

EMC TEST REPORT

Test Report No. : 21IE0016-KT

Applicant : ORION ELECTRIC CO., LTD.

Type of equipment : Video cassette recorder

Model number : VHF6010C

Test standard : FCC Part 15 Subpart B

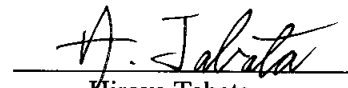
Test result : Complied

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The results in this report apply only to the sample tested.

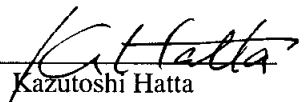
Tested by:


Hisayuki Kioka
Engineer

Tested by:


Hiroya Tabata
Engineer

Approved by:


Kazutoshi Hatta
Assistant section manager

Date of test : April 17 to April 23, 2001

Date of issue : May 02, 2001

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

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Section 1 : Client information

Company name : ORION ELECTRIC CO., LTD.
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.

Unique type identification : Video cassette recorder
Model number : VHF6010C
Serial number : -
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

2.2 Product description

ORION ELECTRIC CO., LTD., Model: VHF6010C (referred to as the EUT in this report) is a video cassette recorder.

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, 9 W
I / O terminal (Video)	:	RCA in 1Vp-p 75 ohm, RCA out 1 Vp-p 75 ohm
I / O terminal (Audio)	:	RCA in 300 mV 50 k ohm, RCA out 300 mV 1 k ohm

Section 3 : Test specification, methods & procedures

3.1 Test specification

Basic standard : FCC Part 15 Subpart B
: Radiated frequency devices
- unintentional radiators

Test methods : ANSI C63.4 : 1992
: Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.

3.2 Methods & procedures

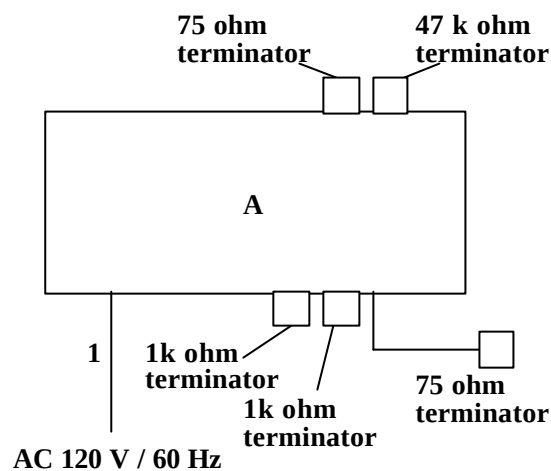
No.	Item	Test requirements	Test procedure	Limits
1	Conducted interference	FCC Part 15 Subpart B Sec. 15.107 (a)	ANSI C63.4 1992	250 uV
2	Radiated emission	FCC Part 15 Subpart B Sec. 15.109 (a)	ANSI C63.4 1992	30 – 88 MHz: 100 uV/m 88 – 216 MHz: 150 uV/m 216 – 960 MHz: 200 uV/m above 960 MHz: 500 uV/m
3	Antenna terminal voltage	FCC Part 15 Subpart B Sec. 15.111 (f)	ANSI C63.4 1992	2 nW (at 75 ohm)
4	RF output level	FCC Part 15 Subpart B Sec. 15.115 (b)	ANSI C63.4 1992	Video signal: 3000 uV Aural signal: 671 uV
	Spurious emission			94.8 uV
5	Picture sensitivity	FCC Part 15 Subpart B Sec. 15.117 (f)	ANSI C63.4 1992	8 dB
6	Noise figure	FCC Part 15 Subpart B Sec. 15.117 (g)	ANSI C63.4 1992	14 dB

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

4.1 Operating modes

- * Receive mode (0 dBmV input / 25 dBmV input)
- * AV Input mode (1 Vp-p input / 5 Vp-p input)
- * Playback mode

4.2 Configuration and peripherals



EUT and support equipment

EUT

Sign	Item	Model number	Serial number	Manufacturer
A	Video cassette recorder	VHF6010C	-	ORION ELECTRIC CO., LTD.

Support item (s)

No.	Item	Length (m)	Shielding	Manufacturer
1	AC power cable	1.75	Unshielded	-
2	RF output cable	1.50	Shielded	Supplies accessory

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Section 5 : Summary of test results

5.1 Test results

We confirmed the EUT complied to the specifications of FCC Part 15 Subpart B in the test configuration mentioned in this test report.

