

EPSON

SEIKO EPSON CORPORATION

FCC ID : BKMFBG680A

RFI MEASUREMENT TEST REPORT

FCC PART 15B CLASS B

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

APPLICANT : SEIKO EPSON CORPORATION

EQUIPMENT : SCANNER

TRADE NAME : EPSON

MODEL NUMBER : G680A

FCC ID NUMBER : BKMFBG680A

TEST REPORT No. : E-103-98080

NVLAP[®]

NVLAP LAB CODE 200157-0

Test
Report

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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
 PHONE : +81-263-53-6024 FAX : +81-263-53-3544

Test Performed

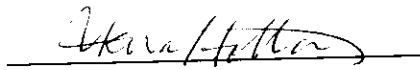
Company : SEIKO EPSON Corporation
 Division/Section : EMC Group, Production Management Division
 Location : 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan
 PHONE: +81-263-52-5094 FAX : +81-263-54-5806

10 meter Semi-anechoic Chamber

FCC File No. : 31040 / SIT 1300F2

NVLAP Lab Code : 200157-0

Test started : 3 June, 1998
 Test completed : 5 June, 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, Production Management Division

Report checked by : Atsushi Shinozaki

 Chief Engineer / EMC group, Production Management Division

Report approved by : Yoshiyuki Sakurai

 Manager / EMC group, Production Management Division / NVLAP signatory

Report issue date : 9 June, 1998

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

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1. DETAILED DESCRIPTION OF TEST ITEM

1-1 Equipment Under Test (EUT)

Kind of equipment	: Scanner
Shape	: Table-top type
Manufacturer	: SEIKO EPSON Corporation
Trade Name	: EPSON
Model Number	: G680A
FCC ID	: BKMFBG680A
Serial Number	: 000001
Voltage input	: AC 120 V/ 60 Hz
Rated current	: 0.5 A
Port(s) / Connector(s)	: SCSI (50 pin half pinch) x 2
Oscillator(s) / Crystal(s)	: 20 MHz, 24 MHz (MAIN Board)
Remarks	: -

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1-2 Auxiliary equipment (AE)

AE	Name	Model (Serial number)	Manufacturer	FCC ID	Voltage input Power consumption	
1	Film adapter	EU-33 (031212)	SEIKO EPSON CORP.	N/A	DC 24 V 0.5 A	a)
2	Automatic document feeder	EU-34 (031263)	SEIKO EPSON CORP.	N/A	DC 24 V, 0.8 A DC 5.0 V 0.2 A	a)
3	Personal computer	D3394B (SG60400519)	Hewlett Packard	K4UVECTRAVL5	AC 120 V / 60 Hz 3.0 A	
4	CRT monitor	D2806B (AR54482848)	Hewlett Packard	CSYSC-528UXH	AC 120 V / 60 Hz 0.7 A	
5	Keyboard	C3755B#ABJ (60552232)	Hewlett Packard	AQ6ZG-RT687XT	DC 5.0 V 300 mA	b)
6	Mouse	M-S34 (LZA63501449)	Hewlett Packard	DZL211029	DC 5.0 V 15 mA	b)
7	Scanner	G550A (1TR0000512)	SEIKO EPSON CORP.	BKMG550A	AC 120 V / 60 Hz 0.8 A	
8	Printer	P850A (1YLY185764)	SEIKO EPSON CORP.	BKMP850A	AC 120 V / 60 Hz 1.0 A	
9	SCSI board	AVA-2902E/J (N/A)	Adaptec	N/A	- -	c)

- a) Supply from EUT
- b) Supply from personal computer (AE3)
- c) Inserted into the personal computer (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	SCSI I/F cable	EUT SCSI	AE9 SCSI	1.0 m	Yes	Metal connector Packed into product box of EUT
2	SCSI I/F cable	EUT SCSI	AE7 SCSI	1.0 m	Yes	Metal connector
3	Film adapter I/F	AE1 Signal in	EUT Signal out	0.3 m	Yes	Metal connector Ferrite core
	Automatic document feeder I/F	AE2 Signal in		0.4 m		
4	Video I/F cable	AE4 Video in	AE3 Video out	1.4 m	Yes	Metal connector Ferrite core
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	Parallel I/F cable	AE8 Parallel in	AE3 Parallel out	2.0 m	Yes	Metal connector
8	Scanner AC cable	EUT AC 120 V in	Main AC 120 V	1.9 m	No	
9	Computer AC cable	AE3 AC 120 V in	Main AC 120 V	1.9 m	No	
10	Monitor AC cable	AE4 AC 120 V in	Main AC 120 V	1.9 m	No	
11	Scanner AC cable	AE7 AC 120 V in	Main AC 120 V	1.9 m	No	
12	Printer AC cable	AC8 AC 120 V in	Main AC 120 V	1.9m	No	

