

EPSON

SEIKO EPSON CORPORATION

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 : P912A

FCC ID NUMBER : BKMFBP912A

TEST REPORT No. : E-103-98229

Test
Report

NVLAP[®]

NVLAP LAB CODE 200157-0

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TEST CERTIFICATION**Applicant Information**

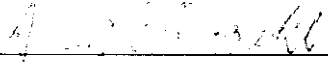
Company : SEIKO EPSON Corporation
 Division/Section : TP Product Safety Design Group
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 Address : 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan
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Test Performed

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 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 : 31 August, 1998
 Test completed : 7 September, 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 
 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 signatory

Report issue date : 9 September, 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 : P912A
FCC ID : BKMFBP912A
Serial Number : 000001
Voltage input : AC 120 V / 60 Hz
Rated current : 1.1 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	D3394B (SG60400940)	Hewlett-Packard	K4UVECTRAVL5	AC 120 V/ 60 Hz 3.0 A	
4	CRT monitor	D2806B (KR54586408)	Hewlett-Packard	CSYSC-528UXH	AC 120 V/ 60 Hz 3.0 A	
5	Keyboard	C3755B (60552408)	Hewlett-Packard	AQ6ZG-RT687XT	DC 5.0 V 300 mA	c)
6	Mouse	M-S34 (LZA63501449)	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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1-3 Relevant Signal and Power lines

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

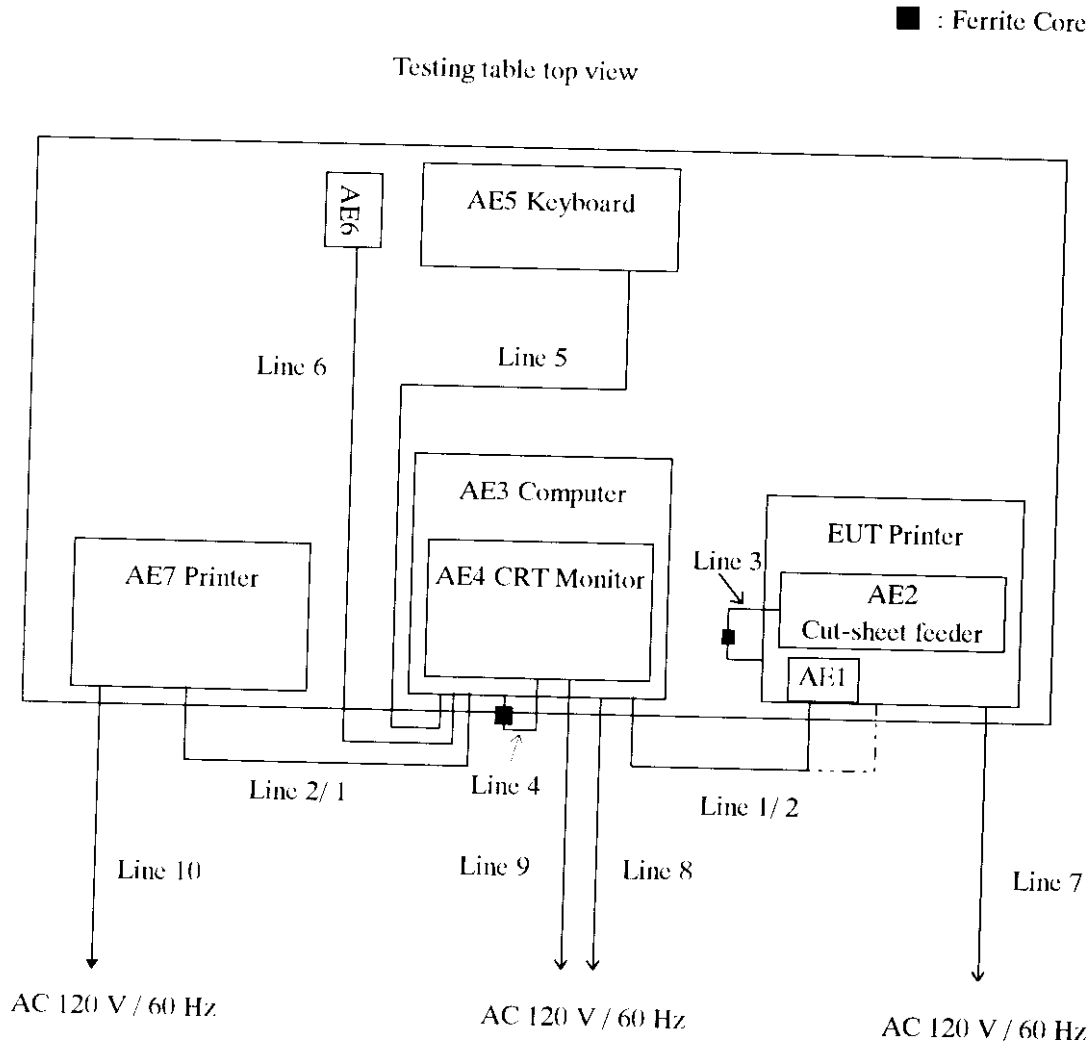
Line	Name	From	To	Length	Shield	Remarks
1	Parallel I/F cable	EUT Parallel in / AE7 Parallel in	AE3 Parallel out	2.0 m	Yes	Metal connector
2	Serial I/F cable	AE1 Serial in / AE7 Serial in	AE3 Serial out	2.0 m	Yes	Metal connector
3	Cut-sheet feeder I/F	AE2 Signal in	EUT Signal out	0.2 m	Yes	Metal connector
4	Video I/F cable	AE4 Video in	AE3 Video out	1.4 m	Yes	Metal connector
5	Keyboard I/F cable	AE5 Keyboard	AE3 Keyboard out	2.9 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 a ferrite core permanently attached.

