FCC Part 15B
Measurement and Test Report

For

CEED LTD

32-38 Leman Street, London, E1 8EW

FCC ID: 2AF9IMODEL1

Test Rule(s):	FCC Part 15 Subpart B
Product Description:	Pi-Top laptop
Tested Model:	Model 1
Report No.:	STR15088316I
Tested Date:	2015-09-06 to 2015-10-14
Issued Date:	2015-10-22
Tested By:	RODE Liu / Engineer
Reviewed By:	Jack Kang / EMC Manager
Approved & Authorized By:	Jandy so / PSQ Manager

Prepared By:

Shenzhen SEM.Test Technology Co., Ltd.
1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C.（518101）
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

TABLE OF CONTENTS

1. GENERAL INFORMATION 3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
1.2 TEST STANDARDS 4
1.3 TEST METHODOLOGY 4
1.4 TEST FACILITY 4
1.5 EUT SETUP AND OPERATION MODE 5
1.6 TEST EQUIPMENT LIST AND DETAILS 5
2. SUMMARY OF TEST RESULTS 6
3. CONDUCTED EMISSIONS 7
3.1 MEASUREMENT UNCERTAINTY 7
3.2 TEST PROCEDURE 7
3.3 BASIC TEST SETUP BLOCK DIAGRAM 7
3.4 ENVIRONMENTAL CONDITIONS 8
3.5 SUMMARY OF TEST RESULTS/PLOTS 8
3.6 CONDUCTED EMISSIONS TEST DATA 8
4. RADIATED EMISSIONS 11
4.1 MEASUREMENT UNCERTAINTY 11
4.2 TEST PROCEDURE 11
4.3 TEST RECEIVER SETUP 12
4.4 CORRECTED AMPLITUDE & MARGIN CALCULATION 12
4.5 ENVIRONMENTAL CONDITIONS 12
4.6 SUMMARY OF TEST RESULTS/PLOTS 12

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	CEED LTD
Address of applicant:	32-38 Leman Street, London, E1 8EW
Manufacturer:	Shenzhen Zealfull Technology Co., Ltd.
Address of manufacturer:	2nd Floor East, B1 Building, Shunheda Area, Liuxiandong Industrial Zone, Nanshan, Shenzhen

General Description of EUT	
Product Name:	Pi-Top laptop
Trade Name:	Pi-Top
Model No.:	Model 1
Adding Model(s):	/
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Rated Voltage:	Adapter DC 18V
Rated Current:	3A
Rated Power:	30W(Charging), 5W(Not Charging)
Power Adapter Model:	ZF120A-1803000 I/P: 100-240V 1A, 50/60Hz; O/P: 18V DC 3A
Lowest Internal Frequency:	27MHz
Highest Internal Frequency:	1GHz
Classification of ITE:	CLASS B

1.2 Test Standards

The following report is prepared on behalf of the CEED LTD in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart B, and section 15.205, 15.107, and 15.109 rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. 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 and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	WORKING	Connected to a mouse and keyboard
TM2	/	/

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
HDMI Cable	0.27	Unshielded	Without
USB Cable	0.27	Unshielded	Without
USB Cable	0.16	Unshielded	Without

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
keyboard	DELL	HY-MA75	/
Mouse	DELL	MS111L	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2015-06-17	2016-06-16
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-06-17	2016-06-16
Amplifier	Agilent	8447F	3113A06717	2015-06-17	2016-06-16
Amplifier	C&D	PAP-1G18	2002	2015-06-17	2016-06-16
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2015-06-17	2016-06-16
Horn Antenna	ETS	3117	00086197	2015-06-17	2016-06-16
Loop Antenna	Schwarz beck	FMZB 1516	9773	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2015-06-17	2016-06-16
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2015-06-17	2016-06-16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2015-06-17	2016-06-16

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.107 (a)	Conducted Emissions	Compliant
§ 15.109 (a)	Radiated Emissions	Compliant

