Designated by Ministry of International Trade and Industry

KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

HEAD OFFICE
6-8-7, NISHITEMMA
KITA-KU, OSAKA, 530-0047 JAPAN

KEC

IKOMA
TESTING LABORATORY
12128, TAKAYAMA-CHO
IKOMA-CITY, NARA, 630-0101 JAPAN

Corporate Juridical Person

ENGINEERING TEST REPORT

Report No. A-014-99-C

Date : May 20, 1999

This test report is to certify that the tested device properly complies with the requirements of:

FCC Rules and Regulations Part 15 Subpart B Unintentional Radiators.

All the tests necessary to show compliance to the requirements were performed and these results met the specifications of requirement. The results of this report should not be construed to imply compliance of equipment other than that which was tested. Unless the laboratory permission, this report should not be copied in part.

1. Applicant
   Company Name : ORION ELECTRIC CO., LTD.
   Mailing Address : 41-1, IEHISA-CHO, TAKEFU-SHI, FUKUI 915-8555 JAPAN

2. Identification of Tested Device
   FCC ID : A7RM4C9C
   Device Name : VIDEO CASSETTE RECORDER
   Trade Name : SANSUI
   Model Number : VHF6010
   Serial Number : ID-112-1243 ☐ prototype ☒ pre-production ☐ production
   Date of Manufacture : April, 1999

3. Test Items Procedure, Reference Rule and Specification
   (1) AC Power Line Conducted Emission Measurement : Section 15.107(a)
   (2) Radiated Emission Measurement : Section 15.109 (a), (c) and Section 15.115(a)
   (3) Output Signal Level Measurement : Section 15.115 (b) (1) (ii)
   (4) Output Terminal Conducted Spurious Emission Measurement : Section 15.115 (b) (2) (ii)
   (5) Transfer Switch Measurement : Section 15.115 (c) (1) (ii)

   Above all tests were performed under : ANSI C63.4 - 1992

4. Date of Test
   Receipt of Test Sample : April 22, 1999
   Test Completed on : May 7, 1999

Fumitoshi Nagaoka
Associate Director of Ikoma Testing Laboratory

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1. GENERAL INFORMATION

1.1 Product Description

The SANSUI Model No.VHF6010 (referred to as the EUT in this report) is a VIDEO CASSETTE RECORDER containing RF modulator and Tuner.

(1) Specification

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

(2) Provided terminal

- ANT Input Terminal
- ANT Output Terminal
- A/V Input Terminals (front side)
- A/V Output Terminals

(3) Used Oscillating Frequencies

- 10 MHz : SYSTEM CONTROL/SERVO CONTROL MICROCOMPUTER CLOCK
- 3.579545 MHz : CHROMINANCE SUBCARRIER OSCILLATOR
- 120 ~ 290 kHz : SWITCHING FREQUENCY OF POWER SUPPLY

(4) Rated Power Supply : AC 120 V, 60 Hz

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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 Radiator

(2) Highest Frequency used in the Device : 71.75 MHz

Upper Frequency of Radiated measurement Range is 1000 MHz

1.3 Test Facility

All tests described in this report were performed by:

Name : KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)
IKOMA TESTING LABORATORY
EMC Measurement Center Anechoic Cnamber No.1
Shielded Room No.4

Address : 12128, 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 International, 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 (a ~ c).

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

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

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

d. Record mode (0 dBmV NTSC TV Signal Input)
NTSC TV U.S. channel 13 (consist of visual carrier and aural carrier) is supplied through the ANTENNA IN terminal.
[Note]
1) Visual Carrier (0 dBmV at 211.25 MHz) is modulated by 1V peak-to-peak VITS signal.
2) Aural Carrier (-10 dBmV at 215.75 MHz) is not modulated.

e. Record mode (25 dBmV NTSC TV Signal Input)
NTSC TV U.S. channel 13 (consist of visual carrier and aural carrier) is supplied through the ANTENNA IN terminal.
[Note]
1) Visual Carrier (25 dBmV at 211.25 MHz) is modulated by 1V peak-to-peak VITS signal.
2) Aural Carrier (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.

