



FCC TEST REPORT

REPORT NO.: RF920519R07

MODEL NO.: 1008

RECEIVED: May 19, 2003

TESTED: May 21 ~ 22, 2003

APPLICANT: Microsoft Corporation

ADDRESS: One Microsoft Way, Redmond,
WA 98052-6399, U.S.A.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chia Pau Tsuen, Linkou Hsiang,
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ILAC MRA



Lab Code: 200102-0

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1 CERTIFICATION

PRODUCT NAME : Wireless Optical Mouse 2.0
BRAND NAME : Microsoft®
MODEL NO. : 1008
APPLICANT : Microsoft Corporation
STANDARDS : 47 CFR Part 15, Subpart C (15.227)
ANSI C63.4-1992, Canada RSS-210

We, **Advance Data Technology Corporation**, hereby certify that three samples of the designation have been tested in our facility from May 21, 2003 to May 22, 2003. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions herein specified.

PREPARED BY : Emily Lu , **DATE :** June 11, 2003
Emily Lu

APPROVED BY : Dr. Alan Lane , **DATE :** June 11, 2003
Dr. Alan Lane, JVP

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
15.207	Conducted Emission Test	N/A	Power supply is 1.5VDC from batteries
15.227	Radiated Emission Test	PASS	Minimum passing margin is -17.30dB at 162.50MHz

NOTE: The receiver part to communicate with the EUT has been verified to comply with FCC Part 15, Subpart B, Class B (DoC). The test report can be provided upon request.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless Optical Mouse 2.0
MODEL NO.	1008
POWER SUPPLY	1.5V for Mouse from AA Battery x 2
MODULATION TYPE	FSK
CARRIER FREQUENCY OF EACH CHANNEL	27.145MHz
BANDWIDTH OF EACH CHANNEL	NA
NUMBER OF CHANNEL	1
ANTENNA TYPE	printed antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DDVCS	NA

NOTE:

1. The EUT is the transmitter part of a wireless mouse.
2. Three identical samples were tested at Microsoft's request. The serial numbers are M-DV-089, M-DV-207 and M-DV-205.
3. Miata Configuration Information:

Configuration #:		Comments: Combi DV phase unit with EMC fixes for formal report			
Manufacturer	Component type	Part no.	RDV sion no	Description	BOM (if known)
KYE	Mouse			Transmitter	K630C345
ST	Optical Sensor	Aviator		ASIC	K130C081
Microsoft	Firmware		DV1	Transmitter	
KYE	Receiver			Combi Receiver	K630D027
Motorola	Micro-controller	MC68HC908JB8		Combi	K130D005
Microsoft	Firmware		V52	Combi Receiver	
YC	Cable			Double-braid	
Bizlink	Cable				
Ji Haw	Cable				
TCT, Express	TX PCB		9	Silver Through Hole	K023C107
TCT, Express	RX RF MC3361 PCB		6	Single Side	K023C101
	RX MOD MC68 PCB		4	Silver Through Hole	K023C102
KYE	PCB Assembly			Combi Receiver (DV)	K000D008
KYE	PCB Assembly			Transmitter	K000C143
Toyoplas	RX TOP Case	X01-03216	DV1	ABS-HB	
Toyoplas	RX Bottom Case	X01-02955	DV1	ABS-HB	
Toyoplas	RX Light Pipe	X-01-02957	DV1	PC	
Toyoplas	RX KEY Button	X01-02956	DV1	ABS-HB	
Merrich	TX Top ASSY		DV1	ABS-HB	K590C449
Merrich	TX CH Shaft		DV1	ABS-HB	K516C051
Merrich	TX Top Cover Plate		DV1	ABS-HB	K580C028
Merrich	TX Bottom Case		DV1	ABS-HB	K512C310
Merrich	TX Battery Door		DV1	ABS-HB	K517C112
Merrich	TX Pirelli ASSY		DV1	ABS & PC & Rubber	K580C024
JH	Communication adapter	X03-97009	A	USB to PS/2 adapter	K550C007

4. For more detailed features description of the EUT, please refer to the manufacturer's specifications or the User's Manual.

3.2 DESCRIPTION OF TEST MODES

One channel (freq. = 27.145MHz) is provided in this EUT.

NOTE: Three test results were presented in the following sections. Test result (A) is for serial number M-DV-089, test result (B) is for M-DV-207 and test result (C) is for M-DV-205.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is the transmitter part of a wireless mouse. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 15, Subpart C (15.227)

ANSI C63.4-1992, Canada RSS-210.

