Certification of Compliance

CFR 47 Part 15 Subpart B

Test Report File No. : 05-IST-0276 **Date of Issue** : Aug 25, 2005

Model(s) : **MM50**
Kind of Product : LCD Monitor
FCC ID : TJLMM50
Applicant : HEEYOUNG Co., Ltd.
Address : 1048-8, Shingil-Dong, Danwon-Gu, Ansan-City, Kyunggi-Do, Korea

Manufacturer : HEEYOUNG Co., Ltd.
Address : 1048-8, Shingil-Dong, Danwon-Gu, Ansan-City, Kyunggi-Do, Korea

Test Result ■ **Positive** ☐ **Negative**

Reviewed By

S.J.CHO / EMC Group Manager

Approved By

J.H.LEE / Chief

Comment(s)

- Investigations requested : Measurement to the relevant clauses of FCC rules and regulations Part 15 Subpart B - Unintentional Radiators, Class B.
- The test report with appendix consists of 21 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued compliance 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 2003.

TABLE OF CONTENTS

Table of contents 2

Information of test laboratory, Environmental conditions, Power used, Product information 3

Descriptions of test

Conducted Emission 4

Radiated Emission 5

Equipment Under Test 6

Summary 7

■ **Test Conditions and Data - Emissions**

◆ Conducted Emissions 0.15MHz - 30MHz Applicable

Test Conditions / Data and Plots 8-10

◆ Radiated Emissions 30MHz - 2GHz Applicable

Test Conditions / Data and Plots 11-17

Appendix A. The Photos of Test Setup 18-19

B. The Photos of Equipment Under Test 20-21

Note:

INFORMATIONS OF TEST LABORATORY

EMC LABORATORY of IST Co., Ltd. ***(FCC Filing Lab.)***
San 21-8, Goan-Ri, Baekam-Myun, Yongin-City
Kyonggi-Do, 449-860, Korea
TEL : +82 31 333 4093 FAX : +82 31 333 4094

ENVIRONMENTAL CONDITIONS

Temperature	24 ℃
Humidity	55 %
Atmospheric pressure	1008 mbar

POWER SUPPLY SYSTEM USED

Power supply system	AC 120Vac, 60Hz (Refer to the product information)

PRODUCT INFORMATION

- EMC suppression device is not used during the test.
- Please refer to user's manual.
-

Model Name :	MM50
FCC ID :	TJLMM50
Pannel :	Size – 20.1"
	Type – a-si TFT Active matrix
	Display Size – 399(H)x319(V) mm
	Brightness – 850cd/㎡
	Pixel Pitch – 0.156mm x 0.156mm
	Contrast Ratio – 600:1
Resolution :	Landscape – 2560 x 2048, Portrait – 2048 x 2560
Digital Interface :	DVI-D Connector
USB Port :	1Up stream, 2Down stream
Power :	100-240Vac, 50/60Hz, 75W
Dimension(mm) :	438(W) x 458(H) x 98(D)

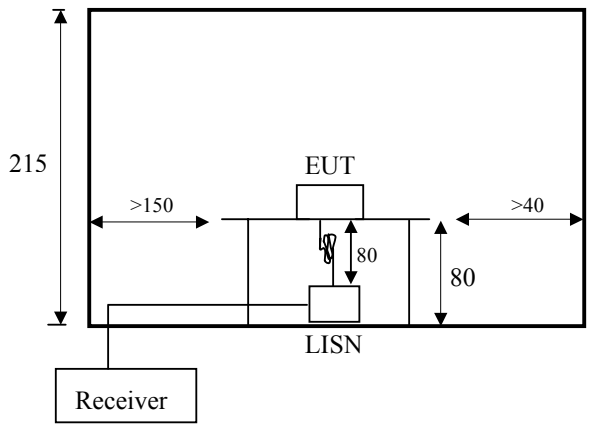
DESCRIPTIONS OF TEST

Conducted Emissions:

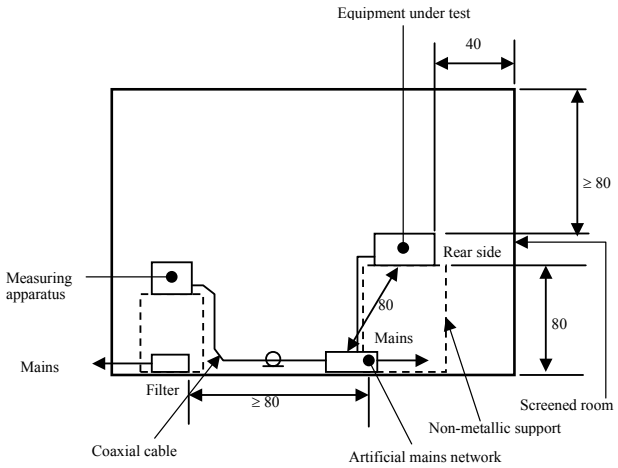
The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" & "Average" within a bandwidth of 9KHz.

