

# FCC Part 15B Measurement and Test Report

For

**CEED LTD**

**499-505 Hackney Road, London**

**FCC ID: 2AF9IMK1**

|                           |                                 |
|---------------------------|---------------------------------|
| Test Rule(s):             | <u>FCC Part 15 Subpart B</u>    |
| Product Description:      | <u>pi-topCEED</u>               |
| Tested Model:             | <u>Model 1</u>                  |
| Report No.:               | <u>STR16048141I</u>             |
| Tested Date:              | <u>2016-04-18 to 2016-04-29</u> |
| Issued Date:              | <u>2016-04-29</u>               |
| Tested By:                | <u>Rode Liu / Engineer</u>      |
| Reviewed By:              | <u>Silin Chen / EMC Manager</u> |
| Approved & Authorized By: | <u>Jandy so / PSQ Manager</u>   |
| Prepared By:              |                                 |

*Rode Liu*  
*Silin Chen*  
*Jandyso*

**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

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

**TABLE OF CONTENTS**

|                                                             |           |
|-------------------------------------------------------------|-----------|
| <b>1. GENERAL INFORMATION .....</b>                         | <b>3</b>  |
| 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 MEASUREMENT UNCERTAINTY .....                           | 5         |
| 1.7 TEST EQUIPMENT LIST AND DETAILS .....                   | 6         |
| <b>2. SUMMARY OF TEST RESULTS .....</b>                     | <b>7</b>  |
| <b>3. CONDUCTED EMISSIONS .....</b>                         | <b>8</b>  |
| 3.1 TEST PROCEDURE.....                                     | 8         |
| 3.2 BASIC TEST SETUP BLOCK DIAGRAM.....                     | 8         |
| 3.3 ENVIRONMENTAL CONDITIONS .....                          | 8         |
| 3.4 SUMMARY OF TEST RESULTS/PLOTS .....                     | 8         |
| 3.5 CONDUCTED EMISSIONS TEST DATA.....                      | 9         |
| <b>4. RADIATED EMISSIONS .....</b>                          | <b>11</b> |
| 4.1 TEST PROCEDURE .....                                    | 11        |
| 4.2 TEST RECEIVER SETUP .....                               | 12        |
| 4.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....           | 12        |
| 4.4 ENVIRONMENTAL CONDITIONS .....                          | 12        |
| 4.5 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: 499-505 Hackney Road, London

Manufacturer: Shenzhen Zealfull Technology Co., Ltd  
Address of manufacturer: 2<sup>nd</sup> Floor East, B1 Building, Shunheda Area, Liuxiandong Industrial Zone, Nanshan, Shenz

| General Description of EUT                                                                     |            |
|------------------------------------------------------------------------------------------------|------------|
| Product Name:                                                                                  | Pi-topCEED |
| Trade Name:                                                                                    | pi-top     |
| Model No.:                                                                                     | Model 1    |
| Adding Model(s):                                                                               | /          |
| <i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i> |            |

| Technical Characteristics of EUT |                            |
|----------------------------------|----------------------------|
| Rated Voltage:                   | AC120V/60HZ Adapter DC 18V |
| Rated Current:                   | 1A                         |
| Rated Power:                     | 18W                        |
| Power Adapter Model:             | YHY-18001000               |
| 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 2<sup>nd</sup> 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     | Connect to PC |
| TM2       |             |               |
| TM3       |             |               |
| TM4       |             |               |

EUT Cable List and Details

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|-------------------|------------|---------------------|------------------------|
| HDMI              | 0.3        | Unshielded          | Without Core           |

Auxiliary Equipment List and Details

| Description | Manufacturer | Model       | Serial Number |
|-------------|--------------|-------------|---------------|
| PC          | Dell         | VOSTRO 260S | J1XTC3X       |
| Keyboard    | Dell         | L100        | /             |
| Mouse       | Dell         | M120        | /             |

