

## FCC TEST REPORT

For

NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD.

DC Tubular motor

Model No.: DM28CEQ/S-2/28

FCC ID:VYY-DM28CEQ-S

Prepared for : Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.  
Address : Loutuo Industrial Area, Zhenhai, Ningbo, Zhejiang, China

Prepared by : SHENZHEN EMTEK CO., LTD  
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Report Number : ES151102005E  
Date of Test : October 30, 2015 to November 16, 2015  
Date of Report : November 17, 2015

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## TEST REPORT DESCRIPTION

Applicant : Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.  
Manufacturer : Loutuo Industrial Area, Zhenhai, Ningbo, Zhejiang, China  
Trade Mark : N/A  
EUT : DC Tubular motor  
Model No. : DM28CEQ/S-2/28  
Input Voltage : DC 12V

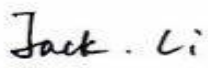
Measurement Procedure Used:


FCC Rules and Regulations Part 15 Subpart B Class B & FCC / ANSI C63.4-2014

The device described above is tested by SHENZHEN EMTEK 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 SHENZHEN EMTEK 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 FCC requirements.

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

Date of Test : October 30, 2015 to November 11, 2015

Prepared by :   
Jack Li/Editor

Reviewer :   
Joe Xia/Supervisor

Approved & Authorized Signer :   
Lisa Wang/Manager

### Modified History

Version	Report No.	Revision date	Summary
Ver.1.0	ES151102005E	\	Original Report

## 1. SUMMARY OF TEST RESULT

<b>Emission</b>		
Description of test item	Standard & Limits	Results
Conducted disturbance at mains terminals	FCC Part15, Subpart B, Class B ANSI C63.4-2014	Pass
Radiated Disturbance	FCC Part15, Subpart B, Class B ANSI C63.4-2014	Pass
Note: N/A is an abbreviation for Not Applicable.		

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

EUT : DC Tubular motor

Model Number : DM28CEQ/S-2/28

Test Voltage : DC 12V (Support Device/AC/DC ADAPTOR: AC 120V/60Hz)

Applicant : Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.

Address : Loutuo Industrial Area, Zhenhai, Ningbo, Zhejiang,China

Manufacturer : Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.

Address : Loutuo Industrial Area, Zhenhai, Ningbo, Zhejiang,China

Date of receiver : October 30, 2015

Date of Test : October 30, 2015 to November 11, 2015

### 2.2. Description of Test Facility

Site Description  
EMC Lab. : Accredited by CNAS, 2013.10.29  
The certificate is valid until 2016.10.28  
The Laboratory has been assessed and proved to be in compliance with  
CNAS/CL01:2006(identical to ISO/IEC17025: 2005)  
The Certificate Registration Number is L2291

Accredited by TUV Rheinland Shenzhen 2010.5.25  
The Laboratory has been assessed according to the requirements ISO/IEC  
17025

Accredited by FCC, April 17, 2014  
The Certificate Registration Number is 406365.

Accredited by Industry Canada, March 5, 2010  
The Certificate Registration Number is 4480A-2.

Name of Firm : SHENZHEN EMTEK CO., LTD  
Site Location : Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen,  
Guangdong, China

### 2.3. Support Device

Item	Equipment	Mfr/Brand	Model/Type No.	Input	Output	Note
1.	AC /DC ADAPTOR	N/A	GM-120200-1	AC 120V 50/60Hz	DC 12V2A	

### 2.4. Measurement Uncertainty

Conducted Emission Uncertainty : 2.8dB

Radiated Emission Uncertainty : 3.3dB (3m Chamber)

### 3. MEASURING DEVICE AND TEST EQUIPMENT

#### 3.1. For Power Line Conducted Emission

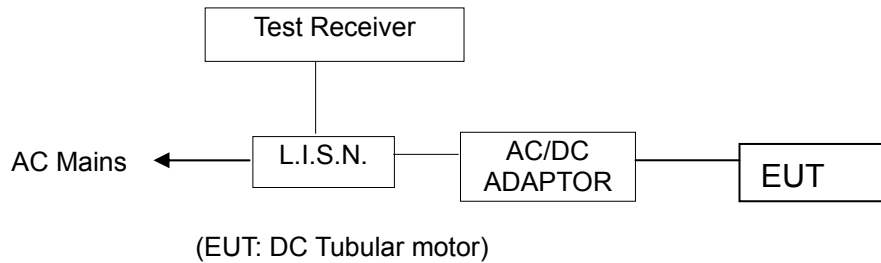
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCS30	101108	05/16/2015	1 Year
2.	L.I.S.N.	Rohde & Schwarz	ENV216	101193	05/16/2015	1 Year
3.	L.I.S.N.	Schwarzbeck	NNLK8129	8126-462	05/16/2015	1 Year
4.	50Ω Coaxial Switch	Anritsu	MP59B	2611115-001-0033	05/16/2015	1 Year
5.	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	38400	05/16/2015	1 Year

#### 3.2. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/16/2015	1 Year
2.	Pre-Amplifier	HP	8447D	2944A07999	05/16/2015	1 Year
3.	Pre-Amplifier	A.H.	PAM-0126	1415261	05/16/2015	1 Year
4.	Bilog Antenna	Schwarzbeck	VULB9163	142	05/16/2015	1 Year
5.	Loop Antenna	Schwarzbeck	FMZB 1519	1519-012	05/16/2015	1 Year
6.	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/16/2015	1 Year
7.	Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/16/2015	1 Year
8.	Cable	Schwarzbeck	AK9513	ACRX1	05/16/2015	1 Year
9.	Cable	Rosenberger	N/A	FP2RX2	05/16/2015	1 Year
10.	Cable	Schwarzbeck	AK9513	CRPX1	05/16/2015	1 Year
11.	Cable	Schwarzbeck	AK9513	CRRX2	05/16/2015	1 Year

## 4. POWER LINE CONDUCTED EMISSION MEASUREMENT

### 4.1. Block Diagram of Test Setup



### 4.2. Measuring Standard

FCC Part15, Subpart B, Class B, ANSI C63.4-2014

### 4.3. Power Line Conducted Emission Limits (Class B)

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.  
NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

### 4.4. EUT Configuration on Measurement

The following equipments are installed on Conducted Emission Measurement to meet FCC requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

EUT : DC Tubular motor  
Model Number : DM28CEQ/S-2/28

### 4.5. Operating Condition of EUT

4.5.1. Turn on the power.

4.5.2. After that, let the EUT work in test mode (Receiving) and measure it.



#### 4.6. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the FCC regulations during conducted emission measurement.

The bandwidth of the test receiver (R&S ESU) is set at 9KHz in 150KHz~30MHz and 200Hz in 9KHz~150KHz.

