

DATE: 18 June 1998

EMC Test Report

from

ITL (Product Testing) Ltd.

for

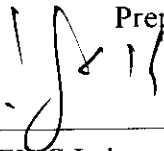
Altec Lansing Technologies Inc.

Equipment under test:

Multimedia Equipment

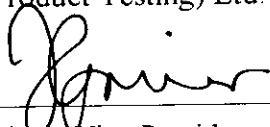
ADA 70

Prepared by:



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ITL (Product Testing) Ltd.

Approved by:



Jon Griver, Vice President, Operations
ITL (Product Testing) Ltd.

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This report relates only to item(s) tested.*

Measurement/Technical Report for Altec Lansing Technologies Inc.

Equipment under test:
Multimedia Equipment
ADA 70
June 18, 1998

This report concerns: Original Grant Class II change__

Class B verification __ Class A verification__ Class I change__

Equipment type: Equipment for multimedia

Request Issue of Grant: Immediately upon completion of review

Limits used: CISPR 22 ___ Part 15

Measurement procedure used is ANSI C63.4-1992.

Application for Certification

Applicant for this device:

prepared by:

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TABLE OF CONTENTS

Section	Title	Page
1	General Information.....	4
2	Product Labeling.....	7
3	System Test Configuration.....	9
4	Block Diagrams.....	11
5	Conducted and Radiated Measurement Photos.....	12
6	Conducted Emission Data.....	14
7	Radiated Emission Data.....	20
8	Photos of Tested EUT.....	31

Attachment A: User Manual

1

General Information

1.1 Product Description

The ADA70 is an amplified stereo speaker system featuring a subwoofer for extended low frequency response. The system is especially designed for multimedia computer audio. A USB interface and two audio inputs (1) and (2) allow mixing of computer audio signals with other sources of sound. A patented control circuit automatically boosts bass at low volume to maintain musical sound realism.

Electronic controls adjust the system volume, bass and treble. The subwoofer has a separate volume control for blending the subwoofer level with the satellites to the listener's preference.

The satellite speakers are magnetically shielded and can be placed close to the monitor without disturbing images.

When the ADA70 is not used with a Multimedia Computer, it can serve as an amplified speaker system for CD players, cassette players and various video/audio sources with excellent results.

1.2 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

<u>Model No.</u>	<u>Serial No.</u>	<u>FCC ID</u>	<u>Description</u>	<u>Cable Description</u>
ADA 70	73489	MDHADA70	EUT Multimedia equipment	See list below.
MMP	M2RW2		PC Dell	
DT-15310	M392492		Monitor DAYTEK	shielded 1.0 m
2.1A	00436856	C3KKS8	Mouse Microsoft	shielded 1.5 m
SK-1000REW	C9709068216	GYUR43SK	Keyboard Dell	shielded 1.2 m
KX-P1180	0BKARB03855		Printer Panasonic	shielded 1.5 m

Cables connecting the EUT:

- (1) USB cable - shielded, 1.5 m
- (2) Analog cable - shielded, 1.5 m
- (3) Right cable - shielded, 3 m
- (4) Left cable - 2 m

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:1992. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the data is located at Kfar Bin Nun, Israel. This site has been fully described in reports dated April 10, 1995 and May 8, 1995, submitted to your office, and accepted in a letter dated May 23, 1995 (31040/SIT 1300F2).

1.5 Measurement Uncertainty

a) Radiated Emission

The Open Site complies with the ± 4 dB Normalised Site Attenuation requirements of ANSI C63.4-1992. In accordance with Paragraph 5.4.6.2 of this standard this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

b) Conducted Emission

The uncertainty for this test is ± 2 dB.

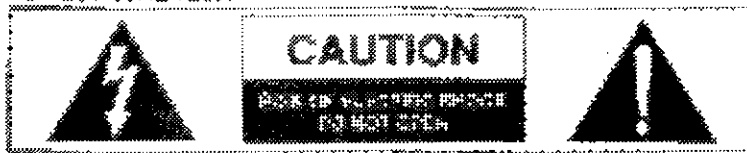
Product Labeling

FCC ID: MDHADA70

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 UNDESIRABLE OPERATION.



ALTEC LANSING MULTIMEDIA
 COMPUTER SPEAKER SYSTEM POWERED SUBWOOFER
 AC 120V/60Hz/120W ADA70



AVIS: RISQUE DE CHOC ELECTRIQUE - NE PAS OUVRI

CAUTION: FOR CONTINUED PROTECTION AGAINST A RISK OF FIRE, REPLACE ONLY WITH SAME TYPE T1A 250V FUSE.

