EMI TEST REPORT

Test Report No. : 23BE0048-YW-1

Applicant :	Orion Electric Co., Ltd.
Type of equipment :	Video Cassette Recorder
Model number :	HR-A592U
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 : September 27 to October 5, 2002

Tested by:

Ser Blanding

Hisayuki Kioka Group Leader of EMC Seciton

Seigo Kakehi EMC Section

Approved by:

Kazutoyo Nakanishi Site Operation Manager of EMC Section

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Section 1 : Client information

Company name	:	Orion Electric Co., Ltd.
Brand Name	:	JVC
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	:	Video Cassette Recorder
Model number	:	HR-A592U
Rating	:	AC 120 V / 60 Hz
Receipt Date of Sample	:	September 27, 2002
Condition of EUT	:	Production Prototype

2.2 Product description

Orion Electronics Co., Ltd. Model: HR-A592U (referred to as the EUT in this report) is a Video Cassette Recorder. 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, 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 -8 dB 47 k ohm, RCA out -8 dB 1 k ohm

2.3 Similar apparatus

There are no similar apparatus.

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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

3.2 Procedures & results

Item	Test procedure	Limits	Worst margin	Result
Conducted emission	ANSI C63.4:1992	250 uV	6.3 dB (0.45 MHz)	Complied
	IEEE 213:1987			_
	IEEE 187:1990			
Radiated emission	ANSI C63.4:1992	30-88 MH: 100 uV/m	8.7 dB (845 MHz)	Complied
	IEEE 213:1987	88–216 MHz: 150 uV/m		
	IEEE 187:1990	216–960 MHz: 200 uV/m		
		above 960 MHz: 500 uV/m		
Antenna terminal	ANSI C63.4:1992	2 nW (at 75 ohm)	11.0 dB	Complied
voltage	IEEE 213:1987		(1549.28198 MHz)	-
-	IEEE 187:1990			
RF output level	ANSI C63.4:1992	Video signal: 3000 uV	2.4 dB (61.25 MHz)	Complied
	IEEE 213:1987	Aural signal: 671 uV		
Spurious emission	IEEE 187:1990	94.8 uV	18.7 dB (166.3 MHz)	Complied
Transfer switch	ANSI C63.4:1992	9.5 dB	4.4 dB	Complied
	IEEE 213:1987		(232.25 MHz)	
	IEEE 187:1990			
Picture sensitivity	ANSI C63.4:1992	8 dB	5.6 dB	Complied
	IEEE 213:1987			_
	IEEE 187:1990			
Noise figure	FCC/OET MP:2:1986	14 dB	7.0 dB	Complied
			(133.25 MHz)	

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 \pm 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 measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ±5.8 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 \pm 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 \pm 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 \pm 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 \pm 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 \pm 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.1 and No.2 Test site 108 Yokowa-cho, Ise-shi, Mie-ken, 516-1106 JAPAN TEL : +81 596 39 1485 FAX : +81 596 39 0232 <u>No.1 Test site</u> This site has been fully described in a report submitted to FCC office, and listed on September 12, 2002. (Registration number: 90412) *NVLAP Lab. Code : 200109-0 <u>No.2 Test site</u> 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.

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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)

* Playback mode

Operation : The EUT was tested at 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



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

Sign	Item	Model number	Serial number	Manufacturer	Remark
Α	Video Cassette Recorder	HR-A592U	-	Orion Electric Co., Ltd.	EUT
В	Remote Controller	-	-	Orion Electric Co., Ltd.	EUT

List of cable used

No.	Item	Length (m)	Shield	Backshell material
1	AC Power Cable	1.8	Ν	Polyvinyl chloride
2	AV Cable	1.5	Y	Polyvinyl chloride
3	RF Output Cable	1.0	Y	Polyvinyl chloride

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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: October 5, 2002Temperature:26°CHumidity:60 %

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 was aligned and flushed 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 cable were bundled in center. I/O cables were hanged at a 40cm 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)

Screened room



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 with video cable Rear audio out: 1 k ohm terminated with audio cable RF output: 75 ohm terminated with RF output cable

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Facsimile:

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

Screened room



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 with video cable Rear audio out: 1 k ohm terminated with audio cable RF output: 75 ohm terminated with RF output cable

Playback mode

Screened room



RF in: 75 ohm terminated Front video in: 75 ohm terminated Front audio in: 47 k ohm terminated Rear video out: 75 ohm terminated with video cable Rear audio out: 1 k ohm terminated with audio cable RF output: 75 ohm terminated with RF output cable

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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 + Rec. mode, AV input + Rec. mode and 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 : QP IF Bandwidth : 10 kHz

5.5 Test result

Passed

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

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Section 6 : Radiated emission

6.1 Operation environment

The test was carried out in an open site.

Date: September 27, 2002Temperature:22°CHumidity:68 %

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 was aligned and flushed with rear of tabletop. AC cable was bundled in center. I/O cables 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



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Facsimile:

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

Open test site



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 with video cable Rear audio out: 1 k 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 test site



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 with video cable Rear audio out: 1 k ohm terminated with audio cable RF output: 75 ohm terminated with RF output cable

Playback mode

Open test site



RF in: 75 ohm terminated Front video in: 75 ohm terminated Front audio in: 47 k ohm terminated Rear video out: 75 ohm terminated with video cable Rear audio out: 1 k ohm terminated with audio cable RF output: 75 ohm terminated with RF output cable

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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 search coil at high level of 80MHz - 90MHz,

270MHz – 290MHz and 500MHz – 700MHz in a shielded room to distinguish disturbances of EUT from the ambient noise. Measurements were performed with quasi-peak detector and average 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 + Rec. mode, AV input + Rec. mode and Playback mode.

The radiated emission measurements were made with the follow

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

		<u>30-1000MHz (Test receiver)</u>	<u>1000-2000MHz (Spectrum analyzer)</u>
Detector Type	:	QP	AV
IF Bandwidth	:	120 kHz	RBW 1 MHz / VBW 10Hz

6.5 Test result

Passed

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

Test engineer: Seigo Kakehi

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: October 5, 2002Temperature:26°CHumidity: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 was performed for Tuning mode (TV receiver mode and CATV receiver mode).

Detector Type : Peak (30-2000 MHz)

7.5 Test result

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

Test engineer: Hisayuki Kioka

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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: October 5, 2002Temperature:26 °CHumidity: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 3ch or 4ch. 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

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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: October 5, 2002Temperature:26 °CHumidity: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 3ch or 4ch. The EUT exercised AV input + Rec. mode and Playback 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

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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: October 4, 2002Temperature:25 °CHumidity :58 %

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

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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: October 5, 2002Temperature:26°CHumidity:60 %

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, Mid-band and Super-band receiver range.

12.4 Test result

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

Test engineer: Hisayuki Kioka

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Appendix 1 : Photographs of test set up

- Page 19: Test set up of conducted emission
- Page 20: Test set up of radiated emission
- Page 21: Test set up of antenna terminal voltage
- Page 22: Test set up of RF output level / spurious emission
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- Page 24: Test set up of picture sensitivity
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Appendix 2 : Data of EMI tests

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Appendix 3 : Test instruments

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Conducted emission





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Radiated emission





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Antenna terminal voltage





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RF output level / spurious emission





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Antenna transfer switch





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Picture sensitivity





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Noise figure





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