No.	Item	Test requirements	Limits	Results
1	Conducted Interference	FCC Part 15 Subpart B Sec. 15.107 (a)	250 uV	Passed
2	Radiated Emission	FCC Part 15 Subpart B Sec. 15.109 (a)	30 – 88 MHz: 100 uV/m 88 – 216 MHz: 150 uV/m 216 – 960 MHz: 200 uV/m above 960 MHz: 500 uV/m	Passed
3	Antenna Terminal Voltage	FCC Part 15 Subpart B Sec. 15.111 (f)	2 nW (at 75 ohm)	Passed
	RF output level	FCC Part 15 Subpart B Sec. 15.115 (b)	Video signal: 3000 uV Aural signal: 671 uV	Passed
	Spurious emission		94.8 uV	Passed
4	Picture Sensitivity	FCC Part 15 Subpart B Sec. 15.117 (f)	8 dB	Passed
5	Noise Figure	FCC Part 15 Subpart B Sec. 15.117 (g)	14 dB	Passed

5.2 Test equipments

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

5.3 Test location

A-PEX International Co.,Ltd. Kanto office EMC Laboratory
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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.

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Section 6 : Test instruments

Instruments	Manufacturer	Model No.	Control No.	Calibration date	Validity
Pre amplifier	Anritsu	MH648A	APPRA01	September 12, 2000	September 11, 2001
Pre amplifier	H.P	8447D	AF-01	November 05, 2000	November 04, 2001
Pre amplifier	Anritsu	MH648A	AF-02	October 22, 2000	October 21, 2001
Pre amplifier	H.P	8449B	AF-04	November 05, 2000	November 04, 2001
Matching pad	TME	ZT-205	APMAT02	Pre Check	
Matching pad	TME	ZT-130	APMAT05	Pre Check	
Attenuator	Anritsu	MP721B	AT-03	June 09, 2000	June 08, 2001
Attenuator	Anritsu	MP721B	AT-06	June 09, 2000	June 08, 2001
Biconical antenna	Schwarzbeck	BBA9106	BA-01	April 29, 2000	April 28, 2001
Biconical antenna	Schwarzbeck	BBA9106	BA-03	April 29, 2000	April 28, 2001
Horn antenna	A.H Systems	SAS200/571	HA-01	February 01, 2000	January 31, 2003
Logperiodic antenna	Schwarzbeck	UHALP9108-A	LA-06	April 30, 2000	April 29, 2001
Logperiodic antenna	Schwarzbeck	UKLP9140-A	LA-07	April 30, 2000	April 29, 2001
Loop Antenna	Rohde & Schwarz	HFH2-Z2	LP-01	November 04, 1999	November 03, 2002
Spectrum analyzer	Advantest	R3365	APSPA04	October 19, 2000	October 18, 2001
Spectrum analyzer	H.P	8567A	SA-01	October 22, 2000	April 21, 2001
Spectrum analyzer	H.P	8567A	SA-04	May 06, 2000	May 05, 2001
Spectrum analyzer	Advantest	R3271	SA-05	September 27, 2000	September 26, 2001
Test receiver	Rohde & Schwarz	ESHS10	APRCV01	May 15, 2000	May 14, 2001
Test receiver	Rohde & Schwarz	ESVS30	TR-02	July 14, 2000	July 13, 2001
Test receiver	Rohde & Schwarz	ESCS30	KTR-01	August 08, 2000	August 07, 2001
LISN	Schwarzbeck	NSLK8127	APLSN05	January 18, 2001	January 17, 2002
LISN	Schwarzbeck	NSLK8127	APLSN07	October 11, 2000	October 10, 2001
TV generator	Leader	408 NPS	APTVG02	Pre Check	
Noise figure indicator	Elena	ENF-2005	APNFI01	September 28, 2000	September 27, 2001

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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.

