



# CE EMC TEST REPORT

for

**NS-600**

**MODEL: NS-600**

Test Report Number:  
60904404-E

Issued for

**NXTAR TECHNOLOGIES, INC.**

51 Hwangong Rd., Yongkang Industrial Park, Tainan 710, Taiwan

Issued By:

**Compliance Certification Services Inc.**

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Issued Date: September 22, 2006



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**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00		Initial Issue	ALL	



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# 1 TEST CERTIFICATION

<b>Product:</b>	NS-600	
<b>Model:</b>	NS-600	
<b>Data Applies To:</b>	NS-400-1; NS-400-2	
<b>Applicant:</b>	NXTAR TECHNOLOGIES, INC. 51 Hwangong Rd., Yongkang Industrial Park, Tainan 710, Taiwan	
<b>Manufacturer:</b>	NXTAR TECHNOLOGIES, INC. 51 Hwangong Rd., Yongkang Industrial Park, Tainan 710, Taiwan	
<b>Tested:</b>	September 7, 2006 ~ September 9, 2006	
<b>Applicable Standards:</b>	<b>EN 55022:1998 +A1: 2000 + A2:2003, Class B</b> EN 61000-3-2:2000 Class A EN 61000-3-3:1995+A1: 2001	<b>EN 55024: 1998 + A1: 2001 + A2: 2003</b> IEC 61000-4-2:1995+A1:1998+A2:2000 IEC 61000-4-3:2002+A1: 2002 IEC 61000-4-4:1995+A1:2000+A2:2001 IEC 61000-4-5:1995+A1:2000 IEC 61000-4-6:1996+A1:2000 IEC 61000-4-11:1994+A1:2000

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in 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:*

*Reviewed by:*

**Alex Chiu**  
Manager

**Jeter Wu**  
Section Manger



## 2 TEST RESULT SUMMARY

EMISSION			
Standard	Item	Result	Remarks
EN 55022: 1998 + A1: 2000 + A2:2003	Conducted (Main Port)	PASS	Meet Class B limit
	Radiated	PASS	Meet Class B limit
EN 61000-3-2 (2000)	Harmonic current emissions	PASS	Meet Class A limit
EN 61000-3-3 (1995)+A1 (2001)	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY 【 EN 55024:1998 + A1: 2001 + A2: 2003 】			
Standard	Item	Result	Remarks
IEC 61000-4-2: 1995 + A1: 1998 + A2: 2000	ESD	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-3: 2002 + A1: 2002	RS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 1995 + A1: 2000 + A2: 2001	EFT	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-5: 1995 + A1: 2000	Surge	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-6: 1996 + A1: 2000	CS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11: 1994 + A1: 2000	Voltage dips & voltage variations	PASS	Meets the requirements of <b>Voltage Dips:</b> 1) >95% reduction Performance Criterion B 2) 30% reduction Performance Criterion C <b>Voltage Interruptions:</b> 1) >95% reduction Performance Criterion C.

- Note:**
1. The test result judgment is decided by the limit of test standard
  2. The information of measurement uncertainty is available upon the customer's request.



### 3 EUT DESCRIPTION

<b>Product</b>	NS-600
<b>Model</b>	NS-600
<b>Data Applies To</b>	NS-400-1; NS-400-2
<b>Applicant</b>	NXTAR TECHNOLOGIES, INC.
<b>Housing material</b>	Metal
<b>EUT Type</b>	<input checked="" type="checkbox"/> Engineering Sample. <input type="checkbox"/> Product Sample, <input type="checkbox"/> Mass Product Sample.
<b>Serial Number</b>	None
<b>Received Date</b>	September 4, 2006
<b>Power Source</b>	AC 100~240V 1.3A 60Hz or DC 12V 1.5A 60Hz
<b>Power Cable</b>	Unshielded, 1.1m

**Note:** 1. Client consigns only one model sample to test (Model Number: NS-600), Therefore, the testing Lab. just guarantees the unit, which has been tested.

2. According to customer declaration, the EUT included power cable for sale.

Model Number / Appearance/Function	NS-600	NS-400-1	NS400-2
Front Penal LED Display	TAMPER 1~6 Normal: Green Abnormal: Red ALARM 1~6 Normal: None Alarm: Red	TAMPER 1~4 Normal: Green Abnormal: Red ALARM 1~4 Normal: None Alarm: Red	TAMPER 1~4 Normal: Green Abnormal: Red ALARM 1~4 Normal: None Alarm: Red
Back Penal Light Source Output & Signal Input	Light Source Output port:1 Signal Input Ports: 6 Optical Connectors: 7	Light Source Output port:4 Signal Input Ports: 4 Optical Connectors: 8	Light Source Output port:1 Signal Input Ports: 4 Optical Connectors: 5
Optical Structure Inside Controller	6 sets of OE converters are connected to signal input ports separately. LD is connected to Isolator then connected to Light Source Output Port.	4 sets of OE converters are connected to signal input ports separately. LD is connected to an Isolator, then thru 3 units of 1x2 coupler, the light is split into 4 outputs.	4 sets of OE converters are connected to signal input ports separately. LD is connected to Isolator then connected to Light Source Output Port.
Circuit Structure Inside Controller	Solder the pieces onto the circuit as indicated by the NS600-5 circuit design	Solder the pieces onto the circuit as indicated by the NS600-5 circuit design except for page 5 and 6 (as referred to C on the Circuit.	Solder the pieces onto the circuit as indicated by the NS600-5 circuit design except for page 5 and 6 (as referred to C on the Circuit.
Number of Relay Ports	14	10	10

## **4 TEST METHODOLOGY**

### **4.1. DECISION OF FINAL TEST MODE**

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ mode is as the following:

**Test Mode:** Normal link

### **4.2. EUT SYSTEM OPERATION**

1. Setup whole system for test completely for test as shown on setup diagram.
2. Turn on power.
3. Check EUT function.
4. Start testing.

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

## 5 SETUP OF EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF SUPPORT UNITS

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

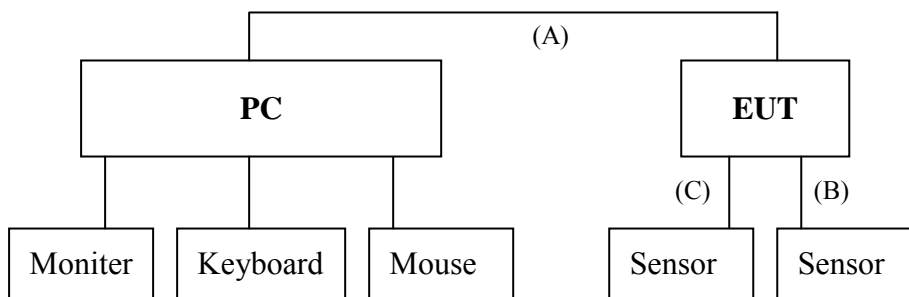
No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	PC	HP	d330uT	R33001	Power cable, unshd, 1.5m
2	LCD Monitor	SAMPO	SL7003	R4AA03	VGA cable, shd, 1.5m
3	Keyboard(PS2)	HP	KB-0133	DOC	Keyboard cable, shd, 1.9m
4	Mouse(PS2)	HP	M-S69	JNZ211443	Mouse cable, shd, 1.8m

No.	Signal cable description	
A	RS-232 cable	1.9m, unshielded, 1pcs
B	Fiber cable	10m, unshielded, 4pcs
C	Fiber cable	3m, unshielded, 3pcs

**Note:**

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

### 5.2. CONFIGURATION OF SYSTEM UNDER TEST





## 6 FACILITIES AND ACCREDITATIONS

### 6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC, NVLAP
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Canada</b>	INDUSTRY CANADA
<b>Taiwan</b>	TAF, BSMI

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsemc.com.tw>

### 6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty	
Conducted emissions	9kHz~30MHz	± 0.98 dB	
Radiated emissions	Horizontal	30MHz ~ 200MHz	± 0.78 dB
		200MHz ~1000MHz	± 0.78 dB
	Vertical	30MHz ~ 200MHz	± 0.78 dB
		200MHz ~1000MHz	± 0.78 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



7 EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

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

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N.	SCHWARZBECK	NNLK 8121	8121-446	OCT. 21, 2006 For Insertion loss
	Rohde & Schwarz	ESH-Z5	840062/021	N.C.R.
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUN. 17, 2007
TYPE N COAXIAL CABLE	SUHNER	-----	-----	FEB. 26, 2007
Test S/W	e-3 (5.04211c) R&S (2.27)			

- NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R = No Calibration Request.

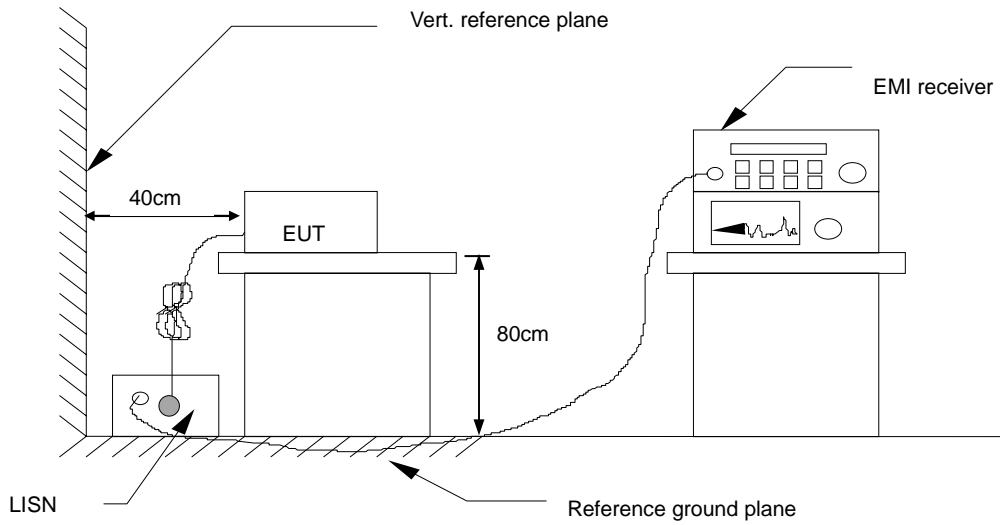
**7.1.3. TEST PROCEDURES (SOP : SI-SP-001)****Procedure of Preliminary Test**

- The EUT and Support equipment, if needed, 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.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received 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 3.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels 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.
- The test data of the worst-case condition(s) was recorded.

