

FCC C2PC Test Report

FCC ID : SQG-PINNACLE1
Equipment : LTE Modem
Model No. : Pinnacle 100
Brand Name : Laird Connectivity
Applicant : Laird Connectivity, Inc.
Address : W66N220 Commerce Court, Cedarburg,
Wisconsin 53012, USA
Standard : 47 CFR FCC Part 24 Subpart E
Received Date : Jun. 24, 2020
Tested Date : Nov. 05 ~ Nov. 13, 2020

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



Table of Contents

| | | |
|----------|---|-----------|
| 1 | GENERAL DESCRIPTION | 5 |
| 1.1 | Information..... | 5 |
| 1.2 | Local Support Equipment List | 7 |
| 1.3 | Test Setup Chart | 7 |
| 1.4 | The Equipment List | 8 |
| 1.5 | Test Standards | 9 |
| 1.6 | Reference Guidance | 9 |
| 1.7 | Deviation from Test Standard and Measurement Procedure..... | 9 |
| 1.8 | Measurement Uncertainty | 9 |
| 2 | TEST CONFIGURATION | 10 |
| 2.1 | Testing Facility..... | 10 |
| 2.2 | The Worst Test Modes and Channel Details | 10 |
| 3 | TEST RESULTS..... | 11 |
| 3.1 | Equivalent Isotropically Radiated Power | 11 |
| 3.2 | Radiated Emissions..... | 17 |
| 4 | TEST LABORATORY INFORMATION | 21 |

Release Record

| Report No. | Version | Description | Issued Date |
|----------------|---------|---------------|---------------|
| FG950303-02P24 | Rev. 01 | Initial issue | Dec. 11, 2020 |

Summary of Test Results

| FCC Rules | Test Items | Measured | Result |
|-----------------------|---|-------------------------------|--------|
| 2.1046 / 22.913(a)(5) | Equivalent Isotropically Radiated Power | Power[dBm] : 27.01 | Pass |
| 2.1053 / 22.917(a) | Radiated Emissions | Meet the requirement of limit | Pass |
| 2.1051 / 22.917(a) | Conducted Emissions | Note | Pass |
| 2.1051 / 22.917(a) | Band Edge | Note | Pass |
| 2.1049 | Occupied Bandwidth | Note | Pass |
| - | Peak to Average Ratio | Note | Pass |
| 2.1055 / 22.355 | Frequency Stability | Note | Pass |

Note: Refers to test report of FCC ID: N7NHL78. Test report no.: RF181126C15B-1

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

This report is issued as a Class II Permissive Change. The modification is adding two antennas and by software setting to enable LTE NB-IOT function.

1.1.1 Specification of the Equipment under Test (EUT)

| | |
|----------------------------|---------------------|
| Operating Frequency | 1850 MHz ~ 1910 MHz |
| Modulation | NB-IoT: QPSK, BPSK |

1.1.2 Antenna Details (New addition is marked in boldface.)

| Ant. No. | Brand / Model | Type | Connector | Gain (dBi) | Operating Band |
|-------------------|--------------------------------------|---------------|-------------|------------|-------------------|
| External | | | | | |
| 1 | Laird / DBA6927C1 | Dipole | U.FL | 2.2 | LTE Band 2 |
| 2 | Laird / EFF6925A3S | Flex | U.FL | 3.7 | LTE Band 2 |
| 3 | ASC / RFDPA131000SMTB803 | Dipole | U.FL | 1.5 | LTE Band 2 |
| 4 | Laird / EFF6989A3S-19MHF1 | Flex | U.FL | 3.7 | LTE Band 2 |
| 5 | Laird / EFF6060A3S-10MHF | Flex | U.FL | 2.8 | LTE Band 2 |
| Integrated | | | | | |
| 6 | Laird/110-00665 | Stamped Metal | N/A | 2.6 | LTE Band 2 |

1.1.3 EUT Operational Condition

| | |
|--------------------------|---------|
| Power Supply Type | 3.7 Vdc |
|--------------------------|---------|

