TEST REPORT

Report No.: 16030698HKG-001R1

Sphero Inc.

Application
For
Certification
(Original Grant)
(FCC ID: SXO-K001WC)

Transmitter

This report supersedes previous report with report number 16030698HKG-001 dated April 23, 2016.

Prepared and Checked by:	Approved by:
Signed On File Leung Sung Tak, Andy Assistant Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Ltd. Wong Kwok Yeung, Kenneth Senior Lead Engineer Date: May 10, 2016

GENERAL INFORMATION

Grantee:	Sphero Inc.
Grantee Address:	4/F., 299QRC, 287-299 Queen's Road Central, Sheung Wan, Hong Kong.
Contact Person:	Jackal Ma
Tel:	+852 9788-7164
Fax:	N/A
e-mail:	jackal.ma@sphero.com
Manufacturer:	Sphero Inc.
Manufacturer Address:	4/F., 299QRC, 287-299 Queen's Road Central, Sheung Wan, Hong Kong.
Brand Name:	SPRK+
Model:	K001WC
Type of EUT:	Transmitter
Description of EUT:	Wireless Induction Charger
Serial Number:	N/A
FCC ID:	SXO-K001WC
Date of Sample Submitted:	March 15, 2016
Date of Test:	March 15, 2016 to April 01, 2016
Report No.:	16030698HKG-001R1
Report Date:	May 10, 2016
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Radiated Emission	15.209	Pass
Transmitter Power Line Conducted Emissions	15.207	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2014 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.
3. Please refer TY-S16-0096 Letter issued on May 10, 2016 for the detail Amendment Summary.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a 125kHz Transmitter (Wireless Inductive battery Charger –WPT source). The EUT is powered by a 5.0VDC (USB Port). After placing the corresponding Ball unit (i.e. WPT Client) on the EUT, the Ball will be charged. As the ball which is placed on the EUT will be turned into a deep sleep mode when the user press the button on the EUT. Thus, there is a modulation on the power transfer frequency for transmitting intelligent communication with the Ball unit.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transmitter.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by 5.0VDC (Powered by USB port).

The corresponding Ball unit is placed on the Inductive charger for testing together.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emission at and above 30 MHz, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data report in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

As the Ball unit contains BLE function, thus for simultaneous transmission, both the inductive charger and Ball unit are also switched on when taking radiated emission for determining worst-case spurious emission.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Support Equipment List and Description

(1) 1 x USB cable of 97cm in length (Provided by Applicant)
(2) HP ProBook 430 G1 (Provided by Intertek)

3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
RR = 18.0 dBµV
LF = 9.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 1.000 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 18.5 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 150 kHz

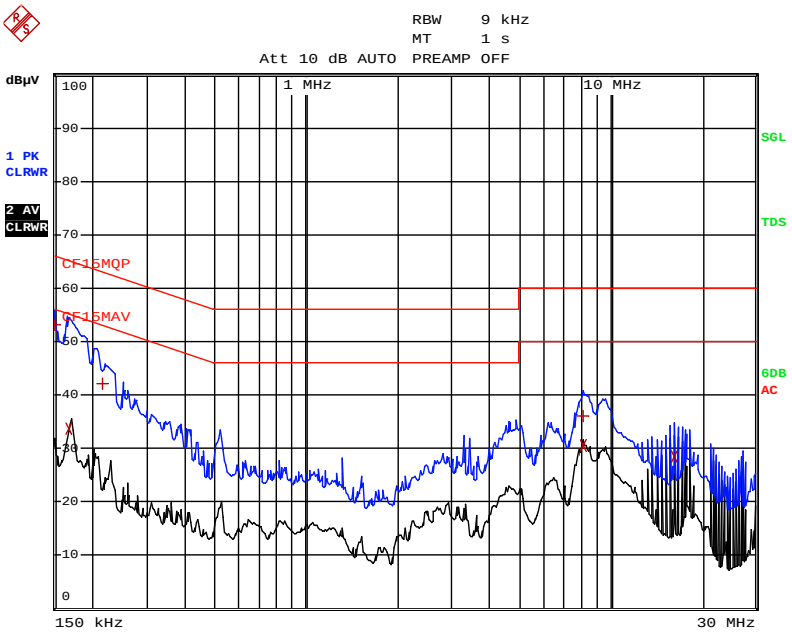
For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 12.94 dB

Worst-Case Operating Mode: Battery Charging



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	150 kHz	53.05	L1	-12.94
2	CISPR Average	168 kHz	33.71	L1	-21.34
1	Quasi Peak	217.5 kHz	42.01	N	-20.89
2	CISPR Average	8.124 MHz	30.45	L1	-19.54
1	Quasi Peak	8.1285 MHz	36.06	L1	-23.94
2	CISPR Average	16.251 MHz	28.52	N	-21.47

