

Dates of Tests: February 04 ~ 21, 2008
Test Report S/N: LR500190802A
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID.

SRVLWS110F

APPLICANT

LINUX CO., LTD.

FCC Classification	:	FCC Part 15 Spread Spectrum Transceiver (DSS)
Manufacturing Description	:	IP DVR SERVER
Manufacturer	:	LINUX CO., LTD.
Model name	:	LWS-110F / LWS-110
Test Device Serial No.:	:	Identical prototype
Rule Part(s)	:	FCC Part 15.247 Subpart C; ANSI C-63.4-2003
Frequency Range	:	2412 ~ 2462MHz
RF power	:	18.90dBm Peak Conducted (802.11b) 18.44dBm Peak Conducted (802.11g)
Data of issue	:	February 22, 2008

This test report is issued under the authority of:

The test was supervised by:



Dong -Min JUNG, Technical Manager



Kyung-Taek LEE, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.



NVLAP LAB Code.: 200723-0

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1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822
 Web site : <http://www.ltalab.com>
 E-mail : chahn@ltalab.com
 Telephone : +82-31-323-6008
 Facsimile : +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2008-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2009-06-20	EMC accredited Lab.
FCC	U.S.A	610755	2008-03-28	FCC filing
VCCI	JAPAN	R2133, C2307	2008-06-22	VCCI registration
IC	CANADA	IC5799	2008-04-23	IC filing

2. Information's about test item

2-1 Applicant & Manufacturer

Company name : LINUDIX Co.,Ltd.
 Address : Anyang K-Center 6F, 1591-9, Kwanyang-Dong, Dongan-Gu, Anyang,
 : Gyeonggi, Korea (431-060)
 TEL / FAX : +82-31-381-4294 / +82-31-381-7684

2-2 Equipment Under Test (EUT)

Trade name : IP DVR SERVER
 FCC ID : SRVLWS110F
 Model name : LWS-110F / LWS-110
 Serial number : Identification
 Date of receipt : February 04, 2008
 EUT condition : Production, not damaged
 Antenna type : Monopole Antenna Max. Gain 4.33 dBi
 Frequency Range : 2412MHz ~ 2462MHz (DSSS)
 RF output power : 18.90dBm Peak Conducted (802.11b)
 18.44dBm Peak Conducted (802.11g)
 Type of Modulation : CCK, DQPSK, DBPSK for DSSS
 64QAM, 16QAM, QPSK, BPSK for OFDM
 Transfer Rate : 11/5.5/2/1Mbps for 802.11b
 54/48/36/24/18/12/9/6Mbps for 802.11g
 Power Source : 120V, 60Hz

2-3 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
PC	HP COMPAG dx2200	CNG6500RX9	HP
Monitor	VS11353	E060T0404	View Sonic
Keyboard	SK-8115	641-OEWW	DELL
Mouse	M056U0	520107013	DELL
Print	STYLUS C65	N/A	EPSON
Dome Camera	SK-D106-TERMINAL	N/A	LINUDIX
-	-	-	-

3. Test Report

3.1 Summary of tests

	Parameter	Limit	Test Condition	Status (note 1)
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I. FCC Part Section(s)

802.11b/g Module is certified by FCC(FCC ID: SRVLWS110F).

II. Additional items

15.209	Field Strength of Harmonics	< 54 dBuV (at 3m)	Radiated	C
15.207	AC Conducted Emissions	EN 55022	Line Conducted	C
15.203	Antenna requirement	-	-	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

→ Antenna Requirement

The LINUDIX Co., Ltd. 'LWS-110F' unit complies with the requirement of §15.203.

The antenna connector is the Reverse type SMA connector.

The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003

3.2 Technical Characteristics Test

3.2.1 Field Strength of Harmonics

Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10th harmonic.

RBW = 100 kHz (30MHz ~ 1 GHz)

VBW \geq RBW

= 1 MHz (1 GHz ~ 10th harmonic)

Span = 100 MHz

Detector function = peak

Trace = max hold

Sweep = auto

Measurement Data: Complies

Minimum Standard: FCC Part 15.109

Frequency (MHz)	Limit (uV/m) @ 10m
30 ~ 88	90 **
88 ~ 216	150 **
216 ~ 960	210 **
Above 960	300

