



CE EMC

TEST REPORT

For

IPC

Model: ARK-3381; ARK 3382

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: IPC

Trade Name: ADVANTECH

Model: ARK-3381; ARK 3382

Detailed EUT Description: See Item 2 of this report

Date of Test: April 18 ~ 27, 2005

Applicable Standard	Class/Limit/Criterion	Test Result
EN 55022: 1998	Class A	No non-compliance noted
EN 55011: 1998 + A1: 1999 + A2: 2000 (Group 1)	Class A	No non-compliance noted
EN 61000-3-2: 2000	Class D	No non-compliance noted
EN 61000-3-3: 1995 + A1: 2001	Limit	No non-compliance noted
EN 55024: 1998 + A1: 2001 (EN 61000-6-2: 2001)		
IEC 61000-4-2: 1995 + A2: 2000	Criterion B	No non-compliance noted
IEC 61000-4-3: 2002	Criterion A	No non-compliance noted
IEC 61000-4-4: 1995 + A1: 2000 + A2: 2001	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
Deviation from Applicable Standard		
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, Amended by 92/31/EEC and 93/68/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

Product	IPC		
Trade Name	ADVANTECH		
Model	ARK-3381; ARK 3382		
Housing Type	Metal Case		
EUT Power Rating	DCV From Power Adapter		
Power Adapter Manufacturer	LE	Model	LE-9702B
Power Adapter Power Rating	I/P: 100-240VAC, 50-60Hz O/P: 12VDC, 4A		
AC Power Cord Type	Unshielded, 1.8m (Detachable) to Power Adapter		
DC Power Cable Type	Unshielded, 1.8m (Non-detachable) with a core at Power Adapter		
HDD Manufacturer	Fujitsu	Model	MHT2040AT
Mother Board Manufacturer	ADVANTECH	Model	PCM-9300
For ARK-3381			
CPU Manufacturer	Intel	Model	1.1GHz
Memory Capacity	512MB		
For ARK-3382			
CPU Manufacturer	Intel	Model	1.4GHz
Memory Capacity	384MB		

**I/O Port of EUT (For ARK-3381)**

I/O Port Type	Q'TY	TESTED WITH
1. Serial Port	7	7
2. PS/2 Keyboard Port	1	1
3. Video Out Port (VGA)	1	1
4. LVDS Port	1	1
5. LAN Port	1	1
6. USB Port	1	1

I/O Port of EUT (For ARK 3382)

I/O Port Type	Q'TY	TESTED WITH
1. Serial Port	2	2
2. PS/2 Keyboard Port	1	1
3. Video Out Port (VGA)	1	1
4. LVDS Port	1	1
5. LAN Port	4	4
6. USB Port	1	1



3 TEST METHODOLOGY

3.1 EUT SYSTEM OPERATION

1. EMI test software was loaded and executed under “Windows XP” environment.
2. A communicated software was loaded and executed to communicate between EUT and remote side.
3. EUT sends and receives data from Notebook PC on remote side via LAN Cable.
4. Data was sent to monitor filling the screen with upper case of “H” patterns.
5. Test program sequentially exercised all related I/O’s of EUT and sent “H” patterns to all applicable output ports of EUT.
6. Repeat step 2 to 5

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

1280 x 1024 Recitation (ARK-3381)

Mode 2

1280 x 1024 Recitation / LAN (ARK 3382)

Mode 3

1024 x 768 Recitation (ARK-3381)

Mode 4

1024 x 768 Recitation (ARK 3382)

Mode 5

800 x 600 Recitation (ARK-3381)

Mode 6

800 x 600 Recitation (ARK 3382)

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

Mode 1, 2.

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

(For ARK-3381)

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1.	Monitor	959NF	AQ19H2RT706122K	FCC DoC	SAMSUNG	Shielded, 1.8m with two cores	Unshielded, 1.8m
2.	Modem	DM-1414	304012266	IFAXDM1414	ACEEX	Unshielded, 1.5m	Unshielded, 1.5m
3.	Modem	DM-1414	304012267	IFAXDM1414	ACEEX	Unshielded, 1.5m	Unshielded, 1.5m
4.	Modem	DM-1414	304012268	IFAXDM1414	ACEEX	Unshielded, 1.5m	Unshielded, 1.5m
5.	PS/2 Keyboard (one to two adapter)	SK-2800C	N/A	FCC DoC	COMPAQ	Shielded, 1.5m	N/A
6.	PS/2 Mouse (one to two adapter)	M-S69	N/A	FCC DoC	COMPAQ	Shielded, 1.5m	N/A
7.	Mouse	M-MM43	LZE95250096	FCC DoC	Logitech	Shielded, 1.5m	N/A
8.	Mouse	M-MM43	LZE93353074	FCC DoC	Logitech	Shielded, 1.5m	N/A
9.	Mouse	M-MM43	LZE94052791	FCC DoC	Logitech	Shielded, 1.5m	N/A
10.	Mouse	M-MM43	LZE94052771	FCC DoC	Logitech	Shielded, 1.5m	N/A
11.	USB 2.0 External HDD	F12-UF	A0100214-43b0001	FCC DoC	TeraSys	Shielded, 1.5m	N/A
12.	Notebook PC (Remote)	PPT	0932RY	E2K24GBRL	DELL	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m

(For ARK 3382)

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1.	Monitor	959NF	AQ19H2RT706122K	FCC DoC	SAMSUNG	Shielded, 1.8m with two cores	Unshielded, 1.8m
2.	PS/2 Keyboard (one to two adapter)	SK-2800C	N/A	FCC DoC	COMPAQ	Shielded, 1.5m	N/A
3.	PS/2 Mouse (one to two adapter)	M-S69	N/A	FCC DoC	COMPAQ	Shielded, 1.5m	N/A
4.	Mouse	M-MM43	LZE95250096	FCC DoC	Logitech	Shielded, 1.5m	N/A
5.	Mouse	M-MM43	LZE93353074	FCC DoC	Logitech	Shielded, 1.5m	N/A
6.	USB 2.0 External HDD	F12-UF	A0100214-43b0001	FCC DoC	TeraSys	Shielded, 1.5m	N/A
7.	HUB (Remote)	DS104	N/A	FCC DoC	NERGEAR	LAN Cable x 4: Unshielded, 10m	Unshielded, 1.8m
8.	Notebook PC (Remote)	PPT	0932RY	E2K24GBRL	DELL	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m

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







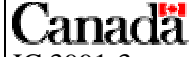
5.1 FACILITIES

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 # 4				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	847793/012	12/27/2005
LISN	EMCO	3825/2	9003-1628	07/26/2005
LISN	R&S	ENV 4200	830326/016	03/30/2006
Spectrum Analyzer	ADVANTEST	R3261AN	31720234	N.C.R
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.

