EMI TEST REPORT

Test Report No. : 23AE0029-YW-1

Applicant : **Orion Electric Co., Ltd.**

Type of equipment : **DVD/VCR Receiver**

Model number : **DWM-3000U**

Test standard : **FCC Part 15 Subpart B**

Test result : **Complied**

1. This test report shall not be reproduced except in full or partial, without the written approval of A-Pex International Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this test report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test : August 19 to 23, 2002

Tested by:

Hisayuki Kioka
Group Leader of EMC Seciton

Hiroya Tabata
Group Leader of EMC Section

Approved by:

Kazutoyo Nakanishi
Site Operation Manager of EMC Section

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Contents

Section 1 : Client information

Company name	:	Orion Electric Co., Ltd.
Brand Name	:	ORION
Address	:	41-1 Iehisa-cho, Takefu-shi, Fukui-ken, 915-8555 JAPAN
Telephone number	:	+81 778 23 0019
Facsimile number	:	+81 778 23 7799
Contact person	:	Hiroshi Tsujimoto

Manufacture

Company name	:	Orion Electric (U.K.) Ltd.
		World Electric (Thailand) Ltd.
		Korat Denki Ltd.

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

2.1 Identification of E.U.T.

Type of equipment	:	DVD/VCR Receiver
Model number	:	DWM-3000U
Rating	:	AC 120 V / 60 Hz
Receipt Date of Sample	:	August 16, 2002
Condition of EUT	:	Production Prototype

2.2 Product description

Orion Electronics Co., Ltd. Model: DWM-3000U (referred to as the EUT in this report) is a DVD/VCR Receiver. 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, 23 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 dB 50 k ohm, RCA out –8 dB 1 k ohm

2.3 Similar apparatus

There are no similar apparatus.

Section 3 : Test specification, procedures and results

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 Procedures & results

No.	Item	Test procedure	Limits	Worst margin	Result
1	Conducted emission	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	250 uV	6.1 dB (28.6364 MHz)	Complied
2	Radiated emission	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	30–88 MH: 100 uV/m 88–216 MHz: 150 uV/m 216–960 MHz: 200 uV/m above 960 MHz: 500 uV/m	7.4 dB (1694.03 MHz)	Complied
3	Antenna terminal voltage	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	2 nW (at 75 ohm)	11.8 dB (118 MHz)	Complied
4	RF output level	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	Video signal: 3000 uV Aural signal: 671 uV	3.3 dB (61.25MHz)	Complied
	Spurious emission		94.8 uV	14.8 dB (49.26 MHz)	
5	Transfer switch	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	9.5 dB	7.8 dB (61.25 MHz, 67.25 MHz)	Complied
6	Picture sensitivity	ANSI C63.4:1992 IEEE 213:1987 IEEE 187:1990	8 dB	5.8 dB	Complied
7	Noise figure	FCC/OET MP:2:1986	14 dB	7.4 dB (723.25 MHz)	Complied

3.3 Additions or deviations to standard

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

3.4 Confirmation

A-Pex International Co., Ltd. hereby confirms that E.U.T., in the configuration tests, complies with the specifications FCC Part15 Subpart B.

3.5 • Uncertainty

Conducted emission (450 kHz – 30 MHz)

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.74 dB.
The data listed in this test report has enough margin, more than site margin.

Radiated emission

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.4 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±4.8 dB.
The data listed in this test report has enough margin, more than site margin.

Antenna terminal voltage

The measurement uncertainty (with a 95% confidence level) for this test was ± 3.48 dB.
The data listed in this test report has enough margin, more than site margin.

RF output level test / spurious emission test

The measurement uncertainty (with a 95% confidence level) for this test was ± 3.48 dB.
The data listed in this test report may exceed the test limit because it does not have enough margin.

Antenna transfer switch

The measurement uncertainty (with a 95% confidence level) for this test was ± 3.48 dB.
The data listed in this test report has enough margin, more than site margin.

Picture sensitivity test

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.0 dB.
The data listed in this test report has enough margin, more than site margin.

Noise Figure Test

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.2 dB.
The data listed in this test report has enough margin, more than site margin.

