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Report No.: SZEM161100966301
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TEST REPORT

Application No.: SZEM1611009663CR
Applicant: Micro:bit Educational Foundation
Address of Applicant: 12 New Fetter Lane, London, United Kingdom
Manufacturer: Micro:bit Educational Foundation
Address of Manufacturer: 12 New Fetter Lane, London, United Kingdom
Factory: Micro:bit Educational Foundation
Address of Factory: 12 New Fetter Lane, London, United Kingdom
Equipment Under Test (EUT):
EUT Name: BBC micro:bit
Model No.: V1.3B
FCC ID: 2AKFPMB013B
Standards: 47 CFR PART 15, Subpart B:2015
Date of Receipt: 2016-11-21
Date of Test: 2016-11-26 to 2016-11-28
Date of Issue: 2016-12-01

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



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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2 Test Summary

Item	Standard	Method	Class	Result
Conducted Disturbance at Mains Terminals (150kHz-30MHz)	47 CFR PART 15,Subpart B:2015	ANSI C63.4	Class B	Pass
Radiated Disturbance (30MHz-1GHz)	47 CFR PART 15,Subpart B:2015	ANSI C63.4	Class B	Pass



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4 General Information

4.1 Details of E.U.T.

Power Supply: 3.0V DC (1.5V x 2 "AAA" Size Batteries)
Or DC 5.0V by USB port

Cable: USB Cable: 10cm shield

The highest operation frequency: 16MHz

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800
Adapter	Apple	A1357 W010A051	REF. No.SEA0500
Mouse	Lenovo	M-U0025-O	REF. No.:SEA2400
Router	NETGEAR	DGN2200	REF. No.SEA2200



4.3 Standards Applicable for Testing

Table 1 : Tests Carried Out Under 47 CFR PART 15,Subpart B:2015

Method	Item	Status
ANSI C63.4	Conducted Disturbance at Mains Terminals(150kHz-30MHz)	√
ANSI C63.4	Radiated Disturbance(30MHz-1GHz)	√
ANSI C63.4	Radiated Disturbance(above 1GHz)	×

- × Indicates that the test is not applicable
√ Indicates that the test is applicable



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 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, 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 and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



5 Equipment List

Conducted Disturbance at Mains Terminals(150kHz-30MHz)						
Item	Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1	Shielding Room	ChangZhou ZhongYu	GB-88	SEM001-06	2016-05-13	2017-05-13
2	LISN	Rohde & Schwarz	ENV216	SEM007-01	2016-10-09	2017-10-09
3	LISN	ETS-LINDGREN	3816/2	SEM007-02	2016-04-25	2017-04-25
4	EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2016-04-25	2017-04-25

Radiated Disturbance(30MHz-1GHz)						
Item	Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1	10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2016-05-13	2017-05-13
2	EMI Test Receiver (9KHz-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2016-04-25	2017-04-25
3	Trilog-Broadband Antenna(30M-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2016-06-29	2019-06-29
4	Pre-amplifier	Sonoma Instrument Co	310N	SEM005-03	2016-07-06	2017-07-06

General used equipment						
Item	Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1	Humidity/Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2016-10-12	2017-10-12
2	Humidity/Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12
3	Humidity/Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12
4	Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2016-05-18	2017-05-18

6 Emission Test Results

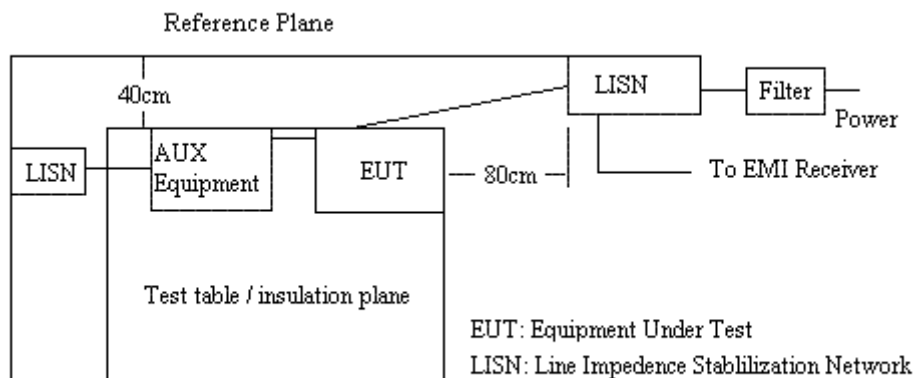
6.1 Conducted Disturbance at Mains Terminals(150kHz-30MHz)

