

EMC Test Report

Certificate No. : TB180117827
Applicant :
Equipment Under Test (EUT)
EUT Name : Power Bank
Model No. : SP0335
Serial Model No. : P324.461
Brand Name : N/A
Receipt Date : 2018-01-15
Test Date : 2018-01-16 to 2018-03-01
Issue Date : 2018-03-02
Standards : EN 55032:2015
EN 55024:2010+A1:2015
Conclusions : **PASS**

In the configuration tested, the EUT complied with the standards specified above. The EUT technically complies with the 2014/30/EU directive requirements

Test/Witness Engineer : Rebecca
Engineer Supervisor : Ivan Su
Approved & Authorized : Ray Lai



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TABLE OF CONTENTS

1.	GENERAL INFORMATION	4
1.1.	Client Information	4
1.2.	General Description of EUT (Equipment Under Test).....	4
1.3.	Description of Operating Mode	5
1.4.	Block Diagram Showing The Configuration of System Tested	5
1.5.	Description of Support Units	6
1.6.	Performance Criterion	6
1.7.	Measurement Uncertainty	7
1.8.	Test Facility	7
2.	TEST RESULTS SUMMARY	8
3.	TEST EQUIPMENT USED	10
4.	RADIATED EMISSION TEST	11
4.1	Test Standard and Limit	11
4.2.	Test Setup	11
4.3.	Test Procedure	13
4.4.	Test Data	13
5.	ELECTROSTATIC DISCHARGE IMMUNITY TEST	14
5.1	Test Requirements	14
5.2.	Test Setup	14
5.3.	Test Procedure	15
5.4.	Test Data	15
6.	RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST	16
6.1.	Test Requirements	16
6.2.	Test Setup	16
6.3.	Test Procedure	16
6.4.	Test Data	17
7.	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	18
8.	PHOTOGRAPHS - TEST SETUP	21
	ATTACHMENT A--RADIATED EMISSION TEST DATA(BELOW 1G)	23
	ATTACHMENT B--ELECTROSTATIC DISCHARGE TEST DATA.....	27
	ATTACHMENT C--RF FIELD STRENGTH SUSCEPTIBILITY TEST DATA.....	29

Revision History

Report No.	Version	Description	Issued Date
TB-EMC157963	Rev.01	Initial issue of report	2018-03-02

1. General Information

1.1. Client Information

Applicant	:	
Address	:	
Manufacturer	:	
Address	:	

1.2. General Description of EUT (Equipment Under Test)

EUT Name	:	Power Bank
Model(s)	:	SP0335, P324.461
Model Difference	:	All these models are identical in the same PCB layout and electrical circuit, the only difference is model name for commercial. therefore, EMI and EMS testing was performed with SP0335 only.
Class of EUT	:	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B
EUT Type	:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing <input type="checkbox"/> combination
F_x	:	≤ 108 MHz
Power Supply	:	Input: DC 5V 1500mA Output: DC 5V 2100mA Capacity: 4000mAh/14.8Wh
F_x : Highest internal frequency.		

1.3. Description of Operating Mode

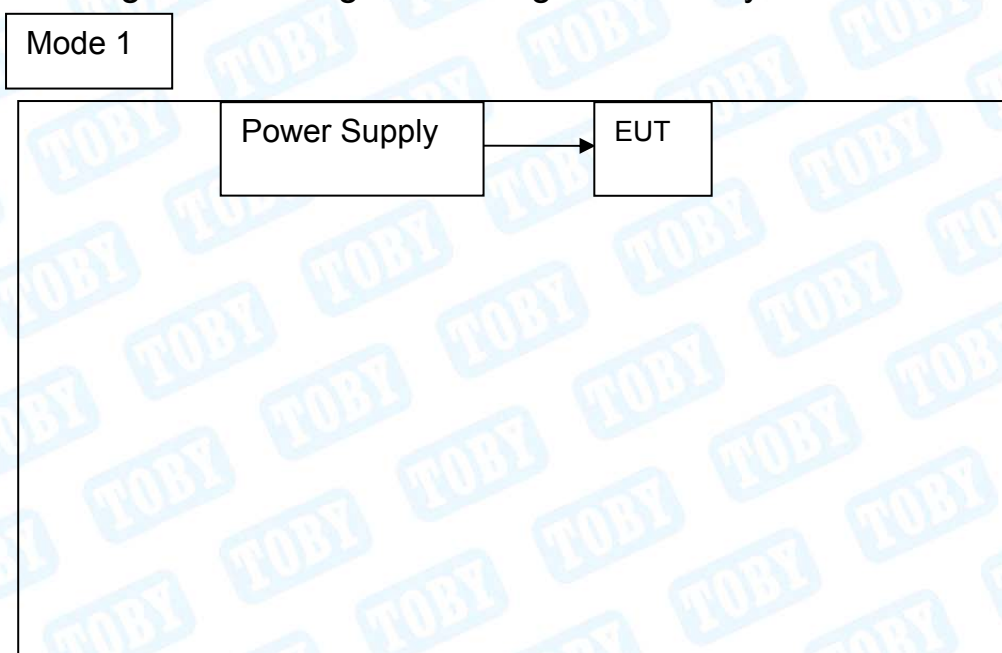
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Charging Mode
Mode 2	Discharging Mode

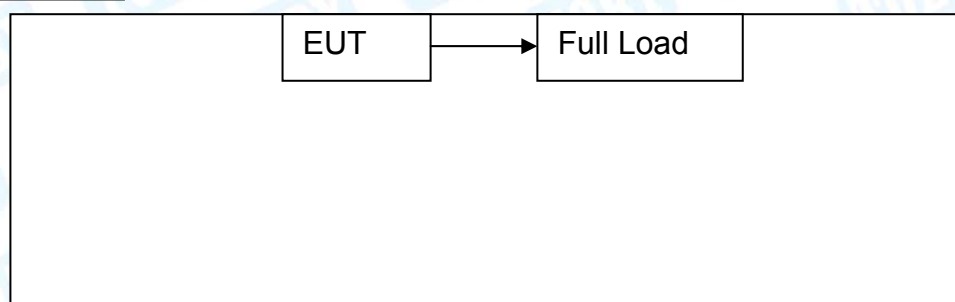
The EUT system operated these modes were found to be the worst case during the pre-scanning test as Following:

For EMI Test	
Final Test Mode	Description
Mode 1	Charging Mode
Mode 2	Discharging Mode
For EMS Test	
Final Test Mode	Description
Mode 1	Charging Mode
Mode 2	Discharging Mode

1.4. Block Diagram Showing The Configuration of System Tested



Mode 2



1.5. Description of Support Units

Equipment Information				
Name	Model	S/N	Manufacturer	Used “√”
LCD Monitor	E170Sc	----	DELL	
PC	OPTIPLEX380	----	DELL	
Keyboard	L100	U01C	DELL	
Mouse	M-UARDEL7	----	DELL	
TV	K600S	----	KONKA	
Power Supply	BSY02D050200V	----	BSY	√
Cable Information				
Number	Shielded Type	Ferrite Core	Length	Note
Cable 1	YES	YES(2)	1.8M	
Cable 2	YES	YES(1)	2.0M	
Cable 3	YES	NO	1.5M	
Cable 4	NO	NO	0.5M	

1.6. Performance Criterion

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 manufacturer when the equipment is used as intended.

