

VCCI Test Report (VCCI 32-1)

Report No.: V190124D02

Test Model: FD9380-HNWL

Series Model: FD9380-H

Received Date: Jan. 24, 2019

Test Date: Jan. 30 to Mar. 29, 2019

Issued Date: Apr. 2, 2019

Applicant: VIVOTEK INC.

VCCI member No.: 2443

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

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Release Control Record

| Issue No. | Description | Date Issued |
|------------|-------------------|--------------|
| V190124D02 | Original release. | Apr. 2, 2019 |

1 Certificate of Conformity

Product: Network Camera
Brand: VIVOTEK
Test Model: FD9380-HNWL
Series Model: FD9380-H
Sample Status: Engineering sample
Applicant: VIVOTEK INC.
Test Date: Jan. 30 to Mar. 29, 2019
Standards: VCCI-CISPR 32:2016, Class B

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 : Albee Chu , **Date:** Apr. 2, 2019
Albee Chu / Specialist

Approved by : Jim Hsiang , **Date:** Apr. 2, 2019
Jim Hsiang / Associate Technical Manager

2 Summary of Test Results

| Emission | | | |
|--------------------|---|--|---------|
| Standard | Test Item | Result/Remarks | Verdict |
| VCCI-CISPR 32:2016 | Conducted emission from the mains power port | Minimum passing Class B margin is -10.06 dB at 0.51646 MHz | Pass |
| | Asymmetric mode conducted emission at telecommunication ports | Minimum passing Class B margin is -7.21 dB at 16.22793 MHz | Pass |
| | Radiated emission 30-1000 MHz | Minimum passing Class B margin is -3.11 dB at 168.01 MHz | Pass |
| | Radiated emission above 1GHz | Minimum passing Class B margin is -10.92 dB at 1500.04 MHz | Pass |
| | Disturbance Voltage at the Antenna Terminals Test | Without tuner port of the EUT | N/A |

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
3. N/A: Not Applicable

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:

| Measurement | Frequency | Expanded Uncertainty (k=2) (\pm) | Facility No. Registered to VCCI |
|---|----------------|--------------------------------------|---------------------------------|
| Conducted disturbance at mains ports | 150kHz ~ 30MHz | 2.79 dB | C-1312 |
| Asymmetric mode conducted emission at telecommunication ports using AAN | 150kHz ~ 30MHz | 3.94 dB | T-11587 |
| Radiated emission, 30MHz ~ 1GHz | 30MHz ~ 1GHz | 3.97 dB | R-237 |
| Radiated emission, 1GHz ~ 6GHz | Above 1GHz | 4.77 dB | G-257 |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

| | |
|---------------------|---|
| Product | Network Camera |
| Brand | VIVOTEK |
| Test Model | FD9380-HNWL |
| Series Model | FD9380-H |
| Model Difference | Refer to below note |
| Sample Status | Engineering sample |
| Operating Software | N/A |
| Power Supply Rating | DC 12V or PoE |
| Accessory Device | N/A |
| Data Cable Supplied | Shielded Y cable (LAN + DC) with one ferrite core. (0.3m) |

Note:

The EUT is a Network Camera, and it has several models, which are identical with each other, except for following difference:

| Model | Power supply rating |
|-------------|---------------------|
| FD9380-HNWL | DC 12V or PoE |
| FD9380-H | DC 12V only |

During the test, the **Model: FD9380-HNWL** was selected as the representative one and therefore only its test data was recorded in this report.

3.2 Features of EUT

The tests reported herein were performed according to the method specified by VIVOTEK INC., 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

- The EUT was pre-tested under operating and standby condition and the worst emission level was found under **operating condition**.
- The EUT consumes power from Adapter, which designed with AC power supply of rating 100-240Vac, 50/60Hz. For radiated emission evaluation, 230Vac/50Hz (for EN 55032 & AS/NZS CISPR 32), 100Vac/50Hz & 100Vac/60Hz (for VCCI) had been covered during the pre-test. The worst radiated emission data was found at **230Vac/50Hz**.
- The EUT has been pre-tested under following test modes, and test **mode 2** was the worst case.

| Mode | Test Condition |
|------|----------------|
| 1 | Adapter Mode |
| 2 | PoE Mode |

- Test modes are presented in the report as below.

| Mode | Test Condition | Input Power |
|---|-----------------------------------|---------------------------------------|
| Conducted emission test | | |
| 1 | Adapter Mode | 12Vdc (from adapter: 100Vac/ 50Hz) |
| | | 12Vdc (from adapter: 100Vac/ 60Hz) |
| Asymmetric Mode Conducted Emission at Telecommunication Ports test | | |
| 1 | Adapter Mode (LAN Speed: 100Mbps) | 12Vdc (from adapter: 100Vac/ 60Hz) |
| 2 | PoE Mode (LAN Speed: 100Mbps) | 55Vdc |

Note:

- 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.
- Mode 1 was selected the worst input power from conducted emission test.

| Radiated emission test | | |
|-------------------------------|--------------|---------------------------------------|
| 1 | Adapter Mode | 12Vdc (from adapter: 230Vac/ 50Hz) |
| 2 | PoE Mode | 55Vdc |

3.4 Test Program Used and Operation Descriptions

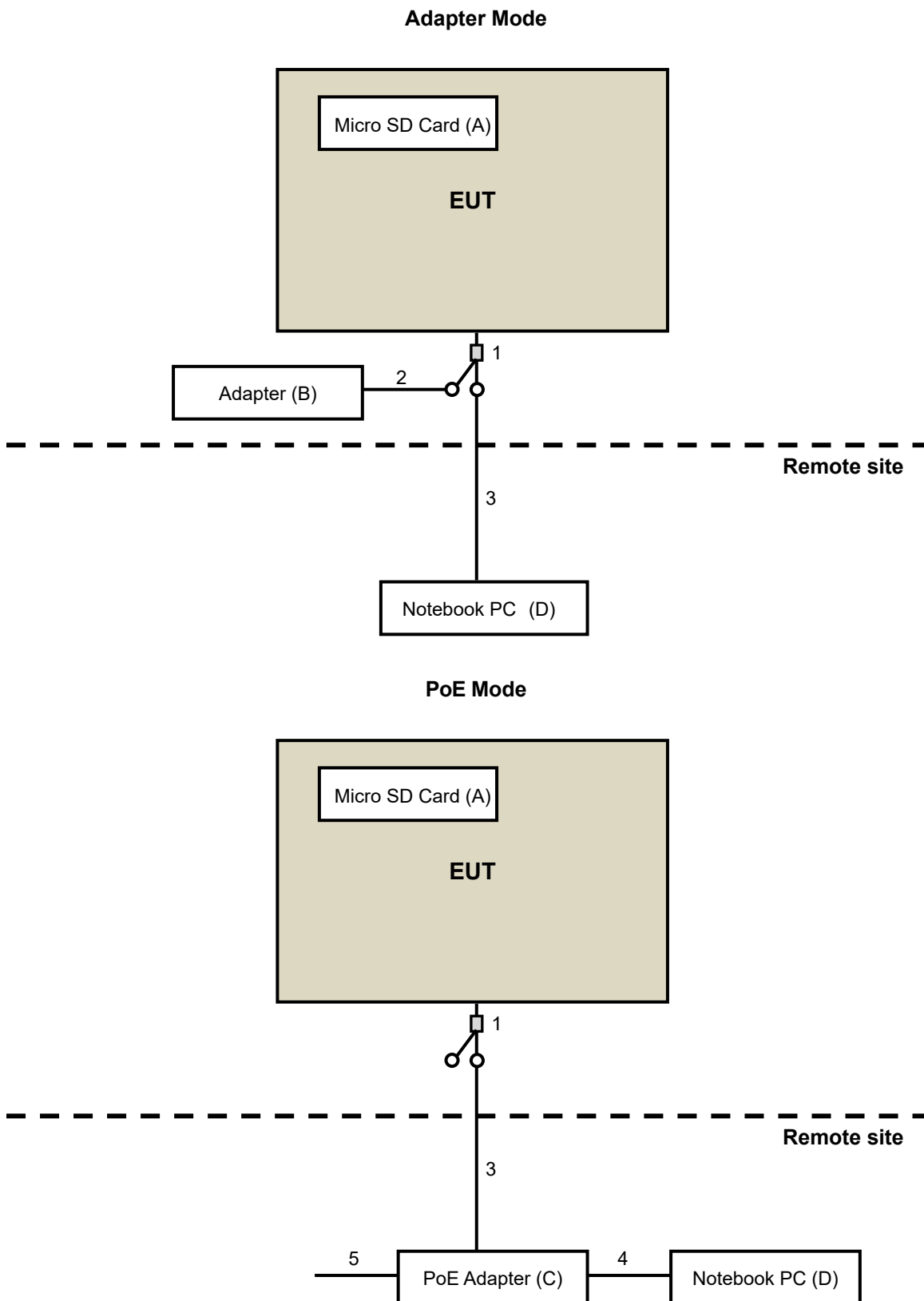
- Connected the EUT with Adapter or PoE adapter.
- Turned on the power of all equipment.
- EUT captured video / audio signal to notebook (kept in a remote area) via an UTP LAN cable, then it displayed messages on its screen simultaneously. **<For Adapter Mode>**
- EUT captured video / audio signal to notebook (kept in a remote area) via PoE adapter with an UTP LAN cable, then it displayed messages on its screen simultaneously. **<For PoE Mode>**
- EUT Save images to Micro SD card.
- Steps c-e 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 1.6GHz, provided by VIVOTEK INC., 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. | Micro SD Card | Transcend | 16GB | N/A | N/A | Provided by Lab |
| B. | Adapter | Atech OEM | ADS018K-X120150 | N/A | N/A | Supplied by client |
| C. | PoE Adapter | Microsemi | PD-9001GR | N/A | N/A | Supplied by client |
| D. | Notebook PC | ASUS | PU401L | ECNXBC01252 8528 | FCC DoC Approved | Provided by Lab |

