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SEIKO EPSON CORPORATION

FCC ID : BKMFBG710U

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 : G710U

FCC ID NUMBER : BKMFBG710U

TEST REPORT No. : E-103-98156

NVLAP[®]

NVLAP LAB CODE 200157-0

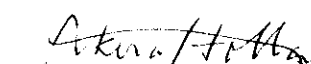
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TEST CERTIFICATION**Applicant Information**

Company : SEIKO EPSON Corporation
Division/Section : TP Product Safety Design Group
Imaging & Information Products Operations
Address : 80, Harashinden, Hirooka, Shiojiri-shi, Nagano, 399-0785 Japan
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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
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 : 7 July, 1998
Test completed : 7 July, 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 : 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 : 15 July, 1998

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

Test Report Contents

	Page
1. DETAILED DESCRIPTION OF TEST ITEM	4
1-1 Equipment Under Test	
1-2 Auxiliary equipment	
1-3 Relevant Signal and Power lines	
1-4 Positioning of Equipment	
2. OPERATING CONDITIONS	8
2-1 Operating modes	
2-2 Operating cycles	
3. TEST PROCEDURE(S)	9
4. EVALUATION OF TEST RESULTS	10
4-1 Conducted Emission Test	
4-2 Photographs of conducted emission test	
4-3 Radiated Emission Test	
4-4 Photographs of radiated emission test	
5. SUMMARY	14
5-1 Test Results	
5-2 Sample Calculations	
5-2-1 Conducted Emission Test	
5-2-2 Radiated Emission Test	
6. LIST OF UTILIZED TEST EQUIPMENT	15
6-1 Conducted Emission Measurement	
6-2 Radiated Emission Measurement	
6-3 Measurement Uncertainties	
7. VALIDITY OF TEST REPORT	16
8. DESCRIPTION OF TEST LABORATORY	17

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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	: G710U
FCC ID	: BKMFBG710U
Serial Number	: 000001
Voltage input	: AC 120 V/ 60 Hz
Rated current	: 0.8 A
Port(s) / Connector(s)	: SCSI
Oscillator(s) / Crystal(s)	: 20 MHz, 24 MHz
Maximum used frequency	: 24 MHz
Remarks	: -

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FCC ID : BKMFBG710U

1-2 Auxiliary equipment (AE)

AE	Name	Model (Serial number)	Manufacturer	FCC ID	Voltage input Power consumption	
1	Film adapter	EU-35 (000065)	SEIKO EPSON CORP.	N/A	DC 24 V 0.6 A DC 5.0 V 0.1 A	a)
2	Personal computer	D3394B (SG60400519)	Hewlett Packard	K4UVECTRAVL5	AC 120 V / 60 Hz 3.0 A	
3	CRT monitor	D2806B (AR54482848)	Hewlett Packard	CSYSC-528UXH	AC 120 V / 60 Hz 0.7 A	
4	Keyboard	C3755B#ABJ (60552232)	Hewlett Packard	AQ6ZG-RT687XT	DC 5.0 V 300 mA	b)
5	Mouse	M-S28 (LTC52900219)	Hewlett Packard	DZL210472	DC 5.0 V 125 mA	b)
6	Scanner	G550A (1TR0000512)	SEIKO EPSON CORP.	BKMG550A	AC 120 V / 60 Hz 0.8 A	
7	Printer	P850A (1YLY185764)	SEIKO EPSON CORP.	BKMP850A	AC 120 V / 60 Hz 1.0 A	
8	SCSI board	AVA-2902E/J (N/A)	Adaptec	N/A	- -	c)

a) Supply from EUT

b) Supply from AE2

c) Inserted into AE2

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1-3 Relevant Signal and Power lines

