

**19. TEST EQUIPMENT LIST**

Equipment	Manufacturer	Model No.	Serial No.	Site	Cal Date	Due Date
Receiver	H.P.	8546A	3520A00259	A	03/97	03/98
RF Filter Section	H.P.	85460A	3448A00232	A	03/97	03/98
Antenna	Chase	CBL6112	2049	A/F	05/97	05/98
Antenna	EMCO	3110	8908-1079	A/F	10/97	10/98
Antenna	EMCO	3146	NSN=X100	A/F	10/97	10/98
Pre-Amp	H.P. (P2)	8447D	2944A06265	A/F	09/97	09/98
Spectrum Analyzer	H.P.	8566B	3014A06685	F	08/97	08/98
Spectrum Display	H.P.	85662A	3026A19146	F	08/97	08/98
Quasi-peak Detector	H.P.	85650A	3145A01654	F	07/97	07/98
Spectrum Analyzer	H.P.	8568A	2314A02604	B	02/98	02/99
Spectrum Display	H.P.	85662A	2314A04793	B	02/98	02/99
Quasi-peak Detector	H.P.	85650A	2521A01038	B	02/98	02/99
Pre-Amp	H.P. (P8)	8447D	2944A06589	B	09/97	09/98
Antenna	Eaton	94455-1	1197	B	10/97	10/98
Antenna	Emco	3146	2120	B	10/97	10/98
Spectrum Analyzer	H.P.	8568B	2732A03661	C	04/97	04/98
Spectrum Display	H.P.	85662A	2811A015728	C	04/97	04/98
Quasi-peak Detector	H.P.	85650A	2811A01335	C	11/97	11/98
Pre-Amp	H.P. (P5)	8447D	2944A06550	C	09/97	09/98
Antenna	Eaton	94455-1	1214	C	10/97	10/98
Antenna	EMCO	3146	9107-3163	C	10/97	10/98
LISN	Fischer	LISN2	N/A	Cond	01/98	01/99
LISN	Fischer	CISPR adapter	N/A	Cond	01/98	01/99
EMI Receiver	Rhode Schwarz	ESHS20	827129/006	Cond	03/97	03/98
LISN	Fischer	FCCLISN 50/250-25-2	114	Cond	08/97	08/98

**20. TEST RESULT SUMMARY**

**Preliminary Radiated Emission Tests** were performed at the 10 meter open area test site. CCS test procedure no:CCSUE2001B and the procedure listed in ANSI C63.4 /1992 section 8.3.1.1. were used. The following preliminary tests were conducted to determine the worst mode of operation and configuration.

Preliminary Radiated Emission Test			
Frequency Range Investigated		30 MHz TO 1000 MHz	
Mode of operation	Date	Data Report No.	Worst Mode
1280X1024 NI	02/12/98	980212B1	<input checked="" type="checkbox"/>
1024X768	02/12/98	980212B1	<input type="checkbox"/>
640X480	02/12/98	980212B1	<input type="checkbox"/>

**Final Radiated Emission Test** was conducted by operating the worst mode as indicated above.

OATS No:	Data Report No.	Date	Tested By:				
B / 10 M	980212B1	02/12/98	JESSE SALDIVAR				
Six Highest Radiated Emission Readings							
Frequency Range Investigated				30 MHz TO 1000 MHz			
Freq (MHz)	Meter Reading (dBuV)	C.F. (dB/m)	Corrected Reading (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Reading Type (P/Q/A)	Polar (H/V)
75.0	44.5	-19.06	25.44	30.0	-4.56	P	V
75.76	42.0	-18.72	23.28	30.0	-6.72	P	V
32.41	37.9	-14.41	23.49	30.0	-6.51	P	V
400.27	35.3	-7.33	27.97	37.0	-9.03	P	V
432.71	36.0	-6.65	29.35	37.0	-7.65	P	V
432.72	39.7	-6.57	33.13	37.0	-3.87	Q	H

C.F. (Correction Factor)=Antenna Factor+Cable Loss-Amplifier Gain

Corrected Reading = Metering Reading + C.F.

