ENGINEERING TEST REPORT

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1. GENERAL INFORMATION

1.1 Product Description

The ORION Model No.VS-XN (referred to as the EUT in this report) is a Video Cassette Recorder containing RF modulator and Tuner.

1) Provided Terminals
   (1) Antenna Input Terminal
   (2) Antenna Output Terminal
   (3) A/V Input Terminal
   (4) A/V Output Terminal

2) RF Modulator Frequency : US CH. #3 Visual Carrier 61.25 MHz,
   Aural Carrier 65.75 MHz
   US CH. #4 Visual Carrier 67.25 MHz,
   Aural Carrier 71.75 MHz

3) Type of RF Output Connector : Type "F" Connector 75Ω (Unbalanced)

4) Used Oscillating Frequency except Local Oscillator
   10 MHz : System Control / Serve Control Microcomputer Clock
   3.579545 MHz : Chrominance Subcarrier Oscillator
   120 ~ 290 kHz : Switching Frequency of Power Supply

5) Rated Power Supply : AC 120 V, 60 Hz

1.2 Description for Equipment Authorization

1) Rules Part(s) under which Equipment operated

   FCC Rule Part 15, Subpart B : TV Interface Device in Unintentional Radiators.

2) Kind of Equipment Authorization

   (X) Certification ( ) Verification

3) Procedure of Application

   (X) Original Equipment ( ) Modification

1.3 Test Facility

All tests described in this report were performed by:

Name : KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)
IKOMA TESTING LABORATORY
Open Test Site No.4
Shielded Room No.4

Address : 10630, Takayama-cho Ikoma-city, Nara, 630-0101 Japan

These test facilities have been filed with the FCC under the criteria of ANSI C63.4-1992. The laboratory has been accredited by the NVLAP(Lab.Code:200207-0) based on ISO/IEC Guide 25. Also the laboratory has been authorized by ITI(Interference Technology Internaitonal, UK), TUV Product Service(GER) and TUV Rheinland(GER) based on their criteria for testing laboratory (EN45001).

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2. TESTED SYSTEM

2.1 Test Mode

In each measurement (excluding antenna transfer switch measurement), the compliance tests were performed under following five EUT operation modes.
In transfer switch measurement, it was done under three modes (①~③).

① Playback mode
Playback the video tape that is recorded 1V peak-to-peak VITS signal.

② Record mode (1V VITS Signal Input)
1V peak-to-peak VITS signal is supplied through the VIDEO IN 1(rear side) terminal.

③ Record mode (5V VITS Signal Input)
5V peak-to-peak VITS signal is supplied through the VIDEO IN 1(rear side) terminal.

④ Record mode (0 dBmV NTSC TV Signal Input)
NTSC TV U.S. channel 13 video and audio signal is supplied through the ANTENNA IN terminal.

[Note]
Video Signal (0 dBmV at 211.25 MHz) is modulated by 1V peak-to-peak VITS signal.
Audio Signal (-10 dBmV at 215.75 MHz) is not modulated.

⑤ Record mode (25 dBmV NTSC TV Signal Input)
NTSC TV U.S. channel 13 video and audio signal is supplied through the ANTENNA IN terminal.

[Note]
Video Signal (25 dBmV at 211.25 MHz) is modulated by 1V peak-to-peak VITS signal.
Audio Signal (15 dBmV at 215.75 MHz) is not modulated.

In each mode, the spectrum was checked and the data of the maximum EUT operation was reported.

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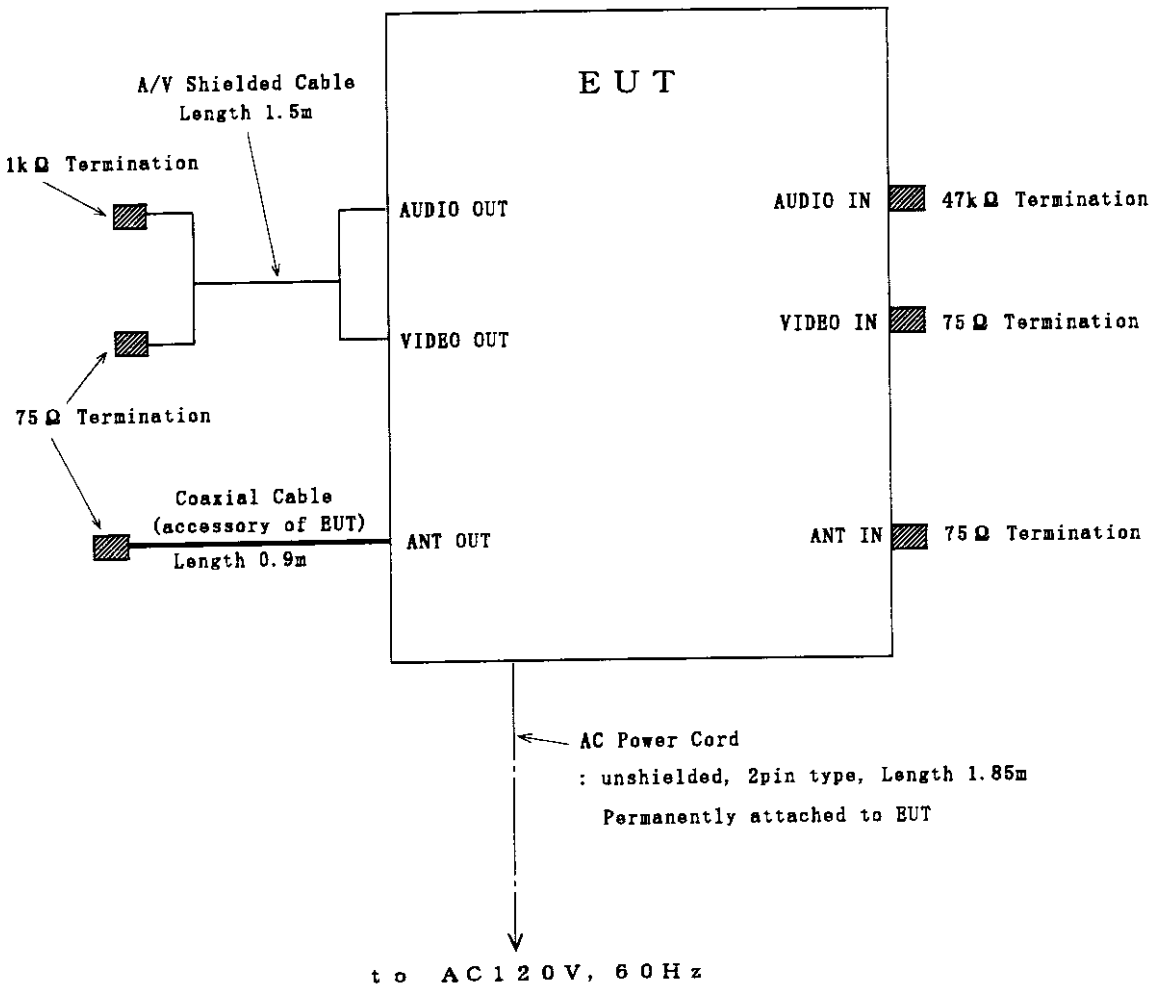
2.2 Block Diagram of EUT System
for Conducted and Radiated Emission Measurements