N/A: not applicable

3. Conducted Emissions

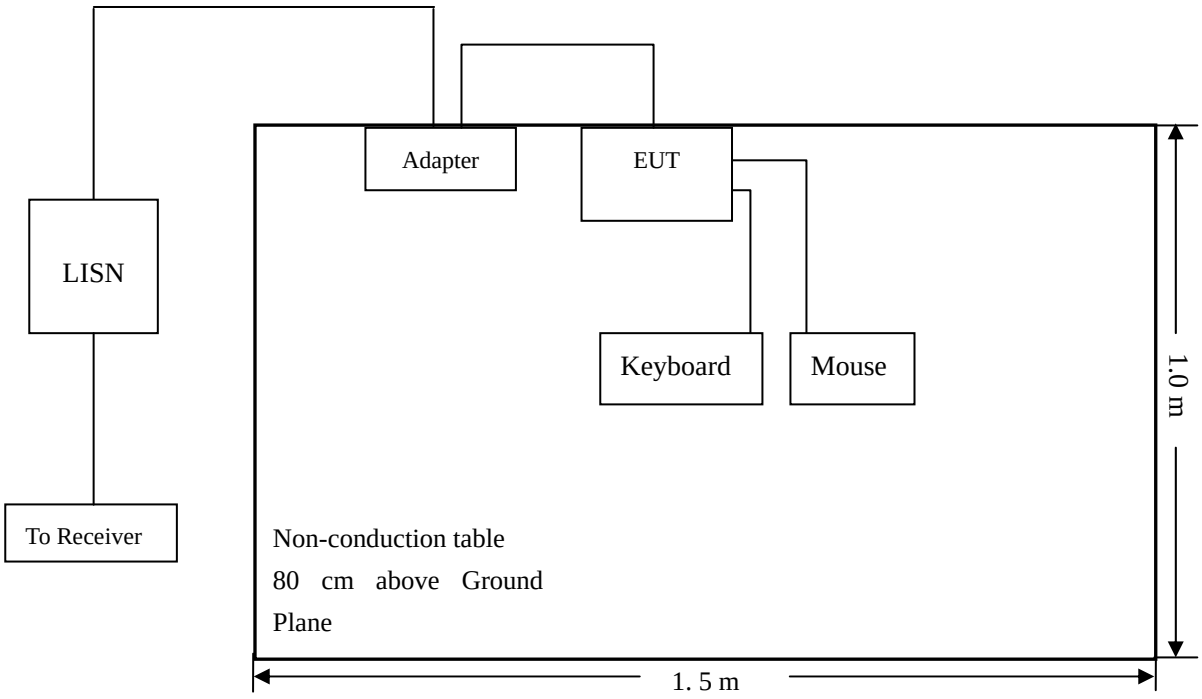
3.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

3.2 Test Procedure

Test is conducting under the description of ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

3.3 Basic Test Setup Block Diagram



3.4 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

3.5 Summary of Test Results/Plots

According to the data in section 3.6, the EUT complied with the FCC Part 15.107(a) Conducted margin for a Class B device, with the *worst* margin reading of:

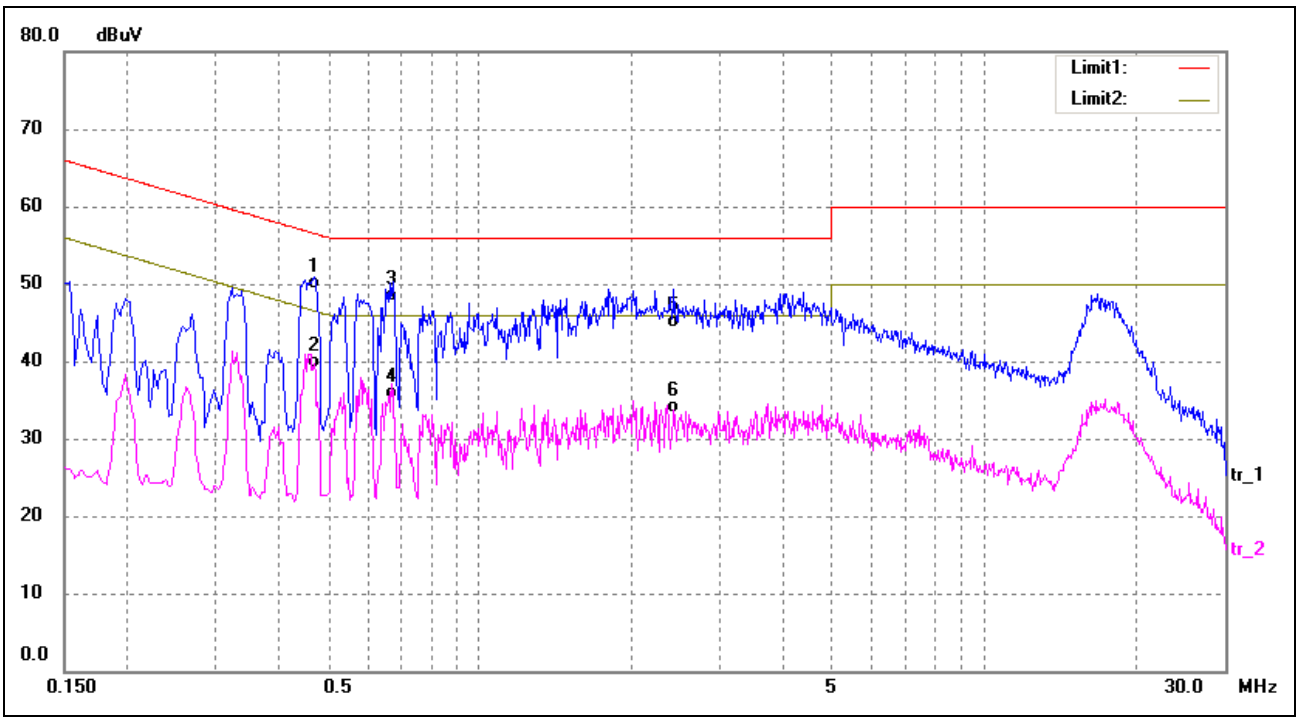
-6.04 dB at **0.4660 MHz** in the **Line**, **AVG** detector, 0.15-30MHz

