



APPLICATION FOR ELECTROMAGNETIC COMPATIBILITY DIRECTIVE

On Behalf of

Shenzhen UVLED Optical Technology Co., Ltd

Laptop Guard

Model No.: SZQ05-mini sun 1

Prepared for : Shenzhen UVLED Optical Technology Co., Ltd
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TEST REPORT DECLARATION

Applicant : Shenzhen UVLED Optical Technology Co., Ltd
 Address : Room 301, FL 3, Phase 1, Bangkai Science and Technology Park Phoenix
 Street Admin, Guangming District, Shenzhen
 Manufacturer : Shenzhen UV Guard Technology Co., Ltd
 Address : 3/4F, Building A, NO. 2 NO.9, Bangkai Road, High-teach Industrial Park,
 Phoenix Street, Guangming New District, Shenzhen
 EUT Description : Laptop Guard
 (A) Model No. : SZQ05-mini sun 1
 (B) Trademark : N/A

Measurement Standard Used:

EN 55014-1:2017

EN 55014-2:2015

The device described above is tested by Shenzhen Alpha Product Testing 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 test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the EN 55014-1 and EN 55014-2 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Ben Sun
 Project Engineer

Approved by (name + signature).....: Simple Guan
 Project Manager

Date of issue.....: July 16, 2020



Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 16, 2020	Initial released Issue	Ben Sun

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	Standard	Limits		Results
Conducted disturbance at mains terminals test	EN 55014-1:2017	Section 4.1.1 Table 1		N/A
Disturbance power test	EN 55014-1:2017	Section 4.1.2 Table 2a		P
Radiated disturbance	EN 55014-1:2017	Section 4.1.2 Table 3		N/A
Clicks	EN 55014-1:2017	Section 4.2		N/A
Harmonic current emissions	EN 61000-3-2:2014	Class A		N/A
Voltage fluctuations & flicker	EN 61000-3-3:2013	Section 5		N/A
IMMUNITY (EN 55014-2:2015)				
Description of Test Item	Standard	Performance Criteria	Observation Criteria	Results
Electrostatic discharge (ESD)	IEC 61000-4-2:2008	B	A	P
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2006 + A1:2007 + A2:2010	B	A	P
Electrical fast transient	IEC 61000-4-4:2012	N/A	N/A	N/A
Surge	IEC 61000-4-5:2014	N/A	N/A	N/A
Radio-frequency, Continuous conducted disturbance	IEC 61000-4-6:2013	N/A	N/A	N/A
Voltage dips, Interruptions	IEC 61000-4-11:2004	N/A	N/A	N/A
Voltage dips , 60% reduction		N/A	N/A	N/A
Voltage dips, 30% reduction		N/A	N/A	N/A
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.				

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : Laptop Guard

Model Number : SZQ05-mini sun 1

Diff : N/A

Test Voltage : DC 5V From DC Power

EUT Information : Input: DC 5V

Highest frequency : Less than 108MHz

Trademark : N/A

Software version : N/A

Hardware version : N/A

2.2. Accessories of Device (EUT)

Power Source : N/A

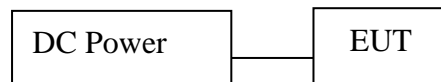
2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number
1	DC Power	JUNKE	JK12010S	20140927-6

2.4. Block Diagram of connection between EUT and simulators

For Tests

For Lighting Mode



Signal Cable Description of the above Support Units					
No.	Port Name	Cable	Length	Shielded (Yes or No)	Detachable (Yes or No)
(a)	N/A	N/A	N/A	N/A	N/A

EUT: Laptop Guard

2.5.Test mode Description

For Radiated Disturbance Test and EMS test

No.	Test Mode	Test Voltage
1.	Lighting	DC 5V From DC Power

2.6.Test Facility

Shenzhen Alpha Product Testing Co., Ltd.

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

2.7.Measurement Uncertainty

(95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Conducted Emission Test	2.74dB	
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB	Polarize: V
	3.80dB	Polarize: H
Uncertainty for Power Clamp Test	3.35 dB	

2.8. Immunity Performance Criteria Description

Performance Level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level by its manufacturer or the requestor of the test, or the agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

- a. Based on the used product standard.
- b. Based on the declaration of the manufacturer, requestor or purchaser

Criterion A:

Definition: normal performance within limits specified by the manufacturer, requestor and purchaser.

The apparatus shall continue to operate as intended during the test and after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Criterion B:

Definition: temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention.

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus 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 actual operation state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus the apparatus if used as intended.

Criterion C:

Definition: temporary loss of function or degradation of performance, the correction of which requires operator intervention.

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

Criterion D:

Definition: loss of function or degradation of performance, which is not recoverable, owing to damage to hardware or software, or loss of data.

2.9. Classification Of Apparatus Description

Category I: apparatus containing no electronic control circuitry.

Electric circuits consisting of passive components (such as radio interference suppression capacitors or inductors, mains transformers and mains frequency rectifiers) are not considered to be electronic control circuitry.

Category II: transformer toys, dual supply toys, mains powered motor operated appliances, tools, heating appliances and similar electric apparatus (for example — UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz.

Note: For toys, examples include educational computers, organs, track sets with electronic control units.

Category III: Battery powered apparatus (with built-in batteries or external batteries), which in normal use is not connected to the mains, containing an electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz.

This category includes apparatus provided with rechargeable batteries which can be charged by connecting the apparatus to the mains power. However, this apparatus shall also be tested as an apparatus in Category II while it is connected to the mains network.

Note: For toys, examples include musical soft toys, cord-controlled toys and motor-operated electronic toys.

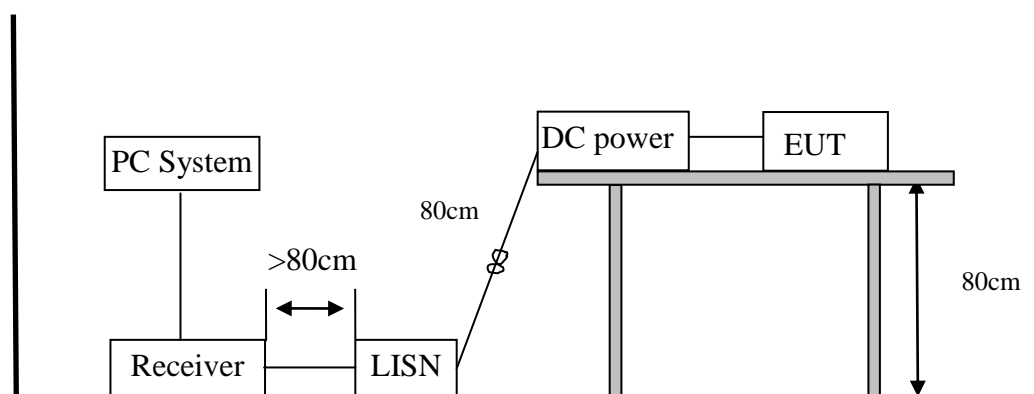
Category IV: all other apparatus covered by the scope of this standard (EN 55014-2).

3. CONDUCTED DISTURBANCE AT MAINS TERMINALS TEST

3.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	101165	2019.09.05	1 Year
2.	L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2019.09.05	1 Year
3.	L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2019.09.05	1 Year
4.	Pulse Limiter	Schwarzbeck	9516F	9618	2019.09.05	1 Year

3.2. Block Diagram of Test Setup



3.3. Power Line Conducted Emission Test Limits

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	59 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

- Notes:
1. Emission level=Read level + LISN factor-Preamplifier factor + Cable loss
 2. * Decreasing linearly with logarithm of frequency.
 3. The lower limit shall apply at the transition frequencies.

3.4.Configuration of EUT on Test

The following equipment are installed on conducted disturbance at mains terminals to meet the EN 55014-1 requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 3.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

3.6.Test Procedure

- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to EN 55014-1 on Conducted Disturbance at Mains Terminals test.
- (2) The frequency range from 150kHz to 30MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 9kHz.
- (3) The test results are reported on Section 3.7.

3.7. Conducted Disturbance at Mains Terminals Test Results

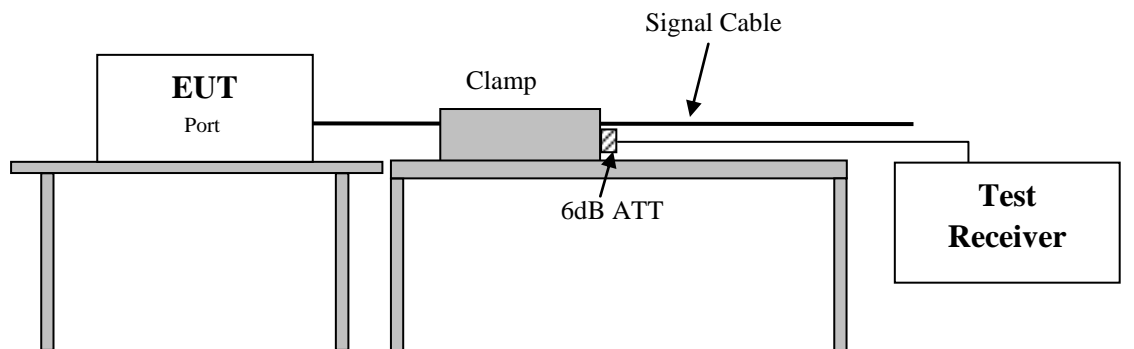
EUT	: Laptop Guard	Test Date	: N/A
M/N	: SZQ05-mini sun 1	Temperature	: N/A
Test Engineer	: N/A	Humidity	: N/A
Test Voltage	: N/A	Pressure	: N/A
Test Mode	: N/A		
Test Results	: N/A		
Note	Not applicable for equipment operated with PC, Battery, or Power Supply.		

