EMISSION TEST REPORT

Test Report No. : 17F0032-02-1
Yamaha Corporation, Model: CRW4216E
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, CRW4216E, 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: June 15, 1998 **Issued date:** June 30, 1998

Tested by: _____ **Approved by:** _____

Naoki Sakamoto — EMC section

Tetsuya Hashimoto — Group Leader of EMC section

Form Version No. 1

This laboratory is registered by the NIST/NVLAP, U.S.A. The tests reported herein have been performed in accordance with its terms of registration.

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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	: CRW4216E, CRW2216E, CRW4416E (YAMAHA) CRW4216E-NB, CRW2216E-NB, CRW4416E-NB (Non-Brand) CDRW-2216 (Memorex)
SERIAL NUMBER	: -
KIND OF EQUIPMENT	: CD-Rewritable Drive
TESTED DATE	: June 15, 1998
TEST REPORT NUMBER	: 17F0032-02-1
TEST SITE	: A-PEX Yokowa NO.3 Open Test Site

1.1 Product Description

Yamaha Corporation, Model CRW4216E/CRW2216E (YAMAHA), CRW4216E-NB/CRW2216E-NB (Non-Brand) (referred to as the EUT in this report) is a CD-Rewritable Drive.

The clock frequency used in the EUT is 33.8688MHz.

Power Supply is DC 5V/ 2A, 12V/2.2A

I/O terminal Front : Headphone

Rear : IDE Interface, DC Input and Audio Output

Model No.	Maximum Speed			Interface
	CD-R	CD-RW	Reading	
CRW4216E, CRW4216E-NB	4	2	16	IDE
CRW2216E, CRW2216E-NB	2	2	16	

1.2 Tested System Details

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

Model	FCC ID	Description	Cable description	Backshell Material
(1) YAMAHA M/N: CRW4216E (EUT)	A6RCRW4216E	CD-Rewritable Drive		P.V.C.
(2) DELL M/N: DPM S/N: JLNY7	E2KXPS590XND	PC	Unshielded AC Power Cable	P.V.C.
(3) Sound Blaster M/N: SBS37	N/A	Speaker	Unshielded Speaker Cable	P.V.C.
(4) DELL M/N: SK-D100M S/N: K9412-040116	CYUM93SK	Keyboard	Shielded Keyboard Cable	P.V.C.
(5) Microsoft M/N: 31660 S/N: 151768	C3K5K5400PS2	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 S/N: -	N/A	AC Adaptor	Unshielded DC Power Cable	P.V.C.

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).

2 SYSTEM TEST CONFIGURATION

2.1 Opearation Environment

	Conduction	Radiation
Temperature	: 24	: 23
Humidity	: 67%	: 65%
Power supply	: AC 120V/60Hz (DC 5V)	: AC 120V/60Hz (DC 5V)

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.

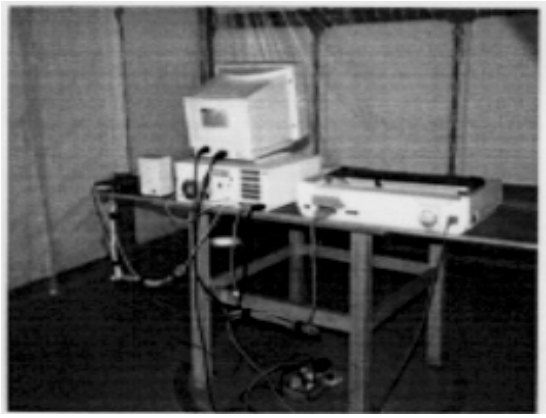
Top View

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

3 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

Figure 3.1 Conducted Measurement Photos

Figure 3.2 Radiated Measurement Photos



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. (Writing mode)
The minimum margin to the limit is as follows :

Frequency (MHz)	Line (N/L)	Measured (dBV)	LISN Factor(dB)	Limit (dBV)	Margin (dBV)
0.5000	N/L	48.2	-3.4	48.0	3.2

* All readings are quasi-peak mode.

5 RADIATED EMISSION DATA

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range(30MHz-1000MHz).
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/m)	Margin (dBV)
37.58	42.6	-6.1	36.5	40.0	3.5

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

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 42.6 dBV is obtained. The antenna Factor of 14.9 dB, Cable Factor of 1.1 dB and Antenna Pad of 6.0 dB is added. The Amplifier Gain of 28.1 dB is subtracted, giving a field strength of 36.5 dBV/m.

