

EPSON

SEIKO EPSON CORPORATION

FCC ID : BKMFBP923A

TEST CERTIFICATION

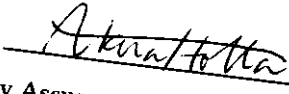
Applicant Information

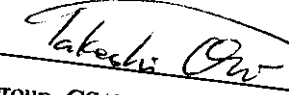
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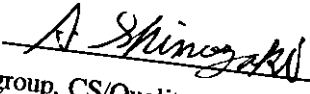
Test Performed

Company : SEIKO EPSON Corporation
Division/Section : EMC Group, CS/Quality Assurance Office
Location : 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan
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10 meter Semi-anechoic Chamber

FCC File No. : 31040 / SIT 1300F2
NVLAP Lab Code : 200157-0
Test started : 2 December, 1998
Test completed : 3 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 : Akira Hotta

EMC group, CS/Quality Assurance Office

Report checked by : Takeshi Ono

Chief Engineer, EMC group, CS/Quality Assurance Office

Report approved by : Atsushi Shinozaki

Chief Engineer, EMC group, CS/Quality Assurance Office, NVLAP signatory

Report issue date : 9 December, 1998

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

RFI MEASUREMENT TEST REPORT
FCC PART 15B CLASS B

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

APPLICANT : SEIKO EPSON CORPORATION
EQUIPMENT : PRINTER
TRADE NAME : EPSON
MODEL NUMBER : P923A
FCC ID NUMBER : BKMFBP923A
TEST REPORT No. : E-103-98411



NVLAP LAB CODE 200157-0

Report

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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 : P923A
FCC ID : BKMFBP923A
Serial Number : 23GU000051
Voltage input : AC 120 V / 60 Hz
Rated current : 1.1 A
Port(s) / Connector(s) : Parallel (Centronics)
Serial (RS-232C)
Serial (RS-232C, Optional)
Oscillator(s) / Crystal(s) : 19.66 MHz
Maximum used frequency : 19.66 MHz
Remarks : With Cut sheet feeder (C80684), Serial I/F card (C82307)

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1-2 Auxiliary equipment (AE)

AE	Name	Model (Serial number)	Manufacturer	FCC ID	Voltage input Power consumption	
1	Cut sheet feeder	C80684 (000043)	SEIKO EPSON Corp.	N/A	DC 35 V 900 mA DC 5.0 V 170 mA	a)
2	Serial I/F card	C82307 (N/A)	SEIKO EPSON Corp.	BKMC82307	DC 5.0 V 160 mA	a)
3	Personal computer	D3394B (SG60400519)	Hewlett-Packard Company	K4UVECTRAVL5	AC 120 V/ 60 Hz 3.0 A	c)
		D6530-WJ101 (SG83801728)		N/A (DoC)	AC 120 V/ 60 Hz 6.0 A	d)
4	CRT monitor	D2806B (AR54482848)	Hewlett-Packard Company	CSYSC-528UXH	AC 120 V/ 60 Hz 0.7 A	c)
		D2825 (MY83033379)		JVP7154E	AC 120 V/ 60 Hz 2.0 A	d)
5	Keyboard	C3755B#ABJ (60552232)	Hewlett-Packard Company	AQ6ZG-RT687XT	DC 5.0 V 300 mA	c)
		SK-2502 (M980900357)		GYUR41SK	DC 5.0 V 60 mA	b)d)
6	Mouse	M-S28 (LTC52900219)	Hewlett-Packard Company	DZL210472)	DC 5.0 V 125 mA	c)
		M-S34 (LZM82377061)		DZL211029	DC 5.0 V 15 mA	b)d)
7	Printer	P850A (1YLY185764)	SEIKO EPSON Corp.	BKMP850A	AC 120 V/ 60 Hz 1.0 A	

- a) EUT option
- b) Supplied from AE3
- c) For conducted emission test
- d) For radiated emission test

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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 / AE7 Parallel in	AE3 Parallel out	2.0 m	Yes	Metal connector
2	Serial I/F cable	AE7 Serial in / EUT Serial in	AE3 Serial out	2.0 m	Yes	Metal connector
3	Serial I/F cable	AE2 Serial in	AE3 Serial out	2.0 m	Yes	Metal connector
4	Cut sheet feeder I/F	AE1 Signal in	EUT Signal out	0.2 m	Yes	Metal connector
5	Video I/F cable	AE4 Video in	AE3 Video out	1.4 m	Yes	Metal connector
6	Keyboard I/F cable	AE5 Keyboard	AE3 Keyboard out	2.9 m (a)	Yes	Metal connector
				1.8 m (b)		
7	Mouse I/F cable	AE6 Mouse	AE3 Mouse out	1.8 m	Yes	Metal connector
8	Printer AC cable	EUT AC 120 V	Main AC 120 V	2.0 m	No	
9	Computer AC cable	AE3 AC 120 V	Main AC 120 V	2.2 m	No	
10	CRT AC cable	AE4 AC 120 V	Main AC 120 V	2.0 m	No	
11	Printer AC cable	AE7 AC 120 V	Main AC 120 V	2.0 m	No	

Note : Line 4 (cut sheet feeder I/F) has a ferrite core permanently attached.

