SAMSUNG ELECTRONICS

EMC TEST REPORT

Project No. :LBE031236

Product : Video Cassette Recorder

Model No. : DVD-V3650

Date of test : May 27 ~ 28, 2003

Issued Date : May 29, 2003

Tested by:
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1. Introduction & Summary

1.1 Description of the EUT

Applicant	SAMSUNG ELECTRONICS Co., Ltd.	
Project Number	LBE031236	
Equipment Under Test	Video Cassette Recorder	
Trade Name	SAMSUNG	
Model Number	DVD-V3650	
Variant Model	None	
Type of RF Output Connector	Type "F" Connector 75ohm(Unbalanced)	
FCC ID Number	A3LSLIMCOMBO	
Operating(RF Modulator) Frequency	CH.3	Visual Carrier 61.25MHz Aural Carrier 65.75MHz
	CH.4	Visual Carrier 67.25MHz Aural Carrier 71.75MHz
Mains input	120V 60Hz	

1.2 Test facility

The EMI/EMS measurement facilities used to collect the tested data are located at 416 Maetan 3 Dong, Paldal-Ku, Suwon City, Kyungki Do, Korea.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1 & 16-2.
SAMSUNG Electronics Co.,Ltd is accredited by Korea Laboratory Accreditation Scheme(KOLAS) which signed the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the above test item(s) and test method(s).

Measured in Semi-anechoic chamber #1 that is FCC Registration Number 98856.

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1.3 Test mode

The EUT was tested in the following operating modes(at both channel 3 and 4) for the tests mention in this report:

1) Playback mode [VHS Play]
A video tape recorded with VITS signal was played on the EUT.

2) Record mode [NTSC Signal Input]
A NTSC signal(Color bar with grea lines) was supplied at ch. 5(77.25MHz) through the Ant. input connector for recording.

3) Record mode [1V VITS Signal Input]
A 1V peak-to-peak VITS signal was supplied through the video input connector for recording.

4) Record mode [5V VITS Signal Input]
A 5V peak-to-peak VITS signal was supplied through the video input connector for recording.

5) Play mode [DVD Play]

Note: The NTSC TV signal input record mode is not applicable to the antenna transfer switch test.

1.4 Measuring instrument setup

The explanation of measuring instrument setup when respective function is used in any frequency band is as following:

Frequency Band [MHz]	Instrument	Detector function	Resolution Bandwidth	Video Bandwidth
30 to 1000	Spectrum analyzer	Peak	100kHz (1MHz)	1MHz
	EMI Test receiver	Quasi-Peak	120kHz	-
Above 1000	EMI Test receiver	Average	1MHz	-

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1.5 Test rule and Procedure

FCC Rule Part 15, Subpart B : Unintentional Radiators
TV Interface Devices.
Test Procedure : ANSI C63.4-1992

1.6 Test Summary

Test item	Applied Standards	Result
AC POWERLINE CONDUCTED EMISSION	ANSI C63.4-1992	Pass
RADIATED EMISSION	ANSI C63.4-1992	Pass
OUTPUT SIGNAL LEVEL	ANSI C63.4-1992	Pass
OUTPUT TERMINAL CONDUCTED SPURIOUS EMISSION	ANSI C63.4-1992	Pass
ANTENNA TRANSFER SWITCH ISOLATION	ANSI C63.4-1992	Pass

* N/A : Test not applicable

2. Test equipment

Equipment	Model No.	Serial No.	Makers	Last calibration and Interval
Spectrum analyzer	8566B	3340A21744	H.P	03/03/04, 12Months
	Firmware versions : Rev.29.9.86			
Quasi-peak adapter	85650A	2521A00687	H.P	02/10/09, 12Months
RF Preselector	85685A	2602A00224	H.P	02/10/09, 12Months
Field strength meter	ESCS30	839809/022	R & S	02/06/18, 12Months
	Firmware versions : Main 1.08, OTP 02.01, GRA 02.03			
Field strength meter	ESVP	860688/015	R & S	03/02/28, 12Months
L.I.S.N	ESH3-Z5	847265/028	R & S	02/12/03, 12Months
Pattern Generator	PM5418-TDSI	LO627116	PHILIPS	02/12/07, 12Months
VITS Generator	MG318A	M08643	ANRITSU	03/02/18, 12Months
Matching PAD	RAM	829712/026	R & S	-
Test Receiver	ESI26	882692/002	R & S	02/10/25, 12Months
Bi-Log Antenna	CBL6112B	2766	SCHAFFNER	03/ 04/26, 12Months

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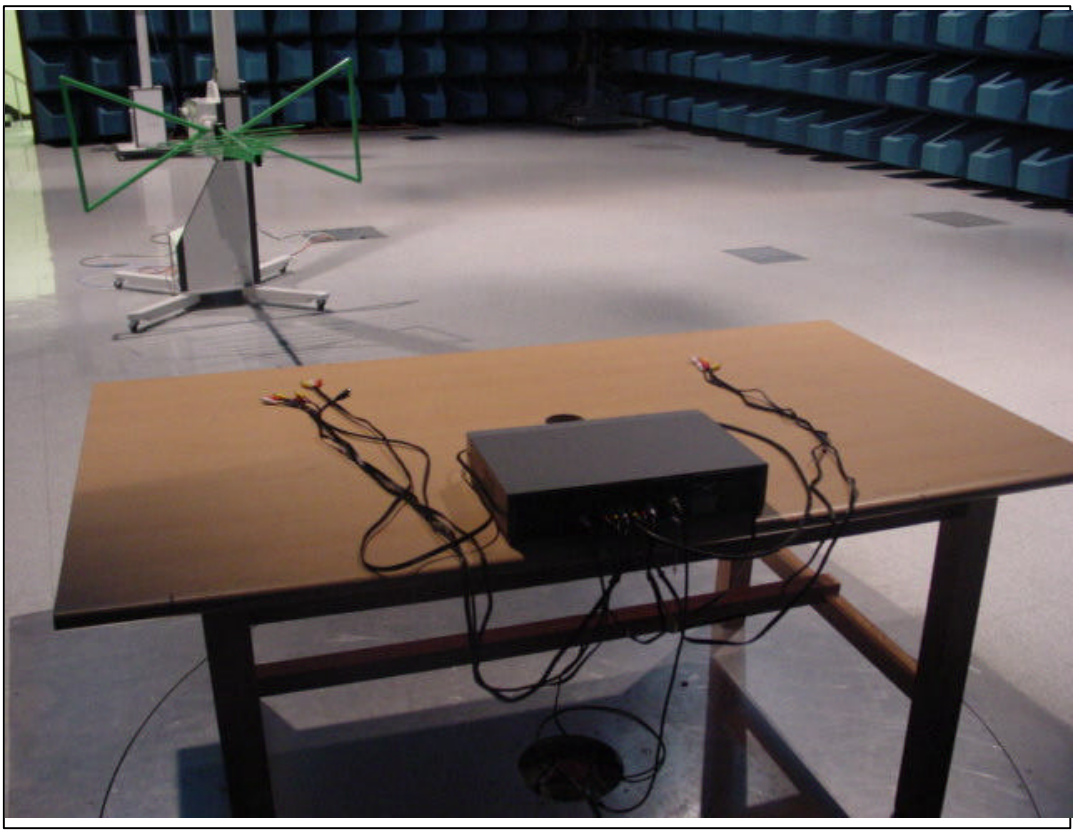
3. Test Results

3.1 RADIATED EMISSION MEASUREMENT

3.1.1 Test Procedure

Configurate the EUT System in accordance with ANSI C63.4-1992section 8 and 12.2.
Power cords for the EUT System are connected the receptacle on the ground plane.
The output ports are connected to the cable provided with the device and the ending port of the cable are terminated in the proper impedance.
To find out the maximum emission, change the position of the cable, and the EUT operation mode under normal usage of the EUT.
The spectrum analyzer are scanned from 30MHz to 1,000MHz in channel 3 and 4.

3.1.2 Setup Photograph



3.1.3 Radiated Emission Test Data

The initial step in collecting radiated data was to perform a quasi-peak scan over the measurement range using a receiver.
All other emission are non-significant.
The minimum margin to the limit is as follows :

Eut Mode : VHS Playback at CH3 and CH4

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B] [dB]	Antenna Height [Cm]	Turn table Degree [Deg]	Results [A+B] [dBuV/m]	Limits at 10m [dBuV/m]	Margin (Limit-Result) [dB]
30 - 88	68.100 85.246	V V	15.7 18.9	6.3 9.3	100 302	245 260	15.7 18.9	**40.0** **40.0**	24.3 21.1
88 - 216	135.310	H	21.3	13.1	223	160	21.3	**43.5**	22.2
216 - 960	249.213 271.100	H V	25.4 19.0	15.3 16.4	100 144	20 230	25.4 19.0	**46.0** **46.0**	20.6 27.0

** Receiving Antenna Mode : **Horizontal, Vertical***
** Test distance : 3m (Semi-Anechoic Chamber)*
** Results = Meter Reading + Total Loss(Antenna factor + Cable loss)*

