

FCC Test Report (5GHz WLAN)

Report No.: RFBEIH-WTW-P21070244-4

FCC ID: P27-IG515

Test Model: IG515-4G

Received Date: 2021/7/8

Test Date: 2021/9/24 ~ 2021/9/27

Issued Date: 2021/11/29

Applicant: Sercomm Corp.

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

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Designation Number: 198487 / TW2021



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Release Control Record

| Issue No. | Description | Date Issued |
|------------------------|-------------------|-------------|
| RFBEIH-WTW-P21070244-4 | Original release. | 2021/11/29 |



1 **Certificate of Conformity**

| Product: | Gateway |
|----------------|--|
| Brand: | Sercomm |
| Test Model: | IG515-4G |
| Sample Status: | Engineering sample |
| Applicant: | Sercomm Corp. |
| Test Date: | 2021/9/24 ~ 2021/9/27 |
| Standard: | 47 CFR FCC Part 15, Subpart E (Section 15.407) |
| | ANSI C63.10: 2013 |

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 RF characteristics under the conditions specified in this report.

Prepared by :

in Chang , Date: 2021/11/29

Annie Chang / Senior Specialist

2021/11/29

Approved by :

Jeremy Lin ____, Date:_____

Jeremy Lin / Project Engineer



2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart E (Section 15.407) | | | | | |
|--|---|--------------|---|--|--|
| FCC Clause | Test Item | Result | Remarks | | |
| 15.407(b)(6) | AC Power Conducted Emissions | Pass | Meet the requirement of limit. Ass Minimum passing margin is -19.32dB at 0.15781MHz. Meet the requirement of limit. Ass Minimum passing margin is -3.55dB at 33.73MHz. | | |
| 15.407(b) (1/2/3/4(i/ii)/6) | Radiated Emissions & Band Edge Measurement | Pass | | | |
| 15.407(a)(1/2/3) | Max Average Transmit Power | N/A | Refer to Note 2 below | | |
| Occupied Bandwidth Measurement Refer to Note 2 below | | lote 2 below | | | |
| 15.407(a)(1/2/3) | Peak Power Spectral Density | N/A | A Refer to Note 2 below | | |
| 15.407(e) | 6dB bandwidth | N/A | Refer to Note 2 below | | |
| 15.407(g) | Frequency Stability | N/A | Refer to Note 2 below | | |
| 15.203 | Antenna Requirement | Pass | Antenna connector is I-PEX not a standard connector. | | |

Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2. Test items: AC Power Conducted Emission and Radiated Emissions below 1GHz were performed for this addendum. The others testing data refer to original test report.

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) (±) |
|------------------------------------|----------------|-----------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 3.00 dB |
| Dedicted Emissions up to 1 CHz | 9kHz ~ 30MHz | 2.38 dB |
| Radiated Emissions up to T GHZ | 30MHz ~ 1GHz | 5.70 dB |

2.2 Modification Record

There were no modifications required for compliance.



3 General Information

3.1 General Description of EUT

| Product | Gateway |
|-----------------------|--|
| Brand | Sercomm |
| Test Model | IG515-4G |
| Status of EUT | Engineering sample |
| Power Supply Rating | 12Vdc from adapter or 7.5Vdc from battery |
| Modulation Type | 256QAM, 64QAM, 16QAM, QPSK, BPSK |
| Modulation Technology | OFDM |
| Transfer Rate | 802.11a: up to 54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps |
| Operating Frequency | 5180 ~ 5240MHz, 5745 ~ 5825MHz |
| Number of Channel | 5180 ~ 5240MHz 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5745 ~ 5825MHz 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 |
| Output Power | 5180 ~ 5240MHz: 71.703mW 5745 ~ 5825MHz: 241.053mW |
| Antenna Type | 5180 ~ 5240MHz: Ant. 4: Dipole Antenna with 3.3dBi gain Ant. 5: Dipole Antenna with 3.1dBi gain 5745 ~ 5825MHz: Ant. 4: Dipole Antenna with 2.5dBi gain Ant. 5: Dipole Antenna with 2.4dBi gain |
| Antenna Connector | I-PEX |
| Accessory Device | Adapter |
| Data Cable Supplied | N/A |

Note:

- 1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to BV CPS report no. RF200709D02-4. The difference compared with original report is listed as below, therefore only Conducted Emission and Radiated Emissions (below 1GHz) tests were performed for this addendum.
 - ♦ Adding new HW, Buzzer, Tamper & Pairing button
 - Adding new battery source (Main source: Simpo: Model: Sercomm NA50X_NA502S, 2nd source: FUJI: Model: IG55)
 - \diamond Cancel the large shell of the original report.



