

Nemko Korea Co., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA

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FCC EVALUATION REPORT FOR CERTIFICATION

Applicant:**DIGITAL CYNOS CO., LTD.****3-906, DaeRyung Technotown, 448,****Gasam-dong, Geumcheon-Gu, Seoul, Korea****Attn : Mr. Hyun Chul Choi****Dates of Issue : December 02, 2003****Test Report No. : NK2DE711****Test Site : Nemko Korea Co., Ltd.****EMC site, Korea****FCC ID****Brand Name****Contact Person*****QEWDCM-150*****Cynos****Digital Cynos Co., Ltd.****3-906, DaeRyung Technotown 448, Gasam-dong****Geumcheon-gu, Seoul, Korea****Mr. Hyun Chul, Choi****Telephone No. : +82 2 2107 3450**

FCC Rule Part(s):

Part 15 & 2

Classification :

FCC Class B Device

EUT Type:

15" TFT LCD Monitor

The device bearing the brand name and FCC ID specified above has been shown to comply 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.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

**Tested By : Y.S. Park****Engineer****Reviewed By : H.H. Kim****Manager & Chief Engineer**

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SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.

Responsible Party* :	Digital Cynos Co., Ltd.
Contact Person :	Mr. Hyun Chul Choi
	Tel No.: +82 2 2107 3450
Manufacturer :	Digital Cynos Co., Ltd.
	Tel : +82 2 2107 3450 / Fax : +82 2 2107 3454

- FCC ID: QEWDCM-150
- Model: DCM-150
- Brand: Cynos
- EUT Type: 15" TFT LCD Monitor
- Adapter Voltage: Input 100-240V AC 50/60Hz
Output 12V DC 3.33A
- Classification: FCC Class B
- Rule Part(s): FCC Part 15 & Part 2
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: November 17, 2003 to November 19, 2003
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2DE711

INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **Digital Cynos Co., Ltd.**

FCC ID : **QEWD CM-150, 15" TFT-LCD Monitor**

These measurement tests were conducted at **Nemko Korea Co., Ltd. EMC Laboratory**.

The site address is 300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA

The area of Nemko Korea Corporation LTD. EMC Test Site is located in a mountain area at 80 kilometers (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 kilometers (18 miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.



Nemko Korea Co., Ltd.
OPEN AREA TEST SITE
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City Kyungki-Do, KOREA 449-852
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Fax) +82-31-322-2332

Fig. 1. The map above shows the Seoul in Korea vicinity area.

The map also shows Nemko Korea Corporation Ltd. EMC Lab and Incheon Airport.

TEST CONDITIONS & EUT INFORMATION

Operating During Test

The EUT was operated by the software. The PC sent “H” pattern to monitor(EUT) and The monitor displayed “H” pattern on screen. It also sent “H” pattern to printer, then the printer printed it out. This software had above all functions conduct in order.

And a audio signal from HDD was played continuously.

The two video interface ports of EUT(monitor) were applied to the tests.

EUT & Support Equipment

PC	Dell Asia Pacific Sdn, Model: DHM(Dimension4550) 1.8m unshielded AC power cable	S/N: N/A
15" TFT LCD Monitor(EUT)	Digital Cynos Co.,Ltd. FCC ID: QEWD CM-150 2.0m shielded D-sub cable 2.0m shielded DVI cable 1.5m unshielded AV Jack cable	S/N: N/A
Adapter(Monitor)	LI SHIN International Enterprise Corp. Model: LSE9802B1240 2.0m unshielded AC power cable 1.5m shielded DC cable	S/N: N/A
Keyboard	Silitek Yet Foundate, Model: SK-8110 1.5m unshielded Din cable	S/N: N/A
Serial Mouse	IO TEC , Model: Laser mouse 1.5m unshielded Din cable	S/N: N/A
USB Mouse	Immanuel, Model: OMA3CB 1.5m shielded Din cable	S/N: N/A
PS/2 Mouse	Microsoft Corp, Model: X06-08477 1.5m unshielded Din cable	S/N: N/A
Earphone	Amac , Model: N/A 1.0m unshielded cable	S/N: N/A
Printer	HP, Model No: C2644A 2.0m unshielded AC power cable 1.5m Shield D-sub cable	S/N: SG6A51COK9