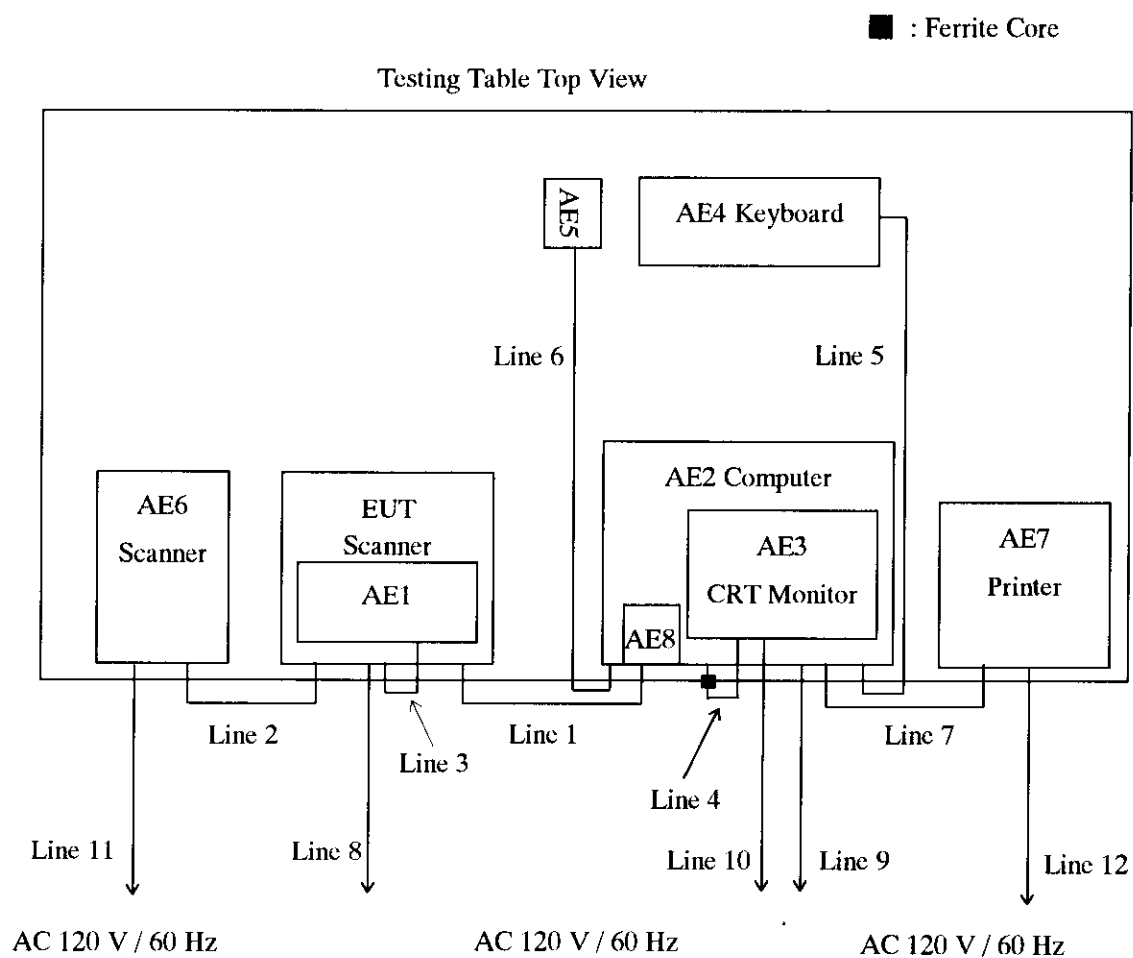
AE = Auxiliary equipment, EUT = Equipment Under Test = Test item

Line	Name	From	To	Length	Shield	Remarks
1	SCSI I/F cable	EUT SCSI	AE8 SCSI	1.0 m	Yes	Metal connector Packed into product box of EUT
2	SCSI I/F cable	EUT SCSI	AE6 SCSI	1.0 m	Yes	Metal connector
3	Film adapter I/F	AE1 Signal in	EUT Signal out	0.3 m	Yes	Metal connector
4	Video I/F cable	AE3 Video in	AE2 Video out	1.4 m	Yes	Metal connector Ferrite core
5	Keyboard I/F cable	AE4 Keyboard	AE2 Keyboard out	2.9 m	Yes	Metal connector
6	Mouse I/F cable	AE5 Mouse	AE2 Mouse out	1.9 m	Yes	Metal connector
7	Parallel I/F cable	AE7 Parallel in	AE2 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	AE2 AC 120 V in	Main AC 120 V	1.9 m	No	
10	Monitor AC cable	AE3 AC 120 V in	Main AC 120 V	1.9 m	No	
11	Scanner AC cable	AE6 AC 120 V in	Main AC 120 V	1.9 m	No	
12	Printer AC cable	AC7 AC 120 V in	Main AC 120 V	1.9m	No	

Note : Line 4 (video I/F cable) have 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.

