TCT 通测检测 TESTING CENTRE TECHNOLOGY

EMC TEST REPORT

Radio Frequency Devices - Unintentional Radiators

Test Report No. .....:	TCT211130E018	
Date of issue .....:	Jan. 06, 2022	
Testing laboratory.....:	SHENZHEN TONGCE TESTING LAB	
Testing location/ address.....:	TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China	
Applicant's name .....:	NEMO POWER TOOLS LIMITED	
Address.....:	21st Floor, CMA Building 64 Connaught Road Central Hong Kong, PRC	
Manufacturer's name .....:	Nemo Power Tools (Huizhou) Co., Ltd.	
Address.....:	2/F, 4th Industrial Area, Luokeng Village, Xiaotie, Zone, Xiaojinkou Town, Huicheng District, Huizhou City, Guangdong Province, China, 516023	
Standard(s) .....:	FCC 47 CFR Part 15 Subpart B	
Test item description.....:	Nemo GRABO	
Trade Mark.....:	GRABO	
Model/Type reference .....:	NG-1B-FB-1S, NG-2B-FB-2S, NG-14.8-2Li	
Rating(s) .....:	Power Supply Model: XVE024-1680140 Power Supply Input: AC 100-240 V, 50/ 60 Hz, 0.7 A Max Power Supply Output: DC 16.8 V, 1.4 A	
Date of receipt of test item.....:	Nov. 30, 2021	
Date (s) of performance of test:	Nov. 30, 2021 ~ Jan. 06, 2022	
Tested by (+signature).....:	Kyle ZHOU	Kyle Zhou
Check by (+signature) .....:	Howie LYU	Howie Lyu
Approved by (+signature) .....:	Tomsin	Tomsin

SHENZHEN TONGCE TESTING LAB TCT

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Hotline: 400-6611-140 **Tel: 86-755-27673339** **Fax: 86-755-27673332** **http://www.tct-lab.com**

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. General Product Information

1.1.EUT description

Test item description ..... :	Nemo GRABO
Model/Type reference ..... :	NG-1B-FB-1S
Rating(s) ..... :	Power Supply Model: XVE024-1680140 Power Supply Input: AC 100-240 V, 50/ 60 Hz, 0.7 A Max Power Supply Output: DC 16.8 V, 1.4 A
Highest internal frequency F_x..... :	☒ *Fx* ≤ 108 MHz ☐ 108 MHz < *Fx* ≤ 500 MHz ☐ 500 MHz < *Fx* ≤ 1 GHz ☐ *Fx* > 1 GHz_
DC Line ..... :	☐Shielded ☒Unshielded ☒Detachable ☐Un-detachable ☐No applicable ☒Length: 1.5 m
AC Line ..... :	☐Shielded ☐Unshielded ☐Detachable ☐Un-detachable ☒No applicable ☐Length:

1.2.Model(s) list

No.	Model No.	Tested with
1	NG-1B-FB-1S	☒
Other models	NG-2B-FB-2S, NG-14.8-2Li	☐
Note: NG-1B-FB-1S is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names, and the number of batteries, sealing rings and cloth bags. So the test data of NG-1B-FB-1S can represent the remaining models.		

2. Test Information

2.1.EUT operation mode(s)

Mode #	Operating mode description	Test voltage
1	Charging	AC 120 V/ 60 Hz
2	Working	DC 14.8 V

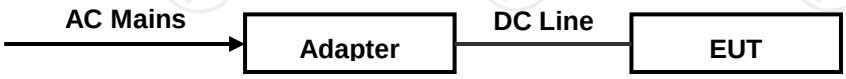
Test worst operating mode	
Radiated emission	Mode 1
Remark: The worst measurement data and graphical presentation show in this report.	

2.2.Special accessories and auxiliary equipment

Product Type	Manufacturer	Model No.	Serial No.
/	/	/	/

2.3.Configuration of system under test

Mode 1



Mode 2

(EUT: Nemo GRABO)

2.4.General test conditions

Environmental reference conditions

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment.

The climatic conditions during the tests were within the following limits:

Temperature	Humidity	Atmospheric pressure
15 °C – 35 °C	30 % - 60 %	86 kPa – 106 kPa

If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.

Measurement uncertainties

Test Item	Uncertainty
Uncertainty for Disturbance voltage at the mains terminals	3.10 dB
Uncertainty for Radiated emission (30 MHz to 1 GHz)	4.56 dB
Uncertainty for Radiated emission (above 1 GHz)	4.22 dB

The overall measurement uncertainty of a measurement is defined as the range of which can be supposed that it contains the true value with a specified probability.

This probability is 95 % for the generally specified measurement uncertainty (so-called expanded measurement uncertainty).

The limits for emission measurements and the Test levels for immunity tests in the applied standards were defined taking into consideration the accuracy limits for measurement and testing equipment required by the Basic standards.

All measurement and test results of the EMC laboratory of SHENZHEN TONGCE TESTING LABfulfil the requirements for measurement uncertainties according to the standards applied.

Decision rule for statement(s) of conformity is based on accuracy method specified in Clause 4.4.3 in IEC Guide 115:2021.

