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Section 1 : Client information

Company name : ORION ELECTRIC CO., LTD.
Brand Name : SANSUI
Address : 41-1 Iehisa-cho, Takefu-shi, Fukui 915-8555, JAPAN
Telephone number : +81-778-23-0019
Facsimile number : +81-778-23-7799
Contact person : Hiroshi Tsujimoto
Section manager
Engineering headquarters
Administration section

Section 2 : Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of equipment : DVD/VCR
Model number : VRDVD4000
Rating : AC 120 V / 60 Hz
Manufacturer : 1. WORLD ELECTRIC (THAILAND) LTD.
236 Moo 2 Nongchark, Banbung, Chonburi 20170, Thailand
2. KORAT DENKI LTD.
149 Moo 10 Thombol Chokchai, Amphur Chokchai, Nakhonratchasima
30190, Thailand
3. ORION AMERICA, INC.
Hwy 41 North, Orion Place, Princeton, Indiana 47670, U.S.A
Receipt Date of Sample : December 04, 2001
Condition of EUT : Production Prototype

2.2 Product description

ORION ELECTRIC CO., LTD., Model: VRDVD4000 (referred to as the EUT in this report) is a DVD/VCR.
The EUT specifications is as follows.

Tuner type	:	Quartz PLL frequency synthesized
I / F	:	45.75 MHz (Picture), 41.25 MHz (Sound)
Receiving channel	:	VHF 2 – 13 ch / UHF 14 – 69 ch / CATV 1 – 125 ch
Antenna input	:	75 ohm
Video signal	:	NTSC color
Power source	:	AC 120 V / 60 Hz
		Operation: 20 W
		Stand by: 3 W
I / O terminal (Video)	:	RCA in 1Vp-p 75 ohm, RCA out 1 Vp-p 75 ohm
I / O terminal (Audio)	:	RCA in – 8 dBm 50 k ohm, RCA out – 8 dBm 1 k ohm

2.3 Similar apparatus

There are no similar apparatus.

Section 3 : Test specification, methods & procedures

3.1 Test specification

Test specification : FCC Part 15 Subpart B

Title : FCC 47 CFR Part 15 Radio Frequency Device
Subpart B Unintentional Radiators (Subpart C Intentional Radiators)

3.2 Methods & procedures

No.	Item	Test procedure	Limits	Remarks
1	Conducted interference	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	250 uV	LISN
2	Radiated emission	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	30–88 MHz: 100 uV/m 88–216 MHz: 150 uV/m 216–960 MHz: 200 uV/m above 960 MHz: 500 uV/m	3 m
3	Antenna terminal voltage	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	2 nW (at 75 ohm)	—
4	RF output level	ANSI C63.4:1992 IEEE 213:1987	Video signal: 3000 uV Aural signal: 671 uV	—
	Spurious emission	IEEE 187:1990	94.8 uV	—
5	Transfer switch	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	9.5 dB	—
6	Picture sensitivity	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	8 dB	—
7	Noise figure	FCC/OET MP:2:1986	14 dB	—

3.3 Additions or deviations to standard

No addition, deviation or exclusion has been made from standards.

Description of EUT and support equipment

Sign	Item	Model number	Serial number	Manufacturer
A	DVD/VCR	VRDVD4000	–	ORION ELECTRIC CO., LTD.
B	Remote Controller	–	–	ORION ELECTRIC CO., LTD.
C	Evaluation monitor	VX-S135U	671-9313106A	AIWA CO., LTD.

Meshed column are represented

List of cable used

No.	Item	Length (m)	Shielding	Manufacturer
1	AC power cable	1.8	Unshielded	–
2	RF output cable	1.0	Shielded	Supplies accessory