1-4 Positioning of Equipment

The positioning of EUT during testing is as follows.



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 mode

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

Mode 2 : Serial interface mode

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

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)
- 4: 'H' characters printed by printer (AE7)

Note The data transfer rate on the serial I/F (RS-232C)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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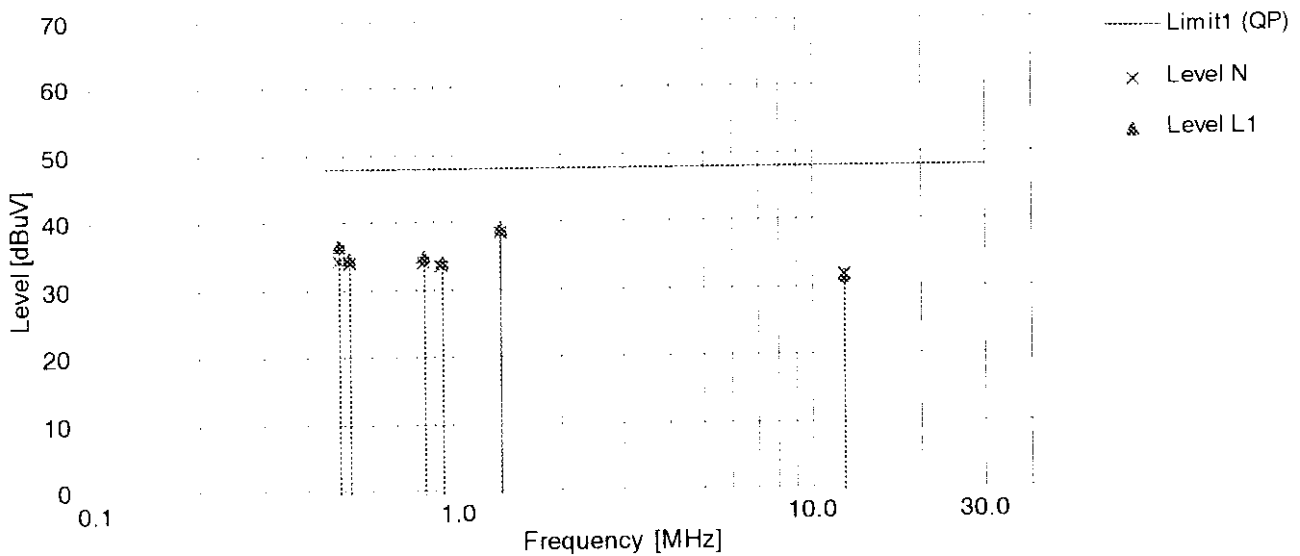
4. EVALUATION OF TEST RESULTS

