


FCC RF Test Report

APPLICANT : Research In Motion Limited
EQUIPMENT : LTE band 13 / CDMA2000 BC0 & BC1 Tablet PC
BRAND NAME : RIM
MODEL NAME : REF31LW
MARKETING NAME : P150-32***The stars "*" in model name can be 0 to 9, A to Z or blank, for marking purpose.
FCC ID : L6AREF30LW
STANDARD : 47 CFR Part 2, 27
CLASSIFICATION : PCS Licensed Transmitter (PCB)
TX FREQUENCY RANGE : 777~787 MHz (LTE – Band 13)
RX FREQUENCY RANGE : 746~756 MHz (LTE – Band 13)
MAX. ERP POWER : 0.183 W (QPSK, 5MHz)
0.165 W (16-QAM, 5MHz)
0.139 W (QPSK, 10MHz)
0.136 W (16-QAM, 10MHz)
EMISSION DESIGNATOR : 4M48G7D (QPSK, 5MHz)
4M48D7W (16-QAM, 5MHz)
9M08G7D (QPSK, 10MHz)
9M04D7W (16-QAM, 10MHz)

The product was received on Oct. 28, 2011 and completely tested on Mar. 06, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI / TIA / EIA-603-C-2004 and shown compliance with the applicable technical standards. The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

SPORTON INTERNATIONAL INC.

TEL : 886-3-327-3456

FAX : 886-3-328-4978

FCC ID : L6AREF30LW

Page Number : 1 of 45

Report Issued Date : Apr. 27, 2012

Report Version : Rev. 03



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REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|------------|---------|---|---------------|
| FG1O2838B | Rev. 01 | Initial issue of report | Jan. 21, 2012 |
| FG1O2838B | Rev. 02 | Update report for Modifying description of "Output Power" to "Output Average Power". | Feb. 14, 2012 |
| FG1O2838B | Rev. 03 | Update report for revising the 3.2.1 description, the spectrum analyzer configuration follows KDB 971168 D01. | Apr. 27, 2012 |
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SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|----------------|---|---|--|--------|--|
| 3.1 | §2.1046 | Conducted Output Average Power | NA | PASS | |
| 3.2 | §27.50(b)(10) | Effective Radiated Power | < 3 Watts | PASS | - |
| 3.3 | §2.1049 | Occupied Bandwidth | NA | PASS | - |
| 3.4 | §2.1049 §27.53(c)(4) | Emission Mask Measurement | < 65+10log ₁₀ (P[Watts]) in a 6.25 KHz bandwidth for emissions in the 763 ~ 805 MHz bands | PASS | - |
| 3.5 | §2.1051 §27.53(c) | Conducted Emission | < 43+10log ₁₀ (P[Watts]) | PASS | - |
| 3.5 | §2.1053 §27.53(f) | Undesirable Emissions in the 1559 ~ 1610 MHz band | < -40 dBm/MHz (wideband) < -50 dBm (narrowband) | PASS | - |
| 3.6 | §2.1053 §27.53(c)(2) §27.53(c)(4) | Undesirable Out of Band Emissions | < 43+10log ₁₀ (P[Watts]) | PASS | Under limit 25.71 dB at 2346 MHz |
| 3.7 | §2.1055 §27.54 | Frequency Stability Temperature & Voltage | < 2.5 ppm | PASS | - |



1 General Description

1.1 Applicant

Research In Motion Limited
295 Phillip Street, Waterloo, Ontario, Canada

1.2 Manufacturer

Quanta Computer Inc.
No. 188, Wen Hwa 2nd Road, Kuei Shan Hsiang, Tao Yuan Shien, 333, Taiwan

1.3 Feature of Equipment Under Test

| Product Feature & Specification | |
|---|--|
| Equipment | LTE band 13 / CDMA2000 BC0 & BC1 Tablet PC |
| Brand Name | RIM |
| Model Name | REF31LW |
| Marketing Name | P150-32***The stars "*" in model name can be 0 to 9, A to Z or blank, for marking purpose. |
| FCC ID | L6AREF30LW |
| Tx Frequency Range | 777~787 MHz |
| Rx Frequency Range | 746~756 MHz |
| Bandwidth | 5MHz / 10MHz |
| Maximum Output Average Power to Antenna | 23.06 dBm (QPSK, 5MHz) 22.33 dBm (16-QAM, 5MHz) 22.70 dBm (QPSK, 10MHz) 21.74 dBm (16-QAM, 10MHz) |
| Antenna Type | Fixed Internal Antenna |
| HW Version | DARU3MB1AD0 REVD |
| SW Version | 1.0.0.0 |
| Type of Modulation | 4M48G7D (QPSK, 5MHz) 4M48D7W (16-QAM, 5MHz) 9M08G7D (QPSK, 10MHz) 9M04D7W (16-QAM, 10MHz) |
| EUT Stage | Identical Prototype |

1.4 Emission Designator and Maximum ERP/EIRP Power

| FCC Rule | System | Type of Modulation | BW | Emission Designator | Maximum ERP/EIRP |
|----------|--------|--------------------|----------|---------------------|------------------|
| Part 27 | LTE | QPSK | BW 5MHz | 4M48G7D | 0.183 W |
| Part 27 | LTE | 16-QAM | BW 5MHz | 4M48D7W | 0.165 W |
| Part 27 | LTE | QPSK | BW 10MHz | 9M08G7D | 0.139 W |
| Part 27 | LTE | 16-QAM | BW 10MHz | 9M04D7W | 0.136 W |

1.5 Testing Site

| | | | | |
|---------------------------|---|-----------|-----------|--------------------------------|
| Test Site | SPORTON INTERNATIONAL INC. | | | |
| Test Site Location | No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978 | | | |
| Test Site No. | Sporton Site No. | | | FCC/IC Registration No. |
| | TH02-HY | 03CH07-HY | 03CH05-HY | TW1022/4086B-1 |

1.6 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2, 27
- ♦ ANSI / TIA / EIA-603-C-2004
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

1.7 Ancillary Equipment List

| Item | Equipment | Trade Name | Model No. | FCC ID | Data Cable | Power Cord |
|------|------------------|------------|-----------|--------|------------|-------------------|
| 1. | System Simulator | Anritsu | MT-8820C | N/A | N/A | Unshielded, 1.8 m |
| 2. | iPod Earphone | Apple | A1285 | N/A | N/A | N/A |

2 Test Configuration of Equipment Under Test

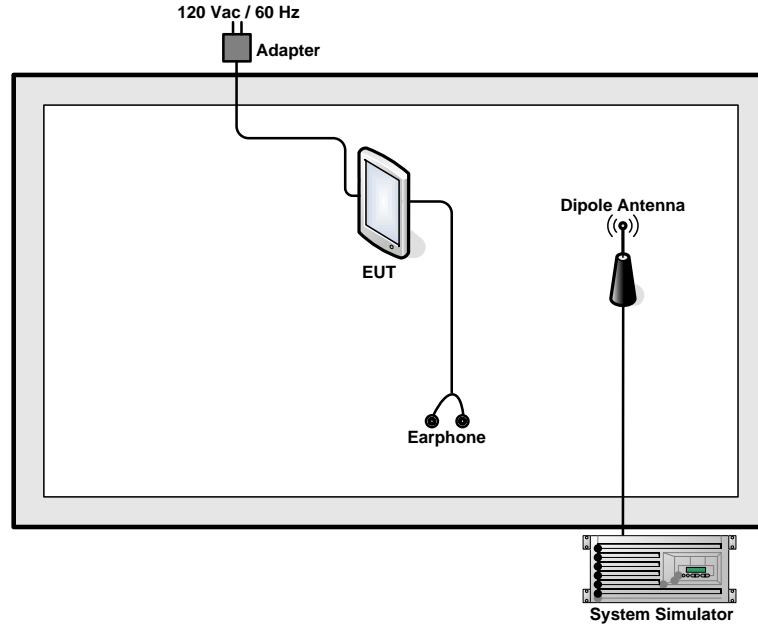
2.1 Test Mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Frequency range investigated for radiated emission: 30MHz to 10th harmonic.

| Test Modes | | | |
|----------------|-------------|---|--|
| Band | | Radiated TCs | Conducted TCs |
| LTE Band 13 | BW 5MHz | <ul style="list-style-type: none"> ■ LTE QPSK Link | <ul style="list-style-type: none"> ■ LTE QPSK Link ■ LTE 16-QAM Link |
| | BW 10MHz | <ul style="list-style-type: none"> ■ LTE QPSK Link | <ul style="list-style-type: none"> ■ LTE QPSK Link ■ LTE 16-QAM Link |

2.2 Connection Diagram of Test System



3 Test Result

3.1 Conducted Output Average Power Measurement

3.1.1 Description of the Conducted Output Average Power Measurement

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured average power in the radio frequency on the transmitter output terminals shall be reported.

3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The transmitter output port was connected to base station.
2. Set EUT at maximum average power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Average Power

| Modes | Bandwidth | Modulation | Channel | Frequency (MHz) | Average Power (dBm) | Average Power (Watts) |
|-------------|-----------|------------|---------|-----------------|---------------------|-----------------------|
| LTE Band 13 | 5MHz | QPSK | 23205 | 779.5 | 22.60 | 181.97 |
| | | | 23230 | 782.0 | 23.06 | 202.30 |
| | | | 23255 | 784.5 | 23.02 | 200.45 |
| | | 16-QAM | 23205 | 779.5 | 21.60 | 144.54 |
| | | | 23230 | 782.0 | 22.33 | 171.00 |
| | | | 23255 | 784.5 | 22.05 | 160.32 |
| | 10MHz | QPSK | 23230 | 782.0 | 22.70 | 186.21 |
| | | 16-QAM | 23230 | 782.0 | 21.74 | 149.28 |



3.2 Effective Radiated Power Measurement

3.2.1 Description of the ERP Measurement

Effective radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v01. Mobile and portable (hand-held) stations operating in the 777~787 MHz band are limited to a peak ERP of 3 watt.