Special Cable List and Details

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

## 1.6 Measurement Uncertainty

| Measurement uncertainty        |            |                     |
|--------------------------------|------------|---------------------|
| Parameter                      | Conditions | Uncertainty         |
| Conducted Emissions            | Conducted  | $\pm 2.88\text{dB}$ |
| Transmitter Spurious Emissions | Radiated   | $\pm 5.1\text{dB}$  |

## 1.7 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 |

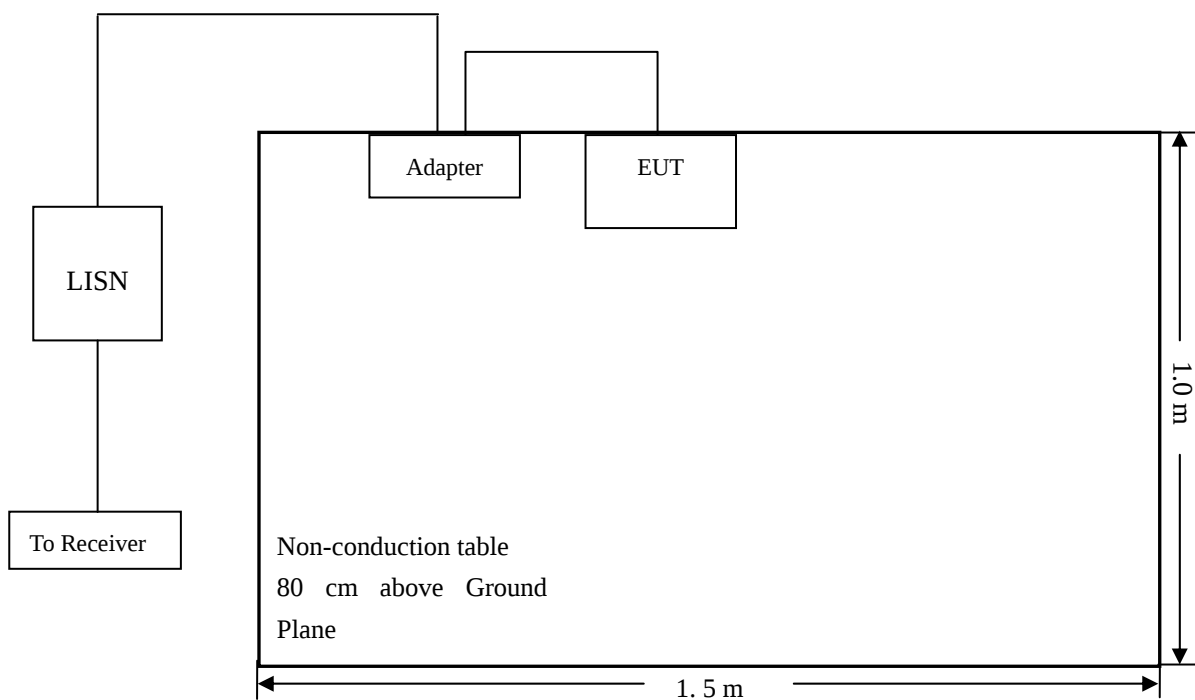
N/A: not applicable

### 3. Conducted Emissions

#### 3.1 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.

#### 3.2 Basic Test Setup Block Diagram



#### 3.3 Environmental Conditions

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

#### 3.4 Summary of Test Results/Plots

According to the data in section 3.5, the EUT complied with the FCC Part 15.107(a) Conducted margin for a Class B device, with the *worst* margin reading of:

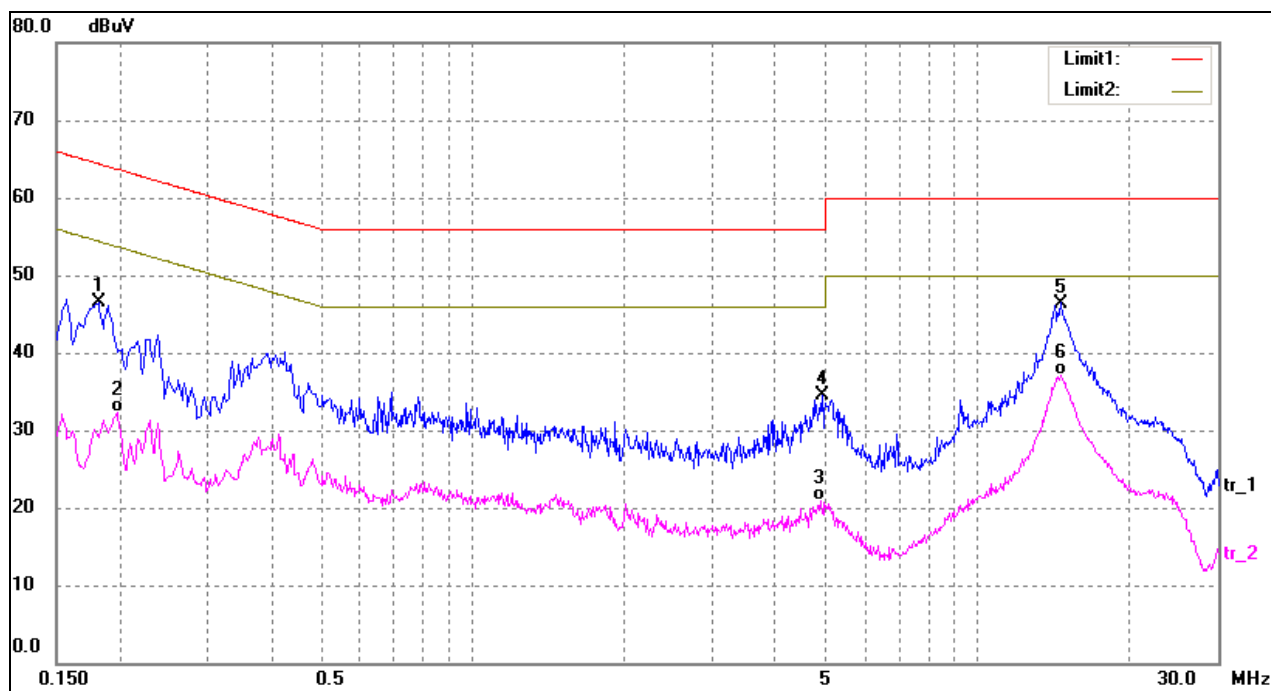
**-7.10 dB at 14.6740 MHz in the Line, AVG detector, 0.15-30MHz**

### 3.5 Conducted Emissions Test Data

#### Plot of Conducted Emissions Test Data

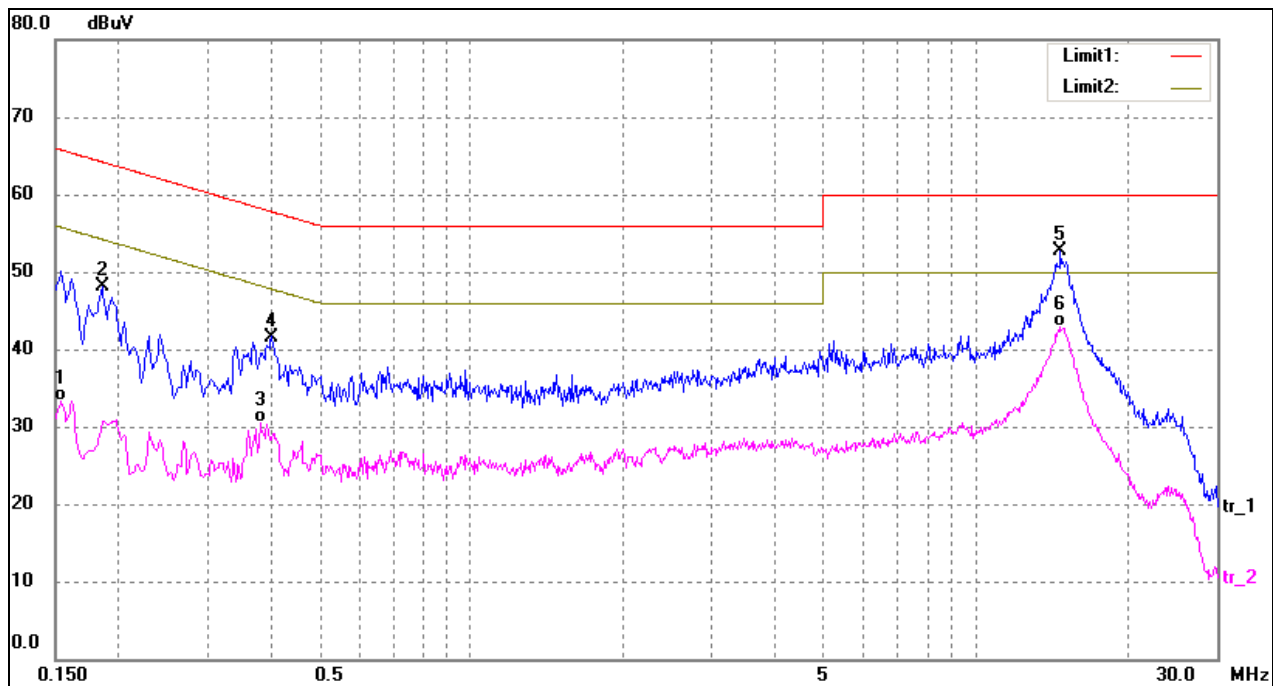
EUT: *Pi-topCEED*  
 Tested Model: *Model 1*  
 Operating Condition: *TM1*  
 Comment: *AC120V/60Hz Adapter DC 18V*