2. OPERATING CONDITIONS

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

2-1 Operating modes

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

2-2 Operating cycles

Performed following operation continuously.

- 1: Scan data transferred to computer (AE2)
- 2: Scan data displayed on the full screen of the CRT monitor (AE3)
- 3: 'H' data printed by printer (AE7)
- 4: Scanner (AE6) is stand-by condition



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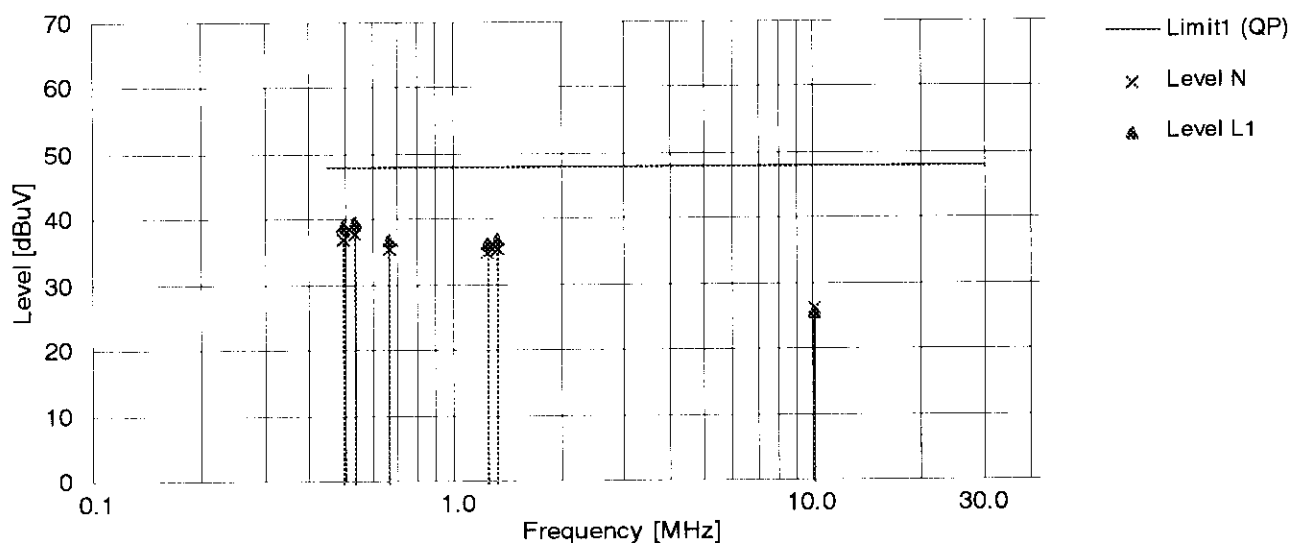
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4. EVALUATION OF TEST RESULTS**4-1 Conducted Emission Test**

Kind of Equipment : Scanner
 Model Name : G710U
 Serial No. : 000001
 Comment : -
 Detector : QP
 Points : 6

Temperature : 24 C
 Humidity : 65 %
 Engineer : A. Hotta
 Date : 98/7/7
 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]							
0.4953	36.5	-	38.5	-	-	-	0.4	36.9	38.9	48.0	9.1
0.5330	37.5	-	39.0	-	-	-	0.4	37.9	39.4	48.0	8.6
0.6671	35.0	-	36.5	-	-	-	0.3	35.3	36.8	48.0	11.2
1.2516	34.6	-	36.0	-	-	-	0.3	34.9	36.3	48.0	11.7
1.3339	35.0	-	36.5	-	-	-	0.3	35.3	36.8	48.0	11.2
10.0214	24.5	-	24.0	-	-	-	1.5	26.0	25.5	48.0	22.0