4. DISTURBANCE POWER TEST

4.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	Rohde & Schwarz	ESCI	101165	2019.09.05	1 Year
2	Absorbing Clamp	Liithi	MDS-21	4054	2019.09.08	1 Year
3	N50(f-m) 6dB Fixed Attenuator	Rohde & Schwarz	A0835	J01006A0835	2019.09.05	1 Year

4.2. Block Diagram of Test Setup



4.3. Disturbance Power Test Limits

For Household and similar appliances and Rated motor power not exceeding 700 W Tools:

Frequency	Interference Power Limits	
	Quasi-Peak Level dB(pW)	Average Level dB(pW)
30MHz ~ 300MHz	45 Increasing Linearly with Frequency to 55	35 Increasing Linearly with Frequency to 45

For Rated motor power above 700 W and not exceeding 1 000 W Tools:

Frequency	Interference Power Limits	
	Quasi-Peak Level dB(pW)	Average Level dB(pW)
30MHz ~ 300MHz	49 Increasing Linearly with Frequency to 59	39 Increasing Linearly with Frequency to 49

Notes: Emission level=Read level + Clamp factor-Preamp factor + Cable loss

4.4.Configuration of EUT on Test

The EN55014-1 regulations test method must be used to find the maximum emission during radiated power test. Any lead connecting the EUT to an auxiliary apparatus is disconnected if this does not affect the operation of the EUT, or is isolated by means of absorbing clamp close to the EUT, a similar measure was made on each lead which is or may be connected to an auxiliary apparatus, whether or not it is necessary for the operation of the EUT.

4.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 4.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

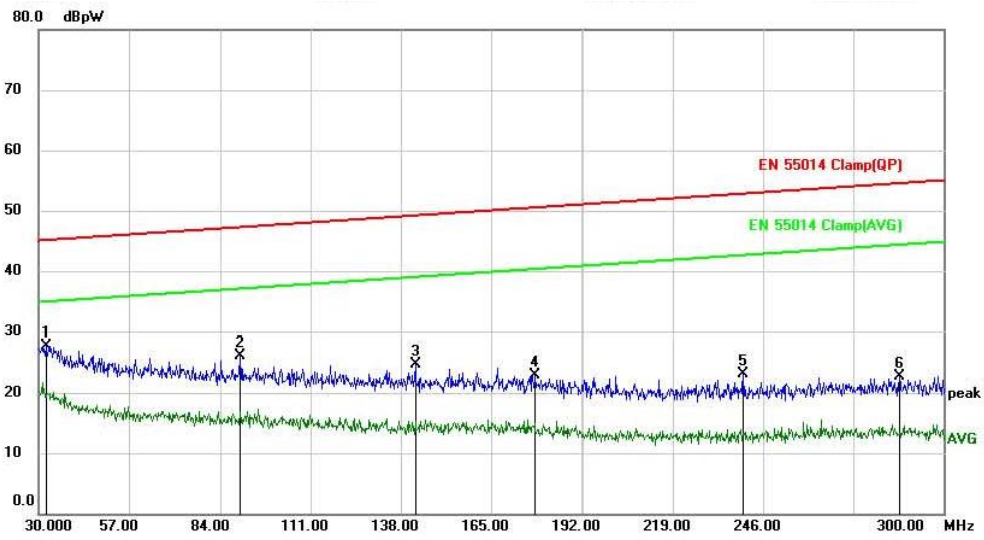
4.6.Test Procedure

- (1) The EUT is placed on the table which is high 0.8m by insulating support and away from other metallic surface at least 0.8m. It is connected to the power mains through an extension cord of 6m minimums. The absorber clamp was clamps the cord and moves from the far end to EUT to measure the disturbing energy emitted from the cord.
- (2) The frequency range from 30MHz to 300MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 120kHz.
- (3) The test results are reported on Section 4.7.

4.7. Disturbance Power Test Results

EUT	: Laptop Guard	Test Date	: 2020.07.15
M/N	: SZQ05-mini sun 1	Temperature	: 24°C
Test Engineer	: Ben Sun	Humidity	: 56%
Test Voltage	: DC 5V From DC Power	Pressure	: 101.3KPa
Test Mode	: Lighting		
Test Results	: PASS		
Note:	1. The data is shown in the next page.		
	2. If the limits for the measurement with the average detector are met when using a receiver with a quasi-peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.		

DC Line



No.	Mk.	Freq. MHz	Reading Level dBpW	Correct Factor dB	Measure- ment dBpW	Limit dBpW	Margin dB	Detector	Position cm	Comment
1	*	32.3200	0.79	27.01	27.80	45.09	-17.29	peak		
2		90.2000	3.21	22.95	26.16	47.23	-21.07	peak		
3		142.4400	2.69	22.02	24.71	49.16	-24.45	peak		
4		178.4800	1.86	21.05	22.91	50.50	-27.59	peak		
5		240.2800	2.72	20.34	23.06	52.79	-29.73	peak		
6		286.8800	1.73	21.04	22.77	54.51	-31.74	peak		

*:Maximum data x:Over limit !:over margin <Reference Only

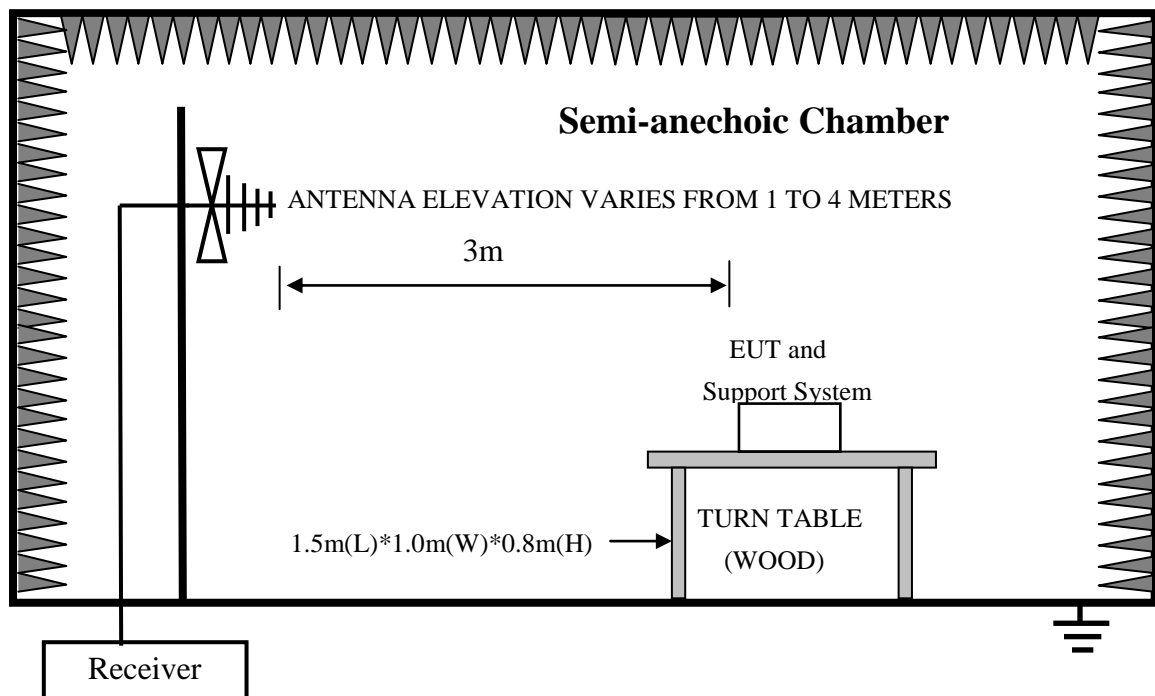
Note: Measurement=Reading Level+Correc Factor Factor=CLAMP Factor+Cable Loss+Attenuator.

5. RADIATED DISTURBANCE TEST

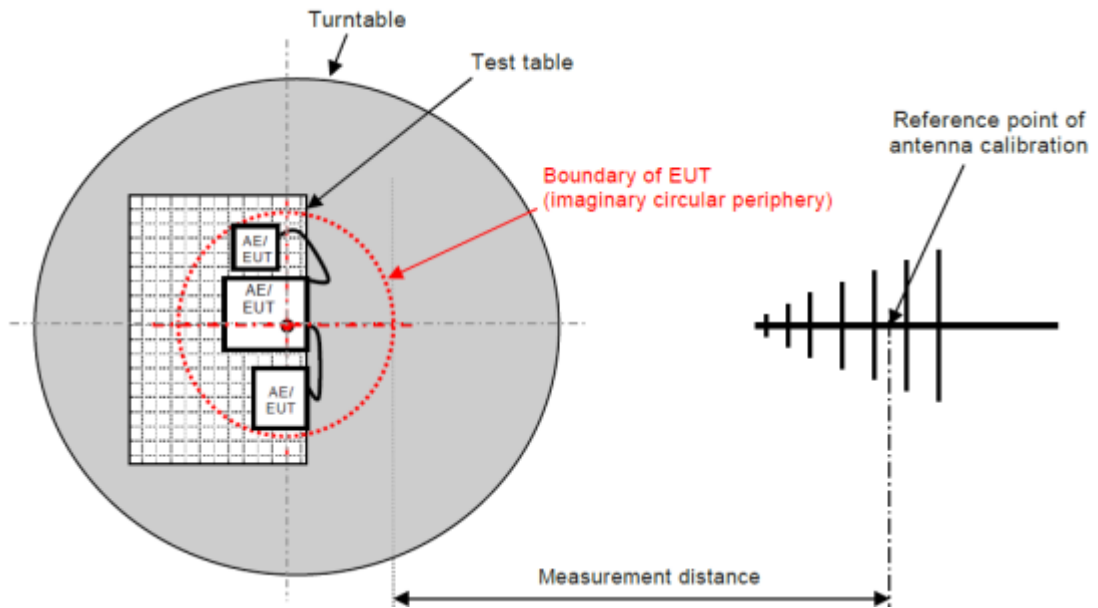
5.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	Rohde&Schwarz	ESR	1316.3003K0 3-102082-Wa	2019.09.06	1 Year
3	Bilog Antenna	Schwarzbeck	VULB 9168	9168-438	2020.04.12	2 Year
4	Cable	Resenberger	SUCOFLEX 104	309972/4	2019.09.05	1 Year

5.2. Block Diagram of Test Setup



For 3m distance description:



5.3. Radiated Emission Limit

Frequency MHz	Distance (Meters)	Field Strengths Limits dB(μ V)/m
30 ~ 230	3	40
230 ~ 1000	3	47

- Notes:
1. Emission level = Read level + Antenna Factor - Preamp Factor + Cable Loss
 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.Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the EN 55014-1 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

5.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 5.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

5.6.Test Procedure

- (1) The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all the interface cables were changed according to EN 55014 on Radiated Disturbance test.
- (2) The frequency range from 30MHz to 1000MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESR) is set at 120kHz.
- (3) The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values, all measurement distance is 3m in 3m semi anechoic chamber.
- (4) The test results are reported on Section 5.7.

