Electromagnetic Emission

F C C M E A S U R E M E N T R E P O R T

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	15" TV MONITOR
MODEL/TYPE NO	:	LN150X
FCC ID	:	QTHLN150X
APPLICANT	:	T3 DIGITAL CO., LTD. 150-812 3rd Fl, Sungwon bld, 651 Daerim-3Dong, Youngdungpo-Gu, Seoul, Korea Attn. : Ha-Seop, Lee / Executive Director
FCC CLASSIFICATION	:	Part 15 Class B Unintentional Radiators Computing Device Peripheral (JBP)
FCC RULE PART(S)	:	FCC Part 15 Subpart B
FCC PROCEDURE	:	Certification
TRADE NAME	:	T3 DIGITAL
TEST REPORT No.	:	E03.0106. FCC.014N
DATES OF TEST	:	January 4~6, 2003
DATES OF ISSUE	:	January 6, 2003
TEST LABORATORY	:	ETL Inc (FCC Registration Number : 95422) 584 Sangwhal-ri, Kanam-myon, Yoju-kun, Kyounggi-do, 469-885, Korea Tel : (031) 885-0072 Fax : (031) 885-0074

This 15" TV MONITOR, Model LN150X has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B : Unintentional Radiators.
I attest to the accuracy of data. All measurement 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.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Yo han, Park

Name : Yo han, park

Title : Chief Engineer & Lab.Manager

E-RAE Testing Laboratory Inc
584 Sangwhal-ri, Kanam-myon,
Yoju-kun, Kyounggi-do,
469-885, Korea

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FCC MEASUREMENT REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

General Information

Applicant Name : T3 DIGITAL CO., LTD.

Address : 150-812 3rd Fl, Sungwon bld, 651 Daerim-3Dong, Youngdungpo-Gu, Seoul, Korea

Attention : Ha-Seop, Lee / Executive Director

- **EUT Type :** 15" TV MONITOR
- **Model Number :** LN150X
- **FCC Identifier :** QTHLN150X
- **S/N :** N/A
- **Modulation :** N/A
- **FCC Rule Part(s) :** Part 15 Subpart B Unintentional Radiators
- **Test Procedure :** ANSI C63.4-1992
- **FCC Classification :** Part 15 Class B Unintentional Radiators
  Computing Device Peripheral (JBP)
- **Dates of Tests :** January 4 ~ 6, 2003
- **Place of Tests :** ETL Inc
  EMC Testing Lab (FCC Registration Number : 95422)
  584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,
  Kyounggi-Do, Korea
  Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No. :** E03.0106.FCC.014N

1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myun, Youju-kun, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission(Registration Number : 95422).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-1992) was used in determining radiated and conducted emissions from the T3 DIGITAL CO., LTD., Model : LN150X

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test(EUT) is the T3 DIGITAL CO., LTD. / 15" TV MONITOR/ LN150X
Please refer to Users manual

2.2 General Specification

● Chassis Type	: Plastic & Metal Cover
● List of Each OSC. Or X-Tal. Freq. (>=1MHz)	: X-TAL – 24.576MHz, 14.3181MHz, 12.0MHz
● Chipset Brand & Part No.	: SCL8884-100 – SCL, SAA7114H – PHILIPS, ASI310 – AURORA
● Number of Layers	: Main board – 4Layers, Tuner/Audio board – 2 Layers
	: Inverter board – 4 Layers, Front board – 2 Layers
● LCD	: Screen Size – 15 inch (Diagonal Length)
	: Visible Screen Size – 304.1(H) X 228.1(V) (15 Inch diagonal)
	: Pixel Range – 0.297(H) X 0.297(W)
	: Type – a-si TFT-LCD (Liquid Crystal Display)
	: Visual Angle – Upper70/Lower70/Left55/Right55
● Sync	: Horizontal Frequency – 30~60KHz (Auto Set)
	: Vertical Frequency – 56~75Hz (Auto Set)
● Color Display	: Displayable color – 16.7M Color
● Input Signal	: Input Signal – Analog 0.7Vpp Positive (75Ω)
● Video Signal	: Video Signal – NTSC
	: Audio Signal – MONO / STEREO
	: Video Type – CVBS, S-VHS, COMPOSITE VIDEO
● Sync Signal	: Separate Sync Signal – TTL LEVEL POSITIVE OR NEGATIVE
	: Composite Sync Signal – TTL LEVEL POSITIVE OR NEGATIVE
	: Green Video + Composite – Composite Sync: Vp-p Negative
● Power / Voltage	: Flow 100-240V, 60/50Hz DC12V/3A
● Consumption	: Regular – Maximum 33W, Safe – under 3W

