

# MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : P910

This report concerns(check one) : Original grant ☒ Class ☐ ±change \_\_\_\_\_

Equipment type : MONITOR

Deferred grant requested per 47 CFR 0.457(d)(1)(☐ ☒? yes \_\_\_\_\_ no ☒

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 ☒

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

## TABLE OF CONTENTS

	PAGE
<b>1. GENERAL INFORMATION.....</b>	<b>3</b>
1.1 Product Description.....	3
1.2 Related submittal(s)/Grant(s).....	3
1.3 Tested System Details.....	4
1.4 Test Methodology.....	4
1.5 Test Facility.....	4
<b>2. SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
2.1 Justification.....	5
2.2 EUT Exercise Software.....	5
2.3 Cable Description.....	6
2.4 Noise Suppression Parts on Cable.....	6
2.5 Equipment Modifications.....	7
2.6 Configuration of Tested System.....	8
<b>3. PRELIMINARY TESTS.....</b>	<b>9</b>
3.1 Power line Conducted Emissions Tests.....	9
3.2 Radiated Emissions Tests.....	9
<b>4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY.....</b>	<b>10</b>
4.1 Conducted Emission Tests.....	10
4.2 Radiated Emission Tests.....	11
<b>5. FIELD STRENGTH CALCULATION.....</b>	<b>12</b>

ATTACHMENT A .....	I D Label / Location Info.
ATTACHMENT B .....	E x t e r n a l Photos.
ATTACHMENT C .....	B l o c k Diagram..
ATTACHMENT D .....	T e s t Setup Photos.
ATTACHMENT E .....	U s e r 's Manual.
ATTACHMENT F .....	I n t e r n a l Photos.

# 1. GENERAL INFORMATION

## 1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model P910(referred to as the EUT in this report) is a 19"COLOR Monitor HOR. Freq.106kHz w/max. Resolution of 1600; 1200 Non-Interlaced.

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

<b>CHASSIS TYPE</b>	<b>PLASTIC</b>
<b>LIST OF EACH OSC. OR XTAL. FREQ.(FREQ. ±1MHz)</b>	<b>6 MHz</b>
<b>CHIPSET BRAND AND PART NO.</b>	SAMSUNG : KA3843 PHILIPS : TDA4856 PHILIPS : TDA8354 MITSUBISHI : M52743ASP NATIONAL : LM7805CT NATIONAL : LM7812CT NATIONAL : LM358N MICRO CHIP : 24LC08B/P MOTOROLA : MC68HC705BD9B MOTOROLA : LSC4388P2 KEC : KIA7045B N/S : LM2402
<b>POWER REQUIREMENT</b>	<b>100 - 240 VAC(Universal Power) 3A</b>
<b>NUMBER OF LAYERS</b>	MAIN BOARD 1 LAYER CRT SOCKET BOARD 1 LAYER D-SUB BOARD 1 LAYER OSD BOARD 1 LAYER
<b>MAX. RESOLUTION</b>	<b>1600 X 1200 NON-INTERLACED (@ 106 kHz/85 Hz)</b>
<b>H-SYNC FREQUENCY RANGE</b>	<b>30 kHz ; - 107 kHz</b>
<b>V-SYNC FREQUENCY RANGE</b>	<b>50 Hz ; - 150 Hz</b>
<b>CRT SIZE</b>	<b>19" (SAMSUNG/ Type : M46QCE261X111)</b>
<b>VIDEO CONNECTOR TYPE</b>	<b>D-SUB 15-PIN</b>

## 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)	HYUNDAI	P910	CKLP910	HOST
PC(HOST)	H/P	HP VECTRA	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
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	HYUNDAI	E4208715801
CRT SOCKET BOARD	HYUNDAI	E4208615802
D-SUB BOARD	HYUNDAI	E4208515804
OSD BOARD	HYUNDAI	E4208615803