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

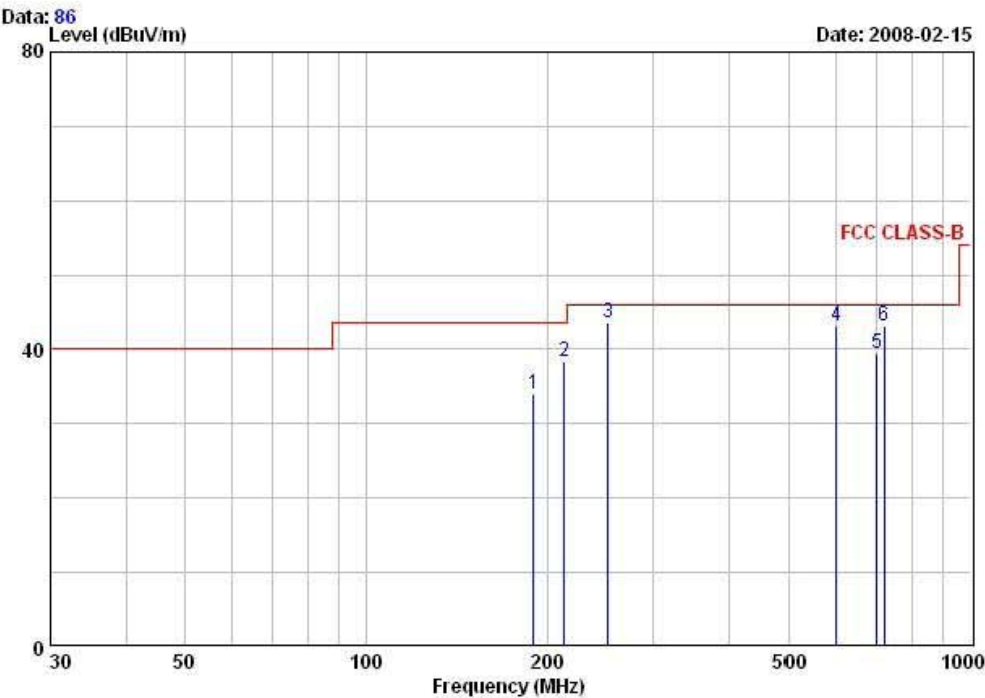
1. Measurement Data: other spurious



243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT/Model No.: LWS-110F TEST MODE: WIRELESS 802.11b mode

Temp Humi : 6 / 34 Tested by: B.S.KIM



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV	dB	QK dBuV/m	dBuV/m	dB	cm	deg	
1	189.56	46.60	-12.57	34.03	43.50	9.47	231	212	HORIZONTAL
2	213.46	51.10	-12.80	38.30	43.50	5.20	117	322	HORIZONTAL
3	251.90	54.60	-11.05	43.55	46.00	2.45	100	271	VERTICAL
4	600.36	45.90	-2.84	43.06	46.00	2.94	215	298	HORIZONTAL
5	700.35	41.00	-1.45	39.55	46.00	6.45	122	131	HORIZONTAL
6	720.13	44.10	-0.98	43.12	46.00	2.88	151	332	HORIZONTAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT/Model No.: LWS-110F

TEST MODE: WIRELESS 802.11g mode

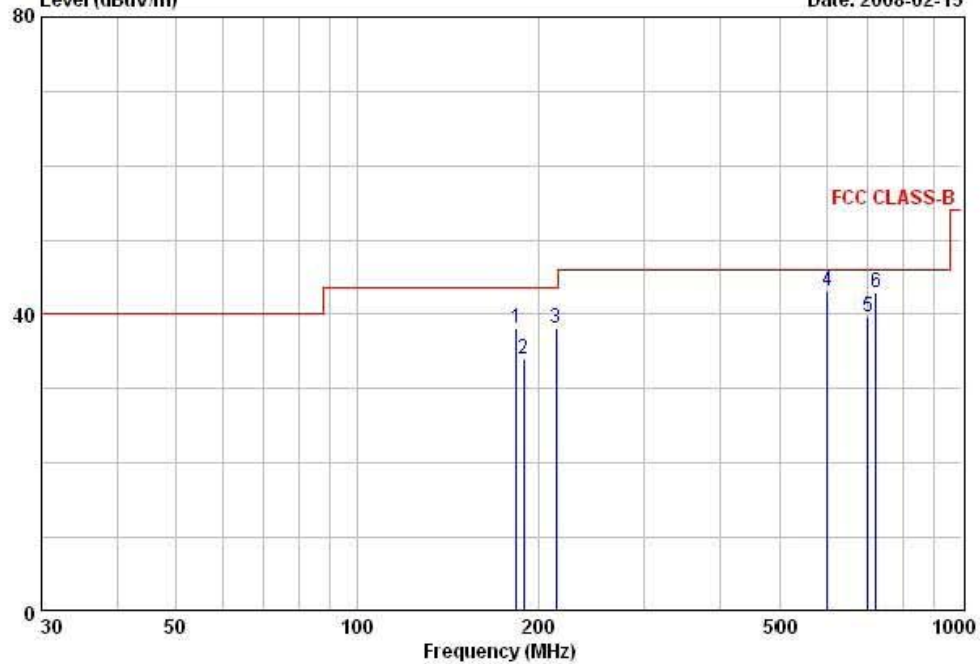
Temp Humi : 6 / 34

Tested by: B.S.KIM

Data: 87

Level (dBuV/m)

