



**Underwriters Laboratories Inc.**

[www.ul.com/emc](http://www.ul.com/emc)

[www.ulk.co.kr](http://www.ulk.co.kr)

Project: 09CA47215

File: TC8329

Report: 09CA47215-FCC

Date: November 17 , 2009

Model: Ethernet Access Residential Unit 1114

## **FCC Certification Report**

**For**

## **WDM-PON ONT**

**LG-NORTEL CO., LTD.**

**LG R&D Complex 533 Hogye-1dong, Dongan-gu, Anyang-si, Kyungki-do,  
431-749, Korea**

**Copyright © 2005 Underwriters Laboratories Inc.**


UL Korea, Ltd . authorizes the above-named company to reproduce this Report provided it is reproduced in its entirety.

---

UL Korea, Ltd  
33<sup>rd</sup> FL, Gangnam Finance Center, 737  
Yeoksam-dong, Gangnam-gu, Seoul  
135-984 Korea  
Tel: +82.2.2009.9000, Fax:+82.2.2009.9405

**A not-for-profit organization dedicated  
to public safety and committed to  
quality service for over 100 years**

## TEST REPORT DETAILS

Test Report No. 09CA47215-FCC  
Tests Performed By: UL Korea Ltd.  
33<sup>rd</sup> FL. Gangnam Finance Center, 737 Yeoksam-dong,  
Kangnam-ku, Seoul, 135-984, Korea  
Test site: LG-Nortel Co. Ltd.(Test Laboratory)  
299, Kongdan-Dong, Gumi, Kyungsangbuk-Do, KOREA  
Applicant: LG-Nortel Co. Ltd.  
LG R&D Complex 533 Hogue-1dong, Dongan-gu, Anyang-si,  
Kyungki-do, 431-749, Korea  
Applicant Contact: Mr. Young-Ho Son  
Title: Chief Research Engineer  
Phone: 82-31-450-4263  
E-mail: yhsonb@lg-nortel.com  
Test Report Date: November 17, 2009  
Product Type: WDM-PON ONT  
FCC ID: TUIEARU1114  
Product standards: FCC 47CFR Part 15 Subpart B Class B  
FCC Classification : Class B Digital Device  
FCC Procedure : Certification  
Model Number: Ethernet Access Residential Unit 1114  
Additional model Number: Ethernet Access Residential Unit 1113  
This report covers multi-model name which is identical to the  
basic model according to the manufacturer's specification.  
Trade Name:   
Sample Serial Number: None (Proto type)  
Sample Receive Date: October 26, 2009  
Testing Start Date: October 26, 2009  
Date Testing Complete: October 30, 2009  
**Overall Results: PASS**

UL Korea Ltd. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports.

### TEST SUMMARY

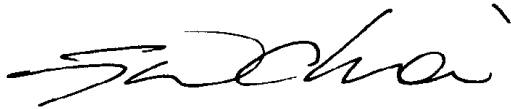
#### Test Result

Requirement – Test	Reference standards	Result	Verdict
Conducted Disturbance at the mains ports	FCC Part 15 Subpart B, Class B	Pass	Complied
Radiated Disturbance		Pass	Complied

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea, Ltd. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

The equipment under test has

- met the technical requirements
- not met the technical requirements



Tested by  
Jeawoon, Choi, Senior Project Engineer  
Conformity Assessment Services - 3014ASEO  
UL Korea Ltd.  
November 17, 2009



Reviewed by  
Kyungyong, Kim, EMC Section Manager  
Conformity Assessment Services - 3014ASEO  
UL Korea Ltd.  
November 17, 2009

## Report Directory

<b>1. EQUIPMENT UNDER TEST(EUT)</b> .....	<b>5</b>
1.1 EQUIPMENT DESCRIPTION.....	5
1.2 EQUIPMENT MARKING PLATE.....	6
1.3 EQUIPMENT USED DURING TEST.....	6
1.4 INPUT/OUTPUT PORTS.....	6
1.5 EUT INTERNAL OPERATING FREQUENCIES:.....	7
1.6 POWER INTERFACE:.....	7
<b>2. EUT OPERATION MODES:</b> .....	<b>8</b>
<b>3. EUT CONFIGURATIONS:</b> .....	<b>8</b>
<b>4. CONDUCTED EMISSION</b> .....	<b>10</b>
<b>5. RADIATED EMISSION</b> .....	<b>13</b>
<b>APPENDIX A _ACCREDITATIONS AND AUTHORIZATIONS</b> .....	<b>17</b>
<b>APPENDIX B _MEASUREMENT UNCERTAINTIES</b> .....	<b>18</b>