FS = 42.6 + 14.9 + 1.1 + 6.0 - 28.1 = 36.5dBV/m

6 TEST EQUIPMENT USED

INSTRUMENTS	Mfr.	MODEL	C/N	Calibrated Until
Pre Amplifier	Hewlett Packard	8447D	AP1	July 6, 1998
Pre Amplifier	Anritsu	MH648A	AP2	July 6, 1998
Biconical Antenna	Schwarzbeck	BBA9106	BA1	April 3, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA2	July 19, 1998
Biconical Antenna	Schwarzbeck	BBA9106	BA5	July 19, 1998
Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA5	July 19, 1998
Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA6	July 19, 1998
Logperiodic Antenna	Schwarzbeck	UKLP9104-ALA7		May 3, 1999
LISN	Rohde & Schwarz	ESH2-Z5	LS1	July 6, 1998
LISN	Rohde & Schwarz	ESH3-Z5	LS2	July 6, 1998
LISN	Schwarzbeck	NSLK8127	LS3	July 6, 1998
LISN	Rohde & Schwarz	ESH3-Z5	LS4	July 6, 1998
LISN	Schwarzbeck	NNLK8121	LS5	July 6, 1998
LISN	Rolf Heine	NNB-4/200	LS6	July 6, 1998
LISN	Schwarzbeck	NNLK8126	LS7	July 6, 1998
Spectrum Analyzer	Hewlett Packard	8567A	SA1	July 6, 1998
Spectrum Analyzer	Hewlett Packard	8560A	SA2	July 6, 1998
Spectrum Analyzer	Hewlett Packard	8567A	SA4	July 6, 1998
Spectrum Analyzer	Hewlett Packard	R3271	YTSA1	July 24, 1998
Test Receiver	Rohde & Schwarz	ESHS-20	TR1	April 3, 1999
Test Receiver	Rohde & Schwarz	ESVS-30	TR2	July 8, 1998
Test Receiver	Rohde & Schwarz	ESHS-30	TR3	July 27, 1998
Test Receiver	Rohde & Schwarz	ESVS-10	TR4	July 17, 1998
Test Receiver	Rohde & Schwarz	ESHS-10	TR5	October 14, 1998
Test Receiver	Rohde & Schwarz	ESVS-10	TR6	October 14, 1998
Electro Magnetic Interference Receiver	Meb Messelektronik Berlin	SMV41	-	September 14, 1998

indicates EMI Test Equipment used.

*All measurement equipment is traceable to national standard.

APPENDIX

A : Test Data

Conducted emissions	A1 - A7
Radiated emissions	A8 - A11

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DATA OF CONDUCTION TEST

A－P E X INTERNATIONAL CO., LTD.
YOKOWA NO.3 SITE

COMPANY	: YAMAHA CORPORATION	REPORT NO.	: 17F0032-02-1
TRADE NAME	: YAMAHA	REGULATION	: FCC Part 15 Subpart B
EQUIPMENT	: CD-ReWritable Drive	CLASS	: CLASS B
MODEL	: CRW4216E	DATE	: 06/15/1998
POWER	: AC120V/60Hz (DC5V)	LISN TYPE	: LISN(C/N:LS-01)
DESCRIPTION	: Reading	FCC ID	: A6RCRW4216E
REMARKS	:		
		ENGINEER	: NAOKI.SAKAMOTO

No	FREQ [MHz]	N QP [dBμV]	N AV [dBμV]	L QP [dBμV]	L AV [dBμV]	LISN FACTOR [dB]	RESULT QP [dBμV]	RESULT AV [dBμV]	LIMITS QP [dBμV]	LIMITS AV [dBμV]	MARGIN QP [dB]	MARGIN AV [dB]
1	0.4991	47.0	-	46.5	-	-3.4	43.6	-	48.0	-	4.4	-
2	0.5618	47.7	-	47.3	-	-3.4	44.3	-	48.0	-	3.7	-
3	0.7507	46.2	-	46.2	-	-3.4	42.8	-	48.0	-	5.2	-
4	1.1260	40.1	-	39.7	-	-3.2	36.9	-	48.0	-	11.1	-
5	2.5044	37.0	-	37.5	-	-3.3	34.2	-	48.0	-	13.8	-
6	6.2620	33.7	-	33.3	-	-2.9	30.8	-	48.0	-	17.2	-
7	12.5261	36.6	-	36.0	-	-2.1	34.5	-	48.0	-	13.5	-
8	14.6571	39.2	-	38.7	-	-1.8	37.5	-	48.0	-	10.6	-
9	19.3227	29.6	-	29.4	-	-1.5	28.1	-	48.0	-	19.9	-

SAMPLE CALCULATION :
RESULT = READING(higher data of N/L) + LISN FACTOR(include cable loss)

Except for the above table : adequate margin data below the limits.