Note:

- All power cords of the above support units are non-shielded (1.8m).
- Items D acted as communication partners to transfer data.
- Rating of item B was listed as below:
AC I/P: 100-240V, 50-60Hz, 0.5A
DC O/P: 12V, 1.5A
- Rating of item C was listed as below:
AC I/P: 100-240V, 50/60Hz, 0.67A
DC O/P: 55V, 0.6A

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|----|--------------------|------|------------|--------------------|--------------|--------------------|
| 1. | Y cable (LAN + DC) | 1 | 0.3 | Y | 1 | Supplied by client |
| 2. | DC cable | 1 | 1.5 | N | 0 | Supplied by client |
| 3. | LAN cable (Cat.5e) | 1 | 10 | N | 0 | Provided by Lab |
| 4. | LAN cable (Cat.5e) | 1 | 1.0 | N | 0 | Provided by Lab |
| 5. | 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 Emission from the Mains Power Port

5.1 Limits

| Frequency range (MHz) | Coupling device | Detector type / bandwidth | Class A limits (dBuV) |
|-----------------------|-----------------|---------------------------|-----------------------|
| 0.15 - 0.5 | AMN | Quasi-peak / 9kHz | 79 |
| 0.5 - 30.0 | | | 73 |
| 0.15 - 0.5 | | Average / 9kHz | 66 |
| 0.5 - 30.0 | | | 60 |

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

5.2 Test Instruments

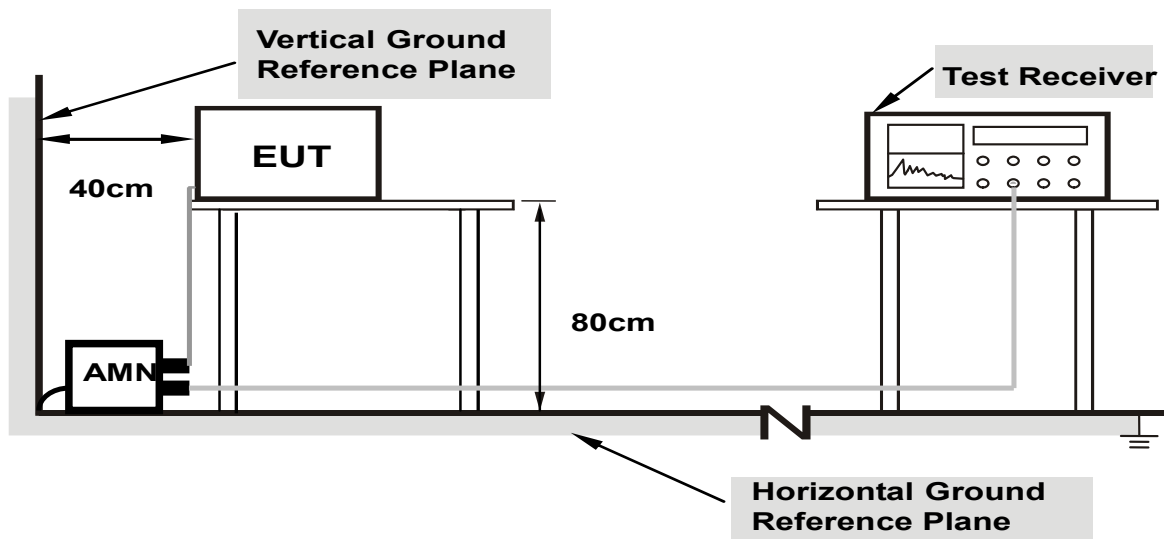
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|--|---------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESR3 | 102413 | Feb. 18, 2019 | Feb. 17, 2020 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ESH2-Z5 | 100104 | Dec. 18, 2018 | Dec. 17, 2019 |
| LISN With Adapter (for EUT) | AD10 | C09Ada-001 | Dec. 18, 2018 | Dec. 17, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 847265/023 | Nov. 5, 2018 | Nov. 4, 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. 15, 2019 | Mar. 14, 2020 |
| Software | Cond_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) With 10dB PAD | 5D-FB | Cable-C09.01 | Feb. 20, 2019 | Feb. 19, 2020 |
| SUHNTER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-010789 | May 8, 2018 | May 7, 2019 |

- 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-1312.
 4. Tested Date: Mar. 29, 2019.

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 an Artificial Mains Network (AMN). Other support units were connected to the power mains through another AMN. The two AMNs 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:**
1. Support units were connected to second AMN.
 2. The distance specified between EUT/AE and other metallic objects is ≥ 0.8 m in the measurement arrangement for table-top EUT.
 3. Cable on the RGP must to be insulated.

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

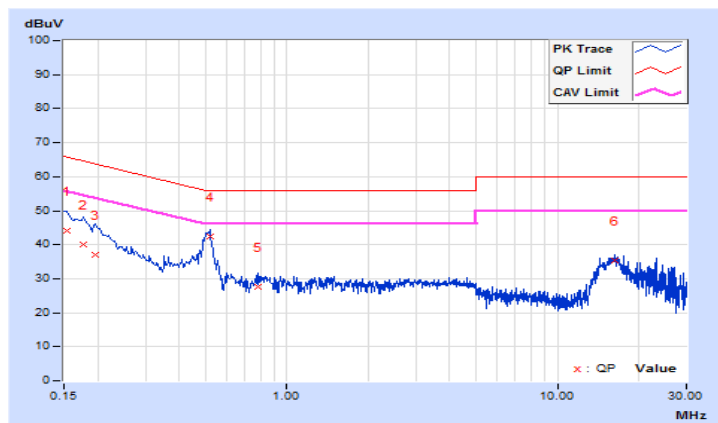
5.4 Test Results

| | | | |
|------------------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 75%RH, 1002mbar |
| Tested by | Kobe Lu | | |
| Test Mode | Mode 1A | | |

| 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 | 0.15391 | 10.17 | 33.90 | 14.80 | 44.07 | 24.97 | 65.79 | 55.79 | -21.72 | -30.82 |
| 2 | 0.17737 | 10.18 | 30.05 | 12.69 | 40.23 | 22.87 | 64.61 | 54.61 | -24.38 | -31.74 |
| 3 | 0.19665 | 10.19 | 26.80 | 10.68 | 36.99 | 20.87 | 63.75 | 53.75 | -26.76 | -32.88 |
| 4 | 0.51955 | 10.25 | 32.06 | 25.34 | 42.31 | 35.59 | 56.00 | 46.00 | -13.69 | -10.41 |
| 5 | 0.78543 | 10.27 | 17.43 | 9.29 | 27.70 | 19.56 | 56.00 | 46.00 | -28.30 | -26.44 |
| 6 | 16.22561 | 11.18 | 24.28 | 19.64 | 35.46 | 30.82 | 60.00 | 50.00 | -24.54 | -19.18 |

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

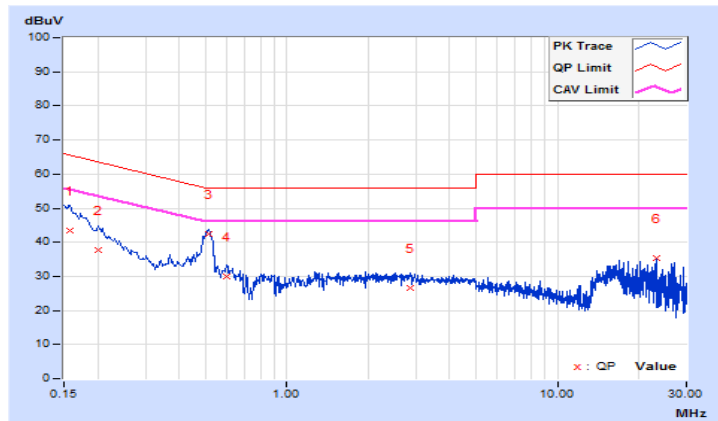


| | | | |
|------------------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 75%RH, 1002mbar |
| Tested by | Kobe Lu | | |
| Test Mode | Mode 1A | | |

| 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 | 0.15719 | 10.21 | 33.24 | 13.04 | 43.45 | 23.25 | 65.61 | 55.61 | -22.16 | -32.36 |
| 2 | 0.20083 | 10.23 | 27.54 | 12.23 | 37.77 | 22.46 | 63.58 | 53.58 | -25.81 | -31.12 |
| 3 | 0.51176 | 10.29 | 32.27 | 24.75 | 42.56 | 35.04 | 56.00 | 46.00 | -13.44 | -10.96 |
| 4 | 0.59775 | 10.30 | 19.70 | 11.35 | 30.00 | 21.65 | 56.00 | 46.00 | -26.00 | -24.35 |
| 5 | 2.84600 | 10.57 | 16.16 | 8.45 | 26.73 | 19.02 | 56.00 | 46.00 | -29.27 | -26.98 |
| 6 | 23.12676 | 11.07 | 24.26 | 23.58 | 35.33 | 34.65 | 60.00 | 50.00 | -24.67 | -15.35 |

