# FCC RF Test Report

| | | |
|---|---|---|
| APPLICANT | : | Brightstar Coporation |
| EQUIPMENT | : | GSM mobile phone |
| BRAND NAME | : | Avvio |
| MODEL NAME | : | Avvio SN52S/SN52 |
| MARKETING NAME | : | Avvio SN52S/SN52 |
| FCC ID | : | WVBASN52 |
| STANDARD | : | FCC 47 CFR Part 2, 22(H), 24(E) |
| CLASSIFICATION | : | PCS Licensed Transmitter Held to Ear (PCE) |

**The product was received on Sep. 12, 2012 and completely tested on Oct. 15, 2012. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.**

**Reviewed by:**

Jones Tsai

**Jones Tsai / Manager**

Testing Laboratory 1190

***SPORTON INTERNATIONAL (KUNSHAN) INC.***
***No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.***

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# REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FG291206 | Rev. 01 | Initial issue of report | Oct. 15, 2012 |
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# SUMMARY OF TEST RESULT

| Report Section | FCC Rule | IC Rule | Description | Limit | Result | Remark |
|---|---|---|---|---|---|---|
| 3.1 | §2.1046 | N/A | Conducted Output Power | N/A | PASS | - |
| 3.2 | §24.232(d) | N/A | Peak-to-Average Ratio | < 13 dB | PASS | - |
| 3.3 | §22.913(a)(2) | RSS-132(4.4) 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(a) | N/A | Occupied Bandwidth | N/A | PASS | - |
| 3.5 | §2.1051 §22.917(a) §24.238(a) | RSS-132 (4.5.1) RSS-133 (6.5.1) | Band Edge Measurement | < $43+10\log_{10}$(P[Watts]) | PASS | - |
| 3.6 | §2.1051 §22.917(a) §24.238(a) | RSS-132 (4.5.1) RSS-133 (6.5.1) | Conducted Spurious Emission | < $43+10\log_{10}$(P[Watts]) | PASS | - |
| 3.7 | §2.1053 §22.917(a) §24.238(a) | RSS-132 (4.5.1) RSS-133 (6.5.1) | Field Strength of Spurious Radiation | < $43+10\log_{10}$(P[Watts]) | PASS | Under limit 24.10 dB at 7520.000 MHz |
| 3.8 | §2.1055 §22.355 §24.235 | RSS-132(4.3) RSS-133(6.3) | Frequency Stability for Temperature & Voltage | < 2.5 ppm | PASS | - |

# 1 General Description

## 1.1 Applicant

**Brightstar Coporation**
9725 NW 117th Ave., Miami, Florida, United States

## 1.2 Manufacturer

**Shanghai Huaqin Telecom Technology Co., Ltd.**
Building 12, 399 Keyuan Road, Pudong district, Shanghai, China

## 1.3 Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **Equipment** | GSM mobile phone |
| **Brand Name** | Avvio |
| **Model Name** | Avvio SN52S/SN52 |
| **Marketing Name** | Avvio SN52S/SN52 |
| **FCC ID** | WVBASN52 |
| **EUT supports Radios application** | GSM/GPRS/WLAN 11bgn/Bluetooth 3.0 EDR |
| **HW Version** | V298_MB_V1.0 |
| **SW Version** | ZV298PAC_057A_V0_0_1 |
| **EUT Stage** | Identical Prototype |

**Remark:**

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two different types of EUT. They are single SIM card mobile (Model Name: Avvio SN52) and dual SIM card mobile (Model Name: Avvio SN52S). The others are the same including circuit design, PCB board, structure and all components. It is special to declare. After pre-scan two types of EUT, we found test result of the sample that dual SIM was the worst, so we choose dual SIM card mobile to perform all tests.

| Product Specification subjective to this standard | |
|---|---|
| **Tx Frequency** | GSM850: 824.2 MHz ~ 848.8 MHz<br>GSM1900: 1850.2 MHz ~ 1909.8MHz |
| **Rx Frequency** | GSM850: 869.2 MHz ~ 893.8 MHz<br>GSM1900: 1930.2 MHz ~ 1989.8 MHz |
| **Maximum Output Power to Antenna** | GSM850 : 31.67 dBm<br>GSM1900 : 29.83 dBm |
| **Antenna Type** | PIFA Antenna |
| **Type of Modulation** | GSM: GMSK<br>GPRS: GMSK<br>EDGE: 8PSK (Downlink only) |

## 1.4 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

| FCC Rule | System | Type of Modulation | Maximum ERP/EIRP (W) | Frequency Tolerance (%, Hz, ppm) | Emission Designator |
|---|---|---|---|---|---|
| Part 22 | GSM850 GSM | GMSK | 0.3357 | 0.03 ppm | 248KGXW |
| Part 24 | GSM1900 GSM | GMSK | 0.4932 | 0.03 ppm | 250KGXW |

## 1.5 Testing Site

| | | | |
|---|---|---|---|
| **Test Site** | SPORTON INTERNATIONAL (KUNSHAN) INC. | | |
| **Test Site Location** | No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.<br>TEL: +86-0512-5790-0158<br>FAX: +86-0512-5790-0958 | | |
| **Test Site No.** | **Sporton Site No.** | | **FCC/IC Registration No.** |
| | TH01-KS | 03CH01-KS | 149928/4086E-1 |

## 1.6 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 v01
- IC RSS-132 Issue 2
- IC RSS-133 Issue 5

**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 | R&S | CMU200 | N/A | N/A | Unshielded, 1.8 m |
| 2. | DC Power Supply | GWINSTEK | GPS-3030D | N/A | N/A | Unshielded, 1.8 m |

# 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 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** | ■ GSM Link | ■ GSM Link |
| **GSM 1900** | ■ GSM Link | ■ GSM Link |

**Note:**

**1.** The maximum power level is GSM mode for GMSK link, only this mode was used for all tests.

**2.** Because there are individual antennas for each WWAN, WLAN, and Bluetooth, the co-location test modes are not required.

**The conducted power tables are as follows:**

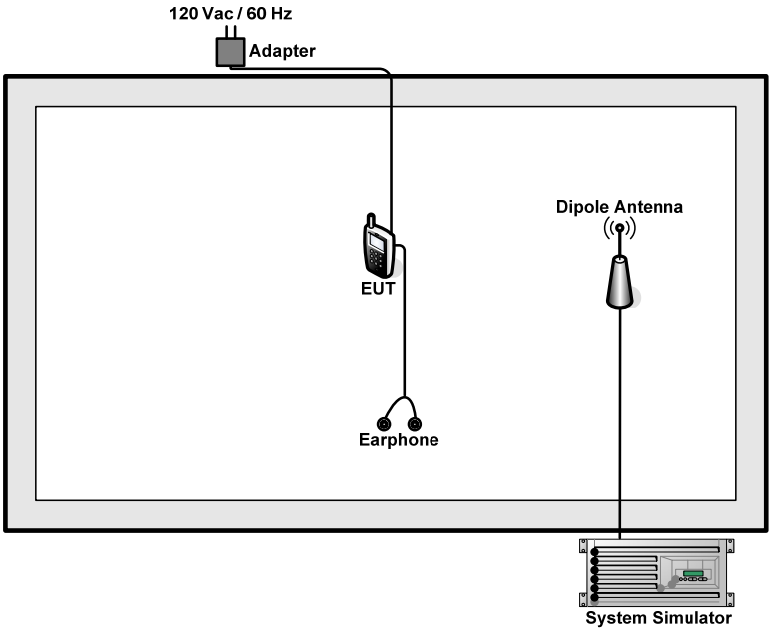
**For SIM 1**

| 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** |
| **GSM** | **31.67** | 31.64 | 31.60 | 29.16 | 29.53 | **29.83** |
| **GPRS 8** | 31.62 | 31.59 | 31.55 | 29.12 | 29.50 | 29.80 |
| **GPRS 10** | 31.50 | 31.49 | 31.45 | 28.42 | 28.83 | 29.17 |

**For SIM 2**

| 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** |
| **GSM** | **31.63** | 31.61 | 31.58 | 29.16 | 29.53 | **29.83** |
| **GPRS 8** | 31.61 | 31.59 | 31.55 | 29.11 | 29.50 | 29.80 |
| **GPRS 10** | 31.50 | 31.49 | 31.45 | 28.42 | 28.82 | 29.17 |

## 2.2 Connection Diagram of Test System



# 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.

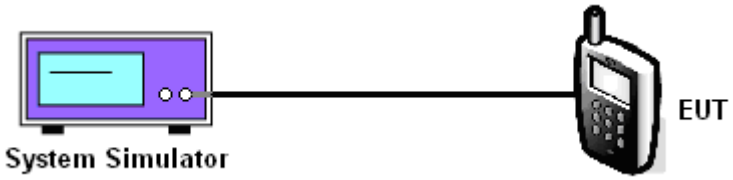
### 3.1.2 Measuring Instruments

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 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 (GSM)** | | |
| **Channel** | **128 (Low)** | **189 (Mid)** | **251 (High)** |
| **Frequency (MHz)** | **824.2** | **836.4** | **848.8** |
| **Conducted Power (dBm)** | 31.67 | 31.64 | 31.60 |
| **Conducted Power (Watts)** | 1.47 | 1.46 | 1.45 |

| PCS Band | | | |
|---|---|---|---|
| **Modes** | **GSM1900 (GSM)** | | |
| **Channel** | **512 (Low)** | **661 (Mid)** | **810 (High)** |
| **Frequency (MHz)** | **1850.2** | **1880** | **1909.8** |
| **Conducted Power (dBm)** | 29.16 | 29.53 | 29.83 |
| **Conducted Power (Watts)** | 0.82 | 0.90 | 0.96 |

**Note:** maximum burst average power for GSM.

## 3.2 Peak-to-Average Ratio

### 3.2.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

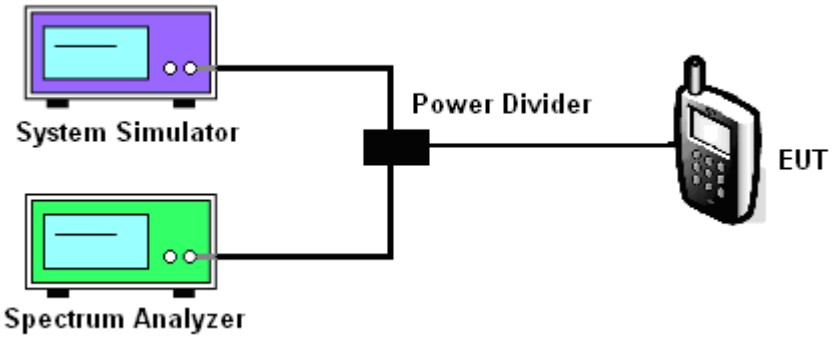
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. For GSM/EGPRS operating modes:
   a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.
   b. Set EUT in maximum power output, and triggered the burst signal.
   c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.
3. For UMTS operating modes:
   a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
   b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