### **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	BOTH 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**

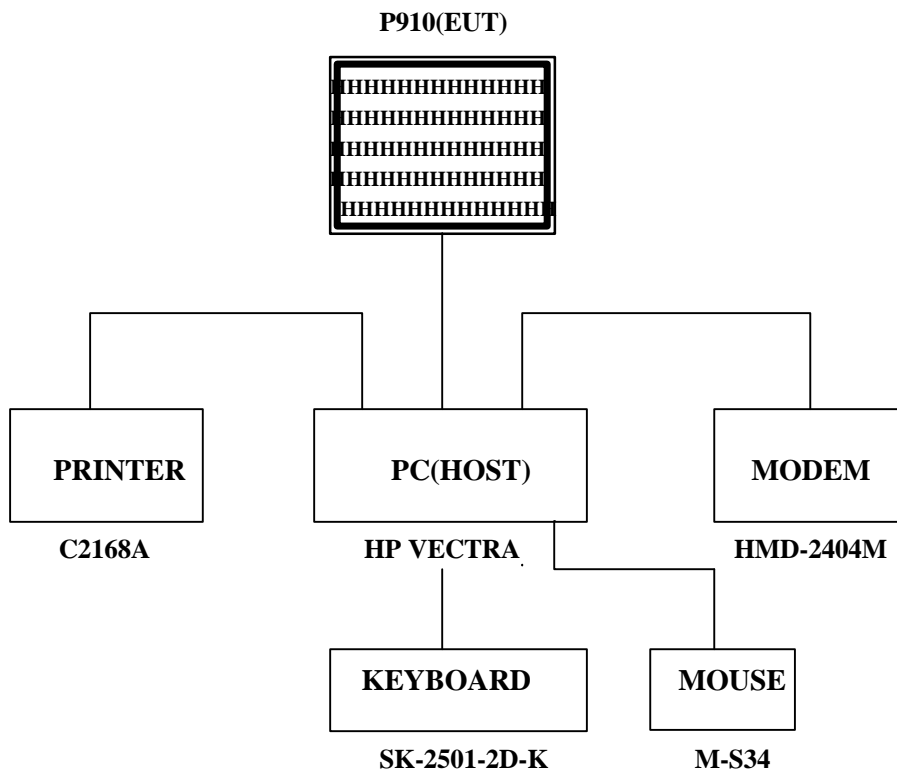
N/A

## 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	1600 x 1200 Non-Interlaced (106.2KHz/85Hz)	X
Pentium 75 MHz	1600 x 1200 Non-Interlaced (93.5KHz/75Hz)	
Pentium 75 MHz	1280 x 1024 Non-Interlaced (91.1KHz/85Hz)	
Pentium 75 MHz	1024 x 768 Non-Interlaced (81.1KHz/100Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (63.6KHz/120Hz)	

#### 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	1600 x 1200 Non-Interlaced (106.2KHz/85Hz)	X
Pentium 75 MHz	1600 x 1200 Non-Interlaced (93.5KHz/75Hz)	
Pentium 75 MHz	1280 x 1024 Non-Interlaced (91.1KHz/85Hz)	
Pentium 75 MHz	1024 x 768 Non-Interlaced (81.1KHz/100Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (63.6KHz/120Hz)	