Line 5 (video I/F cable for D2806B) has a ferrite core permanently attached.

a) Keyboard, model C3755B#ABJ

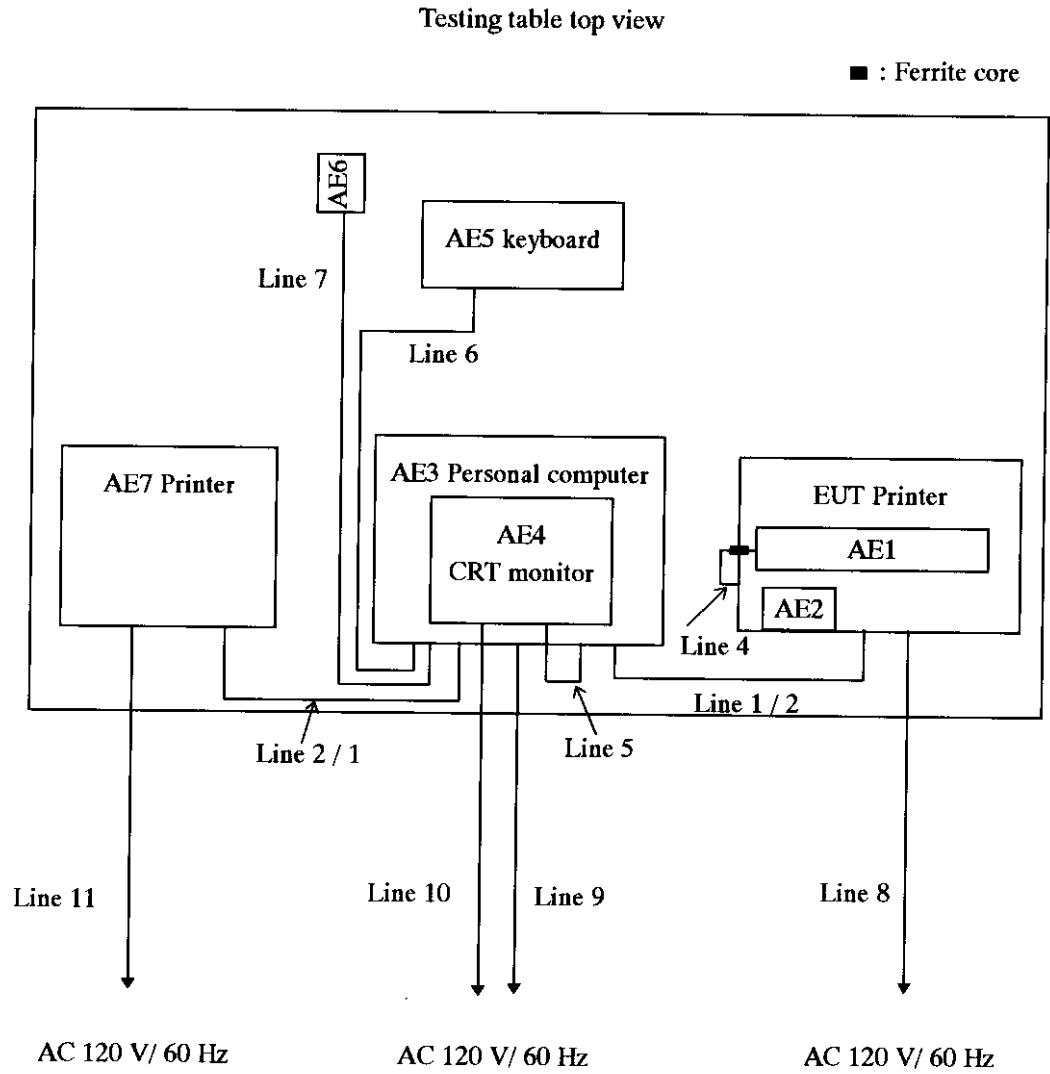
b) Keyboard, model SK-2502

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1-4 Positioning of Equipment