Date: 2008-02-15



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV	dB	QK dBuV/m	dBuV/m	dB	cm	deg	
1	184.02	50.00	-11.91	38.09	43.50	5.41	100	278	VERTICAL
2	189.34	46.50	-12.55	33.95	43.50	9.55	152	266	HORIZONTAL
3	213.79	51.00	-12.79	38.21	43.50	5.29	221	311	HORIZONTAL
4	600.00	46.10	-2.84	43.26	46.00	2.74	271	202	HORIZONTAL
5	700.40	41.10	-1.45	39.65	46.00	6.35	125	233	HORIZONTAL
6	720.79	44.00	-0.97	43.03	46.00	2.97	177	203	HORIZONTAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT/Model No.: LWS-110F

TEST MODE: CAMERA mode

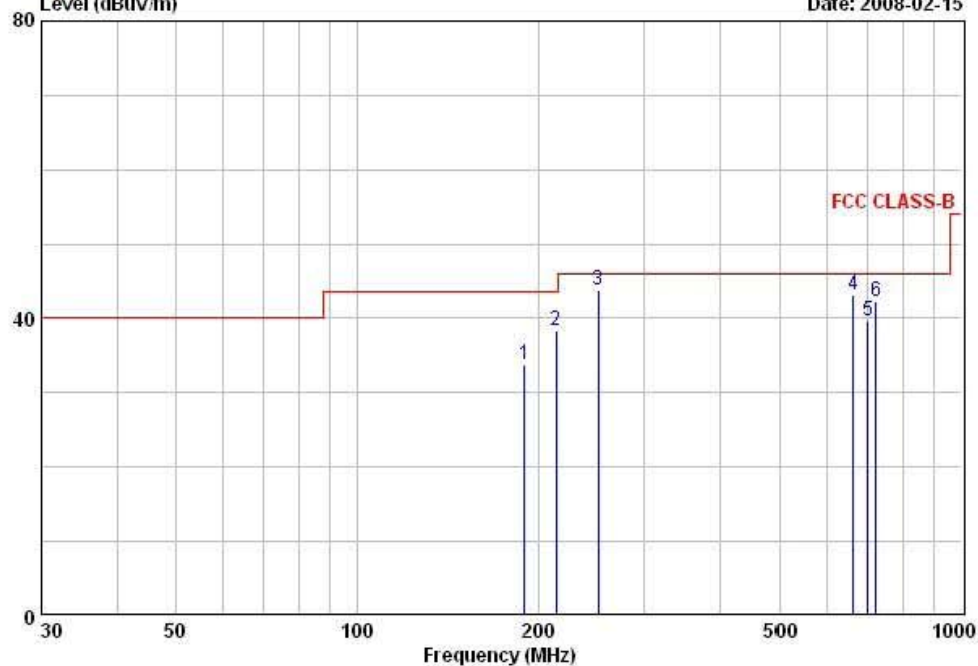
Temp Humi : 6 / 34

Tested by: B.S.KIM

Data: 85

Level (dBuV/m)

Date: 2008-02-15



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV	dB	QK dBuV/m	dBuV/m	dB	cm	deg	
1	189.85	46.30	-12.61	33.69	43.50	9.81	100	252	HORIZONTAL
2	213.79	51.10	-12.79	38.31	43.50	5.19	155	262	HORIZONTAL
3	251.78	54.80	-11.05	43.75	46.00	2.25	100	232	VERTICAL
4	660.80	45.20	-2.06	43.14	46.00	2.86	100	118	VERTICAL
5	700.34	41.20	-1.45	39.75	46.00	6.25	266	332	HORIZONTAL
6	721.00	43.30	-0.96	42.34	46.00	3.66	100	332	HORIZONTAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

3.2.2 AC Conducted Emissions

Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Measurement Data: Complies

- See next pages for actual measured spectrum plots.
- No emissions were detected at a level greater than 10dB below limit.

