## FCC Co-Location Test Report



We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:


Approved by:



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## Release Record

| Report No. | Version | Description | Issued Date |
| :---: | :--- | :--- | :--- |
| FG851703CO | Rev. 01 | Initial issue | Jun. 27, 2018 |

## Summary of Test Results

| FCC Rules | Test Items | Measured | Result |
| :---: | :---: | :--- | :---: |
| $15.247(\mathrm{~d}) / 15.209$ |  | [dBuV/m at 3m]: 55.22 MHz |  |
| $2.1053 / 22.917(\mathrm{a})$ | Radiated Emissions | $38.97($ Margin $-1.03 \mathrm{~dB})-\mathrm{QP}$ |  |
| $2.1053 / 24.238(\mathrm{a})$ | [dBuV/m at 3m]: 593.57MHz | Pass |  |
| $2.1053 / 27.53(\mathrm{~h})$ | $44.97($ Margin $-1.03 \mathrm{~dB})-\mathrm{QP}$ |  |  |

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## 1 General Description

### 1.1 Information

### 1.1.1 Product Details

The following models are provided to this EUT.

| Brand Name | Model Name | Product Name | Description |
| :---: | :---: | :---: | :--- |
| Gemtek | WLTFQT-141GN | Cat4 Indoor CPE | Main tested model. |
|  | Blu-Castle |  |  |

+ All models are electrically identical, different model names are for marketing purpose.


### 1.1.2 Specification of the Equipment under Test (EUT)

| WLAN |  |
| :---: | :---: |
| Operating Frequency | 802.11b/g/n: 2412 MHz ~ 2462 MHz |
| Modulation Type | 802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) |
| WWAN |  |
| Operating Frequency | GPRS: 824.2 ~ 848.8 MHz WCDMA: $826.4 \sim 846.6 \mathrm{MHz}$ GPRS: 1850.2 ~ 1909.8 MHz WCDMA: 1852.4 ~ 1907.6 MHz |
| Modulaton Type | GPRS: GMSK WCDMA / HSDPA / DC-HSDPA: QPSK (uplink) |
| LTE |  |
| Operating Frequency | LTE Band 2 : <br> Channel Bandwidth: 1.4MHz: 1850.7~1909.3 MHz <br> Channel Bandwidth: 3MHz: 1851.5 MHz ~ 1908.5 MHz <br> Channel Bandwidth: 5MHz: 1852.5 MHz ~ 1907.5 MHz <br> Channel Bandwidth: 10MHz: $1855 \mathrm{MHz} \sim 1905 \mathrm{MHz}$ <br> Channel Bandwidth: 15MHz: 1857.5 MHz ~ 1902.5 MHz <br> Channel Bandwidth: 20MHz: 1860 MHz ~ 1900 MHz <br> LTE Band 4: <br> Channel Bandwidth: 1.4MHz: 1710.7~1754.3 <br> Channel Bandwidth: 3MHz: 1711.5~1753.5 <br> Channel Bandwidth: 5MHz: 1712.5~1752.5 <br> Channel Bandwidth: 10MHz: 1715~1750 <br> Channel Bandwidth: 15MHz: 1717.5~1747.5 <br> Channel Bandwidth: 20MHz: 1720~1745 |
| Modulaton Type | QPSK, 16QAM (Uplink) |

