

FCC Test Report

Report No.: FV181031D08

Test Model: ECX-1000-PoER

Series Model: ECX-1XXXXXXXXXXXXXXXXX
("X" can be 0-9,A-Z or blank for marketing purpose)

Received Date: Oct. 31, 2018

Test Date: Nov. 12 ~ 16, 2018

Issued Date: Nov. 27, 2018

Applicant: Vecow Co., Ltd.

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(R.O.C.)

**FCC Registration/
Designation Number:** 418586 / TW1078



Certificate #4327.01



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Release Control Record

| Issue No. | Description | Date Issued |
|-------------|-------------------|---------------|
| FV181031D08 | Original release. | Nov. 27, 2018 |

2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2016 Issue 6, Class A

ANSI C63.4:2014

| FCC Clause | ICES-003 Clause | Test Item | Result/Remarks | Verdict |
|------------|-----------------|-----------------------------------|--|---------|
| 15.107 | 6.1 | AC Power Line Conducted Emissions | Minimum passing Class A margin is -20.68 dB at 0.46250 MHz | Pass |
| 15.109 | 6.2.1 | Radiated Emissions up to 1 GHz | Minimum passing Class A margin is -1.00 dB at 154.00 MHz | Pass |
| | 6.2.2 | Radiated Emissions above 1 GHz | Minimum passing Class A margin is -9.99 dB at 2774.77 MHz | Pass |

Note: There is no deviation to the applied test methods and requirements covered by the scope of this report.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

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 | Frequency | Expanded Uncertainty (k=2) (\pm) |
|------------------------------------|----------------|--------------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 2.77 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 3.97 dB |
| Radiated Emissions above 1 GHz | Above 1GHz | 5.08 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

| | |
|---------------------|---|
| Product | High-Performance Fanless System |
| Brand | Vecow |
| Test Model | ECX-1000-PoER |
| Series Model | ECX-1XXXXXXXXXXXXXXXXX (“X” can be 0-9,A-Z or blank for marketing purpose) |
| Model Difference | Marketing Differentiation |
| Sample Status | Engineering sample |
| Operating Software | Windows 10 |
| Power Supply Rating | 24V, DC-in |
| Accessory Device | Adapter |
| Data Cable Supplied | N/A |

Note:

1. The EUT is a High-Performance Fanless System with following interfaces:

- ✧ COM*4
- ✧ USB 3.0*6
- ✧ Isolated DIO
- ✧ DVI-D (resolution up to 1920 x 1200 @ 60Hz)
- ✧ DVI-I (resolution up to 1920 x 1200 @ 60Hz)
- ✧ DP (resolution up to 4096 x 2304 @ 60Hz)
- ✧ Line out
- ✧ Mic. in
- ✧ LAN (10/100/1000Mbps)*2
- ✧ POE LAN*4
- ✧ DC input

2. The EUT uses following adapter.

| | |
|--------------|--|
| Brand | FSP |
| Model | FSP120-AABN2 |
| Input Power | 100-240Vac, 50-60Hz, 1.8A |
| Output Power | 24V, 5A |
| Power Line | Non-shielded DC (1.5m) with one ferrite core Non-shielded AC (1.8m) |

3.2 Features of EUT

1. 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.

2. The EUT was configured with the following key components:

| Component | Brand | Model No. or P/N | Spec. |
|-----------|----------|------------------|----------|
| CPU | Intel | i7-8700 | 3.20 GHz |
| Memory | Kingston | KVR21S15S8/4 | 4GB |
| CFast | innodisk | 3ME3 Series | 64GB |

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

1. 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 **230Vac/50Hz** and recorded in the applied test report. Then the other test items were tested at 120Vac/60Hz.
2. Test modes are presented in the report as below.

| Mode | Test Condition | Input Power |
|-------------------------|----------------|--------------|
| Conducted emission test | | |
| 1 | Full system | 120Vac/ 60Hz |
| Radiated emission test | | |
| 1 | Full system | 230Vac/ 50Hz |

3.4 Test Program Used and Operation Descriptions

- 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 "H" messages to ext. LCD Monitors. Then they displayed "H" 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.