4-1 Conducted Emission Test

Mode 1 : Parallel interface

Kind of Equipment	: Printer	Temperature	: 22 °C
Model Name	: P912A	Humidity	: 55 %
Serial No.	: 000001	Engineer	: T. Omori
Comment	: Parallel I/F	Date	: 98/8/31
Detector	: QP	EMI Receiver(s)	: R/S ESH 2
Points	: 6		

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]							
0.4870	34.2	-	36.3	-	-	-	0.2	34.4	36.5	48.0	11.5
0.5241	33.8	-	34.3	-	-	-	0.2	34.0	34.5	48.0	13.5
0.8397	33.8	-	34.7	-	-	-	0.1	33.9	34.8	48.0	13.2
0.9449	33.2	-	33.8	-	-	-	0.1	33.3	33.9	48.0	14.1
1.3625	38.3	-	38.8	-	-	-	0.1	38.4	38.9	48.0	9.1
12.1927	30.7	-	30.6	-	-	-	0.9	31.6	31.5	48.0	16.4

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

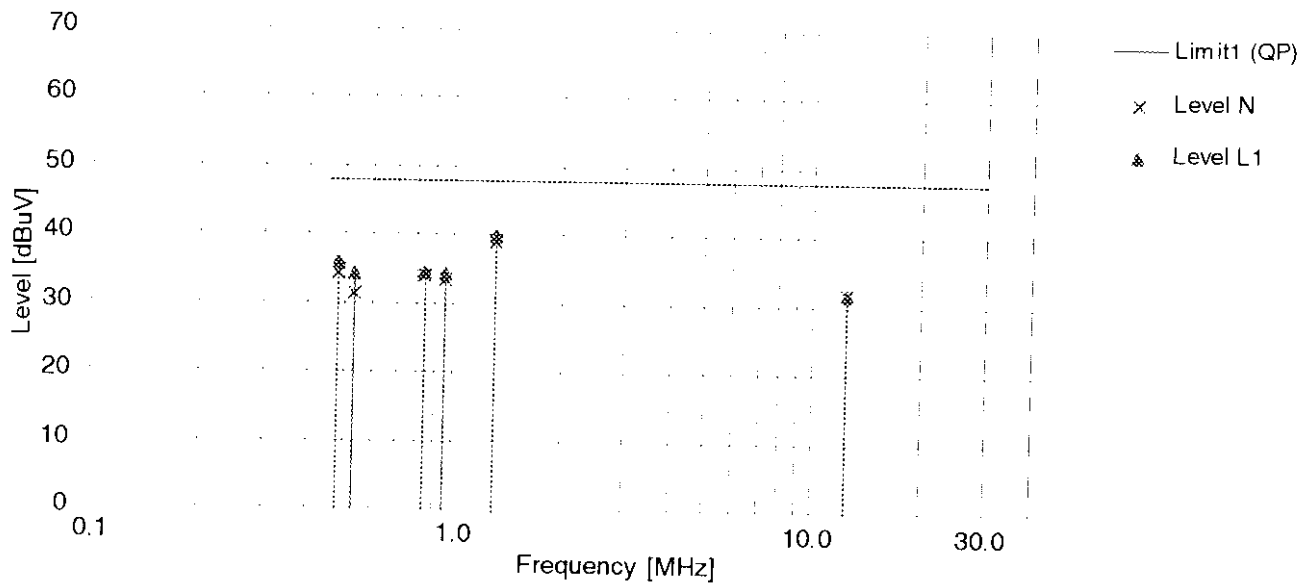
Correction Factor = LISN factor + Cable Loss

Level is rounded off to one decimal place.

Mode 2 : Serial interface

Kind of Equipment	: Printer	Temperature	: 22 °C
Model Name	: P912A	Humidity	: 55 %
Serial No.	: 000001	Engineer	: T. Omori
Comment	: Serial I/F		
Detector	: QP	Date	: 98/8/31
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]							
0.4837	34.2	-	35.8	-	-	-	0.2	34.4	36.0	48.0	12.0
0.5366	31.3	-	34.0	-	-	-	0.2	31.5	34.2	48.0	13.8
0.8373	33.8	-	34.5	-	-	-	0.1	33.9	34.6	48.0	13.4
0.9522	33.2	-	34.3	-	-	-	0.1	33.3	34.4	48.0	13.6
1.3220	38.8	-	39.7	-	-	-	0.1	38.9	39.8	48.0	8.2
12.3257	30.7	-	30.8	-	-	-	0.9	31.6	31.7	48.0	16.3

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.

