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Project: 09CA08706
File: TC8329
Report: 09CA08706-FCC
Date: March 9, 2009
Model: NS 16 1G NN, PNY16-ONT-1250

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

TEST REPORT DETAILS

Test Report No.	09CA08706-FCC
Tests Performed By:	UL Korea Ltd. 33rd FL. Gangnam Finance Center, 737 Yeoksam-dong, Kangnam-ku, Seoul, 135-984, Korea
Test site:	Chungbuk Technopark Electronics & Information Center 685-3 Yangcheong-ri, Ochang-eup, Cheongwon-gun, Chungcheongbuk-do, 363-883, Korea
Applicant:	LG-NORTEL Co., Ltd. LG R&D Complex 533 Hogye-1dong, Dongan-gu, Anyang-si, Kyungki-do, 431-749, Korea
Applicant Contact: Title: Phone: E-mail:	Mr. Young-Ho Son Chief Research Engineer 82-31-450-4263 yhsonb@lg-nortel.com
Test Report Date:	March 9, 2009
Product Type:	WDM-PON ONT
FCC ID:	TUJNS161GNN
Product standards:	FCC Part 15 Subpart B Class B
FCC Classification :	Class B Computing Device Peripheral
FCC Procedure :	Certification
Model Number:	NS 16 1G NN
Additional model Number:	PNY16-ONT-1250 This report covers multi-model name which is identical to the basic model according to the manufacturer's specification.
Trade Name:	TurboLIGHT16, PONy Express™ 16
Sample Serial Number:	None (Proto type)
Sample Receive Date:	February 23, 2009
Testing Start Date:	February 23, 2009
Date Testing Complete:	February 23, 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.
March 9, 2009

Reviewed by
Kyungyong, Kim, EMC Section Manager
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UL Korea Ltd.
March 9, 2009

Report Directory

1. EQUIPMENT UNDER TEST(EUT)

1.1 Equipment Description SPEC

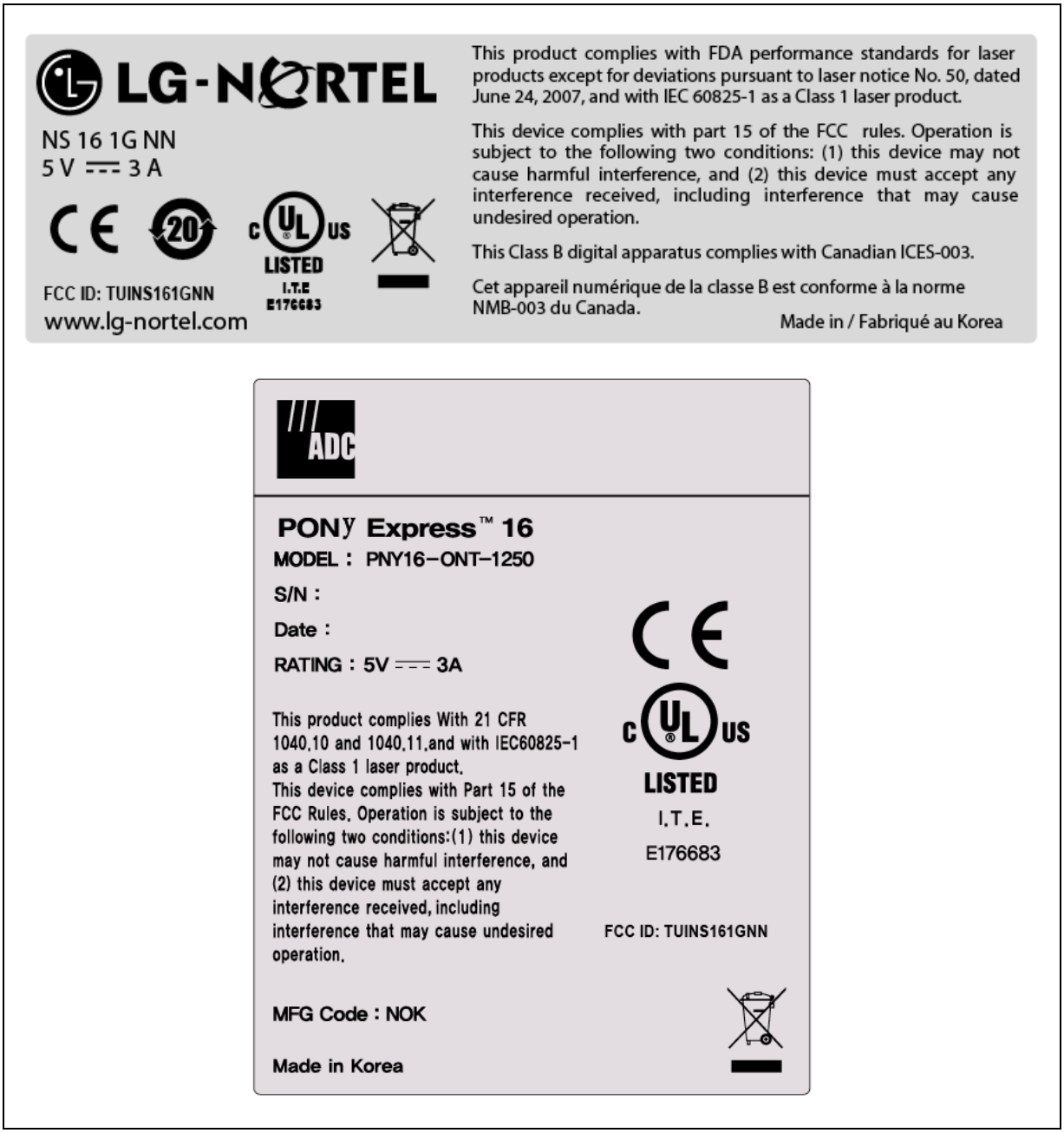
SpeedLIGHT 16 and T urboLIGHT 16 are designed for the realization of high-speed access networks. The equip ment enables symmetric and dedicated high-band width optical data links to deliver services such as video, Internet and voice communications. Existing subscriber devices such as xDSL or cable-modems have limitations in distance and data rates. SpeedLIGHT 16 and T urboLIGHT 16 are optimum solutions for complementing these limitations by enabling efficient and cost-effective optical connectivity for FTTC and FTTB network applications.