1.1.4 Accessories

N/A

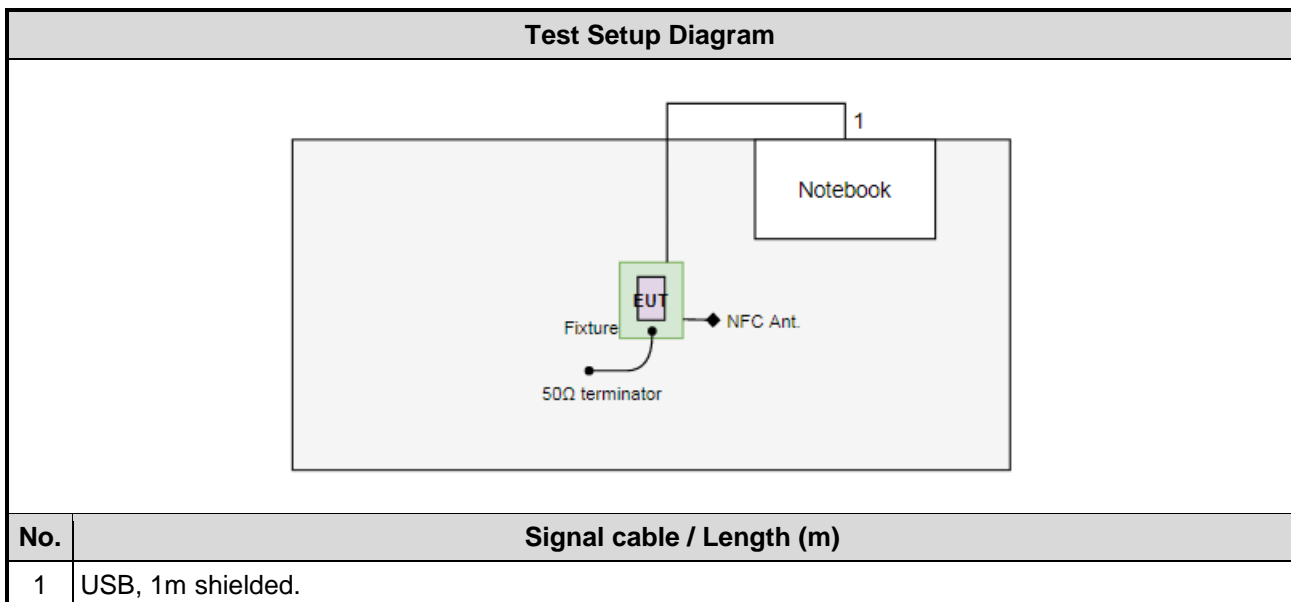
1.1.5 Operating Channel List

| LTE Band 2 | | |
|--------------------------------|---------|-----------------|
| --- | Channel | Frequency (MHz) |
| Stand-alone | 18602 | 1850.2 |
| | 18900 | 1880 |
| | 19198 | 1909.8 |
| LTE Band 2 | | |
| Channel Bandwidth (MHz) | Channel | Frequency (MHz) |
| In-Band | | |
| 3 | 18607 | 1850.7 |
| 3 | 18891 | 1879.1 |
| 3 | 19193 | 1909.3 |
| Guard-Band | | |
| 5 | 18602 | 1850.2 |
| 5 | 18876 | 1877.6 |
| 5 | 19198 | 1909.8 |
| In-Band- NB-IoT PRB: 30 | | |
| 10 | 18661 | 1856.09 |
| 10 | 18910 | 1880.99 |
| 10 | 19159 | 1905.89 |
| In-Band- NB-IoT PRB: 35 | | |
| 10 | 18670 | 1856.99 |
| 10 | 18919 | 1881.89 |
| 10 | 19168 | 1906.79 |

1.2 Local Support Equipment List

| Support Equipment List | | | | | |
|------------------------|----------------|--------|----------------|--------|------------------------|
| No. | Equipment | Brand | Model | FCC ID | Remarks |
| 1 | Notebook | DELL | Latitude E6440 | DoC | --- |
| 2 | USB Cable | I-Gota | micro to A | --- | --- |
| 3 | 50Ω terminator | --- | --- | --- | --- |
| 4 | Fixture | --- | --- | --- | Provided by applicant. |

