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SEIKO EPSON CORPORATION

FCC ID : BKMFBP910C

RFI MEASUREMENT TEST REPORT

FCC PART 15B CLASS B

***** CLASS B DIGITAL DEVICES AND PERIPHERALS *****

APPLICANT : SEIKO EPSON CORPORATION

EQUIPMENT : PRINTER

TRADE NAME : EPSON

MODEL NUMBER : P910C

FCC ID NUMBER : BKMFBP910C

TEST REPORT No. : E-103-98212



NVLAP LAB CODE 200157-0

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TEST CERTIFICATION**Applicant Information**

Company : SEIKO EPSON Corporation
Division/Section : TP Product Safety Design Group
Imaging & Information Products Operations
Address : 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan
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Test Performed

Company : SEIKO EPSON Corporation
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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 : 18 August, 1998
Test completed : 20 August, 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 : Toshiyuki Omori T. Omori

EMC group, CS/Quality Assurance Office

Report checked by : Atsushi Shinozaki A. Shinozaki
Chief Engineer, EMC group, CS/Quality Assurance Office

Report approved by : Yoshiyuki Sakurai Yoshiyuki Sakurai
Manager, EMC group, CS/Quality Assurance Office, NVLAP signatory

Report issue date : 26 August, 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	: P910C
FCC ID	: BKMFBP910C
Serial Number	: 000051
Voltage input	: AC 120 V / 60 Hz
Rated current	: 1.0 A
Port(s) / Connector(s)	: Parallel (Centronics) Serial (RS-232C, optional)
Oscillator(s) / Crystal(s)	: 19.66 MHz
Maximum used frequency	: 19.66 MHz
Remarks	: With serial I/F card (C82305), cut-sheet feeder (C806731)

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1-2 Auxiliary equipment (AE)

AE	Name	Model (Serial number)	Manufacturer	FCC ID	Voltage input Power consumption	
1	Serial I/F card	C82305 (N/A)	SEIKO EPSON Corp.	BKMC82305	DC 5.0 V 50 mA	a) b)
2	Cut-sheet feeder	C806731 (000073)	SEIKO EPSON Corp.	N/A	DC 35 V 900 mA DC 5.0 V 170 mA	a) b)
3	Personal computer	D4594B (SG74350438)	Hewlett-Packard	N/A (DoC)	AC 120 V/ 60 Hz 3.0 A	
4	CRT monitor	D2830A (KR70913448)	Hewlett-Packard	A3LCGC560	AC 120 V/ 60 Hz 1.2 A	
5	Keyboard	RT6656TWJP (52370445)	Hewlett-Packard	AQ6-MTN4C15	DC 5.0 V 300 mA	c)
6	Mouse	M-S34 (LZA72026370)	Hewlett-Packard	DZL211029	DC 5.0 V 15 mA	c)
7	Printer	P850A (1YLY185764)	SEIKO EPSON Corp.	BKMP850A	AC 120 V/ 60 Hz 1.0 A	

- a) EUT option
- b) Supplied from EUT
- c) Supplied from AE3

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a) **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	AE1 Serial in / AE7 Serial in	AE3 Serial out	2.0 m	Yes	Metal connector
3	Cut-sheet feeder I/F	AE2 Signal in	EUT Signal out	0.2 m	Yes	Metal connector
4	Video I/F cable	AE4 Video in	AE3 Video out	1.5 m	Yes	Metal connector
5	Keyboard I/F cable	AE5 Keyboard	AE3 Keyboard out	2.0 m	Yes	Metal connector
6	Mouse I/F cable	AE6 Mouse	AE3 Mouse out	1.8 m	Yes	Metal connector
7	EUT AC cable	EUT AC 120 V in	Main AC 120 V	1.9 m	No	
8	Computer AC cable	AE3 AC 120 V in	Main AC 120 V	1.9 m	No	
9	Monitor AC cable	AE4 AC 120 V in	Main AC 120 V	1.9 m	No	
10	Printer AC cable	AE7 AC 120 V in	Main AC 120 V	1.9 m	No	

Note : Line 3 (Cut-sheet feeder I/F) has a ferrite core permanently attached.