3.7 Test location

A-Pex International Co., Ltd. Yokowa Lab. No.2 Test site
108 Yokowa-cho, Ise-shi, Mie-ken, 516-1106 JAPAN
TEL : +81 596 39 1485
FAX : +81 596 39 0232

This site has been fully described in a report submitted to FCC office, and listed on October 26, 2002.
(Registration number: 90411) *NVLAP Lab. Code : 200109-0

3.8 Test setup, Data of EMI & Test instruments

Please refer to Appendix 1 to 3.

Section 4 : Operation of E.U.T. during tests

4.1 Operating modes

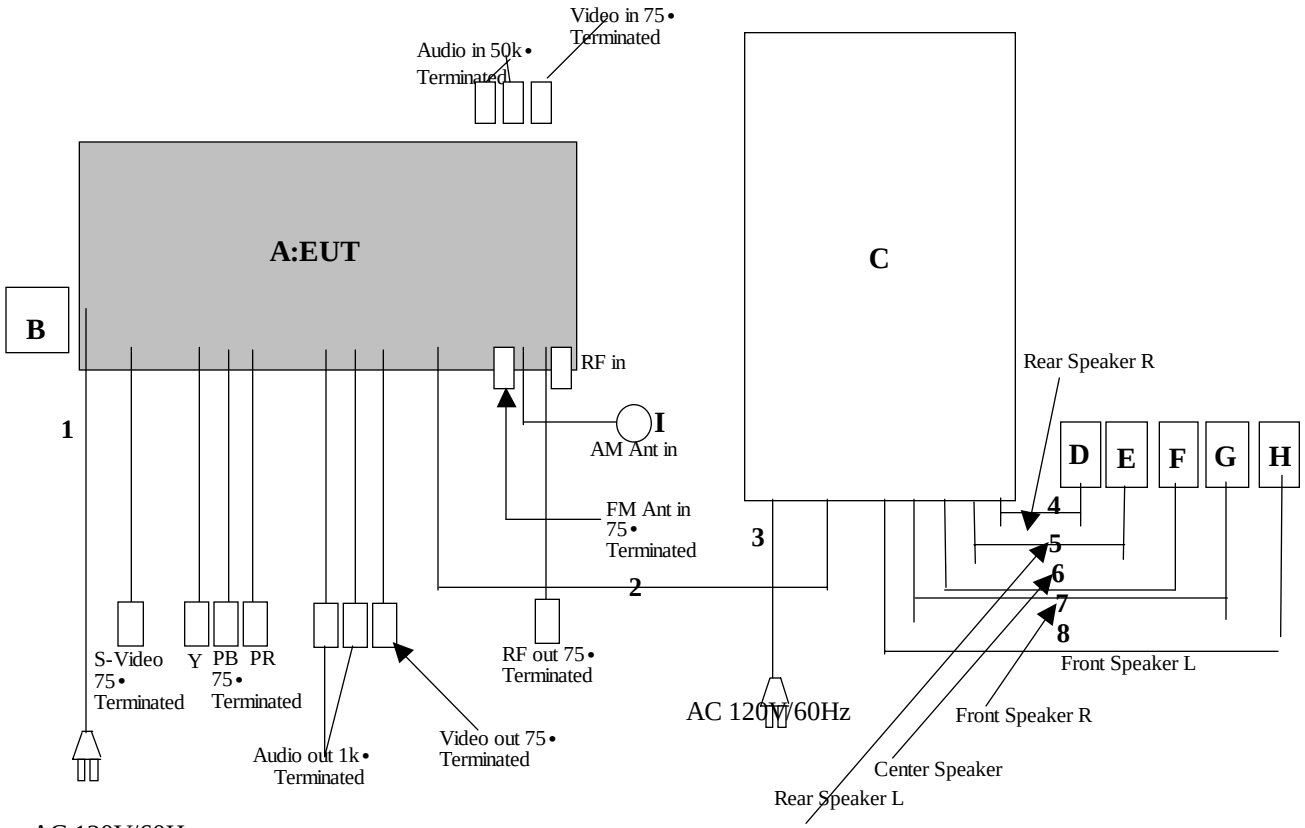
The EUT exercise program used during testing was designed exercise the various system components in a manner similar to typical use.

