



EMC TEST REPORT

Product : Handheld massager
Trade mark : LELO
Model/Type reference : SONA2 CRUISE
Ratings : Input: DC 5V
Output: DC3.7V
Report Number : EED45L000380
Date : Aug. 30, 2019
Regulations : See below

Test Standards	Results
☒ EN 55014-1: 2017	PASS
☒ EN 55014-2: 2015	PASS

Prepared for:

SUZHOU ARMOCON TECHNOLOGY CO., LTD
3-5/F No 77 SuHong Middle Road SIP Jiangsu China 215027

Prepared by:

Centre Testing International (Ningbo) Co., Ltd.
1-2F, Eastern Factory, No.76, Jinghua Road, High-Tech Zone, Ningbo,
Zhejiang, China
TEL: +86-574-8737 0781 FAX: +86-574-8189 6829

Compiled by: Simon Le

Reviewed by: Jerry Xu

Approved by: Mary Zhou

Date: Aug. 30, 2019

Mary Zhou
Lab Supervisor

Check No.: 3915511126



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(Note: N/A means not applicable)

1. GENERAL INFORMATION

Applicant: SUZHOU ARMOCON TECHNOLOGY CO., LTD
3-5/F No 77 SuHong Middle Road SIP Jiangsu China 215027

Manufacturer: SUZHOU ARMOCON TECHNOLOGY CO., LTD
3-5/F No 77 SuHong Middle Road SIP Jiangsu China 215027

EMC Directive: 2014/30/EU

Product: Handheld massager

Trade mark: LELO

Model/Type reference: SONA2 CRUISE

Report Number: EED45L000380

Sample Received Date: Jul. 17, 2019

Sample tested Date: Jul. 26, 2019 to Aug. 12, 2019

The tested sample(s) and the sample information are provided by the client.

All test data are come from the report of No. EED45L000289.

2. TEST SUMMARY

The Product has been tested according to the following specifications:

EMISSION		
Standard	Test Item	Test
EN 55014-1	Terminal disturbance voltages	N/A ¹
EN 55014-1	Discontinuous disturbance (Clicks)	N/A ¹
EN 55014-1	Disturbance power	Yes
EN 55014-1	Radiated disturbance	Yes
EN 55014-1	Radiated disturbances in the frequency range 9KHz to 30MHz	N/A ²

IMMUNITY (EN 55014-2)		
Standard	Test Item	Test
IEC 61000-4-2	Electrostatic discharge	Yes
IEC 61000-4-3	Radio frequency electromagnetic fields	Yes
IEC 61000-4-4	Fast transients	Yes
IEC 61000-4-5	Surges	N/A ¹
IEC 61000-4-6	Injected currents	Yes
IEC 61000-4-11	Voltage dips and interruptions	N/A ¹

Remark:

1. The Product is powered by DC 5V.
2. It only apply to induction cooking appliances.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Disturbance power	3.6
Radiated disturbance	4.5

4. PRODUCT INFORMATION AND TEST SETUP

4.1 PRODUCT INFORMATION

Product Classification: Battery operated equipment (EN 55014-1)
Category IV (EN 55014-2)

Ratings: Input: DC 5V
Output: DC3.7V

4.2 TEST SETUP CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between Product and support equipment.

5. FACILITIES AND ACCREDITATIONS

5.1 TEST LOCATION

All tests were performed at:

Centre Testing International (Ningbo) Co., Ltd.

1-2F, Eastern Factory, No.76, Jinghua Road, High-Tech Zone, Ningbo, Zhejiang, China

TEL: +86-574-8737 0781 FAX: +86-574-8189 6829

No tests were sub-contracted.

5.2 TEST EQUIPMENT LIST

Instrumentation: The following list contains equipments used at CTI for testing. The calibrations of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

Equipment used during the tests:

Shielding Room - DP Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	R&S	ESR3	102043	08/26/2019
EM Clamp	R&S	MDS21	100789	07/02/2020

3M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3	---	---
Receiver	R&S	ESU8	100537	08/26/2019
Antenna Towers	---	T-E-TAC-2	MF780208449	---
Microwave Preamplifier	R&S	SCU-08	100748	08/26/2019
Antenna(30MHz~1GHz)	SCHWARZBECK	VULB9163	9163-965	11/15/2019

Shielding Room - Electrostatic discharge Test				
Equipment	Equipment	Equipment	Equipment	Equipment
ESD Simulator	EM-TEST	ESD 30N	P1526159867	11/20/2019

