FCC PART 15 CLASS B

EMI MEASUREMENT AND TEST REPORT

For

NMB Technologies Inc.

9730 Independence Ave.,
Chatsworth, CA 91311

FCC ID: AQ6-7R26

February 25, 2003

This Report Concerns:	**Equipment Type:**
☒ Original Report	Keyboard - Peripheral, ITE

Test Engineer:	Jerry Wang
Report No.:	R0302044
Test Date:	February 12, 2003
Reviewed By:	Hans Mellberg
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732-9164

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *NMB Technologies Inc.'s RT7R26* and *Logitech Inc.'s Y-BF38* or the "EUT" as referred to in this report is a keyboard which measures approximately 19.5 "Lx 11.0"Wx 1.25"H.

1.2 Objective

This Class B report is prepared on behalf of *NMB Technologies Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules and to ICES-003 of the Canadian Interference-Causing Equipment Regulations.

Also this Class B report is prepared on behalf of *Logitech Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules and to ICES-003 of the Canadian Interference-Causing Equipment Regulations.

The objective of the manufacturer is to demonstrate compliance with FCC Part 15 Class B limits for conducted and radiated margin and to ICES-003 requirements for Information Technology Equipment.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2610A02165	12/6/03
HP	Spectrum Analyzer	8593B	2919A00342	12/20/03
HP	Amplifier	8349B	2644A03662	12/20/03
HP	Quasi-Peak Adapter	85650A	917059	12/6/03
HP	Amplifier	8447E	1937A01046	12/6/03
A.H. System	Horn Antenna	SAS0300/571	261	12/27/03
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/03
Com-Power	Biconical Antenna	AB-100	14012	11/2/03
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/03
Com-Power	LISN	LI-200	12208	12/20/03
Com-Power	LISN	LI-200	12005	12/20/03
BACL	Data Entry Software	DES1	0001	12/20/03

* Statement of Traceability: Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to National Institute of Standards and Technology (NIST).

1.7 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Mouse	IntelliMouse	4629061-0	none
HP	Printer	2225C	2821S14783	DS16XU2225
EVEREX	Modem	EV-945	None	E3E5UVEV-945
KDS	Monitor	KD-1731	891265478	EUOKD-1731
Dell	PC System	8200 XP	None	None

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Shielded KB Cable	1.8	EUT	PS2 Port/PC System
Shielded Mouse Cable	1.8	Mouse Port/Host	Mouse
Shielded Video Cable	1.8	Video Port/Host	Monitor
Shielded IO Cable	1.5	IO port/ Host	Printer
Shielded RS232 Cable	1.5	Com port/ Host	Modem

1.9 Host PC Configuration Details

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Motherboard	CC820	IMCC00404093	DOC
NEC	Floppy Drive	FD1231T	D9WL01MB3634	DOC
MAXTOR	Hard Drive	54098U8	K806D1SC	DOC
SPI	Power Supply	FSP235-60GT	974909	DOC
TOSHIBA	CD-ROM	XM-6303B	898B003924	CJ6AT98-32
Dell	Chassis	Dimension 4300	US-03F364-03731-196-5123	None
Creative	Sound Card	Build-in	None	None

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, H pattern, contained on the hard drive, is started in a DOS window under the Windows 98 operating system. Once loaded, the program sequentially exercises each system component.

The sequence used is as follows:

1. Lines of Hs scroll across the VGA monitor.
2. The modem(s) receives Hs.
3. The printer output Hs.

The complete cycle takes approximately 5 ~ 10 seconds and the process is continuously repeated.

2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied by INMAC, Y.C. Cable and from their respective support equipment manufacturers. The EUT, modem, printer and VGA monitor featured shielded metal connectors.

