

# EMI TEST REPORT

## FCC Part 15 Class B

*for*

**PENANDFREE Co., Ltd.**

**#801, Kenmkang Hitech valley 2nd, Sangdaewon1-dong, Jungwon-gu,  
Seongnam-City, Gyeonggi-do, Republic of Korea**

*on the*

**U-Board lite  
WB-859-03**

**FCC ID : ZGBWB-859-03**

Issued Date : December 08, 2011

Report Number : KSQ-FCC111207

**Prepared By:**

**Test Date:** December 12, 2011

**Test Engineer:** Sang Min, Lee

Printed Name

Signature



**Compliance Engineer:** Sung Bum, Hong

Printed Name

Signature



**Korea Standard Quality Laboratories**  
Testing Laboratories for EMC and Safety Compliance  
#102, Jangduk-Dong, Hwasung-City, Kyunggi-Do, KOREA

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## 1.. General Information

### 1.1 Introduction

The EMI Test Report of Information Technology Equipment is prepared on behalf of named applicant in accordance with the ANSI C63.4-2003. The test results reported in this document relate only to the item that was tested.

The detailed description of the measurement facility was found to be in compliance with the requirement of Section 2.948 of the FCC Rules. The Federal Communications Commission has the reports on file and is listed under Registration Number 100384. The scope of the accreditation covers the FCC Method - 47 CFR Part 15 or 18 of the Commission's Rules.

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003. The instrumentation utilized for the measurements conforms with CISPR16 Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. Calibration checks are performed yearly on the instruments by a local calibration laboratories.

All radiated and conducted emission measurements are performed manually at Korea Standard Quality Laboratories (hereinafter referred to as "KSQLab"), #102, Jan gduk-Dong, Hwasung-City, Gyeonggi-Do, KOREA. The radiated emission measurements required by the FCC Rules were performed on 3 meter or 10 meter, Open Area Test Site, test range maintained by KSQLab. Complete ANSI 63.4-2003 description and site attenuation measurement data records are maintained at the test facility and have been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure also located at the same facility. The KSQLab EMC test facility in Hwasung-City are designated testing laboratory according to ISO/IEC 17025 by Radio Research Laboratory (RRL), Ministry of Information and Communication.

### 1.2 Product Description for Equipment Under Test (EUT)

PENANDFREE Co., Ltd., U-Board lite, Model No: WB-859-03, FCC ID: ZGBWB-859-03, or the "EUT" as referred to in this report is best model.

\* Main Specifications of EUT are:

◆ Input Voltage : DC 5V(USB)

◆ Station

Effective working area : 120inches(diagonal/wide screen/ideal condition)

USB Device Class : Microsoft HID Pen/standard pen device

◆ Digital Pen

Full recharging time : 2 hours

Continuous Operating time : 15 hours

◆ Humidity : 0~90RH + 35°C(Non condensing)

◆ Recommended Operating temperature : 15°C ~ 40°C

◆ Interface : USB 2.0 or USB 1.1

◆ Size

Station : 220 x 30 x 17 mm

Pen : 135 x 16 x 16 mm

◆ Weight : 75 g

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## 1.3 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
U-Board lite	WB-859-03	Prototype	PENANDFREE Co., Ltd.	EUT

## 1.4 Host System Configuration

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	LGW2	-	LG Electronics	-
Beam Projector	LPF-4902	-	FUJITSU	-

## 1.5 External I/O Cabling

Description	Length (m)	Port/From	Port/To	Remarks
EUT	2.5	USB / EUT	USB / Notebook	-
Notebook	1.0	D-SUB / Notebook	D-SUB / Beam Projector	-

