

EPSON

SEIKO EPSON CORPORATION

FCC ID : BKMFBG680B

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 : G680B

FCC ID NUMBER : BKMFBG680B

TEST REPORT No. : E-103-98191

NVLAP[®]

NVLAP LAB CODE 200157-0

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700/423/101

OCT 20 1998

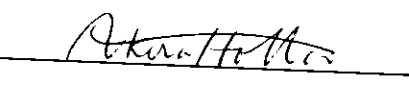
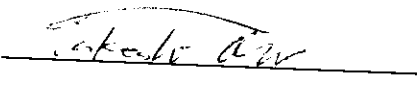
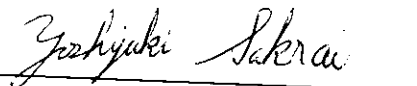
FCC ID : BKMFBG680B

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, 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 : 27 August 1998
Test completed : 31 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 : Akira Hotta 
EMC group, CS/ Quality Assurance Office
Report checked by : Takeshi Ono 
Chief Engineer, EMC group, CS/ Quality Assurance Office
Report approved by : Yoshiyuki Sakurai 
Manager, EMC group, CS/ Quality Assurance / NVLAP signatory
Report issue date : 2 September, 1998

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

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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	: G680B
FCC ID	: BKMFBG680B
Serial Number	: 000014
Voltage input	: AC 120 V/ 60 Hz
Rated current	: 0.5 A
Port(s) / Connector(s)	: USB (Universal Serial Bus)
Oscillator(s) / Crystal(s)	: 48 MHz, 20 MHz (MAIN Board)
Maximum used frequency	: 48 MHz
Remarks	: With film adapter (EU-33) or automatic document feeder (EU-34)

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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	D5605A (SG74900300)	Hewlett Packard	N/A (DoC)	AC 120 V/ 60 Hz 5.0 A	
4	CRT monitor	D2805A (KR338I3857)	Hewlett Packard	A3LCSQ432	AC 120 V/ 60 Hz 1.2 A	
5	Keyboard	C4729A#ABJ (70270545)	Hewlett Packard	AQ6-MTN4C15	DC 5.0 V 300 mA	b)
6	Mouse	M-S34 (LZA74556867)	Hewlett Packard	DZL211029	DC 5.0 V 15 mA	b)
7	Printer	P954A (A681038810)	SEIKO EPSON CORP.	BKMFBP954A	AC 120 V/ 60 Hz 0.4 A	

a) Supplied from EUT

b) Supplied from 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	USB I/F cable	EUT USB in	AE3 USB out	1.8 m	Yes	Metal connector
2	Film adapter I/F	AE1 Signal in	EUT Signal out	0.4 m	Yes	Metal connector Ferrite core
	Automatic document feeder I/F	AE2 Signal in				
3	Video I/F cable	AE4 Video in	AE3 Video out	1.2 m	Yes	Metal connector
4	Keyboard I/F cable	AE5 Keyboard	AE3 Keyboard out	1.9 m	Yes	Metal connector
5	Mouse I/F cable	AE6 Mouse	AE3 Mouse out	1.8 m	Yes	Metal connector
6	Parallel I/F cable	AE7 Parallel in	AE3 Parallel out	2.0 m	Yes	Metal connector
7	Scanner 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	1.9m	No	

Note : Line 2 (film adapter I/F cable or automatic document feeder I/F cable) has a ferrite core permanently attached.

