EMC TEST REPORT

For

Jiangsu DINGS' Intelligent Control Technology Co., Ltd

Hybrid stepper motor lead screw linear actuators(Kaptive)

Test Model: 17K2205AA4-020SCSN-001

Additional Model No.: 8K, 11K, 14K, 17K, 23K, 24K

Prepared for	:	Jiangsu DINGS' Intelligent Control Technology Co., Ltd
Address	:	No.355 Longjin Road, Lucheng street, Changzhou Economic Development Zone, Jiangsu Province
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
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Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	January 11, 2021
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	January 11, 2021 ~ January 13, 2021
Date of Report	:	January 13, 2021

CE

EMC TEST REPORT
EN 55014-1: 2017
Requirements for household appliances, electric tools and similar apparatus -- Part 1: Emission
EN 55014-2: 2015
Requirements for household appliances, electric tools and similar apparatus -- Part 2: Immunity - Product family standard

Report Reference No. .....:	**LCS210104169AE**
Date Of Issue .....:	January 13, 2021
Testing Laboratory Name....:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address .....:	Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure ..:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name .....:	**Jiangsu DINGS' Intelligent Control Technology Co., Ltd**
Address .....:	No.355 Longjin Road, Lucheng street, Changzhou Economic Development Zone, Jiangsu Province
Test Specification:	
Standard .....:	EN 55014-1: 2017 EN 55014-2: 2015
Test Report Form No. .....:	LCSEMC-1.0
TRF Originator .....:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF .....:	Dated 2011-03

Test Item Description.....:	**Hybrid stepper motor lead screw linear actuators(Kaptive)**
Trade Mark.....:	DINGS´
Test Model .....:	17K2205AA4-020SCSN-001
Ratings.....:	Please Refer to Page 8
Result .....:	**Positive**

Compiled by:	Supervised by:	Approved by:
Mia Huang	Jason Deng	
Mia Huang/ File administrators	Jason Deng /Technique principal	Gavin Liang/ Manager

EMC -- TEST REPORT

Test Report No. : LCS210104169AE	January 13, 2021 Date of issue

Test Model.....	: 17K2205AA4-020SCSN-001
EUT.....	: Hybrid stepper motor lead screw linear actuators(Kaptive)
Applicant.....	**: Jiangsu DINGS' Intelligent Control Technology Co., Ltd**
Address.....	: No.355 Longjin Road, Lucheng street, Changzhou Economic Development Zone, Jiangsu Province
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Jiangsu DINGS' Intelligent Control Technology Co., Ltd**
Address.....	: No.355 Longjin Road, Lucheng street, Changzhou Economic Development Zone, Jiangsu Province
Telephone.....	: /
Fax.....	: /
Factory.....	**: Jiangsu DINGS' Intelligent Control Technology Co., Ltd**
Address.....	: No.355 Longjin Road, Lucheng street, Changzhou Economic Development Zone, Jiangsu Province
Telephone.....	: /
Fax.....	: /

Test Result according to the standards on page 6: **Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	January 13, 2021	Initial Issue	Gavin Liang

TABLE OF CONTENT

Test Report Description Page

1. SUMMARY OF STANDARDS AND RESULTS

1.1.Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION (EN 55014-1: 2017)			
Description of Test Item	**Standard**	**Limits**	**Results**
Radiated disturbance	EN 55014-1: 2017	--------	PASS
IMMUNITY (EN 55014-2: 2015)			
Description of Test Item	**Basic Standard**	**Performance Criteria**	**Results**
Electrostatic discharge (ESD)	EN 61000-4-2: 2009	B	PASS
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A2: 2010	A	PASS
N/A is an abbreviation for Not Applicable.			

Test mode:		
Mode 1	Working	Record

1.2.Description of Performance Criteria

General Performance Criteria
Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:
─ essential operational modes and states;
─ tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse, etc.);
─ quality of software execution;
─ quality of data display and transmission;
─ quality of speech transmission.

1.2.1.Performance criterion A
The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacture when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deriver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

1.2.2.Performance criterion B
After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacture, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operation state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be deriver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

1.2.3.Performance criterion C
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacture's instructions.

Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be loss.

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	: Hybrid stepper motor lead screw linear actuators(Kaptive)
Trade Mark	: DINGS´
Test Model	: 17K2205AA4-020SCSN-001
Model Lists	: 8K, 11K, 14K, 17K, 23K, 24K
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power Supply	: Power: 0.5A
EUT Clock Frequency	: ≤108MHz

2.2.Test Facility

Site Description

EMC Lab. : NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

2.3.Statement of the Measurement Uncertainty

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

2.4.Measurement Uncertainty

Test	Parameters	Expanded Uncertainty (U_{lab})	Expanded Uncertainty (U_{cispr})
Coucted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 2.63 dB ± 2.35 dB	± 3.8 dB ± 3.4 dB
Power Disturbance	Level accuracynd (30MHz to 300MHz)	± 2.90dB	± 4.5 dB
Electromagnetic Radiated Emission (3-loop)	Level accuracy (9kHz to 30MHz)	± 3.60 dB	± 3.3 dB
Radiated Emission	Level accuracy (9kHz to 30MHz)	± 3.68 dB	N/A
Radiated Emission	Level accuracy (30MHz to 1000MHz)	± 3.48 dB	± 5.3 dB
Radiated Emission	Level accuracy (above 1000MHz)	± 3.90 dB	± 5.2 dB
Mains Harmonic	Voltage	± 0.510%	N/A
Voltage Fluctuations & Flicker	Voltage	± 0.510%	N/A
EMF		± 21.59%	N/A