ATTENTION: UTILISER UN FUSIBLE DE PERFORMANCE DE MEME TYPE DE T1A 250V

U.S. Patents 4425151 and 4625328 plus other patents pending
 ALTEC LANSING TECHNOLOGIES, INC., MILFORD PA 18337 U.S.A.
 MADE IN CHINA

Figure 2.1 FCC ID Label

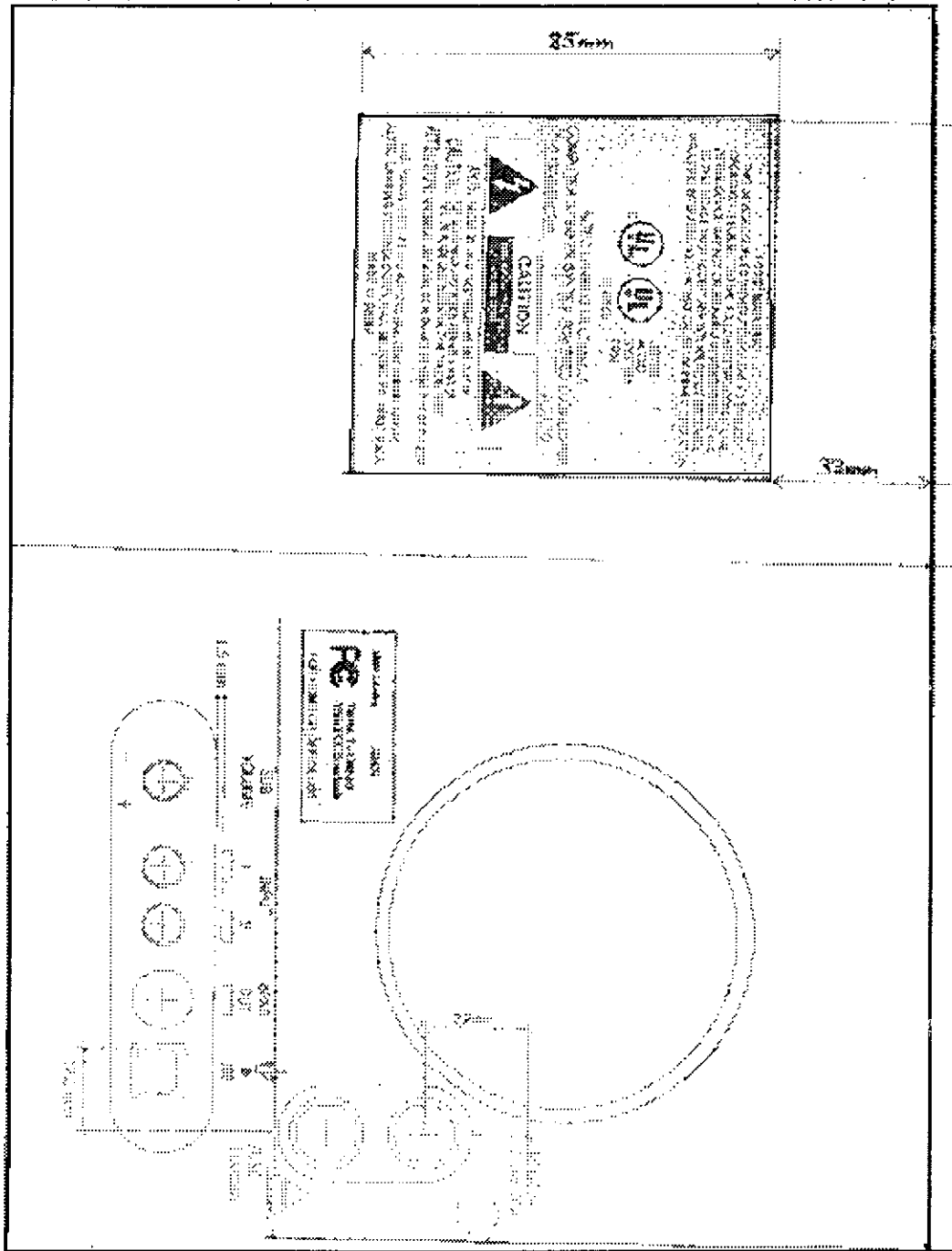


Figure 2.2 Location of Label on EUT

3 System Test Configuration

3.1 Justification

The system was configured for testing as a customer would normally use it i.e. the ADA70 speaker system (the EUT) was connected to a PC system which includes monitor, keyboard, mouse and a printer.

The EUT was tested in the worst case operating mode, which was the following:

The analog audio was played through the analog input from the CD player of the PC, and digital audio signal was transmitted through the USB.

3.2 EUT Exercise Software

The PC operating system was Microsoft Windows 98 version 4.10.1713. During the test, a Windows 98 media player application was playing a file which was used as an analog audio source.

3.3 Special Accessories

No special accessories were needed to achieve compliance.

3.4 Equipment Modifications

To achieve compliance, a ferrite filter with five turns, manufactured by Ferrite, P/N 2643626302, was added at the common mode to the power cable.

The above modifications will be implemented in all production units.

Applicant Signature  ALTEC LANSING
CORPORATION Date 2/7/98

Printed Name GIORA SUSSMANN Position GENERAL MANAGER

3.5 Configuration of Tested System

The configuration of the tested system is described in Figure 3.1.