Test Requirement:	47 CFR PART 15,Subpart B:2015
Test Method:	ANSI C63.4
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:	25.0 °C	Humidity:	56 % RH	Atmospheric Pressure:	1015	mbar
Pretest these mode to find the worst case:	a:Operation mode: Keep the EUT in normal operation mode (powered by USB port). c: PC mode: Keep the EUT in data exchanging with PC mode.					
The worst case for final test:	c: PC mode: Keep the EUT in data exchanging with PC mode.					

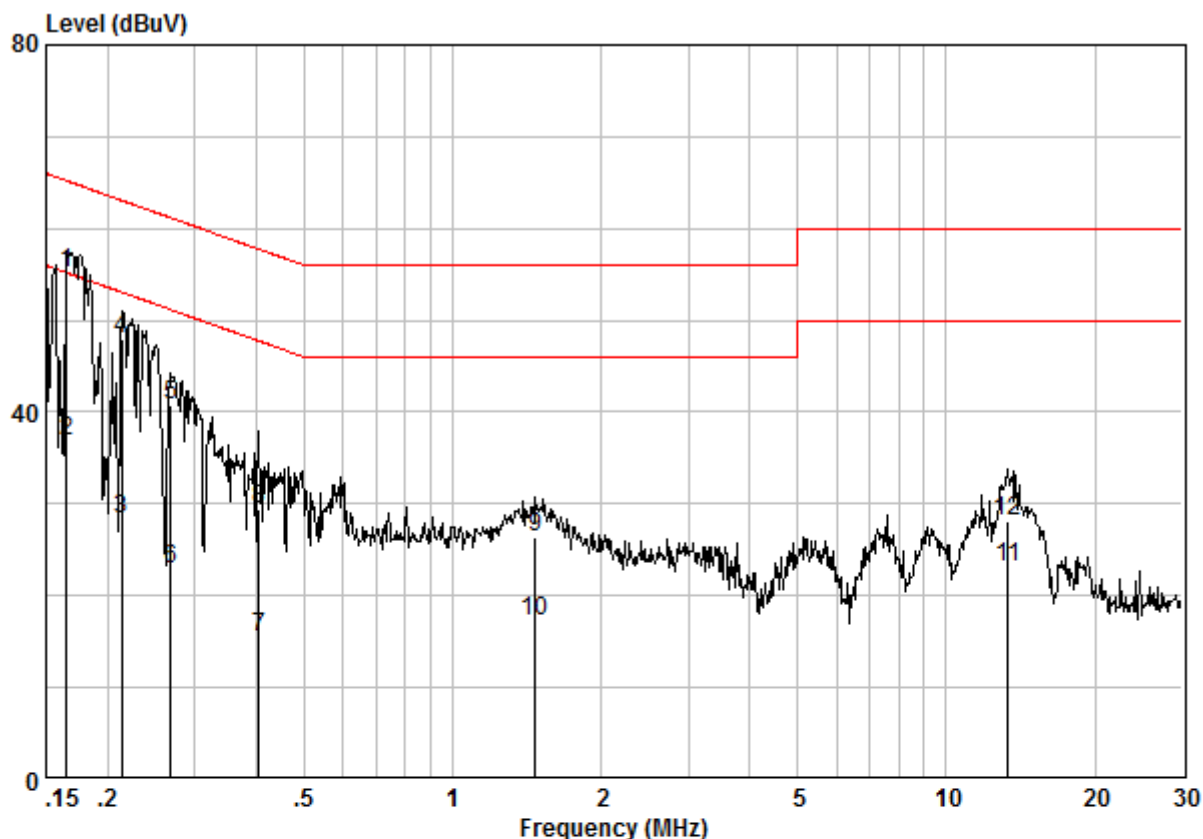
6.1.2 Test Setup



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.

