

FCC TEST REPORT

REPORT NO.: RF970714H03

MODEL NO.: M-R0004

RECEIVED: July 14, 2008

TESTED: July 16, 2008

ISSUED: July 18, 2008

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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1 CERTIFICATION

PRODUCT: 2.4GHz Cordless Mouse

BRAND NAME: Logitech **MODEL NO**.: M-R0004

TESTED: July 16, 2008

TEST SAMPLE: ENGINEERING SAMPLE

APPLICANT: LOGITECH FAR EAST LTD.

STANDARDS: 47 CFR Part 15, Subpart C (Section 15.249),

ANSI C63.4-2003

The above equipment (Model: M-R0004) 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: July 18, 2008

(Sunny W**e**∕n, Specialist)

TECHNICAL

ACCEPTANCE: Mank Chy , DATE: July 18, 2008

Responsible for RF (Hank Chung, Deputy Manager)

APPROVED BY: , **DATE**: *July 18, 2008*

(May Cher, Deputy 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 DC 3V from batteries				
15.249	Radiated Emission Test	PASS	Minimum passing margin is –10.94dB at 2390.00MHz				
15.249	Band Edge Measurement	PASS	Meet the requirement of limit				

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz -18GHz)	2.33 dB
Radiated emissions (18GHz -40GHz)	2.55 dB



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	2.4GHz Cordless Mouse
MODEL NO.	M-R0004
FCC ID	JNZMR0004
POWER SUPPLY	DC 3V from batteries
MODULATION TYPE	GFSK
CARRIER FREQUENCY OF EACH CHANNEL	2405MHz ~ 2474MHz
NUMBER OF CHANNEL	24
ANTENNA TYPE	PCB printed antenna with 0.83dBi antenna gain
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. 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

Twenty-four channels are provided in this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2405	7	2423	13	2441	19	2459
2	2408	8	2426	14	2444	20	2462
3	2411	9	2429	15	2447	21	2465
4	2414	10	2432	16	2450	22	2468
5	2417	11	2435	17	2453	23	2471
6	2420	12	2438	18	2456	24	2474

NOTE:

- 1. Below 1 GHz, the channel 1, 15, and 24 were pre-tested in chamber. The channel 15, worst case one, was chosen for final test.
- 2. Above 1 GHz, the channel 1, 15, and 24 were tested individually.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a 2.4GHz 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 (Section 15.249) ANSI C63.4: 2003

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.

3.5 CONFIGURATION OF SYSTEM UNDER TEST

TEST TABLE



4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

NA

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.249 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency	Field Strength of Fundamental (dBuV/m)			
(MHz)	Peak Averag			
	114	94		
2400 ~ 2483.5	Field Strength of Ha	rmonics (dBuV/m)		
	74	54		

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.



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.



4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 15, 2009
HP Pre_Amplifier	8449B	3008A01922	Oct. 04, 2008
ROHDE & SCHWARZ Test Receiver	ESCS30	100375	Mar. 31, 2009
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	July 26, 2008
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 16, 2008
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 27, 2009
R&S Loop Antenna	HFH2-Z2	100070	Jan. 13, 2009
RF Switches (ARNITSU)	CS-201	1565157	Aug. 13, 2008
RF CABLE (Chaintek)	SF102	22054-2	Dec. 06. 2008
RF Cable(RICHTEC)	9913-30M N-N Cable	STCCAB-30M-1 GHz	Aug. 13, 2008
Software	ADT_Radiated_V 7.6.15.8	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 and the calibrations are traceable to NML/ROC and NIST/USA.

 2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) are used only for the measurement of emission frequency above 1GHz if tested.

