EMC Test Report

Client Name	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Product Name	:	Grove Beginner Kit for Arduino - All-in-one Arduino Compatible Board with 10 Sensors and 12 Projects
Date	:	Jul. 13, 2020

Shenzhen Anbotek Compliance Laboratory Limited

Contents

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TEST REPORT

Applicant	:	Seeed Technology Co., Ltd.
Manufacturer	:	Seeed Technology Co., Ltd.
Product Name	:	Grove Beginner Kit for Arduino - All-in-one Arduino Compatible Board with 10 Sensors and 12 Projects
Model No.	:	Grove Beginner Kit for Arduino
Trade Mark	:	Seeed Studio
Rating(s)	:	DC5V, 100mA
Test Standard(s)	**:**	**EN 55032: 2015; EN 55035: 2017; (IEC 61000-4-2; IEC 61000-4-3)**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited 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 Anbotek Compliance Laboratory Limited 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 EN 55032, EN 55035 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt: Jun. 17, 2020

Date of Test: Jun. 17~Jul. 02, 2020

Prepared By: Winnie Huang
(Engineer / Winnie Huang)

Reviewer: Well Wang
(Supervisor / Well Wang)

Approved & Authorized Signer: Tom Chen
(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Manufacturer	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Factory	:	Seeed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C

1.2. Description of Device (EUT)

Product Name	:	Grove Beginner Kit for Arduino - All-in-one Arduino Compatible Board with 10 Sensors and 12 Projects	
Model No.	:	Grove Beginner Kit for Arduino	
Trade Mark	:	Seeed Studio	
Test Power Supply	:	DC 5V via PC	
Test Sample No.	:	1-1-1	
Product Description	:	Adapter:	N/A
Remark: (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

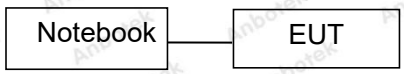
1.3. Auxiliary Equipment Used During Test

Notebook	:	Manufacturer: MacBook Air
		Model: A1466 Input: 14.85V/3.05A CMIIT ID:C02HXB48DRVC
		Adapter:
		Input: AC 100-240V, 1A, 50-60Hz Output: 14.85V/3.05A

1.4. Description of Test Mode

Pretest Mode	Description
Mode 1	On

For Mode 1 Block Diagram of Test Setup



1.5. Test Summary

Test Items	Test Mode	Status
Power Line Conducted Emission Test (150KHz To 30MHz)	/	N
Radiated Emission Test (30MHz To 1000MHz)	Mode 1	P
Electrostatic Discharge immunity Test	Mode 1	P
RF Field Strength susceptibility Test	Mode 1	P
Electrical Fast Transient/Burst Immunity Test	/	N
Surge Immunity Test	/	N
Injected Currents Susceptibility Test	/	N
Magnetic Field Susceptibility Test	/	N
Voltage Dips and Interruptions Test	/	N
P) Indicates “PASS”. N) Indicates “Not applicable”.		

1.6. Test Equipment List

Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 04, 2019	1 Year
2.	Pre-amplifier	Schwarzbeck	BBV-9745	9745-075	Nov. 04, 2019	1 Year
3.	Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	01109	Nov. 01, 2019	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	EMEC-3A1	N/A	N/A	N/A

Electrostatic Discharge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	emtest	ESD NX30.1	11891	Mar. 07, 2020	1 Year

R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Signal Generator	Agilent	N5182A	MY48180656	Nov. 04, 2019	1 Year
2	Amplifier	Micotoop	MPA-80-1000-250	MPA1903096	Nov. 04, 2019	1 Year
3	Amplifier	Micotoop	MPA-1000-6000-100	MPA1903122	Nov. 04, 2019	1 Year
4	Log-Periodic Antenna	Schwarzbeck	VULP9118E	00992	Apr. 17, 2020	1 Year
5	Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 01, 2019	1 Year
6	Power Sensor	Agilent	E9301A	MY41498906	Nov. 04, 2019	1 Year
7	Power Sensor	Agilent	E9301A	MY41498088	Nov. 04, 2019	1 Year
8	Power Meter	Agilent	E4419B	GB40202909	Nov. 04, 2019	1 Year
9	Field Probe	ETS-Lindgren	HI-6006	00212747	Apr. 17, 2020	1 Year
10	software	EMtrace	EM 3	N/A	N/A	N/A

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1.7. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, September 27, 2019.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A, March 07, 2019.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518128

1.8. EMS Performance Criteria

√ A: Normal performance within the specification limits
√ B: Temporary degradation or loss of function or performance which is self-recoverable
√ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
√ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

