



EMC TEST REPORT

for

power

MODEL:

TPI100-112BA, TPI100-112A, TPI100-115BA, TPI100-115A, TPI100-124BA, TPI100-124A,
TPI100-128BA, TPI100-128A, TPI100-136BA, TPI100-136A, TPI100-148BA, TPI100-148A,
TPI100-112BU, TPI100-112U, TPI100-115BU, TPI100-115U, TPI100-124BU, TPI100-124U,
TPI100-128BU, TPI100-128U, TPI100-136BU, TPI100-136U, TPI100-148BU, TPI100-148U,
TPI100-112B, TPI100-112BD, TPI100-112, TPI100-112D, TPI100-115B, TPI100-115BD,
TPI100-115, TPI100-115D, TPI100-124B, TPI100-124BD, TPI100-124, TPI100-124D,
TPI100-128B, TPI100-128BD, TPI100-128, TPI100-128D, TPI100-136B, TPI100-136BD,
TPI100-136, TPI100-136D, TPI100-148B, TPI100-148BD, TPI100-148, TPI100-148D

Test Report Number:

T141225W03-E-1

Issued for

TRACO ELECTRONIC AG

Sihlbruggstrasse 111 CH-6340 Baar Switzerland

Issued By:

Compliance Certification Services Inc.

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Issued Date: January 20, 2015



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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

TPI100-112BA, TPI100-112A, TPI100-115BA, TPI100-115A, TPI100-124BA,
TPI100-124A, TPI100-128BA, TPI100-128A, TPI100-136BA, TPI100-136A,
TPI100-148BA, TPI100-148A, TPI100-112BU, TPI100-112U, TPI100-115BU,
TPI100-115U, TPI100-124BU, TPI100-124U, TPI100-128BU, TPI100-128U,

Model: TPI100-136BU, TPI100-136U, TPI100-148BU, TPI100-148U, TPI100-112B,
TPI100-112BD, TPI100-112, TPI100-112D, TPI100-115B, TPI100-115BD, TPI100-115,
TPI100-115D, TPI100-124B, TPI100-124BD, TPI100-124, TPI100-124D, TPI100-128B,
TPI100-128BD, TPI100-128, TPI100-128D, TPI100-136B, TPI100-136BD, TPI100-136,
TPI100-136D, TPI100-148B, TPI100-148BD, TPI100-148, TPI100-148D

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 6 ~ 8, 2013

Applicable **EN 55022:2010/AC:2011**

Standards: **EN 61000-3-2:2006+A1:2009+A2:2009**

EN 61000-3-3:2013

EN 55024:2010

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



| 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 |
| EN 55022: 2010/AC: 2011 | Conducted (Power Port) | PASS | Meet Class B limit |
| | Conducted (Telecom port) | N/A | Not applicable, the EUT doesn't have LAN Port or Modem port. |
| | Radiated | PASS | Meet Class A limit |
| EN 61000-3-2:2006+A1:2009+A2:2009 | Harmonic current emissions | PASS | Meet Class D limit |
| EN 61000-3-3:2013 | Voltage fluctuations & flicker | PASS | Meets the requirements |

| IMMUNITY [EN 55024 (2010)] | | | |
|------------------------------------|-----------------------------------|--------|---|
| Standard | Item | Result | Remarks |
| IEC 61000-4-2:2008 | ESD | PASS | For Standard requirement: Meets the requirements of Performance Criterion B According to the customer's requirement: 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 | For Standard requirement: Meets the requirements of Performance Criterion B According to the customer's requirement: Meets the requirements of Performance Criterion A |
| IEC 61000-4-5:2005 | Surge | PASS | For Standard requirement: Meets the requirements of Performance Criterion B According to the customer's requirement: Meets the requirements of Performance Criterion A |
| IEC 61000-4-6:2008 | 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 | For Standard requirement: Meets the requirements of Voltage Dips: 1) >95% reduction Performance Criterion B 2) 30% reduction Performance Criterion C Voltage Interruptions: 1) >95% reduction Performance Criterion C According to the customer's requirement: Meets the requirements of Voltage Dips: 2) >95% reduction Performance Criterion A 2) 30% reduction Performance Criterion A Voltage Interruptions: 1) >95% reduction 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

| | | | |
|-----------------------------------|--|--------------|--------------|
| Product | power | | |
| Brand Name | TRACO POWER | | |
| Model | TPI100-112BA, TPI100-112A, TPI100-115BA, TPI100-115A, TPI100-124BA, TPI100-124A, TPI100-128BA, TPI100-128A, TPI100-136BA, TPI100-136A, TPI100-148BA, TPI100-148A, TPI100-112BU, TPI100-112U, TPI100-115BU, TPI100-115U, TPI100-124BU, TPI100-124U, TPI100-128BU, TPI100-128U, TPI100-136BU, TPI100-136U, TPI100-148BU, TPI100-148U, TPI100-112B, TPI100-112BD, TPI100-112, TPI100-112D, TPI100-115B, TPI100-115BD, TPI100-115, TPI100-115D, TPI100-124B, TPI100-124BD, TPI100-124, TPI100-124D, TPI100-128B, TPI100-128BD, TPI100-128, TPI100-128D, TPI100-136B, TPI100-136BD, TPI100-136, TPI100-136D, TPI100-148B, TPI100-148BD, TPI100-148, TPI100-148D | | |
| Applicant | TRACO ELECTRONIC AG | | |
| Housing material | Plastic | | |
| Identify Number | T141225W03 | | |
| Received Date | December 25, 2014 | | |
| EUT Power Rating | 48VDC 2.09A | | |
| Power Adapter Manufacturer | TRACO ELECTRONIC AG | Model | TPI100-148BA |
| 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 |
|---------------------------|-------------------------|--------------|----------------|----------------|
| TPI100-112BA | TPI100-112A | 85 – 264 VAC | 12 VDC | 8.34A |
| TPI100-115BA | TPI100-115A | 85 – 264 VAC | 15 VDC | 6.67A |
| TPI100-124BA | TPI100-124A | 85 – 264 VAC | 24 VDC | 4.17A |
| TPI100-128BA | TPI100-128A | 85 – 264 VAC | 28 VDC | 3.58A |
| TPI100-136BA | TPI100-136A | 85 – 264 VAC | 36 VDC | 2.78A |
| TPI100-148BA | TPI100-148A | 85 – 264 VAC | 48 VDC | 2.09A |
| TPI100-112BU | TPI100-112U | 85 – 264 VAC | 12 VDC | 8.34A |
| TPI100-115BU | TPI100-115U | 85 – 264 VAC | 15 VDC | 6.67A |
| TPI100-124BU | TPI100-124U | 85 – 264 VAC | 24 VDC | 4.17A |
| TPI100-128BU | TPI100-128U | 85 – 264 VAC | 28 VDC | 3.58A |
| TPI100-136BU | TPI100-136U | 85 – 264 VAC | 36 VDC | 2.78A |
| TPI100-148BU | TPI100-148U | 85 – 264 VAC | 48 VDC | 2.09A |
| TPI100-112B, TPI100-112BD | TPI100-112, TPI100-112D | 85 – 264 VAC | 12 VDC | 8.34A |
| TPI100-115B, TPI100-115BD | TPI100-115, TPI100-115D | 85 – 264 VAC | 15 VDC | 6.67A |
| TPI100-124B, TPI100-124BD | TPI100-124, TPI100-124D | 85 – 264 VAC | 24 VDC | 4.17A |
| TPI100-128B, TPI100-128BD | TPI100-128, TPI100-128D | 85 – 264 VAC | 28 VDC | 3.58A |
| TPI100-136B, TPI100-136BD | TPI100-136, TPI100-136D | 85 – 264 VAC | 36 VDC | 2.78A |
| TPI100-148B, TPI100-148BD | TPI100-148, TPI100-148D | 85 – 264 VAC | 48 VDC | 2.09A |

2. For more details, please refer to the User's manual of the EUT

3. The model TPI100-148BA was considered the main model for testing.

4. Difference of the thirty-six model numbers (list on this report) is just for marketing purpose only.

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 (TPI100-112BA) |
| Mode 2: Full Load (TPI100-148BA) |

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:

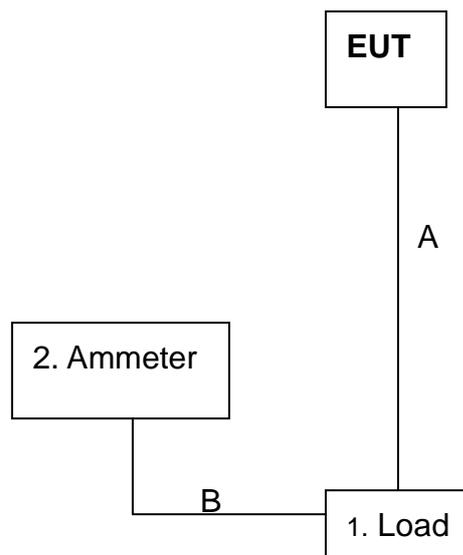
| No. | Equipment | Model No. | Serial No. | FCC ID | Trade Name | Data Cable | Power Cord |
|-----|-----------|-------------------------|------------|--------|------------|------------|------------|
| 1. | Load | 10W1.2KJ*3 20W10RJ*8 | N/A | N/A | N/A | N/A | N/A |
| 2. | Ammeter | DM-3000 | N/A | N/A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

| No. | Cable Name | Unit | Shielded | Length | With Core |
|-----|--------------|------|--|--------|---|
| (A) | Signal Cable | 1 | <input type="checkbox"/> Shielded, <input checked="" type="checkbox"/> Non | 1.8 m | <input type="checkbox"/> With Core, <input checked="" type="checkbox"/> Non |
| (B) | Signal Cable | 1 | <input type="checkbox"/> Shielded, <input checked="" type="checkbox"/> Non | 0.2 m | <input type="checkbox"/> With Core, <input checked="" type="checkbox"/> 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 VCCI 966 Chamber C: Radiated emissions: 30 MHz -1000 MHz: R-3282 / Above 1GHz: G-146 |
| Japan | 10M Chamber: Radiated emissions: 30 MHz -1000 MHz: R-3283 / Above 1GHz: G-147 Conducted Emission A: C-3612 / T-1745 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 |
| | Above 1GHz | ±2.5208 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 UCISPR which is 3.6dB and 5.2dB respectively. CCS values (called ULab in CISPR 16-4-2) is less than UCISPR 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) | Class A (dBuV) | | Class B (dBuV) | |
|-----------------|----------------|---------|----------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

Note:

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

7.1.2. TEST INSTRUMENTS

| Conducted Emission Room # 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 | SCHWARZBECK | NSLK 8127 | 8127-541 | 12/10/2013 |
| 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

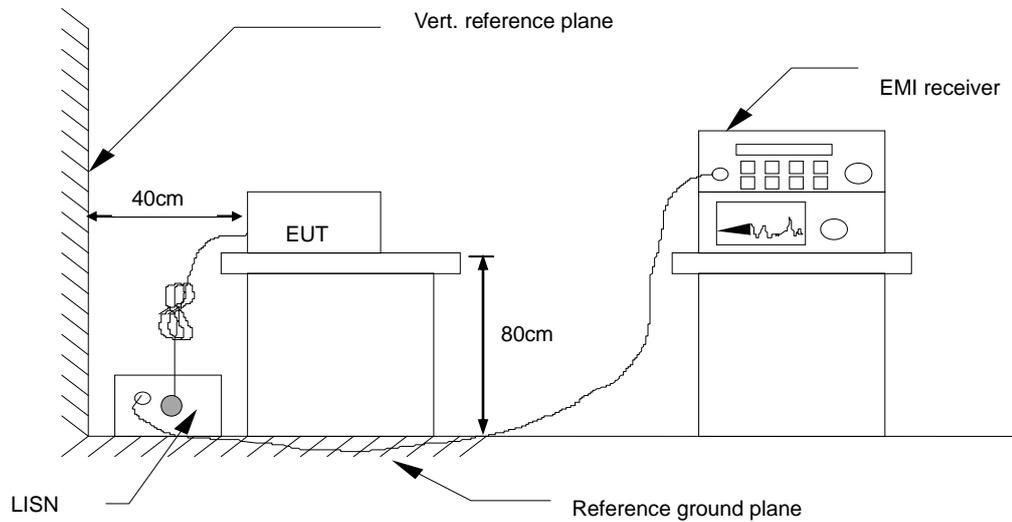
- The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 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 levels were recorded for reference of the final test.