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

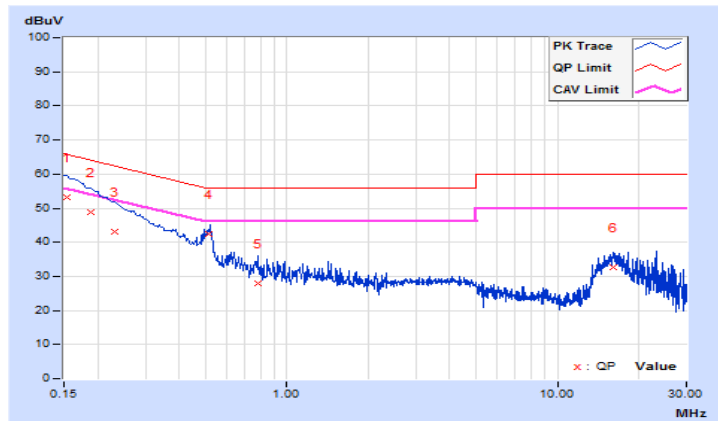


| | | | |
|------------------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 75%RH, 1002mbar |
| Tested by | Kobe Lu | | |
| Test Mode | Mode 1B | | |

| 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 | 0.15391 | 10.17 | 42.87 | 15.60 | 53.04 | 25.77 | 65.79 | 55.79 | -12.75 | -30.02 |
| 2 | 0.18910 | 10.18 | 38.53 | 13.57 | 48.71 | 23.75 | 64.08 | 54.08 | -15.37 | -30.33 |
| 3 | 0.22972 | 10.20 | 32.91 | 10.04 | 43.11 | 20.24 | 62.46 | 52.46 | -19.35 | -32.22 |
| 4 | 0.51646 | 10.25 | 32.08 | 25.69 | 42.33 | 35.94 | 56.00 | 46.00 | -13.67 | -10.06 |
| 5 | 0.77761 | 10.27 | 17.76 | 8.97 | 28.03 | 19.24 | 56.00 | 46.00 | -27.97 | -26.76 |
| 6 | 16.01056 | 11.17 | 21.41 | 16.12 | 32.58 | 27.29 | 60.00 | 50.00 | -27.42 | -22.71 |

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

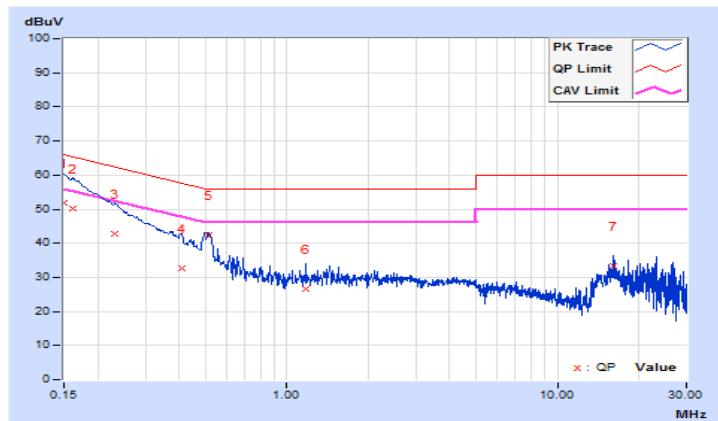


| | | | |
|------------------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 75%RH, 1002mbar |
| Tested by | Kobe Lu | | |
| Test Mode | Mode 1B | | |

| 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 | 0.15000 | 10.20 | 41.71 | 15.34 | 51.91 | 25.54 | 66.00 | 56.00 | -14.09 | -30.46 |
| 2 | 0.16173 | 10.21 | 40.02 | 16.58 | 50.23 | 26.79 | 65.37 | 55.37 | -15.14 | -28.58 |
| 3 | 0.23211 | 10.24 | 32.63 | 9.42 | 42.87 | 19.66 | 62.37 | 52.37 | -19.50 | -32.71 |
| 4 | 0.40692 | 10.28 | 22.36 | 11.70 | 32.64 | 21.98 | 57.71 | 47.71 | -25.07 | -25.73 |
| 5 | 0.51173 | 10.29 | 32.01 | 25.48 | 42.30 | 35.77 | 56.00 | 46.00 | -13.70 | -10.23 |
| 6 | 1.17252 | 10.37 | 16.33 | 7.46 | 26.70 | 17.83 | 56.00 | 46.00 | -29.30 | -28.17 |
| 7 | 16.16696 | 11.04 | 22.18 | 18.65 | 33.22 | 29.69 | 60.00 | 50.00 | -26.78 | -20.31 |

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

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

For Class B Equipment

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

6.2 Test Instruments

For Mode 1

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|--|-----------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESR3 | 102413 | Feb. 18, 2019 | Feb. 17, 2020 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ESH2-Z5 | 100104 | Dec. 18, 2018 | Dec. 17, 2019 |
| LISN With Adapter (for EUT) | AD10 | C09Ada-001 | Dec. 18, 2018 | Dec. 17, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 847265/023 | Nov. 5, 2018 | Nov. 4, 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. 15, 2019 | Mar. 14, 2020 |
| Software | Cond_V7.3.7.4 | NA | NA | NA |
| Software | ISN_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) | 5D-FB | Cable-C09.01 | Feb. 20, 2019 | Feb. 19, 2020 |
| SUHNER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-010789 | May 8, 2018 | May 7, 2019 |
| FCC ISN | F-071115-1057-1 | 20651 | Feb. 15, 2019 | Feb. 14, 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. T-11587
 4. Tested Date: Mar. 29, 2019.

For Mode 2

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|-----------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESR3 | 102413 | Feb. 8, 2018 | Feb. 7, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ESH2-Z5 | 100104 | Dec. 18, 2018 | Dec. 17, 2019 |
| LISN With Adapter (for EUT) | AD10 | C09Ada-001 | Dec. 18, 2018 | Dec. 17, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 847265/023 | Nov. 5, 2018 | Nov. 4, 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 |
| Software | ISN_V7.3.7.4 | NA | NA | NA |
| RF cable (JYEBAO) | 5D-FB | Cable-C09.01 | Feb. 21, 2018 | Feb. 20, 2019 |
| SUHNER Terminator (For ROHDE & SCHWARZ LISN) | 65BNC-5001 | E1-010789 | May 8, 2018 | May 7, 2019 |
| FCC ISN | F-071115-1057-1 | 20651 | Feb. 12, 2018 | Feb. 11, 2019 |

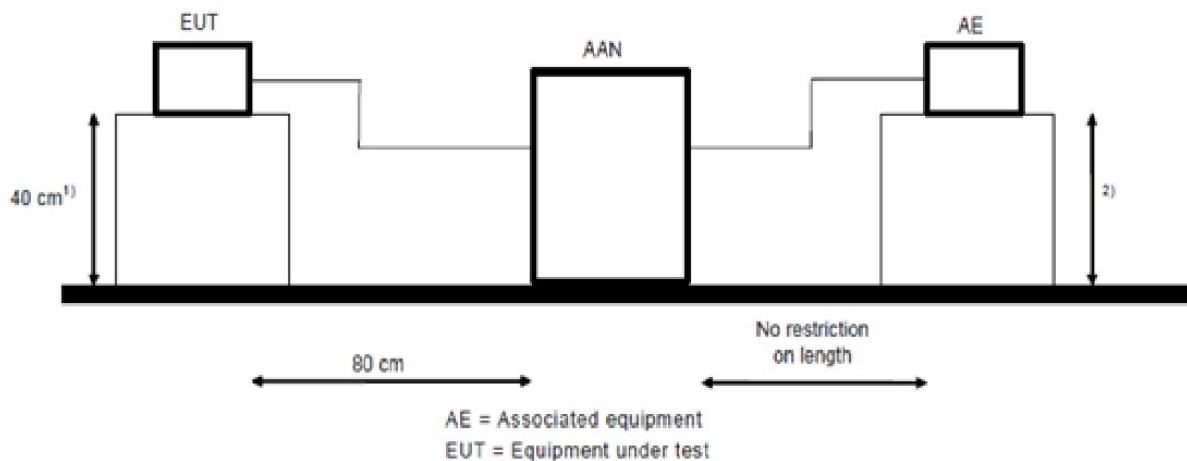
- Notes:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Shielded Room No. 9.
 3. The VCCI Site Registration No. T-11587
 4. Tested Date: Jan. 31, 2019.

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



1) Distance to the reference groundplane (vertical or horizontal).

2) Distance to the reference groundplane is not critical.

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.

