



## CE EMC

### TEST REPORT

For

**Intel® Pentium®-M PCI-104 CPU module**

**Model: PCM-3380**

**Trade Name: ADVANTECH**

Issued for

**Advantech Co., Ltd.**

**No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,  
Taipei 114, Taiwan, R.O.C.**

Issued by

**Compliance Certification Services Inc.**

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# 1 TEST RESULT CERTIFICATION

**Applicant:** Advantech Co., Ltd.  
No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,  
Taipei 114, Taiwan, R.O.C.

**Manufacturer:** Advantech Co., Ltd.  
No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,  
Taipei 114, Taiwan, R.O.C.

**Equipment Under Test:** Intel® Pentium®-M PCI-104 CPU module

**Trade Name:** ADVANTECH

**Model:** PCM-3380

**Detailed EUT Description:** See Item 2 of this report

**Date of Test:** January 24 ~ 26, 2005

Applicable Standard	Class/Limit/Criterion	Test Result
EN 55022: 1998 + A1: 2000	Class A	No non-compliance noted
EN 55011: 1998 + A1: 1999 + A2: 2000 (Group 1)	Class A	No non-compliance noted
<b>EN 61000-3-2: 2000</b>	Class A/B/C/D	N/A
<b>EN 61000-3-3: 1995 + A1: 2001</b>	Limit	No non-compliance noted
<b>EN 55024: 1998 + A1: 2001 (EN 61000-6-2: 2001)</b>		
IEC 61000-4-2: 1995 + A2: 2000	Criterion B	No non-compliance noted
IEC 61000-4-3: 1995 + A2: 2000	Criterion A	No non-compliance noted
IEC 61000-4-4: 1995 + A1: 2000	Criterion B	No non-compliance noted
IEC 61000-4-5: 1995 + A1: 2000	Criterion B	No non-compliance noted
IEC 61000-4-6: 1996 + A1: 2000	Criterion A	No non-compliance noted
IEC 61000-4-8: 1993 + A1: 2000	Criterion A	No non-compliance noted
IEC 61000-4-11: 1994 + A1: 2000	Criterion B/C/C	No non-compliance noted
<b>Deviation from Applicable Standard</b>		
According to applicant's declaration this EUT is a class A product, and to be market in industrial environment only.		

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in the EMC Directive 89/336/EEC and the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

**Approved by:**

Kurt Chen  
Director of Linkou Laboratory  
Compliance Certification Services Inc.

**Reviewed by:**

Susan Su  
Section Manager of Linkou Laboratory  
Compliance Certification Services Inc.



## 2 EUT DESCRIPTION

<b>Product</b>	Intel® Pentium®-M PCI-104 CPU module
<b>Trade Name</b>	ADVANTECH
<b>Model</b>	PCM-3380
<b>Housing Type</b>	Metal case
<b>EUT Power Rating</b>	DCV From Power Supply

### I/O Port of EUT

<b>I/O Port Type</b>	<b>Q'TY</b>	<b>TESTED WITH</b>
1. Parallel Port	1	1
2. Serial Port	2	2
3. PS/2 Port	1	1
4. Video Out Port (VGA)	1	1
5. Audio In Port	1	1
6. Audio Out Port	1	1
7. AT K/B Port	1	1
8. LAN Port	1	1
9. USB Port	6	6



### 3 TEST METHODOLOGY

#### 3.1 EUT SYSTEM OPERATION

1. EUT was installed at internal of metal chassis to simulate an IPC.
2. EMI test program was loaded and executed in “Windows 2000” mode.
3. A communication software was loaded and executed to communicate between EUT and remote side.
4. EUT sends and receives data from Notebook PC on remote side via LAN cable.
5. Data was sent to monitor filling the screen with upper case of “H” patterns.
6. Test program sequentially exercised all related I/O's of EUT and send “H” patterns to all applicable output ports of EUT.
7. Repeat 3 to 6.

*Note: Test program is self-repeating throughout the test.*

#### 3.2 DECISION OF FINAL TEST MODE

1. The following test mode was scanned during the preliminary test:

**Mode 1**

1024 × 768 Resolution

2. After the preliminary scan, the following test mode(s) were found to produce the highest emission level.

Mode 1.

Then, the EUT configuration and cable configuration of the above highest emission mode was chosen for all final test items.



## 4 SETUP OF EQUIPMENT UNDER TEST

### Setup Diagram

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

### Support Equipment

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	Monitor	959NF	AQ19H2RT706139P	FCC DoC	SAMSUNG	VGA Cable: Shielded, 1.8m with two cores	Unshielded, 1.8m
2	Modem	DM-1414	211026194	IFAXDM1418	ACEEX	Unshielded, 1.5m	Unshielded, 2.2m
3	Printer	STYLUS C60	DR3K041737	FCC DoC	EPSON	Unshielded, 1.5m	Unshielded, 1.8m
4	PS/2 Keyboard (One to two Adapter)	Y-SP29	SYU30272826	FCC DoC	Logitech	Unshielded, 1.8m	N/A
5	PS/2 Mouse (One to two Adapter)	M-S34	HCA25200473	DZL211029	Logitech	Unshielded, 1.8m	N/A
6	USB 2.0 External HDD	F12-UF	A0100214-43b0013	FCC DoC	TeraSys	Shielded, 1.8m	N/A
7	USB 2.0 External HDD	F12-UF	A0100214-39g0018	FCC DoC	TeraSys	Shielded, 1.8m	N/A
8	USB 2.0 External HDD	F12-UF	A0100214-39t0003	FCC DoC	TeraSys	Shielded, 1.8m	N/A
9	USB 2.0 External HDD	F12-UF	A0100214-39t0001	FCC DoC	TeraSys	Shielded, 1.8m	N/A
10	USB 2.0 External HDD	F12-UF	A0100214-39t0005	FCC DoC	TeraSys	Shielded, 1.8m	N/A
11	USB 2.0 External HDD	F12-UF	A0100214-39t0004	FCC DoC	TeraSys	Shielded, 1.8m	N/A
12	AT Keyboard	5121	N/A	N/A	BTC	Shielded, 1.8m	N/A
13	Mouse	M-MM43	LZE95250096	FCC DoC	Logitech	Unshielded, 1.8m	N/A
14	Multimedia Earphone	Axis-301	N/A	FCC DoC	Labtec	Unshielded, 1.8m	N/A
15	Walkman	RQ-L10	HB001392	FCC DoC	Panasonic	Unshielded, 1.8m	N/A
16	Notebook PC (Remote)	M285	NU2503544	FCC DoC	LEO	LAN Cable Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
PC Configuration							
CPU Manufacturer			Intel	Model	1.7GHz		
Power Supply Manufacturer			DELTA	Model	DPS-200PB-103D		
Memory Capacity			256MB				
HDD Manufacturer			IBM	Model	DJNA-371350		
Chassis Manufacturer			ADVANTECH	Model	IPC-610		

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.



## **5 FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at CCS Taiwan Linkou Lab at No. 81-1, Lane 210, Bade Rd., 2, Luchu Hsiang, Taoyuan Hsien, Taiwan.

The measurement facilities are constructed in conformance with the requirements of CISPR 16-1, ANSI C63.4 and other equivalent standards.

## 5.2 LABORATORY ACCREDITATIONS AND LISTINGS

The test facilities used to perform Electromagnetic compatibility tests are registered or accredited by the organizations listed in the following table which includes the recognized scope specifically.

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP	EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11	 Lab. Code 200600-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 93105, 90471
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	 R-393/1066/725/879/1868 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328-2, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	CNLA	EN 300 328-1, EN 300 328-2, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	 0363 ILAC MRA
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	 SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	 IC 3991-3 IC 3991-4

*Note: No part of this report may be used to claim or imply product endorsement by CNLA, NVLAP or other government agency.*



## 6 INSTRUMENT AND CALIBRATION

### 6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

### 6.2 TEST AND MEASUREMENT EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective manual.

#### Equipment Used for Emission Measurement

Conducted Emission Test Site # 3				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	845552/030	03/14/2005
LISN	R&S	ESH2-Z5	843285/010	01/08/2006
LISN	EMCO	3825/2	9003-1628	07/26/2005
ISN	FCC	FCC-TLISN-T4	20065	04/30/2005
ISN	FCC	FCC-TLISN-T8-02	20148	11/10/2005

*Note: The measurement uncertainty is less than +/- 2.83dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*



## For EN 55022

Open Area Test Site # 1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ADVANTEST	R3261C	71720533	N.C.R
EMI Test Receiver	R&S	ESVS10	834468/006	04/16/2005
Pre-Amplifier	Anritsu	MH648A	M18767	08/31/2005
Bilog Antenna	CHASE	CBL6112A	2309	01/30/2006
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	EMCO	2075-2	9707-2604	N.C.R
Controller	EMCO	2090	N/A	N.C.R
RF Switch	Anritsu	MP59B	M54367	N.C.R
Site NSA	CCS	N/A	N/A	08/06/2005
DECOUPLING NETWORK	FCC	F-201-DCN-5-6MM	20	09/19/2005

## For EN 55011

Open Area Test Site # 1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ADVANTEST	R3261C	71720533	N.C.R
EMI Test Receiver	R&S	ESVS10	834468/006	04/16/2005
Pre-Amplifier	Anritsu	MH648A	M18767	08/31/2005
Bilog Antenna	CHASE	CBL6112A	2309	01/30/2006
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	EMCO	2075-2	9707-2604	N.C.R
Controller	EMCO	2090	N/A	N.C.R
RF Switch	Anritsu	MP59B	M54367	N.C.R
Site NSA	CCS	N/A	N/A	08/06/2005

*Note: The measurement uncertainty is less than +/- 3.36dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

Power Harmonic & Voltage Fluctuation/Flicker Measurement (EN 61000-3-2&-3-3)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
HARMONICS SYSTEM	EMC-PARTNER	HARMONICS-1000	094	11/04/2005

