

Verification of Compliance

Product Name : **Smart Card Reader**
Trade Name : 
Model Number : **SCR11**
Applicant : **Singular Technology Co., Ltd.**
Address : **7FL., NO. 31 Sec. 2, San Min Rd., Pan Chiao District, New Taipei City, Taiwan, 220, R.O.C.**
Report Number : **C22-U070-1210-096**
Issue Date : **October 23, 2012**
Applicable Standards : **EN 55022:2010 Class B ITE**
EN 55024:2010
EN 61000-4-2:2009
EN 61000-4-3:2006+A1:2008+A2:2010
EN 61000-4-4:2004+A1:2010
AS/NZS CISPR22:2009 Class B ITE

Based on the EMC Directive 2004/108/EC and the specifications of the customer, one sample of the designated product has been tested in our laboratory and found to be in compliance with the EMC standards cited above.



TAF 0905
FCC CAB Code TW1053
NVLAP Lab Code 200575-0
IC Code 4699A
VCCI Accep. No. R-1527, C-1609, T-1441, G-10



Central Research Technology Co.
EMC Test Laboratory
11, Lane 41, Fushuen St., Jungshan Chiu,
Taipei, Taiwan, 104, R.O.C.
Tel: 886-2-25984568
Fax: 886-2-25984546



(Tsun-Yu Shih/ General Manager)

Date: October 23, 2012

CE EMC Test Report

for

Smart Card Reader

Trade Name : 
Model Number : SCR11
Report Number : C22-U070-1210-096
Date of Receipt : October 5, 2012
Date of Report : October 23, 2012

Prepared for

Singular Technology Co., Ltd.

7FL., NO. 31 Sec. 2, San Min Rd., Pan Chiao District, New Taipei City, Taiwan, 220, R.O.C.

Prepared by



Central Research Technology Co.
EMC Test Laboratory

11, Lane 41, Fushuen St., Jungshan Chiu, Taipei, Taiwan, 104, R.O.C.

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Verification of Compliance

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EN 61000-4-3:2006+A1:2008+A2:2010
EN 61000-4-4:2004+A1:2010
AS/NZS CISPR22:2009 Class B ITE
Date of Testing : October 9~15, 2012
Deviation : According to the requirements of manufacturer, the test method and configuration of EMS test items are following the requirement of the applicable standards cited above.
Condition of Test Sample : Engineering Sample



We, **Central Research Technology Co.**, hereby certify that one sample of the designated product was tested in our facility during the period mentioned above. The test records, data evaluation and Equipment Under Test (EUT) configurations shown in the present report are true and accurate representation of the measurements of the sample's EMC characteristics under the conditions herein specified.

The test results show that the EUT as described in the present report is in compliance with the requirements set forth in the standards mentioned above and apply to the tested sample identified in the present report only. The test report shall not be reproduced, except in its entirety, without the written approval of Central Research Technology Co.

PREPARED BY : Cathy Chen , **DATE** : Oct. 23, 2012
(Cathy Chen/System Executive)
APPROVED BY : J. Y. Shih , **DATE** : Oct. 23, 2012
(Tsun-Yu Shih/General Manager)

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Attachment 1 – Photographs of the Test Configurations

Attachment 2 – Photographs of EUT

1. General Description

1.1 General Description of EUT

Equipment Under Test : Smart Card Reader
Model No. : SCR11
Power in : Supplied by the connected PC.
Highest Operating Frequency : 32MHz from the test specification
Manufacturer : Singular Technology Co., Ltd.
Function Description :

The EUT is an engineering sample of the Smart Card Reader. Please refer to the user's manual for the details.

The I/O ports of EUT are listed below:

No.	I/O Port Type	Quantity
1	USB port	1
2	IC card slot	1

1.2 Test Mode

Normal operating as the specification of manufacturer.

1.3 Applied standards

According to the specifications of the manufacturer and the requirements set in European Council EMC Directive 2004/108/EC, the applied standards to evaluate the compliance of the EUT are as following:

Applied Standards	Test Items	Results
<input checked="" type="checkbox"/> EN 55022:2010 Class B ITE	Conducted Emission Measurement	<u>PASS</u>
<input checked="" type="checkbox"/> AS/NZS CISPR22:2009 Class B ITE	Radiated Emission Measurement	<u>PASS</u>
<input type="checkbox"/> EN 61000-3-2:2006+A1:2009+A2:2009	Harmonic Current Emission Measurement	<u>N/A</u>
<input type="checkbox"/> EN 61000-3-3:2008	Voltage Fluctuation and Flicker Emission Measurement	<u>N/A</u>
<input checked="" type="checkbox"/> EN 55024:2010		
<input checked="" type="checkbox"/> EN 61000-4-2:2009	Electrostatic discharge Test (ESD)	<u>PASS</u>
<input checked="" type="checkbox"/> EN 61000-4-3:2006+A1:2008+A2:2010	Radiated electromagnetic field immunity Test (RS)	<u>PASS</u>
<input checked="" type="checkbox"/> EN 61000-4-4:2004+A1:2010	Electrical fast transient / burst immunity Test (EFT)	<u>PASS</u>
<input type="checkbox"/> EN 61000-4-5:2006	Surge immunity Test	<u>N/A</u>
<input type="checkbox"/> EN 61000-4-6:2009	Immunity to conducted disturbances, induced by radio-frequency fields (CS)	<u>N/A</u>
<input type="checkbox"/> EN 61000-4-8:2010	Power frequency magnetic field immunity Test (PFM)	<u>N/A</u>
<input type="checkbox"/> EN 61000-4-11:2004	Voltage dips, short interruptions Test	<u>N/A</u>

1.4 Test Setup for the EUT

The EUT is an unique unit connected with other necessary accessories and support units listed in the next section. It has been tested against each standard after the following setup steps:

- a. Connect the EUT and all the support units to the appropriate power source.
- b. Turn on all the accessories and support units.
- c. Install an EMC test software into PC and execute it under the Windows environment.
- d. The PC sends "H" patterns to the monitor, which fills the whole screen of it.
- e. The PC reads messages from IC Card by the EUT.
- f. The PC sends messages to the modem.
- g. The PC sends "H" patterns to the printer, which prints them on paper.
- h. Repeat and keep setup steps listed above before and during all tests.

EUT I/O ports / Peripherals	Exerciser Program (software)	Version of Program
Monitor	BurnIn Test.exe	V6.0
Modem		
Printer		

1.5 The Support Units

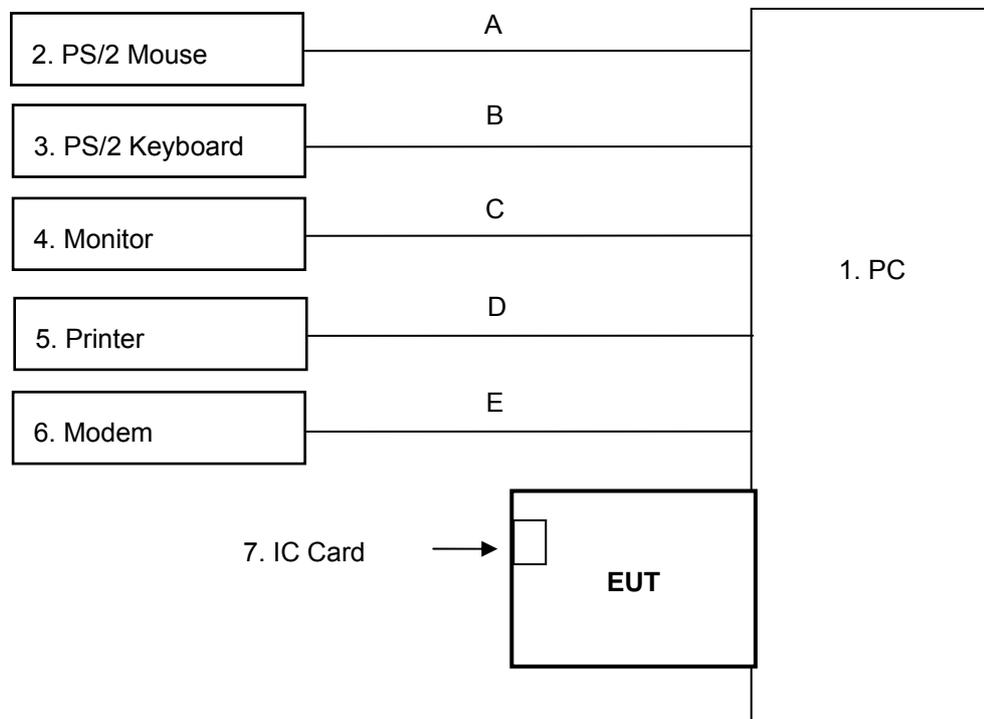
Conducted Emission and Radiated Emission Tests

