SPORTON LAB.

Project No : EC4O1707-02

VERIFICATION OF COMPLIANCE

EQUIPMENT : **AC-DC Power Module**
MODEL NO. : **TMG 07105、TMG 07112、TMG 07115、TMG 07124**
APPLICANT : **Traco Electronic AG**
Sihlbruggstrasse 111, 6340 Baar, Switzerland

SPORTON LAB.

I HEREBY DECLARE THAT :

THE MEASUREMENTS SHOWN IN THIS TEST REPORT WERE MADE IN ACCORDANCE WITH THE PROCEDURES GIVEN IN **EUROPEAN COUNCIL DIRECTIVE 2014/30/EU.** THE EQUIPMENT WAS **PASSED** THE TEST PERFORMED ACCORDING TO
European Standard EN 55022:2010/AC:2011 Class B, EN 55032:2012 Class B, EN 61000-3-2:2014, EN 61000-3-3:2013 and EN 55024:2010 (IEC 61000-4-2 Edition 2.0 2008-12, IEC 61000-4-3 Edition 3.2 2010-04, IEC 61000-4-4 Edition 3.0 2012-04, IEC 61000-4-5 Edition 2.0 2005-11, IEC 61000-4-6 Edition 3.0 2008-10, IEC 61000-4-8 Edition 2.0 2009-09, IEC 61000-4-11 Edition 2.0 2004-03)
THE TEST WAS CARRIED OUT ON **Jan. 27, 2016** AT **SPORTON INTERNATIONAL INC.** LAB.

Jack Deng
Engineering Manager

CE EMC TEST REPORT

According to

**European Standard EN 55022:2010/AC:2011 Class B,
EN 61000-3-2:2014, EN 61000-3-3:2013,
EN 55024:2010 (IEC 61000-4-2 Edition 2.0 2008-12,
IEC 61000-4-3 Edition 3.2 2010-04, IEC 61000-4-4 Edition 3.0 2012-04,
IEC 61000-4-5 Edition 2.0 2005-11, IEC 61000-4-6 Edition 3.0 2008-10,
IEC 61000-4-8 Edition 2.0 2009-09, IEC 61000-4-11 Edition 2.0 2004-03)**

Equipment : AC-DC Power Module

Model No. : TMG 07105、TMG 07112、
TMG 07115、TMG 07124

Applicant : **Traco Electronic AG**
Sihlbruggstrasse 111, 6340 Baar, Switzerland

- The test result refers exclusively to the test presented test model / sample.
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- This test report is only applicable to European Community.

TAF
Testing Laboratory
1190

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan, R.O.C.

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
EC4O1707-02	Rev. 01	Initial issue of report	Jul. 11, 2016
EC4O1707-02	Rev. 01	Additional EN 55032 Measurement Data as Appendix B.	Jul. 11, 2016

Verification No. : EC4O1707-02

VERIFICATION OF COMPLIANCE

According to

European Standard EN 55022:2010/AC:2011 Class B, EN 61000-3-2:2014, EN 61000-3-3:2013, EN 55024:2010 (IEC 61000-4-2 Edition 2.0 2008-12, IEC 61000-4-3 Edition 3.2 2010-04, IEC 61000-4-4 Edition 3.0 2012-04, IEC 61000-4-5 Edition 2.0 2005-11, IEC 61000-4-6 Edition 3.0 2008-10, IEC 61000-4-8 Edition 2.0 2009-09, IEC 61000-4-11 Edition 2.0 2004-03)

Equipment	: AC-DC Power Module
Model No.	: TMG 07105、TMG 07112、TMG 07115、TMG 07124
Applicant	: **Traco Electronic AG** Sihlbruggstrasse 111, 6340 Baar, Switzerland

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 2014/30/EU.** The equipment was ***passed*** the test performed according to **European Standard EN 55022:2010/AC:2011 Class B, EN 61000-3-2:2014, EN 61000-3-3:2013 and EN 55024:2010 (IEC 61000-4-2 Edition 2.0 2008-12, IEC 61000-4-3 Edition 3.2 2010-04, IEC 61000-4-4 Edition 3.0 2012-04, IEC 61000-4-5 Edition 2.0 2005-11, IEC 61000-4-6 Edition 3.0 2008-10, IEC 61000-4-8 Edition 2.0 2009-09, IEC 61000-4-11 Edition 2.0 2004-03).**
The product sample received on **Oct. 16, 2014** and completely tested on **Dec. 28, 2015** at **SPORTON International Inc.** LAB.

Jack Deng
Engineering Manager

SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan, R.O.C.

1. General Description of Equipment under Test

1.1 Applicant

Traco Electronic AG
Sihlbruggstrasse 111, 6340 Baar, Switzerland

1.2 Manufacturer

Traco Electronic AG
Sihlbruggstrasse 111, 6340 Baar, Switzerland

1.3 Basic Description of Equipment under Test

Equipment	:	AC-DC Power Module
Model No.	:	TMG 07105、TMG 07112、TMG 07115、TMG 07124
Brand Name	:	Traco
Power Supply Type	:	Switching
AC Power Cord	:	Non-Shielded, 1.8m, 2 pin

The maximum operating frequency is 60MHz

1.4 Feature of Equipment under Test

Please refer to user manual.

2. Test Configuration of Equipment under Test

2.1 Test Manner

a. During testing, the interface cables and equipment positions were varied according to European Standard EN 55022 and EN55024.

b. The complete test system included Load and EUT for EMI test.

c. The following test mode was for conducted final test:

Mode 1. TMG 07105 (FULL LOAD)

d. The following test mode was for radiated final test:

Mode 1. TMG 07105 (FULL LOAD)

Note: The highest frequency of the internal sources of the EUT is less than 108MHz, so the measurement shall only be made up to 1GHz.

e. The complete test system included Load, Multi-meter and EUT for EMS test.

f. The following test mode was for EMS final test:

Mode 1. TMG 07105 (FULL LOAD)

Note: The test configuration, test modes and test software used in this test report are designated by the applicant.

g. Frequency range investigated: Conducted 150 kHz to 30 MHz, Radiated 30 MHz to 1,000 MHz.

2.2 Description of Test System

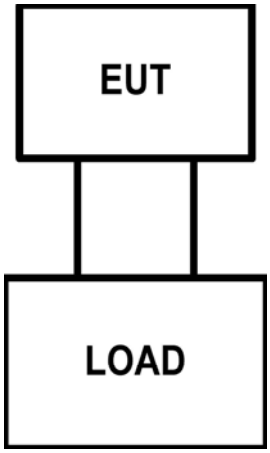
< EMI >

No.	Description	Manufacturer	Model	Signal Cable Description
For Local				
1	Load	[redacted]	3.9Ω	---

< EMS >

No.	Description	Manufacturer	Model	Signal Cable Description
For Local				
1	Dummy Load	SSR	400W / 25Ω	---
2	Multi-meter	YFE	YF-370A	Probe Cable, Non-Shielded, 1.0m

2.3 Connection Diagram of Test System for Conducted and Radiated Emission



3. Test Software

No test software was used during testing.

4. General Information of Test

4.1 Test Facility

< EMI >

For conducted emission and radiated emission below 1GHz

Test Site Location	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 886-2-2631-5551 FAX : 886-2-2631-9740
Test Site No.	:	CO01-NH **(For conducted emission)** OS03-NH **(For radiated emission below 1GHz)**

< EMS >

Test Site Location	:	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan, R.O.C TEL : 886-3-327-3456 FAX : 886-3-327-0973

4.2 Test Voltage

230Vac / 50Hz

4.3 Standard for Methods of Measurement

EMI Test	:	European Standard EN 55022 Class B
Harmonics Test	:	European Standard EN 61000-3-2
Voltage Fluctuations Test	:	European Standard EN 61000-3-3
EMS Test	:	European Standard EN 55024 (ESD: IEC 61000-4-2, RS: IEC 61000-4-3, EFT: IEC 61000-4-4, Surge: IEC 61000-4-5, CS: IEC 61000-4-6, Power Frequency Magnetic Field: IEC 61000-4-8, Dips: IEC 61000-4-11)

4.4 Test in Compliance with

EMI Test	:	European Standard EN 55022 Class B
Harmonics Test	:	European Standard EN 61000-3-2
Voltage Fluctuations Test	:	European Standard EN 61000-3-3
EMS Test	:	European Standard EN 55024 (ESD: IEC 61000-4-2, RS: IEC 61000-4-3, EFT: IEC 61000-4-4, Surge: IEC 61000-4-5, CS: IEC 61000-4-6, Power Frequency Magnetic Field: IEC 61000-4-8, Dips: IEC 61000-4-11)

4.5 Frequency Range Investigated

a. Conducted emission test: from 150 kHz to 30 MHz
b. Radiated emission test: from 30 MHz to 1,000 MHz
c. Radio frequency electromagnetic field immunity test: 80-1,000 MHz

4.6 Test Distance

a. The test distance of radiated emission from antenna to EUT is 10 M (from 30MHz ~ 1GHz)
b. The test distance of radio frequency electromagnetic field immunity test from antenna to EUT is 3 M

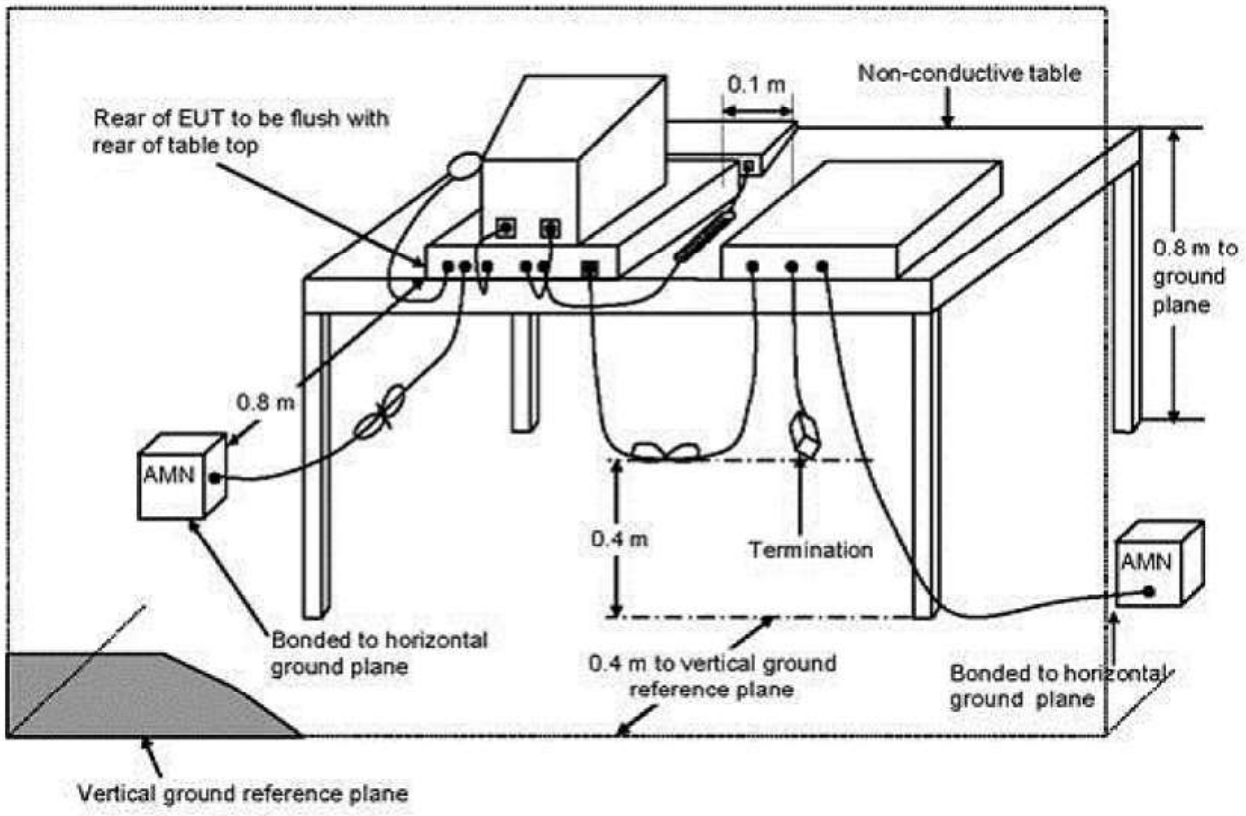
5. Test of Conducted Powerline

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz and return leads of the EUT according to the methods defined in EN 55022, Clause 9. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 5.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

5.1 Test Procedures

a. The EUT was warmed up for 15 minutes before testing started.
b. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
c. Connect EUT to the power mains through a line impedance stabilization network (LISN).
d. All the support units are connected to the other LISN.
e. The LISN provides 50 ohm coupling impedance for the measuring instrument.
f. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
g. Both sides of AC line were checked for maximum conducted interference.
h. The frequency range from 150 kHz to 30 MHz was searched.
i. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5.2 Typical Test Setup Layout of Conducted Powerline

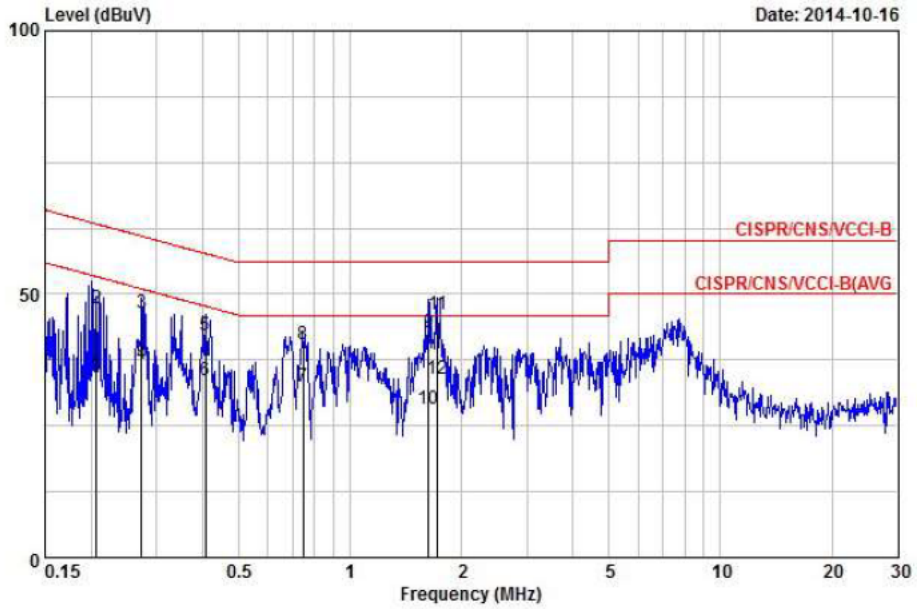


5.3 Test Result of AC Powerline Conducted Emission

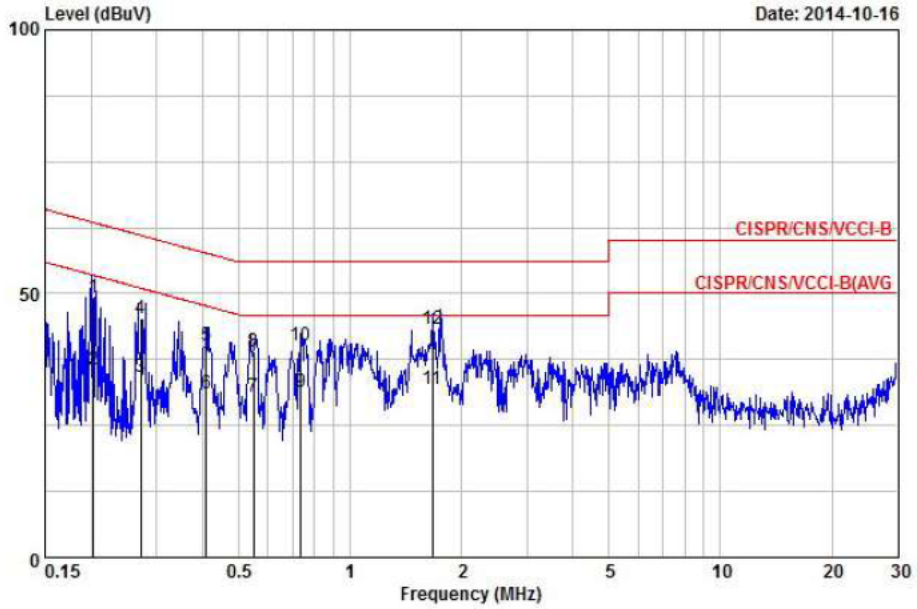
Test Mode	Mode 1	Temperature	25℃
Test Engineer	Willy Lee	Humidity	52%

Note: Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level

■ **The test was passed at the minimum margin that marked by the frame in the following data**



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.207	34.90	-18.43	53.33	24.24	10.56	0.10	AVERAGE
2	0.207	47.21	-16.12	63.33	36.55	10.56	0.10	QP
3	0.273	46.37	-14.66	61.03	35.74	10.53	0.10	QP
4	0.273	36.82	-14.21	51.03	26.19	10.53	0.10	AVERAGE
5	0.406	42.21	-15.51	57.73	31.62	10.49	0.10	QP
6	0.406	33.70	-14.02	47.73	23.11	10.49	0.10	AVERAGE
7	0.746	32.50	-13.50	46.00	21.90	10.50	0.10	AVERAGE
8	0.746	40.50	-15.50	56.00	29.90	10.50	0.10	QP
9	1.628	42.78	-13.22	56.00	32.07	10.54	0.17	QP
10	1.628	28.32	-17.68	46.00	17.61	10.54	0.17	AVERAGE
11 @	1.725	46.02	-9.98	56.00	35.30	10.54	0.18	QP
12	1.725	33.93	-12.07	46.00	23.21	10.54	0.18	AVERAGE



