



Report No.: SZEM181200003601 Page: 1 of 17

## **TEST REPORT**

Application No.:	SZEM1812000036CR
Applicant:	Shearwater Research Inc.
Address of Applicant:	Unit 250 13155 Delf Place Richmond, British Columbia, Canada
Manufacturer:	Shearwater Research Inc.
Address of Manufacturer:	Unit 250 13155 Delf Place Richmond, British Columbia, Canada
Factory:	Shenzhen Itian Technology Co., Ltd
Address of Factory:	501, Building C, Hongde Industrial Area, Lianrun Road, Dalang Street, Longhua District, Shenzhen
Equipment Under Test (EUT	):
EUT Name:	Teric Charger Dock-IT
Model No.:	55095-02
Trade mark:	3 SHEARWATER
FCC ID:	2AO24-55095-02
Standard(s) :	47 CFR Part 18
Date of Receipt:	2018-12-18
Date of Test:	2018-12-20 to 2019-03-14
Date of Issue:	2019-03-21
Test Result:	Pass*

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

Ceny. XM

Keny Xu EMC Laboratory Manager



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	Revision Record					
Version	Chapter	Date	Modifier	Remark		
01		2019-03-21		Original		

Authorized for issue by:		
	fore Boro	
	Powell Bao /Project Engineer	-
	Evic Fu	
	Eric Fu /Reviewer	-



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#### 2 **Test Summary**

Radio Spectrum Matter Part					
Item	Standard	Method	Requirement	Result	
Conducted disturbance	47 CFR Part 18	FCC MP-5	Part 18.307	Pass	
Radiated emission	47 CFR Part 18	FCC MP-5	Part 18.305	Pass	



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#### **General Information** 4

#### 4.1 Details of E.U.T.

Power supply:	Powered by adapter with model: EQ-24BCN		
	Input: AC100-240V, 50/60Hz, 0.8A Max;		
	Output: DC3.6V-8V, 3.0A/ DC12V, 2.0A		
Cable:	USB Cable(Unshielded, 104cm)		
Antenna Type:	Inductive Loop Coil Antenna		
Working Power:	5W		
Modulation Type:	Load Modulation		
Operation Frequency:	113.269kHz to 204.423kHz		
Remark:	This device has been tested with the Gear S3 and the device has been tested with load at zero charge, intermediate charge, and full charge, the worst status at zero charge had been recorded in the report.		

#### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Gear S3	SAMSUNG	R760	N/A
(provided by client)	SAMOUNG	U01U	N/A

#### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10 <sup>-8</sup>
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 3%
4	RF conducted power	± 0.75dB
5	RF power density	± 2.84dB
6	Conducted Spurious emissions	± 0.75dB
7	DE Dedicted newer	± 4.5dB (below 1GHz)
	RF Radiated power	± 4.8dB (above 1GHz)
8	Dedicted Sourieus emission test	± 4.5dB (Below 1GHz)
0	Radiated Spurious emission test	± 4.8dB (Above 1GHz)
9	Temperature test	± 1 °C
10	Humidity test	± 3%
11	Supply voltages	± 1.5%
12	Time	± 3%



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#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057. Tel: +86 755 2601 2053 Fax: +86 755 2671 0594 No tests were sub-contracted.

### 4.5 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.

#### A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

#### • VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

#### FCC – Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

#### Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

## 4.6 Deviation from Standards

None

### 4.7 Abnormalities from Standard Conditions

None



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## 5 Equipment List

Conducted disturbance	)				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ChangZhou ZhongYu	GB-88	SEM001-06	2017-05-10	2020-05-09
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018-07-12	2019-07-11
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018-09-25	2019-09-24
LISN	ETS-LINDGREN	3816/2	SEM007-02	2018-04-02	2019-04-01
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2018-04-02	2019-04-01

Radiated emission					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2018-07-12	2019-07-11
EMI Test Receiver (9kHz-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2018-04-02	2019-04-01
Trilog-Broadband Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2016-06-29	2019-06-28
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2018-04-13	2019-04-12
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2018-09-27	2019-09-26
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2018-09-27	2019-09-26
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2018-09-27	2019-09-26
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2018-04-08	2019-04-07



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## 6 Radio Spectrum Matter Test Results

#### 6.1 Conducted disturbance

Test Requirement	Part 18.307
Test Method:	FCC MP-5
Limit:	

	Conducted limit (dBµV)		
Frequency of emission (MHz)	Quasi-peak	Average	
0.15-0.5	66 to 56*	56 to 46*	
0.5-5	56	46	
5-30	60	50	

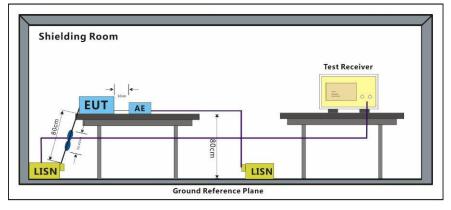
\*Decreases with the logarithm of the frequency.

