# EMC

# TEST REPORT

REPORT NO. : ADT-F97021A
MODEL NO. : PCM-4890
DATE OF TEST : Feb. 27, 1997

PREPARED FOR: AAEON TECHNOLOGY INC.

ADDRESS : 1F, NO. 6, ALLEY 6, LANE 45, PAO-HSIN RD.,
HSIN-TIEN CITY, TAIPEI, TAIWAN, R.O.C.

PREPARED BY:

NVLAP®
Accredited Laboratory

ADVANCE DATA TECHNOLOGY CORPORATION
12F, NO.1, SEC.4, NAN-KING EAST RD.,
TAIPEI, TAIWAN, R.O.C.

This test report consists of 14 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. The test result in the report only applies to the tested sample.

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# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF EUT

| | | |
|---|---|---|
| Product | : | MOTHERBOARD |
| Model No. | : | PCM-4890 |
| Power Supply | : | DC |
| Power Cord | : | N/A |
| Protection Class | : | Class III |

Note: During the test, the EUT was installed in a metal enclosure to form an industrial PC. The other parts of industrial PC includes the following:

* Case: AAEON, model: AIPC-110
* Switching power supply: SEASONIC, model: SSG-250G

The EUT was tested under the following CPU:

* AMD X5-133 MHz

For more detailed features, please refer to ATTACHMENT 1 - TECHNICAL DESCRIPTION OF EUT and User's Manual.

## 2.2 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories are used to form representative test configuration during the tests.

| No | Product | Brand | Model No. | FCC ID | I/O Cable |
|---|---|---|---|---|---|
| 1 | COLOR MONITOR | ACER | 7134T | JVP7134T | Nonshielded Power<br>Shielded Signal |
| 2 | KEYBOARD | FORWARD | FDA-102D | F4Z4K3FDA-102D | Shielded signal |
| 3 | PRINTER | HP | 2225C+ | DSI6XU2225 | Shielded Signal<br>Nonshielded Power |
| 4 | MODEM X 2 | DATATRONICS | 1200CK | E2O5OV1200CK | Shielded signal<br>Nonshielded Power |
| 5 | PERSONAL COMPUTER | ADVANTECH | MIPC-50E | N/A | Nonshielded Power |
| 6 | COLOR MONITOR | OPTIQUEST | 4500DC | KZQ4500DC | Nonshielded Power<br>Shielded Signal |
| 7 | KEYBOARD | DATACOMP | DFK701 | FBX5E9 | Shielded signal |
| 8 | HUB | SVEC | FD916H | N/A | Shielded signal<br>Nonshielded Power |

Note: There is no ferrite core on the interface cable of all support units.

Support unit 5 acted as HOST PC kept at remote side during the test.

Support unit 6-8 acted as communication partner kept at remote side during the test.

Industrial PC and HOST PC communicated with each other via a RJ45 cable and support unit 7.

A ferrite core was added on the RJ-45 cable.

## 2.3 TEST METHODOLOGY AND CONFIGURATION

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 10 m on an open area test site. Please refer to the photos of test configuration in Item 5.

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# 3. TEST INSTRUMENTS

## 3.1 TEST INSTRUMENTS (EMISSION)

**RADIATED EMISSION MEASUREMENT**

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|---|---|---|---|
| HP Spectrum Analyzer | 8594A | 3144A00308 | Aug. 27, 1996 |
| HP Preamplifier | 8447D | 2944A08313 | Sept. 9, 1996 |
| HP Preamplifier | 8347A | 3307A01088 | Aug. 27, 1996 |
| ROHDE & SCHWARZ TEST RECEIVER | ESVS 30 | 841977/008 | Oct. 2, 1996 |
| SCHWARZBECK Tunable Dipole Antenna | VHA 9103<br>UHA 9105 | E101051<br>E101055 | Nov. 30, 1996 |
| CHASE BiLOG Antenna | CBL6111A | 1647 | Aug. 17, 1996 |
| EMCO Double Ridged Guide Antenna | 3115 | 9312-4192 | Feb 19, 1996 |
| EMCO Turn Table | 1016 | 1722 | N/A |
| Chance Most Tower | N/A | ADT No. E101103 | N/A |
| Open Field Test Site | Site 4 | ADT-R04 | Nov. 22, 1996 |

**CONDUCTED EMISSION MEASUREMENT**

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|---|---|---|---|
| ROHDE & SCHWARZ Test Receiver | ESH3 | 893495/006 | July 17, 1996 |
| ROHDE & SCHWARZ Spectrum | EZM | 893787/013 | July 17, 1996 |
| ROHDE & SCHWARZ Artificial Mains Network | ESH2-Z5 | 892107/003 | July 25, 1996 |
| EMCO-L.I.S.N. | 3825/2 | 9204-1964 | July 25, 1996 |
| Shielding Room | Site 2 | ADT-C02 | N/A |

Note: The calibration interval of the above test instruments is 12 months.
And the calibrations are traceable to NML/ROC and NIST/USA.

