



EMISSION TEST REPORT

Test report file No. : **03-IST-211/FB** Date of issue : Aug. 19, 2003

Model / Type No. : 531X ☒ Basic ☐ Alternate

Kind of product : 15" Monitor

Brand name : LUCOMS

Applicant : DAEWOO LUCOMS CO.,LTD.

Manufacturer : WEIHAI DAEWOO ELECTRONICS CO.,LTD.

License holder : DAEWOO LUCOMS CO.,LTD.

Address : Gaya-Venture B/D, 28-130, Yeongdeungpo-Dong, Yeongdeungpo-Gu, Seoul, Korea

Test result according to the regulation(s)

☒ Positive ☐ Negative

at page 3.

This test report with appendix consists of 16 pages. The 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 equipment is complied with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.

DIRECTORY

A) Documentation.	Page
Directory	<u>2</u>
Test regulations	<u>3</u>
Information of Test Regulation	<u>3</u>
Equipment under Test	<u>4</u>
Test Conditions	<u>5 ~ 6</u>
Test Result	<u>7</u>
Measurement Uncertainty	<u>8</u>
Test-setup	<u>9 ~ 11</u>
Summary	<u>17</u>

B) Test Data.

Conducted emissions (Mains)	: 150 kHz - 30 MHz	<u>12 ~ 14</u>
Radiated emissions	: 30 MHz – 1 GHz	<u>15 ~ 16</u>

C) Appendix

TEST REGULATIONS

The tests were performed according to the following regulations ;

- - FCC Part 15, Subpart B (Unintentional Radiators, Class B)

Information of Test Laboratory

IST EMC Lab.

San 21-8 Goan-Ri, Baekam-Myun, Yongin-Si, Kyunggi-Do, Korea

International - Tel : 82-31 - 333 - 4093. Fax : 82-31 - 333 - 4094.

Domestic - Tel : 031 - 333 - 4093. Fax : 031 - 333 - 4094.

EQUIPMENT UNDER TEST

Equipment Description :

CDT	15inch
Diagonal visible image area :	14-inch
Dot Pitch :	0.28mm
Synchronization :	Vertical 50 ~ 160 Hz, Horizontal 30 ~ 54 kHz
Plug and Plug :	VESA DDC Compatible
Power Saving :	EPA, VESA DPMS, Nutek Compliant
Power Consumption :	70W
Dimensions (W x H x D) :	360 x 377 x 389 mm (set with stand)
Weight-unpacked(1bs/kg) :	25.4/11.5
Operating Temperature :	10 ~ 40 °C/50 ~ 104 °F

EUT Type :

- ☒ Table-Top.
☐ Floor-Standing.
☐ Table-Top and Floor-Standing(Combination).

Operation – mode of the E.U.T. :

The equipment under test was operated during the measurement under following conditions :

- ☐ Standby.
☒ Operational Condition : Scrolling “H” characters under MS Windows,
 at test mode of 1024 X 768, 60 Hz

Configuration of the equipment under test :

Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
PC	Brio BA600/550	HP	SG01301176
Keyboard	SK-2502C	HP	M000375059
PS/2 Mouse	M-S48A	HP	LZA00850320
Serial Mouse	M-S428	Logitech	LCA53305547
Printer	A0302384	Northern Telecom	26633S60168

Connecting Interface Cables :

- Unshielded AC power cable : 1.8 m
- Unshielded DC power cable : 1.5 m
- Shielded monitor's signal cable : 1.5 m
- Shielded printer's signal cable : 1.8 m

TEST CONDITIONS

The measurement of the conducted emissions (Interference voltage) was performed in a shielded room.

