



ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CLASS B CERTIFICATION

Test report file number : E026R-034

Applicant : SAROTECH CO., LTD.
Address : Hangang Bldg. 1549-7, Seocho-Dong, Seocho-Ku, Seoul, 137-070, Korea

Manufacturer : SAROTECH CO., LTD.
Address : Hangang Bldg. 1549-7, Seocho-Dong, Seocho-Ku, Seoul, 137-070, Korea

Type of Equipment : External HDD Enclosure

FCC ID : PBCFHD-353

Model / Type No. : FHD-353

Serial number : N/A

Total page of Report : 16 pages (including this page)

Date of Incoming : April 26, 2002

Date of issuing : June 27, 2002

SUMMARY

The equipment complies with the regulation; ***FCC CFR 47 PART 15 SUBPART B, Class B.***

This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by:



G. W. Lee / Assist.Chief Engineer
EMC Dept.
ONETECH Corp.

Reviewed by:



Y. K. Kwon / Chief Engineer
EMC Dept.
ONETECH Corp.

CONTENTS

Page

1. VERIFICATION OF COMPLIANCE.....	3
2. GENERAL INFORMATION.....	4
2.1 PRODUCT DESCRIPTION.....	4
2.2 RELATED SUBMITTAL(S) / GRANT(S).....	4
2.3 TEST SYSTEM DETAILS.....	5
2.4 TEST METHODOLOGY	5
2.5 TEST FACILITY	5
3. SYSTEM TEST CONFIGURATION.....	6
3.1 JUSTIFICATION.....	6
3.2 EUT EXERCISE SOFTWARE	6
3.3 CABLE DESCRIPTION	6
3.4 NOISE SUPPRESSION PARTS ON CABLE	7
3.5 EQUIPMENT MODIFICATIONS	7
3.6 CONFIGURATION OF TEST SYSTEM.....	7
4. PRELIMINARY TEST.....	8
4.1 AC POWER LINE CONDUCTED EMISSION TEST	8
4.2 RADIATED EMISSION TEST	8
5. FINAL RESULT OF MEASUREMENT.....	9
5.1 CONDUCTED EMISSION TEST FOR USB OPERATING MODE	9
5.2 CONDUCTED EMISSION TEST FOR 1394 OPERATING MODE	10
5.3 RADIATED EMISSION TEST FOR USB OPERATING MODE	13
5.4 RADIATED EMISSION TEST FOR 1394 OPERATING MODE.....	14
6. FIELD STRENGTH CALCULATION.....	15
7. LIST OF TEST EQUIPMENT	16



1. VERIFICATION OF COMPLIANCE

APPLICANT : SAROTECH CO., LTD.
ADDRESS : Hangang Bldg. 1549-7, Seocho-Dong, Seocho-Ku, Seoul, 137-070, Korea
CONTACT PERSON : Mr. Cheol-Young, Cho / Manager
TELEPHONE NO : +82-2-585-4501
FCC ID : PBCFHD-353
MODEL NO/NAME : FHD-353
SERIAL NUMBER : N/A
DATE : June 27, 2002

DEVICE TYPE	Peripheral Device for Class B Computing Device - Unintentional Radiator
E.U.T. DESCRIPTION	External HDD Enclosure
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4/1992
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR 47 PART 15 §15.101
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 METER OPEN AREA TEST SITE

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The SAROTECH CO., LTD., Model FHD-353 (referred to as the EUT in this report) is an External HDD Enclosure, that is a personal computer peripheral with IEEE 1394 port and USB Port. Product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Metal
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	24.576MHz and 30MHz on the main board
DATA TRANSFER RATE	Max. 400Mbps – IEEE1394, Max. 480bps – USB
NUMBER OF LAYERS	Main Board: 4 Layers
ELECTRICAL RATING	Input: AC 110-230V, Output: DC 5V and 12V, 1.5A
DIMENSION(W X H X D)	150 X 210 X 35.6 mm
EXTERNAL TERMINALS	1394(2EA), USB(1EA) and AC Input Port