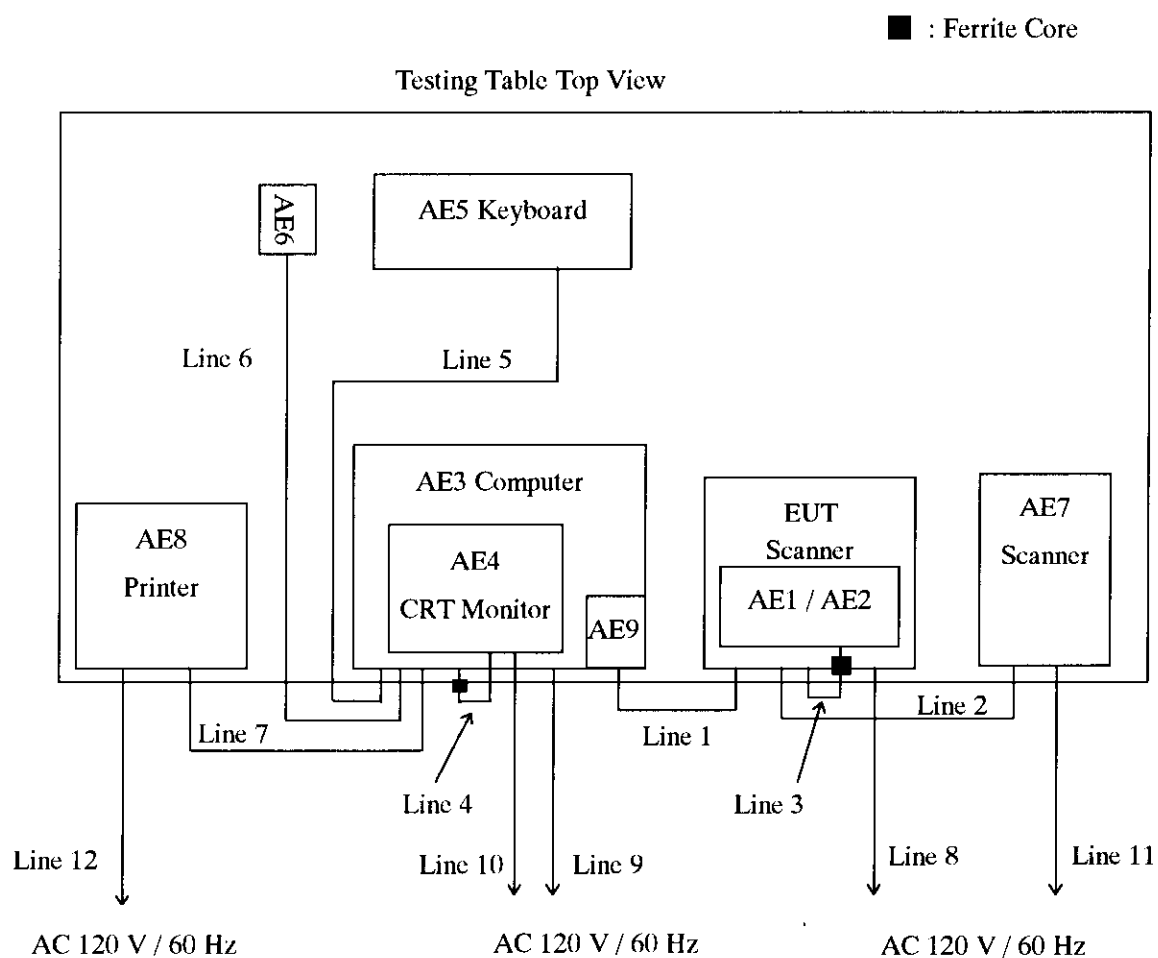
Note : Line 3 and 4 (Film adapter I/F cable or Automatic document feeder I/F cable and Video I/F cable) are permanently attached a ferrite core.