 3. The test was performed in ADT Open Site No. C.

 4. The FCC Site Registration No. is 656396.

 5. The VCCI Site Registration No. is R-1626.

 6. The CANADA Site Registration No. is IC 3789C-3.

 7. Loop antenna was used for all emissions below 30 MHz.



4.2.3 TEST PROCEDURES

- 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 peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

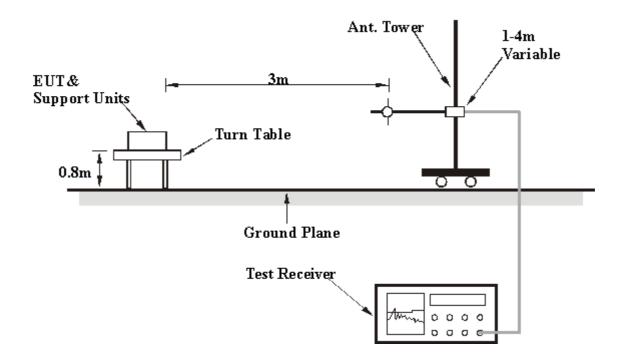
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation



4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Set the EUT under transmission / receiver condition continuously at specific channel frequency.



4.2.7 TEST RESULTS

MODE	Channel 15	INPUT POWER	DC 3V from batteries
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	27 deg. C, 60%RH, 960 hPa	TESTED BY	Phoenix Huang

	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	42.05	18.83 QP	40.00	-21.17	1.00 H	182	6.08	12.75
2	118.70	26.41 QP	43.50	-17.09	1.00 H	108	13.45	12.96
3	240.00	16.70 QP	46.00	-29.30	1.00 H	63	2.67	14.03
4	362.32	24.69 QP	46.00	-21.31	1.00 H	51	6.03	18.66
5	480.00	22.44 QP	46.00	-23.56	1.00 H	43	1.37	21.07
6	719.25	28.63 QP	46.00	-17.37	1.00 H	165	2.47	26.16

	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq.	Emission Level	Limit	Margin	Antenna Height	Table Angle	Raw Value	Correction Factor
	(MHz)	(dBuV/m)	(dBuV/m)	m) (dB)	(m)	(Degree)	(dBuV)	(dB/m)
1	64.00	19.47 QP	40.00	-20.53	1.00 V	75	6.37	13.10
2	123.95	20.85 QP	43.50	-22.65	1.00 V	135	7.45	13.40
3	180.00	16.01 QP	43.50	-27.49	1.00 V	277	2.22	13.79
4	245.55	22.15 QP	46.00	-23.85	1.00 V	73	7.86	14.29
5	333.73	22.43 QP	46.00	-23.57	1.00 V	264	4.90	17.53
6	719.75	28.37 QP	46.00	-17.63	1.00 V	99	2.19	26.18

REMARKS:

- 1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
- 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.



MODE	Channel 1	INPUT POWER	DC 3V from batteries	
FREQUENCY		DETECTOR	Peak (PK)	
RANGE	1000~25000MHz	FUNCTION &	Average (AV)	
KANGE		BANDWIDTH	1 MHz	
ENVIRONMENTAL	27 deg. C, 60%RH,	TESTED BY	Phoonix Huang	
CONDITIONS	960 hPa	IESIED BI	Phoenix Huang	

	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
	Freq.	Emission	Limit	Margin	Antenna	Table	Raw	Correction		
No.	(MHz)	Level	(dBuV/m)	(dB)	Height	Angle	Value	Factor		
	()	(dBuV/m)	(======================================	(45)		(Degree)	(dBuV)	(dB/m)		
1	2390.00	55.02 PK	74.00	-18.98	1.00 H	344	24.96	30.06		
2	2390.00	43.01 AV	54.00	-10.99	1.00 H	344	12.95	30.06		
3	*2405.00	87.42 PK	114.00	-26.58	1.00 H	344	57.30	30.12		
4	*2405.00	53.40 AV	94.00	-40.60	1.00 H	344	23.28	30.12		
5	4810.00	50.52 PK	74.00	-23.48	1.00 H	261	15.08	35.44		
6	4810.00	16.50 AV	54.00	-37.50	1.00 H	261	-18.94	35.44		
7	7215.00	54.12 PK	74.00	-19.88	1.00 H	189	12.32	41.80		
8	7215.00	20.10 AV	54.00	-33.90	1.00 H	189	-21.70	41.80		

