

FCC Test Report

Report No.: FD180620D13B

Test Model: Calliope Mini

Received Date: Aug. 5, 2019

Test Date: Aug. 16, 2019

Issued Date: Aug. 22, 2019

Applicant: Calliope gGmbH

Address: Raumerstraße 11; 10437 Berlin

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

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



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Release Control Record

| Issue No. | Description | Date Issued |
|--------------|-------------------|---------------|
| FD180620D13B | Original release. | Aug. 22, 2019 |

1 Certificate of Conformity

Product: Calliope Mini
Brand: Calliope gGmbh
Test Model: Calliope Mini
Sample Status: Engineering Sample
Applicant: Calliope gGmbH
Test Date: Aug. 16, 2019
Standards: 47 CFR FCC Part 15, Subpart B, Class B
ICES-003:2016 Issue 6, updated Apr. 2019 Class B
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 : Celia Chen , **Date:** Aug. 22, 2019
Celia Chen / Supervisor

Approved by : Jim Hsiang , **Date:** Aug. 22, 2019
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 B

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 B margin is -18.13 dB at 0.79453 MHz | Pass |
| 15.109 | 6.2.1 | Radiated Emissions up to 1 GHz | Minimum passing Class B margin is -6.72 dB at 60.39 MHz | Pass |
| | 6.2.2 | Radiated Emissions above 1 GHz | Minimum passing Class B margin is -18.74 dB at 5497.77 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:

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

| Measurement | Frequency | Expanded Uncertainty (k=2) (\pm) |
|------------------------------------|----------------|--------------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 2.79 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 3.67 dB |
| Radiated Emissions above 1 GHz | Above 1GHz | 4.85 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

| | |
|---------------------|--|
| Product | Calliope Mini |
| Brand | Calliope gGmbH |
| Test Model | Calliope Mini |
| Sample Status | Engineering Sample |
| Operating Software | N/A |
| Power Supply Rating | 3Vdc from Battery holder, 5Vdc from USB interface |
| Accessory Device | Battery holder |
| Data Cable Supplied | USB cable (0.15m) |

Note:

1. This report is issued as a supplementary report to BV CPS report no.: FD180620D13. The difference compared with original report is change the hardware a bit and add a memory chip on the PCB, therefore the EUT is re-tested in this report.
2. The EUT with Bluetooth technology.

3.2 Features of EUT

The tests reported herein were performed according to the method specified by Calliope gGmbH, 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. The EUT was tested with previous worst case (test condition: normal mode + BT Link+ power from adapter) for final test.
2. Test modes are presented in the report as below.

| Mode | Test Condition | Input Power |
|-------------------------|---|-------------------------|
| Conducted emission test | | |
| 1 | Normal mode + BT Link+ power from adapter | 120Vac / 60Hz (Adapter) |
| Radiated emission test | | |
| 1 | Normal mode + BT Link+ power from adapter | 120Vac / 60Hz (Adapter) |

