

Variant FCC Test Report (Part 90)

Report No.: RFBEEKK-WTW-P20080111A-4
FCC ID: 2AARN-DLWPH-8M
Test Model: DLWPH-8M-RW
Series Model: DLWPH-8M
Received Date: Dec. 22, 2021
Test Date: Jan. 11 ~ Mar. 29, 2022
Issued Date: Mar. 30, 2022

Applicant: PHIHONG TECHNOLOGY CO. LTD.
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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

| Issue No. | Description | Date Issued |
|-------------------------|------------------|---------------|
| RFBEKK-WTW-P20080111A-4 | Original Release | Mar. 30, 2022 |

1 Certificate of Conformity

Product: EV charging system module 4G with WI-FI
Brand: Pihong Technology Co., Ltd.
Test Model: DLWPH-8M-RW
Series Model: DLWPH-8M
Sample Status: Engineering Sample
Applicant: PHIHONG TECHNOLOGY CO. LTD.
Test Date: Jan. 11 ~ Mar. 29, 2022
Standards: FCC Part 90, Subpart I, R

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 : Lena Wang, **Date:** Mar. 30, 2022
Lena Wang / Specialist

Approved by : Jeremy Lin, **Date:** Mar. 30, 2022
Jeremy Lin / Project Engineer

2 Summary of Test Results

LTE Band 14

| Applied Standard: FCC Part 90 & Part 2 | | | |
|--|------------------------------|--------|---|
| FCC Clause | Test Item | Result | Remarks |
| 2.1046 90.542 (a) | Effective Radiated Power | Pass | Meet the requirement of limit. |
| 2.1047 | Modulation Characteristics | N/A | Refer to note |
| 2.1055 90.539 (e) | Frequency Stability | Pass | Meet the requirement of limit. |
| 2.1049 | Occupied Bandwidth | N/A | Refer to note |
| 90.210 (n) & (b) | Emission Masks | N/A | Refer to note |
| 2.1051 90.543 (e) (2) & (3) | Band Edge Measurements | N/A | Refer to note |
| 2.1051 90.543 (c) & (f) | Conducted Spurious Emissions | N/A | Refer to note |
| 2.1053 90.543 (c) & (f) | Radiated Spurious Emissions | Pass | Meet the requirement of limit. Minimum passing margin is -14.41 dB at 1586.00 MHz. |

Note:

1. This report is a partial report, only test item of Effective Radiated Power, Radiated Spurious Emissions and Frequency Stability test was performed for this report. Other testing data please refer to original report.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement | Frequency | Expanded Uncertainty (k=2) (\pm) |
|--------------------------------|------------------|--------------------------------------|
| Radiated Emissions up to 1 GHz | 9kHz ~ 30MHz | 3.04 dB |
| | 30MHz ~ 200MHz | 3.86 dB |
| | 200MHz ~ 1000MHz | 3.87 dB |
| Radiated Emissions above 1 GHz | 1GHz ~ 18GHz | 2.29 dB |
| | 18GHz ~ 40GHz | 2.29 dB |

2.2 Test Site and Instruments

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration | Due Date of Calibration |
|---|------------------------------|--------------------------|---------------------|-------------------------|
| Test Receiver ROHDE & SCHWARZ | ESCI | 100424 | Dec. 30, 2021 | Dec. 29, 2022 |
| Spectrum Analyzer ROHDE & SCHWARZ | FSP40 | 100040 | Sep. 15, 2021 | Sep. 14, 2022 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-155 | Nov. 01, 2021 | Oct. 31, 2022 |
| HORN Antenna SCHWARZBECK | BBHA 9120D | 9120D-1170 | Nov. 14, 2021 | Nov. 13, 2022 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | BBHA9170241 | Oct. 26, 2021 | Oct. 25, 2022 |
| Preamplifier Agilent (Below 1GHz) | 8447D | 2944A10631 | Jun. 05, 2021 | Jun. 04, 2022 |
| Preamplifier KEYSIGHT (Above 1GHz) | 83017A | MY53270295 | Jun. 05, 2021 | Jun. 04, 2022 |
| RF Coaxial Cable WOKEN With 5dB PAD | 8D-FB | Cable-CH4-01 | Jul. 24, 2021 | Jul. 23, 2022 |
| RF Coaxial Cable EMCI | EMC102-KM-KM-3000 | 150929 | Jul. 24, 2021 | Jul. 23, 2022 |
| RF Coaxial Cable EMCI | EMC102-KM-KM-600 | 150928 | Jul. 24, 2021 | Jul. 23, 2022 |
| RF signal cable HUBER+SUHNER | SUCOFLEX 104 | MY 13380+295012/04 | Jun. 05, 2021 | Jun. 04, 2022 |
| RF signal cable HUBER+SUHNER | SUCOFLEX 104 | Cable-CH4-03 (250724) | Jun. 05, 2021 | Jun. 04, 2022 |
| Software BV ADT | ADT_Radiated_ V7.6.15.9.5 | NA | NA | NA |
| Antenna Tower Controller BV ADT | AT100 | AT93021703 | NA | NA |
| Turn Table Controller BV ADT | SC100 | SC93021703 | NA | NA |
| Boresight Antenna Fixture | FBA-01 | FBA-SIP01 | 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 HwaYa Chamber 4.

