

FCC Co-Location Test Report

FCC ID : MXF-WLTFSM13641
Equipment : LTE Cat 6 Single-Mode Indoor CPE
Model No. : WLTFSM-136ACN_384041
Brand Name : Gemtek
Applicant : Gemtek Technology Co., Ltd.
Address : No.15-1 Zhonghua Road, Hsinchu Industrial
Park, Hukou, Hsinchu, Taiwan, 30352
Standard : 47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
47 CFR FCC Part 27 Subpart M
Received Date : Dec. 09, 2016
Tested Date : Feb. 20, 2017

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:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

| Report No. | Version | Description | Issued Date |
|------------|---------|---------------|--------------|
| FR6D1001CO | Rev. 01 | Initial issue | May 10, 2017 |

Summary of Test Results

| FCC Rules | Test Items | Measured | Result |
|----------------------------------------------------|--------------------|---------------------------------------------------------|--------|
| 15.247(d) 15.407(b) 15.209 27.53(m)(4)(6) | Radiated Emissions | [dBuV/m at 3m]: 60.07MHz 36.97 (Margin -3.03dB) - PK | Pass |

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

| WLAN | |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating Frequency | 802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5745 ~ 5825 MHz |
| Modulation Type | 802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) |
| LTE Band 41 | |
| Operating Frequency | Channel Bandwidth: 5MHz: 2498.5 MHz ~ 2687.5 MHz Channel Bandwidth: 10MHz: 2501.0 MHz ~ 2685.0 MHz Channel Bandwidth: 15MHz: 2503.5 MHz ~ 2682.5 MHz Channel Bandwidth: 20MHz: 2506.0 MHz ~ 2680.0 MHz |
| Modulation Type | QPSK, 16QAM (Uplink) |

1.1.2 Antenna Details

For LTE

| Ant. No. | Type | Connector | Gain (dBi) | Remark |
|----------|-----------------|-----------|------------|--------|
| 1 | Internal Dipole | UFL | 3.69 | --- |

For WLAN

| Ant. No. | Model | Type | Connector | Operating Frequencies (MHz) / Antenna Gain (dBi) | | |
|----------|---------------|--------|-----------|--------------------------------------------------|-----------|-----------|
| | | | | 2400~2483.5 | 5150~5250 | 5725~5850 |
| 1 | WLTFSM-136ACN | Dipole | UFL | 4.11 | 3.94 | 4.34 |
| 2 | WLTFSM-136ACN | Dipole | UFL | 1.29 | 2.95 | 3.97 |

1.1.3 Support Units

| No. | Equipment | Description |
|-----|-------------------------|-------------------------|
| 1 | External Dipole Antenna | Antenna Gain (dBi): 2.5 |

1.1.4 Power Supply Type of Equipment under Test (EUT)

| | |
|-------------------|--------------------|
| Power Supply Type | 12Vdc from 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 | Nov. 25, 2016 | Nov. 24, 2017 |
| Receiver | R&S | ESR3 | 101658 | Nov. 24, 2016 | Nov. 23, 2017 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-522 | Aug. 04, 2016 | Aug. 03, 2017 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1096 | Dec. 21, 2016 | Dec. 20, 2017 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170517 | Oct. 25, 2016 | Oct. 24, 2017 |
| Loop Antenna | R&S | HFH2t-Z2 | 100330 | Nov. 10, 2016 | Nov. 09, 2017 |
| Loop Antenna Cable | KOAX KABEL | 101354-BW | 101354-BW | Dec. 09, 2016 | Dec. 08, 2017 |
| Preamplifier | EMC | EMC02325 | 980225 | Aug. 05, 2016 | Aug. 04, 2017 |
| Preamplifier | Agilent | 83017A | MY39501308 | Oct. 06, 2016 | Oct. 05, 2017 |
| Preamplifier | EMC | EMC184045B | 980192 | Aug. 24, 2016 | Aug. 23, 2017 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16014/4 | Dec. 09, 2016 | Dec. 08, 2017 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16019/4 | Dec. 09, 2016 | Dec. 08, 2017 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16139/4 | Dec. 09, 2016 | Dec. 08, 2017 |
| LF cable 1M | EMC | EMCCFD400-NM-N M-1000 | 16052 | Dec. 09, 2016 | Dec. 08, 2017 |
| LF cable 3M | Woken | CFD400NL-LW | CFD400NL-001 | Dec. 09, 2016 | Dec. 08, 2017 |
| LF cable 10M | Woken | CFD400NL-LW | CFD400NL-002 | Dec. 09, 2016 | Dec. 08, 2017 |
| Radio Communication Analyzer | Anritsu | MT8820C | 6201240341 | Mar. 28, 2016 | Mar. 27, 2017 |
| Measurement Software | AUDIX | e3 | 6.120210g | NA | NA |