2. Radiated Emission Test

2.1. Test Standard and Limit

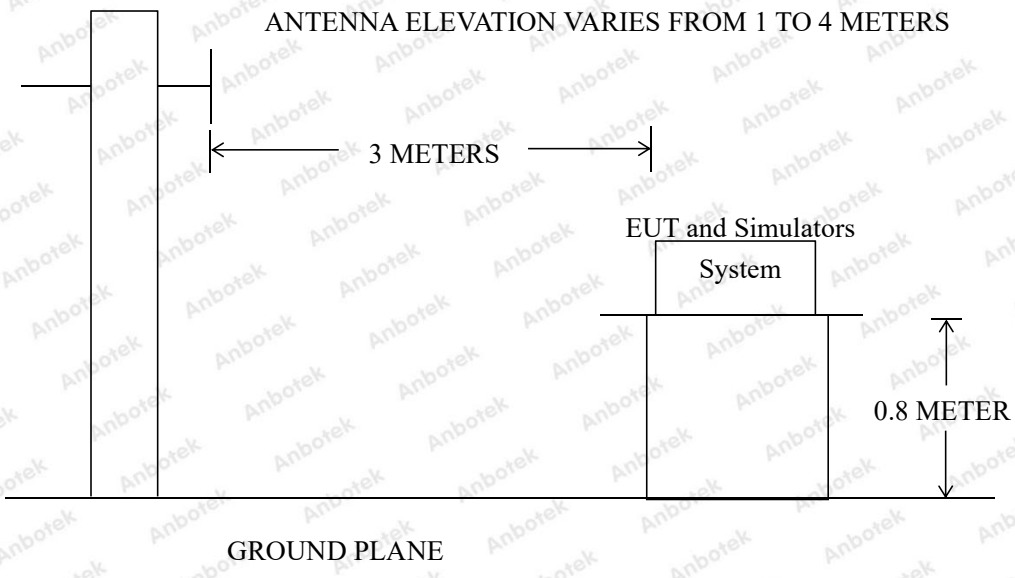
Test Standard	EN 55032

Radiated Emission Test Limit

Test Limit	Frequency (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
	30 ~ 230	3	40
	230 ~ 1000	3	47

Remark: (1)The smaller limit shall apply at the combination point between two frequency bands.
(2) Distancer efers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.
(3) 3M Limit=10M Limit+k k=20log(D1/D2)=10
3M Limit=10M Limit +10
(D1= 10M D2=3M)

2.2. Test Setup



2.3. EUT Configuration on Measurement

The EN 55032 regulations test method must be used to find the maximum emission during radiated emission measurement.

2.4. Operating Condition of EUT

2.4.1. Setup the EUT as shown in Section 2.2.

2.4.2. Turn on the power of all equipments.

2.4.3. Let the EUT work in test mode and measure it.

2.5. 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 a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in 9*6*6 Chamber.

The test results are listed in Section 2.6.

2.6. Test Results

PASS

The frequency range from 30MHz to 1000MHz is investigated.

The test curves are shown in the following pages.