Model Differences

None

2.2 Related Submittal(s) / Grant(s)

Original submittal only

2.3 Test System Details

The model numbers for all the equipments which were used in the tested system is:

Model	Manufacturer	FCC ID	Description	Connected to
FHD-353	SAROTECH CO., LTD.	PBCFHD-353	External HDD Enclosure (EUT)	PC
DCM	DEL Computer	DoC	PC	-
CPD-G220	SONY	DoC	MONITOR	PC
KB-9963	Compaq	DoC	KEYBOARD	PC
M-S48a	Logitech	JNZ201213	MOUSE	PC
2225C	HP	DSI6XU2225	PRINTER	PC
020-0470	CARDINAL	GDE0196	MODEM	PC

2.4 Test Methodology

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

2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-080 Korea. Description details of test facilities were submitted to the Commission on January 18, 2002. (Registration Number: 92819)

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MAIN BOARD	SAROTECH CO., LTD.	N/A	N/A
POWER BOARD	SEYANG ELECTRONICS CO., LTD	N/A	N/A

3.2 EUT exercise Software

-. After connecting the EUT to a personal computer, data were continuously read and written between the EUT and the Personal computer. The EUT has a USB port and two 1394 ports, so above operating mode was tested at each port.

3.3 Cable Description

	Power Cord Shielded (Y/N)	I/O cable Shielded (Y/N)	Length (M)
External HDD Enclosure (EUT)	N	Y	0.5(P), 1.2(D)
PC	N	-	1.5(P)
MONITOR	N	Y	1.5(P), 1.8(D)
KEYBOARD	N/A	N	1.5(D)
MOUSE	N/A	N	1.5(D)
PRINTER	N	Y	1.5(P), 1.5(D)
MODEM	N	Y	1.5(P), 1.5(D)

* The marked “(P)” means the Power Cable and “(D)” means Signal Cable.

3.4 Noise Suppression Parts on Cable

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
External HDD Enclosure (EUT)	N	N/A	Y	BOTH END
PC	-	-	-	-
MONITOR	N	N/A	Y	PC END
KEYBOARD	N	N/A	Y	PC END
MOUSE	N	N/A	Y	PC END
PRINTER	N	N/A	Y	BOTH END
MODEM	N	N/A	Y	BOTH END

3.5 Equipment Modifications

To achieve compliance to CLASS B levels, the following change(s) was made by ONETECH Corp. during compliance testing:

“There was no Modified items during EMI test”

3.6 Configuration of Test System

Line Conducted Test: The EUT was connected to PC, and the power line of the EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emission test was conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 3 meters open area test site.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emission Test

During Preliminary Test, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Data transferring between the EUT and a PC (1394 and USB Mode)	X

4.2 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Data transferring between the EUT and a PC (1394 and USB Mode)	X

5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level

5.1 Conducted Emission Test for USB Operating Mode

Humidity Level : 48%

Temperature : 25°C

Limits apply to : FCC CFR 47, PART 15, SUBPART B

Type of Test : CLASS B

Result : PASSED BY -7.33 dB at 4.56 MHz

EUT : External HDD Enclosure

Date: May 24, 2002

Operating Condition : Data transferring between the EUT and a PC

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

Power Line Conducted Emission			FCC CLASS B	
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.56	34.38	HOT	48.00	-13.62
4.56	40.67	NEUTRAL	48.00	-7.33
8.72	34.38	HOT	48.00	-13.62
16.77	36.02	HOT	48.00	-11.98
24.09	34.27	HOT	48.00	-13.73
28.10	28.18	HOT	48.00	-19.82

Line Conducted Emission Tabulated Data



Tested by: Young Min, Choi / Project Engineer

5.2 Conducted Emission Test for 1394 Operating Mode

Humidity Level : 48%Temperature : 25°CLimits apply to : FCC CFR 47, PART 15, SUBPART BType of Test : CLASS BResult : PASSED BY -6.95 dB at 4.56 MHz

