

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart B, Class B  
ANSI C63.4:2014

**Report No.:** FDBENL-WTW-P22070904

**FCC ID:** RYK-WNFQ269AXB

**Product:** 802.11ax/ac/a/b/g/n Wi-Fi + BT M.2 card

**Brand:** Sparklan

**Model No.:** WNFQ-269AX(BT)

**Received Date:** 2022/7/31

**Test Date:** 2022/10/5 ~ 2022/10/13

**Issued Date:** 2022/12/23

**Applicant:** SparkLAN Communications, Inc.


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

**FCC Registration /**  
**Designation Number:** 960022 / TW1058

**Approved by:**  , **Date:** 2022/12/23  
Ken Lu / Manager

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Prepared by : Vito Lung / Specialis



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## Release Control Record

| Issue No.            | Description       | Date Issued |
|----------------------|-------------------|-------------|
| FDBENL-WTW-P22070904 | Original release. | 2022/12/23  |

## 1 Certificate

**Product:** 802.11ax/ac/a/b/g/n Wi-Fi + BT M.2 card

**Brand:** Sparklan

**Test Model:** WNFQ-269AX(BT)

**Sample Status:** Engineering sample

**Applicant:** SparkLAN Communications, Inc.

**Test Date:** 2022/10/5 ~ 2022/10/13

**Standard:** 47 CFR FCC Part 15, Subpart B, 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.

## 2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions, are as follows:

| Standard / Clause | Test Item                            | Result | Remark   |
|-------------------|--------------------------------------|--------|--|
| FCC Part 15.107   | Conducted Emissions from Power Ports | Pass   | Minimum passing Class B margin is -16.63 dB at 0.16562 MHz |
| FCC Part 15.109   | Radiated Emissions up to 1 GHz       | Pass   | Minimum passing Class B margin is -4.98 dB at 31.29 MHz    |
| FCC Part 15.109   | Radiated Emissions above 1 GHz       | Pass   | Minimum passing Class B margin is -9.60 dB at 17864.00 MHz |

Note: 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 as specified in CISPR 16-4-2:

| Measurement                          | Specification   | Expanded Uncertainty (k=2) (±) | Maximum allowable uncertainty (±) |
|--------------------------------------|-----------------|--------------------------------|-----------------------------------|
| Conducted Emissions from Power Ports | 9 kHz ~ 30 MHz  | 1.8 dB                         | 3.4 dB ( $U_{\text{CISPR}}$ )     |
| Radiated Emissions up to 1 GHz       | 30 MHz ~ 1 GHz  | 5.8 dB                         | 6.3 dB ( $U_{\text{CISPR}}$ )     |
| Radiated Emissions above 1 GHz       | 1 GHz ~ 6 GHz   | 4.85 dB                        | 5.2 dB ( $U_{\text{CISPR}}$ )     |
|                                      | 6 GHz ~ 18 GHz  | 4.66 dB                        | 5.5 dB ( $U_{\text{CISPR}}$ )     |
|                                      | 18 GHz ~ 40 GHz | 5.07 dB                        | -                                 |

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 Description of EUT

|                     |   |
|---------------------|---|
| Product             | 802.11ax/ac/a/b/g/n Wi-Fi + BT M.2 card |
| Brand               | Sparklan                                |
| Test Model          | WNFQ-269AX(BT)                          |
| Sample Status       | Engineering sample                      |
| Operating Software  | NA                                      |
| Power Supply Rating | 3.3Vdc from host equipment              |
| Accessory Device    | NA                                      |
| Data Cable Supplied | NA                                      |

Note:

1. This is a supplementary report of Report No.: FC201119E01 R1. The differences between them are as below information:

- ◆ Change applicant & Brand Name & Model Name.
- ◆ Add dipole antenna.

2. The antenna gain was declared by client; please refer to the following table:

| Original    |              |          |           |                             |   |                 |                |                |              |
|-------------|--------------|----------|-----------|-----------------------------|---|-----------------|----------------|----------------|--------------|
| Antenna Set | RF Chain No. | Brand    | Model     | Antenna Net Gain (dBi)      | Frequency Range   | Cable Loss (dB) | Antenna Type   | Connector Type | Cable Length |
| 1           | Chain0/1     | HONGBO   | 260-25094 | 3.53                        | 2.4~2.4835 GHz  | 0.76            | PIFA           | i-pex(MHF 4L)  | 300mm        |
|             |              |          |           | 3.06                        | 5.15~5.25 GHz   | 1.16            |                |                |              |
|             |              |          |           | 3.07                        | 5.25~5.35 GHz   | 1.18            |                |                |              |
|             |              |          |           | 4.81                        | 5.47~5.725 GHz  | 1.2             |                |                |              |
|             |              |          |           | 4.2                         | 5.725~5.850GHz  | 1.27            |                |                |              |
| 2           | Chain0/1     | HONGBO   | 260-25083 | 5.09                        | 5.850~5.895 GHz   | 1.29            | PIFA           | i-pex(MHF 4L)  | 300mm        |
|             |              |          |           | 5.14                        | 5.925~6.425 GHz   | 1.32            |                |                |              |
|             |              |          |           | 5.09                        | 6.425~6.525 GHz   | 1.35            |                |                |              |
|             |              |          |           | 5.16                        | 6.525~6.875 GHz   | 1.4             |                |                |              |
|             |              |          |           | 5.12                        | 6.875~7.125 GHz   | 1.45            |                |                |              |
| 3           | Chain0/1     | HONGBO   | 260-25084 | 3.22                        | 2.4~2.4835 GHz<br>5.150~5.250 GHz<br>5.250~5.350 GHz<br>5.470~5.725 GHz | 0.5             | Monopole       | i-pex(MHF 4L)  | 200mm        |
|             |              |          |           | 3.35                        |   | 0.76            |                |                |              |
|             |              |          |           | 3.42                        |   | 0.78            |                |                |              |
|             |              |          |           | 4.77                        |   | 0.81            |                |                |              |
|             |              |          |           | 4.72                        |   | 0.85            |                |                |              |
|             |              |          |           | 4.71                        |   | 0.86            |                |                |              |
|             |              |          |           | 4.75                        |   | 0.87            |                |                |              |
|             |              |          |           | 4.29                        |   | 0.91            |                |                |              |
|             |              |          |           | 4.81                        |   | 0.96            |                |                |              |
|             |              |          |           | 4.74                        |   | 0.98            |                |                |              |
| Newly       |              |          |           |                             |   |                 |                |                |              |
| Antenna Set | RF Chain No. | Brand    | Model     | Antenna Net Gain (dBi)      | Frequency Range   | Antenna Type    | Connector Type | Cable Length   |              |
| 4           | Chain0/1     | Sparklan | AD-510AX  | 2.27<br>2.88<br>2.6<br>3.52 | 2.4~2.4835 GHz<br>5.150~5.825 GHz<br>5.850~5.895 GHz<br>5.925~7.125 GHz | Dipole          | RP-SMA (M)     | 150mm          |              |

|   |          |          |                         |                      |   |        |            |       |
|---|----------|----------|-------------------------|----------------------|---|--------|------------|-------|
| 5 | Chain0/1 | SparkLAN | AD-103AG<br>(UHW0935A4) | 2.02<br>2.03<br>1.9  | 2.4~2.4835<br>GHz<br>5.150~5.850<br>GHz<br>5.850~5.895<br>GHz | Dipole | RP-SMA (M) | 150mm |
| 6 | Chain0/1 | SparkLAN | AD-302N                 | 3.14<br>2.87<br>1.63 | 2.4~2.4835<br>GHz<br>5.150~5.850<br>GHz<br>5.850~5.895<br>GHz | Dipole | RP-SMA (M) | 150mm |

Note: From the antenna set above models, model: **AD-510AX** was selected as representative model for the test and its data was recorded in this report.

