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

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TEST REPORT

Application No.:	SZEM1803002316CR
Applicant:	Teenage Engineering AB
Address of Applicant:	Virkesvagen 3A, Stockholm, 12030, Sweden
Manufacturer:	Teenage Engineering AB
Address of Manufacturer:	Virkesvagen 3A, Stockholm, 12030, Sweden
Factory:	S&O Electronics (M) Sdn. Bhd.
Address of Factory:	Lot 202, Bakar Arang Industrial Estate, 08000 Sungai Petani, Kedah, West Malaysia
Equipment Under Test (EUT):	
EUT Name:	Portable Musical Instrument
Model No.:	TE012AS001
Trade mark:	OP-Z
FCC ID:	Z23012A
Standard(s) :	47 CFR Part 15, Subpart B
Date of Receipt:	2018-09-10
Date of Test:	2018-09-25 to 2018-09-29
Date of Issue:	2018-09-30
Test Result:	**Pass***

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

Keny Xu
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.

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2018-09-27		Original

Authorized for issue by:				
				
		Moon Zhang /Project Engineer		
				
		Eric Fu /Reviewer		

2 Test Summary

Emission Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at Mains Terminals (150kHz-30MHz)	47 CFR Part 15, Subpart B	ANSI C63.4:2014	Class B	Pass
Radiated Emissions (30MHz-1GHz)	47 CFR Part 15, Subpart B	ANSI C63.4:2014	Class B	Pass

Internal Source	Upper Frequency
Below 1.705MHz	30MHz
1.705MHz to 108MHz	1GHz
108MHz to 500MHz	2GHz
500MHz to 1GHz	5GHz
Above 1GHz	5th harmonic of the highest frequency or 40GHz, whichever is lower

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Rechargeable battery LI-ION: DC 3.7V 740mAh 2.74Wh Supplied by DC 5V Type-C port
Cable:	Type-C cable: 80cm 3* Aux in cable: 8cm
Internal source:	32MHz
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	V4.0 BT Single mode Bluetooth LE
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency	2402MHz to 2480MHz
Receiver Category:	2
Antenna Type:	Chip Antenna
Antenna Gain:	3.3dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	Apple	A1357 W010A051	REF. No.SEA0500
Earphone	Supplied by Client	N/A	N/A
Laptop	Lenovo	T430u	REF. No.SEA1800
Mouse	Lenovo	M-U0025-O	REF. No.:SEA2400
Router	NETGEAR	DGN2200	REF. No.SEA2200

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0dB (150kHz to 30MHz)
2	Radiated Emission	± 4.5dB (30MHz-1GHz)
3	Temperature test	± 1℃
4	Humidity test	± 3%

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

5 Equipment List

Conducted Emissions at Mains Terminals (150kHz-30MHz)					
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 Emissions (30MHz-1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018-07-12	2019-07-11
EMI Test Receiver	Agilent Technologies	N9038A	SEM004-05	2018-09-25	2019-09-24
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2018-04-02	2019-04-01

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	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-28
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2018-04-08	2019-04-07

6 Emission Test Results

6.1 Conducted Emissions at Mains Terminals (150kHz-30MHz)

Test Requirement:	47 CFR Part 15, Subpart B
Test Method:	ANSI C63.4:2014
Frequency Range:	150kHz to 30MHz
Limit:	
0.15M-0.5MHz	66dB(μV)-56dB(μV) quasi-peak, 56dB(μV)-46dB(μV) average
0.5M-5MHz	56dB(μV) quasi-peak, 46dB(μV) average
5M-30MHz	60dB(μV) quasi-peak, 50dB(μV) average
Detector:	Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

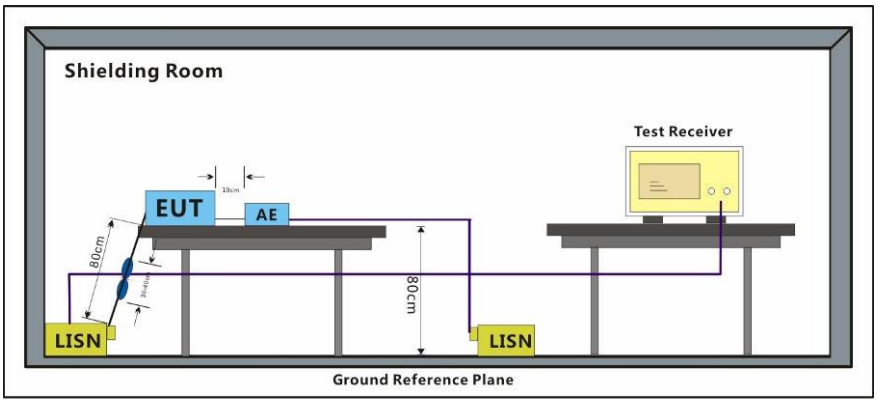
6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 60 % RH Atmospheric Pressure: 1010 mbar

Test mode e: Normal working and being charged ,Keep the EUT working at normal working with earphone.

