

HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

PRODUCT COMPLIANCE TEAM
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA
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CERTIFICATION

Manufacture;
IMAGEQUEST CO., LTD.

SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI,
KYOUINKI-DO, 467-701, KOREA

IMAGEQUEST FRN : 0005-8664-39

Date of Issue: OCTOBER 21, 2002

Test Report No.: HCT-F02-1011

**Test Site: HYUNDAI CALIBRATION & CERTIFICATION
TECHNOLOGIES CO., LTD.**

HCT FRN : 0005-8664-21

FCC ID :

PJIC21F05120

MODEL / TYPE :

F230

FCC Rule Part(s):

Part 15 & 2; ET Docket 95-19

Classification:

FCC Class B Peripheral Device (JBP)

Standard(s):

FCC Class B: 1998 (CISPR 22)

Equipment(EUT) Type:

21" CRT Monitor

Max Resolution:

2048 X 1536 Non-interlaced (@121.9KHz/ 75Hz)

Port/ Connector(s)

15-pin D-sub VGA connector, 5 BNC Port

The device bearing the trade name and model 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.(See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. 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.

HYUNDAI C-Tech. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse of 1988,21 U.S.C.853(a).

Ki Soo Kim

Report prepared by : Ki-Soo Kim
Manager of EMC Tech. Part



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1. GENERAL INFORMATION

1.1 Product Description

The ImageQuest CO., LTD. Model F230 (referred to as the EUT in this report) is a 21" CRT Monitor with HOR. Freq. 123KHz (Max) and Resolution of 2048 X 1536 (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)	12MHz
POWER REQUIREMENT	100 - 240 VAC, 3.0A
NUMBER OF LAYERS	MAIN BOARD 1 LAYER CRT BOARD 1 LAYER BNC BOARD 1 LAYER
MAX. RESOLUTION	2048 X 1536 NON-INTERLACED(@121.9KHz/ 75Hz)
H-SYNC FREQUENCY RANGE	30KHz ~ 123KHz
V-SYNC FREQUENCY RANGE	50Hz ~ 150Hz
CRT TYPE	21" (CRT Type :M51QEQ991X001)

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
MONITOR (EUT)	IMAGEQUEST CO., LTD.	F230	PJIC21F05120	HOST
PC(HOST)	H/P	KR14111606	DoC	N/A
VIDEO CARD	ELSA	ELSA GLADIAC MX	DoC	HOST
KEY BOARD	H/P	BF12502086	DoC	HOST
MOUSE	H/P	M-BE55	DoC	HOST
PRINTER	H/P	HP895C	DoC	HOST
MODEM	3COM CORPORATION	56K FAX MODEM	DoC	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 10 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 and accepted dated July 24, 2000 (Confirmation Number: EA90661)

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	ImageQuest CO., Ltd.	E4205019701
CRT BOARD	ImageQuest CO., Ltd.	E4208621902
BNC BOARD	ImageQuest CO., Ltd.	E4208621903

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)
MONITOR(EUT)	N	Y	1.8(P), 1.5(D)
PC(HOST)	N	N/A	1.8(P)
PRINTER	N	Y	2.0(P),1.8(D)
KEY BOARD	N/A	Y	2.0(D)
MODEM	N	Y	2.0(P),0.8(D)
MOUSE	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. (I/O CABLE)

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
MONITOR(EUT)	Y	BOTH END	Y	BOTH END
PRINTER	N	N/A	Y	BOTH END
KEY BOARD	N	N/A	Y	PC END
MODEM	N	N/A	Y	BOTH END
MOUSE	N	N/A	Y	PC END