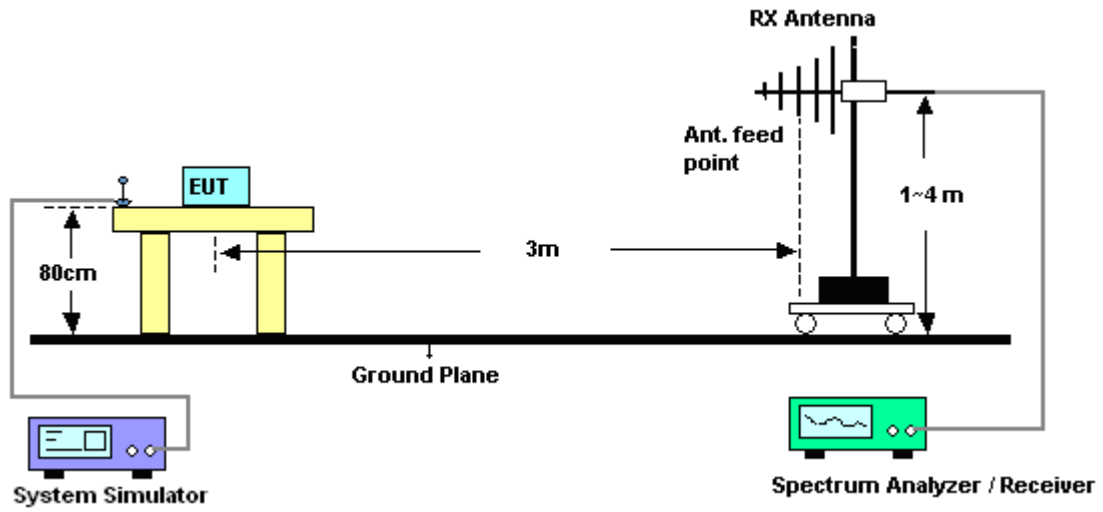
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The EUT was placed on a non-conductive rotating platform with 0.8 meter height in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RBW= 300KHz, VBW= 1MHz, RMS detector, and used Channel Power function with measurement bandwidth = 5MHz/10MHz per section 4.0 of KDB 971168 D01.
2. During the measurement, the EUT was enforced in maximum power and linked with a base station. The highest emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
3. Effective Radiated Power (ERP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by dipole antenna (substitution antenna) at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's ERP was calculated with the correction factor, $ERP = LVL + \text{Correction factor} - 2.15$.

3.2.4 Test Setup



3.2.5 Test Result of ERP

| LTE Band 13 Radiated Power ERP for BW 5MHz (QPSK, 1RB Size, RB Offset 0) | | | | |
|---|-----------|------------------------|-----------|---------|
| Horizontal Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 779.5 | -8.58 | 31.78 | 21.05 | 0.127 |
| 782.0 | -8.18 | 31.9 | 21.57 | 0.144 |
| 784.5 | -7.33 | 32.1 | 22.62 | 0.183 |
| Vertical Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 779.5 | -19.89 | 33.84 | 11.80 | 0.015 |
| 782.0 | -19.06 | 33.96 | 12.75 | 0.019 |
| 784.5 | -19.16 | 34.07 | 12.76 | 0.019 |

* ERP = LVL (dBm) + Correction Factor (dB) - 2.15

| LTE Band 13 Radiated Power ERP for BW 5MHz (16-QAM, 1RB Size, RB Offset 0) | | | | |
|---|-----------|------------------------|-----------|---------|
| Horizontal Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 779.5 | -8.60 | 31.78 | 21.03 | 0.127 |
| 782.0 | -8.72 | 31.9 | 21.03 | 0.127 |
| 784.5 | -7.78 | 32.1 | 22.17 | 0.165 |
| Vertical Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 779.5 | -19.96 | 33.84 | 11.73 | 0.015 |
| 782.0 | -19.33 | 33.96 | 12.48 | 0.018 |
| 784.5 | -19.25 | 34.07 | 12.67 | 0.018 |

* ERP = LVL (dBm) + Correction Factor (dB) - 2.15



| LTE Band 13 Radiated Power ERP for BW 10MHz (QPSK, 1 RB Size, RB Offset 0) | | | | |
|---|--------------|---------------------------|--------------|------------|
| Horizontal Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 782.0 | -8.31 | 31.9 | 21.44 | 0.139 |
| Vertical Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 782.0 | -18.77 | 33.96 | 13.04 | 0.020 |

* ERP = LVL (dBm) + Correction Factor (dB) - 2.15

| LTE Band 13 Radiated Power ERP for BW 10MHz (16-QAM, 1 RB Size, RB Offset 49) | | | | |
|--|--------------|---------------------------|--------------|------------|
| Horizontal Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 782.0 | -8.42 | 31.9 | 21.33 | 0.136 |
| Vertical Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 782.0 | -20.80 | 33.96 | 11.01 | 0.013 |

* ERP = LVL (dBm) + Correction Factor (dB) - 2.15

3.3 Occupied Bandwidth Measurement

3.3.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

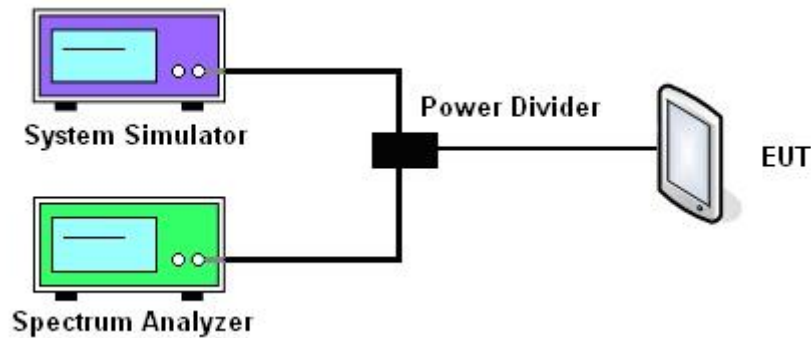
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The 99% occupied bandwidth (BW) of the middle channel for the highest RF powers with full RB sizes were measured.

3.3.4 Test Setup

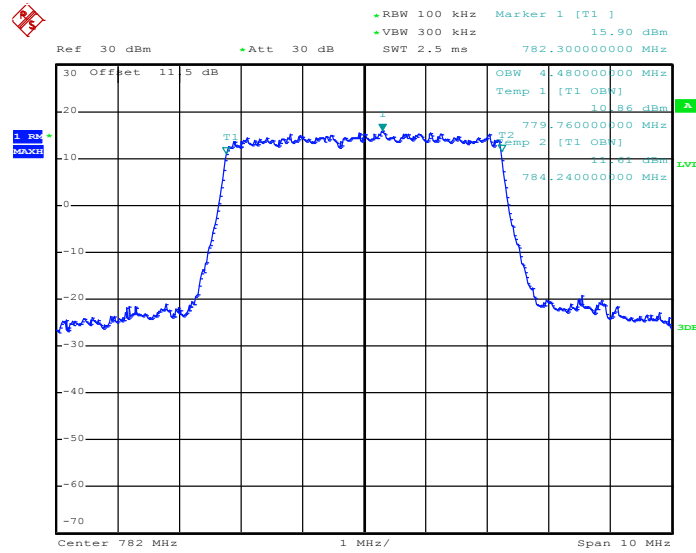




3.3.5 Test Result (Plots) of Occupied Bandwidth

| | | | |
|--------|-------------|-----------|-------------|
| Band : | LTE Band 13 | BW/Mode : | 5MHz / QPSK |
|--------|-------------|-----------|-------------|

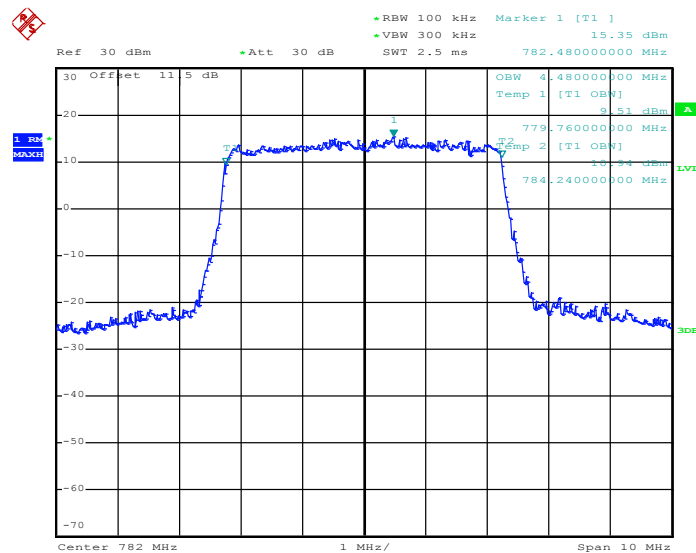
99% Occupied Bandwidth Plot on Channel 23230



Date: 2.DEC.2011 10:20:45

| | | | |
|--------|-------------|-----------|---------------|
| Band : | LTE Band 13 | BW/Mode : | 5MHz / 16-QAM |
|--------|-------------|-----------|---------------|

99% Occupied Bandwidth Plot on Channel 23230

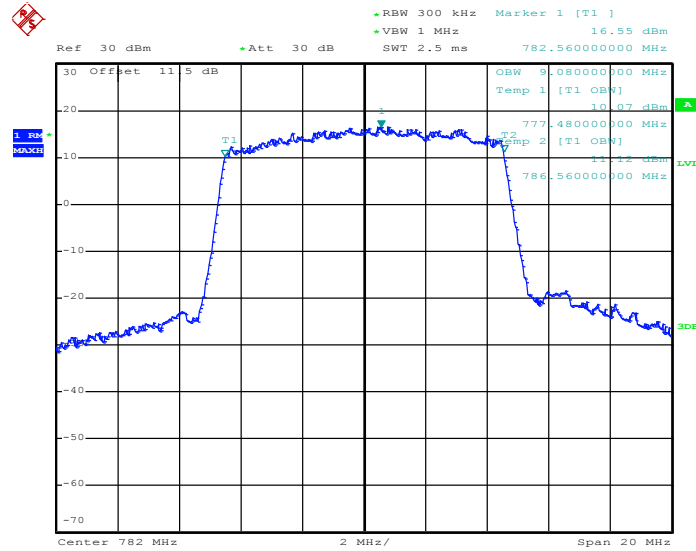


Date: 2.DEC.2011 10:22:33



| | | | |
|--------|-------------|-----------|--------------|
| Band : | LTE Band 13 | BW/Mode : | 10MHz / QPSK |
|--------|-------------|-----------|--------------|

