

Certification of Compliance

CFR 47 Part 15 Subpart B PC Peripherals

Test Report File No. : 04-IST-0217 Date of Issue : Aug. 9, 2004
Model(s) : ES130
Kind of Product : LCD Projector
Applicant : Hyundai ImageQuest Co., Ltd.
Address : San 136-1, Ami-Ri, Bubal-Eub, Icheon-Si, Kyoungki-Do,
467-701, Korea
Manufacturer : Hyundai ImageQuest Co., Ltd.
Address : San 136-1, Ami-Ri, Bubal-Eub, Icheon-Si, Kyoungki-Do,
467-701, Korea

Test Result

☒ Positive

☐ Negative

Reviewed By

Approved By



J. H. Lee / EMC Group Manager



G. Chung / Chief

- Investigations requested : Measurement to the relevant clauses of F.C.C rules and regulations Part 15 Subpart B (Unintentional Radiators, Class B) - Class B PC Peripherals
- The test report with appendix consists of 14 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 2001.



TABLE OF CONTENTS

Table of contents	2
Test Regulations	
Information of test laboratory	
Environmental condition	
Measurement Uncertainty	3
Product Information	4
Description of Difference between the original and the changed equipment	5
Description of test	
Conducted Emission	6
Radiated Emission	7
Equipment Under Test	8
Summary	9
Test conditions and data	
Conducted emissions	0.15 MHz - 30 MHz
Test equipment	Applicable
Data and plots	10
Radiated emissions	11-12
Test equipment	30 MHz - 1 GHz
Data and plots	Applicable
	13
	14-15

Appendix

TEST REGULATIONS

The tests were performed according to the following regulations ;
FCC Part 15, Subpart B (Unintentional Radiators, Class B)

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	20 °C
Humidity	44 %
Atmospheric pressure	1013 mbar

MEASUREMENT UNCERTAINTY

The measurement uncertainty was evaluated for all test items listed in this report. Also it, " The evaluation and treatment of uncertainty ", is described in IST Quality Manual according to ISO17025 Guide. The data and results described in this report are true and include evaluated uncertainty. It may cause some deviation of uncertainty by change component or process of the test for similar products.

PRODUCT INFORMATION

Panel size	0.7 inch
Lens :	Zoom Lens F/1.7 - 2.1 , F=26 - 32 mm
Lamp :	150W (Life time 3000 hours)
Dimension :	220(W) X 305(D) X 102.5(H)
Power Consumption :	220 W
Brightness	1500 ANSI Lumens
I/O Port:	D-SUB (15 Pin X 1) Video In (RCA Pin jack) S-Video In (Mini Din 4pin) RS-232C

- EMC suppression device is not used during the test.

