



EMC TEST REPORT
EN 55032:2015/A11:2020
EN 55035:2017/A11:2020
MEASUREMENT AND TEST REPORT

For

Shenzhen Rtelligent Technology Co.,Ltd
B301Room 301,B Building,Zhuangbian Industrial park,Nanchang Road,Gushu,Baoan
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Model No.: 42A02, 20A002, 20A003, 28A006, 28A012, 28A01, 35A01, 35A02, 39A02, 42A02C, 42A03, 42A08, 57A09, 57A1, 57A2, 57A2-Z, 57A3, 60A2, 60A3, 60A4

2022-07-04

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Stepper Motor Motor(Closed)
Test Engineer:	Eric Tao / <i>Eric Tao</i>
Report Number:	TH2206052-C02-R01
Test Date:	2022-06-05 to 2022-06-23
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of TianHai Compliance Testing Laboratory Ltd.



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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				
Description of Test Item	Test Standard	Basic Standard	Requirement	Results
Conducted disturbance	EN 55032:2015/A11:2020	EN 55032:2015/A11:2020	--	N/A
Radiated disturbance	EN 55032:2015/A11:2020	EN 55032:2015/A11:2020	See Section 5	PASS
Harmonic current emissions	EN IEC 61000- 2:2019/A1:2021	EN IEC 61000- 2:2019/A1:2021	--	N/A
Voltage fluctuations & flicker	EN 61000-3- 3:2013/A2:2021	EN 61000-3- 3:2013/A2:2021	--	N/A
IMMUNITY				
Description of Test Item	Test Standard	Basic Standard	Requirement	Results
Electrostatic discharge (ESD)	EN 55035:2017/A11:2020	IEC 61000-4-2:2008	See Section 8.1	PASS
Radio-frequency, Continuous radiated disturbance	EN 55035:2017/A11:2020	IEC 61000-4-3:2020	See Section 8.2	PASS
Electrical fast transient (EFT)	EN 55035:2017/A11:2020	IEC 61000-4-4:2012	--	N/A
Surge (Input a.c. power ports)	EN 55035:2017/A11:2020	IEC 61000-4- 5:2014+A1:2017	--	N/A
Radio-frequency, Continuous conducted disturbance	EN 55035:2017/A11:2020	IEC 61000-4-6:2013	--	N/A
Power frequency magnetic field*	EN 55035:2017/A11:2020	IEC 61000-4-8:2009	--	N/A
Voltage dips and interruptions	EN 55035:2017/A11:2020	IEC 61000-4-11:2020	--	N/A
<p>Note: N/A is an abbreviation for Not Applicable “*” : The EUT does not contain devices susceptible to magnetic fields; therefore the Power-Frequency Magnetic Fields test is not necessary.</p>				



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 deliver 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 deliver 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 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST EUT

Client Information

Applicant: Shenzhen Rtelligent Technology Co.,Ltd
Address: B301Room 301,B Building,Zhuangbian Industrial park,Nanchang Road,Gushu,Baoan District,Shenzhen,Guangdong China
Manufacturer: Shenzhen Rtelligent Technology Co.,Ltd
Address: B301Room 301,B Building,Zhuangbian Industrial park,Nanchang Road,Gushu,Baoan District,Shenzhen,Guangdong China

General Description of E.U.T

EUT Name: Stepper Motor Motor(Closed)
Sample No.: TH2206052-02
Trade Mark: /
Model No.: 42A02, 20A002, 20A003, 28A006, 28A012, 28A01, 35A01, 35A02, 39A02, 42A02C, 42A03, 42A08, 57A09, 57A1, 57A2, 57A2-Z, 57A3, 60A2, 60A3, 60A4
Ratings: DC48V, 1.5A, 150W
Test Mode: A. On
 1. Normal working
 B. Off
Note: All the models are identical with circuit diagram and PCB layout, only different in ratings of some components and appearance.

2.2 STATEMENT OF THE MEASUREMENT UNCERTAINTY TEST FACILITY

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 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty" 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.

2.3 MEASUREMENT UNCERTAINTY

Test Item	Frequency range	Uncertainty	Limits
Radiated Emission	30 MHz ~ 1,000 MHz	± 5.78 dB	± 6.3 dB

(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%.



