

FCC Test Report

Report No.: FD200316D05

Test Model: PE-5004

Series Model: PE-5XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)

Received Date: Mar. 16, 2020

Test Date: Mar. 19 to 21, 2020

Issued Date: Apr. 6, 2020

Applicant: Vecow Co., Ltd.

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

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



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Release Control Record

| Issue No. | Description | Date Issued |
|-------------|-------------------|--------------|
| FD200316D05 | Original release. | Apr. 6, 2020 |

1 Certificate of Conformity

Product: PCI Express 10G PoE+ Expansion Card

Brand: Vecow

Test Model: PE-5004

Series Model: PE-5XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)


Sample Status: Engineering sample

Applicant: Vecow Co., Ltd.

Test Date: Mar. 19 to 21, 2020

Standards: 47 CFR FCC Part 15, Subpart B, Class A
ICES-003: 2016 Issue 6, updated Apr. 2019 Class A
ANSI C63.4:2014

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:** Apr. 6, 2020
Vivian Chen / Specialist

Approved by :  , **Date:** Apr. 6, 2020
Jim Hsiang / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003: 2016 Issue 6, updated Apr. 2019 Class A

ANSI C63.4:2014

| FCC Clause | ICES-003 Clause | Test Item | Result/Remarks | Verdict |
|------------|-----------------|------------------------------------|--|---------|
| 15.107 | 6.1 | Conducted Emissions at mains ports | Minimum passing Class A margin is -3.22 dB at 0.25125 MHz | Pass |
| 15.109 | 6.2.1 | Radiated Emissions up to 1 GHz | Minimum passing Class A margin is -0.73 dB at 151.49 MHz | Pass |
| | 6.2.2 | Radiated Emissions above 1 GHz | Minimum passing Class A margin is -15.68 dB at 1500.20 MHz | Pass |

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

| Measurement | Frequency | Expanded Uncertainty (k=2) (±) |
|------------------------------------|----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 2.94 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 4.25 dB |
| Radiated Emissions above 1 GHz | Above 1GHz | 4.68 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

| | |
|---------------------|--|
| Product | PCI Express 10G PoE+ Expansion Card |
| Brand | Vecow |
| Test Model | PE-5004 |
| Series Model | PE-5XXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose) |
| Model Difference | For marketing purpose |
| Sample Status | Engineering sample |
| Operating Software | N/A |
| Power Supply Rating | DC power from IPC |
| Accessory Device | N/A |
| Data Cable Supplied | N/A |

Note:

1. The EUT is a PCI Express 10G PoE+ Expansion Card and installed in IPC during the test.
2. The EUT maximum data rate is 10Gbps.

3.2 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.

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

1. EUT has been pre-tested under following test modes, and test **mode B** was the worst case for final test.

| Mode | Test Condition |
|------|--|
| A | EUT installed in IPC+ LAN Mode (10Gbps) |
| B | EUT installed in IPC+ PoE Mode (1Gbps) ^{Note} |

Note: As client's request, using the maximum data rate of PoE Load (Supplied by client) is 1Gbps during the test.

2. Test modes are presented in the report as below.

| Mode | Test Condition | Input Power |
|------|--|----------------|
| 1 | EUT installed in IPC+ PoE Mode (1Gbps) | 36Vdc (System) |

3.4 Test Program Used and Operation Descriptions

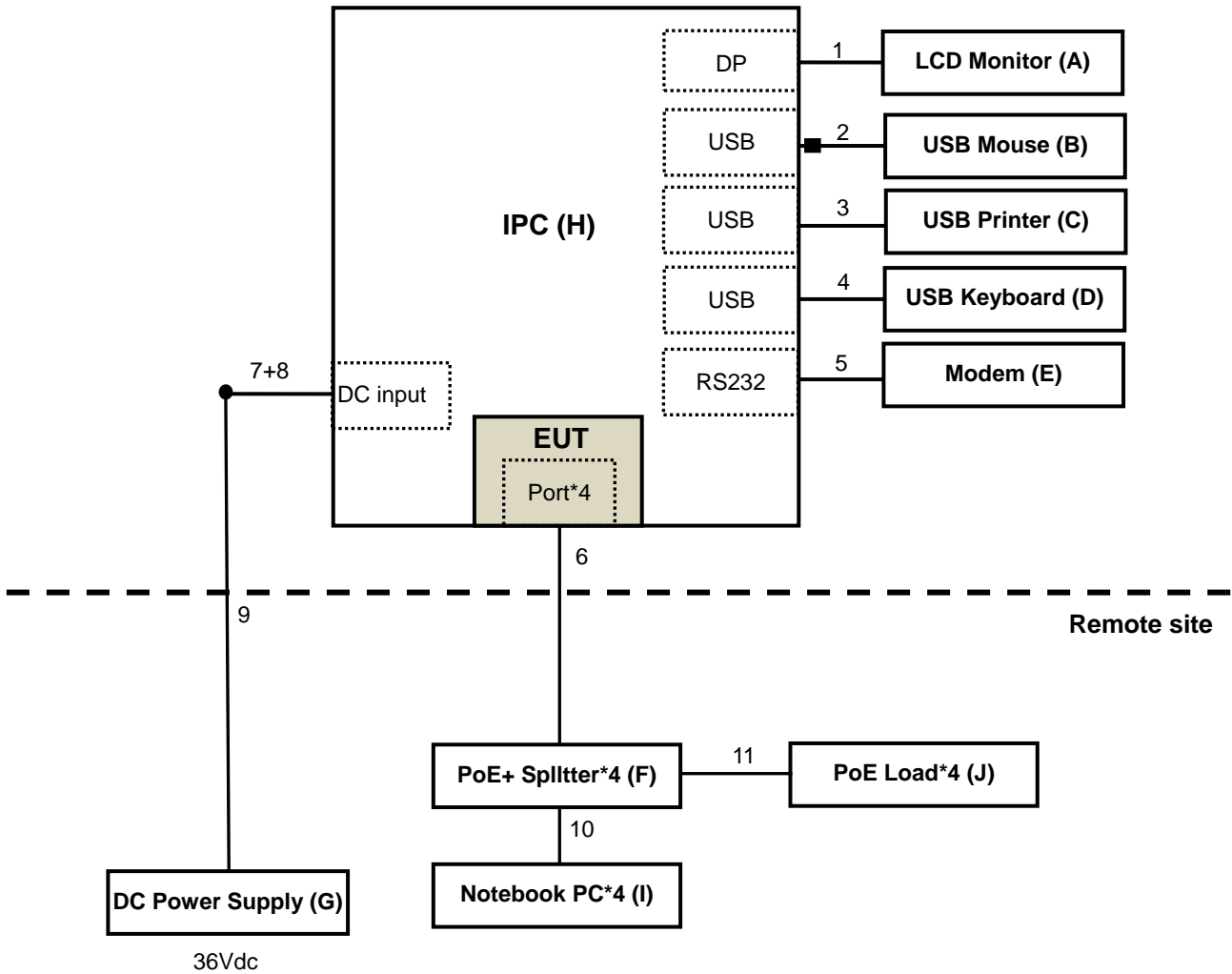
- a. Installed the EUT into IPC.
- b. Turned on the power of all equipment.
- c. IPC ran a test program to enable all functions.
- d. IPC read and wrote messages from/to storage.
- e. IPC sent and received messages to/from Notebook PCs (kept in a remote area) via EUT & PoE+ Splitter with UTP LAN cables. (10m each).
- f. IPC sent "H" patterns to ext. LCD Monitor. Then it displayed "H" patterns on its screen.
- g. IPC sent messages to printer and printer printed them out.
- h. IPC sent messages to modem.
- i. Steps d-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 10GHz, 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



