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SEIKO EPSON CORPORATION

RFI MEASUREMENT TEST REPORT

FCC PART 15B CLASS B

Test
Report

***** CLASS B PERSONAL COMPUTERS AND PERIPHERALS *****

APPLICANT : SEIKO EPSON CORPORATION

EQUIPMENT : PRINTER

TRADE NAME : EPSON

MODEL NUMBER : P954A

FCC ID NUMBER : BKMFBP954A

TEST REPORT No. : E-103-98461

NVLAP[®]

NVLAP LAB CODE 200157-0

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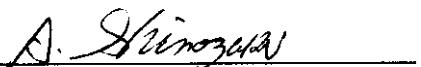
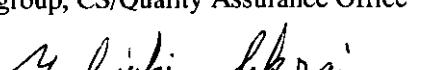
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TEST CERTIFICATION

Applicant Information

Company : SEIKO EPSON Corporation
Division/Section : TP Product Safety Design Group
Address : 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan
PHONE : +81-263-53-6024 FAX : +81-263-53-3544

Test Performed

Company	: SEIKO EPSON Corporation
Division/Section	: EMC Group, CS/Quality Assurance Office
Location	: 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan PHONE: +81-263-52-5094 FAX: +81-263-54-5806 10 meter Semi-anechoic Chamber
	FCC File No. : 31040 / SIT 1300F2
	NVLAP Lab Code : 200157-0
Test started	: 19 December, 1998
Test completed	: 21 December, 1998
Purpose of test	: Compliance with standards
Test specification(s)	: FCC Part 15B Class B (Unintentional Radiators)
Test procedure(s)	: ANSI C63.4-1992
Test engineer	: Takeshi Ono  Chief Engineer, EMC group, CS/Quality Assurance Office
Report checked by	: Atsushi Shinozaki  Chief Engineer, EMC group, CS/Quality Assurance Office
Report approved by	: Yoshiyuki Sakurai  Manager, EMC group, CS/Quality Assurance Office, NVLAP s
Report issue date	: 24 December, 1998

The test item under the test conditions and configuration shown in this test report complies with above standard.

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1. DETAILED DESCRIPTION OF TEST ITEM

1-1 Equipment Under Test (EUT)

Kind of equipment	: Printer
Shape	: Table-top type
Manufacturer	: SEIKO EPSON Corporation
Trade Name	: EPSON
Model Number	: P954A
FCC ID	: BKMFBP954A
Serial Number	: 000002
Voltage input	: AC 120 V / 60 Hz
Rated current	: 0.4 A
Port(s) / Connector(s)	: Parallel (Centronics)
Oscillator(s) / Crystal(s)	: 25 MHz, 14 MHz, 32.768 kHz
Maximum used frequency	: 25 MHz
Remarks	: -

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1-2 Auxiliary equipment (AE)

AE	Name	Model (Serial number)	Manufacturer	FCC ID	Voltage input Power consumption	
1	Personal computer	D6612A (SG84303082)	Hewlett-Packard Company	N/A (DoC)	AC 120 V/ 60 Hz 6.0 A	a)
		D6530-WJ101 (SG83801728)		N/A (DoC)	AC 120 V/ 60 Hz 6.0 A	b)
2	CRT monitor	D2825 (MY83441847)	Hewlett-Packard Company	JVP7154E	AC 120 V/ 60 Hz 2.0 A	a)
		D2825 (MY83033379)		JVP7154E	AC 120 V/ 60 Hz 2.0 A	b)
3	Keyboard	SK-2502 (M981089476)	Hewlett-Packard Company	GYUR41SK	DC 5.0 V 60 mA	a) c)
		SK-2502 (M980900357)		GYUR41SK	DC 5.0 V 60 mA	b) c)
4	Mouse	M-S34 (LZB83964125)	Hewlett-Packard Company	DZL211029	DC 5.0 V 15 mA	a) c)
		M-S34 (LZM82377061)		DZL211029	DC 5.0 V 15 mA	b) c)
5	Printer	P850A (1YLY185764)	SEIKO EPSON Corp.	BKMP850A	AC 120 V/ 60 Hz 1.0 A	

- a) For conducted emission test
- b) For radiated emission test
- c) Supplied from personal computer(AE1)

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1-3 Relevant Signal and Power lines