Margin=Corrected Reading - Limits

P=Peak Reading

H=Horizontal Polarization/Antenna

Q=Quasi-peak

V=Vertical Polarization/Antenna

A=Average Reading

Comments: N/A

**APPENDICES**

EXTERNAL I/O CABLE CONSTRUCTION DESCRIPTION

CONFIGURATION BLOCK DIAGRAM

CONDUCTED EMISSION PLOT

RADIATED EMISSION DATA

EUT PHOTOGRAPHS

**External I/O Cable Construction Description**

CABLE NO: 1	
I/O Port: VGA	Number of I/O ports of this type: 1
Number of Conductors: 14	Connector Type: DB15
Capture Type: Screw-In	Type of Cable used: Shielded
Cable Connector Type: Molded	Cable Length: 1.5 m
Bundled During Tests: Yes	Data Traffic Generated: Yes
Remark: Ferrite beads loaded at both ends.	

CABLE NO: 2, 3	
I/O Port: PS/2	Number of I/O ports of this type: 2
Number of Conductors: 6	Connector Type: PS/2
Capture Type: Snap-In	Type of Cable used: Unshielded-Mouse Shielded-Keyboard
Cable Connector Type: Molded	Cable Length: 1.5 m
Bundled During Tests: No	Data Traffic Generated: No
Remark: N/A	

CABLE NO: 4	
I/O Port: RS232	Number of I/O ports of this type: 1
Number of Conductors: 9	Connector Type: DB9
Capture Type: Screw-In	Type of Cable used: Shielded
Cable Connector Type: Metal	Cable Length: 1 m
Bundled During Tests: No	Data Traffic Generated: Yes
Remark: N/A	

CABLE NO: 5	
I/O Port: Parallel	Number of I/O ports of this type: 1
Number of Conductors: 25	Connector Type: DB25
Capture Type: Screw-In	Type of Cable used: Shielded
Cable Connector Type: Metal	Cable Length: 2 m
Bundled During Tests: Yes	Data Traffic Generated: Yes
Remark: N/A	

CABLE NO: 6, 7, 8	
I/O Port: Power Plug	Number of I/O ports of this type: 3
Number of Conductors: 3	Connector Type: USA Power Plug
Capture Type: Snap-In	Type of Cable used: Unshielded
Cable Connector Type: Plastic	Cable Length: 1.6 m
Bundled During Tests: Yes-Line Conduction, No-Radiation	Data Traffic Generated: No
Remark: N/A	

CABLE NO: 9	
I/O Port: AC Adaptor	Number of I/O ports of this type: 1
Number of Conductors: 2	Connector Type: AC Adaptor
Capture Type: Snap-In	Type of Cable used: Unshielded
Cable Connector Type: Molded	Cable Length: 1.5 m
Bundled During Tests: No	Data Traffic Generated: No
Remark: N/A	