Section 5 : Summary of test results

5.1 Test results

No.	Item	Test procedure	Limits	Worst margin	Results
1	Conducted interference	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	250 uV	12.5 dB (0.45 MHz)	Passed
2	Radiated emission	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	30–88 MHz: 100 uV/m 88–216 MHz: 150 uV/m 216–960 MHz: 200 uV/m above 960 MHz: 500 uV/m	3.1 dB (513.04 MHz)	Passed
3	Antenna terminal voltage	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	2 nW (at 75 ohm)	17.4 dB (1285 MHz)	Passed
4	RF output level	ANSI C63.4:1992 IEEE 213:1987	Video signal: 3000 uV Aural signal: 671 uV	1.5 dB (61.25 MHz)	Passed
	Spurious emission	IEEE 187:1990	94.8 uV	15.5 dB (220.05 MHz)	Passed
5	Transfer switch	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	9.5 dB	2.6 dB (61.25 MHz)	Passed
6	Picture sensitivity	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	8 dB	3.6 dB	Passed
7	Noise figure	FCC/OET MP:2:1986	14 dB	6.2 dB (77.25 MHz)	Passed

A-PEX INTERNATIONAL hereby confirms that E.U.T., in the configuration tests, complies with the specifications FCC Part15 Subpart B.

5.2 Test instruments

Please refer to the list of test instruments in Section 6.

5.3 Test location

A-PEX International Co.,Ltd. Kanto office EMC Laboratory
Newstage Yokohama Bldg. 1F 1-1-32 Shin-Urashima-cho, Kanagawa-ku, Yokohama-shi, Kanagawa
221-0031, JAPAN
TEL : +81-45-450-1515
FAX : +81-45-450-1534

A-PEX International Co.,Ltd. Yokowa Laboratory
108 Yokowa-cho, Ise-shi, Mie 516-1106, JAPAN
TEL : +81-596-39-1485
FAX : +81-596-39-0232

5.4 Photographs of test set up

Please refer to Appendix 1.

5.5 Test data

Please refer to Appendix 2.

Section 6 : Test instruments

Instruments	Manufacturer	Model No.	Control No.	Test Item	Calibration date	Validity
LISN	Schwarzbeck	NSLK8127	APLSN05	CE	January 18, 2001	January 17, 2002
Test receiver	Rohde & Schwarz	ESS	APRCV05	CE	June 04, 2001	June 03, 2002
TV generator	Leader	408	APTVG04	CE	Pre check	-
Coaxial cable	Fujikura	5D2W	APCBL02	CE	August 07, 2001	August 06, 2002
Spectrum analyzer	Advantest	R3365	YTSPA01	AT	April 03, 2001	April 02, 2002
Matching pad	TME	ZT-204	APMAT04	AT	October 23, 2001	October 22, 2002
Matching pad	TME	ZT-130	APMAT05	AT	October 23, 2001	October 22, 2002
Pre amplifier	Anritsu	MH648A	APPRA01	AT	August 09, 2001	August 08, 2002
Pre amplifier	Hewlett Packard	8449B	APPRA05	AT	August 09, 2001	August 08, 2002
Coaxial cable	Fujikura	5D2W	APCBL06	AT	August 07, 2001	August 06, 2002
Coaxial cable	Fujikura	5D2W	APCBL07	AT	August 07, 2001	August 06, 2002
Signal generator	Rohde & Schwarz	SMY01	YTSSG02	PS	May 07, 2001	May 06, 2002
Oscillo scope	Tektronix	TDS410A	APOSC01	PS	April 27, 2001	April 26, 2002
Band Pass Filter	Erika Fiedlar	BP	APBPF01	PS	Pre check	-
Noise figure indicator	Elena	ENF-2005	APNFM01	NF	September 27, 2000	September 26, 2002
Noise source	Elena	MC1100	APNFS01	NF	September 27, 2000	September 26, 2002

Instruments	Manufacturer	Model No.	Control No.	Test Item	Calibration date	Validity
Pre amplifier	Anritsu	MH648A	AF-03	RE	March 31, 2001	March 30, 2002
Attenuator	Anritsu	MP721B	AT-04	RE	March 31, 2001	March 30, 2002
Biconical antenna	Schwarzbeck	BBA9106	BA-05	RE	May 01, 2001	April 30, 2002
Logperiodic antenna	Schwarzbeck	UKLP9140-A	LA-08	RE	May 01, 2001	April 30, 2002
Spectrum analyzer	Hewlett Packard	8567A	SA-03	RE	March 31, 2001	March 30, 2002
Test receiver	Rohde & Schwarz	ESVS10	TR-04	RE	April 24, 2001	April 23, 2002
Yokowa No. 2 open coaxial cable (0.01 – 1000 MHz)	A-Pex	CC-21, CC-22, CC-23, CC-24, CC-25, CC-26, CC-27, SW-21, SW-22	CC-2ORC	RE	March 31, 2001	March 30, 2002
Open test site	JSE	10 m	YOATS-02	RE	May 04, 2001	May 03, 2002
Pre amplifier	Hewlett Packard	8449B	AF-04	RE	November 03, 2001	November 02, 2002
Horn antenna	A.H Systems	SAS200/571	HA-01	RE	May 20, 2001	May 19, 2002
Spectrum analyzer	Advantest	R3271	SA-05	RE	February 01, 2001	January 31, 2002
Microwave cable	Suhner	CC-C2,C8	CC-C28G	RE	September 14, 2001	September 13, 2002