3. Test Result Summary

FCC 47 CFR Part 15 Subpart B	
Requirement – Test case	**Verdict**
Classification Class (☐A ☒B)	—
Disturbance voltage at the mains terminals	Pass
Radiated emission	Pass
Remark:---	

Test case verdicts	
- Test case does not apply to the test object ..... :	N/A
- Test object does meet the requirement ..... :	P (Pass)
- Test object does not meet the requirement ..... :	F (Fail)

4. List of Test Equipment

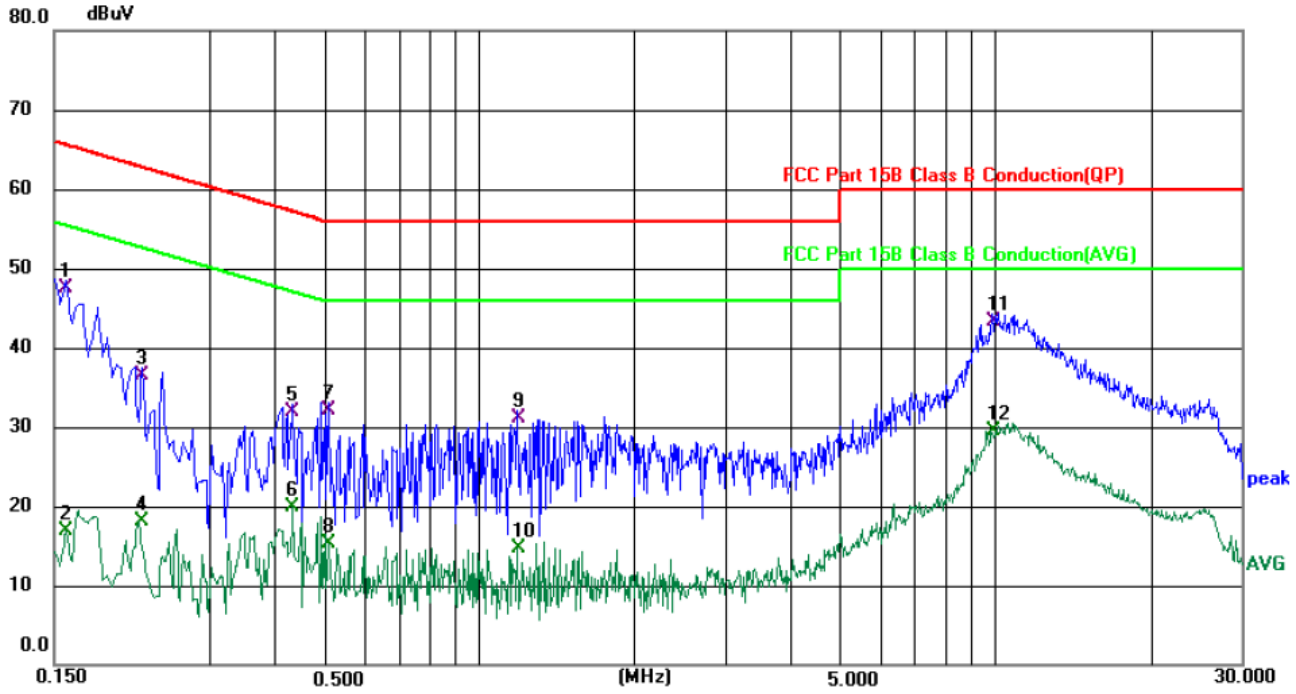
Equipment	Manufacturer	Model No.	Serial No.	Cal. Due
Disturbance voltage at mains terminals				
EMI Test Receiver	R&S	ESCI3	100898	2022/07/07
LISN	Schwarzbeck	NSLK 8126	8126453	2022/03/11
Attenuator	N/A	10 dB	164080	2022/07/07
Radiated emission (30 MHz to 1 GHz)				
Broadband Antenna	Schwarzbeck	VULB9163	340	2022/09/04
EMI Test Receiver	R&S	ESIB7	100197	2022/07/07
Pre-amplifier	HP	8447D	2727A05017	2022/07/07
Radiated emission (above 1 GHz)				
Horn Antenna	Schwarzbeck	BBHA 9120 D	02372	2023/03/06
EMI Test Receiver	R&S	ESIB7	100197	2022/07/07
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012102	2022/03/11

5. Test Conditions and Results

5.1.Disturbance voltage at mains terminals

Test requirement.....:	FCC 47 CFR Part 15 Subpart B		
Basic standard .....:	ANSI C63.4: 2014		
Test frequency range.:	150 kHz to 30 MHz		
Limits.....:	**Limits for Class A**		
	Frequency (MHz)	**dBµV Quasi-peak**	**dBµV Average**
	0.15 to 0.5	79	66
	0.5 to 30	73	60
	Limits for Class B		
	Frequency (MHz)	**dBµV Quasi-peak**	**dBµV Average**
	0.15 to 0.5	66 to 56	56 to 46
	0.5 to 5	56	46
	5 to 30	60	50
Test method.....:	The AMN placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN).		
Ambient temperature.:	19.4 °C		
Relative humidity.....:	46 %		
Test location .....:	TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China		
Test model(s) .....:	NG-1B-FB-1S		
EUT operation mode..:	Mode 1		
Test results .....:	Pass		
Remark.....:	/		