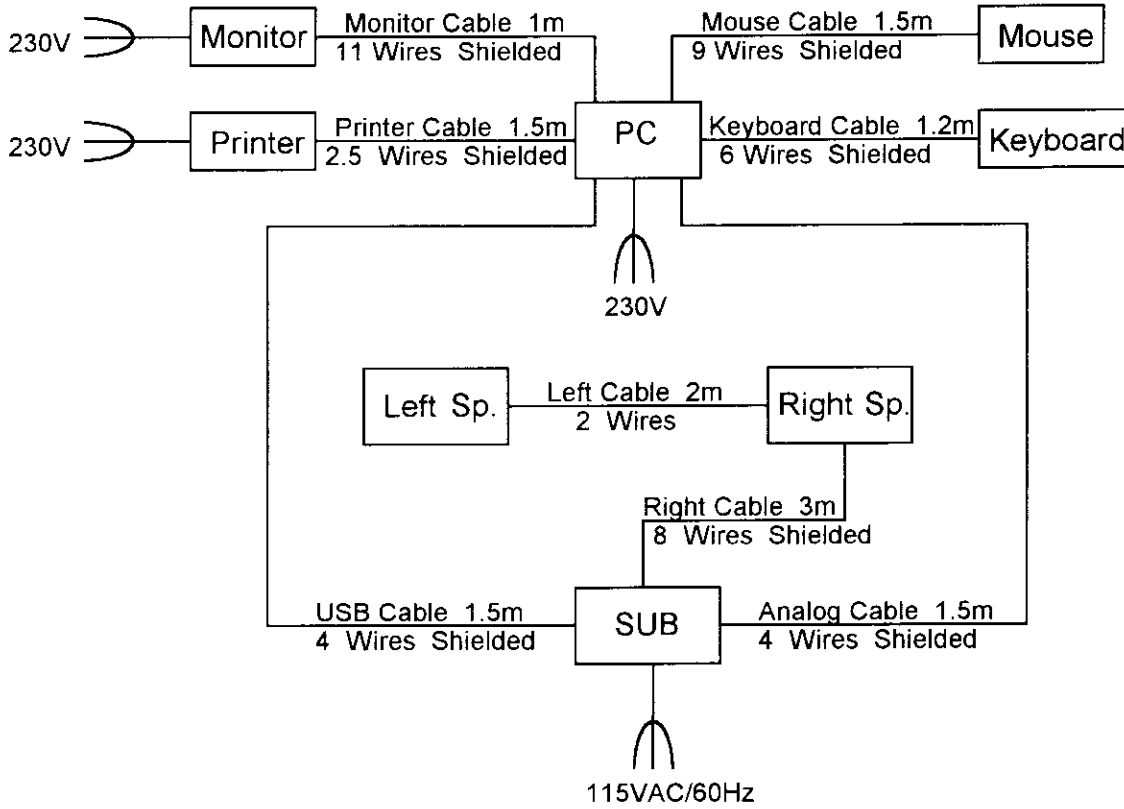


Figure 3.1 Configuration of Tested System

4 Block Diagram

4.1 Schematic Block/Connection Diagram

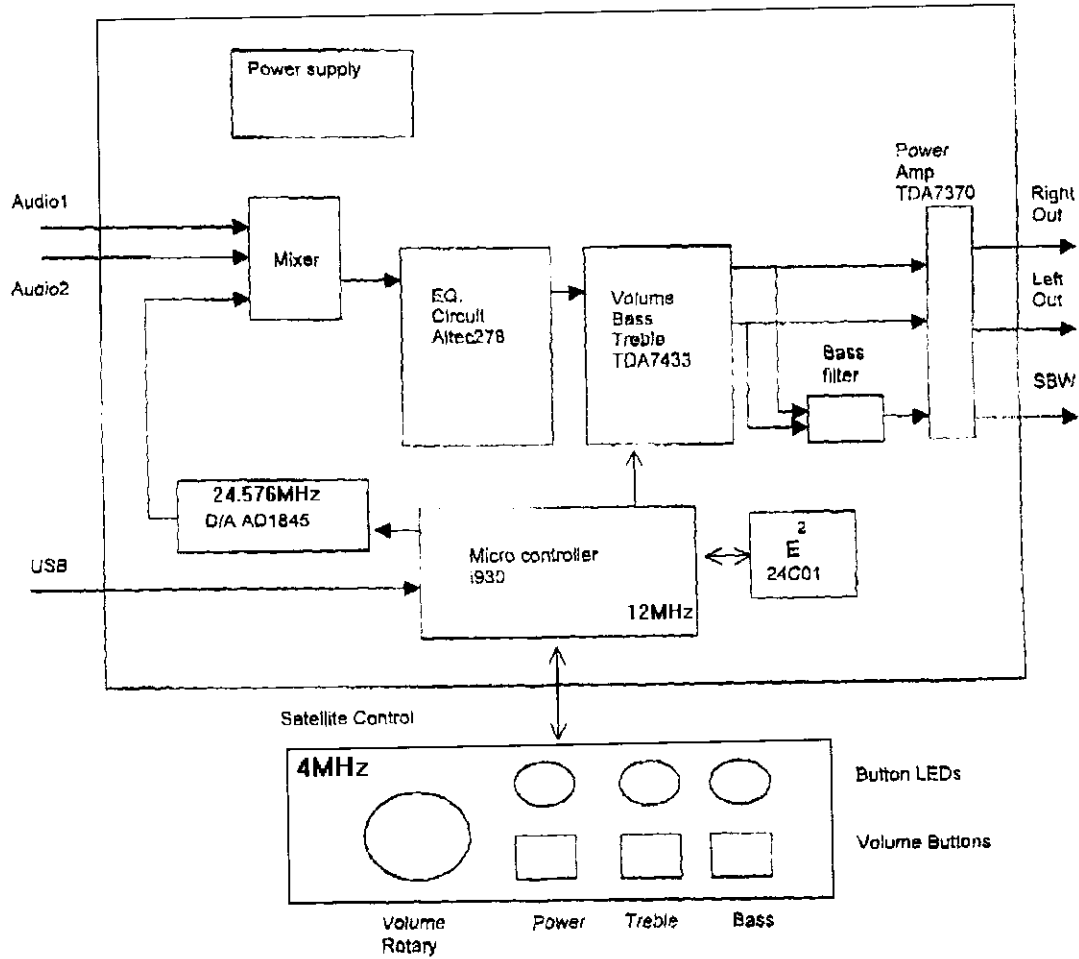


Figure 4.1 Block Diagram

6 Conducted Emission Data

6.1 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimise background noise interference, the conducted emission testing was performed inside a shielded room (see section 3), with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 μ Hn Line Impedance Stabilisation Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The centre of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission.

The emission voltages at the LISN's outputs were measured using a computerised receiver, complying to CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.45 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak detector.

6.2 Measured Data

JUDGEMENT: Passed by 1.0 db μ V

The EUT met the requirements of the specification.

Note - To meet the requirements of the specification, a ferrite filter with five turns, manufactured by Ferrite P/N 2643626302, was added at the common mode to the power cable.

The details of the highest emissions are given in Figures 6.1 to 6.4