SpeedLIGHT 16 and/or TurboLIGHT 16 system consists of Optical Line Terminals (OLT), Remote Nodes (RN) and Optical Network Terminals (ONT). A fiber trunk path is used from CO to the passive RN in the subscriber area. A fiber trunk path is used from the RN to each ONT . The ONT can be connected to an electrical switch for connectivity to multiple users. The ONT converts the optical signal from the OLT into an electric signal at the remote location. It also converts the electric signal into an optical signal for transmission to the OLT . The ONT is auto matically allocated with a dense WDM optical wavelength for a dedicated and independent connection to the OLT .

The following are the technical specification of the ONT product

Optical Interface	
Optical cable	Single mode optical fiber
Line Rate	1.25 Gbps
Ooptical Interface	SC/APC connetor
Input optical data power	-20 dBm to -2 dBm(E-band)
Output optical data power	-1.5 dBm to +6 dBm(C-band)
BLS input power	-7.5 dBm to +5 dBm(C-band)
Ethernet Port	
Operation mode	Giga bit Ethernet / Auto-Negotiation Mode
Electrical interface	RJ-45 connector
Environmental Conditions	
Operating temperature	0℃ ~ 50℃
Operating humidity	5% ~ 85%

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.	NS 16 1G NN	-
AE	WDM-PON OLT	LG-NORTEL Co., Ltd	NS 16 1G CO	-
AE	Adapter	AULT KOREA Corp	PW118	-
AE	RN	LG-NORTEL Co., Ltd	NS 16 1G PN	-
AE	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	AC	1.5m	Unshielded	Connected with EUT/Adaptor
2	Fiber Optic	TP	20.0m	Optic cable	Connected to RN (OPTICAL)
3	Gigabit Ethernet	TP	20.0m	unshielded	Connected to Performance Analysis System
4	1000Base-LX/SX	TP	20.0m	Optic cable	Connected to Data Quality Analyzer

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
100.0	I²C	1250.0	Data(Tranceiver to 88E6161 SW)
100.0	MII Ethernet	25.0	SW Clock
133.0	SDRam bus	250.0	TX
25.0	CPU Clock		