EUT Information

Clock	14.318MHz(X1),
Chipset(s)	THC63LVDM83A(U6),THC63LVDM83A(U5), PQFP208(U8),TDA7266(U16),
Sync frequency	Vertical 60 – 75Hz
	Horizontal 31.469 – 60.023KHz
LCD Panel	LP150X05 / LG PHILIPS LCD
Power consumption	Operation < 20W, DPMS/OFF < 10W
Port(s)	D-sub, DVI, Audio In, Audio Out Ports

Description of Test Modes

The EUT was pre-tested under the following resolutions mode:

For Analogue video interface port(D-sub)

1. 1024 X 768 (75.029Hz/ 60.023kHz), clock frequency 78.75MHz
2. 800 X 600 (75Hz/ 46.875kHz), clock frequency 49.5MHz
3. 720 X 400(70.078/ 31.469), clock frequency 28.322MHz
4. 640 X 480 (75Hz/ 37.5kHz), clock frequency 31.5MHz
- 5.

For Digital video interface port(DVI)

1. 1024 X 768 (75.029Hz/ 60.023kHz), clock frequency 78.75MHz
2. 800 X 600 (75Hz/ 46.875kHz), clock frequency 49.5MHz
3. 720 X 400(70.078/ 31.469), clock frequency 28.322MHz
4. 640 X 480 (75Hz/ 37.5kHz), clock frequency 31.5MHz

The worst emission level was found when the EUT was tested under 1024 X 768, 75Hz at D-sub mode and DVI mode

therefore, the test data of this mode was recorded in the report.

SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	Paragraph No.	Result	Remark
Conducted Emission	15.107	Complies	
Radiated Emission	15.109	Complies	

RECOMMENDATION/CONCLUSION

The data collected shows that the **Digital Cynos Co.,Ltd.**

FCC ID : **QEWDCM-150, 15" TFT LCD Monitor.**

The highest emission observed was at **0.52 MHz** for conducted emissions with a Q.P margin of **7.7dB**, at **77.25 MHz** for radiated emissions with a margin of **3.5 dB**.

SAMPLE CALCULATION

$$\text{dB } \mu\text{V} = 20 \log_{10} (\mu\text{V/m})$$

$$\mu\text{V} = 10^{(\text{dB } \mu\text{V}/20)}$$

EX. 1.

@57.7 MHz

Class B limit = 100 $\mu\text{V/m}$ = 40.0 dB $\mu\text{V/m}$

Reading = 19.1 dB μV (calibrated level)

Antenna factor + Cable Loss = 10.12 dB

Total = 29.22 dB $\mu\text{V/m}$

Margin = 40.0 - 29.22 = 10.78

10.78 dB below the limit

DESCRIPTION OF TESTS

Conducted Emissions

The Line conducted emission test facility is located inside a 4 X 7 X 2.5 meter shielded enclosure.

It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.

A 1mX 1.5M wooden table 0.8m height is placed 0.4m away from the vertical wall and 1.5m away from the side of wall of the shielded room

Rohde & Schwarz LISN ESH3-Z5 and Kyoritsu LISN KNW-407 50ohm/50uH line impedance stabilization network are bonded to the shielded room.

The EUT is powered from the Rohde & Schwarz LISN and the support equipment is powered from the Kyoritsu LISN. Power to the LISN s are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1/2".

If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs,

All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT. The spectrum was scanned from 150KHz to 30MHz with 20msec sweep time.

The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz, ESCS30).

The detector function were set to CISPR quasi-peak & average mode.

The bandwidth of receiver was set to 9KHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.

Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.

