EMC

TEST REPORT

REPORT NO. : ADT-EC97055A
MODEL NO. : PCM-4890
DATE OF TEST : Feb. 27 ~ March 10, 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: ADVANCE DATA TECHNOLOGY CORPORATION

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

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TABLE OF CONTENTS

1. CERTIFICATION

Issue date: March 13, 1997

Product	:	MOTHERBOARD	
Trade Name	:	AAEON	
Model No.	:	PCM-4890	
Applicant	:	AAEON TECHNOLOGY INC.	
Standard	:	EN55 022:1994, Class A	**EN50 082-2:1995**
			EN61000-4-2:1995
			ENV50140:1993
			EN61000-4-4:1995
			ENV50141:1993
			EN61000-4-8:1993
			ENV50204:1995

We hereby certify that one sample of the designation has been tested in our facility from Feb. 27 to March 10, 1997. The test record, data evaluation and Equipment Under Test (EUT) configurations represent herein are true and accurate representation of the measurements of the sample's EMC characteristics under the conditions herein specified.

PREPARED BY: Sharon Hsiung (Sharon Hsiung) DATE: 3/13/97

CHECKED BY: Andy Cheng (Andy Cheng) , DATE: 3/13/97

APPROVED BY: (Harris W. Lai) , DATE: 3/13/97

ADVANCE DATA TECHNOLOGY CORPORATION

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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

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.

FOR EMISSION TEST

No	Product	Brand	Model No.	Serial No.	I/O Cable
1	COLOR MONITOR	ACER	7134T	M5400233562	Nonshielded Power Shielded Signal
2	KEYBOARD	FORWARD	FDA-102D	3005142	Shielded signal
3	PRINTER	HP	2225C+	3123S97230	Shielded Signal Nonshielded Power
4	MODEM X 2	DATATRONICS	1200CK	07-503068 07-503003	Shielded signal Nonshielded Power
5	PERSONAL COMPUTER	ADVANTECH	MIPC-50E	I9442745	Nonshielded Power
6	COLOR MONITOR	OPTIQUEST	4500DC	N/A	Nonshielded Power Shielded Signal
7	KEYBOARD	DATACOMP	DFK701	50902521	Shielded signal
8	HUB	SVEC	FD916H	612000011	Shielded signal 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.

FOR IMMUNITY TEST

No	Product	Manufacturer	Model No.	Serial No.	I/O Cable
1	MONITOR	ACTION	CV-0951	N/A	Shielded Signal Nonshielded Power
2	KEYBOARD	ACER	6311	K6357050921	Shielded Signal
3	PRINTER	HP	C2145A	SG5BN160GY	Shielded Signal Nonshielded Power
4	MOUSE	LOGITECH	M-M35	LZA63601664	Shielded Signal
5	MODEM	GVC	F-1114V/R6	8503E100	Shielded signal Nonshielded Power
6	MODEM	HAYES	5300AP	A1425300K045	Shielded signal Nonshielded Power

Note: There is a ferrite core on the interface cable of support unit 1.
The support units of communication partner are same as emission tests.

2.3 Test setup

Please refer to the photos of test configuration in Item 6.

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	2944A08119	Jan. 17, 1997
ROHDE & SCHWARZ TEST RECEIVER	ESVP	893496/030	July 17, 1996
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Nov. 30, 1996
CHASE Bilog Antenna	CBL6112	2086	Dec. 28, 1996
EMCO Turn Table	1060	1195	N/A
EMCO Tower	1051	1263	N/A
Open Field Test Site	Site-2	ADT-R02	Oct. 1, 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 TEST INSTRUMENTS (IMMUNITY)