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

Applicant: Sphero Inc. Date of Test: April 01, 2016
Model: K001WC
Worst-Case Operating Mode: Transmitting

Table 1
Radiated Emissions
Pursuant to FCC Part 15 Section 15.209 Requirement

Data Table

Radiated Scan

Pursuant to FCC Part 15 Section 209: Emissions Requirement

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Distance Factor (-dB)	Calculated at 300m (dBµV/m)	Limit at 300m (dBµV/m)	Margin (dB)
H	0.125	69.4	0	11.8	81.2	80.0	1.2	25.7	-24.5
H	0.250	40.7	0	11.7	52.4	80.0	-27.6	19.6	-47.2
H	0.377	42.0	0	11.6	53.6	80.0	-26.4	16.1	-42.5

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Distance Factor (-dB)	Calculated at 30m (dBµV/m)	Limit at 30m (dBµV/m)	Margin (dB)
H	***0.500***	***37.5***	***0***	***11.6***	***49.1***	***40.0***	***9.1***	***33.6***	***-24.5***
H	0.625	36.5	0	11.5	48.0	40.0	8.0	31.7	-23.7
H	0.750	35.4	0	11.4	46.8	40.0	6.8	30.1	-23.3
H	0.875	35.6	0	11.3	46.9	40.0	6.9	28.8	-21.9
H	1.000	37.8	0	11.3	49.1	40.0	9.1	27.6	-18.5
H	1.125	33.7	0	11.3	45.0	40.0	5.0	26.6	-21.6
H	1.250	33.4	0	11.3	44.7	40.0	4.7	25.7	-21.0

NOTES:

1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Loop antenna is used for the emissions below 30MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 Instruction Manual

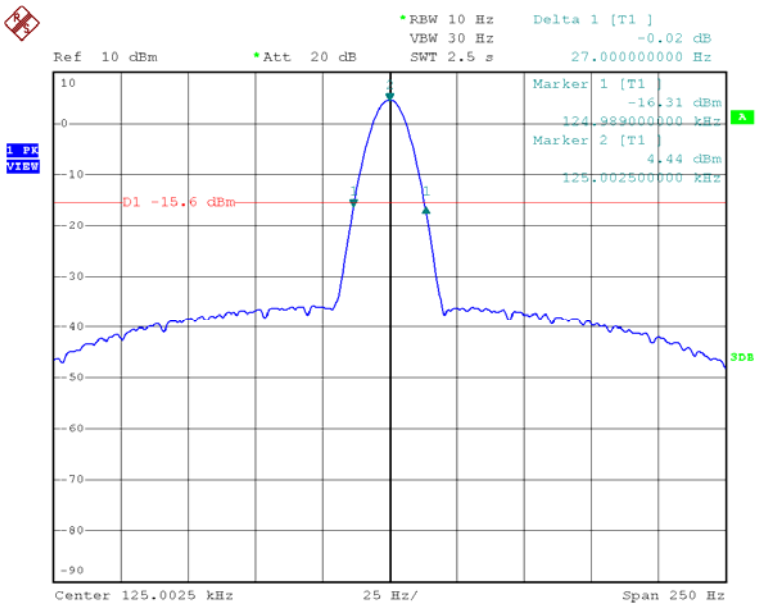
For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

8.0 Miscellaneous Information

The miscellaneous information includes details of the test procedure.

8.1 Measured Bandwidth



Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designed (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

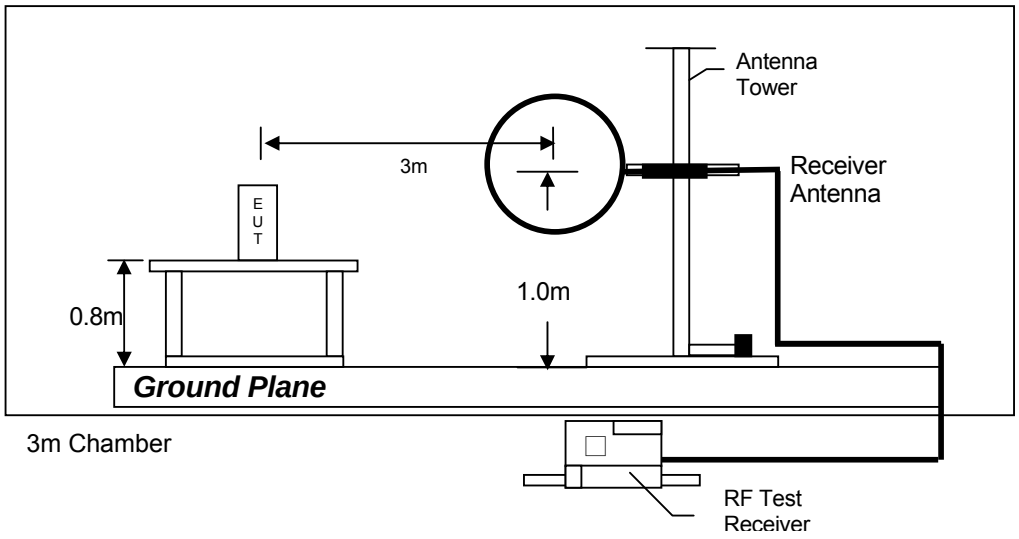
Conducted measurements were made as described in ANSI C63.10 (2013).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

