



FCC RF Test Report

APPLICANT : Locus Solutions
EQUIPMENT : 2G Tracker
BRAND NAME : LOCUS TRAXX
MODEL NAME : SmartTraxx go 1.0
FCC ID : AMH101004
STANDARD : FCC 47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION : PCS Licensed Transmitter (PCB)

The product was received on Dec. 10, 2013 and testing was completed on Dec. 13, 2013. We, SPORTON INTERNATIONAL (SHENZHEN) 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 to be compliant with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



Testing Laboratory
2353

SPORTON INTERNATIONAL (SHENZHEN) INC.

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SUMMARY OF TEST RESULT

| Report Section | FCC Rule | IC Rule | Description | Limit | Result | Remark |
|----------------|-------------------------------------|----------------------------------|---|-------------------------------------|--------|---|
| 3.1 | §2.1046 | RSS-132 (5.4) RSS-133 (6.4) | Conducted Output Power | N/A | PASS | - |
| 3.2 | §24.232(d) | RSS-132 (5.4) RSS-133(6.4) | Peak-to-Average Ratio | < 13 dB | PASS | - |
| 3.3 | §22.913(a)(2) | RSS-132(5.4) SRSP-503(5.1.3) | Effective Radiated Power | < 7 Watts | PASS | - |
| 3.3 | §24.232(c) | RSS-133 (6.4) SRSP-510(5.1.2) | Equivalent Isotropic Radiated Power | < 2 Watts | PASS | - |
| 3.4 | §2.1049 §22.917(a) §24.238(b) | RSS-GEN(4.6.1) RSS-133(2.3) | Occupied Bandwidth | N/A | PASS | - |
| 3.5 | §2.1051 §22.917(a) §24.238(a) | RSS-132 (5.5) RSS-133 (6.5) | Band Edge Measurement | < 43+10log ₁₀ (P[Watts]) | PASS | - |
| 3.6 | §2.1051 §22.917(a) §24.238(a) | RSS-132 (5.5) RSS-133 (6.5) | Conducted Spurious Emission | < 43+10log ₁₀ (P[Watts]) | PASS | - |
| 3.7 | §2.1053 §22.917(a) §24.238(a) | RSS-132 (5.5) RSS-133 (6.5) | Field Strength of Spurious Radiation | < 43+10log ₁₀ (P[Watts]) | PASS | Under limit 4.16 dB at 2510.000 MHz |
| 3.8 | §2.1055 §22.355 §24.235 | RSS-132(5.3) RSS-133(6.3) | Frequency Stability for Temperature & Voltage | < 2.5 ppm | PASS | - |

1 General Description

1.1 Applicant

Locus Solutions

14924 Corporate Rd S, Jupiter, FL 33478, USA

1.2 Manufacturer

Shenzhen Zhenhua Communication Equipment Co., Ltd.

Zhenhua Industrial Park, No.44, Tiezai Rd., Xixiang Town, BaoAn, Shenzhen, Guang Dong, China

1.3 Feature of Equipment Under Test

| Product Feature | |
|---------------------------------|---------------------|
| Equipment | 2G Tracker |
| Brand Name | LOCUS TRAXX |
| Model Name | SmartTraxx go 1.0 |
| FCC ID | AMH101004 |
| EUT supports Radios application | GSM/GPRS |
| HW Version | TK108_V11 |
| SW Version | M6000_V1.8.9 |
| EUT Stage | Identical Prototype |

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

| Product Specification subjective to this standard | |
|---|---|
| Tx Frequency | GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8MHz |
| Rx Frequency | GSM850: 869.2 MHz ~ 893.8 MHz GSM1900: 1930.2 MHz ~ 1989.8 MHz |
| Maximum Output Power to Antenna | GSM850 : 33.04 dBm GSM1900 : 30.32 dBm |
| Antenna Type | PIFA Antenna |
| Type of Modulation | GPRS: GMSK |



1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

| FCC Rule | System | Type of Modulation | Maximum ERP/EIRP (W) | Frequency Tolerance (ppm) | Emission Designator |
|----------|----------------------|--------------------|----------------------|---------------------------|---------------------|
| Part 22 | GSM850 GPRS class 8 | GMSK | 0.42 | 0.03 ppm | 242KGXW |
| Part 24 | GSM1900 GPRS class 8 | GMSK | 0.83 | 0.02 ppm | 246KGXW |

1.7 Testing Site

| | | | |
|---------------------------|--|-----------|--------------------------------|
| Test Site | SPORTON INTERNATIONAL (SHENZHEN) INC. | | |
| Test Site Location | No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755- 3320-2398 | | |
| Test Site No. | Sporton Site No. | | FCC/IC Registration No. |
| | TH01-SZ | 03CH01-SZ | 831040/4086F-1 |

1.8 Applied Standards

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

- FCC 47 CFR Part 2, 22(H), 24(E)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01
- IC RSS-132 Issue 3
- IC RSS-133 Issue 6
- IC RSS-Gen Issue 3
- NOTICE 2012-DRS0126

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.

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.

Frequency range investigated for radiated emission is as follows:

1. 30 MHz to 9000 MHz for GSM850.
2. 30 MHz to 19000 MHz for GSM1900.

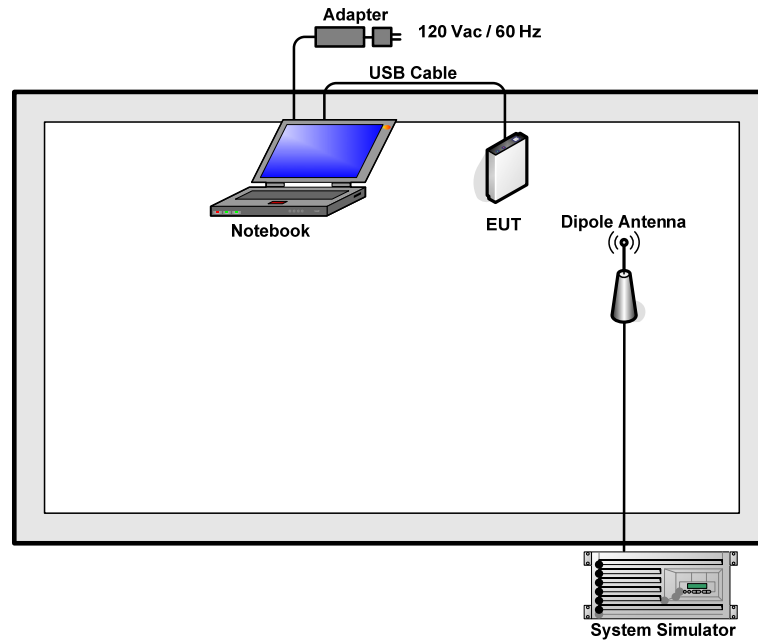
| Test Modes | | |
|------------|---------------------|---------------------|
| Band | Radiated TCs | Conducted TCs |
| GSM 850 | ■ GPRS class 8 Link | ■ GPRS class 8 Link |
| GSM 1900 | ■ GPRS class 8 Link | ■ GPRS class 8 Link |

Note: The maximum power levels is GPRS multi-slot class 8 mode for GMSK link, only this mode was used for all tests.

The conducted power tables are as follows:

| Conducted Power (*Unit: dBm) | | | | | | |
|------------------------------|--------|-------|-------|---------|--------|--------|
| Band | GSM850 | | | GSM1900 | | |
| Channel | 128 | 189 | 251 | 512 | 661 | 810 |
| Frequency | 824.2 | 836.4 | 848.8 | 1850.2 | 1880.0 | 1909.8 |
| GPRS class 8 | 33.03 | 33.03 | 33.04 | 30.14 | 30.21 | 30.32 |
| GPRS class 10 | 32.09 | 32.11 | 32.12 | 29.15 | 29.21 | 29.32 |
| GPRS class 11 | 30.33 | 30.37 | 30.37 | 27.20 | 27.25 | 27.38 |
| GPRS class 12 | 29.50 | 29.53 | 29.54 | 26.33 | 26.39 | 26.52 |

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model No. | FCC ID | Data Cable | Power Cord |
|------|------------------|------------|-----------|--------|----------------|-------------------|
| 1. | System Simulator | Agilent | E5515C | N/A | N/A | Unshielded, 1.8 m |
| 2. | DC Power Supply | TOPWORD | 3303DR | N/A | N/A | N/A |
| 3. | USB Cable | N/A | N/A | N/A | Shielded, 1.2m | N/A |

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 7 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 7 + 10 = 17 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output 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 power in the radio frequency on the transmitter output terminals shall be reported.

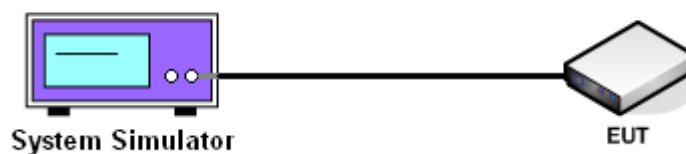
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

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

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

| Cellular Band | | | |
|-------------------------|-----------------------|-----------|------------|
| Modes | GSM850 (GPRS class 8) | | |
| Channel | 128 (Low) | 189 (Mid) | 251 (High) |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 |
| Conducted Power (dBm) | 33.03 | 33.03 | 33.04 |
| Conducted Power (Watts) | 2.01 | 2.01 | 2.01 |

| PCS Band | | | |
|-------------------------|------------------------|-----------|------------|
| Modes | GSM1900 (GPRS class 8) | | |
| Channel | 512 (Low) | 661 (Mid) | 810 (High) |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| Conducted Power (dBm) | 30.14 | 30.21 | 30.32 |
| Conducted Power (Watts) | 1.03 | 1.05 | 1.08 |

Note: Maximum burst average power for GSM.

3.2 Peak-to-Average Ratio

3.2.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

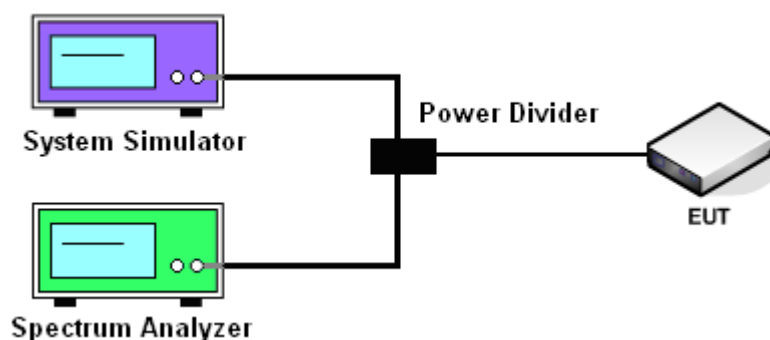
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and System Simulator via power divider.
2. For GPRS operating modes:
 - a. Set EUT in maximum power output.
 - b. Set the RBW = 1MHz, VBW = 3MHz, Peak detector in spectrum analyzer for first trace.
 - c. Set the RBW = 1MHz, VBW = 3MHz, RMS detector in spectrum analyzer for second trace.
 - d. The wanted burst signal is triggered by spectrum analyzer, and measured respectively the peak level and Mean level without burst-off time, after system simulator synchronized with the spectrum analyzer.
3. Record the deviation as Peak to Average Ratio.

