

MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : IM765A

This report concerns(check one) : Original grant **X** Class ☐ change

Equipment type : **MONITOR**

Deferred grant requested per 47 CFR 0.457(d)(1)(☐) ? yes ☐ no **X**

If yes, defer until:

 agrees to notify the Commission by

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? yes ☐ no **X**

If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR [10-1-91 Edition] provision.

Report prepared by : **BONG JAE, HUR - Manager of QA Office**

Company : HYUNDAI ELECTRONICS INDUSTRIES CO., LTD.

**Address : SAN 136-1, AMI-RI, BUBAL-EUB, ICHON-SI,
KYOUNGKI-DO, KOREA**

Phone No : 82-336-630-3280

Fax No : 82-336-630-3265

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1. GENERAL INFORMATION

1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model P790(referred to as the EUT in this report) is a 17"COLOR Monitor HOR. Freq. 93.5kHz w/max. Resolution of 1600×1200 Non-Interlaced.

Product specification information described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	PLASTIC
LIST OF EACH OSC. OR XTAL. FREQ.(FREQ.≥ 1MHz)	6 MHz
CHIPSET BRAND AND PART NO.	SAMSUNG : KA358 SAMSUNG : KA3842B MOTOROLA : MC13282EP MOTOROLA : MC141545P2A MOTOROLA : MC68HC705BD981 SGS TOMSON : TDA9111 SGS TOMSON : TDA9302H ATMEL : 706 CALOGIC : CAV1404T
POWER REQUIREMENT	100 - 240 VAC 1.8A 50/60 Hz
NUMBER OF LAYERS	MAIN BOARD 1 LAYER CRT SOCKET BOARD 2 LAYER
MAX. RESOLUTION	1280 X 1024 NON-INTERLACED (@ 64 kHz/60Hz)
H-SYNC FREQUENCY RANGE	30 kHz □ 70kHz
V-SYNC FREQUENCY RANGE	50 Hz □ 150 Hz
CRT SIZE	17" (LG / Type : M41LFQ803X16)
VIDEO CONNECTOR TYPE	D-SUB 15-PIN

1.2 Related Submittal(s) / Grant(s)

ORIGINAL SUBMITTAL ONLY

1.3 Tested System Details

The Model names for all equipment, plus descriptions used in the tested system (including inserted cards) are:

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
COLOR MONITOR(EUT)	IMRI	IM765A	OMNIM765A	HOST
PC(HOST)	H/P	HP VECTRA 500	DoC	N/A
KEYBOARD	H/P	SK-2501-2D-K	DZL211029	HOST
PRINTER	H/P	C2168A	B94C2121X	HOST
MODEM	HYUNDAI	HMD-2404M	CKL8J7HMD-2404M	HOST
VIDEO CARD	TNC Chemical	2 THE MAX	JDF-765PCI-001	HOST
MOUSE	H/P	M-S34	GYUR38SK	HOST

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission on May 22, 1997 and accepted dated July 25,1997(1300F2)

2.SYSTEM TEST CONFIGURATION

2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following components and I/O cards inside the E.U.T were used.

DEVICE TYPE	MANUFACTURE	MODEL/PART NUMBER
MAIN BOARD	IMRI CO.,LTD.	IM76*
CRT SOCKET BOARD	IMRI CO.,LTD.	IM76*

2.2 EUT exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disc, was inserted into drive A and is auto starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is :(1) Display test, (2) RS 232 test (3) Key board test,(4) Printer test,(5) FDD test,(6) HDD test. The complete cycle takes about 20 seconds and is repeated continuously. As the keyboard and mouse are strictly input devices, no data is transmitted to them during test. They are however, continuously scanned for data input activity. The video resolution modes setup and change program was used during the radiated and conducted emission testing.