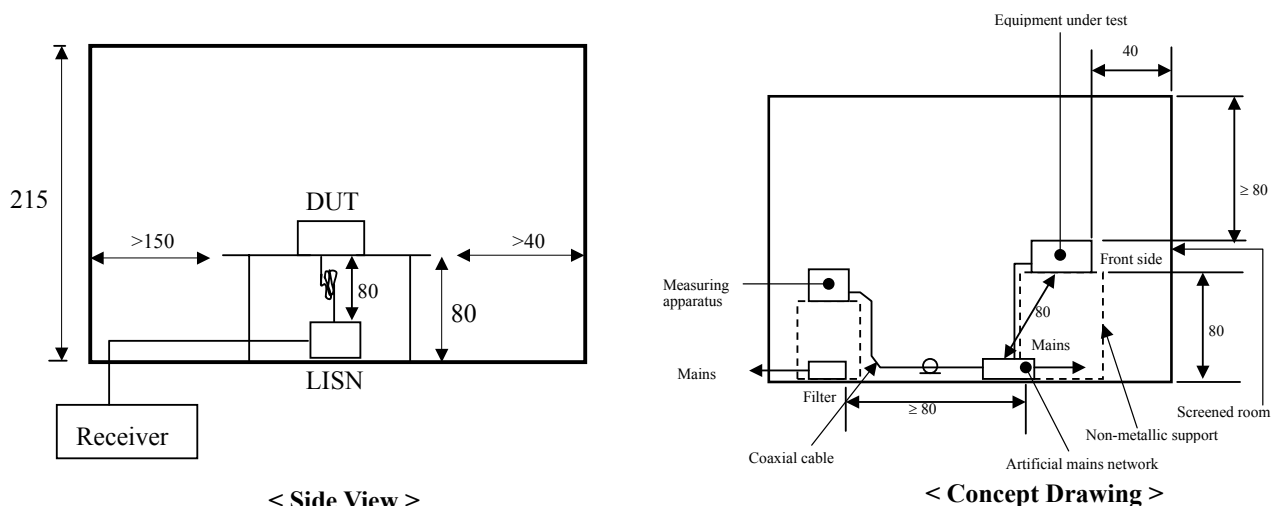
DESCRIPTIONS OF TEST

Conducted Emissions:

The measurement were performed over the frequency range of 0.15MHz to 30MHz using a $50\Omega/50\mu\text{H}$ 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-Z5 and EMCO 3825/2 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.



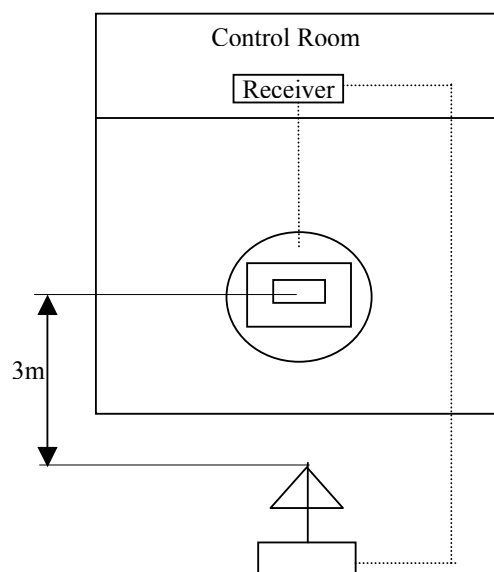
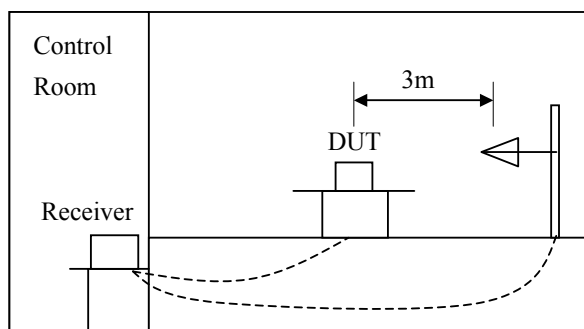
DESCRIPTION OF TEST

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 :

- ☒ Operational Condition : 1024X768, 85Hz

The test was performed with above mentioned conditions because the maximum input resolution is XVGA(1024x768) with 85Hz. Also there was the worst case emissions for VGA, SVGA and XVGA.

Configuration of the equipment under test :

