

TEST REPORT

Report Number: 102028516MPK-007

Project Number: G102028516

June 30, 2015

**Testing performed on the
BB-8 App-Enabled Droid**

Model Number: R001WC

FCC ID: SXO-RWC1

IC: 10016A-RWC1

to

FCC Part 15 Subpart C (15.209)

FCC Part 15 Subpart C (15.207)

RSS-210 Issue 8

FCC Part 15, Subpart B

Industry Canada ICES-003

Class: B

for

Orbotix, Inc. dba Sphero

Test Performed by:

Intertek

1365 Adams Court

Menlo Park, CA 94025 USA

Test Authorized by:

Orbotix, Inc. dba Sphero

4772 Walnut Street, Suite 206

Boulder, CO 80301, USA

Prepared by:


Anderson Soungpanya

Date: June 30, 2015

Reviewed by:


Krishna K Vemuri

Date: June 30, 2015

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VERIFICATION OF COMPLIANCE

Report No. 102028516MPK-007

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Equipment Under Test: BB-8 App-Enabled Droid

Trade Name: sphero

Model No.: R001WC

Applicant: Orbotix, Inc. dba Sphero

Contact: Gerald Wallner

Address: Orbotix, Inc. dba Sphero
4772 Walnut Street, Suite 206
Boulder, CO 80301, USA

Country USA

Tel. number: (720) 340-2310

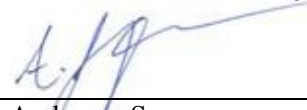
email: gerald@sphero.com

Applicable Regulation: FCC Part 15, Subpart C (15.209)
FCC Part 15, Subpart C (15.207)
RSS-210 Issue 8
FCC Part 15, Subpart B
Industry Canada ICES-003 Issue 5

Equipment Class: Class B

Date of Test: June 01 – 18, 2015

We attest to the accuracy of this report:


Anderson Soungpanya
Project Engineer

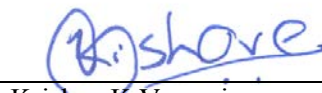

Krishna K Vemuri
EMC Senior Staff Engineer

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EXECUTIVE SUMMARY

Test	Reference FCC	Reference IC	Result
Transmitter Radiated Emissions	15.209	RSS 210 (2.5)	Complies
AC Line Conducted Emission (Transmitting mode)	15.207	RSS GEN	Complies
Radiated Emission from Digital Part and Receiver	15.109	ICES 003	Complies
AC Line Conducted Emission (Charging mode)	15.107	ICES 003	Complies
Antenna Requirement	15.203	RSS GEN	Complies. The EUT does not have an external antenna connector
Occupied Bandwidth	15.215(c)	RSS GEN	Complies



1.0 Job Description

The Equipment under Test (EUT) is the BB-8 App-Enabled Droid; model number R001WC.

1.1 Client Information

The EUT has been tested at the request of:

Company: Orbotix, Inc. dba Sphero
4772 Walnut Street, Suite 206
Boulder, CO 80301, USA

Name of contact: Gerald Wallner
Telephone: (720) 340-2310
Email: gerald@sphero.com

1.2 Test Plan Reference

Tests were performed to the following standards:

- FCC Part 15, Subpart C (15.209)
- FCC Part 15, Subpart C (15.207)
- FCC Part 15, Subpart B
- Industry Canada ICES – 003 Issue 5



1.3 Description of Equipment Under Test (EUT)

Description	Charging Cradle
Model No.	R001WC
FCC Identifier	SXO-RWC1
IC Identifier	10016A-RWC1
Operating Frequency	Single frequency, 125 kHz
Number of Channels	1
Type of Modulation	CW
Antenna Type	Internal Antenna

EUT receive date: May 18, 2015

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: June 01, 2015

Test completion date: June 18, 2015

The test results in this report pertain only to the item tested.

Orbotix, Inc. dba Sphero supplied the following description of the EUT:

The Sphero Ray BB-8 is an app-controlled robot that works with iOS & Android devices. The unit is battery powered and it charged using a wireless inductive cradle.

1.4 Equipment Under Test

Ref No.	Description	Model Numbers	Serial Number
1	Charging Cradle	R001WC	23

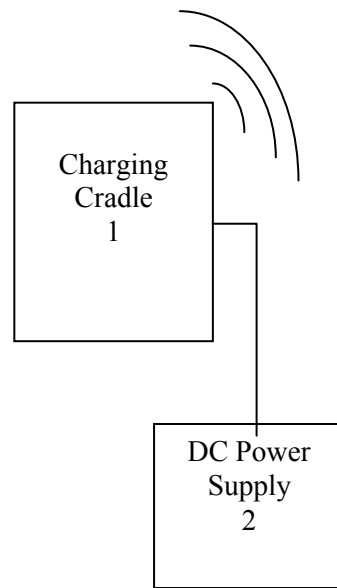
System Support Equipment

Ref No.	Description	Model Numbers	Serial Number
2	Extech DC Power Supply	382260	ITS 00486

1.5 Block Diagram of Test Setup

The diagrams showed below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.

Test Setup for Radiated Emissions Tests



S = Shielded	m = Length in Meters
U = Unshielded	



1.6 Justification

The EUT was configured for testing in a table-top configuration, as specified by Orbotix, Inc. dba Sphero

1.7 Mode(s) of Operation

EUT was continuously transmitting during the tests.

1.8 Modifications Required for Compliance

No modifications were made during compliance testing in order to bring the product into compliance.



