



SPORTON LAB.

Certificate No: EC462761

CERTIFICATE OF COMPLIANCE

EQUIPMENT : 2.5"SSD/HDD RAID Enclosure

MODEL NO. : GR2660-B3

APPLICANT : RAIDON TECHNOLOGY, INC.

7F-9, No.16, Lane 609, Sec. 5, Chung-Hsin Rd.,
San-Chung Dist., New Taipei City, Taiwan (R.O.C)



I HEREBY

CERTIFY THAT:

The equipment is in accordance with the procedures are given in **Directive 2004/108/EC.**

The equipment was **Passed** the test performed according to

European Standard EN 55022:2010/AC:2011 Class B,

EN 61000-3-2:2006/A1:2009 and /A2:2009, 61000-3-3:2008 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 2.1 2011-03, 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 **Jul. 07, 2014** SPORTON INTERNATIONAL INC. LAB.

Kero Kuo

Engineering Supervisor

CE EMC TEST REPORT

According to

European Standard EN 55022:2010/AC:2011 Class B

EN61000-3-2:2006/A1:2009 and /A2:2009

EN 61000-3-3:2008 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 2.1 2011-03

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 : 2.5"SSD/HDD RAID Enclosure

Model No. : GR2660-B3

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7F-9, No.16, Lane 609, Sec. 5, Chung-Hsin Rd.,
San-Chung Dist., New Taipei City, Taiwan (R.O.C)

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- This test report is only applicable to European Community.



SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

Table of Contents

History of this test report.....	iii
CERTIFICATE OF COMPLIANCE.....	1
1. General Description of Equipment under Test.....	2
1.1 Applicant.....	2
1.2 Manufacturer	2
1.3 Basic Description of Equipment under Test	2
1.4 Feature of Equipment under Test	2
2. Test Configuration of Equipment under Test.....	3
2.1 Test Manner	3
2.2 Description of Test System	4
2.3 Connection Diagram of Test System for Radiated Emission	5
3. Test Software	6
4. General Information of Test.....	7
4.1 Test Facility	7
4.2 Test Voltage	7
4.3 Standard for Methods of Measurement.....	7
4.4 Test in Compliance with	7
4.5 Frequency Range Investigated	8
4.6 Test Distance	8
5. Test of Conducted Powerline	9
5.1 Test Procedures.....	9
5.2 Typical Test Setup Layout of Conducted Powerline and Telecommunication Ports.....	10
5.3 Test Result of AC Powerline Conducted Emission	11
5.4 Photographs of Conducted Power line Test Configuration	13
6. Test of Radiated Emission.....	15
6.1 Test Procedures.....	15
6.2 Typical Test Setup Layout of Radiated Emission.....	17
6.3 Test Result of Radiated Emission (Below 1GHz).....	18
6.4 Photographs of Radiated Emission (Below 1GHz) Test Configuration	22
6.5 Test Result of Radiated Emission (From 1GHz to 6GHz).....	23
6.6 Photographs of Radiated Emission Test Configuration (From 1GHz to 6GHz)	25
7. Harmonics Test.....	26
7.1 Standard.....	26
7.2 Test Procedure.....	26
7.3 Test Equipment Settings	26
7.4 Test Setup	26
7.5 Current Harmonics Test	27
8. Voltage Fluctuations Test.....	28
8.1 Standard.....	28
8.2 Test Procedure.....	28
8.3 Test Equipment Settings	28
8.4 Test Setup	28
8.5 Test Result of Voltage Fluctuation and Flicker Test.....	29
8.6 Photographs of Voltage Fluctuation and Flicker Test	30
9. Electrostatic Discharge Immunity Test (ESD)	31
9.1 Test Setup	32

9.2 Test Setup for Tests Performed in Laboratory	32
9.3 ESD Test Procedure	33
9.4 Test Severity Levels	34
9.5 Test Points	35
9.6 Photographs of Test Points	36
9.7 Photographs of Electrostatic Discharge Immunity Test	39
10. Radio Frequency Electromagnetic Field Immunity Test (RS).....	40
10.1 Test Setup	40
10.2 Test Procedure	41
10.3 Test Severity Levels	41
10.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test	42
11. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)	43
11.1 Test Setup	43
11.2 Test on Power Line	44
11.3 Test on Communication Lines	44
11.4 Test Procedure	44
11.5 Test Severity Levels	45
11.6 Photographs of Electrical Fast Transient/Burst Immunity Test	46
12. Surge Immunity Test	47
12.1 Test Record	47
12.2 Test Level	47
12.3 Test Procedure	48
12.4 Operating Condition	49
12.5 Photographs of Surge Immunity Test	50
13. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (CS).....	51
13.1 Test Level	51
13.2 Test Procedure	52
13.3 Photographs of CS Immunity Test	53
14. Power Frequency Magnetic Field Immunity Tests	54
14.1 Test Record	54
14.2 Test Setup	54
14.3 Photographs of Power Frequency Magnetic Field Immunity Tests	55
15. Voltage Dips and Voltage Interruption Immunity Tests	56
15.1 Test Record of Voltage Interruption	56
15.2 Test Record of Voltage Dips	56
15.3 Testing Requirement and Procedure	56
15.4 Test Conditions	56
15.5 Operating Condition	56
15.6 Photographs of Voltage Dips and Voltage Interruption Immunity Tests	57
16. Uncertainty of Test Site	58
17. List of Measuring Equipment Used	64
Appendix A. Photographs of EUT	A1 ~ A9

History of this test report

Original Report Issue Date: Jul. 21, 2014

- ☒ No additional attachment.
☐ Additional attachments were issued as in the following record:

Report No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

According to

European Standard EN 55022:2010/AC:2011 Class B

EN61000-3-2:2006/A1:2009 and /A2:2009

EN 61000-3-3:2008 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 2.1 2011-03

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 : 2.5"SSD/HDD RAID Enclosure

Model No. : GR2660-B3

Applicant : **RAIDON TECHNOLOGY, INC.**
7F-9, No.16, Lane 609, Sec. 5, Chung-Hsin Rd.,
San-Chung Dist., New Taipei City, Taiwan (R.O.C)

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 2004/108/EC**. The equipment was **passed** the test performed according to **European Standard EN 55022:2010/AC:2011 Class B, EN 61000-3-2:2006/A1:2009 and /A2:2009, EN 61000-3-3:2008 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 2.1 2011-03, 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 **Jun. 30, 2014** and completely tested on **Jul. 07, 2014** at **SPORTON International Inc. LAB**.


Kero Kuo
Engineering Supervisor

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

1. General Description of Equipment under Test

1.1 Applicant

RAIDON TECHNOLOGY, INC.

7F-9, No.16, Lane 609, Sec. 5, Chung-Hsin Rd., San-Chung Dist., New Taipei City, Taiwan (R.O.C)

1.2 Manufacturer

Same as 1.1


1.3 Basic Description of Equipment under Test

Equipment	:	2.5"SSD/HDD RAID Enclosure
Model No.	:	GR2660-B3
Trade Name	:	RAIDON
USB Cable	:	D-Shielded, 1.0 m
Power Supply Type	:	Adapter
AC Power Cord	:	Non-Shielded, 1.8m, 2 pin
DC Power Cable	:	Non-Shielded, 1.85m, 2 pin

1.4 Feature of Equipment under Test

Adapter (UNIFIVE, UIA324-12)

Input : AC 100-240V, 50/60Hz, 0.6A

Output : DC 12V  2A

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.
- b. The complete test system included PC, LCD Monitor, USB Keyboard, USB Mouse, Printer, Modem and EUT for EMI test.
- c. The following test modes were pretested for EMI test:
 - Mode 1. R/W
- d. The complete test system included PC, LCD Monitor, USB Keyboard, USB Mouse and EUT for Harmonic, Flicker & EMS test.
- e. The following test mode was for Harmonic, Flicker and EMS final test:
 - Mode 1. R/W
- f. Frequency range investigated: Conducted 150 kHz to 30 MHz, Radiated 30 MHz to 6,000 MHz.

2.2 Description of Test System

< EMI >

For conducted emission and radiated emission below 1GHz

No.	Description	Manufacturer	Model	FCC ID	Signal Cable Description
1	PC	Lenovo	C61	DoC	---
2	LCD Monitor	DELL	E198WFPF	DoC	D-SUB Cable, D-Shielded, 1.8m
3	USB Keyboard	Lenovo	KU-0225	DoC	USB Cable, AL-F-Shielded, 1.8m
4	USB Mouse	Lenovo	M-U0025-O	DoC	USB Cable, AL-F-Shielded, 1.8m
5	Printer	HP	C2642A	B94C2642X	LPT Cable, D-Shielded, 1.2m
6	Modem	ACEEX	DM1414	IFAXDM1414	RS-232 Cable, D-Shielded, 1.15m
7	HDD(320G) x2	WD	WD3200BJKT-00F4T0	---	---

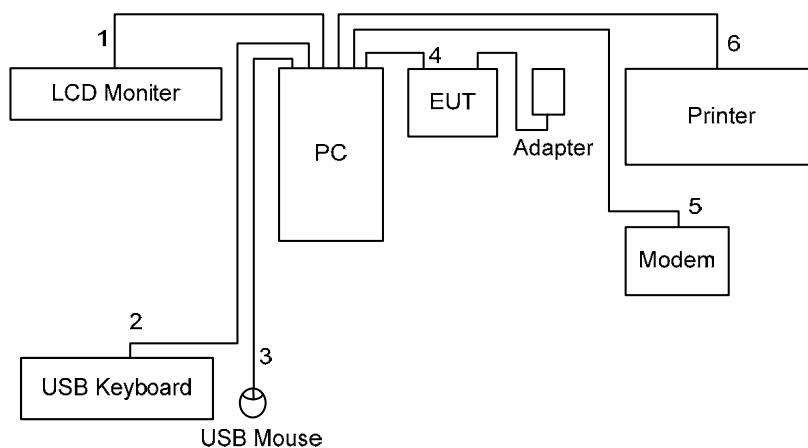
For radiated emission above 1GHz

No.	Description	Manufacturer	Model	FCC ID	Signal Cable Description
1	PC	DELL	DCTA	DoC	---
2	LCD Monitor	DELL	2408WFPb	DoC	D-SUB Cable, D-Shielded, 1.8m
3	USB Keyboard	DELL	SK-8175	DoC	USB Cable, AL-F-Shielded, 1.8m
4	USB Mouse	DELL	MOC5UO	DoC	USB Cable, AL-F-Shielded, 1.8m
5	Printer	HP	C2642A	B94C2642X	LPT Cable, D-Shielded, 1.2m
6	Modem	ACEEX	DM1414	IFAXDM1414	RS-232 Cable, D-Shielded, 1.15m
7	HDD(320G) x2	WD	WD3200BJKT-00F4T0	---	---

< EMS >

No.	Description	Manufacturer	Model	FCC ID	Signal Cable Description
1	PC	DELL	470	DoC	---
2	LCD Monitor	View Sonic	VS15032	DoC	D-SUB Cable, Shielded, 1.8m
3	USB Keyboard	DELL	KB113t	DoC	USB Cable, AL-F-Shielded, 2.0m
4	USB Mouse	DELL	MS111-P	DoC	USB Cable, AL-F-Shielded, 1.8m
5	HDD(320G) x2	WD	WD3200BJKT-00F4T0	---	---

2.3 Connection Diagram of Test System for Radiated Emission



The support unit 7 is insert into EUT.

1. The D-Sub cable is connected from support unit 1 to the support unit 2.
2. The USB cable is connected from support unit 1 to the support unit 3.
3. The USB cable is connected from support unit 1 to the support unit 4.
4. The USB cable is connected from EUT to the support unit 1.
5. The RS232 cable is connected from support unit 1 to the support unit 6.
6. The LPT cable is connected from support unit 1 to the support unit 5.

Note: Above support unit on behalf of the meaning, please refer to section 2.2. (EMI part)

3. Test Software

< EMI >

An executive program, "EMIprogram" under Win 7, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the hard disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the modem.
- f. Repeat the steps from c to e.

At the same time, the following program was executed:

- The PC executed "WINTHRAX" to read and write the HDD of EUT via USB cable.

<EMS>

During the test, the PC executed "WINTHRAX" program under Win 7 to read and write the HDD of EUT via USB cable.