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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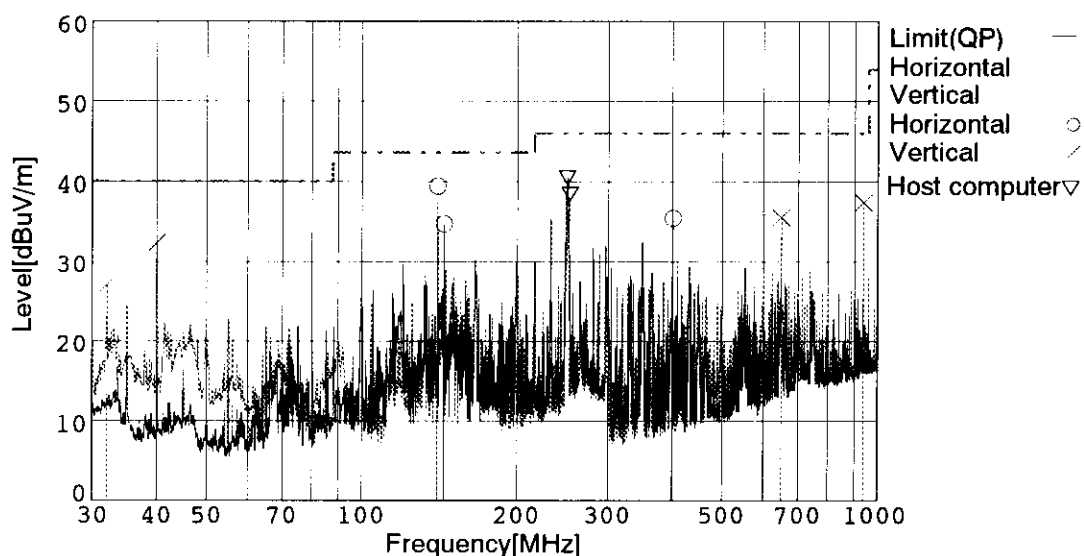
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4-3 Radiated Emission Test

Kind of Equipment : Scanner
 Model Name : G710U
 Serial No. : 000001
 Comment :
 Detector : QP
 Points : 8
 Limit: [FCC] Class B<3m>

Temperature : 24 C
 Humidity : 55 %
 Engineer : A.Hotta

Date : 1998/7/7 13:39
 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]
32.064	28.9	BC	18.5	-20.4	27.0	286	100	Vert.	40.0	13.0
40.067	37.1	BC	15.5	-20.2	32.4	106	100	Vert.	40.0	7.6
140.238	44.1	BC	13.9	-18.5	39.5	93	224	Hori.	43.5	4.0
144.289	38.9	BC	14.2	-18.5	34.6	93	204	Hori.	43.5	8.9
400.794	36.6	LP	14.6	-15.8	35.4	83	100	Hori.	46.0	10.6
601.184	32.8	LP	17.8	-14.6	36.0	1	100	Vert.	46.0	10.0
649.288	30.6	LP	19.2	-14.3	35.5	309	100	Vert.	46.0	10.5
937.866	27.8	LP	21.8	-12.2	37.4	73	100	Vert.	46.0	8.6

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 = 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 8.6 dB at 0.5330 MHz
- Radiation measurement 4.0 dB at 140.238 MHz

This data represent the worst case emissions.

5-2 Sample Calculations

5-2-1 Conducted Emission

Example 0.5330 MHz

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 39.0 \text{ dBuV} \\
 & & + \text{ Correction Factor} & + & 0.4 \text{ dB} \\
 & & & = & 39.4 \text{ dBuV} \\
 \\
 \text{Margin} & = & \text{Limit} & & 48.0 \text{ dBuV} \\
 & & - \text{ Emission Level} & - & 39.4 \text{ dBuV} \\
 & & & = & 8.6 \text{ dB}
 \end{array}$$

Meter reading = Test Receiver reading

The numerical value are rounded off to one decimal place.

5-2-2 Radiated Emission

Example 140.238 MHz

$$\begin{array}{rclcl}
 \text{Emission Level} & = & \text{Meter Reading} & & 44.1 \text{ dBuV} \\
 & & + \text{ Antenna Factor} & + & 13.9 \text{ dB} \\
 & & + \text{ Total Loss} & - & 18.5 \text{ dB} \\
 & & & = & 39.5 \text{ dBuV/m} \\
 \\
 \text{Margin} & = & \text{Limit} & & 43.5 \text{ dBuV/m} \\
 & & - \text{ Emission Level} & - & 39.5 \text{ dBuV/m} \\
 & & & = & 4.0 \text{ dB}
 \end{array}$$

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	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
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 phase “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)