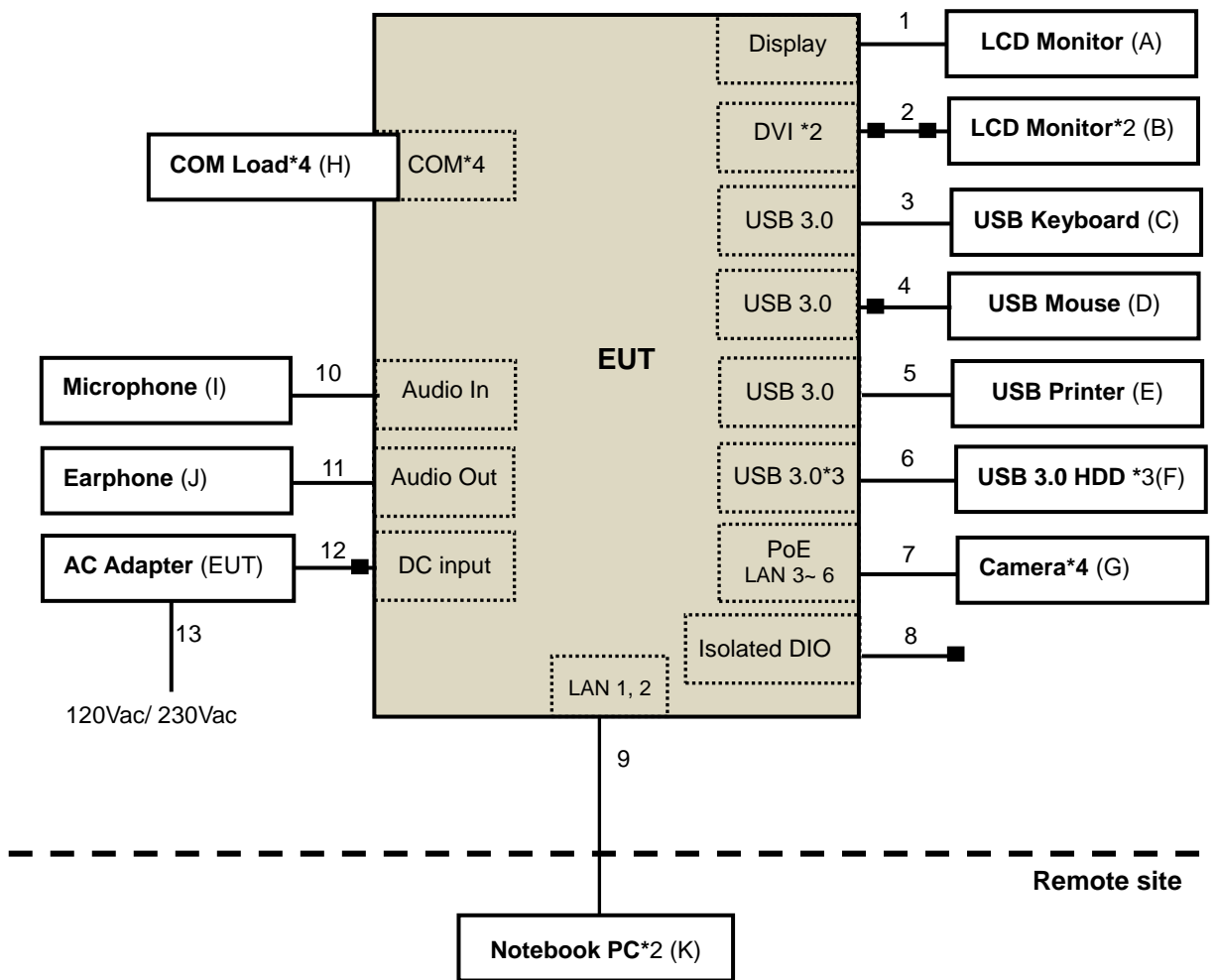
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 3200 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

TEST CONFIGURATION



4.2 Configuration of Peripheral Devices and Cable Connections

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|----|-------------------|-----------|------------------------|------------------------------|------------------|-----------------|
| A. | LCD Monitor | ASUS | MG28UQ | N/A | FCC DoC Approved | Provided by Lab |
| B. | LCD Monitor | DELL | U2410 | CN082WXD728720CC 0UHL | FCC DoC Approved | Provided by Lab |
| | LCD Monitor | DELL | U2410 | CN082WXD728720CC 0LGL | FCC DoC Approved | Provided by Lab |
| C. | USB KEYBOARD | Dell | KB216t | CN-0W33XP-LO300-7 CL-190A | FCC DoC Approved | Provided by Lab |
| D. | USB Mouse | Microsoft | 1113 | 9170515772204 | FCC DoC Approved | Provided by Lab |
| E. | Printer | HP | Officejet pro 251dw | N/A | B94SDGOB1191 | Provided by Lab |
| F. | USB 3.0 Hard Disk | WD | WDBUZG0010BB K-PESN | WXM1E1532Z4Z | FCC DoC Approved | Provided by Lab |
| | USB 3.0 Hard Disk | WD | WDBUZG0010BB K-PESN | WX61A45JRXLf | FCC DoC Approved | Provided by Lab |
| | USB 3.0 Hard Disk | WD | WDBUZG0010BB K-PESN | WX61A45JR2YK | FCC DoC Approved | Provided by Lab |
| G. | IP Camera*4 | N/A | A301RZ-0309P | N/A | N/A | Provided by Lab |
| H. | COM Load*4 | N/A | N/A | N/A | N/A | Provided by Lab |
| I. | MICROPHONE | Labtec | mic-333 | N/A | N/A | Provided by Lab |
| J. | EARPHONE | PHILIPS | SBC HL145 | N/A | N/A | Provided by Lab |
| K. | Notebook PC | SONY | SVS151A12P | 275548477001024 | FCC DoC Approved | Provided by Lab |
| | Notebook PC | ASUS | PU401L | ECNXC012528528 | FCC DoC Approved | Provided by Lab |

Note:

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

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|-----|---------------|------|------------|--------------------|--------------|--------------------|
| 1. | Display cable | 1 | 1.8 | Y | 0 | Provided by Lab |
| 2. | DVI cable | 2 | 1.8 | Y | 2 | Provided by Lab |
| 3. | USB cable | 1 | 1.8 | Y | 0 | Provided by Lab |
| 4. | USB cable | 1 | 1.8 | Y | 1 | Provided by Lab |
| 5. | USB cable | 1 | 1.5 | Y | 0 | Provided by Lab |
| 6. | USB cable | 3 | 0.4 | Y | 0 | Provided by Lab |
| 7. | LAN cable | 4 | 1.5 | Y | 0 | Supplied by client |
| 8. | Signal cable | 1 | 0.3 | N | 0 | Provided by Lab |
| 9. | LAN cable | 2 | 10 | Y | 0 | Provided by Lab |
| 10. | Audio cable | 1 | 1.5 | N | 0 | Provided by Lab |
| 11. | Audio cable | 1 | 2.0 | N | 0 | Provided by Lab |
| 12. | DC power | 1 | 1.5 | N | 1 | Supplied by client |
| 13. | AC power cord | 1 | 1.8 | N | 0 | Supplied by client |

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

5 Conducted Emissions at Mains Ports

5.1 Limits

| Frequency (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|-----------------|----------------|---------|----------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