2.5 Equipment Modifications

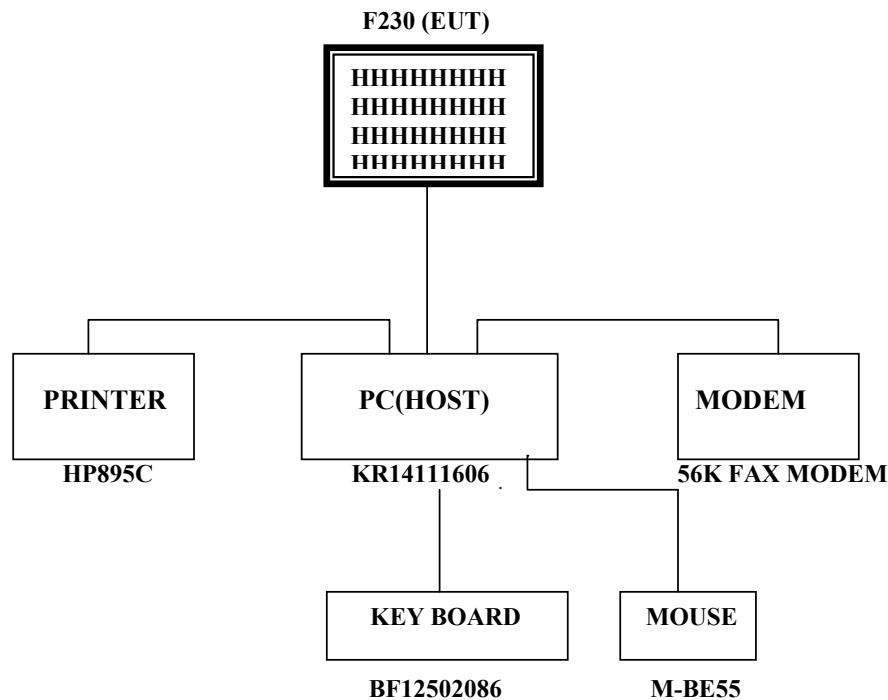
N/A

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 10 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 1GHz	2048 X 1536 Non-Interlaced (112.5KHz/75Hz)	X
	1920 X 1440 Non-Interlaced (112.5KHz/75Hz)	
	1600 X 1200 Non-Interlaced (106.3KHz/85Hz)	
	1280 X 1024 Non-Interlaced (91.1KHz/85Hz)	
	1024 X 768 Non-Interlaced (81.8KHz/100Hz)	
	640 x 480 Non-Interlaced (31.5KHz/60Hz)	

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 1GHz	2048 X 1536 Non-Interlaced (112.5KHz/75Hz)	X
	1920 X 1440 Non-Interlaced (112.5KHz/75Hz)	
	1600 X 1200 Non-Interlaced (106.3KHz/85Hz)	
	1280 X 1024 Non-Interlaced (91.1KHz/85Hz)	
	1024 X 768 Non-Interlaced (81.8KHz/100Hz)	
	640 x 480 Non-Interlaced (31.5KHz/60Hz)	

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 Kyoung-Houn Seo / Engineer

Date : OCTOBER 7, 2002

4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY

4.1 Conducted Emission Test

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

Humidity Level	: 38%	Temperature : 23 °C
Limit apply to	: CISPR 22	
Type of Tests	: CLASS B	
Date	: OCTOBER 10, 2002	
Result	: PASSED BY 4.6 dB	

EUT	: 21" CRT MONITOR
Operating Condition	: 2048 X 1536 Non-Interlaced (Hf : 121.9KHz, Vf : 75Hz)
Detector	: CISPR Quasi-Peak (6 dB Bandwidth : 9 KHz) CISPR Average(6 dB Bandwidth : 9 KHz)

Line Conducted Emission Tabulated Data

Power Line Conducted Emissions			CISPR 22		
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)	Detector Mode
10.90	41.4	HOT	46.0	4.6	Average
1.090	40.8	NEUTRAL	46.0	5.2	Average
0.850	46.0	NEUTRAL	46.0	6.5	Average
0.850	39.3	HOT	46.0	6.7	Average

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.