① Playback mode



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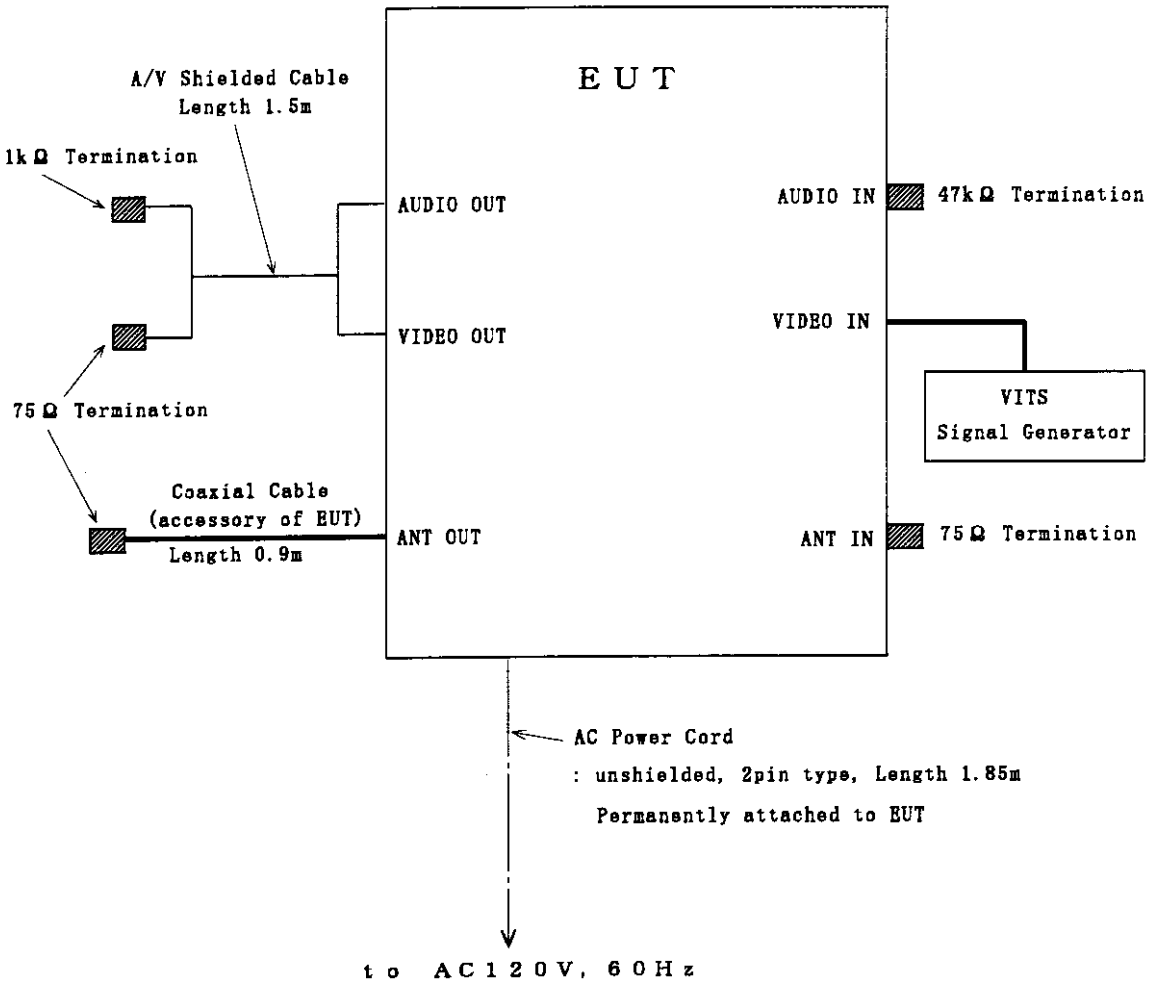
- Continued -

② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)



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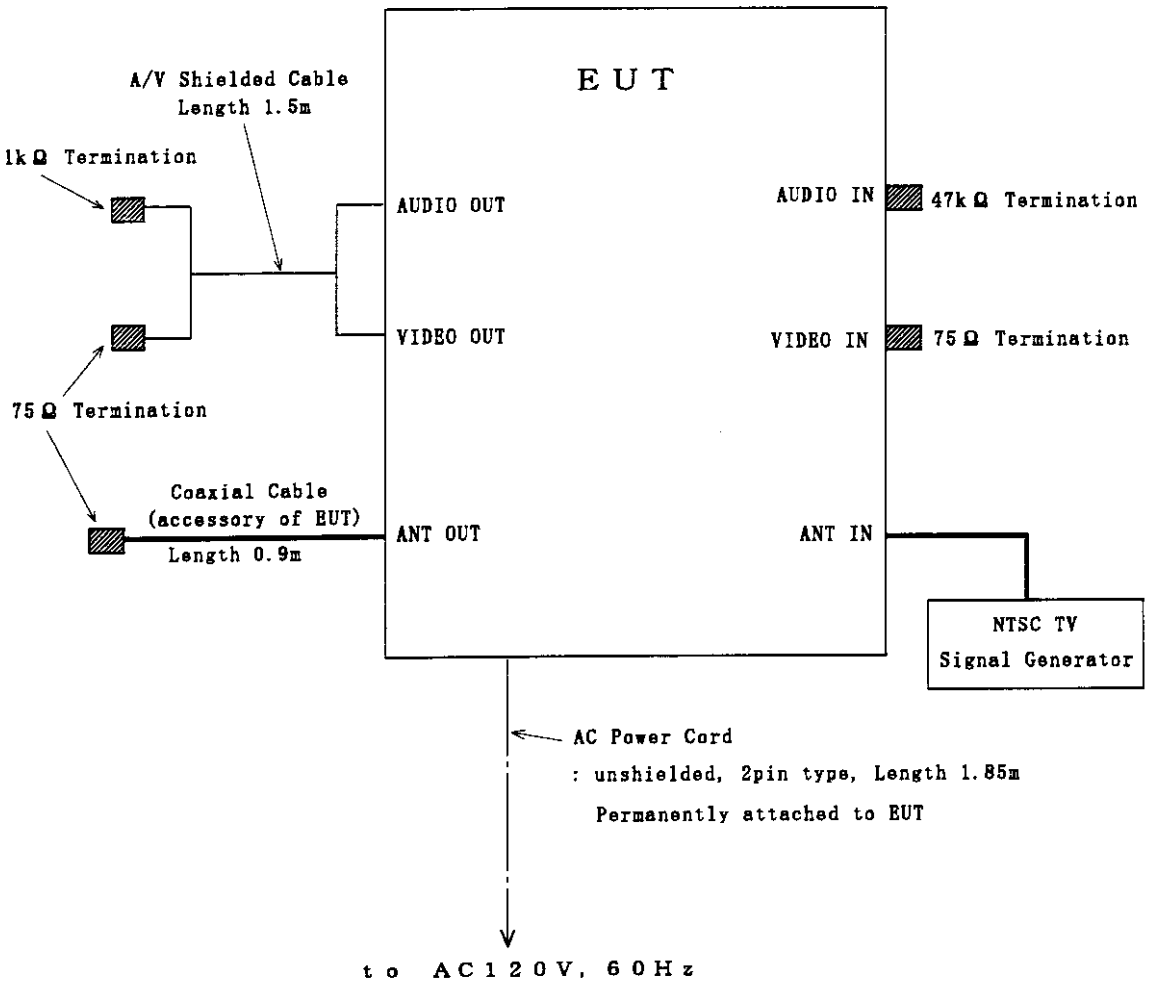
- Continued -

