# CE EMC Test Report

**Report No.:** CE161109D19

**Test Model:** ECS-9000-PoER

**Series Model:** ECS-9XXXXXXXXXX
( “X” can be 0-9, A-Z or blank for marketing purpose)

**Received Date:** Nov. 14, 2016

**Test Date:** Nov. 24 ~ Dec. 14, 2016

**Issued Date:** Dec. 19, 2016

**Applicant:** Vecow Co., Ltd.

**Address:** 12F., No. 111, Zhongcheng Rd., Tucheng Dist., New Taipei City 23674 Taiwan (R.O.C.)

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

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**Release Control Record**

| Issue No. | Description | Date Issued |
|---|---|---|
| CE161109D19 | Original release. | Dec. 19, 2016 |

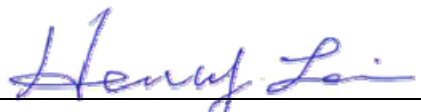
## 1 Certificate of Conformity

| | |
|---|---|
| **Product:** | Fanless Embedded System |
| **Brand:** | Vecow |
| **Test Model:** | ECS-9000-PoER |
| **Series Model:** | ECS-9XXXXXXXXXX (“X” can be 0-9, A-Z or blank for marketing purpose) |
| **Sample Status:** | Engineering sample |
| **Applicant:** | Vecow Co., Ltd. |
| **Test Date:** | Nov. 24 ~ Dec. 14, 2016 |
| **Standards:** | **EN 55032:2012 +AC:2013, Class A** |
| | **EN 61000-3-2:2014, Class A** |
| | **EN 61000-3-3:2013** |
| | **EN 55024:2010** |
| | EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0 |
| | EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2 |
| | EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0 |
| | EN 61000-4-5:2014 / IEC 61000-4-5:2014 ED. 3.0 |
| | EN 61000-4-6:2014 / IEC 61000-4-6:2013 ED. 4.0 |
| | EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0 |
| | EN 61000-4-11:2004 / IEC 61000-4-11:2004 ED. 2.0 |

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample’s EMC characteristics under the conditions specified in this report.

**Prepared by :**  , **Date:** Dec. 19, 2016

Celia Chen / Supervisor

**Approved by :**  , **Date:** Dec. 19, 2016

Henry Lai / Director

## 2 Summary of Test Results

| Emission | | | | |
|---|---|---|---|---|
| Standard | Clause | Test Item | Result/Remarks | Verdict |
| EN 55032:2012 +AC:2013 | A.3 | Conducted emission from the AC mains power port | Minimum passing Class A margin is -15.04 dB at 0.15382 MHz | Pass |
| EN 55032:2012 +AC:2013 | A.3 | Asymmetric mode conducted emission at telecommunication ports | Minimum passing Class A margin is -11.74 dB at 1.78772 MHz | Pass |
| EN 55032:2012 +AC:2013 | A.2 | Radiated emission 30-1000 MHz | Minimum passing Class A margin is -2.44 dB at 34.15 MHz | Pass |
| EN 55032:2012 +AC:2013 | A.2 | Radiated emission above 1GHz | Minimum passing Class A margin is -8.10 dB at 1000.00 MHz | Pass |
| EN 61000-3-2:2014 | - | Harmonic current emissions | Class A | Pass |
| EN 61000-3-3:2013 | - | Voltage fluctuations and flicker | $P_{st} \leqq 1.0$ $d_{max} \leqq 4\%$<br>$P_{lt} \leqq 0.65$ $d_c \leqq 3.3\%$<br>$T_{max} \leqq 500ms$ | Pass |

| Immunity | | | | |
|---|---|---|---|---|
| EN 55024 Clause | Basic standard | Test Item | Result/Remarks | Verdict |
| 4.2.1 | EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0 | Electrostatic discharges (ESD) | Performance Criterion B | Pass |
| 4.2.3.2 | EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2 | Continuous radiated disturbances (RS) | Performance Criterion A | Pass |
| 4.2.2 | EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0 | Electrical fast transients (EFT) | Performance Criterion A | Pass |
| 4.2.5 | EN 61000-4-5:2014 / IEC 61000-4-5:2014 ED. 3.0 | Surges | Performance Criterion A | Pass |
| 4.2.3.3 | EN 61000-4-6:2014 / IEC 61000-4-6:2013 ED. 4.0 | Continuous conducted disturbances (CS) | Performance Criterion A | Pass |
| 4.2.4 | EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0 | Power-frequency magnetic fields (PFMF) | Performance Criterion A | Pass |
| 4.2.6 | EN 61000-4-11:2004 / IEC 61000-4-11:2004 ED. 2.0 | Voltage dips and interruptions | Voltage Dips:<br>>95% reduction – 0.5 period, Performance Criterion A<br>30% reduction – 25 periods, Performance Criterion A<br>Voltage Interruptions:<br>>95% reduction – 250 periods, Performance Criterion C | Pass |

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. The above EN/IEC basic standards are applied with latest version if customer has no special requirement.

## 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

| Measurement | Expended Uncertainty (k=2) (±) | Maximum allowable uncertainty (±) |
|---|---|---|
| Conducted emission from AC mains power port using AMN, 150kHz ~ 30MHz | 2.77 dB | 3.4 dB ($U_{cispr}$) |
| Asymmetric mode conducted emission using AAN, 150kHz ~ 30MHz | 3.94 dB | 5.0 dB ($U_{cispr}$) |
| Radiated emission, 30MHz ~ 1GHz | 3.89 dB | 6.3 dB ($U_{cispr}$) |
| Radiated emission, 1GHz ~ 6GHz | 5.12 dB | 5.2 dB ($U_{cispr}$) |

## 2.2 Modification Record

There were no modifications required for compliance.

## 3 General Information

### 3.1 Features of EUT

The tests reported herein were performed according to the method specified by Vecow Co., Ltd., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

### 3.2 General Description of EUT

| | |
|---|---|
| Product | Fanless Embedded System |
| Brand | Vecow |
| Test Model | ECS-9000-PoER |
| Series Model | ECS-9XXXXXXXXXX<br>( “X” can be 0-9, A-Z or blank for marketing purpose) |
| Model Difference | For marketing purpose |
| Sample Status | Engineering sample |
| Operating Software | Windows 10, Windows 8.1, Windows 7, Linux |
| Power Supply Rating | 6V to 36V, DC-in |
| Accessory Device | Adapter |
| Data Cable Supplied | N/A |

Note:

1. The EUT is a Fanless Embedded System with following interfaces:
   - ✧ COM*4 (RS-232/ 422/ 485)
   - ✧ USB 3.0*6 (External)
   - ✧ USB2.0*1 (Internal)
   - ✧ Isolated DIO (16 Isolated DIO : 8 DI, 8 DO)
   - ✧ DVI-D (resolution Up to 1920 x 1200 @ 60Hz)
   - ✧ DVI-I (resolution Up to 1920 x 1200 @ 60Hz)
   - ✧ Display (resolution up to 4096 x 2304 @ 60Hz)
   - ✧ Line out
   - ✧ Mic. in
   - ✧ LAN (10/100/1000Mbps)*2
   - ✧ POE LAN*4
   - ✧ DC input
   - ✧ CFast socket
2. The EUT was configured with the following key components:

| Component | Brand | Model No. or P/N | Spec. |
|---|---|---|---|
| CPU | Intel | Core™ i7-6700 | 3.40 GHz |
| Memory | DSL | D4SS12081SH21A-A | DDR4 2133 4GB |
| SSD | innodisk | P/N: DGS25-64GD81SCAQN | 64GB |
| CFast | innodisk | 3ME3 Series | 32GB |

3. The EUT uses following adapter.

| | |
|---|---|
| Brand | MW |
| Model | GS160A24 |
| Input Power | 100-240Vac, 50/60Hz, 2.0A |
| Output Power | 24V, 6.67A, 160W max. |
| Power Line | Non-shielded DC (1.15m) with one ferrite core |

### 3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

1. The EUT was pre-tested under operating and standby condition and the worst emission level was found under **operating condition**.
2. The EUT is designed with AC power of rating 100-240Vac, 50/60Hz.
   For radiated emission evaluation, 230Vac/50Hz & 110Vac/60Hz (for EN 55032), 230Vac/50Hz (for EN 55011), 120Vac/60Hz (for FCC Part 15) had been covered during the pre-test. The worst data was found at **110Vac/60Hz** and recorded in the applied test report.
3. Test modes are presented in the report as below.

| Mode | Test Condition | Input Power |
|---|---|---|
| Conducted emission test | | |
| 1 | Full system | 230Vac/ 50Hz & 110Vac/ 60Hz |
| Conducted emission at telecom port test | | |
| 1 | Full system (LAN port 1, 1000Mbps) | 230Vac/ 50Hz |
| 2 | Full system (LAN port 2, 1000Mbps) | |
| 3 | Full system (PoE LAN port 3) | |
| The idle mode of conducted emission test at telecom port was pre-tested based on the worst case of link mode. Due to emissions of idle mode being very low compared to link mode, only the link mode data were presented in the test report. | | |
| Radiated emission test | | |
| 1 | Full system | 110Vac/ 60Hz |
| Harmonics, Flicker, Immunity tests | | |
| 1 | Full system | 230Vac/ 50Hz |

### 3.4 Test Program Used and Operation Descriptions

Emission tests (Harmonics & Flicker excluded):

a. Turned on the power of all equipment.
b. EUT ran a test program to enable all functions.
c. EUT read and wrote messages from/to SSD and ext. HDDs.
d. EUT sent and received messages to/from Notebook PCs (kept in a remote area) via two UTP LAN cables.
e. EUT sent “color bar patterns” messages to ext. LCD Monitors. Then they displayed “color bar patterns” on their screens simultaneously.
f. EUT sent 1kHz audio signal to earphone.
g. EUT sent messages to printer and printer printed them out.
h. Cameras captured video image to LCD Monitors via EUT.
i. Steps c-h were repeated.

Harmonics, Flicker, Immunity tests:

a. Turned on the power of all equipment.
b. EUT ran a test program to enable all functions.
c. EUT read and wrote messages from/to SSD and ext. USB flashs.
d. EUT sent and received messages to/from Notebook PCs (kept in a remote area) via two UTP LAN cables.
e. EUT sent and received messages to/from Notebook PCs (kept in a remote area) via two STP LAN cables. **(For RS test only)**
f. EUT sent "H" messages to ext. LCD Monitors. Then they displayed "H" patterns on their screens simultaneously.
g. EUT sent audio signal to speaker.
h. Cameras captured video image to LCD Monitors via EUT.
i. Steps c-h were repeated.

### 3.5 Primary Clock Frequencies of Internal Source

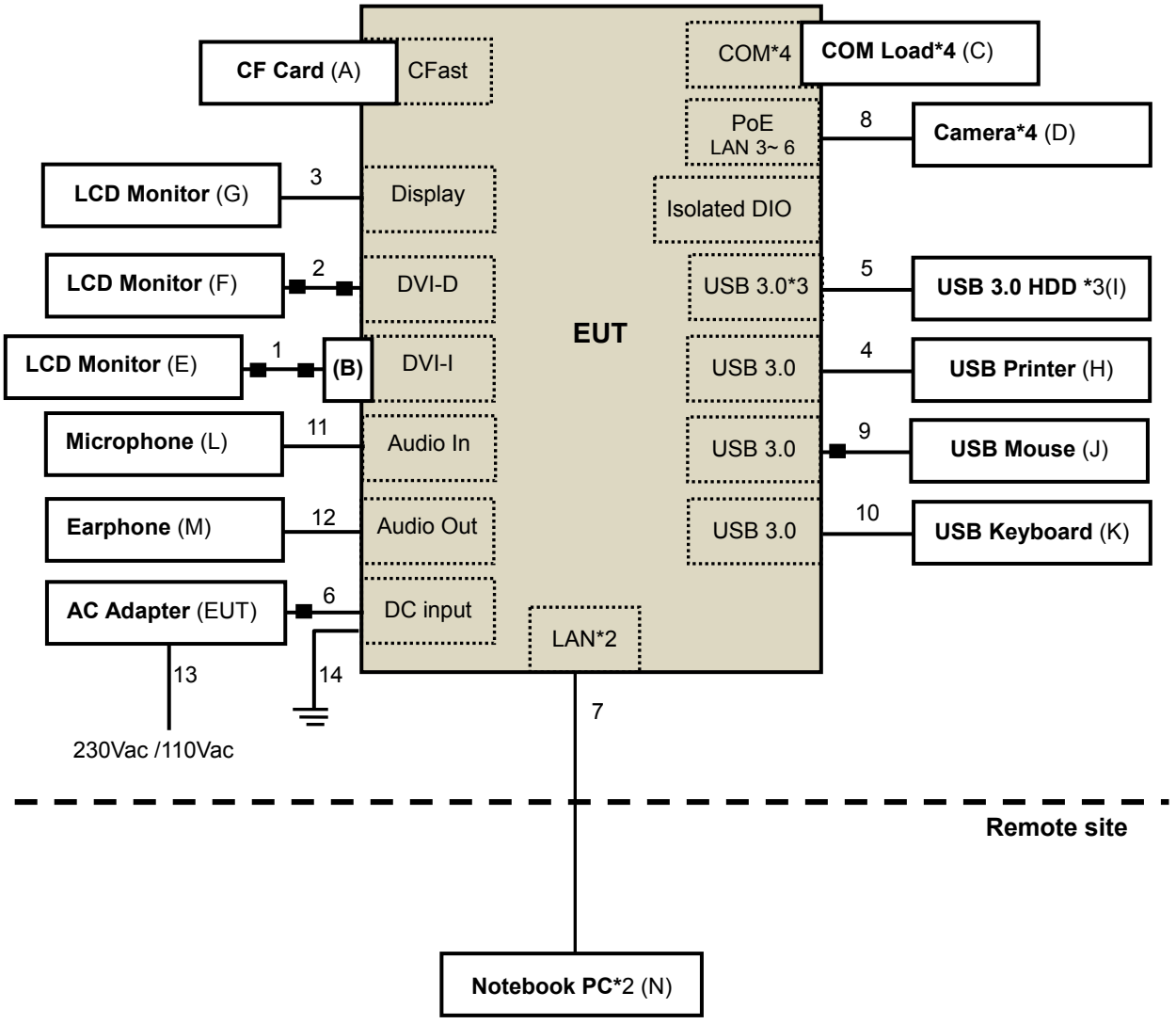
The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 3400 MHz, provided by Vecow Co., Ltd., for detailed internal source, please refer to the manufacturer's specifications.

## 4 Configuration and Connections with EUT

### 4.1 Connection Diagram of EUT and Peripheral Devices

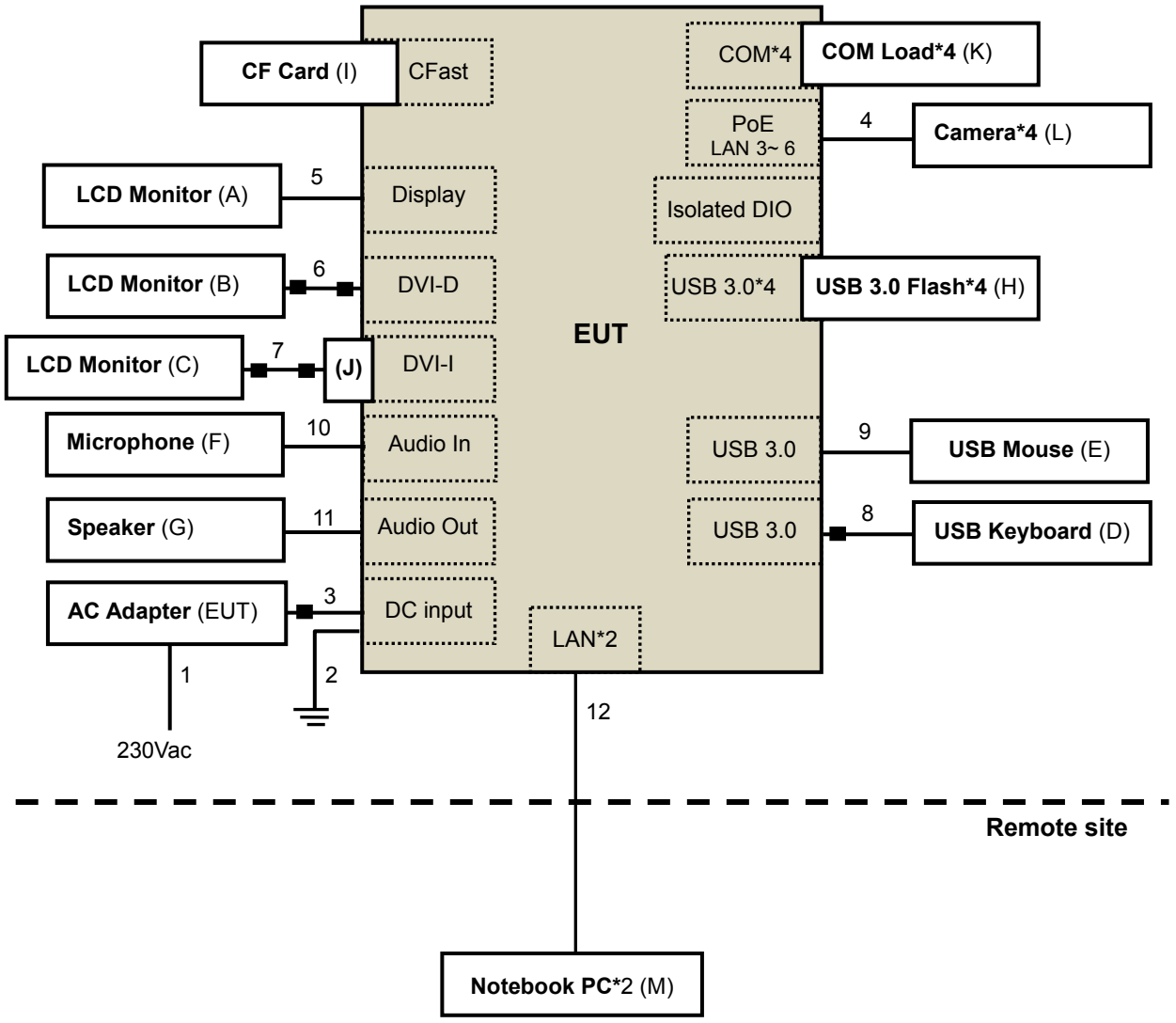
Emission tests (Harmonics & Flicker excluded):

**TEST CONFIGURATION**



Harmonics, Flicker, Immunity tests:

**TEST CONFIGURATION**



## 4.2 Configuration of Peripheral Devices and Cable Connections

Emission tests (Harmonics & Flicker excluded):

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|---|---|---|---|---|---|---|
| A. | CF Card | Innodisk | 3ME3 Series | N/A | N/A | Supplied by client |
| B. | DVI-I to D-Sub connector | N/A | N/A | N/A | N/A | Supplied by client |
| C. | COM Load*4 | N/A | N/A | N/A | N/A | Supplied by client |
| D. | 2M Fixed Mini Indoor Dome Nework Camera*2 | N/A | A200MIF-HNG-03 | N/A | N/A | Supplied by client |
| | 3M Fixed Mini Indoor Dome Nework Camera*2 | N/A | A301MIF-3N | N/A | N/A | Supplied by client |
| E. | 24" LCD MONITOR | DELL | U2410 | CN082WXD728720CC0YAL | FCC DoC Approved | Provided by Lab |
| F. | 24" LCD MONITOR | DELL | U2410 | CN082WXD728720CC0LDL | FCC DoC Approved | Provided by Lab |
| G. | LCD Monitor | HP | HP Z24s | 6CM5172L56 | FCC DoC Approved | Provided by Lab |
| H. | PRINTER | LEXMARK | Z33 | N/A | FCC DoC Approved | Provided by Lab |
| I. | USB 3.0 Hard Disk*3 | WD | WDBUZG0010BBK-PESN | WXN1E94A9S8X | FCC DoC Approved | Provided by Lab |
| | | WD | WDBUZG0010BBK-PESN | WXN1E94681PK | FCC DoC Approved | Provided by Lab |
| | | WD | WDBUZG0010BBK-PESN | WX21E9423VL3 | FCC DoC Approved | Provided by Lab |
| J. | USB Mouse | Microsoft | 1113 | 9170515772204 | FCC DoC Approved | Provided by Lab |
| K. | USB KEYBOARD | BTC | 5200U | G09302046625 | E5XKB5122U | Provided by Lab |
| L. | MICROPHONE | Labtec | mic-333 | N/A | N/A | Provided by Lab |
| M. | EARPHONE | PHILIPS | SBC HL145 | N/A | N/A | Provided by Lab |
| N. | Notebook PC*2 | ASUS | PU401L | E9NXBC002007372 | FCC DoC Approved | Provided by Lab |
| | | ASUS | PU401L | ECNXBC012528528 | FCC DoC Approved | Provided by Lab |

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item N acted as communication partners to transfer data.