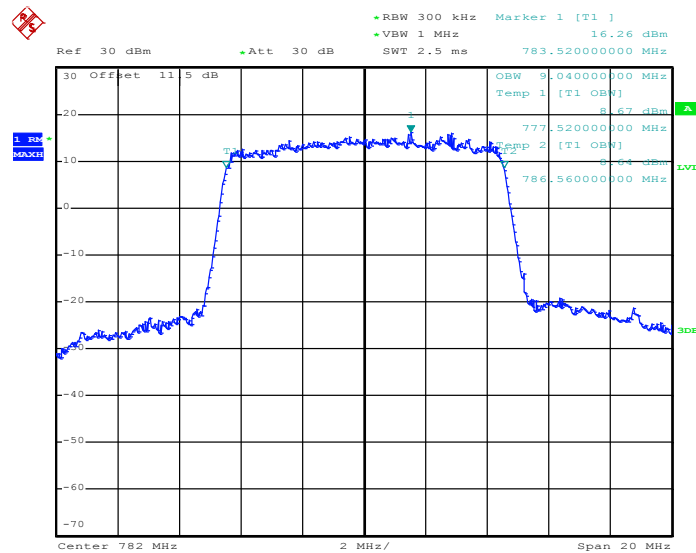
99% Occupied Bandwidth Plot on Channel 23230



Date: 2.DEC.2011 16:07:45

| | | | |
|--------|-------------|-----------|----------------|
| Band : | LTE Band 13 | BW/Mode : | 10MHz / 16-QAM |
|--------|-------------|-----------|----------------|

99% Occupied Bandwidth Plot on Channel 23230



Date: 2.DEC.2011 16:09:13

3.4 Emission Mask Measurement

3.4.1 Limit

The emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit is $65 + 10\log_{10}(P[\text{Watts}])$
 = -35dBm in a 6.25kHz bandwidth.

3.4.2 Measuring Instruments

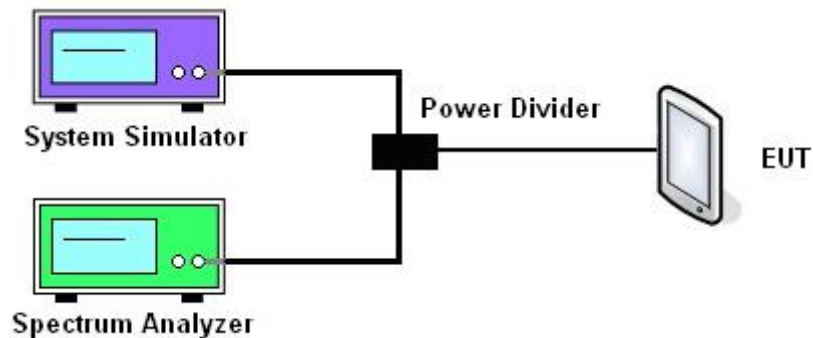
See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The band edges of low and high channels for the highest RF powers were measured. Setting RBW = 10kHz
3. $\text{RealPwr(dBm)} = \text{PwrAbs(dBm)} - 10 * \text{LOG}(10\text{k}/6.25\text{k})(\text{dB})$
 $\text{Real } \Delta \text{Limit(dB)} = \Delta \text{Limit(dB)} - 10 * \text{LOG}(10\text{k}/6.25\text{k})(\text{dB})$
 $10 * \text{LOG}(10\text{k}/6.5\text{k}) \sim 2.04\text{dB}$

3.4.4 Test Setup

<Conducted Emission Mask >

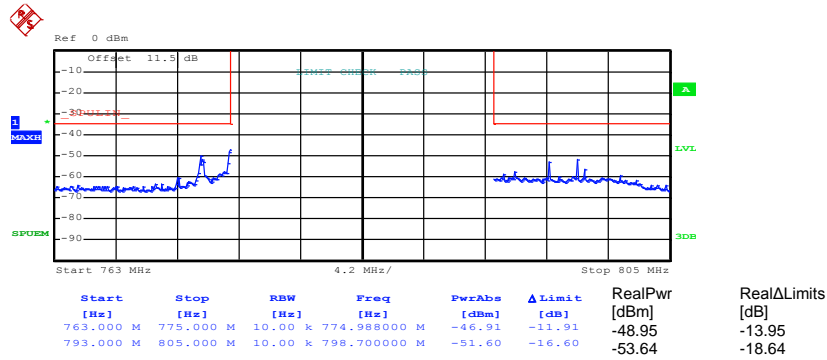




3.4.5 Test Result (Plots) of Conducted Emission Mask

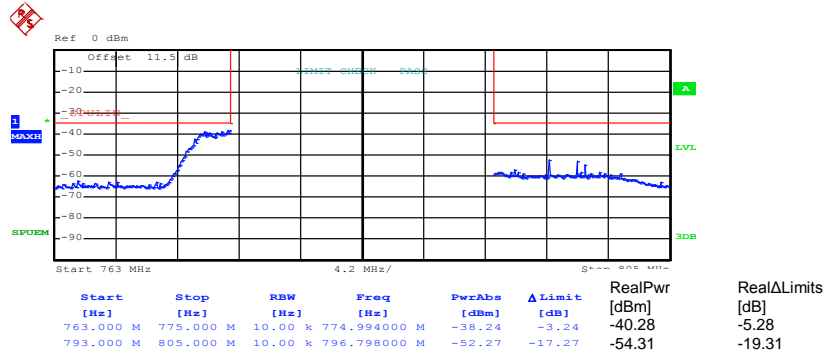
| | | | |
|-----------|---------------|-------------|-------------|
| Band : | LTE Band 13 | BW / Mode : | 5MHz / QPSK |
| Channel : | CH23205 (Low) | | |

Emission Mask Plot for RB Size 1, RB Offset 0



Date: 2.DEC.2011 14:33:57

Emission Mask Plot for RB Size 25, RB Offset 0

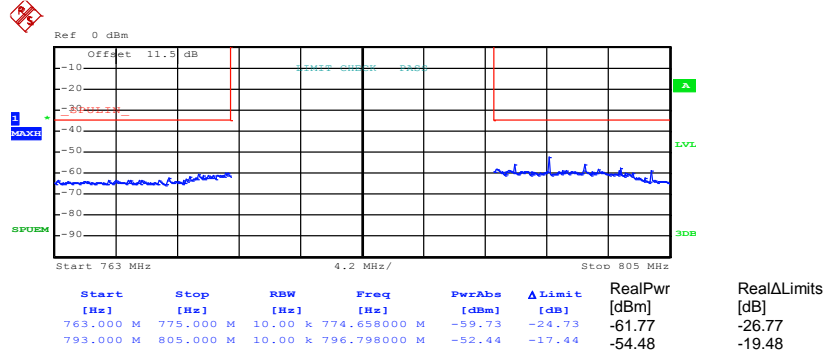


Date: 2.DEC.2011 14:32:28



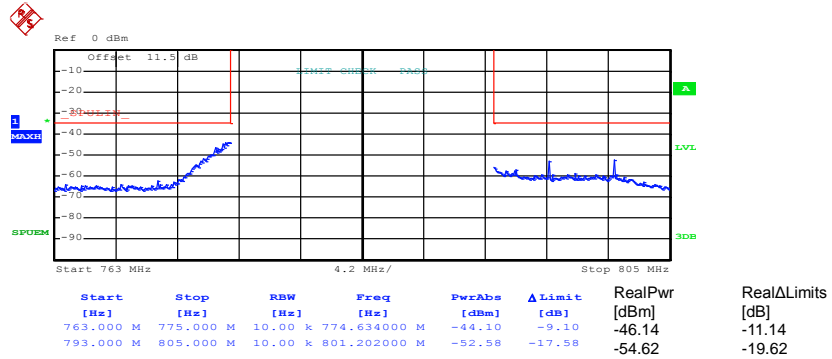
| | | | |
|------------------|----------------|--------------------|-------------|
| Band : | LTE Band 13 | BW / Mode : | 5MHz / QPSK |
| Channel : | CH23255 (High) | | |

Emission Mask Plot for RB Size 1, RB Offset 24



Date: 2.DEC.2011 14:49:35

Emission Mask Plot for RB Size 25, RB Offset 0

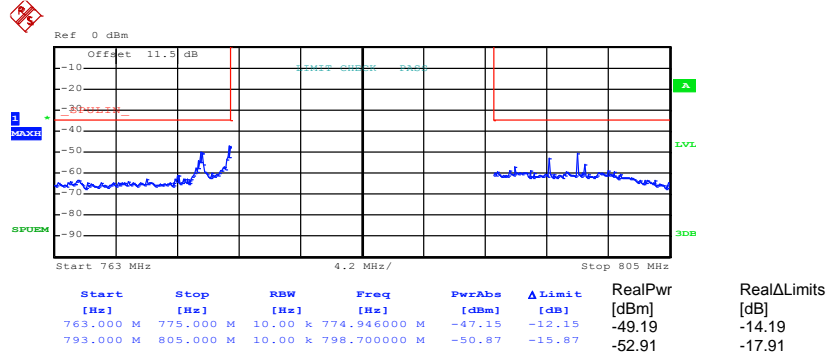


Date: 2.DEC.2011 14:42:22



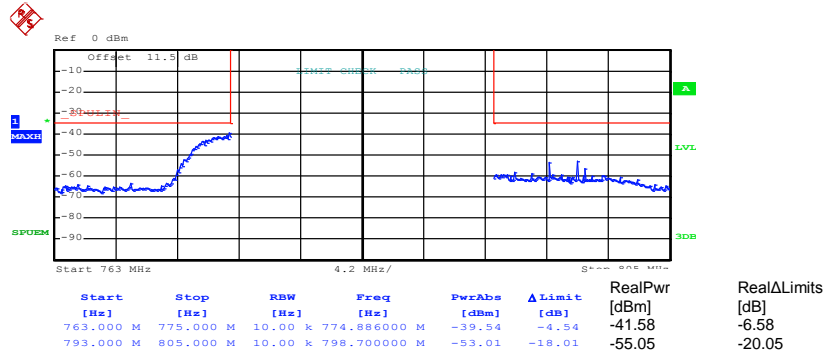
| | | | |
|------------------|---------------|--------------------|---------------|
| Band : | LTE Band 13 | BW / Mode : | 5MHz / 16-QAM |
| Channel : | CH23205 (Low) | | |