4. General Information of Test

4.1 Test Facility

< EMI >

For conducted emission

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 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. : OS02-NH

For radiated emission above 1GHz

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang,
Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-327-0973
03CH04-HY

< EMS >

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

4.2 Test Voltage

230V / 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: EN/IEC 61000-4-2, RS: EN/IEC 61000-4-3, EFT: EN/IEC 61000-4-4,
Surge: EN/IEC 61000-4-5, CS: EN/IEC 61000-4-6, Power Frequency
Magnetic Field: EN/IEC 61000-4-8, DIPS: EN/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: EN/IEC 61000-4-2, RS: EN/IEC 61000-4-3, EFT: EN/IEC 61000-4-4,
Surge: EN/IEC 61000-4-5, CS: EN/IEC 61000-4-6, Power Frequency
Magnetic Field: EN/IEC 61000-4-8, DIPS: EN/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 6,000 MHz
- c. Radio frequency electromagnetic field immunity test: 80-1000 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 radiated emission from antenna to EUT is 3 M (from 1GHz ~ 6GHz)
- c. The test distance of radio frequency electromagnetic field immunity test from antenna to EUT is 3 M

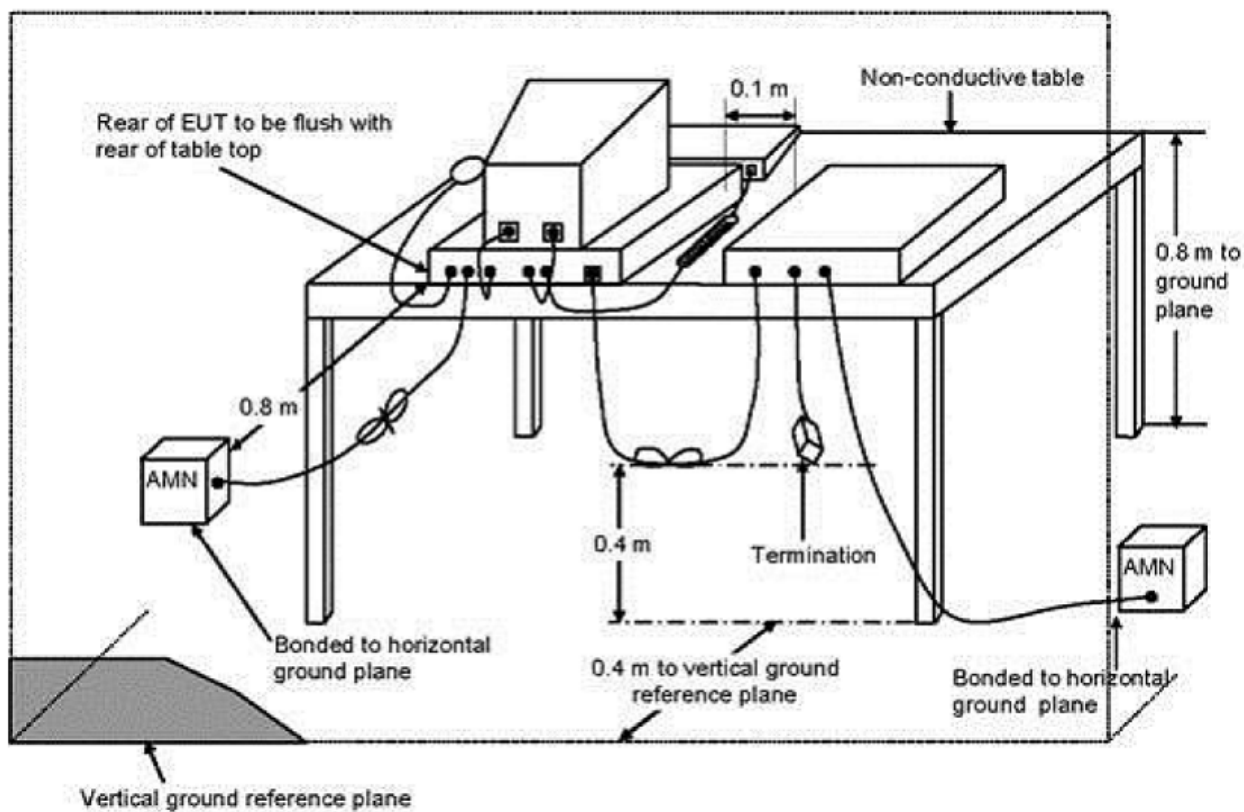
5. Test of Conducted Powerline

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 European Standard 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 5.3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing 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 and Telecommunication Ports



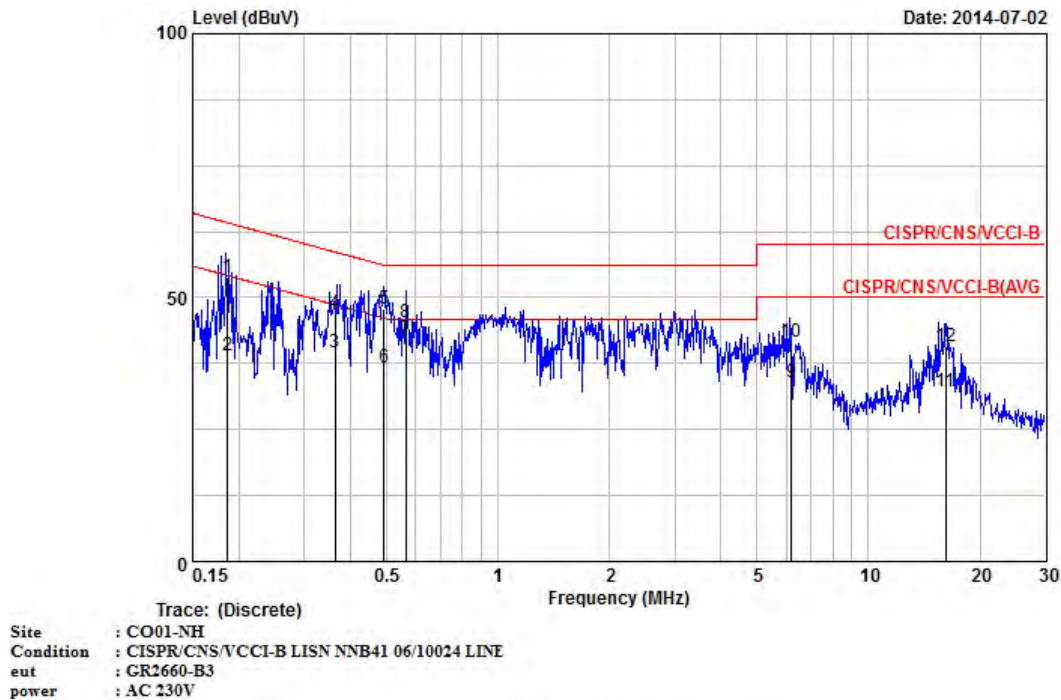
5.3 Test Result of AC Powerline Conducted Emission

Test Mode	Mode 1	Temperature	28°C
Test Engineer	Willy Lee	Humidity	50%

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

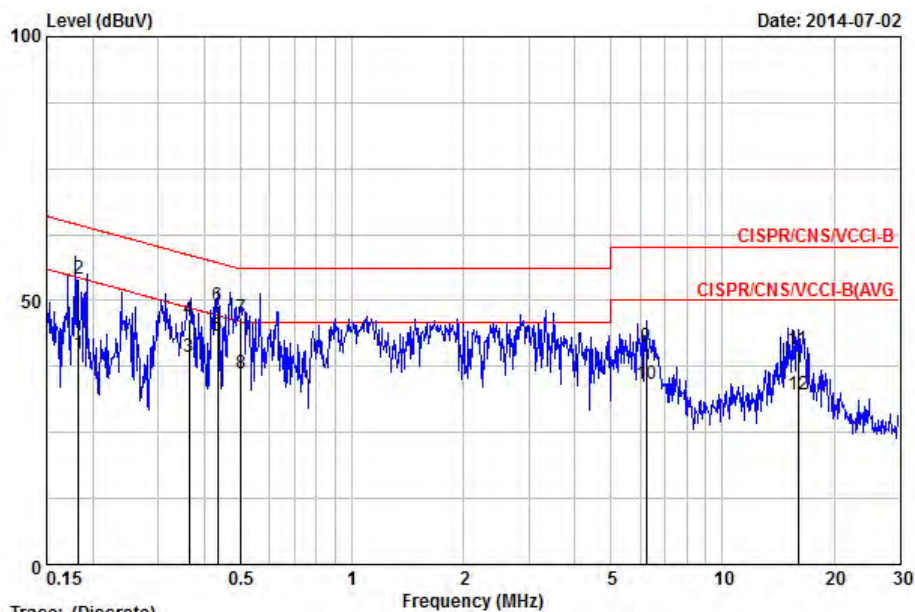
■ The test was passed at the minimum margin that marked by the frame in the following data

LINE



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBμV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBμV	dBμV	dB	dB	
1	0.186	53.90	-10.29	64.20	43.24	10.56	0.10	QP
2	0.186	39.07	-15.12	54.20	28.41	10.56	0.10	AVERAGE
3	0.363	39.65	-9.01	48.66	29.05	10.50	0.10	AVERAGE
4	0.363	46.88	-11.78	58.66	36.28	10.50	0.10	QP
5	0.493	47.82	-8.31	56.12	37.22	10.49	0.10	QP
6	0.493	36.65	-9.48	46.12	26.05	10.49	0.10	AVERAGE
7	0.565	42.18	-3.82	46.00	31.58	10.50	0.10	AVERAGE
8	0.565	45.32	-10.68	56.00	34.72	10.50	0.10	QP
9	6.186	33.79	-16.21	50.00	22.93	10.66	0.20	AVERAGE
10	6.186	41.59	-18.41	60.00	30.73	10.66	0.20	QP
11	16.140	32.14	-17.86	50.00	20.99	10.85	0.30	AVERAGE
12	16.140	40.85	-19.15	60.00	29.70	10.85	0.30	QP

NEUTRAL



Trace: (Discrete)

Site : CO01-NH
 Condition : CISPR/CNS/VCCI-B LISN NNB41 06/10024 NEUTRAL
 eut : GR2660-B3
 power : AC 130V

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.183	39.99	-14.34	54.34	29.81	10.08	0.10	AVERAGE
2	0.183	54.06	-10.27	64.34	43.88	10.08	0.10	QP
3	0.363	39.39	-9.26	48.65	29.21	10.08	0.10	AVERAGE
4	0.363	46.35	-12.30	58.65	36.17	10.08	0.10	QP
5	0.433	43.23	-3.96	47.19	33.05	10.08	0.10	AVERAGE
6	0.433	49.04	-8.15	57.19	38.86	10.08	0.10	QP
7	0.502	46.62	-9.38	56.00	36.43	10.08	0.10	QP
8	0.502	36.11	-9.89	46.00	25.92	10.08	0.10	AVERAGE
9	6.219	41.28	-18.72	60.00	30.85	10.23	0.20	QP
10	6.219	34.09	-15.91	50.00	23.66	10.23	0.20	AVERAGE
11	15.970	40.85	-19.15	60.00	30.14	10.41	0.30	QP
12	15.970	32.23	-17.77	50.00	21.52	10.41	0.30	AVERAGE