RFI VOLTAGE

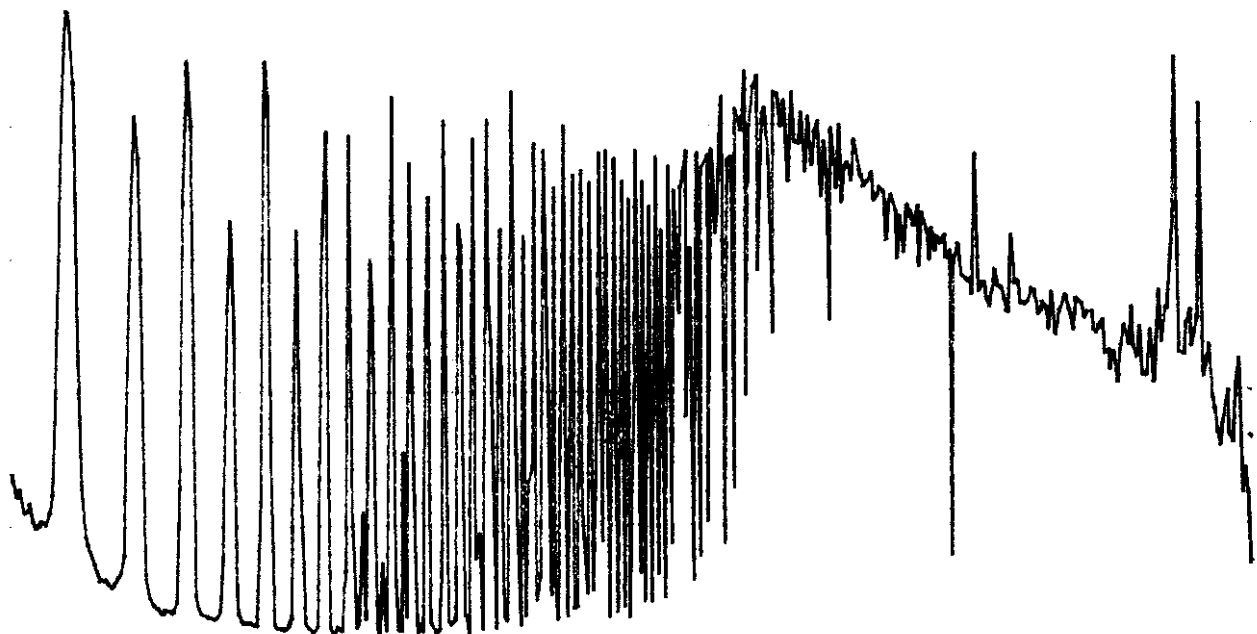
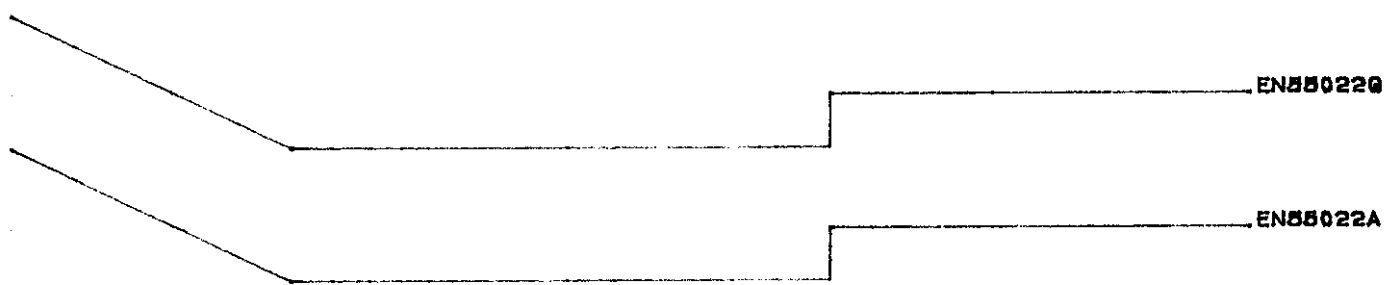
98

EUT: IBM 17" MONITOR MODEL: 8847-MBM.  
 Manuf: IBM  
 Op Cond: 1280x1024/EMCTEST  
 Operator: JESSE SALDIVAR  
 Test Spec: EN55022 CLASS B  
 Comment: LINE TWO: PEAK (RED), AVERAGE (BLUE).  
 120VAC 60Hz.

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
180k	500k	1k	10k	PK+AV	100ms	AUTO	LN OFF	80dB
500k	30M	10k	10k	PK+AV	20ms	AUTO	LN OFF	80dB

Final Measurement: x GP / + AV      Transducer No. Start      Stop      Name  
 Measure Time: 1 s      1      9k      30M      FISCHER  
 Subranges: 25  
 Acc Margin: 8dB



