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EMC TEST REPORT

Applicant's company	**ICP DAS CO., LTD.**
Applicant Address	No. 111, Kuangfu N. Rd., Hukou Shiang, Hsinchu, Taiwan 303, R.O.C.
Manufacturer's company	**ICP DAS CO., LTD.**
Manufacturer Address	No. 111, Kuangfu N. Rd., Hukou Shiang, Hsinchu, Taiwan 303, R.O.C.

Product Name	I/O Board
Brand Name	ICP DAS
Model Name	ICPDAS (Please refer to section 3.1)
Receive Date	Dec. 30, 2005
Test Date	Dec. 30, 2005
File Type	New Applicant
Test Standard	EN 55022:1998/A1:2000/A2:2003 EN 55024:1998/A1:2001/A2:2003 EN 61000-3-3:1995/A1:2001

Statement

The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Table of Contents

History of This Test Report

Original Issue Date: Dec. 30, 2005

Report No.: EC5D3104

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**I/O Board**
Brand Name	:	**ICP DAS**
Model Name	:	**ICPDAS (Please refer to section 3.1)**
Applicant	:	**ICP DAS CO., LTD.**
Test Standard	:	**EN 55022:1998/A1:2000/A2:2003**
		EN 55024:1998/A1:2001/A2:2003
		EN 61000-3-3:1995/A1:2001

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Dec. 30, 2005 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

2. SUMMARY OF THE TEST RESULT

2.1. Emission Tests

Applicable Standard : EN 55022:1998/A1:2000/A2:2003				
Part	Test Standard	Description of Test	Result	Under Limit
4.1	EN 55022/A1:2000/A2:2003	AC Power Conducted Emissions	Complies	10.26 dB
-	EN 55022/A1:2000/A2:2003	Telecom Line Conducted Emissions	-	-
4.2	EN 55022/A1:2000/A2:2003	Radiated Emissions	Complies	5.83 dB
-	EN 61000-3-2:2000	Harmonic Current Emissions	-	-
4.3	EN 61000-3-3:1995/A1:2001	Voltage Fluctuations and Flicker	Complies	-

2.2. Immunity Tests

Applicable Standard : EN 55024:1998/A1:2001/A2:2003				
Part	Test Standard	Description of Test	Result	Criteria
5.1	EN 61000-4-2:1995/A2:2000	ESD (EUT of Enclosure)	Complies	A
5.2	EN 61000-4-3:1995/A2:2002	RS (EUT of Enclosure)	Complies	A
5.3	EN 61000-4-4:1995/A2:2001	EFT (EUT of AC Power Port)	Complies	A
-	EN 61000-4-4:1995/A2:2001	EFT (EUT of Telecom Port)	-	-
5.4	EN 61000-4-5:1995/A1:2000	Surge (EUT of AC Power Port)	Complies	A
-	EN 61000-4-5:1995/A1:2000	Surge (EUT of Telecom Port)	-	-
5.5	EN 61000-4-6:1996/A1:2001	CS (EUT of AC Power Port)	Complies	A
-	EN 61000-4-6:1996/A1:2001	CS (EUT of Telecom Port)	-	-
-	EN 61000-4-11:1994/A1:2001	DIP (EUT of AC Power Port)	-	-
-	EN 61000-4-8:1993/A1:2001	MF (EUT of Enclosure)	-	-

Test Items	Uncertainty	Remark
Conducted Emissions	±2.26dB	Confidence levels of 95%
Radiated Emissions	±3.72dB	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Category

Items	Description
Product Type	I/O Board
Power Type	HOST (PC)

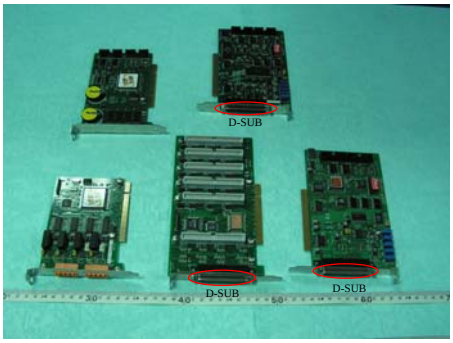
Main Control Unit	Model Number	Diversity
PCI-M512	PCI-M512	PCI bus 32-bit Memory Board
	DB-16P	16-channel OPTO-Isolated Digital Input Board
	DB-16R	16-channel Relay Output Board
PIO-D168	PIO-D168	PCI Bus 168-bit OPTO-22 DIO Board
	DB-24POR	24-channel OPTO-22 Compatible Photo-Mos Relay Output Board
	DB-24R	24-channel OPTO-22 Compatible Relay Output Board
	DB-24PR	24-channel OPTO-22 Compatible Power-relay Board
	DB-24OD	24-channel Open-drain Output Board
PISO-CAN400-T	PISO-CAN200-D	2-Port Isolated Protection CAN Communication Board with 9-Pin D-subConnector
	PISO-CAN200-T	2-Port Isolated Protection CAN Communication Board with 5-Pin Screw Terminal Connector
	PISO-CAN400-D	4-Port Isolated Protection CAN Communication Board with 9-Pin D-subConnector
	PISO-CAN400-T	4-Port Isolated Protection CAN Communication Board with 5-Pin Screw Terminal Connector
A-81111	A-8111	30KS/s 12-bit Analog and Digital I/O Board
	DB-24C	24-channel OPTO-22 Compatible Open-collector output board
	DB-24P	24-channel OPTO-22 Compatible Opto-isolated Input Board
A-821PGH	A-821PGH	45KS/s 12-bit Analog and Digital I/O Board
	DB-889D	16-channel Analog Multiplexer Board

Note:

For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2. EUT Enclosure Port

REAR VIEW



Not-Applicable, EUT has any enclosure ports.

3.3. Accessories

N/A

3.4. Table for Testing Locations

Test Site No.	Site Category	Location	Test Site No.	Site Category	Location
10CH02-HY	SAC	Hwa Ya	CS01-HY	CS	Hwa Ya
CO04-HY	Conduction	Hwa Ya	ES01-HY	EFT, DIP, Surge	Hwa Ya
CS06-LK	SAC	Hwa Ya	CL01-HY	Clamp	Hwa Ya
RS01/02-HY	RS	Hwa Ya			

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

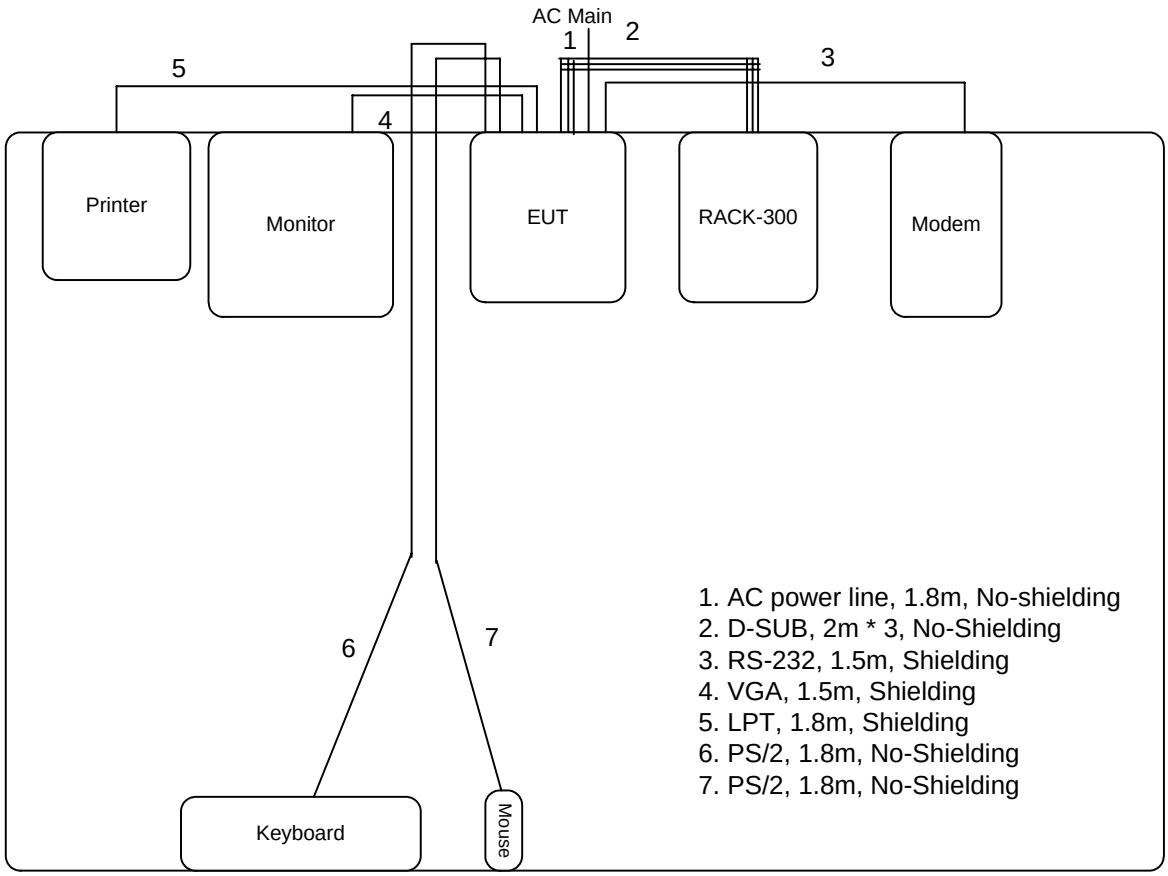
Please refer section 6 for Test Site Address.

3.5. Table for Supporting Units

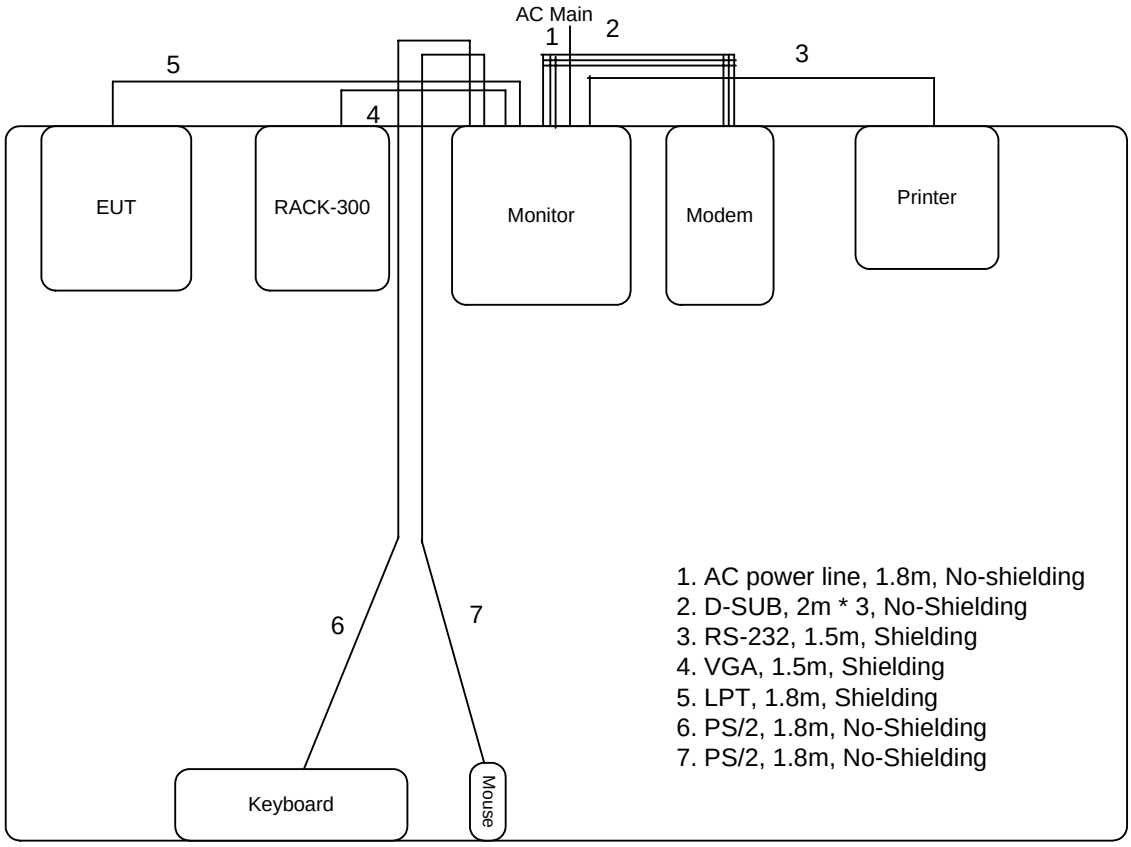
Support Unit	Brand	Model	FCC ID
Modem	ACEEX	DM-1414	FCC ID IFAXDM1414
Printer	EPSON	LQ-300	DOC
Monitor	SUN	DP17M0	DOC
Keyboard	HP	KB-0133	DOC
Mouse	Microsoft	1004	DOC

3.6. Test Configurations

3.6.1. Radiation Emissions Test Configuration



3.6.2. AC Power Line Conduction Emissions Test Configuration



3.7. EMS Performance Criteria Description

Criteria	Performance criteria
A	No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.
B	After the test, loss of function is allowed. But functions shall be self-recoverable.
C	After the test, loss of function is allowed. But functions shall be recoverable by the operator.

