

# CE EMC TEST REPORT

for

**Industrial Data Gateway**

**MODEL: x-BOX; UNO1032; WISE1032; SxxX32; GxxW32; iCMxx32; ICCxx32;  
EKlxx32; ADAMxx32 (x=A~Z, a~z, 0~9, "-" or blank, any character)**

Test Report Number:

T160130D09-E

Issued to:

**Cermate Technologies Inc.**

**7F-1, No.168, Lien Cheng Rd., Chung-Ho District,  
New Taipei City, Taiwan 235**

Issued by:

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**Issued Date: February 4, 2016**



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**Revision History**

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		February 4, 2016		Initial Issue	ALL	Joy Hsiao

## TABLE OF CONTENTS

<b>1</b>	<b>TEST CERTIFICATION .....</b>	<b>4</b>
<b>2</b>	<b>TEST RESULT SUMMARY .....</b>	<b>5</b>
<b>3</b>	<b>EUT DESCRIPTION .....</b>	<b>6</b>
<b>4</b>	<b>TEST METHODOLOGY .....</b>	<b>7</b>
4.1.	DECISION OF FINAL TEST MODE.....	7
4.2.	EUT SYSTEM OPERATION .....	7
<b>5</b>	<b>SETUP OF EQUIPMENT UNDER TEST .....</b>	<b>7</b>
5.1.	DESCRIPTION OF SUPPORT UNITS.....	7
5.2.	CONFIGURATION OF SYSTEM UNDER TEST .....	8
<b>6</b>	<b>FACILITIES AND ACCREDITATIONS.....</b>	<b>9</b>
6.1.	FACILITIES .....	9
6.2.	ACCREDITATIONS .....	9
6.3.	MEASUREMENT UNCERTAINTY.....	9
<b>7</b>	<b>EMISSION TEST .....</b>	<b>10</b>
7.1.	CONDUCTED EMISSION MEASUREMENT.....	10
7.2.	CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS.....	17
7.3.	RADIATED EMISSION MEASUREMENT.....	23
7.4.	HARMONICS CURRENT MEASUREMENT.....	34
7.5.	VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT .....	39
<b>8</b>	<b>IMMUNITY TEST .....</b>	<b>42</b>
8.1.	GENERAL DESCRIPTION .....	42
8.2.	GENERAL PERFORMANCE CRITERIA DESCRIPTION.....	43
8.3.	ELECTROSTATIC DISCHARGE (ESD) .....	44
8.4.	RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS) .....	52
8.5.	ELECTRICAL FAST TRANSIENT (EFT) .....	56
8.6.	SURGE IMMUNITY TEST .....	60
8.7.	CONDUCTED RADIO FREQUENCY DISTURBANCES (CS).....	63
8.8.	POWER FREQUENCY MAGNETIC FIELD.....	66
8.9.	VOLTAGE DIP & VOLTAGE INTERRUPTIONS.....	69
<b>9</b>	<b>PHOTOGRAPHS OF THE TEST CONFIGURATION.....</b>	<b>71</b>
<b>APPENDIX 1 - PHOTOGRAPHS OF EUT .....</b>		<b>A1-1</b>

# 1 TEST CERTIFICATION

**Product:** Industrial Data Gateway

**Model:** x-BOX; UNO1032; WISE1032; SxxX32; GxxW32; iCMxx32; ICCxx32; EKlxx32; ADAMxx32 (x=A~Z, a~z, 0~9, "-" or blank, any character)

**Brand:** Cermate

**Applicant:** **Cermate Technologies Inc.**  
7F-1, No.168, Lien Cheng Rd., Chung-Ho District,  
New Taipei City, Taiwan 235

**Manufacturer:** **Cermate Technologies Inc.**  
7F-1, No.168, Lien Cheng Rd., Chung-Ho District,  
New Taipei City, Taiwan 235

**Tested:** January 27, 2016 ~ February 3, 2016

**Applicable Standards:** EN 61000-6-4: 2007 + A1: 2011

EN 61000-3-2: 2014

EN 61000-3-3: 2013

EN 61000-6-2: 2005 / AC: 2005, including

IEC 61000-4-2: 2008

IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010

IEC 61000-4-4: 2012

IEC 61000-4-5: 2014

IEC 61000-4-6: 2013

IEC 61000-4-8: 2009

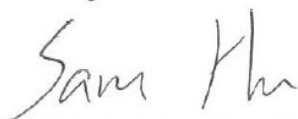
IEC 61000-4-11: 2004

Deviation from Applicable Standard
None

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements of technical standards specified above under the EMC Directive 2004/108/EC\* and 2014/30/EU. 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.


\*: Directive 2004/108/EC is repealed with effect from 20 April 2016.

**Approved by:**



Sam Hu  
Assistant Manager

**Reviewed by:**



Eva Fan  
Supervisor of report document dept.

## 2 TEST RESULT SUMMARY

EMISSION			
Standard	Item	Result	Remarks
EN 61000-6-4: 2007 + A1: 2011	Conducted (Power Port)	PASS	Meet limit
	Conducted (Telecom port)	PASS	Meet limit
	Radiated	PASS	Meet limit
EN 61000-3-2: 2014	Harmonic current emissions	PASS	Meet Class A limit
EN 61000-3-3: 2013	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY [ EN 61000-6-2: 2005 / AC: 2005 ]			
Standard	Item	Result	Remarks
IEC 61000-4-2: 2008	ESD	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010	RS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 2012	EFT	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-5: 2014	Surge	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6: 2013	CS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-8: 2009	PFMF	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11: 2004	Voltage dips & voltage variations	PASS	Meets the requirements of <b>Voltage Dips:</b> 1)0% residual Performance Criterion A 2)40% residual Performance Criterion A 3)70% residual Performance Criterion A <b>Voltage Interruptions:</b> 1) 100% residual Performance Criterion B

**Note:** 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.  
2. The information of measurement uncertainty is available upon the customer's request.

### 3 EUT DESCRIPTION

<b>Product</b>	Industrial Data Gateway
<b>Brand Name</b>	Cermate
<b>Model</b>	x-BOX; UNO1032; WISE1032; SxxX32; GxxW32; iCMxx32; ICCxx32; EKlxx32; ADAMxx32 (x=A~Z, a~z, 0~9, "-" or blank, any character)
<b>Applicant</b>	Cermate Technologies Inc.
<b>Housing material</b>	Metal case
<b>Identify Number</b>	T160130D09
<b>Received Date</b>	January 30, 2016
<b>EUT Power Rating</b>	24VDC from Power Supply

#### Model Differences

Model Name	Difference	Tested (Check)
S-BOX	Original	<input checked="" type="checkbox"/>
UNO1032; WISE1032	For marketing purpose only	<input type="checkbox"/>
x-BOX; SxxX32; GxxW32; iCMxx32; ICCxx32; EKlxx32; ADAMxx32	1. x=A~Z, a~z, 0~9, "-" or blank, any character 2. For marketing purpose only	<input type="checkbox"/>

#### I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. COM 1 Port	1	1
2. COM 2 Port	1	1
3. COM 3 Port	1	1
4. Host (USB) Port	1	1
5. Client (USB) Port	1	1
6. Ethernet Port	2	2
7. SD Slot	1	1

**Note:** Client consigns only one model sample to test (Model Number: S-BOX).

## 4 TEST METHODOLOGY

### 4.1. DECISION OF FINAL TEST MODE

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

The test configuration/ modes are as the following:

#### Conduction Modes (Power port):

1	AC Power Mode
2	DC Power Mode

#### Conduction Modes (Telecom port):

1	LAN 1	100Mbps
2	LAN 2	10Mbps
3		100Mbps

#### Radiation Mode:

1	Normal Mode
	Normal Mode / 1-6GHz

#### Worst:

Conduction (Power port): Mode 2

Conduction (Telecom port): Mode 2

Radiation: Mode 1

### 4.2. EUT SYSTEM OPERATION

1. Windows 7 boots system
2. Press the start menu, select executive and type ping 192.168.10.10 -t (EUT), ping 192.168.10.100 -t (Server PC).

**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.

#### EUT Devices:

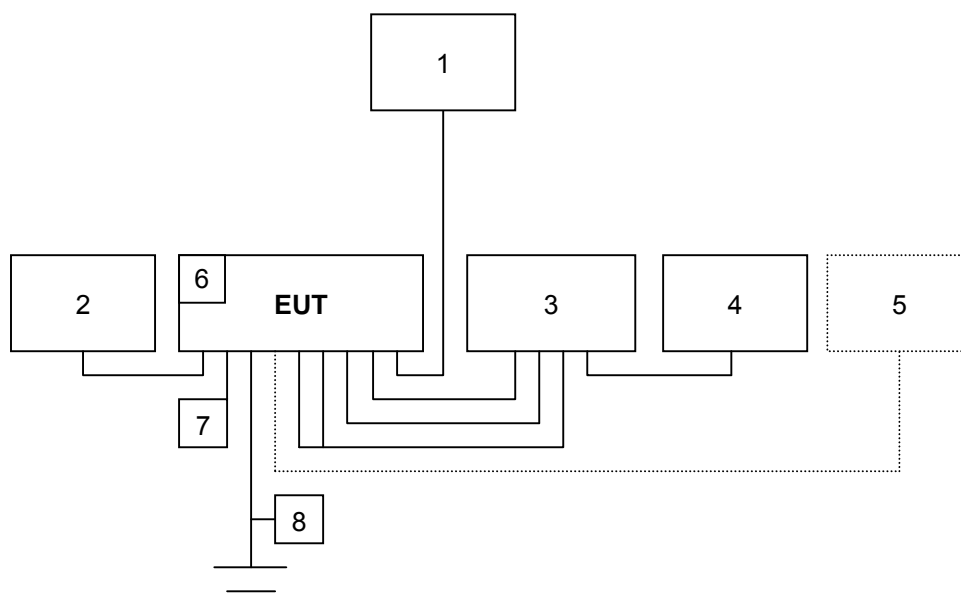
No.	Equipment	Model No.	Brand Name
1	I/O Board Power Module	B5WR4-2405AS9A	CTC
2	CPU (200MHz)	NUC950ADN	Nuvoton
3	Memory (SDRAM 64M bytes /100MHz)	N/A	CTC

**Peripherals Devices:**

No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Brand Name	Data Cable	Power Cord
1	USB Mouse	M-U0026	N/A	DOC BSMI: T41126	Logitech	Shielded, 1.8m	N/A
2	Power Supply	DPS-02A-D24	N/A	N/A	Cermate	N/A	Unshielded, 1.8m
3	HMI	PT1070	N/A	N/A	Cermate	LAN: Unshielded, 1.5m COM 2 & COM 3: Shielded, 2.0m COM 1: Shielded, 2.0m	Unshielded, 1.8m
4	DC Power Supply	DPS-02A-D24	N/A	N/A	Cermate	N/A	Unshielded, 1.5m
5	Server PC	T3500	8X36VBX	DOC BSMI: R33002	DELL	Unshielded, 20m	Unshielded, 1.8m
6	SD Card	N/A	N/A	N/A	PQI	N/A	N/A
7	USB Cable	N/A	N/A	N/A	PQI	Shielded, 1.8m	N/A
8	Ground Cable	N/A	N/A	N/A	N/A	Unshielded, 1.5m	N/A

**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 CCSrf Taiwan Xindian Lab. at No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

### 6.2. ACCREDITATIONS

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

<b>Taiwan</b>	TAF
<b>USA</b>	A2LA

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

<b>Canada</b>	Industry Canada
<b>Norway</b>	Nemko
<b>Japan</b>	VCCI
<b>Taiwan</b>	BSMI
<b>USA</b>	FCC

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

### 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 (Power port)	0.15MHz ~ 30MHz	$\pm 1.59$
Conducted emissions (Telecom port)	0.15MHz ~ 30MHz	$\pm 2.91$
Radiated emissions	30MHz ~ 1000MHz	$\pm 4.12$
	1000MHz ~ 6000MHz	$\pm 4.74$

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

Consistent with industry standard (e.g. CISPR 22: 2005, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than  $U_{CISPR}$  which is 3.6dB and 5.2dB respectively. CCS values (called  $U_{Lab}$  in CISPR 16-4-2) is less than  $U_{CISPR}$  as shown in the table above. Therefore, MU need not be considered for compliance.

## 7 EMISSION TEST

### 7.1. CONDUCTED EMISSION MEASUREMENT

#### 7.1.1. LIMITS

FREQUENCY (MHz)	dBuV	
	Quasi-peak	Average
0.15 - 0.5	79	66
0.50 - 5.0	73	60
5.0 - 30.0	73	60

**NOTE:** 1. The lower limit shall apply at the transition frequencies.  
2. All emanations from 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 # A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	R&S	ESCI	101201	08/21/2016
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/23/2016
LISN	SCHWARZBECK	NSLK 8127	8127526	08/23/2016
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/23/2016
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
Test S/W	EZ-EMC			

**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.

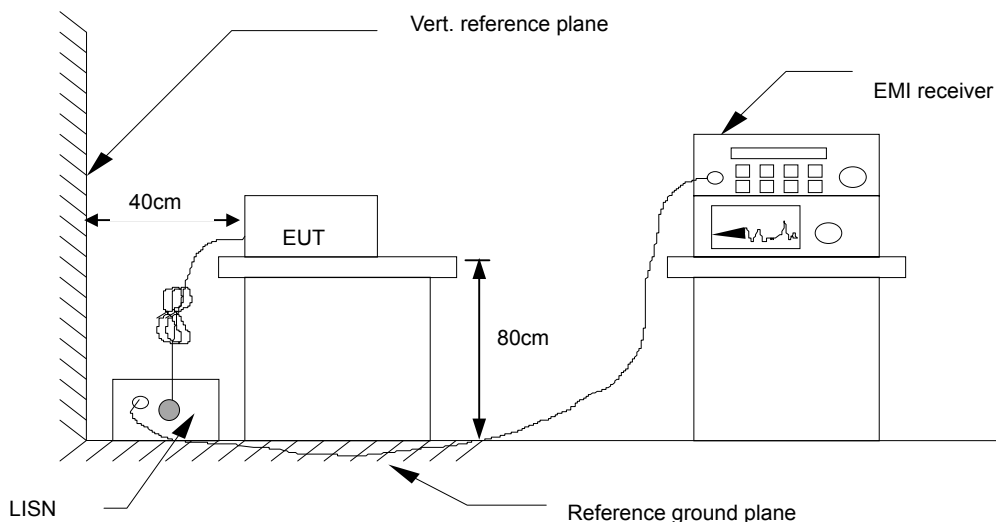
**7.1.3. TEST PROCEDURES** (please refer to measurement standard or CCS SOP PA-031)**Procedure of Preliminary Test**

- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per CISPR 16-2-1, 7.4.1 (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 15 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per CISPR 16-2-1, 7.4.1.
- All I/O cables were positioned to simulate typical actual usage as per CISPR 16-2-1, 7.4.1.
- 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 received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.

**Procedure of Final Test**

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- 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)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
x.xx	42.95	0.55	43.50	73	-29.50	Q	L1

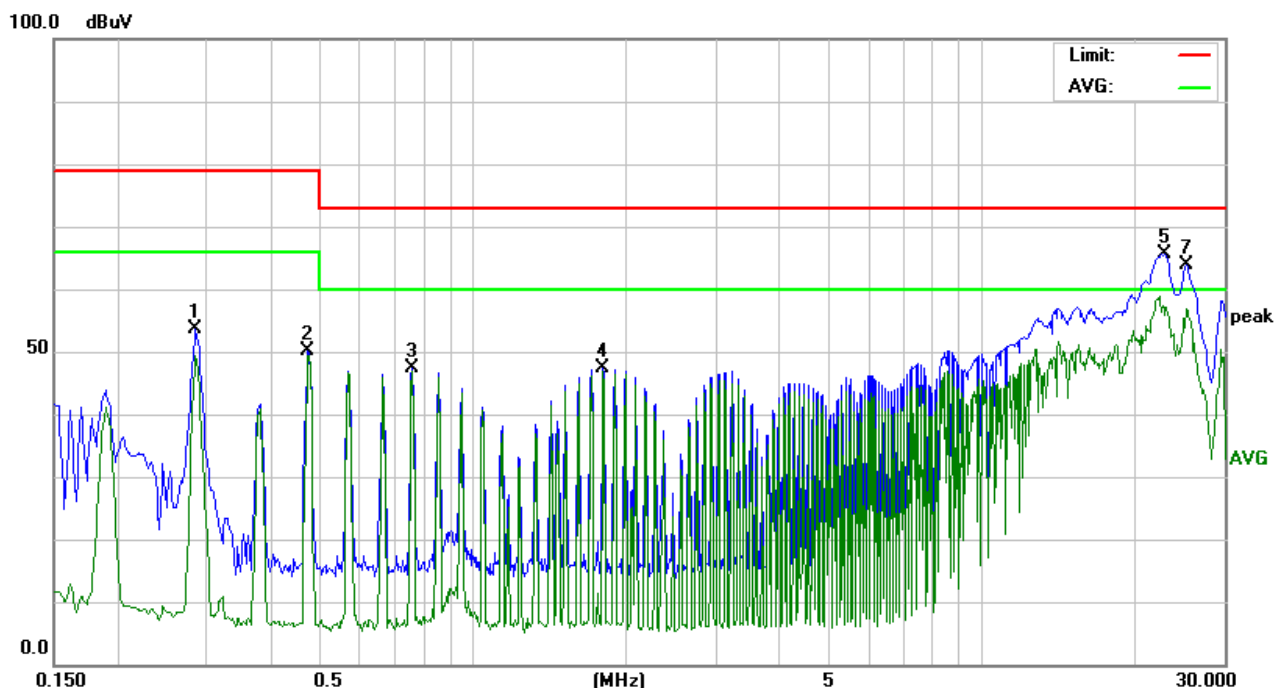
Freq.	= Emission frequency in MHz
Reading	= Uncorrected Analyzer/Receiver reading
Factor	= Insertion loss of LISN + Cable Loss + Pulse Limit
Result	= Read Level + Factor
Limit	= Limit stated in standard
Margin	= Reading in reference to limit
P	= Peak Reading
Q	= Quasi-peak Reading
A	= Average Reading
L1	= Hot side
L2	= Neutral side