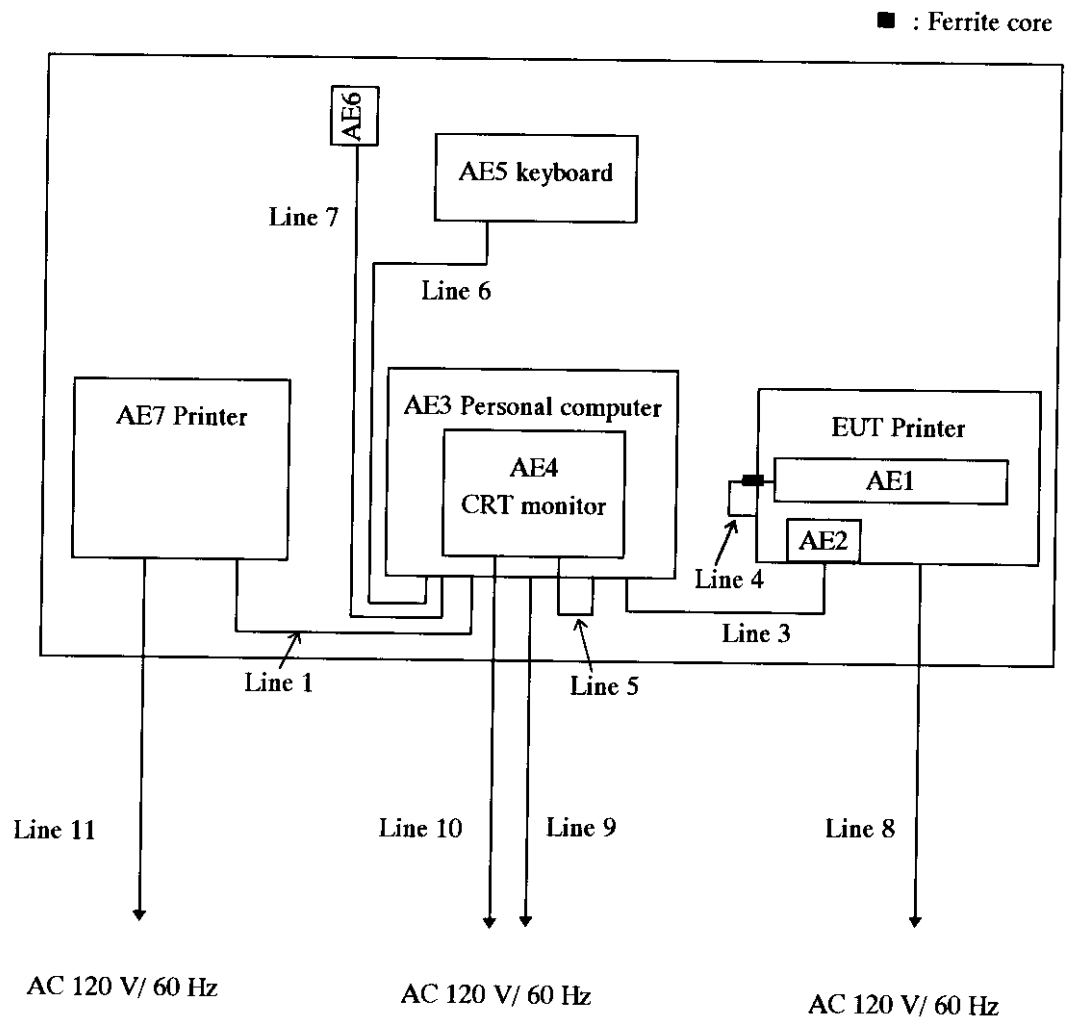
Configuration 1



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

Configuration 2

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

Mode 1 : Parallel interface

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

Mode 2 : Serial interface

The EUT continuously prints character 'H' via the serial interface (line 2) with below operating cycles in configuration 1.

Mode 3 : Option serial interface

The EUT continuously prints character 'H' via the option serial interface (line 3) with below operating cycles in configuration 2.

2-2 Operating cycles

Performed following operation continuously.

- 1: The Data transferred from computer(AE3)
- 2: 'H' characters printed by EUT
- 3: 'H' characters displayed on the full screen of monitor (AE4)

Note : The data transfer rate on the serial I/F(RS-232C) and option serial I/F(RS-232 C) is 9600 bps.