No.	Unit	Model No.	FCC ID	Trade Name	Power Cord	Supported by lab.	Note
1	PC	9439-E44	DoC	Lenovo	1.8m	✓	
2	PS/2 Mouse	MO71KC	DoC	DELL	N/A	✓	
3	PS/2 Keyboard	SK-8110	DoC	DELL	N/A	✓	
4	Monitor	U2410	DoC	DELL	1.8m	✓	
5	Printer	LQ-300+	N/A	EPSON	1.8m	✓	
6	Modem	DM-1414	IFAXDM1414	ACEEX	1.9m	✓	
7	IC Card	N/A	N/A	N/A	N/A		

Immunity Test (ESD, RS and EFT)

No.	Unit	Model No.	FCC ID	Trade Name	Power Cord	Supported by lab.	Note
1	PC	8200E TM	DoC	HP	1.8m	✓	
2	PS/2 Mouse	MO71KC	DoC	DELL	N/A	✓	
3	PS/2 Keyboard	SK-8110	DoC	DELL	N/A	✓	
4	Monitor	2408WFP	DoC	DELL	1.8m	✓	
5	Printer	LQ-300+II	N/A	EPSON	1.9m	✓	
6	Modem	DM-1414	IFAXDM1414	ACEEX	1.9m	✓	
7	IC Card	N/A	N/A	N/A	N/A		

1.6 Layout of the Setup



Connecting Cables :

No.	Cable	Length	Shielded	Core	Shielded Backshell	Supported by lab.	Note
A	PS/2 Mouse Cable	1.8m	✓			✓	
B	PS/2 Keyboard Cable	2.0m	✓			✓	
C	VGA Cable	1.7m	✓	✓		✓	2 cores
D	Printer Cable	1.8m	✓	✓		✓	
E	Serial Cable	1.8m	✓	✓		✓	2 cores

1.7 Test Capability

Test Facility

The test facility used for evaluating the conformance of the EUT with each standard in the present report meets what required in CISPR16-1-4, CISPR16-2-3.

Test Room	Type of Test Room	Descriptions
TR1	10m semi-anechoic chamber (23m×14m×9m)	Complying with the NSA and the site VSWR requirements in documents CISPR 22 and CISPR 16-1-4 for the radiated emission measurement.
TR1	3m fully-anechoic chamber (23m×14m×9m)	
TR11	3m semi-anechoic chamber (9m×6m×6m)	Complying with the NSA requirements set in documents CISPR 22/ EN 55022 for the radiated emission measurement.
TR5	Shielding Room (8m×5m×4m)	For the conducted emission measurement.
TR4	Shielding Room (5m×3m×3m)	
TR2	3m fully-anechoic chamber (7m×3m×3m)	Complying with the field uniformity requirements in standard IEC/ EN 61000-4-3 for the radiated immunity test.
TR7	Shielding Room (5m×3m×3m)	For the Current Harmonic / Voltage Flicker and other immunity tests.
TR8	Shielding Room (5m×3m×3m)	
AR	Shielding Room (3m×3m×3m)	
TR12	Plane Grounding Site (2.4m×3m)	
TR300	3m fully-anechoic chamber (8m×5m×5m)	Complying with the site VSWR requirements set in documents CISPR 16-1-4 for the radiated emission measurement.

Test Laboratory Competence Information

Central Research Technology Co. has been accredited / filed / authorized by the agencies listed in the following table.

Certificate	Nation	Agency	Code	Mark
Accreditation Certificate	USA	NVLAP	200575-0	ISO/IEC 17025
	R.O.C. (Taiwan)	TAF	0905	ISO/IEC 17025
	R.O.C. (Taiwan)	BSMI	SL2-IN-E-0033, SL2-IS-E-0033, SL2-R1/R2-E-0033, SL2-A1-E-0033 SL2-L1-E-0033	ISO/IEC 17025
Site Filing Document	USA	FCC	474046,TW1053	Test facility list & NSA Data
	Canada	IC	4699A-1,-3	Test facility list & NSA Data
	Japan	VCCI	R-1527,C-1609,T-1441,G-10	Test facility list & NSA Data
Authorization Certificate	Germany	TUV	10021687	ISO/IEC 17025
	Norway	Nemko	ELA 212	ISO/IEC 17025

The copy of each certificate can be downloaded from our web site: www.crc-lab.com

2. Conducted Emission Measurement

Test Result : **PASS**

2.1 Limits for Emission Measurement

Limits for conducted disturbances at the power mains

Frequency (MHz)	Class A Equipment		Class B Equipment	
	Quasi-peak (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 to 0.5	79	66	66 – 56	56 – 46
0.5 to 5	73	60	56	46
5 to 30	73	60	60	50

Note 1- The lower limit shall apply at the transition frequency.
 Note 2- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5MHz for Class B equipment.

Limits for conducted common mode disturbances at telecommunication ports

Frequency (MHz)	Class A Equipment				Class B Equipment			
	Voltage Limits		Current Limits		Voltage Limits		Current Limits	
	Q.P. (dB μ V)	Average (dB μ V)	Q.P. (dB μ A)	Average (dB μ A)	Q.P. (dB μ V)	Average (dB μ V)	Q.P. (dB μ A)	Average (dB μ A)
0.15 to 0.5	97 - 87	84 – 74	53 – 43	40 – 30	84 – 74	74 - 64	40 – 30	30 - 20
0.5 to 30	87	74	43	30	74	64	30	20

Note 1- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5MHz.
 Note 2- The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test.

2.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Test Receiver	R&S	ESCS 30/ 836858/021	Jan. 11, 2012	Jan. 11, 2013
LISN	R&S	ESH2-Z5/ 836613/001	June 5, 2012	June 5, 2013
2 nd LISN	R&S	ENV4200/ 833209/010	March 26, 2012	March 26, 2013
Balanced TELE. ISN	FCC	<input type="checkbox"/> FCC-TLISN-T2-02/ 20269	August 8, 2012	August 8, 2013
	FCC	<input type="checkbox"/> FCC-TLISN-T4-02/ 20270	March 22, 2012	March 22, 2013
	FCC	<input type="checkbox"/> FCC-TLISN-T8-02/ 20318	Dec. 26, 2011	Dec. 26, 2012
<input type="checkbox"/> Capacitive Voltage Probe	FCC	F-CVP-1/ 84	Aug. 18, 2012	Aug. 18, 2013
<input type="checkbox"/> Broadband Current Probe	AH	BCP-511/ 769	Aug. 18, 2012	Aug. 18, 2013
50Ω terminator	N/A	N/A/ 001	Aug. 20, 2012	Aug. 20, 2013
RF Switch	N/A	RSU28/ 338965/002	Aug. 20, 2012	Feb. 20, 2013
RF Cable	N/A	N/A/ C0052 ~ 56	Aug. 20, 2012	Feb. 20, 2013
Test Software	Audix	e3/ Ver. 5.2004-2-19k	NCR	NCR
TR5 shielded room	ETS LINDGREN	TR5/ 15353-F	NCR	NCR

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

Measurement Uncertainty

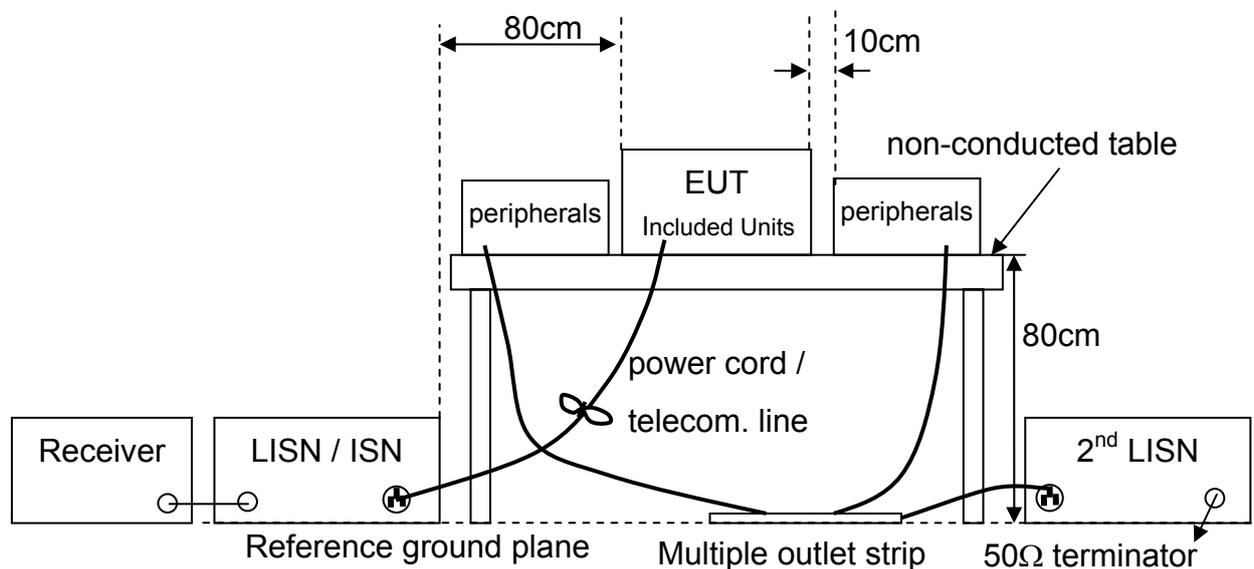
The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{CISPR} in table 1 of CISPR 16-4-2.