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

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

3. MEASURING DEVICES AND TEST EQUIPMENT

Test Item: Radiated Disturbance (Electric Field)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	E3	E3-EMC	/	N/A	N/A
2	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
3	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2021-07-01
4	EMI Test Receiver	R&S	ESR 7	101181	2020-06-22	2021-06-21
5	Broadband Preamplifier	/	BP-01M18G	P150501	2020-06-22	2021-06-21

Test Item: Electrostatic Discharge						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	ESD Simulator	SCHLODER	SESD 230	604035	2020-07-21	2021-07-20

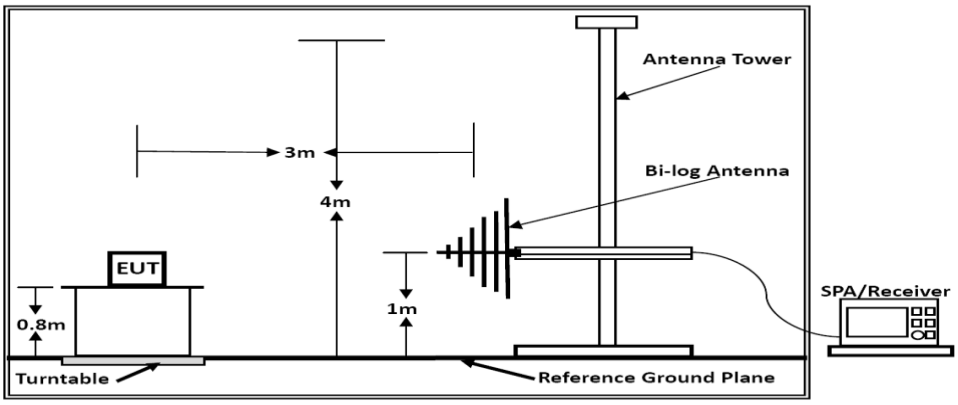
Test Item: RF Field Strength Susceptibility						
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	ESG Vector Signal Generator	Agilent	E4438C	MY490726276	2020-6-22	2021-6-21
2	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2020-06-22	2021-06-21
3	RF POWER AMPLIFIER	OPHIR	5225R	1052	NCR	NCR
4	RF POWER AMPLIFIER	OPHIR	5273F	1019	NCR	NCR
5	Stacked Broadband Log Periodic Antenna	SCHWARZBECK	STLP 9128	9128ES-145	NCR	NCR
6	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBECK	STLP 9149	9149-484	NCR	NCR
7	Electric field probe	Narda S.TS./PMM	EP601	611WX80208	2020-6-22	2021-6-21

Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.
NCR --- No calibration requirement.

4. TEST RESULTS

4.1.RADIATED EMISSION MEASUREMENT

4.1.1.Block Diagram of Test Setup



Below 1GHz

4.1.2.Test Standard

EN 55014-1: 2017

4.1.3.Radiated Emission Limits

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
30-230	3	40
230-1000	3	47

***Note:
(1) The smaller limit shall apply at the combination point between two frequency bands.
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

4.1.4.EUT Configuration on Test

The EN 55014-1 regulations test method must be used to find the maximum emission during radiated emission measurement.

4.1.5.Operating Condition of EUT

4.1.5.1.Turn on the power.

4.1.5.2.After that, let the EUT work in test Mode 1 and measure it.

4.1.6.Test Procedure

The EUT is placed on a turntable, which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. By-log antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.The bandwidth of the Receiver is set at 120kHz. The frequency range from 30MHz to 1000MHz is investigated.

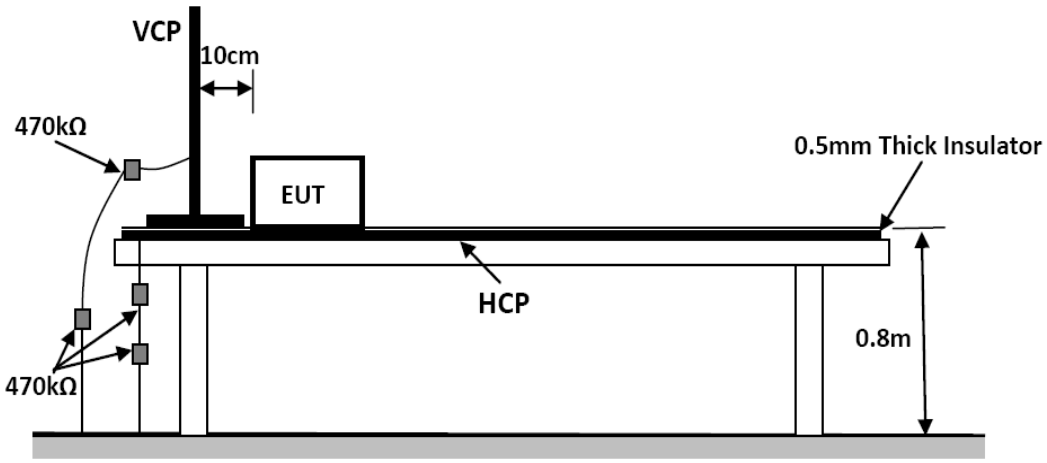
4.1.7.Test Results

PASS.

Refer to attached Annex B.1

4.2.Electrostatic Discharge immunity Test

4.2.1.Block Diagram of Test Setup



4.2.2.Test Standard

EN 55014-2: 2015 (EN 61000-4-2: 2009, Severity Level: 3 / Air Discharge: ± 8KV, Level: 2 / Contact Discharge: ±4KV)

4.2.3.Severity Levels and Performance Criterion

4.2.3.1.Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1	±2	±2
2	±4	±4
3	±6	±8
4	±8	±15
X	Special	Special

4.2.3.2.Performance criterion: B

4.2.4.EUT Configuration on Test

The configuration of EUT are listed in Section 4.2.1.