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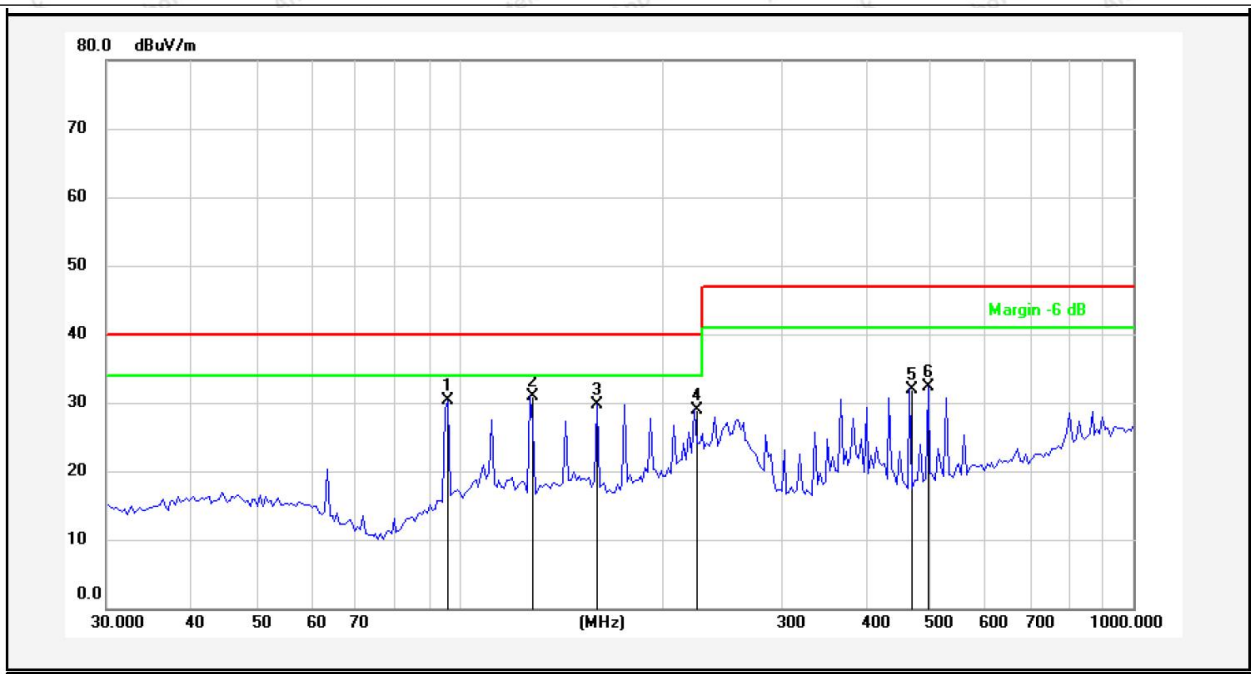
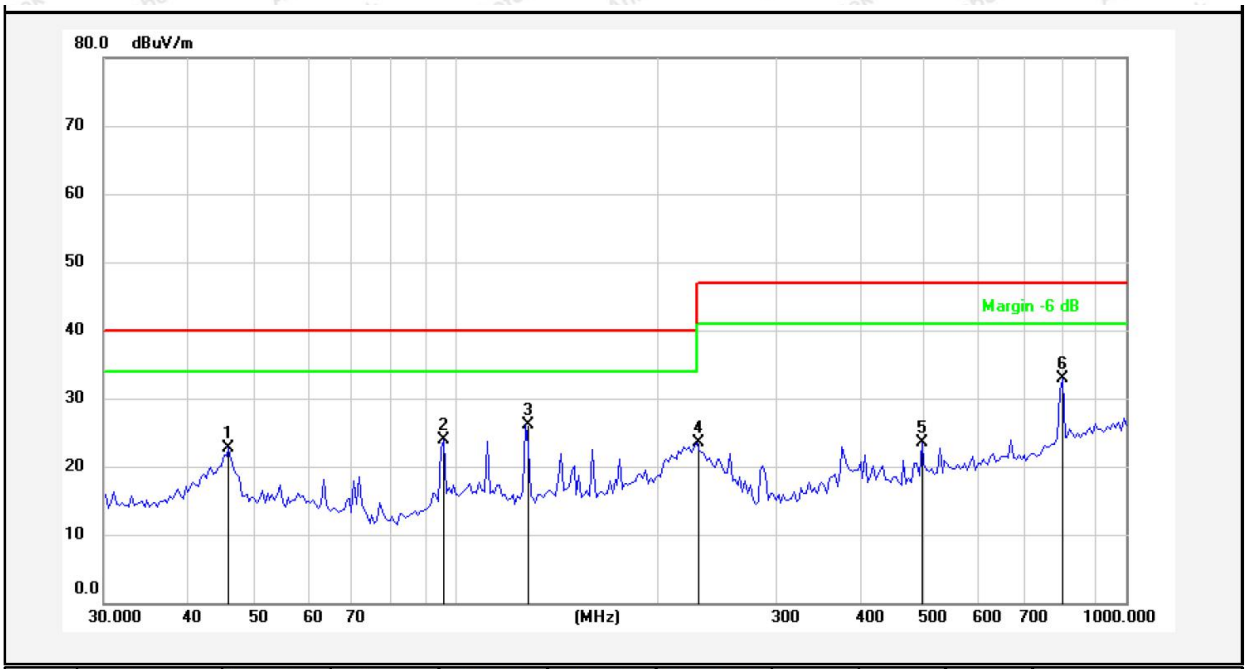
Test item:	**Radiation Test**	**Polarization:**	**Horizontal**
Standard:	**(RE)EN55032**	**Power Source:**	**DC 5V via PC**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.5(℃)/58%RH**