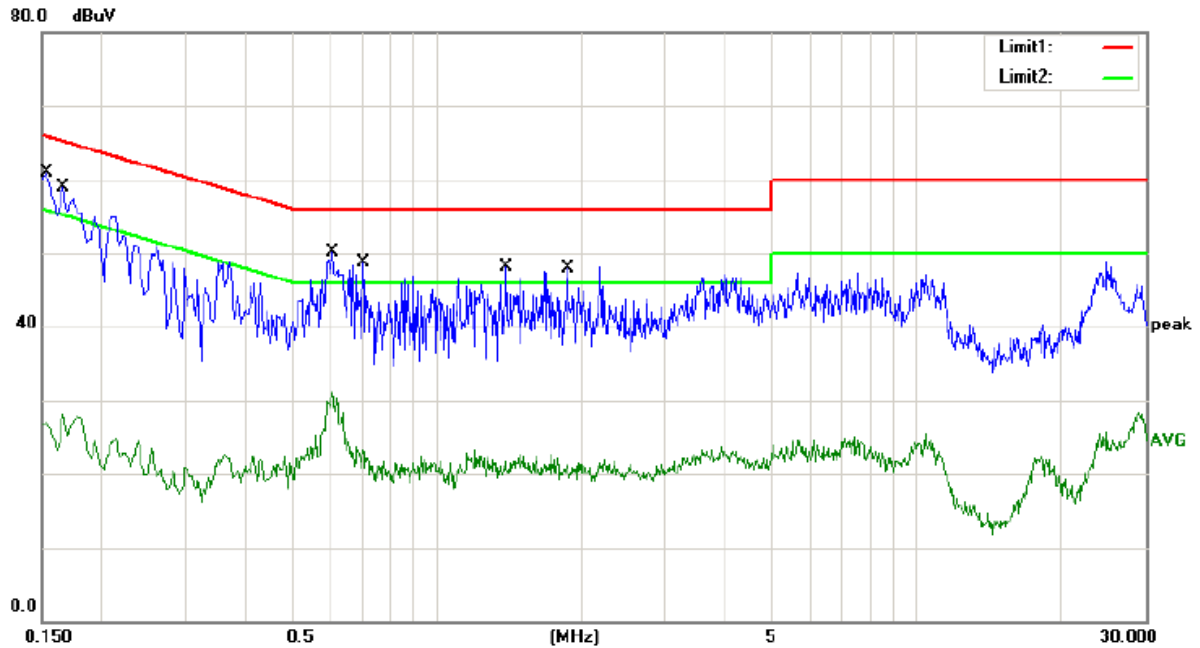
The frequency range from 150kHz to 30MHz is investigated

#### 4.7. Measurement Results

**PASS.**

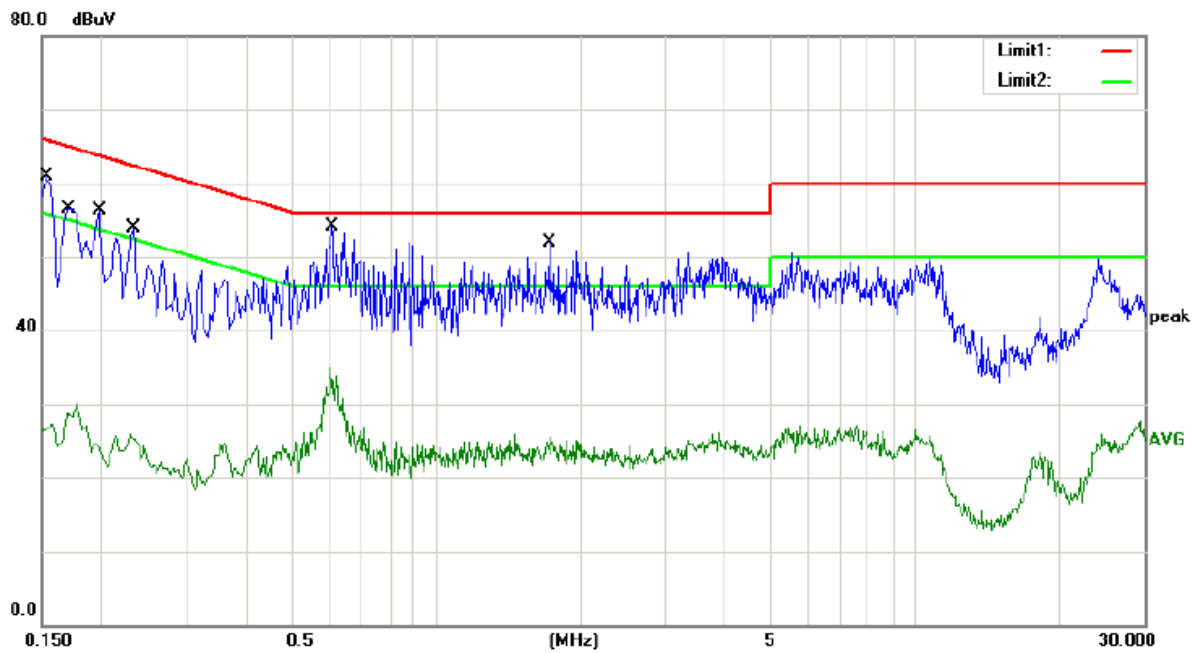
Please refer to the following pages.