2. The EUT provides 2 completed transmitters and 2 receivers.

| Modulation Mode | TX FUNCTION |
|------------------|-------------|
| 802.11a | 2TX |
| 802.11n (HT20) | 2TX |
| 802.11n (HT40) | 2TX |
| 802.11ac (VHT20) | 2TX |
| 802.11ac (VHT40) | 2TX |
| 802.11ac (VHT80) | 2TX |

3. The EUT was pre-tested with the following modes:

♦ Operating Mode (EUT + Battery)

Operating + Charging Mode (EUT + Adapter)
 The worst emission level was found when the EUT tested under Operating + Charging Mode (EUT + Adapter), therefore, only its test data was recorded in this report.

4. The EUT uses following adapter or battery.

| Item | Adapter | Battery |
|---------------|--|------------------------|
| Brand | APD | FUJI |
| Model | WB-24J12FU | IG55 |
| AC I/P Rating | 100-240V, 50/60Hz, 0.7A | - |
| DC O/P Rating | 12V, 2A | 7.2V, 3100mAh, 22.32Wh |
| Power cord | AC 2 Pin, Non-shielded DC cable (1.5m) | - |

- 2.4GHz & 5GHz WLAN technologies cannot transmit at same time.
 WCDMA & LTE technologies cannot transmit at same time.
 WLAN, WWAN, Bluetooth, Zigbee & Z-Wave technologies can transmit at same time.
- 6. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
- 7. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.



3.2 Description of Test Modes

5180~5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 36 | 5180 MHz | 44 | 5220 MHz |
| 40 | 5200 MHz | 48 | 5240 MHz |

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 38 | 5190 MHz | 46 | 5230 MHz |

1 channel is provided for 802.11ac (VHT80):

| Channel | Frequency |
|---------|-----------|
| 42 | 5210MHz |

5745~5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 149 | 5745MHz | 161 | 5805MHz |
| 153 | 5765MHz | 165 | 5825MHz |
| 157 | 5785MHz | | |

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 151 | 5755MHz | 159 | 5795MHz |

1 channel is provided for 802.11ac (VHT80):

| Channel | Frequency | | |
|---------|-----------|--|--|
| 155 | 5775MHz | | |



3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT | | Applic | able To | | Description | |
|-------|----------------|--|--------------|---------|---|--|
| Mode | , RE≥1G | RE<1G | PLC | APCM | Description | |
| - | Note 2 | \checkmark | \checkmark | Note 2 | Operating + Charging Mode (EUT + Adapter) | |
| Where | RE≥1G: Radiate | E≥1G: Radiated Emission above 1GHz RE<1G: Radiated Emission below 1GHz | | | | |
| | PLC: Power Lin | e Conducted I | Emission | APCM: A | Antenna Port Conducted Measurement | |

NOTE: 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane.
2. Test items: Conducted Emission and Radiated Emissions below 1GHz were performed for this addendum. The others testing data refer to original test report.

Radiated Emission Test (Below 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Mode | Frequency Band (MHz) | Available Channel | Tested Channel | Modulation Technology | Data Rate (Mbps) |
|-----------------------|---------|-------------------------|----------------------|----------------|--------------------------|---------------------|
| - | 802.11a | 5180-5240 | 36 to 48 | 4.05 | OFDM | 6.0 |
| - | 802.11a | 5745-5825 | 149 to 165 | 165 | OFDM | 6.0 |

Power Line Conducted Emission Test:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure | Mada | Frequency Band | Available | Tested Chappel | Modulation | Data Rate |
|---------------|---------|----------------|------------|----------------|------------|-----------|
| Mode | Mode | (MHz) | Channel | rested Charmer | Technology | (Mbps) |
| - | 802.11a | 5180-5240 | 36 to 48 | 405 | OFDM | 6.0 |
| - | 802.11a | 5745-5825 | 149 to 165 | 165 | OFDM | 6.0 |