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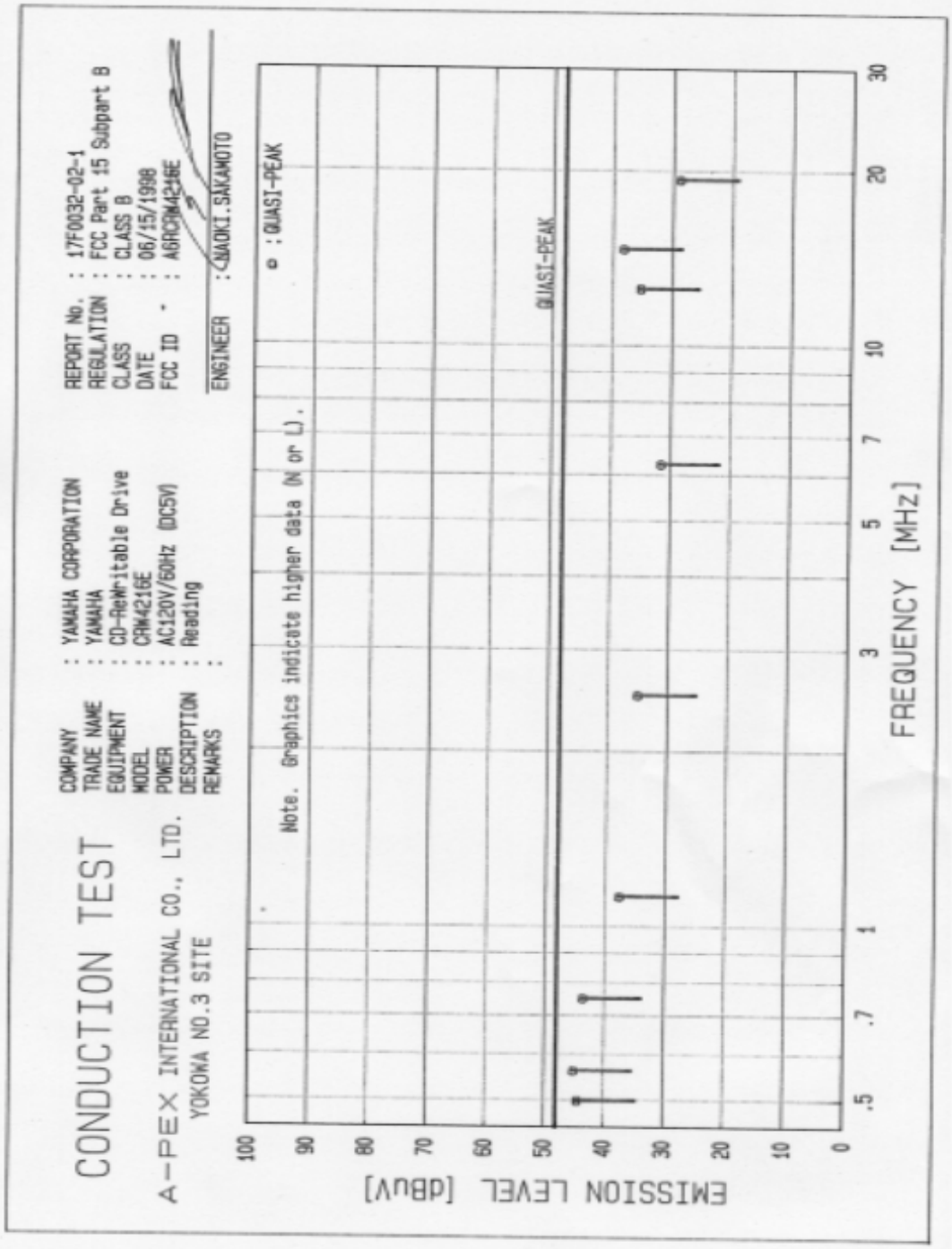

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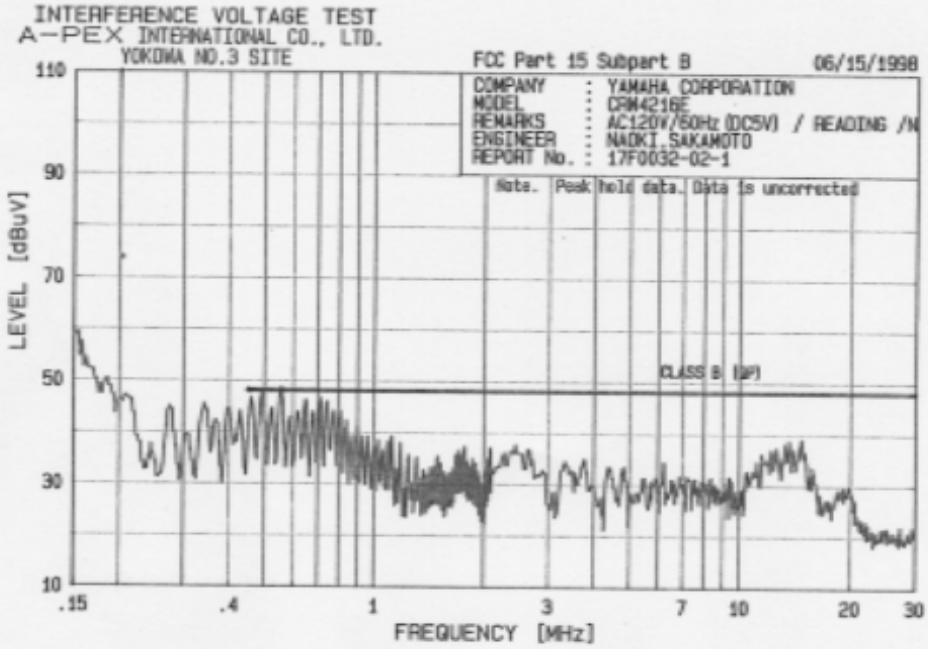