EUT : External HDD Enclosure

Date: May 24, 2002

Operating Condition : Data transferring between the EUT and a PC

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

Remark: 1394 Operating Mode

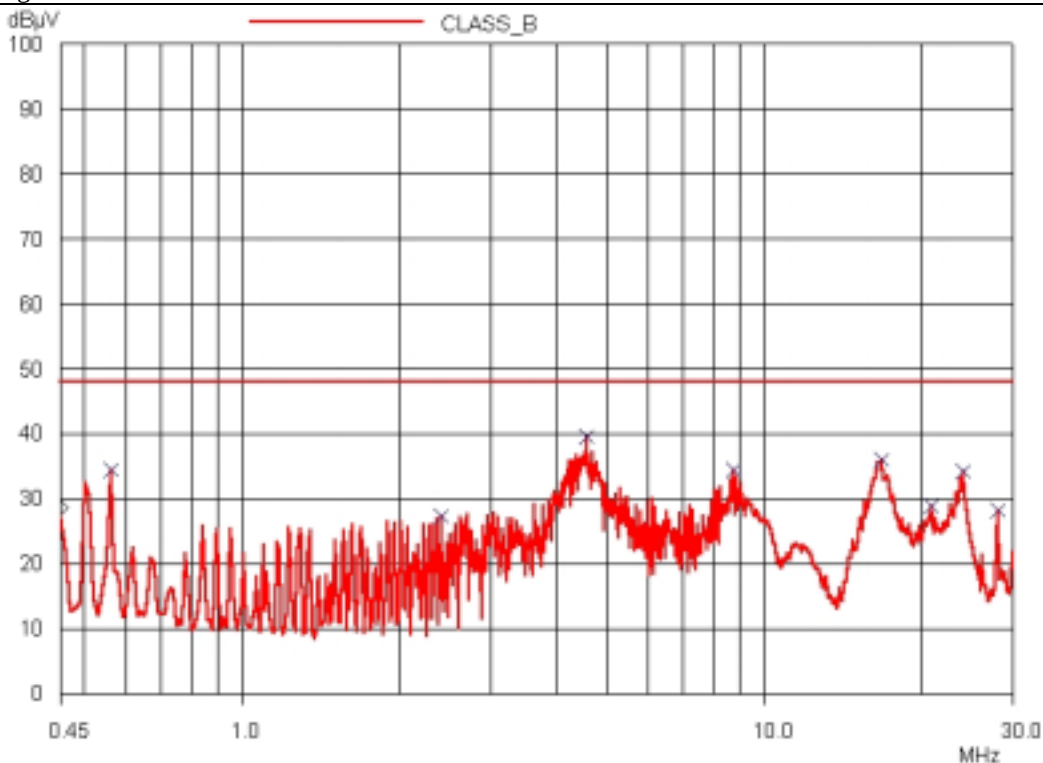
Power Line Conducted Emission			FCC CLASS B	
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.56	34.42	HOT	48.00	-13.58
4.56	41.05	HOT	48.00	-6.95
8.92	34.76	HOT	48.00	-13.24
15.69	33.81	NEUTRAL	48.00	-14.19
23.38	29.25	NEUTRAL	48.00	-18.75
28.10	27.94	NEUTRAL	48.00	-20.06

