



INTERNATIONAL STANDARDS LABORATORY

No. 65, Ku Dai Keng St., Hsichih, Taipei 221, R.O. C.
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd. Lung-Tan Hsiang,
Tao Yuan County 325, Taiwan, R.O.C.

Tel: 886-2-2646-2550 FAX: 886-2-26464641

Tel: 886-3-407-1718 FAX: 886-3-407-1738

Certificate

Applicant:
BEHAVIOR TECH COMPUTER CORP.
2F,51,Tung Hsing Rd.,
Taipei 110
Taiwan, R. O. C.

Test Report No.: ISL-04LE223FB
Issue Date: 2004/07/27

Product Name: Keyboard
Model: 5211A
Responsible Party: BEHAVIOR TECH COMPUTER CORP.
Address: 2F,51,Tung Hsing Rd.,
Taipei 110
Taiwan, R. O. C.

FCC Rule Part(s): **FCC Rules Part 15 Subpart B Class B**
ANSI C63.4-2001

We, **International Standards Laboratory**, certify that

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified. (see Test Report if any modifications were made for compliance).

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

We certify that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988.21 U.S.C. 853(a)

Eddy Hsiung

Eddy Hsiung/Director
International Standards Laboratory



NVLAP Lab. Code: 200234-0

TEST REPORT

FOR

FCC PART 15 Subpart B

of

Keyboard

Model

5211A

Applied by:

BEHAVIOR TECH COMPUTER CORP.
2F,51,Tung Hsing Rd.,
Taipei 110
Taiwan, R. O. C.

Test Performed by:
International Standards Laboratory



(NVLAP Lab. Code: 200234-0)

Hsichih LAB	(V) Lung-Tan LAB
Site Registration No.: (NVLAP Lab. Code: 200234-0)	Site Registration No.: (NVLAP Lab. Code: 200234-0)
No. 65, Ku Dai Keng St.	No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
Hsichih, Taipei Hsien 22117	Lung-Tan Hsiang, Tao Yuan County 325
Taiwan, R.O.C.	Taiwan, R.O.C
Tel:(02)2646-2550	Tel:(03)407-1718
Fax:(02)2646-4641	Fax:(03)407-1738

Report Number: ISL-04LE223FB

Issue Date: 2004/07/27

HC LAB: NVLAP:200234-0; VCCI: R-341, C-354; NEMKO: ELA 113a, 113c; BSMI: SL2-IN-E-0037; SL2-R1-E-0037; CNLA: 1178

LT LAB: NVLAP:200234-0; VCCI: R-1435, C-1440; NEMKO: ELA 113b, 113d; BSMI: SL2-IN-E-0013; CNLA: 0997

ISL-T10-R4-9

Report Number: ISL-04LE223FB

Issue Date: 2004/07/27

HC LAB:NVLAP:200234-0;VCCI: R-341,C-354;NEMKO:ELA 113a,113c;BSMI:SL2-IN-E-0037;SL2-R1-E-0037;CNLA:1178

LT LAB:NVLAP:200234-0;VCCI: R-1435,C-1440;NEMKO:ELA 113b,113d;BSMI:SL2-IN-E-0013;CNLA:0997

ISL-T10-R4-9

Contents of Report

1.	General.....	1
1.1	Certification of Accuracy of Test Data.....	1
1.2	Applicant Information.....	2
1.3	Operation Environment	2
2.	Powerline Conducted Emissions	3
2.1	Configuration and Procedure.....	3
2.1.1	EUT Configuration.....	3
2.1.2	Test Procedure.....	3
2.1.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	3
2.2	Test Data: The EUT inserted into the Personal Computer PS/2 Keyboard port.....	4
3.	Open Field Radiated Emissions	6
3.1	Configuration and Procedure.....	6
3.1.1	EUT Configuration.....	6
3.1.2	Test Procedure.....	6
3.1.3	Spectrum Analyzer Configuration (for the frequencies tested).....	6
3.2	Test Data: The EUT inserted into the Personal Computer PS/2 Keyboard port.....	7
4.	Appendix	9
4.1	Appendix A: Warning Labels	9
4.2	Appendix B: Warning Statement.....	10
4.3	Appendix C: Measurement Procedure for Powerline Conducted Emissions	11
4.4	Appendix D: Test Procedure for Radiated Emissions	12
4.5	Appendix E: Test Equipment	13
4.5.1	Test Equipment List.....	13
4.5.2	Software for Controlling Spectrum/Receiver and Calculating Test Data.....	14
4.6	Appendix F: Layout of EUT and Support Equipment	15
4.6.1	General Conducted Test Configuration.....	15
4.6.2	General Radiation Test Configuration.....	16
4.7	Appendix G: Description of Support Equipment.....	17
4.7.1	Description of Support Equipment.....	17
4.7.2	Software for Controlling Support Unit	21
4.7.3	I/O Cable Condition of EUT and Support Units	22
4.8	Appendix H: Description of Equipment Under Test.....	23
4.9	Appendix I: Uncertainty of Measurement	24
4.10	Appendix J: Photographs of EUT Configuration Test Set Up	27
4.11	Appendix K: Photographs of EUT	30

1. General

1.1 Certification of Accuracy of Test Data

Standards: ANSI C63.4-2001, CFR 47 Part 15 Subpart B
or EN55022: 1998
Industry Canada Interference-Causing Equipment Standard
ICES-003 Issue 4: 2004

Equipment Tested: Keyboard


Model: 5211A

Applied by: BEHAVIOR TECH COMPUTER CORP.

Sample received Date: 2004/07/19

Final test Date : refer to the date of test data

Test Result: PASS

Test Engineer: 
Jason Liao

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the radiated and power line conducted electromagnetic emissions generated by sample equipment under test at the time of the test.

The sample equipment tested as described in this report is in compliance with the limits of above standards.

Approve & Signature



Eddy Hsiung/Director

Test results given in this report apply only to the specific sample(s) tested under stated test conditions. This report shall not be reproduced other than in full without the explicit written consent of ISL. This report totally contains 32 pages, including 1 cover page, 1 contents page, and 30 pages for the test description.
This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

This test data shown below is traceable to NIST or national or international standard.
International Standards Laboratory certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

International Standards Laboratory

Report Number: ISL-04LE223FB

HC LAB: NVLAP: 200234-0; VCCI: R-341, C-354; NEMKO: ELA 113a, 113c; BSMI: SL2-IN-E-0037, SL2-R1-E-0037; CNLA:1178
LT LAB: NVLAP: 200234-0; VCCI: R-1435, C-1440; NEMKO: ELA 113b, 113d; BSMI: SL2-IN-E-0013; CNLA:0997

1.2 Applicant Information

Applicant: BEHAVIOR TECH COMPUTER CORP.
2F,51,Tung Hsing Rd.,
Taipei 110
Taiwan, R. O. C.

1.3 Operation Environment

Test Site: Chamber 02; Conduction 02

Test Distance 10M

Temperature refer to each site test data

Humidity: refer to each site test data

input power: Conduction input power: AC 110 V / 60 Hz
Radiation input power: AC 110 V / 60 Hz

2. Powerline Conducted Emissions

2.1 Configuration and Procedure

2.1.1 EUT Configuration

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall was 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit of standards used.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms impedance termination was connected to the test instrument. The excess length of the power cord was folded back and forth at the center of the lead to form a bundle 30cm to 40cm in length.

Any changes made to the configuration or modifications made to EUT during testing, are noted in the following test record.

If EUT has an extra auxiliary AC outlet which can provide power to an external monitor, all measurements will be made with the monitor power from EUT-mounted AC outlet and then from floor-mounted AC outlet.

