



SPORTON LAB.

Certificate No: EC441703

CERTIFICATE OF COMPLIANCE

● **EQUIPMENT: Multi-Bay Hard Disk Enclosure**

MODEL NO. : ST4-SB3

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)



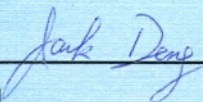
I HEREBY

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 61000-4-2:2008,
IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2004/A1:2010,
IEC 61000-4-5:2005, IEC 61000-4-6:2008,
IEC 61000-4-8:2009, IEC 61000-4-11:2004).**

THE PRODUCT SAMPLE RECEIVED ON Apr. 17, 2014 AND COMPLETELY
TESTED ON **May 01, 2014** 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 61000-3-2:2006/A1:2009 and /A2:2009, EN 61000-3-3:2008 and
EN 55024:2010 (IEC 61000-4-2:2008,
IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2004/A1:2010,
IEC 61000-4-5:2005, IEC 61000-4-6:2008,
IEC 61000-4-8:2009, IEC 61000-4-11:2004)**

Equipment : Multi-Bay Hard Disk Enclosure

Model No. : ST4-SB3

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)

Statement

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
- This test report is only applicable to European Community.

SPORTON International Inc.

6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

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Appendix A. Photographs of EUT

History of this test report

Report No.	Version	Issue Date	Description
EC441703	Rev.01	May 08, 2014	Initial issue of report

CERTIFICATE OF COMPLIANCE

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 61000-4-2:2008,
IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2004/A1:2010,
IEC 61000-4-5:2005, IEC 61000-4-6:2008,
IEC 61000-4-8:2009, IEC 61000-4-11:2004)**

Equipment : Multi-Bay Hard Disk Enclosure

Model No. : ST4-SB3

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 61000-4-2:2008, IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2004/A1:2010, IEC 61000-4-5:2005, IEC 61000-4-6:2008, IEC 61000-4-8:2009, IEC 61000-4-11:2004)**.
The product sample received on Apr. 17, 2014 and completely tested on **May 01, 2014** at **SPORTON International Inc. LAB.**



Jack Deng
Engineering Manager

SPORTON International Inc.

6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei 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	: Multi-Bay Hard Disk Enclosure
Model No.	: ST4-SB3
Trade Name	: STARDOM
e-SATA Cable	: D-Shielded, 1.05 m
USB3.0 Cable	: D-Shielded, 1 m
Power Supply Type	: From Switching Power Supply
AC Power Cord	: Non-Shielded, 1.8 m, 3 pin

1.4. Feature of Equipment under Test

Please refer to user manual.

2. Summary of the Test Result

2.1. Emission Tests

Emissions			
Test Standard	Description of Test	Result	Remark
EN 55022:2010/AC:2011	AC Power Conducted Emissions	Complies	-
EN 55022:2010/AC:2011	Telecommunication Ports Conducted	-	NA
EN 55022:2010/AC:2011	Radiated Emissions (Below 1GHz)	Complies	-
	Radiated Emissions (Above 1GHz)	Complies	-
EN 61000-3-2:2006/A1:2009 and /A2:2009	Harmonic Current Emissions	-	NA
EN 61000-3-3:2008	Voltage Fluctuations and Flicker	Complies	-

Remark: The "N/A" is means not applicable.

2.2. Immunity Tests

Applicable Standard : EN 55024:2010			
Test Standard	Description of Test	Result	Criteria
IEC 61000-4-2:2008	ESD (EUT of Enclosure)	Complies	B
IEC 61000-4-3:2006/A1:2007/A2:2010	RS (EUT of Enclosure)	Complies	A
IEC 61000-4-4:2004/A1:2010	EFT (EUT of AC Power Port)	Complies	B
IEC 61000-4-4:2004/A1:2010	EFT (EUT of signal ports and telecommunication ports)	-	-
IEC 61000-4-5:2005	Surge (EUT of AC Power Port)	Complies	A
IEC 61000-4-5:2005	Surge (EUT of signal ports and telecommunication ports)	-	-
IEC 61000-4-6:2008	CS (EUT of AC Power Port)	Complies	A
IEC 61000-4-6:2008	CS (EUT of signal ports and telecommunication ports)	-	-
IEC 61000-4-8:2009	PFMF (EUT of Enclosure)	Complies	A
IEC 61000-4-11:2004	DIP (EUT of AC Power Port)	Complies	C/C/A

3. Test Configuration of Equipment under Test

3.1. Test Manner

- a. The EUT has been associated with personal computer and peripherals pursuant to European Standard EN 55022 and EN 55024.
- b. The equipment under test were performed the following test modes:

Test Items	Description of test modes
AC Conducted Emission	Mode 1. ESATA, R/W Mode 2. USB3.0, R/W Cause "mode 2" generated the worst test result; it was reported as final data.
Radiated Emissions < below 1GHz >	Mode 1. ESATA, R/W Mode 2. USB3.0, R/W Cause "mode 2" generated the worst test result; it was reported as final data.
Radiated Emissions < above 1GHz >	Mode 1. USB3.0, R/W
Harmonic and Flicker Emissions	Mode 1. USB3.0, R/W
EMS	Mode 1. USB3.0, R/W

- c. Frequency range investigated: Conduction 150 kHz to 30 MHz, Radiation 30 MHz to 6,000 MHz.
- d. Frequency range investigated immunity test: CS 150 kHz to 80 MHz, RS 80 MHz to 1,000 MHz.

3.2. Description of Test System

< EMI ><Conducted and Radiated below 1GHz>

No.	Peripheral	Manufacturer	Model Number	FCC ID	Cable / Spec. Description
For Local					
1	Personal Computer	Lenovo	C61	DoC	-
2	LCD Monitor	DELL	U2410F	DoC	D-SUB Cable, D-Shielded, 1.8m
3	Keyboard	Lenovo	KU-0225	DoC	USB Cable, AL-F-Shielded, 1.8m
4	Mouse	Lenovo	M-U0025-O	DoC	USB Cable, AL-F-Shielded, 1.8m
5	Printer	HP	C2642X(DJ400)	B94C2642X	LPT Cable, D-Shielded, 1.2m
6	Modem	ACEEX	DM1414	IFAXDM1414	RS232 Cable, D-Shielded, 1.15m

< EMI ><Radiated above 1GHz>

No.	Peripheral	Manufacturer	Model Number	FCC ID	Cable / Spec. Description
For Local					
1	Personal Computer	DELL	DCTA	DoC	-
2	LCD Monitor	DELL	U2410F	DoC	D-SUB Cable, D-Shielded, 1.8m
3	Keyboard	DELL	SK-8175	DoC	USB Cable, AL-F-Shielded, 1.8m
4	Mouse	DELL	MOC5UO	DoC	USB Cable, AL-F-Shielded, 1.8m
5	Printer	HP	C2642X(DJ400)	B94C2642X	LPT Cable, D-Shielded, 1.2m
6	Modem	ACEEX	DM1414	IFAXDM1414	RS232 Cable, D-Shielded, 1.15m

< EMS >

No.	Peripheral	Manufacturer	Model Number	FCC ID	Cable / Spec. Description
For Local					
1	Personal Computer	DELL	470	DoC	-
2	LCD Monitor	View Sonic	VS15032	DoC	D-SUB Cable, Shielded, 1.8m
3	Keyboard	DELL	SK-8115	DoC	USB Cable, AL-F-Shielded, 2m
4	Mouse	DELL	MOA8BO	DoC	USB Cable, AL-F-Shielded, 1.8m

4. Test Software

< EMI >

An executive program, " EMIprogram.exe" under WIN 7, which generate a complete line of continuously repeating "H" pattern were 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" pattern to the monitor, and the monitor displays "H" patterns on the screen.
- d. The PC sends "H" messages to the printer, and then the printer prints them on the paper.
- e. The PC sends signal messages to the modem.
- f. The PC sends signal messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from c to f.

At the same time, the following program was executed:

- Executed "Winthrax.exe" to read and write data from EUT.

< EMS >

During the test, the program under Win 7 was executed:

- Executed "Winthrax.exe" to read and write data from EUT.

5. General Information of Test

5.1. Test Facility

<EMI>

Test Site : SPORTON INTERNATIONAL INC.

Test Site Location : No. 3, Lane 238, Kang Lo Street, Nei Hwu District, Taipei 11424,
Taiwan, R.O.C.

TEL : 886-2-2631-4739

FAX : 886-2-2631-9740

Test Site No. : CO01-NH, OS02-NH

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 : 886-3-318-0055

Test Site No. : 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 : 886-3-318-0055

5.2. Test Voltage

AC 230V / 50Hz

5.3. Measurement Procedure

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)

5.4. 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)

5.5. 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

5.6. Test Distance

- a. The test distance of radiated emission test from antenna to EUT is 10 M (from 30MHz~1GHz).
- b. The test distance of radiated emission test 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.

