# RF EXPOSURE REPORT

| | |
|---|---|
| Applicant | International Toy, Inc. |
| Address | 17922 Fitch STE 100, Irvine, CA 92614, USA |

| | |
|---|---|
| Manufacturer or Supplier | International Toy, Inc. |
| Address | 17922 Fitch STE 100, Irvine, CA 92614, USA |
| Product | AV BANSHEE 2.0 AQUA |
| Brand Name | Disney |
| Model | 1000021809 |
| Additional Model & Model Difference | N/A |
| Date of tests | May 18, 2024 ~ Jun. 25, 2024 |

The submitted sample of the above equipment has been tested according to the requirements of the following standard:

☒ **FCC Part 2 (Section 2.1093)**
☒ **KDB 447498 D04 Interim General RF Exposure Guidance v01**

**CONCLUSION: The submitted sample was found to <u>COMPLY</u> with the test requirement**

| Tested by Niko Zhang<br>Project Engineer / EMC Department | Approved by Glyn He<br>Assistant Manager / EMC Department |
|---|---|
| | |
| | Date: Jul. 16, 2024 |

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# RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|---|---|---|
| FM2405WDG0164-2 | Original release | Jul. 16, 2024 |

Report Version A

# 1. GENERAL INFORMATION

## 1.1. GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| **FCC ID** | 2ACU8INT127 |
| **PRODUCT** | AV BANSHEE 2.0 AQUA |
| **MODEL NO.** | 1000021809 |
| **ADDITIONAL MODEL** | N/A |
| **SAMPLE STATUS** | Engineering sample |
| **POWER SUPPLY** | DC 4.5V(1.5V*AA*3) from battery |
| **MODULATION TECHNOLOGY** | GFSK |
| **OPERATING FREQUENCY RANGE** | FT24160AV: 2412MHz ~ 2474MHz<br>FT92090: 2401.5MHz ~ 2477.5MHz |
| **ANTENNA TYPE** | Wire Antenna, with 1.13dBi gain |
| **I/O PORTS** | N/A |
| **CABLE SUPPLIED** | N/A |

**NOTES:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.

3. Please refer to the EUT photo document (Reference No.: 2405WDG0164-2) for detailed product photo.

4. This product has two SRD 2.4G modules(FT24160AV and FT92090).

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## 2. APPLICABLE RF EXPOSURE LIMIT

### 2.1. LIMITS

§ 1.1310 Radiofrequency radiation exposure limits.
(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).
(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatialaverage SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.
(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(d) Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields

➤ Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm$^2$) | Average Time (minutes) |
|---|---|---|---|---|
| Limits For General Population / Uncontrolled Exposure | | | | |
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f$^2$)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | … | … | f/1500 | 30 |
| 1500-100,000 | … | … | 1.0 | 30 |

f = frequency in MHz.   * = Plane-wave equivalent power density.

➤ Limits for Occupational/Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m ) | Power Density (mW/cm$^2$) | Average Time (minutes) |
|---|---|---|---|---|
| Limits For General Population / Uncontrolled Exposure | | | | |
| 0.3-3.0 | 614 | 1.63 | *(100) | ≤6 |
| 3.0-30 | 1842/f | 4.89/f | *(900/f$^2$) | <6 |
| 30-300 | 61.4 | 0.163 | 1.0 | <6 |
| 300-1,500 | | | f/300 | <6 |
| 1,500-100,000 | | | 5 | <6 |

f = frequency in MHz.   * = Plane-wave equivalent power density.

## 2.2. DETERMINATION OF EXEMPTION

"Blanket" Exemption – §1.1307(b)(3)(i)(A)

➢ Regardless of the separation distance, the maximum time-averaged power is no more than 1mw.

"MPE" Exemption – §1.1307(b)(3)(i)(C)

➢ 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. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.