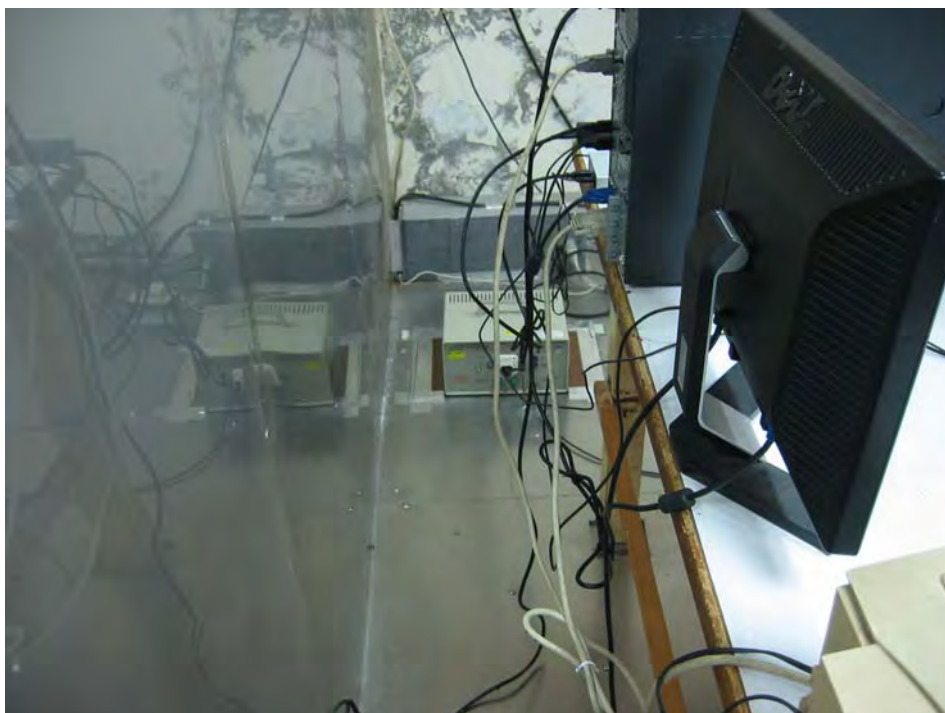
5.4 Photographs of Conducted Power line Test Configuration

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

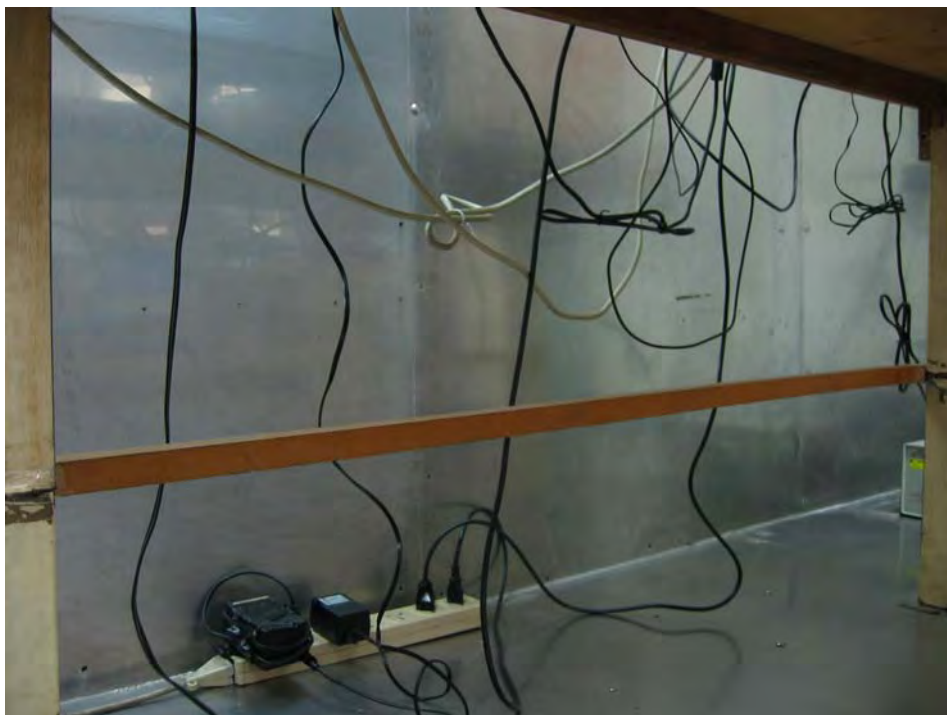
FRONT VIEW



REAR VIEW



SIDE VIEW



6. Test of Radiated Emission

Radiated emissions below 1 GHz were measured with a bandwidth of 120 kHz for 30 MHz to 1,000 MHz, 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 6.3. 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.
- 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.

< Above 1GHz >

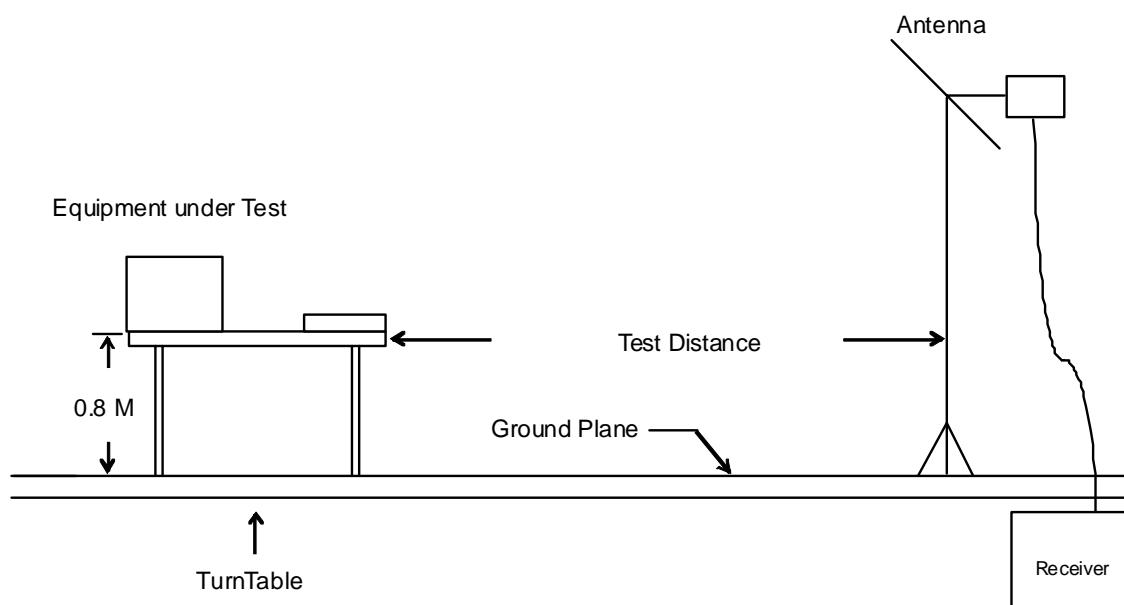
- a. The EUT was placed on a turntable at the height of 0.8 meters from the ground.
- b. The EUT was set at a distance of 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. An absorber was placed between the EUT and Antenna as required 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.

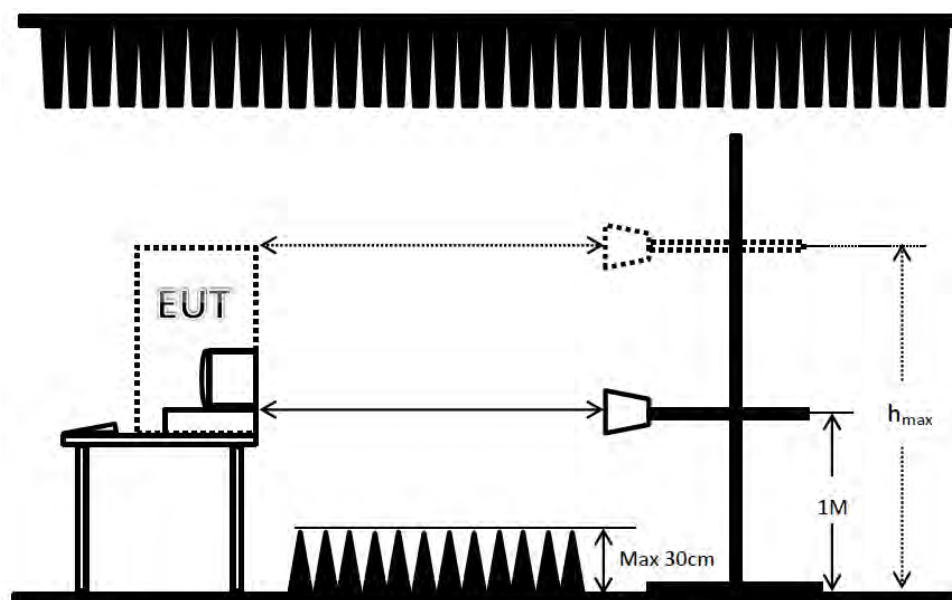
- h. If the emission level of the EUT in "Peak Detection" mode is 20dB lower than the "Average" limit (means that the emission level in "Peak Detection" mode also complies with the limit in "Average Mode"), testing will be stopped and "Peak" values of the EUT will be reported, otherwise, the emissions 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 (Below 1GHz)

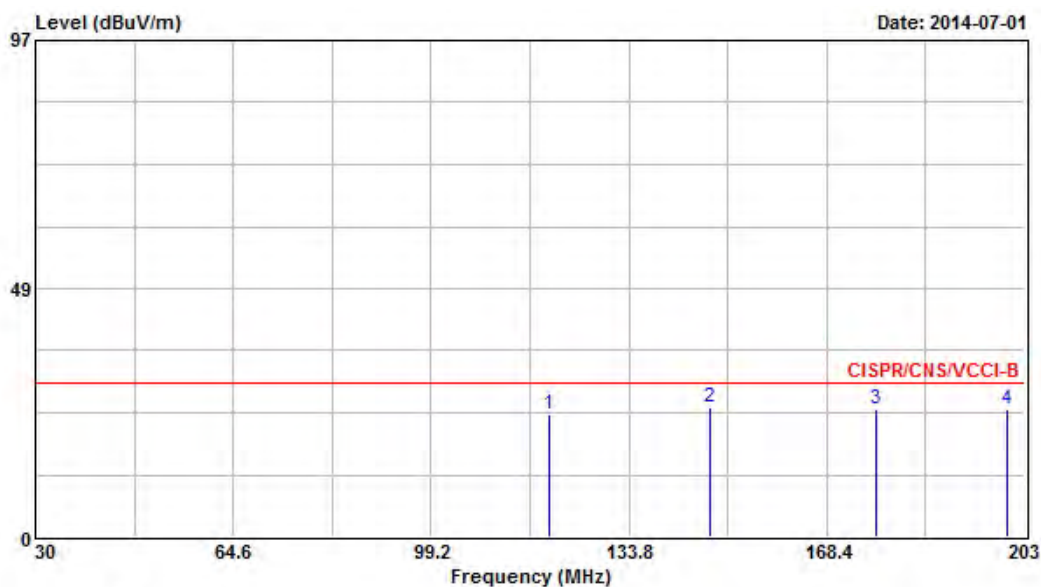
Frequency Range of Test	From 30 MHz to 1,000 MHz	Test Distance	10m
Test Mode	Mode 1	Temperature	30°C
Test Engineer	Chas Yeh	Humidity	57%

Note: 1. Emission level (dB μ V/m) = 20 log Emission level (μ V/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

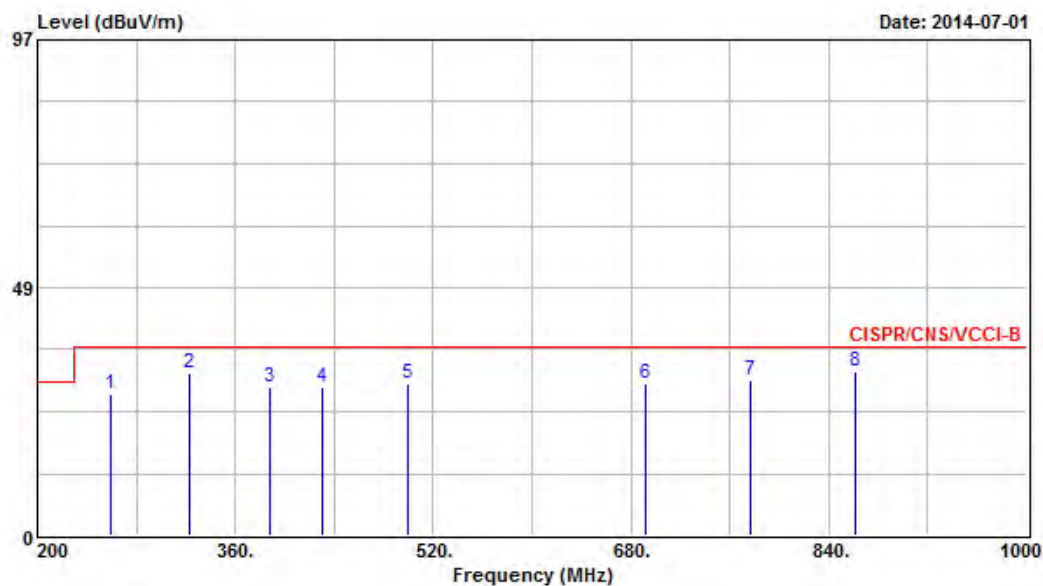
Vertical



Site : OS02-NH
Condition : CISPR/CNS/VCCI-B 10m OS02-ANT-03-03-2014 VERTICAL
EUT : GR2660-B3
POWER : 230VAC