2.0 Test Environment for Emissions Testing

2.1 Test Facility

The test facility is located at 1365 Adams Court, Menlo Park, California. The test site is a 10-meter semi-anechoic chamber. The site meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The A2LA certificate number for this site is 1755-01.

The Industry Canada (IC) Site Number is 2042L-1.

2.2 Test Equipment

Table 2-1 contains a list of the test equipment used during the testing.

Table 2-1 List of Test Equipment

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
LISN	FCC	FCC-LISN-50-50-M-H	ITS 00552	12	09/04/15
Digital Multi Meter	Fluke	87V	ITS 01019	12	03/16/16
Spectrum Analyzer	Rohde & Schwarz	FSU	ITS 00913	12	12/16/15
Passive Loop Antenna	EMCO	6512	ITS 01598	12	08/22/15
BI-Log Antenna	Teseq	CBL 6111D	ITS 01058	12	11/21/15
BI-Log Antenna	Antenna Research	LPB-2513	ITS 00355	12	08/21/15
Pre-Amplifier	Sonoma Instrument	310	ITS 00942	12	11/26/15
EMI Receiver	Rohde & Schwarz	ESU	ITS 00961	12	11/10/15
Signal Generator	Rohde & Schwarz	SMR40	ITS 00981	12	10/17/15
Electric Field Probe	Wandel and Goltermann	2244/90.20 and EMC-20	ITS 09126	12	10/03/15
Magnetic Field Probe	Narda	ELT 400	ITS 012769	12	7/07/15



2.3 Example Field Strength Calculation

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

$$FS = RA + AF + CF - PA + DCF$$

Where

FS = Field Strength in dB ($\mu\text{V}/\text{m}$)

RA = Receiver Amplitude (including preamplifier) in dB (μV)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB (1/m)

PA = Preamplifier Factor in dB

DCF = Distance Correction Factor dB (for measurements made at X meters when compared to Y meter limits, $40\log(X/Y)$ for below 30MHz and $20\log(X/Y)$ for above 30MHz)

Assume a receiver reading of 52.0 dB (μV) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted and the Distance Correction Factor of 10.5 dB is added, giving field strength of 42.5 dB ($\mu\text{V}/\text{m}$).

$$RA = 52.0 \text{ dB } (\mu\text{V})$$

$$AF = 7.4 \text{ dB } (1/\text{m})$$

$$CF = 1.6 \text{ dB}$$

$$PA = 29.0 \text{ dB}$$

$$DCF = 10.5 \text{ dB}$$

$$FS = RF + AF + CF - PA + DCF$$

$$FS = 52.0 + 7.4 + 1.6 - 29.0 + 10.5$$

$$FS = 42.5 \text{ dB } (\mu\text{V}/\text{m})$$



2.4 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.

Radiated Emission:

The uncertainty in the measured field strength is estimated as follows, for a minimum confidence probability of 95 %

Freq. Range	Detection Mode	Uncertainty
30 MHz to 1000 MHz	Quasi-peak	± 4.2 dB
1 GHz to 18 GHz	Average	± 5.1 dB

Conducted Emission:

The uncertainty in the measured voltage is estimated as follows, for a minimum confidence probability of 95 %

Freq. Range	Detection Mode	Uncertainty
150 kHz to 30 MHz	Average	± 2.6 dB
	Quasi-peak	± 2.6 dB



3.0 Emissions Test Results

3.1 Transmitter Radiated Emissions

FCC: 15.209

IC: RSS-GEN

3.1.1 Test Limits

Limits for Electromagnetic Radiated Disturbance, FCC Section 15.209(b)& RSS-GEN

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

In addition, the level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.



3.1.2 Test Procedure

Radiated emission measurements were performed from 9 kHz to 30 MHz with the Spectrum Analyzer Resolution Bandwidth 200 Hz. In the frequency range from 9 kHz to 30 MHz the Quasi-peak value of the Field Strength (FS) is measured. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

The EUT is placed on a plastic table that is 80 cm in height on top of a turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emission measurements were performed from 9 kHz to 1 GHz.

Analyzer resolution was:

9 kHz or greater for frequencies below 30 MHz

100 kHz or greater for frequencies 30 MHz to 1000 MHz

Below 30 MHz

Radiated emissions are taken at 10 meter for frequencies below 30MHz. An inverse proportionality factor of 40 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 10 meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent 30 meter reading using inverse scaling with distance.

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.

Equipment was setup as "Transmission Mode." See section 1.5 for setup details.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