AE = Auxiliary equipment, EUT = Equipment Under Test = Test item

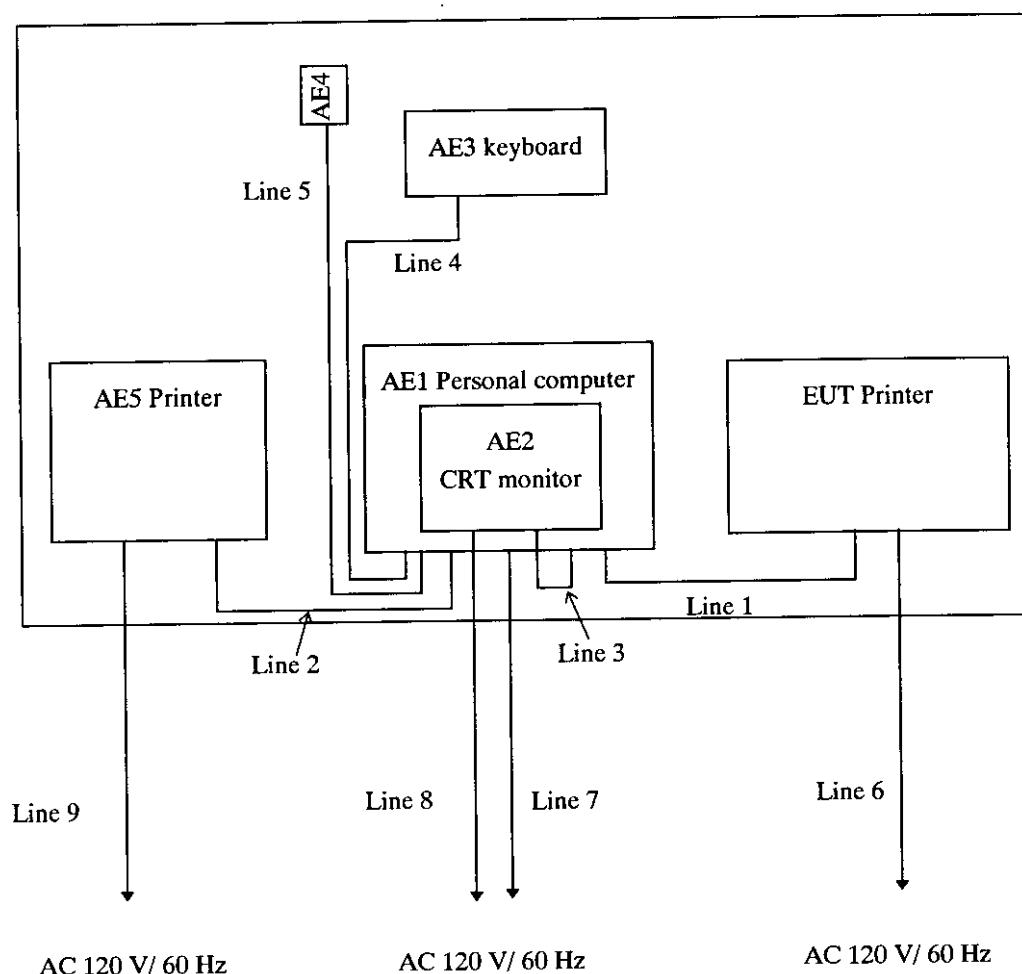
Line	Name	From	To	Length	Shield	Remarks
1	Parallel I/F cable	EUT Parallel in	AE1 Parallel out	2.0 m	Yes	Metal connector
2	Serial I/F cable	AE5 Serial in	AE1 Serial out	2.0 m	Yes	Metal connector
3	Video I/F cable	AE2 Video in	AE1 Video out	1.4 m	Yes	Metal connector
4	Keyboard I/F cable	AE3 Keyboard	AE1 Keyboard out	1.8 m	Yes	Metal connector
5	Mouse I/F cable	AE4 Mouse	AE1 Mouse out	1.8 m	Yes	Metal connector
6	Printer AC cable	EUT AC 120 V	Main AC 120 V	2.0 m	No	
7	Computer AC cable	AE1 AC 120 V	Main AC 120 V	2.2 m	No	
8	CRT AC cable	AE2 AC 120 V	Main AC 120 V	2.2 m	No	
9	Printer AC cable	AE5 AC 120 V	Main AC 120 V	2.0 m	No	

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1-4 Positioning of Equipment

Testing table top view



Abbreviations shown in the above diagram correspond to equipment or cables in tables in Section 1-1, 1-2, 1-3.

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2. OPERATING CONDITIONS

The EUT has been operated under the following conditions during the tests.