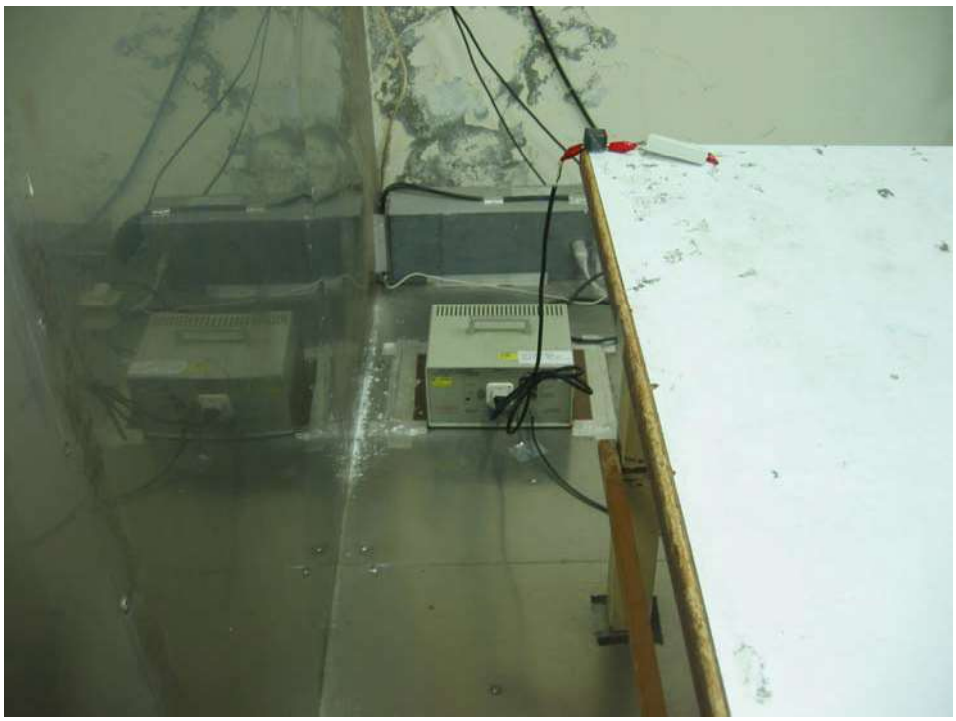
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.203	49.43	-14.07	63.49	39.25	10.08	0.10	QP
2	0.203	35.52	-17.98	53.49	25.34	10.08	0.10	AVERAGE
3	0.272	34.10	-16.97	51.07	23.92	10.08	0.10	AVERAGE
4	0.272	45.31	-15.76	61.07	35.13	10.08	0.10	QP
5	0.409	40.26	-17.40	57.66	30.08	10.08	0.10	QP
6	0.409	30.91	-16.75	47.66	20.73	10.08	0.10	AVERAGE
7	0.549	30.36	-15.64	46.00	20.17	10.08	0.10	AVERAGE
8	0.549	38.98	-17.02	56.00	28.79	10.08	0.10	QP
9	0.736	31.40	-14.60	46.00	21.22	10.09	0.10	AVERAGE
10	0.736	40.28	-15.72	56.00	30.10	10.09	0.10	QP
11	1.671	32.02	-13.98	46.00	21.73	10.11	0.17	AVERAGE
12	1.671	43.30	-12.70	56.00	33.01	10.11	0.17	QP

5.4 Photographs of Conducted Power line Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW

REAR VIEW



SIDE VIEW

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in European Standard EN 55022, Clause 10. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 6.2. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1 Test Procedures

< Below 1GHz >

a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 10 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
   If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.

< Above 1GHz >

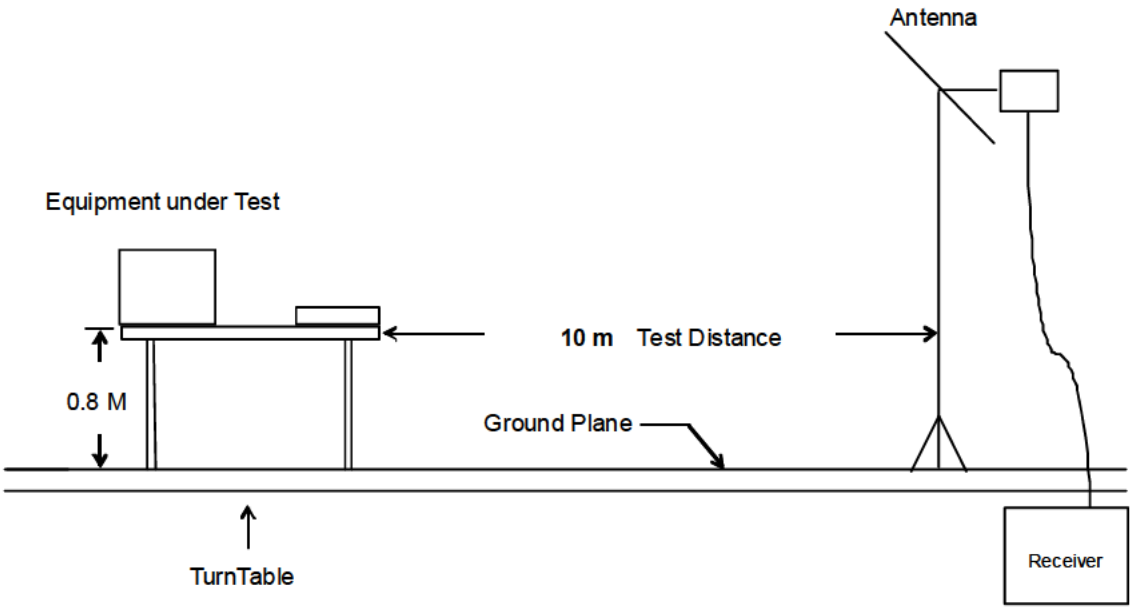
a. The EUT was placed on a turntable at the height of 0.8 meters from the ground.
b. The EUT was set at a distance of 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
c. An absorber was placed between the EUT and Antenna as required per the CISPR16-1-14 standard, specifically, the measurement setup requirements defined for an accredited test site.
d. The table was rotated 360 degrees to determine the position of the highest radiation.
e. Set the measuring receiver system to “Peak Detection” function and “Specified Bandwidth” with the “Maximum Hold” mode set on the measuring receiver.
f. The DRG Horn Antenna was set at a height of 1 meter while turning the turntable to obtain the EUT’s most maximized operational radiation noise readings from both the “Horizontal” and “Vertical” polarizations separately.
g. When an EUT is located on the turntable, and its height is over 172cm (when the antenna’s 3dB beam width of 6GHz is at 27°), the DRG Horn Antenna must be raised and descended while turning the turntable to obtain the EUT’s most maximized operational radiation noise readings from both the “Horizontal” and “Vertical” polarizations separately.

   NOTE: The maximum raise height of the antenna is the same height as that of the top of the EUT while located on top of the turntable.

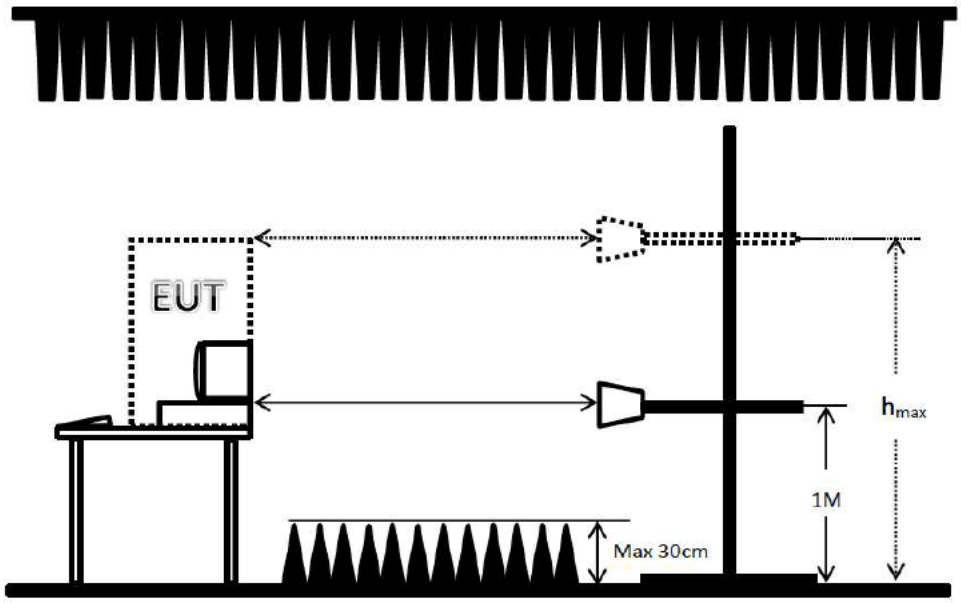
   If the emission level of the EUT in “Peak Detection” mode is 20dB lower than the “Average” limit (means that the emission level in “Peak Detection” mode also complies with the limit in “Average Mode”), testing will be stopped and “Peak” values of the EUT will be reported, otherwise, the emissions of the EUT will be measured in “Average Mode” again and then reported.

6.2 Typical Test Setup Layout of Radiated Emission

< Below 1GHz >



< Above 1GHz >



Remark: When EUT's height is over 172cm, h_{max} = top of EUT

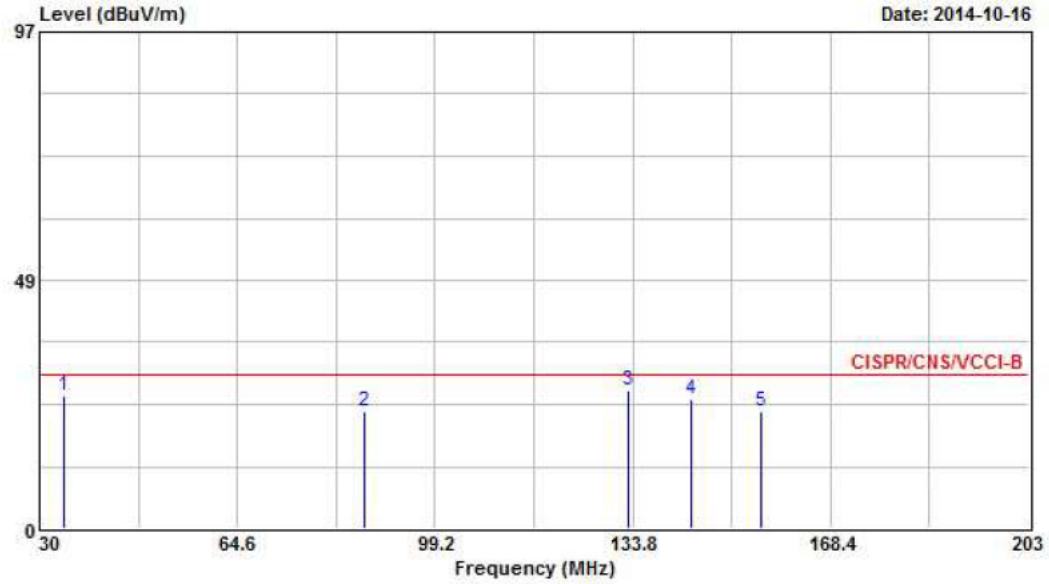
6.3 Test Result of Radiated Emission

Frequency Range of Test	From 30 MHz to 1000 MHz	Test Distance	10m
Test Mode	Mode 1	Temperature	20℃
Test Engineer	Alan Hsieh	Humidity	55%

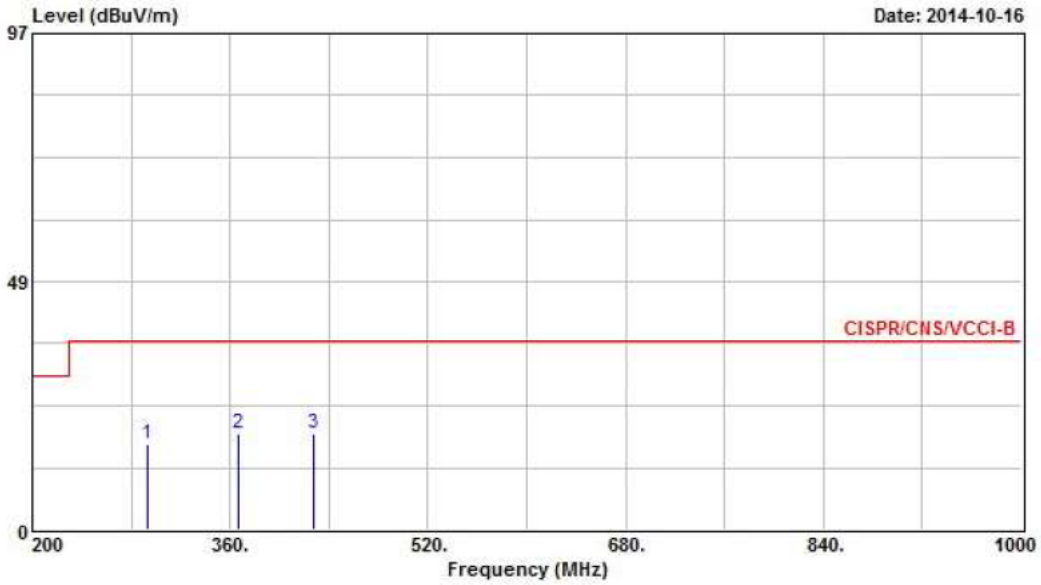
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)

2. Corrected Reading : Probe Factor + Cable Loss + Read Level – Preamp Factor = Level

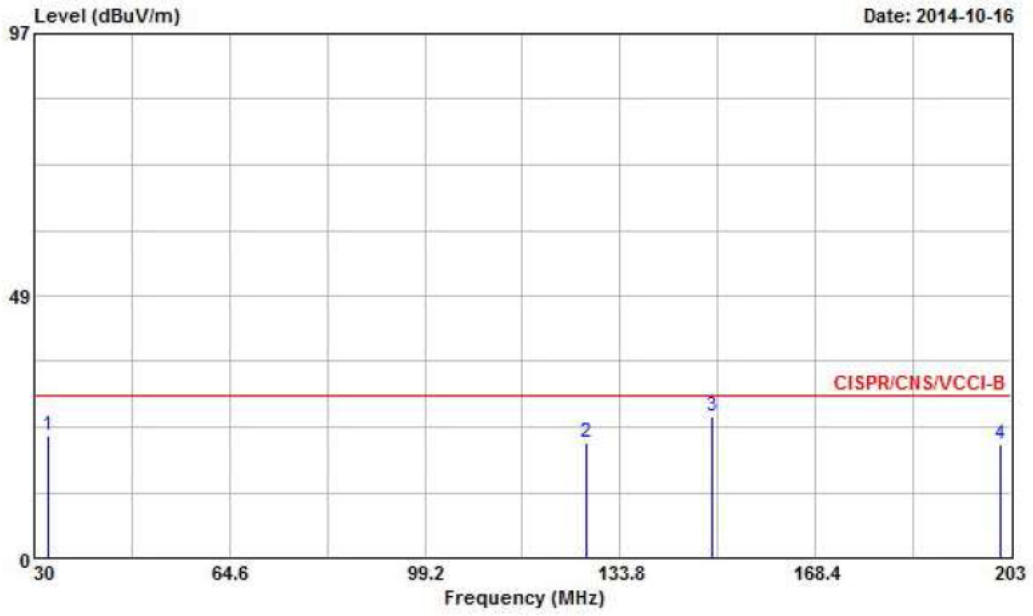
■ **The test was passed at the minimum margin that marked by the frame in the following data**



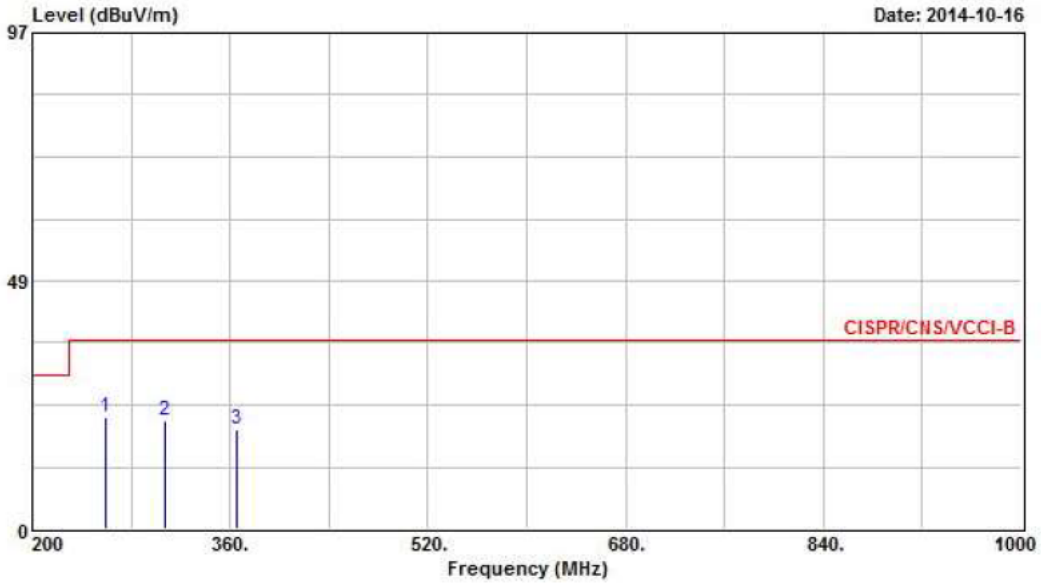
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	34.320	26.11	-3.89	30.00	37.14	16.46	0.96	28.45	Peak	---	---
2	86.700	23.02	-6.98	30.00	41.57	8.20	1.55	28.30	Peak	---	---
3 @	133.140	26.83	-3.17	30.00	41.06	11.94	1.98	28.15	QP	100	32
4	143.940	25.27	-4.73	30.00	40.15	11.17	2.07	28.12	Peak	---	---
5	156.360	22.84	-7.16	30.00	38.37	10.39	2.15	28.07	Peak	---	---



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	293.600	16.87	-20.13	37.00	28.40	13.16	3.05	27.74	Peak	---	---
2	366.400	18.74	-18.26	37.00	28.61	14.92	3.43	28.22	Peak	---	---
3	427.200	18.95	-18.05	37.00	27.61	16.21	3.73	28.60	Peak	---	---



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	32.430	22.56	-7.44	30.00	33.01	17.07	0.94	28.46	Peak	---	---
2	127.740	21.43	-8.57	30.00	35.40	12.27	1.93	28.17	Peak	---	---
3 @	150.150	26.04	-3.96	30.00	41.39	10.64	2.10	28.09	Peak	---	---
4	201.000	21.04	-8.96	30.00	36.89	9.60	2.47	27.92	Peak	---	---
5	257.610	21.08	-15.92	37.00	33.59	12.49	2.81	27.81	Peak	---	---



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	259.200	21.71	-15.29	37.00	34.21	12.50	2.81	27.81	Peak	---	---
2	307.200	21.02	-15.98	37.00	32.20	13.46	3.15	27.79	Peak	---	---
3	365.600	19.52	-17.48	37.00	29.40	14.90	3.43	28.21	Peak	---	---

6.4 Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW

REAR VIEW

6.5 Test Result of Radiated Emission (Above 1GHz)

The highest frequency of the internal sources of the EUT is less than 108MHz, so the measurement shall only be made up to 1GHz.