**Equipment Used for Immunity Measurement**

<b>ESD Test Site (IEC/EN 61000-4-2)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
ESD Generator	SCHAFFNER	NSG438	170	04/19/2005

<b>Radiated Electromagnetic Field Immunity Test Site (IEC/EN 61000-4-3)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
S.G.	R&S	SMY02	100094	08/05/2005
Power Meter	R&S	NRVD	837794/029	08/06/2005
Power Sensor	R&S	URV5-Z2	835640/015	08/06/2005
Power Sensor	R&S	URV5-Z2	835640/016	08/06/2005
Power Amplifier	ar	150W1000	300300	N.C.R

<b>Fast Transients/Burst Test Site (IEC/EN 61000-4-4)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
Fast Transients/Burst Generator	HAEFELY TRENCH	PEFT- JUNIOR	583 333-117	08/25/2005
Clamp	HAEFELY TRENCH	093 506.1	080 421.13	N.C.R

<b>Surge Immunity Test Site (IEC/EN EN 61000-4-5)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
Surge Tester	HAEFELY TRENCH	PSUGER 4010	583 334-71	08/25/2005

<b>CS Test Site (IEC/EN 61000-4-6)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
S.G.	R&S	SMY02	100094	08/05/2005
Power Meter	R&S	NRVD	837794/029	08/06/2005
Power Sensor	R&S	URV5-Z2	835640/015	08/06/2005
Power Sensor	R&S	URV5-Z2	835640/016	08/06/2005
Power Amplifier	ar	500A100A	300299	N.C.R
CDN	Lüthi	801-M3	1879	03/03/2005
CDN	FRANKONIA	CDN-M2	A3002010	08/06/2005



<b>Power Frequency Magnetic Field Immunity Test Site (IEC/EN 61000-4-8)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
TRIAX ELF Magnetic Field Meter	F.W.BELL	4090	9711	11/21/2005
Magnetic Field Tester	HAEFELY TRENCH	MAG 100.1	080 938-01	N.C.R

<b>Voltage Dips/Short Interruption and Voltage Variation Immunity Test Site (IEC/EN 61000-4-11)</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
Dips/Interruption and Variations Simulator	HAEFELY TRENCH	PLINE 1610	080 344-05	04/06/2005



## 7 LINE CONDUCTED & RADIATED EMISSION TEST

### 7.1 LIMIT

#### Maximum permissible level of Line Conducted Emission

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: The lower limit shall apply at the transition frequency.*

#### Maximum permissible level of Common Mode Conducted Emission (Telecommunication Ports)

##### CLASS A

Frequency (MHZ)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 - 87	84 - 74	53 - 43	40 - 30
0.5 - 30.0	87	74	43	30

*Note: The lower limit shall apply at the transition frequency.*

##### CLASS B

Frequency (MHZ)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74	74 - 64	40 - 30	30 - 20
0.5 - 30.0	74	64	30	20

*Note: The lower limit shall apply at the transition frequency.*

#### Maximum permissible level of Radiated Emission measured at 10 meter

Frequency (MHZ)	Class A (dBuV/m)	Class B (dBuV/m)
	Quasi-peak	Quasi-peak
30 - 230	40	30
230 - 1000	47	37

*Note: The lower limit shall apply at the transition frequency.*



## **7.2 TEST PROCEDURE OF LINE CONDUCTED EMISSION**

### **7.2.1 EN 55022**

#### **Procedure of Preliminary Test**

- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed received AC power, 230VAC/50Hz, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.

#### **Procedure of Final Test**

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the Average limit in Q.P. mode, then the emission signal was re-checked using an Average detector.
- The test data of the worst-case condition(s) was recorded.

**Data Sample:**

Freq. (MHz)	Q.P. Raw (dBuV)	Average Raw (dBuV)	Q.P. Limit (dBuV)	Average Limit (dBuV)	Q.P. Margin (dB)	Average Margin (dB)	Note
x.xx	43.95	---	56.00	46.00	-12.05	---	L1

Freq. = Emission frequency in MHz

Raw dBuV = Uncorrected Analyzer/Receiver reading + Insertion loss of LISN, if it > 0.5 dB

Limit dBuV = Limit stated in standard

Margin dB = Reading in reference to limit

Note = Current carrying line of reading

“---“ = The emission level complied with the Average limits, with at least 2dB margin limits, so no further recheck.

**Calculation Formula**

Margin (dB) = RAW (dBuV) – Limit (dBuV)

**7.2.2 EN 55011****Procedure of Preliminary Test**

- The EUT was set up as per the test configuration to simulate typical usage per the user’s manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55011 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55011.
- All I/O cables were positioned to simulate typical actual usage as per EN 55011.
- The test equipment EUT installed received AC power, 230VAC/50Hz, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.



**Procedure of Final Test**

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the Average limit in Q.P. mode, then the emission signal was re-checked using an Average detector.
- The test data of the worst-case condition(s) was recorded.

**Data Sample:**

Freq. (MHz)	Q.P. Raw (dBuV)	Average Raw (dBuV)	Q.P. Limit (dBuV)	Average Limit (dBuV)	Q.P. Margin (dB)	Average Margin (dB)	Note
x.xx	43.95	---	73.00	60.00	-29.05	---	L1

- Freq. = Emission frequency in MHz  
 Raw dBuV = Uncorrected Analyzer/Receiver reading + Insertion loss of LISN, if it > 0.5 dB  
 Limit dBuV = Limit stated in standard  
 Margin dB = Reading in reference to limit  
 Note = Current carrying line of reading  
 “---“ = The emission level complied with the Average limits, with at least 2dB margin limits, so no further recheck.

**Calculation Formula**

Margin (dB) = RAW (dBuV) – Limit (dBuV)



### 7.3 TEST PROCEDURE OF COMMON MODE CONDUCTED EMISSION FOR TELECOMMUNICATION PORT

- Selecting ISN for unscreened cable or a current probe for screened cable to take measurement.
- The port of the EUT was connected to the remote side support equipment through the ISN/Current Probe and communication in normal condition.
- Making a overall range scan by using the test receiver controlled by controller and record at least six highest emissions for showing in the test report.
- Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- In case of measuring on the screened cable, the current limit shall be applied, otherwise the voltage limit should be applied.
- The following test mode was scanned during the preliminary test:

**Mode 1**  
**10 / 100 Mbps**

- After the preliminary scan, we found the following test mode(s) producing the highest emission level and test data of the worst case was recorded.

**Mode 1**

#### Data Sample:

Freq. (MHz)	Q.P. Raw (dBuV)	AV. Raw (dBuV)	Q.P. Limit (dBuV)	AV. Limit (dBuV)	Q.P. Margin (dB)	AV. Margin (dB)	Note
x.xx	43.95	---	74.00	64.00	-30.05	---	---

- Freq.: Emission frequency
- Raw: Uncorrected Analyzer / Receiver reading
- Limit: Limit stated in standard
- Margin: Reading in reference to limit
- Note: Current carrying line of reading
- “-“: The emission level complied with the Average limits, with at least 2 dB margin, so no further recheck.



## 7.4 TEST PROCEDURE OF RADIATED EMISSION

### 7.4.1 EN 55022

#### Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical usage as per EN 55022.
- The EUT received AC power source, 230VAC/50Hz, from the outlet socket under the turntable. All support equipment received power from another socket under the turntable.

*Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor; be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No. extension cords shall be used to mains receptacle.*

- The antenna was placed at 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

#### Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.



**Data Sample:**

<b>Freq. (MHz)</b>	<b>Raw Data (dBuV)</b>	<b>Corr. Factor (dB/m)</b>	<b>Emiss. Level (dBuV/m)</b>	<b>Limits (dBuV/m)</b>	<b>Margin (dB)</b>
xx.xx	14.00	12.20	26.20	30.00	-3.80

- Freq. = Emission frequency in MHz
- Raw Data (dBuV) = Uncorrected Analyzer / Receiver reading
- Corr. Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
- Emiss. Level (dBuV/m) = Raw reading converted to dBuV/m and CF added
- Limit (dBuV/m) = Limit stated in standard
- Margin (dB) = Reading in reference to limit
- P = Peak Reading
- Q = Quasi-peak Reading
- A = Average Reading

**Calculation Formula**

Margin (dB) = Emiss. Level (dBuV/m) – Limits (dBuV/m)

Emission Level (dBuV/m) = Raw Data (dBuV) + Corr. Factor (dB/m)



## 7.4.2 EN 55011

### **Procedure of Preliminary Test**

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55011.
- All I/O cables were positioned to simulate typical usage as per EN 55011.
- The EUT received AC power source, 230VAC/50Hz, from the outlet socket under the turntable. All support equipment received power from another socket under the turntable.
- The antenna was placed at 10 meter away from the EUT as stated in EN 55011. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

### **Procedure of Final Test**

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.