Minimum Standard: FCC Part 15.107/EN 55022 Class A

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

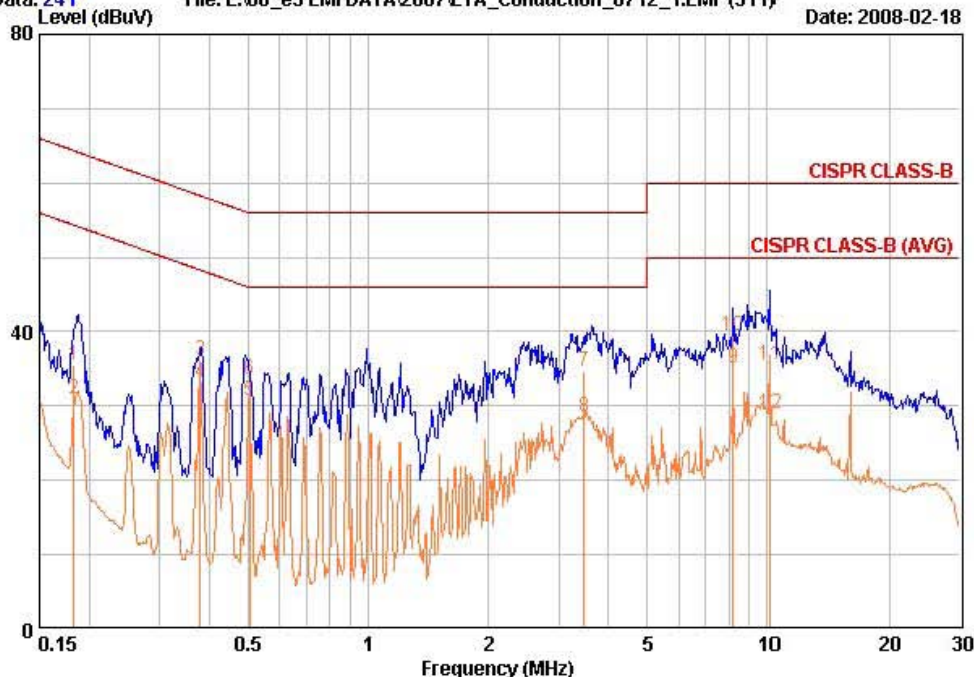
* Decreases with the logarithm of the frequency

AC Conducted Emissions –Line

243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-323-6008
Fax:+82-31-323-6010

EUT / Model No. : LWS-110F	Phase : LINE
Test Mode : WIRELESS 802.11b mode	Test Power : 120 / 60
Temp./Humi. : 23 / 36	Test Engineer : B.S.KIM

Data: 241 File: E:\00_e3 EMI DATA\2007\LTA_Conduction_0712_1.EMI (311) Date: 2008-02-18



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.183	35.30	30.70	0.32	35.62	31.02	64.35	54.35	28.73	23.33
0.379	35.90	32.80	0.36	36.26	33.16	58.30	48.30	22.04	15.14
0.505	33.30	30.40	0.29	33.59	30.69	56.00	46.00	22.41	15.31
3.472	34.10	28.00	0.55	34.65	28.55	56.00	46.00	21.35	17.45
8.188	38.80	34.50	0.64	39.44	35.14	60.00	50.00	20.56	14.86
10.118	34.60	28.00	0.91	35.51	28.91	60.00	50.00	24.49	21.09

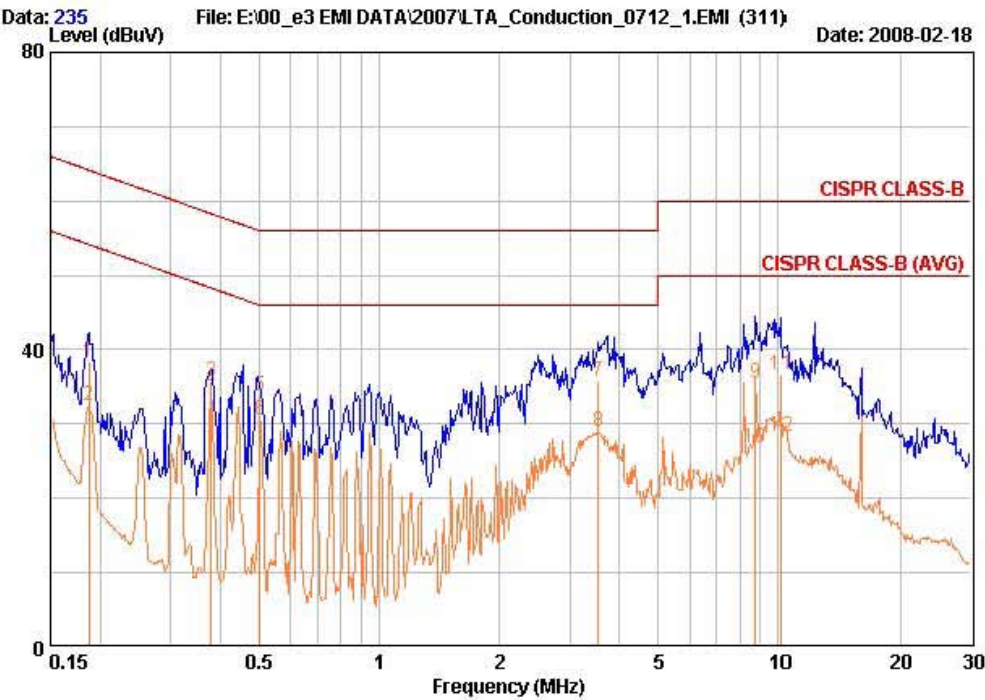
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –Neutral



