THRU Lab. & Engineering

FCC PART 15 CLASS B
EMI MEASUREMENT AND TEST REPORT

FOR

Sasem Co., Ltd.

3rd Hansung Bldg., 375-36 Seokyo-Dong,
Mapo-Gu, Seoul 121-839, KOREA

MODEL: OnAir DTV Pro

Issued Date: April 30, 2001
Report No.: THRU-F010430B

This Report Concerns:	**Equipment Type:**
☑ Original Report	Digital TV Card OnAir DTV Pro

Test Date: April 27, 2001

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1. General Information

1.1 Test Facility

The open area test site used by Thru Lab. & Engineering to collect radiated and conducted emissions measurement data is located in the 389 JeArm-Rhi, HyangNam-Myun, HwaSung-Gun, KyungKi-Do, Korea.

Test sites at Thru Lab. & Engineering has been fully described in reports submitted to the Federal Communication Commission and the details of the reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The test facility also complies with the radiated and AC line conducted test site criterion in ANSI C63.4-1992. The Federal Communications Commission has the reports on file and is listed under Registration Number 92583. The scope of the accreditation covers the FCC Method - 47 CFR Part 15 or 18 of the Commission's Rules.

1.2 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9kHz to 40GHz. All radiated and conducted emissions measurements were performed at Thru Lab. & Engineering. The radiated testing was performed at an antenna-to-EUT distance of 10 meters for Class A devices and 3 meters for Class B devices.

1.3 Test Equipment List

Description	Model Number	Serial Number	Manufacturer	Cal. Due Date
EMI Test Receiver	ESVS 10	830489/001	Rohde & Schwarz	2002.04.25.
Spectrum Analyzer	R3261C	71720189	Advantest	2002.04.25.
Biconical Antenna	94455-1	0977	Eaton	2002.04.25.
Log Periodic Antenna	3146	2051	EMCO	2002.04.25.
Dipole Antenna Set	TDA25/TDS25.1/2	176/200/200	Electro Metrics	2001.10.04.
Signal Generator	SMS	8721651100	Rohde & Schwarz	2002.04.25.
Spectrum Analyzer	8566B	2311A02394	Hewlett Packard	2002.03.17
Quasi-Peak Adapter	85650A	2521A00887	Hewlett Packard	2002.03.17
RF Preselector	85685A	2648A00504	Hewlett Packard	2002.03.17
Switch Driver	11713A	2223A01633	Hewlett Packard	None
LISN	KNW-242	8-923-2	Kyoritsu	None
LISN	8012-50-R-24	8379121	Solar	None
Plotter	7475A	2210A 02802	Hewlett Packard	None

1.4 Product Description for Equipment Under Test (EUT)

Sasem Co., Ltd.'s OnAir DTV Pro or the "EUT" as referred to in this report is a next generation HDTV tuner card that is composed of OnAir DTV Board, Digital Signal Receiver and Decoder, and OnAir DTV Sub-board, Audio/Video Input and Output ports.

Main Features of EUT are:

- Video output resolution: 1920x1080i, 1440x1080i, 704x480i/P, 1280x720P, 1024x768P
- 1920 x 1080i in 17inch monitor by direct control
- Supports two screen ratio (16 :9 Wide/4:3 Normal) and NTSC Progressive Mode (30/60 Hz)
- Supports RGB Video Output
- Supports Component (Y-Pb-Pr) video output for Digital Ready TV and Projector
- Supports Dual Monitor Display (Overlay & RGB or Component Display)
- Supports Analog TV Audio Digital output
- Supports NTSC, PAL Analog Video & S-Video input
- Easy to connect A/V cable
- Program and timer of TV program

1.5 Equipment Under Test (EUT)

Description	Model Number	Serial Number	Manufacturer	Remarks
Digital TV Card	OnAir DTV Pro	none	Sasem Co., Ltd.	-

1.6 Support Equipment

Description	Model Number	Serial Number	Manufacturer	Remarks
Host Computer	ART586C	TRL0080730	Art Computer	ATX
VGA Monitor	CGC5607L	H1BH900689	Samsung Electronics	15"
Keyboard	BTC-5560	K71200885	BTC Korea	PS/2
Mouse	Mouse 2.0	02873445	Microsoft Corp.	PS/2
Printer	C2605	3221S66649	Hewlett Packard	300dpi
Modem	SM1200A1	71000230	Samsung Electronics	1200bps
Zip Drive	Z100USB	PSBL35F137	Iomega Corp.	USB
TV Monitor	CT-14F1S	35PR100346	Samsung Electronics	14"
Speaker	RP-SP10	6ACSA01550	Matsushita Electronics	-
Microphone	ECM	none	-	-