6. Conducted Emissions Measurement

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 meter above the ground plane as shown in section 6.3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

6.1. Limits for conducted disturbance at mains terminals and telecommunication ports

Limits for conducted disturbance at mains terminals

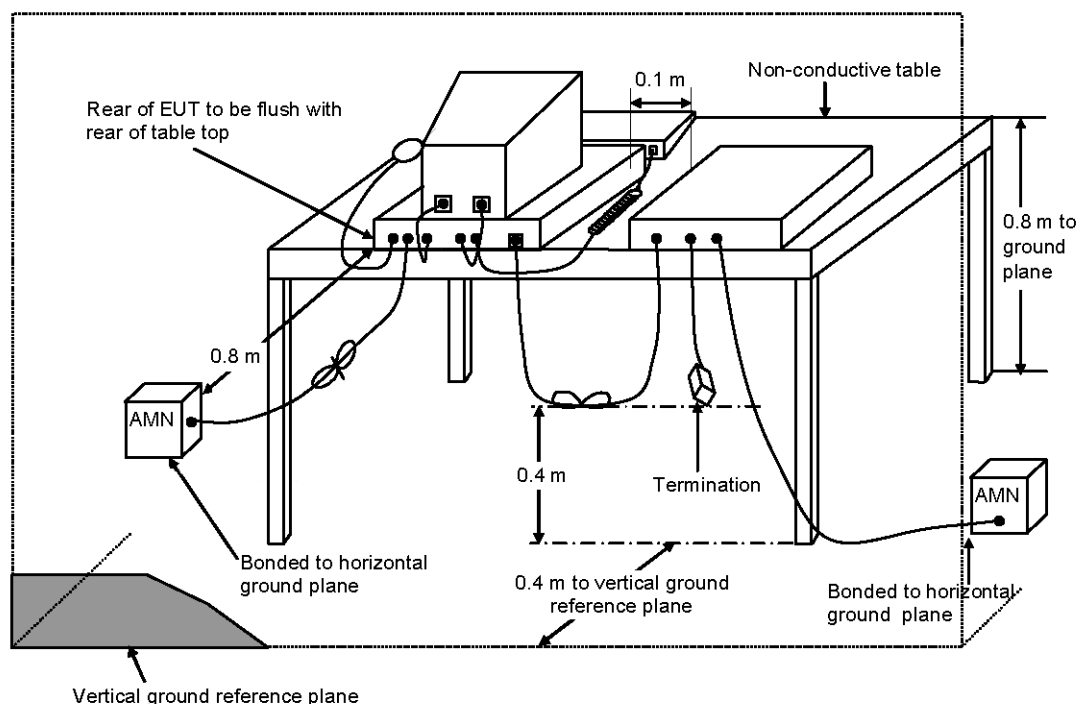
Frequency range (MHz)	Class A Limits dB(μV)		Class B Limits dB(μV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	79	66	66 - 56	56 - 46
0.50 to 5	73	60	56	46
5 to 30	73	60	60	50

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

6.2. Test Procedures

- The EUT was warmed up for 15 minutes before testing started.
- 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.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connect to the other LISN.
- The LISN provides 50 ohm, coupling impedance for the measuring instrument.
- The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

6.3. Typical Test Setup Layout of AC Powerline Conducted Emissions

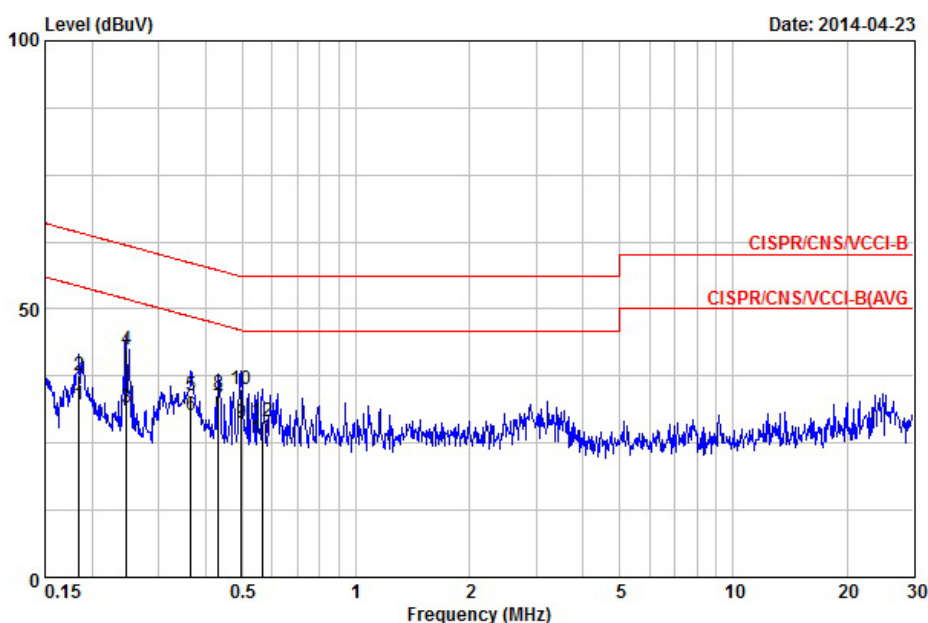


- AMN is 80 cm from the EUT and at least 80 cm from other units and other metal planes.
- EUT is connected to one artificial mains network (AMN).
- All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
- Rear of EUT to be flushed with rear of table top.
- Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
- If cables, which hang closer than 40 cm to the horizontal metal ground plane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
- Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
- Cables of hand operated devices, such as keyboards, mice, etc. shall be placed as for normal usage.

6.4. Test Result of AC Powerline Conducted Emission

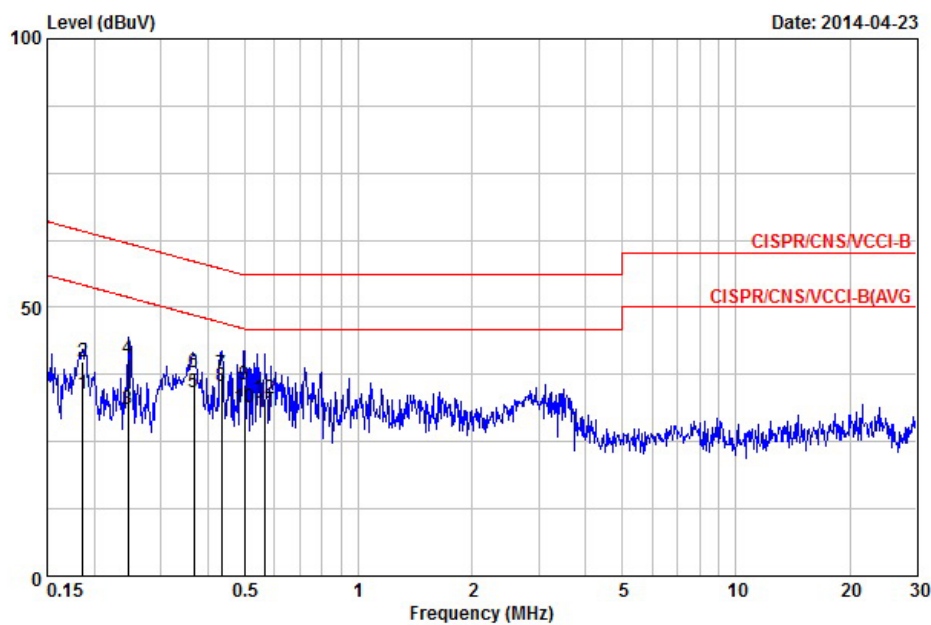
Test Mode	Mode 2	Test Site No.	CO01-NH
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	Willy
Temperature	25 °C	Relative Humidity	50 %
Note: 1. Corrected Reading (dB μ V) = LISN Factor + Cable Loss + Read Level = Level			
2. All emissions not reported here are more than 10 dB below the prescribed limit.			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dB μ V	Limit	Line	Level	Factor	Loss	Remark
			dB	dB μ V	dB μ V	dB	dB	
1	0.184	32.28	-22.01	54.28	21.61	10.57	0.10	AVERAGE
2	0.184	37.52	-26.77	64.28	26.85	10.57	0.10	QP
3	0.247	31.76	-20.11	51.86	21.09	10.54	0.13	AVERAGE
4	0.247	42.41	-19.46	61.86	31.74	10.54	0.13	QP
5	0.365	33.84	-24.77	58.61	23.16	10.50	0.19	QP
6	0.365	30.24	-18.37	48.61	19.56	10.50	0.19	AVERAGE
7	0.433	31.71	-15.49	47.20	21.02	10.49	0.20	AVERAGE
8	0.433	34.08	-23.12	57.20	23.39	10.49	0.20	QP
9	0.498	28.80	-17.24	46.03	18.10	10.49	0.20	AVERAGE
10	0.498	35.11	-20.93	56.03	24.41	10.49	0.20	QP
11	0.564	25.86	-20.14	46.00	15.16	10.50	0.20	AVERAGE
12	0.564	29.14	-26.86	56.00	18.44	10.50	0.20	QP

Neutral



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.187	33.87	-20.31	54.18	23.69	10.08	0.10	AVERAGE
2	0.187	39.88	-24.30	64.18	29.70	10.08	0.10	QP
3	0.246	30.98	-20.93	51.91	20.77	10.08	0.13	AVERAGE
4	0.246	40.57	-21.34	61.91	30.36	10.08	0.13	QP
5	0.367	34.07	-14.49	48.56	23.80	10.08	0.19	AVERAGE
6	0.367	37.80	-20.76	58.56	27.53	10.08	0.19	QP
7	0.434	37.58	-19.60	57.18	27.30	10.08	0.20	QP
8	0.434	35.31	-11.87	47.18	25.03	10.08	0.20	AVERAGE
9	0.499	35.73	-20.28	56.01	25.44	10.08	0.20	QP
10	0.499	31.36	-14.65	46.01	21.07	10.08	0.20	AVERAGE
11	0.567	30.44	-15.56	46.00	20.16	10.08	0.20	AVERAGE
12	0.567	33.01	-22.99	56.00	22.73	10.08	0.20	QP

7. Radiated Emission Measurement

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 55022, Clause 10. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 7.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

7.1. Limits for radiated disturbance

Limits for radiated disturbance at a measuring distance of 10 m

Frequency range (MHz)	Class A	Class B
	Quasi-peak limits dB(μV/m)	Quasi-peak limits dB(μV/m)
30 to 230	40	30
230 to 1000	47	37

