

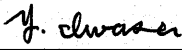
EMI TEST REPORT

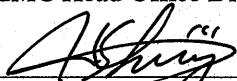
Test Report No. : 23AE0021-HO-1

Applicant : SEIKO EPSON CORPORATION
Type of Equipment : Bluetooth Unit
Model No. : EU-62
Test standard : FCC Part15 Subpart C
Section15.207, Section15.247
FCC ID : BKMFBUEU-62
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of A-Pex International Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test : September 18,19,20 and 25, 2002

Tested by : 
Yoshiaki Iwasa
EMC Head Office Division

Approved by : 
Hironobu Shimoji
Group Leader of EMC Head Office Division

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SECTION 1: Client information

Company name : SEIKO EPSON CORPORATION
Brand name : EPSON
Address : 80 Harashinden, Hirooka, Shiojiri-shi Nagano-ken 399-0785 Japan
Telephone Number : +81-263-53-8909
Facsimile Number : +81-263-53-3702
Contact Person : Yukinori Soma

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Bluetooth Unit
Model No. : EU-62
Serial No. : 00110
Rating : DC 5.0V / 100mA
Country of Manufacture : Japan
Receipt Date of Sample : September 13, 2002
Condition of EUT : Engineering prototype

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2.2 Product Description

SEIKO EPSON CORPORATION Model: EU-62(referred to as the EUT in this report) is a Bluetooth Unit.
The clock frequency used in EUT is 32MHz.

Frequency characteristics	: from 2402MHz to 2480MHz
Number of Channel / Channel spacing	: 79 channels / 1MHz
Modulation	: FSK (Frequency Shift Keying) and FHSS (Frequency Hopping Spread Spectrum)
Antenna Type	: Internal Ceramic Antenna (AH104F245003)
Antenna Gain	: 2.044dBi
ITU code	: 79M3F1D

***FCC Part 15.31 (e)**

The host device EU-62 provide the stable power supply DC 5.0V and the Bluetooth Unit complies power supply regulation.

***FCC Part 15.203 Antenna requirement**

Bluetooth Unit and its antenna comply with this requirement since they are built in host device EU-62 when they are put up for sale and they are used with a particular antenna connector.

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SECTION 3: Test specification, procedures and results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted Emissions
Section 15.247 Operation within the Bands 902-928MHz, 2400-2483.5MHz and
5725-5850MHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	ANSI C63.4:2000	Section 15.207	-	N/A	12.7dB 150.0kHz, N	Complied
2	Carrier Frequency Separation	ANSI C63.4:2000	Section15.247(a)(1)	Conducted	N/A	-	Complied
3	20dB Bandwidth	ANSI C63.4:2000	Section15.247(a)(1)	Conducted	N/A	-	Complied
4	Number of Hopping Frequency	ANSI C63.4:2000	Section15.247(a)(1)(iii)	Conducted	N/A	-	Complied
5	Dwell time	ANSI C63.4:2000	Section15.247(a)(1)(iii)	Conducted	N/A	-	Complied
6	Maximum Peak Output Power	ANSI C63.4:2000	Section15.247(b)(1)	Conducted	N/A	-	Complied
7	Band Edge Compliance	ANSI C63.4:2000	Section15.247(c)	Conducted	N/A	-	Complied
8	Spurious Emission	ANSI C63.4:2000	Section15.247(c)	Conducted/ Radiated	N/A	7.2dB 960.00MHz Horizontal	Complied

*These tests were also referred to FCC Public Notice DA 00-705 "Guidance on Measurement for Frequency Hopping Spread Spectrum Systems".

3.3 Additions to Standards

No addition, deviation or exclusion has been made from standards.

3.4 Confirmation

A-Pex International hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.207 and 247.

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3.5 Uncertainty

Conducted Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was $\pm 1.3\text{dB}$.

- The data listed in this test report may exceed the test limit because it does not have enough margin.
 The data listed in this test report has enough margin, more than the site margin.

Spurious Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.5\text{dB}$.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}$.

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 6.6\text{dB}$.

- The data listed in this test report may exceed the test limit because it does not have enough margin.
 The data listed in this test report has enough margin.

Carrier Frequency Separation, 20dB Bandwidth, Number of Hopping Frequency, Dwell Time, Maximum Peak Output Power and Band Edge Compliance Test

The measurement uncertainty (with a 95% confidence level) for this test was $\pm 3.0\text{dB}$.

- The data listed in this test report may exceed the test limit because it does not have enough margin.
 The data listed in this test report has enough margin.

3.6 Test Location

A-Pex International Co., Ltd.

EMC Head Office Division. No.1 and No.2 semi Anechoic chambers and No.3 Measurement room.