5.7.Radiated Disturbance Test Results

EUT	: Laptop Guard	Test Date	: N/A
M/N	: SZQ05-mini sun 1	Temperature	: N/A
Test Engineer	: N/A	Humidity	: N/A
Test Voltage	: N/A	Pressure	: N/A
Test Mode	: N/A		
Test Results	: N/A		
<p>Note: 1. See section 4.6 all emission readings from the equipment under test shall be lower than the applicable limits reduced by the margin. The maximum clock frequency shall be less than 30 MHz. So, the frequency range 30-1000MHz radiation test not applicable.</p>			

6. CLICKS

The EUT which fulfill the following condition:

- the click rate is no more than 5;
- none of the caused clicks has duration longer than 20 ms,
- 90% of the caused clicks have a duration less than 10 ms (measured duration time is 0.4ms),
was deemed to comply with the limits.

The disturbance from individual switching operations, caused directly or indirectly, manually or by similar activities on a switch or a control which is included in an appliance or otherwise to be used for:

- a) the purpose of mains connection or disconnection only;
- b) the purpose of programmer selection only;
- c) the control of energy or speed by switching between a limited number of fixed positions;
- d) the changing of the manual setting of a continuously adjustable control such as a variable speed device for water extraction or electronic thermostats, is to be disregarded for the purpose of testing the appliance for compliance with the limits of radio disturbance set out in this standard.

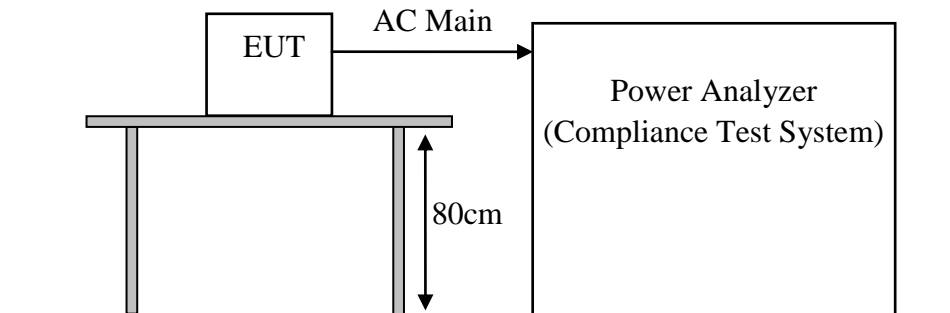
Also the disturbance caused by the operation of any switching device or control which is included in an appliance for the purpose of mains disconnection for safety only, is to be disregarded for the purpose of testing the appliance for compliance with the limits of radio disturbance as described in this standard.

7. HARMONIC CURRENT TEST

7.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Harmonics Flicker Analyser	Voltech	PM6000	20000670049 5	2019.09.06	1 Year

7.2. Block Diagram of Test Setup



7.3. Harmonic Current Test Limits

For Class A equipment:

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \leq n \leq 39$	$0,15 \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \leq n \leq 40$	$0,23 \frac{8}{n}$

for Class B equipment:

The harmonics of the input current shall not exceed the values given in Class A equipment limit multiplied by a factor of 1,5.

7.4.Configuration of EUT on Test

The following equipment are installed on Harmonic Current Test to meet the EN61000-3-2 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

7.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 7.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

7.6.Test Procedure

- (1) The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the necessary for the EUT to be exercised.
- (2) The test results are reported on Section 7.7.

7.7.Harmonic Current Test Results

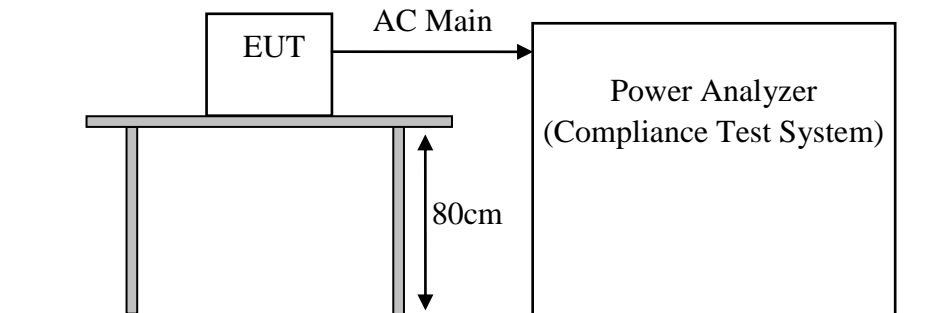
EUT : Laptop Guard	Test Date : N/A
M/N : SZQ05-mini sun 1	Temperature : N/A
Test Engineer : N/A	Humidity : N/A
Test Voltage : N/A	Pressure : N/A
Test Mode : N/A	
Test Results : N/A	
Note: Not applicable for equipment operated with Battery DC supply.	

8. VOLTAGE FLUCTUATIONS & FLICKER TEST

8.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Harmonics Flicker Analyser	Voltech	PM6000	20000670049 5	2019.09.06	1 Year

8.2. Block Diagram of Test Setup



8.3. Voltage Fluctuation and Flicker Test Limits

Test Item	Limit	Note
P_{st}	1.0	P_{st} means Short-term flicker indicator
P_{lt}	0.65	P_{lt} means long-term flicker indicator
T_{dt}	0.2	T_{dt} means maximum time that dt exceeds 3%
$d_{max}(\%)$	4%	d_{max} means maximum relative voltage change.
$d_c(\%)$	3.3%	d_c means relative steady-state voltage change.

8.4.Configuration of EUT on Test

The following equipment are installed on Harmonic Current Test to meet the EN61000-3-3 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

8.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 8.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

8.6.Test Procedure

- (1) The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal conditions During the flick measurement; the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.
- (2) The test results are reported on Section 8.7.

8.7.Voltage Fluctuation and Flicker Test Results

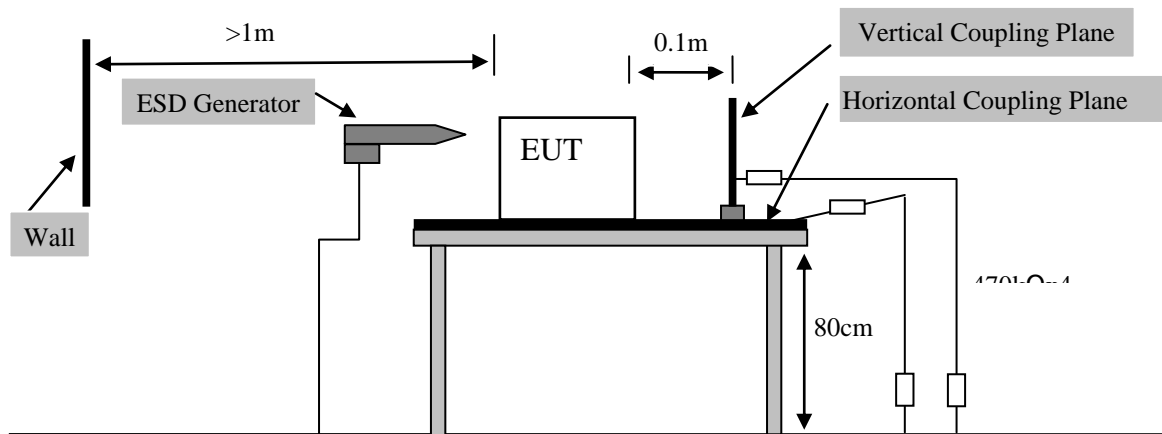
EUT : Laptop Guard	Test Date : N/A
M/N : SZQ05-mini sun 1	Temperature : N/A
Test Engineer : N/A	Humidity : N/A
Test Voltage : N/A	Pressure : N/A
Test Mode : N/A	
Test Results : N/A	
Note: Not applicable for equipment operated with Battery DC supply.	

9. ELECTROSTATIC DISCHARGE TEST

9.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	ESD Tester	HAEFELY	PESD1610	H310546	2019.09.12	1 Year

9.2. Block Diagram of Test Setup



9.3. Electrostatic Discharge Test Limits

Test Type	Test Level	Performance Criterion
Air Discharge	8KV	B
Contact Discharge	4KV	B

- Notes:
1. A performance criterion C could be applied to toys not using score or data entered by the user. Examples are musical soft toys, sounding toys, etc.
 2. Test set-up reference IEC 61000-4-2:2008

9.4.Configuration of EUT on Test

The following equipment are installed on Electrostatic Discharge Test to meet the IEC 61000-4-2 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

9.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 9.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

9.6.Test Procedure

(1) Air Discharge:

The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times (10 with positive and 10 negative with positive) for each pre-selected test point. This procedure was repeated until all the air discharge completed.