4. EMISSION TESTS RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For a Low-power Radio-frequency Device which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

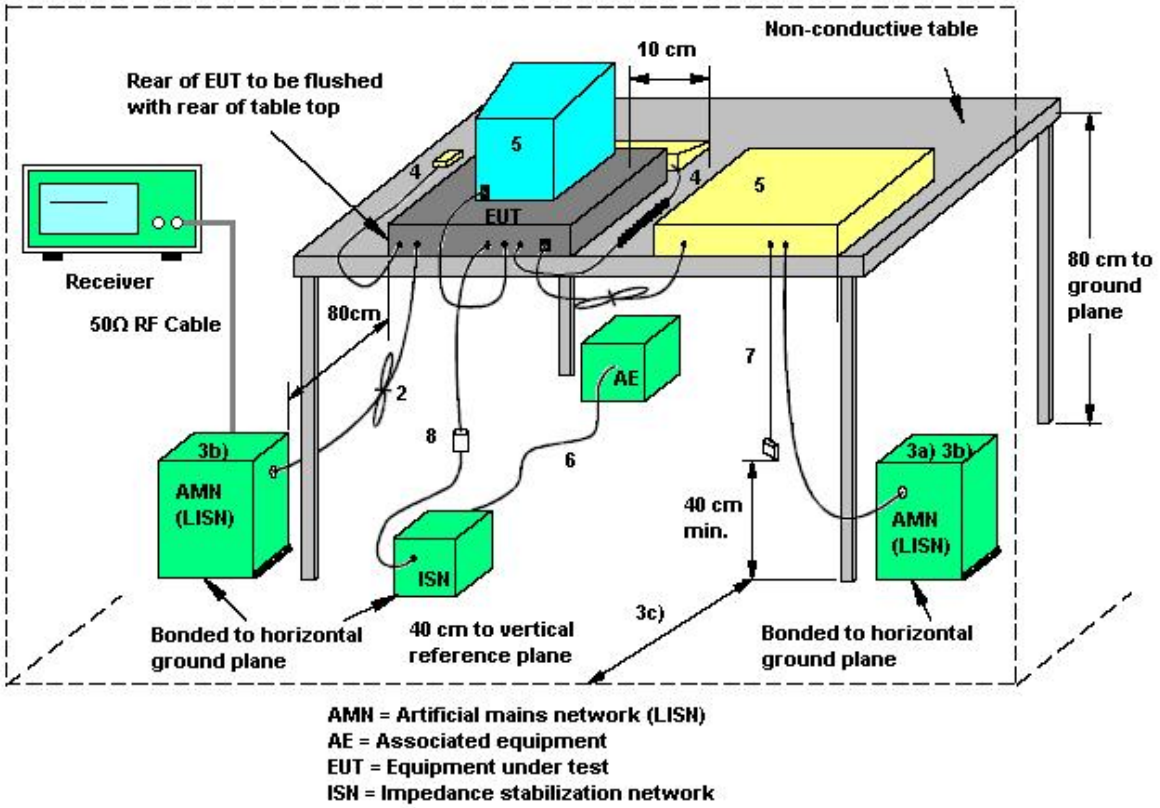
Please refer to section 6 in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

4.1.3. Test Procedures

1. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

1. If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
2. Excess mains cord shall be bundled in the centre or shortened to appropriate length.
3. EUT is connected to one artificial mains network (AMN). All AMNs and ISNs may alternatively be connected to a vertical reference plane or metal wall.
4. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
5. AMN and ISN are 80 cm from the EUT and at least 80 cm from other units and other metal planes.
6. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
7. Cables of hand operated devices, such as keyboards, mouses, etc. shall be placed as for normal usage.
8. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
9. I/O signal cable intended for external connection.
10. The end of the I/O signal cables which are not connected to an AE may be terminated, if required, using correct terminating impedance.
11. If used, the current probe shall be placed at 0,1 m from the ISN.

4.1.5. Test Deviation

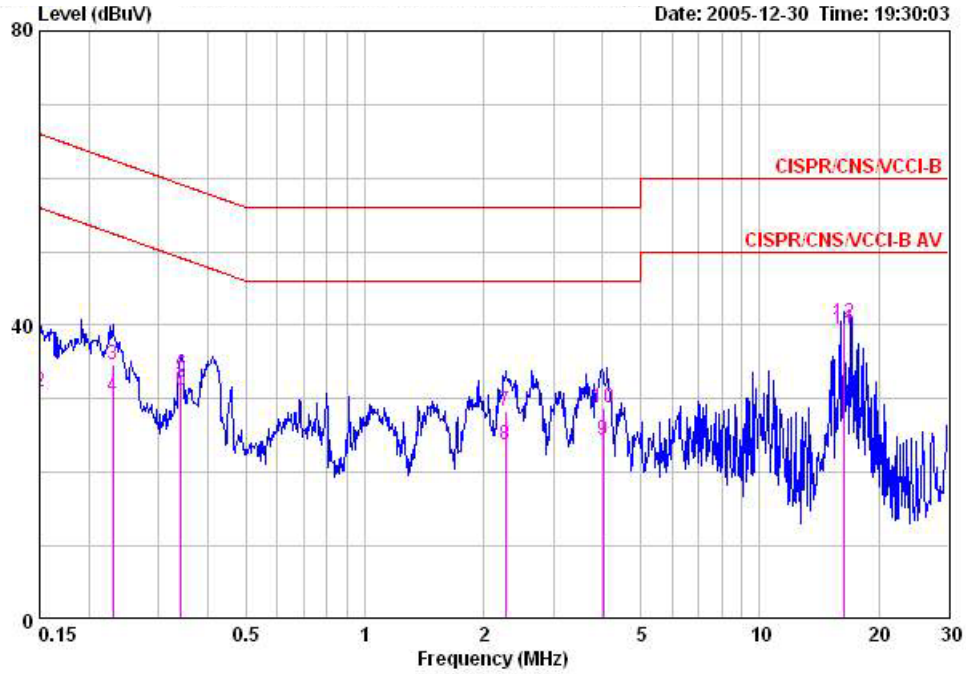
There are no deviations with the original standard.

4.1.6. EUT Operation during Test

The EUT was placed on the test table with essential peripherals connected. The EUT was tested on the normal function.

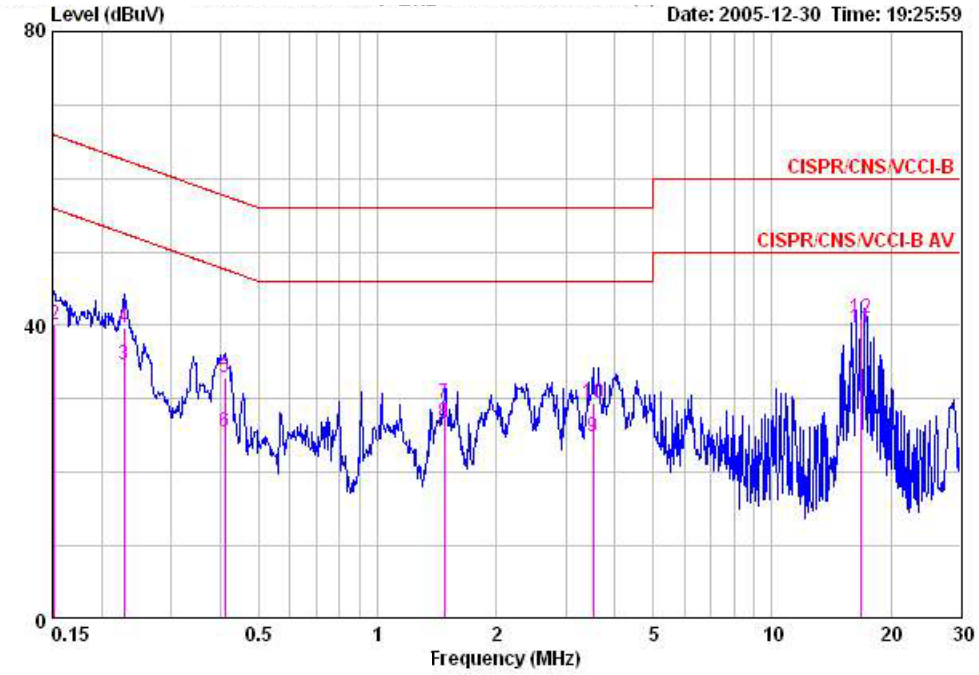
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	20℃	Humidity	70%
Test Engineer	Ken Tu	Phase	Line
Configuration	Normal Use		



		Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15000	36.42	-29.58	66.00	34.22	2.00	0.20	QP
2	0.15000	31.00	-25.00	56.00	28.80	2.00	0.20	AVERAGE
3	0.23040	34.65	-27.79	62.44	33.45	1.00	0.20	QP
4	0.23040	30.23	-22.21	52.44	29.03	1.00	0.20	AVERAGE
5	0.34226	33.08	-26.07	59.15	32.18	0.70	0.20	QP
6	0.34226	31.23	-17.92	49.15	30.33	0.70	0.20	AVERAGE
7	2.273	28.28	-27.72	56.00	27.78	0.30	0.20	QP
8	2.273	23.67	-22.33	46.00	23.17	0.30	0.20	AVERAGE
9	4.020	24.32	-21.68	46.00	23.62	0.40	0.30	AVERAGE
10	4.020	28.83	-27.17	56.00	28.13	0.40	0.30	QP
11 @	16.406	39.56	-10.44	50.00	38.86	0.30	0.40	AVERAGE
12	16.406	40.29	-19.71	60.00	39.59	0.30	0.40	QP

Temperature	20℃	Humidity	70%
Test Engineer	Ken Tu	Phase	Neutral
Configuration	Normal Use		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15160	33.74	-22.17	55.91	31.64	1.90	0.20	AVERAGE
2	0.15160	40.20	-25.71	65.91	38.10	1.90	0.20	QP
3	0.22797	34.73	-17.79	52.52	33.61	0.92	0.20	AVERAGE
4	0.22797	39.57	-22.95	62.52	38.45	0.92	0.20	QP
5	0.41048	32.88	-24.76	57.64	32.28	0.40	0.20	QP
6	0.41048	25.53	-22.11	47.64	24.93	0.40	0.20	AVERAGE
7	1.480	29.36	-26.64	56.00	28.96	0.30	0.10	QP
8	1.480	26.86	-19.14	46.00	26.46	0.30	0.10	AVERAGE
9	3.528	24.88	-21.12	46.00	24.28	0.30	0.30	AVERAGE
10	3.528	29.50	-26.50	56.00	28.90	0.30	0.30	QP
11 @	16.743	39.74	-10.26	50.00	38.99	0.30	0.45	AVERAGE
12	16.743	40.89	-19.11	60.00	40.14	0.30	0.45	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Radiated Emissions Measurement

4.2.1. Limit

Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30 MHz to 1000 MHz.The quasi-peak measuring receiver shall be in accordance with clause 2 of CISPR 16-1. Receivers with peak detectors shall be in accordance with clause 3 of CISPR 16-1, and shall have a 6 dB bandwidth in accordance with clause 2 of CISPR 16-1.

Frequency of Emission (MHz)	Field Strength QP Limit (dBuV/m) at 10m
30~230	30
230~1000	37

4.2.2. Measuring Instruments and Setting

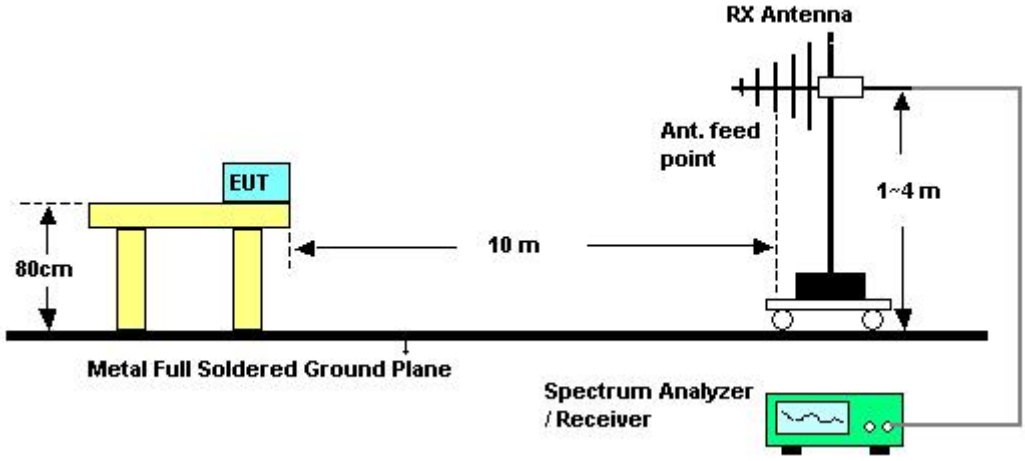
Please refer to section 6 in this report. The following table is the setting of the Spectrum Analyzer.