4.2.5.Operating Condition of EUT

Same as radiated emission measurement, which is listed in Section 4.1.5 except the test set up replaced by Section 4.2.1.

4.2.6.Test Procedure

4.2.6.1.Air Discharge

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

4.2.6.2.Contact Discharge

All the procedure shall be same as Section 4.2.6.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

4.2.6.3.Indirect Discharge For Horizontal Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

4.2.6.4.Indirect Discharge For Vertical Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different ,positions that the four faces of the EUT are completely illuminated.

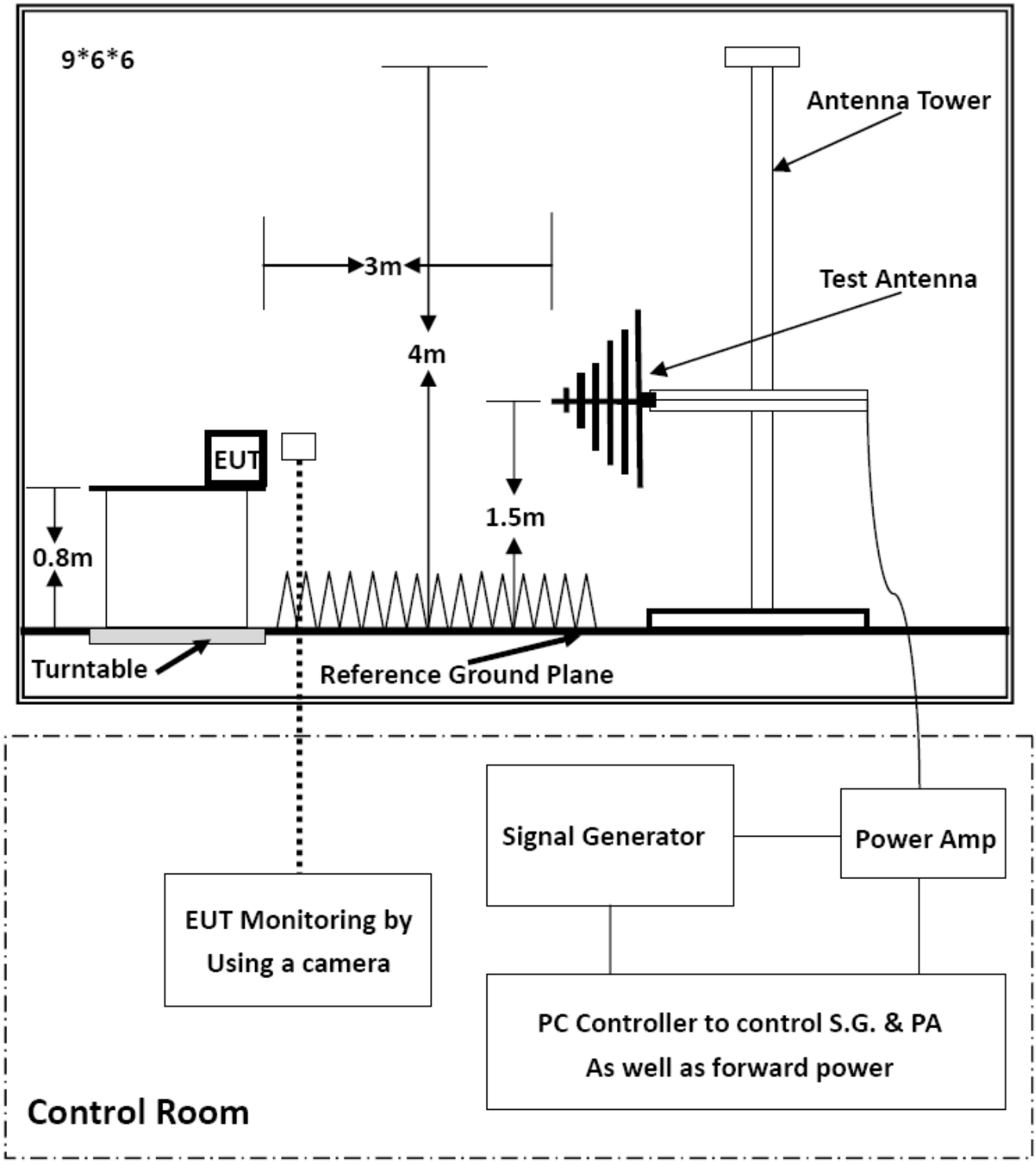
4.2.7.Test Results

PASS.

Refer to attached Annex B.2

4.3.RF FIELD STRENGTH SUSCEPTIBILITY TEST

4.3.1.Block Diagram of Test



4.3.2.Test Standard

EN 55014-2: 2015 (EN 61000-4-3: 2006+A2: 2010 Severity Level: 2, 3V / m)

4.3.3.Severity Levels and Performance Criterion

4.3.3.1.Severity Levels

Level	Field Strength (V/m)
1	1
2	3
3	10
X	Special

4.3.3.2.Performance Criterion: A

4.3.4.EUT Configuration on Test

The configuration of the EUT is same as Section 4.3.1.

4.3.5.Operating Condition of EUT

Same as radiated emission measurement, which is listed in Section 4.1.5, except the test setup replaced as Section 4.3.1.

4.3.6.Test Procedure

The EUT are placed on a table, which is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna, which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD Recording is used to monitor its screen.