(2) Contact Discharge:

All the procedure was same as Section 9.6.1. Except that the generator was re-triggered for a new single discharge for each pre-selected test point. The tip of the discharge electrode was touching the EUT before the discharge switch was operated.

(3) Indirect discharge for horizontal coupling plane:

At least 20 single discharges (10 with positive and 10 negative with positive) were 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.

(4) Indirect discharge for vertical coupling plane:

At least 20 single discharge (10 with positive and 10 negative with positive) were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

9.7.Electrostatic Discharge Test Results

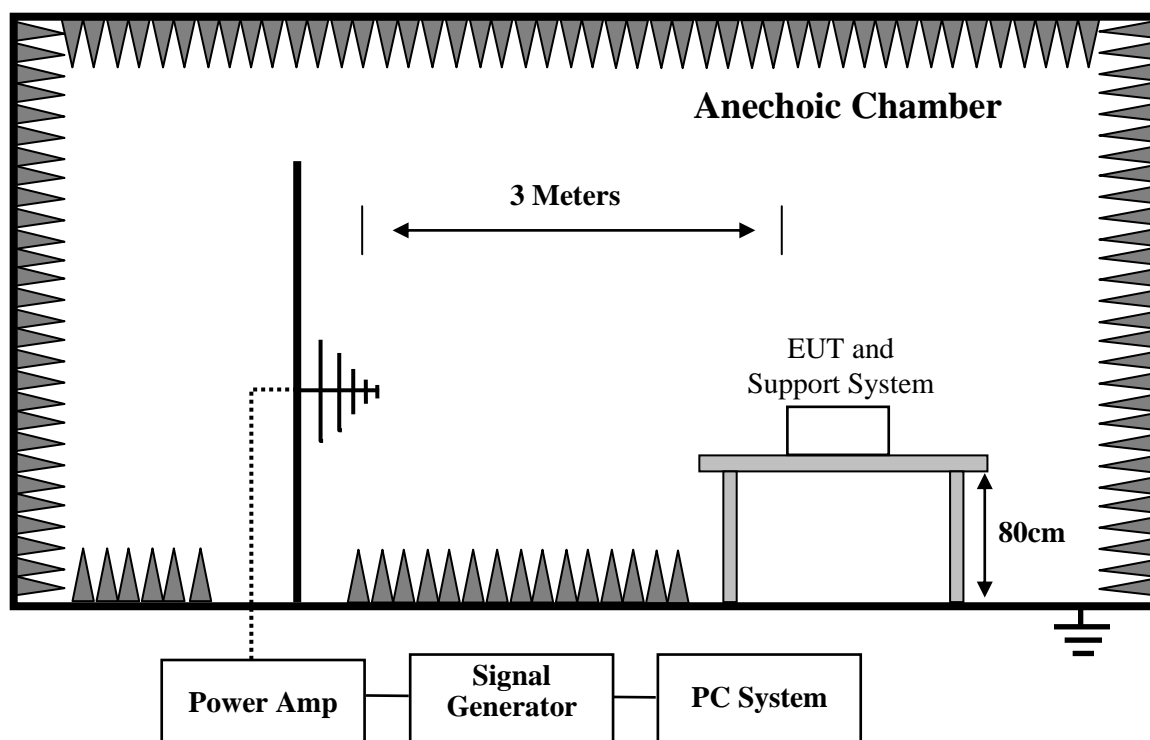
EUT	: Laptop Guard	Test Date	: 2020.07.15	
M/N	: SZQ05-mini sun 1	Temperature	: 24°C	
Test Engineer	: Ben Sun	Humidity	: 56%	
Test Voltage	DC 5V From DC Power	Pressure	: 101.3KPa	
Test Mode	: Lighting			
Test Results	: PASS			
Discharge Voltage (kV)	Type Of Discharge	Dischargeable Points	Performance	
			Required	Observation
±4	Contact	N/A	B	N/A
±8	Air	1	B	A
±4	HCP-Bottom	Edge of the HCP	B	A
±4	VCP-Front	Center of the VCP	B	A
±4	VCP-Left	Center of the VCP	B	A
±4	VCP-Back	Center of the VCP	B	A
±4	VCP-Right	Center of the VCP	B	A
Discharge Points Description				
<u>1</u>	Port	<u>4</u>	/	
<u>2</u>		<u>5</u>	/	
<u>3</u>	/	<u>6</u>	/	
Note:	<p>1. For the time interval between successive single discharges an initial value of one second.</p> <p>2. For Air Discharge each Point Positive 25 times and negative 25 times discharge.</p> <p>3. EUT is pure plastic shell, so is not apply to contact discharge.</p> <p>4. Class A is no function loss.</p>			

10.RF FIELD STRENGTH SUSCEPTIBILITY TEST

10.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	vector Signal Generator	Agilent	E4438C	US44271917	2019.09.06	1 Year
2.	Power meter	Agilent	E4419B	GB40202122	2019.09.06	1 Year
3.	Power Sensor	Agilent	E9300A	MY41496625	2019.09.06	1 Year
4.	RF power Amplifier	OPHIR	5225R	1045	N/A	NCR
5.	RF power Amplifier	OPHIR	5273R	1018	N/A	NCR
6.	Antenna	SCHWARZBECK	STLP9128E-special	STLP9128E s#139	N/A	NCR
7.	Antenna	SCHWARZBECK	STLP9128E-special	STLP 9149 #456	N/A	NCR

10.2.Block Diagram of Test Setup



10.3.RF Field Strength susceptibility Test Limits

Test Specifications	Test Level	Performance Criterion
80MHz-1000MHz	3V/m (r.m.s.)	A

Notes: 1. Test set-up reference IEC 61000-4-3:2006 + A1:2007 + A2:2010

10.4.Configuration of EUT on Test

The following equipment are installed on Electrostatic Discharge Test to meet the IEC 61000-4-3 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

10.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 10.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

10.6.Test Procedure

- (1) Testing was performed in a Fully anechoic chamber as recommended by IEC 61000-4-3. The EUT was placed on an 80 cm high non-conductive table located in the area of field uniformity. The radiating antenna was placed 3m in front of the EUT and Support system, and dwell time of the radiated interference was controlled by an automated, computer-controlled system.
- (2) The signal source was stepped through the applicable frequency range at a rate no faster than 1% of the fundamental. The signal was amplitude modulated 80% over the frequency range 80 MHz to 1GHz at a level of 3 V/m. The dwell time was set at 3 s.
- (3) Field presence was monitored during testing via a field probe placed in close proximity to the EUT.
- (4) Throughout testing, the EUT was closely monitored for signs of susceptibility. The test was performed with the antennae oriented in both a horizontal and vertical polarization.
- (5) All the scanning conditions are as follows:

Condition of Test	Require of Test
Test Fielded Strength	3 V/m
Radiated Signal	80% amplitude modulated with a 1kHz sine wave
Scanning Frequency	80 - 1000 MHz
Sweeping time of radiated	0.0015 decade/s
Dwell Time	1 Sec.

10.1.RF Field Strength susceptibility Test Limits

Test Specifications	Test Level	Performance Criterion
80MHz-1000MHz	3V/m (r.m.s.)	A

Notes: 1. Test set-up reference IEC 61000-4-3:2006 + A1:2007 + A2:2010

10.2.Configuration of EUT on Test

The following equipment are installed on RF Field Strength Susceptibility Test to meet the IEC 61000-4-3 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

10.3.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 10.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

10.4.Test Procedure

- (1) Testing was performed in a Fully anechoic chamber as recommended by IEC 61000-4-3. The EUT was placed on an 80 cm high non-conductive table located in the area of field uniformity. The radiating antenna was placed 3m in front of the EUT and Support system, and dwell time of the radiated interference was controlled by an automated, computer-controlled system.
- (2) The signal source was stepped through the applicable frequency range at a rate no faster than 1% of the fundamental. The signal was amplitude modulated 80% over the frequency range 80 MHz to 1GHz at a level of 3 V/m. The dwell time was set at 3 s.
- (3) Field presence was monitored during testing via a field probe placed in close proximity to the EUT.
- (4) Throughout testing, the EUT was closely monitored for signs of susceptibility. The test was performed with the antennae oriented in both a horizontal and vertical polarization.
- (5) All the scanning conditions are as follows:

Condition of Test	Require of Test
Test Fielded Strength	3 V/m
Radiated Signal	80% amplitude modulated with a 1kHz sine wave
Scanning Frequency	80 - 1000 MHz
Sweeping time of radiated	0.0015 decade/s
Dwell Time	1 Sec.

