FCC TEST REPORT

REPORT NO.: RF970326A03

MODEL NO.: 1356

RECEIVED: March 27, 2008

TESTED: April 16 ~ 17, 2008

ISSUED: April 30, 2008

APPLICANT: MICROSOFT CORPORATION

ADDRESS: ONE MICROSOFT WAY REDMOND,
WA 98052-6399, U.S.A

ISSUED BY: Advance Data Technology Corporation

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang
244, Taipei Hsien, Taiwan, R.O.C.

Testing Laboratory
0528

TESTING CERT #2177-01

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1 CERTIFICATION

PRODUCT:	Microsoft® Wireless Keyboard
BRAND NAME:	Microsoft®
MODEL NO.:	1356
APPLICANT:	MICROSOFT CORPORATION
TEST SAMPLE:	ENGINEERING SAMPLE
TESTED:	April 16 ~ 17, 2008
STANDARDS:	FCC Part 15, Subpart C (Section 15.227), ANSI C63.4 -2003

The above equipment 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 : Celia Chen , **DATE:** April 30, 2008
(Celia Chen / Specialist)

TECHNICAL ACCEPTANCE : Jamison Chan , **DATE:** April 30, 2008
Responsible for RF
(Jamison Chan / Senior Engineer)

APPROVED BY : Ken Liu , **DATE:** April 30, 2008
(Ken Liu / Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD PARAGRAPH	**TEST TYPE**	**RESULT**	**REMARK**
15.207	Conducted Emission Test	N/A	Power supply is 3Vdc from batteries
15.227 15.209	Radiated Emission Test	PASS	Minimum passing margin is –13.56dB at 245.772MHz

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

Measurement	Frequency	Uncertainty
Radiated emissions	30MHz ~ 1GHz	3.72 dB
	1GHz ~ 40GHz	2.89 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Microsoft® Wireless Keyboard
MODEL NO.	1356
FCC ID	C3K1356
POWER SUPPLY	3.0Vdc from batteries
MODULATION TYPE	FSK
CARRIER FREQUENCY OF EACH CHANNEL	27.195 MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Loop antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is a wireless keyboard which is a transmitter

2. The EUT has 3 samples, which are defined as their serial no. as follows:

Model No.	Serial no.
1356	85
	95
	164

3. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.1 DESCRIPTION OF TEST MODES

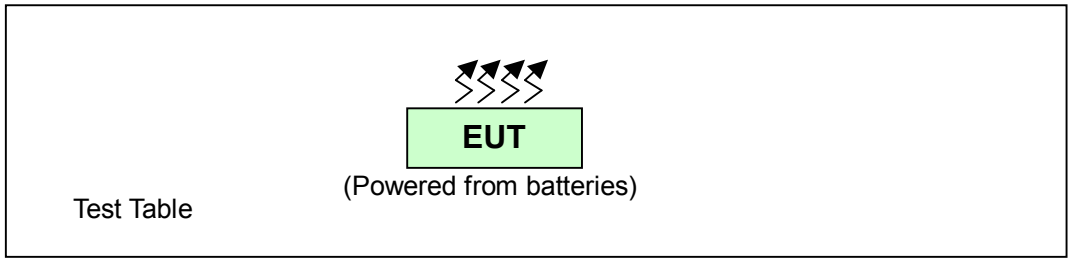
1 channel was provided to this EUT

Channel	Frequency (MHz)
1	27.195MHz

Three of identical samples are tested and presented in the report.

Keyboard Serial Number
85
95
164

3.2 CONFIGURATION OF SYSTEM UNDER TEST



3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT configure mode	Applicable to		Description
	PLC	RE<1G	
1	Note	√	serial number: 85
2	Note	√	serial number: 95
3	Note	√	serial number: 164

Where PLC: Power Line Conducted Emission RE<1G RE: Radiated Emission below 1GHz

Note: No need to concern of Conducted Emission due to the EUT is powered by battery.

RADIATED EMISSION TEST (BELOW 1 GHz):

☒Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	OPERATING STATE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	Operating	1	1	FSK
2	Operating	1	1	FSK
3	Operating	1	1	FSK

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. (15.227)

ANSI C63.4 -2003

NOTE: The receiver part of this product (receiver USB dongle) has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

All test items 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 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)	
26.96-27.28	Peak	Average
	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(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 INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	May 09, 2008
HP Preamplifier	8449B	3008A01201	Oct. 01, 2008
HP Preamplifier	8449B	3008A01292	Aug. 05, 2008
ROHDE & SCHWARZ TEST RECEIVER	ESI7	836697/012	Dec. 05, 2008
Schwarzbeck Antenna	VULB 9168	137	Sep. 13, 2008
Schwarzbeck Antenna	VHBA 9123	480	Apr. 22, 2009
ADT. Turn Table	TT100	0306	NA
ADT. Tower	AT100	0306	NA
Software	ADT_Radiated_V 7.6.15	NA	NA
SUHNER RF cable	SF104-26.5	CABLE-CH6-17m-01	Nov. 04, 2008
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100035	Mar. 25, 2009
Loop Antenna R & S	HFH2-Z2	100070	Jan. 13, 2009

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 and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Chamber No. 6.
4. The Industry Canada Reference No. IC 3789-6.

