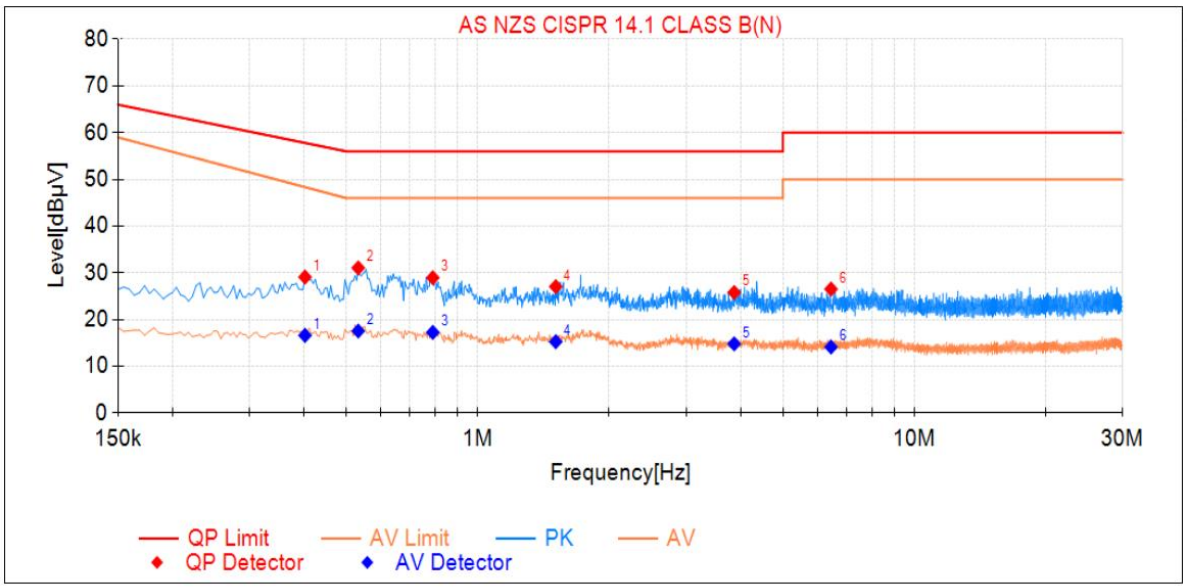
Please refer to the following diagram:

Line:



Final Data List								
NO.	Freq. [MHz]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.411	32.34	57.63	25.29	18.11	48.12	30.01	PASS
2	0.551	32.12	56.00	23.88	18.32	46.00	27.68	PASS
3	0.785	31.19	56.00	24.81	18.09	46.00	27.91	PASS
4	1.712	31.40	56.00	24.60	16.39	46.00	29.61	PASS
5	2.886	28.03	56.00	27.97	15.39	46.00	30.61	PASS
6	4.335	28.71	56.00	27.29	14.27	46.00	31.73	PASS

Neutral:



Final Data List								
NO.	Freq. [MHz]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.402	29.11	57.81	28.70	16.63	48.36	31.73	PASS
2	0.533	31.06	56.00	24.94	17.56	46.00	28.44	PASS
3	0.789	28.96	56.00	27.04	17.26	46.00	28.74	PASS
4	1.509	27.06	56.00	28.94	15.27	46.00	30.73	PASS
5	3.867	25.81	56.00	30.19	14.81	46.00	31.19	PASS
6	6.446	26.53	60.00	33.47	14.13	50.00	35.87	PASS

7.2. DISTURBANCE POWER MEASUREMENT

7.2.1. LIMITS

FREQUENCY (MHz)	Household appliances and similar appliances		Rated motor power not exceeding 700W		Rated motor power above 700W and not exceeding 1000W		Rated motor power above 1000W	
	QP dBpW	Average dBpW	QP dBpW	Average dBpW	QP dBpW	Average dBpW	QP dBpW	Average dBpW
30 ~ 300	45-55	35-45	45-55	35-45	49-59	39-49	55-65	45-55

Note: 1) The lower limit shall apply at the transition frequencies.
2) Increasing linearly with the frequency.
3) QP means Quasi-peak, AV means Average.
4) The limit of column 2 and 3 apply to this product.