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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 2-1, 2-2, 2-3.

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2. OPERATING CONDITIONS

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

2-1 Operating modes

Mode 1 : Film adapter

The scanner (EUT) connecting film adapter (AE1) scan data continuously with below operating cycles.

Mode 2 : Automatic document feeder

The scanner (EUT) connecting automatic document feeder (AE2) scan data continuously with below operating cycles.

2-2 Operating cycles

Performed following operation continuously.

- 1: Scan data transferred to computer (AE3)
- 2: Displays scan data on the full screen of the CRT monitor (AE4)
- 3: Prints 'H' data by printer (AE8)

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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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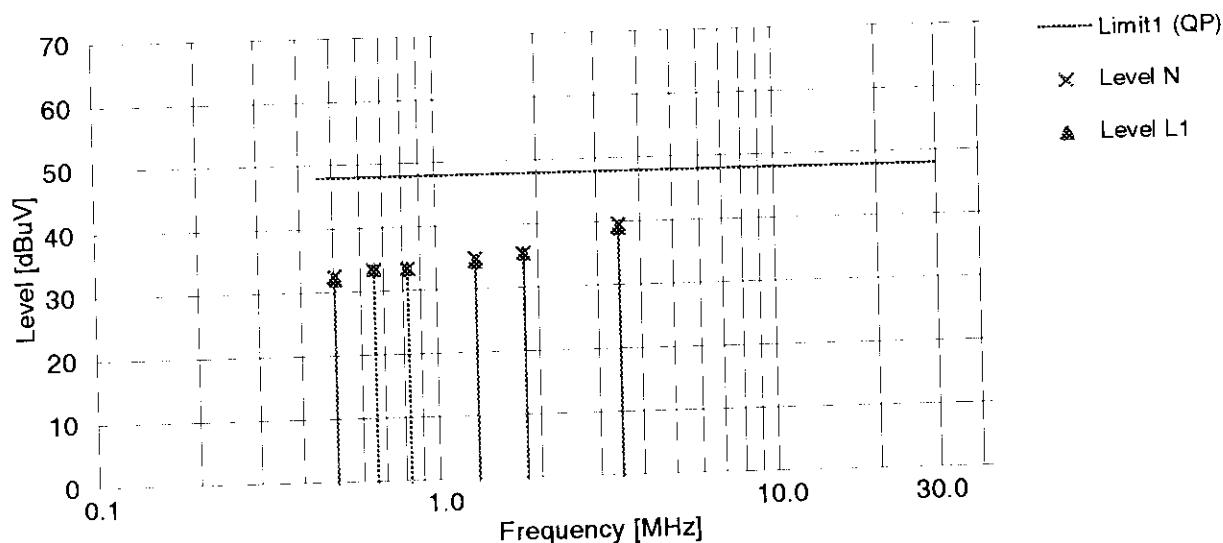
4. EVALUATION OF TEST RESULTS

4-1 Conducted Emission Test

Mode 1

Kind of Equipment	: Scanner	Temperature	: 24 °C
Model Name	: G680A	Humidity	: 55 %
Serial No.	: 000001	Engineer	: A. Hotta
Comment	: Film adapter	Date	: 98/6/3
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]	LISN Factor [dB]	Level N [dBuV]	Level L1 [dBuV]	Limit [dB]	Margin [dB]
	QP [dBuV]	AVE [dBuV]	QP [dBuV]	AVE [dBuV]							
0.5035	32.0	-	31.5	-	-	-	0.4	32.4	31.9	48.0	15.6
0.6601	33.0	-	33.0	-	-	-	0.3	33.3	33.3	48.0	14.7
0.8261	33.0	-	33.0	-	-	-	0.3	33.3	33.3	48.0	14.7
1.3090	34.5	-	34.0	-	-	-	0.3	34.8	34.3	48.0	13.2
1.8128	35.0	-	35.0	-	-	-	0.3	35.3	35.3	48.0	12.7
3.4662	39.0	-	38.5	-	-	-	0.5	39.5	39.0	48.0	8.5

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

LISN factor = LISN factor + Cable loss

Level is rounded off to one decimal place.