Note: Calibration Interval of instruments listed above is one year.

| Test Item | RF Conducted | | | | |
|------------------------------------|---------------|-----------|------------|------------------|-------------------|
| Test Site | (TH01-WS) | | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | ROHDE&SCHWARZ | FSV40 | 101486 | Nov. 15, 2016 | Nov. 14, 2017 |
| Power Meter | Anritsu | ML2495A | 1241002 | Oct. 06, 2016 | Oct. 05, 2017 |
| Power Sensor | Anritsu | MA2411B | 1207366 | Oct. 06, 2016 | Oct. 05, 2017 |
| Radio Communication Analyzer | Anritsu | MT8820C | 6201240341 | Mar. 28, 2016 | Mar. 27, 2017 |
| Measurement Software | Sporton | Sporton_1 | 1.3.30 | NA | NA |

Note: Calibration Interval of instruments listed above is one year.

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

47 CFR FCC Part 15.407

47 CFR FCC Part 27 Subpart M

ANSI C63.10-2013

ANSI C63.4-2014

ANSI/TIA-603-D 2010

FCC KDB 558074 D01 DTS Meas Guidance v04

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03

FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01

FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

FCC KDB 971168 D02 Misc OOB License Digital Systems v01

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

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 | Uncertainty |
| Radiated emission \leq 1GHz | ± 3.66 dB |
| Radiated emission $>$ 1GHz | ± 5.63 dB |

2 Test Configuration

2.1 Testing Condition

| Test Item | Test Site | Ambient Condition | Tested By |
|---------------------|-----------|-------------------|-------------|
| Radiated Emissions | 03CH01-WS | 21°C / 60% | Vincent Yeh |
| Conducted Emissions | TH01-WS | 21°C / 60% | 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 | LTE B41 CH39750 +WLAN 2.4G 11b CH06 + WLAN 5G 11ac VHT40 CH159 |
| Conducted Emissions | WLAN 2.4G 11n HT20 CH06 + WLAN 5G 11ac VHT40 CH159 |

NOTE

1. The selected channel is the maximum power channel of Wi-Fi mode and LTE function
2. Conducted emission measurement is for Wi-Fi function only since Wi-Fi 2.4 / 5GHz share same antennas.

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) |
| 0.009~0.490 | 2400/F(kHz) | 48.5 - 13.8 | 300 |
| 0.490~1.705 | 24000/F(kHz) | 33.8 - 23 | 30 |
| 1.705~30.0 | 30 | 29 | 30 |
| 30~88 | 100 | 40 | 3 |
| 88~216 | 150 | 43.5 | 3 |
| 216~960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Note 1:
 Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. 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 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

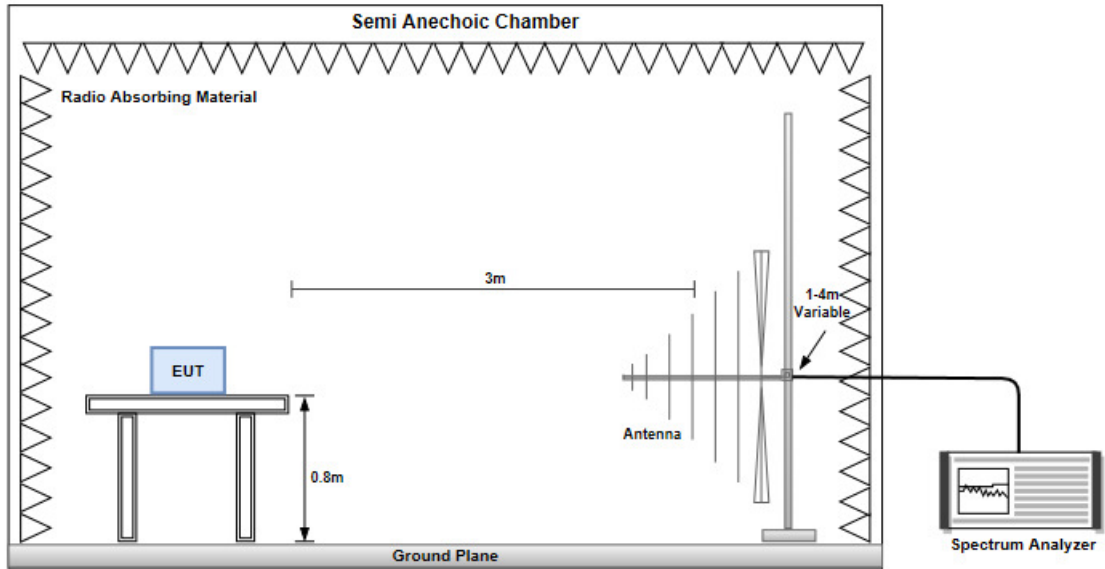
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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 (1m ~ 4m) 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°, 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:

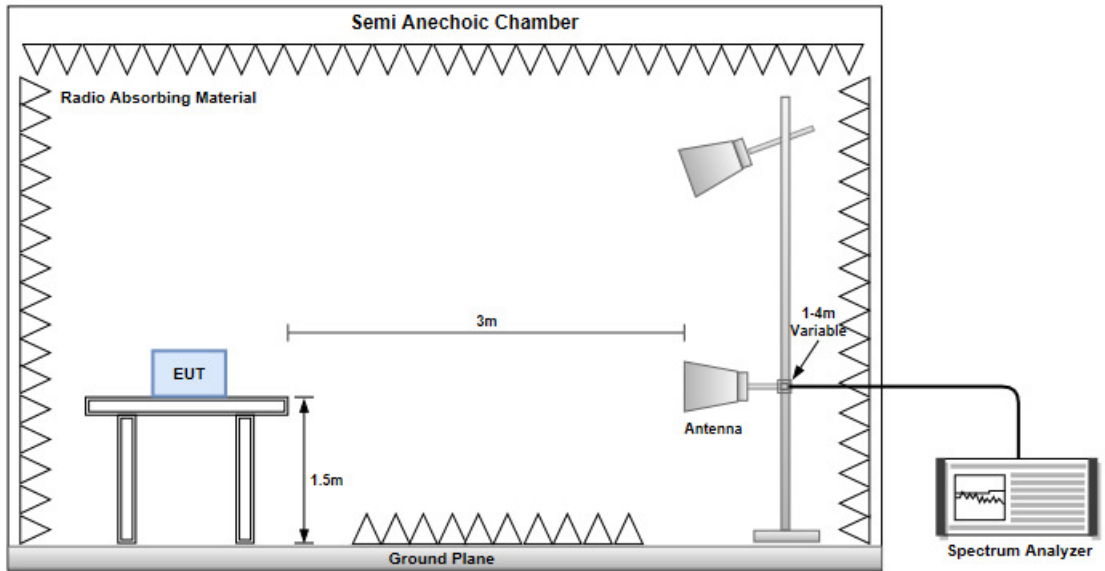
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