All tests have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

NA

4 TEST PROCEDURE AND RESULT

4.1 CONDUCTED EMISSION MEASUREMENT

NA

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.227 the field strength of Emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)	
	Peak	Average
26.96-27.28	100	80

Field strength limits are at the distance of 3 meters, Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	$2400/F(\text{kHz})$	300
0.490-1.705	$24000/F(\text{kHz})$	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any Emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.2.2 TEST INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* HP Spectrum Analyzer	8590L	3544A01176	May 13, 2004
* HP Preamplifier	8447D	2944A08485	May 01, 2004
* ANTENNA (Large Biconical)	VHBA9123	449	Dec. 22, 2003
HP Preamplifier	8449B	3008A01201	Dec. 01, 2003
HP Preamplifier	8449B	3008A01292	Aug. 07, 2003
Spectrum Analyzer	8593E	3926A04191	Mar. 24, 2004
* Test Receiver	ESI7	838496/016	Feb. 23, 2004
SCHAFFNER Tunable Dipole Antenna	VHBA 9123	459	Nov. 22, 2003
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* CHASE BILOG Antenna	CBL6112A	2221	Aug. 02, 2003
SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	July 03, 2003
EMCO Horn Antenna	3115	9312-4192	Mar. 23, 2004
* EMCO Turn Table	1060	1115	NA
* SHOSHIN Tower	AP-4701	A6Y005	NA
* Software	ADT_Radiated_V5.09	NA	NA
* ANRITSU RF Switches	MP59B	M35046	Jul. 11. 2003
* TIMES RF cable	LMR-600	CABLE-ST5-01	Jul. 11. 2003

- NOTE:** 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. "*" = These equipment are used for the final measurement.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of Emission frequency above 1GHz if tested.
4. The test was performed in ADT Open Site No. 5.
5. The VCCI Site Registration No. is R-1039.

4.2.3 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected Emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the Emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the Emissions that did not have 10 dB margin would be re-tested one by one using the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP mode.

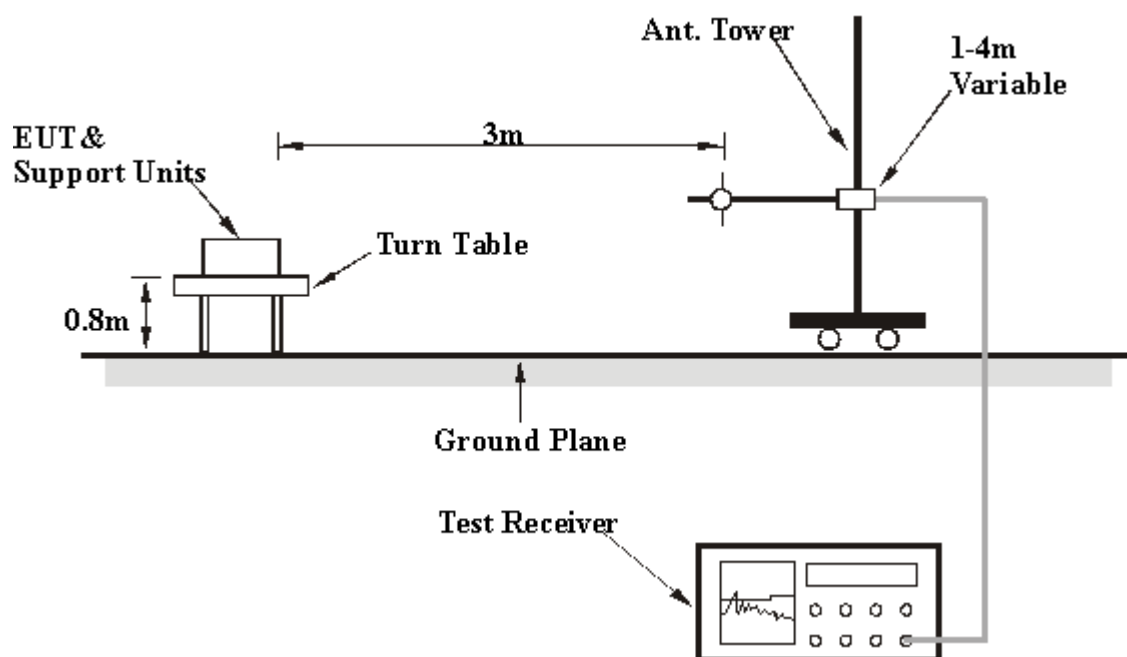
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.

4.2.4 DDVATION FROM TEST STANDARD

No dDVation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item in this test report - Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITION

Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.

4.2.7 TEST RESULT (A)

EUT	Wireless Optical Mouse 2.0	MODEL	1008
		SERIAL NO.	M-DV-089
FREQUENCY	27.145MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	1.5VDC	DETECTOR FUNCTION	Peak / Quasi-Peak / Average
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 991hPa	TESTED BY: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.14	49.9 PK	100.00	-50.10	2.21 H	54	43.30	6.60
2	*27.14	39.0 AV	80.00	-41.00	2.21 H	54	32.40	6.60
3	108.50	24.5 QP	43.50	-19.00	1.44 H	66	11.80	12.70
4	135.60	24.8 QP	43.50	-18.70	1.10 H	85	12.40	12.40
5	162.20	25.5 QP	43.50	-18.00	1.21 H	52	14.70	10.80
6	189.78	25.8 QP	43.50	-17.70	1.17 H	32	15.00	10.80
7	217.70	26.0 QP	46.00	-20.00	1.12 H	331	13.40	12.60
8	271.42	24.8 QP	46.00	-21.20	1.14 H	1	8.40	16.40