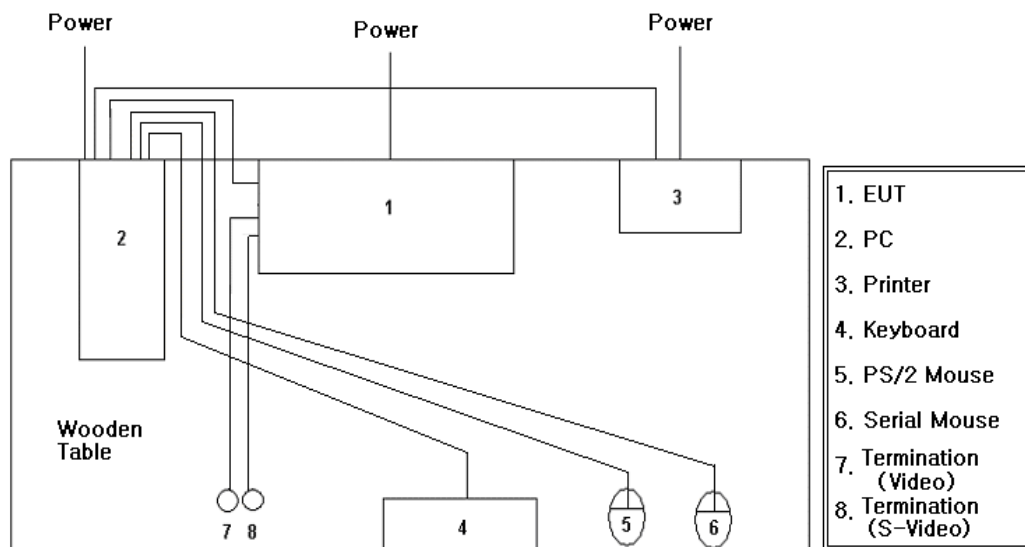
Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
PC	Vectra VL420MT	HP	SG23101784
Keyboard	SK-2502C	HP	M020321066
PS/2 Mouse	M-S48A	HP	LZC20602926
Serial Mouse	M-S428	Logitech	LCA53305547
Printer	A0302384	Northern Telecom	26633S60168
Headset	NM-V33	TOCO	N/A

Connecting Interface Cables :

- Unshielded AC power cable : 1.8 m
- Unshielded DC power cable (with one ferrite core) : 1.5 m
- Shielded monitor's signal cable (with two ferrite core) : 1.5 m
- Shielded printer's signal cable (with two ferrite core) : 1.8 m

The drawing of general test setup :



SUMMARY

Emissions

■ Conducted Emission

The requirements are (●) MET () Not MET
Minimum limit margin 6.9 dB 3.4 MHz
Maximum limit exceeding
Remarks : **Limits are kept with more than 3dB margin**
Find the test data in following pages 8 to 17

■ Radiated Emission

The requirements are (●) MET () Not MET
Minimum limit margin 5.4 dB 59.3 MHz
Maximum limit exceeding
Remarks : **Limits are kept with more than 3dB margin**
Find the test data in following pages 8 to 17

Test Date

Begin of Testing : April 8, 2004.
End of Testing : April 14, 2004.

Note :

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

Prepared By



H.C.Kim / Engineer

TEST CONDITIONS AND DATA

Conducted Emissions

[Applicable]

◆ Test Equipment Used

Model Name	Description	Manufacture	Calibration Date	Serial Number
ESH 3	Test Receiver	Rohde & Schwarz	Jul. 15, 2004	892108/018
3725/2	LISN	EMCO	Jul. 15, 2004	9101-2068
KNW-407	LISN	Hyup-Rip	Jul. 15, 2004	8-883-10
ESH3-Z2	Pulse Limiter	Rohde & Schwarz	Jul. 15, 2004	357.8810.52

◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

◆ Test Program Scrolling "H" Patterns on the windows

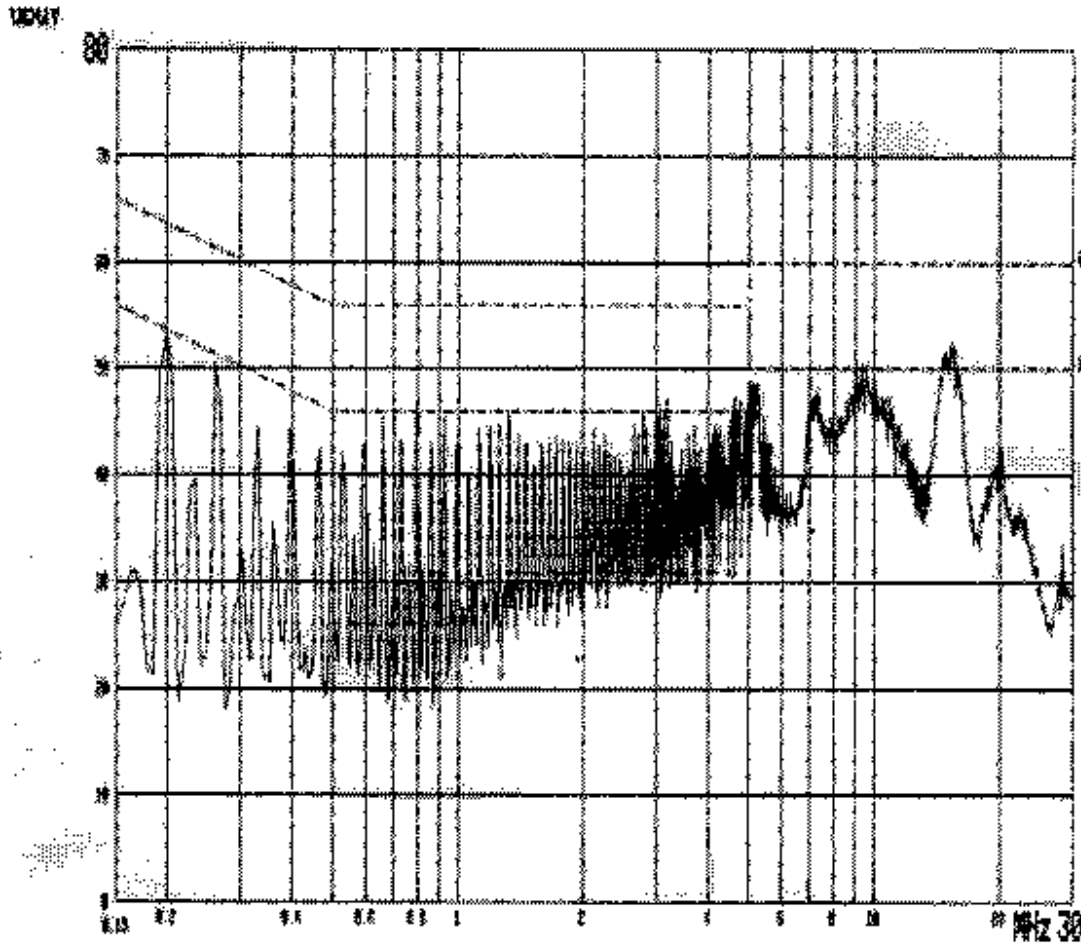
◆ Test Date Aug. 3, 2004

◆ Test Area Shielded room No.1

Note :