Notes: 1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Test Instruments

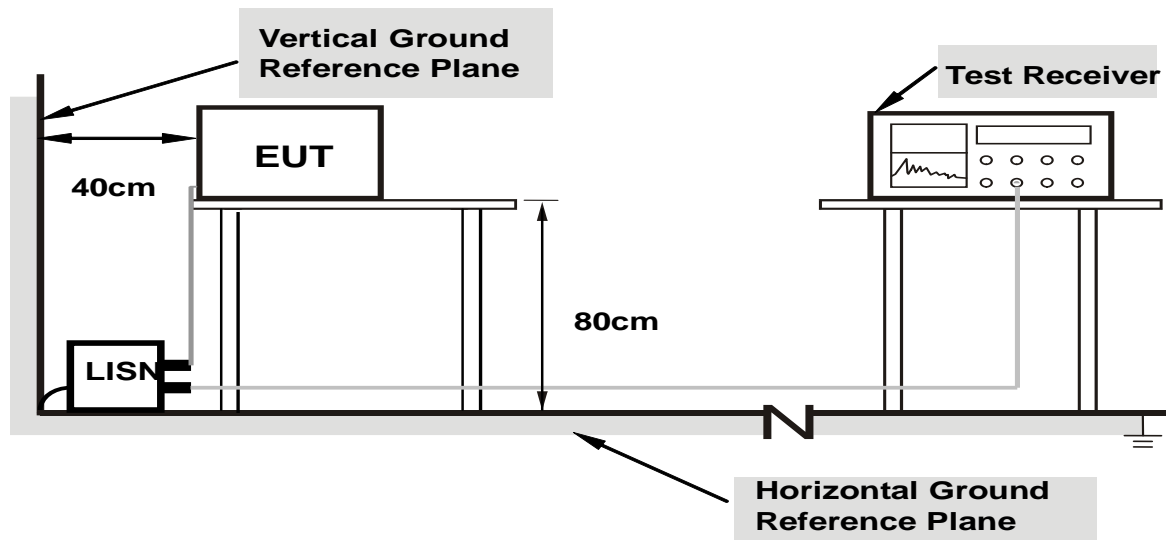
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|--|---------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESCS 30 | 838251/021 | Nov. 1, 2018 | Oct. 31, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (For EUT) | ENV216 | 101195 | May 2, 2018 | May 1, 2019 |
| LISN With Adapter (for EUT) | AD10 | C03Ada-002 | May 2, 2018 | May 1, 2019 |
| EMCO L.I.S.N. (For peripherals) | 3825/2 | 9504-2359 | Jul. 26, 2018 | Jul. 25, 2019 |
| SCHWARZBECK Artificial Mains Network (For EUT) | NNLK8129 | 8129229 | May 3, 2018 | May 2, 2019 |
| SCHWARZBECK Artificial Mains Network (For EUT) | NNLK 8121 | 8121-808 | Mar. 5, 2018 | Mar. 4, 2019 |
| Software | Cond_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) With 10dB PAD | 5D-FB | Cable-C03-01 | Sep. 18, 2018 | Sep. 17, 2019 |
| LYNICS Terminator (For EMCO LISN) | 0900510 | E1-01-300 | Jan. 19, 2018 | Jan. 18, 2019 |
| LYNICS Terminator (For EMCO LISN) | 0900510 | E1-01-301 | Jan. 19, 2018 | Jan. 18, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (For TV EUT) | ESH3-Z5 | 100220 | Nov. 14, 2017 | Nov. 13, 2018 |
| LISN With Adapter (for TV EUT) | 100220 | N/A | Nov. 14, 2017 | Nov. 13, 2018 |

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. 3.
 3. The VCCI Site Registration No. C-10274.
 4. Tested Date: Nov. 12, 2018

5.3 Test Arrangement

- 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.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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: Support units were connected to second LISN.

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

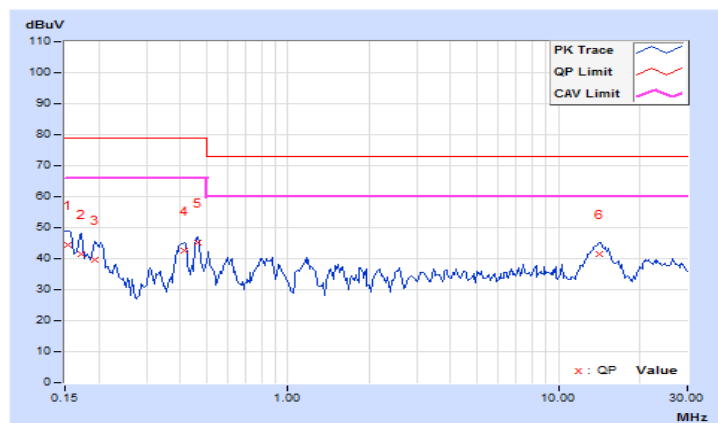
5.4 Test Results

| | | | |
|------------------------|----------------|---|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 23°C, 70%RH |
| Tested by | Vic 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 | 9.68 | 34.88 | 25.65 | 44.56 | 35.33 | 79.00 | 66.00 | -34.44 | -30.67 |
| 2 | 0.17344 | 9.68 | 31.71 | 19.28 | 41.39 | 28.96 | 79.00 | 66.00 | -37.61 | -37.04 |
| 3 | 0.19297 | 9.67 | 30.06 | 19.11 | 39.73 | 28.78 | 79.00 | 66.00 | -39.27 | -37.22 |
| 4 | 0.41563 | 9.69 | 32.93 | 29.92 | 42.62 | 39.61 | 79.00 | 66.00 | -36.38 | -26.39 |
| 5 | 0.46250 | 9.69 | 35.53 | 34.90 | 45.22 | 44.59 | 79.00 | 66.00 | -33.78 | -21.41 |
| 6 | 14.18750 | 9.95 | 31.53 | 25.03 | 41.48 | 34.98 | 73.00 | 60.00 | -31.52 | -25.02 |