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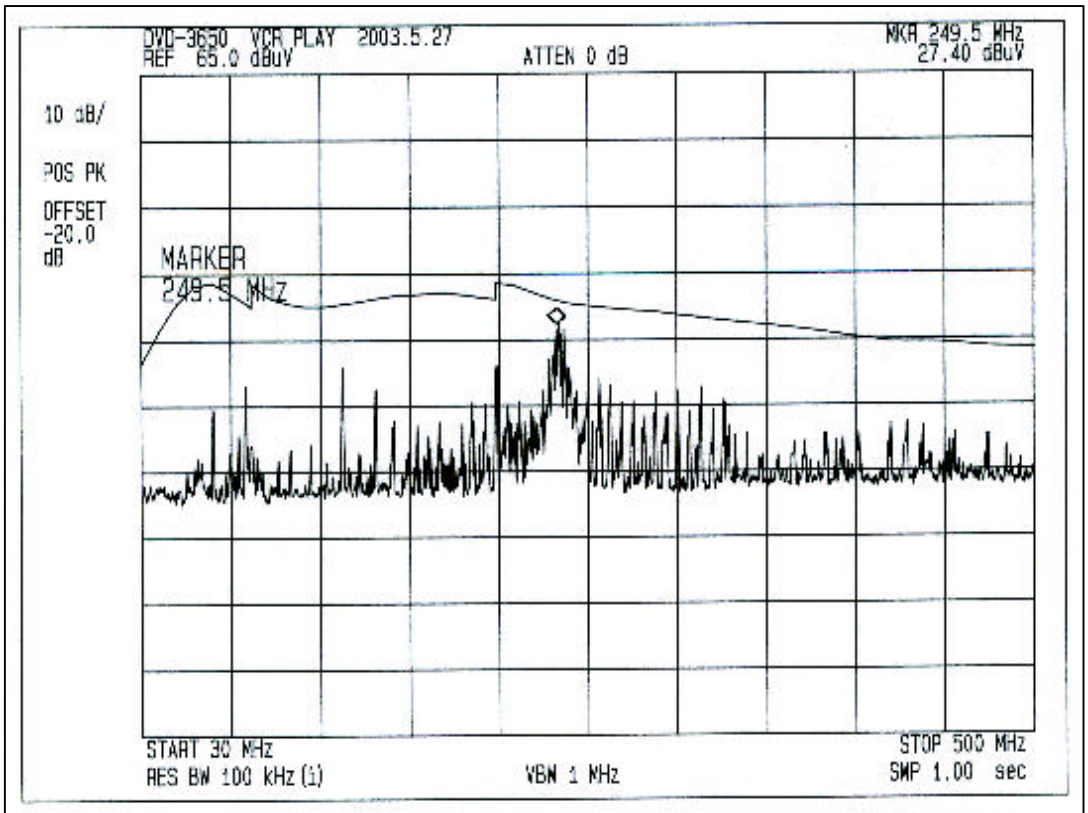
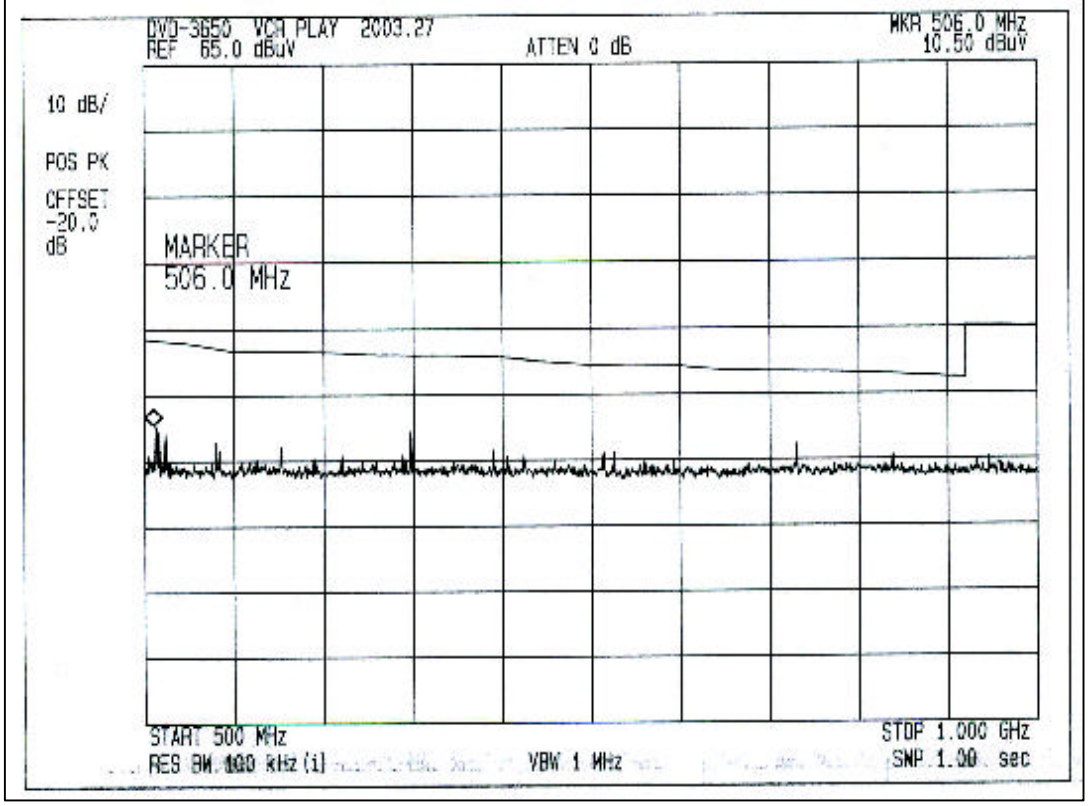
Eut Mode : VHS Playback at CH3 and CH4





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Eut Mode : Recording(NTSC) at CH3 and CH4

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B] [dB]	Antenna Height [Cm]	Turn table Degree [Deg]	Results [A+B] [dBuV/m]	Limits at 10m [dBuV/m]	Margin (Limit-Result) [dB]
30 - 88	68.100	V	18.8	6.3	100	120	18.8	**40.0**	21.2
	85.035	V	17.1	9.3	120	250	17.1	**40.0**	22.9
88 - 216	135.487	H	17.6	13.1	400	140	17.6	**43.5**	25.9
	153.214	H	16.8	12.2	380	150	16.8	**43.5**	26.7
216 - 960	216.600	V	18.8	12.0	150	360	18.8	**46.0**	29.2
	248.600	H	20.1	15.2	350	210	20.1	**46.0**	25.9
	325.200	H	14.9	17.9	360	0	14.9	**46.0**	31.1
	433.310	H	14.3	21.6	400	20	14.0	**46.0**	32.0

** Receiving Antenna Mode : **Horizontal, Vertical***
** Test distance : 3m (Semi-Anechoic Chamber)*
** Results = Meter Reading + Total Loss(Antenna factor + Cable loss)*

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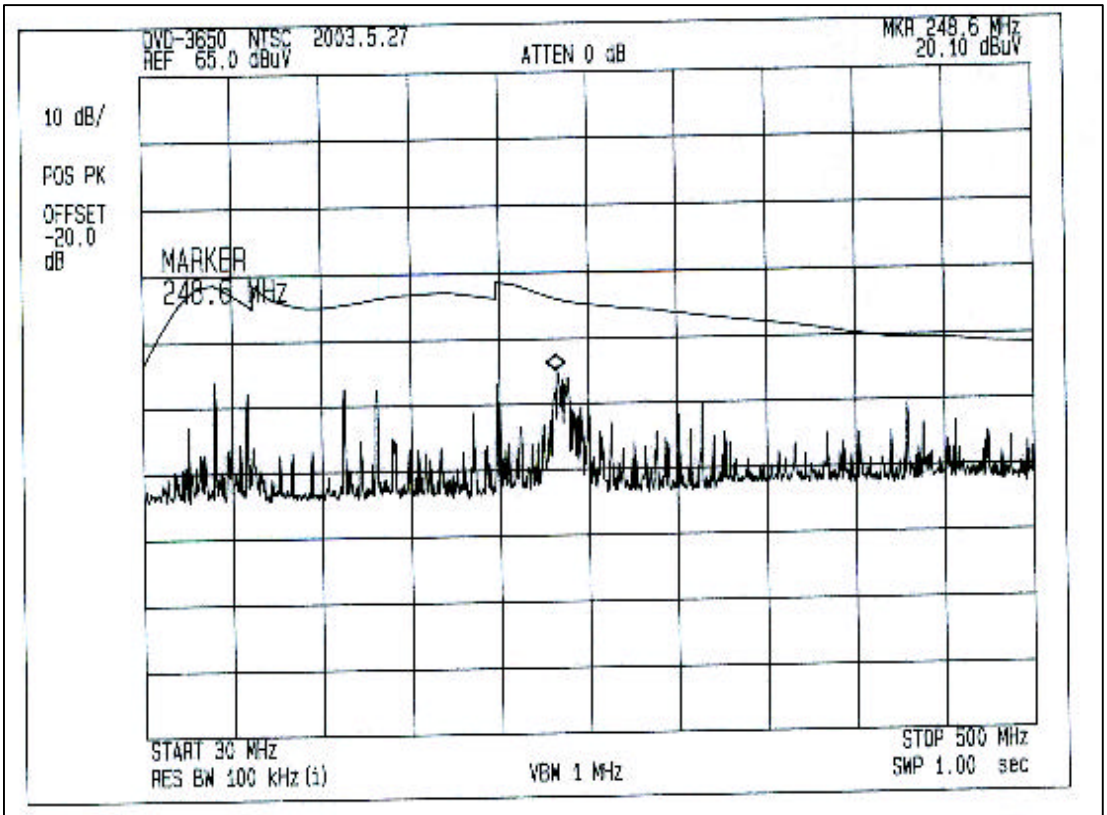
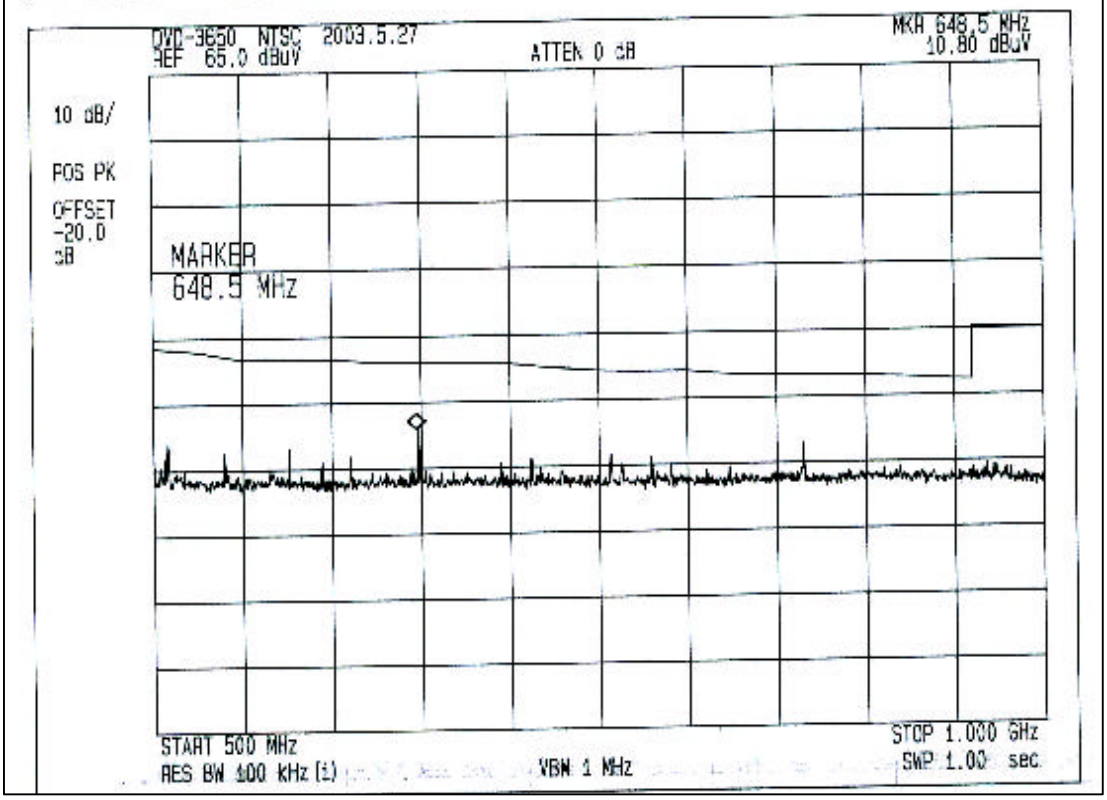
Eut Mode : Recording(NTSC) at CH3 and CH4