2.2 Operation of EUT System

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

(2) Record mode (1V / 5V VITS Signal Input)
1V/5V peak-to-peak VITS signal is supplied through the VIDEO IN terminal, if applicable.

(3) Record mode (0 dBmV / 25 dBmV NTSC TV Signal Input)
NTSC TV U.S. channel 13 (consist of visual carrier and aural carrier) is supplied through the ANTENNA IN terminal, if applicable.

KEC

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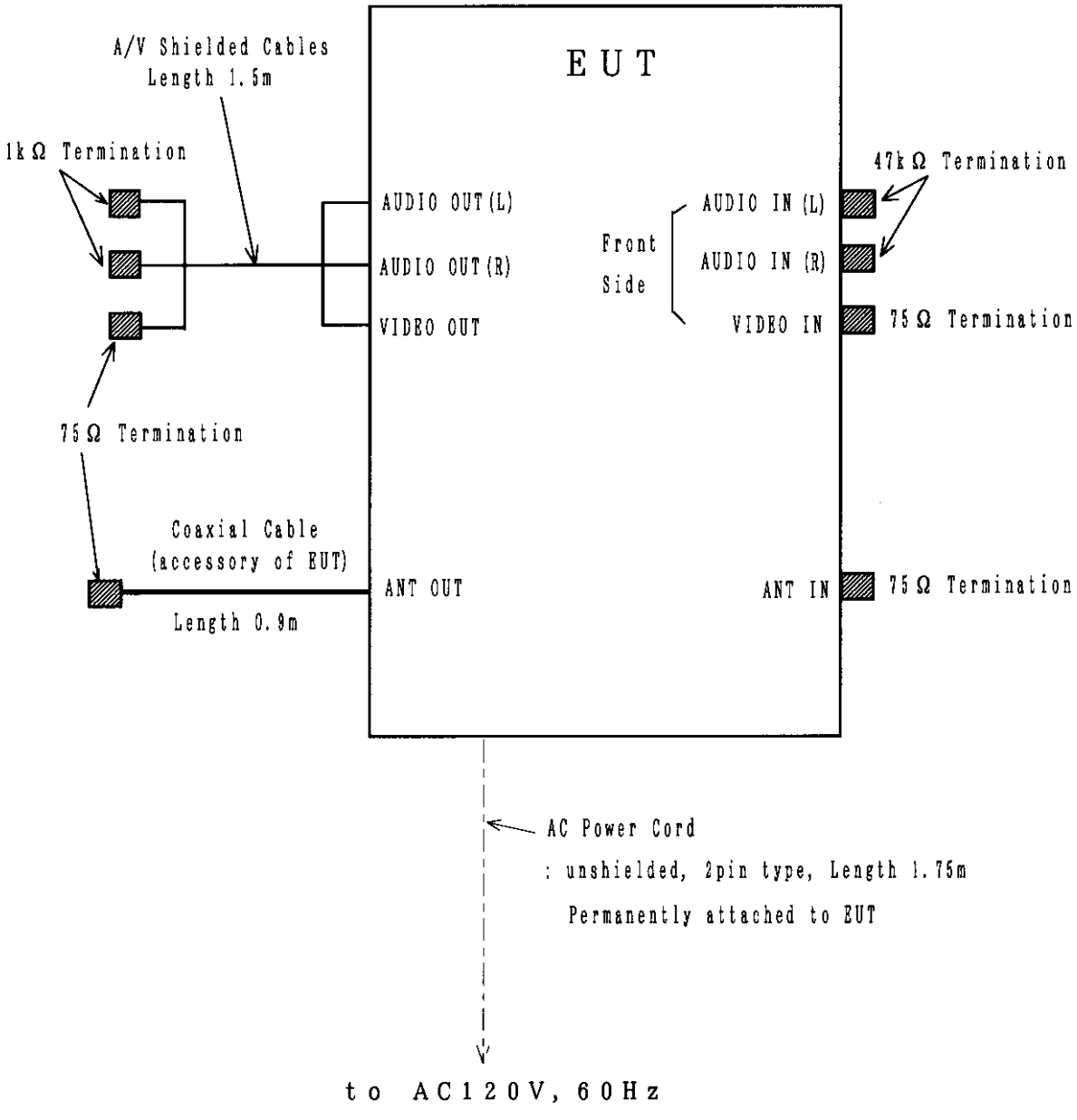
2.3 Block Diagram of EUT System for Conducted and Radiated Emission Measurements