2-1 Operating modes

The EUT continuously prints character 'H' via the parallel interface (line 1) with below operating cycles.

2-2 Operating cycles

Performed following operation continuously.

- 1: The Data transferred from computer(AE1)
- 2: 'H' characters printed by EUT
- 3: 'H' characters displayed on the full screen of monitor (AE2)
- 4: 'H' characters printed by printer(AE5)



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3. TEST PROCEDURE(S)

These tests have been carried out with the test procedure(s) drawn up by our laboratory based on the following test procedure(s).

Test Item	Test procedure used	Scanned Frequency Range
Conducted Emission	ANSI C63.4 - 1992	0.45 - 30 MHz
Radiated Emission	ANSI C63.4 - 1992	30 - 1000 MHz

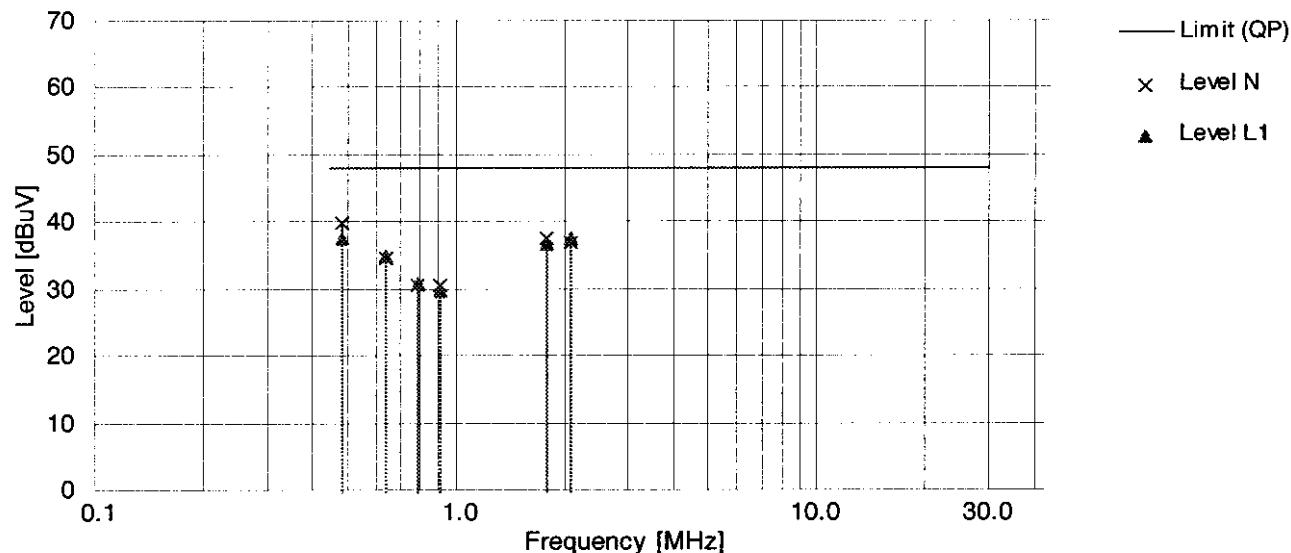
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4. EVALUATION OF TEST RESULTS**4-1 Conducted Emission Test**

Kind of Equipment	:	Printer	Temperature	:	24 °C
Model Name	:	P954A	Humidity	:	40 %
Serial No.	:	000002	Engineer	:	T. Ono
Comment	:	Parallel I/F			
Detector	:	QP	Date	:	98/12/21
Points	:	6	EMI Receiver(s)	:	R/S ESH 2

Limit : [FCC] Class B



Frequency [MHz]	Reading N		Reading L1		QP-AVE [dB]	QP/AVE [dB]	Correction Factor [dB]	Level N [dBuV]	Level L1 [dBuV]	Limit [dBuV]	Margin [dB]
	QP [dBuV]	AVE [dBuV]	QP [dBuV]	AVE [dBuV]							
0.4848	39.7	-	37.3	-	-	-13	0.2	39.9	37.5	48.0	8.1
0.6441	34.5	-	34.7	-	-	-	0.2	34.7	34.9	48.0	13.1
0.7885	30.3	-	30.5	-	-	-	0.2	30.5	30.7	48.0	17.3
0.9013	30.2	-	29.3	-	-	-	0.2	30.4	29.5	48.0	17.6
1.7823	37.3	-	36.4	-	-	-	0.2	37.5	36.6	48.0	10.5
2.0941	36.8	-	37.2	-	-	-	0.2	37.0	37.4	48.0	10.6

Note : All other frequencies in the range from 450 kHz to 30 MHz have emission level of more than 10 dB below the limit.