1.7 Host System Configuration

Description	Model Number	Serial Number	Manufacturer	Remarks
Power Supply	ST-250GL	S008016533	Seventeam Electronics	250W
Motherboard	Richmond AGP	LA700937	Sambo Computer	ATX
Video Card	PV-822	PV258729	Leotech	AGP
DTV Card	OnAir DTV Pro	none	Sasem Co., Ltd.	EUT
Sound Card	CT4180	T740085953	Creative Tech.	ISA
Hard Drive	PLS-31084A	JQXG917701	Samsung Electronics	30GB
Floppy Drive	SFD-321D/T	J2YD611113	Samsung Electronics	3.5"
CD-ROM Drive	SCR-831	63PH400104	Samsung Electronics	24X
CPU	Pentium MMX	none	Intel Corporation	233MHz
Memory	SDRAM	none	Samsung Electronics	128MB
Host Chassis	ART586C	TRL0080730	Art Computer	Middle Tower

1.8 External I/O Cabling

Description	Length (m)	Port/From	Port/To	Remarks
Video Cable	1.2	VGA/EUT	Dsub/Monitor	Shielded
VGA Cable	0.2	miniDIN/EUT	Dsub/Host	Shielded
Keyboard Cable	1.8	Keyboard/Host	Keyboard	Shielded
Mouse Cable	2.0	Mouse/Host	Mouse	Shielded
Printer Cable	1.5	Parallel/Host	Printer/Centronics	Shielded
Modem Cable	2.0	Serial/Host	Modem/RS232	Shielded
USB Cable	1.0	USB/Host	Zip Drive/USB	Shielded
Sound Cable	0.1	Line-In/Host	Line-Out/EUT	Shielded
Speaker Cable	1.0	SPKR/Host	Speaker	Shielded
Microphone Cable	2.0	MIC/Host	Microphone	Shielded
AV Cable	1.0	AV/EUT	TV/RCA	Shielded

2. System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user). Worst case conducted and radiated emissions are presented in section 3.5 and section 4.6 of this report.

The test was performed with a VGA monitor for the final qualification test. The VGA Loopback port (Dsub-miniDIN) and AV port (RCA) provided by the EUT, Video port (VGA/DB15), PS/2 Keyboard/Mouse ports (miniDIN), Parallel port (LPT/DB25), Serial port (COM/DB9), USB port (Type A), Speaker/Microphone jacks (3.5mm stereo) provided by the host computer were also tested.

2.2 EUT Exercise

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, supplied by the client, running on Windows 98SE operating system allowed watching Digital TV programs.