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	96.2672	46.18	-15.96	30.22	40.00	-9.78	peak			
2	127.4409	50.30	-19.39	30.91	40.00	-9.09	peak			
3	160.0648	49.68	-19.90	29.78	40.00	-10.22	peak			
4	223.3415	45.97	-16.98	28.99	40.00	-11.01	peak			
5	466.4165	46.99	-15.17	31.82	47.00	-15.18	peak			
6	495.9344	46.68	-14.38	32.30	47.00	-14.70	peak			

Note: **Result=Reading+Factor** **Over Limit=Result-Limit**

Test item:	**Radiation Test**	**Polarization:**	**Vertical**
Standard:	**(RE)EN55032**	**Power Source:**	**DC 5V via PC**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.5(℃)/58%RH**



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	46.0971	38.39	-15.68	22.71	40.00	-17.29	peak			
2	96.2672	39.77	-15.96	23.81	40.00	-16.19	peak			
3	127.4409	45.42	-19.39	26.03	40.00	-13.97	peak			
4	229.2931	40.13	-16.70	23.43	40.00	-16.57	peak			
5	495.9344	37.84	-14.38	23.46	47.00	-23.54	peak			
6	803.1933	41.79	-8.90	32.89	47.00	-14.11	peak			

Note: **Result=Reading+Factor Over Limit=Result-Limit**

3. Electrostatic Discharge Immunity Test

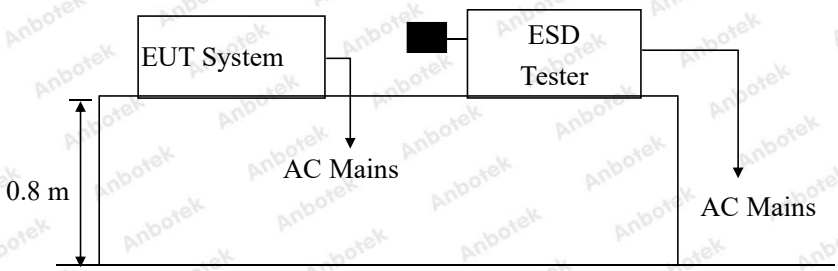
3.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-2)
Performance Criterion:	B
Severity Level: 3 / Air Discharge: ±8kV, Level: 2 / Contact Discharge: ±4kV	

Test 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

3.2. Test Setup



3.3. EUT Configuration on Measurement

The following equipments are installed on electrostatic discharge immunity measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

3.4. Operating Condition of EUT

3.4.1. Setup the EUT as shown on Section 3.2.

3.4.2. Turn on the power of all equipments.

3.4.3. After that, let the EUT work in test mode measure it.

3.5. Test Procedure

3.5.1. 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

3.5.2. Contact Discharge:

All the procedure shall be same as Section 3.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

3.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

3.5.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 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.

3.6. Test Results

PASS

Please refer to the following page.

Electrostatic Discharge Test Results

Air discharge :	±8.0kV	Temperature :	23.9℃
Contact discharge :	±4.0kV	Humidity :	47.1%
Power Supply :	DC 5V via PC	Expert conclusion:	B
Number of discharge :	10	Test Result:	☒ Pass ☐ Fail

Location		**Kind** A-Air Discharge C-Contact Discharge	**Result**
Micro Port	4 points	C	☐ A ☑ B ☐ C ☐ D
HCP	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the front	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the rear	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the left	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the right	4 points	C	☑ A ☐ B ☐ C ☐ D