The sequence in used : * TV reception + Rec mode (0 dBmV input / 25 dBmV input)
* AV input + Rec mode (1 Vp-p input / 5 Vp-p input)
* VCR playback mode
* DVD play mode
* FM Reception mode

Operation : The EUT tested above operation mode
(Using a video tape with a typical TV signal recorded on it, if necessary.)

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals



AC 120V/60Hz

* Cabling was taken into consideration and test data was taken under worse case conditions.

Description of EUT and support equipment

Sign	Item	Model number	Serial number	Manufacturer
A	DVD/VCR Receiver	DWM-3000u	–	Orion Electric Co., Ltd.
B	Remote Controller	–	–	Orion Electric Co., Ltd.
C	Powered Subwoofer	ASX-3000	–	Orion Electric Co., Ltd.
D	Speaker	–	–	Orion Electric Co., Ltd.
E	Speaker	–	–	Orion Electric Co., Ltd.
F	Speaker	–	–	Orion Electric Co., Ltd.
G	Speaker	–	–	Orion Electric Co., Ltd.
H	Speaker	–	–	Orion Electric Co., Ltd.
I	A|M Antenna	–	–	Orion Electric Co., Ltd.

Meshed column are represented

List of cable used

No.	Item	Length (m)	Shielding	Backshell material
1	AC Power Cable	1.8	N	Polyvinyl chloride
2	6ch Audio Out Cable	3.0	Y	Polyvinyl chloride
3	AC Power Cable	2.1	N	Polyvinyl chloride
4	Speaker Cable	5.0	N	Polyvinyl chloride
5	Speaker Cable	5.0	N	Polyvinyl chloride
6	Speaker Cable	5.0	N	Polyvinyl chloride
7	Speaker Cable	5.0	N	Polyvinyl chloride
8	Speaker Cable	5.0	N	Polyvinyl chloride

Section 5 : Conducted emission

5.1 Operation environment

The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7m.

Date: August 23, 2002
Temperature: 26°C
Humidity: 59 %

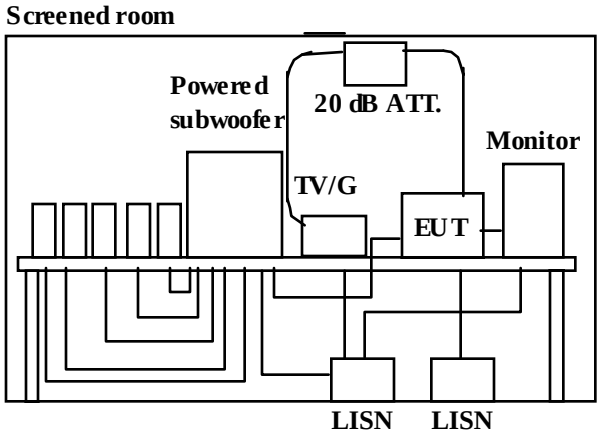
5.2 Test configuration

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 emission

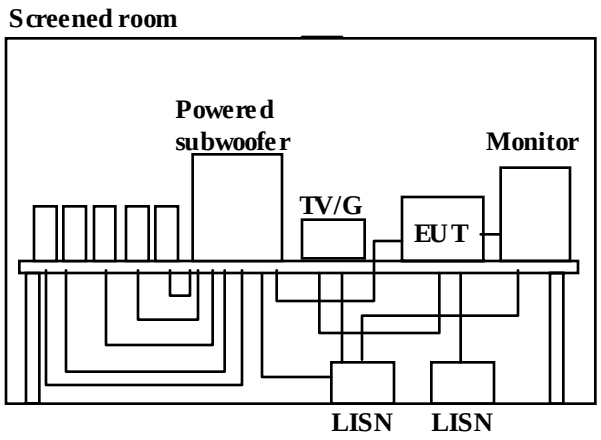
TV reception + Rec. mode (0 dBmV input / 25 dBmV input)



Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
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
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