Equipment	Model Number	Uncertainty Value
LISN	ESH2-Z5	3.1dB
	ENV 4200	2.7dB

2.3 Test Procedures

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters above the reference ground plane and 0.4 meters from the conducting wall of the shielded room. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 meters above the reference ground plane.
- c. Connect the EUT's power source / telecommunication lines to the appropriate power mains / peripherals through the LISN / ISN.
- d. All the other peripherals are connected to the 2nd LISN, if any.
- e. The LISN / ISN was placed 0.8 meters from the EUT and at least 0.8 meters from other units and other metal planes.
- f. Measure the conducted emissions on each power line (Neutral Line and Line 1 – Hot side) of the EUT's power source by using the test receiver connected to the coupling RF output port of LISN.
- g. Rapidly scan the signal from 150kHz to 30MHz by using the receiver through the Maximum-Peak detector to determine those frequencies associated with higher emission levels for each measured line.
- h. Then measure the maximum level of conducted disturbance for each frequency found from step g. by using the receiver through the Quasi-Peak and Average detectors per CISPR 16-1.
- i. Record the level for each frequency and compare with the required limit.
- j. If required, measure the conducted emissions on telecommunication lines of EUT by using the test receiver connected to the coupling RF output port of ISN and repeat step g. to i.
- k. If the peak emission level is lower than the specified Average limit, then the emission values presented will be the peak value only. Otherwise, accurate Q.P. or Average values will be measured and presented.

2.4 Test Configurations

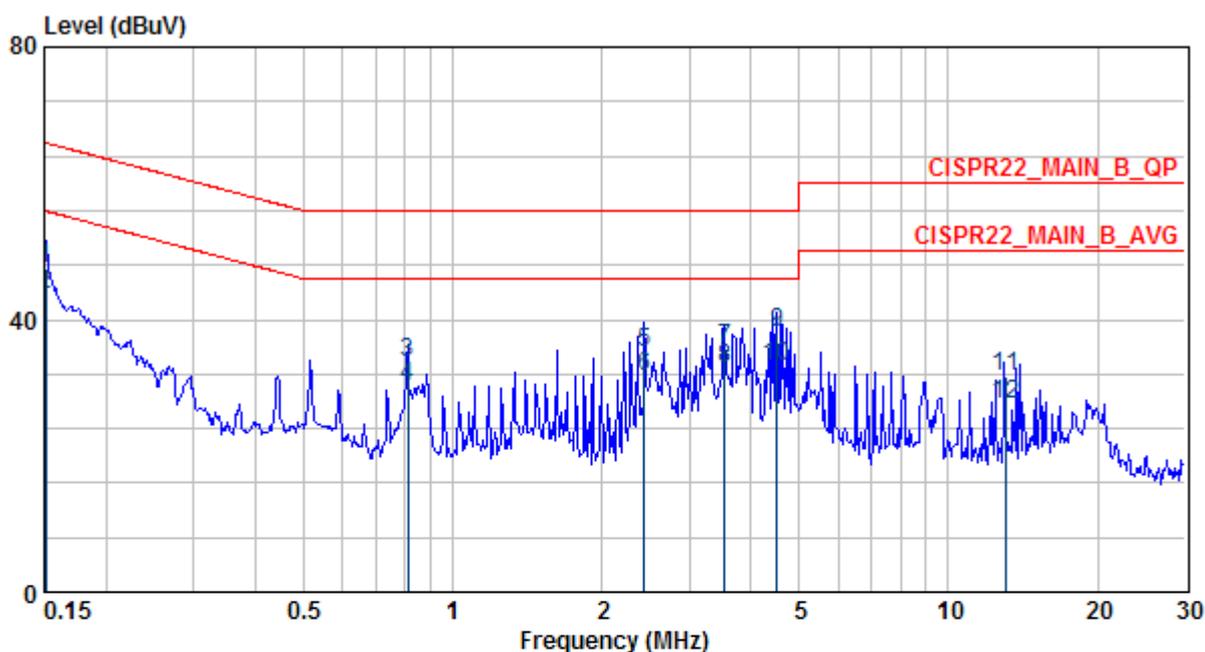


2.5 Photographs of the Test Configurations

Please refer to the Attachment 1 of the present report.

2.6 Test Results

Test Mode : Normal
Test Voltage : 230V/50Hz to the connected PC
Tester : Mathew **Temperature** : 27°C
Humidity : 59%RH **Frequency Range** : 150kHz~30MHz
IF Bandwidth : 9kHz **Phase** : Line

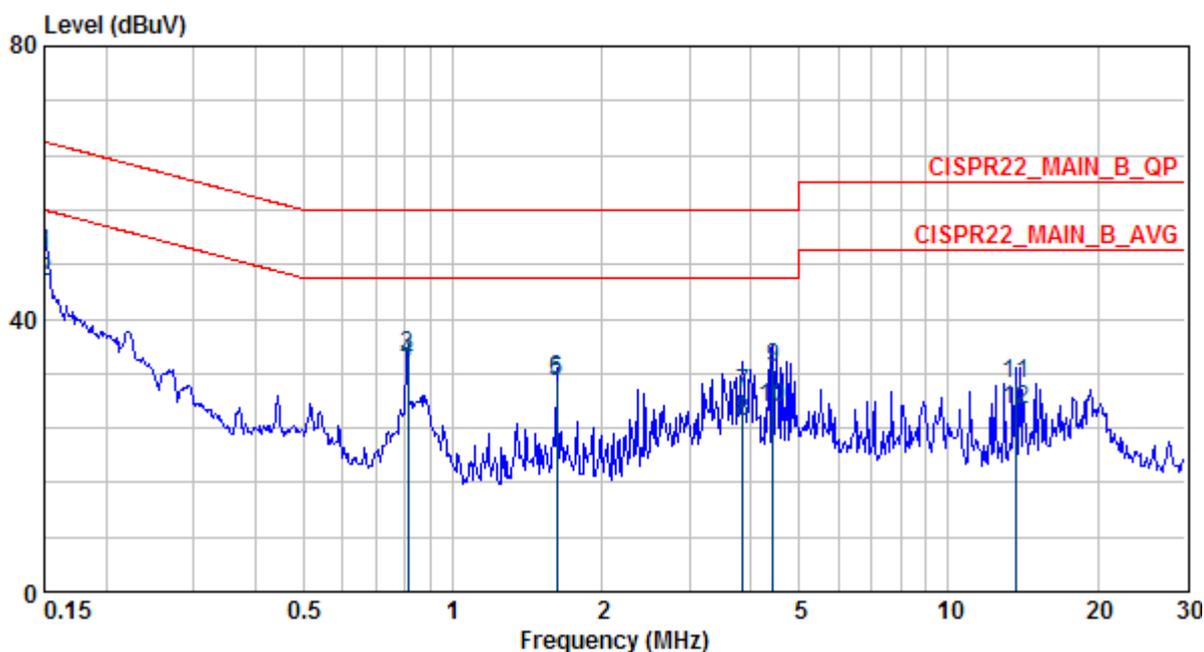


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.151	47.51	0.26	47.25	65.96	-18.45	LINE	QP
2	0.151	43.58	0.26	43.32	55.96	-12.38	LINE	AVERAGE
3	0.813	33.81	0.33	33.48	56.00	-22.19	LINE	QP
4	0.813	30.27	0.33	29.94	46.00	-15.73	LINE	AVERAGE
5	2.437	35.12	0.42	34.70	56.00	-20.88	LINE	QP
6	2.437	31.71	0.42	31.29	46.00	-14.29	LINE	AVERAGE
7	3.547	35.79	0.47	35.32	56.00	-20.21	LINE	QP
8	3.547	32.84	0.47	32.37	46.00	-13.16	LINE	AVERAGE
9	4.507	38.11	0.50	37.61	56.00	-17.89	LINE	QP
10	4.507	33.14	0.50	32.64	46.00	-12.86	LINE	AVERAGE
11	13.004	31.61	0.67	30.94	60.00	-28.39	LINE	QP
12	13.004	27.54	0.67	26.87	50.00	-22.46	LINE	AVERAGE

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.
4. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the EUT shall be deemed to meet both limits.

Test Mode : Normal
Test Voltage : 230V/50Hz to the connected PC
Tester : Mathew **Temperature** : 27°C
Humidity : 59%RH **Frequency Range** : 150kHz~30MHz
IF Bandwidth : 9kHz **Phase** : Neutral



	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.150	49.43	0.16	49.27	66.00	-16.57	NEUTRAL	QP
2	0.150	45.40	0.16	45.24	56.00	-10.60	NEUTRAL	AVERAGE
3	0.811	34.62	0.21	34.41	56.00	-21.38	NEUTRAL	QP
4	0.811	33.76	0.21	33.55	46.00	-12.24	NEUTRAL	AVERAGE
5	1.620	30.81	0.27	30.54	56.00	-25.19	NEUTRAL	QP
6	1.620	30.97	0.27	30.70	46.00	-15.03	NEUTRAL	AVERAGE
7	3.845	29.14	0.37	28.77	56.00	-26.86	NEUTRAL	QP
8	3.845	24.77	0.37	24.40	46.00	-21.23	NEUTRAL	AVERAGE
9	4.436	32.79	0.40	32.39	56.00	-23.21	NEUTRAL	QP
10	4.436	26.91	0.40	26.51	46.00	-19.09	NEUTRAL	AVERAGE
11	13.678	30.58	0.87	29.71	60.00	-29.42	NEUTRAL	QP
12	13.678	26.77	0.87	25.90	50.00	-23.23	NEUTRAL	AVERAGE

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.
4. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the EUT shall be deemed to meet both limits.