Line 4 (Video I/F cable) has two ferrite cores permanently attached.

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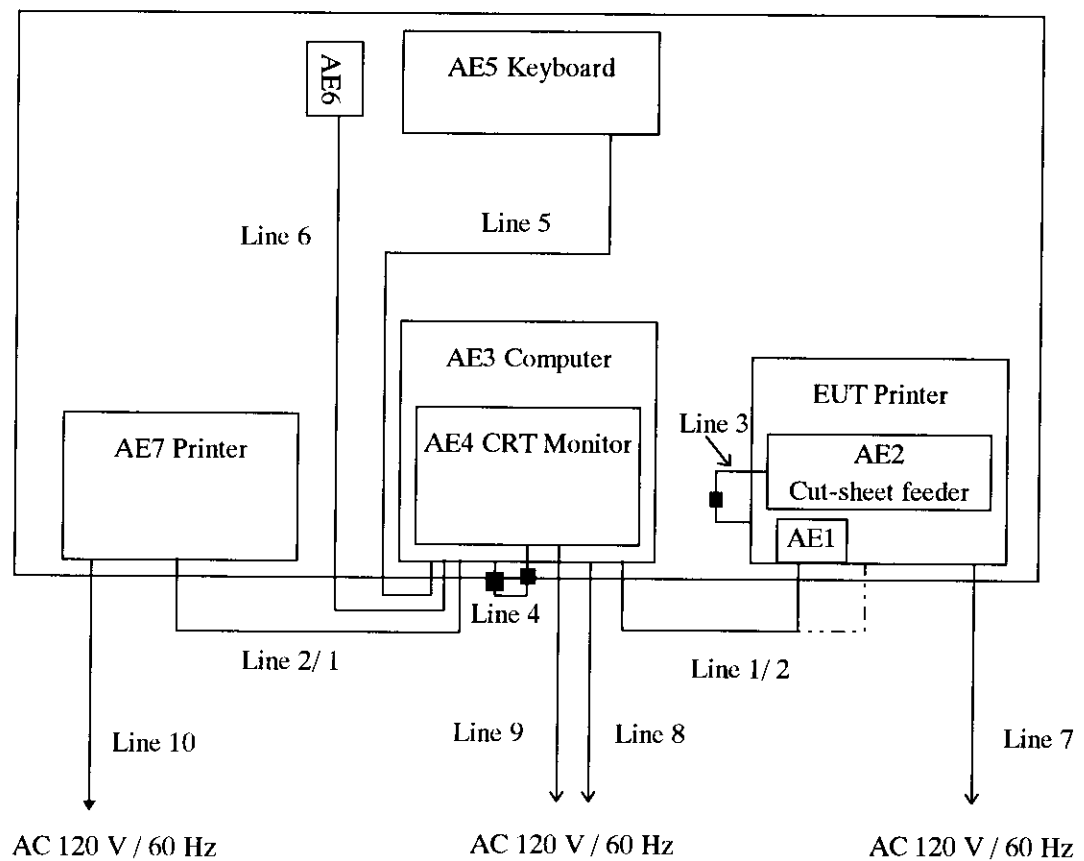
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1-4 Positioning of Equipment

The positioning of EUT during testing is as follows.

■ : Ferrite Core

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.

2. OPERATING CONDITIONS

The EUT is operated under the following conditions during the tests.

2-1 Operating modes

Mode 1 : Parallel interface mode

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

Mode 2 : Serial interface mode

The EUT continuously printing character 'H' via the serial interface (line 2) with below operating cycles.

2-2 Operating cycles

Performed following operation continuously.