- Movement Condition : Temperature> -20℃ ~ 40℃
  : Humidity – 10% ~ 95%
- Size : Excluding BASE – 440 X 55 X 298
  : Including BASE – 518 X 280 X 466
- Weight : Net – 5.7kg (11 lbs)
  : Gross – 6.8kg (15.4 lbs)

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located inside a shielded room 1m X 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the side wall of the shielded room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from the another EMCO LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMCO LISN. Non-inductive bundling to a 1m length shortened all interconnecting cables more than 1m. Sufficient time for the 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 R3261A Spectrum Analyzer to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

3. DESCRIPTION OF TESTS

3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determined the frequency producing the max. emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using SchwarzBeck Log-Bicon antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 10-meters. The test equipment was placed on a wooden turn-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 re-examined by manual. 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 of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the max. emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

4.2 EUT operation

The EUT was connected as user`s guide. And during the test executed test program for EMI Test Program with " H" Pattern display on Monitor.

Operating Mode	Worst case
Stand by	X
DVD Play	X
" H " Pattern Display	O
TV Signal Receiving	X

Resolution	H /V Frequency	Worst case
640 X 350	31.5KHz / 70.0Hz	X
640 X 480	37.5KHz / 75Hz	X
800 X 600	48.1KHz / 72.2Hz	X
1024 X 768	56.5KHz / 60.0Hz	X
1024 X 768	60.0KHz / 75.0Hz	O

O: Worst case investigated during the Test

4.3 Support Equipment Used

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

EUT – 15" TV MONITOR (T3 DIGITAL CO., LTD.)

FCC ID	: QTHLN150X
Model Name	: LN150X
Serial No.	: N/A
Manufacturer	: T3 DIGITAL CO., LTD.
Power Supply Type	: Switching, DC 12V/3A of AC/DC Adapter
Power Cord	: Non-shielded, Detachable:1.2m
Port	: RGB:1, Antenna:1, S-VHS:1, Video in:1, PC Audio in:1,
	: Audio in:2, Audio out: 2, CVBS:1, Composite video:1
	: DC IN:1

Support Unit 1 – PC (DELL)

FCC ID	: DOC
Model Name	: MMP
Serial No.	: BK1W31S
Manufacturer	: DELL
Power Supply Type	: Switching
Power Cord	: Non-Shielded, Detachable, 1.2m
Port	: RGB IN:1, Parallel:1, RS-232:2, PS/2: 2, USB: 2, RJ-45:1
	: Audio in:1, Audio out:1, MIC IN:1

Support Unit 2 – Keyboard (DELL)

FCC ID	: DOC
Model Name	: SK-8000
Serial No.	: MY-0970WY-38843-0CB-3064
Manufacturer	: DELL
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Shielded: 1.2m

Support Unit 3 - MOUSE (LOGITECH)

FCC ID	: JNZ201213
Model Name	: M-S48a
Serial No.	: HCA13711225
Manufacturer	: LOGITECH
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Shielded, 1.2m

Support Unit 5 – USB MOUSE (LOGITECH)

FCC ID	: JNZ211360
Model Name	: M-U48a
Serial No.	: N/A
Manufacturer	: LOGITECH
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Shielded, 1.0m