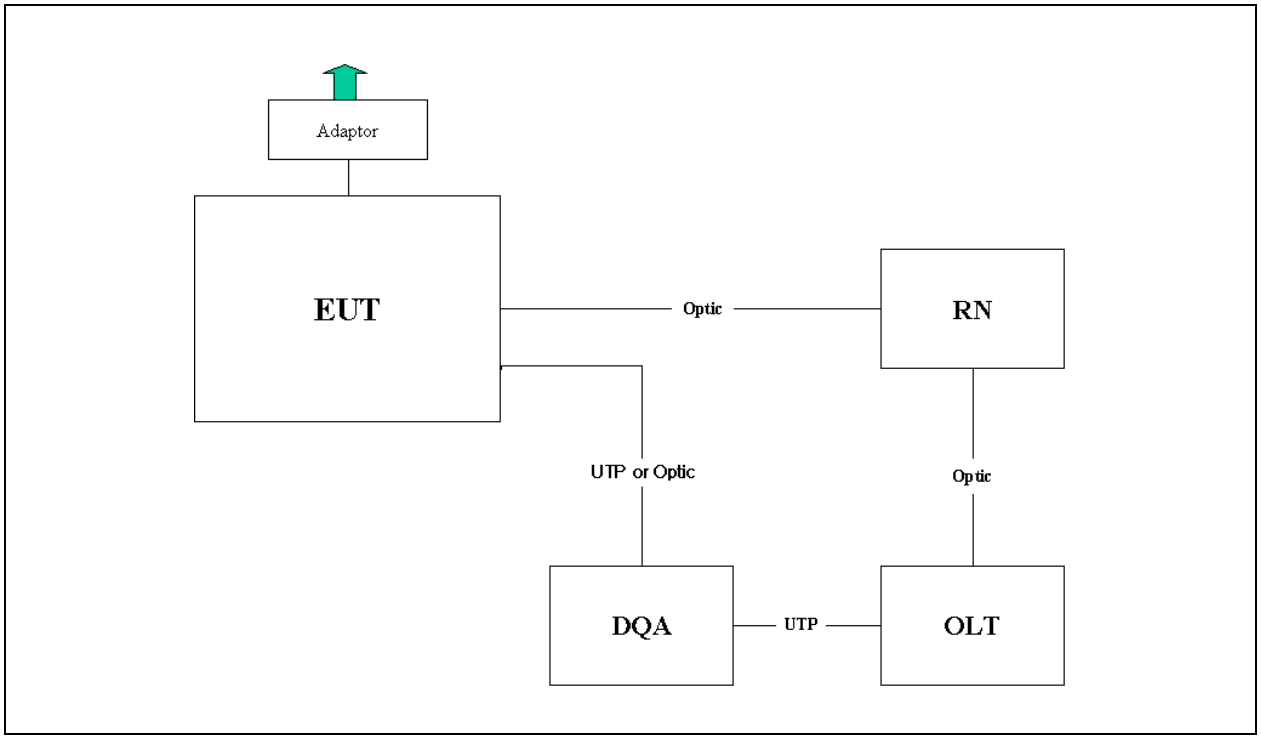
1.6 Power Interface:

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	100-250Vac	0.5	-	50 - 60HZ	Single Phase	Input of AC/DC Adapter
Rated	+5 DC	3.0	-	-	-	Output of AC/DC Adapter
Rated	+5 DC	2.0	10.0	-	-	EUT

2. EUT Operation Modes:

Mode #	Description
1	**Communication link and Data transmission function(Optical mode)** Emission tests have been performed by establishing optic communication links between ONT and OLT OCU 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 1000 Mbps SFP port of EUT.
2	**Communication link and Data transmission function(UTP mode)** Emission tests have been performed by establishing optic communication links between ONT and OLT OCU 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 1000Mbps GIGABIT ETHERNET port of EUT.