2.4 TEST LOCATION

All tests were performed at Shenzhen Tianhai Test Technology Co., Ltd.
125-126, No.66, Zhangge Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen,
Guangdong Province, P.R. China

2.5 PRINCIPLE OF CONFIGURATION SELECTION

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

2.6 TEST OPERATION

Test operation refers to test setup in chapter 4 & 5 & 6.
Pre-test in all operation modes, and find out the worst case for compliance test.
According to section 2.1, full tests were applied on model 42A02.

2.7 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

The EUT was tested together with the following accessories:

Kind of Equipment	Manufacturer	Type	S/N
DC Source	ShenZhen HXL Technology Co., Ltd.	L25025D	202101023001



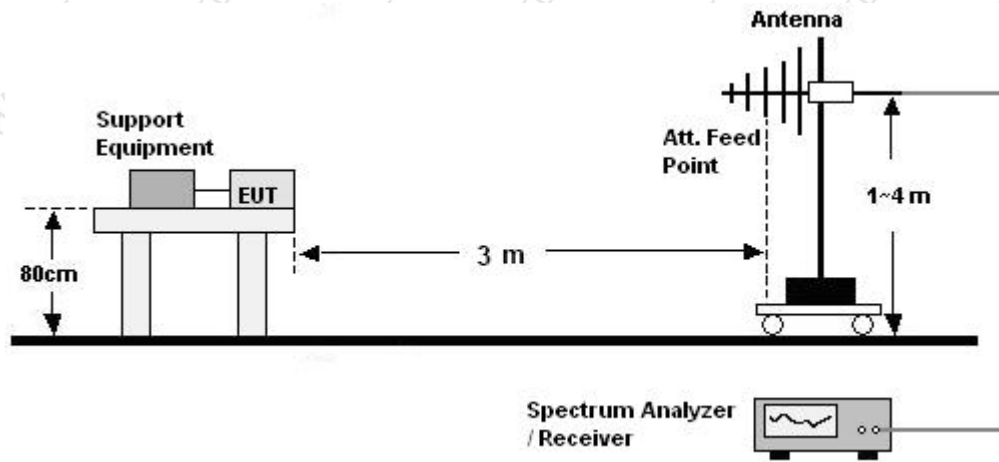
3 - TEST EQUIPMENT LIST AND DETAILS

Kind of Equipment	Manufacturer	Type	S/N	Calibrate until
Radiated Emission (3m)				
EMI Test Receiver	R&S	ESR7	102333	2022-11-15
MXA Signal Analyzer	Keysight	N9020A	MY51281805	2023-04-15
Bilog Antenna	Schwarzbeck	VULB 9168	01148	2022-11-20
Pre-Amplifier	Schwarzbeck	BBV 9718 B	00109	2022-11-16
Pre-Amplifier	Schwarzbeck	BBV 9743 B	00253	2022-11-15
Horn Antenna	Schwarzbeck	BBHA 9120	02379	2022-11-20
Electrostatic discharge (ESD)				
ESD Simulator	TESEQ	NSG 437	1569	2022-11-20
Radio-frequency, Continuous radiated disturbance (RS)				
Signal generator	R&S	SMB 100A	113650	2023-04-15
Power meter	Agilent	E4417A	MY45100899	2023-04-15
Power sensor	Agilent	E9300	US40390494	2023-04-15
Power sensor	Agilent	E9300	MY44420219	2023-04-15
Power amplifier	Micotop	MPA-80-1000-250	MPA2112426	2023-04-15
Power amplifier	Micotop	MPA-1000-6000-100	MPA2201013	2023-04-15
Stacked Log. Periodic Antenna	Schwarzbeck	STLP 9129	201	N/A
RF Switch	Emtrace	SW X4	/	N/A
Software	Emtrace	EM 3	V1.2.1	N/A



4 - RADIATED EMISSION MEASUREMENT

4.1 BLOCK DIAGRAM OF TEST SETUP



4.2 LIMITS

Frequency (MHz)	Quasi-peak Limits at 3m dB(μ V/m)
30-230	40
230-1000	47

NOTE: The lower limit shall apply at the transition frequencies.