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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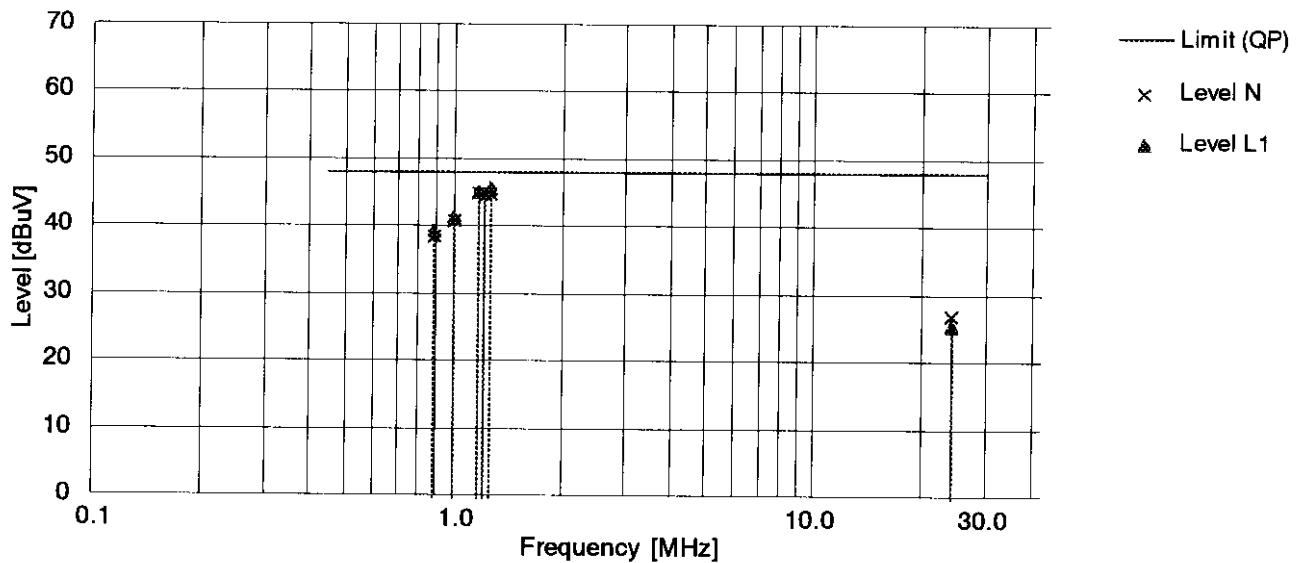
4. EVALUATION OF TEST RESULTS

4-1 Conducted Emission Test

Mode 1 : Parallel interface

Kind of Equipment	: Printer	Temperature	: 24 °C
Model Name	: P923A	Humidity	: 40 %
Serial No.	: 23GU000051	Engineer	: A. Hotta
Comment	: Parallel I/F		
Detector	: QP	Date	: 98/12/3
Points	: 6	EMI Receiver(s)	: R/S ESH 2

Limit : [FCC] Class B



Frequency [MHz]	Reading N		Reading L1		QP-AVE [dB]	QP/AVE -13 [dB]	Correction Factor [dB]	Level N [dBuV]	Level L1 [dBuV]	Limit [dBuV]	Margin [dB]
	QP [dBuV]	AVE [dBuV]	QP [dBuV]	AVE [dBuV]							
0.8781	38.0	-	39.0	-	-	-	0.2	38.2	39.2	48.0	8.8
1.0047	40.5	-	41.0	-	-	-	0.2	40.7	41.2	48.0	6.8
1.1768	44.5	-	44.7	-	-	-	0.2	44.7	44.9	48.0	3.1
1.2147	44.7	-	44.5	-	-	-	0.2	44.9	44.7	48.0	3.1
1.2573	44.5	-	45.5	-	-	-	0.2	44.7	45.7	48.0	2.3
24.1347	25.5	-	24.0	-	-	-	1.3	26.8	25.3	48.0	21.2

