FCC ID: E5XKB5309

FCC TEST REPORT

REPORT NO.: FC940318A12

MODEL NO.: 5309

RECEIVED: March 18, 2005

TESTED: March 21, 2005

ISSUED March 24, 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, Taiwan, R.O.C.

0528
ILAC MRA

Lab Code: 200102-0

No. 2177-01

Table of Contents

1 CERTIFICATION

PRODUCT:	KEYBOARD
BRAND NAME:	BTC, EMPREX
MODEL NO:	5309
TEST ITEM:	ENGINEERING SAMPLE
APPLICANT:	BEHAVIOR TECH COMPUTER CORP.
TESTED:	March 21, 2005
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 : Celia Chen , **DATE:** March 24, 2005
(Celia Chen)

TECHNICAL ACCEPTANCE : , **DATE:** March 24, 2005
Responsible for EMI
(Jun Wu)

APPROVED BY : Kenny Meng , **DATE:** March 24, 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 CISPR 22: 1997, Class B ICES-003: 2004, Class B	Conducted Test	PASS	Meets Class B Limit Minimum passing margin is –21.48 dB at 0.353 MHz
	Radiated Test	PASS	Meets Class B Limit Minimum passing margin is –6.15 dB at 144.03 MHz

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	2.46dB
Radiated emissions	3.74dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	KEYBOARD
MODEL NO.	5309
POWER SUPPLY	DC 5V (from PC)
DATA CABLE SUPPLIED	Non-shielded USB cable (1.8m)

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.

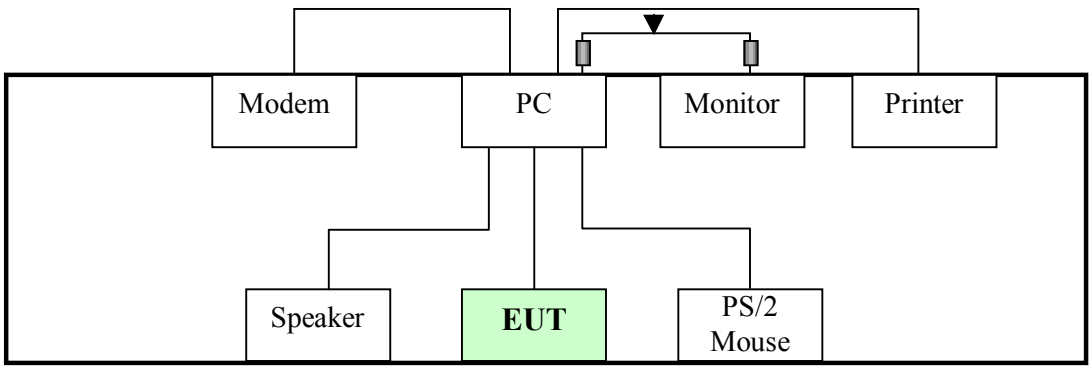
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	HP	DTPC 27	21402951	FCC DoC Approved
2	PRINTER	EPSON	LQ-300+	DCGY017096	FCC DoC Approved
3	COLOR MONITOR	ADI	CM100	026058T10200611 A	FCC DoC Approved
4	MODEM	ACEEX	1414	980020503	IFAXDM1414
5	PS/2 MOUSE	BTC	M851	M4-010377	E5XMSM860
6	SPEAKER	KINYO	KSP-25	S5-010116	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	1.8m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core
3	1.8 m braid shielded wire, terminated with VGA connector via metallic frame, with two cores
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	N/A

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

Test Configuration

Non-shielded D-SUB cable (1.8m) with two ferrite cores



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	ESHS30	828109/007	June 06, 2005
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	839135/006	June 15, 2005
LISN With Adapter (for EUT)	AD10	C02Ada-001	June.15, 2005
EMCO-L.I.S.N. (for peripheral)	3825/2	9204-1964	June 11, 2005
Software	ADT_Cond_V7.3.2	NA	NA
Software	ADT_ISN_V7.3.2	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C02.01	May 9, 2005
HP Terminator (For EMCO LISN)	11593A	E1-01-298	Jan. 14, 2006
HP Terminator (For EMCO LISN)	11593A	E1-01-299	Jan. 14, 2006

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. 2.