All the scanning conditions are as following:

Condition of Test	Remark
1. Fielded Strength	3V/m (Severity Level 2)
2. Radiated Signal	Unmodulated
3. Scanning Frequency	80-1000MHz
4. Sweep time of radiated	0.0015 Decade/s
5. Dwell Time	3 Sec.

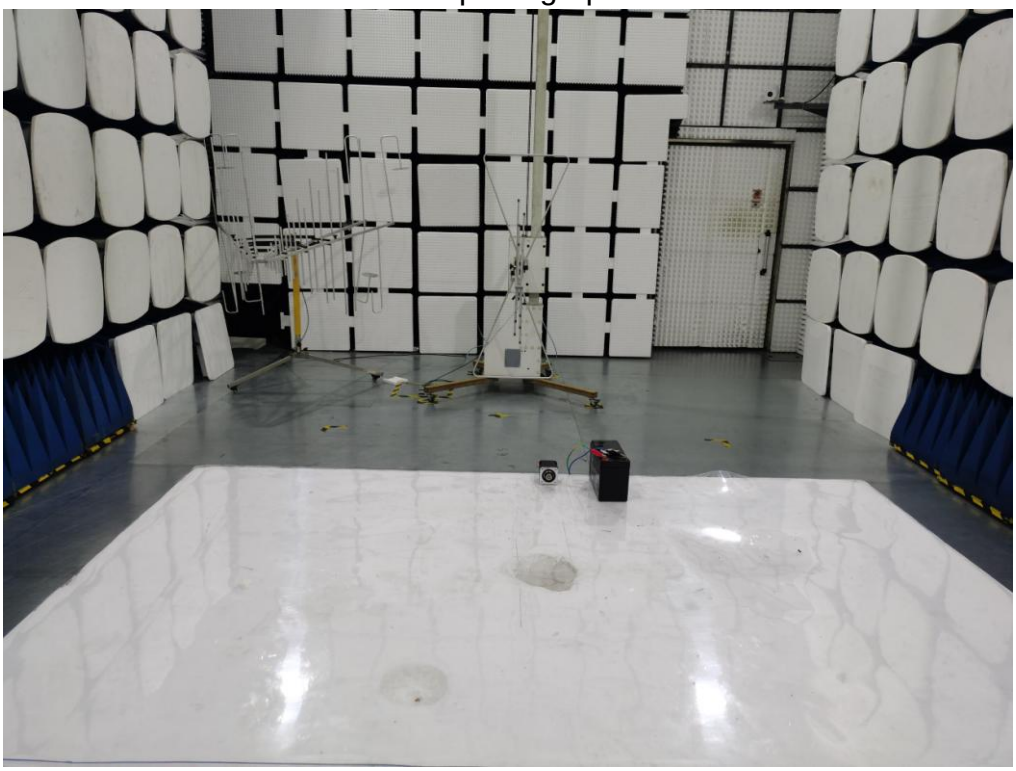
4.3.7.Test Results

PASS.

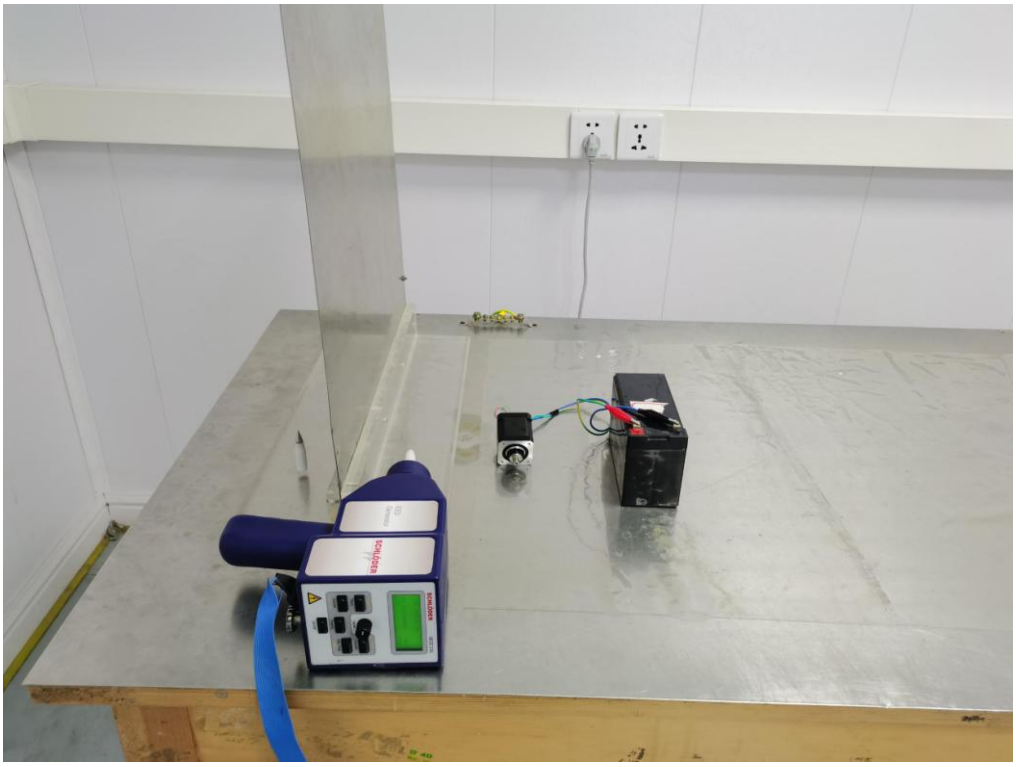
Refer to attached Annex B.3

ANNEX A

（Test photograph）



Test Setup Photo of Radiated Measurement (30MHz~1GHz)