2.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on both hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dB below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dB below the applicable average limits, the emissions were also measured with the average detectors.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

2.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	150KHz~30MHz
Detector Function:	Quasi-Peak / Average Mode
Resolution Bandwidth:	9KHz

2.2 Test Data: *The EUT inserted into the Personal Computer PS/2 Keyboard port*

Table 2.2.1 Power Line Conducted Emissions (Hot)

Operator: Jason Liao

Temperature (C): 23

02:22:18 PM, Wednesday, July 21, 2004

Humidity (%): 55

Frequency	LISN Loss	Cable Loss	QP Corrt.	QP Limit	QP Margin	AVE Corrt.	AVE Limit	AVE Margin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.21868	0.10	0.06	47.48	64.04	-16.56	46.76	54.04	-7.28
0.32683	0.10	0.10	42.80	60.95	-18.15	41.63	50.95	-9.32
0.76161	0.16	0.07	36.50	56.00	-19.50	35.38	46.00	-10.62
0.87008	0.18	0.07	36.57	56.00	-19.43	35.01	46.00	-10.99
0.97906	0.20	0.07	33.65	56.00	-22.35	32.64	46.00	-13.36
1.41414	0.26	0.08	35.03	56.00	-20.97	34.53	46.00	-11.47
1.52325	0.25	0.08	35.38	56.00	-20.62	34.78	46.00	-11.22
3.18588	0.20	0.12	28.05	56.00	-27.95	21.82	46.00	-24.18
14.0009	0.38	0.28	37.63	60.00	-22.37	32.88	50.00	-17.12
14.0994	0.38	0.28	35.13	60.00	-24.87	28.91	50.00	-21.09

* Note:

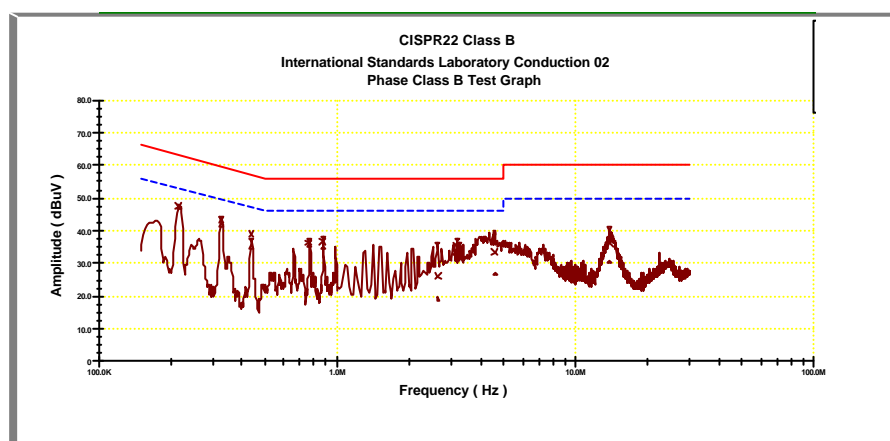
Margin = Corrected Amplitude - Limit

Corrected Amplitude = Receiver Reading + LISN Loss + Cable Loss

A margin of -8dB means that the emission is 8dB below the limit

The total Uncertainty value is 1.701dB .

Graph 2.2.1 Power Line Conducted Emissions (Hot)



International Standards Laboratory

Report Number: ISL-04LE223FB

HC LAB: NVLAP: 200234-0; VCCI: R-341, C-354; NEMKO: ELA 113a, 113c; BSMI: SL2-IN-E-0037, SL2-R1-E-0037; CNLA:1178

LT LAB: NVLAP: 200234-0; VCCI: R-1435, C-1440; NEMKO: ELA 113b, 113d; BSMI: SL2-IN-E-0013; CNLA:0997

Table 2.2.2 Power Line Conducted Emissions (Neutral)

Operator: Jason Liao

Temperature (C): 23

02:34:46 PM, Wednesday, July 21, 2004

Humidity (%): 55

Frequency	LISN Loss	Cable Loss	QP Corrt.	QP Limit	QP Margin	AVE Corrt.	AVE Limit	AVE Margin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.3266	0.10	0.10	44.49	60.95	-16.47	43.02	50.95	-7.94
0.43568	0.11	0.08	42.76	57.84	-15.08	40.17	47.84	-7.67
0.87108	0.18	0.07	38.32	56.00	-17.68	37.09	46.00	-8.91
0.9783	0.20	0.07	36.84	56.00	-19.16	35.33	46.00	-10.67
0.97836	0.20	0.07	36.83	56.00	-19.17	35.31	46.00	-10.69
2.06603	0.20	0.09	35.61	56.00	-20.39	34.79	46.00	-11.21
2.61047	0.20	0.11	33.82	56.00	-22.18	32.14	46.00	-13.86
2.71938	0.20	0.11	34.03	56.00	-21.97	32.07	46.00	-13.93
4.05356	0.20	0.14	33.42	56.00	-22.58	26.10	46.00	-19.90
4.5125	0.20	0.15	34.67	56.00	-21.33	29.33	46.00	-16.67

* Note:

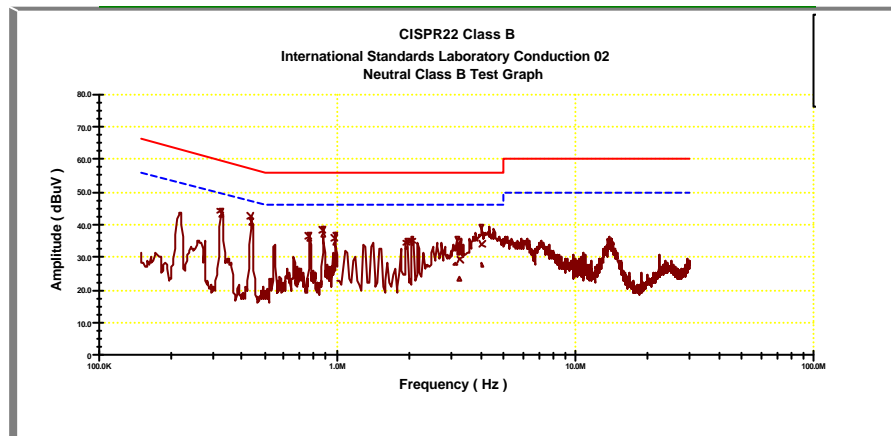
Margin = Corrected Amplitude - Limit

Corrected Amplitude = Receiver Reading + LISN Loss + Cable Loss

A margin of -8dB means that the emission is 8dB below the limit

The total Uncertainty value is 1.701dB .

Graph 2.2.2 Power Line Conducted Emissions (Neutral)



3. Open Field Radiated Emissions

3.1 Configuration and Procedure

3.1.1 EUT Configuration

The equipment under test was set up on a non-conductive table 80cm above ground, on a 10 meter open field or 10 meter chamber. The excess length of the power cord was folded back and forth at the center of the lead to form a bundle 30cm to 40cm in length.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If EUT has an extra auxiliary AC outlet which can provide power to an external monitor, all measurements will be made with the monitor power from EUT-mounted AC outlet and then from floor-mounted AC outlet.

3.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The maximum emission was measured by varying the height of antenna and then by rotating the turntable. Both polarization of antenna, horizontal and vertical, were measured.

The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. The highest emissions of frequency higher than 1000 MHz was analyzed in peak mode and/or average mode to determine the precise amplitude of the emission.