- According to above condition, all test items need to be performed. And all data was verified to meet the requirements.
- The module has two variant designs as following table:

| SKU No. | Description     |
|---------|-----------------|
| SKU #1  | M.2 2230 E-key  |
| SKU #2  | M.2 2230 AE-key |

- The product provides option to depopulate external LNA (Low-Noise amplifier) from 5GHz/6GHz receive path. This test report covers variation of with/without external LNA and test was conducted to confirm not change in RF compliance and EMC. And worst case was found in without external LNA.

### 3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 7125MHz, provided by SparkLAN Communications, Inc., for detailed internal source, please refer to the manufacturer's specifications.

### 3.3 Features of EUT

The tests reported herein were performed according to the method specified by SparkLAN Communications, Inc., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

### 3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

| Test Condition  |  |
|---|--|
| Mode  | Radiated Emissions up to 1 GHz   |
| 1   | Client MODE AX 2.4G + Bluetooth link + Input Power(3.3 Vdc from host)                          |
| 2   | Client MODE AX 5G + Bluetooth link + Input Power(3.3 Vdc from host)                            |
| 3   | Client MODE AX 6G + Bluetooth link + Input Power(3.3 Vdc from host)                            |
| <b>4</b>  | <b>Hotspot MODE AX 2.4G + Client MODE 6G + Bluetooth link + Input Power(3.3 Vdc from host)</b> |
| 5   | Hotspot MODE AX 5G + Client MODE 6G + Bluetooth link + Input Power(3.3 Vdc from host)          |
| 6   | Hotspot MODE AX 2.4G + Client MODE 5G + Bluetooth link + Input Power(3.3 Vdc from host)        |
| 7   | Hotspot MODE AX 2.4G + Client MODE 2.4G + Bluetooth link + Input Power(3.3 Vdc from host)      |
| Note: The worst case is that mode 4 is shown in bold. |  |

Test modes are presented in the report as below.

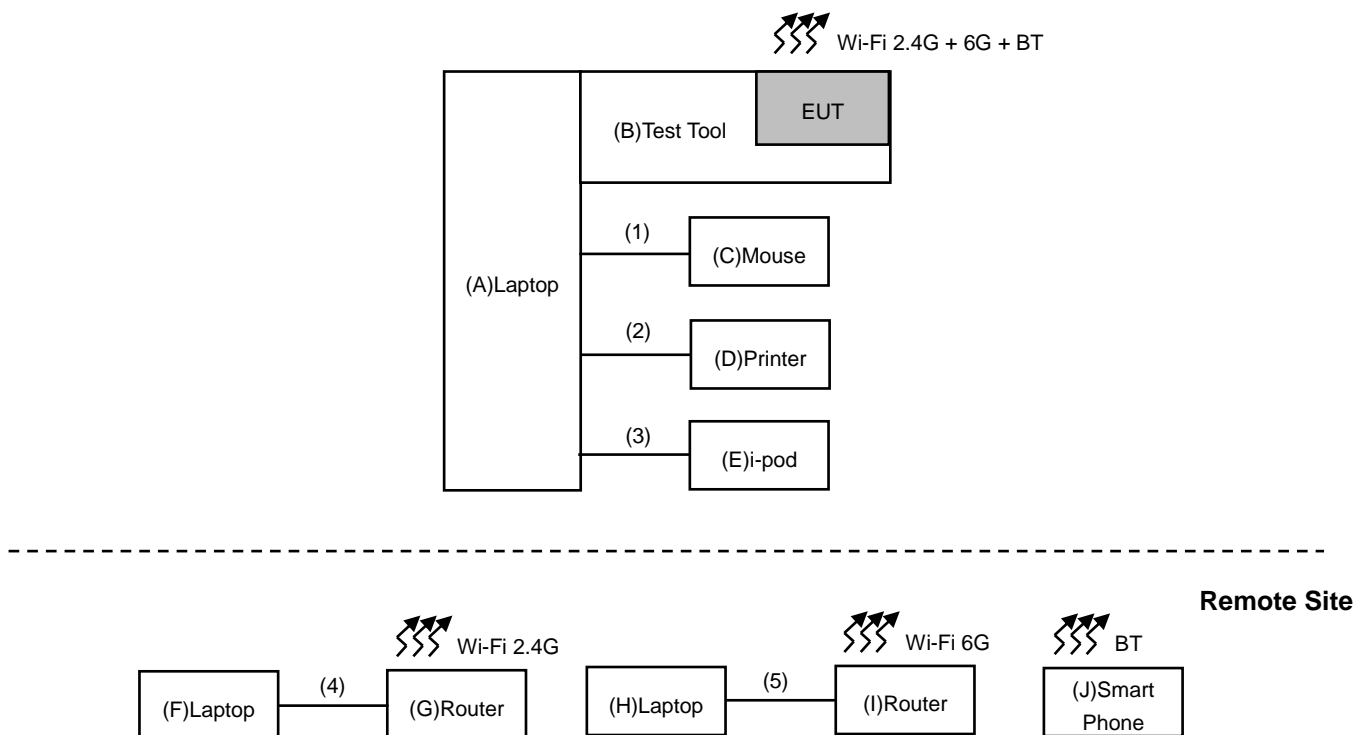
| Test Condition |   |
|----------------|---|
| Mode           | Conducted Emissions from Power Ports  |
| A              | Hotspot MODE AX 2.4G + Client MODE 6G + Bluetooth link + Input Power(3.3 Vdc from host) |
| Mode           | Radiated Emissions up to 1 GHz  |
| A              | Hotspot MODE AX 2.4G + Client MODE 6G + Bluetooth link + Input Power(3.3 Vdc from host) |
| Mode           | Radiated Emissions above 1 GHz  |
| A              | Hotspot MODE AX 2.4G + Client MODE 6G + Bluetooth link + Input Power(3.3 Vdc from host) |



### 3.5 Test Program Used and Operation Descriptions

1. Turn on the power of all equipment.
2. Support unit J (Laptop) links with support unit A (Laptop) via BT.
3. Support units F & H (Laptop) run “ping.exe” programs to communicate with support unit A (Laptop) via wireless.
4. Support unit A (Laptop) run “EMC test.exe” then sends “H” messages to itself.