4. The VCCI Site Registration No. C-240.

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.

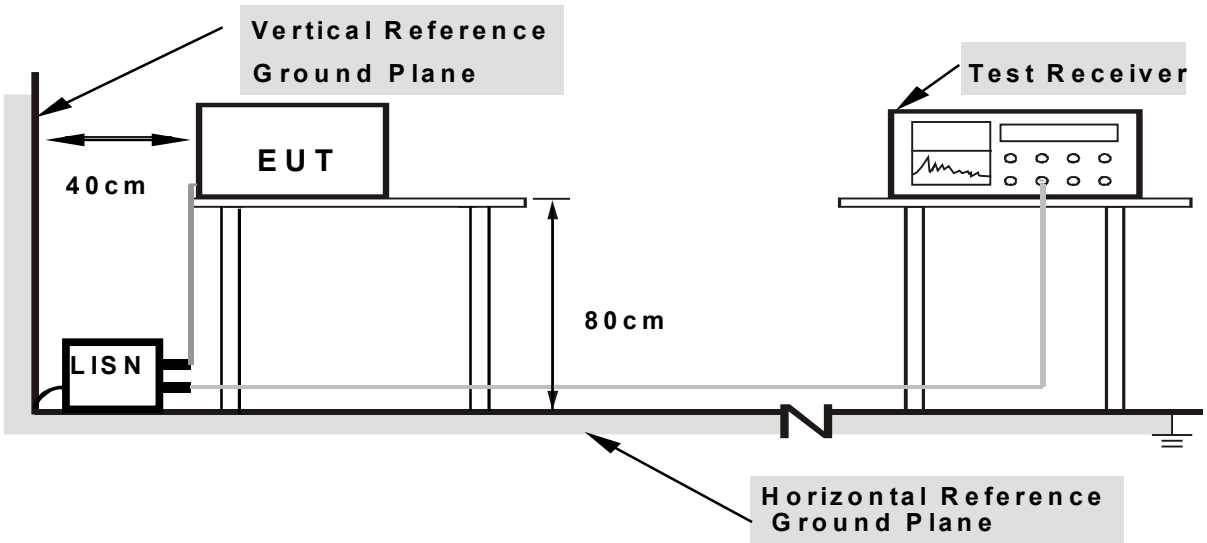
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit - 20dB) were 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

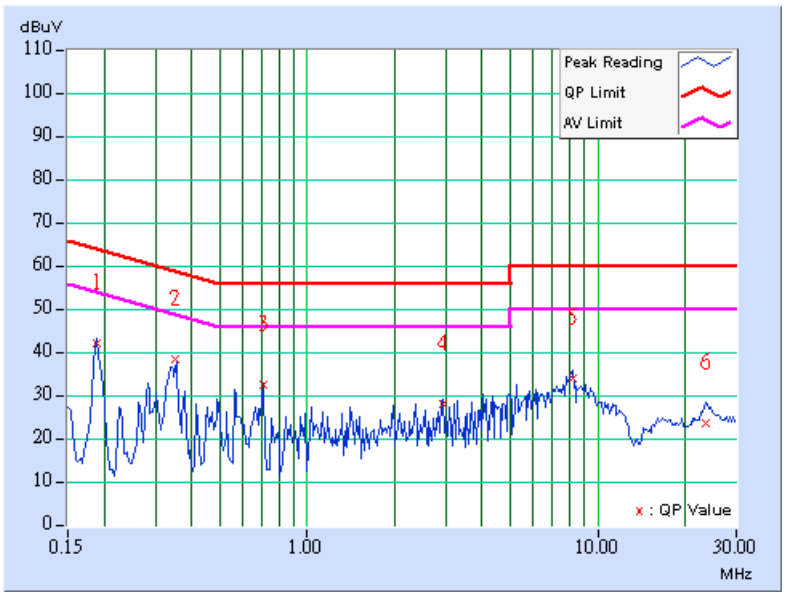
a. Turned on the power of all equipment.
b. PC ran a test program to enable all functions.
c. PC read and wrote messages from FDD and HDD.
d. EUT sent "H" character to PC.
e. PC sent "H" messages to monitor and monitor displayed "H" patterns on screen.
f. PC sent "H" messages to modem.
g. PC sent "H"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