3.1.3 Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	30MHz-- 1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	120KHz

Frequency Range:	Above 1000Mhz
Detector Function:	Peak/Average Mode
Resolution Bandwidth:	1MHz

3.2 Test Data: *The EUT inserted into the Personal Computer PS/2 Keyboard port*

Table 3.2.1 Radiated Emissions (Horizontal)

Operator: Jason Liao

Temperature (C): 24

08:11:13 AM, Friday, July 23, 2004

Humidity (%): 58

Frequency MHz	RX_R dBuV	Ant_F dB/m	Cab_L dB	PreAmp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	Table Pos deg.
66.86	15.45	5.40	1.46	0.00	22.31	30.00	-7.69	288	187
96.93	5.30	9.69	1.84	0.00	16.83	30.00	-13.17	159	226
129.91	3.70	11.40	2.21	0.00	17.31	30.00	-12.69	115	164
139.61	5.05	10.34	2.28	0.00	17.68	30.00	-12.32	105	58
149.31	4.50	9.46	2.35	0.00	16.32	30.00	-13.68	189	335
169.68	5.00	8.51	2.57	0.00	16.08	30.00	-13.92	292	153
190.05	5.12	8.50	2.80	0.00	16.43	30.00	-13.57	399	293
199.75	4.66	8.89	2.90	0.00	16.44	30.00	-13.56	292	56
664.38	5.05	19.00	6.32	0.00	30.36	37.00	-6.64	162	110
972.84	4.55	21.15	8.29	0.00	33.99	37.00	-3.01	205	65

* Note:

Margin = Corrected Amplitude – Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

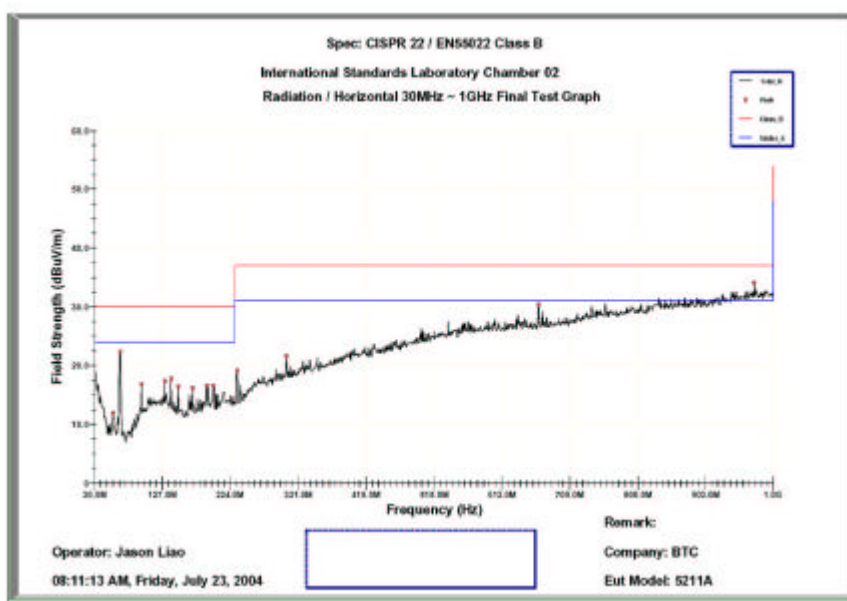
A margin of -8dB means that the emission is 8dB below the limit

BILOG Antenna Distance: 10 meter, Frequency: under 1000MHz

Horn Antenna Distance: 3 meter, Frequency: 1000MHz–18GHz

The total Uncertainty value is 1.831 dB .

Graph 3.2.1 Open Field Radiated Emissions (Horizontal)



International Standards Laboratory

Report Number: ISL-04LE223FB

HC LAB: NVLAP: 200234-0; VCCI: R-341, C-354; NEMKO: ELA 113a, 113c; BSMI: SL2-IN-E-0037, SL2-R1-E-0037; CNLA:1178

LT LAB: NVLAP: 200234-0; VCCI: R-1435, C-1440; NEMKO: ELA 113b, 113d; BSMI: SL2-IN-E-0013; CNLA:0997

Table 3.2.2 Radiated Emissions (Vertical)

Operator: Jason Liao

Temperature (C): 24

08:41:06 AM, Friday, July 23, 2004

Humidity (%): 58

Frequency	RX_R	Ant_F	Cab_L	PreAmp	Emission	Limit	Margin	Ant.Pos	Table Pos
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg.
34.85	10.07	15.18	1.01	0.00	26.26	30.00	-3.74	152	268
49.4	10.77	7.59	1.26	0.00	19.62	30.00	-10.38	368	137
59.1	6.00	5.57	1.38	0.00	12.95	30.00	-17.05	174	127
125.06	4.30	11.55	2.16	0.00	18.01	30.00	-11.99	165	87
194.9	6.00	8.70	2.82	0.00	17.52	30.00	-12.48	346	174
215.27	5.94	8.35	3.01	0.00	17.29	30.00	-12.71	219	205
497.54	5.16	17.44	5.28	0.00	27.88	37.00	-9.12	173	202
582.9	4.83	18.87	5.78	0.00	29.47	37.00	-7.53	288	173
973.81	4.51	21.15	8.30	0.00	33.96	37.00	-3.04	205	63

* Note:

Margin = Corrected Amplitude – Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

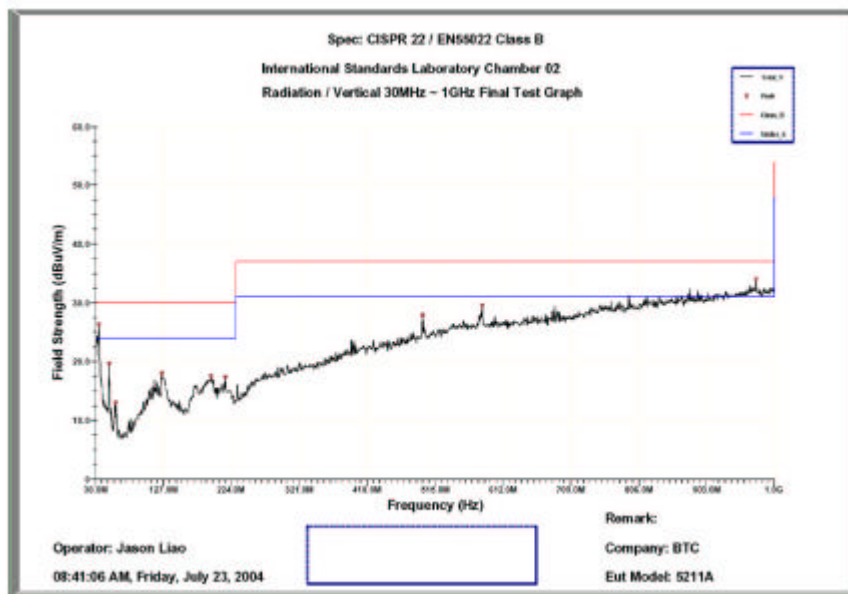
A margin of -8dB means that the emission is 8dB below the limit

BILOG Antenna Distance: 10 meter, Frequency: under 1000MHz

Horn Antenna Distance: 3 meter, Frequency: 1000MHz–18GHz

The total Uncertainty value is 1.831 dB .

Graph 3.2.2 Open Field Radiated Emissions (Vertical)



International Standards Laboratory

Report Number: ISL-04LE223FB

HC LAB: NVLAP: 200234-0; VCCI: R-341, C-354; NEMKO: ELA 113a, 113c; BSMI: SL2-IN-E-0037, SL2-R1-E-0037; CNLA:1178

LT LAB: NVLAP: 200234-0; VCCI: R-1435, C-1440; NEMKO: ELA 113b, 113d; BSMI: SL2-IN-E-0013; CNLA:0997

4. Appendix

4.1 Appendix A: Warning Labels

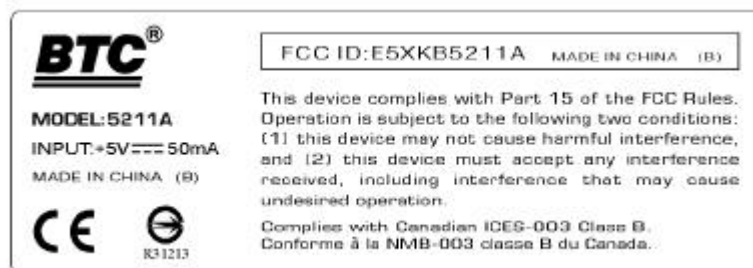
Label Requirements

A Class B digital device subject to FCC shall carry a label which includes the following statement:

*** * * W A R N I N G * * ***

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The sample label shown shall be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.



4.2 Appendix B: Warning Statement

Statement Requirements

The operators manual for a Class B digital device shall contain the following statements or their equivalent:

* * * W A R N I N G * * *

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

Notice: The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equivalent.