**Data Sample:**

<b>Freq. (MHz)</b>	<b>Raw Data (dBuV)</b>	<b>Corr. Factor (dB/m)</b>	<b>Emiss. Level (dBuV/m)</b>	<b>Limits (dBuV/m)</b>	<b>Margin (dB)</b>
xx.xx	14.00	12.20	26.20	40.00	-13.80

- Freq. = Emission frequency in MHz
- Raw Data (dBuV) = Uncorrected Analyzer / Receiver reading
- Corr. Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
- Emiss. Level (dBuV/m) = Raw reading converted to dBuV/m and CF added
- Limit (dBuV/m) = Limit stated in standard
- Margin (dB) = Reading in reference to limit
- P = Peak Reading
- Q = Quasi-peak Reading
- A = Average Reading

**Calculation Formula**

Margin (dB) = Emiss. Level (dBuV/m) – Limits (dBuV/m)

Emission Level (dBuV/m) = Raw Data (dBuV) + Corr. Factor (dB/m)



### 7.5 TEST RESULTS

#### Line Conducted Emission

**Model:** PCM-3380

**Test Mode:** Mode 1

**Temperature:** 22°C

**Humidity:** 63% RH

**Tested by:** Bill Cheng

**Test Results:** Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Q.P. Raw (dBuV)	AVG Raw (dBuV)	Q.P. Limit (dBuV)	AVG Limit (dBuV)	Q.P. Margin (dB)	AVG Margin (dB)	NOTE
0.203	53.70	---	79.00	66.00	-25.30	---	L1
0.931	33.60	---	73.00	60.00	-39.40	---	L1
2.703	33.70	---	73.00	60.00	-39.30	---	L1
4.049	30.20	---	73.00	60.00	-42.80	---	L1
13.610	31.00	---	73.00	60.00	-42.00	---	L1
16.203	32.00	---	73.00	60.00	-41.00	---	L1
0.204	52.40	---	79.00	66.00	-26.60	---	L2
1.141	36.50	---	73.00	60.00	-36.50	---	L2
2.492	33.70	---	73.00	60.00	-39.30	---	L2
4.152	34.00	---	73.00	60.00	-39.00	---	L2
6.850	33.00	---	73.00	60.00	-40.00	---	L2
7.271	32.40	---	73.00	60.00	-40.60	---	L2

L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

*Note: "----" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.*

**Common Mode Conducted Emission****Model:** PCM-3380**Test Mode:** Mode 1**Temperature:** 21°C**Humidity:** 56% RH**Tested by:** Bill Cheng**Test Results:** Pass

(The chart below shows the highest readings taken from the final data)

<b>Freq. (MHz)</b>	<b>Q.P. Raw (dBuV)</b>	<b>AVG Raw (dBuV)</b>	<b>Q.P. Limit (dBuV)</b>	<b>AVG Limit (dBuV)</b>	<b>Q.P. Margin (dB)</b>	<b>AVG Margin (dB)</b>	<b>NOTE</b>
1.893	59.00	---	87.00	74.00	-28.00	---	10Base
6.308	69.10	---	87.00	74.00	-17.90	---	10Base
7.122	63.40	---	87.00	74.00	-23.60	---	10Base
8.743	68.60	---	87.00	74.00	-18.40	---	10Base
10.770	62.80	---	87.00	74.00	-24.20	---	10Base
11.860	60.80	---	87.00	74.00	-26.20	---	10Base
16.232	70.60	---	87.00	74.00	-16.40	---	100Base
20.258	70.50	---	87.00	74.00	-16.50	---	100Base
23.133	73.00	---	87.00	74.00	-14.00	---	100Base
24.352	69.40	---	87.00	74.00	-17.60	---	100Base
26.607	70.40	---	87.00	74.00	-16.60	---	100Base
27.157	69.20	---	87.00	74.00	-17.80	---	100Base

L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

*Note: "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.*



7.5.1 EN 55022

**Radiated Emission (A)**

**Model:** PCM-3380

**Test Mode:** Mode 1

**Temperature:** 20°C

**Humidity:** 64% RH

**Detector Function:** Quasi-peak.

**Antenna:** Vertical at 10m

**Tested by:** Bill Cheng

**Test Results:** Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
48.61	24.3	12.3	36.6	40.0	-3.4
65.00	22.2	5.7	27.9	40.0	-12.1
113.42	24.2	11.7	35.9	40.0	-4.1
129.62	24.4	12.0	36.4	40.0	-3.6
132.60	22.0	12.1	34.1	40.0	-5.9
146.02	23.4	11.6	35.0	40.0	-5.0
165.75	21.4	10.4	31.8	40.0	-8.2
194.56	13.5	11.0	24.5	40.0	-15.5
210.73	17.8	10.6	28.4	40.0	-11.6
233.48	27.8	11.4	39.2	47.0	-7.8
265.06	21.3	15.1	36.4	47.0	-10.6
300.19	10.7	15.6	26.3	47.0	-20.7
364.40	13.7	18.4	32.1	47.0	-14.9



---

397.40	8.7	19.9	28.6	47.0	-18.4
-----					
434.00	14.2	19.3	33.5	47.0	-13.5
-----					
464.60	9.1	19.6	28.7	47.0	-18.3
-----					
567.10	4.1	22.3	26.4	47.0	-20.6
-----					
663.30	2.9	23.6	26.5	47.0	-20.5
-----					



**Radiated Emission (B)**

**Model:** PCM-3380

**Test Mode:** Mode 1

**Temperature:** 20°C

**Humidity:** 64% RH

**Detector Function:** Quasi-peak.

**Antenna:** Horizontal at 10m

**Tested by:** Bill Cheng

**Test Results:** Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
113.49	22.9	11.7	34.6	40.0	-5.4
129.63	22.2	12.0	34.2	40.0	-5.8
133.60	15.7	12.1	27.8	40.0	-12.2
166.80	17.4	10.4	27.8	40.0	-12.2
194.50	14.3	11.0	25.3	40.0	-14.7
210.77	20.9	10.6	31.5	40.0	-8.5
231.89	25.8	11.2	37.0	47.0	-10.0
265.07	19.2	15.1	34.3	47.0	-12.7
298.11	18.3	15.6	33.9	47.0	-13.1
333.90	4.9	17.0	21.9	47.0	-25.1
364.40	15.2	18.4	33.6	47.0	-13.4
400.00	9.9	20.0	29.9	47.0	-17.1
431.00	10.2	19.4	29.6	47.0	-17.4
467.30	6.6	19.7	26.3	47.0	-20.7
508.30	6.7	21.3	28.0	47.0	-19.0
565.10	1.9	22.4	24.3	47.0	-22.7
664.70	2.5	23.6	26.1	47.0	-20.9



7.5.2 EN 55011

**Radiated Emission (A)**

**Model:** PCM-3380

**Test Mode:** Mode 1

**Temperature:** 20°C

**Humidity:** 64% RH

**Detector Function:** Quasi-peak.

**Antenna:** Vertical at 10m

**Tested by:** Bill Cheng

**Test Results:** Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
44.11	11.9	13.7	25.6	40.0	-14.4
113.42	21.8	11.7	33.5	40.0	-6.5
131.81	19.7	12.1	31.8	40.0	-8.2
133.42	19.1	12.1	31.2	40.0	-8.8
145.82	21.8	11.6	33.4	40.0	-6.6
165.72	22.3	10.4	32.7	40.0	-7.3
210.64	21.0	10.6	31.6	40.0	-8.4
233.45	25.0	11.4	36.4	47.0	-10.6
266.85	19.5	15.3	34.8	47.0	-12.2
300.21	11.2	15.6	26.8	47.0	-20.2
334.00	8.8	17.0	25.8	47.0	-21.2
367.10	7.4	18.5	25.9	47.0	-21.1
399.00	7.0	20.0	27.0	47.0	-20.0
433.90	14.1	19.3	33.4	47.0	-13.6



---

464.60	10.8	19.6	30.4	47.0	-16.6
-----					
496.67	5.7	21.0	26.7	47.0	-20.3
-----					
595.10	18.9	22.1	41.0	47.0	-6.0
-----					
666.00	2.4	23.6	26.0	47.0	-21.0
-----					



**Radiated Emission (B)**

**Model:** PCM-3380

**Test Mode:** Mode 1

**Temperature:** 20°C

**Humidity:** 61% RH

**Detector Function:** Quasi-peak.

**Antenna:** Horizontal at 10m

**Tested by:** Bill Cheng

**Test Results:** Pass

(The chart below shows the highest readings taken from the final data)

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
133.44	18.4	12.1	30.5	40.0	-9.5
156.43	16.9	10.3	27.2	40.0	-12.8
165.73	18.0	10.4	28.4	40.0	-11.6
186.66	13.9	11.3	25.2	40.0	-14.8
204.87	17.8	10.7	28.5	40.0	-11.5
233.50	24.6	11.4	36.0	47.0	-11.0
265.06	20.9	15.1	36.0	47.0	-11.0
298.13	13.5	15.6	29.1	47.0	-17.9
333.90	6.3	17.0	23.3	47.0	-23.7
367.00	12.3	18.5	30.8	47.0	-16.2
397.30	10.2	19.9	30.1	47.0	-16.9
434.00	7.8	19.3	27.1	47.0	-19.9
467.10	6.4	19.7	26.1	47.0	-20.9
565.90	2.8	22.3	25.1	47.0	-21.9
667.10	4.3	23.6	27.9	47.0	-19.1



## 8 POWER HARMONICS TEST

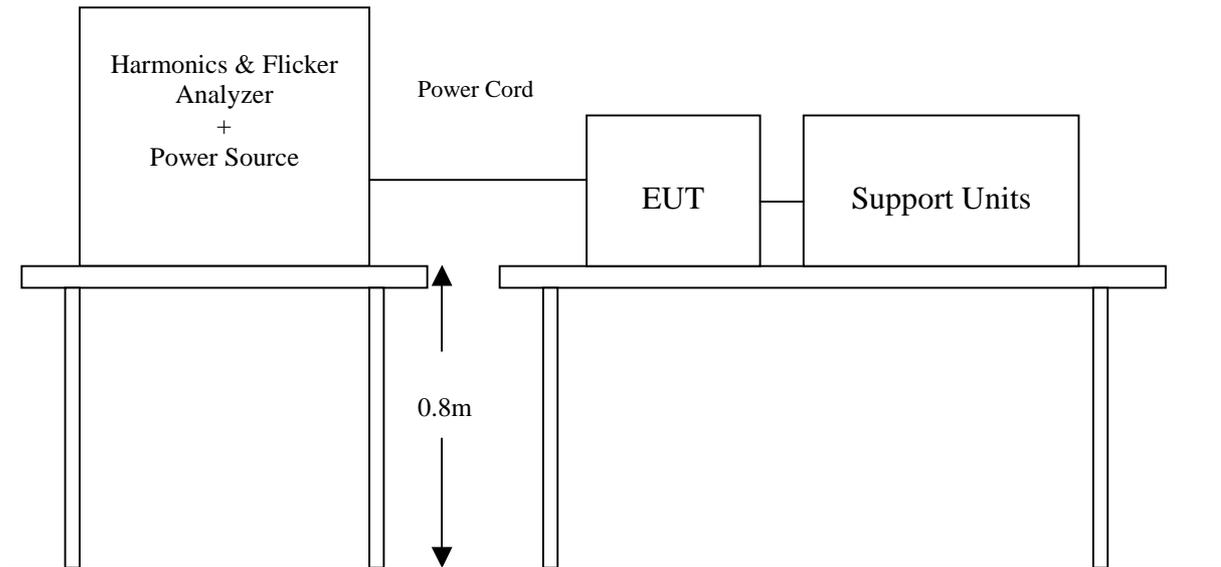
**Port** : AC mains  
**Basic Standard** : EN 61000-3-2 (2000)  
**Limits** :  CLASS A ;  CLASS B ;  CLASS C ;  CLASS D  
**Tested by** : N/A  
**Temperature** : N/A  
**Humidity** : N/A