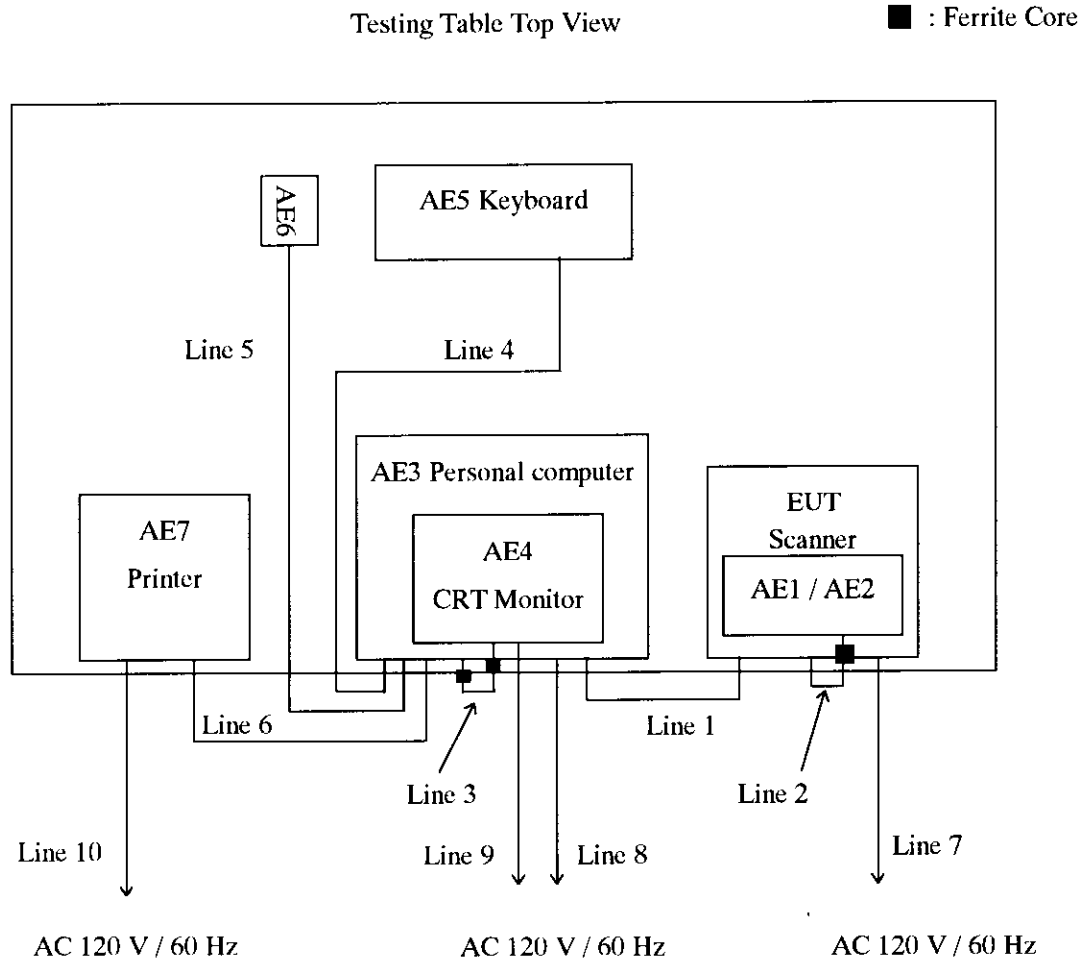
Line 3 (video I/F cable) has two ferrite cores permanently attached.

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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: Scan data displayed on the full screen of the CRT monitor (AE4)
- 3: Stand-by condition on printer (AE7)

Note : The transfer rate on the USB I/F is 12 M 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

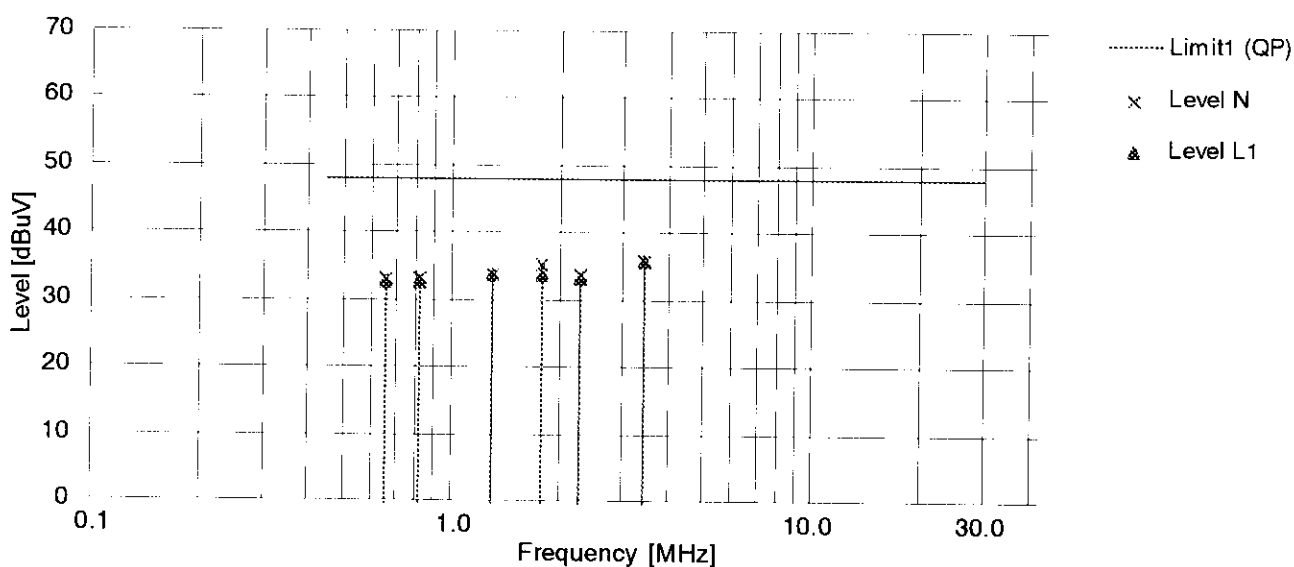
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4. EVALUATION OF TEST RESULTS**4-1 Conducted Emission Test****Mode 1**