3.2.4 Test Setup





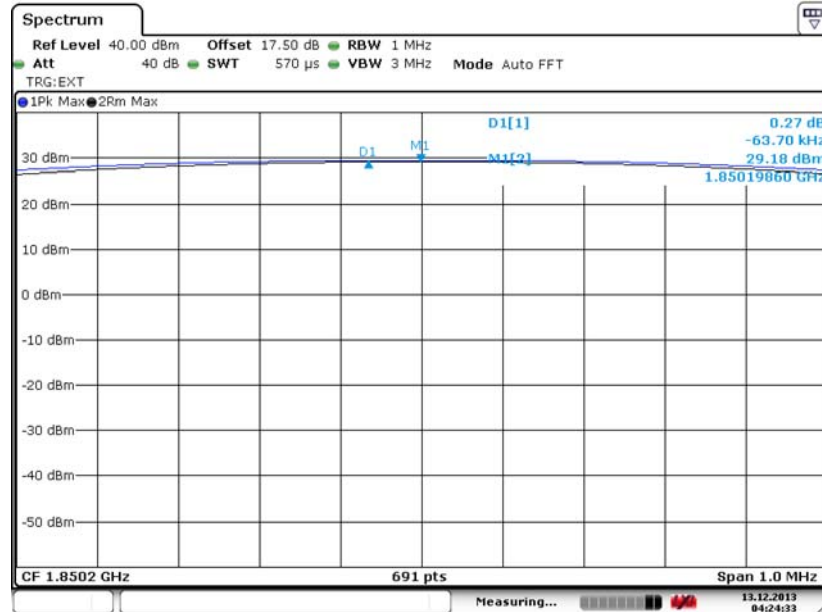
3.2.5 Test Result of Peak-to-Average Ratio

| PCS Band | | | |
|----------------------------|------------------------|-----------|------------|
| Modes | GSM1900 (GPRS class 8) | | |
| Channel | 512 (Low) | 661 (Mid) | 810 (High) |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| Peak-to-Average Ratio (dB) | 0.27 | 0.27 | 0.27 |

3.2.6 Test Result (Plots) of Peak-to-Average Ratio

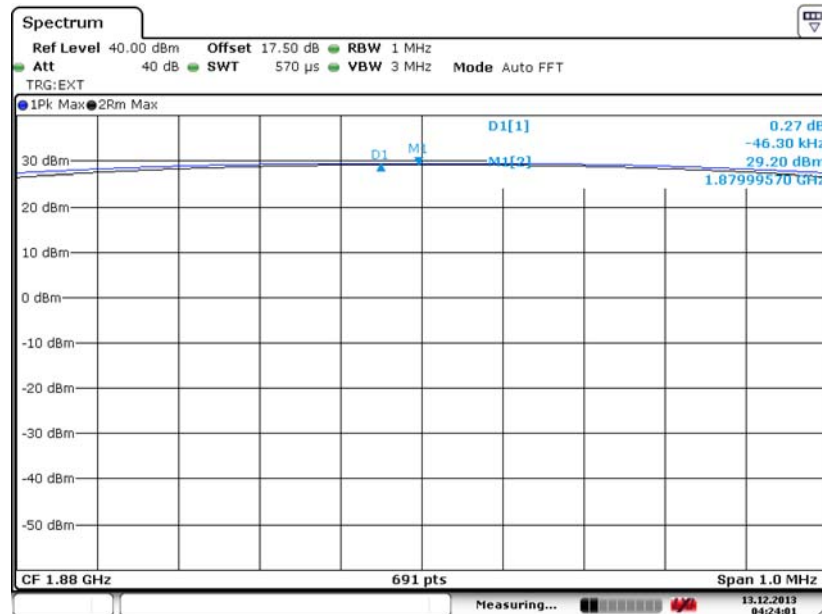
| | | | |
|--------|----------|-------------|--------------------------|
| Band : | GSM 1900 | Test Mode : | GPRS class 8 Link (GMSK) |
|--------|----------|-------------|--------------------------|

Peak-to-Average Ratio on Channel 512 (1850.2 MHz)



Date: 13. DEC. 2013 04:24:32

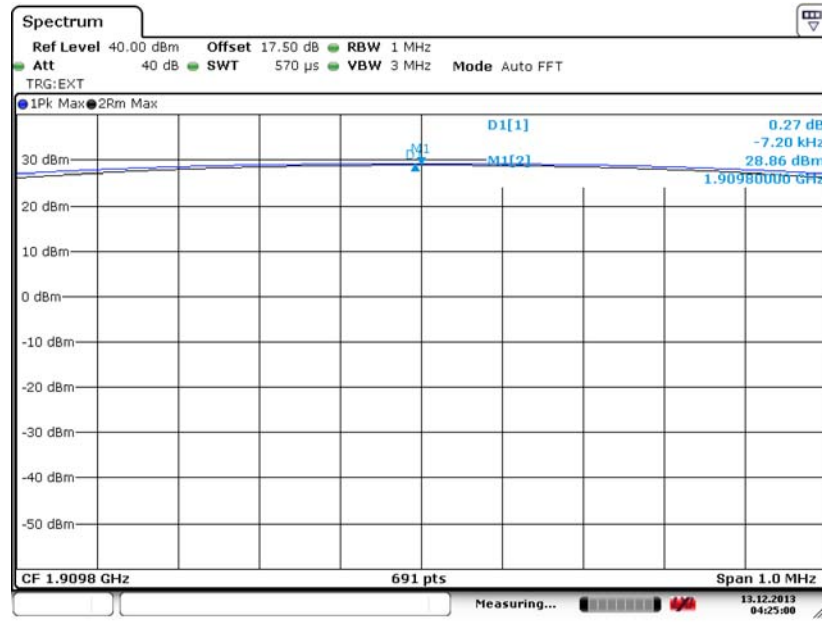
Peak-to-Average Ratio on Channel 661 (1880.0 MHz)



Date: 13. DEC. 2013 04:24:00



Peak-to-Average Ratio on Channel 810 (1909.8 MHz)



Date: 13.DEC.2013 04:25:00

3.3 Effective Radiated Power and Effective Isotropic Radiated Power Measurement

3.3.1 Description of the ERP/EIRP Measurement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. The ERP of mobile transmitters must not exceed 7 Watts and the EIRP of mobile transmitters are limited to 2 Watts.

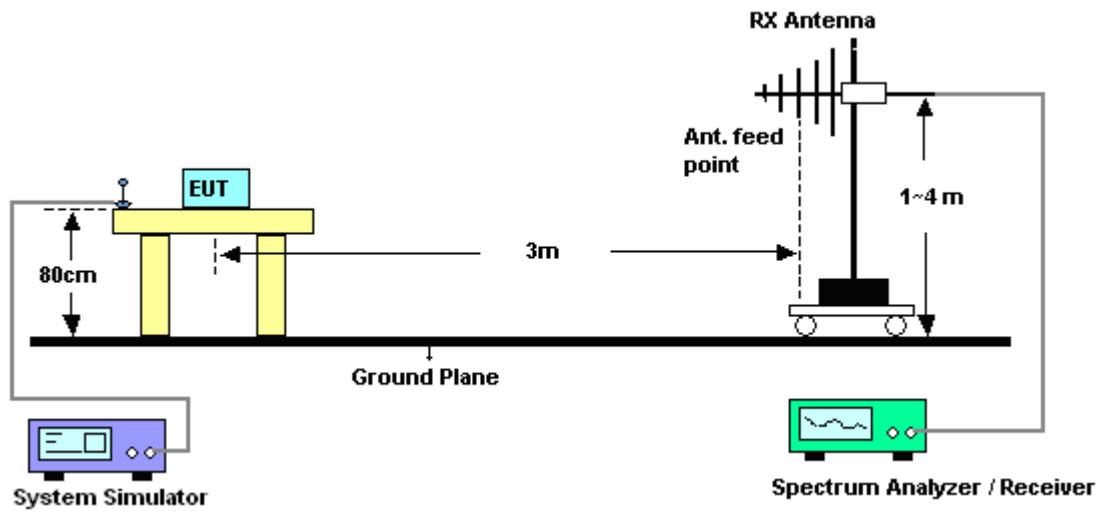
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 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= 1MHz, VBW= 3MHz for GSM, RBW= 100 kHz, VBW= 300 kHz, used channel power option with bandwidth=5MHz for WCDMA, and RMS detector settings per 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 Isotropic Radiated Power (EIRP) 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 EIRP was calculated with the correction factor, $EIRP = LVL + \text{Correction factor}$ and $ERP = EIRP - 2.15$.

3.3.4 Test Setup



3.3.5 Test Result of ERP

| GSM850 (GPRS class 8) Radiated Power ERP | | | | |
|---|------------------|-------------------------------|------------------|----------------|
| Horizontal Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 824.2 | -1.66 | 28.80 | 24.99 | 0.32 |
| 836.4 | -0.81 | 28.58 | 25.62 | 0.36 |
| 848.8 | 0.33 | 28.06 | 26.24 | 0.42 |
| Vertical Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 824.2 | -5.05 | 32.60 | 25.40 | 0.35 |
| 836.4 | -4.27 | 31.95 | 25.53 | 0.36 |
| 848.8 | -3.15 | 31.56 | 26.26 | 0.42 |

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

3.3.6 Test Result of EIRP

| GSM1900 (GPRS class 8) Radiated Power EIRP | | | | |
|---|------------------|-------------------------------|-------------------|-----------------|
| Horizontal Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1850.2 | -11.44 | 39.63 | 28.19 | 0.66 |
| 1880.0 | -11.14 | 40.35 | 29.21 | 0.83 |
| 1909.8 | -12.76 | 40.05 | 27.29 | 0.54 |
| Vertical Polarization | | | | |
| Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1850.2 | -20.51 | 41.84 | 21.33 | 0.14 |
| 1880.0 | -21.72 | 43.25 | 21.53 | 0.14 |
| 1909.8 | -21.46 | 42.30 | 20.84 | 0.12 |

* EIRP = LVL (dBm) + Correction Factor (dB)

3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.4.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The 99% 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.