Level = Reading + Correction Factor

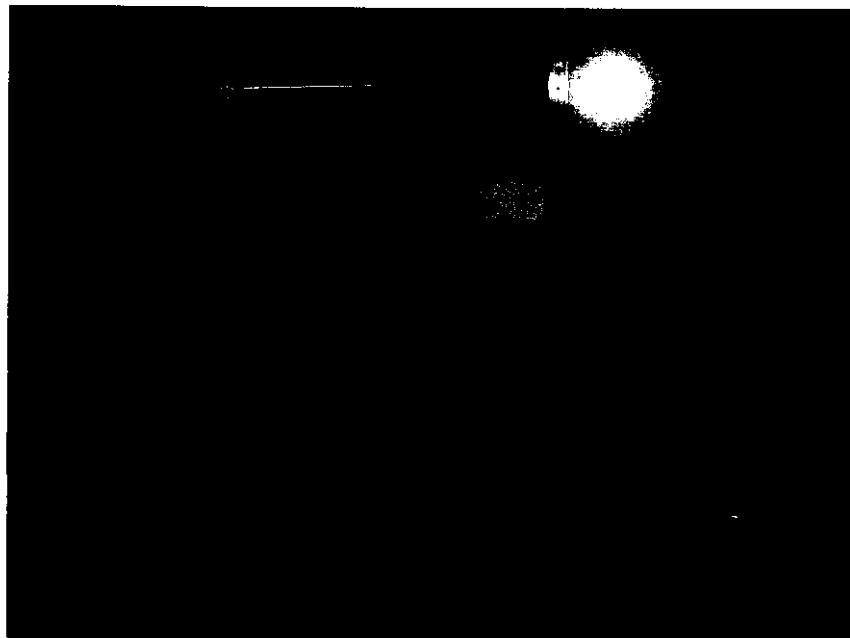
Correction Factor = LISN factor + Cable Loss

Level is rounded off to one decimal place.

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4-2 Photographs of Conducted Emission Test



Front view



Rear view

Test set-up complies with ANSI C63.4 - 1992

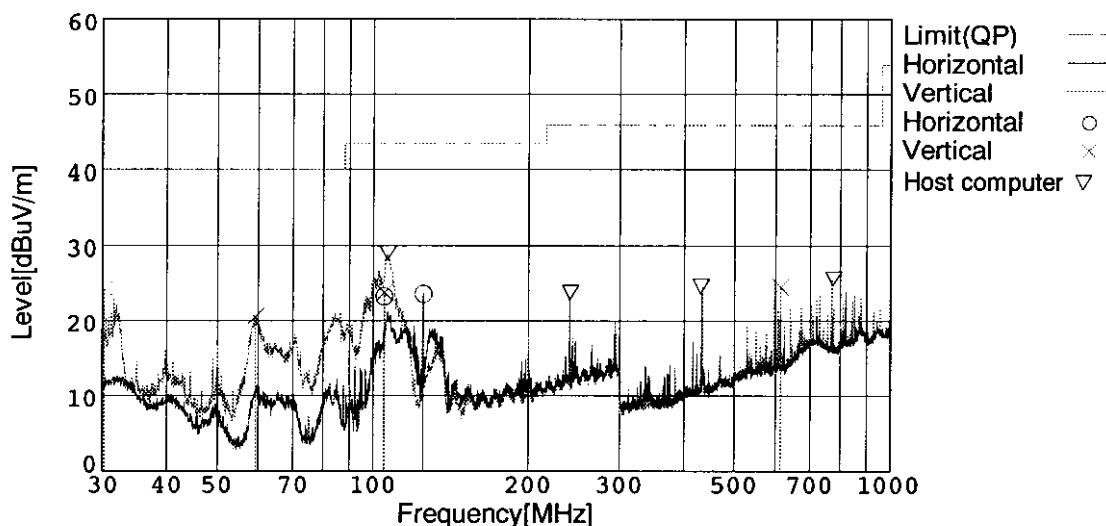
This configuration of the equipment and cable produce the highest conducted emissions.