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

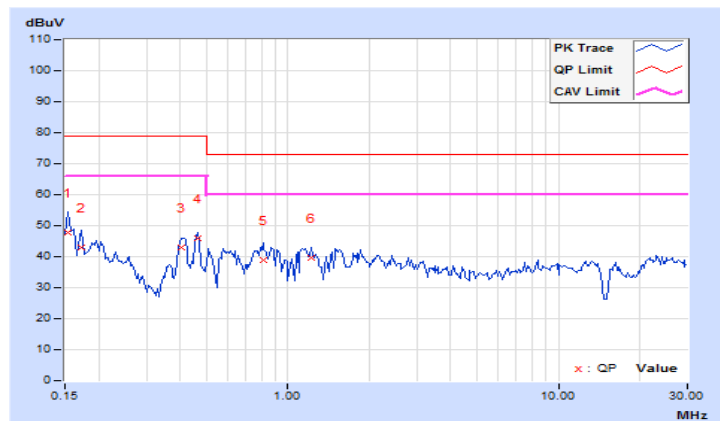


| | | | |
|------------------------|----------------|---|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 23°C, 70%RH |
| Tested by | Vic 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 | 0.15391 | 9.68 | 38.24 | 24.19 | 47.92 | 33.87 | 79.00 | 66.00 | -31.08 | -32.13 |
| 2 | 0.17344 | 9.68 | 33.19 | 20.34 | 42.87 | 30.02 | 79.00 | 66.00 | -36.13 | -35.98 |
| 3 | 0.40391 | 9.69 | 33.32 | 25.32 | 43.01 | 35.01 | 79.00 | 66.00 | -35.99 | -30.99 |
| 4 | 0.46250 | 9.69 | 36.11 | 35.63 | 45.80 | 45.32 | 79.00 | 66.00 | -33.20 | -20.68 |
| 5 | 0.81406 | 9.72 | 29.30 | 23.08 | 39.02 | 32.80 | 73.00 | 60.00 | -33.98 | -27.20 |
| 6 | 1.21875 | 9.74 | 29.99 | 23.91 | 39.73 | 33.65 | 73.00 | 60.00 | -33.27 | -26.35 |

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 Radiated Emissions up to 1 GHz

6.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

| Radiated Emissions Limits at 10 meters (dB μ V/m) | | | | |
|---|-----------------------------|-----------------------------|-------------------|-------------------|
| Frequencies (MHz) | FCC 15B / ICES-003, Class A | FCC 15B / ICES-003, Class B | CISPR 22, Class A | CISPR 22, Class B |
| 30-88 | 39 | 29.5 | 40 | 30 |
| 88-216 | 43.5 | 33.1 | | |
| 216-230 | 46.4 | 35.6 | | |
| 230-960 | | | 47 | 37 |
| 960-1000 | 49.5 | 43.5 | | |

| Radiated Emissions Limits at 3 meters (dB μ V/m) | | | | |
|--|-----------------------------|-----------------------------|-------------------|-------------------|
| Frequencies (MHz) | FCC 15B / ICES-003, Class A | FCC 15B / ICES-003, Class B | CISPR 22, Class A | CISPR 22, Class B |
| 30-88 | 49.5 | 40 | 50.5 | 40.5 |
| 88-216 | 54 | 43.5 | | |
| 216-230 | 56.9 | 46 | | |
| 230-960 | | | 57.5 | 47.5 |
| 960-1000 | 60 | 54 | | |

- Notes:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (uV/m).
 3. QP detector shall be applied if not specified.

6.2 Test Instruments

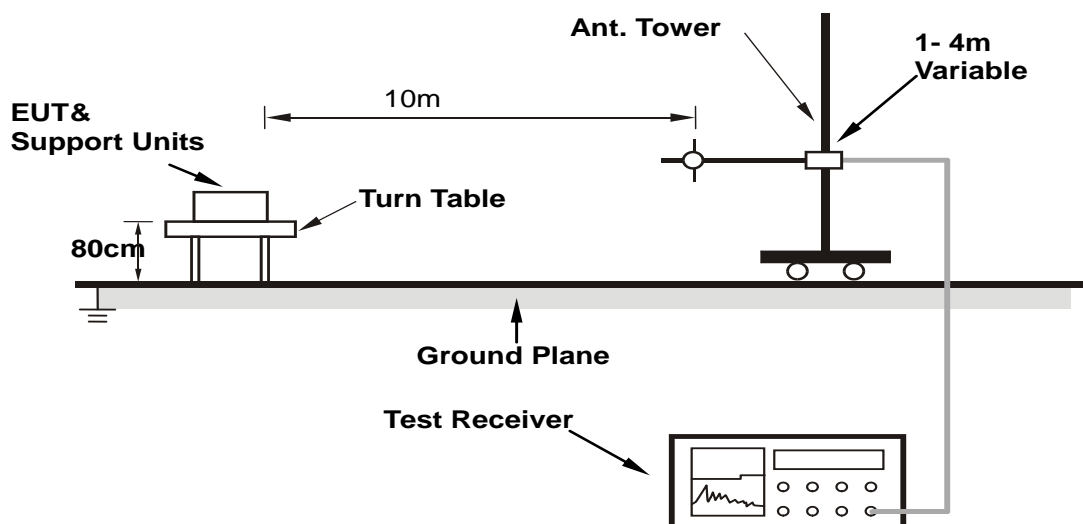
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|-------------------------------|----------------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESCS 30 | 100027 | Dec. 4, 2017 | Dec. 3, 2018 |
| Schwarzbeck Bilog Antenna | VULB9168 | 9168-303 | Nov. 29, 2017 | Nov. 28, 2018 |
| Agilent Preamplifier | 8447D | 2944A08119 | Feb. 21, 2018 | Feb. 20, 2019 |
| ADT. Turn Table | TT100 | 0205 | NA | NA |
| ADT. Tower | AT100 | 0205 | NA | NA |
| Software | Radiated_V7.6.15.9.5 | NA | NA | NA |
| ADT RF Switches BOX | EMH-011 | 1001 | Oct. 25, 2018 | Oct. 24, 2019 |
| Pacific RF cable With 5dB PAD | 8D | CABLE-ST2-01 | Oct. 25, 2018 | Oct. 24, 2019 |