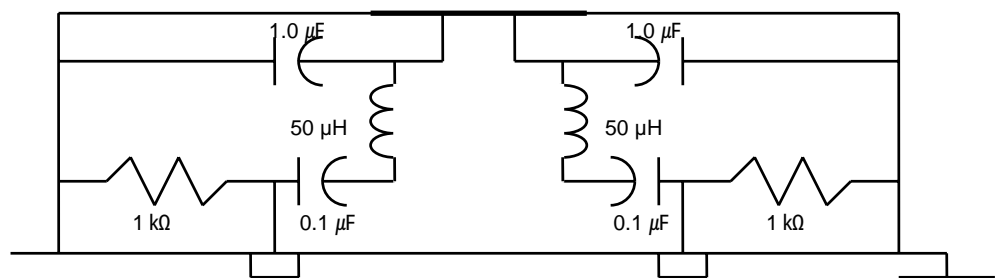


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TESTS

Radiated Emissions

Preliminary measurement were made indoors at 3 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found.

The spectrum was scanned from 30 to 1000MHz using Biconical log Antenna(ARA, LPB-2520/A). Above 1GHz, Horn antenna (Schwarzbeck BBHA 9120D:up to 18GHz) was used.

Final Measurements were made outdoors at 3 or 10m test range using Logbicon Super Antenna(Schwarzbeck, VULB9166) or Horn antenna.(Schwarzbeck BBHA 9120D)

The test equipment was placed on a wooden table.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during pre-scan measurements was reexamined and investigated using EMI test receiver.(ESCS30)

The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120KHz or 1MHz depending on the frequency or type of signal.

The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.

The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non- metallic 1.0X 1.5 meter table.

The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.

The turn table containing the Technology was rotated; the antenna height was varied 1 to 4meter and stopped at the azimuth or height producing the maximum emission Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.

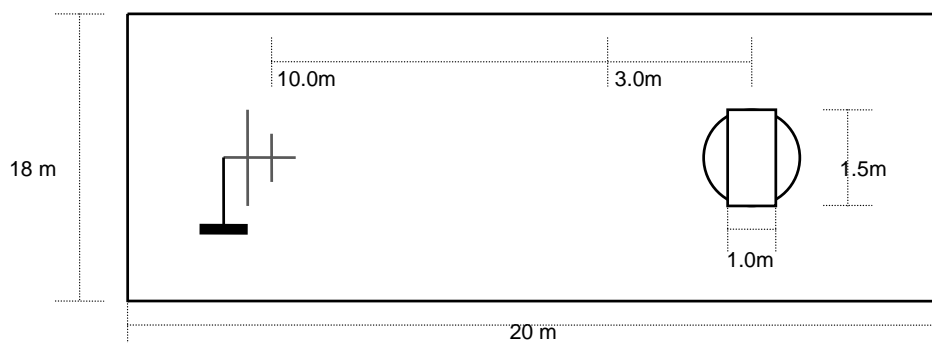


Fig. 3. Dimensions of Outdoor Test Site

TEST DATA

Conducted Emissions

FCC ID : QEWD-150

► Analogue Mode

Frequency (MHz)	Level(dBμV)		Line	Limit(dBuV)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	45.6	36.7	N	65.0	55.0	19.4	18.3
0.52	38.8	38.0	L	55.7	45.7	16.9	7.7
0.63	34.5	33.8	L	56.0	46.0	21.5	12.2
1.67	33.0	32.5	L	56.0	46.0	23.0	13.5
2.13	32.5	30.4	L	56.0	46.0	23.5	15.6
24.07	28.6	28.2	N	60.0	50.0	31.4	21.8

Table 1. Line Conducted Emissions Tabulated Data

► DVI Mode

Frequency (MHz)	Level(dBμV)		Line	Limit(dBuV)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	45.1	37.8	N	65.0	55.0	19.9	17.2
0.52	38.9	38.1	N	56.0	46.0	17.1	7.9
0.57	35.2	34.6	L	56.0	46.0	20.8	11.4
1.73	33.6	32.3	N	56.0	46.0	22.4	13.7
2.25	33.5	32.0	N	56.0	46.0	22.5	14.0
24.07	31.3	30.5	L	60.0	50.0	28.7	19.5

Table 2. Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using CISPR quasi-peak & average mode
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3. The limit for Class B device is on the FCC part section 15.107 (a).
4. LINE : L =Line , N = Neutral