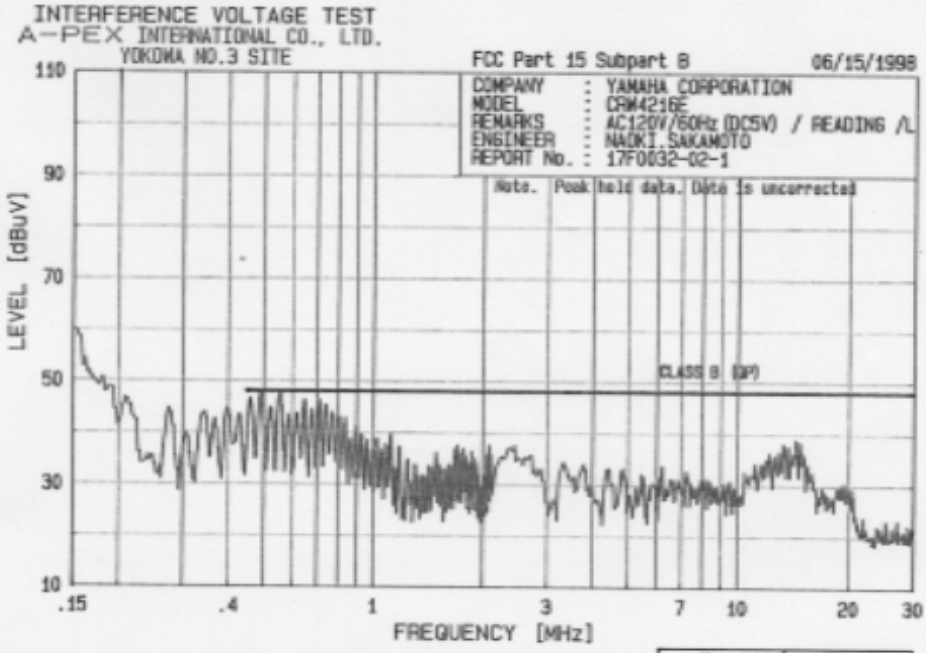

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DATA OF CONDUCTION TEST

A－P E X INTERNATIONAL CO., LTD.
YOKOWA NO.3 SITE

COMPANY	: YAMAHA CORPORATION	REPORT NO.	: 17F0032-02-1
TRADE NAME	: YAMAHA	REGULATION	: FCC Part 15 Subpart B
EQUIPMENT	: CD-ReWritable Drive	CLASS	: CLASS B
MODEL	: CRW4216E	DATE	: 06/15/1998
POWER	: AC120V/60Hz (DC5V)	LISN TYPE	: LISN(C/N:LS-01)
DESCRIPTION	: Writing	FCC ID	: A6RCRW4216E
REMARKS	:		
		ENGINEER	: NAOKI.SAKAMOTO

No	FREQ	N		L		LISN	RESULT		LIMITS		MARGIN	
		QP	AV	QP	AV	FACTOR	QP	AV	QP	AV	QP	AV
	[MHz]	[dBμV]		[dBμV]		[dB]	[dBμV]		[dBμV]		[dB]	
1	0.5000	48.2	-	48.2	-	-3.4	44.8	-	48.0	-	3.2	-
2	0.5617	48.1	-	47.9	-	-3.4	44.7	-	48.0	-	3.3	-
3	0.7515	47.3	-	47.1	-	-3.4	43.9	-	48.0	-	4.1	-
4	1.1279	40.7	-	40.7	-	-3.2	37.5	-	48.0	-	10.5	-
5	2.3778	37.3	-	37.5	-	-3.3	34.2	-	48.0	-	13.8	-
6	7.2655	32.5	-	32.4	-	-2.7	29.8	-	48.0	-	18.2	-
7	13.5295	39.6	-	39.3	-	-1.9	37.7	-	48.0	-	10.3	-
8	14.5928	40.1	-	40.1	-	-1.8	38.3	-	48.0	-	9.7	-
9	19.5423	30.1	-	30.1	-	-1.5	28.6	-	48.0	-	19.4	-

SAMPLE CALCULATION :
RESULT = READING(higher data of N/L) + LISN FACTOR(include cable loss)

Except for the above table : adequate margin data below the limits.

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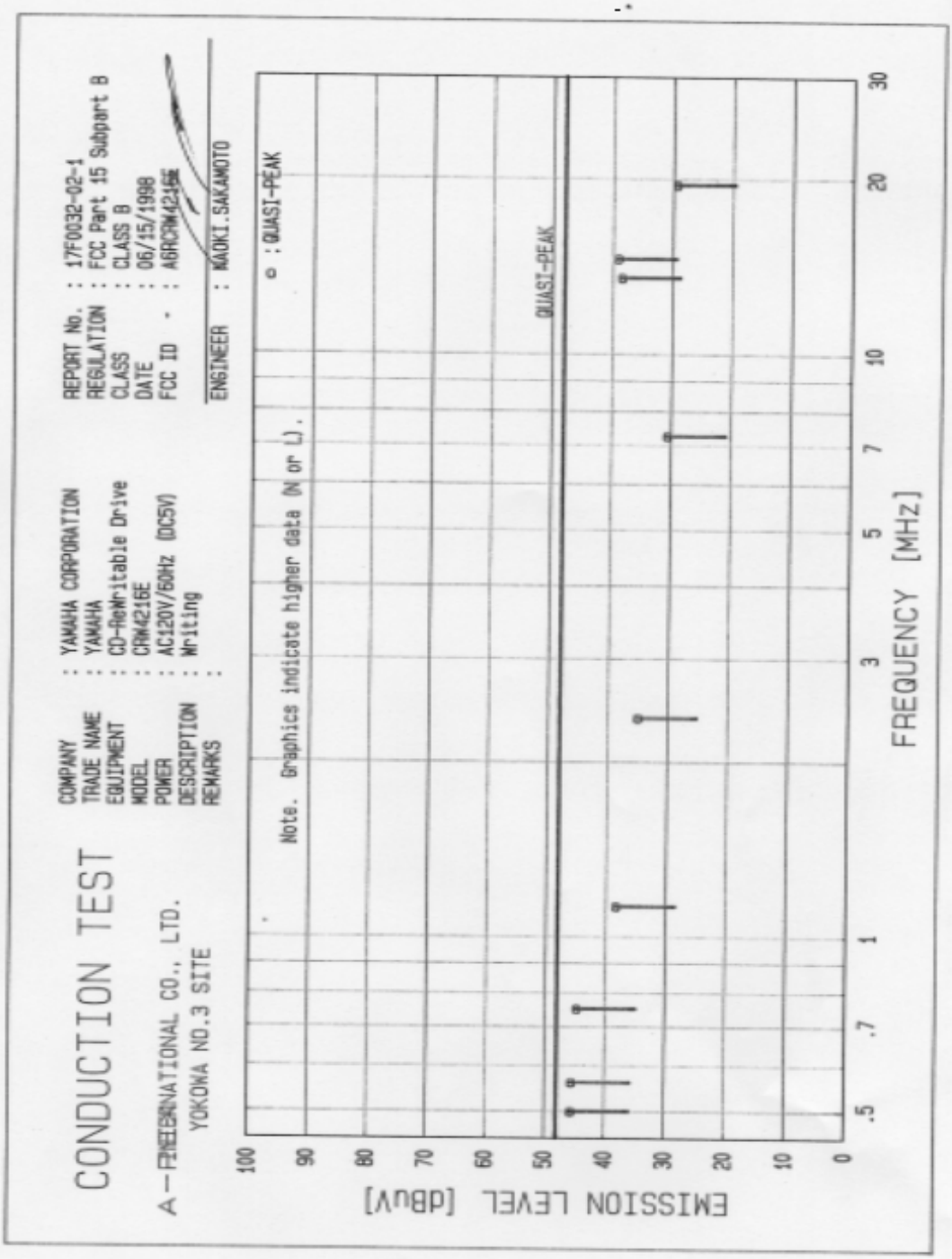