- 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. 2.
 3. The VCCI Site Registration No. R-237.
 4. Tested Date: Nov. 13, 2018

6.3 Test Arrangement

- 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.
- The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



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

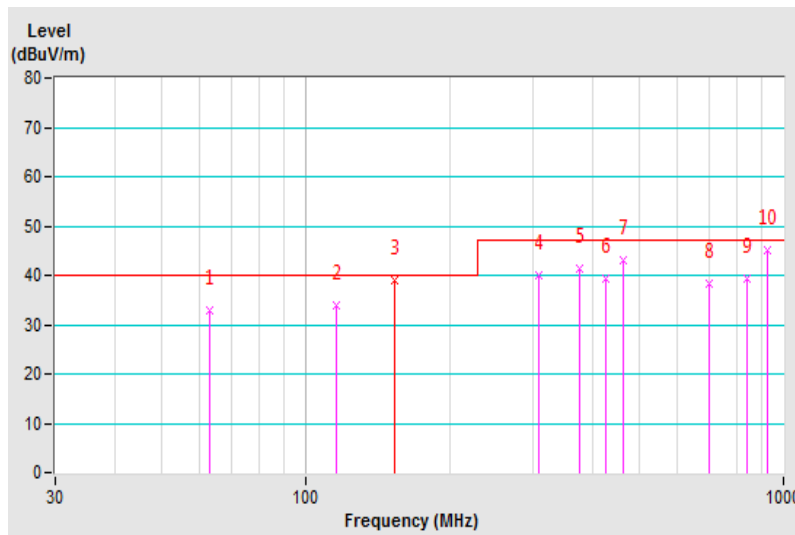
6.4 Test Results

| | | | |
|------------------------|--------------|---|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120kHz |
| Tested by | ED. Lin | Environmental Conditions | 23°C, 70%RH |
| 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 | 63.20 | 32.86 QP | 40.00 | -7.14 | 3.99 H | 108 | 42.74 | -9.88 |
| 2 | 116.30 | 33.78 QP | 40.00 | -6.22 | 3.99 H | 244 | 45.18 | -11.40 |
| 3 | 154.01 | 38.96 QP | 40.00 | -1.04 | 4.00 H | 214 | 47.76 | -8.80 |
| 4 | 307.87 | 40.16 QP | 47.00 | -6.84 | 3.23 H | 298 | 48.39 | -8.23 |
| 5 | 375.25 | 41.27 QP | 47.00 | -5.73 | 1.91 H | 23 | 47.71 | -6.44 |
| 6 | 425.50 | 39.27 QP | 47.00 | -7.73 | 2.37 H | 266 | 44.36 | -5.09 |
| 7 | 462.25 | 43.07 QP | 47.00 | -3.93 | 1.72 H | 21 | 47.39 | -4.32 |
| 8 | 701.50 | 38.25 QP | 47.00 | -8.75 | 1.26 H | 109 | 37.76 | 0.49 |
| 9 | 838.75 | 39.31 QP | 47.00 | -7.69 | 1.22 H | 294 | 36.91 | 2.40 |
| 10 | 924.00 | 45.01 QP | 47.00 | -1.99 | 1.02 H | 262 | 41.08 | 3.93 |

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

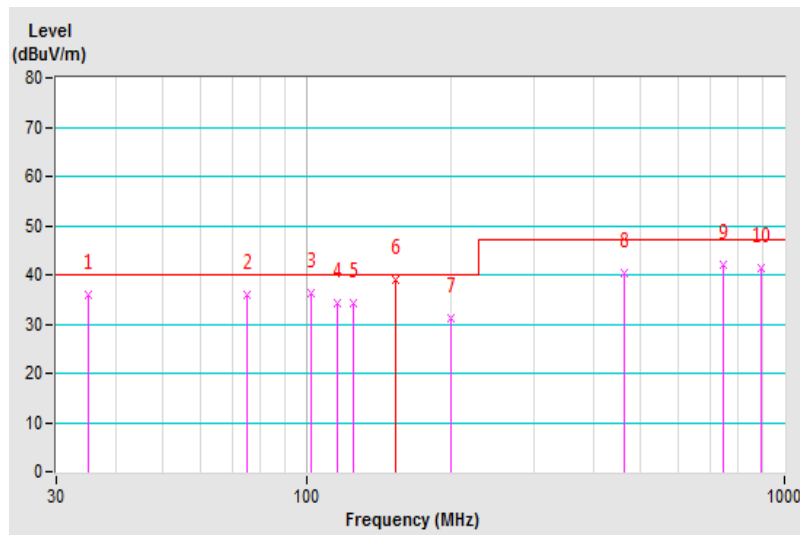


| | | | |
|------------------------|--------------|---|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120kHz |
| Tested by | ED. Lin | Environmental Conditions | 23°C, 70%RH |
| Test Mode | Mode 1 | | |