④ Record mode (0 dBmV NTSC TV Signal Input)
⑤ Record mode (25 dBmV NTSC TV Signal Input)



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3. AC POWER LINE CONDUCTED EMISSION MEASUREMENT

3.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.107(a).

3.2 Test Procedure

1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 7. See also the block diagram and the photographs of EUT System configuration in this report.

2) Connect the EUT's AC power cord to one Line Impedance Stabilization Network(LISN).

3) Any other equipment power cord are connected to a LISN different from the LISN used for the EUT.

4) Warm up the EUT System.

5) Activate the EUT System and run the software prepared for the test, if require.

6) Using a calibrated coaxial cable, connect the spectrum analyzer(*1) to the mesuring port of the LISN for the EUT.

7) To find out an EUT System condition produces the maximum emission, change the position of the cables, and the EUT operation mode under normal usage of the EUT.

8) The spectrum are scanned from 450 kHz to 30 MHz and collect the minimum six highest emissions on the spectrum analyzer relative to the total limits.

9) The test receiver(*2) is connected to the LISN for the EUT, and the minimum six highest emissions recorded above are measured.

[Note]

(*1) : Spectrum Analyzer Set Up Conditions

Frequency range	:	450 kHz - 30 MHz
Resolution bandwidth	:	10 kHz
Video bandwidth	:	1 MHz
Detector function	:	Peak mode

(*2) : Test Receiver Set Up Conditions

Detector function	:	Quasi-Peak / Average (if necessary)
IF bandwidth	:	10 kHz

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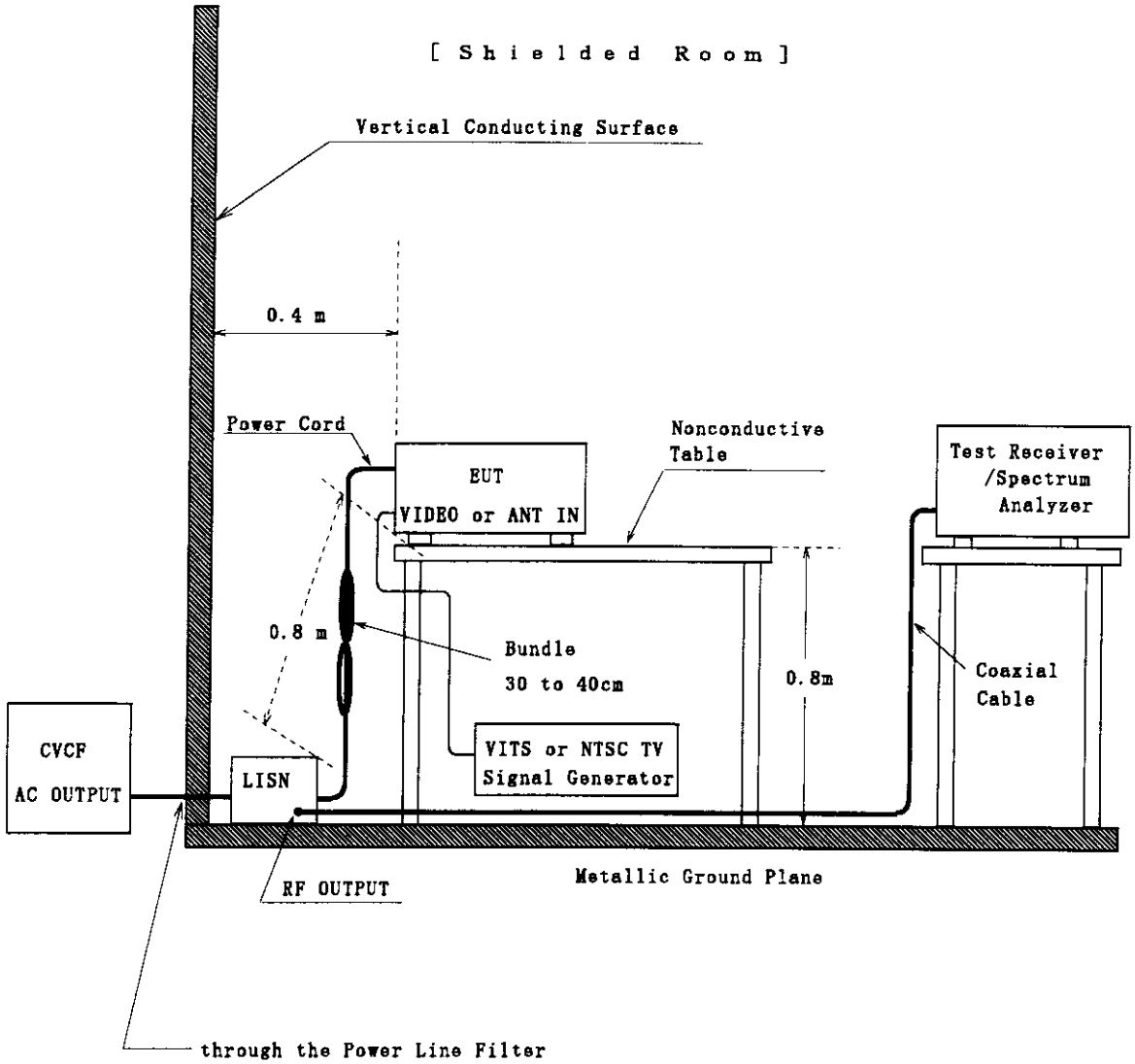
3.3 Test Configuration



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3.5 Test Results

Emission Frequency [MHz]	LISN Corr. Factor [dB]	Meter Reading: One-end to Ground [dBμV]	Meter Reading: Other-end to Ground [dBμV]	Maximum R F Voltage [dBμV]	Limit [dBμV]	Maximum E U T Operation (*)
Test Channel #3						
0.4994	0.1	28.9	26.5	29.0	48.0	①
18.58	0.8	30.3	29.4	31.1	48.0	④
19.53	0.9	33.3	32.4	34.2	48.0	⑤
23.15	1.1	36.5	36.9	38.0	48.0	②③
26.44	1.2	25.7	25.1	26.9	48.0	①
29.97	1.3	31.3	31.4	32.7	48.0	①

[Environment]

Temperature : 23 ℃ Humidity : 69 %

[Note]

1) LISN Correction Factor includes the cable loss.

