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RF Exposure Evaluation Report

Application No.:	KSCR2410002175HS
FCC ID:	ZT5-SONA
IC:	9798A-SONA
Applicant:	SUZHOU ARMOCON TECHNOLOGY CO.,LTD
Address of Applicant:	No 77 SuHong Middle Road SIP Jiangsu China
Manufacturer:	SUZHOU ARMOCON TECHNOLOGY CO.,LTD
Address of Manufacturer:	No 77 SuHong Middle Road SIP Jiangsu China
Factory:	SUZHOU ARMOCON TECHNOLOGY CO.,LTD
Address of Factory:	No 77 SuHong Middle Road SIP Jiangsu China

Equipment Under Test (EUT):

EUT Name:	Handheld massager
Model No.:	Sona™ 3
Add Model No.:	Sona™ 3 Cruise
Trade Mark:	LELO
Standard(s) :	FCC Rules 47 CFR §2.1093
	KDB 447498 D04 interim General RF Exposure Guidance v01
	RSS-102 Issue 6 (December 15, 2023)
Date of Receipt:	2024-05-14
Date of Test:	2024-05-15 to 2024-06-10
Date of Issue:	2024-06-11
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

SGS

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Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2024-06-11	/

Authorized for issue by:			
Tested By	*Damon zhou* **Damon_Zhou/Project Engineer**		
Approved By	*Terry Hou* **Terry Hou /Reviewer**		

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3   General Information

3.1   General Description of E.U.T.

Power supply:	DC 3.7V 520mAh Rechargeable battery
Product Type:	☒ Portable device
	☐ Mobile device
	☐ Fixed device

3.2   Details of E.U.T.

Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	Ceramic Antenna
Antenna Gain:	2 dBi (Provided by manufacturer)
S/N:	Sona™ 3: 9615eXCdA2549R Sona™ 3 Cruise: 9820eXCdA2549R
Firmware Version:	SONA 3 F.REV.C

3.3   Separation Distance

Separation distance between the antenna to person (R):	＜5mm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.	

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Compliance Certification Services (Kunshan) Inc.

3.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888　　　　Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1. SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock

frequency, highest internal frequency, antenna gain, cable loss, etc) is provided by the applicant.

(if applicable).

2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on

results of the data provided by applicant. (if applicable).

3. Sample source: sent by customer.

3.5 Test Facility

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

• A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4   Test Standards and Limits

5   FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

5.1   RF Exposure Test Exemptions for single RF sources

5.1.1   Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

5.1.2   MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz. The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, **R must be at least $\lambda/2\pi$**, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 R^2f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R^2
Subscripts L and H are low and high; λ is wavelength.						
R:Separation distance between the antenna to person						

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

Limit calculation				
Frequency range	Frequency(MHz)	$\lambda/2\pi$(m)	R(m)	Threshold ERP(W)
1500~100000MHz	**2480**	0.0193	0.0600	0.069

5.1.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from **0.5cm to 40cm** and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20\,cm}(d/20\,cm)^x & d \leq 20\,cm \\ ERP_{20\,cm} & 20\,cm < d \leq 40\,cm \end{cases} \qquad (B.2)$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

5.2 RF Exposure Test Exemptions for Simultaneous Transmission

The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluatedk term) shall be used to determine exemption for simultaneous transmission. In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for Pth, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

Pi = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERPj = the ERP of fixed, mobile, or portable RF source j.

ERPth,j = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ /2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated$_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit$_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.

6   IC SAR exemption limits

According to RSS-102 issue 6 section 6.3, devices operating at or below the applicable output power levels (adjusted for tune-up tolerance) specified in table 1, based on the separation distance, are exempt from SAR evaluation. The separation distance, defined as the distance between the user and/or bystander and the antenna and/or radiating element of the device or the outer surface of the device, shall be less than or equal to 20 cm for these exemption limits to apply.

Table 1: Power limits for exemption from routine SAR evaluation based on the separation distance

MHz	5	10	15	20	25	30	35	40	45	50	mm
≤300	45	116	139	163	189	216	246	280	319	362	
450	32	71	87	104	124	147	175	208	248	296	
835	21	32	41	54	72	96	129	172	228	298	
1900	6	10	18	33	57	92	138	194	257	323	mW
2450	3	7	16	32	56	89	128	170	209	245	
3500	2	6	15	29	50	72	94	114	134	158	
5800	1	5	13	23	32	41	54	74	102	128	

The exemption limits in table 1 Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 50 mm from a flat phantom, which provides a SAR value of approximately 0.4 W/kg for 1 g of tissue. For limb-worn devices where the 10 gram of tissue applies, the exemption limits for routine evaluation in table 1 are multiplied by a factor of 2.5. For controlled-use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in table 1 are multiplied by a factor of 5.

When the operating frequency of the device is between two frequencies located in table 1, linear interpolation shall be applied for the applicable separation distance. If the separation distance of the device is between two distances located in table 1, linear interpolation may be applied for the applicable frequency. Alternatively, the limit corresponding to the smaller distance may be employed. For example, in case of a 7 mm separation distance, either use the exception value for a 5 mm separation distance or interpolate between the limits corresponding to 5 mm and 10 mm separation distances.

For implanted medical devices, the exemption limit for routine SAR evaluation is set at an output power of 1 mW, regardless of frequency.

The practical use condition for this device is as a handhold and body accessories. So the applicable limit is 1-g extremity SAR

For 2.4GHz devices, the limit is Pmax≤3mW

7   Measurement and Calculation

7.1   Maximum transmit power

The Power Data is based on the RF Test Report KSCR241000217501.

Test Mode	Antenna	Channel	Result[dBm]	Result[mW]
BLE_1M	Ant1	2402	-3.60	**0.44**
		2440	-4.30	0.37
		2480	-4.52	0.35
BLE_2M	Ant1	2402	-3.70	0.43
		2440	-4.20	0.38
		2480	-4.51	0.35

7.2   RF Exposure Calculation

For single RF source :

	Evaluation method	Separation distance between the antenna to person (R)
☒	Blanket 1 mW Blanket Exemption	Regardless of separation distance
☐	MPE-based Exemption(ERP)	$R \geqslant (\lambda/2\pi)$
☐	SAR-based Exemption(P_{th})	0.5cm<R<40cm

The Max Conducted Peak Output Power is 0.44mW. The best case gain of the antenna is 2dBi.

2dBi logarithmic terms convert to numeric result is nearly 1.58.

According to the formula. calculate the EIRP test result:

EIRP= P x G = 0.44 mW x 1.58 = 0.70mW<1mW

Remark: we used the maximum power between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

For IC:
EIRP= P x G = 0.44 mW x 1.58 = 0.70mW <3mW

So, the device is to qualify for FCC & IC SAR test exemption, the exemption report is in lieu of the SAR report.

-End of the Report-