RFI VOLTAGE

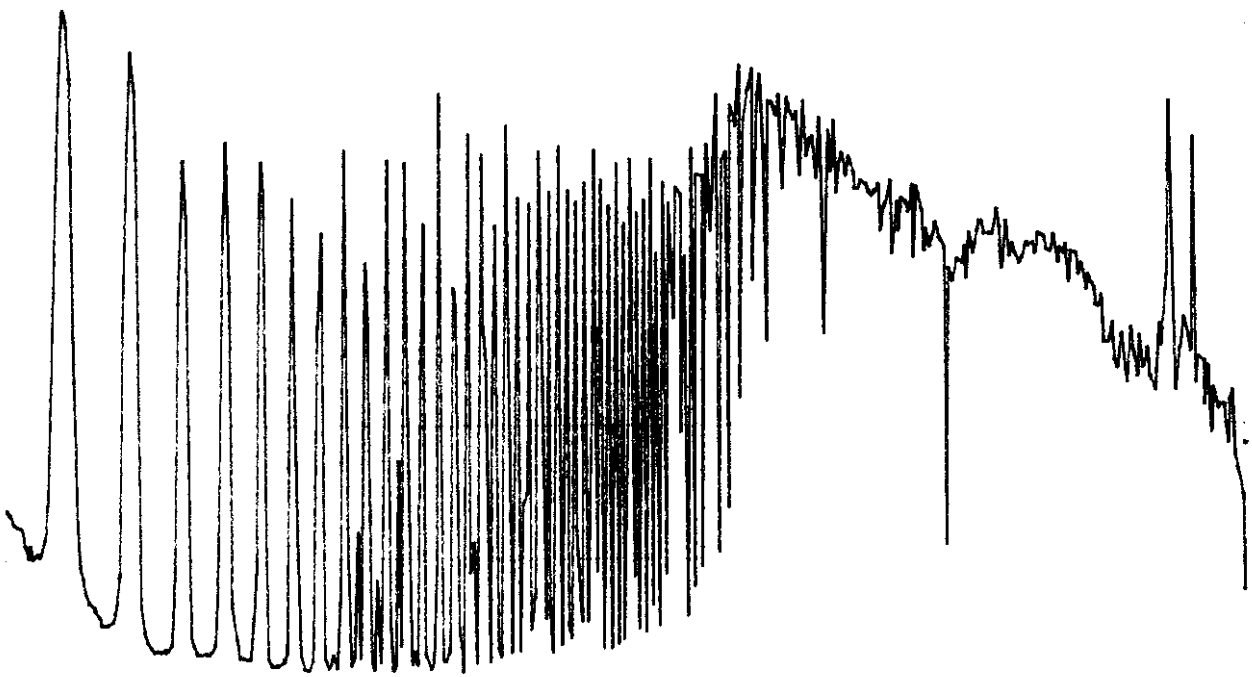
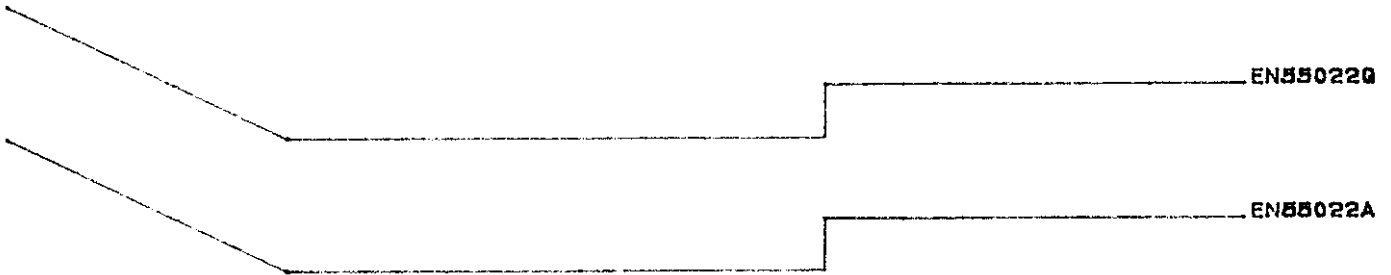
98

EUT: IBM 17" MONITOR MODEL: 6547-MB\*.  
 Manuf: IBM  
 Op Cond: 1280x1024/EMCTEST  
 Operator: JESSE SALDIVAR  
 Test Spec: EN55022 CLASS B  
 Comment: LINE ONE: PEAK (RED), AVERAGE (BLUE).  
 120VAC 60Hz.

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	1k	10k	PK+AV	100ms	AUTO	LN OFF	60dB
500k	30M	10k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV      Transducer No.    Start      Stop      Name  
 Meas Time:            1 s            1      9k            30M      FISCHER  
 Subranges:            25  
 Acc Margin:            6dB



Compliance Engineering Services Inc.