7. Harmonics Test

7.1 Standard

- Standard : EN 61000-3-2

7.2 Test Procedure

The measurement of harmonic currents shall be performed as follows:

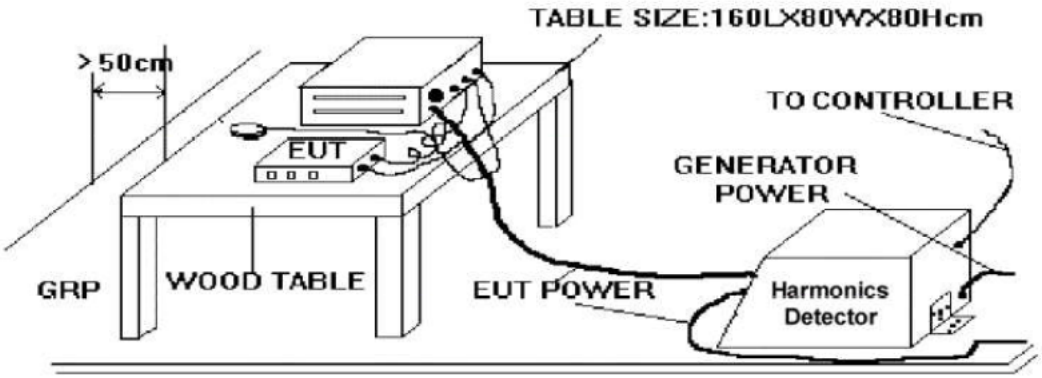
– for each harmonic order, measure the 1.5 s smoothed r.m.s. harmonic current in each DFT time window as defined in EN / IEC 61000-4-7: 2002.

– calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period Short cyclic (Tcycle ≦ 2.5 min). Because of synchronisation to meet the requirements for repeatability in 5%.

7.3 Test Equipment Settings

Line Voltage	230 V
Line Frequency	50 Hz
Device Class	---
Current Measurement Range	High
Measurement Delay	10.0 seconds
Test Duration	10.0 minutes
Class determination Pre-test Duration	10.0 seconds

7.4 Test Setup



7.5 Current Harmonics Test

V_RMS (Volts):	230.33	Frequency(Hz):	50.00
I_Peak (Amps):	0.386	I_RMS (Amps):	0.076
I_Fund (Amps):	0.035	Crest Factor:	5.099
Power (Watts):	7.6	Power Factor:	0.439

As specified on clause 7 of EN 61000-3-2, the limits are not specified for equipment with a rated power of 75W or less. The EUT meets the above condition, so it conforms to EN 61000-3-2.

8. Voltage Fluctuations Test

8.1 Standard

- Standard : EN 61000-3-3

8.2 Test Procedure

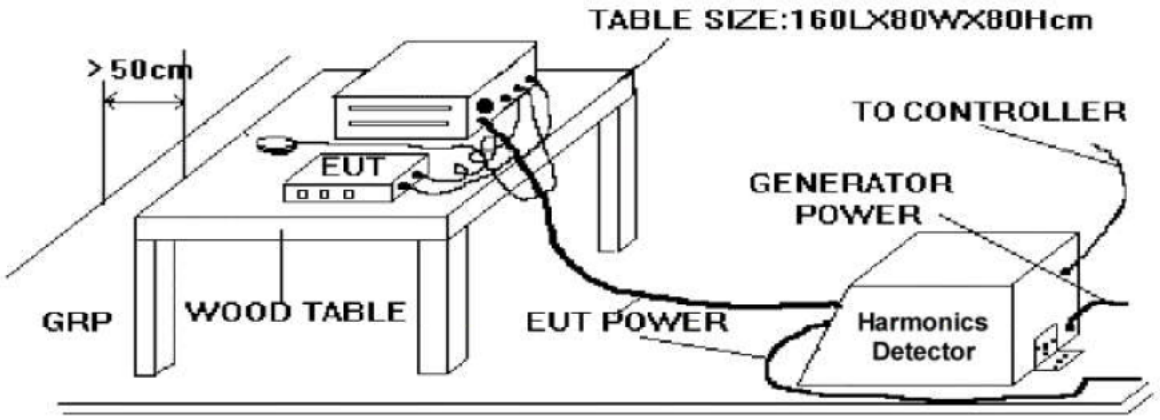
The equipment shall be tested under the conditions of **Clause 5.**

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

8.3 Test Equipment Settings

Line Voltage	230 V
Line Frequency	50 Hz
Measurement Delay	10.0 seconds
Pst Integration Time	10.0 minutes
Pst Integration Periods	1
Test Duration	10.0 minutes

8.4 Test Setup



8.5 Test Result Of Voltage Fluctuation And Flicker Test

Final Test Result	***PASS***
Temperature	25℃
Relative Humidity	51%
Atmospheric Pressure	100 kPa
Test Date	Dec. 28, 2015
Test Engineer	Easton

Test Result: Pass **Status: Test Completed**

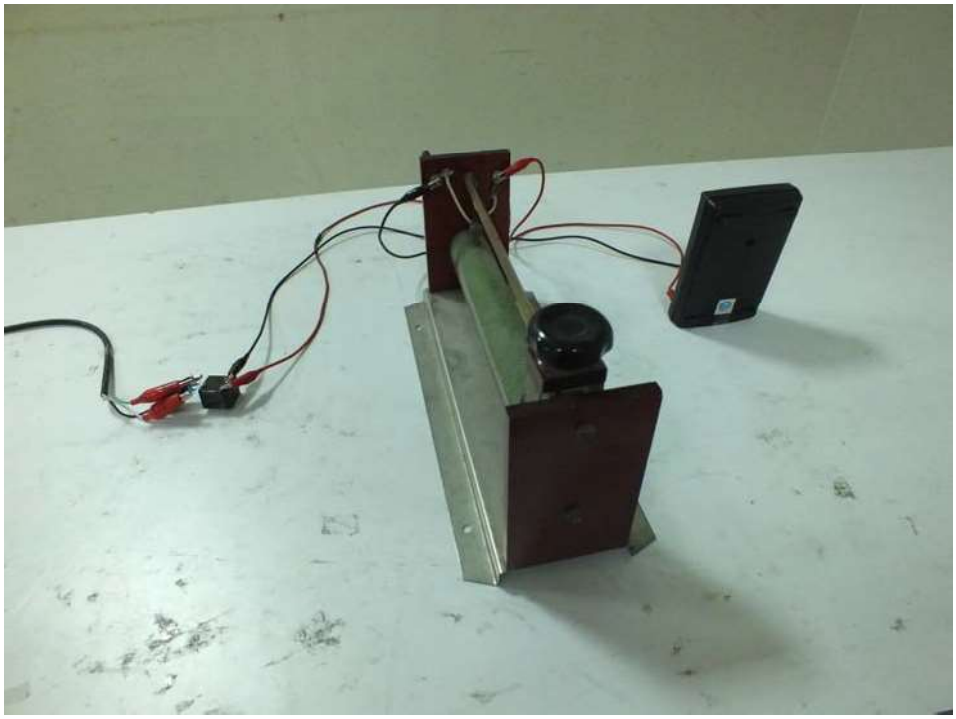
Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.28			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
T-max (mS):	0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.02	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.261	Test limit:	1.000	Pass

8.6 Photographs of Voltage Fluctuation and Flicker Test

FRONT VIEW

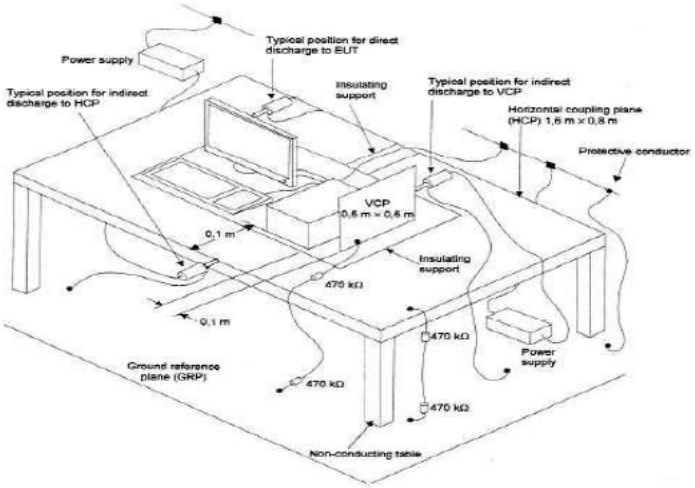
REAR VIEW



9. Electrostatic Discharge Immunity Test (ESD)

Final Test Result	***PASS***
Obtained Performance Criterion	A
Required Performance Criteria	B
Basic Standard	IEC 61000-4-2
Product Standard	EN 55024:2010
Level	3 for air discharge 2 for contact discharge
Test Voltage	±2 / ±4 / ±8 kV for air discharge ±2 / ±4 kV for contact discharge
Temperature	25°C
Relative Humidity	51 %
Atmospheric Pressure	100 kPa
Test Date	Oct. 31, 2014
Test Engineer	Eric Liu
Observation	The test point, please refer to section 9.5

9.1 Test Setup



setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the follow manner :

a. CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
b. AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

9.2 Test Setup for Tests Performed in Laboratory

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

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

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

9.3 ESD Test Procedure

a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
   - ambient temperature: 15℃ to 35℃;
   - relative humidity : 30% to 60%;
   - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).

b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.

c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.

d. The test shall be performed with both air discharge and contact discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On preselected points at least 25 single discharges (in the most sensitive polarity) shall be applied on contact discharge.

e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
- If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
- Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
- The contact discharge test shall not be applied to such surfaces.

h. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

9.4 Test Severity Levels

9.4.1 Contact Discharge

Level	Test Voltage (kV) of Contact Discharge
1	±2
2	±4
3	±6
4	±8
X	Specified

Remark : "X" is an open level.

9.4.2 Air Discharge

Level	Test Voltage (kV) of Air Discharge
1	±2
2	±4
3	±8
4	±15
X	Specified

Remark : "X" is an open level.

9.5 Test Points

9.5.1 Test Result of Air Discharge

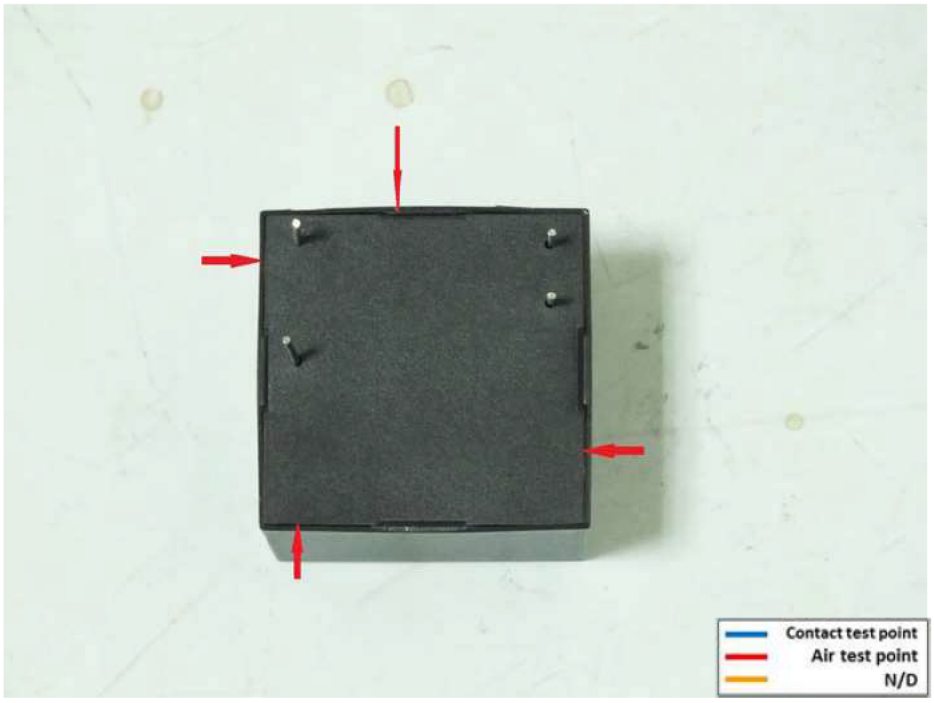
Test Point	No. Of Discharges	Air Discharge / Round Tip						Test Record
		+2kV	-2kV	+4kV	-4kV	-8kV	+8kV	
Case	10	A	A	A	A	A	A	None

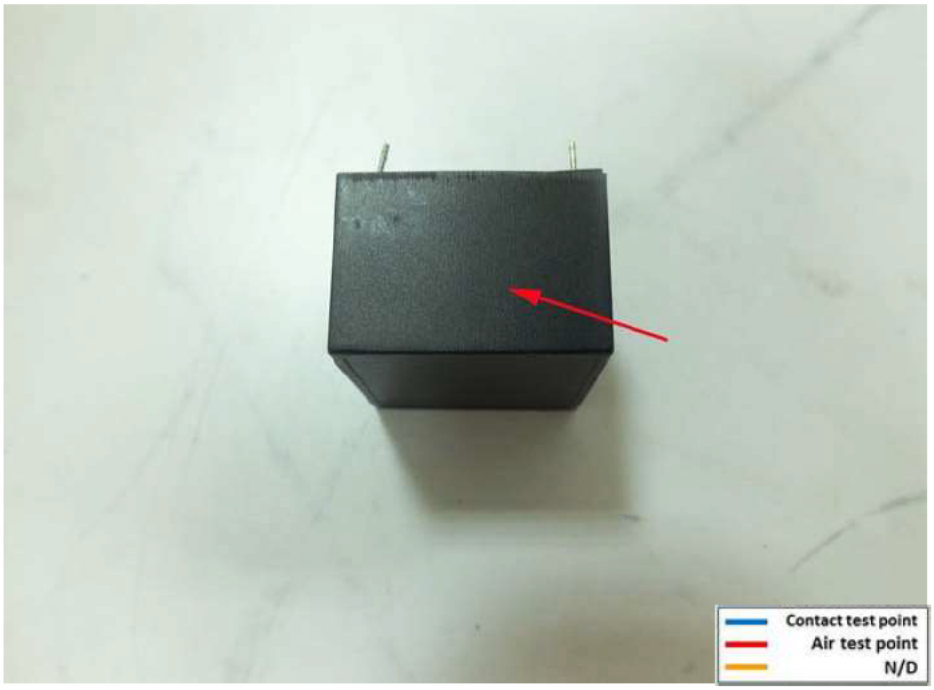
9.5.2 Test Result of Contact Discharge

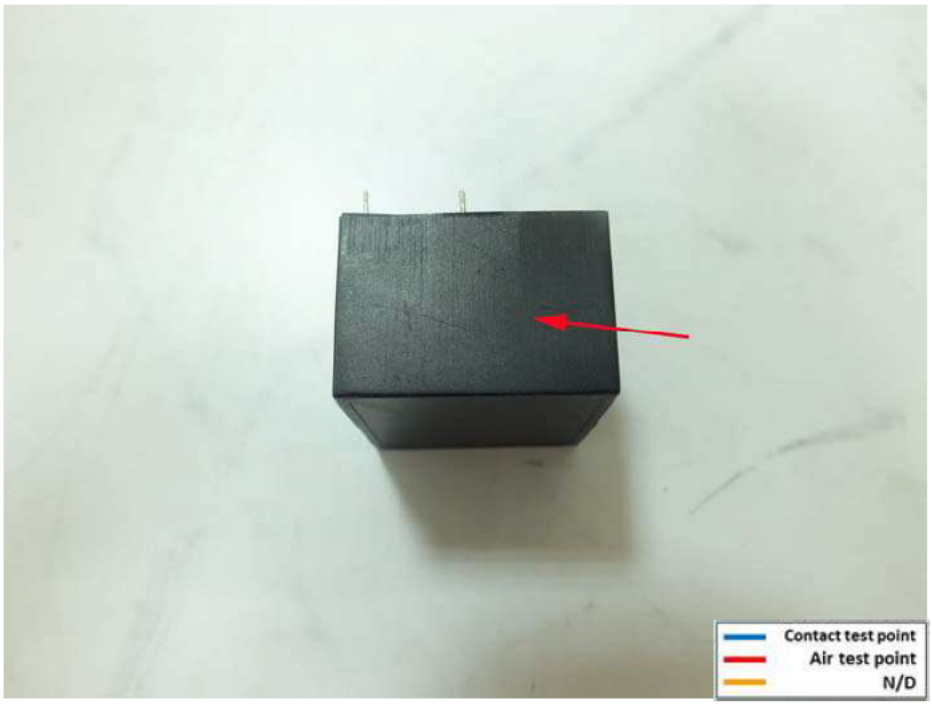
For indirect discharge to HCP and VCP

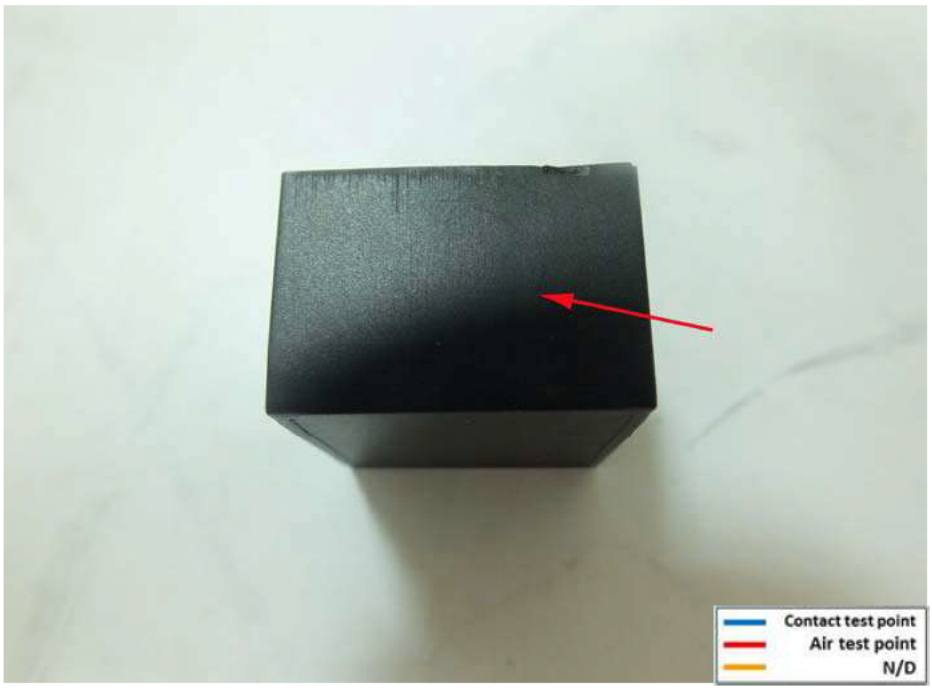
Test Point	No. Of Discharges	Contact Discharge / Pointed Tip				Test Record
		+2kV	-2kV	+4kV	-4kV	
HCP (At Front)	25	A	A	A	A	None
HCP (At Rear)	25	A	A	A	A	None
HCP (At Left)	25	A	A	A	A	None
HCP (At Right)	25	A	A	A	A	None
VCP (At Front)	25	A	A	A	A	None
VCP (At Rear)	25	A	A	A	A	None
VCP (At Left)	25	A	A	A	A	None
VCP (At Right)	25	A	A	A	A	None