Kind of Equipment	: Scanner	Temperature	: 24 °C
Model Name	: G680B	Humidity	: 60 %
Serial No.	: 000014	Engineer	: A. Hotta
Comment	: Film adapter		
Detector	: QP	Date	: 98/8/27
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]							
0.6547	33.0	-	32.5	-	-	-	0.1	33.1	32.6	48.0	14.9
0.8143	33.0	-	32.5	-	-	-	0.1	33.1	32.6	48.0	14.9
1.3038	33.5	-	33.5	-	-	-	0.1	33.6	33.6	48.0	14.4
1.7973	35.0	-	33.5	-	-	-	0.1	35.1	33.6	48.0	12.9
2.2837	33.5	-	33.0	-	-	-	0.2	33.7	33.2	48.0	14.3
3.4437	35.5	-	35.5	-	-	-	0.2	35.7	35.7	48.0	12.3

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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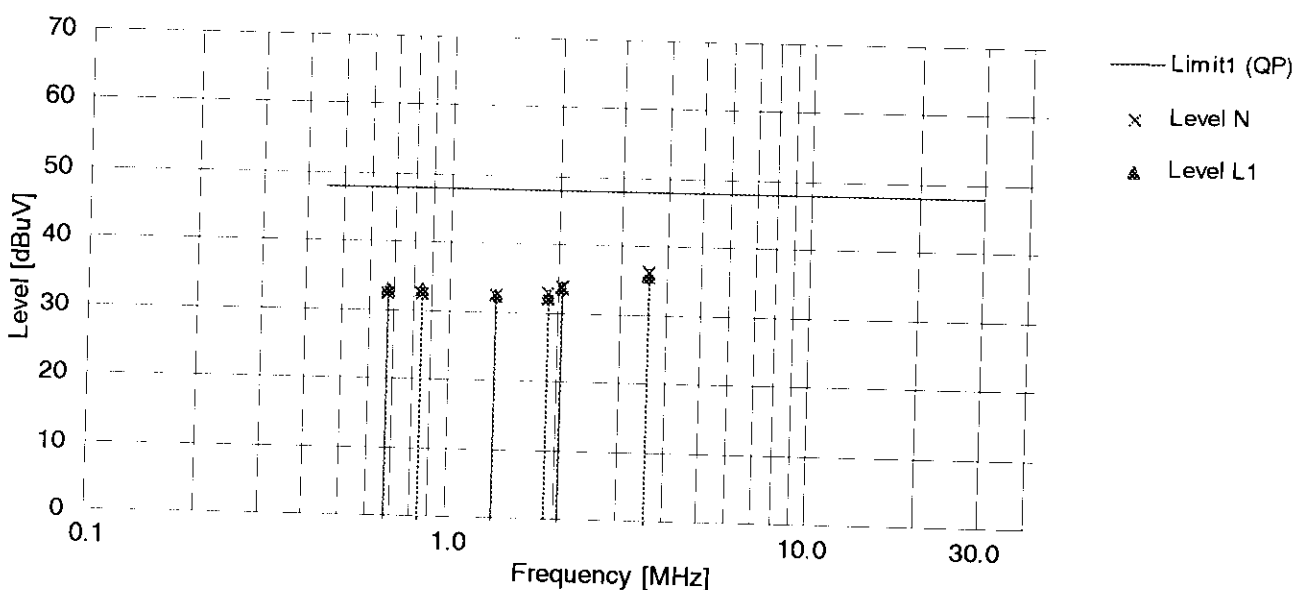
FCC ID : BKMFBG680B

Mode 2

Kind of Equipment : Scanner
Model Name : G680B
Serial No. : 000014
Comment : A.D.F
Detector : QP
Points : 6