a. Playback mode



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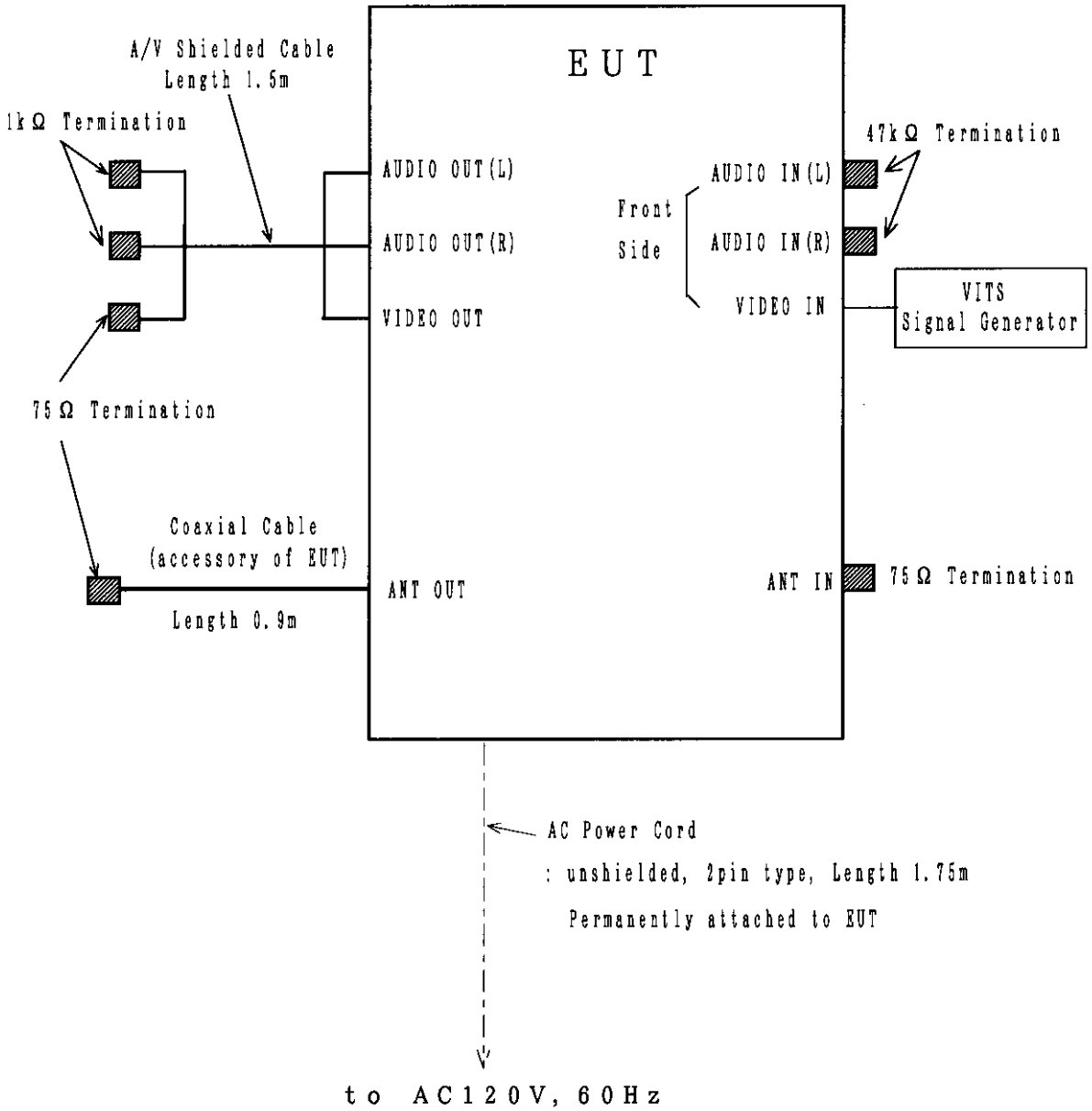
- Continued -

b. Record mode (1V VITS Signal Input)
c. Record mode (5V VITS Signal Input)