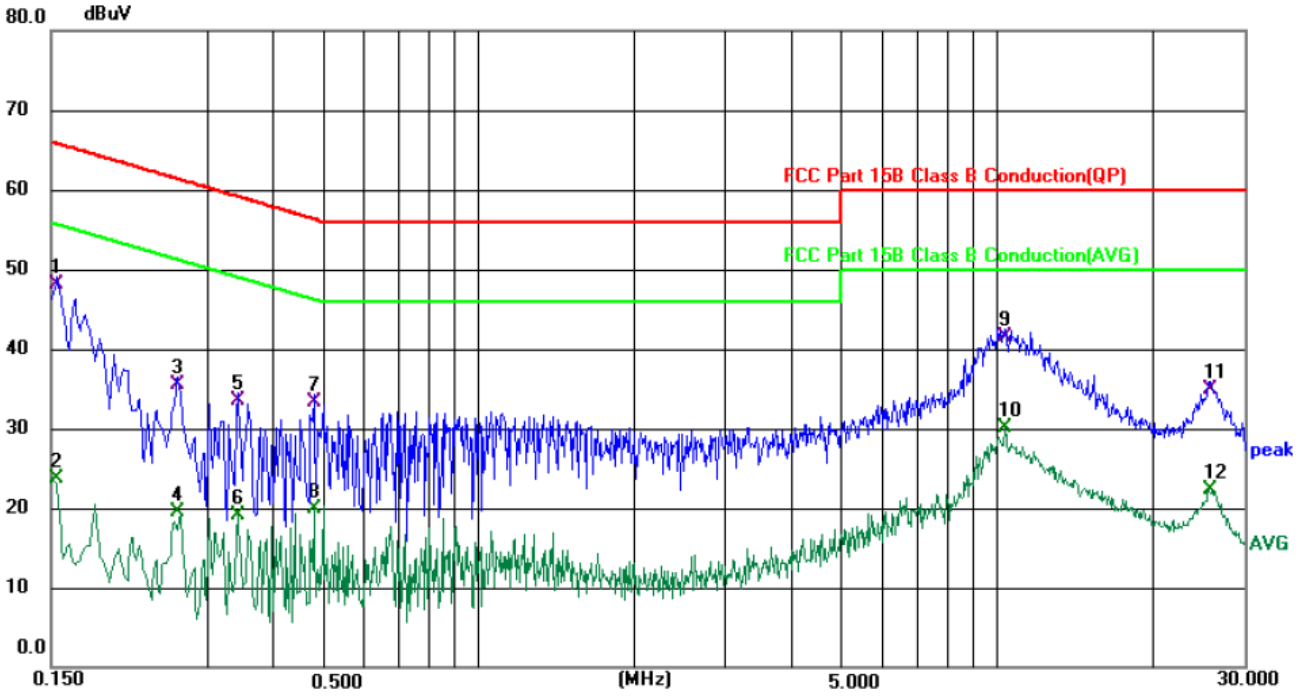
Measurement data and Graphical presentation of the result



Site 844 Shielding Room Phase: *L1* Temperature: 19.4 (℃) Humidity: 46 %

Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120 V/60 Hz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1580	37.81	9.60	47.41	65.57	-18.16	QP	
2		0.1580	7.37	9.60	16.97	55.57	-38.60	AVG	
3		0.2220	27.22	9.37	36.59	62.74	-26.15	QP	
4		0.2220	8.65	9.37	18.02	52.74	-34.72	AVG	
5		0.4339	22.69	9.22	31.91	57.18	-25.27	QP	
6		0.4339	10.59	9.22	19.81	47.18	-27.37	AVG	
7		0.5100	22.84	9.20	32.04	56.00	-23.96	QP	
8		0.5100	6.01	9.20	15.21	46.00	-30.79	AVG	
9		1.1859	21.79	9.35	31.14	56.00	-24.86	QP	
10		1.1859	5.37	9.35	14.72	46.00	-31.28	AVG	
11	*	9.8979	33.76	9.61	43.37	60.00	-16.63	QP	
12		9.8979	19.89	9.61	29.50	50.00	-20.50	AVG	



Site 844 Shielding Room Phase: *N* Temperature: 19.4 (℃) Humidity: 46 %

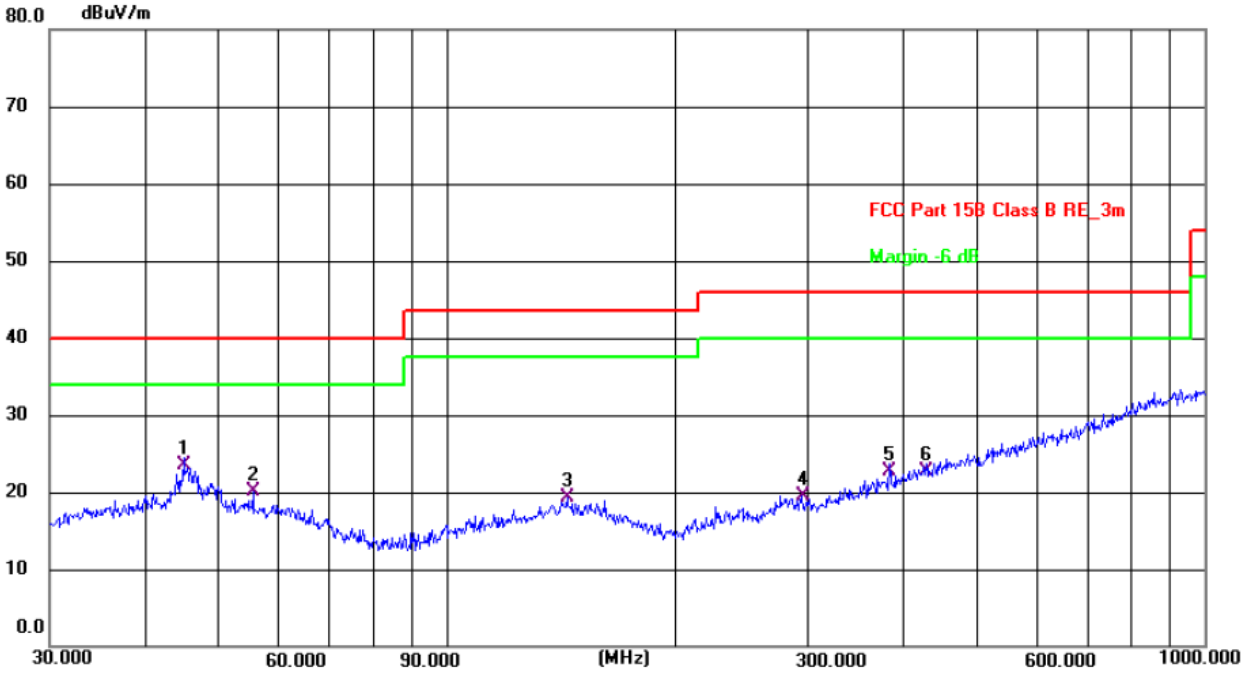
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120 V/60 Hz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1539	38.43	9.60	48.03	65.79	-17.76	QP	
2		0.1539	14.04	9.60	23.64	55.79	-32.15	AVG	
3		0.2620	26.22	9.34	35.56	61.37	-25.81	QP	
4		0.2620	10.09	9.34	19.43	51.37	-31.94	AVG	
5		0.3420	24.24	9.31	33.55	59.15	-25.60	QP	
6		0.3420	9.79	9.31	19.10	49.15	-30.05	AVG	
7		0.4819	23.99	9.23	33.22	56.31	-23.09	QP	
8		0.4819	10.76	9.23	19.99	46.31	-26.32	AVG	
9		10.3500	31.93	9.62	41.55	60.00	-18.45	QP	
10		10.3500	20.44	9.62	30.06	50.00	-19.94	AVG	
11		25.7259	25.16	9.83	34.99	60.00	-25.01	QP	
12		25.7259	12.41	9.83	22.24	50.00	-27.76	AVG	