-Procedure of Test

The line-conducted facility is located inside a shielded room No.1. A 1m X 1.5m wooden table 80cm height is placed 40cm away from the vertical wall and 1.5m away from the other wall of the shielded room. The R/S ESH3 and Hyup-Rip KNW-407 LISN are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80cm from the LISN and powered from the EMCO LISN .The peripheral equipment is powered from the other 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 this supply lines will be connected to the EMCO LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using Quasi-Peak mode by manual measurement, after scanned by automatic Peak mode for frequency range from 0.15 to 30MHz. The bandwidth of the receiver was set to 10kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.



< Side View >



< Concept Drawing >

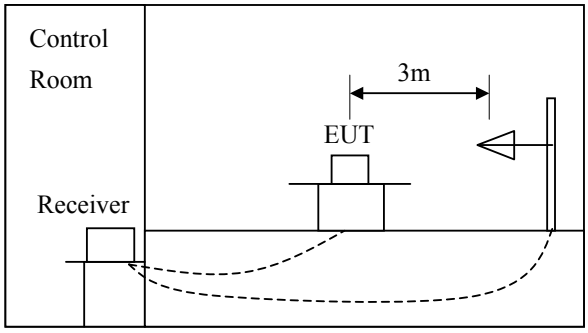
DESCRIPTION OF TEST

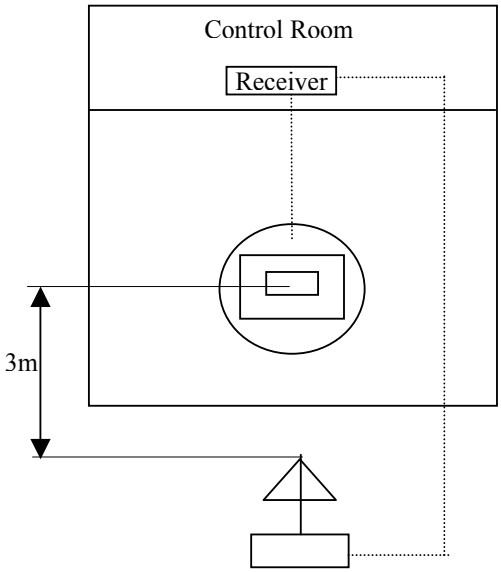
Radiated Emissions:

The measurement was 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 measurement was made with the detector set for "quasi-peak" within a bandwidth of 120KHz.

-Procedure of Test

Preliminary measurements were made at 3 meter using bi-conical and log-periodic antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 300MHz using S/B bi-conical antenna and 300 to 1000MHz using S/B log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using S/B bi-log antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral 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, peripheral 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, peripheral 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 maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.





Equipment Under Test

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 Mode

■ Operational Condition : ■ 'H' Patterns on the windows (2560 x 2048/2048 x 2560)

Configuration of the equipment under test :

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

Equipment	Type	Brand	Serial No.
Desktop Computer	Vectra VL420 MT	HP	SG23101785
Keyboard(PS/2)	SK-2502C	HP	M020321066
Mouse(PS/2)	M-S48a	HP	LZC20602926
Mouse(Serial)	M-M28	Logitech	LCA53305547
Printer	A0302384	Northern Telecom	26633S60168
USB Mouse	M-U48a	Logitech	LZE01858776

Connecting Interface Cables :

shielded DVI cable (with two ferrite core) : 1.8 m

Unshielded AC power cable : 1.8 m

Shielded printer's signal cable (with two ferrite core) : 1.8 m

Unshielded Keyboard(PS/2) cable : 1.8 m

Unshielded Mouse(PS/2) cable : 1.8 m

Unshielded Mouse(USB) cable : 1.8 m

Unshielded Mouse(Serial) cable : 1.8 m

Note :

SUMMARY

Emissions

■ Conducted Emission

The requirements are ● MET ○ Not MET

Minimum limit margin 3.1 dB at 0.457 MHz

Maximum limit exceeding

Remarks : With Neutral phase, for average detect mode.

Find the test data in following pages 8 to 10.

■ Radiated Emission

The requirements are ● MET ○ Not MET

Minimum limit margin 6.3 dB at 114.9 MHz

Maximum limit exceeding

Remarks : 2048 x 2560, 47Hz mode.

Find the test data in following page 11 to 17.

Test Date

Begin of Testing : August 23, 2005

End of Testing : August 25, 2005

Prepared By

Note :

- ■ means the test is applicable,
- □ is not applicable.

S.J.OH / Senior Engineer

TEST CONDITIONS AND DATA

Conducted Emissions

[Applicable]

◆ Test Equipment Used

Model Name	Description	Manufacturer	Calibration Date	Serial No.
ESH3	Test Receiver	Rohde & Schwarz	Jul. 12, 2005	892108/018
3725/2	LISN	EMCO	Jul. 12, 2005	9101-2068
KNW-407	LISN	Hyup-Rip	Jul. 12, 2005	8-883-10
ESH3-Z2	Pulse Limiter	Rohde & Schwarz	Jul. 12, 2005	357.8810.52

◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

◆ Test Program Scrolling "H" Patterns on the windows

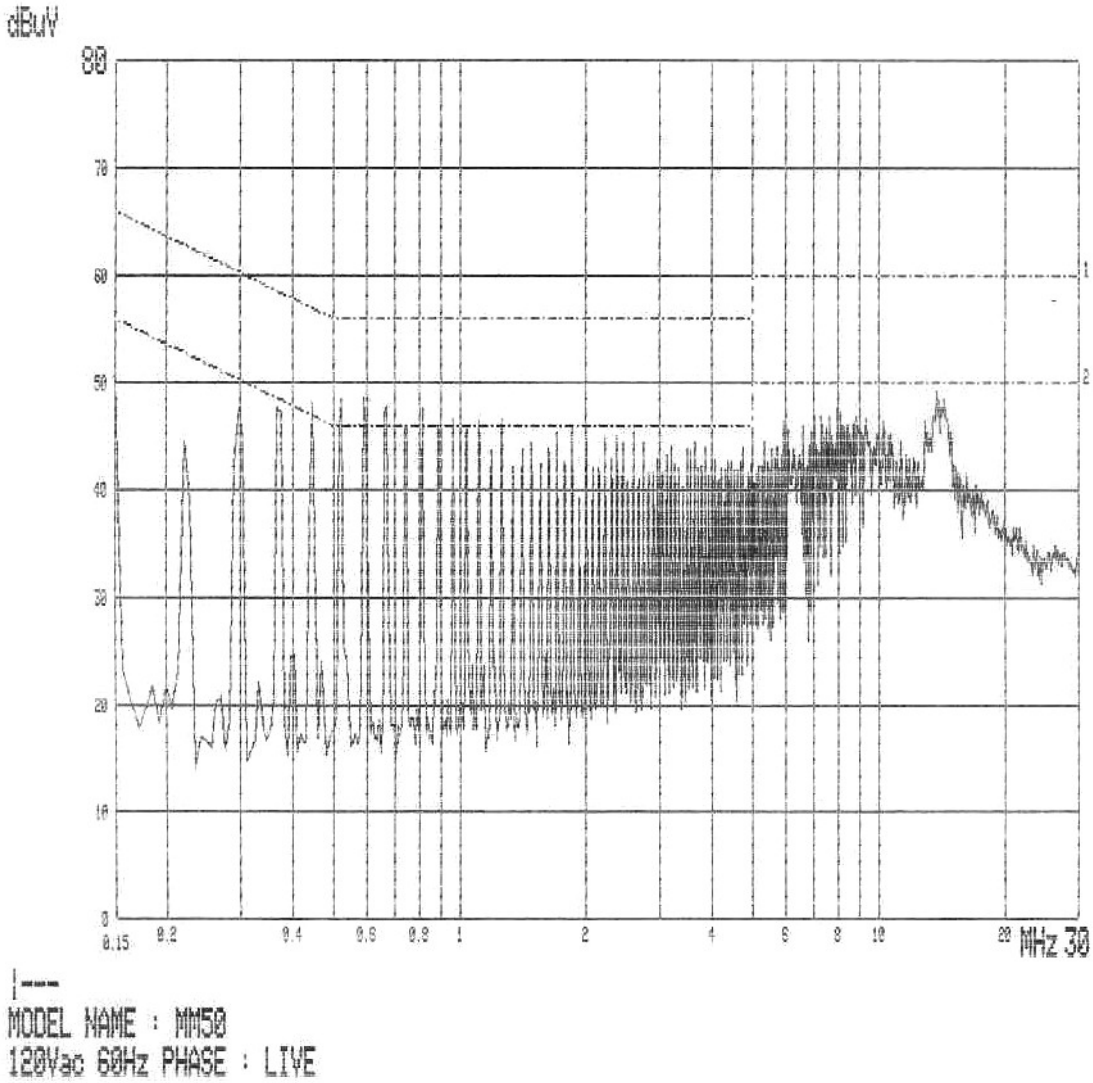
◆ Test Date August 24, 2005

◆ Test Area Conducted room No.1

Note : The equipment used is calibrated in regular for every year.