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
KeyTek, ESD Test System	2000	9105240/41	Aug. 5, 1996
KeyTek, ESD Simulator	MZ-15/EC	92022232	June 7,1996
KeyTek, EFT Generator	CE-40	9508257	Sept. 12, 1996
KeyTek, Capacitive Clamp	CE-40-CCL	9508259	Sept. 12, 1996
KeyTek, Control Center	E103	9508347	N/A
KeyTek, Surge Combination Wave	E501A	9508349	Sept. 20, 1996
KeyTek, Surge Coupler/Decoupler	E551	9508350	Sept. 20, 1996
ROHDE & SCHWARZ Signal Generator	SMY01	840490/009	Oct. 1, 1996
KALMUS Power Amplifier	LA1000V	091995-1	N/A
KALMUS Power Amplifier	757LC	091995-2	N/A
HOLADAY Field Probe	HI-4422	89915	Sept. 12, 1996
EMCO BiconiLog Antenna	3141	1001	N/A
FCC Coupling Decoupling Network	FCC-801-M3-25	48	N/A
FCC Coupling Decoupling Network	FCC-801-M2-25	20	N/A
FCC Coupling Decoupling Network	FCC-801-M1-25	17	N/A
BOONTON RF Voltage Meter	9200B	331801AE	Oct. 1, 1996