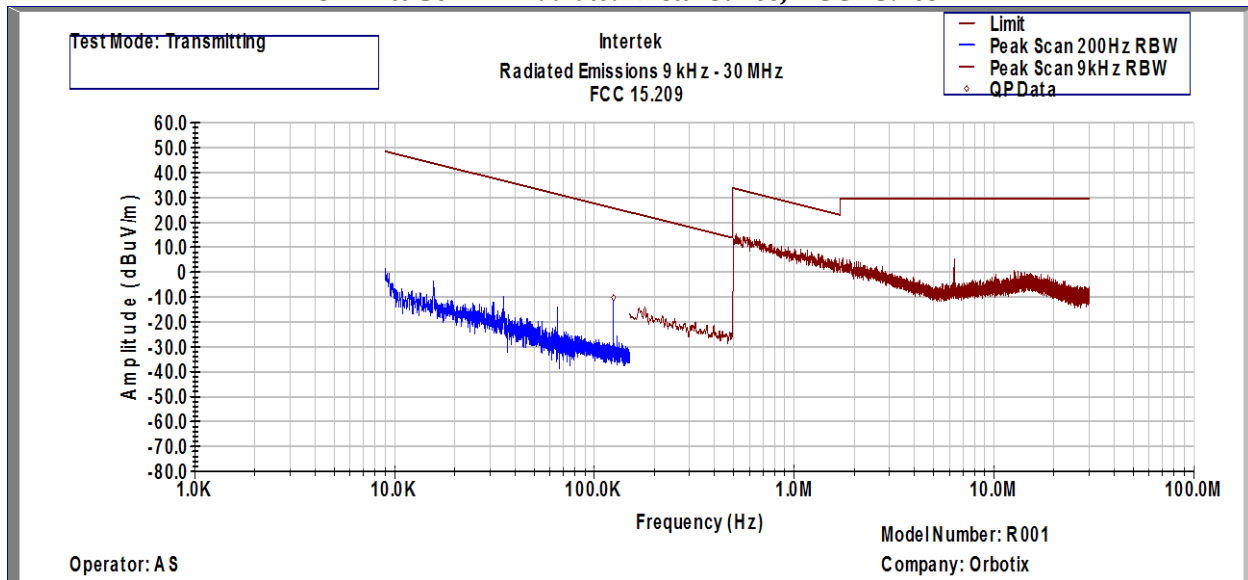
Tested By:	Anderson Soungpanya
Test Date:	June 2 & 11, 2015



3.1.3 Test Results

The EUT met the radiated disturbance requirements of FCC 15.209 for an Intentional Radiator.

9kHz to 30MHz Radiated Disturbance, FCC 15.209



Frequency	QP Level	Limit @300m	Margin	Raw Value	Cable	Amp Gain	Antenna Factor	DCF
(kHz)	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)	dB
125	-10.2	25.7	-35.9	16.7	0.1	32.0	64.1	-59.1

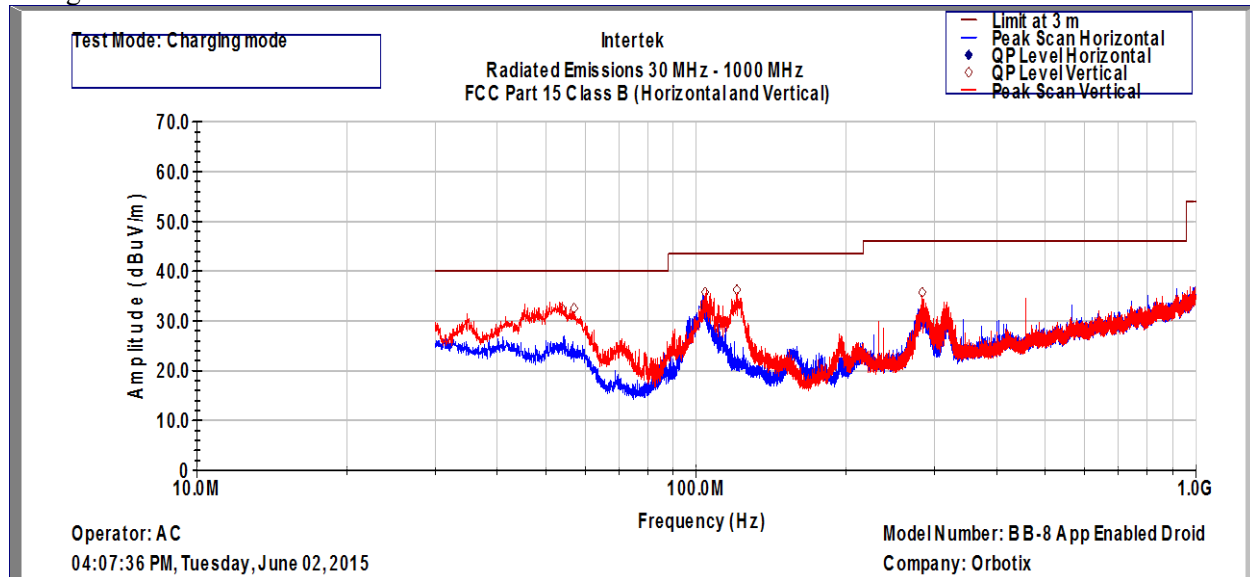
Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

Result: Complies



30MHz to 1GHz Radiated Disturbance, FCC 15.209

Charge Mode



Intertek Testing Services

Radiated Emissions 30 MHz - 1000 MHz

FCC Part 15 Class B (QP-Vertical)

Model Number: BB-8 App-Enabled Droid

Company: Orbotix

FCC Part 15 Class B (QP-Vertical)										
Frequency	Quasi Pk FS	Limit@3m	Margin	RA	Cable	AG	DCF	AF	Azimuth	Height
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB	dB(1/m)	deg	cm
53.9	32.5	40	-7.5	39.8	0.9	32.1	10.5	13.4	200	100
56.95	32.5	40	-7.5	41.1	0.9	32.1	10.5	12.1	220	100
104.27	35.8	43.5	-7.7	45	1.2	32.1	10.5	11.1	208	100
120.7	36.3	43.5	-7.2	44.9	1.2	32	10.5	11.7	234	100
283.6	35.7	46	-10.3	42.7	1.7	32	10.5	12.8	198	100

FCC Part 15 Class B (QP-Horizontal)										
Frequency	Quasi Pk FS	Limit@3m	Margin	RA	CF	AG	DCF	AF	Azimuth	Height
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB	dB(1/m)	deg	cm
103.5	32.8	43.5	-10.7	41.9	1.2	32.1	10.5	11.3	302	400

Test Mode: Charging Mode

Result: Complies by 7.2 dB

3.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.