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## 1.6 Special Accessories

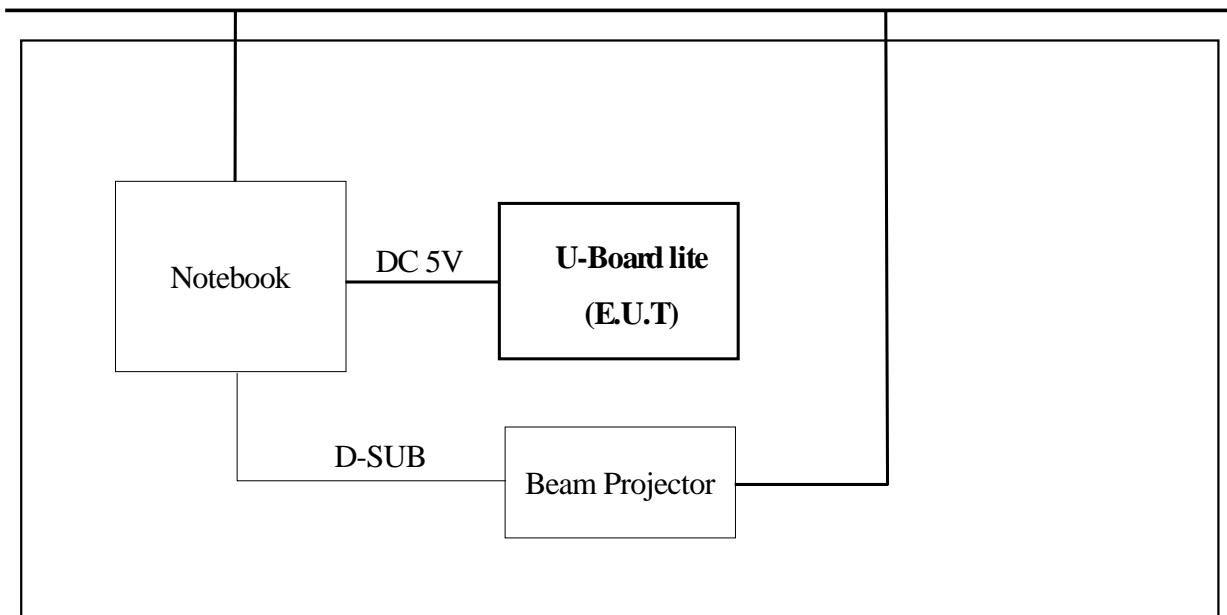
As shown in section 1.8, all interface cables used for compliance testing are unshielded as normally supplied or by use respective component manufacturers.

## 1.7 EUT Modifications

No modifications were made to the EUT in order to achieve and maintain compliance to the standards described in this report.

## 1.8 Configuration of Test System

AC 100V/50Hz



Wooden Table

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## 2.. Test Performed

### 2.1 Conducted Emission Measurements

#### 2.1.1 Test Description

The power line conducted emission measurements were performed in a shielded enclosure, using the setup in accordance with ANSI C63.4-2003 conducted emission measurement procedure.

#### 2.1.2 Test Equipments

Description	Manufacturer	Model Number	Serial Number	Cal. Due
EMI TEST Receiver	LIG NEX1	LSA-265	L7098003	12, 2011
LISN1	Electro Metrics	ANS-25/2	2535	09, 2012
LISN2	Kyoritsu	KNW-407	8-1010-14	09, 2012

#### 2.1.3 Test Environments

Ambient Temperatures	Relative Humidity
15~35°C	30~60%

#### 2.1.4 Test Limits

Frequency (MHz)	FCC Part 15 Class B			
	Class B (dBuV)		Class A (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	66.0 to 56.0	56.0 to 46.0	79.0	66.0
0.50 to 5.00	56.0	46.0	73.0	60.0
5.00 to 30.00	60.0	50.0	73.0	60.0

#### 2.1.5 Test Procedure

Conducted emission levels were measured on each current-carrying line with the EMI TEST Receiver operating in the CISPR quasi-peak mode (or peak mode if applicable). The Receiver's 6dB bandwidth was set to 9kHz. The initial step in collecting conducted data is a EMI TEST Receiver peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 150kHz to 30MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP".

The conducted emission test was performed with the EUT exercise program loaded, and the emissions were scanned between 150kHz to 30MHz on the HOT side and NEUTRAL side, herein referred to as H and N, respectively.