Limits for radiated disturbance at a measuring distance of 3 m

Frequency range (MHz)	Class A		Class B	
	Average limit dB(μV/m)	Peak limit dB(μV/m)	Average limit dB(μV/m)	Peak limit dB(μV/m)
1000 to 3000	56	76	50	70
3000 to 6000	60	80	54	74

7.2. Test Procedures

For Below 1GHz

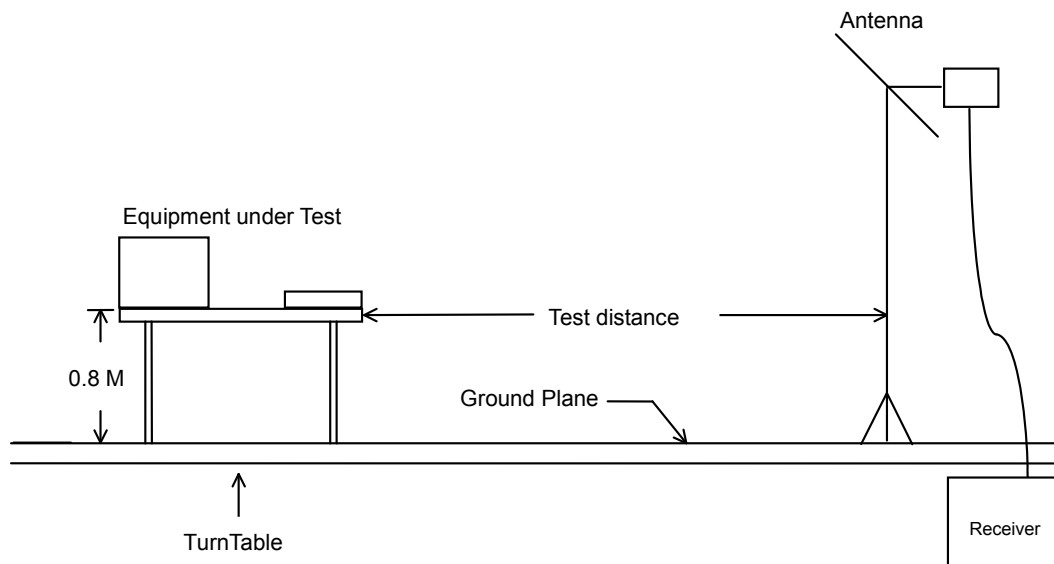
- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 10 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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.

For above 1GHz

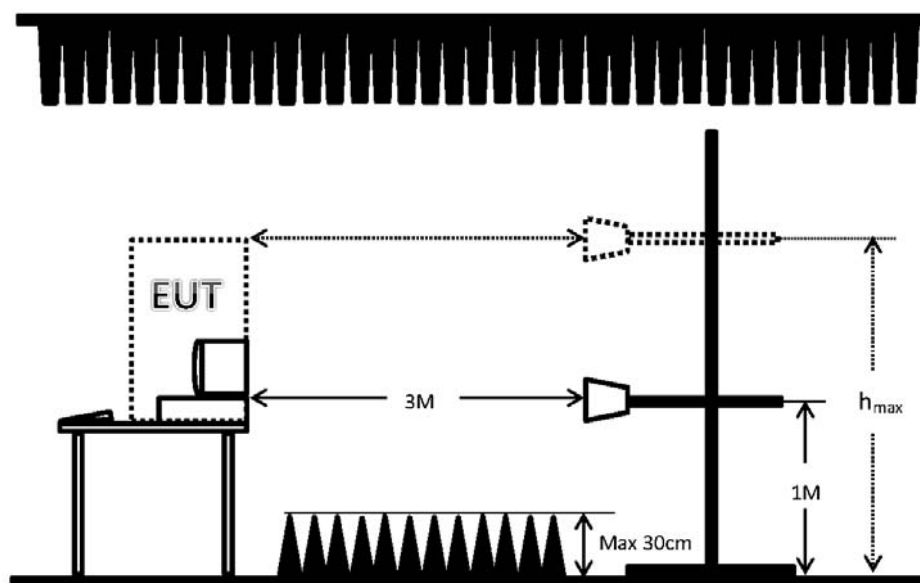
- a. Same test set up as below 1GHz radiated testing.
- b. The EUT was set 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. There should be absorber placed between the EUT and Antenna and its located size should let the test site meet 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.

7.3. Typical Test Setup Layout of Radiated Emissions

For Below 1GHz



For above 1GHz

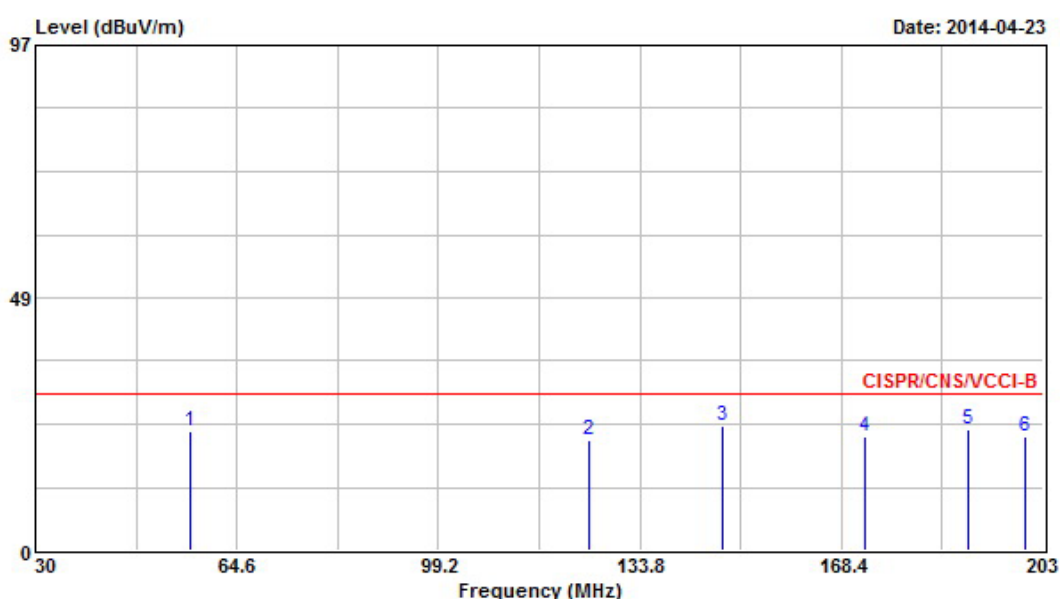


Remark: When EUT's height is over 172cm, h_{max} = top of EUT

7.4. Test Result of Radiated Emission for Below 1GHz

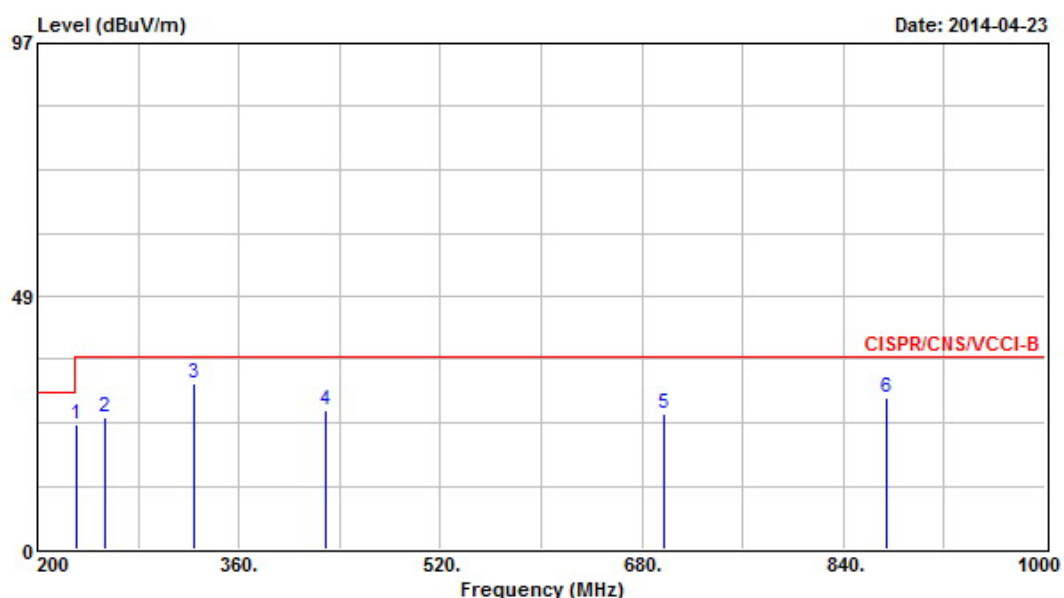
Test mode	Mode 2	Test Site No.	OS02-NH
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Chas
Temperature	28 °C	Relative Humidity	54 %
Note: 1. Emission level (dB μ V/m) = 20 log Emission level (μ V/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