3M Full-anechoic Chamber - Radio frequency electromagnetic fields Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3	----	---
Signal Generator	R&S	SMB100A	179680	08/26/2019
Stacked double Log.-Per. Antenna	R&S	HL046E	-----	N/A
Power Amplifier	R&S	BBA150-BC100 0	102131	08/26/2019

Shielding Room - Fast transients				
Equipment	Manufacturer	Model	Serial No.	Due Date
Compact Generator	EM-TEST	UCS500N7	P1608172945	08/27/2019
coupling/decoupling network	EM-TEST	CNI503B7	P1626181212	08/27/2019
Motorized Variac	EM-TEST	MV2616	P1532162313	08/27/2019

Shielding Room - Injected currents Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
Signal Generator	R&S	SMC100A	105636	08/26/2019
Power Amplifier	R&S	BBA150A200B2 50	102124	08/26/2019
Attenuator	Bird	300-A-FFN-06	1617	08/26/2019
CDN	FCC	FCC-801-M2/M3 -16A	170209	08/26/2019

6 DISTURBANCE POWER

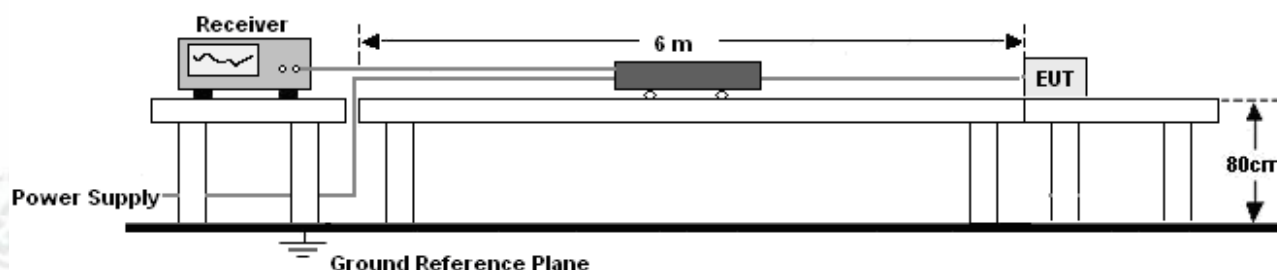
6.1 LIMITS

TABLE-1 For household and similar appliances

Frequency range (MHz)	Limits dB(pW)	
	Quasi-peak	Average
30 to 300	45 to 55	35 to 45

NOTE: The limit Increasing linearly with the frequency from 30 to 300 MHz.

6.2 BLOCK DIAGRAM OF TEST SETUP



6.3 TEST PROCEDURE

- The absorbing clamp was placed around the lead to be measured, with its current transformer towards the equipment under test.
- All connectors having a connected lead shall be terminated in a manner representative of use.
- The absorbing clamp was applied successively to all leads whose length is 25cm or longer, unscreened or screened, which may be connected to the individual units of the equipment under test.
- The Product was placed on a nonconductive table of 0.8 m of height above the floor and at least 0.8m from other metallic objects and from any person. The lead to be measured shall be stretched in a straight horizontal line for length sufficient to accommodate the absorbing clamp.
- A test at about 50 MHz shall be made over a range of 0.9 to 1.1 times the rated voltage in order to check whether the level of disturbance varies considerably with the supply voltage; in which case, the measurements are to be made at the voltage that causes maximum disturbance.
- Pre-scans were performed with a quasi-peak detector and an average detector.
- At each test frequency the absorbing clamp shall be moved along the lead until the maximum value is found between a position adjacent to the equipment under test and a distance of about a half wavelength from it.