### 3.6 Connection Diagram of EUT and Peripheral Devices



### 3.7 Configuration of Peripheral Devices and Cable Connections

| ID | Product     | Brand    | Model No.   | Serial No.      | FCC ID | Remarks               |
|----|-------------|----------|-------------|-----------------|--------|-----------------------|
| A  | Laptop      | Lenovo   | L440        | R90JUJU7        | N/A    | Provided by Lab       |
| B  | Test Tool   | N/A      | N/A         | N/A             | N/A    | Provided by applicant |
| C  | Mouse       | Logitech | M-U0026     | 810-002182_008  | DoC    | Provided by Lab       |
| D  | Printer     | EPSON    | LQ-300+II   | G88Y074015      | DoC    | Provided by Lab       |
| E  | i-pod       | Apple    | MD778TA/A   | CC4JMH7LF4T1    | N/A    | Provided by Lab       |
| F  | Laptop      | DELL     | P70F        | 1KY07L2         | DoC    | Provided by Lab       |
| G  | Router      | ASUS     | RT-AX88U    | N/A             | N/A    | Provided by lab       |
| H  | Laptop      | ASUS     | X413F       | L3N0CX14V85713A | DoC    | Provided by Lab       |
| I  | Router      | NETGEAR  | AXE11000    | N/A             | N/A    | Provided by lab       |
| J  | Smart Phone | SAMSUNG  | SM-A715F/DS | R58N64SLYWH     | N/A    | Provided by Lab       |

| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks         |
|----|--------------------|------|------------|--------------------|--------------|-----------------|
| 1  | USB cable          | 1    | 1.8        | Yes                | 0            | Provided by lab |
| 2  | USB cable          | 1    | 1.8        | Yes                | 0            | Provided by lab |
| 3  | USB cable          | 1    | 0.1        | Yes                | 0            | Provided by lab |
| 4  | Cat.5e cable       | 1    | 3          | No                 | 0            | Provided by lab |
| 5  | Cat.5e cable       | 1    | 3          | No                 | 0            | Provided by lab |

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 Conducted Emissions from Power Ports

| Description<br>Manufacturer | Model No.               | Serial No. | Calibrated<br>Date | Calibrated<br>Until |
|-----------------------------|-------------------------|------------|--------------------|---------------------|
| 50 ohm terminal resistance  | N/A                     | EMC-03     | 2022/9/27          | 2023/9/26           |
|                             |                         | EMC-04     | 2021/10/27         | 2022/10/26          |
| DC LISN<br>TESEQ            | HV-AN 150               | 45176      | 2022/5/11          | 2023/5/10           |
|                             |                         | 45177      | 2022/5/11          | 2023/5/10           |
| Fixed attenuator<br>STI     | STI02-2200-10           | 006        | 2022/8/24          | 2023/8/23           |
| LISN<br>R&S                 | ENV216                  | 100071     | 2021/10/27         | 2022/10/26          |
| LISN<br>Schwarzbeck         | NNLK 8121               | 0809       | 2022/3/4           | 2023/3/3            |
|                             | NSLK 8127               | 8127-522   | 2022/9/16          | 2023/9/15           |
| RF Coaxial Cable<br>JYEBO   | 5D-FB                   | COACAB-002 | 2022/8/24          | 2023/8/23           |
| Software<br>BV              | BVADT_Cond_<br>V7.3.7.4 | N/A        | N/A                | N/A                 |
| Test Receiver<br>R&S        | ESR3                    | 102982     | 2022/5/25          | 2023/5/24           |

Notes:

1. The test was performed in HC - Conduction 3.
2. Tested Date: 2022/10/5

### 4.2 Radiated Emissions up to 1 GHz

| Description<br>Manufacturer                  | Model No.            | Serial No.     | Calibrated<br>Date | Calibrated<br>Until |
|--|----------------------|----------------|--------------------|---------------------|
| Antenna Tower & Turn Table<br>CT             | N/A                  | N/A            | N/A                | N/A                 |
| Fixed attenuator<br>Marvelous Microwave Inc. | MVE2252-05           | MVE2252-05-001 | 2022/9/8           | 2023/9/7            |
| Pre_Amplifier<br>Mini-Circuits               | ZFL-1000VH2B         | AMP-ZFL-03     | 2021/10/19         | 2022/10/18          |
| RF Coaxial Cable<br>COMMATE/PEWC             | 8D                   | CHGCAB-005     | 2022/9/8           | 2023/9/7            |
|  | 8D-FB                | CHGCAB-001-2   | 2022/9/8           | 2023/9/7            |
| RF Coaxial Cable                             | RF-141               | CHGCAB-004     | 2022/9/8           | 2023/9/7            |
| Software<br>BV                               | ADT_Radiated_V8.7.08 | N/A            | N/A                | N/A                 |
| Test Receiver<br>Agilent                     | N9038A               | MY51210105     | 2022/6/14          | 2023/6/13           |
| Trilog Broadband Antenna<br>Schwarzbeck      | VULB 9168            | 9168-360       | 2021/10/28         | 2022/10/27          |

Notes:

1. The test was performed in HC - 966 chamber 1. The test site validated date: 2022/9/8 (NSA)
2. Tested Date: 2022/10/13

### 4.3 Radiated Emissions above 1 GHz

| Description<br>Manufacturer      | Model No.            | Serial No.    | Calibrated<br>Date | Calibrated<br>Until |
|----------------------------------|----------------------|---------------|--------------------|---------------------|
| Antenna Tower & Turn Table<br>CT | N/A                  | N/A           | N/A                | N/A                 |
| Fix tool for Boresight<br>BV     | BAF-01               | 5             | N/A                | N/A                 |
| Horn Antenna<br>FT-RF            | HA-07M18G-NF         | 0000320091110 | 2021/11/14         | 2022/11/13          |
| Horn Antenna<br>Schwarzbeck      | BBHA 9170            | 9170-424      | 2021/11/14         | 2022/11/13          |
| Pre_Amplifier<br>Agilent         | 8449B                | 3008A02578    | 2022/6/6           | 2023/6/5            |
| Pre_Amplifier<br>EMCI            | EMC118A45SE          | 980817        | 2022/7/8           | 2023/7/7            |
|                                  | EMC184045SE          | 980770        | 2022/7/8           | 2023/7/7            |
| RF Cable(46GHz /1.5M)<br>SUHNER  | SUCOFLEX 102         | 36432/2       | 2022/1/4           | 2023/1/3            |
| RF Coaxial Cable<br>EMCI         | EMC104-SM-SM-2000    | 181208        | 2022/8/15          | 2023/8/14           |
|                                  | EMC104-SM-SM-6000    | 181209        | 2022/8/15          | 2023/8/14           |
|                                  | EMC104-SM-SM-8500    | 181211        | 2022/8/15          | 2023/8/14           |
| RF Coaxial Cable<br>EMEC         | EM102-KMKM-450       | 21090302      | 2022/9/8           | 2023/9/7            |
| Software<br>BV                   | ADT_Radiated_V8.7.08 | N/A           | N/A                | N/A                 |
| Spectrum<br>Keysight             | N9020B               | MY60112816    | 2022/5/20          | 2023/5/19           |
| Test Receiver<br>Agilent         | N9038A               | MY51210105    | 2022/6/14          | 2023/6/13           |