5.2.Radiated emission

<table>
<tr><td>Test requirement.....:</td><td colspan="5">FCC 47 CFR Part 15 Subpart B</td></tr>
<tr><td>Basic standard .....:</td><td colspan="5">ANSI C63.4: 2014</td></tr>
<tr><td>Test frequency range.:</td><td colspan="5">30 MHz to 40 GHz</td></tr>
<tr><td rowspan="9">Limits.....:</td><td rowspan="3">Frequency (MHz)</td><td colspan="4">3 m measurement distance</td></tr>
<tr><td colspan="4">Quasi-peak (dBµV/m)</td></tr>
<tr><td colspan="2">Class A</td><td colspan="2">Class B</td></tr>
<tr><td>30 to 88</td><td colspan="2">49</td><td colspan="2">40</td></tr>
<tr><td>88 to 216</td><td colspan="2">53.5</td><td colspan="2">43.5</td></tr>
<tr><td>216 to 960</td><td colspan="2">56.4</td><td colspan="2">46</td></tr>
<tr><td>960 to 1000</td><td colspan="2">59.5</td><td colspan="2">54</td></tr>
<tr><td rowspan="3">Frequency (MHz)</td><td colspan="4">3 m measurement distance</td></tr>
<tr><td colspan="2">Class A</td><td colspan="2">Class B</td></tr>
<tr><td>Peak (dBµV/m)</td><td>Average (dBµV/m)</td><td>Peak (dBµV/m)</td><td>Average (dBµV/m)</td></tr>
<tr><td>Above 1000</td><td>79.5</td><td>59.5</td><td>74</td><td>54</td></tr>
<tr><td>Test method.....:</td><td colspan="5">Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meters with the receive antenna located at 1 to 4-meter height in both horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.</td></tr>
<tr><td>Ambient temperature.:</td><td colspan="5">24.9 °C</td></tr>
<tr><td>Relative humidity.....:</td><td colspan="5">51 %</td></tr>
<tr><td>Test location.....:</td><td colspan="5">TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao’an District Shenzhen, Guangdong, 518103, People’s Republic of China</td></tr>
<tr><td>Test model(s) .....:</td><td colspan="5">NG-1B-FB-1S</td></tr>
<tr><td>EUT operation mode..:</td><td colspan="5">Mode 1</td></tr>
<tr><td>Test results .....:</td><td colspan="5">Pass</td></tr>
<tr><td>Remark.....:</td><td colspan="5">/</td></tr>
</table>