3.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

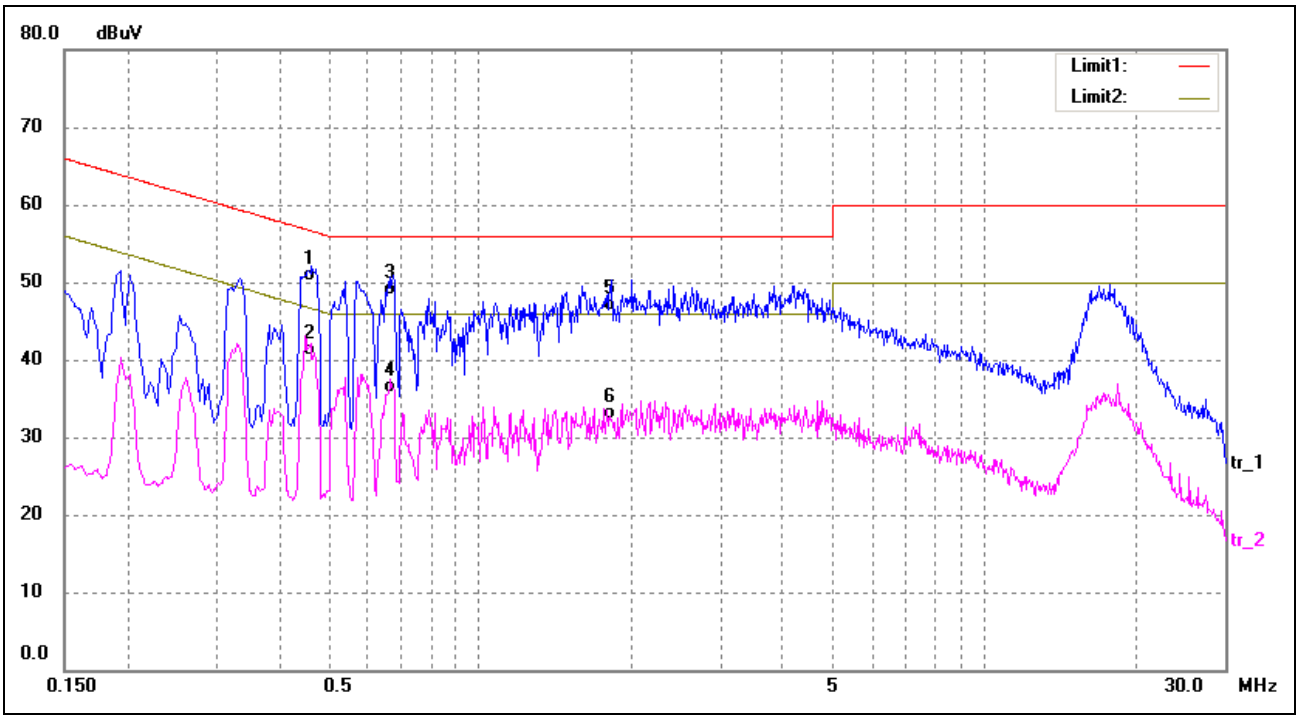
EUT: *Pi Top laptop*
Tested Model: *Model 1*
Operating Condition: *TM1*
Comment: *AC 120V/60HZ Adapter DC 18V*

