



FCC TEST REPORT

REPORT NO.: FC940110A15

MODEL NO.: 5149

RECEIVED: Jan. 10, 2005

TESTED: Jan. 11 ~ 12, 2005

ISSUED: Jan. 20, 2005

APPLICANT: BEHAVIOR TECH COMPUTER CORP.

ADDRESS: 2F, 51, Tung Hsing Rd., Taipei, Taiwan, R.O.C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chiapau Tsun, Linko, Taipei,
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0528
ILAC MRA



Lab Code: 200102-0



No. 2177-01



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1 CERTIFICATION

PRODUCT: Keyboard
BRAND NAME: EMPREX, BTC
MODEL NO: 5149
APPLICANT: BEHAVIOR TECH COMPUTER CORP.
TESTED: Jan. 11 ~ 12, 2005
TEST ITEM: ENGINEERING SAMPLE
STANDARDS: FCC Part 15, Subpart B, Class B
CISPR 22: 1997, Class B
ICES-003: 2004, Class B
ANSI C63.4-2003

The above equipment have 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 : Annie Chang , **DATE:** Jan. 20, 2005
(Annie Chang)

TECHNICAL ACCEPTANCE : Arthur Lin , **DATE:** Jan. 20, 2005
Responsible for EMI (Arthur Lin)

APPROVED BY : Kenny Meng , **DATE:** Jan. 20, 2005
(Kenny Meng Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Remarks
FCC Part 15, Subpart B, Class B	Conducted Test	PASS	Meets Class B Limit Minimum passing margin is -15.60dB at 0.157 MHz
CISPR 22: 1997, Class B			Meets Class B Limit Minimum passing margin is -10.12dB at 78.44MHz
ICES-003: 2004, Class B	Radiated Test	PASS	Meets Class B Limit Minimum passing margin is -10.12dB at 78.44MHz

Note: The limit for radiated test was performed according to CISPR 22: 1997, which was specified in FCC PART 15 Subpart B 15.109(g). Also the limits of ICES-003: 2004 and CISPR 22:1997 Subpart B are same.

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:

Measurement	Value
Conducted emissions	2.55dB
Radiated emissions	3.69dB



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Keyboard
MODEL NO.	5149
POWER SUPPLY	DC 5V (from PC)
DATA CABLE SUPPLIED	Shielded PS/2 cable (1.5m)

NOTE:

1. The EUT is a Keyboard with PS/2 interface.
2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



3.2 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	LEO	Persica 8620G	1A36I98A000205	FCC DoC Approved
2	MONITOR	ADI	CM100	020058T10200179	FCC DoC Approved
3	PRINTER	EPSON	LQ-300+	DCGY017089	FCC DoC Approved
4	MODEM	ACEEX	1414	980020506	IFAXDM1414
5	PS/2 MOUSE	BTC	M851	M4-010375	E5XMSM860
6	SPEAKER	KINYO	KSP-25	S5-010099	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	1.8 m braid shielded wire, terminated with VGA connector via metallic frame, with two cores.
3	1.8m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core
4	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.
5	1.5 m Non shielded wire, terminated with PS/2 connector via drain wire, w/o core.
6	1.0 m audio cable

NOTE: All power cords of the above support units are non-shielded (1.8m).



4 EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

- NOTES:**
- (1) The lower limit shall apply at the transition frequencies.
 - (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 - (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS30	834115/016	Jan. 30, 2005
ROHDE & SCHWARZ Artificial Mains Network (For EUT)	ESH2-Z5	892107/003	Jun 17, 2005
LISN With Adapter (for EUT)	AD10	C03Ada-001	Jun. 17, 2005
* ROHDE & SCHWARZ 4-wire ISN	ENY41	838119/028	Oct. 28, 2005
* ROHDE & SCHWARZ 2-wire ISN	ENY22	837497/018	Oct. 28, 2005
EMCO L.I.S.N. (For peripherals)	3825/2	9504-2359	Jun 28, 2005
Software	ADT_Cond_V7.3.2	NA	NA
Software	ADT_ISN_V7.3.2	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C03.01	May 9, 2005
Terminator (For EMCO LISN)	NA	E1-01-300	Feb. 1, 2005
Terminator (For EMCO LISN)	NA	E1-01-301	Feb. 1, 2005

- 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 conducted telecom port test only (if tested).
 3. The test was performed in ADT Shielded Room No. 3.
 4. The VCCI Site Registration No. C-274.