Procedure of Final Test

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



7.1.4. TEST SETUP

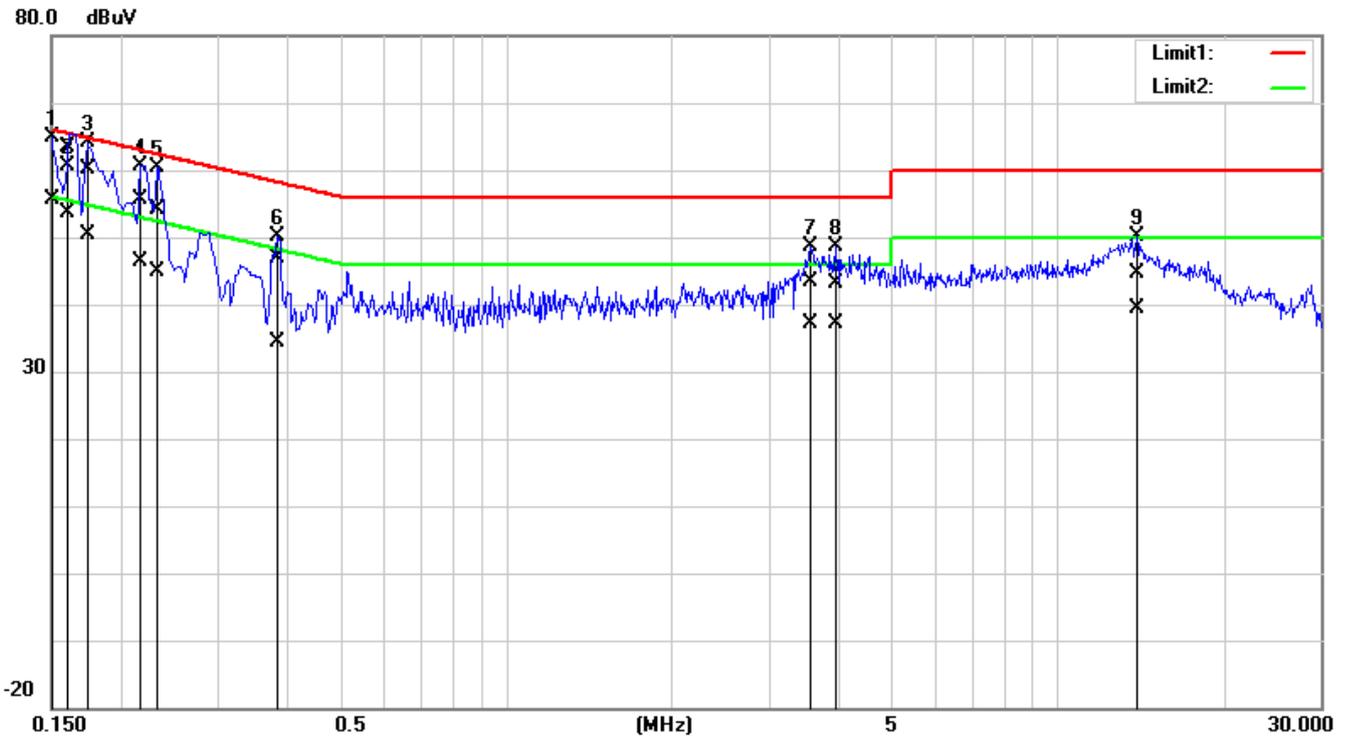


- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



7.1.5. TEST RESULTS

| | | | |
|---------------------------------|--------------|------------------|----------|
| Model No. | TPI100-148BA | Line: | L1 |
| Environmental Conditions | 24°C, 50% RH | Test Date | 2013/2/8 |
| Tested by | Moore Cheng | Test Mode | Mode 2 |

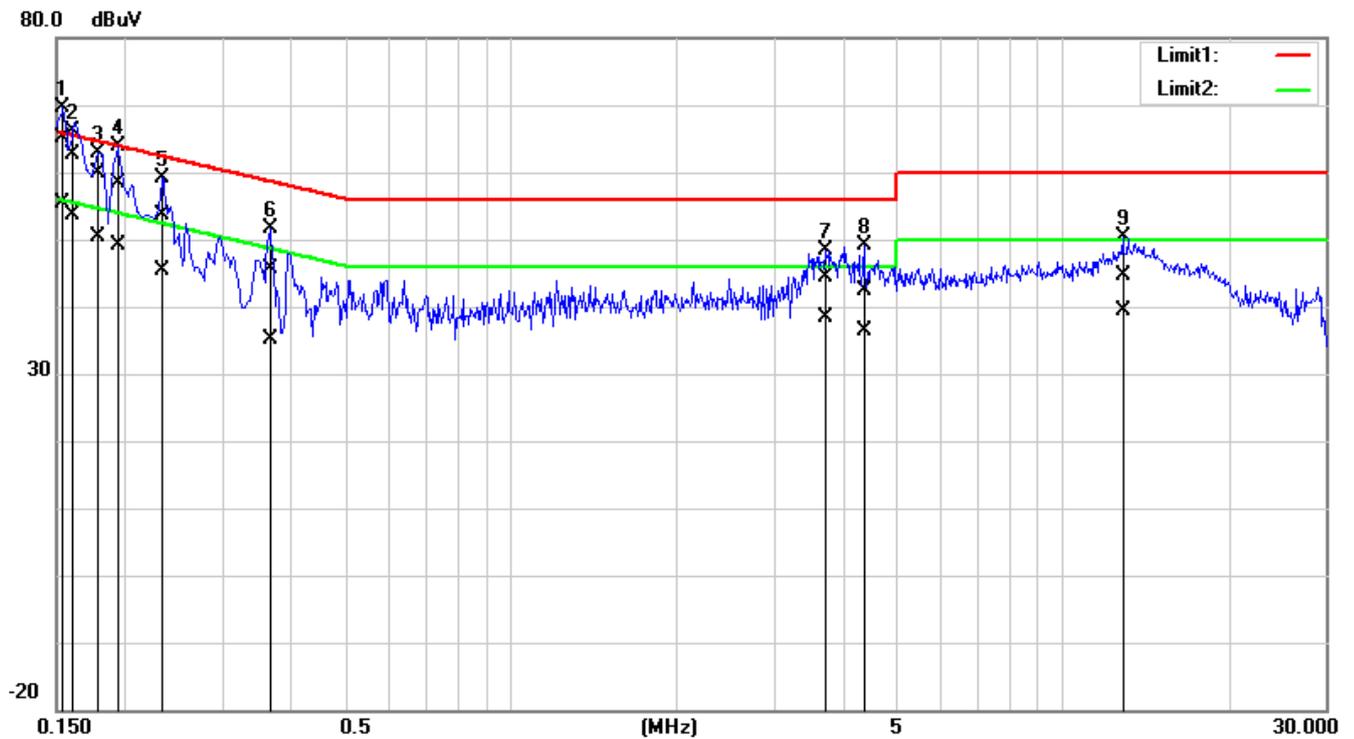


| NO | Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark (Pass/Fail) |
|----|-----------------|---------------------------|------------------------|------------------------|--------------------------|-----------------------|-------------------------|----------------------|------------------------|---------------------|--------------------|
| 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. | TPI100-148BA | Line: | L2 |
| Environmental Conditions | 24°C, 50% RH | Test Date | 2013/2/8 |
| Tested by | Moore Cheng | Test Mode | Mode 2 |



| NO | Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|----|-----------------|---------------------------|------------------------|------------------------|--------------------------|-----------------------|-------------------------|----------------------|------------------------|---------------------|--------|
| 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. CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

7.2.1. LIMITS

For Class A Equipment

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

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

For Class B Equipment

| FREQUENCY (MHz) | Voltage Limit (dBuV) | | Current Limit (dBuA) | |
|-----------------|----------------------|---------|----------------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 84 ~ 74 | 74 ~ 64 | 40 ~ 30 | 30 ~ 20 |
| 0.5 - 30.0 | 74 | 64 | 30 | 20 |

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

7.2.2. TEST INSTRUMENTS

| Conducted Emission Room | | | | |
|-------------------------|--------------|-------|---------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| N/A | | | | |



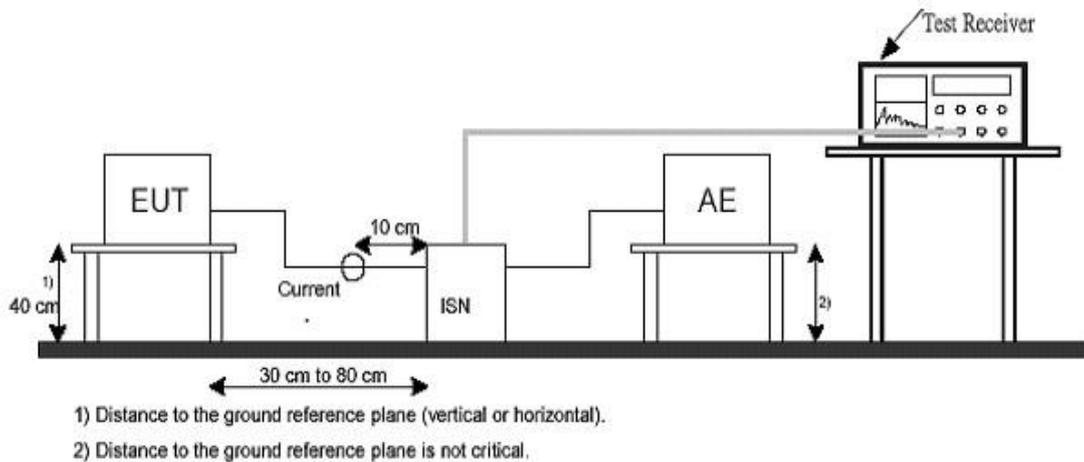
7.2.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-031)

- 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:

Not applicable, the EUT doesn't have LAN Port or Modem port.



7.2.4. TEST SETUP



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

7.2.5. TEST RESULTS

Not applicable, the EUT doesn't have LAN Port or Modem port.



