

FCC Test Report (NFC)

Report No.: RFBBGM-WTW-P21116011-6

FCC ID: WIYUPT1000-LTE

Test Model: UPT1000F

Received Date: Dec. 01, 2021

Test Date: Dec. 15, 2021

Issued Date: Jan. 04, 2022

Applicant: CASTLES TECHNOLOGY CO., LTD.

Address: 6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 23143, TAIWAN (R. O. C.)

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

Test Location (1): No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan

Test Location (2): No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

FCC Registration / 788550 / TW0003

Designation Number: 281270 / TW0032



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Release Control Record

| Issue No. | Description | Date Issued |
|------------------------|------------------|---------------|
| RFBGGM-WTW-P21116011-6 | Original Release | Jan. 04, 2022 |

1 Certificate of Conformity

Product: POS Terminal

Brand:  CASTLES
TECHNOLOGY

Test Model: UPT1000F

Sample Status: Identical Prototype

Applicant: CASTLES TECHNOLOGY CO., LTD.

Test Date: Dec. 15, 2021

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.225)

47 CFR FCC Part 15, Subpart C (Section 15.215)

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 : Pettie Chen, **Date:** Jan. 04, 2022

Pettie Chen / Senior Specialist

Approved by : Jeremy Lin, **Date:** Jan. 04, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.225, 15.215) | | | |
|--|--|--------|---|
| FCC Clause | Test Item | Result | Remarks |
| 15.207 | Conducted emission test | N/A | Refer to Note 1 |
| 15.225 (a) | The field strength of any emissions within the band 13.553-13.567 MHz | N/A | Refer to Note 1 |
| 15.225 (b) | The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz | N/A | Refer to Note 1 |
| 15.225 (c) | The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz | N/A | Refer to Note 1 |
| 15.225 (d) | The field strength of any emissions appearing outside of the 13.110-14.010 MHz band | Pass | Meet the requirement of limit. Minimum passing margin is -1.16 dB at 332.67 MHz. |
| 15.225 (e) | The frequency tolerance | N/A | Refer to Note 1 |
| 15.215 (c) | 20 dB Bandwidth | N/A | Refer to Note 1 |
| 15.203 | Antenna Requirement | Pass | No antenna connector is used. |

Note:

1. This report is a partial report. Therefore, only radiated emissions (Frequency below 1GHz) was verified and recorded in this report. Other testing data please refer to the original BV CPS report no.: RF171113C54B-1.
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 as specified in CISPR 16-4-2:

| Measurement | Frequency | Expanded Uncertainty (k=2) (±) |
|--------------------------------|--------------------|--------------------------------|
| Radiated Emissions up to 1 GHz | 9 kHz ~ 30 MHz | 3.00 dB |
| | 30 MHz ~ 200 MHz | 2.91 dB |
| | 200 MHz ~ 1000 MHz | 2.93 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

| | |
|---------------------------------|---|
| Product | POS Terminal |
| Brand |  CASTLES TECHNOLOGY |
| Test Model | UPT1000F |
| Model Difference | Refer to Note |
| Status of EUT | Identical Prototype |
| Power Supply Rating | 9 Vdc (Adapter) |
| Modulation Type | ASK |
| Data Rate | Type A: 106 kbit/s |
| Operating Frequency | 13.56 MHz |
| Field Strength (Maximum) | 36.9 dBuV/m (3m) |
| Antenna Type | Loop Antenna |
| Accessory Device | Refer to Note |
| 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 of BV CPS report no.: RF171113C54B-1. The difference from the original report is the addition of the same type of antenna, the gain is less than the original report, and changing WWAN module. Only radiated emissions (Frequency below 1GHz) for EUT with new antenna was verified and recorded in this report. Other testing data please refer to the original BV CPS report no.: RF171113C54B-1.

| | Original Module | New Module |
|-------------------------------------|------------------------|-----------------------|
| WWAN Module | LE910-SV1 | LE910C1-NF |
| LCD Luminance | 390 cd/m ² | 760 cd/m ² |
| Speaker EMI Component | Inductor 10nH | Ferrite Bead 221A |
| High Power Capacitance Value | 47uH | 33uH |

2. The EUT uses following accessory devices. (No. 4, 5 are the new antennas)

| No | Product | Brand | Model | Description |
|-----------|-----------------|--------------|----------------------|---|
| 1 | WWAN Antenna | Aristotle | RFA-LTE-T100-41-2M | - |
| 2 | WLAN/BT Antenna | Aristotle | RFA-25-C2M2-U-M70 | - |
| 3 | NFC Antenna | Sporton | SGR-0.7x90.16x3-S | - |
| 4 | WLAN/BT Antenna | Aristotle | RFA-25-T100-41-3M-A2 | BT gain: -0.1dBi, Connector: RP SMA PLUG |
| 5 | WWAN Antenna | Aristotle | RFA-US-T1000G-2M-A5 | |

3. The EUT contains following accessory devices. (Support unit)

| Product | Brand | Model | Description |
|----------------|---|--------------|--|
| Adapter |  CASTLES TECHNOLOGY | FSP040-DRAN2 | I/P: 100-240 Vac, 50-60 Hz, 1.4 A O/P: 9.0 Vdc, 4.44 A MAX Power Line: 1.45 m cable w/o core |

4. 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.