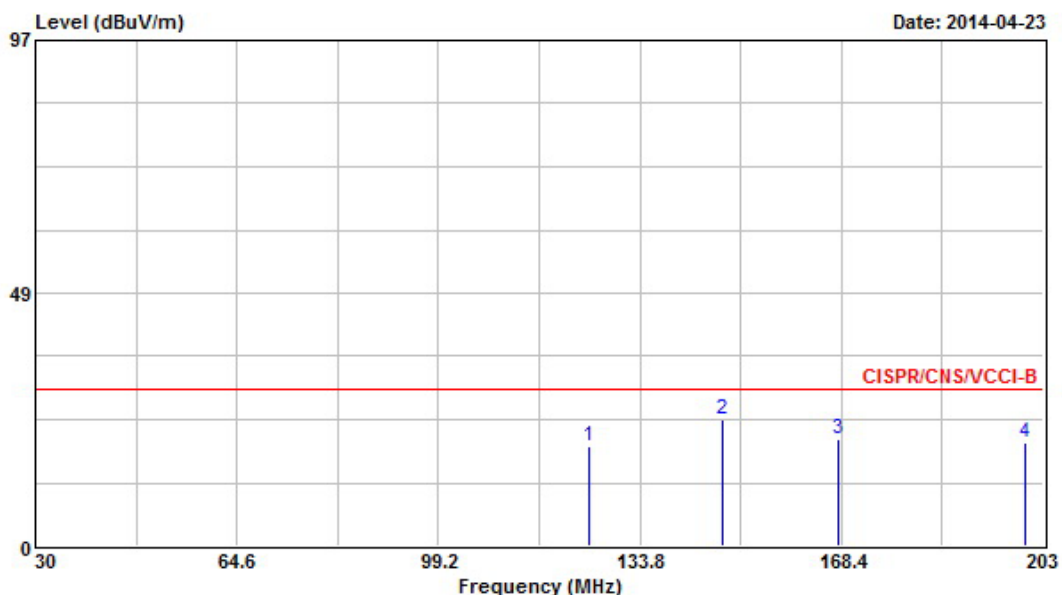
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dB μ V/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
	MHz	dB μ V/m	dB	dB μ V/m	dB μ V	dB/m	dB	dB	cm	deg
1	56.640	22.90	-7.10	30.00	46.43	7.20	0.99	31.72	Peak	---
2	124.980	21.30	-8.70	30.00	39.34	12.08	1.42	31.54	Peak	---
3	147.990	24.01	-5.99	30.00	43.25	10.70	1.54	31.48	Peak	---
4	172.380	21.76	-8.24	30.00	41.82	9.69	1.67	31.42	Peak	---
5	190.030	23.26	-6.74	30.00	43.54	9.36	1.73	31.37	Peak	---
6	200.060	21.94	-8.06	30.00	42.07	9.42	1.79	31.34	Peak	---

Vertical



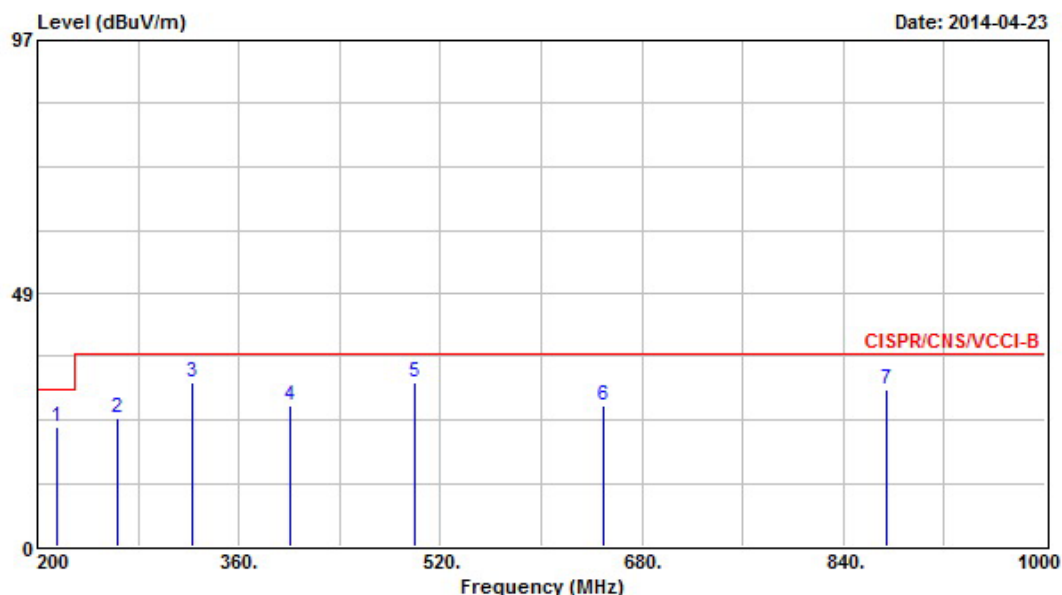
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	231.200	23.91	-13.09	37.00	42.05	11.23	1.94	31.31	Peak	---	---
2	253.600	25.26	-11.74	37.00	42.08	12.43	2.04	31.29	Peak	---	---
3	324.000	31.64	-5.36	37.00	46.71	13.89	2.31	31.27	Peak	100	180
4	428.800	26.80	-10.20	37.00	39.06	16.34	2.73	31.33	Peak	---	---
5	697.600	26.02	-10.98	37.00	34.46	19.26	3.58	31.28	Peak	---	---
6	874.400	29.04	-7.96	37.00	35.03	21.11	3.98	31.08	Peak	---	---

Horizontal



	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	124.980	18.97	-11.03	30.00	37.01	12.08	1.42	31.54	Peak	---	---
2	147.990	24.41	-5.59	30.00	43.65	10.70	1.54	31.48	Peak	---	---
3	167.710	20.37	-9.63	30.00	40.24	9.91	1.65	31.43	Peak	---	---
4	200.060	19.87	-10.13	30.00	40.00	9.42	1.79	31.34	Peak	---	---

Horizontal

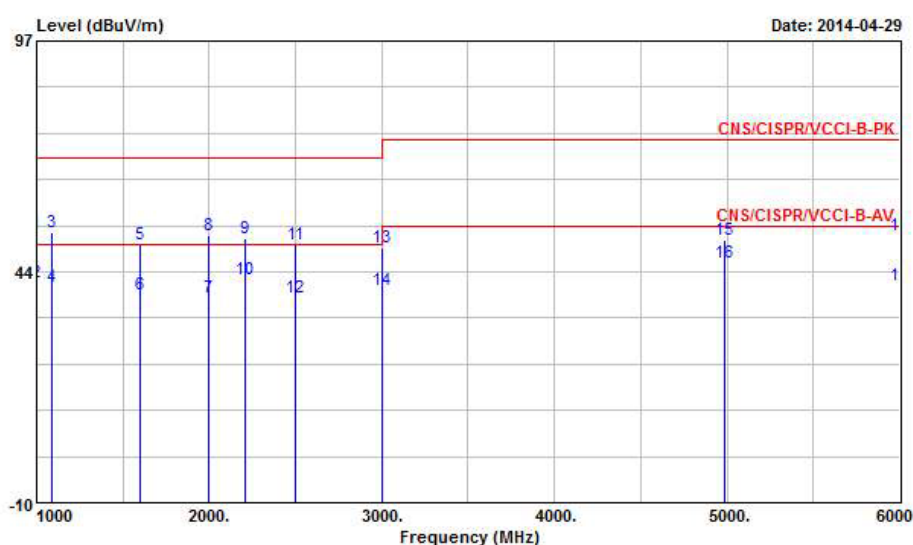


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	215.200	22.74	-7.26	30.00	41.87	10.32	1.88	31.33	Peak	---	---
2	263.200	24.64	-12.36	37.00	41.25	12.59	2.08	31.28	Peak	---	---
3	323.200	31.31	-5.69	37.00	46.41	13.86	2.31	31.27	Peak	---	---
4	400.800	27.12	-9.88	37.00	39.98	15.83	2.65	31.34	Peak	---	---
5	499.200	31.52	-5.48	37.00	42.25	17.64	2.95	31.32	Peak	---	---
6	649.600	26.94	-10.06	37.00	35.60	19.16	3.46	31.28	Peak	---	---
7	874.400	30.01	-6.99	37.00	36.00	21.11	3.98	31.08	Peak	---	---

7.5. Test Result of Radiated Emission for Above 1GHz

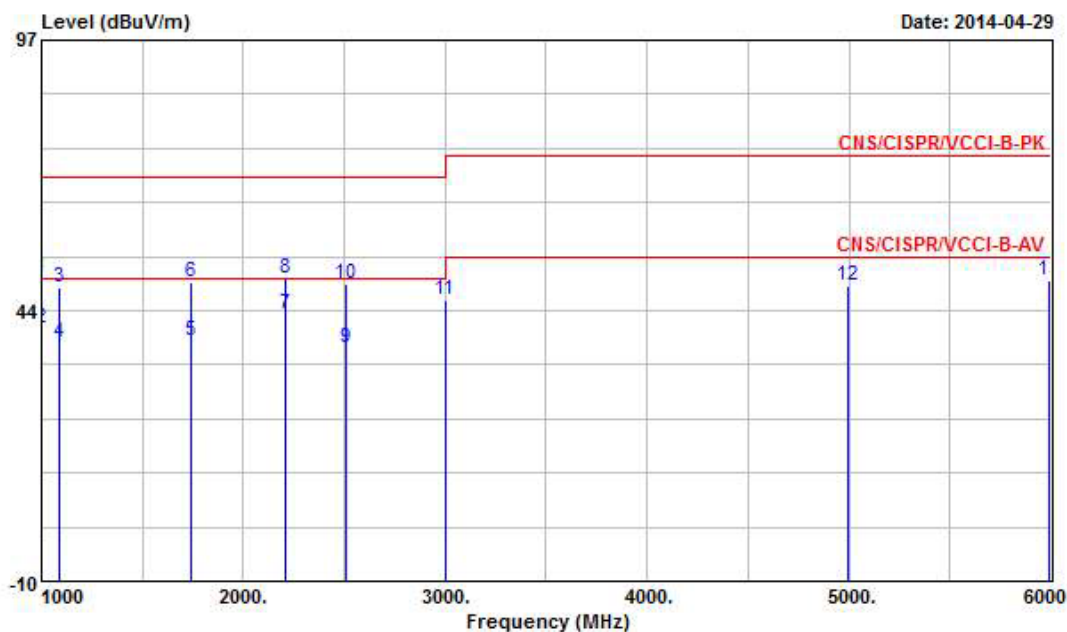
Test mode	Mode 1	Test Site No.	03CH04-HY
Test frequency	1 GHz ~ 6 GHz	Test Engineer	Alan
Temperature	26 °C	Relative Humidity	52 %
Note: 1. Emission level (dB μ V/m) = 20 log Emission level (μ V/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