4.2 Configuration of Peripheral Devices and Cable Connections

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|----|---------------------------------------|-----------|------------------------|---------------------------|------------------|--------------------|
| A. | LCD Monitor | ASUS | MG28U | H1LMTF041254 | N/A | Provided by Lab |
| B. | USB Mouse | Microsoft | 1113 | 9170528317887 | FCC DoC Approved | Provided by Lab |
| C. | USB PRINTER | HP | HP Officejet Pro 251dw | N/A | N/A | Provided by Lab |
| D. | USB Keyboard | Dell | KB216t | CN-0W33XP-LO300-7C L-1919 | N/A | Provided by Lab |
| E. | MODEM | ACEEX | 1414 | 980020508 | IFAXDM1414 | Provided by Lab |
| F. | 10/100/1000M Gigabit PoE+ Splltter *4 | GERIO | POE-PD04S | N/A | N/A | Supplied by client |
| G. | DC Power supply | CHROMA | 62150H-600S | 62150EC00479 | N/A | Provided by Lab |
| H. | IPC | Vecow | RCS-9000 | N/A | N/A | Supplied by client |
| I. | Notebook PC | LENOVO | T480 | PF1EZSAW | N/A | Provided by Lab |
| | Notebook PC | LENOVO | T480 | PF1EK03U | N/A | Provided by Lab |
| | Notebook PC | SONY | SVS151A12P | 275548477001024 | N/A | Provided by Lab |
| | Notebook PC | ASUS | PU401L | ECNXBC012528528 | N/A | Provided by Lab |
| J. | PoE Load *4 | N/A | N/A | N/A | N/A | Supplied by client |

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items G, I-J acted as communication partners to transfer data.

| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|-----|--------------------|------|------------|--------------------|--------------|-------------------------------|
| 1. | Display cable | 1 | 1.8 | Y | 0 | Provided by Lab |
| 2. | USB cable | 1 | 1.8 | Y | 1 | Provided by Lab |
| 3. | USB cable | 1 | 1.5 | Y | 0 | Provided by Lab |
| 4. | USB cable | 1 | 1.8 | Y | 0 | Provided by Lab |
| 5. | RS232 cable | 1 | 1.5 | Y | 0 | Provided by Lab |
| 6. | LAN cable | 4 | 10 | N | 0 | Provided by Lab (RJ45 Cat.5e) |
| 7. | DC cable | 1 | 0.12 | N | 0 | Supplied by client |
| 8. | DC cable | 1 | 1.8 | N | 0 | Provided by Lab |
| 9. | DC cable | 1 | 10 | N | 0 | Provided by Lab |
| 10. | LAN cable | 4 | 1.8 | N | 0 | Provided by Lab (RJ45 Cat.5e) |
| 11. | DC cable | 4 | 0.3 | N | 0 | Provided by Lab |