| 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 | 34.93 | 35.78 QP | 40.00 | -4.22 | 1.41 V | 21 | 45.65 | -9.87 |
| 2 | 75.24 | 35.98 QP | 40.00 | -4.02 | 1.62 V | 118 | 48.15 | -12.17 |
| 3 | 102.35 | 36.33 QP | 40.00 | -3.67 | 1.00 V | 299 | 49.43 | -13.10 |
| 4 | 116.50 | 34.27 QP | 40.00 | -5.73 | 1.00 V | 53 | 45.66 | -11.39 |
| 5 | 125.01 | 34.09 QP | 40.00 | -5.91 | 1.00 V | 137 | 44.66 | -10.57 |
| 6 | 154.00 | 39.00 QP | 40.00 | -1.00 | 1.00 V | 349 | 47.80 | -8.80 |
| 7 | 200.00 | 31.21 QP | 40.00 | -8.79 | 1.00 V | 60 | 43.37 | -12.16 |
| 8 | 462.25 | 40.21 QP | 47.00 | -6.79 | 3.18 V | 8 | 44.53 | -4.32 |
| 9 | 742.75 | 41.95 QP | 47.00 | -5.05 | 1.55 V | 105 | 40.77 | 1.18 |
| 10 | 891.00 | 41.43 QP | 47.00 | -5.57 | 2.35 V | 172 | 38.48 | 2.95 |

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



7 Radiated Emissions above 1 GHz

7.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

| Radiated Emissions Limits at 10 meters (dB μ V/m) | | | | |
|---|-----------------------------|-----------------------------|-------------------|-------------------|
| Frequencies (MHz) | FCC 15B / ICES-003, Class A | FCC 15B / ICES-003, Class B | CISPR 22, Class A | CISPR 22, Class B |
| 1000-3000 | Avg: 49.5 | Avg: 43.5 | Not defined | Not defined |
| Above 3000 | Peak: 69.5 | Peak: 63.5 | Not defined | Not defined |

| Radiated Emissions Limits at 3 meters (dB μ V/m) | | | | |
|--|-----------------------------|-----------------------------|---------------------|---------------------|
| Frequencies (MHz) | FCC 15B / ICES-003, Class A | FCC 15B / ICES-003, Class B | CISPR 22, Class A | CISPR 22, Class B |
| 1000-3000 | Avg: 60 | Avg: 54 | Avg: 56 Peak: 76 | Avg: 50 Peak: 70 |
| Above 3000 | Peak: 80 | Peak: 74 | Avg: 60 Peak: 80 | Avg: 54 Peak: 74 |

- Notes: 1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (uV/m).
 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Frequency Range (For unintentional radiators)

| Highest frequency generated or used in the device or on which the device operates or tunes (MHz) | Upper frequency of measurement range (MHz) |
|--|--|
| Below 1.705 | 30 |
| 1.705-108 | 1000 |
| 108-500 | 2000 |
| 500-1000 | 5000 |
| Above 1000 | 5th harmonic of the highest frequency or 40GHz, whichever is lower |

7.2 Test Instruments

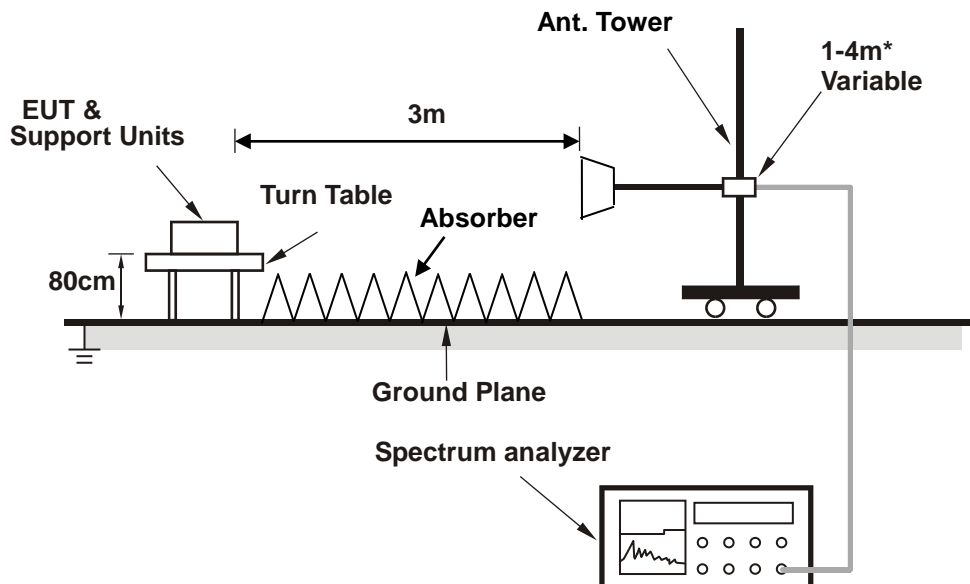
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|-----------------------------------|---------------------|-----------------|---------------|---------------|
| Agilent Spectrum | E4446A | MY51100009 | Jun. 4, 2018 | Jun. 3, 2019 |
| Agilent Test Receiver | N9038A | MY51210137 | Jun. 19, 2018 | Jun. 18, 2019 |
| Agilent Preamplifier | 8449B | 3008A01292 | Feb. 22, 2018 | Feb. 21, 2019 |
| MITEQ Preamplifier | AMF-6F-260400-33-8P | 892164 | Feb. 21, 2018 | Feb. 20, 2019 |
| EMCI Preamplifier | EMC184045B | 980235 | Feb. 22, 2018 | Feb. 21, 2019 |
| Schwarzbeck Horn Antenna | BBHA-9170 | 212 | Dec. 1, 2017 | Nov. 30, 2018 |
| EMCO Horn Antenna | 3115 | 6714 | Dec. 12, 2017 | Dec. 11, 2018 |
| Max Full. Turn Table | MF7802 | MF780208216 | NA | NA |
| Software | Radiated_V8.7.08 | NA | NA | NA |
| SUHNER RF cable With 3/4dB PAD | SF102 | Cable-CH10-3.6m | Aug. 13, 2018 | Aug. 12, 2019 |
| MICRO-TRONICS Notch filter | BRC50703-01 | 010 | May 31, 2018 | May 30, 2019 |
| MICRO-TRONICS Band Pass Filter | BRM17690 | 005 | May 31, 2018 | May 30, 2019 |

- 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 Chamber No. 10.
3. The Industry Canada Reference No. IC 7450E-11.
4. The VCCI Site Registration No. G-10427
5. Tested Date: Nov. 16, 2018

7.3 Test Arrangement

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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: 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.