**7.1.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**7.1.5. Data Sample:**

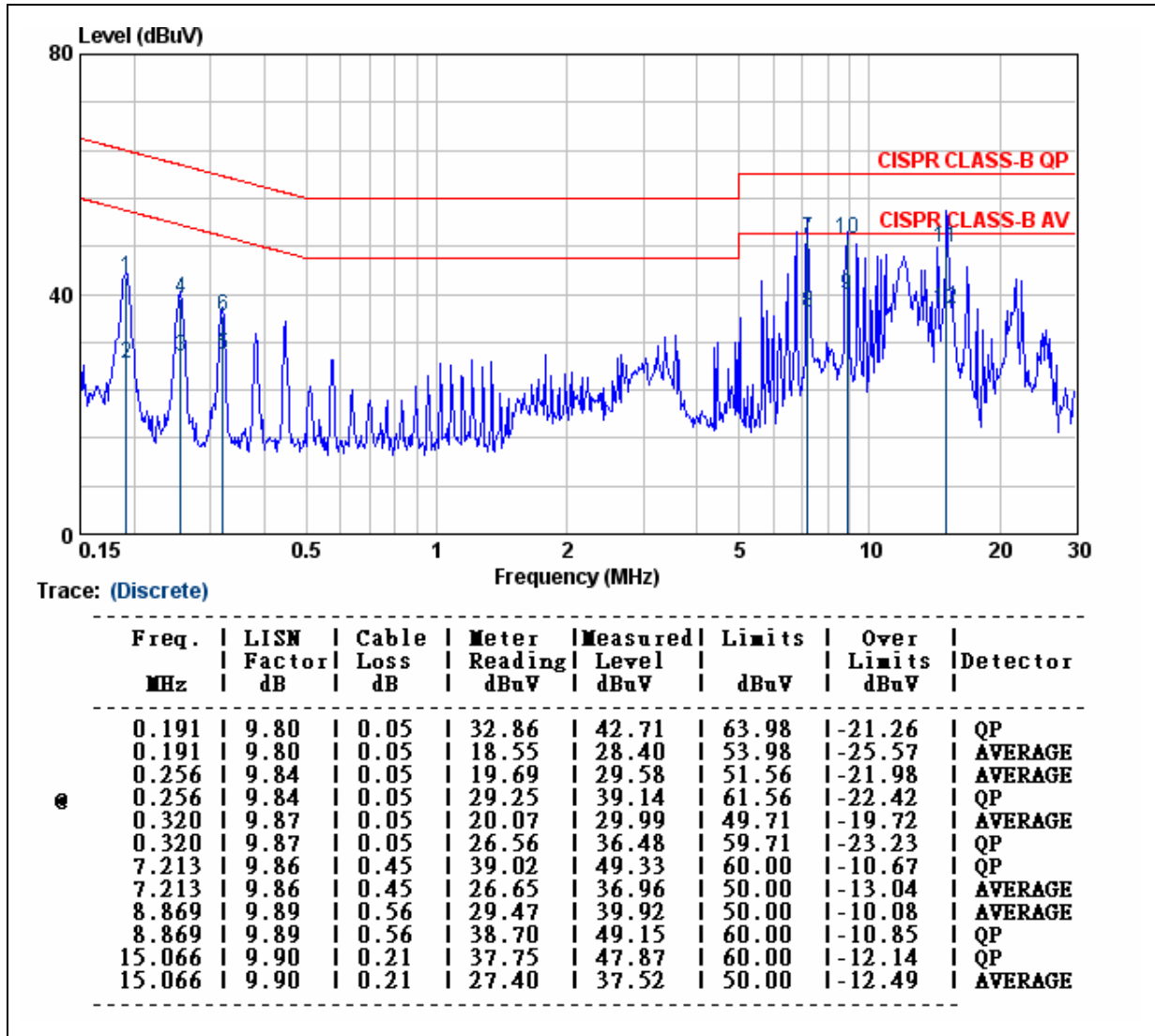
Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Meter Reading (dBuV)	Measured Level (dBuV)	Limits (dBuV)	Over Limits (dBuV)	Detector
x.xx	9.6	0.1	15.7	25.4	46	-20.6	QP

- REMARKS :
1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)
  2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

**7.1.6. TEST RESULTS**

<b>Model No.</b>	NS-600	<b>6dB BANDWIDTH</b>	9 kHz
<b>Environmental Conditions</b>	25.7deg.C, 49% RH,	<b>Test Mode</b>	Normal Link
<b>Tested by:</b>	Agun		

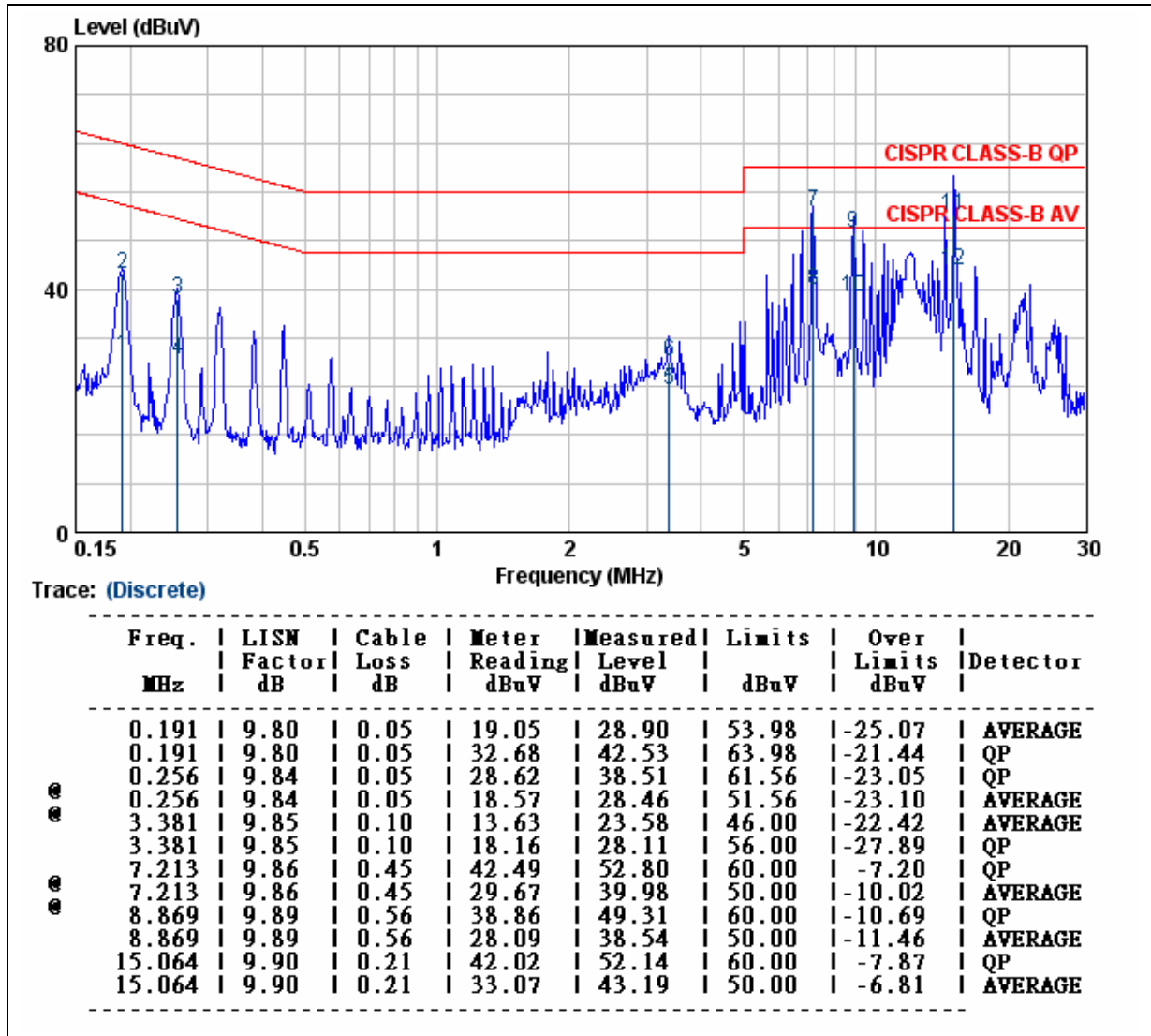
**LINE**



REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)  
 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

<b>Model No.</b>	NS-600	<b>6dB BANDWIDTH</b>	9 kHz
<b>Environmental Conditions</b>	25.7deg.C, 49% RH,	<b>Test Mode</b>	Normal Link
<b>Tested by:</b>	Agun		

## NEUTRAL



REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)  
 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



7.2. RADIATED EMISSION MEASUREMENT

7.2.1. LIMITS

FREQUENCY (MHz)	dBuV/m (At 10m)	
	Class A	Class B
30 ~ 230	40	30
230 ~ 1000	47	37

NOTE: (1) The lower limit shall apply at the transition frequencies.  
 (2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

7.2.2. TEST INSTRUMENTS

Open Area Test Site # 5				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
O.A.T.S	-----	-----	No.5	SEP. 12, 2007
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100294	JAN. 09, 2007
Pre-Amplifier	CCS	EPA-3000A	-----	MAR. 09, 2007
SPECTRUM ANALYZER	HP	8595E	3308A00344	APR. 08, 2007
TYPE N COAXIAL CABLE	SUHNER	CHA9513	004	SEP. 12, 2007
BILOG ANTENNA	CHASE	CBL6112B	2563	FEB. 06, 2007
Test Software	EMI e-3 / AUDIX (5.04211c)			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R = No Calibration Request.