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Eut Mode : Recording(1V & 5V VITS Signal) at CH3 and CH4

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B] [dB]	Antenna Height [Cm]	Turn table Degree [Deg]	Results [A+B] [dBuV/m]	Limits at 10m [dBuV/m]	Margin (Limit-Result) [dB]
30 - 88	46.210	V	19.0	10.2	100	120	19.0	**40.0**	21.0
	68.054	H	17.6	6.3	380	340	17.6	**40.0**	22.4
	85.011	H	17.4	9.3	400	210	17.4	**40.0**	22.6
88 - 216	135.800	V	21.6	13.1	100	310	21.6	**43.5**	21.9
	152.457	H	16.6	12.3	400	200	16.6	**43.5**	26.9
	203.110	H	17.9	12.0	400	80	17.9	**43.5**	25.6
216 - 960	247.245	H	27.2	15.1	400	360	27.2	**46.0**	18.8
	253.661	H	27.1	15.7	380	40	27.1	**46.0**	18.9
	508.010	H	11.1	22.8	400	90	11.1	**46.0**	34.9

** Receiving Antenna Mode : **Horizontal, Vertical***
** Test distance : 3m (Semi-Anechoic Chamber)*
** Results = Meter Reading + Total Loss(Antenna factor + Cable loss)*

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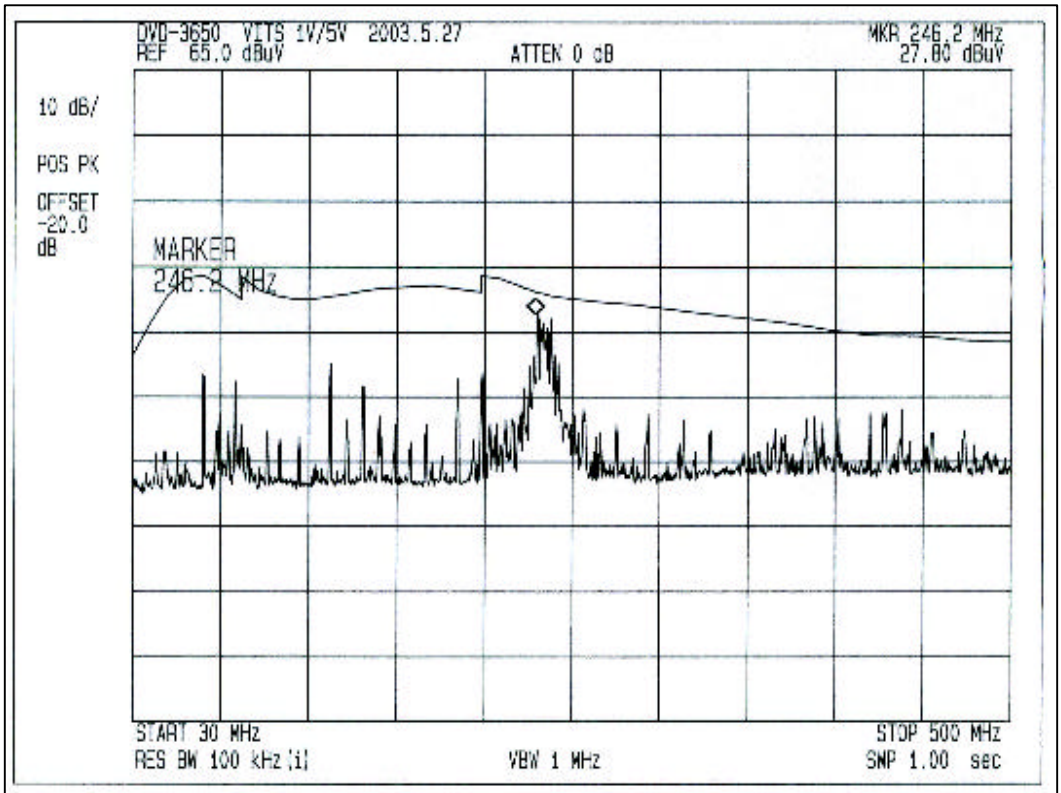
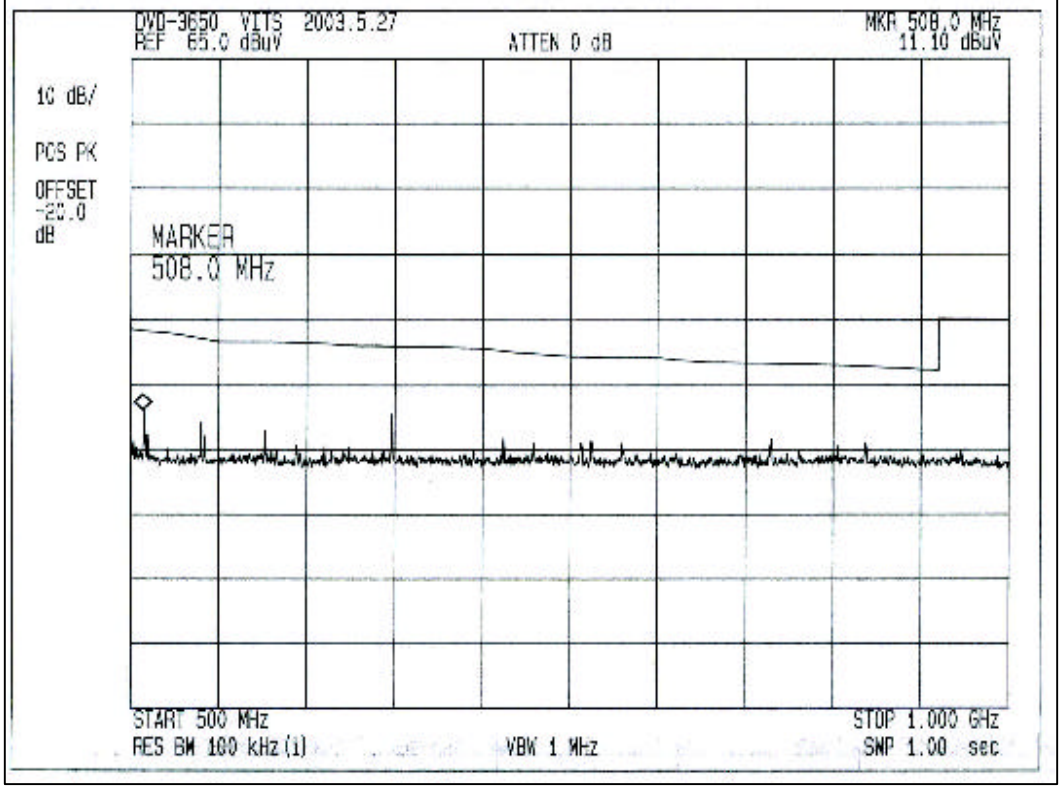
Eut Mode : Recording(1V & 5V VITS Signal) at CH3 and CH4





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Eut Mode : DVD PLAY at CH 3 & CH 4

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B] [dB]	Antenna Height [Cm]	Turn table Degree [Deg]	Results [A+B] [dBuV/m]	Limits at 10m [dBuV/m]	Margin (Limit-Result) [dB]
30 - 88	67.156	V	16.7	6.2	100	360	16.7	**40.0**	23.3
	85.234	V	20.0	9.3	150	20	20.0	**40.0**	20.0
88 - 216	135.558	H	22.5	13.1	350	240	22.5	**43.5**	21.0
	152.667	H	19.1	12.2	400	360	19.1	**43.5**	24.4
216 - 960	216.103	H	21.1	12.0	400	150	21.1	**46.0**	24.9
	229.102	V	18.6	13.2	100	280	18.6	**46.0**	27.4
	276.800	H	18.6	16.3	400	90	18.6	**46.0**	27.4
	325.024	H	18.5	17.9	400	75	18.5	**46.0**	27.5

** Receiving Antenna Mode : **Horizontal, Vertical***
** Test distance : 3m (Semi-Anechoic Chamber)*
** Results = Meter Reading + Total Loss(Antenna factor + Cable loss)*