Conducted Emissions

LIVE Line

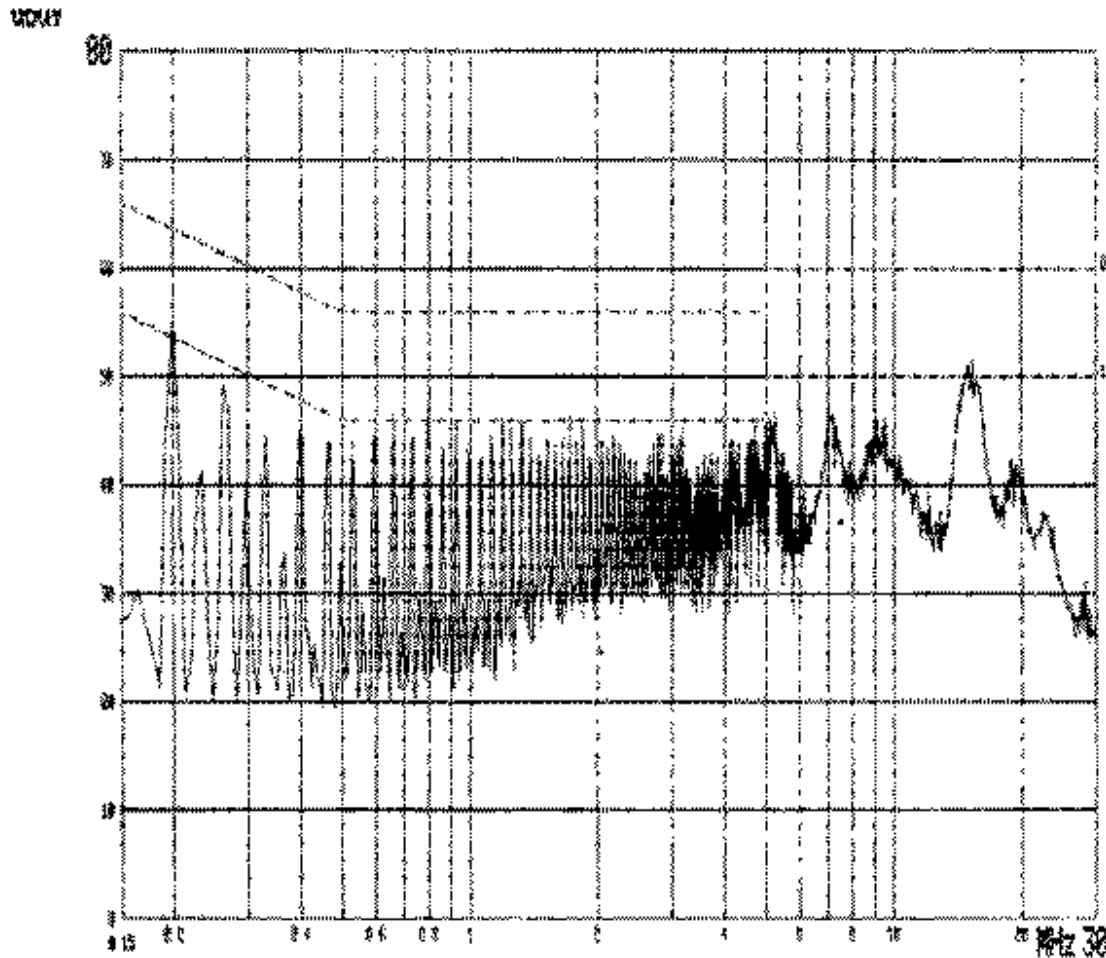


Freq. [MHz]	Measurement [dB μ V]		Limit [dB μ V]		Insertion Loss [dB]	Result [dB μ V]		Margin [dB]	
	Q-peak	Average	Q-peak	Average		Q-peak	Average	Q-peak	Average
0.185	52.0	38.4	63.9	53.9	0.8	52.8	39.2	11.1	14.7
0.246	49.1	38.6	62.0	52.0	0.8	49.9	39.4	12.1	12.6
1.917	44.0	37.4	56.0	46.0	0.8	44.8	38.2	11.2	7.8
3.400	47.6	38.3	56.0	46.0	0.8	48.4	39.1	7.6	6.9
7.846	48.0	32.6	60.0	50.0	0.8	48.8	33.4	11.2	16.6
15.457	46.1	34.8	60.0	50.0	0.8	46.9	35.6	13.1	14.4

Note :

Conducted Emissions

NEUTRAL Line



Freq. [MHz]	Measurement [dB μ V]		Limit [dB μ V]		Insertion Loss [dB]	Result [dB μ V]		Margin [dB]	
	Q-peak	Average	Q-peak	Average		Q-peak	Average	Q-peak	Average
0.185	50.1	40.0	63.9	53.9	0.8	50.9	40.8	13.0	13.1
0.246	46.6	31.9	62.0	52.0	0.8	47.4	32.7	14.6	19.3
1.540	40.9	33.4	56.0	46.0	0.8	41.7	34.2	14.3	11.8
3.512	45.9	34.2	56.0	46.0	0.8	46.7	35.0	9.3	11.0
8.625	46.3	34.3	60.0	50.0	0.8	47.1	35.1	12.9	14.9
15.453	48.1	32.8	60.0	50.0	0.8	48.9	33.6	11.1	16.4