#### Calculation Formula

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

## 7.1.6. TEST RESULTS

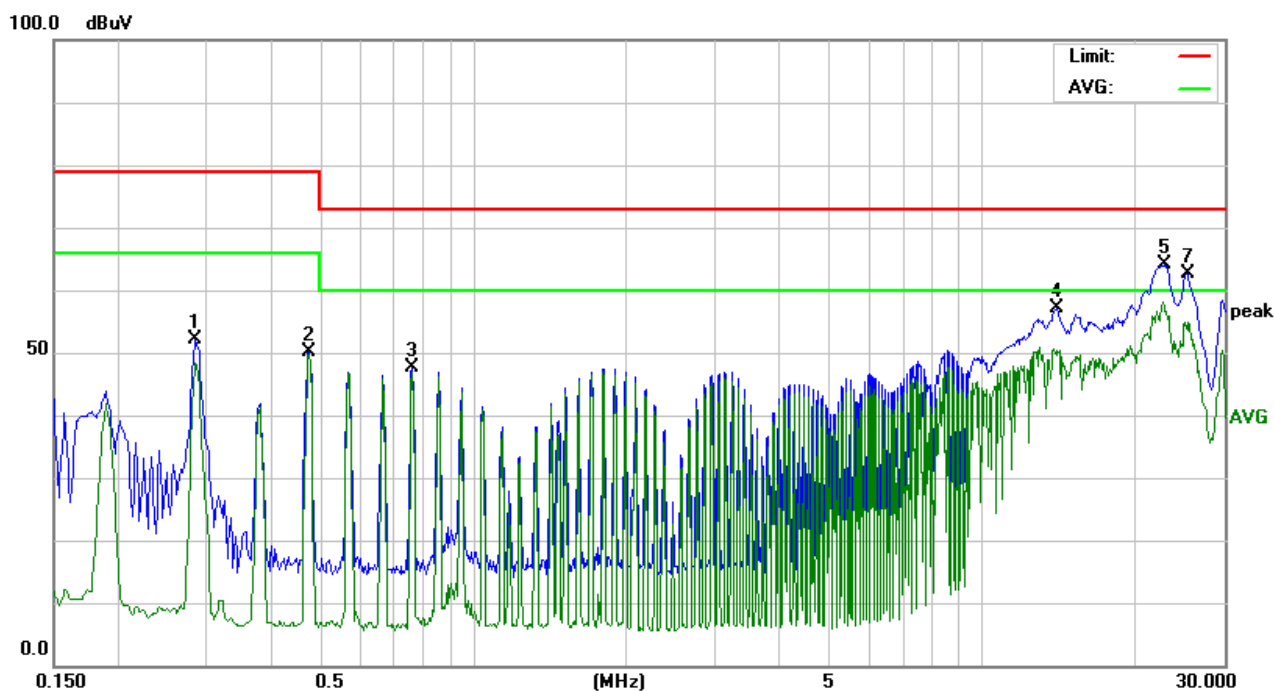
Model No.	S-BOX	6dB Bandwidth	9 kHz
Environmental Conditions	21°C, 64% RH	Test Mode	Mode 1
Tested by	Frank Liao	Phase	L1
Standard	EN 61000-6-4		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.2860	43.64	10.08	53.72	79.00	-25.28	P	L1
0.4740	39.98	10.09	50.07	79.00	-28.93	P	L1
0.7620	37.15	10.11	47.26	73.00	-25.74	P	L1
1.8060	37.21	10.19	47.40	73.00	-25.60	P	L1
22.9180	54.29	11.44	65.73	73.00	-7.27	P	L1
22.9180	44.55	11.44	55.99	60.00	-4.01	A	L1
25.2860	52.03	11.75	63.78	73.00	-9.22	P	L1
25.2860	45.19	11.75	56.94	60.00	-3.06	A	L1

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

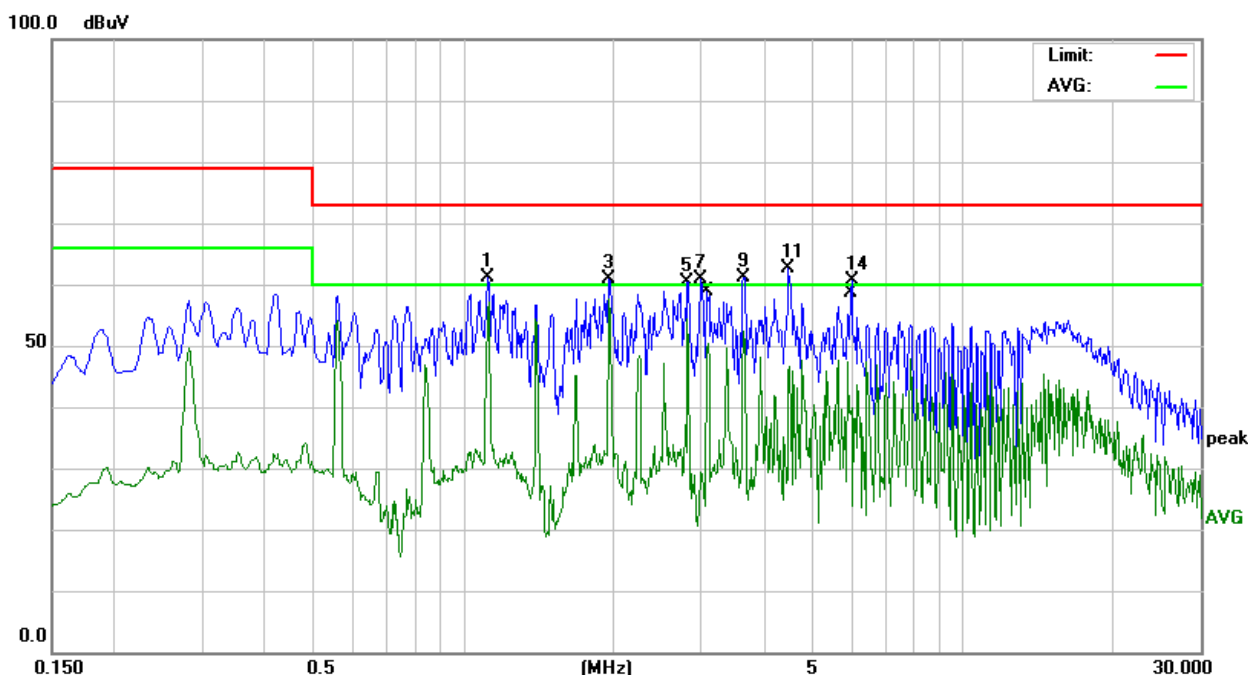
<b>Model No.</b>	S-BOX	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	21°C, 64% RH	<b>Test Mode</b>	Mode 1
<b>Tested by</b>	Frank Liao	<b>Phase</b>	L2
<b>Standard</b>	EN 61000-6-4		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.2860	42.01	10.08	52.09	79.00	-26.91	P	L2
0.4780	40.10	10.09	50.19	79.00	-28.81	P	L2
0.7620	37.40	10.11	47.51	73.00	-25.49	P	L2
14.0820	46.29	10.75	57.04	73.00	-15.96	P	L2
22.9340	52.60	11.44	64.04	73.00	-8.96	P	L2
22.9340	45.17	11.44	56.61	60.00	-3.39	A	L2
25.3220	50.98	11.75	62.73	73.00	-10.27	P	L2
25.5100	41.95	11.80	53.75	60.00	-6.25	A	L2

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

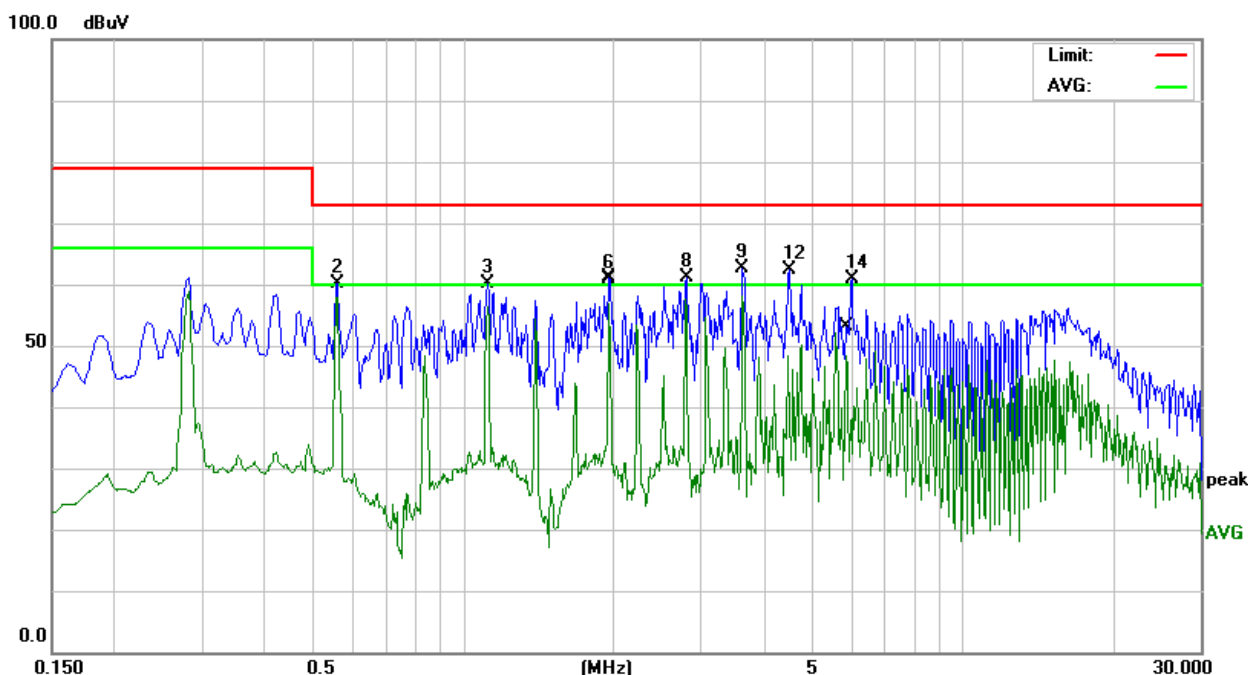
<b>Model No.</b>	S-BOX	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 58% RH	<b>Test Mode</b>	Mode 2 / Worst
<b>Tested by</b>	Frank Liao	<b>Phase</b>	L1
<b>Standard</b>	EN 61000-6-4		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
1.1220	50.96	10.13	61.09	73.00	-11.91	P	L1
1.1260	46.91	10.13	57.04	60.00	-2.96	A	L1
1.9580	50.70	10.21	60.91	73.00	-12.09	P	L1
1.9660	47.33	10.21	57.54	60.00	-2.46	A	L1
2.8100	50.07	10.24	60.31	73.00	-12.69	P	L1
2.8100	44.20	10.24	54.44	60.00	-5.56	A	L1
3.0020	50.54	10.25	60.79	73.00	-12.21	P	L1
3.0980	40.22	10.25	50.47	60.00	-9.53	A	L1
3.6540	50.93	10.27	61.20	73.00	-11.80	P	L1
3.6540	42.08	10.27	52.35	60.00	-7.65	A	L1
4.4980	52.26	10.30	62.56	73.00	-10.44	P	L1
4.5020	36.29	10.31	46.60	60.00	-13.40	A	L1
5.8940	36.99	10.37	47.36	60.00	-12.64	A	L1
5.9980	50.35	10.39	60.74	73.00	-12.26	P	L1

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

<b>Model No.</b>	S-BOX	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 58% RH	<b>Test Mode</b>	Mode 2 / Worst
<b>Tested by</b>	Frank Liao	<b>Phase</b>	L2
<b>Standard</b>	EN 61000-6-4		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.5580	47.79	10.09	57.88	60.00	-2.12	A	L2
0.5620	50.01	10.09	60.10	73.00	-12.90	P	L2
1.1220	50.04	10.12	60.16	73.00	-12.84	P	L2
1.1220	46.32	10.12	56.44	60.00	-3.56	A	L2
1.9540	46.69	10.19	56.88	60.00	-3.12	A	L2
1.9620	50.81	10.19	61.00	73.00	-12.00	P	L2
2.7900	47.37	10.22	57.59	60.00	-2.41	A	L2
2.8060	50.97	10.22	61.19	73.00	-11.81	P	L2
3.6260	52.29	10.24	62.53	73.00	-10.47	P	L2
3.6260	47.81	10.24	58.05	60.00	-1.95	A	L2
4.4620	38.22	10.27	48.49	60.00	-11.51	A	L2
4.5020	52.00	10.30	62.30	73.00	-10.70	P	L2
5.8660	38.03	10.35	48.38	60.00	-11.62	A	L2
5.9980	50.44	10.36	60.80	73.00	-12.20	P	L2

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).



## 7.2. CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

### 7.2.1. LIMITS

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

**NOTE:** 1. At transitional frequencies the lower limit applies.

2. The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3. The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of  $150\Omega$  to the telecommunication port under test (conversion factor is  $20 \log_{10} 150 / I = 44 \text{ dB}$ ).

### 7.2.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	R&S	ESCI	101201	08/21/2016
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/23/2016
LISN	SCHWARZBECK	NSLK 8127	8127526	08/23/2016
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/23/2016
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
ISN	Teseq	ISN T800	29449	08/24/2016
Test S/W	EZ-EMC			

**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** (please refer to measurement standard or CCS SOP PA-031)

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

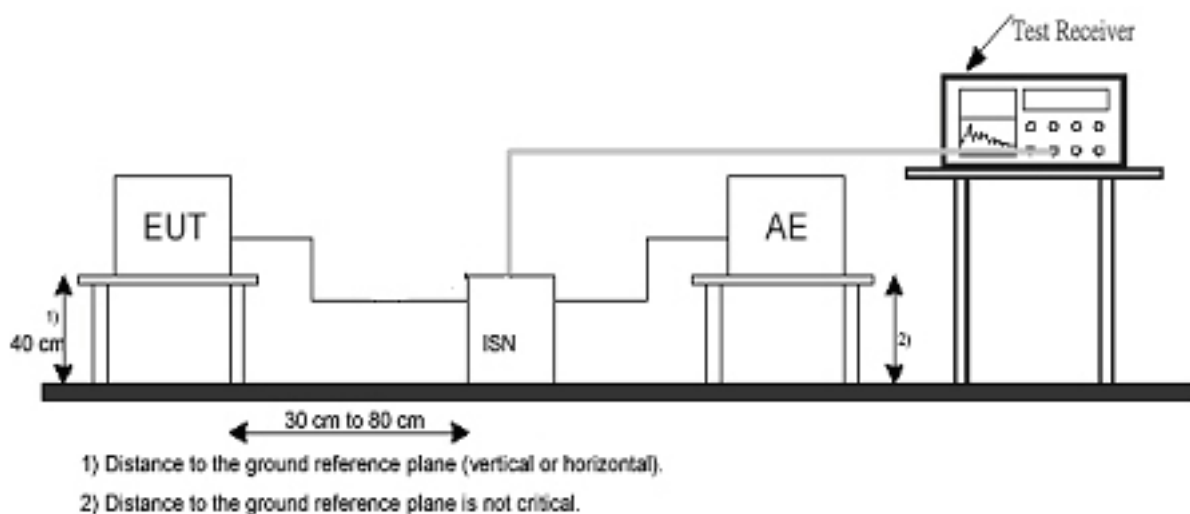
**Modes:**

1	LAN 1	100Mbps
2	LAN 2	10Mbps
3		100Mbps

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

**Mode: 2.**

## 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 (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
x.xx	62.95	0.55	63.50	87	-23.50	Q

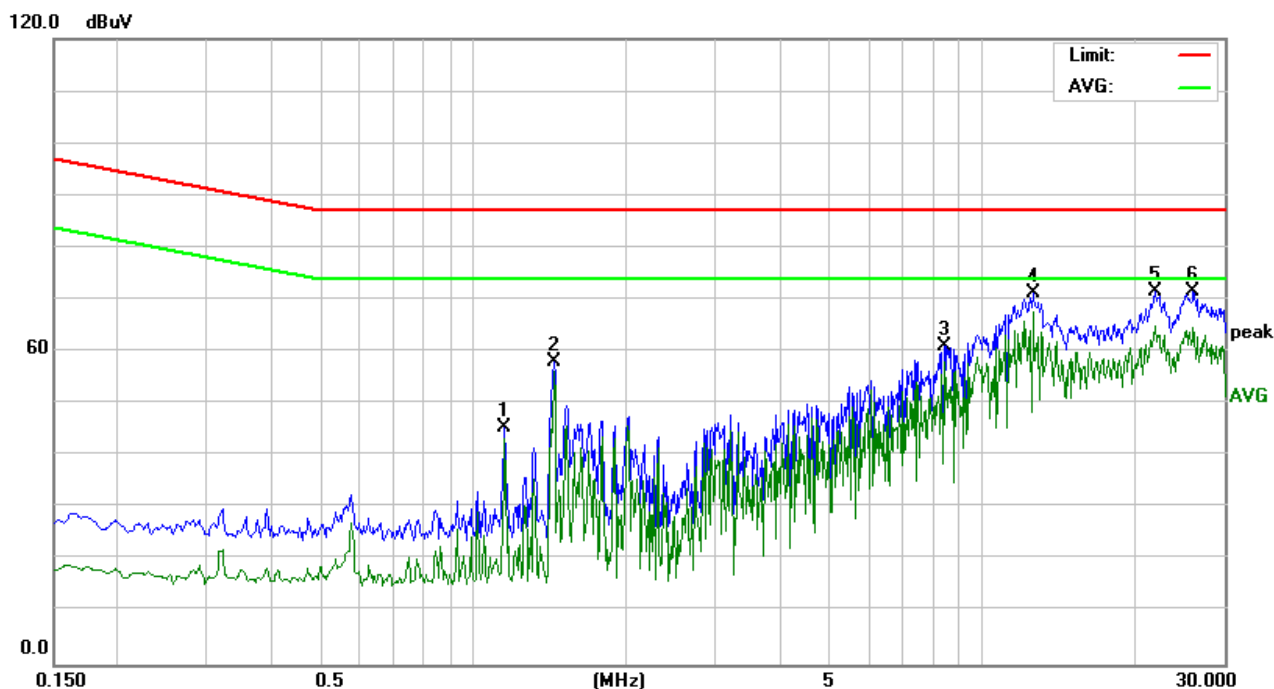
Freq. = Emission frequency in MHz  
 Reading = Uncorrected Analyzer/Receiver reading  
 Factor = Insertion loss of LISN + Cable Loss + Pulse Limit  
 Result = Reading + Factor  
 Limit = Limit stated in standard  
 Margin = Reading in reference to limit  
 P = Peak Reading  
 Q = Quasi-peak Reading  
 A = Average Reading