### Test Data:



Site site #1 Phase: **L1** Temperature: 22  
 Limit: (CE)FCC PART 15 class B\_QP Power: AC 120V/60Hz Humidity: 50 %  
 EUT: DC Tubular motor  
 M/N: DM28CEQ/S-2/28  
 Mode: Receiving  
 Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV	dB	dBuV	dBuV	dB		
1	*	0.1540	50.00	11.00	61.00	65.78	-4.78	QP	
2		0.1540	16.00	11.00	27.00	55.78	-28.78	AVG	
3		0.1660	47.80	11.00	58.80	65.16	-6.36	QP	
4		0.1660	17.10	11.00	28.10	55.16	-27.06	AVG	
5		0.6060	39.00	11.00	50.00	56.00	-6.00	QP	
6		0.6060	20.10	11.00	31.10	46.00	-14.90	AVG	
7		0.7020	37.70	11.00	48.70	56.00	-7.30	QP	
8		0.7020	12.30	11.00	23.30	46.00	-22.70	AVG	
9		1.4020	37.00	11.00	48.00	56.00	-8.00	QP	
10		1.4020	9.70	11.00	20.70	46.00	-25.30	AVG	
11		1.8740	36.90	11.00	47.90	56.00	-8.10	QP	
12		1.8740	9.70	11.00	20.70	46.00	-25.30	AVG	



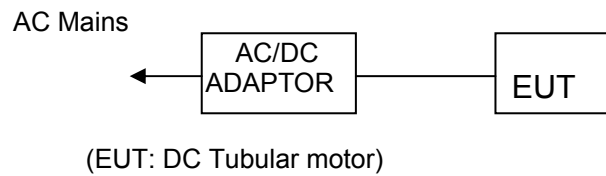
Site site #1	Phase: <b>N</b>	Temperature: 22
Limit: (CE)FCC PART 15 class B_QP	Power: AC 120V/60Hz	Humidity: 50 %
EUT: DC Tubular motor		
M/N: DM28CEQ/S-2/28		
Mode: Receiving		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1540	49.80	11.00	60.80	65.78	-4.98	QP	
2		0.1540	15.60	11.00	26.60	55.78	-29.18	AVG	
3		0.1730	45.50	11.00	56.50	64.82	-8.32	QP	
4		0.1730	17.30	11.00	28.30	54.82	-26.52	AVG	
5		0.1980	45.30	11.00	56.30	63.69	-7.39	QP	
6		0.1980	12.80	11.00	23.80	53.69	-29.89	AVG	
7		0.2340	42.90	11.00	53.90	62.31	-8.41	QP	
8		0.2340	14.20	11.00	25.20	52.31	-27.11	AVG	
9		0.6060	38.50	11.00	49.50	56.00	-6.50	QP	
10		0.6060	22.50	11.00	33.50	46.00	-12.50	AVG	
11	*	1.7220	40.80	11.00	51.80	56.00	-4.20	QP	
12		1.7220	12.30	11.00	23.30	46.00	-22.70	AVG	

## 5. RADIATED EMISSION MEASUREMENT

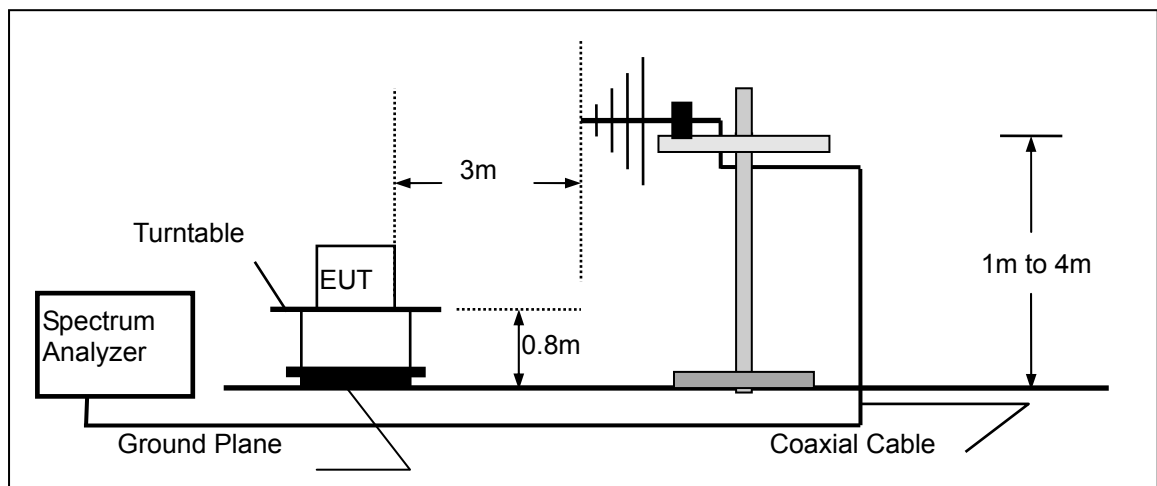
### 5.1. Block Diagram of Test

5.1.1. Block diagram of connection between the EUT and simulators.

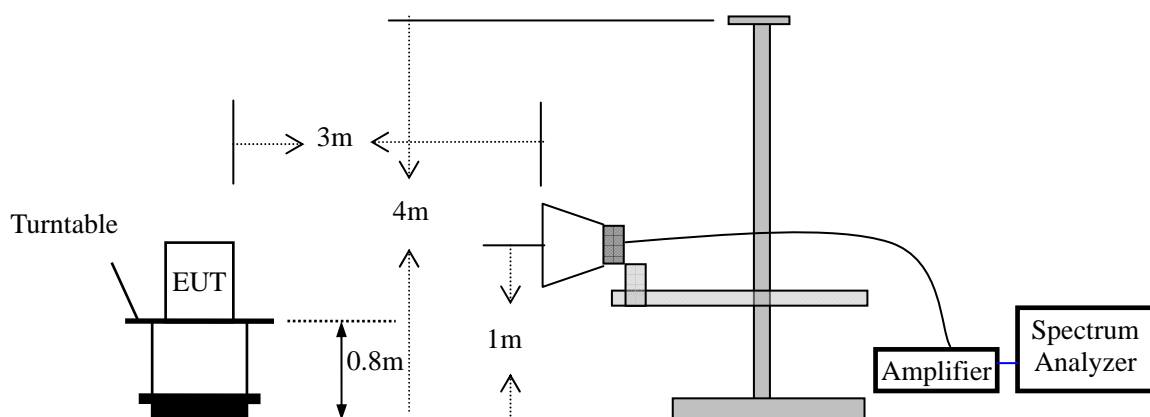


5.1.2. Block diagram of test setup (In chamber)

Below 1GHz



Above 1GHz



## 5.2. Measuring Standard

FCC Part15, Subpart B, Class B ANSI C63.4-2014

## 5.3. Radiated Emission Limits (class B)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0

Remark: (1) Emission level  $(\text{dB})\mu\text{V} = 20 \log$  Emission level  $\mu\text{V}/\text{m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

## 5.4. EUT Configuration on Test

The FCC Class B regulations test method must be used to find the maximum emission during radiated emission measurement.