	Freq	Level	Over Limit	Limit Line	ReadAntenna 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	119.960	23.95	-6.05	30.00	41.89	12.21	1.45	31.60	Peak	---	---
2	147.990	25.29	-4.71	30.00	44.55	10.70	1.59	31.55	Peak	100	180
3	177.050	24.77	-5.23	30.00	45.03	9.45	1.77	31.48	Peak	---	---
4	200.060	24.83	-5.17	30.00	44.96	9.42	1.88	31.43	Peak	---	---

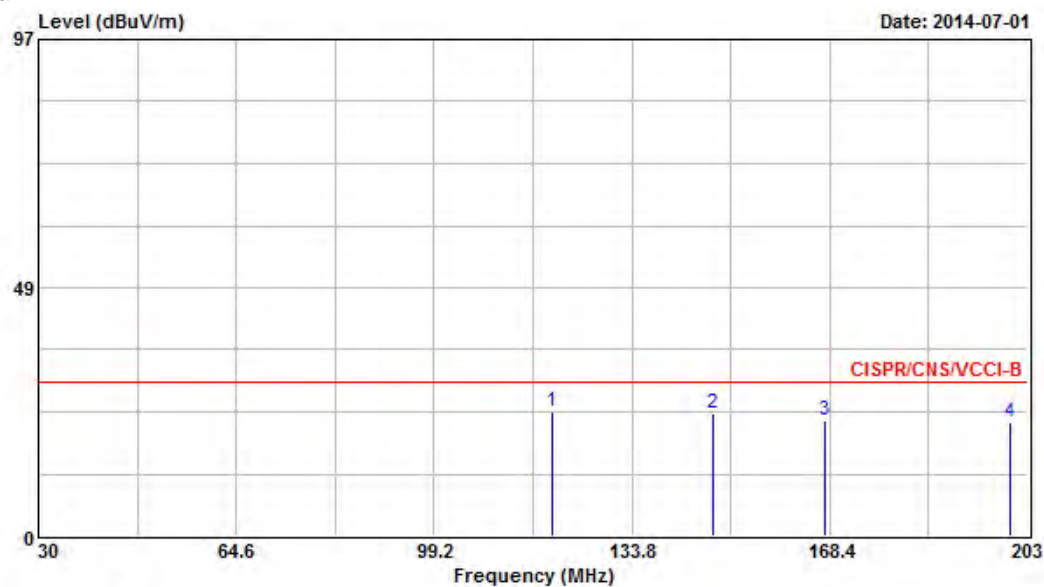
Vertical



Site : OS02-NH
 Condition : CISPR/CNS/VCCI-B 10m OS02-ANT-03-03-2014 VERTICAL
 EUT : GR2660-B3
 POWER : 230VAC

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	259.200	27.58	-9.42	37.00	44.24	12.52	2.15	31.33	Peak	---	---
2	323.200	31.72	-5.28	37.00	46.73	13.86	2.42	31.29	Peak	---	---
3	388.000	29.18	-7.82	37.00	42.33	15.51	2.71	31.37	Peak	---	---
4	430.400	29.19	-7.81	37.00	41.32	16.38	2.86	31.37	Peak	---	---
5	499.200	29.70	-7.30	37.00	40.30	17.64	3.09	31.33	Peak	---	---
6	691.200	29.79	-7.21	37.00	37.95	19.25	3.85	31.26	Peak	---	---
7	776.800	30.42	-6.58	37.00	37.39	20.17	4.07	31.21	Peak	---	---
8	860.800	32.15	-4.85	37.00	38.04	20.98	4.27	31.14	Peak	---	---

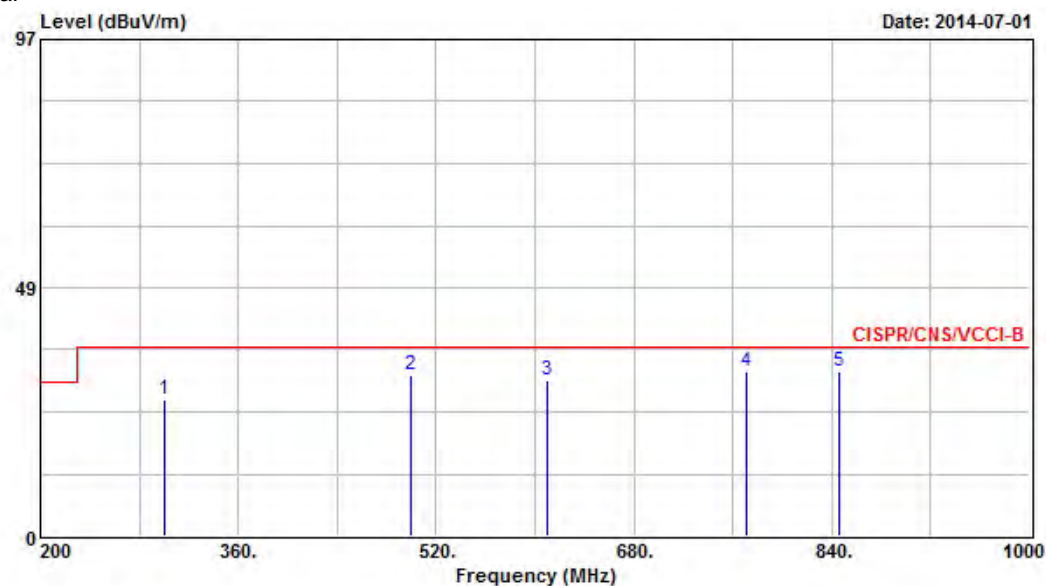
Horizontal



Site : OS02-NH
 Condition : CISPR/CNS/VCCI-B 10m OS02-ANT-03-03-2014 HORIZONTAL
 EUT : GR2660-B3
 POWER : 230VAC

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	119.960	24.22	-5.78	30.00	42.16	12.21	1.45	31.60	Peak	---	---
2	147.990	24.01	-5.99	30.00	43.27	10.70	1.59	31.55	Peak	---	---
3	167.540	22.44	-7.56	30.00	42.31	9.91	1.72	31.50	Peak	---	---
4	200.060	22.33	-7.67	30.00	42.46	9.42	1.88	31.43	Peak	---	---

Horizontal



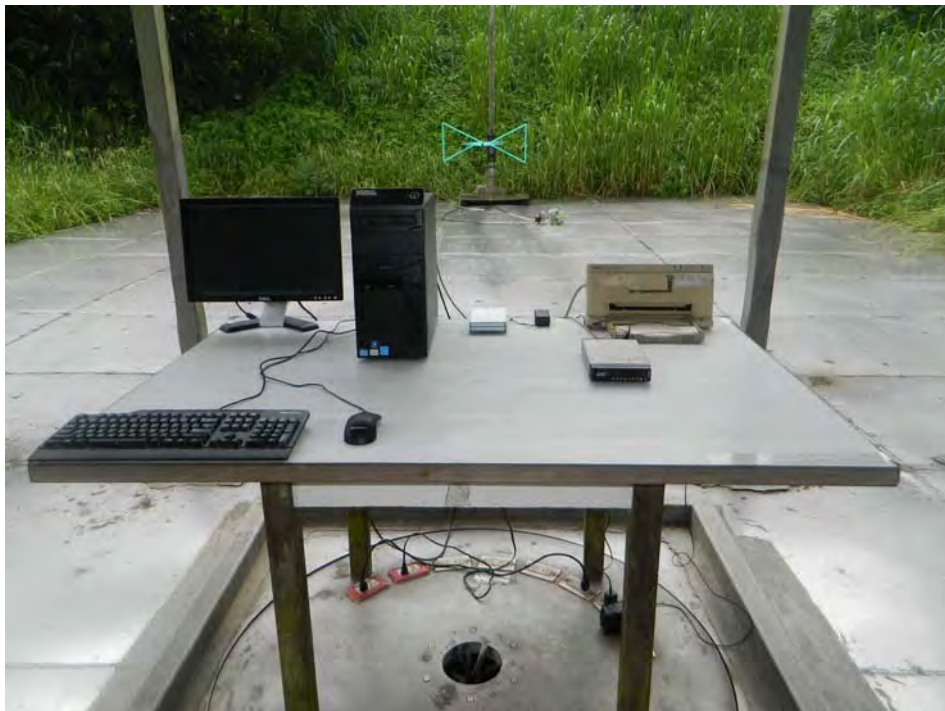
Site : OS02-NH
 Condition : CISPR/CNS/VCCI-B 10m OS02-ANT-03-03-2014 HORIZONTAL
 EUT : GR2660-B3
 POWER : 230VAC

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	300.000	26.81	-10.19	37.00	42.50	13.27	2.30	31.26 Peak	---	---
2 @	499.200	31.31	-5.69	37.00	41.91	17.64	3.09	31.33 Peak	---	---
3	609.600	30.52	-6.48	37.00	39.11	19.07	3.57	31.23 Peak	---	---
4 @	771.200	32.11	-4.89	37.00	39.17	20.10	4.05	31.21 QP	---	---
5 @	845.600	32.01	-4.99	37.00	38.09	20.85	4.22	31.15 QP	---	---

6.4 Photographs of Radiated Emission (Below 1GHz) Test Configuration

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

FRONT VIEW



REAR VIEW



6.5 Test Result of Radiated Emission (From 1GHz to 6GHz)

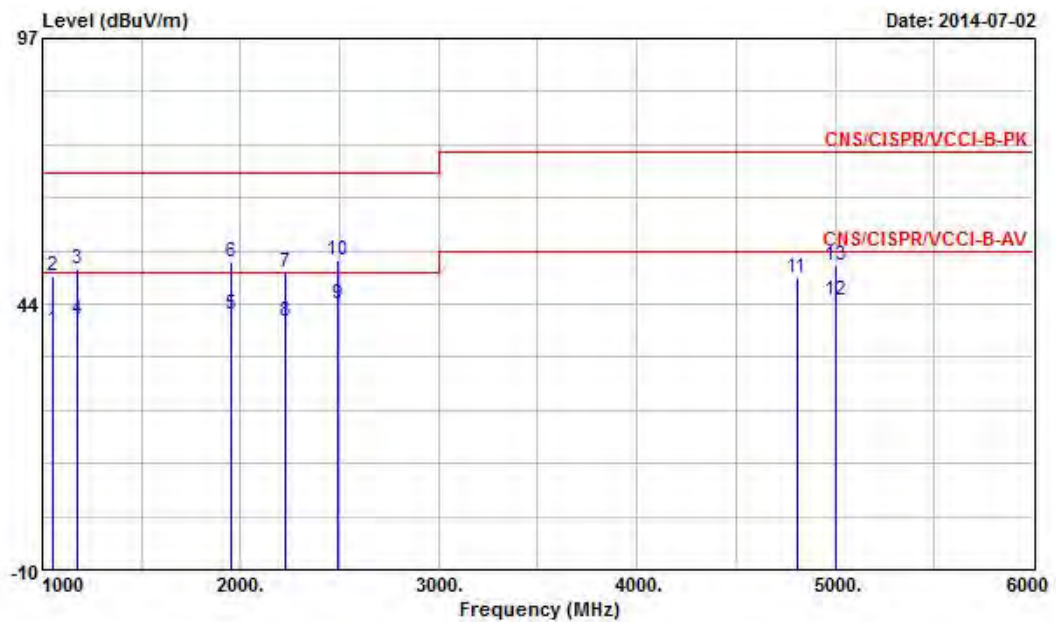
Frequency Range of Test	From 1000 MHz to 6000 MHz	Test Distance	3m
Test Mode	Mode 1	Temperature	22°C
Test Engineer	Kevin Huang	Humidity	57%