Open Area Test Site # 2				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ADVANTEST	R3261A	21720279	N.C.R
EMI Test Receiver	R&S	ESVS10	834468/006	04/06/2006
Pre-Amplifier	HP	8447D	2944A08780	07/14/2005
Bilog Antenna	Sunol Sciences	JB1	A111203	12/24/2005
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R
RF Switch	ANRITSU	MP59B	M76890	N.C.R
Site NSA	CCS	N/A	N/A	08/13/2005

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 (IEC/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

ESD Test Site (IEC/EN 61000-4-2)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Generator	SCHAFFNER	NSG438	170	04/19/2006

Radiated Electromagnetic Field Immunity Test Site (IEC/EN 61000-4-3)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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

Fast Transients/Burst Test Site (IEC/EN 61000-4-4)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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

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



CS Test Site (IEC/EN 61000-4-6)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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	03/04/2006
CDN	FRANKONIA	CDN-M2	A3002010	08/06/2005
CDN	SCHAFFNER	T400	16906	12/29/2005

Power Frequency Magnetic Field Immunity Test Site (IEC/EN 61000-4-8)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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

Voltage Dips/Short Interruption and Voltage Variation Immunity Test Site (IEC/EN 61000-4-11)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Dips/Interruption and Variations Simulator	HAEFELY TRENCH	PLINE 1610	080 344-05	04/10/2006

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 (ARK-3381)****Mode 2****10/100 Mbps (ARK-3382)**

- 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, 2.**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.
- 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:**

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
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:**

Freq. (MHz)	Raw Data (dBuV)	Corr. Factor (dB/m)	Emiss. Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
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: ARK-3381**Test Mode:** Mode 1**Temperature:** 25°C**Humidity:** 58% RH**Tested by:** Carl Chang**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
8.562	28.70	---	73.00	60.00	-44.30	---	L1
11.508	25.50	---	73.00	60.00	-47.50	---	L1
12.993	25.10	---	73.00	60.00	-47.90	---	L1
14.168	26.40	---	73.00	60.00	-46.60	---	L1
15.891	29.70	---	73.00	60.00	-43.30	---	L1
17.118	31.60	---	73.00	60.00	-41.40	---	L1
8.581	25.40	---	73.00	60.00	-47.60	---	L2
10.169	24.00	---	73.00	60.00	-49.00	---	L2
13.072	27.20	---	73.00	60.00	-45.80	---	L2
16.129	29.60	---	73.00	60.00	-43.40	---	L2
17.151	29.80	---	73.00	60.00	-43.20	---	L2
19.070	31.20	---	73.00	60.00	-41.80	---	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.

**Line Conducted Emission****Model:** ARK 3382**Test Mode:** Mode 2**Temperature:** 25°C**Humidity:** 58% RH**Tested by:** Carl Chang**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
10.029	26.10	---	73.00	60.00	-46.90	---	L1
11.008	27.40	---	73.00	60.00	-45.60	---	L1
13.091	28.40	---	73.00	60.00	-44.60	---	L1
14.129	30.30	---	73.00	60.00	-42.70	---	L1
15.633	31.70	---	73.00	60.00	-41.30	---	L1
17.192	30.90	---	73.00	60.00	-42.10	---	L1
9.719	27.40	---	73.00	60.00	-45.60	---	L2
10.353	26.50	---	73.00	60.00	-46.50	---	L2
12.243	28.70	---	73.00	60.00	-44.30	---	L2
13.218	29.30	---	73.00	60.00	-43.70	---	L2
15.629	29.80	---	73.00	60.00	-43.20	---	L2
16.542	30.20	---	73.00	60.00	-42.80	---	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:** ARK-3381**Test Mode:** Mode 1**Temperature:** 28°C**Humidity:** 59% RH**Tested by:** Carl Chang**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
0.931	61.20	---	87.00	74.00	-25.80	---	10Base
3.040	59.60	---	87.00	74.00	-27.40	---	10Base
4.409	55.80	---	87.00	74.00	-31.20	---	10Base
5.912	53.70	---	87.00	74.00	-33.30	---	10Base
7.922	57.10	---	87.00	74.00	-29.90	---	10Base
9.391	58.40	---	87.00	74.00	-28.60	---	10Base
0.931	62.60	---	87.00	74.00	-24.40	---	100Base
3.039	60.00	---	87.00	74.00	-27.00	---	100Base
4.408	55.90	---	87.00	74.00	-31.10	---	100Base
5.911	54.80	---	87.00	74.00	-32.20	---	100Base
7.921	59.40	---	87.00	74.00	-27.60	---	100Base
9.392	59.20	---	87.00	74.00	-27.80	---	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.

**Common Mode Conducted Emission****Model:** ARK 3382**Test Mode:** Mode 2**Temperature:** 28°C**Humidity:** 59% RH**Tested by:** Carl Chang**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
0.931	63.70	---	87.00	74.00	-23.30	---	10Base
3.038	58.50	---	87.00	74.00	-28.50	---	10Base
4.411	52.60	---	87.00	74.00	-34.40	---	10Base
5.908	53.40	---	87.00	74.00	-33.60	---	10Base
7.919	55.30	---	87.00	74.00	-31.70	---	10Base
9.393	56.10	---	87.00	74.00	-30.90	---	10Base
0.931	63.90	---	87.00	74.00	-23.10	---	100Base
3.039	59.00	---	87.00	74.00	-28.00	---	100Base
4.412	54.30	---	87.00	74.00	-32.70	---	100Base
9.000	53.70	---	87.00	74.00	-33.30	---	100Base
7.921	56.20	---	87.00	74.00	-30.80	---	100Base
9.392	56.90	---	87.00	74.00	-30.10	---	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.

**Radiated Emission (A)****Model:** ARK-3381**Test Mode:** Mode 1**Temperature:** 23°C**Humidity:** 56% RH**Detector Function:** Quasi-peak.**Antenna:** Vertical at 10m**Tested by:** Carl Chang**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)
108.13	25.5	13.4	38.9	40.0	-2.4
147.58	18.9	15.1	34.0	40.0	-6.0
153.86	20.8	14.7	35.5	40.0	-4.5
162.36	11.3	14.3	25.6	40.0	-14.4
378.00	26.0	18.5	44.5	47.0	-2.5
540.15	15.8	22.7	38.5	47.0	-8.5
648.21	14.8	24.4	39.2	47.0	-7.8
702.20	17.1	25.0	42.1	47.0	-4.9
756.19	17.4	25.4	42.8	47.0	-4.2
810.24	15.5	27.5	43.0	47.0	-4.0
864.31	15.0	27.1	42.1	47.0	-4.9
918.14	12.6	28.0	40.6	47.0	-6.4
972.14	15.1	28.8	43.9	47.0	-3.1

**Radiated Emission (B)****Model:** ARK-3381**Test Mode:** Mode 1**Temperature:** 23°C**Humidity:** 56% RH**Detector Function:** Quasi-peak.**Antenna:** Horizontal at 10m**Tested by:** Carl Chang**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)
108.06	22.8	13.4	36.2	40.0	-3.8
144.10	21.0	15.3	36.3	40.0	-3.7
162.05	25.3	14.3	39.6	40.0	-2.4
216.01	25.7	14.1	39.8	40.0	-2.1
378.07	26.0	18.5	44.5	47.0	-2.5
399.81	11.9	18.8	30.7	47.0	-16.3
410.60	13.7	19.1	32.8	47.0	-14.2
432.26	12.9	19.8	32.7	47.0	-14.3
487.26	14.0	21.3	35.3	47.0	-11.7
864.27	15.6	27.1	42.7	47.0	-4.3
918.31	13.4	28.0	41.4	47.0	-5.6
972.33	9.0	28.8	37.8	47.0	-9.2