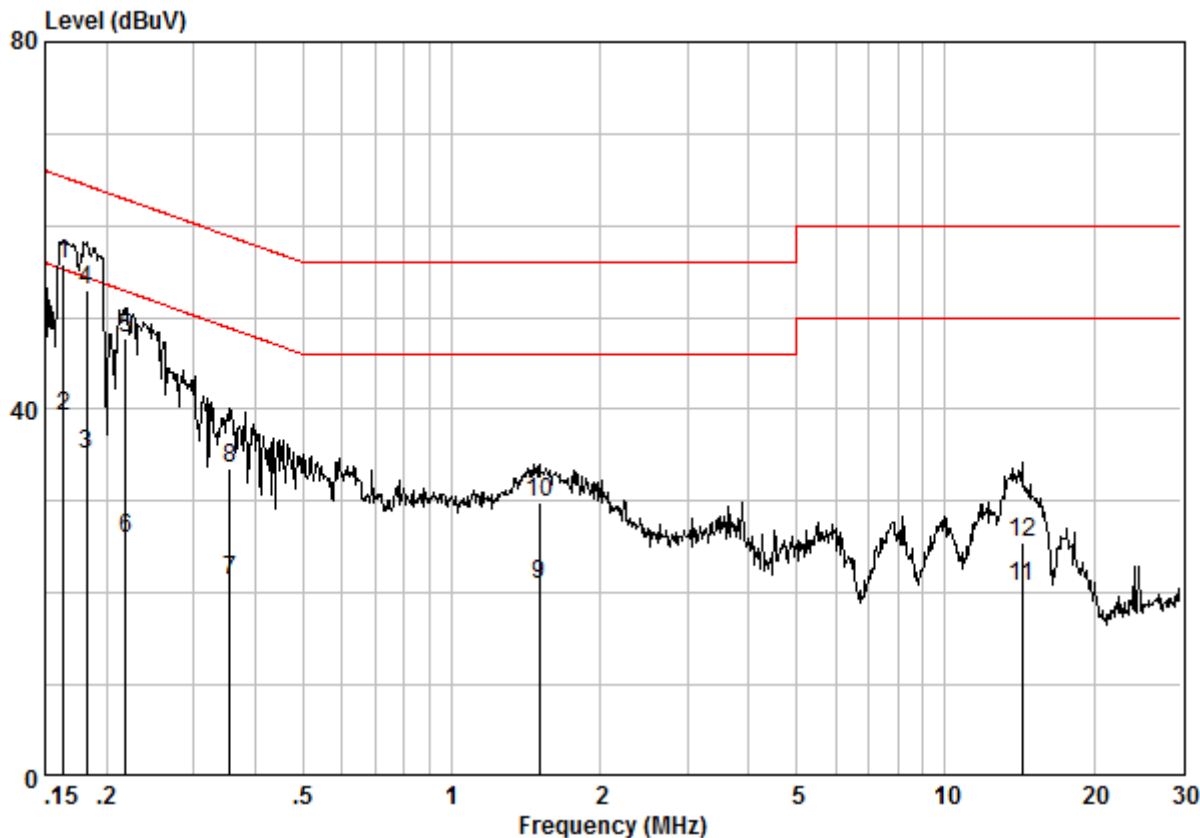
Mode:c;Line:Live Line



Site : Shielding Room
Condition : CE LINE
Job No. : 9663CR
Test Mode : c

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 @	0.16501	0.02	9.60	45.45	55.07	65.21	-10.14	QP
2	0.16501	0.02	9.60	27.18	36.80	55.21	-18.41	AVERAGE
3	0.21392	0.02	9.60	18.66	28.28	53.05	-24.78	AVERAGE
4	0.21392	0.02	9.60	38.31	47.93	63.05	-15.12	QP
5	0.26866	0.02	9.60	31.15	40.76	61.16	-20.40	QP
6	0.26866	0.02	9.60	13.24	22.86	51.16	-28.30	AVERAGE
7	0.40400	0.02	9.60	5.84	15.46	47.77	-32.31	AVERAGE
8	0.40400	0.02	9.60	19.86	29.48	57.77	-28.29	QP
9	1.472	0.03	9.58	16.87	26.48	56.00	-29.52	QP
10	1.472	0.03	9.58	7.62	17.23	46.00	-28.77	AVERAGE
11	13.337	0.15	9.75	13.25	23.15	50.00	-26.85	AVERAGE
12	13.337	0.15	9.75	18.31	28.21	60.00	-31.79	QP