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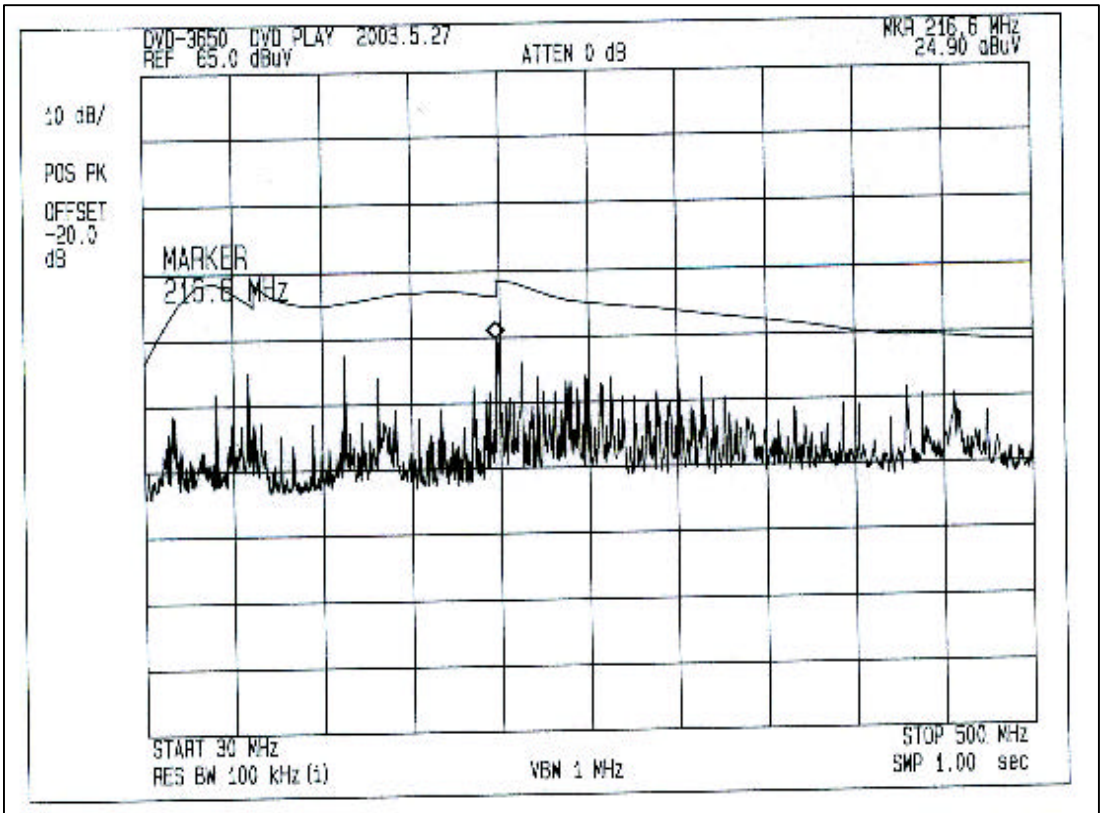
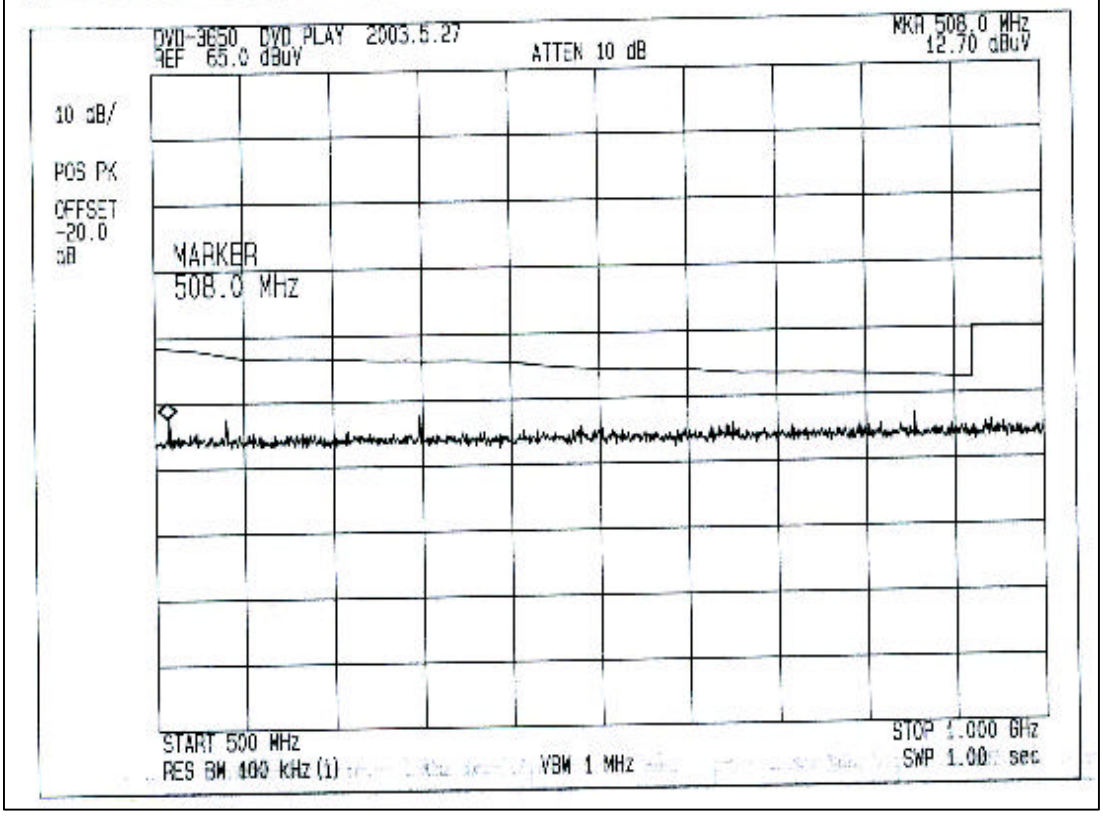
Eut Mode : DVD PLAY at CH 3 & CH 4





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3.2 AC POWERLINE CONDUCTED EMISSION MEASUREMENT

3.2.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.107(a)

3.2.2 Test Procedure

1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 7 and 12.2. Connect the EUT's AC line cord to the EUT port of LISN.
2) All input terminals are terminated in the proper impedance.
   The output ports are connected to the cable provided with the device and the ending port are terminated in the proper impedance.
3) Using a calibrated coaxial cable, the TEST RECEIVER is connected to the measuring port of the LISN for EUT. To the find out an EUT condition procedures the maximum emission, the position of cables, EUT operations mode are the position of cables, EUT operations mode are checked under normal usage of EUT.
   Then, the emission are scanned from 0.15MHz to 30MHz relative to the limit are recorded.

3.2.3 Setup Photograph

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3.2.4 Test Results

1) EUT Mode : VCR Playback mode [VHS Play]

Frequency [MHz]	Line	Meter reading (a) QP [dBuV]	Total Loss (b) [dB]	Results (a) + (b) QP [dBuV]	Limits QP [dBuV]	Margin QP [dB]
0.180	Live	38.6	0.2	38.8	**65.0**	26.2
2.970	Neutral	33.4	0.2	33.6	**56.0**	22.4
3.115	Neutral	34.4	0.3	34.7	**56.0**	21.3
3.765	Neutral	34.9	1.3	35.2	**56.0**	20.8
4.080	Neutral	37.5	2.3	39.8	**56.0**	16.2
4.285	Neutral	37.1	3.3	40.4	**56.0**	15.6
5~30		<20 dB				

* QP : Quasi-peak

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)

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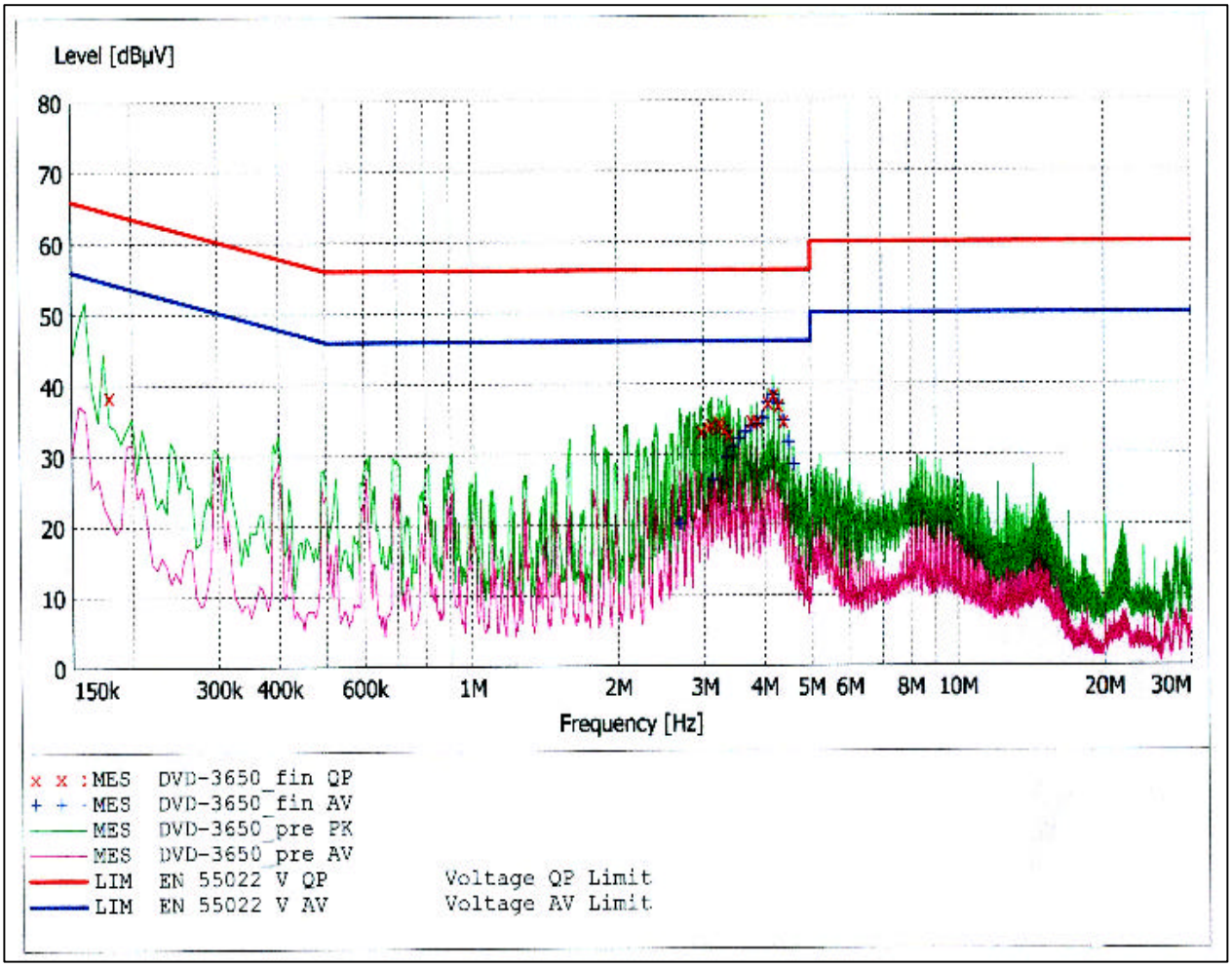
EUT Mode : VCR Playback mode [VHS Play] LISN Mode : Live & Neutral