**Radiated Emission (A)****Model:** ARK 3382**Test Mode:** Mode 2**Temperature:** 23°C**Humidity:** 56% RH**Detector Function:** Quasi-peak.**Antenna:** Vertical at 10m**Tested by:** Carl Chang**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)
108.05	24.7	13.4	38.1	40.0	-1.9
162.02	23.4	14.3	37.7	40.0	-2.3
171.84	23.7	14.1	37.8	40.0	-2.2
199.35	22.8	14.7	37.5	40.0	-2.5
365.56	20.3	18.4	38.7	47.0	-8.3
498.57	23.0	21.7	44.7	47.0	-2.3
697.91	16.2	25.0	41.2	47.0	-5.8
756.29	13.4	25.4	38.8	47.0	-8.2
797.54	13.7	27.5	41.2	47.0	-5.8
816.27	9.2	27.4	36.6	47.0	-10.4
996.90	8.1	29.1	37.2	47.0	-9.8

**Radiated Emission (B)****Model:** ARK 3382**Test Mode:** Mode 2**Temperature:** 23°C**Humidity:** 56% RH**Detector Function:** Quasi-peak.**Antenna:** Horizontal at 10m**Tested by:** Carl Chang**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)
332.44	22.2	17.4	39.6	47.0	-7.4
365.66	19.9	18.4	38.3	47.0	-8.7
432.66	24.0	19.8	43.8	47.0	-3.2
487.25	21.8	21.3	43.1	47.0	-3.9
498.47	18.4	21.7	40.1	47.0	-6.9
564.97	9.6	23.0	32.6	47.0	-14.4
631.02	18.2	24.0	42.2	47.0	-4.8
668.02	15.4	24.6	40.0	47.0	-7.0
972.02	11.8	28.8	40.6	47.0	-6.4



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

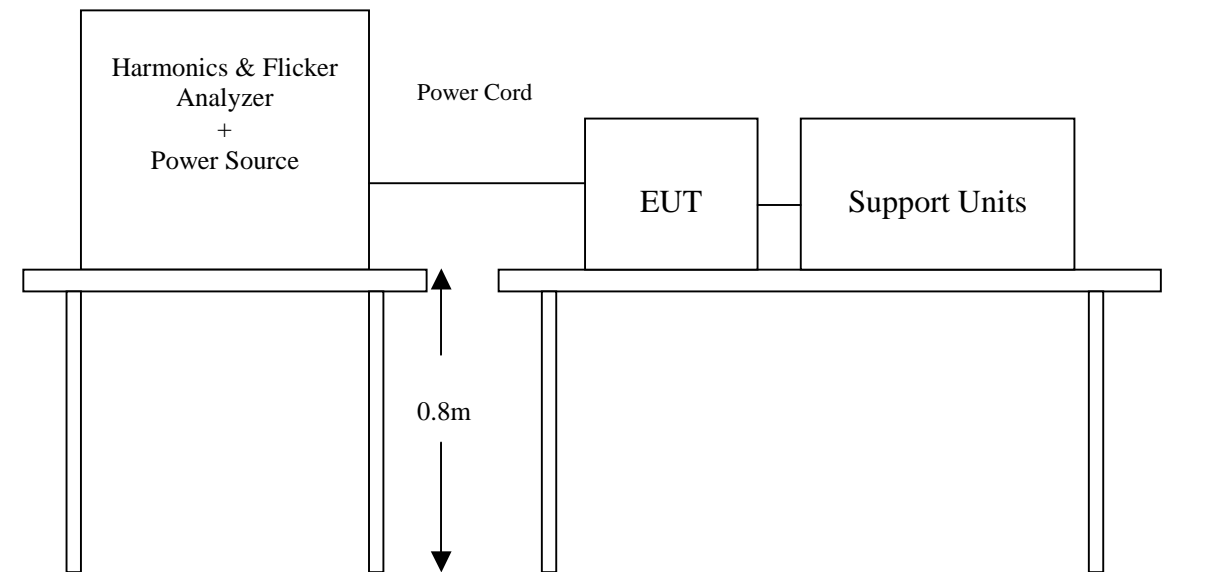
Temperature : N/A

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 :**Mode 1*****EUT max Power : 36.89W*****Mode 2*****EUT max Power : 38.32W***

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

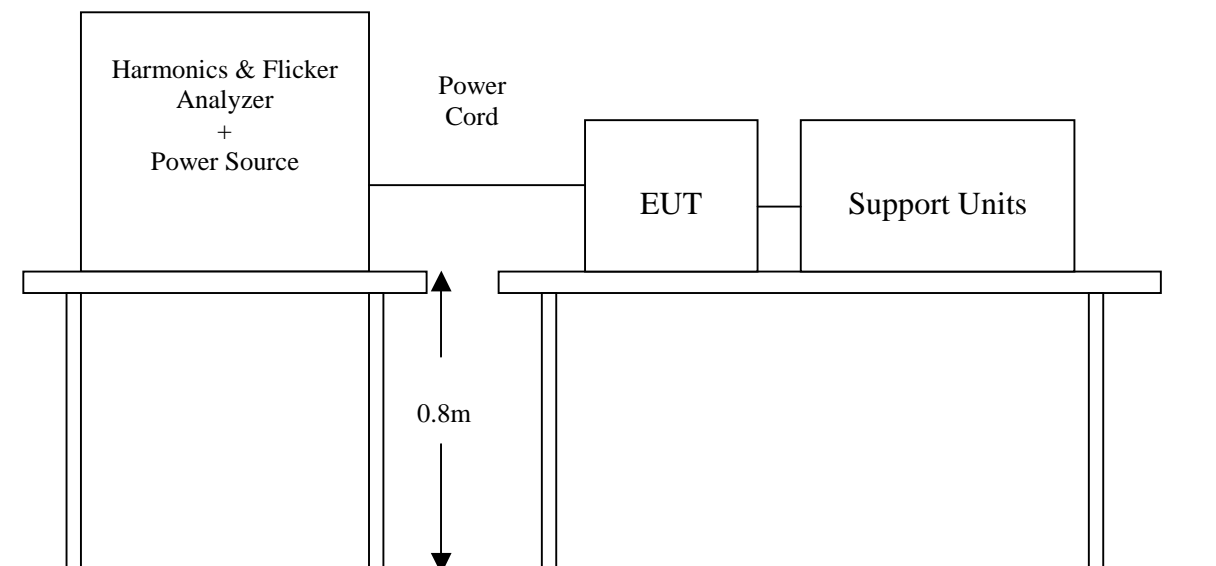
9 POWER VOLTAGE FLUCTUATION / FLICKER TEST

Port : AC mains
Basic Standard : EN 61000-3-3 (1995 + A1: 2001)
Limits : §5 of EN 61000-3-3
Tested by : Carl Chang
Temperature : 26
Humidity : 55%