7.3. RADIATED EMISSION MEASUREMENT

7.3.1. LIMITS

Below 1GHz

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

Note: The lower limit shall apply at the transition frequencies.

Above 1GHz

| FREQUENCY (MHz) | Class A (dBuV/m) (At 3m) | | Class B (dBuV/m) (At 3m) | |
|-----------------|--------------------------|------|--------------------------|------|
| | Average | Peak | Average | Peak |
| 1000 ~ 3000 | 56 | 76 | 50 | 70 |
| 3000 ~ 6000 | 60 | 80 | 54 | 74 |

Note: The lower limit shall apply at the transition frequencies.

According to EN 55022: 2010/AC: 2011 clause 6.2, the measurement frequency range shown in the following table:

| 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 | 5 times of the highest frequency or 6GHz, whichever is less |



7.3.2. 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.



7.3.3. 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 from 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 from 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.

Frequency range above 1GHz

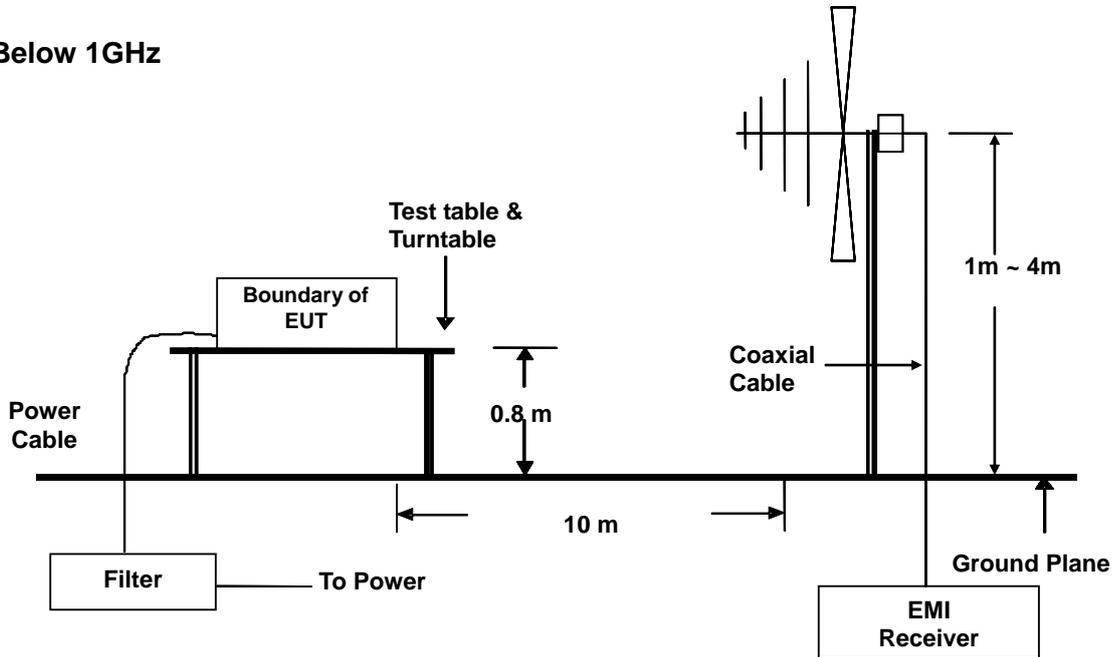
1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position.
2. The EUT was set 3 meters away from the directional antenna, which was pointed towards the source of the emission within the EUT. This could be done by either pointing the antenna at an angle towards the source of the emission, or by rotating the EUT, in both height and polarization, to maximize the measured emission.
3. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3 dB beamwidth both, to detect 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.

NOTE:

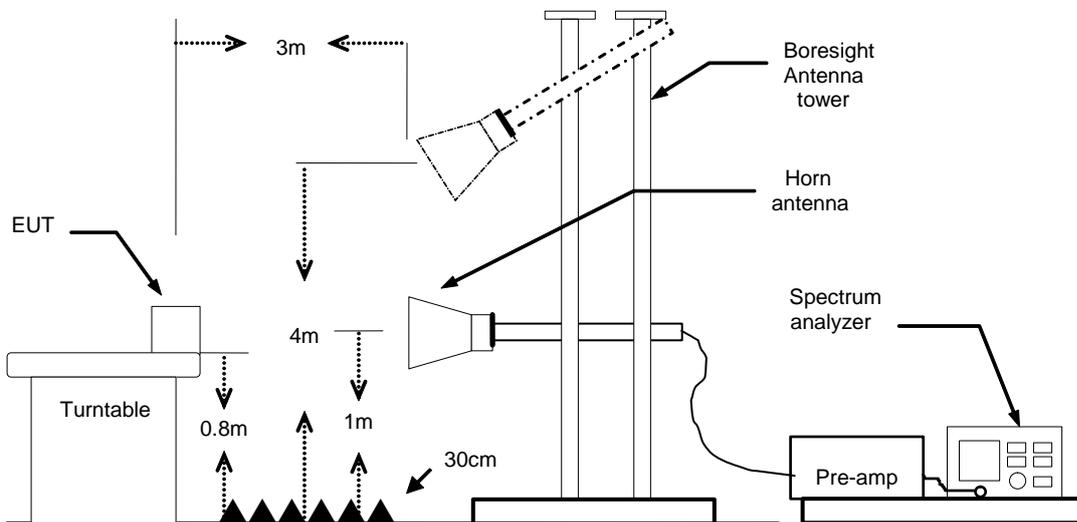
1. The resolution bandwidth is 1MHz and video bandwidth of test spectrum analyzer is 1 MHz for peak detection at above 1GHz. The resolution bandwidth is 1MHz and video bandwidth of test spectrum analyzer is 100Hz for average detection at frequency above 1 GHz.
2. For measurement of frequency above 1GHz, the EUT was set 3 meters away from the directional antenna.

7.3.4. TEST SETUP

Below 1GHz



Above 1GHz



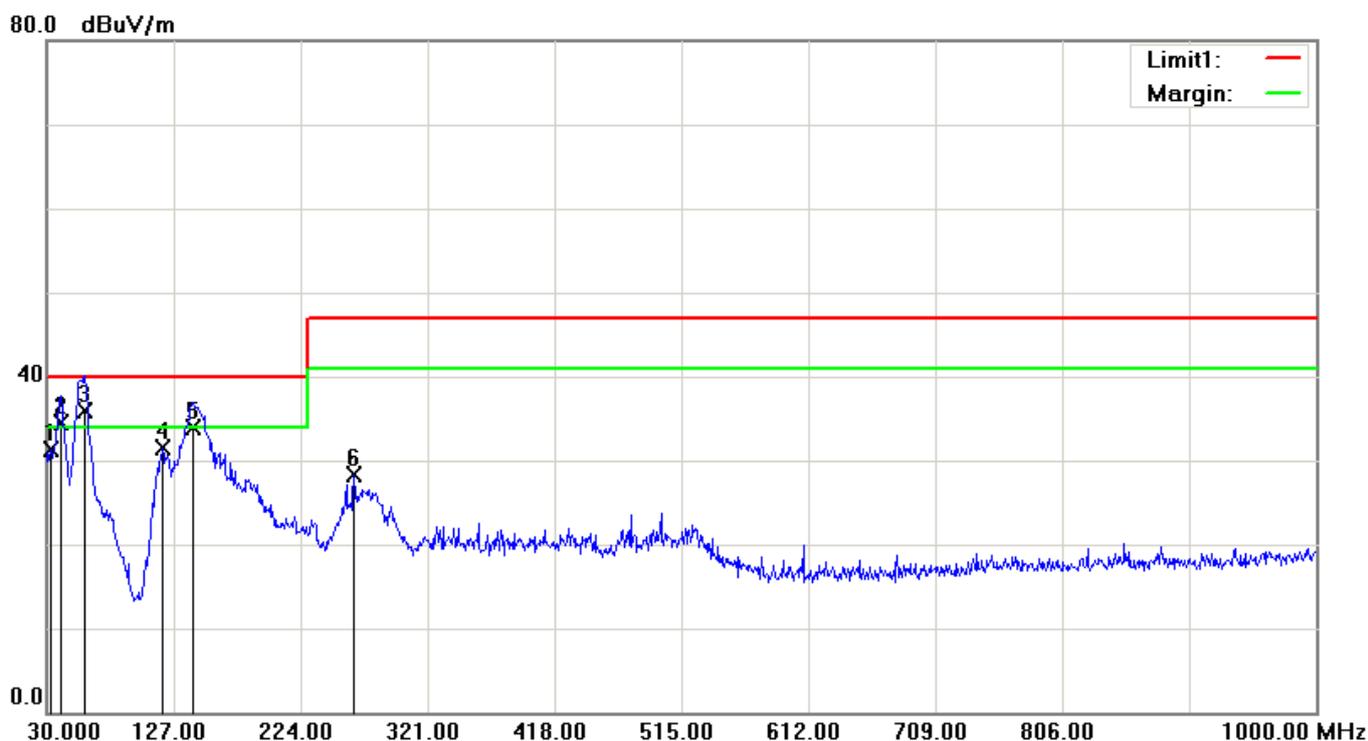
- For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.



7.3.5. TEST RESULTS

Below 1GHz

| | | | |
|---------------------------------|--------------|-------------------------|-------------|
| Model No. | TPI100-148BA | Test Mode | Mode 2 |
| Environmental Conditions | 26°C, 60% RH | Test Date | 2013/2/6 |
| Antenna Pole | Vertical | Antenna Distance | 10m |
| Detector Function | Quasi-peak. | Tested by | Moore Cheng |