Test location :

☒ Shielded room. No.1

☐ Compact chamber 2

Used testing instruments :

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESH 3	Test Receiver	Rohde & Schwarz	Jul. 22, 2003	892108/018
3725/2	LISN	EMCO	Jul. 23, 2003	9101-2068
KNW-407	LISN	Hyup-Rip	Jul. 23, 2003	8-883-10
ESH 3-Z2	Pulse Limiter	Rohde & Schwarz	Jul. 23, 2003	357.8810.52

Test - accessories :

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

Measurement Procedures :

Conducted emissions measurements were made in accordance with ANSI C-63.4-1992, "Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to an EMI/Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within an IF bandwidth of 10kHz or for "quasi-peak" within a bandwidth of 9kHz.

All used test-instruments as well as the test-accessories are calibrated regularly.

Test engineer :



S. J. Oh / Research Engineer
IST EMC Lab.

The **measurement of the radiated emissions (Electric field)** in the frequency range from 30 MHz to 1GHz was performed in horizontal and vertical antenna polarization at a open-site which meet the site attenuation requirement of ANSI C63.4-1992 and a test distance of :

Location : ☒ Open Site No. 1 ☐ Open Site No. 2 ☐ Open Site No. 3
 Distance : ☒ 3 meters ☐ 10 meters

Used testing instruments :

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESVP	Test Receiver	Rohde & Schwarz	Jul. 22, 2003	861744/004
VULB 9160	Antenna	Schwarzbeck	Jul. 09, 2003	3048

Test - accessories :

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

Measurement procedures

Radiated measurements were in accordance with ANSI C63.4-1992 "Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a EMI/Field Intensity Meter. The measurements were made with the detector set for "quasi-peak" within a bandwidth of 120kHz.

All used test-instruments as well as the test-accessories are calibrated regularly.

Test engineer :



S. J. Oh / Research Engineer
IST EMC Lab.

TEST RESULT

Conducted emissions : 150 kHz - 30 MHz

The requirements are.

☒ KEPT

☐ NOT KEPT

Min. limit margin

8.8 dB at 11.713 MHz

Remarks : See test-data at pages 12 ~ 14.

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are.

☒ KEPT

☐ NOT KEPT

Min. limit margin

4.7 dB at 457.3 MHz

Remarks : See test-data at page 15 ~ 16.

Measurement Uncertainty Calculation

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994).

Contribution (Conducted Emissions)	Probability Distribution	Uncertainty ($\pm$ dB)
		0.15-30MHz
Receiver Specification	Rectangular	1.5
LISN Coupling Specification	Rectangular	1.5
Cable and Input Attenuator Calibration	Normal (k=2)	0.5
Mismatch to Receiver	U-Shaped	-0.8 / +0.7
System Repeatability	Normal (k=1)	0.2
Combined Standard Uncertainty	Normal (k=2)	-1.85 / +1.71
Expanded Uncertainty U	Normal (k=2)	-3.7 / +3.42