Remark: Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

4. RF Field Strength Susceptibility Test

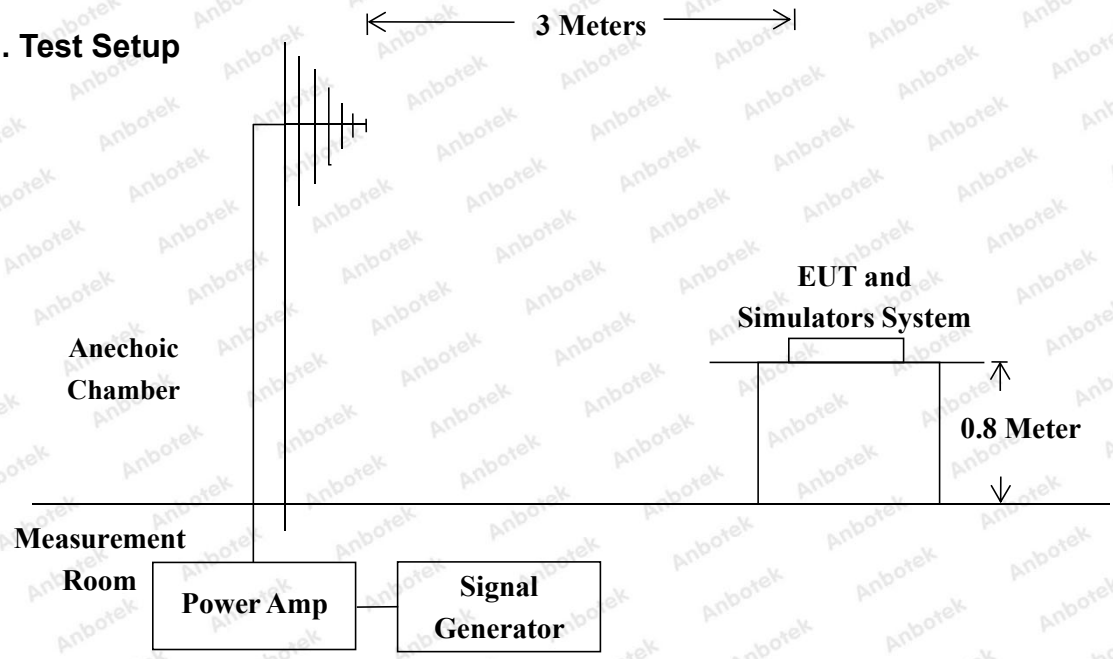
4.1. Test Standard and Level

Test Standard:	EN 55035 (IEC 61000-4-3)
Required Performance:	A
Frequency Range:	80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 0.5s

Test Level

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

4.2. Test Setup



4.3. EUT Configuration on Measurement

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN 55035 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

4.4. Operating Condition of EUT

4.4.1. Setup the EUT as shown on Section 4.2.

4.4.2. Turn on the power of all equipments.

4.4.3. After that, let the EUT work in test mode measure it.

4.5. Test Procedure

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters.

1) 80 MHz to 1000 MHz the field strength level was 3V/m, 1800MHz, 2600MHz, 3500MHz, 5000MHz the field strength level was 3V/m.
2) The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
3) The frequency range is swept from 1800MHz, 2600MHz, 3500MHz, 5000MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
4) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.
5) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.6. Measuring Results

PASS

Please refer to the following page.

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RF Field Strength Susceptibility Test Results

Field Strength :	3V/m	Temperature :	23.9℃
Expert conclusion:	A	Humidity :	47.1%
Power Supply :	DC 5V via PC	Test Result :	☒ Pass ☐ Fail
Dwell Time:	1s		

Frequency Range	Antenna Polarity	R.F. Field Strength	Azimuth	Result
80MHz~1000MHz	H / V	3 V/m (rms)	Front	☑ A ☐ B ☐ C ☐ D
			Rear	
			Left	
			Right	
1800MHz 2600MHz 3500MHz 5000MHz	H / V	3 V/m (rms)	Front	☑ A ☐ B ☐ C ☐ D
			Rear	
			Left	
			Right	