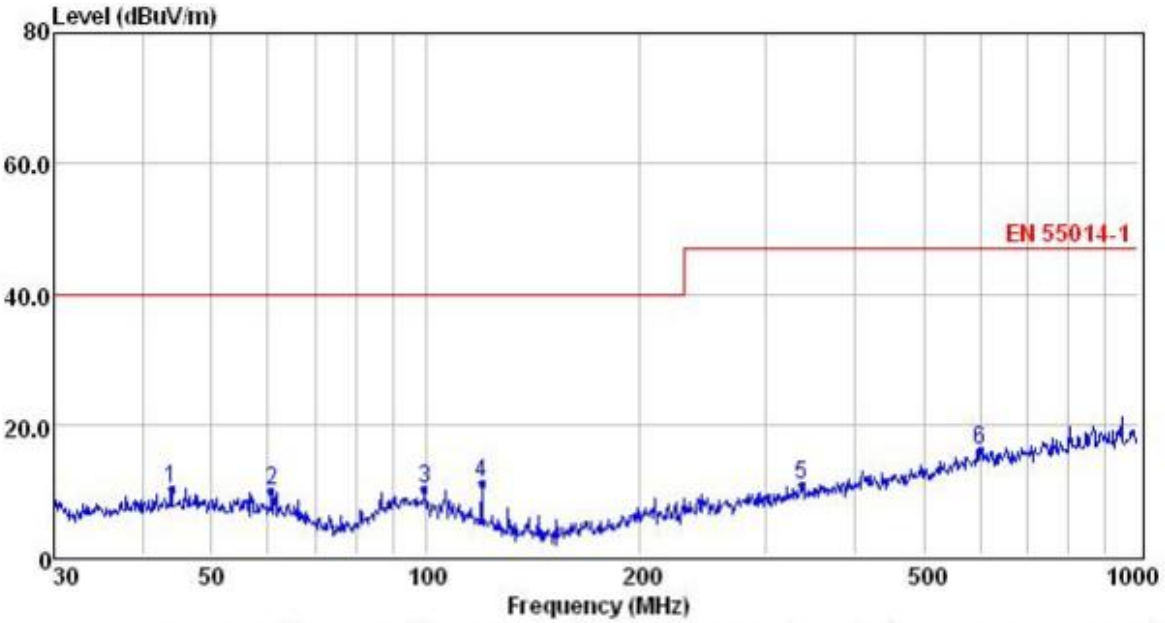
Test Setup Photo of Electrostatic Discharge Test

ANNEX B

（Emission and Immunity test results）

B.1 Radiated Disturbance Test Results（30MHz to 1000MHz）

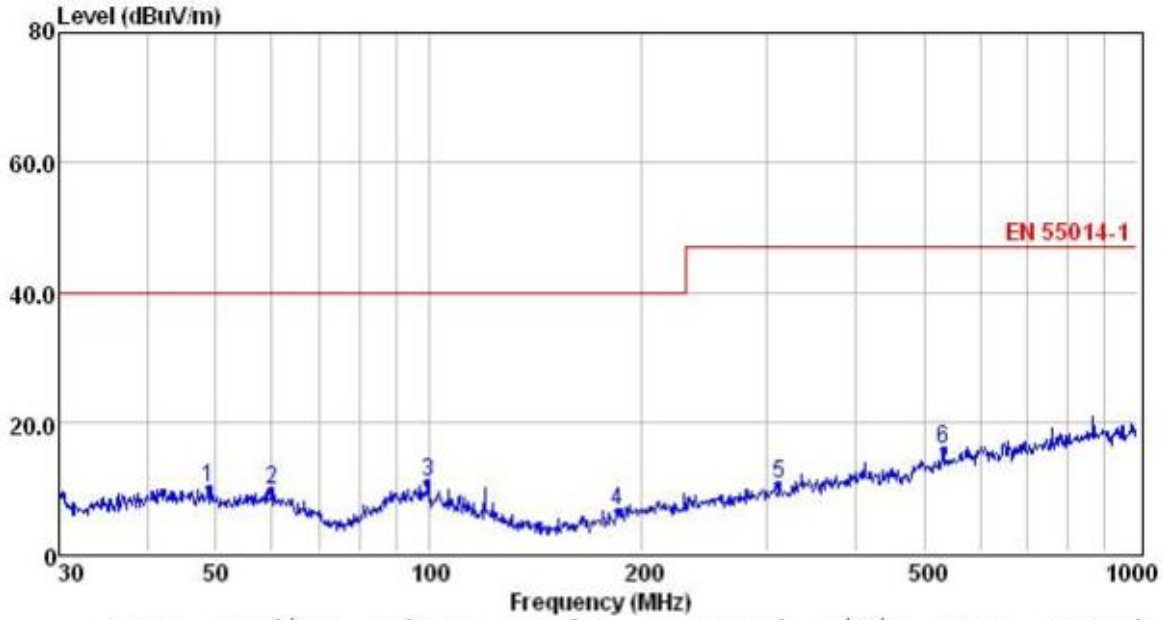
Environmental Conditions:	22.1℃, 53.2% RH
Test Voltage:	DC
Test Model:	17K2205AA4-020SCSN-001
Test Mode:	Mode 1
Test Engineer:	ZQ PANG
Pol:	Vertical
Detailed results are shown below	