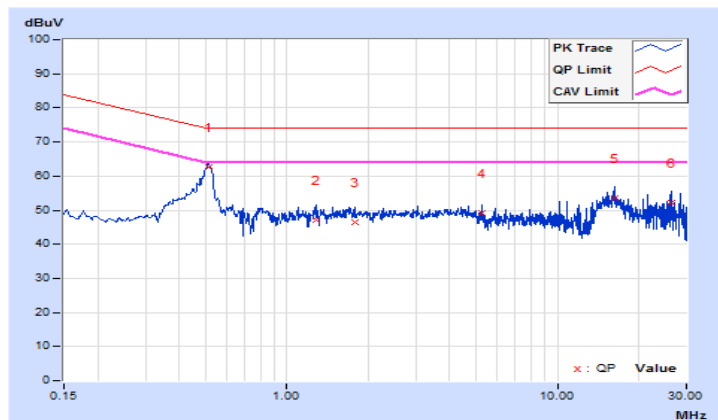
6.4 Test Results

| | | | |
|------------------------|---|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 75%RH, 1002mbar |
| Tested by | Kobe Lu | | |
| Test Mode | Mode 1 RJ45 TELECOM PORT (100Mbps, TFGEN + PING) | | |

| 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 | 0.51311 | 9.50 | 53.28 | 46.25 | 62.78 | 55.75 | 74.00 | 64.00 | -11.22 | -8.25 |
| 2 | 1.28982 | 9.39 | 37.79 | 29.70 | 47.18 | 39.09 | 74.00 | 64.00 | -26.82 | -24.91 |
| 3 | 1.79421 | 9.38 | 36.95 | 28.76 | 46.33 | 38.14 | 74.00 | 64.00 | -27.67 | -25.86 |
| 4 | 5.23460 | 9.34 | 39.88 | 35.21 | 49.22 | 44.55 | 74.00 | 64.00 | -24.78 | -19.45 |
| 5 | 16.22952 | 9.77 | 43.68 | 38.68 | 53.45 | 48.45 | 74.00 | 64.00 | -20.55 | -15.55 |
| 6 | 26.48936 | 10.27 | 42.01 | 37.63 | 52.28 | 47.90 | 74.00 | 64.00 | -21.72 | -16.10 |

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

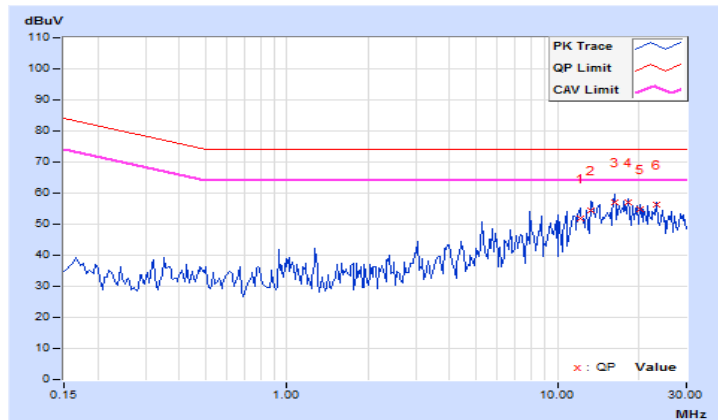


| | | | |
|------------------------|---|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 55Vdc | Environmental Conditions | 22°C, 71%RH, 1012mbar |
| Tested by | Chin-Wen Wang | | |
| Test Mode | Mode 2 RJ45 TELECOM PORT (100Mbps, TFGEN + PING) | | |

| 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 | 12.13672 | 9.54 | 42.43 | 41.85 | 51.97 | 51.39 | 74.00 | 64.00 | -22.03 | -12.61 |
| 2 | 13.35711 | 9.59 | 44.88 | 44.28 | 54.47 | 53.87 | 74.00 | 64.00 | -19.53 | -10.13 |
| 3 | 16.22793 | 9.72 | 47.19 | 47.07 | 56.91 | 56.79 | 74.00 | 64.00 | -17.09 | -7.21 |
| 4 | 18.24219 | 9.81 | 47.15 | 46.93 | 56.96 | 56.74 | 74.00 | 64.00 | -17.04 | -7.26 |
| 5 | 20.25917 | 9.91 | 44.98 | 44.71 | 54.89 | 54.62 | 74.00 | 64.00 | -19.11 | -9.38 |
| 6 | 23.12891 | 10.08 | 46.25 | 46.23 | 56.33 | 56.31 | 74.00 | 64.00 | -17.67 | -7.69 |

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

| Frequency range (MHz) | Distance (m) | Limits (dBuV/m) |
|-----------------------|--------------|-----------------|
| 30 - 230 | 10 | 40 |
| 230 - 1000 | | 47 |
| 30 - 230 | 3 | 50 |
| 230 - 1000 | | 57 |

For Class B Equipment

| Frequency range (MHz) | Distance (m) | Limits (dBuV/m) |
|-----------------------|--------------|-----------------|
| 30 - 230 | 10 | 30 |
| 230 - 1000 | | 37 |
| 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 | ESCS 30 | 100291 | Sep. 3, 2018 | Sep. 2, 2019 |
| Schwarzbeck Bilog Antenna | VULB9168 | 9168-303 | Nov. 22, 2018 | Nov. 21, 2019 |
| 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 |

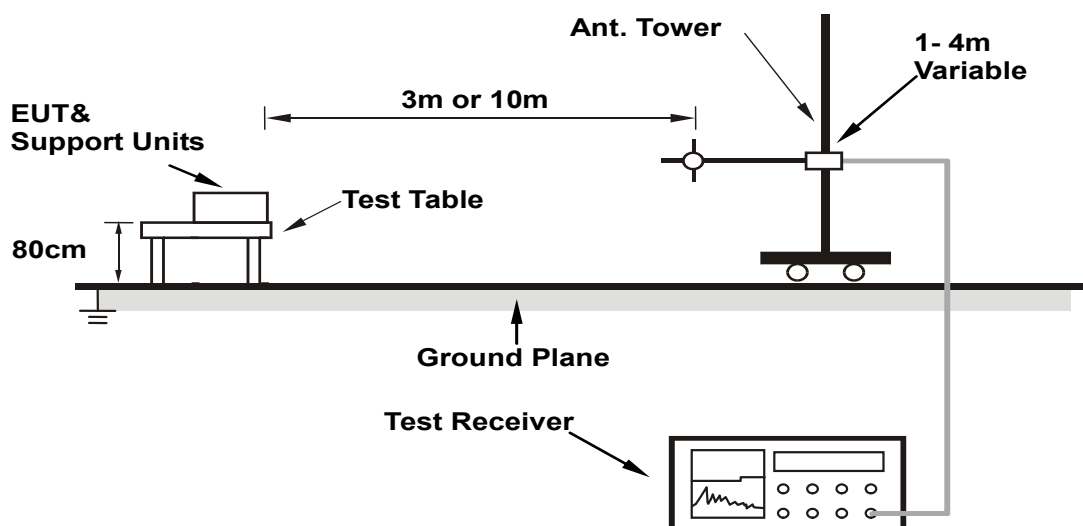
- Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Open Site No. 2.
 3. The VCCI Site Registration No. R-237.
 4. Tested Date: Jan. 31, 2019

7.3 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.
- 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 be insulated.

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

7.4 Test Results

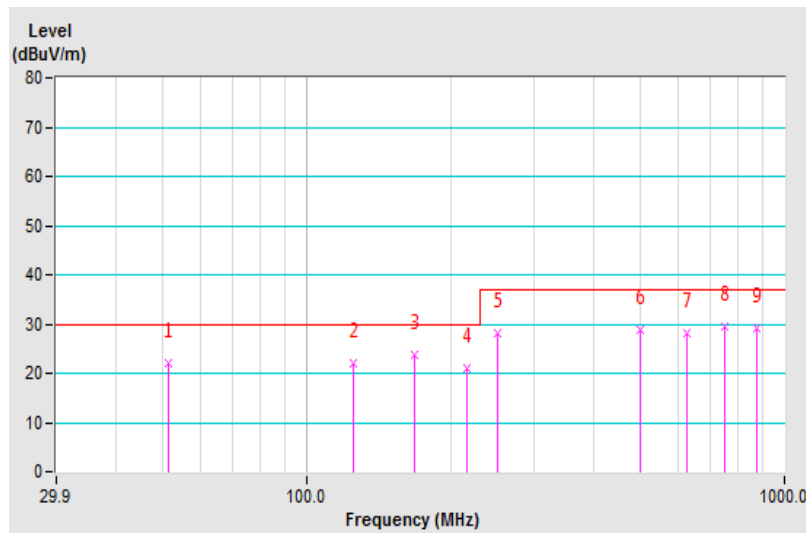
| | | | |
|------------------------|--------------|--|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 73%RH, 1013mbar |
| Tested by | Paul Chen | | |
| Test Mode | Mode 1 | | |

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 | 51.46 | 22.19 QP | 30.00 | -7.81 | 4.00 H | 271 | 31.02 | -8.83 |
| 2 | 125.01 | 22.12 QP | 30.00 | -7.88 | 4.00 H | 299 | 32.51 | -10.39 |
| 3 | 168.01 | 23.69 QP | 30.00 | -6.31 | 4.00 H | 20 | 32.86 | -9.17 |
| 4 | 216.01 | 20.98 QP | 30.00 | -9.02 | 4.00 H | 149 | 32.52 | -11.54 |
| 5 | 250.01 | 28.13 QP | 37.00 | -8.87 | 3.64 H | 148 | 38.27 | -10.14 |
| 6 | 500.01 | 28.95 QP | 37.00 | -8.05 | 2.03 H | 250 | 32.51 | -3.56 |
| 7 | 625.00 | 28.12 QP | 37.00 | -8.88 | 1.36 H | 108 | 28.47 | -0.35 |
| 8 | 750.01 | 29.64 QP | 37.00 | -7.36 | 1.12 H | 4 | 28.51 | 1.13 |
| 9 | 875.01 | 29.06 QP | 37.00 | -7.94 | 1.00 H | 260 | 26.49 | 2.57 |