2) * : ① Playback mode
② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)
④ Record mode (0 dBmV NTSC TV Signal Input)
⑤ Record mode (25 dBmV NTSC TV Signal Input)

3) The emissions at channel #3 were nearly equal to channel #4.

[Sample calculation]

Frequency : 0.4994 [MHz]
Meter Reading : 28.9 [dBμV] (at One-end to Ground)
LISN Corr. Factor : 0.1 [dB]

Then, RF voltage is calculated as follows.

RF Voltage = 28.9 + 0.1 = 29.0 [dBμV]

[Summary of Test Results]

Minimum margin was 10.0 dB at 23.15 MHz, other-end to ground.

Tested Date : September 28, 1998 Signature Y. Kotani
Yoshiko Kotani

ENGINEERING TEST REPORT

4. RADIATED EMISSION MEASUREMENT

4.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.109(a),(c) and 15.115(a).

4.2 Test Procedure

1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 8. See also the block diagram and the photographs of EUT System configuration in this report.

2) If the EUT system is connected to a public power network, all power cords for the EUT System are connected the receptacle on the turn floor.

3) Warm up the EUT System.

4) Activate the EUT System and run the prepared software for the test, if require.

5) To find out the emissions of the EUT System, preliminary radiated measurement are performed at a closer distance than that specified for final radiated measurement using the spectrum analyzer(*1) and the broad band antenna.

6) To find out an EUT System condition produces the maximum emission, change the position of the cables, and the EUT operation mode under normal usage of the EUT.

7) The spectrum are scanned from 30 MHz to 1 GHz and collect the minimum six highest emissions on the spectrum analyzer relative to the total limits.

8) In final compliance test, the minimum six highest emissions recorded above are measured at the specified distance using the broad band antenna or the tuned dipole antenna and the test receiver(*2).

[Note]

(*1) : Spectrum Analyzer Set Up Conditions
Frequency range : 30 - 1000 MHz
Resolution bandwidth : 100 kHz
Detector function : Peak mode

(*2) : Test Receiver Set Up Conditions
Detector function : Quasi-Peak
IF bandwidth : 120 kHz

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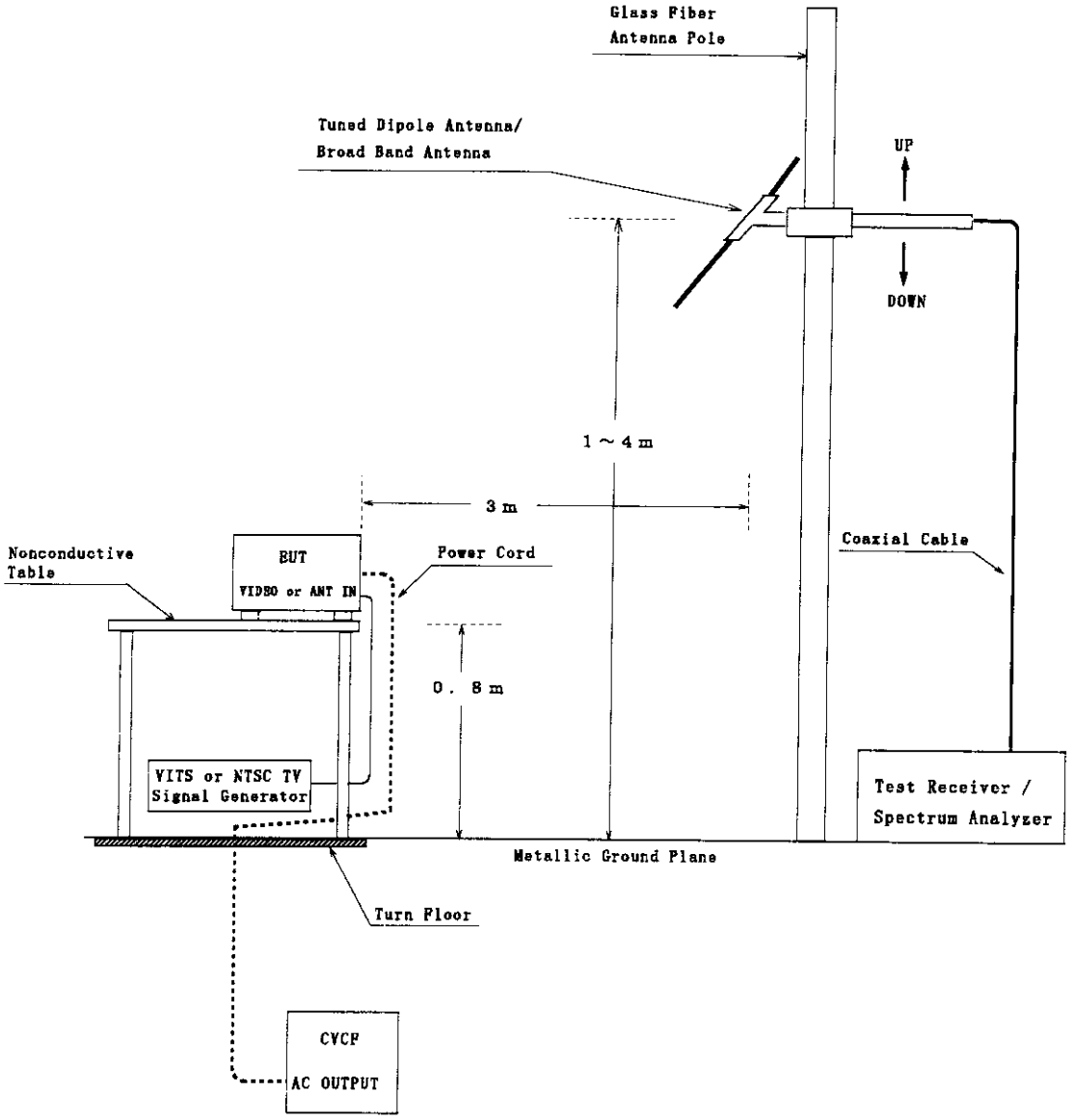
4.3 Test Configuration