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

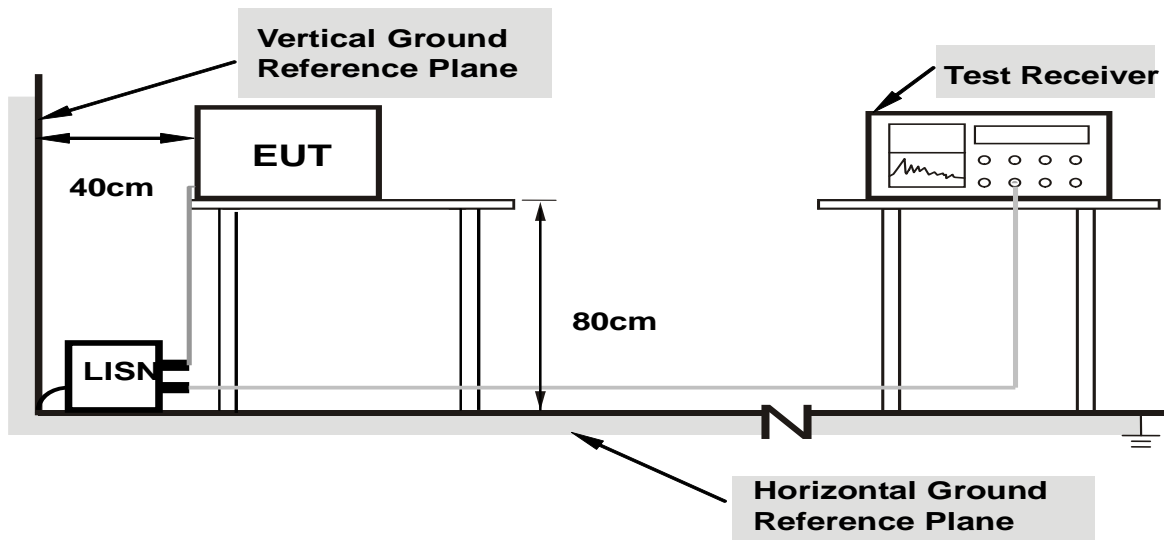
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|--|---------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESR3 | 102413 | Feb. 17, 2020 | Feb. 16, 2021 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ESH2-Z5 | 100104 | Dec. 13, 2019 | Dec. 12, 2020 |
| LISN With Adapter (for EUT) | AD10 | C09Ada-001 | Dec. 13, 2019 | Dec. 12, 2020 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 847265/023 | Oct. 31, 2019 | Oct. 30, 2020 |
| SCHWARZBECK Artificial Mains Network (For EUT) | NNLK8129 | 8129229 | May 14, 2019 | May 13, 2020 |
| SCHWARZBECK Artificial Mains Network (for EUT) | NSLK 8128 | 8128-244 | Nov. 11, 2019 | Nov. 10, 2020 |
| Software | Cond_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) With 10dB PAD | 5D-FB | Cable-C09.01 | Aug. 15, 2019 | Aug. 14, 2020 |
| SUHNER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-010789 | May 13, 2019 | May 12, 2020 |

Note: 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. 9.
 3. The VCCI Site Registration No. C-11312.
 4. Tested Date: Mar. 19, 2020

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.

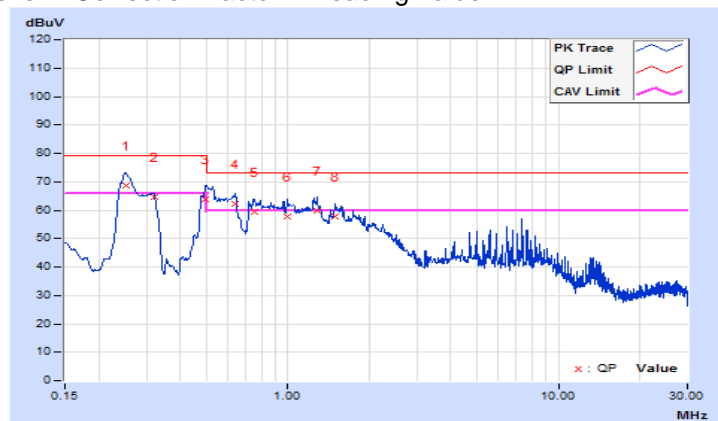
5.4 Test Results

| | | | |
|-----------------------------|----------------|---|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 21°C, 70%RH |
| Tested by | Chenghan Wu | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Positive (+) | | | | | | | | | | |
|-------------------------------|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
| 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 | 0.25125 | 10.40 | 58.40 | 52.38 | 68.80 | 62.78 | 79.00 | 66.00 | -10.20 | -3.22 |
| 2 | 0.32017 | 10.40 | 54.23 | 37.40 | 64.63 | 47.80 | 79.00 | 66.00 | -14.37 | -18.20 |
| 3 | 0.49799 | 10.40 | 53.49 | 46.15 | 63.89 | 56.55 | 79.00 | 66.00 | -15.11 | -9.45 |
| 4 | 0.64076 | 10.39 | 51.92 | 38.49 | 62.31 | 48.88 | 73.00 | 60.00 | -10.69 | -11.12 |
| 5 | 0.74988 | 10.39 | 48.97 | 41.32 | 59.36 | 51.71 | 73.00 | 60.00 | -13.64 | -8.29 |
| 6 | 0.99657 | 10.38 | 47.44 | 39.78 | 57.82 | 50.16 | 73.00 | 60.00 | -15.18 | -9.84 |
| 7 | 1.28591 | 10.39 | 49.54 | 41.24 | 59.93 | 51.63 | 73.00 | 60.00 | -13.07 | -8.37 |
| 8 | 1.49705 | 10.39 | 47.28 | 39.99 | 57.67 | 50.38 | 73.00 | 60.00 | -15.33 | -9.62 |