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 3 meter semi-anechoic chamber. 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's 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.

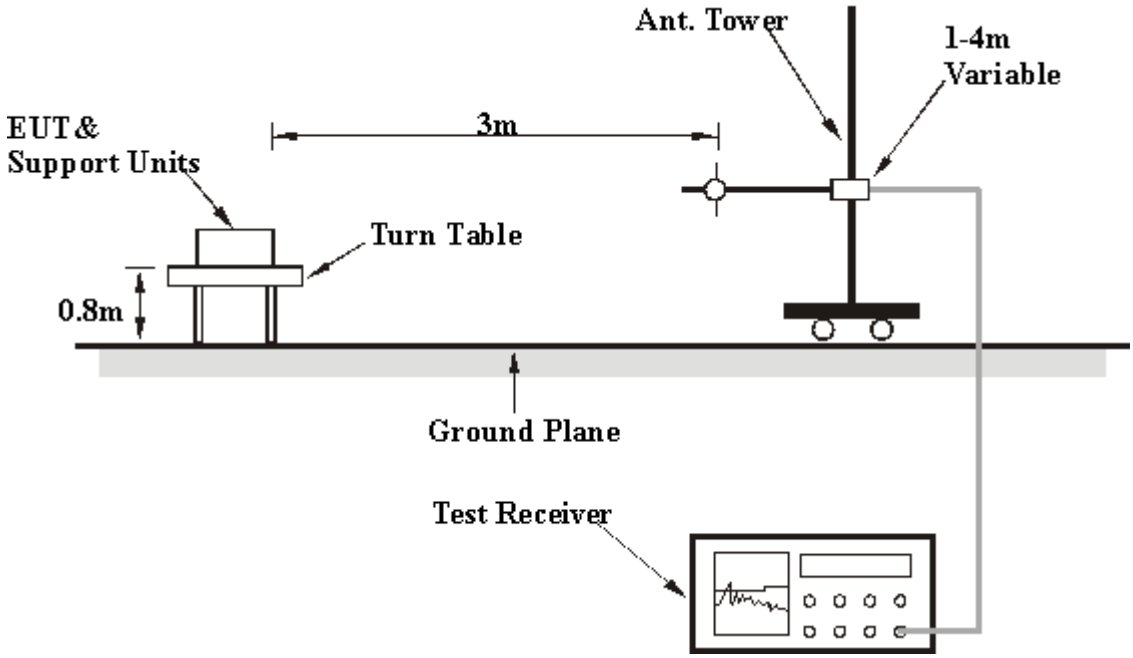
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak method or average method as specified and then reported in data sheet.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection 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. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the interference-receiving antenna.

4.2.4 TEST SETUP



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

4.2.5 EUT OPERATING CONDITION

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

4.2.6 TEST RESULT

TEST MODE	1	SERIAL NO.	85
MODULATION TYPE	FSK	CHANNEL	1
INPUT POWER	3Vdc	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 75% RH, 1001hPa	DETECTOR FUNCTION	Peak / Average
TESTED BY	Jun Wu	OPERATING STATE	Operating

TEST DISTANCE: 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	*27.195	50.27 PK	100.00	-49.73	1.89	176	30.05	20.22
2	*27.195	29.01 AV	80.00	-50.99	1.89	176	8.79	20.22

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 Loop antenna was used for all radiated emission below 30MHz.

TEST MODE	1	**SERIAL NO.**	85
MODULATION TYPE	FSK	**CHANNEL**	1
INPUT POWER	3Vdc	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 75% RH, 1000hPa	**DETECTOR FUNCTION**	Quasi-Peak
TESTED BY	Jun Wu	**OPERATING STATE**	Operating

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	33.888	26.16 QP	40.00	-13.84	1.42 H	343	12.01	14.15
2	185.511	27.28 QP	43.50	-16.22	1.37 H	31	14.13	13.15
3	220.501	30.41 QP	46.00	-15.59	1.31 H	202	17.39	13.02
4	**245.772**	**32.44 QP**	**46.00**	**-13.56**	**1.27 H**	**199**	**17.88**	**14.56**
5	288.537	28.55 QP	46.00	-17.45	1.24 H	217	12.82	15.73
6	817.275	28.18 QP	46.00	-17.82	1.16 H	58	-0.25	28.43
7	871.703	28.44 QP	46.00	-17.56	1.12 H	142	-0.54	28.98
8	896.974	28.16 QP	46.00	-17.84	1.08 H	133	-1.03	29.19
9	928.076	27.87 QP	46.00	-18.13	1.03 H	157	-1.54	29.41

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	706.473	26.19 QP	46.00	-19.81	1.05 V	103	0.09	26.10
2	749.238	26.22 QP	46.00	-19.78	1.12 V	271	-0.94	27.16
3	770.621	27.14 QP	46.00	-18.86	1.18 V	229	-0.47	27.61
4	799.780	26.54 QP	46.00	-19.46	1.21 V	10	-1.69	28.23
5	840.601	27.17 QP	46.00	-18.83	1.25 V	349	-1.53	28.70
6	850.321	28.81 QP	46.00	-17.19	1.32 V	325	0.00	28.81
7	889.198	27.74 QP	46.00	-18.26	1.36 V	61	-1.38	29.12
8	928.076	28.13 QP	46.00	-17.87	1.41 V	112	-1.28	29.41

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.