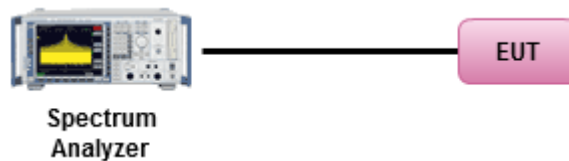
Radiated Emissions below 1 GHz



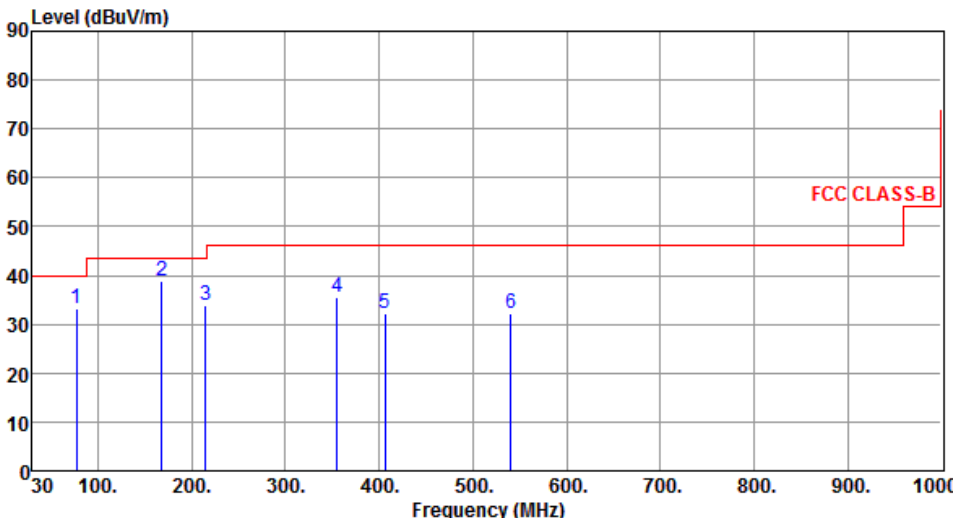
Radiated Emissions above 1 GHz



Transmitter Conducted Unwanted Emissions (30MHz~40GHz)

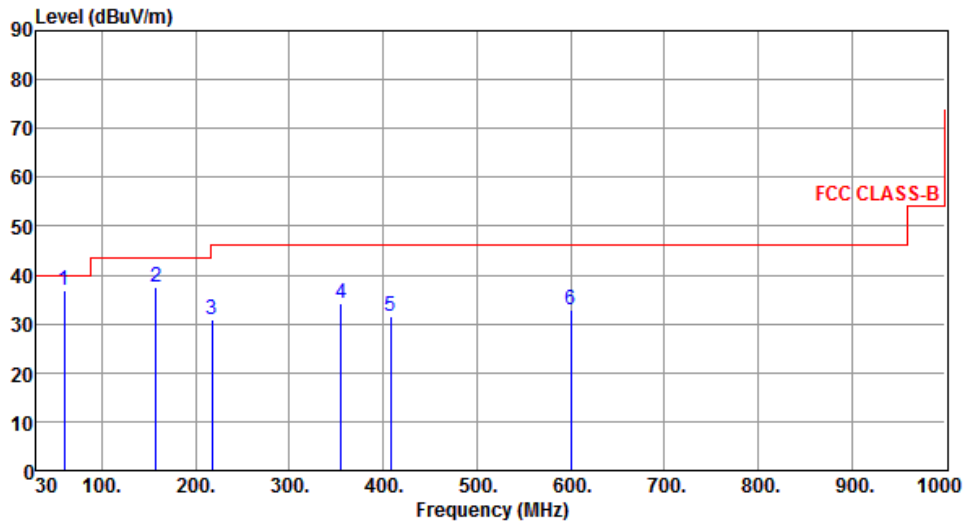


3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

| Mode | LTE B41 CH39750 +WLAN 2.4G 11b CH06 + WLAN 5G 11ac VHT40 CH159 | | | | | | | | |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------|----------|--------|--------|---------|--------|--------|------|-------|
| Polarization | Horizontal | | | | | | | | |
|  | | | | | | | | | |
| | Freq. | Emission | Limit | Margin | SA | Factor | Remark | ANT | Turn |
| | MHz | level | dBuV/m | dB | reading | dB | | High | Table |
| | | dBuV/m | dBuV/m | dB | dBuV | dB | | cm | deg |
| 1 | 77.53 | 33.10 | 40.00 | -6.90 | 45.20 | -12.10 | Peak | --- | --- |
| 2 | 167.74 | 38.92 | 43.50 | -4.58 | 47.37 | -8.45 | Peak | --- | --- |
| 3 | 215.27 | 34.01 | 43.50 | -9.49 | 44.70 | -10.69 | Peak | --- | --- |
| 4 | 354.95 | 35.50 | 46.00 | -10.50 | 41.62 | -6.12 | Peak | --- | --- |
| 5 | 406.36 | 32.08 | 46.00 | -13.92 | 36.91 | -4.83 | Peak | --- | --- |
| 6 | 540.22 | 32.22 | 46.00 | -13.78 | 34.27 | -2.05 | Peak | --- | --- |