Notes:

1. The test was performed in HC - 966 chamber 1. The test site validated date: 2022/8/13 (VSWR)
2. Tested Date: 2022/10/8

## 5 Limits of Test Items

### 5.1 Conducted Emissions from Power Ports

| 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 Radiated Emissions up to 1 GHz

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

| Radiated Emissions Limits at 10 meters (dB $\mu$ V/m) |                  |                  |                   |                   |
|---|------------------|------------------|-------------------|-------------------|
| Frequencies (MHz)                                     | FCC 15B, Class A | FCC 15B, Class B | CISPR 22, Class A | CISPR 22, Class B |
| 30-88   | 39.1             | 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 $\mu$ V/m) |                  |                  |                   |                   |
|--|------------------|------------------|-------------------|-------------------|
| Frequencies (MHz)                                    | FCC 15B, Class A | FCC 15B, Class B | CISPR 22, Class A | CISPR 22, Class B |
| 30-88  | 49.5             | 40.0             | 50.5              | 40.5              |
| 88-216   | 54.0             | 43.5             |                   |                   |
| 216-230  | 56.9             | 46.0             |                   |                   |
| 230-960  |                  |                  |                   |                   |
| 960-1000   | 60.0             | 54.0             | 57.5              | 47.5              |

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

### 5.3 Radiated Emissions above 1 GHz

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 |

| Radiated Emissions Limits at 3 meters (dB $\mu$ V/m) |                     |                     |
|--|---------------------|---------------------|
| Frequency range                                      | Class A             | Class B             |
| Above 1GHz   | Avg: 60<br>Peak: 80 | Avg: 54<br>Peak: 74 |

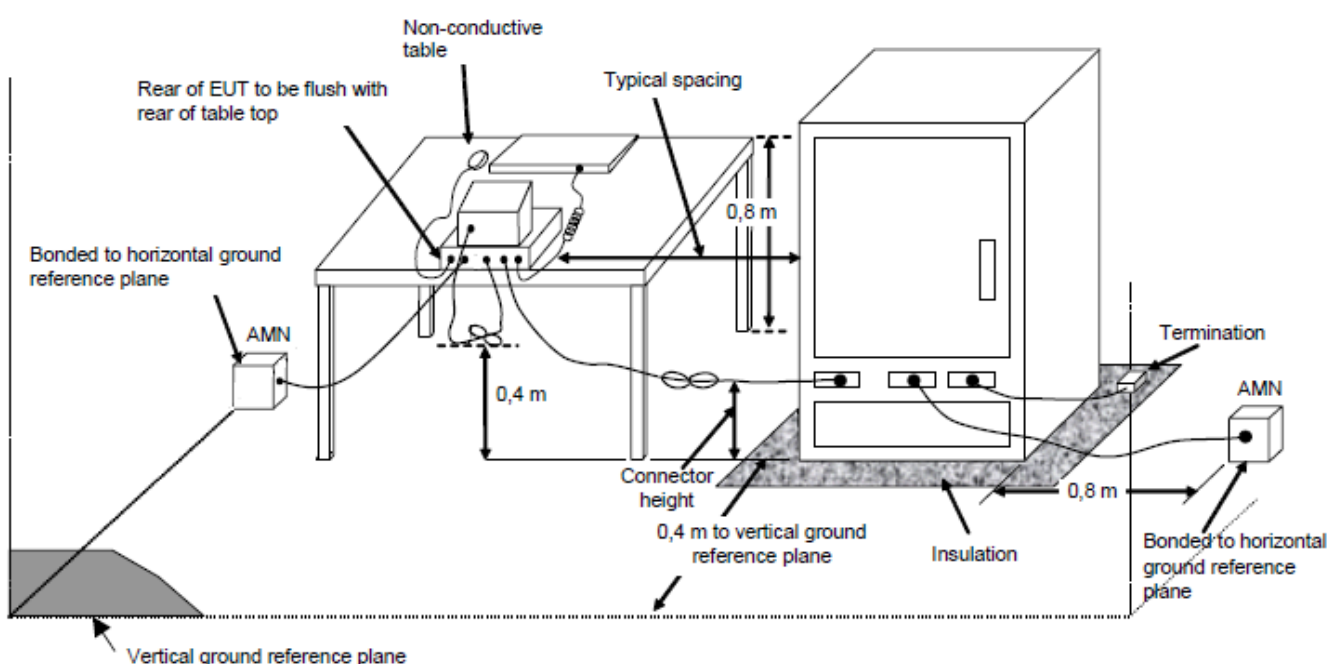
Notes: 1. These limit levels apply for a measurement distance of 3 m. If using a different measurement distance, the measured levels shall be extrapolated to the 3 m limit distance using a factor of 20 dB per decade of distance. The measurement distance shall place the measurement antenna in the far field of the ITE or digital apparatus under test.

## 6 Test Arrangements

### 6.1 Conducted Emissions from Power Ports

- For the table-top EUT is placed on a 0.8 meter insulation table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The EUT is 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 are connected to the power mains through another LISN. They provide 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.

