EMC
TEST REPORT

for

power

MODEL:

TPP100-112BA, TPP100-112A, TPP100-115BA, TPP100-115A, TPP100-124BA, TPP100-124A, TPP100-128BA, TPP100-128A, TPP100-136BA, TPP100-136A, TPP100-148BA, TPP100-148A, TPP100-112BU, TPP100-112U, TPP100-115BU, TPP100-115U, TPP100-124BU, TPP100-124U, TPP100-128BU, TPP100-128U, TPP100-136BU, TPP100-136U, TPP100-148BU, TPP100-148U, TPP100-112B, TPP100-112BD, TPP100-112, TPP100-112D, TPP100-115B, TPP100-115BD, TPP100-115, TPP100-115D, TPP100-124B, TPP100-124BD, TPP100-124, TPP100-124D, TPP100-128B, TPP100-128BD, TPP100-128, TPP100-128D, TPP100-136B, TPP100-136BD, TPP100-136, TPP100-136D, TPP100-148B, TPP100-148BD, TPP100-148, TPP100-148D

Test Report Number:

T141225W02-E-1

Issued for

TRACO ELECTRONIC AG

Sihlbruggstrasse 111 CH-6340 Baar Switzerland

Issued By:

Compliance Certification Services Inc.
Wugu Laboratory
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Issued Date: January 20, 2015

Testing Laboratory
1309

ACCREDITED
TESTING CERT #0824.01

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		January 20, 2015		Initial Issue	ALL	Kelly Cheng

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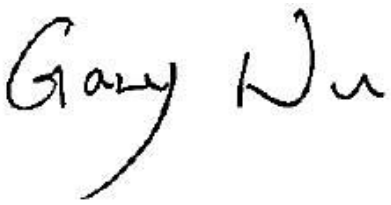
1 TEST CERTIFICATION

Product:	power
Model:	TPP100-112BA, TPP100-112A, TPP100-115BA, TPP100-115A, TPP100-124BA, TPP100-124A, TPP100-128BA, TPP100-128A, TPP100-136BA, TPP100-136A, TPP100-148BA, TPP100-148A, TPP100-112BU, TPP100-112U, TPP100-115BU, TPP100-115U, TPP100-124BU, TPP100-124U, TPP100-128BU, TPP100-128U, TPP100-136BU, TPP100-136U, TPP100-148BU, TPP100-148U, TPP100-112B, TPP100-112BD, TPP100-112, TPP100-112D, TPP100-115B, TPP100-115BD, TPP100-115, TPP100-115D, TPP100-124B, TPP100-124BD, TPP100-124, TPP100-124D, TPP100-128B, TPP100-128BD, TPP100-128, TPP100-128D, TPP100-136B, TPP100-136BD, TPP100-136, TPP100-136D, TPP100-148B, TPP100-148BD, TPP100-148, TPP100-148D
Brand:	TRACO POWER
Applicant:	**TRACO ELECTRONIC AG** Sihlbruggstrasse 111 CH-6340 Baar Switzerland
Manufacturer:	**TRACO ELECTRONIC AG** Sihlbruggstrasse 111 CH-6340 Baar Switzerland
Tested:	February 06 ~ 08, 2013
Applicable Standards:	**EN 60601-1-2:2010** EN 55011:2009/A1:2010 CISPR 11:2009/A1:2010 IEC 61000-4-2:2008 IEC 61000-4-3:2006+A1:2007+A2:2010 IEC 61000-4-4:2012 IEC 61000-4-5:2005 IEC 61000-4-6:2008 IEC 61000-4-8:2009 IEC 61000-4-11:2004 **IEC 61000-3-2:2005+A1:2008+A2:2009, Class D** **IEC 61000-3-3:2013**

Deviation from Applicable Standard
None

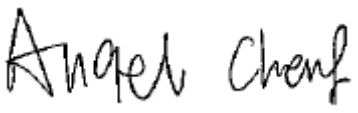
The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily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

Approved by:



Gary Wu
Section Manager

Reviewed by:



Angel Cheng
Section Manager

2 TEST RESULT SUMMARY

EMISSION			
Standard	**Item**	**Result**	**Remarks**
(Group 1, Class B) EN 55011: 2009/A1:2010 CISPR 11: 2009/A1:2010	Conducted (Power Port)	PASS	Meet Class B limit
	Radiated	PASS	Meet Class A limit
IEC 61000-3-2:2005+A1:2008+A2:2009	Harmonic current emissions	PASS	Meet Class D limit
IEC 61000-3-3:2013	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY			
Standard	**Item**	**Result**	**Remarks**
IEC 61000-4-2:2008	ESD	PASS	See Item 8.3 of this report
IEC 61000-4-3:2006+A1:2007+A2:2010	RS	PASS	See Item 8.4 of this report
IEC 61000-4-4:2012	EFT	PASS	See Item 8.5 of this report
IEC 61000-4-5:2005	Surge	PASS	See Item 8.6 of this report
IEC 61000-4-6:2008	CS	PASS	See Item 8.7 of this report
IEC 61000-4-8:2009	PFMF	PASS	See Item 8.8 of this report
IEC 61000-4-11:2004	Voltage dips & short interruptions	PASS	See Item 8.9 of this report

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

Product	power		
Brand Name	TRACO POWER		
Model	TPP100-112BA, TPP100-112A, TPP100-115BA, TPP100-115A, TPP100-124BA, TPP100-124A, TPP100-128BA, TPP100-128A, TPP100-136BA, TPP100-136A, TPP100-148BA, TPP100-148A, TPP100-112BU, TPP100-112U, TPP100-115BU, TPP100-115U, TPP100-124BU, TPP100-124U, TPP100-128BU, TPP100-128U, TPP100-136BU, TPP100-136U, TPP100-148BU, TPP100-148U, TPP100-112B, TPP100-112BD, TPP100-112, TPP100-112D, TPP100-115B, TPP100-115BD, TPP100-115, TPP100-115D, TPP100-124B, TPP100-124BD, TPP100-124, TPP100-124D, TPP100-128B, TPP100-128BD, TPP100-128, TPP100-128D, TPP100-136B, TPP100-136BD, TPP100-136, TPP100-136D, TPP100-148B, TPP100-148BD, TPP100-148, TPP100-148D		
Applicant	TRACO ELECTRONIC AG		
Housing material	Plastic		
Identify Number	T141225W02		
Received Date	December 25, 2014		
EUT Power Rating	48VDC 2.09A		
Power Adapter Manufacturer	TRACO ELECTRONIC AG	**Model**	TPP100-148BA
Power Adapter Power Rating	I/P: 85-264VAC, 50-60Hz, 2.09A O/P: 48VDC, 2.09A		
AC Power Cord Type	Shielded, 1.8m (Non-Detachable) to Power Adapter		

Note:

1. The difference of the models.

Model Name		Input Range	Output Voltage	Output Current
TPP100-112BA	TPP100-112A	85 – 264 VAC	12 VDC	8.34A
TPP100-115BA	TPP100-115A	85 – 264 VAC	15 VDC	6.67A
TPP100-124BA	TPP100-124A	85 – 264 VAC	24 VDC	4.17A
TPP100-128BA	TPP100-128A	85 – 264 VAC	28 VDC	3.58A
TPP100-136BA	TPP100-136A	85 – 264 VAC	36 VDC	2.78A
TPP100-148BA	TPP100-148A	85 – 264 VAC	48 VDC	2.09A
TPP100-112BU	TPP100-112U	85 – 264 VAC	12 VDC	8.34A
TPP100-115BU	TPP100-115U	85 – 264 VAC	15 VDC	6.67A
TPP100-124BU	TPP100-124U	85 – 264 VAC	24 VDC	4.17A
TPP100-128BU	TPP100-128U	85 – 264 VAC	28 VDC	3.58A
TPP100-136BU	TPP100-136U	85 – 264 VAC	36 VDC	2.78A
TPP100-148BU	TPP100-148U	85 – 264 VAC	48 VDC	2.09A
TPP100-112B, TPP100-112BD	TPP100-112, TPP100-112D	85 – 264 VAC	12 VDC	8.34A
TPP100-115B, TPP100-115BD	TPP100-115, TPP100-115D	85 – 264 VAC	15 VDC	6.67A
TPP100-124B, TPP100-124BD	TPP100-124, TPP100-124D	85 – 264 VAC	24 VDC	4.17A
TPP100-128B, TPP100-128BD	TPP100-128, TPP100-128D	85 – 264 VAC	28 VDC	3.58A
TPP100-136B, TPP100-136BD	TPP100-136, TPP100-136D	85 – 264 VAC	36 VDC	2.78A
TPP100-148B, TPP100-148BD	TPP100-148, TPP100-148D	85 – 264 VAC	48 VDC	2.09A

1. For more details, please refer to the User's manual of the EUT.
2. The model TPP100-148BA was considered the main model for testing.

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. Signal Port	1	1

4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

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

The test configuration / modes are as the following:

1. The following test modes were scanned during the preliminary test:

Pre-Test Mode
Mode 1: Full Load (TPP100-112BA)
Mode 2: Full Load (TPP100-148BA)

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Conducted Emission	**Mode 2**
	Radiated Emission	**Mode 2**
Immunity		**Mode 2**

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

4.2. EUT SYSTEM OPERATION

1. Setup the EUT and simulators as shown on 5.2.
2. Turn on the power of all equipment.
3. Adjust to the test mode, and begin the test.

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.

Peripherals Devices:

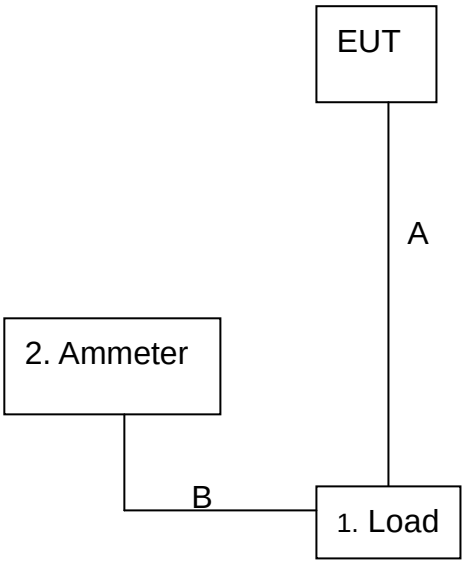
No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Trade Name	Power Cord
1.	Load	10W1.2KJ*3 20W10RJ*8	N/A	N/A	N/A	N/A
2.	Ammeter	DM-3000	N/A	N/A	HOLA	N/A

No.	Cable Name	Unit	Shielded	Length	With Core
(A)	Signal Cable	1	☐Shielded, ■Non	1.8 m	☐With Core×____, ■Non
(B)	Signal Cable	1	☐Shielded, ■Non	0.2 m	☐With Core×____, ■Non

Note:

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

5.2. CONFIGURATION OF SYSTEM UNDER TEST



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

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

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

☒ No.139, Wugong Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.

☐ No.163-1, Jhongsheng Rd. Sindian City, Taipei County 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.

Taiwan	TAF (TAF 1309)
USA	A2LA (0824.01)

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

Canada	Industry Canada (3M Semi Anechoic Chamber: IC 2324G-1 / IC 2324G-2 / 2324J-1 / 2324J-2 to perform)
Norway	Nemko
Japan	VCCI 966 Chamber C: Radiated emissions: 30 MHz -1000 MHz: R-3282 / Above 1GHz: G-146 10M Chamber: Radiated emissions: 30 MHz -1000 MHz: R-3283 / Above 1GHz: G-147 Conducted Emission B: C-3700 / T-1839
USA	FCC (3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements)

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	0.15MHz ~ 30MHz	±1.2575 dB
Radiated emissions	30MHz ~ 200MHz	±3.9163 dB
	200MHz ~1000MHz	±3.9030 dB

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 22:2008, 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

CLASS A

FREQUENCY (MHz)	Group 1		Group 2		Group 2*	
	Quasi-peak (dBuV)	Average (dBuV)	Quasi-peak (dBuV)	Average (dBuV)	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.5	79	66	100	90	130	120
0.50 - 5.0	73	60	86	76	125	115
5.0 - 30.0	73	60	90-70	80-60	115	105
			Decreasing linearly with logarithm of frequency			

* Mains supply currents in excess of 100 A per phase when using the CISPR voltage probe or a suitable V-network (LISN or AMN).

Note:

1. *The lower limit shall apply at the transition frequency*
2. *Care should be taken to comply with leakage current requirements.*

CLASS B

FREQUENCY (MHz)	Group 1 & 2	
	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.5	66-56 Decreasing linearly with logarithm of frequency	56-46 Decreasing linearly with logarithm of frequency
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note:

1. *The lower limit shall apply at the transition frequency*
2. *Care should be taken to comply with leakage current requirements.*

7.1.2. TEST INSTRUMENTS

Conducted Emission Room # B				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCI	101073	07/31/2013
LISN	R&S	ENV216	101054	06/06/2013
LISN	EMCO	3825/2	9106-1809	07/03/2013
ISN	FCC	FCC-TLISN-T2-02-09	100105	07/30/2013
ISN	FCC	FCC-TLISN-T4-02-09	20395	05/24/2013
ISN	FCC	FCC-TLISN-T8-02-09	100106	07/31/2013
Capacitive Voltage Probe	FCC	F-CVP-1	100185	03/25/2013
Test S/W	CCS-3A1-CE			

Note:

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

7.1.3. TEST PROCEDURES (please refer to measurement standard or CCS SOP PA-031)

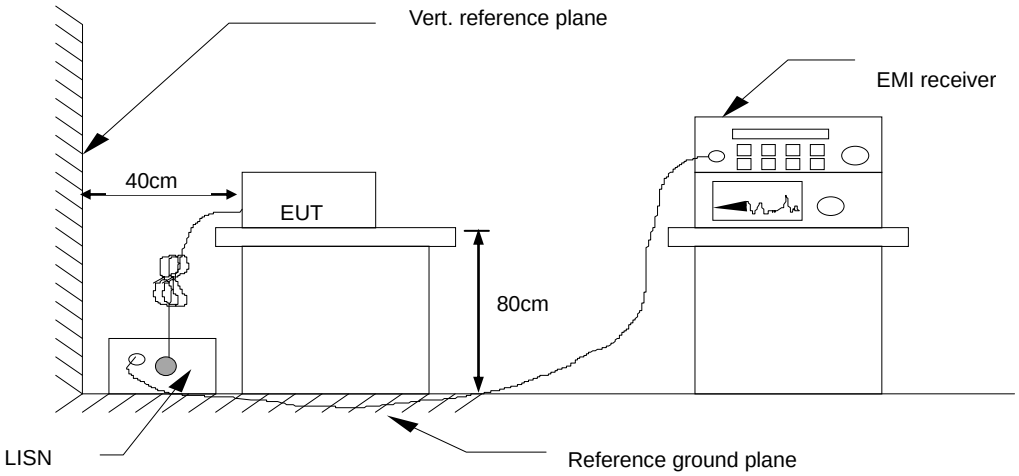
Procedure of Preliminary Test

- 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 11 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per CISPR 11.
- All I/O cables were positioned to simulate typical actual usage as per CISPR 11.
- The test equipment EUT installed received AC power, 230VAC/50Hz, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.