Note :

TEST CONDITIONS AND DATA

Radiated Emission

[Applicable]

◆ Test Equipment Used

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESVP	Test Receiver	Rohde & Schwarz	Jul. 15, 2004	861744/004
VULB 9160	Antenna	Schwarzbeck	Jul. 19, 2004	3048
8449B	Amplifier	Hewlett Packard	Jul. 15, 2004	3008A00530
3115	Horn Antenna	EMCO	Jul. 5, 2003	9012-3602
E7402A	Spectrum Analyzer	Agilent	Feb. 24, 2004	US40240254

Note : The calibration period of horn antenna is 2 years according IST Quality system based on ISO 17025.

◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

◆ Test Program Scrolling "H" Patterns on the windows

◆ Test Date Aug. 9, 2004 / Aug.25, 2004

◆ Test Area Open site No.1 / Compact chamber

Note :

Radiated Emissions

Operational Condition : 1024x768, 85Hz

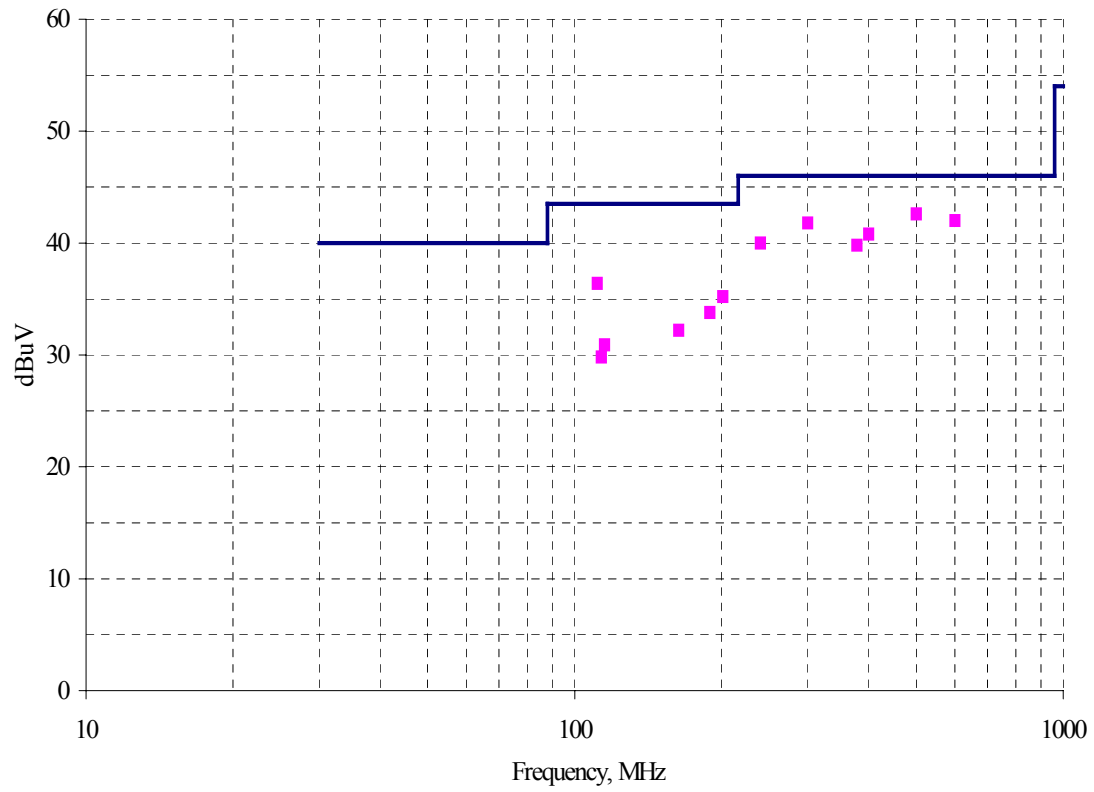
Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
111.3	23.5	10.5	2.4	V	36.4	43.5	7.1
113.4	16.8	10.6	2.4	V	29.8	43.5	13.7
115.2	17.5	10.9	2.5	V	30.9	43.5	12.6
163.4	16.4	12.9	2.9	H	32.2	43.5	11.3
189.2	20.4	10.2	3.2	V	33.8	43.5	9.7
201.1	22.7	9.2	3.3	H	35.2	43.5	8.3
240.0	25.3	10.8	3.9	V	40.0	46.0	6.0
300.1	24.9	12.5	4.4	V	41.8	46.0	4.2
378.1	20.5	14.2	5.1	V	39.8	46.0	6.2
400.0	21.1	14.5	5.2	V	40.8	46.0	5.2
500.0	19.7	16.9	6.0	H	42.6	46.0	3.4
600.1	16.5	18.8	6.7	H	42.0	46.0	4.0