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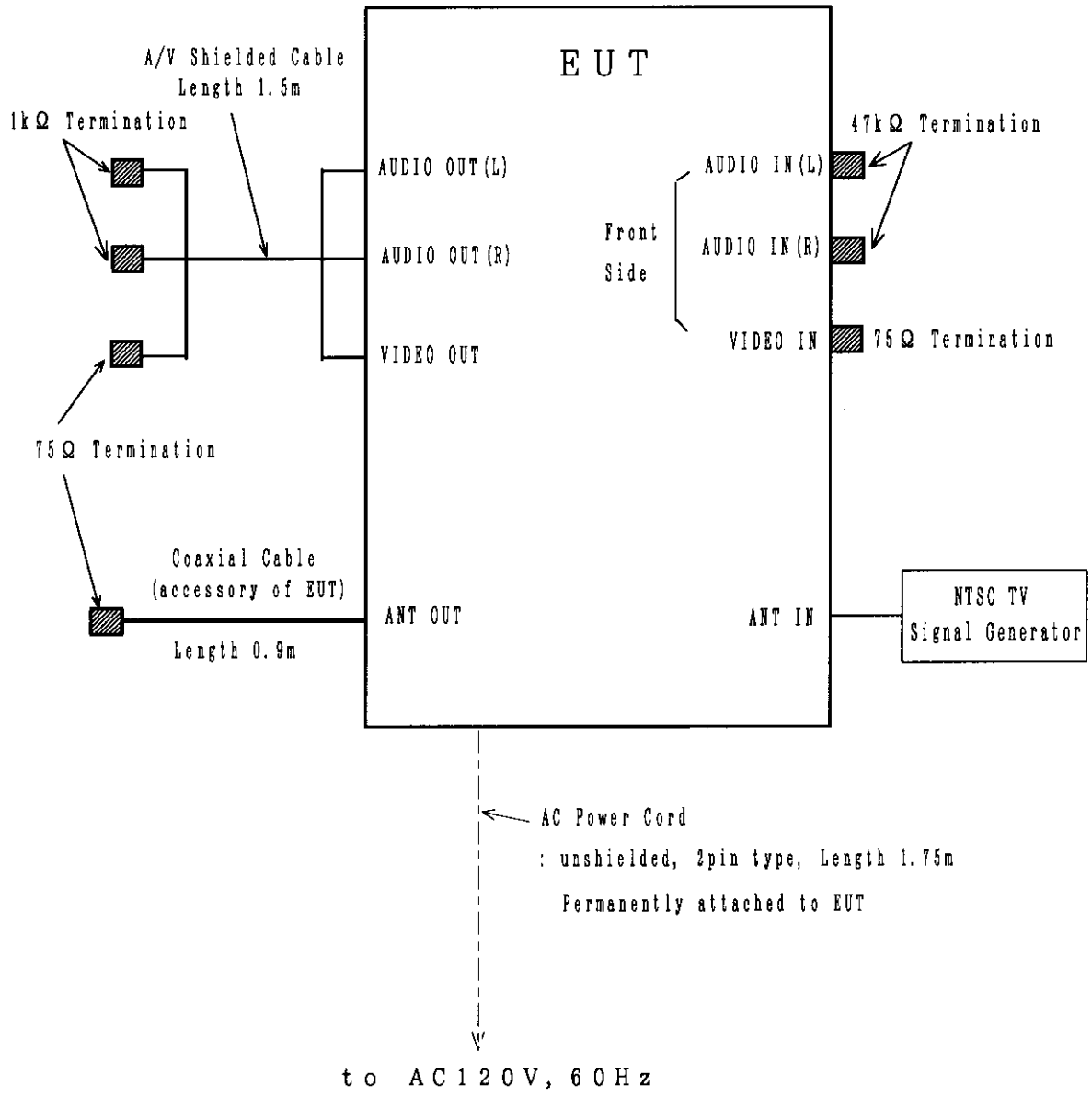
- Continued -

d. Record mode (0 dBmV NTSC TV Signal Input)
e. Record mode (25 dBmV NTSC TV Signal Input)