COMTEST Compact Full Anechoic Chamber (7x3x3 m)	CFAC	ADT-S01	Aug. 2, 1996
HAEFELY Mains Interference Simulator	PLINE 1610	083690-17	Jan. 31, 1996
HAFEELY Magnetic Field Tester	MAG 100.1	083794-06	Jan. 31, 1996

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

4. TEST RESULTS (EMISSION)

4.1 Radio Disturbance

Product Family Standard	:	EN 55 022, Class A
Frequency Range	:	0.15 - 30 MHz (Conducted Emission)
		30 - 1000 MHz (Radiated Emission)
Input Voltage	:	230 Vac, 50 Hz (to power supply of Industrial PC)
Temperature	:	20 ℃
Humidity	:	60 %
Atmospheric Pressure	:	1060 mbar

TEST RESULT	Remarks
PASS	Minimum passing margin of conducted emission: 32.0 dB at 5.818 MHz 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)

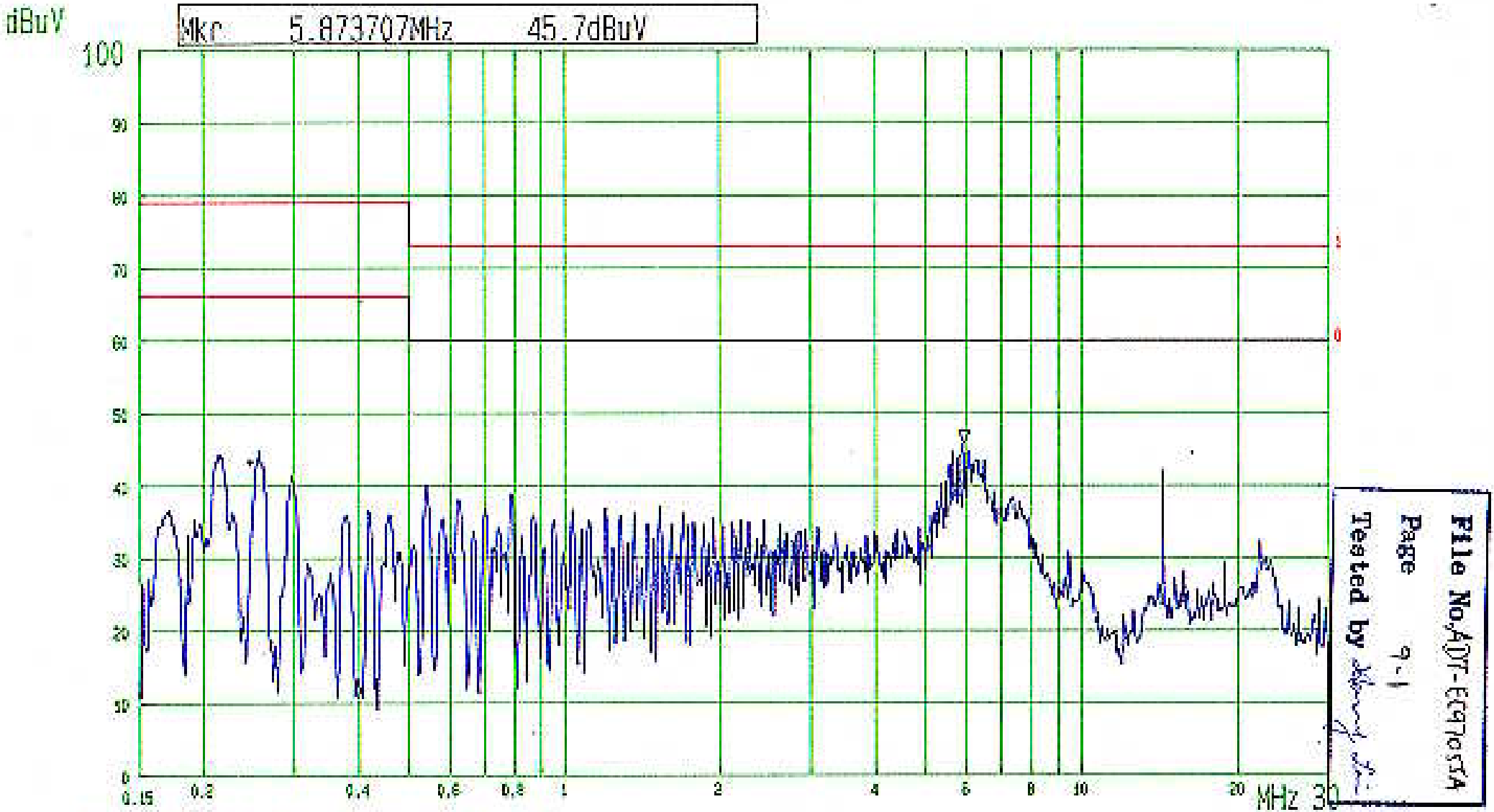
EUT: **MOTHERBOARD** MODEL: **PCM-4890** CPU: **AMD X5-133MHz**