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 manufacturer, when the equipment is used as intended.

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 manufacturer's instructions.

1.7. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

Test	Parameters	Expanded Uncertainty (U_{Lab})	Expanded Uncertainty (U_{Cispr})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	± 3.42 dB ± 3.42 dB	± 4.0 dB ± 3.6 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	± 4.60 dB	N/A
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	± 4.40 dB	± 5.2 dB
Radiated Emission	Level Accuracy: Above 1000MHz	± 4.20 dB	N/A
Mains Harmonic	Voltage	$\pm 3.11\%$	N/A
Voltage Fluctuations & Flicker	Voltage	$\pm 3.25\%$	N/A

1.8. Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation (A2LA) to ISO/IEC 17025 : 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.

IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. TEST Results Summary

EMISSION (<input checked="" type="checkbox"/> EN 55032:2015)			
Description of test items	Standards	Class	Results
Conducted disturbance at mains terminals	EN 55032: 2015	<input type="checkbox"/> Class A	N/A ⁽¹⁾
		<input type="checkbox"/> Class B	
Conducted disturbance for asymmetric mode	EN 55032: 2015	<input type="checkbox"/> Class A	N/A ⁽²⁾
		<input type="checkbox"/> Class B	
Conducted differential voltage emission	EN 55032: 2015	Class B	N/A ⁽²⁾
Radiated Disturbance	EN 55032: 2015	<input type="checkbox"/> Class A	Pass
		<input checked="" type="checkbox"/> Class B	
Harmonic current emissions	EN 61000-3-2: 2014	<input type="checkbox"/> Class A	N/A ⁽⁴⁾
		<input type="checkbox"/> Class D	
Voltage fluctuation and flicker	EN 61000-3-3: 2013		N/A
Note: (1) Class A/Class B: Applicable to AC mains power ports (2) Class A: Applicable to wired network ports, optical fibre ports with metallic shield or tension members and antenna ports. Class B: Applicable to wired network ports, optical fibre ports with metallic shield or tension members, broadcast receiver tuner ports and antenna ports. Applicable to ports listed above and intended to connect to cables longer than 3 m. (3) Class B: Applicable to TV broadcast receiver tuner ports with an accessible connector, RF modulator output ports and FM broadcast receiver tuner ports with an accessible connector. (4) Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes. Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.			

IMMUNITY (<input checked="" type="checkbox"/> EN 55024:2010+A1:2015)		
Description of test items	Standards	Results
Electrostatic Discharge (ESD)	EN 61000-4-2: 2009	Pass
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A2:2008+A2: 2010	Pass
EFT/B Immunity	EN 61000-4-4: 2012	N/A
Surge Immunity	EN 61000-4-5: 2014	N/A
Conducted RF Immunity	EN 61000-4-6: 2014	N/A
Power frequency magnetic field	EN 61000-4-8: 2010	N/A ₍₁₎
Voltage dips, >95% reduction	EN 61000-4-11: 2004	N/A
Voltage dips, 30% reduction		
Voltage interruptions		
Note: N/A is an abbreviation for Not Applicable. (1) Not applicable, the EUT is not containing devices susceptible to magnetic fields.		

3. Test Equipment Used

Radiation Emission Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 20, 2017	Jul. 19, 2018
EMI Test Receiver	Rohde & Schwarz	ESCI	101165	Jul. 20, 2017	Jul. 19, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.25, 2017	Mar. 24, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar.25, 2017	Mar. 24, 2018
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.24, 2017	Mar. 23, 2018
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	HP	11909A	185903	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	HP	8449B	3008A00849	Mar.25, 2017	Mar. 24, 2018
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 24, 2017	Mar. 23, 2018
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Mar. 24, 2017	Mar. 23, 2018
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Discharge Immunity Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
ESD Generator	HAFELY	PESD 1610	H808671	Mar. 27, 2017	Mar.26, 2018
ESD Tester	TESEQ	NSG437	304	Jul. 21, 2017	Jul. 20, 2018
Radiated Immunity Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
Signal Generator	Rohde & Schwarz	SMT03	200754	Mar. 24, 2017	Mar. 23, 2018
Power Meter	Rohde & Schwarz	NRVD	110562	Feb. 12, 2018	Feb. 11, 2019
Voltage Probe	Rohde & Schwarz	URV5-Z2	12056	Feb. 12, 2018	Feb. 11, 2019
Voltage Probe	Rohde & Schwarz	URV5-Z2	12074	Feb. 12, 2018	Feb. 11, 2019
RF Amplifier	AR	50S1G4A	326720	Feb. 12, 2018	Feb. 11, 2019
Bilog Antenna	ETS	3142C	00047662	Feb. 12, 2018	Feb. 11, 2019
Horn Antenna	ARA	DRG-118A	16554	Feb. 12, 2018	Feb. 11, 2019

4. Radiated Emission Test

4.1 Test Standard and Limit

4.1.1. Test Standard

EN 55032: 2015

4.1.2. Test Limit

Bellow 1GHz

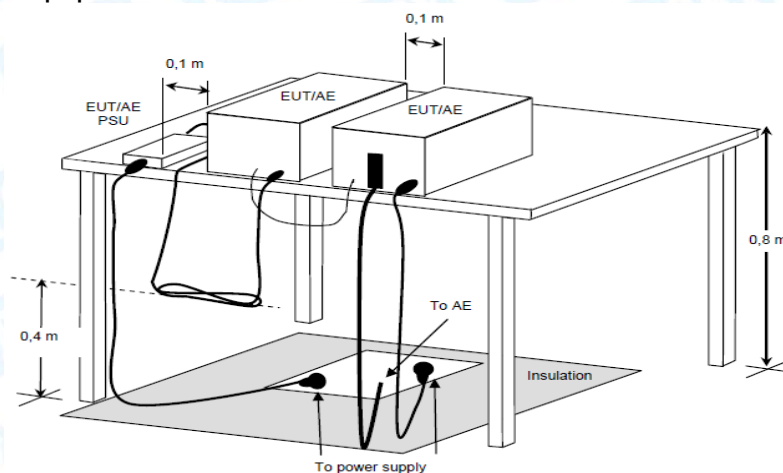
Frequency	Limit (dB μ V/m) (3m)	
	Quasi-peak Level	
	Class A	Class B
30MHz~230MHz	50	40
230MHz~1000MHz	57	47
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.		