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

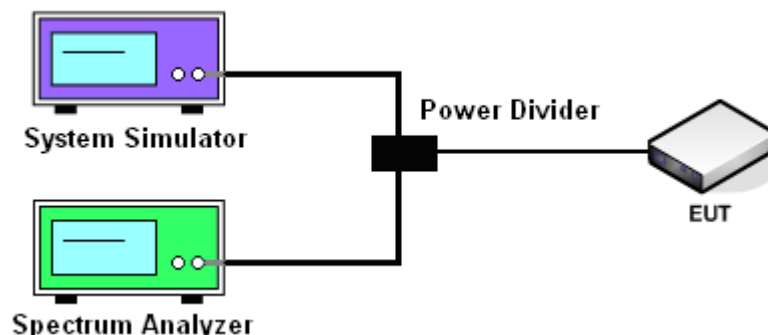
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.
4. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.

3.4.4 Test Setup



3.4.5 Test Result of Occupied Bandwidth and 26dB Bandwidth

| Cellular Band | | | |
|-----------------|-----------------------|-----------|------------|
| Modes | GSM850 (GPRS class 8) | | |
| Channel | 128 (Low) | 189 (Mid) | 251 (High) |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 |
| 99% OBW (kHz) | 242.00 | 242.00 | 238.00 |
| 26dB BW (kHz) | 308.00 | 306.00 | 310.00 |

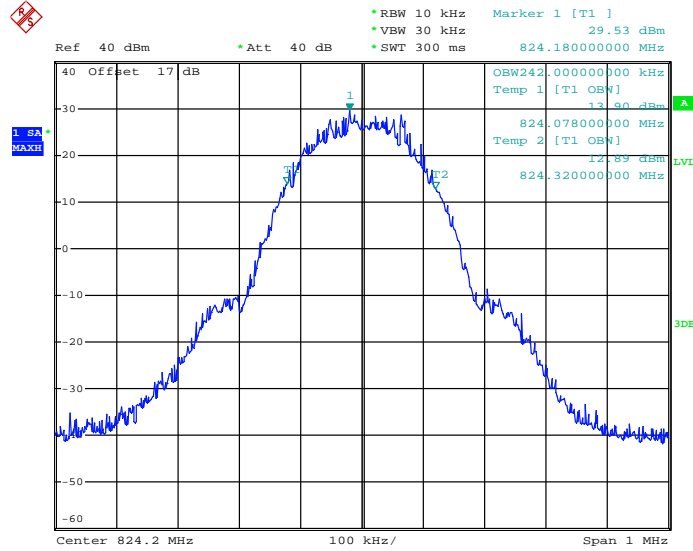
| PCS Band | | | |
|-----------------|------------------------|-----------|------------|
| Modes | GSM1900 (GPRS class 8) | | |
| Channel | 512 (Low) | 661 (Mid) | 810 (High) |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| 99% OBW (kHz) | 240.00 | 242.00 | 246.00 |
| 26dB BW (kHz) | 314.00 | 308.00 | 310.00 |



3.4.6 Test Result (Plots) of Occupied Bandwidth and 26dB Bandwidth

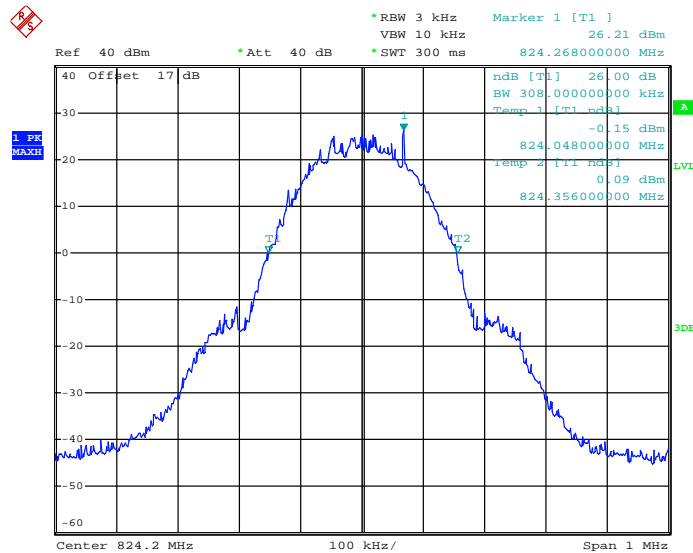
| | | | |
|--------|---------|-------------|--------------------------|
| Band : | GSM 850 | Test Mode : | GPRS class 8 Link (GMSK) |
|--------|---------|-------------|--------------------------|

99% Occupied Bandwidth Plot on Channel 128 (824.2 MHz)



Date: 13.DEC.2013 08:56:38

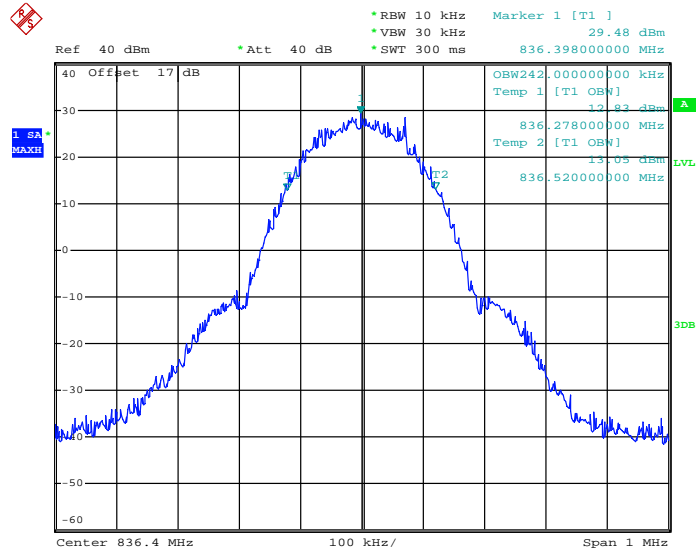
26dB Bandwidth Plot on Channel 128 (824.2 MHz)



Date: 13.DEC.2013 08:46:16

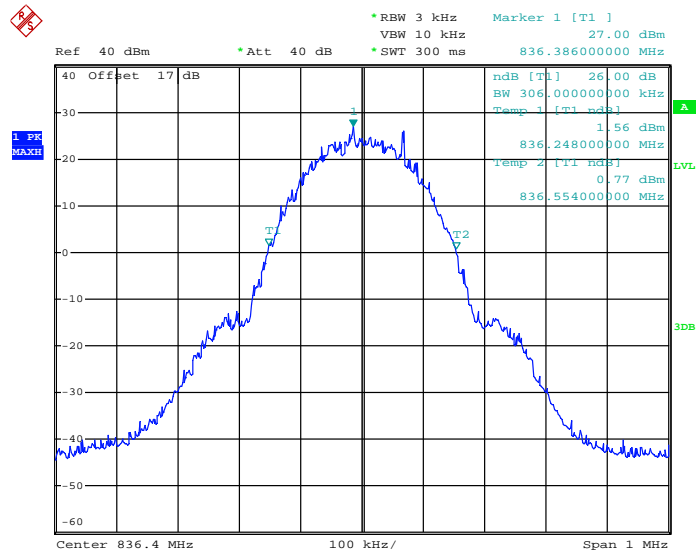


99% Occupied Bandwidth Plot on Channel 189 (836.4 MHz)



Date: 13.DEC.2013 08:54:35

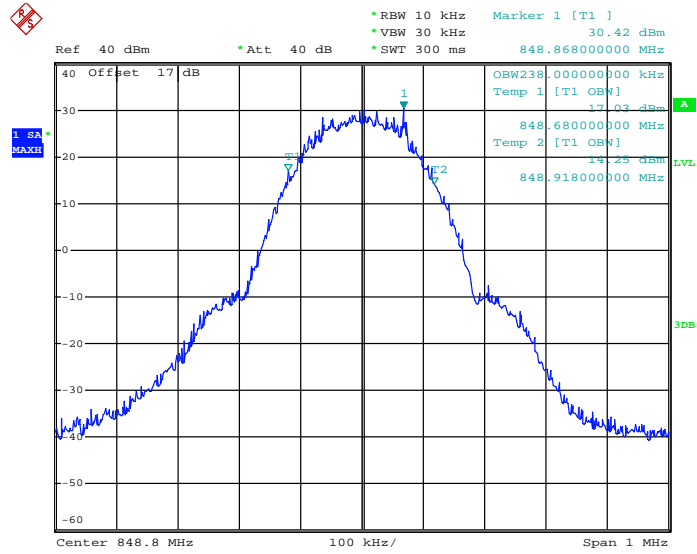
26dB Bandwidth Plot on Channel 189 (836.4 MHz)



Date: 13.DEC.2013 08:44:38

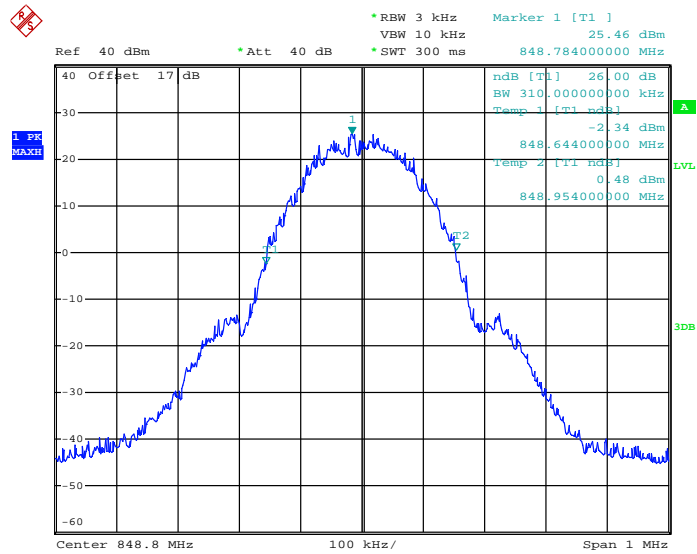


99% Occupied Bandwidth Plot on Channel 251 (848.8 MHz)



Date: 13.DEC.2013 08:52:19

26dB Bandwidth Plot on Channel 251 (848.8 MHz)