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	44.70	-	45.60	-	79.00	66.00	34.3	-	33.4	-
0.250	42.90	-	41.90	-	79.00	66.00	36.1	-	37.1	-
0.287	41.00	-	40.20	-	79.00	66.00	38.0	-	38.8	-
0.534	39.00	-	38.30	-	73.00	60.00	34.0	-	34.7	-
0.783	37.20	-	35.20	-	73.00	60.00	35.8	-	37.8	-
5.878	41.00	-	40.80	-	73.00	60.00	32.0	-	32.2	-
14.318	40.40	-	40.60	-	73.00	60.00	32.6	-	32.4	-

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.



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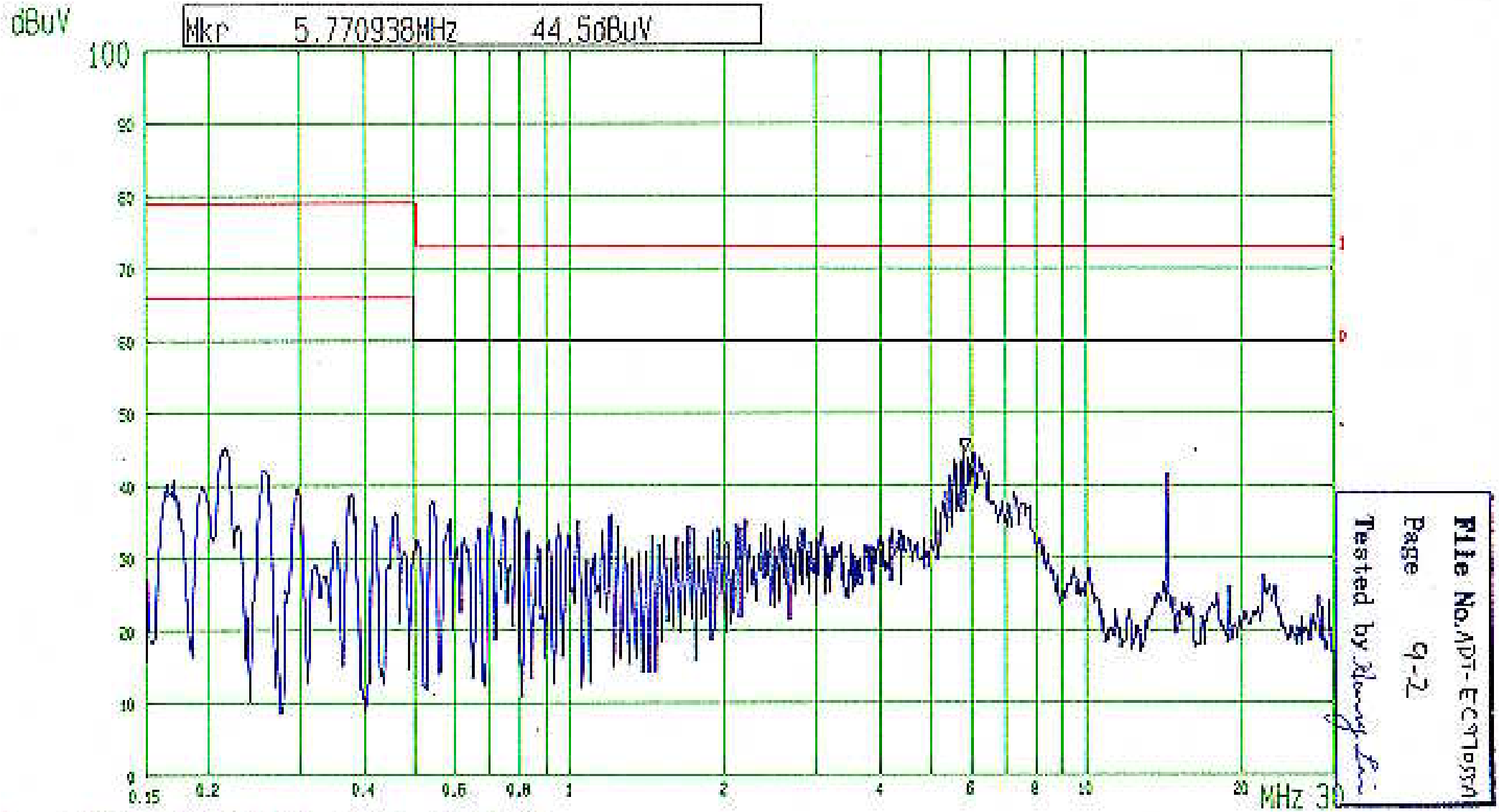
EN55022 CLASS A CONDUCTION TEST (PEAK VALUE) ADT CO.