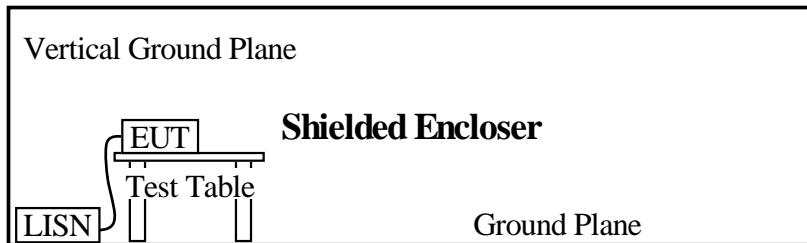
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## 2.1.6 Test Configuration



## 2.1.7 Test Results

According to the data in section 2.1.8, the EUT complied with the FCC Part 15 Class B limits, and had the worst margin reading of:

22.89dB at 1.44MHz in the HOT side and 20.79dB at 0.19MHz in the NEUTRAL side.

## 2.1.8 Test Data

Line Conducted Emission				CISPR 22 Class B		
Frequency (MHz)	Amplitude (dBuV)	Phase Hot/Neutral	Detector QP/AV/PK	Applicable Limit		Quasi-peak Margin (dB)
				Quasi-peak (dBuV)	Average (dBuV)	
0.18	34.63	H	QP	64.48	54.48	29.85
0.19	43.24	N	QP	64.03	54.03	20.79
0.25	34.43	H	QP	64.75	54.75	30.32
0.26	39.46	N	QP	61.43	51.43	21.97
0.33	34.38	H	QP	59.45	49.45	25.07
0.39	34.44	N	QP	58.06	48.06	23.62
0.60	30.48	H	QP	56.00	46.00	25.52
0.91	25.82	N	QP	56.00	46.00	30.18
1.37	29.89	N	QP	56.00	46.00	26.11
1.44	33.11	H	QP	56.00	46.00	22.89
2.29	28.93	H	QP	56.00	46.00	27.07
4.46	30.09	N	QP	56.00	46.00	25.91
5.18	37.41	H	QP	60.00	50.00	22.59
5.39	26.18	N	QP	60.00	50.00	33.82
5.57	30.85	H	QP	60.00	50.00	29.15
5.85	19.21	N	QP	60.00	50.00	40.97
9.59	23.02	H	QP	60.00	50.00	36.98
10.70	26.95	N	QP	60.00	50.00	33.05

Temperature: 21°C Humidity: 49% Test Date: December 23, 2011 Tested by: Sang Min, Lee