$$U_{c,min\ us} = -1.85, \ U_{c,plus} = 1.71$$

$$U = -3.70 / +3.42 \ (k=2, \ 95.45\% \text{ confidence level})$$

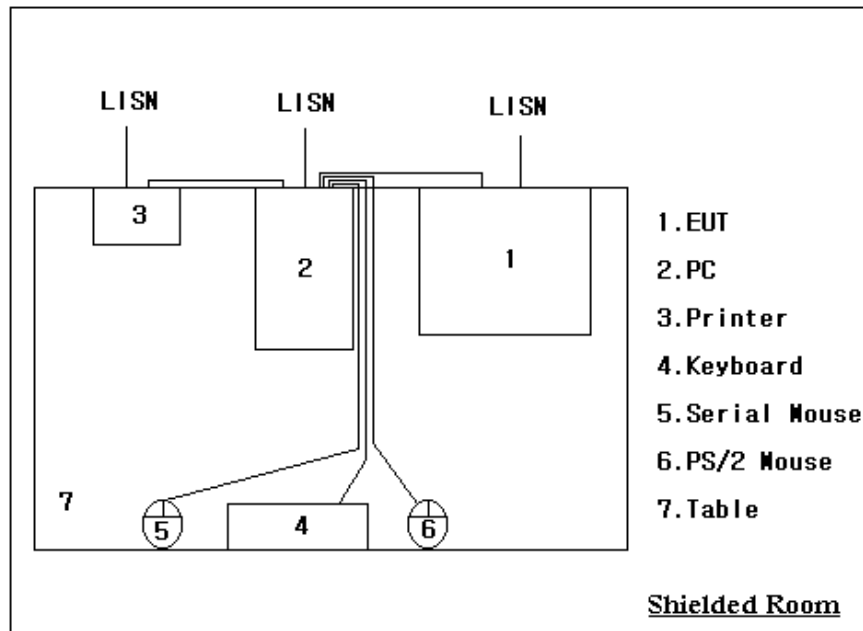
Contribution (Radiated Emissions)	Probability Distribution	Uncertainties($\pm$ dB)
		3 m
Antenna		
Factor	Normal (k=2)	0.9968
Frequency Interpolation	Rectangular	0.1039
Height Variation	Rectangular	-2.6 / +1.5
Directivity Difference	Rectangular	-1.0 / +0
Phase Center Location	Rectangular	1.0
Cable Loss	Normal (k=2)	0.5
Receiver		
Voltage Accuracy	Normal (k=2)	2.0
Pulse Response	Rectangular	1.5
Absolute Repetition Rate	Rectangular	1.5
Mismatch to Receiver		
$ \Gamma_{\text{antenna}} = 0.33$	U-Shaped	-1.0 / +0.9
$ \Gamma_{\text{receiver}} = 0.33$		
System Repeatability	Std Deviation	0.5
Combined Standard Uncertainty	Normal	-2.6048 / 2.2775
Expanded Uncertainty U	Normal (k=2)	-5.21 / +4.55

$$U_{c,min\ us} = -2.6048, \ U_{c,plus} = 2.2775$$

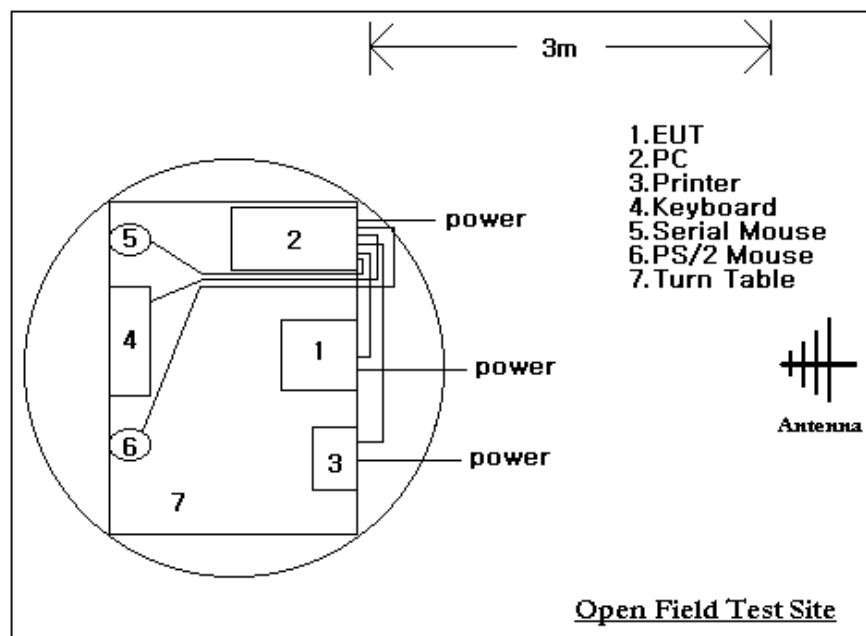
$$U = -5.21 / +4.55 \ (k=2, \ 95.45\% \text{ confidence level})$$

TEST SETUP (Drawings)

Type : 531X



Conducted Emissions 150kHz - 30 MHz



Radiated Emissions 30 MHz - 1000 MHz

TEST SETUP (Photos)