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiated Emission Test

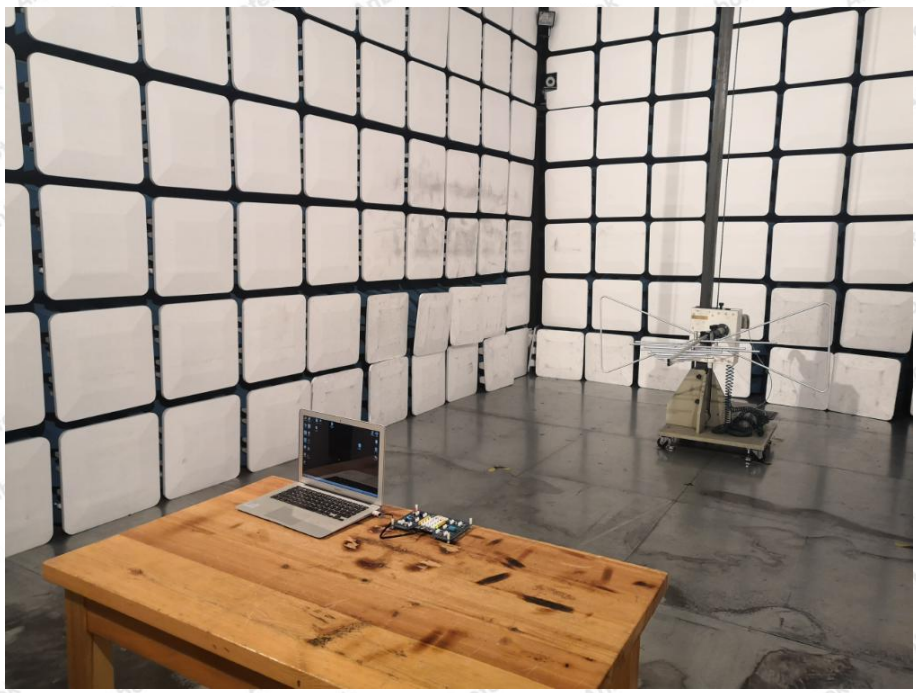


Photo of Electrostatic Discharge Immunity Test