3.4 Test Program Used and Operation Descriptions

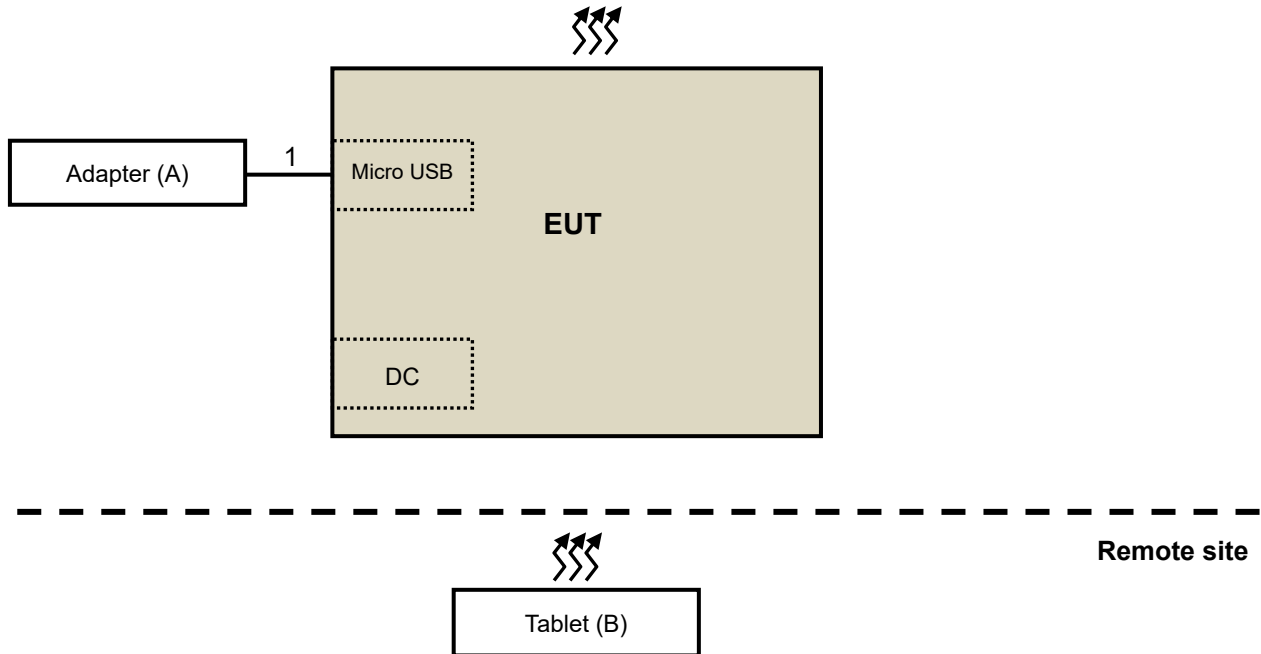
- a. Connect the adapter to EUT.
- b. Turned on the power of all equipment.
- c. Tablet (kept in a remote area) link EUT via Bluetooth transmission.
- d. Tablet (kept in a remote area) received messages from EUT.

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 2.5GHz, provided by Calliope gGmbH, 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. | Adapter | Apple | A1385 | N/A | N/A | Provided by Lab |
| B. | Tablet | ASUS | K00R(ME572CL) | N/A | N/A | Provided by Lab |

Note:

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

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|----|--------------|------|------------|--------------------|--------------|--------------------|
| 1. | USB cable | 1 | 0.15 | Y | 0 | Supplied by client |