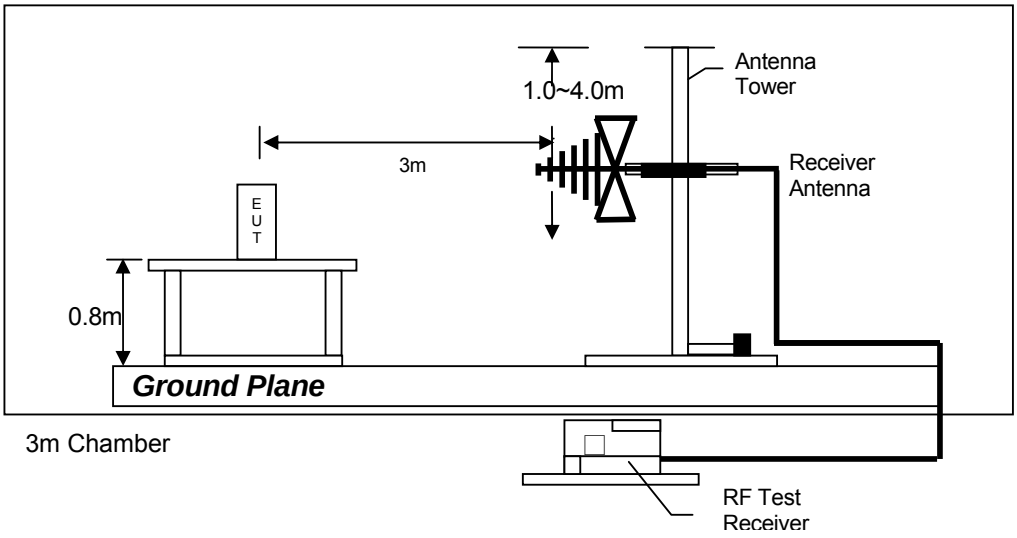
Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions below 30MHz



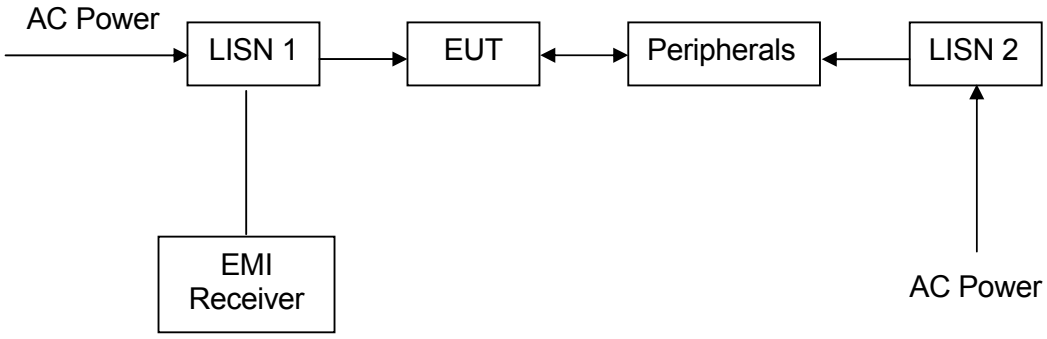
Test setup of radiated emissions up to 1GHz

8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4.3 Conducted Emission Test Setup



9.0 Confidentiality Request

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	BiConiLog Antenna
Registration No.	EW-3156	EW-2253	EW-3061
Manufacturer	R&S	R&S	EMCO
Model No.	ESR26	FSP40	3412E
Calibration Date	Nov. 03, 2015	May 27, 2015	Jul. 22, 2015
Calibration Due Date	Nov. 03, 2016	May 27, 2016	Jul. 22, 2016

Equipment	Active Loop H-field
Registration No.	EW-2313
Manufacturer	ELETROMETRIC
Model No.	EM-6876
Calibration Date	Dec. 16, 2014
Calibration Due Date	June. 16, 2016

2) AC Mains Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2666	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI7	ENV-216
Calibration Date	May 13, 2015	Jan. 28, 2016
Calibration Due Date	May 13, 2016	Jan. 28, 2017

END OF TEST REPORT