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

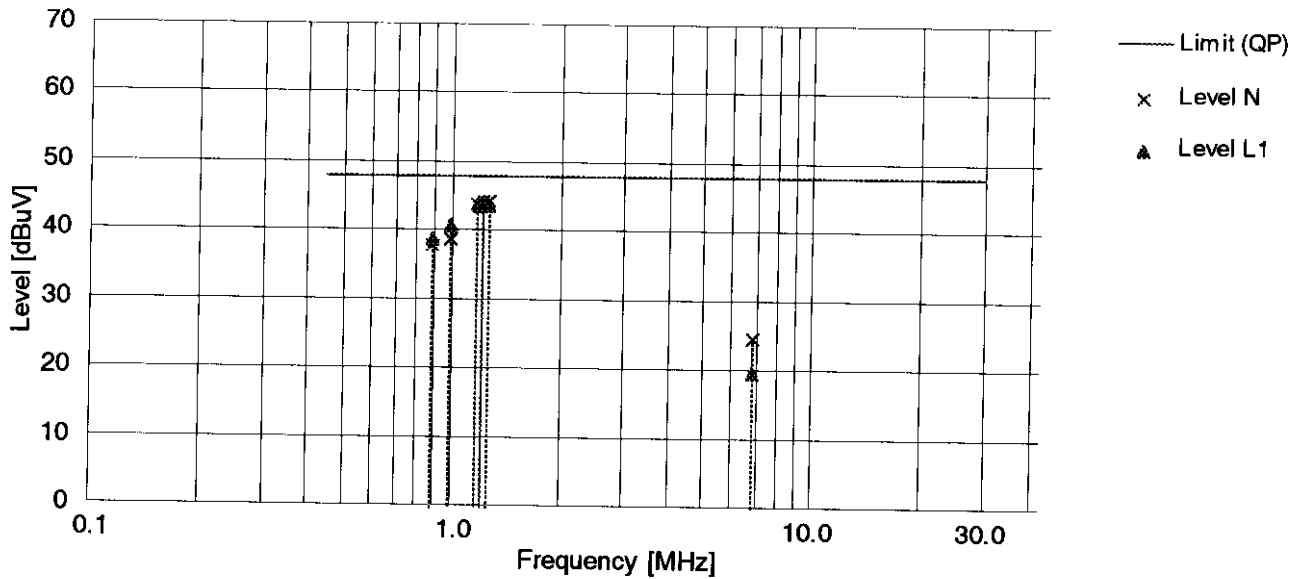
Level is rounded off to one decimal place.

Mode 2 : Serial interface

Kind of Equipment : Printer
 Model Name : P923A
 Serial No. : 23GU000051
 Comment : Serial I/F
 Detector : QP
 Points : 6

Temperature : 24 °C
 Humidity : 40 %
 Engineer : A. Hotta
 Date : 98/12/3
 EMI Receiver(s) : R/S ESH 2

Limit : [FCC] Class B



Frequency [MHz]	Reading N		Reading L1		QP-AVE [dB]	QP/AVE -13 [dB]	Correction Factor [dB]	Level N [dBuV]	Level L1 [dBuV]	Limit [dBuV]	Margin [dB]
	QP [dBuV]	AVE [dBuV]	QP [dBuV]	AVE [dBuV]							
0.8782	37.5	-	38.5	-	-	-	0.2	37.7	38.7	48.0	9.3
0.9957	38.5	-	40.5	-	-	-	0.2	38.7	40.7	48.0	7.3
1.1761	43.5	-	43.5	-	-	-	0.2	43.7	43.7	48.0	4.3
1.2143	44.0	-	44.0	-	-	-	0.2	44.2	44.2	48.0	3.8
1.2606	44.0	-	43.5	-	-	-	0.2	44.2	43.7	48.0	3.8
6.8285	24.0	-	19.0	-	-	-	0.5	24.5	19.5	48.0	23.5

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.