2) EUT Mode : Recording(NTSC) mode

Frequency [MHz]	Line	Meter reading (a) QP [dBuV]	Total Loss (b) [dB]	Results (a) + (b) QP [dBuV]	Limits QP [dBuV]	Margin QP [dB]
0.15~0.5		<20 dB				
1.560	Live	35.1	0.2	35.3	**56.0**	20.7
1.735	Live	35.6	0.3	35.9	**56.0**	20.1
2.020	Neutral	37.9	1.3	39.2	**56.0**	16.8
2.225	Neutral	35.5	2.3	37.8	**56.0**	18.2
3.550	Live	34.2	3.3	37.5	**56.0**	18.5
5~30		<20 dB				

* QP : Quasi-peak
* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)

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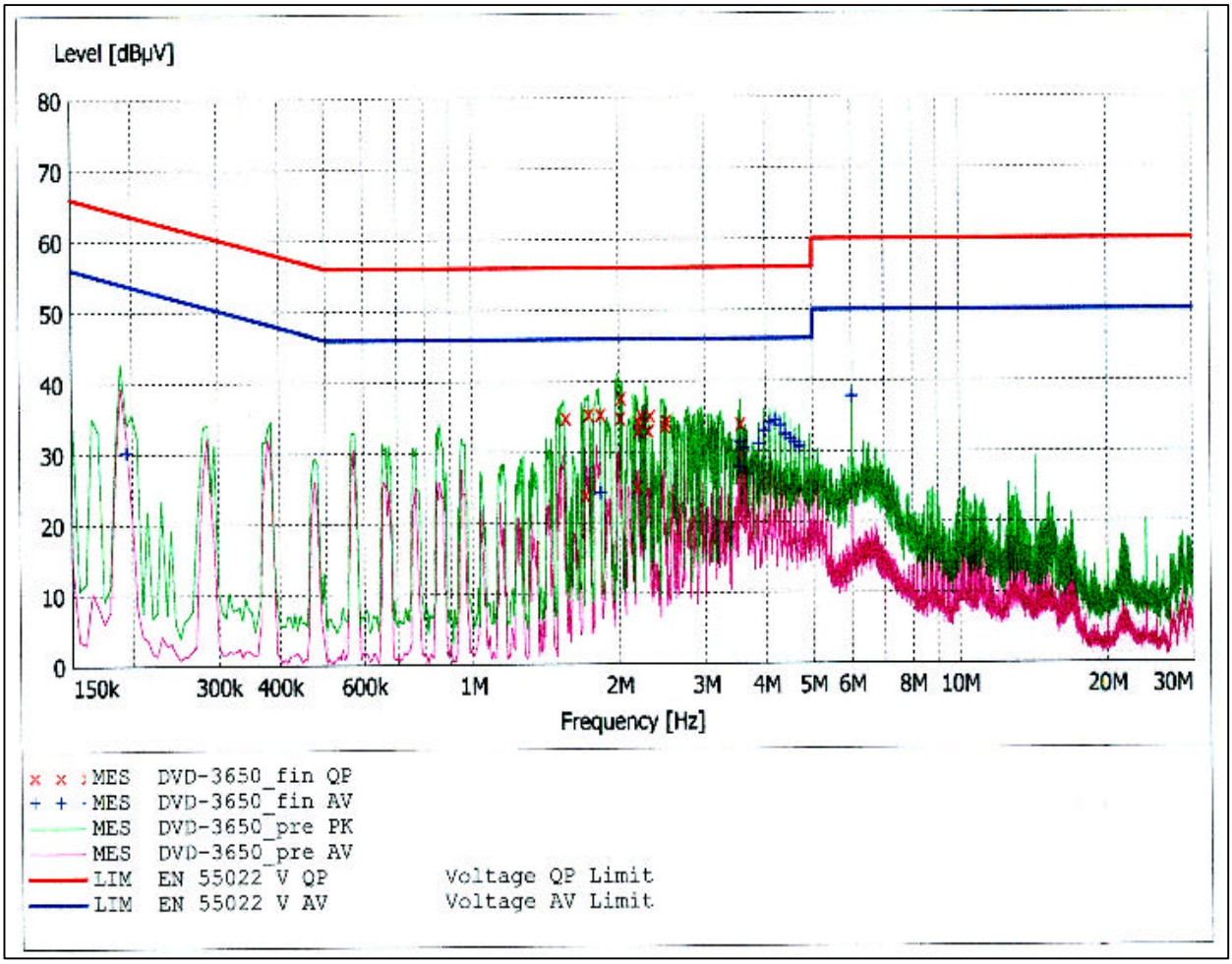
EUT Mode : Recording(NTSC) mode LISN Mode : Live & Neutral



3) EUT Mode : Recording(1V VITS) mode

Frequency [MHz]	Line	Meter reading (a) QP [dBuV]	Total Loss (b) [dB]	Results (a) + (b) QP [dBuV]	Limits QP [dBuV]	Margin QP [dB]
0.150	Live	46.8	0.2	47.0	**66.0**	23.2
2.080	Neutral	33.6	0.2	33.8	**56.0**	22.2
2.910	Neutral	34.4	0.3	34.7	**56.0**	21.3
3.065	Neutral	34.7	1.3	36.0	**56.0**	20.0
3.175	Neutral	35.0	2.3	37.3	**56.0**	18.7
5~30		<20 dB				

* QP : Quasi-peak

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)

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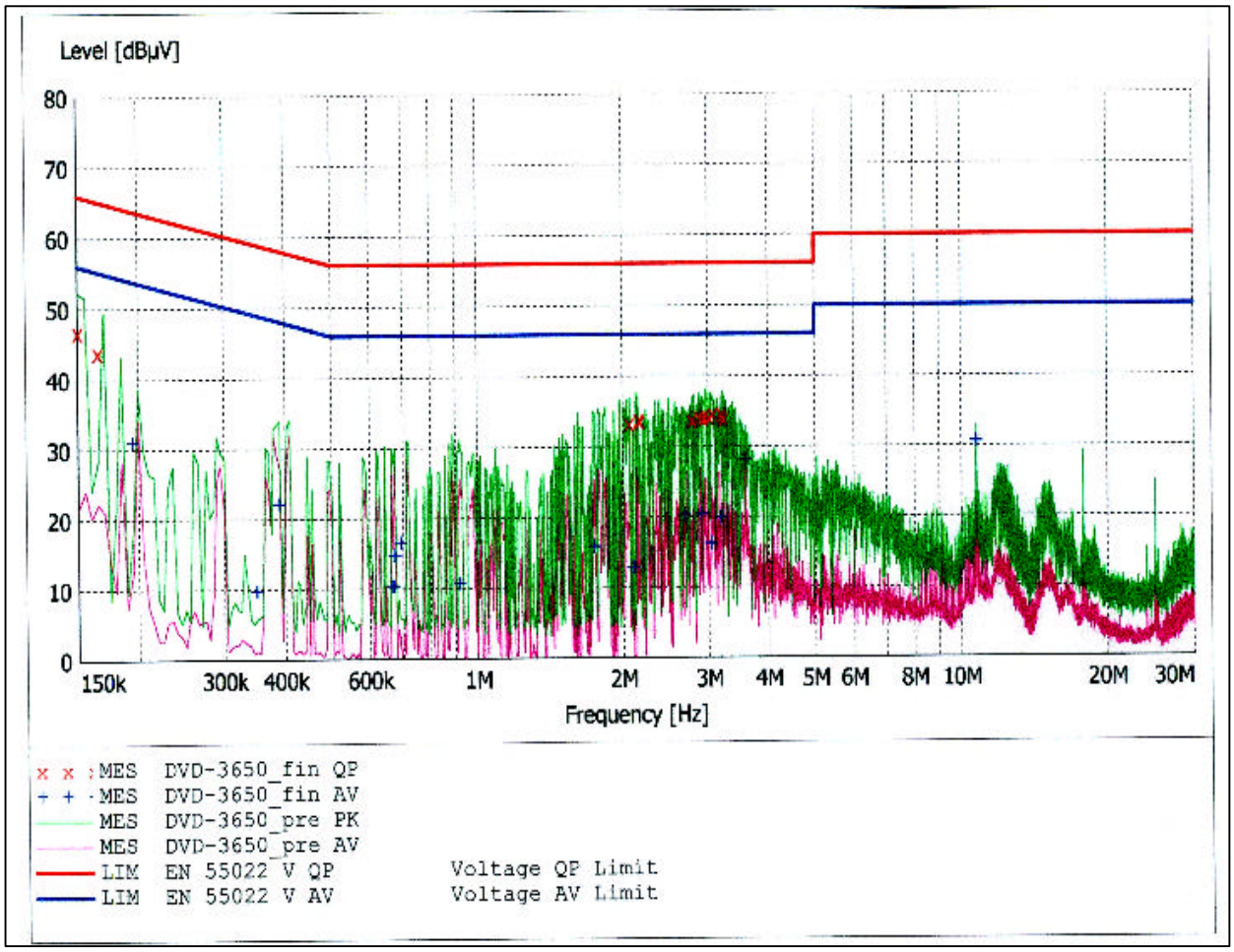
EUT Mode : Recording(1V VITS) mode **LISN Mode : Live & Neutral**