Test Specification: *Neutral*



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>(dB/m) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Detector |
|-----|--------------------|-------------------|-------------------|------------------|-----------------|----------------|----------|
| 1   | 0.1820             | 36.99             | 9.50              | 46.49            | 64.39           | -17.90         | peak     |
| 2   | 0.1980             | 22.90             | 9.50              | 32.40            | 53.69           | -21.29         | AVG      |
| 3   | 4.9139             | 10.61             | 10.23             | 20.84            | 46.00           | -25.16         | AVG      |
| 4   | 4.9499             | 24.21             | 10.23             | 34.44            | 56.00           | -21.56         | peak     |
| 5   | 14.6619            | 35.98             | 10.42             | 46.40            | 60.00           | -13.60         | peak     |
| 6*  | 14.6619            | 26.67             | 10.42             | 37.09            | 50.00           | -12.91         | AVG      |

Test Specification: Line



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>(dB/m) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Detector |
|-----|--------------------|-------------------|-------------------|------------------|-----------------|----------------|----------|
| 1   | 0.1540             | 23.82             | 9.50              | 33.32            | 55.78           | -22.46         | AVG      |
| 2   | 0.1860             | 38.57             | 9.50              | 48.07            | 64.21           | -16.14         | peak     |
| 3   | 0.3820             | 20.98             | 9.50              | 30.48            | 48.24           | -17.76         | AVG      |
| 4   | 0.4020             | 32.10             | 9.50              | 41.60            | 57.81           | -16.21         | peak     |
| 5   | 14.6740            | 42.27             | 10.42             | 52.69            | 60.00           | -7.31          | peak     |
| 6*  | 14.6740            | 32.48             | 10.42             | 42.90            | 50.00           | -7.10          | AVG      |