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 (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

| | |
|---------------------|----------------------------------------------------------------|
| Mode | LTE B41 CH39750 +WLAN 2.4G 11b CH06 + WLAN 5G 11ac VHT40 CH159 |
| Polarization | Vertical |



| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 60.07 | 36.97 | 40.00 | -3.03 | 45.90 | -8.93 | Peak | --- | --- |
| 2 | 158.04 | 37.58 | 43.50 | -5.92 | 45.67 | -8.09 | Peak | --- | --- |
| 3 | 217.21 | 30.80 | 46.00 | -15.20 | 41.50 | -10.70 | Peak | --- | --- |
| 4 | 354.95 | 34.05 | 46.00 | -11.95 | 40.17 | -6.12 | Peak | --- | --- |
| 5 | 408.30 | 31.49 | 46.00 | -14.51 | 36.28 | -4.79 | Peak | --- | --- |
| 6 | 600.36 | 32.95 | 46.00 | -13.05 | 33.60 | -0.65 | Peak | --- | --- |

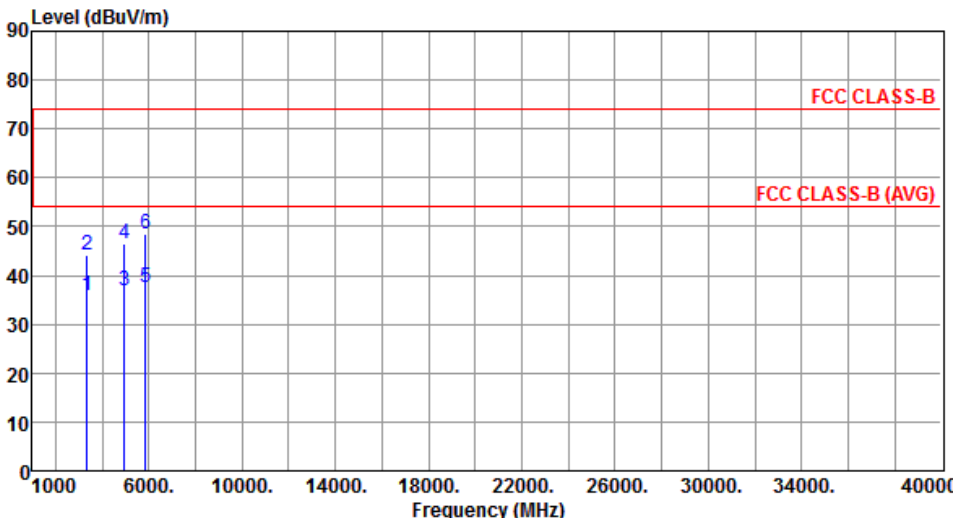
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

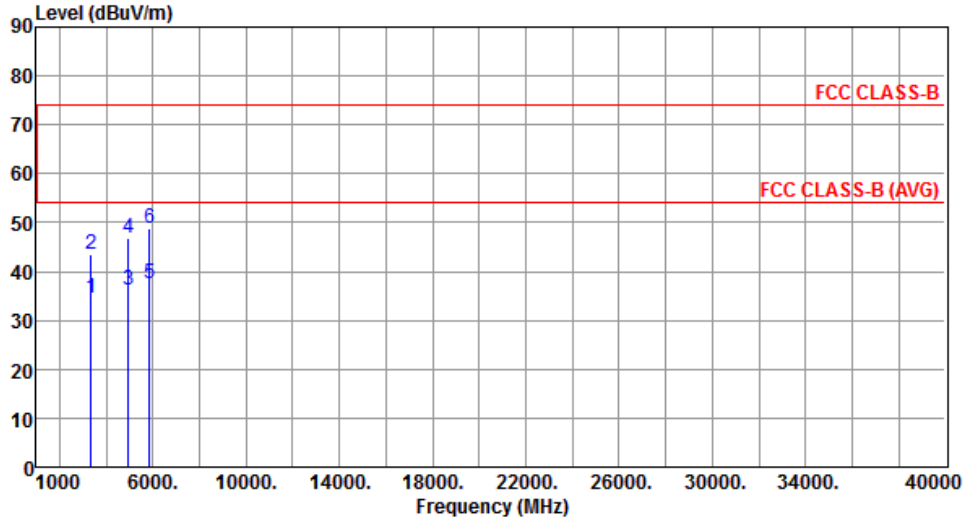
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