Project No. : 98E7055  
Report No. : 980212B1  
Date : 02/12/1998  
Time : 10:01  
Test Engr : JESSE S *JS*

>> 10 M RADIATED EMISSION DATA <<

Company : IBM  
Equipment Under Test : IBM 17" MONITOR MODEL: 6547-\*B\*  
Test Configuration : EUT/PC/KEYBOARD/MOUSE/MODEM/PRINTER  
Type of Test : EN55022 CLASS B  
Mode of Operation : 1280X1024/1024X768/640X480 RESOLUTIONS/EMCTEST

Freq. dBuV PreAmp Ant Cable dBuV/m Limit Margin Pol Hgt (m) Az

1280X1024 RESOLUTION HF:64KHz VF:60Hz:

Biconical 1197 ; Pre-pamp = 8447D-P8 2944A06589:

75.00 44.50 -27.57 6.40 2.12 25.44 30.00 -4.56 V 1.0 180  
75.76 42.00 -27.57 6.72 2.14 23.28 30.00 -6.72 V 1.0 180

10.8MHz STEP:

32.41 37.90 -27.68 11.70 1.57 23.49 30.00 -6.51 V 1.0 180

LP 2120 ; Pre-pamp = 8447D-P8 2944A06589:

400.27 35.30 -27.25 15.48 4.44 27.97 37.00 -9.03 V 1.0 90  
432.71 36.00 -27.46 16.18 4.62 29.35 37.00 -7.65 V 1.0 0  
238.01 35.00 -26.89 11.75 3.44 23.29 37.00 -13.71 V 1.0 0  
378.62 31.60 -27.14 15.19 4.32 23.97 37.00 -13.03 V 1.0 0

346.18 34.00 -26.97 14.94 4.13 26.09 37.00 -10.91 H 1.0 180  
411.06 34.40 -27.32 15.66 4.50 27.24 37.00 -9.76 H 1.0 18

432.72 41.00 -27.46 16.27 4.62 34.43 37.00 -2.57 H 1.2 180

Q-P:

432.72 39.70 -27.46 16.27 4.62 33.13 37.00 -3.87 H 1.2 180

1024X768 HF:69KHz VF:85Hz:

LP 2120 ; Pre-pamp = 8447D-P8 2944A06589:

235.22 34.90 -26.91 11.68 3.42 23.09 37.00 -13.91 V 1.0 180  
254.03 32.20 -26.82 12.22 3.54 21.14 37.00 -15.86 V 1.0 90  
423.35 33.60 -27.40 15.98 4.57 26.75 37.00 -10.25 V 1.0 180

235.22 36.80 -26.91 11.32 3.42 24.62 37.00 -12.38 H 2.5 90  
423.35 35.90 -27.40 16.00 4.57 29.08 37.00 -7.92 H 1.0 270

640X48Hz HF:38KHz VF:75Hz:

LP 2120 ; Pre-pamp = 8447D-P8 2944A06589:

425.23 30.00 -27.41 16.02 4.58 23.19 37.00 -13.81 V 1.0 180  
415.77 28.80 -27.35 15.79 4.53 21.77 37.00 -15.23 H 1.0 180  
425.23 30.80 -27.41 16.06 4.58 24.03 37.00 -12.97 H 1.0 180  
440.98 34.00 -27.51 16.50 4.67 27.66 37.00 -9.34 H 1.0 180

COMPLETED SCAN FROM 30MHz TO 1GHz IN VERTICAL AND HORIZONTAL POLARIZATIONS.