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | D-Sub cable | 1 | 1.8 | Y | 2 | Provided by Lab |
| 2. | DVI cable | 1 | 1.8 | Y | 2 | Provided by Lab |
| 3. | Display cable | 1 | 1.5 | Y | 0 | Provided by Lab |
| 4. | USB cable | 1 | 1.8 | Y | 0 | Provided by Lab |
| 5. | USB cable | 3 | 0.6 | Y | 0 | Provided by Lab |
| 6. | DC cable | 1 | 1.15 | N | 1 | Supplied by client |
| 7. | LAN cable | 2 | 10 | N | 0 | Provided by Lab |
| 8. | LAN cable | 4 | 2.0 | Y | 0 | Supplied by client |
| 9. | USB cable | 1 | 1.8 | Y | 1 | Provided by Lab |
| 10. | USB cable | 1 | 1.5 | Y | 0 | Provided by Lab |
| 11. | Audio cable | 1 | 2.3 | N | 0 | Provided by Lab |
| 12. | Audio cable | 1 | 1.2 | N | 0 | Provided by Lab |
| 13. | AC power cord | 1 | 1.8 | N | 0 | Provided by Lab |
| 14. | Ground cable | 1 | 1.8 | N | 0 | Provided by Lab |

Note: The core(s) is(are) originally attached to the cable(s).

Harmonics, Flicker, Immunity tests:

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|---|---|---|---|---|---|---|
| A. | 24" LCD MONITOR | DELL | U2413f | CN-06VNX5-72872-46D-A89L | FCC DoC Approved | Provided by Lab |
| B. | 24" LCD MONITOR | DELL | U2410 | CN082WXD728720CC0KDL | FCC DoC Approved | Provided by Lab |
| C. | 28" LCD MONITOR | AOC | U2868PQU | HCXE8JA000354 | FCC DoC Approved | Provided by Lab |
| D. | USB KEYBOARD | DELL | SK-8115 | CN-0J4635-71616-63I-076X | FCC DoC Approved | Provided by Lab |
| E. | USB Mouse | HP | M-UAE96 | N/A | FCC DoC Approved | Provided by Lab |
| F. | Microphone | Yinue | YW-001 | N/A | N/A | Provided by Lab |
| G. | Speaker | N/A | N/A | N/A | N/A | Provided by Lab |
| H. | USB 3.0 Flash*4 | PNY | GG16GS | N/A | N/A | Provided by Lab |
| I. | CF Card | Innodisk | 3ME3 Series | N/A | N/A | Supplied by client |
| J. | DVI-I to D-Sub connector | N/A | N/A | N/A | N/A | Supplied by client |
| K. | COM Load*4 | N/A | N/A | N/A | N/A | Supplied by client |
| L. | 2M Fixed Mini Indoor Dome Nework Camera*2 | N/A | A200MIF-HNG-03 | N/A | N/A | Supplied by client |
| | 3M Fixed Mini Indoor Dome Nework Camera*2 | N/A | A301MIF-3N | N/A | N/A | Supplied by client |
| M. | Notebook PC | LENOVO | TP00057A | R9-0JMLFS16/01 | FCC DoC Approved | Provided by Lab |
| | Notebook PC | DELL | Latitude E6520 | GTW55Q1 | FCC DoC Approved | Provided by Lab |

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item M acted as communication partners to transfer data.

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | AC power cord | 1 | 1.8 | N | 0 | Provided by Lab |
| 2. | Ground cable | 1 | 1.8 | N | 0 | Provided by Lab |
| 3. | DC cable | 1 | 1.15 | N | 1 | Supplied by client |
| 4. | LAN cable | 4 | 2.0 | Y | 0 | Supplied by client |
| 5. | Display cable | 1 | 1.0 | Y | 0 | Provided by Lab |
| 6. | DVI cable | 1 | 1.8 | Y | 2 | Provided by Lab |
| 7. | D-Sub cable | 1 | 1.8 | Y | 2 | Provided by Lab |
| 8. | USB cable | 1 | 1.7 | Y | 1 | Provided by Lab |
| 9. | USB cable | 1 | 1.8 | Y | 0 | Provided by Lab |
| 10. | Audio cable | 1 | 1.0 | N | 0 | Provided by Lab |
| 11. | Audio cable | 1 | 1.1 | N | 0 | Provided by Lab |
| 12. | LAN cable | 2 | 10 | N | 0 | Provided by Lab |
| | LAN cable (For RS test only) | 2 | 10 | Y | 0 | Provided by Lab |

Note: The core(s) is(are) originally attached to the cable(s).

## 5 Conducted Emission from the AC Mains Power Port

### 5.1 Limits

| EN 55032 Table clause | Frequency range (MHz) | Coupling device | Detector type / bandwidth | Class A limits (dBuV) |
|---|---|---|---|---|
| A8.1 | 0.15 - 0.5 | AMN | Quasi-peak / 9kHz | 79 |
| | 0.5 - 30.0 | | | 73 |
| A8.2 | 0.15 - 0.5 | | Average / 9kHz | 66 |
| | 0.5 - 30.0 | | | 60 |

| EN 55032 Table clause | Frequency range (MHz) | Coupling device | Detector type / bandwidth | Class B limits (dBuV) |
|---|---|---|---|---|
| A9.1 | 0.15 - 0.5 | AMN | Quasi-peak / 9kHz | 66 - 56 |
| | 0.5 - 5 | | | 56 |
| | 5 - 30.0 | | | 60 |
| A9.2 | 0.15 - 0.5 | | Average / 9kHz | 56 - 46 |
| | 0.5 - 5 | | | 46 |
| | 5 - 30.0 | | | 50 |

### 5.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| ROHDE & SCHWARZ TEST RECEIVER | ESCS 30 | 100276 | Apr. 12, 2016 | Apr. 11, 2017 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ENV216 | 101197 | May 04, 2016 | May 03, 2017 |
| LISN With Adapter (for EUT) | AD10 | C10Ada-002 | May 04, 2016 | May 03, 2017 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 100218 | Nov. 23, 2016 | Nov. 22, 2017 |
| SCHWARZBECK Artificial Mains Network (For EUT) | NNLK8129 | 8129229 | May 04, 2016 | May 03, 2017 |
| Software | Cond_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) With 10dB PAD | 5D-FB | Cable-C10.01 | Feb. 15, 2016 | Feb. 14, 2017 |
| SUHNER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-011484 | May 12, 2016 | May 11, 2017 |
| ROHDE & SCHWARZ Artificial Mains Network (For TV EUT) | ESH3-Z5 | 100220 | Nov. 08, 2016 | Nov. 07, 2017 |
| LISN With Adapter (for TV EUT) | 100220 | N/A | Nov. 08, 2016 | Nov. 07, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 10.
3. The VCCI Site Registration No. C-1852.
4. Tested Date: Nov. 28, 2016.

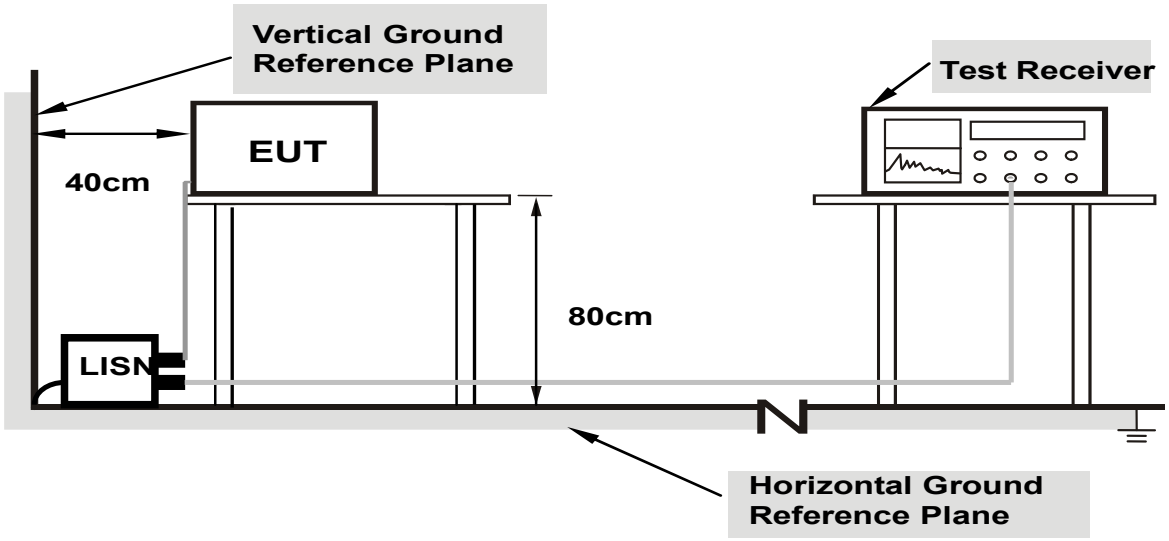
### 5.3 Test Arrangement

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.




**Note: 1. Support units were connected to second LISN.**
**2. The distance specified between EUT/AE and other metallic objects is ≥ 0.8 m in the measurement arrangement for table-top EUT.**

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

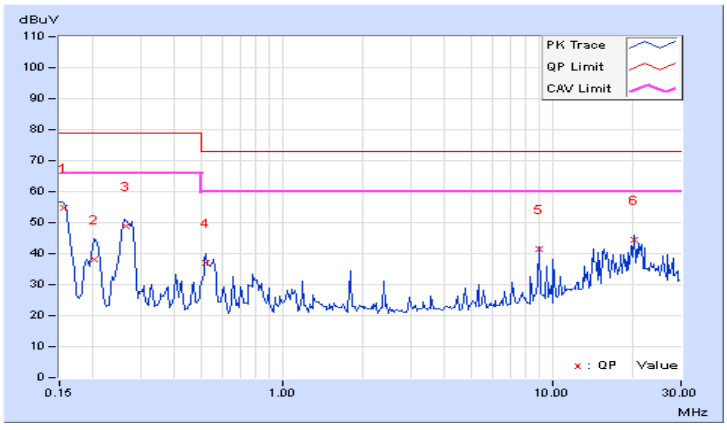
## 5.4 Test Results

| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
|---|---|---|---|
| Input Power | 230Vac, 50Hz | Environmental Conditions | 23℃, 76%RH, 1015mbar |
| Tested by | Chiawei Lin | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Line (L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15656 | 9.70 | 45.28 | 40.53 | 54.98 | 50.23 | 79.00 | 66.00 | -24.02 | -15.77 |
| 2 | 0.20078 | 9.70 | 28.55 | 16.72 | 38.25 | 26.42 | 79.00 | 66.00 | -40.75 | -39.58 |
| 3 | 0.26447 | 9.70 | 39.09 | 34.62 | 48.79 | 44.32 | 79.00 | 66.00 | -30.21 | -21.68 |
| 4 | 0.52109 | 9.70 | 27.28 | 20.07 | 36.98 | 29.77 | 73.00 | 60.00 | -36.02 | -30.23 |
| 5 | 8.92459 | 9.90 | 31.68 | 30.78 | 41.58 | 40.68 | 73.00 | 60.00 | -31.42 | -19.32 |
| 6 | 20.22266 | 9.94 | 34.42 | 28.56 | 44.36 | 38.50 | 73.00 | 60.00 | -28.64 | -21.50 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

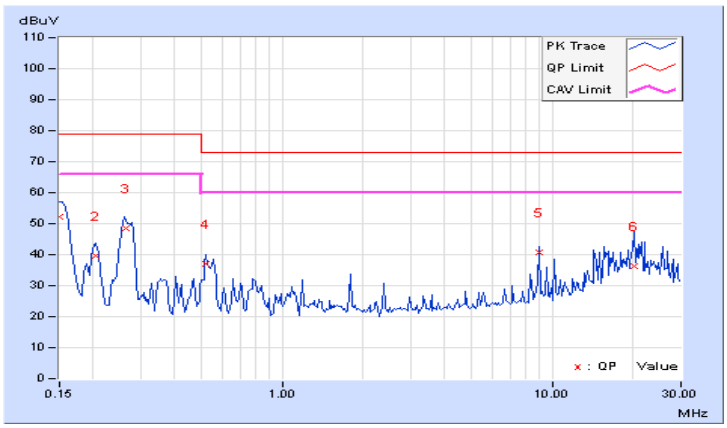


| | | | |
|---|---|---|---|
| **Frequency Range** | 150kHz ~ 30MHz | **Detector Function & Bandwidth** | Quasi-Peak (QP) / Average (AV), 9kHz |
| **Input Power** | 230Vac, 50Hz | **Environmental Conditions** | 23℃, 76%RH, 1015mbar |
| **Tested by** | Chiawei Lin | | |
| **Test Mode** | Mode 1 | | |

| Phase Of Power : Neutral (N) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **No** | **Frequency (MHz)** | **Correction Factor (dB)** | **Reading Value (dBuV)** | | **Emission Level (dBuV)** | | **Limit (dBuV)** | | **Margin (dB)** | |
| | | | **Q.P.** | **AV.** | **Q.P.** | **AV.** | **Q.P.** | **AV.** | **Q.P.** | **AV.** |
| 1 | 0.15000 | 9.70 | 42.57 | 38.57 | 52.27 | 48.27 | 79.00 | 66.00 | -26.73 | -17.73 |
| 2 | 0.20469 | 9.69 | 29.78 | 16.07 | 39.47 | 25.76 | 79.00 | 66.00 | -39.53 | -40.24 |
| 3 | 0.26447 | 9.69 | 39.01 | 34.68 | 48.70 | 44.37 | 79.00 | 66.00 | -30.30 | -21.63 |
| 4 | 0.52109 | 9.70 | 27.23 | 19.82 | 36.93 | 29.52 | 73.00 | 60.00 | -36.07 | -30.48 |
| 5 | 8.93750 | 9.89 | 30.74 | 28.20 | 40.63 | 38.09 | 73.00 | 60.00 | -32.37 | -21.91 |
| 6 | 20.25391 | 9.95 | 26.44 | 19.67 | 36.39 | 29.62 | 73.00 | 60.00 | -36.61 | -30.38 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

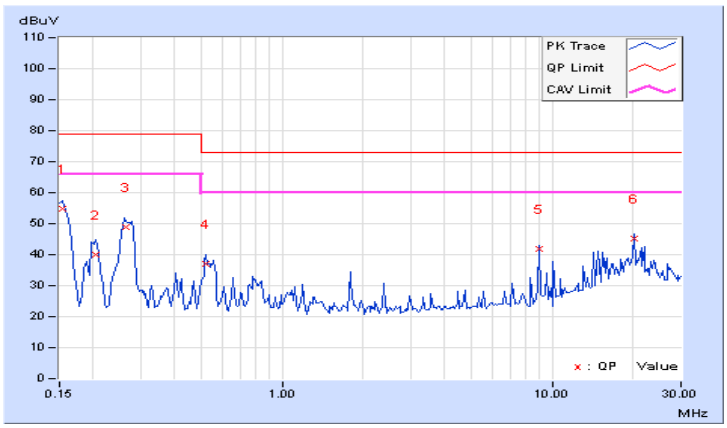


| | | | |
|---|---|---|---|
| **Frequency Range** | 150kHz ~ 30MHz | **Detector Function & Bandwidth** | Quasi-Peak (QP) / Average (AV), 9kHz |
| **Input Power** | 110Vac, 60Hz | **Environmental Conditions** | 23℃, 76%RH, 1015mbar |
| **Tested by** | Chiawei Lin | | |
| **Test Mode** | Mode 1 | | |

| Phase Of Power : Line (L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **No** | **Frequency (MHz)** | **Correction Factor (dB)** | **Reading Value (dBuV)** | | **Emission Level (dBuV)** | | **Limit (dBuV)** | | **Margin (dB)** | |
| | | | **Q.P.** | **AV.** | **Q.P.** | **AV.** | **Q.P.** | **AV.** | **Q.P.** | **AV.** |
| 1 | 0.15391 | 9.70 | 45.27 | 39.52 | 54.97 | 49.22 | 79.00 | 66.00 | -24.03 | -16.78 |
| 2 | 0.20469 | 9.70 | 30.16 | 16.13 | 39.86 | 25.83 | 79.00 | 66.00 | -39.14 | -40.17 |
| 3 | 0.26447 | 9.70 | 39.21 | 34.62 | 48.91 | 44.32 | 79.00 | 66.00 | -30.09 | -21.68 |
| 4 | 0.52109 | 9.70 | 27.34 | 20.21 | 37.04 | 29.91 | 73.00 | 60.00 | -35.96 | -30.09 |
| 5 | 8.92188 | 9.90 | 31.99 | 30.64 | 41.89 | 40.54 | 73.00 | 60.00 | -31.11 | -19.46 |
| 6 | 20.22266 | 9.94 | 35.14 | 33.31 | 45.08 | 43.25 | 73.00 | 60.00 | -27.92 | -16.75 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

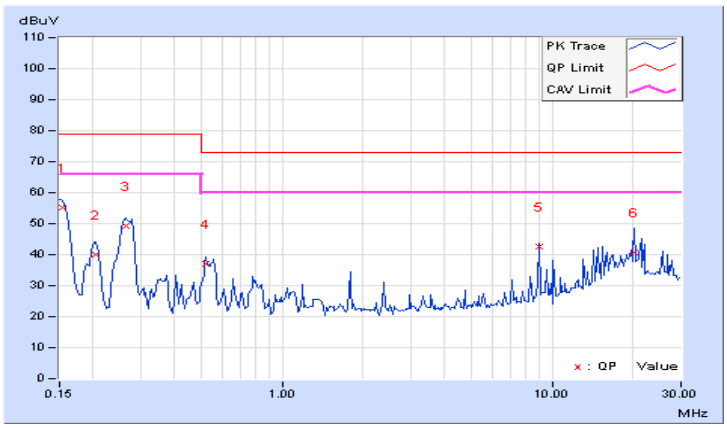


| | | | |
|---|---|---|---|
| **Frequency Range** | 150kHz ~ 30MHz | **Detector Function & Bandwidth** | Quasi-Peak (QP) / Average (AV), 9kHz |
| **Input Power** | 110Vac, 60Hz | **Environmental Conditions** | 23℃, 76%RH, 1015mbar |
| **Tested by** | Chiawei Lin | | |
| **Test Mode** | Mode 1 | | |

| Phase Of Power : Neutral (N) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **No** | **Frequency (MHz)** | **Correction Factor (dB)** | **Reading Value (dBuV)** | | **Emission Level (dBuV)** | | **Limit (dBuV)** | | **Margin (dB)** | |
| | | | **Q.P.** | **AV.** | **Q.P.** | **AV.** | **Q.P.** | **AV.** | **Q.P.** | **AV.** |
| **1** | **0.15382** | **9.70** | **45.59** | **41.26** | **55.29** | **50.96** | **79.00** | **66.00** | **-23.71** | **-15.04** |
| 2 | 0.20469 | 9.69 | 30.22 | 16.64 | 39.91 | 26.33 | 79.00 | 66.00 | -39.09 | -39.67 |
| 3 | 0.26456 | 9.69 | 39.67 | 35.17 | 49.36 | 44.86 | 79.00 | 66.00 | -29.64 | -21.14 |
| 4 | 0.52109 | 9.70 | 27.35 | 19.76 | 37.05 | 29.46 | 73.00 | 60.00 | -35.95 | -30.54 |
| 5 | 8.91406 | 9.89 | 32.63 | 31.33 | 42.52 | 41.22 | 73.00 | 60.00 | -30.48 | -18.78 |
| 6 | 20.21484 | 9.95 | 30.64 | 21.79 | 40.59 | 31.74 | 73.00 | 60.00 | -32.41 | -28.26 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



## 6 Asymmetric Mode Conducted Emission at Telecommunication Ports

### 6.1 Limits

For Class A Equipment

| EN 55032 Table clause | Frequency range (MHz) | Coupling device | Detector type / bandwidth | Voltage limits (dBuV) | Current limits (dBuA) |
|---|---|---|---|---|---|
| A10.1 | 0.15 - 0.5 | AAN | Quasi-peak / 9kHz | 97 – 87 | N/A |
| | 0.5 - 30.0 | | | 87 | |
| | 0.15 - 0.5 | AAN | Average / 9kHz | 84-74 | |
| | 0.5 - 30.0 | | | 74 | |
| A10.2 | 0.5 - 30.0 | CVP and current probe | Quasi-peak / 9kHz | 97 – 87 | 53 – 43 |
| | 0.15 - 0.5 | | | 87 | 43 |
| | 0.5 - 30.0 | CVP and current probe | Average / 9kHz | 84-74 | 40 – 30 |
| | 0.5 - 30.0 | | | 74 | 30 |
| A10.3 | 0.5 - 30.0 | Current Probe | Quasi-peak / 9kHz | N/A | 53 – 43 |
| | 0.15 - 0.5 | | | | 43 |
| | 0.5 - 30.0 | Current Probe | Average / 9kHz | | 40 – 30 |
| | 0.5 - 30.0 | | | | 30 |

For Class B Equipment

| EN 55032 Table clause | Frequency range (MHz) | Coupling device | Detector type / bandwidth | Voltage limits (dBuV) | Current limits (dBuA) |
|---|---|---|---|---|---|
| A11.1 | 0.15 - 0.5 | AAN | Quasi-peak / 9kHz | 84 – 74 | N/A |
| | 0.5 - 30.0 | | | 74 | |
| | 0.15 - 0.5 | AAN | Average / 9kHz | 74-64 | |
| | 0.5 - 30.0 | | | 64 | |
| A11.2 | 0.5 - 30.0 | CVP and current probe | Quasi-peak / 9kHz | 84 – 74 | 40 – 30 |
| | 0.15 - 0.5 | | | 74 | 30 |
| | 0.5 - 30.0 | CVP and current probe | Average / 9kHz | 74-64 | 30 – 20 |
| | 0.5 - 30.0 | | | 64 | 20 |
| A11.3 | 0.5 - 30.0 | Current Probe | Quasi-peak / 9kHz | N/A | 40 – 30 |
| | 0.15 - 0.5 | | | | 30 |
| | 0.5 - 30.0 | Current Probe | Average / 9kHz | | 30 – 20 |
| | 0.5 - 30.0 | | | | 20 |

### 6.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| ROHDE & SCHWARZ TEST RECEIVER | ESCS 30 | 100276 | Apr. 12, 2016 | Apr. 11, 2017 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ENV216 | 101197 | May 04, 2016 | May 03, 2017 |
| LISN With Adapter (for EUT) | AD10 | C10Ada-002 | May 04, 2016 | May 03, 2017 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 100218 | Nov. 23, 2016 | Nov. 22, 2017 |
| Software | Cond_V7.3.7.4 | NA | NA | NA |
| Software | ISN_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) With 10dB PAD | 5D-FB | Cable-C10.01 | Feb. 15, 2016 | Feb. 14, 2017 |
| SUHNER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-010773 | Feb. 15, 2016 | Feb. 14, 2017 |
| FCC ISN | F-071115-1057-1 | 20652 | Jan. 12, 2016 | Jan. 11, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 10.
3. The VCCI Site Registration No. T-1611.
4. Tested Date: Nov. 28, 2016.

