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Report No.: SZEM130700370402

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SAR Evaluation Report

Application No.:	SZEM1307003704RF
Applicant:	ORBOTIX, INC
Manufacturer:	JETTA (GUANGZHOU) INDUSTRIES CO.,LTD
Factory:	JETTA (GUANGZHOU) INDUSTRIES CO.,LTD
Product Name:	Sphero 2
Model No.(EUT):	S003
Add Model No.:	S003AP
FCC ID:	SXO-SPV2
Standards:	47 CFR Part 1.1307(2012) 47 CFR Part 2.1093 (2012) KDB447498D01 General RF Exposure Guidance v05
Date of Receipt:	2013-07-10
Date of Test:	2013-08-09 to 2013-08-15
Date of Issue:	2013-09-04

Test Result :	PASS*
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* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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3 General Information

3.1 Client Information

Applicant:	ORBOTIX, INC
Address of Applicant:	1155 CANYON BLVD, SUITE 210, BOULDER, CO 80302, USA
Manufacturer:	JETTA (GUANGZHOU) INDUSTRIES CO.,LTD
Address of Manufacturer:	163 CHENG AO DA DAO DONG LU, CHENG JIAO JIE, CONG HUA SHI, GUANGZHOU SHI, GUNAGDONG PROVINCE, CHINA
Factory:	JETTA (GUANGZHOU) INDUSTRIES CO.,LTD
Address of Factory:	163 CHENG AO DA DAO DONG LU, CHENG JIAO JIE, CONG HUA SHI, GUANGZHOU SHI, GUNAGDONG PROVINCE, CHINA

3.2 General Description of EUT

Product Name:	Sphero 2
Model No.:	S003, S003AP
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V2.1+EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	Portable production
Antenna Type	Integral
Antenna Gain	0dBi
Power Supply:	3.7V 350mAh rechargeable battery
Test Voltage:	3.7V DC battery fully charged

Remark:

Model No: S003, S003AP

The Model No. S003 includes 4 version: S003, S003AS, S003BS, S003RW.

Only the Model S003 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for all above models, Only different on model No., and other detail difference information as below:

Model No.	Difference
S003(includes 4 version:S003, S003AS, S003BS, S003RW)	<ol style="list-style-type: none">1. S003 and S003BS have US version adapter, S003RW and S003AS have international version adapter;2. S003, S003AS, S003BS, S003RW have same ball shell;3. S003BS has clear Nubby Cover, S003, S003AS, S003RW has not;4. The Ball holder & The Ramp of S003BS are in glow-in-dark color, S003, S003AS, S003RW are green;5. S003BS has Pouch, S003, S003AS, S003RW has not;6. The cradle color of S003, S003AS, S003BS, S003RW are same.
S003AP	<ol style="list-style-type: none">1. S003AP has international version adapter;2. S003AP has different ball shell color and printing to S003;3. S003AP has not clear Nubby Cover;4. The Ball holder & The Ramp of S003AP are in green;5. S003AP has not Pouch;6. The cradle color of S003AP is different to S003.

3.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch E&E Lab

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
518057

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No tests were sub-contracted.

3.4 Test Facility

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

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **VCCI**

The 3m Semi-anechoic chamber, Full-anechoic Chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2197, G-416, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers of SGS-CSTC Standards Technical Services Co., Ltd. have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1 & 4620C-2.

3.5 Deviation from Standards

None.

3.6 Abnormalities from Standard Conditions

None.

3.7 Other Information Requested by the Customer

None.

4 SAR Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v05

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

4.1.2 Limits

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

$f(\text{GHz})$ is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation¹⁷

The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

4.1.3 EUT RF Exposure

The Max Conducted Peak Output Power is 2.05dBm in highest channel(2.480GHz);

The best case gain of the antenna is 0dBi.

$$\text{EIRP} = 2.05\text{dBm} + 0\text{dBi} = 2.05\text{dBm}$$

2.05dBm logarithmic terms convert to numeric result is nearly 1.6032mW

According to the formula. calculate the EIRP test result:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}]$$

$$\text{General RF Exposure} = (1.6032\text{mW} / 5 \text{ mm}) \times \sqrt{2.480\text{GHz}} = 0.5049 \text{ ①}$$

SAR requirement:

$$S = 3.0 \quad ② ;$$

$$\text{①} < \text{②}.$$

So the SAR report is not required.