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 :**Mode 1****Continue**

Test Parameter	Measurement Value	Limit	Result
P _{st}	0.072	1.0	Pass
P _{lt}	0.072	0.65	Pass
T _{dt} (ms)	0	500	Pass
d _{max} (%)	0%	4%	Pass
dc (%)	0.02%	3.3%	Pass

Manual Switch

Test Parameter	Measurement Value	Limit	Result
P _{st}	0.075	1.0	Pass
P _{lt}	0.075	0.65	Pass
T _{dt} (ms)	0	500	Pass
d _{max} (%)	0%	4%	Pass
dc (%)	0.03%	3.3%	Pass

**Mode 2****Continue**

Test Parameter	Measurement Value	Limit	Result
P _{st}	0.072	1.0	Pass
P _{lt}	0.072	0.65	Pass
T _{dt} (ms)	0	500	Pass
d _{max} (%)	0%	4%	Pass
dc (%)	0.04%	3.3%	Pass

Manual Switch

Test Parameter	Measurement Value	Limit	Result
P _{st}	0.072	1.0	Pass
P _{lt}	0.072	0.65	Pass
T _{dt} (ms)	0	500	Pass
d _{max} (%)	0%	4%	Pass
dc (%)	0.04%	3.3%	Pass

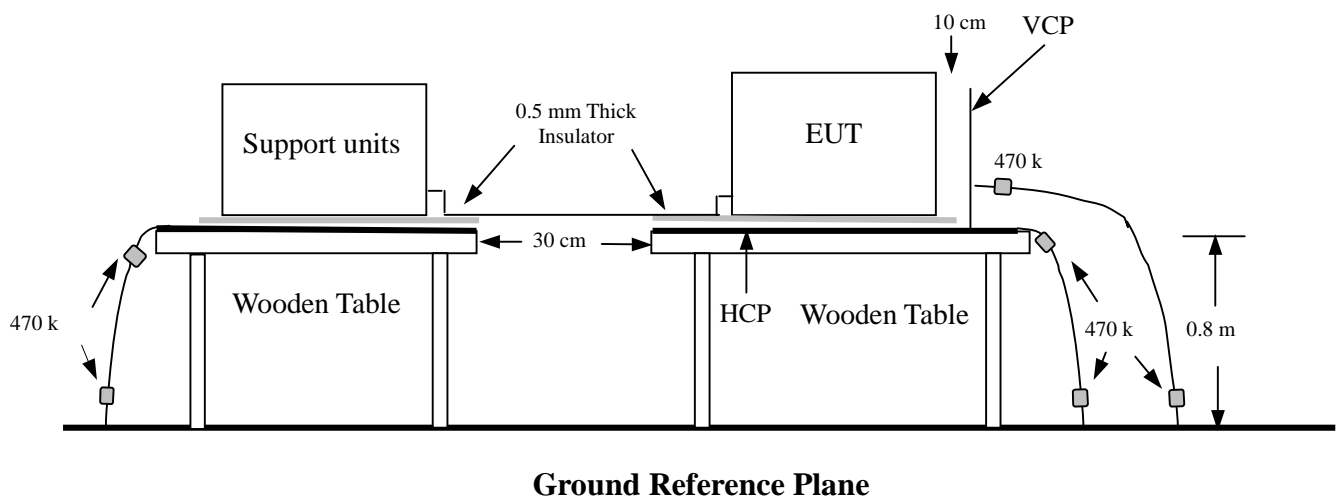
10 ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

10.1 EN 55024

Port	: Enclosure
Basic Standard	: IEC/EN 61000-4-2
Test Level	: ± 8 kV (Air Discharge) : ± 4 kV (Contact Discharge) : ± 4 kV (Indirect Discharge)
Performance Criterion	: B (Standard Required)
Tested by	: Carl Chang
Temperature	: 23°C
Humidity	: 58% RH
Pressure	: 1019mbar
Test Mode	: 1, 2.

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 XP 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.

☒ **PASS** ☐ **FAIL**

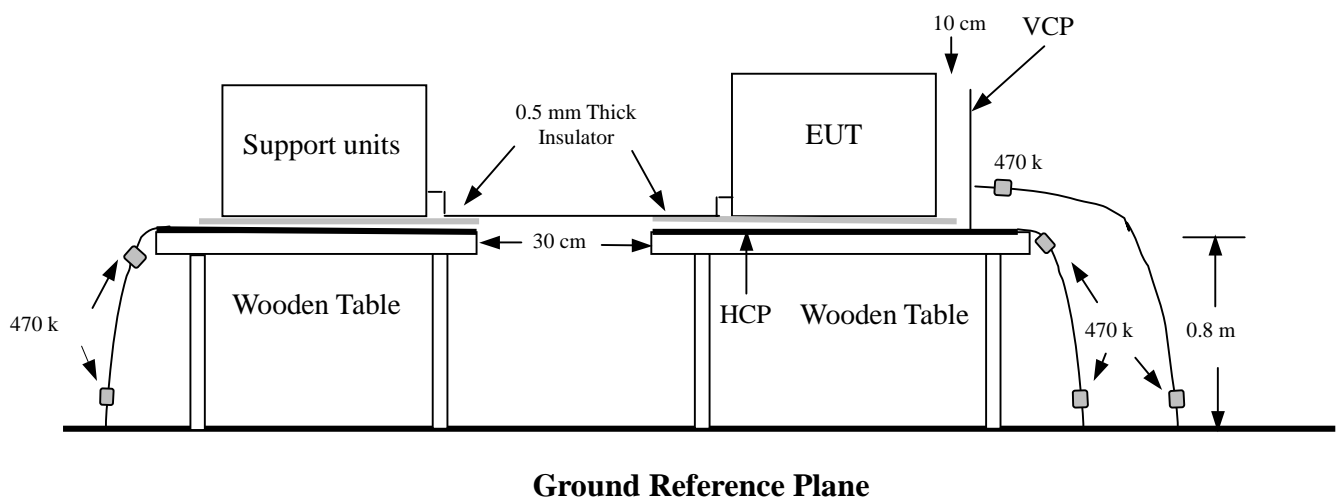
Observation: No function degraded during the tests.

10. 2 EN 61000-6-2

Port	: Enclosure
Basic Standard	: IEC/EN 61000-4-2
Test Level	: ± 8 kV (Air Discharge) ± 4 kV (Contact Discharge) ± 4 kV (Indirect Discharge)
Performance Criterion	: B (Standard Required)
Tested by	: Carl Chang
Temperature	: 23°C
Humidity	: 58% RH
Pressure	: 1019mbar
Test Mode	: 1, 2.

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 XP 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.

☒ **PASS** ☐ **FAIL**

Observation: No function degraded during the tests.