### Limit:

Limits for Class A equipment	
Harmonics Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15<=n<=39	0.15x15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8<=n<=40	0.23x8/n

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

### **Block Diagram of Test Setup:**



### **Test Procedure:**

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- b. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

### **Test Result :**

***EUT max Power : 63.9W***

***Note: According to clause 7 of EN 61000-3-2: 2000, equipment with a rated power of 75W or less, no limits apply.***

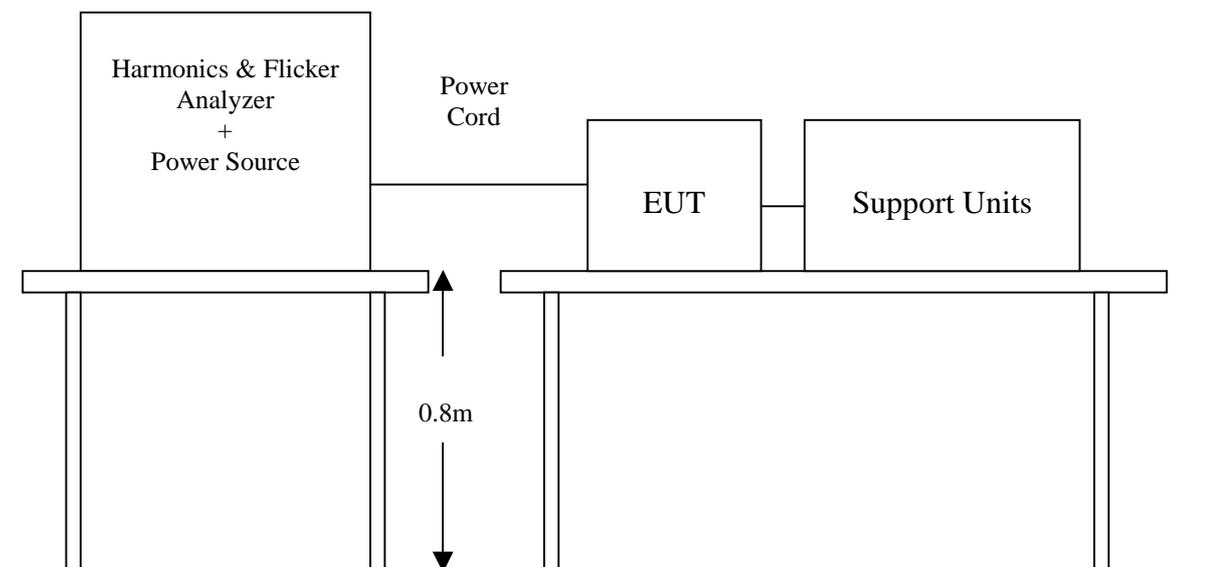
## 9 POWER VOLTAGE FLUCTUATION / FLICKER TEST

**Port** : AC mains  
**Basic Standard** : EN 61000-3-3 (1995 + A1: 2001)  
**Limits** : §5 of EN 61000-3-3  
**Tested by** : Bill Cheng  
**Temperature** : 26°C  
**Humidity** : 55% RH

### Limit:

TEST ITEM	LIMIT	REMARK
$P_{st}$	1.0	$P_{st}$ means short-term flicker indicator.
$P_{lt}$	0.65	$P_{lt}$ means long-term flicker indicator.
$T_{dt}$ (ms)	500	$T_{dt}$ means maximum time that dt exceeds 3 %.
$d_{max}$ (%)	4%	$d_{max}$ means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

### Block Diagram of Test Setup:





**Test Procedure:**

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

**Test Result:** (See Appendix II for details)

**Continue**

Test Parameter	Measurement Value	Limit	Result
P <sub>st</sub>	0.072	1.0	Pass
P <sub>lt</sub>	0.072	0.65	Pass
T <sub>dt</sub> (ms)	0	500	Pass
d <sub>max</sub> (%)	0%	4%	Pass
dc (%)	0.01%	3.3%	Pass

**Manual Switch**

Test Parameter	Measurement Value	Limit	Result
P <sub>st</sub>	0.072	1.0	Pass
P <sub>lt</sub>	0.072	0.65	Pass
T <sub>dt</sub> (ms)	0	500	Pass
d <sub>max</sub> (%)	0.32%	4%	Pass
dc (%)	0.24%	3.3%	Pass

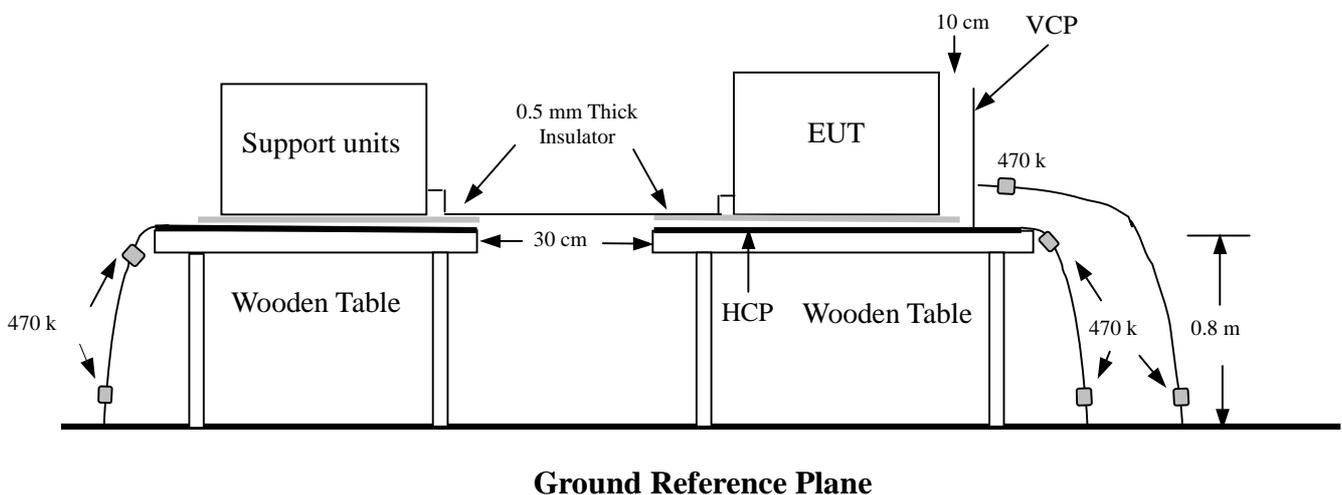
## 10 ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

### 10.1 EN 55024

<b>Port</b>	: Enclosure
<b>Basic Standard</b>	: IEC/EN 61000-4-2
<b>Test Level</b>	: $\pm 8$ kV (Air Discharge) : $\pm 4$ kV (Contact Discharge) : $\pm 4$ kV (Indirect Discharge)
<b>Performance Criterion</b>	: B (Standard Required)
<b>Tested by</b>	: Bill Cheng
<b>Temperature</b>	: 24°C
<b>Humidity</b>	: 53% RH
<b>Pressure</b>	: 1010mbar

#### **Block Diagram of Test Setup:**

(The 470 k ohm resistors are installed per standard requirement.)





**Test Procedure:**

1. The EUT was located 0.1 m minimum from all side of the HCP.
2. The indirect support units were located 1 m minimum away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
3. A scroll ‘H’ test program was loaded and executed in Windows 95 mode.
4. The EUT sent above message to monitor and related peripherals through the test.
5. Active the communication function if the EUT with such port(s).
6. As per the requirement of EN 55024; applying direct contact discharge at the sides other than front of EUT at minimum 50 discharges (25 positive and 25 negative) if applicable, can’t be applied direct contact discharge side of EUT then the indirect discharge shall be applied. One of the test points shall be subjected to at least 50 indirect discharge (contact) to the front edge of horizontal coupling plane.
7. Other parts of EUT where it is not possible to perform contact discharge then selecting appropriate points of EUT for air discharge, a minimum of 10 single air discharges shall be applied.
8. The application of ESD to the contact of open connectors is not required.
9. The EUT direct connection units also need to be applied ESD at the port of EUT cable connected.
10. Putting a mark on EUT to show tested points. The following test condition was followed during the tests.

**Note:** As per EN 61000-4-2, two 470k bleed resistors cable is connected between the EUT and HCP during the test applicable for power ungrounded or battery operating unit only.

