

Exhibit B – Test Report

Wireless Computing

RF-150 Wireless Mouse

Project Number: 03435-10

Prepared for:
WIRELESS COMPUTING
14101 West Highway 290, Bldg. 700
Austin, TX

By

Professional Testing (EMI), Inc.
1601 FM 1460, Suite B
Round Rock, Texas 78664

June 2003

CERTIFICATION
Electromagnetic Interference
Test Report

WIRELESS COMPUTING
RF-150 WIRELESS MOUSE
(Transmitter)

Table of Contents

Title Page	1
Table of Contents	2
Certificate of Compliance	3
1.0 EUT Description	4
1.1 EUT Operation	4
2.0 Electromagnetic Emissions Testing	4
2.1 Conducted Emissions Measurements	4
2.2 Radiated Emissions Measurements	4
2.2.1 Test Procedure	5
2.2.2 Test Criteria	5
2.2.3 Test Results	6
3.0 Antenna Requirement	6
3.1 Evaluation Procedure	6
3.2 Evaluation Criteria	6
3.3 Evaluation	6
4.0 RF Safety	7
5.0 Modifications to Equipment	7
6.0 List of Test Equipment	7

Figures

FIGURE 1: Radiated Emissions Test Setup	8
---	---

Appendices

Appendix A: Emissions Data Sheets.....	9
--	---

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF PROFESSIONAL TESTING (EMI), INC.



Certificate of Compliance

Applicant: Wireless Computing

Applicant's Address: 14101 West Highway 290, Bldg. 700
Austin, TX

Model: RF-150 Wireless Mouse

Project Number: 03435-10

The **Wireless Computing RF-150 Wireless Mouse** was tested to and found to be in compliance with FCC Part 15.203, 15.205, 15.209, and 15.249 for Intentional Radiators.

The highest average emissions generated by the above equipments are listed below:

	<u>Frequency (MHz)</u>	<u>Level (dBμV/m)</u>	<u>Limit (dBμV/m)</u>	<u>Margin (dB)</u>
Peak Fundamental	916.6	93.9	94	-.1
Harmonics	1833	48.5	63.5	-15.0
Spurious	500	21.8	46	-24.2

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

Jeffrey A. Lenk
President

1.0 EUT Description

The RF-150 Mouse is a handheld, 2-button wireless mouse for computers operating on Windows and Macintosh systems. The EUT is battery operated and works in conjunction with a receiver. RF packets are sent to the receiver, which in turn, are passed to the computer by the receiver. Packets are acknowledged via an RF packet that is sent back to the transmitter. The RF-150 can operate PowerPoint slideshows and other mouse-controllable computer applications. It transmits reliably at a distance of 100 feet.

The EUT operates on a frequency of 916.5 MHz and is designed for compliance with 47 CFR 15.249 of the FCC rules. Specific test requirements for the devices include the following:

47 CFR 15.249	Fundamental and Harmonic Radiated Power
47 CFR 15.209	General Radiated Emission Limits
47 CFR 15.203	Antenna Requirements
47 CFR 15.205	Restricted Bands of Operation

The system tested consisted of the following:

<u>Manufacturer & Model</u>	<u>Serial #</u>	<u>FCC ID #</u>	<u>Description</u>
Wireless Computing RF-150	None	None	Wireless remote handheld mouse
Wireless Mouse			

System Peripherals

None.

1.1 EUT Operation

The EUT was tested while operating in the normal mode. It was transmitting and receiving RF packets to and from the remote device.

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing.

2.1 Conducted Emissions Measurements

Conducted emissions were not measured. The EUT operates strictly from battery power (one AA battery). This test is not required.

2.2 Radiated Emissions Measurements

Radiated emission measurements were made on the transmitter Fundamental and Spurious/Harmonic Emission levels for the **Wireless Computing RF-150 Wireless Mouse**.

Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the transmitter were made at the Professional Testing "Open Field" Site 3, located in Round Rock, Texas. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

Tests of the fundamental for the device were performed to determine the worst case orientation and polarization of the device.

2.2.1 Test Procedure

The following testing procedure was applied to the EUT mentioned above.

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable, which allows 360-degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious/harmonic measurements above 1 GHz, the measurement antenna was placed at a distance of 1 meter from the EUT. The radiated emissions were maximized by energizing the EUT and by rotating the EUT.

A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 1.

2.2.2 Test Criteria

The table below shows FCC 15.249 radiated limits for an intentional radiator operating at 902 to 928 MHz. In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.205 and §15.209. The measurements of the harmonics and spurious emissions were performed to the 10th harmonic of the fundamental.