## 3.2 LIMITS OF CONDUCTED AND RADIATED EMISSION

### LIMIT OF RADIATED EMISSION OF CISPR 22

| FREQUENCY (MHz) | Class A (at 10m) dBuV/m | Class B (at 10m) dBuV/m |
|---|---|---|
| 30 - 230 | 40 | 30 |
| 230 - 1000 | 47 | 37 |

### LIMIT OF RADIATED EMISSION OF FCC PART 15, SUBPART B FOR FREQUENCY ABOVE 1000 MHz

| FREQUENCY (MHz) | Class A (at 10m) | | Class B (at 3m) | |
|---|---|---|---|---|
| | uV/m | dBuV/m | uV/m | dBuV/m |
| Above 1000 | 300 | 49.5 | 500 | 54.0 |

Note: (1) The lower limit shall apply at the transition frequencies.

(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### LIMIT OF CONDUCTED EMISSION OF CISPR 22

| FREQUENCY (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

Note: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz

(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

# 4. TEST RESULTS (EMISSION)

## 4.1 RADIO DISTURBANCE

| | | |
|---|---|---|
| Frequency Range | : | 0.15 - 30 MHz (Conducted Emission) |
| | | 30 - 2000 MHz (Radiated Emission) |
| Input Voltage | : | 120 Vac, 60 Hz |
| Temperature | : | 25 ℃ |
| Humidity | : | 59 % |
| Atmospheric Pressure | : | 1060 mbar |

| TEST RESULT | Remarks |
|---|---|
| PASS | Minimum passing margin of conducted emission: 32.3 dB at 14.318 MHz<br>Minimum passing margin of radiated emission: 3.7 dB at 158.48 MHz |

### 4.1.1 EUT OPERATION CONDITION

1. Turn on the power of all equipments.
2. Confirm the motherboard installed in Industrial PC is model: PCM-4890.
3. Industrial PC reads a test program to enable all functions.
5. The Industrial PC sends messages to and receives messages from Host PC via RJ-45 cable.
6. The Industrial PC sends "H" messages to monitor and monitor display "H" patterns on screen.
7. The Industrial PC sends "H" messages to each modem.
8. The Industrial PC sends "H" messages to printer, and the printer prints them on paper.
9. Repeat steps 3-9.