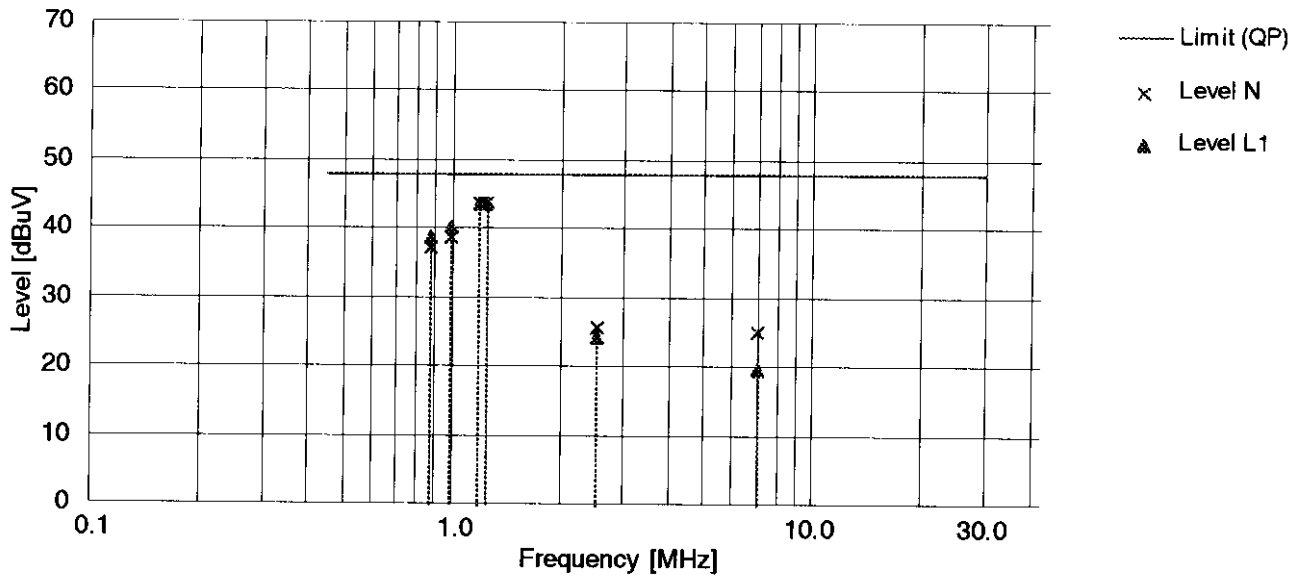


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Mode 3 : Option serial interface

Kind of Equipment	: Printer	Temperature	: 24 °C
Model Name	: P923A	Humidity	: 40 %
Serial No.	: 23GU000051	Engineer	: A. Hotta
Comment	: Option serial I/F	Date	: 98/12/3
Detector	: QP	EMI Receiver(s)	: R/S ESH 2
Points	: 6		

Limit : [FCC] Class B



Frequency [MHz]	Reading N		Reading L1		QP-AVE [dB]	QP/AVE -13 [dB]	Correction Factor [dB]	Level N [dBuV]	Level L1 [dBuV]	Limit [dBuV]	Margin [dB]
	QP [dBuV]	AVE [dBuV]	QP [dBuV]	AVE [dBuV]							
0.8723	37.0	-	38.5	-	-	-	0.2	37.2	38.7	48.0	9.3
0.9916	38.5	-	40.0	-	-	-	0.2	38.7	40.2	48.0	7.8
1.1827	43.5	-	43.5	-	-	-	0.2	43.7	43.7	48.0	4.3
1.2445	43.5	-	43.5	-	-	-	0.2	43.7	43.7	48.0	4.3
2.5430	25.5	-	24.0	-	-	-	0.2	25.7	24.2	48.0	22.3
7.0048	24.5	-	19.0	-	-	-	0.5	25.0	19.5	48.0	23.0

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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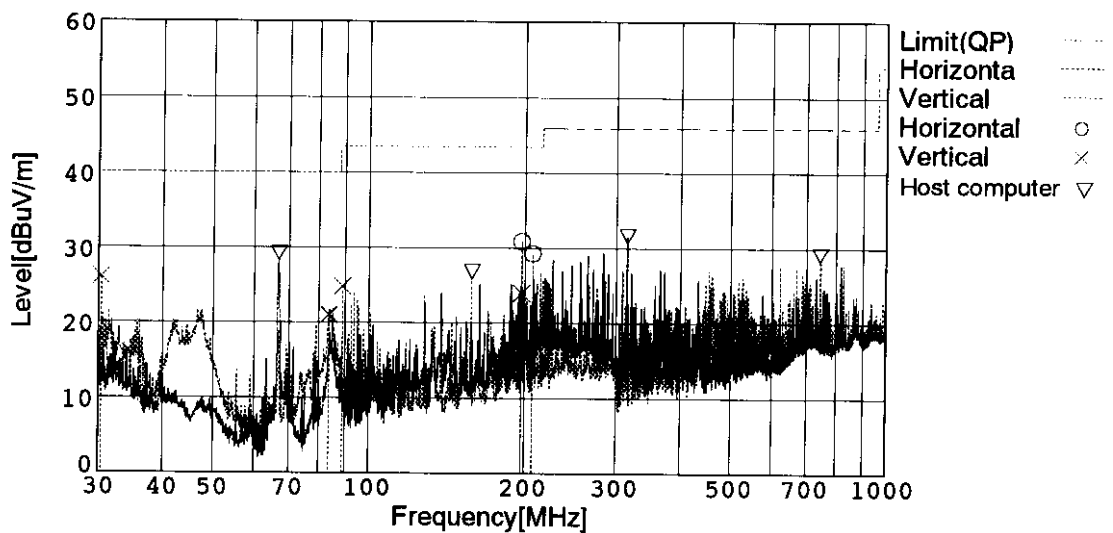
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4-3 Radiated Emission Test

Mode 1 : Parallel interface

Kind of Equipment : Printer
 Model Name : P923A
 Serial No. : 23GU000051
 Comment : Parallel I/F
 Detector : QP
 Points : 6
 Limit: [FCC] Class B<3m>

Temperature : 22 °C
 Humidity : 44 %
 Engineer : A.Hotta
 Date : 1998/12/2 9:58
 EMI Receiver(s) : ESCS30