Procedure of Final Test

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

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)	Read Level (dBuV)	Factor (dB)	Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark (P/Q/A)	Line (L1/L2)
x.xx	42.95	0.55	43.50	56	-12.50	Q	L1

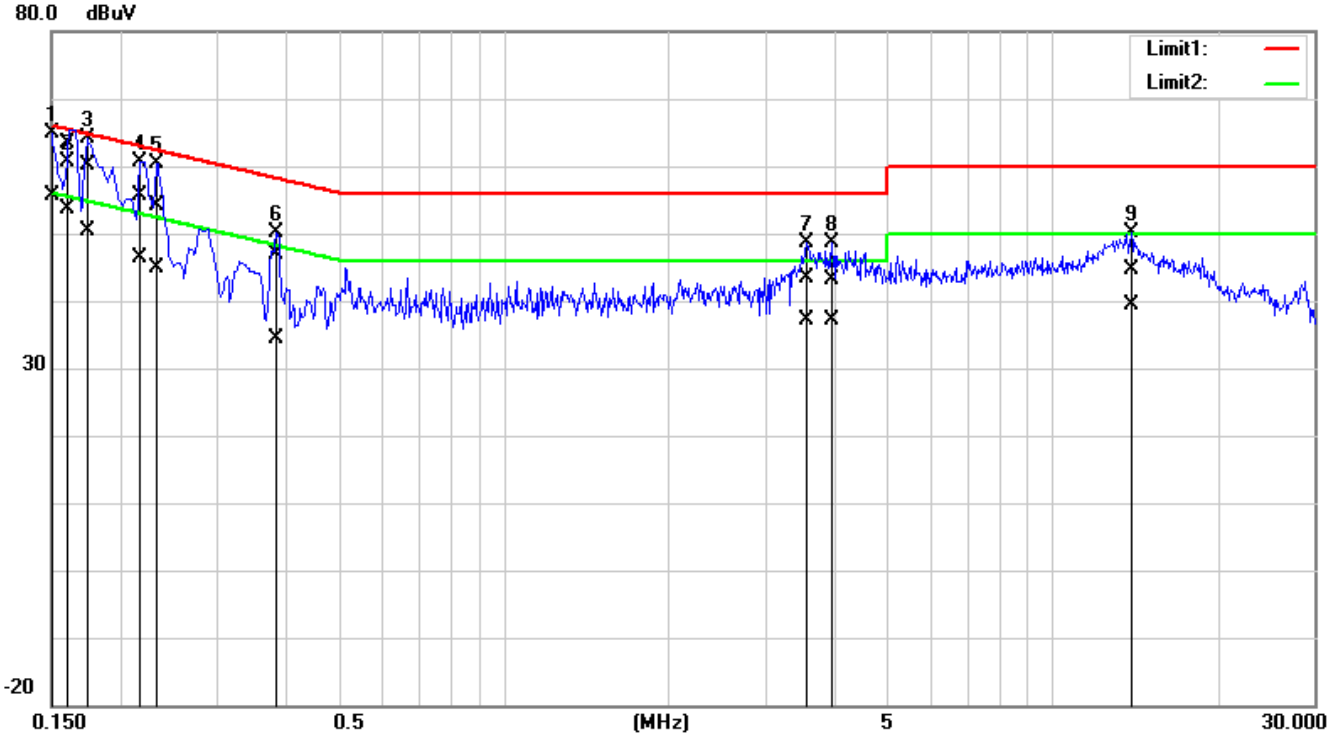
Freq. = Emission frequency in MHz
Read Level = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss
Level = Read Level + Factor
Limit Line = Limit stated in standard
Over Limit = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
L1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

Calculation Formula

Over Limit (dB) = Level (dBuV) – Limit Line (dBuV)

7.1.6. TEST RESULTS

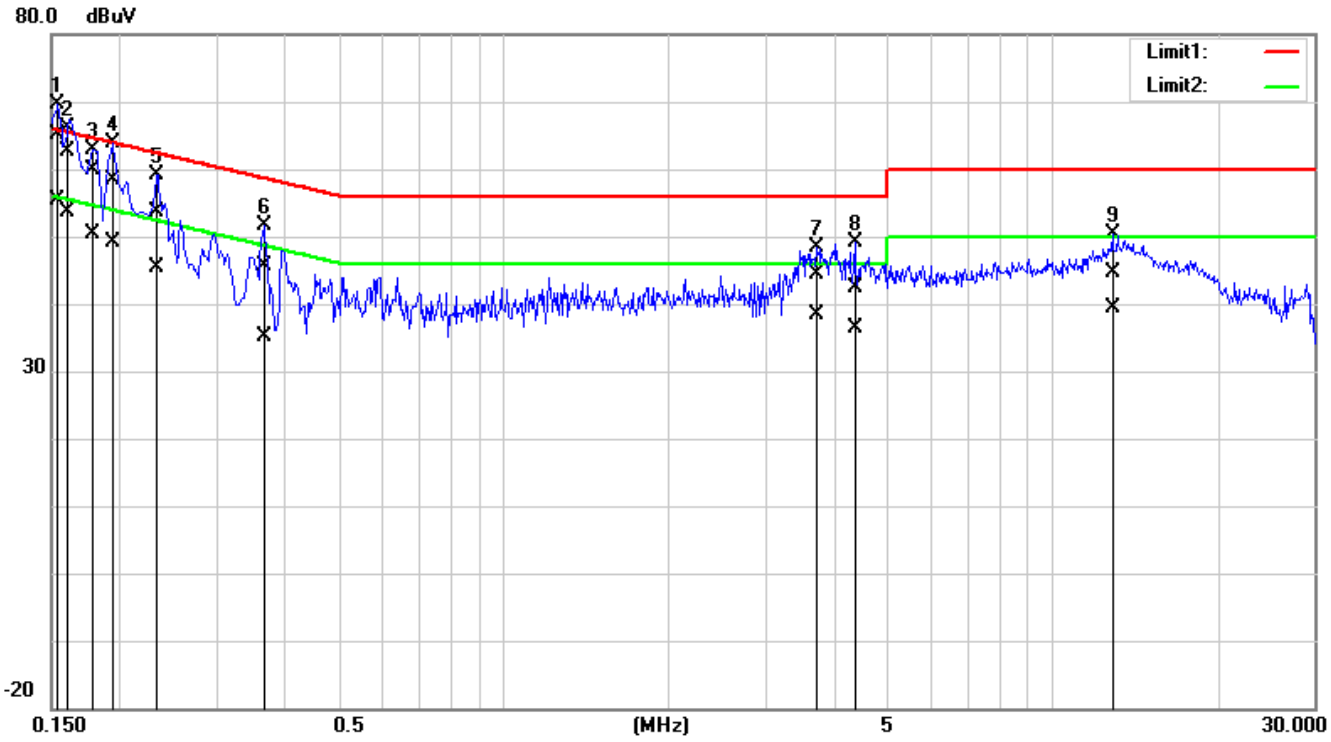
Model No.	TPP100-148BA	Line:	L1
Environmental Conditions	24°C, 50% RH	Test Date	2013/02/08
Tested by	Moore Cheng	Test Mode	Mode 2



NO.	Frequency	Quasi Peak reading	Average reading	Correction factor	Quasi Peak result	Average result	Quasi Peak limit	Average limit	Quasi Peak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	(Pass/Fail)
1*	0.1500	55.09	45.69	9.87	64.96	55.56	65.99	56.00	-1.03	-0.44	Pass
2	0.1581	53.40	43.81	9.87	63.27	53.68	65.56	55.56	-2.29	-1.88	Pass
3	0.1718	50.32	40.43	9.87	60.19	50.30	64.87	54.87	-4.68	-4.57	Pass
4	0.2171	45.66	36.49	9.87	55.53	46.36	62.93	52.93	-7.40	-6.57	Pass
5	0.2311	44.17	35.03	9.87	54.04	44.90	62.41	52.41	-8.37	-7.51	Pass
6	0.3875	36.89	24.59	9.88	46.77	34.47	58.12	48.12	-11.35	-13.65	Pass
7	3.5716	33.49	27.04	10.00	43.49	37.04	56.00	46.00	-12.51	-8.96	Pass
8	3.9963	33.10	27.09	10.01	43.11	37.10	56.00	46.00	-12.89	-8.90	Pass
9	14.0196	34.37	29.09	10.24	44.61	39.33	60.00	50.00	-15.39	-10.67	Pass

REMARKS: L1 = Line One (Live Line)

Model No.	TPP100-148BA	**Line:**	L2
Environmental Conditions	24°C, 50% RH	**Test Date**	2013/02/08
Tested by	Moore Cheng	**Test Mode**	Mode 2



NO.	Frequency	Quasi Peak reading	Average reading	Correction factor	Quasi Peak result	Average result	Quasi Peak limit	Average limit	Quasi Peak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	(Pass/Fail)
1*	0.1540	55.47	45.79	9.63	65.10	55.42	65.78	55.78	-0.68	-0.36	Pass
2	0.1588	53.11	44.01	9.63	62.74	53.64	65.53	55.53	-2.79	-1.89	Pass
3	0.1757	50.32	40.86	9.64	59.96	50.50	64.69	54.69	-4.73	-4.19	Pass
4	0.1904	48.68	39.56	9.64	58.32	49.20	64.02	54.02	-5.70	-4.82	Pass
5	0.2313	44.11	35.63	9.64	53.75	45.27	62.40	52.40	-8.65	-7.13	Pass
6	0.3630	35.95	25.46	9.66	45.61	35.12	58.66	48.66	-13.05	-13.54	Pass
7	3.7014	34.50	28.66	9.79	44.29	38.45	56.00	46.00	-11.71	-7.55	Pass
8	4.3790	32.62	26.66	9.82	42.44	36.48	56.00	46.00	-13.56	-9.52	Pass
9	12.8945	34.62	29.34	10.06	44.68	39.40	60.00	50.00	-15.32	-10.60	Pass

REMARKS: L2 = Line Two (Neutral Line)

7.2. RADIATED EMISSION MEASUREMENT

7.2.1. LIMITS

FREQUENCY (MHz)	Measured on a test site		Measured in situation
	Group 1, class A	Group 1, class B	Group 1, class A Limits with measuring distance 30 m from exterior wall outside the building in which the equipment is situated
	Quasi-peak (dBuV/m)	Quasi-peak (dBuV/m)	Quasi-peak (dBuV/m)
0.15 - 30	Under consideration	Under consideration	Under consideration
30 - 230	40	30	30
230 - 1000	47	37	37

Note:

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

7.2.2. TEST INSTRUMENTS

Wugu 10M Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250297	10/04/2013
EMI Test Receiver	R&S	ESCI	100961	09/02/2013
EMI Test Receiver	R&S	ESCI	100962	09/02/2013
Pre-Amplifier	HP	8447D	2944A07754	06/06/2013
Pre-Amplifier	HP	8447D	2944A08150	06/06/2013
Pre-Amplifier	EMC	EMC012645	980056	05/10/2013
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	08/06/2013
Bilog Antenna	TESEQ	CBL 6112D	31674	10/01/2013
Bilog Antenna	TESEQ	CBL6112D	31675	10/01/2013
Horn Antenna	EMCO	3117	55167	01/09/2014
Horn Antenna	EMCO	3116	26370	01/07/2014
Coaxial Cable	Huber+Suhner	104PEA	33948/4PEA	05/10/2013
Coaxial Cable	Huber+Suhner	104PEA	33949/4PEA	05/10/2013
Coaxial Cable	Huber+Suhner	104	330026/4	05/10/2013
Coaxial Cable	Huber+Suhner	104	330029/4	05/10/2013
Coaxial Cable	Huber+Suhner	104	329382/4	05/10/2013
Coaxial Cable	Huber+Suhner	104	330028/4	05/10/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Antenna Tower	Sunol Sciences	TLT2	031010-5	N.C.R.
Controller	Sunol Sciences	SC104V	031010-1	N.C.R.
Site NSA	CCS	N/A	N/A	11/04/2013
Site VSWR	CCS	N/A	N/A	12/02/2013
Test S/W	EZ-EMC (CCS-3A1RE)			

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)