Emission Mask Plot for RB Size 1, RB Offset 0



Date: 2.DEC.2011 14:33:36

Emission Mask Plot for RB Size 25, RB Offset 0

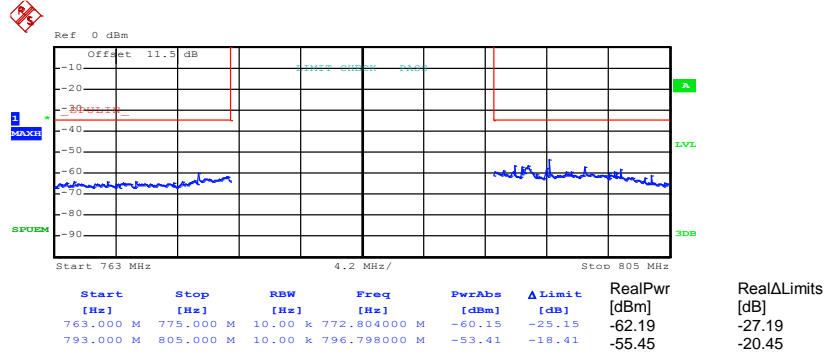


Date: 2.DEC.2011 14:32:45



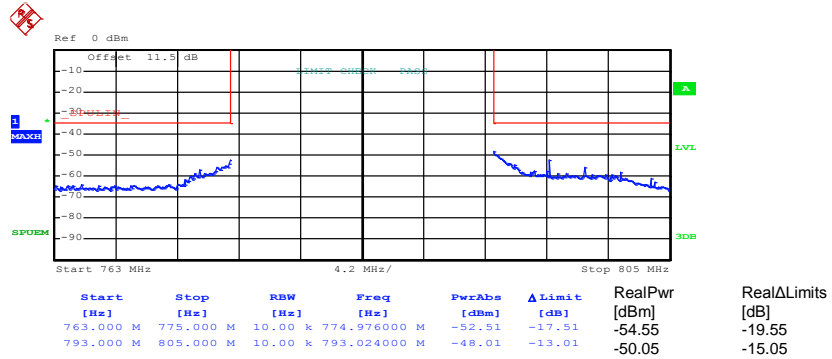
| | | | |
|------------------|----------------|--------------------|---------------|
| Band : | LTE Band 13 | BW / Mode : | 5MHz / 16-QAM |
| Channel : | CH23255 (High) | | |

Emission Mask Plot for RB Size 1, RB Offset 24



Date: 2.DEC.2011 14:47:30

Emission Mask Plot for RB Size 25, RB Offset 0

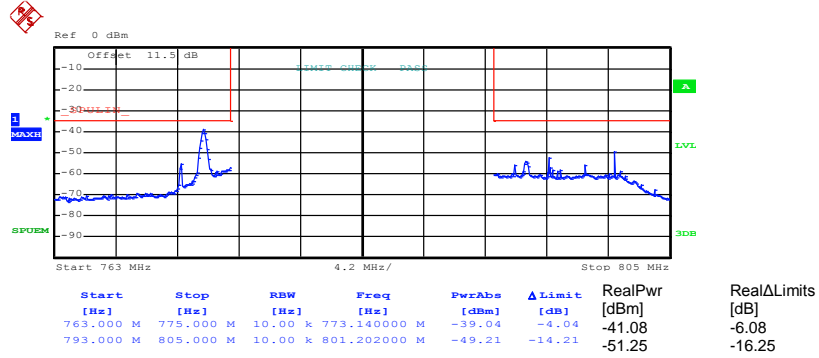


Date: 2.DEC.2011 14:51:14



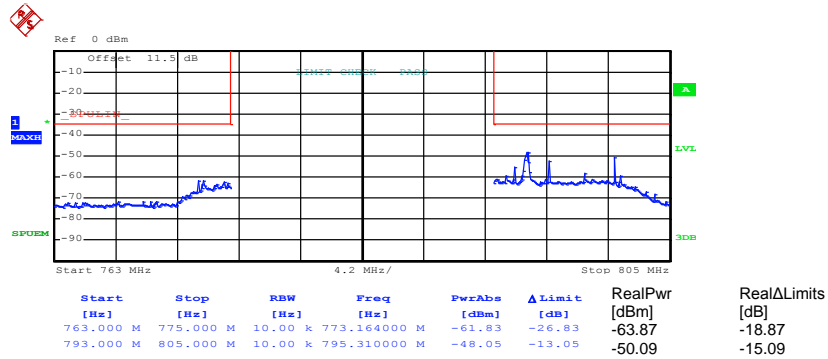
| | | | |
|------------------|------------------|--------------------|--------------|
| Band : | LTE Band 13 | BW / Mode : | 10MHz / QPSK |
| Channel : | CH23230 (Middle) | | |

Emission Mask Plot for RB Size 1, RB Offset 0



Date: 2.DEC.2011 16:37:57

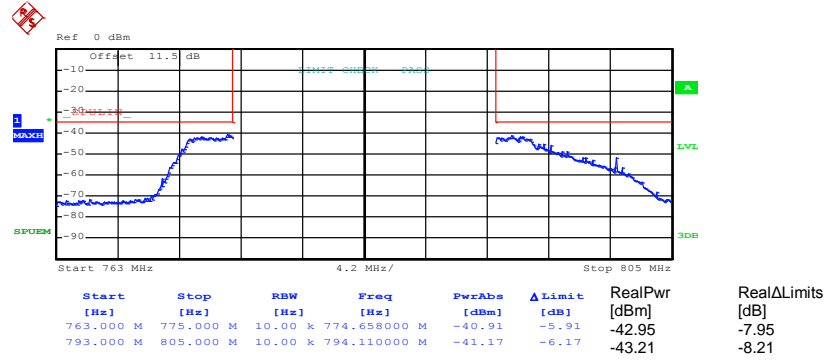
Emission Mask Plot for RB Size 1, RB Offset 49



Date: 2.DEC.2011 16:41:05



Emission Mask Plot for QPSK (RB Size 50, RB Offset 0)

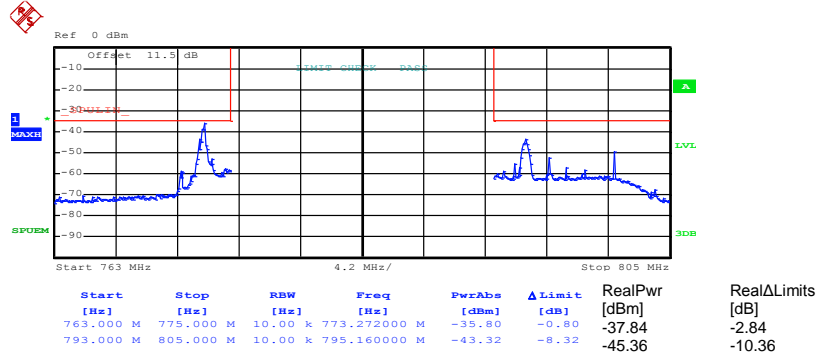


Date: 2.DEC.2011 16:42:01



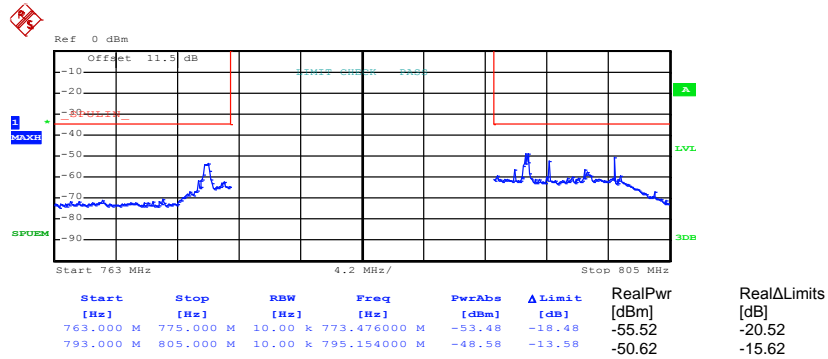
| | | | |
|------------------|------------------|--------------------|----------------|
| Band : | LTE Band 13 | BW / Mode : | 10MHz / 16-QAM |
| Channel : | CH23230 (Middle) | | |

Emission Mask Plot for RB Size 1, RB Offset 0



Date: 2.DEC.2011 16:39:06

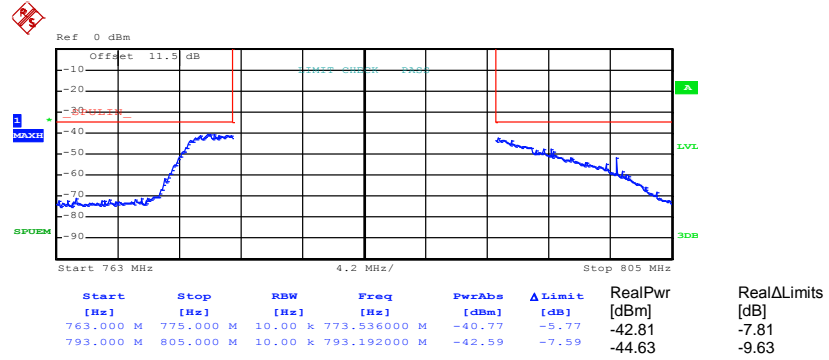
Emission Mask Plot for RB Size 1, RB Offset 49



Date: 2.DEC.2011 16:40:20



Emission Mask Plot for RB Size 50, RB Offset 0



Date: 2.DEC.2011 16:42:41

3.5 Conducted Emission Measurement

3.5.1 Description of Conducted Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

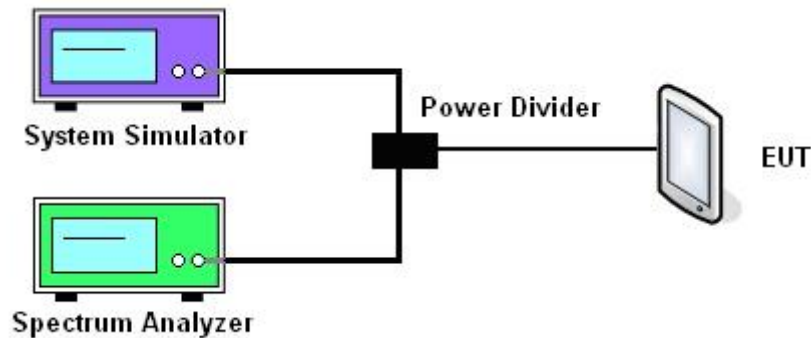
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The EUT was connected to spectrum analyzer and base station via power divider.
2. The middle channel for the highest RF power within the transmitting frequency was measured.
3. The conducted spurious emission for the whole frequency range was taken.