## 4.1.2 TEST DATA OF CONDUCTED EMISSION (A)

EUT: **MOTHERBOARD** MODEL: **PCM-4890**

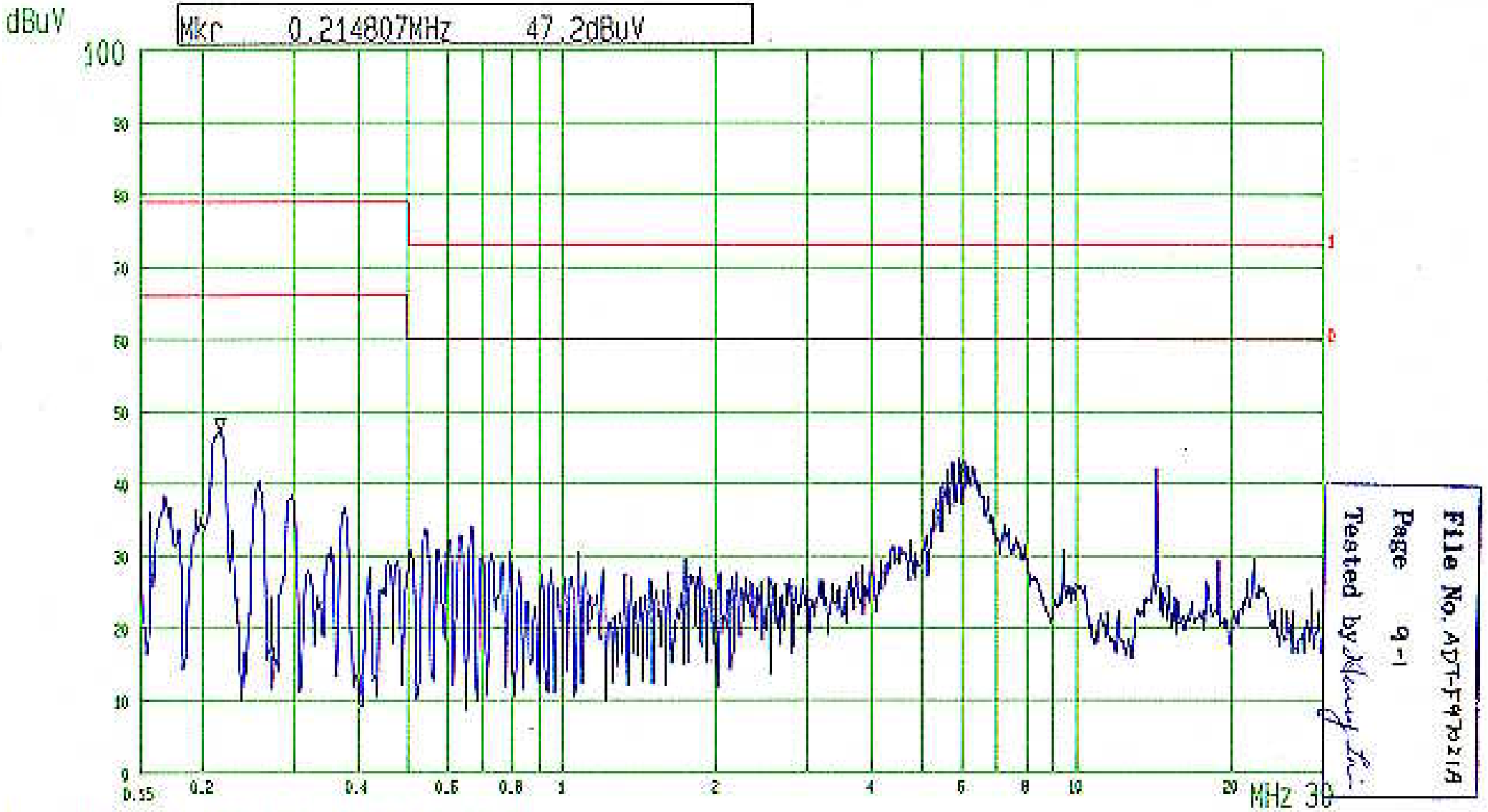
CPU: **AMD X5-133MHz**

6 dB Band Width: 10 kHz

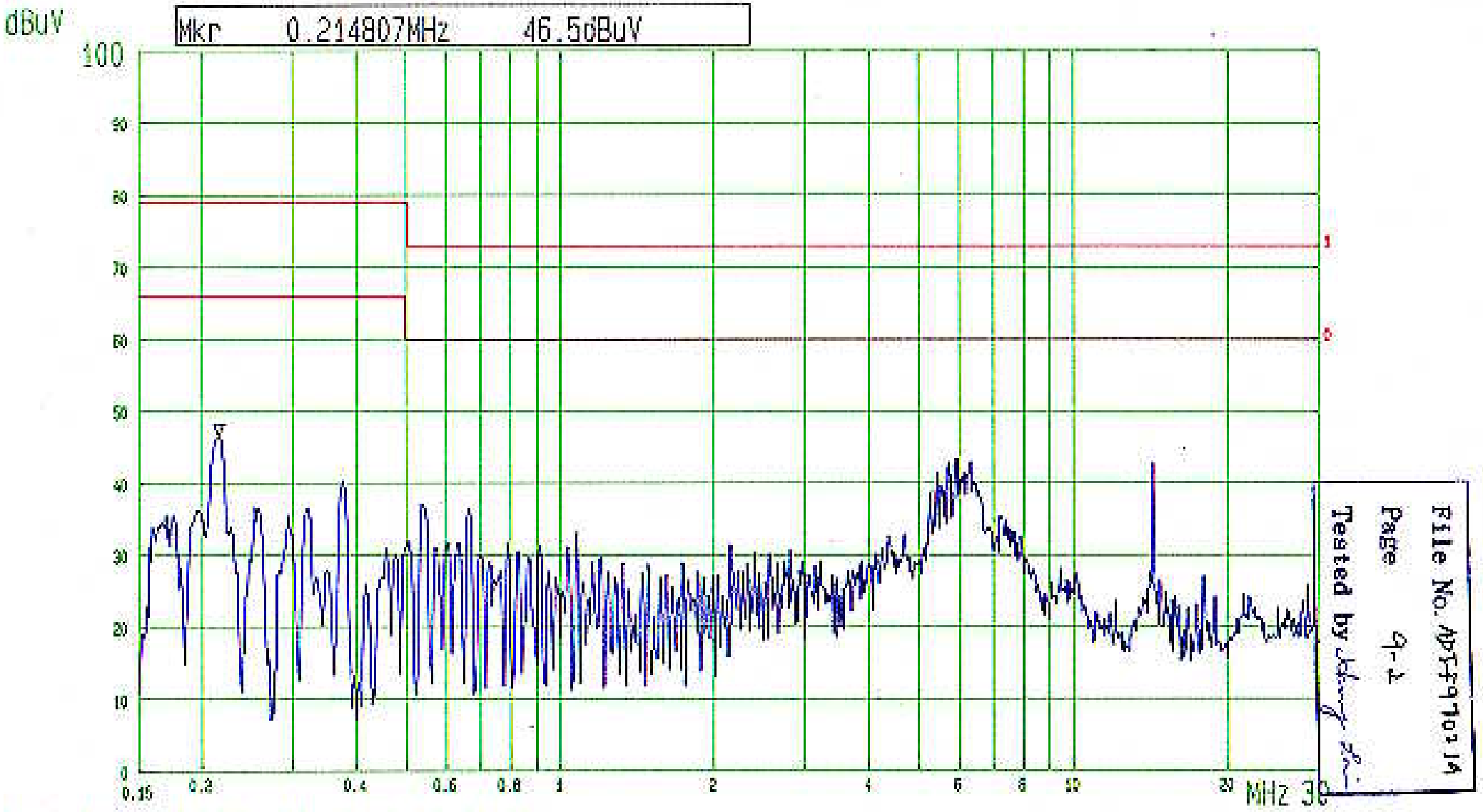
TEST PERSONNEL: Henry Lai

| Freq. | L1 Level | | N Level | | Limit | | Margin [dB (μV)] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dB (μV)] | | [dB (μV)] | | [dB (μV)] | | L1 | | N | |
| | QP | AV | QP | AV | QP | AV | QP | AV | QP | AV |
| 0.204 | 46.60 | - | 46.00 | - | 79.00 | 66.00 | 32.4 | - | 33.0 | - |
| 0.368 | 34.70 | - | 39.00 | - | 79.00 | 66.00 | 44.3 | - | 40.0 | - |
| 0.533 | 33.40 | - | 36.60 | - | 73.00 | 60.00 | 39.6 | - | 36.4 | - |
| 0.658 | 33.60 | - | 34.30 | - | 73.00 | 60.00 | 39.4 | - | 38.7 | - |
| 5.960 | 40.30 | - | 39.00 | - | 73.00 | 60.00 | 32.7 | - | 34.0 | - |
| 14.318 | 40.70 | - | 39.60 | - | 73.00 | 60.00 | 32.3 | - | 33.4 | - |