1.3 Test Setup Chart



1.4 The Equipment List

| Test Item | Radiated Emission | | | | |
|-------------------------|----------------------------|---------------------------|------------------|------------------|-------------------|
| Test Site | 966 chamber1 / (03CH01-WS) | | | | |
| Tested Date | Nov. 05 ~ Nov. 13, 2020 | | | | |
| Instrument | Brand | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSV40 | 101498 | Dec. 17, 2019 | Dec. 16, 2020 |
| Receiver | R&S | ESR3 | 101657 | Feb. 14, 2020 | Feb. 13, 2021 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-522 | Jul. 10, 2020 | Jul. 09, 2021 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1096 | Dec. 12, 2019 | Dec. 11, 2020 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170508 | Dec. 25, 2019 | Dec. 24, 2020 |
| Loop Antenna | TESEQ | HLA 6120 | 31244 | Mar. 16, 2020 | Mar. 15, 2021 |
| Loop Antenna Cable | KOAX KABEL | 101354-BW | 101354-BW | Oct. 06, 2020 | Oct. 05, 2021 |
| Preamplifier | EMC | EMC02325 | 980225 | Jul. 03, 2020 | Jul. 02, 2021 |
| Preamplifier | Agilent | 83017A | MY39501308 | Sep. 26, 2020 | Sep. 25, 2021 |
| Preamplifier | EMC | EMC184045B | 980192 | Jul. 21, 2020 | Jul. 20, 2021 |
| RF Cable | EMC | EMC104-SM-SM-80 00 | 181106 | Oct. 06, 2020 | Oct. 05, 2021 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16019/4 | Oct. 06, 2020 | Oct. 05, 2021 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16014/4 | Oct. 06, 2020 | Oct. 05, 2021 |
| LF cable 1M | EMC | EMCCFD400-NM-N M-1000 | 160502 | Oct. 06, 2020 | Oct. 05, 2021 |
| LF cable 3M | Woken | CFD400NL-LW | CFD400NL-001 | Oct. 06, 2020 | Oct. 05, 2021 |
| LF cable 11M | EMC | EMCCFD400-NW-N W-11000 | 200801 | Oct. 06, 2020 | Oct. 05, 2021 |
| 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) | | | | |
| Tested Date | Nov. 10, 2020 | | | | |
| Instrument | Brand | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSV40 | 101063 | Apr. 30, 2020 | Apr. 29, 2021 |
| Spectrum Analyzer | R&S | FSV40 | 101499 | Jan. 09, 2020 | Jan. 08, 2021 |
| Power Meter | Anritsu | ML2495A | 1241002 | Nov. 04, 2020 | Nov. 03, 2021 |
| Power Sensor | Anritsu | MA2411B | 1207366 | Nov. 04, 2020 | Nov. 03, 2021 |
| DC POWER SOURCE | GW INSTEK | GPC-6030D | GES855395 | Nov. 09, 2020 | Nov. 08, 2021 |
| Measurement Software | Sporton | Sporton_1 | 1.3.30 | NA | NA |

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

1.5 Test Standards

47 CFR FCC Part 24 Subpart E

ANSI C63.26-2015

1.6 Reference Guidance

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

FCC KDB 971168 D02 Misc Rev Approv License Devices v02r01

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

| Measurement Uncertainty | |
|--------------------------|-------------|
| Parameters | Uncertainty |
| Conducted emission | ±2.715 dB |
| Radiated emission ≤ 1GHz | ±3.41 dB |
| Radiated emission > 1GHz | ±4.59 dB |

2 Test Configuration

2.1 Testing Facility

| | |
|-----------------------------|---|
| Test Laboratory | International Certification Corp. |
| Test Site | 03CH01-WS, TH01-WS |
| Address of Test Site | No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C. |

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

| LTE Band 2 | | | |
|--|-------------------------|-------------|-----------------------|
| Test item | Mode | Modulation | Test channel |
| E.I.R.P | Stand-alone | BPSK / QPSK | 18602 / 18900 / 19198 |
| | In-Band | BPSK / QPSK | 18607 / 18891 / 19193 |
| | In-Band- NB-IoT PRB: 30 | BPSK / QPSK | 18661 / 18910 / 19159 |
| | In-Band- NB-IoT PRB: 35 | BPSK / QPSK | 18670 / 18919 / 19168 |
| | Guard-Band | BPSK / QPSK | 18602 / 18876 / 19198 |
| Radiated Emission \leq 1GHz | Stand-alone | BPSK | 18602 |
| Radiated Emission $>$ 1GHz | Stand-alone | BPSK | 18602 / 18900 / 19198 |
| Note: | | | |
| 1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Y-plane results were found as the worst case and were shown in this report. | | | |
| 2. 50Ω terminators is connected to antenna port of EUT for radiated emission measurement. | | | |

3 Test Results

3.1 Equivalent Isotropically Radiated Power

3.1.1 Limit of Equivalent Isotropically Radiated Power

Mobile and portable stations are limited to 2 watts EIRP.