[O p e n S i t e]



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4.5 Test Results

[Distance : 3 m]

Emission Frequency [MHz]	Antenna Factor [dB]	Meter Reading Horizontal Polarization [dBμV]	Meter Reading Vertical Polarization [dBμV]	Maximum Field Strength [dBμV/m]	Limits [dBμV/m]	Maximum E U T Operation (*)
Test Channel #3						
61.25	9.1	<3.0	<3.0	<12.1	40.0	①~⑤
65.75	8.5	<3.0	<3.0	<11.5	40.0	①~⑤
122.50	15.1	7.8	5.5	22.9	43.5	②③
245.00	20.2	2.2	<0.0	22.4	46.0	②③
Test Channel #4						
67.25	8.4	<3.0	<3.0	<11.4	40.0	①~⑤
71.75	8.0	<3.0	<3.0	<11.0	40.0	①~⑤
134.50	16.2	<0.0	<0.0	<16.2	43.5	①~⑤
201.75	18.9	<0.0	<0.0	<18.9	43.5	①~⑤
Other emissions						
37.55	15.9	<0.0	9.9	25.8	40.0	③
42.07	14.2	6.6	16.1	30.3	40.0	①
44.01	13.4	2.5	17.5	30.9	40.0	②③
46.90	12.4	<0.0	15.0	27.4	40.0	①
80.00	7.9	13.9	14.6	22.5	40.0	①
85.91	9.0	19.7	18.6	28.7	40.0	②③
126.25	15.4	12.2	13.8	29.2	43.5	②③
138.74	16.6	14.4	12.0	31.0	43.5	④⑤
161.26	17.6	13.1	12.6	30.7	43.5	②③
168.76	17.9	12.5	12.4	30.4	43.5	④⑤
178.73	18.2	9.5	6.2	27.7	43.5	④⑤
200.47	18.9	11.8	3.0	30.7	43.5	③
256.97	20.8	12.9	9.2	33.7	46.0	④⑤

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[Environment]

Temperature : 25℃ Humidity : 84 %

[Note]

1) * : ① Playback mode
② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)
④ Record mode (0 dBmV NTSC TV Signal Input)
⑤ Record mode (25 dBmV NTSC TV Signal Input)

2) Antenna factor includes the cable loss.

[Sample calculation]

Frequency : 122.50 [MHz] (Test Channel #3)
Meter Reading : 7.8 [dBμV] (at Horizontal Polarization)
Antenna Factor : 15.1 [dB]

Then, Field Strength is calculated as follows.

Field Strength = 7.8 + 15.1 = 22.9 [dBμV/m]

[Summary of Test Results]

Minimum margin was 9.1 dB at 44.01 MHz, other emissions : Vertical polarization.

Tested Date : September 25, 1998

Signature Y. Kotani
Yoshiko Kotani

ENGINEERING TEST REPORT

5. OUTPUT SIGNAL LEVEL MEASUREMENT

5.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.115(b)(1)(ii).

5.2 Test Procedure

1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.

2) Unused RF input/output terminals are terminated in the proper impedance.

3) Activate the EUT system.

4) Set the spectrum analyzer as follows.

Frequency Span	: 1 MHz
Resolution bandwidth	: 100 kHz
Video bandwidth	: 3 MHz
Detector function	: Peak mode

5) The RF output terminal is connected to the spectrum analyzer through the matching transformer with a calibrated 50 ohms coaxial cable.

6) Then, the RF output signal level is measured under the EUT condition produced the maximum signal level.

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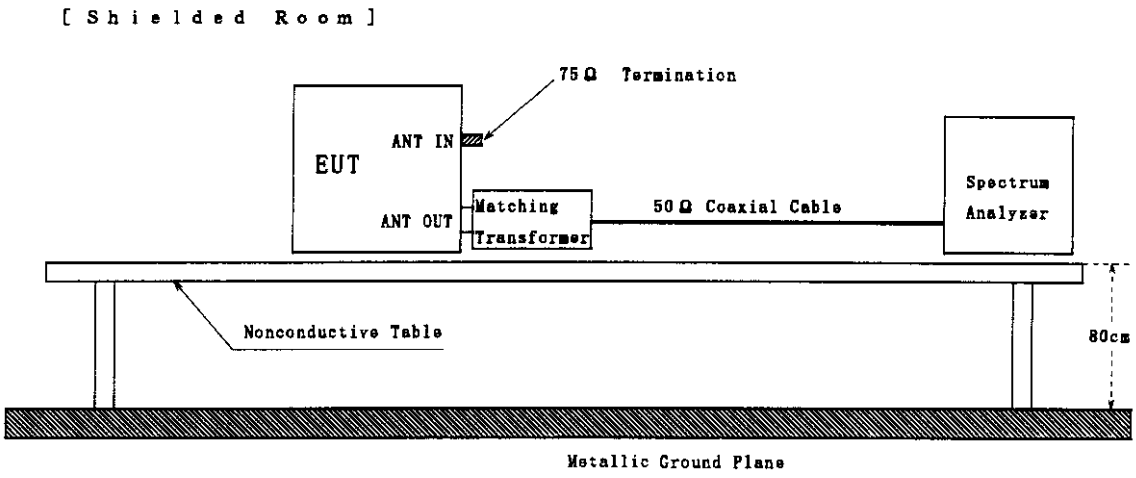
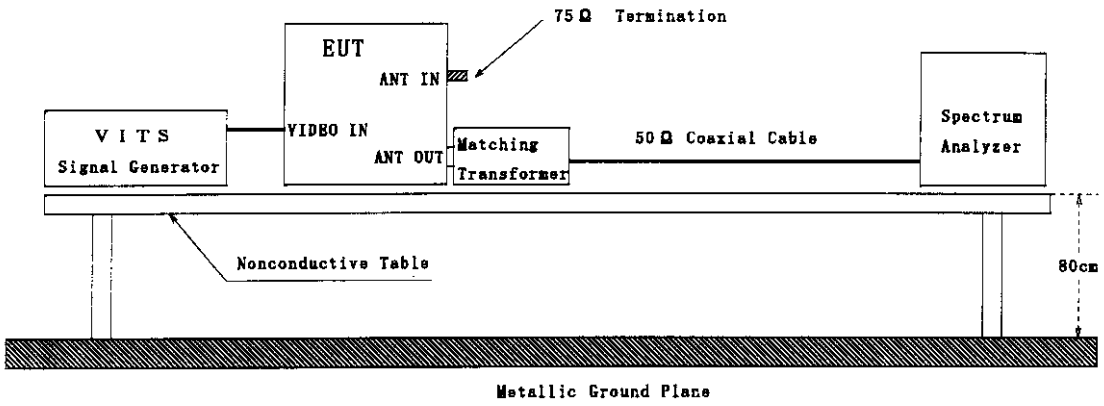
5.3 Test Configuration