Above 1GHz

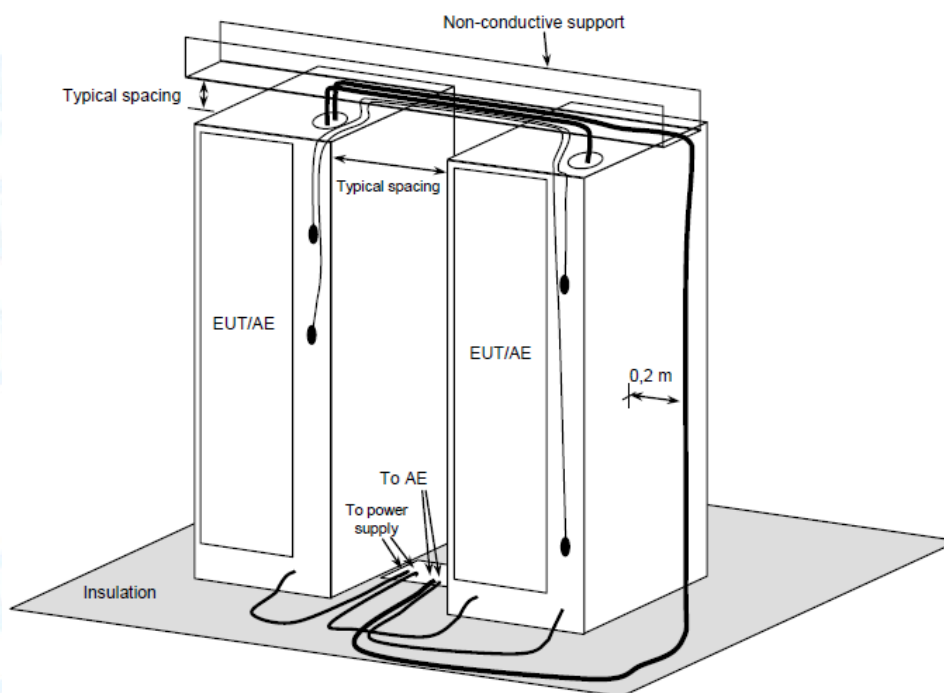
Frequency (GHz)	Limit (dB μ V/m) (3m)			
	Class A		Class B	
	Peak	Average	Peak	Average
1~3	76	56	70	50
3~6	80	60	74	54
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.				

4.2. Test Setup

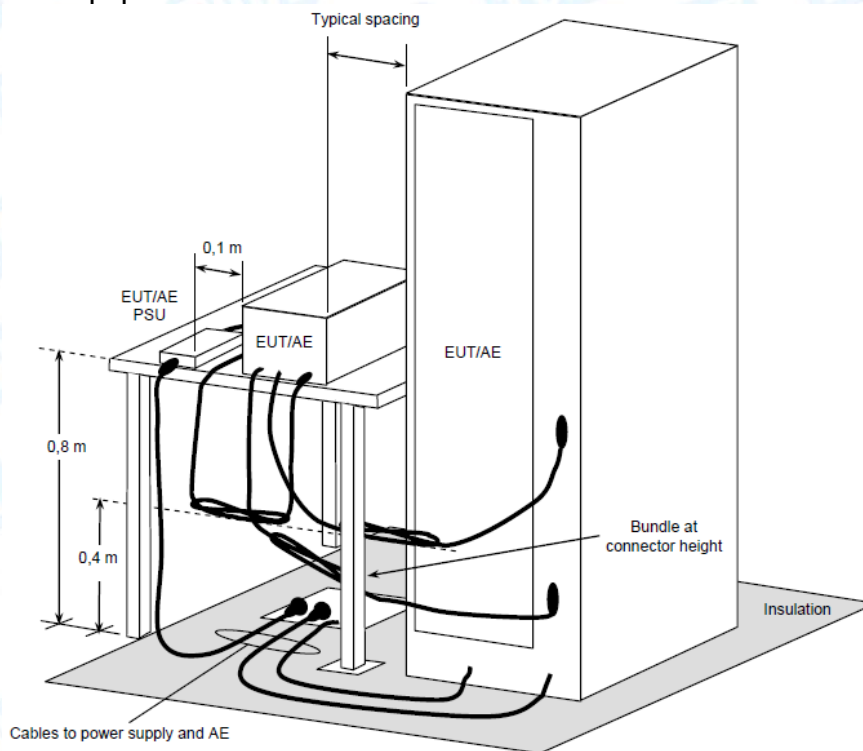
☒ For table top equipment



☐ For floor standing equipment



☐ For combination equipment



4.3. Test Procedure

Measurement was performed according to clause 7.3 of CISPR 16-2-3.

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m. The table was rotated 360 degrees to determine the position of the highest radiation. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range.

If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

Highest internal frequency (Fx)	Highest measured frequency for radiated measurement	Measured Bandwidth
$Fx \leq 108 \text{ MHz}$	1 GHz	120kHz
$108 \text{ MHz} < Fx \leq 500 \text{ MHz}$	2 GHz	1MHz
$500 \text{ MHz} < Fx \leq 1 \text{ GHz}$	5 GHz	1MHz
$Fx > 1 \text{ GHz}$	5*Fx up to a maximum of 6 GHz	1MHz
NOTE 1: For FM and TV broadcast receivers, Fx is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.		
NOTE 2: For outdoor units of home satellite equipment receiving systems highest measured frequency shall be 18GHz.		

4.4. Test Data

Please refer to the Attachment A.