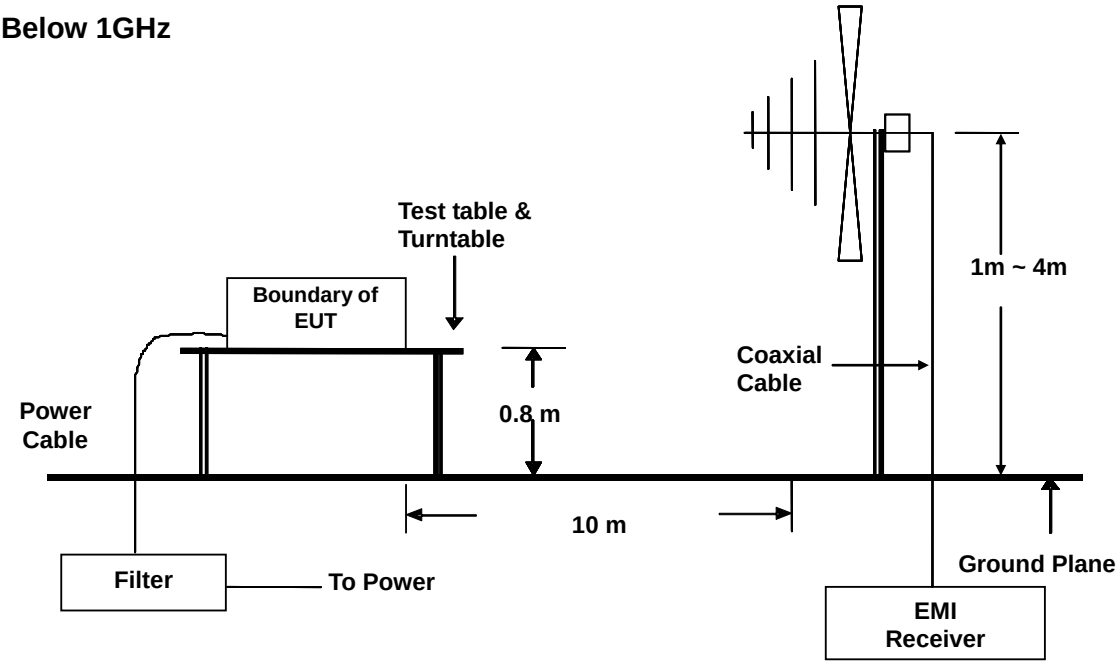
Frequency range 30MHz ~ 1GHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position.
2. The EUT was set 10 meters away form the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The height of antenna is varied from one meter to four meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was turned to heights for 1 meter to 4 meters and the turn table was turned form 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTE: The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

7.2.4. TEST SETUP

Below 1GHz



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

7.2.5. DATA SAMPLE

Below 1GHz

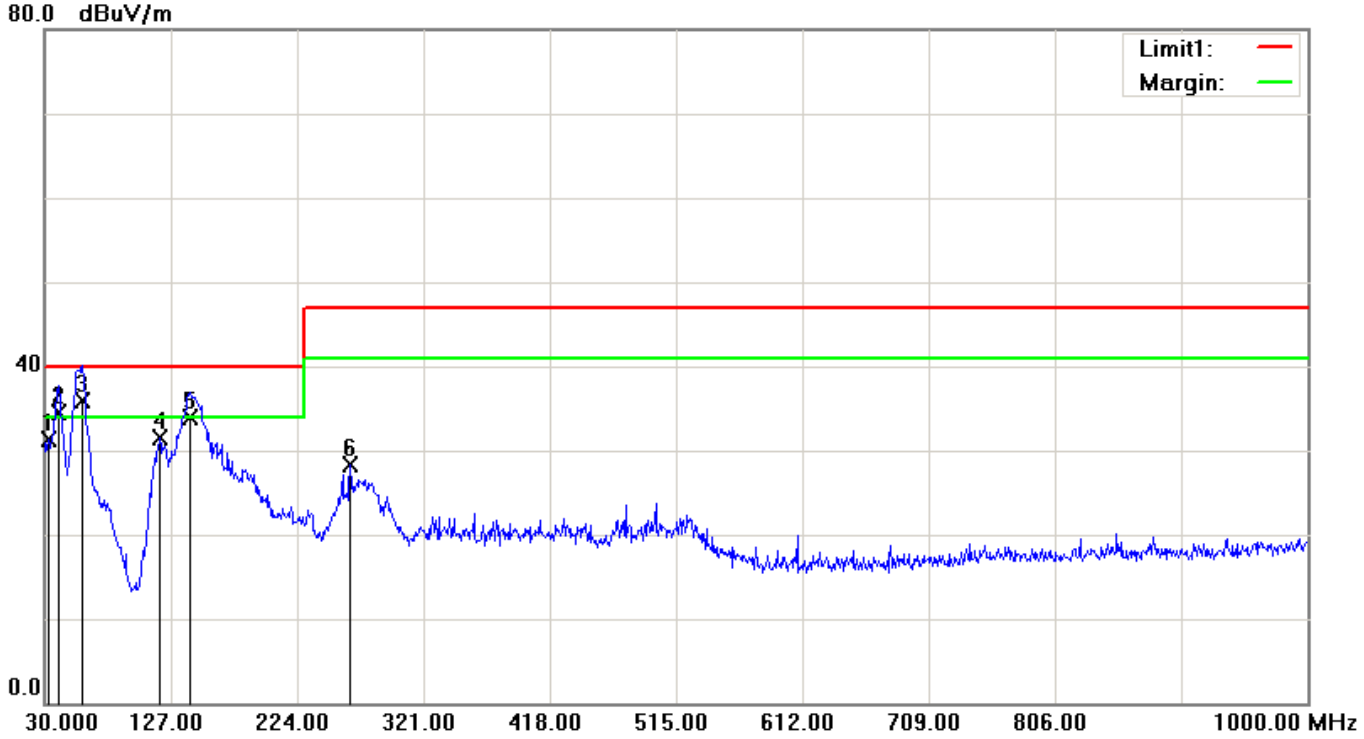
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (◦)	Remark
xx.xx	16.49	9.86	26.35	30.00	-3.65	116.00	101.00	QP

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
Q.P. = Quasi-Peak

7.2.6. TEST RESULTS

Below 1GHz

Model No.	TPP100-148BA	**Test Mode**	Mode 2
Environmental Conditions	26°C, 60% RH	**Test Date**	2013/02/06
Antenna Pole	Vertical	**Antenna Distance**	10m
Detector Function	Quasi-peak.	**Tested by**	Moore Cheng

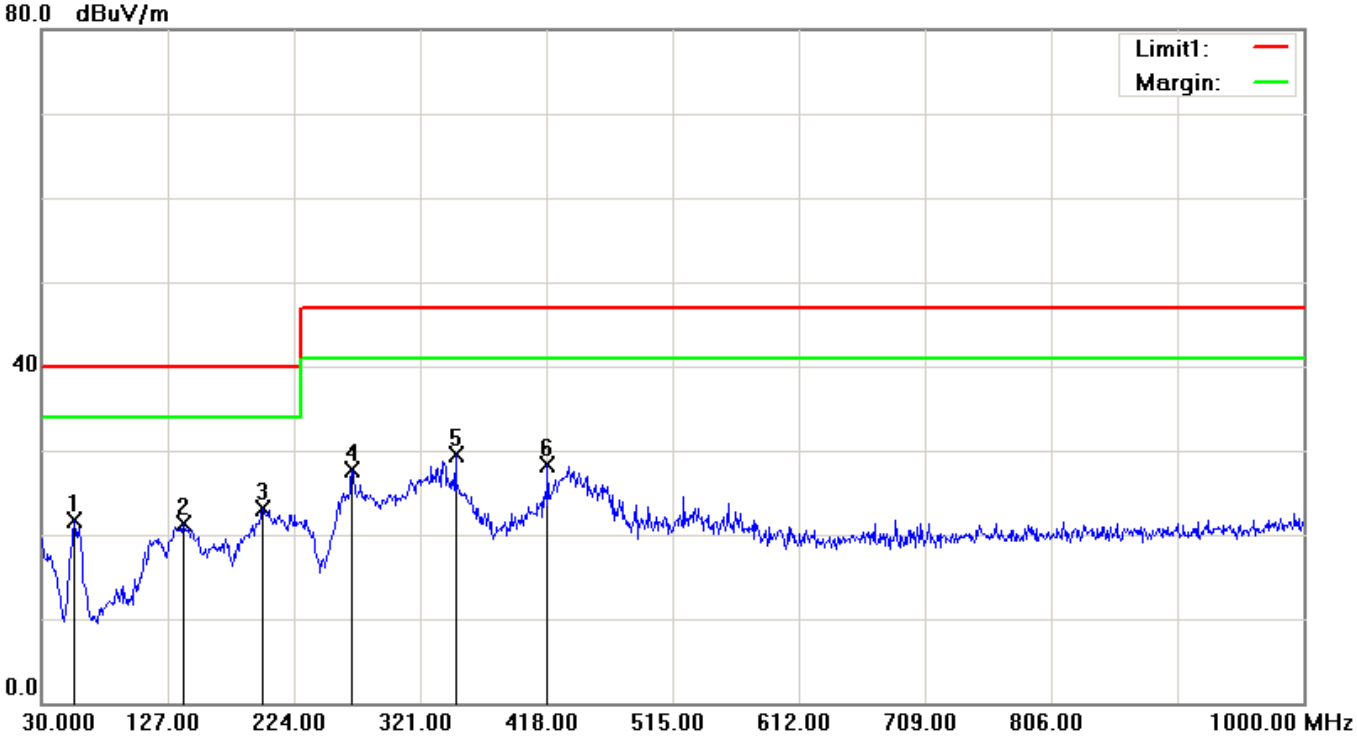


No.	Frequency (MHz)	Reading (dBuV)	Correction Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	32.9100	42.23	-10.96	31.27	40.00	-8.73	100	0	QP
2	40.6700	44.05	-9.58	34.47	40.00	-5.53	299	291	QP
3	59.1000	56.24	-20.43	35.81	40.00	-4.19	243	0	QP
4	118.2700	45.94	-14.49	31.45	40.00	-8.55	100	0	QP
5	141.5500	48.60	-14.76	33.84	40.00	-6.16	100	62	QP
6	264.7400	39.69	-11.35	28.34	47.00	-18.66	100	184	QP

Note:

1. *PK= Peak Reading; QP= Quasi-peak Reading.*
2. *The other emission levels were very low against the limit.*

Model No.	TPP100-148BA	Test Mode	Mode 2
Environmental Conditions	26°C, 60% RH	Test Date	2013/02/06
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Moore Cheng



No.	Frequency (MHz)	Reading (dBuV)	Correction Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	55.2200	41.92	-20.26	21.66	40.00	-18.34	115	360	QP
2	139.6100	36.03	-14.73	21.30	40.00	-18.70	300	105	QP
3	199.7500	38.86	-15.83	23.03	40.00	-16.97	400	85	QP
4	268.6200	38.81	-11.07	27.74	47.00	-19.26	400	109	QP
5	348.1600	39.42	-9.88	29.54	47.00	-17.46	300	105	QP
6	418.9700	36.78	-8.49	28.29	47.00	-18.71	200	123	QP

Note:

1. *PK= Peak Reading; QP= Quasi-peak Reading.*
2. *The other emission levels were very low against the limit.*

Above 1GHz

Model No.	N/A	**Test Mode**	N/A
Environmental Conditions	N/A	**6dB Bandwidth**	N/A
Antenna Pole	N/A	**Antenna Distance**	N/A
Highest frequency generated or used	60kHz	**Upper frequency**	1000MHz
Detector Function	N/A	**Tested by**	N/A

Note: *No applicable, when the highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1 GHz.*

7.3. HARMONICS CURRENT MEASUREMENT

7.3.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

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

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

Note:

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

7.3.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
HARMONICS SYSTEM	EMC-PARTNER	HARMONICS-1000	107	08/27/2013
Test S/W	HARCS Immunity (4.10)			

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

7.3.3. TEST PROCEDURE (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.

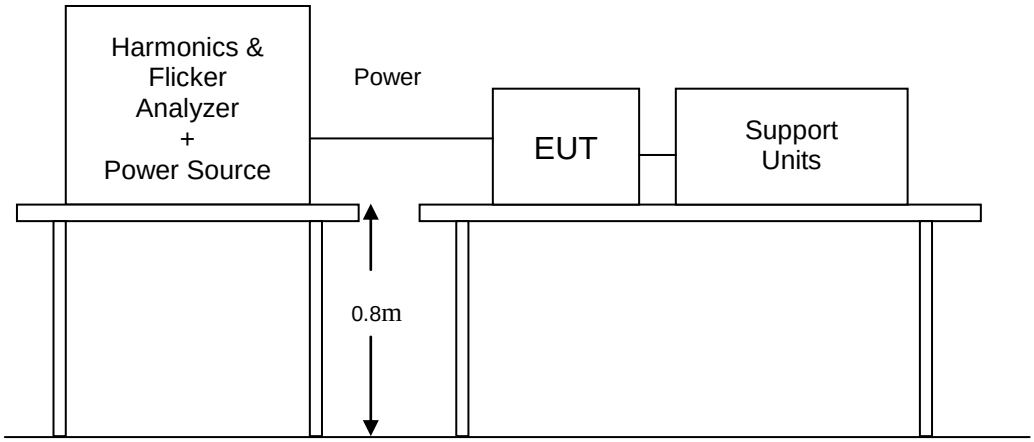
Class B: Portable tools; Arc welding equipment which is not professional equipment.

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 and television receivers.

- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

7.3.4. TEST SETUP



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

7.3.5. TEST RESULTS

Power Consumption	94.71W	Test Mode	Operating
Environmental Conditions	25°C, 49% RH	Tested by	Michael Chen

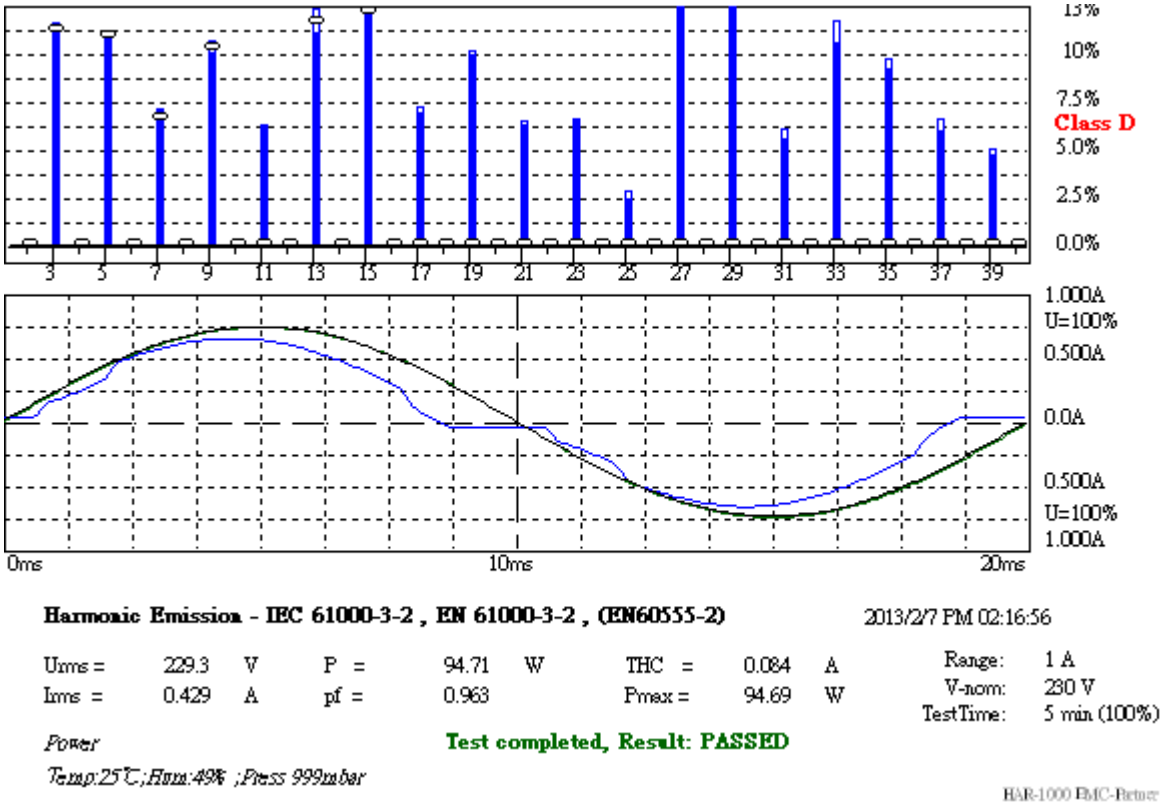
Test result of EN 61000-3-2

Operator : Michael Chen

EUT : Power

Model : TPP100-148BA

Remarks : Temp: 25°C;Hum: 49% RH;Press 999mbar



Full Bar : Actual Values

Empty Bar : Maximum Values

Blue : Current , Green : Voltage , Red : Failed

Note:

1. *Limits classified according to item 7.3.3.*
2. *According to clause 7 of IEC 61000-3-2:2005+A1:2008+A2:2009, equipment with a rated power of 75W or less, no limits apply. The test result is only for reference.*

7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

7.4.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

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

7.4.2. TEST INSTRUMENTS

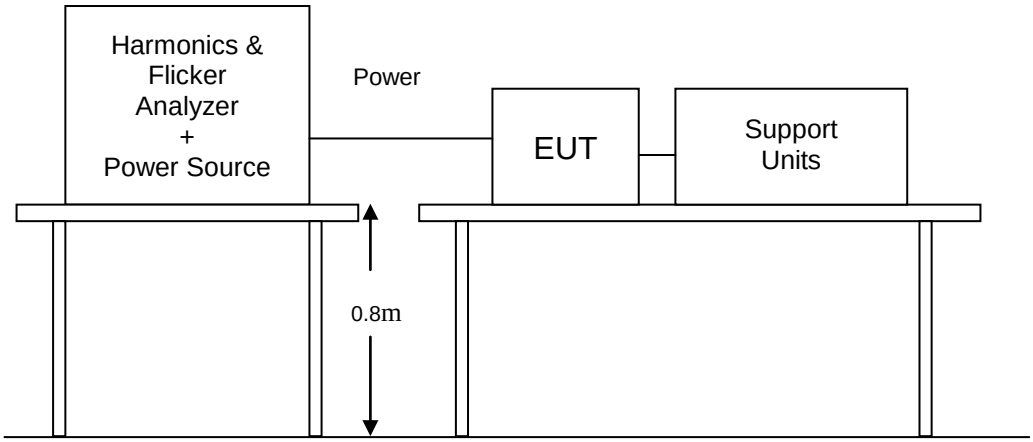
IMMUNITY SHIELDED ROOM				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
HARMONICS SYSTEM	EMC-PARTNER	HARMONICS-1000	107	08/27/2013
Test S/W	HARCS Immunity (4.10)			

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-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.

7.4.4. TEST SETUP



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

7.4.5. TEST RESULTS

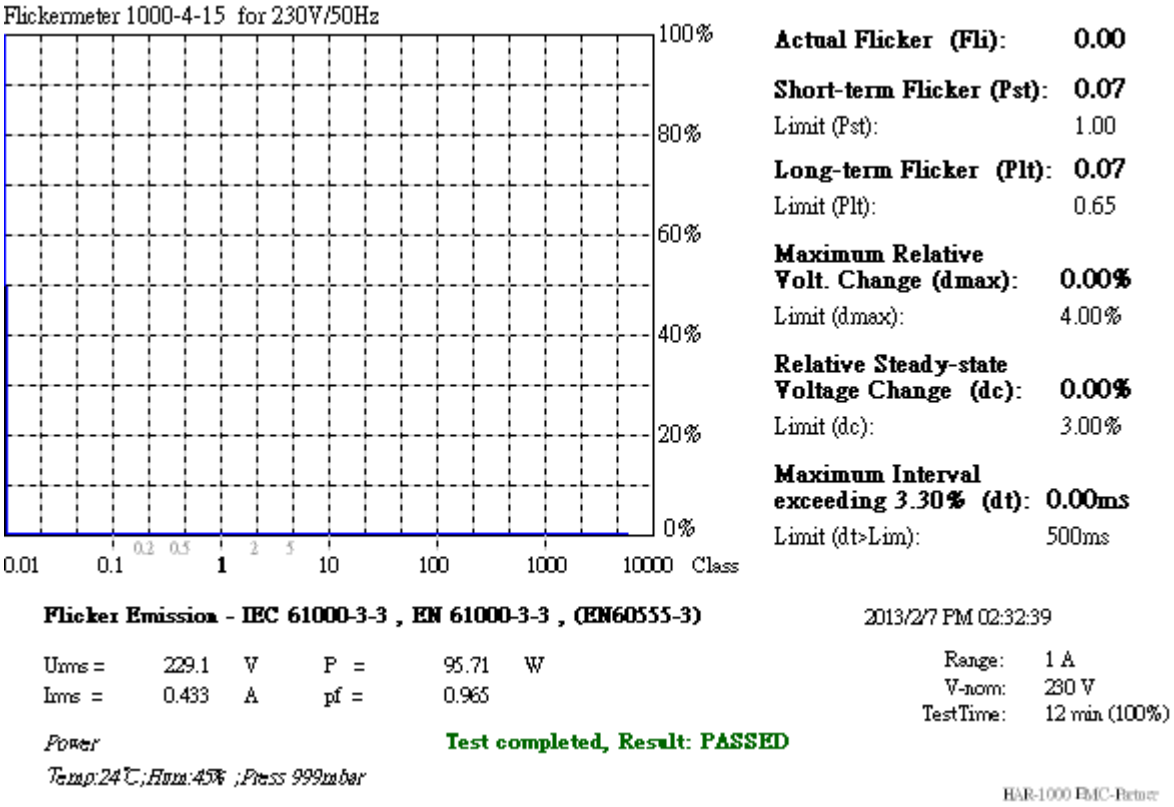
Observation Period (Tp)	12mins	Test Mode	Operating
Environmental Conditions	24°C, 45% RH, 999mbar	Tested by	Michael Chen

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
P_{st}	0.07	1.0	Pass
P_{lt}	0.07	0.65	Pass
T_{dt} (ms)	0.00	500	Pass
d_{max} (%)	0.00	4%	Pass
dc (%)	0.00	3.3%	Pass

Note: *None.*

Test result of EN 61000-3-3

Operator : Michael Chen
EUT : Power
Model : TPP100-148BA
Remarks : Temp: 24°C; Hum: 45% RH; Press 999mbar



Full Bar : Actual Values
Empty Bar : Maximum Values
Circles : Average Values
Blue : Current , Green : Voltage , Red : Failed

8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	Immunity	
	Test Type	**Minimum Requirement**
Basic Standard, Specification, and Performance Criterion required	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 6kV Contact discharge Criterion required please see 8.2
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~2500 MHz, 3V/m, 80% AM(1kHz) Criterion required please see 8.2
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power Port: 2kV Signal cable greater than 3 meters: 1kV Criterion required please see 8.2
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV Criterion required please see 8.2
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz Criterion required please see 8.2
	IEC 61000-4-8	Power frequency magnetic field immunity test 50 Hz/60Hz, 3A/m Criterion required please see 8.2
	IEC 61000-4-11	Voltage Dips: <5 % UT (>95 % dip in UT) for 0,5 cycle 40 % UT (60 % dip in UT) for 5 cycles 70 % UT (30 % dip in UT) for 25 cycles Voltage Interruptions: <5 % UT(>95 % dip in UT) for 5 s Criterion required please see 8.2

8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Compliance Criteria:

Under the test conditions specified in 6.2.1.10 of EN 60601-1-2, the ME EQUIPMENT or ME SYSTEM shall be able to provide the BASIC SAFETY and ESSENTIAL PERFORMANCE. The following DEGRADATIONS, if associated with BASIC SAFETY and ESSENTIAL PERFORMANCE, shall not be allowed:

- Component failures
- Changes in programmable parameters
- Reset to factory defaults (manufacturer's presets)
- Chang of operating mode
- False alarms
- Cessation or interruption of any intended operation, even if accompanied by an alarm
- Initiation of any unintended operation, including unintended or uncontrolled motion, even if accompanied by an alarm
- Error of a displayed numerical value sufficiently large to affect diagnosis or treatment
- Noise on a waveform in which the noise would interfere with diagnosis, treatment or monitoring;
- Artefact or distortion in an image in which the artefact would interfere with diagnosis, treatment or monitoring
- Failure of automatic diagnosis or treatment ME EQUIPMENT and ME SYSTEMS to diagnose or treat, even if accompanied by an alarm.

For ME EQUIPMENT and ME SYSTEMS with multiple FUNCTIONS, the criteria apply to each FUNCTION, parameter and channel.

The ME EQUIPMENT or ME SYSTEMS may exhibit DEGRADATION of performance (e.g. deviation from MANUFACTURER'S specifications) that does not affect BASIC SAFETY and ESSENTIAL PERFORMANCE.

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 ; 6 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 Simulator	EM TEST	dito	V0947105559	05/09/2013

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 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **H**orizontal **C**oupling **P**lane (**HCP**). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

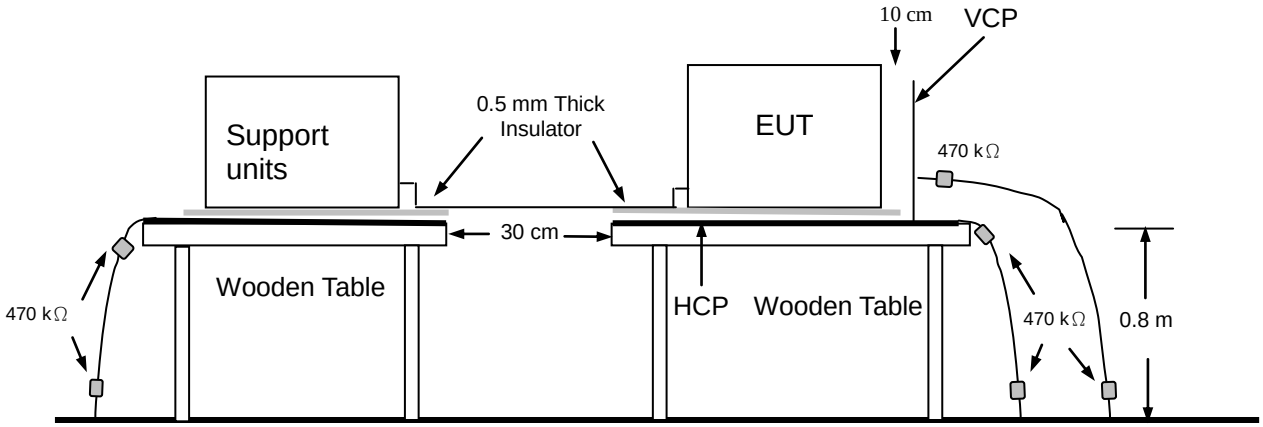
b) Air discharges at slots and apertures and insulating surfaces:

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

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

a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
c) The time interval between two successive single discharges was at least 1 second.
d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane (**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



Ground Reference Plane

- 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 0.8 meters high standing on the **G**round **R**eference **P**lane. 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 **H**orizontal **C**oupling **P**lane (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

Temperature	23°C	**Humidity**	50% RH
Pressure	997mbar	**Tested by**	Moore Cheng
Required Passing Performance		**Criteria B**	

Air Discharge												
Test Points	Test Levels								Results			
	± 2 kV	Performance Criterion		± 4 kV	Performance Criterion		± 8 kV	Performance Criterion		Pass	Fail	Observation
Front	☒	☒A	☐B	☒	☒A	☐B	☒	☒A	☐B	☒	☐	Note 1
Back	☒	☒A	☐B	☒	☒A	☐B	☒	☒A	☐B	☒	☐	Note 1
Left	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Right	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Top	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Bottom	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2

Contact Discharge												
Test Points	Test Levels								Results			
	± 2 kV	Performance Criterion		± 4 kV	Performance Criterion		± 8 kV	Performance Criterion		Pass	Fail	Observation
Front	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Back	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Left	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Right	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Top	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2
Bottom	☐	☐A	☐B	☐	☐A	☐B	☐	☐A	☐B	☐	☐	Note 2

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

Discharge To Horizontal Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒A ☐B	Note 1
Back	☒	☒	☐	☒	☐	☒A ☐B	Note 1
Left	☒	☒	☐	☒	☐	☒A ☐B	Note 1
Right	☒	☒	☐	☒	☐	☒A ☐B	Note 1