3. Radiated Emission Measurement

Test Result : PASS

3.1 Limits for Emission Measurement

Type of EUT	Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
<input checked="" type="checkbox"/>	Below 108	1000
<input type="checkbox"/>	108 - 500	2000
<input type="checkbox"/>	500 - 1000	5000
<input type="checkbox"/>	Above 1000	5 th harmonic of the highest frequency or 6GHz, whichever is lower

Limits for radiated disturbances at a measuring distance of 10m

Frequency (MHz)	Class A Equipment		Class B Equipment	
	Quasi-peak (dB μ V/m)		Quasi-peak (dB μ V/m)	
30 to 230	40		30	
230 to 1000	47		37	

Note 1- The lower limit shall apply at the transition frequency.
 Note 2- Additional provisions may be required for cases where interference occurs.

Limits for radiated disturbances at a measuring distance of 3m

Frequency (GHz)	Class A Equipment		Class B Equipment	
	Peak (dB μ V/m)	Average (dB μ V/m)	Peak (dB μ V/m)	Average (dB μ V/m)
1 to 3	76	56	70	50
3 to 6	80	60	74	54

Note 1- The lower limit shall apply at the transition frequency.

3.2 Test Instruments

 Below 1GHz measurement

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESCS 30/ 836858/020	Sept. 10, 2012	Sept. 10, 2013
Broadband Antenna	R&S	HL-562/ 360543/007	March 23, 2012	March 23, 2013
Broadband Antenna	R&S	HL-562/ 830547/010	April 26, 2012	April 26, 2013
Pre-Amplifier	Mini Circuit	ZKL-2/ 001	July 16, 2012	Jan. 16, 2013
Pre-Amplifier	Mini Circuit	ZKL-2/ 002	July 16, 2012	Jan. 16, 2013
Spectrum Analyzer	R&S	FSP7/ 100108	June 13, 2012	June 13, 2013
Spectrum Analyzer	R&S	FSP7/ 100384	Jan. 3, 2012	Jan. 3, 2013
RF Cable	JYEBAO	0214/ C0049	July 16, 2012	Jan. 16, 2013
RF Cable	JYEBAO	0214/ C0050	July 16, 2012	Jan. 16, 2013
Test Software	Audix	e3/ Ver. 4.3.714.e	NCR	NCR
TR1 Semi - anechoic Chamber	ETS. LINDGREN	TR1/ 17627-B	April 21, 2012	April 21, 2013

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the chamber TR1 listed above is the date of NSA measurement.

Measurement Uncertainty

The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{CISPR} in table 1 of CISPR 16-4-2.

Test Site (Measuring distance)	Polarization	Frequency Range	
		30MHz ~200MHz	200MHz ~1000MHz
TR1(10m)	Horizontal	3.2dB	3.5dB
	Vertical	3.3dB	3.6dB

Test Site (Measuring distance)	Polarization	Frequency Range
		1GHz ~6GHz
TR1(3m)	Horizontal	3.7dB
	Vertical	3.7dB
TR300(3m)	Horizontal	3.9dB
	Vertical	3.8dB

3.3 Test Procedures

Below 1GHz measurement

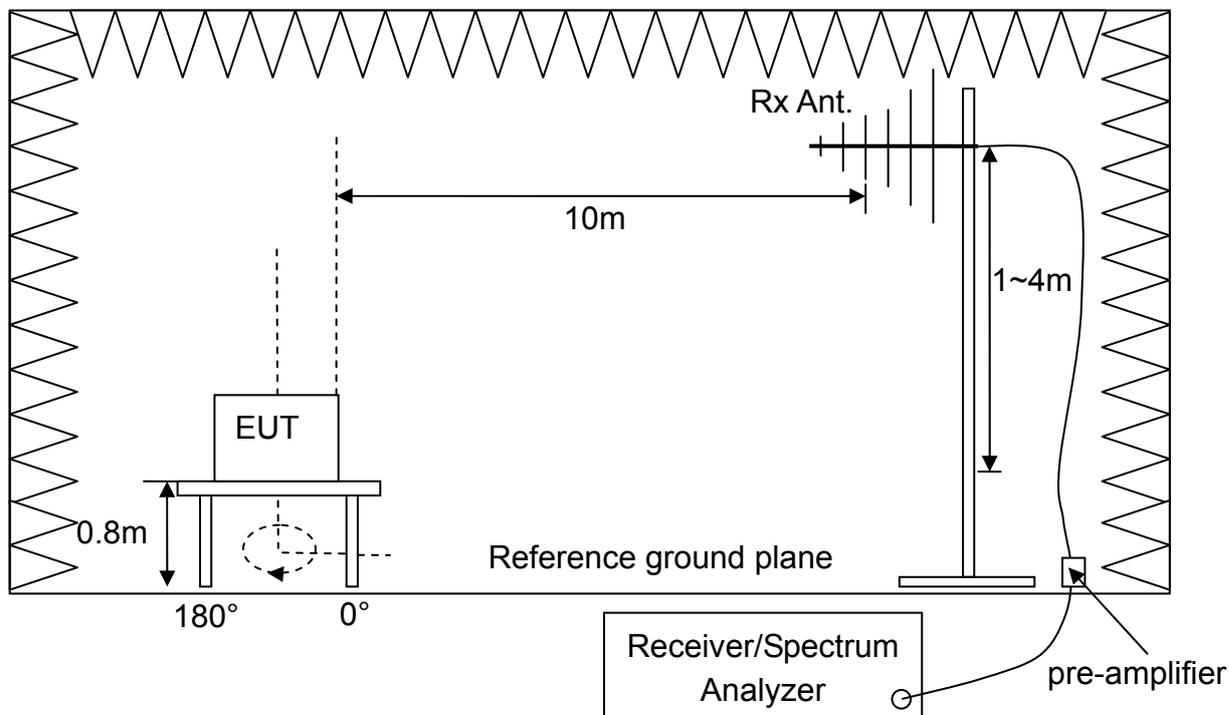
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters above the reference ground plane and 10 meters away from the interference receiving antenna in the semi-anechoic chamber.
- c. If the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 meters above the reference ground plane and 10 meters away from the interference-receiving antenna in the semi-anechoic chamber.
- d. Rapidly sweep the signal from 30MHz to 1GHz by using the spectrum through the Maximum-peak detector.
- e. Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 to 4 meters above the reference ground plane continuously to determine at least six frequencies associated with higher emission levels and record them.
- f. Then measure each frequency found from step e. by using the spectrum with rotating the EUT and positioning the receiving antenna height to determine the maximum level.
- g. Finely tune the antenna and turntable around the recorded position of each frequency found from step f. by using the receiver through the Quasi-Peak detector per CISPR 16-1 to find out where the maximum level occurred.
- h. Record frequency, azimuth angle of the turntable, height, and polarization of the receiving antenna and compare the maximum level with the required limit.
- i. Change the receiving antenna to another polarization to measure radiated emission by following step d. to h. again.
- j. If the peak emission level measured from step e. is 4dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate Q.P. value will be measured and presented.