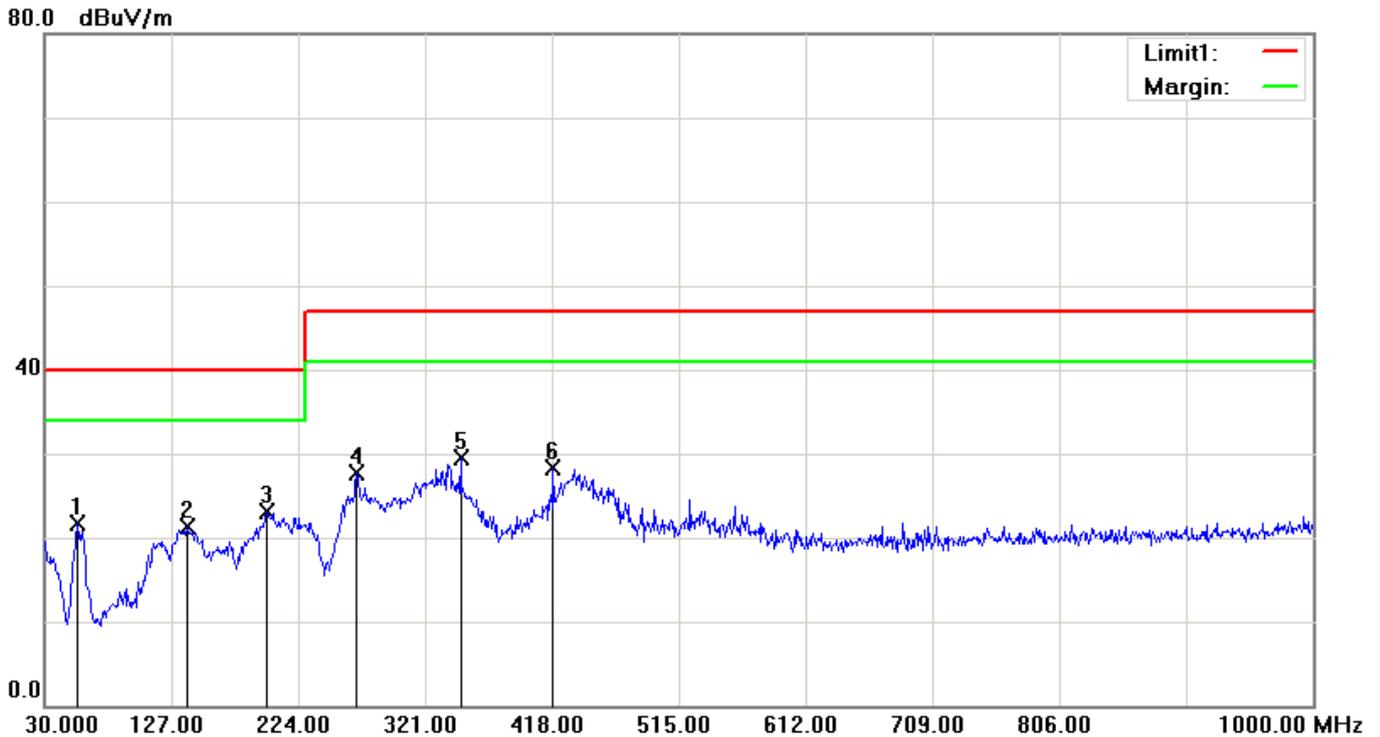
| No. | Frequency (MHz) | Reading (dBuV) | Correction Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (°) | Remark |
|-----|-----------------|----------------|-------------------------|-----------------|----------------|-------------|-------------|------------|--------|
| 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. | TPI100-148BA | Test Mode | Mode 2 |
| Environmental Conditions | 26°C, 60% RH | Test Date | 2013/2/6 |
| 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.



7.4. 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 |
|-------------------|-----------------------|----------------|---------------|-----------------|
| 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-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.

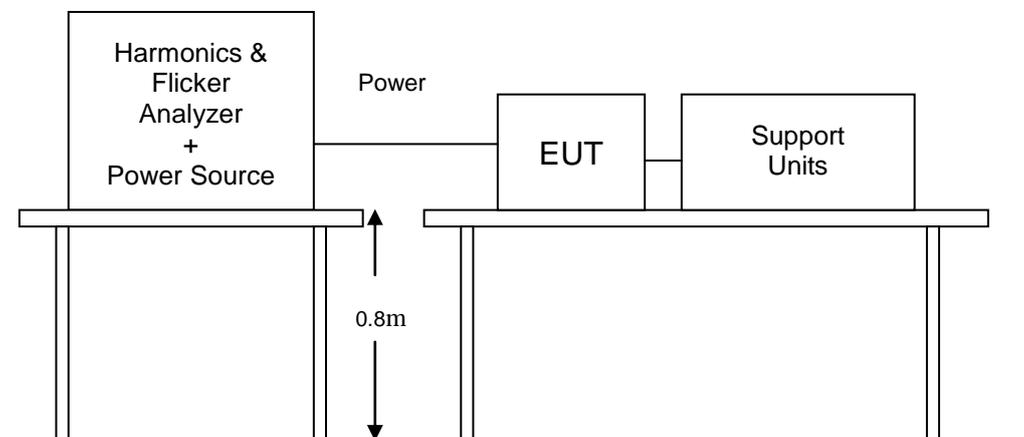
Class B: Portable tools; Arc welding equipment which is not professional equipment.

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.

7.4.4. TEST SETUP



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



7.4.5. TEST RESULTS

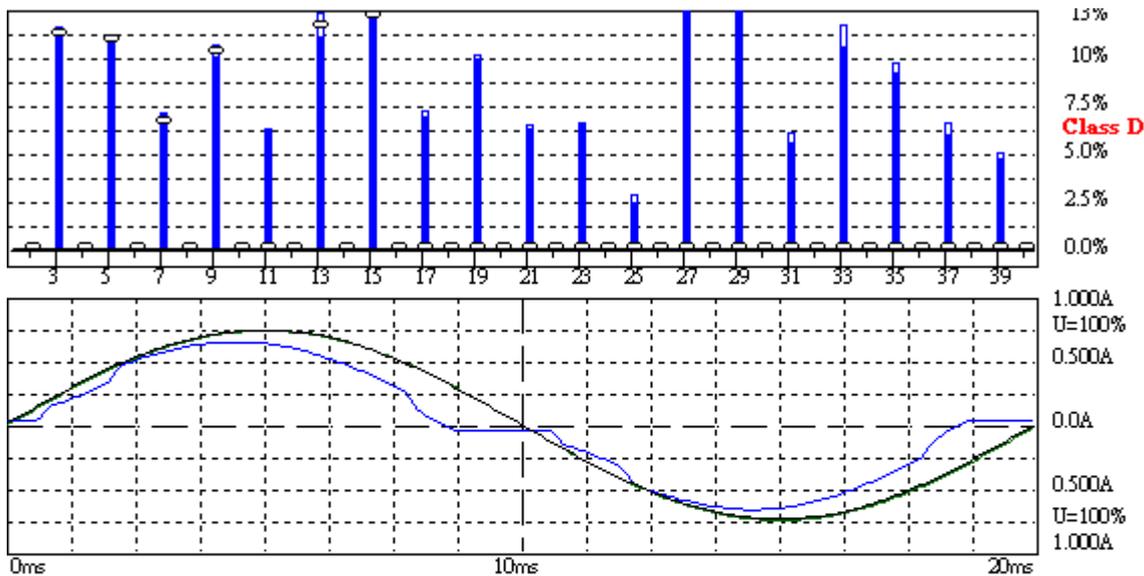
| | | | |
|---------------------------------|--------------|------------------|--------------|
| Power Consumption | 94.71W | Test Mode | Mode 2 |
| Environmental Conditions | 25°C, 49% RH | Tested by | Michael Chen |

Note:

- Limits classified according to item 7.4.3.
- According to clause 7 of EN 61000-3-2: EN61000-3-2: 2006 + A1: 2009 + A2: 2009, equipment with a rated power of 75W or less, no limits apply. The test result is only for reference.

Test result of EN 61000-3-2

Operator : Michael Chen
 EUT : Power
 Model : TPI100-148BA
 Remarks : Temp:25°C;Hum:49%;Press 999mbar



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

2013/2/7 PM 02:16:56

U_{rms} = 229.3 V P = 94.71 W THC = 0.084 A Range: 1 A
 I_{rms} = 0.429 A pf = 0.963 P_{max} = 94.69 W V_{nom}: 230 V
 TestTime: 5 min (100%)

Power Test completed, Result: PASSED

Temp:25°C;Hum:49%;Press 999mbar

HAR-1000 EMC-Retec

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



7.5. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

7.5.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

| TEST ITEM | LIMIT | REMARK |
|---------------|-------|--|
| P_{st} | 1.0 | P_{st} means short-term flicker indicator. |
| P_{lt} | 0.65 | P_{lt} means long-term flicker indicator. |
| T_{dt} (ms) | 500 | T_{dt} means maximum time that dt exceeds 3 %. |
| d_{max} (%) | 4% | d_{max} means maximum relative voltage change. |
| dc (%) | 3.3% | dc means relative steady-state voltage change |

7.5.2. TEST INSTRUMENTS

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

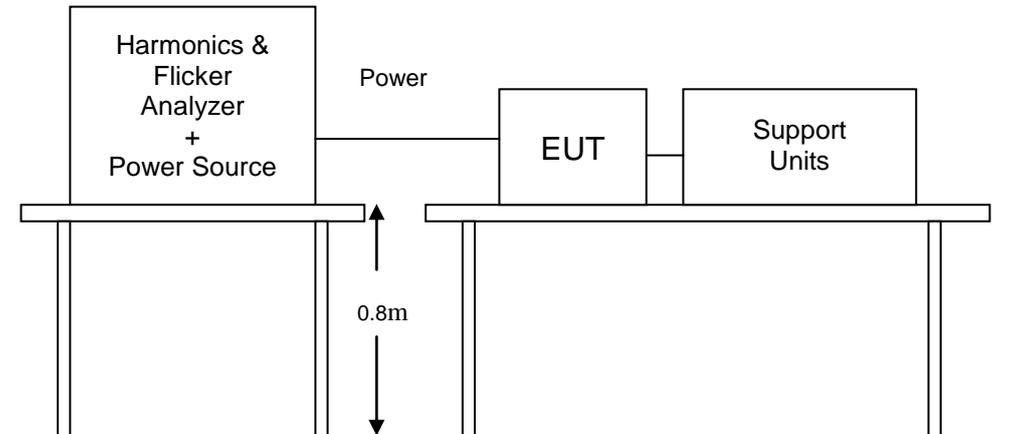
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.5.3. 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) | 10mins | Test Mode | Mode 2 |
| Environmental Conditions | 24°C, 45% RH | 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) | 0.0 | 500 | Pass |
| d_{max} (%) | 0.00 | 4% | Pass |
| dc (%) | 0.00 | 3.3% | Pass |

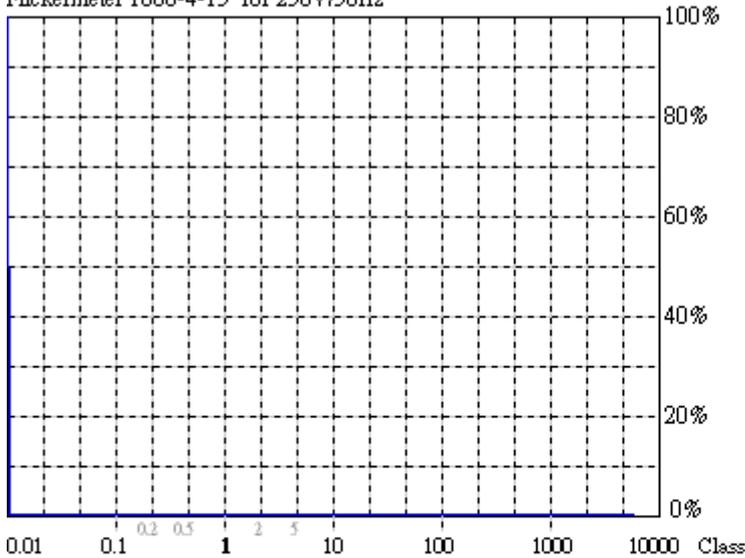
Note: None.