Conducted Emissions

Live Phase

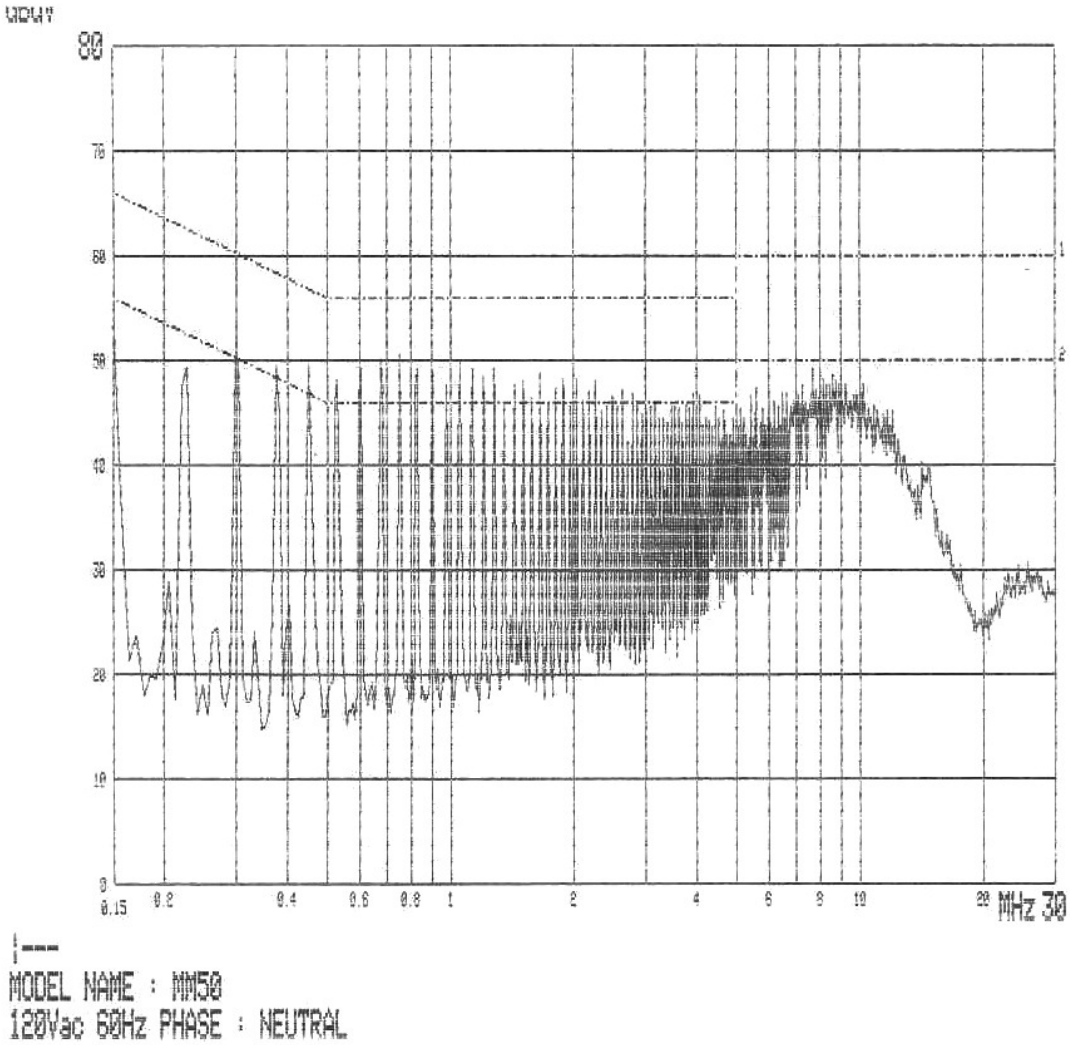


Freq. [MHz]	Measurement [dB μV]		Limit [dB μV]		Insertion Loss	Cable Loss	Result [dB μV]		Margin [dB]	
	Q-peak	Average	Q-peak	Average	[dB]	[dB μV]	Q-peak	Average	Q-peak	Average
0.150	49.4	37.8	66.0	56.0	0.3	0.5	50.2	38.6	15.8	17.4
0.449	46.3	42.8	56.9	46.9	0.4	0.4	47.1	43.6	9.8	3.3
0.599	46.2	39.3	56.0	46.0	0.4	0.4	47.0	40.1	9.0	5.9
1.274	45.6	41.9	56.0	46.0	0.3	0.5	46.4	42.7	9.6	3.3
7.953	45.6	40.5	60.0	50.0	0.3	0.6	46.5	41.4	13.5	8.6
13.745	43.5	31.7	60.0	50.0	0.3	0.6	44.4	32.6	15.6	17.4

Note :

Conducted Emissions

Neutral Phase



Freq. [MHz]	Measurement [dB μV]		Limit [dB μV]		Insertion Loss	Cable Loss	Result [dB μV]		Margin [dB]	
	Q-peak	Average	Q-peak	Average	[dB]	[dB μV]	Q-peak	Average	Q-peak	Average
0.150	49.1	45.8	66.0	56.0	0.3	0.5	49.9	46.6	16.1	9.4
0.457	48.5	42.8	56.7	46.7	0.4	0.4	49.3	43.6	7.4	3.1
0.762	46.5	40.9	56.0	46.0	0.4	0.4	47.3	41.7	8.7	4.3
1.067	48.4	42.0	56.0	46.0	0.3	0.5	49.2	42.8	6.8	3.2
7.704	45.0	39.5	60.0	50.0	0.3	0.6	45.9	40.4	14.1	9.6
8.625	45.4	39.7	60.0	50.0	0.3	0.6	46.3	40.6	13.7	9.4

Note :

TEST CONDITIONS AND DATA

Radiated Emission

[Applicable]

◆ Test Equipment Used

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESCS 30	Test Receiver	Rohde & Schwarz	Aug. 22, 2005	100171
VULB 9160	Antenna	Schwarzbeck	Jul. 19, 2005	3047
3115	Horn Antenna	EMCO	Sep. 26, 2004	90123602
8566B	Hewlett Packard	Spectrum Analyzer	Dec. 01, 2004	3014A07159
85685A	Hewlett Packard	RF preselector	Dec. 01, 2004	2817A00760

◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

◆ Test Program Scrolling "H" Patterns on the windows

◆ Test Date August 23, 2005

◆ Test Area Open site No.2

Note : The equipment used is calibrated in regular for every year.