4.1.7 TEST RESULTS

EUT	KEYBOARD	**MODEL NO.**	5309
		6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	22deg. C, 75% RH, 1006hPa	**TESTED BY:** Linden Chang	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.19	40.83	-	41.02	-	64.09	54.09	-23.07	-
2	0.353	0.12	37.18	-	37.30	-	58.88	48.88	-21.58	-
3	0.707	0.15	31.48	-	31.63	-	56.00	46.00	-24.37	-
4	2.917	0.30	26.83	-	27.13	-	56.00	46.00	-28.87	-
5	8.187	0.51	32.71	-	33.22	-	60.00	50.00	-26.78	-
6	23.509	1.24	22.60	-	23.84	-	60.00	50.00	-36.16	-

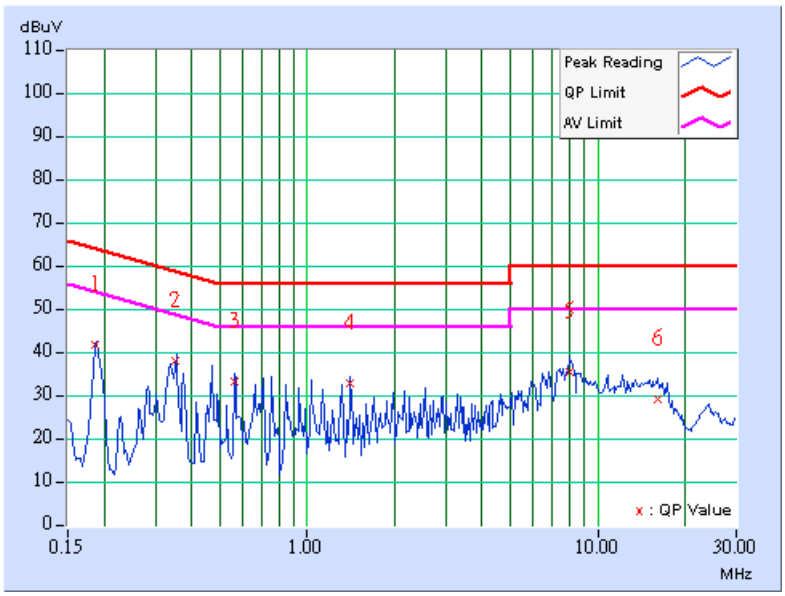
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



EUT	KEYBOARD	**MODEL NO.**	5309
		6dB BANDWIDTH	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	**PHASE**	Neutral (N)
ENVIRONMENTAL CONDITIONS	22deg. C, 75% RH, 1006hPa	**TESTED BY:** Linden Chang	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.187	0.19	41.05	-	41.24	-	64.18	54.18	-22.95	-
2	**0.353**	**0.12**	**37.30**	**-**	**37.42**	**-**	**58.90**	**48.90**	**-21.48**	**-**
3	0.564	0.13	32.40	-	32.53	-	56.00	46.00	-23.47	-
4	1.410	0.20	32.09	-	32.29	-	56.00	46.00	-23.71	-
5	7.992	0.40	34.62	-	35.02	-	60.00	50.00	-24.98	-
6	16.183	0.82	28.40	-	29.22	-	60.00	50.00	-30.78	-