Above 1GHz measurement

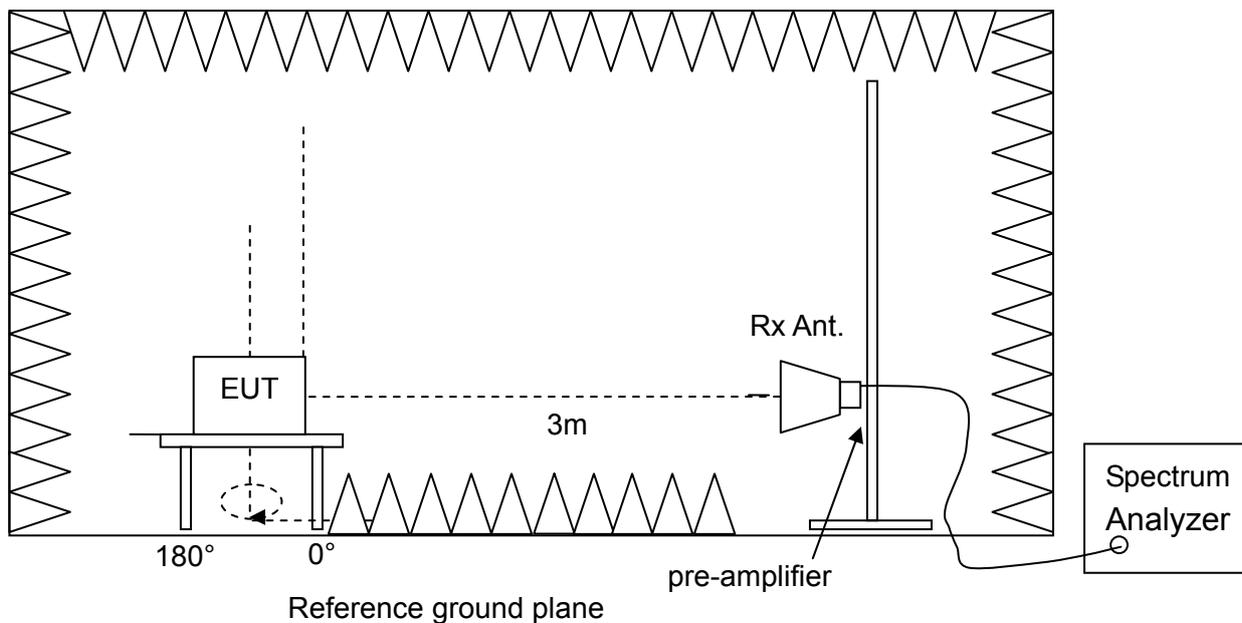
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it should be placed on a non-conducted table with a height of 0.8 meters above the reference ground plane and 3 meters away from the interference receiving antenna in the fully-anechoic chamber.
- c. If the EUT is floor-standing equipment, it should be placed on a non-conducted support with a height up to 0.15 meters above the reference ground plane and 3 meters away from the interference-receiving antenna in the fully-anechoic chamber.
- d. Rapidly sweep the signal from 1GHz to the upper frequency of measurement range by using the spectrum through the Maximum-peak detector.
- e. Rotate the EUT from 0° to 360° continuously and position the receiving antenna at specified height above the reference ground plane to determine the frequencies associated with higher emission levels and record them.
- f. Then measure each frequency found from step e. by using the spectrum with rotating the EUT to determine the maximum peak and average level.
- g. Record frequency, azimuth angle of the turntable and compare the maximum level with the required limit.
- h. Change the receiving antenna to another polarization to measure radiated emission by following step d. to g. again.

3.4 Test Configurations

Below 1GHz measurement



Above 1GHz measurement



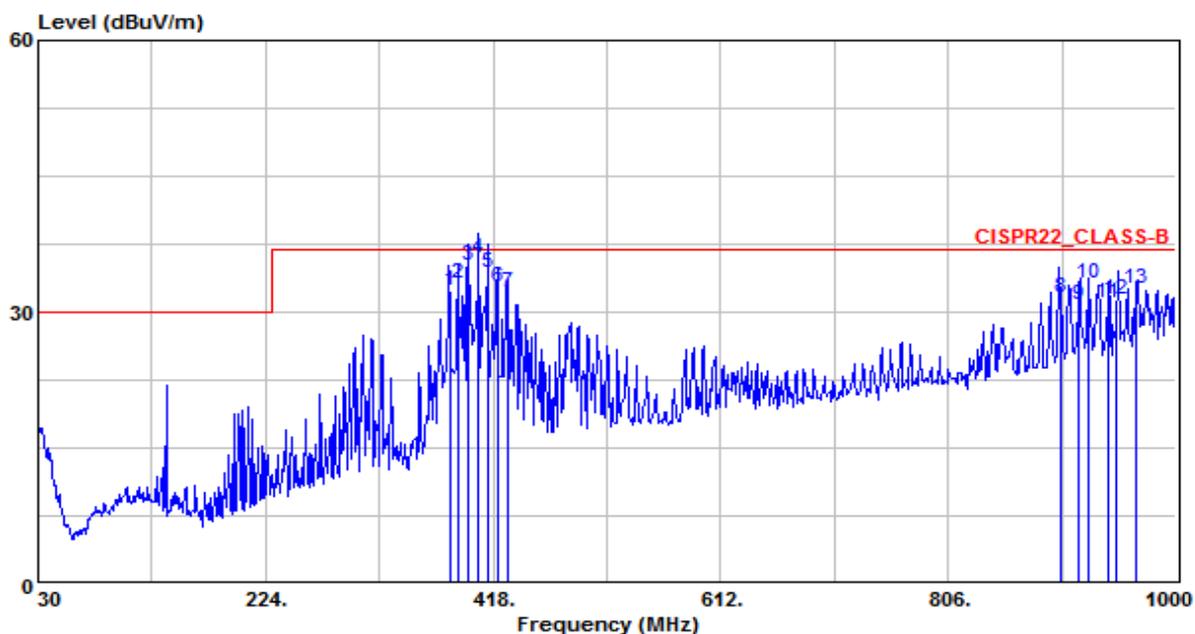
3.5 Photographs of the Test Configurations

Please refer to the Attachment 1 of the present report.

3.6 Test Results

Radiated Emission Measurement below 1000MHz

Test Mode : Normal
Test Voltage : 230V/50Hz to the connected PC
Tester : Carl **Temperature** : 26°C
Humidity : 70%RH **Frequency Range** : 30MHz~1GHz
IF Bandwidth : 120kHz **Polarization** : Horizontal

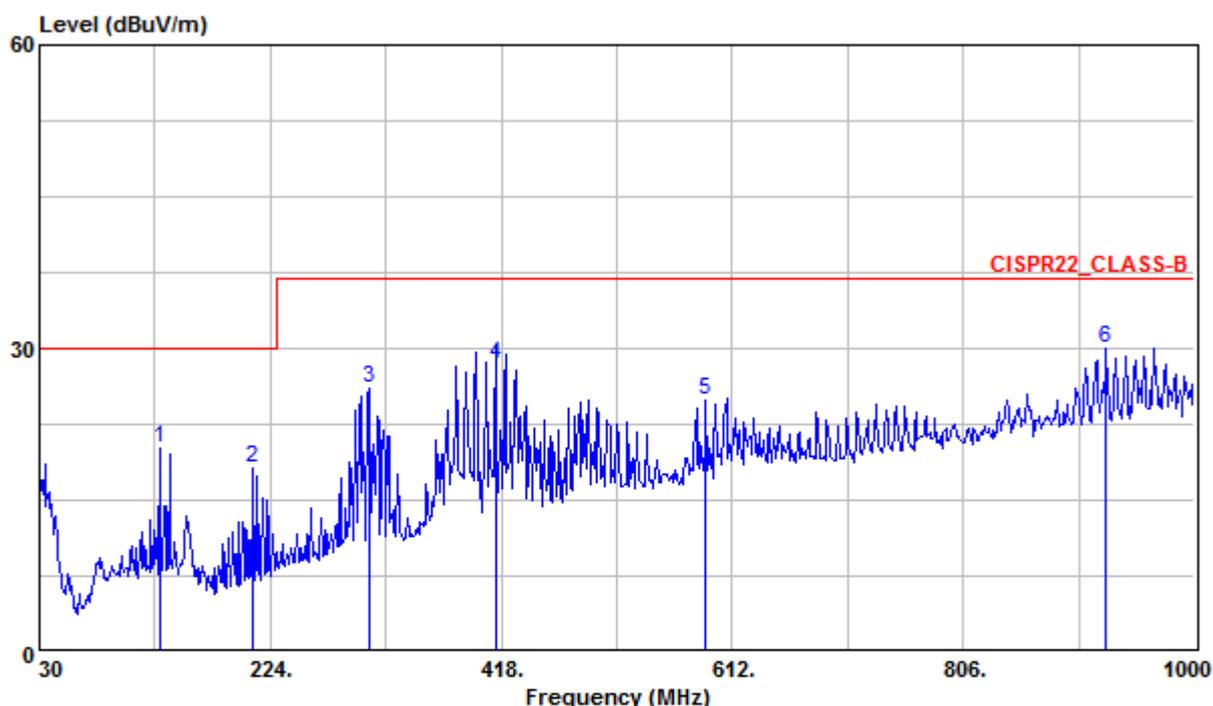


	Freq	Level	Read Level	Limit	Over	Ant	Table			
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	Pos	Pos	Pol/Phase	Remark
							cm	deg		
1 @	380.902	32.27	46.00	-13.73	37.00	-4.73	332	184	HORIZONTAL	QP
2 @	388.962	33.19	46.69	-13.50	37.00	-3.81	248	72	HORIZONTAL	QP
3 @	397.220	35.12	48.41	-13.29	37.00	-1.88	226	80	HORIZONTAL	QP
4 @	405.400	35.97	48.98	-13.01	37.00	-1.03	208	73	HORIZONTAL	QP
5 @	413.470	34.36	47.05	-12.69	37.00	-2.64	191	66	HORIZONTAL	QP
6 @	421.688	32.82	45.19	-12.37	37.00	-4.18	185	65	HORIZONTAL	QP
7 @	430.040	32.14	44.20	-12.06	37.00	-4.86	167	56	HORIZONTAL	QP
8 @	901.160	31.55	35.20	-3.65	37.00	-5.45	216	85	HORIZONTAL	QP
9 @	917.480	30.70	34.30	-3.60	37.00	-6.30	215	81	HORIZONTAL	QP
10 @	925.540	33.07	36.65	-3.58	37.00	-3.93	222	85	HORIZONTAL	QP
11 @	942.390	31.04	34.57	-3.53	37.00	-5.96	218	92	HORIZONTAL	QP
12 @	949.800	31.32	34.83	-3.51	37.00	-5.68	218	145	HORIZONTAL	QP
13 @	966.330	32.66	35.91	-3.25	37.00	-4.34	254	159	HORIZONTAL	QP

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + antenna factor – gain of pre-amplifier.
3. Q.P is abbreviation of quasi-peak.

