FCC CLASS B COMPLIANCE REPORT

for

Electromagnetic Emissions

of

LCD Monitor

Trade Name	**:**	Lenovo
Model Number	**:**	LXB-L15C
FCC ID	**:**	GKRLXB-L15C
Serial Number	**:**	N/A
Report Number	**:**	B30709204-F
Date	**:**	July 18, 2003

Prepared for：

Compal Electronics Inc.
No. 581, Jui Kuang Rd., Neihu,
Taipei, (114) Taiwan, R.O.C.

Prepared by：

C&C LABORATORY, CO., LTD.
No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang,
Taoyuan, Taiwan, R.O.C.
TEL: (03) 324-0332
FAX: (03) 324-5235

This report shall not be reproduced, except in full, without the written approval of C&C LABORATORY, CO., LTD.

The client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government must not use this report.

TABLE OF CONTENTS

1 VERIFICATION OF COMPLIANCE

Equipment Under Test: LCD Monitor
Trade Name: Lenovo
Model Number: LXB-L15C
FCC ID: GKRLXB-L15C
Serial Number: N/A
Applicant: **Compal Electronics Inc.**
No. 581, Jui Kuang Rd., Neihu, Taipei, (114) Taiwan, R.O.C.

Manufacturer: **1.) Compal Electronics Inc.**
No. 8, Nan-Tung Rd., Pin-Cheng City, Tao-Yuan Hsien, Taiwan, R.O.C.
2.) Compal Electronics (China) Co., Ltd.
No. 988, Tung Fen East Rd., Economic & Technical Development Zone
Kunshan, Jiangsun, P.R. China

Type of Test: FCC Class B
Measurement Procedure: ANSI C63.4: 1992
File Number: B30709204-F
Date of Test: July 9, 2003
Deviation: None
Condition of Test Sample: Normal
Final Result: Pass
Worst Data: See below

Test Item	Freq. (MHz)	Measured Data	Margin (MµC)	Remark
Radiated Emission	156.89	27.4 (dB/m)	-2.6 dB (± 2.1464 dB)	
Conducted Emission	0.150	49.7 (dB)	-6.3 dB (± 2.8104 dB)	

- The negative sign in Margin cell means under the specific limit.
- This test result traceable to national or international standards.

The above equipment was tested by C&C Laboratory, Co., Ltd. for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart B and the measurement procedure according to ANSI C63.4. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.

Approved by: Reviewed by:

Jonson Lee / EMC Director **Jessie Wang / Section Manager**

2 SYSTEM DESCRIPTION

EUT Test Program:

1. EMI test program was loaded and executed in Windows XP mode.
2. Data was sent to EUT filling the screen with upper case of “H” patterns.
3. Test program sequentially exercised printer and modem, then sent “H” patterns to them individually.
4. Repeat 2 to 4. Test program is self-repeating throughout the test.

3 PRODUCT INFORMATION

Housing Type:	Plastic		
EUT Power Rating:	100-240VAC, 50/60Hz		
AC power during Test:	120VAC/60Hz		
AC Power Cord Type:	Unshielded, 1.8m (Non-detachable)		
OSC/Clock Frequencies：	14.318MHz		
Power Board Manufacturer:	Compal	**Model:**	VP-575
Main Board Manufacturer:	Compal	**Model:**	VL-575
Key Board Manufacturer:	Compal	**Model:**	VK-575
LCD Panel Manufacturer:	HannStar	**Model:**	HSD150SX87
VGA Cable Type:	Shielded, 1.8m with two cores (Non-detachable)		

I/O Port of EUT

I/O Port Type	Q'TY	TESTED WITH
1). Video Out Port (VGA)	1	1

4 SUPPORT EQUIPMENT

No.	Equipment	Model #	Serial #	FCC ID	Trade Name	Data Cable	Power Cord
1.	PC	D51C	7251 KN8Z 0009	FCC DoC	Compaq	N/A	Unshielded, 1.8m
2.	Modem	DM-1414	0304012269	IFAXDM1414	ACEEX	Shielded, 1.8m	Unshielded, 1.8m
3.	Printer	STYLUS C60	DR3K041995	FCC DoC	EPSON	Shielded, 1.8m	Unshielded, 1.8m
4.	PS/2 Keyboard	KB-0133	N/A	FCC DoC	Compaq	Shielded, 1.8m	N/A
5.	PS/2 Mouse	M-S69	N/A	FCC DoC	Compaq	Shielded, 1.8m	N/A

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

5 MEASUREMENT PROCEDURE

5.1 PRELIMINARY LINE CONDUCTED EMISSION TEST

1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

2) Support equipment, if needed, was placed as per ANSI C63.4.

3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

4) The EUT received AC power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

5) All support equipment received power from a second LISN supplying power of 110VAC/60Hz, if any.

6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

7) Analyzer / Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.

8) During the above scans, the emissions were maximized by cable manipulation.