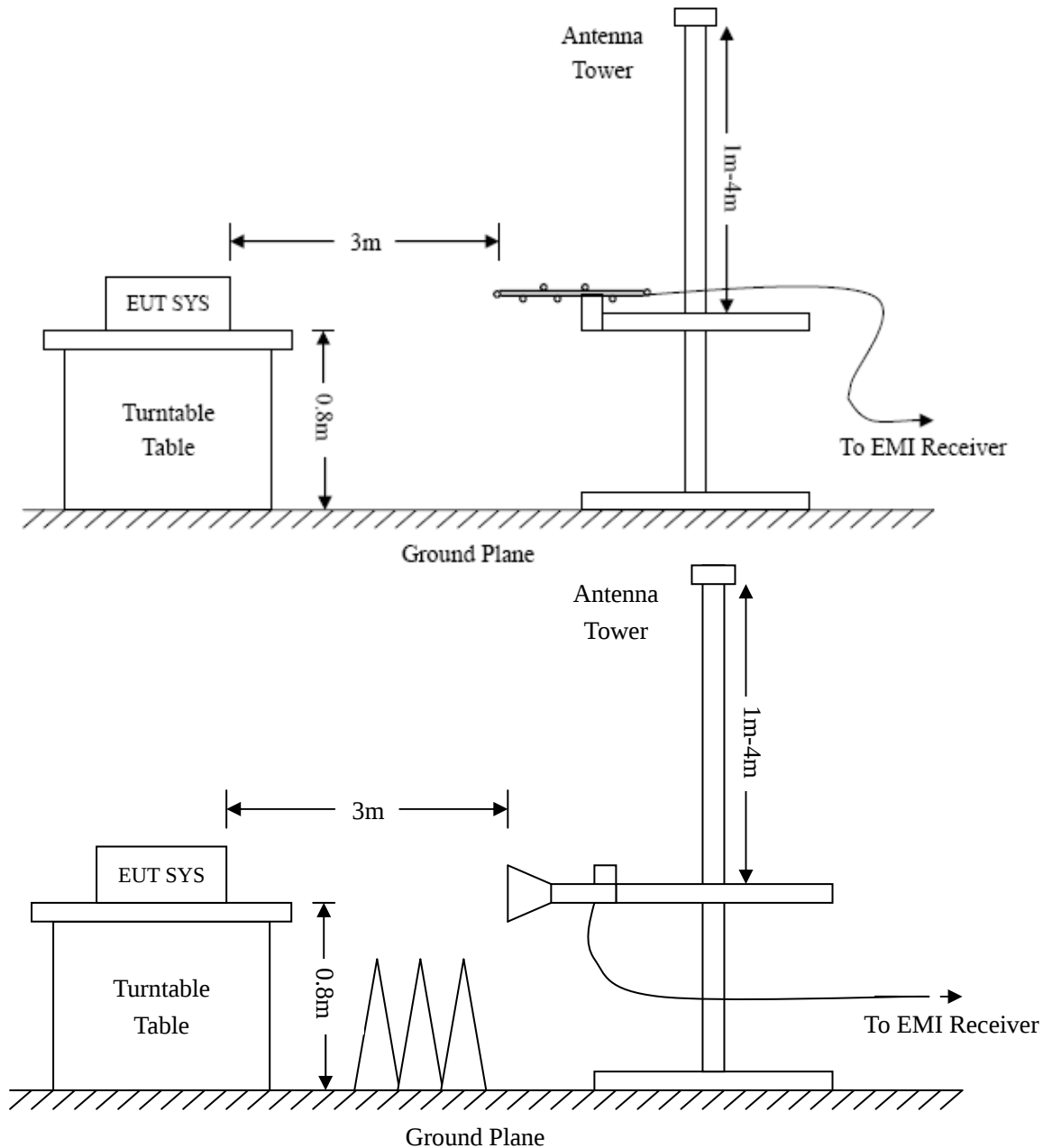
## 4. Radiated Emissions

### 4.1 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.



## 4.2 Test Receiver Setup

Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

## 4.3 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

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