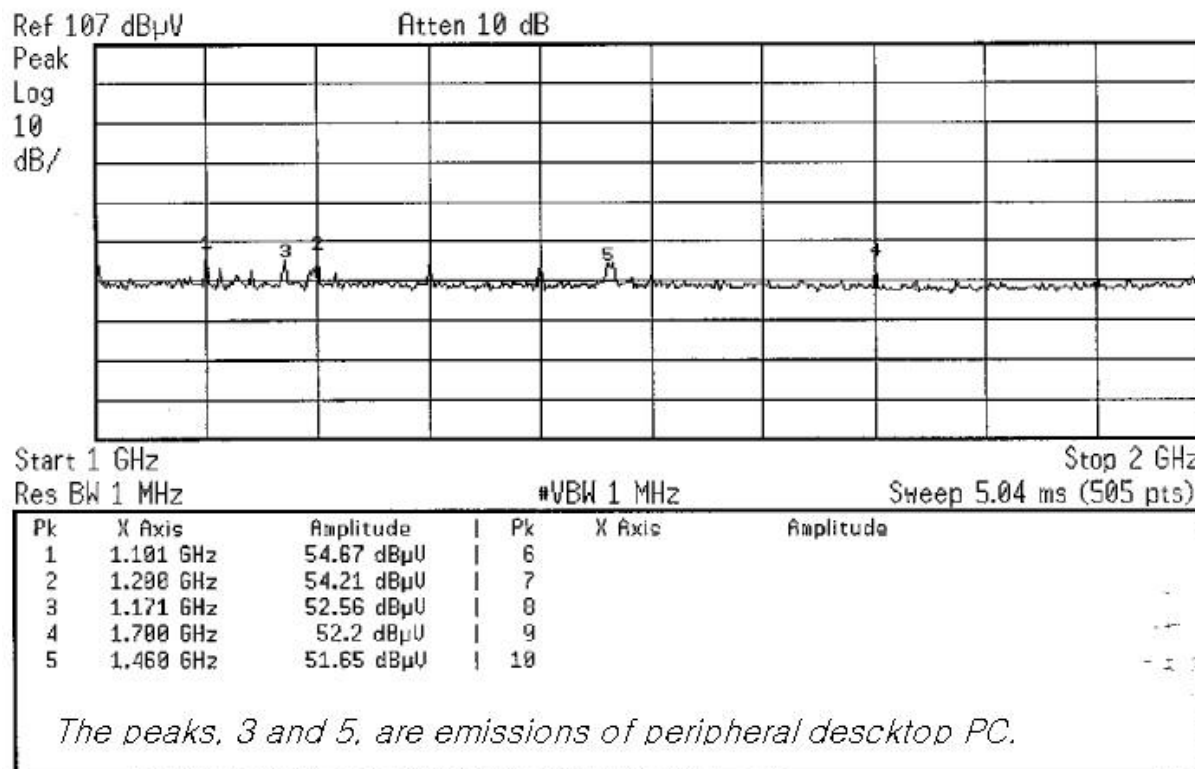
Above 1GHz

Freq. [GHz]	Reading [dBuV]	AF _{Horn}	CL	Gain _{Amp}	Result _{Peak}	Limit _{Peak}
1.1	54.7	23.6	6.9	31.1	54.1	74.0
1.2	54.2	23.9	7.1	31.0	54.2	74.0
1.7	52.2	25.7	8.2	31.1	55.0	74.0