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

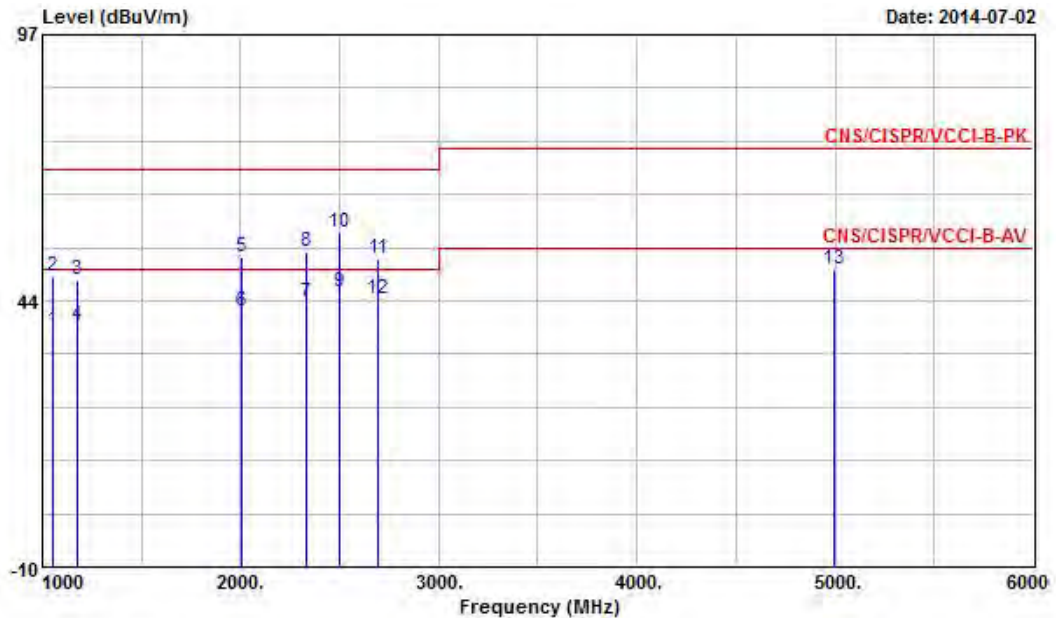
VERTICAL



Site :03CH04-HY
 Condition:CNS/CISPR/VCCI-B-PK 3m HF-ANT-9120D VERTICAL
 EUT :External Box
 MODEL :GR2660-B3
 POWER :230V 50Hz
 MEMO :MODE 1

	Freq	Level	Over Limit	Limit Line	ReadAntenna	Preamp	Cable	Ant	Table	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	1052.000	38.21	-11.79	50.00	46.24	24.81	34.44	1.60	100	196 Average
2	1052.000	49.16	-20.84	70.00	57.19	24.81	34.44	1.60	100	196 Peak
3	1174.000	50.53	-19.47	70.00	58.02	25.08	34.25	1.68	100	193 Peak
4	1174.000	40.20	-9.80	50.00	47.69	25.08	34.25	1.68	100	193 Average
5 @	1956.000	41.38	-8.62	50.00	46.62	26.07	33.54	2.24	100	145 Average
6	1956.000	52.09	-17.91	70.00	57.33	26.07	33.54	2.24	100	145 Peak
7	2228.000	49.88	-20.12	70.00	54.58	26.64	33.73	2.39	100	98 Peak
8	2228.000	39.88	-10.12	50.00	44.58	26.64	33.73	2.39	100	98 Average
9 @	2494.000	43.55	-6.45	50.00	47.67	27.30	33.99	2.57	100	276 Average
10	2494.000	52.25	-17.75	70.00	56.37	27.30	33.99	2.57	100	276 Peak
11	4809.000	48.71	-25.29	74.00	48.33	31.20	34.40	3.58	---	---
12	5001.000	44.12	-9.88	54.00	43.56	31.50	34.40	3.46	100	155 Average
13	5001.000	51.28	-22.72	74.00	50.72	31.50	34.40	3.46	100	155 Peak

HORIZONTAL



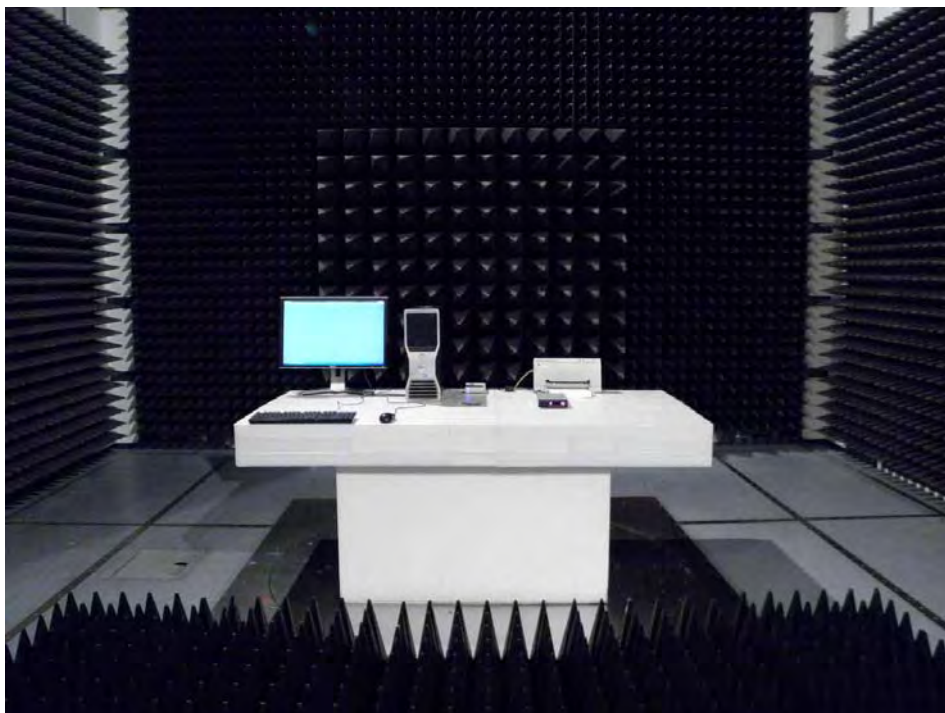
Site : 03CH04-HY
 Condition: CNS/CISPR/VCCI-B-PK 3m HF-ANT-9120D HORIZONTAL
 EUT : External Box
 MODEL : GR2660-B3
 POWER : 230V 50Hz
 MEMO : MODE 1

	Freq	Level	Over	Limit	ReadAntenna	Preamp	Cable	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level	Factor	Factor	Loss	Pos	Pos Remark
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	1052.000	37.35	-12.65	50.00	45.38	24.81	34.44	1.60	100	195 Average
2	1052.000	48.32	-21.68	70.00	56.35	24.81	34.44	1.60	100	195 Peak
3	1172.000	47.64	-22.36	70.00	55.13	25.08	34.25	1.68	100	190 Peak
4	1172.000	38.64	-11.36	50.00	46.13	25.08	34.25	1.68	100	190 Average
5	2004.000	52.15	-17.85	70.00	57.30	26.10	33.52	2.27	100	178 Peak
6 @	2004.000	41.32	-8.68	50.00	46.47	26.10	33.52	2.27	100	178 Average
7 @	2332.000	43.31	-6.69	50.00	47.78	26.89	33.83	2.47	100	142 Average
8	2332.000	53.31	-16.69	70.00	57.78	26.89	33.83	2.47	100	142 Peak
9 @	2500.000	45.18	-4.82	50.00	49.30	27.30	33.99	2.57	100	140 Average
10	2500.000	57.18	-12.82	70.00	61.30	27.30	33.99	2.57	100	140 Peak
11	2694.000	51.83	-18.17	70.00	55.52	27.70	34.11	2.72	100	156 Peak
12 @	2694.000	43.75	-6.25	50.00	47.44	27.70	34.11	2.72	100	156 Average
13	4998.000	49.73	-24.27	74.00	49.17	31.50	34.40	3.46	---	---

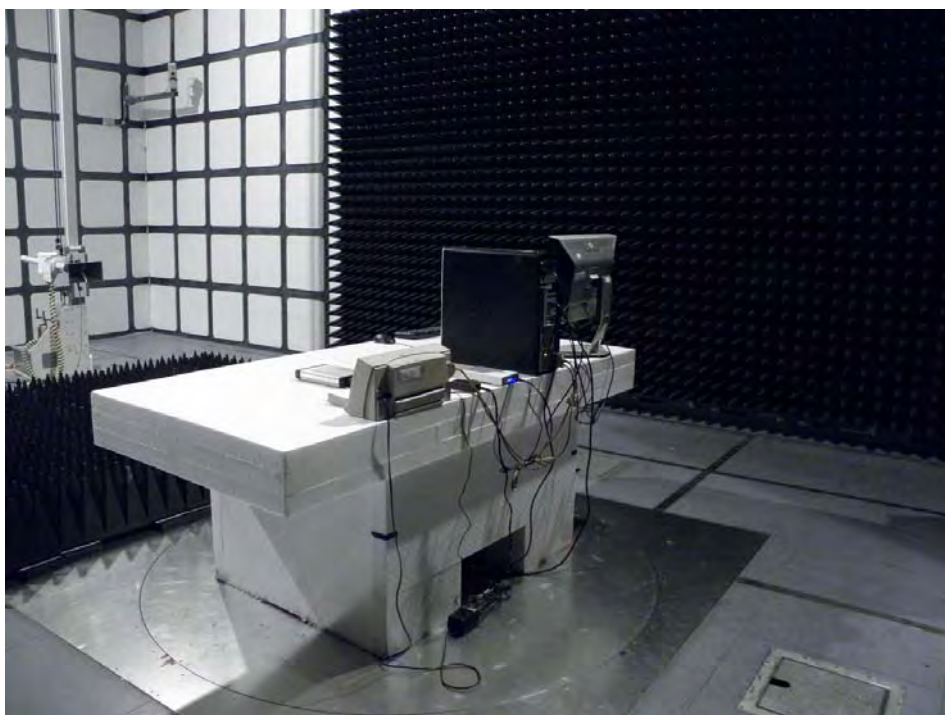
6.6 Photographs of Radiated Emission Test Configuration (From 1GHz to 6GHz)

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

FRONT VIEW



REAR VIEW



7. Harmonics Test

7.1 Standard

- Standard : EN 61000-3-2:2006/A1:2009 and /A2:2009

7.2 Test Procedure

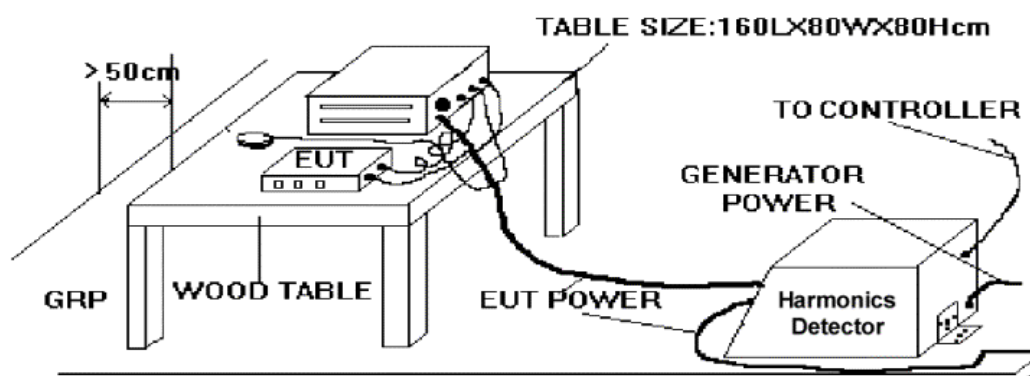
The measurement of harmonic currents shall be performed as follows:

- 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 ($T_{cycle} \leq 2.5$ 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
Current Measurement Range	High
Measurement Delay	10 seconds
Test Duration	10 minutes
Class determination Pre-test Duration	10 seconds

7.4 Test Setup



7.5 Current Harmonics Test

As specified on clause 7 of EN 61000-3-2:2006/A1:2009 and /A2:2009, 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.