## 5.5. Operating Condition of EUT

5.5.1. Turn on the power.

5.5.2. After that, let the EUT work in test mode (Receiving) and measure it.

## 5.6. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table 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. Bilog antenna (calibrated by Dipole Antenna) and horn antenna are used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector (RBW=100kHz, VBW=300kHz) and all final readings of measurement from Test Receiver are Quasi-Peak values (Quasi Peak detector used with a bandwidth of 120 kHz).

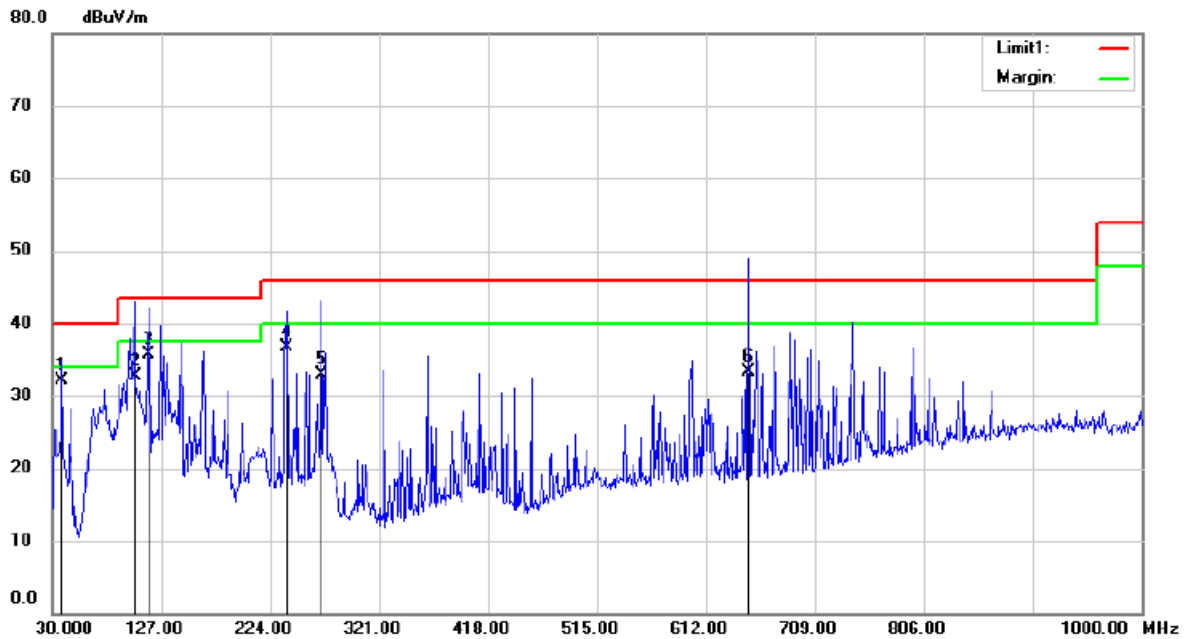
The frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

## 5.7. Measuring Results

**PASS.**

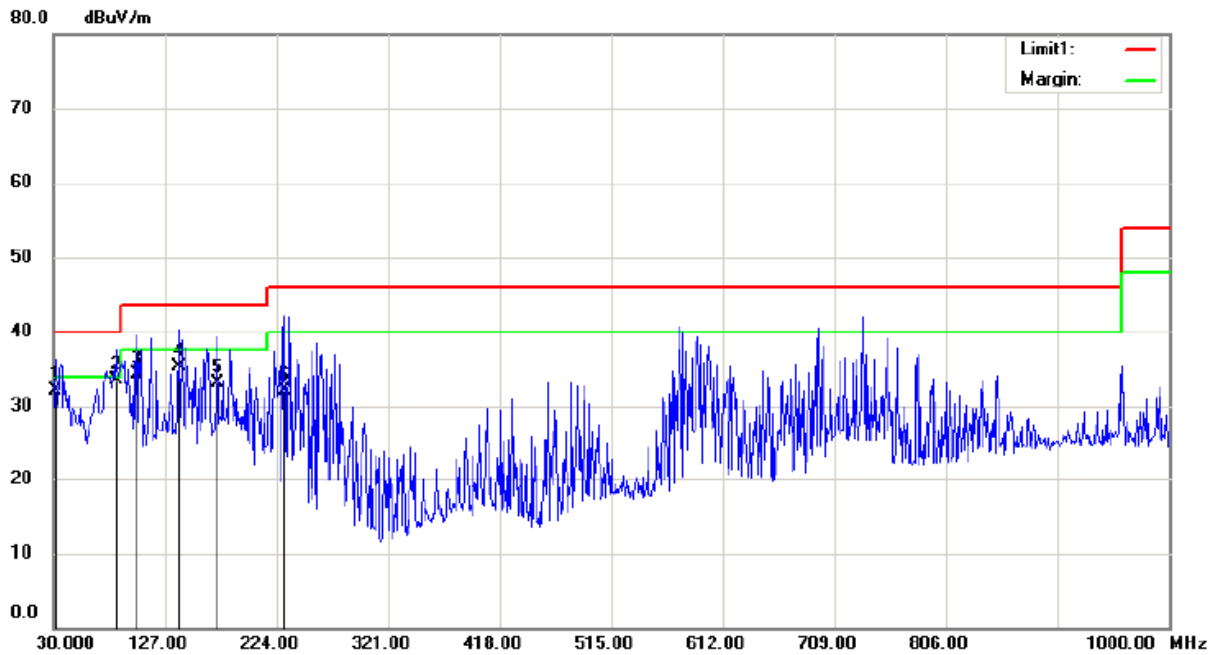
Please refer to the following pages.