### 3.2.4 Test Setup



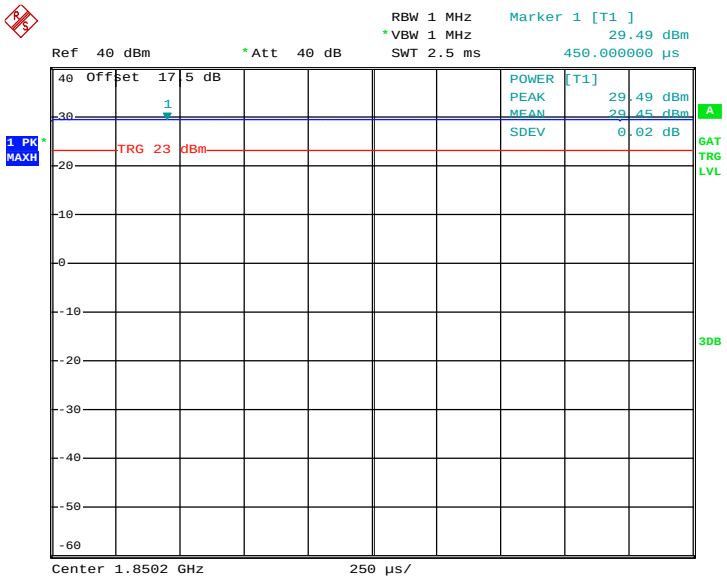

### 3.2.5 Test Result of Peak-to-Average Ratio

| PCS Band | | | |
|---|---|---|---|
| **Modes** | **GSM1900 (GSM)** | | |
| **Channel** | **512 (Low)** | **661 (Mid)** | **810 (High)** |
| **Frequency (MHz)** | **1850.2** | **1880** | **1909.8** |
| **Peak-to-Average Ratio (dB)** | 0.04 | 0.04 | 0.03 |

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

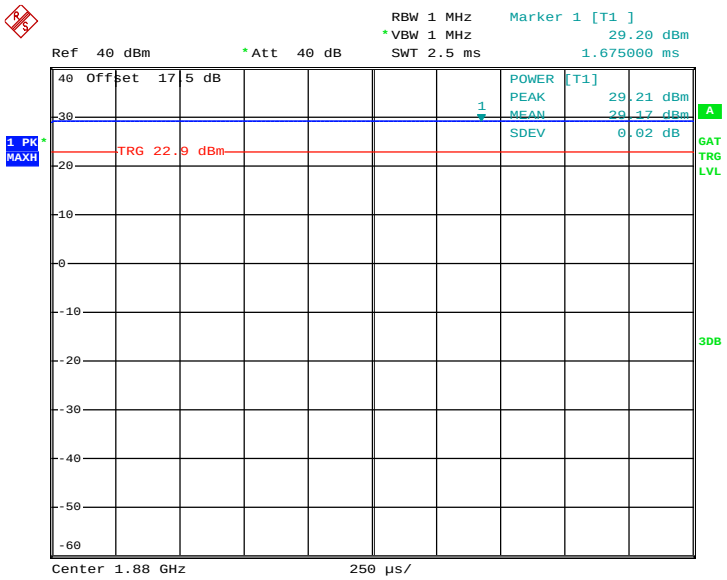
| Band : | GSM 1900 | Test Mode : | GSM Link |
|---|---|---|---|

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



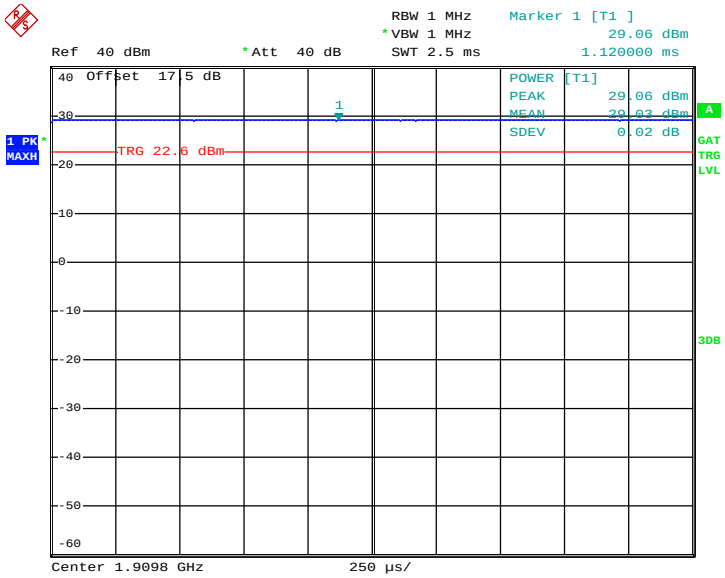

Date: 27.SEP.2012 06:56:17

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




Date: 27.SEP.2012 06:55:43

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

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## 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 v01. The ERP of mobile transmitters must not exceed 7 Watts and the EIRP of mobile transmitters are limited to 2 Watts.

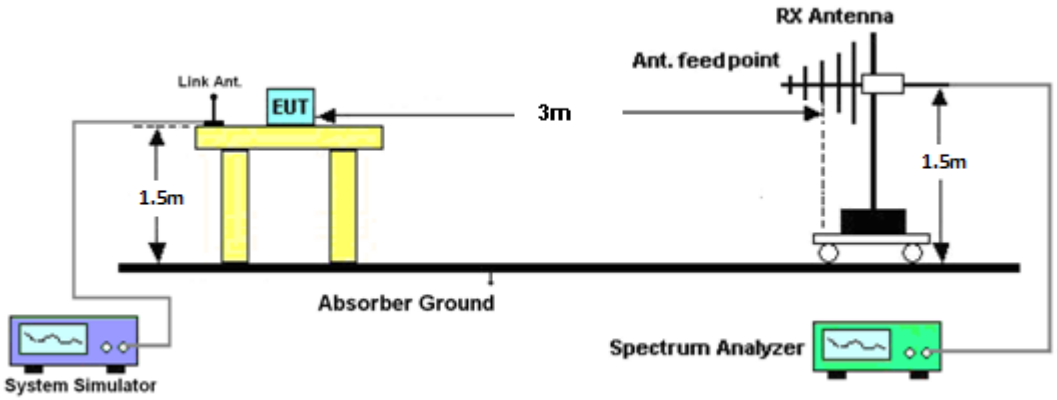
### 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.3.3 Test Procedures

1. The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
2. The EUT was set at 3 meter from the receiving antenna, which was mounted on the antenna tower.
3. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst;
   UMTS operating modes: Set RBW= 100 KHz, VBW= 300 KHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per section 4.0 of KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
6. Taking the record of maximum ERP/EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10. ERP/EIRP = Ps + Et – Es + Gs = Ps + Rt – Rs + Gs
    Ps (dBm)：Input power to substitution antenna.
    Gs (dBi or dBd)：Substitution antenna Gain.
    Et = Rt + AF
    Es = Rs + AF
    AF (dB/m)：Receive antenna factor
    Rt：The highest received signal in spectrum analyzer for EUT.
    Rs：The highest received signal in spectrum analyzer for substitution antenna.

### 3.3.4 Test Setup



### 3.3.5 Test Result of ERP

| GSM850 (GSM) Radiated Power ERP | | | | | | |
|---|---|---|---|---|---|---|
| Horizontal Polarization | | | | | | |
| **Frequency (MHz)** | **Rt (dBm)** | **Rs (dBm)** | **Ps (dBm)** | **Gs (dBd)** | **ERP (dBm)** | **ERP (W)** |
| 824.20 | -22.24 | -48.12 | 0.00 | -1.08 | 24.80 | 0.3020 |
| 836.40 | -22.26 | -48.28 | 0.00 | -0.93 | 25.09 | 0.3228 |
| 848.80 | -22.33 | -48.35 | 0.00 | -0.76 | 25.26 | 0.3357 |
| Vertical Polarization | | | | | | |
| **Frequency (MHz)** | **Rt (dBm)** | **Rs (dBm)** | **Ps (dBm)** | **Gs (dBd)** | **ERP (dBm)** | **ERP (W)** |
| 824.20 | -30.89 | -47.97 | 0.00 | -1.08 | 16.00 | 0.0398 |
| 836.40 | -30.68 | -48.01 | 0.00 | -0.93 | 16.40 | 0.0437 |
| 848.80 | -30.34 | -48.05 | 0.00 | -0.76 | 16.95 | 0.0495 |

### 3.3.6 Test Result of EIRP

| GSM1900 (GSM) Radiated Power EIRP | | | | | | |
|---|---|---|---|---|---|---|
| Horizontal Polarization | | | | | | |
| **Frequency (MHz)** | **Rt (dBm)** | **Rs (dBm)** | **Ps (dBm)** | **Gs (dBi)** | **EIRP (dBm)** | **EIRP (W)** |
| 1850.20 | -27.96 | -51.88 | 0.00 | 1.96 | 25.88 | 0.3873 |
| 1880.00 | -28.38 | -52.99 | 0.00 | 2.00 | 26.61 | 0.4581 |
| 1909.80 | -29.79 | -54.28 | 0.00 | 1.98 | 26.47 | 0.4436 |
| Vertical Polarization | | | | | | |
| **Frequency (MHz)** | **Rt (dBm)** | **Rs (dBm)** | **Ps (dBm)** | **Gs (dBi)** | **EIRP (dBm)** | **EIRP (W)** |
| 1850.20 | -28.27 | -52.13 | 0.00 | 1.96 | 25.82 | 0.3819 |
| 1880.00 | -28.24 | -53.17 | 0.00 | 2.00 | 26.93 | 0.4932 |
| 1909.80 | -29.36 | -54.13 | 0.00 | 1.98 | 26.75 | 0.4732 |

## 3.4 Occupied Bandwidth and 26dB Bandwidth Measurement

### 3.4.1 Description of Occupied Bandwidth and 26dB 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.

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.

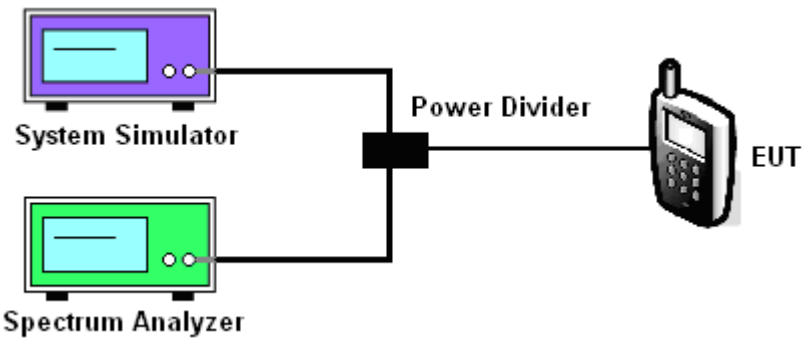
### 3.4.2 Measuring Instruments

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 99% occupied bandwidth and 26 dB bandwidth of the middle channel for the highest RF powers were measured.