5 Conducted Emissions at Mains Ports

5.1 Limits

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

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

5.2 Test Instruments

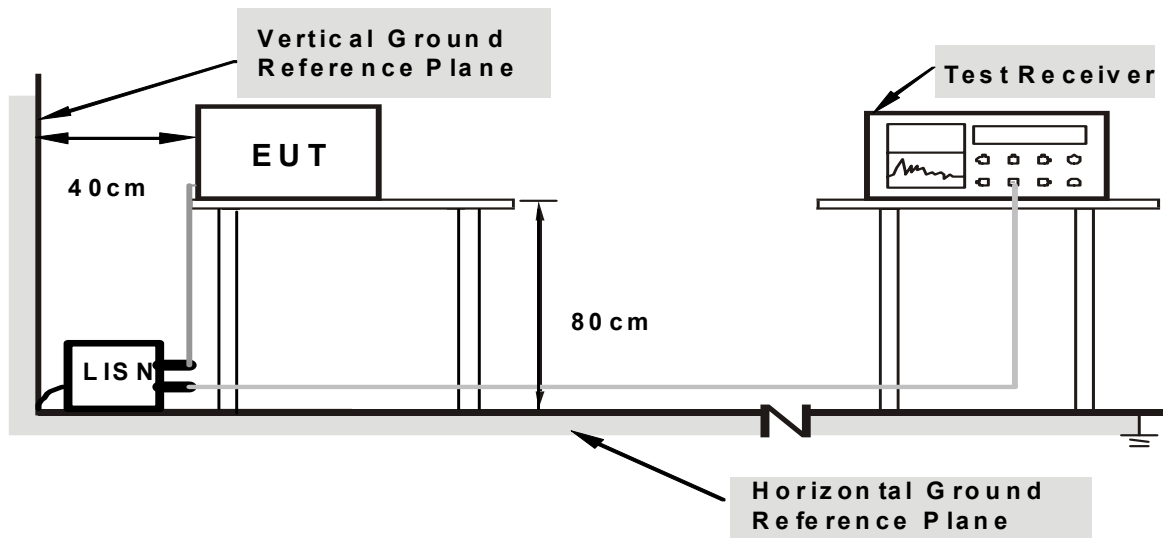
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|--|---------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESCS 30 | 100290 | Dec. 18, 2018 | Dec. 17, 2019 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ENV216 | 101197 | Jun. 5, 2019 | Jun. 4, 2020 |
| LISN With Adapter (for EUT) | 101197 | NA | Jun. 5, 2019 | Jun. 4, 2020 |
| ROHDE & SCHWARZ Artificial Mains Network (for peripherals) | ESH3-Z5 | 100218 | Nov. 30, 2018 | Nov. 29, 2019 |
| SCHWARZBECK Artificial Mains Network (For EUT) | NNLK8129 | 8129229 | May 14, 2019 | May 13, 2020 |
| 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-C10.01 | Feb. 13, 2019 | Feb. 12, 2020 |
| LYNICS Terminator (For ROHDE & SCHWARZ LISN) | 0900510 | E1-011484 | May 13, 2019 | May 12, 2020 |
| ROHDE & SCHWARZ Artificial Mains Network (For TV EUT) | ENV216 | 101196 | Apr. 16, 2019 | Apr. 15, 2020 |
| LISN With Adapter (for TV EUT) | 101196 | NA | Apr. 16, 2019 | Apr. 15, 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. 10.
 3. The VCCI Site Registration No. C-11852.
 4. Tested Date: Aug. 16, 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 a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

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



Note: Support units were connected to second LISN.

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

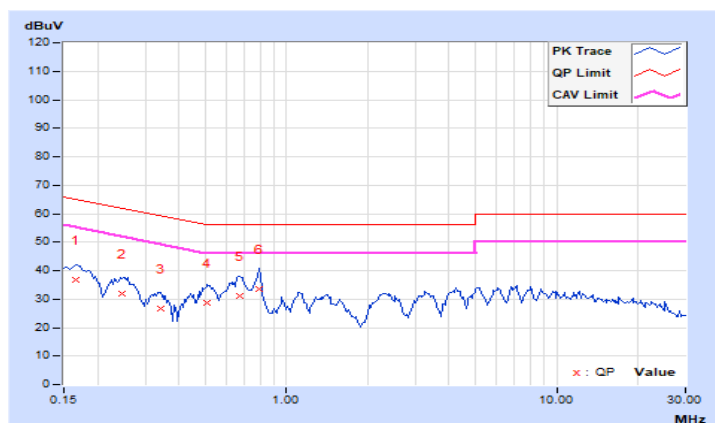
5.4 Test Results

| | | | |
|-----------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 25°C, 75%RH |
| Tested by | Vincent Lin | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Line (L) | | | | | | | | | | |
|---------------------------|-----------------|------------------------|----------------------|--------------|-----------------------|--------------|--------------|--------------|---------------|---------------|
| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.16562 | 9.68 | 26.90 | 8.15 | 36.58 | 17.83 | 65.18 | 55.18 | -28.60 | -37.35 |
| 2 | 0.24766 | 9.72 | 22.11 | 7.25 | 31.83 | 16.97 | 61.84 | 51.84 | -30.01 | -34.87 |
| 3 | 0.34141 | 9.75 | 16.92 | 4.68 | 26.67 | 14.43 | 59.17 | 49.17 | -32.50 | -34.74 |
| 4 | 0.50938 | 9.79 | 18.93 | 12.95 | 28.72 | 22.74 | 56.00 | 46.00 | -27.28 | -23.26 |
| 5 | 0.66953 | 9.83 | 21.10 | 12.72 | 30.93 | 22.55 | 56.00 | 46.00 | -25.07 | -23.45 |
| 6 | 0.79453 | 9.86 | 23.62 | 18.01 | 33.48 | 27.87 | 56.00 | 46.00 | -22.52 | -18.13 |