**7.2.3. TEST PROCEDURE (SOP : SI-SP-002)****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 from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- Mains cables, telephone lines or other connections to auxiliary equipment located outside the test shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.
- The antenna was placed at 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.1 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.

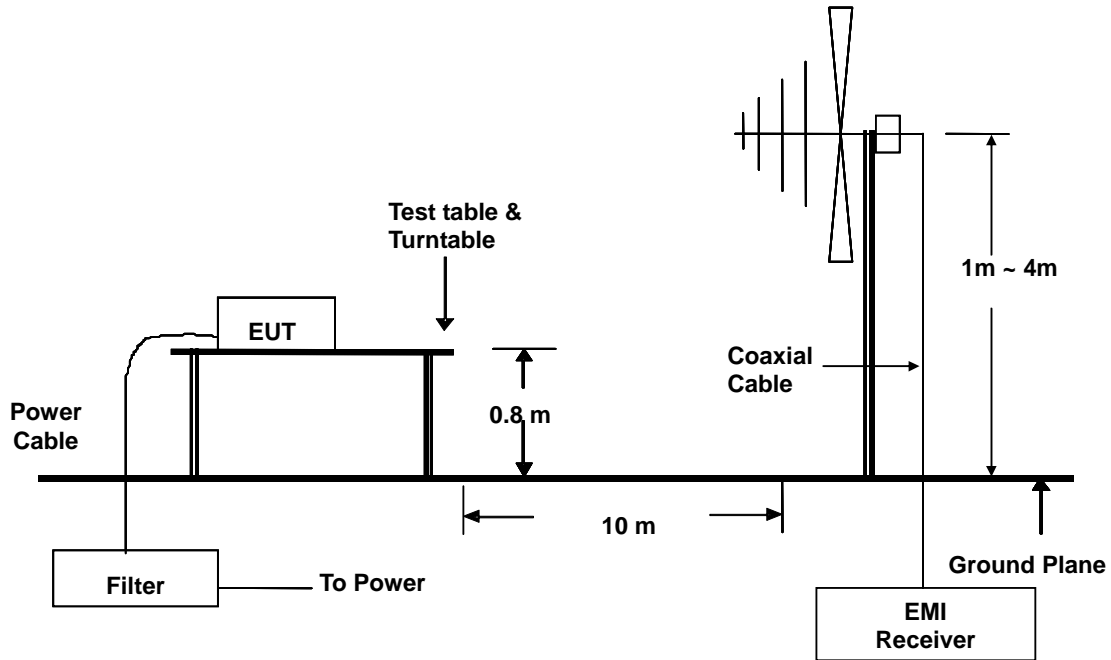




**Procedure of Final Test**

- 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.

**7.2.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

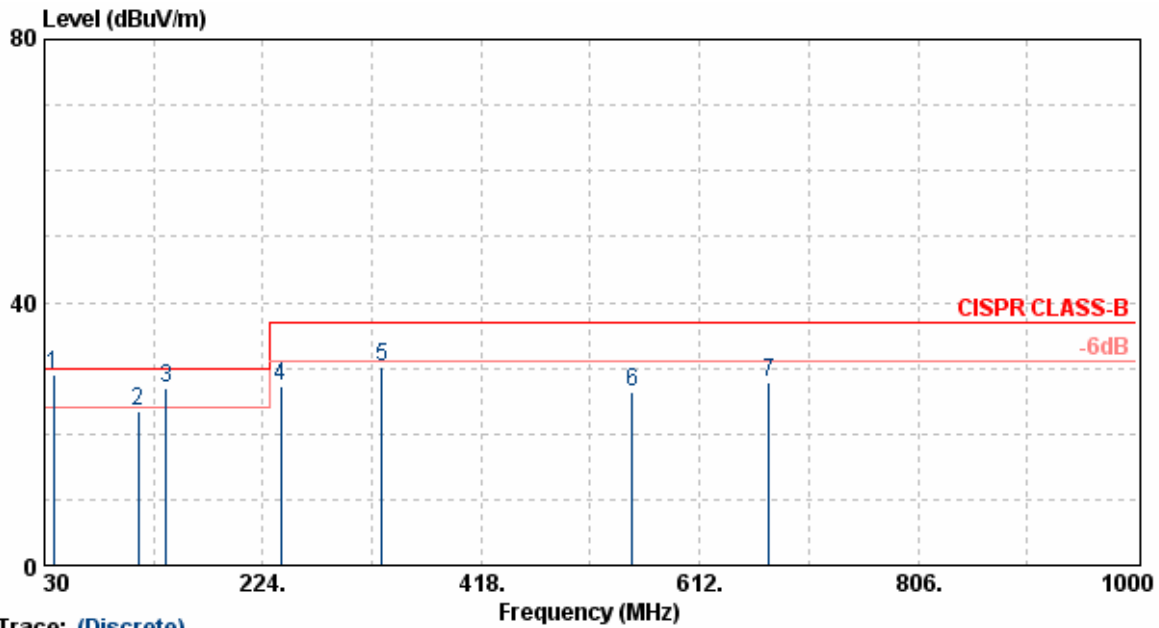
**7.2.5. Data Sample:**

Freq. (MHz)	Reading Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dBuV/m)
XX.XX	14.00	12	0.2	26.2	30	-3.80

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)  
 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

**7.2.6. TEST RESULTS**

<b>Model No.</b>	NS-600	<b>Test Mode</b>	Normal Link
<b>Environmental Conditions</b>	31.2deg.C, 48% RH,	<b>6dB BANDWIDTH</b>	120 kHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	10m
<b>Detector Function:</b>	Quasi-peak.	<b>Tested by:</b>	Eric yang

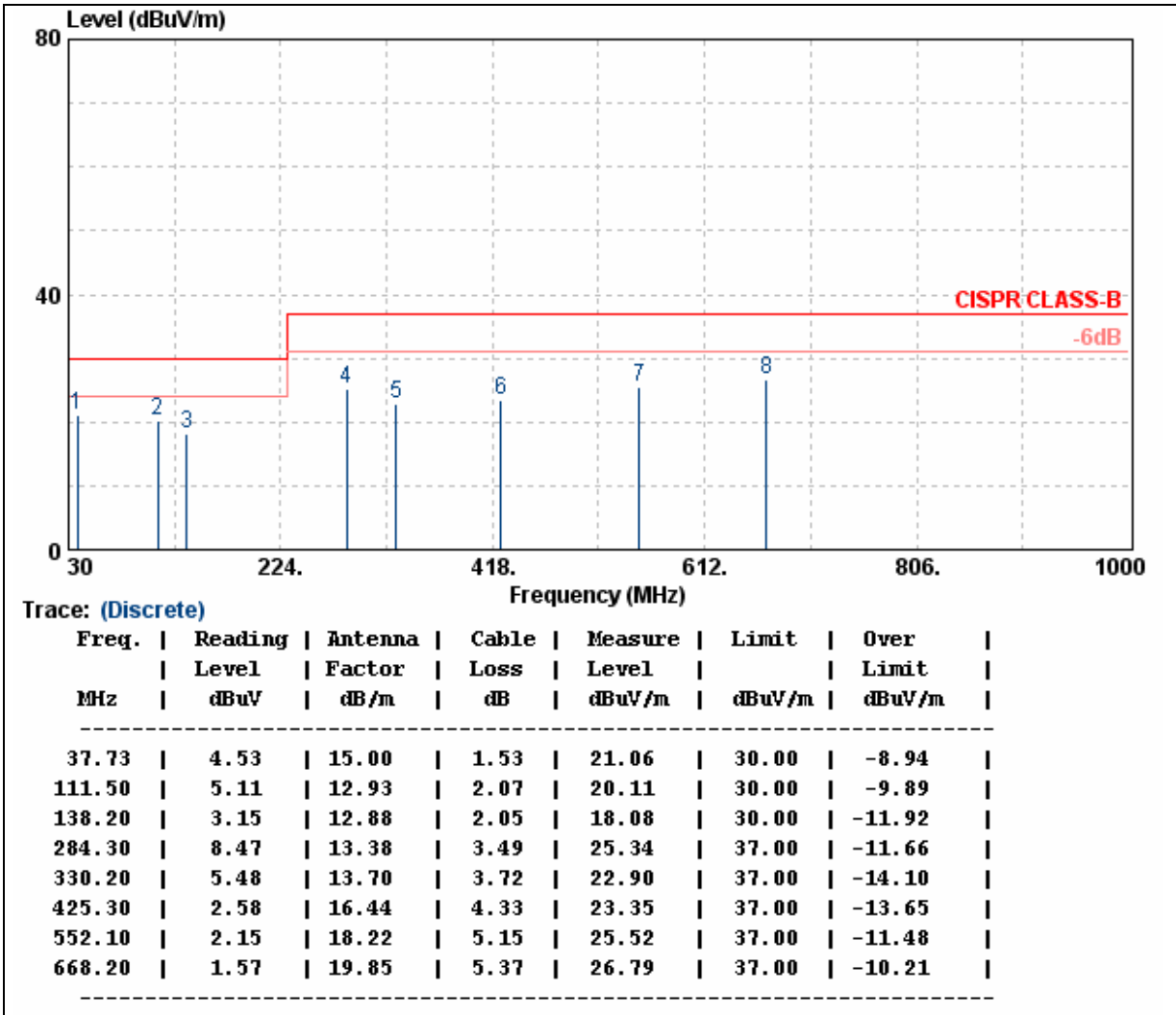


Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m
37.73	12.46	15.00	1.53	28.99	30.00	-1.01
113.28	8.22	13.17	2.05	23.43	30.00	-6.57
138.43	11.90	12.88	2.05	26.83	30.00	-3.17
240.30	13.20	11.42	2.77	27.39	37.00	-9.61
330.00	12.85	13.70	3.72	30.27	37.00	-6.73
552.30	3.11	18.22	5.15	26.48	37.00	-10.52
673.50	2.58	19.81	5.51	27.90	37.00	-9.10