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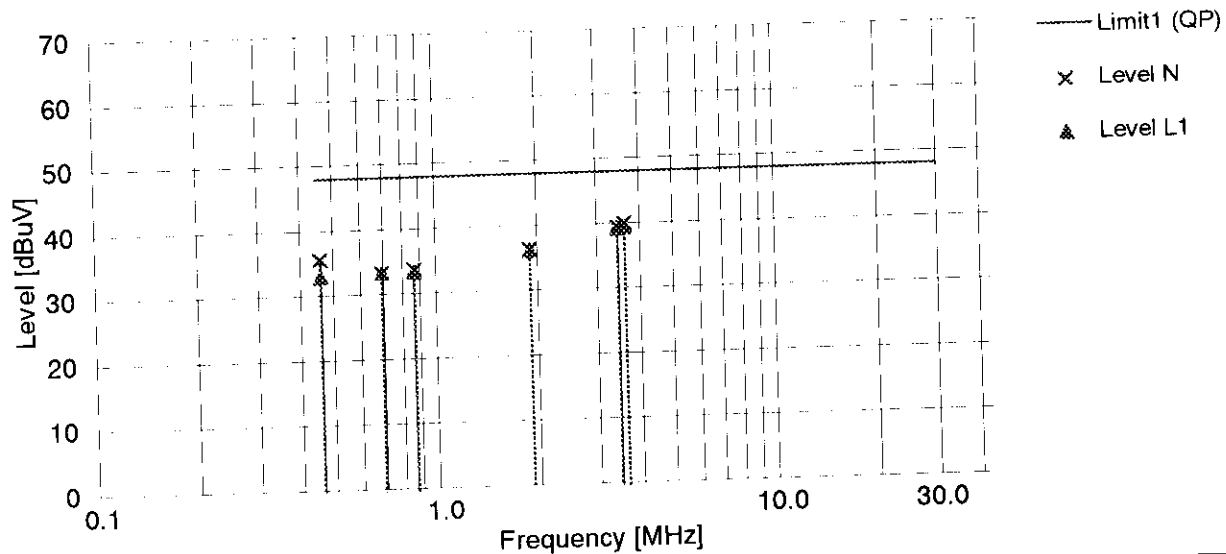
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Mode 2

Kind of Equipment : Scanner
 Model Name : G680A
 Serial No. : 000001
 Comment : A.D.F
 Detector : QP
 Points : 6

Temperature : 24 C
 Humidity : 55 %
 Engineer : A. Hotta
 Date : 98/6/3
 EMI Receiver(s) : R/S ESH 2

Limit1 : [FCC] Class B



Frequency	Reading N		Reading L1		QP-AVE	QP/AVE	LISN	Level N	Level L1	Limit	Margin
[MHz]	QP	AVE	QP	AVE	[dB]	-13	Factor	[dBuV]	[dBuV]	[dB]	[dB]
	[dBuV]	[dBuV]	[dBuV]	[dBuV]		[dB]	[dB]				
0.4593	35.2	-	32.5	-	-	-	0.3	35.5	32.8	48.0	12.5
0.6940	33.0	-	33.0	-	-	-	0.3	33.3	33.3	48.0	14.7
0.8672	33.5	-	33.0	-	-	-	0.3	33.8	33.3	48.0	14.2
1.9036	35.9	-	35.8	-	-	-	0.4	36.3	36.2	48.0	11.7
3.4624	38.8	-	38.7	-	-	-	0.5	39.3	39.2	48.0	8.7
3.6294	39.3	-	38.8	-	-	-	0.6	39.9	39.4	48.0	8.1

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

LISN factor = LISN factor + Cable loss

Level is rounded off to one decimal place.

