


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



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(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



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Verification of Compliance

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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.
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
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

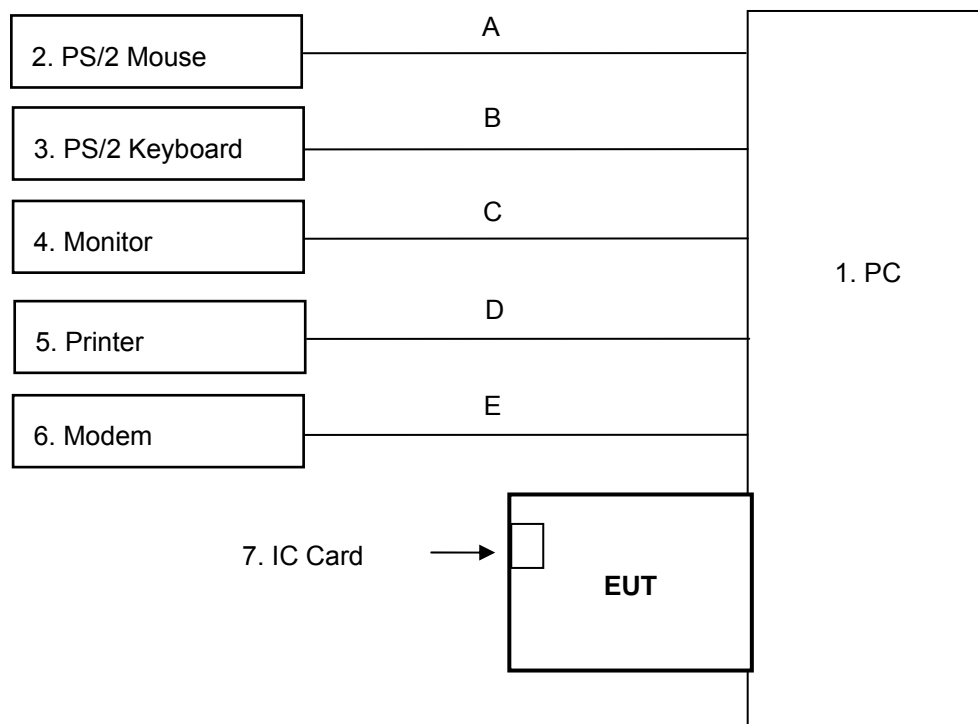
Conducted Emission and Radiated Emission Tests

| 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

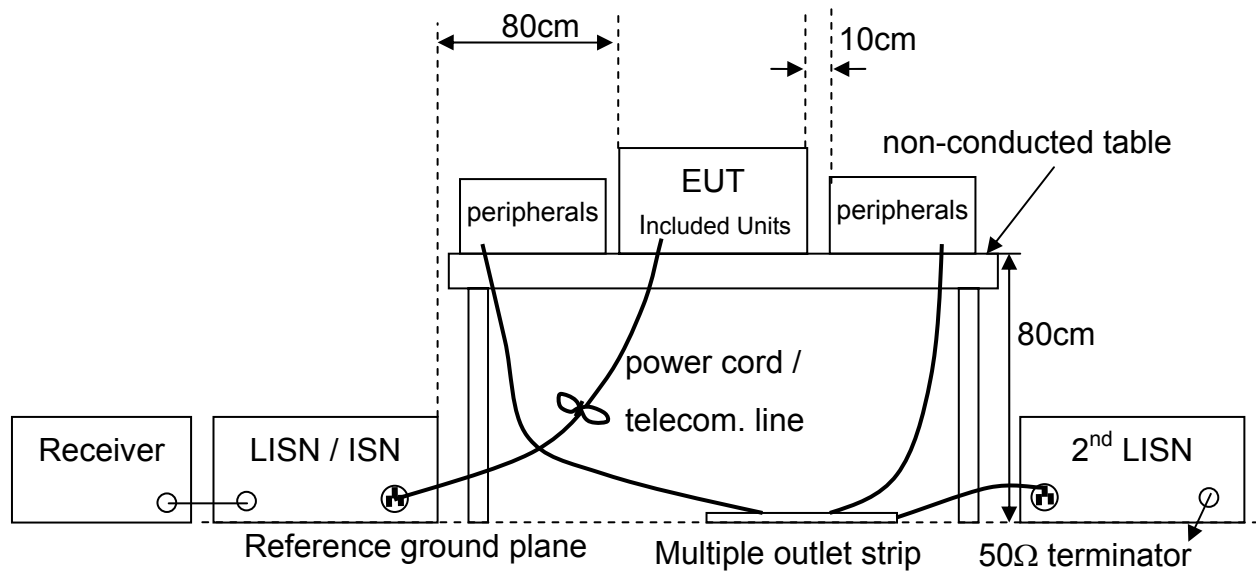
The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{cispr} in table 1 of CISPR 16-4-2.