3.1.2 Test Procedures

For E.I.R.P measurement

EIRP can be calculated by below formula from KDB 412172 D01.

1. $EIRP = P_T + G_T - L_C$

P_T = transmitter output power, in dBm.

G_T = gain of the transmitting antenna, in dBi (EIRP).

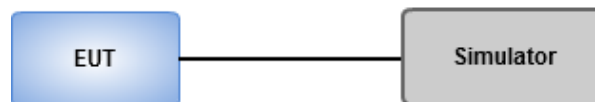
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For Conducted power measurement

1. The EUT links up with simulator and is set to maximum output power level at low / middel / high channel.
2. Measure the output power of low / middle / high channel of the EUT

3.1.3 Test Setup

Conducted Power Measurement



3.1.4 Test Result of Equivalent Isotropically Radiated Power (dBm)

| Stand-alone -LTE Band 2 | | | | | | | | | | | |
|-------------------------|-----|---------------------------|-------------------------------------|--------|---------------------------|-------------------------|-----------------------|--------------------|---------------------|-------------------|-------------------|
| NUL | MUL | Frequency of Uplink (MHz) | Test Configuration Initial of Power | | | EUT | | Antenna Gain (dBi) | E.I.R.P Power (dBm) | E.I.R.P Power (W) | E.I.R.P Limit (W) |
| | | | Modulation | Ntones | Sub-carrier Spacing (kHz) | Cell Power (dBm/15 kHz) | Conducted Power (dBm) | | | | |
| 18602 | 0 | 1850.2 | BPSK | 1@0 | 3.75 | -110 | 23.31 | 3.7 | 27.01 | 0.502 | 2 |
| | | | BPSK | 1@0 | 15 | -110 | 22.66 | 3.7 | 26.36 | 0.433 | 2 |
| | | | QPSK | 1@0 | 3.75 | -110 | 22.86 | 3.7 | 26.56 | 0.453 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.62 | 3.7 | 26.32 | 0.429 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.83 | 3.7 | 25.53 | 0.357 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.42 | 3.7 | 24.12 | 0.258 | 2 |
| 18900 | 0 | 1880 | BPSK | 1@0 | 3.75 | -110 | 23.28 | 3.7 | 26.98 | 0.499 | 2 |
| | | | BPSK | 1@0 | 15 | -110 | 22.37 | 3.7 | 26.07 | 0.405 | 2 |
| | | | BPSK | 1@47 | 3.75 | -110 | 23.25 | 3.7 | 26.95 | 0.495 | 2 |
| | | | QPSK | 1@0 | 3.75 | -110 | 22.58 | 3.7 | 26.28 | 0.425 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.3 | 3.7 | 26 | 0.398 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.21 | 3.7 | 25.91 | 0.390 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.8 | 3.7 | 25.5 | 0.355 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.22 | 3.7 | 23.92 | 0.247 | 2 |
| 19198 | 0 | 1909.8 | BPSK | 1@47 | 3.75 | -110 | 23.16 | 3.7 | 26.86 | 0.485 | 2 |
| | | | BPSK | 1@11 | 15 | -110 | 22.48 | 3.7 | 26.18 | 0.415 | 2 |
| | | | QPSK | 1@47 | 3.75 | -110 | 22.88 | 3.7 | 26.58 | 0.455 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.29 | 3.7 | 25.99 | 0.397 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.95 | 3.7 | 25.65 | 0.367 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.25 | 3.7 | 23.95 | 0.248 | 2 |

Note1: EIRP = Conducted Output Power + Antenna Gain.