- 1: Print data are transferred from computer(AE3)
- 2: Print 'H' characters by EUT
- 3: Monitor(AE4) displays 'H' characters on the full screen
- 4: Print 'H' characters by printer (AE7)

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

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3. TEST PROCEDURE(S)

This test is 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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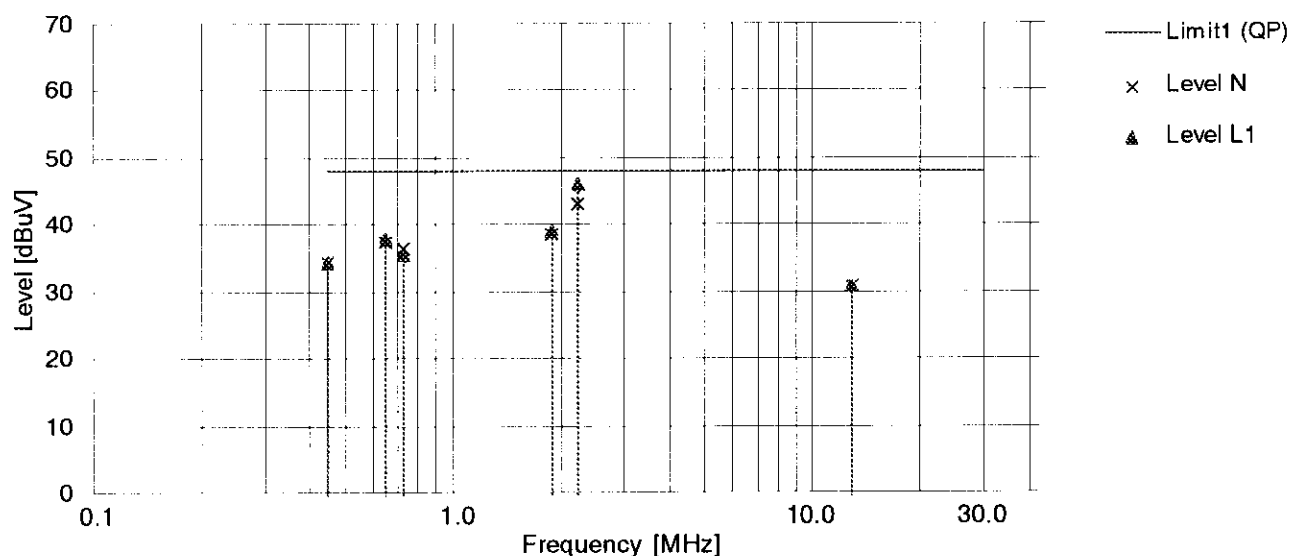
4. EVALUATION OF TEST RESULTS

4-1 Conducted Emission Test

Mode 1 : Parallel interface

Kind of Equipment	: Printer	Temperature	: 22 °C
Model Name	: P910C	Humidity	: 55 %
Serial No.	: 000051	Engineer	: T. Omori
Comment	: Parallel I/F		
Detector	: QP	Date	: 98/8/20
Points	: 6	EMI Receiver(s)	: R/S ESH 2

Limit1 : [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]							
0.4503	34.0	-	34.0	-	-	-	0.3	34.3	34.3	48.0	13.7
0.6483	37.0	-	37.5	-	-	-	0.3	37.3	37.8	48.0	10.2
0.7318	36.0	-	35.0	-	-	-	0.3	36.3	35.3	48.0	11.7
1.8912	38.0	-	38.5	-	-	-	0.4	38.4	38.9	48.0	9.1
2.2240	42.5	-	45.5	-	-	-	0.4	42.9	45.9	48.0	2.1
12.8902	29.0	-	29.0	-	-	-	1.9	30.9	30.9	48.0	17.1