### 1.1.3 Power Supply Type of Equipment under Test (EUT)

| Power Supply Type | 12 Vdc from AC adapter |
| :--- | :--- |

### 1.2 The Equipment List

| Test Item | Radiated Emission |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Test Site | 966 chamber1 / (03CH01-WS) |  |  |  |  |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R\&S | FSV40 | 101498 | Dec. 04, 2017 | Dec. 03, 2018 |
| Receiver | R\&S | ESR3 | 101658 | Nov. 20, 2017 | Nov. 19, 2018 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-522 | Jul. 25, 2017 | Jul. 24, 2018 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1096 | Dec. 20, 2017 | Dec. 19, 2018 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170517 | Nov. 23, 2017 | Nov. 22, 2018 |
| Loop Antenna | R\&S | HFH2-Z2 | 100330 | Nov. 13, 2017 | Nov. 12, 2018 |
| Loop Antenna Cable | KOAX KABEL | 101354-BW | 101354-BW | Dec. 07, 2017 | Dec. 06, 2018 |
| Preamplifier | EMC | EMC02325 | 980225 | Jul. 28, 2017 | Jul. 27, 2018 |
| Preamplifier | Agilent | 83017A | MY39501308 | Oct. 06, 2017 | Oct. 05, 2018 |
| Preamplifier | EMC | EMC184045B | 980192 | Aug. 22, 2017 | Aug. 21, 2018 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16140/4 | May 09, 2018 | May 08, 2019 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16019/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16139/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 1M | EMC | $\begin{aligned} & \text { EMCCFD400-NM-N } \\ & \text { M-1000 } \end{aligned}$ | 16052 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 3M | Woken | CFD400NL-LW | CFD400NL-001 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 10M | Woken | CFD400NL-LW | CFD400NL-002 | Dec. 07, 2017 | Dec. 06, 2018 |
| Measurement Software | AUDIX | e3 | 6.120210 g | NA | NA |

### 1.3 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.
47 CFR FCC Part 15.247
ANSI C63.10-2013
FCC KDB 558074 D01 DTS Meas Guidance v04
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
47 CFR FCC Part 22 Subpart H
47 CFR FCC Part 24 Subpart E
47 CFR FCC Part 27 Subpart L
ANSI C63.4-2014
ANSI C63.26-2015
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01
FCC KDB 971168 D02 Misc Rev Approv License Devices v02r01
FCC KDB 412172 D01 Determining ERP and EIRP v01r01
FCC KDB 442401 ERP/EIRP measurement procedures for licensed radio service devices

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### 1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a $95 \%$ confidence level (based on a coverage factor ( $k=2$ )

| Measurement Uncertainty |  |
| :--- | :---: |
|  | Parameters |
| Radiated emission $\leq 1 \mathrm{GHz}$ | $\pm 3.66 \mathrm{~dB}$ |
| Radiated emission $>1 \mathrm{GHz}$ | $\pm 5.63 \mathrm{~dB}$ |

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## 2 Test Configuration

### 2.1 Testing Condition

| Test Item | Test Site | Ambient Condition | Tested By |
| :---: | :---: | :---: | :---: |
| Radiated Emissions | $03 \mathrm{CH} 01-\mathrm{WS}$ | $22^{\circ} \mathrm{C} / 63 \%$ | Vincent Yeh |

$>$ FCC Designation No.: TW2732
$>$ FCC site registration No.: 181692
> IC site registration No.: 10807A-1

### 2.2 The Worst Test Modes and Channel Details

| Test item | Test mode |
| :---: | :--- |
| Radiated Emissions | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+\mathrm{GSM} 850 \mathrm{CH} 190$ |
|  | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+\mathrm{GSM} 1900 \mathrm{CH} 512$ |
|  | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+$ LTE B4 5M CH20375 |
| NOTE: The selected channel is the maximum power channel of each band. |  |

## 3 Transmitter Test Results

### 3.1 Unwanted Emissions into Restricted Frequency Bands

### 3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

| Restricted Band Emissions Limit |  |  |  |
| :---: | :---: | :---: | :---: |
| Frequency Range (MHz) | Field Strength (uV/m) | Field Strength (dBuV/m) | Measure Distance (m) |
| $0.009 \sim 0.490$ | $2400 / \mathrm{F}(\mathrm{kHz})$ | $48.5-13.8$ | 300 |
| $0.490 \sim 1.705$ | $24000 / \mathrm{F}(\mathrm{kHz})$ | $33.8-23$ | 30 |
| $1.705 \sim 30.0$ | 30 | 29 | 30 |
| $30 \sim 88$ | 100 | 40 | 3 |
| $88 \sim 216$ | 150 | 43.5 | 3 |
| $216 \sim 960$ | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

## Note 1:

Qusai-Peak value is measured for frequency below 1 GHz except for $9-90 \mathrm{kHz}, 110-490 \mathrm{kHz}$ frequency band. Peak and average value are measured for frequency above 1 GHz . The limit on average radio frequency emission is as above table.
The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz : $20 \mathrm{~dB} /$ decade Frequency below $30 \mathrm{MHz}: 40 \mathrm{~dB} / \mathrm{decade}$.