➢ 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.

| RF Source frequency (MHz) | Minimum Distance | | Threshold ERP (watts) |
|---|---|---|---|
| | $\lambda_L / 2\pi$ | $\lambda_H / 2\pi$ | |
| 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 $R^2 f$. |
| 1,500-100,000 | 31.8 mm–0.5 mm | | 19.2 $R^2$. |
| R must be at least $\lambda/2\pi$, where $\lambda$ is the free-space operating wavelength in meters. | | | |

➢ For mobile devices that are not exempt per Table 1 of §1.1307(b)(1)(i)(C) and device at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.

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

"SAR" Exemption – §1.1307(b)(3)(i)(B)

➢ the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold $P_{th}$ (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). $P_{th}$ is given by:

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

where

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

And

$$ERP_{20\,\text{cm}}\,(\text{mW}) = \begin{cases} 2040f & 0.3\,\text{GHz} \leq f < 1.5\,\text{GHz} \\ 3060 & 1.5\,\text{GHz} \leq f \leq 6\,\text{GHz} \end{cases}$$

## 2.3. MULTIPLE RF SOURCES ARE EXEMPT

Multiple RF sources are exempt– §1.1307(b)(3)(ii)

(a) 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).

(b) 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) should be used to determine exemption for simultaneous transmission according to Formula below,

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

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE should be less than 1, to determine simultaneous transmission exposure compliance.

Where:

$a$ = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for $P_{th}$, 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.

$P_i$ = 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 paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source $i$.

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

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source $j$, at a distance of at least $\lambda/2\pi$ 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.

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## 2.4. MPE CALCULATION FORMULA

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in $mW/cm^2$

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

# 3. CLASSIFICATION

The antenna of this product, under normal use condition, is at less than 20cm away from the body of the user. So, this device is classified as **Portable Device.**

# 4. ANTENNA GAIN

The antennas provided to the EUT, please refer to the following table:

| Mode | Transmitter Circuit | Peak Gain (dBi) | Antenna Type |
|------|---------------------|-----------------|--------------|
| GFSK (FT24160AV) | Chain 0 | 1.13 | Wire Antenna |
| GFSK (FT92090) | Chain 0 | 1.13 | Wire Antenna |

## 5. CALCULATED RESULT OF MAXIMUM CONDUCTED POWER

When the measurement distance is specified at 3 m, the relationship between EIRP and field strength can be expressed by the following formula:

EIRP(dBm)= E(dB $\mu$ V/m)-95.3

| Mode | Frequency (MHz) | E (dB $\mu$ V/m) | EIRP (dBm) | ERP (dBm) |
|---|---|---|---|---|
| GFSK (FT24160AV) | 2474 | 54.48 | -40.82 | -42.97 |
| GFSK (FT92090) | 2441.5 | 71.84 | -23.46 | -25.61 |

The tuned EIRP (declared by client)

| Mode | Frequency (MHz) | Target Power (dBm) | Tolerance (dBm) | Lower Tolerance (dBm) | Upper Tolerance (dBm) |
|---|---|---|---|---|---|
| GFSK (FT24160AV) | 2412-2474 | -40 | $\pm$1 | -41 | -39 |
| GFSK (FT92090) | 2401.5-2477.5 | -23 | $\pm$1 | -24 | -22 |

| MPE-based Exemption §1.1307(b)(3)(i)(A) | | | | | |
|---|---|---|---|---|---|
| Operation Mode | Frequency Band (MHz) | M$_{ax}$. EIRP (dBm) | M$_{ax}$. EIRP Power (mW) | Limit Threshold (mW) | Test Result |
| GFSK (FT24160AV) | 2412-2474 | -39 | 0.000126 | 1 | Pass |
| GFSK (FT92090) | 2401.5-2477.5 | -22 | 0.006310 | 1 | Pass |

**CONCLUSION:**

The 2.4G SRD(FT24160AV) and 2.4G SRD(FT92090) can transmit simultaneously, the formula of calculated the MPE is:

**CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1**
**CPD = Calculation power density**
**LPD = Limit of power density**

(0.000126/1)+( 0.006310/1) = 0.006436<1, which is less than the "1" limit

**--- END ---**