Tested by Y.S. Park

Tested by Y.S. Park

TEST DATA

Radiated Emissions

FCC ID : QEWD CM-150

► Analogue Mode

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
77.25	57.3	V	-20.8	36.5	40.0	3.5
129.98	45.0	V	-15.7	29.3	43.5	14.2
198.08	40.9	H	-13.7	27.2	43.5	16.3
319.99	36.1	H	-10.8	25.3	46.0	20.7
380.50	34.0	H	-9.2	24.8	46.0	21.2
960.13	29.6	H	5.0	34.6	54.0	19.4

Table 3. Radiated Measurements at 3meters

► DVI Mode

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
128.96	45.7	V	-15.9	29.8	43.5	13.7
198.17	46.4	H	-13.7	32.7	43.5	10.8
236.24	51.9	H	-12.8	39.1	46.0	6.9
393.74	44.8	H	-8.9	35.9	46.0	10.1
629.98	38.0	H	-2.8	35.2	46.0	10.8
944.98	33.9	V	4.7	38.6	46.0	7.4

Table 4. Radiated Measurements at 3meters

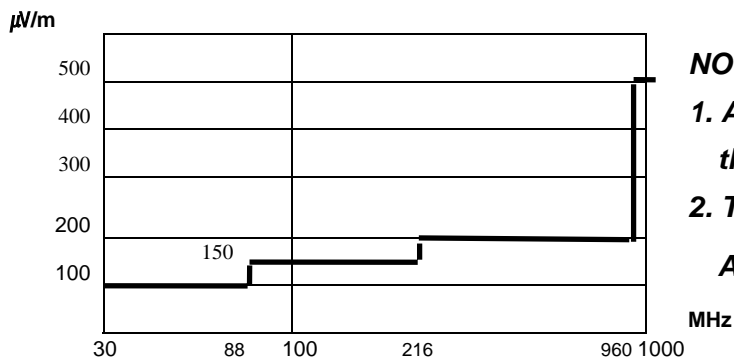


Fig. 4. Limits at 3 meters

NOTES:

1. All modes of operation were investigated the worst-case emission are reported.
2. The radiated limits are shown on Figure 4.

Above 1GHz the limit is 500 μ V/m.

NOTES:

1. *Pol. H=Horizontal V=Vertical
2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.
3. Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

Tested by Y. S Park

Tested by Y. S Park

PLOTS OF EMISSIONS

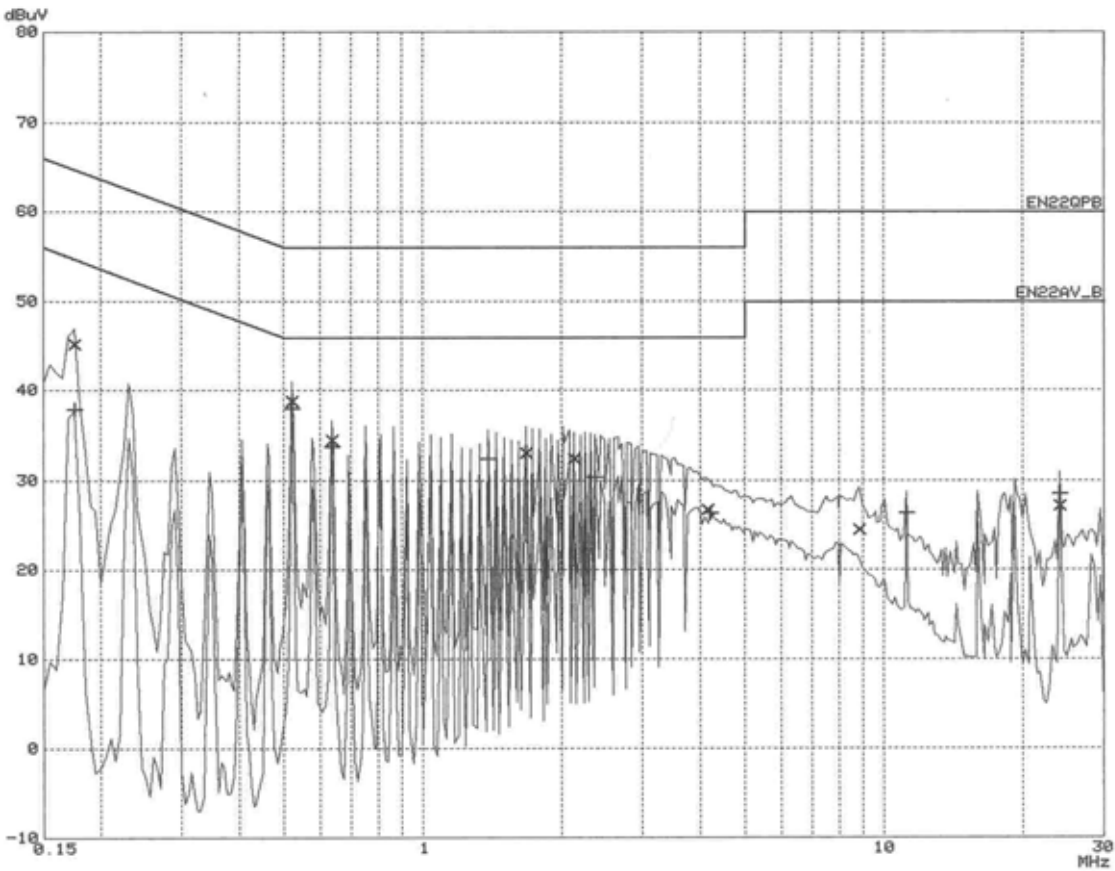
Conducted Emission at the Mains port (Line, Analogue Mode)