## Below 1000MHz (30M-1GHz)



Site: 3m Chamber #3      Polarization: **Horizontal**      Temperature: 24 C  
 Limit: (RE)FCC PART 15 CLASS B      Power: AC 120V/60Hz      Humidity: 53 %  
 EUT: DC Tubular motor  
 M/N: DM28CEQ/S-2/28  
 Mode:Receiving  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Detector	Comment
1		38.7300	45.43	-13.33	32.10	40.00	-7.90			QP	
2		103.7200	46.87	-14.07	32.80	43.50	-10.70			QP	
3	*	115.3600	51.06	-15.36	35.70	43.50	-7.80			QP	
4		238.5500	50.72	-14.02	36.70	46.00	-9.30			QP	
5		269.5900	45.59	-12.69	32.90	46.00	-13.10			QP	
6		649.8300	39.89	-6.49	33.40	46.00	-12.60			QP	



Site site #1 Polarization: **Vertical** Temperature: 24 C  
 Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %  
 EUT: DC Tubular motor  
 M/N: DM28CEQ/S-2/28  
 Mode:Receiving  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		31.9400	48.01	-15.81	32.20	40.00	-7.80	QP			
2	*	84.3200	52.13	-18.63	33.50	40.00	-6.50	QP			
3		102.7500	48.45	-14.05	34.40	43.50	-9.10	QP			
4		138.6400	53.00	-17.70	35.30	43.50	-8.20	QP			
5		172.5900	52.51	-19.31	33.20	43.50	-10.30	QP			
6		230.7900	47.10	-15.00	32.10	46.00	-13.90	QP			

**Above 1000MHz:**

Test Date :	11/16/2015	Temperature :	23 °C
Test Result:	PASS	Humidity :	52 %
Test By:	KK		

Mode: Receiving							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
1276.500	V	38.65	28.50	74.00	54.00	-35.35	-25.50
2039.500	V	39.68	29.60	74.00	54.00	-34.32	-24.40
2354.500	V	40.28	29.80	74.00	54.00	-33.72	-24.20
2708.000	V	40.81	30.50	74.00	54.00	-33.19	-23.50
3184.000	V	39.41	28.90	74.00	54.00	-34.59	-25.10
3457.000	V	40.31	30.10	74.00	54.00	-33.69	-23.90
1311.500	H	39.24	28.60	74.00	54.00	-34.76	-25.40
1542.500	H	39.18	27.60	74.00	54.00	-34.82	-26.40
2319.500	H	39.86	26.90	74.00	54.00	-34.14	-27.10
3002.000	H	40.66	30.50	74.00	54.00	-33.34	-23.50
3691.500	H	39.70	29.80	74.00	54.00	-34.30	-24.20
4129.000	H	41.94	31.20	74.00	54.00	-32.06	-22.80

---The End---

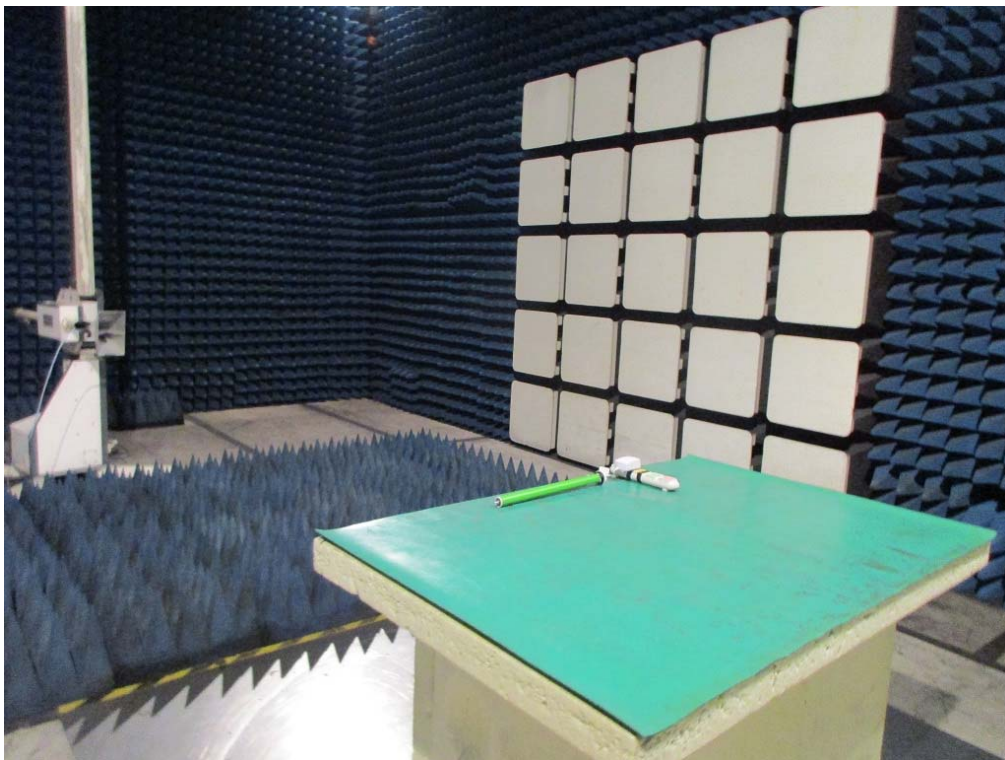
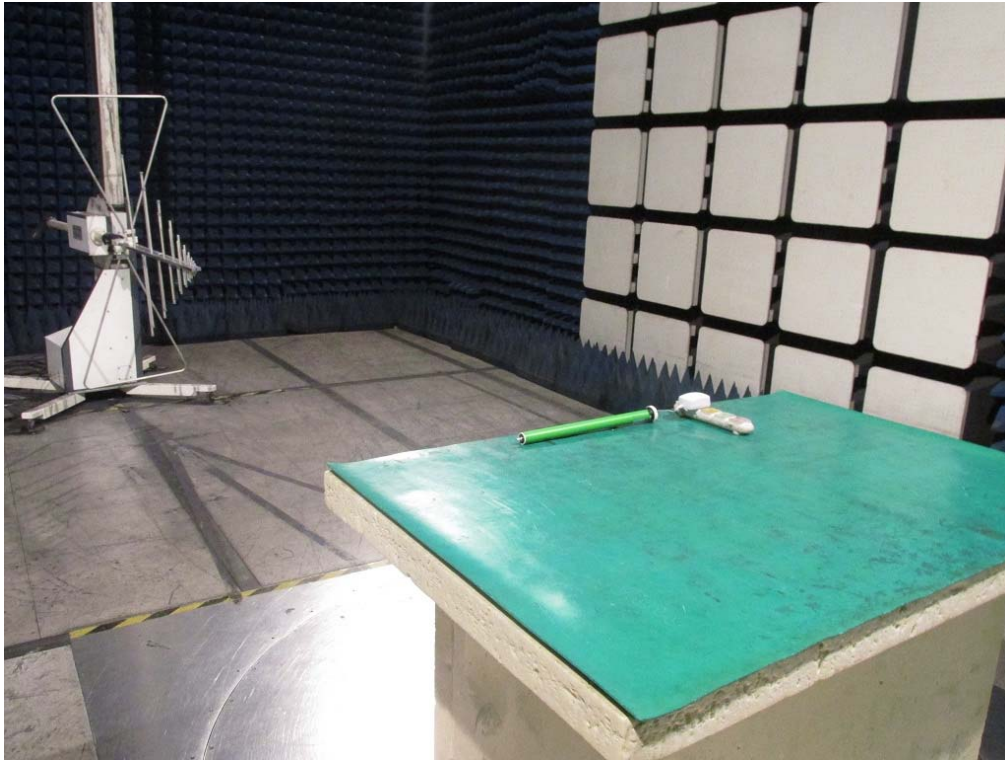