	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
	Freq.	Emission	Limit	Margin	Antenna	Table	Raw	Correction		
No.	(MHz)	Level	(dBuV/m)	(dB)	Height	Angle	Value	Factor		
	(IVIIIZ)	(dBuV/m)	(ubu v/III)	(ub)	(m)	(Degree)	(dBuV)	(dB/m)		
1	2390.00	56.55 PK	74.00	-17.45	1.00 V	193	26.49	30.06		
2	2390.00	43.06 AV	54.00	-10.94	1.00 V	193	13.00	30.06		
3	*2405.00	91.23 PK	114.00	-22.77	1.00 V	193	61.11	30.12		
4	*2405.00	57.21 AV	94.00	-36.79	1.00 V	193	27.09	30.12		
5	4810.00	51.20 PK	74.00	-22.80	1.00 V	179	15.76	35.44		
6	4810.00	17.18 AV	54.00	-36.82	1.00 V	179	-18.26	35.44		
7	7215.00	57.46 PK	74.00	-16.54	1.00 V	109	15.66	41.80		
8	7215.00	23.44 AV	54.00	-30.56	1.00 V	109	-18.36	41.80		

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

- 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.
- 6. Duty cycle = 1.99%
- 7. Average value = peak reading + 20log(duty cycle).



MODE	Channel 15	INPUT POWER	DC 3V from batteries	
EDECHENCY		DETECTOR	Peak (PK)	
FREQUENCY RANGE	1000~25000MHz	FUNCTION &	Average (AV)	
10.1102		BANDWIDTH	1 MHz	
ENVIRONMENTAL	27 deg. C, 60%RH,	TESTED BY	Phoenix Huang	
CONDITIONS	960 hPa	IESIEDBI		

	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	*2447.00	87.78 PK	114.00	-26.22	1.00 H	165	57.50	30.28		
2	*2447.00	53.76 AV	94.00	-40.24	1.00 H	165	23.47	30.28		
3	4894.00	49.20 PK	74.00	-24.80	1.00 H	320	13.62	35.58		
4	4894.00	15.18 AV	54.00	-38.82	1.00 H	320	-20.40	35.58		
5	7341.00	53.40 PK	74.00	-20.60	1.00 H	203	11.28	42.12		
6	7341.00	19.38 AV	54.00	-34.62	1.00 H	203	-22.74	42.12		

	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	*2447.00	92.74 PK	114.00	-21.26	1.00 V	193	62.46	30.28		
2	*2447.00	58.72 AV	94.00	-35.28	1.00 V	193	28.43	30.28		
3	4894.00	50.70 PK	74.00	-23.30	1.00 V	167	15.12	35.58		
4	4894.00	16.68 AV	54.00	-37.32	1.00 V	167	-18.90	35.58		
5	7341.00	56.67 PK	74.00	-17.33	1.00 V	53	14.55	42.12		
6	7341.00	22.65 AV	54.00	-31.35	1.00 V	53	-19.47	42.12		

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

- 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.
- 6. Duty cycle = 1.99%
- 7. Average value = peak reading + 20log(duty cycle).



Report Format Version 2.1.1

MODE	Channel 24	INPUT POWER	DC 3V from batteries
FREQUENCY RANGE	1000~25000MHz	DETECTOR FUNCTION & BANDWIDTH	Peak (PK) Average (AV) 1 MHz
ENVIRONMENTAL CONDITIONS	27 deg. C, 60%RH, 960 hPa	TESTED BY	Phoenix Huang

	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	*2474.00	84.00 PK	114.00	-30.00	1.00 H	127	53.61	30.39		
2	*2474.00	49.98 AV	94.00	-44.02	1.00 H	127	19.59	30.39		
3	2483.50	55.36 PK	74.00	-18.64	1.00 H	128	24.93	30.43		
4	2483.50	42.95 AV	54.00	-11.05	1.00 H	128	12.52	30.43		
5	4948.00	50.30 PK	74.00	-23.70	1.00 H	331	14.63	35.67		
6	4948.00	16.28 AV	54.00	-37.72	1.00 H	331	-19.40	35.67		
7	7422.00	55.36 PK	74.00	-18.64	1.00 H	214	13.04	42.32		
8	7422.00	21.34 AV	54.00	-32.66	1.00 H	214	-20.99	42.32		