Tested by Sang Jun, Lee

Date : JAN. 25. 1999



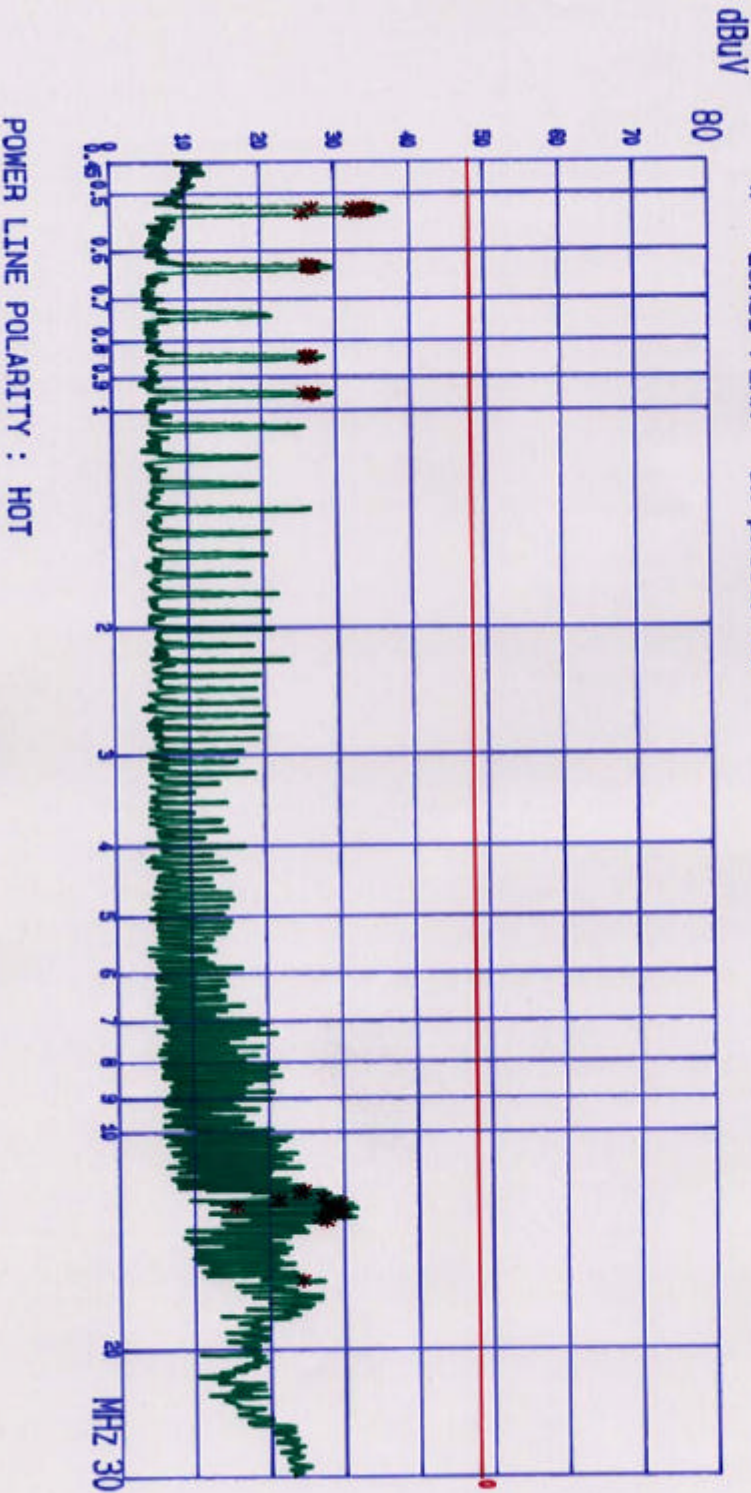
HYUNDAI

RFI Voltage Test

E.U.T.: P310  
Oper. condition 1600 W 1200 Ohm=106.2KHz . Vt=859Hz  
Test spec:  
FCC PART 15 SUBPART B CLASS B

Start Ff.	Stop Ff.	IF-BW	Detec	Att.	Meas.T.	Transd.
MHz	MHz	KHz	for	dB	a	type
0.4500	5.0000	10	Peak	LN	0.020	
5.0000	30.0000	10	Peak	LN	0.010	

Final evaluation: Quasi Peak  
\* = QUASI PEAK on phase: L1



# HYUNDAI RFI Voltage Test

S.U.T.: P310  
Oper. condition 1800 W 1200 (W-100.20KHz, V-80KHz)  
Test spec:  
FCC PART 15 SUBPART B CLASS B