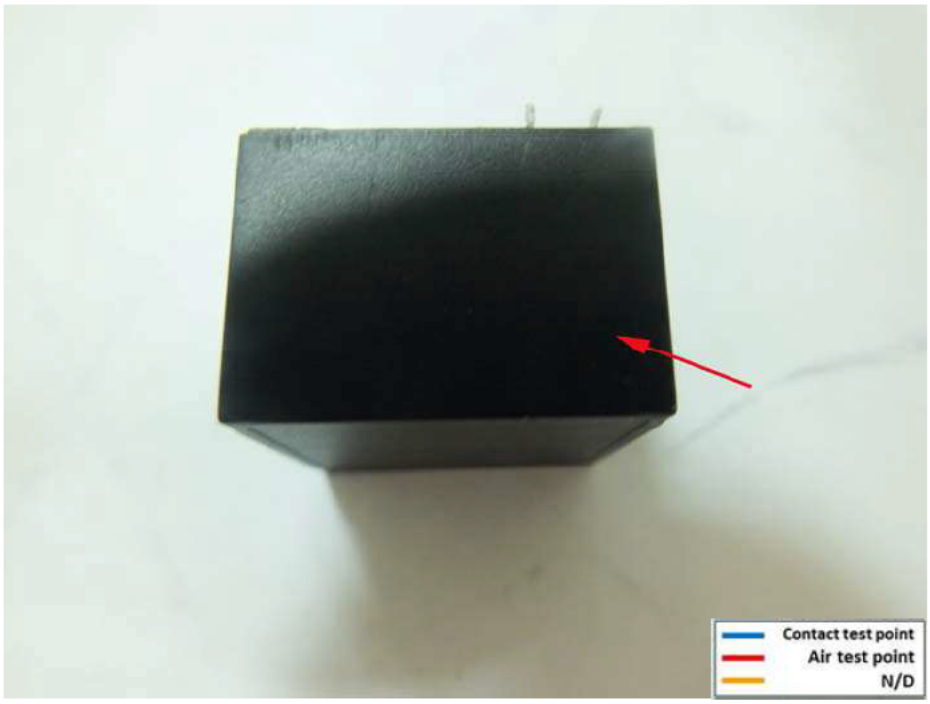
9.6 Photographs of Test Point

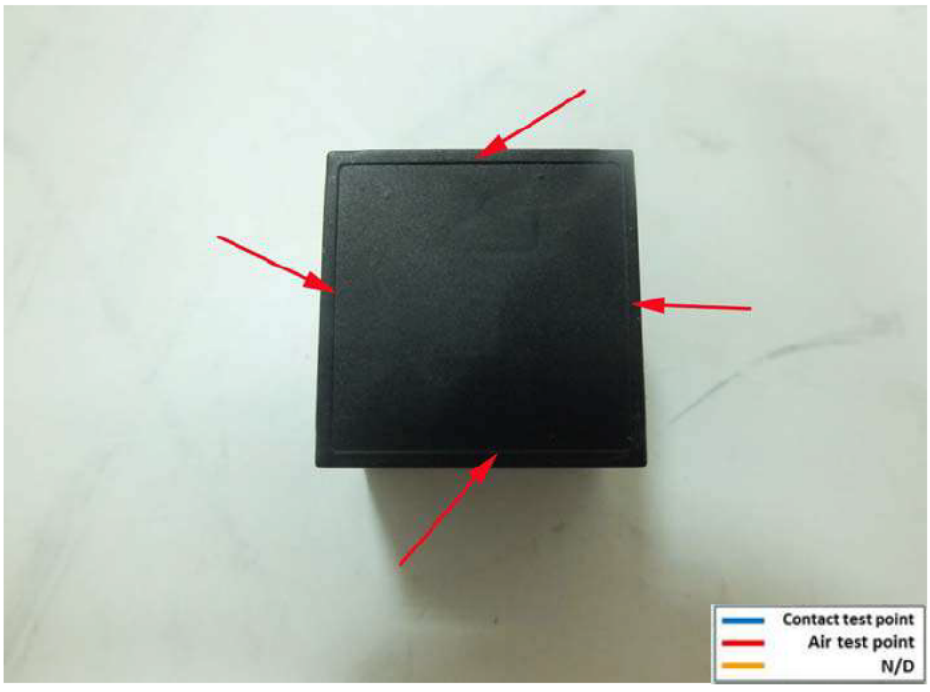





Contact test point
Air test point
N/D


Contact test point
Air test point
N/D


Contact test point
Air test point
N/D


Contact test point
Air test point
N/D

9.7 Photographs of Electrostatic Discharge Immunity Test

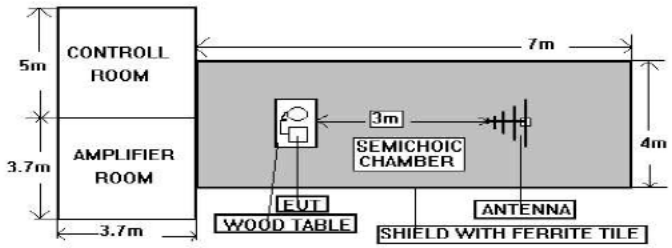
FRONT VIEW

REAR VIEW

10. Radio Frequency Electromagnetic Field Immunity Test (RS)

Final Test Result	***PASS***
Obtained Performance Criterion	A
Required Performance Criteria	A
Basic Standard	IEC 61000-4-3
Product Standard	EN 55024:2010
Level	2
Frequency Range	80-1000 MHz
Field Strength	3 V/m (unmodulated, r.m.s) 80% AM (1 kHz)
Temperature	24°C
Relative Humidity	53 %
Atmospheric Pressure	100 kPa
Test Date	Oct. 30, 2014
Test Engineer	Eric Liu
Observation	Normal

10.1 Test Setup



NOTE : The SPORTON 7m x 4m x 4m semichoic chamber is compliance with the sixteen points uniform field requirement as stated in IEC 61000-4-3 Section 6.2.

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

10.2 Test Procedure

a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
b. The bilog antenna which is enabling the complete frequency range of 80-1000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
c. The test is normally performed with the generating antenna facing each of four sides of the EUT. The polarization of the field generated by the broadband (bilog) antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.
d. At each of the above conditions, the frequency range is swept 80-1000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of $1.5*10^{-3}$ decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

10.3 Test Severity Levels

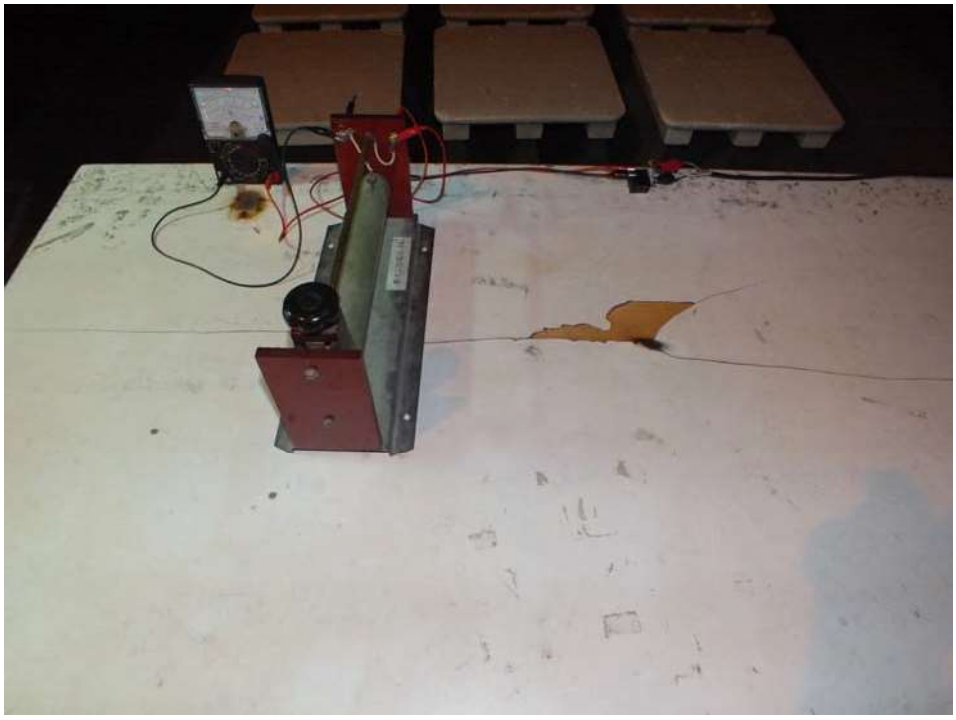
Frequency Band : 80-1000 MHz

Level	Test Field Strength (V/m)
1	1
2	3
3	10
X	Specified

Remark : “X” is an open class.

10.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test

FRONT VIEW

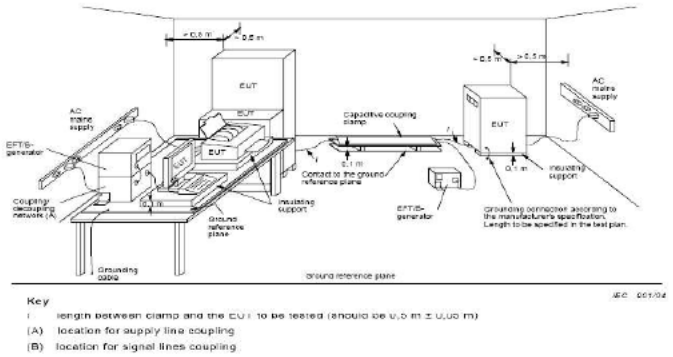


REAR VIEW

11. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)

Final Test Result	***PASS***
Obtained Performance Criterion	A
Required Performance Criteria	B
Basic Standard	IEC 61000-4-4
Product Standard	EN 55024:2010
Level	on AC input power ports -- 2
Test Voltage	on Input AC Power Port -- ± 0.5 / ± 1.0 kV
Test Location	L+N
Temperature	25℃
Relative Humidity	49%
Atmospheric Pressure	100 kPa
Test Date	Oct. 30, 2014
Test Engineer	Eric Liu
Observation	Normal

11.1 Test Setup



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

11.2 Test on Power Line

i. The EFT/B-generator was located on the GRP. The length from the EFT/B-generator to the EUT as not exceed 0.5 m.

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

11.3 Test on Communication Lines

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

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

11.4 Test Procedure

m. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:

- ambient temperature: 15℃ to 35℃;
- relative humidity: 45% to 75%;
- atmospheric pressure: 86 kPa (860 mbar) to 106 kPa (1060 mbar).

n. In order to minimize the effect of environmental parameters on test results, the electromagnetic enironment of the laboratory shall not influence the test results.

o. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.

p. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria:

- Normal performance within the specification limits.
- Temporary degradation or loss of function or performance which is self-recoverable.
- Temporary degradation or loss of function or performance which requires operator intervention or system reset.
- Degradation or loss of function which is not recoverable due to damage of equipment (components).

11.5 Test Severity Levels

The following test severity levels are recommended for the fast transient/burst test:

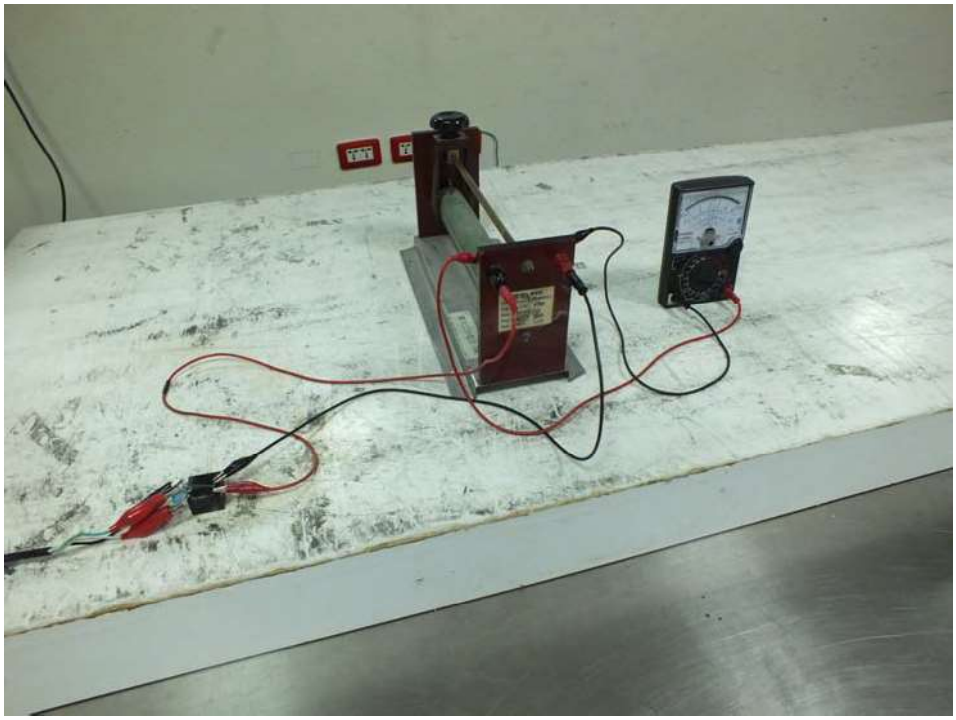
Open Circuit Output Test Voltage ± 10%		
Level	**On Power Supply**	**On I/O Signal, Data and Control Line**
1	0.5 kV	0.25 kV
2	1.0 kV	0.50 kV
3	2.0 kV	1.00 kV
4	4.0 kV	2.00 kV

X	Specified	Specified

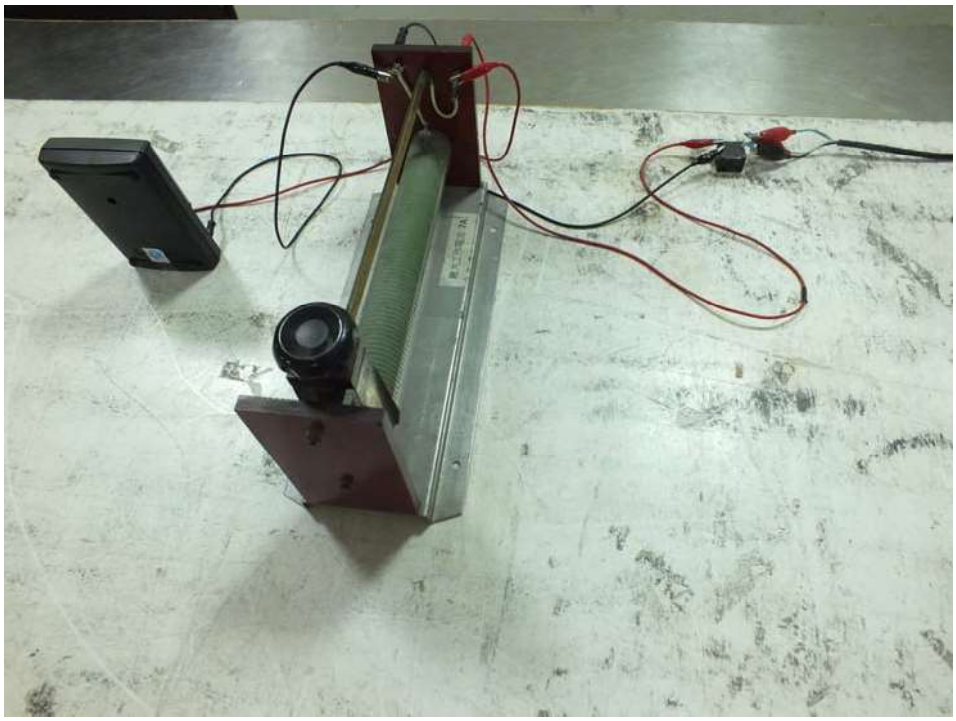
Remark: " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

11.6 Photographs of Electrical Fast Transient/Burst Immunity Test

FRONT VIEW



REAR VIEW



12. Surge Immunity Test

Final Test Result	***PASS***
Obtained Performance Criterion	**B**
Required Performance Criteria	B
Basic Standard	IEC 61000-4-5
Product Standard	EN 55024:2010
Surge wave form (Tr/Th)	1,2/50 (8/20) for input power ports
Level	on input power ports -- 3
Test Voltage	on Input AC Power Port -- ± 1.0 / ± 2.0 kV
Temperature	24°C
Relative Humidity	48%
Atmospheric Pressure	100 kPa
Test Date	Oct. 30, 2014
Test Engineer	Eric Liu
Observation	The test point, please refer to section 12.1

12.1 Test Record

■ Input AC power port:

Voltage (kV)	Test Location	Polarity	Phase Angle				Test Record
			0°	90°	180°	270°	
1.0 kV	L - N	+	A	A	A	A	None
		−	A	A	A	A	None
2.0 kV	L - PE	+	A	A	A	A	None
		−	A	A	A	**B**	**Note [1]**
	N - PE	+	A	A	A	A	None
		−	A	A	A	A	None
Remark	**Note [1]** When testing at -2kV/L-PE/270°, the EUT was interfered, the power of EUT was off. The power of EUT must be replugged-in to recover to normal operation. This instruction is described in the user manual.						