### Calculation Formula

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

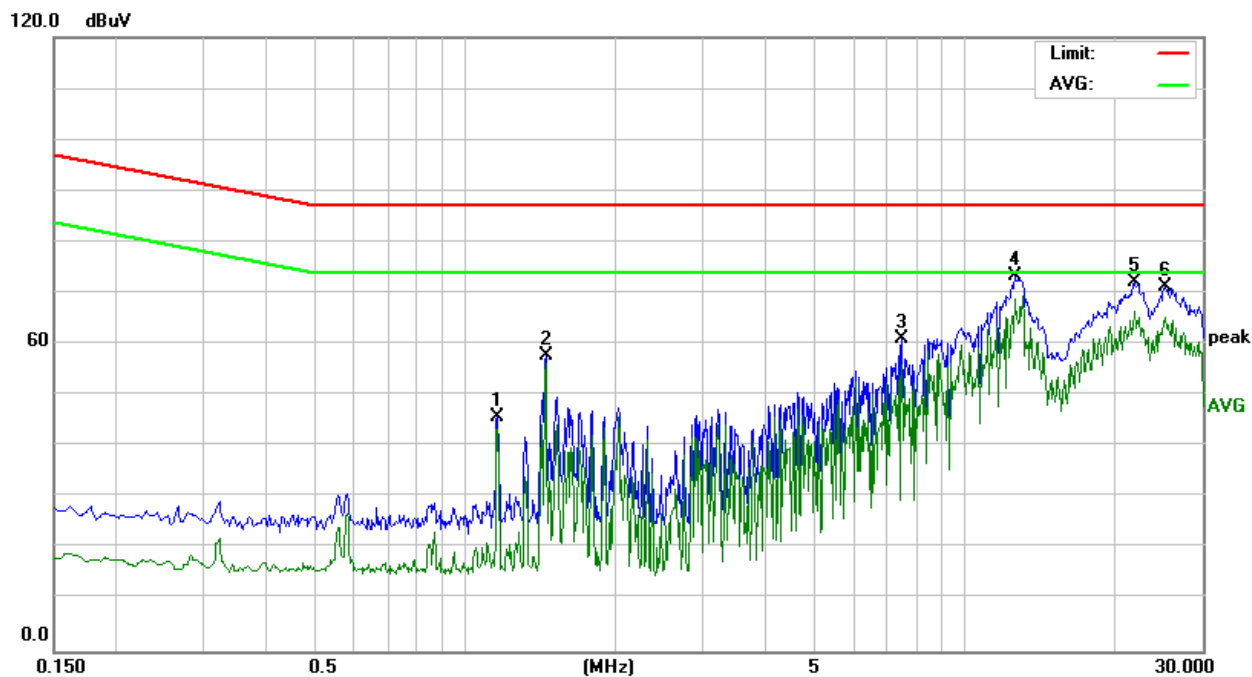
## 7.2.6. TEST RESULTS

<b>Model No.</b>	S-BOX	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	21°C, 64% RH	<b>Test Mode</b>	Mode 1
<b>Tested by</b>	Frank Liao	<b>Standard</b>	EN 61000-6-4



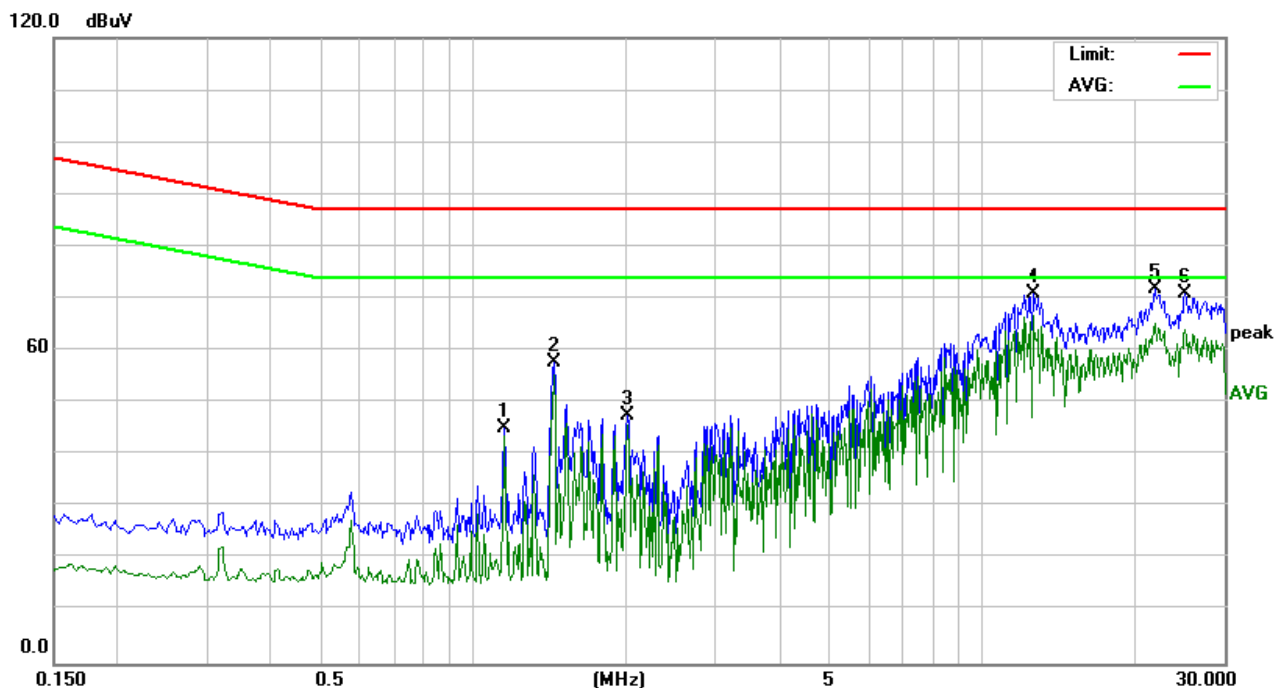
Conducted Emission Readings						
Frequency Range Investigated				150 kHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
1.1580	25.83	19.70	45.53	87.00	-41.47	P
1.4460	38.24	19.71	57.95	87.00	-29.05	P
8.4379	41.38	19.75	61.13	87.00	-25.87	P
12.6020	51.32	19.85	71.17	87.00	-15.83	P
21.8900	51.37	20.07	71.44	87.00	-15.56	P
26.0620	51.17	20.24	71.41	87.00	-15.59	P

<b>Model No.</b>	S-BOX	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	21°C, 64% RH	<b>Test Mode</b>	Mode 2 / Worst
<b>Tested by</b>	Frank Liao	<b>Standard</b>	EN 61000-6-4



Conducted Emission Readings						
Frequency Range Investigated				150 kHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
1.1620	26.04	19.70	45.74	87.00	-41.26	P
1.4500	38.05	19.71	57.76	87.00	-29.24	P
7.4900	41.31	19.73	61.04	87.00	-25.96	P
12.6100	53.49	19.85	73.34	87.00	-13.66	P
21.8980	52.07	20.07	72.14	87.00	-14.86	P
25.2220	51.19	20.20	71.39	87.00	-15.61	P

<b>Model No.</b>	S-BOX	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 58% RH	<b>Test Mode</b>	Mode 3
<b>Tested by</b>	Frank Liao	<b>Standard</b>	EN 61000-6-4



Conducted Emission Readings						
Frequency Range Investigated				150 kHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
1.1539	25.55	19.70	45.25	87.00	-41.75	P
1.4460	37.95	19.71	57.66	87.00	-29.34	P
2.0220	27.84	19.71	47.55	87.00	-39.45	P
12.6059	51.09	19.85	70.94	87.00	-16.06	P
21.9020	51.69	20.07	71.76	87.00	-15.24	P
25.1180	50.67	20.19	70.86	87.00	-16.14	P

## 7.3. RADIATED EMISSION MEASUREMENT

### 7.3.1. LIMITS

#### Below 1GHz

FREQUENCY (MHz)	dBuV/m (At 10m)
30 ~ 230	40
230 ~ 1000	47

#### Above 1GHz

FREQUENCY (MHz)	dBuV/m (At 3m)	
	Average	Peak
1000 ~ 3000	56	76
3000 ~ 6000	60	80

**NOTE:** The lower limit shall apply at the transition frequencies.

Highest frequency generated or used within the EUT or on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Less than 108	1000
108-500	2000
500-1000	5000
Above 1000	If the highest internal frequency of the EUT is above 1 GHz, the measurement shall be made up to 6 GHz

## 7.3.2. TEST INSTRUMENTS

Open Area Test Site # H				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	101340	04/07/2016
BilogAntenna	Sunol	JB1	A061711	08/05/2016
Pre-Amplifier	HP	8447D	1937A01554	10/01/2016
CABLE	EMCI	CFD400-E	N-Type#H10	04/08/2016
Thermo-Hygro Meter	Wisewind	201A	No. 03	06/02/2016
Test S/W	EZ-EMC			
Above 1GHz Used				
Signal Analyzer (9k – 44GHz)	Agilent	N9010A	MY53440125	12/13/2016
Horn Antenna (1 – 18GHz)	EMCO	3117	00139062	10/21/2016
Pre-Amplifier (1 – 26.5GHz)	HP	8449B	3008A01266	12/13/2016
CABLE (1 – 18GHz)	Rosnol	A1K50-EW0630	151126-1	12/20/2016
THERMO- HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
Test S/W	EZ-EMC			

**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.



**7.3.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-031)**Procedure of Preliminary Test**

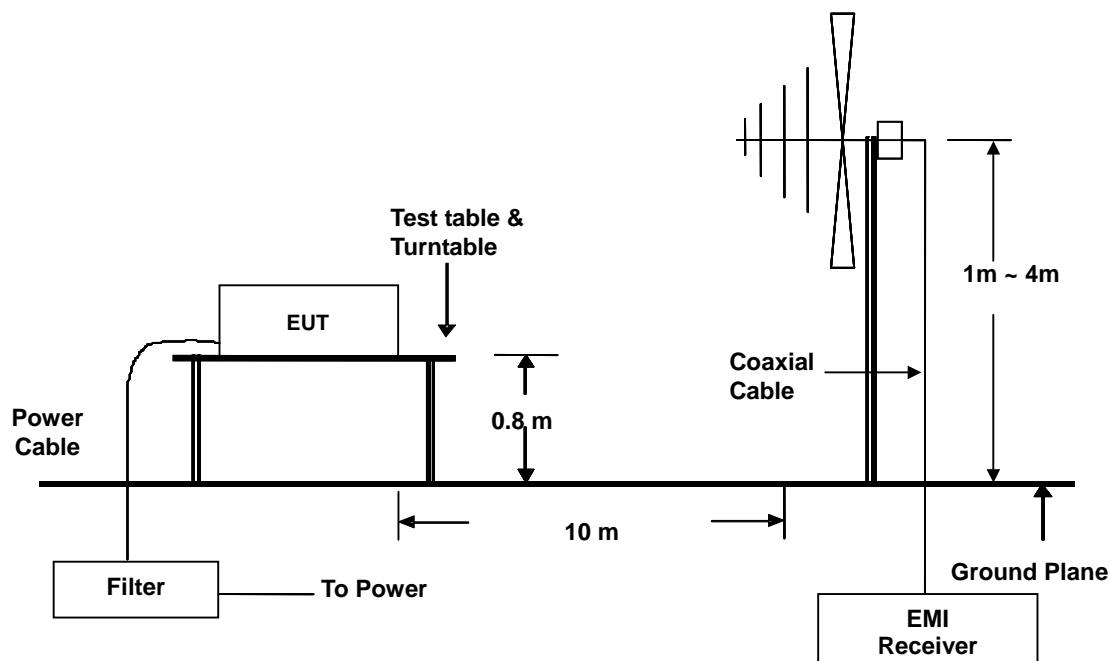
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per CISPR 16-2-3.
- All I/O cables were positioned to simulate typical usage as per CISPR 16-2-3.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 3 or 10 meter away from the EUT as stated in CISPR 16-2-3. 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 6000MHz. 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 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 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**

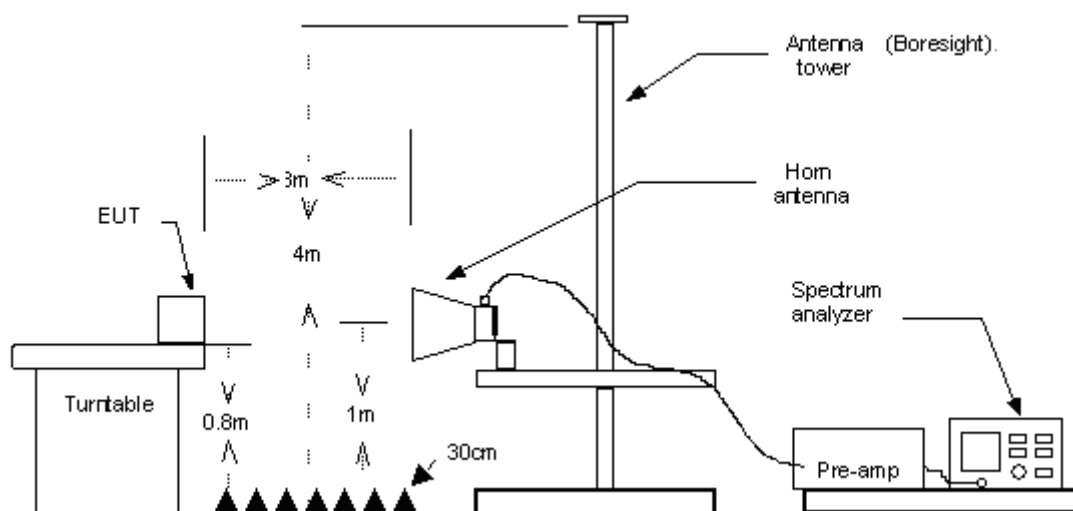
- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning 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. Below 1GHz the Q.P. reading and above 1GHz the Peak and Average reading are presented.
- The test data of the worst-case condition(s) was recorded.

### 7.3.4. TEST SETUP

#### Below 1GHz



#### Above 1GHz



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

### 7.3.5. DATA SAMPLE

#### Below 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
x.xx	14.0	12.2	26.2	40	-13.8	Q	H

#### Above 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
x.xx	42.95	0.55	43.50	60	-16.50	A	H

Freq. = Emission frequency in MHz  
Reading = Uncorrected Analyzer/Receiver reading  
Factor = Antenna Factor + Cable Loss - Amplifier Gain  
Result = Reading + Factor  
Limit = Limit stated in standard  
Margin = Reading in reference to limit  
P = Peak Reading  
Q = Quasi-peak Reading  
A = Average Reading  
H = Antenna Polarization: Horizontal  
V = Antenna Polarization: Vertical

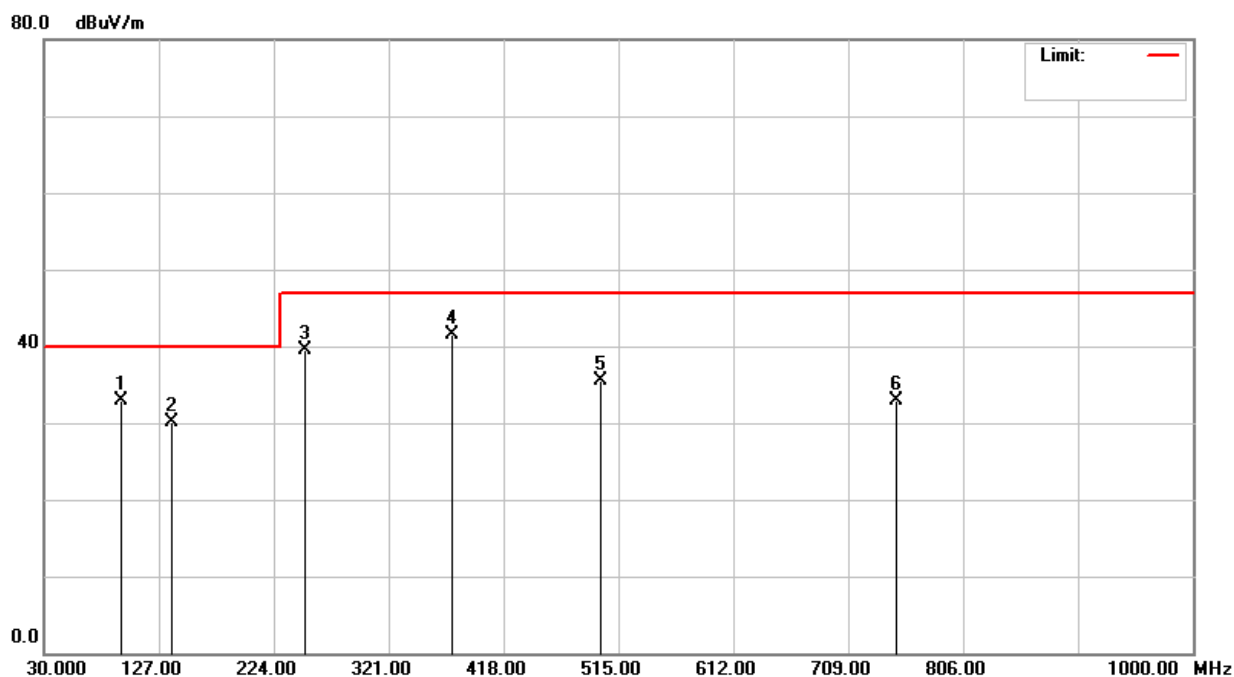
#### Calculation Formula

Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)

## 7.3.6. TEST RESULTS

## Below 1GHz

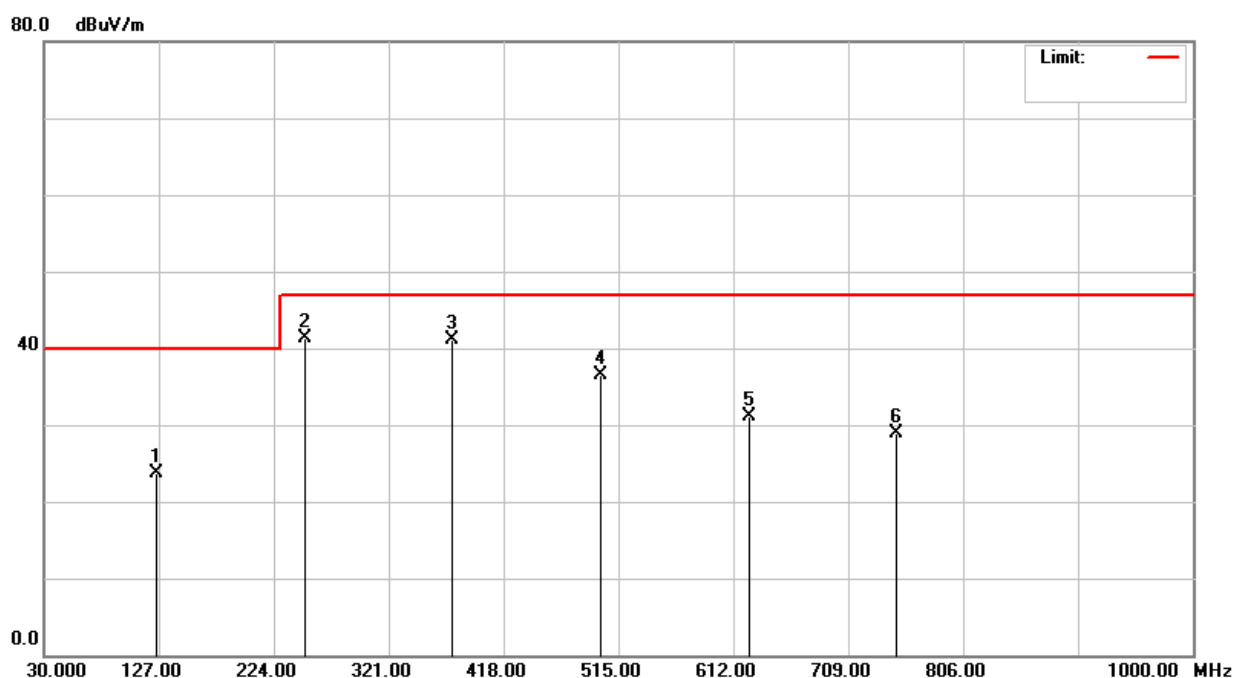
Model No.	S-BOX	Test Mode	Mode 1
Environmental Conditions	16°C, 80% RH	6dB Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	David Cheng
Standard	EN 61000-6-4		



Radiated Emission Readings									
Frequency Range Investigated					30 MHz to 1000 MHz at 10m				
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
95.8700	49.80	-16.94	32.86	40.00	-7.14	100	219	Q	V
137.6300	42.50	-12.48	30.02	40.00	-9.98	100	166	Q	V
250.0100	52.80	-13.23	39.57	47.00	-7.43	100	51	Q	V
375.0510	51.50	-9.91	41.59	47.00	-5.41	100	138	Q	V
500.0160	42.30	-6.78	35.52	47.00	-11.48	400	311	Q	V
750.0100	35.10	-2.27	32.83	47.00	-14.17	400	151	Q	V

Note: 1. P= Peak Reading; Q= Quasi-peak Reading.