The electrostatic discharges were applied as follows:

Amount of discharge	Voltage	Coupling	Result (Pass/Fail)
Mini 10 /Point	± 8 kV	Air Discharge	Pass
Mini 25 /Point	± 4 kV	Contact Discharge	Pass
Mini 25 /Point	± 4 kV	Indirect Discharge HCP	Pass
Mini 25 /Point	± 4 kV	Indirect Discharge VCP (Right)	Pass
Mini 25 /Point	± 4 kV	Indirect Discharge VCP (Left)	Pass

***For the tested points to EUT, please refer to attached page.***  
*(Blue arrow mark for Contact Discharge and red arrow mark for Air Discharge)*



**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
  
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
  
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

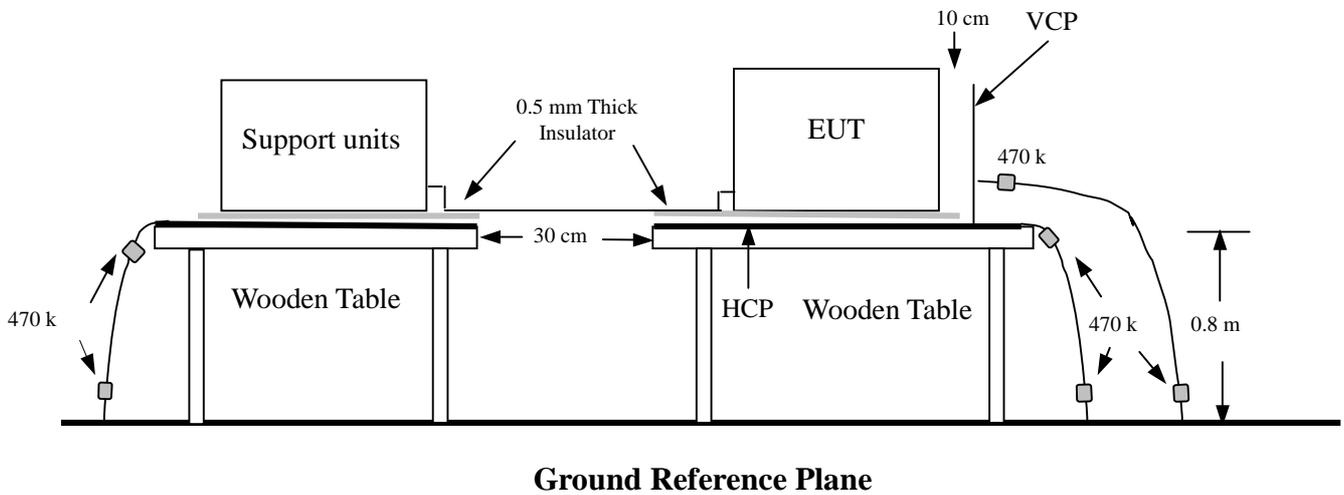
<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
<b>Observation:</b> No function degraded during the tests.

**10. 2 EN 61000-6-2**

<b>Port</b>	: Enclosure
<b>Basic Standard</b>	: IEC/EN 61000-4-2
<b>Test Level</b>	: $\pm 8$ kV (Air Discharge) $\pm 4$ kV (Contact Discharge) $\pm 4$ kV (Indirect Discharge)
<b>Performance Criterion</b>	: B (Standard Required)
<b>Tested by</b>	: Bill Cheng
<b>Temperature</b>	: 24°C
<b>Humidity</b>	: 53% RH
<b>Pressure</b>	: 1010mbar

**Block Diagram of Test Setup:**

(The 470 k ohm resistors are installed per standard requirement.)



**Test Procedure:**

1. The EUT was located 0.1 m minimum from all side of the HCP.
2. The indirect support units were located 1 m minimum away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
3. A scroll 'H' test program was loaded and executed in Windows 95 mode.
4. The EUT sent above message to monitor and related peripherals through the test.
5. Active the communication function if the EUT with such port(s).
6. As per the requirement of IEC 61000-6-2; applying direct contact discharge to the metal parts and VCP at minimum 10 discharges (each polarity).
7. Other parts of EUT where it is not possible to perform contact discharge then selecting appropriate points of EUT for air discharge, a minimum of 10 single air discharges shall be applied.
8. The application of ESD to the contact of open connectors is not required.
9. Putting a mark on EUT to show tested points. The following test condition was followed during the tests.

**Note:** As per IEC/EN 61000-4-2, two 470k bleed resistors cable is connected between the EUT and HCP during the test applicable for power ungrounded or battery operating unit only.

The electrostatic discharges were applied as follows:

Amount of discharge	Voltage	Coupling	Result (Pass/Fail)
Mini 10 /Point	± 8 kV	Air Discharge	Pass
Mini 10 /Point	± 4 kV	Contact Discharge	Pass
Mini 10 /Point	± 4 kV	Indirect Discharge HCP	Pass
Mini 10 /Point	± 4 kV	Indirect Discharge VCP (Front)	Pass
Mini 10 /Point	± 4 kV	Indirect Discharge VCP (Right)	Pass
Mini 10 /Point	± 4 kV	Indirect Discharge VCP (Left)	Pass
Mini 10 /Point	± 4 kV	Indirect Discharge VCP (Back)	Pass

***For the tested points to EUT, please refer to attached page.***

***(Blue arrow mark for Contact Discharge and red arrow mark for Air Discharge)***



**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
  
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
  
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
<b>Observation:</b> No function degraded during the tests.

***The Tested Points of EUT***  
***Photo 1 of 3***



***Photo 2 of 3***





*Photo 3 of 3*

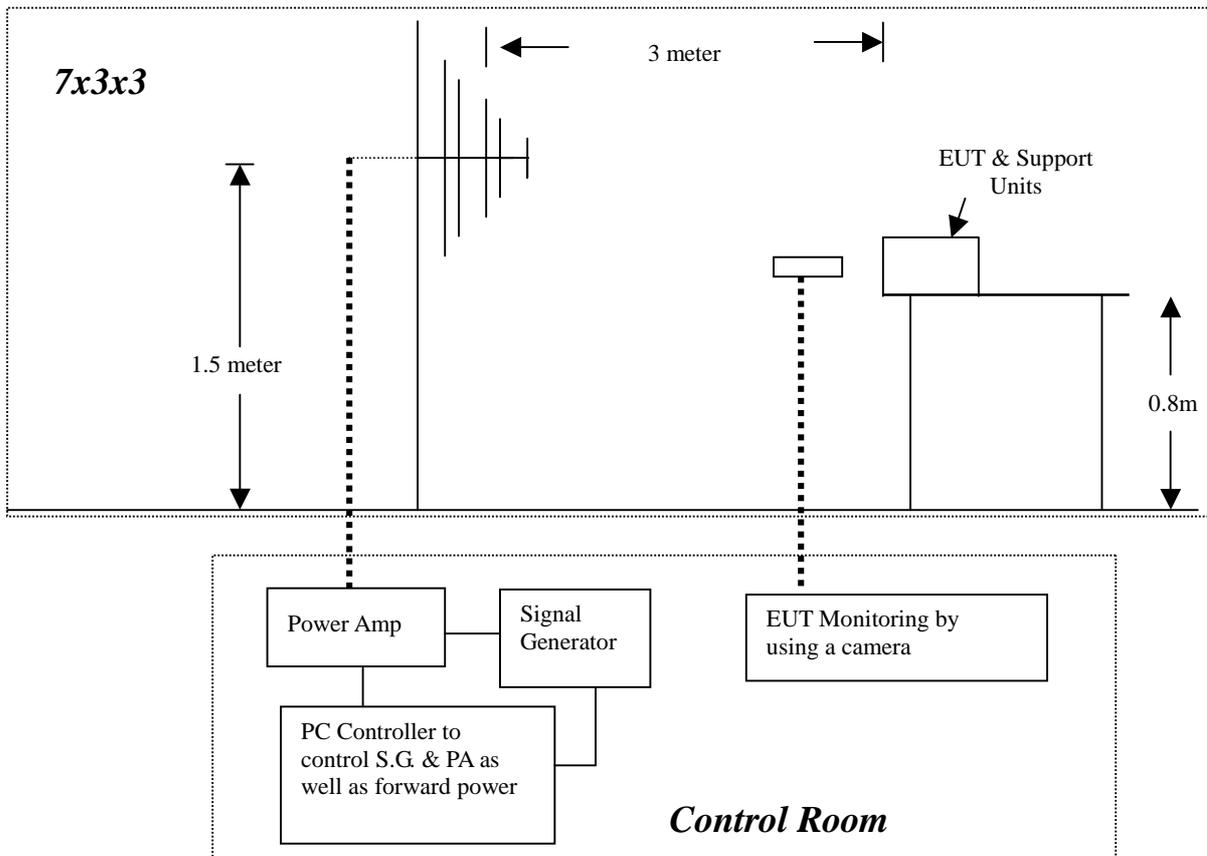


## 11 RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

### 11.1 EN 55024

<b>Port</b>	: Enclosure
<b>Basic Standard</b>	: IEC/EN 61000-4-3
<b>Requirements</b>	: 3 V/m / with 80% AM. 1kHz Modulation.
<b>Performance Criterion</b>	: A (Standard Required)
<b>Tested by</b>	: Bill Cheng
<b>Temperature</b>	: 20°C
<b>Humidity</b>	: 54% RH
<b>Pressure</b>	: 1007mbar

#### Block Diagram of Test Setup:



**Test Procedure:**

1. The EUT was located at the edge of supporting table keep 3 meter away from transmitting antenna, it just the calibrated square area of field uniformity. The support units were located outside of the uniformity area, but the cable(s) connected with EUT were exposed to the calibrated field as per IEC 61000-4-3.
2. Setting the testing parameters of RS test software per IEC/EN 61000-4-3.
3. Performing the pre-test at each side of with double specified level (6V/m) at 4% steps.
4. From the result of pre-test in step 5, choice the worst side of EUT for final test from 80 MHz to 1000 MHz at 1% steps.
5. Recording the test result in following table.
6. It is not necessary to perform test as per annex A of EN 55024 if the EUT doesn't belong to ITE product.