Test Specification: *Neutral*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.4700	36.74	12.50	49.24	56.51	-7.27	QP
2	0.4700	26.61	12.50	39.11	46.51	-7.40	AVG
3	0.6740	35.05	12.67	47.72	56.00	-8.28	QP
4	0.6740	22.51	12.67	35.18	46.00	-10.82	AVG
5	2.4260	31.39	13.00	44.39	56.00	-11.61	QP
6	2.4260	20.21	13.00	33.21	46.00	-12.79	AVG

Test Specification: *Line*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.4660	37.52	12.50	50.02	56.58	-6.56	QP
2*	0.4660	28.04	12.50	40.54	46.58	-6.04	AVG
3	0.6740	35.61	12.67	48.28	56.00	-7.72	QP
4	0.6740	22.95	12.67	35.62	46.00	-10.38	AVG
5	1.8220	33.31	13.00	46.31	56.00	-9.69	QP
6	1.8220	19.25	13.00	32.25	46.00	-13.75	AVG

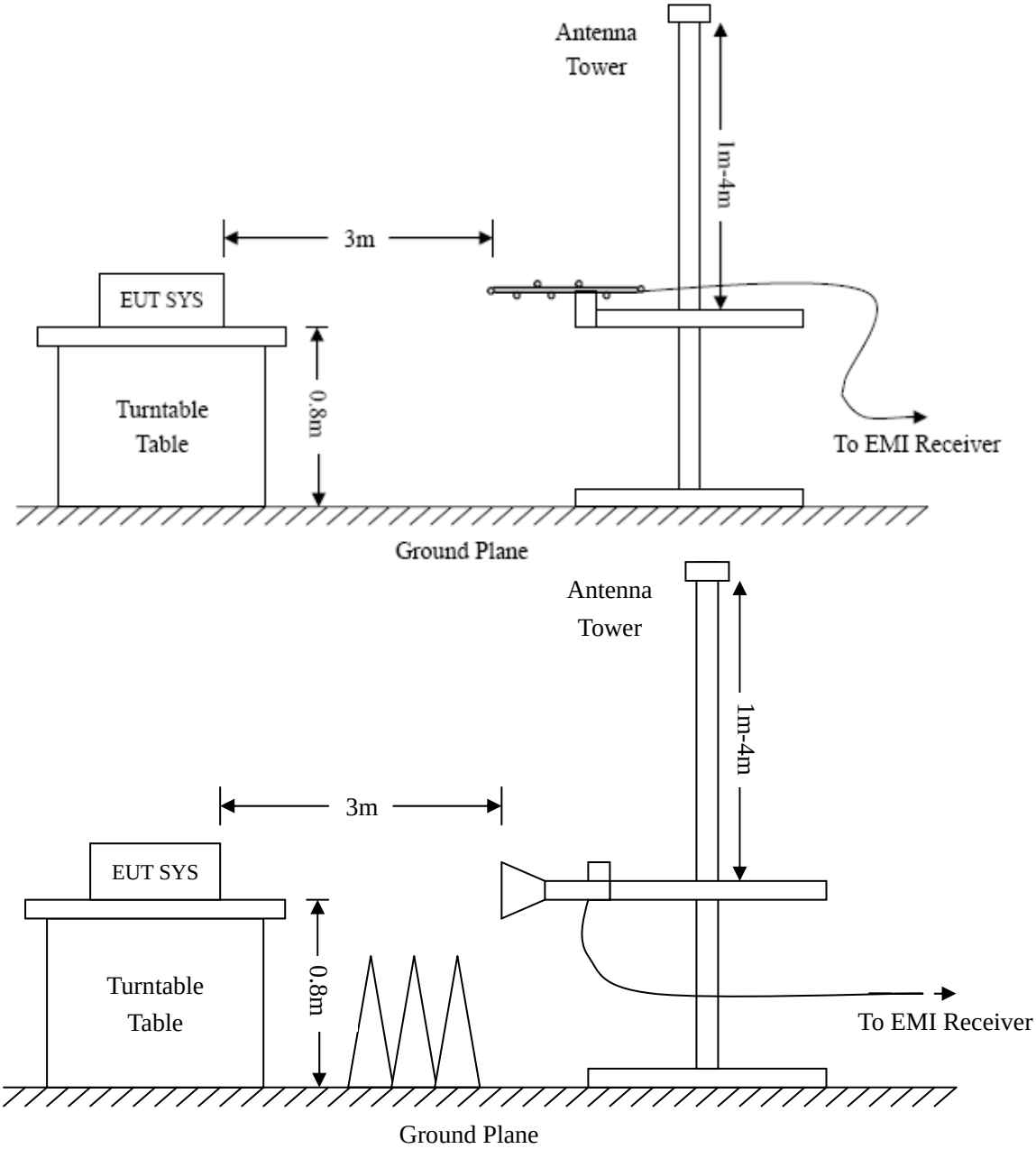
4. Radiated Emissions