TEST PERSONNEL:

Tester Signature:  DATE: 28.06.98

Typed/Printed Name Y. Mordukhovitch

Conducted Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Phase**. Detectors: **Peak, Quasi-peak**

Remarks:

Frequency (MHz)	Meas. Level (dB μ V)		Specification (dB μ V)	Pass/Fail	Margin (dB)
	Peak	Quasi- Peak			
1.59	36.3	33.1	48.0	Pass	-14.9
3.0	40.0	38.6	48.0	Pass	-9.4
4.42	28.2	26.4	48.0	Pass	-21.7
18.98	25.5	23.3	48.0	Pass	-24.7
24.0	39.7	37.9	48.0	Pass	-10.1
24.8	27.9	25.5	48.0	Pass	-22.5

Figure 6.1 Conducted Emission: Phase.

Detectors: Peak, Quasi-peak

TEST PERSONNEL:

Tester Signature: _____

DATE: 28.06.98

Typed/Printed Name: _____

Y. Mordukhovitch

Conducted Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial number: 73489

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Neutral.** Detectors: **Peak, Quasi-peak**

Remarks:

Frequency (MHz)	Meas. Level (dB μ V)		Specification (dB μ V)	Pass/Fail	Margin (dB)
	Peak	Quasi- Peak			
3.35	37.5	33.7	48.0	Pass	-14.3
5.47	38.1	35.9	48.0	Pass	-12.1
6.89	42.5	41.1	48.0	Pass	-6.9
8.83	40.5	39.0	48.0	Pass	-9.0
10.42	44.7	42.4	48.0	Pass	-5.6
24.00	47.6	47.0	48.0	Pass	-1.0

Figure 6.2 Conducted Emission: Neutral.

Detectors: Peak, Quasi-peak.