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)  
 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

<b>Model No.</b>	NS-600	<b>Test Mode</b>	Normal Link
<b>Environmental Conditions</b>	31.2deg.C, 48% RH,	<b>6dB BANDWIDTH</b>	120 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	10m
<b>Detector Function:</b>	Quasi-peak.	<b>Tested by:</b>	Eric yang



REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)  
 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



### 7.3. HARMONICS CURRENT MEASUREMENT

#### 7.3.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment		Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd harmonics		Odd Harmonics only		
3	2.30	3	3.4	2.30
5	1.14	5	1.9	1.14
7	0.77	7	1.0	0.77
9	0.40	9	0.5	0.40
11	0.33	11	0.35	0.33
13	0.21	13	0.30	0.21
15<=n<=39	0.15x15/n	15<=n<=39	3.85/n	0.15x15/n
Even harmonics				
2	1.08			
4	0.43			
6	0.30			
8<=n<=40	0.23x8/n			

- NOTE:** 1. Class A and Class D are classified according to item 4.4.3.  
 2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

#### 7.3.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	NOV. 18, 2006
Test S/W	H/F HA 1600 PC LINK Field Probe			

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

**7.3.3. TEST PROCEDURE (SOP : SS-SP-012)**

- 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.

- The classification of EUT is according to section 5 of EN 61000-3-2.

- The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

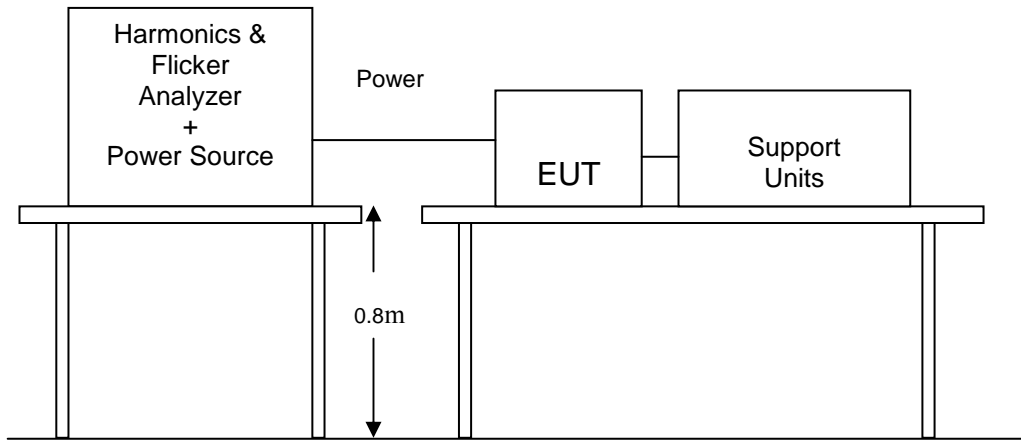
Class B: Portable tools; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600 W of the following types:  
Personal computers and personal computer monitors and television receivers.

- 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.

**7.3.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**7.3.5. TEST RESULTS**

<b>POWER CONSUMPTION</b>	150W	<b>Test Results</b>	PASS
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg.C, 50% RH, 1003 mbar	<b>Limits</b>	Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
<b>Test Mode</b>	Normal Link	<b>Tested by:</b>	Marlboro Shue

**NOTE:** 1. Limits classified according to item 7.4.3.  
 2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.



Test Result

Supply Voltage: 229.1 to 229.2 Vrms 324.5 Vpk Frequency: 49.99 Hz
THD: 0.1% Crest Factor: 1.416 peak at: 91.0 deg
Supply meets IEC requirements.

Load Power: 8.44 to 8.80 W 24.65 VA Power Factor: 0.357

Load Current: 104.3 to 107.6 mArms 475.5 mApk Crest Factor: 4.417

Limits: EN 61000-3-2:2000 Class A limits
No limits apply: Load below 75W

Table with 7 columns: Harmonic Number, Limit Current (mA), Average (filtered) (mA), % Limit, max. value (filtered) (mA), % Limit, Assessment. Rows include Fundamental and harmonics 2 through 23.





24:	-	0.2	-	0.20	-	-
25:	-	8.8	-	8.83	-	-
26:	-	0.2	-	0.22	-	-
27:	-	6.2	-	6.31	-	-
28:	-	0.2	-	0.24	-	-
29:	-	3.9	-	4.00	-	-
30:	-	0.2	-	0.26	-	-
31:	-	2.0	-	2.09	-	-
32:	-	0.2	-	0.24	-	-
33:	-	0.6	-	0.60	-	-
34:	-	0.3	-	0.29	-	-
35:	-	1.3	-	1.46	-	-
36:	-	0.2	-	0.24	-	-
37:	-	2.2	-	2.42	-	-
38:	-	0.2	-	0.22	-	-
39:	-	2.9	-	3.05	-	-
40:	-	0.2	-	0.26	-	-
21 - 39:	-	22.2	-	22.34	-	-



7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

7.4.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

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

7.4.2. TEST INSTRUMENTS

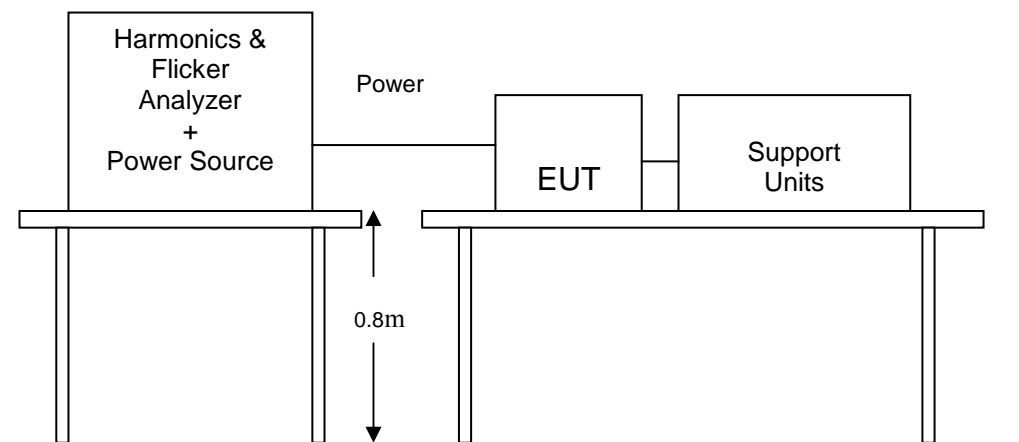
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	NOV. 18, 2006
Test S/W	H/F HA 1600 PC LINK Field Probe			

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

**7.4.3. TEST PROCEDURE (SOP : SS-SP-013)**

- 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.
- 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.

**7.4.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**7.4.5. TEST RESULTS**

<b>OBSERVATION PERIOD (Tp)</b>	10mins	<b>Test Mode</b>	Normal Link
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg.C, 50% RH, 1003 mbar	<b>Tested by:</b>	Marlboro Shue



**Test Result**

Supply Voltage: 5.3 to 230.1 Vrms 325.8 Vpk Frequency: 50.00 Hz  
THD: 5.8% Crest Factor: 1.730 peak at: 91.3 deg

Load Power: 0.00 to 4.19 W 17.73 VA Power Factor: 0.237

Load Current: 0.8 to 96.0 mArms 581.8 mApk Crest Factor: 1.917

Voltage Variations

Highest Half-cycle level: +19.12%

Lowest Half-cycle level: -25.00%

d(max): 44.12% Pass

Number of Change Intervals: 1

Highest d(t) for 200 ms: 0.00% Pass

Longest d(t) over 3.00%: 0.06 seconds

'Steady State' definition: >1000 ms below 0.15%

Highest Steady State level: -

Lowest Steady State level: -

max d(c) between adjacent: 0.00% Pass

max d(c) between any: 0.00%

Short-term Flicker indicator Pst : 0.00

Pst classifier:	Duration	Flicker
	0.1%	0
	0.7%	0
	1.0%	0
	1.5%	0
	2.2%	0
	3%	0
	4%	0
	6%	0
	8%	0
	10%	0
	13%	0
	17%	0



30%	0
50%	0
80%	0

Long-term Flicker indicator Plt : 4.53

Plt calculation:	Interval	Pst
	1:	9.63
	2:	0.00
	3:	0.00
	4:	0.00
	5:	0.00
	6:	6.03
	7:	0.00
	8:	0.00
	9:	0.00
	10:	0.00
	11:	0.00
	12:	0.00



### 8 IMMUNITY TEST

#### 8.1. GENERAL DESCRIPTION

Product Standard	EN 55024:1998 + A1: 2001 + A2: 2003	
	Test Type	Minimum Requirement
<b>Basic Standard, Specification, and Performance Criterion required</b>	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 1kV, Signal line: 0.5kV, Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, Power Port ~ Line to line: 1kV, Line to ground: 2kV Signal Port ~ Lines to ground : 0.5kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test –CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-11	<b>Voltage Dips:</b> i) >95% reduction for 0.5 period, Performance Criterion B ii) 30% reduction for 25 period, Performance Criterion C <b>Voltage Interruptions:</b> >95% reduction for 250 period Performance Criterion C



**8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION**

<b>Criteria A:</b>	The apparatus shell continues to operate as intended without operator intervention. 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. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
<b>Criteria B:</b>	After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance.  During the test, degradation of performance is however allowed. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
<b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions.  Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.