### 3.4.4 Test Setup



### 3.4.5 Test Result of Occupied Bandwidth and 26dB Bandwidth

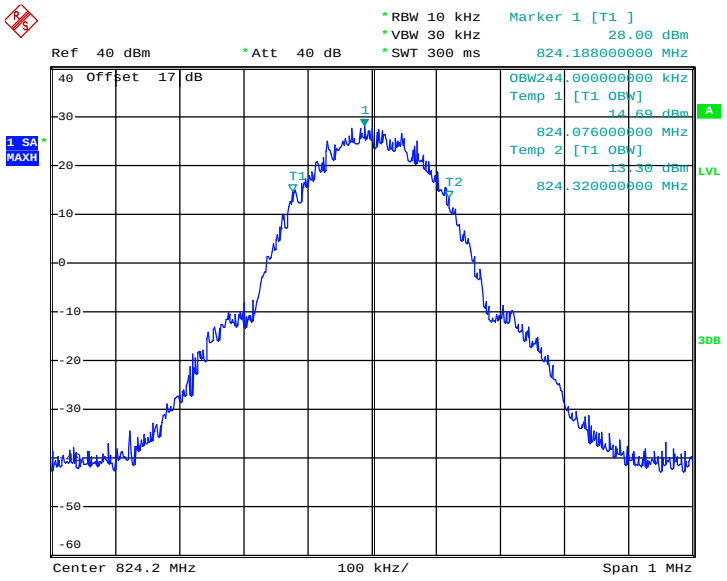
| Cellular Band | | | |
|---|---|---|---|
| **Modes** | **GSM850 (GSM)** | | |
| **Channel** | **128 (Low)** | **189 (Mid)** | **251 (High)** |
| **Frequency (MHz)** | **824.2** | **836.4** | **848.8** |
| **99% OBW (KHz)** | 244.00 | 248.00 | 244.00 |
| **26dB BW (KHz)** | 312.00 | 314.00 | 312.00 |

| PCS Band | | | |
|---|---|---|---|
| **Modes** | **GSM1900 (GSM)** | | |
| **Channel** | **512 (Low)** | **661 (Mid)** | **810 (High)** |
| **Frequency (MHz)** | **1850.2** | **1880** | **1909.8** |
| **99% OBW (KHz)** | 244.00 | 244.00 | 250.00 |
| **26dB BW (KHz)** | 312.00 | 312.00 | 314.00 |

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

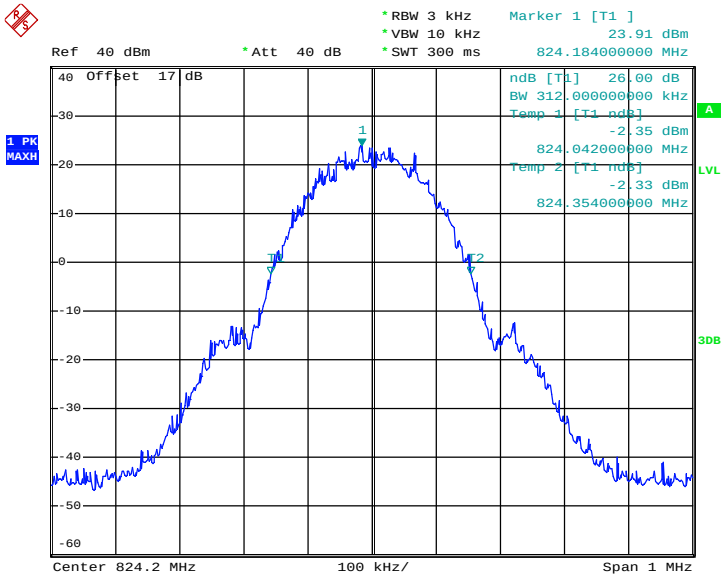
| Band : | GSM 850 | Test Mode : | GSM Link |
|---|---|---|---|

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



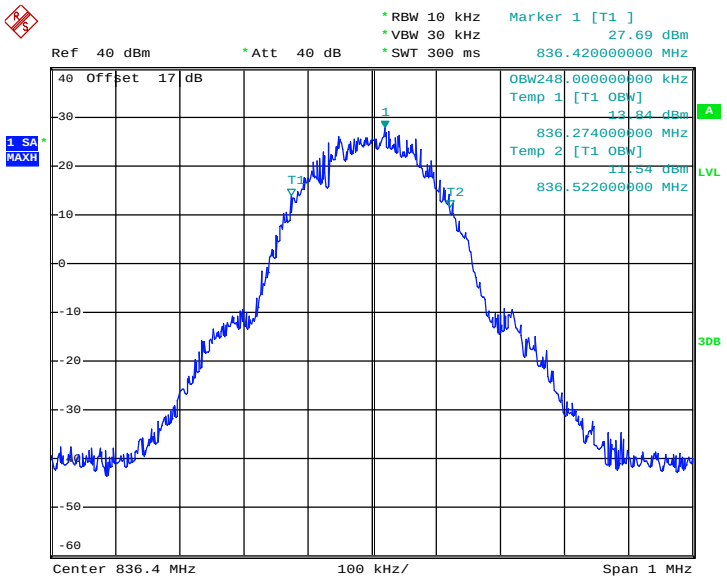

Date: 10.OCT.2012 23:07:03

**26dB Bandwidth Plot on Channel 128 (824.2 MHz)**



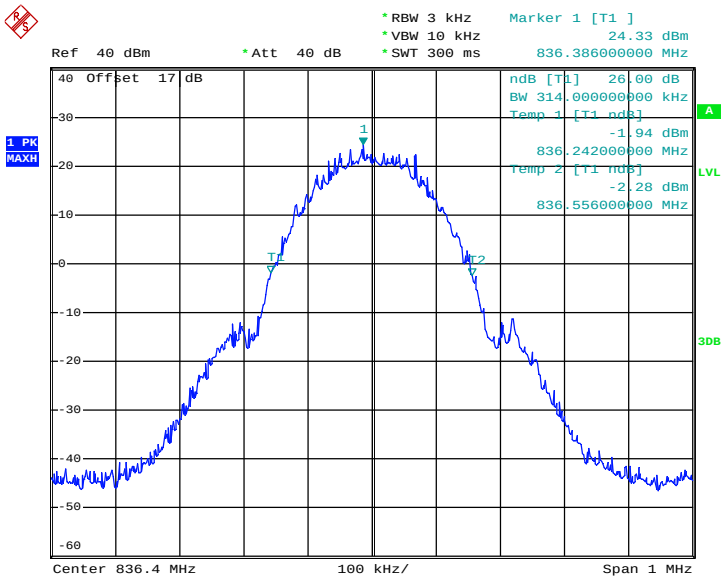

Date: 10.OCT.2012 22:43:40

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



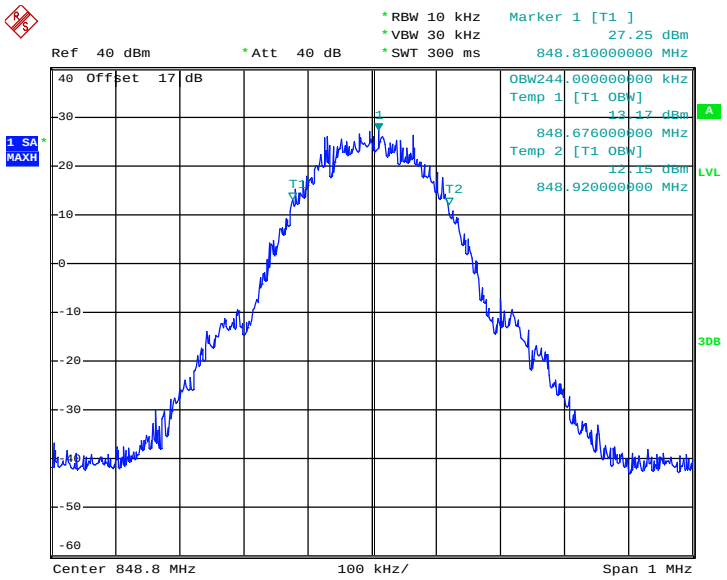

Date: 10.OCT.2012 22:46:11

## 26dB Bandwidth Plot on Channel 189 (836.4 MHz)



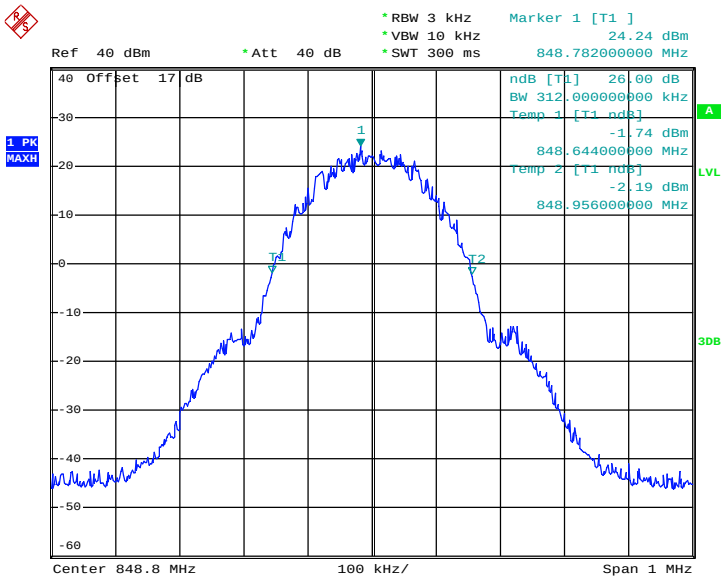

Date: 10.OCT.2012 22:42:52

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




Date: 10.OCT.2012 22:47:09

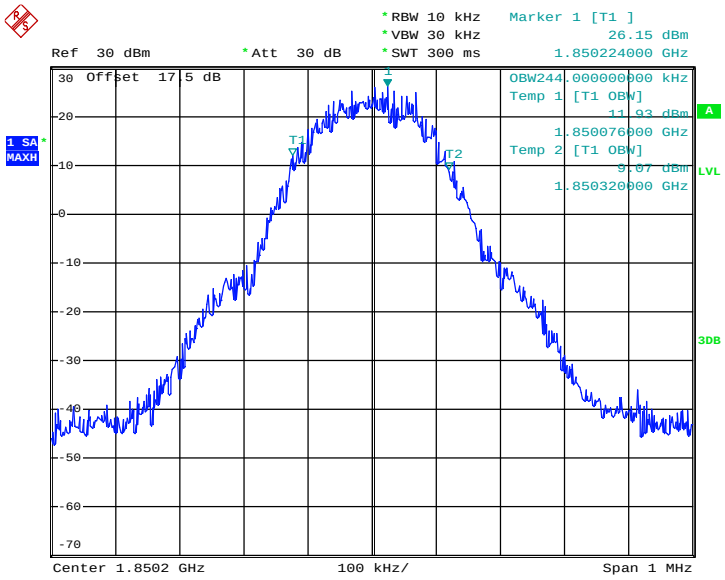
## 26dB Bandwidth Plot on Channel 251 (848.8 MHz)