TEST PERSONNEL:

Tester Signature:  DATE: 28.06.98

Typed/Printed Name: Y. Mordukhovitch

Conducted Emission

E.U.T Description: Multimedia Equipment
 Type: ADA 70
 Serial number: 73489
 Specification: F.C.C., Part 15, Subpart B: Class B
 Lead: **Phase** Detectors: **Peak, Quasi-peak**
 REMARKS:

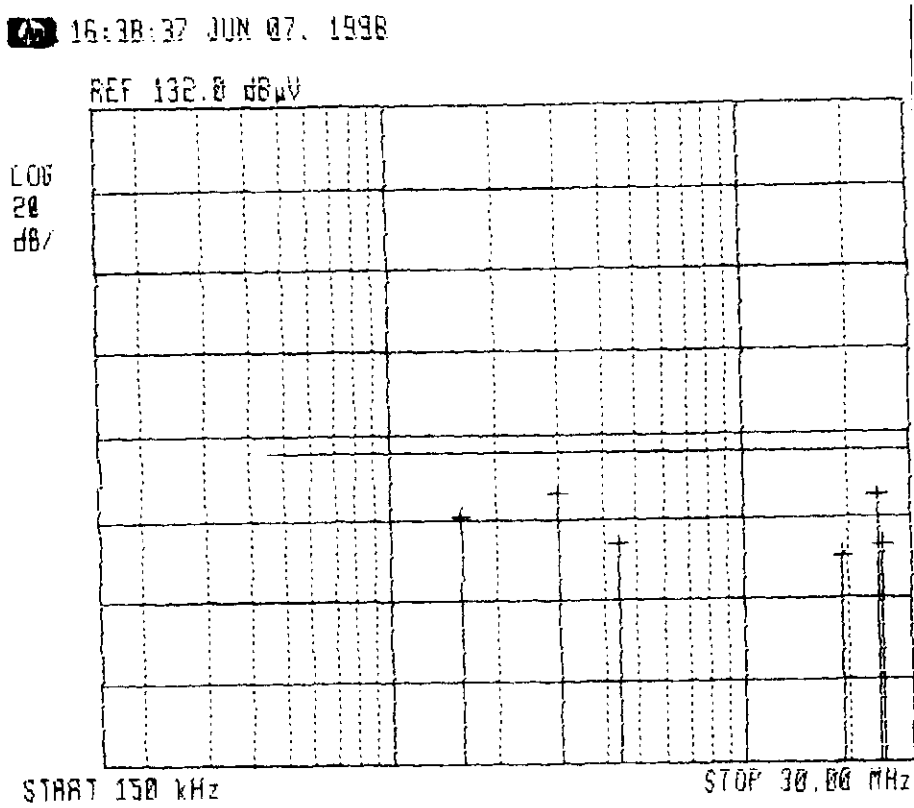


Figure 6.3 Conducted Emission: Phase. Detectors: Peak, Quasi-peak

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Conducted Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial number: 73489

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Neutral** Detectors: **Peak, Quasi-peak**

REMARKS:

15:58:31 JUN 07, 1998

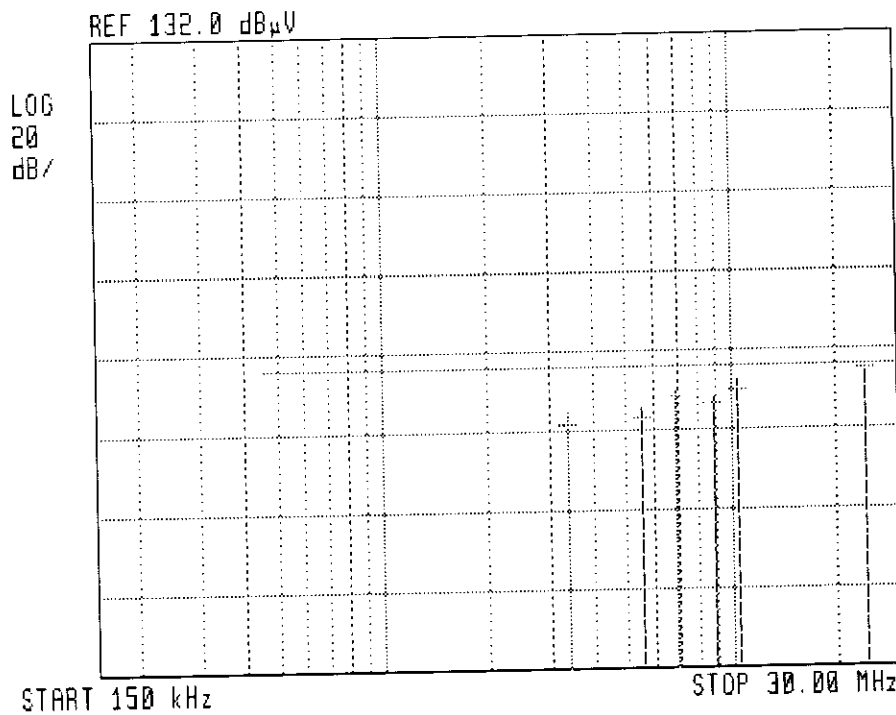


Figure 6.4 Conducted Emission: Neutral. Detectors: Peak, Quasi-peak

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB µV).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

6.3 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration	
				Last Cal.	Period
LISN	Fischer	FCC-LISN-2A	127	May 18, 1997	1 year
LISN	Fischer	FCC-LISN-2A	128	May 18, 1997	1 year
Receiver	HP	85420E/85422E	3427A00103/34	Oct. 26, 1997	1 year
Printer	HP	ThinkJet2225	2738508357	N/A	N/A

7 Radiated Emission Data

7.1 Radiated Emission 30-1000 MHz F.C.C., Part 15, Subpart B: CLASS B

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterise the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in Figure 3.1.