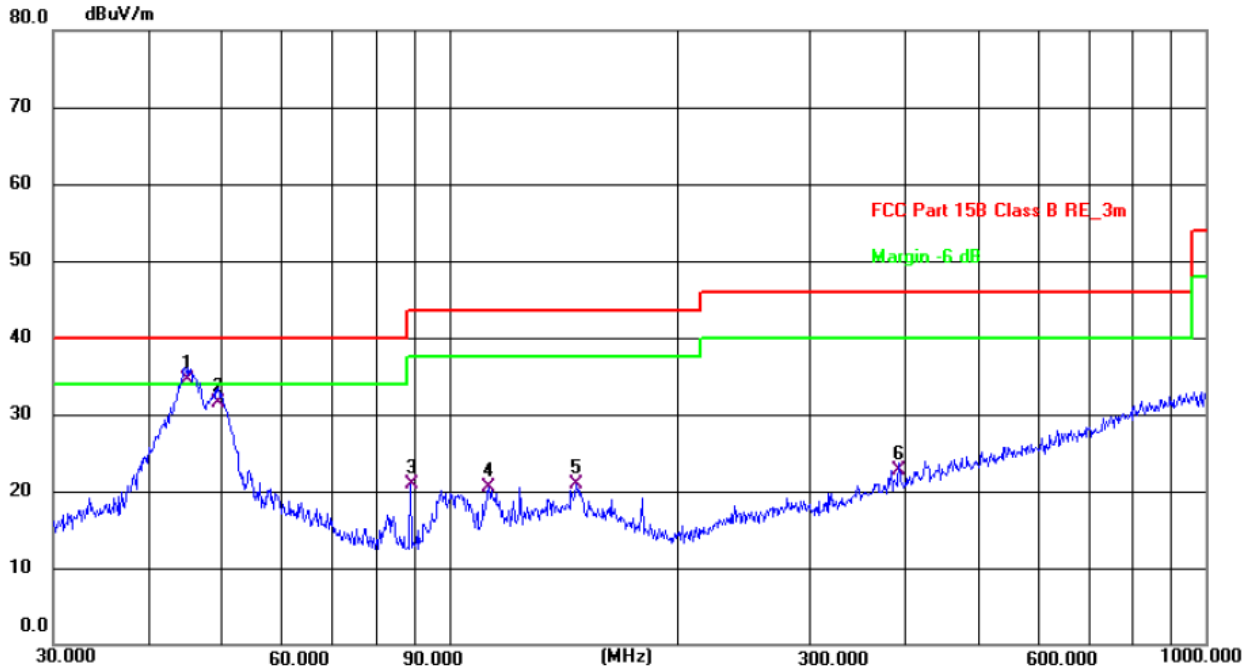
Measurement data and Graphical presentation of the result



Site #2 3m Anechoic Chamber Polarization: *Horizontal* Temperature: 24.9(C) Humidity: 51 %

Limit: FCC Part 15B Class B RE_3m Power: AC 120 V/60 Hz

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	45.0583	9.61	13.89	23.50	40.00	-16.50	QP	P	
2	55.6094	6.74	13.42	20.16	40.00	-19.84	QP	P	
3	144.3348	6.11	13.28	19.39	43.50	-24.11	QP	P	
4	294.1137	5.60	13.87	19.47	46.00	-26.53	QP	P	
5	383.9318	6.01	16.69	22.70	46.00	-23.30	QP	P	
6	429.5228	4.91	17.89	22.80	46.00	-23.20	QP	P	



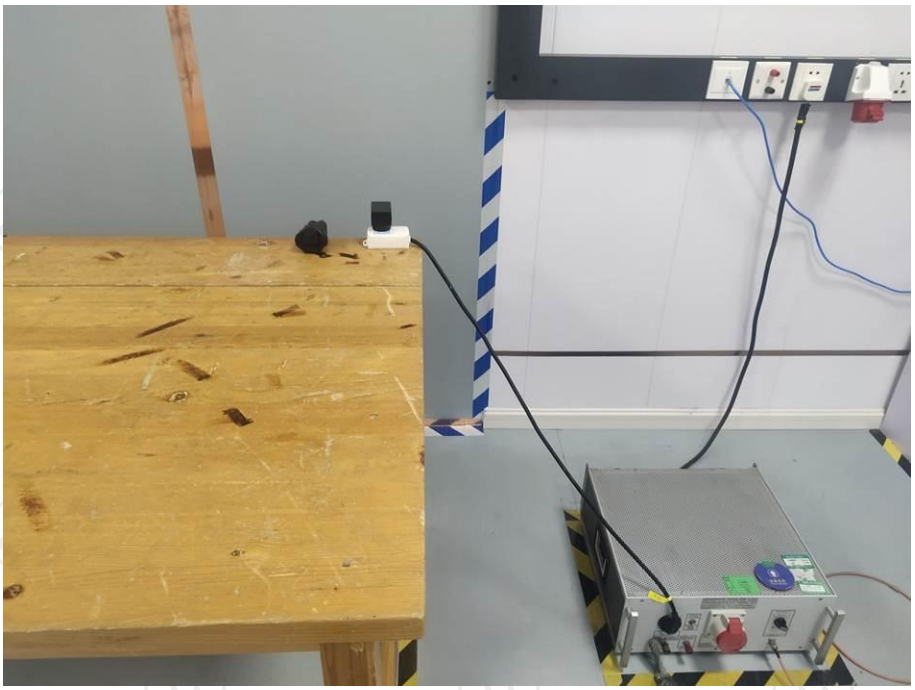
Site #2 3m Anechoic Chamber Polarization: *Vertical* Temperature: 24.9(C) Humidity: 51 %