4.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any radiation emissions measurement is ± 5.10 dB.

4.2 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.109 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.



4.3 Test Receiver Setup

Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

4.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading – Corr. Factor

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for a Class B device. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15.109(a) Limit

4.5 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	1011 mbar

4.6 Summary of Test Results/Plots

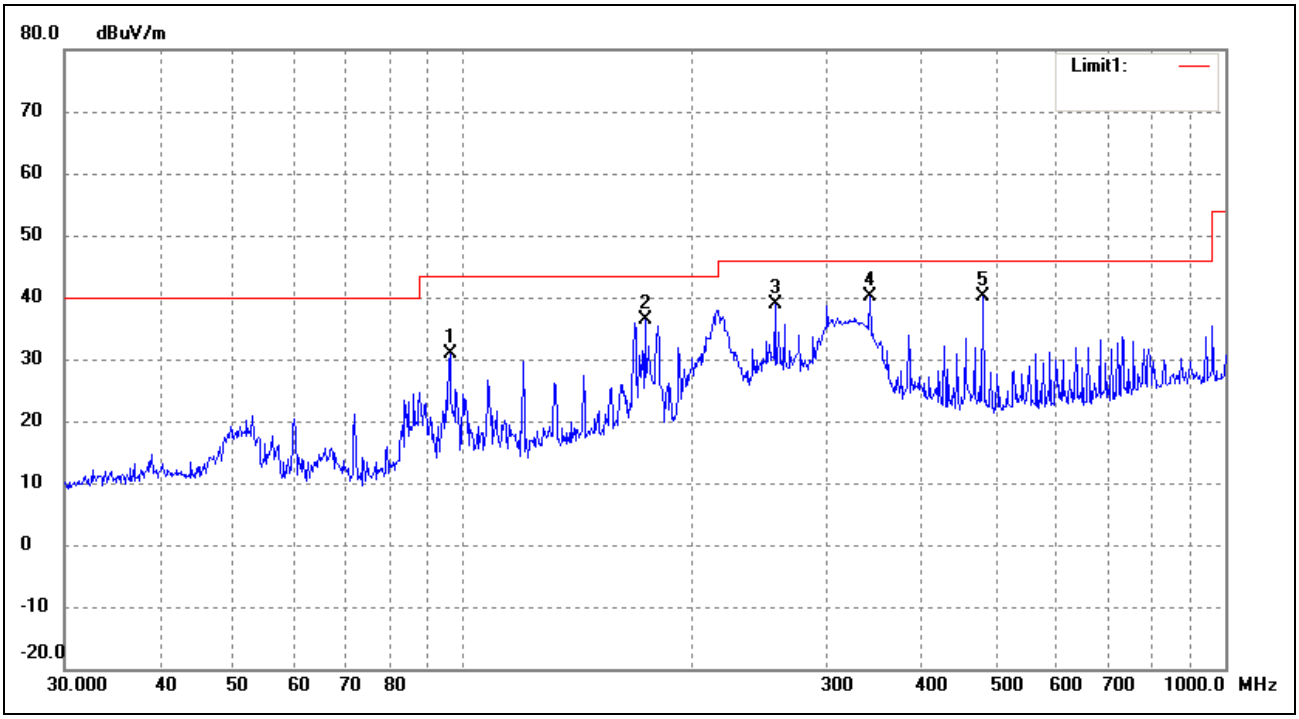
According to the data, the EUT complied with the FCC Part 15.109(a) rule, and had the worst margin of:

-5.78dB at **341.9787 MHz** in the **Horizontal** polarization, **9kHz** to **6 GHz**, **3Meters**

Plot of Radiated Emissions Test Data (Below 1GHz)

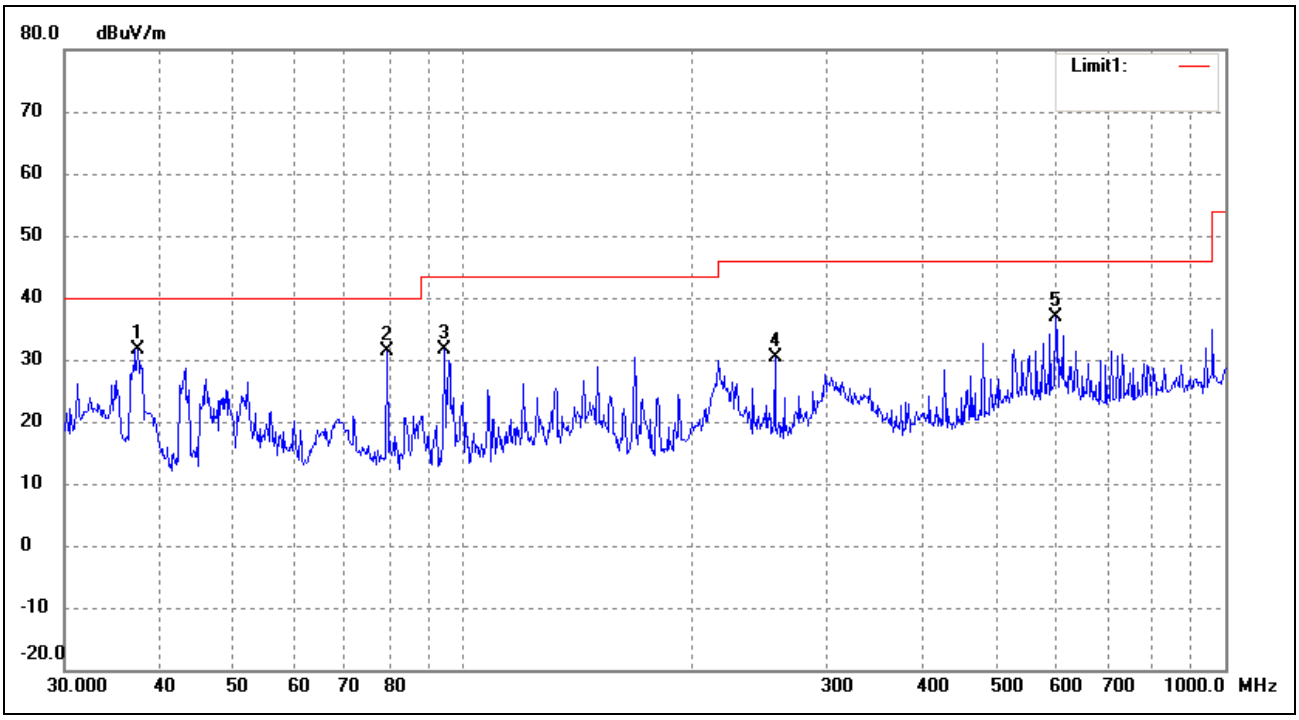
EUT: *Pi Top laptop*
Tested Model: *Model 1*
Operating Condition: *TM1*
Comment: *AC 120V/60HZ Adapter DC 18V*

Test Specification: *Horizontal*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	96.0986	43.18	-12.19	30.99	43.50	-12.51	100	100	peak
2	173.2051	46.63	-10.28	36.35	43.50	-7.15	100	100	peak
3	256.5211	45.37	-6.50	38.87	46.00	-7.13	100	100	peak
4	341.9787	44.18	-3.96	40.22	46.00	-5.78	100	100	peak
5	480.5276	41.48	-1.47	40.01	46.00	-5.99	100	100	peak