Test result of EN 61000-3-3

Operator : Michael Chen
 EUT : Power
 Model : TPI100-148BA
 Remarks : Temp:24°C;Hum:45%;Press 999mbar

Flickermeter 1000-4-15 for 230V/50Hz



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): 3.00%
Maximum Interval exceeding 3.30% (dt): 0.00ms
 Limit (dt>Lim): 500ms

Flicker Emission - IEC 61000-3-3 , EN 61000-3-3 , (EN60555-3)

2013/2/7 PM 02:32:39

U_{rms} = 229.1 V P = 95.71 W
 I_{rms} = 0.433 A pf = 0.965

Range: 1 A
 V_{nom}: 230 V
 TestTime: 12 min (100%)

Power

Test completed, Result: PASSED

Temp:24°C;Hum:45%;Press 999mbar

BAR-1000 FMC-Retro

- 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 | EN 55024:2010 | |
|--|---|--|
| | Test Type | Minimum Requirement |
| Basic Standard, Specification, and Performance Criterion required | IEC 61000-4-2 | Electrostatic Discharge – ESD: 8KV air discharge, 4kV Contact discharge, Performance Criterion B |
| | IEC 61000-4-3 | Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A |
| | IEC 61000-4-4 | Electrical Fast Transient/Burst - EFT, AC Power Port: 1kV DC Power Port: 0.5kV Signal Ports and Telecommunication Ports: 0.5kV Performance Criterion B |
| | IEC 61000-4-5 | Combination Wave for power port 1.2/50µs Open Circuit Voltage 8/20µs Short Circuit Current |
| | | Combination Wave for Signal and Telecommunication port 10/700µs Open Circuit Voltage 5/320µs Short Circuit Current |
| | IEC 61000-4-6 | AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV DC Power Port ~ line to earth: 0.5kV Performance Criterion B Signal and Telecommunication Ports ~ line to ground: 1kV Performance Criterion C |
| | IEC 61000-4-8 | Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A |
| | IEC 61000-4-11 | Power frequency magnetic field immunity test 50 Hz, 1A/m Performance Criterion A |
| | Voltage Dips: i) >95% reduction for 0.5 periods, Performance Criterion B ii) 30% reduction for 25 periods, Performance Criterion C Voltage Interruptions: >95% reduction for 250 periods Performance Criterion C | |



8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

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



8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

| | |
|-----------------------------|---|
| 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: | Air Discharge: min. 10 times at each test point for each polarity Contact Discharge: min. 200 times in total |
| 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:

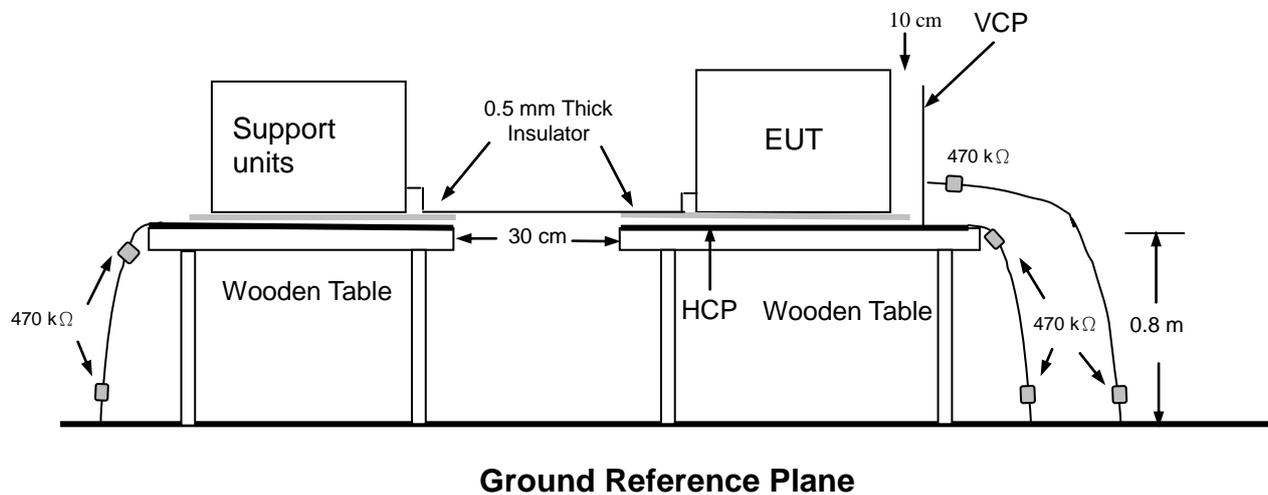
- a) Contact discharges to the conductive surfaces and coupling planes:
The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **Horizontal Coupling Plane (HCP)**. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
- b) Air discharges at slots and apertures and insulating surfaces:
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

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

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



8.3.4. TEST SETUP



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

Note:

TABLETOP 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 Ω 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 | | Criterion B | |

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

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

| Discharge To Horizontal Coupling Plane | | | | | | | | |
|--|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|---------------------------------------|----------------------------|-------------|
| Side of EUT | Test Levels | | | Results | | | | |
| | ± 2 kV | ± 4 kV | ± 6 kV | Pass | Fail | Performance Criterion | | Observation |
| Front | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> A | <input type="checkbox"/> B | Note 1 |
| 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 1 |
| Left | <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 1 |
| Right | <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 1 |

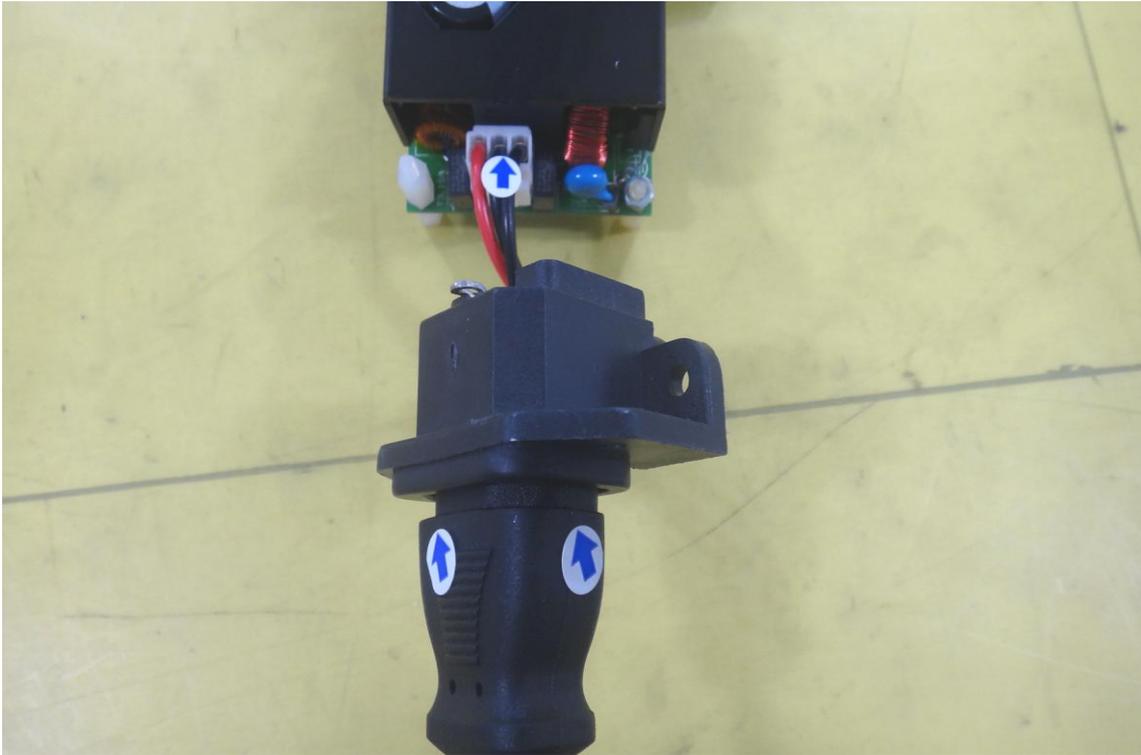
| Discharge To Vertical Coupling Plane | | | | | | | | |
|--------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|---------------------------------------|----------------------------|-------------|
| Side of EUT | Test Levels | | | Results | | | | |
| | ± 2 kV | ± 4 kV | ± 6 kV | Pass | Fail | Performance Criterion | | Observation |
| Front | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> A | <input type="checkbox"/> B | Note 1 |
| 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 1 |
| Left | <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 1 |
| Right | <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 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 ~1000 MHz

Field Strength: For Standard requirement: 3 V/m
According to the customer's requirement: 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: 1.5m



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 | 02/05/2014 |
| Power Sensor | BOONTON | 51011-EMC | 32862 | 02/05/2014 |
| Power Sensor | BOONTON | 51011-EMC | 32864 | 02/05/2014 |
| 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.



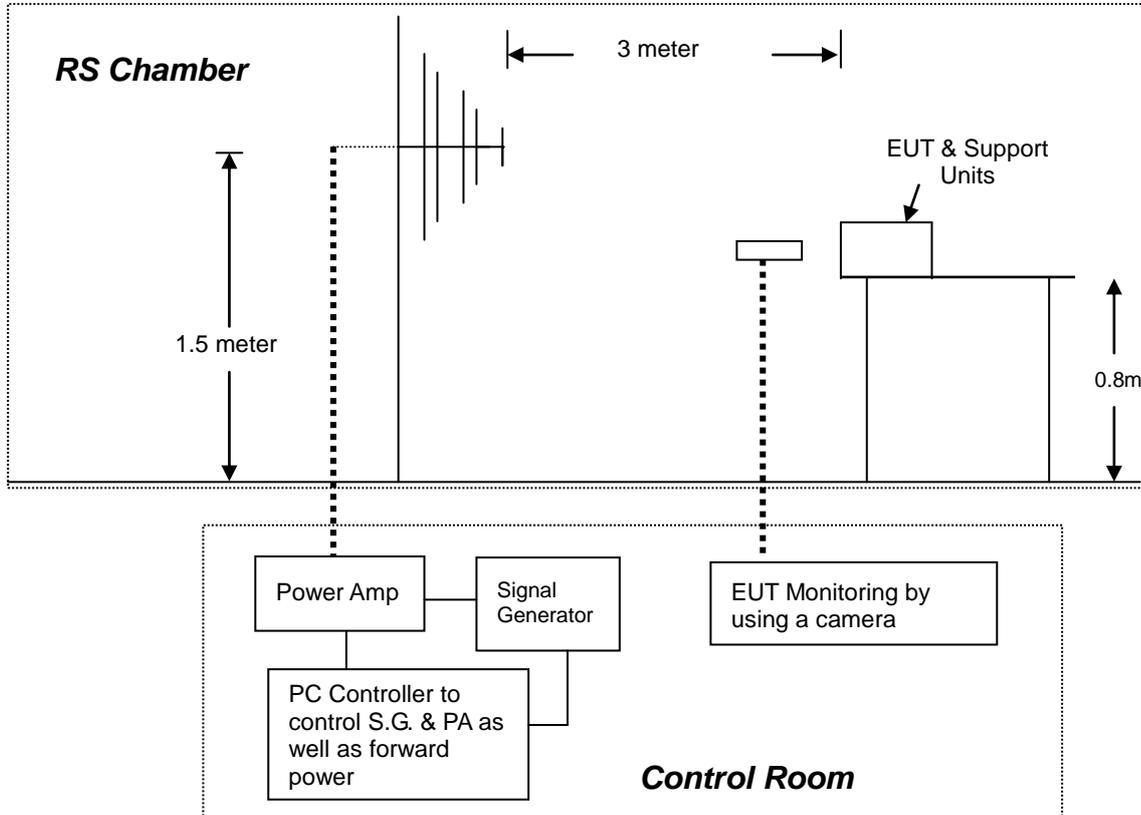
8.4.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-023)

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 1000 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 | Criterion A |

For Standard requirement:

| Frequency (MHz) | Polarity | Azimuth | Field Strength (V/m) | Performance Criterion | Observation | Result |
|-----------------|----------|---------|----------------------|--|---|--------|
| 80 ~ 1000 | V&H | 0 | 3 | <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 | 3 | <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 | 3 | <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 | 3 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 0 | 3 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 90 | 3 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 180 | 3 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 270 | 3 | <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.