Remarks: 1. "*": Undetectable
2. Q.P. and AV. are abbreviations of quasi-peak and average individually.
3. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
4. The emission level of other frequencies were very low against the limit.




[--- Date 27.FEB '97 Time 10:37:54
CISPR22 CLASS A CONDUCTION TEST (PEAK VALUE) ADT CO.
MODEL: PCM-4890 CPU: AMD X5-133MHz LISN: L1




|--- Date 27.FEB '97 Time 10:31:35
CISPR22 CLASS A CONDUCTION TEST (PEAK VALUE) ADT CO.
MODEL: PCM-4890 CPU: AMD X5-133MHz LISN: N

## 4.1.3 TEST DATA OF RADIATED EMISSION(A)

EUT: **MOTHERBOARD** MODEL: **PCM-4890**

CPU: **AMD X5-133MHz**

ANTENNA: CHASE BILOG CBL 6111A/EMCO Horn 3115

POLARITY: Horizontal

DETECTOR FUNCTION AND BANDWIDTH: Quasi peak, 120 KHz (30-1000 MHz)
Peak, 1 MHz (1000 MHz-2000 MHz)

FREQUENCY RANGE: 30-2000 MHz MEASURED DISTANCE: 10 M

TEST PERSONNEL: Henry Lai

| Frequency (MHz) | Correction Factor (dB/m) | Reading Data (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 66.84 | 8.2 | 9.0 | 17.2 | 40.0 | -22.8 |
| 110.00 | 13.5 | 10.4 | 23.9 | 40.0 | -16.1 |
| 133.43 | 14.5 | 7.9 | 22.4 | 40.0 | -17.6 |
| 158.43 | 13.1 | 17.0 | 30.1 | 40.0 | -9.9 |
| 175.07 | 12.3 | 21.0 | 33.3 | 40.0 | -6.7 |
| 200.15 | 14.2 | 8.5 | 22.7 | 40.0 | -17.3 |
| 233.50 | 16.1 | 7.8 | 23.9 | 47.0 | -23.1 |
| 266.88 | 18.5 | 17.9 | 36.4 | 47.0 | -10.7 |
| 400.28 | 21.1 | 12.8 | 33.9 | 47.0 | -13.1 |
| 533.73 | 25.3 | 5.8 | 31.1 | 47.0 | -16.0 |

REMARKS :
1. Emission level (dBuV/m) = Correction Factor(dB/m) +Meter Reading (dBuV).
2. Correction Factor(dB/m) = Ant. Factor(dB/m)+Cable loss(dB)
3. The other emission levels were very low against the limit.

# Graph of Test Result

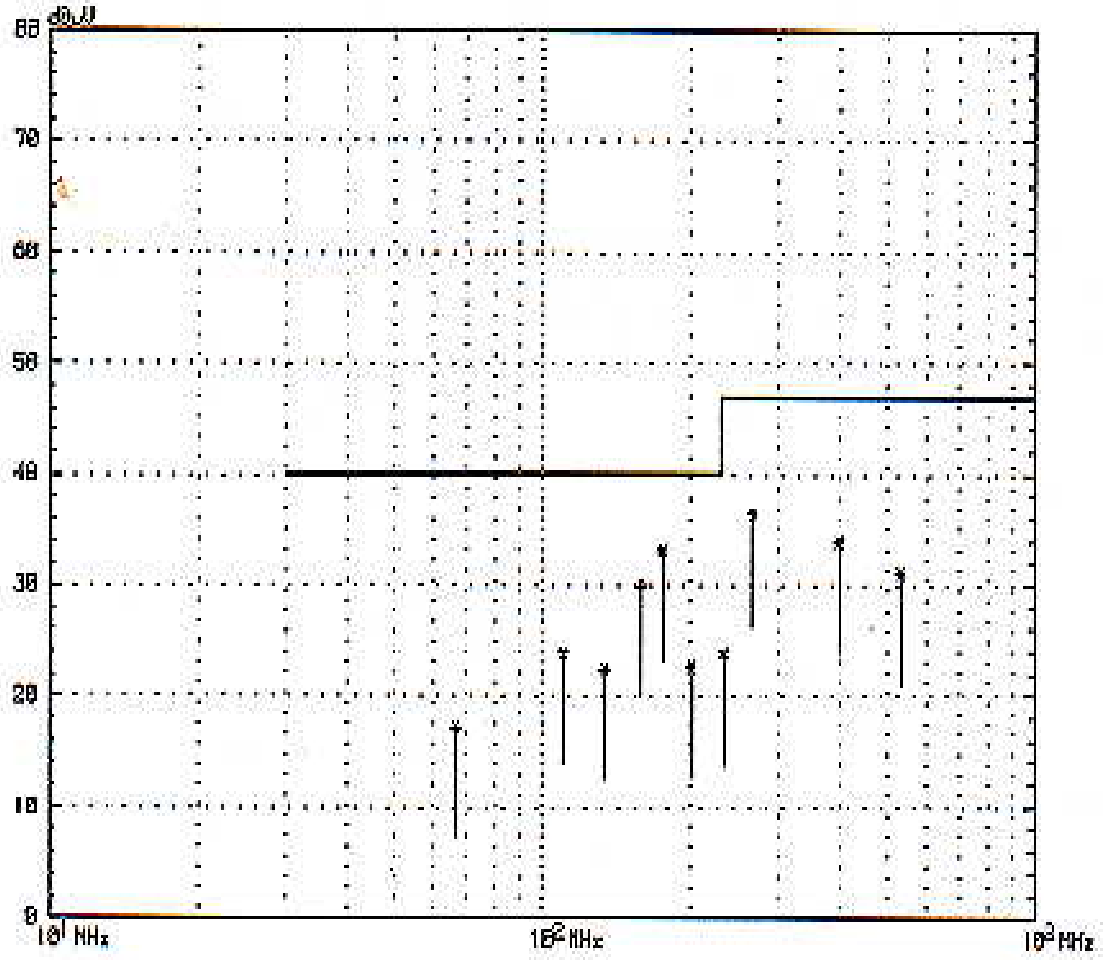
Model:PCM-4890
Mode: AMD X5-133MHz
EMI Type:CISPR 22 Class A
Freq. Range:30-1000 MHz
Antenna:CHASE Bi_Log