Test Mode : Normal
Test Voltage : 230V/50Hz to the connected PC
Tester : Carl **Temperature** : 26°C
Humidity : 70%RH **Frequency Range** : 30MHz~1GHz
IF Bandwidth : 120kHz **Polarization** : Vertical



	Freq	Level	Read Level	Limit	Over	Ant	Table			
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	Pos	Pos	Pol/Phase	
							cm	deg	Remark	
1	130.880	20.14	40.26	-20.12	30.00	-9.86	---	---	VERTICAL	Peak
2	209.450	18.10	38.37	-20.27	30.00	-11.90	---	---	VERTICAL	Peak
3	307.420	26.01	42.28	-16.27	37.00	-10.99	---	---	VERTICAL	Peak
4	413.580	28.41	41.23	-12.82	37.00	-8.59	107	91	VERTICAL	QP
5	589.690	24.96	33.33	-8.37	37.00	-12.04	---	---	VERTICAL	Peak
6 @	926.280	29.98	32.58	-2.60	37.00	-7.02	---	---	VERTICAL	Peak

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + antenna factor – gain of pre-amplifier.
3. Q.P is abbreviation of quasi-peak.

4. Electrostatic Discharge (ESD) Immunity Test

Test Result : PASS

4.1 Specifications of Immunity Test Requirement

Product (Generic) Standard	: EN 55024:2010
Basic Standard	: EN 61000-4-2:2009
Required Performance	: B
Test Level	: 2 (Contact discharge) 3 (Air discharge)
Discharge Voltage	: Contact → ±4kV (Direct / Indirect discharge) Air → ±2 kV, ±4kV, ±8kV (Direct discharge)
Time Interval	: 1 sec. minimum
Number of discharges	: Minimum 20 times at each test point
Test Voltage	: 230V/50Hz to the connected PC
Tester	: Mathew
Ambient Temperature	: 23°C
Relative Humidity	: 49%
Atmospheric Pressure	: 1014mbar

4.2 Description of Performance Criteria

- Criteria A** : normal performance within levels specified by the manufacturer, requestor or purchaser;
- Criteria B** : temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the EUT recovers its normal performance, without operator intervention;
- Criteria C** : temporary loss of function or degradation of performance, the correction of which requires operator intervention;
- Criteria D** : loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

4.3 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Electrostatic Generator	EM TEST	DITO/ V0537100716	July 5, 2012	July 5, 2013
TR8 shielded room	ETS. LINDGREN	TR8/ 15353-C	NCR	NCR

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

4.4 Test Procedures

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters above the ground reference plane in the shielded room. Also a HCP (Horizontal Coupling Plane) which was connected to the ground reference plane via a cable with a 470k Ω resistor located at each end was placed on the wooden table and isolated with the EUT by an insulating support 0.5mm thick. The ground reference plane shall project beyond the EUT or HCP by at least 0.5m on all sides.
- c. If the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 0.1 meters above the ground reference plane in the shielded room. The ground reference plane shall project beyond the EUT by at least 0.5m on all sides.
- d. Keep the EUT 1m away from all other metallic walls in the shielded room as the minimum distance.
- e. The static electricity discharges shall be applied only to those points and surfaces of the EUT which are accessible to persons during normal use. Contact discharge is the preferred test method and it is applied to the conductive surfaces of EUT and coupling planes. Air discharge shall be used where contact discharge cannot be performed and it is applied to the insulating surfaces of EUT.
- f. The discharge return cable of the generator shall be kept at a distance of at least 0.2m from the EUT whilst the discharge is being applied.
- g. The time interval between successive single discharges was at least 1 second.
- h. Select appropriate points of the EUT for contact discharge and put marks on it to indicate the tested point(s). Then start the contact discharge with the tip of the discharge electrode to touch the EUT before the discharge switch is operated.
- i. Use the round discharge tip of the discharge electrode to scan the EUT to select the points for air discharge. Then start the air discharge by approaching the discharge electrode as fast as possible to touch the EUT. After each discharge, the ESD generator shall be removed from the EUT.
- j. The indirect HCP discharge test is applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

- k. The indirect VCP (Vertical Coupling Plane) discharge test is applied to the center of one vertical edge of the coupling plane. The VCP, of dimensions 0.5m×0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. It shall be applied with sufficient different positions such that the four faces of the EUT are completely illuminated.

Special Test Requirements for Information Technology Equipment (ITE)

The discharges shall be applied in two ways as below:

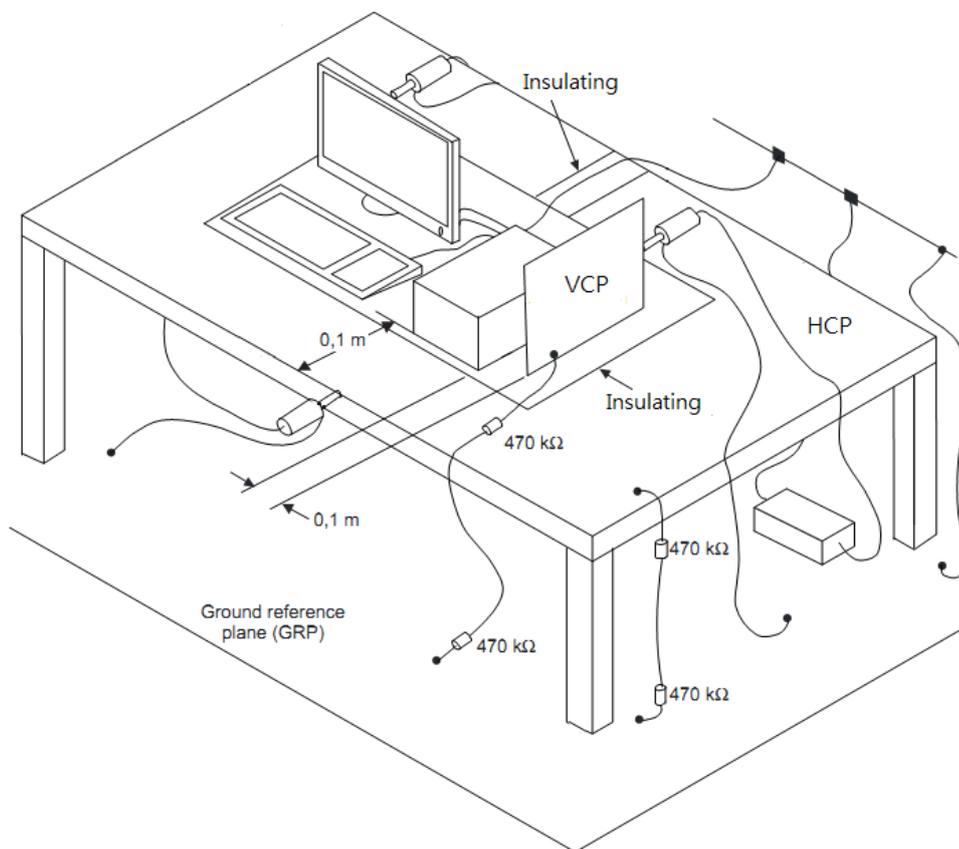
- a. Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, at least 200 indirect discharges shall be applied in the indirect mode (for use of the VCP).

- b. Air discharges at slots and apertures and insulating surfaces:

A minimum of 10 single air discharges shall be applied to the each selected test point.

4.5 Test Configurations



4.6 Photographs of the Test Configurations

Please refer to the Attachment 1 of the present report.