#### 6.1.1 E.U.T. Operation

#### Operating Environment:

Temperature:23.1 °CHumidity:58 % RHAtmospheric Pressure:1020 mbarTest modea:Charge mode\_Keep the EUT charging

#### 6.1.2 Test Setup Diagram





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#### 6.1.3 Measurement Procedure and Data

**Test Procedure:** 1) The mains terminal disturbance voltage test was conducted in a shielded room.

- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50\Omega/50\mu$ H +  $5\Omega$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed on conducted measurement.



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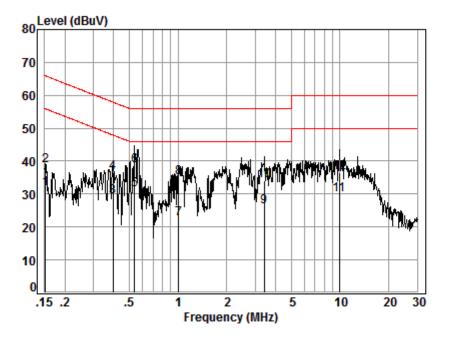
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#### Mode:a; Line:Live Line



Site :	Shielding	Room
Condition:	Line	
Job No. :	00036CR	
Test mode:	а	

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15	0.01	9.66	21.92	31.59	55.91	-24.32	Average
2	0.15	0.01	9.66	28.94	38.61	65.91	-27.30	QP
3	0.40	0.05	9.67	19.43	29.15	47.95	-18.80	Average
4	0.40	0.05	9.67	26.92	36.64	57.95	-21.31	QP
5	0.54	0.06	9.67	21.50	31.23	46.00	-14.77	Average
6	0.54	0.06	9.67	29.03	38.76	56.00	-17.24	QP
7	1.01	0.09	9.74	12.60	22.43	46.00	-23.57	Average
8	1.01	0.09	9.74	25.20	35.03	56.00	-20.97	QP
9	3.42	0.16	9.71	16.31	26.18	46.00	-19.82	Average
10	3.42	0.16	9.71	24.14	34.01	56.00	-21.99	QP
11	9.91	0.17	9.85	19.75	29.77	50.00	-20.23	Average
12	9.91	0.17	9.85	26.46	36.48	60.00	-23.52	QP



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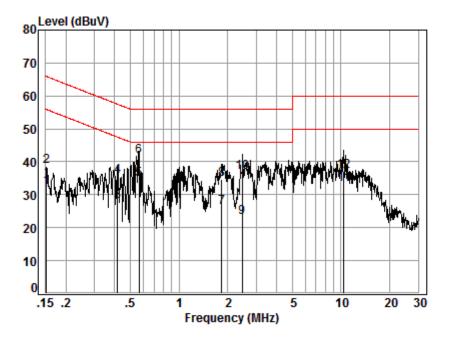
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Mode:a; Line:Neutral Line



Site :	Shielding	Room
Condition:	Neutral	
Job No. :	00036CR	
Test mode:	а	

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15	0.01	9.63	22.58	32.22	55.91	-23.69	Average
2	0.15	0.01	9.63	28.84	38.48	65.91	-27.43	QP
3	0.42	0.05	9.65	18.19	27.89	47.51	-19.62	Average
4	0.42	0.05	9.65	26.01	35.71	57.51	-21.80	QP
5	0.57	0.07	9.64	25.05	34.76	46.00	-11.24	Average
6	0.57	0.07	9.64	31.88	41.59	56.00	-14.41	QP
7	1.84	0.15	9.69	16.27	26.11	46.00	-19.89	Average
8	1.84	0.15	9.69	24.96	34.80	56.00	-21.20	QP
9	2.46	0.16	9.68	13.27	23.11	46.00	-22.89	Average
10	2.46	0.16	9.68	27.05	36.89	56.00	-19.11	QP
11	10.40	0.17	9.89	23.22	33.28	50.00	-16.72	Average
12	10.40	0.17	9.89	27.08	37.14	60.00	-22.86	QP



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#### 6.2 Radiated emission

Test Requirement	Part 18.305
Test Method:	FCC MP-5
Measurement Distance:	10m
Limit:	

(b) The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise	Any ISM	Below 500	25	300
specified (miscellaneous)	frequency	500 or more	25 × SQRT(power/500)	<sup>1</sup> 300
	Any non-ISM	Below 500	15	300
	frequency	500 or more	15 × SQRT(power/500)	<sup>1</sup> 300
Industrial heaters and RF	On or below	Any	10	1,600
stabilized arc welders	5,725 MHz Above 5,725 MHz	Any	(²)	(²)
Medical diathermy	Any ISM	Any	25	300
	frequency Any non-ISM	Any	15	300
	frequency			
Ultrasonic	Below 490 kHz	Below 500	2,400/F(kHz)	300
		500 or more	2,400/F(kHz) × SQRT (power/500)	<sup>3</sup> 300
	490 to 1,600 kHz	Any	24,000/F(kHz)	30
	Above 1,600 kHz	Any	15	30
Induction cooking ranges	Below 90 kHz	Any	1,500	<sup>4</sup> 30
	On or above 90 kHz	Any	300	<sup>4</sup> 30

<sup>1</sup>Field strength may not exceed 10  $\mu$ V/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

<sup>2</sup>Reduced to the greatest extent possible.