The frequency range 30-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The emissions were measured using a computerised EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximised by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarisation.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.

Using a frequency span less than 10 MHz.

Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

7.2 Measured Data

JUDGEMENT: Passed by 5.5 dB.

The EUT met the requirements of the specification.

The details of the highest emissions are given in Figures 7.1 to 7.8.

TEST PERSONNEL:

Tester Signature: _____



DATE: _____

28.06.98

Typed/Printed Name: _____

Y. Mordukhovitch

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Horizontal** Detector: **Quasi-peak**

REMARKS: Antenna at 3 meters distance, Frequency range: 30 MHz to 300 MHz.

Freq (MHz)	QP Amp (dB μ V/m)	Specification (dB μ V/m)	Margin (dB μ V/m)	Correction Factor (dB)	
				Ant	Cable
48.00	26.1	40.0	-13.9	10.6	1.4
60.00	26.5	40.0	-13.5	10.4	1.6
73.73	28.0	40.0	-12.0	10.3	1.7
120.02	24.0	43.5	-19.5	9.8	2.3
264.03	31.8	46.0	-14.2	17.4	3.6
276.02	31.5	46.0	-14.5	17.8	3.7

Figure 7.1 Radiated Emission. Antenna Polarisation: Horizontal.

Detectors: Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

TEST PERSONNEL:

Tester Signature: _____



DATE: _____

28.06.98

Typed/Printed Name: _____

Y. Mordukhovitch

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Horizontal** Detector: **Quasi-peak**

REMARKS: Antenna at 3 meters distance, Frequency range: 30 MHz to 300 MHz.

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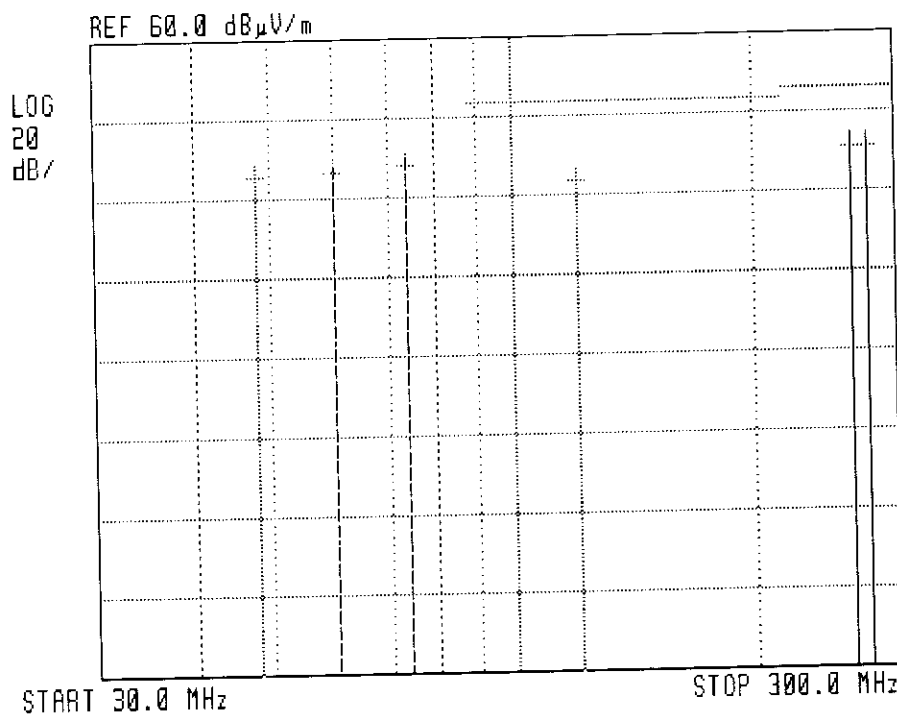


Figure 7.2 Radiated Emission. Antenna Polarisation: Horizontal.

Detector: Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB $\mu V/m$).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Horizontal** Detector: **Quasi-peak**

REMARKS: Antenna at 3 meters distance, Frequency range: 300 MHz to 1 GHz.

Freq (MHz)	QP Amp (dB μ V/m)	Specification (dB μ V/m)	Margin (dB μ V/m)	Correction Factor (dB)	
				Ant	Cable
316.5	27.0	46.0	-19.0	11.9	4.0
336.03	30.8	46.0	-15.2	12.5	4.1
374.76	27.5	46.0	-18.5	13.8	4.3
417.02	28.5	46.0	-17.5	14.6	4.6
576.24	27.9	46.0	-18.1	16.7	5.6
816.05	31.1	46.0	-14.9	19.8	6.8

Figure 7.3 Radiated Emission. Antenna Polarisation: Horizontal.