Remarks:

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

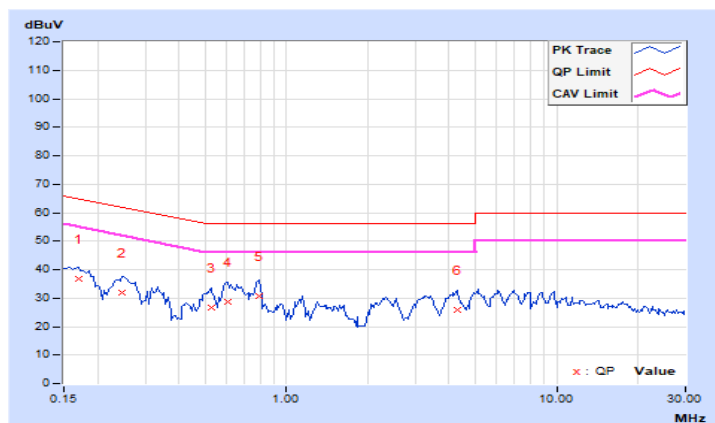


| | | | |
|------------------------|----------------|---|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 25°C, 75%RH |
| Tested by | Vincent Lin | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Neutral (N) | | | | | | | | | | |
|------------------------------|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.16953 | 9.72 | 27.04 | 6.91 | 36.76 | 16.63 | 64.98 | 54.98 | -28.22 | -38.35 |
| 2 | 0.24766 | 9.76 | 22.05 | 3.16 | 31.81 | 12.92 | 61.84 | 51.84 | -30.03 | -38.92 |
| 3 | 0.52500 | 9.85 | 16.85 | 8.44 | 26.70 | 18.29 | 56.00 | 46.00 | -29.30 | -27.71 |
| 4 | 0.60703 | 9.86 | 18.71 | 7.62 | 28.57 | 17.48 | 56.00 | 46.00 | -27.43 | -28.52 |
| 5 | 0.79453 | 9.91 | 20.61 | 13.82 | 30.52 | 23.73 | 56.00 | 46.00 | -25.48 | -22.27 |
| 6 | 4.26953 | 10.14 | 15.71 | 10.23 | 25.85 | 20.37 | 56.00 | 46.00 | -30.15 | -25.63 |

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 | | | | |
| 960-1000 | 49.5 | 43.5 | 47 | 37 |

| 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 | | | | |
| 960-1000 | 60 | 54 | 57.5 | 47.5 |