## 6.3 Test Arrangement

**Method of Using AANs:**

a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AAN directly to reference ground plane.

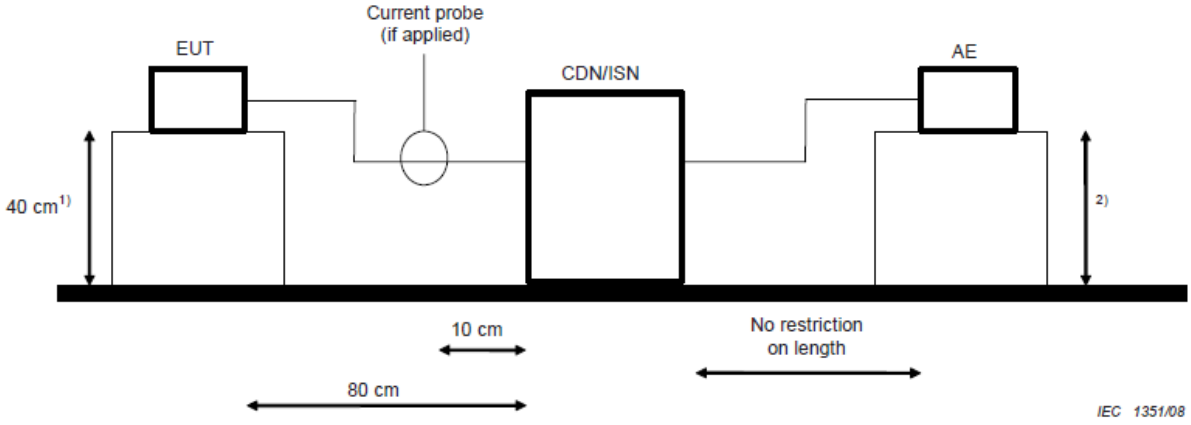
b. If voltage measurement is used, measure voltage at the measurement port of the AAN, correct the reading by adding the AAN voltage division factor, and compare to the voltage limit.

c. If current measurement is used, measure current with the current probe and compare to the current limit. A 50 Ω load has to be connected to the measurement port of the AAN during the current measurement.

d. It is not necessary to apply the voltage and the current limit if an AAN is used.

e. The test results of disturbance at telecommunication ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.




AE = Associated equipment
EUT = Equipment under test

1) Distance to the reference groundplane (vertical or horizontal).
2) Distance to the reference groundplane is not critical.

## 6.4 Supplementary Information

The condition of LAN utilization in excess of 10 % and sustaining that level for a minimum of 250 ms is created by command TFGEN + PING.

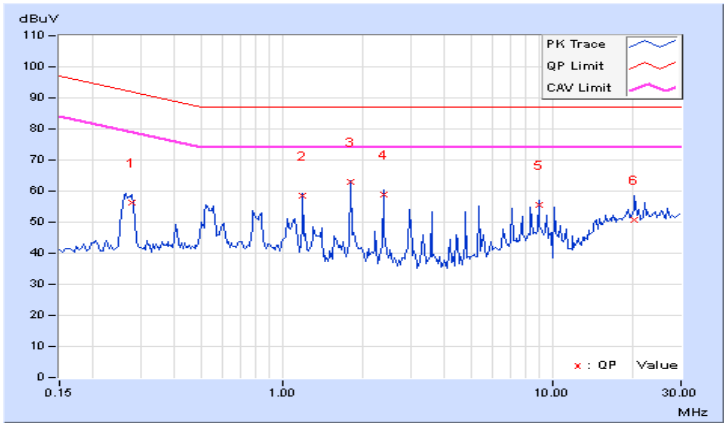
## 6.5 Test Results

| | | | |
|---|---|---|---|
| **Frequency Range** | 150kHz ~ 30MHz | **Detector Function & Bandwidth** | Quasi-Peak (QP) / Average (AV), 9kHz |
| **Input Power** | 230Vac, 50Hz | **Environmental Conditions** | 23℃, 76%RH, 1013mbar |
| **Tested by** | Chiawei Lin | | |
| **Test Mode** | Mode 1<br>LAN PORT 1 (1Gbps) | | |

| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.27891 | 9.46 | 46.75 | 39.41 | 56.21 | 48.87 | 91.85 | 78.85 | -35.64 | -29.98 |
| 2 | 1.19141 | 9.24 | 49.35 | 48.98 | 58.59 | 58.22 | 87.00 | 74.00 | -28.41 | -15.78 |
| **3** | **1.78772** | **9.21** | **53.93** | **53.05** | **63.14** | **62.26** | **87.00** | **74.00** | **-23.86** | **-11.74** |
| 4 | 2.38281 | 9.20 | 49.54 | 49.13 | 58.74 | 58.33 | 87.00 | 74.00 | -28.26 | -15.67 |
| 5 | 8.93487 | 9.23 | 46.17 | 45.94 | 55.40 | 55.17 | 87.00 | 74.00 | -31.60 | -18.83 |
| 6 | 20.25391 | 9.42 | 41.43 | 40.41 | 50.85 | 49.83 | 87.00 | 74.00 | -36.15 | -24.17 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

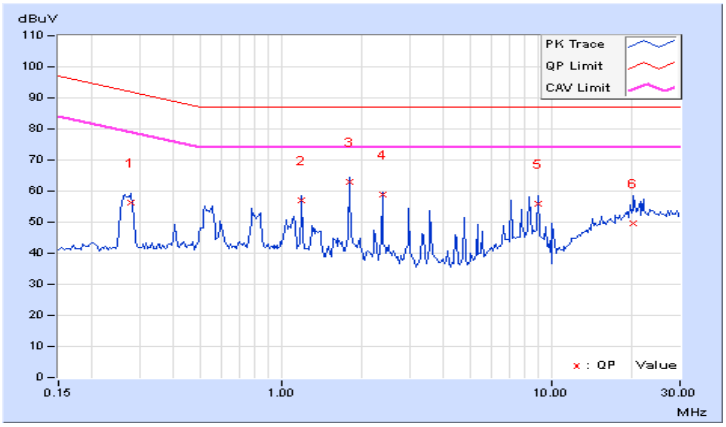


| | | | |
|---|---|---|---|
| **Frequency Range** | 150kHz ~ 30MHz | **Detector Function & Bandwidth** | Quasi-Peak (QP) / Average (AV), 9kHz |
| **Input Power** | 230Vac, 50Hz | **Environmental Conditions** | 23℃, 76%RH, 1013mbar |
| **Tested by** | Chiawei Lin | | |
| **Test Mode** | Mode 2<br>LAN PORT 2 (1Gbps) | | |

| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.27891 | 9.46 | 46.85 | 39.85 | 56.31 | 49.31 | 91.85 | 78.85 | -35.54 | -29.54 |
| 2 | 1.19141 | 9.24 | 47.93 | 47.56 | 57.17 | 56.80 | 87.00 | 74.00 | -29.83 | -17.20 |
| 3 | 1.78516 | 9.21 | 53.81 | 53.01 | 63.02 | 62.22 | 87.00 | 74.00 | -23.98 | -11.78 |
| 4 | 2.37891 | 9.20 | 49.54 | 49.50 | 58.74 | 58.70 | 87.00 | 74.00 | -28.26 | -15.30 |
| 5 | 8.92188 | 9.23 | 46.79 | 44.86 | 56.02 | 54.09 | 87.00 | 74.00 | -30.98 | -19.91 |
| 6 | 20.22266 | 9.42 | 40.37 | 37.66 | 49.79 | 47.08 | 87.00 | 74.00 | -37.21 | -26.92 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

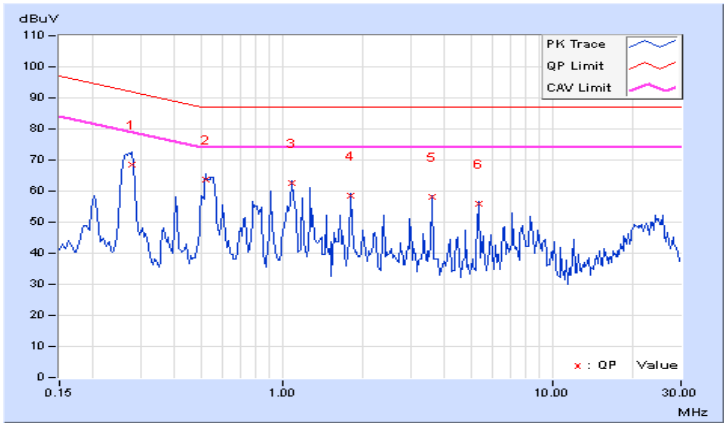


| | | | |
|---|---|---|---|
| **Frequency Range** | 150kHz ~ 30MHz | **Detector Function & Bandwidth** | Quasi-Peak (QP) / Average (AV), 9kHz |
| **Input Power** | 230Vac, 50Hz | **Environmental Conditions** | 23℃, 76%RH, 1013mbar |
| **Tested by** | Chiawei Lin | | |
| **Test Mode** | Mode 3<br>PoE LAN 3 PORT | | |

| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.27891 | 9.91 | 58.74 | 52.14 | 68.65 | 62.05 | 91.85 | 78.85 | -23.20 | -16.80 |
| 2 | 0.52109 | 9.90 | 53.70 | 45.03 | 63.60 | 54.93 | 87.00 | 74.00 | -23.40 | -19.07 |
| 3 | 1.08984 | 9.90 | 52.72 | 50.97 | 62.62 | 60.87 | 87.00 | 74.00 | -24.38 | -13.13 |
| 4 | 1.78516 | 9.94 | 48.60 | 48.56 | 58.54 | 58.50 | 87.00 | 74.00 | -28.46 | -15.50 |
| 5 | 3.57422 | 10.07 | 48.04 | 47.49 | 58.11 | 57.56 | 87.00 | 74.00 | -28.89 | -16.44 |
| 6 | 5.36320 | 10.14 | 45.71 | 45.69 | 55.85 | 55.83 | 87.00 | 74.00 | -31.15 | -18.17 |

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



## 7 Radiated Emission at Frequencies up to 1GHz

### 7.1 Limits

For Class A Equipment

| EN 55032 Table clause | Frequency range (MHz) | Distance (m) | Limits (dBuV/m) |
|---|---|---|---|
| A2.1 | 30 - 230 | 10 | 40 |
| | 230 - 1000 | | 47 |
| A2.2 | 30 - 230 | 3 | 50 |
| | 230 - 1000 | | 57 |

For Class B Equipment

| EN 55032 Table clause | Frequency range (MHz) | Distance (m) | Limits (dBuV/m) |
|---|---|---|---|
| A4.1 | 30 - 230 | 10 | 30 |
| | 230 - 1000 | | 37 |
| A4.2 | 30 - 230 | 3 | 40 |
| | 230 - 1000 | | 47 |

### 7.2 Test Instruments

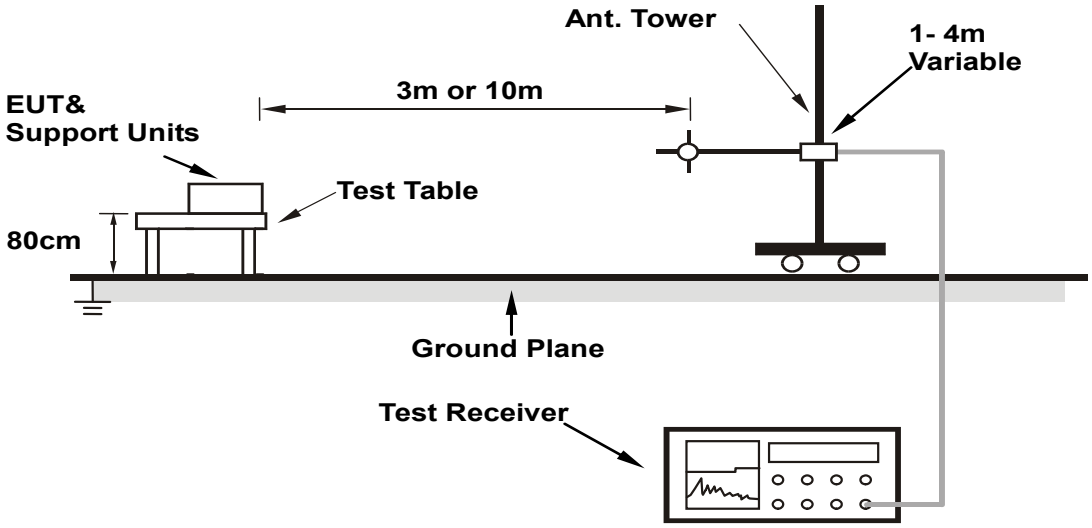
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| ROHDE & SCHWARZ TEST RECEIVER | ESCI | 100412 | Sep. 05, 2016 | Sep. 04, 2017 |
| Schwarzbeck BILOG Antenna | VULB9168 | 9168-479 | Jan. 05, 2016 | Jan. 04, 2017 |
| CT Turn Table | TT100 | CT-0055 | NA | NA |
| CT Tower | AT100 | CT-0055 | NA | NA |
| Software | Radiated_V7.6.15.9.5 | NA | NA | NA |
| ADT RF Switches BOX | EM-H-01-1 | 1002 | Mar. 22 2016 | Mar. 21, 2017 |
| WOKEN RF cable With 5dB PAD | 8D | CABLE-ST6-01 | Sep. 22 2016 | Sep. 21, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Open Site No. 6.
3. The VCCI Site Registration No. R-728.
4. The FCC Site Registration No. 90427.
5. Tested Date: Nov. 24, 2016.

### 7.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.
2. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.




**Note: Cable on the RGP must to be insulated.**

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

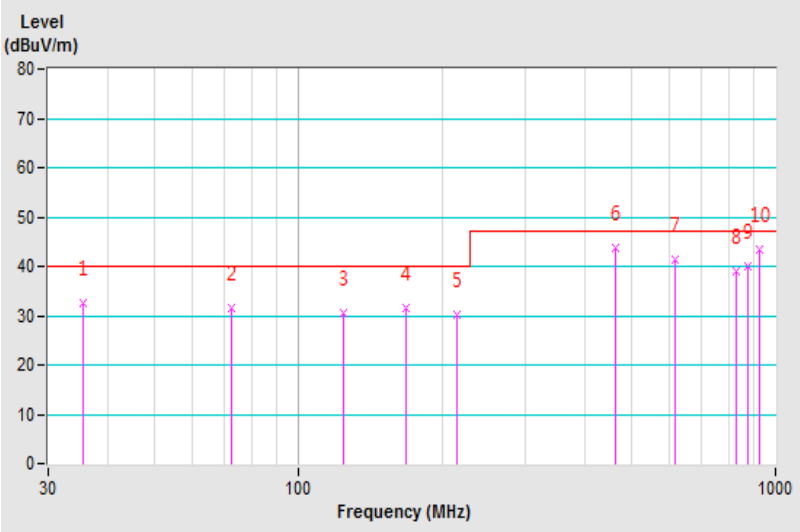
## 7.4 Test Results

| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
|---|---|---|---|
| Tested by | Chin-Wen Wang | Environmental Conditions | 22℃, 77%RH, 1013mbar |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Horizontal at 10 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 35.50 | 32.45 QP | 40.00 | -7.55 | 4.00 H | 46 | 43.26 | -10.81 |
| 2 | 72.35 | 31.57 QP | 40.00 | -8.43 | 4.00 H | 18 | 43.72 | -12.15 |
| 3 | 125.00 | 30.58 QP | 40.00 | -9.42 | 4.00 H | 185 | 41.69 | -11.11 |
| 4 | 168.22 | 31.69 QP | 40.00 | -8.31 | 4.00 H | 239 | 40.86 | -9.17 |
| 5 | 216.00 | 30.25 QP | 40.00 | -9.75 | 4.00 H | 145 | 41.76 | -11.51 |
| 6 | 462.01 | 43.75 QP | 47.00 | -3.25 | 2.23 H | 180 | 47.88 | -4.13 |
| 7 | 615.99 | 41.28 QP | 47.00 | -5.72 | 1.84 H | 15 | 41.74 | -0.46 |
| 8 | 825.00 | 38.96 QP | 47.00 | -8.04 | 1.12 H | 205 | 35.97 | 2.99 |
| 9 | 875.00 | 40.12 QP | 47.00 | -6.88 | 1.52 H | 222 | 36.74 | 3.38 |
| 10 | 924.01 | 43.48 QP | 47.00 | -3.52 | 1.32 H | 170 | 38.60 | 4.88 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

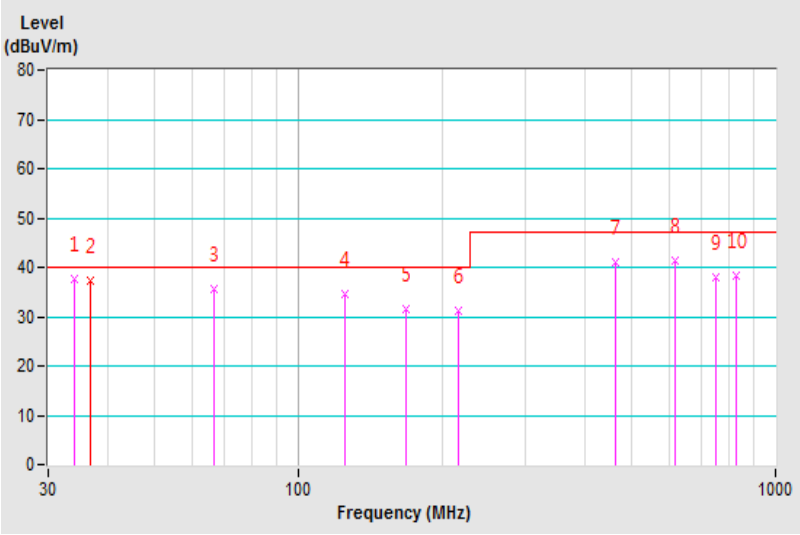


| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
|---|---|---|---|
| Tested by | Chin-Wen Wang | Environmental Conditions | 22℃, 77%RH, 1013mbar |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Vertical at 10 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| **1** | **34.15** | **37.56 QP** | **40.00** | **-2.44** | **1.00 V** | **187** | **48.63** | **-11.07** |
| 2 | 36.65 | 37.24 QP | 40.00 | -2.76 | 1.00 V | 89 | 48.01 | -10.77 |
| 3 | 66.74 | 35.47 QP | 40.00 | -4.53 | 1.63 V | 110 | 46.36 | -10.89 |
| 4 | 125.01 | 34.74 QP | 40.00 | -5.26 | 1.00 V | 2 | 45.83 | -11.09 |
| 5 | 168.65 | 31.52 QP | 40.00 | -8.48 | 1.00 V | 228 | 40.70 | -9.18 |
| 6 | 216.23 | 31.17 QP | 40.00 | -8.83 | 1.00 V | 67 | 42.68 | -11.51 |
| 7 | 462.01 | 40.86 QP | 47.00 | -6.14 | 2.95 V | 134 | 44.99 | -4.13 |
| 8 | 616.01 | 41.36 QP | 47.00 | -5.64 | 3.32 V | 139 | 41.82 | -0.46 |
| 9 | 749.99 | 37.96 QP | 47.00 | -9.04 | 1.36 V | 356 | 36.16 | 1.80 |
| 10 | 825.00 | 38.44 QP | 47.00 | -8.56 | 1.95 V | 341 | 35.45 | 2.99 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



## 8 Radiated Emission at Frequencies above 1GHz

### 8.1 Limits

For Class A Equipment

| EN 55032 Table clause | Frequency range (MHz) | Distance (m) | Detector type | Limits (dBuV/m) |
|---|---|---|---|---|
| A3.1 | 1000 - 3000 | 3 | Average | 56 |
| | 3000 - 6000 | | | 60 |
| A3.2 | 1000 - 3000 | | Peak | 76 |
| | 3000 - 6000 | | | 80 |

For Class B Equipment

| EN 55032 Table clause | Frequency range (MHz) | Distance (m) | Detector type | Limits (dBuV/m) |
|---|---|---|---|---|
| A5.1 | 1000 - 3000 | 3 | Average | 50 |
| | 3000 - 6000 | | | 54 |
| A5.2 | 1000 - 3000 | | Peak | 70 |
| | 3000 - 6000 | | | 74 |

**Required highest frequency for radiated measurement**

| EN 55032 Table clause | Highest internal frequency ($F_x$) | Highest measured frequency |
|---|---|---|
| 1 | $F_x \leqq$ 108 MHz | 1 GHz |
| | 108 MHz $< F_x \leqq$ 500 MHz | 2 GHz |
| | 500 MHz $< F_x \leqq$ 1 GHz | 5 GHz |
| | $F_x >$ 1 GHz | 5 x $F_x$ up to a maximum of 6 GHz |

NOTE 1 For FM and TV broadcast receivers, $F_x$ is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

NOTE 2 $F_x$ is highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.