The Tested Points of EUT

Mode 1

Photo 1 of 2



Photo 2 of 2



Mode 2

Photo 1 of 2



Photo 2 of 2

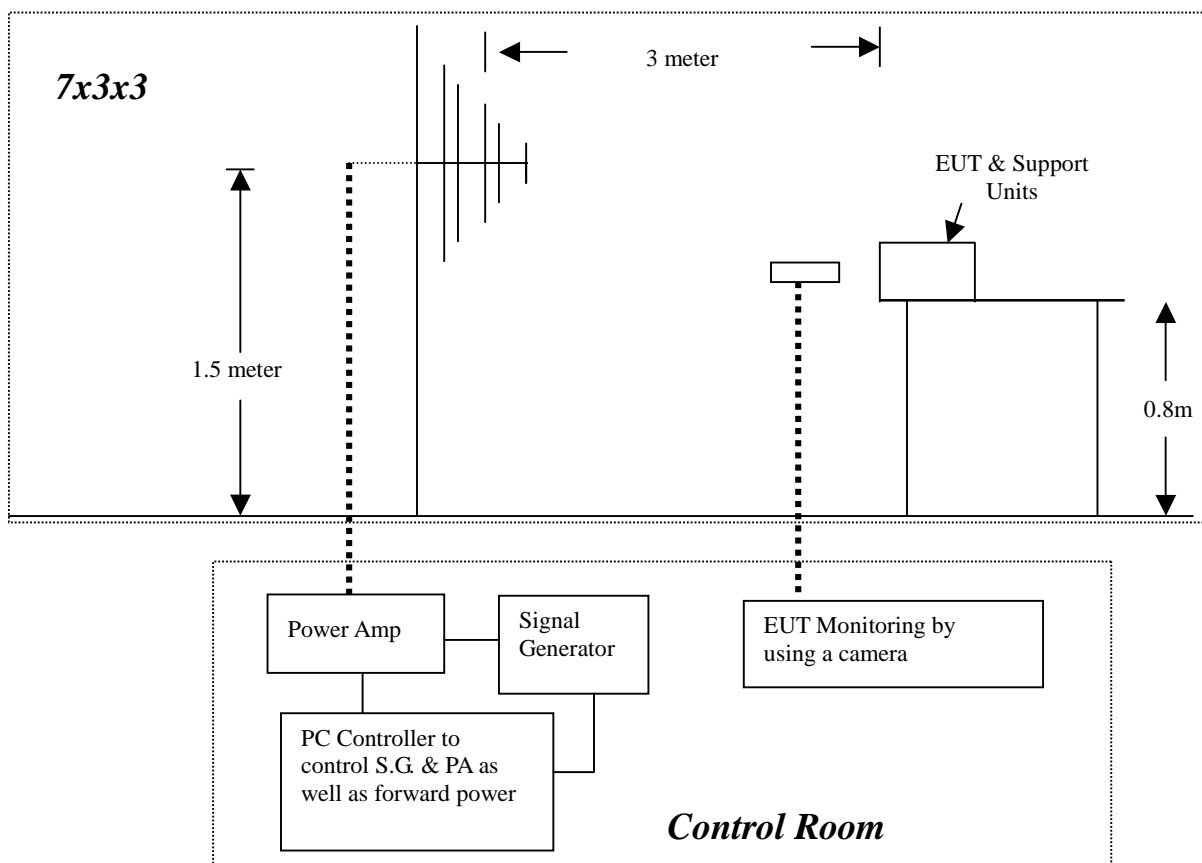


11 RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

11.1 EN 55024

Port	: Enclosure
Basic Standard	: IEC/EN 61000-4-3
Requirements	: 3 V/m / with 80% AM. 1kHz Modulation.
Performance Criterion	: A (Standard Required)
Tested by	: Carl Chang
Temperature	: 25°C
Humidity	: 57% RH
Pressure	: 1019mbar
Test Mode	: 1, 2.

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.

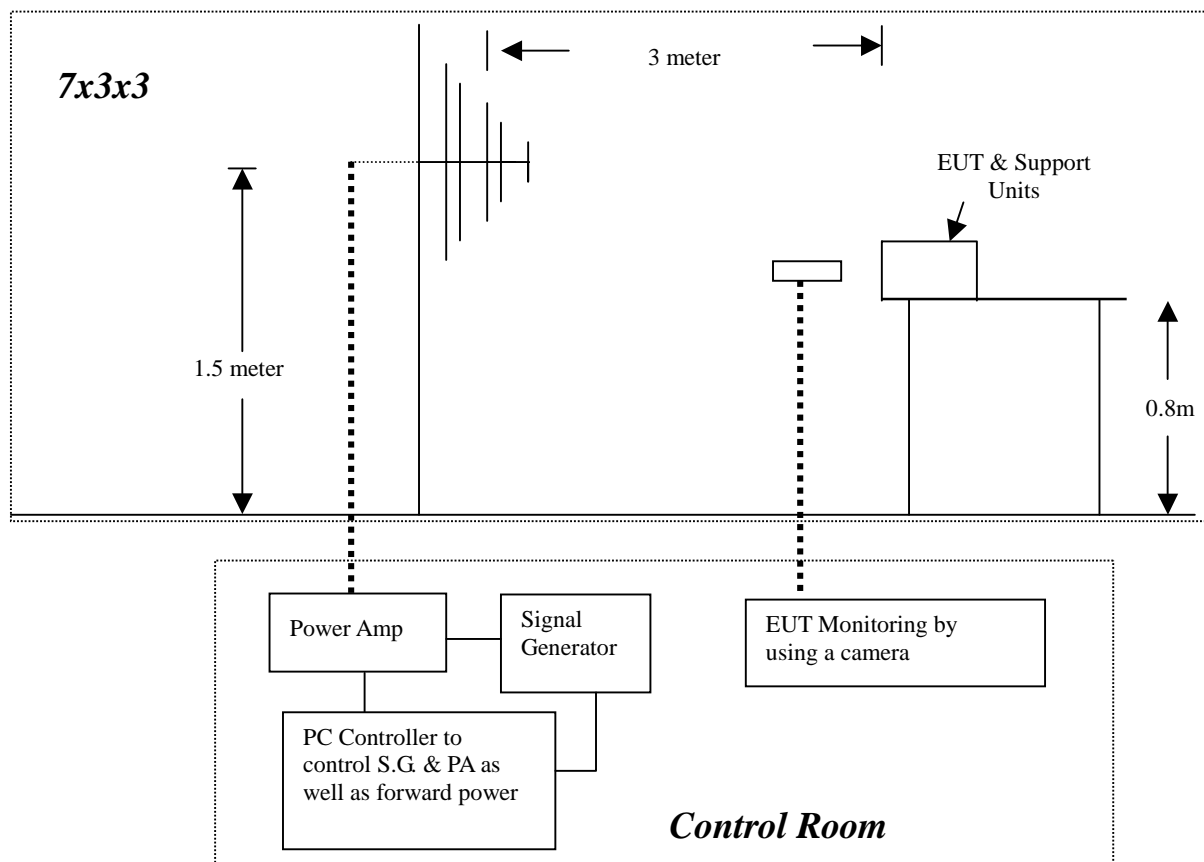
☒ **PASS** ☐ **FAIL**

Observation: 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	: Carl Chang
Temperature	: 25°C
Humidity	: 57% RH
Pressure	: 1019mbar
Test Mode	: 1, 2.

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 field 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.

☒ **PASS** ☐ **FAIL**

Observation: No function degraded during the tests.