5. Electrostatic Discharge Immunity Test

5.1 Test Requirements

5.1.1. Test Standard

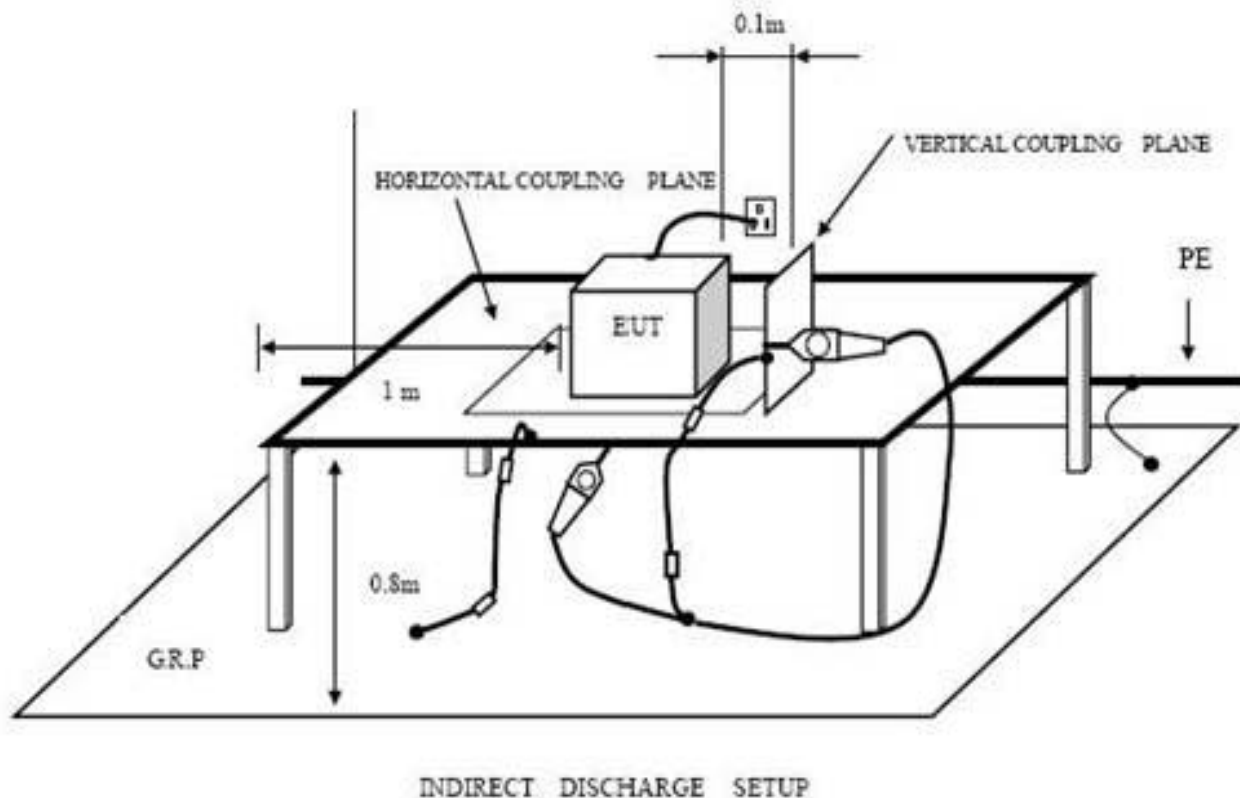
EN 55024:2010+A1:2015 (EN 61000-4-2:2009)

5.1.2. 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

5.1.3. Performance criterion: **B**

5.2. Test Setup



5.3. Test Procedure

10.3.1 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.

10.3.2 Contact Discharge:

All the procedure shall be same as air discharge. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

10.3.3 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.

10.3.4 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 Data

Please refer to the Attachment B.

6. Radiated Electromagnetic Field Immunity Test

6.1. Test Requirements

6.1.1. Test Standard

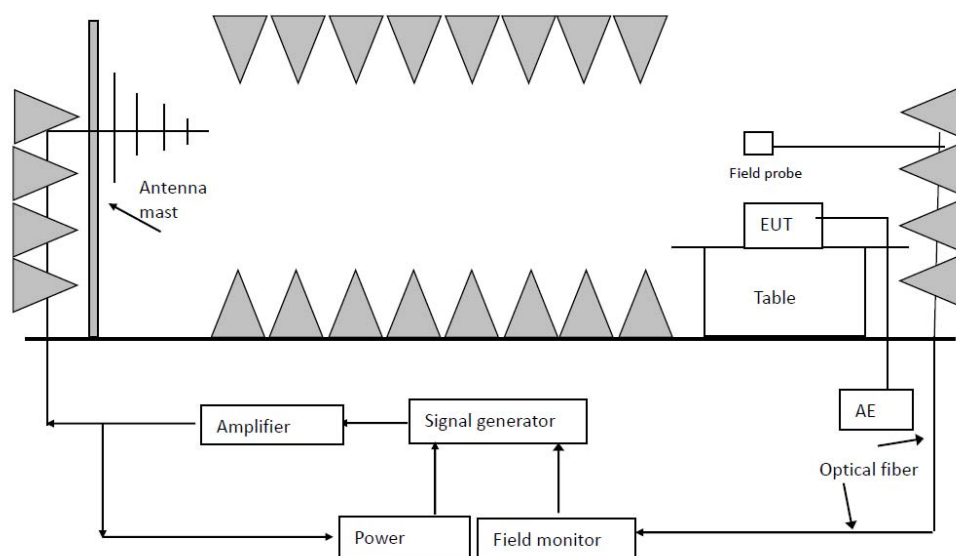
EN 55024:2010+A1:2015 (EN 61000-4-3:2006+A1:2008+A2:2010)

6.1.2. Test Level

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

Performance criterion: **A**

6.2. Test Setup



6.3. 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 camera is used to monitor its screen.

All the scanning conditions are as following:

Condition of Test	Remark
Fielded strength	3V/m (Severity Level 2)
Radiated signal	Modulated
Scanning frequency	80-1000MHz
Sweep time of radiated	0.0015 Decade/s
Dwell time	1 Sec.

6.4. Test Data

Please refer to the Attachment C.