| 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

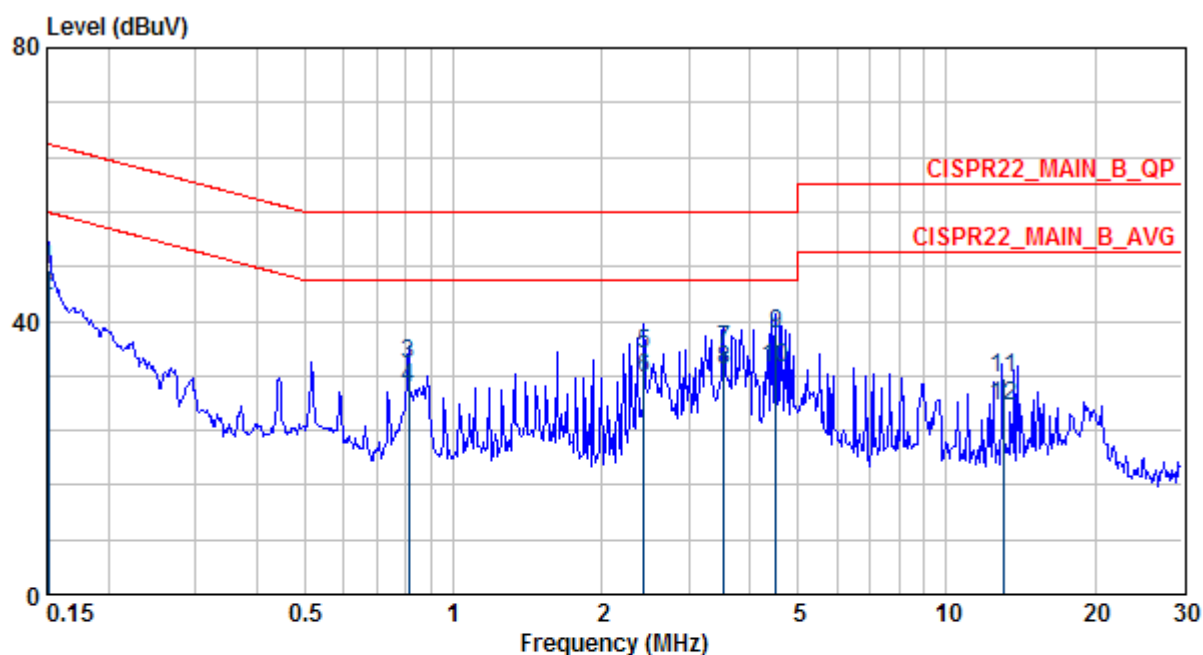


2.5 Photographs of the Test Configurations

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

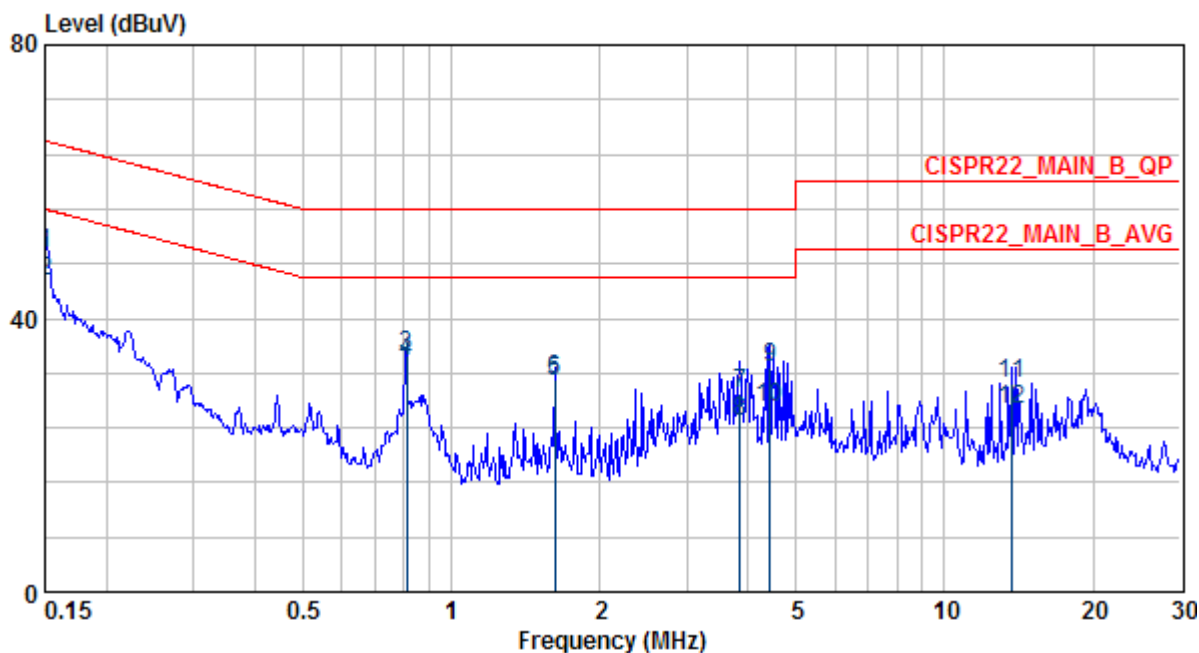


| | Freq | Level | Factor | Read Level | Limit Line | Over Limit | Pol/Phase | Remark |
|----|--------|-------|--------|------------|------------|------------|-----------|---------|
| | MHz | dBuV | dB | dBuV | dBuV | dB | | |
| 1 | 0.151 | 47.51 | 0.26 | 47.25 | 65.96 | -18.45 | LINE | QP |