10.1.RF Field Strength Susceptibility Test Results

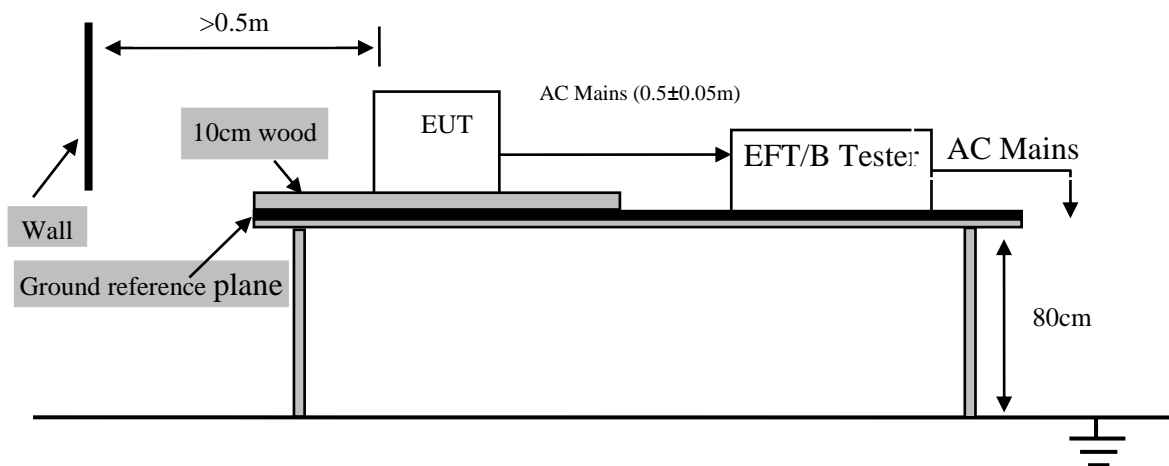
EUT	: Laptop Guard	Test Date	: 2020.07.15		
M/N	: SZQ05-mini sun 1	Temperature	: 24°C		
Test Engineer	: Ben Sun	Humidity	: 56%		
Test Voltage	: DC 5V From DC Power	Pressure	101.3KPa		
Test Mode	: Lighting				
Test Results	: PASS				
Field Strength	: 3V/m				
Modulation:	<input checked="" type="checkbox"/> AM	<input type="checkbox"/> Pulse	<input type="checkbox"/> none 1 kHz 80%		
	Frequency Range :80 MHz -1000MHz				
Steps	1%				
	Horizontal		Vertical	Result	
	Required	Observation	Required	Observation	(Pass / Fail)
Front	A	A	A	A	Pass
Right	A	A	A	A	Pass
Rear	A	A	A	A	Pass
Left	A	A	A	A	Pass
Remark: Class A is no function loss					

11.ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

11.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Cal. Interval
1.	Multifunctional Compact Immunity Test system	3ctest	CCS 600	ES0801655	2019.09.05	1 Year
2.	Surge & EFT Coupling Decoupling Network	3ctest	SEPN 3832T	ES0951601	2019.09.05	1 Year
3.	Voltage variation and PF magnetic field regulating device	3ctest	VMT2216S	ES0441601	2019.09.06	1 Year
4.	Capacitive Coupling Clamp	3ctest	CCC 100	EC0441660	2019.09.06	1 Year

11.2.Block Diagram of Test Setup



11.3.Test Standard

EN 55014 -2:2015

(Severity Level 2 at 1kV)

11.4.Electrical Fast Transient/Burst Test Limits

Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1.	0.5 kV	0.25 kV
2.	1 kV	0.5 kV
3.	2 kV	1 kV
4.	4 kV	2 kV
X	Special	Special

Notes: 1. Test set-up reference IEC 61000-4-4:2012
2. Performance criterion : **B**

11.5.Configuration of EUT on Test

The following equipment are installed on Electrostatic Discharge Test to meet the IEC 61000-4-4 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

11.6.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 12.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

11.7.Test Procedure

The EUT and its simulators were placed on the ground reference plane and were insulated from it by a wood support 0.1m + 0.01m thick. The ground reference plane was 1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane was project

- (1) beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5m. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.

12.7.1. For input and AC power ports:

The EUT was connected to the power mains by using a coupling device that couples the EFT interference signal to AC power lines. Both positive transients and negative transients of test voltage were applied during compliance test and the duration of the test can't less than 2 min.

12.7.2. For signal lines and control lines ports:

No I/O ports. It's unnecessary to test.

12.7.3. For DC input and DC output power ports:

It's unnecessary to test.

11.8.Electrical Fast Transient/Burst immunity Test Results

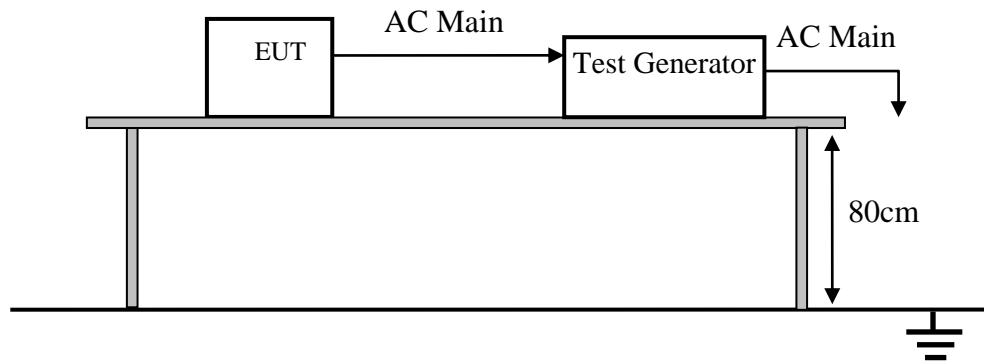
EUT	: Laptop Guard	Test Date	: N/A
M/N	: SZQ05-mini sun 1	Temperature	: N/A
Test Engineer	: N/A	Humidity	: N/A
Test Voltage	: N/A	Pressure	: N/A
Test Mode	: N/A		
Test Results	: N/A		
Note: Not applicable for equipment operated with PC, Battery, or Power Supply.			

12.SURGE TEST

12.1.Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Multifunctional Compact Immunity Test system	3ctest	CCS 600	ES0801655	2019.09.05	1 Year
2.	Surge & EFT Coupling Decoupling Network	3ctest	SEPN 3832T	ES0951601	2019.09.05	1 Year
3.	Voltage variation and PF magnetic field regulating device	3ctest	VMT22 16S	ES0441601	2019.09.06	1 Year
4.	Capacitive Coupling Clamp	3ctest	CCC 100	EC0441660	2019.09.06	1 Year

12.2.Block Diagram of Test Setup



12.3.Surge Test Limits

Environmental phenomenon	Test specifications	Test set-up
Surge	1,2/50 (8/20) μ s Tr/Td 2 kV line-to-earth with 12 Ω Impedance 1 kV line-to-line with 2 Ω Impedance	IEC 61000-4-5

Severity level

Severity Level [↵]	Open-Circuit Test Voltage [↵] kV [↵]
1 [↵]	0.5 [↵]
2 [↵]	1.0 [↵]
3 [↵]	2.0 [↵]
4 [↵]	4.0 [↵]
* [↵]	Special [↵]

Performance criterion : B

12.4.Configuration of EUT on Test

The following equipment are installed on Electrostatic Discharge Test to meet the IEC 61000-4-5 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

12.5.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 13.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

12.6.Test Procedure

- (1) For line to line coupling mode, provide a 1.0kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- (2) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- (3) Different phase angles are done individually.
- (4) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

12.7.Surge Test Results

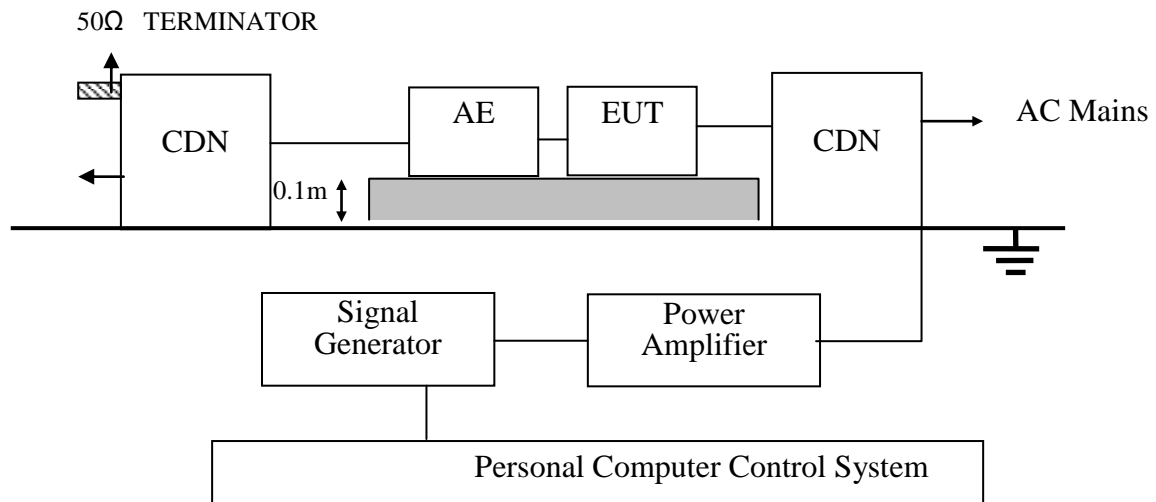
EUT : Laptop Guard	Test Date : N/A
M/N : SZQ05-mini sun 1	Temperature : N/A
Test Engineer : N/A	Humidity : N/A
Test Voltage : N/A	Pressure : N/A
Test Mode : N/A	
Test Results : N/A	
Note: Not applicable for equipment operated with PC, Battery, or Power Supply.	