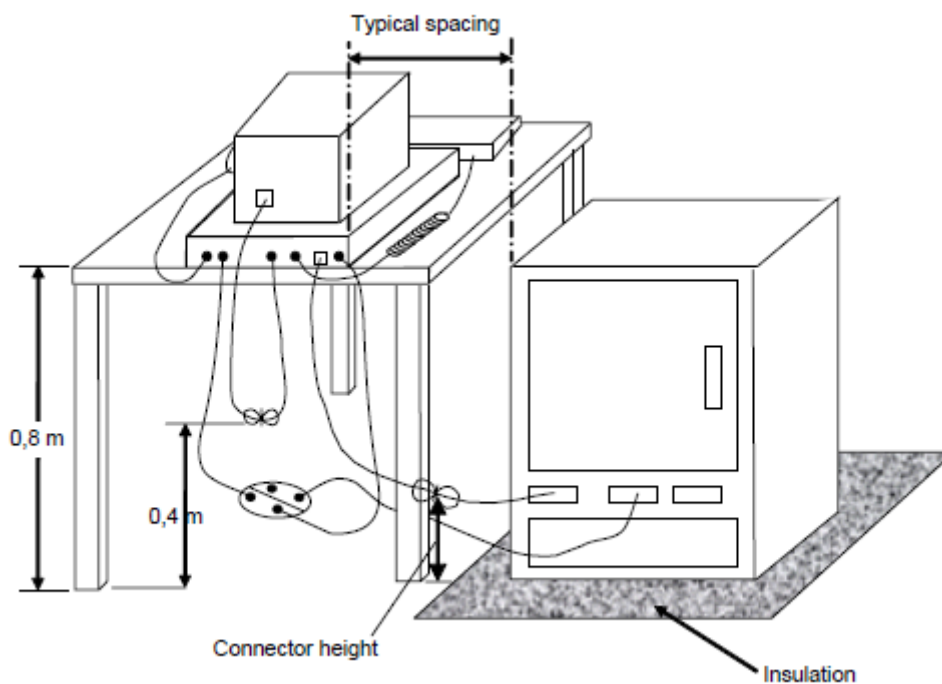


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

## 6.2 Radiated Emissions up to 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- 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 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.

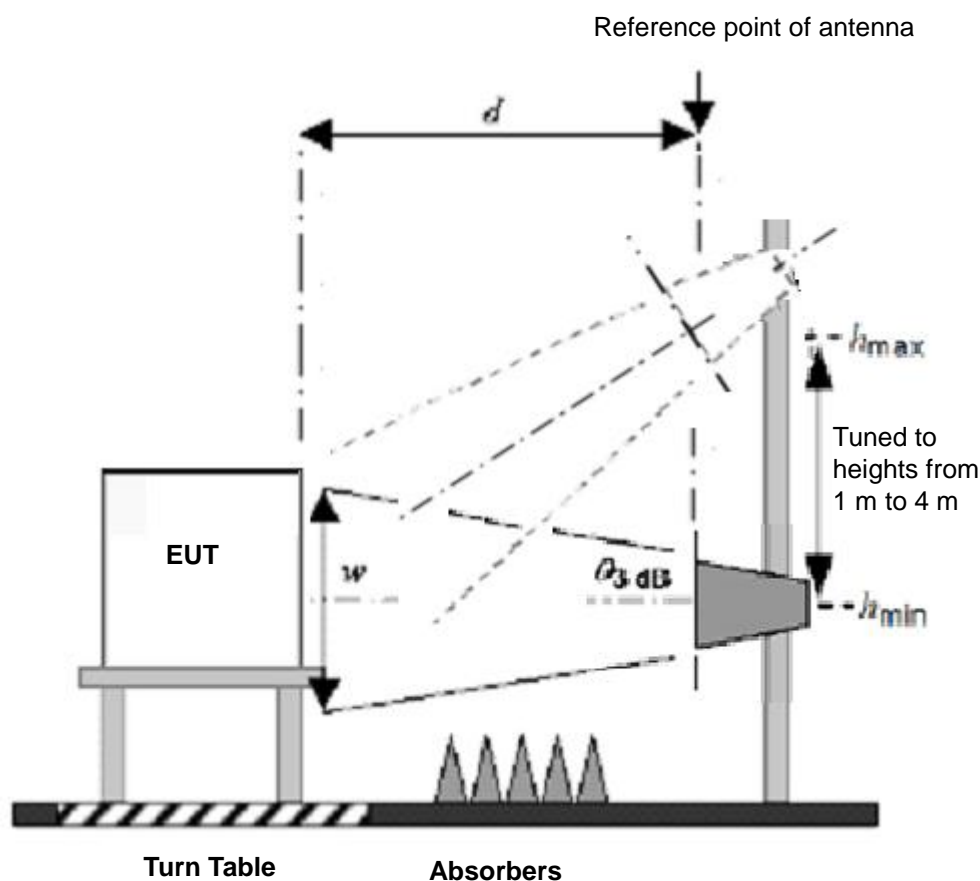


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### 6.3 Radiated Emissions above 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT was set  $d = 3$  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 detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

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



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



## 7 Test Results of Test Item

### 7.1 Conducted Emissions from Power Ports

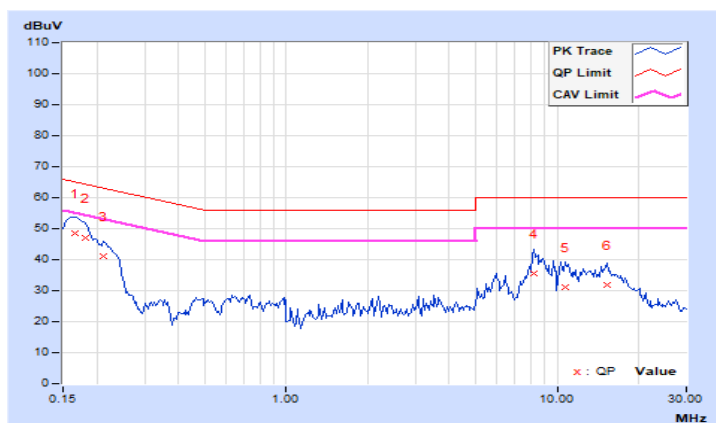
#### Mode A

|                      |                  |  |                                      |
|----------------------|------------------|--|--------------------------------------|
| Frequency Range      | 150 kHz ~ 30 MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power (System) | 120 Vac, 60 Hz   | Environmental Conditions                 | 25°C, 68% RH                         |
| Tested by            | Eagle Chen       |  |                                      |

| 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         | 10.00                  | 38.55                | 18.17 | 48.55                 | 28.17 | 65.18        | 55.18 | -16.63      | -27.01 |
| 2                         | 0.18125         | 10.00                  | 36.90                | 17.19 | 46.90                 | 27.19 | 64.43        | 54.43 | -17.53      | -27.24 |
| 3                         | 0.21250         | 10.00                  | 31.25                | 12.53 | 41.25                 | 22.53 | 63.11        | 53.11 | -21.86      | -30.58 |
| 4                         | 8.19531         | 10.27                  | 25.34                | 17.80 | 35.61                 | 28.07 | 60.00        | 50.00 | -24.39      | -21.93 |
| 5                         | 10.68750        | 10.35                  | 20.80                | 13.29 | 31.15                 | 23.64 | 60.00        | 50.00 | -28.85      | -26.36 |
| 6                         | 15.21094        | 10.44                  | 21.23                | 12.98 | 31.67                 | 23.42 | 60.00        | 50.00 | -28.33      | -26.58 |