* The abbreviation in the test item column stands for:

CE: Conducted emission, RE: Radiated emission, AT: Antenna terminal voltage,
RF: RF output level / spurious emission, TS :Antenna transfer switch,
PS: Picture sensitivity, NF: Noise figure

A-pex International Co., Ltd. Kanto Office EMC Laboratory.

Newstage Yokohama Bldg.1F 1-1-32 Shin-Urashima-cho, Kanagawa-ku, Yokohama-shi, Kanagawa 221-0031, JAPAN
Telephone : +81 45 450 1515 Facsimile: +81 45 450 1534

Section 7 : Conducted interference

7.1 Operation environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m, at Kanto office EMC laboratory.

Date : December 11, 2001
Temperature : 24.0 °C
Humidity : 35 %

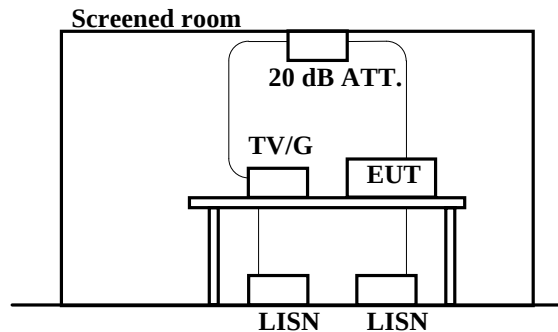
7.2 Test configuration

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flush with rear of tabletop. All other surfaces of tabletop was at least 80 cm from any other grounded conducting surface. I/O cables and AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, were individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

A drawing of the set up is shown in figure 1 and photographs in Appendix 1.

Figure 1. Conducted interference

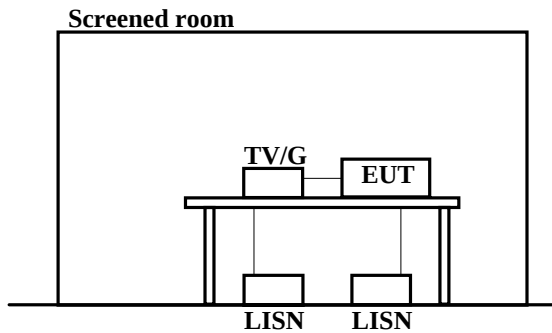
Receive + Rec. mode (0 dBmV input / 25 dBmV input)



Note:

RF in: TV signal generator connected
Front video in: 75 ohm terminated with video cable
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
Rear digital audio out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

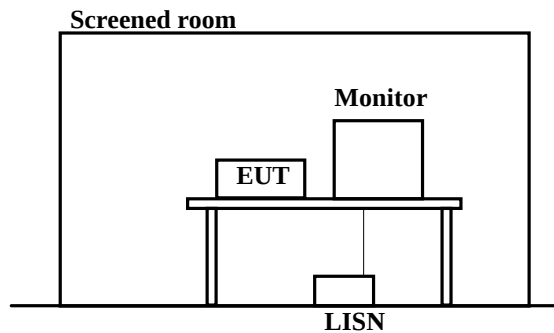
AV input + Rec. mode (1 Vp-p input / 5 Vp-p input)



Note:

RF in: 75 ohm terminated with cable
Front video in: Video generator connected
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
Rear digital audio out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