Frequency MHz	Exceeding values on phase L1		
	Peak dBV	g-Peak dBV	g-Margin dB
0.5225	29.7	27.1	-20.8
0.5235	34.8	32.7	-18.2
0.5245	36.8	34.0	-13.9
0.5255	36.9	34.4	-13.6
0.5265	36.9	34.6	-13.9
0.5275	37.2	34.7	-13.2
0.5285	36.8	34.4	-13.5
0.5295	35.2	34.1	-13.8
0.5305	35.9	33.7	-14.2
0.5315	34.4	32.2	-15.7
0.5325	27.5	25.7	-22.2
0.5335	28.2	25.2	-21.7
0.5345	29.4	26.9	-21.0
0.5355	29.1	27.2	-20.7
0.5365	29.4	27.2	-20.7
0.5375	28.5	26.8	-21.1
0.5385	28.2	26.4	-21.5
0.5395	28.3	26.1	-21.8
0.5405	28.8	26.6	-21.3
0.5415	28.8	26.6	-21.3
0.5425	28.0	26.0	-21.9
0.5435	28.7	25.9	-22.0
0.5445	28.2	25.9	-21.0
0.5455	29.4	27.1	-20.9
0.5465	29.0	26.6	-21.3
0.5475	27.6	24.7	-23.2
0.5485	27.2	24.1	-23.8
0.5495	30.8	27.2	-20.8
0.5505	24.6	21.3	-26.6
0.5515	31.5	29.4	-18.5
0.5525	21.0	15.6	-32.4
0.5535	29.5	27.7	-20.2
0.5545	30.6	28.4	-19.6
0.5555	31.0	28.6	-19.4
0.5565	32.3	29.8	-18.0
0.5575	31.1	27.9	-20.0
0.5585	28.7	25.8	-21.1
0.5595	29.8	27.7	-20.3
0.5605	26.9	24.4	-23.5