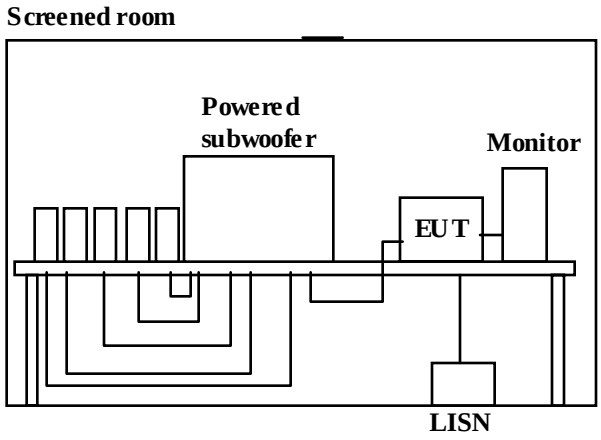
AV input + Rec. mode (1 Vp-p input / 5 Vp-p input)



Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
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
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

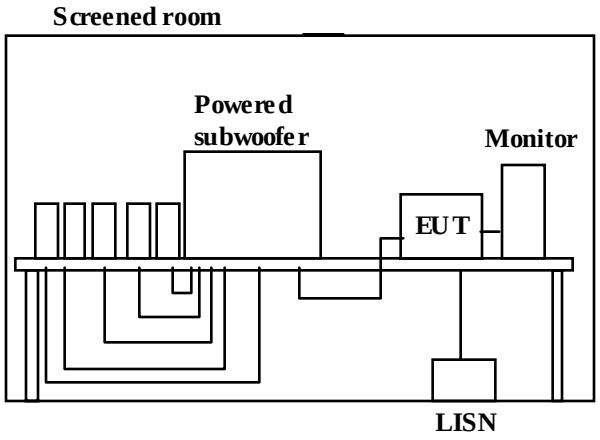
VCR playback mode



Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
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
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

DVD play mode



Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
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
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

5.3 Test conditions

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

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT within a shielded 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 TV reception mode, FM reception mode, AV input mode, VCR playback mode and DVD play 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

5.5 Test result

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

Test engineer: Hisayuki Kioka

Section 6 : Radiated emission

6.1 Operation environment

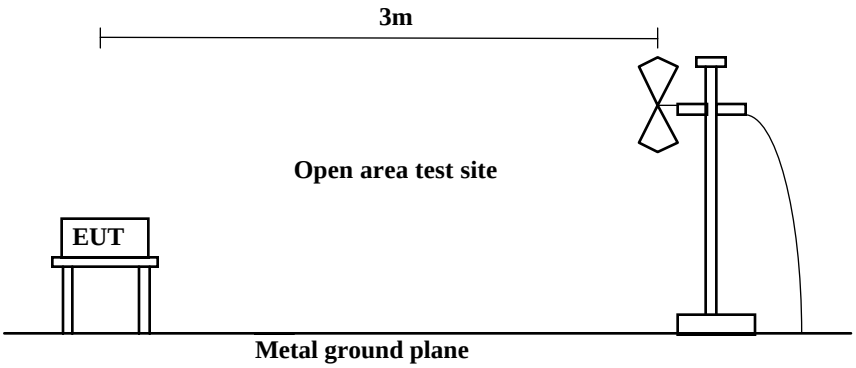
The test was carried out in an open site.

Date: August 19, 2002
Temperature: 21 °C
Humidity: 46 %

6.2 Test configuration

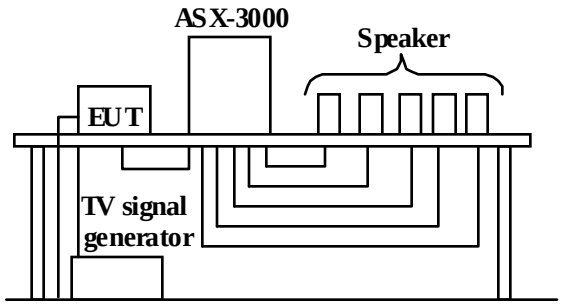
EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of EUT, including peripherals was aligned and flush with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming 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



TV reception + Rec. mode (0 dBmV / 25 dBmV)