* * * * *

If the EUT was tested with special shielded cables the operators manual for such product shall also contain the following statements or their equivalent:

Shielded interface cables and/or AC power cord, if any, must be used in order to comply with the emission limits.

4.3 Appendix C: Measurement Procedure for Powerline Conducted Emissions

The measurements are performed in a 3.5m x 3.4m x 2.5m shielded room, which referred as Conduction 01 test site, or a 3m x 3m x 2.3m test site, which referred as Conduction 02 test site. The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the standard. Power to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

If the EUT is supplied with a flexible power cord, the power cord length in excess of the distance separating the EUT from the LISN shall be folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length. If the EUT is provided with a permanently coiled power cord, bundling of the cord is not required. If the EUT is supplied without a power cord, the EUT shall be connected to the LISN by a power cord of the type specified by the manufacturer which shall not be longer than 1 meter. The excess power cord shall be bundled as described above. If a non-flexible power cord is provided with the EUT, it shall be cut to the length necessary to attach the EUT to the LISN and shall not be bundled.

The interconnecting cables were arranged and moved to get the maximum measurement. Both the line of power cord, hot and neutral, were measured.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

4.4 Appendix D: Test Procedure for Radiated Emissions

Preliminary Measurements in the Anechoic Chamber

The radiated emissions are initially measured in the anechoic chamber at a measurement distance of 3 meters. Desktop EUT are placed on a wooden stand 0.8 meter in height. The measurement antenna is 3 meters from the EUT. The test setup in anechoic chamber is the same as open site. The turntable rotated 360°C. The antenna height is varied from 1-2.5m. The primary objective of the radiated measurements in the anechoic chamber is to identify the frequency spectrum in the absence of the electromagnetic environment existing on the open test site. The frequencies can then be pre-selected on the open test site to obtain the corresponding amplitude. The initial scan is made with the spectrum analyzer in automatic sweep mode. The spectrum peaks are then measured manually to determine the exact frequencies.

Measurements on the Open Site or 10m EMC Chamber

The radiated emissions test will then be repeated on the open site or 10m EMC chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of one of 3 or 10 meter open field sites. Desktop EUT are set up on a wooden stand 0.8 meter above the ground.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. Both reading are recorded with the quasi-peak detector with 120KHz bandwidth. For frequency between 30 MHz and 1000MHz, the reading is recorded with peak detector or quasi-peak detector. For frequency above 1 GHz, the reading is recorded with peak detector or average detector with 1 MHz bandwidth.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.

4.5 Appendix E: Test Equipment

4.5.1 Test Equipment List

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction	CDN T2 03	FCC Inc.	FCC-801-T2	02066	01/07/2004	01/07/2005
Conduction	CDN T4 04	FCC Inc.	FCC-801-T4	02069	01/07/2004	01/07/2005
Conduction	Coaxial Cable 1F-C2	Harbourindustries	RG400	1F-C2	06/02/2004	06/02/2005
Conduction	Current Probe	Schaffner	SMZ 11	18030	12/30/2003	12/30/2004
Conduction	Digital Hygro-Thermometer Conduct	MicroLife	HT-2126G	ISL-Conduction02	12/04/2002	12/04/2004
Conduction	EMI Receiver 02	HP	85460A	3448A00183	10/02/2003	10/02/2004
Conduction	ISN T4	Schaffner	ISN T400	16593	12/19/2003	12/19/2004
Conduction	ISN T4 02	FCC	F-CMISN-CAT 5	02003	12/29/2003	12/29/2004
Conduction	Capacitive Voltage Probe	FCC	F-CVP-1	68	05/19/2004	05/19/2005
Conduction	LISN 04	EMCO	3810/2	9604-1429	12/18/2003	12/18/2004
Conduction	LISN 01	R&S	ESH2-Z5	890485/013	04/29/2004	04/29/2005
Radiation	BILOG Antenna 08	Schaffner	CBL6112B	2756	06/02/2004	06/02/2005
Radiation	Coaxial Cable Chmb 02-10M	Belden	RG-8/U	Chmb 02-10M	06/24/2004	06/24/2005
Radiation	Digital Hygro-Thermometer Chmb 02	MicroLife	HT-2126G	Chmb 02	12/04/2002	12/04/2004
Radiation	EMI Receiver 03	HP	85460A	3448A00209	01/08/2004	01/08/2005
Radiation	Loop Antenna 01	R&S	HFH2-Z2	881056/46	01/20/2004	01/20/2005
Radiation	Microwave Cable Chmb 02 3M	HUBER+SUHNER AG.	Sucoflex 103	42731/3 & 42729/3	03/15/2004	03/15/2005
Radiation	Spectrum Analyzer 08	Advantest	R3132	111000867	12/16/2003	12/16/2004
Rad. Above 1Ghz	BILOG Antenna 07	Schaffner	CBL6112B	2755	12/19/2003	12/19/2006
Rad. Above 1Ghz	Digital Hygro-Thermometer Chmb 05	MicroLife	HT-2126G	Chmb 05	12/04/2002	12/04/2004
Rad. Above 1Ghz	High Pass Filter 01	HEWLETT-PACKARD	84300-80038	001	N/A	N/A
Rad. Above 1Ghz	High Pass Filter 02	HEWLETT-PACKARD	84300-80039	005	N/A	N/A
Rad. Above 1Ghz	Horn Antenna 02	Com-Power	AH-118	10088	02/17/2004	02/17/2005
Rad. Above 1Ghz	Horn Antenna 04	Com-Power	AH-826	081-001	01/07/2004	01/07/2005
Rad. Above 1Ghz	Horn Antenna 05	Com-Power	AH-640	100A	09/18/2003	09/18/2005
Rad. Above 1Ghz	Microwave Cable RF SK-01	HUBER+SUHNER AG.	Sucoflex 102	22139 /2	02/17/2004	02/17/2005
Rad. Above 1Ghz	Microwave Cable RF SK-03	HUBER+SUHNER AG.	Sucoflex 102	20085 /2	06/18/2004	06/18/2005