## 6.PHOTOGRAPH OF TEST

### 6.1Photo of Conducted Emission Measurement

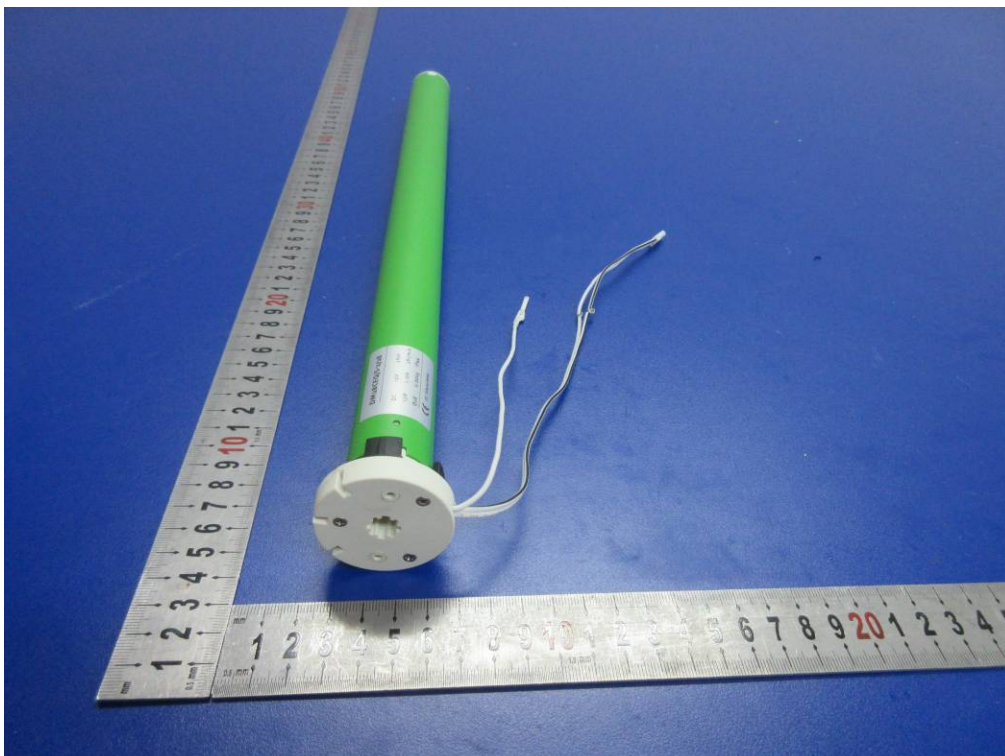


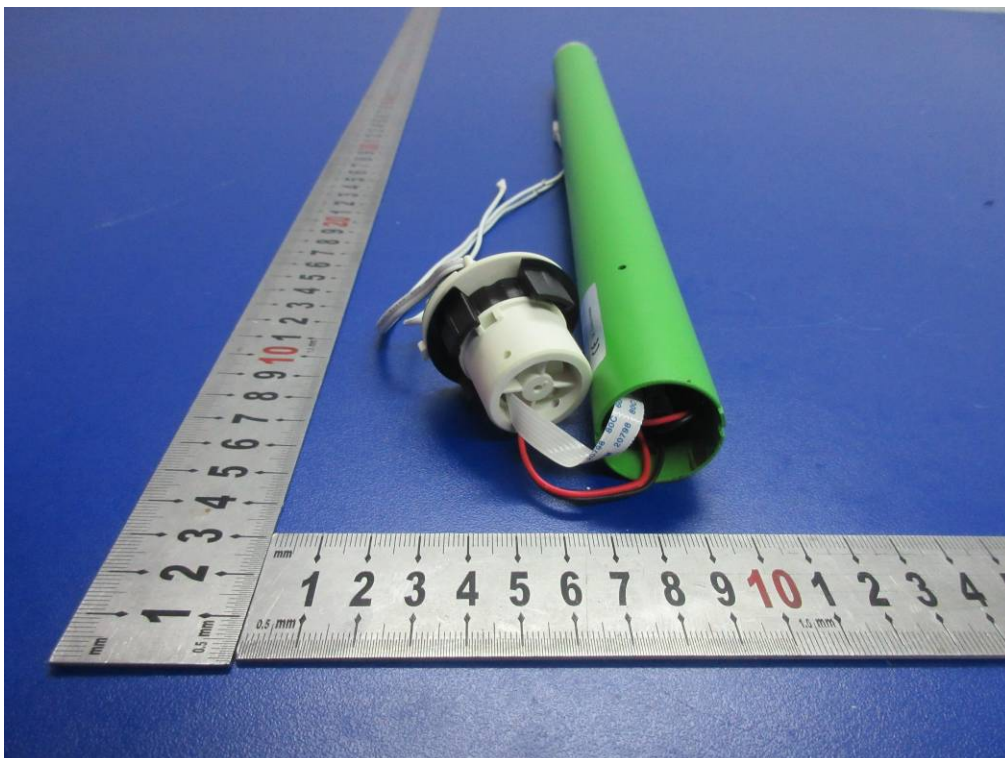
6.2 Photo of Radiation Emission Measurement