### 3.1.2 Test Procedures

1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of $360^{\circ}$. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz , the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz , the table height is 1.5 m .
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height ( $1 \mathrm{~m} \sim 4 \mathrm{~m}$ ) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m .
3. This investigation is performed with the EUT rotated $360^{\circ}$, the antenna height scanned between 1 m and 4 m , and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.
Note:
4. 120 kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1 GHz .
5. $R B W=1 \mathrm{MHz}, \mathrm{VBW}=3 \mathrm{MHz}$ and Peak detector is for peak measured value of radiated emission above 1 GHz .
6. $R B W=1 \mathrm{MHz}, \mathrm{VBW}=1 / \mathrm{T}$ and Peak detector is for average measured value of radiated emission above 1 GHz .

### 3.1.3 Test Setup

Radiated Emissions below 1 GHz


Radiated Emissions above 1 GHz


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### 3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin ( dB ) = Emission level ( $\mathrm{dBuV} / \mathrm{m}$ ) - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).
Note 3: All spurious emissions below 30 MHz are more than 20 dB below the limit.

| Mode | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+$ GSM850 CH190 |
| :--- | :--- |
| Polarization | Vertical |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).
Note 3: All spurious emissions below 30 MHz are more than 20 dB below the limit.

| Mode | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+$ GSM1900 CH512 |
| :--- | :--- |
| Polarization | Horizontal |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).
Note 3: All spurious emissions below 30 MHz are more than 20 dB below the limit.

| Mode | $2.4 \mathrm{G} \mathrm{11g} \mathrm{CH06} \mathrm{+} \mathrm{GSM1900} \mathrm{CH512}$ |
| :--- | :--- |
| Polarization | Vertical |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin (dB) = Emission level ( $\mathrm{dBuV} / \mathrm{m}$ ) - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).
Note 3: All spurious emissions below 30 MHz are more than 20 dB below the limit.

| Mode | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH06} \mathrm{+} \mathrm{LTE} \mathrm{B4} \mathrm{5M} \mathrm{CH20375}$ |
| :--- | :--- |
| Polarization | Horizontal |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).
Note 3: All spurious emissions below 30 MHz are more than 20 dB below the limit.

| Mode | $2.4 \mathrm{G} \mathrm{11g} \mathrm{CH06} \mathrm{+} \mathrm{LTE} \mathrm{B4} \mathrm{5M} \mathrm{CH20375}$ |
| :--- | :--- |
| Polarization | Vertical |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).
Note 3: All spurious emissions below 30 MHz are more than 20 dB below the limit.

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### 3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)



Note 1: Emission Level ( $\mathrm{dBuV} / \mathrm{m}$ ) $=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit $(\mathrm{dBuV} / \mathrm{m})$.

| Mode | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+$ GSM850 CH190 |
| :--- | :--- |
| Polarization | Vertical |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).

| Mode | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+$ GSM1900 CH512 |
| :--- | :--- |
| Polarization | Horizontal |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).

| Mode | $2.4 \mathrm{G} 11 \mathrm{~g} \mathrm{CH} 06+$ GSM1900 CH512 |
| :--- | :--- |
| Polarization | Vertical |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).

| Mode | $2.4 \mathrm{G} \mathrm{11g} \mathrm{CH06} \mathrm{+} \mathrm{LTE} \mathrm{B4} \mathrm{5M} \mathrm{CH20375}$ |
| :--- | :--- |
| Polarization | Horizontal |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).

| Mode | $2.4 \mathrm{G} \mathrm{11g} \mathrm{CH06} \mathrm{+} \mathrm{LTE} \mathrm{B4} \mathrm{5M} \mathrm{CH20375}$ |
| :--- | :--- |
| Polarization | Vertical |



Note 1: Emission Level $(\mathrm{dBuV} / \mathrm{m})=$ SA Reading $(\mathrm{dBuV} / \mathrm{m})+$ Factor* $(\mathrm{dB})$
*Factor includes antenna factor, cable loss and amplifier gain
Note 2: Margin $(\mathrm{dB})=$ Emission level $(\mathrm{dBuV} / \mathrm{m})$ - Limit ( $\mathrm{dBuV} / \mathrm{m}$ ).

## 4 Test laboratory information

Established in 2012, ICC provides foremost EMC \& RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

## Linkou

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## Kwei Shan

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## Kwei Shan Site II

Tel: 886-3-271-8640
No. 14-1, Lane 19, Wen San 3rd
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If you have any suggestion, please feel free to contact us as below information

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