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2.3. Test Procedures

1. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 10 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence.

4.2.4. Test Setup Layout



4.2.5. Test Deviation

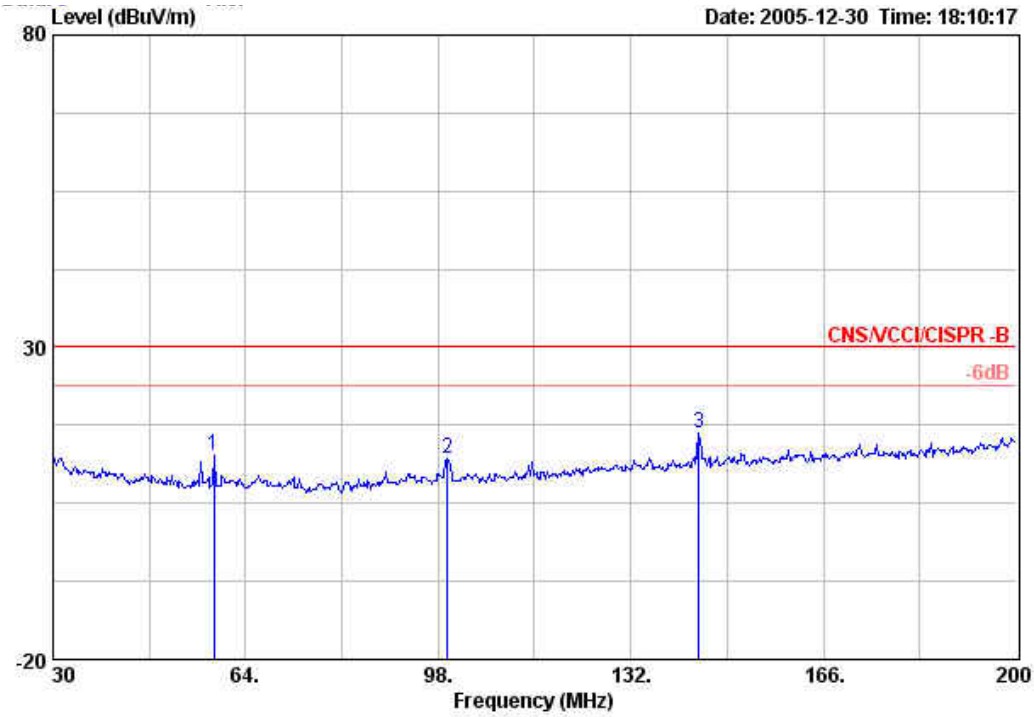
There are no deviations with the original standard.

4.2.6. EUT Operation during Test

The EUT was placed on the test table with essential peripherals connected. The EUT was tested on the normal function.

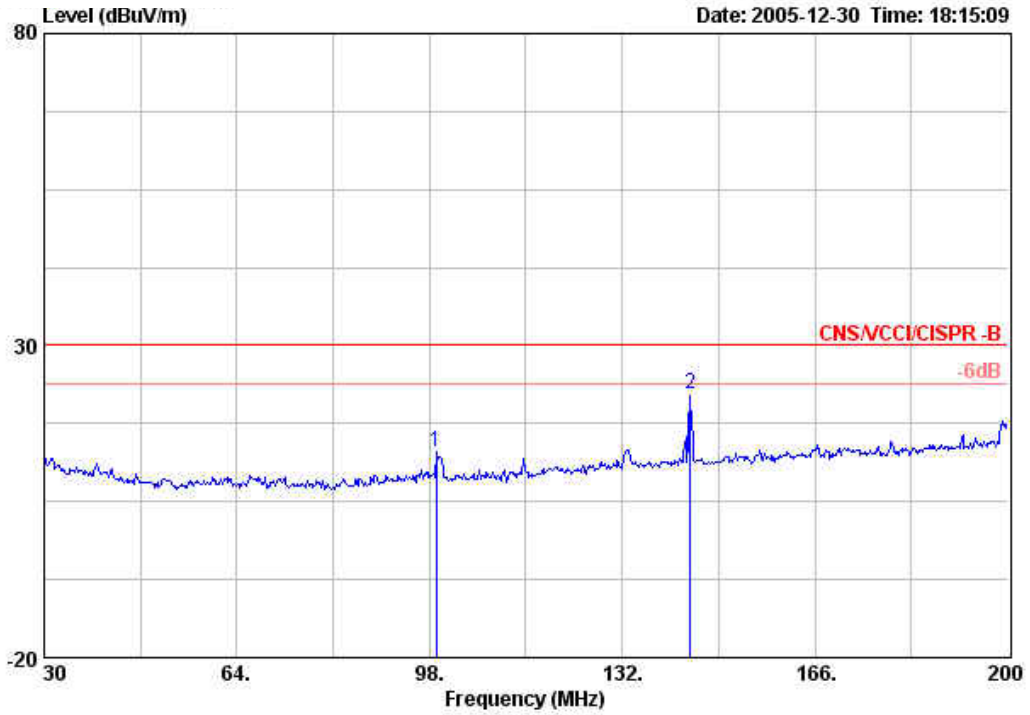
4.2.7. Results for Radiated Emissions (30MHz~1GHz)

Temperature	24℃	Humidity	60%
Test Engineer	Beck Wu	Configurations	Normal Use (Vertical)



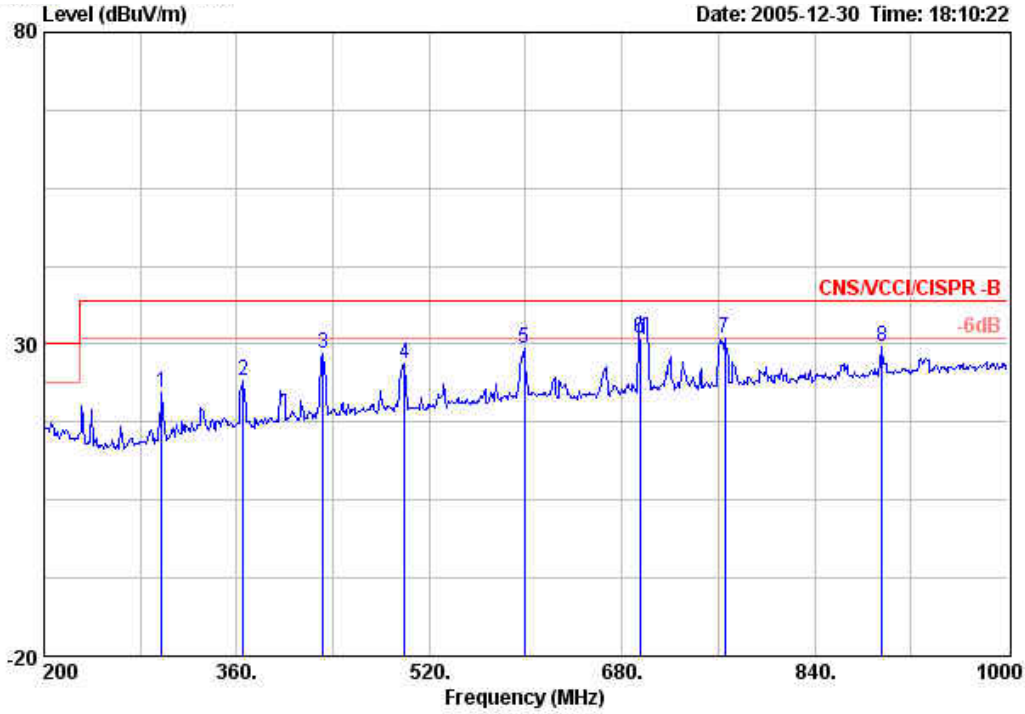
	Freq	Level	Over Limit	Limit Line	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB/m		cm	deg
1	58.390	12.67	-17.33	30.00	28.27	27.62	1.53	10.49	Peak	---	---
2	99.700	12.17	-17.83	30.00	29.76	27.63	1.89	8.15	Peak	---	---
3	144.070	16.36	-13.64	30.00	30.01	27.64	2.19	11.79	Peak	---	---

Temperature	24℃	Humidity	60%
Test Engineer	Beck Wu	Configurations	Normal Use (Horizontal)



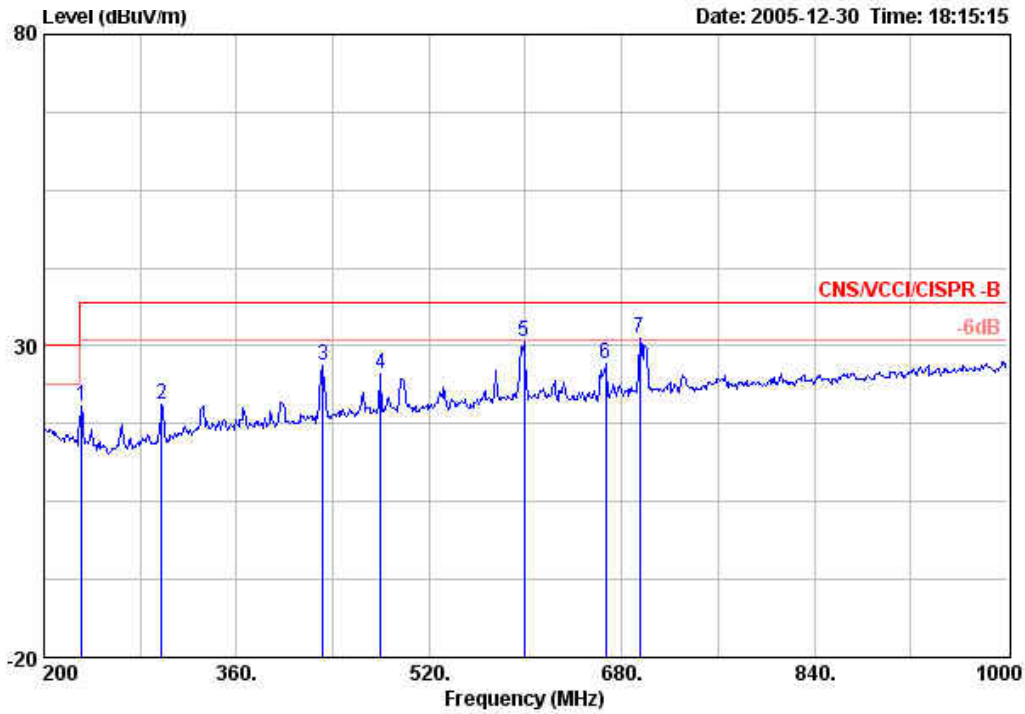
	Freq	Level	Over Limit	Limit Line	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB/m		cm	deg
1	99.190	12.87	-17.13	30.00	30.42	27.63	1.86	8.21	Peak	---	---
2	144.070	22.28	-7.72	30.00	35.93	27.64	2.19	11.79	Peak	---	---

Temperature	24℃	Humidity	60%
Test Engineer	Beck Wu	Configurations	Normal Use (Vertical)



	Freq	Level	Over Limit	Limit Line	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB/m		cm	deg
1	297.600	22.37	-14.63	37.00	36.20	29.61	2.74	13.04	Peak	---	---
2	365.600	24.27	-12.73	37.00	35.64	29.70	2.98	15.35	Peak	---	---
3	432.000	28.61	-8.39	37.00	38.76	29.70	3.15	16.39	Peak	---	---
4	499.200	26.81	-10.19	37.00	36.85	29.50	3.35	16.10	Peak	---	---
5	599.200	29.31	-7.69	37.00	34.73	29.40	3.59	20.40	Peak	---	---
6	695.200	30.98	-6.02	37.00	35.74	29.41	3.81	20.84	QP	100	0
7 @	765.600	31.08	-5.92	37.00	36.74	29.60	4.04	19.90	Peak	---	---
8	896.000	29.61	-7.39	37.00	34.14	29.42	4.30	20.58	Peak	---	---

Temperature	24℃	Humidity	60%
Test Engineer	Beck Wu	Configurations	Normal Use (Horizontal)



	Freq	Level	Over Limit	Limit Line	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB/m		cm	deg
1	231.200	20.41	-16.59	37.00	34.26	29.68	2.42	13.42	Peak	---	---
2	297.600	20.52	-16.48	37.00	34.36	29.61	2.74	13.04	Peak	---	---
3	432.000	26.88	-10.12	37.00	37.04	29.70	3.15	16.39	Peak	---	---
4	480.000	25.51	-11.49	37.00	35.62	29.58	3.29	16.19	Peak	---	---
5	599.200	30.79	-6.21	37.00	36.20	29.40	3.59	20.40	Peak	---	---
6	666.400	27.04	-9.96	37.00	32.03	29.47	3.76	20.72	Peak	---	---
7 @	695.200	31.17	-5.83	37.00	35.92	29.41	3.81	20.84	Peak	---	---

Note: Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

V: Vertical Polarization ; H: Horizontal Polarization.