Test Specification: *Vertical*

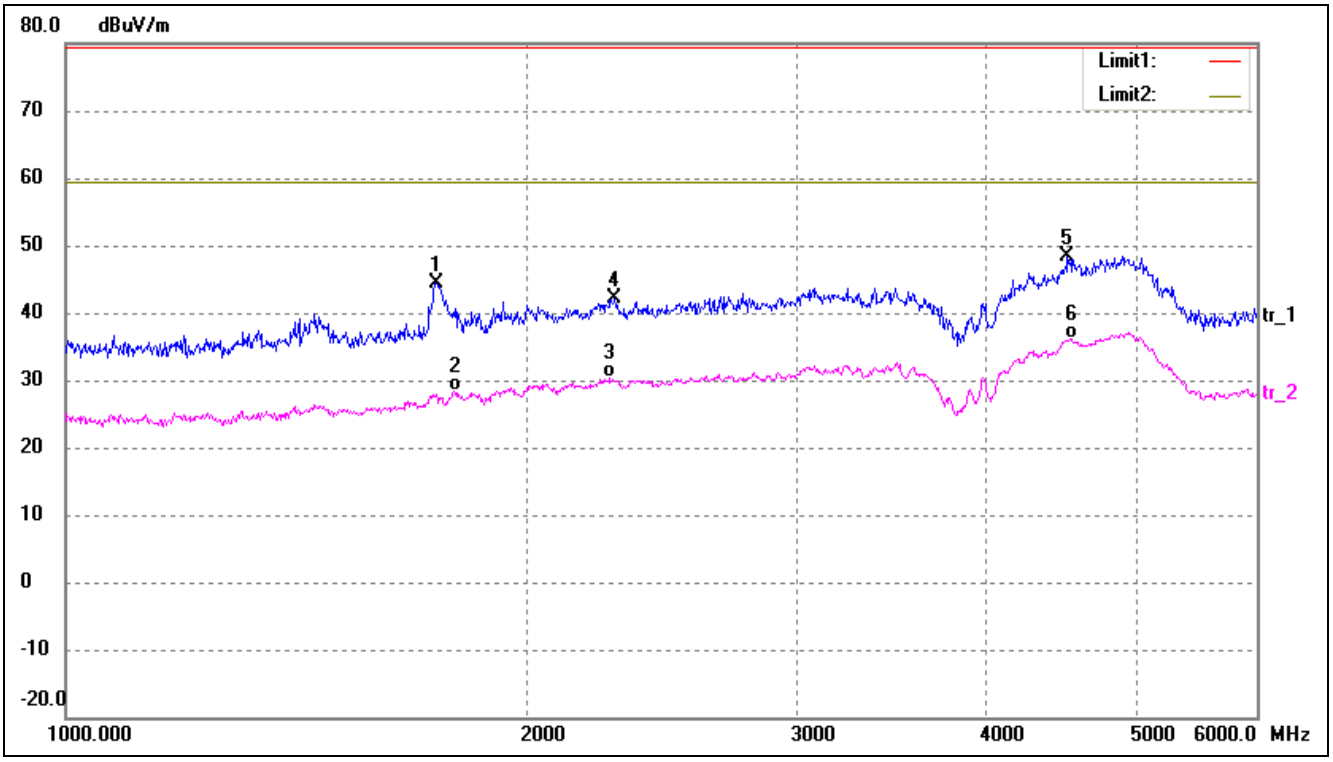


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	37.4165	42.45	-10.77	31.68	40.00	-8.32	100	100	peak
2	79.5209	44.40	-12.94	31.46	40.00	-8.54	100	100	peak
3	94.4284	43.92	-12.33	31.59	43.50	-11.91	100	100	peak
4	256.5211	37.00	-6.50	30.50	46.00	-15.50	100	100	peak
5	599.3212	35.68	1.24	36.92	46.00	-9.08	100	100	peak

Plot of Radiated Emissions Test Data (Above 1GHz)