Support Unit 6 – Serial Mouse (INFO)

FCC ID	: EMJMUSOG
Model Name	: MUSOG
Serial No.	: Q36E
Manufacturer	: INFO
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Un-Shielded, 1.2m

Support Unit 7 – Printer (SINDORICO)

FCC ID	: N/A
Model Name	: Colorcab330
Serial No.	: 11-03098
Manufacturer	: LEXMARK INTERNATIONAL INC.
Power Supply Type	: Switching
Power Cord	: Non-Shielded, Detachable, 1.2m
Data Cable	: Shielded, 1.5m

Support Unit 8 – EAR MIC (JE TECH)

FCC ID	: N/A
Model Name	: N/A
Serial No.	: N/A
Manufacturer	: JE TECH
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Non-Shielded, 1.0m

Support Unit 8 – DVD (ALPHACAST)

FCC ID	: N/A
Model Name	: DVDP-100
Serial No.	: N/A
Manufacturer	: ALPHACAST
Power Supply Type	: Power supply from DC 12V of AC/DC Adapter
Power Cord	: N/A
Port	: S-VHS:1, OPTICAL:1, COAXTAL:1, Remote:1, Audio out:6
	: Composite video:3, Video:1, DC IN:1

5. TEST RESULTS

5.1 Summary of Test Results

This equipment is Power Supply system from DC12V of AC/DC Adapter, The Conducted Test data is AC/DC Adapter Power Test data
The measurement results were obtained with the EUT tested in the conditions described in this report.
Detailed measurement data and plots showing the maximum emission of the EUT are reported.

Test Rule Parts	Measurement Required	Result
15.107(e)	Conducted Emissions Measurement	Passed by – 14.50 dB
15.109(e)	Radiated Emissions Measurement	Passed by – 3.05 dB

The data collected shows that the T3 DIGITAL CO., LTD., 15" TV MONITOR, LN150X complies with technical requirements of above rules part 15.107 and 15.109 Class B Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

5. TEST RESULTS

5.2 Conducted Emissions Measurement

EUT	15" TV MONITOR / LN150X (SN:N/A)
Limit apply to	15.107(e) : CISPR Pub.22(1997) Class B
Test Date	January 4, 2003
Operating Condition	" H" Pattern display Mode, Resolution 1024 X 768 60.0KHz/75Hz
Environment Condition	Humidity Level : 40 %RH, Temperature : 25℃
Result	Passed by – 14.50 dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarization of live and neutral line.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 9 KHz)

Frequency [MHz]	Reading [dBμV]		Phase (*H/**N)	Limit [dBμV]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Q.Peak	Average
0.200	49.10	-	H	63.6	53.6	14.50	-
0.266	42.30	-	H	61.2	51.2	18.90	-
0.530	32.70	-	H	56.0	46.0	23.30	-
3.820	31.30	-	N	56.0	46.0	24.70	-
15.86	35.10	-	H	60.0	50.0	24.90	-
23.83	31.70	-	N	60.0	50.0	28.30	-

NOTES :

1. *** H : HOT Line , **N : Neutral Line**
2. **Margin value = Limit – Reading**
3. **Measurement were performed at the AC/DC Adapter Power Inlet in the frequency band of 150kHz ~ 30MHz according to the CISPR 22 Class B**
4. **If the Reading Quasi-Peak value is bellowed the Average Limit, Do not test Average Mode.**