6.4 GRAPHS AND DATA

Product : Handheld massager

Model/Type reference : SONA2
CRUISE

Power : DC 5V

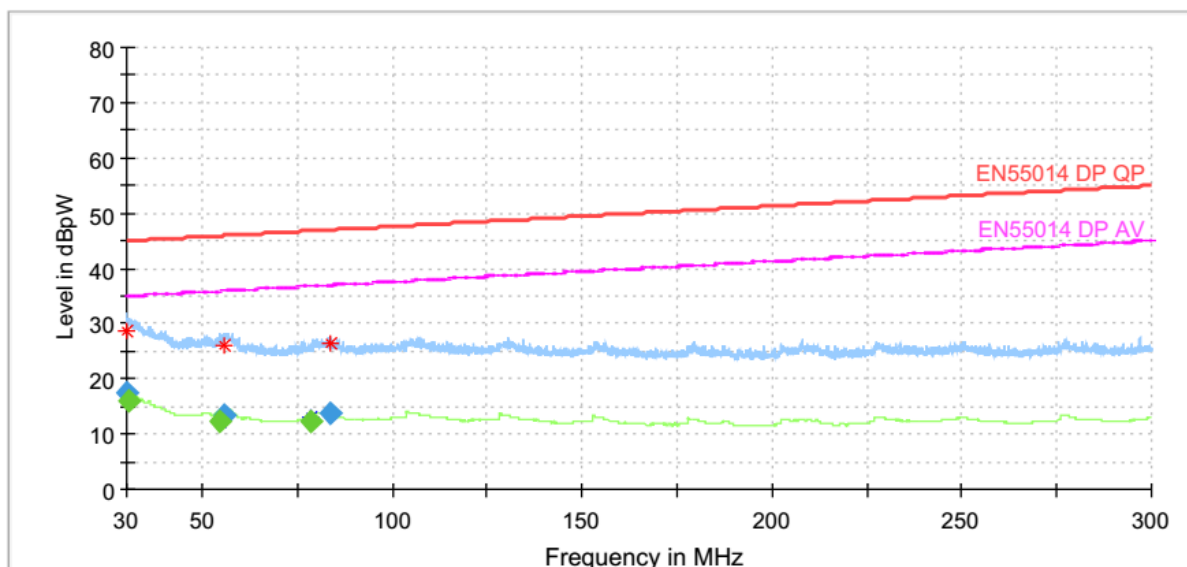
Temperature : 22.7°C

Mode : CHARGING

Humidity : 47.8%

Frequency : 30MHz-300MHz

Port : DC Port



Final Result

Frequency (MHz)	QuasiPeak (dBpW)	CAverage (dBpW)	Limit (dBpW)	Margin (dB)	Bandwidth (kHz)	Position (cm)	Corr. (dB)
30.238080	17.50	---	45.01	27.51	120.000	200.0	10.9
30.726684	---	16.14	35.03	18.88	120.000	500.0	10.8
54.260640	---	12.42	35.90	23.48	120.000	200.0	7.8
55.762320	13.58	---	45.95	32.38	120.000	400.0	7.8
78.547200	---	12.23	36.80	24.56	120.000	200.0	7.3
83.512560	13.64	---	46.98	33.34	120.000	400.0	7.6

Remark: The maximum clock frequency of the Product is less than 30 MHz and all emission readings from the Product are lower than the applicable limits (Table 2) reduced by the margin, So, Appliances are deemed to comply in the frequency range from 300 MHz to 1 000 MHz.

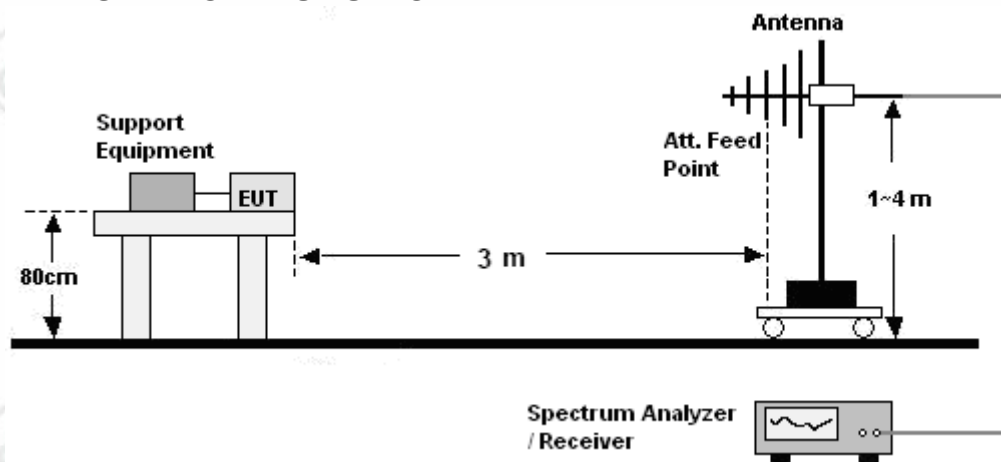
7 RADIATED DISTURBANCE

7.1 LIMITS

Frequency (MHz)	Quasi-peak limits at 3m dB(μ V/m)
30-230	40
230-1000	47

NOTE: The lower limit shall apply at the transition frequencies.