According to the customer's requirement:

| Frequency (MHz) | Polarity | Azimuth | Field Strength (V/m) | Performance Criterion | Observation | Result |
|-----------------|----------|---------|----------------------|--|---|--------|
| 80 ~ 1000 | V&H | 0 | 20 | <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 | 20 | <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 | 20 | <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 | 20 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 0 | 10 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 90 | 10 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 180 | 10 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 1G~2.5G | V&H | 270 | 10 | <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

| | |
|----------------------------|--|
| Basic Standard: | IEC 61000-4-4 |
| Test Voltage: | For Standard requirement: AC Power Port: 1kV DC Power Port: 0.5kV Signal Ports and Telecommunication Ports: 0.5kV According to the customer's requirement: AC Power Port: 2kV |
| Polarity: | Positive & Negative |
| Impulse Frequency: | 5 kHz |
| Impulse Wave-shape: | 5/50 ns |
| Burst Duration: | 15 ms |
| Burst Period: | 300 ms |
| 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:

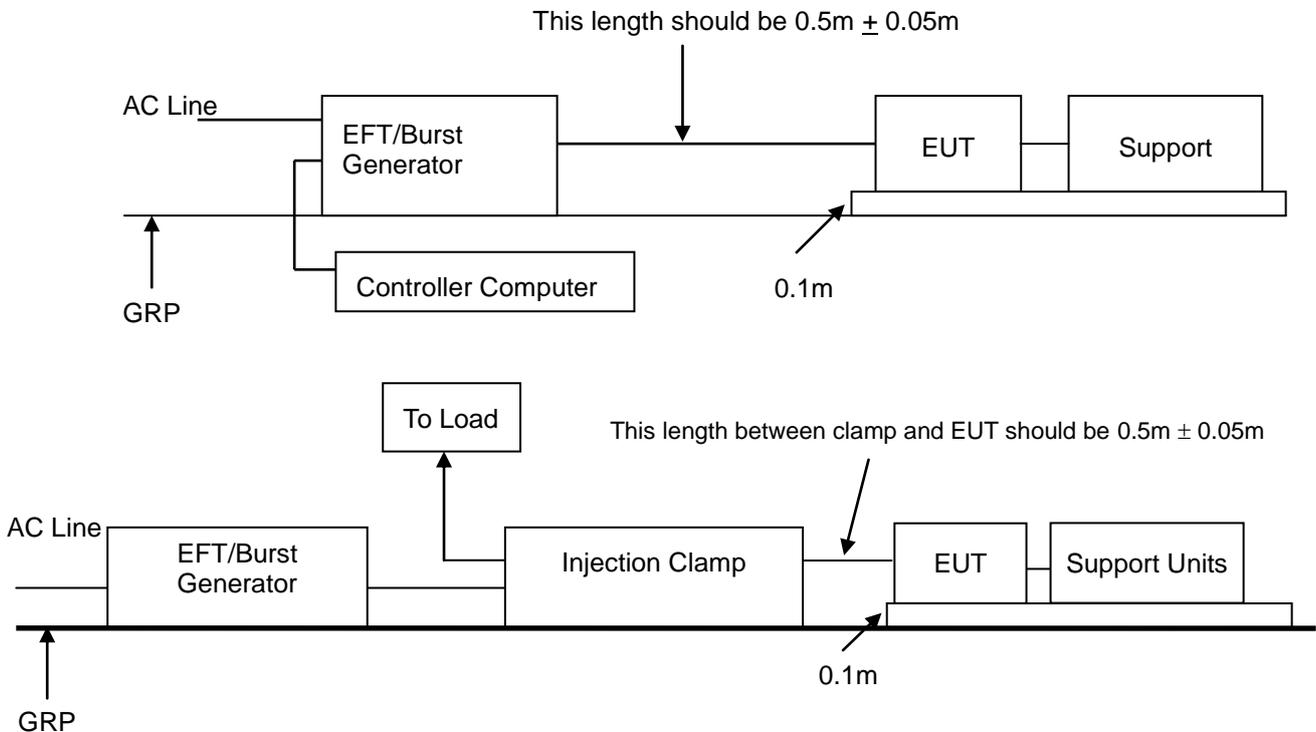
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

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 | | 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 |
| PE | +/- | 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 |
| 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 |

Note: 1. 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 for power port 1.2/50µs Open Circuit Voltage 8/20µs Short Circuit Current |
| | Combination Wave for Signal and Telecommunication port 10/700µs Open Circuit Voltage 5/320µs Short Circuit Current |
| Test Voltage: | AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV DC Power Port ~ line to earth: 0.5kV Performance Criterion B Signal and Telecommunication Ports ~ line to ground: 1kV Performance Criterion C |
| Surge Input/Output: | AC Power Line: L - N |
| 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:

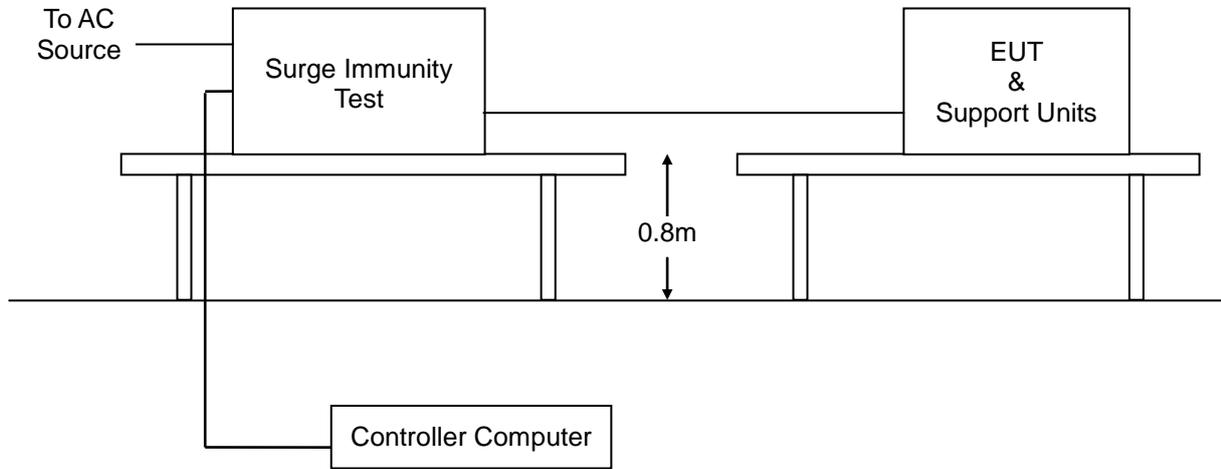
The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

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 | | 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 |

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: For Standard requirement:
3 Vrms
According to the customer's requirement:
20 Vrms

Modulation: 1kHz Sine Wave, 80%, AM Modulation

Frequency Step: 1 % of preceding frequency value

Coupled cable: Power Mains, Unshielded; LAN, Line, Unshielded

Coupling device:

- CDN-M2 (2 wires)
- CDN-M3 (3 wires)
- CDN-T2 for Line
- CDN-T4/T8 for LAN



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 |
| 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.

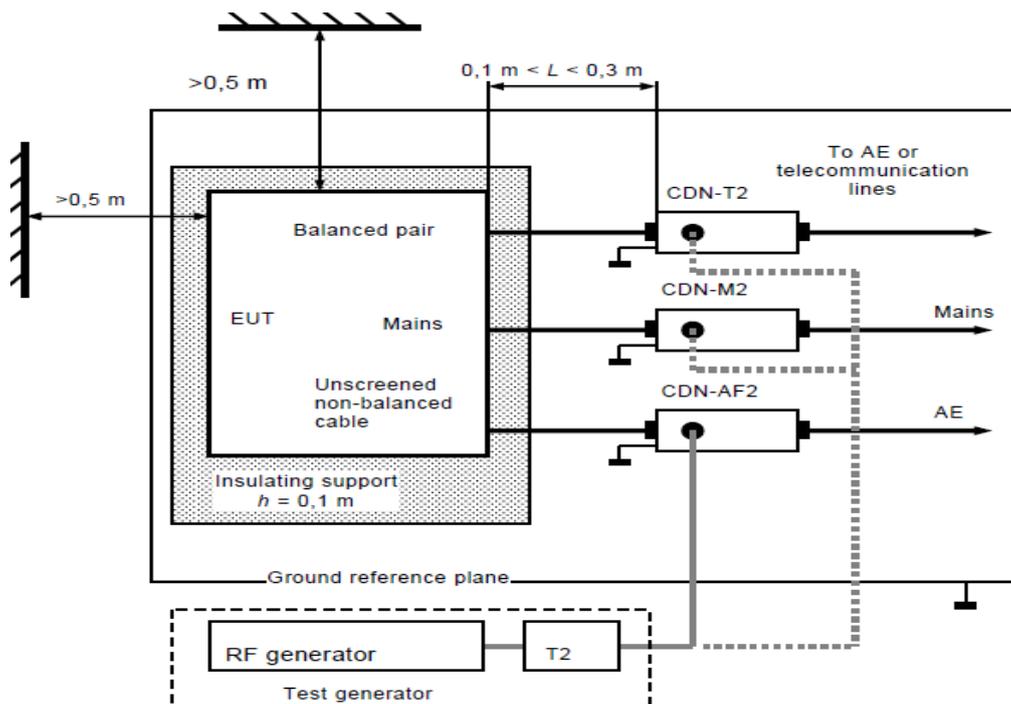
The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5×10^{-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 depend 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 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

| | | | |
|------------------------------|---------|-------------|-----------|
| Temperature | 25°C | Humidity | 50% RH |
| Pressure | 999mbar | Tested By | Eason Liu |
| Required Passing Performance | | Criterion A | |

For Standard requirement:

| Frequency Band (MHz) | Field Strength (Vrms) | Cable | Injection Method | Performance Criterion | Observation | Result |
|----------------------|-----------------------|---------------|------------------|--|---|--------|
| 0.15 ~ 80 | 3 | AC Power Line | CDN-M3 | <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.