13.INJECTED CURRENTS SUSCEPTIBILITY TEST

13.1.Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Conducted Immunity test System	SKET	CITS_150 K230M	SK2019101 001_CITS	2019.11.08	1 Year
2.	Fixed Coaxial Attenuator (6dB Attenuation)	CD	ATT-0675	120540086	2019.09.06	1 Year
3.	coupling-decoupling network (CDN)	CD	CDN M2/M3	2302	2019.09.06	1 Year
4.	Electromagnetic Injection Clamp (EMC-Clamp)	CD	EM-Clamp	0513A0312 01	2019.09.05	1 Year

13.2.Block Diagram of Test Setup



13.3.Test Standard

EN 55014 -2: 2015

(Severity Level 2 at 3Vrms and frequency is from 0.15MHz to 230MHz)

13.4. Injected currents susceptibility Test Limits

Level	Voltage Level (e.m.f.) V
1	1
2	3
3	10
X	Special

- Notes:
1. Test set-up reference IEC 61000-4-6:2013
 2. Performance criterion: **A**

13.5. Configuration of EUT on Test

The following equipment are installed on Electrostatic Discharge Test to meet the IEC 61000-4-6 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

13.6. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 14.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

13.7. Test Procedure

- (1) Let the EUT work in test mode and test it.
The EUT are placed on an insulating support 0.1m high above a ground reference plane.
- (2) CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- (3) The disturbance signal described below is injected to EUT through CDN.
- (4) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- (5) The frequency range is swept from 0.150MHz to 230MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.
The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept
- (6) incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- (7) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

13.8.Injected currents susceptibility Test Results

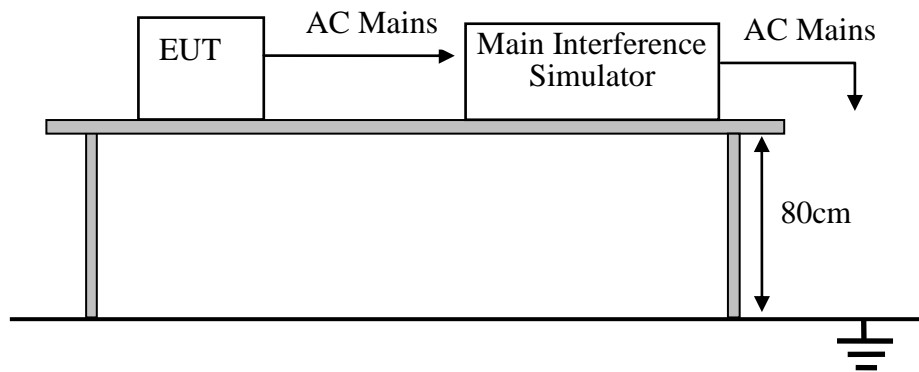
EUT : Laptop Guard	Test Date : N/A
M/N : SZQ05-mini sun 1	Temperature : N/A
Test Engineer : N/A	Humidity : N/A
Test Voltage : N/A	Pressure : N/A
Test Mode : N/A	
Test Results : N/A	
Note: Not applicable for equipment operated with PC, Battery, or Power Supply.	

14. VOLTAGE DIPS AND INTERRUPTIONS TEST

14.1. Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Cal. Interval
1.	Multifunctional Compact Immunity Test system	3ctest	CCS 600	ES0801655	2019.09.05	1 Year
2.	Surge & EFT Coupling Decoupling Network	3ctest	SEPN 3832T	ES0951601	2019.09.05	1 Year
3.	Voltage variation and PF magnetic field regulating device	3ctest	VMT2216S	ES0441601	2019.09.06	1 Year
4.	Capacitive Coupling Clamp	3ctest	CCC 100	EC0441660	2019.09.06	1 Year

14.2. Block Diagram of Test Setup



14.3. Test Standard

EN 55014 -2: 2015

14.4.Voltage dips and interruptions Test Limits

Test Level %U _T	Voltage dip and short interruptions %U _T	Performance Criterion	Duration (in period)
0	100	C	0.5P
40	60	C	10P
70	30	C	25P

Notes: Test set-up reference IEC 61000-4-11:2004

14.5.Configuration of EUT on Test

The following equipment are installed on Electrostatic Discharge Test to meet the IEC 61000-4-11 requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

14.6.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 15.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

14.7.Test Procedure

- (1) The interruption is introduced at selected phase angles with specified duration.
- (2) Record any degradation of performance.

14.8.Voltage dips and interruptions Test Results

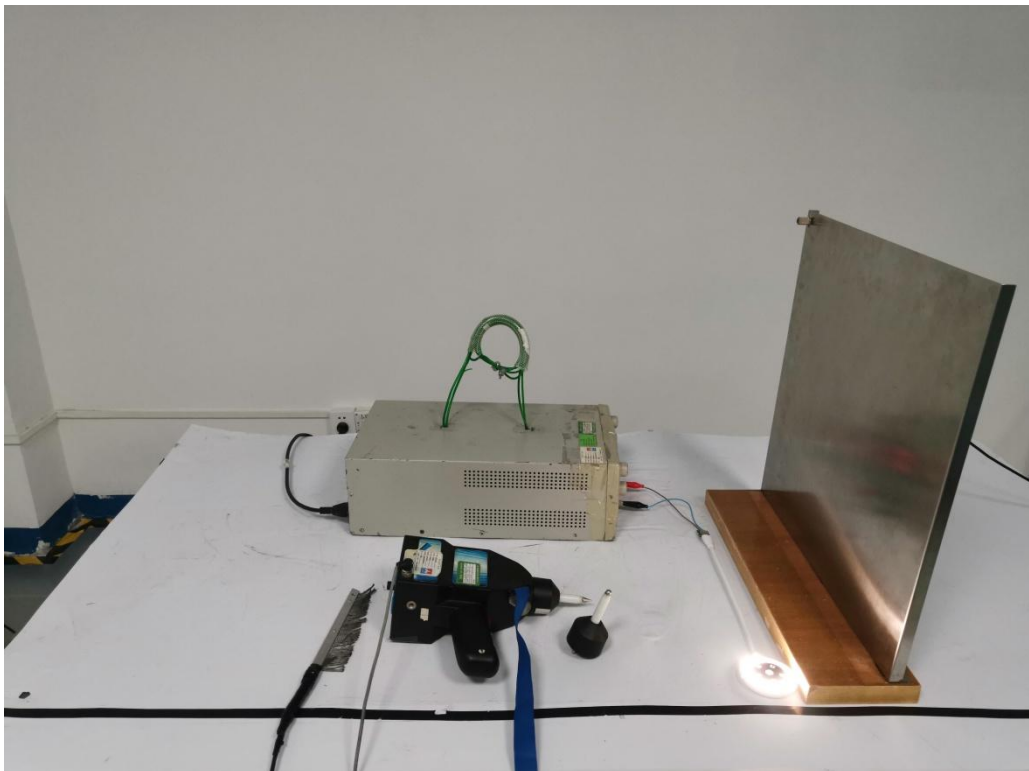
EUT	: Laptop Guard	Test Date	: N/A
M/N	: SZQ05-mini sun 1	Temperature	: N/A
Test Engineer	: N/A	Humidity	: N/A
Test Voltage	: N/A	Pressure	: N/A
Test Mode	: N/A		
Test Results	: N/A		
Note: Not applicable for equipment operated with PC, Battery, or Power Supply.			

15.PHOTOGRAPH

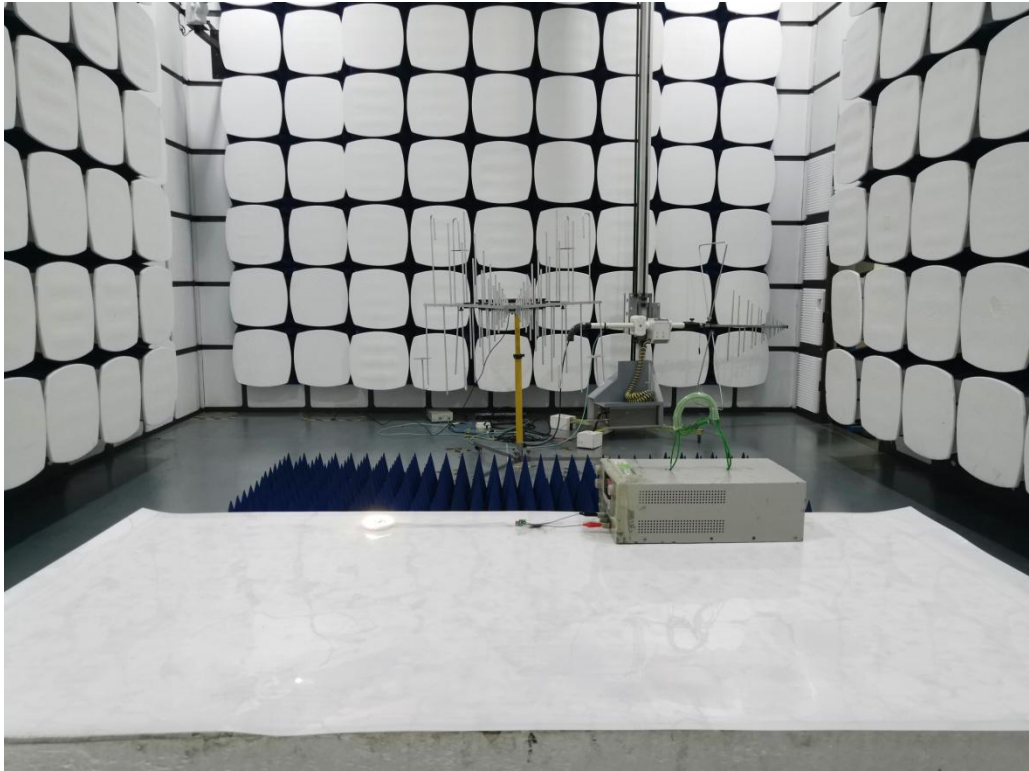
15.1.Photo of Disturbance Power Test



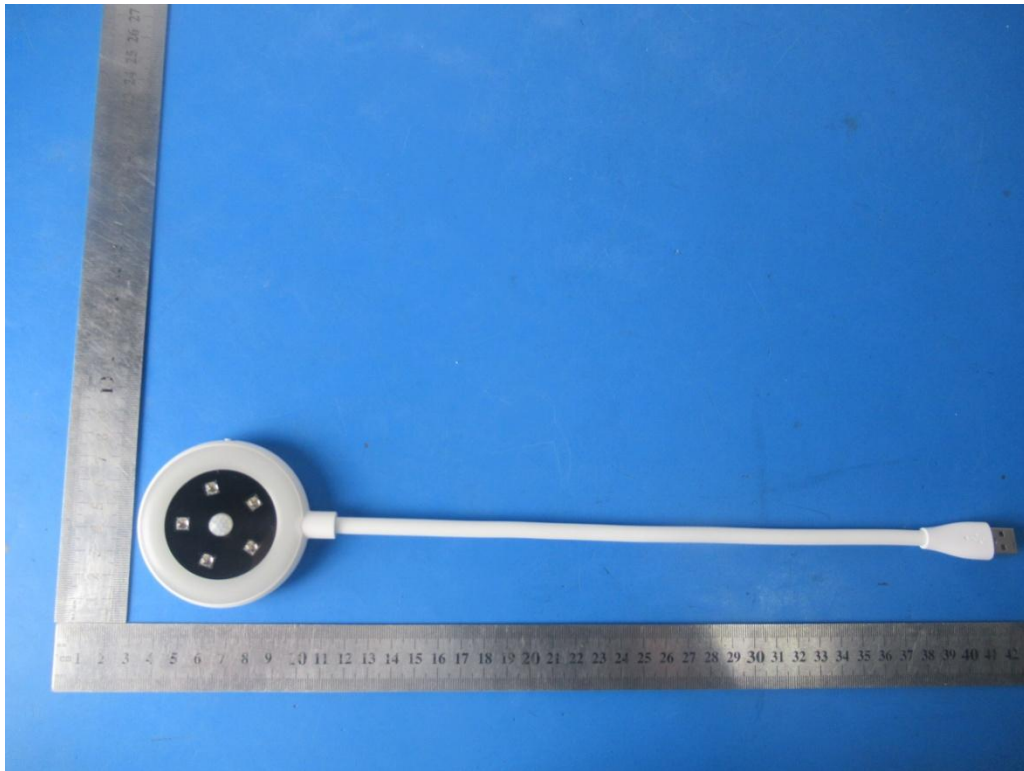
15.2.Photos of Electrostatic Discharge Test