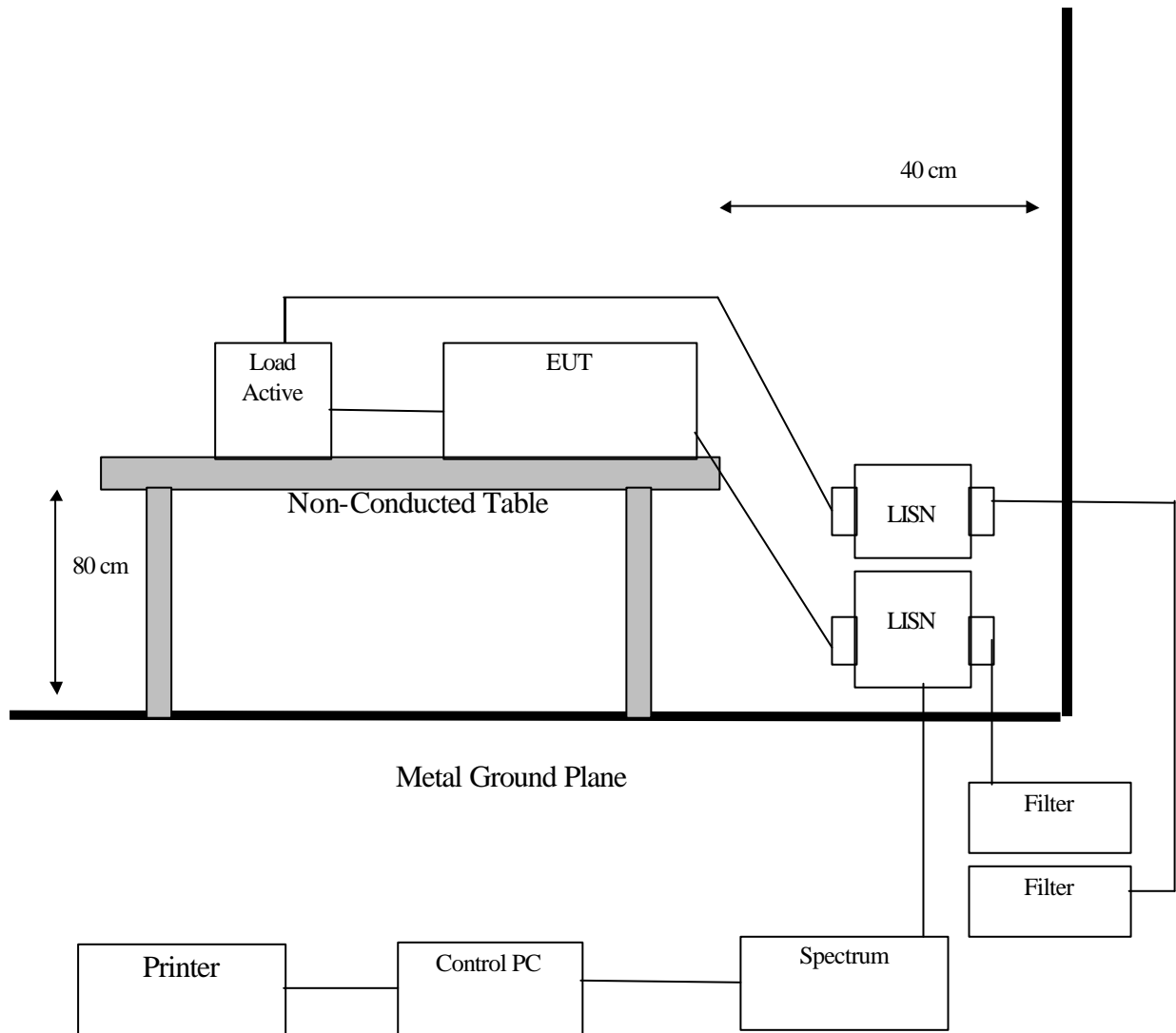
Rad. Above 1Ghz	Peak Power Analyzer	HP	8990A	3621A01269	01/02/2004	01/02/2005
Rad. Above 1Ghz	Power Meter 01	HP	438A	3513U06187	01/07/2004	01/07/2005
Rad. Above 1Ghz	Power Sensor -4-3/-6	HP	8482A	3318A29614	01/09/2004	01/09/2005
Rad. Above 1Ghz	Power Sensor Radar	HP	84815A	3318A01828	01/02/2004	01/02/2006
Rad. Above 1Ghz	Power Sensor RF 01	HP	8481H	MY41091048	05/28/2004	05/28/2005
Rad. Above 1Ghz	Preamplifier 02	MITEQ	AFS44-0010265 0-40-10P-44	728229	05/12/2004	05/12/2005
Rad. Above 1Ghz	Preamplifier 09	MITEQ	AFS44-0010265 0-40-10P-44	858687	05/12/2004	05/12/2005
Rad. Above 1Ghz	Preamplifier 10	MITEQ	JS-26004000-27- 5A	818471	N/A	N/A
Rad. Above 1Ghz	Spectrum Analyzer 07	Advantest	R3182	110600649	04/08/2004	04/08/2005

4.5.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

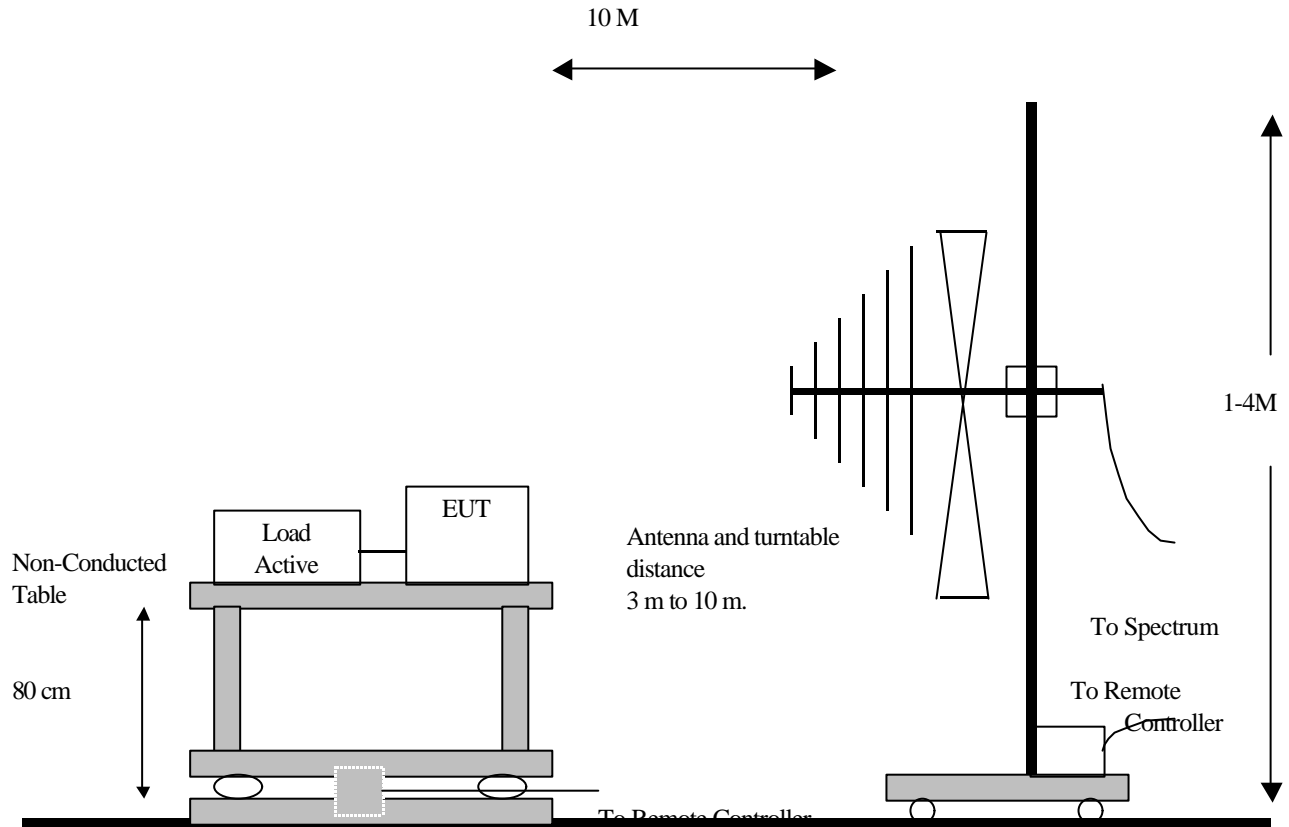
Radiation/Conduction	Filename	Version	Issued Date
Hsichih Conduction	Tile.exe	2.0.P	2/12/2002
Hsichih Radiation	Tile.exe	2.0.P	2/12/2002
Lung_Tan Conduction	Tile.exe	2.3.B	12/30/2003
Lung_Tan Radiation	Tile.exe	2.3.B	12/30/2003

4.6 Appendix F: Layout of EUT and Support Equipment

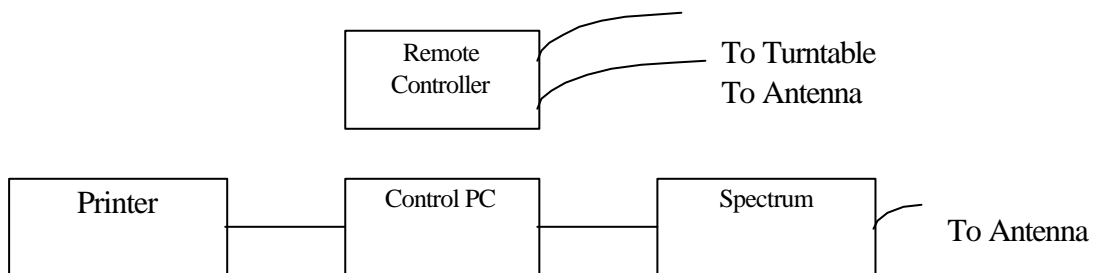
4.6.1 General Conducted Test Configuration



4.6.2 General Radiation Test Configuration



Metal Full Soldered Ground Plane



4.7 Appendix G: Description of Support Equipment

4.7.1 Description of Support Equipment

Support Unit 1.