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]
30.400	28.0	BC	18.6	-20.5	26.1	230	100	Vert.	40.0	13.9
83.721	33.2	BC	7.0	-19.2	21.0	255	100	Vert.	40.0	19.0
88.913	36.2	BC	7.7	-19.1	24.8	242	100	Vert.	43.5	18.7
196.918	25.7	BC	16.1	-17.8	24.0	200	183	Vert.	43.5	19.5
196.920	32.6	BC	16.1	-17.8	30.9	272	166	Hori.	43.5	12.6
206.768	30.5	BC	16.4	-17.7	29.2	275	164	Hori.	43.5	14.3

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)

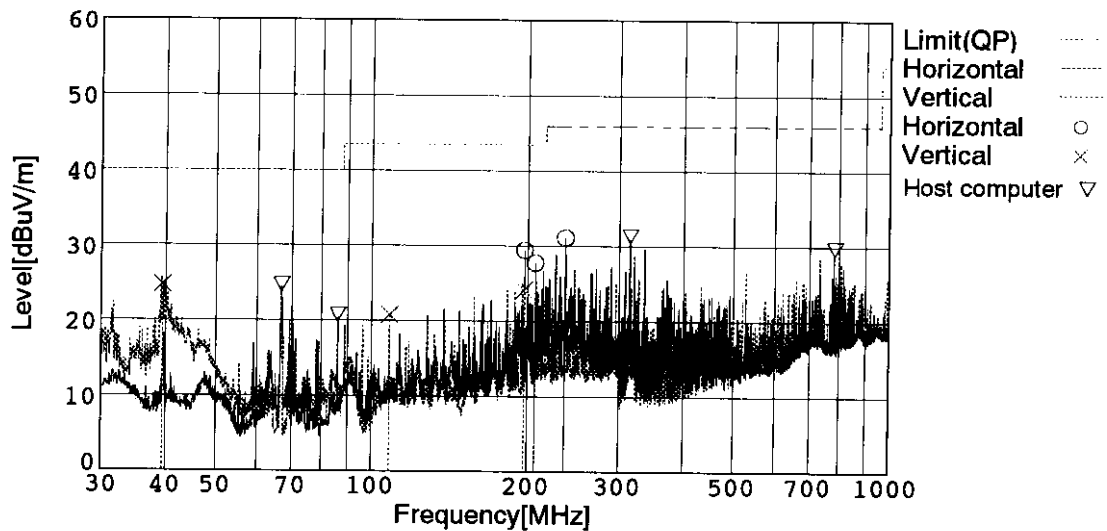
Level is rounded off to one decimal place.

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Mode 2 : Serial interface

Kind of Equipment : Printer	Temperature : 22 °C
Model Name : P923A	Humidity : 44 %
Serial No. : 23GU000051	Engineer : A.Hotta
Comment : Serial I/F	
Detector : QP	Date : 1998/12/2 16:21
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]
39.386	29.9	BC	15.1	-20.2	24.8	245	100	Vert.	40.0	15.2
108.313	28.4	BC	11.2	-18.8	20.8	288	100	Vert.	43.5	22.7
196.931	31.1	BC	16.1	-17.8	29.4	279	166	Hori.	43.5	14.1
196.932	25.9	BC	16.1	-17.8	24.2	221	198	Vert.	43.5	19.3
206.778	29.0	BC	16.4	-17.7	27.7	285	155	Hori.	43.5	15.8
236.318	30.9	BC	17.6	-17.4	31.1	288	143	Hori.	46.0	14.9

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.

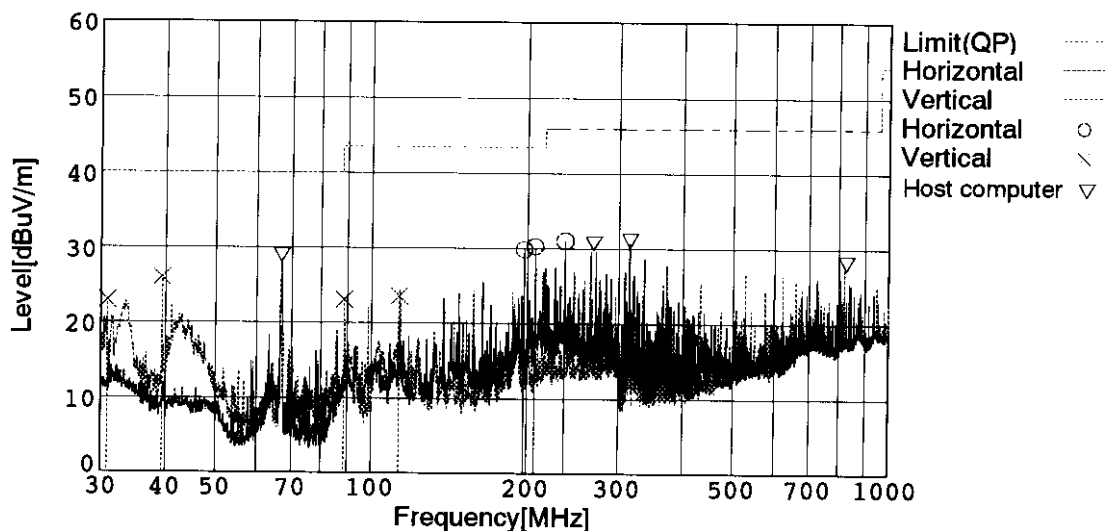
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Mode 3 : Option serial interface