3. AC POWER LINE CONDUCTED EMISSION MEASUREMENT

3.1 Test Procedure

(1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 7.
☒ :without deviation, ☐ :with deviation(details are found below)
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 measuring port of the LISN for the EUT.

(7) To find out an EUT System condition produces the maximum emission, the configuration of EUT System, the position of the cables, and the operation mode was changed 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 Results

Emission Frequency [MHz]	LISN Corr. Factor [dB]	Meter Reading [dBμV]		Maximum RF Voltage [dBμV]	Limits [dBμV]
		One-end to Ground	Other-end to Ground		
0.450	0.3	30.4	31.1	31.4	48.0
1.276	0.3	28.5	30.3	30.6	48.0
1.413	0.3	29.5	30.5	30.8	48.0
14.320	0.7	30.4	29.6	31.1	48.0
21.464	1.0	32.2	32.7	33.7	48.0
30.000	1.3	31.5	31.0	32.8	48.0

[Note]

1) LISN Correction Factor includes the cable loss.
2) The emissions at channel #3 and channel #4 were measured, and the maximum emissions were repoted either channel #3 or channel #4.
3) The spectrum was checked in each test mode and operation mode, and the data of the maximum EUT operation was reported.

[Environment]

Temperature : 21℃ Humidity : 53%

[Sample Calculation]

Measurement with the quasi-peak detector

Frequency : 0.450 [MHz]
Meter Reading : 31.1 [dBμV] (at Other-end to Ground)
LISN Corr. Factor : 0.3 [dB]

Then, RF voltage is calculated as follows.

RF Voltage = 31.1 + 0.3 = 31.4 [dBμV]

[Summary of Test Results]

Minimum margin was 14.3 dB at 21.464 MHz, other-end to ground.

Tested Date : May 6, 1999

Signature Y. Kotani
Yoshiko Kotani

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4. RADIATED EMISSION MEASUREMENT

4.1 Test Procedure

(1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 8.
☒ :without deviation, ☐ :with deviation(details are found below)
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, the configuration of EUT System, the position of the cables, and the operation mode was changed 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 Results

[Distance : 3m]

Emission Frequency [MHz]	Antenna Factor [dB]	Meter Reading [dBμV] Horizontal Polarization	Meter Reading [dBμV] Vertical Polarization	Maximum Field Strength [dBμV/m]	Limits [dBμV/m]
Test Channel #3					
61.25	10.5	7.9	12.6	23.1	40.0
65.75	10.0	9.2	11.9	21.9	40.0
122.50	16.8	3.8	<0.0	20.6	43.5
245.00	22.9	<0.0	<0.0	<22.9	46.0
Test Channel #4					
67.25	9.8	12.7	11.7	22.5	40.0
71.75	9.4	11.5	5.1	20.9	40.0
134.50	18.0	<0.0	<0.0	<18.0	43.5
201.75	21.6	<0.0	<0.0	<21.6	43.5
Other emissions					
30.00	19.4	<0.0	3.5	22.9	40.0
31.51	18.8	<0.0	5.7	24.5	40.0
42.96	14.8	1.6	18.2	33.0	40.0
66.31	9.9	13.1	12.1	23.0	40.0
71.60	9.4	21.9	15.3	31.3	40.0
80.01	9.5	10.6	13.2	22.7	40.0
114.55	15.8	18.4	13.3	34.2	43.5
200.46	21.6	6.8	3.4	28.4	43.5

[Note]

Antenna Factor includes the cable loss.

[Environment]

Temperature : 20°C Humidity : 60%

[Sample Calculation]

Frequency : 61.25 MHz (Test Channel #3)
Meter Reading : 12.6 dBμV (at Vertical Polarization)
Antenna Factor : 10.5 dB/m

Then, Field Strength is calculated as follows.

