FCC TEST REPORT

REPORT NO.: RF930813H01
MODEL NO.: M-RAS88A
RECEIVED: Aug. 13, 2004
TESTED: Aug. 17, 2004

APPLICANT: LOGITECH FAR EAST LTD.

ADDRESS: #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien, Taiwan, R.O.C.

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0536
ILAC MRA

No. 2177-01

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1 CERTIFICATION

PRODUCT :	Cordless Mouse
BRAND NAME :	Logitech
MODEL NO :	M-RAS88A
TESTED:	Aug. 17, 2004
APPLICANT :	LOGITECH INC.
STANDARDS :	47 CFR Part 15, Subpart C(15.227) ANSI C63.4-2001

The above equipment (Model: M-RAS88A) has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Carol Liao , **DATE:** Aug. 27, 2004
(Carol Liao)

TECHNICAL ACCEPTANCE : Hank Chung , **DATE:** Aug. 27, 2004
Responsible for RF
(Hank Chung)

APPROVED BY : , **DATE:** Aug. 27, 2004
(Eric Lin, Manager)

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	NA	Power supply is 1.5VDC from batteries
15.227	Radiated Emission Test	PASS	Minimum passing margin is –17.60 dBuV at 108.21 MHz
15.227	Band Edges Test	PASS	Meet the requirement of limit

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	Cordless Mouse
MODEL NO.	M-RAS88A
POWER SUPPLY	1.5VDC from battery
MODULATION TYPE	FSK
CARRIER FREQUENCY OF EACH CHANNEL	27.045 MHz, 27.195MHz
NUMBER OF CHANNEL	2
ANTENNA TYPE	Loop antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is the transmitter part of Cordless Mouse.
2. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

There are two channels have been pretested in our facility which are identical to each other in all aspects except for the following:

Mode	Frequency
1	27.045MHz
2	27.195MHz

NOTE: 27.045MHz, the worst case, was chosen for final test and it's data was recorded in this report.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

47 CFR Part 15, Subpart C (15.227)

ANSI C63.4-2001

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

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

4 EMISSION TEST

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 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)	
26.96-27.28	Peak	Average
	100	80

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(kHz)	300
0.490-1.705	24000/F(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.

4.1.2 TEST INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Spectrum Analyzer	8594ER	3829U04676	Aug. 30, 2004
ADVANTEST Spectrum Analyzer	R3271A	85060311	Jun 16, 2005
CHASE RF Pre_Amplifier	CPA9232	1057	May. 10, 2005
HP Pre_Amplifier	8449B	3008A01922	Oct. 13, 2004
ROHDE & SCHWARZ Test Receiver	ESVS 10	849231 /019	Sep. 30, 2004
CHASE Broadband Antenna	VULB9168	138	May.22, 2005
Schwarzbeck Horn_Antenna	3115	5619	Jun 16, 2005
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170192	Feb. 16, 2005
SCHWARZBECK Tunable Dipole Antenna	UHAP	897	Mar. 07, 2005
R&S Loop Antenna	HFH2-Z2	881058/15	Mar. 07, 2005
SCHWARZBECK Tunable Dipole Antenna	VHAP	880	Mar. 07, 2005
RF Switches (ARNITSU)	CS-201	1565157	Dec. 01, 2004
RF CABLE (Chaintek) 1GHz-20GHz	SF102	22054-2	Feb. 10. 2005
RF Cable(RICHTEC)	9913-30M	STCCAB-30M-1GHz-021	Dec. 01, 2004
Software	AS60P8	NA	NA
CHANCE MOST Antenna Tower	AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

Note: 1. The calibration interval of the above test instruments is 12 months (36 months for Tunable Dipole Antenna)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. C.
5. The FCC Site Registration No. is 656396.
6. The VCCI Site Registration No. is R-1626.
7. The CANADA Site Registration No. is IC 4824-3.
8. The measurement uncertainty is 3.56 dB, which is calculated as per the document CISPR 16-4