#### 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

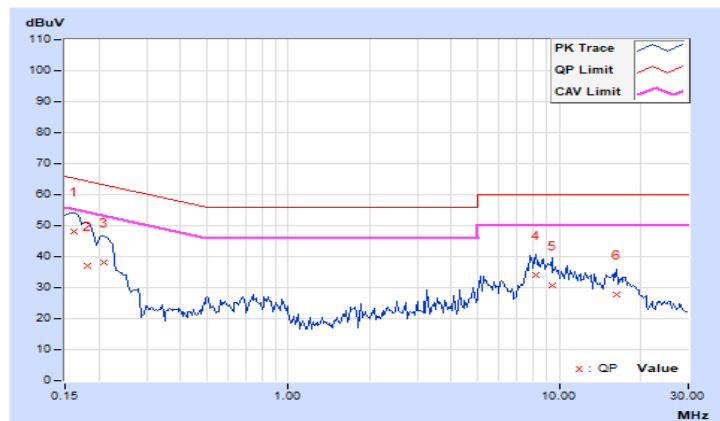


|                      |                  |  |                                      |
|----------------------|------------------|--|--------------------------------------|
| Frequency Range      | 150 kHz ~ 30 MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power (System) | 120 Vac, 60 Hz   | Environmental Conditions                 | 25°C, 68% RH                         |
| Tested by            | Eagle Chen       |  |                                      |

| 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                            | 0.16172         | 10.00                  | 38.03                | 26.43 | 48.03                 | 36.43 | 65.38        | 55.38 | -17.35      | -18.95 |
| 2                            | 0.18125         | 10.00                  | 26.90                | 13.47 | 36.90                 | 23.47 | 64.43        | 54.43 | -27.53      | -30.96 |
| 3                            | 0.20859         | 10.00                  | 27.97                | 18.79 | 37.97                 | 28.79 | 63.26        | 53.26 | -25.29      | -24.47 |
| 4                            | 8.16406         | 10.26                  | 23.79                | 16.34 | 34.05                 | 26.60 | 60.00        | 50.00 | -25.95      | -23.40 |
| 5                            | 9.38281         | 10.30                  | 20.26                | 13.11 | 30.56                 | 23.41 | 60.00        | 50.00 | -29.44      | -26.59 |
| 6                            | 16.21875        | 10.46                  | 17.14                | 10.52 | 27.60                 | 20.98 | 60.00        | 50.00 | -32.40      | -29.02 |

**Remarks:**

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



## 7.2 Radiated Emissions up to 1 GHz

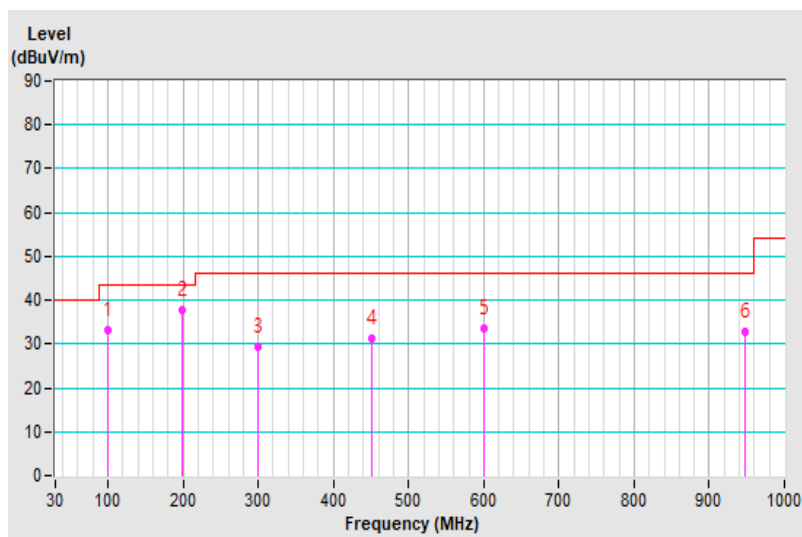
### Mode A

|                 |                   |  |                          |
|-----------------|-------------------|--|--------------------------|
| Frequency Range | 30 MHz ~ 1 GHz    | Detector Function & Resolution Bandwidth | Quasi-Peak (QP), 120 kHz |
| Input Power     | 3.3 Vdc from host | Environmental Conditions                 | 24°C, 58% RH             |
| Tested By       | Darren Lin        |  |                          |

| 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  | 99.96           | 33.25 QP                | 43.50          | -10.25      | 3.00 H             | 359                  | 45.77            | -12.52                   |
| 2  | 199.19          | 37.75 QP                | 43.50          | -5.75       | 1.88 H             | 360                  | 48.86            | -11.11                   |
| 3  | 299.85          | 29.42 QP                | 46.00          | -16.58      | 1.00 H             | 304                  | 36.51            | -7.09                    |
| 4  | 451.10          | 31.15 QP                | 46.00          | -14.85      | 2.00 H             | 281                  | 34.21            | -3.06                    |
| 5  | 599.90          | 33.70 QP                | 46.00          | -12.30      | 2.00 H             | 22                   | 33.37            | 0.33                     |
| 6  | 946.87          | 32.88 QP                | 46.00          | -13.12      | 2.00 H             | 252                  | 26.56            | 6.32                     |

#### 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

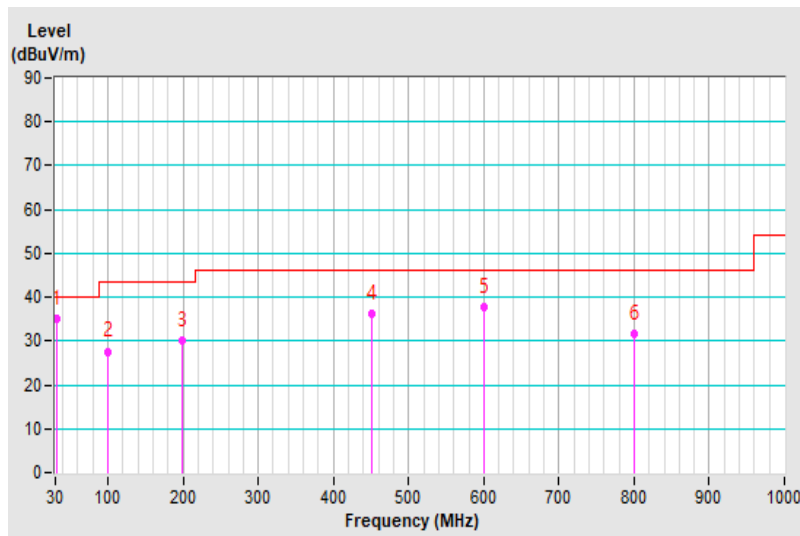


|                        |                   |   |                          |
|------------------------|-------------------|---|--------------------------|
| <b>Frequency Range</b> | 30 MHz ~ 1 GHz    | <b>Detector Function &amp; Resolution Bandwidth</b> | Quasi-Peak (QP), 120 kHz |
| <b>Input Power</b>     | 3.3 Vdc from host | <b>Environmental Conditions</b>                     | 24°C, 58% RH             |
| <b>Tested By</b>       | Darren Lin        |   |                          |

| 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  | 31.29           | 35.02 QP                | 40.00          | -4.98       | 1.12 V             | 301                  | 44.65            | -9.63                    |
| 2  | 99.91           | 27.63 QP                | 43.50          | -15.87      | 3.00 V             | 59                   | 40.16            | -12.53                   |
| 3  | 199.22          | 30.17 QP                | 43.50          | -13.33      | 1.00 V             | 229                  | 41.28            | -11.11                   |
| 4  | 450.16          | 36.12 QP                | 46.00          | -9.88       | 1.00 V             | 319                  | 39.21            | -3.09                    |
| 5  | 599.90          | 37.71 QP                | 46.00          | -8.29       | 1.00 V             | 312                  | 37.38            | 0.33                     |
| 6  | 799.45          | 31.79 QP                | 46.00          | -14.21      | 1.00 V             | 185                  | 27.89            | 3.90                     |