Where $F_x$ is unknown, the radiated emission measurements shall be performed up to 6 GHz.

## 8.2 Test Instruments

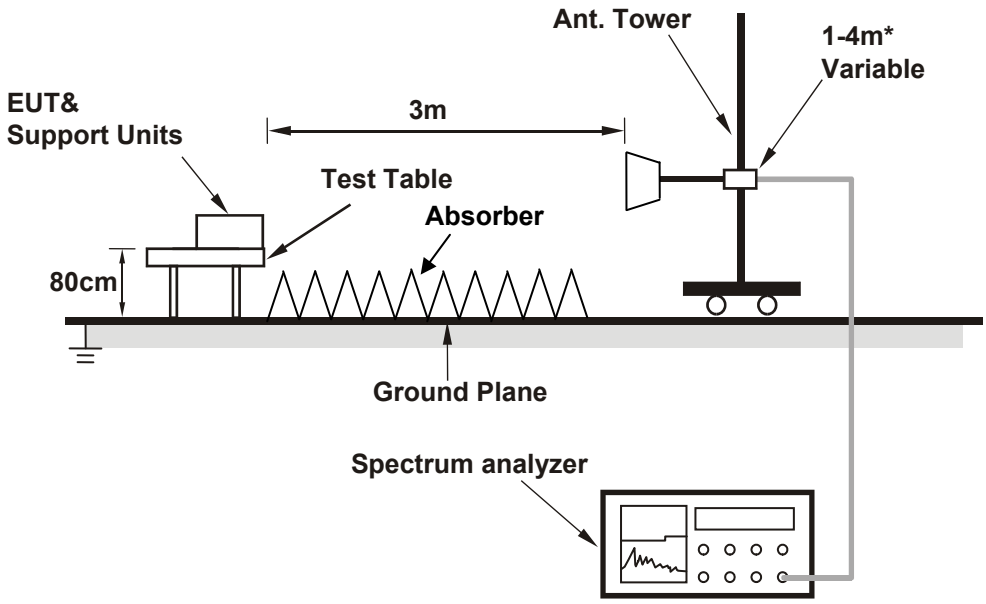
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| Agilent Spectrum | E4446A | MY51100009 | May 30, 2016 | May 29, 2017 |
| Agilent<br>Test Receiver | N9038A | MY50010135 | Aug. 01, 2016 | Jul. 31, 2017 |
| Agilent Preamplifier | 8449B | 3008A02367 | Feb. 27, 2016 | Feb. 26, 2017 |
| MITEQ Preamplifier | AMF-6F-260400-33-8P | 892164 | Mar. 01, 2016 | Feb. 28, 2017 |
| EMCI Preamplifier | EMC184045B | 980235 | Mar. 01, 2016 | Feb. 28, 2017 |
| Schwarzbeck Horn Antenna | BBHA-9170 | 212 | Jan. 08, 2016 | Jan. 07, 2017 |
| EMCO<br>Horn Antenna | 3115 | 9312-4192 | Jan. 18, 2016 | Jan. 17, 2017 |
| Max Full. Turn Table & Tower | MF7802 | MF780208103 | NA | NA |
| Software | Radiated_V8.7.08 | NA | NA | NA |
| SUHNER RF cable<br>With 4dB PAD | SF106-18 | Cable-CH7 | Aug. 15, 2016 | Aug. 14, 2017 |
| SUHNER RF cable<br>With 3dB PAD | SF102 | Cable-CH7-3.6m | Aug. 15, 2016 | Aug. 14, 2017 |

Notes:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The 3dB beamwidth of the horn antenna is minimum 30 degree (or w = 1.6m at 3m distance) for 1~6 GHz.
3. The test was performed in Chamber No. 7.
4. The Industry Canada Reference No. IC 7450E-7.
5. The FCC Site Registration No. 127748.
6. The VCCI Site Registration No. G-39.
7. Tested Date: Nov. 25, 2016.

### 8.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note:
1. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna.




**Note: Cable on the RGP must to be insulated.**

* :depends on the EUT height and the antenna 3dB beamwidth both.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

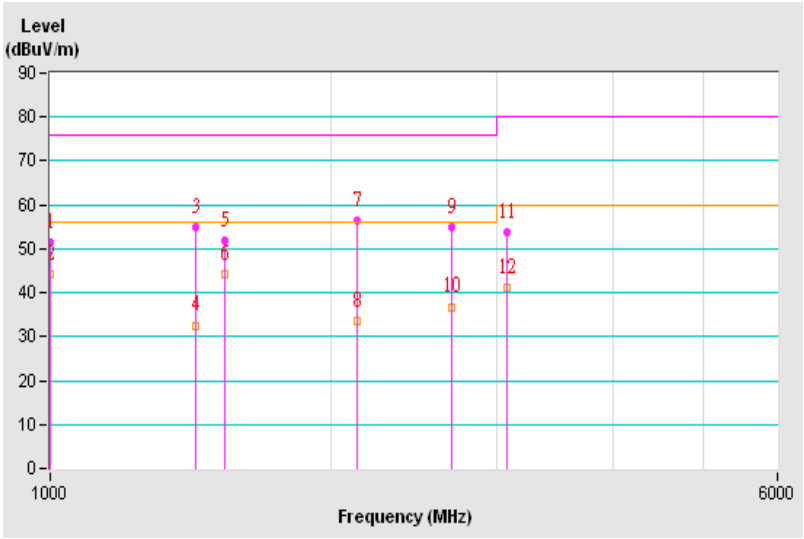
## 8.4 Test Results

| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
|---|---|---|---|
| Tested by | Vincent Chen | Environmental Conditions | 20℃, 75%RH, 1005mbar |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1000.00 | 51.33 PK | 76.00 | -24.67 | 1.00 H | 316 | 54.90 | -3.57 |
| 2 | 1000.00 | 44.33 AV | 56.00 | -11.67 | 1.00 H | 316 | 47.90 | -3.57 |
| 3 | 1430.32 | 54.84 PK | 76.00 | -21.16 | 2.46 H | 73 | 57.18 | -2.34 |
| 4 | 1430.32 | 32.58 AV | 56.00 | -23.42 | 2.46 H | 73 | 34.92 | -2.34 |
| 5 | 1540.01 | 51.79 PK | 76.00 | -24.21 | 1.53 H | 207 | 53.92 | -2.13 |
| 6 | 1540.01 | 44.15 AV | 56.00 | -11.85 | 1.53 H | 207 | 46.28 | -2.13 |
| 7 | 2131.70 | 56.26 PK | 76.00 | -19.74 | 1.47 H | 236 | 55.76 | 0.50 |
| 8 | 2131.70 | 33.37 AV | 56.00 | -22.63 | 1.47 H | 236 | 32.87 | 0.50 |
| 9 | 2693.06 | 54.78 PK | 76.00 | -21.22 | 1.36 H | 250 | 52.98 | 1.80 |
| 10 | 2693.06 | 36.76 AV | 56.00 | -19.24 | 1.36 H | 250 | 34.96 | 1.80 |
| 11 | 3080.09 | 53.80 PK | 80.00 | -26.20 | 2.47 H | 360 | 50.43 | 3.37 |
| 12 | 3080.09 | 41.20 AV | 60.00 | -18.80 | 2.47 H | 360 | 37.83 | 3.37 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

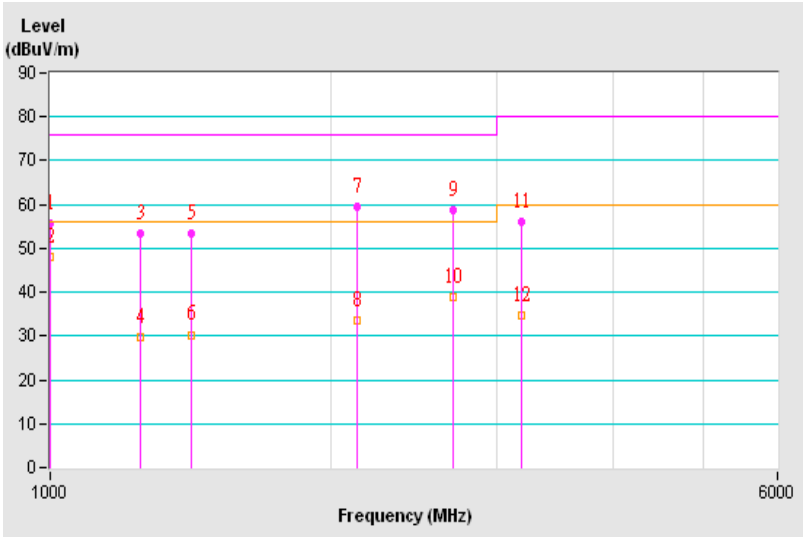


| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
|---|---|---|---|
| Tested by | Vincent Chen | Environmental Conditions | 20℃, 75%RH, 1005mbar |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1000.00 | 55.52 PK | 76.00 | -20.48 | 1.55 V | 332 | 59.09 | -3.57 |
| **2** | **1000.00** | **47.90 AV** | **56.00** | **-8.10** | **1.55 V** | **332** | **51.47** | **-3.57** |
| 3 | 1249.27 | 53.28 PK | 76.00 | -22.72 | 1.05 V | 360 | 56.04 | -2.76 |
| 4 | 1249.27 | 29.83 AV | 56.00 | -26.17 | 1.05 V | 360 | 32.59 | -2.76 |
| 5 | 1416.67 | 53.44 PK | 76.00 | -22.56 | 1.44 V | 190 | 55.79 | -2.35 |
| 6 | 1416.67 | 30.28 AV | 56.00 | -25.72 | 1.44 V | 190 | 32.63 | -2.35 |
| 7 | 2132.26 | 59.56 PK | 76.00 | -16.44 | 1.53 V | 22 | 59.06 | 0.50 |
| 8 | 2132.26 | 33.56 AV | 56.00 | -22.44 | 1.53 V | 22 | 33.06 | 0.50 |
| 9 | 2699.91 | 58.56 PK | 76.00 | -17.44 | 1.97 V | 236 | 56.74 | 1.82 |
| 10 | 2699.91 | 38.83 AV | 56.00 | -17.17 | 1.97 V | 236 | 37.01 | 1.82 |
| 11 | 3196.25 | 56.19 PK | 80.00 | -23.81 | 1.00 V | 342 | 52.55 | 3.64 |
| 12 | 3196.25 | 34.55 AV | 60.00 | -25.45 | 1.00 V | 342 | 30.91 | 3.64 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



## 9 Harmonics Current Measurement

### 9.1 Limits

| Limits for Class A equipment | |
|---|---|
| Harmonic Order n | Max. permissible harmonics current A |
| Odd harmonics | |
| 3 | 2.30 |
| 5 | 1.14 |
| 7 | 0.77 |
| 9 | 0.40 |
| 11 | 0.33 |
| 13 | 0.21 |
| 15≦n≦39 | 0.15 x 15/n |
| Even harmonics | |
| 2 | 1.08 |
| 4 | 0.43 |
| 6 | 0.30 |
| 8≦n≦40 | 0.23 x 8/n |

| Limits for Class D equipment | | |
|---|---|---|
| Harmonic Order n | Max. permissible harmonics current per watt mA/W | Max. permissible harmonics current A |
| Odd Harmonics only | | |
| 3 | 3.4 | 2.30 |
| 5 | 1.9 | 1.14 |
| 7 | 1.0 | 0.77 |
| 9 | 0.5 | 0.40 |
| 11 | 0.35 | 0.33 |
| 13 | 0.30 | 0.21 |
| 15≦n≦39 | 3.85/n | 0.15 x 15/n |
| | | |
| | | |
| | | |
| | | |
| | | |

Notes: 1. Class A and Class D are classified according to section 5 of EN 61000-3-2.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

### 9.2 Classification of Equipment

| Class A | Class B | Class C | Class D |
|---|---|---|---|
| Balanced three-phase equipment;<br>Household appliances excluding equipment as Class D;<br>Tools excluding portable tools;<br>Dimmers for incandescent lamps;<br>Audio equipment;<br>Equipment not specified in one of the three other classes. | Portable tools;<br>Arc welding equipment which is not professional equipment. | Lighting equipment. | Equipment having a specified power less than or equal to 600 W of the following types:<br>Personal computers and personal computer monitors;<br>Television receivers;<br>Refrigerators and freezers having one or more variable-speed drives to control compressor motor(s). |

### 9.3 Test Instruments

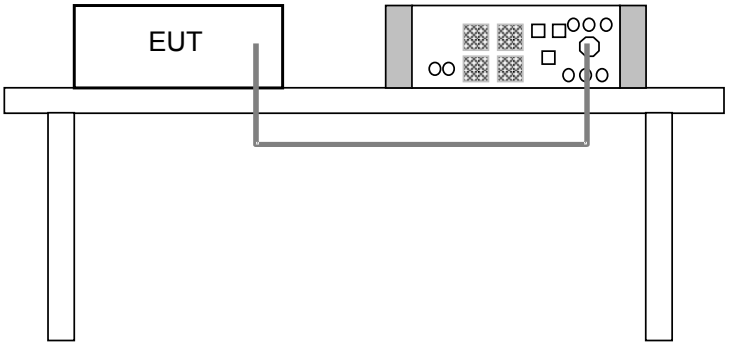
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| EMC PARTNER<br>EMC Emission Tester | HAR1000-1P | 084 | Apr. 20, 2016 | Apr. 19, 2017 |
| Software | HARCS | NA | NA | NA |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 1.
3. According to IEC 61000-4-7: 2002, the time window shall be synchronized with each group of 10 or 12 cycles (200 ms)for power frequency of 50 or 60Hz.
4. Tested Date: Dec. 5, 2016.

### 9.4 Test Arrangement

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

b. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 9.5 Test Results

| TEST MODE | Mode 1 | | |
|---|---|---|---|
| FUNDAMENTAL VOLTAGE/AMPERE | 230.3Vrms/ 0.655Arms | POWER FREQUENCY | 49.987Hz |
| POWER CONSUMPTION | 142.9W | POWER FACTOR | 0.947 |
| ENVIRONMENTAL CONDITIONS | 27deg. C, 73%RH | **TESTED BY:** Ken Chen | |

| Harm. Order | Iavg (A) | Iavg Limit (A) | Imax (A) | Imax Limit (A) | Harm. Order | Iavg (A) | Iavg Limit (A) | Imax (A) | Imax Limit (A) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.6461 | - | 0.6732 | - | 2 | 0.0070 | 1.0800 | 0.0109 | 1.6200 |
| 3 | 0.0412 | 2.3000 | 0.0431 | 3.4500 | 4 | 0.0000 | 0.4300 | 0.0013 | 0.6450 |
| 5 | 0.0094 | 1.1400 | 0.0099 | 1.7100 | 6 | 0.0000 | 0.3000 | 0.0012 | 0.4500 |
| 7 | 0.0104 | 0.7700 | 0.0107 | 1.1550 | 8 | 0.0000 | 0.2300 | 0.0013 | 0.3450 |
| 9 | 0.0096 | 0.4000 | 0.0098 | 0.6000 | 10 | 0.0000 | 0.1840 | 0.0015 | 0.2760 |
| 11 | 0.0091 | 0.3300 | 0.0094 | 0.4950 | 12 | 0.0000 | 0.1533 | 0.0016 | 0.2300 |
| 13 | 0.0082 | 0.2100 | 0.0089 | 0.3150 | 14 | 0.0000 | 0.1314 | 0.0017 | 0.1971 |
| 15 | 0.0070 | 0.1500 | 0.0074 | 0.2250 | 16 | 0.0000 | 0.1150 | 0.0017 | 0.1725 |
| 17 | 0.0057 | 0.1324 | 0.0065 | 0.1985 | 18 | 0.0000 | 0.1022 | 0.0018 | 0.1533 |
| 19 | 0.0011 | 0.1184 | 0.0056 | 0.1776 | 20 | 0.0000 | 0.0920 | 0.0021 | 0.1380 |
| 21 | 0.0000 | 0.1071 | 0.0054 | 0.1607 | 22 | 0.0000 | 0.0836 | 0.0020 | 0.1255 |
| 23 | 0.0000 | 0.0978 | 0.0052 | 0.1467 | 24 | 0.0000 | 0.0767 | 0.0020 | 0.1150 |
| 25 | 0.0000 | 0.0900 | 0.0044 | 0.1350 | 26 | 0.0000 | 0.0708 | 0.0020 | 0.1062 |
| 27 | 0.0000 | 0.0833 | 0.0035 | 0.1250 | 28 | 0.0000 | 0.0657 | 0.0021 | 0.0986 |
| 29 | 0.0000 | 0.0776 | 0.0035 | 0.1164 | 30 | 0.0000 | 0.0613 | 0.0020 | 0.0920 |
| 31 | 0.0000 | 0.0726 | 0.0037 | 0.1089 | 32 | 0.0000 | 0.0575 | 0.0018 | 0.0863 |
| 33 | 0.0000 | 0.0682 | 0.0035 | 0.1023 | 34 | 0.0000 | 0.0541 | 0.0020 | 0.0812 |
| 35 | 0.0000 | 0.0643 | 0.0028 | 0.0964 | 36 | 0.0000 | 0.0511 | 0.0016 | 0.0767 |
| 37 | 0.0000 | 0.0608 | 0.0027 | 0.0912 | 38 | 0.0000 | 0.0484 | 0.0012 | 0.0726 |
| 39 | 0.0000 | 0.0577 | 0.0028 | 0.0865 | 40 | 0.0000 | 0.0460 | 0.0016 | 0.0690 |

**NOTE:** Steady state values on AC mains are recorded in the table.

## 10 Voltage Fluctuations and Flicker Measurement

### 10.1 Limits

| Test item | Limit | Note |
|---|---|---|
| $P_{st}$ | 1.0 | $P_{st:}$ short-term flicker severity. |
| $P_{lt}$ | 0.65 | $P_{lt:}$ long-term flicker severity. |
| $T_{max}$ (ms) | 500 | $T_{max:}$ maximum time duration during the observation period that the voltage deviation d(t) exceeds the limit for $d_c$ . |
| $d_{max}$ (%) | 4 | $d_{max:}$ maximum absolute voltage change during an observation period. |
| $d_c$ (%) | 3.3 | $d_{c:}$ maximum steady state voltage change during an observation period. |

### 10.2 Test Instruments

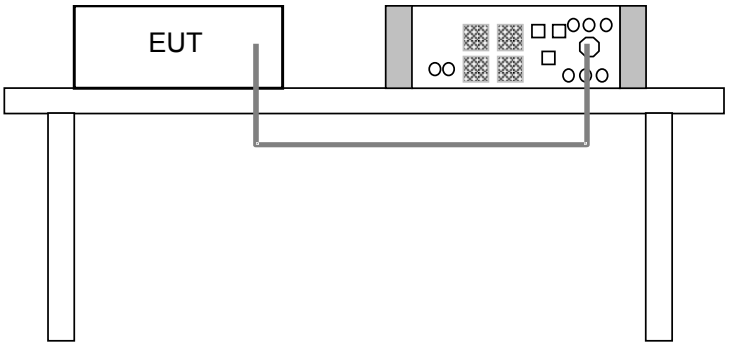
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| EMC PARTNER<br>EMC Emission Tester | HAR1000-1P | 084 | Apr. 20, 2016 | Apr. 19, 2017 |
| Software | HARCS | NA | NA | NA |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 1.
3. Tested Date: Dec. 5, 2016.