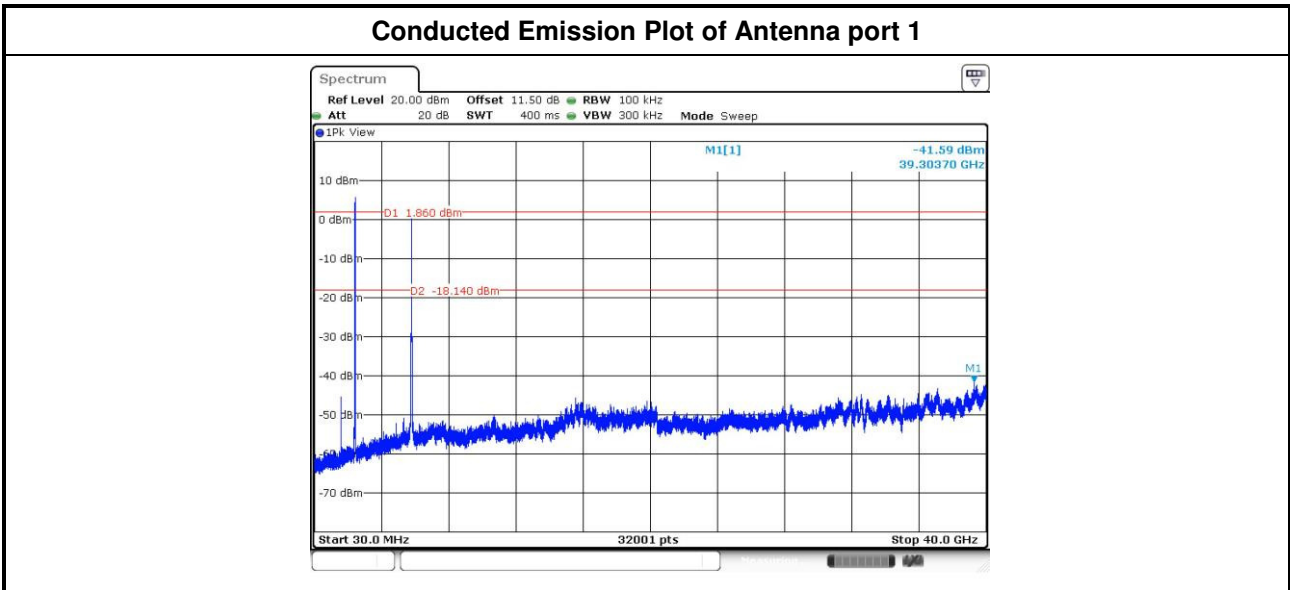
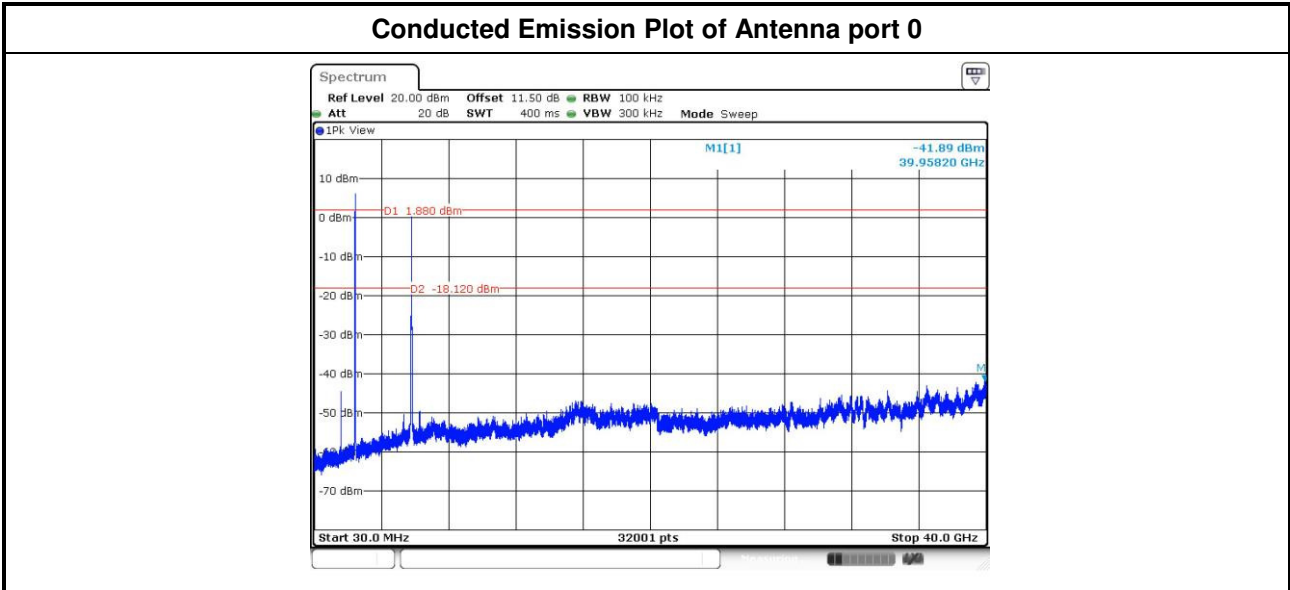
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

| | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------|--------|--------|---------|--------|---------|------|-------|
| Mode | LTE B41 CH39750 +WLAN 2.4G 11b CH06 + WLAN 5G 11ac VHT40 CH159 | | | | | | | | |
| Polarization | Horizontal | | | | | | | | |
|  | | | | | | | | | |
| | Freq. | Emission | Limit | Margin | SA | Factor | Remark | ANT | Turn |
| | MHz | level | dBuV/m | dB | reading | dB | | High | Table |
| | | dBuV/m | | | dBuV | | | cm | deg |
| 1 | 3358.00 | 35.86 | 54.00 | -18.14 | 36.19 | -0.33 | Average | 123 | 182 |
| 2 | 3358.00 | 44.11 | 74.00 | -29.89 | 44.44 | -0.33 | Peak | 123 | 182 |
| 3 | 4943.00 | 36.78 | 54.00 | -17.22 | 32.62 | 4.16 | Average | 112 | 166 |
| 4 | 4943.00 | 46.35 | 74.00 | -27.65 | 42.19 | 4.16 | Peak | 112 | 166 |
| 5 | 5864.00 | 37.56 | 54.00 | -16.44 | 32.01 | 5.55 | Average | 100 | 202 |
| 6 | 5864.00 | 48.46 | 74.00 | -25.54 | 42.91 | 5.55 | Peak | 100 | 202 |
| <p>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 (dBuV/m) – Limit (dBuV/m).</p> | | | | | | | | | |

| | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------|--------|--------|------------|--------|---------|----------|------------|
| Mode | LTE B41 CH39750 +WLAN 2.4G 11b CH06 + WLAN 5G 11ac VHT40 CH159 | | | | | | | | |
| Polarization | Vertical | | | | | | | | |
|  <p>The graph displays emission levels for six frequency points. The y-axis represents Level (dBUV/m) from 0 to 90, and the x-axis represents Frequency (MHz) from 1000 to 40000. Two horizontal red lines indicate FCC CLASS-B (at ~75 dB) and FCC CLASS-B (AVG) (at ~55 dB) limits. Six vertical blue lines represent the measured emission levels at various frequencies, labeled 1 through 6. The measured levels are significantly below the FCC limits.</p> | | | | | | | | | |
| | Freq. | Emission level | Limit | Margin | SA reading | Factor | Remark | ANT High | Turn Table |
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | | cm | deg |
| 1 | 3358.00 | 34.65 | 54.00 | -19.35 | 34.98 | -0.33 | Average | 105 | 118 |
| 2 | 3358.00 | 43.39 | 74.00 | -30.61 | 43.72 | -0.33 | Peak | 105 | 118 |
| 3 | 4943.00 | 36.26 | 54.00 | -17.74 | 32.10 | 4.16 | Average | 228 | 203 |
| 4 | 4943.00 | 46.88 | 74.00 | -27.12 | 42.72 | 4.16 | Peak | 228 | 203 |
| 5 | 5864.00 | 37.53 | 54.00 | -16.47 | 31.98 | 5.55 | Average | 100 | 254 |
| 6 | 5864.00 | 48.69 | 74.00 | -25.31 | 43.14 | 5.55 | Peak | 100 | 254 |
| <p>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 (dBUV/m) – Limit (dBUV/m).</p> | | | | | | | | | |

3.1.6 Conducted Emissions (30MHz~40GHz)



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

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

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Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C..

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==END==