Radiated Emissions

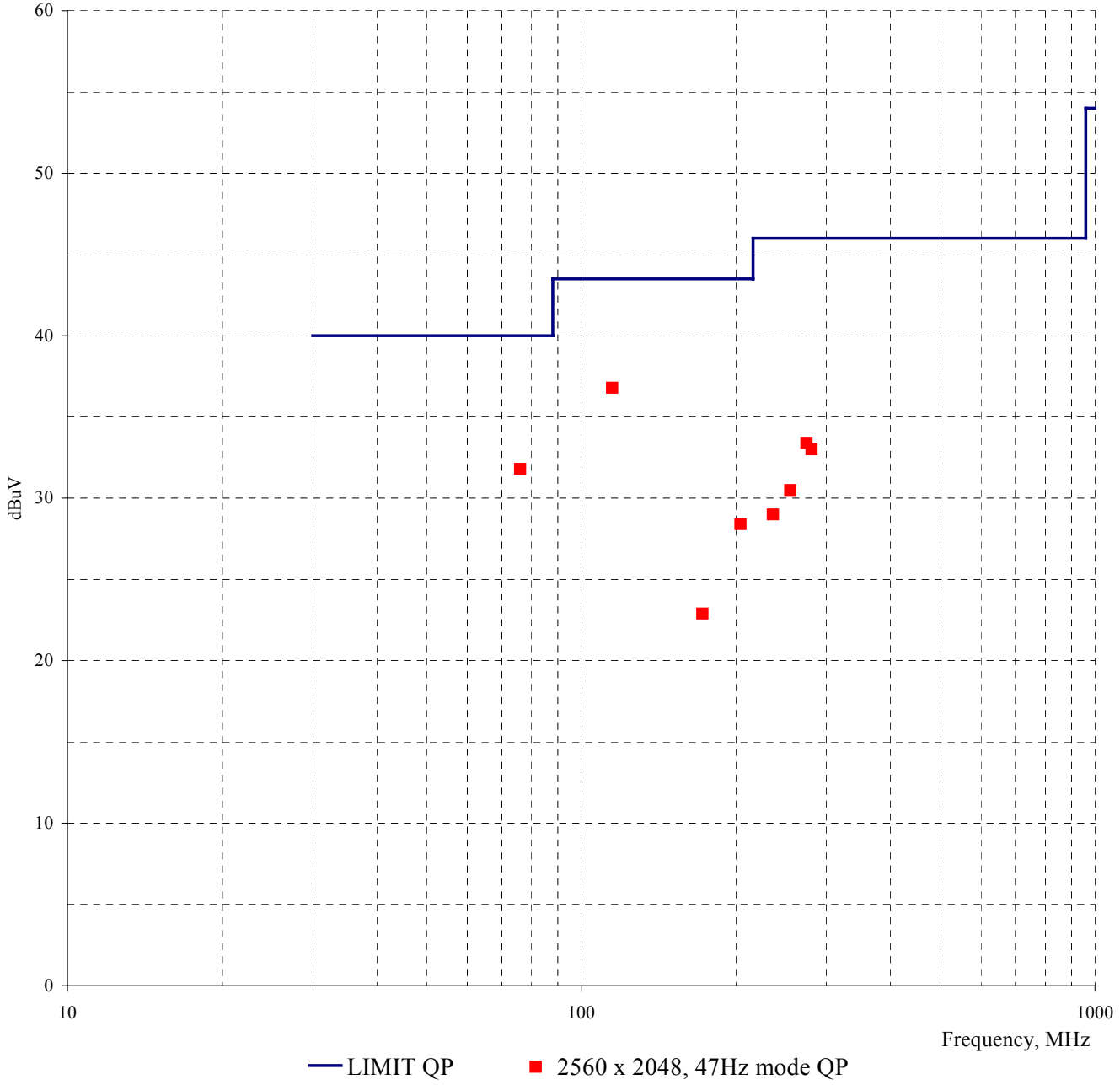
(Disturbance Radiation)

[Applicable]

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
76.0	21.3	8.6	1.9	V	31.8	40.0	8.2
114.9	23.6	10.8	2.4	V	36.8	43.5	6.7
172.2	7.8	12.0	3.1	V	22.9	43.5	20.6
204.2	15.9	9.2	3.3	H	28.4	43.5	15.1
236.1	14.7	10.5	3.8	H	29.0	46.0	17.0
255.3	15.4	11.2	3.9	V	30.5	46.0	15.5
274.4	17.7	11.7	4.0	H	33.4	46.0	12.6
280.8	16.8	12.0	4.2	V	33.0	46.0	13.0