<b>Model No.</b>	S-BOX	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	16°C, 80% 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>	David Cheng
<b>Standard</b>	EN 61000-6-4		

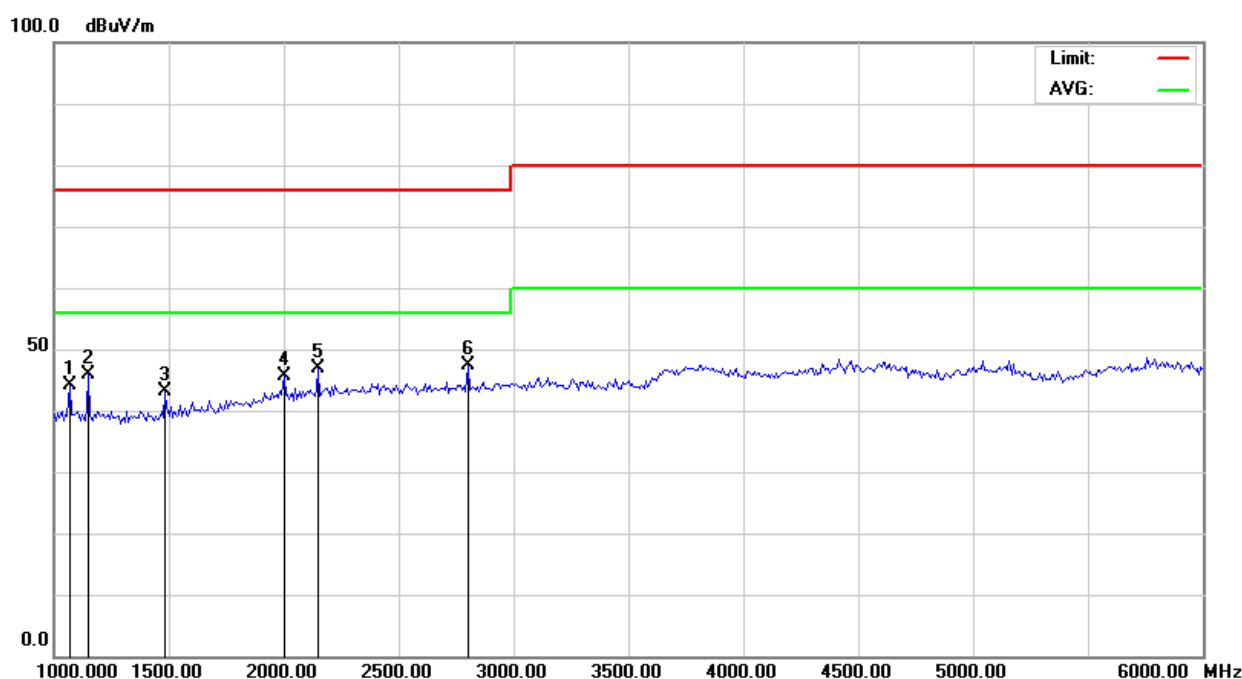


Radiated Emission Readings									
Frequency Range Investigated					30 MHz to 1000 MHz at 10m				
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
125.0300	36.10	-12.30	23.80	40.00	-16.20	400	99	Q	H
250.0420	54.50	-13.23	41.27	47.00	-5.73	400	295	Q	H
375.0100	51.10	-9.91	41.19	47.00	-5.81	400	135	Q	H
500.0500	43.20	-6.78	36.42	47.00	-10.58	100	87	Q	H
625.0100	35.60	-4.54	31.06	47.00	-15.94	100	145	Q	H
750.0200	31.20	-2.27	28.93	47.00	-18.07	100	108	Q	H

**Note:** 1. P= Peak Reading; Q= Quasi-peak Reading.

**Above 1GHz**

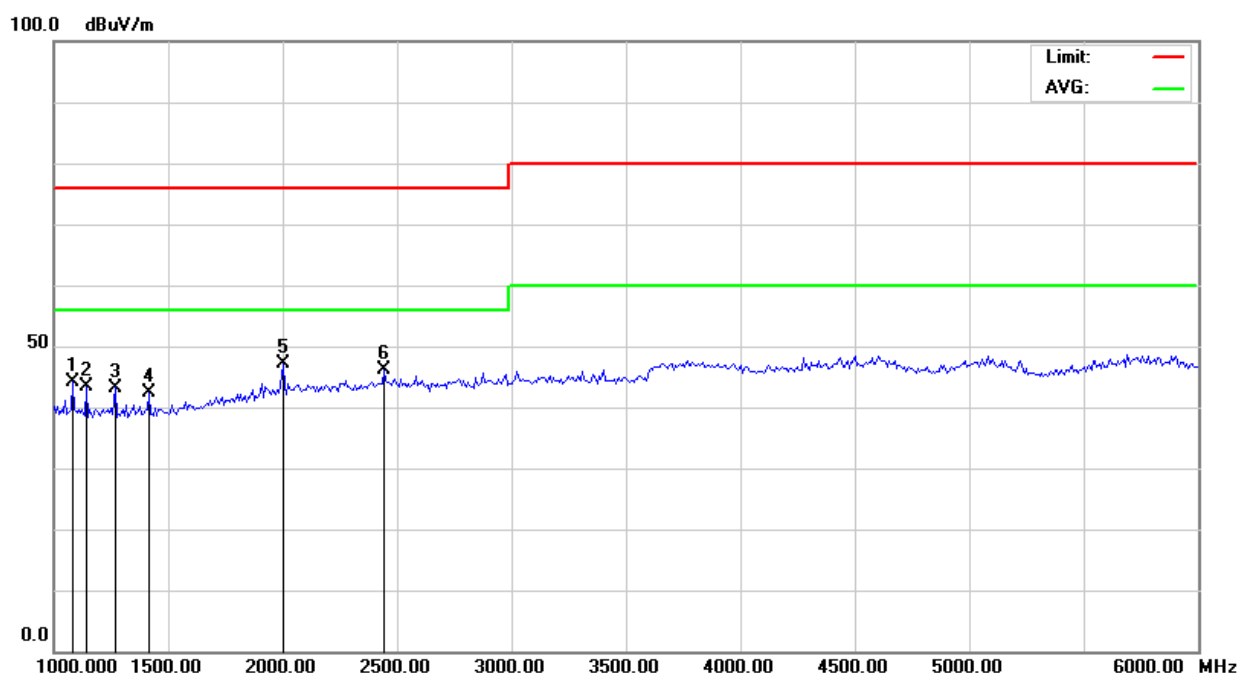
<b>Model No.</b>	S-BOX	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	1 MHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	3m
<b>Highest frequency generated or used</b>	200MHz	<b>Upper frequency</b>	6000MHz
<b>Detector Function</b>	Peak and average.	<b>Tested by</b>	Frank Liao
<b>Standard</b>	EN 61000-6-4		



Radiated Emission Readings							
Frequency Range Investigated				Above 1GHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
1066.667	52.83	-8.77	44.06	76.00	-31.94	P	V
1150.000	54.48	-8.60	45.88	76.00	-30.12	P	V
1483.333	51.12	-7.91	43.21	76.00	-32.79	P	V
2000.000	49.08	-3.39	45.69	76.00	-30.31	P	V
2150.000	50.02	-3.18	46.84	76.00	-29.16	P	V
2800.000	49.84	-2.36	47.48	76.00	-28.52	P	V

**Note:** 1. P= Peak Reading; A= Average Reading.

<b>Model No.</b>	S-BOX	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	1 MHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	3m
<b>Highest frequency generated or used</b>	200MHz	<b>Upper frequency</b>	6000MHz
<b>Detector Function</b>	Peak and average.	<b>Tested by</b>	Frank Liao
<b>Standard</b>	EN 61000-6-4		

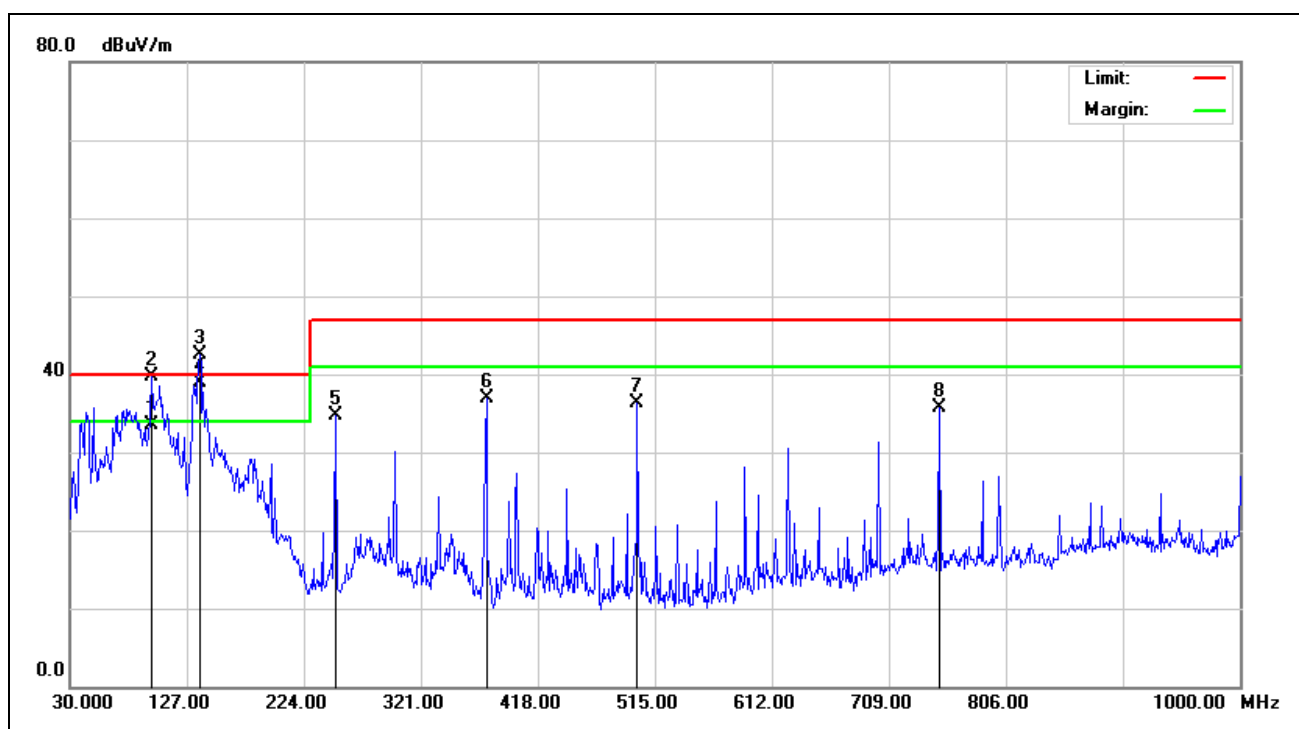


Radiated Emission Readings							
Frequency Range Investigated				Above 1GHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
1083.333	52.91	-8.73	44.18	76.00	-31.82	P	H
1141.667	51.95	-8.61	43.34	76.00	-32.66	P	H
1266.667	51.61	-8.36	43.25	76.00	-32.75	P	H
1416.667	50.47	-8.05	42.42	76.00	-33.58	P	H
2000.000	50.43	-3.39	47.04	76.00	-28.96	P	H
2441.667	48.80	-2.75	46.05	76.00	-29.95	P	H

Note: 1. P= Peak Reading; A= Average Reading.

**966 Chamber Test Data**

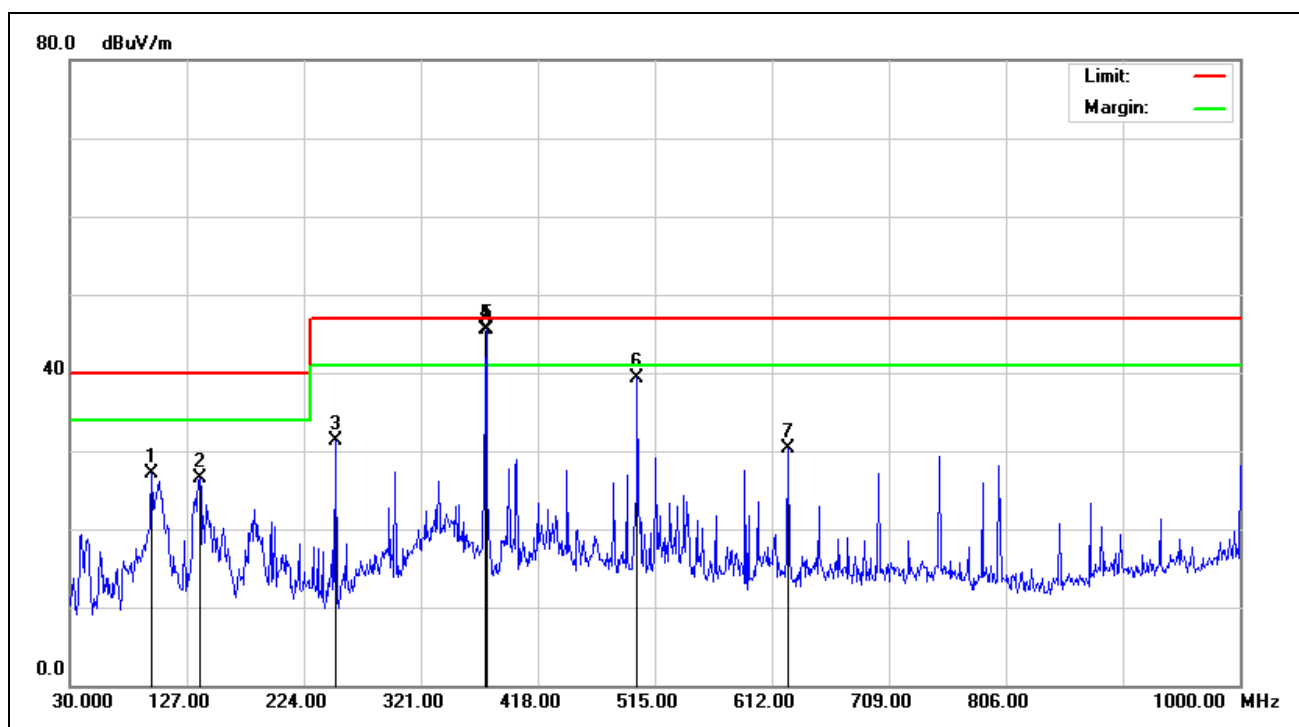
Job No.:	T160130D09	Polarization:	Vertical
Standard:	EN 61000-6-4	Power Source:	230VAC/50Hz
Test item:	Radiation Test	Date:	2016/1/27
Company:	Cermate Technologies Inc.	Time:	11:41:27
Model:	S-BOX	Temp.(°C)/Hum.(%)	26(°C)/60%
Description:	Normal Mode	Engineer Signature:	Frank Liao



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	97.8570	54.70	-21.25	33.45	40.00	-6.55	QP	
2	97.9000	60.88	-21.24	39.64	40.00	-0.36	peak	
3	137.6700	63.38	-20.94	42.44	40.00	2.44	peak	
4	137.7710	59.90	-20.93	38.97	40.00	-1.03	QP	
5	250.1900	56.18	-21.43	34.75	47.00	-12.25	peak	
6	375.3200	56.67	-19.78	36.89	47.00	-10.11	peak	
7	500.4500	51.49	-15.23	36.26	47.00	-10.74	peak	
8	750.7100	46.51	-10.89	35.62	47.00	-11.38	peak	



Job No.:	T160130D09	Polarization:	Horizontal
Standard:	EN 61000-6-4	Power Source:	230VAC/50Hz
Test item:	Radiation Test	Date:	2016/1/27
Company:	Cermate Technologies Inc.	Time:	11:47:04
Model:	S-BOX	Temp.(°C)/Hum.(%):	26(°C)/60%
Description:	Normal Mode	Engineer Signature:	Frank Liao



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	97.9000	55.21	-28.05	27.16	40.00	-12.84	peak	
2	137.6700	49.61	-23.02	26.59	40.00	-13.41	peak	
3	250.1900	54.96	-23.68	31.28	47.00	-15.72	peak	
4	375.0169	64.60	-19.00	45.60	47.00	-1.40	QP	
5	375.3200	64.49	-19.01	45.48	47.00	-1.52	peak	
6	500.4500	53.01	-13.71	39.30	47.00	-7.70	peak	
7	625.5800	43.38	-13.08	30.30	47.00	-16.70	peak	

## 7.4. HARMONICS CURRENT MEASUREMENT

### 7.4.1. 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 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.

### 7.4.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
H/F Measurement System	EMC Partner	HAR1000-1P	189	11/10/2016
5KVA Power Source	Teseq	5001IX-208-TSQ	1537A01296	11/10/2016
Software	HARCS V4.19			

**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** (please refer to measurement standard or CCS SOP PA-029)

- 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:

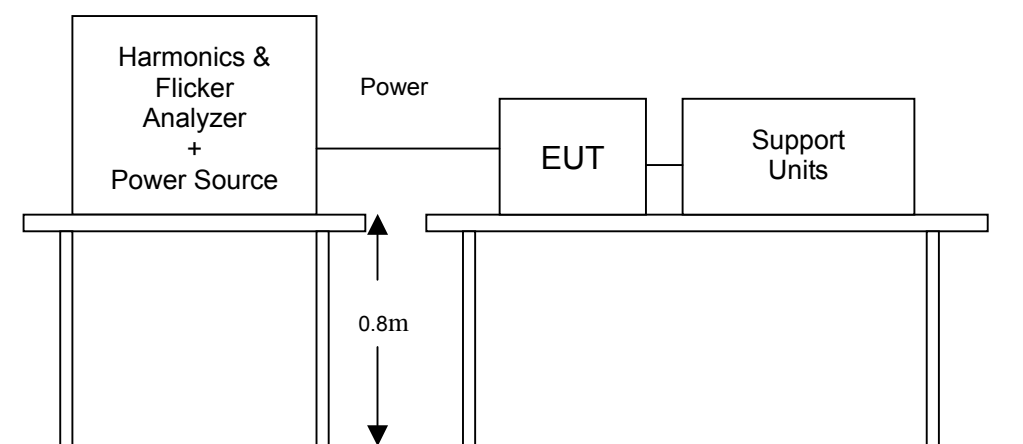
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

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; television receivers and refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

- 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.