NEMKO KOREA
EUT: LCD MONITOR
Manuf: DIGITAL CYNOS
Op Cond: Analog RGB
Operator: Park
Test Spec: FCC PART15 CLASS B
Comment: MODEL:DCM-150
LINE : LINE-PE
File name: 711L.RES
Date: 18. Nov 03 02:06

Scan Settings (1 Range)
----- Frequencies ----- Receiver Settings -----
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 30M 5k 9k PK+AV 20ms AUTO LN OFF

Transducer No. Start Stop Name
11 9k 30M CE_FACT

Final Measurement: x QP / + AV
Meas Time: 20 ms
Subranges: 8
Acc Margin: 50dB



PLOTS OF EMISSIONS

● **Conducted Emission at the Mains port (Neutral, Analogue Mode)**

NEMKO KOREA

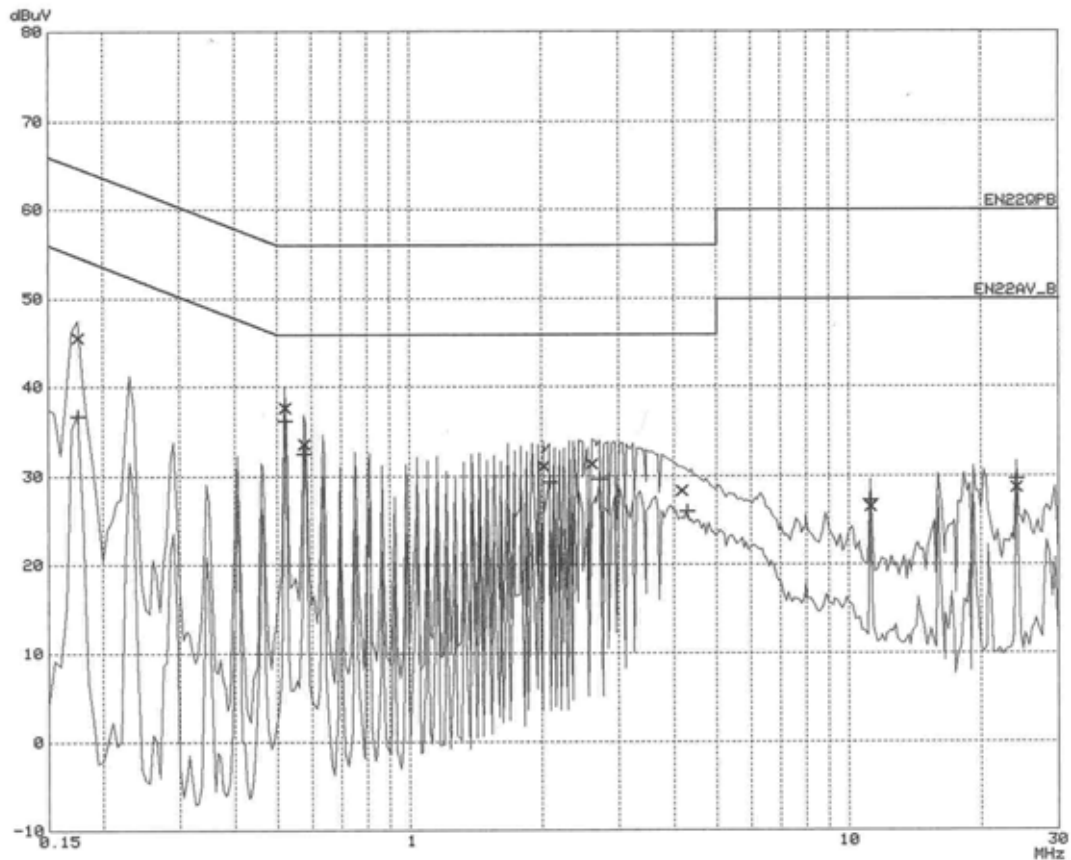
EUT: LCD MONITOR
Manuf: DIGITAL CYNOS
Op Cond: Analog RGB
Operator: Park
Test Spec: FCC PART15 CLASS B
Comment: MODEL:DCM-150
LINE : NEUTRAL-PE
File name: 711L.RES
Date: 18. Nov 03 02:20