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	43.97	26.23	0.41	13.56	10.21	40.00	-29.79	QP
2	60.70	27.01	0.49	12.41	9.87	40.00	-30.13	QP
3	99.53	26.53	0.61	13.13	10.17	40.00	-29.83	QP
4	119.86	29.94	0.64	10.51	10.92	40.00	-29.08	QP
5	337.22	26.24	1.09	14.01	10.70	47.00	-36.30	QP
6	601.43	27.20	1.43	18.46	15.99	47.00	-31.01	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that are 20db below the official limit are not reported

Environmental Conditions:	22.1℃, 53.2% RH
Test Voltage:	DC
Test Model:	17K2205AA4-020SCSN-001
Test Mode:	Mode 1
Test Engineer:	ZQ PANG
Pol:	Horizontal
Detailed results are shown below	



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	48.84	26.11	0.35	13.32	9.78	40.00	-30.22	QP
2	59.86	26.23	0.49	12.70	9.38	40.00	-30.62	QP
3	99.53	27.14	0.61	13.13	10.78	40.00	-29.22	QP
4	184.49	25.91	0.70	10.08	6.37	40.00	-33.63	QP
5	312.18	26.68	1.09	13.22	10.44	47.00	-36.56	QP
6	533.83	28.33	1.46	17.21	15.90	47.00	-31.10	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that are 20db below the official limit are not reported

B.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST

Electrostatic Discharge Test Results

Standard	☐ IEC 61000-4-2 ☑ EN 61000-4-2		
Applicant	Jiangsu DINGS' Intelligent Control Technology Co., Ltd		
EUT	Hybrid stepper motor lead screw linear actuators(Kaptive)	**Temperature**	22.6℃
M/N	17K2205AA4-020SCSN-001	**Humidity**	53.2%
Criterion	B	**Pressure**	1021mbar
Test Mode	Mode 1	**Test Engineer**	ZQ PANG

Air Discharge

Test Points	Test Levels			Results		
	± 2KV	± 4KV	± 8KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☒	☐	☐A ☒B
Top	☒	☒	☒	☒	☐	☐A ☒B
Bottom	☒	☒	☒	☒	☐	☐A ☒B

Contact Discharge

Test Points	Test Levels		Results		
	± 2 KV	±4 KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B
Top	☒	☒	☒	☐	☐A ☒B
Bottom	☒	☒	☒	☐	☐A ☒B

Discharge To Horizontal Coupling Plane

Side of EUT	Test Levels		Results		
	± 2 KV	± 4 KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B

Discharge To Vertical Coupling Plane

Side of EUT	Test Levels		Results		
	± 2 KV	± 4 KV	Pass	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B

B.3 RF FIELD STRENGTH SUSCEPTIBILITY TEST

RF Field Strength Susceptibility Test Results

Standard	☐ IEC 61000-4-3 ☑ EN 61000-4-3		
Applicant	Jiangsu DINGS' Intelligent Control Technology Co., Ltd		
EUT	Hybrid stepper motor lead screw linear actuators(Kaptive)	**Temperature**	22.3℃
M/N	17K2205AA4-020SCSN-001	**Humidity**	53.4%
Field Strength	3 V/m	**Criterion**	A
Test Mode	Mode 1	**Test Engineer**	ZQ PANG
Frequency Range	80 MHz to 1000 MHz		
Modulation	☐None ☐ Pulse ☑AM 1KHz 80%		
Steps	1%		

	Horizontal	**Vertical**
Front	PASS	PASS
Right	PASS	PASS
Rear	PASS	PASS
Left	PASS	PASS

Note:

ANNEX C

（External and internal photos of the EUT）

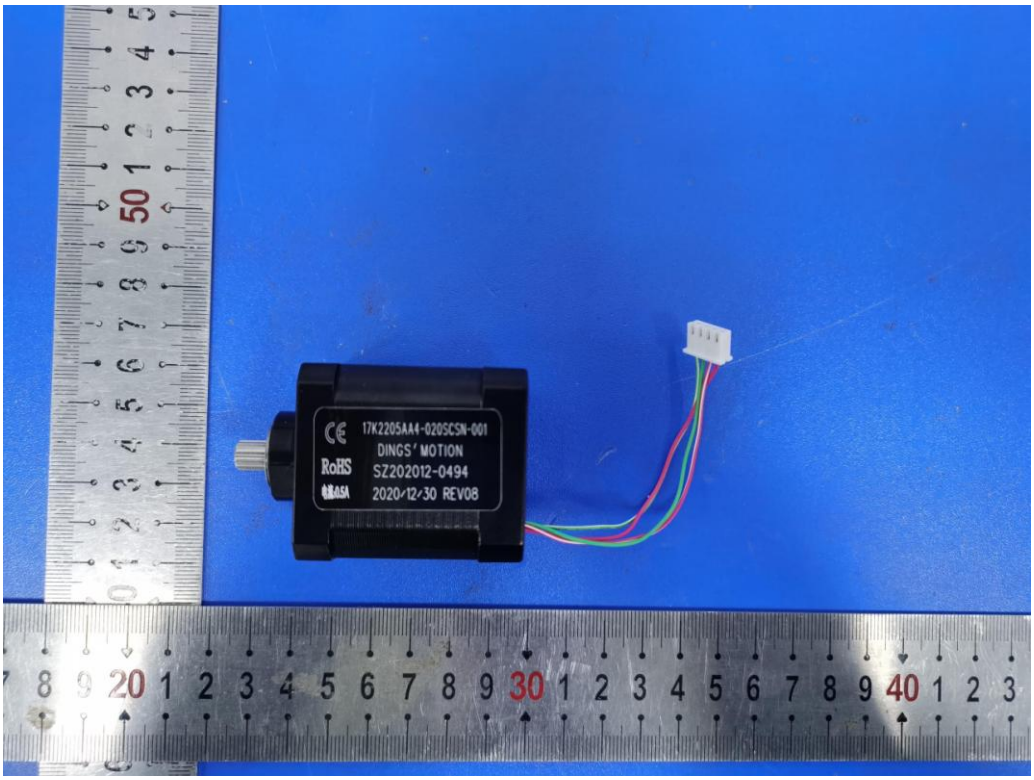


Fig. 1

Fig. 2

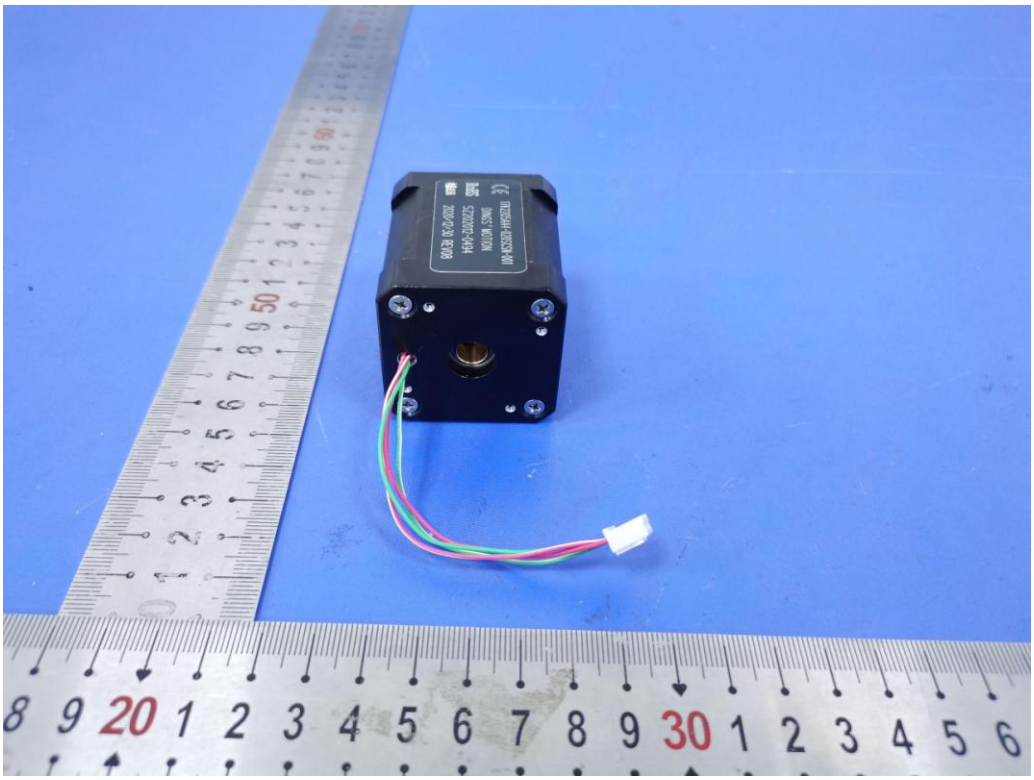


Fig. 3