Test Date: 21 Feb 1997
Remark:Full system
Distance:10 M
Detector:CISPR,QUASI_Peak
Ant. Polarization:Horizontal

Tested By : Johnny Lai

Report No. : P97021A

| No. | Freq.(MHz) | Emission(dBuV) | No. | Freq.(MHz) | Emission(dBuV) |
|---|---|---|---|---|---|
| 1 | 66.8 | 17.2 | 2 | 110.0 | 23.9 |
| 3 | 133.4 | 22.4 | 4 | 158.4 | 30.1 |
| 5 | 175.1 | 33.3 | 6 | 200.1 | 22.7 |
| 7 | 233.5 | 29.9 | 8 | 266.9 | 36.4 |
| 9 | 400.3 | 33.9 | 10 | 533.7 | 31.1 |



# Graph of Test Result

Model:PCM-4890
Mode: AMD X5-133MHz
EMI Type:FCC Class A
Freq. Range:1000-2000 MHz
Antenna:EMCO 3115

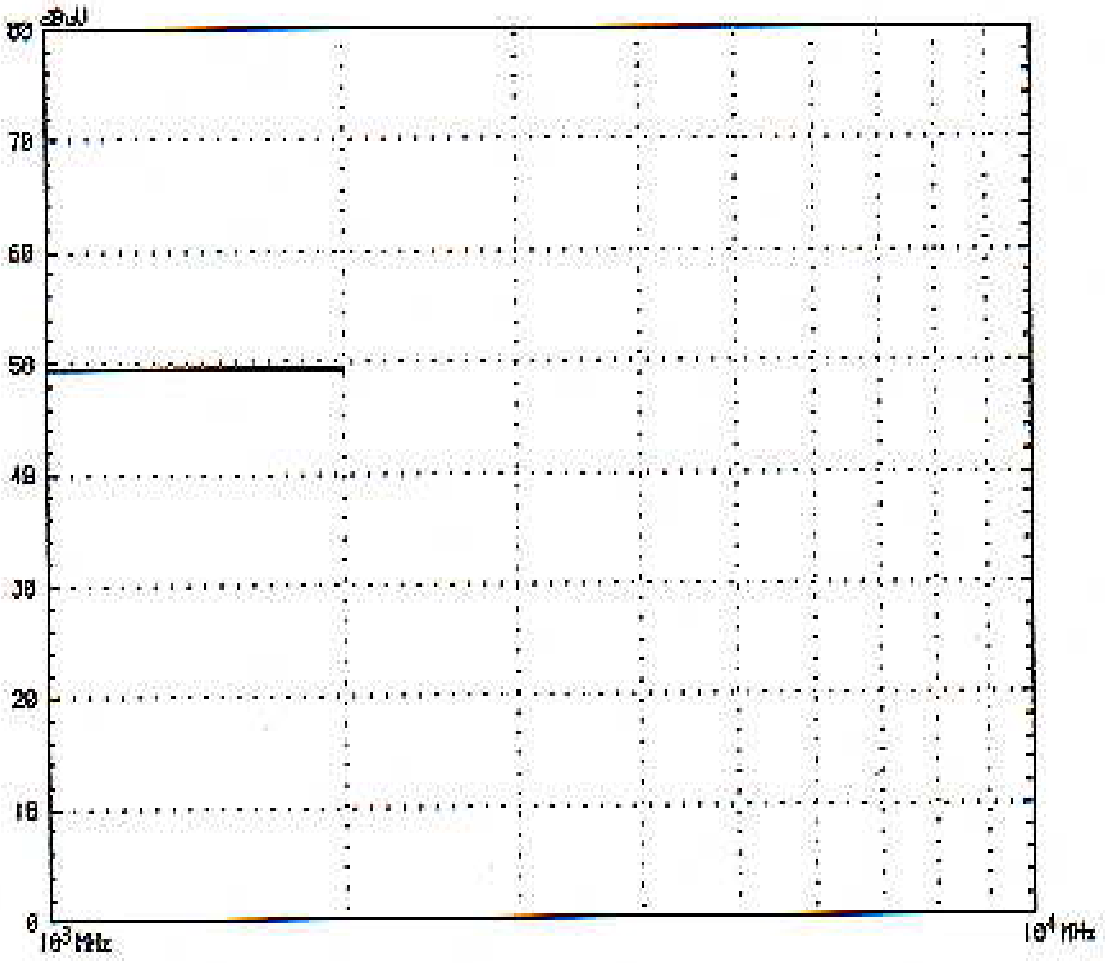
Test Date: 21 Feb 1997
Remark:Full system
Distance:10 M
Detector:Peak
Ant. Polarization:Horizontal