7.2 BLOCK DIAGRAM OF TEST SETUP



7.3 TEST PROCEDURE

- The Product was placed on the nonconductive turntable 0.8 m above the ground at a chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

7.4 GRAPHS AND DATA

Product : Handheld massager

Model/Type reference : SONA2
CRUISE

Power : DC 3.7V

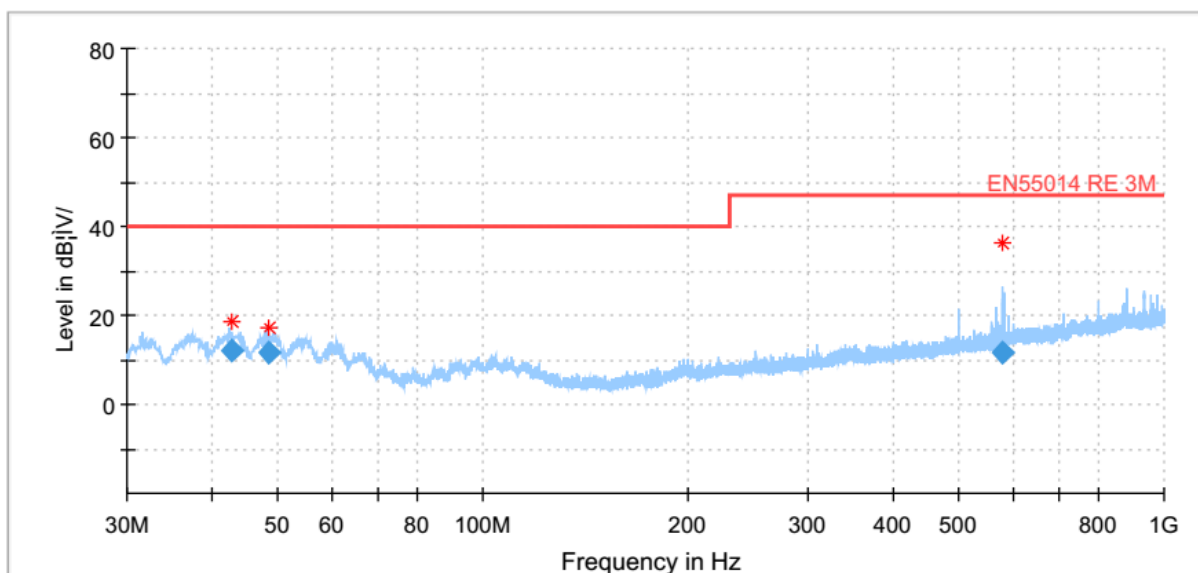
Temperature : 22.1℃

Mode : WORKING

Humidity : 62.6%

Frequency : 30MHz-1GHz

Direction : H



Final Result

Frequency (MHz)	QuasiPeak (dB _i V/m)	Limit (dB _i V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
42.789623	11.90	40.00	28.10	100.0	H	214.0	-21.6
48.546733	11.40	40.00	28.60	100.0	H	262.0	-21.3
579.638756	11.61	47.00	35.39	201.8	H	0.0	-14.9