**7.4.4. TEST SETUP**

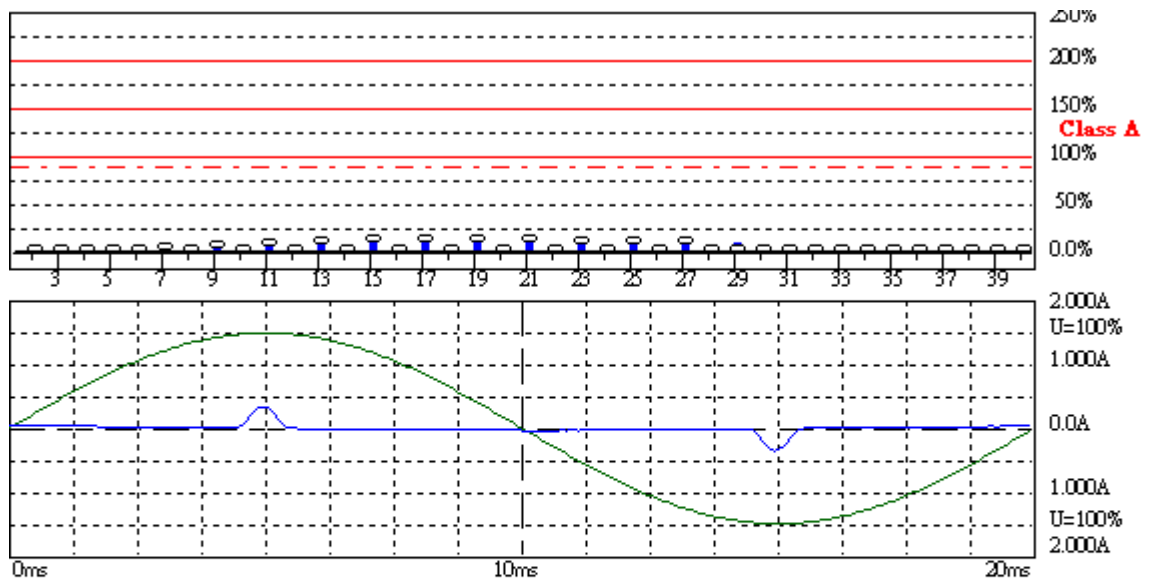
- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 7.4.5. TEST RESULTS

Power Consumption	6.626W	Test Results	PASS
Environmental Conditions	19°C, 50% RH, 1003mbar	Limits	Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Test Mode	Operating	Tested by	Frank Liao

**NOTE:** Limits classified according to item 7.4.1.

#### Test result of EN 61000-3-2



**Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2)**

2016/2/3 19:37:48

U<sub>rms</sub> = 229.9 V P = 6.626 W THC = 0.067 A  
I<sub>rms</sub> = 0.073 A pf = 0.394

Range: 2 A  
V<sub>nom</sub>: 230 V  
TestTime: 5 min (100%)

S-BOX

**Test completed, Result: PASSED**

HAR-1000 EMC-Return

Urms = 229.9V      Freq = 50.013      Range: 2 A  
 Irms = 0.073A      Ipk = 0.350A      cf = 4.773  
 P = 6.626W      S = 16.84VA      pf = 0.394  
 THDi = 181 %      THDu = 0.10 %      Class A

Test - Time : 5min      ( 100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax% [%]	Imax%L [%]	Limit [A]	Status
1	50	0.0369	0.0370	50.500		0.0371	50.667			
2	100	0.0000	0.0006	0.8333	0.0565	0.0006	0.8333	0.0565	1.0800	
3	150	0.0255	0.0255	34.833	1.1092	0.0256	35.000	1.1146	2.3000	
4	200	0.0000	0.0005	0.6667	0.1136	0.0005	0.6667	0.1136	0.4300	
5	250	0.0251	0.0251	34.333	2.2058	0.0251	34.333	2.2058	1.1400	
6	300	0.0000	0.0005	0.6667	0.1628	0.0005	0.6667	0.1628	0.3000	
7	350	0.0242	0.0242	33.000	3.1390	0.0243	33.167	3.1548	0.7700	
8	400	0.0000	0.0005	0.6667	0.2123	0.0005	0.6667	0.2123	0.2300	
9	450	0.0231	0.0231	31.500	5.7678	0.0231	31.500	5.7678	0.4000	
10	500	0.0000	0.0004	0.5000	0.1990	0.0005	0.6667	0.2654	0.1840	
11	550	0.0216	0.0216	29.500	6.5474	0.0216	29.500	6.5474	0.3300	
12	600	0.0000	0.0004	0.5000	0.2388	0.0005	0.6667	0.3184	0.1533	
13	650	0.0199	0.0200	27.333	9.5331	0.0200	27.333	9.5331	0.2100	
14	700	0.0000	0.0004	0.5000	0.2786	0.0004	0.5000	0.2786	0.1314	
15	750	0.0180	0.0182	24.833	12.126	0.0182	24.833	12.126	0.1500	
16	800	0.0000	0.0004	0.5000	0.3184	0.0004	0.5000	0.3184	0.1150	
17	850	0.0161	0.0162	22.167	12.267	0.0162	22.167	12.267	0.1324	
18	900	0.0000	0.0002	0.3333	0.2388	0.0004	0.5000	0.3582	0.1022	
19	950	0.0141	0.0142	19.333	11.957	0.0142	19.333	11.957	0.1184	
20	1000	0.0000	0.0002	0.3333	0.2654	0.0004	0.5000	0.3981	0.0920	
21	1050	0.0121	0.0122	16.667	11.393	0.0122	16.667	11.393	0.1071	
22	1100	0.0000	0.0002	0.3333	0.2919	0.0004	0.5000	0.4379	0.0836	
23	1150	0.0101	0.0103	14.000	10.482	0.0103	14.000	10.482	0.0978	
24	1200	0.0000	0.0002	0.3333	0.3184	0.0002	0.3333	0.3184	0.0767	
25	1250	0.0081	0.0083	11.333	9.2231	0.0083	11.333	9.2231	0.0900	
26	1300	0.0000	0.0002	0.3333	0.3450	0.0002	0.3333	0.3450	0.0708	
27	1350	0.0063	0.0065	8.8333	7.7637	0.0065	8.8333	7.7637	0.0833	
28	1400	0.0000	0.0002	0.3333	0.3715	0.0002	0.3333	0.3715	0.0657	
29	1450	0.0000	0.0048	6.5000	6.1361	0.0049	6.6667	6.2934	0.0776	
30	1500	0.0000	0.0002	0.3333	0.3981	0.0002	0.3333	0.3981	0.0613	
31	1550	0.0000	0.0033	4.5000	4.5410	0.0034	4.6667	4.7092	0.0726	
32	1600	0.0000	0.0002	0.3333	0.4246	0.0002	0.3333	0.4246	0.0575	
33	1650	0.0000	0.0021	2.8333	3.0436	0.0021	2.8333	3.0436	0.0682	
34	1700	0.0000	0.0002	0.3333	0.4511	0.0002	0.3333	0.4511	0.0541	
35	1750	0.0000	0.0010	1.3333	1.5191	0.0010	1.3333	1.5191	0.0643	
36	1800	0.0000	0.0002	0.3333	0.4777	0.0002	0.3333	0.4777	0.0511	
37	1850	0.0000	0.0004	0.5000	0.6022	0.0004	0.5000	0.6022	0.0608	
38	1900	0.0000	0.0002	0.3333	0.5042	0.0002	0.3333	0.5042	0.0484	
39	1950	0.0000	0.0007	1.0000	1.2695	0.0010	1.3333	1.6927	0.0577	
40	2000	0.0000	0.0002	0.3333	0.5307	0.0002	0.3333	0.5307	0.0460	

**Definitions of Abbreviations**

Urms	***	Actual total Voltage in Volt RMS
Irms	***	Actual total Current in Ampere RMS
Ipk	***	Actual Peak value of the Current in Ampere
cf	***	Actual Crest Factor (Ipk/Irms)
P	***	Actual Active Power in Watt
S	***	Actual Apparent Power in VA (Urms*Irms)
pf	***	Actual Power Factor (P/S)
THDi	***	Actual Total Harmonic Current Distortion in %
THDu	***	Actual Total Harmonic Voltage Distortion in %
THC	***	Actual Total Harmonic Current in Ampere
PHC	***	Actual Partial Harmonic Current in Ampere

Individual measurements for 2nd to 40th order:

Iavg		Average value of the Individual Harmonic Current in Ampere RMS
Irms	***	Actual Individual Harmonic Current in Ampere RMS
Irms%	***	Actual Individual Harmonic Current in percentage of the actual total RMS Current
Irms%L	***	Actual Individual Harmonic Current in percentage of the applicable Limit
I <sub>max</sub>		Maximum Individual Harmonic Current in Ampere RMS
I <sub>max</sub> %		Maximum Individual Harmonic Current in percentage of the actual total RMS Current
I <sub>max</sub> %lim		Maximum Individual Harmonic Current in percentage of the applicable Limit
Limit Irms		Individual Limit (100%) for the selected Class in Ampere RMS

## 7.5. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

### 7.5.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKER 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

### 7.5.2. TEST INSTRUMENTS

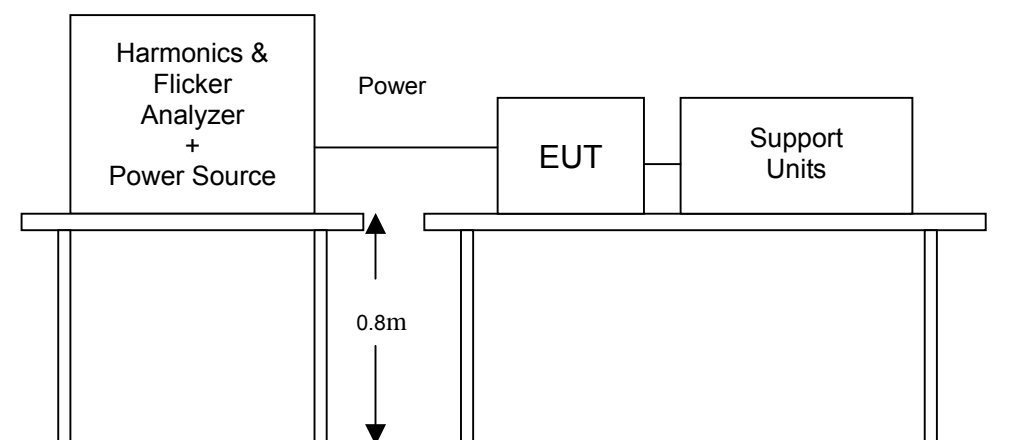
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
H/F Measurement System	EMC Partner	HAR1000-1P	189	11/10/2016
5KVA Power Source	Teseq	5001IX-208-TSQ	1537A01296	11/10/2016
Software	HARCS V4.19			

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

### 7.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-030)

- 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.

## 7.5.4. TEST SETUP



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

## 7.5.5. TEST RESULTS

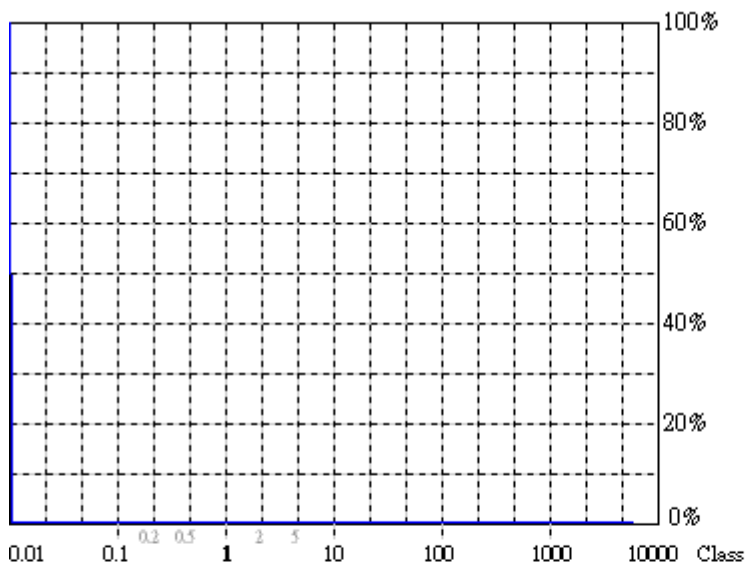
Observation Period (Tp)	30mins	Test Mode	Operating
Environmental Conditions	19°C, 50% RH, 1003mbar	Tested by	Frank Liao

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
$P_{st}$	0.07	1.0	PASS
$P_{lt}$	0.07	0.65	PASS
$T_{dt}$ (ms)	0	500	PASS
$d_{max}$ (%)	0	4%	PASS
dc (%)	0	3.3%	PASS

**Note:** None.



## Test result of EN 61000-3-3



**Actual Flicker (Fli):** 0.00  
**Short-term Flicker (Pst):** 0.07  
 Limit (Pst): 1.00  
**Long-term Flicker (Plt):** 0.07  
 Limit (Plt): 0.65  
**Maximum Relative Volt. Change (dmax):** 0.00%  
 Limit (dmax): 4.00%  
**Relative Steady-state Voltage Change (dc):** 0.00%  
 Limit (dc): 3.30%  
**Maximum Interval exceeding 3.30% (dt):** 0.00ms  
 Limit (dt>Lim): 500ms

## Flicker Emission - IEC 61000-3-3, EN 61000-3-3

2016/2/3 19:31:55

U<sub>rms</sub> = 229.9 V    P = 6.626 W  
 I<sub>rms</sub> = 0.072 A    pf = 0.399

Range: 2 A  
 V<sub>nom</sub>: 230 V  
 TestTime: 30 min (100%)

S-BOX

Test completed, Result: PASSED

BAR-1000 EMC-Return

## 8 IMMUNITY TEST

### 8.1. GENERAL DESCRIPTION

Product Standard	EN 61000-6-2: 2005 / AC: 2005	
	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, 10V/m, 80% AM(1kHz), 1400 ~2000 MHz, 3V/m, 80% AM(1kHz), 2000 ~2700 MHz, 1V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power Port: 2kV, DC Power Port: 2kV, Signal Port: 1kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 $\mu$ s Open Circuit Voltage, 8 /20 $\mu$ s Short Circuit Current, AC Power Port ~ line to line: 1kV, line to earth: 2kV DC Power Port ~ line to line and line to earth: 0.5kV Signal Port ~ lines to earth: 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS, AC Power Port; DC Power Port; Signal Port: 0.15 ~ 80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power frequency magnetic field immunity test 50Hz/60Hz, 30A/m Performance Criterion A
	IEC 61000-4-11	<b>Voltage Dips:</b> i) 0% residual for 1 cycle, Performance Criterion B ii) 40% residual for 10/12 cycles at 50/60Hz, Performance Criterion C iii) 70% residual for 25/30 cycles at 50/60Hz, Performance Criterion C <b>Voltage Interruptions:</b> 0% residual for 250/300 cycles at 50/60Hz Performance Criterion C

## 8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

<b>Criteria A:</b>	The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
<b>Criteria B:</b>	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
<b>Criteria C:</b>	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

### 8.3. ELECTROSTATIC DISCHARGE (ESD)

#### 8.3.1. TEST SPECIFICATION

**Basic Standard:** IEC 61000-4-2

**Discharge Impedance:** 330 ohm / 150 pF

**Discharge Voltage:** Air Discharge: 2 ; 4 ; 8 kV (Direct)  
Contact Discharge: 2 ; 4 kV (Direct/Indirect)

**Polarity:** Positive & Negative

**Number of Discharge:** Minimum 10 times at each test point

**Discharge Mode:** Single Discharge  
1 second minimum

#### 8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Generator	Teseq	NSG 437	249	12/13/2016
Aneroid Barometer	Sato	7610-20	89090	10/15/2016
Thermo-Hygrometer	TECPEL	DTM-303	080269	04/19/2016

**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** (please refer to measurement standard or CCS SOP PA-022)

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 20 discharges, 10 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 10 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 10 direct contact discharges. If no direct contact test points are available, then at least 20 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

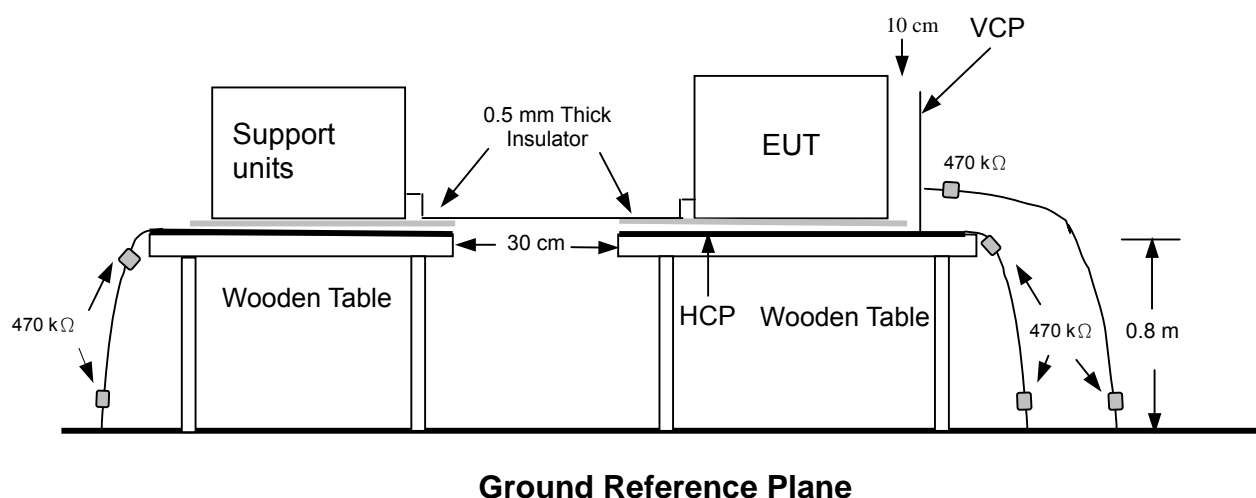
b) Air discharges at slots and apertures and insulating surfaces:

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 IEC 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

## AC Power

Temperature	19°C	Humidity	42% RH
Pressure	1012mbar	Tested By	Frank Liao
Required Passing Performance		Criterion B	

Air Discharge								
Test Points	Test Levels			Results				
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Top	<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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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

## DC Power

Temperature	19°C	Humidity	42% RH
Pressure	1012mbar	Tested By	Frank Liao
Required Passing Performance		Criterion B	

Air Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Top	<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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
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	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

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



The Photo for Discharge Points of EUT

Front

**T160130D09**



Back

**T160130D09**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged

Left

**T160130D09**



Right

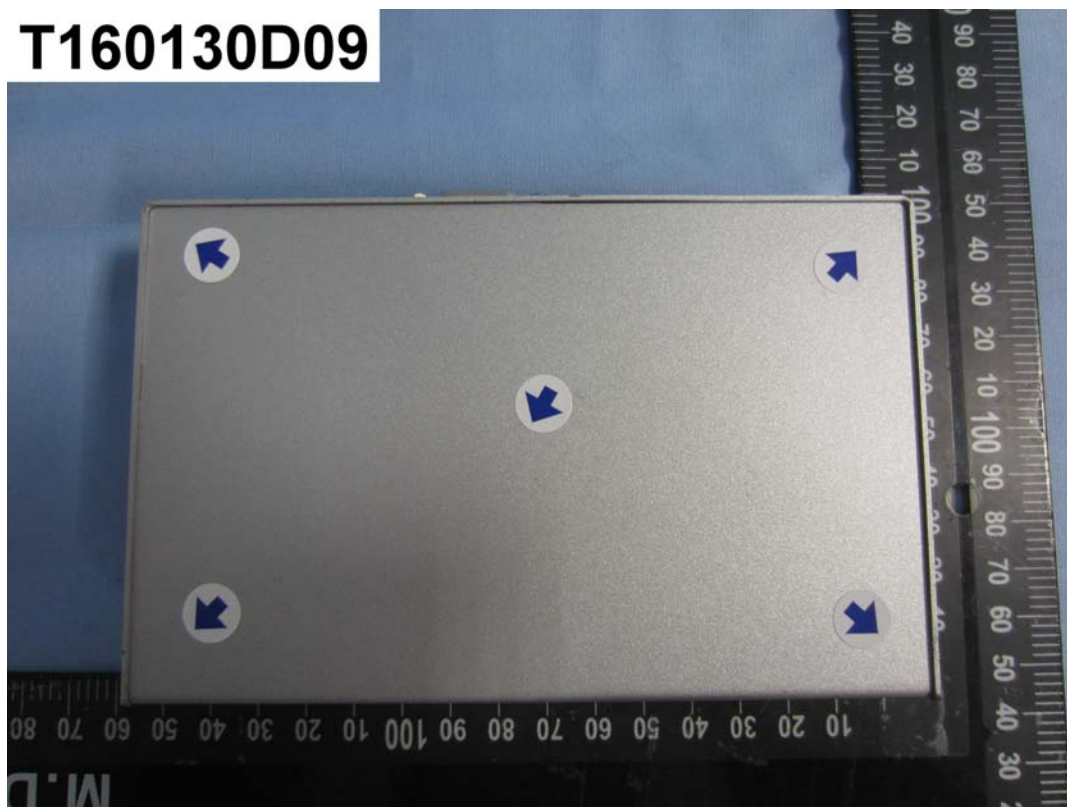
**T160130D09**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged

Top

**T160130D09**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged

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

### 8.4.1. TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-3
<b>Frequency Range:</b>	80 ~ 1000 MHz, 1400 ~ 2000 MHz, 2000 ~ 2700 MHz
<b>Field Strength:</b>	10 V/m, 3 V/m, 1 V/m
<b>Modulation:</b>	1kHz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of preceding frequency value
<b>Polarity of Antenna:</b>	Horizontal and Vertical
<b>Test Distance:</b>	3 m
<b>Antenna Height:</b>	1.5 m

### 8.4.2. TEST INSTRUMENT

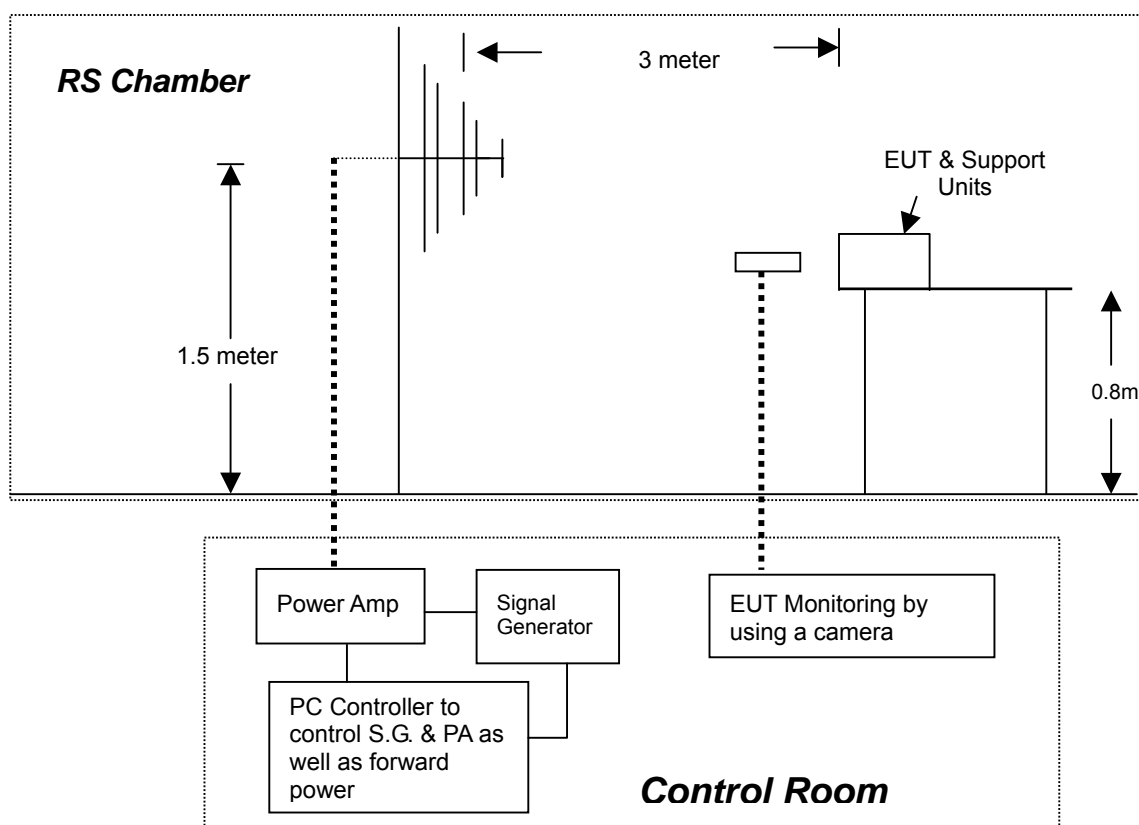
844 RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Calibration of Field	N/A	Chamber#RS	80-1000MHz	04/01/2016
Signal Generator	Agilent	N5181A	MY47421336	12/10/2016
Electric Field Probe	AR	FL7006	0338955	06/14/2016
RF Power Meter	Boonton	4242-01-02	14357	03/15/2016
Amplifier	AR	500W1000A	320994	No Cal. Required
Direction Coupler	AR	DC6180A	312189	No Cal. Required
Broadband Antenna	AR	AT1080	311819	No Cal. Required
Thermo-Hygrometer	TFA	N/A	NO.6	10/25/2016
Calibration of Field	N/A	Chamber#RS	1000-6000MHz	06/21/2016
Amplifier	AR	50S1G6M1	0343693	No Cal. Required
Horn Antenna	EMCO	3115	5761	No Cal. Required
Direction Coupler	AR	DC7200	0343647	No Cal. Required
Software	Emcware Ver. 2.6.0.16			

**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** (please refer to measurement standard or CCS SOP PA-023)

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

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meter from the EUT.
- The frequency range is swept from 80 MHz to 2700 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.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- 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 IEC 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****AC Power**

<b>Temperature</b>	19°C	<b>Humidity</b>	49% RH
<b>Pressure</b>	1007mbar	<b>Dwell Time</b>	3 sec.
<b>Tested By</b>	Frank Liao	<b>Required Passing Performance</b>	<b>Criterion A</b>

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Observation	Result
80 ~ 1000	V&H	0	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
80 ~ 1000	V&H	90	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
80 ~ 1000	V&H	180	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
80 ~ 1000	V&H	270	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	0	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	90	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	180	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	270	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	0	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	90	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	180	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	270	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## DC Power

Temperature	19°C	Humidity	49% RH
Pressure	1007mbar	Dwell Time	3 sec.
Tested By	Frank Liao	Required Passing Performance	Criterion A

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Observation	Result
80 ~ 1000	V&H	0	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
80 ~ 1000	V&H	90	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
80 ~ 1000	V&H	180	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
80 ~ 1000	V&H	270	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	0	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	90	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	180	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
1400 ~ 2000	V&H	270	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	0	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	90	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	180	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2000 ~ 2700	V&H	270	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## 8.5. ELECTRICAL FAST TRANSIENT (EFT)

### 8.5.1. TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-4
<b>Test Voltage:</b>	AC Power Port: 2kV DC Power Port: 2kV Signal Port: 1kV
<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>	300 ms
<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
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/03/2016
Capacitive Clamp	EMC-Partner	CN-EFT1000	589	07/21/2016
Software	Genecs Ver. 3.27			

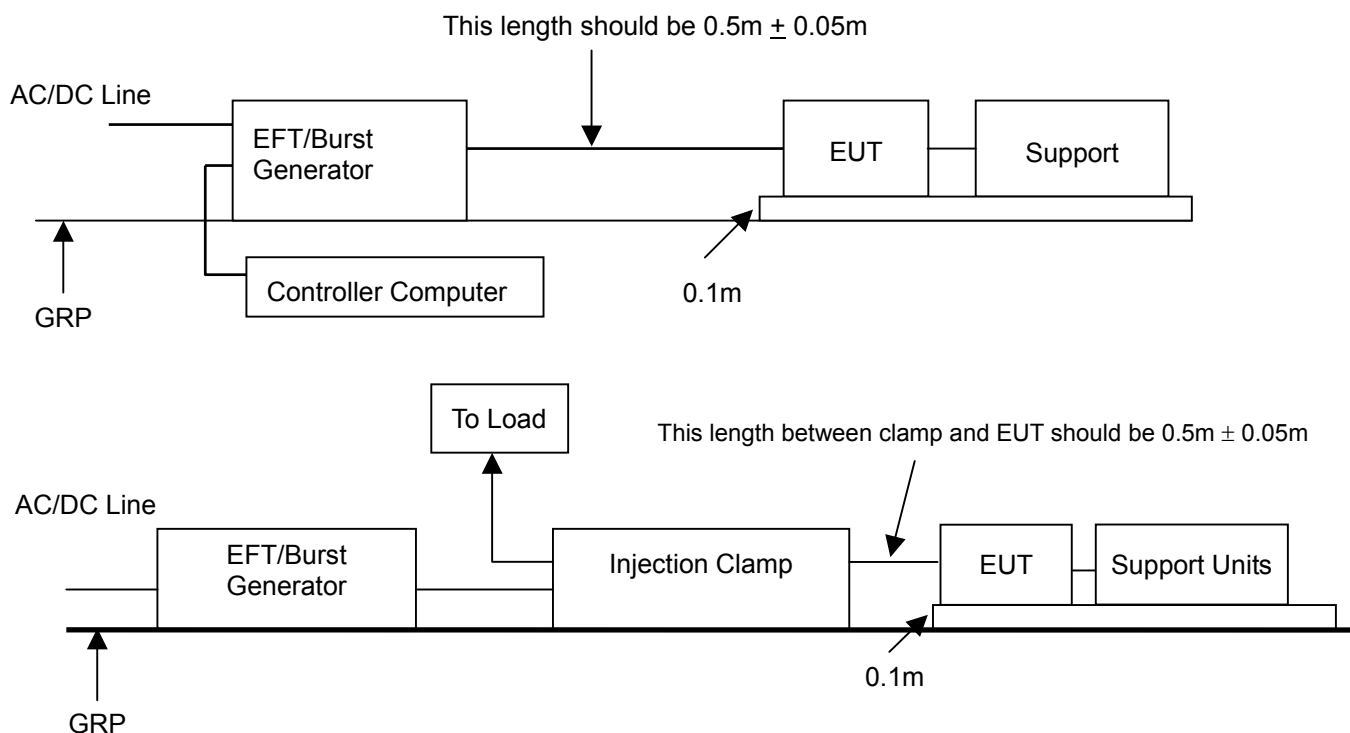
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required.

### 8.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-024)

- All types of cables, including their length, and the interface port of the EUT to which they were connected.
- Both positive and negative polarity discharges were applied.
- The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with IEC 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 (0.1m 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

## AC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - N	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
RJ45	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
LAN (HMI)	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 1	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 2	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 3	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
USB	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## DC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - N	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
RJ45	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
LAN (HMI)	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 1	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 2	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 3	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
USB	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## 8.6. SURGE IMMUNITY TEST

### 8.6.1. TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-5
<b>Wave-Shape:</b>	Combination Wave 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current
<b>Test Voltage:</b>	AC Power Port ~ line to line: 1kV, line to earth: 2kV DC Power Port ~ line to line and line to earth: 0.5kV Signal Port ~ lines to earth: 1kV
<b>Surge Input/Output:</b>	AC Power Line: L-N / L-PE / N-PE DC Power Line: L-N / L-PE / N-PE Signal Line: L-G
<b>Generator Source Impedance:</b>	2 ohm between networks 12 ohm between network and ground 42 ohm between network and ground
<b>Polarity:</b>	Positive/Negative
<b>Phase Angle:</b>	AC Power: 0° / 90° / 180° / 270° DC Power: 0°
<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
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/03/2016
CDN	EMC Partner	CDN-UTP8	CDN-UTP8-1505	03/03/2016
Software	Genecs Ver. 3.27			

**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 required.

**8.6.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-025)

## a) For EUT power supply:

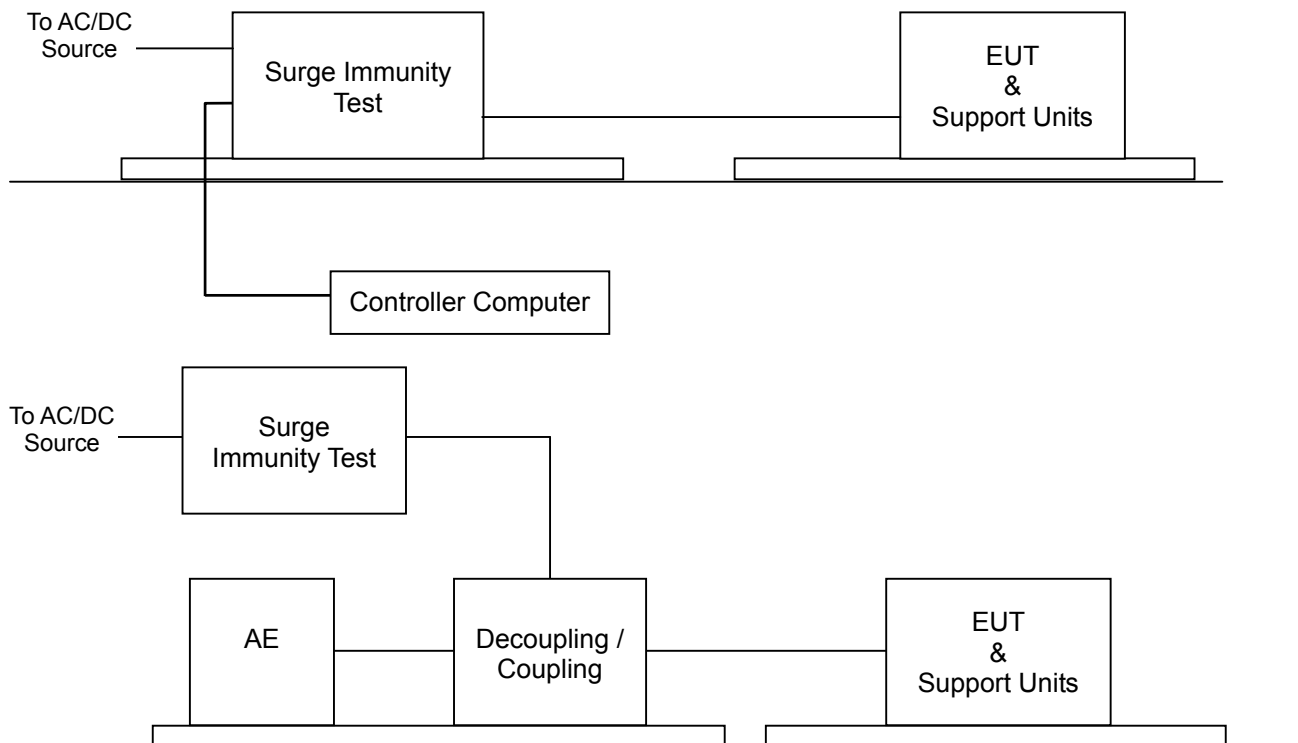
The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave.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

## AC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L - N	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
RJ45	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 1	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 2	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 3	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## DC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L - N	+/-	0.5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - PE	+/-	0.5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N - PE	+/-	0.5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
RJ45	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 1	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 2	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
COM 3	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## 8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

### 8.7.1. TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-6
<b>Frequency Range:</b>	0.15 MHz ~ 80 MHz
<b>Field Strength:</b>	10 Vrms
<b>Modulation:</b>	1kHz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of preceding frequency value
<b>Coupled cable:</b>	AC/DC Power Mains, Unshielded; RJ45 Line, Unshielded; LAN Line, Unshielded; USB Line, Shielded; COM 1 Line, Shielded; COM 2 Line, Shielded; COM 3 Line, Shielded
<b>Coupling device:</b>	CDN-M3 (3 wires); CDN-T4; EM-Clamp