Mode:c;Line:Neutral Line



Site : Shielding Room
Condition : CE NEUTRAL
Job No. : 9663CR
Test Mode : c

	Freq	Cable Loss	LISN Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 @	0.16327	0.02	9.61	46.08	55.71	65.30	-9.59	QP
2	0.16327	0.02	9.61	29.56	39.19	55.30	-16.11	AVERAGE
3	0.18249	0.02	9.61	25.40	35.03	54.37	-19.35	AVERAGE
4	0.18249	0.02	9.61	43.40	53.03	64.37	-11.34	QP
5	0.21851	0.02	9.62	38.16	47.79	62.88	-15.08	QP
6	0.21851	0.02	9.62	16.29	25.93	52.88	-26.95	AVERAGE
7	0.35576	0.02	9.62	11.67	21.31	48.83	-27.52	AVERAGE
8	0.35576	0.02	9.62	23.95	33.59	58.83	-25.24	QP
9	1.503	0.03	9.64	11.35	21.02	46.00	-24.98	AVERAGE
10	1.503	0.03	9.64	20.16	29.83	56.00	-26.17	QP
11	14.288	0.16	9.89	10.76	20.80	50.00	-29.20	AVERAGE
12	14.288	0.16	9.89	15.50	25.54	60.00	-34.46	QP



6.2 Radiated Disturbance(30MHz-1GHz)

Test Requirement:	47 CFR PART 15, Subpart B:2015
Test Method:	ANSI C63.4
Frequency Range:	30MHz to 1GHz
Limit:	
30MHz -88MHz	29.5(dBμV/m) quasi-peak
88MHz-216MHz	33.1(dBμV/m) quasi-peak
216MHz-960MHz	35.6(dBμV/m) quasi-peak
960MHz-1000MHz	43.5(dBμV/m) quasi-peak
Detector:	Peak for pre-scan (120kHz resolution bandwidth) 30M to1000MHz