According to customer's requirement:

Discharge To Horizontal Coupling Plane					
Side of EUT	Test Levels	Results			
	± 6kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒A ☐B	Note 1
Back	☒	☒	☐	☒A ☐B	Note 1
Left	☒	☒	☐	☒A ☐B	Note 1
Right	☒	☒	☐	☒A ☐B	Note 1

Discharge To Vertical Coupling Plane								
Side of EUT	Test Levels			Results				
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
Front	☒	☒	☐	☒	☐	☒A	☐B	Note 1
Back	☒	☒	☐	☒	☐	☒A	☐B	Note 1
Left	☒	☒	☐	☒	☐	☒A	☐B	Note 1
Right	☒	☒	☐	☒	☐	☒A	☐B	Note 1

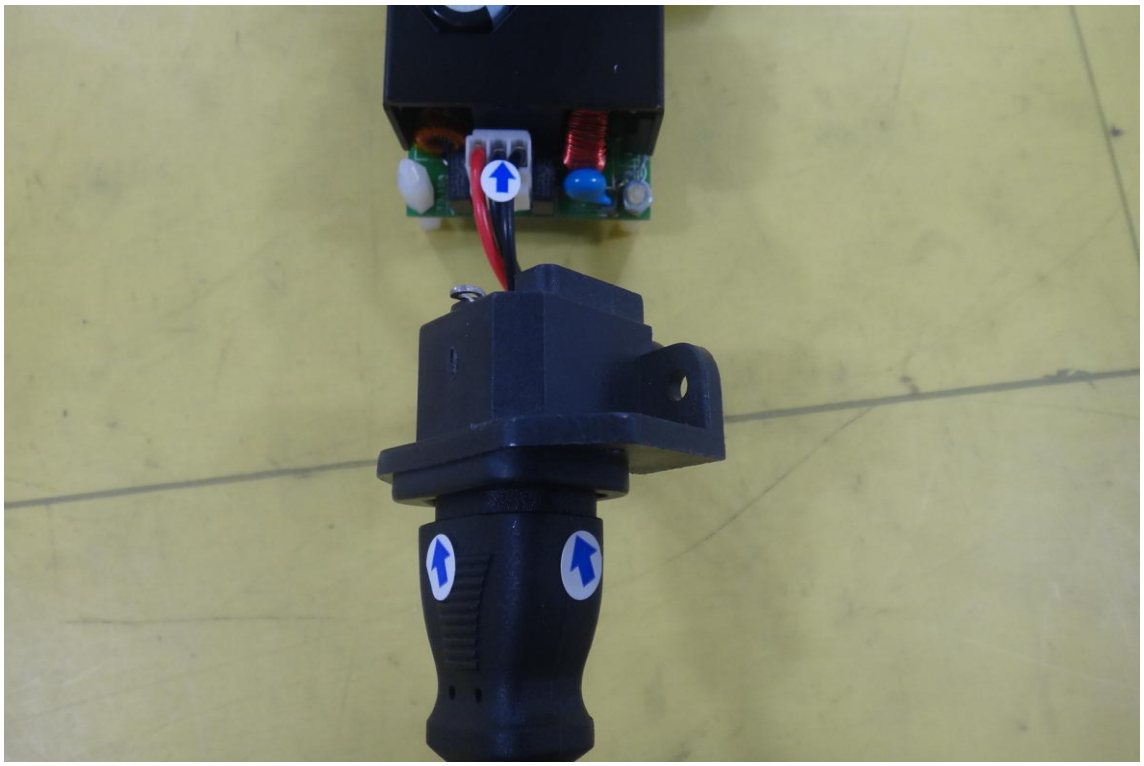
According to customer's requirement:

Discharge To Vertical Coupling Plane						
Side of EUT	Test Levels	Results				
	± 6kV	Pass	Fail	Performance Criterion		Observation
Front	☒	☒	☐	☒A	☐B	Note 1
Back	☒	☒	☐	☒A	☐B	Note 1
Left	☒	☒	☐	☒A	☐B	Note 1
Right	☒	☒	☐	☒A	☐B	Note 1

Note:

1. *There was no change compared with initial operation during the test.*
2. *Means that no discharge point had been occurred during that particular coupling method.*

The Photo for Discharge Points of EUT



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

8.4.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz ~2500 MHz,
Field Strength:	3 V/m According to customer's requirement: 10 V/m 20 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m

8.4.2. TEST INSTRUMENT

RS Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
S.G.	Agilent	E8257C	US42340383	09/26/2013
Power Meter	BOONTON	4232A-01-02	98501	02/06/2013
Power Sensor	BOONTON	51011-EMC	32862	02/06/2013
Power Sensor	BOONTON	51011-EMC	32864	02/06/2013
Power Amplifier	ar	150W1000M3	306730	N.C.R
Power Amplifier	ar	500W1000A	320994	N.C.R
Power Amplifier	ar	1000W1000D	0339180	N.C.R
Power Amplifier	ar	250T1G3M1	0320245	N.C.R
Power Amplifier	ar	300T2G8M1	0320255	N.C.R
Power Amplifier	ar	250T8G18M1	0320246	N.C.R
Dual Directional Coupler	ar	DC6180A	320285	N.C.R.
Dual Directional Coupler	ar	DC7144A	313674	N.C.R.
Dual Directional Coupler	ar	DC7280A	320524	N.C.R.
Dual Directional Coupler	ar	DC7450M1	320073	N.C.R.
RF Test System Controller	ar	SC1000M3	306666	N.C.R.
Bilog Antenna	ar	AT1080	306709	N.C.R
Horn Antenna	SCHWARZBECK	BBHA 9120D	530	N.C.R.
EM PROBE	ar	FL7018	311430	08/17/2013
Test S/W	SW1006 (V1.13)			

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

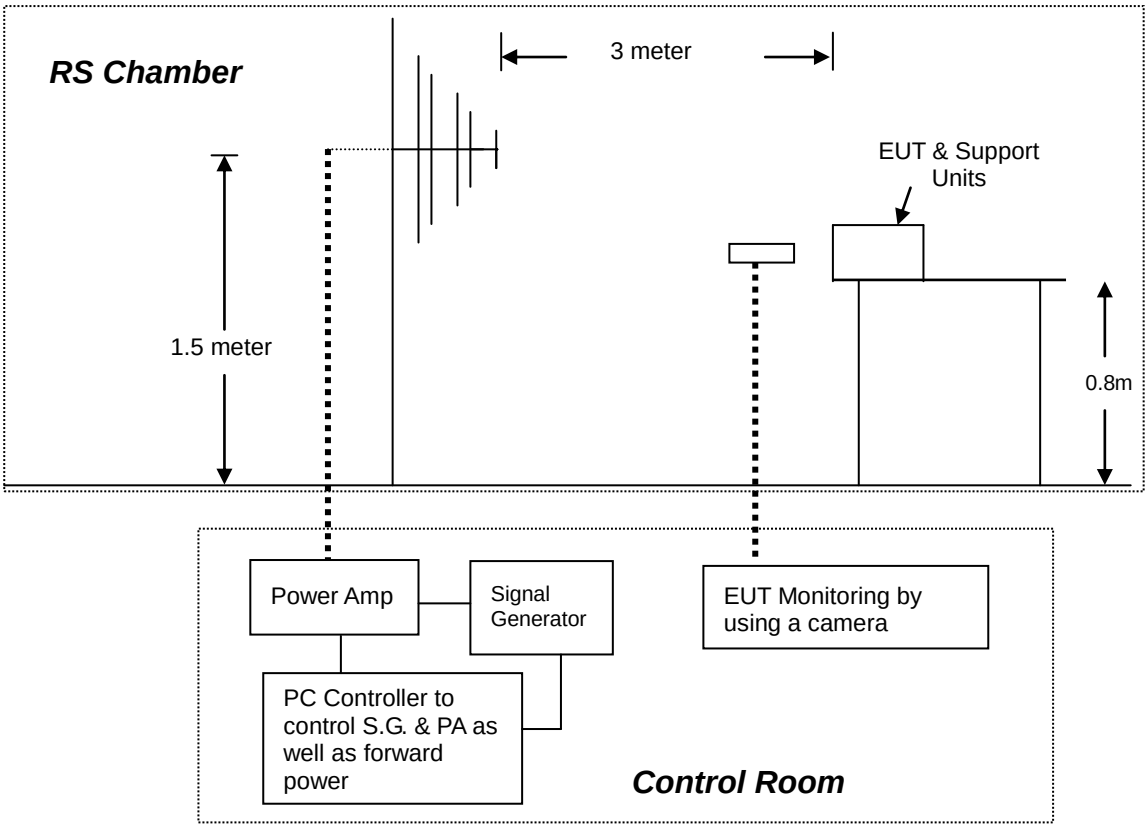
a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80 MHz to 2500 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

e) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

8.4.4. TEST SETUP



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

Note:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of 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

Temperature	23°C	**Humidity**	49% RH
Pressure	999mbar	**Dwell Time**	3 sec.
Tested by	Hank Wang		
Required Passing Performance	The ME Equipment or ME System shall be able to provide the basic safety and essential performance.		

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 2500	V&H	0	3	Note 1	PASS
80 ~ 2500	V&H	90	3	Note 1	PASS
80 ~ 2500	V&H	180	3	Note 1	PASS
80 ~ 2500	V&H	270	3	Note 1	PASS

According to customer's requirement:

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
1000~ 25000	V&H	0	10	Note 1	PASS
1000~ 25000	V&H	90	10	Note 1	PASS
1000~ 25000	V&H	180	10	Note 1	PASS
1000~ 25000	V&H	270	10	Note 1	PASS

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 1000	V&H	0	20	Note 1	PASS
80 ~ 1000	V&H	90	20	Note 1	PASS
80 ~ 1000	V&H	180	20	Note 1	PASS
80 ~ 1000	V&H	270	20	Note 1	PASS

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

8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	Power Line: 2 kV Signal/Control Line: 1 kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300ms
Test Duration:	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	TRA2000IN6	1144	01/03/2014
CDN	EMC Partner	CDCN-UTP8	046	01/09/2014
Clamp	EMC Partner	CN-EFT1000	683	N.C.R.
Test S/W	Genecs (3.03)			

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)

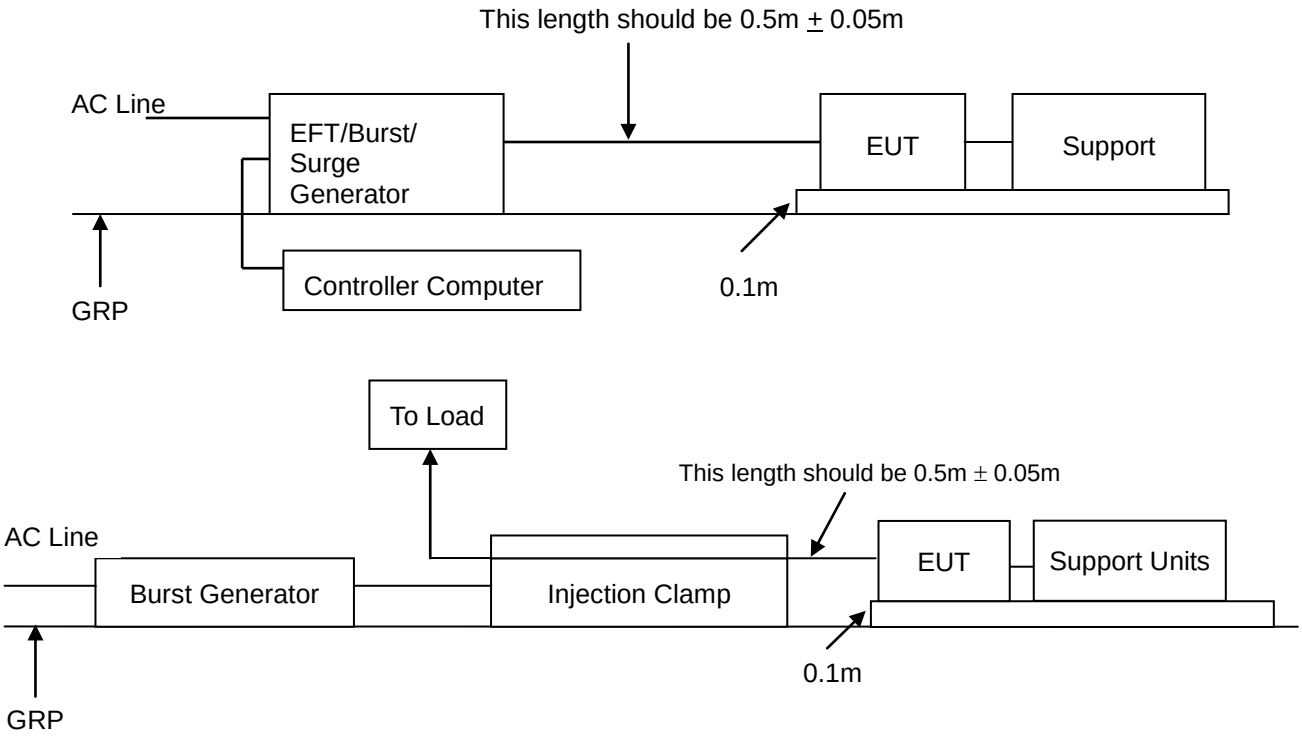
a) Both positive and negative polarity discharges were applied.

b) The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter.

c) The duration time of each test sequential was 1 minute.

d) 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

Temperature	22°C	**Humidity**	50% RH
Pressure	999mbar	**Tested by**	Moore Cheng
Required Passing Performance	The ME Equipment or ME System shall be able to provide the basic safety and essential performance.		

Test Point	Polarity	Test Level (kV)	Inject Method	Observation	Result
L	+/-	2	Direct	Note 1	PASS
N	+/-	2	Direct	Note 1	PASS
PE	+/-	2	Direct	Note 1	PASS
L + N	+/-	2	Direct	Note 1	PASS
L + PE	+/-	2	Direct	Note 1	PASS
N + PE	+/-	2	Direct	Note 1	PASS
L +N +PE	+/-	2	Direct	Note 1	PASS

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

8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

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

8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMC Immunity Tester	EMC Partner	TRA2000IN6	1144	01/03/2014
CDN	EMC Partner	CDCN-UTP8	046	01/09/2014
Clamp	EMC Partner	CN-EFT1000	683	N.C.R.
Test S/W	Genecs (3.03)			

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.