Description:	USB 2.0 Card Reader/Writer
Model Number:	UID12W
Serial Number:	N/A
Power Supply Type:	From USB Port
USB 2.0 Port:	one 4-pin
SD/MMC Card Slot:	one
SecureDigital Card (Option):	SD (Model: SD-M16B1) 16MB
USB Cable:	Shielded, Detachable (With Cord)
FCC ID:	(Comply with FCC DOC)

Support Unit 1.

Description:	USB 2.0 Card Reader/Writer
Model Number:	UID12W
Serial Number:	N/A
Power Supply Type:	From USB Port
USB 2.0 Port:	one 4-pin
SD/MMC Card Slot:	one
SecureDigital Card (Option):	SD (Model: SD-M16B1) 16MB
USB Cable:	Shielded, Detachable (With Cord)
FCC ID:	(Comply with FCC DOC)

Support Unit 2.

Description:	KOKA Headphone
Model Number:	ST-304
Serial Number:	N/A
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	N/A

Support Unit 3.

Description:	KOKA Headphone
Model Number:	ST-304
Serial Number:	N/A
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	N/A

Support Unit 4.

Description:	KOKA Microphone
Model Number:	DM-510
Serial Number:	N/A
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	N/A

Support Unit 5.

Description:	Coson radio cassette player
Model Number:	C-2087
Serial Number:	N/A
Power Supply Type:	N/A
Power Cord:	N/A

Support Unit 6.

Description:	HP Printer (for parallel interface port)
Model Number:	C2642A
Serial Number:	TH84T1N3J3
Power Supply Type:	AC Adaptor (HP Model: C2175A)
Power Cord:	Non-shielded, Detachable
Data Cable:	Shielded, Detachable, With Metal Hood
FCC ID:	B94C2642X

Support Unit 7.

Description:	DELL Mouse
Model Number:	M-SAW34
Serial Number:	LZE24108086
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	DZL211029

Support Unit 8.

Description:	Aceex Modem (for serial interface port 1)
Model Number:	DM1414
Serial Number:	0301000558
Power Supply Type:	Linear, Power Adapter (AC to AC Xfmr, Wall Mounted Type)
Power Cord:	Nonshielded, Without Grounding Pin
FCC ID:	IFAXDM1414

Support Unit 9.

Description:	Aceex Modem (for serial interface port 2)
Model Number:	DM1414
Serial Number:	0301000557
Power Supply Type:	Linear, Power Adapter (AC to AC Xfmr, Wall Mounted Type)
Power Cord:	Nonshielded, Without Grounding Pin
FCC ID:	IFAXDM1414

Support Unit 10.

Description:	Acer Monitor
Model:	G781
Serial Number:	999007101214400445T7AA31T
Power Cord:	Non-shielded, Detachable
FCC ID:	(Comply with FCC Standards)

Support Unit 11.

Description:	Acer Personal Computer
Model:	VT7200
Serial No.:	N/A
Power Supply Type:	Delta (Model: DPS-300GB-1)
Hard Disk Drive:	Maxtor (Model:53073U6)30GB
Floppy Driver:	Panasonic (Model: JU-256A047P K2)
CD-ROM Drive:	AOpen (Model: CD-952E/AKH)
VGA Card:	WinFast (Model: LRI2830)
Modem Card:	AMBIT(Model: 1456VQH20E-04)
Parallel Port:	one 25-pin
Serial Port:	two 9-pin
LAN Port:	one 8-pin
Keyboard Connector:	one 6-pin
Mouse Connector:	one 6-pin
USB Connector:	two 4-pin
Game Port:	one 15-pin
Speaker Port:	one
Microphone Port:	one
Line In Port:	one
Power Cord:	Non-shielded, Detachable

Support Unit 12.

Description:	Acer Personal Computer
Model:	VT7200
Serial No.:	N/A
Power Supply Type:	Delta (Model: DPS-300GB-1)
Hard Disk Drive:	Maxtor (Model:53073U6)30GB
Floppy Driver:	Panasonic (Model: JU-256A047P K2)
CD-ROM Drive:	AOpen (Model: CD-952E/AKH)
VGA Card:	WinFast (Model: LRI2830)
Modem Card:	AMBIT(Model: 1456VQH20E-04)
Parallel Port:	one 25-pin
Serial Port:	two 9-pin
LAN Port:	one 8-pin
Keyboard Connector:	one 6-pin
Mouse Connector:	one 6-pin
USB Connector:	two 4-pin
Speaker Port:	one
Microphone Port:	one
Line In Port:	one
Power Cord:	Non-shielded, Detachable

4.7.2 Software for Controlling Support Unit

Test programs exercising various part of EUT were used. The programs were executed as follows:

- A. Read and write to the disk drives.
- A. R/W memory card form EUT USB Port through Card Reader/Writer
- B. Send audio signal to the headphone.
- C. Receive audio signal from the microphone.
- D. Receive audio signal from walkman.
- E. Send H pattern to the parallel port device (Printer).
- F. Send H pattern to the serial port device (Modem 1).
- G. Send H pattern to the serial port device (Modem 2).
- H. Send H pattern to the video port device (Monitor).
- I. Send signal from EUT to server through LAN port.
- J. Press the "H" font key, Send H pattern to the WordPad file show on the monitor screen.
- K. Repeat the above steps.

	Filename	Issued Date
LAN	EMC.exe	11/22/1996
Monitor	HH.bat	8/20/1991
Modem 1	Hm.bat	8/20/1991
Modem 2	Hm.bat	8/20/1991
Printer1	Wordpad.exe	11/11/1999
Winthrax	Winthrax.exe	5/21/1996
WordPad	WordPad.exe	8/21/2002

4.7.3 I/O Cable Condition of EUT and Support Units

Description	Path	Cable Length	Cable Type	Connector Type
AC Power Cord	110V (~240V) to AC Power Cord Inlet (3-pin)	1.8M	Nonshielded, Detachable	Plastic Head
Server Data Cable	Server to EUT LAN Port	33 feet	Non-shielded, Detachable	RJ-45, with Plastic Head
Monitor Data Cable	Monitor to PC VGA port	1.6M	Shielded, Un-detachable	Metal Head
Modem Data Cable	Modem to PC COM 1 port	1.5M	Shielded, Detachable	Metal Head
Modem Data Cable	Modem to PC COM 2 port	1.5M	Shielded, Detachable	Metal Head
Mouse Data Cable	Mouse to PC Mouse port	1.8M	Shielded, Un-detachable	Metal Head
Printer Data Cable	Printer to PC Parallel port	1.5M	Shielded, Detachable	Metal Head
Audio-in Data Cable	Walkman to PC Line In Port	2M	Non-shielded, Detachable	Plastic Head
Microphone Data Cable	Microphone to PC Microphone Port	1.5M	Nonshielded, Undetachable	Plastic Head
Headphone Data Cable*2	Headphone to PC Line Out Port	1.2M	Nonshielded, Undetachable	Plastic Head
USB Data Cable*2	EUT USB Port to Card Reader/Writer	1.0 M	Shielded, detachable (with cord)	Metal Head
Data Cable	EUT to Personal Computer PS/2 port	1.7M	Shielded, Un-detachable	Metal Head

4.8 Appendix H: Description of Equipment Under Test

EUT

Description:	Keyboard
Condition:	Pre-Production
Model:	5211A
Serial Number:	N/A
Power:	From Personal Computer PS/2 port
PS/2 Connector:	one 6 pin
PS/2 Signal Data Cable:	Shielded, Un-detachable

The test configuration is listed below:

Configuration 1:

The EUT was inserted into the Personal Computer PS/2 Keyboard port.