5. 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.

6. WWAN, BT and NFC module cannot transmitter simultaneous. WWAN mode detailed as below.

| LTE module | FCC ID |
|------------|--------------|
| LE910C1-NF | WIYLE910C1NF |

3.2 Description of Test Modes

One channel was provided to this EUT:

| Channel | Frequency (MHz) |
|---------|-----------------|
| 1 | 13.56 |

3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT Configure Mode | Applicable To | Description |
|--------------------|---------------|-------------|
| | RE | |
| - | √ | - |

Where RE: Radiated Emission

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.

Radiated 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 Mode | Available Channel | Tested Channel | Modulation Type | Axis |
|--------------------|-------------------|----------------|-----------------|------|
| - | 1 | 1 | ASK | Z |

Test Condition:

| Applicable To | Environmental Conditions | Input Power | Tested By |
|---------------|--------------------------|----------------|------------|
| RE | 23 deg. C, 68 % RH | 120 Vac, 60 Hz | Edison Lee |

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.

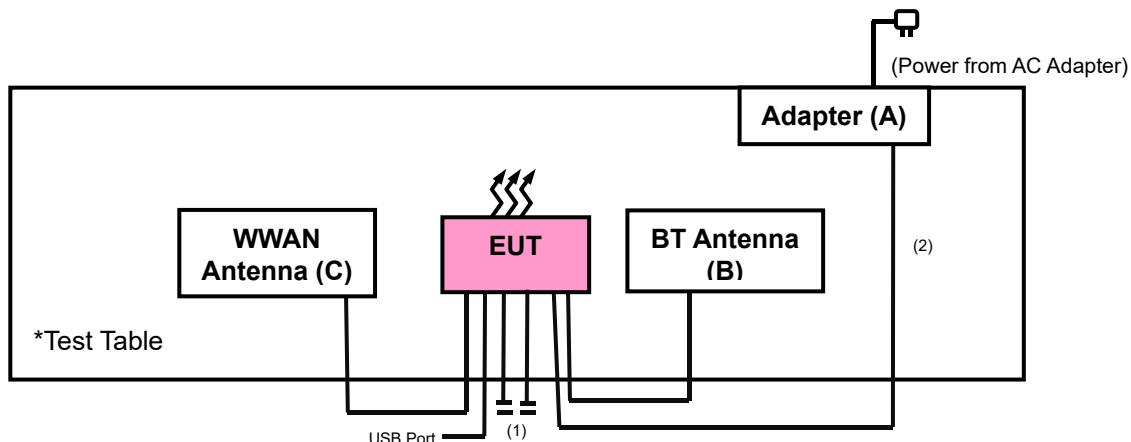
| No. | Product | Brand | Model No. | Serial No. | FCC ID |
|-----|--------------|-----------|----------------------|------------|--------|
| A | Adapter | CASTLES | FSP040-DRAN2 | N/A | N/A |
| B | BT Antenna | Aristotle | RFA-25-T100-41-3M-A2 | N/A | N/A |
| C | WWAN Antenna | Aristotle | RFA-US-T1000G-2M-A5 | N/A | N/A |

| No. | Signal Cable Description Of The Above Support Units |
|-----|---|
| 1. | LAN Cable*2: 1.5m |
| 2. | Power Line: 1.45 m |

Note:

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

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards 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:

FCC Part 15, Subpart C (15.225)

FCC Part 15, Subpart C (15.215)

ANSI C63.10-2013

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

References Test Guidance :

KDB 414788 D01 Radiated Test Site v01r01

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

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

- a. The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- b. Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- c. Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- d. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 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 (dB_BV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, 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 20 dB under any condition of modulation.