Test Condition:

| Applicable To | Environmental Conditions | Input Power | Tested By |
|---------------|--------------------------|--------------|-----------|
| RE<1G | 28deg. C, 72%RH | 120Vac, 60Hz | Jed Wu |
| PLC | 25deg. C, 75%RH | 120Vac, 60Hz | Ian Chang |



3.3 **Description of Support Units**

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|----|-------------|-------|-----------|-----------------|--------|-----------------|
| Α. | Notebook PC | ASUS | PU401L | E9NXBC002007372 | NA | Provided by Lab |

Note:

1. All power cords of the above support units are non-shielded (1.8m).

2. Item A acted as communication partners to transfer data.

| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/ No) | Cores (Qty.) | Remarks |
|----|--------------------|------|------------|------------------------|-----------------|--------------------------------|
| 1. | DC cable | 1 | 1.5 | N | 0 | Supplied by client |
| 2. | LAN cable | 1 | 10 | N | 0 | Provided by Lab (RJ45, Cat.5e) |

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

3.3.1 Configuration of System under Test





3.4 General Description of Applied Standard and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard: FCC Part 15, Subpart E (15.407) ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance: KDB 789033 D02 General UNII Test Procedure New Rules v02r01 KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.



4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 |
| 1.705 ~ 30.0 | 30 | 30 |
| 30 ~ 88 | 100 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

NOTE:

1. The lower limit shall apply at the transition frequencies.

- 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3. 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.

Limits of unwanted emission out of the restricted bands

| Applicable To | | Limit | | | |
|---|---------------|----------------------|---|---|--|
| 789033 D02 General UNII Test Procedure | | Field Strength at 3m | | | |
| New Ru | les v(|)2r01 | PK:74 (dBµV/m) | AV:54 (dBµV/m) | |
| Frequency Band | Applicable To | | EIRP Limit | Equivalent Field Strength at 3m | |
| 5150~5250 MHz | | 15.407(b)(1) | | | |
| 5250~5350 MHz | | 15.407(b)(2) | PK:-27 (dBm/MHz) | PK:68.2(dBµV/m) | |
| 5470~5725 MHz | | 15.407(b)(3) | | | |
| 5725~5850 MHz | | 15.407(b)(4)(i) | PK:-27 (dBm/MHz) ^{*1} PK:10 (dBm/MHz) ^{*2} PK:15.6 (dBm/MHz) ^{*3} PK:27 (dBm/MHz) ^{*4} | PK: 68.2(dBµV/m) ^{*1} PK:105.2 (dBµV/m) ^{*2} PK: 110.8(dBµV/m) ^{*3} PK:122.2 (dBµV/m) ^{*4} | |
| | | 15.407(b)(4)(ii) | Emission limits in s | section 15.247(d) | |
| *1 beyond 75 MHz or more above of the band edge. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level increasing linearly to a level of 27 dBm/MHz at the band edge. | | | | | |

Note:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

 $E = \frac{1000000\sqrt{30P}}{3}$

 μ V/m, where P is the eirp (Watts).



4.1.2 Test Instruments

| Description & Manufacturer | Model no. | Serial No. | Calibrated Date | Calibrated Until |
|---|----------------------------------|--------------|-----------------|------------------|
| Test Receiver Agilent | N9038A | MY51210129 | 2021/3/12 | 2022/3/11 |
| Software BVADT | ADT_Radiated_V8.7.08 | NA | NA | NA |
| Software BVADT | ADT_RF Test Software V6.6.5.4 | NA | NA | NA |
| Auto Control | | | | |
| System(Antenna Tower, | SC100+AT100+TT100 | 0306 | NA | NA |
| Table, Controller) ADT | | | | |
| Pre_Amplifier EMCI | EMC001340 | 980269 | 2021/6/29 | 2022/6/28 |
| LOOP ANTENNA EMCI | LPA600 | 270 | 2021/9/2 | 2023/9/1 |
| RF Coaxial Cable Pacific | 8D-FB | Cable-CH6-02 | 2021/7/13 | 2022/7/12 |
| Pre_Amplifier HP | 8447D | 2432A03504 | 2021/2/18 | 2022/2/17 |
| Bi-log Broadband Antenna Schwarzbeck | VULB9168 | 139 | 2020/11/6 | 2021/11/5 |
| Attenuator Mini-Circuits | UNAT-5+ | PAD-CH6-01 | 2021/7/13 | 2022/7/12 |
| RF Coaxial Cable Pacific | 8D-FB | Cable-CH6-02 | 2021/7/13 | 2022/7/12 |

NOTE: 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.