Open area test site

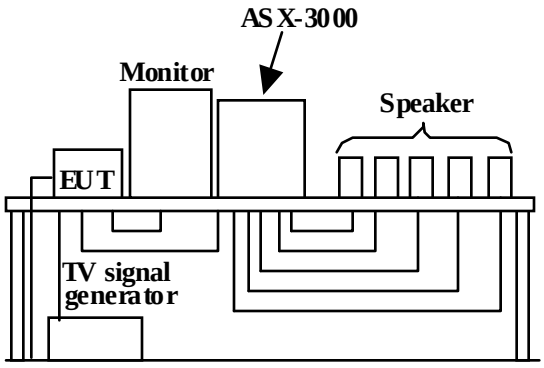


Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

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

Open area test site

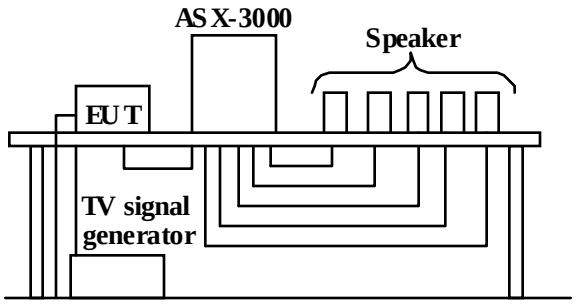


Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

VCR playback mode

Open area test site

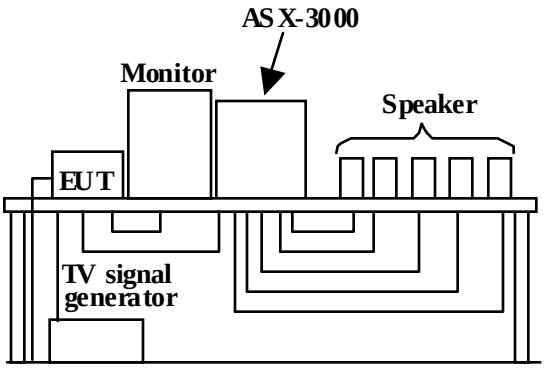


Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
Rear video out: 75 ohm terminated with video cable
Rear audio out: 1 k ohm terminated with audio cable
Rear S-video out: 75 ohm terminated with video cable
Rear component out: 75 ohm terminated with audio cable
RF output: 75 ohm terminated with RF output cable
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

DVD play mode

Open area test site



Note: DWM-3000U
RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 50 k ohm terminated
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
FM in: 75 ohm terminated
AM in: AM Ant. Connected
6ch Audio out: Powered Subwoofer connected

Note: ASX-3000
Front speaker L: Speaker connected
Front speaker R: Speaker connected
Center speaker: Speaker connected
Rear speaker L: Speaker connected
Rear speaker R: Speaker connected

6.3 Test conditions

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

6.4 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 shielded 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 and 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 TV reception mode, RM reception mode, AV input mode, VCR playback mode and DVD play 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

6.5 Test result

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

Test engineer: Hisayuki Kioka

Section 7 : Antenna terminal voltage

7.1 Operation environment

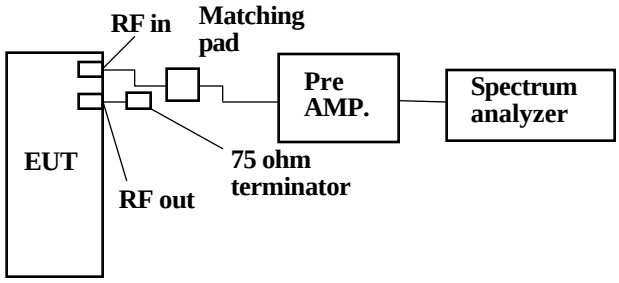
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date: August 23, 2002
Temperature: 26°C
Humidity: 60 %

7.2 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



7.3 Test conditions

Frequency range : 30 MHz – 2000 MHz
EUT position : Table top

7.4 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)