Temperature : 24 °C
Humidity : 60 %
Engineer : A. Hotta
Date : 98/8/27
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]							
0.6784	32.5	-	33.0	-	-	-	0.1	32.6	33.1	48.0	14.9
0.8442	32.5	-	33.0	-	-	-	0.1	32.6	33.1	48.0	14.9
1.3529	32.5	-	32.5	-	-	-	0.1	32.6	32.6	48.0	15.4
1.8827	33.0	-	32.0	-	-	-	0.1	33.1	32.1	48.0	14.9
2.0610	34.0	-	33.5	-	-	-	0.1	34.1	33.6	48.0	13.9
3.5651	36.0	-	35.5	-	-	-	0.2	36.2	35.7	48.0	11.8

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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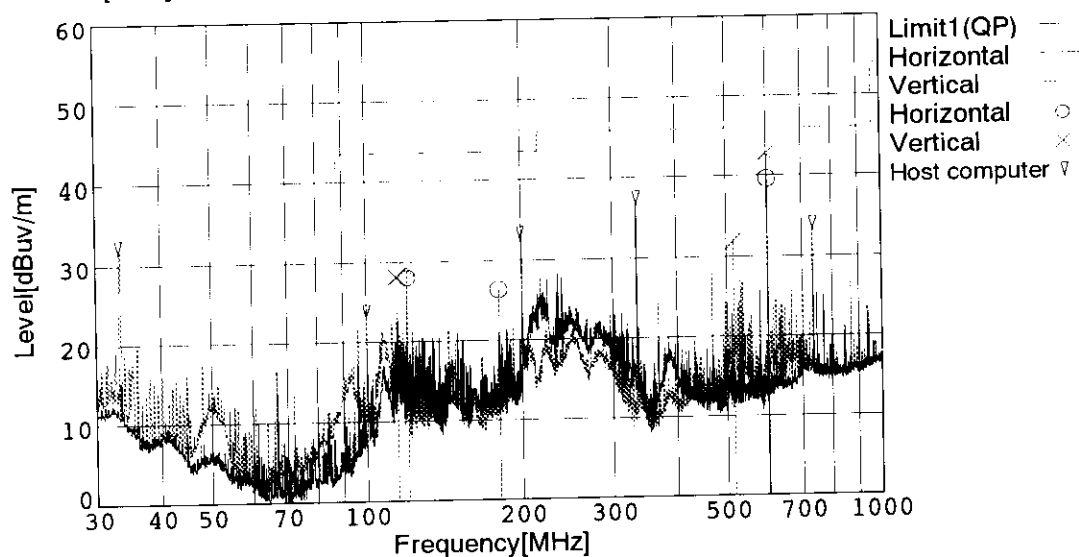
4-3 Radiated Emission Test

Mode 1

Kind of Equipment : Scanner
 Model Name : G680B
 Serial No. : 000014
 Comment : Film adapter
 Detector : QP
 Points : 7
 Limit1: [FCC] Class B<3m>

Temperature : 24 °C
 Humidity : 60%
 Engineer : A.Hotta

Date : 1998/8/31 19:38
 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]
114.666	34.5	BC	12.2	-18.7	28.0	221	100	Vert.	43.5	15.5
120.000	33.5	BC	13.1	-18.6	28.0	246	360	Hori.	43.5	15.5
120.000	34.6	BC	13.1	-18.6	29.1	228	100	Vert.	43.5	14.4
180.616	27.8	BC	16.4	-17.9	26.3	130	344	Hori.	43.5	17.2
515.928	30.4	LP	16.7	-15.3	31.8	262	100	Vert.	46.0	14.2
601.383	39.6	LP	17.8	-14.6	42.8	175	100	Vert.	46.0	3.2
601.384	36.4	LP	17.8	-14.6	39.6	184	128	Hori.	46.0	6.4