MODEL: PCM-4890 CPU: AMD X5-133MHz LISN: L1



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EN55022 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 (A1)

EUT: **MOTHERBOARD** MODEL: **PCM-4890** CPU: **AMD X5-133MHz**

ANTENNA: CHASE BILOG CBL6112 POLARITY: HORIZONTAL

DETECTOR FUNCTION: CISPR, Quasi-peak 6 dB BAND WIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 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

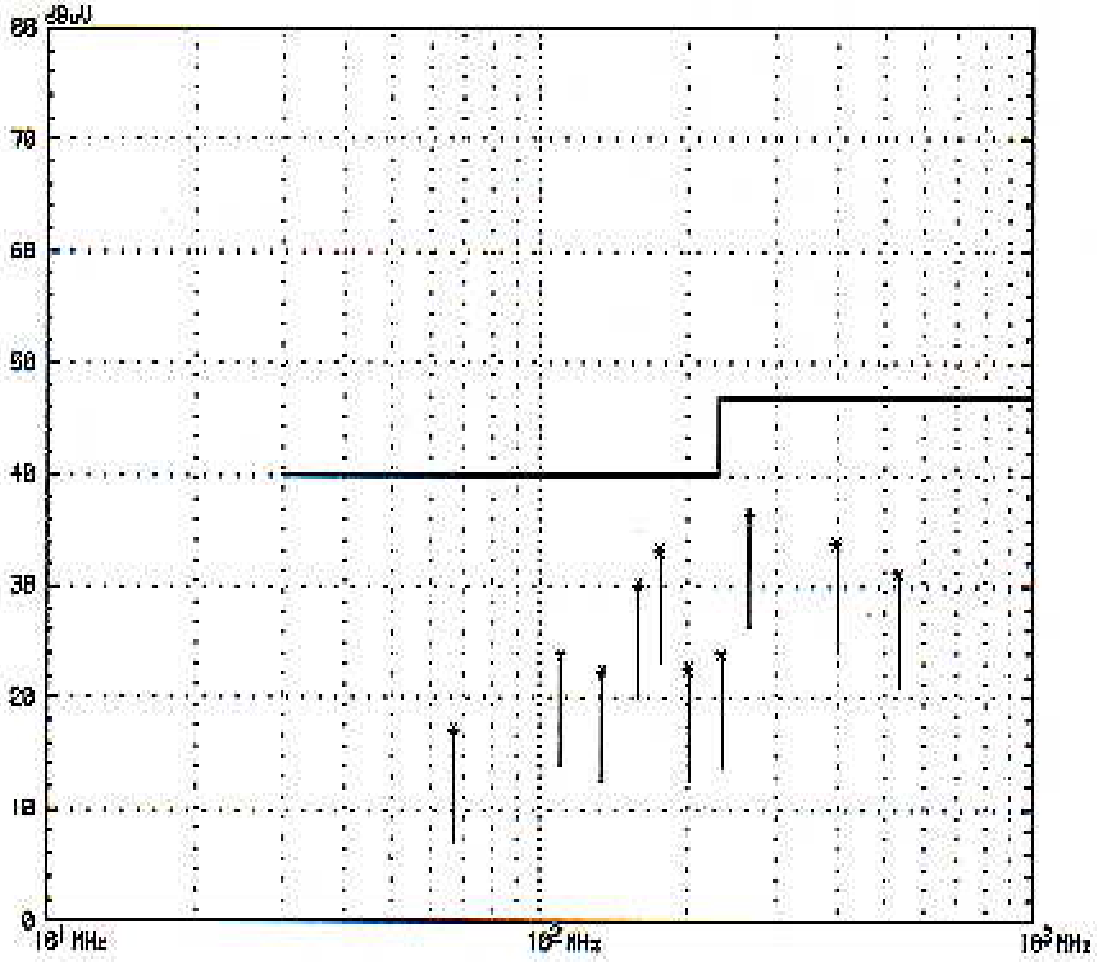
Model:PCM-4890
Mode: AMD X5-133MHz
EMI Type:EN55022 Class A
Freq. Range:30-1000 MHz
Antenna:CHASE Bi_Log

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

Tested By : Henry Lai

Report No. : EC97055

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	150.4	30.1
5	175.1	33.3	6	200.1	22.7
7	233.5	23.9	8	266.9	36.4
9	400.3	33.9	10	533.7	31.1



TEST DATA OF RADIATED EMISSION (A2)

EUT: **MOTHERBOARD** MODEL: **PCM-4890** CPU: **AMD X5-133MHz**

ANTENNA: CHASE BILOG CBL6112 POLARITY: VERTICAL

DETECTOR FUNCTION: CISPR, Quasi-peak 6 dB BAND WIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 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