Total # of data 25  
V. b2.2

1. VERIFICATION OF COMPLIANCE

COMPANY NAME: IBM  
 P. O. BOX 12195  
 RESEARCH TRIANGLE PARK  
 NC 27709

CONTACT PERSON: BEN KIM / ENGINEERING MANAGER

TELEPHONE NO: 408-544-5124

MODEL NO/NAME: 6547-\*B\*

SERIAL NO: N/A

DATE TESTED: FEBRUARY 12, 1998

TYPE OF EQUIPMENT:	INFORMATION TECHNOLOGY EQUIPMENT (ITE)
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MEASUREMENT DISTANCE:	( ) 3 METER (X) 10 METER
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TECHNICAL LIMIT:	CLASS B
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FCC RULES:	PART 15
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MEASUREMENT PROCEDURE	ANSI C63.4:92 / EN55022
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EQUIPMENT AUTHORIZATION PROCEDURE	CERTIFICATION
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MODIFICATIONS MADE ON EUT	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
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DEVIATIONS FROM MEASUREMENT PROCEDURE	<input type="checkbox"/> YES (refer to section 21 for comments) <input checked="" type="checkbox"/> NO
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RADIATED EMISSION TEST RESULT	-3.87 dB @ 432.72 MHZ/HORIZONTAL
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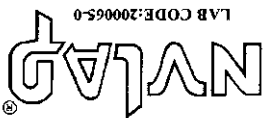
CONDUCTED EMISSION TEST RESULT	-4.2 dB @ 3.46 MHZ/L1
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The above equipment was tested by Compliance Consulting Services for compliance with the requirements set forth in the FCC CFR 47, PART 15. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By  Acknowledged By

MIKE C.I. KUO / VICE PRESIDENT  
 COMPLIANCE CONSULTING SERVICES

BEN KIM / ENGINEERING MANAGER  
 SAMSUNG ELECTRONICS CO., LTD.



**2. PRODUCT DESCRIPTION**

CHASSIS TYPE	PLASTIC
LIST OF EACH OSC. OR CRY. FREQ. (FREQ. >=1 MHz)	24 MHz
CHIPSET BRAND AND PART NO.	ST ST72T752J6B1
POWER SUPPLY/NAME/MODEL/S.N.	BUILT-IN
NUMBER OF PCB LAYERS	1
LINE FILTER NAME AND MODEL	BUILT-IN
POWER REQUIREMENTS	100-240 V AC, 60-50 Hz
MAX. RESOLUTION	1280X1024 NON-INTERLACED
MAX. HOR/VERT FREQUENCY (KHz/Hz)	HF=64 KHz, VF=60 Hz
NO. OF EXTERNAL I/O CONNECTORS	1

Model Differences:

Model Name	Differences	Tested (Checked)
6547-*B*	The star indicates that there can and will be model differences. These differences are cosmetic and for marketing purposes only.	<input checked="" type="checkbox"/>

**3. TESTED SYSTEM DETAILS**

The Model names for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

External Peripheral Devices

Device Type	Manufacturer	Model Number	Serial No.	FCC ID
COMPUTER	DIGITAL	963WW	TA551T2397	A09-96XWW
KEYBOARD	DIGITAL	RT6656TW	62051025	AQ6-MTN4XZ15
MOUSE	DIGITAL	M-S35	LT54402451	DZL210472
MODEM	SMARTEAM	103/212A	A038330	EF56A510/212A
PRINTER	HP	2225C+	2930S52630	DSI6XU2225

#### 4. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

#### 5. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code:200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT(1300F2))

#### 6. MEASUREMENT INSTRUMENTATION

Radiated emissions were measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide, liner horn. EMI receivers were used for line conducted readings, spectrum analyzers with pre-selectors and quasi-peak detectors were used to perform radiated measurements. Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specification for "Radio Interference Measuring Apparatus and Measurement Methods," Publication 16.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

## 7. MEASURING INSTRUMENT CALIBRATION

The measuring equipment which was utilized in performing the tests documented herein has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment which is traceable to recognized national standards.

## 8. UNITS OF MEASUREMENT

Measurements of radiated interference are reported in terms of dB(uV/m) at a specified distance. The indicated readings on the spectrum analyzer were converted to dB(uV/m) by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dB(uV).

The field strength is calculated by adding the Antenna Factor and Cable Factors, then by subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4dB/m and a Cable Factor of 1.1dB is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m. The 32 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dBuV/m}$$

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

**9. ANTENNAS**

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 10 meters from the leading edge of the turn table.

**10. CLASSIFICATION OF DIGITAL DEVICE**

Class A includes digital devices that are marketed for use in commercial, industrial or business environments, excluding devices which are marketed for use by the general public or are intended to be used in the home.

Class B includes digital devices that are marketed for use in residential environments, notwithstanding use in commercial, business and industrial environments.

Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as Class B device, and in fact is encouraged to do so provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

**11. RADIATED EMISSION LIMITS**

## FCC PART 15 CLASS A

## MEASURING DISTANCE OF 10 METER

FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

FCC PART 15 CLASS B

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

FCC RADIATED EMISSION ALTERNATIVE METHOD  
(CISPR 22/EN55022)

Limits for radiated disturbance of Class A ITE at  
measuring distance of 10 m

Frequency range MHz	Quasi-peak limits dB (uV/m)
30 to 230	40
230 to 1000	47

**NOTES**

1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

Limits for radiated disturbance of Class B ITE at  
measuring distance of 10 m

Frequency range MHz	Quasi-peak limits dB (uV/m)
30 to 230	30
230 to 1000	37

**NOTES**

1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

12. CONDUCTED EMISSION LIMITS

FCC CLASS A

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV) /QP
450kHz-1.705MHz	1000	60
1.705MHz - 30MHz	3000	69.54

FCC CLASS B

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-30MHz	250	48

FCC CONDUCTED EMISSION ALTERNATIVE METHOD  
(CISPR 22/EN55022)

Limits for conducted disturbance at the mains ports of  
Class A ITE

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	79	66
0.5 to 30	73	60

Note- The lower limit shall apply at the transition frequency.

Limits of Conducted disturbance at the mains ports  
of Class B ITE

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- The lower limit shall apply at the transition frequencies
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 13. CONDUCTED EMISSION TEST PROCEDURE

The EUT is located so that the distance between the boundary of the EUT and the closest surface to the LISN is 0.8m.

EUT test configuration is according to Section 7 of ANSI C63.4/1992.

Conducted disturbance shall be measured between the phase lead and the ground, and between the neutral lead and the ground. The frequency 0.450 - 30 MHz (or 0.150 - 30 MHz in case of CISPR 22/EN55022 method) shall be investigated.

Set the EMI receiver to PEAK detector setting and sweep continuously over the frequency range to be investigated. Set resolution bandwidth to 9kHz minimum. Connect EMI receiver input cable to LINE 1 RF measurement connection on the LISN. Connect a 50ohm terminator to the unused RF connection on the LISN. For each mode of EUT operation, maximize emissions readings by manipulating cable and wire positions. Record the configuration for each EUT power cord which produces emissions closest to the limit. Repeat the same procedure for LINE 2 of each EUT power cord.

### 14. RADIATED EMISSION TEST PROCEDURE

The EUT and all other support equipment are placed on a wooden table 80 cm above the ground screen. Antenna to EUT distance is either 3 meters or 10 meters (Class B or Class A). During the test, the table is rotated 360 degrees to maximize emissions and the antenna is positioned from 1 to 4 meters above the ground screen to further maximize emissions. The antenna is polarized in both vertical and horizontal positions.

EUT test configuration is according to Section 8 of ANSI C63.4/1992.

Monitor the frequency range of interest at a fixed antenna height and EUT azimuth. Frequency span should be small enough to easily differentiate between broadcast stations and intermittent ambients. Rotate EUT 360 degrees to maximize emissions received from EUT. If emission increases by more than 1 dB, or if another emission appears that is greater by 1 dB, return to azimuth where maximum occurred and perform

additional cable manipulation to further maximize received emission.

Move antenna up and down to further maximize suspected highest amplitude signal. If emission increased by 1 dB or more, or if another emission appears that is greater by 1dB or more, return to antenna height where maximum signal was observed and manipulate cables to produce highest emissions, noting frequency and amplitude.

#### 15. AMBIENT CONDITIONS

The ambient conditions at the time of final tests were as follows:

	Radiated Emission	Conducted Emission
Temperature	13° C	13° C
Humidity	90%	90%

#### 16. SYSTEM TEST CONFIGURATION

The equipment under test was configured and operated in a manner which tended to maximize its emission characteristics in a typical application. Power and signal distribution, ground, interconnecting cabling and physical placement of equipment simulated the typical application and usage insofar as practicable.

SOFTWARE USED DURING THE TESTS	
Operating System	WINDOWS 95
File Name	EMCTEST.EXE
Program Sequence	Displays an "H" pattern for elements selected.

**17. EQUIPMENT MODIFICATIONS**

To achieve compliance to CLASS B levels, the following change(s) were made during compliance testing:

NOT APPLICABLE