3. EUT Configurations:



4. CONDUCTED EMISSION

	TEST: Limits of mains terminal disturbance voltage		
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	21.6 °C	
	Relative Humidity	32.7 %	
	Frequency range on each side of line	Measurement Point	
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	Mains Power Input	

Limits - Class A

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

Limits - Class 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

Test Equipment Used

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	Rohde&Schwarz	ESIB 26	100359	2008.05.26	2009.05.26
Artificial Main Network	Rohde&Schwarz	ESH2-Z5	100146	2008.03.28	2009.03.28

Table 1. Test data for conducted emission :

Optical Mode

Frequency (MHz)	Correction Factor		Line	Quasi-peak			Average		
	LISN	Cable		Limit (dBuV)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Reading (dBuV)	Level (dBuV)
0.200	0.15	9.75	N	63.60	40.70	50.60	53.60	32.30	42.20
0.336	0.14	9.76	H	59.30	32.20	42.10	49.30	31.10	41.00
0.610	0.11	9.79	H	56.00	16.40	26.30	46.00	8.90	18.80
0.674	0.11	9.79	H	56.00	32.60	42.50	46.00	31.00	40.90
0.674	0.11	9.79	N	56.00	28.20	38.10	46.00	27.90	37.80
0.806	0.19	9.81	H	56.00	29.20	39.20	46.00	28.90	38.90
1.954	0.24	9.86	H	56.00	30.80	40.90	46.00	29.10	39.20
2.159	0.22	9.88	N	56.00	31.50	41.60	46.00	24.20	34.30
2.224	0.22	9.88	H	56.00	30.30	40.40	46.00	17.50	27.60
2.292	0.22	9.88	H	56.00	29.90	40.00	46.00	24.90	35.00
2.361	0.21	9.89	H	56.00	31.90	42.00	46.00	27.10	37.20
2.634	0.20	9.90	N	56.00	30.20	40.30	46.00	23.40	33.50
2.968	0.28	9.92	H	56.00	30.10	40.30	46.00	24.90	35.10
4.247	0.28	10.02	H	56.00	28.90	39.20	46.00	27.50	37.80
4.786	0.25	10.05	N	56.00	25.60	35.90	46.00	25.20	35.50

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

UTP Mode

Frequency (MHz)	Correction Factor		Line	Quasi-peak			Average		
	LISN	Cable		Limit (dBuV)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Reading (dBuV)	Level (dBuV)
0.202	0.14	9.76	N	63.50	41.80	51.70	53.50	35.20	45.10
0.610	0.11	9.79	H	56.00	27.40	37.30	46.00	26.30	36.20
0.674	0.11	9.79	H	56.00	33.10	43.00	46.00	28.40	38.30
0.744	0.20	9.80	H	56.00	29.30	39.30	46.00	27.10	37.10
1.212	0.18	9.82	H	56.00	28.30	38.30	46.00	27.40	37.40
1.618	0.15	9.85	H	56.00	29.80	39.80	46.00	22.20	32.20
1.823	0.15	9.85	N	56.00	26.90	36.90	46.00	24.90	34.90
2.095	0.23	9.87	N	56.00	24.90	35.00	46.00	17.40	27.50
2.159	0.22	9.88	H	56.00	29.70	39.80	46.00	26.00	36.10
2.224	0.22	9.88	N	56.00	29.00	39.10	46.00	25.20	35.30
2.292	0.22	9.88	N	56.00	30.60	40.70	46.00	19.90	30.00
2.361	0.21	9.89	H	56.00	32.60	42.70	46.00	28.60	38.70
2.433	0.21	9.89	N	56.00	27.10	37.20	46.00	23.40	33.50
2.634	0.20	9.90	H	56.00	26.80	36.90	46.00	24.10	34.20
2.769	0.20	9.90	N	56.00	28.30	38.40	46.00	22.70	32.80
2.968	0.18	9.92	N	56.00	33.40	43.50	46.00	27.10	37.20