4.7 Test Results

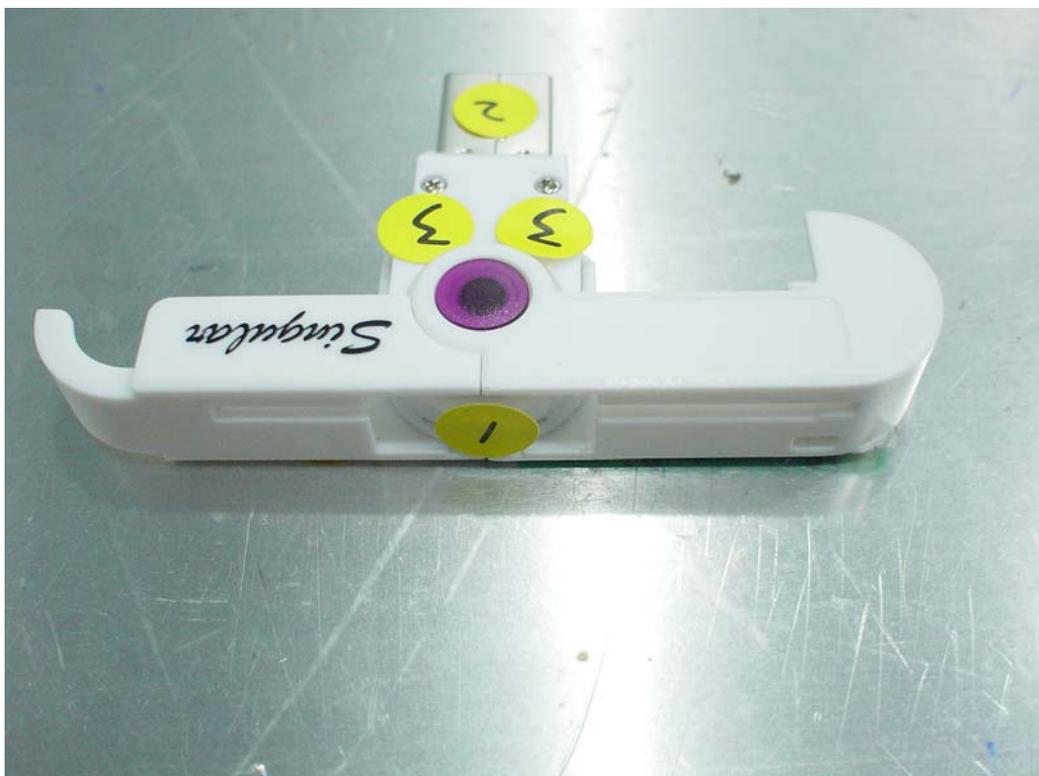
Test Mode : Normal

Discharge Voltage (kV)	Type of discharge	Label for Dischargeable Points	Performance		Result (Pass/Fail)
			Required	Observation	
±4	Contact	2	B	B(2)	Pass
±4	Contact	3	B	A(1)	Pass
±2	Air	No dischargeable point	B	A(1)	Pass
±4	Air	No dischargeable point	B	A(1)	Pass
±8	Air	1	B	A(1)	Pass
±4	HCP-Bottom	Edge of the HCP	B	A(1)	Pass
±4	VCP-Front	Center of the VCP	B	A(1)	Pass
±4	VCP-Left	Center of the VCP	B	A(1)	Pass
±4	VCP-Back	Center of the VCP	B	A(1)	Pass
±4	VCP-Right	Center of the VCP	B	A(1)	Pass

Observation of Performance during Test

- (1) Normal operation condition specified by manufacturer during the test.
- (2) The function of EUT would pause while test is performing, it could self-recover after finishing the test

Photographs of the Dischargeable Points on the EUT for ESD Test



5. Radiated Electromagnetic Field (RS) Immunity Test

Test Result : PASS

5.1 Specifications of Immunity Test Requirement

Product (Generic) Standard	: EN 55024:2010
Basic Standard	: EN 61000-4-3:2006+A1:2008+A2:2010
Required Performance	: A
Test Level	: 2
Field Strength	: 3 V/m
Test Frequency Range	: 80MHz ~ 1GHz
Frequency Step	: 1% of the momentary frequency
Dwell Time	: Minimum 3 sec. per frequency
Modulation	: 1kHz Sine Wave with 80% Amplitude Modulation
Polarization of Antenna	: Horizontal and Vertical
Test Voltage	: 230V/50Hz to the connected PC
Tester	: Mathew
Ambient Temperature	: 25°C
Relative Humidity	: 63%
Atmospheric Pressure	: 1014mbar

5.2 Description of Performance Criteria

- Criteria A** : normal performance within levels specified by the manufacturer, requestor or purchaser;
- Criteria B** : temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the EUT recovers its normal performance, without operator intervention;
- Criteria C** : temporary loss of function or degradation of performance, the correction of which requires operator intervention;
- Criteria D** : loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

5.3 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Signal Generator	R&S	SML03/ 101676	July 12, 2012	July 12, 2013
Switch Box	AR	SC1000M3/ 309064	NCR	NCR
Dual Directional Coupler	AR	DC6180/ 28730	Dec. 26, 2011	Dec. 26, 2012
	AR	DC 7144A/ 308731	May 3, 2012	May 3, 2013
Power Amplifier	AR	150W1000/ 29167	NCR	NCR
	AR	30S1G3/ 308785	NCR	NCR
Bi-Log Antenna	EMCO	3142B/ 1716	NCR	NCR
	R&S	HL046/ 359132/004	NCR	NCR
	TRC	TRC Horn/ 001	NCR	NCR
Field Monitor	AR	FM7004/ 0336364	NCR	NCR
Electric Field Probe	AR	FL7006/ 0336500	April 13, 2012	April 13, 2013
Probe Positioner	HD	FSM916/ 916/319	NCR	NCR
Controller	HD	HD100/ 100/671	NCR	NCR
Dual Channel Power Meter	R&S	NRVD/ 100499	Dec. 26, 2011	Dec. 26, 2012
Test Software	AR	SW1007/ Ver. 2.0.1	NCR	NCR
TR2 fully-anechoic chamber	ETS. LINDGREN	TR2/ 15353-R	Sept. 16, 2012	Sept. 16, 2013

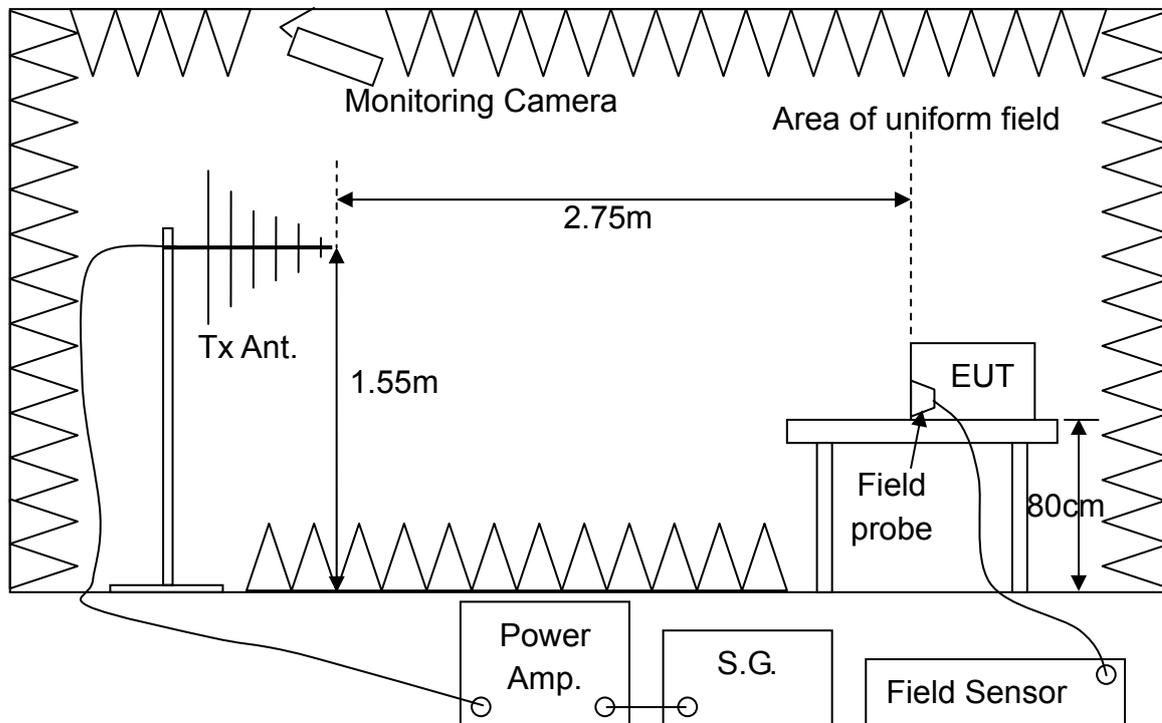
Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the fully-anechoic chamber listed above is the date of Field Uniformity Calibration measurement.

5.4 Test Procedures

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters and 2.75 meters away from the transmitting antenna in the fully anechoic chamber.
- c. If the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 0.1 meters and 2.75 meters away from the transmitting antenna in the fully anechoic chamber. Also if the floor-standing equipment which is capable of being stood on a non-conducting 0.8m high platform may be so arranged.
- d. All EUT's individual faces shall be fully enclosed by the "uniform area" and its wires shall be arranged parallel to the uniform area of the field.
- e. Before testing the EUT, the intensity of the established field strength is checked by placing the field sensor at a calibration grid point to give the calibrated field strength to measure the EUT.
- f. After the calibration has been verified, the test field can be generated using the values obtained from the calibration.
- g. Perform the test with the specified immunity level in the test frequency range and with the specified modulation type.
- h. The transmitting antenna is normally facing each of the four sides of the EUT with two polarizations (Vertical and Horizontal) to perform the test.
- i. The dwell time at each frequency shall be not less than the time necessary for the EUT to be exercised and be able to respond.
- j. The sensitive frequencies of EUT shall be analyzed separately, if any.
- k. Record the performance of the EUT.