2.3 Cable Description

	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
PC(HOST)	N	N/A	1.5(P)
COLOR MONITOR(EUT)	N	Y	1.5(P), 1.5(D)
PARALLEL	N	Y	1.5(P), 1.5(D)
KEYBOARD	N/A	Y	1.0(D)
SERIAL	N	Y	1.5(P), 1.5(D)
MOUSE(PS/2)	N/A	Y	1.8(D)

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

2.4 Noise Suppression Parts on Cable.

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
PC(HOST)	N	N/A	N	N/A
COLOR MONITOR(EUT)	Y	PC END	Y	PC END
KEYBOARD	Y	PC END	Y	PC END
PARALLEL	N	N/A	Y	BOTH END
SERIAL	N	N/A	Y	BOTH END
MOUSE(PS/2)	N	N/A	Y	PC END

2.5 Equipment Modifications

N/A

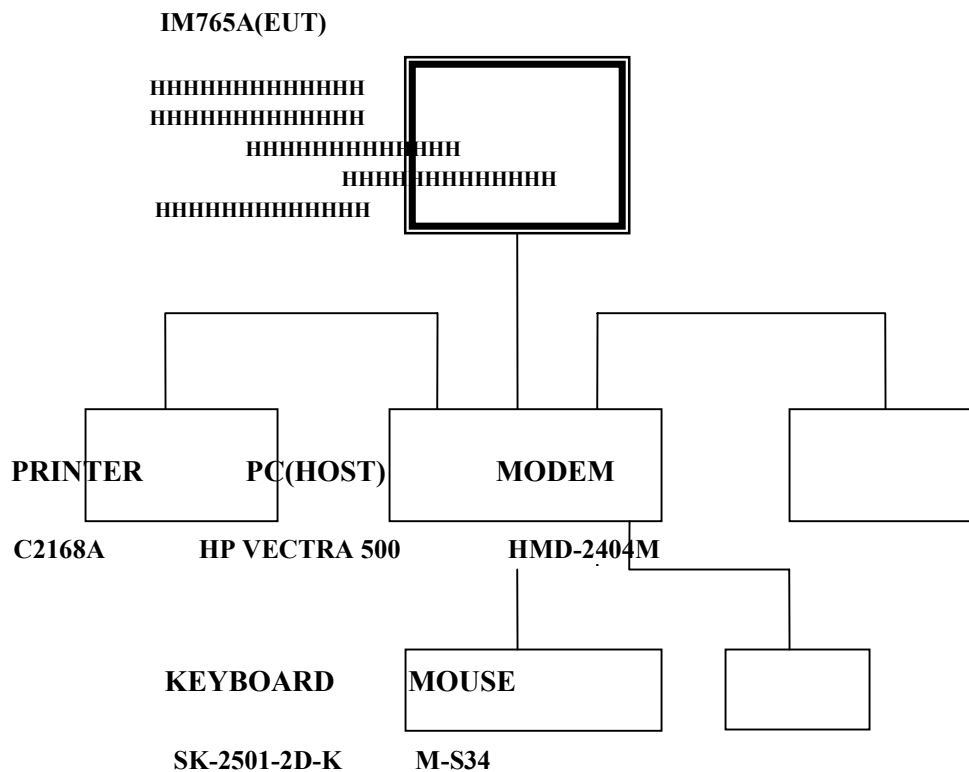
2.6 Configuration of Test system

Line Conducted Test : EUT was connected to LISN, all other supporting equipment were connected to another LISN.

Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

Radiated Emission Test : Preliminary Radiated Emissions tests were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating condition. Final Radiated Emission tests were conducted at 3 meter open area test site.

[Configuration of Tested System]



3. PRELIMINARY TESTS

3.1 AC Power line Conducted Emission Tests

During Preliminary Tests, the following operating mode were investigated

Processor Speed (MHz)	Video Resolution (w/max)	The worst operating condition
Pentium 75 MHz	1280 x 1024 Non-Interlaced (64 kHz/60Hz)	
Pentium 75 MHz	1024 x 768 Non-Interlaced (68.7 kHz/85Hz)	X
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6 KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (43.2 KHz/85Hz)	

4.2 Radiated Emission Tests

During Preliminary Tests, the following operating mode were investigated

Processor Speed (MHz)	Video Resolution (w/max)	The worst operating condition
Pentium 75 MHz	1280 x 1024 Non-Interlaced (64 kHz/60Hz)	
Pentium 75 MHz	1024 x 768 Non-Interlaced (68.7 kHz/85Hz)	X
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6 KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (43.2 KHz/85Hz)	

NOTE :

The monitor(EUT) has two(2) video interface port(VGA 15pin D-sub, 5 BNC) to support various kinds of graphics adapters. So the test were performed with each video interface port. The final measurement was performed with VGA 15pin D-sub video interface port that produce the worst case emission.