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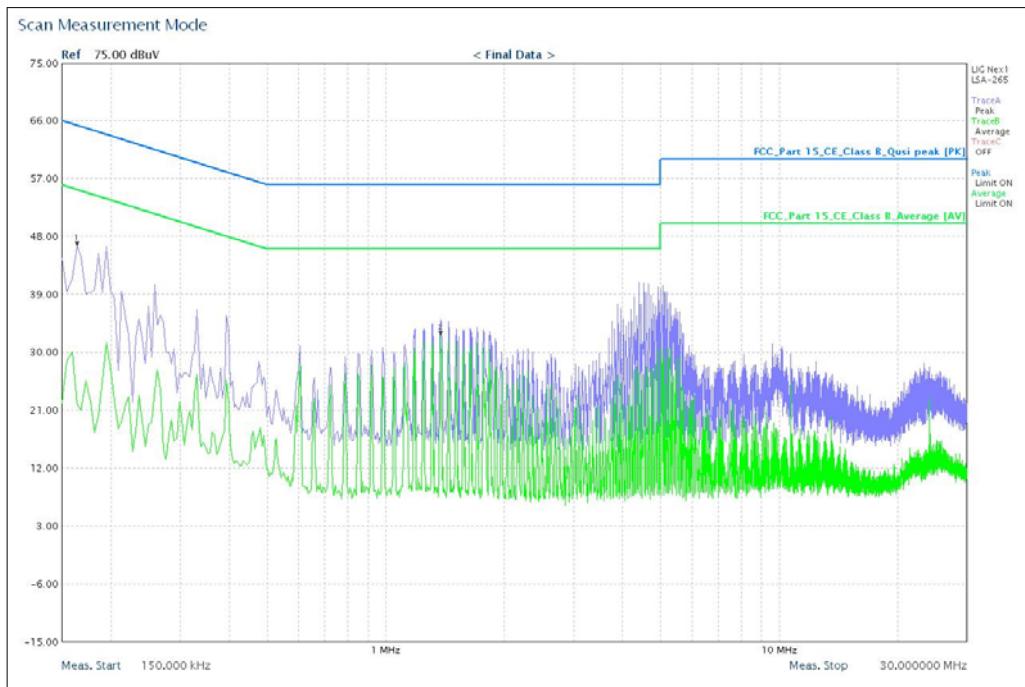
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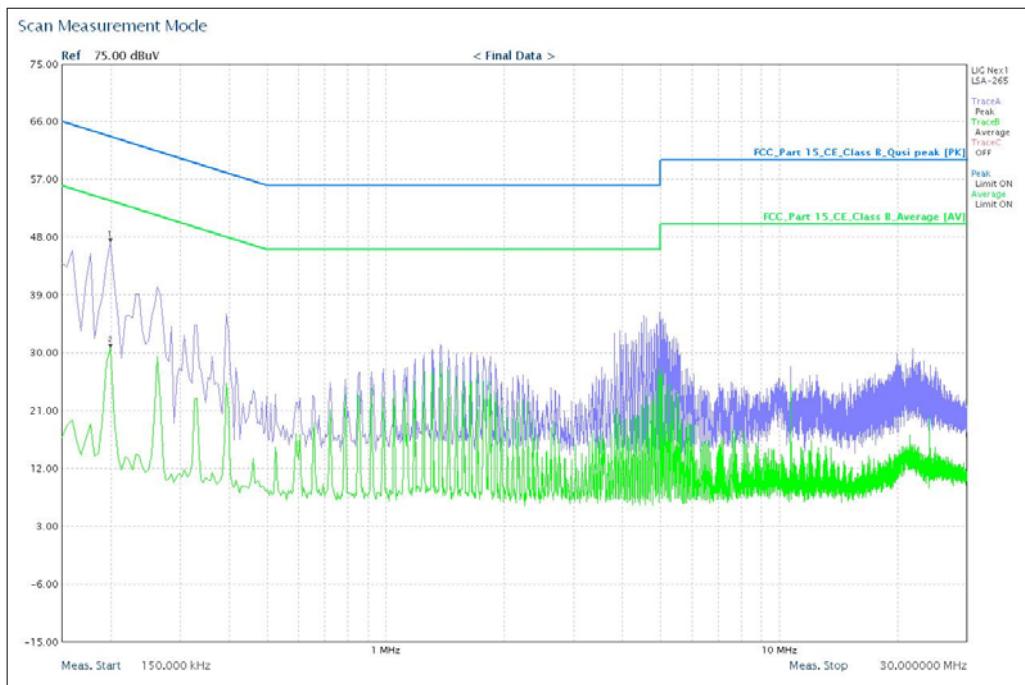
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## 2.1.9 Plots of Test Data

Polarization: HOT (LIVE)



Polarization: NEUTRAL



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## 2.2 Radiated Emission Measurements

### 2.2.1 Test Description

The radiated emission measurements were performed in a Open Area Test Site (OATS), using the setup in accordance with ANSI C63.4-2003 radiated emission measurement procedure.

### 2.2.2 Test Equipments

Description	Manufacturer	Model Number	Serial Number	Cal. Due
EMI TEST Receiver	LIG NEX1	LSA-265	L7098003	12, 2011
Biconical Antenna	Electro Metrics	BIA-30S	164	04, 2012
Log Periodic Antenna	Electro Metrics	LPA-30	387	03, 2012

### 2.2.3 Test Environments

Ambient Temperatures	Relative Humidity
15~35°C	30~60%

### 2.2.4 Test Limits

Frequency (MHz)	FCC Part 15 Limit			
	Class B @3m		Class A @10m	
	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)
30 to 88	40.0	100	39.5	90
88 to 216	43.5	150	43.5	150
216 to 960	46.0	200	46.5	210
above 960	54.0	500	49.5	300

## 2.2.5 Test Procedure

Before final measurements of radiated emission were made on the OATS, the EUT was scanned in semi-anechoic chamber in order to determine its emission spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emission in amplitude, direction and frequency. This process was repeated during final radiated emission measurements on the OATS range, at each frequency, in order to ensure that maximum emissions amplitudes were attained. The radiated emission test was performed with EUT exercise program loaded, and the emissions were scanned between 30MHz to 1000MHz using a LIG-NEX1 LSA-265 EMI TEST Receiver. The EMI TEST Receiver's 6dB bandwidth was set to 120kHz, and EMI TEST Receiver was operated in the CISPR quasi-peak detection mode.