Electromagnetic Radiated Disturbance Setup Photograph

3.1.4 Test Configuration Photograph (Continued)



Electromagnetic Radiated Disturbance Setup Photograph

3.2 Radiated Emissions from Digital Parts

FCC: 15.109

IC: ICES-003

3.2.1 Test Limits

Limits for Electromagnetic Radiated Disturbance, FCC Section 15.109(b)

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 3m dB(μV/m)
30-88	39.0	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt (dBμV), and microvolts (μV). To convert between them, use the following formulas: $20 \text{ LOG}_{10}(\mu\text{V}) = \text{dB}\mu\text{V}$, $\text{dBm} = \text{dB}\mu\text{V} - 107$

Alternative limits per Section 15.109(g):

Radiated Emissions Limits, CISPR 22

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 10m dB(μV/m)
30-230	40.0	30.0
230-1000	47.0	37.0

Note: The lower limit shall apply at the transition frequency.



3.2.2 Test Procedure

Measurements of the radiated field in the frequency range of 30 MHz to 1000 MHz are made with the antenna located at a distance of 10 meters from the EUT and measurements in the frequency range above 1000 MHz are made with the antenna located at a distance of 3 meters from the EUT. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field below 1000 MHz are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material.

Equipment was setup as "Transmission Mode." See section 1.5 for setup details.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

Tested By:	Anderson Soungpanya
Test Date:	June 3, 2014

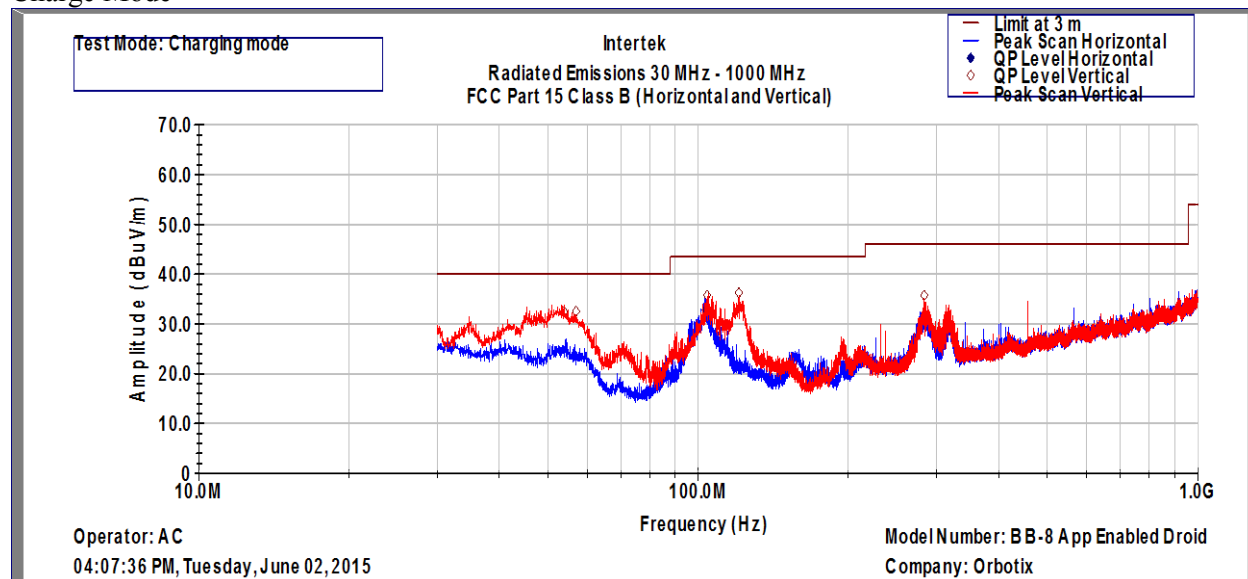


3.2.3 Test Results

The EUT met the radiated disturbance requirements of FCC and ICES 003 for a Class B device.

FCC and ICES 003, Radiated Disturbance

Charge Mode



Intertek Testing Services

Radiated Emissions 30 MHz - 1000 MHz

FCC Part 15 Class B (QP-Vertical)

Model Number: BB-8 App-Enabled Droid

Company: Orbotix

FCC Part 15 Class B (QP-Vertical)										
Frequency	Quasi Pk FS	Limit@3m	Margin	RA	Cable	AG	DCF	AF	Azimuth	Height
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB	dB(1/m)	deg	cm
53.9	32.5	40	-7.5	39.8	0.9	32.1	10.5	13.4	200	100
56.95	32.5	40	-7.5	41.1	0.9	32.1	10.5	12.1	220	100
104.27	35.8	43.5	-7.7	45	1.2	32.1	10.5	11.1	208	100
120.7	36.3	43.5	-7.2	44.9	1.2	32	10.5	11.7	234	100
283.6	35.7	46	-10.3	42.7	1.7	32	10.5	12.8	198	100

FCC Part 15 Class B (QP-Horizontal)										
Frequency	Quasi Pk FS	Limit@3m	Margin	RA	CF	AG	DCF	AF	Azimuth	Height
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB	dB(1/m)	deg	cm
103.5	32.8	43.5	-10.7	41.9	1.2	32.1	10.5	11.3	302	400

Test Mode: Charging Mode

Result:	Complies by 7.2 dB
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3.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.