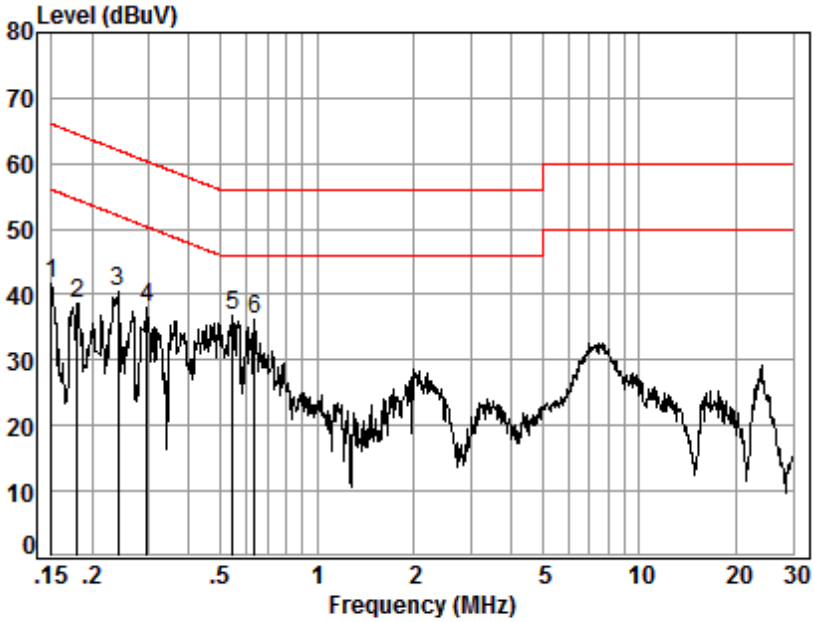
6.1.2 Test Setup Diagram



6.1.3 Measurement Data

An initial pre-scan was performed with peak detector.Quasi-Peak or Average measurement were performed at the frequencies with maximized peak emission were detected.

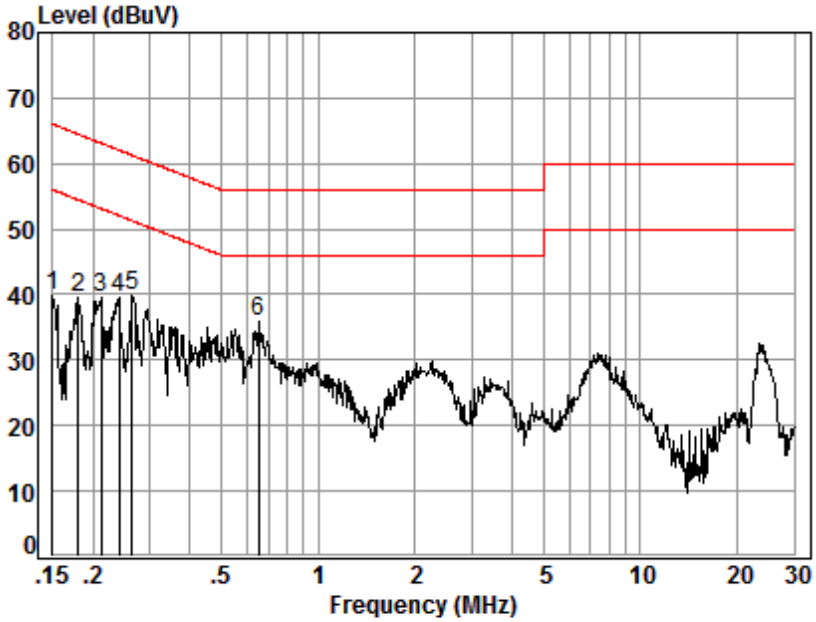
Mode:e; Line:Live Line



Site : Shielding Room
Condition: Line
Job No. : 02316CR
Test mode: e

	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	9.51	32.10	41.62	56.00	-14.38	Peak
2	0.18	0.02	9.51	29.17	38.70	54.46	-15.76	Peak
3	0.24	0.03	9.51	30.88	40.42	52.08	-11.66	Peak
4	0.30	0.04	9.51	28.61	38.16	50.37	-12.21	Peak
5	0.55	0.06	9.51	27.32	36.89	46.00	-9.11	Peak
6	0.64	0.07	9.51	26.53	36.11	46.00	-9.89	Peak