### 8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
CWS Generator	EM Test	CWS 500N1.4	P1446143188	03/02/2016
CDN (EUT)	Teseq	CDN M016	35820	06/15/2016
CDN	Teseq	CDN M016	35821	06/08/2016
EM Clamp	Schaffner	KEMZ 801	19227	03/30/2016
CDN	Teseq	CDN T400A	25674	01/11/2017
Attenuator	EMCI	SA3NL	10006F	No Cal. Required
Software	icd.control Ver. 5.1.9			

**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 (please refer to measurement standard or CCS SOP PA-026)

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

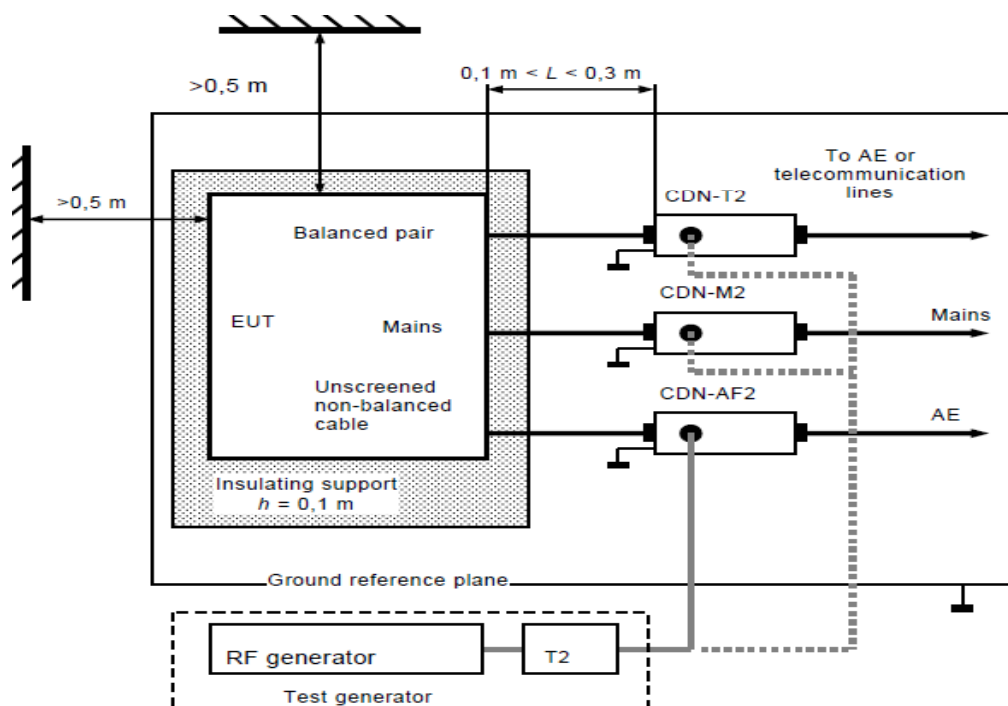
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

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 was 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 CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.  
2. The EUT clearance from any metallic obstacles shall be at least 0.5m

- 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

## AC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance		Criterion A	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	10	AC Power Line (0.3m)	CDN-M3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	RJ45 Line (3.0m)	CDN-T4	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	LAN Line (3.0m)	CDN-T4	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	USB Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	COM 1 Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	COM 2 Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	COM 3 Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## DC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance		Criterion A	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	10	DC Power Line (0.3m)	CDN-M3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	RJ45 Line (3.0m)	CDN-T4	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	LAN Line (3.0m)	CDN-T4	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	USB Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	COM 1 Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	COM 2 Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	10	COM 3 Line (3.0m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

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

## 8.8. POWER FREQUENCY MAGNETIC FIELD

### 8.8.1. TEST SPECIFICATION

**Basic Standard:** IEC 61000-4-8

**Frequency Range:** 50Hz/60Hz

**Field Strength:** 30 A/m

**Observation Time:** 1 minute

**Inductance Coil:** Rectangular type, 1mx1m

### 8.8.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Induction Coil Interface	Teseq	INA 703 W/ 2141	1976 / 1413	04/22/2016
5KVA Power Source	Teseq	5001IX-208-TSQ	1207A03643	No Cal. Required
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	05/26/2016
MagneticField Meter	Sypris	4080	0247	03/30/2016
Software	Win2120Ver. 5.0			

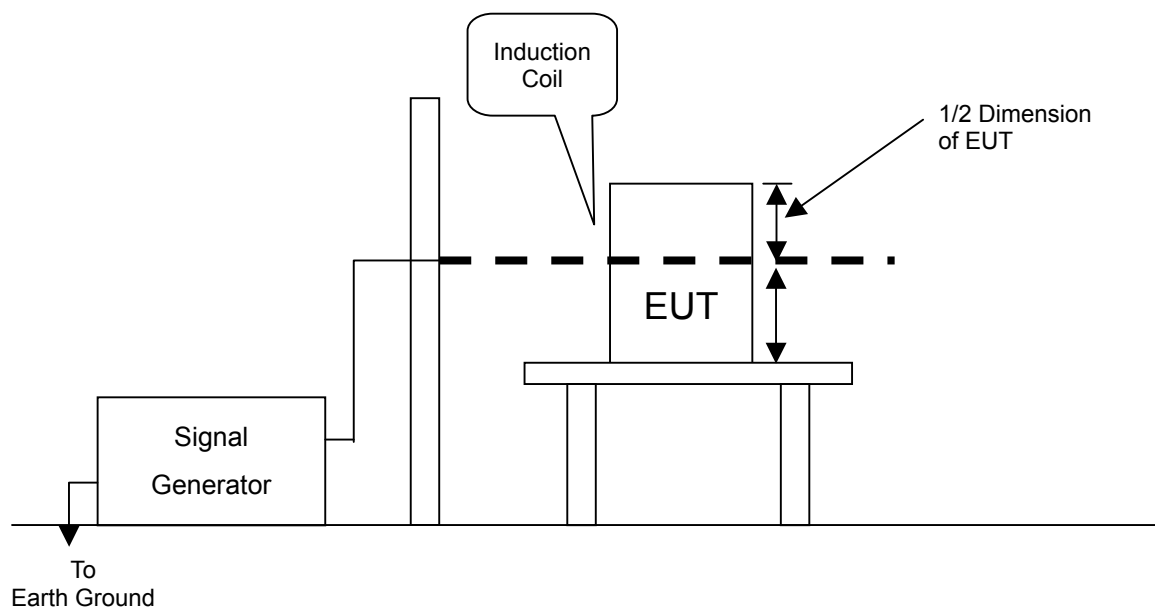
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R.= No Calibration required.

### 8.8.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-027)

- The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.
- The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

#### 8.8.4. TEST SETUP



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

**NOTE:****TABLETOP EQUIPMENT**

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

**FLOOR-STANDING EQUIPMENT**

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

**8.8.5. TEST RESULTS****AC Power**

Temperature	19°C	Humidity	49% RH
Pressure	1007mbar	Tested By	Frank Liao
Required Passing Performance		Criterion A	

DIRECTION	Field Strength (A/m)	Performance Criterion	OBSERVATION	RESULTS
X	30	A	Note	PASS
Y	30	A	Note	PASS
Z	30	A	Note	PASS

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

**DC Power**

Temperature	19°C	Humidity	49% RH
Pressure	1007mbar	Tested By	Frank Liao
Required Passing Performance		Criterion A	

DIRECTION	Field Strength (A/m)	Performance Criterion	OBSERVATION	RESULTS
X	30	A	Note	PASS
Y	30	A	Note	PASS
Z	30	A	Note	PASS

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

## 8.9. VOLTAGE DIP & VOLTAGE INTERRUPTIONS

### 8.9.1. TEST SPECIFICATION

**Basic Standard:** IEC 61000-4-11

**Test duration time:** Minimum three test events in sequence

**Interval between event:** Minimum 10 seconds

**Phase Angle:** 0° / 180°

**Test cycle:** 3 times

### 8.9.2. TEST INSTRUMENT

Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/03/2016
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	05/26/2016
Software	Genecs Ver. 3.27			

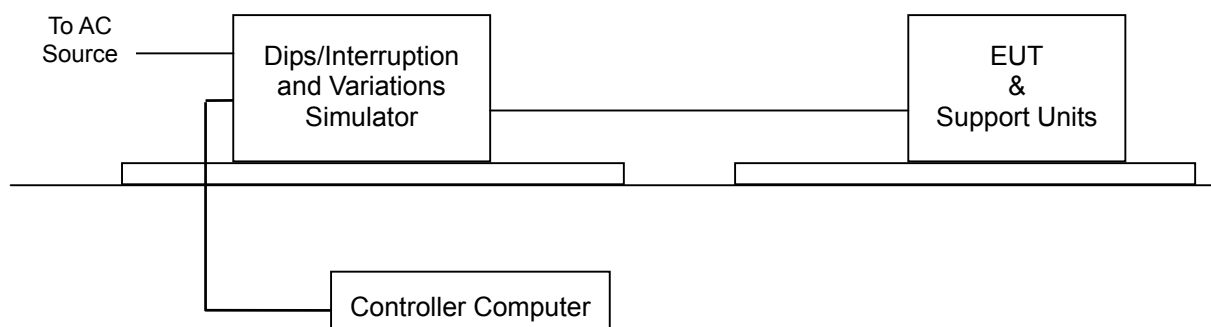
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R.= No Calibration required.

### 8.9.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-028)

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.

### 8.9.4. TEST SETUP



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

## 8.9.5. TEST RESULTS

## AC Power

Temperature	19°C	Humidity	50% RH
Pressure	1003mbar	Tested By	Frank Liao
Required Passing Performance	<b>Criterion B: 0% residual 1 cycle</b> <b>Criterion C: i) 40% residual 10/12 cycles at 50/60Hz</b> <b>ii) 70% residual 25/30 cycles at 50/60Hz</b> <b>iii) 0% residual for 250/300 cycles at 50/60Hz</b>		

Test Power: 230Vac, 50Hz				
Voltage (% Residual)	Duration (Cycle)	Performance Criterion	Observation	Test Result
0	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
40	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
70	25	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0	250	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	PASS

Test Power: 230Vac, 60Hz				
Voltage (% Residual)	Duration (Cycle)	Performance Criterion	Observation	Test Result
40	12	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
70	30	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0	300	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	PASS

**NOTE:** 1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.  
2. EUT shut down, but it could recover automatically afterwards.

## 9 PHOTOGRAPHS OF THE TEST CONFIGURATION CONDUCTED EMISSION TEST





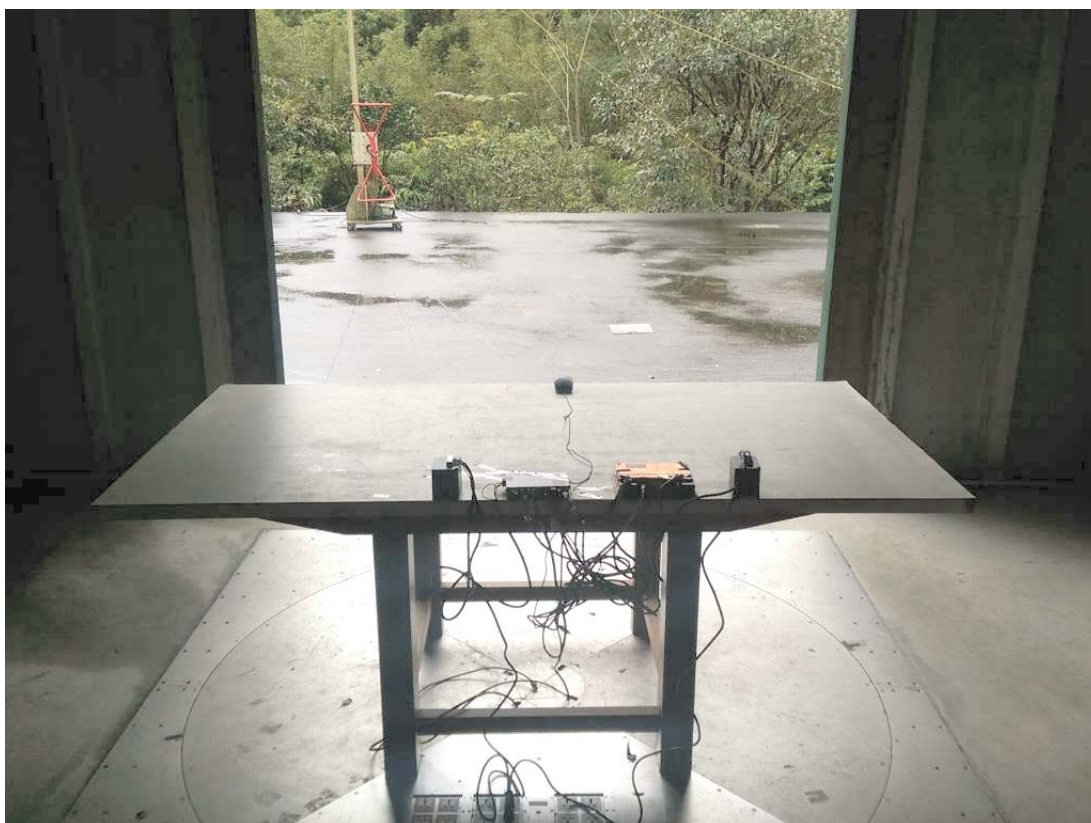
## CONDUCTED EMISSION TEST AT TELECOMMUNICATION PORTS RJ45 Telecom Port with ISN (10Mbps & 100Mbps)