Date: 10.OCT.2012 23:05:14

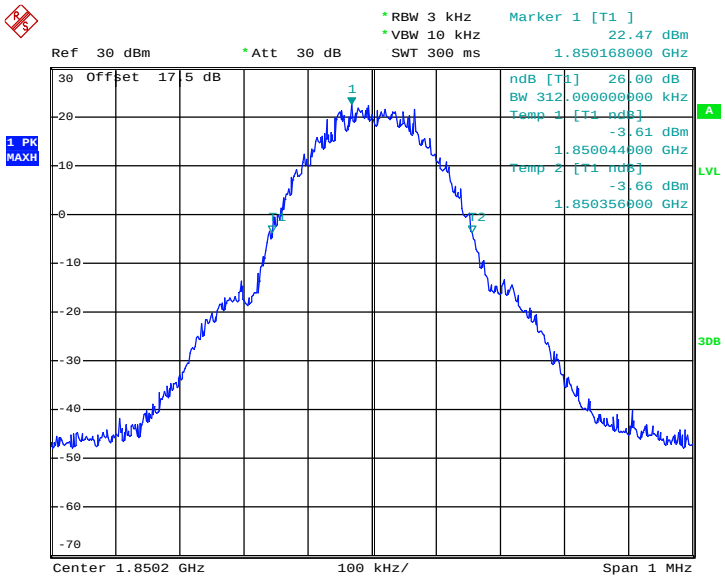
| Band : | GSM 1900 | Test Mode : | GSM Link |
|---|---|---|---|

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



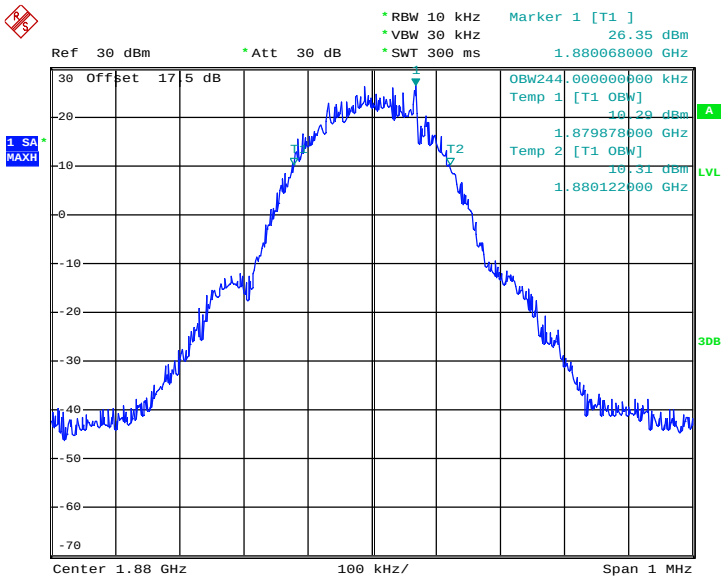

Date: 27.SEP.2012 06:40:27

**26dB Bandwidth Plot on Channel 512 (1850.2 MHz)**



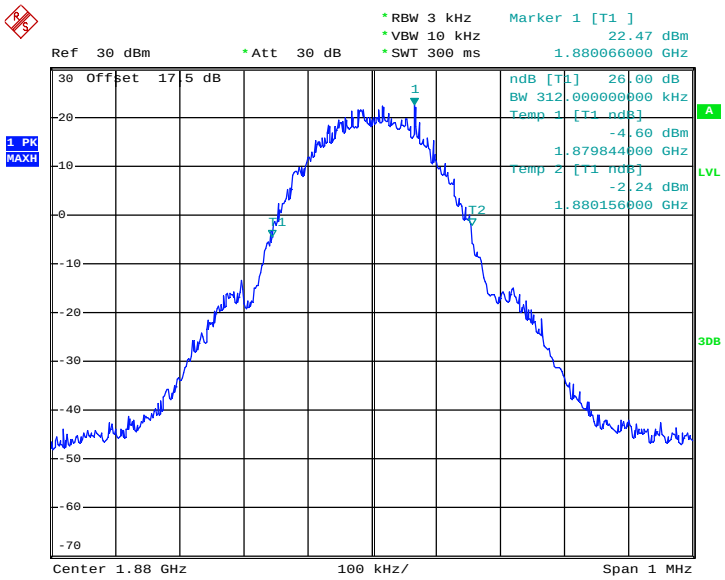

Date: 27.SEP.2012 06:30:24

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



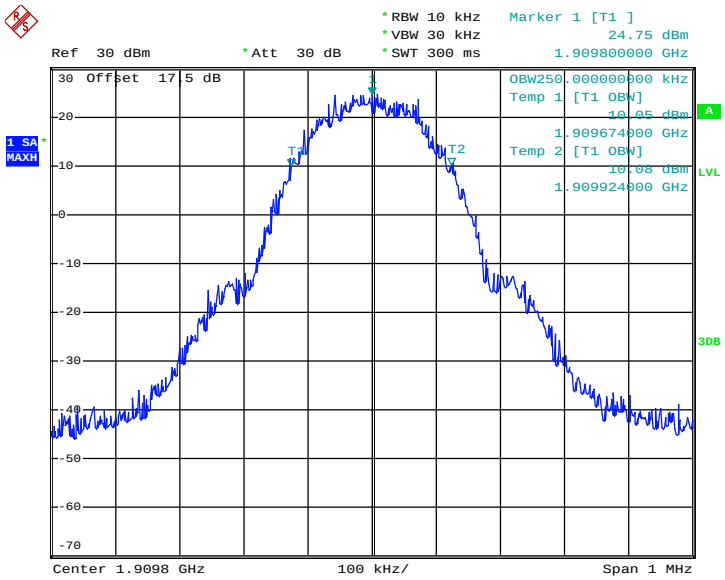

Date: 27.SEP.2012 06:39:35

## 26dB Bandwidth Plot on Channel 661 (1880.0 MHz)



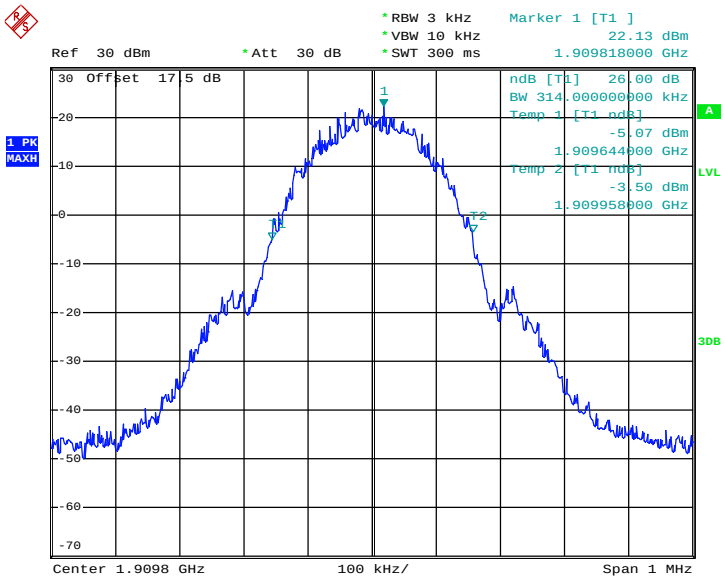

Date: 27.SEP.2012 06:31:46

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




Date: 27.SEP.2012 06:35:04

## 26dB Bandwidth Plot on Channel 810 (1909.8 MHz)




Date: 27.SEP.2012 06:32:43

# 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.

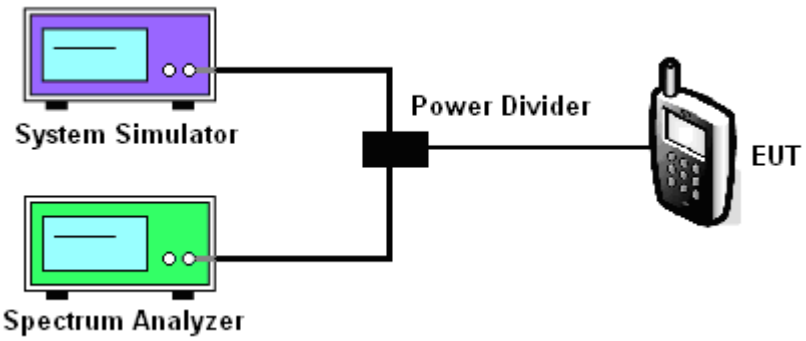
## 3.5.2 Measuring Instruments

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 band edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.

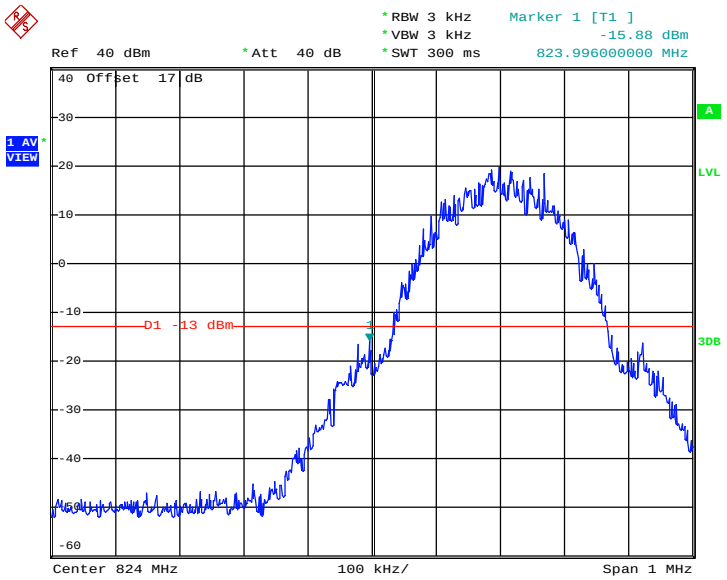
## 3.5.4 Test Setup



### 3.5.5 Test Result (Plots) of Conducted Band Edge

| Band : | GSM850 | Test Mode : | GSM Link |
|---|---|---|---|
| Correction Factor : | 0.20dB | Maximum 26dB Bandwidth : | 0.314MHz |
| Band Edge : | -15.68dBm | Measurement Value : | -15.88dBm |

**Lower Band Edge Plot on Channel 128 (824.2 MHz)**



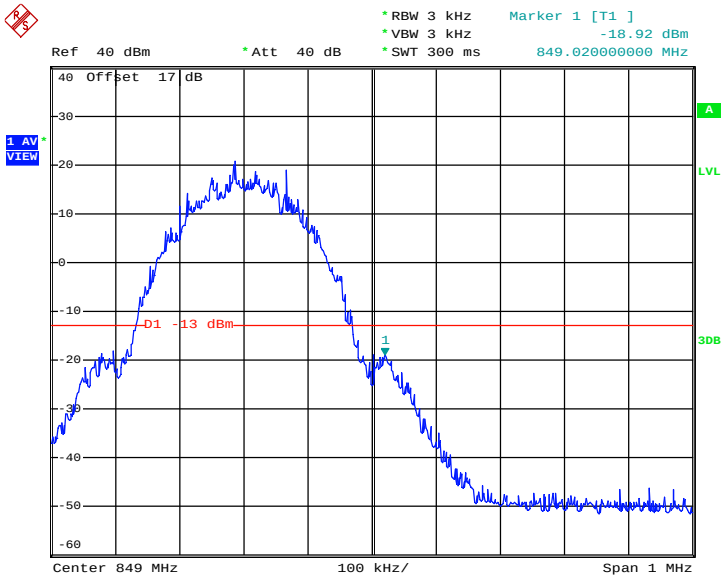

*1. Correction Factor(dB)= 10log(1% Emission BW/RBW)*

*2. Band Edge= Measurement Value + Correction Factor(dB)*

*For example, -15.88dBm + 0.20dB = -15.68dBm*

| Band : | GSM850 | Test Mode : | GSM Link |
|---|---|---|---|
| Correction Factor : | 0.20dB | Maximum 26dB Bandwidth : | 0.314MHz |
| Band Edge : | -18.72dBm | Measurement Value : | -18.92dBm |