**8.3. ELECTROSTATIC DISCHARGE (ESD)**

**8.3.1. TEST SPECIFICATION**

<b>Basic Standard:</b>	EN 61000-4-2
<b>Discharge Impedance:</b>	330 ohm / 150 pF
<b>Discharge Voltage:</b>	Air Discharge: 2 ; 4 ; 8 kV (Direct) Contact Discharge: 2 ; 4 kV (Direct/Indirect)
<b>Polarity:</b>	Positive & Negative
<b>Number of Discharge:</b>	Minimum 10 times at each test point
<b>Discharge Mode:</b>	Single Discharge 1 second minimum

**8.3.2. TEST INSTRUMENT**

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Simulator	NoiseKen	ESS-2002	ESS04Z3762	JUN. 13, 2007

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



**8.3.3. TEST PROCEDURE (SOP : SS-SP-009)**

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and 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. One of the test points shall be subjected to at least 50 indirect discharges 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. Test shall be performed at a maximum repetition rate of one discharge per second.

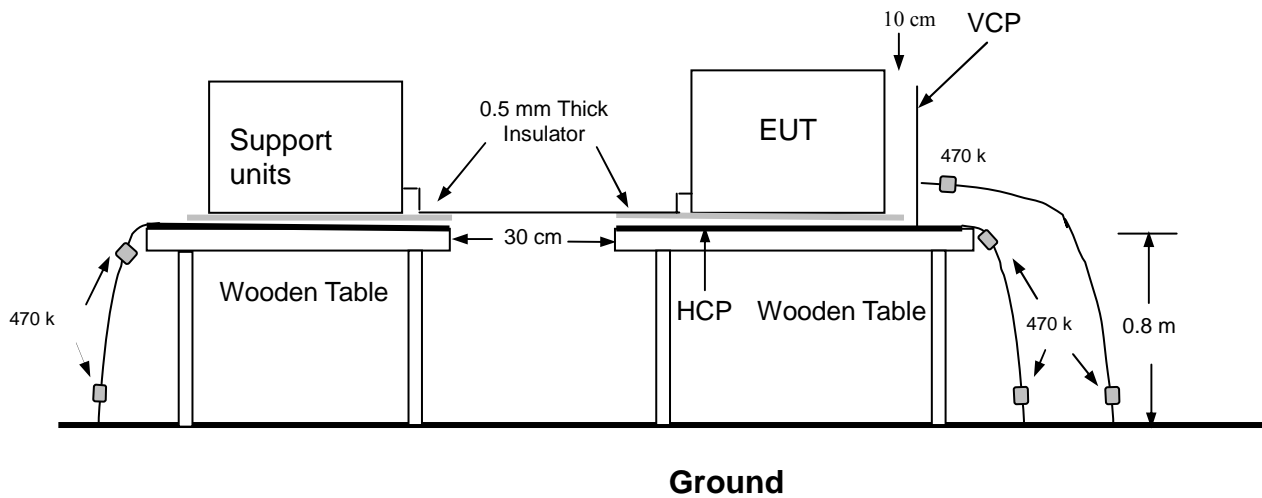
b) Air discharges at slots and apertures and insulating surfaces:

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. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm 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.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

**8.3.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**NOTE:**

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.



8.3.5. TEST RESULTS

Temperature:	25 °C	Humidity	50 % RH
Pressure	1003 mbar	TESTED BY	Marlboro Shue
Required Passing Performance		Criterion B	

Air Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Sensor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Sensor cable	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3

Contact Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3

Please refer to ESD test photo on next page for detail discharge point

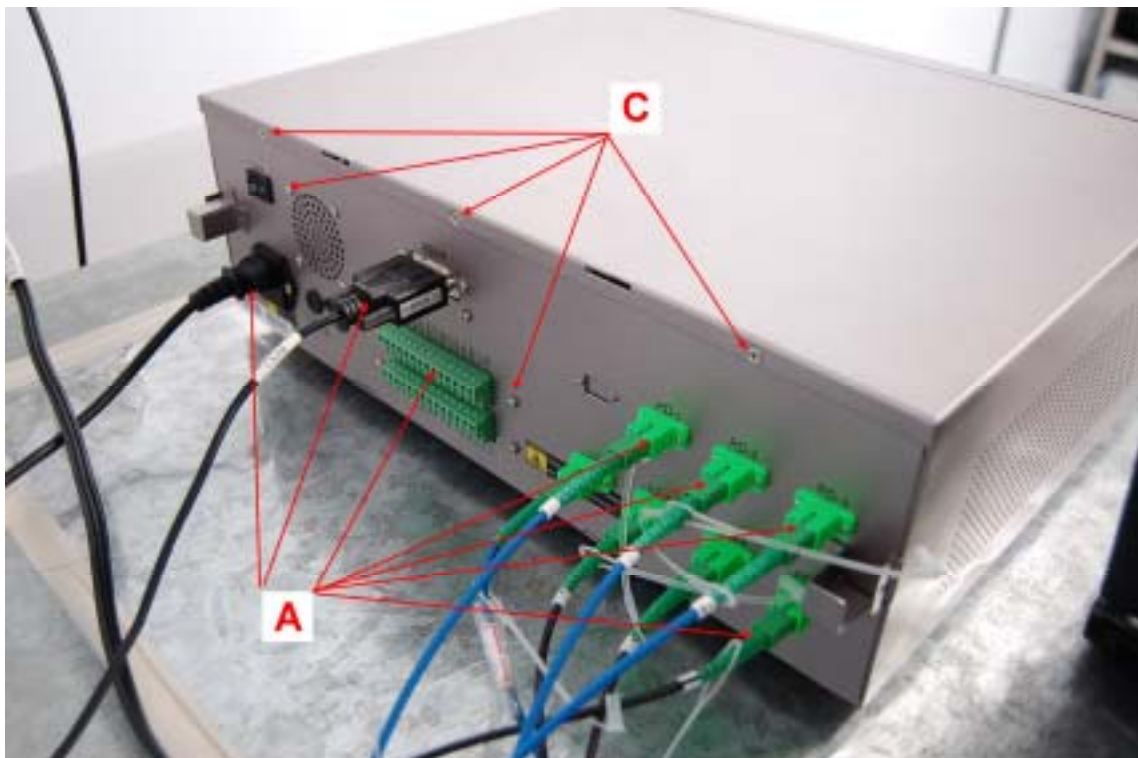
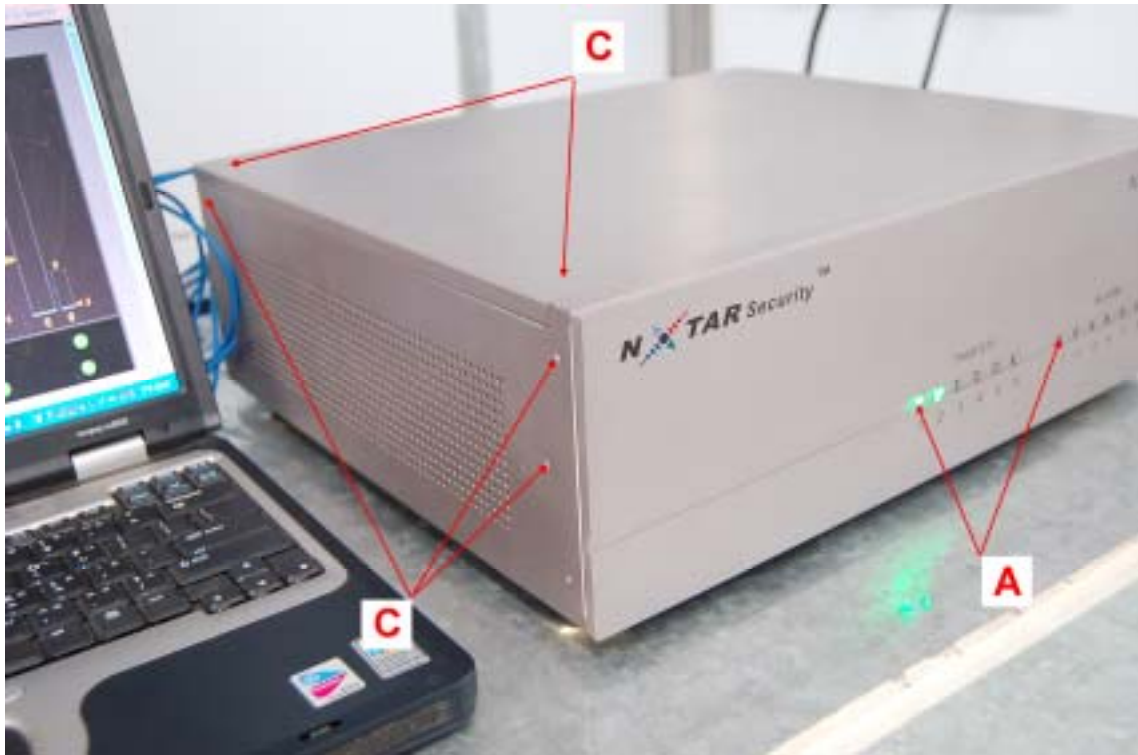
Discharge To Horizontal Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3