 $^{3}$ Field strength may not exceed 10  $\mu$ V/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.

<sup>4</sup>Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.



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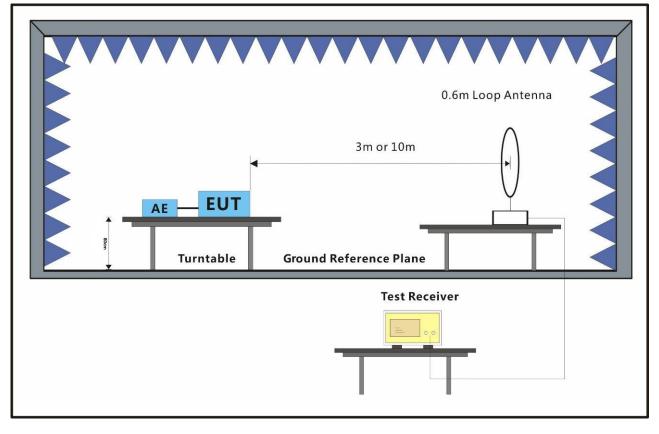
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#### 6.2.1 E.U.T. Operation

Operating Environment:

Temperature:25 °CHumidity:51 % RHAtmospheric Pressure:1020 mbarTest modea:Charge mode Keep the EUT charging

#### 6.2.2 Test Setup Diagram





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#### 6.2.3 Measurement Procedure and Data

Test Procedure:

- e: a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber(30MHz-1000MHz) and 10 meter semi-anechoic chamber(9kHz-30MHz). The table was rotated 360 degrees to determine the position of the highest radiation.
  - b. The EUT was set 10 meters(30MHz-1000MHz) and 10 meter (9kHz-30MHz) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
  - c. Above 30MHz: The Analyzer/Receiver scanned from 30MHz to 1000MHz.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
  - d. Below 30MHz: The Analyzer/Receiver scanned from 9kHz to 30MHz.The antenna height is 2 meters above the ground to determine the maximum value of the field strength.
  - e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 2 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
  - f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
  - g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
  - h. Repeat above procedures until all frequencies measured was complete.
  - i. Measurement Requirement:

1)This product belongs to non-ISM equipment, the field strength limit is 15uV/m at 300 meter distance.

2)Limit: 20log(15uV/m) +20log (300/3) =23.52+40=63.52dBuV/m at 3 meters distance



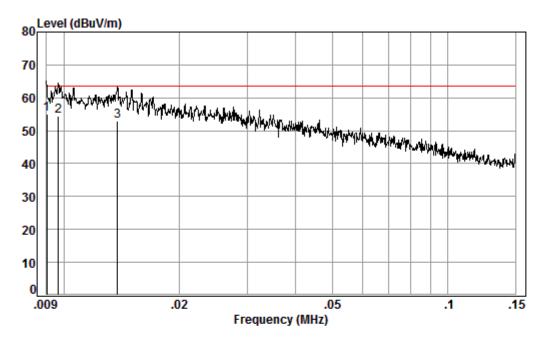
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9kHz-150kHz



Condition: 3m Job No. : 00036CR Test Mode: a

		Cable	Ant	Preamp	Read		Limit	0ver
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
-								
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	0.01	0.30	19.99	31.06	65.71	54.94	63.52	-8.58
2	0.01	0.29	19.53	31.28	66.01	54.55	63.52	-8.97
3	0.01	0.26	17.32	31.57	66.80	52.81	63.52	-10.71
2	0.01	0.29	19.53	31.28	66.01	54.55	63.52	-8.97



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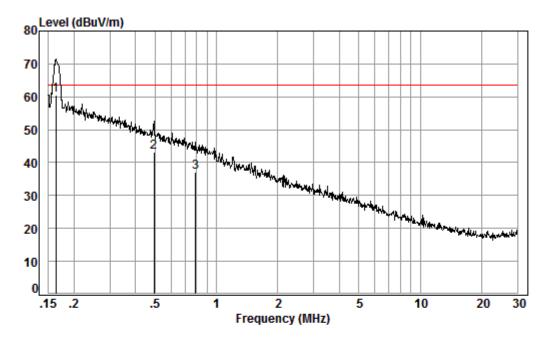
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150kHz-30MHz



Condition: 3m Job No. : 00036CR Test Mode: a

		Cable	Ant	Preamp	Read		Limit	0ver
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	0.16	0.07	11.75	32.67	81.30	60.45	63.52	-3.07
2	0.49	0.11	11.71	32.66	64.18	43.34	63.52	-20.18
3	0.79	0.19	12.00	32.65	57.50	37.04	63.52	-26.48
2	0.16 0.49	0.07 0.11	11.75 11.71	32.67 32.66	81.30 64.18	60.45 43.34	63.52 63.52	-3.0 -20.1



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#### 7 **Photographs**

7.1 Test Setup

Refer to setup photos.

#### 7.2 EUT Constructional Details (EUT Photos) Refer to external and internal photos.

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