Line Conducted Emission Tabulated Data

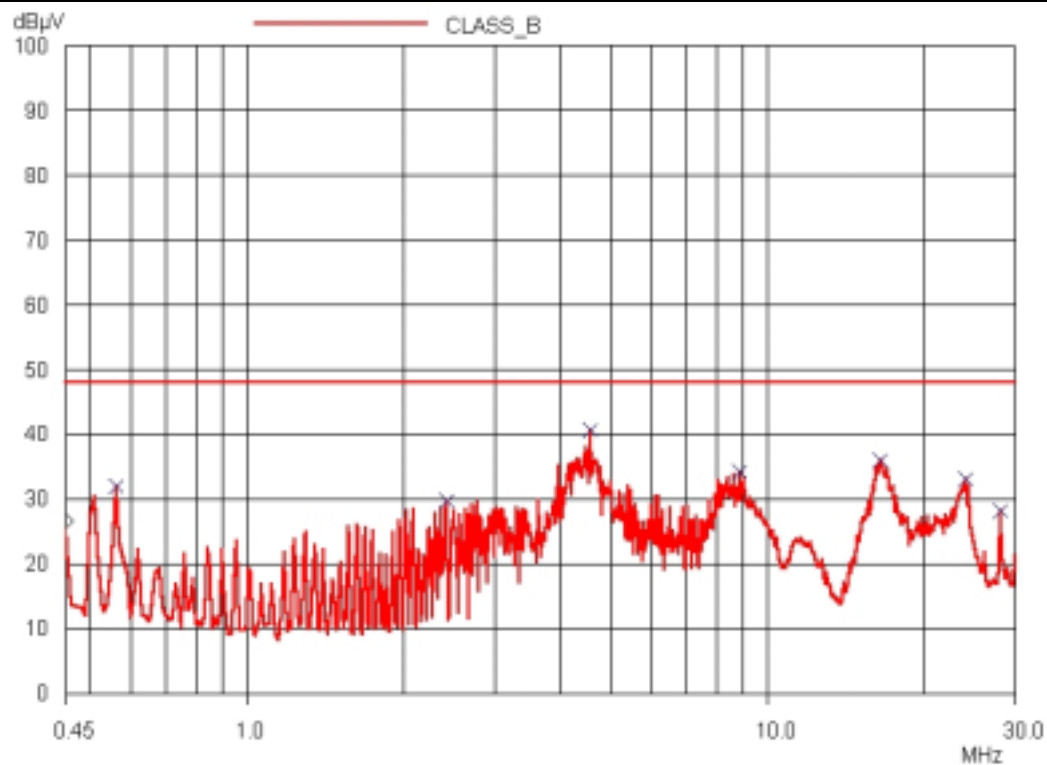


Tested by: Young Min, Choi / Project Engineer

USB Operating Mode

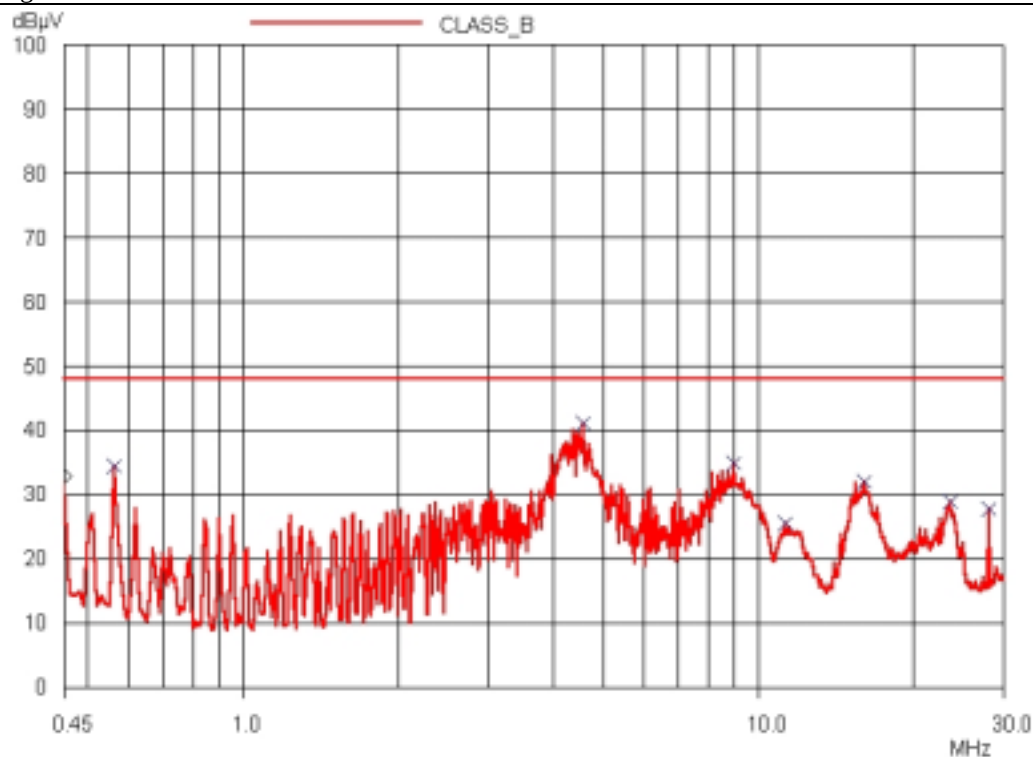


HOT LINE

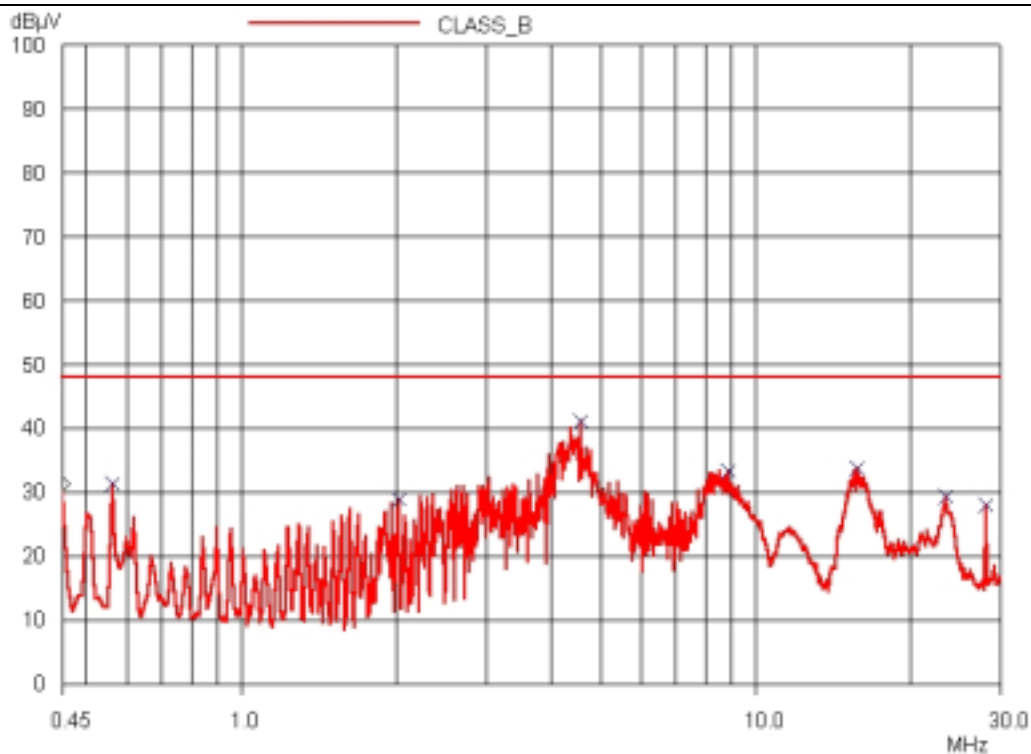


NEUTRAL LINE

1394 Operating Mode



HOT LINE



NEUTRAL LINE

5.3 Radiated Emission Test for USB Operating Mode

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 46 % Temperature : 24°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Test : CLASS B
 Result : PASSED BY -8.82 dB at 249.60 MHz

EUT : External HDD Enclosure Date: May 23, 2002
 Operating Condition : Data transferring between the EUT and a PC
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)
 Distance : 3 Meter

Radiated Emission		Ant	Correction Factors		Total	FCC CLASS B	
Freq. (MHz)	Amp. (dBuV)	Pol.	Ant. (dBuV/m)	Cable (dB)	Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
60.00	14.60	V	9.95	0.98	25.53	40.00	-14.47
112.43	18.00	V	13.79	1.21	33.00	43.50	-10.50
120.00	20.10	H	13.19	1.23	34.52	43.50	-8.98
150.00	16.10	H	13.92	1.35	31.37	43.50	-12.13
180.00	16.10	H	16.33	1.45	33.88	43.50	-9.62
195.00	12.50	V	16.92	1.54	30.96	43.50	-12.54
225.80	20.60	H	10.82	1.70	33.12	46.00	-12.88
240.00	16.10	H	11.44	1.78	29.32	46.00	-16.68
249.60	23.50	H	11.85	1.83	37.18	46.00	-8.82
360.40	13.10	H	15.76	2.33	31.19	46.00	-14.81
419.60	10.70	H	17.26	2.47	30.43	46.00	-15.57