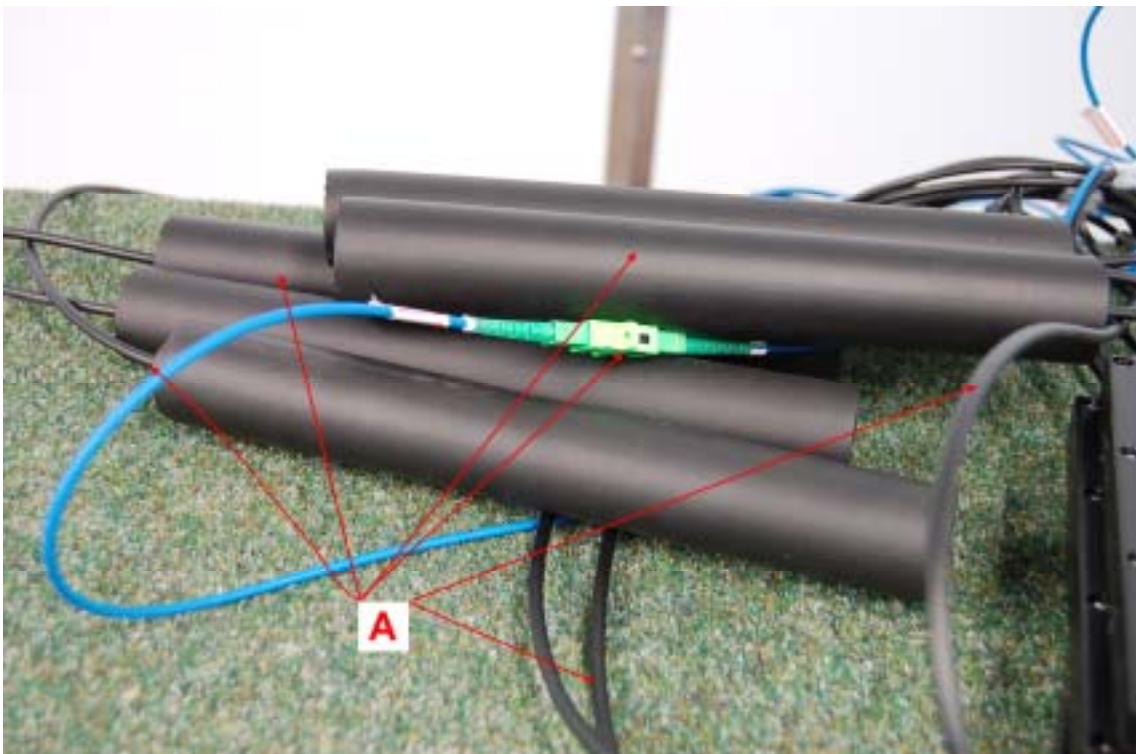
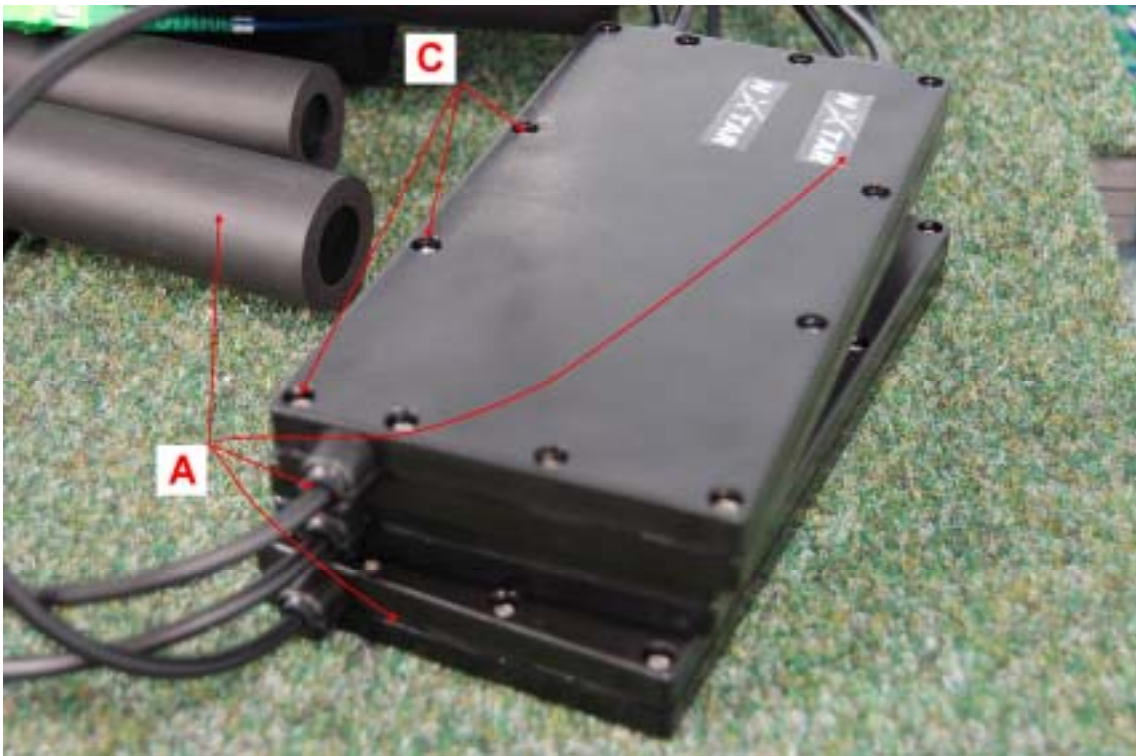
Discharge To Vertical Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

*The Photo for Discharge Points of EUT*







8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

8.4.1. TEST SPECIFICATION

- Basic Standard:** EN 61000-4-3
- Frequency Range:** 80 MHz ~1000 MHz,
- Field Strength:** 3 V/m
- Modulation:** 1kHz Sine Wave, 80%, AM Modulation
- Frequency Step:** 1 % of preceding frequency value
- Polarity of Antenna:** Horizontal and Vertical
- Test Distance:** 3 m
- Antenna Height:** 1.5m

8.4.2. TEST INSTRUMENT

RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	SYNNEX	BTO -LMIW300 - GB	A41202-0031	N.C.R.
LCD Monitor	Acer	AL1715sm	ETL13071994430236 6RH01	N.C.R.
Keyboard	SYNNEX	5211A	G4430091266	N.C.R.
Amplifier Freq. Range :80MHz 1GHz	AR	150W1000M3	310037	N.C.R.
Amplifier Freq. Range :0.8MHz 3GHz	AR	60S1G3M3	310102	N.C.R.
RF TEST Controller Freq. Range : 18GHz	AR	SC1000M1	310126	N.C.R.
Digital SIGNAL GENERATOR	HP	ESG-D3000A	US36260655	NOV. 21 , 2006
RF Power Meter	BOONTON	4232A-01-02	122202	NOV. 01 , 2006
Log – Periodic Antenna	AR	AT5080	309817	N.C.R.
RF Communications test set	HP	8920A	3412A04298	SEP. 16, 2007
Modulator	Jon Jeu	22000	-----	N.C.R.
Test S/W	RS SW1005 R1_4			

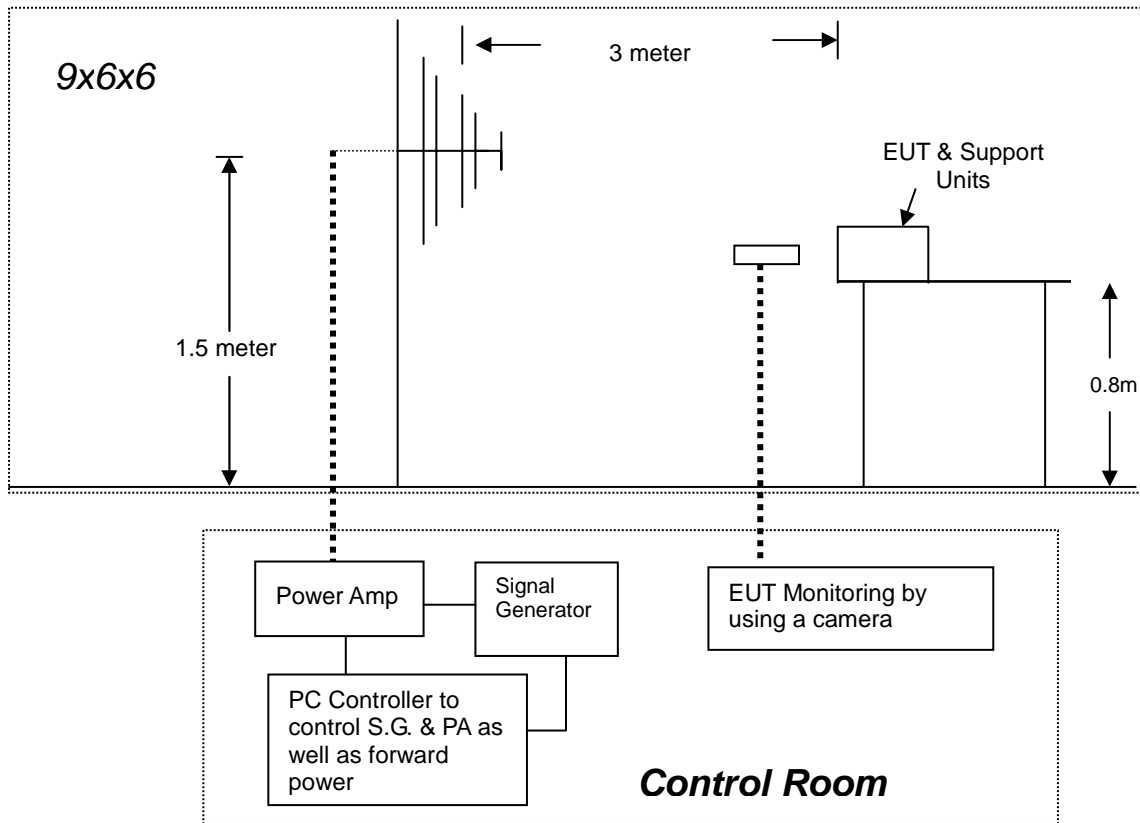
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R.= No Calibration required

**8.4.3. TEST PROCEDURE (SOP : SS-SP-007)**

The test procedure was in accordance with EN 61000-4-3

- a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b) The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.
- c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- e) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

**8.4.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**NOTE:**

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.