* :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.

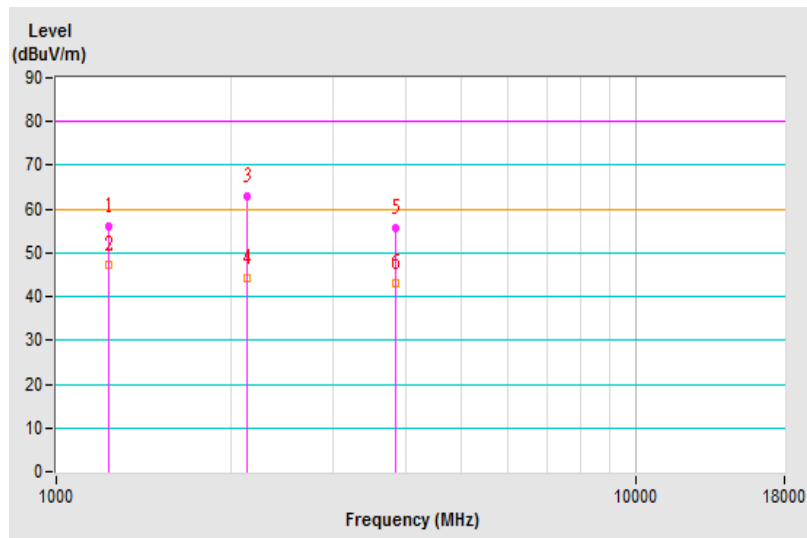
7.4 Test Results

| | | | |
|------------------------|--------------|---|--------------------------------|
| Frequency Range | 1GHz ~ 16GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Tested by | Ken Lee | Environmental Conditions | 26°C, 71%RH |
| 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 | 1233.21 | 55.87 PK | 80.00 | -24.13 | 1.76 H | 193 | 59.83 | -3.96 |
| 2 | 1233.21 | 47.27 AV | 60.00 | -12.73 | 1.76 H | 193 | 51.23 | -3.96 |
| 3 | 2128.71 | 62.85 PK | 80.00 | -17.15 | 2.08 H | 34 | 63.60 | -0.75 |
| 4 | 2128.71 | 44.08 AV | 60.00 | -15.92 | 2.08 H | 34 | 44.83 | -0.75 |
| 5 | 3853.72 | 55.76 PK | 80.00 | -24.24 | 2.09 H | 37 | 50.31 | 5.45 |
| 6 | 3853.72 | 43.09 AV | 60.00 | -16.91 | 2.09 H | 37 | 37.64 | 5.45 |

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

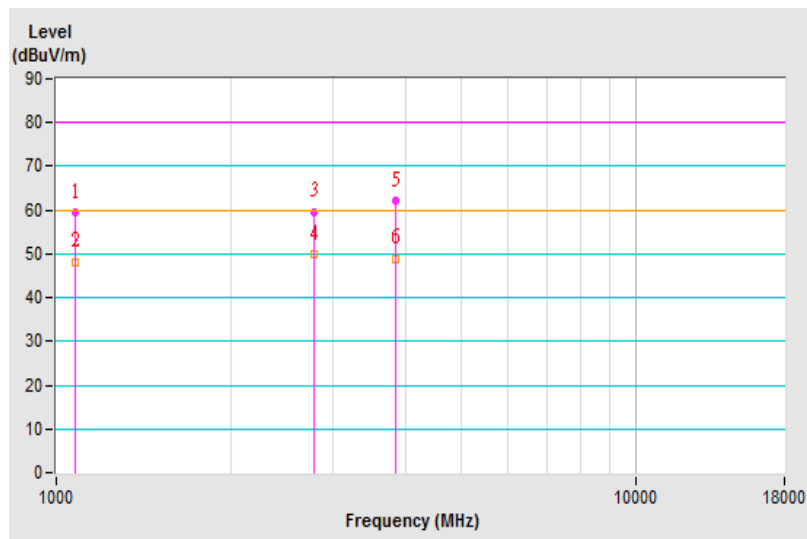


| | | | |
|------------------------|--------------|---|--------------------------------|
| Frequency Range | 1GHz ~ 16GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Tested by | Ken Lee | Environmental Conditions | 26°C, 71%RH |
| Test Mode | Mode 1 | | |

| 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 | 1079.13 | 59.46 PK | 80.00 | -20.54 | 1.63 V | 327 | 63.18 | -3.72 |
| 2 | 1079.13 | 48.22 AV | 60.00 | -11.78 | 1.63 V | 327 | 51.94 | -3.72 |
| 3 | 2774.77 | 59.65 PK | 80.00 | -20.35 | 2.11 V | 356 | 59.08 | 0.57 |
| 4 | 2774.77 | 50.01 AV | 60.00 | -9.99 | 2.11 V | 356 | 49.44 | 0.57 |
| 5 | 3853.79 | 62.10 PK | 80.00 | -17.90 | 2.13 V | 358 | 56.65 | 5.45 |
| 6 | 3853.79 | 48.97 AV | 60.00 | -11.03 | 2.13 V | 358 | 43.52 | 5.45 |