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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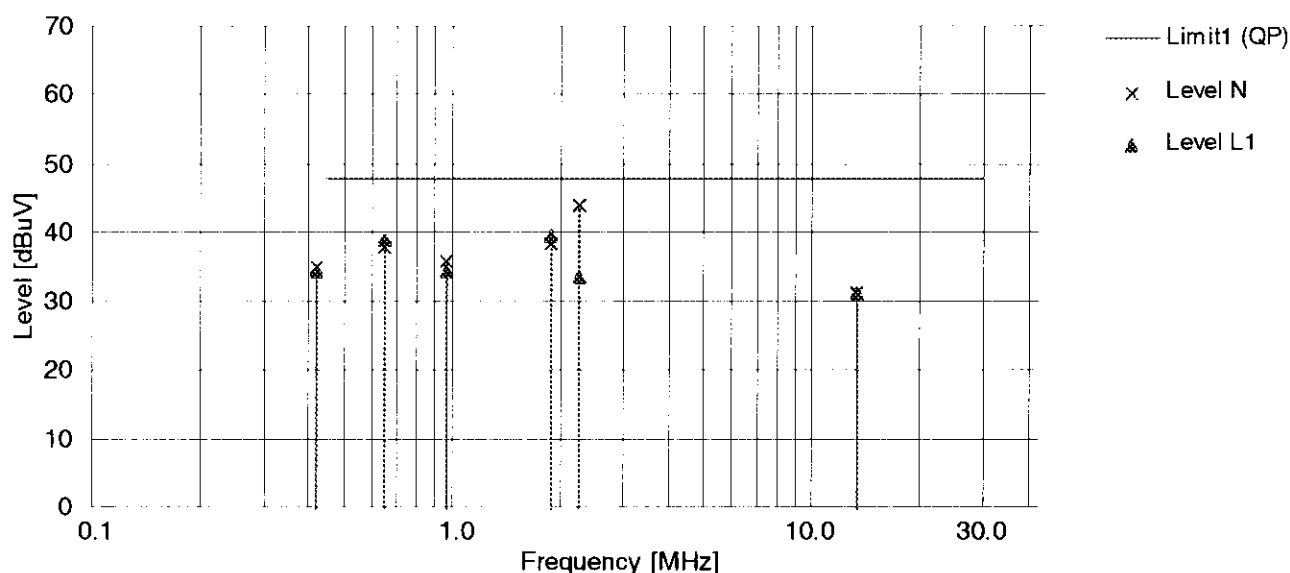
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Mode 2 : Serial interface

Kind of Equipment : Printer
 Model Name : P910C
 Serial No. : 000051
 Comment : Serial I/F
 Detector : QP
 Points : 6

Temperature : 22 °C
 Humidity : 55 %
 Engineer : T. Omori
 Date : 98/8/20
 EMI Receiver(s) : R/S ESH 2

Limit1 : [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]							
0.4203	34.5	-	34.0	-	-	-	0.3	34.8	34.3	48.0	13.2
0.6473	37.5	-	38.5	-	-	-	0.3	37.8	38.8	48.0	9.2
0.9705	35.5	-	34.0	-	-	-	0.3	35.8	34.3	48.0	12.2
1.8895	38.0	-	39.0	-	-	-	0.4	38.4	39.4	48.0	8.6
2.2659	43.5	-	46.0	37.0	9.0	-13.0	0.4	43.9	* 33.4	48.0	4.1
13.3432	29.0	-	29.0	-	-	-	2.0	31.0	31.0	48.0	17.0

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.

* Because the amplitude measured in the quasi-peak mode is at least 6 dB higher than the amplitude measured in the average mode, the level measured in the quasi-peak mode is reduced by 13 dB.

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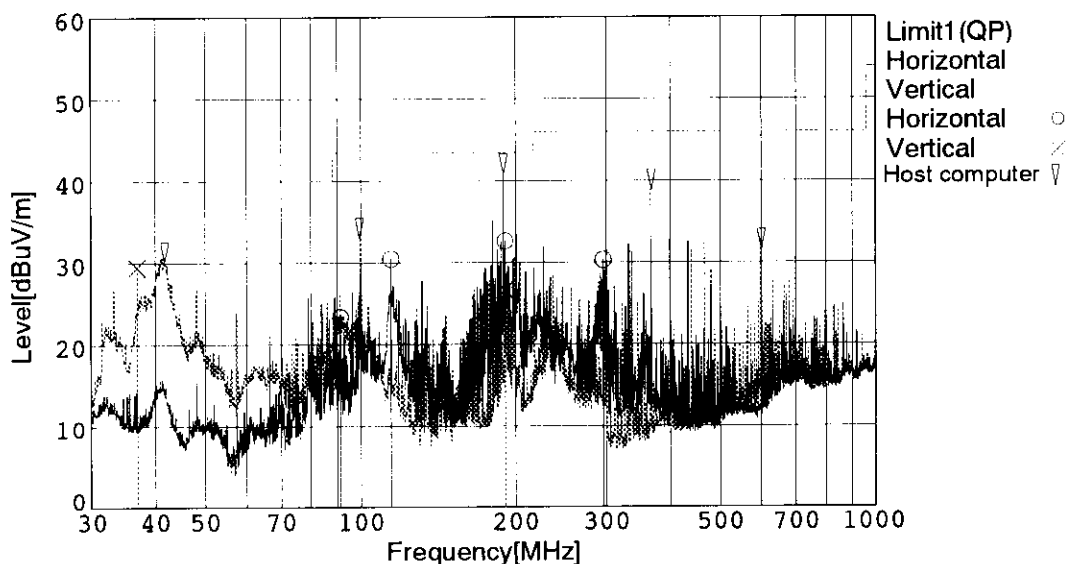
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4-3 Radiated Emission Test**Mode 1 : Parallel interface**