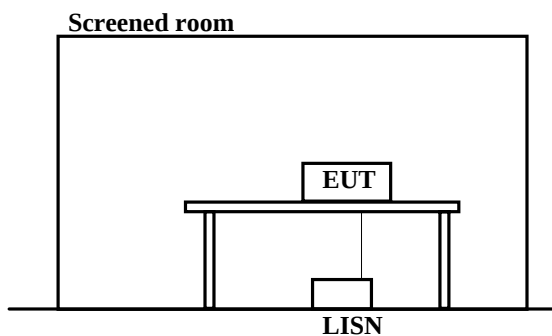
DVD play mode



Note:

RF in: 75 ohm terminated with cable
Front video in: 75 ohm terminated with video cable
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
Rear digital audio out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

VCR playback mode



Note:

RF in: 75 ohm terminated with cable
Front video in: 75 ohm terminated with video cable
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
Rear digital audio out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

7.3 Test conditions

Frequency range : 0.45 MHz – 30 MHz
EUT position : Table top

7.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT within a screened room. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed. The measurements have been performed with a quasi-peak detector and if required, with an average detector.

The EUT was put into operation at receive mode, AV input mode, DVD play mode and VCR playback mode. EUT and desired signal generator should connect through 20 dB attenuator.

The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : Quasi-Peak
IF Bandwidth : 10 kHz

7.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hisayuki Kioka

Section 8 : Radiated emission

8.1 Operation environment

The test was carried out in a open area test site the size of 10 × 20 m, at Yokowa EMC laboratory.

Date : December 06, 2001

Temperature : 22.0 °C

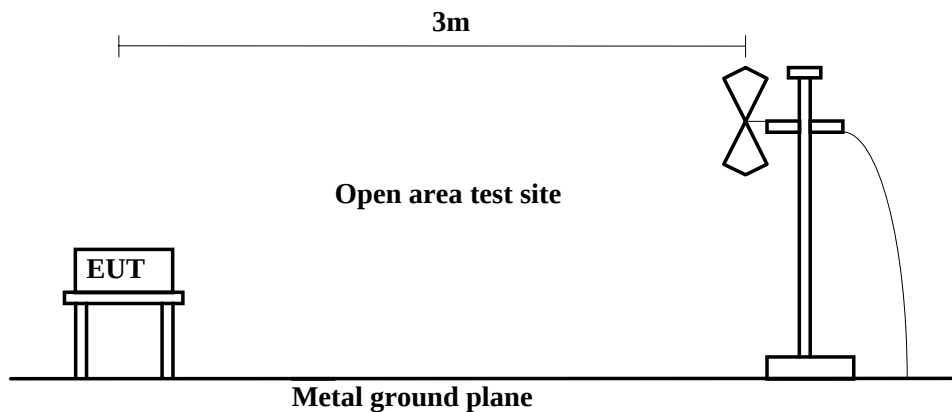
Humidity : 41 %

8.2 Test configuration

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of EUT, including peripherals was aligned and flush with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged 40 cm height to the ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

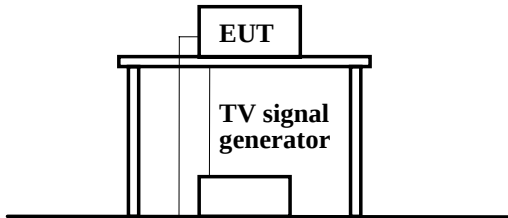
A drawing of the set up is shown in figure 2 and photographs in Appendix 1.

Figure 2. Radiated emission



Receive + Rec. mode (0 dBmV / 25 dBmV)

Open area test site

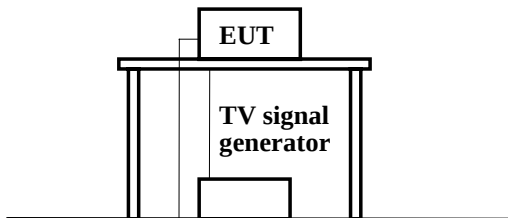


Note:

RF in: TV signal generator connected
Front video in: 75 ohm terminated with video cable
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

AV input + Rec. mode (1 Vp-p input / 5 Vp-p input)

Open area test site

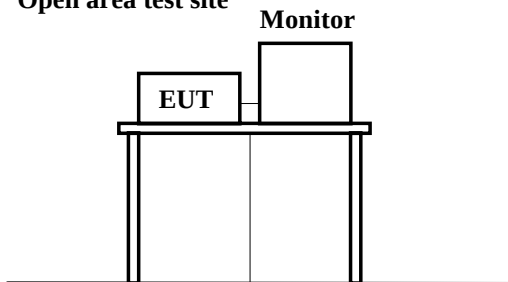


Note:

RF in: 75 ohm terminated with cable
Front video in: Video generator connected
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

DVD play mode

Open area test site

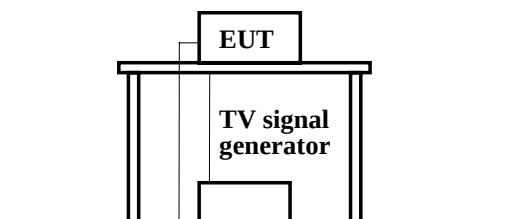


Note:

RF in: 75 ohm terminated with cable
Front video in: 75 ohm terminated with video cable
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

VCR playback mode

Open area test site



Note:

RF in: 75 ohm terminated with cable
Front video in: 75 ohm terminated with video cable
Front audio in: 50 k ohm terminated with audio cable
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable

8.3 Test conditions

Frequency range : 30 MHz – 2000 MHz
Test distance : 3 m
EUT position : Table top

8.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane and at a distance of 3 m.

Pre check measurements were performed within a screened room or used search coil for ambient noise at high-level, especially.

Measurements were performed with a quasi-peak detector.

The measuring antenna height was varied between 1 to 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization. The EUT was put into operation at receive mode, AV input mode, DVD play mode and VCR playback mode.

The radiated emission measurements were made with the following detector function of the test receiver.

Detector Type : QP (30-1000 MHz) / Ave. (1000-2000MHz)
IF Bandwidth : 120 kHz / 1 MHz

8.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hiroya Tabata

Section 9 : Antenna terminal voltage

9.1 Operation environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m, at Kanto office EMC laboratory.

Date : December 11, 2001

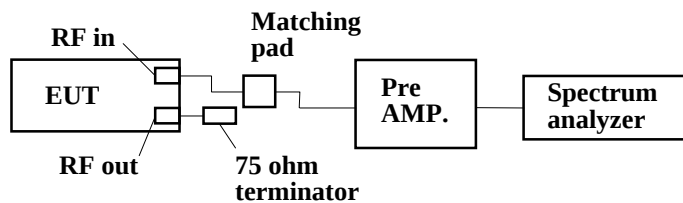
Temperature : 24.0 °C

Humidity : 35 %

9.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane. A drawing of the set up is shown in figure 3 and photographs in Appendix 1.

Figure 3. Antenna terminal voltage



9.3 Test conditions

Frequency range : 30 MHz – 2000 MHz

EUT position : Table top

9.4 Test procedure

Connect EUT and spectrum analyzer through pre-amplifier. Set EUT to CH investigation mode then measure the voltage of local leakage from antenna terminal. Spectrum analyzer should be hold in maximum mode during the measurement. Measurement should be performed for TV receiver mode and CATV receiver mode.

Detector Type : Peak (30-1000 MHz)

9.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hisayuki Kioka

Section 10 : RF output level / spurious emission

10.1 Operation environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m, at Kanto office EMC laboratory.

Date : December 12, 2001

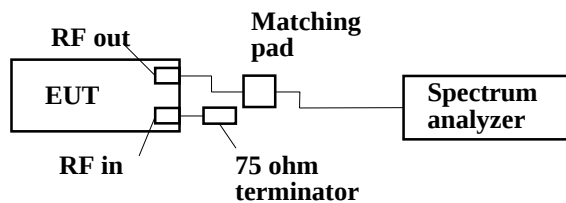
Temperature : 23.0 °C

Humidity : 38 %

10.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane. A drawing of the set up is shown in figure 4 and photographs in Appendix 1.

Figure 4. RF output level



10.3 Test conditions

EUT position : Table top

10.4 Test procedure

EUT was connected spectrum analyzer through matching pad by accessory cable. RF channel selected 3 ch or 4 ch. Picture carrier, sound carrier and spurious levels are measured. Both sound carrier levels (upper and lower side bands) of modulator output are measured.