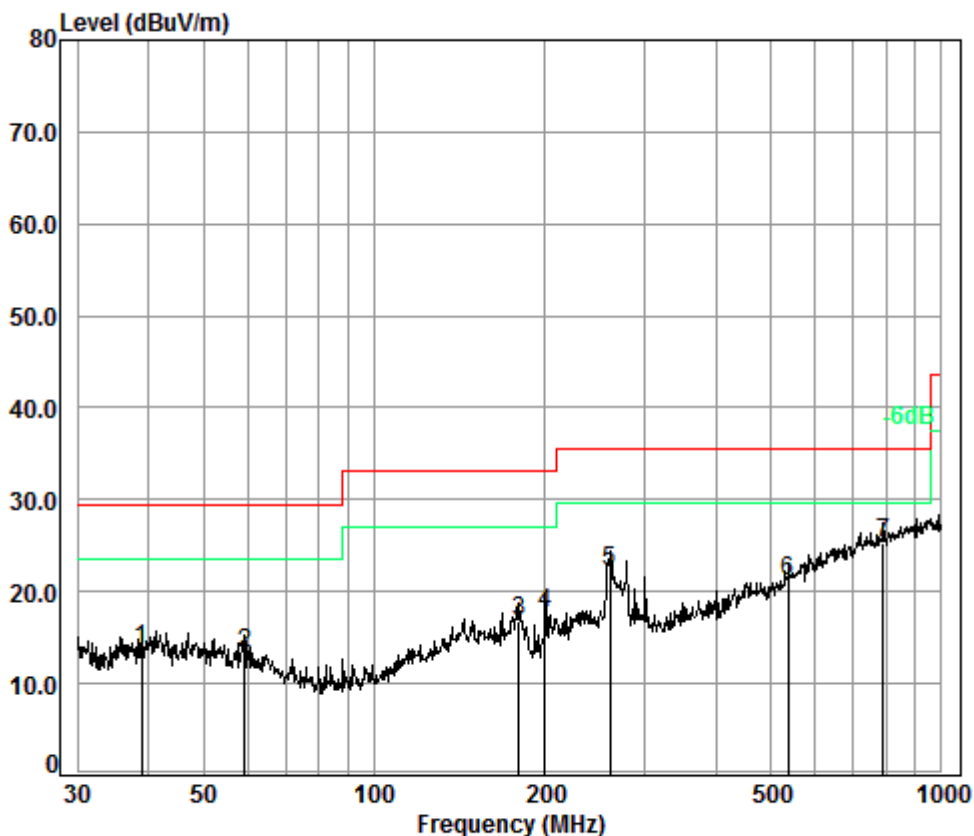
6.2.1 E.U.T. Operation

Operating Environment:							
Temperature:	24.0	°C	Humidity:	54	% RH	Atmospheric Pressure:	1010 mbar
Pretest these mode to find the worst case:	a: Operation mode: Keep the EUT in normal operation mode (powered by USB port). b: Operation mode: Keep the EUT in normal operation mode (powered by battery). c: PC mode: Keep the EUT in data exchanging with PC mode.						
The worst case for final test:	a: Operation mode: Keep the EUT in normal operation mode (powered by USB port). c: PC mode: Keep the EUT in data exchanging with PC mode.						

6.2.2 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:a;Polarization:Horizontal



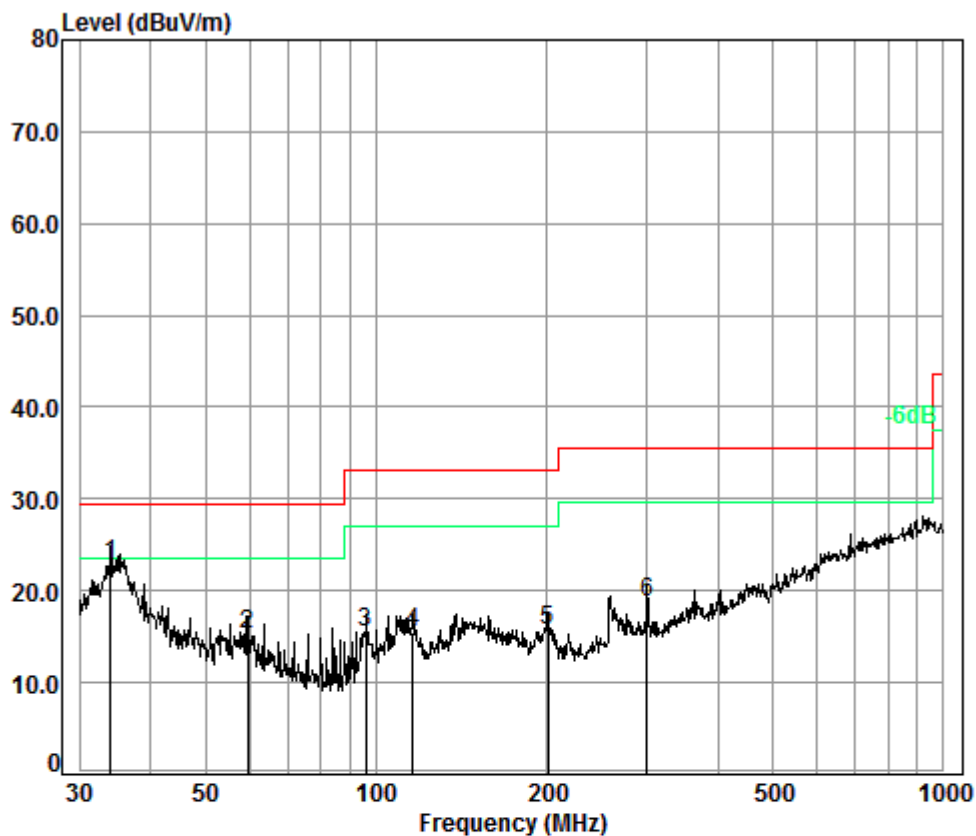
Condition: 10m HORIZONTAL

Job No. : 9663CR

Test mode: a

	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	38.89	6.78	13.18	32.98	26.84	13.82	29.50	-15.68
2	59.23	7.00	12.06	32.95	27.18	13.29	29.50	-16.21
3	180.02	7.50	10.92	32.72	31.01	16.71	33.10	-16.39
4	199.99	7.60	9.29	32.70	33.49	17.68	33.10	-15.42
5	260.14	7.90	11.49	32.64	35.59	22.34	35.60	-13.26
6	537.59	8.74	17.50	32.60	27.44	21.08	35.60	-14.52
7 pp	790.62	9.28	21.17	32.60	27.54	25.39	35.60	-10.21