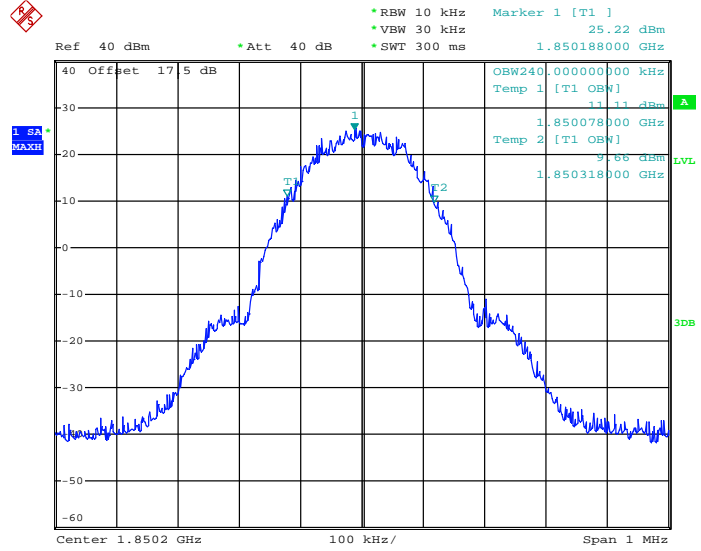


Date: 13.DEC.2013 08:47:27



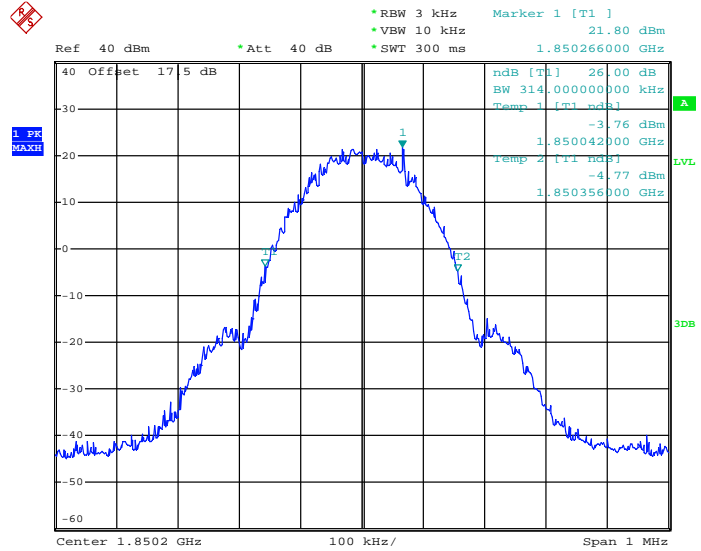
| | | | |
|---------------|----------|--------------------|--------------------------|
| Band : | GSM 1900 | Test Mode : | GPRS class 8 Link (GMSK) |
|---------------|----------|--------------------|--------------------------|

99% Occupied Bandwidth Plot on Channel 512 (1850.2 MHz)



Date: 13.DEC.2013 09:33:14

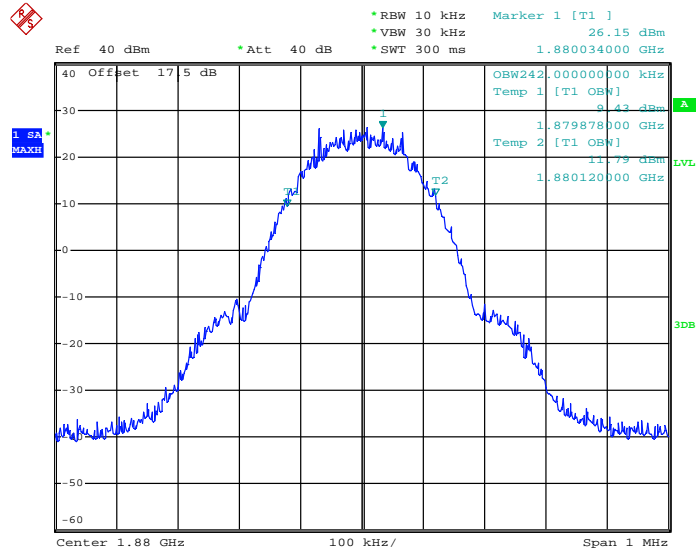
26dB Bandwidth Plot on Channel 512 (1850.2 MHz)



Date: 13.DEC.2013 09:22:31

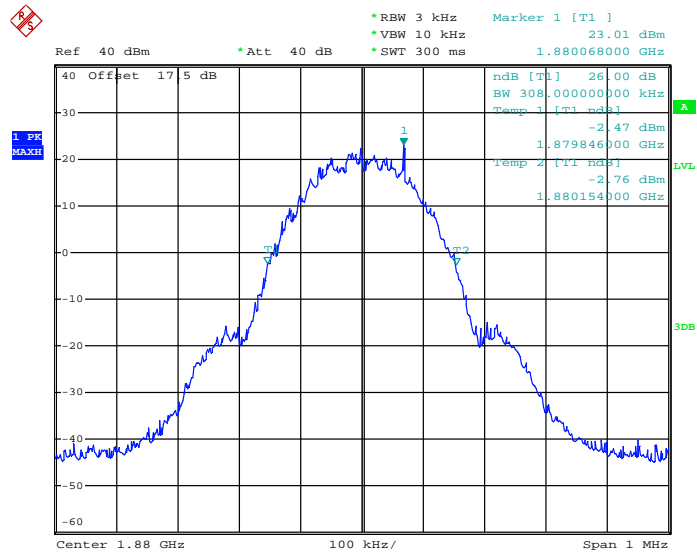


99% Occupied Bandwidth Plot on Channel 661 (1880.0 MHz)



Date: 13.DEC.2013 09:31:14

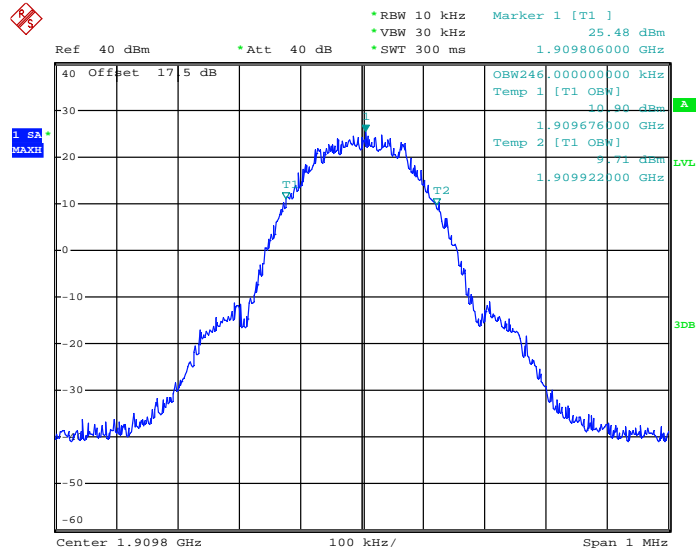
26dB Bandwidth Plot on Channel 661 (1880.0 MHz)



Date: 13.DEC.2013 09:20:20

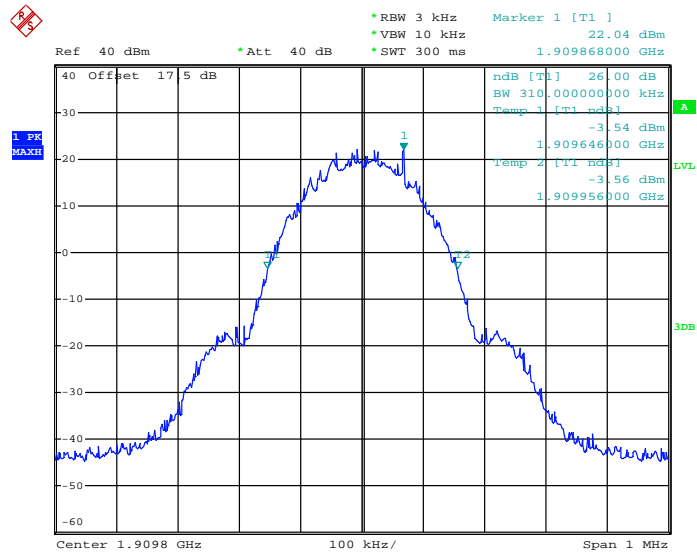


99% Occupied Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 13.DEC.2013 09:28:02

26dB Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 13.DEC.2013 09:24:49

3.5 Band Edge Measurement

3.5.1 Description of Band Edge 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.

3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The band edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly $BW/100$.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

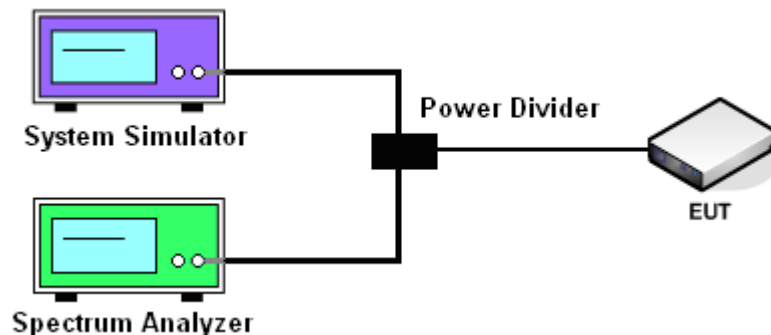
$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

3.5.4 Test Setup

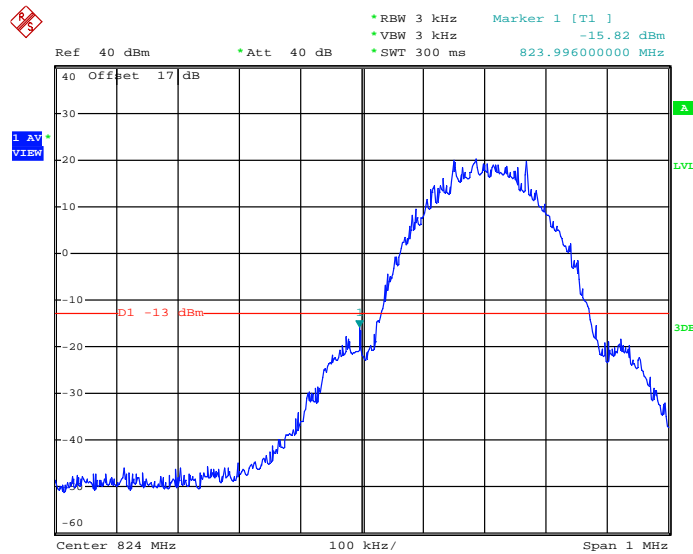
<Conducted Band Edge >



3.5.5 Test Result (Plots) of Conducted Band Edge

| | | | |
|---------------------|-----------|--------------------------|-----------------------------|
| Band : | GSM850 | Test Mode : | GPRS class 8 Link (GMSK) |
| Correction Factor : | 0.14dB | Maximum 26dB Bandwidth : | 0.310MHz |
| Band Edge : | -15.68dBm | Measurement Value : | -15.82dBm |

Lower Band Edge Plot on Channel 128 (824.2 MHz)