	Freq	Level	Over	Limit	Read	Antenna	Preamp	Cable	Ant	Table	
	MHz	dB μ V/m	Limit	Line	Level	Factor	Factor	Loss	Pos	Pos	Remark
			dB	dB μ V/m	dB μ V	dB/m	dB	dB	cm	deg	
1	1000.000	52.39	-17.61	70.00	61.73	24.70	34.52	0.48	100	173	Peak
2 @	1000.000	41.10	-8.90	50.00	50.44	24.70	34.52	0.48	100	173	Average
3	1086.000	52.50	-17.50	70.00	61.50	24.89	34.40	0.51	100	220	Peak
4 @	1086.000	40.07	-9.93	50.00	49.07	24.89	34.40	0.51	100	220	Average
5	1598.000	49.69	-20.31	70.00	56.82	25.86	33.71	0.72	100	200	Peak
6 @	1598.000	38.12	-11.88	50.00	45.25	25.86	33.71	0.72	100	200	Average
7 @	1998.000	37.34	-12.66	50.00	43.86	26.10	33.52	0.90	100	166	Average
8	1998.000	52.02	-17.98	70.00	58.54	26.10	33.52	0.90	100	166	Peak
9	2206.000	51.35	-18.65	70.00	57.50	26.60	33.71	0.96	100	171	Peak
10 @	2206.000	41.72	-8.28	50.00	47.87	26.60	33.71	0.96	100	171	Average
11	2500.000	49.91	-20.09	70.00	55.56	27.30	33.99	1.04	100	205	Peak
12 @	2500.000	37.51	-12.49	50.00	43.16	27.30	33.99	1.04	100	205	Average
13	3000.000	49.10	-20.90	70.00	53.81	28.30	34.31	1.30	100	195	Peak
14 @	3000.000	39.26	-10.74	50.00	43.97	28.30	34.31	1.30	100	195	Average
15	4989.000	51.00	-23.00	74.00	52.23	31.50	34.40	1.67	100	190	Peak
16 @	4989.000	45.71	-8.29	54.00	46.94	31.50	34.40	1.67	100	190	Average
17 @	6000.000	40.19	-13.81	54.00	40.56	32.40	34.47	1.70	100	170	Average
18	6000.000	51.92	-22.08	74.00	52.29	32.40	34.47	1.70	100	170	Peak

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Preampl Factor	Cable Loss	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	1004.000	50.61	-19.39	70.00	59.95	24.70	34.52	0.48	100	225 Peak
2 @	1004.000	39.90	-10.10	50.00	49.24	24.70	34.52	0.48	100	225 Average
3	1086.000	48.05	-21.95	70.00	57.05	24.89	34.40	0.51	100	210 Peak
4 @	1086.000	37.05	-12.95	50.00	46.05	24.89	34.40	0.51	100	210 Average
5 @	1740.000	37.41	-12.59	50.00	44.31	25.95	33.64	0.79	100	160 Average
6	1740.000	49.11	-20.89	70.00	56.01	25.95	33.64	0.79	100	160 Peak
7 @	2206.000	42.91	-7.09	50.00	49.06	26.60	33.71	0.96	100	171 Average
8	2206.000	49.81	-20.19	70.00	55.96	26.60	33.71	0.96	100	171 Peak
9 @	2508.000	36.05	-13.95	50.00	41.64	27.33	33.99	1.06	100	173 Average
10	2508.000	48.91	-21.09	70.00	54.50	27.33	33.99	1.06	100	173 Peak
11	3000.000	45.60	-24.40	70.00	50.31	28.30	34.31	1.30	---	---
12	4998.000	48.48	-25.52	74.00	49.72	31.50	34.40	1.66	---	---
13	5994.000	49.60	-24.40	74.00	49.97	32.40	34.47	1.70	---	---

8. Harmonic Current Emissions Measurement

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.

9. Voltage Fluctuations and Flicker Measurement

9.1. Standard

- Product Standard : EN 61000-3-3:2008

9.2. Test Procedure

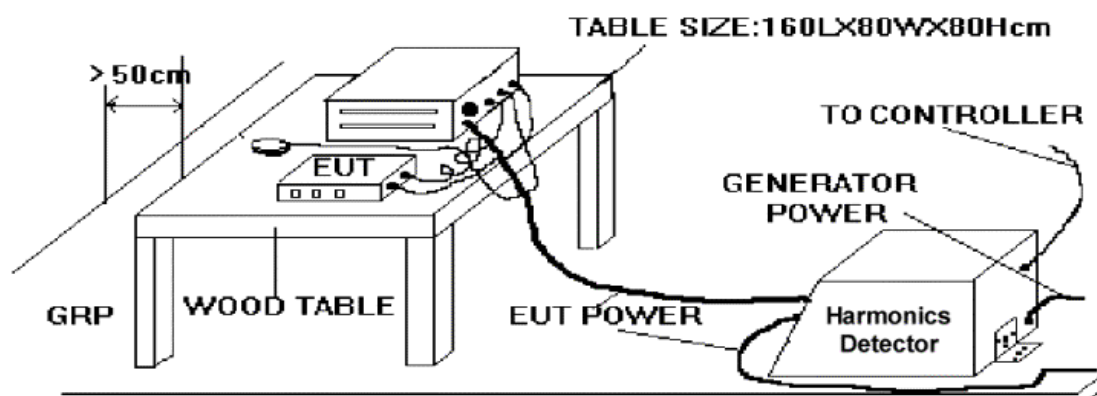
The equipment shall be tested under the conditions of **Clause 5**.

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.

9.3. Test Equipment Settings

Flicker Parameters	Setting
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

9.4. Typical Test Setup Layout of Voltage Fluctuations and Flicker



9.5. Test Result of Voltage Fluctuation and Flicker

Test mode	Mode 1		
Temperature	23 °C	Final Test Result	<u>PASS</u>
Relative Humidity	47 %	Test Date	May 01, 2014
Atmospheric Pressure	100.5 kPa	Test Engineer	Crewe

Urms = 230.1V Freq = 49.987 Range: 0.5 A
 Irms = 0.164A Ipk = 0.281A cf = 1.717
 P = 30.64W S = 37.70VA pf = 0.813

Test - Time : 1 x 10min = 10min (100 %)

LIN (Line Impedance Network) : SLIN 0.24ohm +j0.15ohm N:0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00
 dmax : 4.00 % dc : 3.30 %
 dtLim: 3.30 % dt>Lim: 500ms

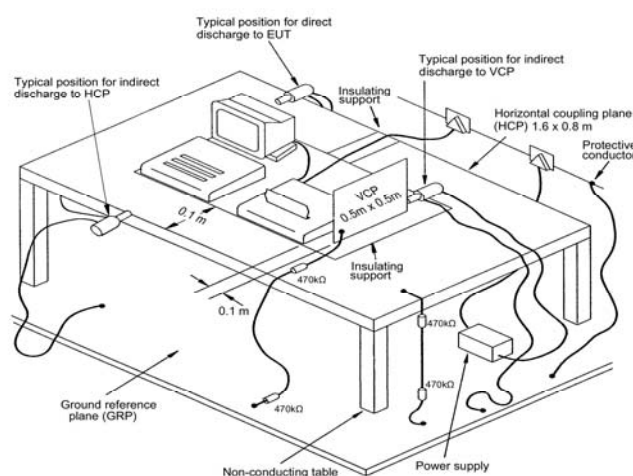
Test completed, Result: PASSED

	Pst	P50s	P10s	P3s	P1s	P0.1s	dmax [%]	dc [%]	dt>Lim [ms]
1	0.072	0.010	0.010	0.010	0.010	0.010	0.000	0.010	0.000

10. Electrostatic Discharge Immunity Measurement (ESD)

• Final Test Result	: <u>PASS</u>
• Pass Performance Criteria	: <u>B</u>
• Required Performance Criteria	: B
• Basic Standard	: IEC 61000-4-2:2008
• 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
• Discharge Impedance	: 330 ohm / 150 pF
• Temperature	: 23 °C
• Relative Humidity	: 46 %
• Atmospheric Pressure	: 100.5 kPa
• Test Date	: May 01, 2014
• Test Engineer	: Crewe

10.1. Test Setup



The test 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.

10.2. 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 1 m 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 0.2 m 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, 0.8 m 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.

10.3. 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.

10.4. Test Severity Levels

10.4.1. 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.	

10.4.2. 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.	

10.5. Test Points

10.5.1. Test Result of Air Discharge

Test Method	No. of Discharges	Air Discharge/Round Tip						Test Record
		+2kV	-2kV	+4kV	-4kV	+8kV	-8kV	
Power Switching	10	A	A	A	A	A	A	Normal
e-SATA Port	10	A	A	A	A	A	A	Normal
Aperture	10	A	A	A	A	A	A	Normal
LED	10	A	A	A	A	A	A	Normal
AC Socket	10	A	A	A	A	A	A	Normal
Control Button	10	A	A	A	A	A	A	Normal

10.5.2. Test Result of Contact Discharge

Direct discharge

Test Method	No. of Discharges	Contact Discharge/Pointed Tip				Test Record
		+2kV	-2kV	+4kV	-4kV	
Case	25	A	A	A	A	Normal
Screw	25	A	A	B	B	Note1
USB3.0 Port	25	A	A	B	B	Note1
Note	1. During the test at contact discharge $\pm 4\text{kV}$ on USB3.0 port & screw, the function of R/W delayed. After the test, the equipment continued to operate as intended without operator intervention.					