Mode:e; Line:Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 02316CR
Test mode: e

	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	9.58	30.18	39.77	56.00	-16.23	Peak
2	0.18	0.02	9.58	30.08	39.68	54.46	-14.78	Peak
3	0.21	0.02	9.57	29.85	39.44	53.14	-13.70	Peak
4	0.24	0.03	9.58	29.91	39.52	52.08	-12.56	Peak
5	0.26	0.03	9.58	30.25	39.86	51.29	-11.43	Peak
6	0.65	0.07	9.62	26.23	35.92	46.00	-10.08	Peak

6.2 Radiated Emissions (30MHz-1GHz)

Test Requirement:	47 CFR Part 15, Subpart B
Test Method:	ANSI C63.4:2014
Frequency Range:	30MHz to 1GHz
Measurement Distance:	3m
Limit:	
30MHz -88MHz	40.0(dBμV/m) quasi-peak
88MHz-216MHz	43.5(dBμV/m) quasi-peak
216MHz-960MHz	46.0(dBμV/m) quasi-peak
960MHz-1000MHz	54.0(dBμV/m) quasi-peak
Detector:	Peak for pre-scan (120kHz resolution bandwidth) 30M to1000MHz

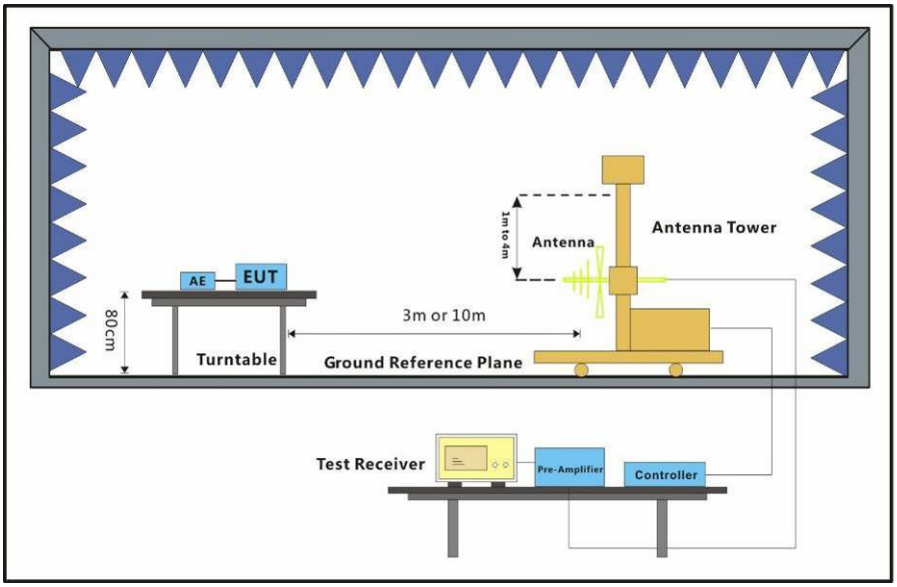
6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C Humidity: 57.4 % RH Atmospheric Pressure: 1010 mbar

Pretest these modes to find the worst case:	c: PC mode,Keep EUT working with PC and comunicating with each other. d: Normal working,Keep the EUT working at normal working with earphone. e: Normal working and being charged ,Keep the EUT working at normal working with earphone.
The worst case for final test:	c:PC mode,Keep EUT working with PC and comunicating with each other.