**Preliminary test conditions:**

Test level : 6V/m  
 Steps : 4 % of fundamental  
 Dwell Time : 3 sec

Range (MHz)	Field	Modulation	Polarity	Position	Result (Pass/Fail)
80-1000	6V/m	Yes	H	Front	Pass
80-1000	6V/m	Yes	V	Front	Pass
80-1000	6V/m	Yes	H	Right	Pass
80-1000	6V/m	Yes	V	Right	Pass
80-1000	6V/m	Yes	H	Back	Pass
80-1000	6V/m	Yes	V	Back	Pass
80-1000	6V/m	Yes	H	Left	Pass
80-1000	6V/m	Yes	V	Left	Pass

**Final test conditions:**

Test level : 3V/m  
 Steps : 1 % of fundamental  
 Dwell Time : 3 sec

Range (MHz)	Field	Modulation	Polarity	Position	Result (Pass/Fail)
80-1000	3V/m	Yes	H	Back	Pass
80-1000	3V/m	Yes	V	Back	Pass



**Performance & Result:**

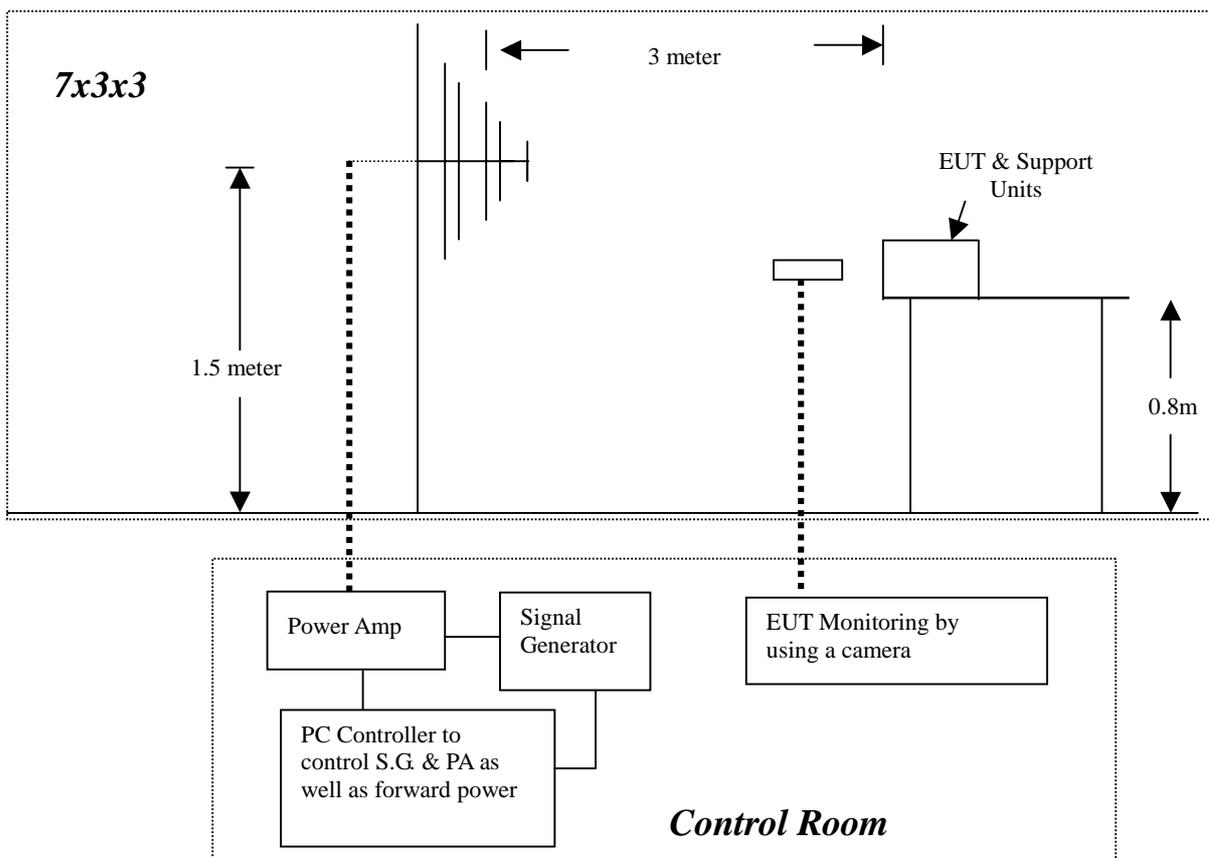
- Criteria A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
<b>Observation:</b> No function degraded during the tests.

**11.2 EN 61000-6-2**

- Port** : Enclosure
- Basic Standard** : IEC/EN 61000-4-3
- Requirements** : 10 V/m / with 80% AM. 1kHz Modulation.
- Performance Criterion** : A (Standard Required)
- Tested by** : Bill Cheng
- Temperature** : 20°C
- Humidity** : 54% RH
- Pressure** : 1007mbar

**Block Diagram of Test Setup:**





**Test Procedure:**

1. The EUT and support units were located at the edge of supporting table keep 3 meter away from transmitting antenna, it just the calibrated square area of field uniformity.
2. Adjusting the cables to be exposed to the electromagnetic filed as possible.
3. Performing a Radiated Emission Scan in range of 30 to 1000 MHz prior to do RS test and records the more higher emission frequencies for the reference of RS test, due to antenna effectiveness.
4. Adjusting the monitoring camera to monitor the multi-meter scale as clear as possible.
5. Setting the testing parameters of RS test software per EN 61000-4-3.
6. Referring to the tested data of step 3 to performing the RS test from 80 to 1000 MHz.
7. Recording the test result in following table.
8. Changing the EUT to the other side and repeat step 3 to 6, until 4 sides of EUT were verified.

**Preliminary test conditions:**

Test level : 10V/m  
 Steps : 1 % of fundamental  
 Dwell Time : 3 sec

Range (MHz)	Field	Modulation	Polarity	Position	Result (Pass/Fail)
80-1000	10V/m	Yes	H	Front	Pass
80-1000	10V/m	Yes	V	Front	Pass
80-1000	10V/m	Yes	H	Right	Pass
80-1000	10V/m	Yes	V	Right	Pass
80-1000	10V/m	Yes	H	Back	Pass
80-1000	10V/m	Yes	V	Back	Pass
80-1000	10V/m	Yes	H	Left	Pass
80-1000	10V/m	Yes	V	Left	Pass



**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
<b>Observation:</b> No function degraded during the tests.

## 12 FAST TRANSIENTS/BURST IMMUNITY TEST

EN 55024 / EN 61000-6-2

**Port** : On Power Supply Line and LAN Cable

**Basic Standard** : IEC/EN 61000-4-4

**Requirements** :  $\pm 1 \text{ kV} / 2 \text{ kV}$  for Power Supply Line  
 $\pm 0.5 \text{ kV} / 1 \text{ kV}$  for LAN/Line Cable

**Performance Criteria** : B (Standard Required)

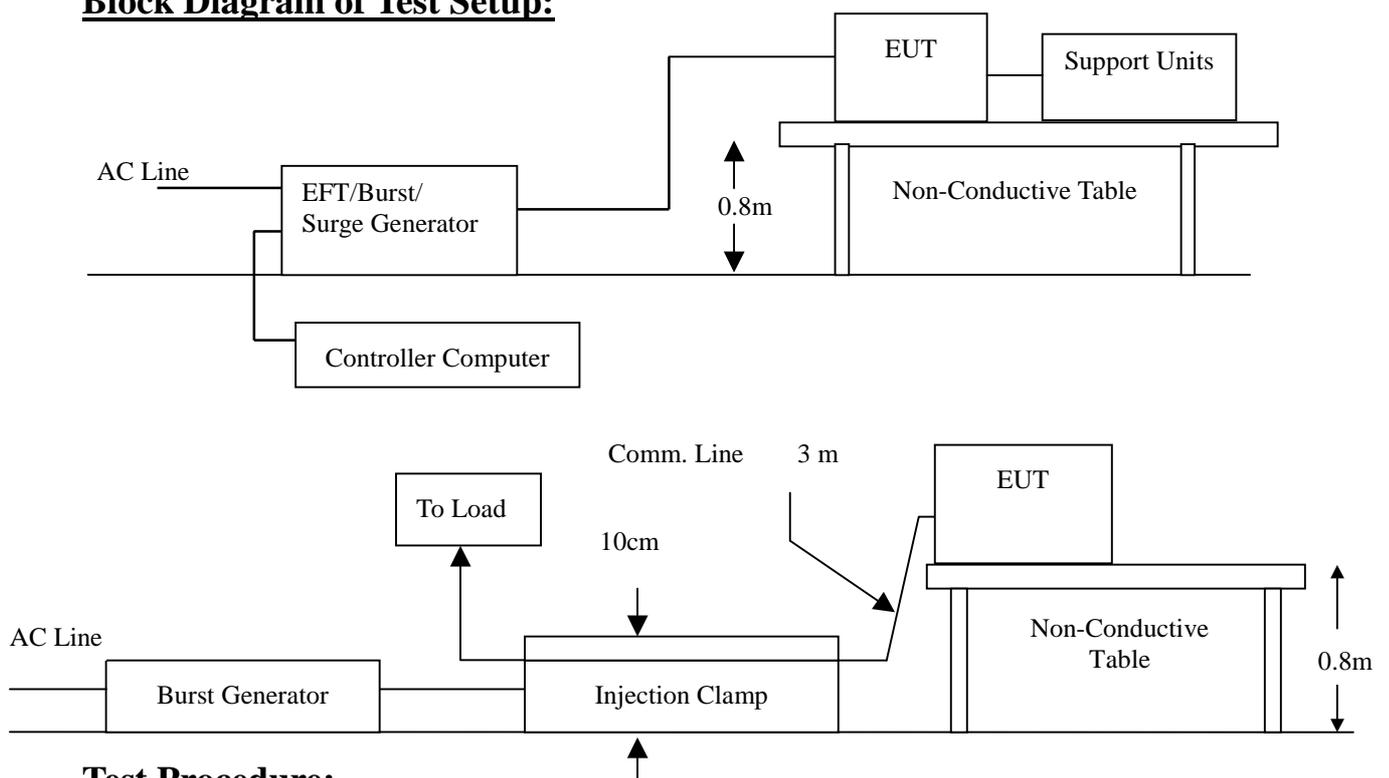
**Tested by** : Bill Cheng

**Temperature** : 23°C

**Humidity** : 54% RH

**Pressure** : 1006mbar

### Block Diagram of Test Setup:



### Test Procedure:

1. The EUT and support units were located on a wooden table 0.8 m away from ground reference plane.
2. A 1.0 meter long power cord was attached to EUT during the test.
3. The length of communication cable between communication port and clamp was keeping within 1 meter.
4. Injected test voltage to the EUT ports from minimum to standard request or client request.
5. Recording the test result as shown in following table.