Tested By : Johnny Lin

Report No. : F97021A

| No. | Freq.(MHz) | Emission(dBuV) |
|---|---|---|

| No. | Freq.(MHz) | Emission(dBuV) |
|---|---|---|



# TEST DATA OF RADIATED EMISSION (A)

EUT: **MOTHERBOARD** MODEL: **PCM-4890**

CPU: **AMD X5-133MHz**

ANTENNA: CHASE BILOG CBL 6111A/EMCO Horn 3115

POLARITY: Vertical

DETECTOR FUNCTION AND BANDWIDTH: Quasi peak, 120 KHz (30-1000 MHz)
Peak, 1 MHz (1000 MHz-2000 MHz)

FREQUENCY RANGE: 30-2000 MHz MEASURED DISTANCE: 10 M

TEST PERSONNEL: Henry Lai

| Frequency (MHz) | Correction Factor (dB/m) | Reading Data (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 66.85 | 8.2 | 17.7 | 25.9 | 40.0 | -14.1 |
| 110.00 | 13.3 | 21.3 | 34.5 | 40.0 | -5.5 |
| 130.00 | 13.9 | 16.8 | 30.7 | 40.0 | -9.3 |
| 133.39 | 14.2 | 16.3 | 30.5 | 40.0 | -9.5 |
| 158.48 | 15.3 | 21.0 | 36.3 | 40.0 | -3.7 |
| 175.14 | 14.2 | 18.9 | 33.1 | 40.0 | -6.9 |
| 176.19 | 14.2 | 15.4 | 29.6 | 40.0 | -10.4 |
| 200.16 | 12.9 | 12.0 | 24.9 | 40.0 | -15.1 |
| 201.46 | 13.0 | 14.4 | 27.4 | 40.0 | -12.6 |
| 266.85 | 17.4 | 12.7 | 30.1 | 47.0 | -16.9 |
| 319.98 | 19.6 | 13.4 | 33.0 | 47.0 | -14.0 |
| 375.29 | 21.8 | 10.8 | 32.6 | 47.0 | -14.4 |
| 391.94 | 22.3 | 10.9 | 33.2 | 47.0 | -13.8 |
| 400.29 | 22.6 | 9.8 | 32.4 | 47.0 | -14.6 |

REMARKS :
1. Emission level (dBuV/m) = Correction Factor(dB/m) +Meter Reading (dBuV).
2. Correction Factor(dB/m) = Ant. Factor(dB/m)+Cable loss(dB)
3. The other emission levels were very low against the limit.