Measured by : Kyoung-Houn Seo / Engineer

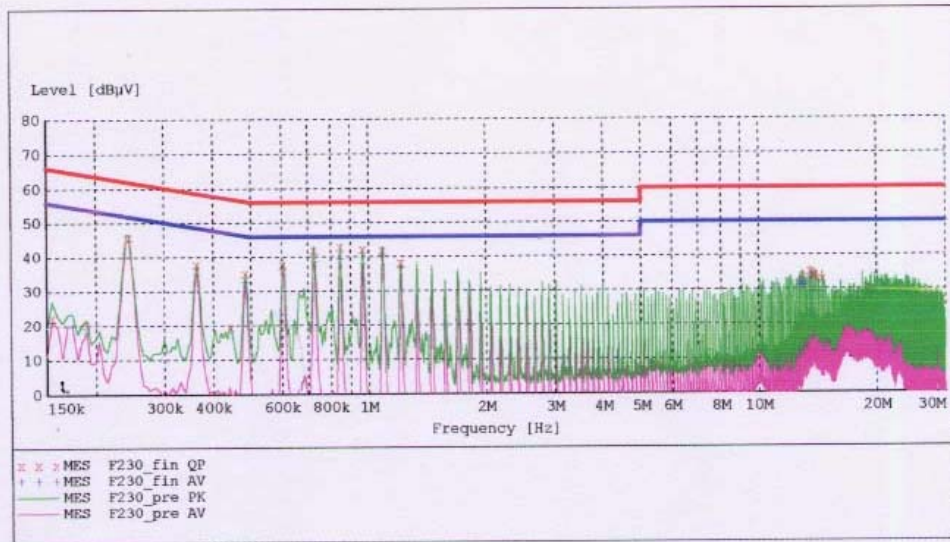
Date : OCTOBER 10, 2002

HYUNDAI C TECH
EMC Testing Laboratory

EUT: F230
Manufacturer: IMAGEQUEST
Operating Condition: 2048 X 1536 75Hz
Test Site: SHIELD ROOM
Operator: KH-SEO
Test Specification: CISPR 22 CLASS B
Comment: N
Start of Test: 10/10/02 / 11:42:58AM

SCAN TABLE: "EN 55022 Voltage"

Short Description:	EN 55022 Voltage	Detector	Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width			
150.0 kHz	500.0 kHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz
			Average		
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz
			Average		

**MEASUREMENT RESULT: "F230_fin QP"**

10/10/02 11:47AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.155000	22.50	10.5	66	43.2	1	---
0.190000	20.50	10.5	64	43.6	1	---
0.245000	45.90	10.5	62	16.1	1	---
0.365000	37.90	10.5	59	20.7	1	---
0.445000	19.50	10.5	57	37.4	1	---
0.485000	35.30	10.5	56	20.9	1	---
0.605000	37.80	10.5	56	18.2	1	---
0.730000	42.10	10.5	56	13.9	1	---
0.850000	42.90	10.5	56	13.1	1	---
0.970000	42.30	10.5	56	13.7	1	---
1.090000	41.90	10.5	56	14.1	1	---
1.215000	38.20	10.5	56	17.8	1	---
12.985000	34.10	11.4	60	25.9	1	---
13.590000	35.20	11.4	60	24.8	1	---

MEASUREMENT RESULT: "F230_fin QP"
(continued)

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
13.835000	34.60	11.5	60	25.4	1	---
13.955000	34.00	11.5	60	26.0	1	---
14.075000	33.20	11.5	60	26.8	1	---
14.560000	33.10	11.5	60	26.9	1	---