<u>Signal Type</u>	<u>Frequency (MHz)</u>	<u>3 m Limit Per §15.249 or §15.209</u>	<u>Field Strength (dB uV/m)</u>
Fundamental	916.5	50 mV/m	94
2 nd Harmonic	1831.4	500 μ V/m	63.5
3 rd Harmonic	2749.5	500 μ V/m	63.5
4 th Harmonic	3666.0	500 μ V/m	63.5
5 th Harmonic	4582.5	500 μ V/m	63.5
6 th Harmonic	5499.0	500 μ V/m	63.5
7 th Harmonic	6415.0	500 μ V/m	63.5
8 th Harmonic	7332.0	500 μ V/m	63.5
9 th Harmonic	8248.8	500 μ V/m	63.5
10 th Harmonic	9165.0	500 μ V/m	63.5

Note: Radiated emissions above 1000 MHz were measured at 1 meter and the limit was increased to 63.5 dBuV/m.

2.2.3 Test Results

The radiated test data for the fundamental is included in Appendix A. The emissions were maximized at each frequency and the highest emissions identified were measured using peak detection. The radiated emissions test data for the harmonics is included in Appendix A.

The radiated emissions generated by the Wireless Computing RF-150 Wireless Mouse are below the FCC Part 15 maximum emission criteria.

2.3 Occupied Bandwidth Measurements

As per §15.249 measurements of occupied bandwidth for the fundamental signals of the EUT are not required. To prevent out of band emissions, the operating frequencies have been selected the center of the band.

3.0 Antenna Requirement

An analysis of the **Wireless Computing RF-150 Wireless Mouse** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulations under the Intentional Radiator portions of Part 15.

3.1 Evaluation Procedure

The structure and application of the **Wireless Computing RF-150 Wireless Mouse** were analyzed with respect to the rules. The antenna for this unit is an internal antenna. An auxiliary antenna port is not present.

3.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

3.3 Evaluation Results

The **Wireless Computing RF-150 Wireless Mouse** meets the criteria of this rule by virtue of having an internal antenna located inside the enclosure. There is no means of relocating the antenna externally without seriously compromising the intrinsic safety feature of this industrial device. The EUT is therefore compliant with §15.203.

4.0 RF Safety

The FCC safety criteria that invokes measurement of specific absorption rate (SAR), from OET Bulletin 65 Supplement C, is 300 mW for 915 MHz operating frequency. The power output of this transmitter is thus 1/100th of the threshold for RF safety concern, and therefore meets the requirements of FCC rules 2.1091 & 2.1093.

5.0 Modifications to Equipment

The following modification was made to the **Wireless Computing RF-150 Wireless Mouse** during the testing process.

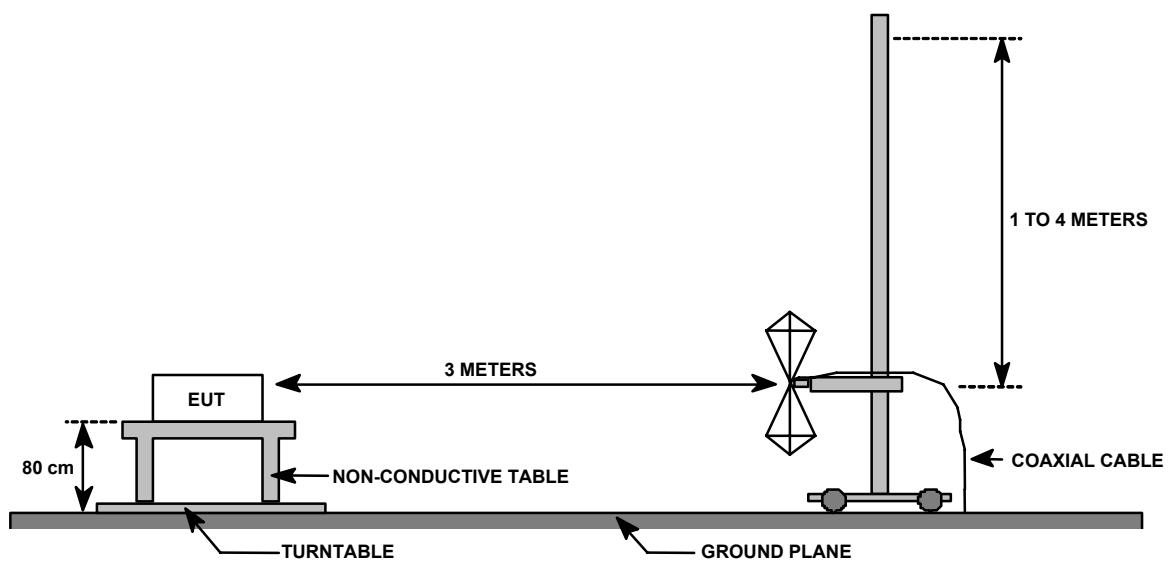
- Resistor R6 was changed to 16.5KOhms.