**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



### 7.3 Radiated Emissions above 1 GHz

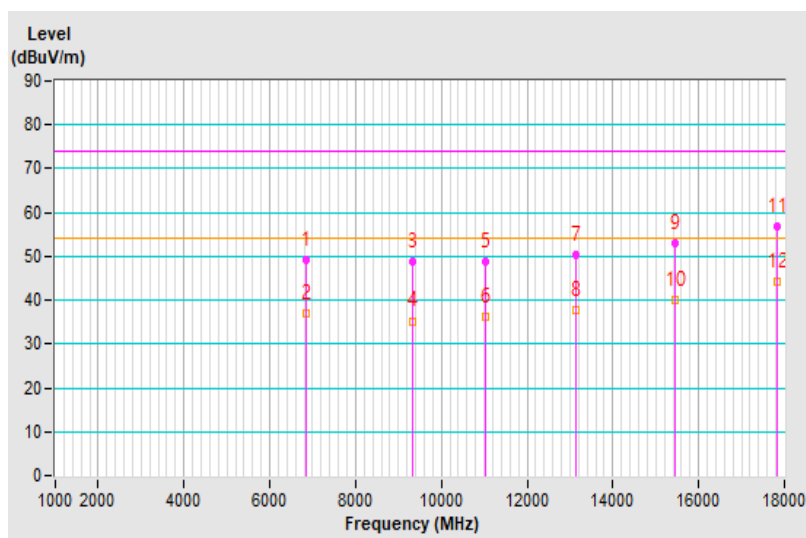
#### Mode A

|                 |                   |  |                                |
|-----------------|-------------------|--|--------------------------------|
| Frequency Range | 1GHz ~ 18GHz      | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power     | 3.3 Vdc from host | Environmental Conditions                 | 24°C, 61% RH                   |
| Tested By       | Darren Lin        |  |                                |

| 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  | 6836.10         | 49.16 PK                | 74.00          | -24.84      | 1.50 H             | 360                  | 40.13            | 9.03                     |
| 2  | 6836.10         | 36.93 AV                | 54.00          | -17.07      | 1.43 H             | 340                  | 27.90            | 9.03                     |
| 3  | 9320.65         | 48.68 PK                | 74.00          | -25.32      | 1.00 H             | 357                  | 43.16            | 5.52                     |
| 4  | 9320.65         | 35.27 AV                | 54.00          | -18.73      | 1.12 H             | 284                  | 29.75            | 5.52                     |
| 5  | 11027.45        | 48.89 PK                | 74.00          | -25.11      | 1.00 H             | 212                  | 43.04            | 5.85                     |
| 6  | 11027.45        | 36.06 AV                | 54.00          | -17.94      | 1.05 H             | 217                  | 30.21            | 5.85                     |
| 7  | 13143.10        | 50.45 PK                | 74.00          | -23.55      | 1.00 H             | 190                  | 44.04            | 6.41                     |
| 8  | 13143.10        | 37.86 AV                | 54.00          | -16.14      | 1.00 H             | 181                  | 31.45            | 6.41                     |
| 9  | 15435.55        | 53.01 PK                | 74.00          | -20.99      | 1.00 H             | 177                  | 46.53            | 6.48                     |
| 10   | 15435.55        | 39.96 AV                | 54.00          | -14.04      | 1.13 H             | 199                  | 33.48            | 6.48                     |
| 11   | 17837.65        | 56.75 PK                | 74.00          | -17.25      | 2.00 H             | 113                  | 47.79            | 8.96                     |
| 12   | 17837.65        | 44.38 AV                | 54.00          | -9.62       | 1.87 H             | 63                   | 35.42            | 8.96                     |

#### Remarks:

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

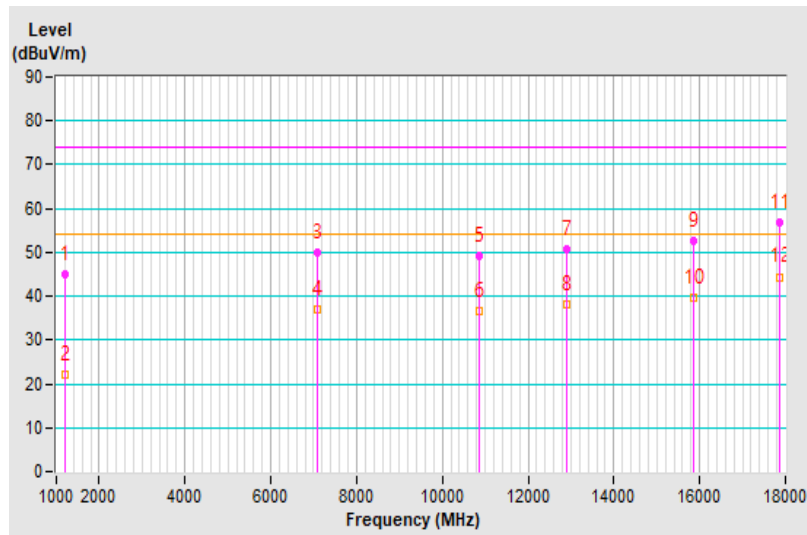


|                 |                   |  |                                |
|-----------------|-------------------|--|--------------------------------|
| Frequency Range | 1GHz ~ 18GHz      | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power     | 3.3 Vdc from host | Environmental Conditions                 | 24°C, 61% RH                   |
| Tested By       | Darren Lin        |  |                                |