12.2 Test Level

Level	Open-Circuit Test Voltage, ± 10%, kV
1	0.5
2	1.0
3	2.0
4	4.0
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

12.3 Test Procedure

a. Climatic conditions

The climatic conditions shall comply with the following requirements:

-- ambient temperature: 15 ℃ to 35 ℃
-- relative humidity: 10 % to 75 %
-- atmospheric pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar)

b. Electromagnetic conditions

The electromagnetic environment of the laboratory shall not influence the test results.

c. The test shall be performed according the test plan that shall specify the test set-up with

-- generator and other equipment utilized;
-- test level (voltage/current);
-- generator source impedance;
-- internal or external generator trigger;
-- number of tests: at least five positive and five negative at the selected points;
-- repetition rate: maximum 1/min.
-- inputs and outputs to be tested;
-- representative operating conditions of the EUT;
-- sequence of application of the surge to the circuit;
-- phase angle in the case of a.c. power supply;
-- actual installation conditions, for example:
AC: neutral earthed,
DC: (+) or (-) earthed to simulated the actual earthing conditions.

d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the A.C. voltage wave (positive and negative).

e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.

g. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worstcase voltage breakdown level (let-through level) of the primary protection.

h. If the actual operating signal sources are not available, the may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according the a test plan.

i. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test a previously unstressed equipment shall be used to the protection devices shall be replaced.

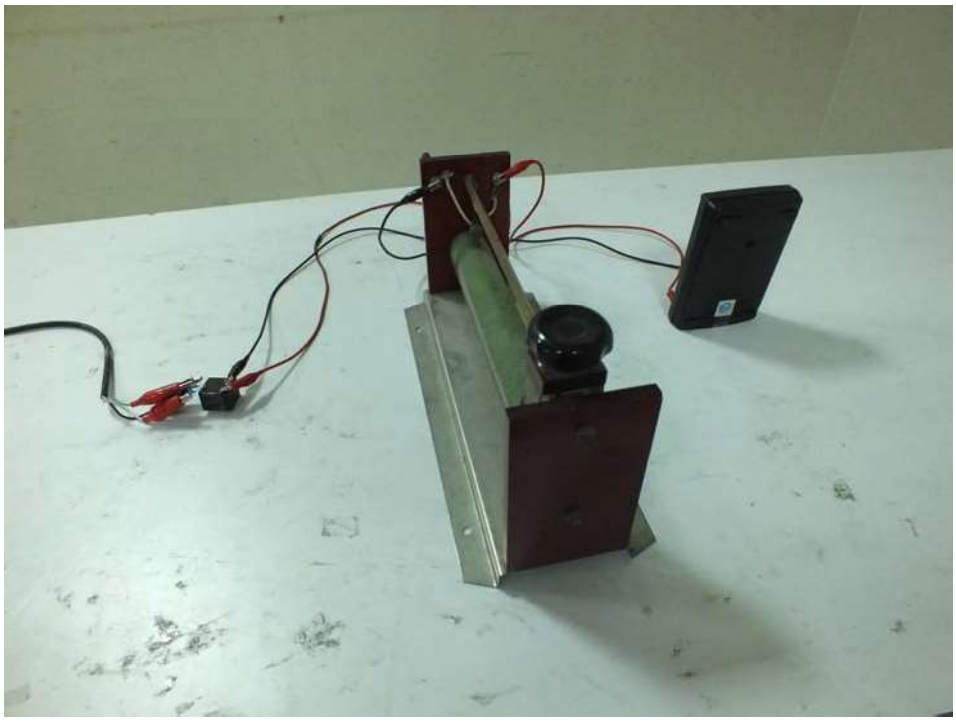
12.4 Operating Condition

Full system

12.5 Photographs of Surge Immunity Test

FRONT VIEW

REAR VIEW



13. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (CS)

Final Test Result	***PASS***
Obtained Performance Criterion	A
Required Performance Criteria	A
Basic Standard	IEC 61000-4-6
Product Standard	EN 55024:2010
Level	2
Test Voltage	3 V (unmodulated, r.m.s), 80% AM (1 kHz)
Frequency Range	0.15 MHz to 80 MHz
Dwell time	2.9 seconds
Frequency step size	1 %
Test Port	on AC Power Port
Coupling mode	CDN-M016 SW M2 for AC power Port
Temperature	25°C
Relative Humidity	50 %
Atmospheric Pressure	100 kPa
Test Date	Oct. 31, 2014
Test Engineer	Eric Liu
Observation	Normal

13.1 Test Level

Level	Voltage Level (EMF)
1	1 V rms
2	3 V rms
3	10 V rms
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

13.2 Test Procedure

a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.

b. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.

c. 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.

d. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1kHz sinewave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5 x 10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.

e. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency(ies) and harmonics or frequencies of dominant interest shall be analyzed separately.

f. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.

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

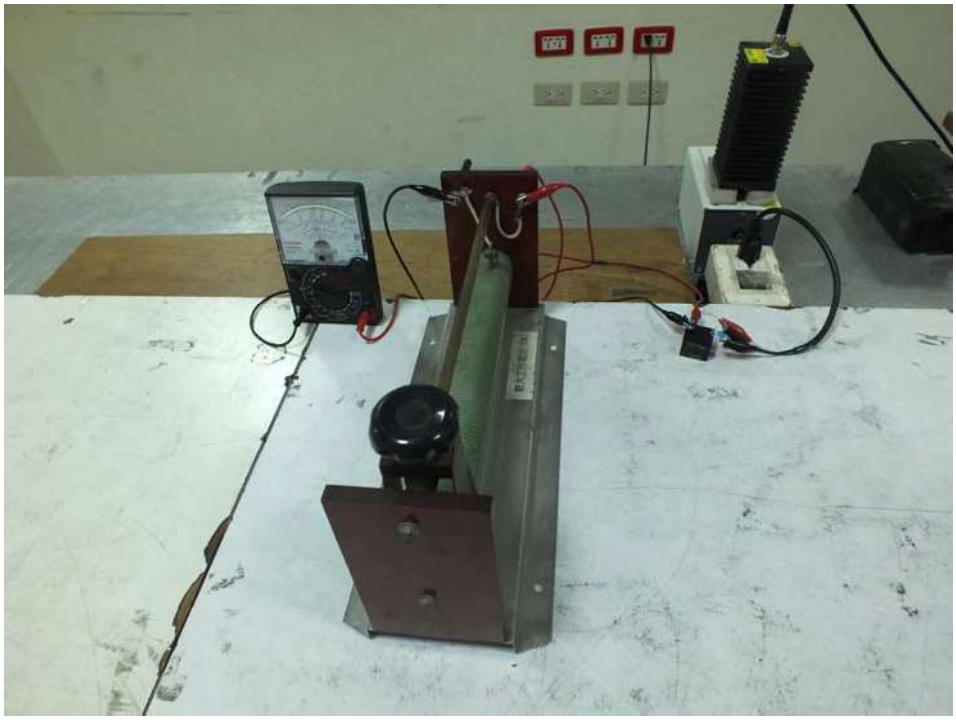
h. The use of special exercising programs is recommended.

i. Testing shall be performed according to a Test Plan, which shall be included in the test report.

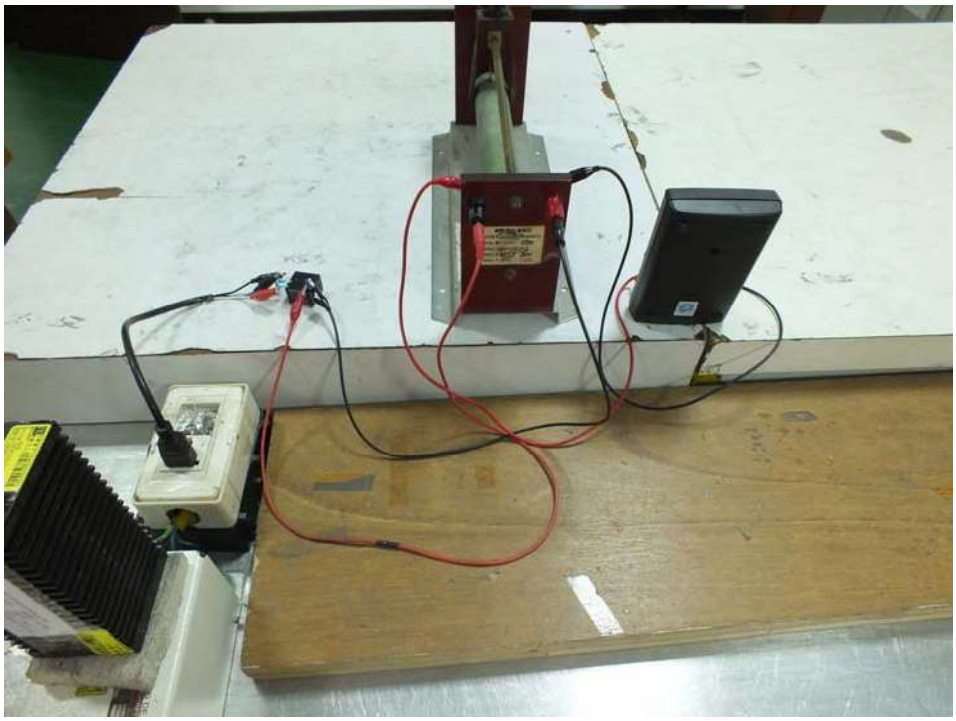
j. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.

13.3 Photographs of CS Immunity Test

FRONT VIEW



REAR VIEW



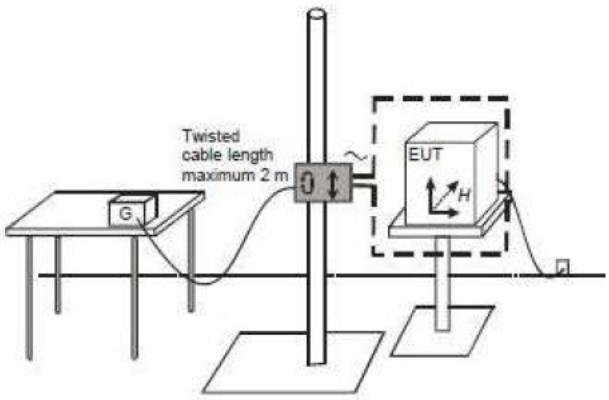
14. Power Frequency Magnetic Field Immunity Tests

Final Test Result	***PASS***
Obtained Performance Criterion	A
Required Performance Criteria	A
Basic Standard	IEC 61000-4-8
Product Standard	EN 55024:2010
Temperature	24˚C
Relative Humidity	48 %
Atmospheric Pressure	100 kPa
Test Date	Oct. 31, 2014
Test Engineer	Eric Liu
Observation	Please refer to section 14.1.

14.1 Test Record

Power Frequency Magnetic Field	Testing duration	Coil Orientation	Results
50/60Hz, 1A/m	1.0 Min	X-axis	A
50/60Hz, 1A/m	1.0 Min	Y-axis	A
50/60Hz, 1A/m	1.0 Min	Z-axis	A

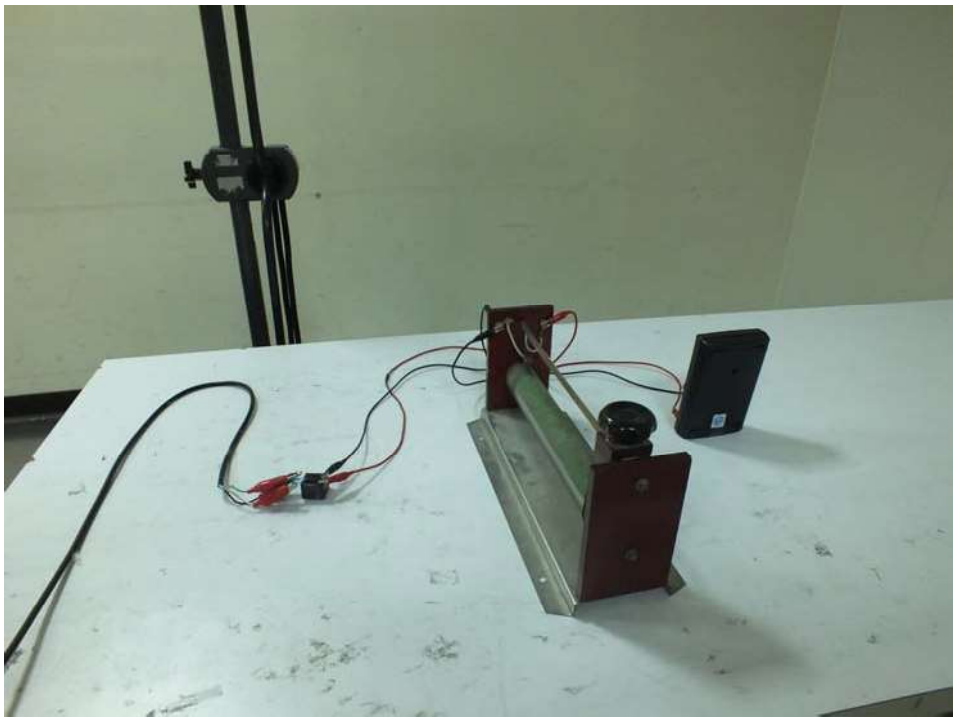
14.2 Test Setup



14.3 Photographs of Power Frequency Magnetic Field Immunity Tests

FRONT VIEW

REAR VIEW



15. Voltage Dips and Voltage Interruption Immunity Tests

Final Test Result	***PASS***
Obtained Performance Criterion	**C** for voltage interruption, **A/A** for voltage dips
Required Performance Criteria	C for voltage interruption, C/B for voltage dips
Basic Standard	IEC 61000-4-11
Product Standard	EN 55024:2010
Test Port	Input power ports
Temperature	24℃
Relative Humidity	50 %
Atmospheric Pressure	100 kPa
Test Date	Oct. 31, 2014
Test Engineer	Eric Liu
Observation	Please refer to section 15.1 and 15.2.

15.1 Test Record of Voltage Interruption

Voltage (V)	Phase Angle		% Reduction	Duration (Periods)	Test Record
	0 °	180 °			
100, 240	C	C	>95%	250	After the interruption, the power of EUT reset automatically.

15.2 Test Record of Voltage Dips

Voltage (V)	Phase Angle		% Reduction	Duration (Periods)	Test Record
	0 °	180 °			
100, 240	A	A	30%	25	None
100, 240	A	A	>95 %	0.5	None

15.3 Testing Requirement and Procedure

The test was based on IEC 61000-4-11

15.4 Test Conditions

1. Source voltage and frequency: 100V / 60Hz, 240V / 50Hz Single phase.
2. Test of interval: 10 sec.
3. Level and duration: Sequency of 3 dips/interrupts.
4. Voltage rise (and fall) time: 1 ~ 5 μs.