- 2. The test was performed in LK 966 chamber 1
- 3. Tested Date: 2021/9/24



4.1.3 Test Procedure

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasipeak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

No deviation.



4.1.5 Test Setup

For Radiated emission below 30MHz





For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Condition

- a. Placed the EUT on the testing table.
- b. Prepared notebook to act as communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The necessary accessories enable the system in full functions.



4.1.7 Test Results

BELOW 1GHz WORST-CASE DATA

| RF Mode | TX 802.11a | Channel | CH 165:5825 MHz |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |

| | 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 | 34.03 | 27.79 QP | 40.00 | -12.21 | 1.88 H | 286 | 36.30 | -8.51 | | |
| 2 | 57.21 | 21.58 QP | 40.00 | -18.42 | 1.29 H | 102 | 28.84 | -7.26 | | |
| 3 | 187.24 | 24.16 QP | 43.50 | -19.34 | 1.56 H | 276 | 32.43 | -8.27 | | |
| 4 | 251.16 | 23.07 QP | 46.00 | -22.93 | 2.75 H | 184 | 29.31 | -6.24 | | |
| 5 | 378.71 | 26.78 QP | 46.00 | -19.22 | 2.61 H | 52 | 29.30 | -2.52 | | |
| 6 | 500.01 | 30.59 QP | 46.00 | -15.41 | 1.32 H | 223 | 30.59 | 0.00 | | |

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. Margin value = Emission Level - Limit value

4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.

5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



| RF Mode | TX 802.11a | Channel | CH 165 : 5825 MHz |
|-----------------|-------------|-------------------|-------------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |

| | 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 | 33.73 | 36.45 QP | 40.00 | -3.55 | 1.28 V | 231 | 44.97 | -8.52 | | |
| 2 | 46.25 | 27.23 QP | 40.00 | -12.77 | 1.58 V | 87 | 34.20 | -6.97 | | |
| 3 | 140.43 | 24.33 QP | 43.50 | -19.17 | 2.03 V | 172 | 31.14 | -6.81 | | |
| 4 | 313.53 | 24.60 QP | 46.00 | -21.40 | 2.42 V | 67 | 28.27 | -3.67 | | |
| 5 | 447.20 | 28.42 QP | 46.00 | -17.58 | 1.53 V | 341 | 29.30 | -0.88 | | |
| 6 | 500.06 | 32.80 QP | 46.00 | -13.20 | 1.79 V | 172 | 32.80 | 0.00 | | |

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. Margin value = Emission Level Limit value
- 4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.

5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

| | Conducted Limit (dBuV) | | | | | |
|-----------------|------------------------|---------|--|--|--|--|
| Frequency (MHz) | Quasi-peak | Average | | | | |
| 0.15 - 0.5 | 66 - 56 | 56 - 46 | | | | |
| 0.50 - 5.0 | 56 | 46 | | | | |
| 5.0 - 30.0 | 60 | 50 | | | | |

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

| Description & Manufacturer | Model no. | Serial No. | Calibrated Date | Calibrated Until |
|---|---------------|--------------|-----------------|------------------|
| Test Receiver R & S | ESCS 30 | 838251/021 | 2020/11/3 | 2021/11/2 |
| LISN R&S | ENV216 | 101197 | 2021/6/23 | 2022/6/22 |
| LISN R&S | ENV216 | 101195 | 2021/5/25 | 2022/5/24 |
| LISN SCHWARZBECK | NNLK8129 | 8129229 | 2021/5/20 | 2022/5/19 |
| DC LISN SCHWARZBECK | NNLK 8121 | 8121-808 | 2021/4/18 | 2022/4/17 |
| LISN SCHWARZBECK | NNLK 8121 | 8121-731 | 2021/4/28 | 2022/4/27 |
| LISN R&S | ENV216 | 101196 | 2021/4/26 | 2022/4/25 |
| LISN EMCO | 3825/2 | 9504-2359 | 2021/7/27 | 2022/7/26 |
| LISN R&S | ESH3-Z6 | 844950/018 | 2021/7/25 | 2022/7/24 |
| LISN EMCO | 3825/2 | 9204-1964 | 2021/5/19 | 2022/5/18 |
| DC LISN R&S | ESH3-Z6 | 100219 | 2021/7/25 | 2022/7/24 |
| Coupling/Dcoupling Network SCHWARZBECK | CDNE-M2 | 00097 | 2021/5/6 | 2022/5/5 |
| Coupling/Dcoupling Network SCHWARZBECK | CDNE-M3 | 00091 | 2021/5/6 | 2022/5/5 |
| Coupling/Dcoupling Network TESEQ | CDN A201A | 44601 | 2020/12/27 | 2021/12/26 |
| RF Coaxial Cable Commate | 5D-FB | Cable-CO3-01 | 2021/9/15 | 2022/9/14 |
| Attenuator STI | STI02-2200-10 | NO.3 | 2020/10/23 | 2021/10/22 |
| 50 ohms Terminator LYNICS | 0900510 | E1-01-300 | 2021/1/27 | 2022/1/26 |
| 50 ohms Terminator LYNICS | 0900510 | E1-01-301 | 2021/1/27 | 2022/1/26 |
| Isolation Transformer Erika Fiedler | D-65396 | 017 | 2021/9/9 | 2022/9/8 |
| Software BVADT | Cond_V7.3.7.4 | NA | NA | NA |

