

EMISSION TEST REPORT

Test Report No. : 18J0006-02-3
Yamaha Corporation, Model: CRW4416SX
FCC Part 15 Subpart B

1. This test report shall not be reproduced except in full, without the written approval of A-Pex International Co., Ltd.
2. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.
3. This equipment is in compliance with above regulation. We hereby certify that the data are contain a true representation of the emission profile.
4. The results in this report apply only to the sample tested.
5. This test report clearly shows that EUT, CRW4416SX, CD-Rewritable Drive is in compliance with FCC Part 15 Subpart B Class B, and Industry Canada ICES-003 Issue 3, CSA C108.8 Class B, specification.

Date of test: October 5, 8, 1998

Issued date: October 19, 1998

Tested by: _____

Osamu Watatani
EMC section

Approved by: _____

Tetsuya Hashimoto
Group Leader of EMC section

Form Version No. 1



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Testing Laboratory

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1 GENERAL INFORMATION

APPLICANT : Yamaha Corporation

ADDRESS : 203 Matsunokijima, Toyooka-mura, Iwata-gun,
Shizuoka-ken, 438-0192 Japan
Tel: +81-539-62-5348
Fax: +81-539-62-5138

REGULATION(S) : FCC Part 15 Subpart B, Class B

MODEL NUMBER : CRW4416SX

SERIAL NUMBER : AAP00000004

KIND OF EQUIPMENT : CD-Rewritable Drive

TESTED DATE : October 5, 8, 1998

TEST REPORT NUMBER : 18J0006-02-3

TEST SITE : A-PEX Yokowa NO.3 Open Test Site

1.1 Product Description

Yamaha Corporation, Model CRW4416SX (referred to as the EUT in this report) is a CD-Rewritable Drive.

The clock frequency used in the EUT is 33.868MHz.

Power Supply is AC 100 240V, 50/60Hz, 0.3A

I/O terminal Front : Headphone

Rear : SCSI Interface2, Audio Line Out L & R

Model No.	Maximum Speed			Interface
	CD-R	CD-RW	Reading	
CRW4416SX	4	4	16	SCSI

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1.2 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

<u>Model</u> <u>Material</u>	<u>FCC ID</u>	<u>Description</u>	<u>Cable description</u>	<u>Backshell</u>
(1) YAMAHA M/N: CRW4416SX S/N: AAP0000004 (EUT)	A6R11F57	CD-Rewritable Drive	Shielded SCSI Cable2 Unshielded Audio Cable Unshielded AC Power Cable	P.V.C. P.V.C. P.V.C.
(2) Hewlett Packard M/N: D4553A S/N: FR71472939	N/A	PC	Unshielded AC Power Cable	P.V.C.
(3) Matsushita Electric Industrial Co., Ltd. M/N: RD-9227	N/A	Headphne	Unshielded Headphone Cable	P.V.C.
(4) Hewlett Packard M/N: E03633WLUS2-C	C1GE03633	Keyboard	Shielded Keyboard Cable	P.V.C.
(5) Hewlett Packard M/N: M-S34 S/N: LZA65242852	DZL211029	Mouse	Shielded Mouse Cable	P.V.C.
(6) Digital M/N: PCXCV-GA S/N: 1K34015842	BEJCQ472	CRT	Shielded Video Cable Unshielded AC Power Cable	P.V.C. P.V.C.
(7) EPSON M/N: P18MA S/N: OFG1007634	BKM5DEP18MA	Printer	Unshielded AC Power Cable Shielded Printer Cable	P.V.C. P.V.C.
(8) EPSON M/N: C202A S/N: 10309	BKM552C202A	Modem	Shielded Modem Cable Unshielded DC Power Cable	P.V.C. P.V.C.
(9) EPSON M/N: PAZ244OU	N/A	AC Adaptor	Unshielded DC Power Cable	P.V.C.
(10) YAMAHA M/N: CRW4A16SX S/N: AAP0000002	A6R11F57	CD-Rewritable Drive	Shielded SCSI Cable Unshielded AC Power Cable	P.V.C. P.V.C.

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1.3 Tested Methodology

Both conducted and radiated testing were performed according to the procedures in FCC/ANSI C63.4(1992). Radiated testing was performed at a distance of 3 meters from the antenna to EUT .

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on 108, Yokowa-cho, Ise-shi, Mie-ken, 516-1106 Japan.
This site has been fully described in a report dated Aug. 1, 1997 submitted to FCC office, and accepted in a letter dated Sep. 16, 1997 (31040/SIT 1300F2).

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2 SYSTEM TEST CONFIGURATION

2.1 Opearation Environment

	Conduction	Radiation
Temperature	: 22.4	: 26.4
Humidity	: 60%	: 34%
Power supply	: AC 120V/60Hz (DC 5V/12V) : AC 120V/60Hz (DC 5V/12V)	

2.2 Justification

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

2.3 EUT Exercise Software

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

The sequence is used:

Operation: Reading mode
Writing mode

Reading : Playback the recorded CD then display "H" on the CRT display continuously.
Writing : Write the data to compact disc four times speed.
Flash "W" on the CRT display.