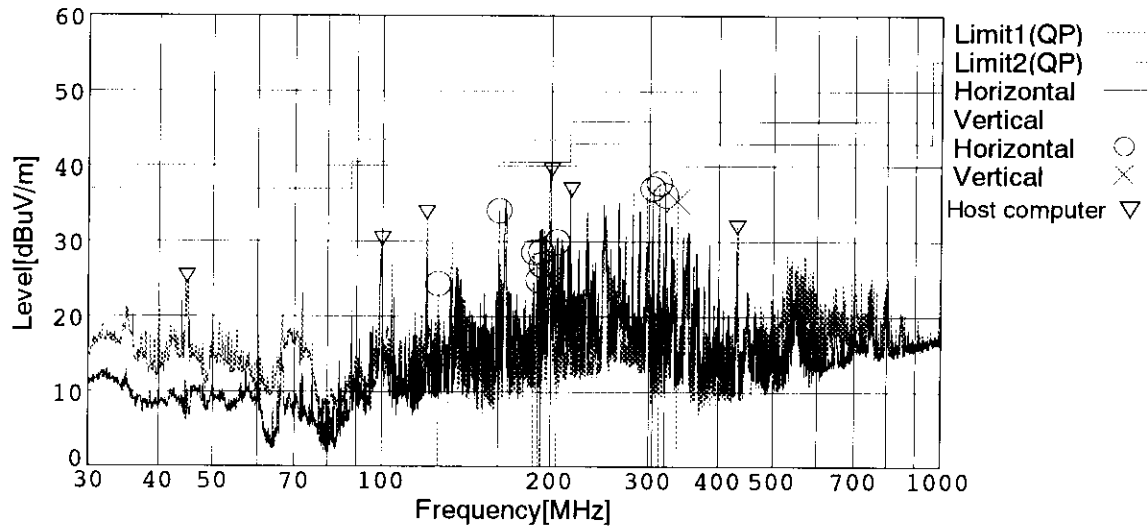
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4-3 Radiated Emission Test**Mode 1**

Kind of Equipment : scanner
 Model Name : G680A
 Serial No. : 000001
 Comment : Film adapter
 Detector : QP
 Points : 11
 Limit1: [FCC] Class B<3m>
 Limit2: [FCC] Class B<3m>(-3.0 dB)

Temperature : 22 C
 Humidity : 55 %
 Engineer : A.Hotta
 Date : 1998/6/5 11:21
 EMI Receiver(s) : ESS



Frequency [MHz]	Meter Reading [dBuV]	Ant. Type	Antenna Factor [dB]	Cable Loss [dB]	Level [dBuV/m]	Angle [degree]	Height [cm]	Pola.	Limit [dBuV/m]	Margin [dB]
125.924	29.4	BC	13.5	-18.6	24.3	129	246	Hori.	43.5	19.2
161.622	36.8	BC	15.6	-18.3	34.1	73	227	Hori.	43.5	9.4
186.552	30.0	BC	16.5	-17.9	28.6	286	246	Hori.	43.5	14.9
189.880	26.2	BC	16.5	-17.9	24.8	130	227	Hori.	43.5	18.7
191.883	30.0	BC	16.5	-17.8	28.7	284	248	Hori.	43.5	14.8
192.273	28.2	BC	16.5	-17.8	26.9	130	229	Hori.	43.5	16.6
205.044	31.0	BC	16.7	-17.7	30.0	99	231	Hori.	43.5	13.5
304.465	40.3	LP	13.5	-16.8	37.0	295	100	Hori.	46.0	9.0
312.454	41.0	LP	13.5	-16.7	37.8	297	101	Hori.	46.0	8.2
320.455	39.2	LP	13.6	-16.6	36.2	307	121	Hori.	46.0	9.8
336.475	38.2	LP	13.6	-16.4	35.4	200	100	Vert.	46.0	10.6

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 is rounded off to one decimal place.

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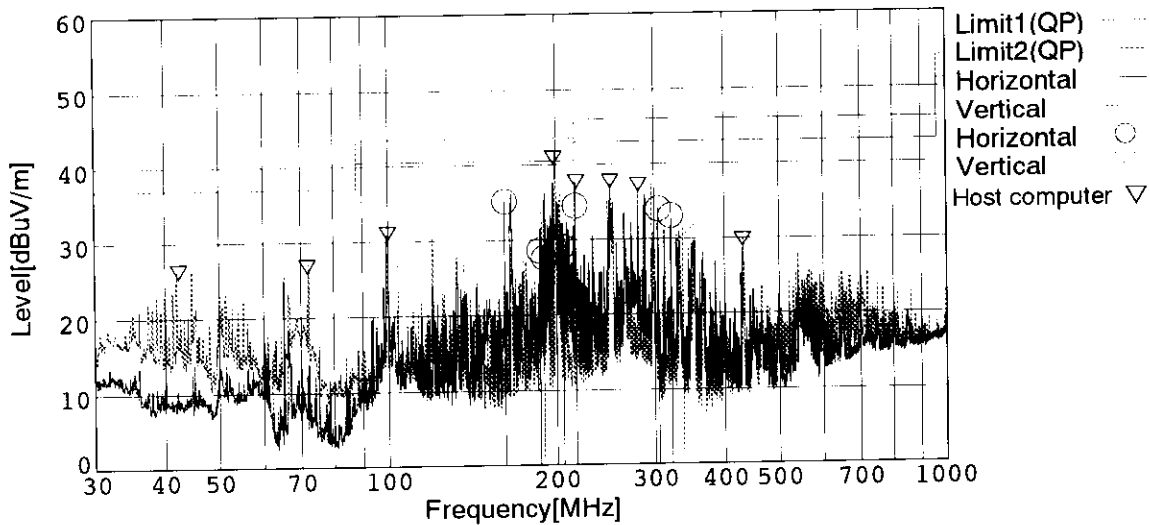
Mode 2