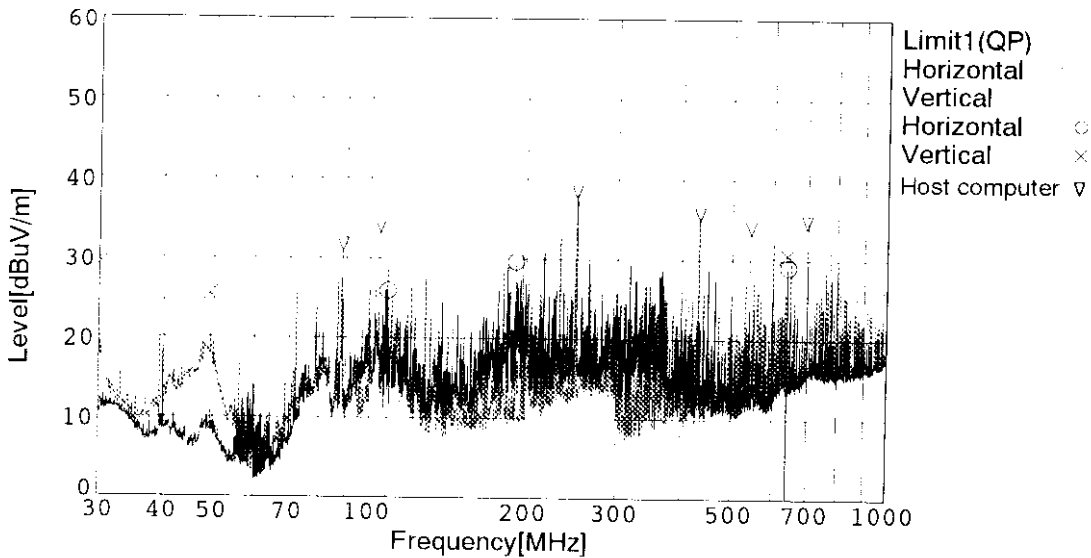


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4-3 Radiated Emission Test

Mode 1 : Parallel interface

Kind of Equipment : Printer	Temperature : 22 °C
Model Name : P912A	Humidity : 55 %
Serial No. : 000001	Engineer : T. Omori
Comment : Parallel I/F	
Detector : QP	Date : 1998/9/7 9:34
Points : 6	EMI Receiver(s) : ESS
Limit1: [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]
30.015	30.5	BC	19.3	-20.5	29.3	206	100	Vert.	40.0	10.7
49.249	33.4	BC	11.9	-19.8	25.5	264	100	Vert.	40.0	14.5
108.344	33.5	BC	11.2	-18.8	25.9	355	292	Hori.	43.5	17.6
190.993	30.9	BC	16.5	-17.8	29.6	288	208	Hori.	43.5	13.9
640.099	26.0	LP	18.9	-14.3	30.6	214	100	Vert.	46.0	15.4
640.192	24.5	LP	18.9	-14.3	29.1	236	100	Hori.	46.0	16.9

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)