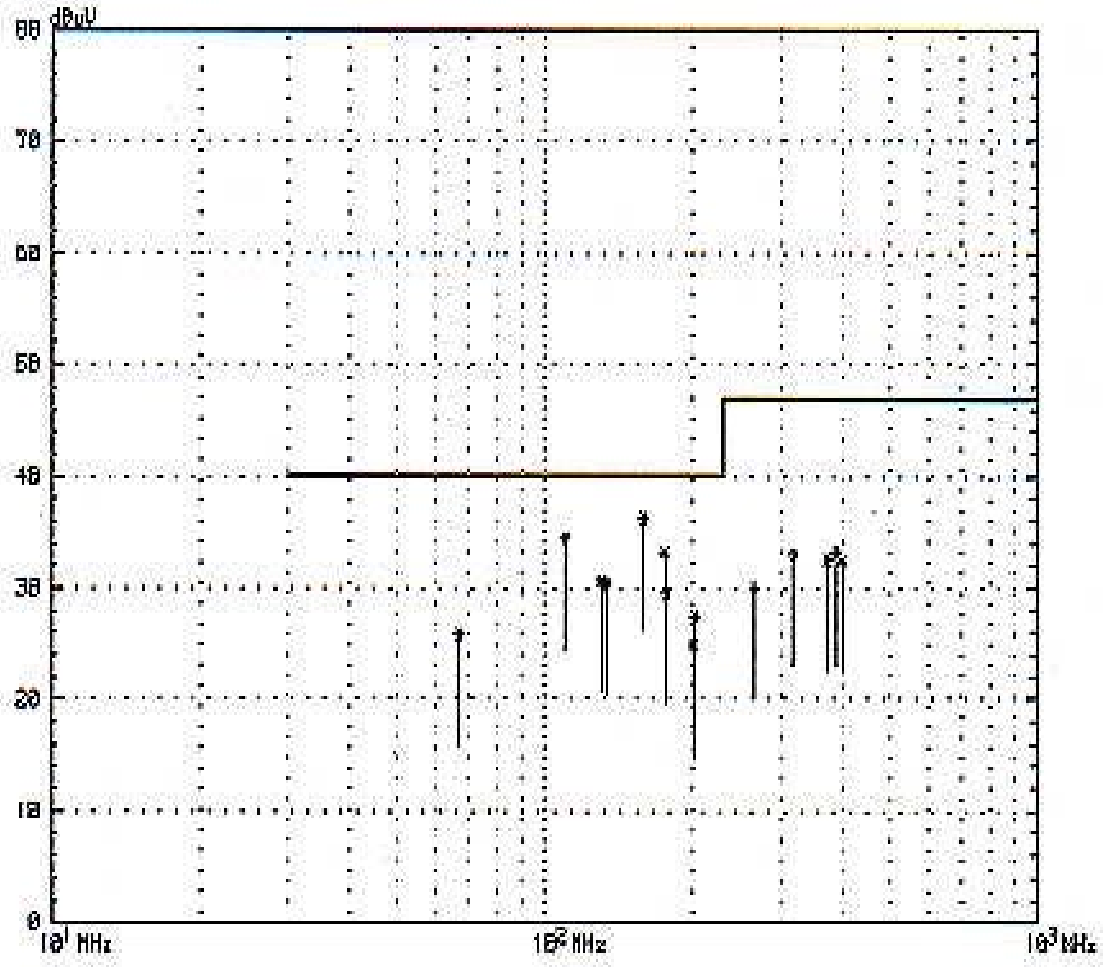
Model:PCM-4890
Mode: AMD X5-133MHz
EMI Type:EN55022 Class A
Freq. Range:30-1000 MHz
Antenna:CHASE Bi_Log

Tested By : Henry Lai

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

Report No. : EC97055

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



5. TEST RESULTS (IMMUNITY)

5.1 GENERAL DESCRIPTION

Basic Standard	:	EN61000-4-2	(Electrostatic Discharge Test, ESD)
		ENV50140	(Radiated Radio-Frequency Disturbance Test, RS)
		EN61000-4-4	(Electrical Fast Transient/Burst Test, EFT)
		ENV50141	(Conducted Radio Frequency Disturbances Test, CS)
		EN61000-4-8	(Power Frequency Magnetic Field Test)
		ENV50204	(Radio-Frequency Electromagnetic Field, Pulse modulated)
Generic Standard	:	EN 50 082-2	
Input Voltage	:	230 Vac, 50 Hz (to power supply of Industrial PC)	
Temperature	:	25 ℃	
Humidity	:	55 %	
Atmospheric Pressure	:	1060 mbar	

5.2 PERFORMANCE CRITERIA DESCRIPTION

Criterion A - The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criterion B - The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

5.3 EUT OPERATION CONDITION

Industrial PC runs a test program to access FDD/HDD/MODEM/PRINTER sequentially and show the result on monitor screen.

5.4 TEST RESULT OF ELECTROSTATIC DISCHARGE (ESD)

Basic Standard	:	EN61000-4-2
Generic Standard	:	EN 50 082-2
Discharge Impedance	:	330 ohm / 150 pF
Discharge Voltage (Direct/Indirect)	:	Air Discharge - 8 kV (Direct/Indirect) Contact Discharge - 4 kV
Polarity	:	Positive/Negative
Number of Discharge	:	Minimum 10 times at each test point
Discharge Mode	:	Single Discharge
Discharge Period	:	1 second minimum
Test Personnel	:	TM Yeung

Test Result		Remarks
Criterion A	**PASS**	Model: PCM-4890

OBSERVATION DESCRIPTION

Direct Application			Test Result	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
4	+	4,5	Note 1	N/A
8	+	1 ~ 3	N/A	Note 1

Description of test point:

1. LED
2. FDD
3. Power Switch
4. Metal case
5. Slot bracket

Indirect Application			Test Result	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
4	+/-	1 ~ 4	Note 1	Note 1

Description of test point:

1. Front side
2. Right side
3. Left side
4. Rear side

Description of test result:

Note 1: There was no change compared with initial operation during the test.