Product : Handheld massager

Model/Type reference : SONA2
CRUISE

Power : DC 3.7V

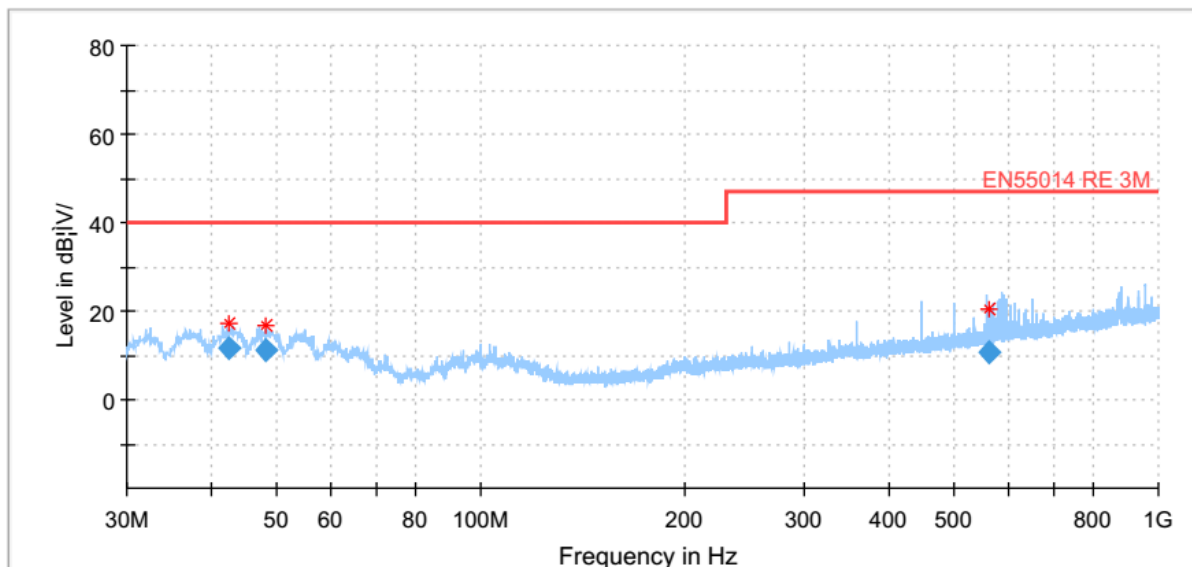
Temperature : 22.1℃

Mode : WORKING

Humidity : 62.6%

Frequency : 30MHz-1GHz

Direction : V



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
42.335822	11.78	40.00	28.22	100.1	V	358.0	-21.6
48.041156	11.30	40.00	28.70	202.0	V	152.0	-21.3
560.484578	10.52	47.00	36.48	100.1	V	146.0	-15.5

8 IMMUNITY TEST

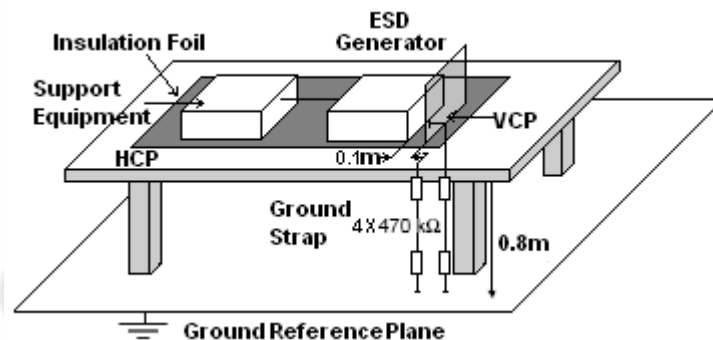
General Performance Criteria	
Product Standard	EN 55014-2: 2015
CRITERION A	The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when 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	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. During the test, degradation of performance is allowed, however, no change of actual operating 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 if used as intended.
CRITERION C	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.

8.1 ELECTROSTATIC DISCHARGE

8.1.1 TEST SPECIFICATION

Basic Standard	: EN 55014-2 & IEC 61000-4-2
Test Port	: Enclosure port
Discharge Impedance	: 330 ohm / 150 pF
Discharge Mode	: Single Discharge
Discharge Period	: one second between each discharge

8.1.2 BLOCK DIAGRAM OF TEST SETUP



8.1.3 TEST PROCEDURE

- Electrostatic discharges were applied only to those points and surfaces of the Product that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the Product.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- Air discharges were applied with the round discharge tip of the discharge electrode approaching the Product as fast as possible (without causing mechanical damage) to touch the Product. After each discharge, the ESD generator was removed from the Product and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the Product. The ESD generator was positioned vertically at a distance of 0.1 meters from the Product with the discharge electrode touching the HCP.
- At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the Product were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the Product.

8.1.4 RESULTS & PERFORMANCE

Product : Handheld massager

Model/Type reference : SONA2
CRUISE

Power : DC 3.7V

Temperature : 24.7°C

Mode : WORKING

Humidity : 56.6%

Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Required Level	Performance Criterion
Contact Discharge	Conductive Surfaces	4	10	B	A
	Indirect Discharge HCP	4	10	B	A
	Indirect Discharge VCP	4	10	B	A
Air Discharge	Slots, Apertures, and Insulating Surfaces	8	10	B	A

☒ There was no observable degradation in performance.