Type : 531X



Conducted Emissions 150kHz - 30 MHz



TEST SETUP (Photos)

Type : 531X



Radiated Emissions 30MHz - 1000 MHz



Conducted Emission Test Data

Type	531X		
Manufacturer	Daewoo Lucoms Co., Ltd.		
Operation mode	Scrolling "H" pattern display 1024 x 768, 60Hz		
Environmental Condition	Temperature	:	21 °C
	Humidity	:	42 %
	Atmospheric pressure	:	1001 mbar
Date	Aug. 05, 2003		

Highest Emissions relative to the limit

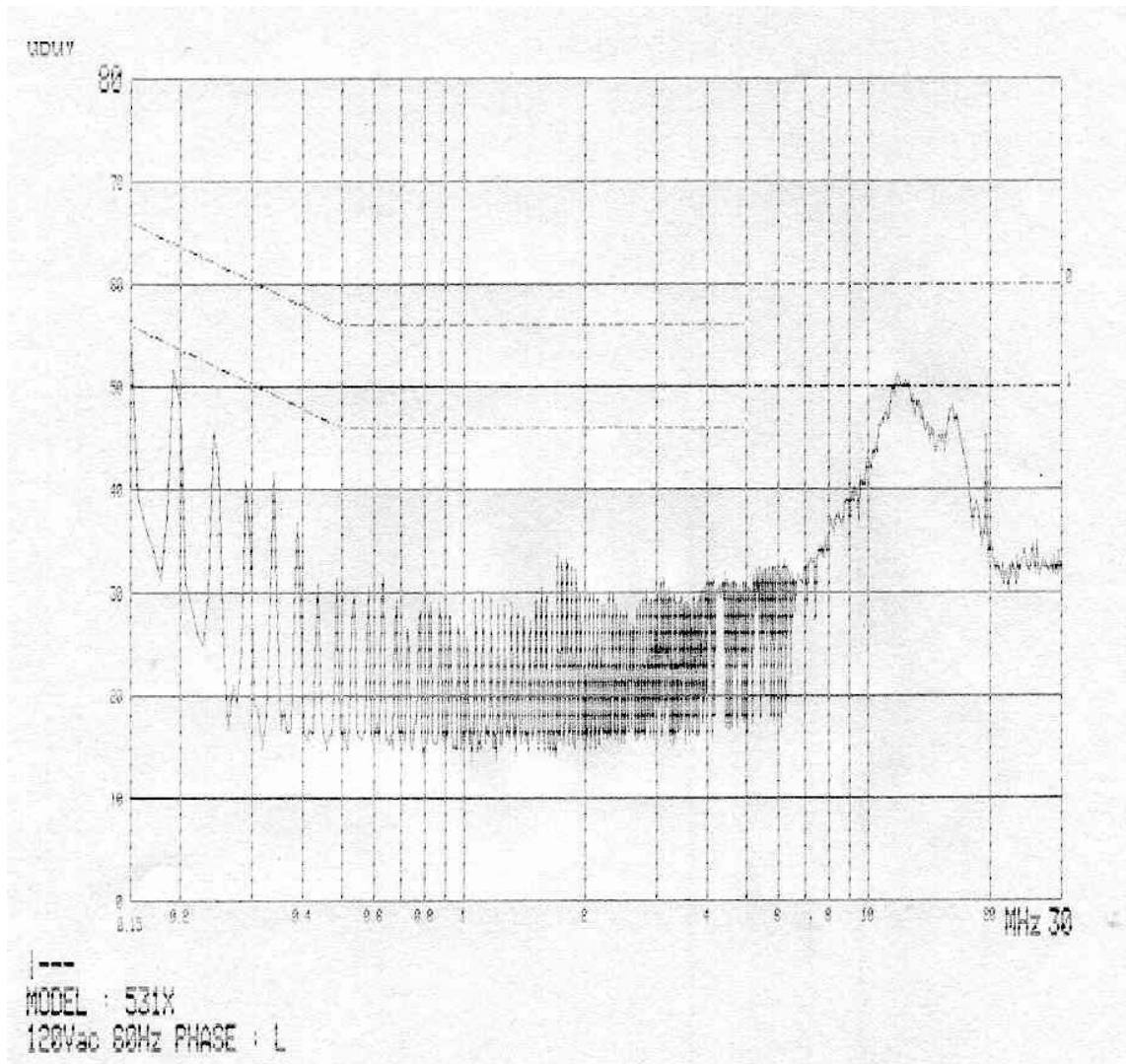
Frequency [MHz]	Reading [dBμV]		Phase	Insertion Loss (LISN)	Limit [dBμV]		Margin [dB]	
	Q-peak	AV			Q-peak	AV	Q-peak	AV
0.194	50.5	41.6	L1	0.8	63.9	53.9	12.6	11.5
0.243	43.9	37.2		0.8	62.0	52.0	17.3	14.0
1.701	32.0	27.8		0.8	56.0	46.0	23.2	17.4
4.420	28.0	23.7		0.8	56.0	46.0	27.2	21.5
11.860	49.9	35.9		0.8	60.0	50.0	9.3	13.3
16.185	46.6	39.4		0.8	60.0	50.0	12.6	9.8
0.194	50.9	40.8	N	0.8	63.9	53.9	12.2	12.3
0.243	43.7	38.0		0.8	62.0	52.0	17.5	13.2
2.916	33.5	28.0		0.8	56.0	46.0	21.7	17.2
4.082	36.2	27.2		0.8	56.0	46.0	19.0	18.0
11.713	50.4	32.8		0.8	60.0	50.0	8.8	16.4
19.588	42.0	35.8		0.8	60.0	50.0	17.2	13.4
Cable loss are less than 0.1 dB								