8.4.5. TEST RESULTS

<b>Temperature:</b>	25 °C	<b>Humidity</b>	50 % RH
<b>Pressure</b>	1003 mbar	<b>Dwell Time</b>	3 sec.
<b>TESTED BY</b>	Marlboro Shue	<b>Required Passing Performance</b>	<b>Criterion A</b>

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 1000	V&H	0	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
80 ~ 1000	V&H	90	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
80 ~ 1000	V&H	180	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
80 ~ 1000	V&H	270	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS

**NOTE:**

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.



8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-4
<b>Test Voltage:</b>	Power Line: 2 kV Signal/Control Line: 1 kV
<b>Polarity:</b>	Positive & Negative
<b>Impulse Frequency:</b>	5 kHz
<b>Impulse Wave-shape:</b>	5/50 ns
<b>Burst Duration:</b>	15 ms
<b>Burst Period:</b>	3 Hz
<b>Test Duration:</b>	Not less than 1 min.

8.5.2. TEST INSTRUMENT

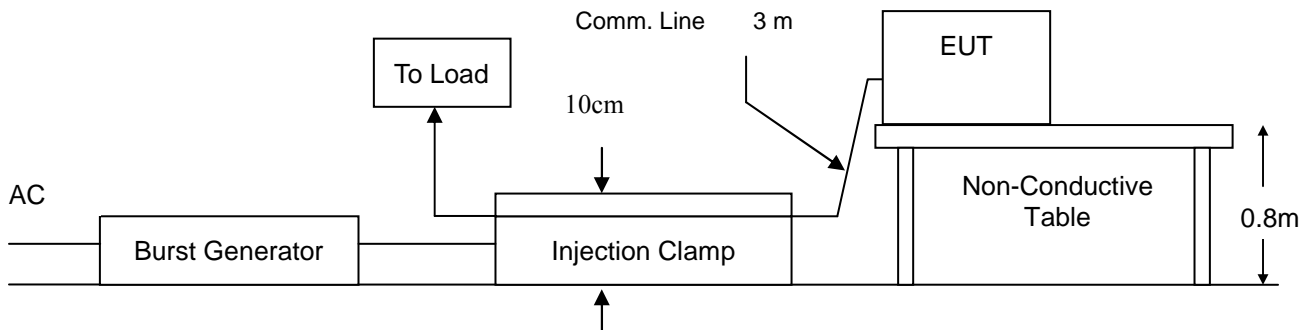
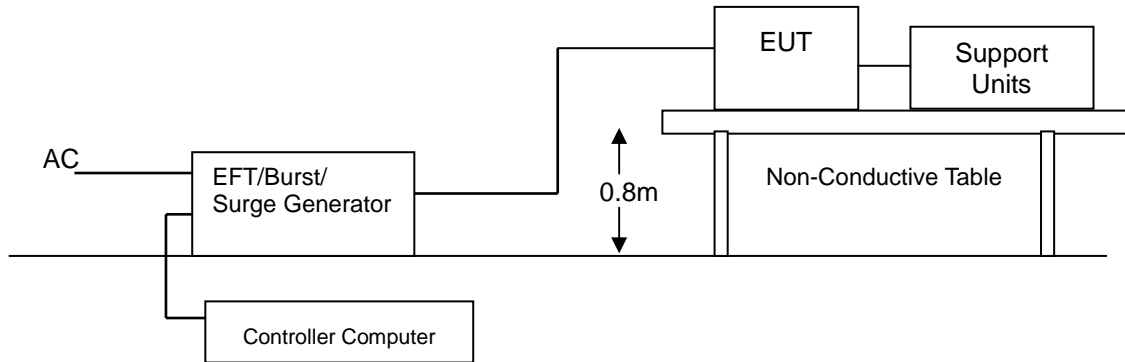
Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	Bi-Wave	0312231	NOV. 17 , 2006
Test S/W	CE Ware 3.00b			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R.= No Calibration required

8.5.3. TEST PROCEDURE (SOP : SS-SP-014)

- a) Both positive and negative polarity discharges were applied.
- b) The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- c) The duration time of each test sequential was 1 minute.
- d) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

**8.5.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**NOTE:**

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.



8.5.5. TEST RESULTS

Temperature:	25 °C	Humidity	50 % RH
Pressure	1003 mbar	TESTED BY	Marlboro Shue
Required Passing Performance		Criterion B	

POWER

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	1kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
N	+/-	1kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
PE	+/-	1kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
L+ N	+/-	1kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS

SIGNAL

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
Sensor Cable	+/-	0.5kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.



8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-5
<b>Wave-Shape:</b>	Combination Wave 1.2/50 us Open Circuit Voltage 8/20 us Short Circuit Current
<b>Test Voltage:</b>	Power line ~ line to line: 1 kV; line to ground: 2kV Telecommunication line: 1 kV;
<b>Surge Input/Output:</b>	Power Line: L1-L2 Telecommunication line: T-Ground / R-Ground
<b>Generator Source Impedance:</b>	2 ohm between networks 12 ohm between network and ground
<b>Polarity:</b>	Positive/Negative
<b>Phase Angle:</b>	0 /90 /180 /270
<b>Pulse Repetition Rate:</b>	1 time / min. (maximum)
<b>Number of Tests:</b>	5 positive and 5 negative at selected points

8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	Bi-Wave	0312231	NOV. 17 , 2006
Test S/W	CE Ware 3.00b			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required

**8.6.3. TEST PROCEDURE (SOP : SS-SP-011)**

## a) For EUT power supply:

The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

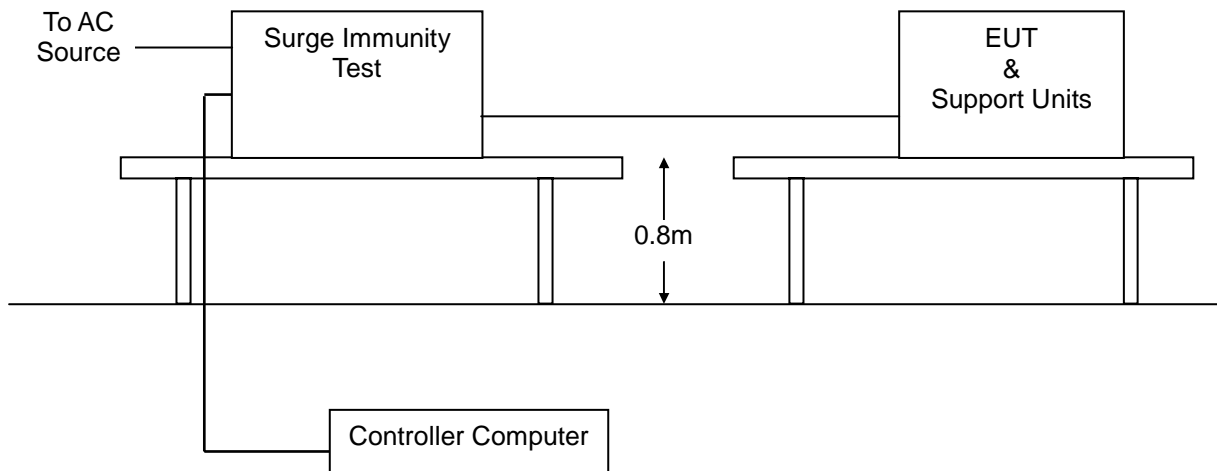
## b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

## c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

### 8.6.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



8.6.5. TEST RESULTS

<b>Temperature:</b>	25 °C	<b>Humidity</b>	52 % RH
<b>Pressure</b>	1003 mbar	<b>TESTED BY</b>	Marlboro Shue
<b>Required Passing Performance</b>		<b>Criterion B</b>	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L – N	+/-	2kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
L – PE	+/-	2kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
N – PE	+/-	2kV	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS

Phase shifting	Repetition Rate	Waveform parameter	Coupling Rate
0°, 90°, 180°, 270°	30 sec	Combine Wave 1.2µs/50µs 8µs /20µs	5 times
		Impedance 12	Each Angel and Polarity

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.





8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

- Basic Standard:** EN 61000-4-6
- Frequency Range:** 0.15 MHz ~ 80 MHz
- Field Strength:** 3 Vrms
- Modulation:** 1kHz Sine Wave, 80%, AM Modulation
- Frequency Step:** 1 % of preceding frequency value
- Coupled cable:** Power Mains, Unshielded
- Coupling device:** CDN-M3 (3 wires)

8.7.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	HP	d330 uT	SGH3480LTH	N.C.R.
VGA Monitor	NEC	JC-1572VMA	6600645RA	N.C.R.
Keyboard	IBM	KB - 8923	1021424	N.C.R.
FRANKONIA CONDUCTED IMMUNITY TEST SYSTEM	CS	CIT-10/75	102C3220	AUG. 01 , 2007
FCC Coupling Decoupling Network Freq. range : 150KHz~230MHz	CDN	CDN M2+M3	A3011040	SEP. 12 , 2007
FCC EM Injection Clamp	-----	F-203I-23mm	449	N.C.R.
Test S/W	CS-EN61000-4-6			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R.= No Calibration required



**8.7.3. TEST PROCEDURE (SOP : SS-SP-010)**

The EUT shall be tested within its intended operating and climatic conditions.