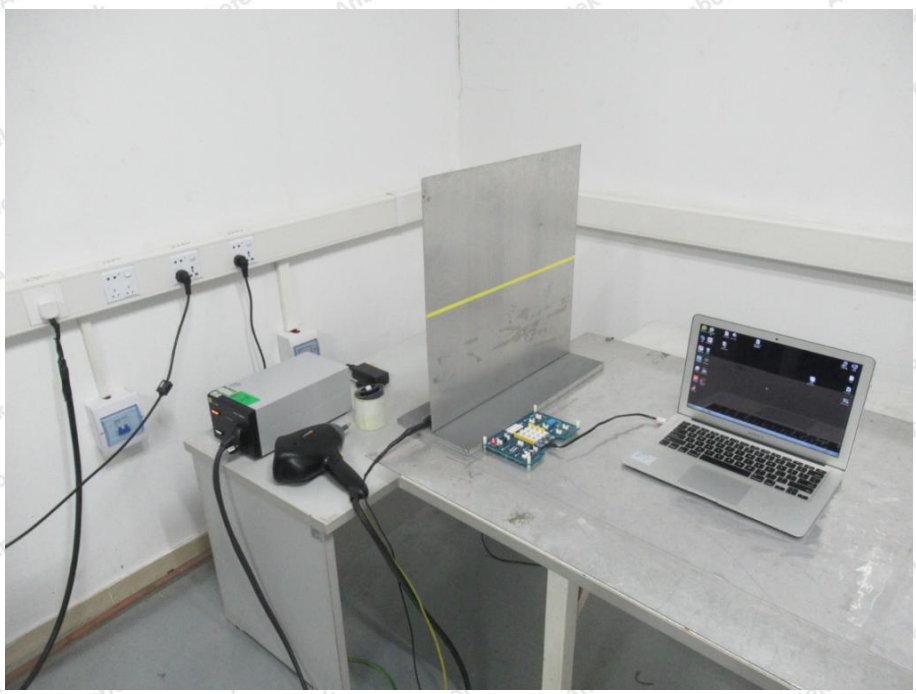
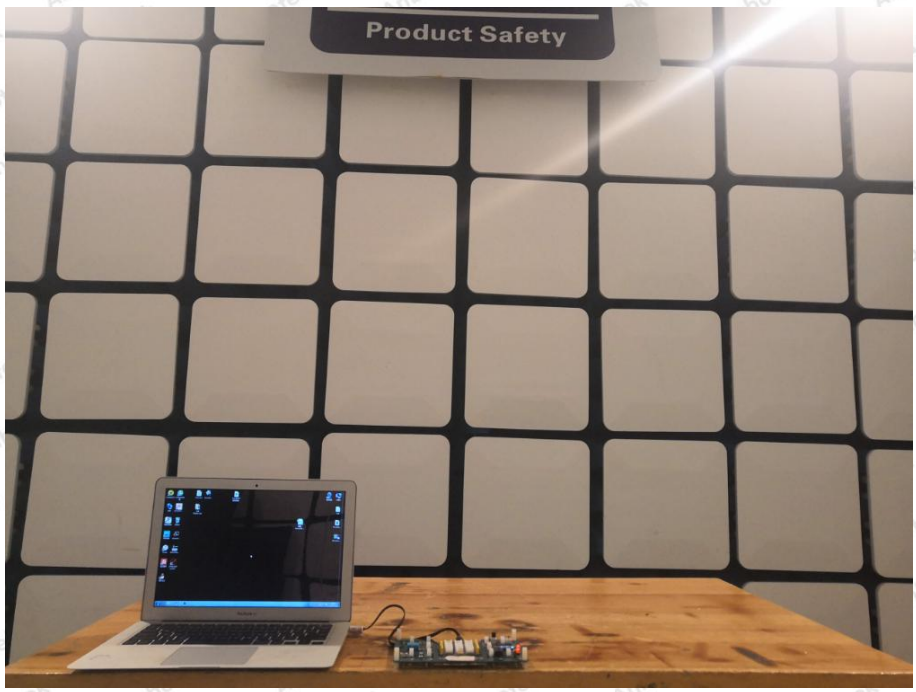
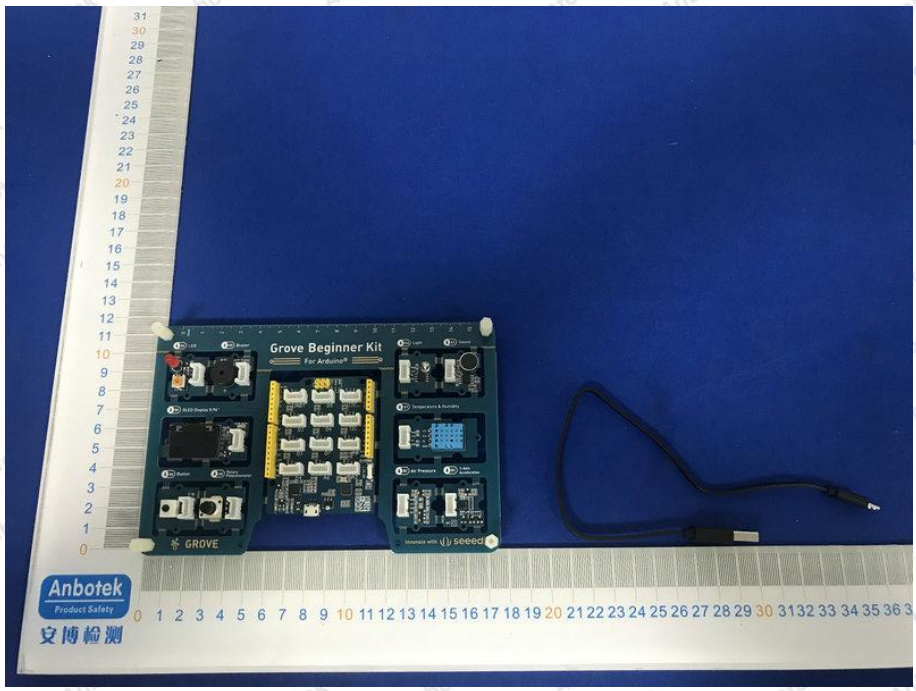
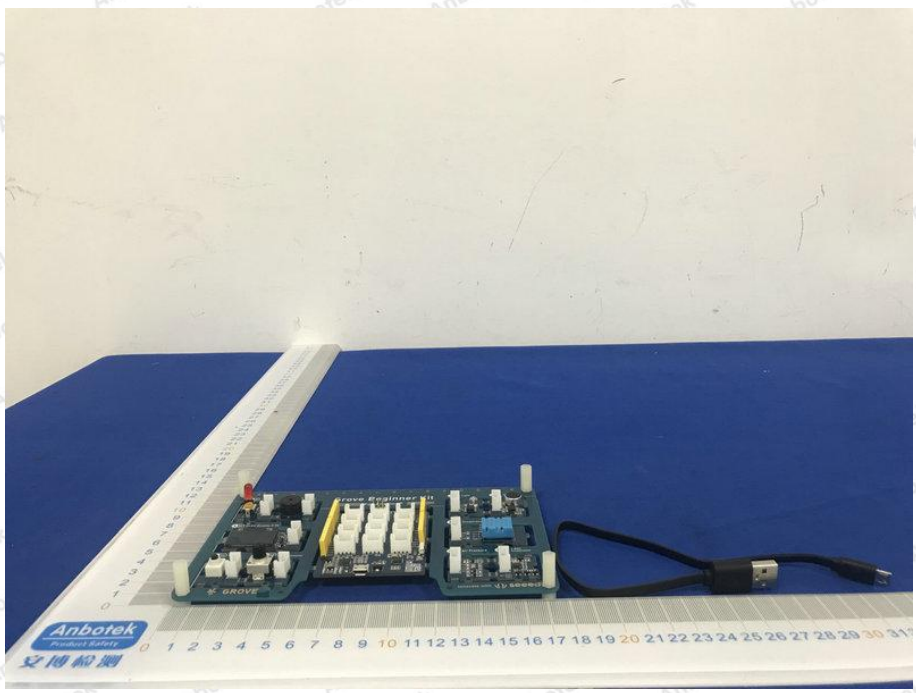