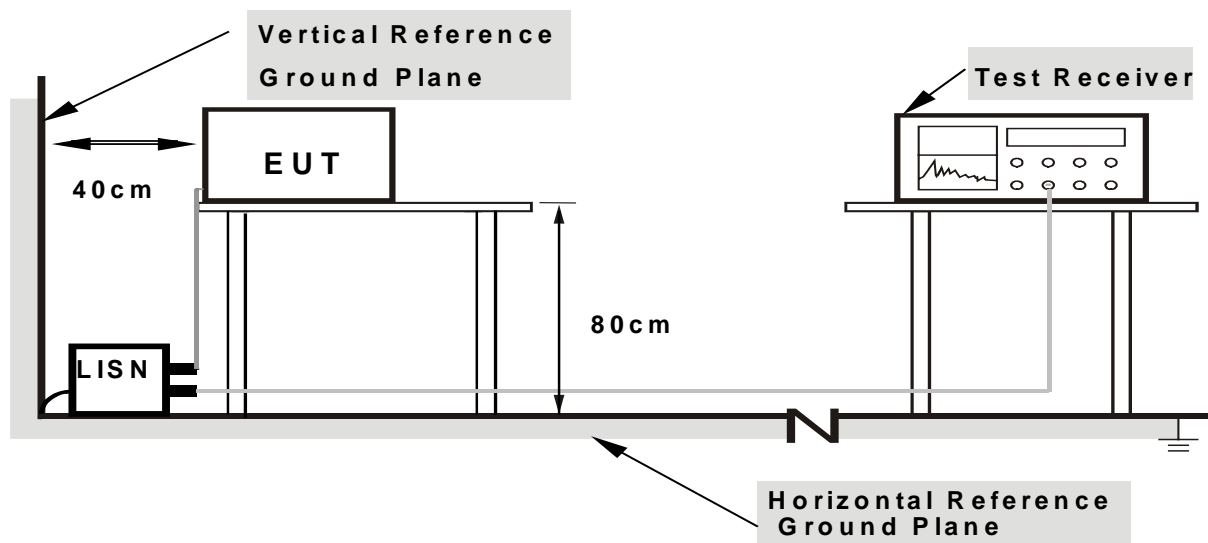
4.1.3 TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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



4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. PC ran a test program to enable all functions.
- c. PC read and wrote messages from FDD and HDD.
- d. EUT sent "H" character to PC.
- e. PC sent "H" messages to monitor and monitor displayed "H" patterns on screen.
- f. PC sent "H" messages to modem.
- g. PC sent "H" messages to printer and the printer printed out.
- h. PC sent "1kHz audio signal" to speaker.
- i. Repeated steps c-i.