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

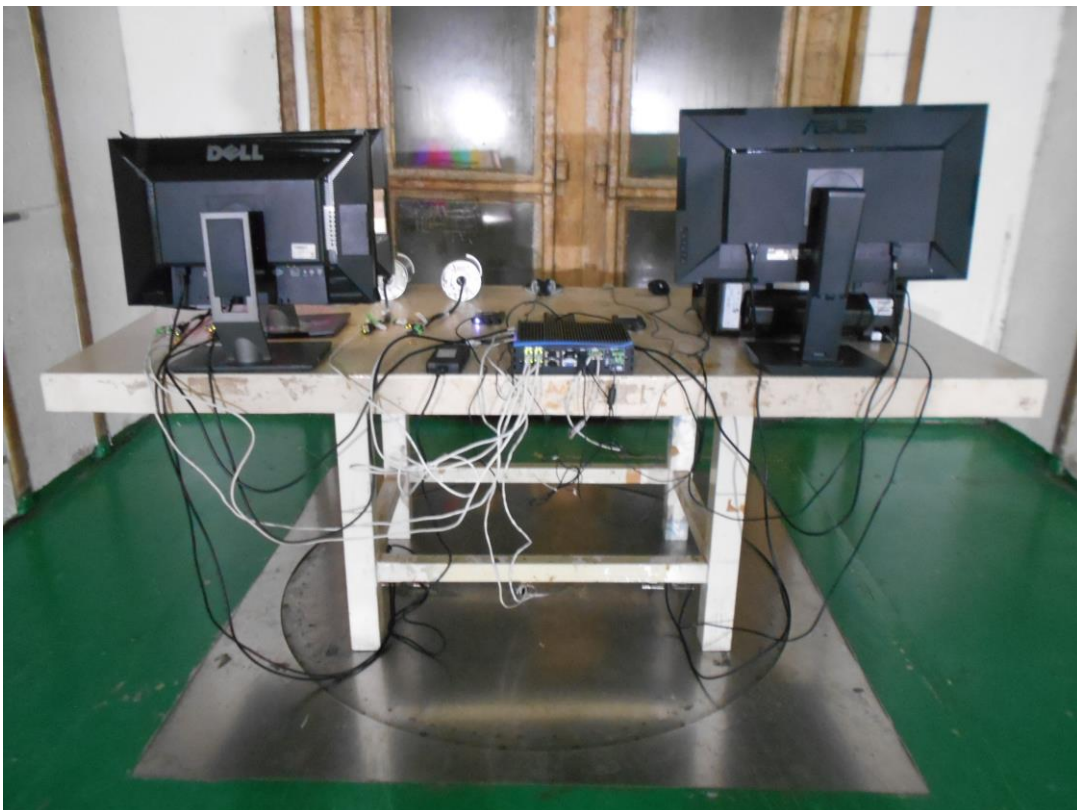


8 Pictures of Test Arrangements

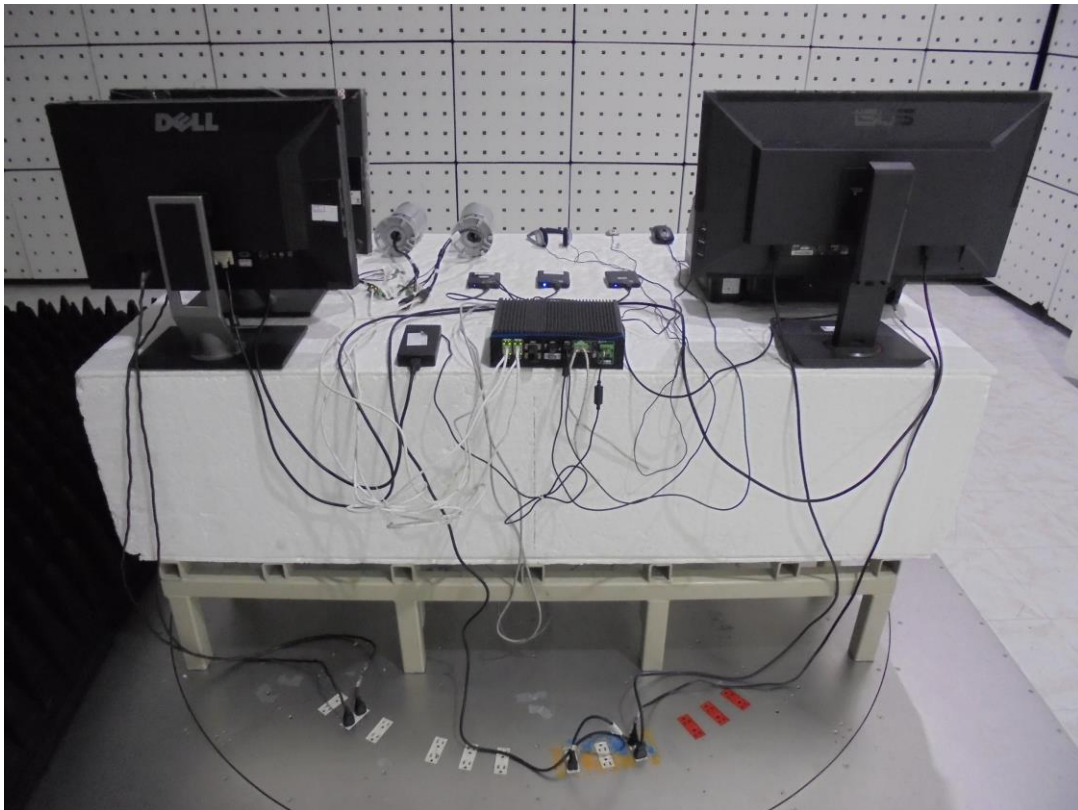
8.1 Conducted Emissions at Mains Ports



8.2 Radiated Emissions up to 1 GHz



8.3 Radiated Emissions above 1 GHz



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 FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

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

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