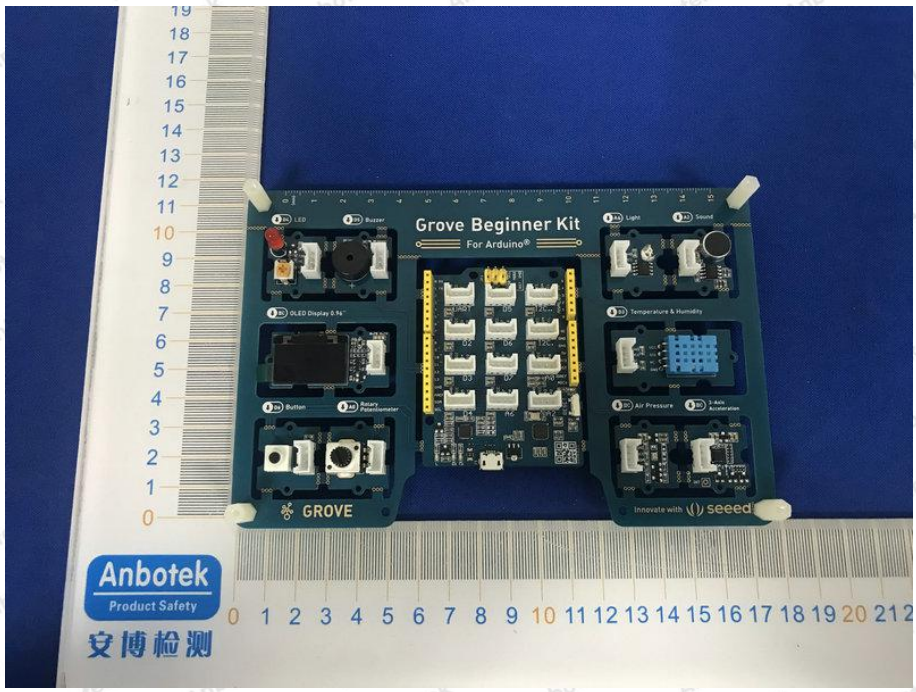
Photo of RF Field Strength susceptibility Test



APPENDIX II -- EXTERNAL PHOTOGRAPH






Grove Beginner Kit
For Arduino
GROVE
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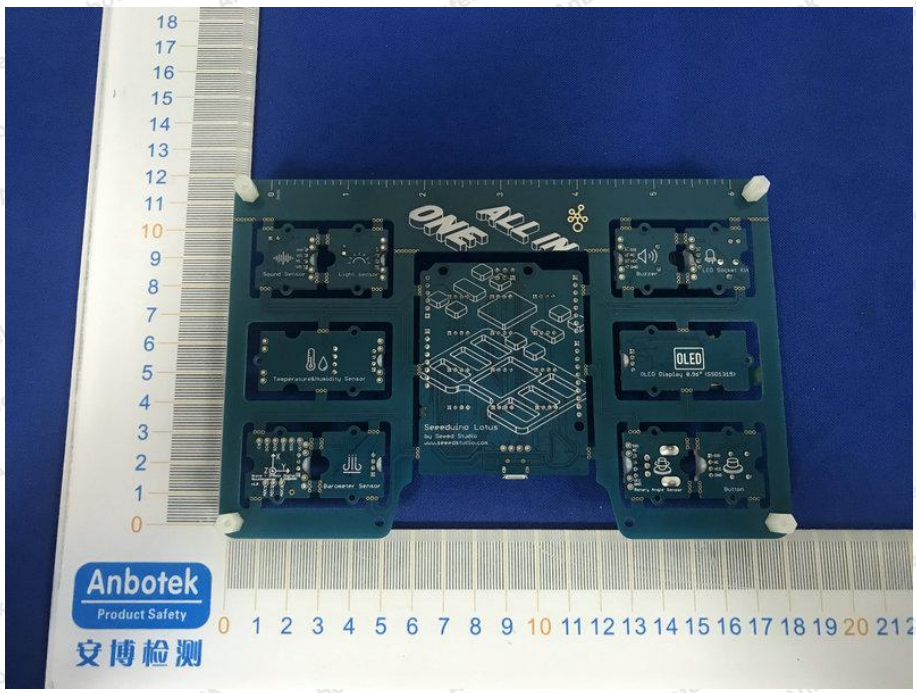
Product Safety
安博检测


ALL IN ONE
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Anbotek
Product Safety
安博检测

CE Label

1. The CE conformity marking must consist of the initials ‘CE’ taking the following form:
   If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
   It must have the same height as the initials ‘CE’.

---------- End of Report ----------