7. Photographs - Constructional Details

Photo 1 Appearance of EUT



Photo 2 Appearance of EUT



Photo 3 Internal of EUT

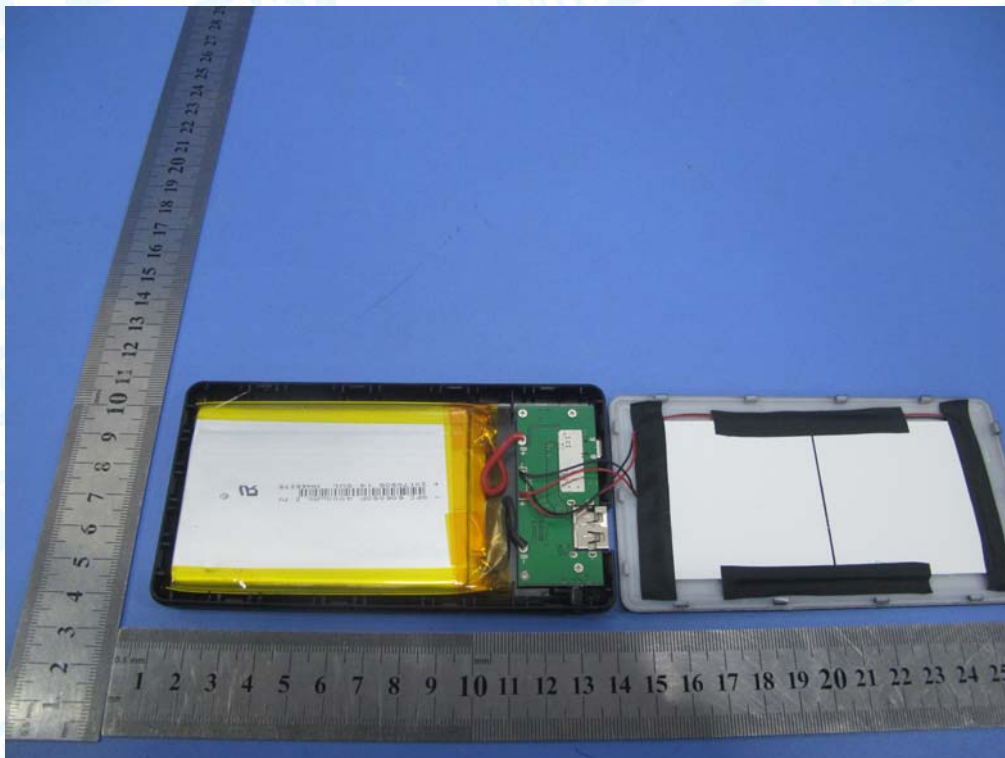


Photo 4 Appearance of PCB

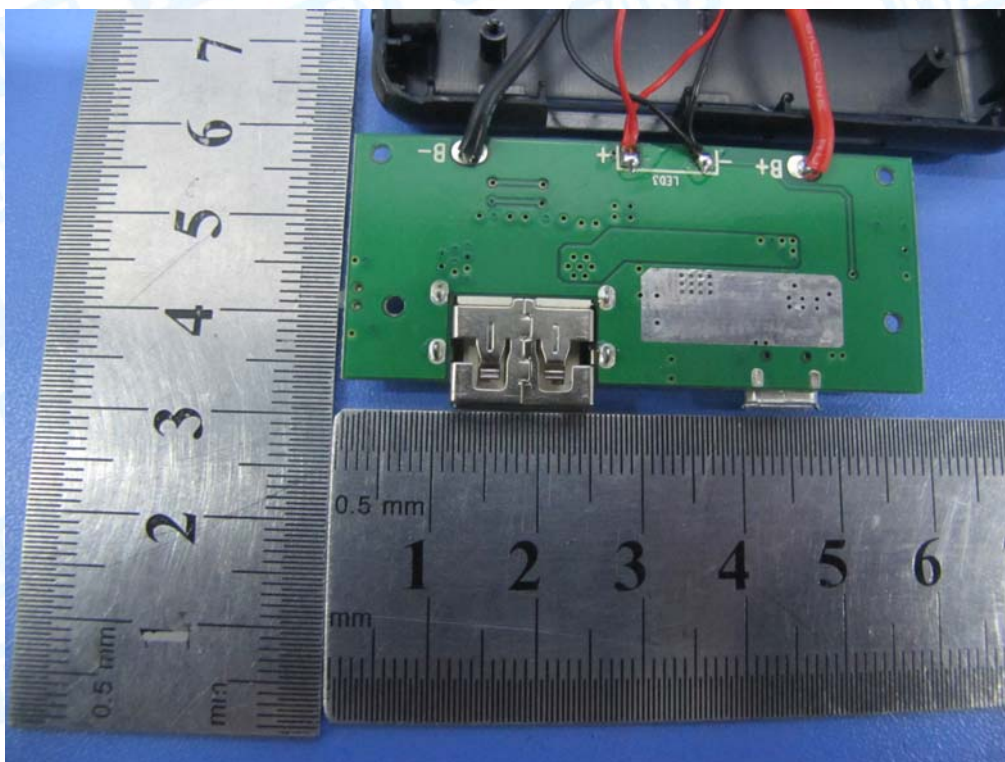
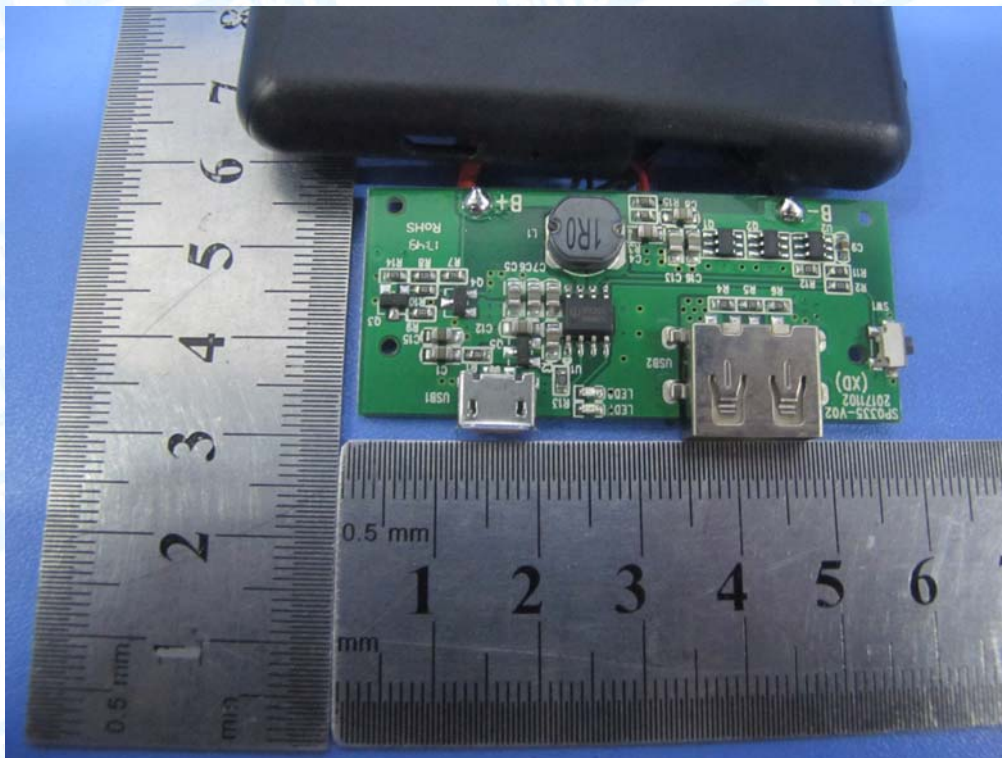
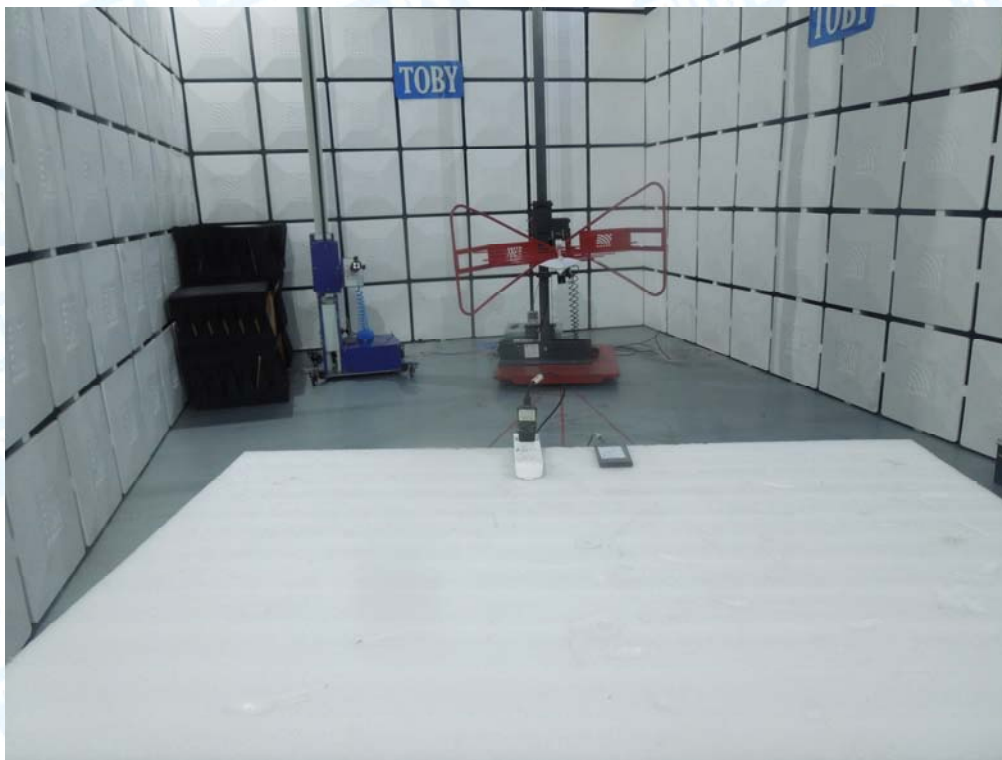