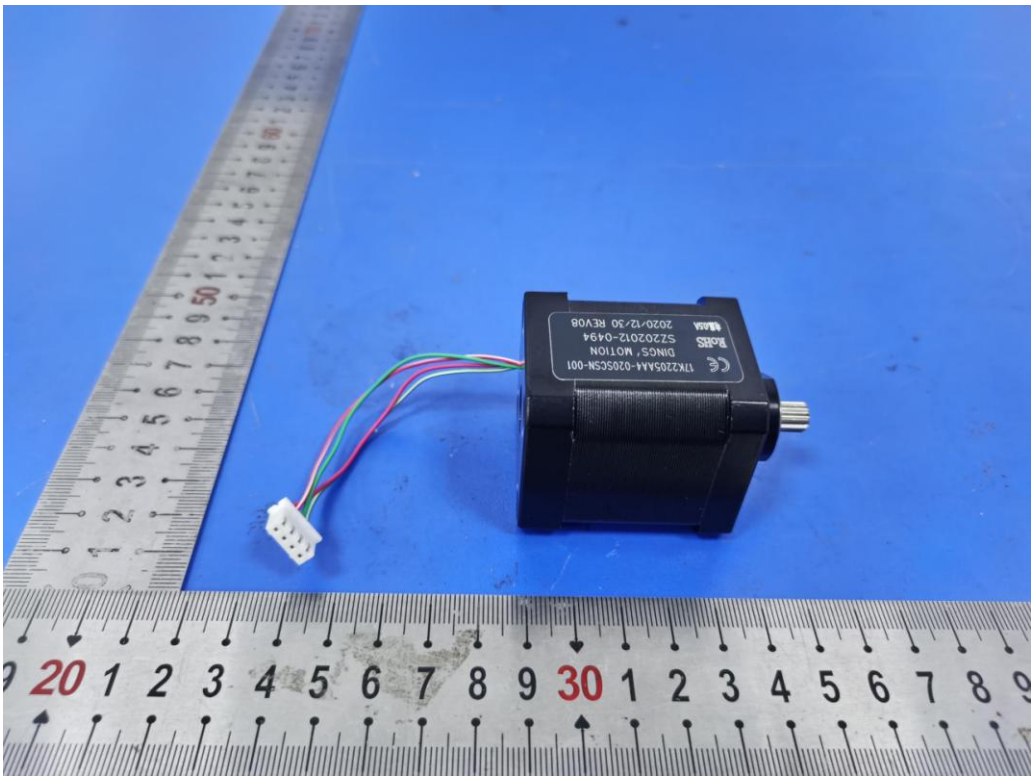


Fig. 4

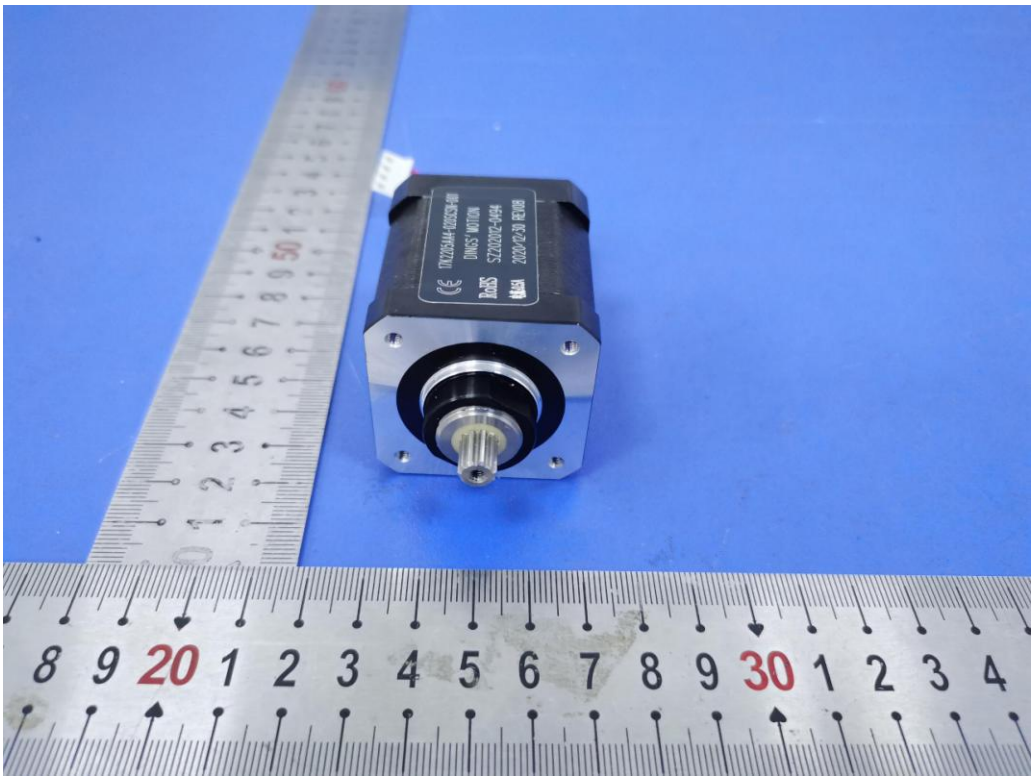


Fig. 5

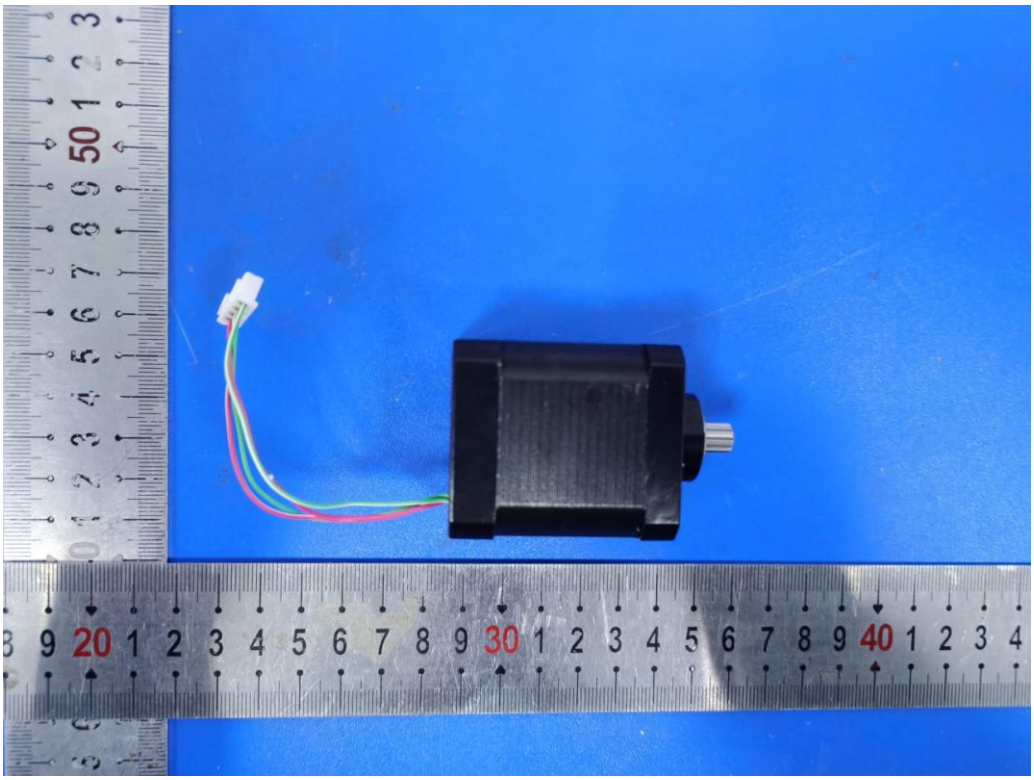


Fig. 6

---------- THE END OF TEST REPORT ----------