4.3 TEST PROCEDURE

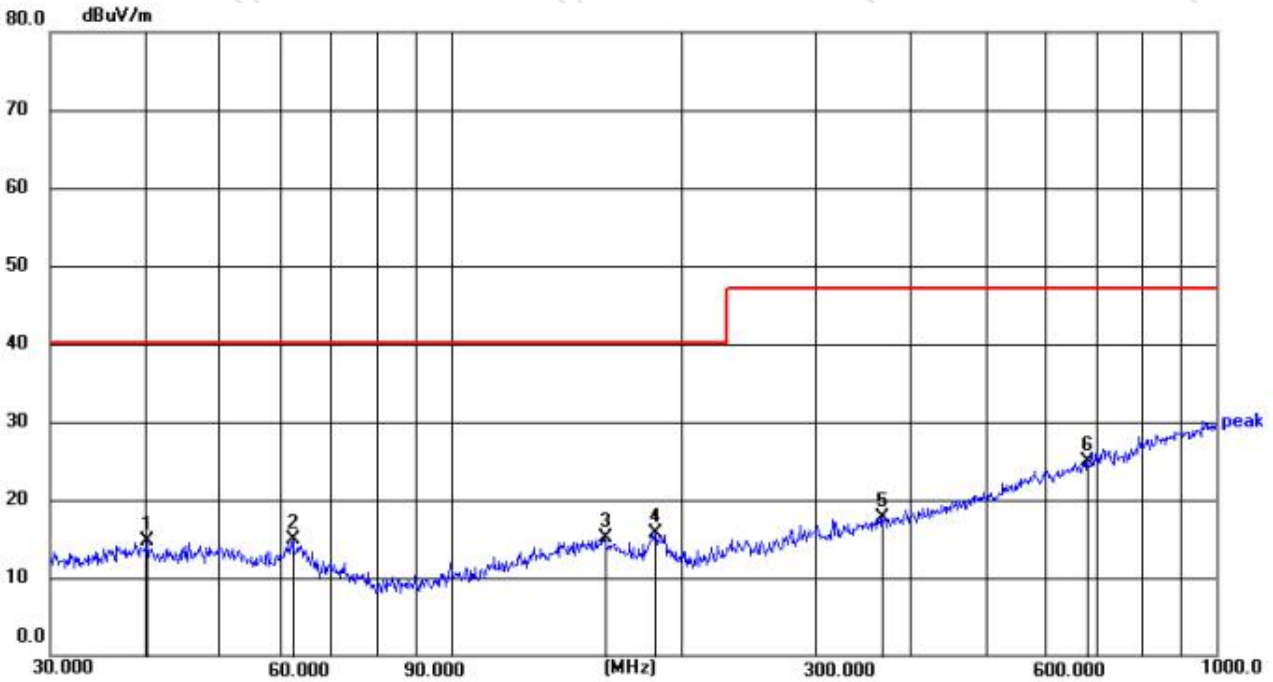
- The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value



4.4 TEST RESULTS AND DATA

EUT:	Stepper Motor Motor(Closed)	Test Voltage :	DC 48V
Test Mode:	ON	Temperature:	26°C
Atmosphere pressure:	101Kpa	Humidity:	54%