- 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

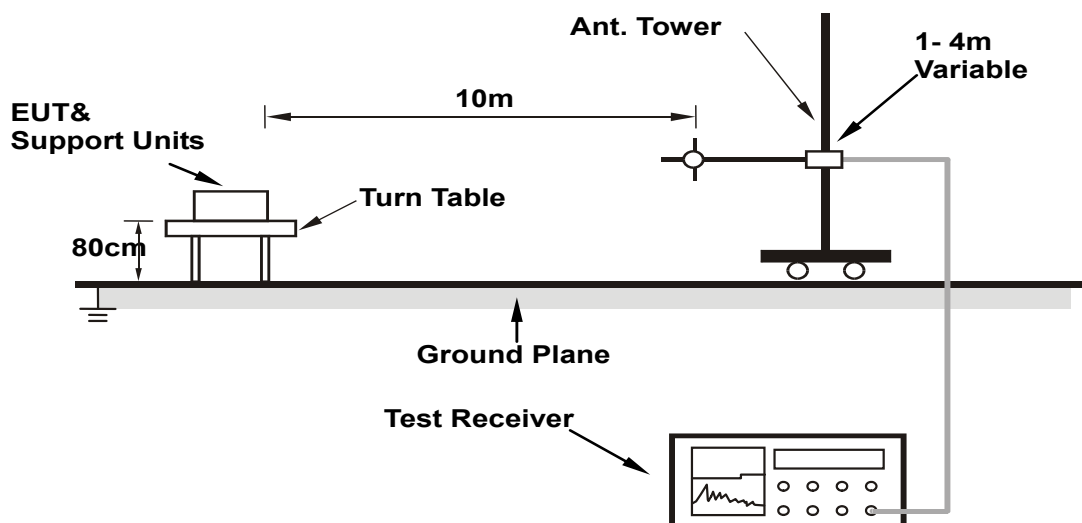
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---------------------------------|------------------|-----------------|---------------|---------------|
| EMCI Preamplifier | EMC9135 | 980326 | Feb. 20, 2019 | Feb. 19, 2020 |
| EMCI Preamplifier | EMC9135 | 980327 | Feb. 20, 2019 | Feb. 19, 2020 |
| Agilent Test Receiver | N9038A | MY55420137 | Apr. 15, 2019 | Apr. 14, 2020 |
| Agilent Test Receiver | N9038A | MY50010135 | May 29, 2019 | May 28, 2020 |
| Schwarzbeck Antenna | VULB9168 | 9168-316 | Nov. 27, 2018 | Nov. 26, 2019 |
| Schwarzbeck Antenna | VULB9168 | 9168-317 | Nov. 27, 2018 | Nov. 26, 2019 |
| Max Full. Turn Table & Tower | MF7802 | MF7802121 | NA | NA |
| Max Full. Tower | MF7802 | MF780208105 | NA | NA |
| Software | Radiated_V8.7.08 | NA | NA | NA |
| JYEBAO RF cable With 5dB PAD | LMR-600 | CABLE-CH8-01.V | Sep. 28, 2018 | Sep. 27, 2019 |
| JYEBAO RF cable With 5dB PAD | LMR-600 | CABLE-CH8-02.H | Sep. 28, 2018 | Sep. 27, 2019 |
| WOKEN RF cable With 5dB PAD | 8D | CABLE-CH8-03.3M | Sep. 28, 2018 | Sep. 27, 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 Chamber No. 8.
 3. The VCCI Site Registration No. R-12946.
 4. Tested Date: Aug. 16, 2019

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

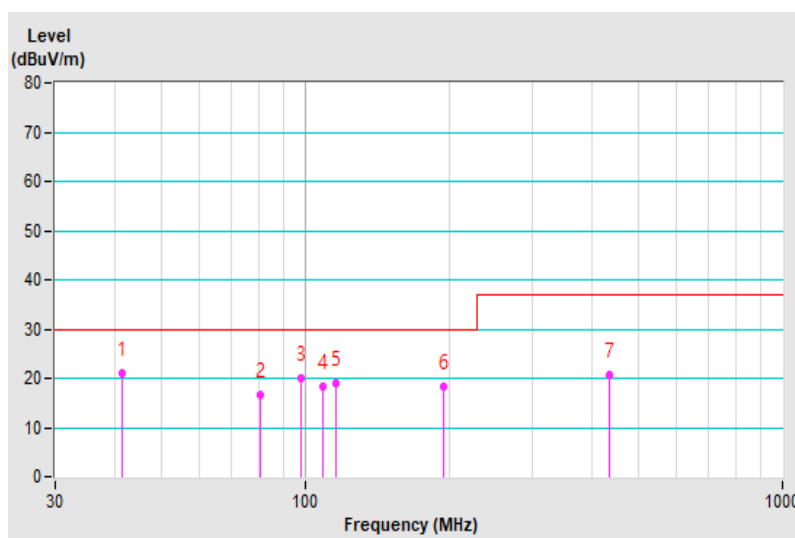
| | | | |
|------------------------|--------------|---|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 31°C, 64%RH |
| Tested by | Vincent Lin | | |
| Test Mode | 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 | 41.54 | 21.18 QP | 30.00 | -8.82 | 1.00 H | 36 | 39.51 | -18.33 |
| 2 | 80.39 | 16.54 QP | 30.00 | -13.46 | 4.00 H | 25 | 38.82 | -22.28 |
| 3 | 98.48 | 20.11 QP | 30.00 | -9.89 | 4.00 H | 77 | 42.06 | -21.95 |
| 4 | 108.79 | 18.28 QP | 30.00 | -11.72 | 1.00 H | 38 | 38.70 | -20.42 |
| 5 | 115.99 | 19.00 QP | 30.00 | -11.00 | 1.05 H | 54 | 38.76 | -19.76 |
| 6 | 195.38 | 18.44 QP | 30.00 | -11.56 | 4.00 H | 62 | 37.89 | -19.45 |
| 7 | 435.05 | 20.80 QP | 37.00 | -16.20 | 2.19 H | 73 | 33.50 | -12.70 |