Indirect discharge to HCP and VCP

Test Method	No. of Discharges	Contact Discharge/Pointed Tip				Test Record
		+2kV	-2kV	+4kV	-4kV	
HCP (At Front)	25	A	A	A	A	Normal
HCP (At Left)	25	A	A	A	A	Normal
HCP (At Right)	25	A	A	A	A	Normal
HCP (At Rear)	25	A	A	A	A	Normal
VCP (At Front)	25	A	A	A	A	Normal
VCP (At Left)	25	A	A	A	A	Normal
VCP (At Right)	25	A	A	A	A	Normal
VCP (At Rear)	25	A	A	A	A	Normal

11. Radio Frequency Electromagnetic Field Immunity Measurement (RS)

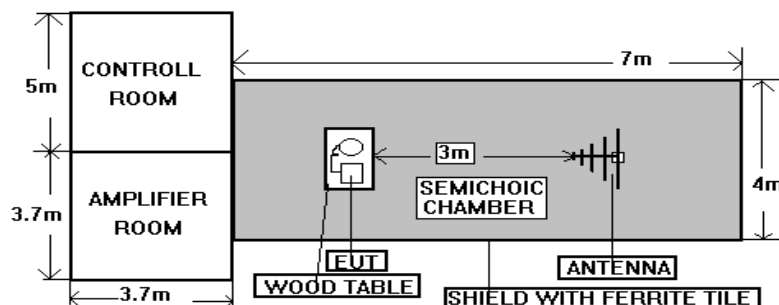
- Final Test Result : **PASS**
- Pass Performance Criteria : **A**
- Required Performance Criteria : A
- Basic Standard : IEC 61000-4-3:2006/A1:2007/A2:2010
- Product Standard : EN 55024:2010
- Level : 2
- Frequency Range : 80-1000 MHz
- Dwell Time : 2.9 seconds
- Frequency Step size : 1 % of the preceding frequency value
- Field Strength : 3 V/m (unmodulated, r.m.s) 80% AM (1 kHz)
- Temperature : 25 °C
- Relative Humidity : 47 %
- Atmospheric Pressure : 100.5 kPa
- Test Date : Apr. 31, 2014
- Test Engineer : Crewe

11.1. Test Record

Frequency Band: 80-1000 MHz

Sides of the EUT have been exposed to the field	Antenna positioned	Test field strength Level	Test field strength (V/m)	Test Record
Front	Vertical	2	3	Normal (No influencing)
	Horizontally	2	3	Normal (No influencing)
Left	Vertical	2	3	Normal (No influencing)
	Horizontally	2	3	Normal (No influencing)
Back	Vertical	2	3	Normal (No influencing)
	Horizontally	2	3	Normal (No influencing)
Right	Vertical	2	3	Normal (No influencing)
	Horizontally	2	3	Normal (No influencing)

11.2. Test Setup



NOTE : The SPORTON 7m x 4m x 4m semi-anechoic chamber is compliance with the sixteen point's 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 semi-anechoic chamber.

11.3. Test Procedure

- 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.
- The bilog antenna which is enabling the complete frequency range of 80-1000MHz 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.
- 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.
- 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.
- At each of the above conditions, the frequency range is swept 80-1000MHz, 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.

11.4. Test Severity Levels

Frequency Band : 80-1000MHz

Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified
Remark : "X" is an open class.	

12. Electrical Fast Transient/Burst Immunity Measurement (EFT/BURST)

- Final Test Result : PASS
- Pass Performance Criteria : B
- Required Performance Criteria : B
- Basic Standard : IEC 61000-4-4:2004/A1:2010
- Product Standard : EN 55024:2010
- Level : on Input power ports -- 2
- Test Voltage : on Input power ports -- $\pm 0.5 / \pm 1.0$ kV
- Impulse wave shape : 5/50 ns (Tr/Th)
- Impulse frequency : 5 kHz
- Test Repetition Rate : 1 time / minute
- Temperature : 24 °C
- Relative Humidity : 45 %
- Atmospheric Pressure : 100.5 kPa
- Test Date : May 01, 2014
- Test Engineer : Crewe

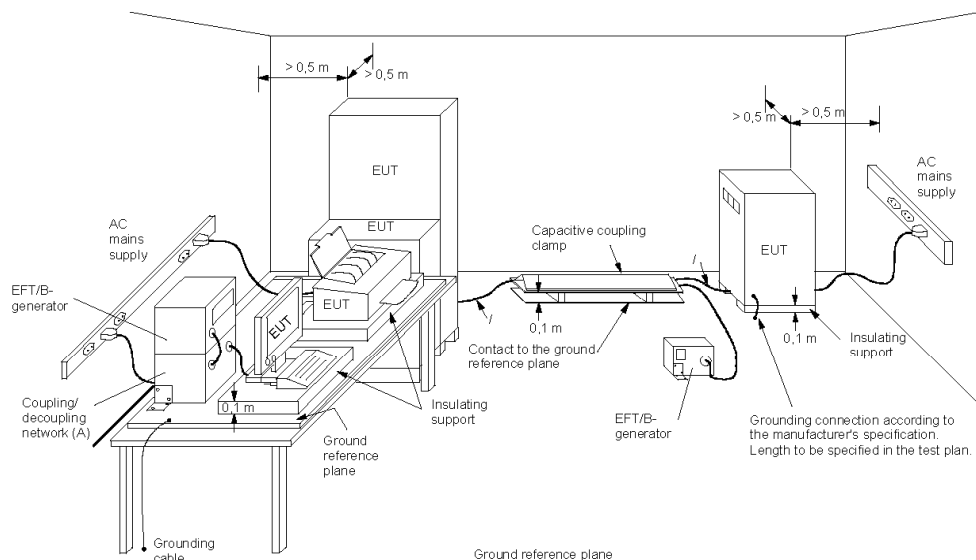
12.1. Test Record

■ on Input power ports:

Test Location	Polarity	Test Level	Voltage (Peak)	Test Record
L+N+PE	+	2	0.5 / 1.0 kV	Note1
	—	2	0.5 / 1.0 kV	
Note	1. When testing at ±1kV on the L+N+PE, there were ERROR messages when operation of R/W. After the test, the equipment continued to operate as intended without operator intervention.			

Remark : PE = Earth reference

12.2. Test setup



IEC 901/04

Kev

- l* length between clamp and the EUT to be tested (should be $0,5\text{ m} \pm 0,05\text{ m}$)
- (A) location for supply line coupling
- (B) location for signal lines coupling

The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1 m thick. If the EUT is table-top equipment, it was located approximately 0.8 m 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 0.1 m 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 1 m or less.

12.3. 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 exceeds 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.

12.4. 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.

12.5. 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).

12.6. 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 Input power ports	On signal port and telecommunication ports
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.		

13. Surge Immunity Measurement

- Final Test Result : **PASS**
- Pass Performance Criteria : **A**
- Required Performance Criteria : B for Input power ports
- Basic Standard : IEC 61000-4-5:2005
- Product Standard : EN 55024:2010
- Surge wave form (Tr/Th) : on Input power ports -- 1.2/50 (8/20) μ s
- Level : on Input power ports -- 3
- Test Voltage : on Input power ports -- ± 1.0 / ± 2.0 kV
- Phase Angle : 0°, 90°, 180°, 270°
- Number of surges : 5 positive and 5 negative pulses
- Pulse Repetition Rate : 1 time / min. (maximum)
- Temperature : 23 °C
- Relative Humidity : 49 %
- Atmospheric Pressure : 100.5 kPa
- Test Date : May 01, 2014
- Test Engineer : Crewe

13.1. Test Record

■ on Input power ports:

Test Location	Voltage (kV)	Polarity	Phase Angle				Test Record
			0°	90°	180°	270°	
L - N	0.5	+	A	A	A	A	Normal (No influencing)
		—	A	A	A	A	Normal (No influencing)
	1.0	+	A	A	A	A	Normal (No influencing)
		—	A	A	A	A	Normal (No influencing)
L - PE	1.0	+	A	A	A	A	Normal (No influencing)
		—	A	A	A	A	Normal (No influencing)
	2.0	+	A	A	A	A	Normal (No influencing)
		—	A	A	A	A	Normal (No influencing)
N - PE	1.0	+	A	A	A	A	Normal (No influencing)
		—	A	A	A	A	Normal (No influencing)
	2.0	+	A	A	A	A	Normal (No influencing)
		—	A	A	A	A	Normal (No influencing)

Remark : PE = Earth reference

13.2. Test Severity Levels

Level	Open-circuit test voltage, $\pm 10\%$, kV
1	0.5
2	1.0
3	2.0
4	4.0
x	Specified
Remark : " X " is an open level. This level can be specified in the product specification.	

13.3. 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 worst-case 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 previously unstressed equipment shall be used and the protection devices shall be replaced.