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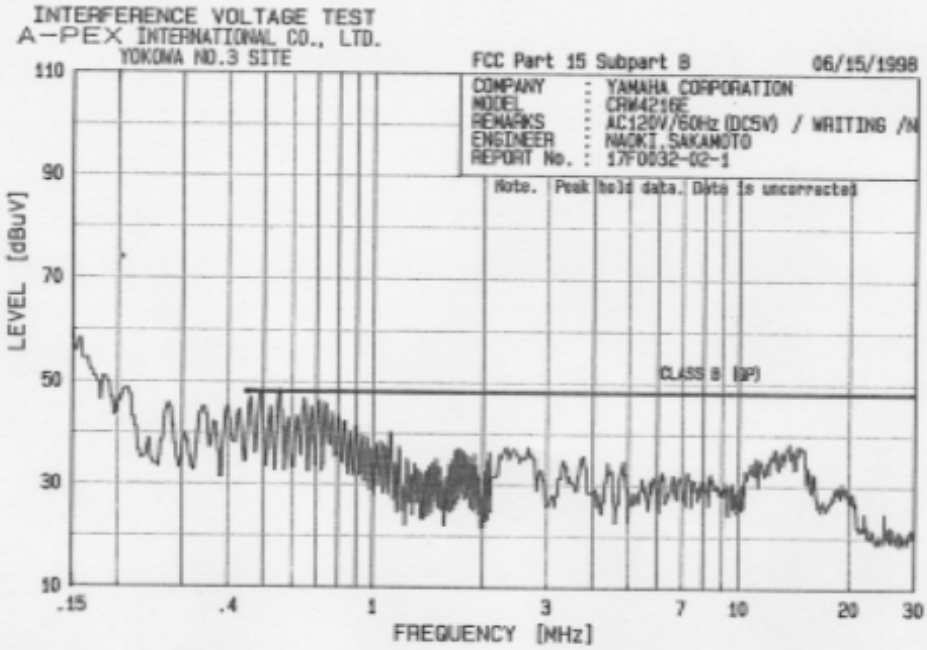