Tested by Sang Jun, Lee

Date : JULY 2, 1999

4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY

4.1 Conducted Emissions Tests

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

Humidity Level : 26% Temperature : 24 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : JULY. 8, 1999
 Result : PASSED BY 4.0 dB

EUT : 17" COLOR MONITOR

Operating Condition : 1024 X 768 Non-Interlaced (Hf : 68.7KHz, Vf : 85Hz)

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

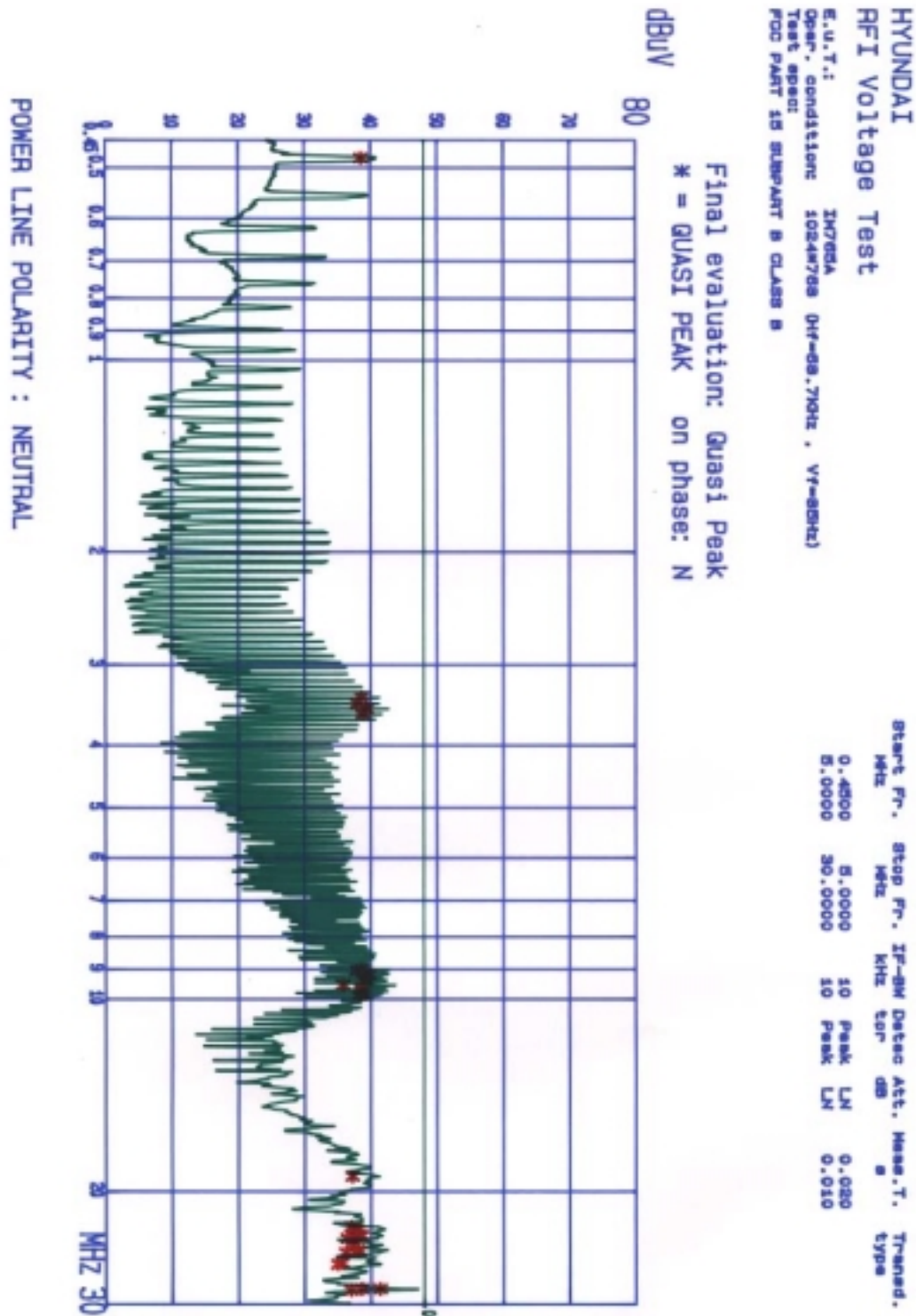
Power Line Conducted Emissions			FCC Class B	
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.4819	40.5	HOT	48	-7.5
3..5154	41.9	HOT	48	-6.1
18.9600	40.2	HOT	48	-7.8
22.8900	38.8	HOT	48	-9.2
24.1300	39.4	HOT	48	-8.6
25.4400	38.9	HOT	48	-9.1
28.470	44.0	HOT	48	-4.0