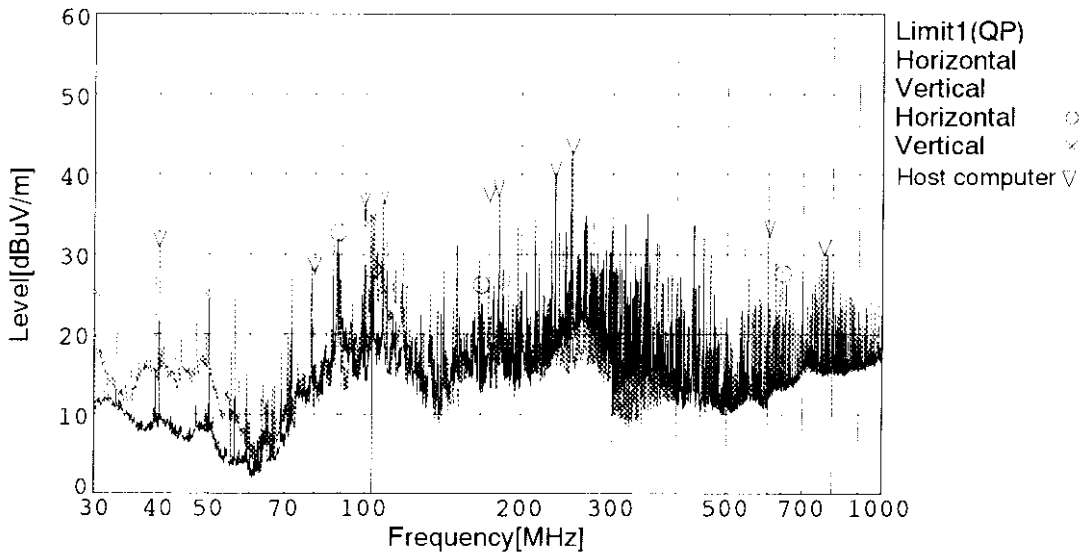
Level is rounded off to one decimal place.

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Mode 2 : Serial interface

Kind of Equipment : Printer	Temperature : 22 °C
Model Name : P912A	Humidity : 55 %
Serial No. : 000001	Engineer : T. Omori
Comment : Serial I/F	
Detector : QP	Date : 1998/9/7 10:32
Points : 8	EMI Receiver(s) : ESS
Limit1: [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]
30.145	26.5	BC	19.2	-20.5	25.2	83	100	Vert.	40.0	14.8
49.252	32.9	BC	11.9	-19.8	25.0	11	100	Vert.	40.0	15.0
88.645	44.0	BC	7.9	-19.1	32.8	187	325	Hori.	43.5	10.7
103.221	36.5	BC	10.4	-18.9	28.0	149	208	Hori.	43.5	15.5
103.438	43.0	BC	10.4	-18.8	34.6	281	100	Vert.	43.5	8.9
167.440	28.5	BC	15.8	-18.2	26.1	0	188	Hori.	43.5	17.4
640.215	23.5	LP	18.9	-14.3	28.1	204	100	Vert.	46.0	17.9
640.217	23.0	LP	18.9	-14.3	27.6	240	207	Hori.	46.0	18.4

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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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	ESH3-Z5	892785/012	June 25, 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	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 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)

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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 8.2 dB at 1.3220 MHz (Mode 2)
- Radiation measurement 8.9 dB at 103.438 MHz (Mode 2)

This data represent the worst case emissions.

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

Example 1.3220 MHz (Mode 2)

$$\begin{array}{rcl}
 \text{Emission Level} & = & \text{Meter Reading} \quad 39.7 \text{ dBuV} \\
 & + & \text{Correction Factor} \quad + \quad 0.1 \text{ dB} \\
 & & \hline
 & = & 39.8 \text{ dBuV} \\
 \\ \\
 \text{Margin} & = & \text{Limit} \quad 48.0 \text{ dBuV} \\
 & - & \text{Emission Level} \quad - \quad 39.8 \text{ dBuV} \\
 & & \hline
 & = & 8.2 \text{ dB}
 \end{array}$$

Meter reading = Test receiver reading

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 103.438 MHz (Mode 2)

$$\begin{array}{rcl}
 \text{Emission Level} & = & \text{Meter Reading} \quad 43.0 \text{ dBuV} \\
 & + & \text{Antenna Factor} \quad + \quad 10.4 \text{ dB} \\
 & + & \text{Total Loss} \quad - \quad 18.8 \text{ dB} \\
 & & \hline
 & = & 34.6 \text{ dBuV/m} \\
 \\ \\
 \text{Margin} & = & \text{Limit} \quad 43.5 \text{ dBuV/m} \\
 & - & \text{Emission Level} \quad - \quad 34.6 \text{ dBuV/m} \\
 & & \hline
 & = & 8.9 \text{ dB}
 \end{array}$$

Meter reading = Test Receiver reading

The numerical values are rounded off to one decimal place.