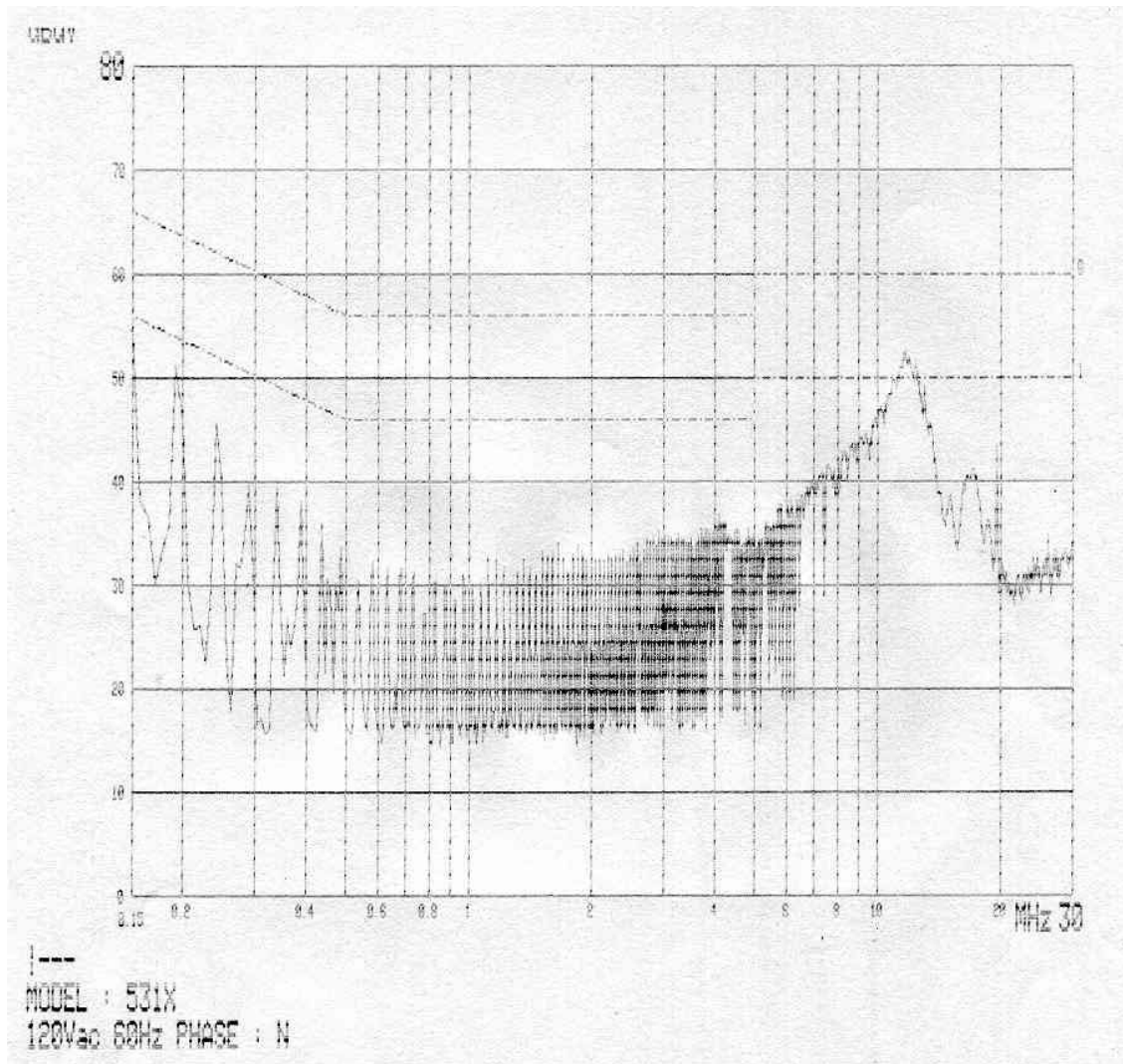
*L1 : Live Line

**N : Neutral Line

*** Please refer to data graphs at page 13 ~ 14.

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -3.70 / +3.42 [dB]