4) EUT Mode : Recording(5V VITS) mode

Frequency [MHz]	Line	Meter reading (a) QP [dBuV]	Total Loss (b) [dB]	Results (a) + (b) QP [dBuV]	Limits QP [dBuV]	Margin QP [dB]
0.150	Neutral	46.8	0.2	47.0	**66.0**	19.0
2.155	Neutral	34.0	0.2	34.2	**56.0**	21.8
2.875	Neutral	34.4	0.3	34.7	**56.0**	21.3
3.195	Neutral	34.9	1.3	36.2	**56.0**	19.8
5~30		<20 dB				

* QP : Quasi-peak

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)

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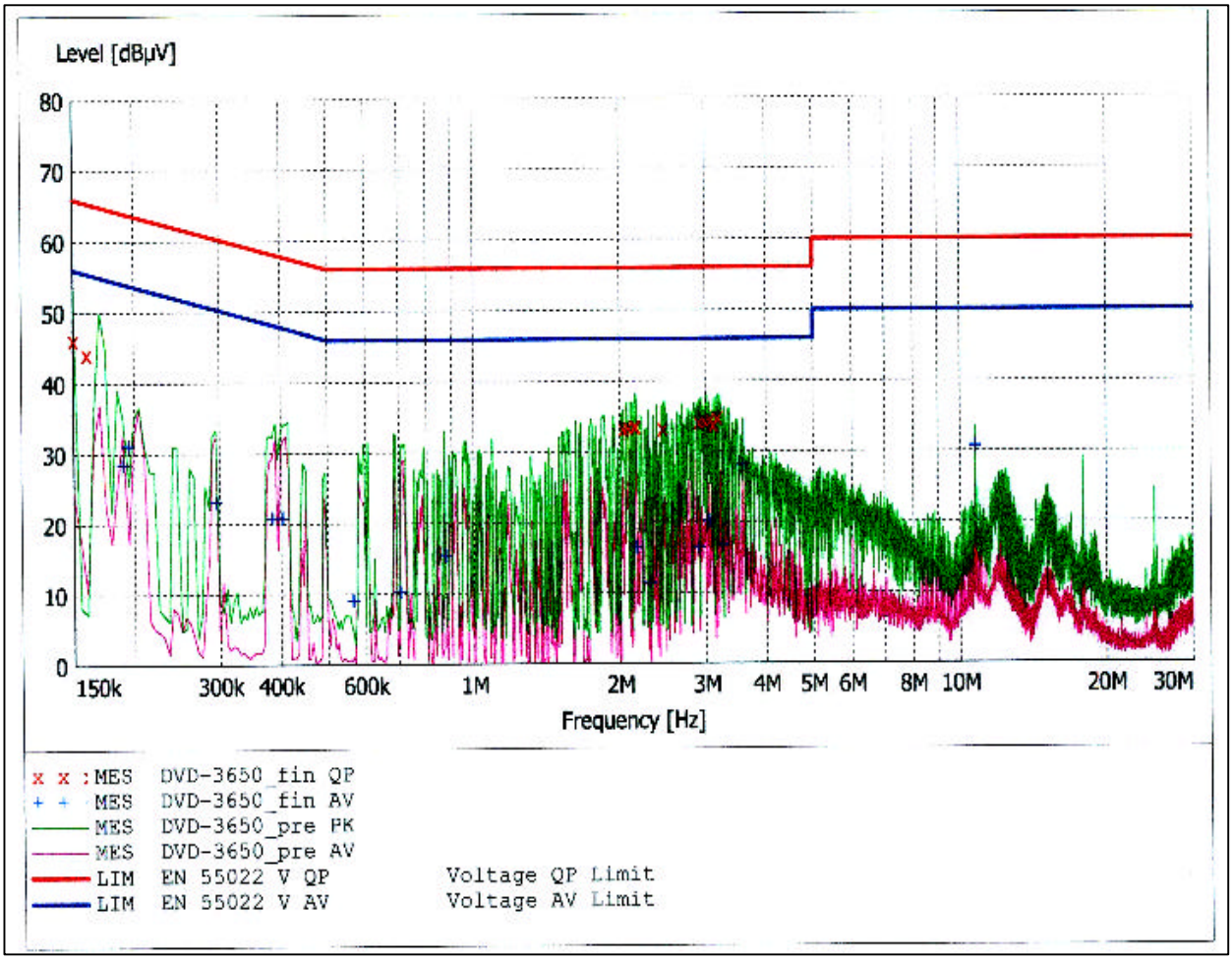
EUT Mode : Recording(5V VITS) mode **LISN Mode : Live & Neutral**



5) EUT Mode : DVD Play mode

Frequency [MHz]	Line	Meter reading (a) QP [dBuV]	Total Loss (b) [dB]	Results (a) + (b) QP [dBuV]	Limits QP [dBuV]	Margin QP [dB]
0.150	Live	45.9	0.2	46.1	**66.0**	19.9
2.945	Neutral	34.6	0.2	34.8	**56.0**	21.2
3.135	Neutral	34.8	0.3	35.1	**56.0**	20.9
4.185	Live	38.3	1.3	39.6	**56.0**	16.4
5~30		<20 dB				

* QP : Quasi-peak

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)

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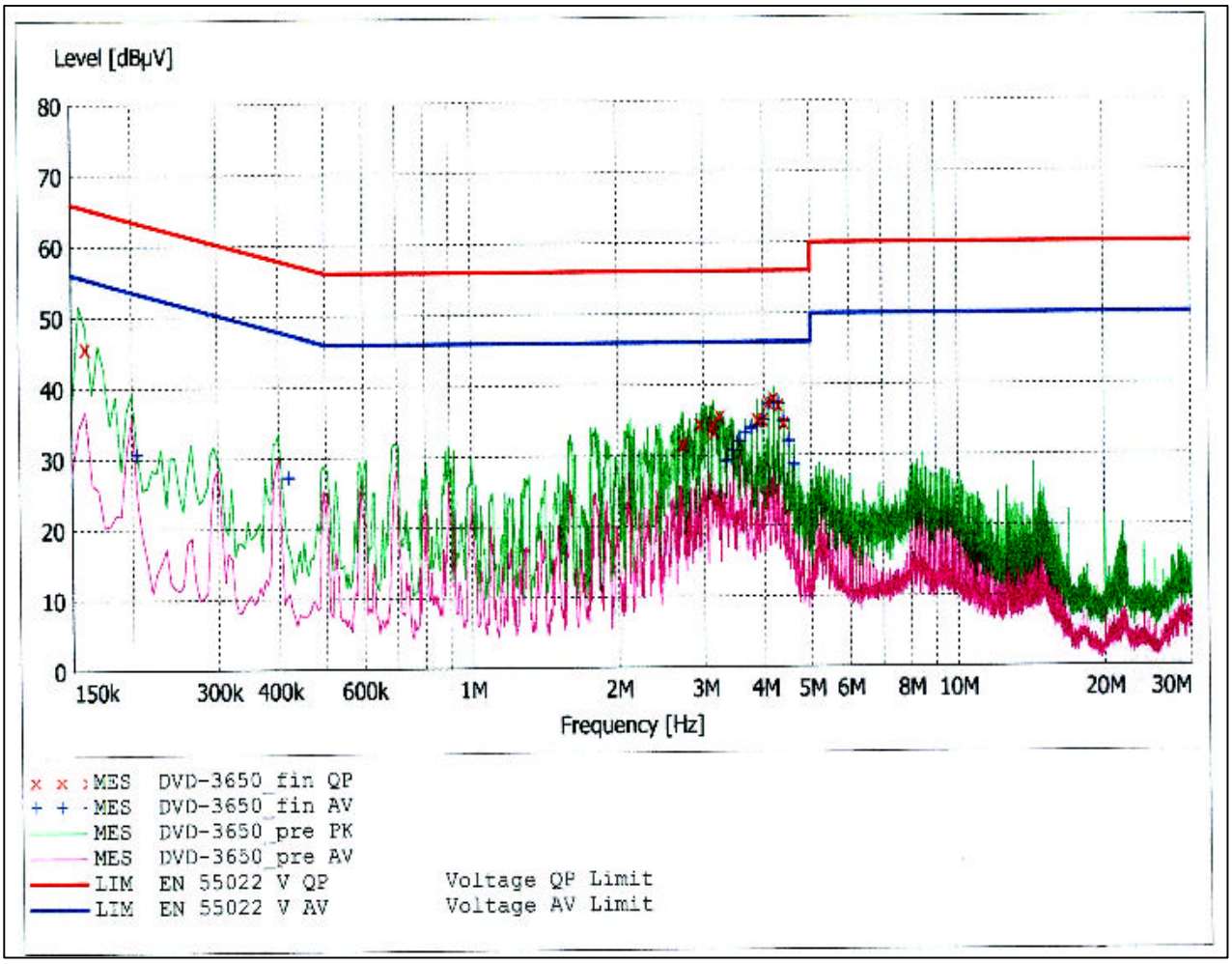
EUT Mode : DVD Play mode **LISN Mode : Live & Neutral**



3.3 OUTPUT SIGNAL LEVEL MEASUREMENT

3.3.1 Test Procedure

Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.
The RF output terminal is connected is to the spectrum analyzer through the matching transformer with a calibrated 75 ohms coaxial cable.
Then, the RF output signal level is measured under the EUT condition produces the maximum signal level.