MEASUREMENT RESULT: "F230_fin AV"
10/10/02 11:47AM

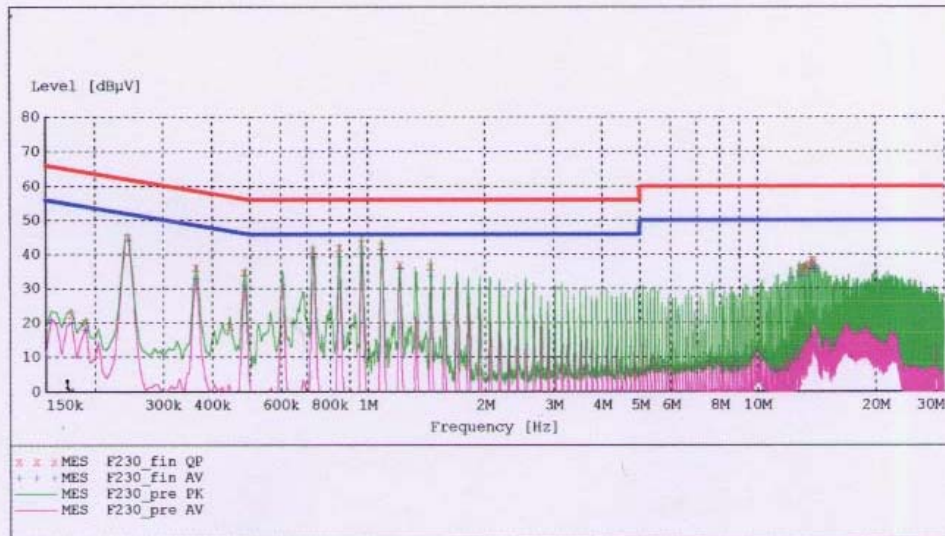
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.155000	21.10	10.5	56	34.7	1	---
0.175000	20.20	10.5	55	34.5	1	---
0.190000	18.40	10.5	54	35.7	1	---
0.245000	44.80	10.5	52	7.1	1	---
0.365000	35.70	10.5	49	12.9	1	---
0.485000	32.70	10.5	46	13.5	1	---
0.605000	35.90	10.5	46	10.1	1	---
0.730000	38.70	10.5	46	7.3	1	---
0.850000	39.50	10.5	46	6.5	1	---
0.970000	37.90	10.5	46	8.1	1	---
1.090000	40.80	10.5	46	5.2	1	---
1.215000	36.80	10.5	46	9.2	1	---
12.740000	32.30	11.4	50	17.7	1	---
12.865000	31.10	11.4	50	18.9	1	---
12.985000	32.00	11.4	50	18.0	1	---
13.105000	31.30	11.4	50	18.7	1	---
13.590000	33.50	11.4	50	16.5	1	---
13.835000	29.90	11.5	50	20.1	1	---

HYUNDAI C TECH
EMC Testing Laboratory

EUT: F230
Manufacturer: IMAGEQUEST
Operating Condition: 2048 X 1536 75Hz
Test Site: SHIELD ROOM
Operator: KH-SEO
Test Specification: CISPR 22 CLASS B
Comment: H
Start of Test: 10/10/02 / 11:49:27AM

SCAN TABLE: "EN 55022 Voltage"

Short Description:			EN 55022 Voltage			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency	Width				
150.0 kHz	500.0 kHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	CABLE LOSS (NEW)
			Average			
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	CABLE LOSS (NEW)
			Average			

**MEASUREMENT RESULT: "F230_fin_QP"**

10/10/02 11:54AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.175000	22.60	10.5	65	42.1	1	---
0.190000	20.20	10.5	64	43.9	1	---
0.245000	45.30	10.5	62	16.7	1	---
0.365000	36.40	10.5	59	22.2	1	---
0.445000	19.00	10.5	57	38.0	1	---
0.485000	35.00	10.5	56	21.2	1	---
0.730000	41.50	10.5	56	14.5	1	---
0.850000	42.10	10.5	56	13.9	1	---
0.970000	43.30	10.5	56	12.7	1	---
1.090000	42.70	10.5	56	13.3	1	---
1.215000	37.20	10.5	56	18.8	1	---
1.455000	36.60	10.5	56	19.4	1	---
12.865000	36.20	11.4	60	23.8	1	---
13.225000	36.40	11.4	60	23.6	1	---

MEASUREMENT RESULT: "F230_fin QP"
(continued)

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
13.350000	36.60	11.4	60	23.4	1	---
13.710000	37.10	11.5	60	22.9	1	---
13.835000	38.50	11.5	60	21.5	1	---
13.955000	37.80	11.5	60	22.2	1	---