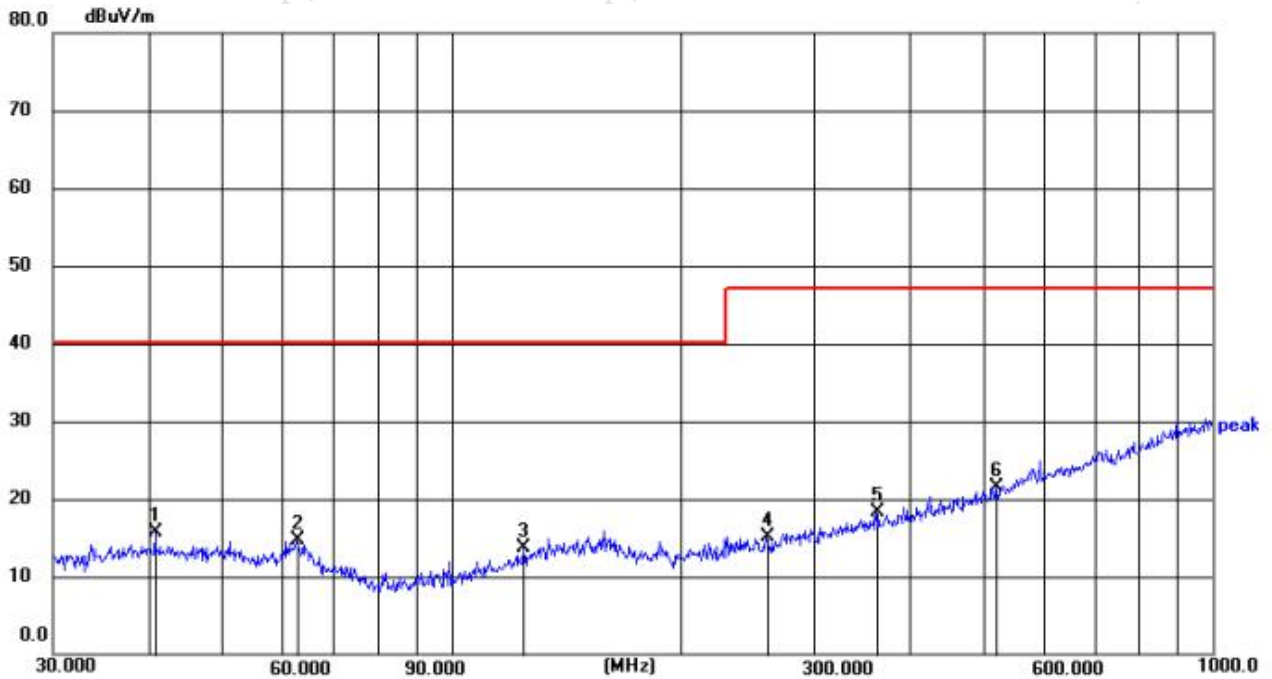
Polarization: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	40.205	29.34	-14.58	14.76	40.00	25.24	peak			P	
2	62.256	31.34	-16.44	14.90	40.00	25.10	peak			P	
3	158.668	30.22	-15.06	15.16	40.00	24.84	peak			P	
4	185.235	32.91	-17.20	15.71	40.00	24.29	peak			P	
5	365.988	30.35	-12.60	17.75	47.00	29.25	peak			P	
6 *	679.126	31.46	-6.53	24.93	47.00	22.07	peak			P	



Polarization: Vertical

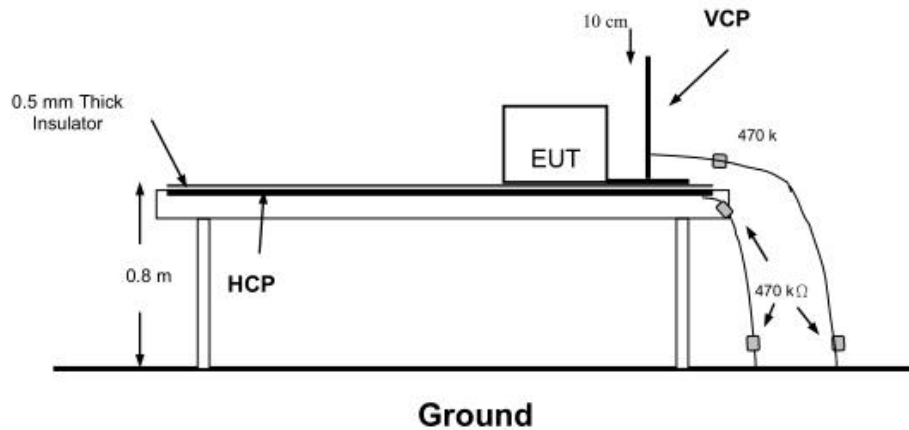


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	40.844	30.39	-14.61	15.78	40.00	24.22	peak			P	
2	62.651	31.11	-16.48	14.63	40.00	25.37	peak			P	
3	124.569	30.35	-16.67	13.68	40.00	26.32	peak			P	
4	259.234	30.50	-15.43	15.07	47.00	31.93	peak			P	
5	361.714	30.99	-12.69	18.30	47.00	28.70	peak			P	
6	520.888	31.25	-9.69	21.56	47.00	25.44	peak			P	



5 - ELECTROSTATIC DISCHARGE IMMUNITY TEST

5.1 BLOCK DIAGRAM OF TEST SETUP



5.2 TEST SPECIFICATION

Basic Standard	: IEC 61000-4-2:2008
Test Port	: Enclosure port
Discharge Impedance	: 330 ohm / 150 pF
Discharge Mode	: Single Discharge
Discharge Period	: one second between each discharge

5.3 TEST PROCEDURE

5.3.1. 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.

5.3.2. Contact Discharge

All the procedure shall be same as Section 5.3.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

5.3.3. 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.

5.3.4. 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.