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK+AV	20ms	AUTO LN	OFF

Transducer No.	Start	Stop	Name
11	9k	30M	CE_FACT

Final Measurement: x QP / + AV
Meas Time: 20 ms
Subranges: 8
Acc Margin: 50dB



PLOTS OF EMISSIONS

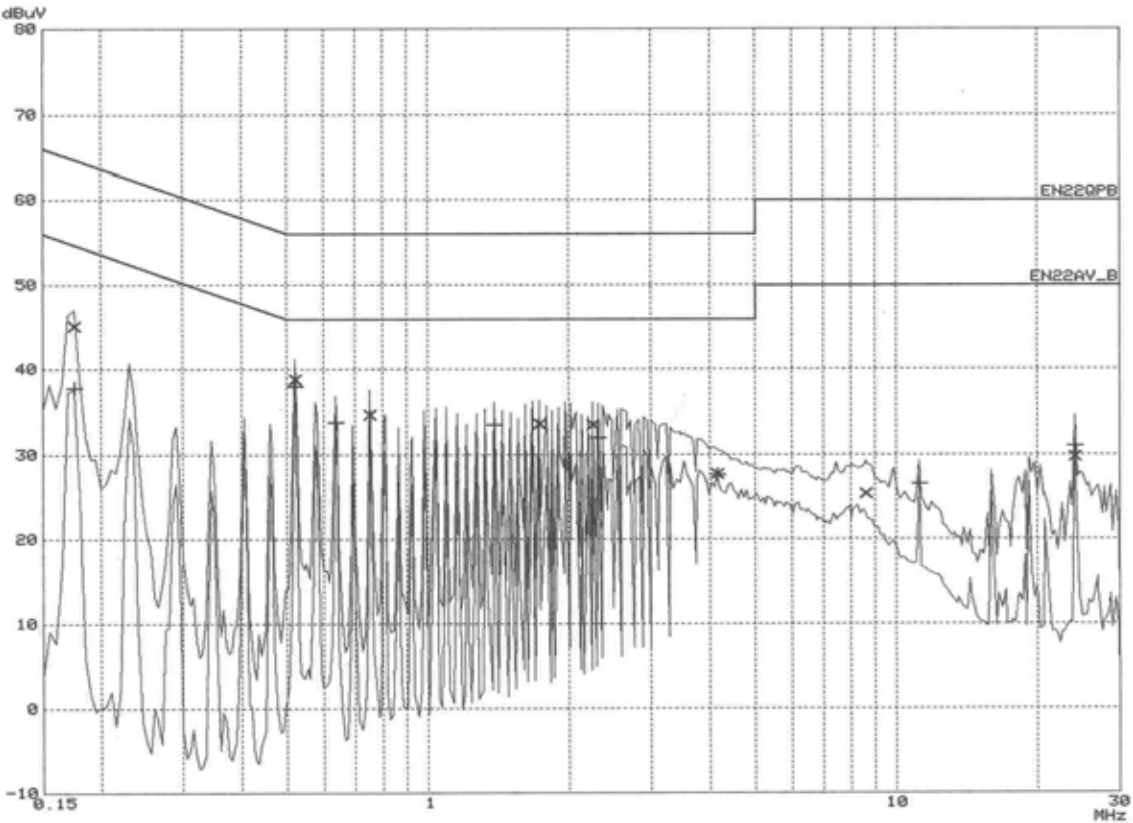
● **Conducted Emission at the Mains port (Line, DVI Mode)**