| In-Band - LTE Band 2, BW (MHz): 3 | | | | | | | | | | | |
|-----------------------------------|-----|---------------------------|-------------------------------------|--------|---------------------------|-------------------------|-----------------------|--------------------|---------------------|-------------------|-------------------|
| NUL | MUL | Frequency of Uplink (MHz) | Test Configuration Initial of Power | | | EUT | | Antenna Gain (dBi) | E.I.R.P Power (dBm) | E.I.R.P Power (W) | E.I.R.P Limit (W) |
| | | | Modulation | Ntones | Sub-carrier Spacing (kHz) | Cell Power (dBm/15 kHz) | Conducted Power (dBm) | | | | |
| 18607 | 0 | 1850.7 | BPSK | 1@0 | 3.75 | -110 | 22.85 | 3.7 | 26.55 | 0.452 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.51 | 3.7 | 26.21 | 0.418 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 22.26 | 3.7 | 25.96 | 0.394 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.55 | 3.7 | 24.25 | 0.266 | 2 |
| 18891 | 0 | 1879.1 | BPSK | 1@0 | 3.75 | -110 | 22.62 | 3.7 | 26.32 | 0.429 | 2 |
| | | | BPSK | 1@47 | 3.75 | -110 | 22.63 | 3.7 | 26.33 | 0.430 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.41 | 3.7 | 26.11 | 0.408 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.45 | 3.7 | 26.15 | 0.412 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.85 | 3.7 | 25.55 | 0.359 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 19.99 | 3.7 | 23.69 | 0.234 | 2 |
| 19193 | 0 | 1909.3 | BPSK | 1@47 | 3.75 | -110 | 22.83 | 3.7 | 26.53 | 0.450 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.29 | 3.7 | 25.99 | 0.397 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 22.11 | 3.7 | 25.81 | 0.381 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.42 | 3.7 | 24.12 | 0.258 | 2 |

Note1: EIRP = Conducted Output Power + Antenna Gain.

| In-Band - NB-IoT PRB: 30, LTE Band 2, BW : 10 | | | | | | | | | | | |
|---|-----|---------------------------|-------------------------------------|--------|---------------------------|-------------------------|-----------------------|--------------------|---------------------|-------------------|-------------------|
| NUL | MUL | Frequency of Uplink (MHz) | Test Configuration Initial of Power | | | EUT | | Antenna Gain (dBi) | E.I.R.P Power (dBm) | E.I.R.P Power (W) | E.I.R.P Limit (W) |
| | | | Modulation | Ntones | Sub-carrier Spacing (kHz) | Cell Power (dBm/15 kHz) | Conducted Power (dBm) | | | | |
| 18661 | -2 | 1856.09 | BPSK | 1@0 | 3.75 | -110 | 22.65 | 3.7 | 26.35 | 0.432 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.85 | 3.7 | 26.55 | 0.452 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 22.23 | 3.7 | 25.93 | 0.392 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.36 | 3.7 | 24.06 | 0.255 | 2 |
| 18910 | -2 | 1880.99 | BPSK | 1@0 | 3.75 | -110 | 22.85 | 3.7 | 26.55 | 0.452 | 2 |
| | | | BPSK | 1@47 | 3.75 | -110 | 22.82 | 3.7 | 26.52 | 0.449 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.28 | 3.7 | 25.98 | 0.396 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.26 | 3.7 | 25.96 | 0.394 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.96 | 3.7 | 25.66 | 0.368 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.16 | 3.7 | 23.86 | 0.243 | 2 |
| 19159 | -2 | 1905.89 | BPSK | 1@47 | 3.75 | -110 | 23.17 | 3.7 | 26.87 | 0.486 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.33 | 3.7 | 26.03 | 0.401 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.85 | 3.7 | 25.55 | 0.359 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.21 | 3.7 | 23.91 | 0.246 | 2 |

Note1: EIRP = Conducted Output Power + Antenna Gain.

| In-Band - NB-IoT PRB: 35, LTE Band 2, BW : 10 | | | | | | | | | | | |
|---|-----|---------------------------|-------------------------------------|--------|---------------------------|-------------------------|-----------------------|--------------------|---------------------|-------------------|-------------------|
| NUL | MUL | Frequency of Uplink (MHz) | Test Configuration Initial of Power | | | EUT | | Antenna Gain (dBi) | E.I.R.P Power (dBm) | E.I.R.P Power (W) | E.I.R.P Limit (W) |
| | | | Modulation | Ntones | Sub-carrier Spacing (kHz) | Cell Power (dBm/15 kHz) | Conducted Power (dBm) | | | | |
| 18670 | -2 | 1856.99 | BPSK | 1@0 | 3.75 | -110 | 22.81 | 3.7 | 26.51 | 0.448 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.57 | 3.7 | 26.27 | 0.424 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 22.22 | 3.7 | 25.92 | 0.391 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.31 | 3.7 | 24.01 | 0.252 | 2 |
| 18919 | -2 | 1881.89 | BPSK | 1@0 | 3.75 | -110 | 22.76 | 3.7 | 26.46 | 0.443 | 2 |
| | | | BPSK | 1@47 | 3.75 | -110 | 22.82 | 3.7 | 26.52 | 0.449 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.25 | 3.7 | 25.95 | 0.394 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.23 | 3.7 | 25.93 | 0.392 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.88 | 3.7 | 25.58 | 0.361 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.15 | 3.7 | 23.85 | 0.243 | 2 |
| 19168 | -2 | 1906.79 | BPSK | 1@47 | 3.75 | -110 | 23.26 | 3.7 | 26.96 | 0.497 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.35 | 3.7 | 26.05 | 0.403 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 22.09 | 3.7 | 25.79 | 0.379 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.31 | 3.7 | 24.01 | 0.252 | 2 |