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

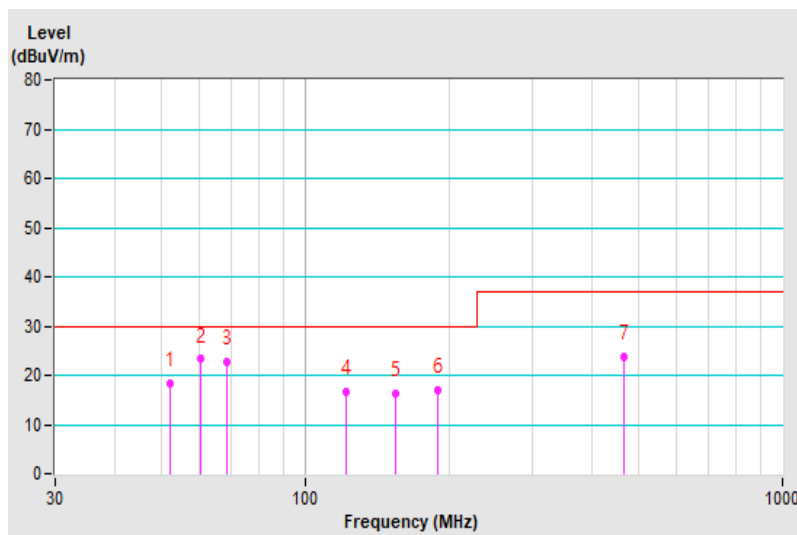


| | | | |
|------------------------|--------------|---|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 31°C, 64%RH |
| Tested by | Vincent Lin | | |
| Test Mode | 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 | 52.19 | 18.29 QP | 30.00 | -11.71 | 1.76 V | 220 | 36.35 | -18.06 |
| 2 | 60.39 | 23.28 QP | 30.00 | -6.72 | 1.00 V | 4 | 41.90 | -18.62 |
| 3 | 68.53 | 22.84 QP | 30.00 | -7.16 | 1.96 V | 52 | 42.67 | -19.83 |
| 4 | 121.74 | 16.77 QP | 30.00 | -13.23 | 1.00 V | 177 | 35.77 | -19.00 |
| 5 | 154.84 | 16.37 QP | 30.00 | -13.63 | 1.00 V | 82 | 33.12 | -16.75 |
| 6 | 189.90 | 16.91 QP | 30.00 | -13.09 | 1.00 V | 4 | 35.86 | -18.95 |
| 7 | 464.46 | 23.79 QP | 37.00 | -13.21 | 1.85 V | 213 | 34.97 | -11.18 |

Remarks:

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



7 Radiated Emissions above 1 GHz

7.1 Limits

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

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

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

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

Frequency Range (For unintentional radiators)