4.3. Voltage Fluctuation and Flicker Measurement

4.3.1. Limit

The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current ≦ 16 A per phase. Ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.

Voltage Fluctuation and Flicker Limits

— the value of P_{st} shall not be greater than 1.0;

— the value of P_{lt} shall not be greater than 0.65;

— the value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms.

— the relative steady-state voltage change, dc, shall not exceed 3.3 %;

— the maximum relative voltage change, dmax, shall not exceed 4 %;

4.3.2. Measuring Instruments and Setting

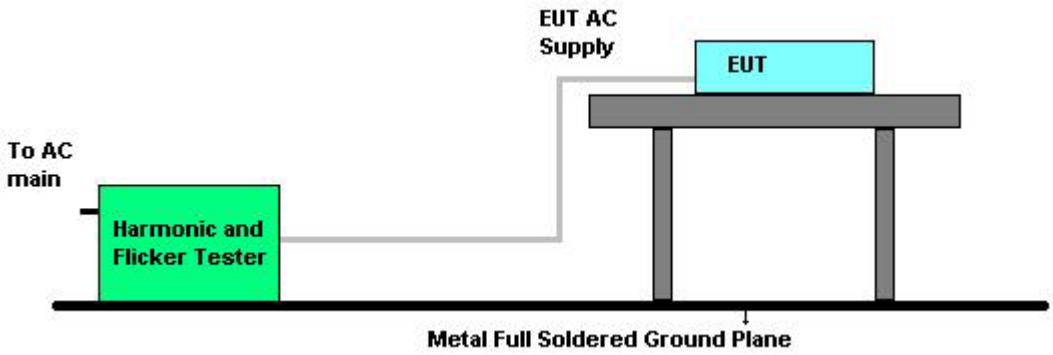
Please refer to section 6 in this report. The following table is the setting of the Harmonic and Flicker Tester.

Harmonic and Flicker Tester	Setting
Line Voltage	230 V
Line Frequency	50 Hz
Measurement Delay	10.0 seconds
Pst Integration Time	10 minutes
Pst Integration Periods	1

4.3.3. Test Procedures

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of ±8% is achieved during the whole assessment procedure

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Voltage Fluctuation and Flicker

Temperature	24.5℃	Humidity	50%
Test Engineer	Jason Ching	Configurations	Normal Use

Urms =	230.1V	Freq =	50.000	Range:	1 A
Irms =	0.230A	Ipk =	0.586A	cf =	2.542
P =	37.65W	Pap =	53.03VA	pf =	0.710

Plt = 0.072

	Pst	P50s	P10s	P3s	P1s	P0.1s	dmax [%]	dc [%]	dt>Lim [ms]
1	0.072	0.010	0.010	0.010	0.010	0.010	0.000	0.020	0.000

5. IMMUNITY TESTS

5.1. Electrostatic Discharge Immunity Measurement (ESD)

5.1.1. Limit

Air discharges and contact charges are estimated to enclsure of EUT on all connectors and conducting surfaces.

Contact Discharges to the conductive surfaces and to coupling planes:

The EUT shall be exposed to at least 200 discharges 100 each at negative and positive polarity, at a minimum of four test points (a minimum of 50 discharges at each point). One of the test points shall be subjected to at least 50 indirect discharges (contact) to the center of the front edge of the horizontal coupling plane(HCP). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode [see IEC 61000-4-2 for use of the Vertical Conducting Plane (VCP)]. Tests shall be performed at a maximum repetition rate of one discharge per second.

Air Discharge at seam bewteen apertures and insulation surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. This investigation should be restricted to those areas normally handled by the user. A minimum of 10 single air discharges of each polarity and test level shall be applied to the selected test point for each area.

The preferential range of test levels for the ESD test is given in following levels:

Contact discharge Test voltage 4 kV ; Air discharge Test voltage 8 kV

Performance criteria is the crireria B.

5.1.2. Measuring Instruments and Setting

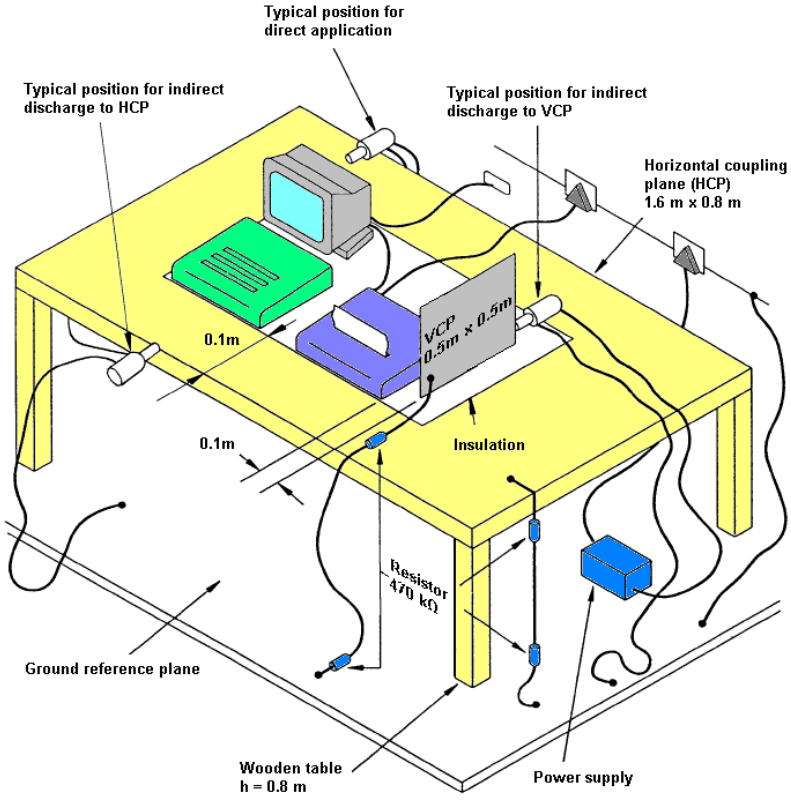
Please refer to section 6 in this report. The following table is the setting of the Electrostatic Discharge Simulator.

Electrostatic Discharge Simulator	Discharge Setting
Contact Charge Voltage Uo	±4 kV
Air Charge Voltage Uo	±8 kV
Rise Time tr	5nS + 30%
Half-Value width tw	30nS + 30%
Polarity	Positive/Negative
Single Discharge Mode	1 discharges per 1s
Successive Discharges Mode	10 discharges per 1s

5.1.3. Test Procedures

1. In the case of air discharge testing the climatic conditions shall be within the following ranges:
   Ambient temperature: 15℃ to 35℃;
   Relative humidity: 30% to 60%;
   Atmospheric pressure: 86 kPa (860 mbar) to 106 kPa (1060 mbar).
2. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
3. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
4. The test shall be performed with both air discharge and contact discharge. On pre-selected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On pre-selected points at least 25 single discharges (in the most sensitive polarity) shall be applied on contact discharge.
5. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
6. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
7. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
   - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
   - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
   - The contact discharge test shall not be applied to such surfaces.
8. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then re-triggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

5.1.4. Test Setup Layout



A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the SPORTON EMC LAB., we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resister located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

5.1.5. Test Deviation

There is no deviation with the original standard.

5.1.6. EUT Operation during Test

The test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT.

5.1.7. Test Result of Electrostatic Discharge Immunity

Temperature	23.6℃	**Humidity**	51%
Pressure	98 kPa	**Test Engineer**	Jason Ching
Discharge Mode	Contact Discharge	**Test Voltage**	±4 kV
Tested No.	25 single	**Configurations**	Normal Use
Performance	Required Criteria B		

Test Point	Observation	Criteria
HCP (At Front)	No performance degradation was observed.	A
HCP (At Left)	No performance degradation was observed.	A
HCP (At Right)	No performance degradation was observed.	A
HCP (At Rear)	No performance degradation was observed.	A
VCP (At Front)	No performance degradation was observed.	A
VCP (At Left)	No performance degradation was observed.	A
VCP (At Right)	No performance degradation was observed.	A
VCP (At Rear)	No performance degradation was observed.	A
Bracket	After interrupt the function then the function is self-recoverable.	B
D-SUB	After interrupt the function then the function is self-recoverable.	B

Temperature	23.6℃	Humidity	51%以下
Pressure	98 kPa	Test Engineer	Jason Ching
Discharge Mode	Air Discharge	Test Voltage	±8 kV
Tested No.	25 single	Configurations	Normal function
Performance	Required Criteria B		

Test Point	Observation	Criteria
N/A	The EUT has no slots, apertures, or insulating surfaces. So, the air discharge test is not applicable.	N/A

5.2. Radio Frequency Electromagnetic Field Immunity Measurement (RS)

5.2.1. Limit

Most electronic equipment is in some manner affected by electromagnetic radiation. RF immunity test entails subjecting the equipment under test to a uniform field of radiated electromagnetic energy of a specified electromagnetic field strength and frequency and monitoring the functionality of the device as the frequency is swept over a specified frequency range.

The preferential range of test field strength levels for the RS test is given in following levels:

80～1GHz: 3V/m

Performance criteria is the crireria A.

5.2.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the RS Immunity Test System.

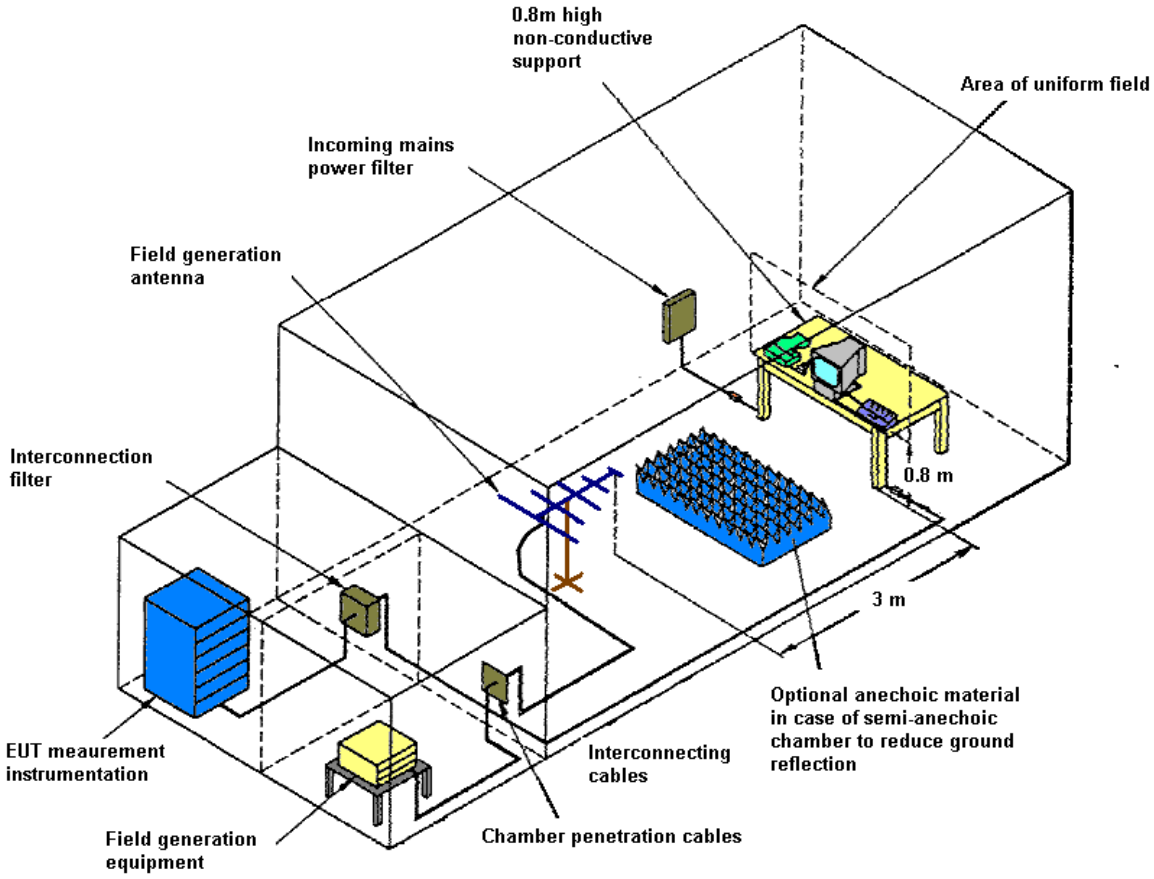
RS Immunity Test System	Setting
Method Used	Bilog antenna and semi-anechoic chamber
Field Strength Exposure	3 Vrms/m (measured un-modulated carrier)
Frequency Range/Modulation	80-1000 MHz, 80% AM modulation
Antenna Polarization	Vertical & Horizontal
Test Distance	3m
Frequency Steps	1% step
Dwell Time	2.9 sec
Exposures	Front, Back, Left and Right of the EUT

5.2.3. Test Procedures

1. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
2. The bilog antenna which is enabling the complete frequency range of 80-1000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
3. The test is normally performed with the generating antenna facing each of four sides of the EUT. The polarization of the field generated by the bi-conical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.
4. At each of the above conditions, the frequency range is swept 80-1000 MHz pausing to adjust

the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of 1.5*10-3 decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

5.2.4. Test Setup Layout



NOTE : The chamber is compliance with the sixteen points uniform field requirement as stated in IEC 61000-4-3 Section 6.2.