**Higher Band Edge Plot on Channel 251 (848.8 MHz)**



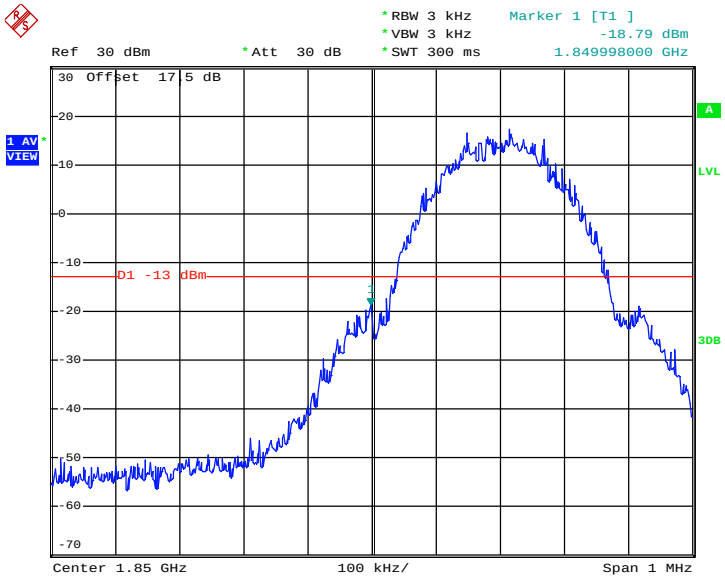

Date: 10.OCT.2012 22:49:09

*1. Correction Factor(dB)= 10log(1% Emission BW/RBW)*

*2. Band Edge= Measurement Value + Correction Factor(dB)*

| Band : | GSM1900 | Test Mode : | GSM Link |
|---|---|---|---|
| Correction Factor : | 0.20dB | Maximum 26dB Bandwidth : | 0.314MHz |
| Band Edge : | -18.59dBm | Measurement Value : | -18.79dBm |

**Lower Band Edge Plot on Channel 512 (1850.2 MHz)**

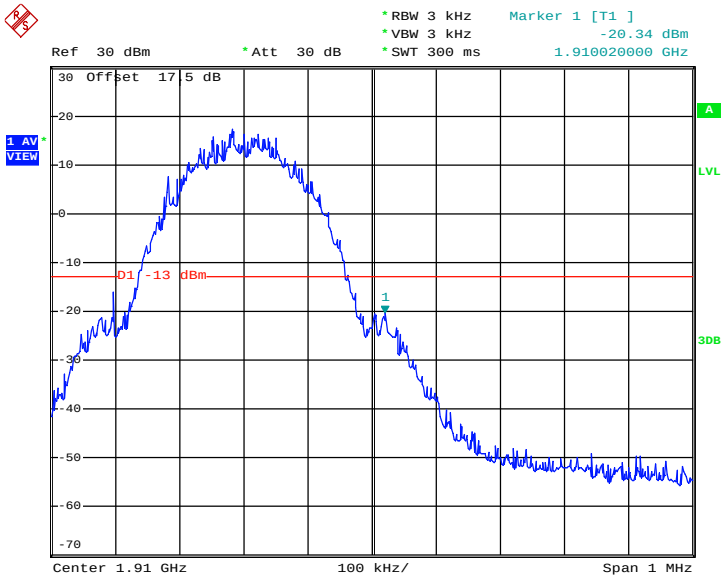



*1. Correction Factor(dB)= 10log(1% Emission BW/RBW)*

*2. Band Edge= Measurement Value + Correction Factor(dB)*

| Band : | GSM1900 | Test Mode : | GSM Link |
|---|---|---|---|
| Correction Factor : | 0.20dB | Maximum 26dB Bandwidth : | 0.314MHz |
| Band Edge : | -20.14dBm | Measurement Value : | -20.34dBm |

**Higher Band Edge Plot on Channel 810 (1909.8 MHz)**




Date: 27.SEP.2012 06:46:35

*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 10$^{th}$ harmonic.

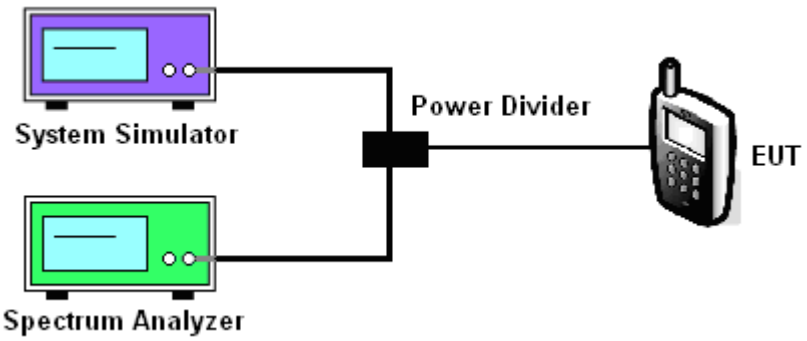
## 3.6.2 Measuring Instruments

See list of measuring instruments 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 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.

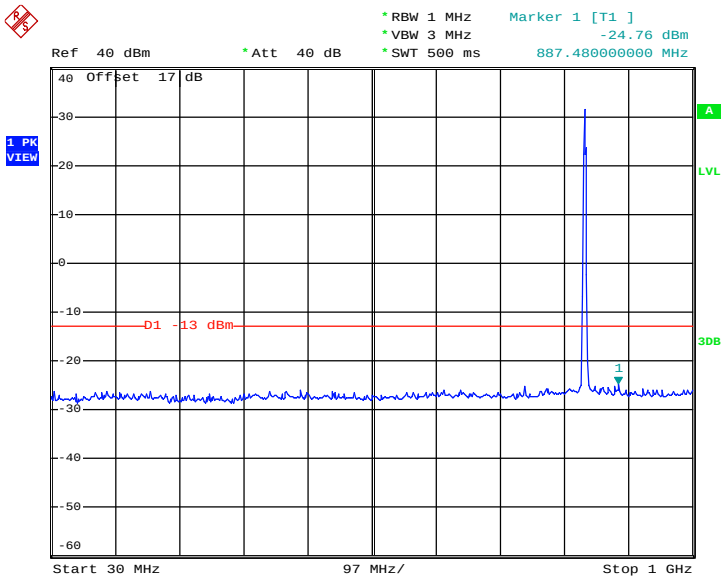
## 3.6.4 Test Setup



## 3.6.5 Test Result (Plots) of Conducted Spurious Emission

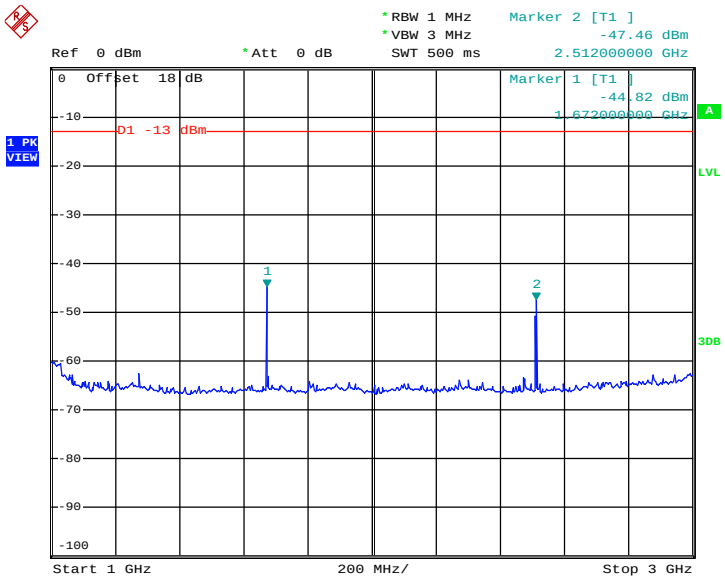
| Band : | GSM850 | Channel : | CH189 |
|---|---|---|---|
| Test Mode : | GSM Link | Frequency : | 836.4 MHz |