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

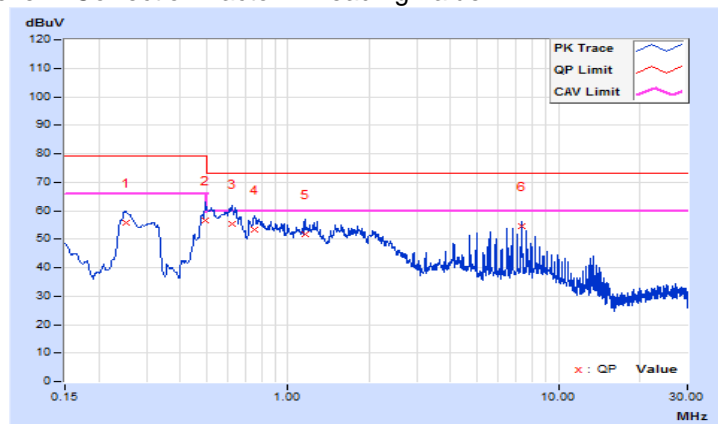


| | | | |
|-----------------------------|----------------|---|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 21°C, 70%RH |
| Tested by | Chenghan Wu | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Negative (-) | | | | | | | | | | |
|-------------------------------|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
| 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 | 0.25166 | 10.40 | 45.22 | 39.16 | 55.62 | 49.56 | 79.00 | 66.00 | -23.38 | -16.44 |
| 2 | 0.49799 | 10.41 | 46.15 | 39.38 | 56.56 | 49.79 | 79.00 | 66.00 | -22.44 | -16.21 |
| 3 | 0.62512 | 10.40 | 44.91 | 37.39 | 55.31 | 47.79 | 73.00 | 60.00 | -17.69 | -12.21 |
| 4 | 0.74988 | 10.39 | 42.87 | 36.09 | 53.26 | 46.48 | 73.00 | 60.00 | -19.74 | -13.52 |
| 5 | 1.15297 | 10.39 | 41.41 | 37.11 | 51.80 | 47.50 | 73.00 | 60.00 | -21.20 | -12.50 |
| 6 | 7.33382 | 10.62 | 43.94 | 38.47 | 54.56 | 49.09 | 73.00 | 60.00 | -18.44 | -10.91 |

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

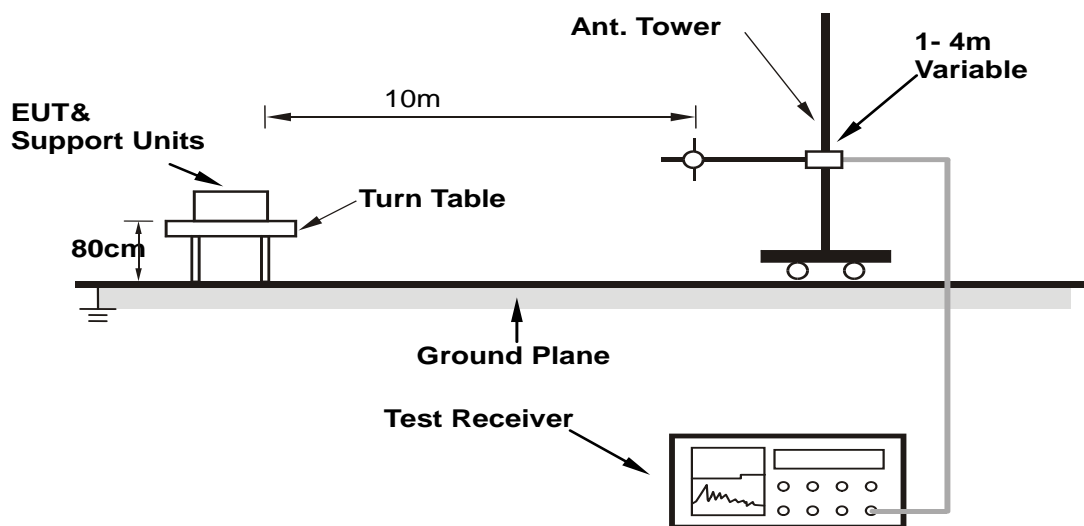
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|-------------------------------|----------------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESCS 30 | 100027 | May 13, 2019 | May 12, 2020 |
| Schwarzbeck Bilog Antenna | VULB9168 | 9168-303 | Nov. 11, 2019 | Nov. 10, 2020 |
| Agilent Preamplifier | 8447D | 2944A08119 | Feb. 19, 2020 | Feb. 18, 2021 |
| 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. 24, 2019 | Oct. 23, 2020 |
| Pacific RF cable With 5dB PAD | 8D | CABLE-ST2-01 | Oct. 24, 2019 | Oct. 23, 2020 |

- Note:
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-10237.
 4. Tested Date: Mar. 20, 2020

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

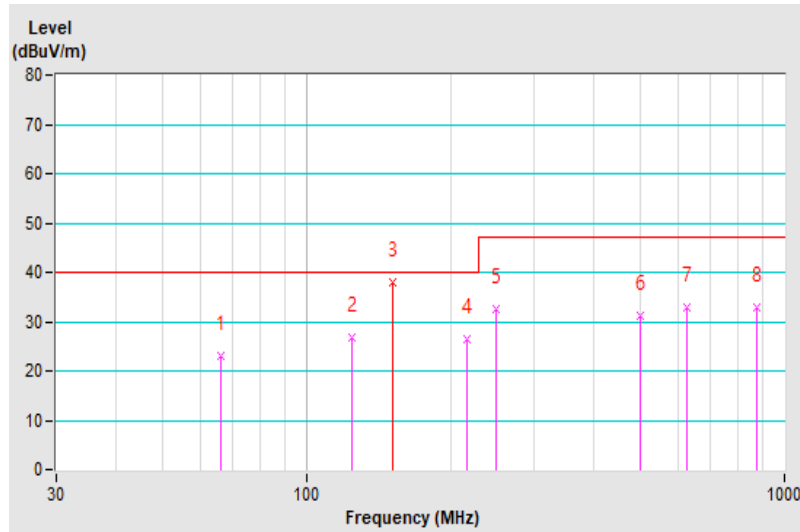
| | | | |
|-----------------------------|--------------|---|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 22°C, 73%RH |
| Tested by | Paul Chen | | |
| Test 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 | 66.39 | 23.19 QP | 40.00 | -16.81 | 4.00 H | 318 | 34.46 | -11.27 |
| 2 | 125.00 | 26.64 QP | 40.00 | -13.36 | 4.00 H | 130 | 37.69 | -11.05 |
| 3 | 151.84 | 37.96 QP | 40.00 | -2.04 | 4.00 H | 344 | 47.16 | -9.20 |
| 4 | 217.17 | 26.48 QP | 40.00 | -13.52 | 4.00 H | 58 | 38.24 | -11.76 |
| 5 | 250.02 | 32.65 QP | 47.00 | -14.35 | 3.81 H | 133 | 42.28 | -9.63 |
| 6 | 500.00 | 31.14 QP | 47.00 | -15.86 | 2.07 H | 39 | 34.53 | -3.39 |
| 7 | 625.01 | 32.73 QP | 47.00 | -14.27 | 1.48 H | 294 | 33.27 | -0.54 |
| 8 | 875.02 | 32.96 QP | 47.00 | -14.04 | 1.00 H | 273 | 28.19 | 4.77 |