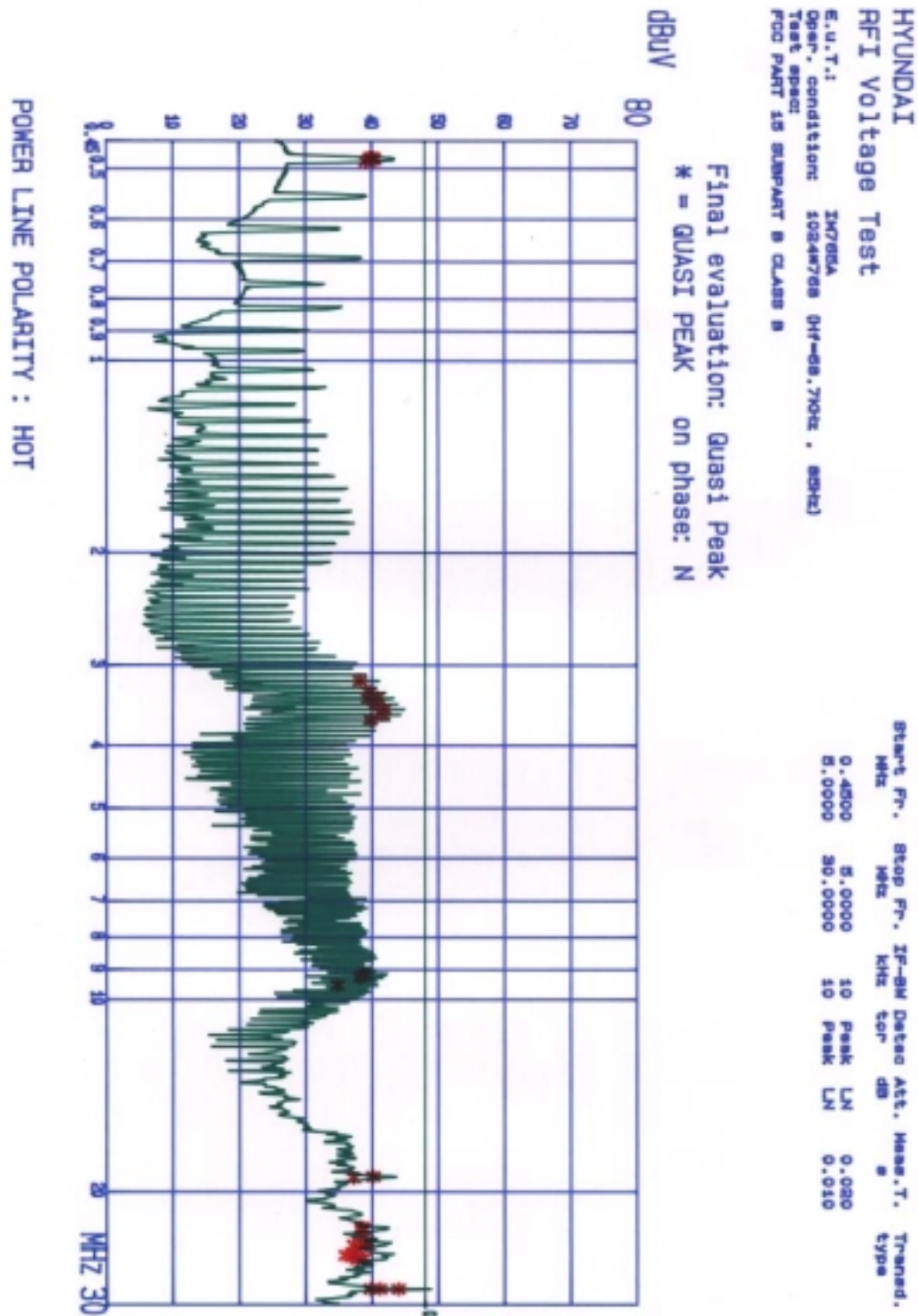
Line Conducted Emissions Tabulated Data

NOET:

1. All video modes and resolutions were investigated and the worst-case emissions are reported
 Other video modes & resolution were tested and found to be in compliance.
2. The limit for Class B device is 250 uV from 450 kHz to 30 MHz.