3 General Information

3.1 General Description of EUT

| | | | |
|---------------------|--|------------------------|------------------------|
| Product | EV charging system module 4G with WI-FI | | |
| Brand | Phihong Technology Co., Ltd. | | |
| Test Model | DLWPH-8M-RW | | |
| Series Model | DLWPH-8M | | |
| Model Difference | Refer to Note as below | | |
| Sample Status | Engineering Sample | | |
| Power Supply Rating | 5Vdc (for DC power supply or host equipment) | | |
| Modulation Type | QPSK, 16QAM | | |
| Operating Frequency | LTE Band 14 (Channel Bandwidth 5MHz) | 790.5MHz ~ 795.5MHz | |
| | LTE Band 14 (Channel Bandwidth 10MHz) | 793MHz | |
| Max. ERP Power | | QPSK | 16QAM |
| | LTE Band 14 (Channel Bandwidth 5MHz) | 63.533mW (18.03dBm) | 46.881mW (16.71dBm) |
| | LTE Band 14 (Channel Bandwidth 10MHz) | 61.944mW (17.92dBm) | 54.576mW (17.37dBm) |
| Antenna Type | Refer to Note as below | | |
| Antenna Connector | Refer to Note as below | | |
| Accessory Device | NA | | |
| Cable Supplied | NA | | |

Note:

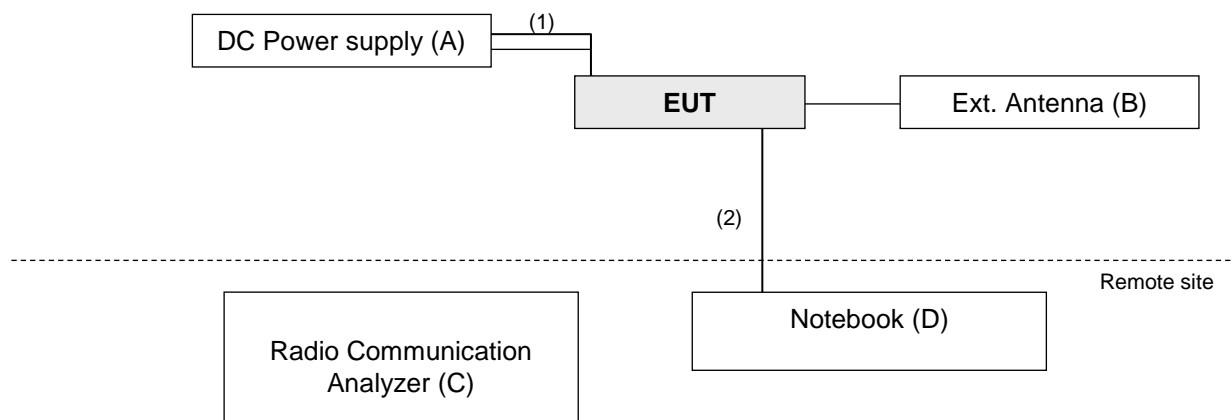
- This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to BV CPS report no. RFBEKK-WTW-P20080111-4. The difference compared with original report is changing the motherboard design and adding external antenna, therefore only Effective Radiated Power, Radiated Spurious Emissions and Frequency Stability tests had been performed and recorded in this report.
- All models are listed as below.