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

Figure 1. Graphical representation of conducted emissions_Optical Mode

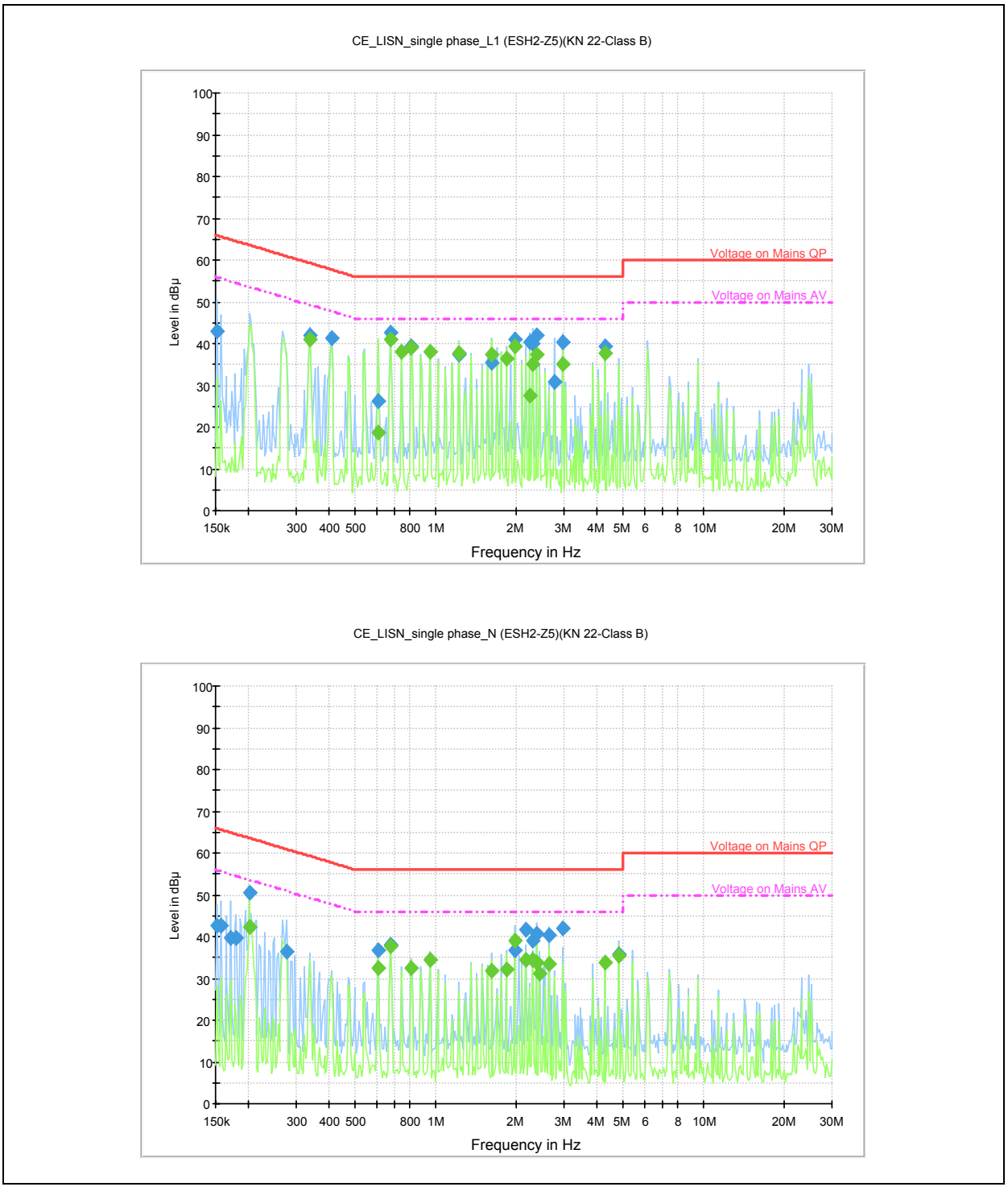
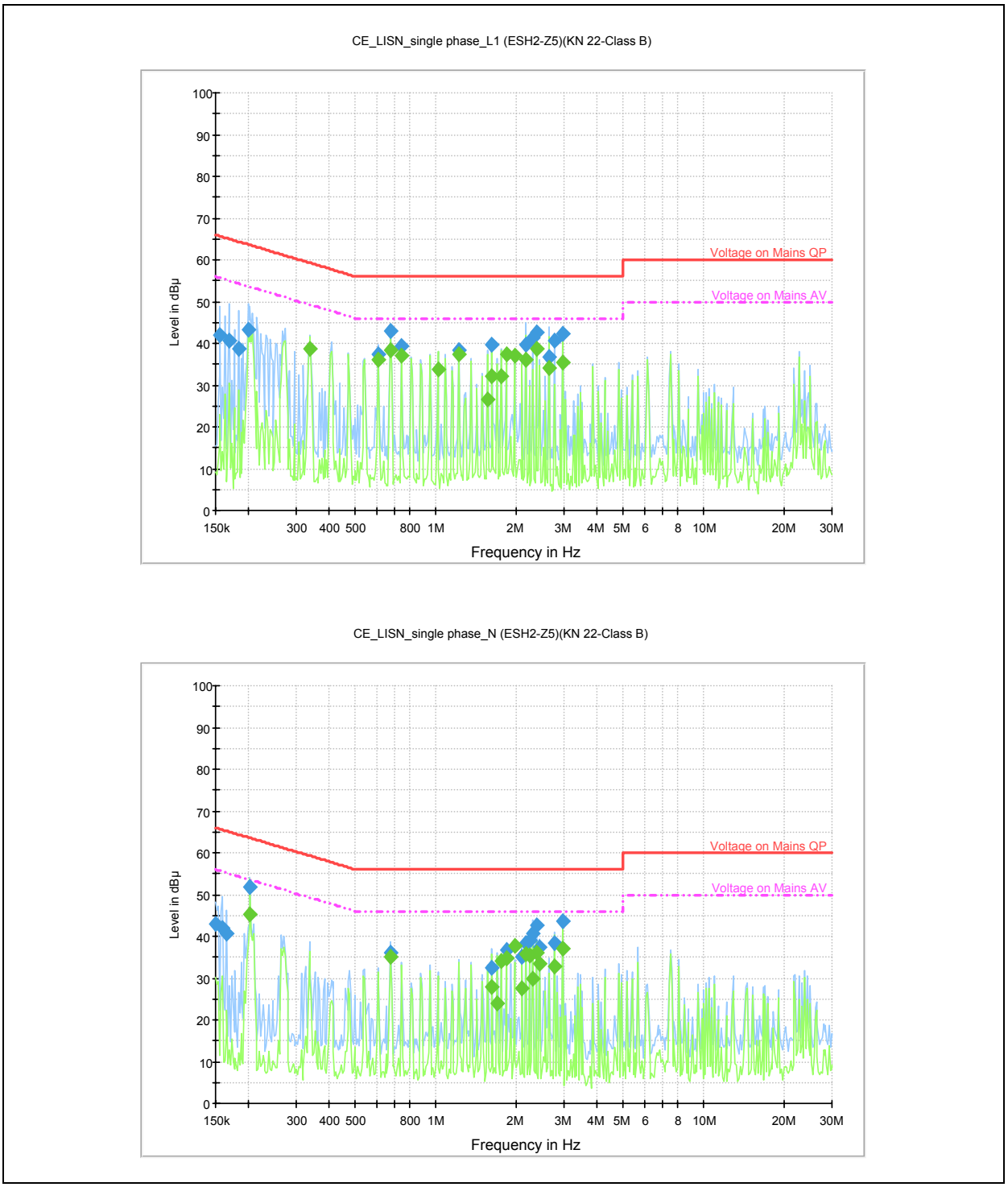