9) The following test mode(s) were scanned during the preliminary test:

Mode(s):

1. **1024 × 768 Resolution/ 75Hz**
2. **800 × 600 Resolution/ 75Hz**
3. **640 × 480 Resolution/ 60Hz**

10) After the preliminary scan, we found the following test mode producing the highest emission level.

Mode: 1.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

5.2 FINAL LINE CONDUCTED EMISSION TEST

1) EUT and support equipment was set up on the test bench as per step 10 of the preliminary test.

2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Q.P. mode, then the emission signal was re-checked using an Average detector.

3) The test data of the worst case condition(s) was reported on the Summary Data page.

Data Sample:

Freq. MHz	Q.P. Raw dBuV	Average Raw dBuV	Q.P. Limit dBuV	Average Limit dBuV	Q.P. Margin dB	Average Margin dB	Note
x.xx	43.95	---	56	46	-12.05	-2.05	L 1

Freq. = Emission frequency in MHz

Raw dBuV = Uncorrected Analyzer/Receiver reading + Insertion loss of LISN, if it > 0.5 dB

Limit dBuV = Limit stated in standard

Margin dB = Reading in reference to limit

Note = Current carrying line of reading

"---" = The emission level complied with the Average limits, with at least 2dB margin limits, so no further recheck.

Calculation example:

Margin (dB) = RAW (dBuV) – Limit (dBuV)

LINE CONDUCTED EMISSION LIMIT

Frequency	Maximum RF Line Voltage	
	Q.P.	AVERAGE
150kHz-500kHz	66-56dBuV	56-46dBuV
500kHz-5MHz	56dBuV	46dBuV
5MHz-30MHz	60dBuV	50dBuV

Note: The lower limit shall apply at the transition frequency.

5.3 PRELIMINARY RADIATED EMISSION TEST

1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

2) Support equipment, if needed, was placed as per ANSI C63.4.

3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

4) The EUT received AC power source from the outlet socket under the turntable. All support equipment received 110VAC/60Hz power from another socket under the turntable, if any.

5) The antenna was placed at 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.

6) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

7) The following test mode(s) were scanned during the preliminary test:

Mode(s):

1. 1024 × 768 Resolution/ 75Hz
2. 800 × 600 Resolution/ 75Hz
3. 640 × 480 Resolution/ 60Hz

8) After the preliminary scan, we found the following test mode producing the highest emission level.

Model: 1.

Then, the EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for reference of final testing.

5.4 FINAL RADIATED EMISSION TEST

1) EUT and support equipment were set up on the turntable as per step 8 of the preliminary test.

2) The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

3) Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

4) The test data of the worst case condition(s) was reported on the Summary Data page.

Data Sample:

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits	Margin (dB)
xx.xx	14.0	11.2	26.2	30	-3.8

Freq.	= Emission frequency in MHz
Raw Data (dBuV)	= Uncorrected Analyzer / Receiver reading
Corr. Factor (dB/m)	= Antenna factor + Cable loss – Amplifier gain
Emiss. Level (dBuV/m)	= Raw reading converted to dBuV/m and CF added
Limit (dBuV/m)	= Limit stated in standard
Margin (dB)	= Reading in reference to limit
P	= Peak Reading
Q	= Quasi-peak Reading
A	= Average Reading

Calculation example:

Margin (dB) = Emiss. Level (dBuV/m) – Limits (dBuV/m)
Emission Level (dBuV/m)=Raw Data (dBuV) + Corr Factor (dB/m)

RADIATED EMISSION LIMIT

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m/ Q.P.)
30-230	10	30
230-1000	10	37

Note: The lower limit shall apply at the transition frequency.

6 SUMMARY DATA

(LINE CONDUCTED TEST)

Model Number: LXB-L15C **Location:** Site # 3

Tested by: Max Yan

Test Mode: Mode 1

Test Results: Passed

Temperature: 30°C **Humidity:** 72%RH

(The chart below shows the highest readings taken from the final data)

FREQ MHz	Q.P. RAW dBuV	AVG RAW dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.150	56.20	46.90	66.00	56.00	-9.80	-9.10	L1
2.200	35.60	---	56.00	46.00	-20.40	---	L1
2.810	39.80	---	56.00	46.00	-16.20	---	L1
4.460	29.90	---	56.00	46.00	-26.10	---	L1
6.840	28.90	---	60.00	50.00	-31.10	---	L1
7.450	27.70	---	60.00	50.00	-32.30	---	L1
0.150	58.50	49.70	66.00	56.00	-7.50	-6.30	L2
2.200	35.60	---	56.00	46.00	-20.40	---	L2
2.810	39.30	---	56.00	46.00	-16.70	---	L2
4.520	29.80	---	56.00	46.00	-26.20	---	L2
6.840	29.00	---	60.00	50.00	-31.00	---	L2
7.450	27.10	---	60.00	50.00	-32.90	---	L2

L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

****NOTE: "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.**

SUMMARY DATA

(RADIATED EMISSION TEST)