Product : Handheld massager

Model/Type reference : SONA2
CRUISE

Power : DC 5V

Temperature : 24.7°C

Mode : CHARGING

Humidity : 56.6%

Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Required Level	Performance Criterion
Contact Discharge	Conductive Surfaces	4	10	B	A
	Indirect Discharge HCP	4	10	B	A
	Indirect Discharge VCP	4	10	B	A
Air Discharge	Slots, Apertures, and Insulating Surfaces	8	10	B	A

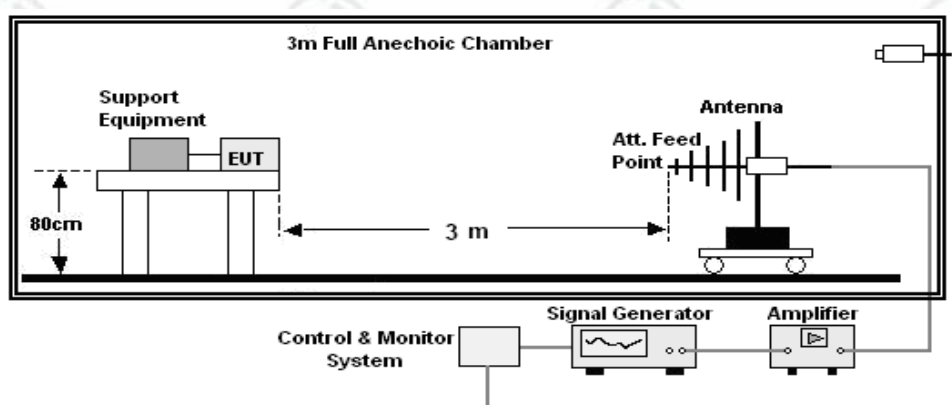
☒ There was no observable degradation in performance.

8.2 RADIO FREQUENCY ELECTROMAGNETIC FIELDS

8.2.1 TEST SPECIFICATION

Basic Standard	: EN 55014-2 & IEC 61000-4-3
Test Port	: Enclosure port
Step Size	: 1%
Modulation	: 1kHz, 80% AM
Dwell Time	: 1 second
Polarization	: Horizontal & Vertical

8.2.2 BLOCK DIAGRAM OF TEST SETUP



8.2.3 TEST PROCEDURE

- The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.
- The frequency range is swept from 80MHz to 1000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1%.
- The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.

8.2.4 RESULT & PERFORMANCE

Product	: Handheld massager	Model/Type reference	: SONA2 CRUISE
Power	: DC 3.7V	Temperature	: 22.0°C
Mode	: WORKING	Humidity	: 63.1%

Frequency (MHz)	Position	Field Strength (V/m)	Required Level	Performance Criterion
80 - 1000	Front, Right, Back, Left	3	A	A

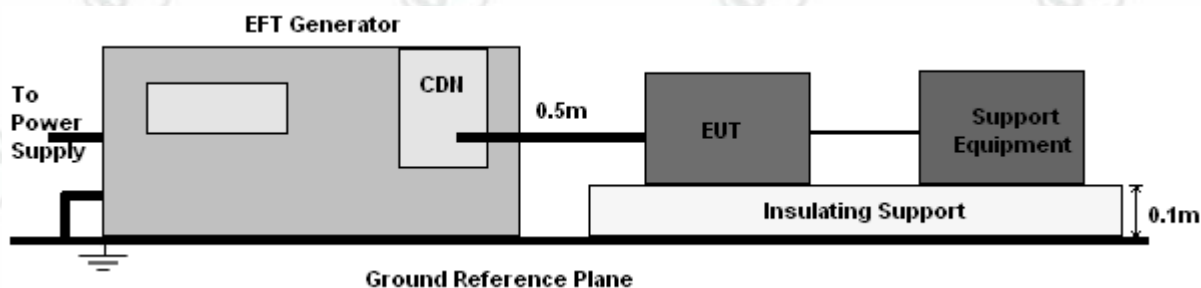
8.3 FAST TRANSIENTS

8.3.1 TEST SPECIFICATION

Basic Standard	: EN 55014-2 & IEC 61000-4-4
Test Port	: input d. c. power port
Impulse Frequency	: 5 kHz
Impulse Wave-shape	: 5/50 ns
Burst Duration	: 15 ms
Burst Period	: 300 ms
Test Duration	: 2 minutes per polarity

8.3.2 BLOCK DIAGRAM OF TEST SETUP

For input d. c. power port:



8.3.3 TEST PROCEDURE

- The Product and support units were located on a non-conductive table above ground reference plane.
- A 0.5m-long power cord was attached to Product during the test.