| 2 | 0.151 | 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 | Limit | Over | | |
|----|--------|-------|--------|-------|-------|--------|-----------|---------|
| | MHz | dBuV | dB | dBuV | dBuV | dB | Pol/Phase | Remark |
| 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

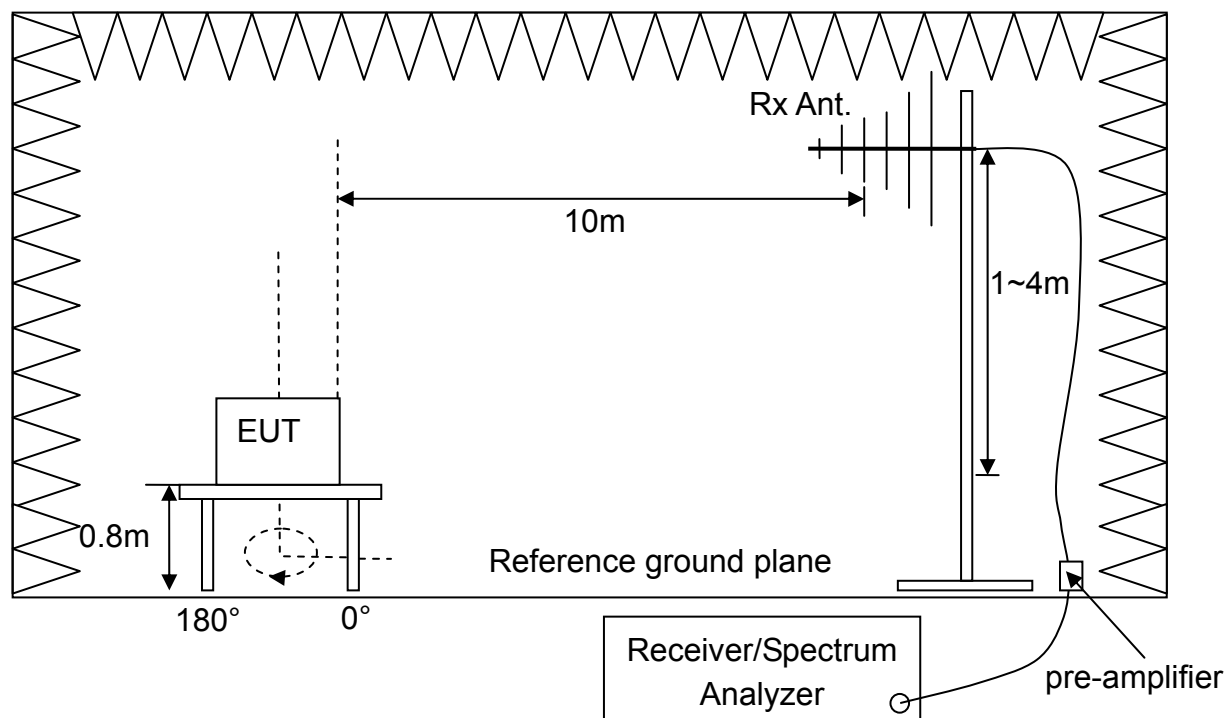
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters above the reference ground plane and 10 meters away from 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