5.4 TEST RESULTS

Electrostatic Discharge	
Basic Standard:	IEC 61000-4-2:2008
EUT:	Stepper Motor Motor(Closed)
M/N:	42A02
Test Voltage:	DC 48V
Test Mode:	ON
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

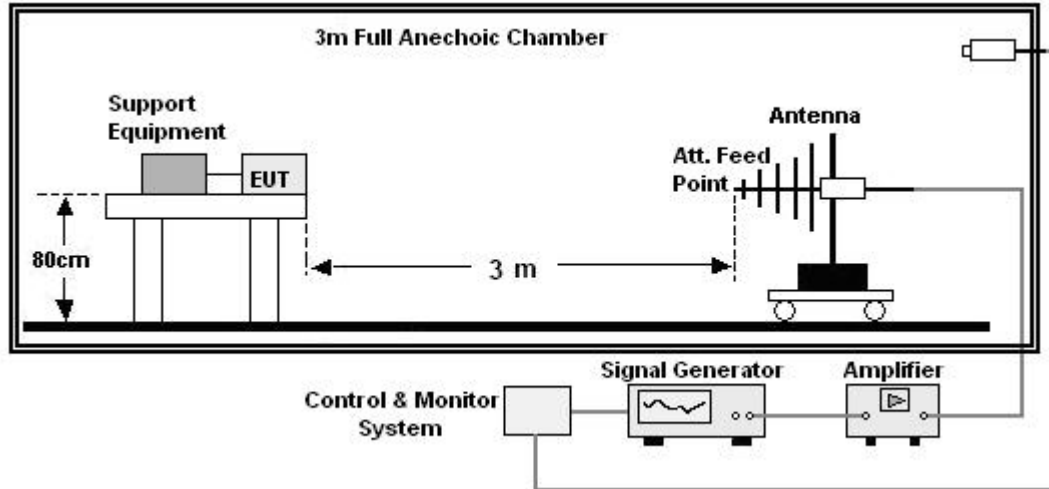
Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Performance Criterion	Result
Contact Discharge	Surface, metal, screw	2, 4	10	B	A
	Indirect Discharge HCP	2, 4	10	B	A
	Indirect Discharge VCP	2, 4	10	B	A
Air Discharge	Surface	2, 4, 8	10	B	A



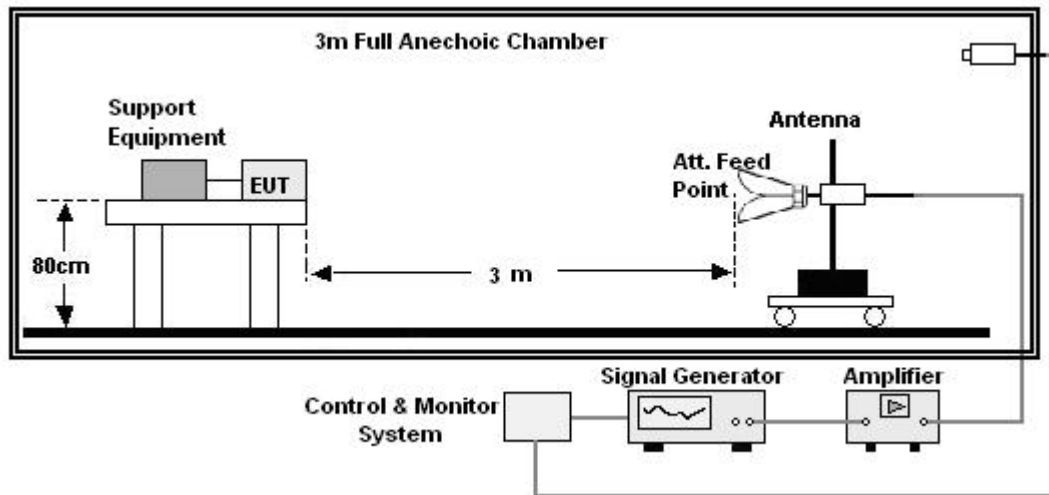
6 - RADIO FREQUENCY ELECTROMAGNETIC FIELDS

6.1 BLOCK DIAGRAM OF TEST SETUP

80-1000MHz:



1000-6000MHz:



6.2 TEST SPECIFICATION

Basic Standard	: IEC 61000-4-3:2020
Test Port	: Enclosure port
Step Size	: 1%
Modulation	: 1kHz, 80% AM
Dwell Time	: 1 second
Polarization	: Horizontal & Vertical



6.3 TEST PROCEDURE

- a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.
- b. The frequency range is swept from 80MHz to 1000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1%.
- c. The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.