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

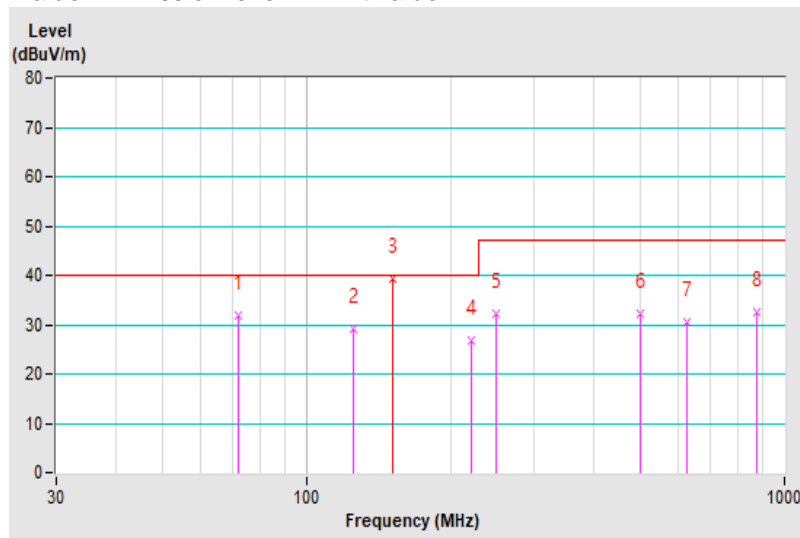


| | | | |
|-----------------------------|--------------|---|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 22°C, 73%RH |
| Tested by | Paul Chen | | |
| Test 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 | 72.11 | 31.84 QP | 40.00 | -8.16 | 1.49 V | 111 | 44.50 | -12.66 |
| 2 | 125.02 | 29.07 QP | 40.00 | -10.93 | 1.00 V | 99 | 40.12 | -11.05 |
| 3 | 151.49 | 39.27 QP | 40.00 | -0.73 | 1.00 V | 190 | 48.50 | -9.23 |
| 4 | 221.36 | 26.79 QP | 40.00 | -13.21 | 1.00 V | 248 | 38.48 | -11.69 |
| 5 | 250.02 | 32.09 QP | 47.00 | -14.91 | 1.00 V | 145 | 41.72 | -9.63 |
| 6 | 500.01 | 32.27 QP | 47.00 | -14.73 | 1.00 V | 329 | 35.66 | -3.39 |
| 7 | 625.00 | 30.66 QP | 47.00 | -16.34 | 3.14 V | 299 | 31.20 | -0.54 |
| 8 | 875.01 | 32.48 QP | 47.00 | -14.52 | 2.32 V | 193 | 27.71 | 4.77 |

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 |

| Radiated Emissions Limits at 1.5 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 |
| Above 18000 | Avg: 66 Peak: 86 | Avg: 60 Peak: 80 | Avg: 66 Peak: 86 | Avg: 60 Peak: 80 |

- 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 of Radiated Measurement (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. 6, 2019 | Jun. 5, 2020 |
| Agilent Test Receiver | N9038A | MY51210137 | Jun. 6, 2019 | Jun. 5, 2020 |
| Agilent Preamplifier | 8449B | 3008A01292 | Feb. 20, 2020 | Feb. 19, 2021 |
| MITEQ Preamplifier | AMF-6F-260400-33-8P | 892164 | Feb. 20, 2020 | Feb. 19, 2021 |
| EMCI Preamplifier | EMC184045B | 980235 | Feb. 20, 2020 | Feb. 19, 2021 |
| ETS Preamplifier | 3117-PA | 00215857 | Nov. 24, 2019 | Nov. 23, 2020 |
| Schwarzbeck Horn Antenna | BBHA-9170 | 212 | Nov. 24, 2019 | Nov. 23, 2020 |
| EMCO Horn Antenna | 3115 | 6714 | Nov. 24, 2019 | Nov. 23, 2020 |
| Max Full. Turn Table | MF7802 | MF780208216 | NA | NA |
| Software | Radiated_V8.7.08 | NA | NA | NA |
| KIK + WOKEN RF cable With 3/4dB PAD | K1K50-UP0279-K1K50 -3000+WC01 | Cable-CH10(3m) -04 +Cable-CH10-03 | Jul. 10, 2019 | Jul. 9, 2020 |
| MICRO-TRONICS Notch filter | BRC50703-01 | 010 | May 30, 2019 | May 29, 2020 |
| MICRO-TRONICS Band Pass Filter | BRM17690 | 005 | May 30, 2019 | May 29, 2020 |

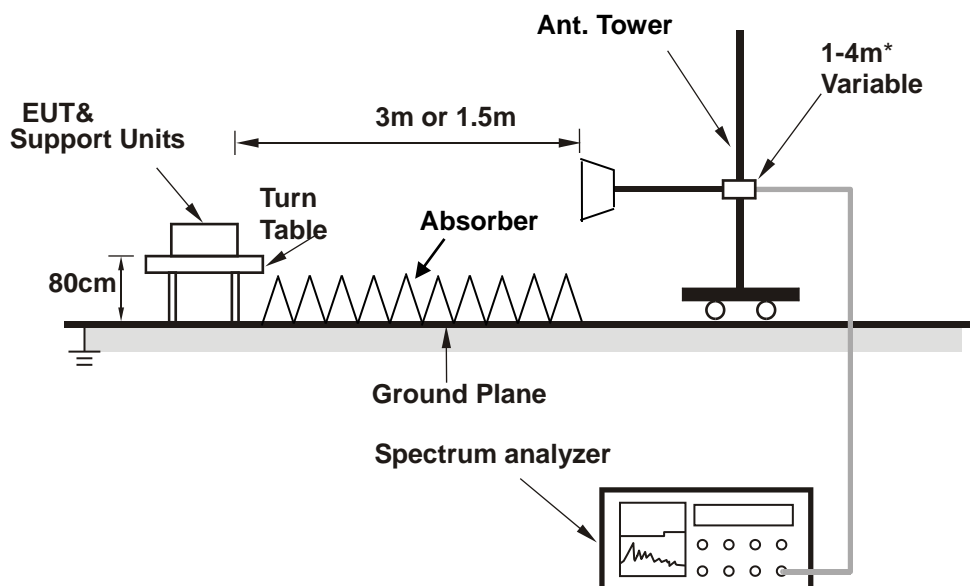
- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Chamber No. 10.
 3. The VCCI Site Registration No. G-10427
 4. Tested Date: Mar. 20 to 21, 2020