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

5.2.5. Test Deviation

There is no deviation with the original standard.

5.2.6. EUT Operation during Test

The test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT.

5.2.7. Test Result of Radio Frequency Electromagnetic Field Immunity

Temperature	26℃	Humidity	55%
Pressure	98 kPa	Test Engineer	Jason Ching
Performance	Required Criteria A	Configurations	Normal Use

EUT Face Exposed	Observation	Performance
Front	No performance degradation was observed.	A
Back	No performance degradation was observed.	A
Left	No performance degradation was observed.	A
Right	No performance degradation was observed.	A

5.3. Electrical Fast Transient/Burst Immunity Measurement (EFT)

5.3.1. Limit

This test interference signal injects to the AC/DC power supply and signal I/O lines of the EUT.

Test on Power Line:

The EFT/B-generator was located on the GRP. The length from the EFT/B-generator to the EUT as not exceed 1 m.

The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

Test on Telecommunication Lines:

The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP.

The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

The preferential range of test peak voltage levels for the EFT test is given in following levels:

Power Line: ±1kV ; Telecommunication Lines: ±0.5kV

Performance criteria is the crireria B.

5.3.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the EMC Test Station.

EMC Test Station (EFT)	Setting
Test Voltage	L - N: ±1kV
Polarity	Positive/Negative
Impulse Frequency	5 kHz
Impulse Wave shape (T_r/T_h)	5/50 ns
Burst Duration	15 ms

5.3.3. Test Procedures

1. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
   ambient temperature: 15℃ to 35℃;
   relative humidity : 10% to 75%;
   atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).
2. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
3. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.
4. The test results may be classified on the basic of the operating conditions and the functional

specification of the equipment under test, according to the following performance criteria :

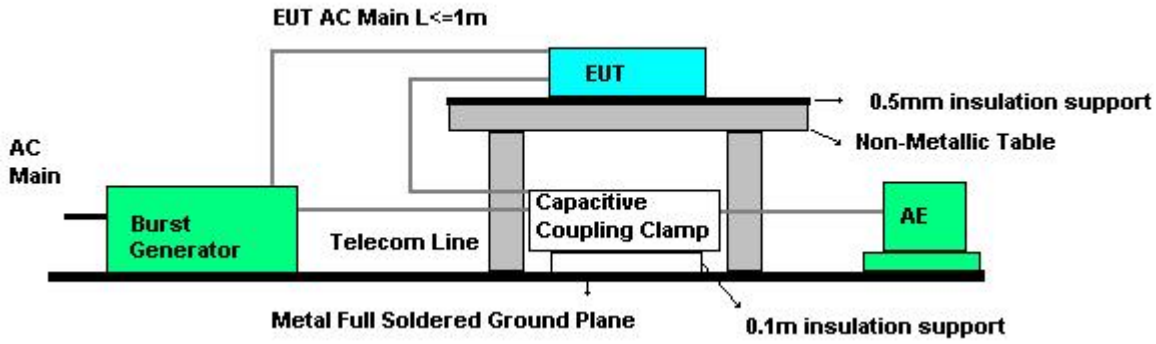
-Normal performance within the specification limits.

-Temporary degradation or loss of function or performance which is self-recoverable.

-Temporary degradation or loss of function or performance which requires operator intervention or system reset.

-Degradation or loss of function which is not recoverable due to damage of equipment (components).

5.3.4. Test Setup Layout



The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1m thick. If the EUT is table-top equipment, it was located approximately 0.8m above the GRP.. The GRP. was a metallic sheet of 0.25 mm ,minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. It shall project beyond the EUT by at least 0.1m on all sides and connected to the protective earth. In the SPORTON EMC LAB. we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system. The EUT was arranged and connected according to its functional requirements. The minimum distance between the EUT and other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. Using the coupling clamp, the minimum distance between the coupling plates and all other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. The length of the signal and power lines between the coupling device and the EUT was 1m or less.

5.3.5. Test Deviation

There is no deviation with the original standard.

5.3.6. EUT Operation during Test

The test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT.

5.3.7. Test Result of Electrical Fast Transient/Burst Immunity

Temperature	26℃	Humidity	55%
Pressure	98 kPa	Test Engineer	Jason Ching
Performance	Required Criteria B	Configurations	Normal Use

AC Power Port		
Peak Voltage	Observation	Performance
±1 kV	No performance degradation was observed.	A

5.4. Surge Immunity Measurement (Surge)

5.4.1. Limit

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common and differential mode.

Each device was tested in a total of two surge configurations:

Line to Gorund(L-G): Combination Wave, Line to Protective Earth with 9uF and 10Ohm and Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.

Line to Line(L-L): Combination Wave, Line to Neutral with 18uF, differential mode, generator floated.

The preferential range of test peak voltage levels for the Surge test is given in following levels:

AC/DC power Line: Line to line: ±1kV ; Line to ground: ±kV; 2

Outdoor Telecommunication Line : Line to ground: ±1kV;

Indoor Telecommunication Line : Not Applicable

Performance criteria is the crireria B.

5.4.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the EMC Test Station.

EMC Test Station (Surge)	Setting
Combination Wave Shape	1.2/50us Open Circuit Voltage; 8/20us Short Circuit Current
Power Line Test Voltage	Line to line ±1kV; Line to ground ±2kV
Polarity	Positive/Negative
Phase Angle	0° /90°/180°/270°
Pulse Repetition Rate	1 time / min. (maximum)
Number of Tests	5 positive and 5 negative at selected points

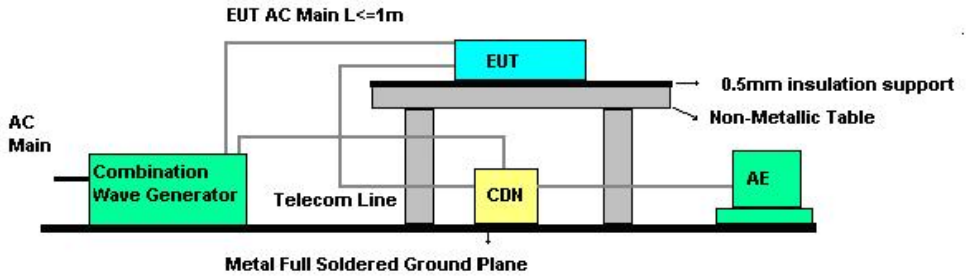
5.4.3. Test Procedures

1. The climatic conditions shall comply with the following requirements :
   -- ambient temperature : 15 ℃ to 35 ℃
   -- relative humidity : 10 % to 75 %
   -- atmospheric pressure : 86 kPa to 106 kPa (860 mbar to 1060 mbar)
2. Electromagnetic conditions, the electromagnetic environment of the laboratory shall not influence the test results.
3. The test shall be performed according the test plan that shall specify the test set-up with
   -- generator and other equipment utilized;
   -- test level (voltage/current);
   -- generator source impedance;
   -- internal or external generator trigger;
   -- number of tests : at least five positive and five negative at the selected points;

-- repetition rate : maximum 1/min.
-- inputs and outputs to be tested;
-- representative operating conditions of the EUT;
-- sequence of application of the surge to the circuit;
-- phase angle in the case of AC power supply;
-- actual installation conditions, for example :
AC : neutral earthed,
DC : (+) or (-) earthed to simulated the actual earth conditions.

4. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
5. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
6. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.
7. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst case voltage breakdown level (let-through level) of the primary protection.
8. If the actual operating signal sources are not available, the may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to the test plan.
9. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test a previously unstressed equipment shall be used to the protection devices shall be replaced.

5.4.4. Test Setup Layout



5.4.5. Test Deviation

There is no deviation with the original standard.

5.4.6. EUT Operation during Test

The test programs and software shall be chosen so as to exercise all normal modes of operation of

the EUT.

5.4.7. Test Result of Surge Immunity

Temperature	26℃	Humidity	55%
Pressure	98 kPa	Test Engineer	Jason Ching
Performance	Required Criteria B	Configurations	Normal Use

AC Power Port on Line to Line		
Peak Voltage	Observation	Performance
±1 kV	No performance degradation was observed.	A

AC Power Port on Line to Ground		
Peak Voltage	Observation	Performance
±2 kV	No performance degradation was observed.	A

5.5. Conducted Disturbances Induced by RF Field Immunity Measurement (CS)

5.5.1. Limit

Injected the conducted disturbances directly into AC/DC power and signal I/O cables.

The preferential range of test field strength levels for the CS test is given in following levels:

150kHz~80MHz: 3V/m.

Performance criteria is the crireria A.

5.5.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the CS Immunity Test.

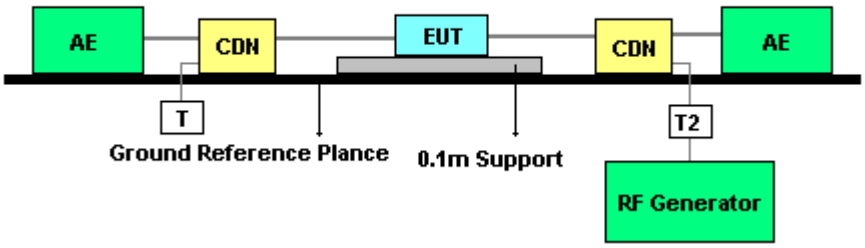
CS Immunity Test System	Setting
Method Used	CDN-M016SWM3
Field Strength Exposure	3 Vrms/m (measured un-modulated carrier)
Frequency Range/Modulation	150kHz~80MHz, 80% AM modulation
Test Distance	3m
Frequency Steps	1% step
Dwell Time	2.9 sec

5.5.3. Test Procedures

1. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
2. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
3. The frequency range is swept from 150 KHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5 x 10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
4. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequencies and harmonics or frequencies of dominant interest shall be analyzed separately.
5. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.

5.5.4. Test Setup Layout

T : 50 ohm
T2: Power attenuator(6dB)



5.5.5. Test Deviation

There is no deviation with the original standard.

5.5.6. EUT Operation during Test

The test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT.

5.5.7. Test Result of Conducted Disturbances Induced by RF Field Immunity

Temperature	26℃	Humidity	55%
Pressure	98 kPa	Test Engineer	Jason Ching
Performance	Required Criteria A	Configurations	Normal Use

AC Power Port	
Observation	Performance
No performance degradation was observed.	A

6. LIST OF MEASURING EQUIPMENTS

<EMI>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Feb. 16, 2005	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	May. 05, 2005	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
10m Semi Anechoic Chamber	TDK	SAC-10M	10CH02-HY	30MHz~1GHz 10m,3m	Mar. 12, 2005	Radiation (10CH02-HY)
Spectrum Analyzer	R&S	FSP7	100645	9KHz – 7GHz	Jun 10, 2005	Radiation (10CH02-HY)
Receiver	R&S	ESI	838496/008	20Hz – 7GHz	Mar. 04, 2005	Radiation (10CH02-HY)
Amplifier	Agilent	8447D	2944A10827	100KHz – 1.3GHz	Jun. 07, 2005	Radiation (10CH02-HY)
Amplifier	Agilent	8447D	2944A10828	100KHz – 1.3GHz	Jun. 07, 2005	Radiation (10CH02-HY)
Biconical Antenna	Schwarzbeck	VHBB 9124	287	30MHz –200MHz	Jan. 03, 2005	Radiation (10CH02-HY)
Log Antenna	Schwarzbeck	VUSLP 9111	207	200MHz -1GHz	Jan. 03, 2005	Radiation (10CH02-HY)
Turn Table	HD	DS 430	430/360	0 ~ 360 degree	N/A	Radiation (10CH02-HY)
Antenna Mast	HD	MA240	240/664	1 m - 4 m	N/A	Radiation (10CH02-HY)
Antenna Mast	HD	MA240	240/667	1 m - 4 m	N/A	Radiation (10CH02-HY)
RF Cable-R10m	Jye Bao	RG142	CB027-INSIDE	30MHz~1GHz	Jan. 02, 2005	Radiation (10CH02-HY)
RF Cable-R10m	Suhner Switzerland + BELDEN	RG223/U + RG8/U	CB026-DOOR	30MHz~1GHz	Jan. 02, 2005	Radiation (10CH02-HY)

Note: Calibration Interval of instruments listed above is one year.