| 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  | 1200.60         | 45.10 PK                | 74.00          | -28.90      | 1.50 V             | 0                    | 52.54            | -7.44                    |
| 2  | 1200.60         | 22.21 AV                | 54.00          | -31.79      | 1.63 V             | 20                   | 29.65            | -7.44                    |
| 3  | 7096.20         | 49.88 PK                | 74.00          | -24.12      | 2.00 V             | 268                  | 40.71            | 9.17                     |
| 4  | 7096.20         | 37.07 AV                | 54.00          | -16.93      | 1.88 V             | 173                  | 27.90            | 9.17                     |
| 5  | 10859.15        | 49.18 PK                | 74.00          | -24.82      | 1.00 V             | 210                  | 42.90            | 6.28                     |
| 6  | 10859.15        | 36.61 AV                | 54.00          | -17.39      | 1.05 V             | 220                  | 30.33            | 6.28                     |
| 7  | 12892.35        | 50.72 PK                | 74.00          | -23.28      | 1.50 V             | 80                   | 44.17            | 6.55                     |
| 8  | 12892.35        | 37.97 AV                | 54.00          | -16.03      | 1.44 V             | 115                  | 31.42            | 6.55                     |
| 9  | 15860.55        | 52.77 PK                | 74.00          | -21.23      | 1.00 V             | 3                    | 46.08            | 6.69                     |
| 10   | 15860.55        | 39.79 AV                | 54.00          | -14.21      | 1.05 V             | 28                   | 33.10            | 6.69                     |
| 11   | 17864.00        | 56.66 PK                | 74.00          | -17.34      | 1.50 V             | 0                    | 47.64            | 9.02                     |
| 12   | 17864.00        | 44.40 AV                | 54.00          | -9.60       | 1.42 V             | 0                    | 35.38            | 9.02                     |

Remarks:

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

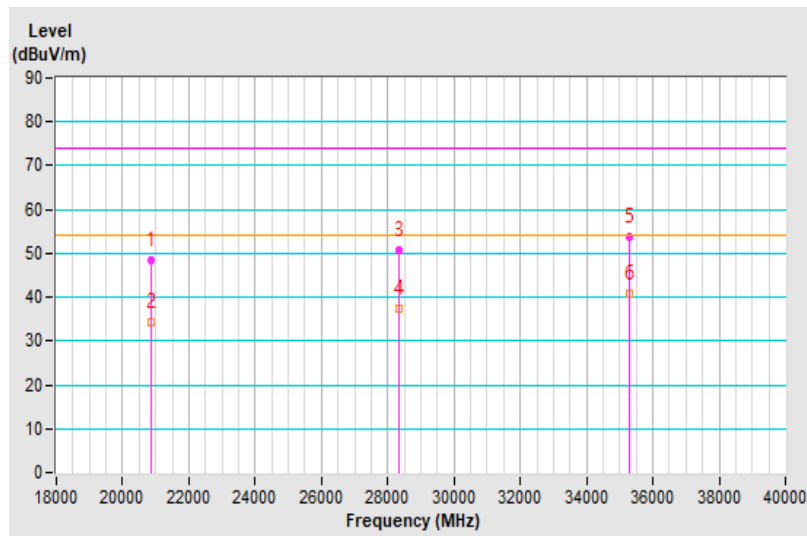


|                 |                   |  |                                |
|-----------------|-------------------|--|--------------------------------|
| Frequency Range | 18GHz ~ 35.625GHz | Detector Function & Resolution Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power     | 3.3 Vdc from host | Environmental Conditions                 | 23°C, 60% RH                   |
| Tested By       | Darren Lin        |  |                                |

| 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  | 20864.40        | 48.42 PK                | 74.00          | -25.58      | 1.50 H             | 36                   | 50.95            | -2.53                    |
| 2  | 20864.40        | 34.16 AV                | 54.00          | -19.84      | 1.44 H             | 0                    | 36.69            | -2.53                    |
| 3  | 28358.70        | 50.77 PK                | 74.00          | -23.23      | 1.00 H             | 150                  | 50.32            | 0.45                     |
| 4  | 28358.70        | 37.50 AV                | 54.00          | -16.50      | 1.12 H             | 182                  | 37.05            | 0.45                     |
| 5  | 35290.90        | 53.81 PK                | 74.00          | -20.19      | 1.00 H             | 357                  | 52.15            | 1.66                     |
| 6  | 35290.90        | 40.86 AV                | 54.00          | -13.14      | 1.08 H             | 336                  | 39.20            | 1.66                     |

**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

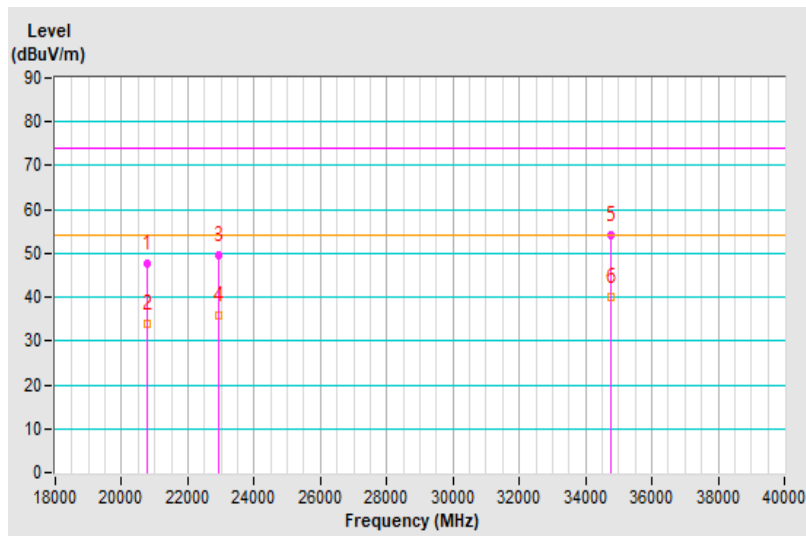


|                        |                   |   |                                |
|------------------------|-------------------|---|--------------------------------|
| <b>Frequency Range</b> | 18GHz ~ 35.625GHz | <b>Detector Function &amp; Resolution Bandwidth</b> | Peak (PK) / Average (AV), 1MHz |
| <b>Input Power</b>     | 3.3 Vdc from host | <b>Environmental Conditions</b>                     | 23°C, 60% RH                   |
| <b>Tested By</b>       | Darren Lin        |   |                                |

| 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  | 20786.30        | 47.51 PK                | 74.00          | -26.49      | 1.00 V             | 248                  | 50.13            | -2.62                    |
| 2  | 20786.30        | 33.82 AV                | 54.00          | -20.18      | 1.13 V             | 253                  | 36.44            | -2.62                    |
| 3  | 22944.50        | 49.41 PK                | 74.00          | -24.59      | 1.00 V             | 136                  | 50.69            | -1.28                    |
| 4  | 22944.50        | 35.92 AV                | 54.00          | -18.08      | 1.05 V             | 149                  | 37.20            | -1.28                    |
| 5  | 34745.30        | 54.03 PK                | 74.00          | -19.97      | 2.00 V             | 279                  | 52.35            | 1.68                     |
| 6  | 34745.30        | 39.95 AV                | 54.00          | -14.05      | 1.83 V             | 248                  | 38.27            | 1.68                     |

**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)

## 9 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:

**Lin Kou EMC/RF Lab**

Tel: 886-2-26052180

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**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

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**Email:** [service.adt@bureauveritas.com](mailto:service.adt@bureauveritas.com)

**Web Site:** <http://ee.bureauveritas.com.tw>

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

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