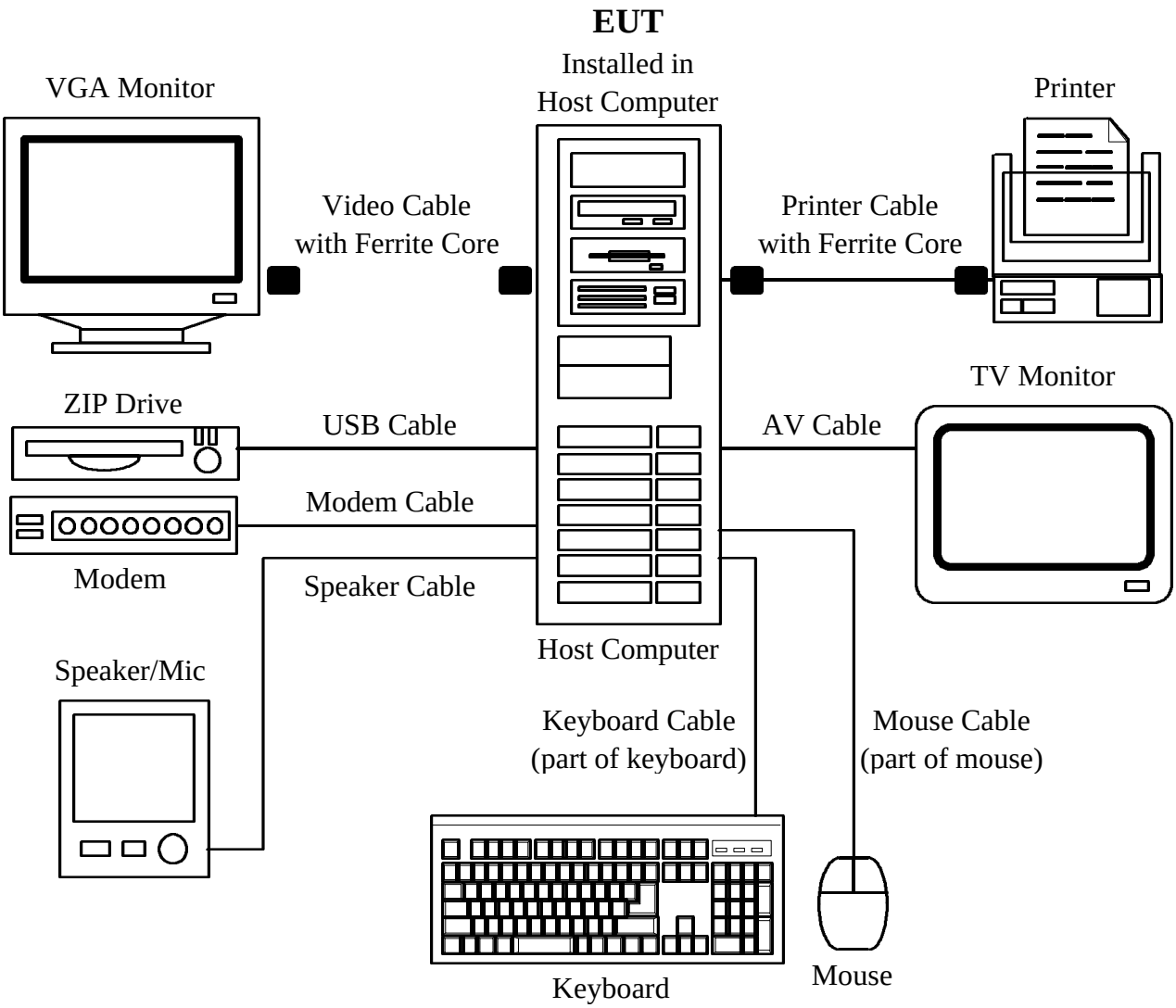
2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied or by use respective component manufacturers. The Printer, Modem and Monitor featured shielded metal connectors.