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



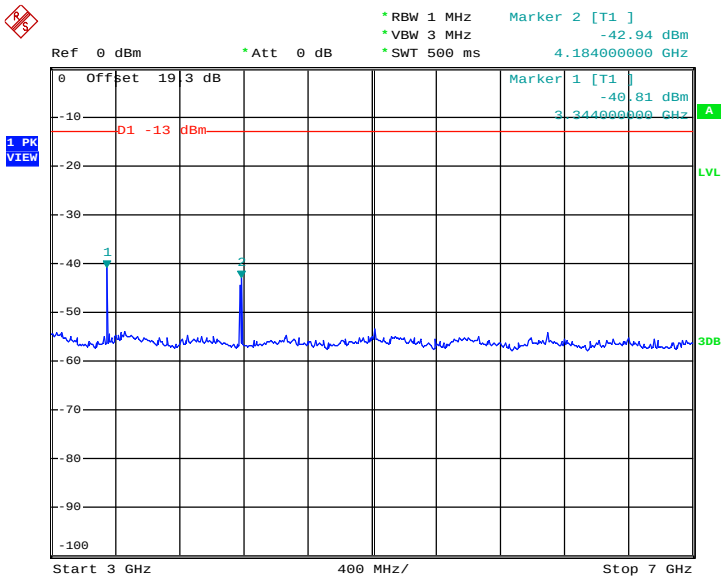

Date: 10.OCT.2012 22:53:11

**Conducted Spurious Emission Plot between 1GHz ~ 3GHz**



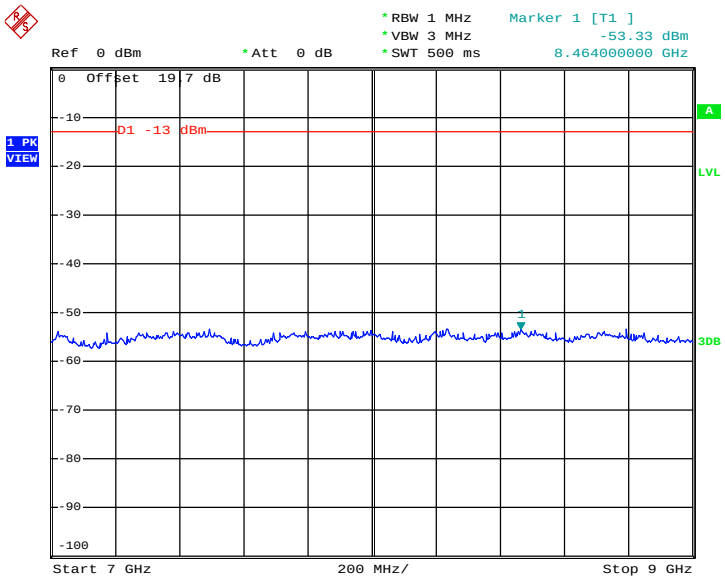

Date: 28.SEP.2012 03:08:03

## Conducted Spurious Emission Plot between 3GHz ~ 7GHz




Date: 28.SEP.2012 03:09:29

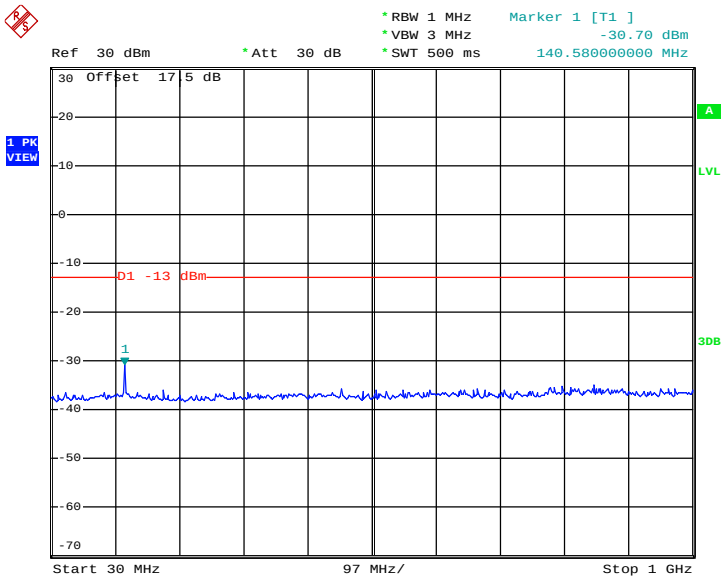
## Conducted Spurious Emission Plot between 7GHz ~ 9GHz




Date: 28.SEP.2012 03:10:49

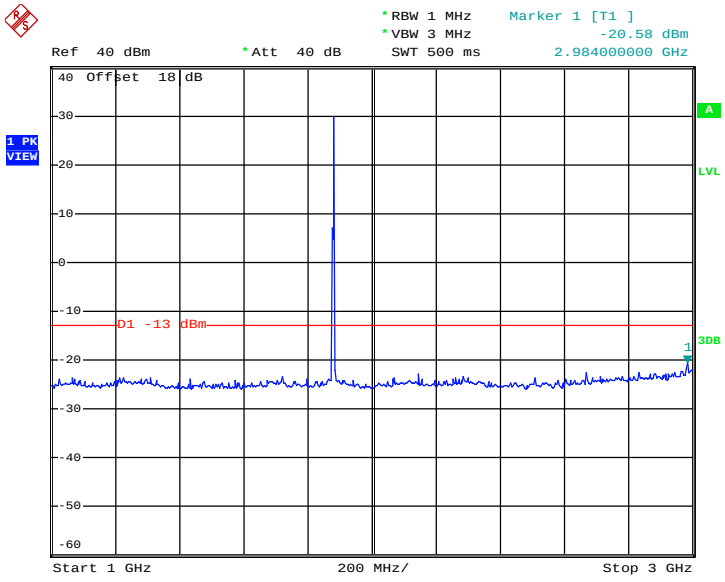
| Band : | GSM1900 | Channel : | CH661 |
|---|---|---|---|
| Test Mode : | GSM Link | Frequency : | 1880.0 MHz |

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



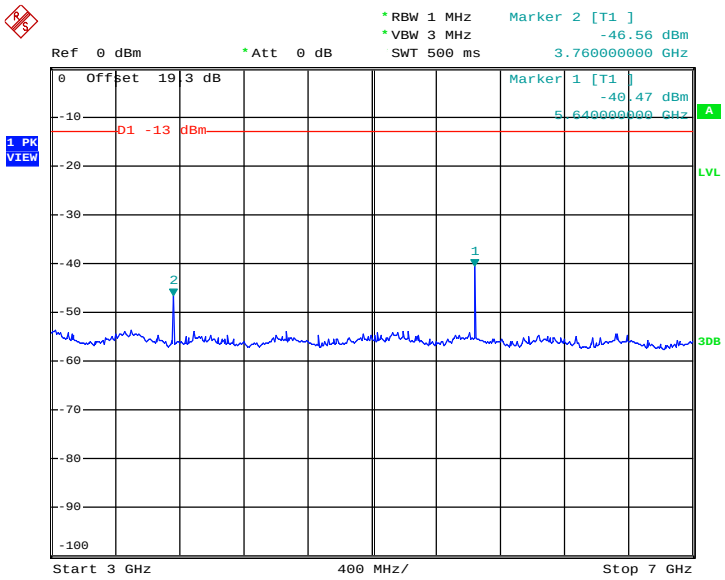

Date: 27.SEP.2012 07:00:59

**Conducted Spurious Emission Plot between 1GHz ~ 3GHz**



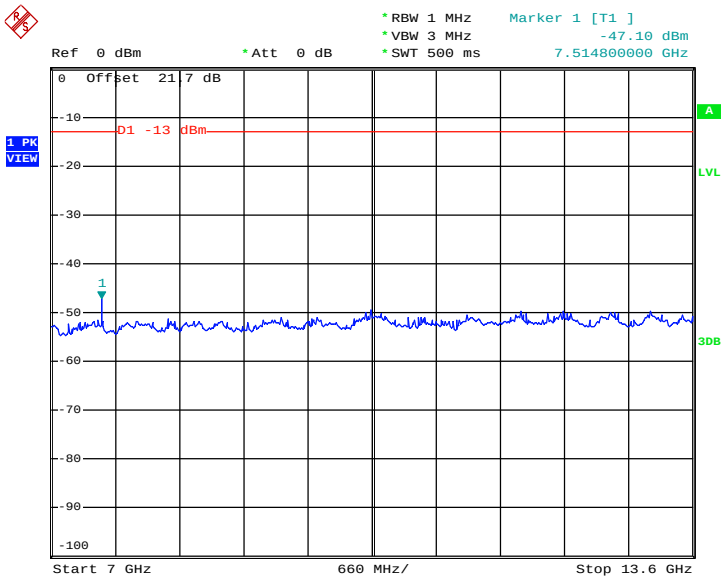

Date: 27.SEP.2012 07:21:56

## Conducted Spurious Emission Plot between 3GHz ~ 7GHz



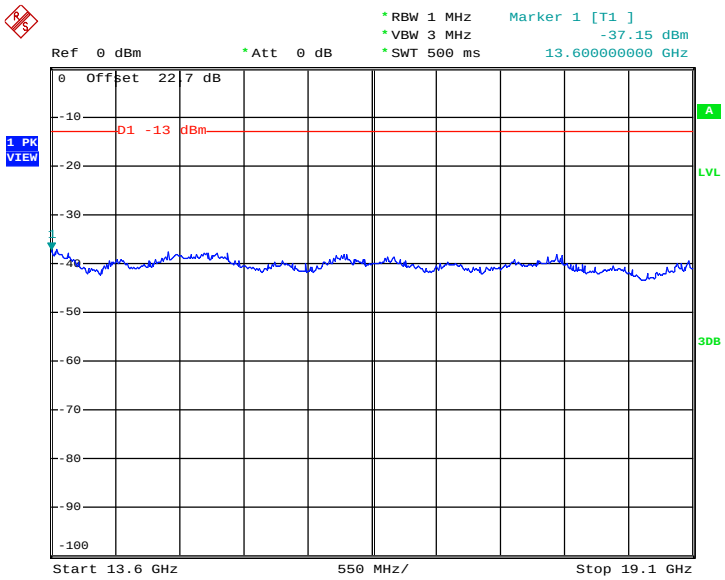

Date: 27.SEP.2012 07:27:41

## Conducted Emission Plot between 7GHz ~ 13.6GHz




Date: 27.SEP.2012 07:29:05

## Conducted Spurious Emission Plot between 13.6GHz ~ 19.1GHz




Date: 27.SEP.2012 07:30:39

# 3.7 Field Strength of Spurious Radiation Measurement

## 3.7.1 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.

## 3.7.2 Measuring Instruments

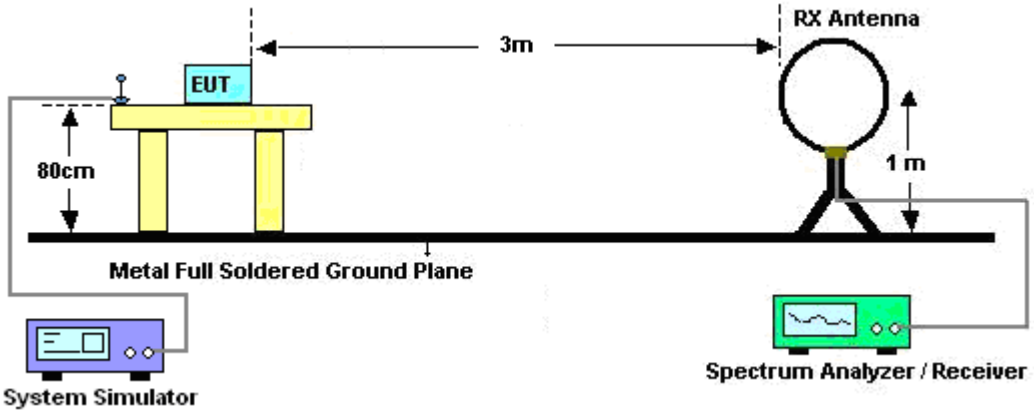
See list of measuring instruments of this test report.