5.5 TEST RESULT OF RADIATED RADIO FREQUENCY DISTURBANCES (RS)

Basic Standard	:	ENV50140
Generic Standard	:	EN 50 082-2
Frequency range	:	80 MHz - 1000 MHz
Field strength	:	10 V/m
Modulation	:	1kHz Sine Wave, 80%, AM Modulation
Frequency step	:	1 % of fundamental
Polarity of Antenna	:	Horizontal and Vertical
Test distance	:	3 m
Test Personnel	:	TM Yeung

Test Result		Remarks
Criterion A	PASS	Model: PCM-4890

Note: Four sides of EUT are verified separately.

OBSERVATION DESCRIPTION

There is no change compared with initial operation during the test.

5.6 TEST RESULT OF ELECTRICAL FAST TRANSIENT/BURST (EFT/BURST)

Basic Standard	:	EN61000-4-4
Generic Standard	:	EN 50 082-2
Test Voltage	:	Power Line - 2 kV
		Signal/Control Line - 1 kV
Polarity	:	Positive/Negative
Impulse Frequency	:	5 kHz
Tr / Tn	:	5/50 ns
Burst Duration	:	15 ms
Burst Period	:	300 ms
Test Duration	:	Not less than 1 min.
Test Personnel	:	

Test Result		Remarks
Criterion A	**PASS**	Model: PCM-4890

OBSERVATION DESCRIPTION

Test Point	Polarity	Test Level (kV)	Result
L1	+/—	2	Note 1
L2	+/—	2	Note 1
GND	+/—	2	Note 1
LAN cable	+/—	1	Note 1

Description of test result:

Note1: There is no change compared with initial operation during the test.

5.7 TEST RESULT OF CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

Basic Standard	:	ENV50141
Generic Standard	:	EN 50 082-2
Frequency range	:	0.15 MHz - 80 MHz
Field strength	:	10 V/m
Modulation	:	1kHz Sine Wave, 80%, AM Modulation
Frequency step	:	1 % of fundamental
Coupled cable	:	Power Mains, Unshielded
Coupling device	:	CDN-M3 (3 wires)
Test Personnel	:	

Test Result		Remarks
Criterion A	**PASS**	Model: PCM-4890

OBSERVATION DESCRIPTION

There is no change compared with initial operation during the test.

5.8 TEST RESULT OF POWER FREQUENCY MAGNETIC FIELD

Basic Standard	:	EN61000-4-8
Generic Standard	:	EN 50 082-2
Frequency range	:	50Hz
Field strength	:	30 A/m
Observation Time	:	1 minute
Inductance coil	:	Rectangular type, 1mx1m
Test Personnel	:	

Test Result		Remarks
Criterion A	**PASS**	Model: PCM-4890

OBSERVATION DESCRIPTION

There was no change compared with initial operation during the test.

5.9 TEST RESULT OF RADIO-FREQUENCY ELECTROMAGNETIC FIELD, PULSE MODULATED

Basic Standard	:	ENV50204
Generic Standard	:	EN 50 082-2
Frequency range	:	900 +/- 5 MHz
Field strength	:	10 V/m
Modulation	:	200Hz, Square Wave, 50% Duty Cycle
Polarity of Antenna	:	Horizontal and Vertical
Test distance	:	3 m
Test Personnel	:	

Test Result		Remarks
Criterion A	**PASS**	Model: PCM-4890

Note: Four sides of EUT are verified separately.

OBSERVATION DESCRIPTION

There is no change compared with initial operation during the test.