5.5 Test Configurations



5.6 Photographs of the Test Configurations

Please refer to the Attachment 1 of the present report.

5.7 Test Results

Test Mode : Normal

Side of the EUT	Polarization	Performance		Result (Pass/Fail)
		Required	Observation	
Front	H	A	A(1)	Pass
	V	A	A(1)	Pass
Left	H	A	A(1)	Pass
	V	A	A(1)	Pass
Back	H	A	A(1)	Pass
	V	A	A(1)	Pass
Right	H	A	A(1)	Pass
	V	A	A(1)	Pass

Observation of Performance during Test

(1) Normal operation condition specified by manufacturer during the test.

6. Electrical fast transient / burst (EFT) Immunity Test

Test Result : PASS

6.1 Specifications of Immunity Test Requirement

Product (Generic) Standard	: EN 55024:2010
Basic Standard	: EN 61000-4-4:2004+A1:2010
Required Performance	: B
Test Level	: 2
Voltage Peak	: <input checked="" type="checkbox"/> ±1kV (on power supply port) <input type="checkbox"/> ±0.5kV (on I/O signal, data and control port)
Impulse Frequency	: 5kHz
Wave Shape of the Pulse (T_r/T_h)	: 5ns / 50ns
Burst Duration	: 15ms
Burst Period	: 300ms
Time Duration	: 1 min
Test Voltage	: 230V/50Hz to the connected PC
Tester	: Mathew
Ambient Temperature	: 26°C
Relative Humidity	: 50%
Atmospheric Pressure	: 1012mbar

6.2 Description of Performance Criteria

- Criteria A** : normal performance within levels specified by the manufacturer, requestor or purchaser;
- Criteria B** : temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the EUT recovers its normal performance, without operator intervention;
- Criteria C** : temporary loss of function or degradation of performance, the correction of which requires operator intervention;
- Criteria D** : loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

6.3 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
EFT/Burst Simulator	EMC PARTNER	TRA2000IN6/ 870	March 16, 2012	March 16, 2013
Coupling Clamp	EMC PARTNER	CN-EFT1000/ 532	NCR	NCR
Test Software	EMC PARTNER	TEMA/ Ver. 1.86	NCR	NCR
TR7 shielded room	ETS. LINDGREN	TR7/ 15353-D	NCR	NCR

Note:

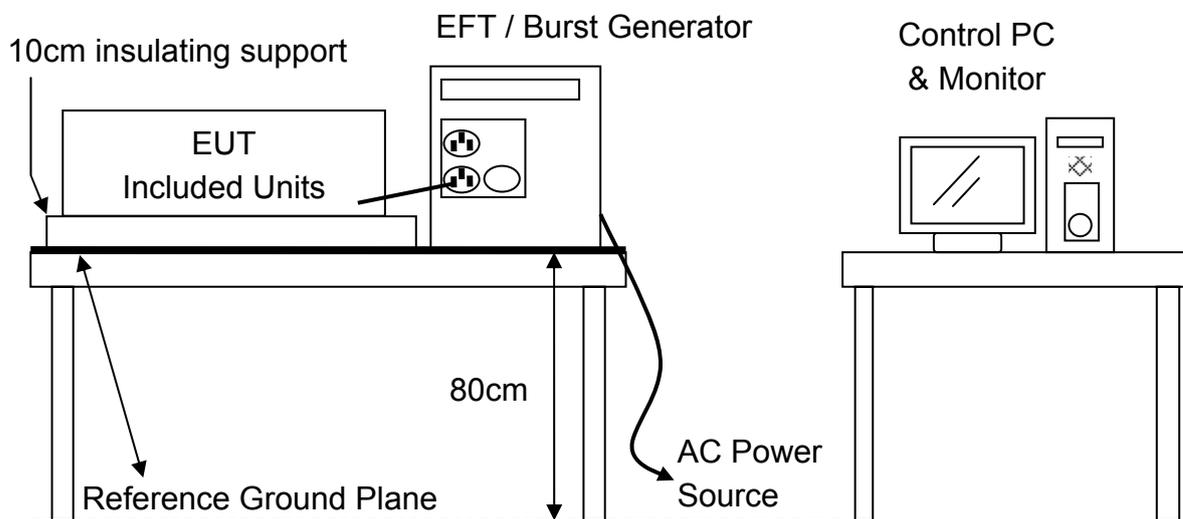
1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

6.4 Test Procedures

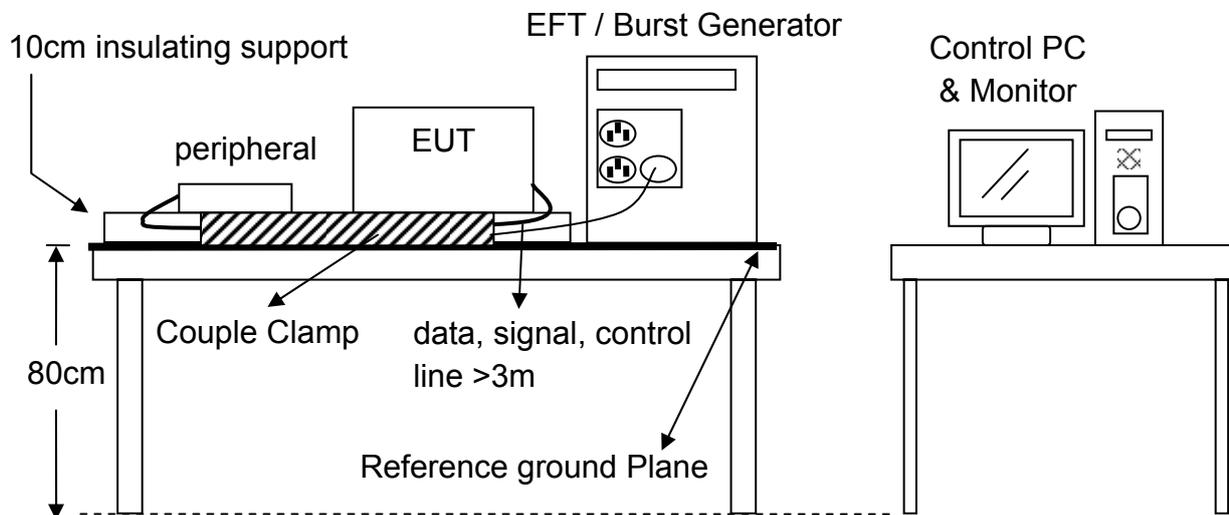
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a non-conducted support with a height 0.1 meters above the ground reference plane. Also the ground reference plane is placed on a wooden table with a height of 0.8 meters in the shielded room. The ground reference plane shall project beyond the EUT by at least 0.1m on all sides.
- c. If the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 0.1 meters above the ground reference plane in the shielded room. The ground reference plane shall project beyond the EUT by at least 0.1m on all sides.
- d. The test generator and the coupling/decoupling network shall be placed directly on, and bonded to, the ground reference plane.
- e. All cables to the EUT shall be placed on the insulation support 0.1 m above the ground reference plane. Cables not subject to electrical fast transients shall be routed as far as possible from the cable under test to minimize the coupling between the cables.
- f. Keep the EUT 0.5m away from all other conductive structures, except the ground reference plane beneath the EUT as the minimum distance. Also if any, the minimum distance between the coupling clamp and all other conductive structures, except the ground reference plane beneath the coupling clamp and EUT shall be 0.5m.
- g. Keep the length of the power and signal lines, if required, between the coupling device and the EUT to be 0.5m. If a non-detachable supply cable more than 0.5m long, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0,1 m above the ground reference plane.
- h. Connect the EUT's power source to the appropriate power through the coupling devices and perform the specified test level.
- i. If any, connect all the I/O signal, data and control lines between EUT and accessories/support units through the coupling devices and perform the specified test level.
- j. Record the performance of the EUT.

6.5 Test Configurations

Power supply port Test



I/O signal, data and control port Test (if any)



6.6 Photographs of the Test Configurations

Please refer to the Attachment 1 of the present report.

6.7 Test Results

Test Mode : Normal

Injected Line	Voltage Peak (kV)	Injected Method	Performance		Result (Pass/Fail)
			Required	Observation	
L1 - L2 - PE	+1.0	Direct	B	A(1)	Pass
L1 - L2 - PE	-1.0	Direct	B	A(1)	Pass

Observation of Performance during Test

(1) Normal operation specified by manufacturer during the test.

Attachment 1

Photographs of the Test Configurations

Contents

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2. Radiated Emission Measurement	2
3. Electrostatic Discharge (ESD) Immunity Test	3
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1. Conducted Emission Measurement



2. Radiated Emission Measurement



3. Electrostatic Discharge (ESD) Immunity Test



4. Radiated Electromagnetic Field (RS) Immunity Test



5. Electrical fast transient / burst (EFT) Immunity Test



Attachment 2

Photographs of EUT