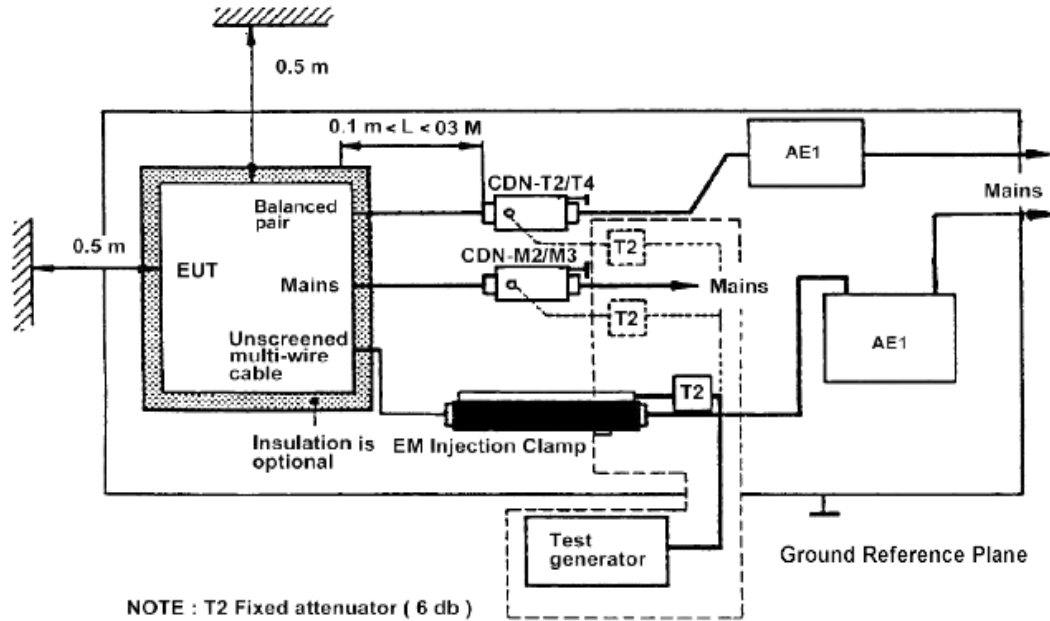
The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was  $1.5 \times 10^{-3}$  decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts were made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

**8.7.4. TEST SETUP**



- Note:**
1. The EUT is setup 0.1m above Ground Reference Plane
  2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**NOTE:**

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.



8.7.5. TEST RESULTS

<b>Temperature:</b>	25 °C	<b>Humidity</b>	52 % RH
<b>Pressure</b>	1003 mbar	<b>TESTED BY</b>	Marlboro Shue
<b>Required Passing Performance</b>		<b>Criterion A</b>	

POWER

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Power Cable	CDN- <input type="checkbox"/> M2 <input checked="" type="checkbox"/> M3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS

SIGNAL

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Sensor Cable	CDN- <input type="checkbox"/> M2 <input checked="" type="checkbox"/> M3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.



8.8. VOLTAGE DIP & VOLTAGE INTERRUPTIONS

8.8.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-11
<b>Test duration time:</b>	Minimum three test events in sequence
<b>Interval between event:</b>	Minimum 10 seconds
<b>Phase Angle:</b>	0 /45 ~ 90 /135 /180 ~ 225 /270 ~ 315 /360
<b>Test cycle:</b>	3 times

8.8.2. TEST INSTRUMENT

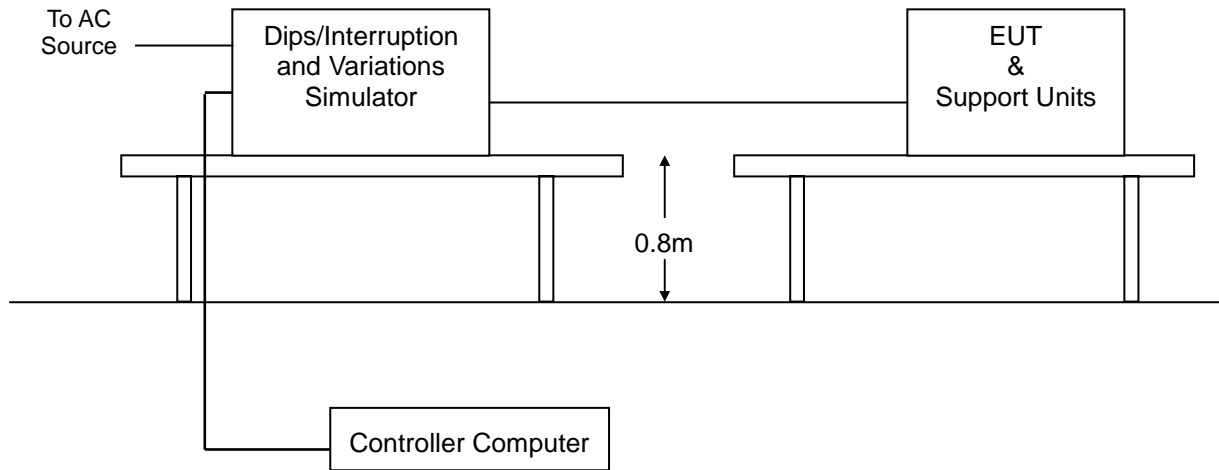
Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	Bi-Wave	0312231	NOV. 17 , 2006
Test S/W	CE Ware 3.00b			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R.= No Calibration required

8.8.3. TEST PROCEDURE (SOP : SS-SP-008)

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.

### 8.8.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



8.8.5. TEST RESULTS

Temperature:	25 °C	Humidity	52 % RH
Pressure	1003 mbar	TESTED BY	Maolboro Shue
Required Passing Performance	Criterion B: >95% reduction 0.5 period Criterion C: 30% reduction 25 period & >95% reduction 250 period		

Test Power: 230Vac, 50Hz				
Voltage (% Reduction)	Duration (Period)	Performance Criterion	Observation	Test Result
>95	0.5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
30	25	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	A PASS
>95	250	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	B PASS

NOTE

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

## 9 PHOTOGRAPHS OF THE TEST CONFIGURATION

### CONDUCTED EMISSION TEST





### RADIATED EMISSION TEST



### HARMONIC TEST



### FLICK TEST



### ESD Test



### RS Test



### EFT Test



### I/O



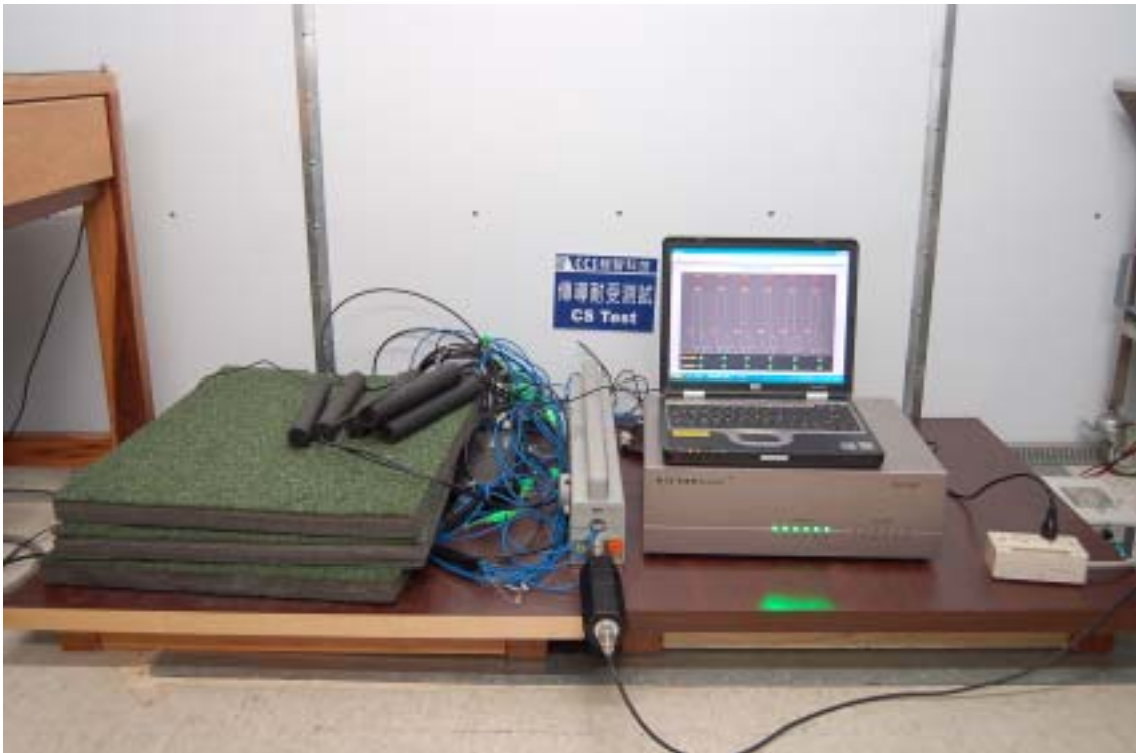
### Surge Test



CS TEST (Power Line)



I/O



### Voltage Dip Test



END OF REPORT