Note1: EIRP = Conducted Output Power + Antenna Gain.

| Guard-Band - LTE Band 2, BW: 5 | | | | | | | | | | | |
|--------------------------------|-----|---------------------------|-------------------------------------|--------|---------------------------|-------------------------|-----------------------|--------------------|---------------------|-------------------|-------------------|
| NUL | MUL | Frequency of Uplink (MHz) | Test Configuration Initial of Power | | | EUT | | Antenna Gain (dBi) | E.I.R.P Power (dBm) | E.I.R.P Power (W) | E.I.R.P Limit (W) |
| | | | Modulation | Ntones | Sub-carrier Spacing (kHz) | Cell Power (dBm/15 kHz) | Conducted Power (dBm) | | | | |
| 18602 | 0 | 1850.2 | BPSK | 1@0 | 3.75 | -110 | 23.05 | 3.7 | 26.75 | 0.473 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.62 | 3.7 | 26.32 | 0.429 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.83 | 3.7 | 25.53 | 0.357 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.42 | 3.7 | 24.12 | 0.258 | 2 |
| 18876 | 0 | 1877.6 | BPSK | 1@0 | 3.75 | -110 | 23.03 | 3.7 | 26.73 | 0.471 | 2 |
| | | | BPSK | 1@47 | 3.75 | -110 | 23.02 | 3.7 | 26.72 | 0.470 | 2 |
| | | | QPSK | 1@0 | 15 | -110 | 22.3 | 3.7 | 26 | 0.398 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.21 | 3.7 | 25.91 | 0.390 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.8 | 3.7 | 25.5 | 0.355 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.22 | 3.7 | 23.92 | 0.247 | 2 |
| 19198 | 0 | 1909.8 | BPSK | 1@47 | 3.75 | -110 | 23.03 | 3.7 | 26.73 | 0.471 | 2 |
| | | | QPSK | 1@11 | 15 | -110 | 22.29 | 3.7 | 25.99 | 0.397 | 2 |
| | | | QPSK | 3@3 | 15 | -110 | 21.95 | 3.7 | 25.65 | 0.367 | 2 |
| | | | QPSK | 12@0 | 15 | -110 | 20.25 | 3.7 | 23.95 | 0.248 | 2 |

Note1: EIRP = Conducted Output Power + Antenna Gain.

3.2 Radiated Emissions

3.2.1 Limit of Radiated Emissions

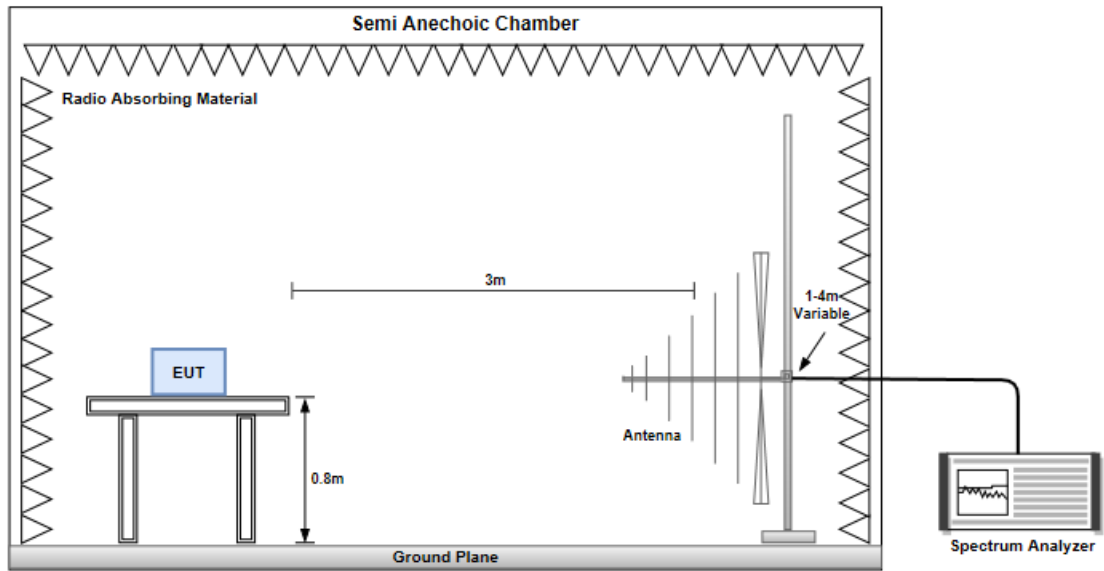
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB equal to -13dBm.