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 Linkou Conduction03

3. Tested Date: 2021/9/27



4.2.3 Test Procedure

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN. For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Condition

Same as Item 4.1.6.



4.2.7 Test Results

| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
|-----------------|----------------|---|---|
| | | | |

| | Phase Of Power : Line (L) | | | | | | | | | | |
|----|---------------------------|--------|--------|---------------|--------|----------------|--------|-------|--------|--------|--|
| | Frequency Correction | | Readin | Reading Value | | Emission Level | | Limit | | Margin | |
| No | | Factor | (dB | uV) | (dBuV) | | (dBuV) | | (dB) | | |
| | (MHz) | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | |
| 1 | 0.15781 | 9.83 | 36.43 | 25.34 | 46.26 | 35.17 | 65.58 | 55.58 | -19.32 | -20.41 | |
| 2 | 0.34141 | 9.86 | 28.93 | 19.80 | 38.79 | 29.66 | 59.17 | 49.17 | -20.38 | -19.51 | |
| 3 | 0.61094 | 9.89 | 9.00 | 0.63 | 18.89 | 10.52 | 56.00 | 46.00 | -37.11 | -35.48 | |
| 4 | 8.36328 | 10.20 | 9.32 | 2.67 | 19.52 | 12.87 | 60.00 | 50.00 | -40.48 | -37.13 | |
| 5 | 15.79297 | 10.29 | 21.80 | 14.07 | 32.09 | 24.36 | 60.00 | 50.00 | -27.91 | -25.64 | |
| 6 | 23.96484 | 10.32 | 21.46 | 17.02 | 31.78 | 27.34 | 60.00 | 50.00 | -28.22 | -22.66 | |

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 Resoluti | · Function on Band | n & width | Quasi-Pe Average | eak (QP) / (AV), 9kH | z | |
|---------------------------------------|------------------------------------|-------|--------------------------|----------------------|-----------------------|-----------------|---------------------|-------------------------|--------|--------|
| Phase Of Power : Neutral (N) | | | | | | | | | | |
| No | Frequency Correction Reading Value | | Emission Level (dBuV) | | Liı (dB | Limit (dBuV) | | Margin (dB) | | |
| | (MHz) | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15781 | 9.80 | 35.99 | 25.13 | 45.79 | 34.93 | 65.58 | 55.58 | -19.79 | -20.65 |
| 2 | 0.25156 | 9.81 | 27.17 | 19.49 | 36.98 | 29.30 | 61.71 | 51.71 | -24.73 | -22.41 |
| 3 | 0.99375 | 9.86 | 10.37 | 2.51 | 20.23 | 12.37 | 56.00 | 46.00 | -35.77 | -33.63 |
| 4 | 4.13672 | 10.08 | 9.80 | 0.25 | 19.88 | 10.33 | 56.00 | 46.00 | -36.12 | -35.67 |
| 5 | 16.27734 | 10.29 | 20.52 | 14.27 | 30.81 | 24.56 | 60.00 | 50.00 | -29.19 | -25.44 |
| 6 | 23.96875 | 10.35 | 22.53 | 17.57 | 32.88 | 27.92 | 60.00 | 50.00 | -27.12 | -22.08 |

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





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

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