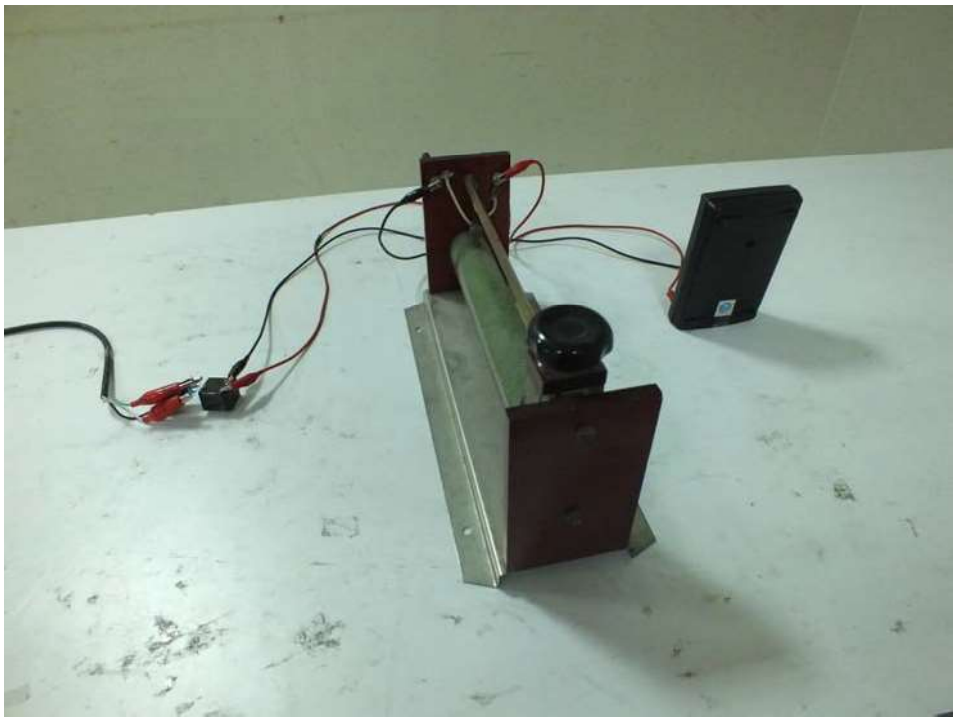
15.5 Operating Condition

Full system

15.6 Photographs of Voltage Dips and Voltage Interruption Immunity Tests

FRONT VIEW

REAR VIEW



16. Uncertainty

For EMI

Test Items	Test Site No.	Uncertainty	Remark
Conducted Emissions	CO01-NH	± 2.6 dB	Confidence levels of 95%
Radiated Emissions	OS03-NH	± 2.9 dB	Confidence levels of 95%

For EMS

- **ESD Immunity (IEC 61000-4-2)**

Negative Discharge Current

From Standard				From calibration certificate					
2kV	First Peak Current	Current at 30ns	Current at 60ns	Measured First Peak Current	1st Peak Worst case. +5%	Measured Current at 30ns	30ns Worst case. +5%	Measured Current at 60ns	60ns Worst case. -5%
Nominal	7.5	4	2	7.48	7.85	4.2	4.41	2.01	2.11
Min	6.75	2.8	1.4	---	6.75	---	2.8	---	1.4
Max	8.25	5.2	2.6	---	8.25	---	5.2	---	2.6
Tolerance in %	10%	30%	30%						

4kV	First Peak Current	Current at 30ns	Current at 60ns	First Peak Current	1st Peak Worst case. +5%	Measured Current at 30ns	30ns Worst case. +5%	Measured Current at 60ns	60ns Worst case. +5%
Nominal	15	8	4	15.12	15.88	8.03	8.43	3.68	3.86
Min	13.5	5.6	2.8	---	13.5	---	5.6	---	2.8
Max	16.5	10.4	5.2	---	16.5	---	10.4	---	5.2
Tolerance in %	10%	30%	30%						

6kV	First Peak Current	Current at 30ns	Current at 60ns	First Peak Current	1st Peak Worst case. -5%	Measured Current at 30ns	30ns Worst case. +5%	Measured Current at 60ns	60ns Worst case. +5%
Nominal	22.5	12	6	22.78	23.92	12.37	12.99	5.45	5.72
Min	20.25	8.4	4.2	---	20.25	---	8.4	---	4.2
Max	24.75	15.6	7.8	---	24.75	---	15.6	---	7.8
Tolerance in %	10%	30%	30%						

From Standard			
8kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	30	16	8
Min	27	11.2	5.6
Max	33	20.8	10.4
Tolerance in %	10%	30%	30%

From calibration certificate					
First Peak Current	1st Peak Worst case. +5%	Measured Current at 30ns	30ns Worst case. +5%	Measured Current at 60ns	60ns Worst case. +5%
30.26	31.77	16.13	16.94	7.39	7.76
---	27	---	11.2	---	5.6
---	33	---	20.8	---	10.4

Negative Discharge Voltage

Standard Parameters				Measured Values (kV)
Indicated Voltage (kV)	Tolerance (%)	Max. (kV)	Min. (kV)	
2	10	2.20	1.80	2.05
4	10	4.40	3.60	4.027
6	10	6.60	5.40	5.955
8	10	8.80	7.20	7.916
15	10	16.50	13.50	14.839

Negative Rise Time

Standard Parameters	
T max.	1ns
T min	0.7ns

Measured Values			
Indicated Voltage	Measured Rise Time	Worst Case max. +6%	Worst Case min. -6%
2kV	0.851	0.902	0.799
4kV	0.780	0.827	0.733
6kV	0.750	0.795	0.705
8kV	0.772	0.818	0.726

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95% confidence.

● **RF Radiated Immunity (IEC 61000-4-3)**

Symbol	Source of Uncertainty	Value	Probability distribution	Divisor	$u_i(y)$
F_{SM}	Felds Strength monitor	1.5	Normal 2	2.000	0.75
FS_{AW}	Field Strength acceptability window	0.50	Rectangular	1.732	0.29
PAH	Power Amplifier Harmonics	0.50	Rectangular	1.732	0.29
R_S	Measurement System Repeatability	0.50	normal 1	1.000	0.50
R_{EUT}	Repeatability of EUT	0.00	normal 1	1.000	0.00
u_c (F_S)	Combined Standard Uncertainty		normal		0.83
U (F_S)	**Expanded Uncertainty**		**normal k= 2**		**1.66**

Specified Level (V/m)	Test level (V/m)
For 1 Volts	1.25
For 3 Volts	3.33
For 10 Volts	11.22

● **EFT/BURST Immunity (IEC 61000-4-4)**

Voltage Output

Standard Parameters				Measured Values (kV)
Indicated Voltage (kV)	Tolerance (%)	Max. (kV)	Min. (kV)	
0.5	10	0.55	0.45	0.489
1	10	1.1	0.9	1.006
2	10	2.2	1.8	2.016
4	10	4.4	3.6	3.830
- 0.5	10	- 0.55	- 0.45	- 0.489
- 1	10	- 1.1	- 0.9	- 0.972
- 2	10	- 2.2	- 1.8	- 1.961
- 4	10	- 4.4	- 3.6	- 3.770

Spike Frequency

Standard Parameters					Measured Values (kHz)
Indicated Voltage		Tolerance (%)	Max. (kHz)	Min. (kHz)	
(kV)	(kHz)				
0.5	5	10	5.5	4.5	5.00
1	5	10	5.5	4.5	4.98
2	5	10	5.5	4.5	4.98
4	2.5	10	2.75	2.25	2.49
4	5	10	5.5	4.5	5.01

Burst Width

Standard Parameters					Measured Values (ms)
Indicated Voltage		Tolerance (%)	Max. (ms)	Min. (ms)	
(kV)	(ms)				
0.5	15	20	18	12	14.97
1	15	20	18	12	14.94
2	15	20	18	12	14.91
4	15	20	18	12	14.95

Burst Period

Standard Parameters					Measured Values (ms)
Indicated Voltage		Tolerance (%)	Max. (ms)	Min. (ms)	
(kV)	(ms)				
0.5	300	20	360	240	299.7
1	300	20	360	240	300.5
2	300	20	360	240	299.2
4	300	20	360	240	300.2

It has been demonstrated that the EFT/BURST generator meets the specified requirements in the standard with at least a 95% confidence.

- **Surge Immunity (IEC 61000-4-5)**

Surge Voltage Output

Standard Parameters				Measured Values (kV)
Indicated Voltage. (kV)	Tolerance (%)	Max.(kV)	Min. (kV)	
0.5	10	0.55	0.45	0.488
1	10	1.1	0.9	0.964
2	10	2.2	1.8	1.984
4	10	4.4	3.6	3.94
6	10	6.6	5.4	5.91
- 0.5	10	- 0.55	- 0.45	- 0.484
- 1	10	- 1.1	- 0.9	- 0.977
- 2	10	- 2.2	- 1.8	- 1.992
- 4	10	- 4.4	- 3.6	- 3.95
- 6	10	- 6.6	- 5.4	- 5.91

Output Wave

Standard Parameters			Measured Values
+ 6 kV			
	Max.	Min.	
Rise Time	1.56 µs	0.84 µs	1.24 µs
Duration Time	60 µs	40 µs	52.83 µs
+ 6 kV			
	Max.	Min.	
Rise Time	1.56 µs	0.84 µs	1.30 µs
Duration Time	60 µs	40 µs	54.72 µs

It has been demonstrated that the Surge generator meets the specified requirements in the standard with at least a 95% confidence.

- **RF Conducted Immunity (IEC 61000-4-6)**

Symbol	Source of Uncertainty	Value	Probability distribution	Divisor	$u_i(y)$
S_A	Spectrum Analyzer	1.50	Rectangular	1.732	0.87
C_C	Current coil Calibration	1.00	normal 2	2.000	0.50
M	Mismatch	-0.5	U-shaped	1.414	-0.35
M	Mismatch	-0.3	U-shaped	1.414	-0.35
R_S	Measurement System Repeatability	0.50	normal 1	1.000	0.50
R_{EUT}	Repeatability of EUT	0.00	normal 1	1.000	0.00
u_c (F_S)	Combined Standard Uncertainty		normal		1.57
U (F_S)	**Expanded Uncertainty**		**normal k= 2**		**3.14**

Specified Level	Test level (V)
For 1 Volts	1.30
For 3 Volts	3.88
For 10 Volts	12.15

- **Magnetic Field Immunity (IEC 61000-4-8)**

Current output

Standard Parameters					Measured Values (A)
Magnetic Field Strength (A/m)	Output Current (A)	Tolerance (%)	Max. (A)	Min. (A)	
1	6	5	6.3	3.8	6.1
3	50	5	52.5	47.5	49.0
10	180	5	189	171	188.0

It has been demonstrated that the Magnetic generator meets the specified requirements in the standard with at least a 95% confidence.

● **Voltage Variation Immunity (IEC 61000-4-11)**

Short Dip Period

Standard Parameters					Measured Values (ms)
Degree	Duration (ms)	Tolerance (%)	Max. (ms)	Min. (ms)	
90	4	5	4.2	3.8	4.17
180	8	5	8.4	7.6	8.33
270	12	5	12.6	11.4	12.50
360	16	5	16.8	15.2	16.67

Long Dip Period

Standard Parameters					Measured Values (ms)
Degree	Duration (ms)	Tolerance (%)	Max. (ms)	Min. (ms)	
90	16	5	16.8	15.2	16.38
180	50	5	55	45	50.04
270	100	5	110	90	99.64
360	150	5	165	135	149.3

It has been demonstrated that the Dip generator meets the specified requirements in the standard with at least a 95% confidence.

17. List of Measuring Equipment Used

< EMI >

For Conducted Emission

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver	R&S	ESCS 30	100357	9 kHz ~ 2.75 GHz	Jun. 13, 2014	Conduction (CO01-NH)
LISN	SCHAFFNER	NNB41	06/10024	9 kHz ~ 30 MHz	Dec. 05, 2013	Conduction (CO01-NH)
Power Filter	CORCOM	MR12030	N/A	30A*2	N/A	Conduction (CO01-NH)
RF Cable-CON	Suhner Switzerland	RG223/U	CB004	9 kHz ~ 30 MHz	Dec. 11, 2013	Conduction (CO01-NH)

※ Calibration Interval of instruments listed above is one year.

For radiated emission

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Open Area Test Site	SPORTON	OATS-10	OS03-NH	30 MHz ~ 1 GHz 10m, 3m	Nov. 10, 2013	Radiation (OS03-NH)
Amplifier	HP	8447D	2944A08292	0.1 MHz ~ 1.3 GHz	Apr. 29, 2014	Radiation (OS03-NH)
Spectrum Analyzer	R&S	R3261C	81720147	9 kHz ~ 2.6 GHz	Oct. 28, 2013	Radiation (OS03-NH)
Receiver	R&S	ESCS 30	838251/002	9 kHz ~ 2.75 GHz	Oct. 23, 2013	Radiation (OS03-NH)
Bilog Antenna	CHASE	CBL6112D	25234	30 MHz ~ 2 GHz	Feb. 28, 2014	Radiation (OS03-NH)
Turn Table	EMCO	2080	9805-2065	0 - 360 degree	N/A	Radiation (OS03-NH)
Antenna Mast	EMCO	2075	9804-2151	1 m - 4 m	N/A	Radiation (OS03-NH)
RF Cable-R10m	HSCN	RG213U	2X11N	30 MHz ~ 1 GHz	Aug. 06, 2014	Radiation (OS03-NH)

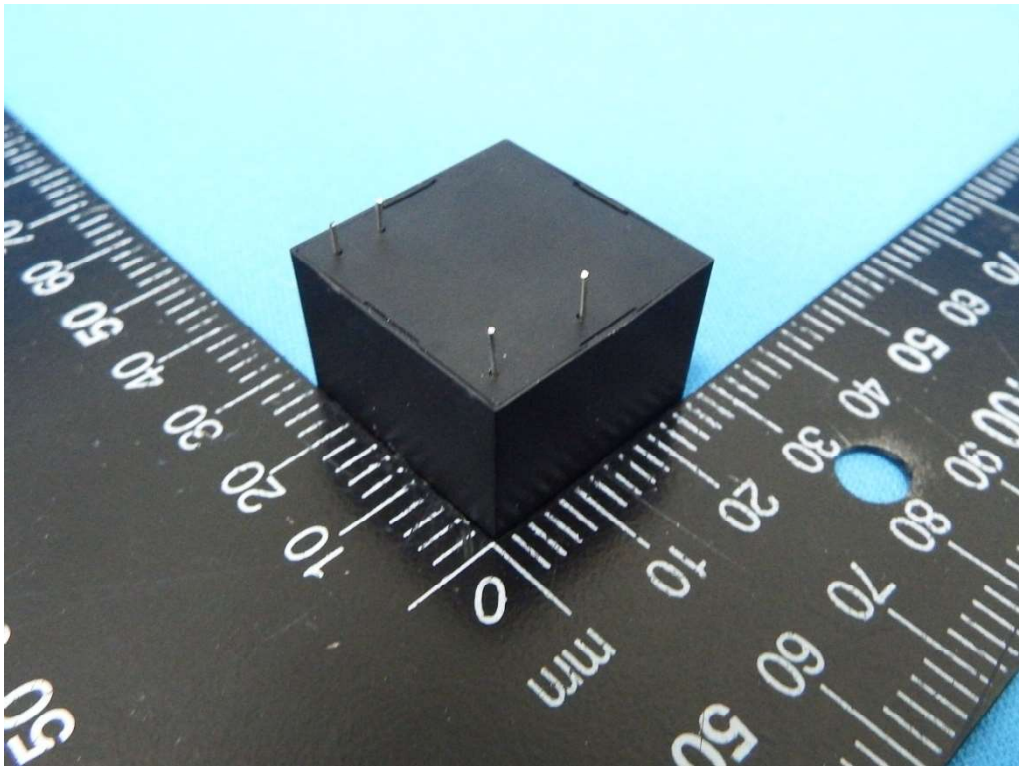
※ Calibration Interval of instruments listed above is one year.