V_RMS (Volts):	231.26	Frequency(Hz):	50.00
I_Peak (Amps):	0.472	I_RMS (Amps):	0.096
I_Fund (Amps):	0.042	Crest Factor:	5.323
Power (Watts):	8.8	Power Factor:	0.410

8. Voltage Fluctuations Test

8.1 Standard

- Standard : EN 61000-3-3:2008

8.2 Test Procedure

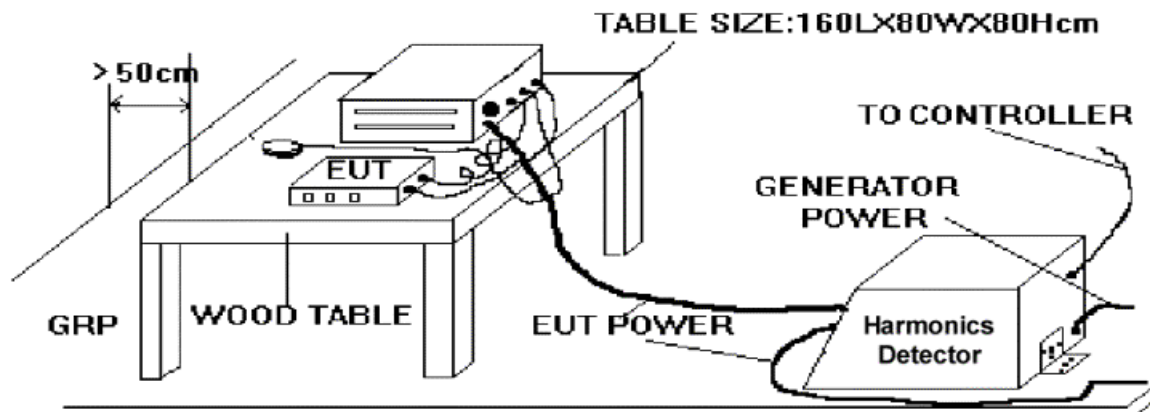
The equipment shall be tested under the conditions of **Clause 5**.

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 $\pm 8\%$ 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 minutes
Pst Integration Periods	1
Test Duration	10 minutes

8.4 Test Setup



8.5 Test Result of Voltage Fluctuation and Flicker Test

Final Test Result	PASS
Temperature	26°C
Relative Humidity	52 %
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 04, 2014
Test Engineer	Cat Lin

Test Result: Pass

Status: Test Completed

Parameter values recorded during the test:

Vrms at the end of test (Volt): 231.21

Highest dt (%): 0.00

Time(mS) > dt: 0.0

Highest dc (%): 0.00

Highest dmax (%): 0.00

Highest Pst (10 min. period): 0.078

Test limit (%): 3.30 Pass

Test limit (mS): 500.0 Pass

Test limit (%): 3.30 Pass

Test limit (%): 4.00 Pass

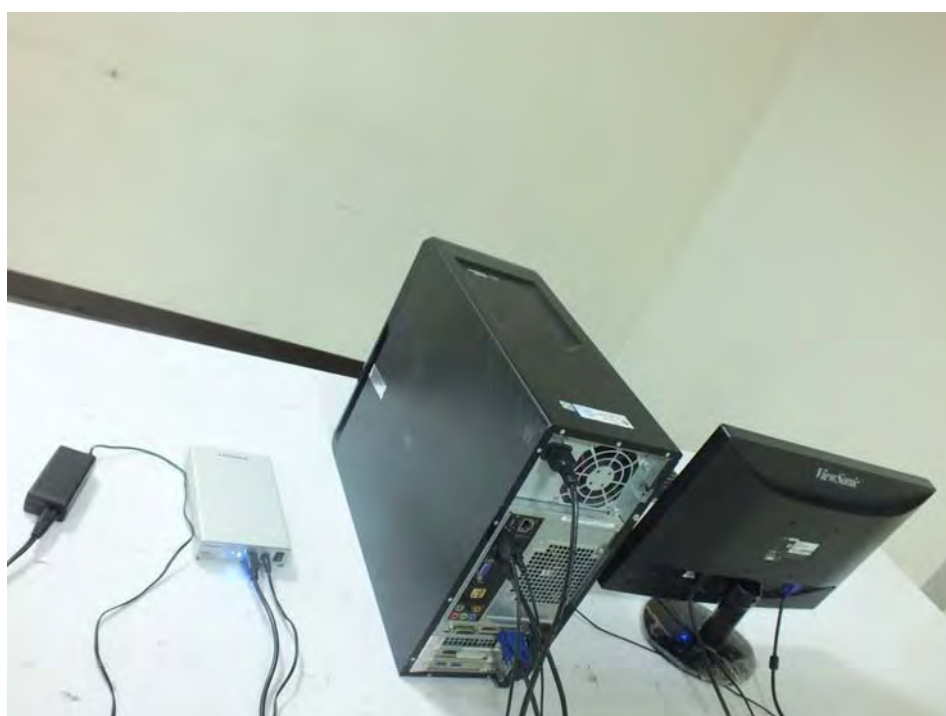
Test limit: 1.000 Pass

8.6 Photographs of Voltage Fluctuation and Flicker Test

FRONT VIEW



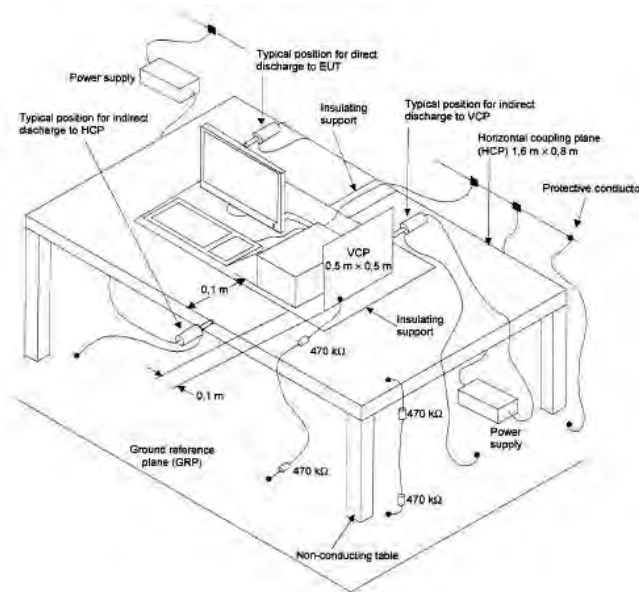
REAR VIEW



9. Electrostatic Discharge Immunity Test (ESD)

Final Test Result	PASS
Obtained Performance Criterion	B
Required Performance Criteria	B
Basic Standard	IEC 61000-4-2 Edition 2.0 2008-12
Product Standard	EN 55024:2010
Level	3 for air discharge 2 for contact discharge
Test Voltage	$\pm 2 / \pm 4 / \pm 8$ kV for air discharge $\pm 2 / \pm 4$ kV for contact discharge
Temperature	25°C
Relative Humidity	47%
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 07, 2014
Test Engineer	Cat Lin
Observation	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 :

- CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- 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 resistor 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°C to 35°C;
 - 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	
Power Switch	10	A	A	A	A	B	B	Note¹
Gap	10	A	A	A	A	A	A	None
DC input jack	10	A	A	A	A	A	A	None
LED	10	A	A	A	A	A	A	None
AC Socket	10	A	A	A	A	A	A	None
Power Control button	10	A	A	A	A	A	A	None
Function Switch	10	A	A	A	A	B	B	Note¹
Hole	10	A	A	A	A	A	A	None
Remark	Note ¹ : During the test at $\pm 8\text{kV}$ at Air Discharge on the Power Switch and Function Switch, the R/W function was delayed. After the test, the equipment continued to operate as intended without operator intervention.							

9.5.2 Test Result of Contact Discharge

Direct discharge

Test Point	No. of Discharges	Contact Discharge / Pointed Tip				Test Record
		+2kV	-2kV	+4kV	-4kV	
Case	25	A	A	B	B	Note¹
USB 3.0 Port	25	A	A	B	B	Note¹
Remark	Note ¹ : During the test at $\pm 4\text{kV}$ at Contact Discharge on the Case and USB 3.0 port, the R/W function was delayed. After the test, the equipment continued to operate as intended without operator intervention.					

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 Left)	25	A	A	A	A	None
HCP (At Right)	25	A	A	A	A	None
HCP (At Rear)	25	A	A	A	A	None
VCP (At Front)	25	A	A	A	A	None
VCP (At Left)	25	A	A	A	A	None
VCP (At Right)	25	A	A	A	A	None
VCP (At Rear)	25	A	A	A	A	None

9.6 Photographs of Test Points

ESD TEST POINT



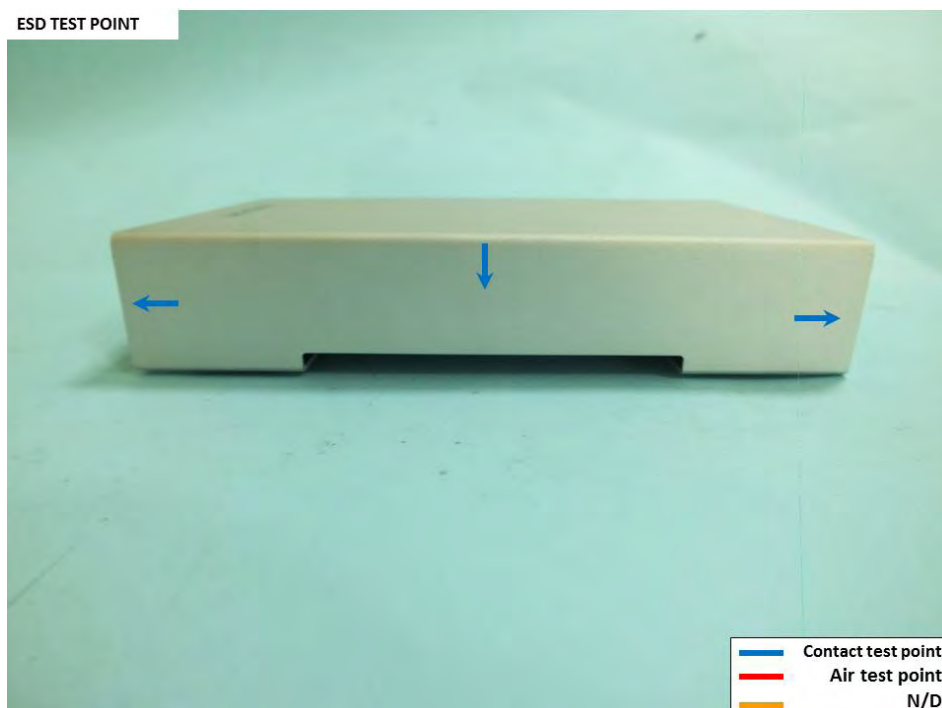
ESD TEST POINT



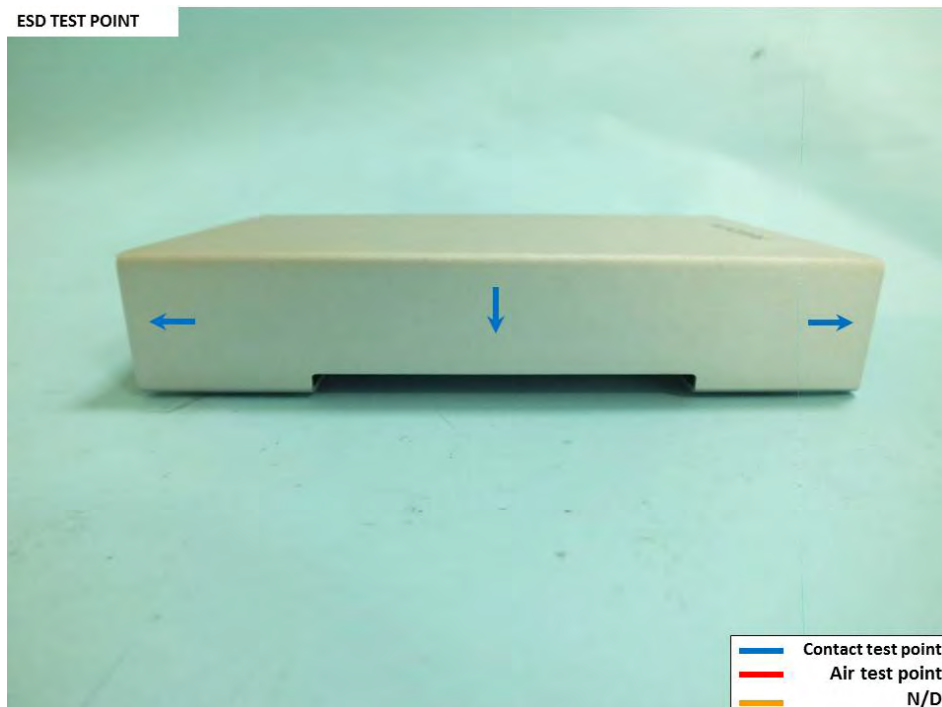
ESD TEST POINT



ESD TEST POINT



ESD TEST POINT



9.7 Photographs of Electrostatic Discharge Immunity Test

FRONT VIEW



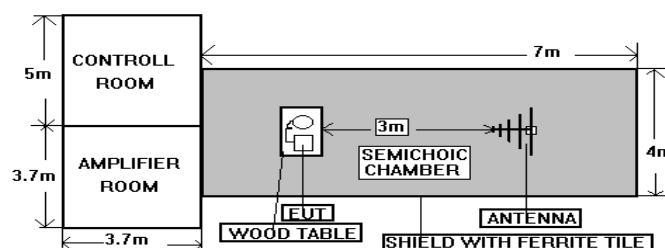
REAR VIEW



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 Edition 3.2 2010-04
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	49%
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 07, 2014
Test Engineer	Cat Lin
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