6.4 TEST RESULTS

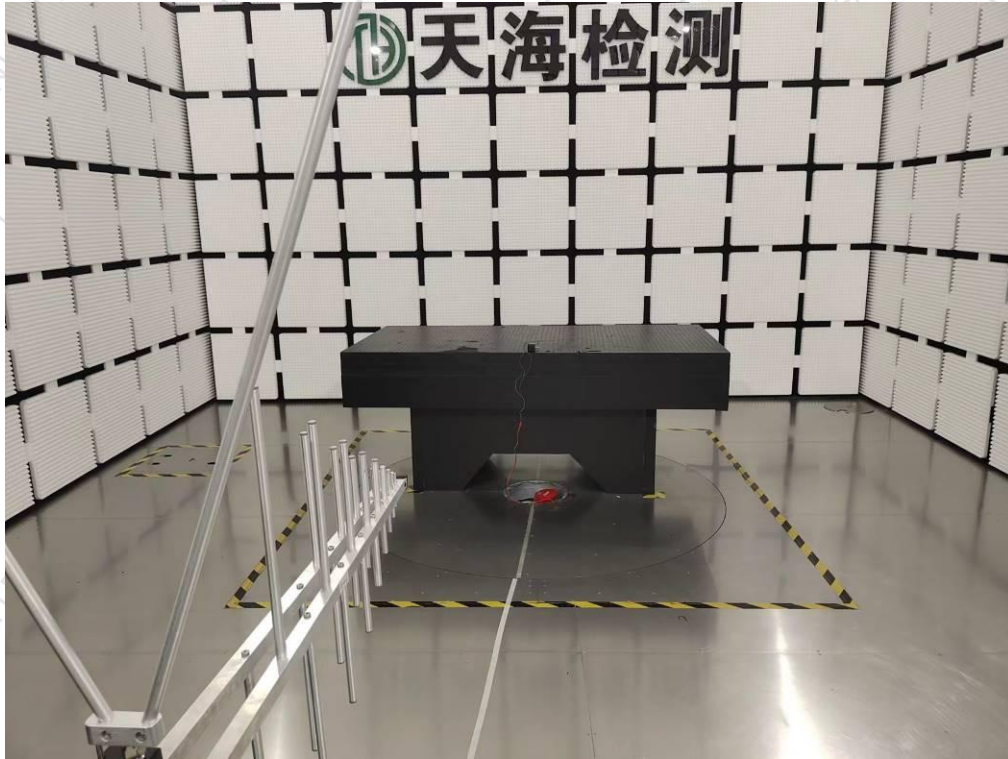
Radio frequency electromagnetic fields	
Basic Standard:	IEC 61000-4-3:2020
EUT:	Stepper Motor Motor(Closed)
M/N:	42A02
Test Voltage:	DC 48V
Test Mode:	ON
Temperature:	24°C
Humidity:	60%
Atmosphere pressure:	101Kpa

Frequency (MHz)	Position	Field Strength (V/m)	Performance Criterion	Result
80 - 1000	Front, Right, Back, Left	3	A	A
1800	Front, Right, Back, Left	3	A	A
2600	Front, Right, Back, Left	3	A	A
3500	Front, Right, Back, Left	3	A	A
5000	Front, Right, Back, Left	3	A	A



APPENDIX A - TEST SETUP PHOTOGRAPHS

Photographs 1: Set-up for Radiated Emission (RE)