### 10.3 Test Arrangement

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 10.4 Test Results

| | | | |
|---|---|---|---|
| Observation ($T_p$) | 10 min. | Power Frequency | 50.000 Hz |
| Fundamental Voltage/Ampere | 229.9 Vrms / 0.705 Arms | Power Factor | 0.956 |
| Environmental Conditions | 27 °C, 73 % RH | Tested by | Ken Chen |
| Test Mode | Mode 1 | | |

| Test Parameter | Measurement Value | Limit | Remarks |
|---|---|---|---|
| $P_{st}$ | 0.072 | 1.00 | Pass |
| $P_{lt}$ | 0.072 | 0.65 | Pass |
| $T_{max}$ (ms) | 0 | 500 | Pass |
| $d_{max}$ (%) | 0 | 4 | Pass |
| $d_c$ (%) | 0.030 | 3.3 | Pass |

Note: (1) $P_{st}$ means short-term flicker indicator.
(2) $P_{lt}$ means long-term flicker indicator.
(3) $T_{max}$ means accumulated time value of d(t) with a deviation exceeding 3.3 %.
(4) $d_{max}$ means maximum relative voltage change.
(5) $d_c$ means maximum relative steady-state voltage change.

## 11 General Immunity Requirements

| EN 55024:2010, Immunity requirements | | | | |
|---|---|---|---|---|
| Clause | Reference standard | Table | Test specification | Performance Criterion |
| 4.2.1 | EN/IEC 61000-4-2 ESD | 1.3 | Enclosure port:<br>±8kV Air discharge, ±4kV Contact discharge | B |
| 4.2.3.2 | EN/IEC 61000-4-3 RS | 1.2 | Enclosure port:<br>80-1000 MHz, 3V/m, 80% AM (1kHz) | A |
| 4.2.2 | EN/IEC 61000-4-4 EFT | 2.3 | Signal ports and telecommunication ports:<br>xDSL equipment: ±0.5kV, 5/50 ($T_r$/$T_h$) ns, 100kHz<br>others: ±0.5kV, 5/50 ($T_r$/$T_h$) ns, 5kHz | B |
| | | 3.3 | Input DC power port: ±0.5kV, 5/50 ($T_r$/$T_h$) ns, 5kHz | |
| | | 4.5 | Input AC Power ports: ±1kV, 5/50 ($T_r$/$T_h$) ns, 5kHz | |
| 4.2.5 | EN/IEC 61000-4-5 Surge | 2.2 | Signal and telecommunication ports (direct to outdoor cables): 10/700 (5/320) ($T_r$/$T_h$) μs<br>w/o primary protectors: ±1kV, or<br>with primary protectors fitted: ±4kV | C |
| | | 3.2 | Input DC power port (direct to outdoor cables):<br>1.2/50 (8/20) ($T_r$/$T_h$) μs<br>Line to earth: ±0.5kV | B |
| | | 4.4 | Input AC Power ports: 1.2/50 (8/20) ($T_r$/$T_h$) μs,<br>Line to line: ±1kV<br>Line to earth: ±2kV | |
| 4.2.3.3 | EN/IEC 61000-4-6 CS | 2.1 | Signal and telecommunication ports(cable length > 3m): 0.15-80 MHz, 3V, 80% AM (1kHz) | A |
| | | 3.1 | Input DC power port: 0.15-80 MHz, 3V, 80% AM (1kHz) | |
| | | 4.1 | Input AC Power ports: 0.15-80 MHz, 3V, 80% AM (1kHz) | |
| 4.2.4 | EN/IEC 61000-4-8 PFMF | 1.1 | Enclosure port:<br>50 or 60 Hz, 1A/m | A |
| 4.2.6 | EN/IEC 61000-4-11 Dips & Interruptions | 4.2 | Input AC Power ports:<br>Voltage Dips:<br>>95% reduction – 0.5 period<br>30% reduction – 25 periods | B<br>C |
| | | 4.3 | Input AC Power ports:<br>Voltage Interruptions:<br>>95% reduction – 250 periods | C |

## 11.1 Performance Criteria

**General Performance Criteria**

Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion B

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

**Particular performance criteria**

The particular performance criteria which are specified in the normative annexes of EN 55024 take precedence over the corresponding parts of the general performance criteria. Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

## 12 Electrostatic Discharge Immunity Test (ESD)

### 12.1 Test Specification

| | |
|---|---|
| **Basic Standard:** | EN/IEC 61000-4-2 |
| **Discharge Impedance:** | 330 ohm / 150 pF |
| **Discharge Voltage:** | Air Discharge: ±2, ±4, ±8kV (Direct)<br>Contact Discharge: ±2, ±4kV (Direct/Indirect) |
| **Number of Discharge:** | Air – Direct: 10 discharges per location (each polarity)<br>Contact – Direct & Indirect: 25 discharges per location (each polarity) and min. 200 times in total |
| **Discharge Mode:** | Single Discharge |
| **Discharge Period:** | 1-second minimum |

### 12.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| KeyTek, ESD Simulator | MZ-15/EC | 1203252 | Jul. 28, 2016 | Jul. 27, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in ESD Room No. 2.
3. Tested Date: Dec. 6, 2016.

### 12.3 Test Arrangement

The discharges shall be applied in two ways:

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, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

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

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN/IEC 61000-4-2:

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

g. At least ten single discharges (in the most sensitive polarity) were applied to the **H**orizontal **C**oupling **P**lane at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP.**

h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

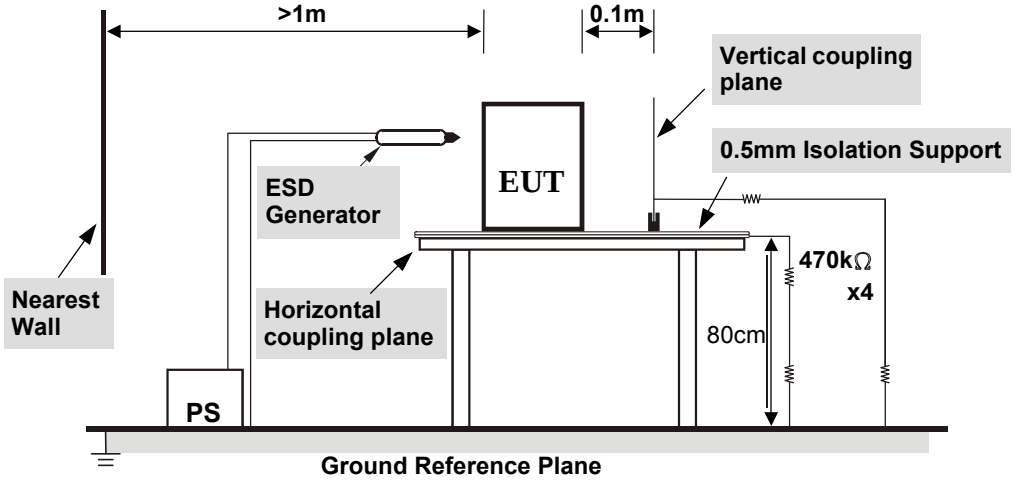



TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN/IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 12.4 Test Results

| Input Power | 230 Vac, 50 Hz | Tested by | Ken Chen |
|---|---|---|---|
| Environmental Conditions | 23 °C, 51% RH<br>1015 mbar | Test mode | Mode 1 |

| Test Results of Direct Application | | | | | |
|---|---|---|---|---|---|
| Discharge Level (kV) | Polarity (+/-) | Test Point | Contact Discharge | Air Discharge | Performance Criterion |
| 2 | +/- | 1-5 | Note 1 | NA | A |
| 4 | +/- | 1-5 | Note 2, 3 | NA | B |
| 2, 4, 8 | +/- | 7 | NA | Note 1 | A |
| 2, 4 | +/- | 6, 8 | NA | Note 1 | A |
| 8 | +/- | 6, 8 | NA | Note 2 | B |

Description of test points of direct application: Please refer to following page for representative mark only.

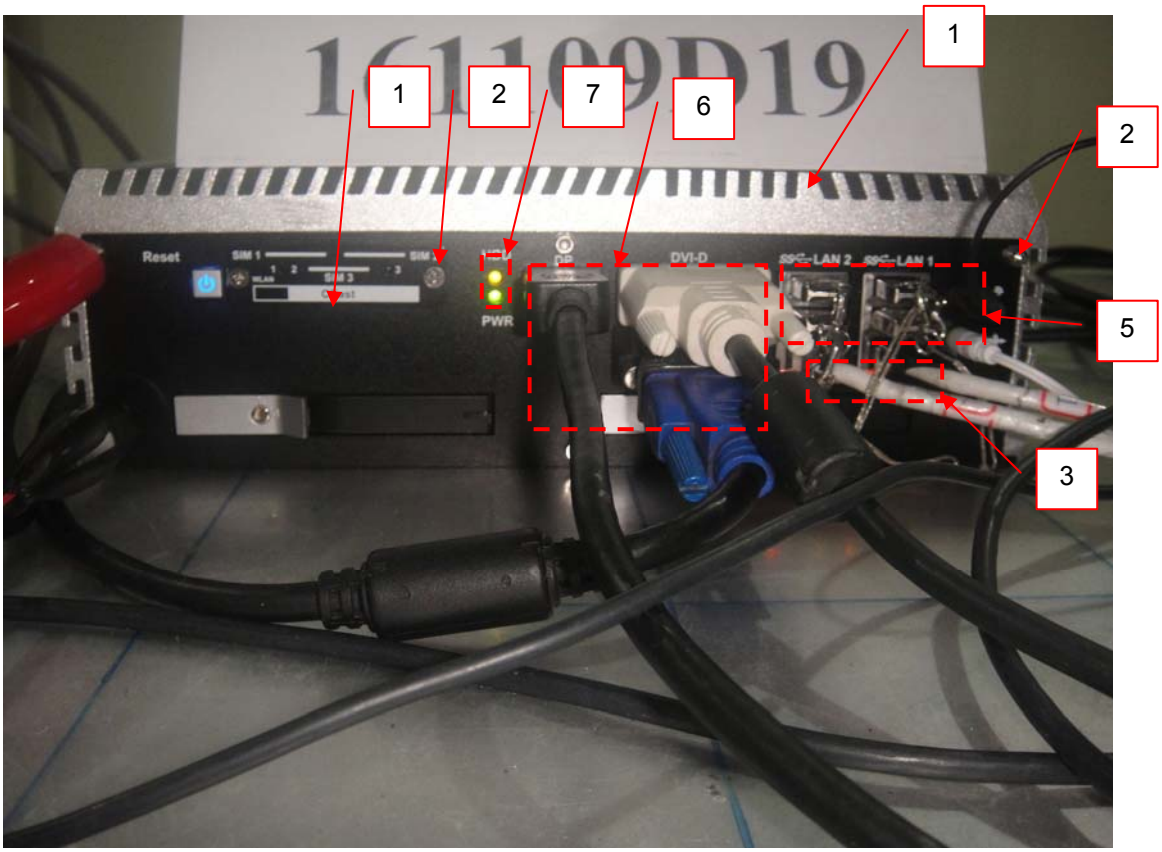
| Test Results of Indirect Application | | | | | |
|---|---|---|---|---|---|
| Discharge Level (kV) | Polarity (+/-) | Test Point | Horizontal Coupling Plane | Vertical Coupling Plane | Performance Criterion |
| 2 | +/- | Four Sides | Note 1 | Note 1 | A |
| 4 | +/- | Four Sides | Note 2 | Note 2 | B |

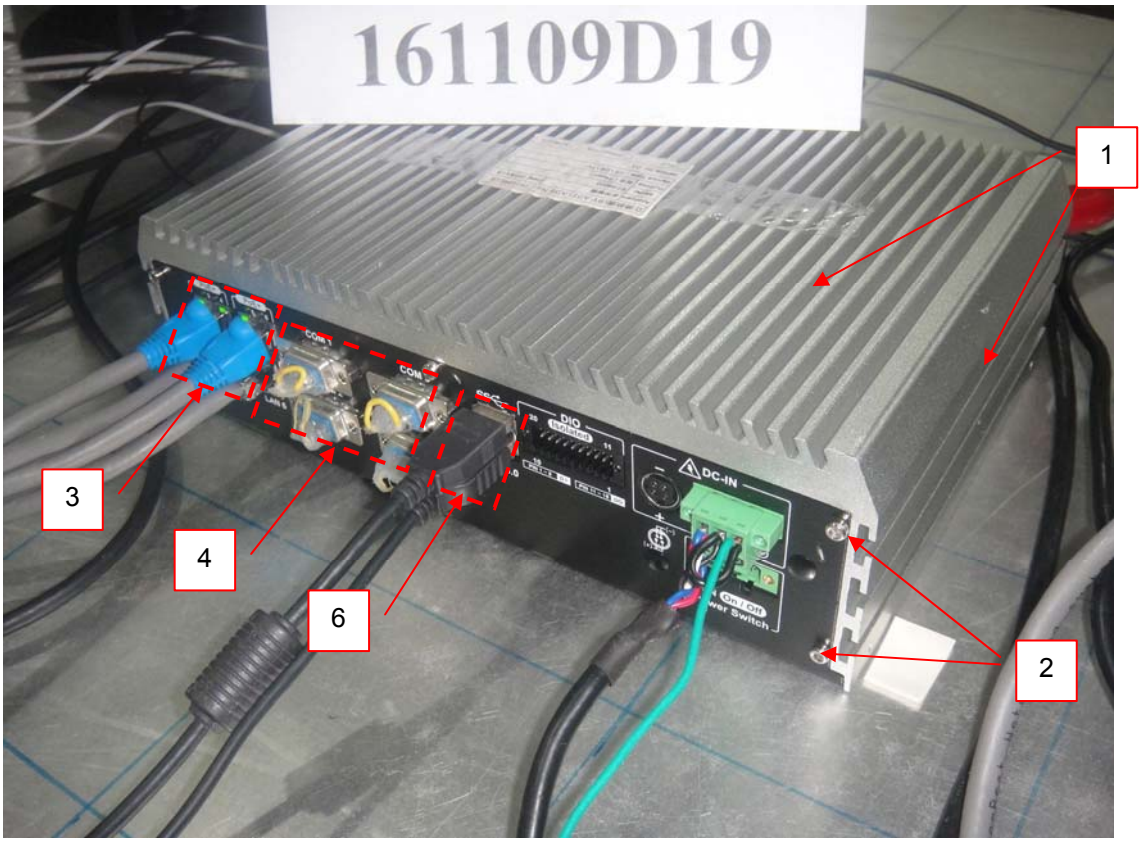
Description of test points of indirect application:

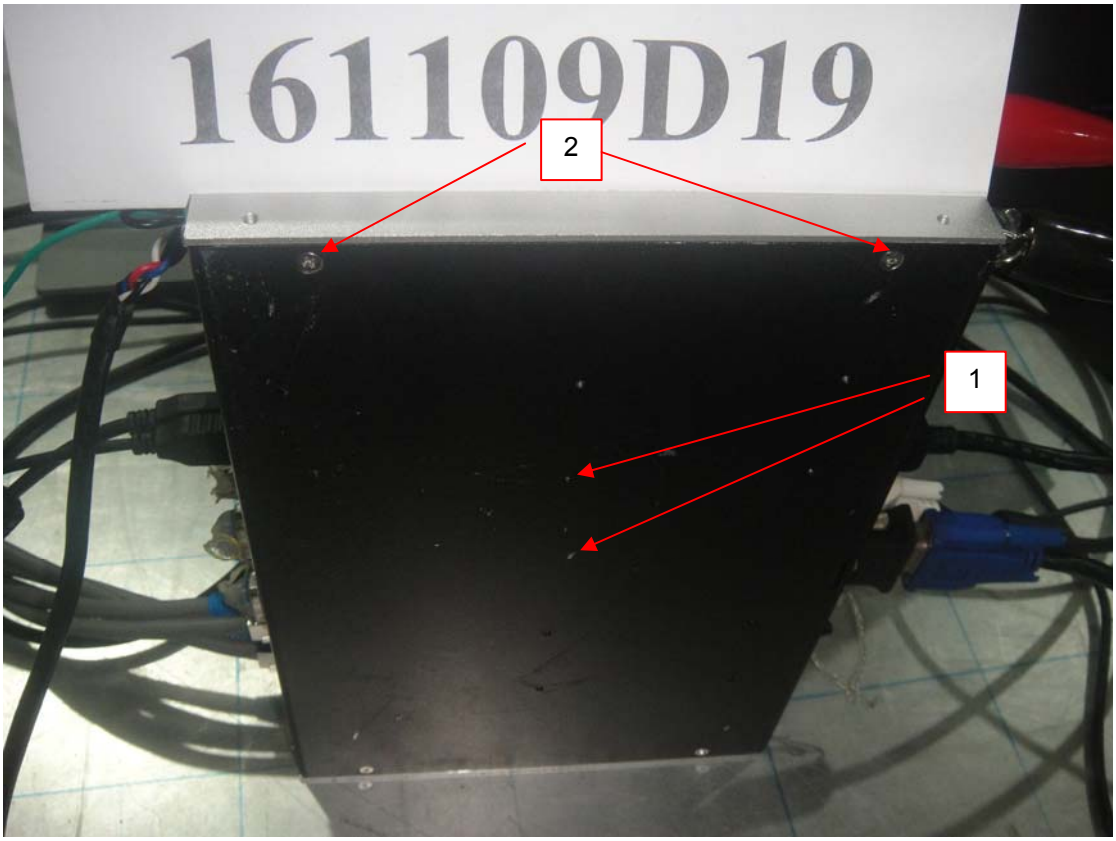
1. Front side 2. Rear side 3. Right side 4. Left side

Note: 1. The EUT function was correct during the test.
2. There was flicker disturbance on screen during the test, but self-recoverable after the test.
3. The LAN transmission was timeout during the test, but self-recoverable after the test.

Description of Test Points




161109D19
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1


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8

## 13 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

### 13.1 Test Specification

| | |
|---|---|
| Basic Standard: | EN/IEC 61000-4-3 |
| Frequency Range: | 80 MHz - 1000 MHz |
| Field Strength: | 3 V/m |
| Modulation: | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step: | 1 % of preceding frequency value |
| Polarity of Antenna: | Horizontal and Vertical |
| Antenna Height: | 1.5m |
| Dwell Time: | 3 seconds |

### 13.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| Agilent<br>Signal Generator | E8257D | MY48050465 | Jul. 20, 2016 | Jul. 19, 2017 |
| PRANA<br>RF Amplifier | AP32DP280 | 0811-894 | NA | NA |
| TESEQ RF Amplifier | CBA1G-150 | T44220 | NA | NA |
| AR RF Amplifier | 35S4G8AM4 | 0326094 | NA | NA |
| AR RF Amplifier | 100S1G4M3 | 0329249 | NA | NA |
| AR Controller | SC1000M3 | 305910 | NA | NA |
| Narda<br>Broadband Field Meter | NBM-550 | B-0872 | Feb. 09, 2016 | Feb. 08, 2018 |
| BOONTON<br>RF Voltage Meter | 4232A | 10180 | Jun. 01, 2016 | May 31, 2017 |
| BOONTON Power Sensor | 51013-4E | 34870 | Jun. 01, 2016 | May 31, 2017 |
| BOONTON Power Sensor | 51013-4E | 34873 | Jun. 01, 2016 | May 31, 2017 |
| AR<br>Log-Periodic Antenna | AT6080 | 0329465 | NA | NA |
| EMCO<br>BiconiLog Antenna | 3141 | 1001 | NA | NA |
| AR<br>High Gain Antenna | AT4002A | 306533 | NA | NA |
| AR<br>High Gain Horn Antenna | AT4010 | 0329800 | NA | NA |
| CHANCE MOST<br>Full Anechoic<br>Chamber (9x5x3m) | Chance Most | RS-002 | Feb. 05, 2016 | Feb. 04, 2017 |
| Software | RS_V7.6 | NA | NA | NA |

Notes: 1. The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in RS Room No.2.
3. Tested Date: Dec. 9, 2016.