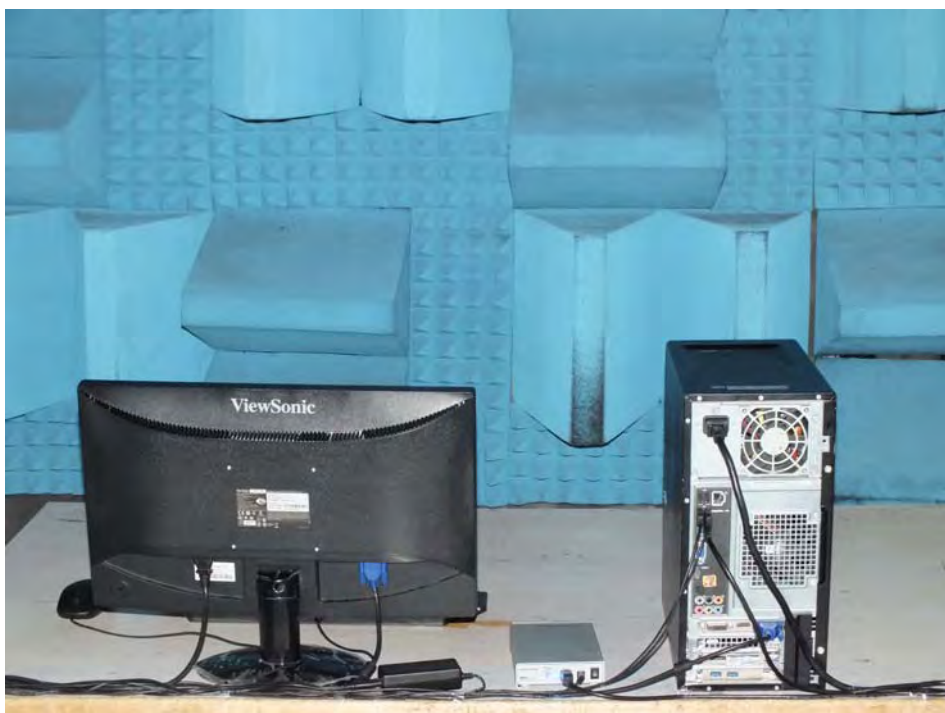
Remark : "X" is an open class.

10.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test

FRONT VIEW



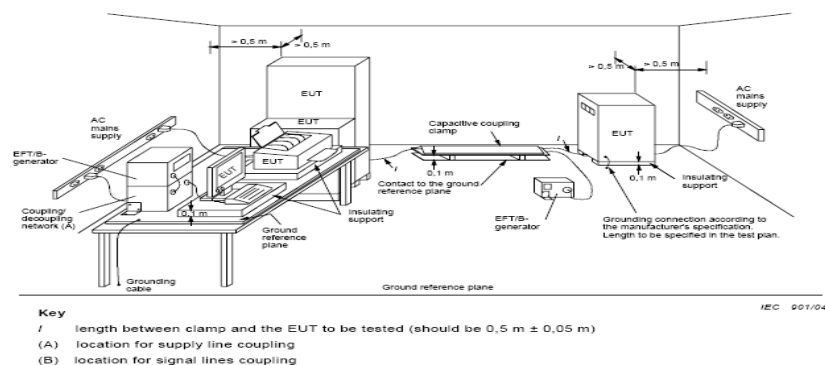
REAR VIEW



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

Final Test Result	PASS
Obtained Performance Criterion	B
Required Performance Criteria	B
Basic Standard	IEC 61000-4-4 Edition 2.1 2011-03
Product Standard	EN 55024:2010
Level	on input power ports -- 2
Test Voltage	on input power ports -- $\pm 0.5 / \pm 1.0$ kV
Test Location	L+N
Temperature	25°C
Relative Humidity	48%
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 04, 2014
Test Engineer	Cat Lin
Observation	During the test at ± 1 kV on the AC port, the R/W function was delayed. After the test, the equipment continued to operate as intended without operator intervention.

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

- a. The EFT/B-generator was located on the GRP.. The length from the EFT/B-generator to the EUT as not exceed 1 m.
- b. 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

- a. The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP..
- b. The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

11.4 Test Procedure

- a. 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°C to 35°C;
 - relative humidity : 45% to 75%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)..
- b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
- c. 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.
- d. 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 $\pm 10\%$		
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	A
Required Performance Criteria	B
Basic Standard	IEC 61000-4-5 Edition 2.0 2005-11
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 -- $\pm 1.0 / \pm 2.0$ kV
Temperature	24°C
Relative Humidity	51 %
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 04, 2014
Test Engineer	Cat Lin
Observation	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	A	None
	N - PE	+	A	A	A	A	None
		—	A	A	A	A	None

12.2 Test Level

Level	Open-Circuit Test Voltage, $\pm 10\%$, 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 °C to 35 °C
- 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, they may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to the 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

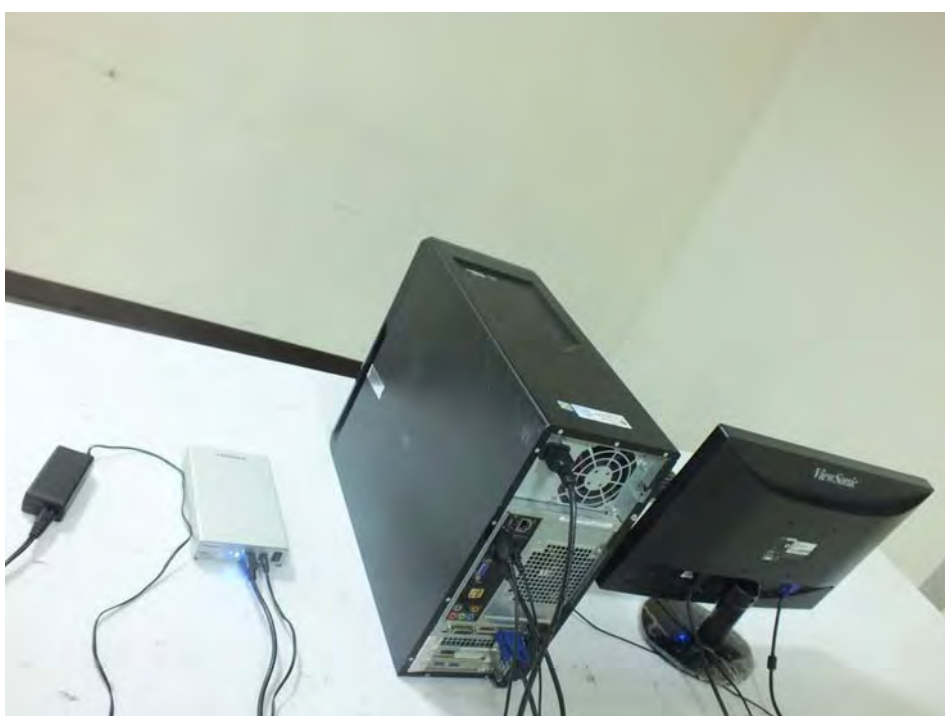
Full system

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 Edition 3.0 2008-10
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
Test Port	on AC Power Port
Dwell time	2.9 seconds
Frequency step size	1 %
Coupling mode	CDN-M16 SW M2 for AC power Port
Temperature	24°C
Relative Humidity	52 %
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 07, 2014
Test Engineer	Cat Lin
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

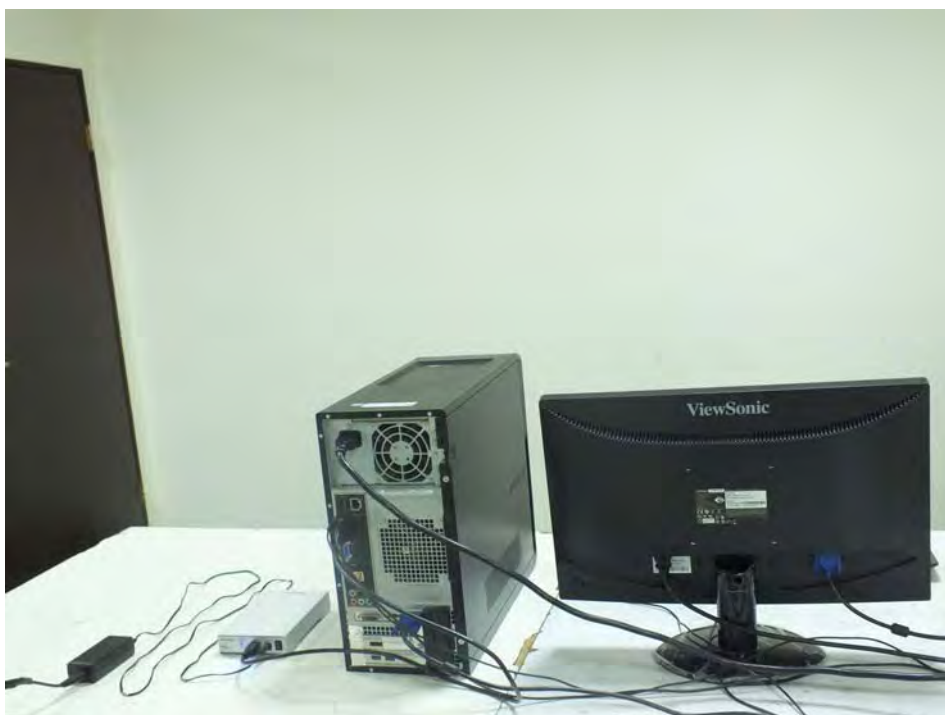
- a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- b. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not 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 1.5×10^{-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. An alternative test procedure may be adopted, wherein the frequency range is swept incrementally, with a step size not exceeding 4% of the start ad thereafter 4% of the preceding frequency value. The test level should be at least twice the value of the specified test level.
- g. 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.
- h. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.
- i. The use of special exercising programs is recommended.
- j. Testing shall be performed according to a Test Plan, which shall be included in the test report.
- k. 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



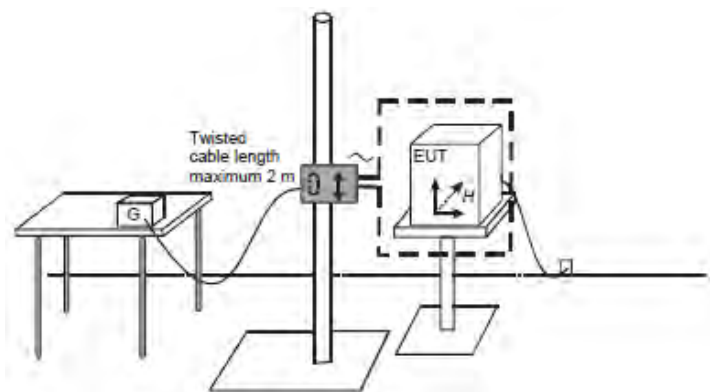
14. Power Frequency Magnetic Field Immunity Tests