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

7.2 Test Instruments

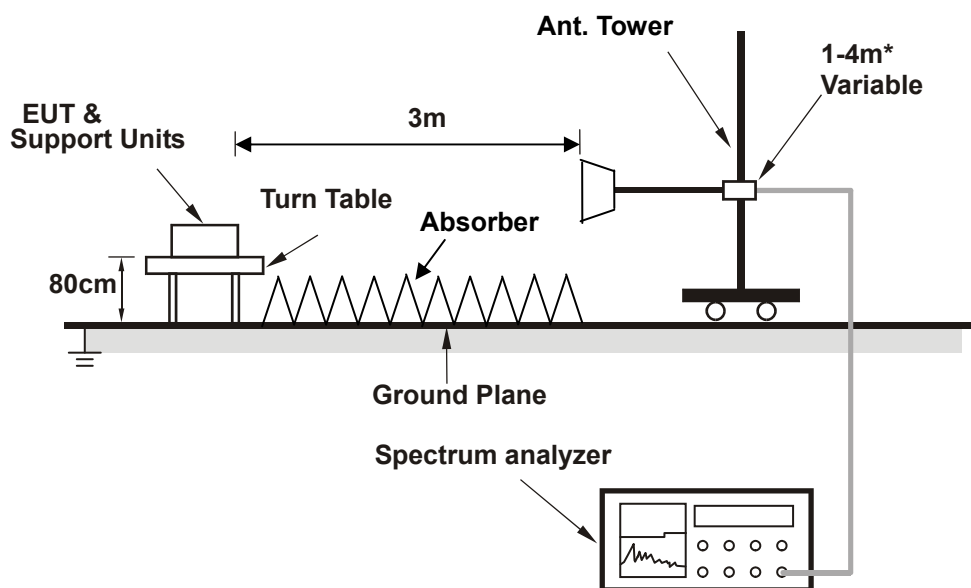
| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|--|----------------------------------|---|---------------|---------------|
| Agilent Spectrum | E4446A | MY51100009 | Jun. 6, 2019 | Jun. 5, 2020 |
| Agilent Test Receiver | N9038A | MY51210137 | Jun. 6, 2019 | Jun. 5, 2020 |
| Agilent Preamplifier | 8449B | 3008A01292 | Feb. 21, 2019 | Feb. 20, 2020 |
| MITEQ Preamplifier | AMF-6F-260400-33-8P | 892164 | Feb. 21, 2019 | Feb. 20, 2020 |
| EMCI Preamplifier | EMC184045B | 980235 | Feb. 21, 2019 | Feb. 20, 2020 |
| ETS Preamplifier | 3117-PA | 00215857 | Nov. 25, 2018 | Nov. 24, 2019 |
| Schwarzbeck Horn Antenna | BBHA-9170 | 212 | Nov. 25, 2018 | Nov. 24, 2019 |
| EMCO Horn Antenna | 3115 | 6714 | Nov. 25, 2018 | Nov. 24, 2019 |
| 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: Aug. 16, 2019

7.3 Test Arrangement

- The EUT was placed on the horizontal metal ground plane at an accredited test facility, orientated for normal use, but separated from metallic contact with the reference metal ground plane by insulation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