Detector Type : Peak

10.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hisayuki Kioka

Section 11 : Antenna transfer switch

11.1 Operation environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m, at Kanto office EMC laboratory.

Date : December 11, 2001

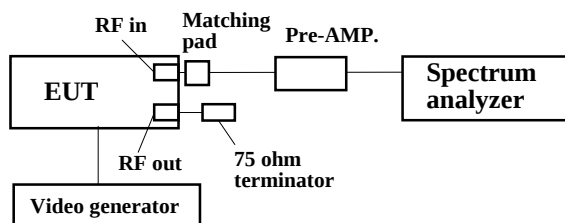
Temperature : 24.0 °C

Humidity : 35 %

11.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane. A drawing of the set up is shown in figure 5 and photographs in Appendix 1.

Figure 5. Transfer switch



11.3 Test conditions

EUT position : Table top

11.4 Test procedure

EUT was connected spectrum analyzer through matching pad by accessory cable. RF channel selected 3 ch or 4 ch. The EUT exercised AV input mode, VCR playback mode and DVD play mode during the test, and interference signals were measured from RF input terminal.

Detector Type : Peak

11.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hisayuki Kioka

Section 12 : Picture sensitivity

12.1 Operation environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m, at Kanto office EMC laboratory.

Date : December 13, 2001

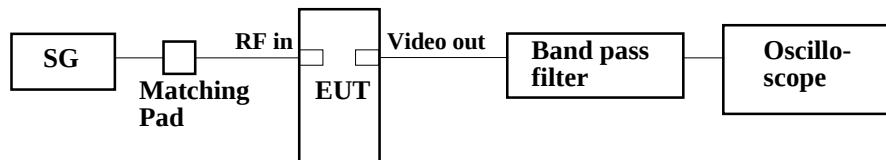
Temperature : 23.4 °C

Humidity : 34 %

12.2 Test configuration

The EUT was placed on a non-metallic platform 0.8 m above a reference ground plane.
A drawing of the set up is shown in figure 6 and photographs in Appendix 1.

Figure 6. Picture sensitivity



12.3 Test conditions

EUT position : Table top

12.4 Test procedure

Signal generator setup is as follows, (Example: 2ch – 55.25 MHz, AM, 1 kHz, 30 %)

The EUT was tuned to appropriate channel.

Output level of signal generator was adjusted to near the frequency output level of EUT output.

EUT output level was adjusted to maximum output level by frequency adjustment of signal generator.

Signal generator output level was adjusted to reference output level of EUT and output level had read.

12.5 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hisayuki Kioka

Section 13 : Noise figure

13.1 Operating environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m, at Kanto office EMC laboratory.

Date : December 13, 2001

Temperature : 23.4 °C

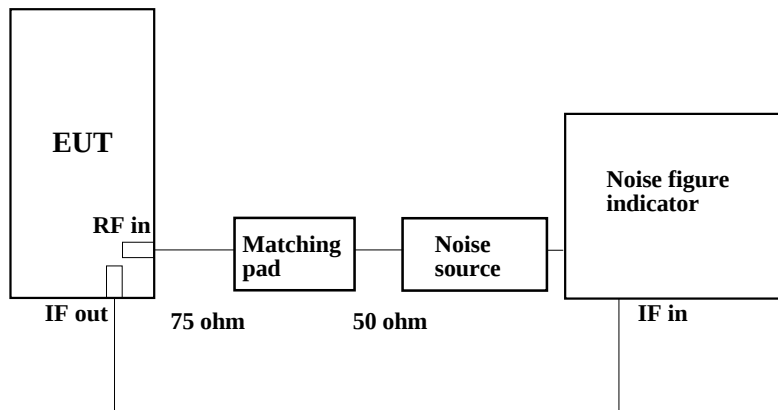
Humidity : 34 %

13.2 Test configuration

The EUT was placed on a non-metallic table.

A drawing of the set up is shown in figure 7 and photographs in Appendix 1.

Figure 7. Noise figure



13.3 Test procedure

This test should be performed in a shielded room or an low noise environment. Connect solid state noise source to antenna input terminal of EUT. Connect IF output terminal of EUT to noise meter through ceramic condenser. Measurement has been performed for VHF,UHF and receiver range.

13.4 Test result

Passed

Please refer to summary of the test results in Appendix 2.

Test engineer : Hisayuki Kioka