# 1. EQUIPMENT UNDER TEST(EUT)

## 1.1 Equipment Description

The EA 1100 solution goes beyond traditional Fiber to the Home (FTTH) or Ethernet to the Home (ETTH), providing Ethernet over Wavelength Division Multiplexing-Passive Optical Networks (WDM-PON). The EA 1100 delivers a dedicated symmetrical upstream and downstream bandwidth capacity that is orders of magnitude above that of Time Division Multiplexing (TDM)-based PON solutions, while overcoming the fiber availability and/or termination density challenges associated with making Ethernet and FTTH an accessible reality to any number of end-users.

In an Ethernet over WDM access solution, a single wavelength is re-directed to an end user from the central office through a passive wavelength router located in the outside plant (OSP). Unlike TDM PON, wavelengths are point-to-point and independent of each other, enabling symmetrical bandwidth from the distribution hub to the home.

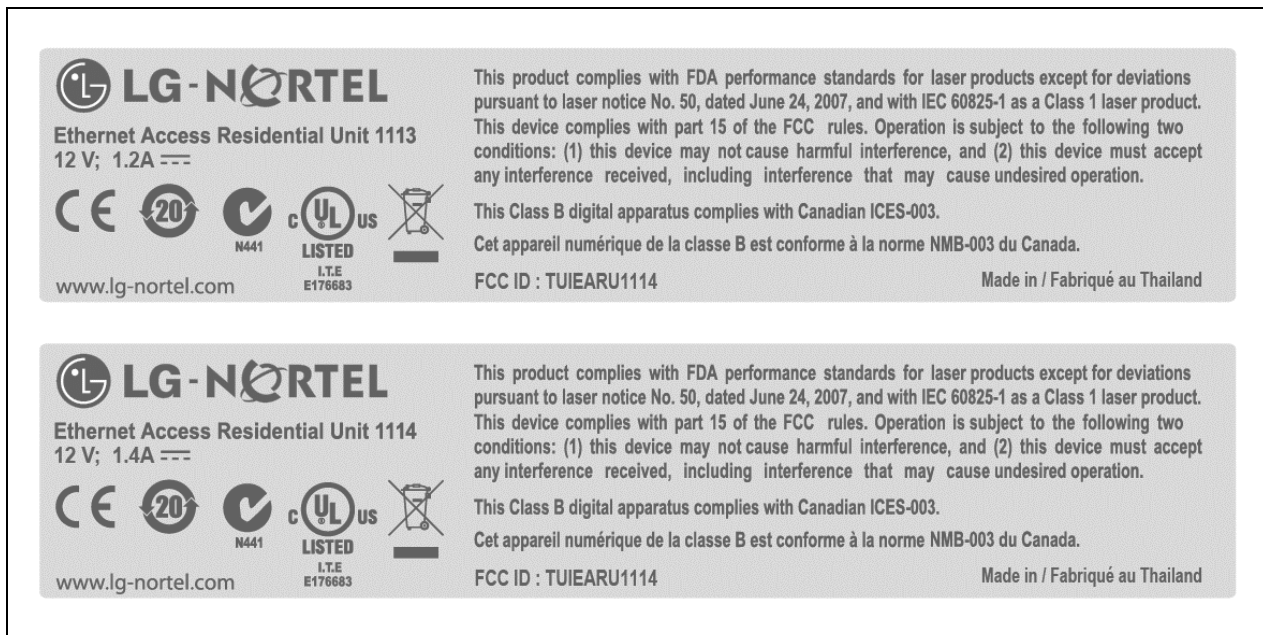
The EA 1100 supports 32 wavelengths of 100 Mbps or 16 wavelengths of 1Gbps on a single fiber. With a reach of 20 km, each point-to-point connection covers the vast majority of residential deployments and enables the capture of business services and wireless backhaul traffic. About service application, it can be set to 100 Mbps for residential service or can be set to 1 Gbps to service a large enterprise or multi-dwelling building.

Equipped with passive wavelength filters and “plug-n-play” colorless Optical Network Terminals (ONTs), the EA 1100 solution is free of the deployment, operations, and engineering complexities associated with other WDM PON systems..