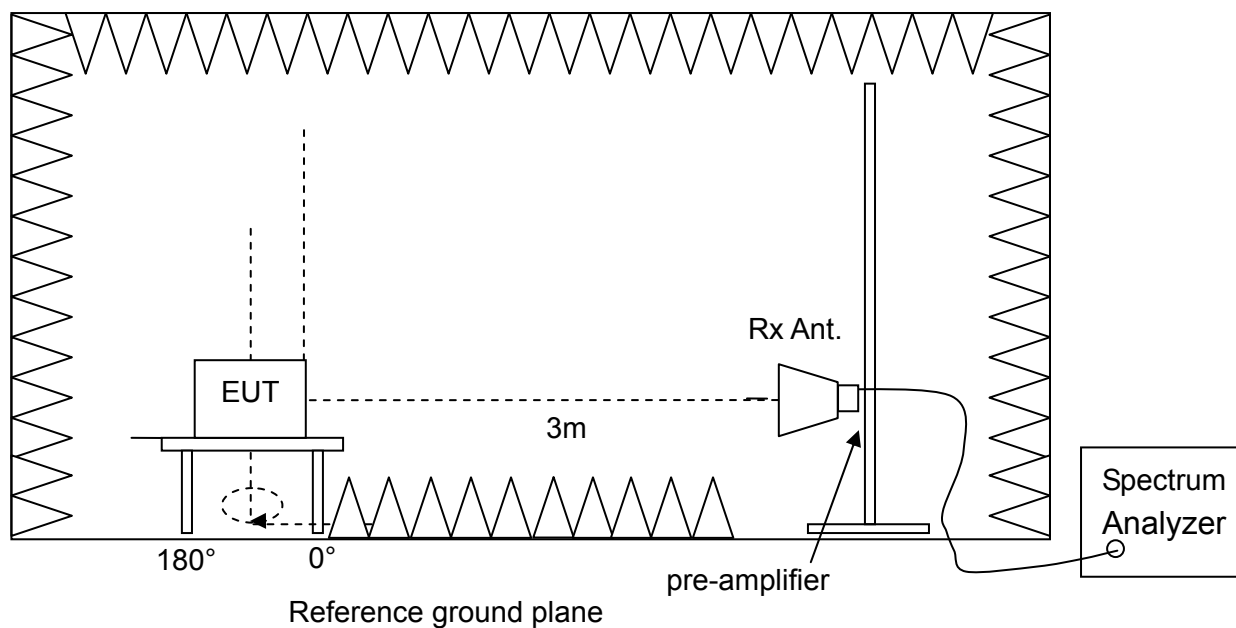
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it should be placed on a non-conducted table with a height of 0.8 meters above the reference ground plane and 3 meters 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