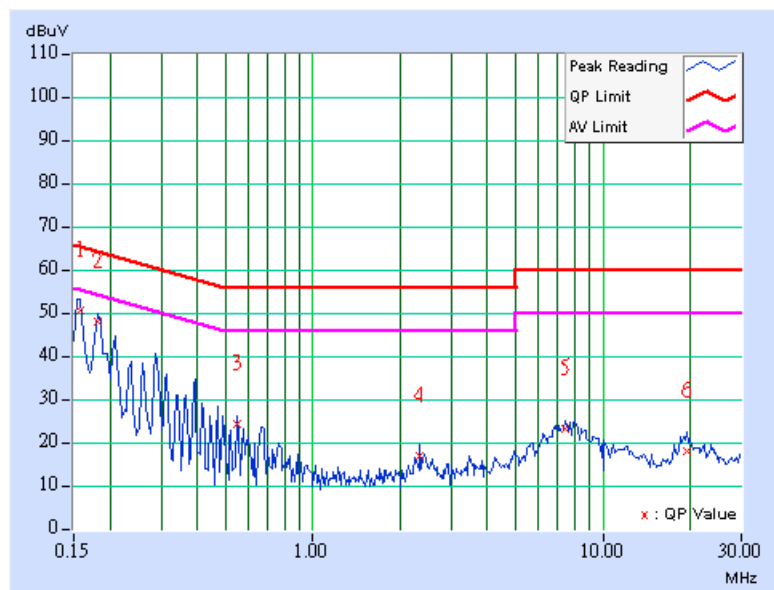


4.1.7 TEST RESULTS

EUT	Keyboard	MODEL NO.	5149
		6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	17deg. C, 80% RH, 1009hPa	TESTED BY: Michael Wang	

No	Freq. [MHz]	Corr. Factor [dB]	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.158	0.16	49.71	-	49.87	-	65.58
2	0.182	0.18	47.08	-	47.26	-	64.39	54.39	-17.13	-
3	0.548	0.20	23.41	-	23.61	-	56.00	46.00	-32.39	-
4	2.346	0.30	16.17	-	16.47	-	56.00	46.00	-39.53	-
5	7.386	0.47	22.27	-	22.74	-	60.00	50.00	-37.26	-
6	19.566	0.98	17.11	-	18.09	-	60.00	50.00	-41.91	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

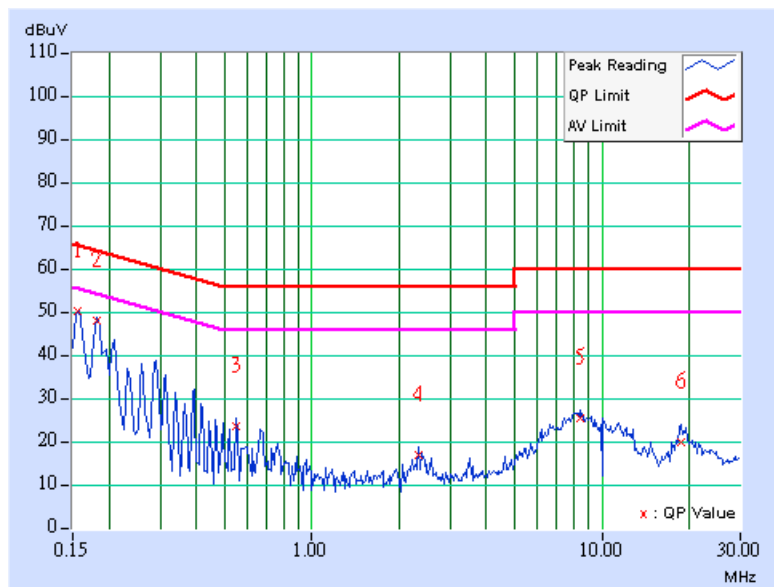




EUT	Keyboard	MODEL NO.	5149
		6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	17deg. C, 80% RH, 1009hPa	TESTED BY: Michael Wang	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.157	0.16	49.89	-	50.05	-	65.65
2	0.183	0.18	47.56	-	47.74	-	64.37	54.37	-16.63	-
3	0.548	0.22	23.25	-	23.47	-	56.00	46.00	-32.53	-
4	2.346	0.30	16.61	-	16.91	-	56.00	46.00	-39.09	-
5	8.404	0.45	25.14	-	25.59	-	60.00	50.00	-34.41	-
6	18.668	0.57	19.41	-	19.98	-	60.00	50.00	-40.02	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT FOR FREQUENCY BELOW 1000 MHz

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 10m)
	dBuV/m	dBuV/m
30 – 230	40	30
230 - 1000	47	37

Note: The limit for radiated test was performed according to CISPR 22: 1997, which was specified in FCC PART 15B 15.109(g). Also the limits of ICES-003: 2004 and CISPR 22: 1997 are same.