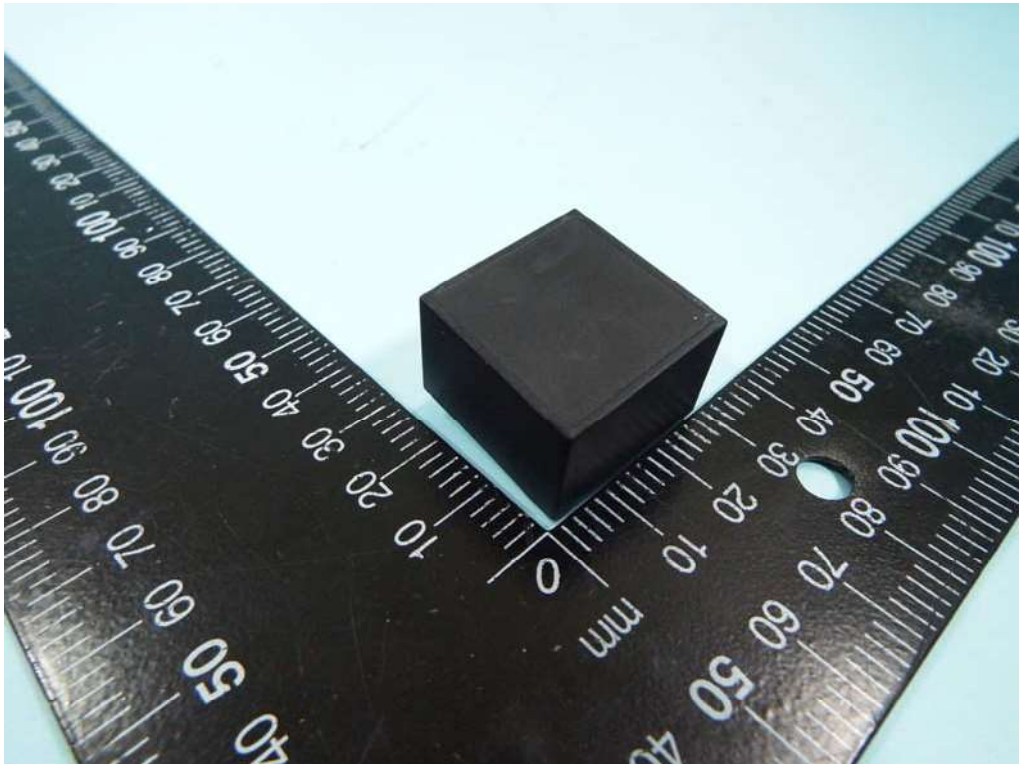
< EMS >

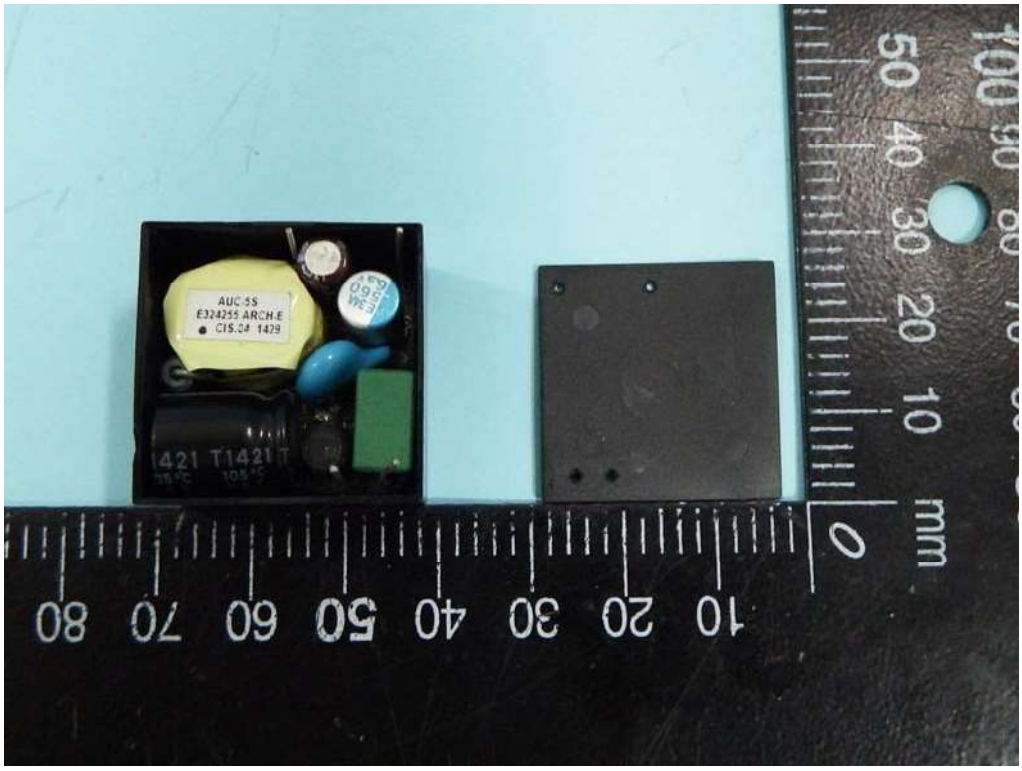
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	KEYTEK	MZ-15/EC	0711355	Air: 0 ~15kV Contact: 0 ~ 8kV	Apr. 28, 2014	ESD
RS immunity Test system	ROHDE& SCHWARZ	RSF	RS-01	80MHz ~ 3GHz	Mar. 14, 2014	RS
Amplifier	AMPLIFIER& RESEARCH	250W 1000AM	0332909	80MHz ~ 1GHz	Mar. 05, 2014	RS
DUAL DIRECTIONAL COUPLER	AMPLIFIER& RESEARCH	DC6180A	312453	0.08 ~ 1GHz	Oct. 20, 2014	RS
INTEGRATED MEASUREMENT SYSTEM	ROHDE& SCHWARZ	IMS	100007	9kHz ~ 3GHz	Mar. 26, 2014	RS
NRP-Z91 POWER SENSOR 6GHZ	ROHDE& SCHWARZ	NRP-Z91 1168.8004.02	100095	9kHz ~ 3GHz	Mar. 26, 2014	RS
Antenna	FRANKONIA	BTA-L	02002L	26MHz ~ 1GHz	May 05, 2014	RS
Probe	ETS-LINDGREN	HI-6005	00052473	0.1MHz ~ 5GHz	Feb. 05, 2014	RS
EFT Generator	TESEQ	FTM3425	0180	0 ~ 4kV	Jan. 02, 2014	EFT
SURGE Generator	TESEQ	CWN 3650	0429	0 ~ 6 kV/2Ω 0 ~ 6 kV/12Ω	Jan. 02, 2014	SURGE
Conducted Immunity Test System	TESEQ	NSG4070	34293	9kHz ~ 1GHz	Jul. 07, 2014	CS
Attenuator	BIRD	100-SA-MFB-06	0232	150kHz ~ 230MHz	Jul. 09, 2014	CS
Coupling and Decoupling Network	SCHAFFNER	CDN M016	16672	150kHz ~ 230MHz	Jul. 04, 2014	CS
Magnetic field Immunity Loop	FCC (KEYTEK)	F-1000-4-8-G-1 25A	03007	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Oct. 20, 2014	PFMF
Magnetic Generator	FCC (KEYTEK)	F-1000-4-8/9/10 -L-1M	03003	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Oct. 20, 2014	PFMF
DIP Generator	TESEQ	VAR 3005-S16	0804	230VA/50Hz/60Hz 0%Open/5S 0%Short/5S 40%0.10S 70%/0.01S	Jan. 02, 2014	DIP
Harmonic/Flicker Test System	SCHAFFNER	CCN1000-1	72471	4000VA 16A PEAK	May 23, 2015	Harmonics, Flicker
AC Power Source	TESEQ	NSG 1007	1510A00144	16A PEAK	May 23, 2015	Harmonics, Flicker

※ Calibration Interval of instruments listed above is one year.

APPENDIX A. Photographs of EUT






AUC.5S
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mm


AUC.5S
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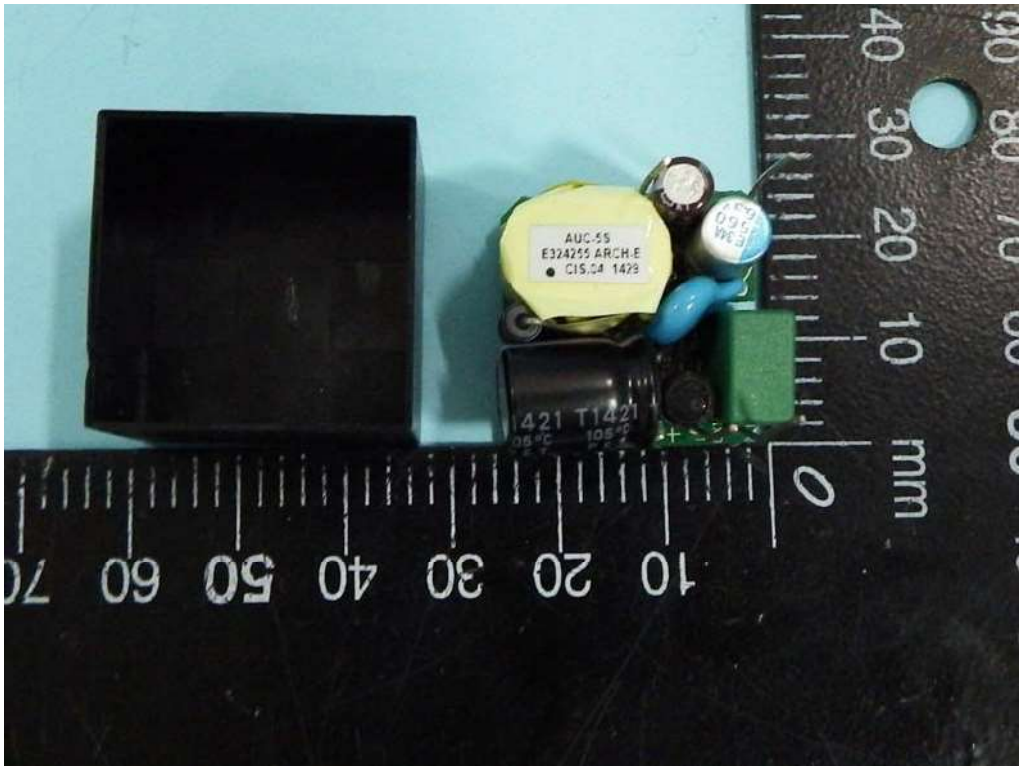
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E324255 ARCH-E
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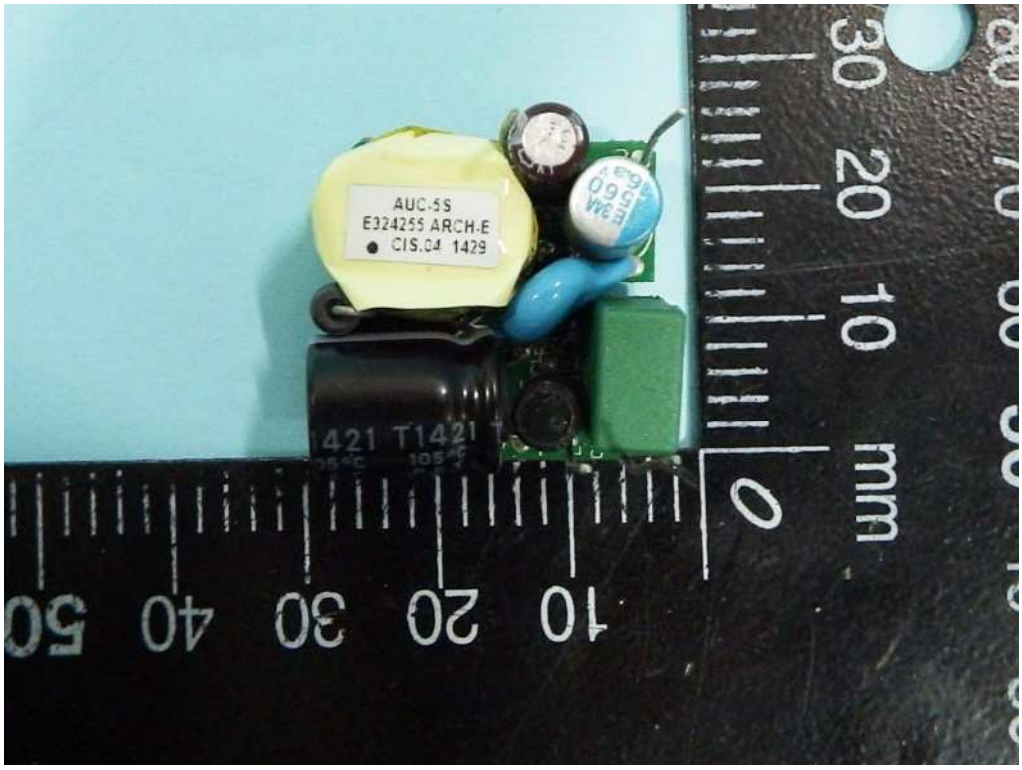
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E324255 ARCH-E
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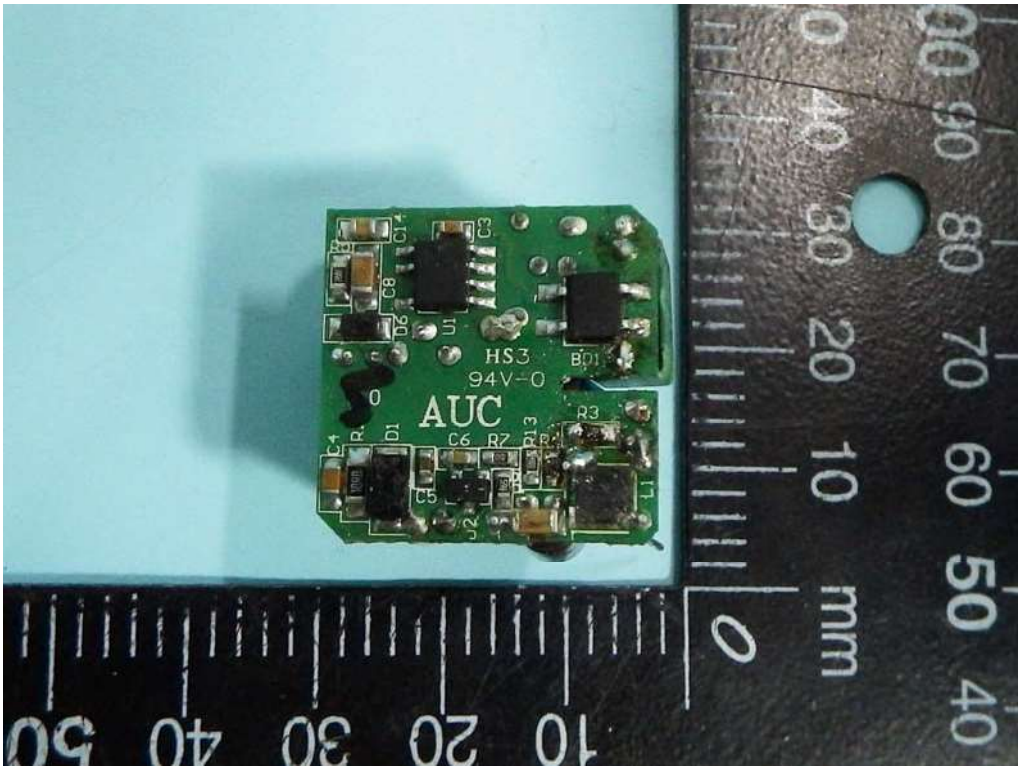
T1421
mm


HS3
94V-0
AUC
mm

Appendix B. Attachment of Report for Additional Measurement Data

The equipment of this attachment is the same as the Equipment under Test of original test report no. **EC4O1707-02** except for the following difference.

Original Information:

Equipment : AC-DC Power Module
Model No. : TMG 07105、TMG 07112、TMG 07115、TMG 07124
Applicant : Traco Electronic AG
Sihlbruggstrasse 111, 6340 Baar, Switzerland

Additional Information:

1) EN 55032 data.

This attachment should be filed together with original test report, Report No.: **EC4O1707-02** for reference.

Jack Deng
Engineering Manager

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan District, Taoyuan City, Taiwan, R.O.C.
Tel: 886-3-327-3456
Fax: 886-3-327-0973

B.1. Test Configuration of Equipment under Test

B.1.1 Test Manner

a. The EUT has been associated with personal computer and peripherals pursuant to European Standard EN 55032.

b. The equipment under test were performed the following test modes:

Test Items	Description of test modes
AC Conducted Emission	Mode 1. TMG 07105(FULL LOAD)
Radiated Emissions	Mode 1. TMG 07105(FULL LOAD)

c. Frequency range investigated: Conduction 150 kHz to 30 MHz, radiation 30 MHz to 1,000 MHz.

B.1.2 Description of Test System

< For conducted emission and radiated emission above 1GHz >

No.	Peripheral	Manufacturer	Model Number	Cable / Spec. Description
For Local				
1	Load	[redacted]	3.9Ω	-

B.2. Test of Conducted Powerline

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz and return leads of the EUT according to the methods defined in European Standard EN 55032 Clause 6.The EUT was placed on a nonmetallic stand in a shielded room 0.8 meter above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

B.2.1 Test Procedures

a. The EUT was warmed up for 15 minutes before testing started.

b. The EUT was placed on a desk 0.8 meter height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meter from any other grounded conducting surface.

c. Connect EUT to the power mains through a line impedance stabilization network (LISN).

d. Connect Telecommunication port to ISN (Impedance Stabilization Network).

e. All the support units are connect to the other LISN.

f. The LISN provides 50 ohm, coupling impedance for the measuring instrument.

g. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.

h. Both sides of AC line were checked for maximum conducted interference.

i. The frequency range from 150 kHz to 30 MHz was searched.

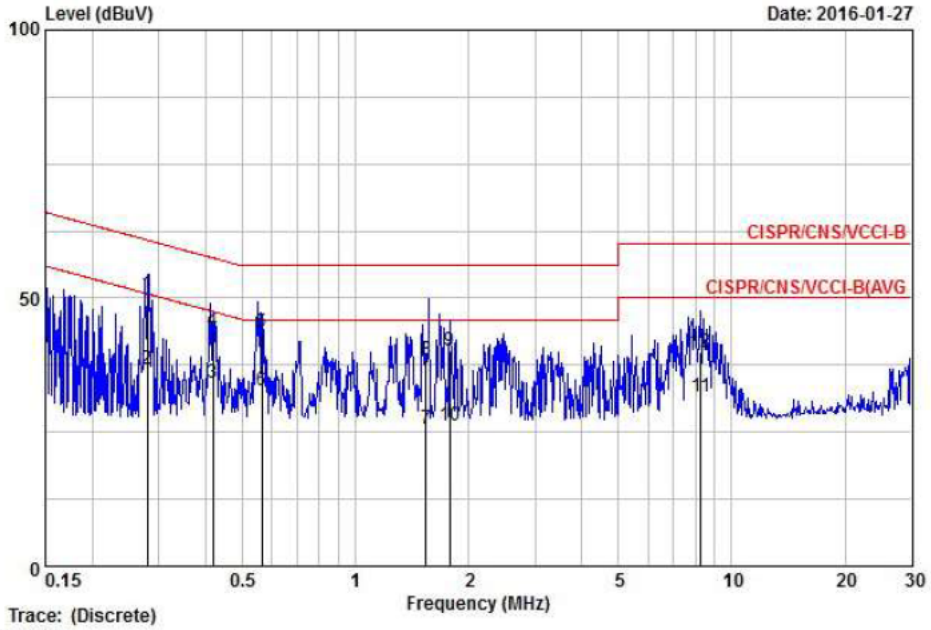
j. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

k. The EUT and local AE shall be arranged in the most compact practical arrangement within the test volume, while respecting typical spacing and the requirements defined in Annex D. The central point of the arrangement shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.

B.2.2 Test Result of AC Powerline Conducted Emission

Test Mode	Mode 1	Test Site No.	CO01-NH
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	Willy Lee
Temperature	21 ℃	Relative Humidity	52 %
Note: 1. Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level			
2. All emissions not reported here are more than 10 dB below the prescribed limit.			
■ The test was passed at the minimum margin that marked by the frame in the following data			

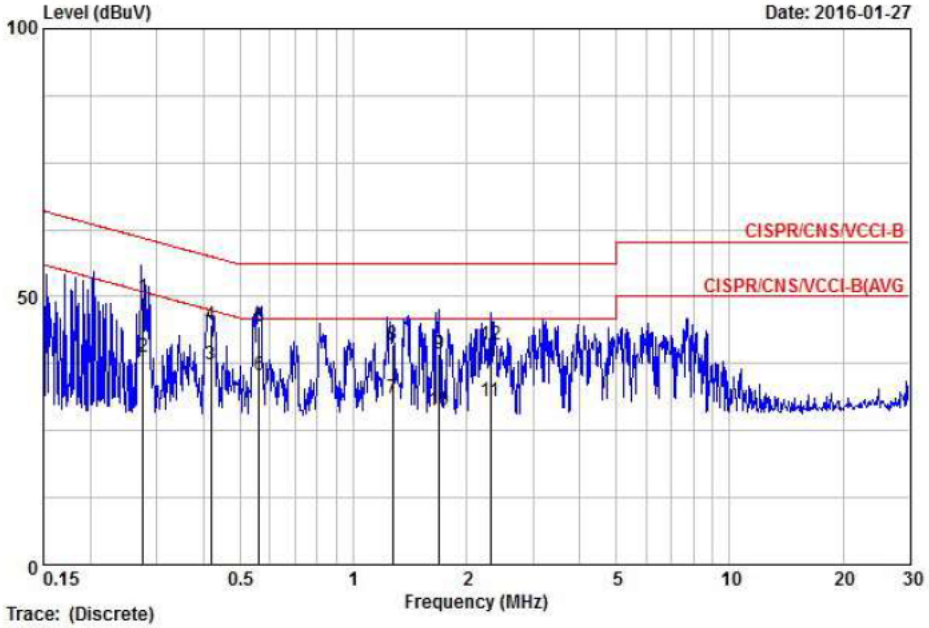
Line



Site : CO01-NH
Condition : CISPR/CNS/VCCI-B LISN NNB41/06/100245 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.279	50.81	-10.03	60.84	40.66	10.05	0.10	QP
2	0.279	36.76	-14.08	50.84	26.61	10.05	0.10	AVERAGE
3	0.419	34.28	-13.19	47.46	24.14	10.04	0.10	AVERAGE
4	0.419	43.74	-13.73	57.46	33.60	10.04	0.10	QP
5	0.564	43.64	-12.36	56.00	33.49	10.05	0.10	QP
6	0.564	32.88	-13.12	46.00	22.73	10.05	0.10	AVERAGE
7	1.544	25.77	-20.23	46.00	15.54	10.07	0.16	AVERAGE
8	1.544	38.41	-17.59	56.00	28.18	10.07	0.16	QP
9	1.781	40.18	-15.82	56.00	29.93	10.07	0.18	QP
10	1.781	26.08	-19.92	46.00	15.83	10.07	0.18	AVERAGE
11	8.279	31.50	-18.50	50.00	21.11	10.19	0.20	AVERAGE
12	8.279	39.90	-20.10	60.00	29.51	10.19	0.20	QP

Neutral



Site : CO01-NH
Condition : CISPR/CNS/VCCI-B LISN NNB41/06/100245 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.276	49.88	-11.06	60.94	39.30	10.48	0.10	QP
2	0.276	38.89	-12.05	50.94	28.31	10.48	0.10	AVERAGE
3	0.418	37.33	-10.16	47.49	26.75	10.48	0.10	AVERAGE
4	0.418	44.86	-12.63	57.49	34.28	10.48	0.10	QP
5	0.561	44.38	-11.62	56.00	33.80	10.48	0.10	QP
6	0.561	35.42	-10.58	46.00	24.84	10.48	0.10	AVERAGE
7	1.269	30.92	-15.08	46.00	20.30	10.49	0.13	AVERAGE
8	1.269	41.14	-14.86	56.00	30.52	10.49	0.13	QP
9	1.689	39.36	-16.64	56.00	28.69	10.50	0.18	QP
10	1.689	28.74	-17.26	46.00	18.07	10.50	0.18	AVERAGE
11	2.309	30.45	-15.55	46.00	19.74	10.51	0.20	AVERAGE
12	2.309	40.94	-15.06	56.00	30.23	10.51	0.20	QP

B.3. Test Result of Disturbance at Telecommunication Ports

This product does not have the communication port.