15.3.Photo of RF Field Strength Susceptibility Test



16.Photos Of The EUT



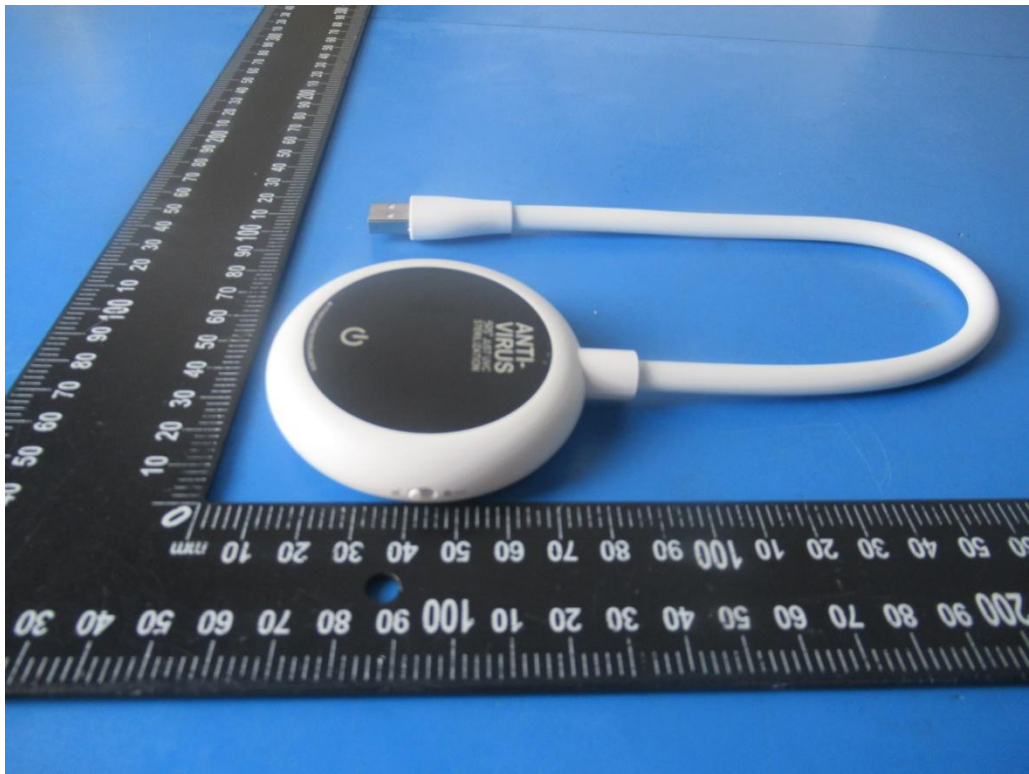
EUT View



EUT View



EUT View



EUT View



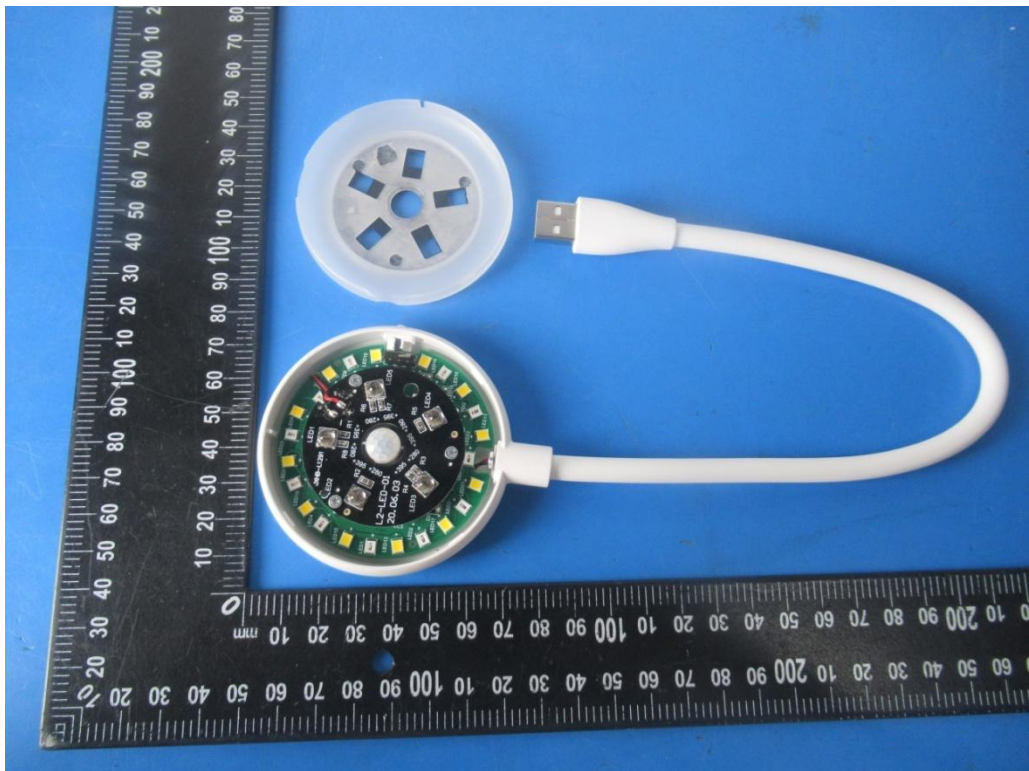
EUT View



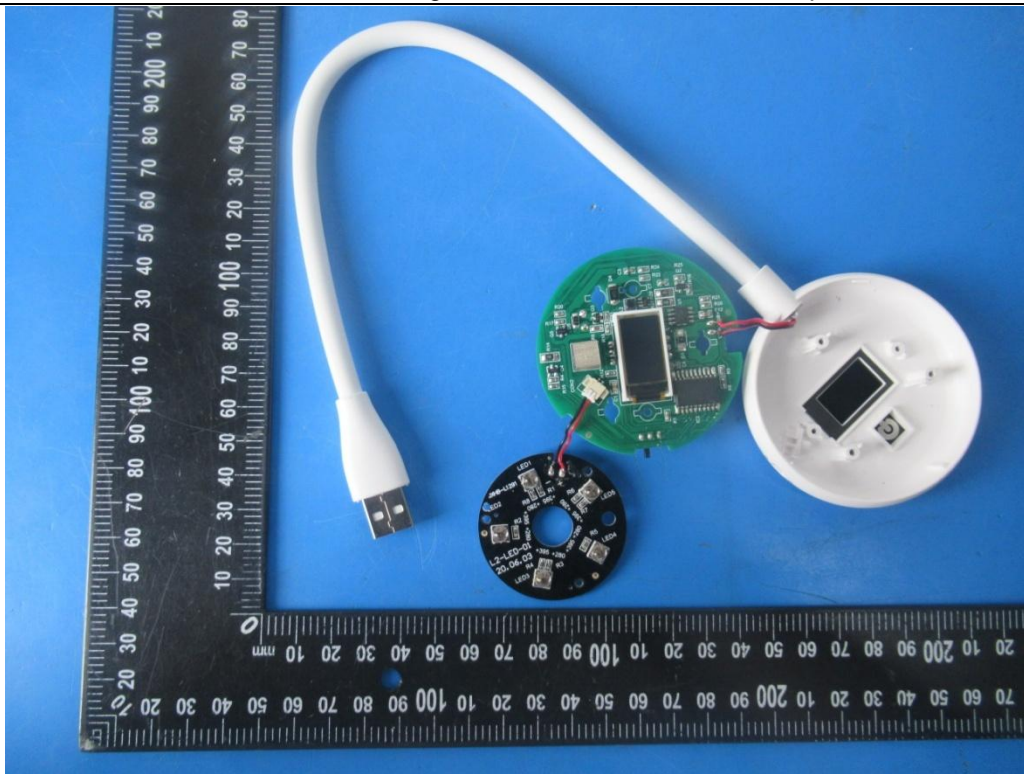
EUT View