The following are the technical specification of the ONT product

<b>Optical Interface</b>	
Optical cable	Single mode optical fiber
Line Rate	125 Mbps
Optical Interface	SC/APC connetor
Optic Transceiver	C band : Uplink, L band :Downlink
Power	12V 1.3A
<b>Ethernet Port</b>	
Operation mode	Fast Ethernet / Auto-Negotiation Mode
Electrical interface	RJ-45 connector
<b>POTS port</b>	
Electrical interface	RJ-11 connector

## 1.2 Equipment Marking Plate



## 1.3 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	WDM-PON ONT	LG-NORTEL Co., Ltd.	Ethernet Access Residential Unit 1114	-
SIM	WDM-PON OLT	LG-NORTEL Co., Ltd	Ethernet Access Service Terminal 1100 R4	-
SIM	WDM-PON ONU	LG-NORTEL Co., Ltd	Ethernet Access Business Unit 2113	-
AE	AC Power Adapter	Weihai Sunlin Electronics.	SR693J01	-
AE	Uninterruptible Power Supply	Cyberpower system, Inc	CS24U12V	
SIM	Remote Node	LG-NORTEL Co., Ltd	WPF 1132	-
SIM	Data Quality Analyzer	Anritsu	MD1230A	-

\* Note: **EUT** - Equipment Under Test , **AE** - Auxiliary/Associated Equipment, **SIM** - Simulator (Not Subjected to Test)

### 1.4 Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
1	Mains Power Input	AC	< 3m	Unshielded	Connected with EUT/Adaptor
2	Fiber Optic	TP	>10 m	Optic cable	Connected to RN (OPTICAL)
3	Fast Ethernet	TP	>10 m	Unshielded	Connected to Data Quality Analyzer
4	POTS	TP	>10m	Unshielded	Connected to Telephone/Indoor

Note:  
 \*AC = AC Power Port                      DC = DC Power Port                      N/E = Non-Electrical  
 I/O = Signal Input or Output Port (Not Involved in Process Control)  
 TP = Telecommunication Ports

### 1.5 EUT Internal Operating Frequencies:

Frequency (MHz)	Description	Frequency (MHz)	Description
25	Main PBA	33	Main PBA
125	Main PBA	-	-

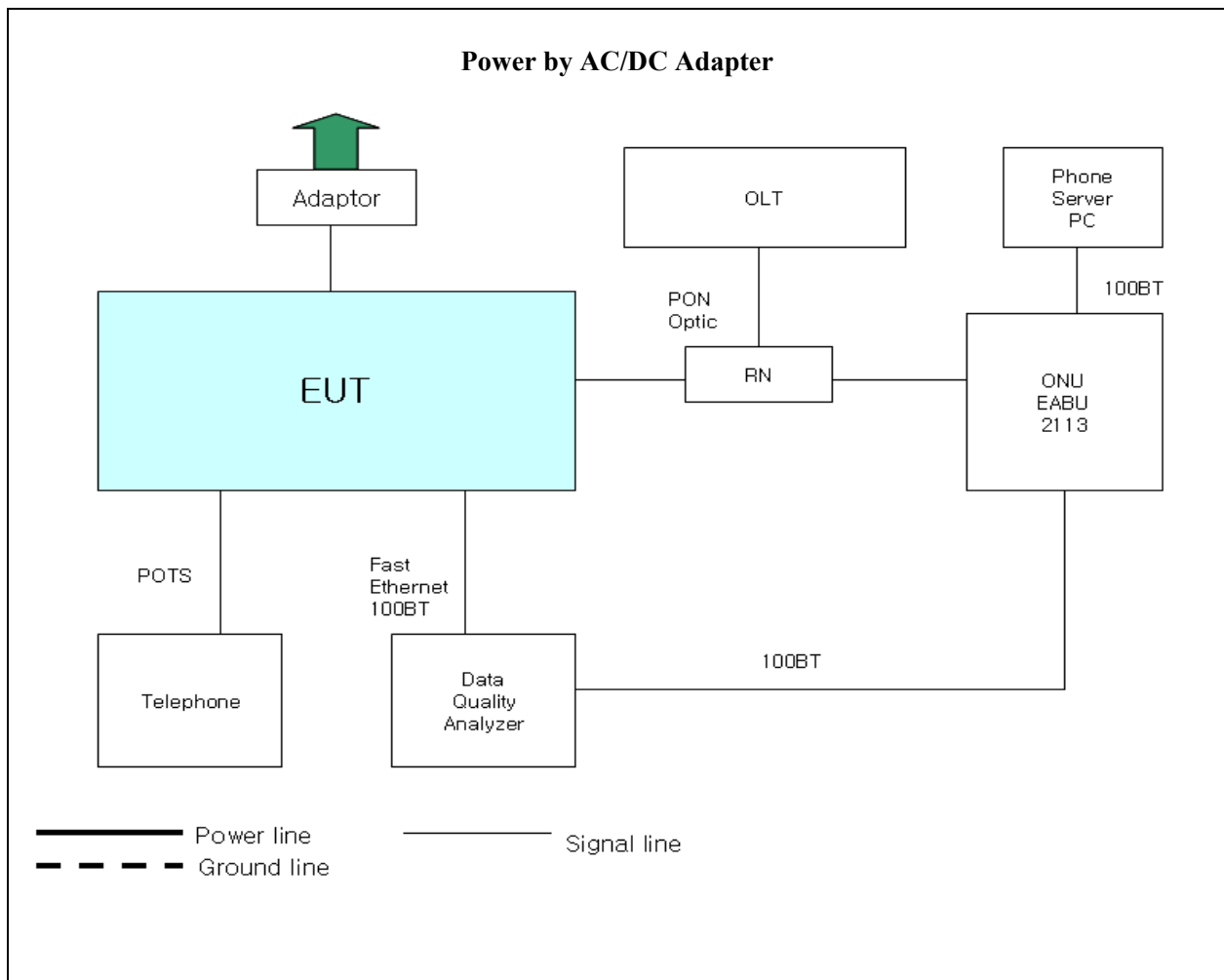
### 1.6 Power Interface:

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	100-240Vac	1	-	50 - 60HZ	Single Phase	Input of AC/DC Adapter
	120V ac	0.75	-	60HZ	Single Phase	Input of UPS Power supply
1	120Vac	-	-	60HZ	Single Phase	Input of AC/DC Adapter
2	120V ac	-	-	60HZ	Single Phase	Input of UPS Power supply

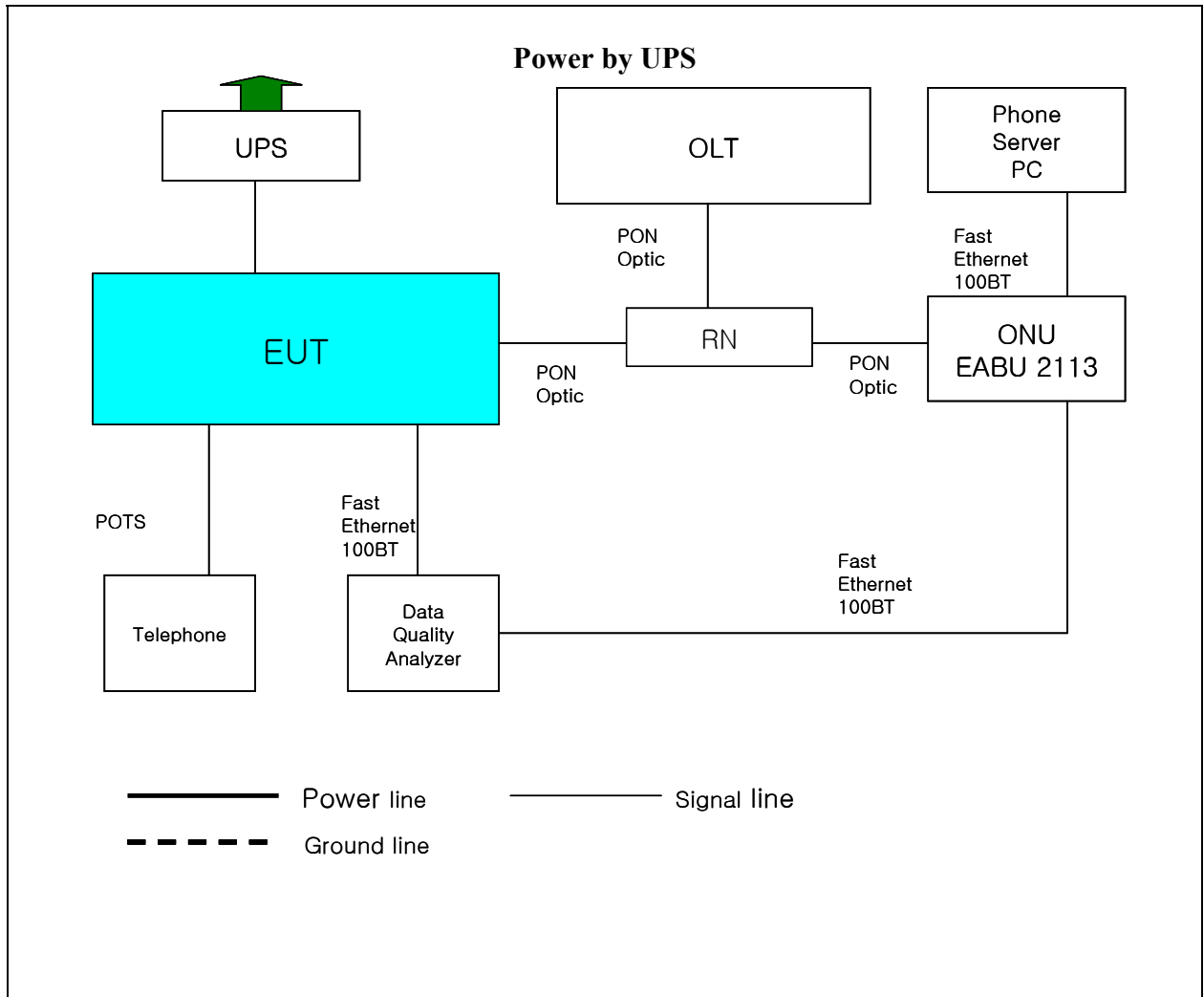
## 2. EUT Operation Modes:

Mode #	Description
1	<p><b>Communication link and Data transmission function</b></p> <p>Emission &amp; Immunity tests have been performed by establishing optic communication links between ONT and OLT PI through RN interface. To simulator and check the optic communication link quality, the Data Quality Analyzer(MD1230A) was used for Ethernet packet data sending / receiving of 100 Mbps LAN port. Telephone was connected to POTS port and Phone service was established Through Phone server.</p>

## 3. EUT Configurations:







#### 4. CONDUCTED EMISSION

<b>TEST: Limits of mains terminal disturbance voltage</b>				
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			
Test Environment				
Parameters recorded during the test	Laboratory Ambient Temperature		24 °C	
	Relative Humidity		43 %	
	Frequency range on each side of line		Measurement Point	
Fully configured sample scanned over the following frequency range	150kHz to 30MHz		Mains Power Input	
<b>Limits - Class A</b>				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Results	Average	Results
0.15 to 0.50	79	N/A	66	N/A
0.50 to 30	73	N/A	60	N/A
<b>Limits - Class B</b>				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Results	Average	Results
0.15 to 0.50	66 to 56	Pass	56 to 46	Pass
0.50 to 5	56	Pass	46	Pass
5 to 30	60	Pass	50	Pass
Supplementary information: None				

<b>Test Equipment Used</b>					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	Rohde&Schwarz	ESI	834000/002	2008. 11. 18	2009. 11. 18
LISN	EMCO	3825/2	9502-2334	2009. 06. 18	2010. 06. 18
ISN	T800	Teseq GmbH	26085	2009. 06. 18	2010. 06. 18

**Table 1. Test data for conducted emission :**

**AC/DC Adapter mode**

Test Frequency (MHz)	Correction Factor (dB)		Quasi-Peak (dBuV)			Average (dBuV)		
	LISN	Cable	Limit	Test Result	Line	Limit	Test Result	Line
0.1843	0.00	0.03	79	42.0	L2	66	33.2	L2
0.2452	0.00	0.03	79	38.6	L1	66	34.5	L2
0.3057	0.00	0.03	79	36.8	L1	66	32.5	L1
2.8798	0.01	0.12	73	38.2	L1	60	33.1	L1
3.8249	0.01	0.13	73	37.5	L2	60	32.2	L2
15.1601	-0.10	0.25	73	43.1	L2	60	42.3	L2
17.9915	-0.12	0.28	73	40.3	L2	60	39.9	L2
29.8820	-0.17	0.39	73	45.7	L1	60	44.5	L1

**Note:**

1. Margin (dB)= Limit (dBuV) - Level (dBuV)
2. If no frequencies are specified in the tables, no measurement for quasi-peak or average was necessary.