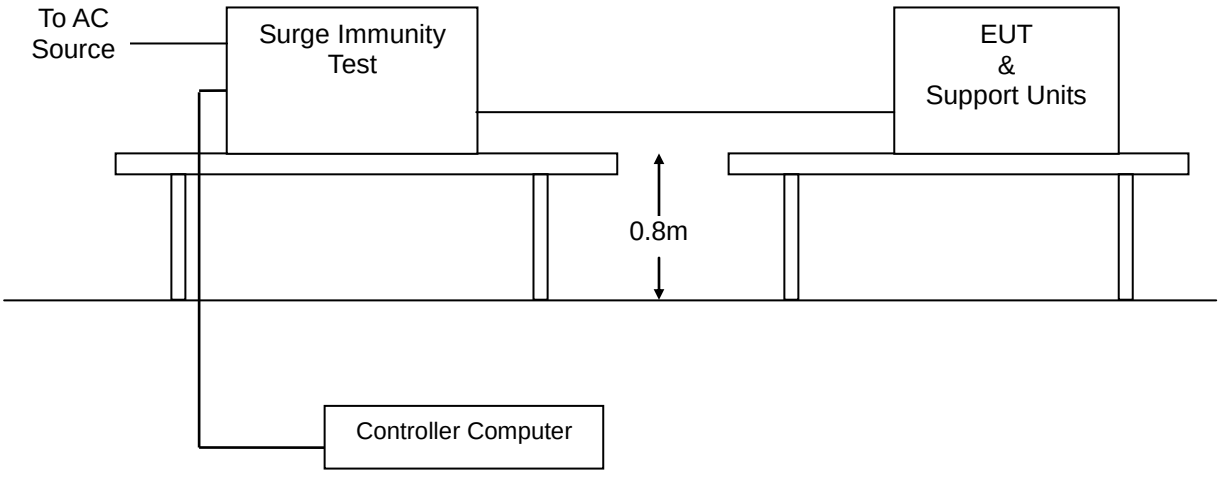
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

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

Temperature	22°C	**Humidity**	50% RH
Pressure	999mbar	**Tested by**	Moore Cheng
Required Passing Performance	The ME Equipment or ME System shall be able to provide the basic safety and essential performance.		

Test Point	Polarity	Test Level (kV)	Coupling Method	Observation	Result
L – N	+/-	1	Capacitive	Note 1	PASS
L - PE	+/-	2	Capacitive	Note 1	PASS
N - PE	+/-	2	Capacitive	Note 1	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

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 Vrms According to customer's requirement: 20 Vrms
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupled cable:	Power Mains, Unshielded; RJ45 Line, Unshielded
Coupling device:	CDN-M3 (3 wires), CDN-T4

8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
S.G.	R&S	SMY02	100094	10/02/2013
Power Meter	BOONTON	4242	13760	01/07/2014
Power Sensor	BOONTON	51013-4E	35522	01/07/2014
Power Sensor	BOONTON	51013-4E	35523	01/07/2014
Power Amplifier	ar	500A100A	300299	N.C.R
Dual Directional Coupler	ar	DC2600A	306621	N.C.R.
Attenuator	EPX	ECA500-6-1-NF-NM	0809180	N.C.R.
CDN	FCC	FCC-801-M2-16A	121695	12/11/2013
CDN	FCC	FCC-801-M3-16A	03027	10/16/2013
CDN	FCC	FCC-801-T2	03016	10/16/2013
CDN	FCC	FCC-801-T4	03017	10/16/2013
CDN	FCC	FCC-801-T8-RJ45	04024	10/16/2013
EM Injection Clamp	FCC	F-203I-23mm	421	12/25/2013
S.G.	R&S	SMY02	100094	10/02/2013
Power Meter	BOONTON	4242	13760	01/07/2014
Power Sensor	BOONTON	51013-4E	34241	11/11/2013
Power Sensor	BOONTON	51013-4E	35087	11/11/2013
Test S/W	SW1006 (V1.22)			

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.

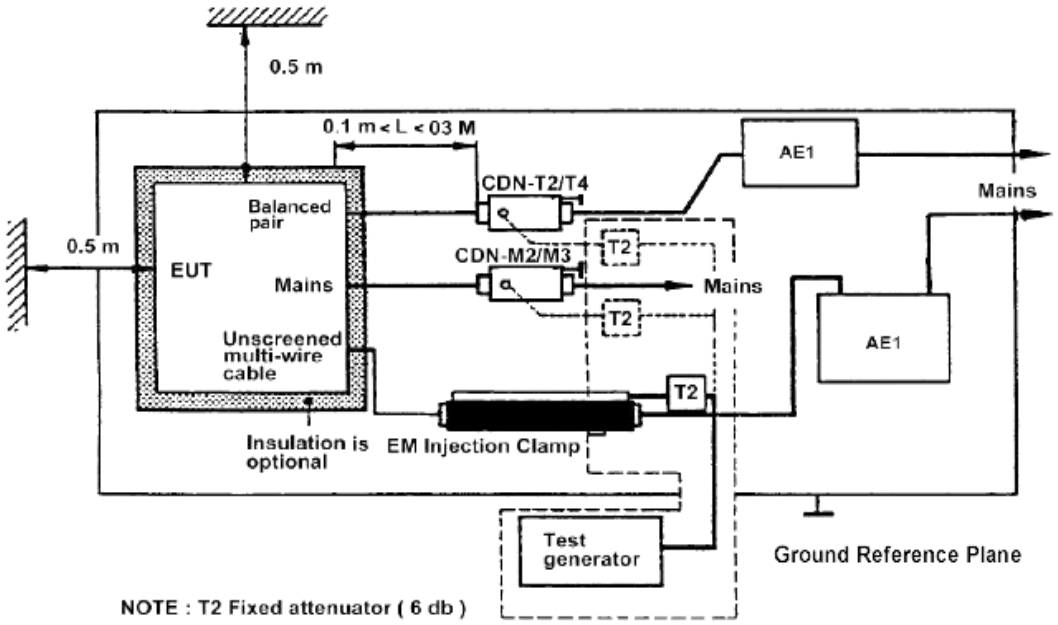
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

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 1.5×10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

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

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

8.7.4. TEST SETUP



Note:

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

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

Note:

TABLETOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested was 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

Temperature	25°C	**Humidity**	50% RH
Pressure	999mbar	**Tested by**	Eason Liu
Required Passing Performance	The ME Equipment or ME System shall be able to provide the basic safety and essential performance.		

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Observation	Result
0.15 ~ 80	3	AC Power Line (0.3m)	CDN-M3	Note 1	PASS

According to customer's requirement:

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Observation	Result
0.15 ~ 80	20	AC Power Line (0.3m)	CDN-M3	Note 1	PASS

Note: *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:	3 A/m According to customer's requirement: 10 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**
Clamp Meter	DHA	CM-312A	W3010087	07/03/2013
Magnetic Field Tester	HAEFELY TRENCH	MAG 100.1	081 436-02	N.C.R.
Frequency Converter	EXTECH	CFC-105	810390	N.C.R.

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)

a) 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.

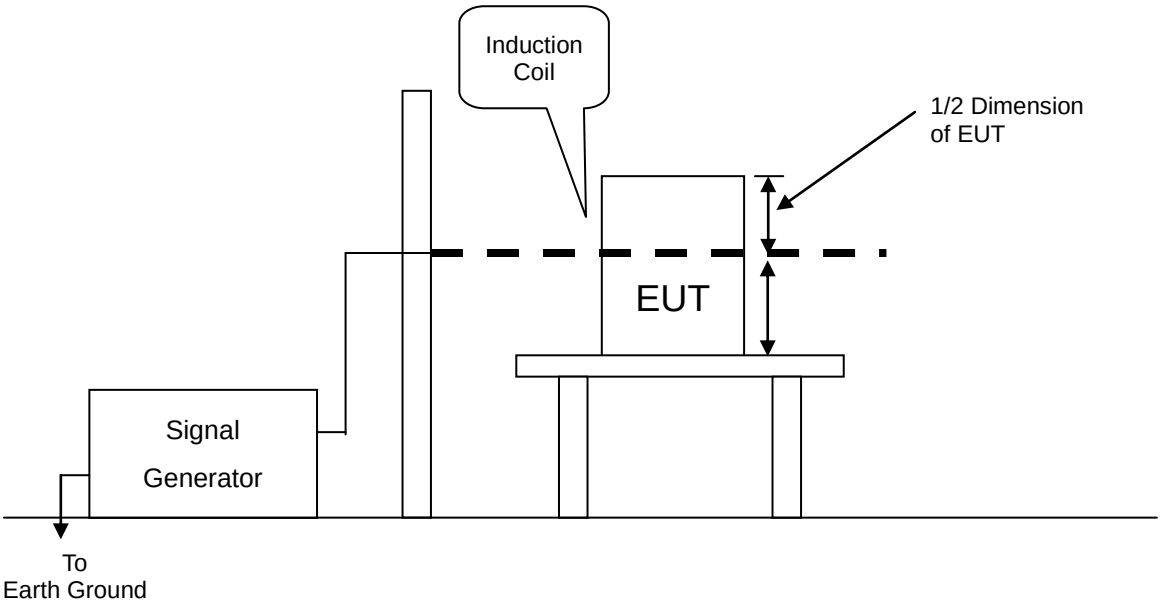
b) The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.

c) The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

d) 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

Temperature	26°C	**Humidity**	50% RH
Pressure	999mbar	**Tested by**	Michael Chen
Required Passing Performance	The ME Equipment or ME System shall be able to provide the basic safety and essential performance.		

Direction	Field Strength (A/m)	Observation	Results
X	3	Note 1	Pass
Y	3	Note 1	Pass
Z	3	Note 1	Pass

According to customer's requirement:

Direction	Field Strength (A/m)	Observation	Results
X	10	Note 1	Pass
Y	10	Note 1	Pass
Z	10	Note 1	Pass

Note: *There was no change compared with the 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
Angle:	0~360 degree
Step:	45 degree

8.9.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMC Immunity Tester	EMC Partner	TRA2000IN6	1144	01/03/2014
CDN	EMC Partner	CDCN-UTP8	046	01/09/2014
Clamp	EMC Partner	CN-EFT1000	683	N.C.R.
Test S/W	Genecs (3.03)			

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)

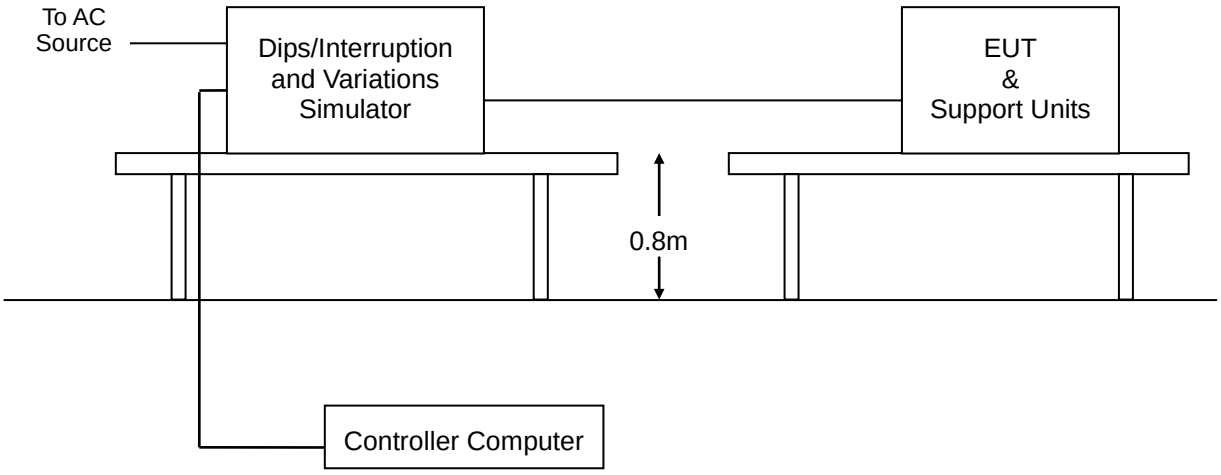
a) The EUT and support units were located on a wooden table, 0.8 m away from ground floor.

b) Setting the parameter of tests and then perform the test software of test simulator.

c) Conditions changes to occur at 0 degree crossover point of the voltage waveform.

d) 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

For 230V

Temperature	22°C	**Humidity**	50% RH
Pressure	999mbar	**Tested by**	Moore Cheng
Required Passing Performance	The ME Equipment or ME System shall be able to provide the basic safety and essential performance.		