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

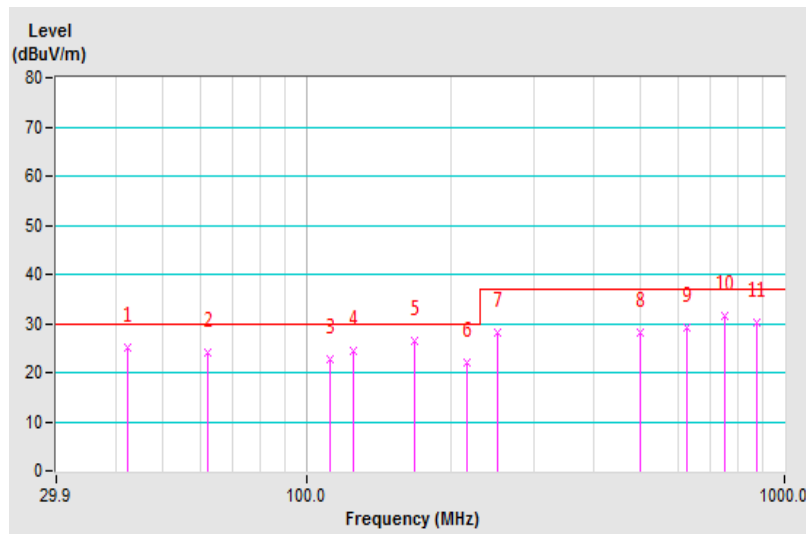


| | | | |
|------------------------|--------------|--|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 12Vdc | Environmental Conditions | 22°C, 73%RH, 1013mbar |
| Tested by | Paul Chen | | |
| Test Mode | Mode 1 | | |

| 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 | 42.26 | 25.01 QP | 30.00 | -4.99 | 1.21 V | 291 | 34.05 | -9.04 |
| 2 | 62.13 | 24.12 QP | 30.00 | -5.88 | 1.54 V | 134 | 34.17 | -10.05 |
| 3 | 112.13 | 22.86 QP | 30.00 | -7.14 | 1.00 V | 235 | 34.67 | -11.81 |
| 4 | 125.00 | 24.53 QP | 30.00 | -5.47 | 1.00 V | 313 | 34.92 | -10.39 |
| 5 | 168.00 | 26.37 QP | 30.00 | -3.63 | 1.00 V | 218 | 35.54 | -9.17 |
| 6 | 216.00 | 22.12 QP | 30.00 | -7.88 | 1.00 V | 247 | 33.66 | -11.54 |
| 7 | 250.01 | 28.09 QP | 37.00 | -8.91 | 1.00 V | 330 | 38.23 | -10.14 |
| 8 | 500.00 | 28.09 QP | 37.00 | -8.91 | 3.18 V | 158 | 31.65 | -3.56 |
| 9 | 625.02 | 29.13 QP | 37.00 | -7.87 | 3.06 V | 275 | 29.48 | -0.35 |
| 10 | 750.01 | 31.69 QP | 37.00 | -5.31 | 2.65 V | 148 | 30.56 | 1.13 |
| 11 | 875.00 | 30.09 QP | 37.00 | -6.91 | 2.12 V | 37 | 27.51 | 2.58 |

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

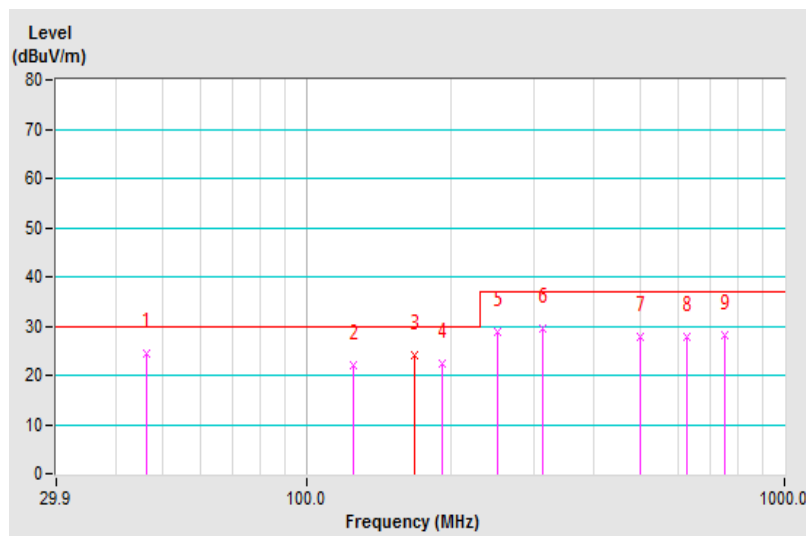


| | | | |
|------------------------|--------------|--|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 55Vdc | Environmental Conditions | 21°C, 74%RH, 1013mbar |
| Tested by | Paul Chen | | |
| Test Mode | Mode 2 | | |

| 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 | 46.24 | 24.27 QP | 30.00 | -5.73 | 4.00 H | 45 | 33.02 | -8.75 |
| 2 | 125.01 | 22.02 QP | 30.00 | -7.98 | 4.00 H | 122 | 32.41 | -10.39 |
| 3 | 168.00 | 23.93 QP | 30.00 | -6.07 | 4.00 H | 285 | 33.10 | -9.17 |
| 4 | 191.99 | 22.30 QP | 30.00 | -7.70 | 4.00 H | 154 | 33.71 | -11.41 |
| 5 | 249.99 | 28.75 QP | 37.00 | -8.25 | 4.00 H | 163 | 38.89 | -10.14 |
| 6 | 312.00 | 29.63 QP | 37.00 | -7.37 | 3.42 H | 263 | 37.85 | -8.22 |
| 7 | 499.99 | 27.64 QP | 37.00 | -9.36 | 2.14 H | 9 | 31.20 | -3.56 |
| 8 | 625.01 | 27.92 QP | 37.00 | -9.08 | 1.40 H | 63 | 28.27 | -0.35 |
| 9 | 749.99 | 28.18 QP | 37.00 | -8.82 | 1.00 H | 136 | 27.05 | 1.13 |

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

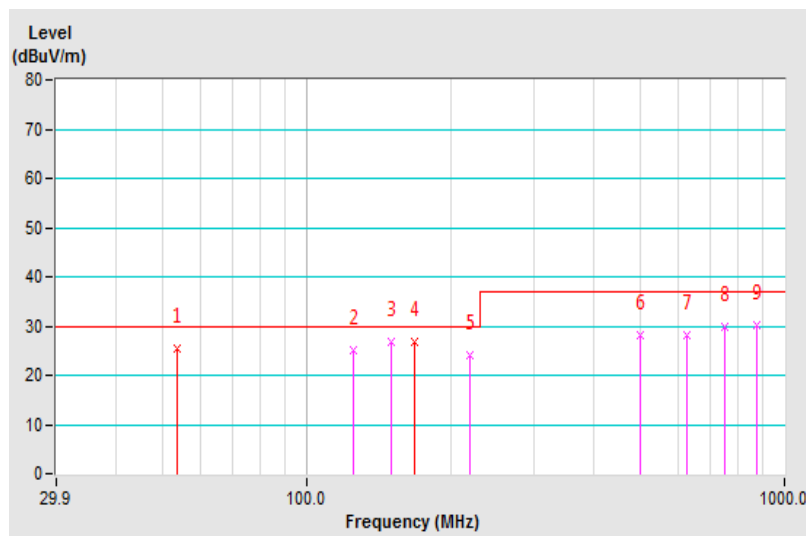


| | | | |
|------------------------|--------------|--|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 55Vdc | Environmental Conditions | 22°C, 73%RH, 1013mbar |
| Tested by | Paul Chen | | |
| Test Mode | Mode 2 | | |

| 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 | 53.69 | 25.37 QP | 30.00 | -4.63 | 1.27 V | 265 | 34.47 | -9.10 |
| 2 | 125.01 | 25.08 QP | 30.00 | -4.92 | 1.00 V | 111 | 35.47 | -10.39 |
| 3 | 150.01 | 26.82 QP | 30.00 | -3.18 | 1.00 V | 124 | 35.71 | -8.89 |
| 4 | 168.01 | 26.89 QP | 30.00 | -3.11 | 1.00 V | 269 | 36.06 | -9.17 |
| 5 | 220.16 | 24.09 QP | 30.00 | -5.91 | 1.00 V | 277 | 35.61 | -11.52 |
| 6 | 500.00 | 28.03 QP | 37.00 | -8.97 | 3.21 V | 144 | 31.59 | -3.56 |
| 7 | 625.01 | 28.07 QP | 37.00 | -8.93 | 2.87 V | 358 | 28.42 | -0.35 |
| 8 | 750.01 | 29.67 QP | 37.00 | -7.33 | 2.74 V | 196 | 28.54 | 1.13 |
| 9 | 875.01 | 30.01 QP | 37.00 | -6.99 | 2.09 V | 66 | 27.44 | 2.57 |

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

| Frequency range (MHz) | Distance (m) | Detector type | Limits (dBuV/m) |
|-----------------------|--------------|---------------|-----------------|
| 1000 - 3000 | 3 | Average | 56 |
| 3000 - 6000 | | | 60 |
| 1000 - 3000 | | Peak | 76 |
| 3000 - 6000 | | | 80 |

For Class B Equipment

| Frequency range (MHz) | Distance (m) | Detector type | Limits (dBuV/m) |
|-----------------------|--------------|---------------|-----------------|
| 1000 - 3000 | 3 | Average | 50 |
| 3000 - 6000 | | | 54 |
| 1000 - 3000 | | Peak | 70 |
| 3000 - 6000 | | | 74 |