Field Strength = 12.6 + 10.5 = 23.1 dBμV/m

[Summary of Test Results]

Minimum margin was 7.0 dB at 42.96 MHz, (Other emissions) vertical polarization.

Tested Date : April 7, 1999 Signature Y. Kotani

Yoshiko Kotani

ENGINEERING TEST REPORT

5. Output Signal Level Measurement

5.1 Test Procedure

(1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.
☒ : without deviation, ☐ : with deviation(details are found below)
See also the block diagram and the photographs of EUT System configuration in this report.

(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 Ω 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 Results

Emission Frequency [MHz]	Correction Factor [dB]	Meter Reading [dBμV/50Ω]	Maximum Signal Level [dBμV/75Ω]	Limits [dBμV/75Ω]
Test Channel #3				
61.25	2.0	64.4	66.4	69.5
65.75	2.1	48.5	50.6	56.5
Test Channel #4				
67.25	2.1	64.1	66.2	69.5
71.75	2.1	47.8	49.9	56.5

[Note]

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

(2) The spectrum was checked in each test mode and operation mode, and the data of the maximum EUT operation was reported.

[Environment]

Temperature : 21 °C Humidity : 53 %

[Sample Calculation]

Frequency : 61.25 MHz (Test Channel #3)
Meter Reading : 64.4 dBμV/50Ω
Correction Factor : 2.0 dB

Then, the output signal level is calculated as follows.

Signal Level = 64.4 + 2.0 = 66.4 dBμV/75Ω

[Summary of Test Results]

Minimum margin was 3.1 dB at 61.25 MHz test channel #3.

Tested Date : May 6, 1999 Signature Y. Kotani
Yoshiko Kotani

ENGINEERING TEST REPORT

6. Output Terminal Conducted Spurious Emission Measurement

6.1 Test Procedure

(1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.
☒ : without deviation, ☐ : with deviation(details are found below)
See also the block diagram and the photographs of EUT System configuration in this report.

(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 Ω coaxial cable.

(6) 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.

(7) Then, the RF output terminal conducted spurious emission level is measured under the EUT condition produced the maximum signal level.

6.2 Photographs of EUT System Configuration

the tested device configuration is the same as the output signal level measurement.
(See 5.2 Photographs of EUT System Configuration.)

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6.3 Test Results

Emission Frequency [MHz]	Correction Factor [dB]	Meter Reading [dBμV/50Ω]	Maximum Signal Level [dBμV/75Ω]	Limits [dBμV/75Ω]
Test Channel #3				
47.75	2.0	8.7	10.7	39.5
56.28	2.0	14.7	16.7	39.5
56.65	2.0	38.4	40.4	39.5
74.75	2.1	10.3	12.4	39.5
122.50	2.2	18.4	20.6	39.5
183.75	2.4	12.0	14.4	39.5
** 56.65	2.0	12.1	14.1	39.5
Test Channel #4				
53.75	2.0	10.6	12.6	39.5
62.28	2.0	14.8	16.8	39.5
62.65	2.0	39.2	41.2	39.5
80.75	2.1	9.8	11.9	39.5
134.50	2.3	13.3	15.6	39.5
201.75	2.4	11.9	14.3	39.5
** 62.65	2.0	12.2	14.2	39.5

[Note]

(1) **: 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.

(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 descrived above are corrected by the gain of pre-amplifier.

(3) The spectrum was checked in each test mode and operation mode, and the data of the maximum EUT operation was reported.

[Environment]

Temperature : 21 ℃ Humidity : 53 %

[Sample Calculation]

Frequency : 47.75 MHz (Test Channel #3)
Meter Reading : 8.7 dBμV/50Ω
Correction Factor : 2.0 dB

Then, the output signal level is calculated as follows.

Signal Level = 8.7 + 2.0 = 10.7 dBμV/75Ω

[Summary of Test Results]

Minimum margin was 18.9 dB at 122.50 MHz, test channel #3.