Date: 2001-04-19

Temperature : 26.4 °C

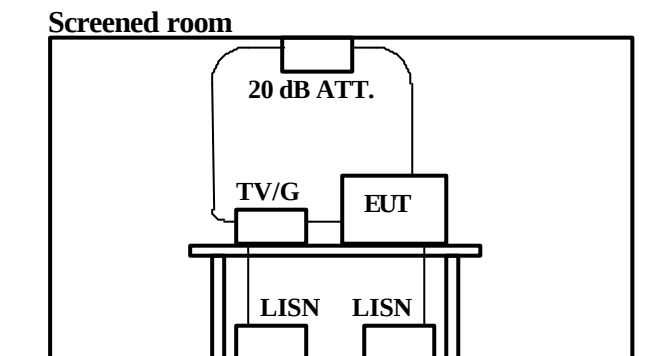
Humidity : 35 %

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 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

Front audio in: 47 k ohm terminated

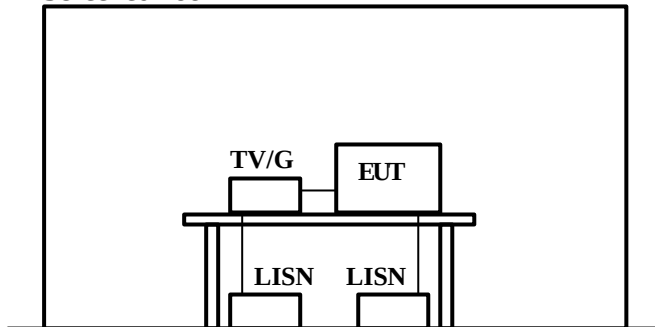
Rear video out: 75 ohm terminated

Rear audio in: 1 k ohm terminated

RF output: 75 ohm terminated

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

Screened room



Note:

RF in: 75 ohm terminated

Front video in: Video signal generator connected

Front audio in: 47 k ohm terminated

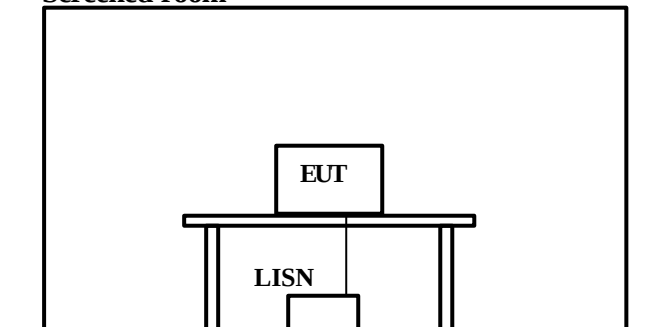
Rear video out: 75 ohm terminated

Rear audio in: 1 k ohm terminated

RF output: 75 ohm terminated

Playback mode

Screened room



Note:

RF in: 75 ohm terminated

Front video in: 75 ohm terminated

Front audio in: 47 k ohm terminated

Rear video out: 75 ohm terminated

Rear audio in: 1 k ohm terminated

RF output: 75 ohm terminated

7.3 Test conditions

Frequency range : 0.45 MHz – 30 MHz

EUT position : Table top

7.4 Test procedure

1. Put EUT on the 80 cm height non-metal table on the turn table .
2. EUT and desired signal generator should connect through 20 dB attenuator.
3. Power to the EUT should be supplied through an LISN.
4. Measurement for 0.45 MHz to 30 MHz should be performed after RF output terminal of an LISN and a spectrum analyzer are connected.

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 an open area test site the size of 10 × 20 m.