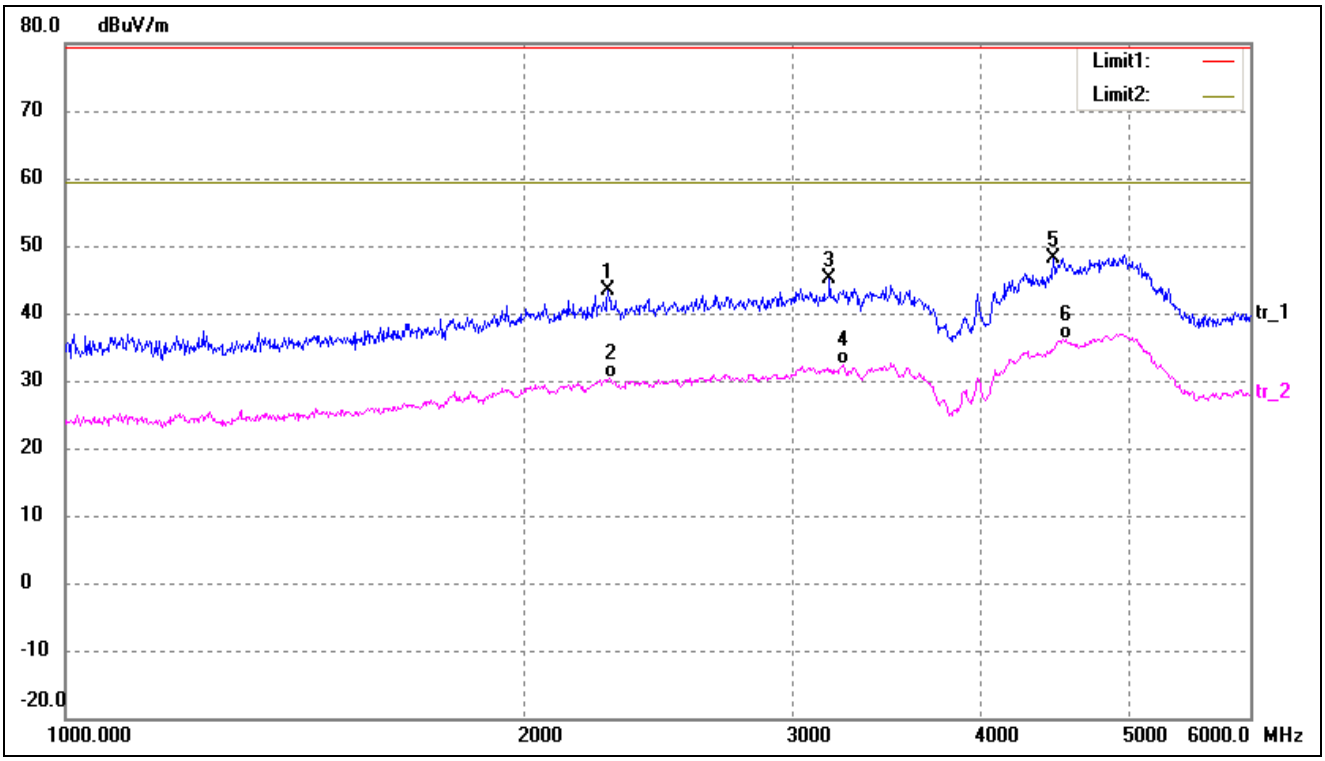
EUT: *Pi Top laptop*
Tested Model: *Model 1*
Operating Condition: *TM1*
Comment: *AC 120V/60HZ Adapter DC 18V*

Test Specification: *Horizontal*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	1745.842	50.37	-5.89	44.48	79.50	-35.02	100	100	peak
2	1793.401	33.87	-5.55	28.32	59.50	-31.18	100	100	AVG
3	2267.854	33.82	-3.37	30.45	59.50	-29.05	100	100	AVG
4	2284.166	45.46	-3.34	42.12	79.50	-37.38	100	100	peak
5	4512.583	46.42	2.04	48.46	79.50	-31.04	100	100	peak
6	4536.905	34.11	2.11	36.22	59.50	-23.28	100	100	AVG

Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	2271.921	46.74	-3.36	43.38	79.50	-36.12	100	100	peak
2	2275.996	33.69	-3.36	30.33	59.50	-29.17	100	100	AVG
3	3176.198	46.44	-1.41	45.03	79.50	-34.47	100	100	peak
4	3245.229	33.54	-1.26	32.28	59.50	-27.22	100	100	AVG
5	4456.338	46.34	1.86	48.20	79.50	-31.30	100	100	peak
6	4536.905	34.05	2.11	36.16	59.50	-23.34	100	100	AVG

******* END OF REPORT *******