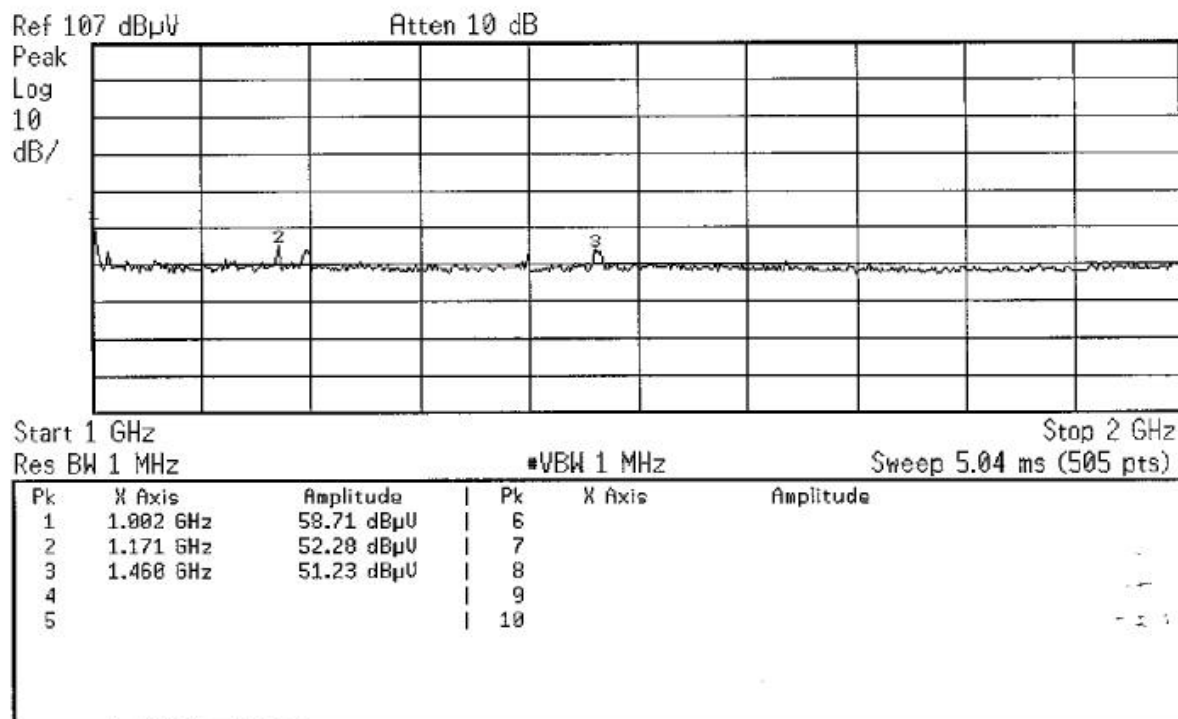
Note : The limit for above 1GHz is employed the CFR47 Part 15.35(b).
 Please refer the plots in following page.

MEASUREMENT OF DISTURBANCE RADIATION





Emissions for above 1GHz



Emissions for Desktop PC above 1GHz