2.4 Test Procedure

2.4.1 Tabletop Equipment Conducted Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
The rear of tabletop was located 40cm 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 80cm 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 30cm to 40cm long and 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 connectors of the LISN were resistively terminated in 50 when not connected to the measuring equipment.

2.4.2 Tabletop Equipment Radiated Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm 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 30cm to 40cm long and were hanged 40cm 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.
The measurement distance was 3m.

Figure2.1 Configuration of Tested System

Front View

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

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Top View

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

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3 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

Figure 3.1 Conducted Measurement Photos

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Figure 3.2 Radiated Measurement Photos

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3.1 Measurement Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was 3.3dB.

The data listed in this test report may exceed the test limit because it does not have enough margin (more than 3.3dB).

The data listed in this test report has enough margin, more than 3.3dB.

Conducted Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was 2.0dB.

The data listed in this test report may exceed the test limit because it does not have enough margin (more than 2.0dB).

The data listed in this test report has enough margin, more than 2.0dB.

4 CONDUCTED EMISSION DATA

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range(450KHz-30MHz).
The final data represents worst-case emissions. (Reading mode)
The minimum margin to the limit is as follows :

Frequency (MHz)	Line (N/L)	Measured (dBV)	LISN Factor(dB)	Resurt (dBV) (dBV)	Limit (dBV)	Margin
27.9344	L	47.0	-1.3	45.7	48.0	2.3

* All readings are quasi-peak mode.

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5 RADIATED EMISSION DATA

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range(30MHz-2000MHz).
 The final data was reported in the worst-case emissions. (Writing mode)
 The minimum margin to the limit is as follows :

Frequency (MHz)	Receiver Reading (dBV)	Correction Factor (dBV)	Field Strength (dBV/m)	Limit (dBV)	Margin
551.37	34.5	4.9	39.4	46.0	6.6

* 30MHz-1000MHz : All readings are quasi-peak mode.
 * 1000MHz-2000MHz : All readings are peak mode.

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5.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

$$FS = RA + AF + CF + AT - AG$$

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AT = Antenna Pad
AG = Amplifier Gain

Assume a receiver reading of 34.5 dBV is obtained. The antenna Factor of 19.5 dB, Cable Factor of 7.0 dB and Antenna Pad of 6.0 dB is added. The Amplifier Gain of 27.6 dB is subtracted, giving a field strength of 39.4 dBV/m.

$$FS = 34.5 + 19.5 + 7.0 + 6.0 - 27.6 = 39.4\text{dBV/m}$$

6 TEST EQUIPMENT USED

INSTRUMENTS	Mfr.	MODEL	C/N	Calibrated Until
Pre Amplifier	Hewlett Packard	8447D	AP1	December 12, 1998
Pre Amplifier	Anritsu	MH648A	AP2	December 11, 1998
Biconical Antenna	Schwarzbeck	BBA9106	BA1	April 3, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA2	July 6, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA5	July 6, 1999
Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA5	July 6, 1999
Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA6	July 19, 1999
Logperiodic Antenna	Schwarzbeck	UKLP9104-ALA8		August 8, 1999
LISN	Rohde & Schwarz	ESH2-Z5	LS1	December 15, 1998
LISN	Rohde & Schwarz	ESH3-Z5	LS2	December 15, 1998
LISN	Schwarzbeck	NSLK8127	LS3	December 15, 1998
LISN	Rohde & Schwarz	ESH3-Z5	LS4	December 15, 1998
LISN	Schwarzbeck	NNLK8121	LS5	December 15, 1998
LISN	Rolf Heine	NNB-4/200	LS6	December 15, 1998
LISN	Schwarzbeck	NNLK8126	LS7	December 15, 1998
Spectrum Analyzer	Hewlett Packard	8567A	SA1	December 15, 1998
Spectrum Analyzer	Hewlett Packard	8560A	SA2	December 15, 1998
Spectrum Analyzer	Hewlett Packard	8567A	SA4	December 15, 1998
Test Receiver	Rohde & Schwarz	ESHS-20	TR1	April 3, 1999
Test Receiver	Rohde & Schwarz	ESVS-30	TR2	July 5, 1999
Test Receiver	Rohde & Schwarz	ESHS-30	TR3	July 14, 1999
Test Receiver	Rohde & Schwarz	ESVS-10	TR4	July 14, 1999
Test Receiver	Rohde & Schwarz	ESHS-10	TR5	March 23, 1999
Test Receiver	Rohde & Schwarz	ESVS-10	TR6	March 23, 1999
Electro Magnetic Interference Receiver	Meb Messelektronik Berlin	SMV41	-	September 14, 1998

indicates EMI Test Equipment used.

*All measurement equipment is traceable to national standard.

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APPENDIX

A : Test Data

Conducted emissions

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Radiated emissions

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