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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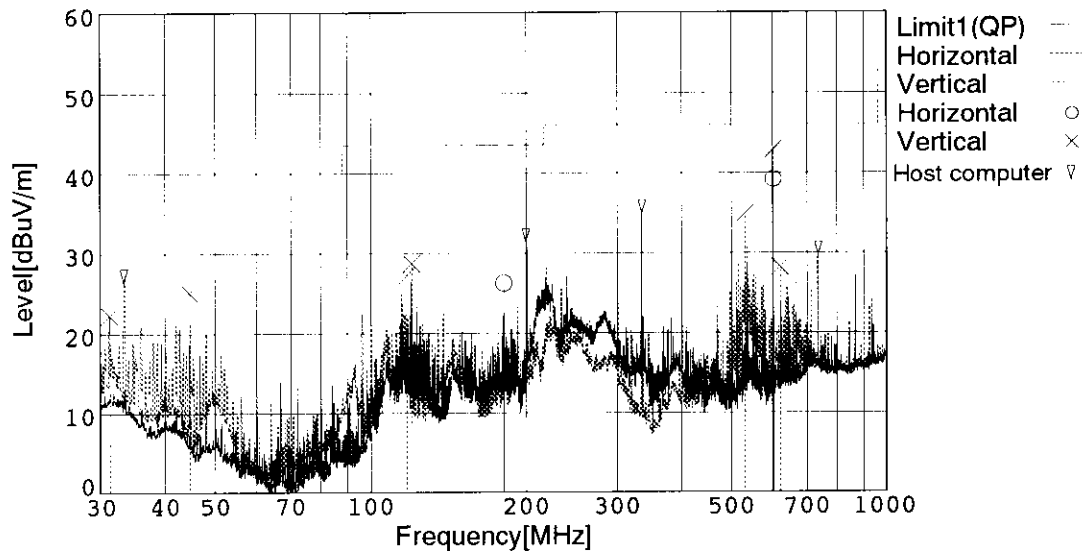
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Mode 2

Kind of Equipment : Scanner
 Model Name : G680B
 Serial No. : 000014
 Comment : A.D.F
 Detector : QP
 Points : 9
 Limit1: [FCC] Class B<3m>

Temperature : 24 °C
 Humidity : 65 %
 Engineer : A.Hotta

Date : 1998/8/31 18:06
 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]
31.322	23.9	BC	18.8	-20.5	22.2	140	100	Vert.	40.0	17.8
44.666	31.6	BC	13.5	-20.0	25.1	230	100	Vert.	40.0	14.9
117.332	33.1	BC	12.7	-18.6	27.2	215	100	Vert.	43.5	16.3
120.001	34.2	BC	13.1	-18.6	28.7	214	100	Vert.	43.5	14.8
180.611	27.8	BC	16.4	-17.9	26.3	138	261	Hori.	43.5	17.2
530.944	33.2	LP	16.9	-15.2	34.9	257	100	Vert.	46.0	11.1
601.383	39.7	LP	17.8	-14.6	42.9	175	100	Vert.	46.0	3.1
601.384	36.0	LP	17.8	-14.6	39.2	189	122	Hori.	46.0	6.8
621.108	24.3	LP	18.4	-14.5	28.2	166	100	Vert.	46.0	17.8

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 = 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 11.8 dB at 3.5651 MHz (Mode 2)

- Radiation measurement 3.1 dB at 601.383 MHz (Mode 2)

This data represent the worst case emissions.

5-2 Sample Calculations

5-2-1 Conducted Emission

Example 3.5651 MHz (Mode 2)

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 36.0 \text{ dBuV} \\
 & & + \text{ Correction Factor} & + & 0.2 \text{ dB} \\
 & & & = & 36.2 \text{ dBuV} \\
 \\
 \text{Margin} & = & \text{Limit} & & 48.0 \text{ dBuV} \\
 & & - \text{ Emission Level} & - & 36.2 \text{ dBuV} \\
 & & & = & 11.8 \text{ dB}
 \end{array}$$

Meter reading = Test Receiver reading

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 601.383 MHz (Mode 2)

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 39.7 \text{ dBuV} \\
 & & + \text{ Antenna Factor} & + & 17.8 \text{ dB} \\
 & & + \text{ Total Loss} & - & 14.6 \text{ dB} \\
 & & & = & 42.9 \text{ dBuV/m} \\
 \\
 \text{Margin} & = & \text{Limit} & & 46.0 \text{ dBuV/m} \\
 & & - \text{ Emission Level} & - & 42.9 \text{ dBuV/m} \\
 & & & = & 3.1 \text{ dB}
 \end{array}$$

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	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	3638A08631	January 7, 1998	1 Year
Quasi-peak Adapter	Hewlett Packard	85650A	3303A01842	January 7, 1998	1 Year
Test Receiver	Rhode & Schwarz	ESS	845420/010	January 8, 1998	1 Year
Pre-amplifier	Hewlett Packard	87405A	3207A00888	March 18, 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)