LIMIT OF RADIATED EMISSION OF FCC PART 15, SUBPART B FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

- Note: (1) The lower limit shall apply at the transition frequencies.
 (2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
 (3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower



4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Spectrum Analyzer	8590L	3544A00941	Oct. 12, 2005
HP Preamplifier	8447D	2944A08312	Aug. 17, 2005
* HP Preamplifier	8449B	3008A01924	Sep. 19, 2005
* HP Preamplifier	8449B	3008A01638	Sep. 30, 2005
* R&S Receiver	ESCS 30	100290	Nov 17, 2005
SCHWARZBECK Tunable Dipole Antenna	VHA 9103	NA	Oct. 29, 2005
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Feb. 12, 2005
* CHASE BILOG Antenna	CBL6111A	1500	Jul. 16, 2005
* EMCO Horn Antenna	3115	6714	Oct. 28, 2005
* EMCO Horn Antenna	3115	9312-4192	Feb. 28, 2005
* ADT Turn Table	TT100	0204	NA
* ADT Tower	AT100	0204	NA
* Software	ADT_Radiated_V 7.5.14	NA	NA
* ANRITSU RF Switches	MP59B	M06089	Jul. 16, 2005
* TIMES RF cable	LMR-600	CABLE-ST1-01	Jul. 16, 2005

- 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. 1.
 5. The VCCI Site Registration No. R-236.



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 10 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

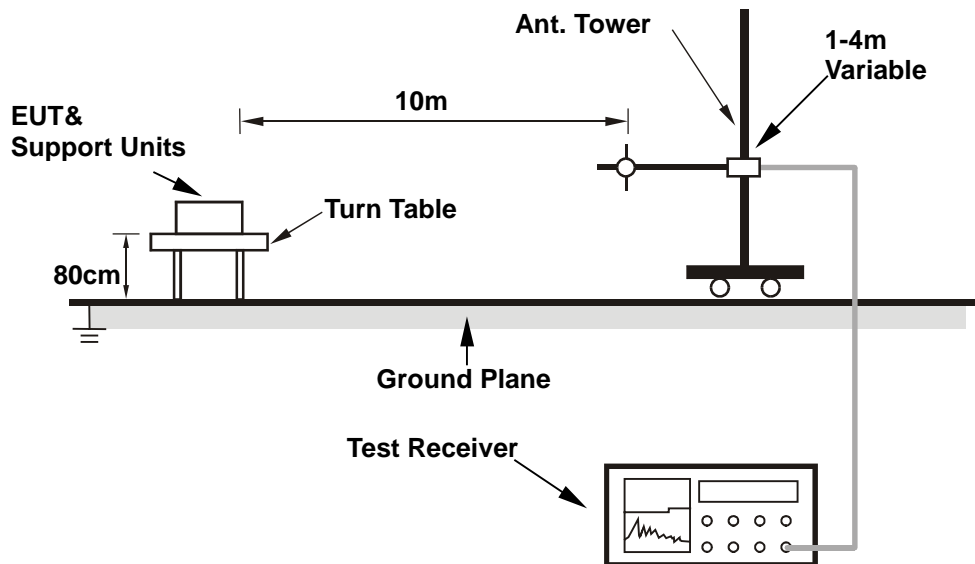
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for 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. 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 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