6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Electromagnetic Emissions Test Equipment

<u>Model</u>	<u>Description</u>	<u>Calibration Due</u>
HP8566B	Spectrum Analyzer	November 2003
Tektronix 2706	RF Preselector	December 2003
HP 8447D	Preamplifier	November 2003
Compliance Design B-100	Biconical Antenna	October 2003
EMCO 3115	Ridge Guide Antenna	July 2003
EMCO 3146	Log Periodic Antenna	December 2003
MITEQ	20 dB Preamp	December 2003
MITEQ	30 dB Preamp	December 2003
Armored 10 meter microwave cable		June 2004
Site Cables for 3 meters (30 -1000 MHz)		December 2003

FIGURE 1: Radiated Emissions Test Setup

Appendix A

Emissions Data Sheets

Fundamental Radiated Data Sheet
Wireless Computing
RF-150 Wireless Mouse

DATE: May 27, 2003
 PROJECT #: 03435-10

DETECTOR FUNCTION: Quasi-Peak
 MEASUREMENT DISTANCE (m): 3

Antenna Polarization: Horizontal

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
916.6	275	1.2	80.9	26.1	25.2	12.0	92.0	94	-2.0
916.6	285	1.3	80	26.1	25.2	12.0	91.1	94	-2.9
916.6	310	1	72.1	26.1	25.2	12.0	83.2	94	-10.8

Antenna Polarization: Vertical

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
916.6	165	2	77.5	26.1	25.2	12.0	88.6	94	-5.4
916.6	345	1.4	77.6	26.1	25.2	12.0	88.7	94	-5.3
916.6	15	1.3	82.8	26.1	25.2	12.0	93.9	94	-0.1

Comment: Test Type FCC 15.249

Test Engineer: Jason Haley

Harmonics Radiated Data Sheet
Wireless Computing
RF-150 Wireless Mouse

DATE: May 8, 2003
 PROJECT #: 03435-10

DETECTOR FUNCTION: Average
 MEASUREMENT DISTANCE (m): 1

Antenna Polarization: Horizontal

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/M)	Cable Loss (dB)	Corrected Level (dBuV/M)	Limit (dBuV/M)	Margin (dB)
1555	90	1	27.4	21.1	25.4	2.2	33.9	63.5	-29.6
1627	270	1	25.2	21.3	25.7	2.3	31.9	63.5	-31.6
1833	110	1	41.1	22.0	26.7	2.4	48.2	63.5	-15.3
2472	90	1	27.2	21.8	26.7	2.9	34.9	63.5	-28.6
2750	300	1	35.2	21.8	27.3	3.1	43.8	63.5	-19.8
3666	190	1	24.7	22.7	29.4	3.6	35.1	63.5	-28.4
4583	170	1	25.1	22.1	30.5	4.1	37.6	63.5	-25.9
5500	170	1	17.7	21.9	32.5	4.4	32.7	63.5	-30.8
7333	0	1	15.2	20.4	34.9	5.4	35.1	63.5	-28.4
9166	0	1	13.7	20.2	37.5	5.7	36.6	63.5	-26.9
9166	0	1	15.6	20.2	37.5	5.7	38.5	63.5	-25.0

Comment: Emission limit over 1 GHz: 500 uV/m

Test Engineer: Jason Haley

Harmonics Radiated Data Sheet
Wireless Computing
RF-150 Wireless Mouse

DATE: May 8, 2003
 PROJECT #: 03435-10

DETECTOR FUNCTION: Average
 MEASUREMENT DISTANCE (m): 1

Antenna Polarization: Vertical

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/M)	Cable Loss (dB)	Corrected Level (dBuV/M)	Limit (dBuV/M)	Margin (dB)
1833	180	1	41.4	22.0	26.7	2.4	48.5	63.5	-15.0
2750	0	1	31.9	21.8	27.3	3.1	40.5	63.5	-23.1
3666	265	1	26.6	22.7	29.4	3.6	37.0	63.5	-26.5
4583	180	1	22.5	22.1	30.5	4.1	35.0	63.5	-28.5
5500	120	1	18.2	21.9	32.5	4.4	33.2	63.5	-30.3
7333	0	1	15.8	20.4	34.9	5.4	35.7	63.5	-27.8
9167	0	1	17.6	20.2	37.5	5.7	40.5	63.5	-23.0

Comment: Emission limit over 1 GHz: 500 uV/m

Test Engineer: Jason Haley

Spurious Radiated Data Sheet
Wireless Computing
RF-150 Wireless Mouse

DATE: May 27, 2003
 PROJECT #: 03435-10

DETECTOR FUNCTION: Quasi-Peak
 MEASUREMENT DISTANCE (m): 3

Antenna Polarization: Horizontal

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
66	0	1	24.4	26.4	8.0	3.0	9.0	40	-31.0
200	0	1	22.3	26.7	13.0	5.5	14.1	43.5	-29.4
500	0	1	21.3	27.1	20.0	7.6	21.8	46	-24.2

Antenna Polarization: Vertical

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
66	0	1	29.6	26.4	8.0	3.0	14.2	43.5	-29.3
200	0	1	18	26.7	13.0	5.5	9.8	40	-30.2
500	0	1	19.1	27.1	20.0	7.6	19.6	46	-26.4

Comment: Spurious Emissions below 1 GHz
 No signals detected, noise-floor readings recorded.

Test Engineer: Jason Haley