4.1.3 TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 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.

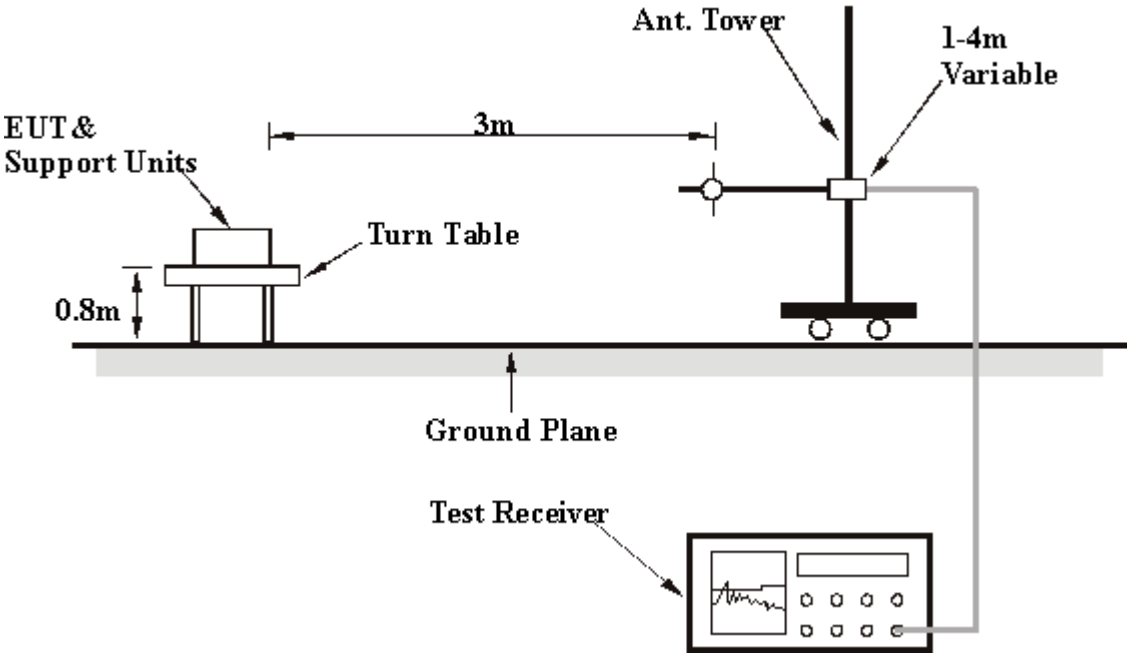
NOTE:

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.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITION

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

4.1.7 TEST RESULT

EUT	Cordless Mouse	**MODEL**	M-RAS88A
FREQUENCY RANGE	Below 1000 MHz	**INPUT POWER**	1.5VDC
ENVIRONMENTAL CONDITIONS	28 deg. C, 68 % RH, 960 hPa	**DETECTOR FUNCTION**	Peak / Quasi-Peak / Average
TEST BY	Sky Liao		

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	*27.045	46.50 PK	100.00	-53.50	2.44 H	90	33.70	12.80
2	*27.045	42.20 AV	80.00	-37.80	2.44 H	90	29.40	12.80
3	81.12	21.80 QP	40.00	-18.20	2.49 H	101	13.60	8.20
4	108.21	25.80 QP	43.50	-17.70	2.79 H	194	14.30	11.50
5	189.29	17.50 QP	43.50	-26.00	1.55 H	260	7.80	9.60
6	216.32	16.90 QP	46.00	-29.10	2.32 H	273	6.90	10.00
7	243.40	20.20 QP	46.00	-25.80	1.19 H	121	7.00	13.20
8	324.55	19.00 QP	46.00	-27.00	2.88 H	112	3.00	16.00

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	*27.045	51.50 PK	100.00	-48.50	1.00 V	144	38.70	12.80
2	*27.045	47.00 AV	80.00	-33.00	1.00 V	144	34.20	12.80
3	81.15	17.10 QP	40.00	-22.90	1.45 V	87	9.00	8.20
4	**108.21**	**25.90 QP**	**43.50**	**-17.60**	**1.11 V**	**94**	**14.40**	**11.50**
5	189.29	13.80 QP	43.50	-29.70	1.07 V	106	4.20	9.60
6	216.17	9.60 QP	46.00	-36.40	1.66 V	197	-0.30	10.00
7	243.21	11.30 QP	46.00	-34.70	1.61 V	340	-1.90	13.20
8	324.35	14.10 QP	46.00	-31.90	1.01 V	243	-1.80	16.00

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.

4.2 BAND EDGES MEASUREMENT

4.2.1 LIMITS OF BAND EDGES MEASUREMENT

The field strength of any emissions appearing between the band edges and up to 10kHz above and below the band edges shall be attenuated at least 26dB below the level of the unmldulated carrier or to the general limits in 15.209, whichever permits the higher emissions levels.