243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-323-6008
Fax:+82-31-323-6010

EUT / Model No. : LWS-110F	Phase : NEUTRAL
Test Mode : WIRELESS 802.11b mode	Test Power : 120 / 60
Temp./Humi. : 23 / 36	Test Engineer : B.S.KIM



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.187	38.00	32.10	0.29	38.29	32.39	64.17	54.17	25.88	21.78
0.379	35.40	34.20	0.36	35.76	34.56	58.30	48.30	22.54	13.74
0.503	33.60	30.30	0.29	33.89	30.59	56.00	46.00	22.11	15.41
3.545	35.30	28.40	0.53	35.83	28.93	56.00	46.00	20.17	17.07
8.768	35.00	26.20	0.60	35.60	26.80	60.00	50.00	24.40	23.20
10.133	35.70	27.50	0.91	36.61	28.41	60.00	50.00	23.39	21.59

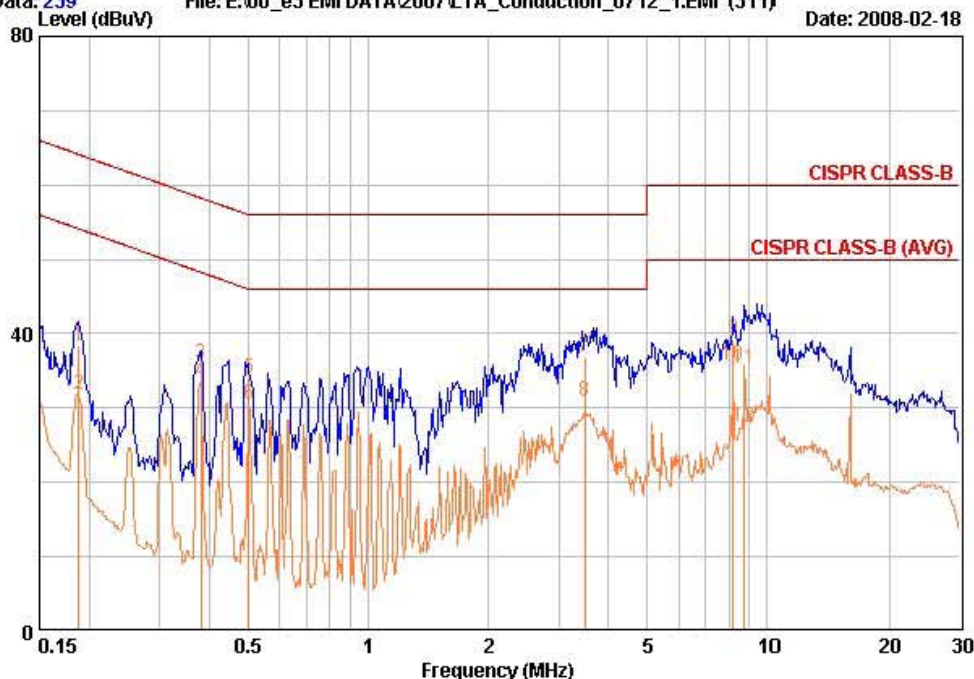
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –Line

243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-323-6008
Fax:+82-31-323-6010

EUT / Model No. : LWS-110F	Phase : LINE
Test Mode : WIRELESS 802.11g mode	Test Power : 120 / 60
Temp./Humi. : 23 / 36	Test Engineer : B.S.KIM

Data: 239 File: E:\00_e3 EMI DATA\2007\LTA_Conduction_0712_1.EMI (311) Date: 2008-02-18



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.188	38.10	31.60	0.28	38.38	31.88	64.12	54.12	25.75	22.25
0.381	35.60	33.20	0.37	35.97	33.57	58.26	48.26	22.29	14.69
0.502	33.70	30.20	0.29	33.99	30.49	56.00	46.00	22.01	15.51
3.496	36.20	30.40	0.54	36.74	30.94	56.00	46.00	19.26	15.06
8.188	38.60	35.00	0.64	39.24	35.64	60.00	50.00	20.76	14.36
8.773	34.70	26.80	0.60	35.30	27.40	60.00	50.00	24.70	22.60