Limit: FCC Part 15B Class B RE_3m Power: AC 120 V/60 Hz

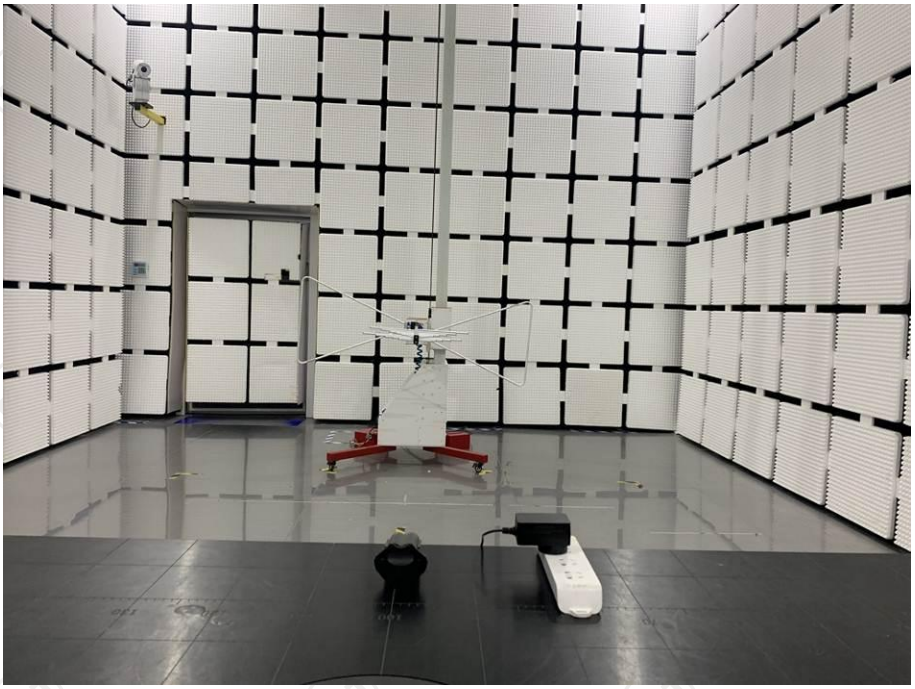
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	45.0583	20.61	13.89	34.50	40.00	-5.50	QP	P	
2	49.5328	17.82	13.78	31.60	40.00	-8.40	QP	P	
3	88.9639	11.56	9.25	20.81	43.50	-22.69	QP	P	
4	112.9196	9.13	11.40	20.53	43.50	-22.97	QP	P	
5	147.4036	7.51	13.31	20.82	43.50	-22.68	QP	P	
6	393.4723	5.77	17.03	22.80	46.00	-23.20	QP	P	