13.4. Operating Condition

Full system

14. Conducted Disturbances Induced by Radio-Frequency Field Immunity Measurement (CS)

- Final Test Result : **PASS**
- Pass Performance Criteria : **A**
- Required Performance Criteria : A
- Basic Standard : IEC 61000-4-6:2008
- 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 % of the preceding frequency value
- Test Port : on Input power ports
- Coupling mode : CDN-M016 for Input power port
- Temperature : 24 °C
- Relative Humidity : 50 %
- Atmospheric Pressure : 100.5 kPa
- Test Date : May 01, 2014
- Test Engineer : Crewe

14.1. Test Record

Test Port	Test field strength level	Test field strength (V rms)	Test Record
Input power port	2	3	Normal (No influencing)

14.2. Test Severity Levels

Level	Voltage Level (EMF)
1	1 V rms
2	3 V rms
3	10 V rms
x	Specified
Remark : " X " is an open level. This level can be specified in the product specification.	

14.3. Operating Condition

Full system

14.4. 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 sine wave, 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. 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.

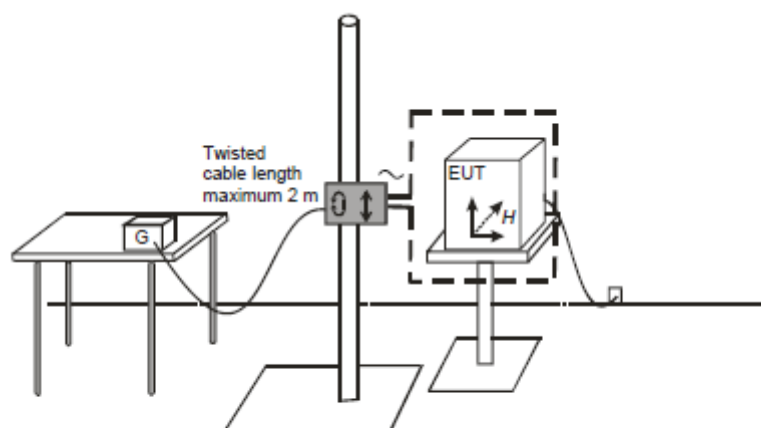
15. Power Frequency Magnetic Field immunity Measurement (PFMF)

- Final Test Result : **PASS**
- Pass Performance Criteria : **A**
- Required Performance Criteria : A
- Basic Standard : IEC 61000-4-8:2009
- Product Standard : EN 55024:2010
- Temperature : 23 °C
- Relative Humidity : 50 %
- Atmospheric Pressure : 100.5 kPa
- Test Date : May 01, 2014
- Test Engineer : Crewe

15.1. Test Record

Power Frequency Magnetic Field	Testing duration	Coil Orientation	Test Record
50/60Hz, 1A/m	1.0 Min	X-axis	Normal (No influencing)
50/60Hz, 1A/m	1.0 Min	Y-axis	Normal (No influencing)
50/60Hz, 1A/m	1.0 Min	Z-axis	Normal (No influencing)

15.2. Test Setup



EUT : Equipment under test G : Test Generator

16. Voltage Dips and Voltage Interruptions Immunity Measurement (DIP)

- Final Test Result : **PASS**
- Pass Performance Criteria : C for voltage interruption, C/A for voltage dips – for 100V
C for voltage interruption, A/A for voltage dips – for 240V
- Required Performance Criteria : C for voltage interruption, C/B for voltage dips
- Basic Standard : IEC 61000-4-11:2004
- Product Standard : EN 55024:2010
- Test Port : Input power ports
- Phase Angle : 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360°
- Temperature : 25 °C
- Relative Humidity : 46 %
- Atmospheric Pressure : 100.5 kPa
- Test Date : May 01, 2014
- Test Engineer : Crewe

16.1. Test Record of Voltage Interruption

Voltage (V)	Performance Criterion (Phase Angle)									Reduction Voltage	Duration (Periods)
	0°	45°	90°	135°	180°	225°	270°	315°	360°		
100/240	C	C	C	C	C	C	C	C	C	>95 %	250
Observation	After the interruption, the power of EUT was off. The power of the EUT must be reset by the operator.										

16.2. Test Record of Voltage Dips

Voltage (V)	Performance Criterion (Phase Angle)									Reduction Voltage	Duration (Periods)
	0°	45°	90°	135°	180°	225°	270°	315°	360°		
100	C	C	C	C	C	C	C	C	C	30 %	25
100	A	A	A	A	A	A	A	A	A	>95 %	0.5
240	A	A	A	A	A	A	A	A	A	30 %	25
240	A	A	A	A	A	A	A	A	A	>95 %	0.5
Observation	After the interruption, the power of EUT was off. The power of the EUT must be reset by the operator.										

16.3. Testing Requirement and Procedure

The test was based on IEC 61000-4-11:2004

16.4. Test Conditions

- a. Source voltage and frequency : 100/240V, 50Hz, Single phase.
- b. Test of interval : 10 sec.
- c. Level and duration : Sequency of 3 dips/interrupts.
- d. Voltage rise (and fall) time : 1 ~ 5 μ s.

16.5. Operating Condition

Full system

17. Photographs of Test Configuration

17.1. Photographs of AC Powerline Conducted Emissions Test Configuration

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

FRONT VIEW



REAR VIEW



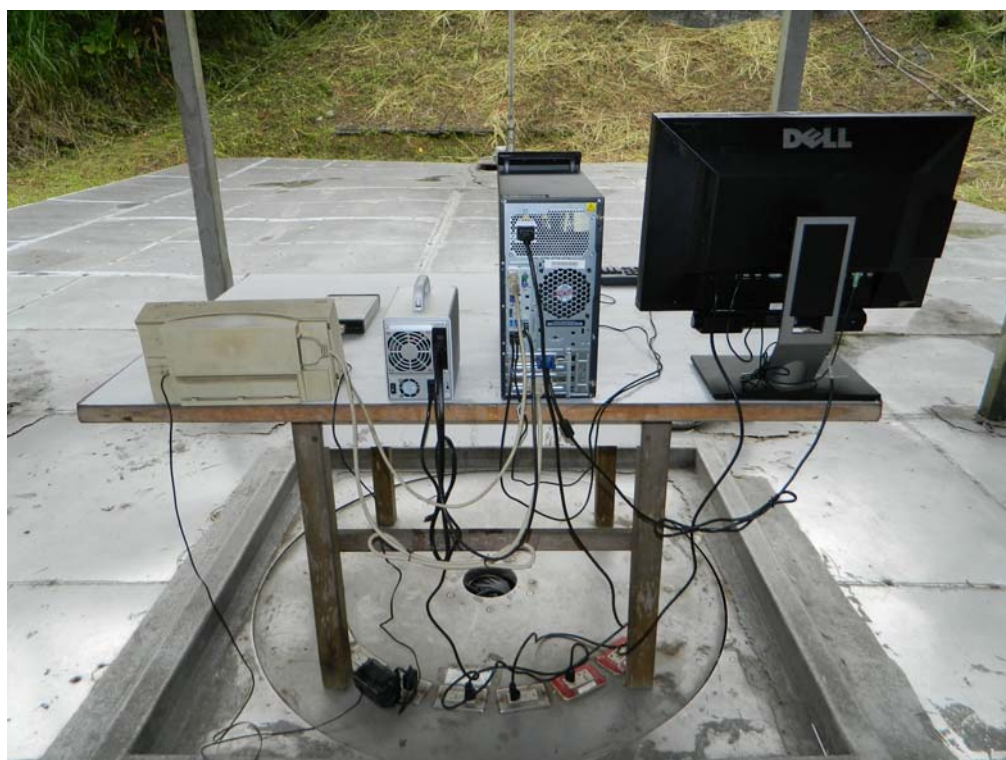
17.2. Photographs of Radiated Emissions Test Configuration