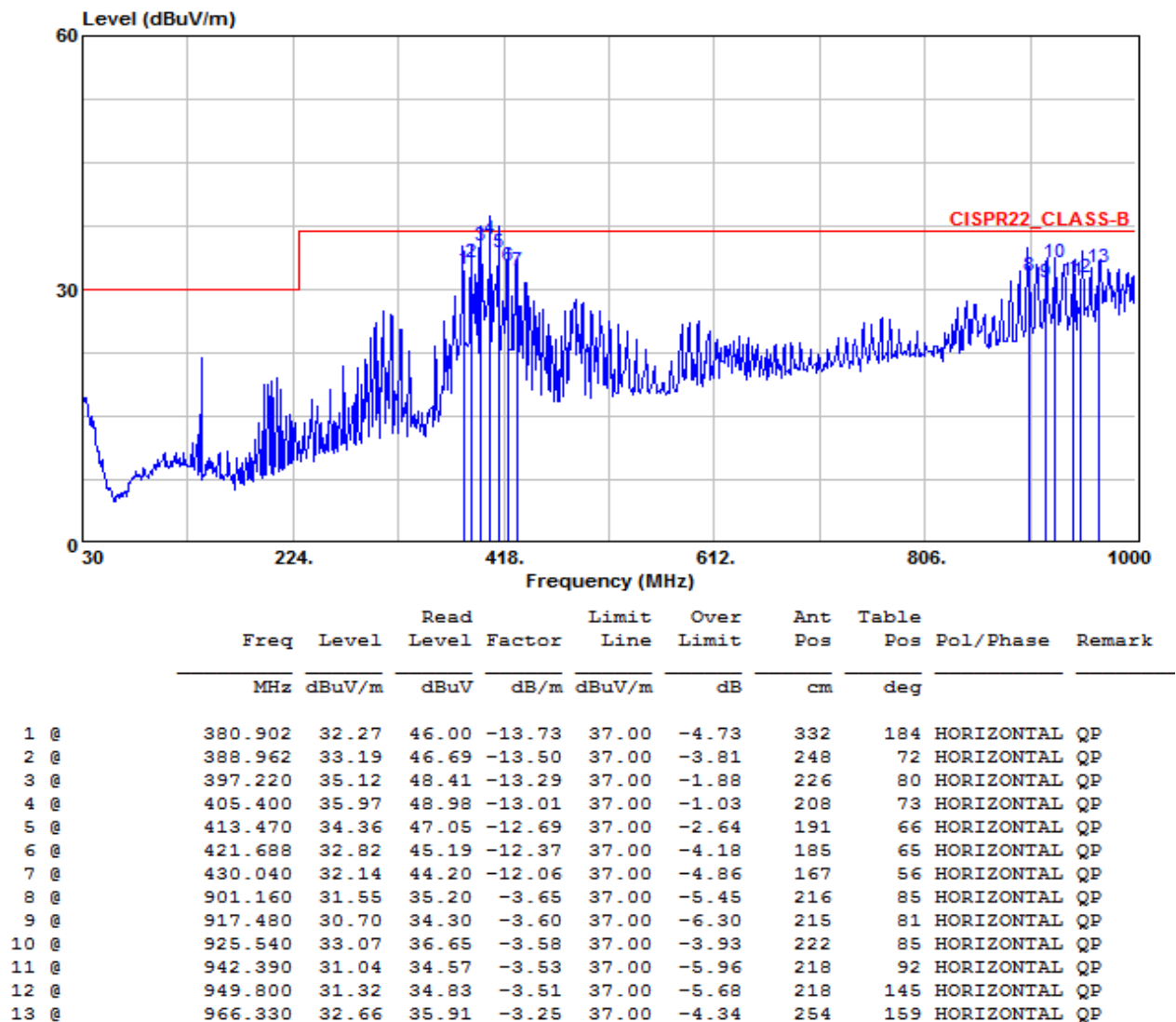
3.5 Photographs of the Test Configurations

Please refer to the Attachment 1 of the present report.