Kind of Equipment	: Printer	Temperature	: 22 °C
Model Name	: P923A	Humidity	: 44 %
Serial No.	: 23GU000051	Engineer	: A.Hotta
Comment	: Option Serial I/F	Date	: 1998/12/2 13:04
Detector	: QP	EMI Receiver(s)	: ESCS30
Points	: 7		

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]
30.891	25.0	BC	18.4	-20.5	22.9	249	100	Vert.	40.0	17.1
39.380	31.1	BC	15.1	-20.2	26.0	253	100	Vert.	40.0	14.0
88.607	34.4	BC	7.7	-19.1	23.0	315	100	Vert.	43.5	20.5
112.945	30.2	BC	12.1	-18.7	23.6	284	100	Vert.	43.5	19.9
196.913	31.6	BC	16.1	-17.8	29.9	259	157	Hori.	43.5	13.6
206.760	31.5	BC	16.4	-17.7	30.2	266	161	Hori.	43.5	13.3
236.303	30.8	BC	17.6	-17.4	31.0	279	139	Hori.	46.0	15.0

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 2.3 dB at 1.2573 MHz (Mode 1)

- Radiation measurement 12.6 dB at 196.920 MHz (Mode 1)

This data represent the worst case emissions.

5-2 Sample Calculations**5-2-1 Conducted Emission**

Example 1.2573 MHz (Mode 1)

$$\begin{array}{rcl}
 \text{Emission Level} & = & \text{Meter Reading} & 45.5 \text{ dBuV} \\
 & & + \text{ Correction Factor} & + 0.2 \text{ dB} \\
 & & & \hline
 & = & & 45.7 \text{ dBuV}
 \end{array}$$

$$\begin{array}{rcl}
 \text{Margin} & = & \text{Limit} & 48.0 \text{ dBuV} \\
 & & - \text{ Emission Level} & - 45.7 \text{ dBuV} \\
 & & & \hline
 & = & & 2.3 \text{ dB}
 \end{array}$$

Meter reading = Test receiver reading

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 196.920 MHz (Mode 1)

$$\begin{array}{rcl}
 \text{Emission Level} & = & \text{Meter Reading} & 32.6 \text{ dBuV} \\
 & & + \text{ Antenna Factor} & + 16.1 \text{ dB} \\
 & & + \text{ Total Loss} & - 17.8 \text{ dB} \\
 & & & \hline
 & = & & 30.9 \text{ dBuV/m}
 \end{array}$$

$$\begin{array}{rcl}
 \text{Margin} & = & \text{Limit} & 43.5 \text{ dBuV/m} \\
 & & - \text{ Emission Level} & - 30.9 \text{ dBuV/m} \\
 & & & \hline
 & = & & 12.6 \text{ dB}
 \end{array}$$

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.

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8. DESCRIPTION OF TEST LABORATORY**Bibliography**

Since commencing operation in 1942 as a watch manufacturer, Seiko Epson Corporation has utilized its own original micromechatronics technologies, gained while developing quartz watches, to diversify into a variety of fields, as computers, printers and electronic devices, including semiconductors and liquid crystal displays. The phrase "highly functional and highly compact" best describes the policy of our product development activities.

Since the initial electrical printer was manufactured in 1971, Seiko Epson Corporation has been working for EMC field. It is a combination of precise machine technology and electric technology.

Now EMC group has 3 semi-anechoic chambers and 8 EMI/EMC test facilities and full responsibilities on EMC testing. It is independent from any other business organizations and admired by the president as neutral and it's independency.

Filing, Certification and Accreditation List**EMC testing**

FCC	(USA)
NVLAP (Lab. Code: 200157-0)	(USA)
NMi	(Netherlands)
VCCI	(Japan)
NEMKO	(Norway)