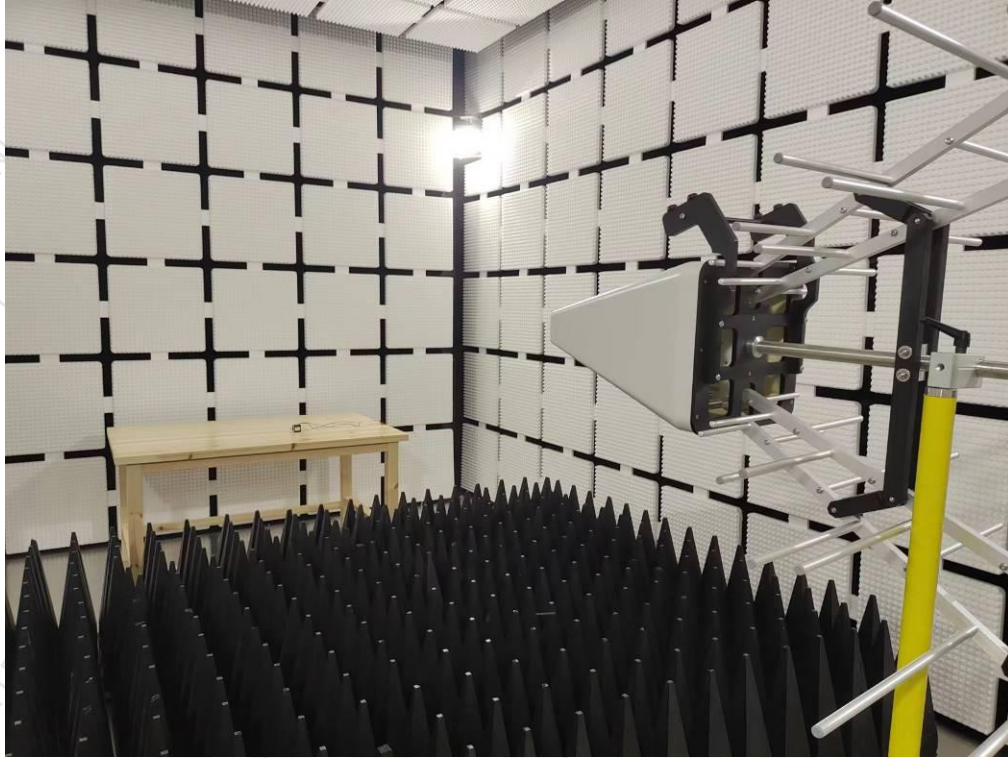


Photographs 2: Set-up for Electrostatic discharge (ESD)





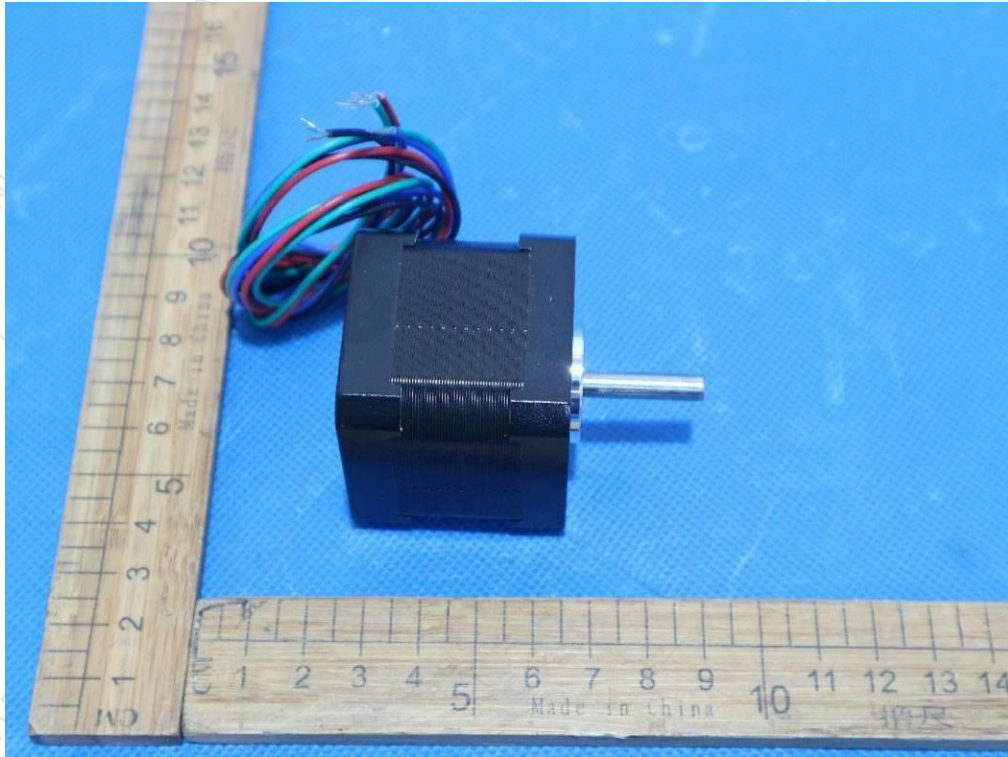
Photographs 3: Radio-frequency, Continuous radiated disturbance (RS)





APPENDIX B - EUT PHOTOGRAPHS





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