Kind of Equipment : scanner
 Model Name : G680A
 Serial No. : 000001
 Comment : A.D.F
 Detector : QP
 Points : 8

Temperature : 22 C
 Humidity : 55 %
 Engineer : A.Hotta

Date : 1998/6/5 9:44
 EMI Receiver(s) : ESS

Limit1: [FCC] Class B<3m>
 Limit2: [FCC] Class B<3m>(-3.0dB)



Frequency [MHz]	Meter Reading [dBuV]	Ant. Type	Antenna Factor [dB]	Cable Loss [dB]	Level [dBuV/m]	Angle [degree]	Height [cm]	Pola.	Limit [dBuV/m]	Margin [dB]
161.607	37.9	BC	15.6	-18.3	35.2	78	222	Hori.	43.5	8.3
186.542	30.0	BC	16.5	-17.9	28.6	279	212	Hori.	43.5	14.9
189.879	29.0	BC	16.5	-17.9	27.6	291	232	Hori.	43.5	15.9
205.325	30.1	BC	16.7	-17.7	29.1	98	235	Hori.	43.5	14.4
216.308	35.1	BC	17.0	-17.6	34.5	94	217	Hori.	46.0	11.5
304.437	37.3	LP	13.5	-16.8	34.0	178	100	Hori.	46.0	12.0
320.453	36.1	LP	13.6	-16.6	33.1	162	100	Hori.	46.0	12.9
336.477	33.0	LP	13.6	-16.4	30.2	202	138	Vert.	46.0	15.8

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 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 3.6294 MHz (Mode 2)
- Radiation measurement 8.2 dB at 312.454 MHz (Mode 1)

This data represent the worst case emissions.

5-2 Sample Calculations

5-2-1 Conducted Emission

Example 3.6294 MHz

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 39.3 \text{ dBuV} \\
 & & + \text{ *LISN Factor} & + & 0.6 \text{ dB} \\
 & & & = & 39.9 \text{ dBuV} \\
 \\
 \text{Margin} & = & \text{Limit} & & 48.0 \text{ dBuV} \\
 & & - \text{ Emission Level} & - & 39.9 \text{ dBuV} \\
 & & & = & 8.1 \text{ dB}
 \end{array}$$

Meter reading = Test Receiver reading

* LISN factor = LISN factor + cable loss

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 312.454 MHz

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 41.0 \text{ dBuV} \\
 & & + \text{ Antenna Factor} & + & 13.5 \text{ dB} \\
 & & + \text{ Cable Loss (*)} & - & 16.7 \text{ dB} \\
 & & & = & 37.8 \text{ dBuV/m} \\
 \\
 \text{Margin} & = & \text{Limit} & & 46.0 \text{ dBuV/m} \\
 & & - \text{ Emission Level} & - & 37.8 \text{ dBuV/m} \\
 & & & = & 8.2 \text{ dB}
 \end{array}$$

Meter reading = Test Receiver reading

(*) Cable Loss = Cable Loss + Antenna Pad Loss - Amplifier Gain

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	2332A02675	July 25, 1997	1 Year
Quasi-peak Adapter	Hewlett Packard	85650A	2043A00284	July 25, 1997	1 Year
Test Receiver	Rhode & Schwarz	ESS	844362/001	August 14, 1997	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	4.84 dB / -4.92 dB

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

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)