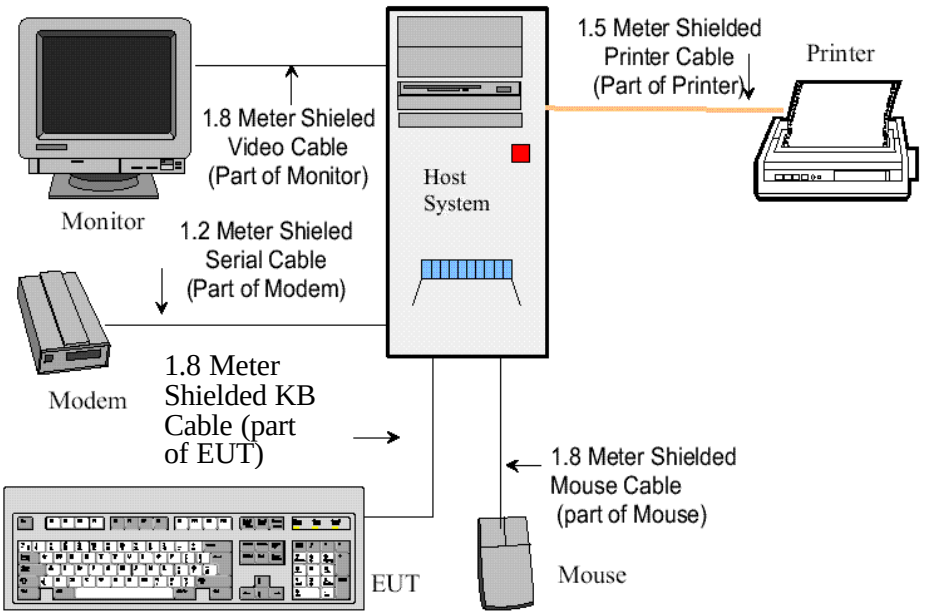
2.4 Block Diagram

Please refer to Appendix D.

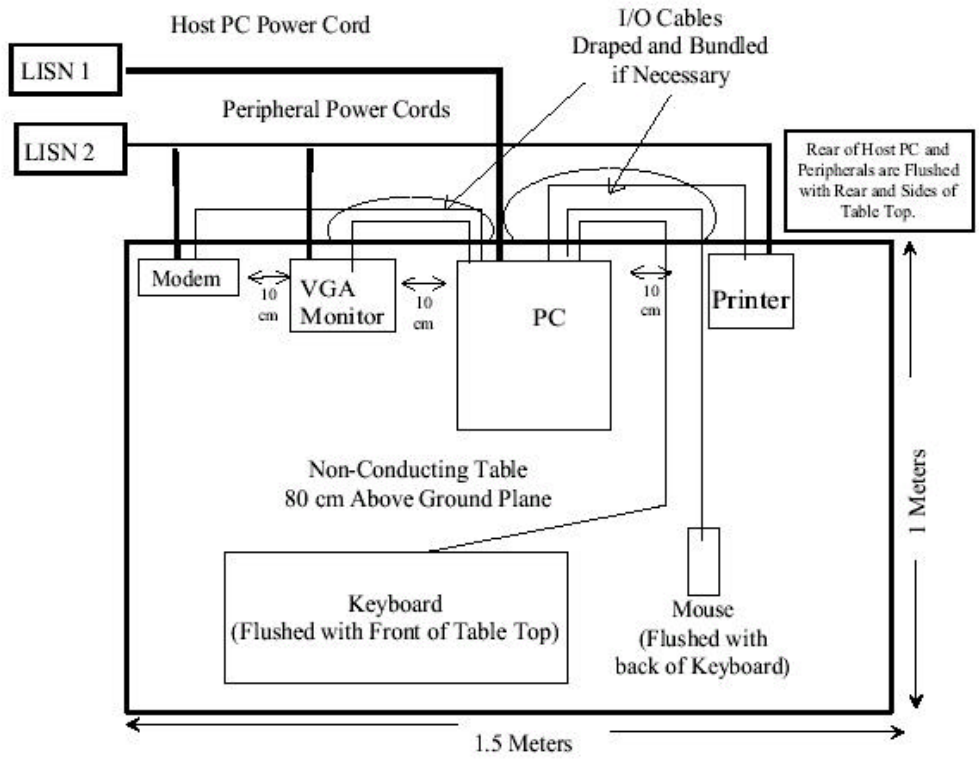
2.5 Equipment Modifications

No modification(s) were necessary for the EUT to comply with the applicable standards and limits.

2.6 Configuration of Test System



2.7 Test Setup Block Diagram



3 - CONDUCTED EMISSIONS TEST DATA

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is $\pm$2.4 dB.

3.2 EUT Setup

The measurement was performed at the **O**pen **A**rea **T**est **S**ite, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the CISPR 22 Class B limits.

The EUT was connected to the host PC. The host PC system was placed on the center back of the test table and connected to 110Vac/60Hz power source. The monitor and the modem were placed on the one side of the host PC in sequence and the printer was on the other side. The rear of the host system and peripherals were placed flushed with the rear of the tabletop.

The EUT keyboard was placed directly in front of the host PC. The mouse was placed next to the EUT.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped over edge of the test table and bundle when necessary.