Radiated Emission Tabulated Data



Tested by: Young Min, Choi / Project Engineer

5.4 Radiated Emission Test for 1394 Operating Mode

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 46 % Temperature : 24°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Test : CLASS B
 Result : PASSED BY -5.20 dB at 786.4 MHz

EUT : External HDD Enclosure Date: May 23, 2002
 Operating Condition : Data transferring between the EUT and a PC
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)
 Distance : 3 Meter

Remark: 1394 Operating Mode

Radiated Emission		Ant	Correction Factors		Total	FCC CLASS B	
Freq. (MHz)	Amp. (dBuV)	Pol.	Ant. (dBuV/m)	Cable (dB)	Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
98.32	24.20	V	11.15	1.14	36.49	43.50	-7.01
122.87	20.68	V	13.29	1.24	35.21	43.50	-8.29
172.10	17.20	H	15.79	1.43	34.42	43.50	-9.08
196.67	16.50	H	16.92	1.55	34.97	43.50	-8.53
245.60	24.80	H	11.68	1.81	38.29	46.00	-7.71
270.40	23.40	H	13.07	1.88	38.35	46.00	-7.65
344.40	21.90	H	15.91	2.25	40.06	46.00	-5.94
393.80	17.50	H	15.58	2.42	35.50	46.00	-10.50
442.20	18.80	H	17.00	2.53	38.33	46.00	-7.67
467.00	18.70	H	16.96	2.58	38.24	46.00	-7.76
786.40	16.20	V	20.94	3.66	40.80	46.00	-5.20

Radiated Emission Tabulated Data


 Tested by: Young Min, Choi / Project Engineer

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

+ Meter reading (dBuV)

+ Cable Loss (dB)

+ Antenna Factor (Loss) (dB/meter)

= Corrected Reading (dBuV/meter)

- Specification Limit (dBuV/meter)

= dB Relative to Spec (+/- dB)

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESVS 10	827864/005	OCT/01	12MONTH	■
2.	Test receiver	R/S	ESHS10	834467/007	APR/02	12MONTH	■
3.	Spectrum analyzer	HP	8568B	3026A0226	SEP/01	12MONTH	■
4.	RF preselector	HP	85685A	3107A01264	SEP/01	12MONTH	■
5.	Quasi-Peak Adapter	HP	85650A	3107A01542	SEP/01	12MONTH	■
6.	Dipole Antenna	EMCO	3121C	9107-745	JUN/01	12MONTH	
7.	Biconical antenna	EMCO	3104C	9109-4441 9109-4443 9109-4444	MAR/02	12MONTH	■
8.	Log Periodic antenna	EMCO	3146	9109-3213 9109-3214 9109-3217	JUN/01	12MONTH	■
9.	LISN	EMCO	3825/2	9109-1867 9109-1869	JUN/01	12MONTH	■
10.	RF Amplifier	HP	8447F	3113A04554	JUN/01	N/A	
11.	Spectrum Analyzer	HP	8591A	3131A02312	APR/02	12MONTH	
12.	Computer System	HP	98581C	98543A	N/A	N/A	■
	Hard disk drive		9153C	CMC762Z9153	N/A	N/A	■
13.	Plotter	HP	7475A	30052 22986	N/A	N/A	■
14.	Position Controller	EMCO	1090	9107-1038	N/A	N/A	■
15.	Turn Table	EMCO	1080-1.21	9109-1576	N/A	N/A	■
16.	Antenna Master	EMCO	1070-1	9109-1624	N/A	N/A	■