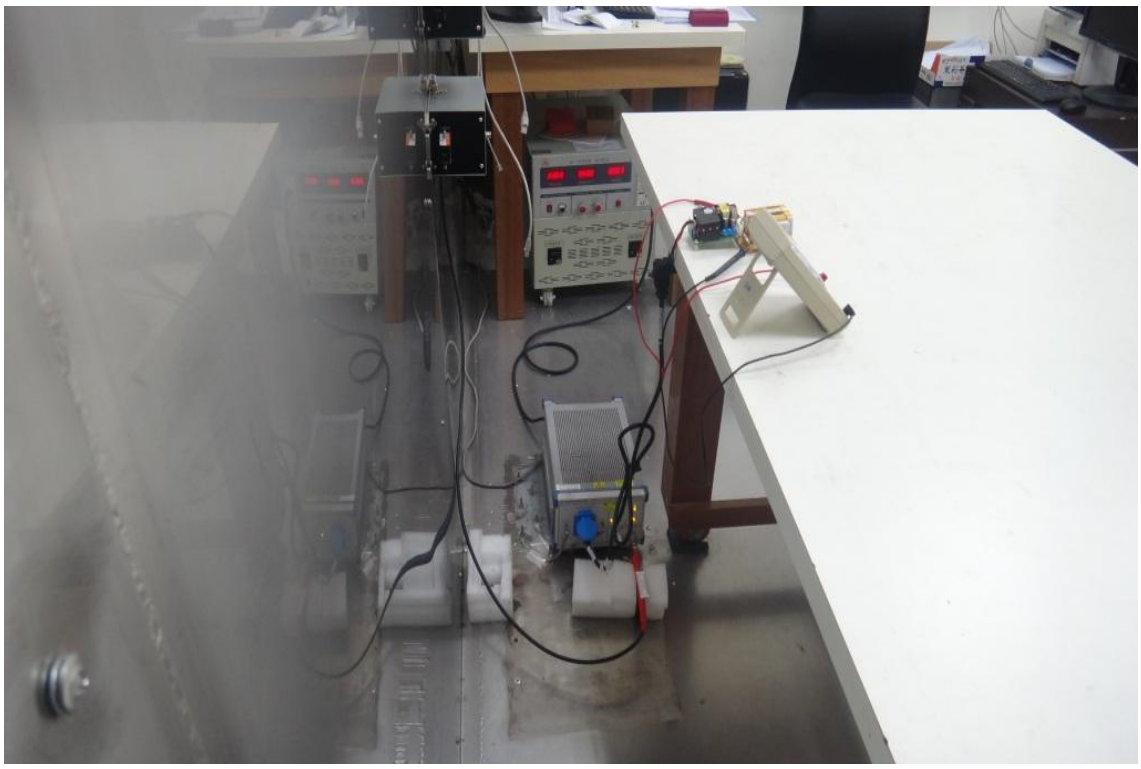
Test Power: 230Vac, 50Hz and 100Vac, 50Hz				
Voltage (% Reduction)	**Duration (Period)**	**Performance Criterion**	**Observation**	**Test Result**
>95	0.5	☒**A** ☐**B** ☐**C**	**Note** ☒**1** ☐**2**	PASS
30	25	☒**A** ☐**B** ☐**C**	**Note** ☒**1** ☐**2**	PASS
>95	250	☐**A** ☒**B** ☐**C**	**Note** ☐**1** ☒**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 can be recovered automatically as the events disappeared.*