| Brand | Model | Difference of WLAN Antenna type |
|------------------------------|-------------|---------------------------------|
| Phihong Technology Co., Ltd. | DLWPH-8M | internal antenna |
| | DLWPH-8M-RW | external antenna |

- The following antennas were provided to the EUT. (New antenna is marked in gray)

| Brand | Model | Antenna Gain(dBi) | Antenna Type | Connector Type |
|-----------|----------------------|-------------------|--------------|----------------|
| Gortec | DR0727-4201BSM | -3.11 | PCB | SMA Male |
| Aristotle | RFA-LTE-JP187-79B300 | 1.8 | PCB | SMA PLUG |

3.2 Configuration of System under Test



3.2.1 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 |
|----|------------------------------|------------------------------|----------------------|----------------|--------|--------------------|
| A. | DC Power Supply | JIN YIH TECHNOLOGY CO., LTD. | ODP3033 | ODP30332027416 | NA | - |
| B. | Ext. Antenna | Aristotle | RFA-LTE-JP187-79B300 | NA | NA | Provided by client |
| C. | Notebook | DELL | E5430 | 2RL3YW1 | NA | - |
| D. | Radio Communication Analyzer | Anritsu | MT8821C | 6201462755 | NA | - |

Note:

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

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|----|--------------|------|------------|--------------------|--------------|--------------------|
| 1. | Power cable | 1 | 2 | N | 0 | - |
| 2. | LAN Cable | 1 | 5 | Y | 0 | Provided by client |

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Z-plane. Following channel(s) was (were) selected for the final test as listed below.

LTE Band 14

| EUT Configure Mode | Test item | Available channel | Tested channel | Channel Bandwidth | Modulation | Mode |
|--------------------|------------------------------|-------------------|---|-------------------|--------------|---------------------|
| - | ERP | 23305 to 23355 | 23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz) | 5MHz | QPSK / 16QAM | 1 RB / 12 RB Offset |
| | | 23330 | 23330(793.0MHz) | 10MHz | QPSK / 16QAM | 1 RB / 0 RB Offset |
| - | Frequency Stability | 23305 to 23355 | 23305(790.5MHz), 23355(795.5MHz) | 5MHz | QPSK | 25RB / 0RB Offset |
| | | 23330 | 23330(793.0MHz) | 10MHz | QPSK | 50RB / 0RB Offset |
| - | Radiated Emission below 1GHz | 23305 to 23355 | 23330(793.0MHz) | 5MHz | QPSK | 1 RB / 12 RB Offset |
| - | Radiated Emission above 1GHz | 23305 to 23355 | 23305(790.5MHz), 23330(793.0MHz), 23355(795.5MHz) | 5MHz | QPSK | 1 RB / 12 RB Offset |
| | | 23330 | 23330(793.0MHz) | 10MHz | QPSK | 1 RB / 0 RB Offset |

Note:

1. The conducted output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only ERP had been tested under QPSK and 16QAM modes, the other test items were performed under QPSK mode only.
2. For radiated emission below 1GHz, select the worst radiated emission (above 1GHz) channel for final testing.
3. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.

Test Condition:

| Test Item | Environmental Conditions | Input Power | Tested By |
|---------------------|--------------------------|--------------|------------|
| ERP | 22deg. C, 69%RH | 120Vac, 60Hz | Rex Wang |
| Frequency Stability | 24deg. C, 64%RH | 120Vac, 60Hz | James Yang |
| Radiated Emission | 23deg. C, 66%RH | 120Vac, 60Hz | Titan Hsu |

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 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:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 90

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

KDB 971168 D02 Misc Rev Approv License Devices v02r01

ANSI/TIA/EIA-603-E 2016

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

LTE Band 14:

Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

4.1.2 Test Procedures

EIRP / ERP Measurement:

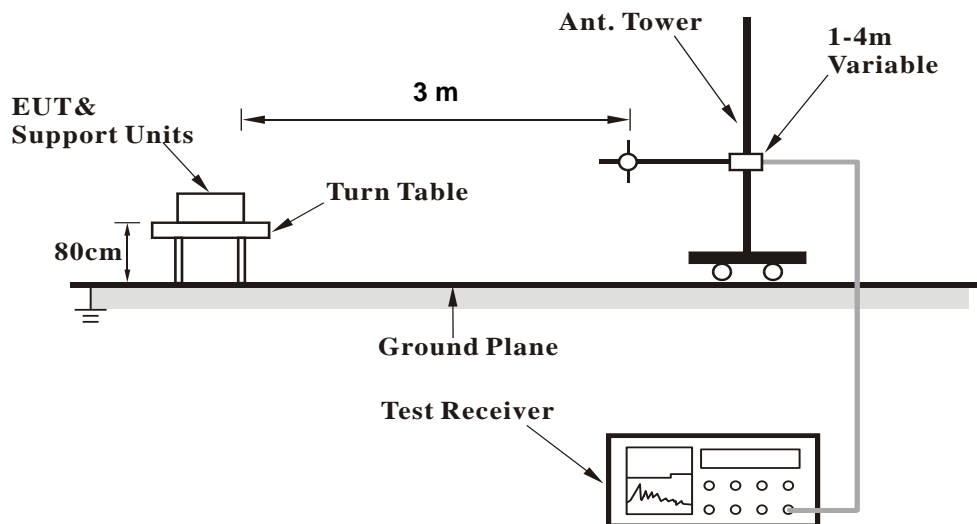
- a. All measurements were done at low, middle and high operational frequency range. 5 MHz - 10 MHz for LTE mode, and VBW $\geq 3 \times$ RBW.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dB.

Conducted Power Measurement:

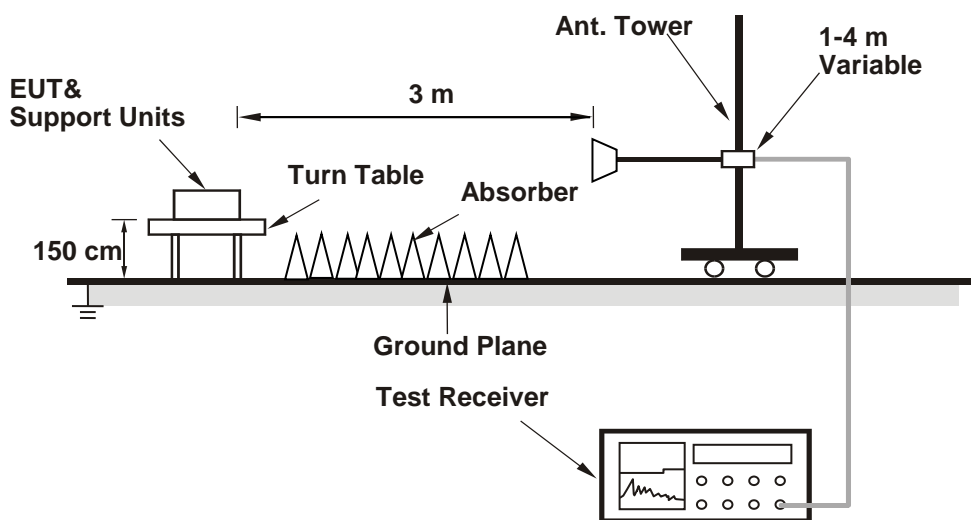
- a. The EUT was set up for the maximum power with CDMA and LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

EIRP / ERP Measurement:
<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

Conducted Power Measurement:



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

4.1.4 Test Results

ERP Power (dBm)

Modulation Type: QPSK

LTE Band 14, Channel Bandwidth 5MHz

| Mode | | TX channel 23305, 23330, 23355 | | | | | | |
|--|-----------------|--------------------------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 790.50 | 16.33 | 34.77 | -18.44 | 1.00 H | 136 | 82.27 | -65.94 |
| 2 | 793.00 | 16.28 | 34.77 | -18.49 | 1.04 H | 142 | 82.18 | -65.90 |
| 3 | 795.50 | 16.34 | 34.77 | -18.43 | 1.05 H | 136 | 82.18 | -65.84 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 790.50 | 17.95 | 34.77 | -16.82 | 1.54 V | 334 | 83.89 | -65.94 |
| 2 | 793.00 | 17.99 | 34.77 | -16.78 | 1.55 V | 336 | 83.89 | -65.90 |
| 3 | 795.50 | 18.03 | 34.77 | -16.74 | 1.56 V | 329 | 83.87 | -65.84 |