3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conducted emission test:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth	10 kHz
Video Bandwidth	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

3.4 Test Procedure

During the conducted emission test, the host PC power cord was connected to the auxiliary outlet of the first LISN with the VGA monitor and all support equipment power cords connected to the second LISN.

Since the EUT has only one operating mode, this mode was to represent worst case results for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 3.6 of this report.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBµV of specified limitation). Quasi-peak readings are distinguished with a "**Qp**".

3.5 Summary of Test Results

According to the data in section 3.6, the EUT complied with the CISPR 22 Conducted margin for a Class B device, with the *worst* margin reading of:

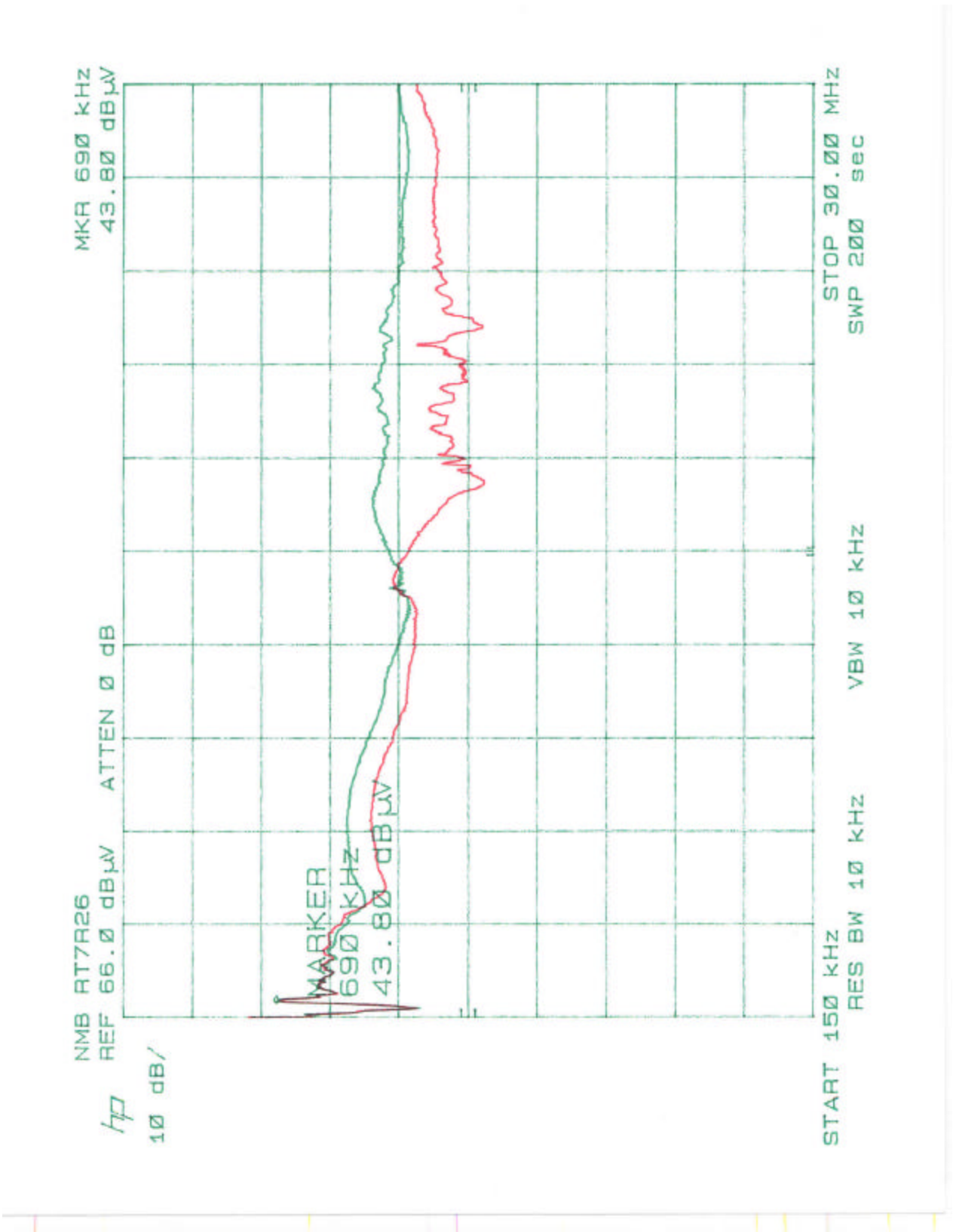
-12.6 dBmV at **0.66 MHz** in the ***Neutral*** mode, **0.15 - 30 MHz**

3.6 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				CISPR 22 CLASS B	
Frequency MHz	Amplitude dBµV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBµV	Margin dB
0.66	43.4	QP	Neutral	56	-12.6
0.66	42.7	QP	Line	56	-13.3
0.15	47.0	QP	Line	66	-19.0
6.21	33.5	QP	Neutral	60	-26.5
16.45	29.6	QP	Neutral	60	-30.4
14.00	27.0	QP	Line	60	-33.0

3.7 Plot of Conducted Emissions Test Data

Plot of Conducted Emissions test data is presented hereinafter as reference.