Date: 2001-04-17

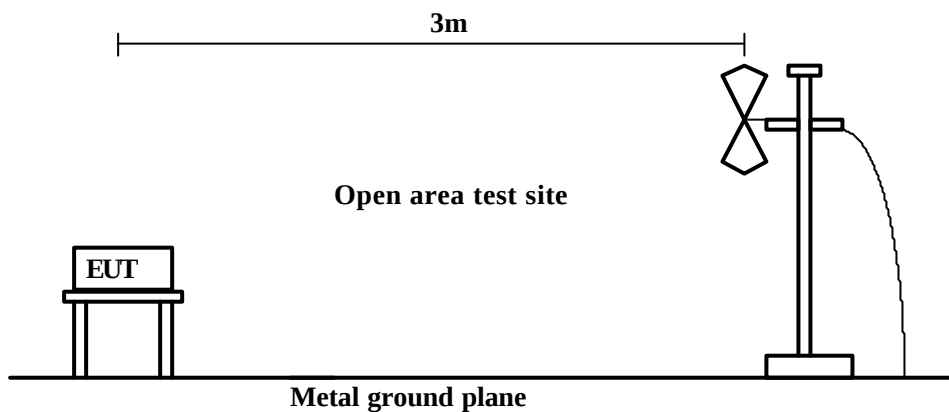
Temperature: 21.0 °C

Humidity: 38 %

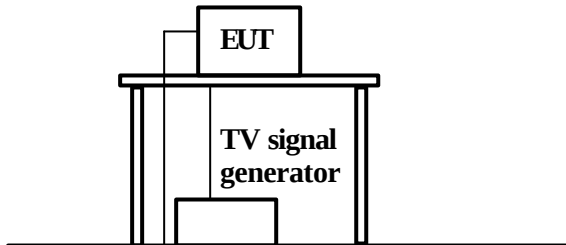
8.2 Test configuration

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 2 and photographs in Appendix 1.

Figure 2. Drawing of radiated emission



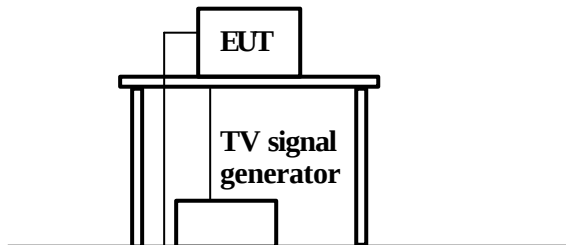
Receive + Rec. mode (0 dBmV input / 25 dBmV input)
Open area test site



Note:

RF in: TV signal generator connected
Front video in: 75 ohm terminated
Front audio in: 47 k ohm terminated
Rear video out: 75 ohm terminated
Rear audio in: 1 k ohm terminated
RF output: 75 ohm terminated

AV input + Rec. mode (1 Vp-p input / 5 Vp-p input)
Open area test site

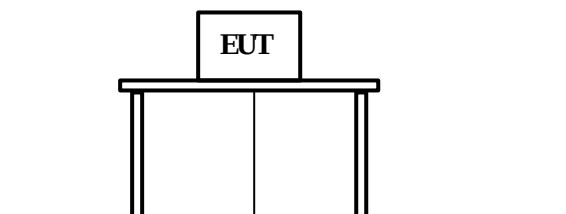


Note:

RF in: 75 ohm terminated
Front video in: Video signal generator connected
Front audio in: 47 k ohm terminated
Rear video out: 75 ohm terminated
Rear audio in: 1 k ohm terminated
RF output: 75 ohm terminated

Playback mode

Open area test site



Note:

RF in: 75 ohm terminated

Front video in: 75 ohm terminated

Front audio in: 47 k ohm terminated

Rear video out: 75 ohm terminated

Rear audio in: 1 k ohm terminated

RF output: 75 ohm terminated

8.3 Test conditions

Frequency range : 30 MHz – 2 GHz

EUT position : Table top

8.4 Test procedure

1. Put EUT on the 80 cm height non-metal table on the turn table .
2. Put receiver antenna on 3 m distance from the center of EUT.
3. Stop the rotation of turn table at the point of maximum wave of radiated emission.
4. Moving antenna from 1 to 4 m then stop at the point of maximum radiated emission.
5. Measurement should be performed for TV receiver mode and CATV receiver mode.

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.

Date: 2001-04-19

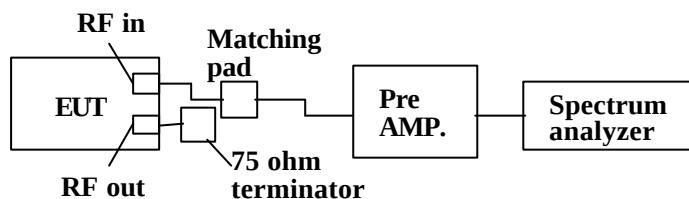
Temperature: 26.4 °C

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. Drawing of antenna terminal voltage



9.3 Test conditions

Frequency range : 30 MHz – 2000 MHz

EUT position : Table top

9.4 Test procedure

1. Connect EUT and spectrum analyzer through pre-amplifier.
2. 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.
3. Measurement should be performed for TV receiver mode and CATV receiver mode.