EMI Noise Source:

U1:1.8MHZ

EMI Solution:

1. On PS/2 Signal Data Cable end of Keyboard add a Core. Vendor: Type: 10.4*5*5.8

The difference between the Model number: 5211A is described as below table.

BRAND	MODEL
BTC	5211A
EMPREX	5211A

4.9 Appendix I: Uncertainty of Measurement

The measurement uncertainties mentioned below refer to CISPR 16-4: 2002 Uncertainty in EMC measurements.

Test Site: Conduction 02 for LT LAB

Item	Source of Uncertainty	Probability Distribution	Total Uncertainties (dB)		Standard Uncertainty (dB)	
1	Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT)	Normal	k=2	0.104	k=1	0.052
2	Random Effects: (Assessment from 20 random observations; 1 reading on EUT)	Normal	k=2	0.330	k=1	0.165
3	Receiver Calibration	Rectangular	k=1.73	1.000	k=1	0.577
4	LISN Factor Calibration	Normal	k=2	1.200	k=1	0.600
5	Cable Loss Calibration	Normal	k=2	1.000	k=1	0.500
6	Combined Standard Uncertainty $U_c(y)$	Normal			k=1	0.850
7	Total Uncertainty @95% minimum Confidence Level	Normal	k=2	1.701		

Measurement Uncertainty Calculations:

$$U_c(y) = \text{square root} (u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2)$$

$$U = 2 * U_c(y)$$

Test Site: Chamber 02-10M for LT LAB

Item	Source of Uncertainty	Probability Distribution	Total Uncertainties (dB)		Standard Uncertainty (dB)	
1	Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT)	Normal	k=2	0.134	k=1	0.067
2	Random Effects: (Assessment from 20 random observations; 1 reading on EUT)	Normal	k=2	0.206	k=1	0.103
3	Receiver Calibration	Rectangular	k=1.73	1.000	k=1	0.577
4	Antenna Factor Calibration	Normal	k=2	1.400	k=1	0.700
5	Cable Loss Calibration	Normal	k=2	1.000	k=1	0.500
6	Combined Standard Uncertainty Uc(y)	Normal			k=1	0.916
7	Total Uncertainty @95% minimum Confidence Level	Normal	k=2	1.831		

Measurement Uncertainty Calculations:

$$U_c(y) = \text{square root} (u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2)$$

$$U = 2 * U_c(y)$$

Test Site: OATS 02 for LT LAB

Item	Source of Uncertainty	Probability Distribution	Total Uncertainties (dB)		Standard Uncertainty (dB)	
1	Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT)	Normal	k=2	0.735	k=1	0.367
2	Random Effects: (Assessment from 20 random observations; 1 reading on EUT)	Normal	k=2	0.539	k=1	0.270
3	Receiver Calibration	Rectangular	k=1.73	1.000	k=1	0.577
4	Antenna Factor Calibration	Normal	k=2	1.000	k=1	0.500
5	Cable Loss Calibration	Normal	k=2	1.000	k=1	0.500
6	Combined Standard Uncertainty $U_c(y)$	Normal			k=1	0.889
7	Total Uncertainty @95% minimum Confidence Level	Normal	k=2	1.779		

Measurement Uncertainty Calculations:

$$U_c(y) = \text{square root} (u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2)$$