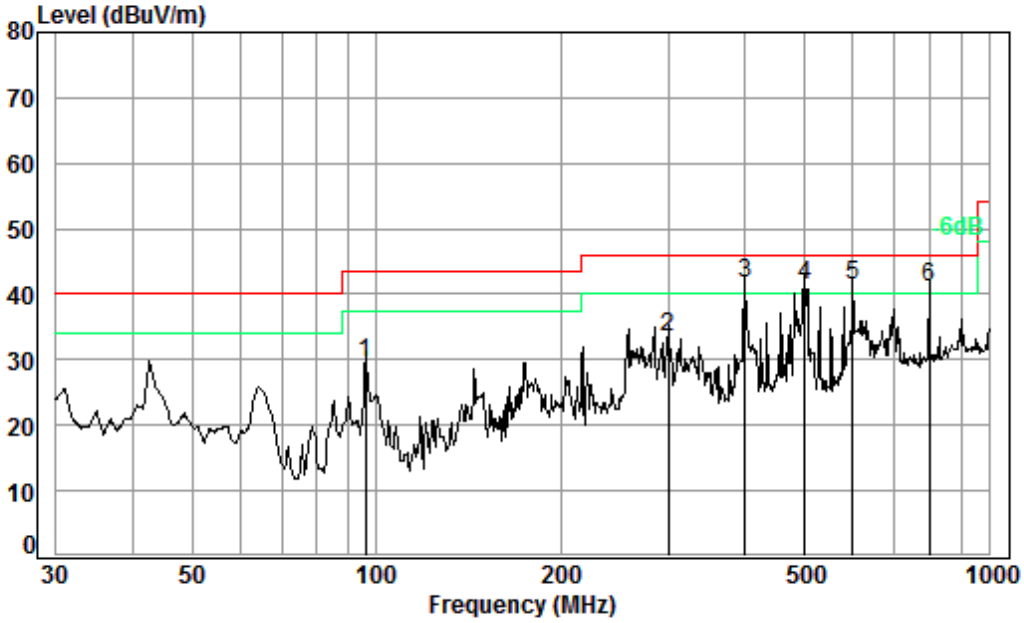
6.2.2 Test Setup Diagram



6.2.3 Measurement Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities.

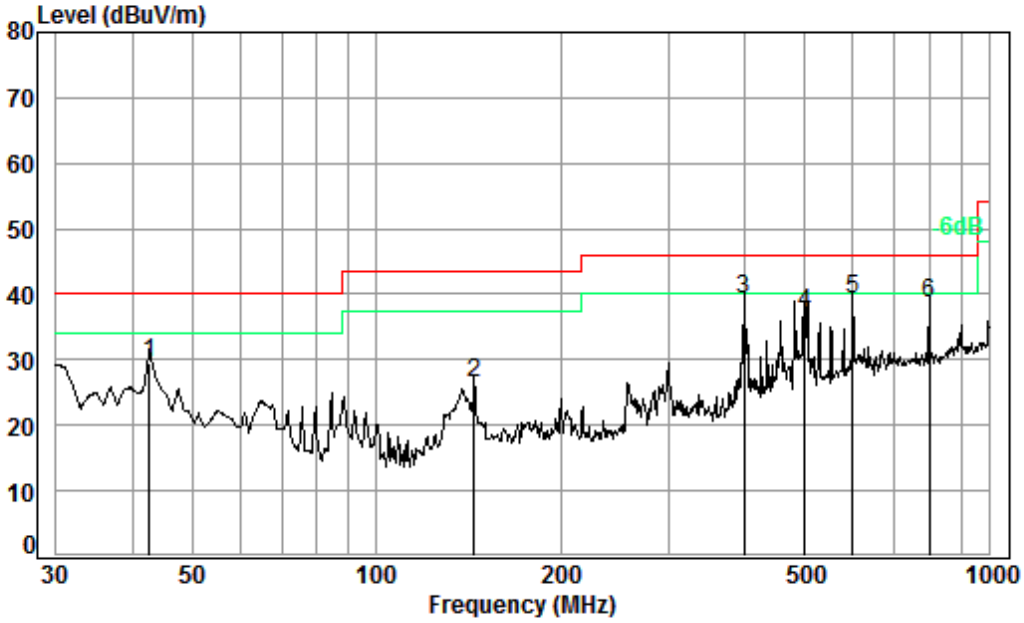
Mode:c; Polarization:Horizontal



Condition: 3m HORIZONTAL
Job No. : 02316CR
Test mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	96.10	1.16	13.66	27.51	42.12	29.43	43.50	-14.07
2	299.32	1.90	19.57	27.54	39.46	33.39	46.00	-12.61
3 pp	400.43	2.20	22.41	27.73	44.69	41.57	46.00	-4.43
4	501.18	2.60	24.63	27.88	41.96	41.31	46.00	-4.69
5	599.32	2.70	26.59	27.70	39.92	41.51	46.00	-4.49
6	798.98	3.20	28.49	27.42	36.87	41.14	46.00	-4.86

Mode:c; Polarization:Vertical



Condition: 3m VERTICAL
Job No. : 02316CR
Test mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	42.60	0.66	16.57	27.62	39.90	29.51	40.00	-10.49
2	144.33	1.31	14.11	27.52	38.56	26.46	43.50	-17.04
3 pp	399.03	2.20	22.38	27.73	42.46	39.31	46.00	-6.69
4	501.18	2.60	24.63	27.88	37.68	37.03	46.00	-8.97
5	599.32	2.70	26.59	27.70	37.53	39.12	46.00	-6.88
6	798.98	3.20	28.49	27.42	34.39	38.66	46.00	-7.34

7 Photographs

7.1 Test Setup

Refer to EUT Setup photos

7.2 EUT Constructional Details (EUT Photos)

Refer to EUT external and internal photos

- End of the Report -