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This semi Anechoic Chamber has been fully described in a report submitted to FCC office, and listed on February 01, 2002 (No.1)/ June 05, 2002 (No.2) (Registration number: No.1: 313583, No.2: 846015 Industry Canada:

No.1: IC4247, No.2: IC4247-2 .

*NVLAP Lab. code: 200572-0

3.7 Test set up, Data of EMI and Test instruments

Refer to APPENDIX 1 to 3.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

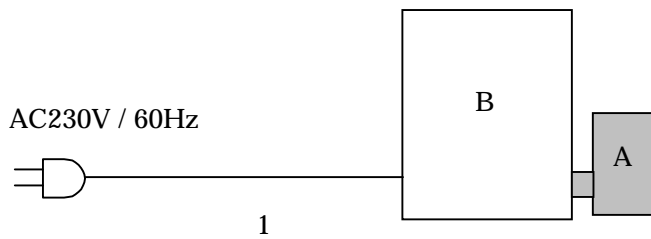
The sequence is used :

1. Transmitting mode (2402MHz)
2. Transmitting mode (2441MHz)
3. Transmitting mode (2480MHz)
4. Transmitting (Hopping on)

The EUT doesn't have Inquiry mode.

Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals



*Cabling was taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No	Item	Model number	Serial number	Manufacturer	FCC ID	Remark
A	Bluetooth Unit	EU-62	00110	EPSON	BKMFBEU-62	EUT
B	Inkjet Printer	B151B	000088	EPSON	-	Conducted Emission
			000117			Except for the above

List of cables used

No	Name	Length (m)	Shield	Backshell Material	Remark
1	AC Power Cable	1.9m	N	Polyvinyl chloride	-

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SECTION 5: Conducted Emission, Section 15.207

Test Procedure

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a reference ground plane 4.0 x 4.0m in a No.2 semi Anechoic Chamber (7.5x5.8x5.2m).

The EUT was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements have been performed with a CISPR quasi-peak detector (IF BW 9 kHz).

Measurement range: 0.15-30MHz

Test data : APPENDIX 2

Test result : Pass

Test instruments : MTR-02, MSA-02, MCC-13, MLS-06

SECTION 6: Carrier Frequency Separation , Section15.247(a)(1)

Test Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2

Test result : Pass

Test instruments : MTR-01, MCC-05

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SECTION 7: 20dB Bandwidth , Section 15.247(a)(1)

Test Procedure

The 20dB bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-05

SECTION 8: Number of Hopping Frequency, Section 15.247(a)(1)(iii)

Test Procedure

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-05

SECTION 9: Dwell time, Section 15.247(a)(1)(iii)

Test Procedure

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-05

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SECTION 10: Maximum Peak Output Power, Section 15.247(b)(1)

Test Procedure

The Maximum Peak Output Power was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-05

SECTION 11: Band Edge Compliance, Section 15.247(c)

Test Procedure

The Band Edge Compliance was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-05

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SECTION 12: Spurious Emission , Section 15.247(c)

[Conducted]

Test Procedure

The Spurious Emission (Conducted) was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-05

[Radiated]

Test Procedure

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength intensity has been measured in No.1 semi anechoic chamber (19.2x11.2x7.7m) and No.2 semi anechoic chamber (7.5x5.8x5.2m) with a ground plane at a distance of 3m. The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

Test data : APPENDIX 2
Test result : Pass
Test instruments : MTR-01, MCC-04, MCC-06, MHA-01, MHA-05, MPA-01, MPA-02, MCC-05
MBF-01, MSA-02, MTR-02, MPA-04, MCC-12, MAT-07, MBA-03, MLA-03

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APPENDIX 1: Photographs of test setup

- Page 13 : Conducted emission
- Page 14 : Spurious Emission Test
- Page 15 : Carrier Frequency Separation, 20dB Bandwidth, Number of Hopping Frequency, Dwell Time, Maximum Peak Output Power and Band Edge Compliance Test

APPENDIX 2: Data of EMI test

- Page 16-20 : Conducted emission
- Page 21-23 : Carrier Frequency Separation
- Page 24-26 : 20dB Bandwidth
- Page 27-29 : Number of Hopping Frequency
- Page 30-48 : Dwell Time
- Page 49-51 : Maximum Peak Output Power
- Page 52-54 : Band Edge Compliance
- Page 55-60 : Spurious emission (Radiated Data)
- Page 61-66 : Spurious emission (Conducted Chart)

APPENDIX 3: Test instruments

- Page 67 : Test instruments

APPENDIX 1: Photographs of test setup
Conducted emission



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Spurious emission



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**Carrier Frequency Separation, 20dB Bandwidth, Number of Hopping Frequency,
Dwell Time, Maximum Peak Output Power and Band Edge Compliance Test**



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