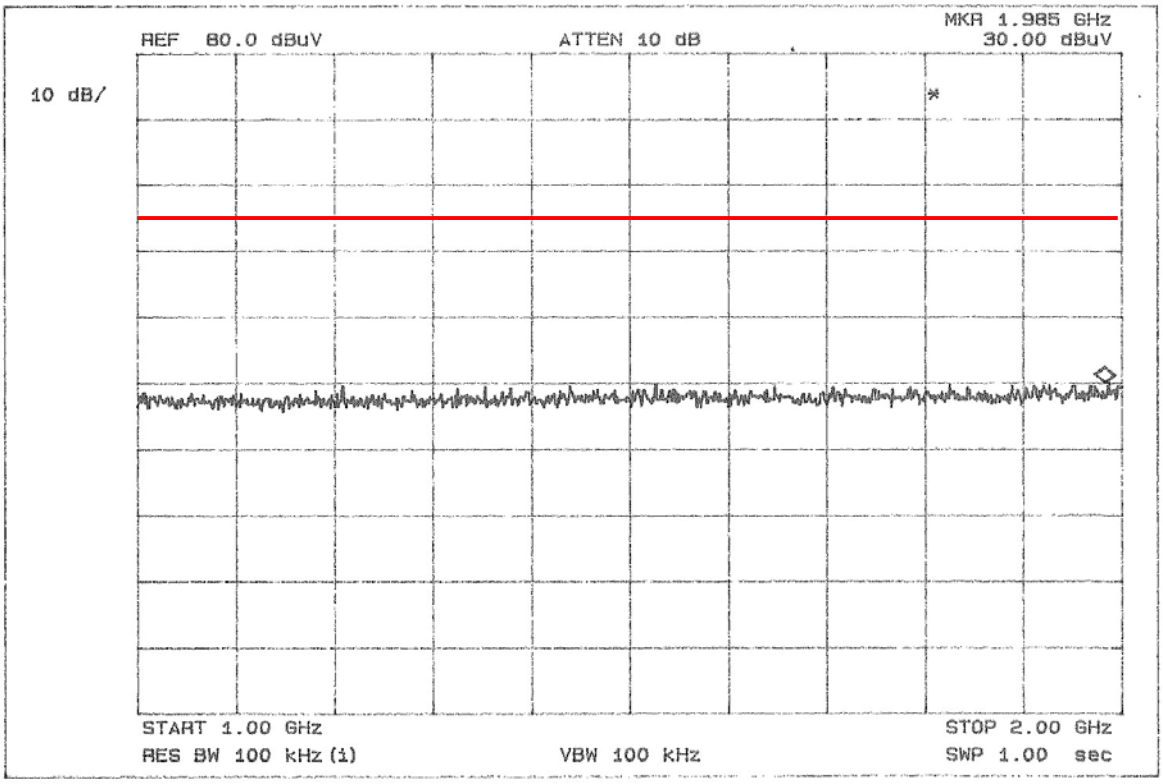
Note: ***2560 x 2048, 47Hz mode***

MEASUREMENT OF DISTURBANCE RADIATION



Radiated Emissions

(Disturbance Radiation)



Radiated Emission Test 1GHz – 2GHz

Measured Data from 1GHz to 2GHz

Above 1GHz, peak detector function mode is used with 23dB gain of preamp.
The following graphs show that all data of full frequencies are meet with the limit.
We automatically change our antenna polarity, when measure radiated emission.
The spectrum plot was obtained with peak detect mode and maximum hold mode. It was used For plot the HP8566B spectrum analyzer, EMCO 3115 Horn antenna and HP85685A RF preselector.
(Section 15.35)
The peak value evaluation at the frequency of 1.985GHz is

30.0dB(measured) + 26.8dB(antenna factor) + 8.9(cable loss)
- 23dB(gain of preamp) – 20dB(corrective factor)
= 22.7dB(less than average limit 54.0dB)

The peak value evaluation is less than the average limit, EUT have the margin relative To peak value more than 10dB for radiated emission for the above 1GHz.