### 13.3 Test Arrangement

The test procedure was in accordance with EN/IEC 61000-4-3.

a. The testing was performed in a modified semi-anechoic chamber.

b. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The field strength level was 3 V/m.

d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

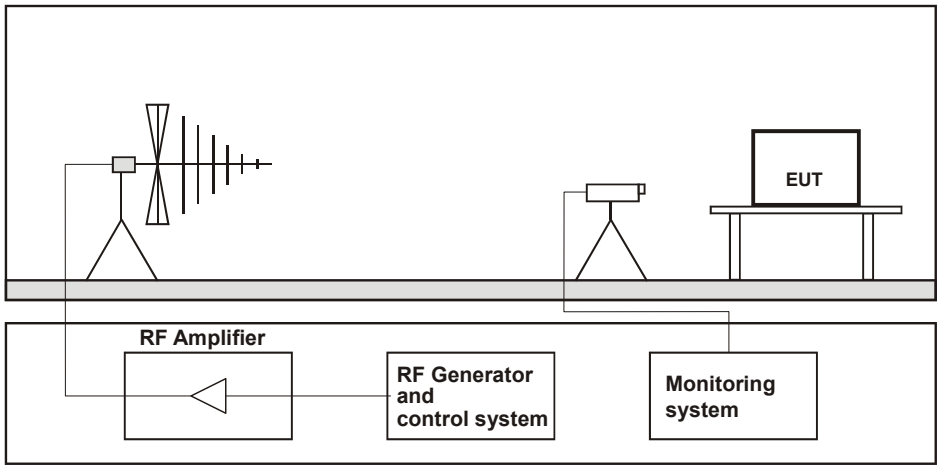



Table-top Equipment

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 13.4 Test Results

| | | | |
|---|---|---|---|
| Input Power | 230 Vac, 50 Hz | Tested by | Ken Chen |
| Environmental Conditions | 24 °C, 68% RH | Test mode | Mode 1 |

| Frequency (MHz) | Polarity | Azimuth(°) | Applied Field Strength | | Observation | Performance Criterion |
|---|---|---|---|---|---|---|
| | | | (V/m) | Modulation | | |
| 80 -1000 | V&H | 0 | 3 | 80% AM (1kHz) | Note | A |
| 80 -1000 | V&H | 90 | 3 | 80% AM (1kHz) | Note | A |
| 80 -1000 | V&H | 180 | 3 | 80% AM (1kHz) | Note | A |
| 80 -1000 | V&H | 270 | 3 | 80% AM (1kHz) | Note | A |

Note: The EUT function was correct during the test.

## 14 Electrical Fast Transient/Burst Immunity Test (EFT)

### 14.1 Test Specification

| | |
|---|---|
| Basic Standard: | EN/IEC 61000-4-4 |
| Test Voltage: | Signal / telecommunication port: ±0.5kV<br>Input DC power port: N/A<br>Input AC power port: ±1kV |
| Impulse Repetition Frequency: | xDSL telecommunication port: 100kHz<br>others: 5kHz |
| Impulse Wave Shape: | 5/50 ns |
| Burst Duration: | 0.75 ms for 100kHz Repetition Frequency<br>15 ms for 5kHz Repetition Frequency |
| Burst Period: | 300 ms |
| Test Duration: | 1 min. |

### 14.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| Haefely, EFT Generator | PEFT 4010 | 154954 | Apr. 20, 2016 | Apr. 19, 2017 |
| Haefely,Capacitive Clamp | IP4A | 155173 | Apr. 20, 2016 | Apr. 19, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EFT Room.
3. Tested Date: Dec. 5, 2016.

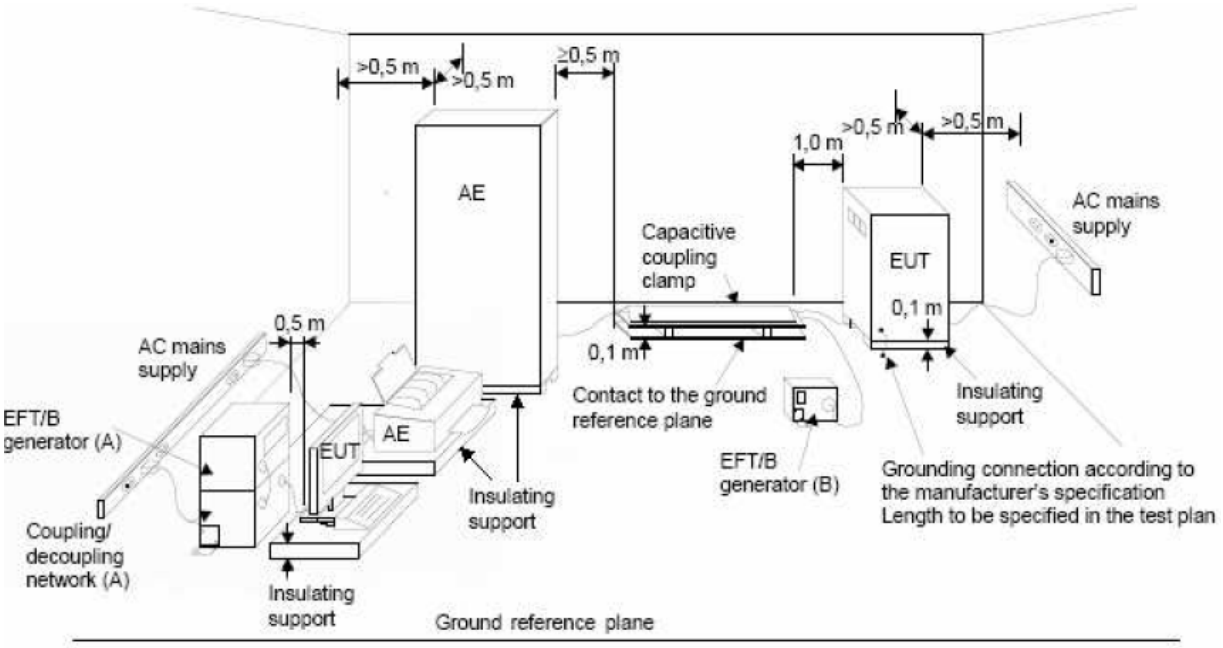
### 14.3 Test Arrangement

a. Both positive and negative polarity discharges were applied.

b. The distance between any coupling devices and the EUT should be 0.5 m for table-top equipment testing, and 1.0 m for floor standing equipment.

c. The duration time of each test sequential was 1 minute.

d. The transient/burst waveform was in accordance with EN/IEC 61000-4-4, 5/50 ns.




**NOTE:**
(A) location for supply line coupling
(B) location for signal lines coupling

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 14.4 Test Results

| | | | |
|---|---|---|---|
| Input Power | 230 Vac, 50 Hz | Tested by | Ken Chen |
| Environmental Conditions | 25 °C, 71% RH | Test mode | Mode 1 |

Input AC power port

| Voltage (kV) | Test Point | Polarity (+/-) | Observation | Performance Criterion |
|---|---|---|---|---|
| 1 | L1 | +/- | Note | A |
| 1 | L2 | +/- | Note | A |
| 1 | PE | +/- | Note | A |
| 1 | L1-L2-PE | +/- | Note | A |

Telecommunication port

| Voltage (kV) | Test Point | Polarity (+/-) | Observation | Performance Criterion |
|---|---|---|---|---|
| 0.5 | LAN | +/- | Note | A |
| 0.5 | PoE LAN | +/- | Note | A |

Note: The EUT function was correct during the test.

## 15 Surge Immunity Test

### 15.1 Test Specification

| | |
|---|---|
| Basic Standard: | EN/IEC 61000-4-5 |
| Wave-Shape: | Signal / telecommunication port (direct to outdoor cables*):<br>10/700 μs Open Circuit Voltage<br>5/320 μs Short Circuit Current |
| | Input DC power port (direct to outdoor cables*):<br>1.2/50 μs Open Circuit Voltage<br>8/20 μs Short Circuit Current |
| | Input AC power port:<br>1.2/50 μs Open Circuit Voltage<br>8/20 μs Short Circuit Current |
| Test Voltage: | Signal and telecommunication ports**:<br>w/o primary protectors: N/A,<br>with primary protectors fitted: N/A |
| | Input DC power port:<br>Line to earth or ground:N/A |
| | Input AC power ports:<br>Line to line: ±0.5kV, ±1kV,<br>Line to earth or ground: ±0.5kV, ±1kV, ±2kV |
| AC Phase Angle (degree): | 0°, 90°, 180°, 270° |
| Pulse Repetition Rate: | 1 time / 20 sec. |
| Number of Tests: | 5 positive and 5 negative at selected points |

* This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables.

** For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors fitted. Otherwise the 1 kV test level is applied without primary protection in place.

### 15.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| TESEQ, Surge Simulator | NSG 3060 | 1572 | May 19, 2016 | May 18, 2017 |
| Coupling Decoupling Network | CDN-UTP8 | 028 | Aug. 22, 2016 | Aug. 21, 2017 |
| TESEQ<br>Coupling Decoupling Network | CDN HSS-2 | 41009 | May 21, 2016 | May 20, 2017 |
| TESEQ<br>Coupling Decoupling Networ | CDN 118-T8 | 40386 | Sep. 09, 2016 | Sep. 08, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 2.
3. Tested Date: Dec. 14, 216.

### 15.3 Test Arrangement

a. Input AC/DC Power ports:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

For double-insulated products without PE or external earth connections, the test shall be done in a similar way as for grounded products but without adding any additional external grounded connections. If there are no other possible connections to earth, line-to-ground tests may be omitted.

b. Signal and telecommunication ports,

- Unshielded unsymmetrical interconnection lines:

The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length.

- Unshielded symmetrical interconnections communication lines:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length.

- High speed communications lines

Prior to the test, the correct operation of the port shall be verified; the external connection shall then be removed and the surge applied directly to the port's terminals with no coupling /decoupling network. After the surge, the correct operation of the port shall again be verified.

- Shielded lines:

- Direct application,

The EUT is isolated from ground and the surge is applied to its metallic enclosure; the termination (or auxiliary equipment) at the port(s) under test is grounded. This test applies to equipment with single or multiple shielded cables.

Rules for application of the surge to shielded lines:

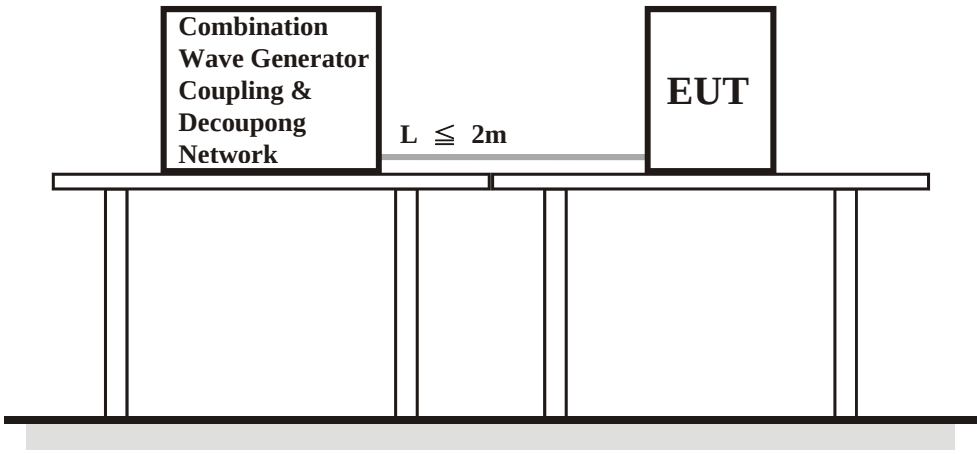
a) Shields grounded at both ends
- The surge injection on the shield.

b) Shields grounded at one end
- If in the installation the shield is connected only at the auxiliary equipment, test shall be done in that configuration but with the generator still connected to the EUT side. If cable lengths allow, the cables shall be on insulated supports 0,1 m above the ground plane or cable tray.

For products which do not have metallic enclosures, the surge is applied directly to the shielded cable.

- Alternative coupling method for testing single cables in a multi-shield configuration,

Surges are applied in close proximity to the interconnection cable under test by a wire. The length of the cable between the port(s) under test and the device attached to the other end of the cable shall be the lesser of: the maximum length permitted by the EUT's specification, or 20 m. Where the length exceeds 1 m, excess lengths of cables shall be bundled at the approximate centre of the cables with the bundles 30 cm to 40 cm in length.




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 15.4 Test Results

| | | | |
|---|---|---|---|
| Input Power | 230 Vac, 50 Hz | Tested by | Joey Liu |
| Environmental Conditions | 25 °C, 56% RH | Test mode | Mode 1 |

Input AC power port

| Voltage (kV) | Test Point | Polarity (+/-) | Observation | Performance Criterion |
|---|---|---|---|---|
| 0.5, 1 | L1-L2 | +/- | Note | A |
| 0.5, 1, 2 | L1-PE | +/- | Note | A |
| 0.5, 1, 2 | L2-PE | +/- | Note | A |

Note: The EUT function was correct during the test.

## 16 Immunity to Conducted Disturbances Induced by RF Fields (CS)

### 16.1 Test Specification

| | |
|---|---|
| Basic Standard: | EN/IEC 61000-4-6 |
| Frequency Range: | 0.15 MHz - 80 MHz |
| Voltage Level: | 3 V |
| Modulation: | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step: | 1 % of preceding frequency value |
| Dwell Time | 3 seconds |

### 16.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| ROHDE & SCHWARZ Signal Generator | SML03 | 101801 | Jan. 07, 2016 | Jan. 06, 2017 |
| Digital Sweep Function Generator | 8120 | 984801 | NA | NA |
| AR Power Amplifier | 75A250AM1 | 306331 | NA | NA |
| FCC Coupling Decoupling Network | FCC-801-M3-25A | 48 | Jun. 23, 2016 | Jun. 22, 2017 |
| FCC Coupling Decoupling Network | FCC-801-M2-16A | 01047 | Jun. 23, 2016 | Jun. 22, 2017 |
| FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp | F-203I-23mm | 455 | NA | NA |
| FISCHER CUSTOM COMMUNICATIONS Current Injection Clamp | F-120-9A | 361 | Feb. 15, 2016 | Feb. 14, 2017 |
| B&K Ear Simulator | 4185 | 2553594 | NA | NA |
| EM TEST Coupling Decoupling Network | CDN M1/32A | 306508 | Jun. 23, 2016 | Jun. 22, 2017 |
| TESEQ Coupling Decoupling Network | CDN T800 | 34428 | Jun. 23, 2016 | Jun. 22, 2017 |
| FCC Coupling Decoupling Network | FCC-801-T4 | 02031 | Jun. 23, 2016 | Jun. 22, 2017 |
| EM TEST Coupling Decoupling Network | CDN T2 | 306509 | Jun. 23, 2016 | Jun. 22, 2017 |
| R&S Power Sensor | NRV-Z5 | 837878/039 | Oct. 27, 2016 | Oct. 26, 2017 |
| R&S Power Meter | NRVD | 837794/040 | Oct. 27, 2016 | Oct. 26, 2017 |
| TESEQ Coupling Decoupling Network | CDN M232 | 37702 | Aug. 16, 2016 | Aug. 15, 2017 |
| TESEQ Coupling Decoupling Network | CDN M332 | 41258 | Aug. 16, 2016 | Aug. 15, 2017 |
| TESEQ Coupling Decoupling Network | CDN M332 | 41256 | Aug. 11, 2016 | Aug. 10, 2017 |
| TESEQ Coupling Decoupling Network | CDN T400A | 28569 | Aug. 11, 2016 | Aug. 10, 2017 |
| TESEQ Coupling Decoupling Network | CDN T8-10 | 40376 | Aug. 11, 2016 | Aug. 10, 2017 |
| Software | CS_V7.4.2 | NA | NA | NA |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in CS Room No. 1.
3. Tested Date: Dec. 8, 2016.

### 16.3 Test Arrangement

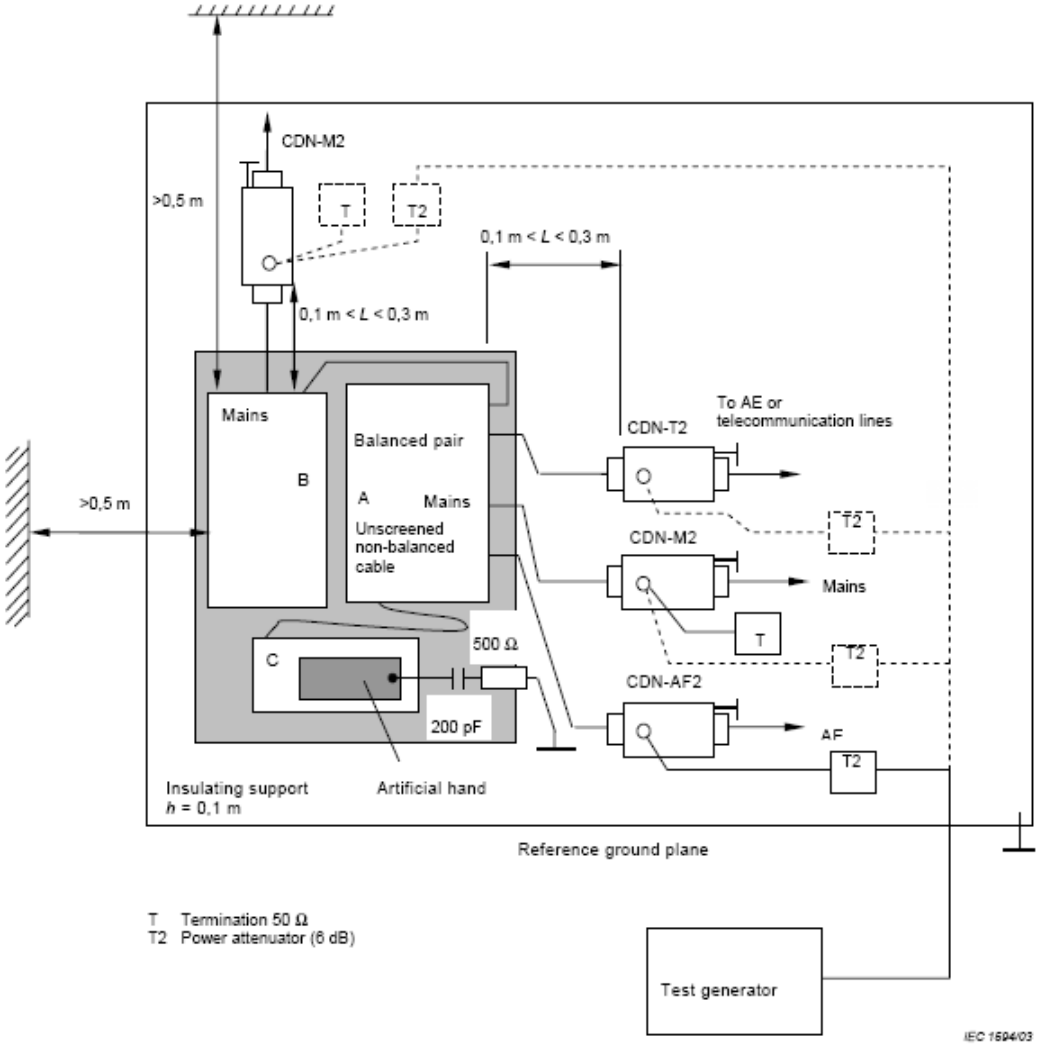
a. The EUT shall be tested within its intended operating and climatic conditions.

b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.

c. One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.

d. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.

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




**Note:** 1.The EUT clearance from any metallic obstacles shall be at least 0,5 m.
2. Interconnecting cables（≦1 m) belonging to the EUT shall remain on the insulating support.
3. The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 16.4 Test Results

| Input Power | 230 Vac, 50 Hz | Tested by | Ken Chen |
|---|---|---|---|
| Environmental Conditions | 24 °C, 69% RH | Test mode | Mode 1 |

| Frequency (MHz) | Level (Vrms) | Tested Line | Injection Method | Return Path | Observation | Performance Criterion |
|---|---|---|---|---|---|---|
| 0.15 – 80 | 3 | AC Power | CDN-M3 | CDN-T8 | Note | A |
| 0.15 – 80 | 3 | LAN | CDN-T8 | CDN-M3 | Note | A |
| 0.15 – 80 | 3 | PoE LAN | EM-Clamp | CDN-M3 | Note | A |

Note: The EUT function was correct during the test.