8.3.4 RESULT & PERFORMANCE

Product	: Handheld massager	Model/Type reference	: SONA2 CRUISE
Power	: DC 5V	Temperature	: 25.6°C
Mode	: CHARGING	Humidity	: 42.1%

Coupling	Voltage (kV)	Polarity	Required Level	Performance Criterion
d. c. port	0.5	±	B	A

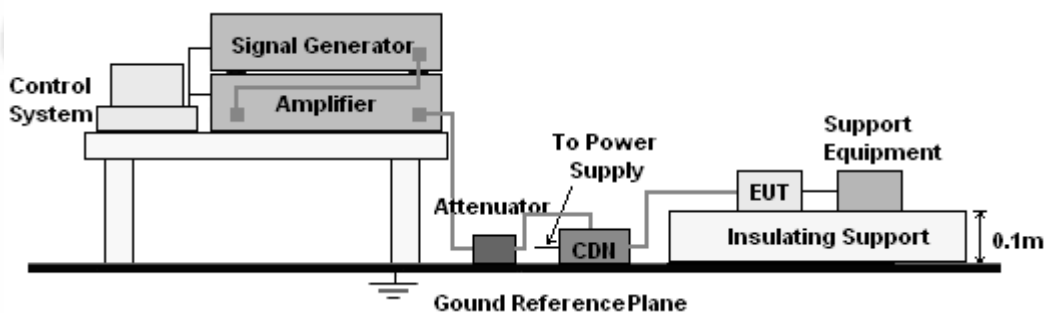
8.4I NJECTED CURRENTS

8.4.1 TEST SPECIFICATION

Basic Standard : EN 55014-2 & IEC 61000-4-6
Test Port : input d. c. power port
Step Size : 1%
Modulation : 80% AM
Dwell Time : 1 second

8.4.2 BLOCK DIAGRAM OF TEST SETUP

For input d. c. power port:



8.4.3 TEST PROCEDURE

For input d. c. power port:

- The Product and support units were located at a ground reference plane with the interposition of a 0.1 m thickness insulating support and the CDN was located on GRP directly.
- The frequency range is swept from 150 kHz to 80, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the Product to be able to respond.

8.4.4 RESULT & PERFORMANCE

Product : Handheld massager
Power : DC 5V
Mode : CHARGING

Model/Type reference : SONA2 CRUISE
Temperature : 21.3°C
Humidity : 56.8%

Inject Line	Frequency (MHz)	Voltage Level (V r.m.s.)	Required Level	Performance Criterion
d. c. port	0.15 - 230	1	A	A

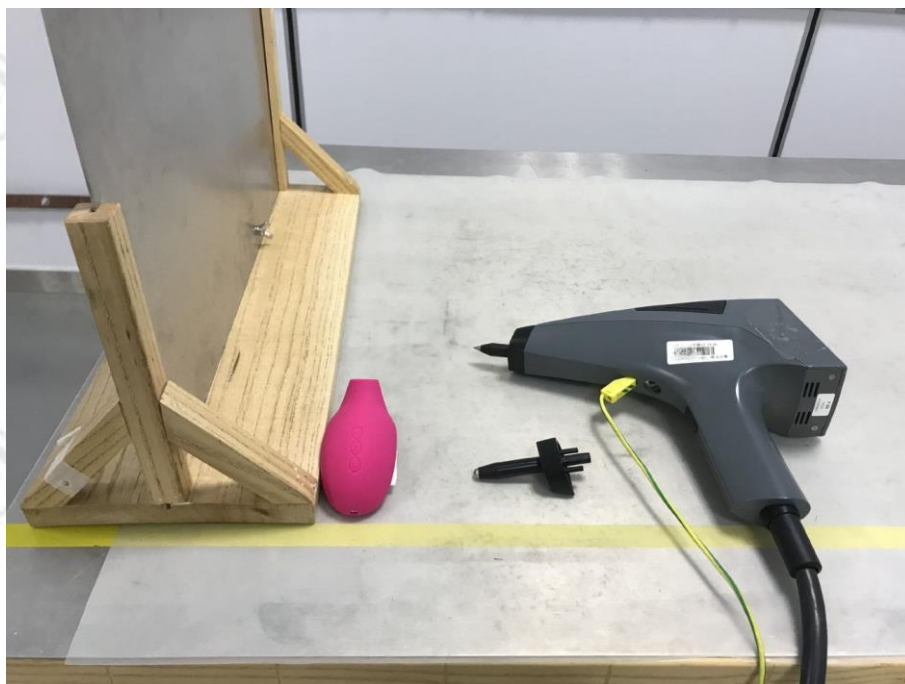
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



DISTURBANCE POWER TEST SETUP



RADIATED DISTURBANCE TEST SETUP



ELECTROSTATIC DISCHARGE TEST SETUP (WORKING MODE)



ELECTROSTATIC DISCHARGE TEST SETUP (CHARGING MODE)