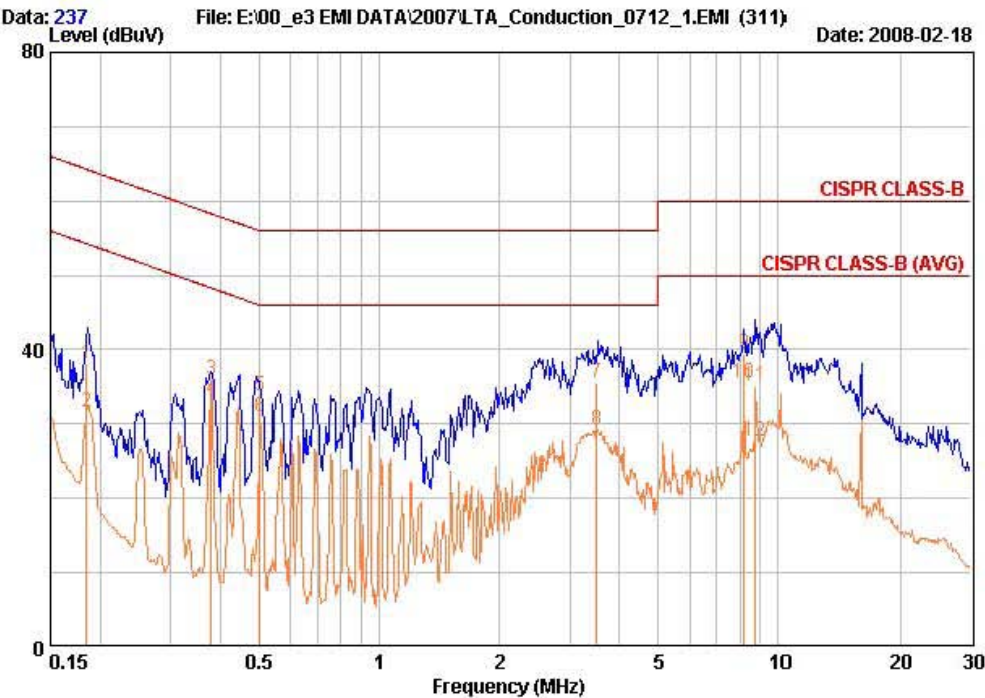
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –Neutral



243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-323-6008
Fax:+82-31-323-6010

EUT / Model No. : LWS-110F	Phase : NEUTRAL
Test Mode : WIRELESS 802.11g mode	Test Power : 120 / 60
Temp./Humi. : 23 / 36	Test Engineer : B.S.KIM



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.185	37.90	31.30	0.30	38.20	31.60	64.26	54.26	26.06	22.66
0.379	35.70	32.90	0.36	36.06	33.26	58.30	48.30	22.24	15.04
0.501	33.60	30.70	0.29	33.89	30.99	56.00	46.00	22.11	15.01
3.498	34.90	28.60	0.54	35.44	29.14	56.00	46.00	20.56	16.86
8.190	38.80	34.90	0.64	39.44	35.54	60.00	50.00	20.56	14.46
8.770	34.40	27.10	0.60	35.00	27.70	60.00	50.00	25.00	22.30

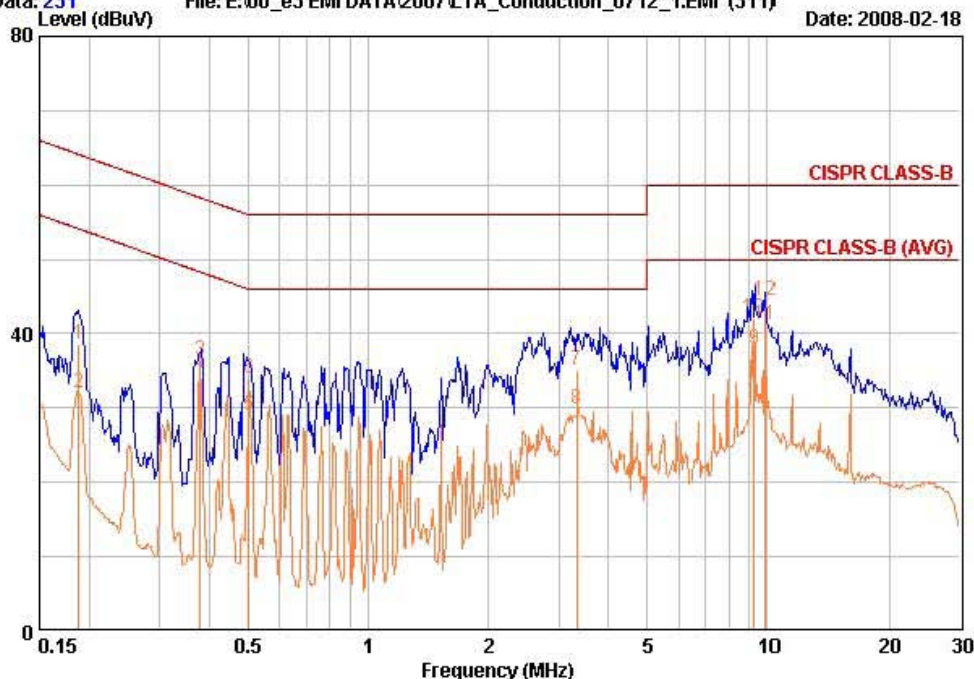
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –Line