Photo 5 Appearance of PCB



8. Photographs - Test Setup

Radiated Emission Test Setup—Below 1G



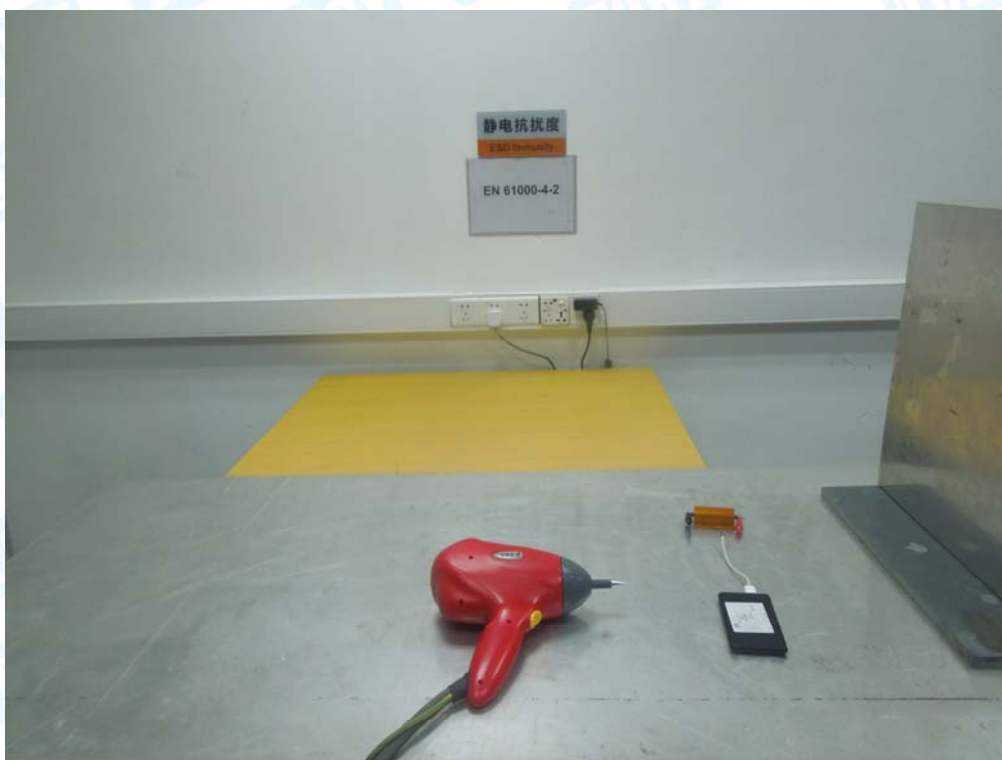
Radiated Emission Test Setup—Below 1G

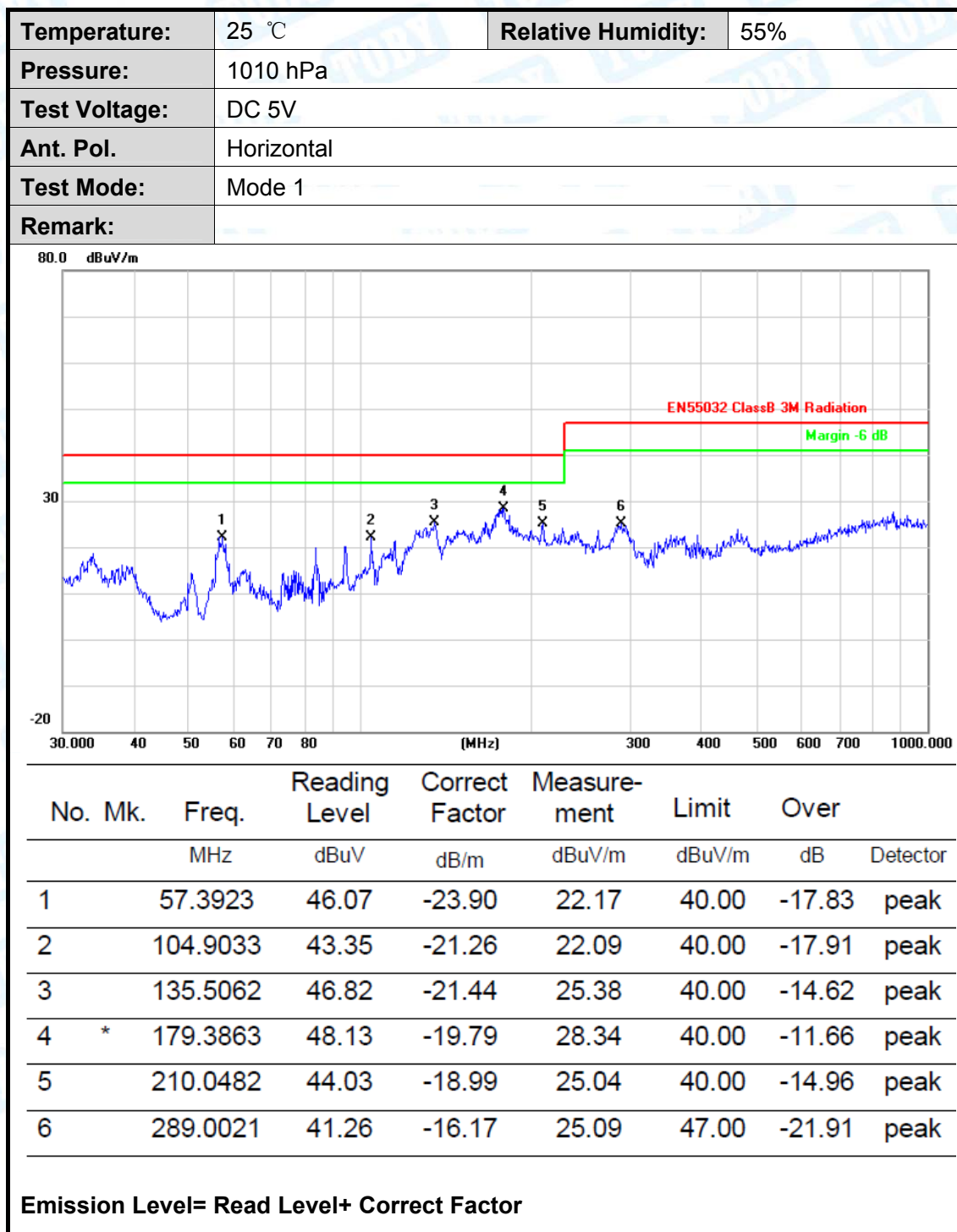


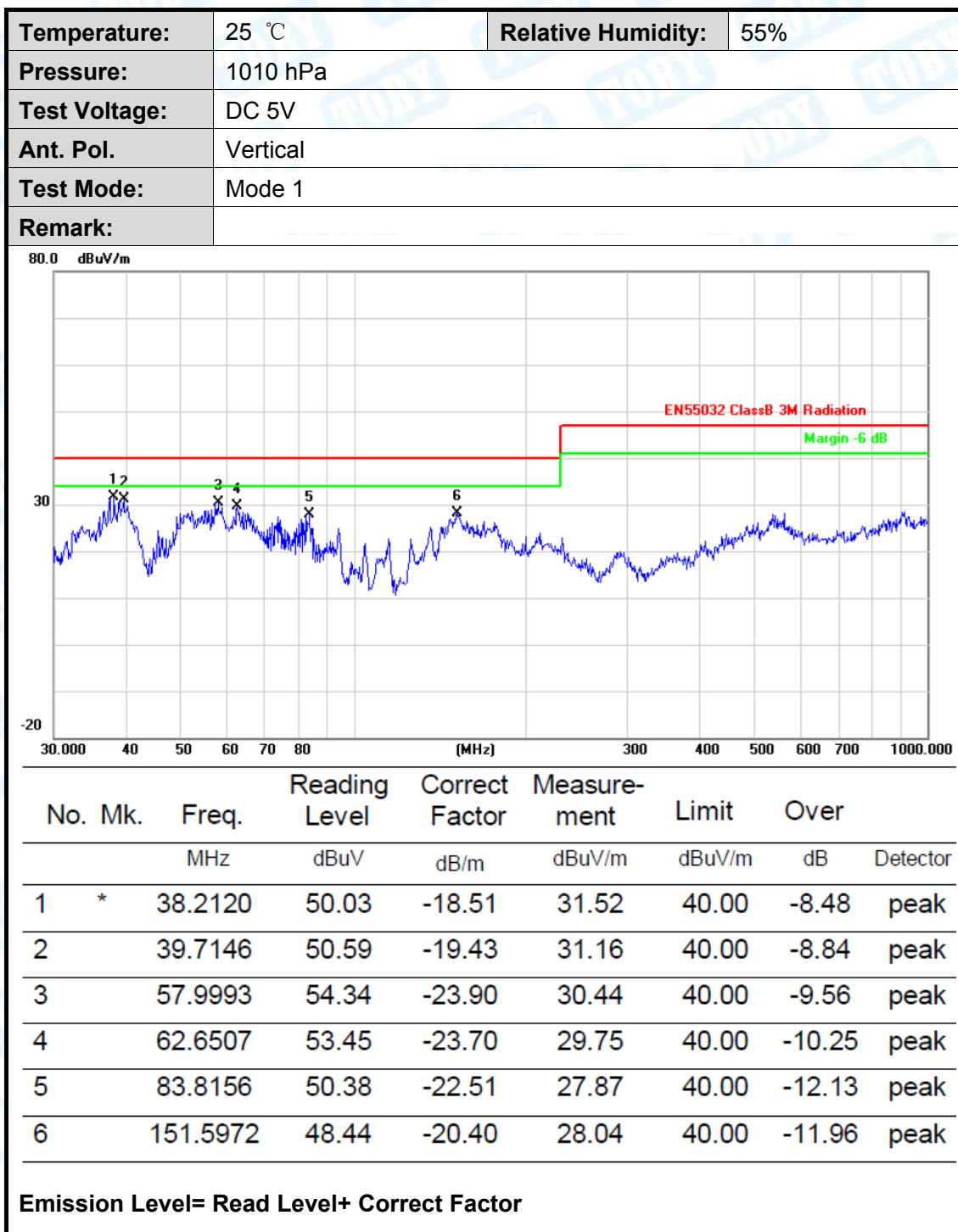
Electrostatic Discharge Test Setup



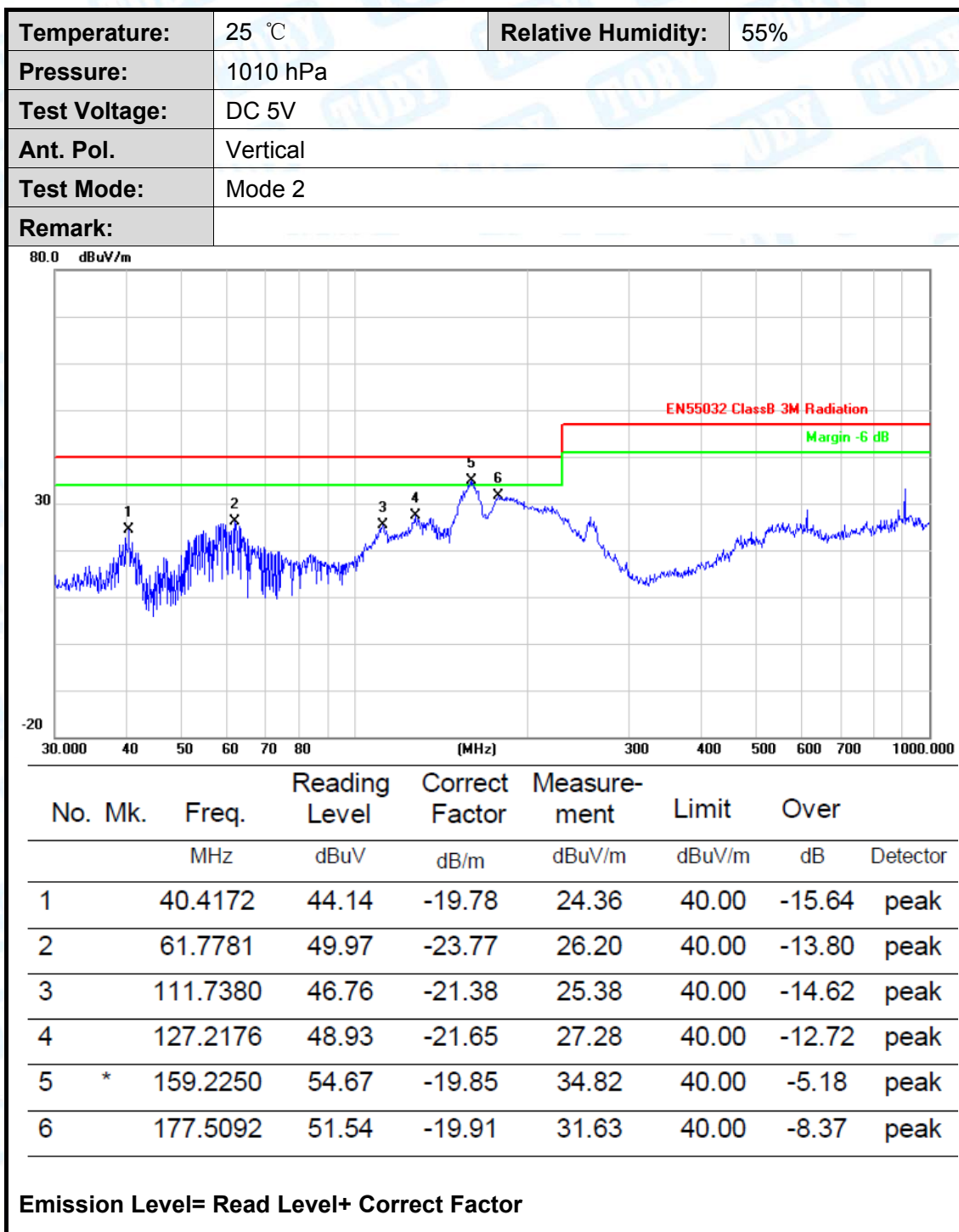
Electrostatic Discharge Test Setup



Attachment A--Radiated Emission Test Data(Below 1G)



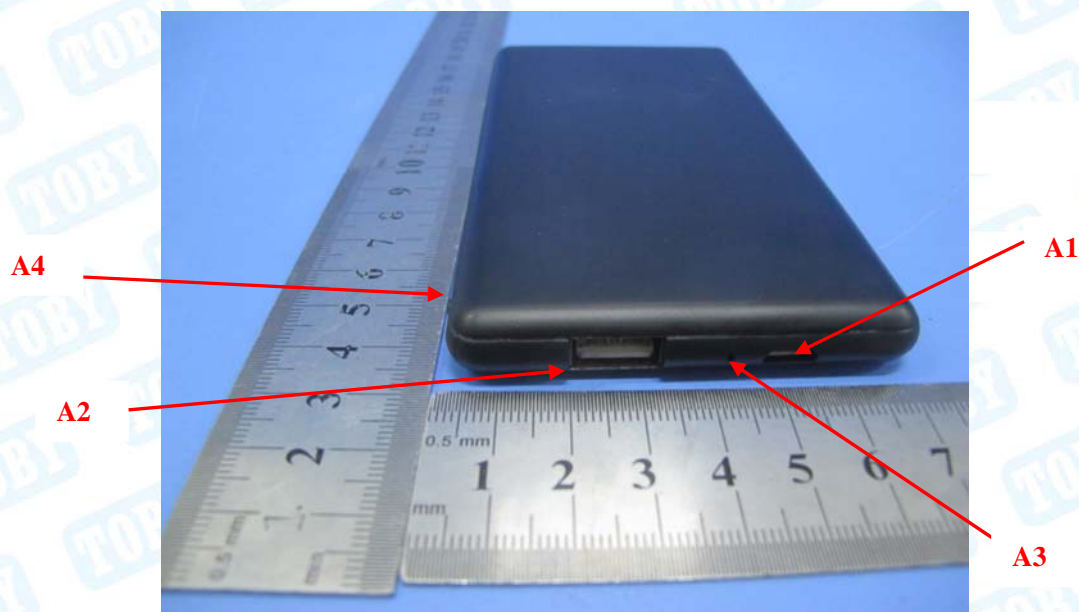




Attachment B--Electrostatic Discharge Test Data

Temperature : 22℃		Humidity : 50%		
Power supply : DC 5V		Test Mode : Mode 1/2		