① Playback mode



② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)



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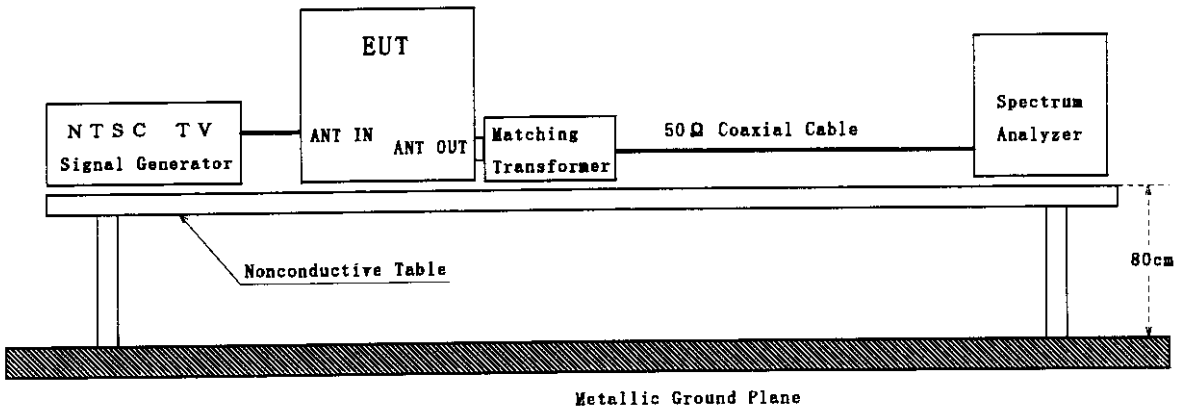
④ Record mode (0dBmV NTSC TV Signal Input)
⑤ Record mode (25dBmV NTSC TV Signal Input)

[S h i e l d e d R o o m]



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5.5 Test Results

Emission Frequency [MHz]	Corr. Factor [dB]	Meter Reading [dBμV/50Ω]	Maximum Signal Level [dBμV/75Ω]	Limits [dBμV/75Ω]	Maximum EUT Operation (*)
Test Channel #3					
61.25	2.3	64.6	66.9	69.5	①②④⑤
65.75	2.3	49.1	51.4	56.5	①
Test Channel #4					
67.25	2.3	64.7	67.0	69.5	⑤
71.75	2.3	48.9	51.2	56.5	③

[Environment]

Temperature : 23℃ Humidity : 69%

[Note]

1) * : ① Playback mode
② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)
④ Record mode (0 dBmV NTSC TV Signal Input)
⑤ Record mode (25 dBmV NTSC TV Signal Input)

2) The correction factor consist of the voltage loss of the impedance matching transformer and the coaxial cable used for the test.

[Sample calculation]

Frequency : 61.25 [MHz] (Test Channel #3)
Meter Reading : 64.6 [dBμV/50Ω]
Correction Factor : 2.3 [dB]

Then, the output signal level is calculated as follows.

Signal Level = 64.6 + 2.3 = 66.9 [dBμV/75Ω]

[Summary of Test Results]

Minimum margin was 2.5 dB at 67.25 MHz, test channel #4.

Tested Date : September 28, 1998

Signature Y. Kotani
Yoshiko Kotani

ENGINEERING TEST REPORT

6. OUTPUT TERMINAL CONDUCTED SPURIOUS EMISSION MEASUREMENT

6.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.115(b)(2)(ii).

6.2 Test Procedure

1) The EUT system and measuring instrument are set up in the same manner of the output signal measurement.

2) Unused RF input/output terminals are terminated in the proper impedance.

3) Activate the EUT system.

4) The spectrum was scanned from 30 MHz to more than 4.6 MHz below the visual carrier frequency, and from more than 7.4 MHz above the visual carrier frequency to 1000 MHz, and the three highest emissions are selected under the EUT condition produced the maximum signal level at each frequency range.

5) The selected emissions are measured.
The spectrum analyzer is set as follow.

Frequency span	: 1 MHz
Resolution bandwidth	: 100 kHz
Video bandwidth	: 3 MHz
Detector function	: Peak mode

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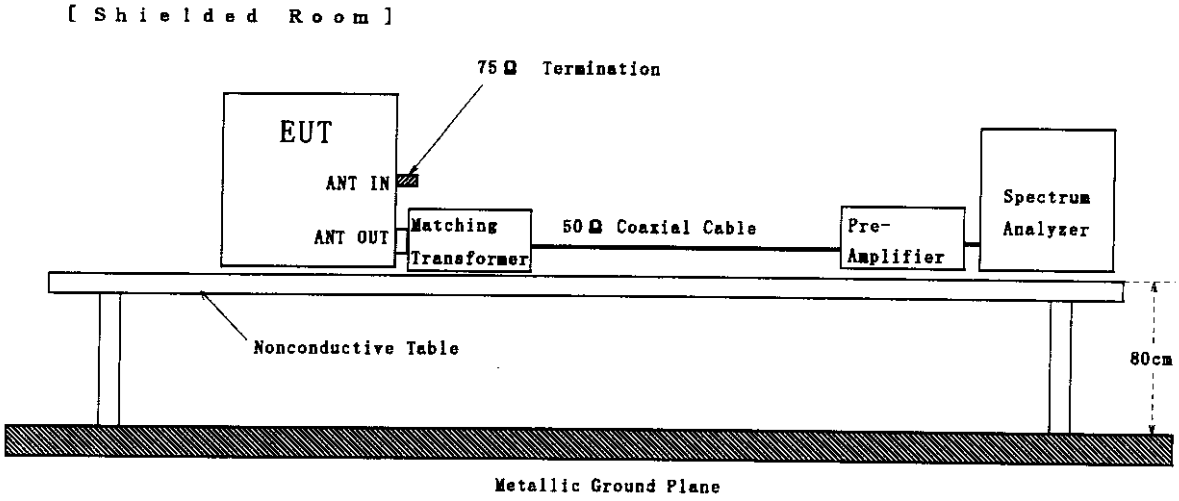
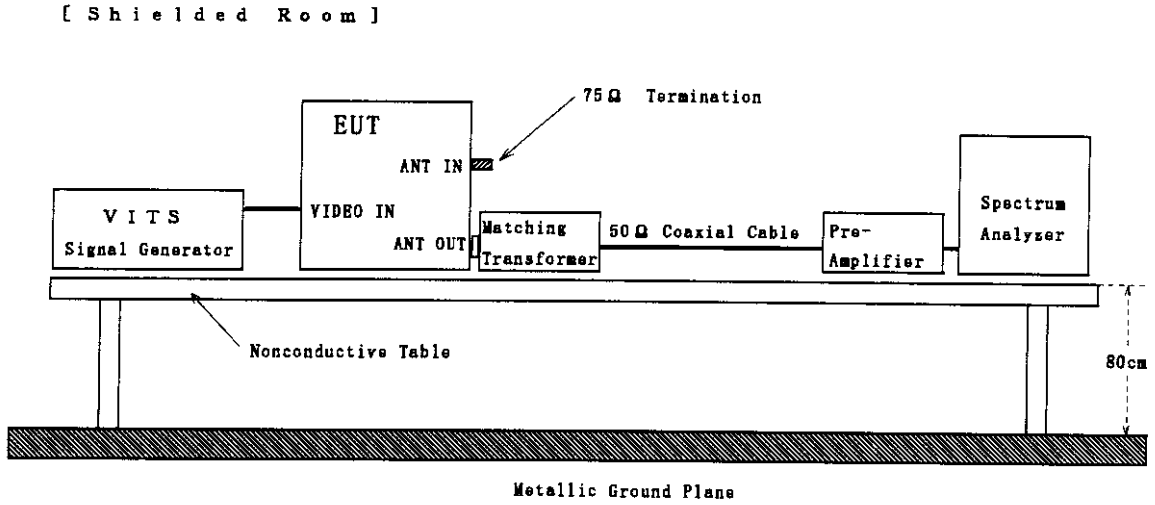
6.3 Test Configuration