NEMKO KOREA
EUT: LCD MONITOR
Manuf: DIGITAL CYNOS
Op Cond: DVI
Operator: Park
Test Spec: FCC PART15 CLASS B
Comment: MODEL:DCM-150
 LINE : LINE-PE
File name: 711L.RES
Date: 18. Nov 03 01:53

Scan Settings (1 Range)
----- Frequencies ----- Receiver Settings -----
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 30M 5k 9k PK+AV 20ms AUTO LN OFF

Transducer No. Start Stop Name
11 9k 30M CE_FACT

Final Measurement: x QP / + AV
Meas Time: 20 ms
Subranges: 8
Acc Margin: 50dB



PLOTS OF EMISSIONS

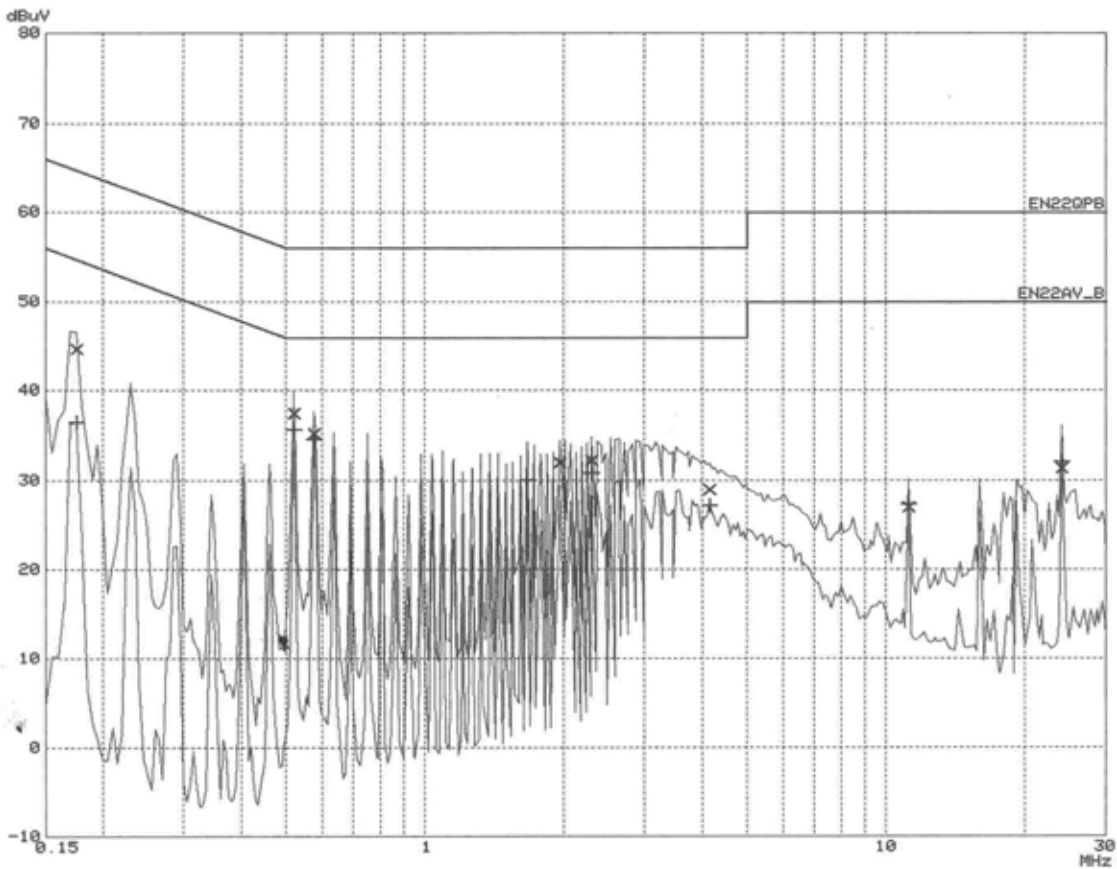
- Conducted Emission at the Mains port (Neutral, DVI Mode)