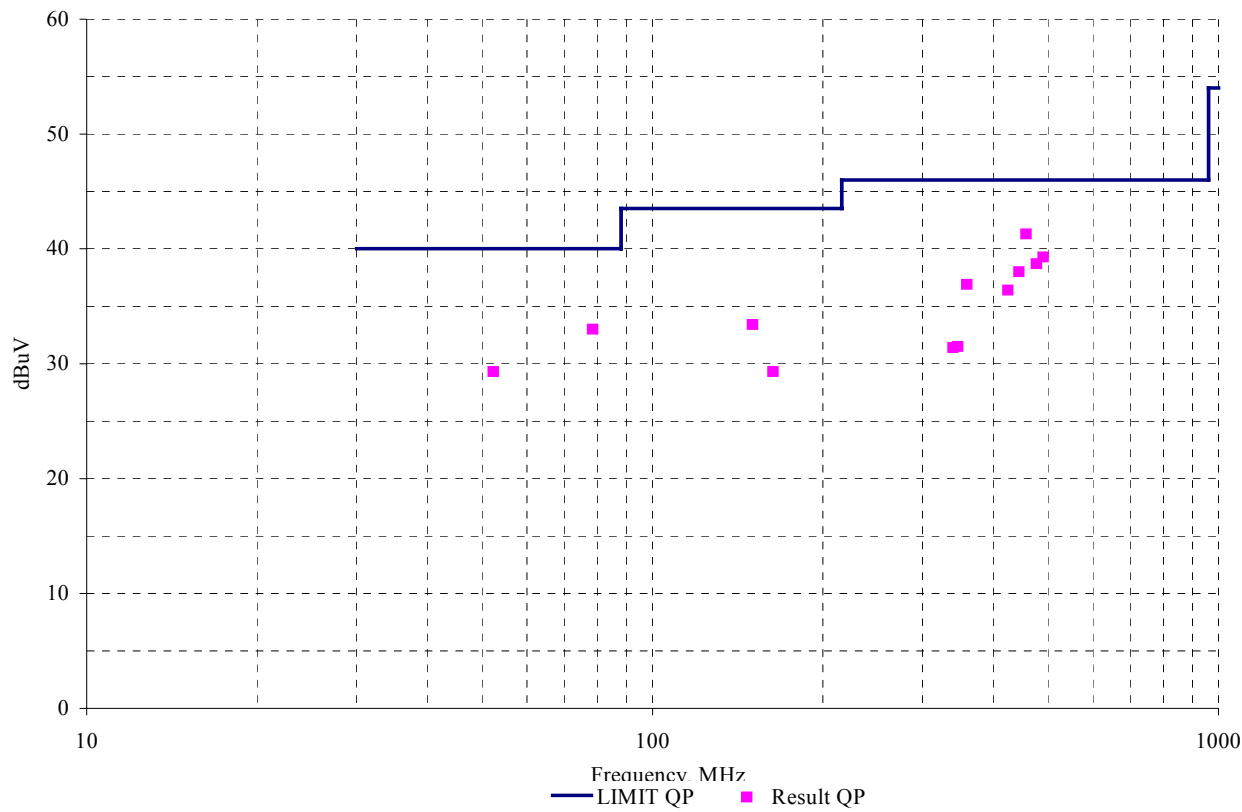
Radiation Test Data

Type 531X
 Manufacturer Daewoo Lucoms Co., Ltd.
 Operation mode Scrolling "H" pattern display 1024 x 768, 60Hz
 Environmental Condition Temperature : 25°C
 Humidity : 41 %
 Atmospheric pressure : 1002 mbar
 Test distance 3 m
 Antenna VULB9160
 Date Aug. 08, 2003

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB]	Cable Loss [dB]	Angle [deg]	Height [cm]	Polar [H/V]	Result [dBuV]	Limit [dBuV]	Margin [dB]
52.3	17.3	10.7	1.3	227	100	V	29.3	40.0	10.7
78.4	23.2	8.2	1.6	219	340	H	33.0	40.0	7.0
150.2	18.9	12.2	2.3	236	310	H	33.4	43.5	10.2
163.3	14.7	12.3	2.3	125	280	H	29.3	43.5	14.2
339.6	16.2	11.7	3.5	123	283	H	31.4	46.0	14.6
346.2	16.2	11.7	3.6	237	244	H	31.5	46.0	14.5
359.3	21.6	11.7	3.6	108	230	H	36.9	46.0	9.1
424.6	18.5	13.5	4.4	289	226	H	36.4	46.0	9.6
444.2	19.6	13.9	4.5	229	184	H	38.0	46.0	8.0
457.3	22.8	14.0	4.5	132	140	H	41.3	46.0	4.7
476.9	19.3	14.6	4.8	180	112	H	38.7	46.0	7.4
489.9	19.7	14.8	4.8	129	100	V	39.3	46.0	6.7

Coverage factor of $k=2$ will ensure that the level of confidence will be approximately 95.45%,
 Uncertainty $U = -5.21 / +4.55$ [dB]

MEASUREMENT OF DISTURBANCE RADIATION



SUMMARY

GENERAL REMARKS :

The equipment is not modified anything, mechanical or circuit to improve EMI status during a measurement and complied the regulation "Part 15 subpart B Class B of CFR 47"

FINAL JUDGMENT :

The requirements according to the technical regulations are

☒ Kept ☐ Not kept

The equipment under test does

☒ Fulfill the general approval requirements mentioned on page 3.
☐ Not fulfill the general approval requirements mentioned on page 3.

Begin of testing : Aug. 01, 2003

End of testing : Aug. 12, 2003

Reviewed by :


Joon H. Lee. EMC Manager
IST EMC Lab.

Approved by :


G. Chung Chief of EMC Lab.