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 – 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 14, Channel Bandwidth 10MHz

| Mode | | TX channel 23330 | | | | | | |
|--|-----------------|------------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 793.00 | 16.36 | 34.77 | -18.41 | 1.04 H | 136 | 82.26 | -65.90 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 793.00 | 17.92 | 34.77 | -16.85 | 1.58 V | 332 | 83.82 | -65.90 |

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 – 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Modulation Type: 16QAM

LTE Band 14, Channel Bandwidth 5MHz

| Mode | | TX channel 23305, 23330, 23355 | | | | | | |
|--|-----------------|--------------------------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 790.50 | 15.23 | 34.77 | -19.54 | 1.03 H | 136 | 81.17 | -65.94 |
| 2 | 793.00 | 15.28 | 34.77 | -19.49 | 1.04 H | 139 | 81.18 | -65.90 |
| 3 | 795.50 | 15.31 | 34.77 | -19.46 | 1.00 H | 145 | 81.15 | -65.84 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 790.50 | 16.68 | 34.77 | -18.09 | 1.55 V | 341 | 82.62 | -65.94 |
| 2 | 793.00 | 16.69 | 34.77 | -18.08 | 1.53 V | 335 | 82.59 | -65.90 |
| 3 | 795.50 | 16.71 | 34.77 | -18.06 | 1.55 V | 338 | 82.55 | -65.84 |

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 14, Channel Bandwidth 10MHz

| Mode | | TX channel 23330 | | | | | | |
|--|-----------------|------------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 793.00 | 16.28 | 34.77 | -18.49 | 1.05 H | 146 | 82.18 | -65.90 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 793.00 | 17.37 | 34.77 | -17.40 | 1.54 V | 330 | 83.27 | -65.90 |

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

LTE Band 14:

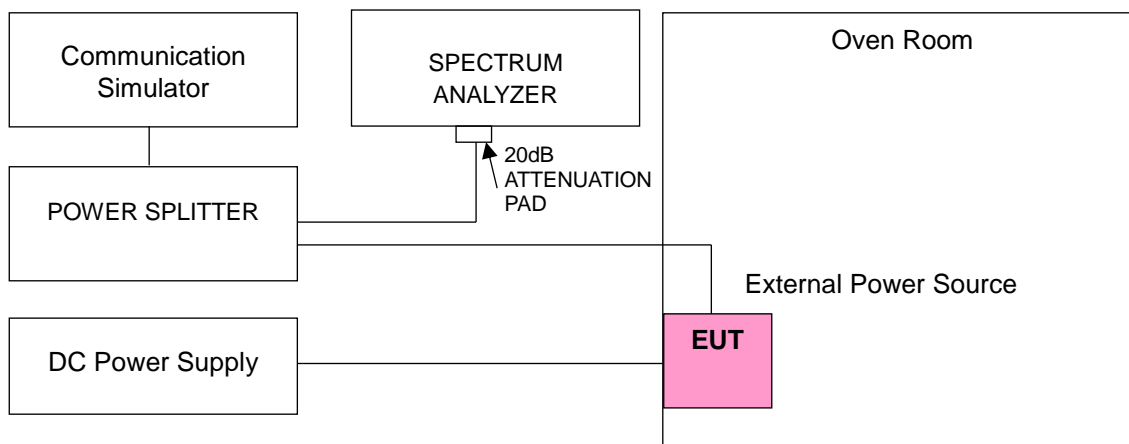
The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

4.2.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ± 0.5 °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Note: The frequency error was recorded frequency error from the communication simulator.

4.2.3 Test Setup



4.2.4 Test Results

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 14 | | | |
|-----------------|-------------------------|-----------------------|-----------------|-----------------------|
| | Channel Bandwidth: 5MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 5 | 790.500003 | 0.003 | 795.500003 | 0.004 |
| 4.25 | 790.500004 | 0.004 | 795.500003 | 0.003 |
| 5.75 | 790.500003 | 0.004 | 795.500004 | 0.005 |

Note: The applicant defined the normal working voltage is from 5Vdc to 5.75Vdc.

Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 14 | | | |
|------------|--------------------------|-----------------------|-----------------|-----------------------|
| | Channel Bandwidth: 5 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -40 | 790.500004 | 0.005 | 795.500004 | 0.005 |
| -30 | 790.500003 | 0.003 | 795.500004 | 0.005 |
| -20 | 790.500001 | 0.002 | 795.500004 | 0.005 |
| -10 | 790.500004 | 0.005 | 795.500003 | 0.004 |
| 0 | 790.500001 | 0.002 | 795.500004 | 0.005 |
| 10 | 790.500004 | 0.005 | 795.500003 | 0.004 |
| 20 | 790.499998 | -0.002 | 795.499999 | -0.002 |
| 30 | 790.499997 | -0.004 | 795.499998 | -0.003 |
| 40 | 790.499998 | -0.003 | 795.499999 | -0.002 |
| 50 | 790.499997 | -0.004 | 795.499996 | -0.005 |
| 60 | 790.499996 | -0.005 | 795.499997 | -0.004 |
| 70 | 790.499996 | -0.005 | 795.499997 | -0.004 |
| 80 | 790.499996 | -0.005 | 795.499998 | -0.002 |
| 85 | 790.499996 | -0.005 | 795.499997 | -0.003 |

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 14 | |
|-----------------|---------------------------|-----------------------|
| | Channel Bandwidth: 10 MHz | |
| | Frequency (MHz) | Frequency Error (ppm) |
| 5 | 793.000001 | 0.001 |
| 4.25 | 793.000002 | 0.002 |
| 5.75 | 793.000004 | 0.005 |

Note: The applicant defined the normal working voltage is from 5Vdc to 5.75Vdc.

Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 14 | |
|------------|---------------------------|-----------------------|
| | Channel Bandwidth: 10 MHz | |
| | Frequency (MHz) | Frequency Error (ppm) |
| -40 | 793.000002 | 0.002 |
| -30 | 793.000001 | 0.001 |
| -20 | 793.000003 | 0.004 |
| -10 | 793.000003 | 0.003 |
| 0 | 793.000003 | 0.003 |
| 10 | 793.000002 | 0.003 |
| 20 | 792.999998 | -0.003 |
| 30 | 792.999997 | -0.004 |
| 40 | 792.999999 | -0.002 |
| 50 | 792.999998 | -0.003 |
| 60 | 792.999999 | -0.002 |
| 70 | 792.999997 | -0.003 |
| 80 | 792.999997 | -0.004 |
| 85 | 792.999999 | -0.001 |

4.3 Radiated Emission Measurement

4.3.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm .

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm.

4.3.2 Test Procedure

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
- c. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15dBi.

NOTE:

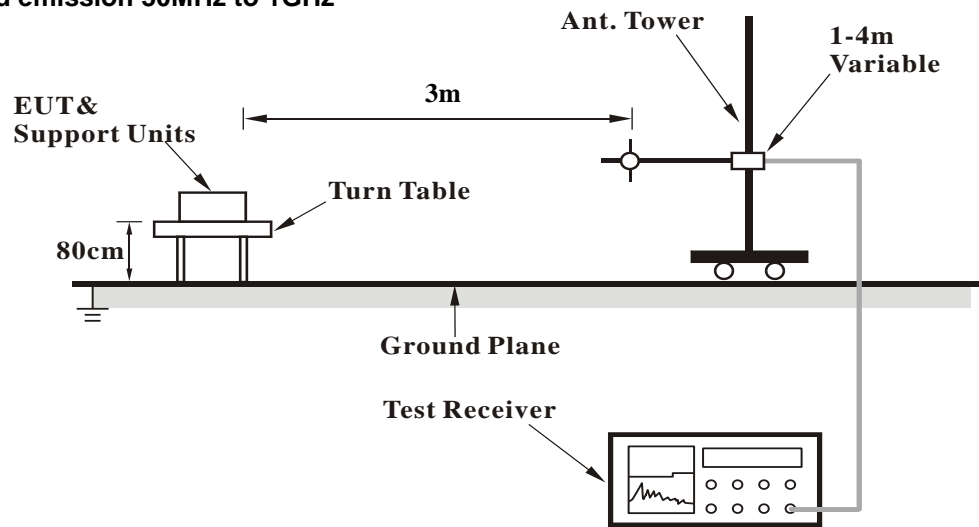
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.3.3 Deviation from Test Standard