Test Engineer : C. S. Kim

5. TEST RESULTS

Line: HOT Line

ETL INC.
CONDUCTED EMISSION

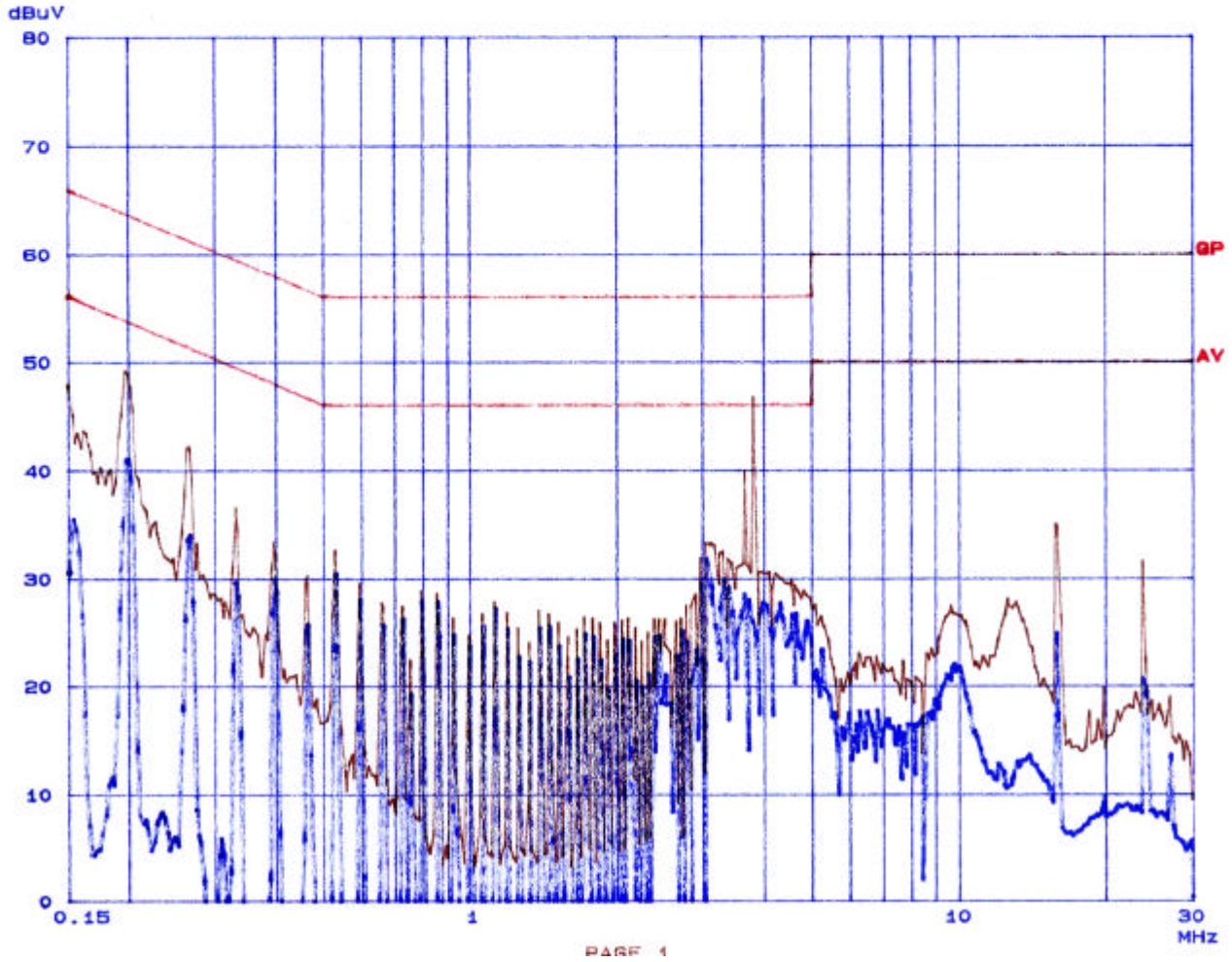
EUT: LCD TV Monitor
Test Spec: EN 55022 CLASS B
Comment: HOT

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpAge
150k	500k	2k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 3dB