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.109(a) Limit}$$

## 4.4 Environmental Conditions

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

## 4.5 Summary of Test Results/Plots

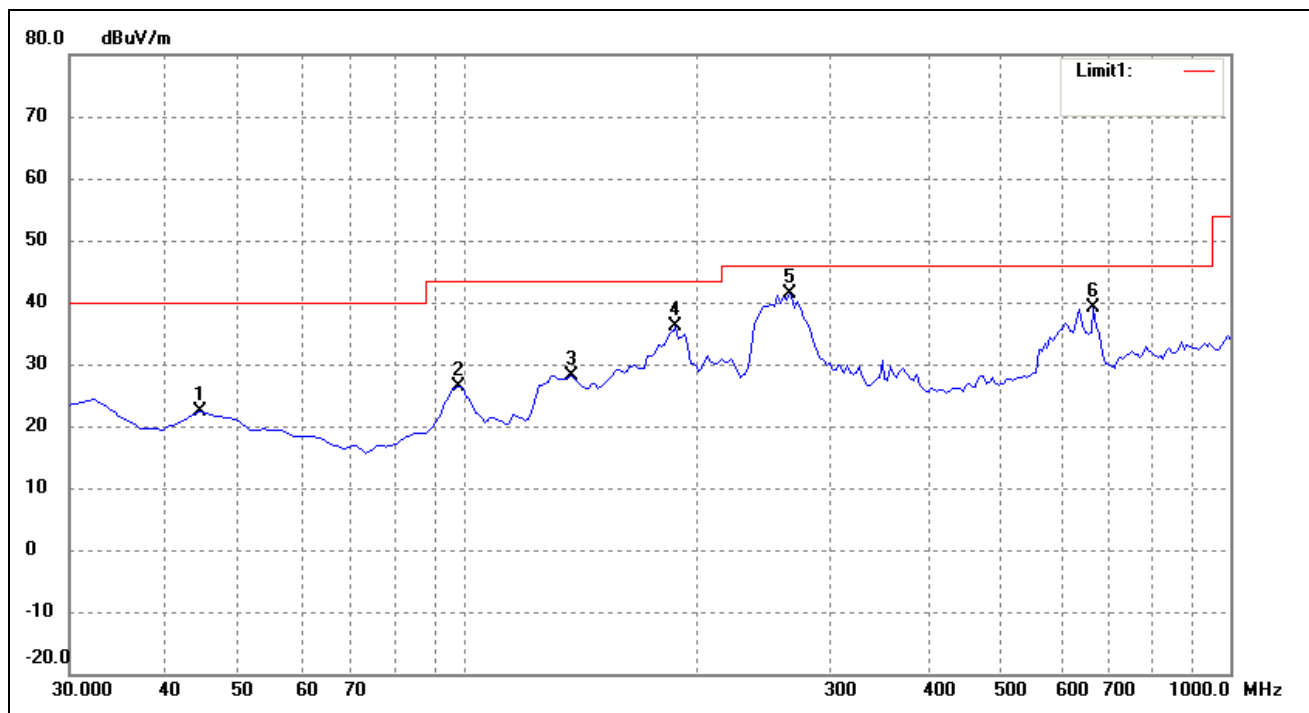
According to the data, the EUT complied with the FCC Part 15.109(a) rule, and had the worst margin of:

**-2.82 dB at 32.4249 MHz in the Vertical polarization, 30MHz to 5 GHz, 3Meters**

### Plot of Radiated Emissions Test Data

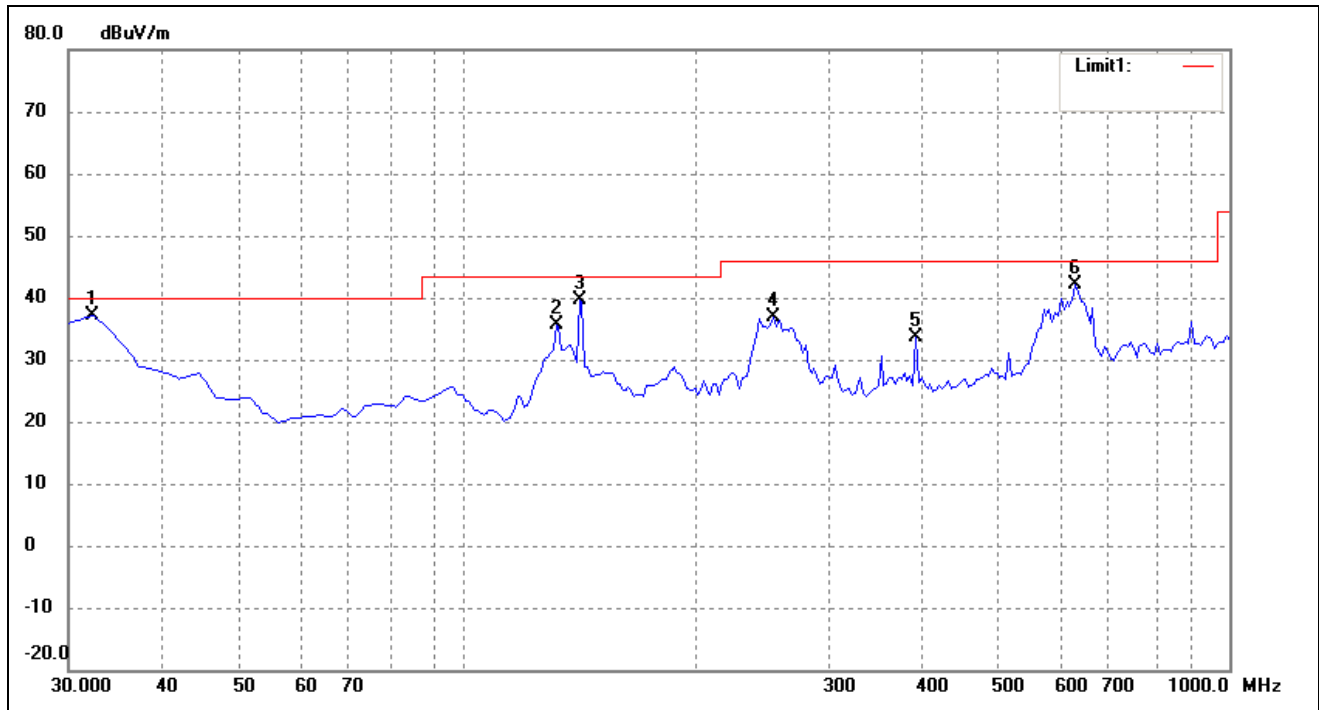
EUT: *Pi-topCEED*  
 Tested Model: *Model 1*  
 Operating Condition: *TM1*  
 Comment: *AC120V/60Hz Adapter DC 18V*

Test Specification: *Horizontal*



| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>Factor(dB) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ° ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------------|--------------------|-------------------|----------------|-----------------|----------------|--------|
| 1   | 44.5499            | 30.30               | -7.96                 | 22.34              | 40.00             | -17.66         | 58              | 200            | peak   |
| 2   | 97.9000            | 37.74               | -11.33                | 26.41              | 43.50             | -17.09         | 326             | 200            | peak   |
| 3   | 136.6999           | 40.61               | -12.38                | 28.23              | 43.50             | -15.27         | 100             | 200            | peak   |
| 4   | 187.6250           | 46.50               | -10.33                | 36.17              | 43.50             | -7.33          | 209             | 200            | peak   |
| 5   | 265.2250           | 48.04               | -6.73                 | 41.31              | 46.00             | -4.69          | 100             | 100            | peak   |
| 6   | 667.7749           | 38.98               | 0.23                  | 39.21              | 46.00             | -6.79          | 100             | 100            | peak   |

Test Specification: Vertical



| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>Factor(dB) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ° ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------------|--------------------|-------------------|----------------|-----------------|----------------|--------|
| 1   | 32.4249            | 46.87               | -9.69                 | 37.18              | 40.00             | -2.82          | 100             | 100            | peak   |
| 2   | 131.8499           | 47.71               | -12.11                | 35.60              | 43.50             | -7.90          | 308             | 100            | peak   |
| 3   | 141.5500           | 52.17               | -12.55                | 39.62              | 43.50             | -3.88          | 120             | 100            | peak   |
| 4   | 253.0999           | 44.36               | -7.42                 | 36.94              | 46.00             | -9.06          | 359             | 100            | peak   |
| 5   | 391.3249           | 36.20               | -2.69                 | 33.51              | 46.00             | -12.49         | 100             | 100            | peak   |
| 6   | 633.8250           | 41.14               | 0.87                  | 42.01              | 46.00             | -3.99          | 100             | 100            | peak   |

Note: Testing is carried out with frequency rang 30MHz to the 5GHz, which above 1GHz is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

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