Mode:a;Polarization:Vertical



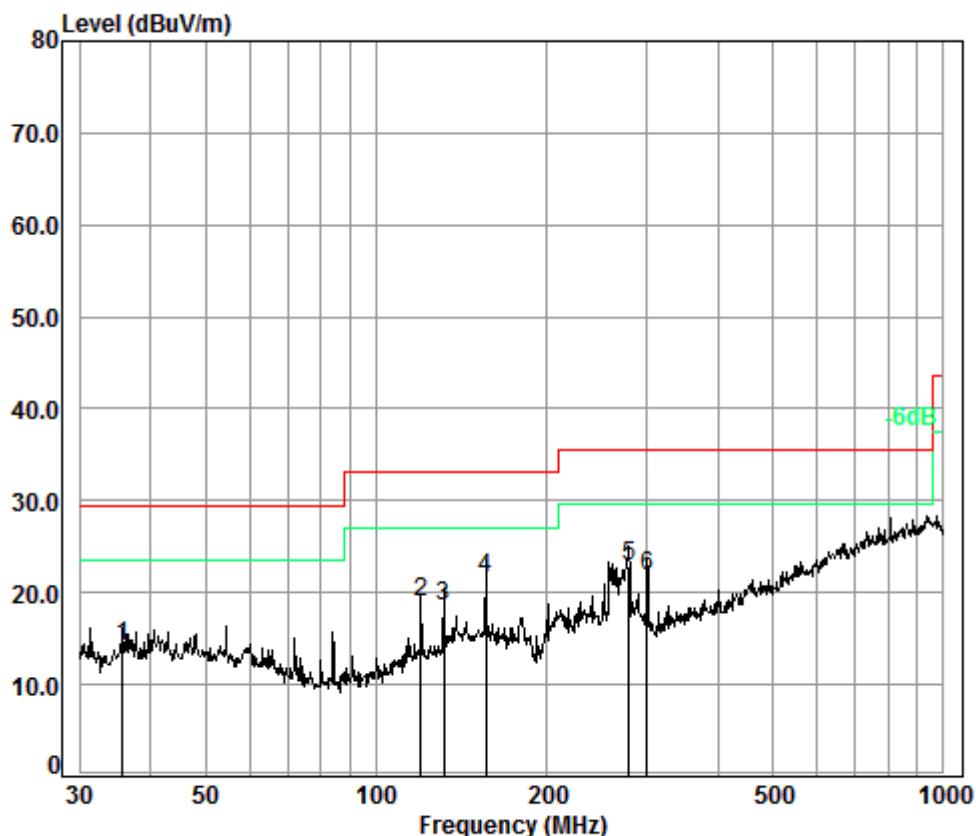
Condition: 10m VERTICAL

Job No. : 9663CR

Test mode: a

		Cable	Ant	Preamp	Read		Limit	Over
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	34.04	6.70	12.61	32.98	36.46	22.79	29.50	-6.71
2	59.44	7.00	12.04	32.95	29.24	15.33	29.50	-14.17
3	96.10	7.20	9.13	32.81	32.02	15.54	33.10	-17.56
4	116.13	7.28	11.07	32.78	29.86	15.43	33.10	-17.67
5	200.69	7.60	9.31	32.70	31.49	15.70	33.10	-17.40
6	300.37	8.05	12.67	32.60	30.59	18.71	35.60	-16.89