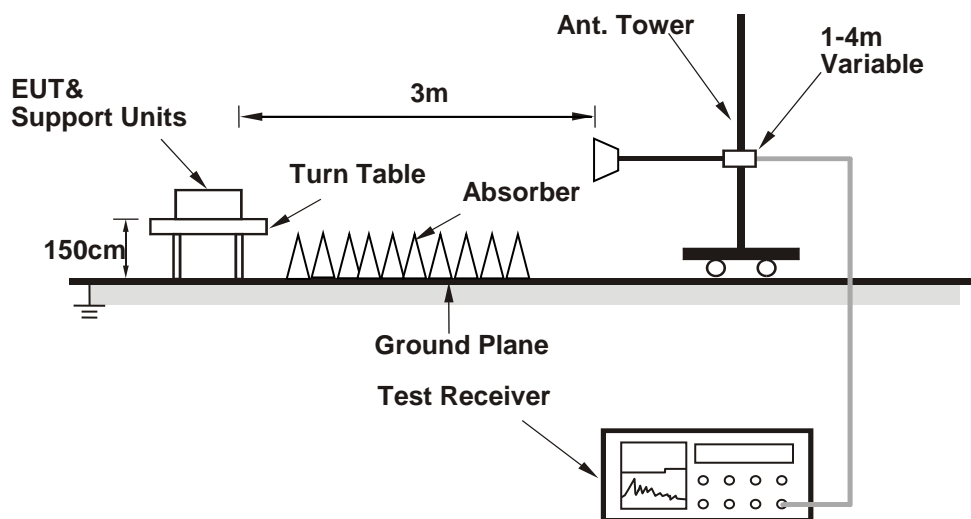
No deviation.

4.3.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

4.3.5 Test Results

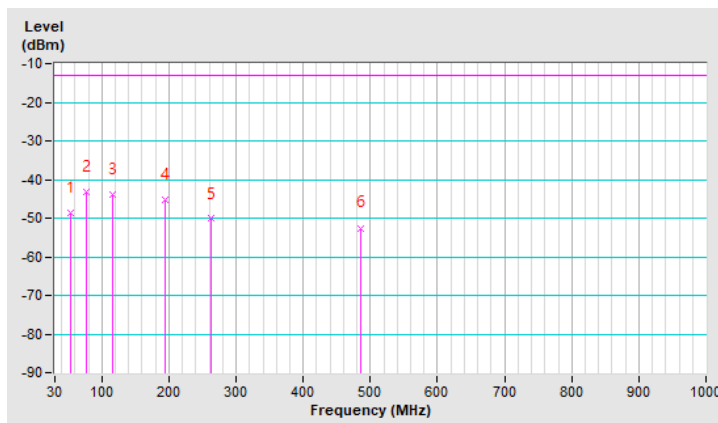
Below 1GHz
 LTE Band 14

| | | | |
|------------------------|----------------------|----------------|--------------------|
| RF Mode | TX LTE Band XIV-5MHz | Channel | CH 23330 :793.0MHz |
| Frequency Range | 30MHz ~ 1GHz | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|--|-----------------|-----------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 53.28 | -48.5 | -13.0 | -35.5 | 1.50 H | 283 | 57.7 | -106.2 |
| 2 | 76.56 | -43.1 | -13.0 | -30.1 | 1.50 H | 288 | 66.5 | -109.6 |
| 3 | 115.36 | -43.9 | -13.0 | -30.9 | 1.50 H | 286 | 65.2 | -109.1 |
| 4 | 194.90 | -45.2 | -13.0 | -32.2 | 1.50 H | 337 | 63.8 | -109.0 |
| 5 | 262.80 | -50.2 | -13.0 | -37.2 | 1.50 H | 148 | 56.1 | -106.3 |
| 6 | 485.90 | -52.5 | -13.0 | -39.5 | 1.50 H | 149 | 49.2 | -101.8 |

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 – 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