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4-3 Radiated Emission Test

Kind of Equipment : Printer Temperature : 19.7 °C
 Model Name : P954A Humidity : 42 %
 Serial No. : 000002 Engineer : T. Ono
 Comment : Parallel I/F
 Detector : QP Date : 1998/12/19 16:22
 Points : 6 EMI Receiver(s) : ESCS30
 Limit: [FCC] Class B<3m>



Frequency [MHz]	Meter Reading [dBuV]	Ant. Type	Antenna Factor [dB]	Total Loss [dB]	Level [dBuV/m]	Angle [degree]	Height [cm]	Pola.	Limit [dBuV/m]	Margin [dB]
30.305	26.1	BC	18.6	-20.5	24.2	91	100	Vert.	40.0	15.8
59.260	31.8	BC	8.5	-19.7	20.6	225	100	Vert.	40.0	19.4
105.030	31.7	BC	10.3	-18.8	23.2	334	275	Hori.	43.5	20.3
105.170	32.2	BC	10.3	-18.8	23.7	169	100	Vert.	43.5	19.8
125.033	28.5	BC	13.6	-18.6	23.5	0	242	Hori.	43.5	20.0
612.627	20.4	LP	18.5	-14.5	24.4	166	100	Vert.	46.0	21.6

Note : All other frequencies in the range from 30 MHz to 1000 MHz have emission level of more than 10 dB below the limit.

Level = Meter Reading + Antenna Factor + Total Loss (Total Loss = Cable Loss + Antenna Pad Loss - Amplifier Gain)

Level is rounded off to one decimal place.



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5. SUMMARY

5-1 Test Results

This test report clearly shows that the EUT complies with the FCC Part 15B Class B specification.

The minimum margins to the limits are as follows:

- Conducted measurement	8.1 dB	at	0.4848 MHz
- Radiation measurement	15.8 dB	at	30.305 MHz

This data represent the worst case emissions.

5-2 Sample Calculations

5-2-1 Conducted Emission

Example 0.4848 MHz

Emission Level	=	Meter Reading	39.7 dBuV
	+	Correction Factor	+ 0.2 dB
	=		39.9 dBuV

Margin	=	Limit	48.0 dBuV
	-	Emission Level	- 39.9 dBuV
	=		8.1 dB

Meter reading = Test receiver reading

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 30.305 MHz

Emission Level	=	Meter Reading	26.1 dBuV
	+	Antenna Factor	+ 18.6 dB
	+	Total Loss	- 20.5 dB
	=		24.2 dBuV/m

Margin	=	Limit	40.0 dBuV/m
	-	Emission Level	- 24.2 dBuV/m
	=		15.8 dB

Meter reading = Test Receiver reading

The numerical values are rounded off to one decimal place.

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6. LIST OF UTILIZED TEST EQUIPMENT**6-1 Conducted Emission Measurement**

Instrument	Manufacturer	Model Number	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	Hewlett Packard	8567A	2718A00363	April 28, 1998	1 Year
Quasi-peak Adapter	Hewlett Packard	85650A	2521A00798	April 3, 1998	1 Year
Test Receiver	Rhode & Schwarz	ESH2	879013/027	April 1, 1998	1 Year
LISN	Rhode & Schwarz	ESH2-Z5	890484/004	September 4, 1998	1 Year

6-2 Radiated Emission Measurement

Instrument	Manufacturer	Model Number	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	Hewlett Packard	8566B	2332A02675	August 24, 1998	1 Year
Quasi-peak Adapter	Hewlett Packard	85650A	2043A00284	August 24, 1998	1 Year
Pre-amplifier	Hewlett-Packard	87405A	3207A00888	March 18, 1998	1 Year
Test Receiver	Rhode & Schwarz	ESCS30	826547/029	August 19, 1998	1 Year
Biconical Antenna	Schwarzbeck	BBA9106	-	October 26, 1998	1 Year
Log-periodic Antenna	EMCO	3146	9712-4989	October 28, 1998	1 Year

Note : The utilized instruments are calibrated by a body that can provide traceability to a national standard.

The abbreviation of antenna types which indicate on the radiated emission test table are follows:

BC : Biconical Antenna LP : Log-periodic Antenna

6-3 Measurement Uncertainties

Measurement uncertainties are shown as below.

Conducted Emission Measurement	± 2.33 dB
Radiated Emission Measurement	5.15 dB / -4.56 dB

Repeating and reproducing maximum emission set-up are not discussed herein.

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7. VALIDITY OF TEST REPORT

- 1: The test result of this report is effective for equipment under test itself and test configuration described on the report.
- 2: This test report shall not be reproduced without the written approval of the laboratory.
- 3: This test report must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government.