① Playback mode



② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)



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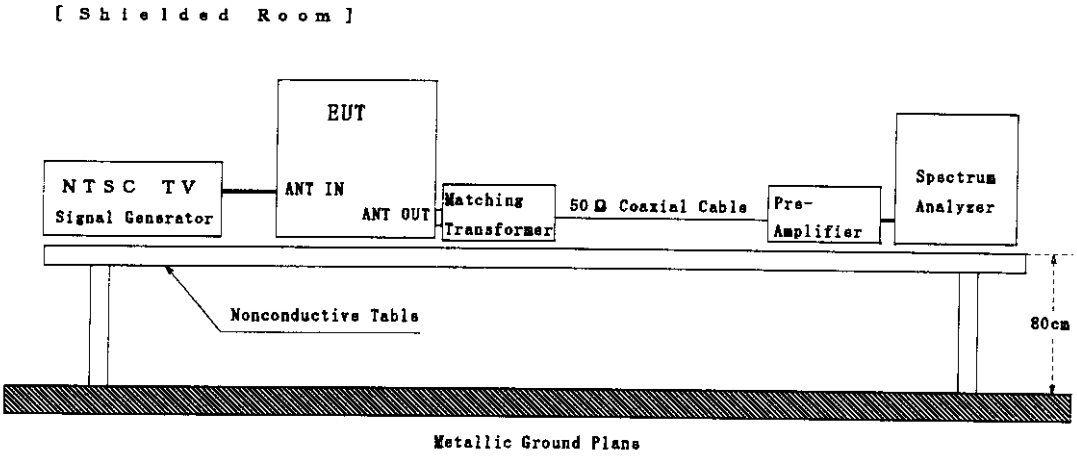
④ Record mode (0dBmV NTSC TV Signal Input)
⑤ Record mode (25dBmV NTSC TV Signal Input)



6.4 Photographs of EUT System Configuration

The tested device configuration is the same as the output signal level measurement.
(See 5.4 Photographs of EUT System Configuration.)

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6.5 Test Results

Emission Frequency [MHz]	Corr. Factor [dB]	Meter Reading [dBμV/50Ω]	Maximum Signal Level [dBμV/75Ω]	Limit [dBμV/75Ω]	Maximum EUT Operation (*)
Test Channel #3					
55.39	2.3	14.9	17.2	39.5	③
56.28	2.3	16.7	19.0	39.5	③
56.65	2.3	39.4	41.7	39.5	③
122.49	2.3	18.8	21.1	39.5	④
183.74	2.3	19.5	21.8	39.5	②
428.73	2.5	10.2	12.7	39.5	①
** 56.65	2.3	14.2	16.5	39.5	③
Test Channel #4					
61.36	2.3	14.5	16.8	39.5	③
62.27	2.3	16.7	19.0	39.5	③
62.65	2.3	39.3	41.6	39.5	③
134.49	2.3	18.1	20.4	39.5	④⑤
201.74	2.3	18.8	21.1	39.5	②④
336.24	2.4	12.5	14.9	39.5	②④⑤
** 62.65	2.3	15.4	17.7	39.5	③

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[Environment]

Temperature : 23 ℃ Humidity : 69 %

[Note]

1) * : ① Playback mode
② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)
④ Record mode (0 dBmV NTSC TV Signal Input)
⑤ Record mode (25 dBmV NTSC TV Signal Input)

2)** : To except the effect of lower sideband of sound sub-carrier frequency component, if set the resolution bandwidth of spectrum analyzer to 30 kHz, these interference become to this value.

3) The correction factor consist of the voltage loss of the impedance matching transformer and the coaxial cable used for the test. And the meter readings described above are corrected by the gain of pre-amplifier.

[Sample calculation]

Frequency	:	55.39 [MHz] (Test Channel #3)
Meter Reading	:	14.9 [dBμV/50Ω]
Correction Factor	:	2.3 [dB]

Then, the emission level is calculated as follows.

Signal Level = 14.9 + 2.3 = 17.2 [dBμV/75Ω]

[Summary of Test Results]

Minimum margin was 17.7 dB at 183.74 MHz, test channel #3.

Tested Date : September 28, 1998

Signature Y. Kotani
Yoshiko Kotani

ENGINEERING TEST REPORT

7. TRANSFER SWITCH MEASUREMENT

7.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.115(c)(1)(ii).

7.2 Test Procedure

1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.

2) Activate the EUT system.

3) Unused RF output terminal is terminated in the proper impedance.

4) Set the spectrum analyzer as follows.

Frequency Span	: 1 MHz
Resolution bandwidth	: 100 kHz
Video bandwidth	: 3 MHz
Detector function	: Peak mode

5) The antenna input terminal is connected to the input of pre-amplifier through the matching transformer with a calibrated 50 ohms coaxial cable. And the output of pre-amplifier is connected to the spectrum analyzer.

6) Then, the signal level on the antenna input terminal is measured under the EUT condition produced the maximum signal level.