RADIO FREQUENCY ELECTROMAGNETIC FIELDS TEST SETUP

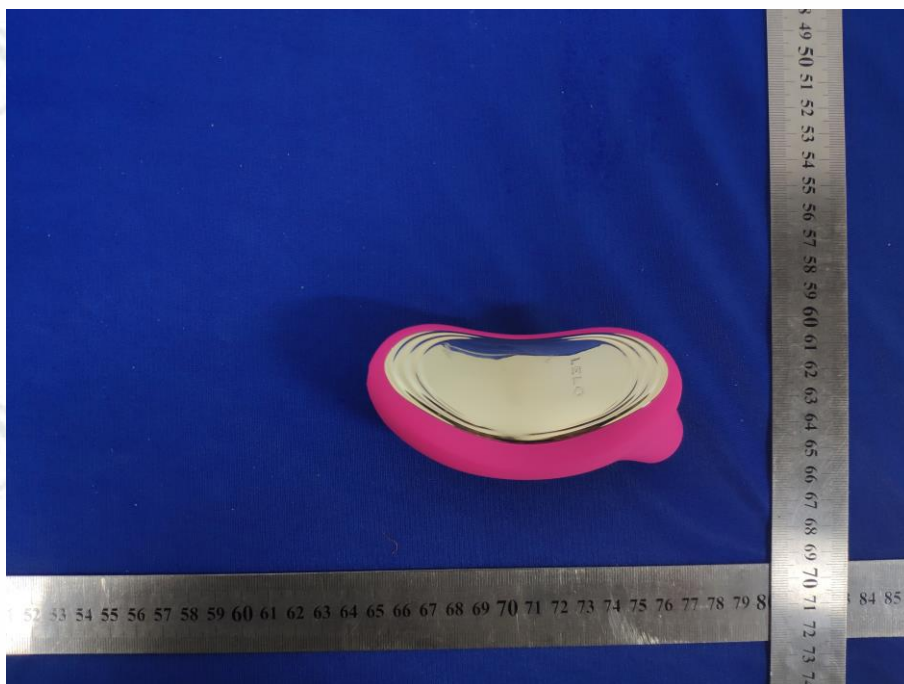


FAST TRANSIENTS TEST SETUP

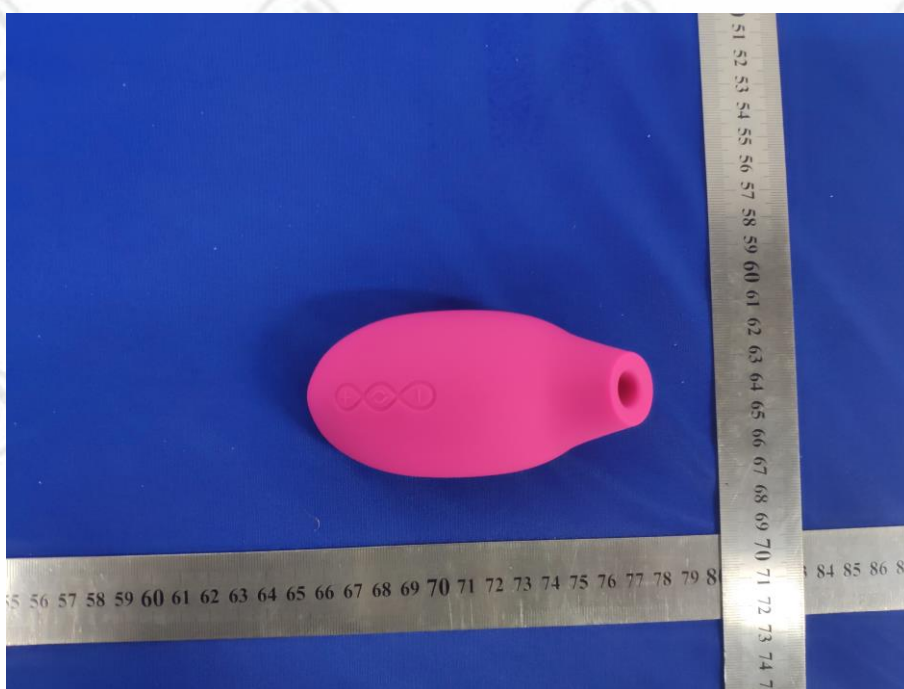


INJECTED CURRENTS TEST SETUP

APPENDIX 2 PHOTOGRAPHS OF PRODUCT



View of Product-1



View of Product-2

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.