# Graph of Test Result

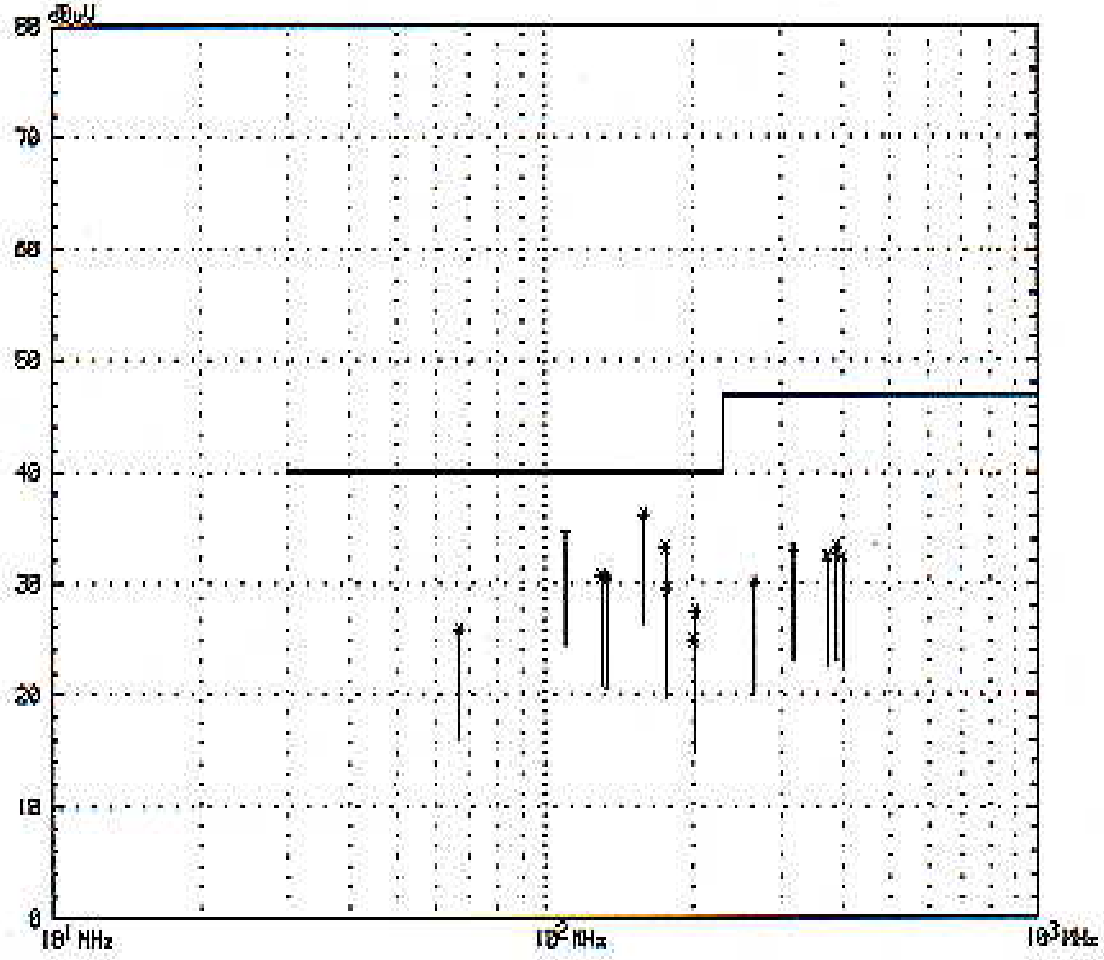
Model:PCM-4890
Mode: AMD X5-133MHz
EMI Type:CISPR 22 Class A
Freq. Range:30-1000 MHz
Antenna:CHASE Bi_Log

Test Date: 21 Feb 1997
Remark:Full system
Distance:10 M
Detector:CISPR,QUASI_Peak
Ant. Polarization:Vertical

Tested By : Henry Lai

Report No. : F97021A

| No. | Freq.(MHz) | Emission(dBuV) | No. | Freq.(MHz) | Emission(dBuV) |
|---|---|---|---|---|---|
| 1 | 66.8 | 25.9 | 2 | 110.0 | 34.5 |
| 3 | 130.0 | 30.7 | 4 | 133.4 | 30.5 |
| 5 | 158.5 | 36.3 | 6 | 175.1 | 33.1 |
| 7 | 176.2 | 29.6 | 8 | 200.2 | 24.9 |
| 9 | 201.5 | 27.4 | 10 | 266.9 | 30.1 |
| 11 | 320.0 | 33.0 | 12 | 375.3 | 32.6 |
| 13 | 391.9 | 33.2 | 14 | 400.3 | 32.4 |



# Graph of Test Result

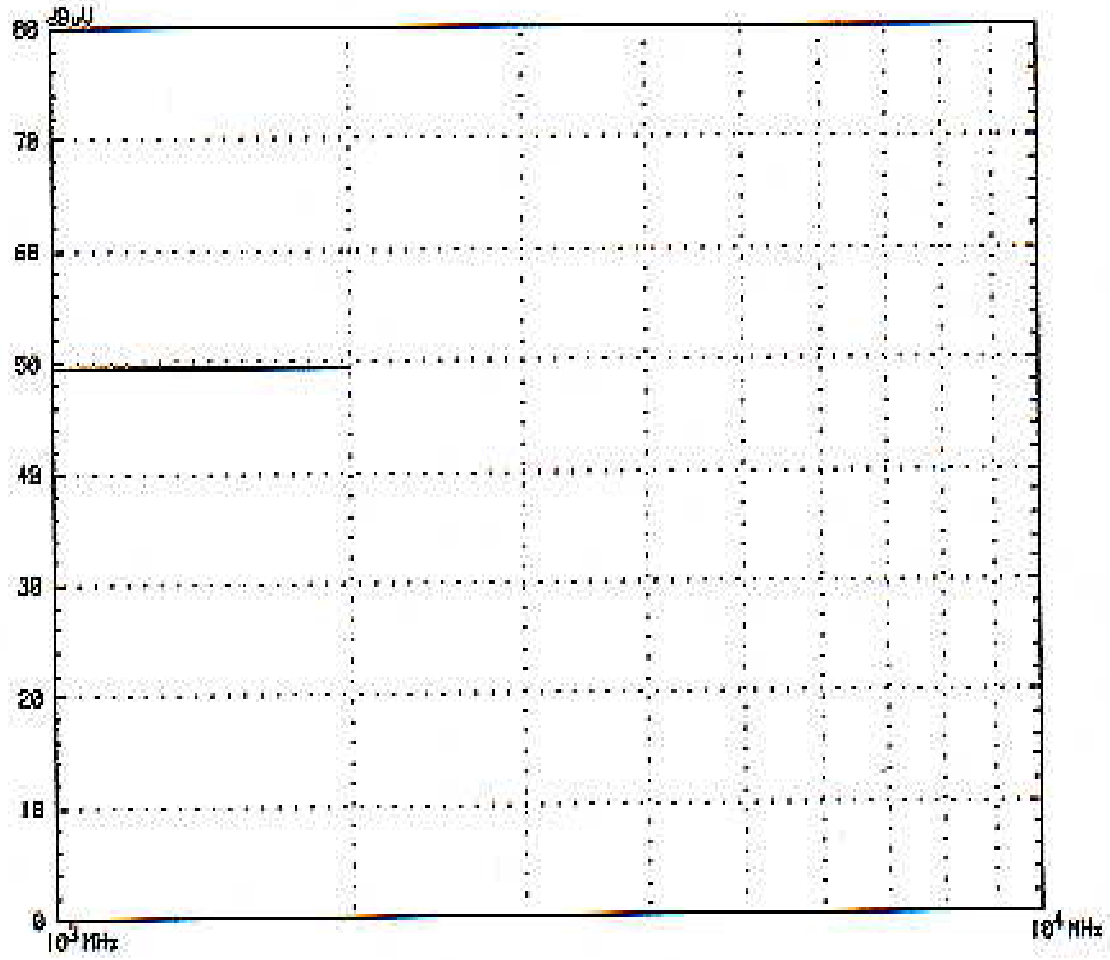
Model:PCM-4890
Mode: AMD X5-133MHz
EMI Type:FCC Class A
Freq. Range:1000-2000 MHz
Antenna:EMCO 3115