Electromagnetic Radiated Disturbance Setup Photograph

3.2 AC Mains Line-Conducted Disturbance

FCC: 15.107

IC: ICES-003

3.2.1 Test Limits

Limits for Electromagnetic Conducted Disturbance, FCC Section 15.207& 15.107

Frequency Band MHz	Class B Limit dB (μV)	
	Quasi-Peak	Average
0.15-0.50	66 to 56 Decreases linearly with the logarithm of the frequency	56 to 46 Decreases linearly with the logarithm of the frequency
0.50-5.00	56	46
5.00-30.00	60	50

Note: At the transition frequency the lower limit applies.



3.2.2 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment was setup as “Charging Mode.” See section 1.5 for setup details.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

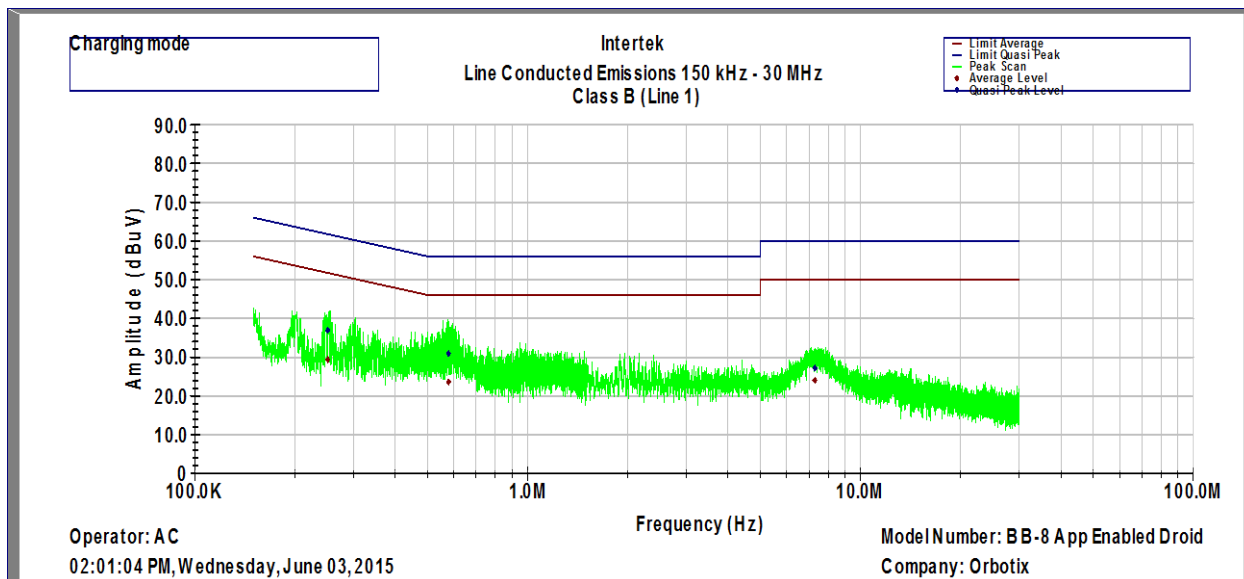
Date of Test:	June 3, 2015
Results	Complies



3.2.3 Test Results

The EUT met the conducted disturbance requirement of FCC and ICES 003 for a Class B device.

FCC and ICES 003 Conducted Disturbance at AC Mains



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
FCC Class B (Line 1)
Operator: AC

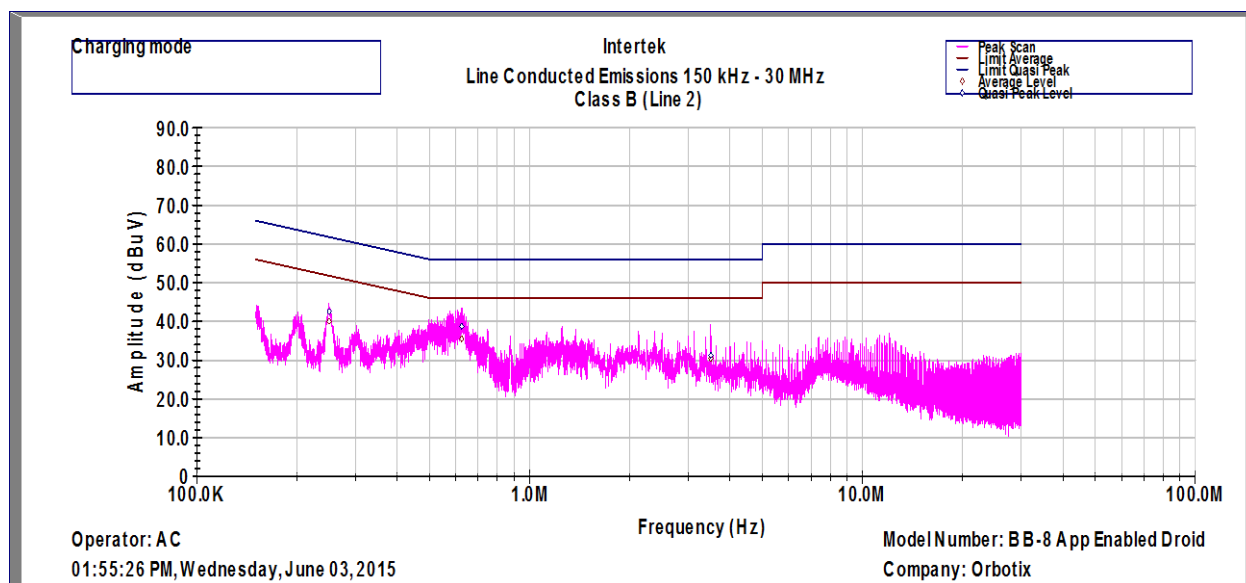
Model Number: BB-8 App-Enabled Droid
Company: Orbotix