	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
	Freg.	Emission	Limit	Margin	Antenna	Table	Raw	Correction		
No.	(MHz)	Level	(dBuV/m)	J	Height	Angle	Value	Factor		
	(1011 12)	(dBuV/m)	(dBuV/m) (dB)		(m)	(Degree)	(dBuV)	(dB/m)		
1	*2474.00	93.02 PK	114.00	-20.98	1.00 V	189	62.63	30.39		
2	*2474.00	59.00 AV	94.00	-35.00	1.00 V	189	28.61	30.39		
3	2483.50	61.62 PK	74.00	-12.38	1.00 V	189	31.19	30.43		
4	2483.50	43.00 AV	54.00	-11.00	1.00 V	189	12.57	30.43		
5	4948.00	51.45 PK	74.00	-22.55	1.00 V	183	15.78	35.67		
6	4948.00	17.43 AV	54.00	-36.57	1.00 V	183	-18.25	35.67		
7	7422.00	58.78 PK	74.00	-15.22	1.00 V	14	16.46	42.32		
8	7422.00	24.76 AV	54.00	-29.24	1.00 V	14	-17.57	42.32		

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

- 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.
- 6. Duty cycle = 1.99%
- 7. Average value = peak reading + 20log(duty cycle).



4.3 BAND EDGES MEASUREMENT

4.3.1 LIMITS OF BAND EDGES MEASUREMENT

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 17, 2008

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.

4.3.3 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 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

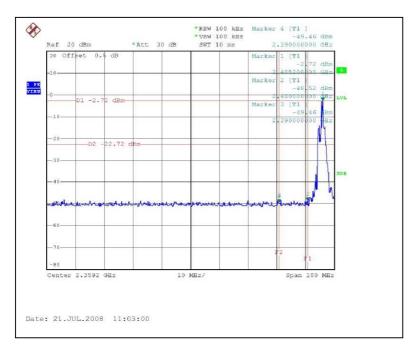
4.3.5 EUT OPERATING CONDITION

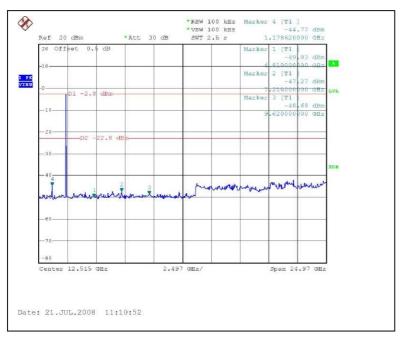
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



4.3.6 TEST RESULTS

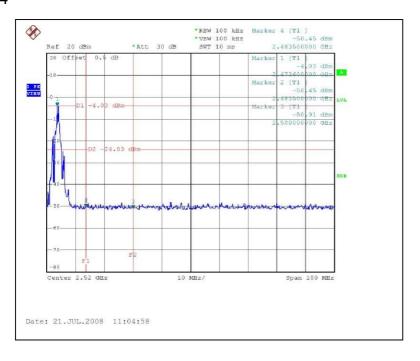
Emissions radiated outside of the specified frequency bands, please refer pages form 13 to 16 for met the requirement of the general radiated emission limits in § 15.209. CH1

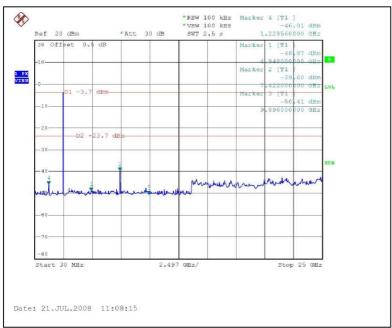






CH24







5 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:

USA FCC, UL, A2LA Germany TUV Rheinland

Japan VCCI Norway NEMKO

Canada INDUSTRY CANADA, CSA

R.O.C. TAF, BSMI, NCC

Netherlands Telefication

Singapore 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:

Linko EMC/RF Lab: Hsin Chu EMC/RF Lab:

Tel: 886-2-26052180 Tel: 886-3-5935343 Fax: 886-2-26052943 Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

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



6 APPENDIX-A- MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

--- END ---

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