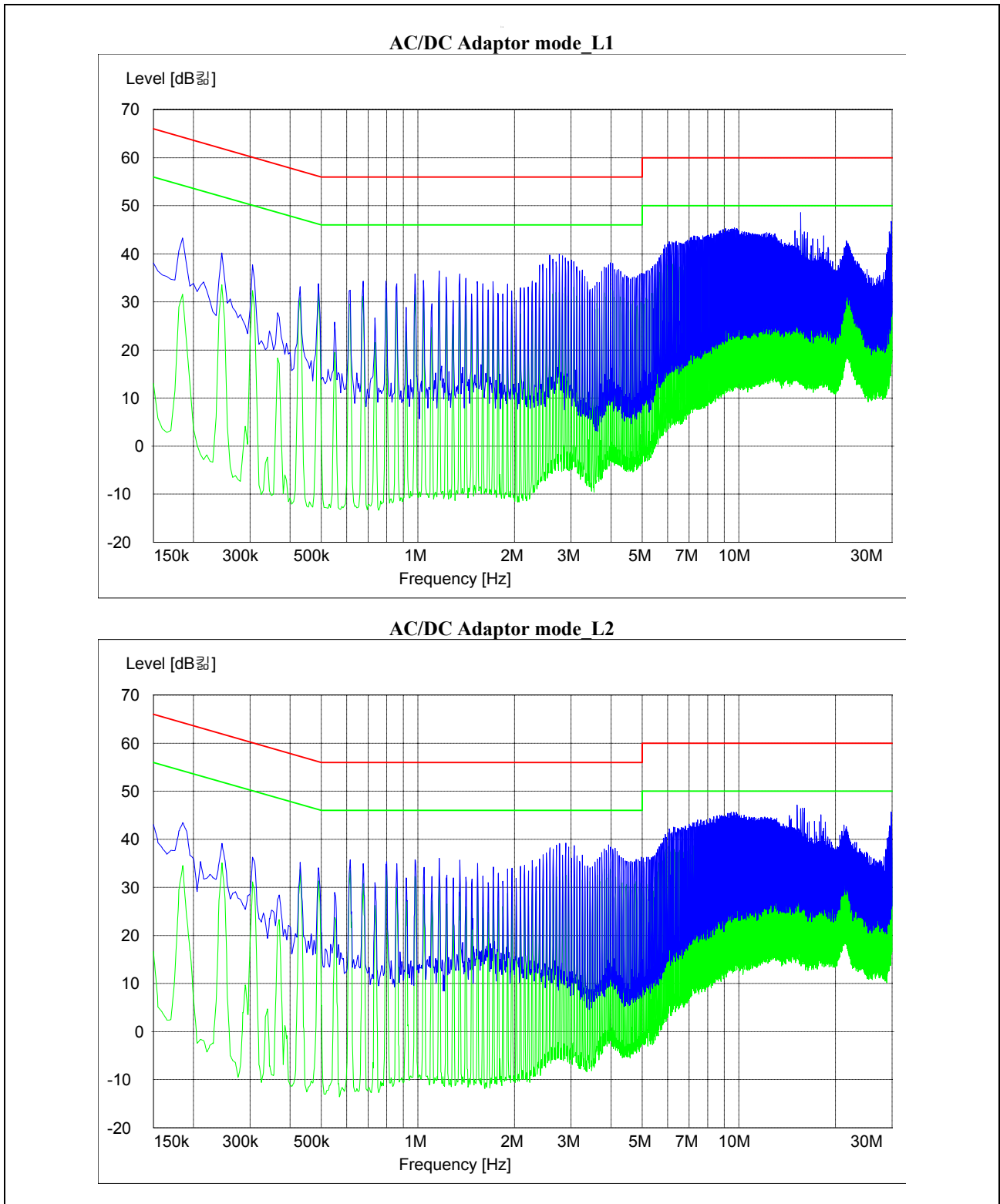
**UPS Power supply mode**

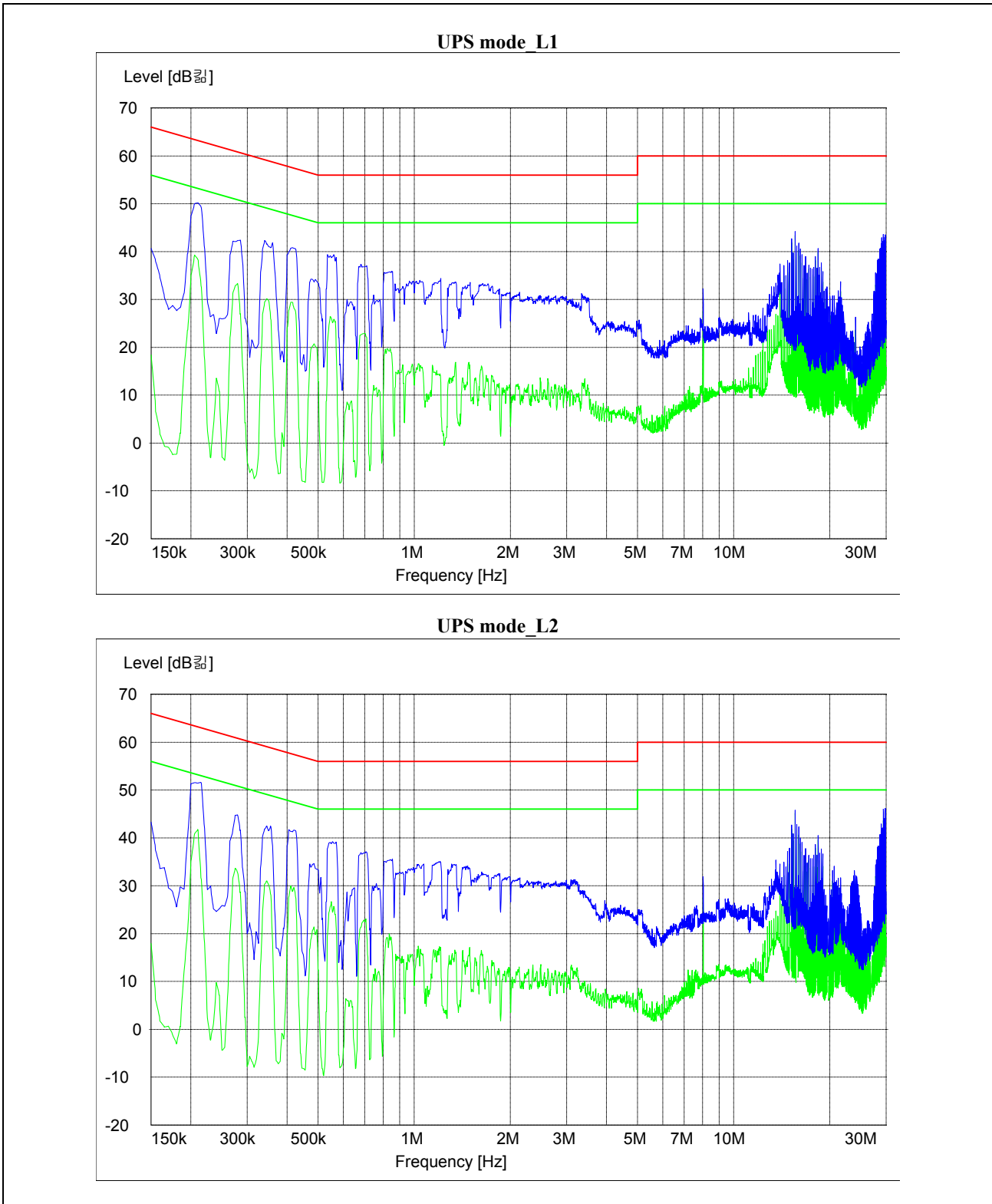
Test Frequency (MHz)	Correction Factor (dB)		Quasi-Peak (dBuV)			Average (dBuV)		
	LISN	Cable	Limit	Test Result	Line	Limit	Test Result	Line
0.2090	0.00	0.03	79	47.2	L1	66	39.1	L1
0.2014	0.00	0.03	79	47.7	L2	66	37.2	L2
0.2974	0.00	0.03	79	41.4	L2	66	33.1	L2
0.3504	0.00	0.04	79	39.2	L2	66	29.6	L1
0.4106	0.00	0.04	79	39.0	L2	66	29.3	L2
0.5490	0.00	0.05	73	37.0	L2	60	25.4	L2
15.5692	-0.10	0.25	73	47.5	L2	60	47.3	L2
29.8262	-0.17	0.39	73	41.9	L2	60	40.6	L2

**Note:**

1. Margin (dB)= Limit (dBuV) - Level (dBuV)
2. If no frequencies are specified in the tables, no measurement for quasi-peak or average was necessary.

Figure 1. Operating condition : Graphical representation of conducted emissions





### 5. RADIATED EMISSION

TEST: Limits for radiated disturbance		
Method	Measurements were made at 10m Anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter and 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
TEST ENVIRONMENT		
Parameters recorded during the test	Laboratory Ambient Temperature	24 °C
	Relative Humidity	43 %
Fully configured sample scanned over the following frequency range	Frequency range	Measurement Point
	30MHz – 2GHz	Product Enclosure
Limits - Class A		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Results
30 to 230	40	N/A
230 to 1000	47	N/A
1000 to 2000	60/80(AV/Peak, 3m distance)	N/A
Limits - Class B		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak(10m distance)	Results
30 to 230	30	Pass
230 to 1000	37	Pass
1000 to 2000	54/74(AV/Peak, 3m distance)	Pass
Supplementary information:		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde&Schwarz	ESI	834000/002	2008. 11. 18	2009. 11. 18
BiconiLog Antenna	EMCO	3142B	9910-1432	2009. 06. 18	2010. 06. 18
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-539	2008.03.24	2010. 03. 24
Antenna Mast	EMCO	1084	862557/010	N/A	N/A
A/M&T/T Controller	EMCO	1090	N/A	N/A	N/A