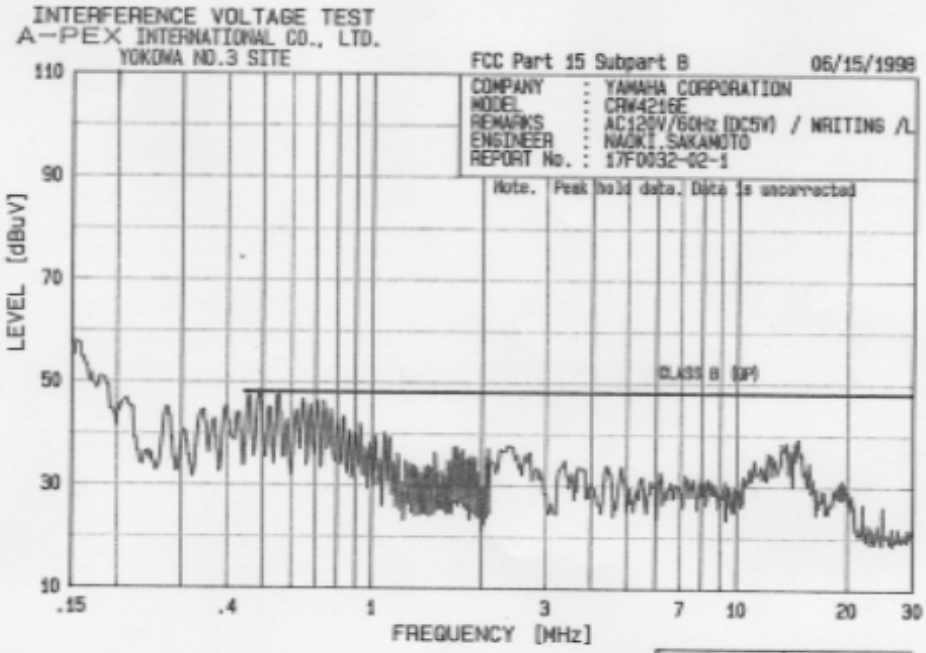

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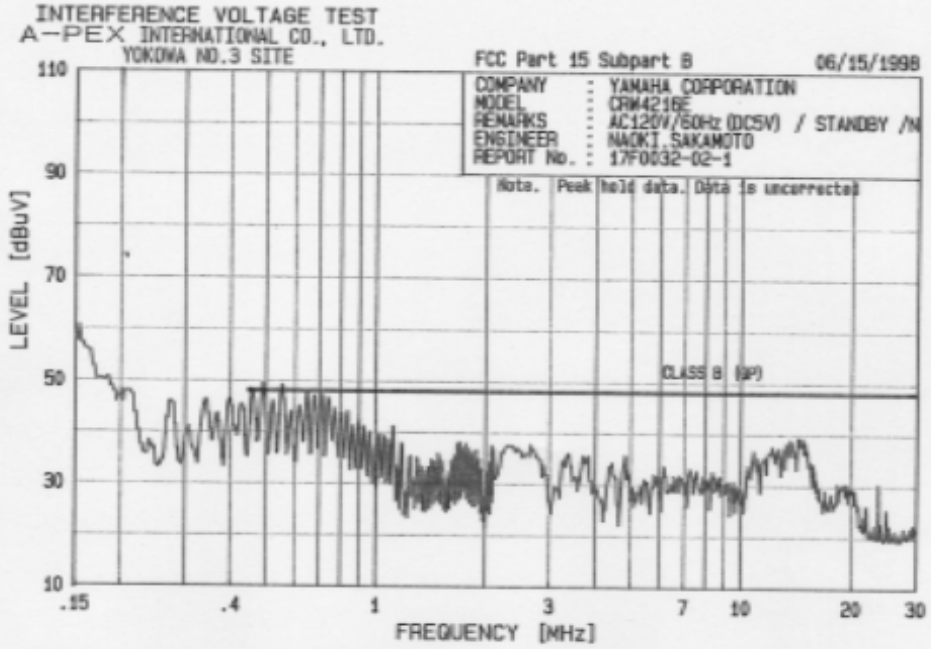

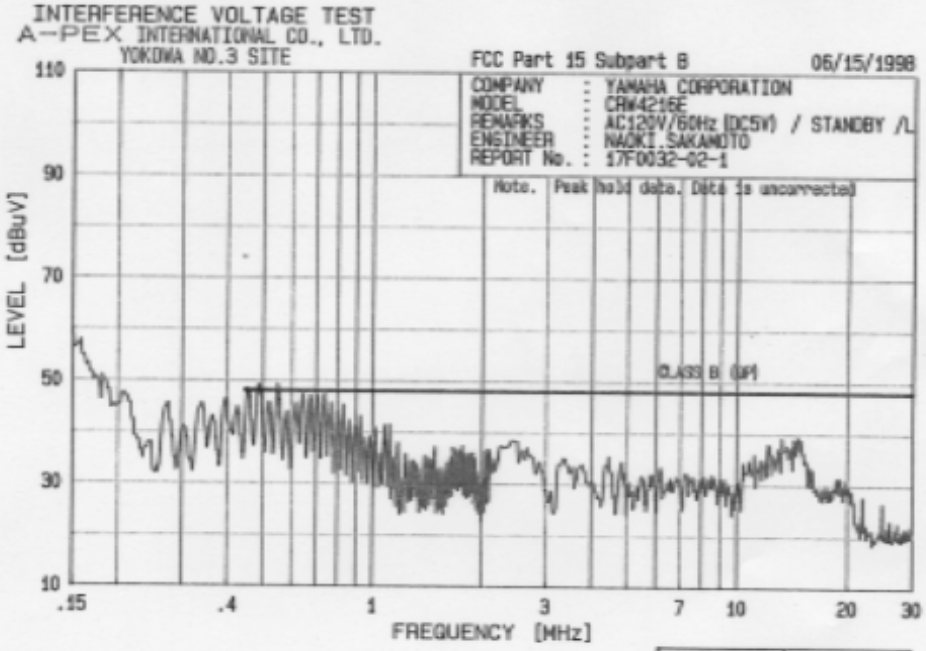

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DATA OF RADIATION TEST

A－P E X INTERNATIONAL CO., LTD.
YOKOWA NO.3 SITE

COMPANY	: YAMAHA CORPORATION	REPORT NO.	: 17F0032-02-1
TRADE NAME	: YAMAHA	REGULATION	: FCC Part 15 Subpart B
EQUIPMENT	: CD-ReWritable Drive	CLASS	: CLASS B
MODEL	: CRW4216E	TEST DISTANCE	: 3m
POWER	: AC120V/60Hz (DC5V)	ATTENUATOR	: 6dB
DESCRIPTION	: Reading	FCC ID	: A6RCRW4216E
REMARKS	:		
DATE	: 06/15/1998		

ENGINEER : NAOKI.SAKAMOTO

No	FREQ [MHz]	ANT TYPE	READING HOR [dBμV] 3m	READING VER [dBμV] 3m	ANT FACTOR [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT HOR [dBμV/m] 3m	RESULT VER [dBμV/m] 3m	FCC LIMITS [dBμV/m] 3m	MARGIN HOR [dB]	MARGIN VER [dB]
1	37.58	BC	26.7	42.5	14.9	1.1	28.1	20.6	36.4	40.0	19.4	3.6
2	53.69	BC	35.5	46.5	9.6	1.5	28.1	24.5	35.5	40.0	15.5	4.5
3	67.64	BC	46.6	44.0	5.6	1.6	28.1	31.7	29.1	40.0	8.3	10.9
4	84.53	BC	47.7	44.5	6.9	1.8	28.1	34.3	31.1	40.0	5.7	8.9
5	118.35	BC	43.0	37.9	11.7	2.3	28.1	34.9	29.8	43.5	8.6	13.7
6	142.54	BC	40.7	40.4	13.9	2.5	28.0	35.1	34.8	43.5	8.4	8.7
7	168.02	BC	39.0	35.7	15.6	2.7	28.0	35.3	32.0	43.5	8.2	11.5
8	175.43	BC	40.8	36.9	16.0	2.7	28.0	37.5	33.6	43.5	6.0	9.9
9	185.98	BC	31.2	27.9	16.6	2.8	28.0	28.6	25.3	43.5	14.9	18.2
10	219.80	BC	41.0	31.7	17.3	3.1	27.8	39.6	30.3	46.0	6.4	15.7
11	300.72	LP	40.4	38.3	16.8	3.7	27.8	39.1	37.0	46.0	6.9	9.0
12	321.24	LP	39.4	32.7	16.3	3.8	27.8	37.7	31.0	46.0	8.3	15.0

SAMPLE CALCULATION :
RESULT = READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

Except for the above table : adequate margin data below the limits.