NEMKO KOREA
EUT: LCD MONITOR
Manuf: DIGITAL CYNOS
Op Cond: DVI
Operator: Park
Test Spec: FCC PART15 CLASS B
Comment: MODEL:DCM-150
LINE : NEUTRAL-PE
File name: 711N.RES
Date: 18. Nov 03 01:38

Scan Settings (1 Range)
----- Frequencies ----- Receiver Settings -----
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 30M 5k 9k PK+AV 20ms AUTO LN OFF

Transducer No. Start Stop Name
11 9k 30M CE_FACT

Final Measurement: x QP / + AV
Meas Time: 20 ms
Subranges: 8
Acc Margin: 50dB



ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

1. Radiation Uncertainty Calculation

Contribution	Probability Distribution	Uncertainty(+/-dB)
Antenna Factor	Normal (k=2)	± 0.5
Cable Loss	Normal (k=2)	± 0.04
Receiver Specification	Rectangular	± 2.0
Antenna directivity	Rectangular	± 1.0
Antenna Factor variation with Height		
Antenna Phase Center Variation		
Antenna Factor Frequency Interpolation		
Measurement Distance Variation		
Site Imperfections	Rectangular	± 2.0
Mismatch:Receiver VRC $r_i=0.3$ Antenna VRC $r_R=0.1(B_i)0.4(L_p)$ Uncertainty Limits $20\log(1+/-r_i r_R)$	U-Shaped	+ 0.25 / - 0.26
System Repeatibility	Std.deviation	± 0.05
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.77
Expended Uncertainty U	Normal (k=2)	± 3.5

2. Conducted Uncertainty Calculation

Contribution	Probability Distribution	Uncertainty(+/-dB)
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch:Receiver VRC $r_i=0.3$ LISN vrc $r_g=0.1$ Uncertainty Limits $20\log(1+/-r_i r_R)$	U-Shaped	± 0.26
System Repeatibility	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Calibration Date
1	*Test Receiver	R & S	ESCS 30	2003.09
2	*Amplifier	HP	8447F	2003.01
3	*Amplifier	HP	8447F	2003.07
4	*Spectrum Analyzer	Advantest	R3265A	2003.03
5	*Logbicon Super Antenna	Schwarzbeck	VULB9166	2003.05
6	Dipole Antenna	R & S	VHA9103	2003.05
7	Dipole Antenna	R & S	UHA9105	2003.05
8	*Biconical Log Antenna	ARA	LPB-2520/A	2003.05
9	Absorbing Clamp	R & S	MDS21	2003.06
10	*LISN	R & S	ESH3-Z5	2003.11
11	*LISN	Kyoritsu	KNW-407	2003.04
12	LISN	Kyoritsu	KNW-408	2002.12
13	*Position Controller	EM Eng.	N/A	N/A
14	*Turn Table	EM Eng.	N/A	N/A
15	*Antenna Mast	EM Eng.	N/A	N/A
16	*Anechoic Chamber	EM Eng.	N/A	N/A
17	*Shielded Room	EM Eng.	N/A	N/A

*) Test equipment used during the test

APPENDIX B – CIRCUIT DIAGRAM

APPENDIX E – USER’S MANUAL

APPENDIX F – SCHEMATIC DIAGRAM