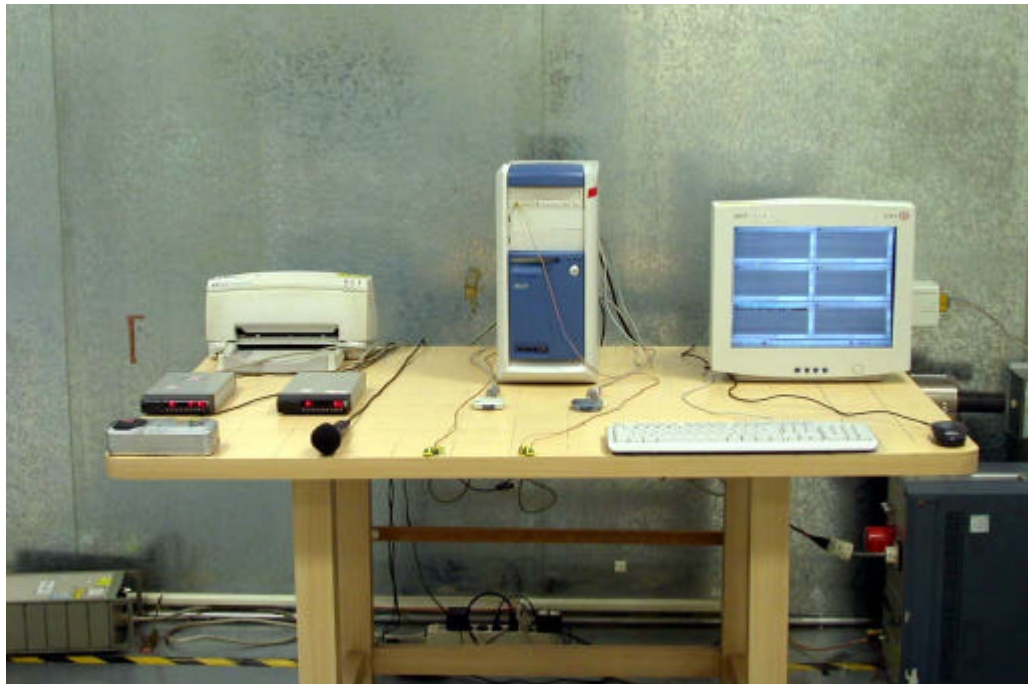
$$U = 2 * U_c(y)$$

4.10 Appendix J: Photographs of EUT Configuration Test Set Up

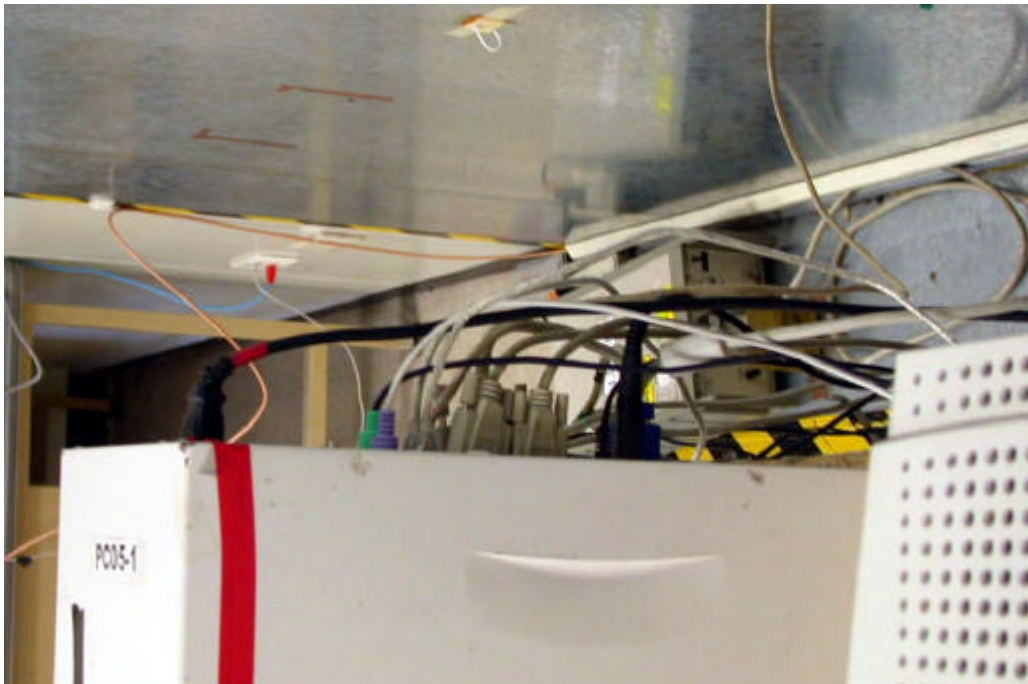
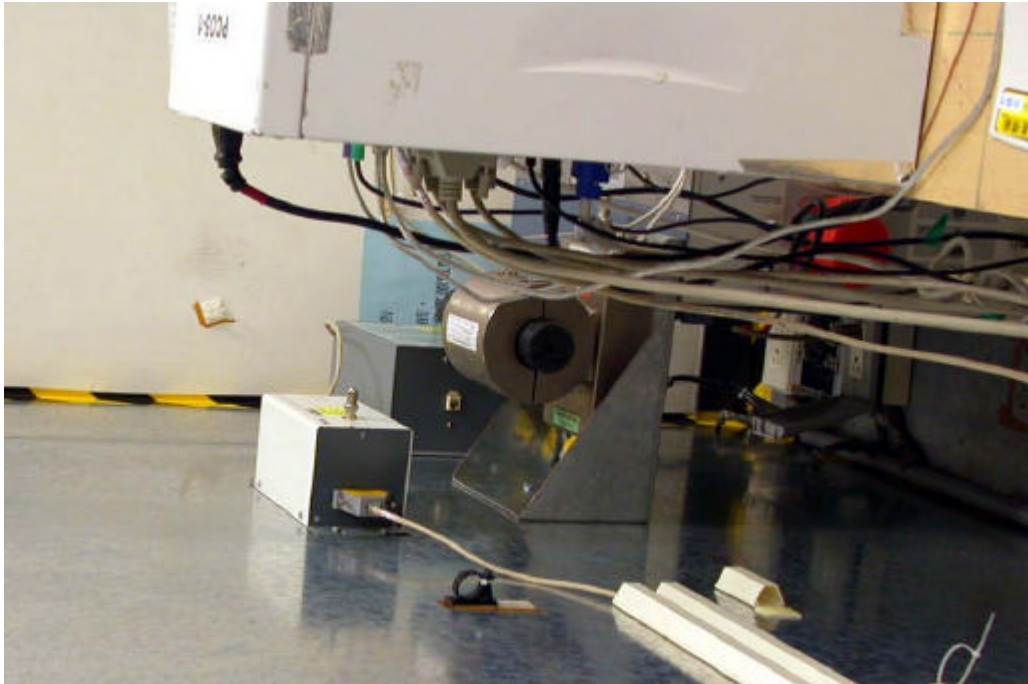
The measurement results along with the appropriate limits for comparison shall be presented in tabular form. If an alternate test method is used, the test report must identify that method and justification for its use shall be provided. Instrumentation, instrument attenuator and bandwidth settings, detector function, EUT arrangements, a sample calculation with all conversion factors and all other pertinent details shall be included along with the measurement results. When automatic scan techniques are used, an explanation of how each emission from the EUT was maximized shall be included in the test report along with the scan rate used to obtain each level.

The justification for selecting a particular EUT configuration and particular length of interface cable to produce maximized emissions must be documented in the test report. Photographs clearly showing the test set-up and interface cable arrangement for the highest radiated and line conducted emission measured shall be included.

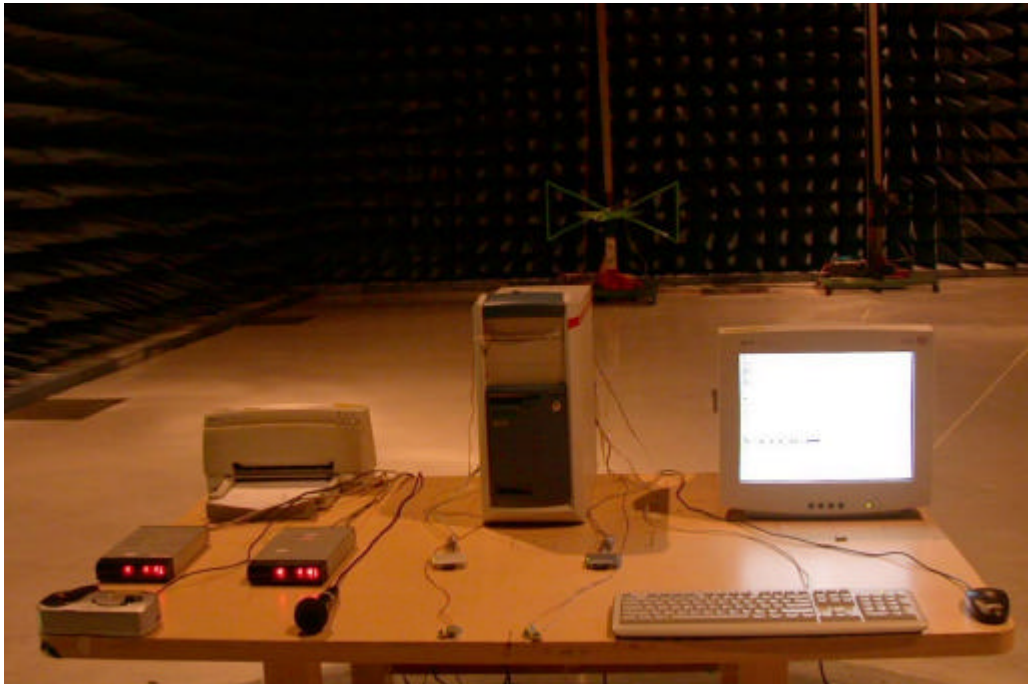
The Front View of Highest Conducted Set-up For EUT



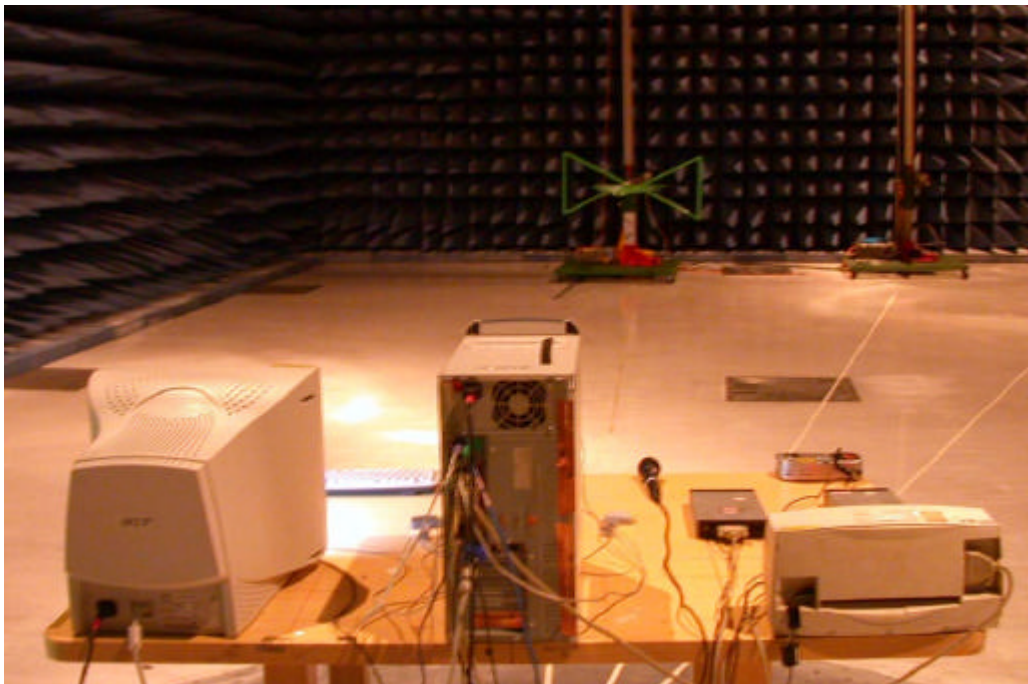
The Back View of Highest Conducted Set-up For EUT



The Front View of Highest Radiated Set-up For EUT



The Back View of Highest Radiated Set-up For EUT



4.11 Appendix K: Photographs of EUT

Please find this appendix in the File of **ISL-04LE223P**