Required highest frequency for radiated measurement

| Highest internal frequency (F_x) | Highest measured frequency |
|--------------------------------------|---|
| $F_x \leq 108$ MHz | 1 GHz |
| 108 MHz $< F_x \leq 500$ MHz | 2 GHz |
| 500 MHz $< F_x \leq 1$ GHz | 5 GHz |
| $F_x > 1$ GHz | $5 \times F_x$ 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 | Jun. 4, 2018 | Jun. 3, 2019 |
| Agilent Test Receiver | N9038A | MY51210129 | Feb. 6, 2018 | Feb. 5, 2019 |
| Agilent Preamplifier | 8449B | 3008A01201 | 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 |
| ETS Preamplifier | 3117-PA | 00215857 | Nov. 25, 2018 | Nov.24, 2019 |
| Schwarzbeck Horn Antenna | BBHA-9170 | 212 | Nov. 25, 2018 | Nov. 24, 2019 |
| Schwarzbeck Horn Antenna | BBHA 9120-D1 | D130 | Nov. 25, 2018 | Nov. 24, 2019 |
| ADT. Turn Table | TT100 | 0306 | NA | NA |
| ADT. Tower | AT100 | 0306 | NA | NA |
| Software | Radiated_V8.7.08 | NA | NA | NA |
| SUHNER RF cable With 4dB PAD | SF102 | Cable-CH6-01 | Aug. 13, 2018 | Aug. 12, 2019 |
| SUHNER RF cable With 3/4dB PAD | SF102 | Cable-CH8-02 (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 |

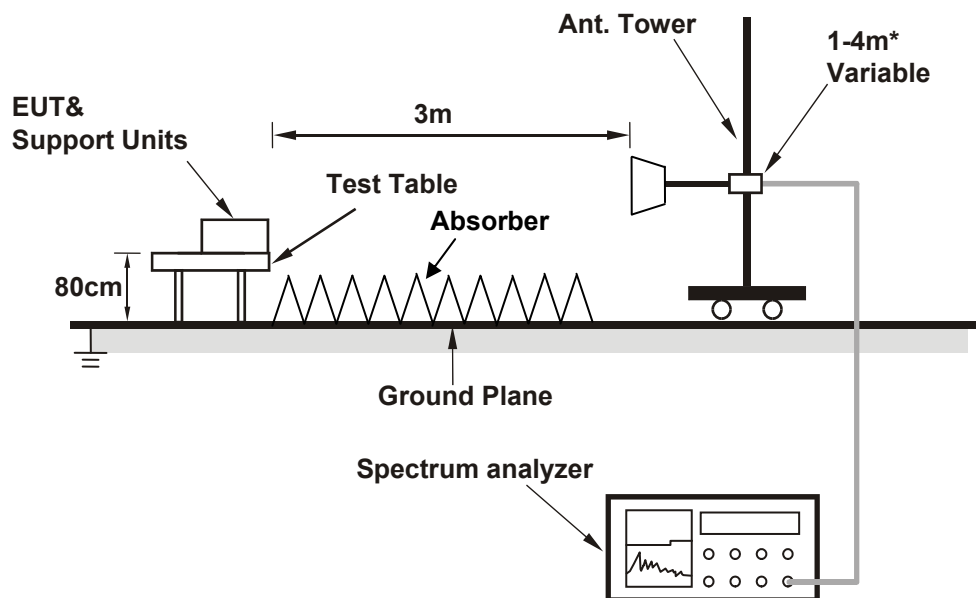
- Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The 3dB beamwidth of the horn antenna is minimum 29 degree (or $w = 1.55m$ at 3m distance) for 1~6 GHz.
3. The test was performed in Chamber No. 6.
4. The Industry Canada Reference No. IC 7450E-6.
5. The VCCI Site Registration No. G-257.
6. Tested Date: Jan. 30, 2019.

8.3 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.
- 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

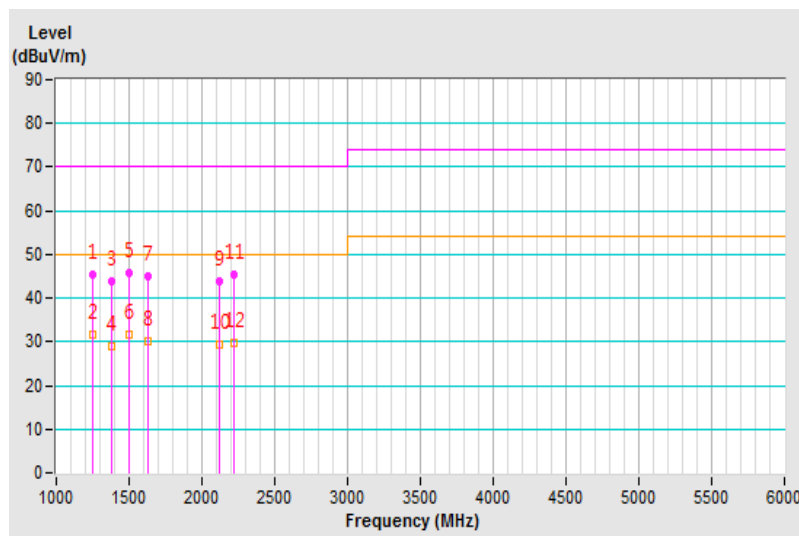
| | | | |
|------------------------|-------------|--|--------------------------------|
| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 12Vdc | Environmental Conditions | 20°C, 71%RH, 1013mbar |
| Tested by | Vincent Lin | | |
| Test Mode | 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 | 1249.85 | 45.52 PK | 70.00 | -24.48 | 1.00 H | 228 | 50.38 | -4.86 |
| 2 | 1249.85 | 31.72 AV | 50.00 | -18.28 | 1.00 H | 228 | 36.58 | -4.86 |
| 3 | 1375.02 | 43.85 PK | 70.00 | -26.15 | 1.82 H | 20 | 47.64 | -3.79 |
| 4 | 1375.02 | 28.95 AV | 50.00 | -21.05 | 1.82 H | 20 | 32.74 | -3.79 |
| 5 | 1500.05 | 45.81 PK | 70.00 | -24.19 | 2.37 H | 42 | 50.28 | -4.47 |
| 6 | 1500.05 | 31.73 AV | 50.00 | -18.27 | 2.37 H | 42 | 36.20 | -4.47 |
| 7 | 1625.07 | 44.91 PK | 70.00 | -25.09 | 1.19 H | 205 | 49.52 | -4.61 |
| 8 | 1625.07 | 30.25 AV | 50.00 | -19.75 | 1.19 H | 205 | 34.86 | -4.61 |
| 9 | 2117.28 | 43.82 PK | 70.00 | -26.18 | 1.53 H | 328 | 44.97 | -1.15 |
| 10 | 2117.28 | 29.18 AV | 50.00 | -20.82 | 1.53 H | 328 | 30.33 | -1.15 |
| 11 | 2220.35 | 45.21 PK | 70.00 | -24.79 | 1.00 H | 218 | 45.61 | -0.40 |
| 12 | 2220.35 | 29.70 AV | 50.00 | -20.30 | 1.00 H | 218 | 30.10 | -0.40 |

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

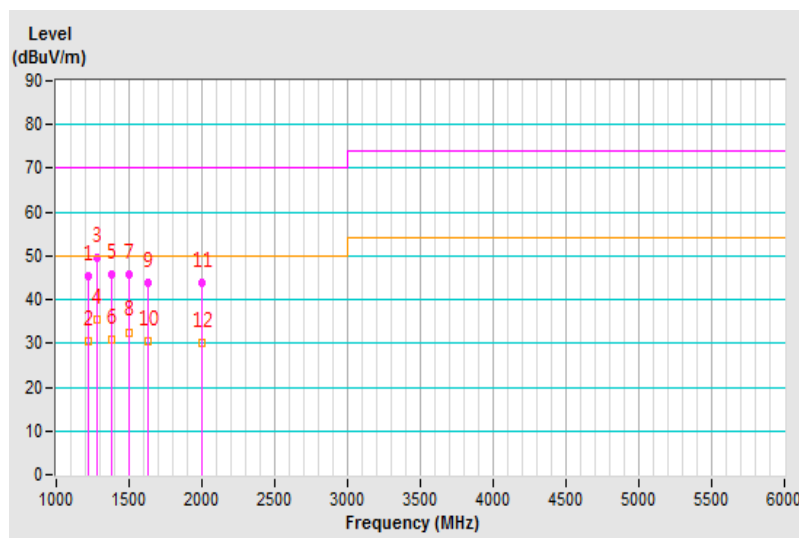


| | | | |
|------------------------|-------------|--|--------------------------------|
| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 12Vdc | Environmental Conditions | 20°C, 71%RH, 1013mbar |
| Tested by | Vincent Lin | | |
| Test Mode | 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 | 1219.35 | 45.28 PK | 70.00 | -24.72 | 1.86 V | 222 | 50.49 | -5.21 |
| 2 | 1219.35 | 30.51 AV | 50.00 | -19.49 | 1.86 V | 222 | 35.72 | -5.21 |
| 3 | 1280.05 | 49.52 PK | 70.00 | -20.48 | 2.05 V | 157 | 54.02 | -4.50 |
| 4 | 1280.05 | 35.33 AV | 50.00 | -14.67 | 2.05 V | 157 | 39.83 | -4.50 |
| 5 | 1375.02 | 45.82 PK | 70.00 | -24.18 | 1.95 V | 342 | 49.61 | -3.79 |
| 6 | 1375.02 | 30.88 AV | 50.00 | -19.12 | 1.95 V | 342 | 34.67 | -3.79 |
| 7 | 1500.01 | 45.82 PK | 70.00 | -24.18 | 1.77 V | 24 | 50.29 | -4.47 |
| 8 | 1500.01 | 32.58 AV | 50.00 | -17.42 | 1.77 V | 24 | 37.05 | -4.47 |
| 9 | 1625.14 | 43.82 PK | 70.00 | -26.18 | 1.00 V | 129 | 48.43 | -4.61 |
| 10 | 1625.14 | 30.65 AV | 50.00 | -19.35 | 1.00 V | 129 | 35.26 | -4.61 |
| 11 | 1999.95 | 43.84 PK | 70.00 | -26.16 | 1.17 V | 332 | 47.23 | -3.39 |
| 12 | 1999.95 | 30.11 AV | 50.00 | -19.89 | 1.17 V | 332 | 33.50 | -3.39 |