<EMS>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	KEYTEK	MZ-15/EC	0408333	Air: 0 KV - 15 KV Contact: 0 KV -8KV	Oct. 20,2005	ESD
EFT Generator	KEYTEK	EMC Pro	040835	0 KV - 4.4 KV	Nov. 14, 2005	EFT
EFT/Clamp	KEYTEK	CCL-4/S	0408329	0KV-1KV	N/A	EFT
SURGE Generator	KEYTEK	EMC Pro	0408325	0 KV - 4.4 KV	Nov. 14, 2005	SURGE
SURGE CDN	KEYTEK	EMC Pro	0408326	0.5KV~2KV	Nov. 14, 2005	SURGE
Conducted Immunity Test System	SCHAFFNER	NSG2070	1091	100KHz ~ 250MHz FM 1KHZ 80%	Jul. 27, 2005	CS
Attenuator	SCHAFFNER	INA 2070-1	2091	150KHz ~ 230MHz -4dB/50Ω,40W min	Jul. 27, 2005	CS
Coupling and Decoupling Network	SCHAFFNER	CDN M016	20579	150KHz ~ 230MHz	Jul. 27, 2005	CS(*)
Coupling and Decoupling Network	FRANKONIA	CDN M2+M3	A3011050	150KHz ~ 230MHz	Feb. 01, 2005	CS(*)

Note: Calibration Interval of instruments listed above is one year.

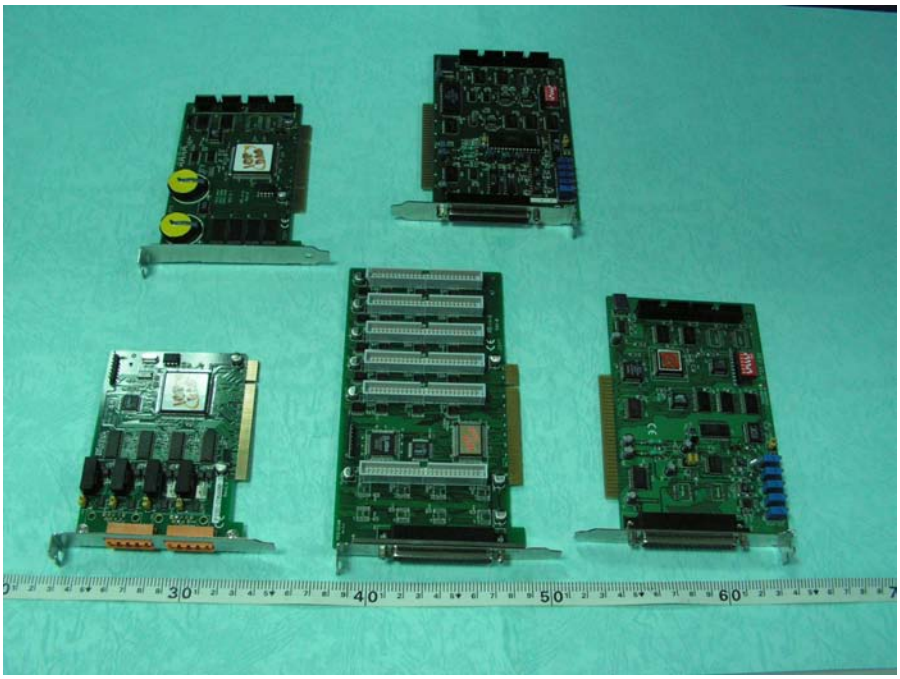
7. SPORTON COMPANY PROFILE

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test familial apart from ERSO. In 1988, one 3M and 10M/3M open area test site were setup and also obtained official accreditation from FCC, VCCI and NEMKO. In 1993, a Safety laboratory was founded and obtained accreditation from UL of USA, CSA of Canada and TUV (Rhineland & PS) of Germany. In 1995, one EMC lab, including EMI and EMS test facilities was setup. In 1997, SPORTON Group has provided financial expense to relocate the headquarter to Orient Scientific Park in Taipei Hsien to offer more comprehensive, more qualified and better service to local suppliers and manufactures. In 1999, Safety Group and Component Group were setup. In 2001, SPORTON has established 3M/10M chamber in Hwa Ya Technology Park.

7.1. Test Location

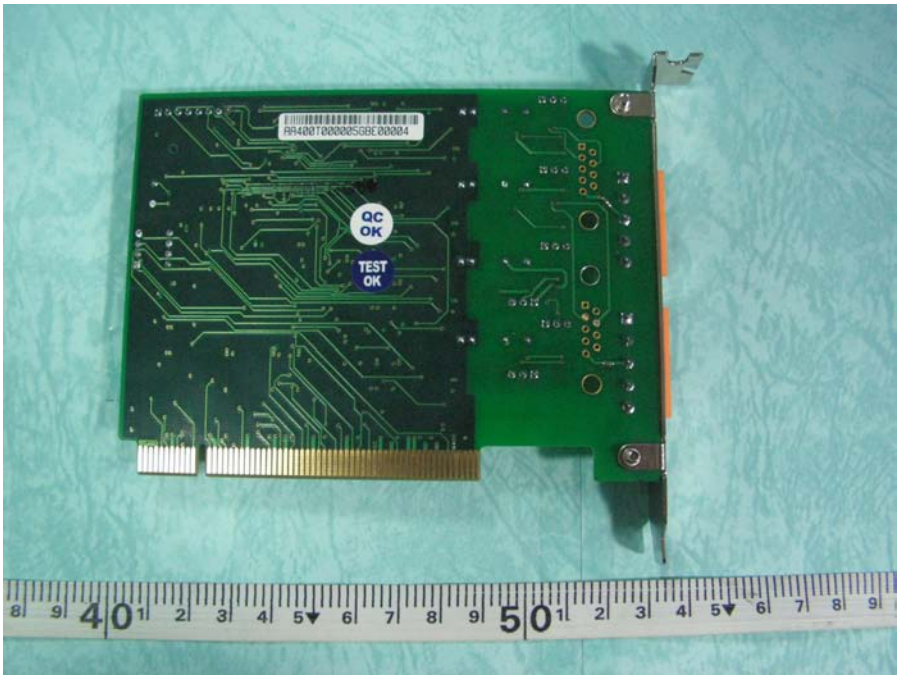
SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	02-2696-2468
	FAX	:	02-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	03-327-3456
	FAX	:	03-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	02-2601-1640
	FAX	:	02-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	02-2631-4739
	FAX	:	02-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	02-8227-2020
	FAX	:	02-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	02-2794-8886
	FAX	:	02-2794-9777
JHUBEI	ADD	:	No.8, Lane 728, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
	TEL	:	03-656-9065
	FAX	:	03-656-9085