Kind of Equipment : Printer
 Model Name : P910C
 Serial No. : 000051
 Comment : Parallel I/F
 Detector : QP
 Points : 6
 Limit1: [FCC] Class B<3m>

Temperature : 22 °C
 Humidity : 55 %
 Engineer : T. Omori

Date : 1998/8/18 16:41
 EMI Receiver(s) : ESS



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]
36.861	33.0	BC	16.7	-20.3	29.4 ✓	234	100	Vert.	40.0	10.6
91.282	34.0	BC	8.3	-19.1	23.2 ✓	206	367	Hori.	43.5	20.3
114.213	37.0	BC	12.2	-18.7	30.5 ✓	238	260	Hori.	43.5	13.0
190.780	33.9	BC	16.5	-17.8	32.6 ✓	187	180	Hori.	43.5	10.9
190.890	27.9	BC	16.5	-17.8	26.6	355	100	Vert.	43.5	16.9
295.878	27.9	BC	19.2	-16.8	30.3 ✓	209	154	Hori.	46.0	15.7

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.

$$\begin{array}{r}
 49.2 \\
 -18.7 \\
 \hline
 30.5
 \end{array}
 \qquad
 \begin{array}{r}
 46.4 \\
 -17.8 \\
 \hline
 28.6
 \end{array}
 \qquad
 \begin{array}{r}
 6.1 \\
 77.1 \\
 -16.8 \\
 \hline
 30.3
 \end{array}$$

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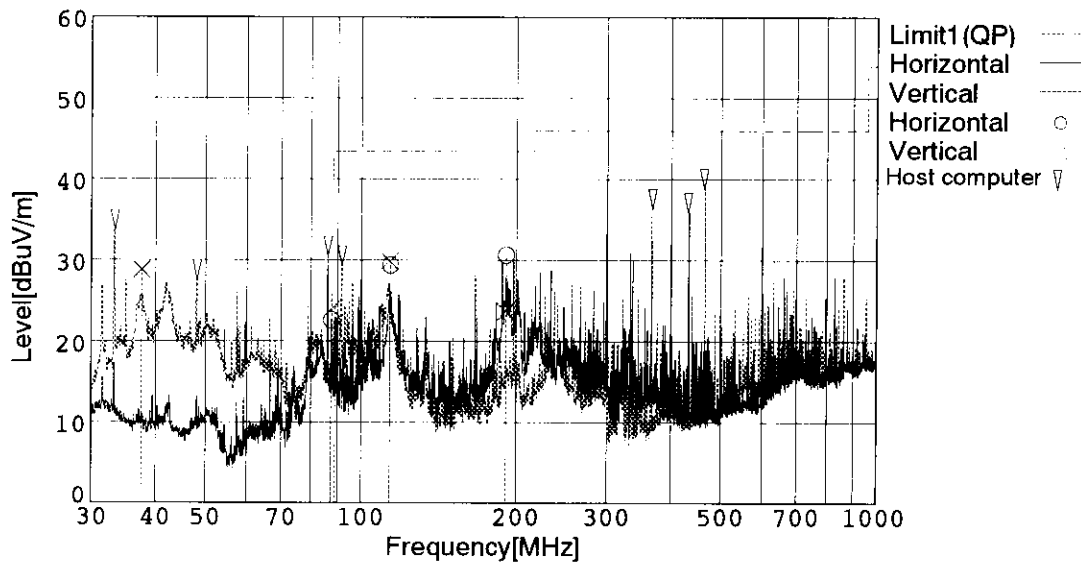
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Mode 2 : Serial interface