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

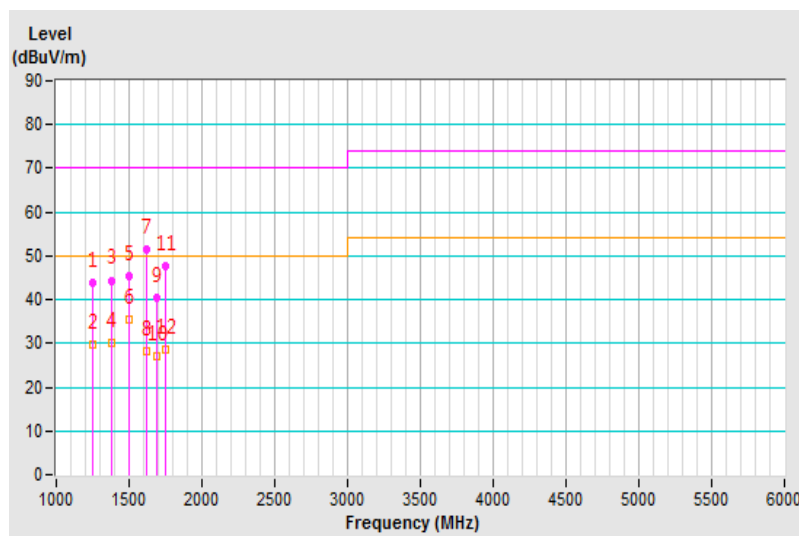


| | | | |
|------------------------|-------------|--|--------------------------------|
| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 55Vdc | Environmental Conditions | 20°C, 71%RH, 1013mbar |
| Tested by | Vincent Lin | | |
| Test Mode | Mode 2 | | |

| 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 | 1249.94 | 43.94 PK | 70.00 | -26.06 | 1.42 H | 205 | 48.80 | -4.86 |
| 2 | 1249.94 | 29.73 AV | 50.00 | -20.27 | 1.42 H | 205 | 34.59 | -4.86 |
| 3 | 1375.23 | 44.42 PK | 70.00 | -25.58 | 1.91 H | 350 | 48.21 | -3.79 |
| 4 | 1375.23 | 29.98 AV | 50.00 | -20.02 | 1.91 H | 350 | 33.77 | -3.79 |
| 5 | 1500.04 | 45.31 PK | 70.00 | -24.69 | 2.87 H | 211 | 49.78 | -4.47 |
| 6 | 1500.04 | 35.32 AV | 50.00 | -14.68 | 2.87 H | 211 | 39.79 | -4.47 |
| 7 | 1624.95 | 51.57 PK | 70.00 | -18.43 | 2.64 H | 360 | 56.18 | -4.61 |
| 8 | 1624.95 | 28.21 AV | 50.00 | -21.79 | 2.64 H | 360 | 32.82 | -4.61 |
| 9 | 1688.86 | 40.53 PK | 70.00 | -29.47 | 1.50 H | 317 | 44.76 | -4.23 |
| 10 | 1688.86 | 27.03 AV | 50.00 | -22.97 | 1.50 H | 317 | 31.26 | -4.23 |
| 11 | 1749.98 | 47.61 PK | 70.00 | -22.39 | 2.06 H | 301 | 51.97 | -4.36 |
| 12 | 1749.98 | 28.67 AV | 50.00 | -21.33 | 2.06 H | 301 | 33.03 | -4.36 |

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

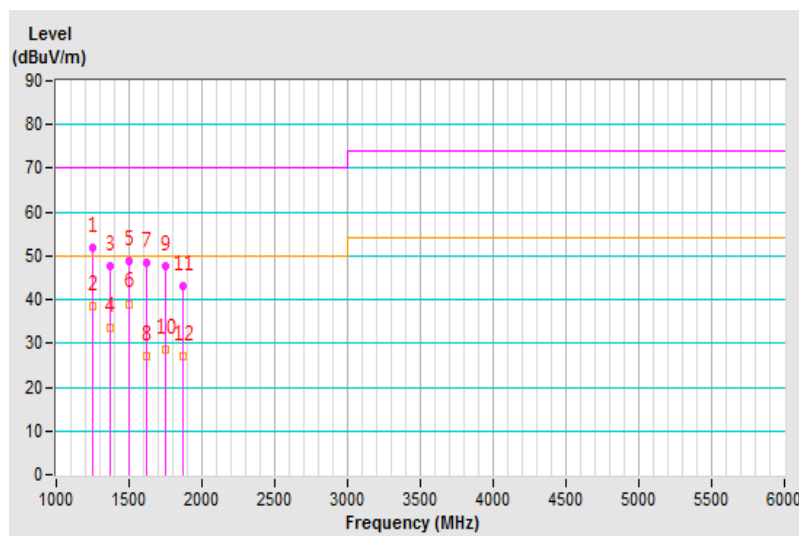


| | | | |
|------------------------|-------------|--|--------------------------------|
| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 55Vdc | Environmental Conditions | 20°C, 71%RH, 1013mbar |
| Tested by | Vincent Lin | | |
| Test Mode | Mode 2 | | |

| 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 | 1250.06 | 51.69 PK | 70.00 | -18.31 | 2.58 V | 14 | 56.54 | -4.85 |
| 2 | 1250.06 | 38.59 AV | 50.00 | -11.41 | 2.58 V | 14 | 43.44 | -4.85 |
| 3 | 1374.89 | 47.68 PK | 70.00 | -22.32 | 2.02 V | 124 | 51.47 | -3.79 |
| 4 | 1374.89 | 33.37 AV | 50.00 | -16.63 | 2.02 V | 124 | 37.16 | -3.79 |
| 5 | 1500.04 | 48.73 PK | 70.00 | -21.27 | 2.44 V | 122 | 53.20 | -4.47 |
| 6 | 1500.04 | 39.08 AV | 50.00 | -10.92 | 2.44 V | 122 | 43.55 | -4.47 |
| 7 | 1624.93 | 48.41 PK | 70.00 | -21.59 | 1.50 V | 144 | 53.02 | -4.61 |
| 8 | 1624.93 | 27.16 AV | 50.00 | -22.84 | 1.50 V | 144 | 31.77 | -4.61 |
| 9 | 1749.99 | 47.72 PK | 70.00 | -22.28 | 2.14 V | 107 | 52.08 | -4.36 |
| 10 | 1749.99 | 28.74 AV | 50.00 | -21.26 | 2.14 V | 107 | 33.10 | -4.36 |
| 11 | 1874.83 | 43.15 PK | 70.00 | -26.85 | 1.08 V | 359 | 46.76 | -3.61 |
| 12 | 1874.83 | 26.98 AV | 50.00 | -23.02 | 1.08 V | 359 | 30.59 | -3.61 |

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 Pictures of Test Arrangements