Final Test Result	PASS
Obtained Performance Criterion	A
Required Performance Criteria	A
Basic Standard	IEC 61000-4-8 Edition 2.0 2009-09
Product Standard	EN 55024:2010
Temperature	24°C
Relative Humidity	51 %
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 04, 2014
Test Engineer	Cat Lin
Observation	Normal

14.1 Test Record

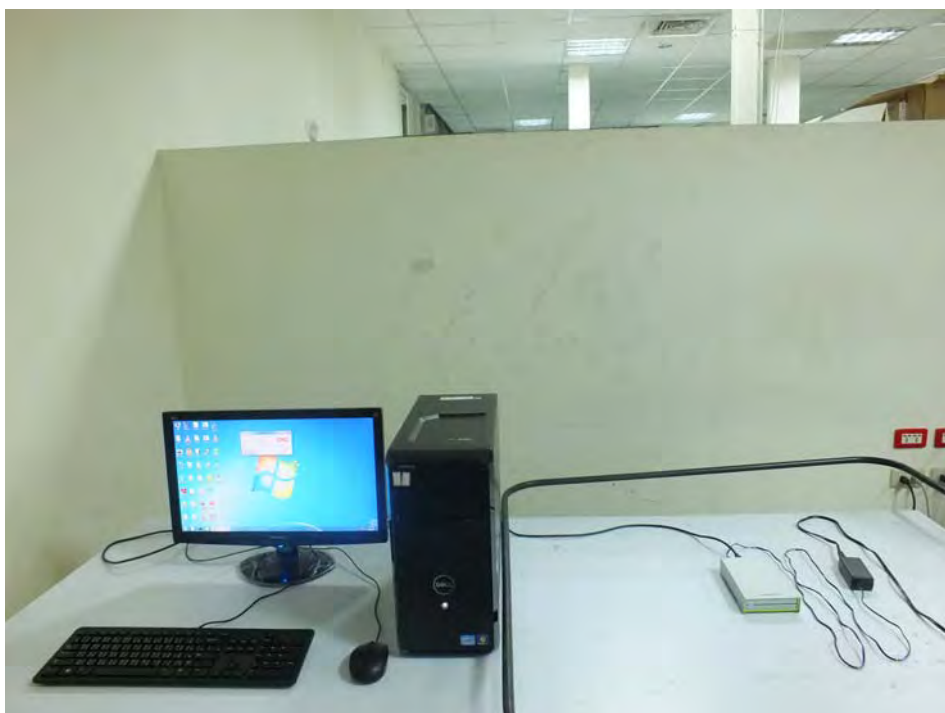
Power Frequency Magnetic Field	Testing duration	Coil Orientation	Results
50Hz/60Hz, 1A/m	1.0 Min	X-axis	A
50Hz/60Hz, 1A/m	1.0 Min	Y-axis	A
50Hz/60Hz, 1A/m	1.0 Min	Z-axis	A

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	<u>C</u> for voltage interruption, <u>A/A</u> for voltage dips
Required Performance Criteria	C for voltage interruption, C/B for voltage dips
Basic Standard	IEC 61000-4-11 Edition 2.0 2004-03
Product Standard	EN 55024:2010
Test Port	Input power ports
Temperature	25°C
Relative Humidity	49 %
Atmospheric Pressure	98.1 kPa
Test Date	Jul. 04, 2014
Test Engineer	Cat Lin
Observation	Normal

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 must be reset by the operator.

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 Edition 2.0 2004-03

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 μ s.

15.5 Operating Condition

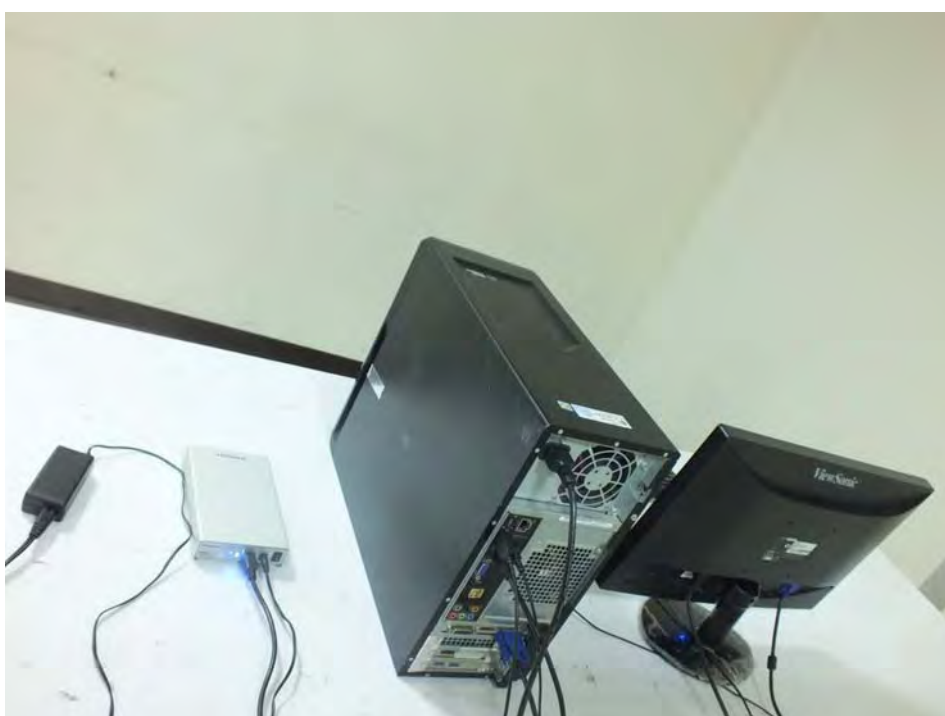
Full system

15.6 Photographs of Voltage Dips and Voltage Interruption Immunity Tests

FRONT VIEW



REAR VIEW



16. Uncertainty of Test Site

< EMI >

Test Items	Test Site No.	Uncertainty	Remark
Conducted Emissions	CO01-NH	± 2.6 dB	Confidence levels of 95%
Radiated Emissions below 1GHz	OS02-NH	± 3.0 dB	Confidence levels of 95%
Radiated Emissions above 1GHz	03CH04-HY	± 4.8 dB	Confidence levels of 95%

< EMS >

● ESD Immunity (IEC 61000-4-2)

Negative Discharge Current

From Standard			
2kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	7.5	4	2
Min	6.75	2.8	1.4
Max	8.25	5.2	2.6
Tolerance in %	10%	30%	30%

From calibration certificate					
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%
7.48	7.85	4.2	4.41	2.01	2.11
---	6.75	---	2.8	---	1.4
---	8.25	---	5.2	---	2.6

4kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	15	8	4
Min	13.5	5.6	2.8
Max	16.5	10.4	5.2
Tolerance in %	10%	30%	30%

First Peak Current	1st Peak Worst case. +5%	Measured Current at 30ns	30ns Worst case. +5%	Measured Current at 60ns	60ns Worst case. +5%
15.12	15.88	8.03	8.43	3.68	3.86
---	13.5	---	5.6	---	2.8
---	16.5	---	10.4	---	5.2

6kV	First Peak Current	Current at 30ns	Current at 60ns
Nominal	22.5	12	6
Min	20.25	8.4	4.2
Max	24.75	15.6	7.8
Tolerance in %	10%	30%	30%

First Peak Current	1st Peak Worst case. -5%	Measured Current at 30ns	30ns Worst case. +5%	Measured Current at 60ns	60ns Worst case. +5%
22.78	23.92	12.37	12.99	5.45	5.72
---	20.25	---	8.4	---	4.2
---	24.75	---	15.6	---	7.8

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			
Indicated Voltage (kV)	Tolerance (%)	Max. (kV)	Min. (kV)
2	10	2.20	1.80
4	10	4.40	3.60
6	10	6.60	5.40
8	10	8.80	7.20
15	10	16.50	13.50

Measured Values (kV)
2.05
4.027
5.955
7.916
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	$u_{\lambda}(y)$
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 μ s	0.84 μ s	1.24 μ s
Duration Time	60 μ s	40 μ s	52.83 μ s
+ 6 kV			
	Max.	Min.	
Rise Time	1.56 μ s	0.84 μ s	1.30 μ s
Duration Time	60 μ s	40 μ s	54.72 μ s

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	$u(y)$
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

< Conducted Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver	R&S	ESCS 30	100167	9 kHz ~ 2.75 GHz	Nov. 05, 2013	Conduction (CO01-NH)
LISN	SCHAFFNER	NNB41	06/10024	9 kHz ~ 30 MHz	Dec. 05, 2013	Conduction (CO01-NH)
LISN	KYORITSU	KNW-407	8-1010-15	9 kHz ~ 30 MHz	N/A	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.

< Radiated Emission below 1GHz >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Open Area Test Site	SPORTON	OATS-10	OS02-NH	30 MHz ~ 1 GHz 10m, 3m	Dec. 30, 2013	Radiation (OS02-NH)
Amplifier	BURGEON	BPA-530	100203	0.01 MHz ~ 3 GHz	May 19, 2014	Radiation (OS02-NH)
Receiver	R&S	ESCI	100497	9 kHz ~ 3 GHz	Apr. 24, 2014	Radiation (OS02-NH)
Bilog Antenna	CHASE	CBL6122B	2884	30 MHz ~ 2 GHz	Feb. 28, 2014	Radiation (OS02-NH)
Turn Table	EMCO	2080	9508-1805	0 - 360 degree	N/A	Radiation (OS02-NH)
Antenna Mast	ETS	2075-2	2385	1 m - 4 m	N/A	Radiation (OS02-NH)
RF Cable-R10m	MIYAZAKI	5DFB	CB044	30 MHz ~ 1 GHz	Aug. 30, 2013	Radiation (OS02-NH)

※ Calibration Interval of instruments listed above is one year.

< Radiated Emission above 1GHz >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH04-HY	1 GHz ~ 6 GHz 3m	May 16, 2014	Radiation (03CH04-HY)
Receiver	R&S	ESU-26	100422/026	20 Hz ~ 26.5 GHz	Jun. 19, 2014	Radiation (03CH04-HY)
Amplifier	Agilent	8449B	3008A02326	1 GHz ~ 26.5 GHz	May 22, 2014	Radiation (03CH04-HY)
Horn Antenna	SCHWARZBECK	BBHA9120	BBHA9120D1130	1 GHz ~ 18 GHz	Sep. 10, 2013	Radiation (03CH04-HY)
Turn Table	Chaintek	3000	MF7802056	0 ~ 360 degree	NCR	Radiation (03CH04-HY)
Antenna Mast	MF	MF-7802	MF780208163	1 m ~ 4 m	NCR	Radiation (03CH04-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	CB063-HF	1 GHz ~ 40 GHz	Nov. 20, 2013	Radiation (03CH04-HY)

※ Calibration Interval of instruments listed above is one year.

※ NCR: No calibration request.

< EMS >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	KEYTEK	MZ-15/EC	0302234	Air: 0 ~ 15 kV Contact: 0 ~ 8 kV	Oct. 25, 2013	ESD
RS immunity Test system	ROHDE & SCHWARZ	RSF	RS-01	80 MHz~3 GHz	Mar. 14, 2014	RS
Amplifier	AR	250W 1000AM	0332909	80 MHz ~ 1 GHz	Mar. 05, 2014	RS
DUAL DIRECTIONAL COUPLER	AMPLIFIER & RESEARCH	DC6180A	312453	0.08 ~ 1GHz	Oct. 07, 2013	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	SCHAFFNER	NSG2070	1092	100KHz~250MHz FM 1KHz 80%	Jun. 24, 2014	CS
Attenuator	EM TEST	ATT06 MHz 06	0004166A	150kHz~230MHz	Jun. 23, 2014	CS
Coupling and Decoupling Network	SCHAFFNER	CDN M016	16676	150kHz ~ 230MHz	Jun. 19, 2014	CS
Magnetic field Immunity Loop	FCC (KEYTEK)	F-1000-4-8-G-125 A	03007	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Oct. 14, 2013	PFMF
Magnetic Generator	FCC (KEYTEK)	F-1000-4-8/9/10-L- 1M	03003	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Oct. 14, 2013	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	Jan. 29, 2014	Harmonics, Flicker

※ Calibration Interval of instruments listed above is one year.

APPENDIX A. Photographs of EUT