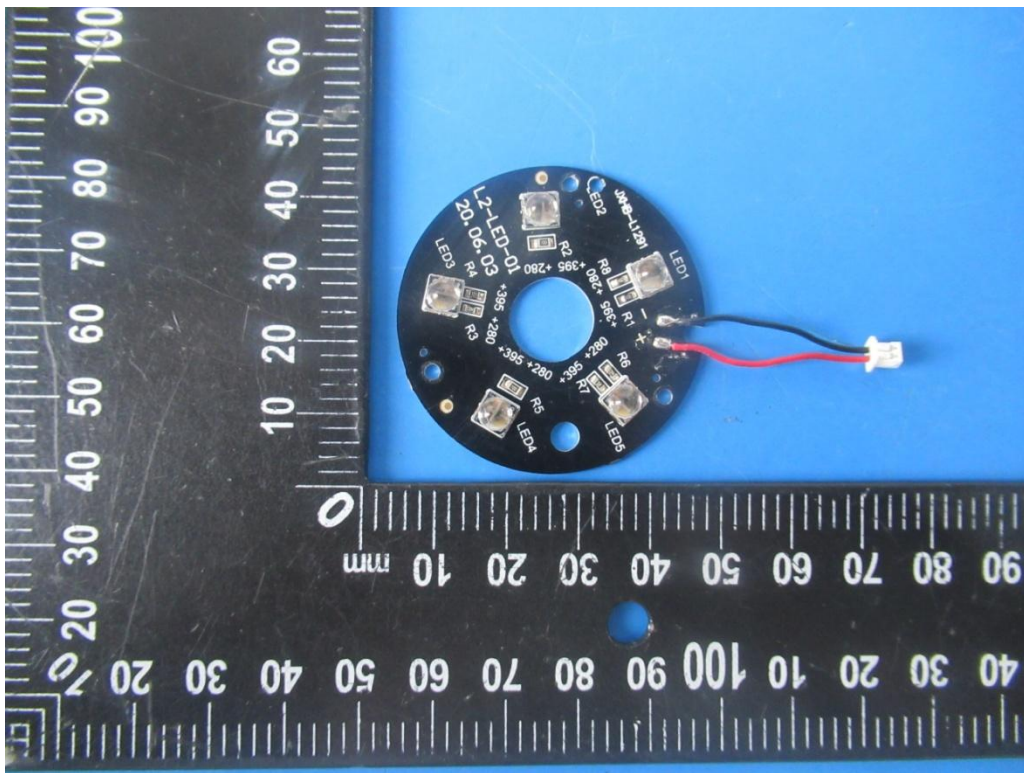
EUT View



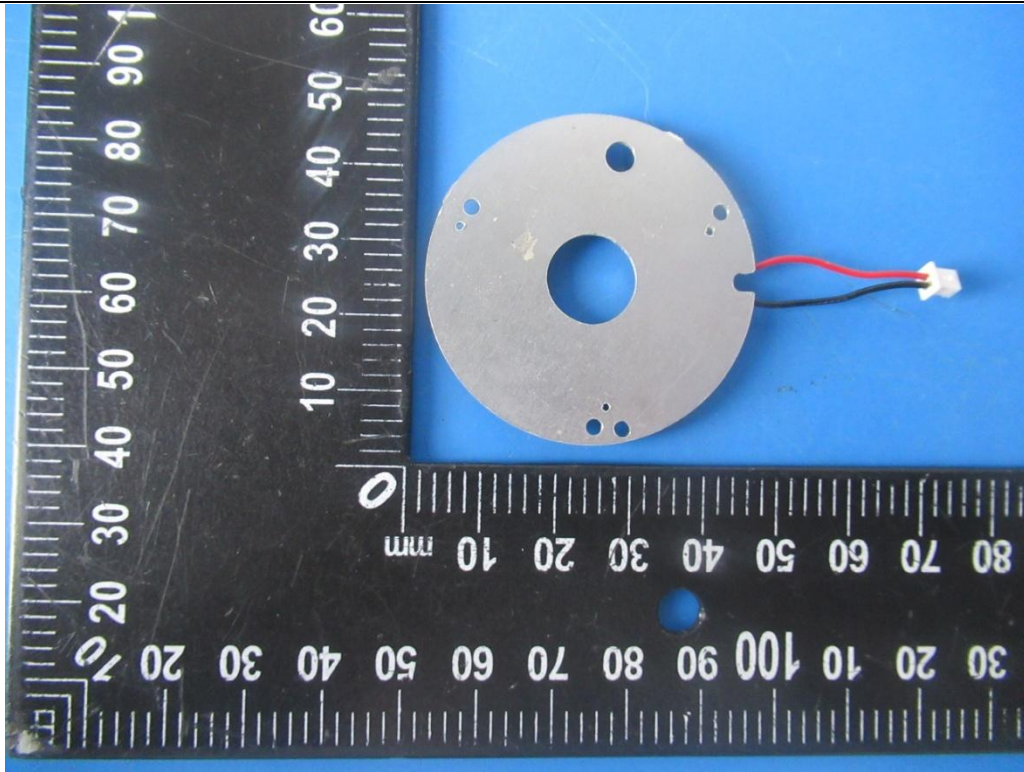
EUT View



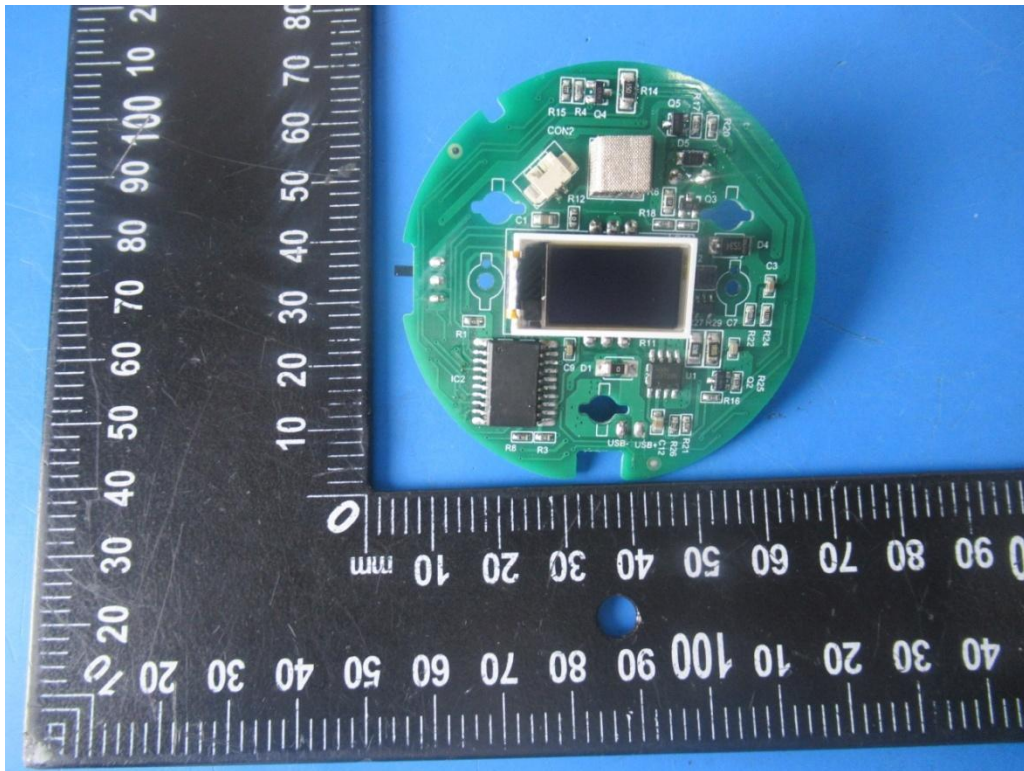
EUT View



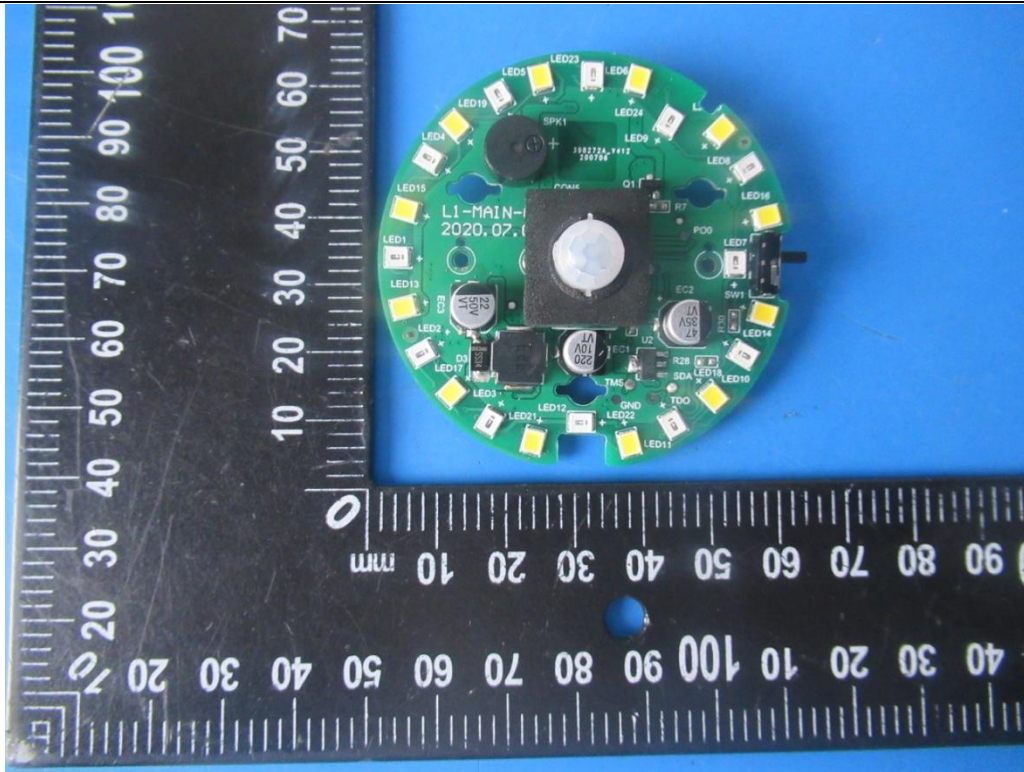
EUT View



EUT View



EUT View



EUT View

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