**Table 3. Radiated emission Test data :**

**[AC/DC Adaptor mode]: 30MHz ~ 1GHz\_10m distance**

Test Frequency (MHz)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Deg.)	Antenna Height (m)	Cable Loss (dB)	Antenna Factor (dB/m)	Level dBuV/m	Limit dBuV/m
47.60	QP	V	320	1.0	0.94	8.83	23.31	30
58.10	QP	V	261	3.1	1.04	6.78	22.44	30
107.54	QP	V	279	1.0	1.43	7.36	21.80	30
165.12	QP	V	93	1.0	1.77	9.02	27.29	30
375.04	QP	V	0	4.0	2.66	15.48	30.66	37
500.04	QP	H	355	2.1	3.04	18.45	36.16	37
625.04	QP	H	333	1.4	3.41	21.00	33.92	37
750.10	QP	H	284	1.0	3.73	22.44	35.20	37

**[AC/DC Adaptor mode]: 1GHz ~ 2GHz\_3m distance**

Test Frequency (GHz)	Polarity (V/H)	Antenna Height (m)	Cable Loss (dB)	Antenna Factor (dB/m)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Limit (dBuV/m)
1.0003	V	1.0	4.43	24.40	45.94	38.80	54
1.0507	V	1.0	4.45	24.57	43.38	35.86	54
1.0663	V	1.0	4.45	24.57	46.45	36.02	54
1.0882	V	1.0	4.60	24.74	43.49	35.43	54
1.1257	V	1.0	4.65	24.90	48.40	42.56	54
1.7509	V	1.0	6.29	26.91	48.23	41.18	54

**[UPS Power supply mode]: 30MHz ~ 1GHz\_10m distance**

Test Frequency (MHz)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Deg.)	Antenna Height (m)	Cable Loss (dB)	Antenna Factor (dB/m)	Level dBuV/m	Limit dBuV/m
124.98	QP	V	151	4.0	1.54	6.81	26.87	30
148.84	QP	V	118	1.0	1.67	7.92	23.75	30
169.50	QP	V	87	1.0	1.79	9.15	26.96	30
250.04	QP	V	115	1.0	2.18	11.77	33.38	37
375.04	QP	V	149	1.0	2.66	15.48	30.49	37
500.04	QP	V	173	3.7	3.04	18.45	31.87	37
625.04	QP	V	345	3.9	3.41	21.00	30.21	37
750.01	QP	H	317	2.2	3.73	22.44	28.42	37

**[UPS Power supply mode]: 1GHz ~ 2GHz\_3m distance**

Test Frequency (GHz)	Polarity (V/H)	Antenna Height (m)	Cable Loss (dB)	Antenna Factor (dB/m)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Limit (dBuV/m)
1.0006	V	1.0	4.43	24.40	48.68	41.27	54
1.0258	V	1.0	4.45	24.57	46.78	34.32	54
1.0372	V	1.0	4.45	24.57	44.92	37.19	54
1.0507	V	1.0	4.45	24.57	46.01	38.32	54
1.0633	V	1.0	4.45	24.57	47.66	37.82	54
1.1257	V	1.0	4.65	24.90	49.89	43.81	54
1.1878	V	1.0	4.78	25.07	47.87	38.66	54
1.7509	V	1.0	6.29	26.91	47.47	39.23	54
1.7740	V	1.0	6.29	26.91	47.59	40.00	54



## Appendix A\_Accreditations and Authorizations



KCC: Designated as a testing laboratory by Radio Research Agency in accordance with the Regulation on Designation of Testing Laboratory for Information and Communication Equipment. Registration No. : KR020



FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland and accepted in a letter dated May 30, 2007 (Reg. No. 90762). As a Conformity Assessment Body (CAB), our organization is designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Part 15 and 18 of the Commission's Rules in a letter dated September 6, 2006 (Reg. No. 614154).

### Appendix B\_Measurement Uncertainties

Test	Uncertainty
Radiated Emissions	±4.08 dB
Conducted Emissions	±2.0 dB