9.5 Test result

Passed

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

Test engineer : Hisayuki Kioka

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Section 10 : RF output level / spurious emission

10.1 Operation environment

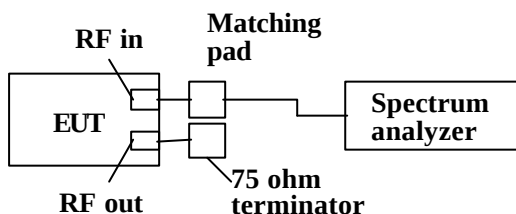
The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m.

Date: 2001-04-19	Date: 2001-04-20
Temperature: 26.4 °C	Temperature: 26.5 °C
Humidity: 35 %	Humidity: 36 %

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. Picture sensitivity



10.3 Test conditions

EUT position : Table top

10.4 Test procedure

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

10.5 Test result

Passed

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

Test engineer : Hisayuki Kioka

Section 11 : Picture sensitivity

11.1 Operation environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m.

Date: 2001-04-23

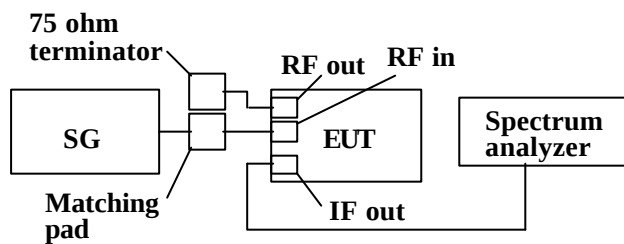
Temperature: 23.6 °C

Humidity: 33 %

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. Picture sensitivity



11.3 Test conditions

EUT position : Table top

11.4 Test procedure

1. Tune RF generator to measurement channel of the EUT.
2. Set spectrum analyzer to IF frequency and keep maximum hold. Set output of signal generator to the maximum effective level of AGC then hold the wave using IF output as a criterion.
3. Set RF generator to image frequency and adjust output level of SG to the level gained in clause 2.
4. Deduction of the result in clause 2 from the result in clause 3 shows image rejection.

11.5 Test result

Passed

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

Test engineer : Hisayuki Kioka

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Section 12 : Noise figure

12.1 Operating environment

The test was carried out in a screened room the size of $6 \times 7 \times 2.4$ m.

Date: 2001-04-23

Temperature: 23.6 °C

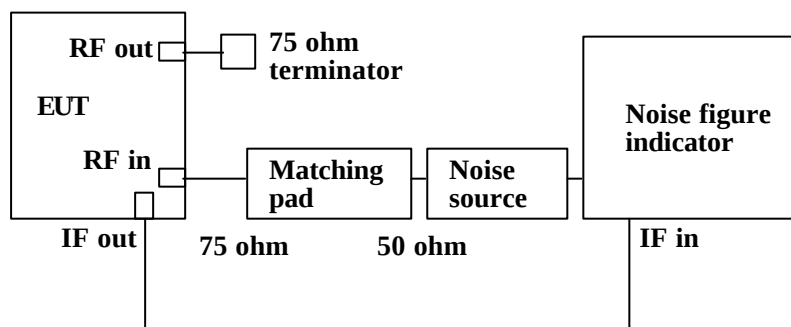
Humidity: 33 %

12.2 Test configuration

The EUT was placed on a non-metallic table.

A drawing of the set up is shown in figure 6 and photographs in Appendix 1.

Figure 6. Drawing of noise figure



12.3 Test procedure

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

This section contains the following photographs.

Page 20 : Test set up of conducted interference

Page 21 : Test set up of radiated emission

Page 22 : Test set up of antenna terminal voltage

Page 23 : Test set up of RF output level / spurious emission

Page 24 : Test set up of picture sensitivity

Page 25 : Test set up of noise figure

Appendix 2 : Data of EMI tests

This section contains the following data.

Conducted interference	: <u>A2-1 to A2-10</u>
Radiated emission	: <u>A2-11 to A2-19</u>
Antenna terminal voltage	: <u>A2-20 to A2-21</u>
RF output level / spurious emission	: <u>A2-22 to A2-36</u>
Picture sensitivity	: <u>A2-37</u>
Noise figure	: <u>A2-38</u>