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
MHz	dBuV	dBuV	dBuV	dBuV	dB	dB
0.251	29.4	36.9	53.1	63.1	-23.7	-26.2
0.579	23.6	30.9	46	56	-22.4	-25.1
7.290	24.0	27.2	50	60	-26.0	-32.8

Test Mode: Transmitter On, EUT with USB Power Adapter, Model: A1357, SI no. W010A051
Temp.: 22C
Humidity: 52.4%



AC Line Conducted Emission Data, EUT in transmitting mode



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
FCC Class B (Line 2)
Operator: AC

Model Number: BB-8 App-Enabled Droid
Company: Orbotix

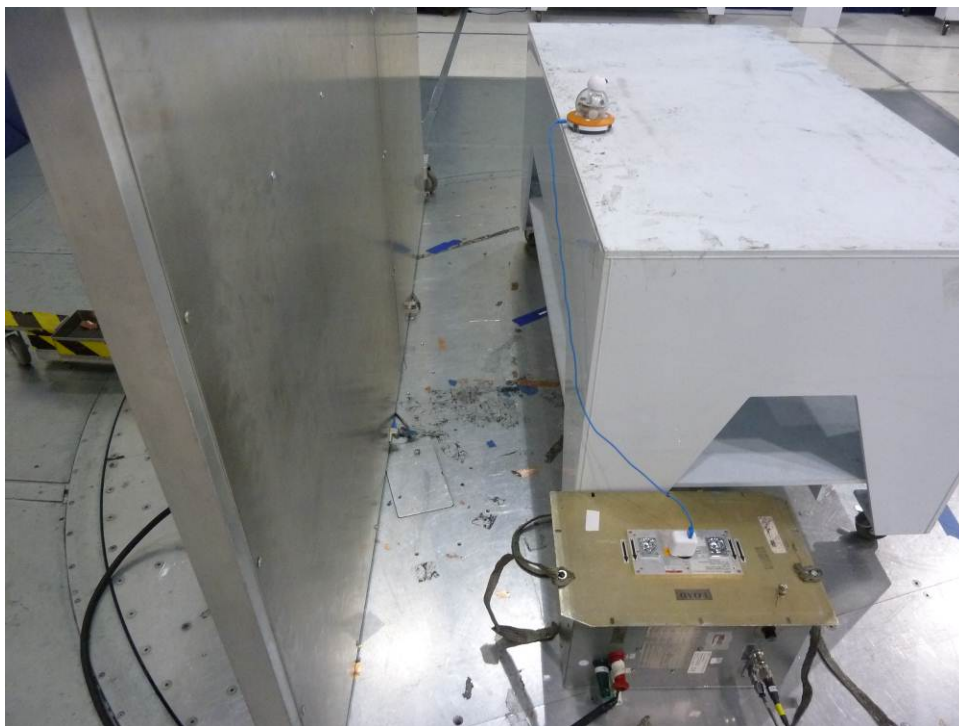
Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
MHz	dBuV	dBuV	dBuV	dBuV	dB	dB
0.250	40	42.5	53.1	63.1	-13.1	-20.6
0.625	35.5	38.7	46	56	-10.5	-17.3
3.500	30.4	31.2	46	56	-15.6	-24.8

Test Mode: Transmitter On, EUT with USB Power Adapter, Model: A1357, SI no. W010A051
Temp.: 22C
Humidity: 52.4%

Results **Complies by 10.5 dB**

3.2.4 Test Configuration Photographs

The following photographs show the testing configurations used.



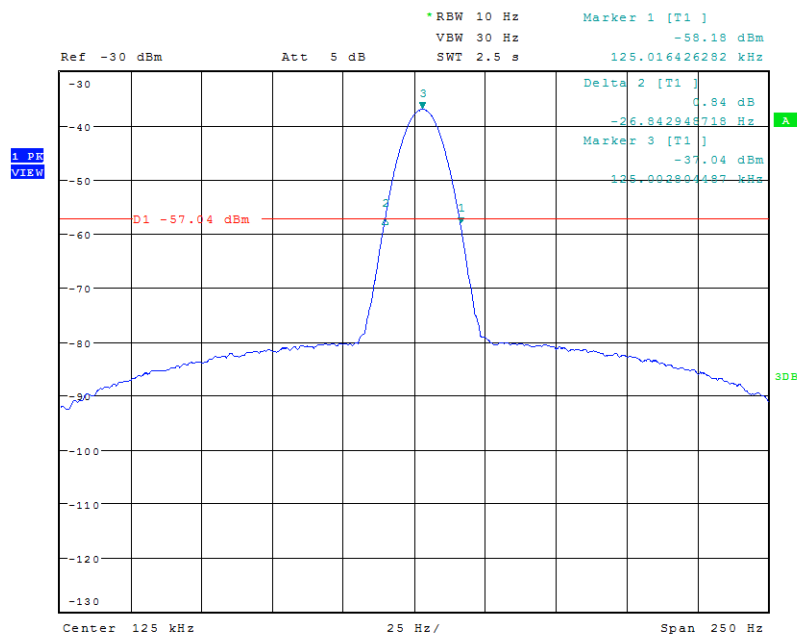
AC Mains Line-Conducted Disturbance Setup Photograph

3.3 Occupied Bandwidth

Equipment was setup as “Transmission Mode.” See section 1.5 for setup details.