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 / 1.5 meter 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.
- For measurement of frequency 1 GHz ~ 18 GHz, the EUT was set 3 meters away from the receiver antenna
- For measurement of frequency 18 GHz ~ 40 GHz, the EUT was set 1.5 meter away from the receiver antenna



* :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.

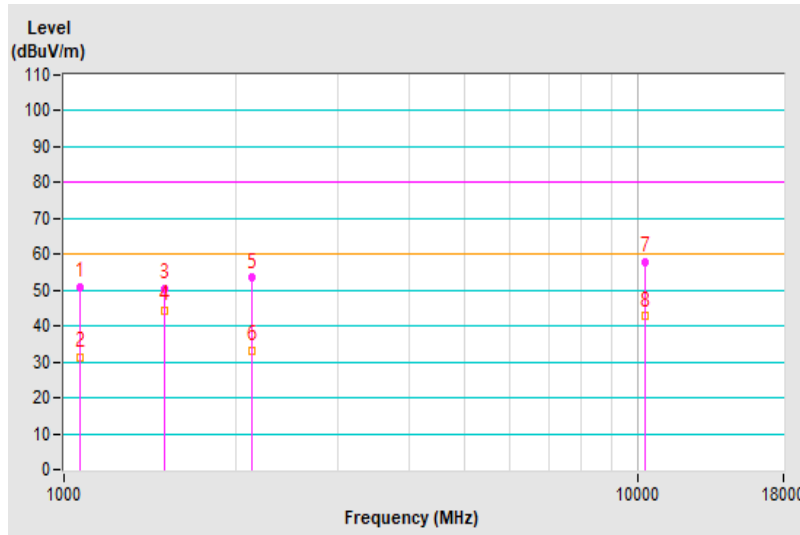
7.4 Test Results

| | | | |
|-----------------------------|--------------|---|--------------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 20°C, 64%RH |
| Tested by | Vincent Lin | | |
| 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 | 1066.78 | 50.81 PK | 80.00 | -29.19 | 2.50 H | 216 | 53.79 | -2.98 |
| 2 | 1066.78 | 31.24 AV | 60.00 | -28.76 | 2.50 H | 216 | 34.22 | -2.98 |
| 3 | 1500.20 | 50.53 PK | 80.00 | -29.47 | 1.00 H | 129 | 53.34 | -2.81 |
| 4 | 1500.20 | 44.32 AV | 60.00 | -15.68 | 1.00 H | 129 | 47.13 | -2.81 |
| 5 | 2126.33 | 53.40 PK | 80.00 | -26.60 | 2.30 H | 125 | 54.53 | -1.13 |
| 6 | 2126.33 | 33.10 AV | 60.00 | -26.90 | 2.30 H | 125 | 34.23 | -1.13 |
| 7 | 10312.86 | 57.91 PK | 80.00 | -22.09 | 2.07 H | 269 | 45.65 | 12.26 |
| 8 | 10312.86 | 42.72 AV | 60.00 | -17.28 | 2.07 H | 269 | 30.46 | 12.26 |

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

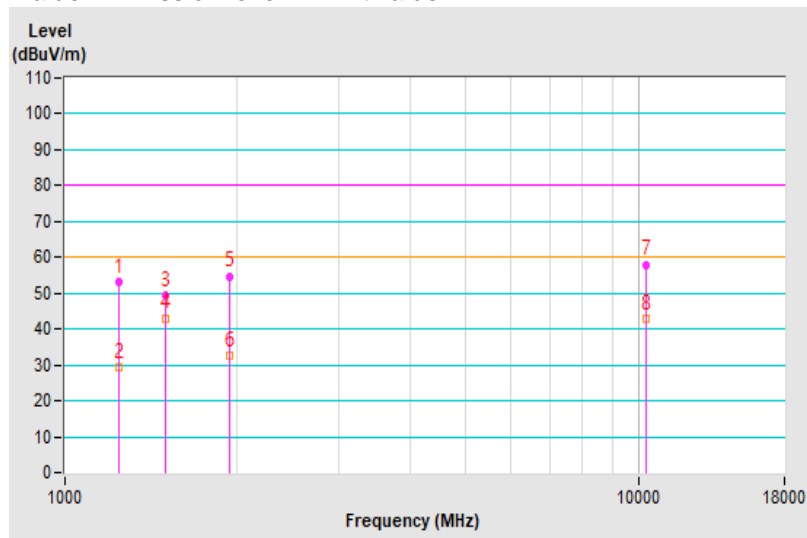


| | | | |
|-----------------------------|--------------|---|--------------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 20°C, 64%RH |
| Tested by | Vincent Lin | | |
| 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 | 1241.12 | 52.98 PK | 80.00 | -27.02 | 2.26 V | 188 | 56.71 | -3.73 |
| 2 | 1241.12 | 29.21 AV | 60.00 | -30.79 | 2.26 V | 188 | 32.94 | -3.73 |
| 3 | 1499.99 | 49.23 PK | 80.00 | -30.77 | 1.66 V | 352 | 52.04 | -2.81 |
| 4 | 1499.99 | 42.94 AV | 60.00 | -17.06 | 1.66 V | 352 | 45.75 | -2.81 |
| 5 | 1932.40 | 54.54 PK | 80.00 | -25.46 | 2.43 V | 151 | 56.15 | -1.61 |
| 6 | 1932.40 | 32.47 AV | 60.00 | -27.53 | 2.43 V | 151 | 34.08 | -1.61 |
| 7 | 10311.66 | 57.79 PK | 80.00 | -22.21 | 1.70 V | 360 | 45.53 | 12.26 |
| 8 | 10311.66 | 42.69 AV | 60.00 | -17.31 | 1.70 V | 360 | 30.43 | 12.26 |