3.3.2 Setup Photograph

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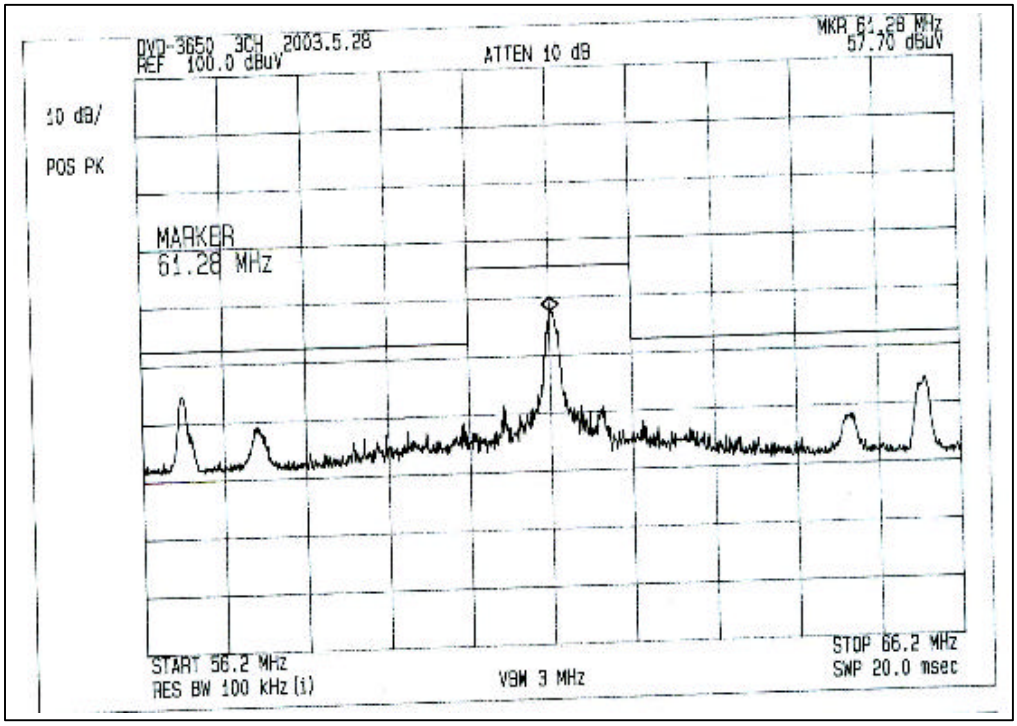
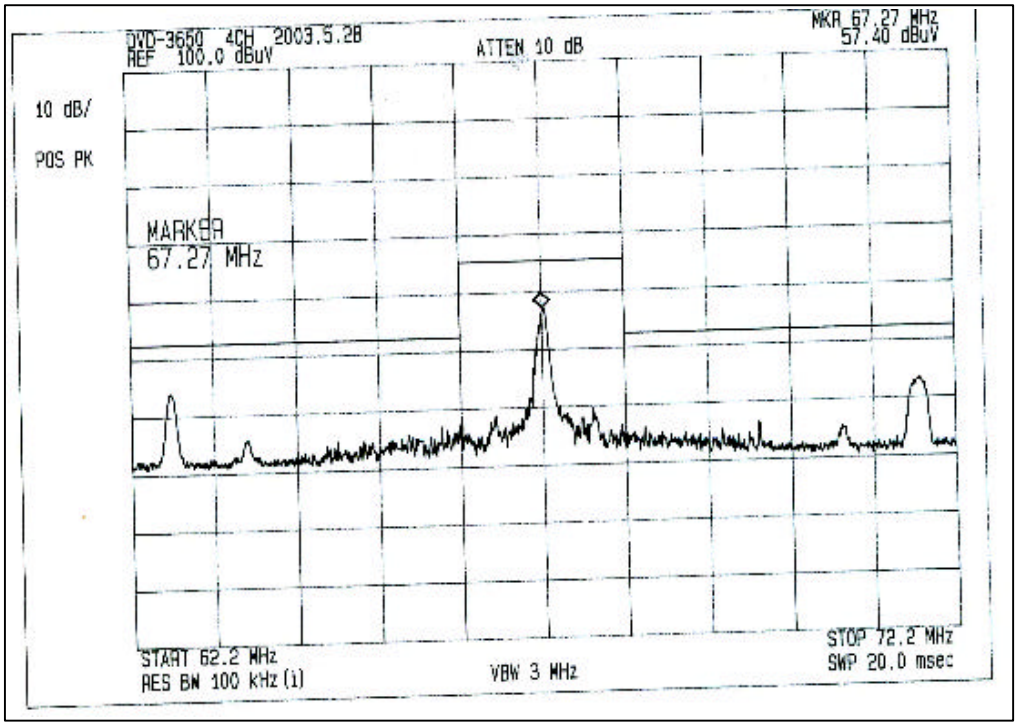
3.3.3 Test Results

Test channel : CH.3



Test channel : CH.4



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1) EUT Mode : Playback[VHS Play]

RF Output channel	Measured carrier frequency[MHz]		Matching Pad [dB]	Meter reding [dBuV/50ohm]		RF Output signal level [dBuV/75ohm]			
	Visual	Aural		Visual	Aural	Visual	Limit	Aural	Limit
3	61.28	65.79	-	57.6	44.6	57.6	69.54	44.6	56.53
4	67.27	71.77	-	57.4	43.8	57.4	69.54	43.8	56.53

* Matching Pad Loss is included in Meter reading

2) EUT Mode : Recording / VITS 1Vp-p

RF Output channel	Measured carrier frequency[MHz]		Matching Pad [dB]	Meter reding [dBuV/50ohm]		RF Output signal level [dBuV/75ohm]			
	Visual	Aural		Visual	Aural	Visual	Limit	Aural	Limit
3	61.28	65.79	-	57.5	44	57.5	69.54	44	56.53
4	67.27	71.77	-	57.3	43.1	57.3	69.54	43.1	56.53

* Matching Pad Loss is included in Meter reading

3) EUT Mode : Recording / VITS 5Vp-p

RF Output channel	Measured carrier frequency[MHz]		Matching Pad [dB]	Meter reding [dBuV/50ohm]		RF Output signal level [dBuV/75ohm]			
	Visual	Aural		Visual	Aural	Visual	Limit	Aural	Limit
3	61.28	65.789	-	57.7	44.3	57.7	69.54	44.3	56.53
4	67.26	71.77	-	57.5	43.3	57.5	69.54	43.3	56.53

* Matching Pad Loss is included in Meter reading

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4) EUT Mode : Recording / NTSC TV Signal

RF Output channel	Measured carrier frequency[MHz]		Matching Pad [dB]	Meter reding [dBuV/50ohm]		RF Output signal level [dBuV/75ohm]			
	Visual	Aural		Visual	Aural	Visual	Limit	Aural	Limit
3	61.28	65.79	-	57.7	44.3	57.7	69.54	43.3	56.53
4	67.26	71.77	-	57.4	43.2	57.4	69.54	43.2	56.53

* Matching Pad Loss is included in Meter reading

5) EUT Mode : DVD Play

RF Output channel	Measured carrier frequency[MHz]		Matching Pad [dB]	Meter reding [dBuV/50ohm]		RF Output signal level [dBuV/75ohm]			
	Visual	Aural		Visual	Aural	Visual	Limit	Aural	Limit
3	61.28	65.79	-	57.5	44	57.5	69.54	44	56.53
4	67.26	71.77	-	57.3	43.2	57.3	69.54	43.2	56.53

* Matching Pad Loss is included in Meter reading

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3.4 OUTPUT TERMINAL CONDUCTED SPURIOUS EMISSION MEASUREMENT

3.4.1 Test Procedure

The EUT system and measuring instrument are set up in the same manner of the output signal measurement.
The spectrum was scanned from 30MHz to more than 4.6MHz below the visual carrier frequency, and from more than 7.4MHz above the visual carrier frequency to 1000MHz.
Then, the significant spurious emissions are measured at the output terminal.

3.4.2 Setup Photograph

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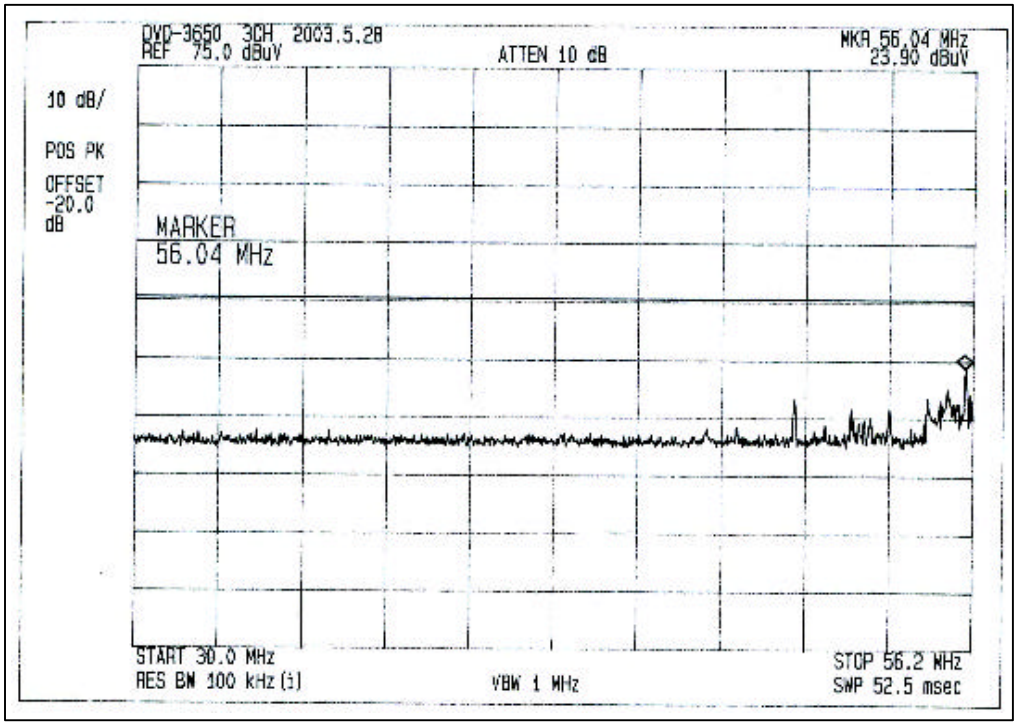
3.4.3 Test Results