Kind of Equipment : Printer
 Model Name : P910C
 Serial No. : 000051
 Comment : Serial I/F
 Detector : QP
 Points : 7
 Limit1: [FCC] Class B<3m>

Temperature : 22 °C
 Humidity : 55 %
 Engineer : T. Omori

Date : 1998/8/18 17:55
 EMI Receiver(s) : ESS



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]
37.610	32.6	BC	16.4	-20.2	28.8 ✓	231	100	Vert.	40.0	11.2
87.474	34.0	BC	7.7	-19.1	22.6	205	322	Hori.	40.0	17.4
88.880	35.5	BC	7.9	-19.1	24.3	245	100	Vert.	43.5	19.2
113.557	36.5	BC	12.1	-18.7	29.9 ✓	193	100	Vert.	43.5	13.6
113.801	36.0	BC	12.1	-18.7	29.4 ✓	254	168	Hori.	43.5	14.1
190.840	31.9	BC	16.5	-17.8	30.6 ✓	168	215	Hori.	43.5	12.9
190.885	24.9	BC	16.5	-17.8	23.6	148	100	Vert.	43.5	19.9

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.

$$\begin{array}{r}
 32.6 \\
 -20.2 \\
 \hline
 12.4
 \end{array}
 \quad
 \begin{array}{r}
 48.6 \\
 -18.7 \\
 \hline
 29.9
 \end{array}
 \quad
 \begin{array}{r}
 48.4 \\
 -17.8 \\
 \hline
 30.6
 \end{array}
 \quad
 \begin{array}{r}
 42.1 \\
 -18.2 \\
 \hline
 23.9
 \end{array}$$

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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 2.1 dB at 2.2240 MHz (Mode 1)
- Radiation measurement 10.6 dB at 36.861 MHz (Mode 1)

This data represent the worst case emissions.

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

Example 2.2240 MHz (Mode 1)

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 45.5 \text{ dBuV} \\
 & & + \text{ Correction Factor} & + & 0.4 \text{ dB} \\
 & & & = & 45.9 \text{ dBuV} \\
 \\
 \text{Margin} & = & \text{Limit} & & 48.0 \text{ dBuV} \\
 & & - \text{ Emission Level} & - & 45.9 \text{ dBuV} \\
 & & & = & 2.1 \text{ dB}
 \end{array}$$

Meter reading = Test receiver reading

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 36.861 MHz (Mode 1)

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 33.0 \text{ dBuV} \\
 & & + \text{ Antenna Factor} & + & 16.7 \text{ dB} \\
 & & + \text{ Total Loss} & - & 20.3 \text{ dB} \\
 & & & = & 29.4 \text{ dBuV/m} \\
 \\
 \text{Margin} & = & \text{Limit} & & 40.0 \text{ dBuV/m} \\
 & & - \text{ Emission Level} & - & 29.4 \text{ dBuV/m} \\
 & & & = & 10.6 \text{ dB}
 \end{array}$$

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	August 20, 1997	1 Year

6-2 Radiated Emission Measurement

Instrument	Manufacturer	Model Number	Serial Number	Last Calibration Date	Period
Spectrum Analyzer	Hewlett Packard	8566B	3638A08631	January 7, 1998	1 Year
Quasi-peak Adapter	Hewlett Packard	85650A	3303A01842	January 7, 1998	1 Year
Pre-amplifier	Hewlett-Packard	87405A	3207A00888	March 18, 1998	1 Year
Test Receiver	Rhode & Schwarz	ESS	845420-010	January 8, 1998	1 Year
Biconical Antenna	Schwarzbeck	BBA9106	-	February 11, 1998	1 Year
Log-periodic Antenna	EMCO	3146	8910-2511	November 24, 1997	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

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)