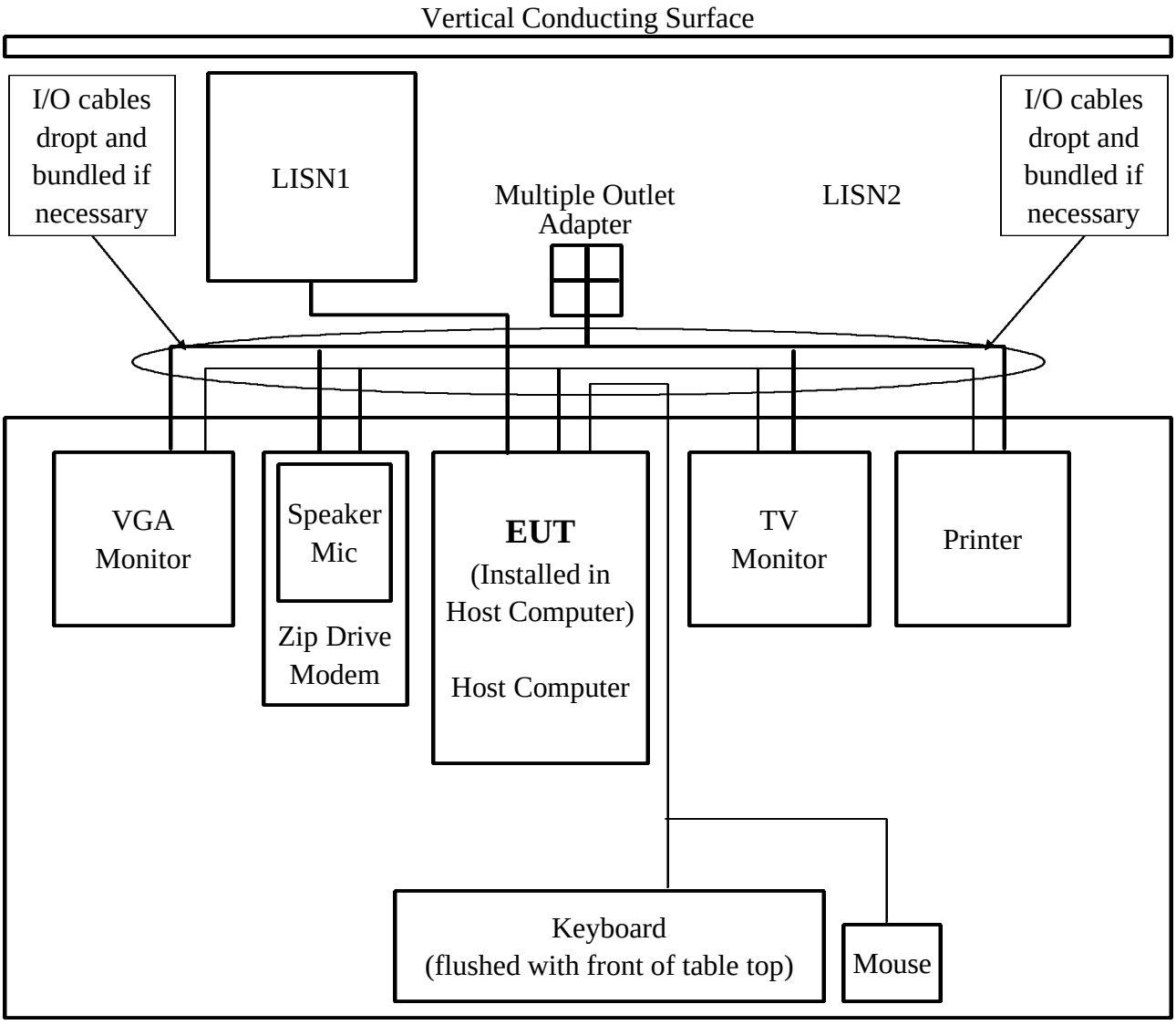
2.4 Schematics/Block Diagram

The EUT schematic or block diagram is presented in Appendix B as reference.

2.5 Configuration of Test System



2.6 Conducted Emissions Test Setup Block Diagram



Wooden Table (1.5m x 0.8m x 0.8m)

3. Conducted Emissions Test

3.1 EUT Setup

The measurement was performed in the screen room of test site, using the setup in accordance with ANSI C63.4-1992 conducted emissions measurement procedure.

The EUT was installed in a middle tower host computer. The host computer was placed on the center and back edge of the test table. The VGA monitor, modem, zip drive, speaker and microphone were placed on one side of the host computer with the printer and TV monitor on the other side. The rear of the host computer and all support equipments were flushed with the rear and sides of the tabletop. The keyboard was placed in front of the host computer, flushed with the front of the tabletop. The mouse was placed flushed with the back of the keyboard.

Spacing between the peripherals was approximately 10 centimeters.

3.2 Test Equipment Setup

The spectrum analyzer was configured during the conduction test in as follows:

Start Frequency.....450kHz
Stop Frequency..... 30MHz
Resolution Bandwidth.....9kHz
Sweep Time..... Auto
Detector Mode..... PK

3.3 Test Procedure

During the conducted emissions test, the host computer power cord was connected to the auxiliary outlet of the LISN1 and all other peripherals power cords were connected to the multiple outlet adapter of the LISN2.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emissions was found to be marginal (less than -4dBuV). Quasi-peak readings are distinguished with a "QP".

The conducted emissions test was performed with EUT exercise program loaded, and the emissions were scanned between 0.45MHz to 30MHz on the LINE side and NEUTRAL side, herein referred to as L and N, respectively. The final test data for this test configuration is recorded in the table listed under section 3.5 of this report.

3.4 Summary of Test Results

According to the data in section 3.5, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin reading of:

-8.1dB at 16.240MHz in the LINE side with the Seventeam Electronics, Model ST-250GL ATX power supply.