Measured by : Sang Jun, Lee / Engineer





HYUNDAI
RFI Voltage TestE.U.T.: IM765A
Def. condition: 1024M765 04-68.70Hz . 80Hz
Test spec:
FOO PART 15 SUBPART B CLASS B

Exceeding values on phase: N			
Frequency MHz	Peak dBuV	Q-Peak dBuV	Q-Margin dB
0.4792	42.6	39.8	-8.8
0.4801	43.1	40.2	-7.8
0.4810	43.1	40.4	-7.6
0.4819	43.7	40.5	-7.5
0.4828	43.4	40.4	-7.6
0.4837	42.6	40.1	-7.9
0.4846	43.3	39.9	-9.1
0.4855	41.6	39.3	-9.7
0.4864	41.3	39.3	-9.7
0.4873	42.3	39.7	-9.3
0.4882	43.5	40.9	-7.1
0.4891	42.7	39.5	-9.5
0.4900	44.0	40.6	-7.4
0.4909	45.1	41.9	-6.1
0.4918	44.4	41.7	-9.3
0.4927	42.9	39.8	-9.2
0.4936	42.3	39.7	-9.3
0.4945	41.8	39.0	-9.0
0.4954	41.1	38.3	-9.7
0.4963	41.1	34.8	-13.2
0.4972	43.9	40.2	-7.6
0.4981	41.2	37.2	-10.8
0.4990	42.4	39.4	-9.6
0.5000	42.7	39.7	-9.3
0.5009	41.7	38.8	-9.2
0.5018	42.0	39.4	-9.6
0.5027	43.0	39.4	-9.6
0.5036	43.1	39.3	-9.7
0.5045	42.5	39.4	-9.6
0.5054	42.5	39.6	-9.2
0.5063	42.1	37.3	-10.7
0.5072	41.0	37.4	-10.6
0.5081	43.4	37.5	-10.5
0.5090	41.6	36.1	-11.9
0.5099	42.2	38.9	-10.6
0.5108	42.4	38.9	-9.1
0.5117	41.9	37.9	-10.1
0.5126	48.0	39.9	-9.1
0.5135	49.0	44.0	-4.0
0.5144	48.2	41.2	-9.6

* List exceeded

POWER LINE POLARITY : HOT

4.2 Radiated Emissions Tests

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Humidity Level : 22 % Temperature : 28 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : JULY. 8, 1999
 Result : PASSED BY 6.0 dB

EUT : 17" COLOR MONITOR

Operating Condition : 1024 X 768 Non-Interlaced (Hf : 68.7 KHz, Vf : 85 Hz)

Detector : CISPR Quasi-Peak (6 dB Bandwidth : 120 KHz)

Radiated Emissions		Ant.	Correction Factors	Total	FCC Class B	
Freq. (MHz)	Ampl. (dBuV)	Pol.	Antenna & Cable Loss (dB/m)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.5	12.1	V	17.9	30.0	40.0	-10.0
39.3	15.2	V	15.2	30.4	40.0	-9.6
47.2	18.0	V	13.0	31.0	40.0	-9.0
55.1	20.9	V	10.6	31.5	40.0	-8.5
63.0	24.0	V	8.4	32.4	40.0	-7.6
70.8	27.2	V	6.8	34.0	40.0	-6.0
78.1	25.4	V	7.3	32.7	40.0	-7.3
78.7	23.3	V	7.5	30.8	40.0	-9.2
86.6	21.5	V	9.1	30.6	40.0	-9.4
94.5	20.9	V	10.5	31.4	43.5	-12.1
141.7	15.9	H	15.9	31.8	43.5	-11.7
173.3	13.8	H	18.2	32.0	43.5	-11.5
181.1	14.0	V	18.7	32.7	43.5	-10.8
196.9	12.4	V	19.6	32.0	43.5	-11.5
204.8	11.9	V	19.7	31.6	43.5	-11.9
291.4	10.6	V	21.8	32.4	46.0	-13.6

NOTE:

- 1.All video modes and resolutions were investigated and the worst-case emissions are reported.
- 2.Other video modes & resolution were tested and found to be in compliance.

Measured by : Sang Jun, Lee / Engineer

5. 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

Assume a receiver reading of 21.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The 30 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm } [(30 \text{ dBuV/m})/20] = 31.6 \text{ uV/m}$$