Detectors: Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

TEST PERSONNEL:

Tester Signature:  DATE: 28.06.98

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Horizontal** Detectors: **Peak, Quasi-peak**

REMARKS: Antenna at 3 meters distance, Frequency range: 300 MHz to 1 GHz.

13:43:00 MAY 12, 1998

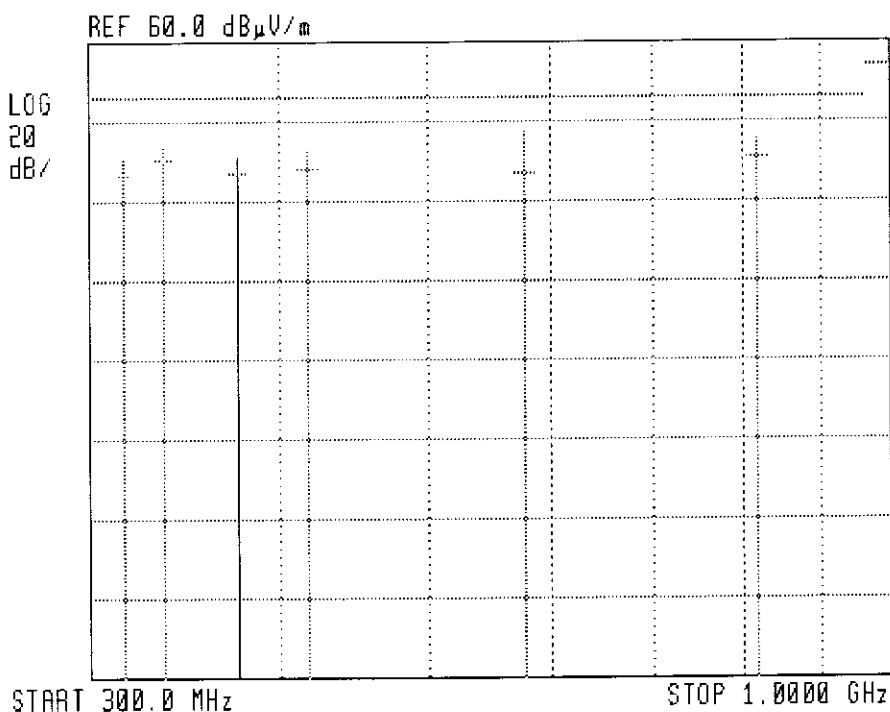


Figure 7.4 Radiated Emission. Antenna Polarisation: Horizontal.

Detector: Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V/m).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Vertical** Detector: **Quasi-peak**

Remarks: Antenna at 3 meters distance, Frequency range: 30 MHz to 300 MHz.

Freq. (MHz)	QP Amp (dB μ V/m)	Specification (dB μ V/m)	Margin (dB μ V/m)	Correction Factor (dB)	
				Ant	Cable
48.00	34.5	40.0	-5.5	10.6	1.4
49.15	28.1	40.0	-11.9	10.6	1.4
72.00	32.4	40.0	-7.6	10.2	1.7
73.74	32.8	40.0	-7.2	10.3	1.7
276.01	33.3	46.0	-12.7	17.8	3.7
288.02	37.2	46.0	-8.8	19.3	3.8

Figure 7.5 Radiated Emission. Antenna Polarisation: Vertical.

Detectors: Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

TEST PERSONNEL:

Tester Signature:  DATE: 28.06.98

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Vertical**

Detector: **Quasi-peak**

Remarks: Antenna at 3 meters distance, Frequency range: 30 MHz to 300 MHz.