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	3544A01176	May. 31, 2005
HP Preamplifier	8447D	2944A08485	Apr. 26, 2005
* HP Preamplifier	8449B	3008A01924	Sep. 19, 2005
* HP Preamplifier	8449B	3008A01638	Sep. 30, 2005
*SCHAFFNER TEST RECEIVER	SCR 3501	408	Jan. 03, 2006
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Feb. 03, 2006
SCHWARZBECK Tunable Dipole Antenna	VHA 9103	NA	Oct. 29, 2005
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* CHASE BILOG Antenna	CBL6112A	2221	Oct 19, 2005
* EMCO Horn Antenna	3115	6714	Oct. 28, 2005
* EMCO Horn Antenna	3115	9312-4192	Feb. 28, 2006
* EMCO Turn Table	1060	1115	NA
* CHANCE Tower	CM-AT40	CM-A010	NA
* Software	ADT_Radiated_V7.5.14	NA	NA
* ADT RF Switches	EM-H-01-1	1002	Dec. 02, 2005
* TIMES RF cable	LMR-600	CABLE-ST5-01	Dec. 02, 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. 5.
5. The VCCI Site Registration No. 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 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.
f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

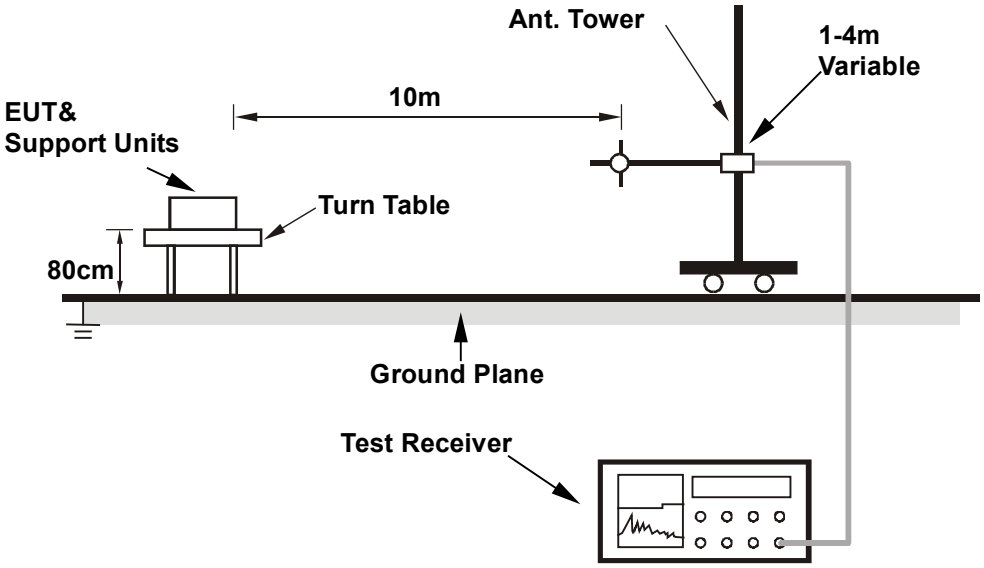
NOTE:

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

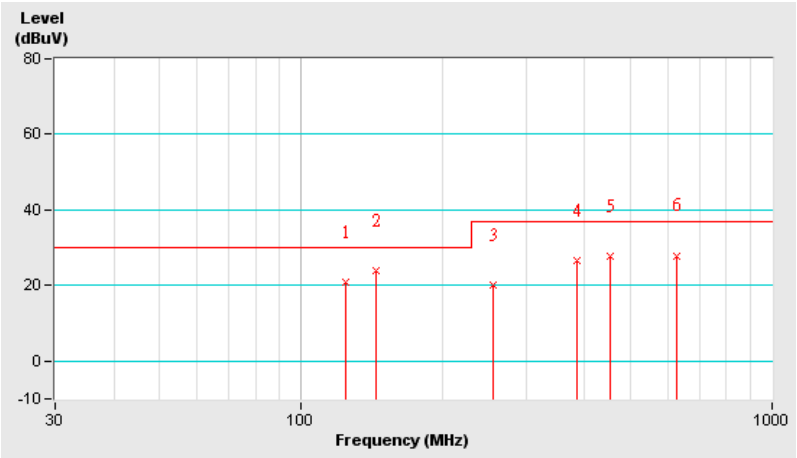
Same as item 4.1.6

4.2.7 TEST RESULTS

EUT	KEYBOARD	**MODEL NO.**	5309
		FREQUENCY RANGE	30-1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	**DETECTOR FUNCTION & BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	22deg. C, 83% RH, 1005hPa	**TESTED BY:** Linden Chang	

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	124.43	20.84 QP	30.00	-9.16	4.00 H	333	8.58	12.26
2	**144.03**	**23.85 QP**	**30.00**	**-6.15**	**4.00 H**	**159**	**12.35**	**11.50**
3	255.88	20.11 QP	37.00	-16.89	4.00 H	297	5.96	14.14
4	386.13	26.50 QP	37.00	-10.50	1.61 H	76	8.62	17.88
5	452.27	27.90 QP	37.00	-9.10	1.51 H	127	8.83	19.07
6	625.61	27.92 QP	37.00	-9.08	1.68 H	187	5.29	22.63

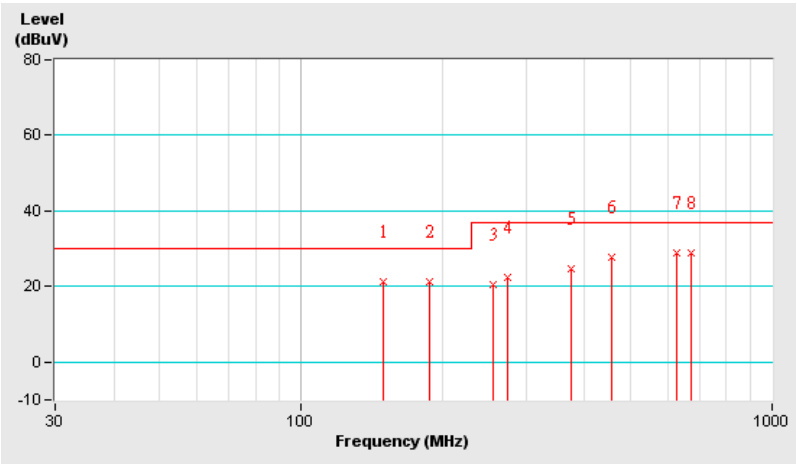
REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



EUT	KEYBOARD	**MODEL NO.**	5309
		FREQUENCY RANGE	30-1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	**DETECTOR FUNCTION & BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	22deg. C, 83% RH, 1005hPa	**TESTED BY:** Linden Chang	

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	149.05	21.15 QP	30.00	-8.85	1.00 V	327	9.94	11.21
2	186.68	21.21 QP	30.00	-8.79	1.00 V	16	11.20	10.01
3	256.06	20.33 QP	37.00	-16.67	1.00 V	234	6.16	14.17
4	275.19	22.41 QP	37.00	-14.59	1.00 V	316	7.49	14.92
5	375.36	24.70 QP	37.00	-12.30	1.00 V	126	7.23	17.47
6	455.32	27.85 QP	37.00	-9.15	2.66 V	329	8.70	19.15
7	627.53	28.90 QP	37.00	-8.10	2.21 V	227	6.25	22.65
8	671.34	28.90 QP	37.00	-8.10	2.71 V	289	5.81	23.09

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:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

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

Email: service@adt.com.tw
Web Site: www.adt.com.tw

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