6. Test set-up photo

Disturbance voltage at the mains terminals Test View

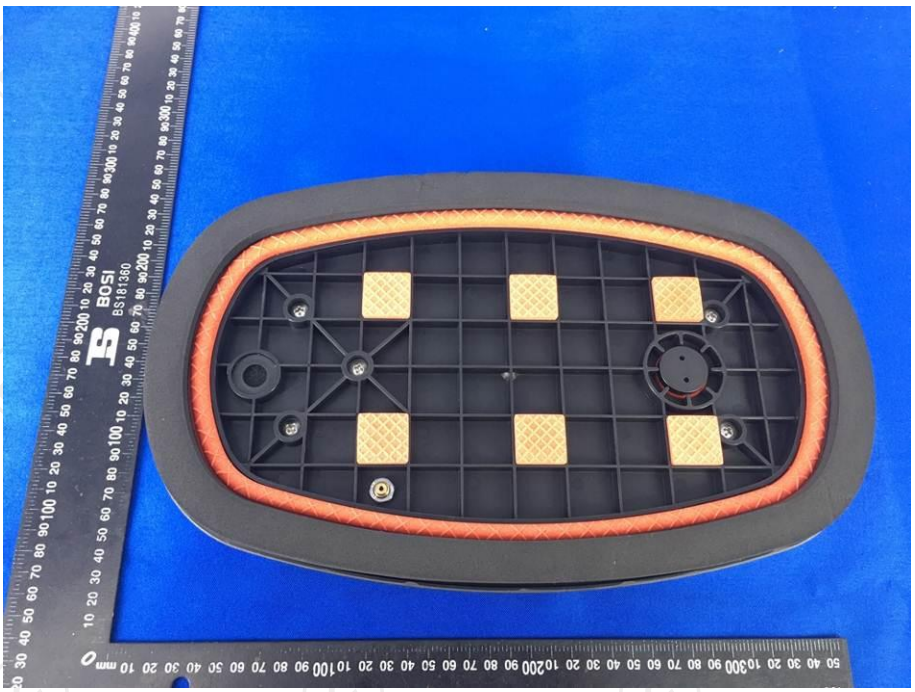


Radiated emission (30 MHz to 1 GHz) Test View



7. Photo of the EUT


BOSI
BS181360
GRABO
PATENTS & TRADEMARKS NOTICE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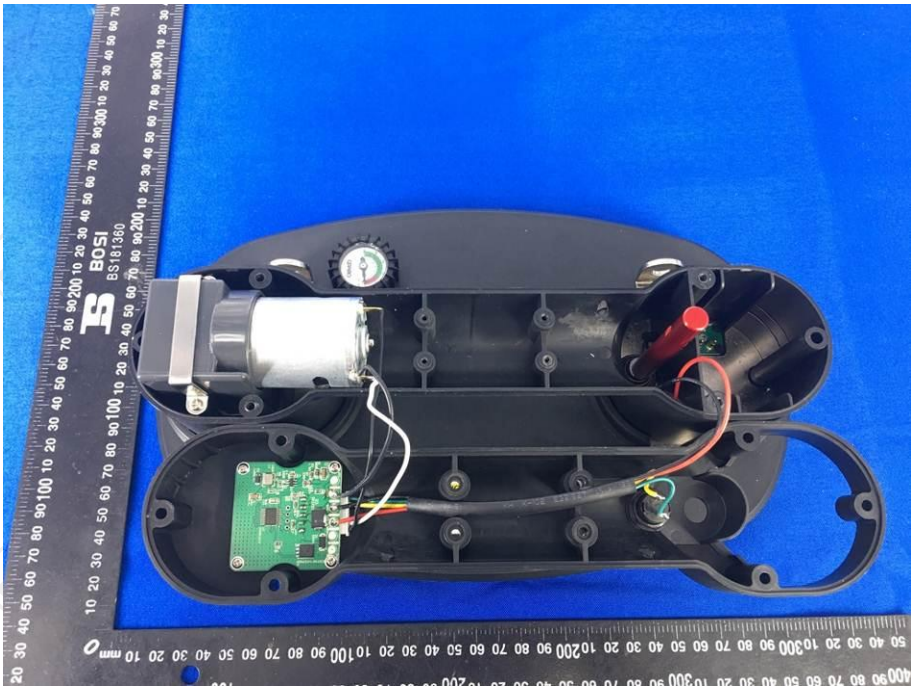
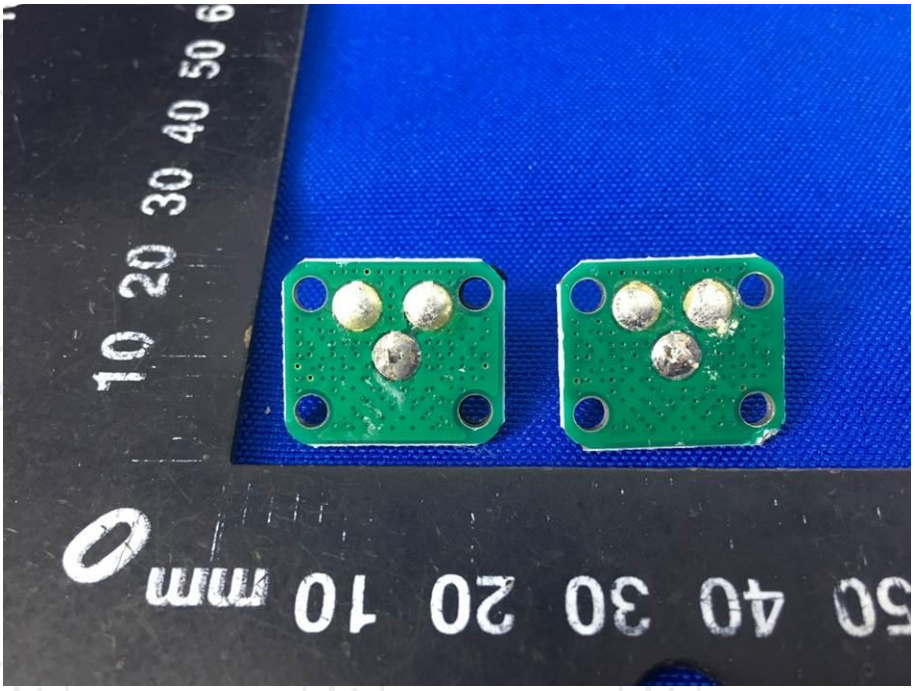
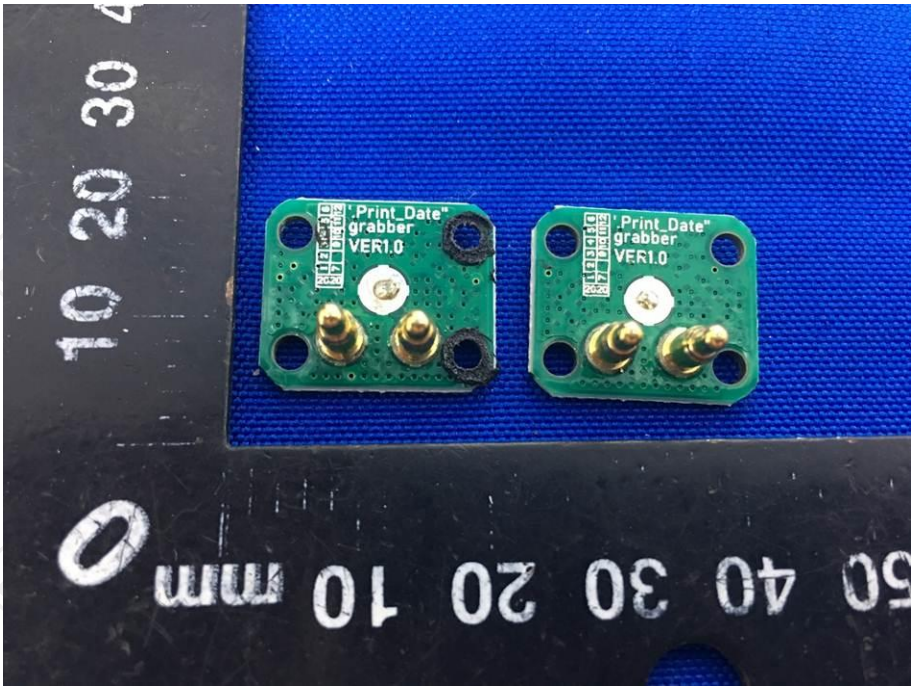
NG-V1-7979-1