Figure 2. Graphical representation of conducted emissions_UTP Mode



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	21.6 °C
	Relative Humidity	32.7 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 6.25GHz	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

Limits - Class B		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak(10m distance)	Results
30 to 230	30	Pass
230 to 1000	37	Pass
Frequency (MHz)	Average(3m distance)	Results
1000 to 6250	54	Pass

Supplementary information:

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Receiver	Rohde & Schwarz	ESIB26	100359	2008.05.26	2009.05.26
BiconiLog ANT	CBL6112D	Schaffner	21784	2008.04.21	2009.04.21
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-539	2008.03.24	2010.03.24
Position controller	Inn-co	CO 2000	11261105/L	-	-

Table 2 Radiated emission Test data : Optical Mode

30MHz~1GHz

Frequency (MHz)	Reading (dBuV)	Polarity	Antenna Height (m)	Correction Factor		Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
				Antenna (dB/m)	Cable (dB)			
54.15	6.00	V	1.00	6.56	1.14	30.00	13.70	16.30
101.51	3.50	V	2.05	10.75	1.55	30.00	15.80	14.20
145.67	2.90	V	1.05	10.64	1.96	30.00	15.50	14.50
218.50	2.30	V	1.00	11.57	2.33	30.00	16.20	13.80
250.03	8.20	V	1.00	13.15	2.55	37.00	23.90	13.10
500.04	11.70	H	2.00	16.99	3.81	37.00	32.50	4.50
Supplementary information: This table is to be use when Gain/Loss and Transducer Factors are provided separately.								