Note : ***2560 x 2048, 47Hz mode***

Radiated Emissions

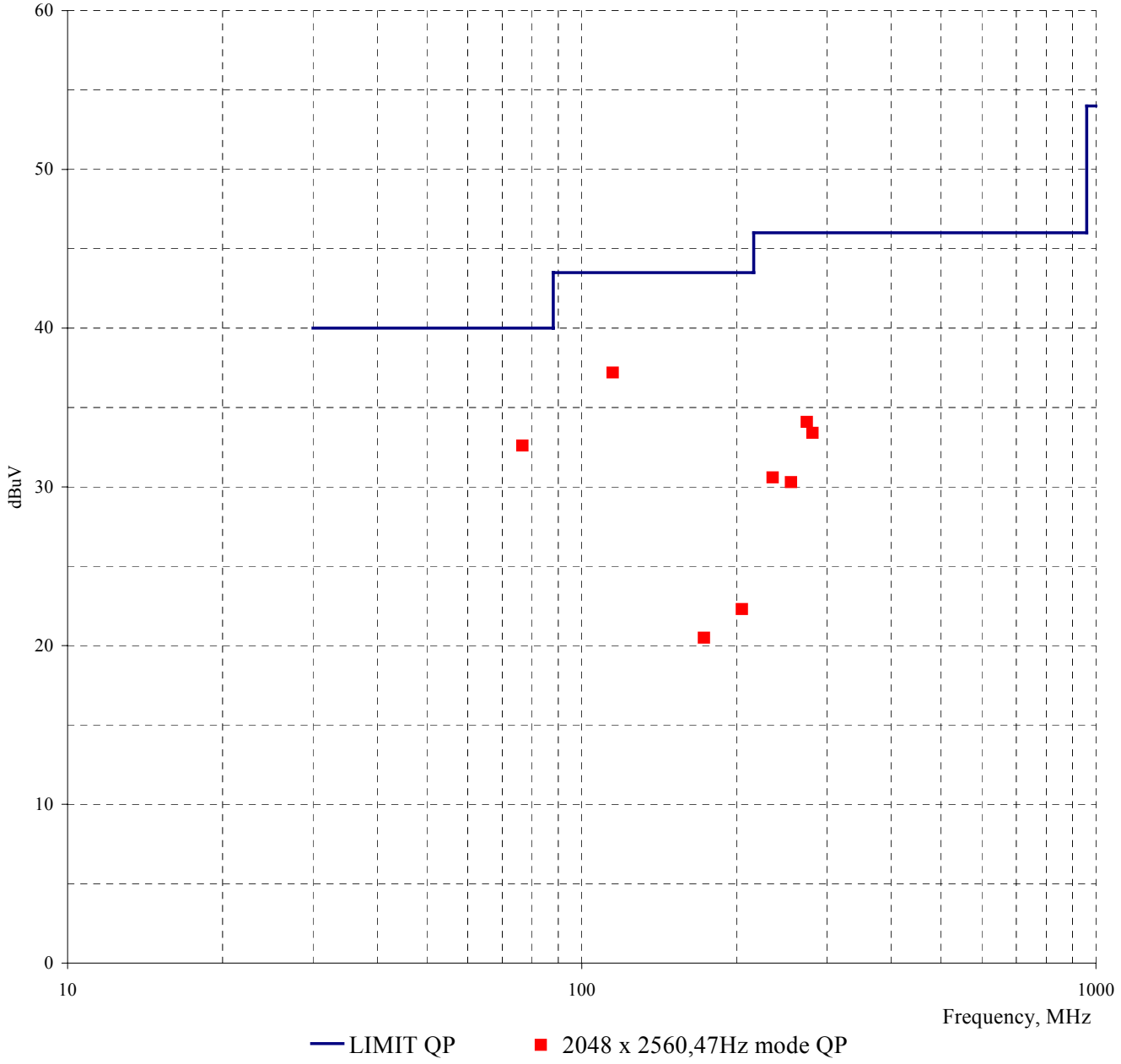
(Disturbance Radiation)

[Applicable]

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
76.7	22.2	8.5	1.9	V	32.6	40.0	7.4
114.9	24.0	10.8	2.4	V	37.2	43.5	6.3
172.9	5.6	11.8	3.1	V	20.5	43.5	23.0
204.8	9.8	9.2	3.3	H	22.3	43.5	21.2
235.2	16.3	10.5	3.8	H	30.6	46.0	15.4
255.3	15.2	11.2	3.9	V	30.3	46.0	15.7
274.0	18.4	11.7	4.0	H	34.1	46.0	11.9
281.0	17.2	12.0	4.2	V	33.4	46.0	12.6