B.4. Test of Radiated Emission

Radiated emissions from 30 MHz to 6,000 MHz were measured with a bandwidth of 120 kHz for 30 MHz to 1,000 MHz and 1 MHz for above 1GHz according to the methods defines in European Standard EN 55032, Clause 6. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

B.4.1 Test Procedures

For Below 1GHz

a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 10 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
H The EUT and local AE shall be arranged in the most compact practical arrangement within the test volume, while respecting typical spacing and the requirements defined in Annex D. The central point of the arrangement shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.

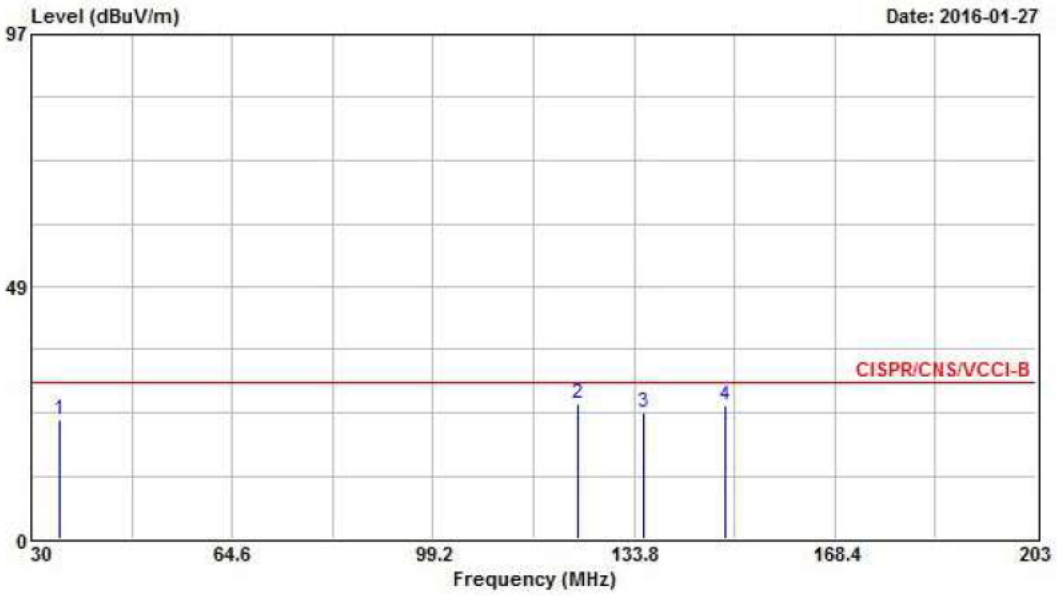
For above 1GHz

a. Same test set up as below 1GHz radiated testing.
b. The EUT was set 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
c. There should be absorber placed between the EUT and Antenna and its located size should let the test site meet CISPR16-1-4 requirement.
d. The table was rotated 360 degrees to determine the position of the highest radiation.
e. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
f. Set the DRG Horn Antenna at 1M height, then run the turn table to get the maximum noise reading from Horizontal and Vertical polarity separately.
g. When EUT locating on the turn-table, and its height is over 172cm (Antenna's 3dB beam width of 6GHz is 27◦), the DRG Horn Antenna must be raised up and descended down, then turning around the turn-table to get the maximum noise reading of the Horizontal and Vertical polarity separately. Note the maximum raise up height is same as the top of EUT.
h. If emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
i The EUT and local AE shall be arranged in the most compact practical arrangement within the test volume, while respecting typical spacing and the requirements defined in Annex D. The central point of the arrangement shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.

B.4.2 Test Result of Radiated Emission

Test mode	Mode 1	Test Site No.	OS03-NH
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Alan Hsieh
Temperature	20℃	Relative Humidity	53%
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

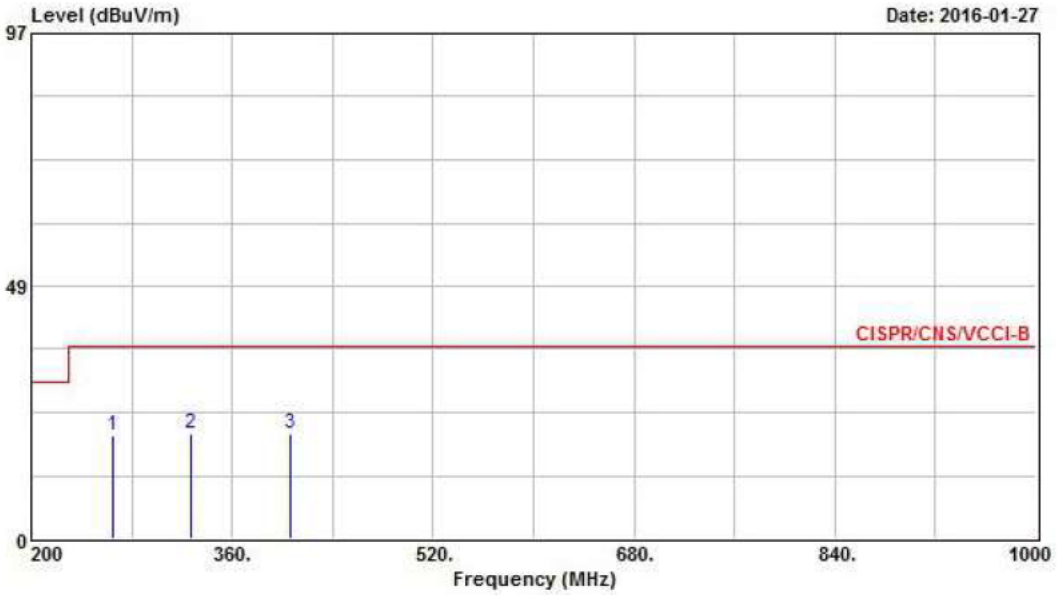
Vertical



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-02-28-2015 VERTICAL

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	34.840	23.01	-6.99	30.00	35.00	15.53	0.92	28.44	Peak	---	---
2 @	124.110	25.91	-4.09	30.00	39.59	12.61	1.91	28.20	QP	100	196
3 @	135.530	24.11	-5.89	30.00	38.50	11.74	2.03	28.16	QP	---	---
4 @	149.540	25.65	-4.35	30.00	40.95	10.67	2.14	28.11	Peak	---	---

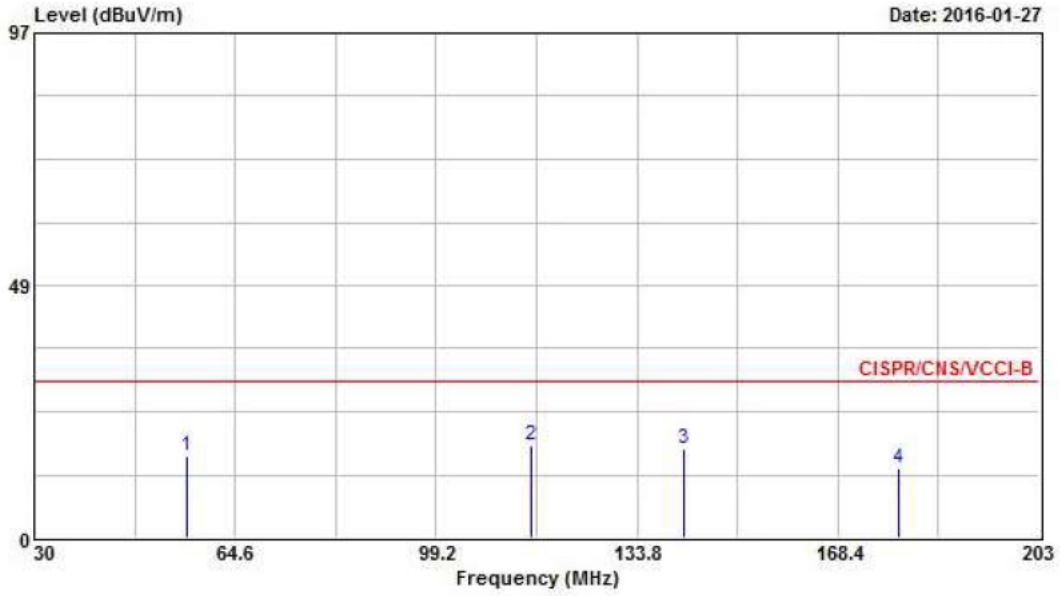
Vertical



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-02-28-2015 VERTICAL

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	264.800	19.71	-17.29	37.00	31.61	12.69	3.24	27.83	Peak	---	---
2	327.200	20.06	-16.94	37.00	30.41	13.94	3.68	27.97	Peak	---	---
3	406.400	20.31	-16.69	37.00	29.00	15.84	4.01	28.54	Peak	---	---

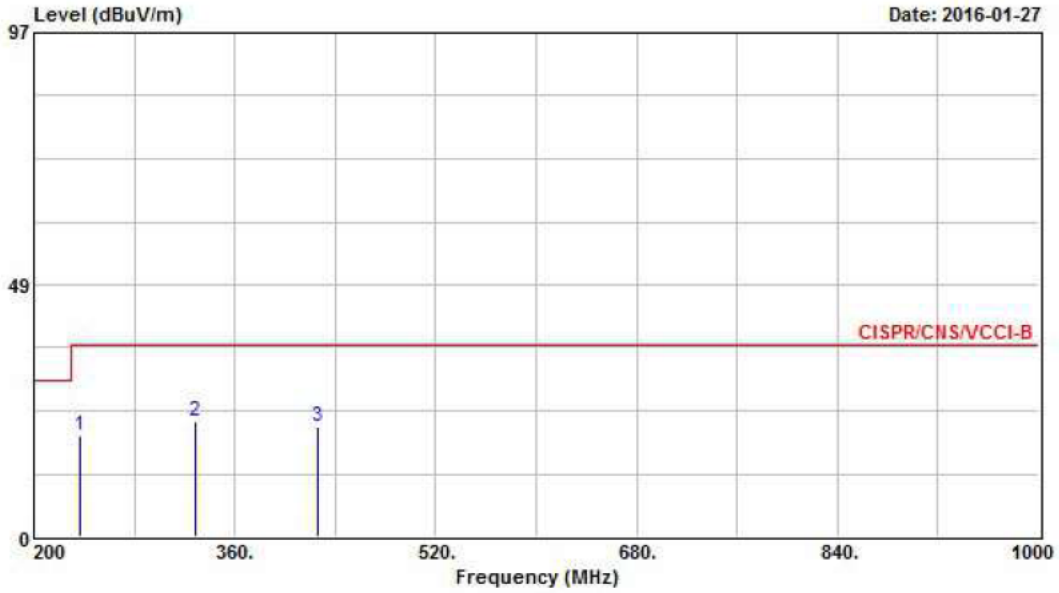
Horizontal



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-02-28-2015 HORIZONTAL

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	56.300	15.59	-14.41	30.00	35.72	7.08	1.19	28.40	Peak	---	---
2 @	115.640	17.83	-12.17	30.00	31.85	12.37	1.84	28.23	Peak	---	---
3	141.930	17.17	-12.83	30.00	31.94	11.29	2.08	28.14	Peak	---	---
4	178.780	13.49	-16.51	30.00	29.58	9.51	2.41	28.01	Peak	---	---

Horizontal



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-02-28-2015 HORIZONTAL

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	236.800	19.36	-17.64	37.00	32.59	11.64	3.00	27.87	Peak	---	---
2	328.800	22.09	-14.91	37.00	32.40	13.99	3.68	27.98	Peak	---	---
3	426.400	21.03	-15.97	37.00	29.40	16.20	4.08	28.65	Peak	---	---

B.4.3 Test Result of Radiated Emission for Above 1GHz

The highest frequency of the internal sources of the EUT is less than 108MHz, so the measurement shall only be made up to 1GHz.

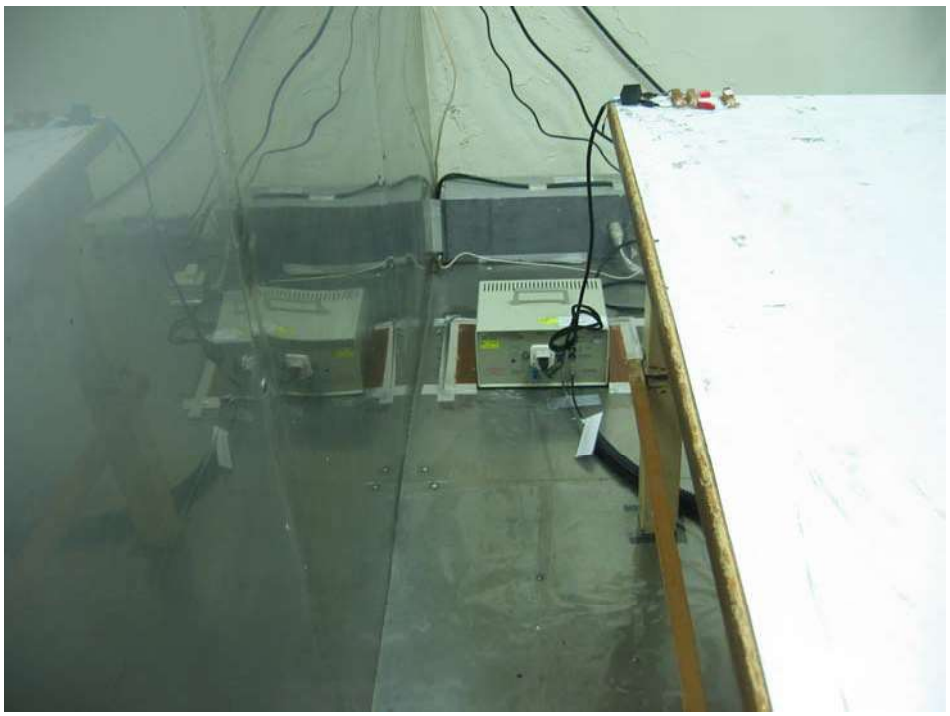
B.5. Photographs of Test Configuration

B.5.1 Photographs of AC Powerline Conducted Emissions Test Configuration

● The photographs show the configuration that generates the maximum emission.

FRONT VIEW

REAR VIEW



SIDE VIEW

B.5.2 Photographs of Radiated Emissions Test Configuration

● The photographs show the configuration that generates the maximum emission.
For Below 1GHz

FRONT VIEW

REAR VIEW

B.6. List of Measuring Equipment Used

Conducted Emission

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver	R&S	ESCS 30	100167	9 kHz - 2.75 GHz	Nov. 12, 2015	Conduction (CO01-NH)
LISN	SCHAFFNER	NNB41	06/10024	9kHz - 30MHz	Dec. 14, 2015	Conduction (CO01-NH)
Power Filter	CORCOM	MR12030	N/A	30A*2	NCR	Conduction (CO01-NH)
RF Cable-CON	Suhner Switzerland	RG223/U	CB004	9kHz - 30MHz	Dec. 10, 2015	Conduction (CO01-NH)

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

Radiation Emission Below 1GHz

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Open Area Test Site	SPORTON	OATS-10	OS03-NH	30 MHz - 1 GHz 10m, 3m	Oct. 03, 2015	Radiation (OS03-NH)
Amplifier	HP	8447D	2944A08292	0.1 MHz - 1.3 GHz	May 11, 2015	Radiation (OS03-NH)
Spectrum Analyzer	Advantest	R3261C	81720147	9 kHz – 2.6 GHz	Nov. 09, 2015	Radiation (OS03-NH)
Receiver	R&S	ESCS 30	838251/002	9 kHz - 2.75 GHz	Nov. 20, 2015	Radiation (OS03-NH)
Bilog Antenna	CHASE	CBL6112D	25234	30 MHz - 2 GHz	Feb. 28, 2015	Radiation (OS03-NH)
Turn Table	EMCO	2080	9805-2065	0 - 360 degree	NCR	Radiation (OS03-NH)
Antenna Mast	EMCO	2075	9804-2151	1 m - 4 m	NCR	Radiation (OS03-NH)
RF Cable-R10m	HSCN	RG213U	2X11N	30 MHz - 1 GHz	Aug. 05, 2015	Radiation (OS03-NH)

Note: Calibration Interval of instruments listed above is one year. NCR: NO CALIBRATION REQUEST.