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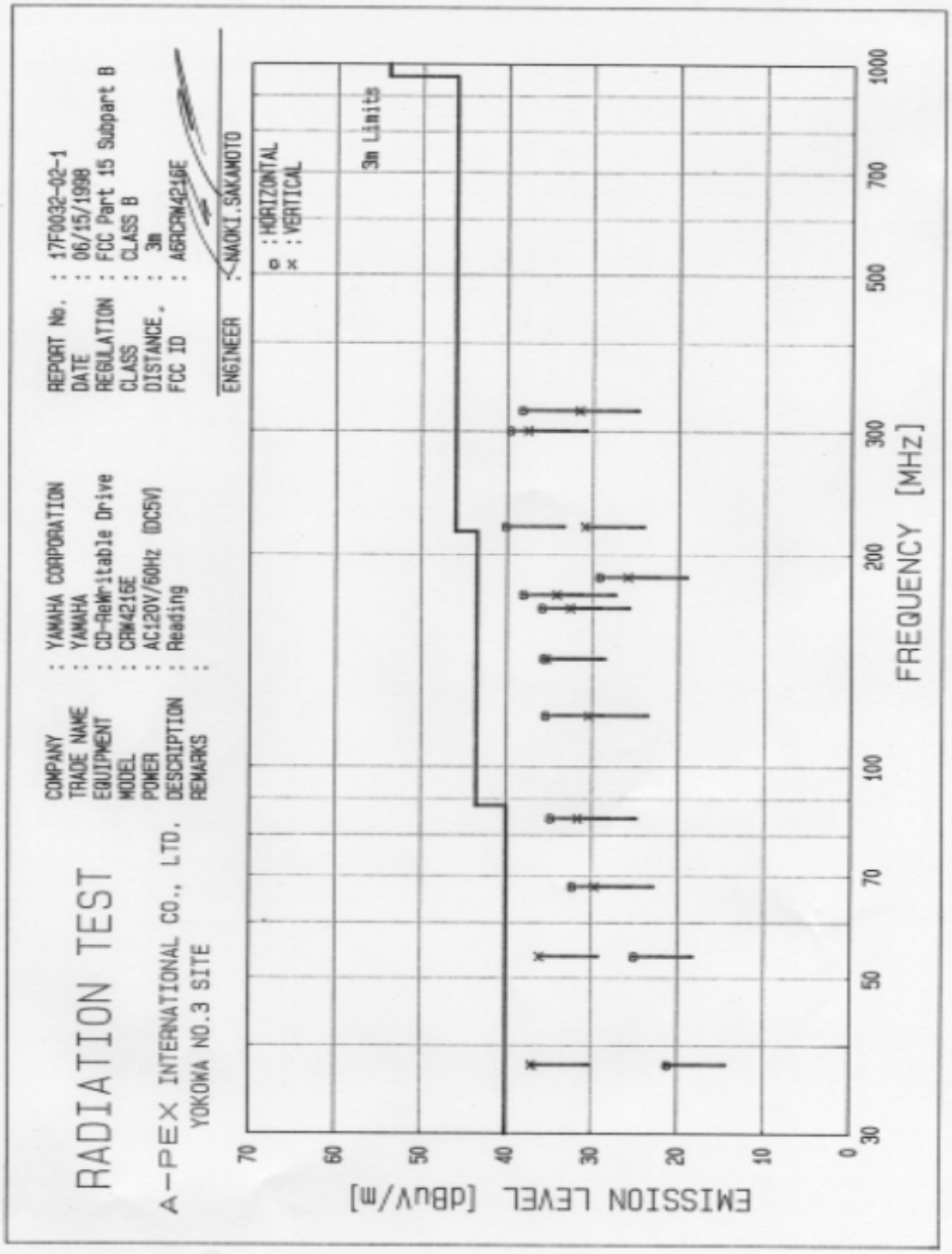

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DATA OF RADIATION TEST

A－P E X INTERNATIONAL CO., LTD.
YOKOWA NO.3 SITE

COMPANY	: YAMAHA CORPORATION	REPORT NO.	: 17F0032-02-1
TRADE NAME	: YAMAHA	REGULATION	: FCC Part 15 Subpart B
EQUIPMENT	: CD-ReWritable Drive	CLASS	: CLASS B
MODEL	: CRW4216E	TEST DISTANCE	: 3m
POWER	: AC120V/60Hz (DC5V)	ATTENUATOR	: 6dB
DESCRIPTION	: Writing	FCC ID	: A6RCRW4216E
REMARKS	:		
DATE	: 06/15/1998		
		ENGINEER	: NAOKI.SAKAMOTO