## 3.7.3 Test Procedures

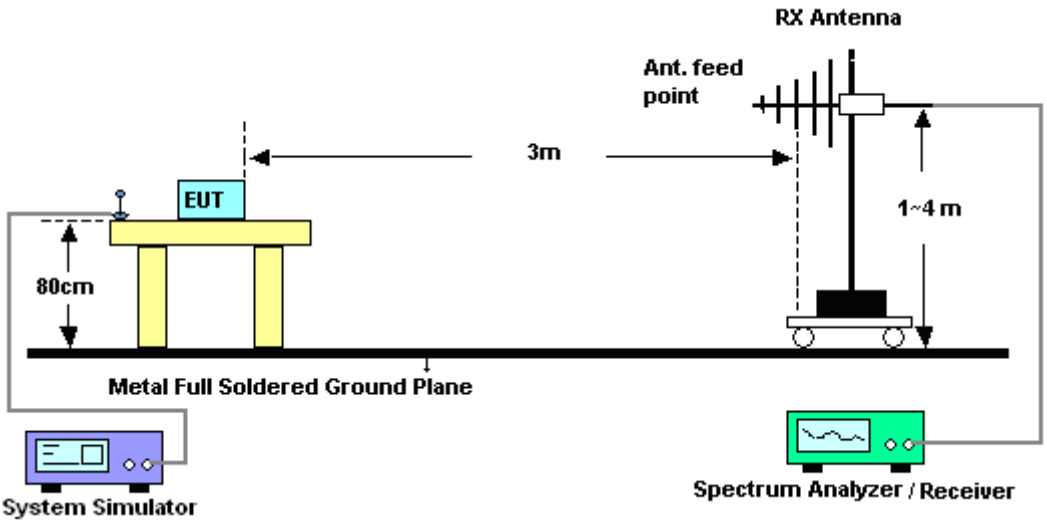
1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving 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. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15

### 3.7.4 Test Setup

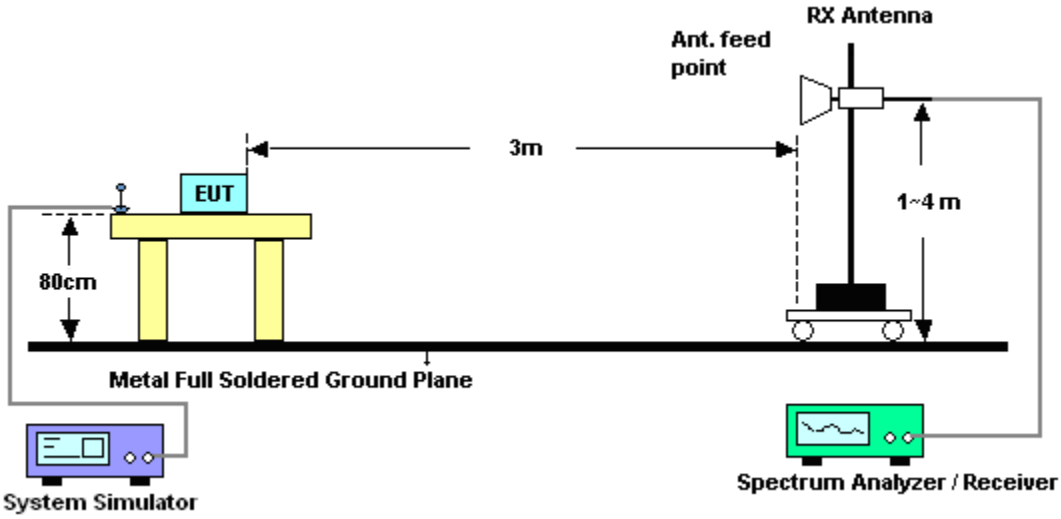
**For radiated emissions below 30MHz**




**For radiated emissions from 30MHz to 1GHz**



**For radiated emissions above 1GHz**

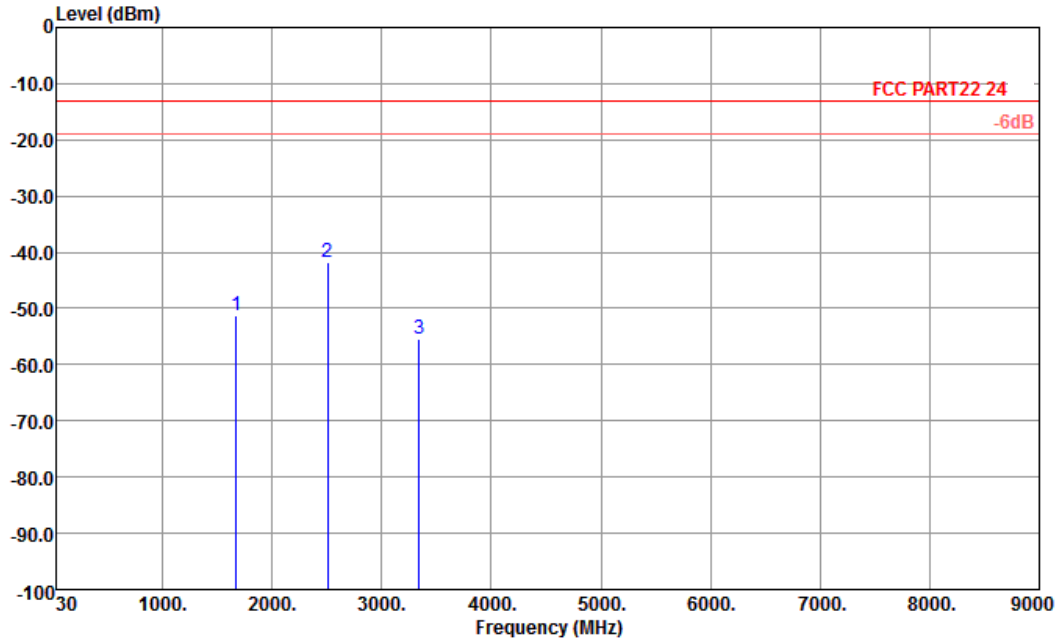



## 3.7.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

### 3.7.6 Test Result of Field Strength of Spurious Radiated

| | | | |
|---|---|---|---|
| **Band :** | GSM850 | **Temperature :** | 23~25°C |
| **Test Mode :** | GSM Link | **Relative Humidity :** | 41~44% |
| **Test Engineer :** | Steven Hao | **Polarization :** | Horizontal |
| **Remark :** | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |

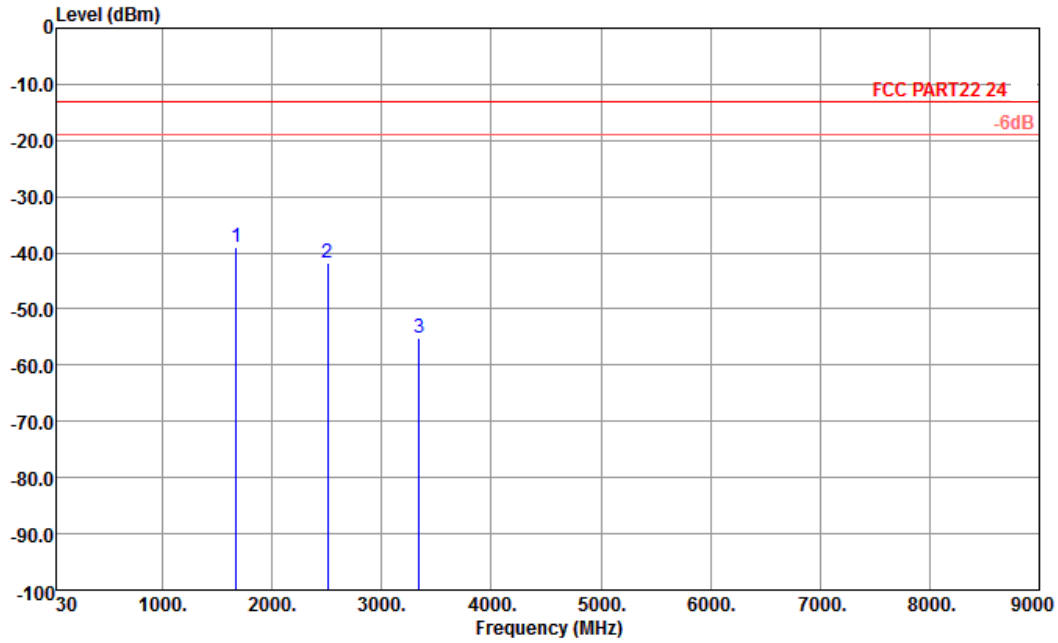



Site : 03CH01-KS
Condition : FCC PART22 24 HF EIRP FACTOR-09020 HORIZONTAL
Project : (FG) 291206

Plan : H

| 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 | -51.20 | -13 | -38.20 | -50.86 | -51.93 | 1.2 | 4.08 | H | Pass |
| 2509 | -41.92 | -13 | -28.92 | -48.46 | -44.45 | 1.55 | 6.23 | H | Pass |
| 3345 | -55.32 | -13 | -42.32 | -60.50 | -58.50 | 2.1 | 7.43 | H | Pass |

| Band : | GSM850 | Temperature : | 23~25°C |
|---|---|---|---|
| Test Mode : | GSM Link | Relative Humidity : | 41~44% |
| Test Engineer : | Steven Hao | Polarization : | Vertical |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |

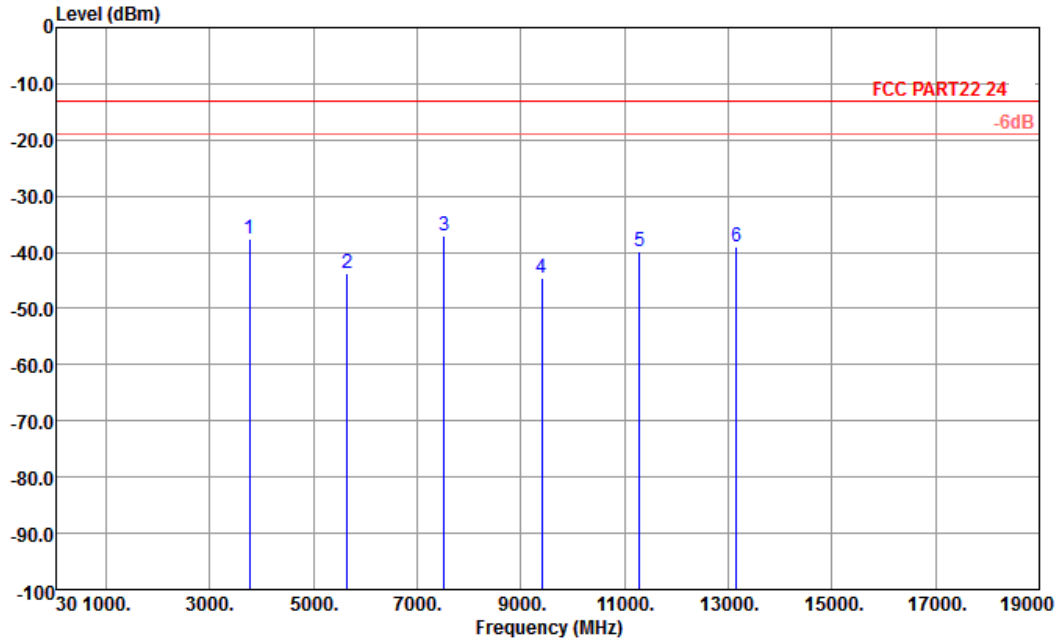



Site : 03CH01-KS
Condition : FCC PART22 24 HF EIRP FACTOR-09020 VERTICAL
Proiect : (FG) 291206

Plan : H

| 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 | -39.12 | -13 | -26.12 | -40.80 | -39.85 | 1.20 | 4.08 | V | Pass |
| 2509 | -41.77 | -13 | -28.77 | -48.34 | -44.30 | 1.55 | 6.23 | V | Pass |
| 3345 | -55.03 | -13 | -42.03 | -59.93 | -58.21 | 2.10 | 7.43 | V | Pass |

| Band : | GSM1900 | Temperature : | 23~25°C |
|---|---|---|---|
| Test Mode : | GSM Link | Relative Humidity : | 41~44% |
| Test Engineer : | Steven Hao | Polarization : | Horizontal |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |

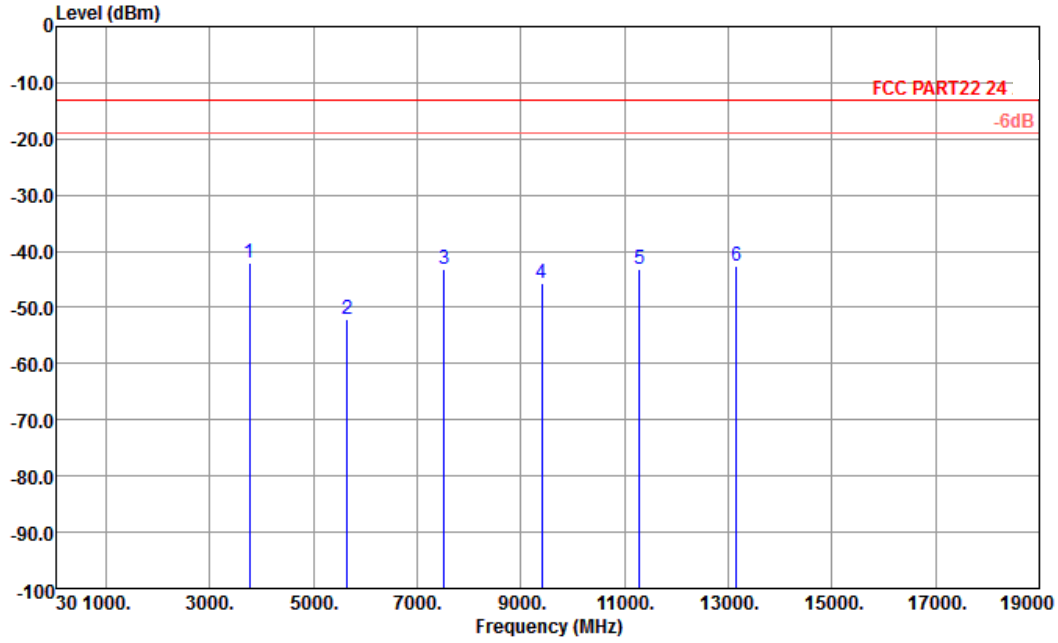



Site : 03CH01-KS
Condition : FCC PART22 24 HF EIRP FACTOR-09020 HORIZONTAL
Project : (FG) 291206

Plan : E1

| 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 | -37.66 | -13 | -24.66 | -50.39 | -43.06 | 2.51 | 7.91 | H | Pass |
| 5640 | -43.84 | -13 | -30.84 | -59.59 | -50.88 | 3.09 | 10.13 | H | Pass |
| 7520 | -37.10 | -13 | -24.10 | -59.07 | -45.57 | 3.11 | 11.58 | H | Pass |
| 9400 | -44.62 | -13 | -31.62 | -63.71 | -54.08 | 3.07 | 12.53 | H | Pass |
| 11280 | -39.93 | -13 | -26.93 | -65.38 | -48.79 | 3.98 | 12.84 | H | Pass |
| 13160 | -39.05 | -13 | -26.05 | -66.16 | -47.13 | 4.73 | 12.81 | H | Pass |

| Band : | GSM1900 | Temperature : | 23~25°C |
|---|---|---|---|
| Test Mode : | GSM Link | Relative Humidity : | 41~44% |
| Test Engineer : | Steven Hao | Polarization : | Vertical |
| Remark : | Spurious emissions within 30-1000MHz were found more than 20dB below limit line. | | |




Site : 03CH01-KS
Condition : FCC PART22 24 HF EIRP FACTOR-09020 VERTICAL
Project : (FG) 291206

Plan : E1

| 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 | -41.95 | -13 | -28.95 | -52.09 | -47.35 | 2.51 | 7.91 | V | Pass |
| 5640 | -51.96 | -13 | -38.96 | -62.89 | -59.00 | 3.09 | 10.13 | V | Pass |
| 7520 | -43.15 | -13 | -30.15 | -61.75 | -51.62 | 3.11 | 11.58 | V | Pass |
| 9400 | -45.75 | -13 | -32.75 | -63.91 | -55.21 | 3.07 | 12.53 | V | Pass |
| 11280 | -43.08 | -13 | -30.08 | -68.8 | -51.94 | 3.98 | 12.84 | V | Pass |
| 13160 | -42.50 | -13 | -29.50 | -68.82 | -50.58 | 4.73 | 12.81 | 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 ±0.00025% (±2.5ppm) of the center frequency.

### 3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

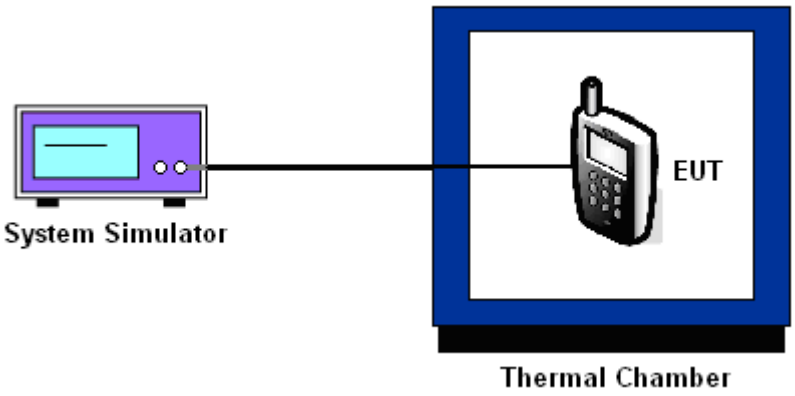
### 3.8.3 Test Procedures for Temperature Variation

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.
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.

### 3.8.4 Test Procedures for Voltage Variation

1. The EUT was placed in a temperature chamber at 25±5° 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) | GSM | | Result |
|---|---|---|---|
| | Freq. Dev. (Hz) | Deviation (ppm) | |
| -30 | -16 | -0.02 | PASS |
| -20 | -14 | -0.02 | |
| -10 | 16 | 0.02 | |
| 0 | 23 | 0.03 | |
| 10 | 27 | 0.03 | |
| 20 | 29 | 0.03 | |
| 30 | -13 | -0.02 | |
| 40 | -16 | -0.02 | |
| 50 | -16 | -0.02 | |
| 60 | -15 | -0.02 | |
| 70 | 21 | 0.02 | |
| 75 | 28 | 0.03 | |

**Note**: The manufacturer declared that the EUT could work properly at temperature 60˚C, 70˚C&75˚C.

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

| Temperature (°C) | GSM | | Result |
|---|---|---|---|
| | Freq. Dev. (Hz) | Deviation (ppm) | |
| -30 | -62 | -0.03 | PASS |
| -20 | -52 | -0.03 | |
| -10 | -32 | -0.02 | |
| 0 | -23 | -0.01 | |
| 10 | 28 | 0.01 | |
| 20 | -32 | -0.02 | |
| 30 | -54 | -0.03 | |
| 40 | -52 | -0.03 | |
| 50 | -51 | -0.03 | |
| 60 | -24 | -0.01 | |
| 70 | 37 | 0.02 | |
| 75 | 36 | 0.02 | |

**Note**: The manufacturer declared that the EUT could work properly at temperature 60˚C, 70˚C&75˚C.

### 3.8.7 Test Result of Voltage Variation

| Band & Channel | Mode | Voltage (Volt) | Freq. Dev. (Hz) | Deviation (ppm) | Limit (ppm) | Result |
|---|---|---|---|---|---|---|
| GSM 850 CH189 | GSM | 3.8 | 16 | 0.02 | 2.5 | PASS |
| | | BEP | 19 | 0.02 | | |
| | | 4.2 | -13 | -0.02 | | |
| GSM 1900 CH661 | GSM | 3.8 | 37 | 0.02 | | |
| | | BEP | 38 | 0.02 | | |
| | | 4.2 | -32 | -0.02 | | |

**Note:**

1. Normal Voltage = 3.8V.
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 | FSP40 | 100319 | 9kHz~40GHz | Dec. 30, 2011 | Sep.27, 2012~ Oct. 10, 2012 | Dec. 29, 2012 | Conducted (TH01-KS) |
| System Simulator | R&S | CMU200 | 837587/066 | 2G Full-Band | Dec. 30, 2011 | Sep.27, 2012~ Oct. 10, 2012 | Dec. 29, 2012 | Conducted (TH01-KS) |
| DC Power Supply | GWINSTEK | GPS-3030D | E1884515 | N/A | Aug. 22, 2012 | Sep.27, 2012~ Oct. 10, 2012 | Aug. 21, 2013 | Conducted (TH01-KS) |
| Thermal Chamber | Ten Billion | TTC-B3S | TBN-960502 | N/A | Dec. 30, 2011 | Sep.27, 2012~ Oct. 10, 2012 | Dec. 29, 2012 | Conducted (TH01-KS) |
| EMI Test Receiver | R&S | ESCI | 100534 | 9kHz~3GHz | Nov. 09, 2011 | Oct. 15, 2012 | Nov. 08, 2012 | Radiation (03CH01-KS) |
| Spectrum Analyzer | R&S | FSP40 | 100319 | 9kHz~40GHz | Dec. 30, 2011 | Oct. 15, 2012 | Dec. 29, 2012 | Radiation (03CH01-KS) |
| Bilog Antenna | SCHAFFNER | CBL6112D | 23182 | 25MHz~2GHz | Dec. 08, 2011 | Oct. 15, 2012 | Dec. 07, 2012 | Radiation (03CH01-KS) |
| Double Ridge Horn | EMCO | 3117 | 00075959 | 1GHz~18GHz | Jan. 06, 2012 | Oct. 15, 2012 | Jan. 05, 2013 | Radiation (03CH01-KS) |
| Amplifier | Wireless | FPA-6592G | 060007 | 30MHz~2GHz | Dec. 30, 2011 | Oct. 15, 2012 | Dec. 29, 2012 | Radiation (03CH01-KS) |
| Amplifier | Agilent | 8449B | 3008A02370 | 1GHz~26.5GHz | Dec. 30, 2011 | Oct. 15, 2012 | Dec. 29, 2012 | Radiation (03CH01-KS) |
| SHE-EHF Horn | Schwarzbeck | BBHA9170 | BBHA170249 | 15GHz-40GHz | Oct. 10, 2012 | Oct. 15, 2012 | Oct. 09, 2013 | Radiation (03CH01-KS) |
| Loop Antenna | R&S | HFH2-Z2 | 860004/001 | 9KHz ~ 30MHz | Jul. 03, 2012 | Oct. 15, 2012 | Jul. 02, 2014 | Radiation (03CH01-KS) |
| System Simulator | R&S | CMU200 | 116456 | Full-Band | Sep. 19, 2012 | Oct. 15, 2012 | Sep. 18, 2013 | Radiation (03CH01-KS) |

# 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))** | **2.54** |

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

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **4.72** |

# Appendix A. Photographs of EUT

Please refer to Sporton report number EP291206 as below.