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

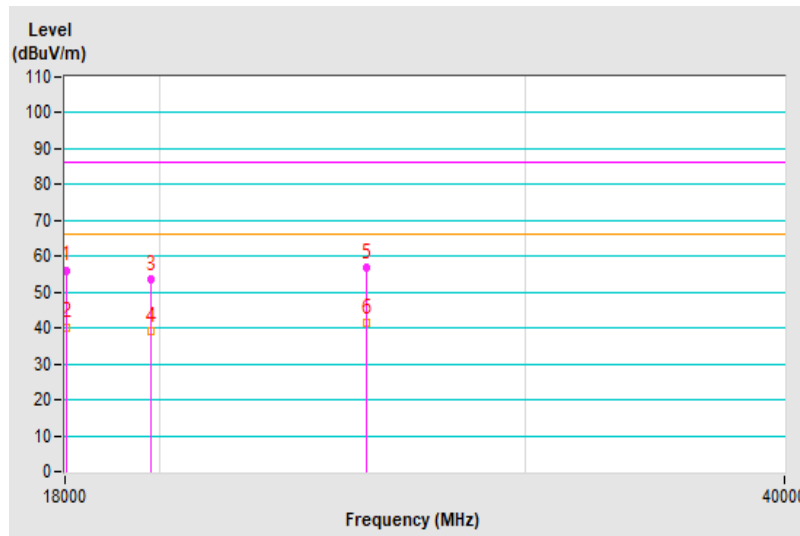


| | | | |
|-----------------------------|---------------|---|--------------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 20°C, 64%RH |
| Tested by | Vincent Lin | | |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Horizontal at 1.5 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 | 18020.74 | 55.87 PK | 86.00 | -30.13 | 1.18 H | 354 | 60.43 | -4.56 |
| 2 | 18020.74 | 40.31 AV | 66.00 | -25.69 | 1.18 H | 354 | 44.87 | -4.56 |
| 3 | 19813.41 | 53.46 PK | 86.00 | -32.54 | 1.08 H | 177 | 57.95 | -4.49 |
| 4 | 19813.41 | 39.02 AV | 66.00 | -26.98 | 1.08 H | 177 | 43.51 | -4.49 |
| 5 | 25145.01 | 56.64 PK | 86.00 | -29.36 | 1.43 H | 343 | 55.28 | 1.36 |
| 6 | 25145.01 | 41.30 AV | 66.00 | -24.70 | 1.43 H | 343 | 39.94 | 1.36 |

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

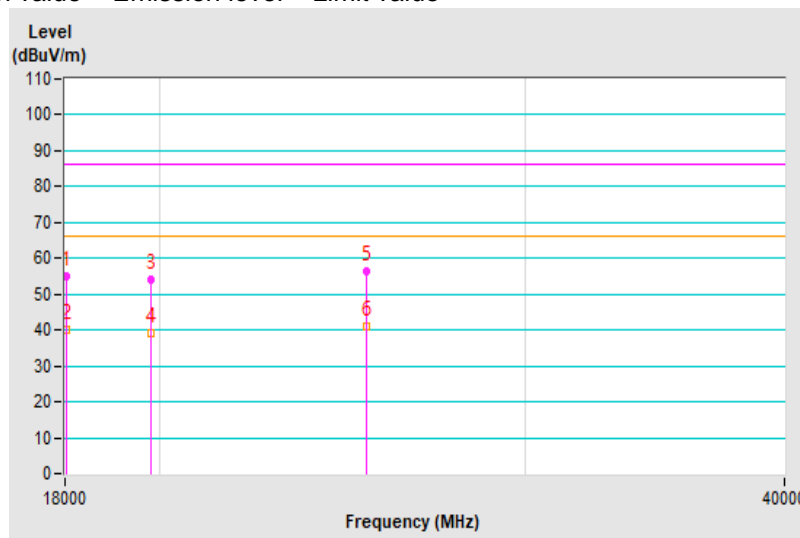


| | | | |
|-----------------------------|---------------|---|--------------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power (System) | 36Vdc | Environmental Conditions | 20°C, 64%RH |
| Tested by | Vincent Lin | | |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Vertical at 1.5 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 | 18017.39 | 55.00 PK | 86.00 | -31.00 | 2.00 V | 358 | 59.51 | -4.51 |
| 2 | 18017.39 | 40.24 AV | 66.00 | -25.76 | 2.00 V | 358 | 44.75 | -4.51 |
| 3 | 19806.71 | 54.12 PK | 86.00 | -31.88 | 1.78 V | 243 | 58.60 | -4.48 |
| 4 | 19806.71 | 39.15 AV | 66.00 | -26.85 | 1.78 V | 243 | 43.63 | -4.48 |
| 5 | 25144.43 | 56.46 PK | 86.00 | -29.54 | 1.00 V | 159 | 55.10 | 1.36 |
| 6 | 25144.43 | 41.08 AV | 66.00 | -24.92 | 1.00 V | 159 | 39.72 | 1.36 |