3.2.2 Test Procedures

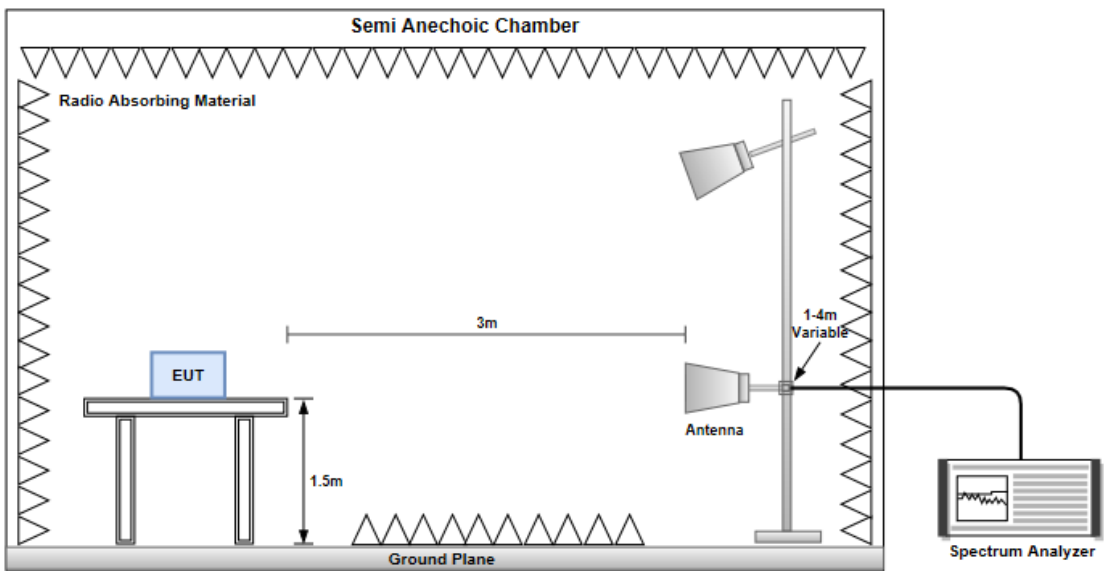
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. 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.
4. After finding the max radiated emission, substitution method will be used for getting effective radiated power. EUT will be removed and substitution antenna will be placed at same position. Signal generator will output CW signal to substitution antenna through a RF cable. Rotate turntable and move antenna to find maximum radiated emission. Adjust output power of signal generator to let the maximum radiated emission is same as step 3. Record the output power level.
5. E.I.R.P = output power of step 4 + gain of substitution antenna – cable loss of RF cable.

3.2.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.2.4 Test Result of Radiated Emissions below 1GHz

| | | | |
|--------------------------|---------------|------------------|---------|
| Ambient Condition | 23°C / 63~68% | Tested By | Brad Wu |
|--------------------------|---------------|------------------|---------|

| Mode | LTE Band 2, Sub-Carrier specing : 3.75KHz , Ntones : 1@0, Channel : 18602 | | | | | | |
|-----------------|---|--------------|-------------|-------------|-------------------|-----------------------|------------------------|
| Frequency (MHz) | Antenna Polarity | E.IR.P (dBm) | Limit (dBm) | Margin (dB) | S.A Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) |
| 36.79 | H | -66.14 | -13 | -53.14 | -73.18 | -48.14 | -18 |
| 90.14 | H | -65.06 | -13 | -52.06 | -62.97 | -60.15 | -4.91 |
| 170.65 | H | -61.2 | -13 | -48.2 | -59.48 | -55.73 | -5.47 |
| 182.29 | H | -65.39 | -13 | -52.39 | -62.47 | -60.83 | -4.56 |
| 257.95 | H | -68.35 | -13 | -55.35 | -65.52 | -67.09 | -1.26 |
| 360.77 | H | -68.58 | -13 | -55.58 | -70.52 | -67.46 | -1.12 |
| 70.74 | V | -60.68 | -13 | -47.68 | -58.17 | -50.37 | -10.31 |
| 90.14 | V | -67.6 | -13 | -54.6 | -65.26 | -62.69 | -4.91 |
| 168.71 | V | -67.6 | -13 | -54.6 | -69.71 | -61.98 | -5.62 |
| 179.38 | V | -62.72 | -13 | -49.72 | -64.5 | -57.9 | -4.82 |
| 194.9 | V | -67.03 | -13 | -54.03 | -67.06 | -63.64 | -3.39 |
| 260.86 | V | -68.94 | -13 | -55.94 | -70.84 | -67.68 | -1.26 |