3.5.4 Test Setup

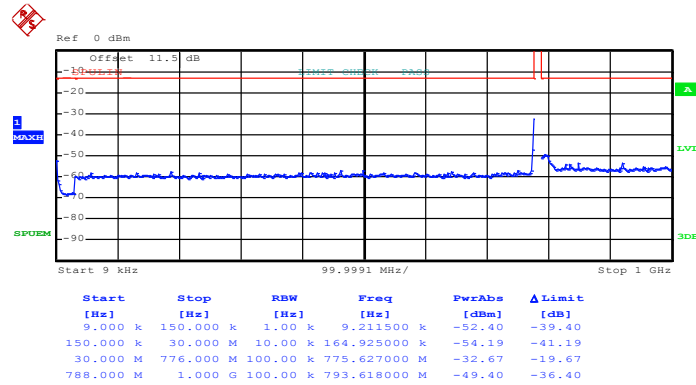




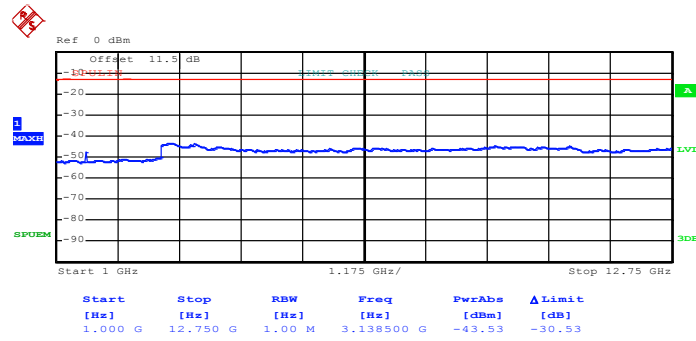
3.5.5 Test Result (Plots) of Conducted Emission

| | | | |
|------------------|---------------|------------------|------|
| Band : | LTE Band 13 | Bandwidth | 5MHz |
| Channel : | CH23205 (Low) | | |

QPSK (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 15:32:00

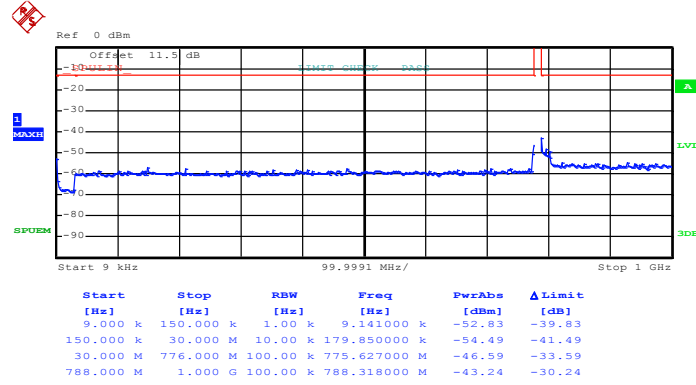


Date: 2.DEC.2011 15:30:14

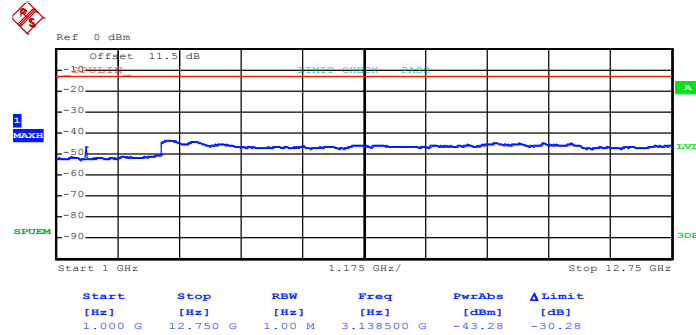


| | | | |
|------------------|------------------|------------------|------|
| Band : | LTE Band 13 | Bandwidth | 5MHz |
| Channel : | CH23230 (Middle) | | |

QPSK (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 15:17:58

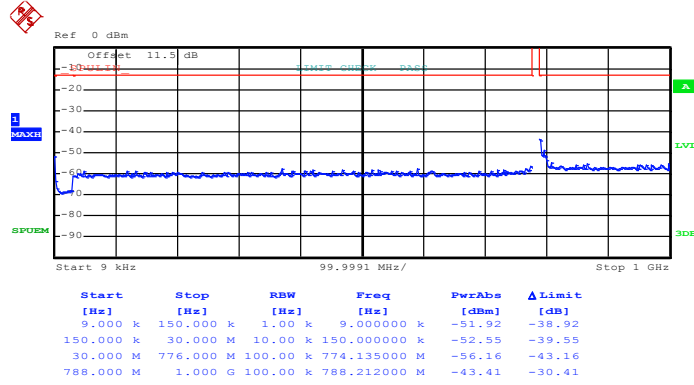


Date: 2.DEC.2011 15:16:24

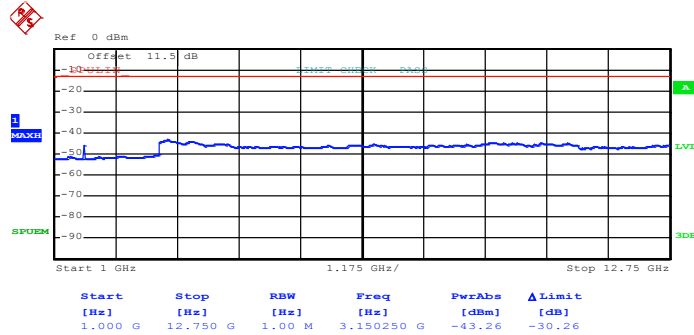


| | | | |
|------------------|----------------|------------------|------|
| Band : | LTE Band 13 | Bandwidth | 5MHz |
| Channel : | CH23255 (High) | | |

QPSK (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 15:10:12

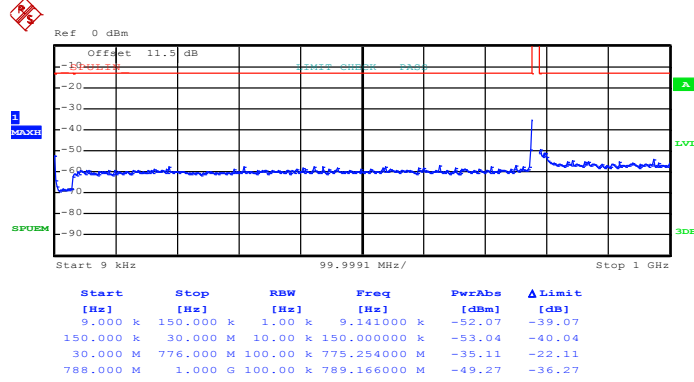


Date: 2.DEC.2011 15:08:02

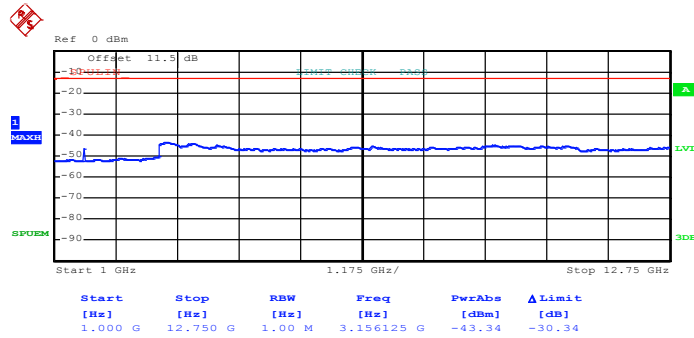


| | | | |
|------------------|---------------|------------------|------|
| Band : | LTE Band 13 | Bandwidth | 5MHz |
| Channel : | CH23205 (Low) | | |

16-QAM (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 15:31:02

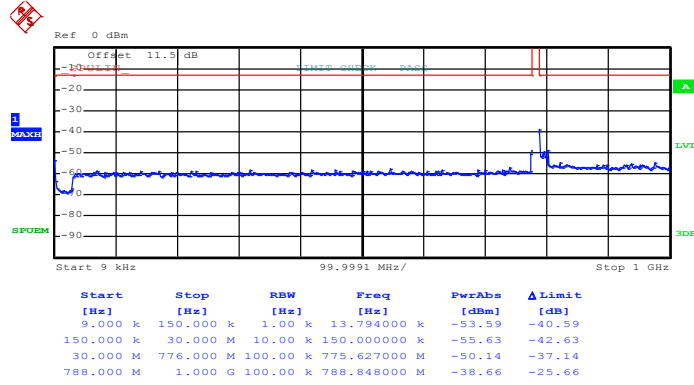


Date: 2.DEC.2011 15:30:32

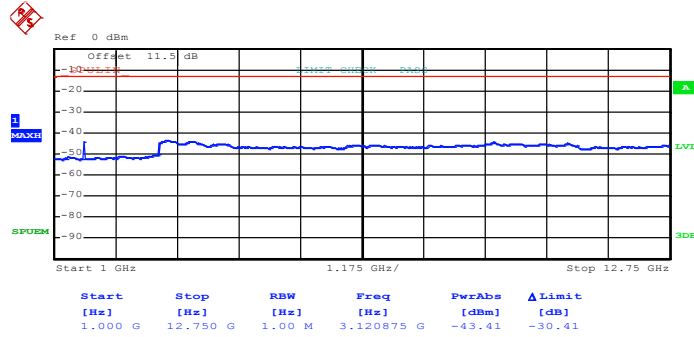


| | | | |
|------------------|------------------|------------------|------|
| Band : | LTE Band 13 | Bandwidth | 5MHz |
| Channel : | CH23230 (Middle) | | |