APPENDIX A. Photographs of EUT

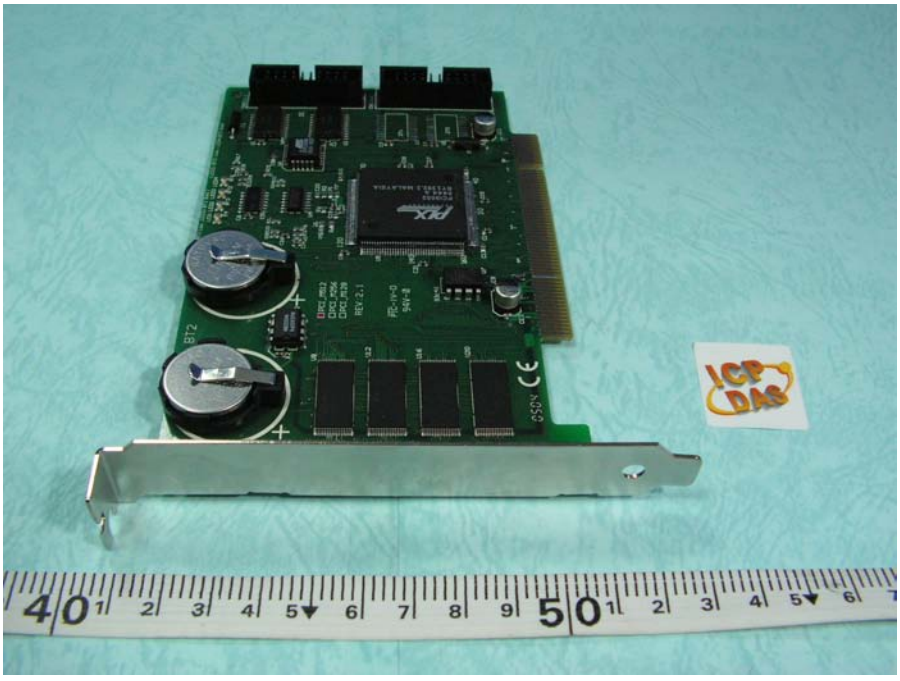



PISO-CAN400-T
Rev2.3
ICP DAS

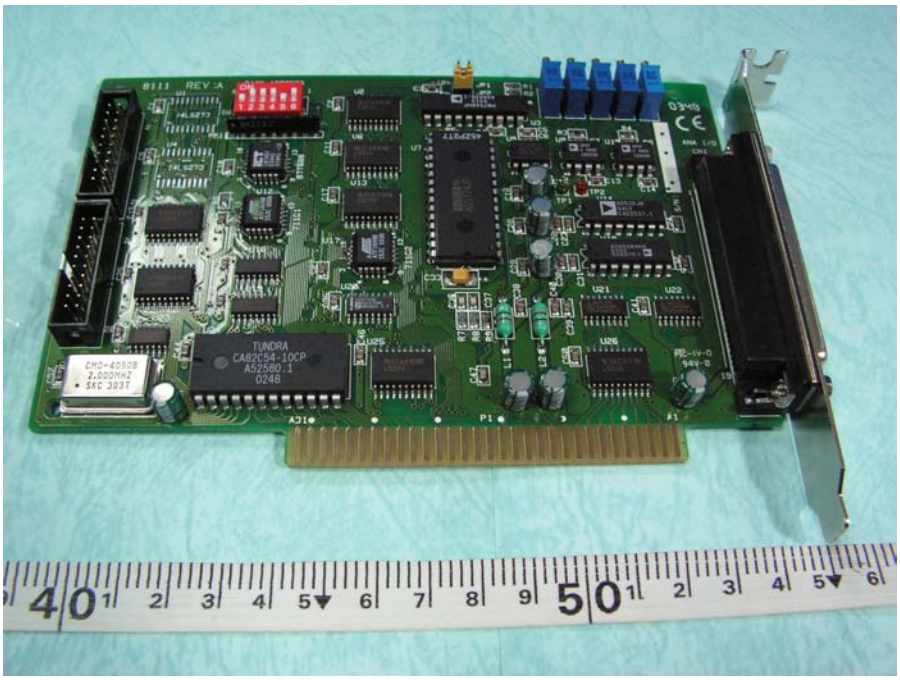

ICP DAS



SPORTON International Inc.
TEL : 886-2-2696-2468
FAX : 886-2-2696-2255




QC
OK
TEST
OK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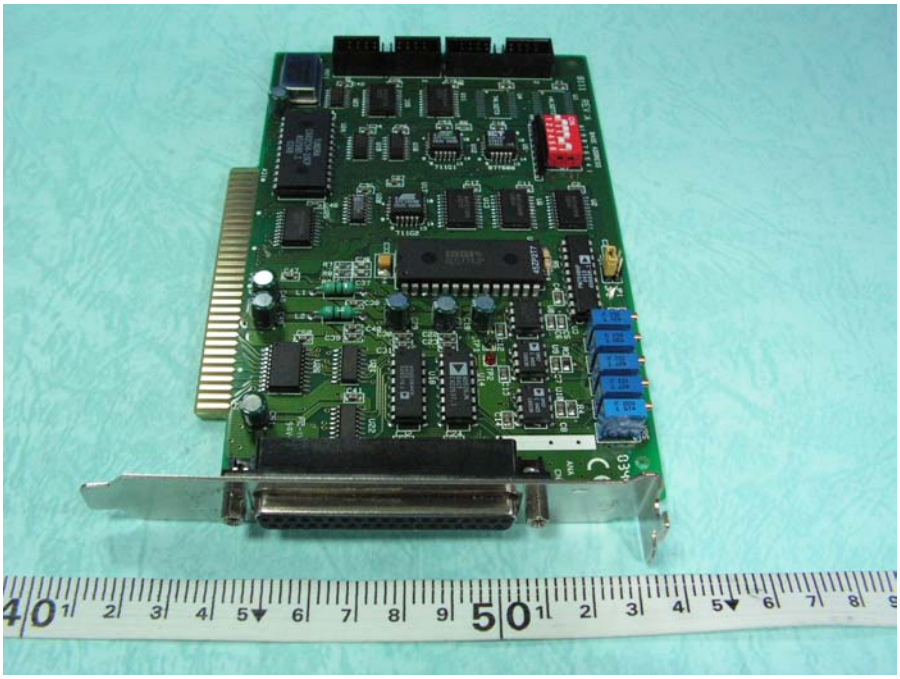
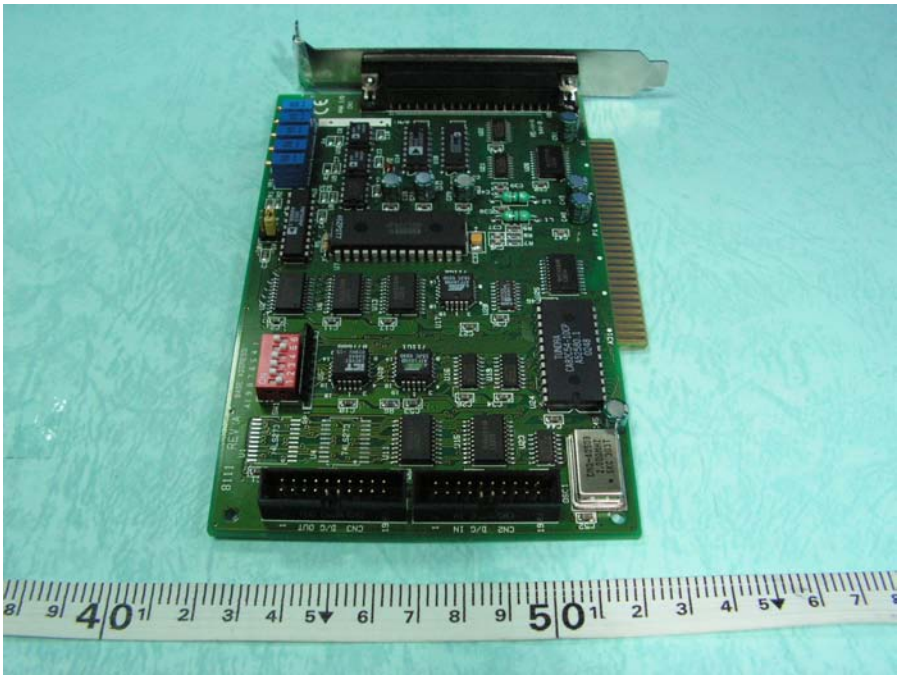
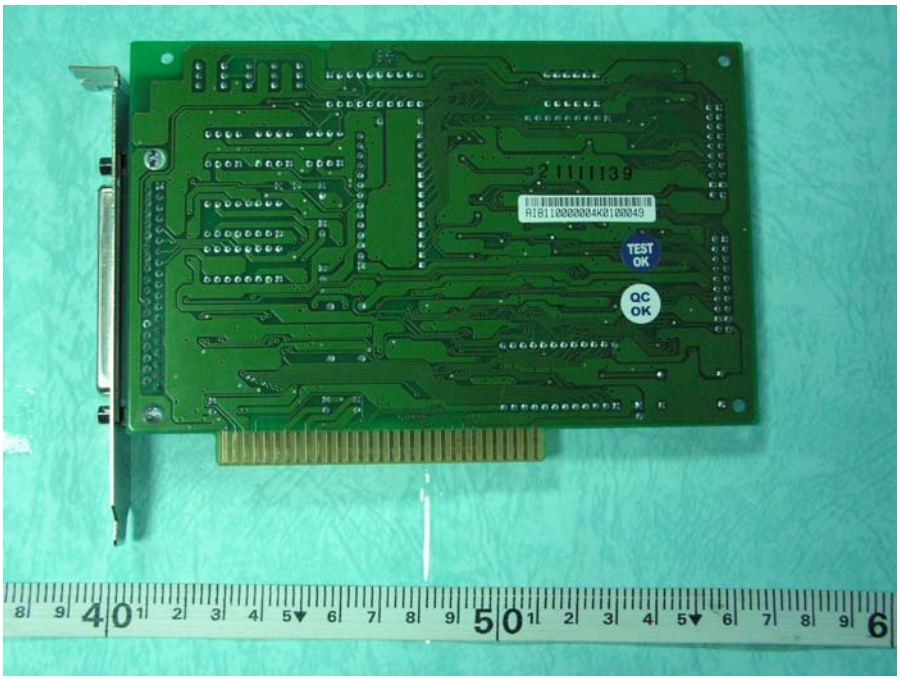
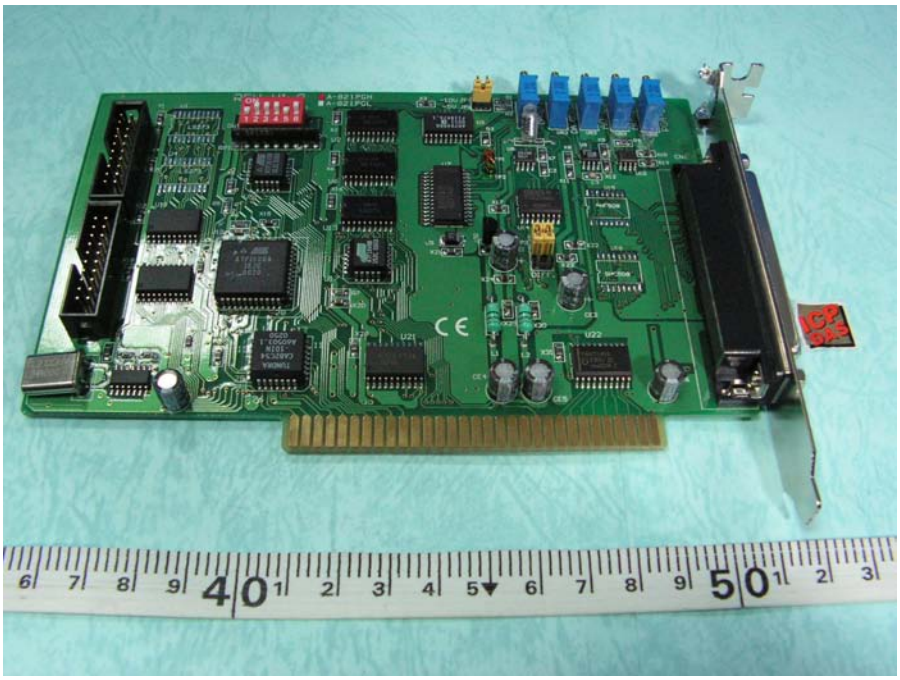


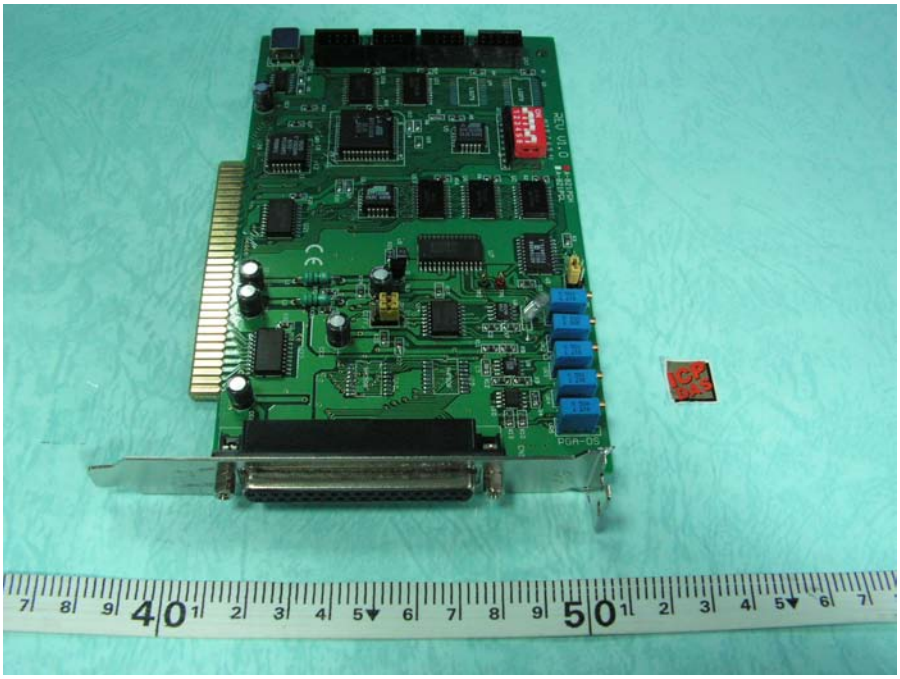


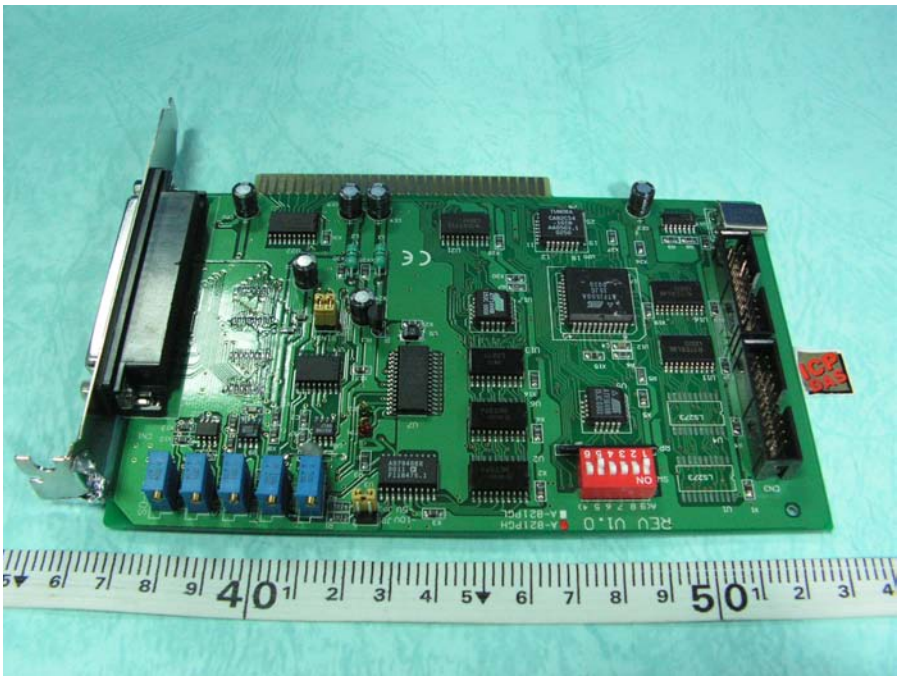
SPORTON International Inc.
TEL : 886-2-2696-2468
FAX : 886-2-2696-2255