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 27, 2004

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.2.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 1kHz with suitable frequency span including 10kHz bandwidth from band edge. The band edges was measured and recorded.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

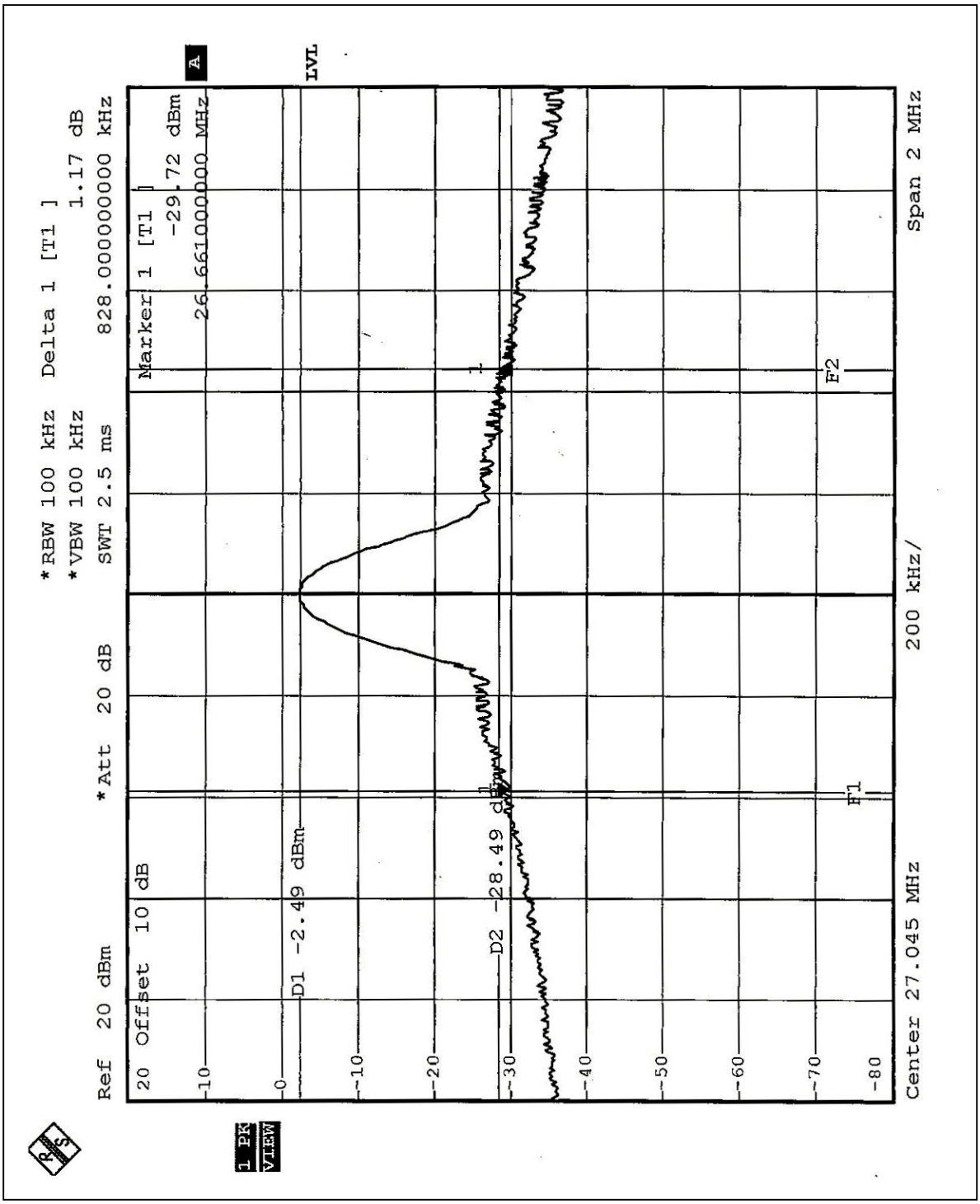
4.2.5 EUT OPERATING CONDITION

Same as Item 4.2.6

4.2.6 TEST RESULTS

The spectrum plots are attached on the following pages. D2 line indicates the highest level, D1 line indicates the 26dB offset below D2. It shows compliance with the requirement in part 15.235(b).

27.045MHz


RBW 100 kHz
VBW 100 kHz
SWT 2.5 ms
Att 20 dB
Offset 10 dB
Ref 20 dBm
Delta 1 [T1]
1.17 dB
828.000000000 kHz
Marker 1 [T1]
-29.72 dBm
26.661000000 MHz
D1 -2.49 dBm
D2 -28.49 dBm
F1
F2
Center 27.045 MHz
200 kHz/
Span 2 MHz
1 PK VIEW

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, Radio, Telecom 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, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, DGT
Netherlands	Telefication
Singapore	PSB , GOST-ASIA(MOU)
Russia	CERTIS(MOU)

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.

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