16-QAM (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 15:17:16

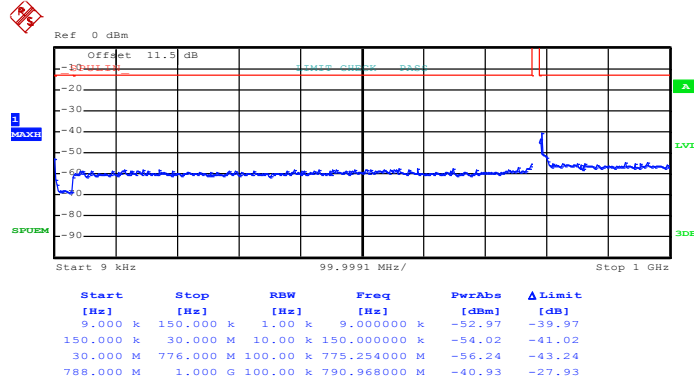


Date: 2.DEC.2011 15:16:42

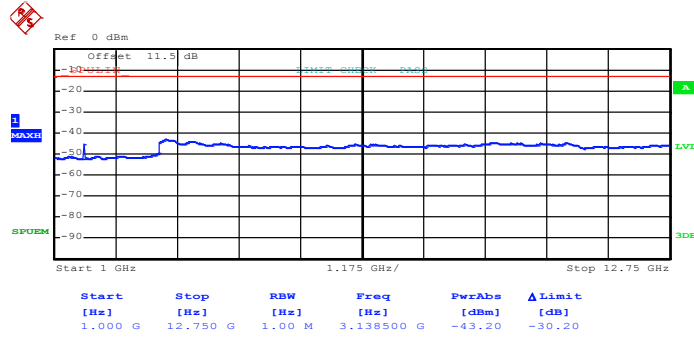


| | | | |
|------------------|----------------|------------------|------|
| Band : | LTE Band 13 | Bandwidth | 5MHz |
| Channel : | CH23255 (High) | | |

16-QAM (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 15:09:50

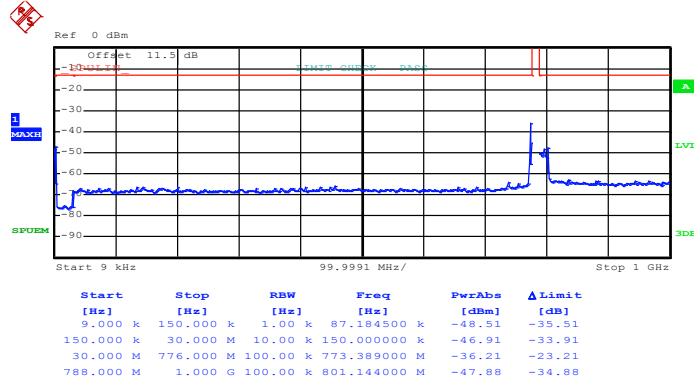


Date: 2.DEC.2011 15:09:08

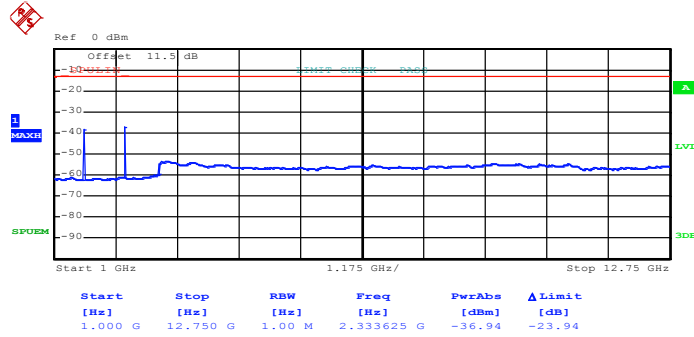


| | | | |
|------------------|------------------|------------------|-------|
| Band : | LTE Band 13 | Bandwidth | 10MHz |
| Channel : | CH23230 (Middle) | | |

QPSK (RB Size 1, RB Offset 0)



Date: 2.DEC.2011 17:19:42

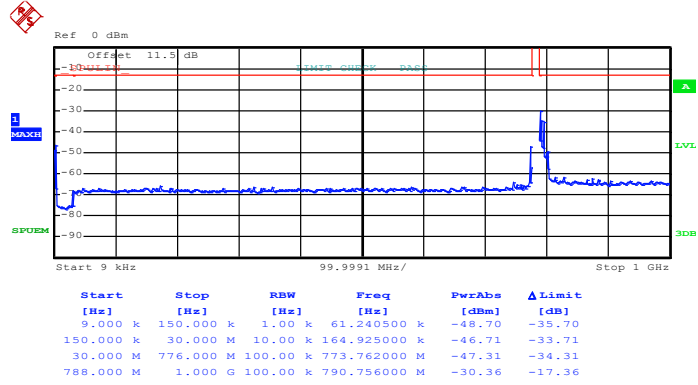


Date: 2.DEC.2011 17:50:12

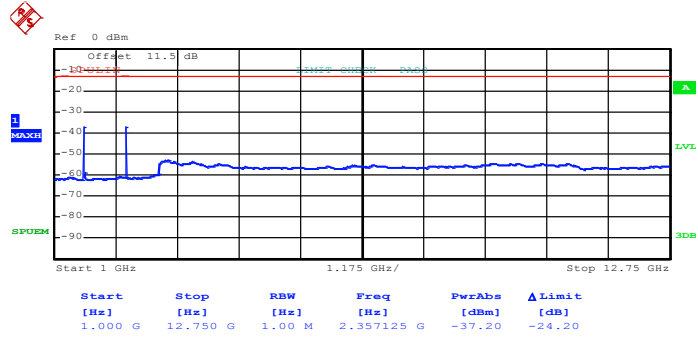


| | | | |
|------------------|------------------|------------------|-------|
| Band : | LTE Band 13 | Bandwidth | 10MHz |
| Channel : | CH23230 (Middle) | | |

16-QAM (RB Size 1, RB Offset 49)



Date: 2.DEC.2011 17:25:55



Date: 2.DEC.2011 17:48:39



3.6 Field Strength of Spurious Radiation Measurement

3.6.1 Description of Field Strength of Spurious Radiated Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

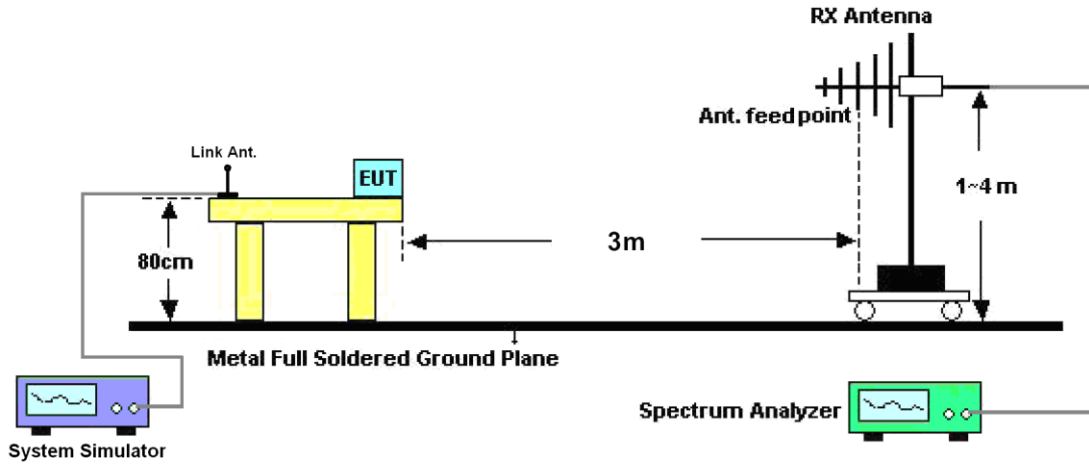
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

1. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. Emission level (dBm) = output power + substitution Gain.

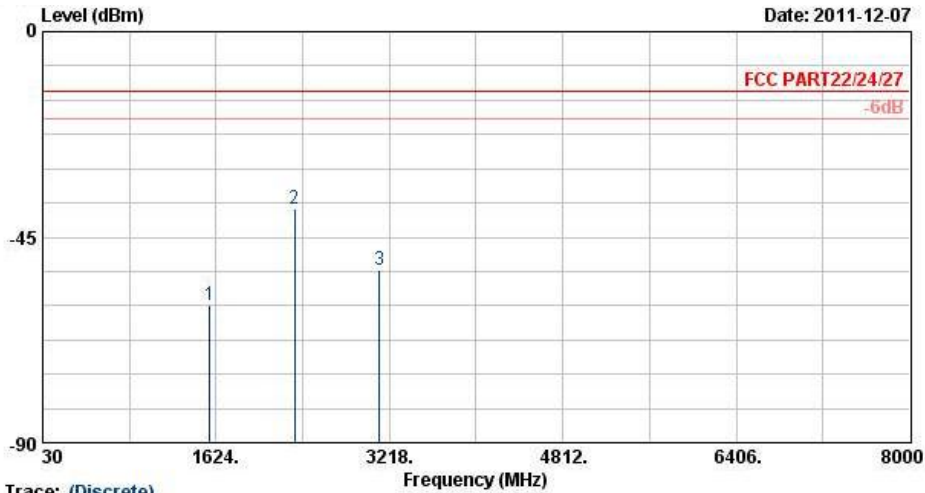
3.6.4 Test Setup





3.6.5 Test Result of Field Strength of Spurious Radiated

| | | | |
|------------------------|--|----------------------------|------------|
| Band : | LTE Band 13 | Temperature : | 20~22°C |
| Test Mode : | 5MHz, QPSK, RB Size 1 | Relative Humidity : | 49~50% |
| Test Engineer : | David Yang | Polarization : | Horizontal |
| Remark : | Spurious emissions were found more than 20dB below limit line. | | |