Required Performance Criteria: B				
Air Discharge: ±2/±4/±8kV Contact Discharge: ±2/±4kV				
Location	Test Level (kV)	No. of Discharge	Judgment	Result
A1	±2kV ±4kV ±8kV	20	A	PASS
A2		20	A	
A3		20	A	
A4		20	A	
/	±2kV	/	/	
/	±4kV	/	/	
HCP	±4kV	40	A	
VCP	±4kV	40	A	

Test Location Photos



Note:

- 1) Criteria A: There was no change operated with initial operating during the test.
- 2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 3) Criteria C: The system shut down during the test.

Attachment C--RF Field Strength Susceptibility Test Data

Temperature	: 22°C	Humidity	: 50%			
Power supply	: DC 5V	Test Mode	: Mode 1/2			
Required Performance Criteria: A						
Modulation: AM 80%						
Pulse: 1 kHz						
EUT Position	Actual Performance Criteria				Result	
	Frequency Range 1: 80~1000MHz		Frequency Range 2: /			
	Horizontal	Vertical	Horizontal	Vertical		
Front	A	A	/	/	PASS	
Right	A	A	/	/	PASS	
Rear	A	A	/	/	PASS	
Left	A	A	/	/	PASS	
Remark: 1) Criteria A: There was no change operated with initial operating during the test. 2) Criteria B: The EUT function loss during the test, but self-recoverable after the test. 3) Criteria C: The system shut down during the test.						

-----END OF REPORT-----