9.1 Conducted Emission from the Mains Power Port



9.2 Asymmetric Mode Conducted Emission at Telecommunication Ports

Mode 1



Mode 2



9.3 Radiated Emission at Frequencies up to 1GHz

Mode 1

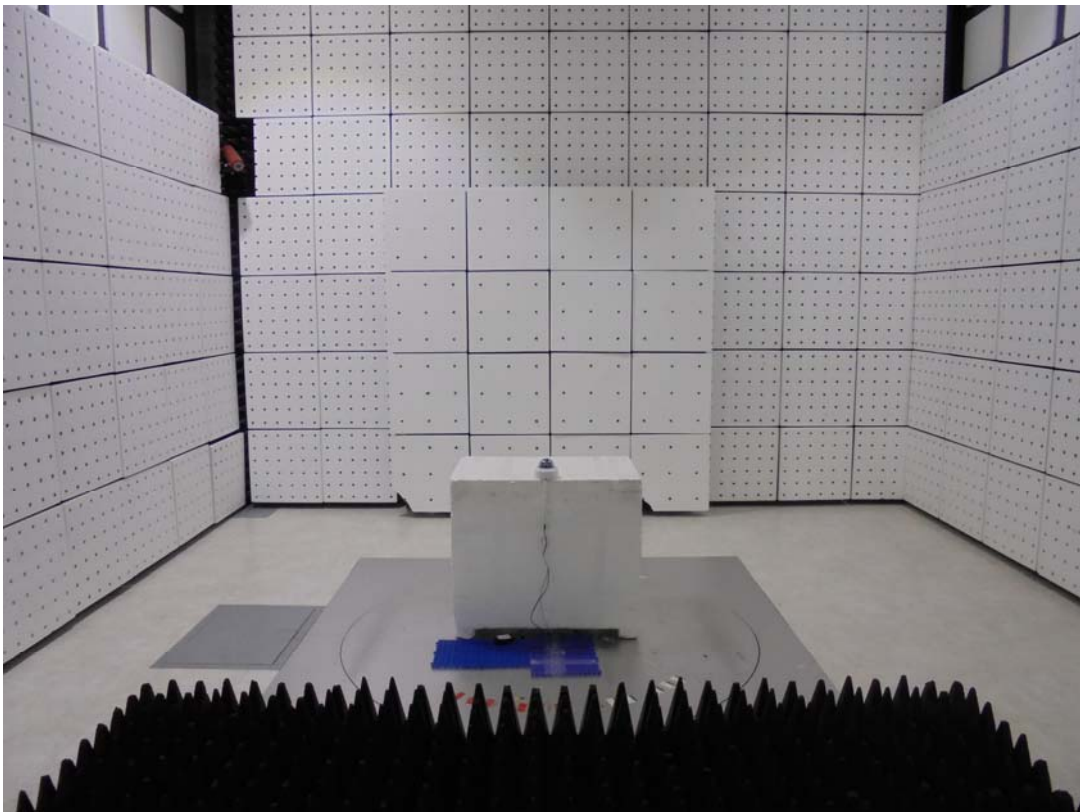
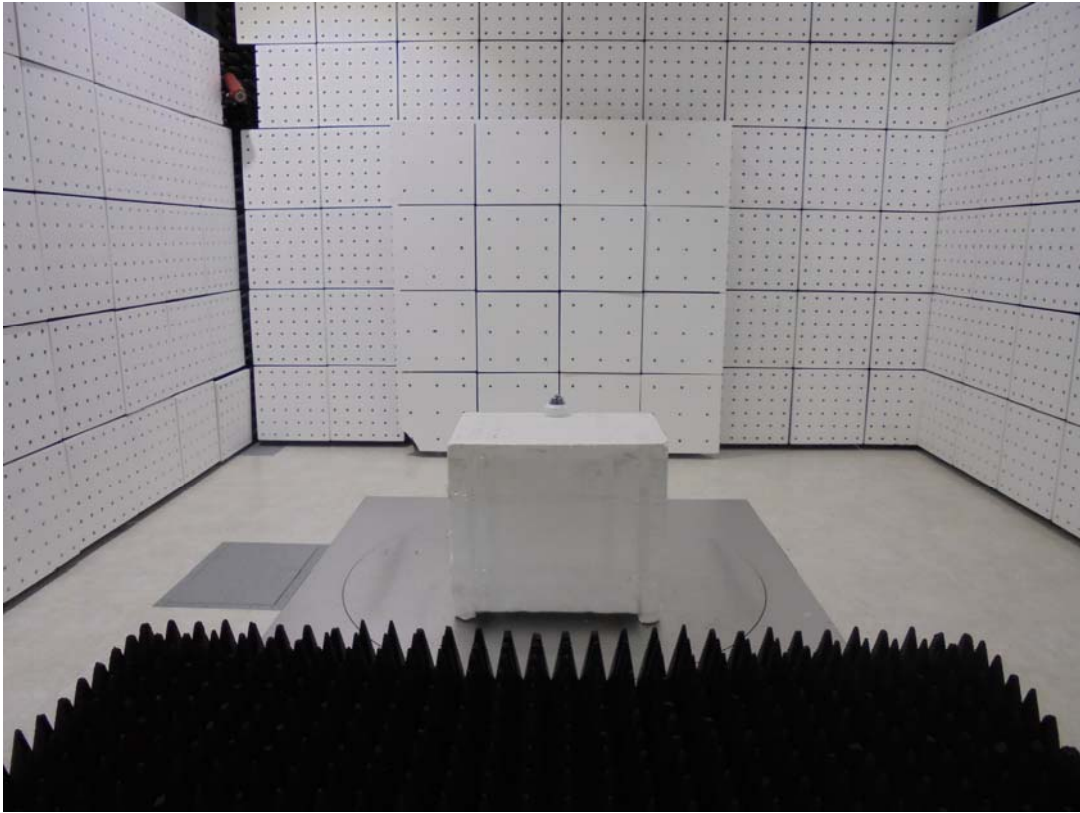


Mode 2

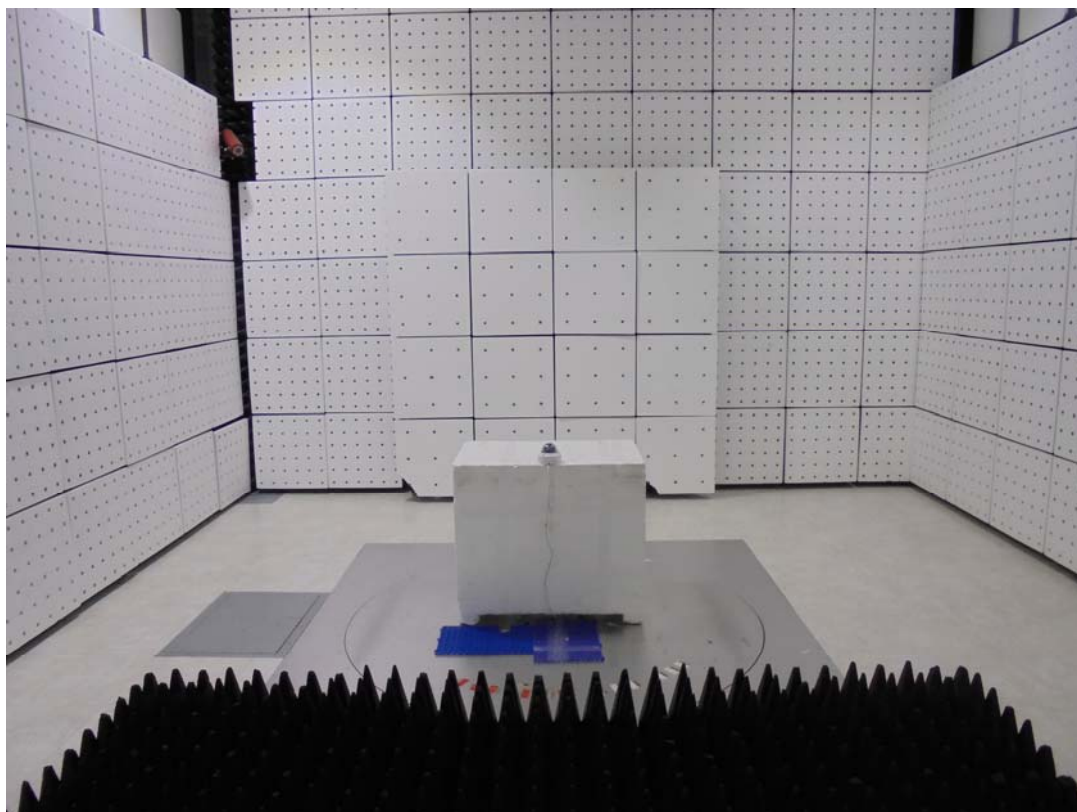
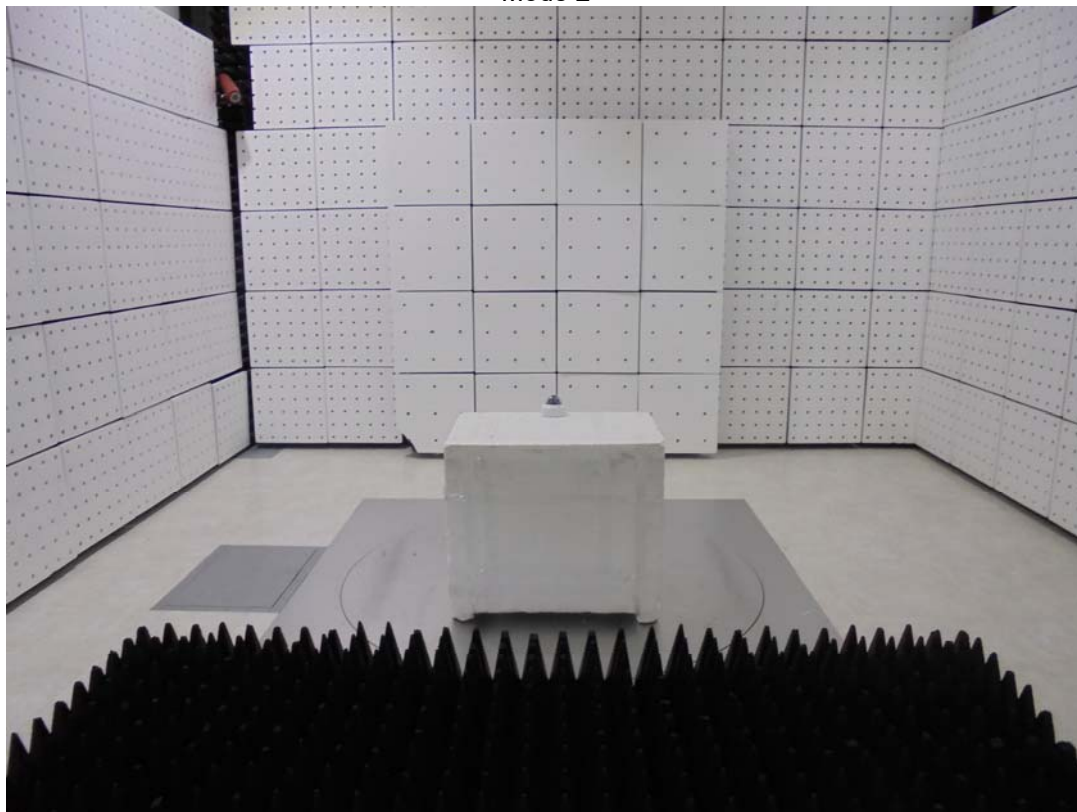


9.4 Radiated Emission at Frequencies above 1GHz

Mode 1



Mode 2



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 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

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

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Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauVeritas.com

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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