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

FRONT VIEW

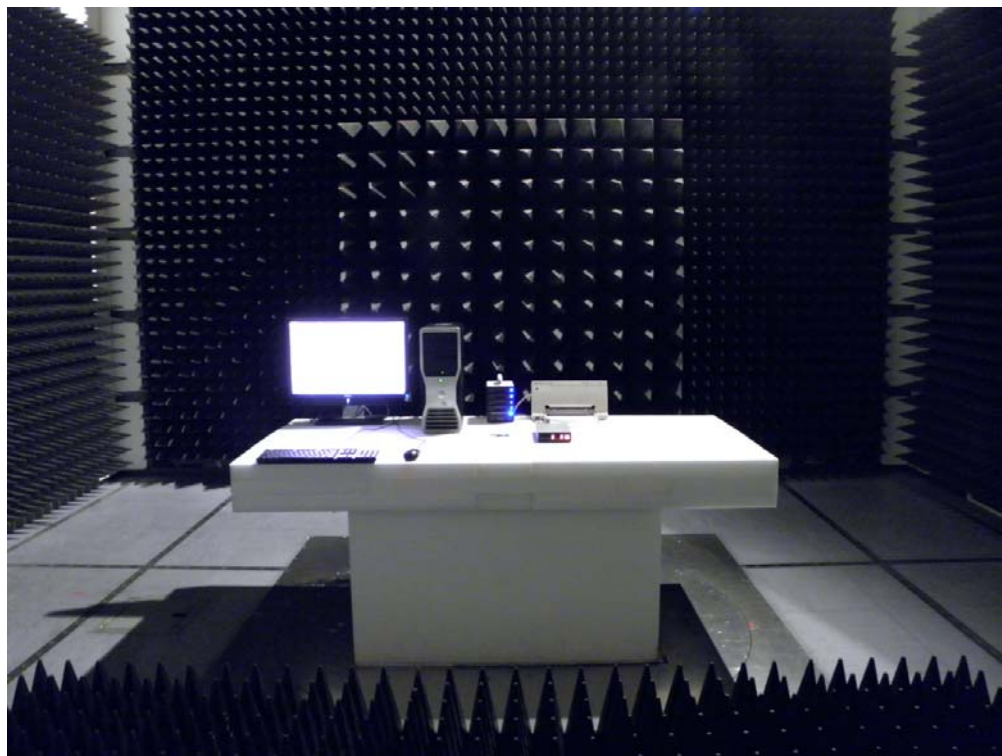


REAR VIEW

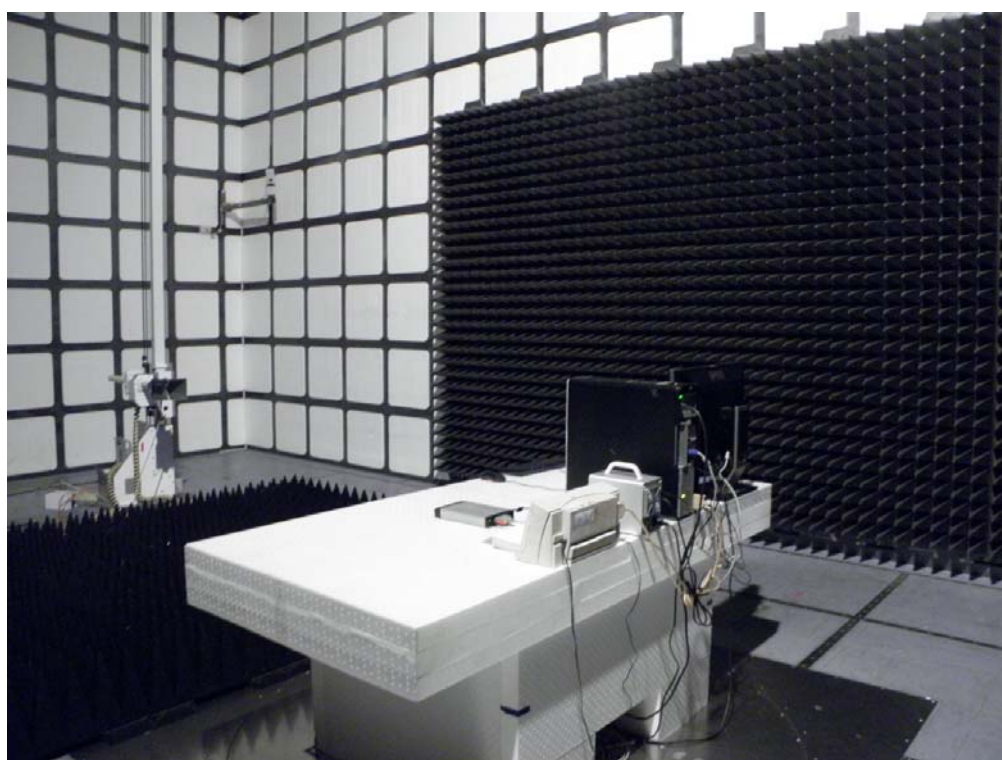


- The photographs show the configuration that generates the maximum emission.
For Above 1GHz

FRONT VIEW



REAR VIEW



17.3. Photographs of Harmonic, Flicker, Surge, Dip Test Configuration

FRONT VIEW



REAR VIEW



17.4. Photographs of ESD Immunity Test Configuration

FRONT VIEW

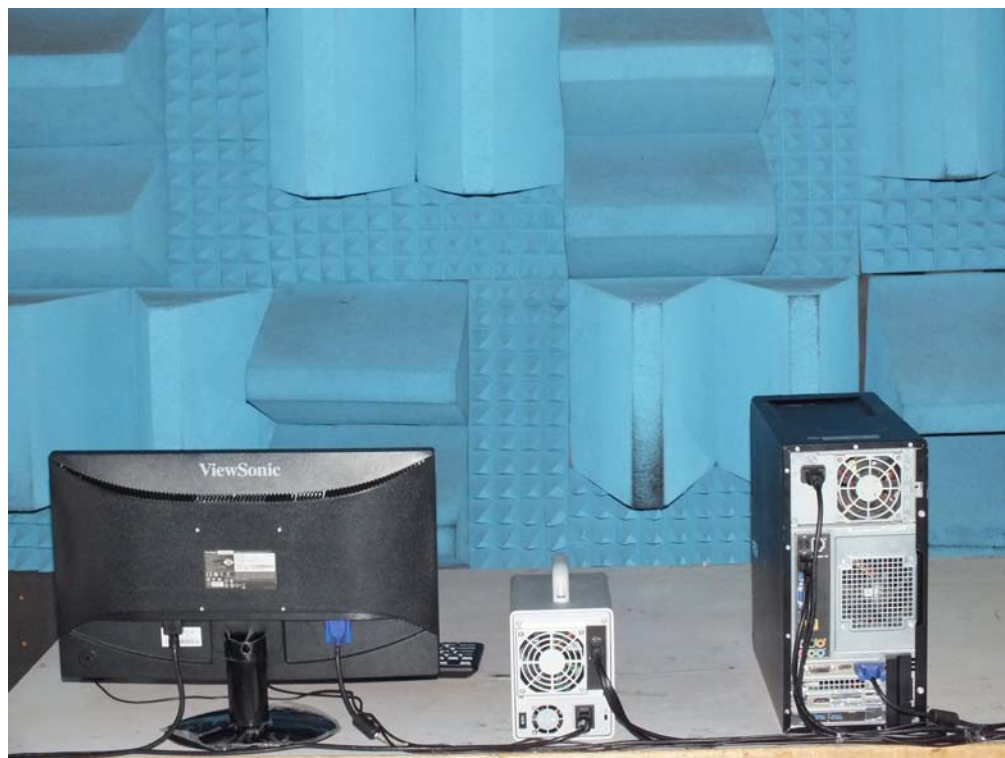


REAR VIEW



17.5. Photographs of RS Immunity Test Configuration

FRONT VIEW



REAR VIEW



17.6. Photographs of EFT/BURST Immunity Test Configuration

FRONT VIEW



REAR VIEW



17.7. Photographs of CS Immunity Test Configuration

FRONT VIEW



REAR VIEW



17.8. Photographs of PFMF immunity test Configuration

FRONT VIEW



REAR VIEW



18. 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	9kHz - 30MHz	Dec. 05, 2013	Conduction (CO01-NH)
LISN	KYORITSU	KNW-407	8-1010-15	9kHz – 30MHz	NCR	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. 11, 2013	Conduction (CO01-NH)

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

NCR: NO CALIBRATION REQUEST.

Radiation 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	Jun. 04, 2013	Radiation (OS02-NH)
Spectrum Analyzer	R&S	FSL-V	100323	9 kHz – 6.0 GHz	Oct. 17, 2013	Radiation (OS02-NH)
Receiver	R&S	ESCS 30	838251/002	9 kHz - 2.75 GHz	Oct. 23, 2013	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	NCR	Radiation (OS02-NH)
Antenna Mast	ETS	2075-2	2385	1 m - 4 m	NCR	Radiation (OS02-NH)
RF Cable-R10m	MIYAZAKI	5DFB	CB044	30 MHz - 1 GHz	Aug. 30, 2013	Radiation (OS02-NH)

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

NCR: NO CALIBRATION REQUEST.

Radiation 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 17, 2013	Radiation (03CH04-HY)
Receiver	R&S	ESI	838496/008	20 Hz ~ 7 GHz	May 16, 2013	Radiation (03CH04-HY)
Amplifier	Agilent	8449B	3008A02326	1 GHz ~ 26.5 GHz	May 17, 2013	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)

Note: 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	SCHAFFNER	NSG 437	192	Air: 0 ~ 30kV Contact: 0 ~ 30kV	Sep. 23, 2013	ESD
RS immunity Test system	ROHDE& SCHWARZ	RSF	RS-01	80M~3GHz	Mar. 14, 2014	RS
Amplifier	AR	250W 1000AM	0332909	80MHz ~ 1GHz	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 06, 2013	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
EMCPro System	KeyTek	EMCPro	0303194	0~ 6kV	Sep. 16, 2013	SURGE
Conducted Immunity Test System	TESEQ	NSG4070	34293	9kHz ~ 1GHz	Jun. 26, 2013	CS
Attenuator	BIRD	100-SA-MFB-06	0232	150kHz ~ 230MHz	Jun. 13, 2013	CS
Coupling and Decoupling Network	SCHAFFNER	CDN M016	16672	150kHz ~ 230MHz	Jun. 29, 2013	CS
Magnetic field Immunity Loop	FCC (KEYTEK)	F-1000-4-8-G-125A	03007	30A/CONTINUOUS 100A/2Hrs 230A/30SEC	Oct. 14, 2013	Magnetic
Magnetic Generator	FCC (KEYTEK)	F-1000-4-8/9/10-L-1M	03003	30A/CONTINUOUS 100A/2Hrs 230A/30SEC	Oct. 14, 2013	Magnetic
EMCPro System	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	EMC PARTNER	Har1000 -1P	041	4000VA 16A PEAK	May 15, 2013	Harmonics, Flicker

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

19. Uncertainty of Test Site

Emission Test Measurement Uncertainty

Test Items	Test Site No.	Uncertainty	Remark
Conducted Emissions	CO01-NH	± 2.62dB	Confidence levels of 95%
Radiated Emissions below 1GHz	OS02-NH	± 3.04dB	Confidence levels of 95%
Radiated Emissions above 1GHz	03CH04-HY	± 4.83dB	Confidence levels of 95%

Immunity Test Measurement Uncertainty

◆ 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

From Standard			
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

From Standard			
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

Negative Discharge Current

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.	Tolerance.	Max.	Min.
kV	%	kV	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	0.268	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

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

APPENDIX A. Photographs of EUT