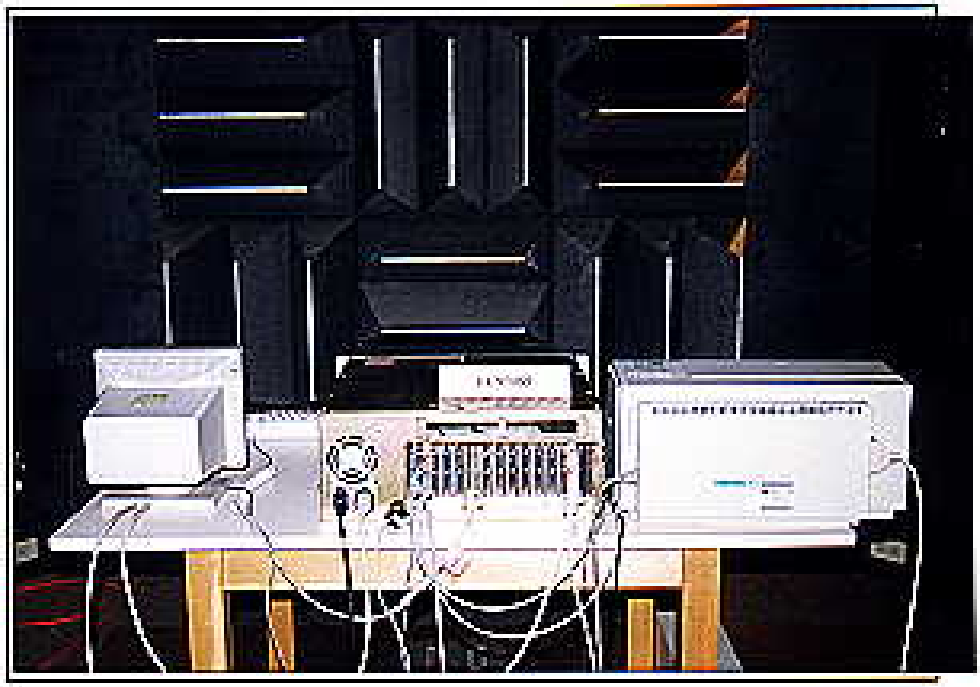
5. PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST

CONDUCTED EMISSION TEST

ESD TEST

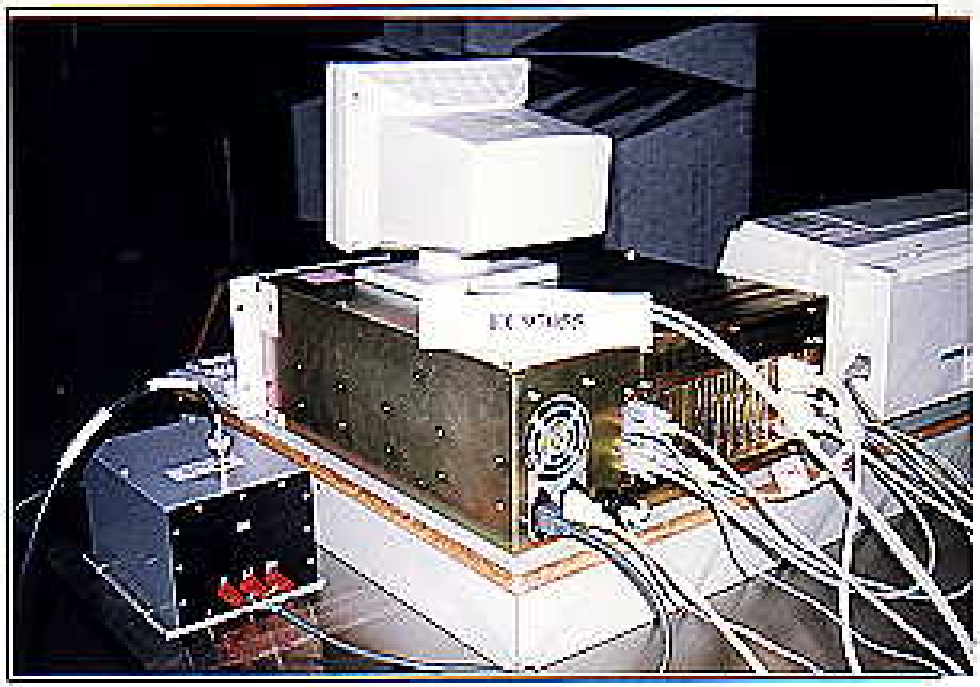
RS TEST (AM MODULATION AND PULSE MODULATION)



EFT TEST

EFT CLAMP

CONDUCTED SUSCEPTIBILITY TEST



MAGNETIC TEST

7. CONSTRUCTION PHOTOS OF EUT

8. 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