## 17 Power Frequency Magnetic Field Immunity Test

### 17.1 Test Specification

| | |
|---|---|
| Basic Standard: | EN/IEC 61000-4-8 |
| Frequency Range: | 50Hz |
| Field Strength: | 1 A/m |
| Observation Time: | 1 minute |
| Inductance Coil: | Rectangular type, 1 m x 1 m |

### 17.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| HAEFELY Magnetic Field Tester | MAG 100 | 083794-06 | NA | NA |
| COMBINOVA Magnetic Field Meter | MFM10 | 224 | Apr. 21, 2016 | Apr. 20, 2017 |

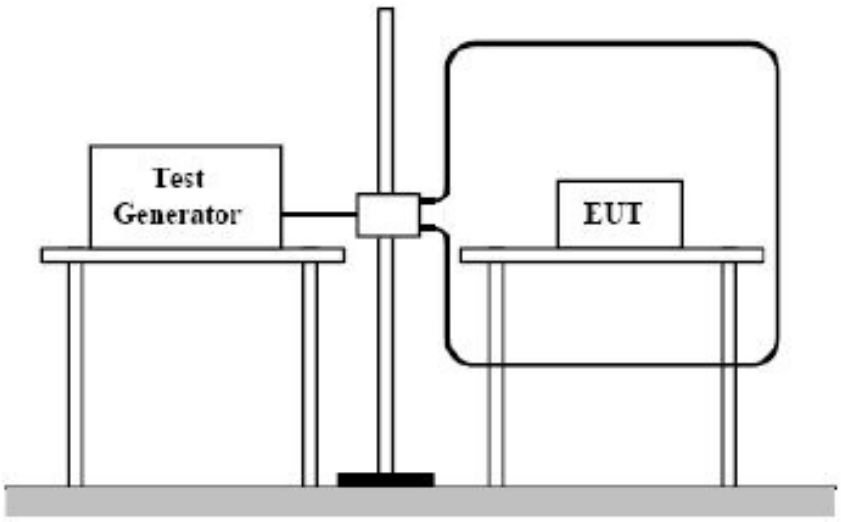
Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 1
3. Tested Date: Dec. 5, 2016.

### 17.3 Test Arrangement

a. The equipment is configured and connected to satisfy its functional requirements.

b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

c. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.




TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 17.4 Test Results

| Input Power | 230 Vac, 50 Hz | Tested by | Ken Chen |
|---|---|---|---|
| Environmental Conditions | 24 °C, 69% RH | Test mode | Mode 1 |

| Application | Frequency (Hz) | Field Strength (A/m) | Observation | Performance Criterion |
|---|---|---|---|---|
| X - Axis | 50 | 1 | Note | A |
| Y - Axis | 50 | 1 | Note | A |
| Z - Axis | 50 | 1 | Note | A |

Note: The EUT function was correct during the test.

## 18 Voltage Dips and Interruptions

### 18.1 Test Specification

| | |
|---|---|
| Basic Standard: | EN/IEC 61000-4-11 |
| Test levels: | Voltage Dips:<br>>95% reduction – 0.5 period<br>30% reduction – 25 periods<br>Voltage Interruptions:<br>>95% reduction – 250 periods |
| Interval between Event: | Minimum ten seconds |
| Sync Angle (degrees): | 0° / 180° |
| Test Cycle: | 3 times |

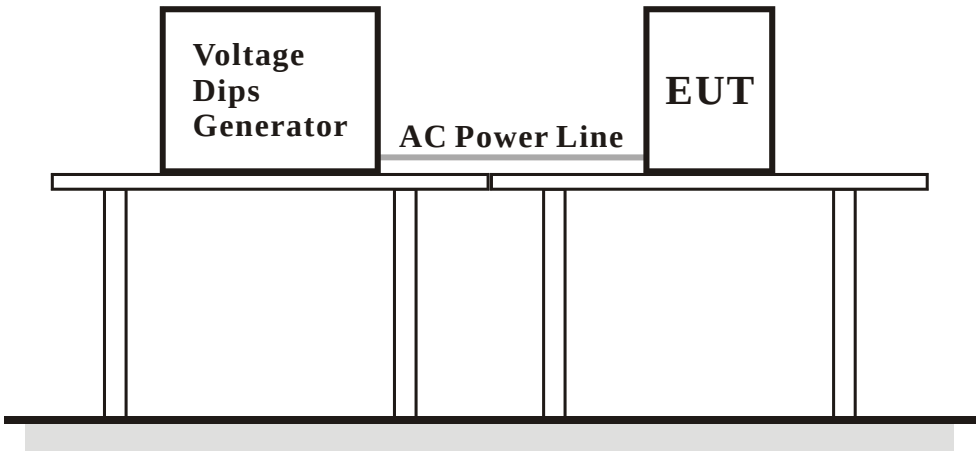
### 18.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| KeyTek, PQF Generator | EMC Pro | 9902207 | May 12, 2016 | May 11, 2017 |

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS Room No. 1.
3. Tested Date: Dec. 5, 2016.

### 18.3 Test Arrangement

The EUT shall be tested for each selected combination of test levels and duration with a sequence of 3 dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at 0 dregee crossover point of the voltage waveform.




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 18.4 Test Results

| | | | |
|---|---|---|---|
| Input Power | 230 Vac, 50 Hz<br>240 Vac, 50 Hz<br>100 Vac, 50 Hz | Tested by | Ken Chen |
| Environmental Conditions | 24 °C, 69% RH | Test mode | Mode 1 |

| Input Power for testing: 230 Vac, 50 Hz (Nominal input Voltage) | | | | | |
|---|---|---|---|---|---|
| Voltage Reduction (%) | Duration (period) | Interval (sec) | Times | Observation | Performance Criterion |
| >95 | 0.5 | 10 | 3 | Note 1 | A |
| 30 | 25 | 10 | 3 | Note 1 | A |
| >95 | 250 | 10 | 3 | Note 2 | C |

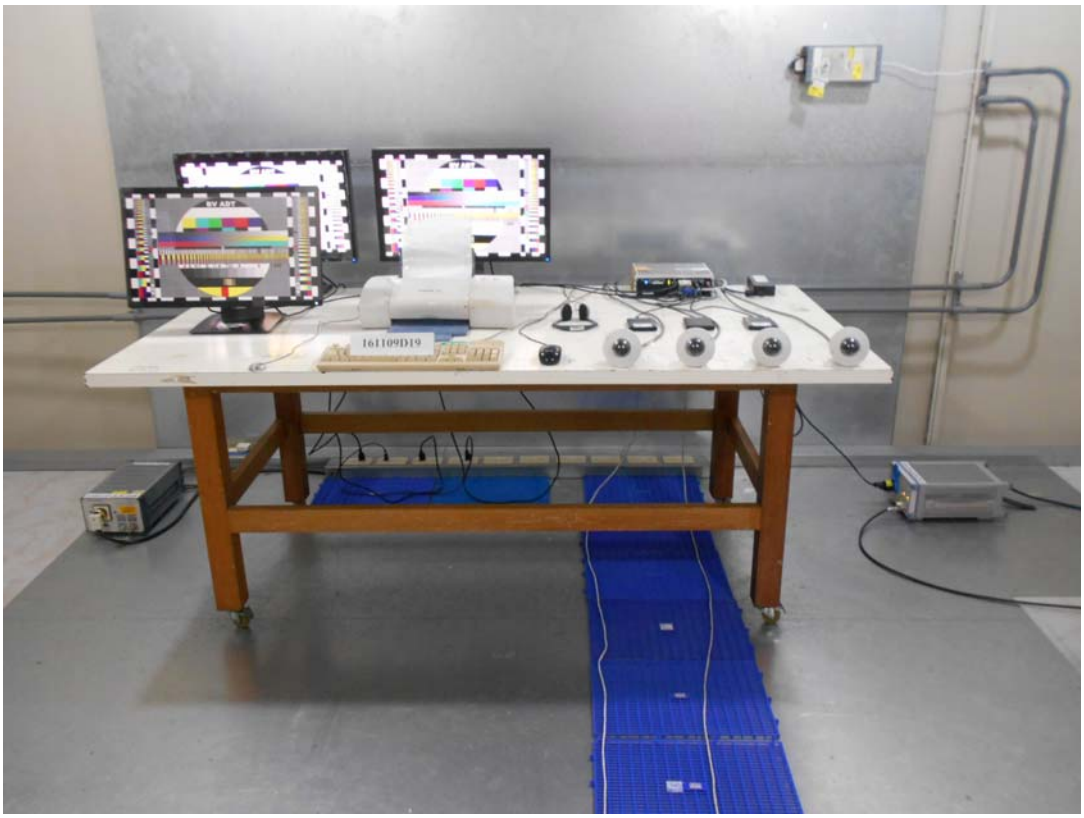
| Input Power for testing: 240 Vac, 50 Hz (Maximum rated input voltage) | | | | | |
|---|---|---|---|---|---|
| Voltage Reduction (%) | Duration (period) | Interval (sec) | Times | Observation | Performance Criterion |
| >95 | 0.5 | 10 | 3 | Note 1 | A |
| 30 | 25 | 10 | 3 | Note 1 | A |
| >95 | 250 | 10 | 3 | Note 2 | C |

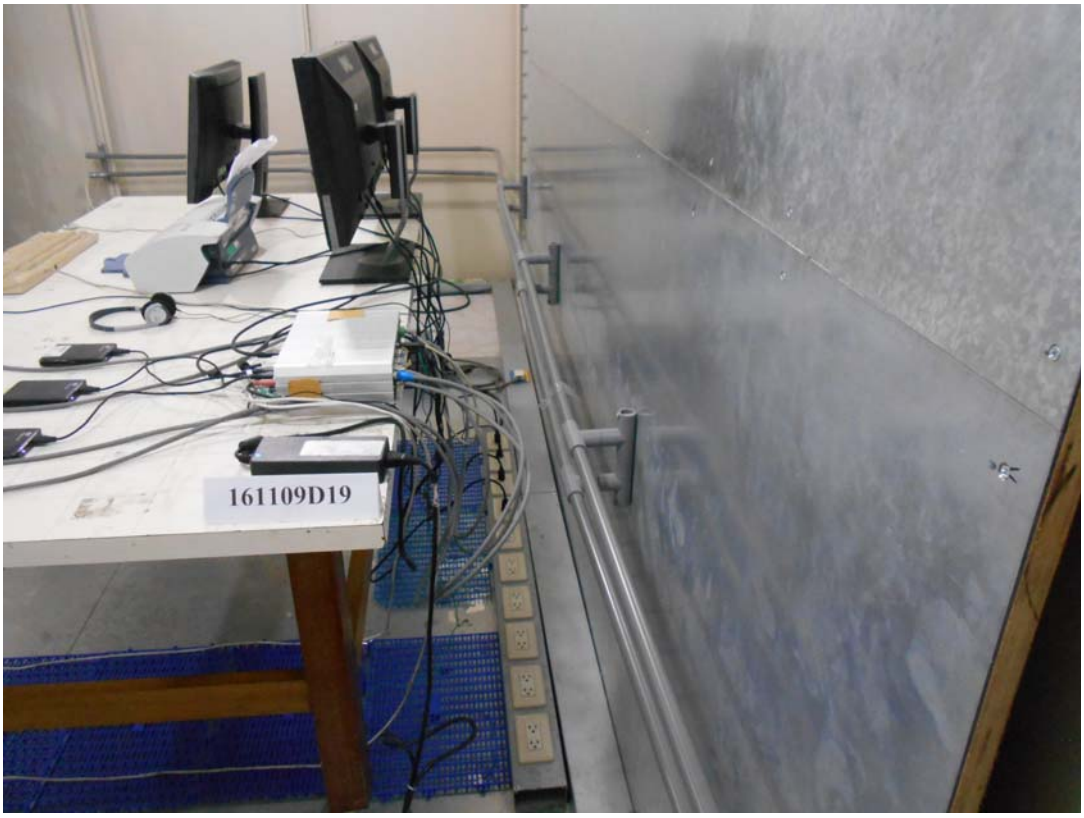
| Input Power for testing: 100 Vac, 50 Hz (Minimum rated input voltage) | | | | | |
|---|---|---|---|---|---|
| Voltage Reduction (%) | Duration (period) | Interval (sec) | Times | Observation | Performance Criterion |
| >95 | 0.5 | 10 | 3 | Note 1 | A |
| 30 | 25 | 10 | 3 | Note 1 | A |
| >95 | 250 | 10 | 3 | Note 2 | C |

Note: 1. The EUT function was correct during the test.
2. The EUT shut down but could be restored by the operator.

## 19 Pictures of Test Arrangements

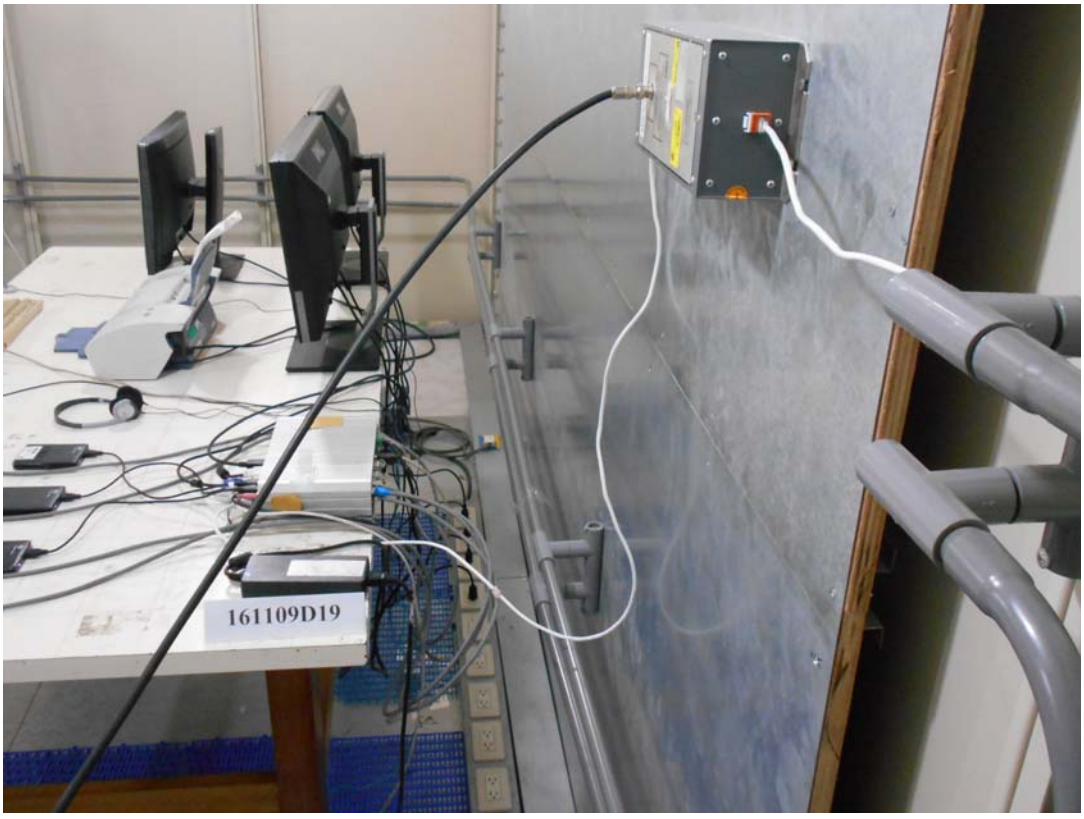
### 19.1 Conducted Emission from the AC Mains Power Port



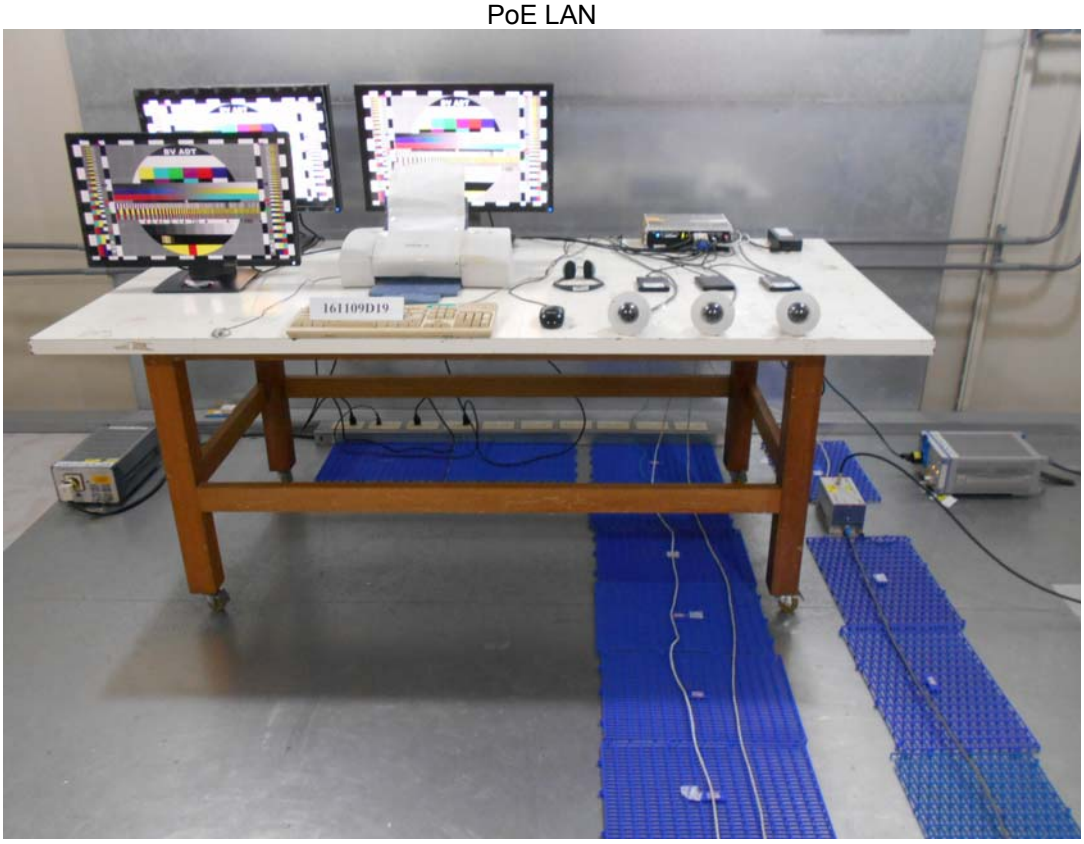



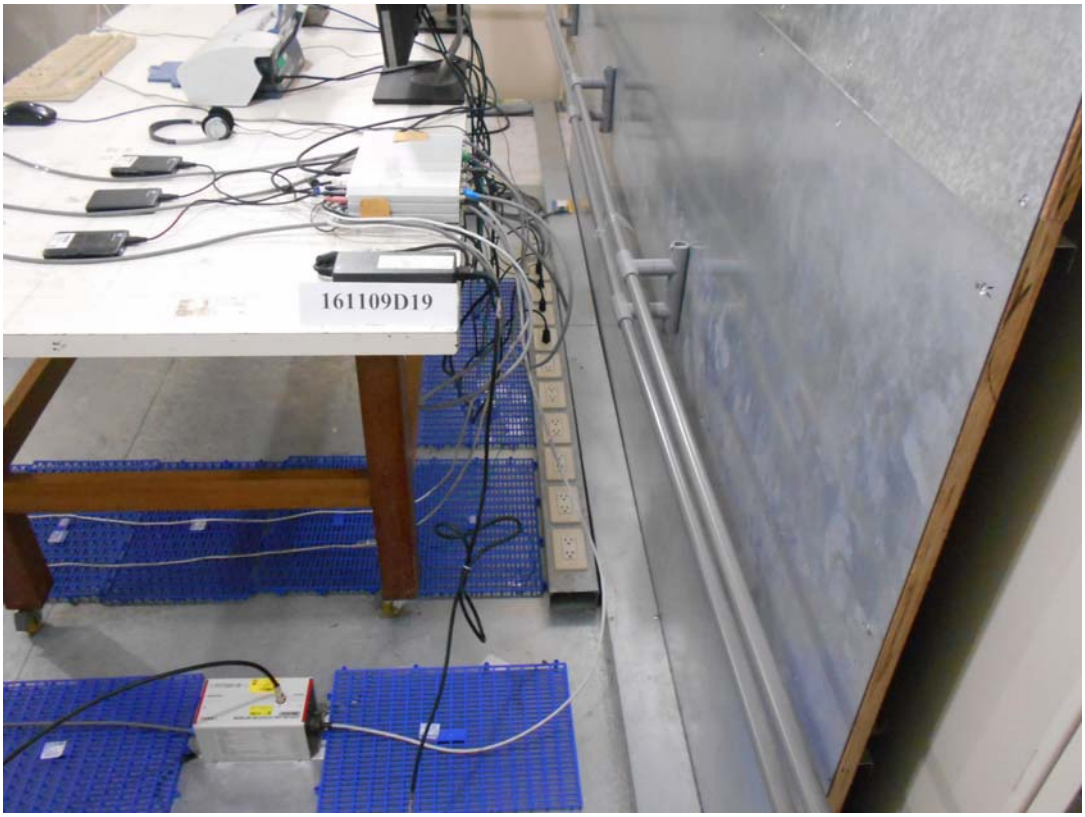
## 19.2 Asymmetric Mode Conducted Emission at Telecommunication Ports