4.1.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration | Due Date of Calibration |
|-----------------------------------|--------------------------------|------------------------|---------------------|-------------------------|
| Test Receiver Rohde & Schwarz | N9038A | MY55420137 | Apr. 09, 2021 | Apr. 08, 2022 |
| Spectrum Analyzer KEYSIGHT | N9020B | MY60110440 | Dec. 18, 2020 | Dec. 17, 2021 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 1214 | Oct. 28, 2021 | Oct. 27, 2022 |
| HORN Antenna RF SPIN | DRH18-E | 210104A18E | Jan. 08, 2021 | Jan. 07, 2022 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | 9170-1048 | Nov. 14, 2021 | Nov. 13, 2022 |
| Preamplifier EMCI | EMC330N | 980782 | Jan. 12, 2021 | Jan. 11, 2022 |
| Preamplifier EMCI | EMC118A45SE | 980808 | Jan. 12, 2021 | Jan. 11, 2022 |
| Preamplifier EMCI | EMC184045SE | 980788 | Jan. 12, 2021 | Jan. 11, 2022 |
| RF signal cable EMCI | EMC104-SM-SM-(9000+2000+1000) | 201243+ 201231+ 210102 | Jan. 12, 2021 | Jan. 11, 2022 |
| RF signal cable EMCI | EMCCFD400-NM-NM-(9000+300+500) | 201236+ 201235+ 201233 | Jan. 12, 2021 | Jan. 11, 2022 |
| RF signal cable EMCI | EMC101G-KM-KM-(5000+3000+2000) | 201260+201257+201254 | Jan. 12, 2021 | Jan. 11, 2022 |
| Software BV ADT | ADT_Radiated_V 7.6.15.9.5 | NA | NA | NA |
| Antenna Tower Max-Full | MFT-151SS-0.5T | NA | NA | NA |
| Turn Table Max-Full | MF-7802BS | NA | NA | NA |
| Turn Table Controller Max-Full | MF-7802BS | MF780208674 | 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 WM Chamber 8.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- 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, except for the frequency band (9kHz-90kHz, 110Hz-490kHz) set to average detect function.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters 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 detected 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:

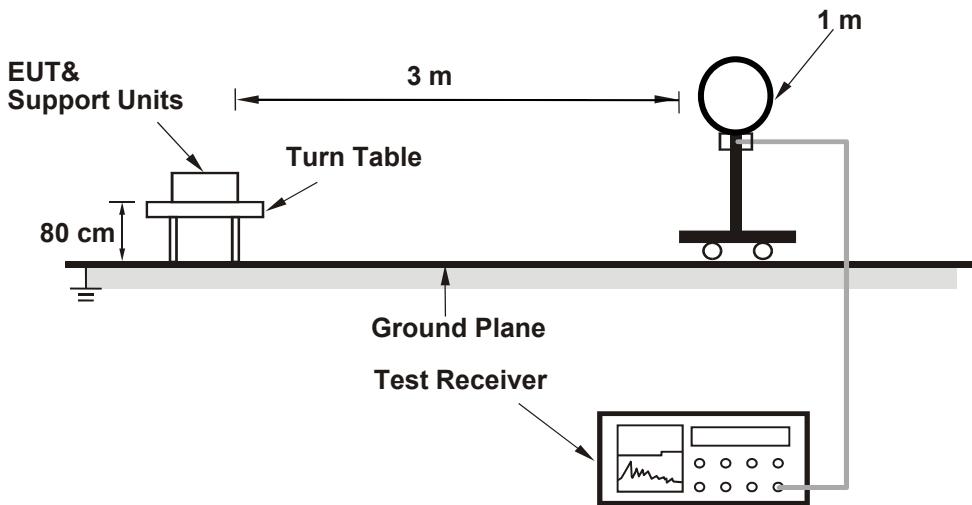
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

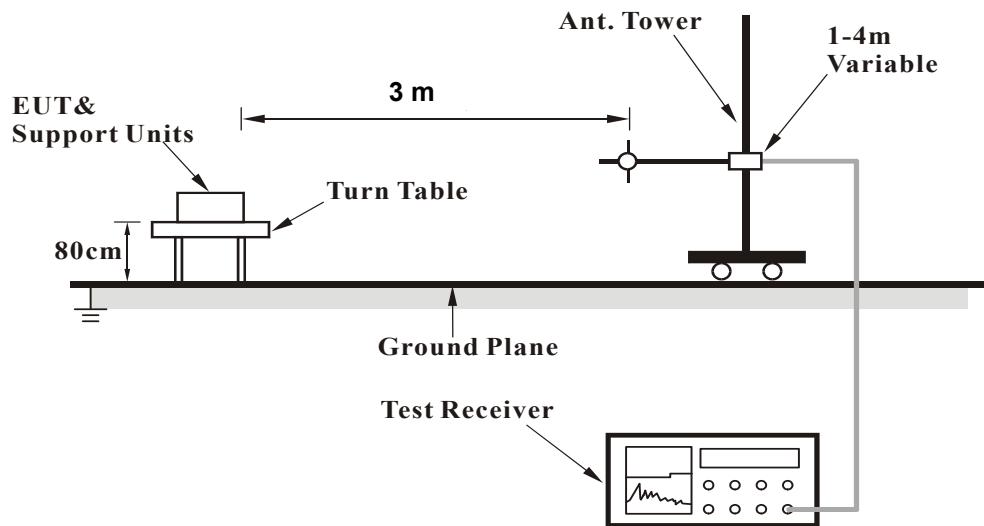
No deviation.