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

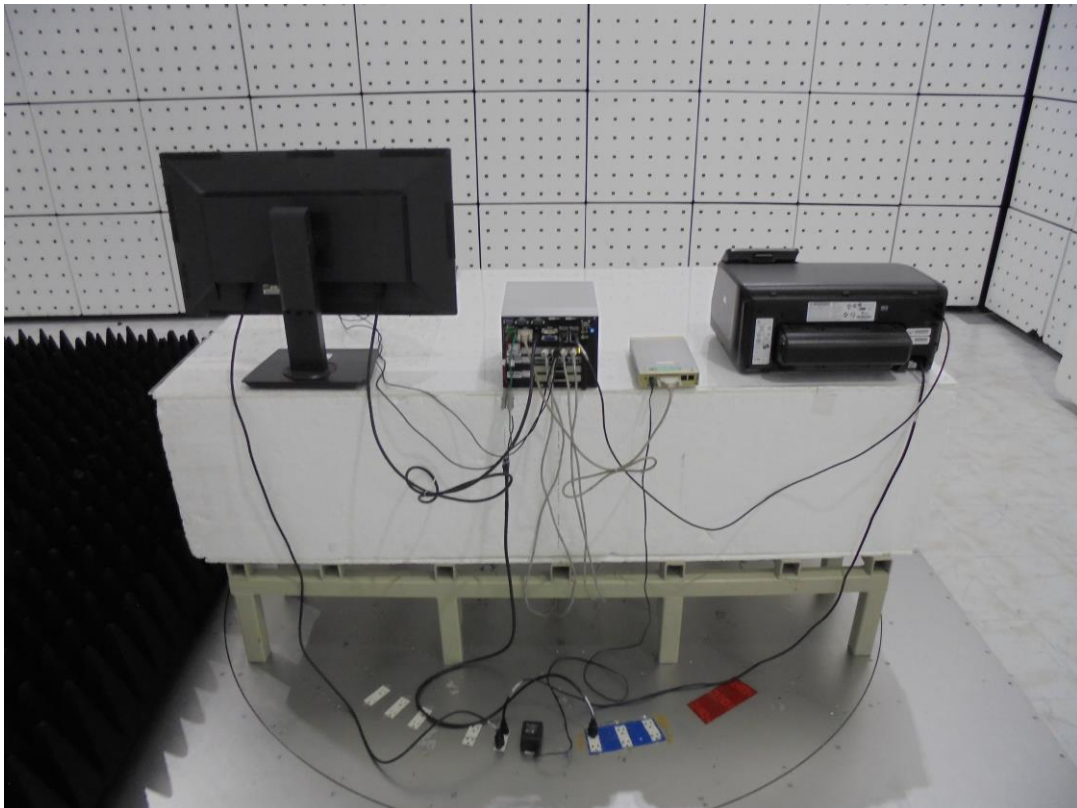
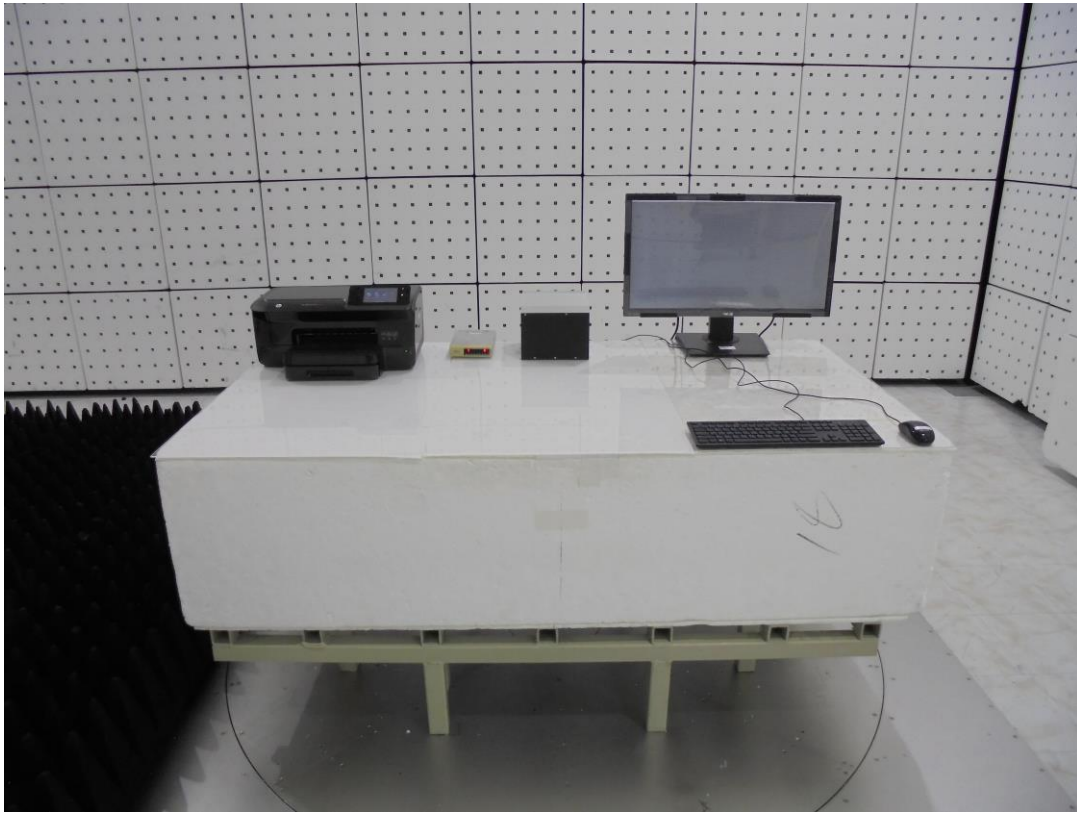
8.1 Conducted Emissions at Mains Ports



8.2 Radiated Emissions up to 1 GHz



8.3 Radiated Emissions above 1 GHz



Appendix – Information of 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.

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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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