3.6 Test Results

Radiated Emission Measurement below 1000MHz

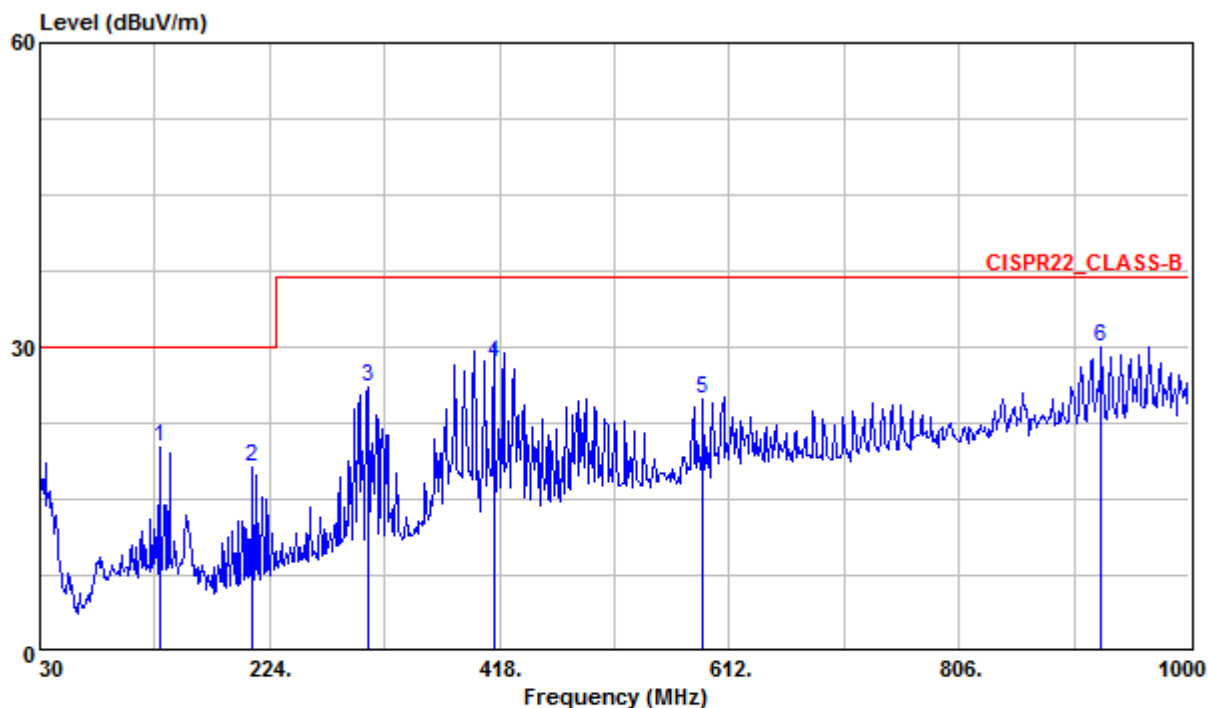
Test Mode : Normal
 Test Voltage : 230V/50Hz to the connected PC
 Tester : Carl Temperature : 26°C
 Humidity : 70%RH Frequency Range : 30MHz~1GHz
 IF Bandwidth : 120kHz Polarization : Horizontal



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

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:

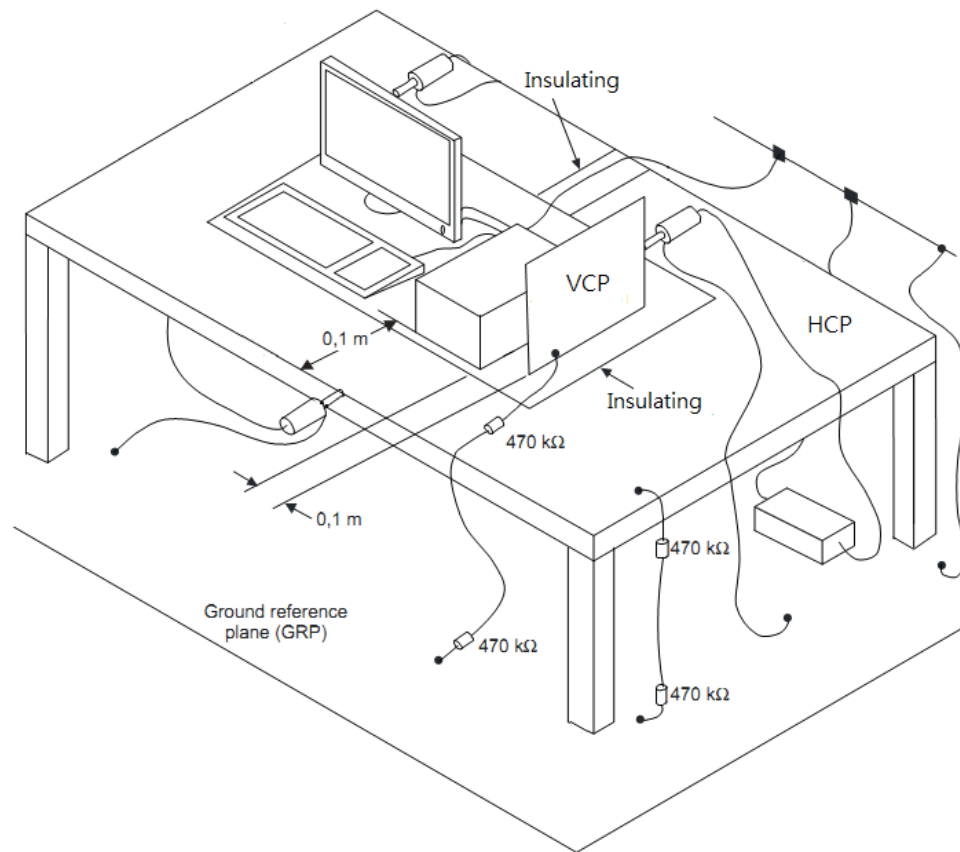
- a. Contact discharges to the conductive surfaces and coupling planes:

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 |

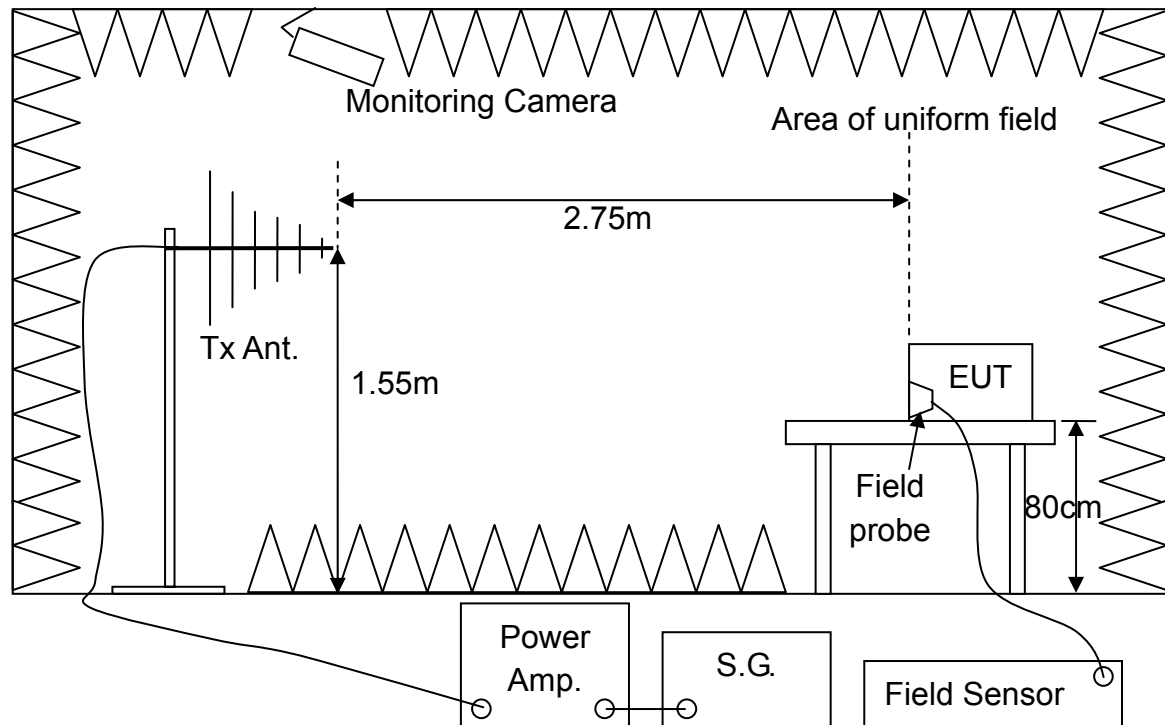
Note:

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:

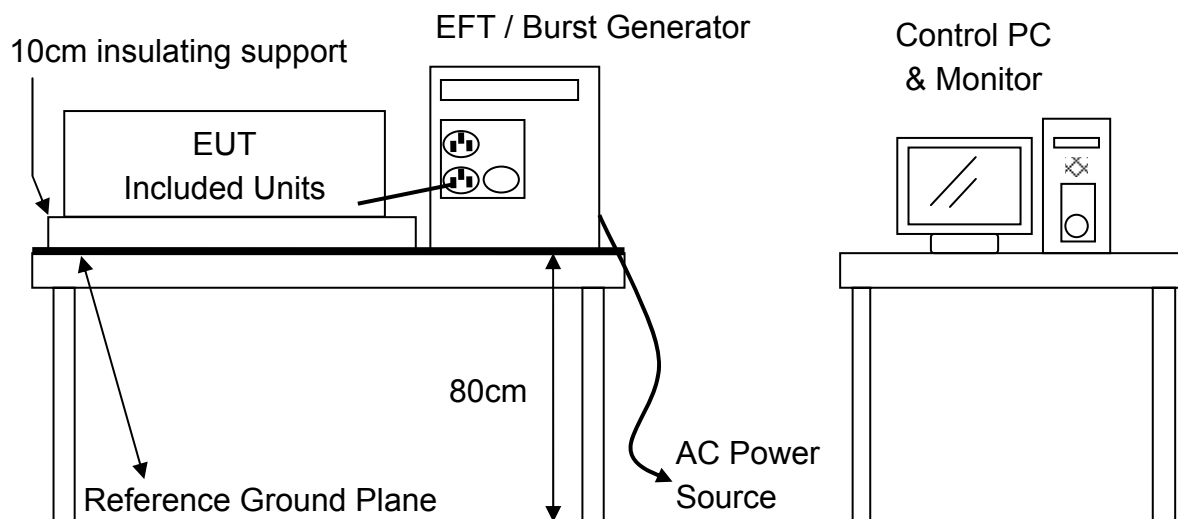
1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

6.4 Test Procedures

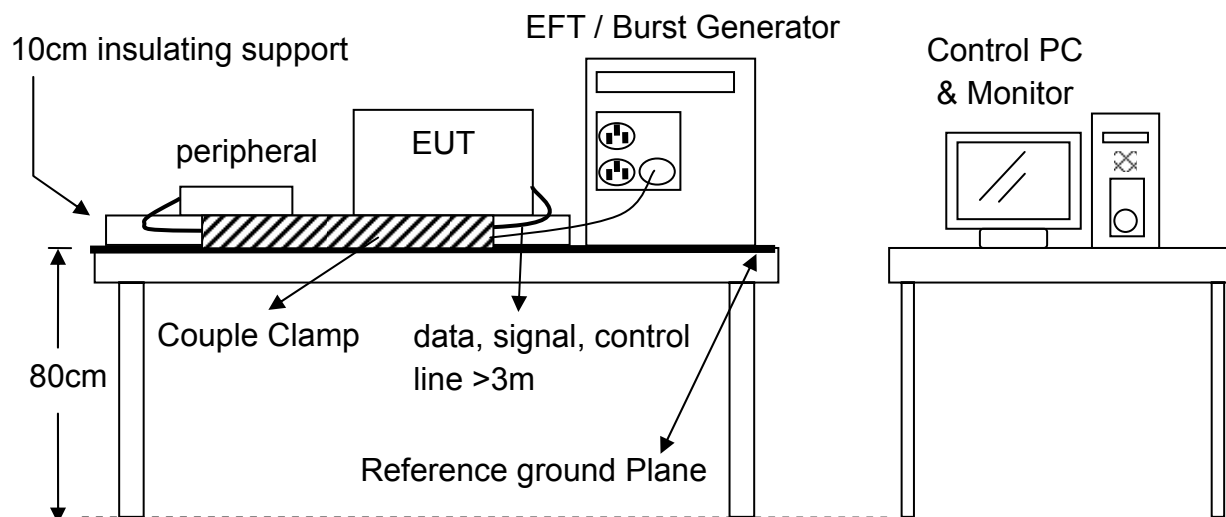
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a non-conducted support with a height 0.1 meters above the ground reference plane. Also the ground 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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| 1. Conducted Emission Measurement..... | 1 |
| 2. Radiated Emission Measurement | 2 |
| 3. Electrostatic Discharge (ESD) Immunity Test | 3 |
| 4. Radiated Electromagnetic Field (RS) Immunity Test..... | 3 |
| 5. Electrical fast transient / burst (EFT) Immunity Test..... | 4 |

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