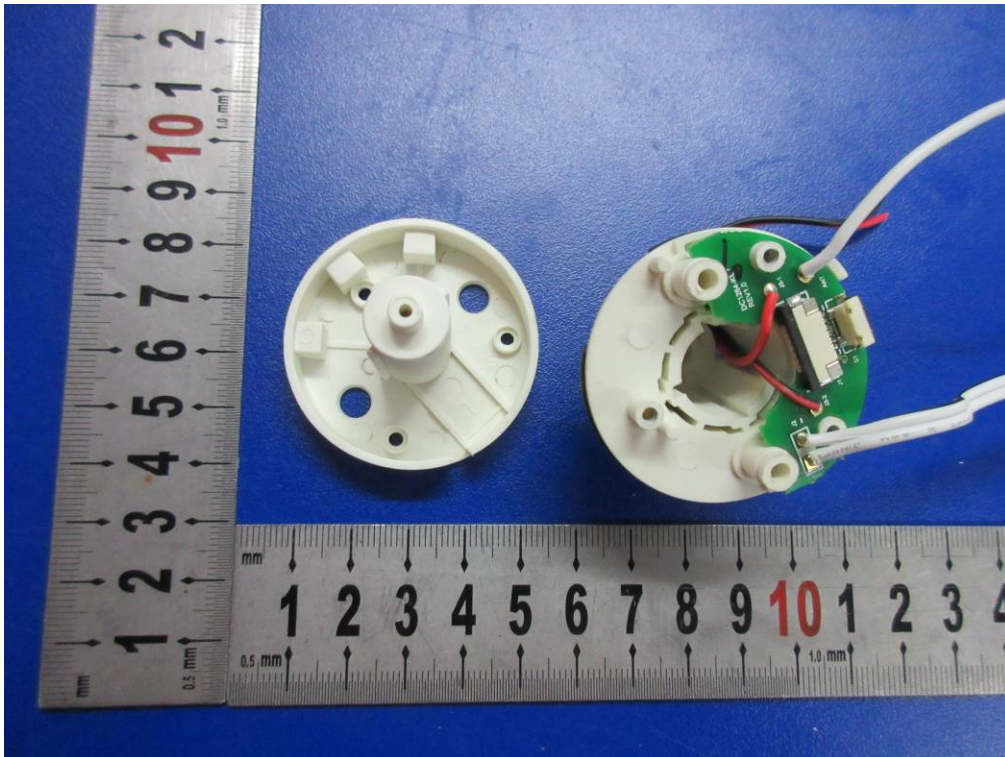


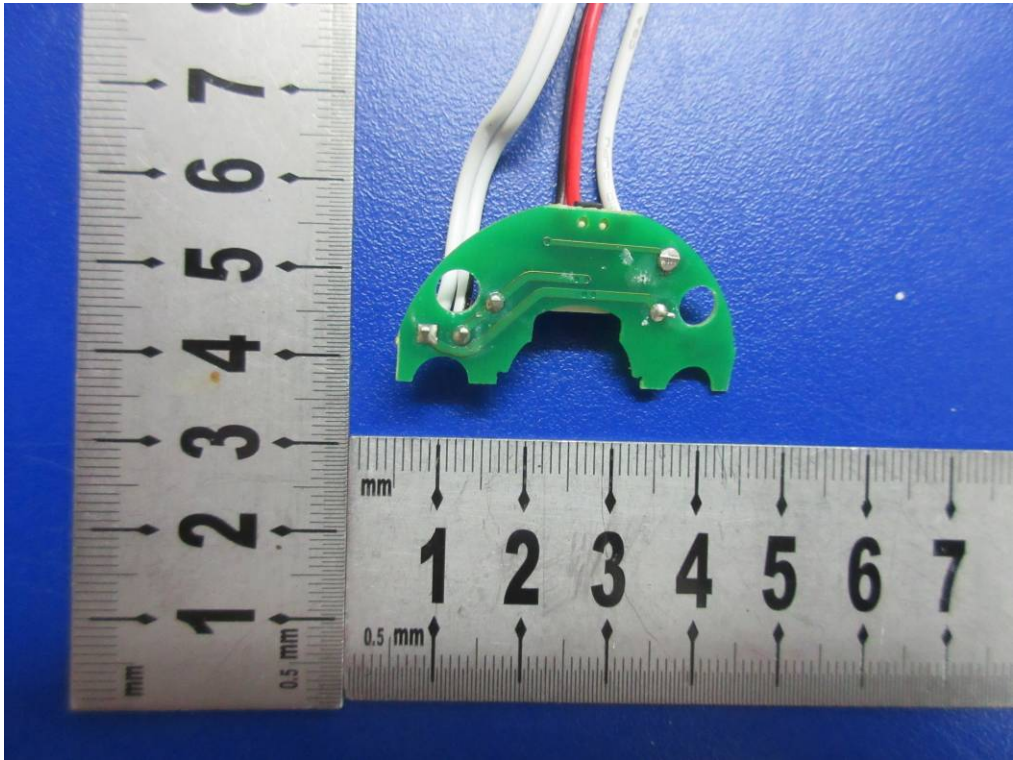
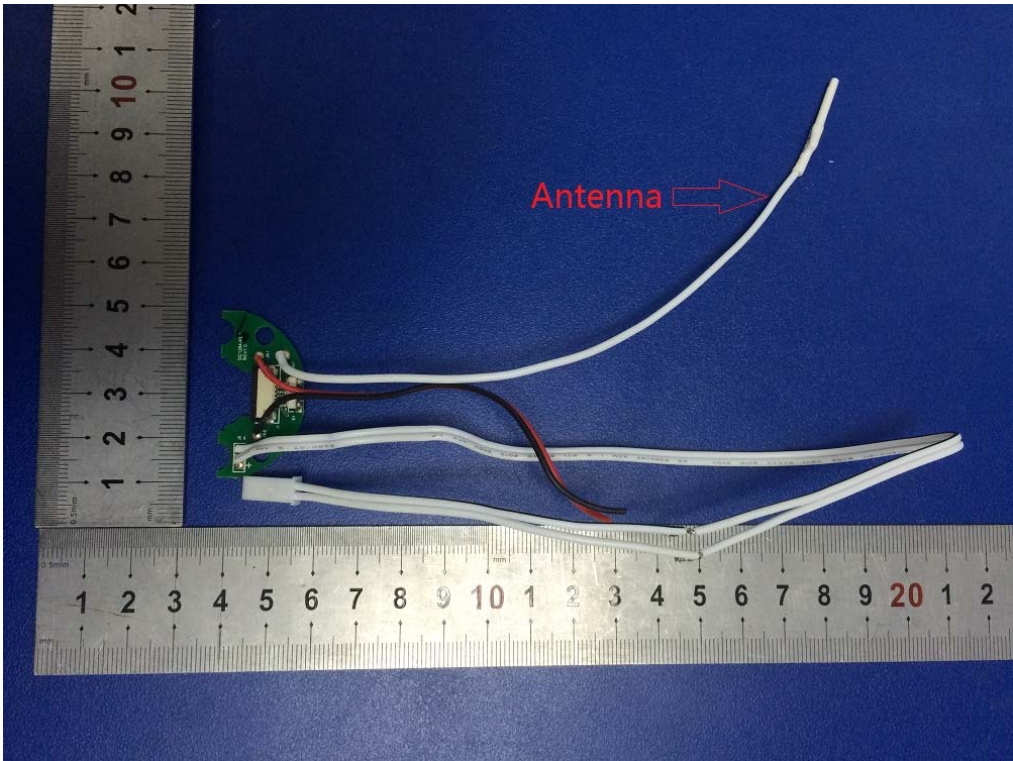
# APPENDIX I (Photos of EUT)