7.5 Test result

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

Test engineer: Hisayuki Kioka

Section 8 : RF output level / spurious emission

8.1 Operation environment

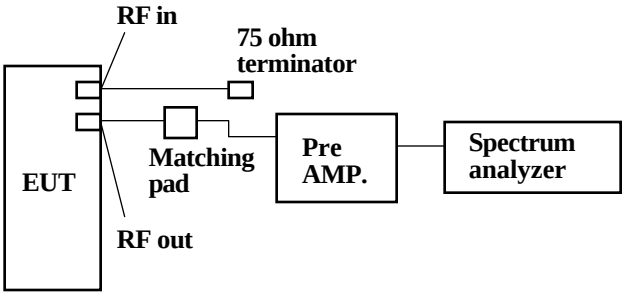
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date: August 23, 2002
Temperature: 26 °C
Humidity: 60 %

8.2 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



8.3 Test conditions

EUT position : Table top

8.4 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

8.5 Test result

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

Test engineer: Hisayuki Kioka

Section 9 : Antenna transfer switch

9.1 Operation environment

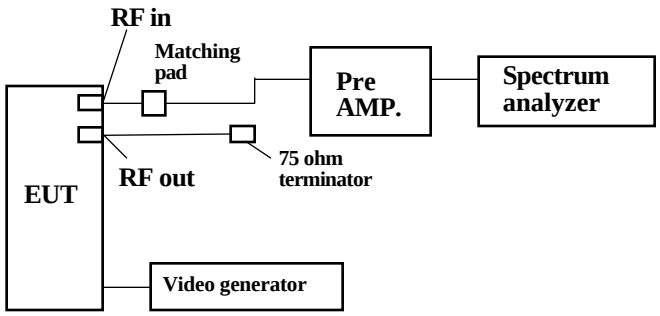
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date: August 22, 2002
Temperature: 26 °C
Humidity: 60 %

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 5 and photographs in Appendix 1.

Figure 5. Transfer switch



9.3 Test conditions

EUT position : Table top

9.4 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

9.5 Test result

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

Test engineer: Hisayuki Kioka

Section 10 : Picture sensitivity

10.1 Operation environment

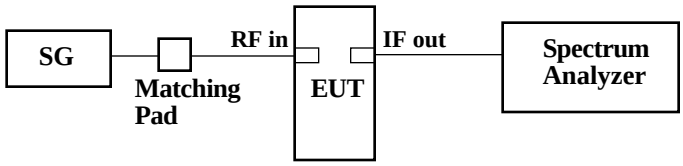
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date: August 23, 2002
Temperature: 27 °C
Humidity : 65 %

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 6 and photographs in Appendix 1.

Figure 6. Picture sensitivity



10.3 Test conditions

EUT position : Table top

10.4 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.

10.5 Test result

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

Test engineer: Hisayuki Kioka

Section 12 : Noise figure

12.1 Operating environment

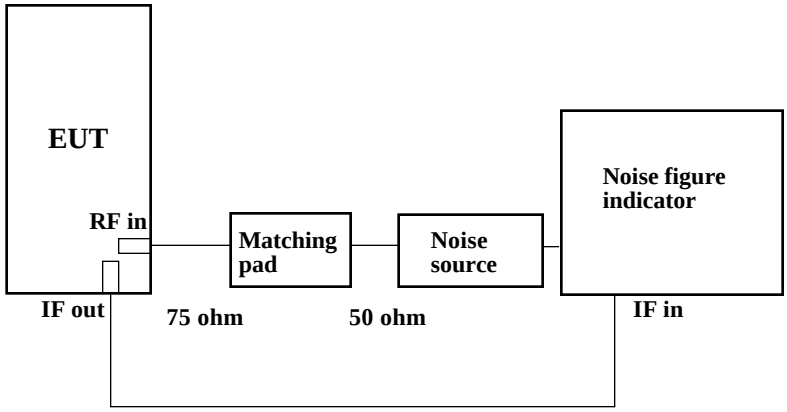
The test was carried out in a shielded room the size of 4.5 x 3.6 x 2.7 m.

Date: August 21, 2002
Temperature: 27°C
Humidity: 65 %

12.2 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



12.3 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.

12.4 Test result

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

Test engineer: Hisayuki Kioka

Appendix 1 : Photographs of test set up

Appendix 2 : Data of EMI tests

Appendix 3 : Test instruments