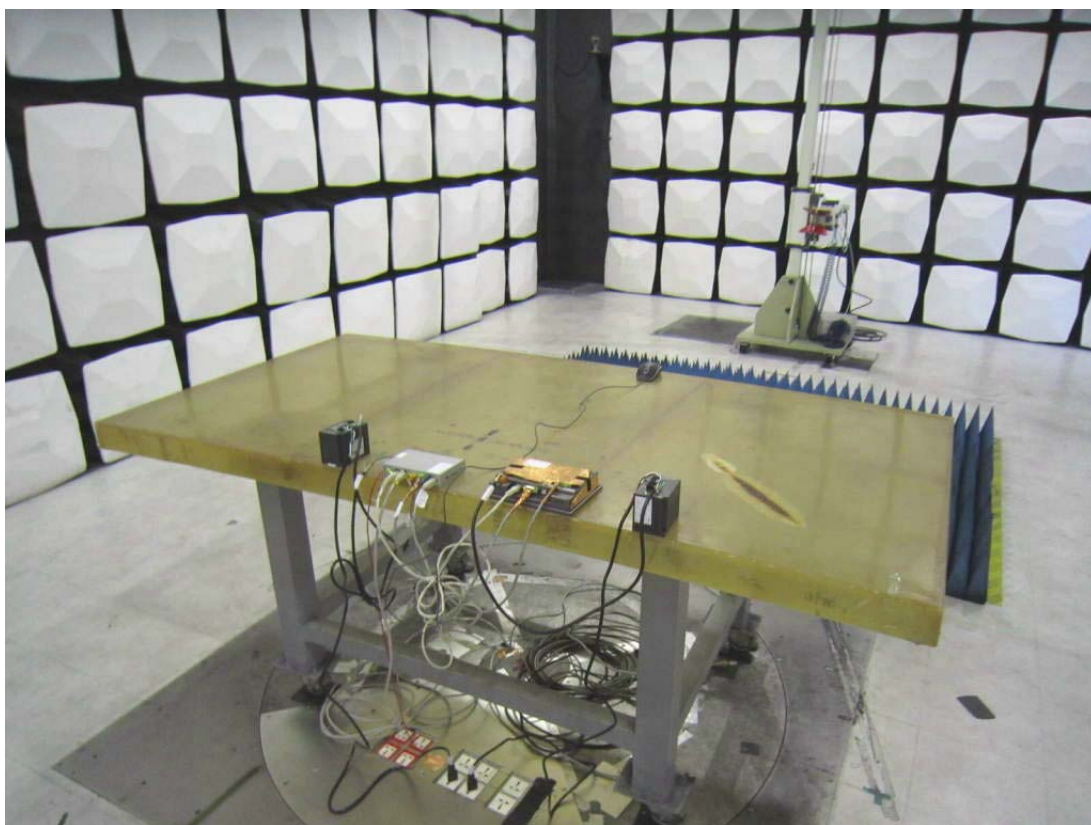


## **RADIATED EMISSION TEST**

### **Below 1GHz**

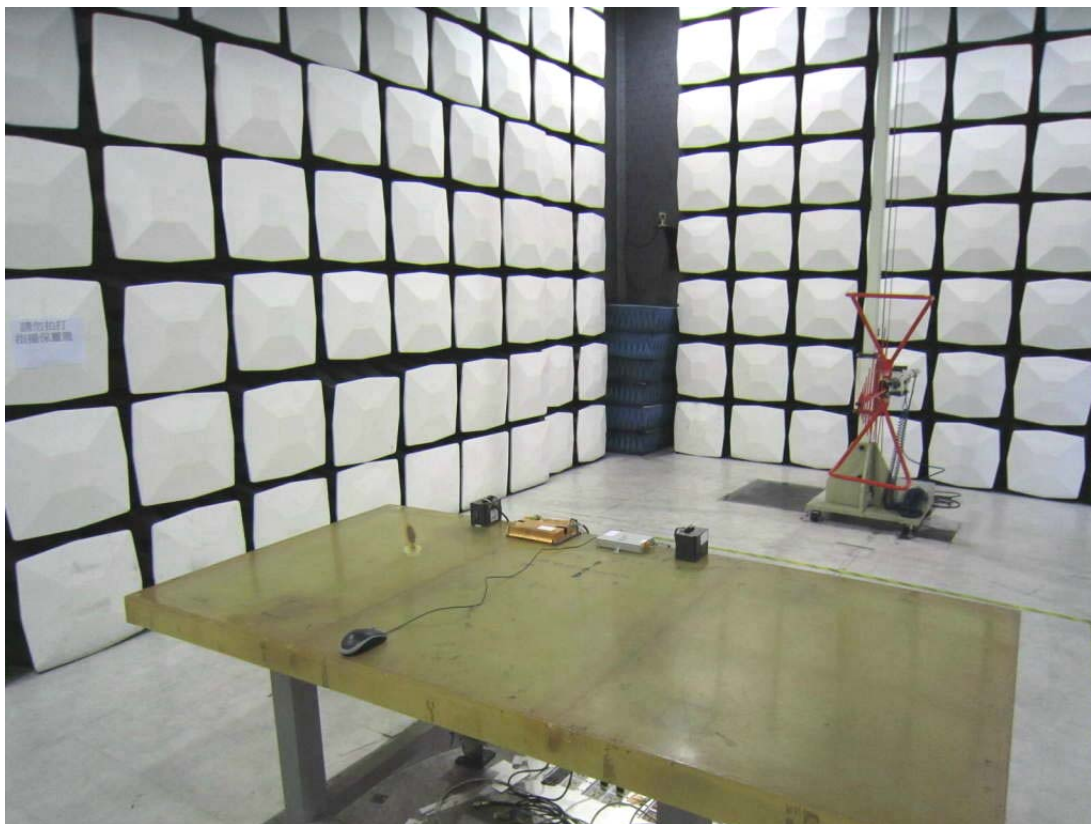


## Above 1GHz





## 966 CHAMBER TEST



## Harmonic & Flick Test (AC Power)



## ESD Test (AC Power)

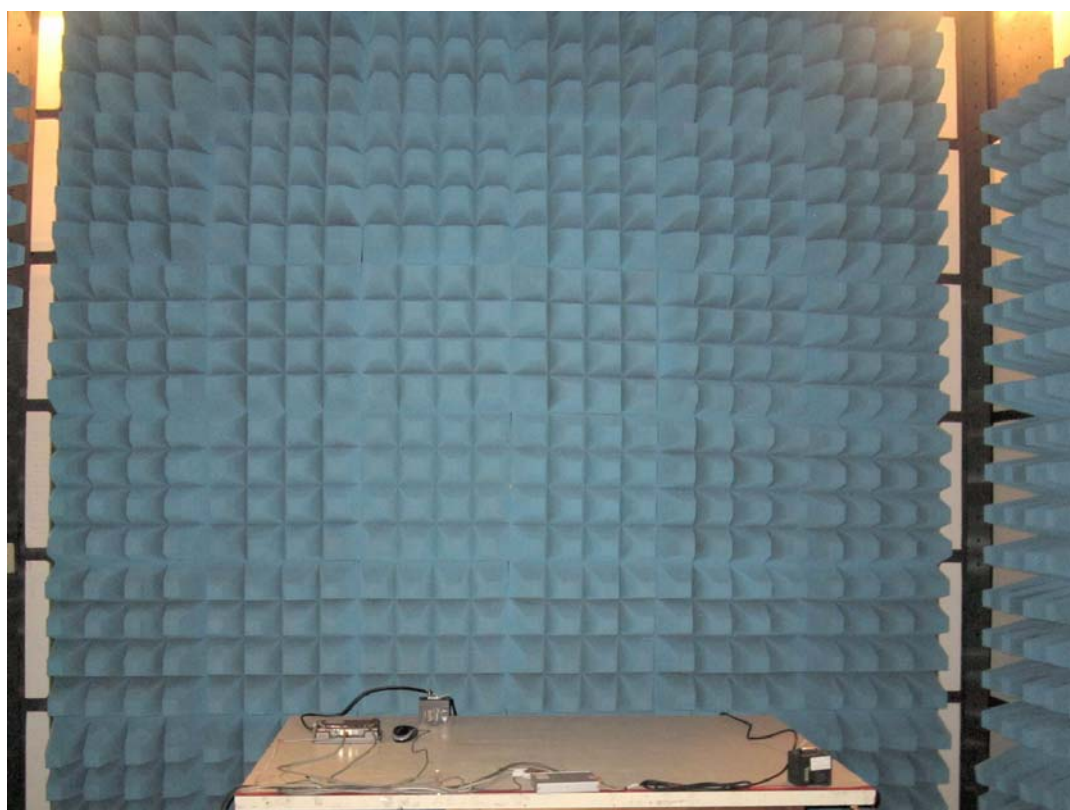




### ESD Test (DC Power)



### RS Test (AC Power)



### RS Test (DC Power)



### EFT Test (AC Power)





### EFT Test (DC Power)



### EFT For RJ45 Test (AC Power)



### EFT For LAN Test (AC Power)



### EFT For USB Test (AC Power)





### EFT For COM 1 Test (AC Power)



### EFT For COM 2 Test (AC Power)



### EFT For COM 3 Test (AC Power)



### EFT For RJ45 Test (DC Power)





### EFT For LAN Test (DC Power)



### EFT For USB Test (DC Power)



### EFT For COM 1 Test (DC Power)



### EFT For COM 2 Test (DC Power)





### EFT For COM 3 Test (DC Power)



### Surge Test (AC Power)



### Surge Test (DC Power)



### Surge For RJ45 Test (AC Power)





### Surge For COM 1 Test (AC Power)



### Surge For COM 2 Test (AC Power)



### Surge For COM 3 Test (AC Power)



### Surge For RJ45 Test (DC Power)





### Surge For COM 1 Test (DC Power)



### Surge For COM 2 Test (DC Power)



### Surge For COM 3 Test (DC Power)



### CS Test (AC Power)

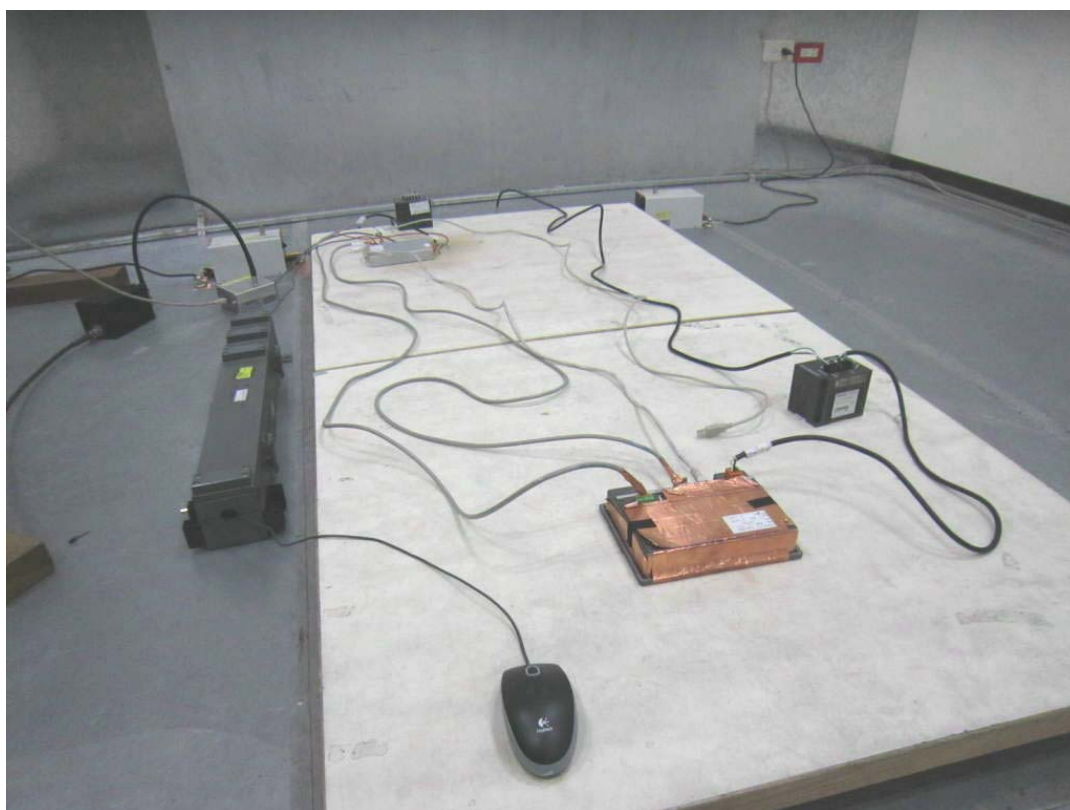




### CS Test (DC Power)



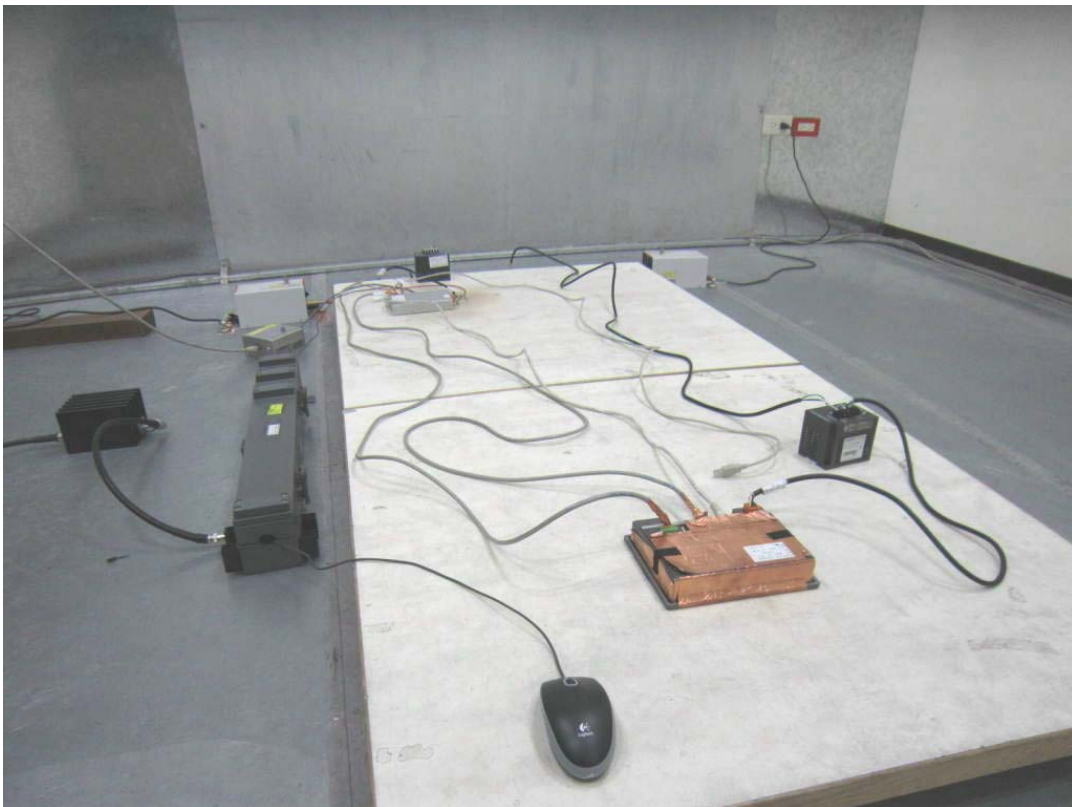
### CS For RJ45 Test (AC Power)



## CS For LAN Test (AC Power)



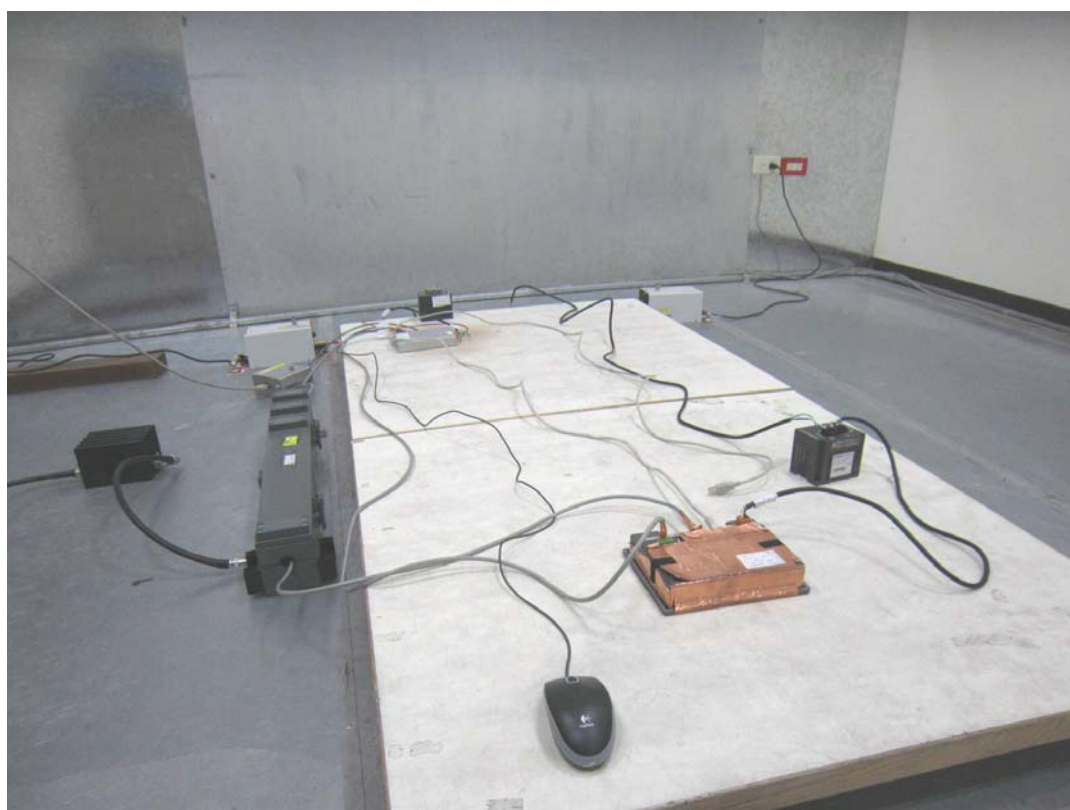
## CS For USB Test (AC Power)



### **CS For COM 1 Test (AC Power)**

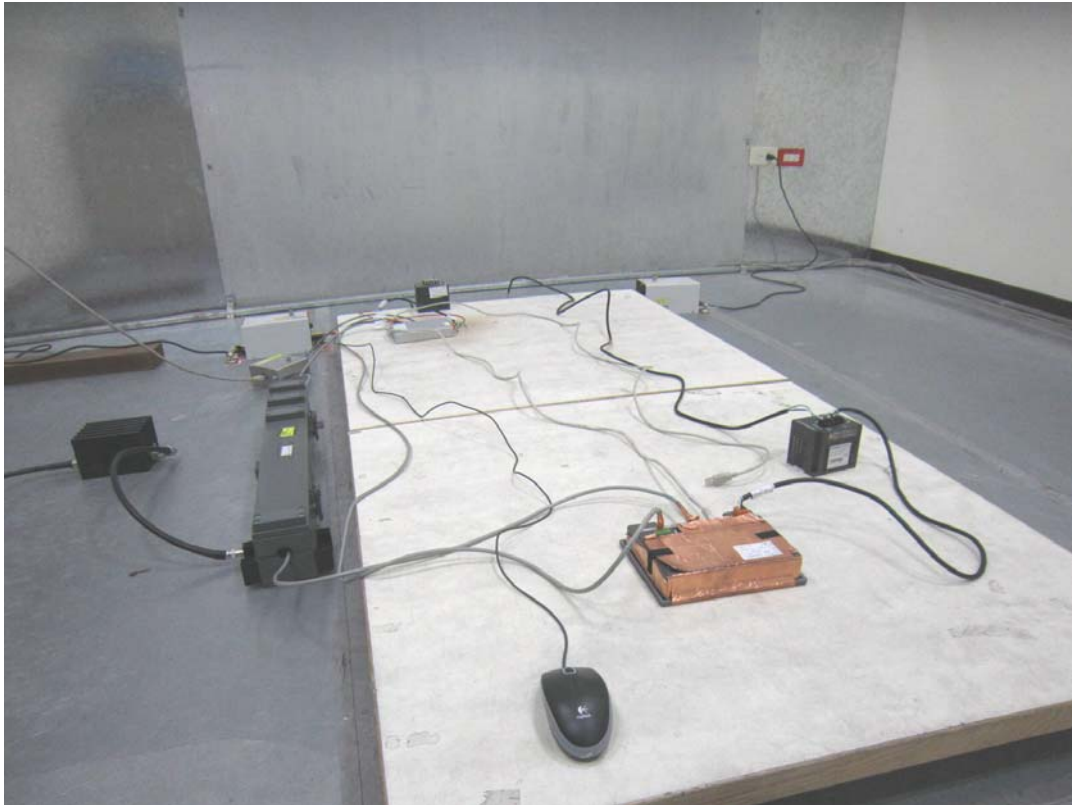


### **CS For COM 2 Test (AC Power)**





### CS For COM 3 Test (AC Power)



### CS For RJ45 Test (DC Power)



## CS For LAN Test (DC Power)

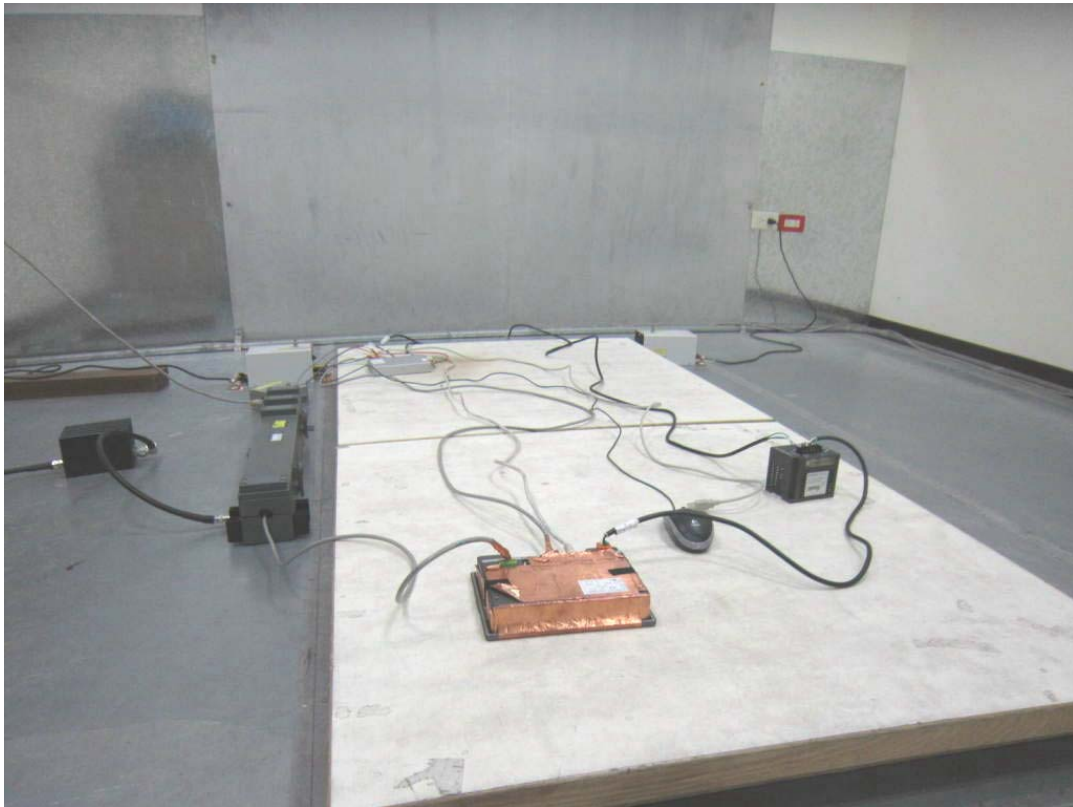


## CS For USB Test (DC Power)





### **CS For COM 1 Test (DC Power)**



### **CS For COM 2 Test (DC Power)**





### CS For COM 3 Test (DC Power)



### PFMF Test (AC Power)



### **PFMF Test (DC Power)**



### **Voltage Dips / Interruptions Test (AC Power)**