No	FREQ [MHz]	ANT TYPE	READING HOR [dBμV] 3m	READING VER [dBμV] 3m	ANT FACTOR [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT HOR [dBμV/m] 3m	RESULT VER [dBμV/m] 3m	FCC LIMITS [dBμV/m] 3m	MARGIN HOR [dB]	MARGIN VER [dB]
1	37.58	BC	27.1	42.6	14.9	1.1	28.1	21.0	36.5	40.0	19.0	3.5
2	53.67	BC	34.5	47.0	9.6	1.5	28.1	23.5	36.0	40.0	16.5	4.0
3	67.65	BC	45.7	43.2	5.6	1.6	28.1	30.8	28.3	40.0	9.2	11.7
4	84.54	BC	47.6	43.4	6.9	1.8	28.1	34.2	30.0	40.0	5.8	10.0
5	118.35	BC	44.0	37.6	11.7	2.3	28.1	35.9	29.5	43.5	7.6	14.0
6	142.52	BC	41.2	37.8	13.9	2.5	28.0	35.6	32.2	43.5	7.9	11.3
7	168.01	BC	38.3	34.7	15.6	2.7	28.0	34.6	31.0	43.5	8.9	12.5
8	175.42	BC	39.8	37.2	16.0	2.7	28.0	36.5	33.9	43.5	7.0	9.6
9	185.99	BC	37.2	28.9	16.6	2.8	28.0	34.6	26.3	43.5	8.9	17.2
10	219.80	BC	38.8	32.0	17.3	3.1	27.8	37.4	30.6	46.0	8.6	15.4
11	300.73	LP	41.4	37.1	16.8	3.7	27.8	40.1	35.8	46.0	5.9	10.2
12	321.24	LP	39.9	31.4	16.3	3.8	27.8	38.2	29.7	46.0	7.8	16.3

SAMPLE CALCULATION :
RESULT = READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

Except for the above table : adequate margin data below the limits.

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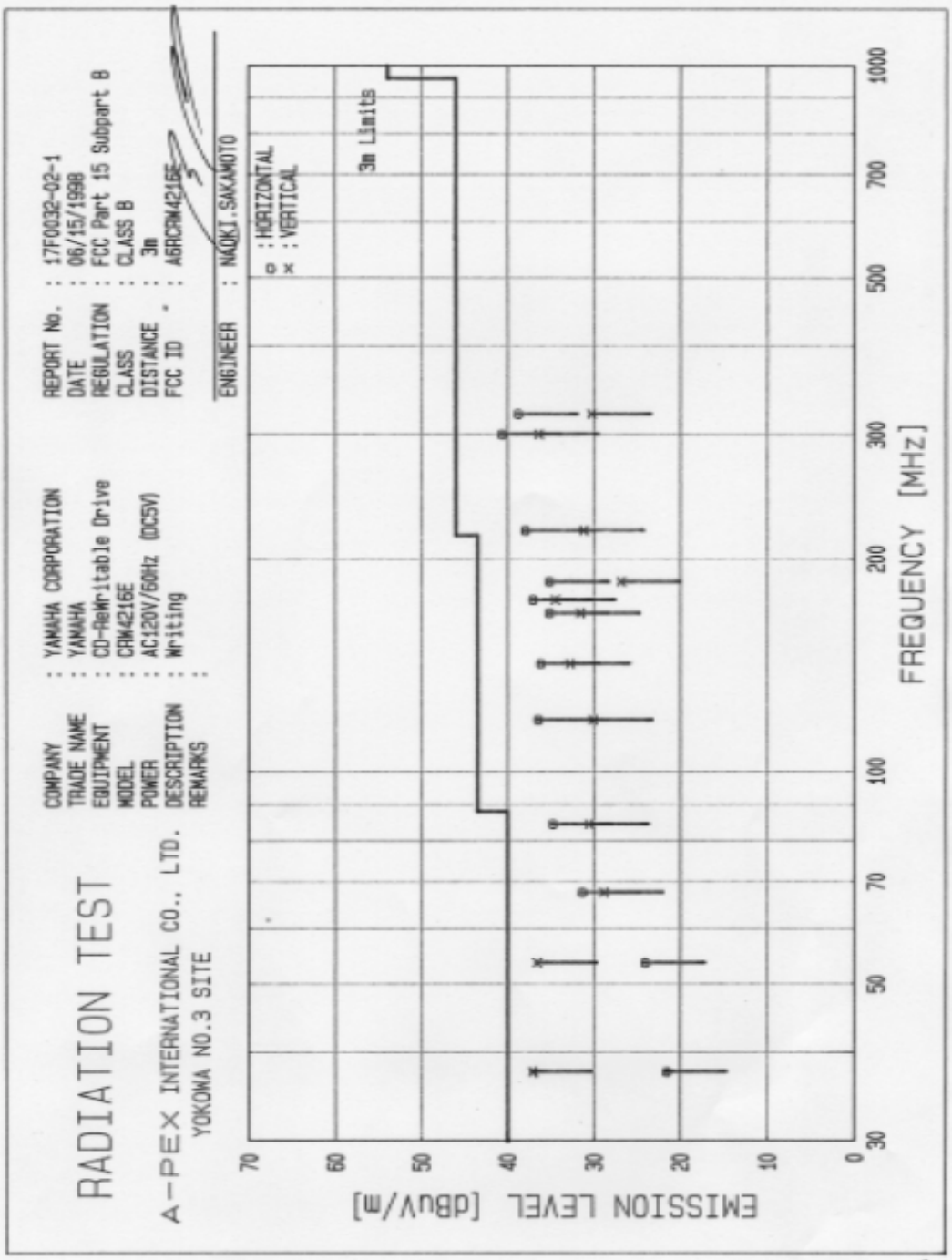

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