13:49:35 JUN 07, 1998

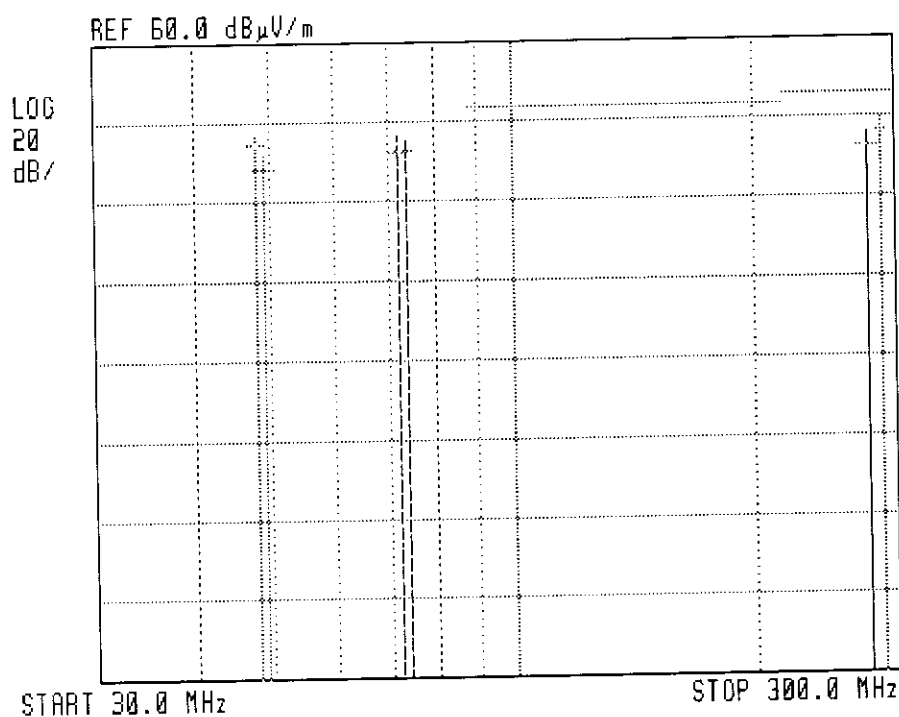


Figure 7.6 Radiated Emission. Antenna Polarisation: Vertical.

Detectors: Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V/m).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Vertical**

Detector: **Quasi-peak**

Remarks: Antenna at 3 meters distance, Frequency range: 300 MHz to 1 GHz.

Freq (MHz)	QP Amp (dB μ V/m)	Specification (dB μ V/m)	Margin (dB μ V/m)	Correction Factor (dB)	
				Ant	Cable
324.03	32.4	46.0	-13.6	12.2	4.0
363.30	24.0	46.0	-22.0	13.3	4.3
420.03	30.7	46.0	-15.3	14.7	4.6
432.03	30.6	46.0	-15.4	14.7	4.7
495.27	26.2	46.0	-19.8	15.1	5.1
504.89	25.4	46.0	-20.6	15.3	5.1

Figure 7.7 Radiated Emission. Antenna Polarisation: Vertical.

Detectors: Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

TEST PERSONNEL:

Tester Signature:  DATE: 28.06.98

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission

E.U.T Description: Multimedia Equipment

Type: ADA 70

Serial Number: 73489

Specification: F.C.C., Part 15, Subpart B: CLASS B

Antenna Polarisation: **Vertical**

Detectors: Quasi-peak

Remarks: Antenna at 3 meters distance, Frequency range: 300 MHz to 1 GHz.

14:15:14 MAY 12, 1998

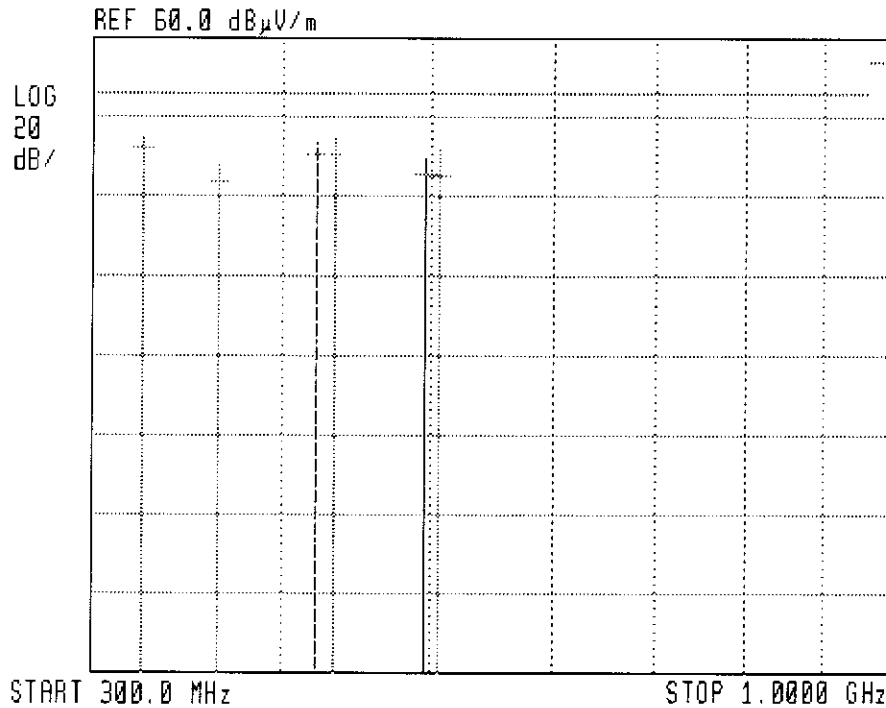


Figure 7.8 Radiated Emission. Antenna Polarisation: Vertical.

Detector: Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB $\mu V m$).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

7.3 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Cal.	Period
Receiver	HP	85420E/85422E	3427A00103/34	Oct. 26, 1997	1 year
Antenna - Biconical HP	ARA	BCH-2030/A	1019	April 2, 1998	1 year
Antenna - Log Periodic	ARA	LPD-2010/A	1038	March 12, 1998	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001.0	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357.0	N/A	N/A

7.4 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{v}/\text{m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

FS: Field Strength [dB μ v/m]
RA: Receiver Amplitude [dB μ v]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.