

# RF EXPOSURE EVALUATION REPORT

**Application No.:** FYCR2205000153AT  
**Applicant:** Voxx Accessories Corp.  
**Address of Applicant:** 3502 Woodview Trace Suite 220, Indianapolis, Indiana 46268 United States  
**Manufacturer:** Voxx Accessories Corp.  
**Address of Manufacturer:** 3502 Woodview Trace Suite 220, Indianapolis, Indiana 46268 United States  
**Factory:** Dongguan City Xinly Electronic Technology Co., Ltd  
**Address of Factory:** No.1 Xiangyuan Road, Jinglian Village, Qiaotou Town, Dongguan, Guangdong, China

**Equipment Under Test (EUT):**  
**EUT Name:** All-in-One Karaoke System  
**Model No.:** SPKA27  
**Trade Mark:** Singsation  
**FCC ID:** VIXSPKA27  
**Standard(s) :** FCC Rules 47 CFR §2.1091  
 KDB 447498 D04 interim General RF Exposure Guidance v01

**Date of Receipt:** 2022-05-11  
**Date of Evaluation:** 2022-05-12 to 2022-06-16  
**Date of Issue:** 2022-06-18

|                           |              |
|---------------------------|--------------|
| <b>Evaluation Result:</b> | <b>Pass*</b> |
|---------------------------|--------------|

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

*Wenkey Wang*

EMC Technical Manager



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| Revision Record |         |            |          |          |
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| Version         | Chapter | Date       | Modifier | Remark   |
| 01              |         | 2022-06-18 |          | Original |
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|                          |  |                            |  |  |
|--------------------------|--|----------------------------|--|--|
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|                          |  | Tree Zhan                  |  |  |
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|                          |  | Winkey Wang/Reviewer       |  |  |



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### 3 General Information

#### 3.1 General Description of E.U.T.

|               |                                                   |
|---------------|---------------------------------------------------|
| Product Type: | <input type="checkbox"/> Portable device          |
|               | <input checked="" type="checkbox"/> Mobile device |
|               | <input type="checkbox"/> Fixed device             |

#### 3.2 Details of E.U.T.

|                             |                                                                                                                                 |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Power Supply:               | DC 3.7V/2500mAh lithium ion rechargeable battery which can be charged from USB port.<br>DC 3.0V (CR2032) for remote controller. |
| Cable(s):                   | USB cable 50cm unshielded                                                                                                       |
| For BT:                     |                                                                                                                                 |
| Operation Frequency:        | 2402MHz to 2480MHz                                                                                                              |
| Bluetooth Version:          | V5.0 Classic for speaker (Modular 1)<br>V5.3 Classic for Wireless microphone RX in speaker (Modular 2)                          |
| Modulation Type:            | GFSK, pi/4DQPSK, 8DPSK                                                                                                          |
| Number of Channels:         | 79                                                                                                                              |
| Channel Spacing:            | 1MHz                                                                                                                            |
| Spectrum Spread Technology: | Frequency Hopping Spread Spectrum(FHSS)                                                                                         |
| Antenna Type:               | PCB Antenna                                                                                                                     |
| Antenna Gain:               | Speaker: -0.68dBi; Microphone RX: -0.58dBi;                                                                                     |

#### 3.3 Separation Distance

|                                                                                                                                                                                                                                                                                                               |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Minimum test separation distance:                                                                                                                                                                                                                                                                             | 20cm |
| 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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### 3.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc. Shenzhen branch.

Fuyong lab. Xinlong TechnoPark, Fengtang Road, Fuyong Subdistrict, Bao'an, Shenzhen, China

Tel: +86 755 8866 3988 Fax: +86 755 2671 0594

No tests were sub-contracted.

### 3.5 Test Facility

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

• **A2LA (Certificate No. 6606.01)**

Compliance Certification Services (Kunshan) Inc. Shenzhen branch is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 6606.01.

• **FCC –Designation Number: CN1322**

Compliance Certification Services (Kunshan) Inc. Shenzhen branch has been recognized as an accredited testing laboratory.

Designation Number: CN1322. Test Firm Registration Number: 718073

• **Innovation, Science and Economic Development Canada**

Compliance Certification Services (Kunshan) Inc. Shenzhen branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0129.

IC#: 28189.

### 3.6 Deviation from Standards

None

### 3.7 Abnormalities from Standard Conditions

None



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## 4 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.