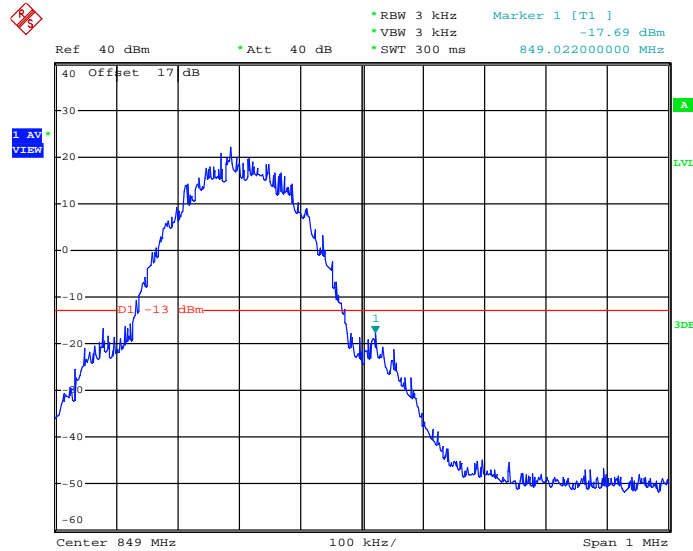


Date: 13.DEC.2013 08:58:54

1. Correction Factor(dB)= $10\log(1\% \text{ Emission BW/RBW})$
 2. Band Edge= Measurement Value + Correction Factor(dB)
- For example, $-15.82\text{dBm} + 0.14\text{dB} = -15.68\text{dBm}$

| | | | |
|---------------------|-----------|--------------------------|-----------------------------|
| Band : | GSM850 | Test Mode : | GPRS class 8 Link (GMSK) |
| Correction Factor : | 0.14dB | Maximum 26dB Bandwidth : | 0.310MHz |
| Band Edge : | -17.55dBm | Measurement Value : | -17.69dBm |

Higher Band Edge Plot on Channel 251 (848.8 MHz)



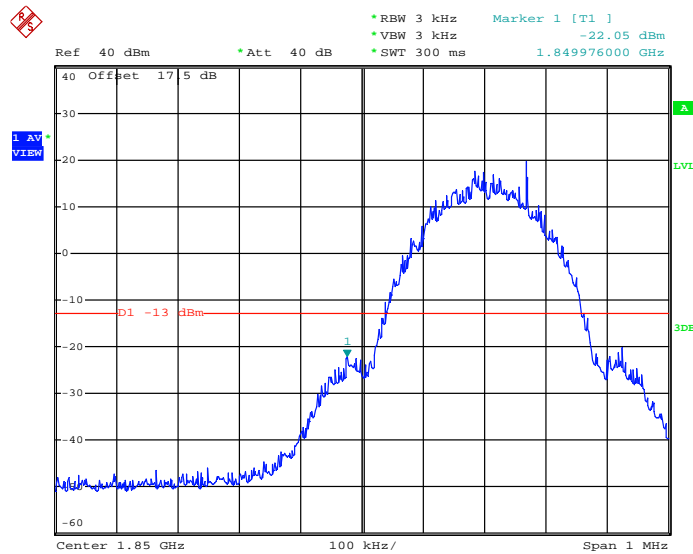
Date: 13.DEC.2013 08:59:50

1. Correction Factor(dB)= $10\log(1\% \text{ Emission BW/RBW})$
2. Band Edge= Measurement Value + Correction Factor(dB)



| | | | |
|----------------------------|-----------|---------------------------------|-----------------------------|
| Band : | GSM1900 | Test Mode : | GPRS class 8 Link (GMSK) |
| Correction Factor : | 0.20dB | Maximum 26dB Bandwidth : | 0.314MHz |
| Band Edge : | -21.85dBm | Measurement Value : | -22.05dBm |

Lower Band Edge Plot on Channel 512 (1850.2 MHz)

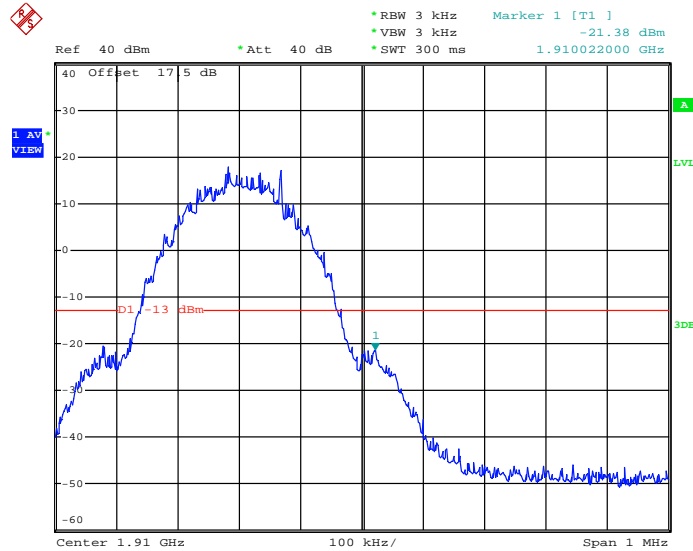


Date: 13.DEC.2013 09:34:42

1. Correction Factor(dB)= 10log(1% Emission BW/RBW)
2. Band Edge= Measurement Value + Correction Factor(dB)

| | | | |
|----------------------------|-----------|---------------------------------|-----------------------------|
| Band : | GSM1900 | Test Mode : | GPRS class 8 Link (GMSK) |
| Correction Factor : | 0.20dB | Maximum 26dB Bandwidth : | 0.314MHz |
| Band Edge : | -21.18dBm | Measurement Value : | -21.38dBm |

Higher Band Edge Plot on Channel 810 (1909.8 MHz)



Date: 13.DEC.2013 09:37:20

1. Correction Factor(dB)= 10log(1% Emission BW/RBW)
2. Band Edge= Measurement Value + Correction Factor(dB)

3.6 Conducted Spurious Emission Measurement

3.6.1 Description of Conducted Spurious 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.

3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

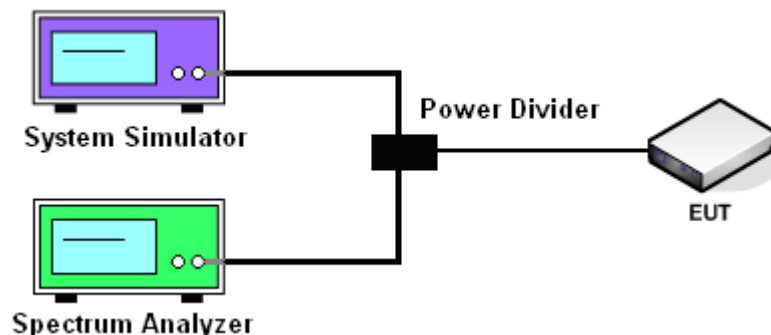
1. The EUT was connected to spectrum analyzer and base station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}$$

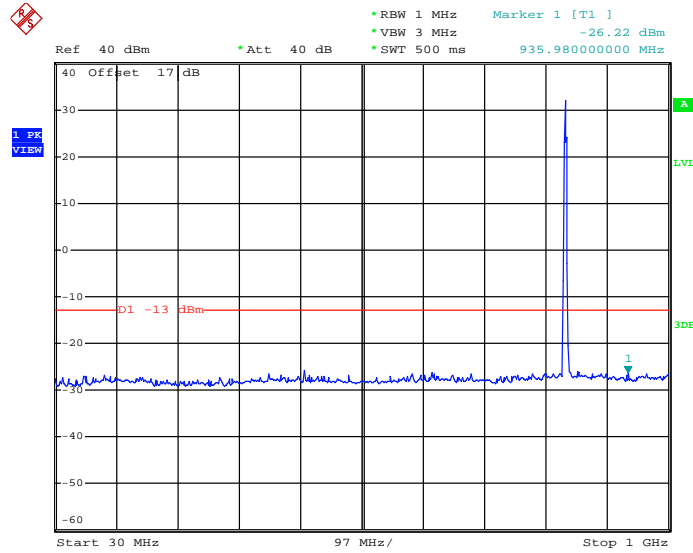
3.6.4 Test Setup



3.6.5 Test Result (Plots) of Conducted Spurious Emission

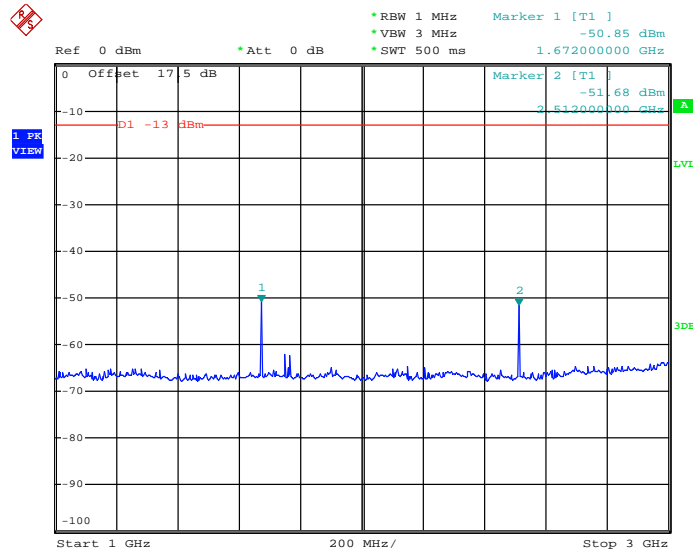
| | | | |
|-------------|--------------------------|-------------|-----------|
| Band : | GSM850 | Channel : | CH189 |
| Test Mode : | GPRS class 8 Link (GMSK) | Frequency : | 836.4 MHz |

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



Date: 13.DEC.2013 09:02:19

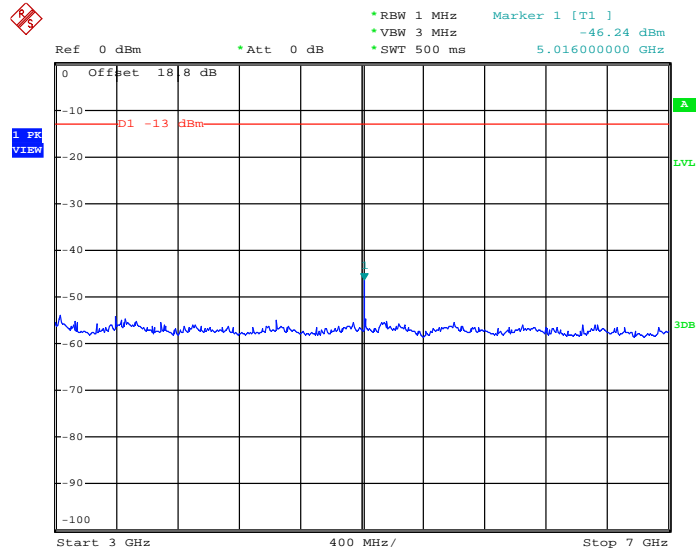
Conducted Spurious Emission Plot between 1GHz ~ 3GHz