12 FAST TRANSIENTS/BURST IMMUNITY TEST

EN 55024 / EN 61000-6-2

Port : Power Supply Line On PC

Basic Standard : IEC/EN 61000-4-4

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

Performance Criteria : B (Standard Required)

Tested by : Carl Chang

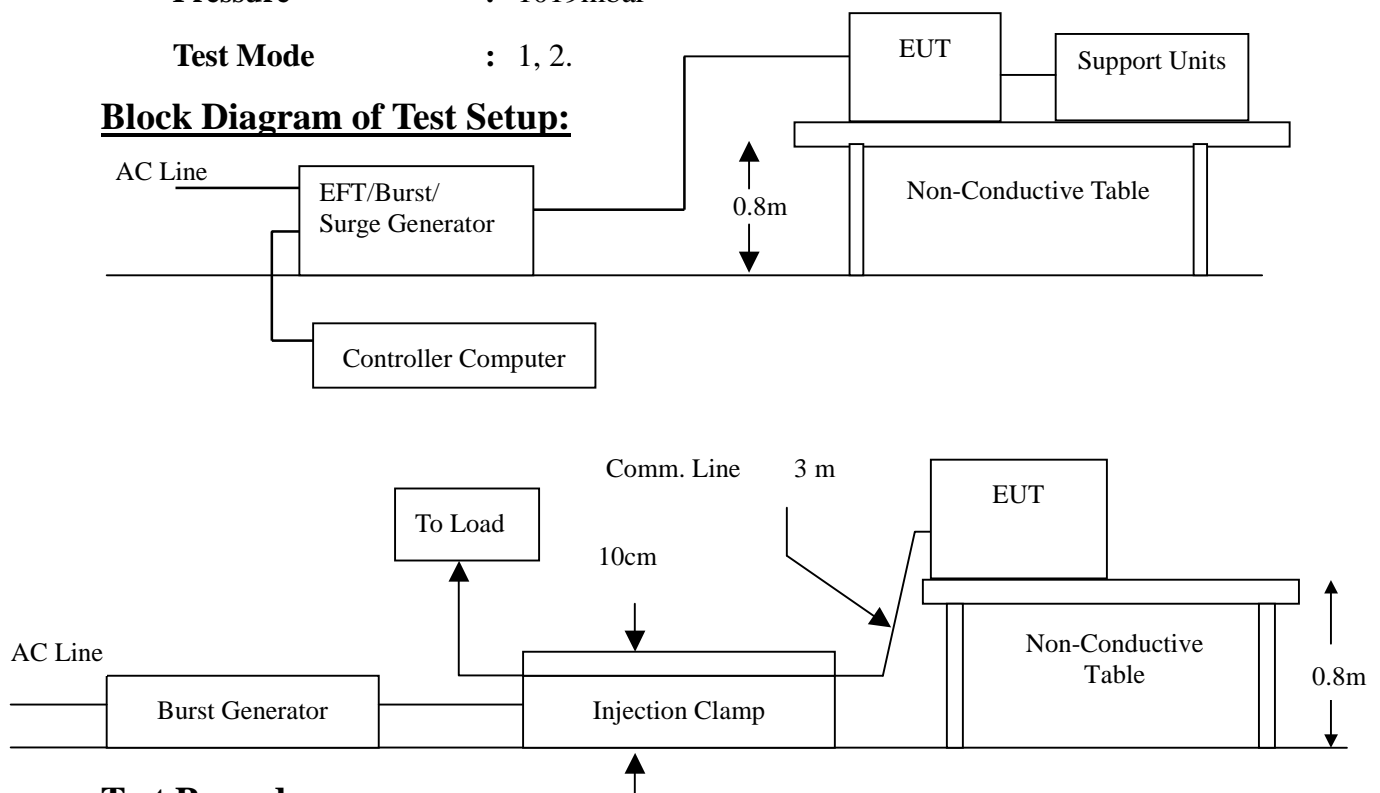
Temperature : 23°C

Humidity : 58% RH

Pressure : 1019mbar

Test Mode : 1, 2.

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.

☒ **PASS** ☐ **FAIL**

Observation: No function degraded during the tests.

13 SURGE IMMUNITY TEST

EN 55024 / EN 61000-6-2

Port : Power Cord and Signal

Basic Standard : IEC/EN 61000-4-5

Requirements : ± 1 kV (Line to Line)
 ± 2 kV (Line to Ground)

Performance Criteria : B (Standard Required)

Tested by : Carl Chang

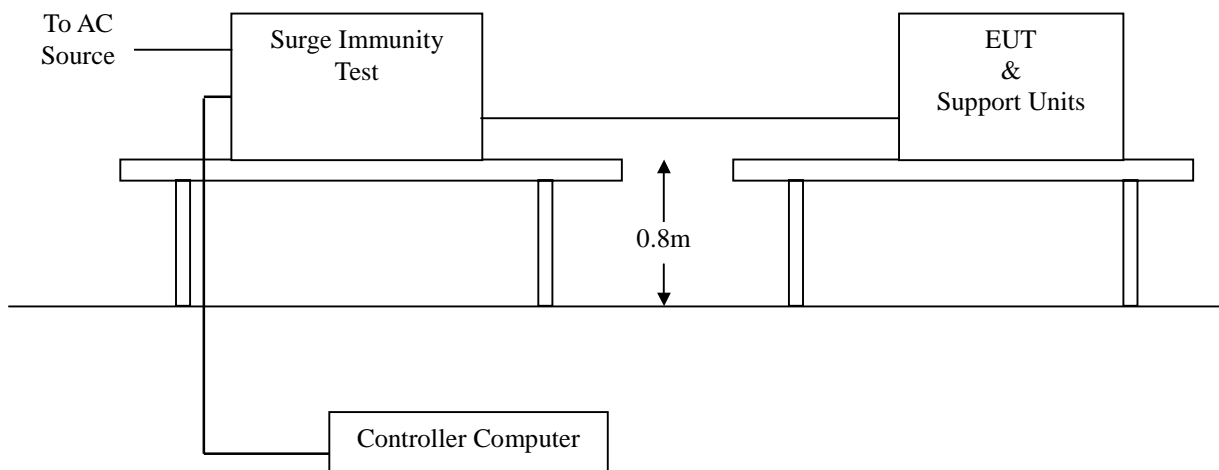
Temperature : 23°C

Humidity : 58% RH

Pressure : 1019mbar

Test Mode : 1. 2.

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 μ s
Current Waveform : 8/20 μ s
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.

☒ **PASS** ☐ **FAIL**

Observation: No function degraded during the tests.