**Test conditions:**

Impulse Frequency : 5kHz  
Tr/Th : 5/50ns  
Burst Duration : 15ms  
Burst Period : 3Hz

Inject Line	Voltage kV		Inject Method	Result (Pass/Fail)
	EN 55024	EN 61000-6-2		
L	± 1	± 2	Direct	Pass
N	± 1	± 2	Direct	Pass
PE	± 1	± 2	Direct	Pass
L + N	± 1	± 2	Direct	Pass
L + PE	± 1	± 2	Direct	Pass
N + PE	± 1	± 2	Direct	Pass
L + N + PE	± 1	± 2	Direct	Pass
RJ 45 Port (LAN Cable)	± 0.5	± 1	Clamp	Pass

**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

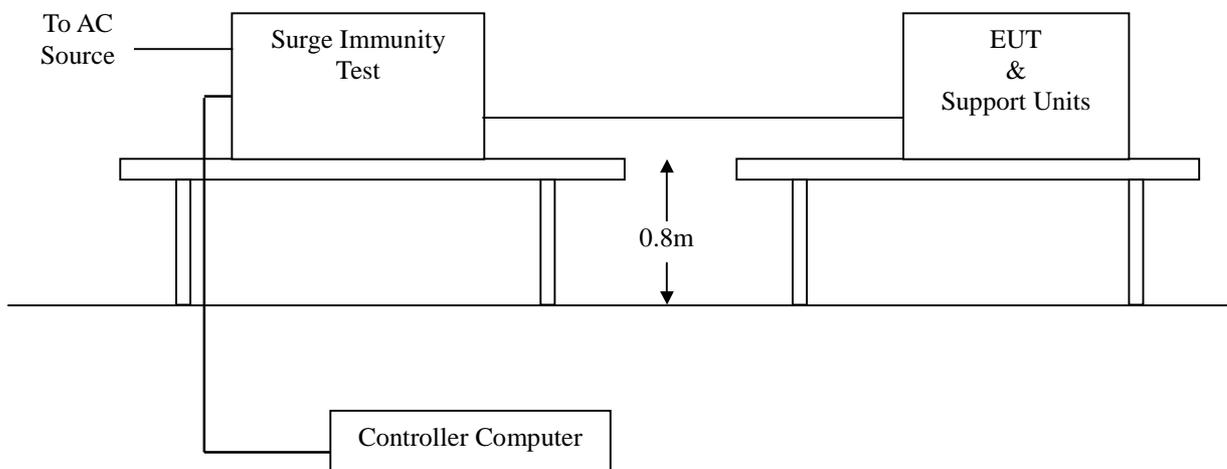
<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
<b>Observation:</b> The LAN ports were lost communicated during the test, but can be auto recovered as the events disappear.

## 13 SURGE IMMUNITY TEST

EN 55024 / EN 61000-6-2

<b>Port</b>	: Power Cord
<b>Basic Standard</b>	: IEC/EN 61000-4-5
<b>Requirements</b>	: $\pm 1$ kV (Line to Line) $\pm 2$ kV (Line to Ground)
<b>Performance Criteria</b>	: B (Standard Required)
<b>Tested by</b>	: Bill Cheng
<b>Temperature</b>	: 23°C
<b>Humidity</b>	: 54% RH
<b>Pressure</b>	: 1006mbar

### Block Diagram of Test Setup:



### Test Procedure:

1. The EUT and support units were located on a wooden table 0.8 m away from ground floor.
2. Injected test voltage to the EUT ports from minimum to standard request or client request.
3. Recording the test result as shown in following table.



**Test conditions:**

Voltage Waveform : 1.2/50 us  
 Current Waveform : 8/20 us  
 Polarity : Positive/Negative  
 Phase angle : 0°, 90°, 270°  
 Number of Test : 5

Coupling Line	Voltage (kV)	Polarity	Coupling Method	Result (Pass/Fail)
L1-L2	1	Positive	Capacitive	Pass
L1-PE	2	Positive	Capacitive	Pass
L2-PE	2	Positive	Capacitive	Pass
L1-L2	1	Negative	Capacitive	Pass
L1-PE	2	Negative	Capacitive	Pass
L2-PE	2	Negative	Capacitive	Pass

**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
<b>Observation:</b> No function degraded during the tests.

# 14 CONDUCTED DISTURBANCE/INDUCED RADIO-FREQUENCY FIELD IMMUNITY TEST

EN 55024 / EN 61000-6-2

**Port** : AC Port and LAN Cable

**Basic Standard** : IEC/EN 61000-4-6

**Requirements** : 3 V / 10V with 80% AM. 1kHz Modulation.

**Injection Method** : CDN-M3 for Power Cord

**Performance Criterion** : A (Standard Required)

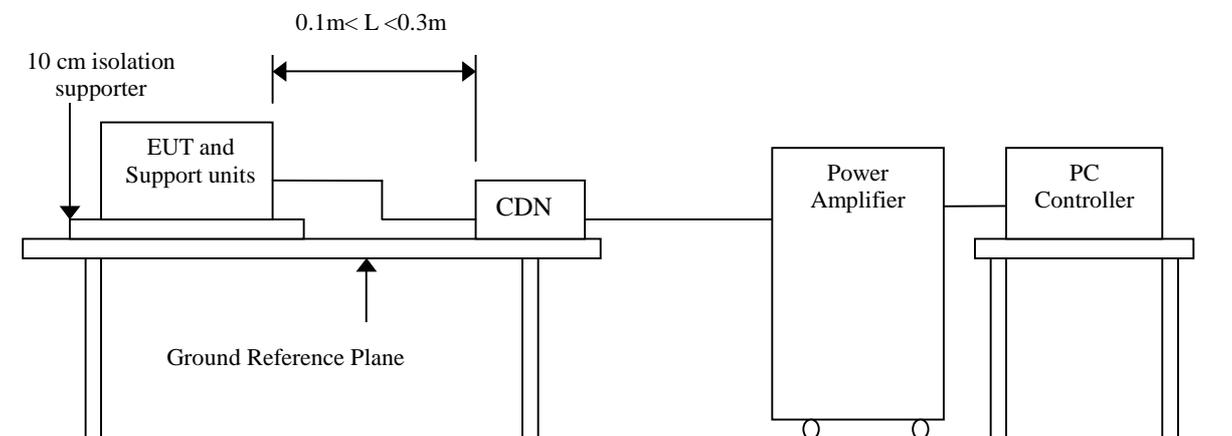
**Tested by** : Bill Cheng

**Temperature** : 20°C

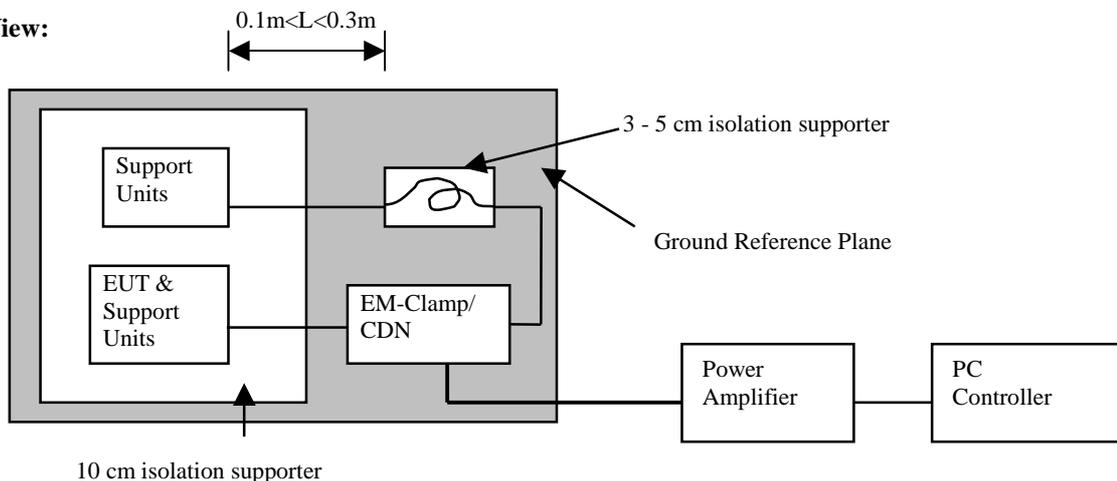
**Humidity** : 54% RH

**Pressure** : 1007mbar

## Block Diagram of Test Setup:



## Top View:





**Test Procedure:**

1. The EUT and support units were located at a ground reference plane with the interposition of a 0.1 m thickness insulating support and the CDN was located on GRP directly.
2. Setting the testing parameters of CS test software as per IEC 61000-4-6.
3. Recording the test result in following table.