Date: 13.DEC.2013 09:07:37

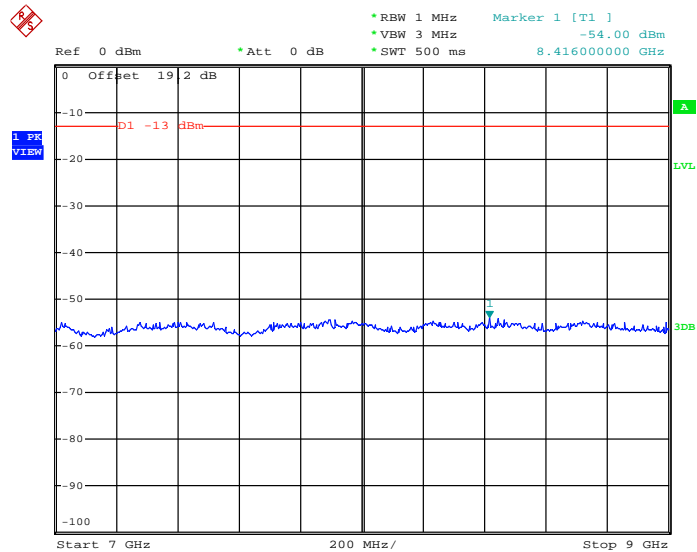


Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 13.DEC.2013 09:09:00

Conducted Spurious Emission Plot between 7GHz ~ 9GHz

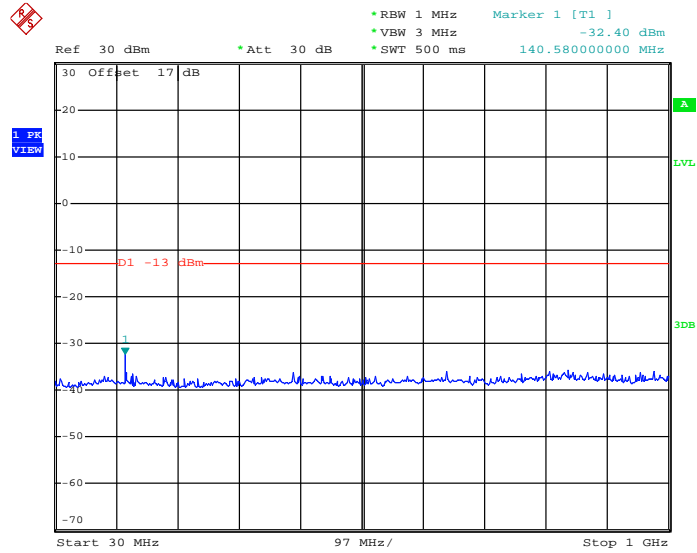


Date: 13.DEC.2013 09:09:46



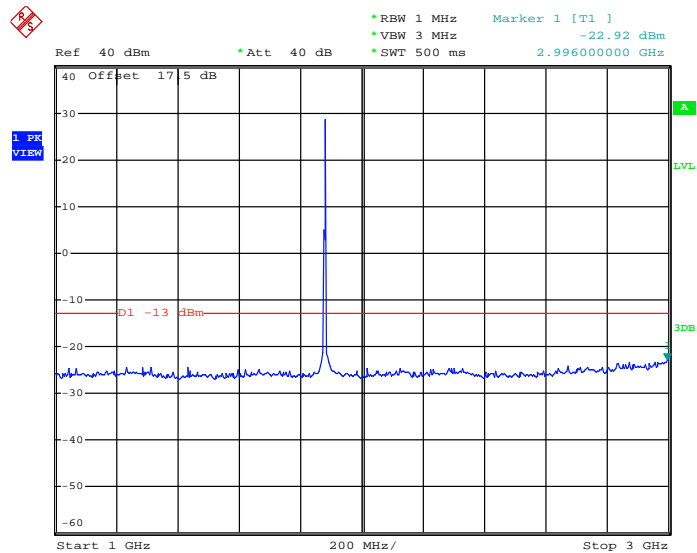
| | | | |
|-------------|--------------------------|-------------|------------|
| Band : | GSM1900 | Channel : | CH661 |
| Test Mode : | GPRS class 8 Link (GMSK) | Frequency : | 1880.0 MHz |

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



Date: 13.DEC.2013 09:16:59

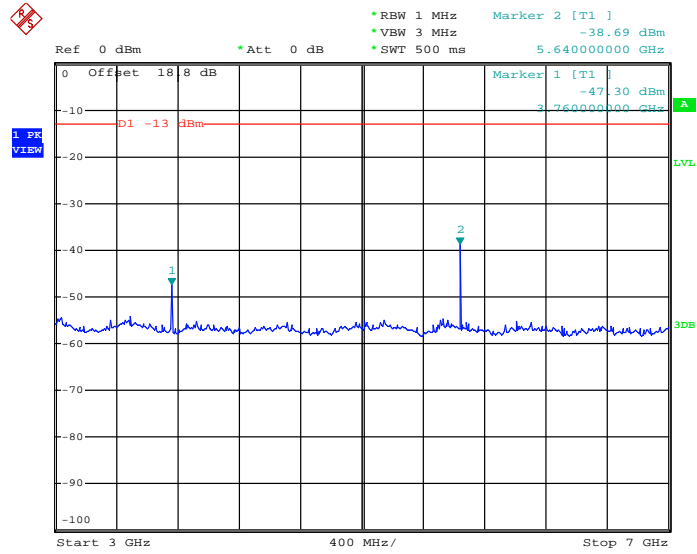
Conducted Spurious Emission Plot between 1GHz ~ 3GHz



Date: 13.DEC.2013 09:18:21

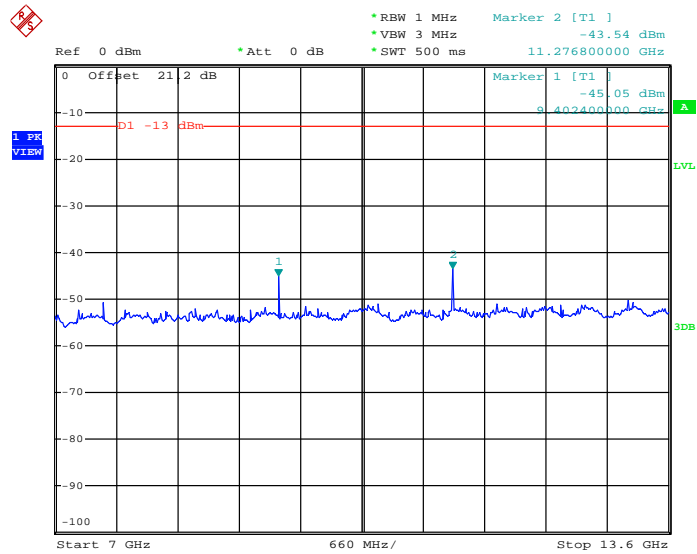


Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 13.DEC.2013 09:13:24

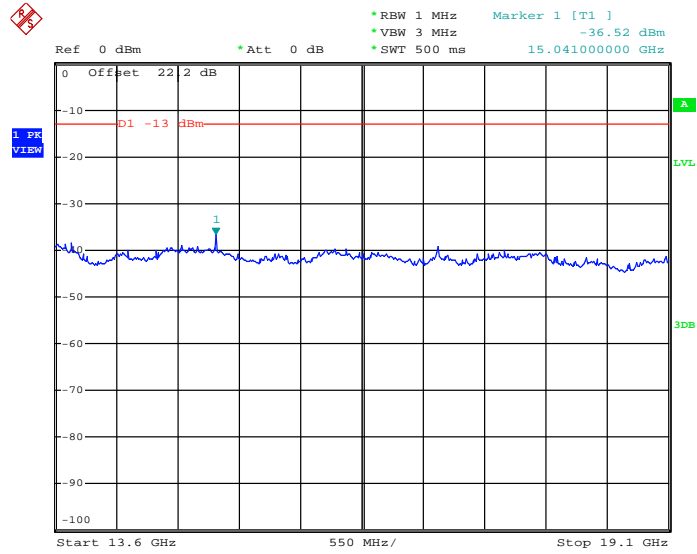
Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



Date: 13.DEC.2013 09:14:13



Conducted Spurious Emission Plot between 13.6GHz ~ 19.1GHz



Date: 13.DEC.2013 09:15:19

3.7 Field Strength of Spurious Radiation Measurement

3.7.1 Description of Field Strength of Spurious Radiated Measurement

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.

3.7.2 Measuring Instruments

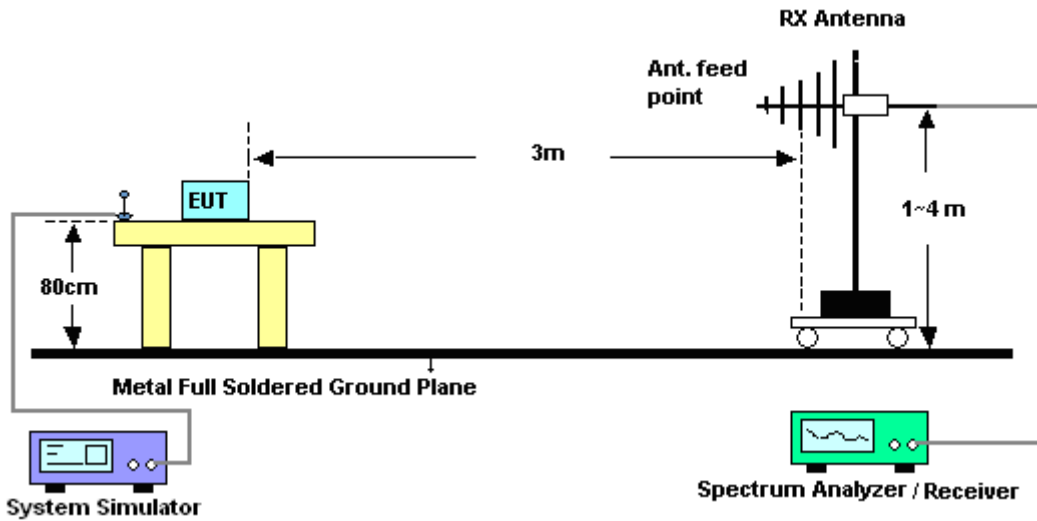
The measuring equipment is listed in the section 4 of this test report.