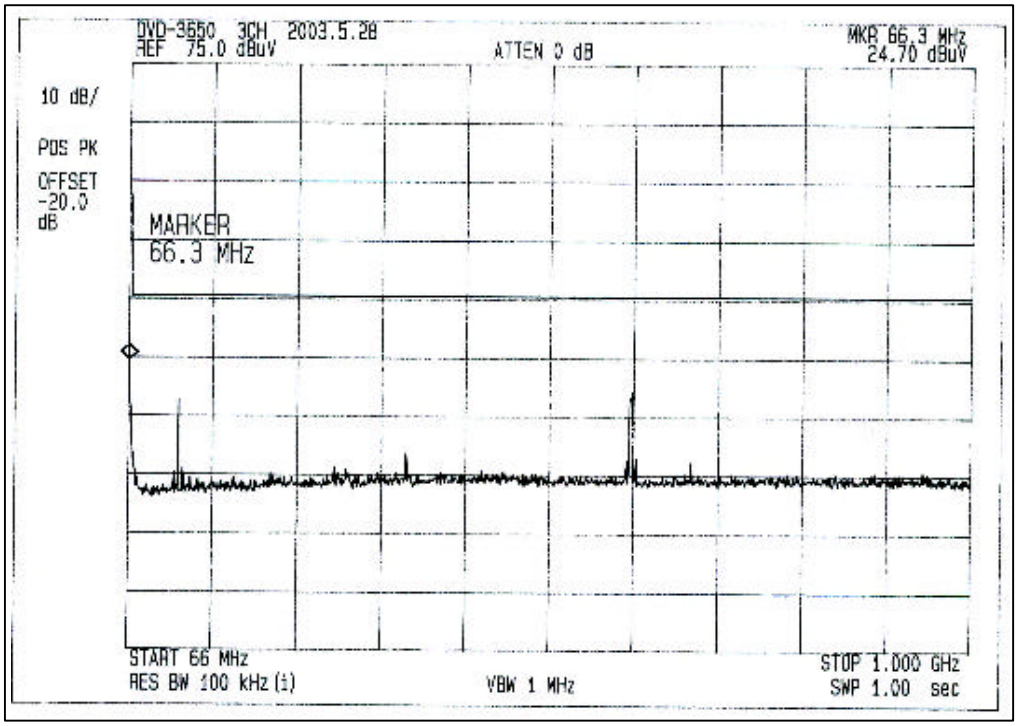
Test channel : 3

EUT mode : Playback / VITS 1Vp-p / VITS 5Vp-p / NTSC TV Signal

From 30MHz to more than 4.6MHz below the visual carrier frequency



From more than 7.4MHz above the visual carrier frequency



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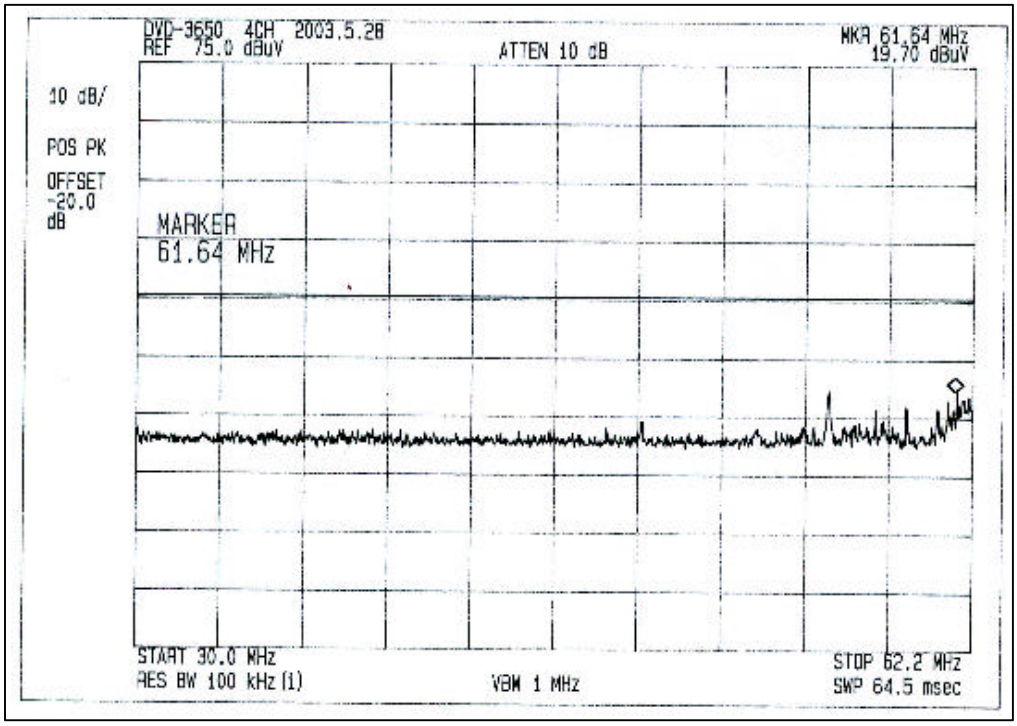
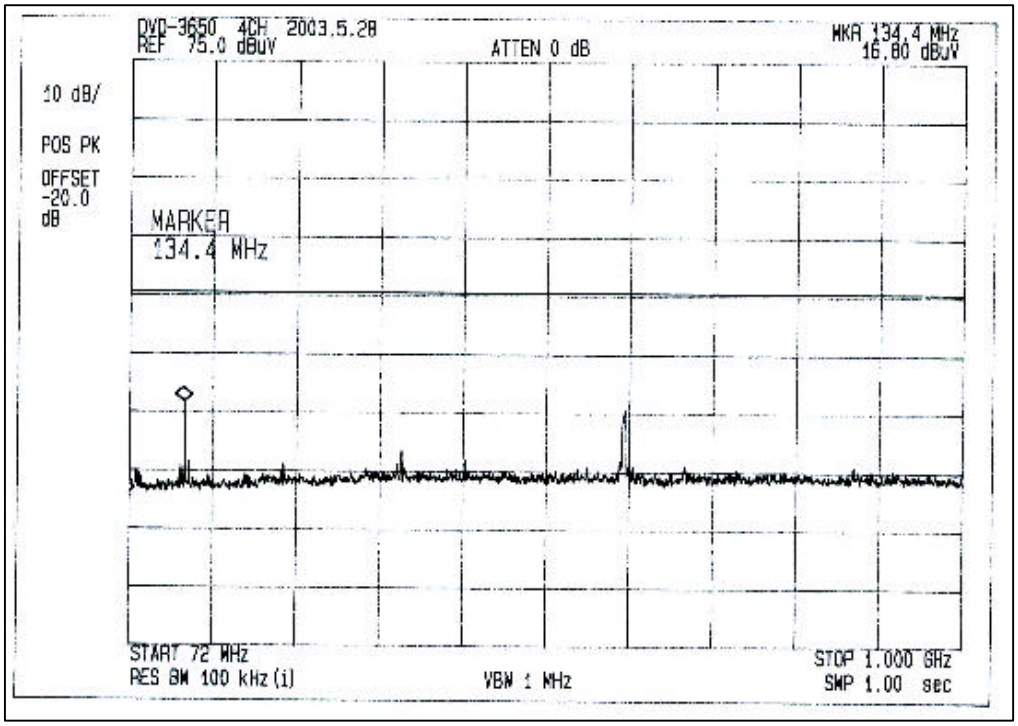
Test channel : 4

EUT mode : Playback / VITS 1Vp-p / VITS 5Vp-p / NTSC TV Signal

From 30MHz to more than 4.6MHz below the visual carrier frequency



From more than 7.4MHz above the visual carrier frequency



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3.5 ANTENNA TRANSFER SWITCH ISOLATION MEASUREMENT

3.5.1 Test Procedure

Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.
The RF output terminal is terminated in the proper impedance.
The ANT input terminal is connected is to the spectrum analyzer through the matching transformer with a calibrated 75 ohms coaxial cable.
Then, the RF output leakage level is measured under the EUT condition produces the maximum signal level.

3.5.2 Setup Photograph

3.5.3 Test Results

1) EUT Mode : Playback[VHS Play]

RF Output channel	Measured frequency [MHz]	Meter reading [dBuV/50ohm]	Matching Pad [dB]	Results [dBuV/75ohm]	Limits [dBuV/75ohm]
3	61.28	0.1	7.5	7.6	9.5
4	67.26	-0.12	7.5	7.38	9.5

2) EUT Mode : Recording / VITS 1Vp-p

RF Output channel	Measured frequency [MHz]	Meter reading [dBuV/50ohm]	Matching Pad [dB]	Results [dBuV/75ohm]	Limits [dBuV/75ohm]
3	61.28	0.1	7.5	7.6	9.5
4	67.26	-0.25	7.5	7.25	9.5

3) EUT Mode : Recording / VITS 5Vp-p

RF Output channel	Measured frequency [MHz]	Meter reading [dBuV/50ohm]	Matching Pad [dB]	Results [dBuV/75ohm]	Limits [dBuV/75ohm]
3	61.28	-0.2	7.5	7.3	9.5
4	67.26	-0.48	7.5	7.02	9.5

4) EUT Mode : DVD Play

RF Output channel	Measured frequency [MHz]	Meter reading [dBuV/50ohm]	Matching Pad [dB]	Results [dBuV/75ohm]	Limits [dBuV/75ohm]
3	61.28	-0.4	7.5	7.1	9.5
4	67.26	-1.07	7.5	6.43	9.5

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