CONDUCTED DISTURBANCE/INDUCED RADIO-FREQUENCY FIELD IMMUNITY TEST

EN 55024 / EN 61000-6-2

Port : Power Supply Line on PC

Basic Standard : IEC/EN 61000-4-6

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

Injection Method : CDN-M3 for Power Cord
CDN-T4 for LAN Cable

Performance Criterion : A (Standard Required)

Tested by : Carl Chang

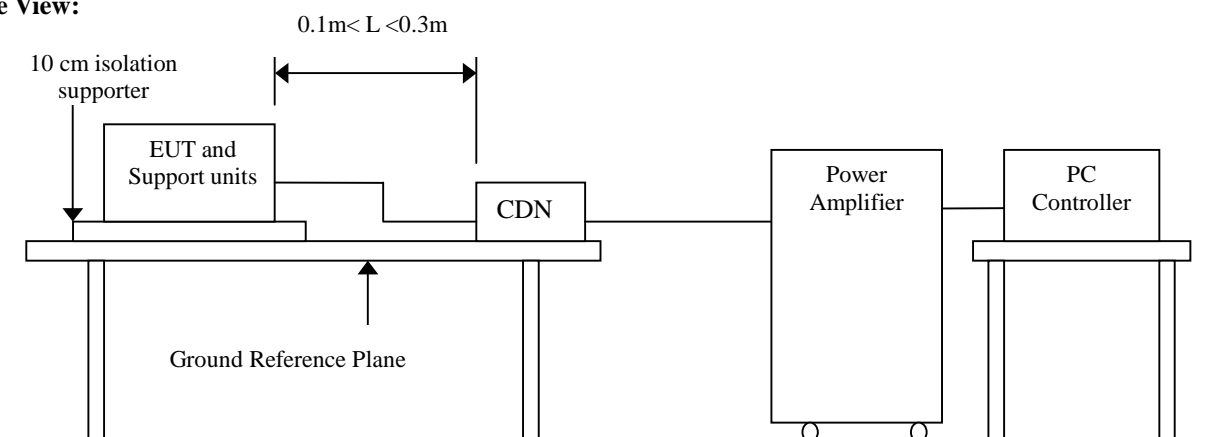
Temperature : 25°C

Humidity : 57% RH

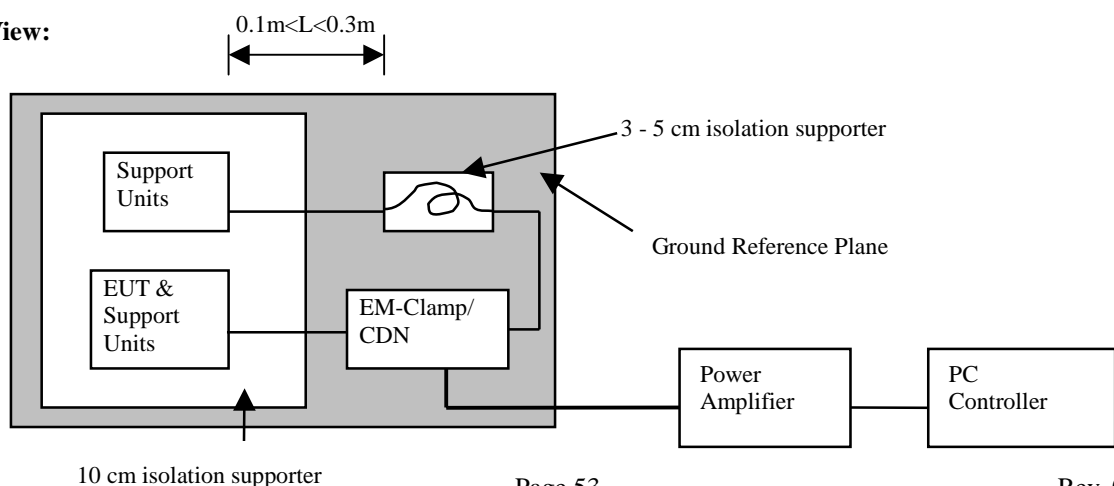
Pressure : 1019mbar

Block Diagram of Test Setup:

Side View:



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.

☒ **PASS** ☐ **FAIL****Observation:** No function degraded during the tests.

14 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 : Carl Chang

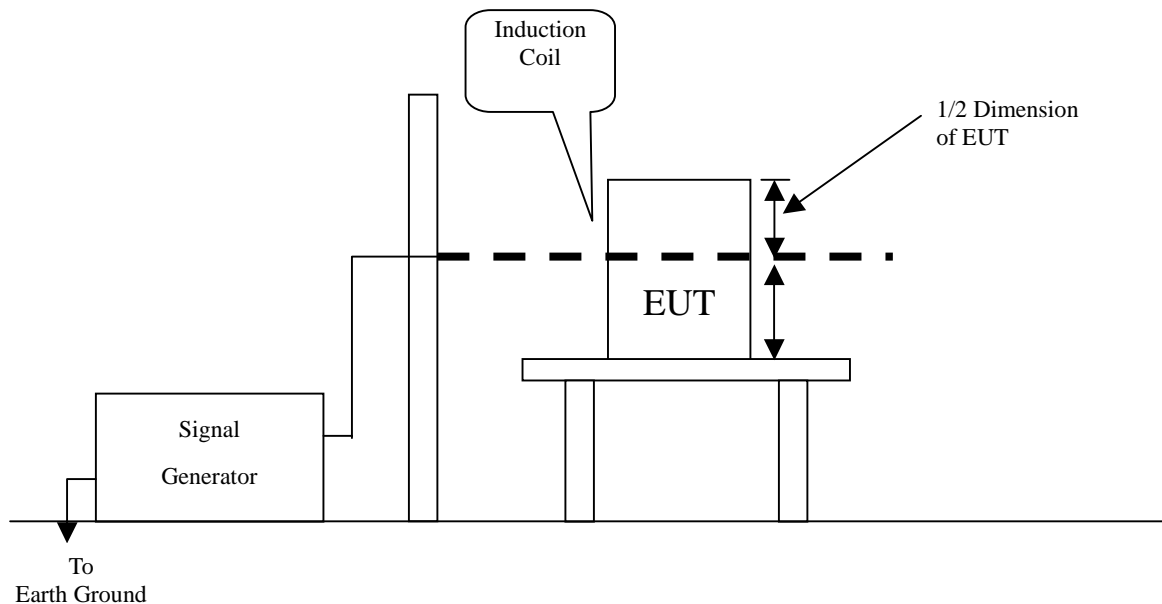
Temperature : 23°C

Humidity : 58% RH

Pressure : 1019mbar

Test Mode : 1, 2.

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.

☒ **PASS** ☐ **FAIL****Observation:** No function degraded during the tests.

15 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 Interruptions	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 Interruptions	Test Level % U _T	Reduction (%)	Duration (periods)	Performance Criteria
	40	60	5 / 50	C

Test Interval : Min. 10 sec.