3.7.3 Test Procedures

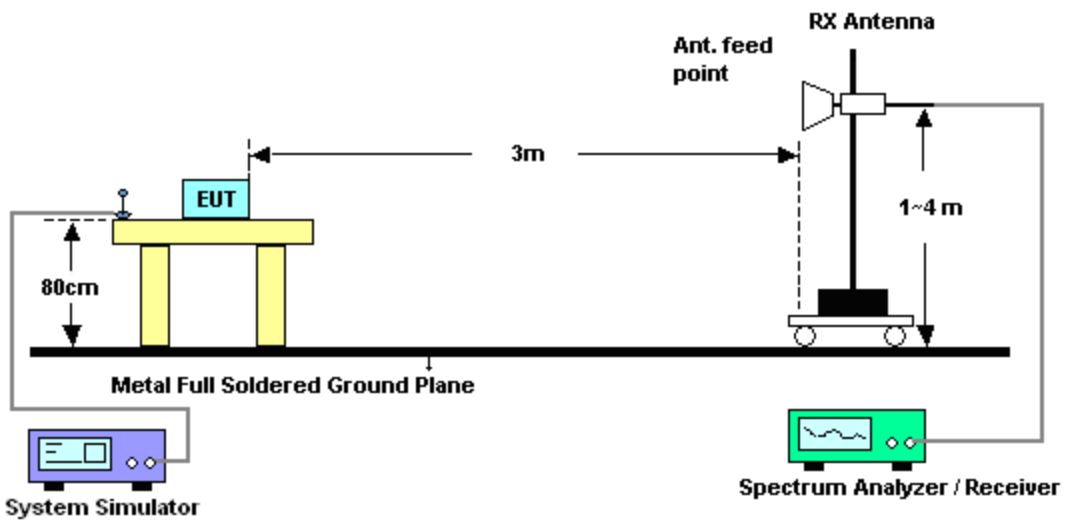
1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving 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, 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. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
11. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10\log(P)]$ (dB)
 $= [30 + 10\log(P)]$ (dBm) - $[43 + 10\log(P)]$ (dB)
 $= -13\text{dBm}$.
12. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
13. ERP (dBm) = EIRP - 2.15

3.7.4 Test Setup

For radiated emissions from 30MHz to 1GHz



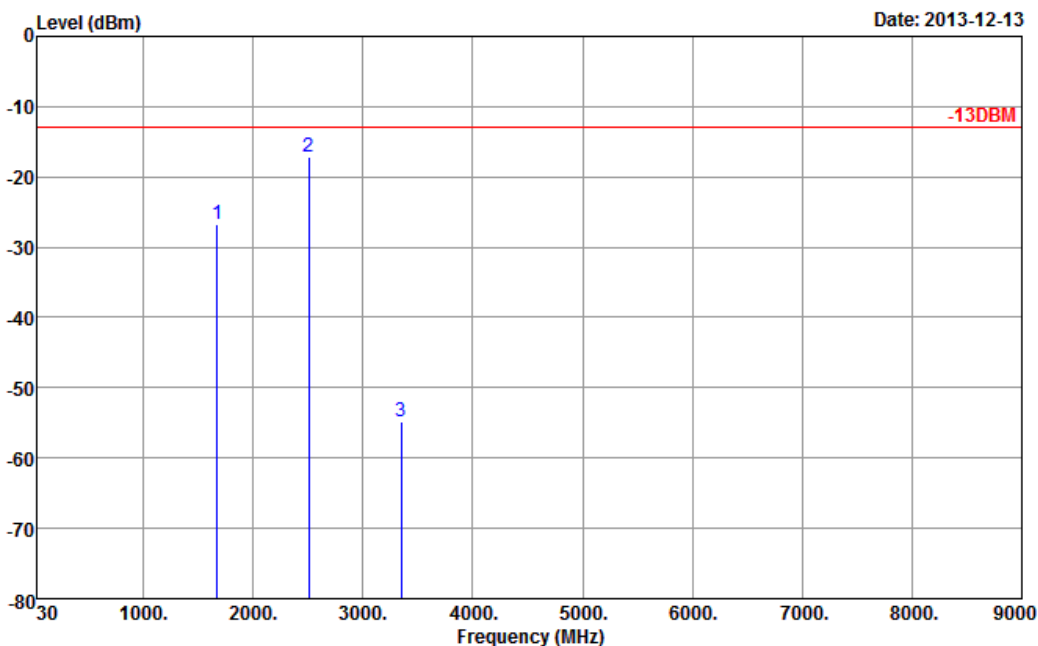
For radiated emissions above 1GHz





3.7.5 Test Result of Field Strength of Spurious Radiated

| | | | |
|------------------------|--|----------------------------|------------|
| Band : | GSM850 | Temperature : | 23~24°C |
| Test Mode : | GPRS class 8 Link (GMSK) | Relative Humidity : | 56~59% |
| Test Engineer : | Robin Luo | Polarization : | Horizontal |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |

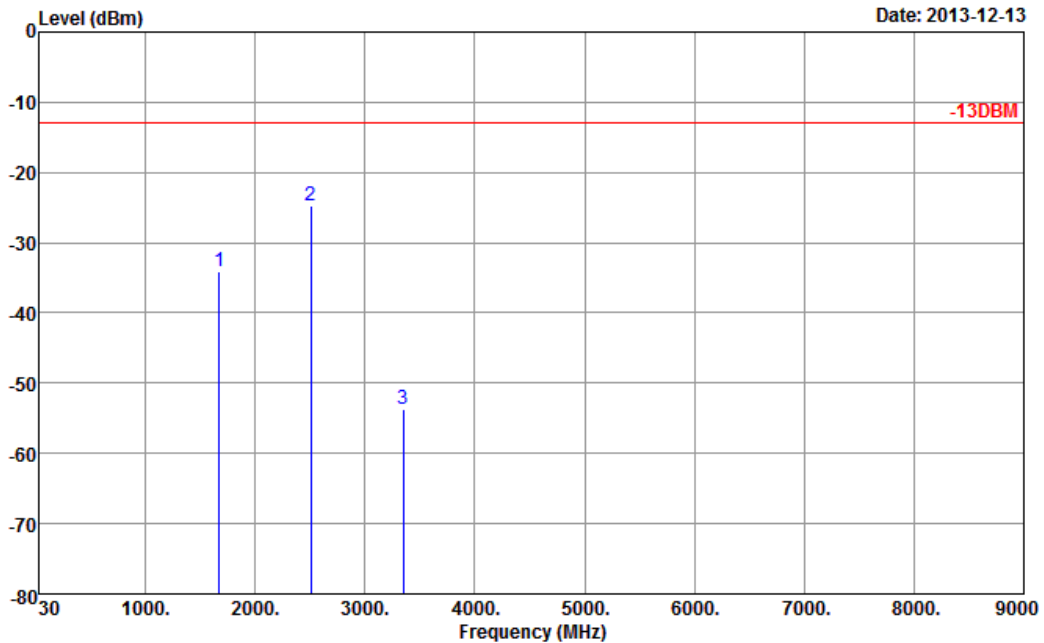


Site : 03CH01-SZ
 Condition : -13DBM HF EIRP H 130101 HORIZONTAL

| Frequency (MHz) | ERP (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 |
|-------------------|-------------|---------------|-------------------|---------------------|--------------------|----------------------|-------------------------|----------------------|--------|
| 1672 | -26.76 | -13 | -13.76 | -43.43 | -29.73 | 0.88 | 6.00 | H | Pass |
| 2510 | -17.16 | -13 | -4.16 | -42.90 | -19.77 | 1.08 | 5.84 | H | Pass |
| 3346 | -54.82 | -13 | -41.82 | -65.42 | -59.19 | 1.14 | 7.66 | H | Pass |



| | | | |
|------------------------|--|----------------------------|----------|
| Band : | GSM850 | Temperature : | 23~24°C |
| Test Mode : | GPRS class 8 Link (GMSK) | Relative Humidity : | 56~59% |
| Test Engineer : | Robin Luo | Polarization : | Vertical |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |

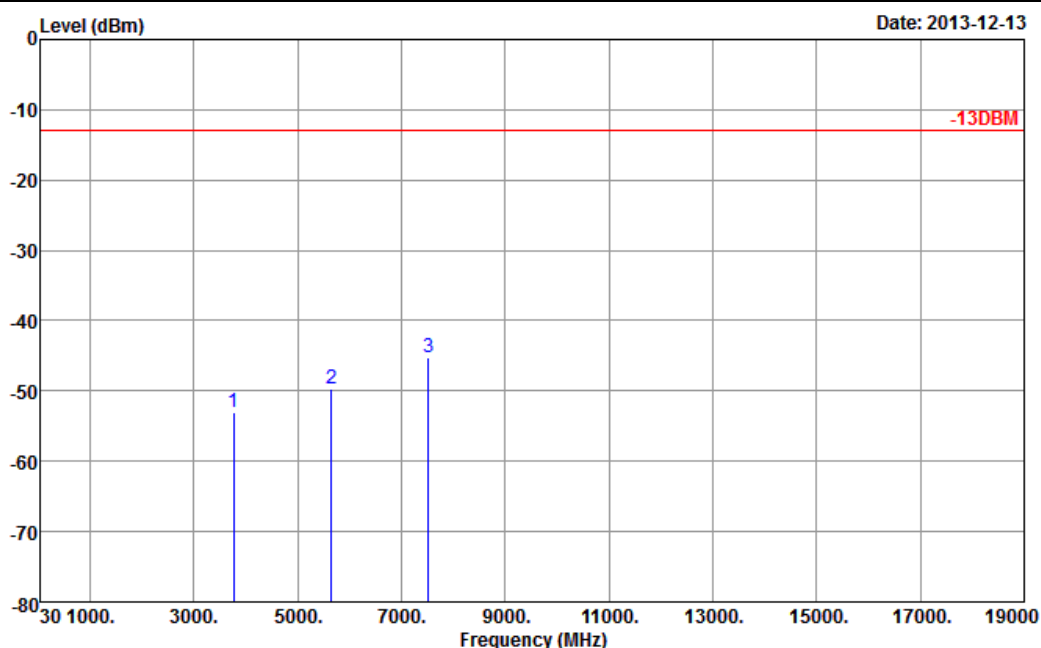


Site : 03CH01-SZ
 Condition : -13DBM HF_EIRP_V_130101 VERTICAL

| Frequency (MHz) | ERP (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 |
|-------------------|-------------|---------------|-------------------|---------------------|--------------------|----------------------|-------------------------|----------------------|--------|
| 1672 | -34.41 | -13 | -21.41 | -48.41 | -37.38 | 0.88 | 6.00 | V | Pass |
| 2510 | -24.64 | -13 | -11.64 | -47.76 | -27.25 | 1.08 | 5.84 | V | Pass |
| 3346 | -53.61 | -13 | -40.61 | -65.44 | -57.98 | 1.14 | 7.66 | V | Pass |



| | | | |
|------------------------|--|----------------------------|------------|
| Band : | GSM1900 | Temperature : | 23~24°C |
| Test Mode : | GPRS class 8 Link (GMSK) | Relative Humidity : | 56~59% |
| Test Engineer : | Robin Luo | Polarization : | Horizontal |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |

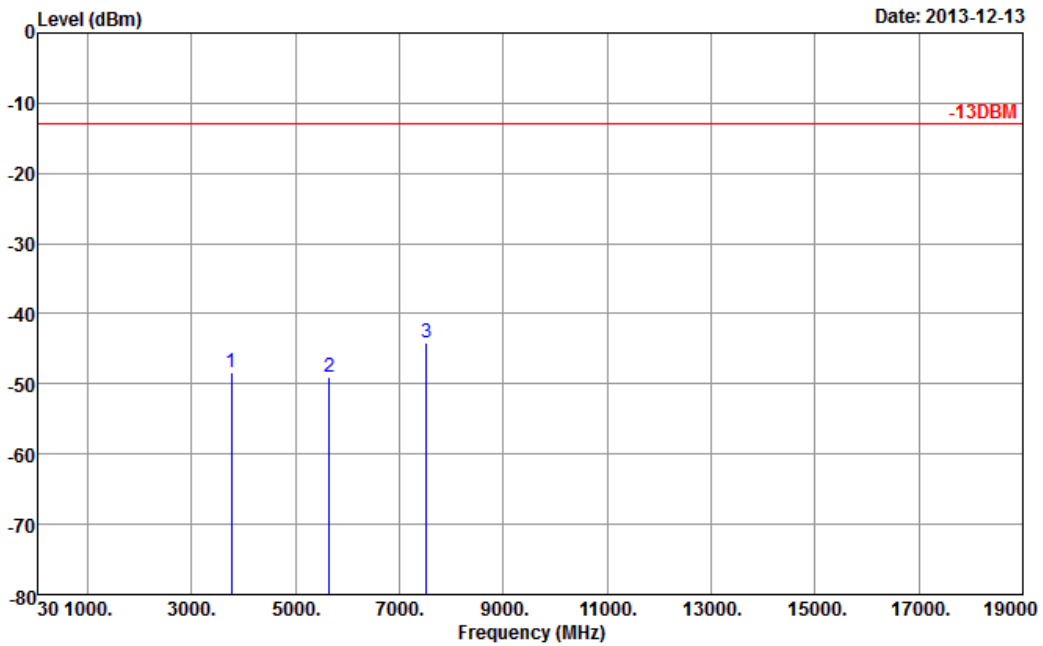


Site : 03CH01-SZ
 Condition : -13DBM HF_EIRP_H_130101 HORIZONTAL

| 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 |
|-------------------|--------------|---------------|-------------------|---------------------|--------------------|----------------------|-------------------------|----------------------|--------|
| 3760 | -52.96 | -13 | -39.96 | -65.11 | -59.70 | 1.28 | 8.02 | H | Pass |
| 5640 | -49.70 | -13 | -36.70 | -67.69 | -58.12 | 1.58 | 10.00 | H | Pass |
| 7520 | -45.22 | -13 | -32.22 | -67.16 | -55.54 | 1.78 | 12.10 | H | Pass |



| | | | |
|------------------------|--|----------------------------|----------|
| Band : | GSM1900 | Temperature : | 23~24°C |
| Test Mode : | GPRS class 8 Link (GMSK) | Relative Humidity : | 56~59% |
| Test Engineer : | Robin Luo | Polarization : | Vertical |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |



Site : 03CH01-SZ
 Condition : -13DBM HF_EIRP_V_130101 VERTICAL

| 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 |
|-------------------|--------------|---------------|-------------------|---------------------|--------------------|----------------------|-------------------------|----------------------|--------|
| 3760 | -48.41 | -13 | -35.41 | -63.44 | -55.15 | 1.28 | 8.02 | V | Pass |
| 5640 | -49.01 | -13 | -36.01 | -66.09 | -57.43 | 1.58 | 10 | V | Pass |
| 7520 | -44.11 | -13 | -31.11 | -66.36 | -54.43 | 1.78 | 12.1 | V | Pass |

3.8 Frequency Stability Measurement

3.8.1 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.

3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

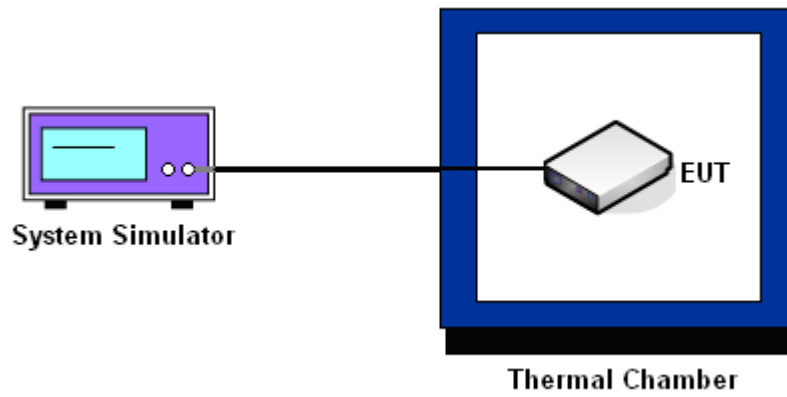
3.8.3 Test Procedures for Temperature Variation

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 before testing. 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.

3.8.4 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 BEP to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

3.8.5 Test Setup





3.8.6 Test Result of Temperature Variation

| | | | |
|---------------|---------|-------------|-----------|
| Band : | GSM 850 | Channel : | 189 |
| Limit (ppm) : | 2.5 | Frequency : | 836.4 MHz |

| Temperature (°C) | GPRS class 8 | | Result |
|------------------|-----------------|-----------------|--------|
| | Freq. Dev. (Hz) | Deviation (ppm) | |
| -30 | -23 | -0.03 | PASS |
| -20 | -20 | -0.02 | |
| -10 | -18 | -0.02 | |
| 0 | -19 | -0.02 | |
| 10 | -17 | -0.02 | |
| 20 | -19 | -0.02 | |
| 30 | -20 | -0.02 | |
| 40 | -18 | -0.02 | |
| 50 | -16 | -0.02 | |

| | | | |
|---------------|----------|-------------|------------|
| Band : | GSM 1900 | Channel : | 661 |
| Limit (ppm) : | 2.5 | Frequency : | 1880.0 MHz |

| Temperature (°C) | GPRS class 8 | | Result |
|------------------|-----------------|-----------------|--------|
| | Freq. Dev. (Hz) | Deviation (ppm) | |
| -30 | -45 | -0.02 | PASS |
| -20 | -36 | -0.02 | |
| -10 | -39 | -0.02 | |
| 0 | -42 | -0.02 | |
| 10 | -41 | -0.02 | |
| 20 | -38 | -0.02 | |
| 30 | -39 | -0.02 | |
| 40 | -41 | -0.02 | |
| 50 | -44 | -0.02 | |

3.8.7 Test Result of Voltage Variation

| Band & Channel | Mode | Voltage (Volt) | Freq. Dev. (Hz) | Deviation (ppm) | Limit (ppm) | Result |
|-------------------|-----------------|----------------|-----------------|-----------------|-------------|--------|
| GSM 850 CH189 | GPRS class 8 | 3.7 | -20 | -0.02 | 2.5 | PASS |
| | | BEP | -18 | -0.02 | | |
| | | 4.2 | -19 | -0.02 | | |
| GSM 1900 CH661 | GPRS class 8 | 3.7 | -40 | -0.02 | | |
| | | BEP | -38 | -0.02 | | |
| | | 4.2 | -41 | -0.02 | | |

Note:

1. Normal Voltage = 3.7V.
2. Battery End Point (BEP) = 3.5 V.



4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---------------------------|----------------------|-----------|-------------|---------------------------|------------------|---------------|---------------|-----------------------|
| Spectrum Analyzer | R&S | FSV30 | 100845 | 9kHz~30GHz | Nov. 05, 2013 | Dec. 13, 2013 | Nov. 04, 2014 | Conducted (TH01-SZ) |
| Spectrum Analyzer | R&S | FSP30 | 101400 | 9kHz~30GHz | Mar. 28, 2013 | Dec. 13, 2013 | Mar. 27, 2014 | Conducted (TH01-SZ) |
| Power Meter | Anritsu | ML2495A | 1218010 | N/A | Mar. 28, 2013 | Dec. 13, 2013 | Mar. 27, 2014 | Conducted (TH01-SZ) |
| Power Sensor | Anritsu | MA2411B | 1207253 | N/A | Mar. 28, 2013 | Dec. 13, 2013 | Mar. 27, 2014 | Conducted (TH01-SZ) |
| Thermal Chamber | Hongzhan | LP-150U | HD20120425 | N/A | Mar. 28, 2013 | Dec. 13, 2013 | Mar. 27, 2014 | Conducted (TH01-SZ) |
| Spectrum Analyzer | Agilent Technologies | N9038A | MY52260185 | 20Hz~26.5GHz | Apr. 04, 2013 | Dec. 13, 2013 | Apr. 03, 2014 | Radiation (03CH01-SZ) |
| Double Ridge Horn Antenna | ETS Lindgren | 3117 | 00119436 | 1GHz~18GHz | Oct. 26, 2013 | Dec. 13, 2013 | Oct. 25, 2014 | Radiation (03CH01-SZ) |
| Bilog Antenna | SCHAFFNER | CBL6112B | 2614 | 30MHz~2GHz | Dec. 26, 2012 | Dec. 13, 2013 | Dec. 25, 2013 | Radiation (03CH01-SZ) |
| Amplifier | ADVANTEST | BB525C | E9007003 | 9kHz-3000MHz GAIN 30db | Mar. 28, 2013 | Dec. 13, 2013 | Mar. 27, 2014 | Radiation (03CH01-SZ) |
| Amplifier | Yiai | AV3860B | 04030 | 2GHz~26.5GHz | Mar. 28, 2013 | Dec. 13, 2013 | Mar. 27, 2014 | Radiation (03CH01-SZ) |
| SHF-EHF-Horn | Schwarzbeck | BBHA9170 | BBHA9170249 | 14GHz~40GHz | Dec. 23, 2012 | Dec. 13, 2013 | Dec. 22, 2013 | Radiation (03CH01-SZ) |
| Turn Table | EM Electronics | EM 1000 | N/A | 0 ~ 360 degree | N/A | Dec. 13, 2013 | N/A | Radiation (03CH01-SZ) |
| Antenna Mast | EM Electronics | EM 1000 | N/A | 1 m - 4 m | N/A | Dec. 13, 2013 | N/A | Radiation (03CH01-SZ) |



5 Uncertainty of Evaluation

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

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 3.90 |
|---|------|