According to the customer's requirement:

| Frequency Band (MHz) | Field Strength (Vrms) | Cable | Injection Method | Performance Criterion | Observation | Result |
|----------------------|-----------------------|---------------|------------------|--|---|--------|
| 0.15 ~ 80 | 20 | AC Power Line | CDN-M3 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |



8.8. POWER FREQUENCY MAGNETIC FIELD

8.8.1. TEST SPECIFICATION

| | |
|--------------------------|--|
| Basic Standard: | IEC 61000-4-8 |
| Frequency Range: | 50Hz |
| Field Strength: | For Standard requirement: 1 A/m According to the 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 |
| Triax Elf Magnetic Field Meter | F.W.BELL | 4190 | 0845014 | 02/21/2014 |
| 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

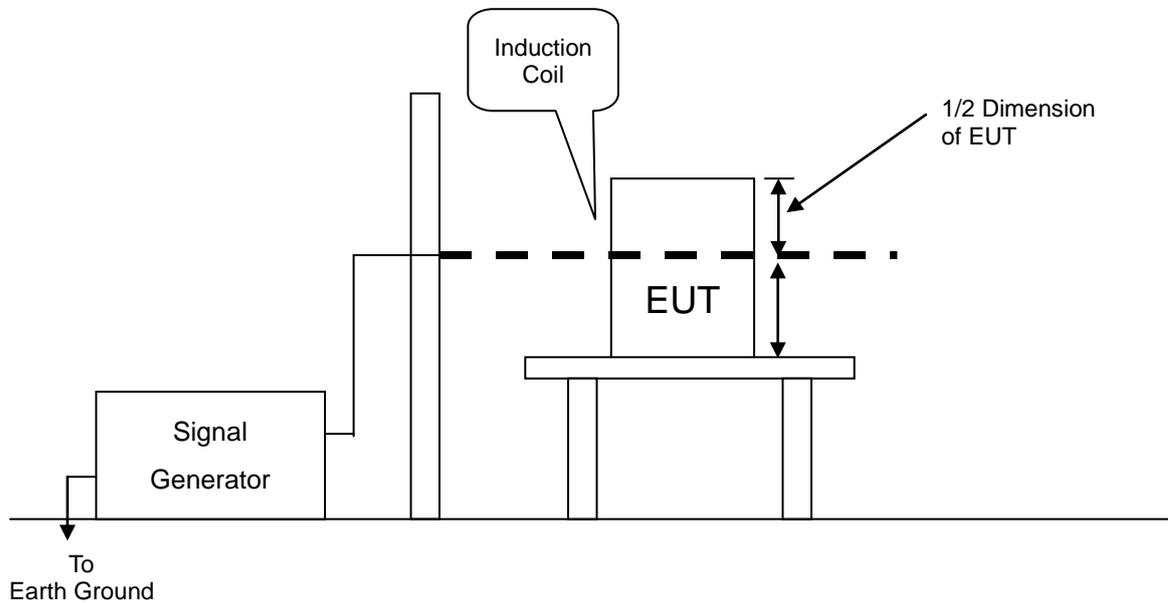
8.8.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-027)

- 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 | 27°C | Humidity | 48% RH |
| Pressure | 999mbar | Tested By | Michael Chen |
| Required Passing Performance | | Criterion A | |

For Standard requirement:

| DIRECTION | Field Strength (A/m) | Performance Criterion | OBSERVATION | RESULTS |
|-----------|----------------------|--|---|---------|
| X | 1 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| Y | 1 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| Z | 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.

According to the customer's requirement:

| DIRECTION | Field Strength (A/m) | Performance Criterion | OBSERVATION | RESULTS |
|-----------|----------------------|--|---|---------|
| X | 10 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| Y | 10 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| Z | 10 | <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.



8.9. 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° / 45° / 90° / 135° / 180° / 225° / 270° / 315° |
| Test cycle: | 3 times |

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:

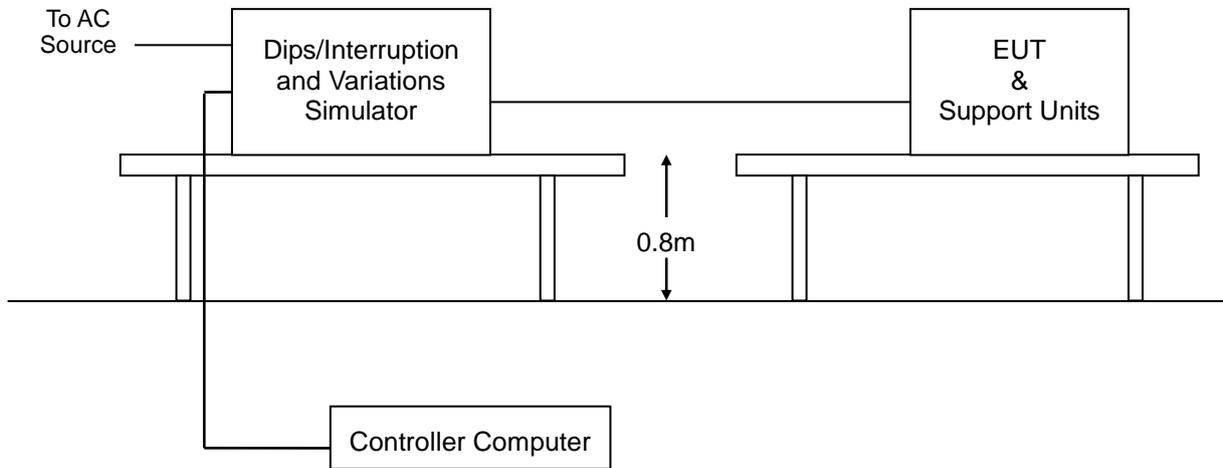
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

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

| | | | |
|-------------------------------------|---|------------------|-------------|
| Temperature | 22°C | Humidity | 50% RH |
| Pressure | 999mbar | Tested By | Moore Cheng |
| Required Passing Performance | Criterion B: >95% reduction 0.5 periods Criterion C: 30% reduction 25 periods & >95% reduction 250 periods | | |

| Test Power: 230Vac, 50Hz and 100Vac, 50Hz | | | | |
|---|-------------------|---|---|-------------|
| Voltage (% Reduction) | Duration (Period) | Performance Criterion | Observation | Test Result |
| >95 | 0.5 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| 30 | 25 | <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C | Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 | PASS |
| >95 | 250 | <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C | Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 | 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 manually as the events disappeared..