243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
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EUT / Model No. : LWS-110F	Phase : LINE
Test Mode : CAMERA mode	Test Power : 120 / 60
Temp./Humi. : 23 / 36	Test Engineer : B.S.KIM

Data: 231 File: E:\00_e3 EMI DATA\2007\LTA_Conduction_0712_1.EMI (311) Date: 2008-02-18



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.188	38.40	31.80	0.28	38.68	32.08	64.12	54.12	25.45	22.05
0.379	36.00	34.40	0.36	36.36	34.76	58.30	48.30	21.94	13.54
0.501	33.80	28.80	0.29	34.09	29.09	56.00	46.00	21.91	16.91
3.337	34.60	29.20	0.58	35.18	29.78	56.00	46.00	20.82	16.22
9.267	41.30	37.20	0.66	41.96	37.86	60.00	50.00	18.04	12.14
9.875	43.60	40.30	0.86	44.46	41.16	60.00	50.00	15.54	8.84

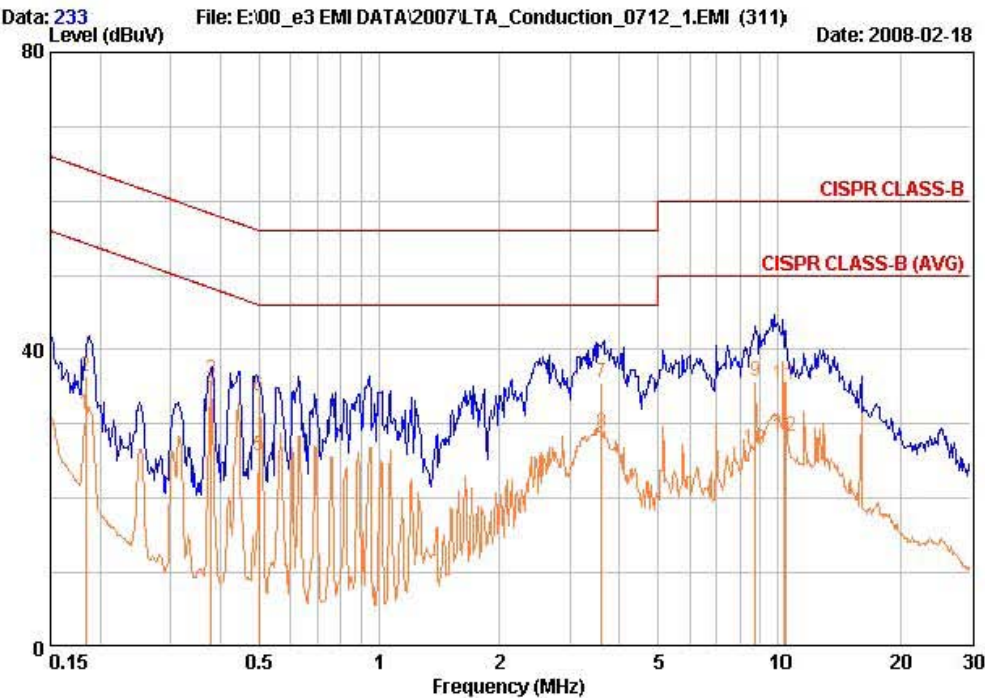
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –Neutral



243 Jubug-ni, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-323-6008
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EUT / Model No. : LWS-110F	Phase : NEUTRAL
Test Mode : CAMERA mode	Test Power : 120 / 60
Temp./Humi. : 23 / 36	Test Engineer : B.S.KIM



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.184	36.20	31.10	0.31	36.51	31.41	64.30	54.30	27.79	22.89
0.379	35.60	34.10	0.36	35.96	34.46	58.30	48.30	22.34	13.84
0.499	33.50	25.40	0.29	33.79	25.69	56.02	46.02	22.23	20.33
3.606	35.10	28.30	0.51	35.61	28.81	56.00	46.00	20.39	17.19
8.765	35.20	26.10	0.60	35.80	26.70	60.00	50.00	24.20	23.30
10.291	34.30	27.40	0.91	35.21	28.31	60.00	50.00	24.79	21.69

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

APPENDIX 1

Maximum Permissible Exposure Calculations

** MPE Calculations **

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user. The MPE calculation for this exposure is shown below.