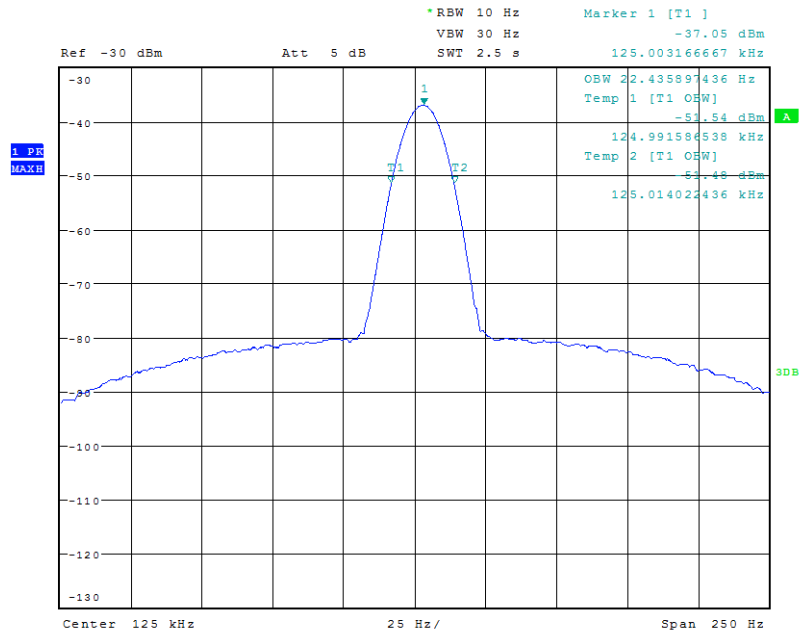
Measurements were made with the loop antenna at 10 cm distance using a Spectrum Analyzer. The spectrum analyzer reading was plotted.

Plot 1, 20dB Bandwidth



Date: 22.JUN.2015 12:47:22

Plot 2, 99% Bandwidth



Date: 22.JUN.2015 12:43:41

3.4 Aggregate leakage

3.4.1 Test Limits

For devices designed for typical desktop applications, such as wireless charging pads, RF exposure evaluation should be conducted assuming a user separation distance of 10 cm. E and H field strength measurements or numerical modeling may be used to demonstrate compliance. Measurements should be made from all sides and the top of the primary/client pair, with the 10 cm measured from the center of the probe(s) to the edge of the device. Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m. A KDB inquiry is required to determine the applicable exposure limits below 100 kHz.

Table 3-4 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled 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
(B) 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
300-1,500	-	-	f/1500	30
1,500-100,000	-	-	1.0	30

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



3.4.2 Test Procedure

Measurements are conducted with an electric field probe and a magnetic field probe located 10cm away from the EUT and its associated attachments. All sides, including top and bottom, of the EUT were scanned for emissions.

For frequencies less than 30MHz, the electric and magnetic field strengths are required to be measured independently. For frequencies between 30MHz and 300MHz, it may be possible to show that measurement of only of the two fields is sufficient for determining MPE compliance. For frequencies above 300MHz, only one field component need to be measured (generally E-field).

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

Equipment setup for the tests followed the guidelines of 680106 D01 RF Exposure Wireless Charging Apps v02.

Tested By:	Anderson Soungpanya
Test Date:	June 18, 2015



3.4.3 Test Results

All measurements are defined at f=125 kHz.

Electric field strength (V/m)

EUT Location (side)	Measured E-field (V/m)	Limit (V/m)	30% of Limit	Delta (V/m)
Left	1.21	614.0	184.20	-182.99
Right	1.23	614.0	184.20	-182.97
Front	1.27	614.0	184.20	-182.93
Back	1.14	614.0	184.20	-183.06
Top	2.79	614.0	184.20	-181.41
Bottom	1.10	614.0	184.20	-183.10

Magnetic field strength (A/m)

EUT Location (side)	Measured H-field (μ T)	Measured H-field (A/m)	Limit (A/m)	30% of Limit	Delta (A/m)
Left	0.236	0.19	1.63	0.49	-0.30
Right	0.237	0.19	1.63	0.49	-0.30
Front	0.237	0.19	1.63	0.49	-0.30
Back	0.238	0.19	1.63	0.49	-0.30
Top	0.420	0.33	1.63	0.49	-0.16
Bottom	0.407	0.32	1.63	0.49	-0.17

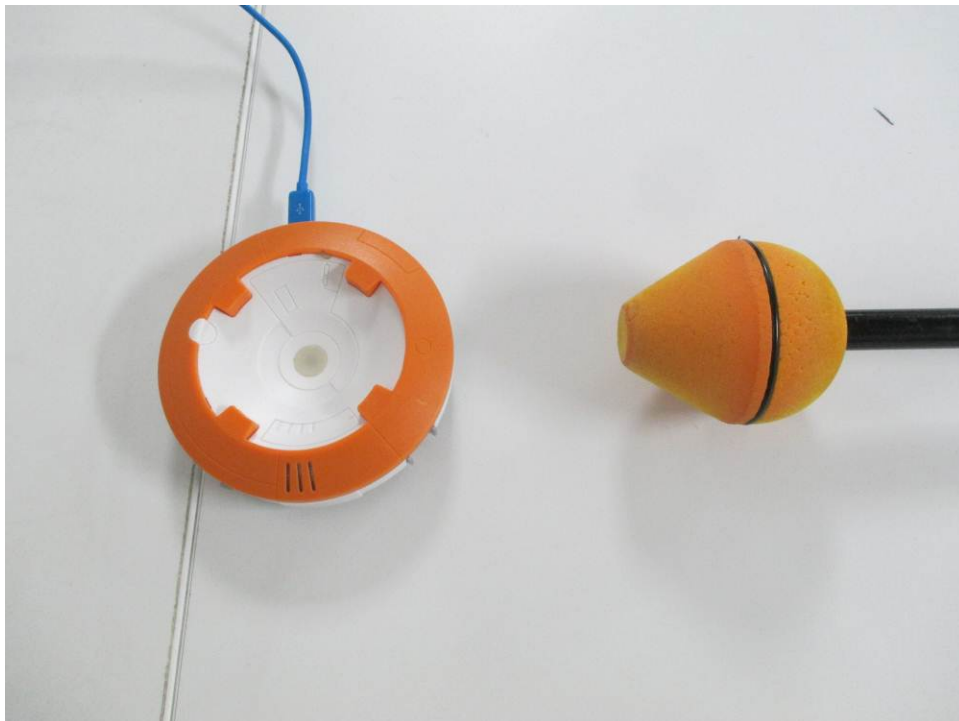
Power density (mW/cm²)