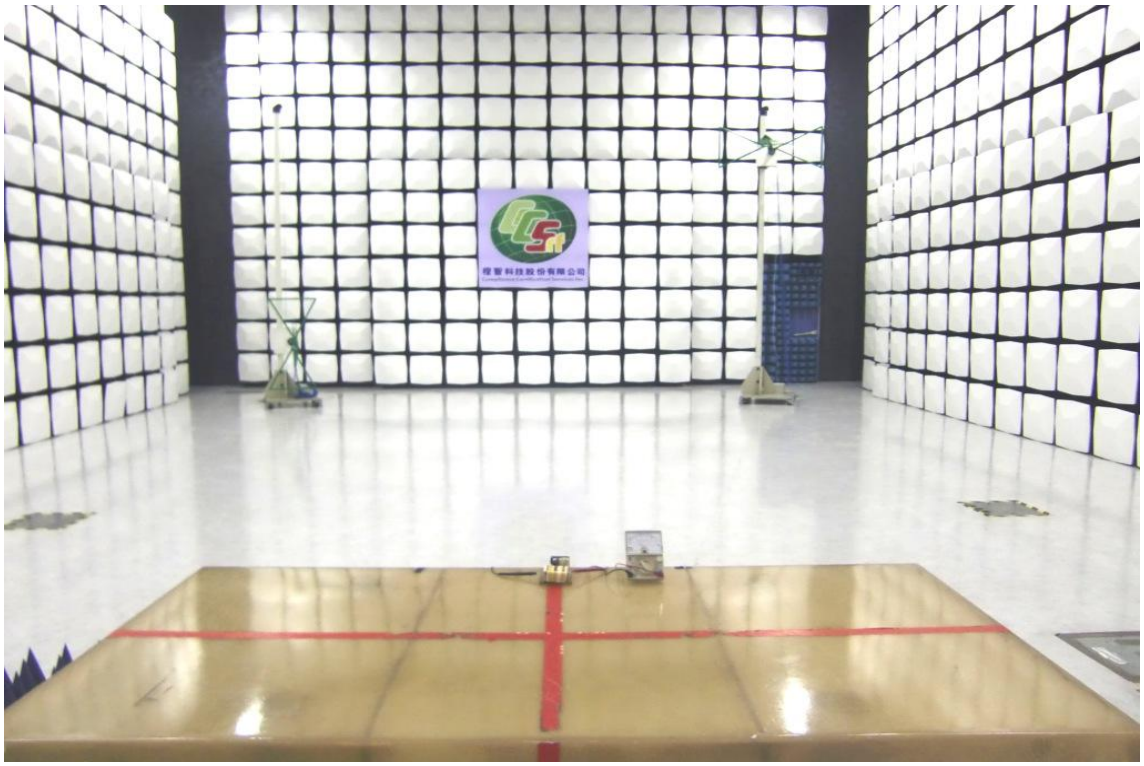
9 PHOTOGRAPHS OF THE TEST CONFIGURATION

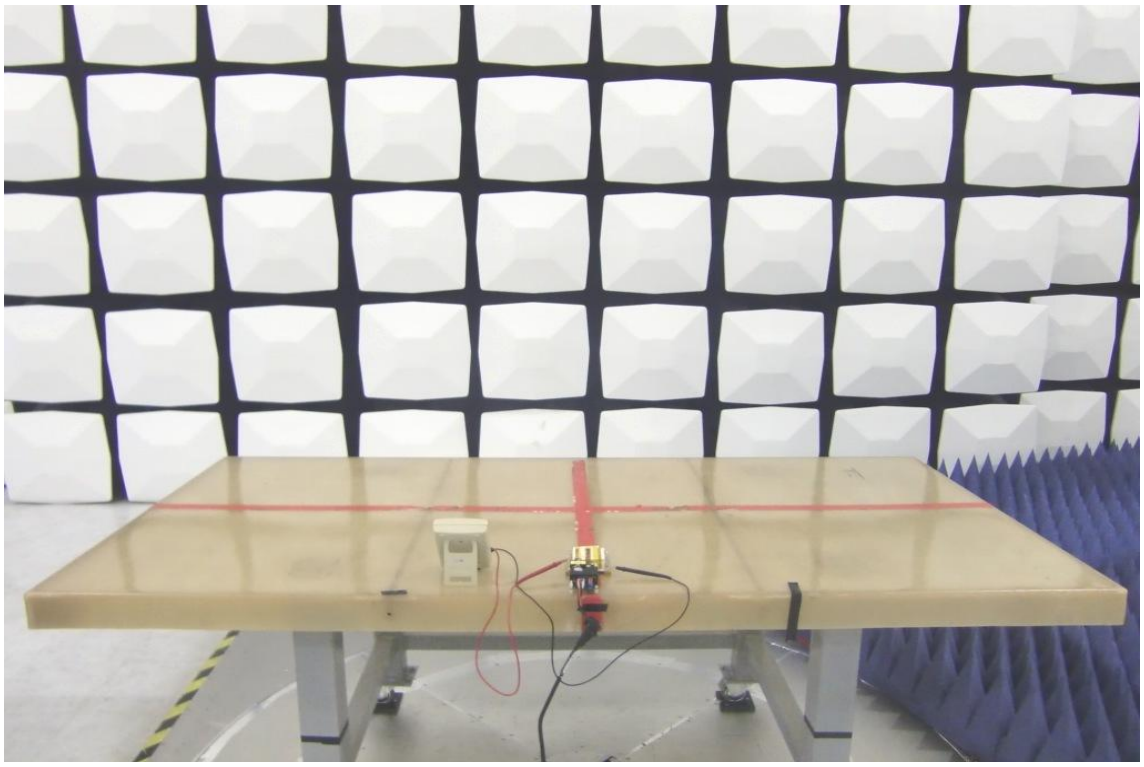
CONDUCTED EMISSION TEST



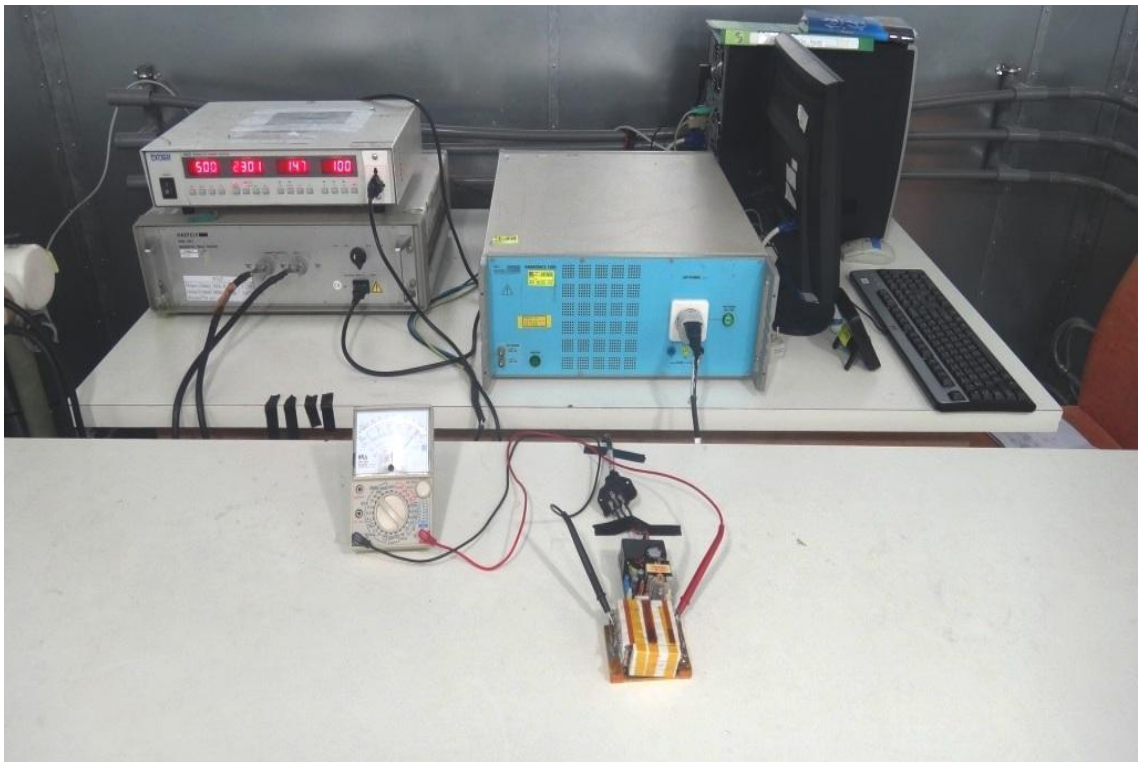
RADIATED EMISSION TEST

Below 1GHz

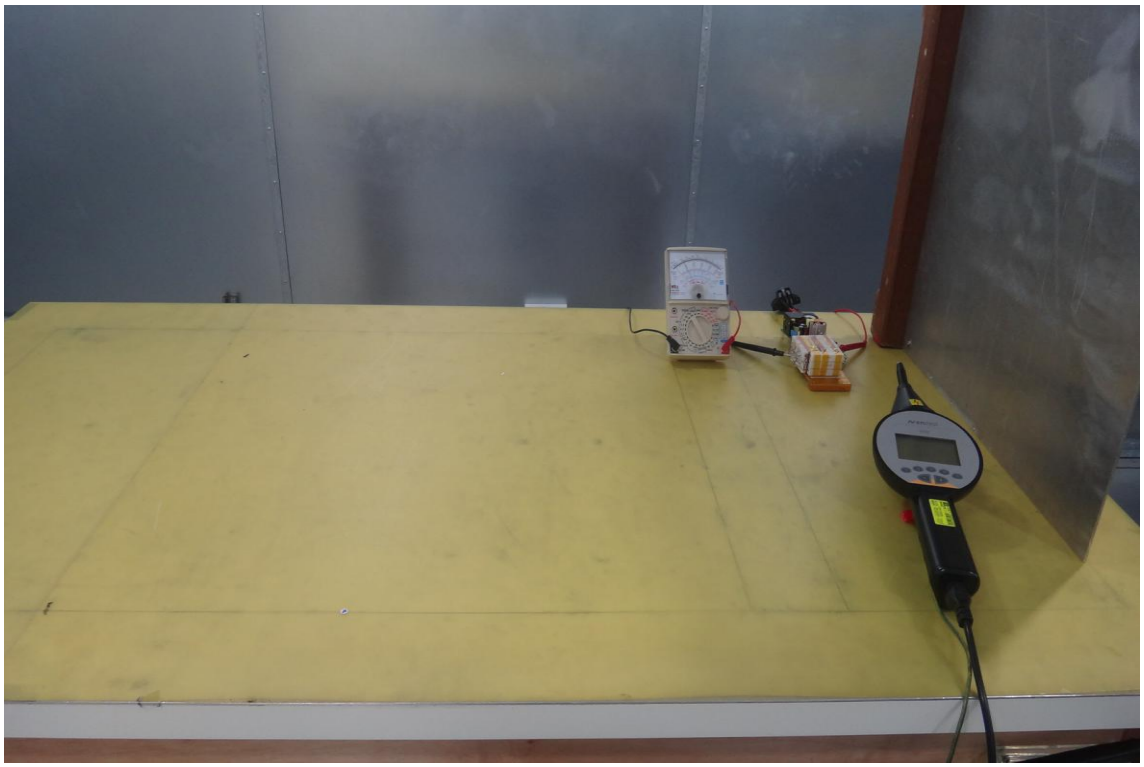




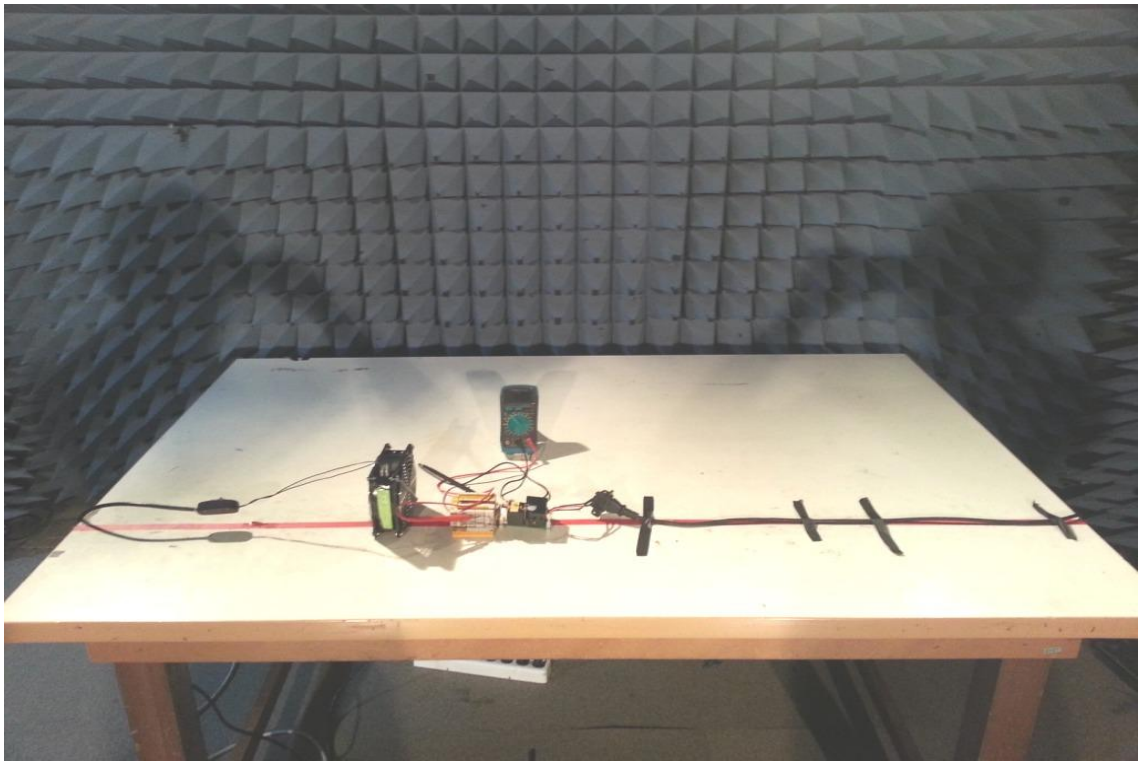
HARMONIC & FLICKER TEST



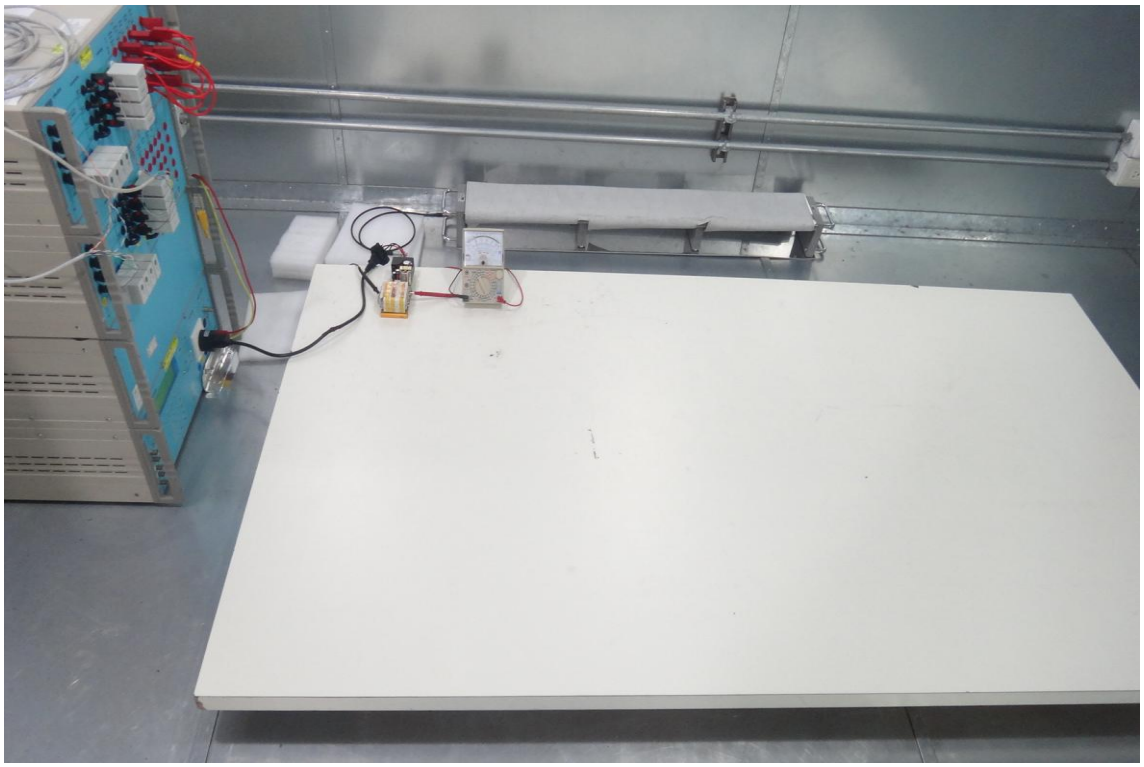
ESD TEST



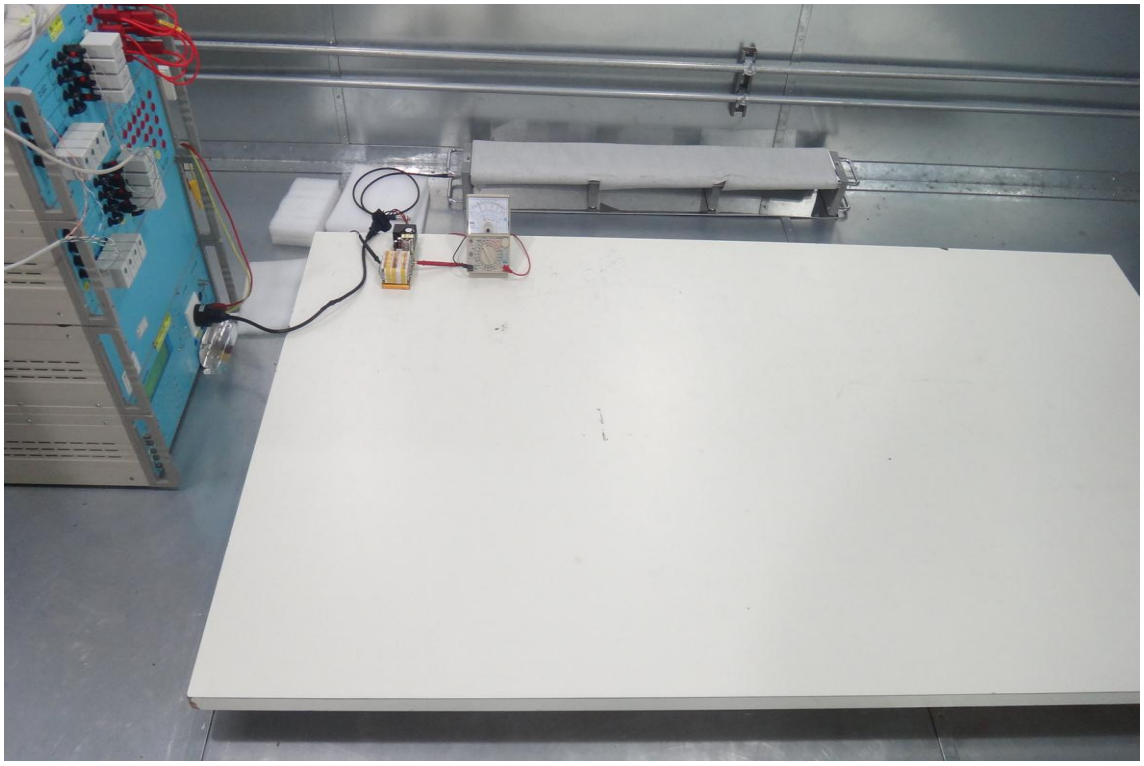
RS TEST



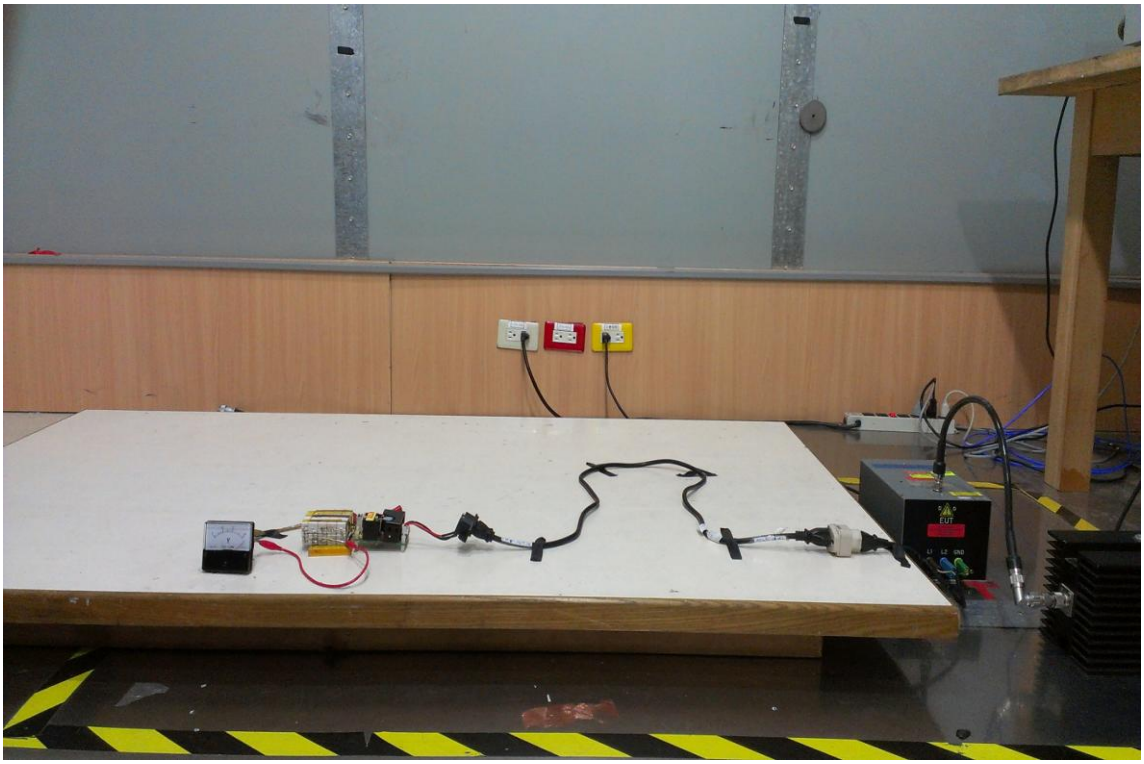
EFT TEST



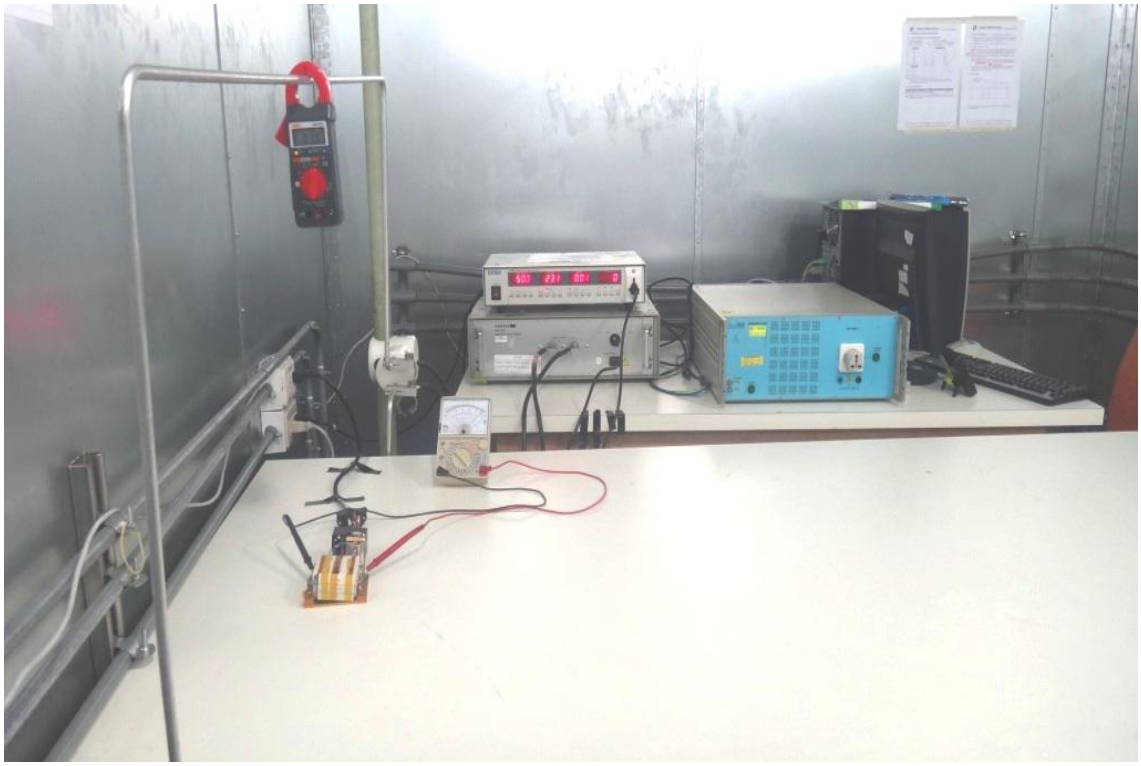
SURGE TEST



CS TEST



POWER FREQUENCY MAGENTIC FIELD



VOLTAGE DIPS / INTERRUPTIONS TEST