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

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

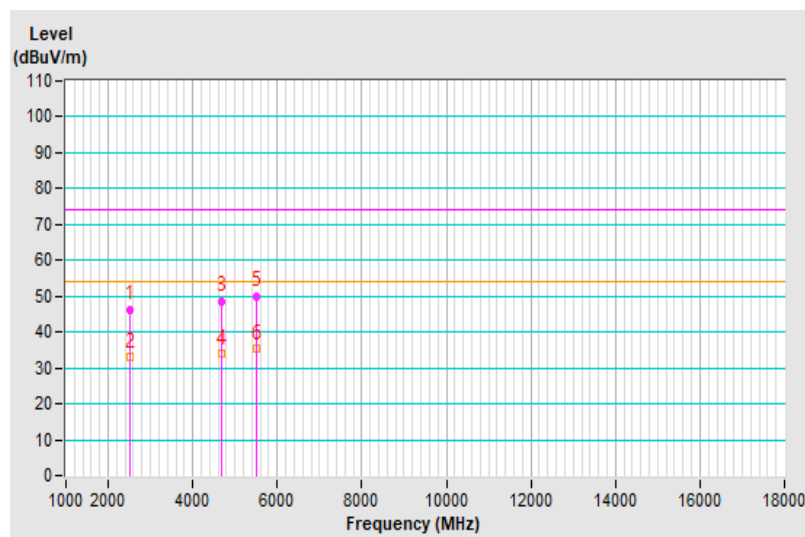
7.4 Test Results

| | | | |
|------------------------|----------------|---|--------------------------------|
| Frequency Range | 1GHz ~ 12.5GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 27°C, 77%RH |
| Tested by | Chenghan Wu | | |
| 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 | 2506.20 | 46.23 PK | 74.00 | -27.77 | 2.42 H | 130 | 45.79 | 0.44 |
| 2 | 2506.20 | 32.92 AV | 54.00 | -21.08 | 2.42 H | 130 | 32.48 | 0.44 |
| 3 | 4695.37 | 48.39 PK | 74.00 | -25.61 | 2.07 H | 196 | 42.81 | 5.58 |
| 4 | 4695.37 | 33.91 AV | 54.00 | -20.09 | 2.07 H | 196 | 28.33 | 5.58 |
| 5 | 5497.77 | 49.77 PK | 74.00 | -24.23 | 1.13 H | 172 | 42.03 | 7.74 |
| 6 | 5497.77 | 35.26 AV | 54.00 | -18.74 | 1.13 H | 172 | 27.52 | 7.74 |

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

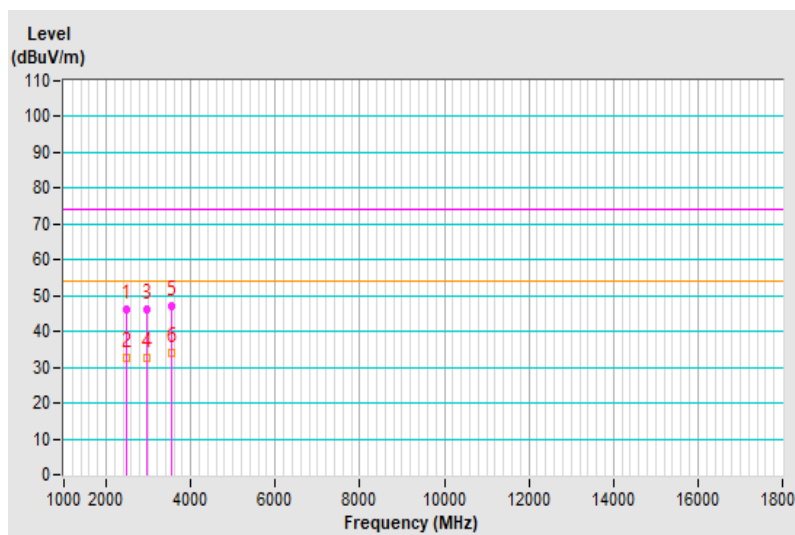


| | | | |
|------------------------|----------------|---|--------------------------------|
| Frequency Range | 1GHz ~ 12.5GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 27°C, 77%RH |
| Tested by | Chenghan Wu | | |
| 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 | 2467.95 | 46.15 PK | 74.00 | -27.85 | 2.04 V | 136 | 45.78 | 0.37 |
| 2 | 2467.95 | 32.82 AV | 54.00 | -21.18 | 2.04 V | 136 | 32.45 | 0.37 |
| 3 | 2954.57 | 46.35 PK | 74.00 | -27.65 | 2.39 V | 164 | 44.21 | 2.14 |
| 4 | 2954.57 | 32.82 AV | 54.00 | -21.18 | 2.39 V | 164 | 30.68 | 2.14 |
| 5 | 3536.40 | 47.09 PK | 74.00 | -26.91 | 1.06 V | 248 | 43.58 | 3.51 |
| 6 | 3536.40 | 34.02 AV | 54.00 | -19.98 | 1.06 V | 248 | 30.51 | 3.51 |

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

Please refer to the attached file (Test Setup Photo).

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.

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

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Web Site: www.bureauveritas-adt.com

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

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