MEASUREMENT RESULT: "F230_fin AV"
10/10/02 11:54AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.155000	20.90	10.5	56	34.8	1	---
0.175000	20.10	10.5	55	34.7	1	---
0.190000	18.10	10.5	54	35.9	1	---
0.245000	44.20	10.5	52	7.8	1	---
0.365000	32.90	10.5	49	15.7	1	---
0.485000	31.10	10.5	46	15.1	1	---
0.730000	39.20	10.5	46	6.8	1	---
0.850000	39.30	10.5	46	6.7	1	---
0.970000	40.30	10.5	46	5.7	1	---
1.090000	41.40	10.5	46	4.6	1	---
1.215000	35.90	10.5	46	10.1	1	---
1.455000	33.60	10.5	46	12.4	1	---
12.255000	33.40	11.4	50	16.6	1	---
12.865000	33.70	11.4	50	16.3	1	---
13.350000	33.70	11.4	50	16.3	1	---
13.835000	35.80	11.5	50	14.2	1	---
13.955000	35.90	11.5	50	14.1	1	---
14.075000	35.10	11.5	50	14.9	1	---

4.2 Radiated Emissions Tests

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

Humidity Level : 35% Temperature : 22 °C
 Limit apply to : CISPR 22
 Type of Tests : CLASS B
 Date : OCTOBER 18, 2002
 Result : PASSED BY -3.1 dB

EUT : 21" CRT MONITOR
 Operating Condition : 2048 X 1536 Non-Interlaced (Hf :112.5 kHz, Vf : 75 Hz)
 Detector : CISPR Quasi-Peak (6 dB Bandwidth : 120 KHz)

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
57.0	16.10	8.80	1.60	V	26.5	30.0	-3.5
86.0	16.26	7.44	1.90	V	25.6	30.0	-4.4
115.1	11.41	12.69	2.30	V	26.4	30.0	-3.6
167.0	9.21	14.89	2.70	H	26.8	30.0	-3.2
201.5	8.07	15.83	3.00	V	26.9	30.0	-3.1
229.2	5.91	17.19	3.30	V	26.4	30.0	-3.6
401.5	12.80	16.50	4.20	H	33.5	37.0	-3.5
602.8	7.06	20.74	5.80	V	33.6	37.0	-3.4
630.8	4.97	21.33	5.90	H	32.2	37.0	-4.8
688.5	4.37	22.33	6.10	V	32.8	37.0	-4.2
744.5	4.66	22.54	6.40	V	33.6	37.0	-3.4
802.3	4.08	23.12	6.70	V	33.9	37.0	-3.1

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.
- 3.The EUT was test up to 2GHz and no significant emission was found.

Measured by : Kyoung-Houn Seo / Engineer

Date : OCTOBER 18, 2002

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.

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

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

6. LIST OF TEST EQUIPMENT

<u>TYPE</u>	<u>MANUFACTURE</u>	<u>MODEL</u>	<u>CAL. DATE</u>
EMI Test Receiver	Rohde & Schwarz	ESH3	2002.7.16
EMI Test Receiver	Rohde & Schwarz	ESVP	2002.7.16
EMI Test Receiver	Rohde & Schwarz	ESI40	2001.11.5
EMI Test Receiver	Rohde & Schwarz	ESVS30	2002.7.16
Spectrum Monitor	Rohde & Schwarz	EZM	N.A
Graphic Plotter	Rohde & Schwarz	DOP2	N.A
Printer	Rohde & Schwarz	PDN	N.A
Spectrum Analyzer	H.P	8591EM	2002.9.1
LISN	EMCO	3825/2	2002.2.7
LISN	Rohde & Schwarz	ESH2-Z5	2002.8.12
Amplifier	Hewlett-Packard	8447E	2002.9.1
Dipole Antennas	Rohde & Schwarz	VHAP	2002.7.16
Dipole Antennas	Rohde & Schwarz	UHAP	2002.7.16
Biconical Antenna	Rohde & Schwarz	BBA-9106	2002.7.12
Log-Periodic Antenna	Rohde & Schwarz	UHALP-9107	2002.7.12
Antenna Position Tower	EMCO	1051-12	N.A
Turn Table	EMCO	1060-06	N.A
Line Filter	KEENE	ULW 2X30-60	N.A
Power Analyzer	Voltech	PM 3300	2002.2.20
Reference Network Impedance	Voltech	IEC 555	N.A
AC Power Source	PACIFIC	Magnetic Module	N.A
AC Power Source	PACIFIC	360AMX	N.A