4.1.5 Test Set Up

<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



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

KDB 414788 OFS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Set the EUT under transmission condition continuously at specific channel frequency.

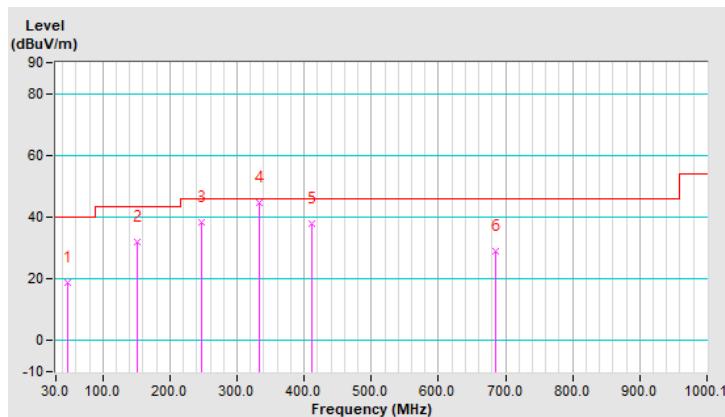
4.1.7 Test Results

| EUT Test Condition | | Measurement Detail | | |
|--------------------------|--|--------------------|--|--------------------|
| Channel | | Frequency Range | | Below 1000 MHz |
| Input Power | | Detector Function | | Quasi-Peak or Peak |
| Environmental Conditions | | Tested By | | Edison Lee |

| 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 | 48.43 | 18.77 QP | 40.00 | -21.23 | 1.50 H | 201 | 36.83 | -18.06 |
| 2 | 152.23 | 32.15 QP | 43.50 | -11.35 | 1.00 H | 169 | 50.15 | -18.00 |
| 3 | 247.30 | 38.24 QP | 46.00 | -7.76 | 2.00 H | 59 | 57.68 | -19.44 |
| 4 | 332.67 | 44.84 QP | 46.00 | -1.16 | 1.00 H | 144 | 61.44 | -16.60 |
| 5 | 412.22 | 37.96 QP | 46.00 | -8.04 | 1.50 H | 338 | 52.88 | -14.92 |
| 6 | 684.82 | 29.04 QP | 46.00 | -16.96 | 2.00 H | 123 | 38.51 | -9.47 |

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.

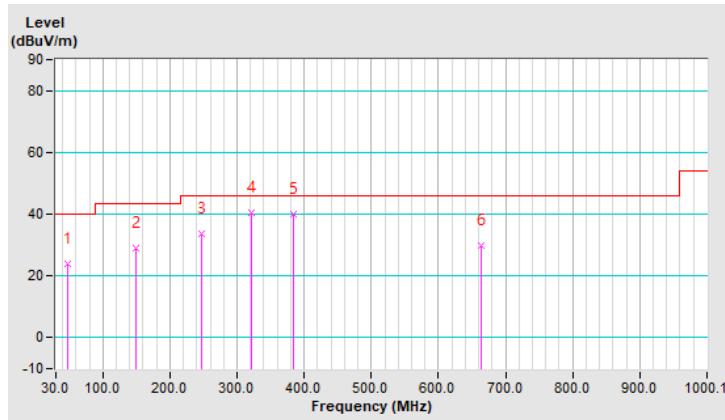


| EUT Test Condition | | Measurement Detail | |
|--------------------------|--------------------|--------------------|--------------------|
| Channel | Channel 1 | Frequency Range | Below 1000 MHz |
| Input Power | 120 Vac, 60 Hz | Detector Function | Quasi-Peak or Peak |
| Environmental Conditions | 23 deg. C, 68 % RH | Tested By | Edison Lee |

| 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 | 48.43 | 23.97 QP | 40.00 | -16.03 | 1.00 V | 159 | 42.03 | -18.06 |
| 2 | 148.35 | 28.96 QP | 43.50 | -14.54 | 2.00 V | 212 | 47.08 | -18.12 |
| 3 | 247.30 | 33.46 QP | 46.00 | -12.54 | 1.00 V | 289 | 52.90 | -19.44 |
| 4 | 321.03 | 40.43 QP | 46.00 | -5.57 | 1.50 V | 313 | 57.40 | -16.97 |
| 5 | 383.12 | 40.14 QP | 46.00 | -5.86 | 1.00 V | 5 | 55.69 | -15.55 |
| 6 | 663.48 | 29.73 QP | 46.00 | -16.27 | 1.00 V | 51 | 39.48 | -9.75 |

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.



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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