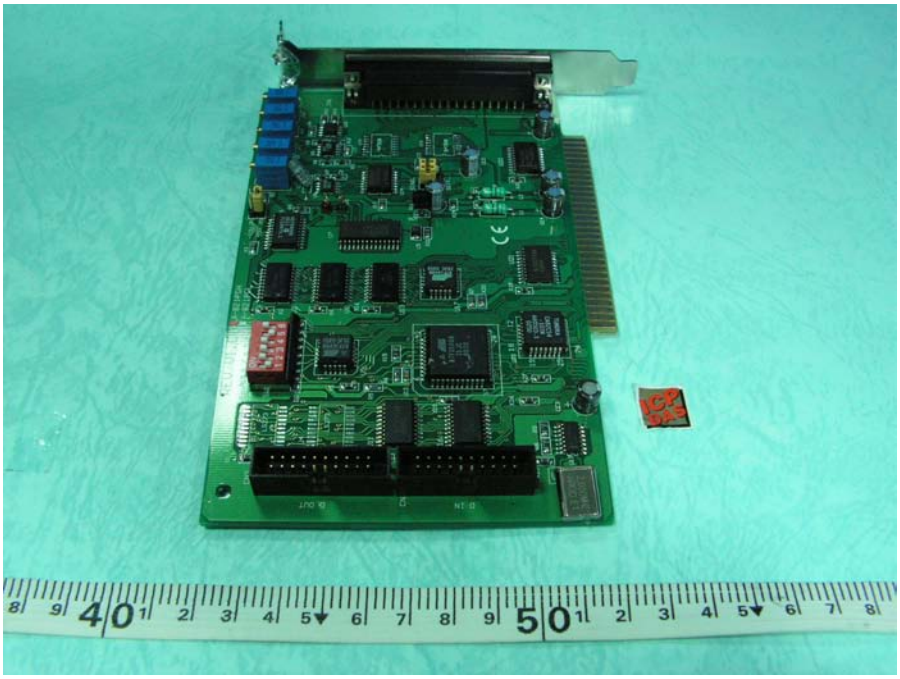


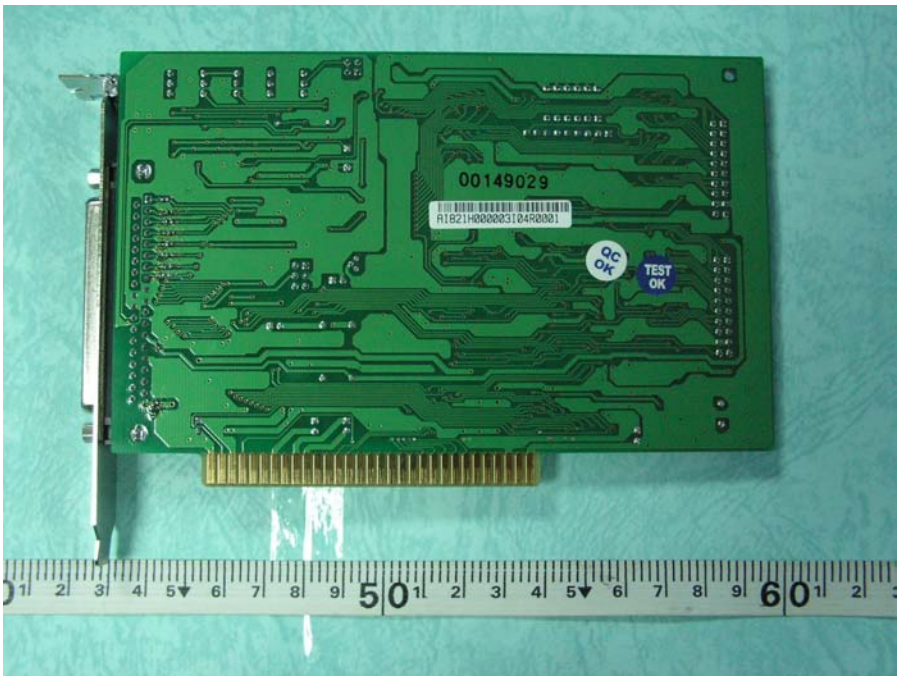
SPORTON International Inc.
TEL : 886-2-2696-2468
FAX : 886-2-2696-2255







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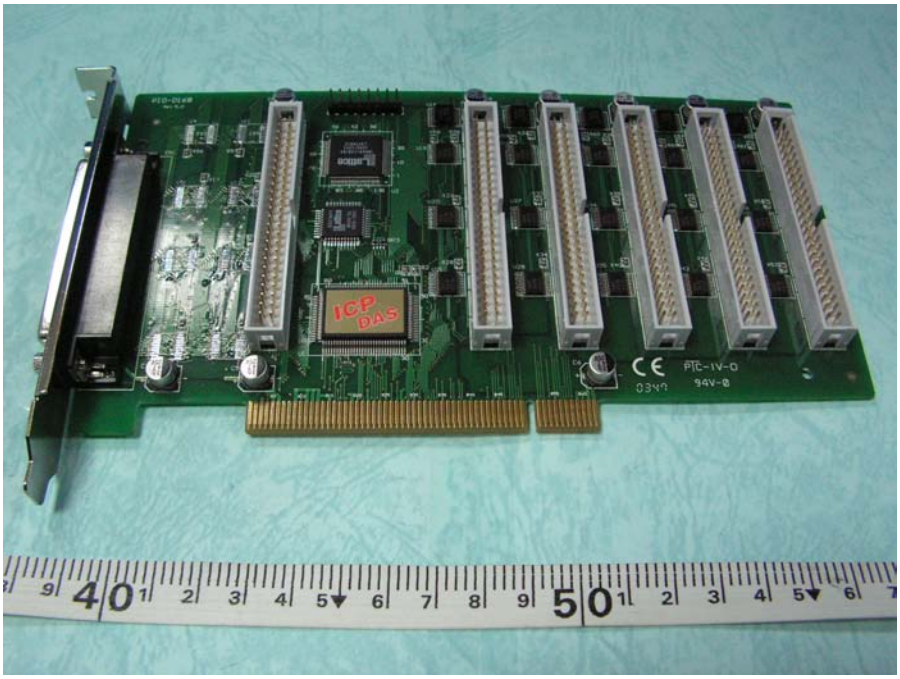
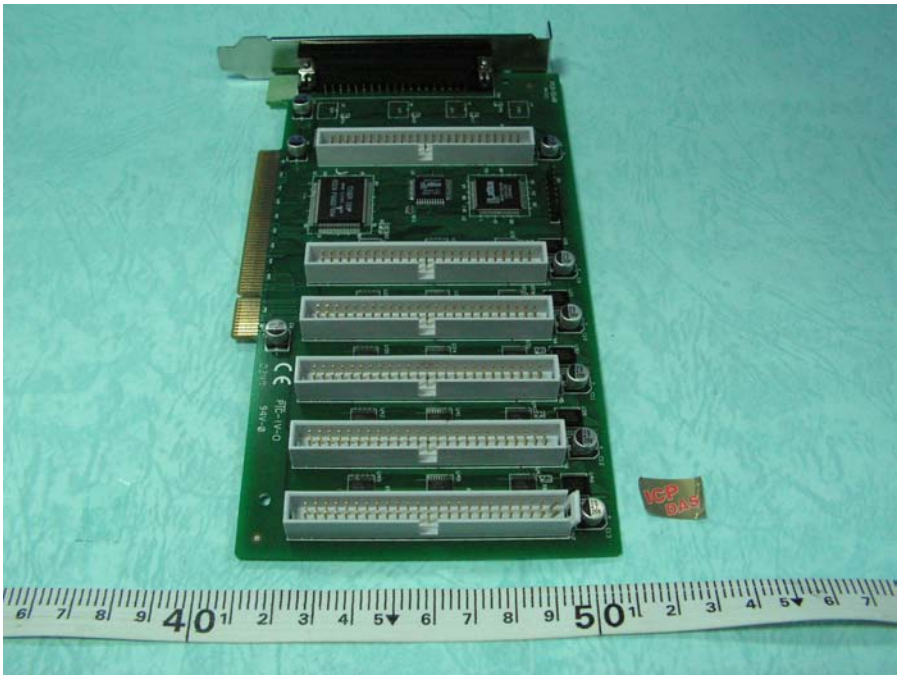

ICP
DAS


PIC-IV-O
94V-0
ICP DAS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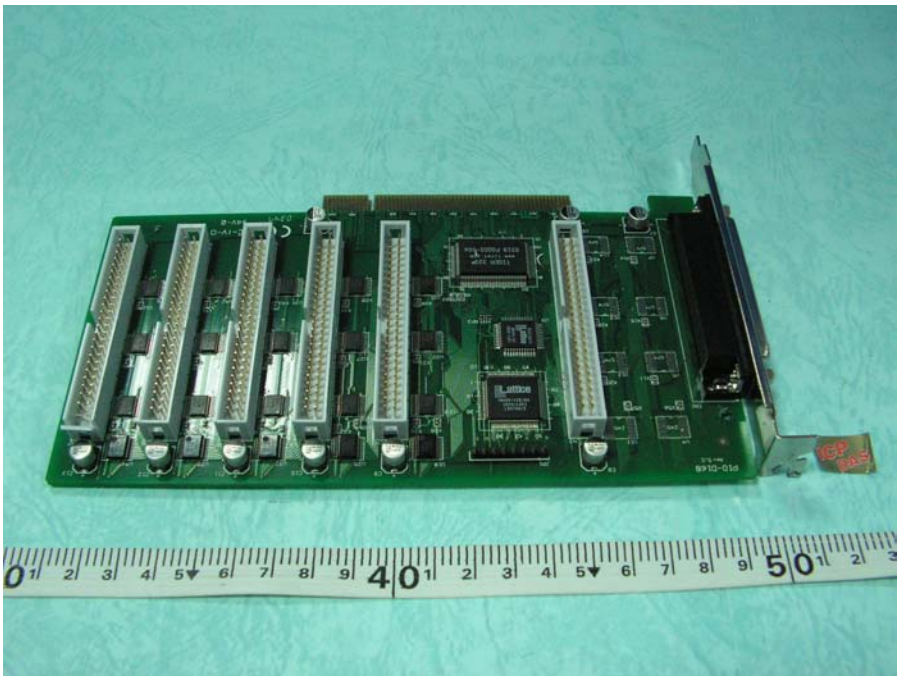

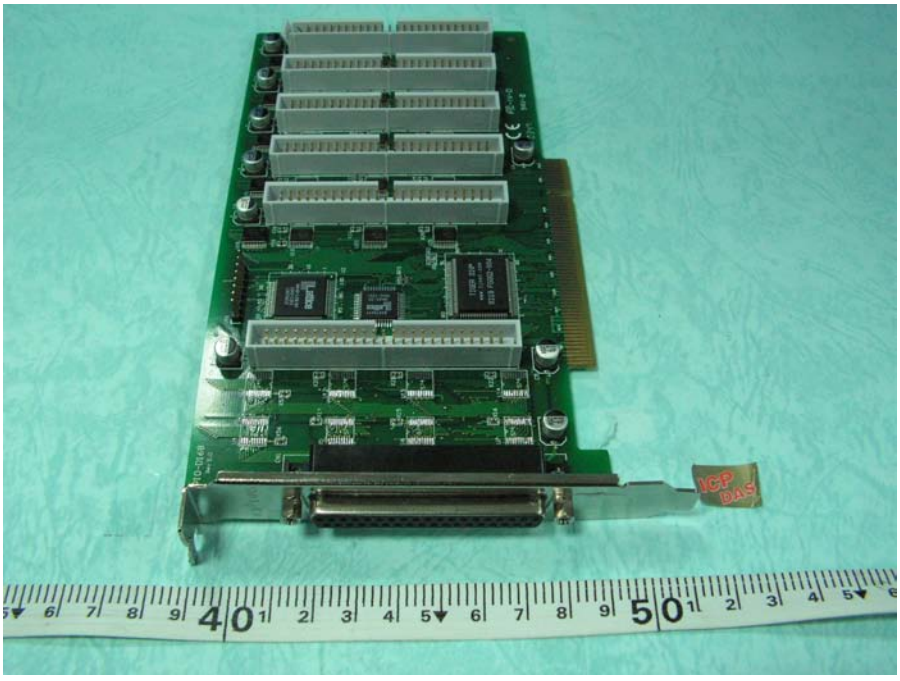

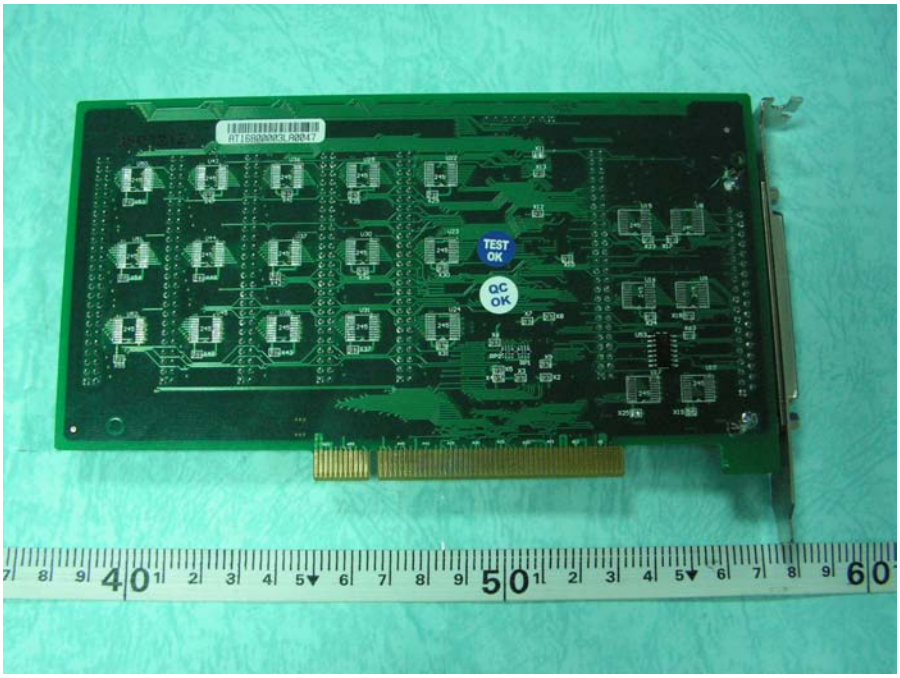
TEST OK
QC OK

Appendix B. Test Photos

1. Photographs of Conducted Emissions Test Configuration

FRONT VIEW

REAR VIEW

2. Photographs of Radiated Emissions Test Configuration

FRONT VIEW

REAR VIEW