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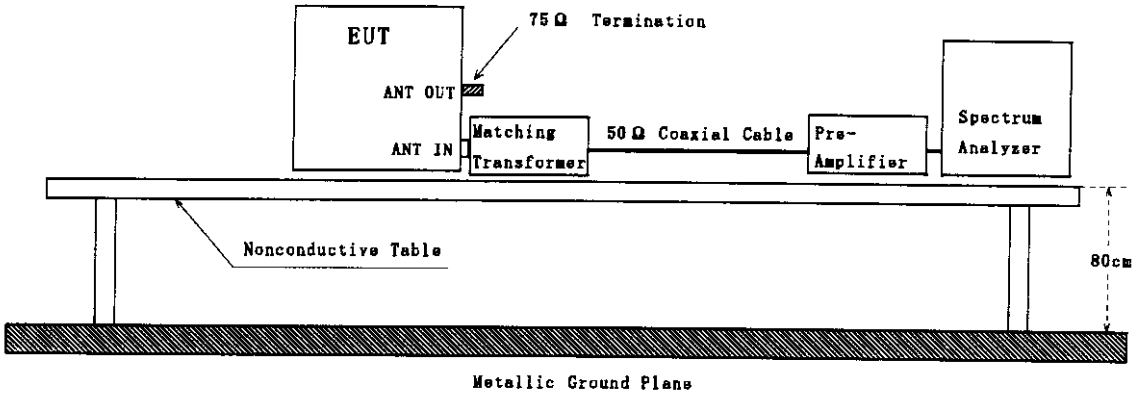
7.3 Test Configuration

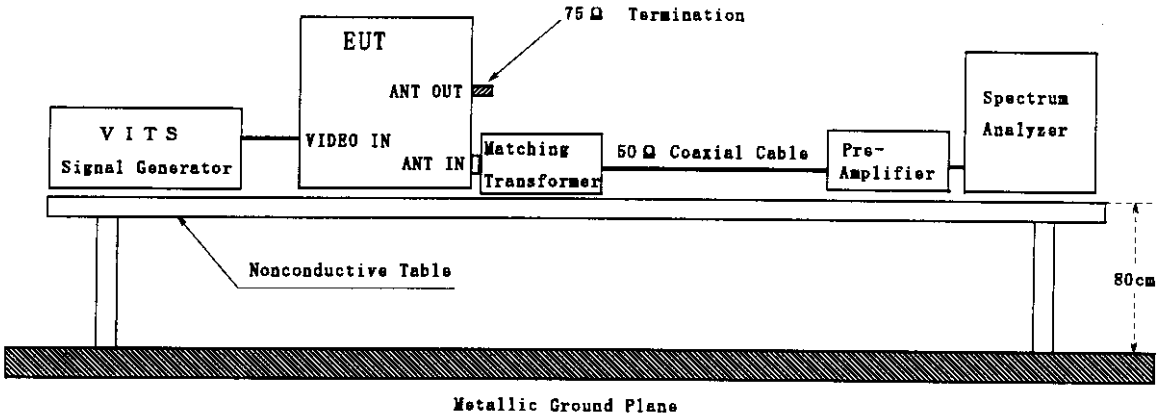
① Playback mode

[Shielded Room]



② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)

[Shielded Room]



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7.5 Test Results

Emission Frequency [MHz]	Corr. Factor [dB]	Meter Reading [dBμV/50Ω]	Maximum Signal Level [dBμV/75Ω]	Limit [dBμV/75Ω]	Maximum EUT Operation (*)
Test Channel #3					
61.25	2.3	3.6	5.9	9.5	①
Test Channel #4					
67.25	2.3	6.0	8.3	9.5	①②③

[Environment]

Temperature : 23 ℃ Humidity : 69 %

[Note]

1) * : ① Playback mode
② Record mode (1V VITS Signal Input)
③ Record mode (5V VITS Signal Input)

2) The correction factor consist of the voltage loss of the impedance matching transformer and the coaxial cable used for the test. And the meter readings described above are corrected by the gain of pre-amplifier.

[Sample calculation]

Frequency : 61.25 [MHz] (Test Channel #3)
Meter Reading : 3.6 [dBμV/50Ω]
Correction Factor : 2.3 [dB]

Then, the signal level is calculated as follows.

Signal Level = 3.6 + 2.3 = 5.9 [dBμV/75Ω]

[Summary of Test Results]

Minimum margin was 1.2 dB at 67.25 MHz, test channel #4.

Tested Date : September 28, 1998

Signature Y. Kotani
Yoshiko Kotani

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8. LIST OF TEST INSTRUMENTS

Instrument	Manufacturer	Model No	Specifications	KEC Control No.	Test Item	Last Cal.	Next Cal.
Test Receiver	Rohde & Schwarz	ESH3	Frequency Range 9 kHz - 30 MHz	FS-48-2	3	1998/6	1999/6
		ESVD	Frequency Range 20 MHz - 2.05 GHz	FS-79	4	1998/2	1999/2
Spectrum Analyzer	Hewlett Packard	8568B	Frequency Range 100 Hz - 1.5 GHz	FS-46-3	3,5, 6,7	1998/6	1999/6
	Advantest	R3261C	Frequency Range 9 kHz - 2.6 GHz	SA-41	4	1998/8	1999/8
Pre-Amplifier	Anritsu	MH648A	Frequency Range 100 kHz - 1.2 GHz	AM-28	6,7	1998/6	1999/6
Line Impedance Stabiliza-tion Network	Kyoritsu	KNW-407	Frequency Range 150 kHz - 30 MHz Impedance 50 Ω / 50 μH Capacity AC250V, 15A	FL-107	3	1998/4	1999/4
Biconical Antenna	Schwarzbeck	BBA9106	Frequency Range 30 MHz - 300 MHz	AN-94	4	1998/2	1999/2
Log-Periodic Antenna	Schwarzbeck	UHALP 9108A	Frequency Range 300 MHz - 1 GHz	AN-217	4	1998/2	1999/2
Turned Dipole Antenna	Kyoritsu	KBA-511AS	Frequency Range 25 MHz - 500 MHz	AN-135	—	1998/2	1999/2
		KBA-611S	Frequency Range 500 MHz - 1 GHz	AN-137	—	1998/2	1999/2

ENGINEERING TEST REPORT

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Instrument	Manufacturer	Model No	Specifications	KEC Control No.	Test Item	Last Cal.	Next Cal.
Video Part Signal Generator	Anritsu	MG3601A	Frequency Range 100 kHz - 1.04 GHz	SG-41	3,4, 5,6	1998/9	1999/9
Audio Part Signal Generator	Anritsu	MG3601A	Frequency Range 100 kHz - 1.04 GHz	SG-40	3,4, 5,6	1998/9	1999/9
Multiburst Signal Generator	Anritsu	MG318A	According to ANSI C63.4(1992) Section 12 Fig.15	MG-35	3,4, 5,6,7	1997/12	1998/12
Matching Trans-former	Anritsu	MG614A	Frequency Range 10 MHz - 1.2 GHz	AX-28-2	5,6,7	1997/11	1998/11
				AX-28-4	3,4, 5,6	1997/11	1998/11
Four-Port Junction Pad	Anritsu	MP659A	Frequency Range 40 MHz - 1 GHz	AX-16	3,4, 5,6	1997/11	1998/11