### 4.1 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.

### 4.2 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.

**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 <sup>2</sup>                 |
| 1.34                | — | 30        | 35.6 m             | — | 1.6 m              | 3,450 R <sup>2</sup> /f <sup>2</sup> |
| 30                  | — | 300       | 1.6 m              | — | 159 mm             | 3.83 R <sup>2</sup>                  |
| 300                 | — | 1,500     | 159 mm             | — | 31.8 mm            | 0.0128 R <sup>2</sup> f              |
| 1,500               | — | 100,000   | 31.8 mm            | — | 0.5 mm             | 19.2R <sup>2</sup>                   |

Subscripts L and H are low and high;  $\lambda$  is wavelength.  
From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

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.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than  $ERP_{20\text{cm}}$  in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{\text{th}} (\text{mW}) = ERP_{20\text{cm}} (\text{mW}) = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only 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.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

| Limit calculation |                |                             |                  |
|-------------------|----------------|-----------------------------|------------------|
| Frequency range   | Frequency(MHz) | $R(\lambda/2\pi)(\text{m})$ | Threshold ERP(W) |
| 300~1500MHz       | <b>915</b>     | 0.0522                      | 0.032            |
| 1500~100000MHz    | <b>2480</b>    | 0.0193                      | 0.007            |

### 4.3 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.



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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 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  is given by Formula (B.2).

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

where

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

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



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Example values shown in Table B.2 are for illustration only.

**Table B.2—Example Power Thresholds (mW)**

| Frequency<br>(MHz) | Distance(mm) |    |    |     |     |     |     |     |     |     |
|--------------------|--------------|----|----|-----|-----|-----|-----|-----|-----|-----|
|                    | 5            | 10 | 15 | 20  | 25  | 30  | 35  | 40  | 45  | 50  |
| 300                | 39           | 65 | 88 | 110 | 129 | 148 | 166 | 184 | 201 | 217 |
| 450                | 22           | 44 | 67 | 89  | 112 | 135 | 158 | 180 | 203 | 226 |
| 835                | 9            | 25 | 44 | 66  | 90  | 116 | 145 | 175 | 207 | 240 |
| 1900               | 3            | 12 | 26 | 44  | 66  | 92  | 122 | 157 | 195 | 236 |
| 2450               | 3            | 10 | 22 | 38  | 59  | 83  | 111 | 143 | 179 | 219 |
| 3600               | 2            | 8  | 18 | 32  | 49  | 71  | 96  | 125 | 158 | 195 |
| 5800               | 1            | 6  | 14 | 25  | 40  | 58  | 80  | 106 | 136 | 169 |

| Limit calculation    |                |       |              |              |
|----------------------|----------------|-------|--------------|--------------|
| Frequency range(GHz) | Frequency(GHz) | X     | Distance(cm) | Pth (mW)     |
| 0.3~1.5              | <b>0.915</b>   | 1.474 | <b>0.5</b>   | <b>8.133</b> |
| 1.5~6                | <b>2.48</b>    | 1.905 | <b>0.5</b>   | <b>2.717</b> |



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## 5 Measurement and Calculation

### 5.1 Maximum transmit power

#### For BT:

The Power Data is based on the RF Test Report FYCR220500015303.

Antenna Gain: Speaker: -0.68dBi (Modular 1); Microphone RX: -0.58dBi (Modular 2);

Output Power Into Antenna & RF Exposure Evaluation Distance:

For Modular 1:

| Frequency | Maximum Conducted Power [dBm] | Maximum Conducted Power (mW) |
|-----------|-------------------------------|------------------------------|
| 2402      | 2.34                          | 1.71                         |

For Modular 2:

| Frequency | Maximum Conducted Power [dBm] | Maximum Conducted Power (mW) |
|-----------|-------------------------------|------------------------------|
| 2480      | 5.75                          | 3.76                         |

Note: Refer to report No. FYCR220500015303 for EUT test Max Power Value.



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## 5.2 RF Exposure Calculation

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

**For BT:**

The Max EIRP is 3.76mW. The best case gain of the antenna is -0.58dBi.

|                                     | Evaluation method               | Exempt Limit(mW) | Verdict |
|-------------------------------------|---------------------------------|------------------|---------|
| <input type="checkbox"/>            | Blanket 1 mW Blanket Exemption  | 1mW              | N/A     |
| <input type="checkbox"/>            | MPE-based Exemption(ERP)        | 7mW(ERP)         | N/A     |
| <input checked="" type="checkbox"/> | SAR-based Exemption( $P_{th}$ ) | 3060mW           | Yes     |

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

### Exposure condition for simultaneous transmission operations

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 (Evaluated $k$  term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

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

**Remark:**

a -number of fixed, mobile, or portable RF sources claiming exemption using the §1.1307(b)(3)(i)(B) formula for  $P_{th}$ , including existing exempt transmitters and those being added.

b -number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula 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.

$P_i$  -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).

$P_{th,i}$  -the exemption threshold power ( $P_{th}$ ) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source  $i$ .



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ERP<sub>j</sub> -the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j. ERP<sub>th,j</sub> -exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least  $\lambda/2\pi$ , according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

Evaluated<sub>k</sub> -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.

Exposure Limit<sub>k</sub> -either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

The sum of the ratios =  $BT+BT= 1.71\text{mW}/3060\text{mW} + 3.76\text{mW}/3060\text{mW} = 0.002 < 1$

Therefore, the device is to qualify for simultaneous transmission SAR test exemption, the exemption report is in lieu of the SAR report.

**--End of the Report--**



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