Same as item 4.1.6

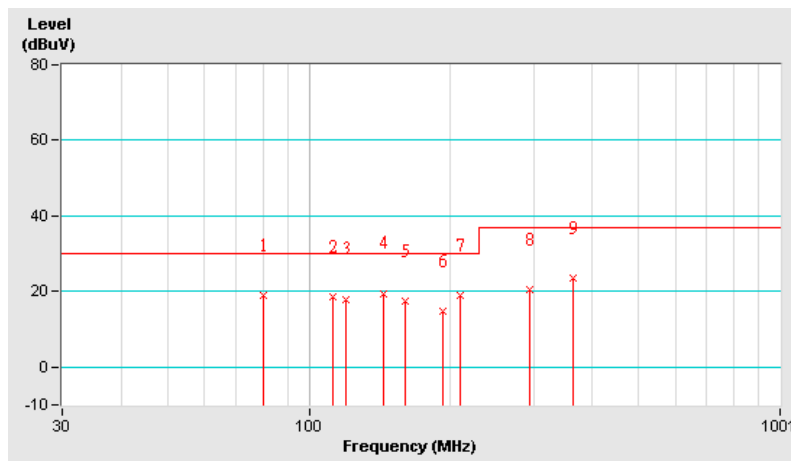


4.2.7 TEST RESULTS

EUT	Keyboard	MODEL NO.	5149
		FREQUENCY RANGE	30-1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	15deg. C, 68% RH, 1010hPa	TESTED BY: Michael Wang	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 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	79.89	19.02 QP	30.00	-10.98	4.00 H	288	10.90	8.12
2	112.31	18.63 QP	30.00	-11.37	4.00 H	123	6.84	11.79
3	119.91	18.02 QP	30.00	-11.98	4.00 H	338	5.31	12.71
4	144.05	19.52 QP	30.00	-10.48	4.00 H	2	7.57	11.95
5	159.80	17.58 QP	30.00	-12.42	4.00 H	154	6.31	11.27
6	192.07	14.69 QP	30.00	-15.31	4.00 H	67	4.24	10.45
7	208.94	18.85 QP	30.00	-11.15	4.00 H	264	7.63	11.22
8	293.53	20.38 QP	37.00	-16.62	4.00 H	98	4.21	16.17
9	363.68	23.47 QP	37.00	-13.53	3.42 H	101	5.43	18.04

- 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.

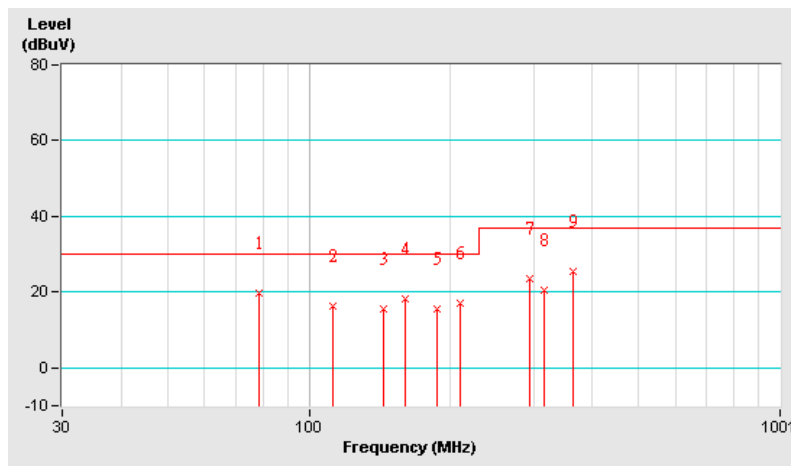




EUT	Keyboard	MODEL NO.	5149
		FREQUENCY RANGE	30-1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	15deg. C, 68% RH, 1010hPa	TESTED BY: Michael Wang	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 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	78.44	19.88 QP	30.00	-10.12	1.00 V	228	11.93	7.95
2	112.01	16.28 QP	30.00	-13.72	1.00 V	182	4.52	11.76
3	144.00	15.62 QP	30.00	-14.38	1.00 V	124	3.66	11.96
4	159.82	18.34 QP	30.00	-11.66	1.00 V	288	7.07	11.27
5	187.53	15.68 QP	30.00	-14.32	1.00 V	229	5.33	10.35
6	208.94	17.05 QP	30.00	-12.95	1.00 V	177	5.83	11.22
7	293.53	23.59 QP	37.00	-13.41	1.00 V	186	7.42	16.17
8	316.01	20.33 QP	37.00	-16.67	1.00 V	28	3.50	16.83
9	363.68	25.31 QP	37.00	-11.69	1.00 V	135	7.27	18.04

- 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 CONDUCTED EMISSION TEST



RADIATED EMISSION TEST





6 APPENDIX - 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, 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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