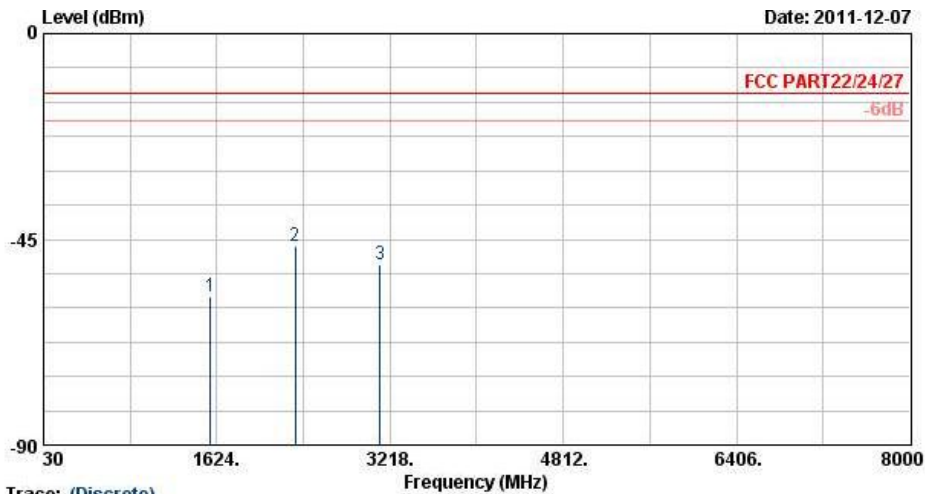


Trace: (Discrete)
 Site : 08CH07-HY
 Condition : FCC PART22/24/27 HF-ETRP(060306) HORIZONTAL
 Project : FG 102838

| Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Over Limit (dB) | SPA Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) | Result |
|-------------------|--------------|---------------|-------------------|---------------------|--------------------|----------------------|-------------------------|----------------------|--------|
| 1564 | -59.95 | -13 | -46.95 | -68.41 | -61.78 | 1.51 | 5.49 | H | Pass |
| 2346 | -38.71 | -13 | -25.71 | -50.8 | -40.63 | 1.98 | 6.05 | H | Pass |
| 3128 | -52.22 | -13 | -39.22 | -65.81 | -55.24 | 2.39 | 7.56 | H | Pass |



| | | | |
|------------------------|--|----------------------------|----------|
| Band : | LTE Band 13 | Temperature : | 20~22°C |
| Test Mode : | 5MHz, QPSK, RB Size 1 | Relative Humidity : | 49~50% |
| Test Engineer : | David Yang | Polarization : | Vertical |
| Remark : | Spurious emissions were found more than 20dB below limit line. | | |

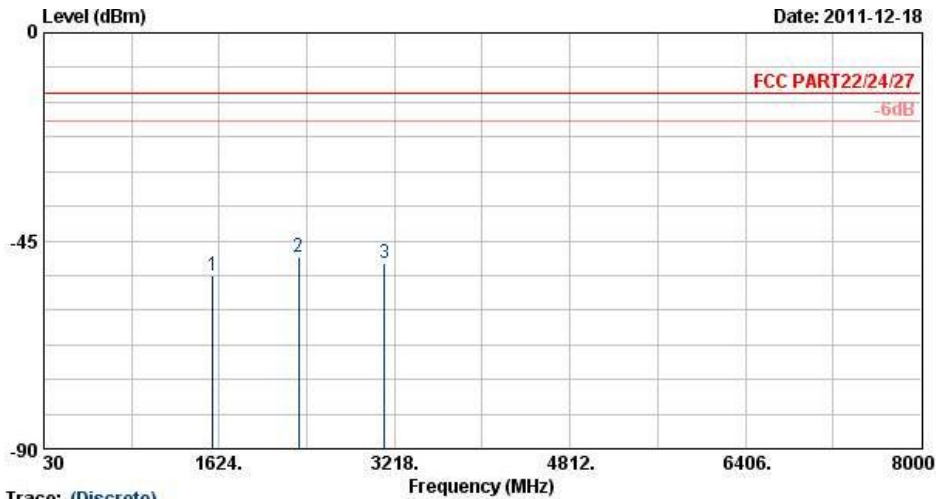


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC PART22/24/27 HF-ETRP(060306) VERTICAL
 Project : FG 102838

| Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Over Limit (dB) | SPA Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) | Result |
|-----------------|------------|-------------|-----------------|-------------------|------------------|--------------------|-----------------------|--------------------|--------|
| 1564 | -57.48 | -13 | -44.48 | -69.22 | -59.31 | 1.51 | 5.49 | V | Pass |
| 2346 | -46.46 | -13 | -33.46 | -59.75 | -48.38 | 1.98 | 6.05 | V | Pass |
| 3128 | -50.44 | -13 | -37.44 | -66 | -53.46 | 2.39 | 7.56 | V | Pass |



| | | | |
|------------------------|--|----------------------------|------------|
| Band : | LTE Band 13 | Temperature : | 20~22°C |
| Test Mode : | 10MHz, QPSK, RB Size 1 | Relative Humidity : | 49~50% |
| Test Engineer : | David Yang | Polarization : | Horizontal |
| Remark : | Spurious emissions were found more than 20dB below limit line. | | |

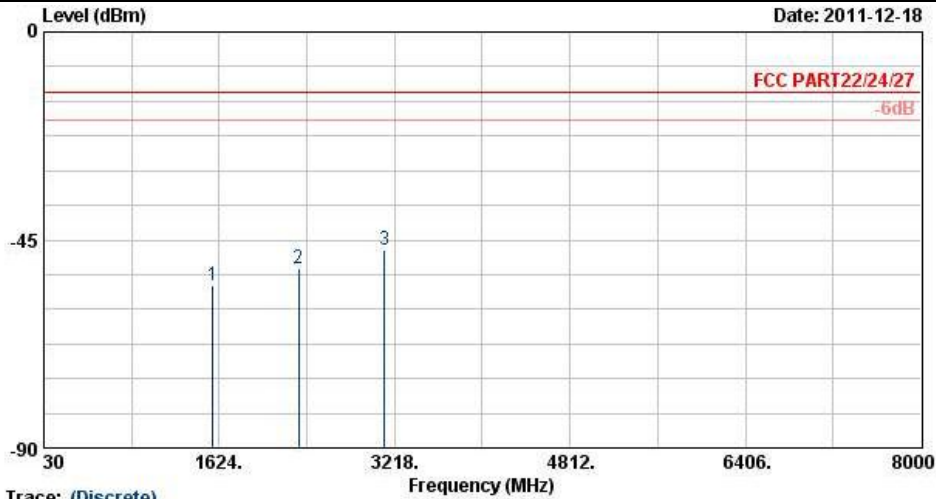


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC PART22/24/27 HF-EIRP(060306) HORIZONTAL
 Project : FG 102838

| Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Over Limit (dB) | SPA Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) | Result |
|----------------------|-----------------|------------------|-------------------------|---------------------------|--------------------------|----------------------------|-------------------------------|-------------------------|--------|
| 1564 | -52.48 | -13 | -39.48 | -60.6 | -54.31 | 1.51 | 5.49 | H | Pass |
| 2346 | -48.50 | -13 | -35.50 | -61.86 | -50.42 | 1.98 | 6.05 | H | Pass |
| 3128 | -49.76 | -13 | -36.76 | -64.12 | -52.78 | 2.39 | 7.56 | H | Pass |



| | | | |
|------------------------|--|----------------------------|----------|
| Band : | LTE Band 13 | Temperature : | 20~22°C |
| Test Mode : | 10MHz, QPSK, RB Size 1 | Relative Humidity : | 49~50% |
| Test Engineer : | David Yang | Polarization : | Vertical |
| Remark : | Spurious emissions were found more than 20dB below limit line. | | |



Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC PART22/24/27 HF-EIRP(060306) VERTICAL
 Project : FG 102838

| Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Over Limit (dB) | SPA Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) | Result |
|-------------------|--------------|---------------|-------------------|---------------------|--------------------|----------------------|-------------------------|----------------------|--------|
| 1564 | -54.91 | -13 | -41.91 | -65.69 | -56.74 | 1.51 | 5.49 | V | Pass |
| 2346 | -51.30 | -13 | -38.30 | -66.02 | -53.22 | 1.98 | 6.05 | V | Pass |
| 3128 | -47.34 | -13 | -34.34 | -64.54 | -50.36 | 2.39 | 7.56 | V | Pass |

3.7 Frequency Stability Measurement

3.7.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

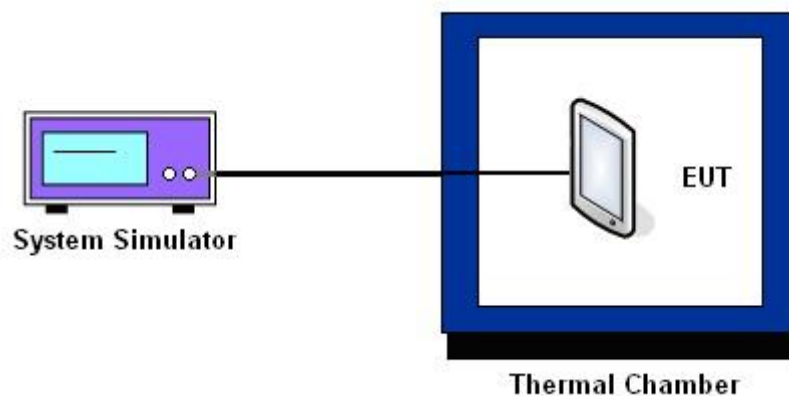
3.7.3 Test Procedures for Temperature Variation

1. The EUT was set up in the thermal chamber and connected with the base station.
2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in 10°C step up to 50°C . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.
4. If the EUT cannot be turned on at -30°C , the testing lowest temperature will be raised in 10°C step until the EUT can be turned on.