Test Date: 21 Feb 1997
Remark:Full System
Distance:10 M
Detector:Peak
Ant. Polarization:Vertical

Tested By : Idaung Lin

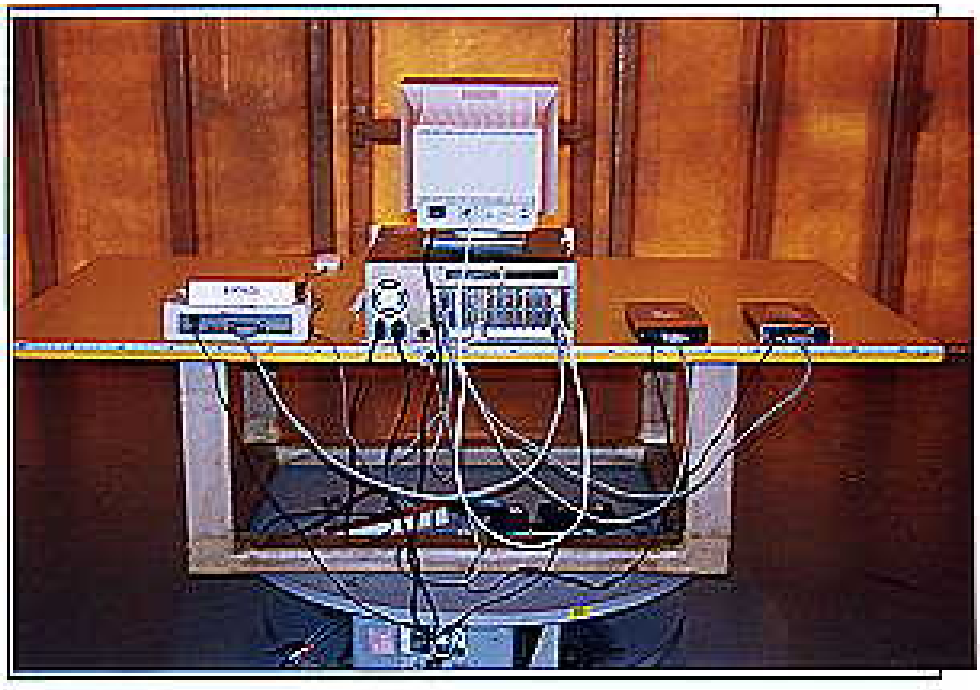
Report No. : F97021A

| No. | Freq.(MHz) | Emission(dBuV) | No. | Freq.(MHz) | Emission(dBuV) |
|---|---|---|---|---|---|



## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION WITH MINIMUM MARGIN

RADIATED EMISSION TEST



# CONDUCTED EMISSION TEST

# 6. ATTACHMENT I - TECHNICAL DESCRIPTION OF EUT

**SPECIFICATIONS:**

| | |
|---|---|
| * CPU | AMD X5-133 MHz |
| * BIOS | Award Flash Win |
| * 2nd Level Cache | 128K-512K |
| * Max. DRAM (MB) | 64 |
| * SCSI Interface | N/A |
| * IDE | Enhanced (VL Bus) |
| * FDD Interlace | Yes |
| * Parallel Port | SPP/EPP/ECP |
| * RS-232 Port | 3 |
| * PS-232/422/485 Port | 1 |
| * Watch Dog Timer | 1.6 sec |
| * SVGA CRT Interface | C&T 65545 (VL Bus) |
| * Flat Panel Interface | C&T 65545 (VL Bus) |
| * Video Memory Size | 512K/M |
| * ISA Bus | Yes |
| * PC-104 Connector | Yes |
| * Power Saving | Yes |
| * Size (LxW Inches) | 8x5.5 |