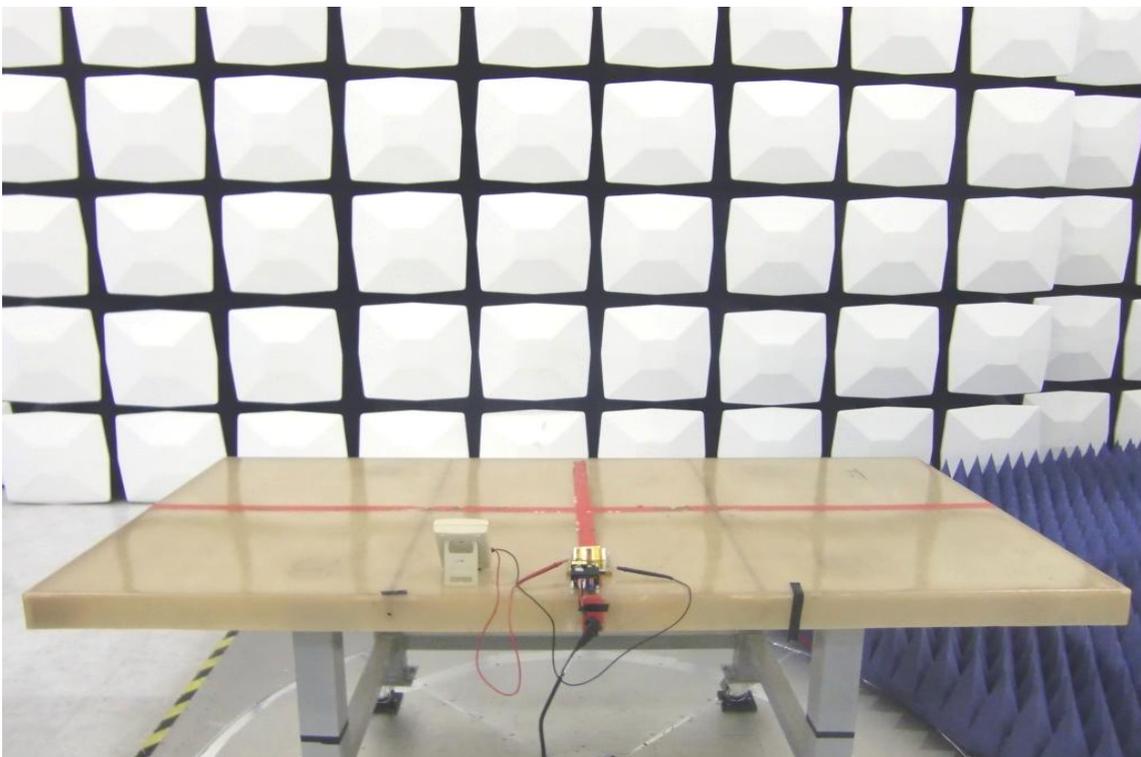
9 PHOTOGRAPHS OF THE TEST CONFIGURATION CONDUCTED EMISSION TEST





RADIATED EMISSION TEST

Below 1GHz





HARMONIC & FLICKER TEST

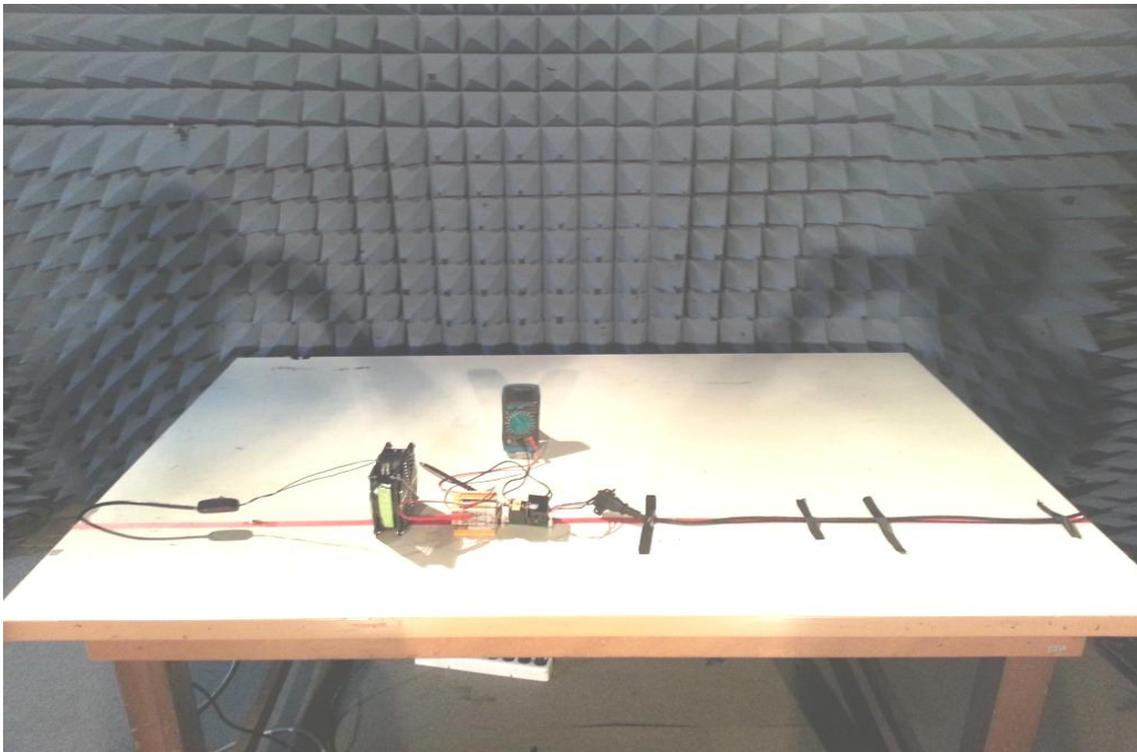




ESD TEST

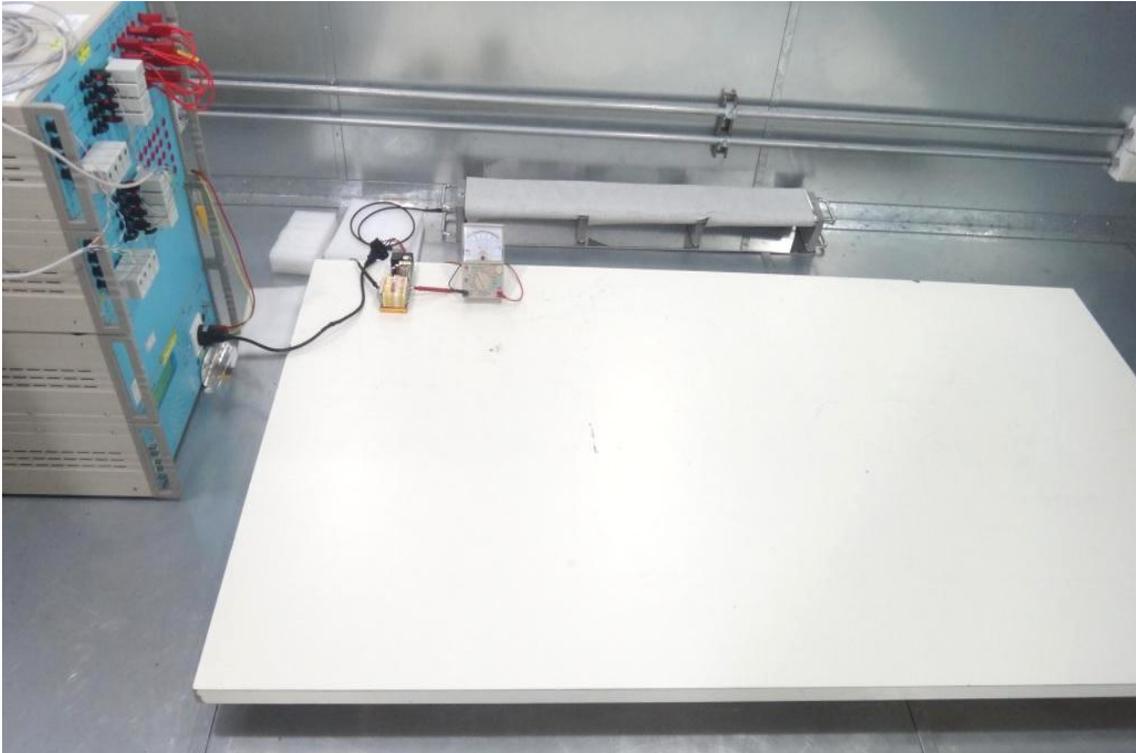


RS TEST

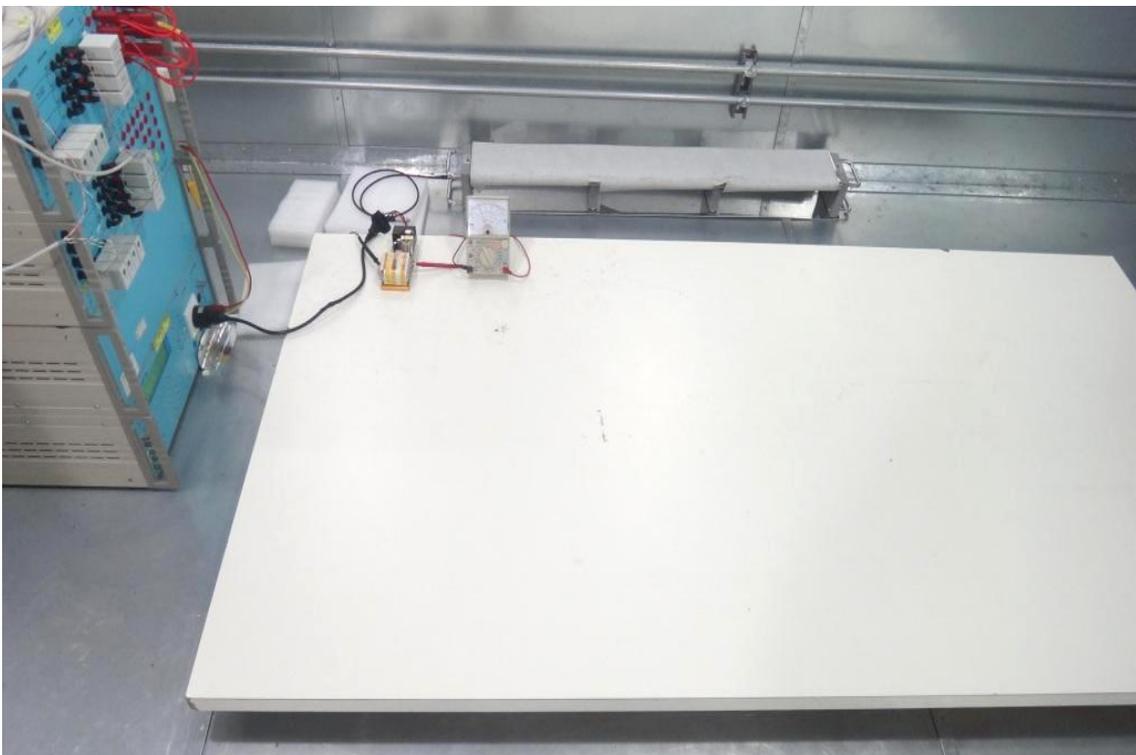




EFT TEST

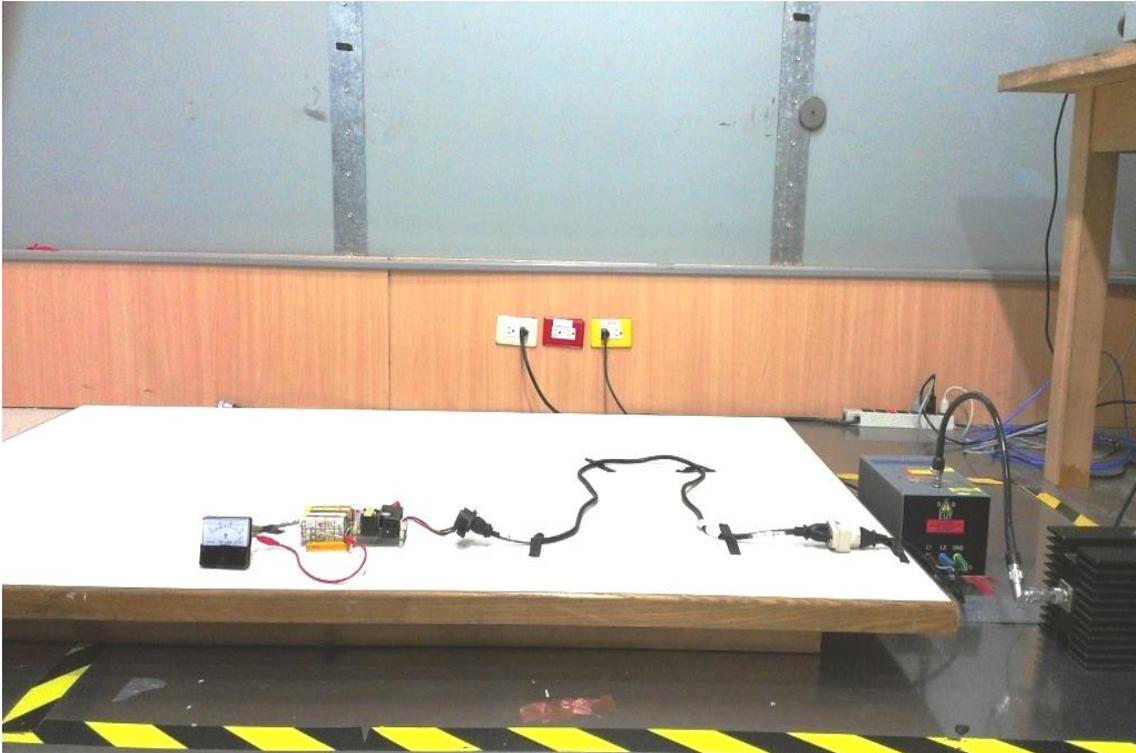


SURGE TEST

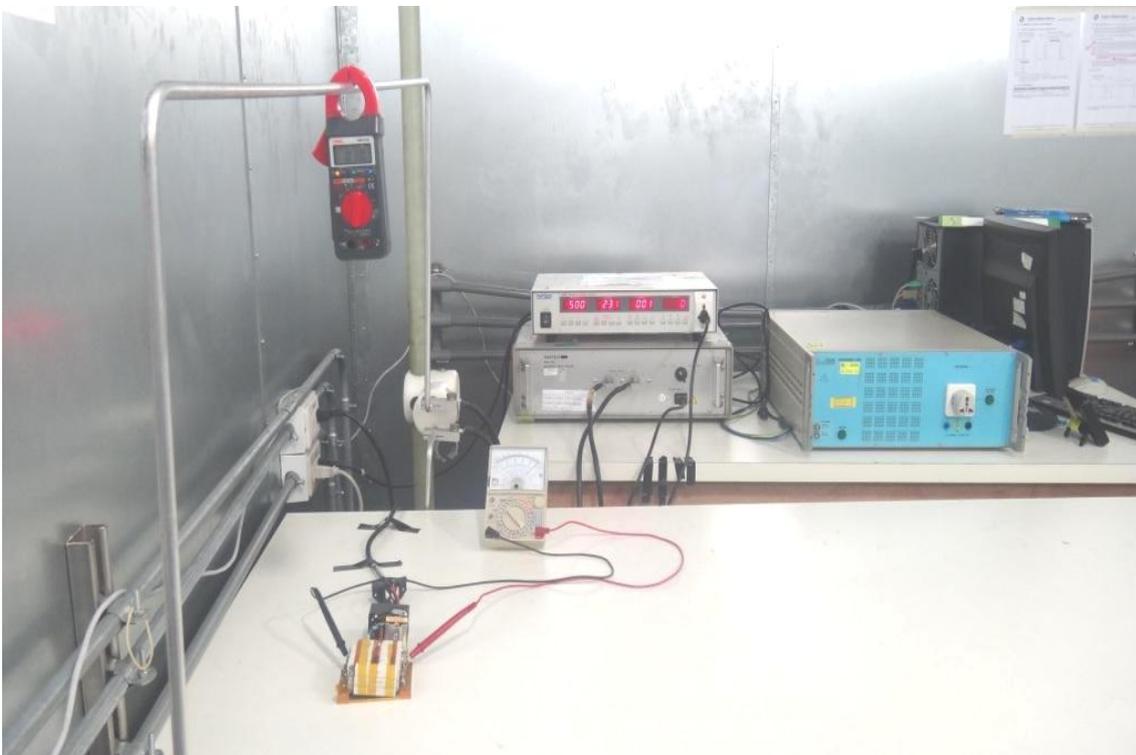




CS TEST



POWER FREQUENCY MAGNETIC FIELD





VOLTAGE DIPS / INTERRUPTIONS TEST