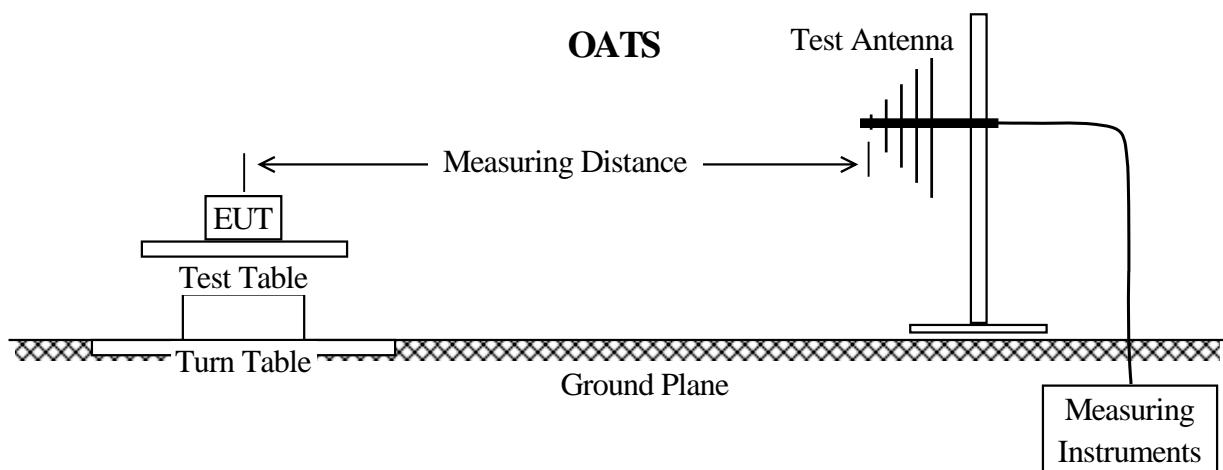
At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum emission levels. Measurements were taken using both HORIZONTAL and VERTICAL antenna polarization, herein referred to as H and V, respectively.

## 2.2.6 Field Strength Calculation

The Field Strength (FS) is calculated by adding the Antenna Factor (AF) and Cable Factor (CF) from the Measured Reading (MR). The basic equation with a sample calculation is as follows:

$$FS(\text{dBuV/m}) = MR(\text{dBuV}) + [AF(\text{dB/m}) + CF(\text{dB})]$$

## 2.2.7 Test Configuration



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## 2.2.8 Test Results

According to the data in section 2.2.9, the EUT complied with the FCC Part 15.109(b) standards, and had the worst margin reading of:

14.69 dB at 900.02 MHz in the VERTICAL antenna polarization.

18.89 dB at 299.77 MHz in the HORIZONTAL antenna polarization.

## 2.2.9 Test Data

Indicated		Antenna		FCC Part15 Class B		
Frequency (MHz)	Amplitude (dBuV/m)	Polar. (H/V)	Height (m)	Applicable Limit		Margin (dB)
				(dBuV/m)	(uV/m)	
38.40	10.32	H	3.5	40.00	100	29.68
50.75	8.33	V	3.4	40.00	100	31.67
88.55	15.59	H	3.3	43.50	150	27.91
108.23	13.17	V	3.3	43.50	150	30.33
192.00	18.34	V	3.0	43.50	150	25.16
299.77	27.11	H	2.8	46.00	200	18.89
432.01	26.32	H	2.4	46.00	200	19.68
619.03	24.07	H	2.3	46.00	200	21.93
900.02	31.31	V	2.1	46.00	200	14.69

Temperature: 26°C Humidity: 55% Test Date: December 12, 2011 Tested by: Sang Min, Lee

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## Appendix - EUB photo