Above 1GHz

Frequency (MHz)	Reading(AV) (dBuV)		Pol.	Ant. Height (m)	Correction Factor			Limit (dBuV/m)	Level (dBuV/m)		Margin (dB)
	Peak	AV			Ant. (dB/m)	Cable (dB)	Amp. (dB)		Peak	AV	
1108.22	57.10	45.00	V	1.00	24.08	4.72	-41.00	54.00	44.90	32.80	21.20
1234.47	61.90	36.60	V	1.00	24.47	4.93	-41.00	54.00	50.30	25.00	29.00
1739.48	59.90	44.20	H	1.00	24.67	5.93	-41.70	54.00	48.80	33.10	20.90
2010.02	62.20	42.70	V	1.00	25.95	6.25	-42.10	54.00	52.30	32.80	21.20
2100.20	57.80	40.40	V	1.00	27.22	6.28	-42.10	54.00	49.20	31.80	22.20
2478.96	52.30	34.50	H	1.00	27.54	6.96	-42.20	54.00	44.60	26.80	27.20
4625.25	46.80	32.60	H	1.00	30.79	9.81	-42.50	54.00	44.90	30.70	23.30

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

Table 3. Radiated emission Test data : UTP Mode

30MHz~1GHz

Frequency (MHz)	Reading (dBuV)	Polarity	Antenna Height (m)	Correction Factor		Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
				Antenna (dB/m)	Cable (dB)			
42.66	6.70	V	1.95	11.07	1.03	30.00	18.80	11.20
375.03	14.40	H	2.50	15.45	3.25	37.00	33.10	3.90
500.03	9.60	H	2.00	16.99	3.81	37.00	30.40	6.60
533.41	5.90	H	1.05	17.43	3.97	37.00	27.30	9.70
Supplementary information: This table is to be use when Gain/Loss and Transducer Factors are provided separately.								

Above 1GHz

Frequency (MHz)	Reading(AV) (dBuV)		Pol.	Ant. Height (m)	Correction Factor			Limit (dBuV/m)	Level (dBuV/m)		Margin (dB)
	Peak	AV			Ant. (dB/m)	Cable (dB)	Amp. (dB)		Peak	AV	
1108.22	54.60	42.00	V	1.00	24.08	4.72	-41.00	54.00	42.40	29.80	24.2
1234.47	59.40	35.70	V	1.00	24.47	4.93	-41.00	54.00	47.80	24.10	29.9
1739.48	59.00	45.60	H	1.00	24.67	5.93	-41.70	54.00	47.90	34.50	19.5
2010.02	58.50	38.90	V	1.00	25.95	6.25	-42.10	54.00	48.60	29.00	25
2100.20	57.70	39.70	V	1.00	27.22	6.28	-42.10	54.00	49.10	31.10	22.9
2478.96	51.80	33.00	H	1.00	27.54	6.96	-42.20	54.00	44.10	25.30	28.7
4625.25	47.20	32.60	H	1.00	30.79	9.81	-42.50	54.00	45.30	30.70	23.3

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

Appendix A: Accreditations and Authorizations

MIC: Designated as a testing laboratory by Radio Research Laboratory in accordance with the Regulation on Designation of Testing Laboratory for Information and Communication Equipment. Registration No. : KR0017

KOLAS: Accredited by Korea Laboratory Accreditation Scheme (KOLAS) as Testing Laboratory in accordance with the provisions of Article 23 of the National Standards Act. These criteria encompass the requirements of ISO/IEC 17025:2000. For a scope listing search at http://kolas.kats.go.kr/02_english/m02_01_s01.asp?OlapCode=KOLU19

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 July 17, 2005 (Reg. No. 553281). 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 July 14, 2005.

VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: (Radiated Emissions) R-2414, (Conducted Emissions) C-2641.

Appendix B_Measurement Uncertainties

Test	Uncertainty
Radiated Emissions	±3.74 dB
Conducted Emissions	±2.42 dB