3.7.4 Test Procedures for Voltage Variation

1. The EUT was placed in a temperature chamber at $25\pm 5^{\circ}\text{C}$ and connected with the base station.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

3.7.5 Test Setup



3.7.6 Test Result of Temperature Variation

| Band : | LTE Band 13 | | | Limit (ppm) : | 2.5 |
|------------------|----------------------------------|-----------------|-----------------|-----------------|--------|
| Temperature (°C) | QPSK (RB Size 1, RB Offset 0) | | | | Result |
| | BW 5MHz | | BW 10MHz | | |
| | Freq. Dev. (Hz) | Deviation (ppm) | Freq. Dev. (Hz) | Deviation (ppm) | |
| -30 | N/A | N/A | N/A | N/A | PASS |
| -20 | N/A | N/A | N/A | N/A | |
| -10 | N/A | N/A | N/A | N/A | |
| 0 | 5.30 | 0.0067775 | 4.60 | 0.0058824 | |
| 10 | 4.90 | 0.006266 | -4.00 | -0.0051151 | |
| 20 | 4.20 | 0.0053708 | -3.90 | -0.0049872 | |
| 30 | -4.70 | -0.0060102 | -4.30 | -0.0054987 | |
| 40 | 7.20 | 0.0092072 | -4.10 | -0.005243 | |
| 50 | N/A | N/A | N/A | N/A | |

Note: The manufacturer declared that the EUT could work properly between temperatures 0°C~40°C.



| Band : | LTE Band 13 | | Limit (ppm) : | 2.5 | |
|------------------|-------------------------------------|-----------------|-----------------|-----------------|--------|
| Temperature (°C) | 16-QAM (RB Size 1, RB Offset 49) | | | | Result |
| | BW 5MHz | | BW 10MHz | | |
| | Freq. Dev. (Hz) | Deviation (ppm) | Freq. Dev. (Hz) | Deviation (ppm) | |
| -30 | N/A | N/A | N/A | N/A | PASS |
| -20 | N/A | N/A | N/A | N/A | |
| -10 | N/A | N/A | N/A | N/A | |
| 0 | 3.80 | 0.0048593 | -4.20 | -0.0053708 | |
| 10 | 5.30 | 0.0067775 | 3.80 | 0.0048593 | |
| 20 | 4.50 | 0.0057545 | -4.00 | -0.0051151 | |
| 30 | 5.20 | 0.0066496 | -4.80 | -0.0061381 | |
| 40 | -10.30 | -0.0131714 | -4.60 | -0.0058824 | |
| 50 | N/A | N/A | N/A | N/A | |

Note: The manufacturer declared that the EUT could work properly between temperatures 0°C~40°C.

3.7.7 Test Result of Voltage Variation

| Band | Bandwidth | Bandwidth | Voltage (Volt) | Freq. Dev. (Hz) | Deviation (ppm) | Limit (ppm) | Result |
|-------------|-----------|-----------|----------------|-----------------|-----------------|-------------|--------|
| LTE Band 13 | 5MHz | QPSK | Normal | 2.3 | 0.0029412 | 2.5 | PASS |
| | | | 3.4 | 2.7 | 0.0034527 | | |
| | | | 4.2 | -2.4 | -0.0030691 | | |
| | | 16-QAM | Normal | -3.9 | -0.0049872 | | |
| | | | 3.4 | 2.5 | 0.0031969 | | |
| | | | 4.2 | -5.2 | -0.0066496 | | |
| | 10MHz | QPSK | Normal | 3.6 | 0.0046036 | | |
| | | | 3.4 | 4 | 0.0051151 | | |
| | | | 4.2 | 4.5 | 0.0057545 | | |
| | | 16-QAM | Normal | 3.9 | 0.0049872 | | |
| | | | 3.4 | 3.9 | 0.0049872 | | |
| | | | 4.2 | 4.2 | 0.0053708 | | |

Remark:

1. Normal Voltage = 3.8V,
2. The manufacturer declared that the EUT could work properly between voltage 3.4V ~ 4.2V.



4 List of Measuring Equipments

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---------------------------|-------------------|--------------------------|------------|--------------------------|------------------|-------------------------------|---------------|-----------------------|
| System Simulator | R&S | CMU200 | 117995 | N/A | Jul. 28, 2011 | Dec. 02, 2011 ~ Dec. 13, 2011 | Jul. 27, 2012 | Conducted (TH02-HY) |
| Spectrum Analyzer | R&S | FSP40 | 100055 | 9kHz~40GHz | Jun. 13, 2011 | Dec. 02, 2011 ~ Dec. 13, 2011 | Jun. 12, 2012 | Conducted (TH02-HY) |
| Thermal Chamber | Ten Billion | TTH-D35P | TBN-930701 | N/A | Jul. 27, 2011 | Dec. 02, 2011 ~ Dec. 13, 2011 | Jul. 26, 2012 | Conducted (TH02-HY) |
| Bilog Antenna | SCHAFFNER | CBL6111C | 2726 | 30MHz ~ 1GHz | Oct. 22, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Oct. 21, 2012 | Radiation (03CH07-HY) |
| Spectrum Analyzer | R&S | FSP30 | 101067 | 9KHz ~ 30GHz | Dec. 06, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Dec. 05, 2012 | Radiation (03CH07-HY) |
| Double Ridge Horn Antenna | ESCO | 3117 | 00075962 | 1GHz ~ 18GHz | Aug. 10, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Aug. 09, 2012 | Radiation (03CH07-HY) |
| Pre Amplifier | Agilent | 8449B | 3008A02362 | 1GHz~ 26.5GHz | Dec. 05, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Dec. 04, 2012 | Radiation (03CH07-HY) |
| Pre Amplifier | COM-POWER | PA-103A | 161241 | 10-1000MHz.32dB. GAIN | Mar. 29, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Mar. 28, 2012 | Radiation (03CH07-HY) |
| EMI TEST RECEIVER | R&S | ESCI 7 | 100724 | 9kHz~7GHz | Aug. 22, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Aug. 21, 2012 | Radiation (03CH07-HY) |
| Pre Amplifier | MITEQ | AMF-7D-00 101800-30-1 | 159088 | 1GHz ~ 18GHz | Feb. 21, 2011 | Dec. 07, 2011 ~ Dec. 18, 2011 | Feb. 20, 2012 | Radiation (03CH07-HY) |
| LTE Base Station | Anritsu | MT8820C | 6200930978 | N/A | Dec. 28, 2010 | Dec. 07, 2011 ~ Dec. 18, 2011 | Dec. 27, 2011 | Radiation (03CH07-HY) |
| Spectrum Analyzer | R&S | ESU26 | 100390 | 20Hz ~ 26.5GHz | Dec. 22, 2011 | Mar. 06, 2012 | Dec. 21, 2012 | Radiation (03CH05-HY) |
| COM-POWER | Double Ridge Horn | AH-118 | 701030 | 1GHz ~ 18GHz | N/A | Mar. 06, 2012 | N/A | Radiation (03CH05-HY) |
| Bilog Antenna | SCHAFFNER | CBL6111C | 2725 | 30MHz ~ 2GHz | Oct. 22, 2011 | Mar. 06, 2012 | Oct. 21, 2012 | Radiation (03CH05-HY) |
| Turn Table | HD | Deis HD 2000 | 420/611 | 0 ~ 360 degree | N/A | Mar. 06, 2012 | N/A | Radiation (03CH05-HY) |
| Antenna Mast | HD | MA 240 | 240/666 | 1 m ~ 4 m | N/A | Mar. 06, 2012 | N/A | Radiation (03CH05-HY) |
| Horn Antenna | ESCO | 3117 | 66584 | 1GHz ~ 18GHz | Aug. 04, 2011 | Mar. 06, 2012 | Aug. 03, 2012 | Radiation (03CH05-HY) |
| COM-POWER | COM-POWER | PA-103 | 161075 | 10Hz ~ 1000MHz Gain:32dB | Mar. 29, 2011 | Mar. 06, 2012 | Mar. 28, 2012 | Radiation (03CH05-HY) |
| Pre Amplifier | EMCI | EMC051845 | SN980048 | 1GHz~18GHz | Jul. 18, 2011 | Mar. 06, 2012 | Jul. 17, 2012 | Radiation (03CH05-HY) |
| System Simulator | R&S | CMU200 | 117591 | N/A | Oct. 21, 2011 | Mar. 06, 2012 | Oct. 20, 2012 | Radiation (03CH05-HY) |

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| Contribution | Uncertainty of X_i | | $u(X_i)$ |
|--|----------------------|--------------------------|----------|
| | dB | Probability Distribution | |
| Receiver Reading | 0.41 | Normal (k=2) | 0.21 |
| Antenna Factor Calibration | 0.83 | Normal (k=2) | 0.42 |
| Cable Loss Calibration | 0.25 | Normal (k=2) | 0.13 |
| Pre-Amplifier Gain Calibration | 0.27 | Normal (k=2) | 0.14 |
| RCV/SPA Specification | 2.50 | Rectangular | 0.72 |
| Antenna Factor Interpolation for Frequency | 1.00 | Rectangular | 0.29 |
| Site Imperfection | 1.43 | Rectangular | 0.83 |
| Mismatch | +0.39 / -0.41 | U-Shape | 0.28 |
| Combined Standard Uncertainty $U_c(y)$ | 1.27 | | |
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$) | 2.54 | | |

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

| Contribution | Uncertainty of X_i | | $u(X_i)$ | C_i | $C_i * u(X_i)$ |
|--|----------------------|--------------------------|----------|-------|----------------|
| | dB | Probability Distribution | | | |
| Receiver Reading | ± 0.10 | Normal (k=2) | 0.10 | 1 | 0.10 |
| Antenna Factor Calibration | ± 1.70 | Normal (k=2) | 0.85 | 1 | 0.85 |
| Cable Loss Calibration | ± 0.50 | Normal (k=2) | 0.25 | 1 | 0.25 |
| Receiver Correction | ± 2.00 | Rectangular | 1.15 | 1 | 1.15 |
| Antenna Factor Directional | ± 1.50 | Rectangular | 0.87 | 1 | 0.87 |
| Site Imperfection | ± 2.80 | Triangular | 1.14 | 1 | 1.14 |
| Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$ | +0.34 / -0.35 | U-Shape | 0.244 | 1 | 0.244 |
| Combined Standard Uncertainty $U_c(y)$ | 2.36 | | | | |
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$) | 4.72 | | | | |



Appendix A. Photographs of EUT

Please refer to Sporton report number EP1O2838 as below.