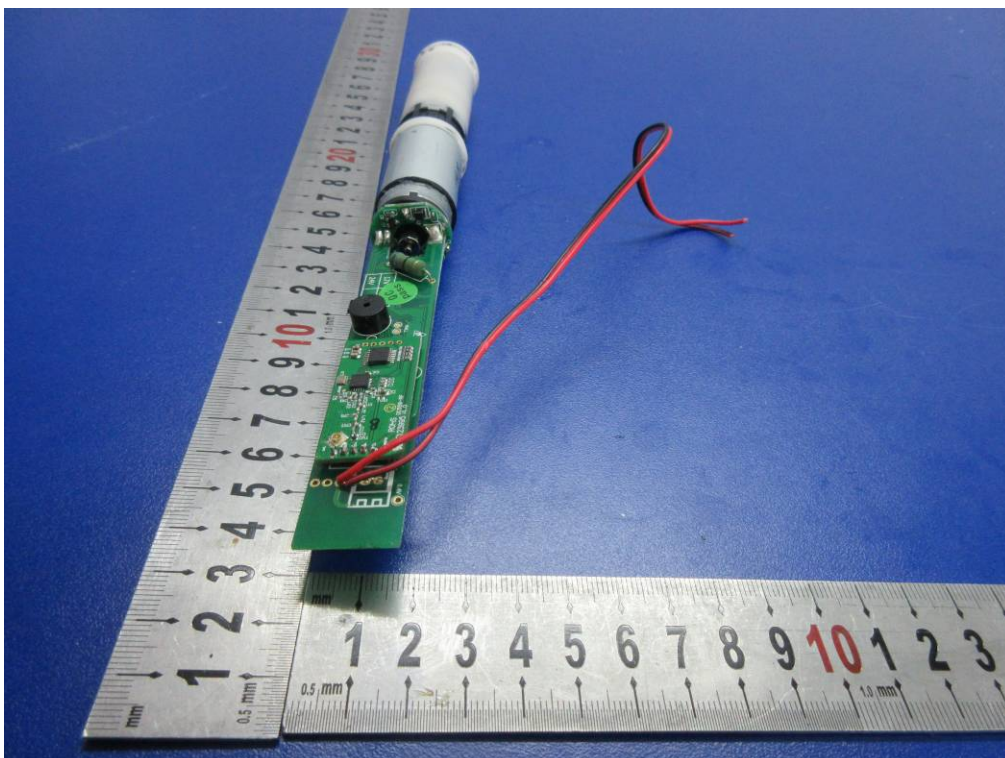


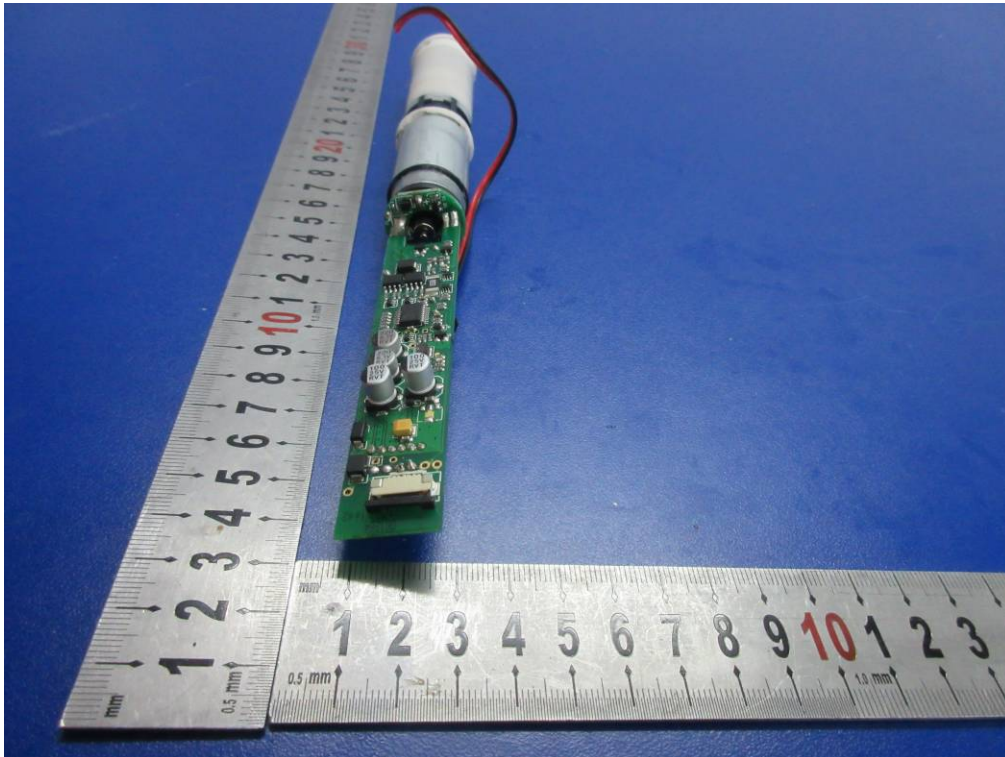












---The End---