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.14	50.8 PK	100.00	-49.20	1.09 V	93	44.20	6.60
2	*27.14	41.0 AV	80.00	-39.00	1.09 V	93	34.40	6.60
3	108.50	25.0 QP	43.50	-18.50	1.11 V	54	12.30	12.70
4	135.78	25.0 QP	43.50	-18.50	1.07 V	24	12.60	12.40
5	162.10	24.0 QP	43.50	-19.50	1.31 V	151	13.20	10.80
6	217.40	23.8 QP	46.00	-22.20	1.12 V	52	11.20	12.60
7	271.40	23.8 QP	46.00	-22.20	1.71 V	51	7.40	16.40
8	298.50	25.8 QP	46.00	-20.20	1.61 V	195	9.00	16.80

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other Emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. "*" = Fundamental frequency.

4.2.8 TEST RESULT (B)

EUT	Wireless Optical Mouse 2.0	MODEL	1008
		SERIAL NO.	M-DV-207
FREQUENCY	27.145MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	1.5VDC	DETECTOR FUNCTION	Peak / Quasi-Peak / Average
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 991hPa	TESTED BY: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.14	47.6 PK	100.00	-52.40	2.18 H	55	41.00	6.60
2	*27.14	38.0 AV	80.00	-42.00	2.18 H	55	31.40	6.60
3	108.50	25.0 QP	43.50	-18.50	1.10 H	54	12.30	12.70
4	135.70	24.1 QP	43.50	-19.40	1.25 H	66	11.70	12.40
5	162.20	24.0 QP	43.50	-19.50	1.18 H	4	13.20	10.80
6	190.44	24.0 QP	43.50	-19.50	1.18 H	45	13.20	10.80
7	217.70	23.8 QP	46.00	-22.20	1.28 H	24	11.20	12.60
8	271.10	25.0 QP	46.00	-21.00	1.23 H	95	8.60	16.40

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.14	51.2 PK	100.00	-48.80	1.15 V	209	44.60	6.60
2	*27.14	42.0 AV	80.00	-38.00	1.15 V	209	35.40	6.60
3	108.33	24.0 QP	43.50	-19.50	1.15 V	85	11.30	12.70
4	135.70	24.8 QP	43.50	-18.70	1.36 V	51	12.40	12.40
5	190.20	25.2 QP	43.50	-18.30	1.11 V	24	14.40	10.80
6	217.16	26.0 QP	46.00	-20.00	1.12 V	84	13.40	12.60
7	244.31	25.2 QP	46.00	-20.80	1.30 V	225	10.10	15.10
8	271.45	25.0 QP	46.00	-21.00	1.85 V	45	8.60	16.40

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other Emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. "*" = Fundamental frequency.

4.2.9 TEST RESULT (C)

EUT	Wireless Optical Mouse 2.0	MODEL	1008
		SERIAL NO.	M-DV-205
FREQUENCY	27.145MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	1.5VDC	DETECTOR FUNCTION	Peak / Quasi-Peak / Average
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 991hPa	TESTED BY: Gary Chang	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.15	37.9 AV	80.00	-42.10	2.40 H	257	31.30	6.60
2	*27.15	47.9 PK	100.00	-52.10	2.40 H	257	41.20	6.60
3	108.50	25.8 QP	43.50	-17.70	1.10 H	74	13.10	12.70
4	135.20	23.8 QP	43.50	-19.70	1.15 H	72	11.30	12.50
5	162.74	24.8 QP	43.50	-18.70	1.10 H	85	14.00	10.80
6	189.97	25.4 QP	43.50	-18.10	1.34 H	27	14.60	10.80
7	217.02	25.4 QP	46.00	-20.60	1.19 H	28	12.90	12.50
8	271.13	25.0 QP	46.00	-21.00	1.15 H	71	8.60	16.40

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.15	41.5 AV	80.00	-38.50	1.08 V	92	34.90	6.60
2	*27.15	50.0 PK	100.00	-50.00	1.08 V	92	43.40	6.60
3	108.50	25.5 QP	43.50	-18.00	1.53 V	214	12.80	12.70
4	135.70	24.2 QP	43.50	-19.30	1.12 V	101	11.80	12.40
5	162.50	26.2 QP	43.50	-17.30	1.15 V	74	15.40	10.80
6	190.20	26.0 QP	43.50	-17.50	1.31 V	24	15.20	10.80
7	217.65	25.4 QP	46.00	-20.60	1.11 V	152	12.80	12.60
8	271.45	24.0 QP	46.00	-22.00	1.30 V	124	7.60	16.40

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other Emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. "*" = Fundamental frequency.

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST



6 INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
New Zealand	MoC
Norway	NEMKO
R.O.C.	BSMI, DGT, CNLA

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.