EUT Location (side)	Measured Power Density E-field (mW/cm ²)	Limit (mW/cm ²)	30% of Limit	Delta (mW/cm ²)
Left	0.0004	100	30	-29.9996
Right	0.0005	100	30	-29.9995
Front	0.0004	100	30	-29.9996
Back	0.0004	100	30	-29.9996
Top	0.0021	100	30	-29.9979
Bottom	0.0004	100	30	-29.9996

Results: Complies

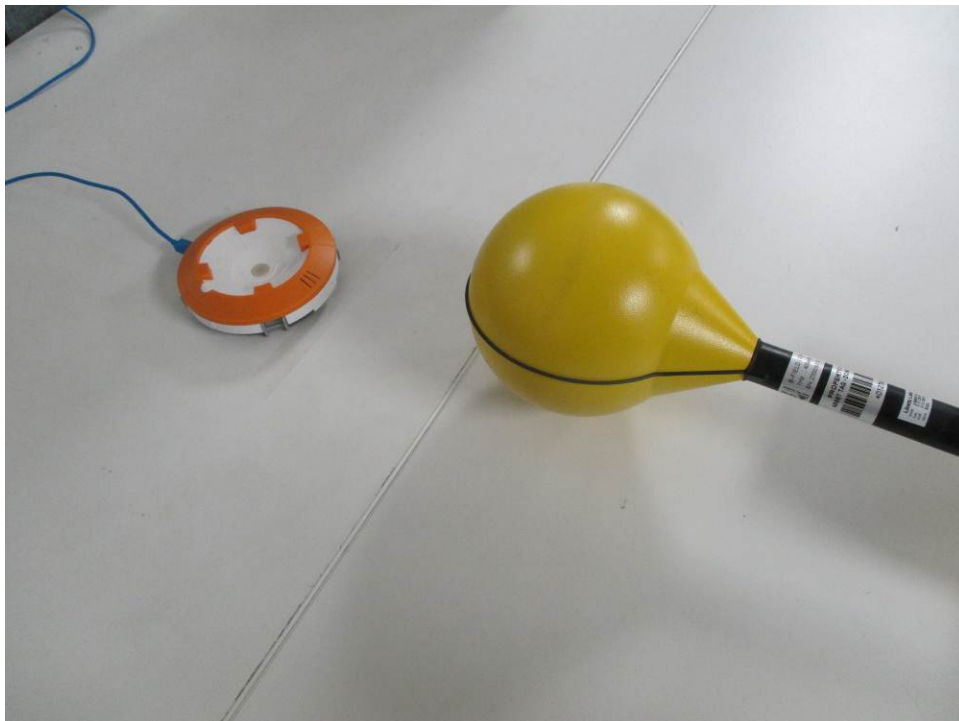
3.4.4 Test Configuration Photographs

Measurements with RF Field Probes



3.4.4 Test Configuration Photographs - Continued

Measurements with RF Field Probes





4.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G102028516	AS	KV	June 30, 2015	Original document

Annex A - RF Exposure Evaluation

Equipment Approval Considerations

- 1) Because of the anticipated design, implementation and operating variations in inductive wireless power transfer applications and complexities in evaluating RF exposure compliance, the discussion above should be used to determine the types of information necessary for inclusion in inquiries to the FCC Laboratory seeking RF exposure guidance on individual wireless power devices.
- 2) Inductive wireless power transfer applications that meet all of the following requirements are excluded from submitting an RF exposure evaluation.

- a) Power transfer frequency is less than 1 MHz:

Complies – See Plots in Section 3.3 of this report.

- b) Output power from each primary coil is less than 5 watts:

Complies - The maximum allowable power into the cradle is 5V at 650mA so 3.25W total at 100% efficiency.

- c) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils:

Complies - There is only one TX coil and one RX coil. See internal photos.

- d) Client device is inserted in or placed directly in contact with the transmitter:

Complies - The Cradle is mechanically contoured to fit the ball and no other device will be able make the cradle start sending power other than the ball. See External Photos

- e) The maximum coupling surface area of the transmit (charging) device is between 60 cm² and 400 cm².

Complies - The TX coil area is 82.9cm² and the RX coil area is 70.7cm².

- f) Aggregate leakage fields at 10 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 30% of the MPE limit.

Complies - See Section 3.4 of this report.

The EUT (an inductive wireless power transfer) meets all the requirements as set forth by 680106 D01 RF Exposure Wireless Charging Apps v02 (05/31/2013) and is excluded from an RF exposure evaluation.