TEST MODE	2	**SERIAL NO.**	95
MODULATION TYPE	FSK	**CHANNEL**	1
INPUT POWER	3Vdc	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 75% RH, 1001hPa	**DETECTOR FUNCTION**	Peak / Average
TESTED BY	Jun Wu	**OPERATING STATE**	Operating

TEST DISTANCE: 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	*27.195	50.81 PK	100.00	-49.19	1.98	172	30.59	20.22
2	*27.195	29.73 AV	80.00	-50.27	1.98	172	9.51	20.22

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 Loop antenna was used for all radiated emission below 30MHz.

TEST MODE	2	**SERIAL NO.**	95
MODULATION TYPE	FSK	**CHANNEL**	1
INPUT POWER	3Vdc	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 75% RH, 1000hPa	**DETECTOR FUNCTION**	Quasi-Peak
TESTED BY	Jun Wu	**OPERATING STATE**	Operating

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	53.327	23.93 QP	40.00	-16.07	1.35 H	196	10.94	12.99
2	185.511	27.32 QP	43.50	-16.18	1.32 H	34	14.17	13.15
3	220.501	30.32 QP	46.00	-15.68	1.27 H	193	17.30	13.02
4	245.772	32.24 QP	46.00	-13.76	1.22 H	199	17.68	14.56
5	288.537	28.60 QP	46.00	-17.40	1.20 H	214	12.87	15.73
6	846.433	28.33 QP	46.00	-17.67	1.13 H	322	-0.43	28.76
7	900.862	28.41 QP	46.00	-17.59	1.05 H	346	-0.81	29.22

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	33.888	29.19 QP	40.00	-10.81	1.00 V	106	15.04	14.15
2	782.285	26.34 QP	46.00	-19.66	1.15 V	40	-1.52	27.86
3	813.387	26.79 QP	46.00	-19.21	1.21 V	97	-1.59	28.38
4	836.713	27.71 QP	46.00	-18.29	1.26 V	121	-0.94	28.65
5	873.647	27.73 QP	46.00	-18.27	1.31 V	16	-1.27	29.00
6	902.806	27.58 QP	46.00	-18.42	1.35 V	55	-1.65	29.23
7	918.357	28.11 QP	46.00	-17.89	1.42 V	118	-1.23	29.34

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.

TEST MODE	3	**SERIAL NO.**	164
MODULATION TYPE	FSK	**CHANNEL**	1
INPUT POWER	3Vdc	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 75% RH, 1001hPa	**DETECTOR FUNCTION**	Peak / Average
TESTED BY	Jun Wu	**OPERATING STATE**	Operating

TEST DISTANCE: 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	*27.195	49.48 PK	100.00	-50.52	1.86	6	29.26	20.22
2	*27.195	27.84 AV	80.00	-52.16	1.86	6	7.62	20.22

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 Loop antenna was used for all radiated emission below 30MHz.

TEST MODE	3	**SERIAL NO.**	164
MODULATION TYPE	FSK	**CHANNEL**	1
INPUT POWER	3Vdc	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 75% RH, 1000hPa	**DETECTOR FUNCTION**	Quasi-Peak
TESTED BY	Jun Wu	**OPERATING STATE**	Operating

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	53.327	23.50 QP	40.00	-16.50	1.46 H	157	10.51	12.99
2	185.511	27.41 QP	43.50	-16.09	1.39 H	34	14.26	13.15
3	220.501	31.06 QP	46.00	-14.94	1.32 H	208	18.04	13.02
4	234.108	32.37 QP	46.00	-13.63	1.27 H	190	18.52	13.85
5	288.537	28.68 QP	46.00	-17.32	1.26 H	220	12.95	15.73
6	842.545	28.38 QP	46.00	-17.62	1.15 H	244	-0.34	28.72
7	920.301	28.02 QP	46.00	-17.98	1.04 H	121	-1.34	29.36

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	41.663	21.78 QP	40.00	-18.22	1.00 V	121	7.52	14.26
2	720.080	26.04 QP	46.00	-19.96	1.05 V	343	-0.40	26.44
3	780.341	26.52 QP	46.00	-19.48	1.14 V	193	-1.30	27.82
4	795.892	26.90 QP	46.00	-19.10	1.20 V	175	-1.24	28.14
5	823.106	27.76 QP	46.00	-18.24	1.24 V	283	-0.74	28.50
6	858.096	27.90 QP	46.00	-18.10	1.29 V	31	-0.97	28.87
7	904.749	27.51 QP	46.00	-18.49	1.32 V	10	-1.73	29.24
8	930.020	27.57 QP	46.00	-18.43	1.38 V	28	-1.86	29.43

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 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

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:
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Web Site: www.adt.com.tw

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

7 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.