MKR 690 kHz
43.80 dBµV
NMB RT7R26
REF 66.0 dBµV
ATTEN 0 dB
10 dB/
MARKER
690 kHz
43.80 dBµV
START 150 kHz
RES BW 10 kHz
VBW 10 kHz
STOP 30.00 MHz
SWP 200 sec

4 - RADIATED EMISSION DATA

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 10-meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the CISPR 22 Class B limits.

The EUT was connected to the host PC. The host PC system was placed on the center back of the test table and connected to 110Vac/60Hz power source. The monitor and the modem were placed on the one side of the host PC in sequence and the printer was on the other side. The rear of the host system and peripherals were placed flushed with the rear of the tabletop.

The EUT keyboard was placed directly in front of the host PC. The mouse, the microphone and the recorder were placed on one side of the keyboard.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped over edge of the test table and bundle when necessary.

4.3 Spectrum Analyzer Setup

According to CISPR 22, the system was tested to 1000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	1000 MHz
Sweep Speed	Auto
IF Bandwidth	100 KHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

4.4 Test Procedure

For the radiated emissions test, the host system, VGA monitor and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBµV of specified limitation), and are distinguished with a "**Qp**" in the data table.

Since the EUT has only one operating mode, this mode was tested with a host system to represent the worst case for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 4.7 of this report as reference.

The parallel port (LPT1), serial port and PS/2 mouse ports were also tested.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the CISPR 22 Class B standards, and had the worst margin of:

-1.3 dBmV at **140.80 MHz** in the **Horizontal** polarization, 30-1000MHz, 10 meters(With Ferrite; EUT in Dell PC System with P/S2 port)

-5.6 dBmV at **122.03 MHz** in the **Horizontal** polarization, 30-1000MHz, 10 meters(With Ferrite; EUT in Dell PC System with USB port)

4.7 Radiated Emissions Test Result Data

4.7.1 Test Data, with P/S2 port

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	CISPR 22 CLASS B	
Frequency MHz	Ampl. dBmV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
140.80	39.4	0	1.0	H	13.2	3.6	27.5	28.7	30	-1.3
113.92	41.3	0	1.0	V	11.7	3.2	27.7	28.5	30	-1.5
65.76	43.5	0	1.0	V	9.7	2.3	27.5	28.0	30	-2.0
137.24	38.4	0	2.0	V	12.9	3.6	27.5	27.4	30	-2.6
70.81	40.2	180	2.0	H	9.6	2.5	27.5	24.8	30	-5.2
237.35	34.2	0	1.0	V	11.3	4.5	27.2	22.8	37	-14.2

4.7.2 Test Data, with USB port

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	CISPR 22 CLASS B	
Frequency MHz	Ampl. dBmV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
122.03	38.1	90	2	H	11	3	27.7	24.4	30	-5.6
158.00	33.9	30	1.2	V	12.5	3.5	27.5	22.4	30	-7.6
120.00	35.6	200	1.2	V	11.1	3	27.7	22	30	-8.0
132.00	35.9	180	1.2	V	10.7	2.8	27.5	21.9	30	-8.1
120.00	35.1	120	2	H	11	3	27.7	21.4	30	-8.6
80.00	36.2	270	1.2	V	9.2	2.3	27.5	20.2	30	-9.8
112.00	34.7	120	2	H	10.3	2.7	27.7	20	30	-10.0
240.00	33.2	270	2	H	16.5	4.4	27.2	26.9	37	-10.1
110.00	33.2	30	1.2	V	10.4	2.7	27.7	18.6	30	-11.4
312.03	33.9	300	2.5	H	12.7	5.4	27.3	24.7	37	-12.3
76.01	33.6	120	2	H	8.9	2.1	27.5	17.1	30	-12.9
86.00	33.2	120	2	H	8.7	2.2	27.5	16.6	30	-13.4
434.00	29.2	30	2	H	15	6.8	28	23	37	-14.0