7.2.2. TEST PROCEDURE

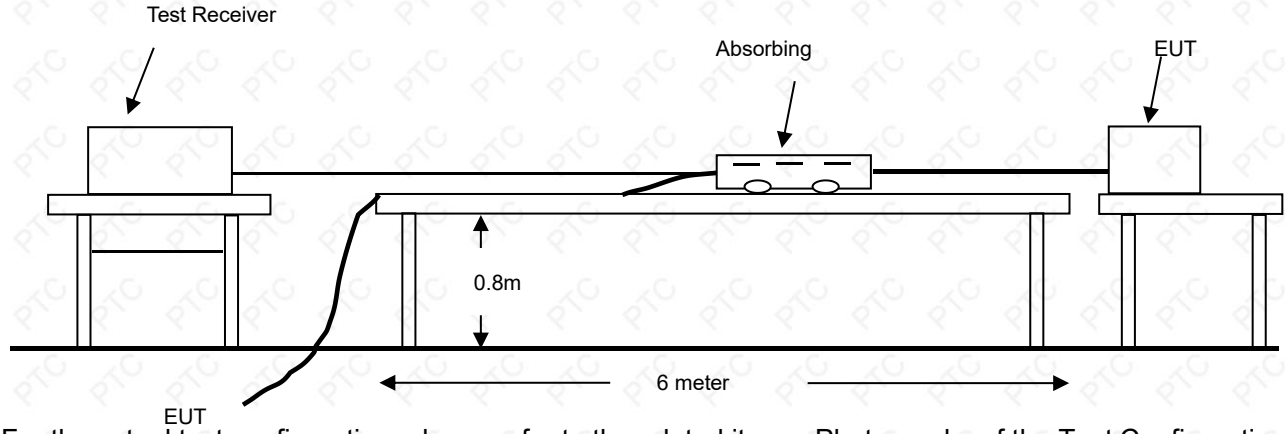
The EUT is place on a 0.8 meters height wooden table above the ground plane, and kept at least 0.8 m from other metallic object. The straight portion of lead would put on 6 m long testing bench of (if lead is shorter than 6 m it should be extended)

Any lead connecting the main appliance to an auxiliary apparatus is disconnected if this does not affect the operation of the appliance, or is isolated by means of ferrite rings (or an absorbing clamp) close to the appliance.

The receiver scanned from 30 MHz to 300 MHz. Emissions were scanned and measured to moving the absorbing clamp along the main lead until the maximum emission value is found. Recorded at least the six highest emissions.

Note: Test Software Name: e3, Software Version: 1.0.0.0.
The test data of the worst-case condition(s) was recorded.

7.2.3. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration

7.2.4. TEST RESULT

N/A

7.3. RADIATED EMISSION MEASUREMENT

7.3.1. LIMITS

FREQUENCY (MHz)	Limit (dBμV/m) (At 3m)
30 ~ 230	40
230 ~ 1000	47

Note: 1) The lower limit shall apply at the transition frequencies.

2) Emission level (dBμV/m) = 20 log Emission level (μV/m).

7.3.2. TEST PROCEDURE

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is floor standing equipment, it is placed on the ground plane which has a 0.1 m non-conductive covering to insulate the EUT from the ground plane.

The antenna was placed at 3 meter away from the EUT. The antenna connected to the spectrum analyzer via a cable and at times a pre-amplifier would be used.

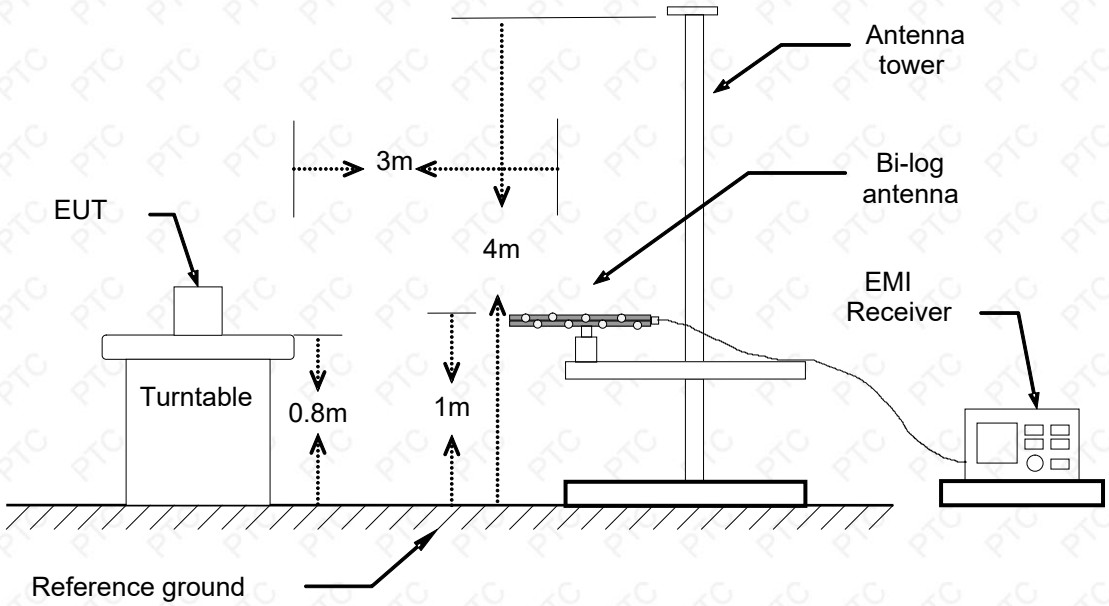
The analyzer / receiver quickly scanned from 30 MHz to 1000 MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