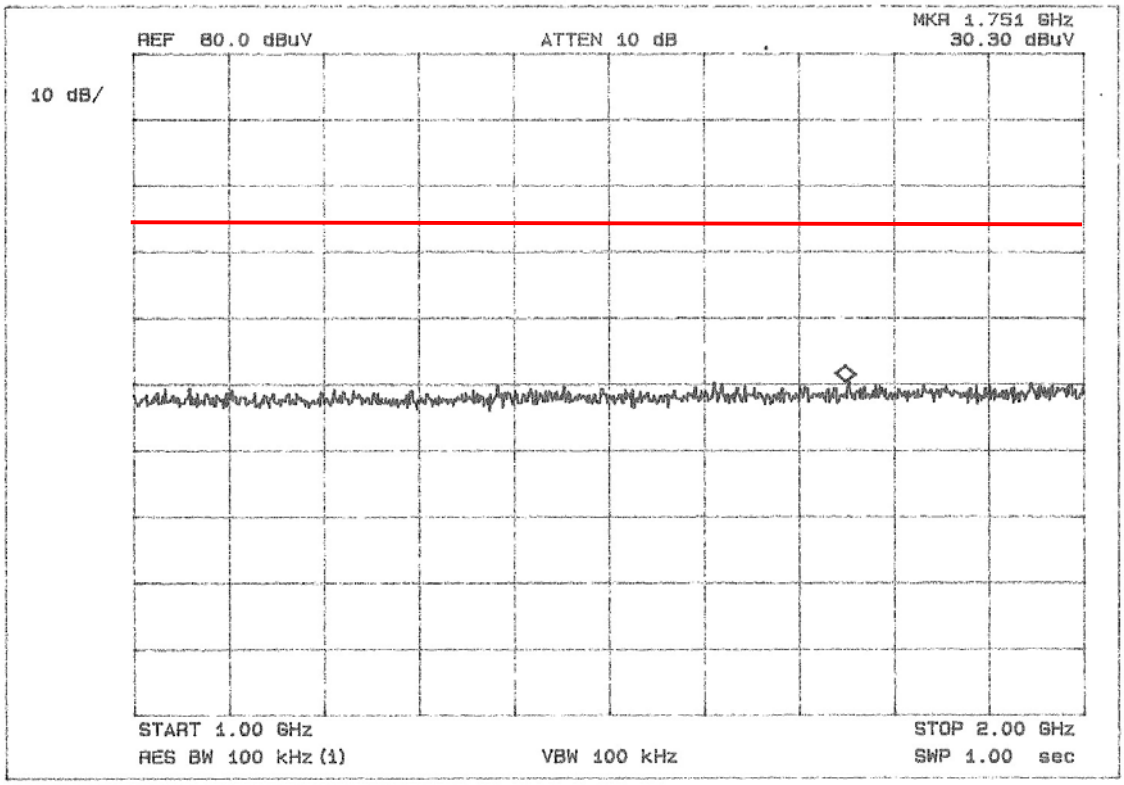
Note: ***2048 x 2560, 47Hz mode***

MEASUREMENT OF DISTURBANCE RADIATION



Radiated Emissions

(Disturbance Radiation)



Radiated Emission Test 1GHz – 2GHz

Measured Data from 1GHz to 2GHz

Above 1GHz, peak detector function mode is used with 23dB gain of preamp.
The following graphs show that all data of full frequencies are meet with the limit.
We automatically change our antenna polarity, when measure radiated emission.
The spectrum plot was obtained with peak detect mode and maximum hold mode. It was used For plot the HP8566B spectrum analyzer, EMCO 3115 Horn antenna and HP85685A RF preselector.
(Section 15.35)
The peak value evaluation at the frequency of 1.751GHz is

30.3dB(measured) + 25.9dB(antenna factor) + 8.3(cable loss)
- 23dB(gain of preamp) – 20dB(corrective factor)
= 21.5dB(less than average limit 54.0dB)

The peak value evaluation is less than the average limit, EUT have the margin relative To peak value more than 10dB for radiated emission for the above 1GHz.

Note: 2048 x 2560, 47Hz mode

Appendix A. The Photos of Test Setup

Conducted Emissions – Front View

Conducted Emissions – Rear View

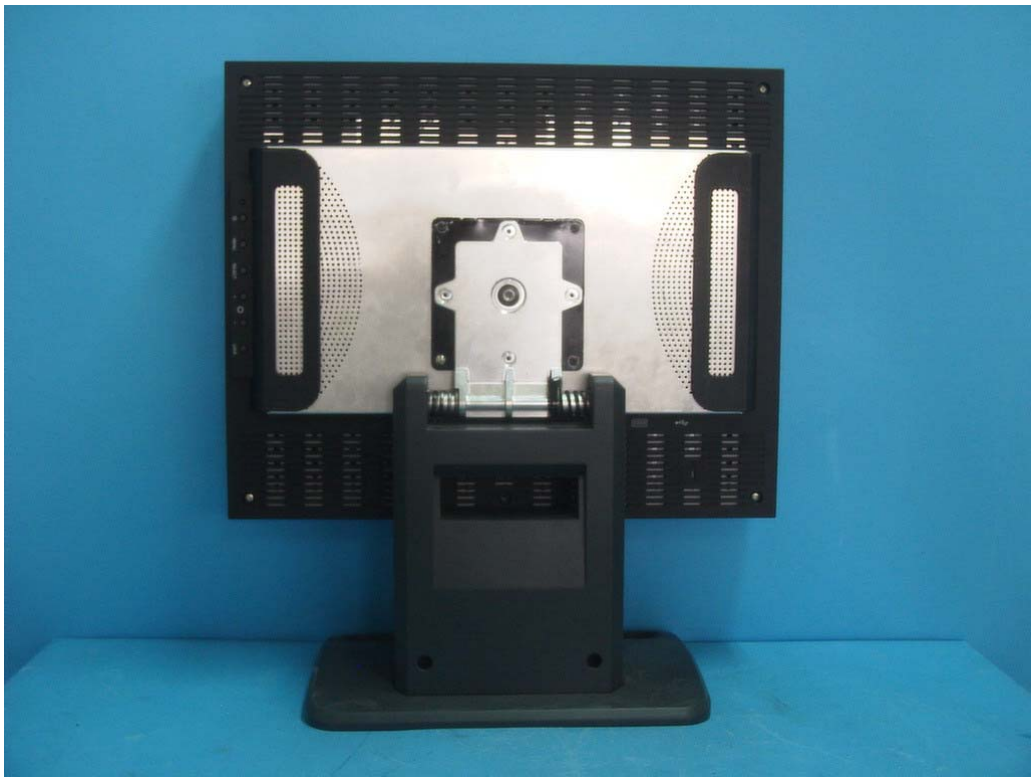
Appendix A. The Photos of Test Setup

Radiated Emissions - Front View

Radiated Emissions - Rear View

Appendix B. The Photos of Equipment Under Test

Front View



Rear View

Appendix B. The Photos of Equipment Under Test

DVI Cable