Transducer No.	Start	Stop	Name
1	100k	30M	EN55022



5.TEST RESULTS

Line: Neutral Line

ETL INC.
CONDUCTED EMISSION

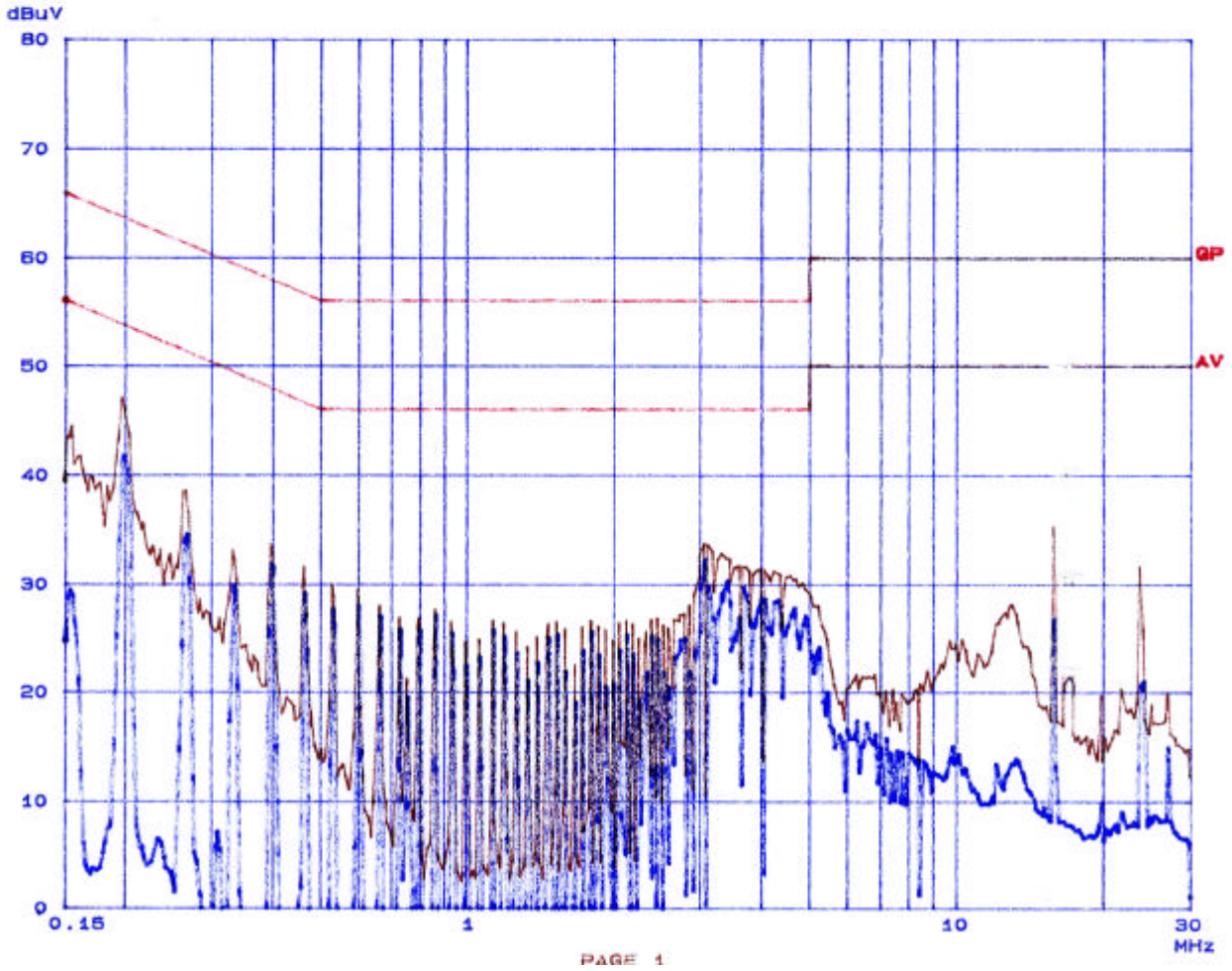
EUT: LCD TV Monitor
Test Spec: EN 55022 CLASS B
Comment: NEUTRAL

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	2k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 3dB