Model Number: LXB-L15C **Location:** Site # 3

Tested by: Louis Tang **Polar:** Vertical--10m

Test Mode: Mode 1 **Test Results:** Passed

Detector Function: Quasi-Peak

Temperature: 30°C **Humidity:** 72%RH

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits	Margin (dB)
57.21	10.4	14.3	24.7	30.0	-5.3
116.83	13.3	13.2	26.5	30.0	-3.5
123.35	11.7	12.7	24.4	30.0	-5.6
130.24	12.1	12.0	24.1	30.0	-5.9
156.89	16.4	11.0	27.4	30.0	-2.6
180.26	12.6	12.2	24.8	30.0	-5.2
322.86	5.8	17.2	23.0	37.0	-14.0
475.40	.8	21.4	22.2	37.0	-14.8
531.40	2.4	21.6	24.0	37.0	-13.0
575.40	7.6	22.8	30.4	37.0	-6.6
594.70	3.1	23.7	26.8	37.0	-10.2
664.10	-.6	24.4	23.8	37.0	-13.2

SUMMARY DATA

(RADIATED EMISSION TEST)

Model Number: LXB-L15C **Location:** Site # 3

Tested by: Louis Tang **Polar:** Horizontal --10m

Test Mode: Mode 1 **Test Results:** Passed

Detector Function: Quasi-Peak

Temperature: 30°C **Humidity:** 72%RH

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits	Margin (dB)
33.00	8.6	13.4	22.0	30.0	-8.0
72.21	11.2	10.9	22.1	30.0	-7.9
115.80	10.2	13.2	23.4	30.0	-6.6
156.26	10.0	11.0	21.0	30.0	-9.0
181.89	9.9	12.4	22.3	30.0	-7.7
200.66	9.5	14.7	24.2	30.0	-5.8
214.33	4.5	15.4	19.9	30.0	-10.1
323.60	1.1	17.2	18.3	37.0	-18.7
532.40	2.2	21.6	23.8	37.0	-13.2

7 TEST FACILITY

Location: No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R. O. C.

Description: There are four 3/10m open area test sites and three line conducted labs for final test. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 1992 and CISPR 16 requirements.

Site Filing: A site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046.

Registration also was made with Voluntary Control Council for Interference (VCCI).

Site Accreditation: Accredited by NEMKO (Authorization #: ELA 124) for EMC & A2LA (Certificate #: 824.01) for Emission

Accredited by NVLAP (Certificate #: 200600-0)

Also accredited by BSMI for the product category of Information Technology Equipment.

Instrument Tolerance: All measuring equipment is in accord with ANSI C63.4 and CISPR 22 requirements that meet industry regulatory agency and accreditation agency requirement.

Ground Plane: Two conductive reference ground planes were used during the Line Conducted Emission, one in vertical and the other in horizontal. The dimensions of these ground planes are as below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden test table on where the EUT and the support equipment were placed during test. The horizontal ground plane projected 50 cm beyond the footprint of the EUT system and distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal conductive ground plane extended at least 1m beyond the periphery of the EUT and the largest measuring antenna, and covered the entire area between the EUT and the antenna. It has no holes or gaps having longitudinal dimensions larger than one-tenth of a wavelength at the highest frequency of measurement up to 1GHz.

Site # 3 & # 4 Line Conducted Test Site: At Shielding Room

8 TEST EQUIPMENT LIST

Instrumentation: The following list contains equipment used at C & C Laboratory, Co., Ltd. for testing. The equipment conforms to the CISPR 16-1 / ANSI C63.2-1988 Specifications for Electromagnetic Interference and Field Strength Instrumentation from 9kHz to 1.0 GHz or above.
Equipment used during the tests:

Open Area Test Site: # 3

Open Area Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL. DUE**
Spectrum Analyzer	ADVANTEST	R3261A	N/A	N/A	N/A
EMI Test Receiver	R&S	ESVS20	838804/004	01/09/2003	01/08/2004
Pre-Amplifier	HP	8447D	2944A09173	03/03/2003	03/02/2004
Bilog Antenna	SCHWAZBECK	VULB9163	128	07/05/2003	07/04/2004
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R	N.C.R
Site NSA	C&C	N/A	N/A	09/07/2002	09/06/2003

Conducted Emission Test Site: # 3

Conducted Emission Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL. DUE**
EMI Test Receiver	R&S	ESHS30	828144/003	08/08/2002	08/07/2003
LISN	R&S	ESH2-Z5	843285/010	12/16/2002	12/15/2003
LISN	EMCO	3825/2	9003-1628	07/26/2002	07/25/2003

The calibrations of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

9 BLOCK DIAGRAM OF TEST SETUP

SYSTEM DIAGRAM OF CONNECTIONS BETWEEN EUT AND SIMULATORS

EUT: LCD Monitor

Trade Name: Lenovo

Model Number: LXB-L15C

Power Cord: Unshielded, 1.8m