The peak radiated output power (EIRP) is calculated as follows:

$EIRP = P + G$ $EIRP = 14.91 \text{ dBm} + 4.33\text{dBi}$ $EIRP = 19.24 \text{ dBm}$	Where, P = Power input to the antenna (mW) G = Power gain of the antenna (dBi)
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Power density at the specific separation:

$S = PG / (4R^2 \pi)$ $S = (30.97 * 2.71) / (4 * 202 * \pi)$ $S = 0.0167 \text{ mW/cm}^2$	Where, S = Maximum power density (mW/cm^2) P = Power input to the antenna (mW) G = Numeric power gain of the antenna R = Distance to the center of the radiation of the antenna (20cm = limit for MPE)
---	--

The Maximum permissible exposure (MPE) for the general population is 1 mW/cm^2 .

The power density at 20cm does not exceed the 1 mW/cm^2 limit. Therefore, the exposure condition is compliant with FCC rules.

Estimated safe separation:

$R = \sqrt{PG / 4 \pi}$ $R = \sqrt{(30.97 * 2.71 / 4\pi)}$ $R = 2.59\text{Cm}$	Where, P = Power input to the antenna (mW) G = Numeric power gain of the antenna R = Distance to the center of the radiation of the antenna (20cm = limit for MPE)
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The numeric gain(G) of the antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (4.33 / 10)$$

$$G = 2.71$$

APPENDIX 2

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Next Cal. Date
1	Spectrum Analyzer	8594E	3649A03649	HP	Apr-08
2	Signal Generator	8648C	3623A02597	HP	Apr-08
3	Attenuator (3dB)	8491A	37822	HP	Oct-08
4	Attenuator (10dB)	8491A	63196	HP	Oct-08
5	EMI Test Receiver	ESVD	843748/001	R&S	Aug-08
6	LISN	KNW-407	8-1430-1	Kyoritsu	Jan-09
7	Two-Line V-Network	ESH3-Z5	893045/017	R&S	Oct-08
8	RF Amplifier	8447D	2949A02670	HP	Jan-09
9	RF Amplifier	8447D	2439A09058	HP	Oct-08
10	RF Amplifier	8449B	3008A02126	HP	Apr-09
11	Test Receiver	ESHS10	828404009	R&S	Aug-08
12	TRILOG Antenna	VULB 9160	9160-3212	SCHWARZBECK	Jul-08
13	Log.-Per. Antenna	VULP 9118	9118 A 401	SCHWARZBECK	Apr-09
14	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	Apr-09
15	Horn Antenna	3115	00055005	ETS LINDGREN	Mar-09
16	Dipole Antenna	VHA9103	2116	Schwarzbeck	Nov-07
17	Dipole Antenna	VHA9103	2117	Schwarzbeck	Nov-07
18	Dipole Antenna	UHA9105	2261	Schwarzbeck	Nov-07
19	Dipole Antenna	UHA9105	2262	Schwarzbeck	Nov-07
20	Spectrum Analyzer	8591E	3649A05888	HP	Oct-08
21	Spectrum Analyzer	8563E	3425A02505	HP	Apr-08
22	Hygro-Thermograph	THB-36	0041557-01	ISUZU	May-08
23	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	Jun-08
24	RF Switch	MP59B	6200414971	ANRITSU	Jun-08
25	RF Switch	MP59B	6200438565	ANRITSU	Jun-08
26	Power Divider	11636A	6243	HP	Oct-08
27	DC Power Supply	6622A	3448A03079	HP	Oct-08
28	Attenuator (30dB)	11636A	6243	HP	Oct-08
29	Frequency Counter	5342A	2826A12411	HP	Apr-08
30	Power Meter	EPM-441A	GB32481702	HP	Apr-08
31	Power Sensor	8481A	2702A64048	HP	Apr-08
32	Audio Analyzer	8903B	3729A18901	HP	Oct-08
33	Modulation Analyzer	8901B	3749A05878	HP	Oct-08
34	TEMP & HUMIDITY Chamber	YJ-500	L05022	JinYoung Tech	Oct-08
35	LOOP-ANTENNA	FMZB 1516	151602/94	SCHWARZBECK	Mar-09