3.5 Conducted Emissions Test Data

Line Conducted Emissions				**FCC Part15 Class B**		
Frequency (MHz)	Amplitude (dBuV)	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit (dBuV/m)	Limit (uV/m)	Margin (dB)
0.492	27.2	PK	N	48.0	250	-20.8
0.625	28.4	PK	H	48.0	250	-19.6
0.708	27.8	PK	N	48.0	250	-20.2
0.812	27.6	PK	H	48.0	250	-20.4
0.975	27.5	PK	H	48.0	250	-20.5
1.001	27.5	PK	H	48.0	250	-20.5
1.780	33.9	PK	H	48.0	250	-14.1
2.246	37.4	PK	H	48.0	250	-10.6
7.133	36.8	PK	N	48.0	250	-11.2
13.542	34.7	PK	N	48.0	250	-13.3
15.785	39.7	PK	N	48.0	250	-8.3
16.240	39.9	PK	H	48.0	250	-8.1

3.6 Plot of Conducted Emissions Test Data

Plot(s) of conducted emissions test data for the Seventeam Electronics, Model ST-250GL ATX power supply is presented in Appendix A of this report as reference.

4. Radiated Emissions Test

4.1 EUT Setup

The radiated emissions tests were performed in the open area test site, using the setup in accordance with ANSI C63.4-1992 radiated emissions measurement procedure.

The host computer was placed on the center of the test table. The VGA monitor and all peripherals were place on the test table same as section 3.1.

Spacing between the peripherals was approximately 10 centimeters.

4.2 Test Equipment Setup

During the radiated emissions test, the EMI test receiver was set with the following configurations:

Start Frequency..... Manual
Stop Frequency..... Manual
IF Bandwidth..... 120kHz
Sweep Time..... 10msec
Detector Mode..... QP

4.3 Test Procedure

For the radiated emissions test, the host computer and all support equipments power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to verify that the EUT complied with all installation combination.

The radiated emissions test was performed with EUT exercise program loaded, and the emissions were scanned between 30MHz to 1000MHz. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum emission levels. Measurements were taken using both HORIZONTAL and VERTICAL antenna polarization. The final test data for this test configuration is recorded in the table listed under section 4.6 of this report.

4.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude is calculated by adding the antenna and cable Correction Factor from the Indicated Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Amplitude + Antenna Factor + Cable Factor

The Margin column of the data table in section 4.6 indicates the degree of compliance with the applicable limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Applicable Limit

4.5 Summary of Test Results

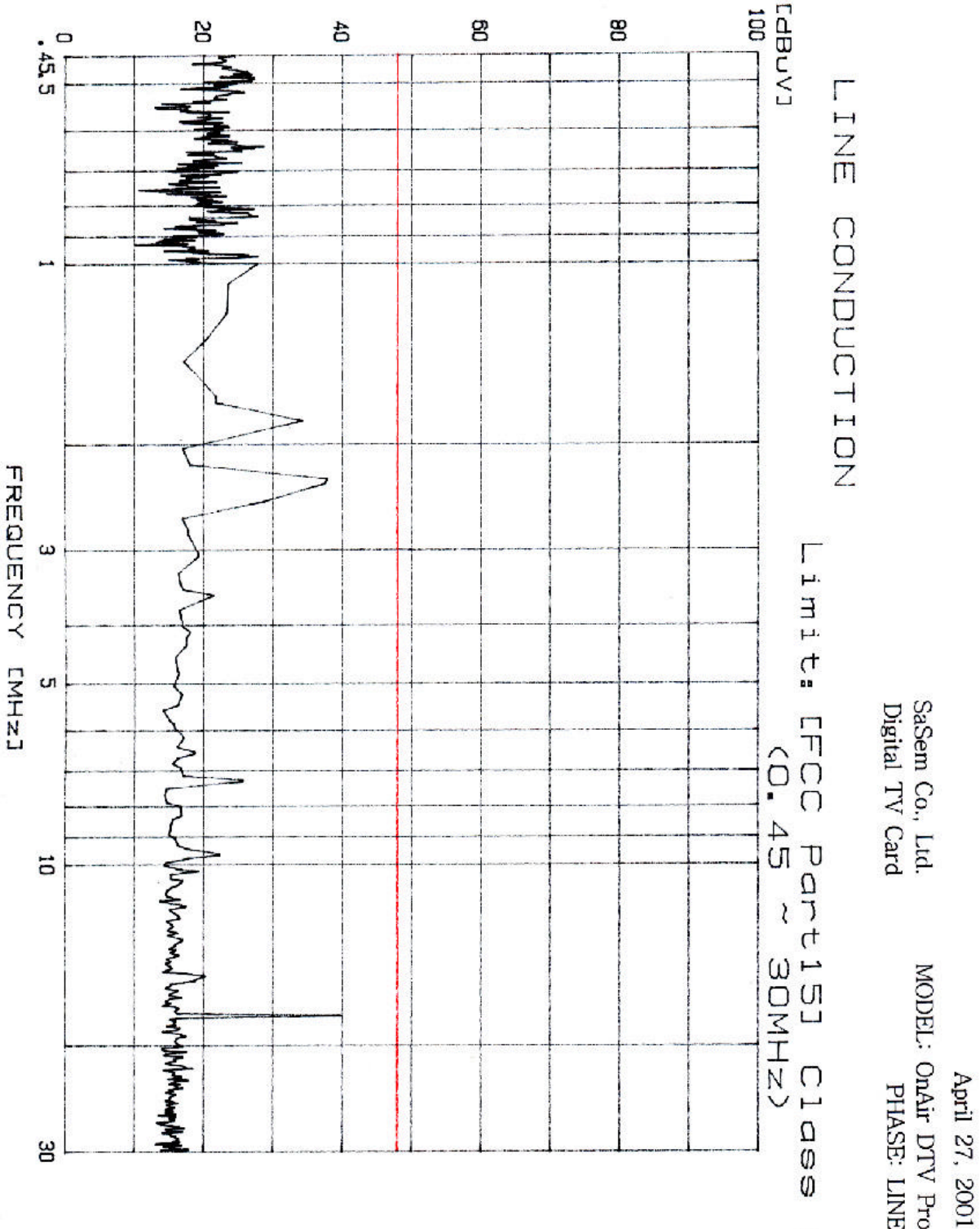
According to the data in section 4.6, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin of:

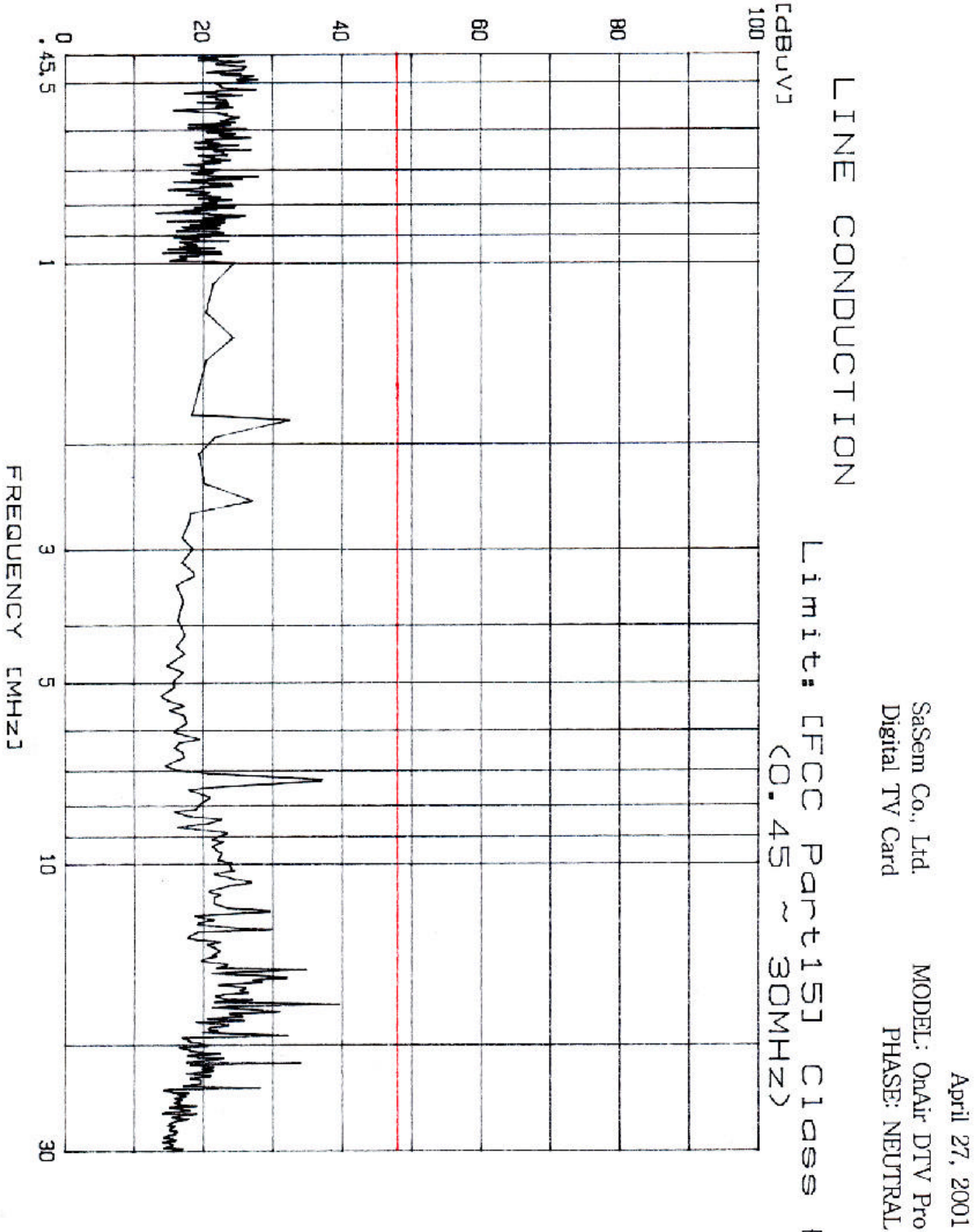
-3.3dB at 405.00MHz in the HORIZONTAL polarization at an antenna-to-EUT distance of 3 meters.