**Test conditions:**

Frequency Range : 0.15MHz-80MHz

Frequency Step : 1% of fundamental

Dwell Time : 3 sec

Range (MHz)	Field		Modulation	Result (Pass/Fail)
	EN 55024	EN 61000-6-2		
0.15-80	3V	10V	Yes	Pass

**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
--

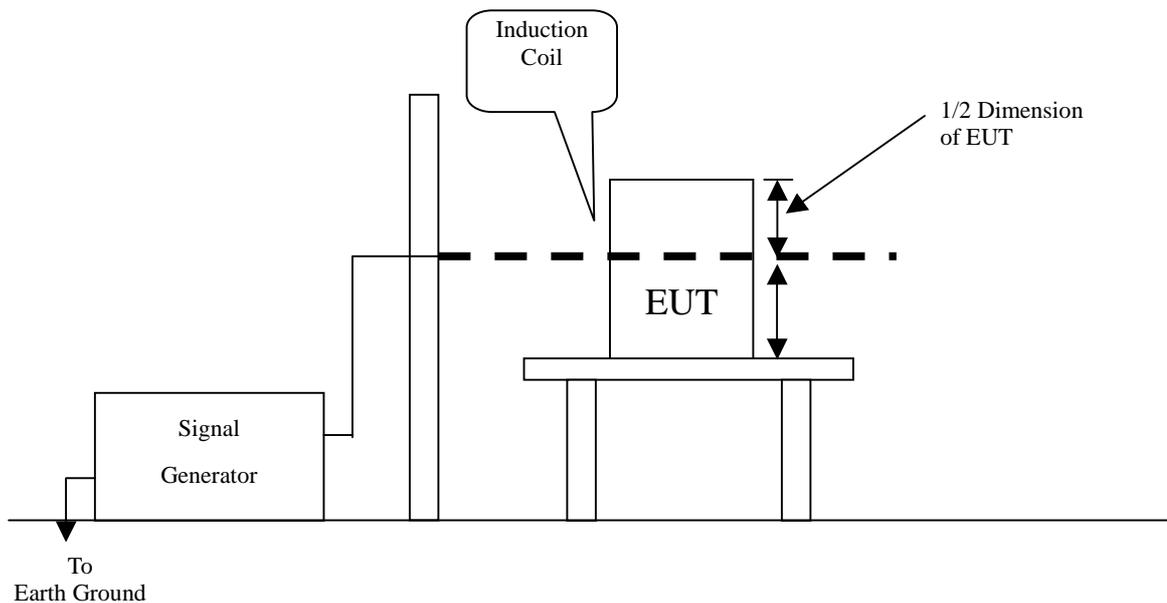
<b>Observation:</b> No function degraded during the tests.
--

## 15 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

EN 55024 / EN 61000-6-2

Port	: Enclosure
Basic Standard	: IEC/EN 61000-4-8
Requirements	: 1 A/m / 30 A/m
Performance Criterion	: A (Standard Required)
Tested by	: Bill Cheng
Temperature	: 23°C
Humidity	: 54% RH
Pressure	: 1006mbar

### Block Diagram of Test Setup:



### Test Procedure:

1. The EUT and support units were located on Ground Reference Plane with the interposition of a 0.1 m thickness insulation support.
2. Putting the induction coil on horizontal direction. ( X direction )
3. Rotating the induction coil by 90° ( Y direction )
4. Rotating the induction coil by 90° again ( Z direction )
5. Recording the test result as shown in following table.



**Test conditions:**

Field Strength: 1A/m; 30A/m

Power Freq.: 50Hz

Orientation: X, Y, Z

Orientation	Field		Result (Pass/Fail)	Remark
	EN 55024	EN 61000-6-2		
X	1A/m	30A/m	Pass	
Y	1A/m	30A/m	Pass	
Z	1A/m	30A/m	Pass	

**Performance & Result:**

- Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.
- Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
--

<b>Observation:</b> No function degraded during the tests.
--

## 16 VOLTAGE DIPS / SHORT INTERRUPTIONS

**Port** : AC mains  
**Basic Standard** : IEC/EN 61000-4-11  
**Requirement** : PHASE ANGLE 0, 45, 90, 135, 180, 225, 270, 315 degrees  
**EN 55024**

Voltage Dips	Test Level % $U_T$	Reduction (%)	Duration ( periods )	Performance Criteria
	<5	>95	0.5	B
	70	30	25	C

Voltage Interceptions	Test Level % $U_T$	Reduction (%)	Duration ( periods )	Performance Criteria
	<5	>95	250	C

### EN 61000-6-2

Voltage Dips	Test Level % $U_T$	Reduction (%)	Duration ( periods )	Performance Criteria
	< 5	> 95	250	C
	70	30	0.5	B

Voltage Interceptions	Test Level % $U_T$	Reduction (%)	Duration ( periods )	Performance Criteria
	40	60	5 / 50	C

**Test Interval** : Min. 10 sec.

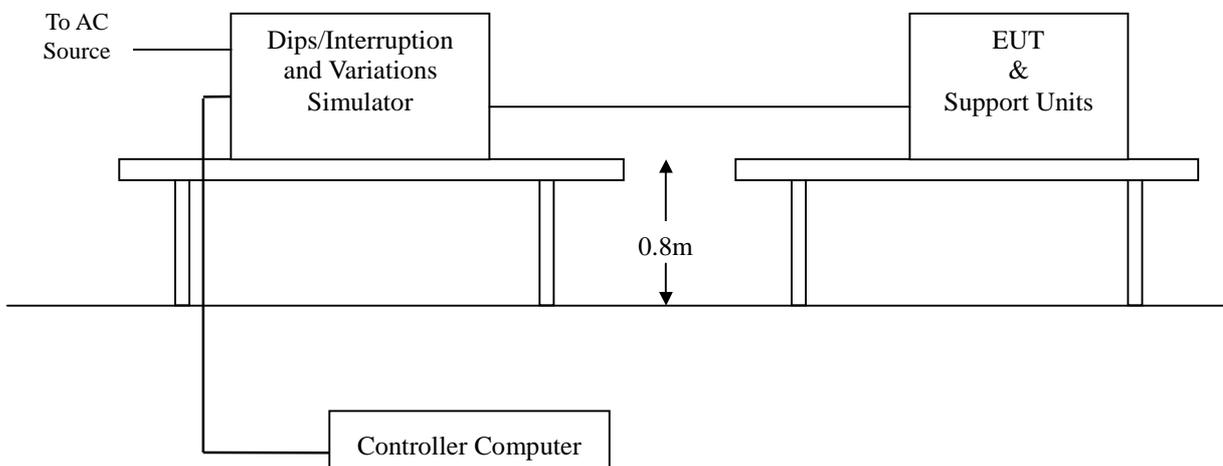
**Tested by** : Bill Cheng

**Temperature** : 23°C

**Humidity** : 54% RH

**Pressure** : 1006mbar

### Block Diagram of Test Setup:



**Test Procedure:**

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then Perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. Recording the test result in test record form.

**Test conditions**

The duration with a sequence of three dips/interruptions with interval of 10 s minimum (Between each test event)

**EN 55024****Voltage Dips:**

Test Level % U <sub>T</sub>	Reduction (%)	Duration (periods)	Observation	Meet Performance Criteria
0	100	0.5	Normal	A
70	30	25	Normal	A

**Voltage Interruptions:**

Test Level % U <sub>T</sub>	Reduction (%)	Duration (periods)	Observation	Meet Performance Criteria
0	100	250	EUT shut down but can be recovered by manual, as the events disappear.	C

**EN 61000-6-2****Voltage Dips:**

Test Level % U <sub>T</sub>	Reduction (%)	Duration (periods)	Observation	Meet Performance Criteria
70	30	0.5	Normal	A
40	60	5 / 50	Normal	A

**Voltage Interruptions:**

Test Level % U <sub>T</sub>	Reduction (%)	Duration (periods)	Observation	Meet Performance Criteria
0	100	250	EUT shut down but can be recovered by manual, as the events disappear.	C



**Performance & Result:**

**Criteria A:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance.

**Criteria B:** The apparatus continues 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. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.

**Criteria C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <b>PASS</b> <input type="checkbox"/> <b>FAIL</b>
--

## APPENDIX I - PHOTOGRAPHS OF TEST SETUP

### LINE CONDUCTED EMISSION TEST



### RADIATED EMISSION TEST (EN 55022)



### RADIATED EMISSION TEST (EN 55011)



## COMMON MODE CONDUCTED EMISSION TEST



## ELECTROSTATIC DISCHARGE TEST





## RADIATED ELECTROMAGNETIC FIELD TEST



## FAST TRANSIENTS/BURST TEST



## SURGE IMMUNITY TEST





## POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST



## VOLTAGE DIPS / INTERRUPTION TEST





## APPENDIX II – TEST RESULT OF EN 61000-3-3

ADVANTECH

Date : 2005/1/26 PM 09:42:5 V3.15

File :

Operator : BILL CHENG  
 EUT : Intel® Pentium®-M PCI-104 CPU module  
 Model No. PCM-3380  
 Remarks TEMP:26 HUMD:55

Urms = 230.1V Freq = 49.987 Range: 5 A  
 Irms = 0.479A Ipk = 1.809A cf = 3.781  
 P = 55.47W Pap = 110.1VA pf = 0.504

Test - Time : 1 x 10min = 10min ( 100 %)

LIN (Line Impedance Network) : SLIN 0.24ohm +j0.15ohm N:0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00  
 dmax : 4.00 % dc : 3.30 %  
 dtLim: 3.30 % dt>Lim: 500ms

Test completed, Result: PASSED

Plt = 0.072

	Pst	dmax	dc	dt>Lim	Fail
		[%]	[%]	[ms]	
1	0.072	0.000	0.010	0.000	



ADVANTECH

Date : 2005/1/26 PM 09:54:2 V3.15

File :

Operator : BILL CHENG  
 EUT : Intel® Pentium®-M PCI-104 CPU module  
 Model No. PCM-3380  
 Remarks TEMP:26 HUMD:55

Urms = 230.1V Freq = 49.987 Range: 5 A  
 Irms = 0.344A Ipk = 1.313A cf = 3.816  
 P = 39.27W Pap = 79.21VA pf = 0.496

Test - Time : 1 x 10min = 10min ( 100 %)

LIN (Line Impedance Network) : SLIN 0.24ohm +j0.15ohm N:0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00  
 dmax : 4.00 % dc : 3.30 %  
 dtLim: 3.30 % dt>Lim: 500ms

Test completed, Result: PASSED

Plt = 0.072

	Pst	dmax	dc	dt>Lim	Fail
		[%]	[%]	[ms]	
1	0.072	0.320	0.240	0.000	