LAN

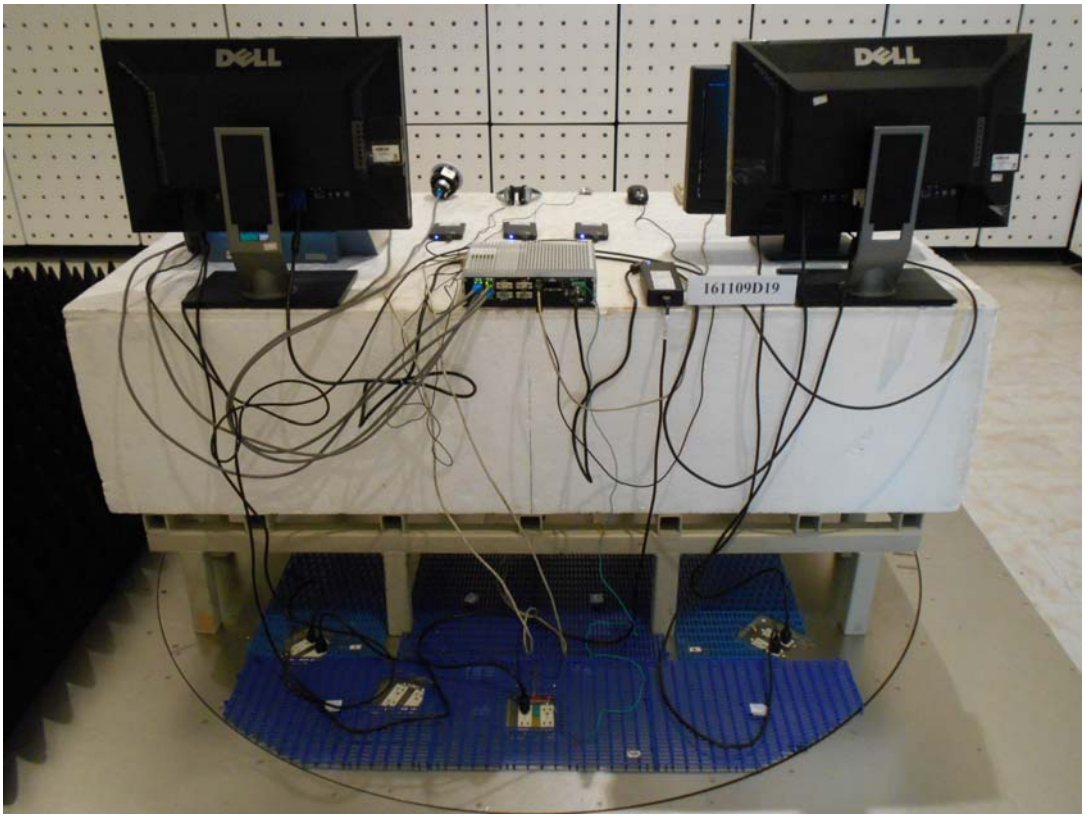
PoE LAN



## 19.3 Radiated Emission at Frequencies up to 1GHz

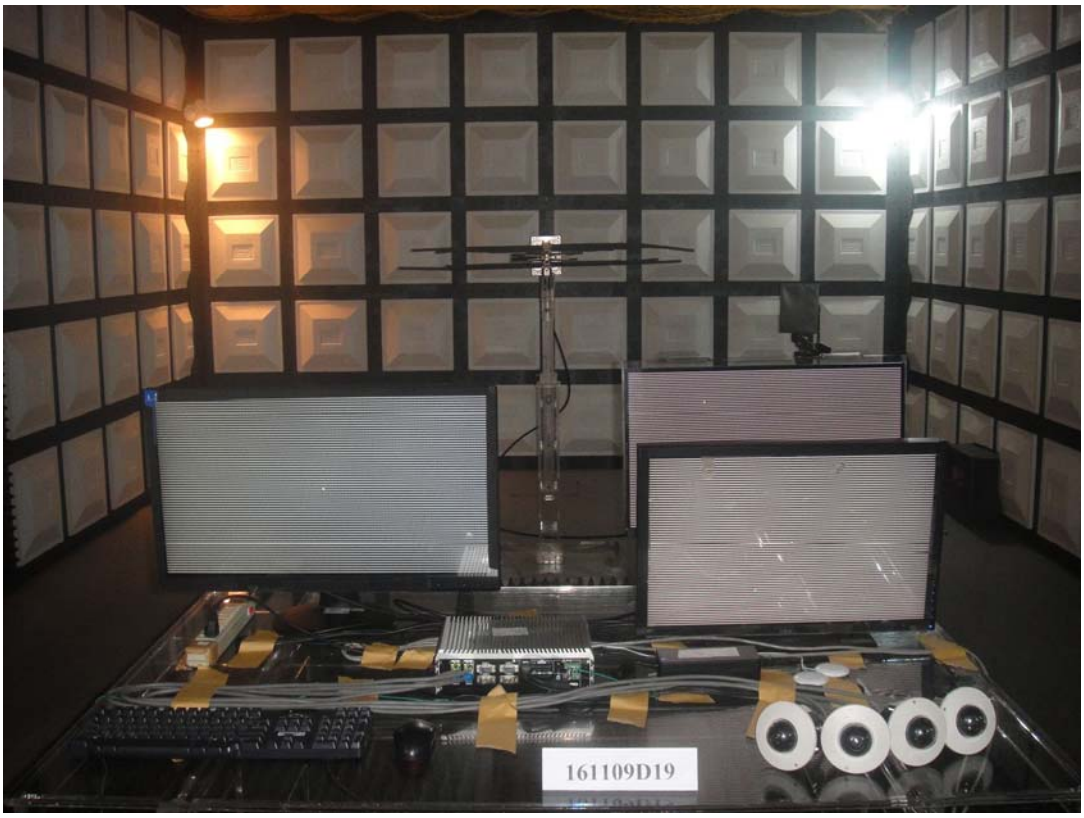

## 19.4 Radiated Emission at Frequencies above 1GHz

## 19.5 Harmonics Current, Voltage Fluctuations and Flicker Measurement

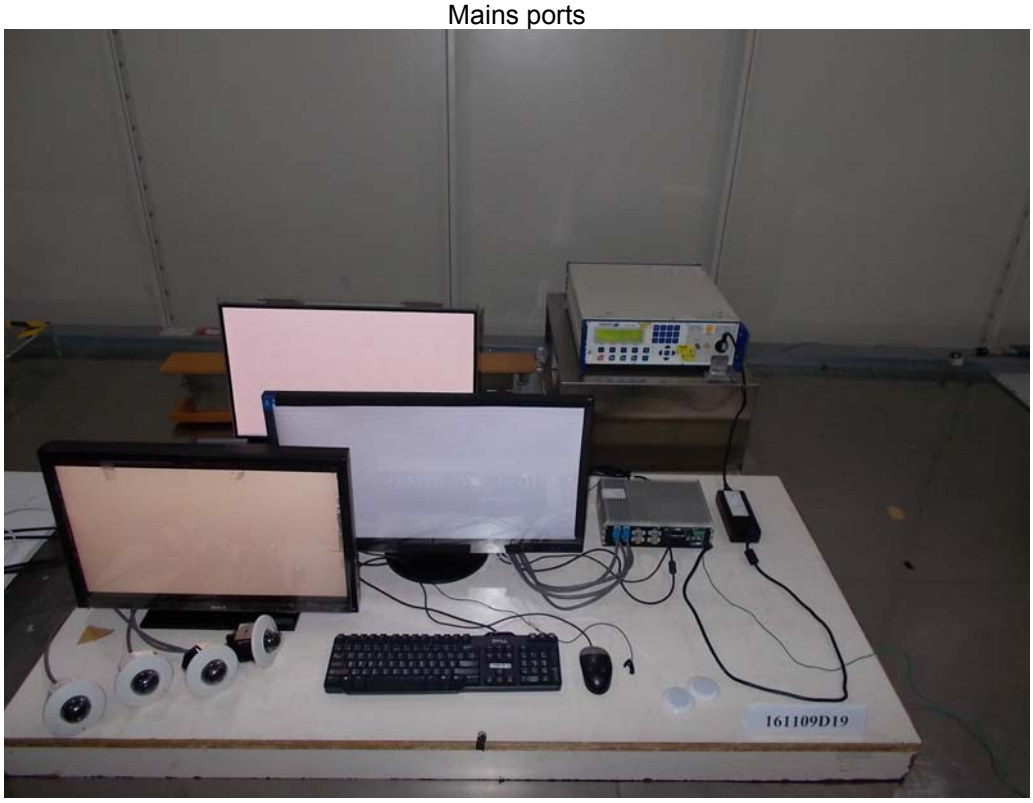

## 19.6 Electrostatic Discharge Immunity Test (ESD)

## 19.7 Radio-frequency, Electromagnetic Field Immunity Test (RS)




## 19.8 Electrical Fast Transient/Burst Immunity Test (EFT)

Mains ports

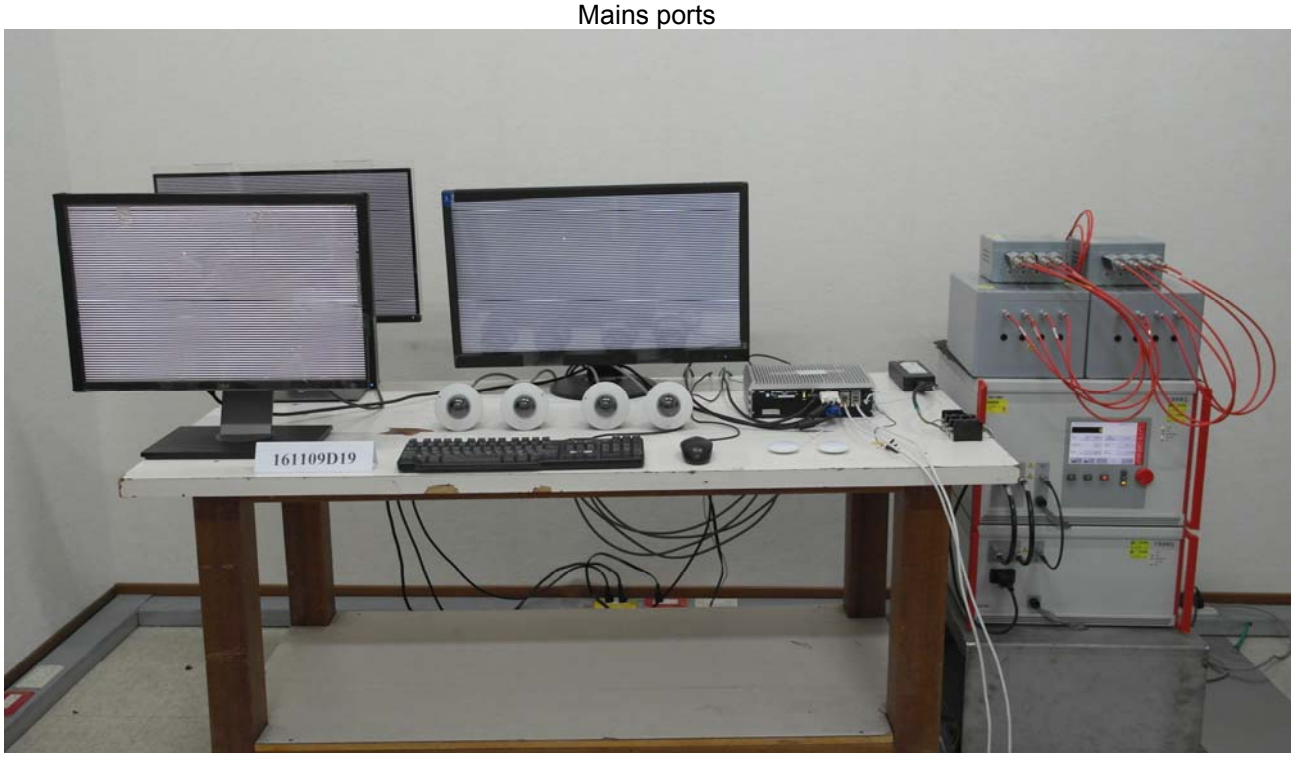



LAN

PoE LAN

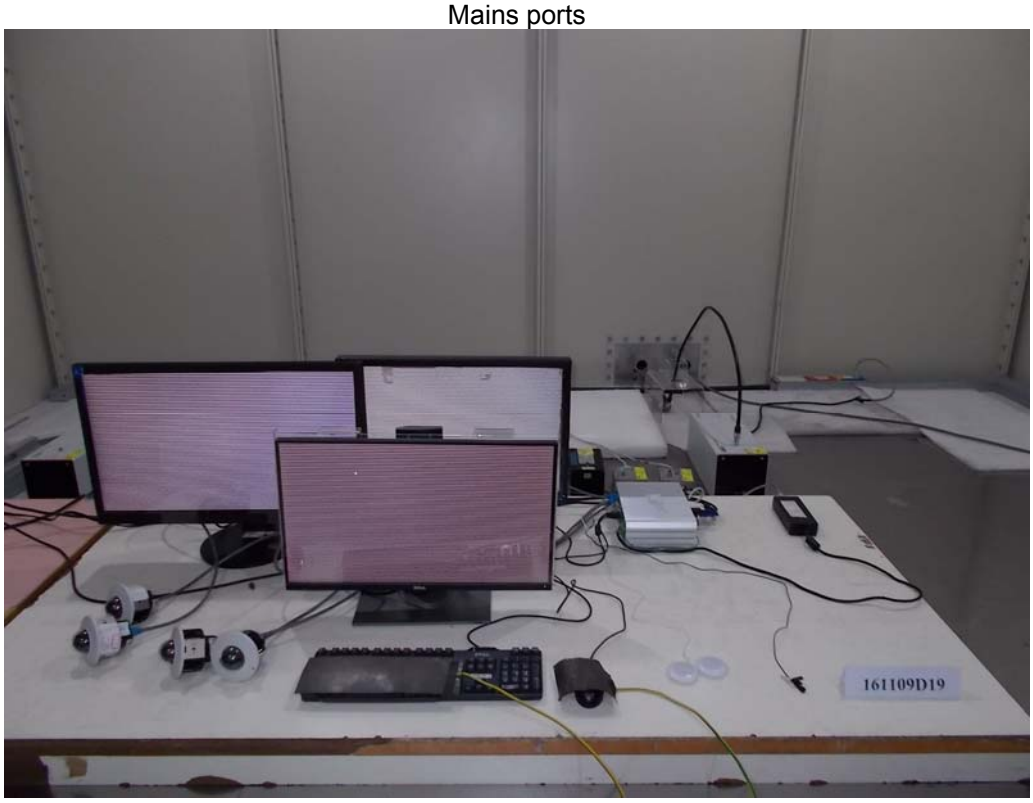
## 19.9 Surge Immunity Test

Mains ports

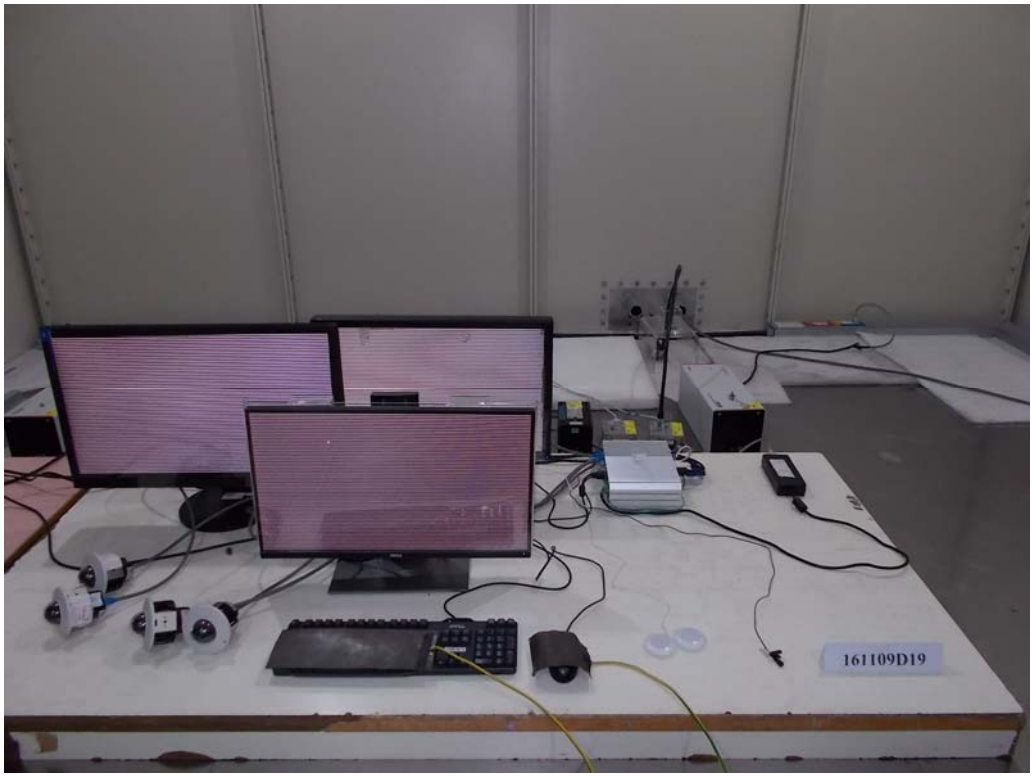


## 19.10 Conducted Disturbances Induced by RF Fields (CS)

Mains ports

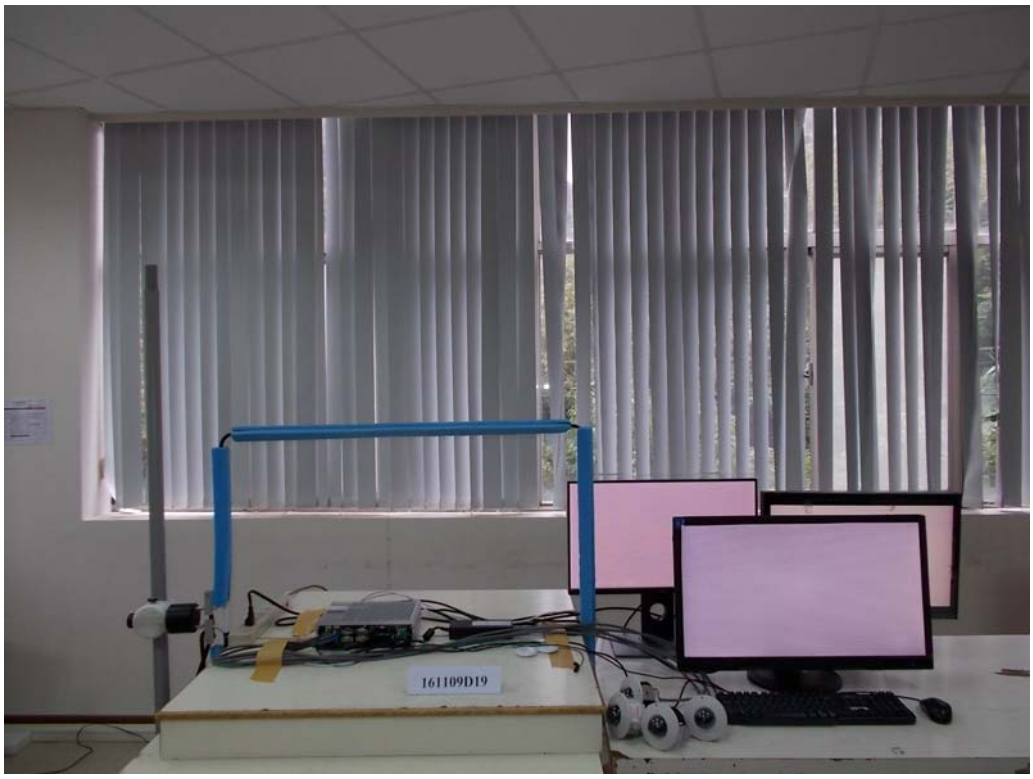



LAN



PoE LAN

## 19.11 Power Frequency Magnetic Field Immunity Test (PFMF)




## 19.12 Voltage Dips and Interruptions

**Appendix – Information on the Testing Laboratories**

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following: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Fax: 886-2-26051924

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The address and road map of all our labs can be found in our web site also.

**--- END ---**