During the above scans, the emissions were maximized by cable manipulation. Each modes is measured, recorded at least the six highest emissions. The emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

The test data of the worst-case condition(s) was recorded.

Note: Test Software Name: e3, Software Version: 8.2.1.0.

7.3.3. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration

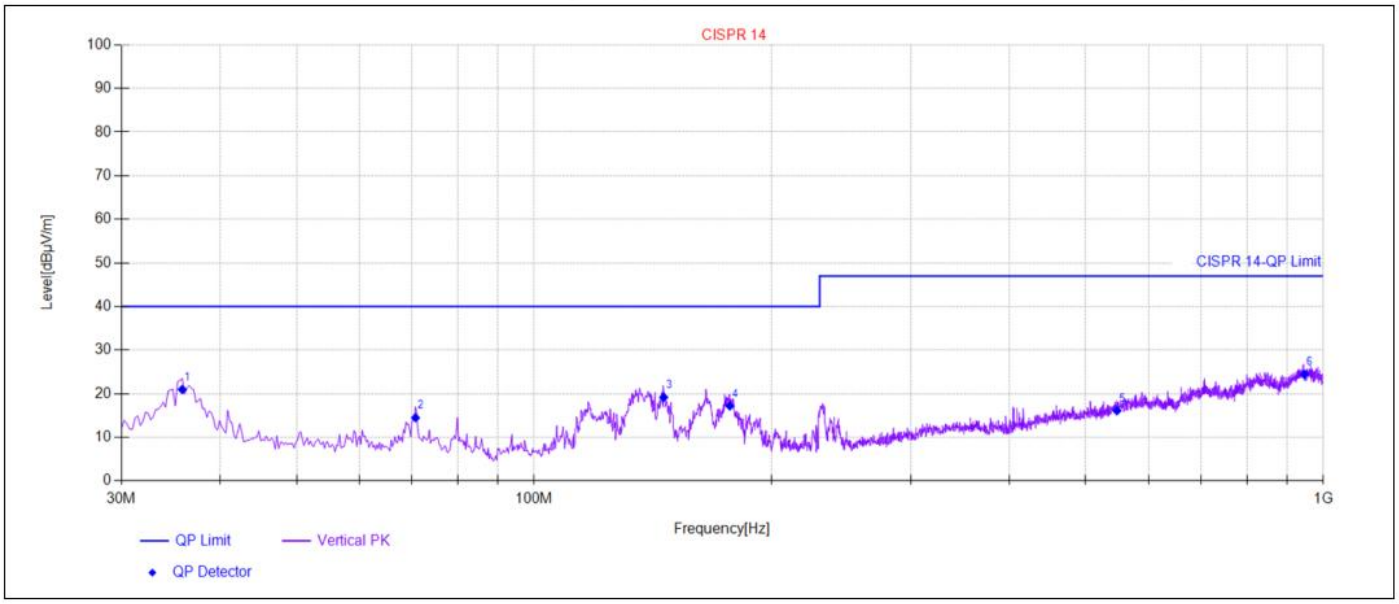
7.3.4. TEST RESULT

Product name	3D printing pen	Antenna Distance	3 m
Model	SL-200	Antenna Pole	Vertical / Horizontal
Test Mode	Working	Detector Function	Peak / Quasi-peak
Environmental Conditions	25℃, 60 % RH, 101.5 kPa	6 dB Bandwidth	120 kHz
Tested by	TangYongZhao	Test Result	Pass

Note:
Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading(dBμV)
Corr.Factor (dB/m)=Antenna factor(dB/m)+Cable loss(dB)
Measurement (dBμV/m)=Reading level(dBμV)+ Corr. Factor (dB/m)
Limit (dBμV/m) = Limit stated in standard
Over Limit (dB) = Measurement (dBμV/m) – Limit (dBμV/m)
QP = Quasi-Peak