Tested by : Carl Chang

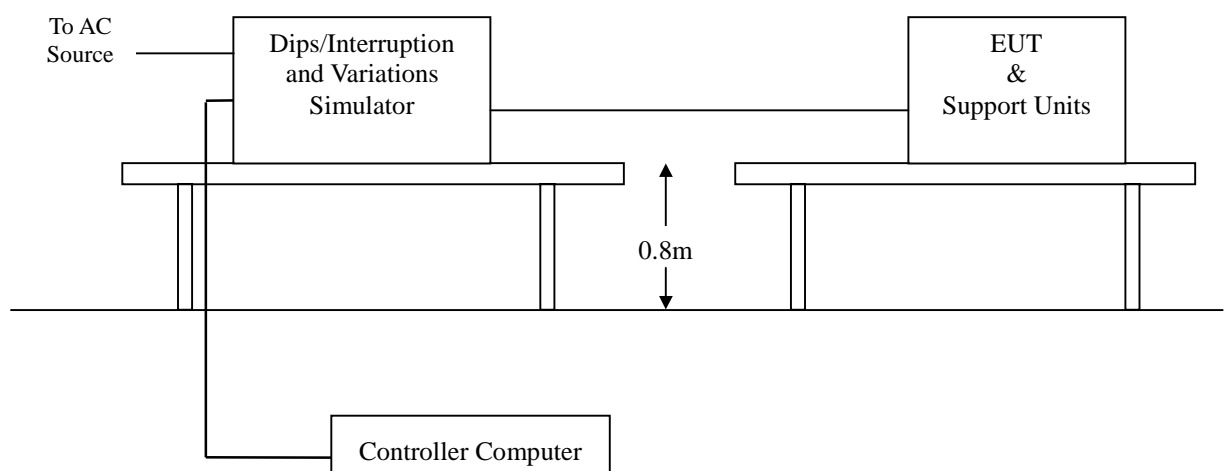
Temperature : 23°C

Humidity : 59% RH

Pressure : 1019mbar

Test Mode : 1, 2.

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 _T	Reduction (%)	Duration (periods)	Observation	Meet Performance Criteria
0	100	0.5	Normal	A
70	30	25	Normal	A

Voltage Interruptions:

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

Voltage Interruptions:

Test Level % U _T	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.



PASS



FAIL

APPENDIX I - PHOTOGRAPHS OF TEST SETUP

LINE CONDUCTED EMISSION TEST

Mode 1



Mode 2



COMMON MODE CONDUCTED EMISSION TEST

Mode 1



Mode 2



RADIATED EMISSION TEST

Mode 1



Mode 2



ELECTROSTATIC DISCHARGE TEST

Mode 1



Mode 2



RADIATED ELECTROMAGNETIC FIELD TEST

Mode 1



Mode 2



FAST TRANSIENTS/BURST TEST

Mode 1



Mode 2



SURGE IMMUNITY TEST

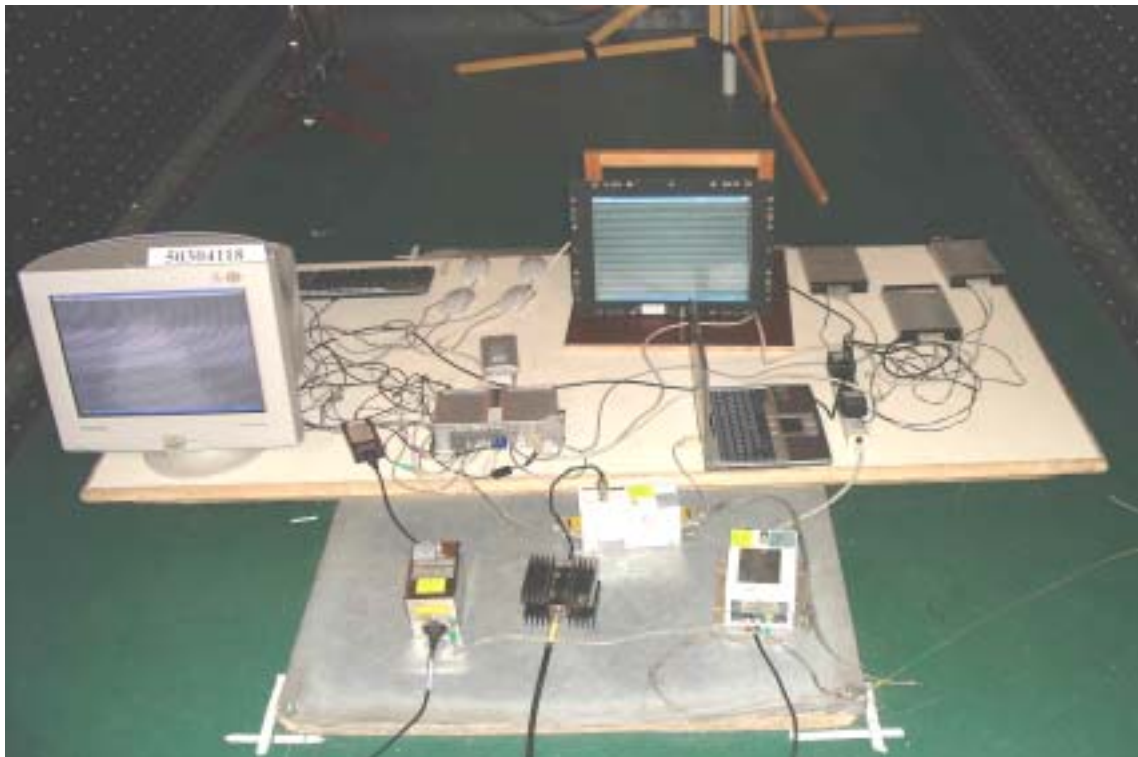
Mode 1



Mode 2



**CONDUCTED DISTURBANCE, INDUCED BY RADIO-FREQUENCY FIELDS
TEST
Mode 1**



Mode 2



POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

Mode 1



Mode 2



VOLTAGE DIPS / INTERRUPTION TEST

Mode 1



Mode 2





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

Mode 1

ADVANTECH

Date : 2005/4/21 PM 05:18:4 V3.15

File :

Operator : CARL
EUT : IPC
Model No. ARK3381
Remarks TEMP:26 HUMD:55 (Continue)

Urms = 230.1V Freq = 49.987 Range: 5 A
Irms = 0.369A Ipk = 1.799A cf = 4.881
P = 35.34W Pap = 84.83VA pf = 0.417

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 = 0.075

	Pst	dmax	dc	dt>Lim	Fail
		[%]	[%]	[ms]	
1	0.075	0.000	0.020	0.000	



ADVANTECH

Date : 2005/4/21 PM 05:32:4 V3.15

File :

Operator : CARL
EUT : IPC
Model No. ARK3381
Remarks TEMP:26 HUMD:55 (Manual Switch)

Urms = 230.1V Freq = 49.987 Range: 5 A
Irms = 0.344A Ipk = 1.707A cf = 4.957
P = 33.01W Pap = 79.21VA pf = 0.417

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 = 0.075

	Pst	dmax	dc	dt>Lim	Fail
		[%]	[%]	[ms]	
1	0.075	0.000	0.030	0.000	

**Mode 2**

ADVANTECH

Date : 2005/4/21 PM 04:24:3 V3.15

File :

Operator : CARL
EUT : IPC
Model No. ARK 3382
Remarks TEMP:26 HUMD:55 (Continue)

Urms = 230.1V Freq = 49.987 Range: 2A
Irms = 0.366A Ipk = 1.759A cf = 4.803
P = 35.49W Pap = 84.27VA pf = 0.421

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	0.040	0.000	



ADVANTECH

Date : 2005/4/21 PM 05:32:4 V3.15

File :

Operator : CARL
EUT : IPC
Model No. ARK 3382
Remarks TEMP:26 HUMD:55 (Manual Switch)

Urms = 230.1V Freq = 49.987 Range: 2A
Irms = 0.354A Ipk = 1.692A cf = 4.787
P = 34.41W Pap = 781.35VA pf = 0.423

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	0.040	0.000	