Note: EIRP = S.G Power value + Correction factor.

3.2.5 Test Result of Radiated Emissions above 1GHz

| | | | |
|--------------------------|---------------|------------------|---------|
| Ambient Condition | 23°C / 63~68% | Tested By | Brad Wu |
|--------------------------|---------------|------------------|---------|

| Mode | | | | | | | |
|---|------------------|---------------|-------------|-------------|-------------------|-----------------------|------------------------|
| LTE Band 2, Sub-Carrier specing : 3.75KHz , Ntones : 1@0, Channel : 18602 | | | | | | | |
| Frequency (MHz) | Antenna Polarity | E.I.R.P (dBm) | Limit (dBm) | Margin (dB) | S.A Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) |
| 3700.22 | H | -45.78 | -13 | -32.78 | -61.22 | -52.65 | 6.87 |
| 5550.33 | H | -33.23 | -13 | -20.23 | -50.61 | -39.86 | 6.63 |
| 7400.44 | H | -39.66 | -13 | -26.66 | -58.89 | -42.69 | 3.03 |
| 3700.22 | V | -45.66 | -13 | -32.66 | -60.94 | -52.53 | 6.87 |
| 5550.33 | V | -31.69 | -13 | -18.69 | -49.25 | -38.32 | 6.63 |
| 7400.44 | V | -41.48 | -13 | -28.48 | -61.22 | -44.51 | 3.03 |

| Mode | | | | | | | |
|---|------------------|---------------|-------------|-------------|-------------------|-----------------------|------------------------|
| LTE Band 2, Sub-Carrier specing : 3.75KHz , Ntones : 1@0, Channel : 18900 | | | | | | | |
| Frequency (MHz) | Antenna Polarity | E.I.R.P (dBm) | Limit (dBm) | Margin (dB) | S.A Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) |
| 3759.82 | H | -45.94 | -13 | -32.94 | -61.53 | -52.86 | 6.92 |
| 5639.73 | H | -35.18 | -13 | -22.18 | -52.64 | -41.74 | 6.56 |
| 7519.64 | H | -39.86 | -13 | -26.86 | -58.39 | -43 | 3.14 |
| 3759.82 | V | -45.81 | -13 | -32.81 | -61.24 | -52.73 | 6.92 |
| 5639.73 | V | -34.35 | -13 | -21.35 | -52.03 | -40.91 | 6.56 |
| 7519.64 | V | -41.68 | -13 | -28.68 | -60.88 | -44.82 | 3.14 |

| Mode | | | | | | | |
|---|-------------------|---------------|-------------|-------------|-------------------|-----------------------|------------------------|
| LTE Band 2, Sub-Carrier specing : 3.75KHz , Ntones : 1@47 , Channel : 19198 | | | | | | | |
| Frequency (MHz) | Antenna Polarity. | E.I.R.P (dBm) | Limit (dBm) | Margin (dB) | S.A Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) |
| 3819.78 | H | -46.22 | -13 | -33.22 | -61.77 | -53.17 | 6.95 |
| 5729.67 | H | -38.44 | -13 | -25.44 | -55.7 | -44.94 | 6.5 |
| 7639.56 | H | -40.25 | -13 | -27.25 | -58.62 | -43.5 | 3.25 |
| 3819.78 | V | -46.24 | -13 | -33.24 | -61.67 | -53.19 | 6.95 |
| 5729.67 | V | -36.85 | -13 | -23.85 | -54.35 | -43.35 | 6.5 |
| 7639.56 | V | -41.98 | -13 | -28.98 | -61.11 | -45.23 | 3.25 |

Note: EIRP = S.G Power value + Correction factor.

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>.

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