# Limit exceeded

POWER LINE POLARITY : HOT

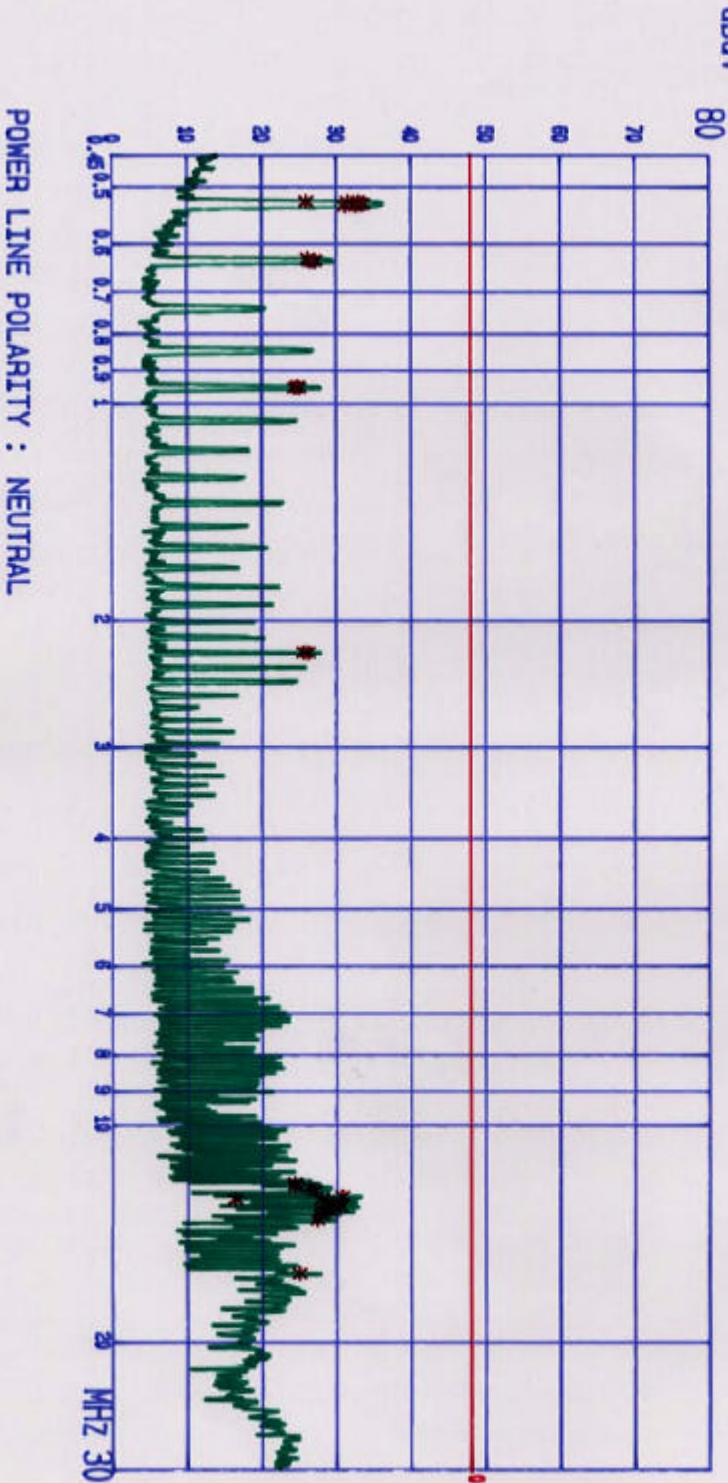


HYUNDAI  
RFI Voltage Test

E.U.T.: PA10  
Oper. condition 1800 M 1200 (Hf=106.2MHz, V=85Hz)  
Test spec:  
FCC PART 15 SUBPART B CLASS B

Start Freq.	Stop Freq.	IF-BW	Detector	Att.	Meas.T.	Trend.
MHz	MHz	KHz	type	dB	s	
0.4500	5.0000	10	Peak	LN	0.020	
5.0000	30.0000	10	Peak	LN	0.010	

Final evaluation: Quasi Peak  
\* = QUASI PEAK on phase: N



HYUNDAI  
RFI Voltage Test

E.U.T.: P210  
Oper. condition 1800 M 1300 Off=106.2KHz . V=80Hz)  
Test spec:  
FCC PART 15 SUBPART B CLASS B

Exceeding values on phase: N			
Frequency MHz	Peak dBuV	g-Peak dBuV	GP-Margin dB
0.53225	28.8	26.1	-21.8
0.53235	34.4	31.6	-18.2
0.53245	35.5	33.0	-14.8
0.53255	36.2	33.3	-14.6
0.53265	36.5	33.6	-14.3
0.53275	36.2	33.6	-14.4
0.53285	36.1	33.3	-14.6
0.53295	35.4	33.0	-14.9
0.53305	35.3	32.6	-15.3
0.53315	33.5	31.2	-16.7
0.53325	28.7	26.2	-21.7
0.53335	29.7	27.3	-20.9
0.53345	29.8	27.2	-20.6
0.53355	29.1	26.9	-20.7
0.53365	28.6	26.5	-21.0
0.53375	27.9	24.9	-21.5
0.53385	28.0	25.1	-23.0
0.53395	27.4	24.5	-23.8
0.53405	28.0	26.3	-23.4
0.53415	27.5	25.6	-21.6
0.53425	27.8	24.5	-22.3
0.53435	27.4	24.5	-23.4
0.53445	29.4	26.4	-21.5
0.53455	29.1	27.1	-20.9
0.53465	33.4	30.9	-17.0
0.53475	31.5	28.1	-19.8
0.53485	32.8	28.6	-19.2
0.53495	32.9	30.3	-17.6
0.53505	33.1	30.4	-19.8
0.53515	30.7	28.0	-18.9
0.53525	32.4	27.9	-20.0
0.53535	30.7	27.4	-20.5
0.53545	28.0	25.0	-22.9

POWER LINE POLARITY : NEUTRAL



## 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.

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

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