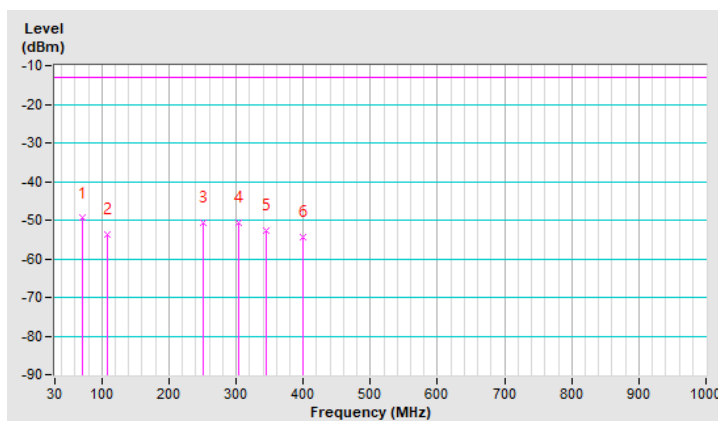


| | | | |
|------------------------|----------------------|----------------|--------------------|
| RF Mode | TX LTE Band XIV-5MHz | Channel | CH 23330 :793.0MHz |
| Frequency Range | 30MHz ~ 1GHz | | |

| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
|--|-----------------|-----------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 70.74 | -49.5 | -13.0 | -36.5 | 1.50 V | 214 | 58.8 | -108.2 |
| 2 | 107.60 | -53.7 | -13.0 | -40.7 | 1.50 V | 261 | 56.0 | -109.7 |
| 3 | 251.16 | -50.6 | -13.0 | -37.6 | 1.50 V | 203 | 56.2 | -106.8 |
| 4 | 303.54 | -50.6 | -13.0 | -37.6 | 1.50 V | 212 | 54.3 | -104.9 |
| 5 | 344.28 | -52.6 | -13.0 | -39.6 | 1.50 V | 212 | 51.6 | -104.2 |
| 6 | 400.54 | -54.3 | -13.0 | -41.3 | 1.50 V | 159 | 49.2 | -103.5 |

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.



Above 1GHz
LTE Band 14

| | | | |
|------------------------|----------------------|----------------|--------------------|
| RF Mode | TX LTE Band XIV-5MHz | Channel | CH 23305 :790.5MHz |
| Frequency Range | 1GMHz ~ 18GHz | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|--|-----------------|------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1581.00 | -56.41 | -40.00 | -16.41 | 2.27 H | 25 | 40.99 | -97.40 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1581.00 | -55.16 | -40.00 | -15.16 | 1.62 V | 242 | 42.24 | -97.40 |

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

| | | | |
|------------------------|----------------------|----------------|--------------------|
| RF Mode | TX LTE Band XIV-5MHz | Channel | CH 23330: 793.0MHz |
| Frequency Range | 1GMHz ~ 18GHz | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|--|-----------------|------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1586.00 | -56.70 | -40.00 | -16.70 | 2.32 H | 26 | 40.69 | -97.39 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1586.00 | -54.41 | -40.00 | -14.41 | 1.62 V | 243 | 42.98 | -97.39 |

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

| | | | |
|------------------------|----------------------|----------------|--------------------|
| RF Mode | TX LTE Band XIV-5MHz | Channel | CH 23355 :795.5MHz |
| Frequency Range | 1GMHz ~ 18GHz | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|--|-----------------|------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1591.00 | -56.80 | -40.00 | -16.80 | 2.31 H | 19 | 40.57 | -97.37 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1591.00 | -55.02 | -40.00 | -15.02 | 1.65 V | 247 | 42.35 | -97.37 |

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

| | | | |
|------------------------|-----------------------|----------------|--------------------|
| RF Mode | TX LTE Band XIV-10MHz | Channel | CH 23330 :793.0MHz |
| Frequency Range | 1GMHz ~ 18GHz | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|--|-----------------|------------|-------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1586.00 | -56.73 | -40.00 | -16.73 | 2.31 H | 23 | 40.66 | -97.39 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1586.00 | -55.27 | -40.00 | -15.27 | 1.61 V | 242 | 42.12 | -97.39 |

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

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 and approved according to ISO/IEC 17025.

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Web Site: www.bureauveritas-adt.com

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

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