Tested Date : May 6, 1999 Signature Y. Kotani
Yoshiko Kotani

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7. Transfer Switch Measurement

7.1 Test Procedure

(1) Configurate the EUT System in accordance with ANSI C63.4-1992 section 12.2.
☒ : without deviation, ☐ : with deviation(details are found below)
See also the block diagram and the photographs of EUT System configuration in this report.

(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 antenna input terminal is connected to the input of pre-amplifier through the matching transformer with a calibrated 50 Ω 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 Results

Emission Frequency [MHz]	Correction Factor [dB]	Meter Reading [dBμV/50Ω]	Maximum Signal Level [dBμV/75Ω]	Limits [dBμV/75Ω]
Test Channel #3 61.25	2.0	3.7	5.7	9.5
Test Channel #4 67.25	2.1	3.5	5.6	9.5

[Note]

1) 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 descrived above are corrected by the gain of pre-amplifier.
2) The spectrum was checked in each test mode and operation mode, and the data of the maximum EUT operation was reported.

[Environment]

Temperature : 21 ℃ Humidity : 53 %

[Sample Calculation]

Frequency : 61.25 MHz (Test Channel #3)
Meter Reading : 3.7 dBμV/50Ω
Correction Factor : 2.0 dB

Then, the output signal level is calculated as follows.

Signal Level = 3.7 + 2.0 = 5.7 dBμV/75Ω

[Summary of Test Results]

Minimum margin was 3.8 dB, at 61.25 MHz, test channel #3.

Tested Date : May 6, 1999

Signature Y. Kotani
Yoshiko Kotani

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8. List of Test Equipments

Instrument	Manufacturer	Model No.	Specifications	KEC Control No.	Test Item (*)	Last Cal.	Next Cal.
Test Receiver	Rohde & Schwarz	ESHS10	Frequency Range 9 kHz – 30 MHz	FS-67	1	1998/10	1999/10
		ESVS10	Frequency Range 20 MHz – 1 GHz	FS-60	2	1998/5	1999/5
Spectrum Analyzer	Hewlett Packard	8568B	Frequency Range 100 Hz – 1.5 GHz	FS-46-3	1,3,4,5	1998/6	1999/6
	Rohde & Schwarz	FSA	Frequency Range 100 Hz – 1.8 GHz	SA-35	2	1998/6	1999/6
Pre-amplifier	Anritsu	MH648A	Frequency Range 100 kHz – 1.2 GHz	AM-28	4,5	1998/6	1999/6
Line Impedance Stabilization Network	Kyoritsu	KNW-407	Frequency Range: 150 kHz - 30 MHz Impedance: 50 Ω / 50 μH	FL-107	1	1999/4	2000/4
Biconical Antenna	Schwarzbeck	BBA9106	Frequency Range 30 MHz – 300 MHz	AN-219	2	1999/2	2000/2
Log-Periodic Antenna	Schwarzbeck	UHALP9108A	Frequency Range 300 MHz – 1 GHz	AN-218	2	1999/2	2000/2

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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	1,2,3,4	1998/9	1999/9
Audio Part Signal Generator	Anritsu	MG3601A	Frequency Range 100 kHz – 1.04 GHz	SG-48	1,2,3,4	1998/9	1999/9
Multiburst Signal Generator	Anritsu	MG318A	According to ANSI C63.4(1992) Section 12 Fig.15	MG-35	1,2,3,4,5	1998/12	1999/12
Matching Trans-former	Anritsu	MG614A	Frequency Range 10 MHz - 1.2 GHz	AX-28-4	3,4,5	1998/12	1999/12
				AX-28-2	1,2,3,4	1998/11	1999/11
Four-Port Junction Pad	Anritsu	MP659A	Frequency Range 40 MHz – 1 GHz	AX-16	1,2,3,4	1998/11	1999/11

[Note] Test Item(*) : 1. AC Power Line Conducted Emission Measurement
2. Radiated Emission Measurement
3. Output Signal Level Measurement
4. Output Terminal Conducted Spurious Emission Measurement
5. Transfer Switch Measurement