Transducer No. Start Stop Name
1 100k 30M EN55022



5. TEST RESULTS

5.3 Radiated Emissions Measurement

EUT	15" TV MONITOR / LN150X (SN:N/A)
Limit apply to	15.109(e) : CISPR Pub.22(1997) Class B
Test Date	January 4, 2003
Operating Condition	" H " Pattern display Mode Resolution 1024 X 768 60.0KHz/75Hz
Environment Condition	Humidity Level : 40 %RH, Temperature : 16℃
Result	Passed by – 3.05dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.
Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 120 kHz)
Measurement Distance : 10 meters

Frequency [MHz]	Reading [dBμV]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
53.63	13.37	V	11.58	1.87	26.83	30.0	3.17
120.70	12.59	H	11.29	2.80	26.68		3.32
134.10	11.45	V	12.13	2.88	26.46		3.54
147.48	11.28	V	12.67	3.00	26.95		3.05
154.19	10.12	V	12.89	3.08	26.09		3.91
181.04	10.91	V	10.70	3.71	25.32		4.68
201.12	11.87	V	8.80	3.91	24.58		5.42
335.21	12.66	H	13.45	4.78	30.89	37.0	6.11
536.40	8.34	H	17.51	6.35	32.19		4.81

NOTES :

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Emission Level = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Emission Level**
4. **The measurement was performed for the frequency range 30MHz ~ 1000MHz according to the CISPR 22 Class B**

Test Engineer : C. S. Kim

6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor

$dB(\mu V/m) = 20 \log_{10} (\mu V /m)$: Equation 1
$dB\mu V = dBm + 107$: Equation 2

Example 1 : @ 0.200 MHz

Class B Limit = 1514 uV = 63.60 dBuV

Reading = 49.10 dBuV

Convert to uV = 285.10 uV

Margin = 49.10 – 63.60 = - 14.50

= -14.50 dB below Limit

Example 2 : @ 147.48 MHz

Class B Limit = 31.62 uV = 30.0 dBuV/m

Reading = 11.28 dBuV

Antenna Factor + Cable Loss = 15.67 dB

Total = 26.95 dBuV/m

Margin = 26.95 – 30.0 = -3.05

= -3.05 dB below Limit

7. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Date
☒	Spectrum Analyzer	R3261A	Advantest	21720033	02-10-25
☒	Receiver	ESVS 10	R & S	835165/001	02-03-21
☒	Receiver	ESHS30	R & S	84190/002	02-01-24
☒	Spectrum Analyzer	E7402A	HP	US39110107	03-05-21
☒	LISN	3825/2	EMCO	9208-1995	02-12-27
☒	LISN	3825/2	EMCO	9006-1669	02-12-28
☒	Preamplifier	HP8447D	HP	2944A07626	02-01-10
☐	Preamplifier	HP 8347A	HP	2834A00544	02-05-23
☒	TriLog Antenna	VULB9160	Schwarz Beck	3082	02-06-19
☐	LogBicon	VULB9165	Schwarz Beck	2023	02-05-28
☒	Dipole Antenna	VHAP	Schwarz Beck	964	02-05-04
☐	Dipole Antenna	VHAP	Schwarz Beck	965	02-05-04
☒	Dipole Antenna	UHAP	Schwarz Beck	949	02-05-04
☐	Dipole Antenna	UHAP	Schwarz Beck	950	02-05-04
☐	Broad-band Horn Antenna	3115	EMCO	9809-2334	02-09-20
☐	Magnetic Loop Antenna	6502	EMCO	9810-2111	02-12-11
☒	Turn-Table	DETT-03	Daeil EMC	-	N/A
☒	Antenna Master	DEAM-03	Daeil EMC	-	N/A
☒	Plotter	7440A	H.P	2725A 75722	N/A
☒	Chamber	DTEC01	DAETONG	-	N/A
☒	Thermo Hygrograph	3-3122	ISUZU	3312201	02-01-10
☒	BaroMeter	-	Regulus	-	-