Mode:c;Polarization:Horizontal



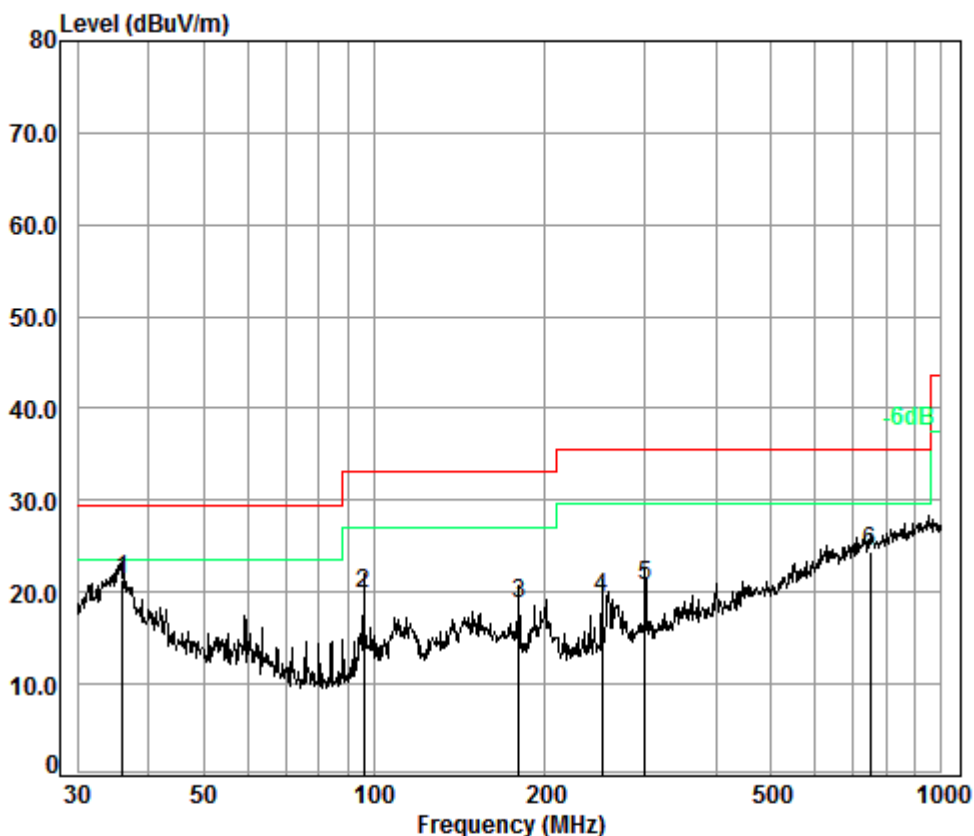
Condition: 10m HORIZONTAL

Job No. : 9663CR

Test mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over
	MHz	dB		dB/m	dB	dBuV	dBuV/m	dBuV/m
1	35.75	6.72	12.75	32.98	27.73	14.22	29.50	-15.28
2	119.86	7.30	11.47	32.77	32.93	18.93	33.10	-14.17
3	131.76	7.36	12.16	32.76	31.69	18.45	33.10	-14.65
4 pp	155.91	7.48	13.40	32.74	33.38	21.52	33.10	-11.58
5	279.04	8.00	12.13	32.62	35.46	22.97	35.60	-12.63
6	300.37	8.05	12.67	32.60	33.73	21.85	35.60	-13.75

Mode:c;Polarization:Vertical



Condition: 10m VERTICAL

Job No. : 9663CR

Test mode: c

		Cable	Ant	Preamp	Read		Limit	Over
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	36.00	6.72	12.78	32.98	34.85	21.37	29.50	-8.13
2	96.10	7.20	9.13	32.81	36.42	19.94	33.10	-13.16
3	180.02	7.50	10.92	32.72	33.09	18.79	33.10	-14.31
4	252.06	7.86	11.29	32.64	32.86	19.37	35.60	-16.23
5	300.37	8.05	12.67	32.60	32.58	20.70	35.60	-14.90
6	747.48	9.20	20.74	32.60	27.02	24.36	35.60	-11.24

7 Photographs

7.1 Conducted Disturbance at Mains Terminals(150kHz-30MHz) Test Setup



7.2 Radiated Disturbance(30MHz-1GHz) Test Setup







7.3 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM SZEM1611009663CR.