4.6 Radiated Emissions Test Result Data

Indicated		**Antenna**		**Table**	**Correction Factor**		**Corrected Amplitude**	**FCC Part15 Class B**		
Freq. (MHz)	Ampl. (dBuV/m)	Polar. (H/V)	Height (m)	Angle (deg.)	Ant. (dB)	Cable (dB)	(dBuV/m)	Applicable Limit (dBuV/m)	(uV/m)	Margin (dB)
55.31	18.8	V	2.6	100	8.7	0.8	28.3	40.0	100	-11.7
57.21	20.8	V	1.8	130	7.8	0.9	29.5	40.0	100	-10.5
70.05	27.3	V	2.0	180	4.8	1.0	33.1	40.0	100	-6.9
77.43	27.4	H	3.5	320	7.0	1.1	35.5	40.0	100	-4.5
80.99	26.3	H	1.9	50	7.3	1.1	34.7	40.0	100	-5.3
85.98	22.9	H	2.0	330	8.7	1.2	32.8	40.0	100	-7.2
145.64	15.2	H	3.3.	90	15.8	1.6	32.6	43.5	150	-10.9
162.00	16.2	H	3.0	270	16.7	1.8	34.7	43.5	150	-8.8
177.58	18.2	H	2.9	90	14.8	1.9	34.9	43.5	150	-8.6
186.21	17.6	H	3.5	230	15.0	2.0	34.6	43.5	150	-8.9
197.99	18.3	H	2.8	270	15.8	2.1	36.2	43.5	150	-7.3
215.98	22.4	H	3.0	170	11.2	2.3	35.9	43.5	150	-7.6
283.50	21.9	V	1.2	180	14.3	2.7	38.9	46.0	200	-7.1
296.97	17.8	H	1.8	160	15.2	2.8	35.8	46.0	200	-10.2
399.96	21.9	H	1.3	90	14.7	3.3	39.9	46.0	200	-6.1
405.00	24.4	H	1.5	270	15.0	3.3	42.7	46.0	200	-3.3
445.50	22.3	H	1.4	230	16.7	3.5	42.5	46.0	200	-3.5
462.83	18.2	H	1.5	220	17.3	3.5	39.0	46.0	200	-7.0

Appendix A - Plot of Conducted Emissions Test Data


LINE CONDUCTION
Limit: [FCC Part15] Class B
(0.45 ~ 30MHz)
SaSem Co., Ltd.
Digital TV Card
MODEL: OnAir DTV Pro
PHASE: LINE
April 27, 2001
[dBuV]
100
80
60
40
20
0
.45
.5
1
3
5
10
30
FREQUENCY [MHz]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SaSem Co., Ltd.
Digital TV Card
MODEL: OnAir DTV Pro
PHASE: NEUTRAL
[dBuV]
100
80
60
40
20
0
.45
.5
1
3
5
10
30
FREQUENCY [MHz]