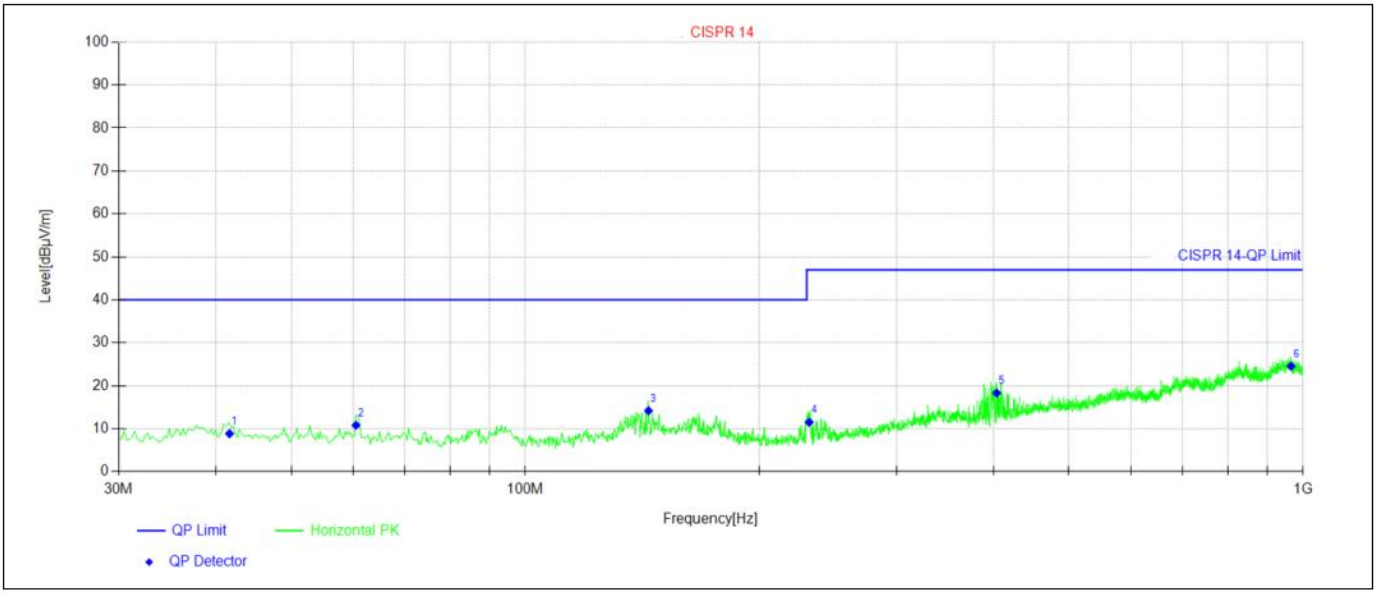
Please refer to the following diagram:

Vertical:



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.82	-18.19	20.98	40.00	19.02	100	28	Vertical
2	70.74	-19.43	14.49	40.00	25.51	100	259	Vertical
3	145.92	-16.39	19.18	40.00	20.82	100	193	Vertical
4	176.96	-16.86	17.19	40.00	22.81	100	85	Vertical
5	547.50	-9.44	16.10	47.00	30.90	100	328	Vertical
6	946.41	-2.28	24.45	47.00	22.55	100	331	Vertical

Horizontal:

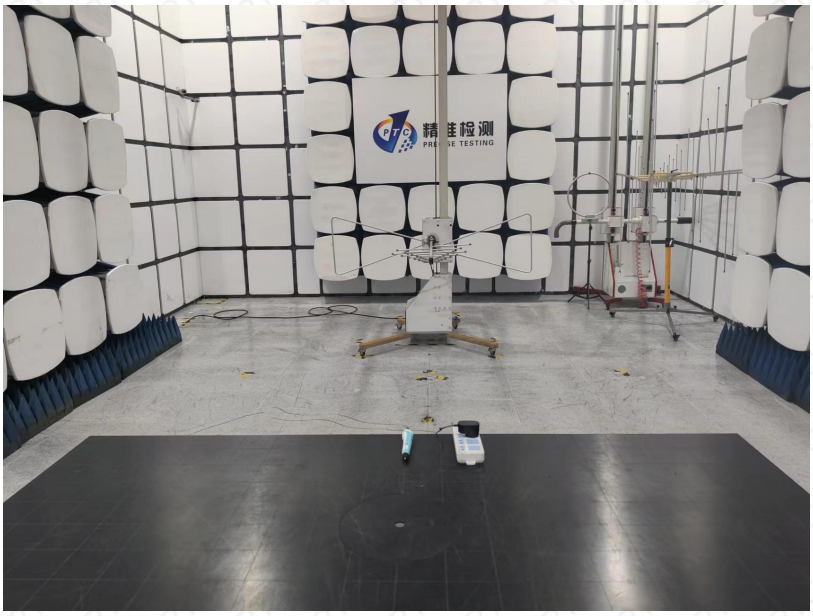


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	41.64	-17.67	8.86	40.00	31.14	100	95	Horizontal
2	60.56	-17.88	10.81	40.00	29.19	100	194	Horizontal
3	143.98	-16.46	14.18	40.00	25.82	100	10	Horizontal
4	231.76	-18.11	11.52	47.00	35.48	100	101	Horizontal
5	403.69	-13.02	18.30	47.00	28.70	100	358	Horizontal
6	965.32	-1.94	24.56	47.00	22.44	100	136	Horizontal

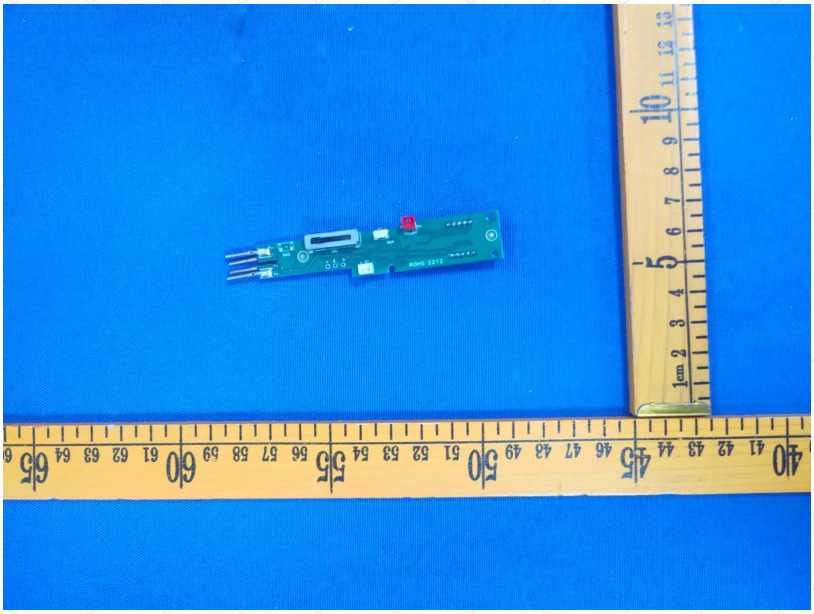
8. PHOTOGRAPHS OF THE TEST CONFIGURATION

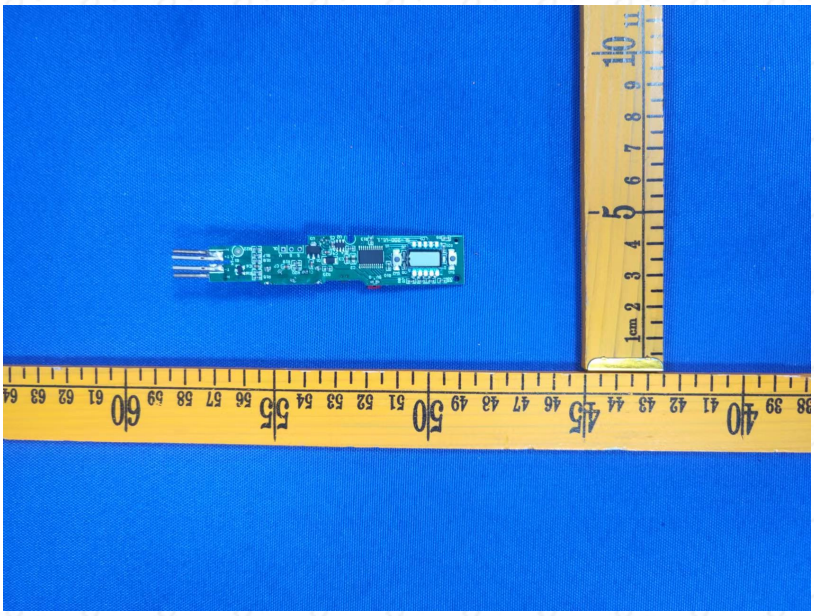
CONDUCTED EMISSION TEST

RADIATED EMISSION TEST



9. PHOTOGRAPHS OF EUT





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