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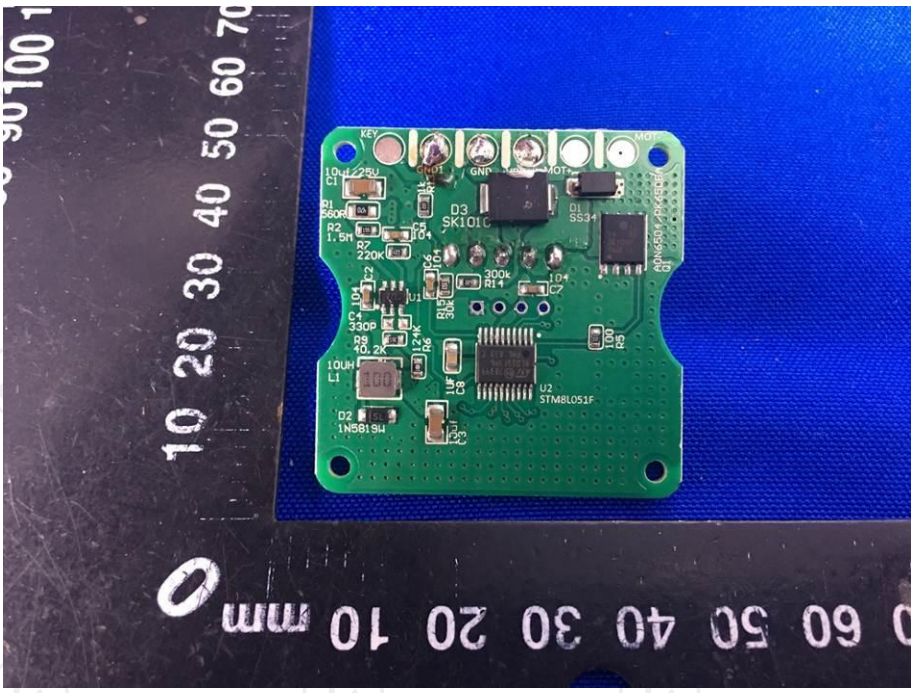
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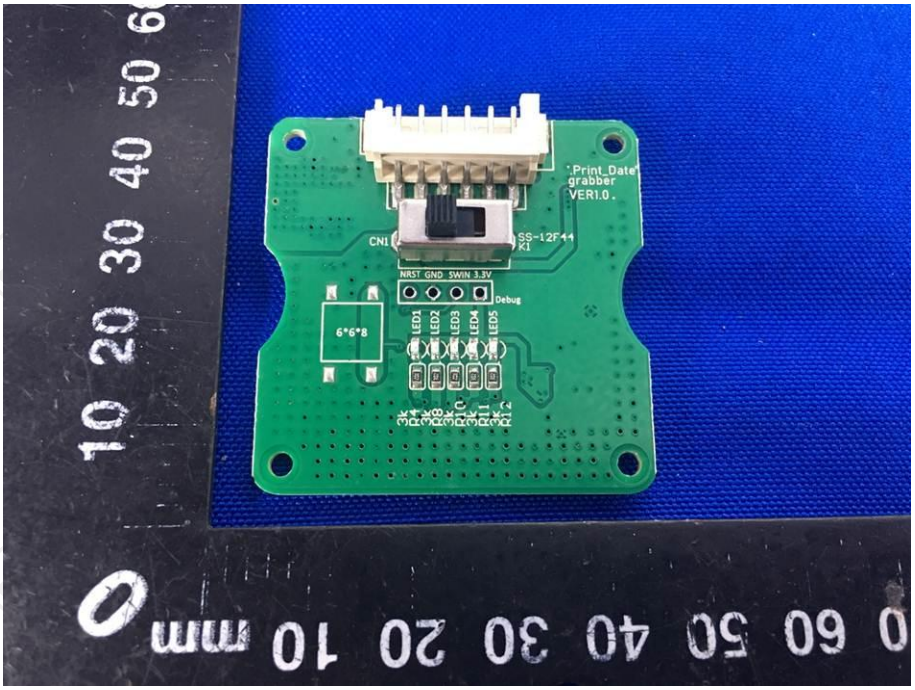
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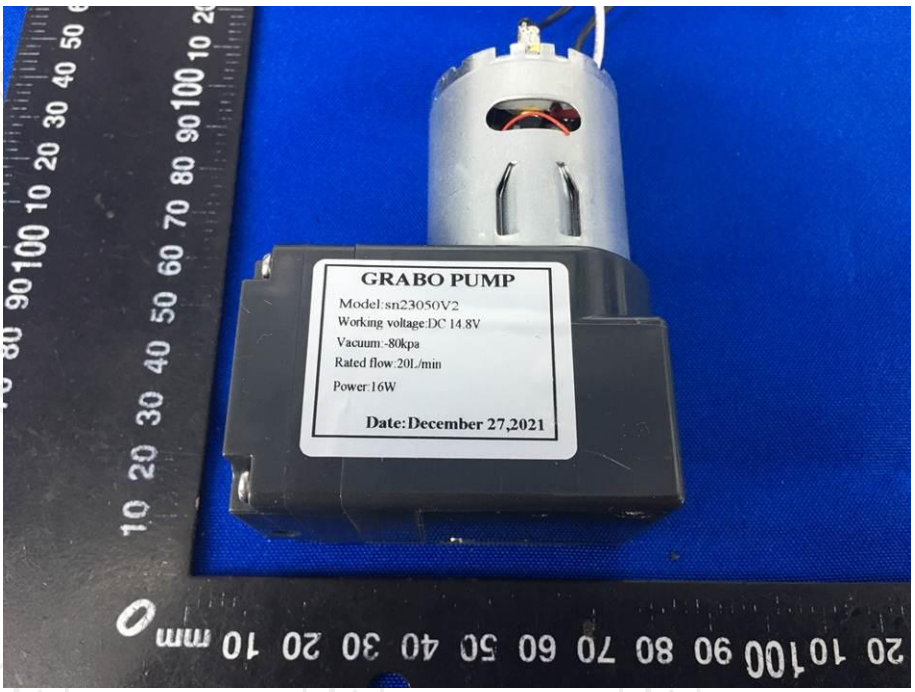
K1
NRST GND SWIN 3.3V
Debug
LED1
LED2
LED3
LED4
LED5
6*6*8


GRABO PUMP
Model:sn23050V2
Working voltage:DC 14.8V
Vacuum:-80kpa
Rated flow:20L/min
Power:16W
Date:December 27,2021

*****End of report*****