# FCC RF Test Report

FCC 47 CFR Part 2, 22(H), 24(E)

| | | |
|---|---|---|
| Product Name | : | GSM MOBILE PHONE |
| Model No. | : | M4TEL SS220 |
| FCC ID | : | CLNSS220G |

| | | |
|---|---|---|
| Prepared By: | : | IAC Regulatory Laboratory |
| Address: | : | No.789 Pu Xing Road,Shanghai,PRC |
| Date of Receipt | : | 2012.03.8 |
| Date of Test | : | 2012.03.9-2012.03.28 |
| Report No. | : | 20120308FCC-D |

# Test Report Certification

Date of Issue : Mar.08.2012

Report No. : 20120308FCC-D

| | |
|---|---|
| Product Name | : GSM MOBILE PHONE |
| Model No. | : M4TEL SS220 |
| Trade Name | : M4TEL |
| Applicant | : FOURTEL MEXICO S.A. DE C.V. |
| Address | : Montecito 38, Piso 23, Oficina 15. Colonia Nápoles. C.P. 03810 Mexico |
| Standard | : FCC 47 CFR Part 2, 22(H), 24(E) |
| Classification | : PCS Licensed Transmitter Held to Ear (PCE) |
| Test Result | : Complied |

| | | | | |
|---|---|---|---|---|
| TX/RX Frequency Range | : | GSM/GPRS 850 | : 824.2 ~ 848.8 MHz | 869.2 ~ 893.8 MHz |
| | | GSM/GPRS 1900 | : 1850.2 ~ 1909.8 MHz | 1930.2 ~ 1989.8 MHz |

The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of IAC regulatory Laboratory

Documented By : Kelly Lin Mar. 28.2012
Kelly Lin/Engineer

Tested By : Byran Hung Mar. 28.2012
Byran Hung/Senior Engineer

Approved By : Jeff Huang, Mar. 28.2012
Jeff Huang/Director of Operations

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# SUMMARY OF TEST RESULT

| Report Section | FCC Rule | IC Rule | Description | Limit | Result | Remark |
|---|---|---|---|---|---|---|
| 2.1 | §2.1046 | N/A | Conducted Output Power | N/A | PASS | |
| 2.2 | §22.913(a)(2) | RSS-132(4.4) SRSP-503(5.1.3) | Effective Radiated Power | < 7 Watts | PASS | - |
| 2.2 | §24.232(c) | RSS-133 (6.4) SRSP-510(5.1.2) | Equivalent Isotropic Radiated Power | < 2 Watts | PASS | - |
| 2.3 | §2.1049 §22.917(a) §24.238(a) | N/A | Occupied Bandwidth | N/A | PASS | - |
| 2.4 | §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 | - |
| 2.5 | §2.1051 §22.917(a) §24.238(a) | RSS-132 (4.5.1) RSS-133 (6.5.1) | Conducted Emission | < $43+10\log_{10}$(P[Watts]) | PASS | - |
| 2.6 | §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 | - |
| 2.7 | §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 INFORMATION

## 1.1 Applicant

Company Name:MFOURTEL MEXICO S.A. DE C.V.

Address: Montecito 38, Piso 23, Oficina 15. Colonia Nápoles. C.P. 03810 Mexico

## 1.2 Manufacturer

Company Name:CK Telecom Limited

Address: Technology Road.High-Tech Development Zone. Heyuan, Guangdong,P.R.China.

## 1.3 Feature of Equipment Under Test

| Product Feature & Specification | |
|---|---|
| **Equipment** | GSM MOBILE PHONE |
| **Brand Name** | M4TEL |
| **Model Name** | M4TEL SS220 |
| **FCC ID** | CLNSS220G |
| **Tx/Rx Frequency Range** | GSM/GPRS 850 : 824.2 ~ 848.8 MHz / 869.2 ~ 893.8 MHz<br>GSM/GPRS 1900: 1850.2 ~ 1909.8 MHz/ 1930.2 ~ 1989.8 MHz |
| **Number of Channels** | GSM850 : 128 189 251<br>GSM1900 : 512 661 810 |
| **Carrier Frequency of Each Channel** | GSM850 : 824.2 836.4 848.8<br>GSM1900 : 1850.2 1880.0 1909.8 |
| **Maximum Output Power to Antenna** | GSM850 : 31.49 ( dBm ) ,1.409(W)<br>GSM1900 : 29.71 ( dBm ) ,0.935(W) |
| **Antenna Type** | Fixed Internal Antenna |
| **HW Version** | NICOLE-V2.0 |
| **SW Version** | NICOLE-S03A_M4TEL_L2EN_100_111111 |
| **Type of Modulation** | GSM/GPRS:GMSK |
| **Type of Emission** | 250KGXW |

**Remark:**

1. For other wireless features of this EUT, test report will be issued separately.
2. This test report recorded only product characteristics and test results of PCS Licensed Transmitter Held to Ear (PCE).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Applied Standards

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

- Preliminary Guidance for Receiving Applications for Certification of 3G Device. May 9, 2006.
- FCC 47 CFR Part 2, 22(H), 24(E)
- ANSI / TIA / EIA-603-C-2004

**Remark:**

All test items were verified and recorded according to the standards and without any deviation during the test.

## 2. Test Configuration of Equipment Under Test

### 2.1 Conducted Power

**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** |
| **GSM** | 31.35 | 31.49 | 31.42 | 29.64 | 29.71 | 29.70 |
| **GPRS 8** | 30.54 | 30.60 | 30.57 | 29.43 | 29.55 | 29.51 |
| **GPRS 10** | 30.59 | 30.64 | 30.61 | 28.42 | 28.57 | 28.55 |

### 2.2 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, GPRS850.

The following table shows the test modes as the worst cases and recorded in this report.

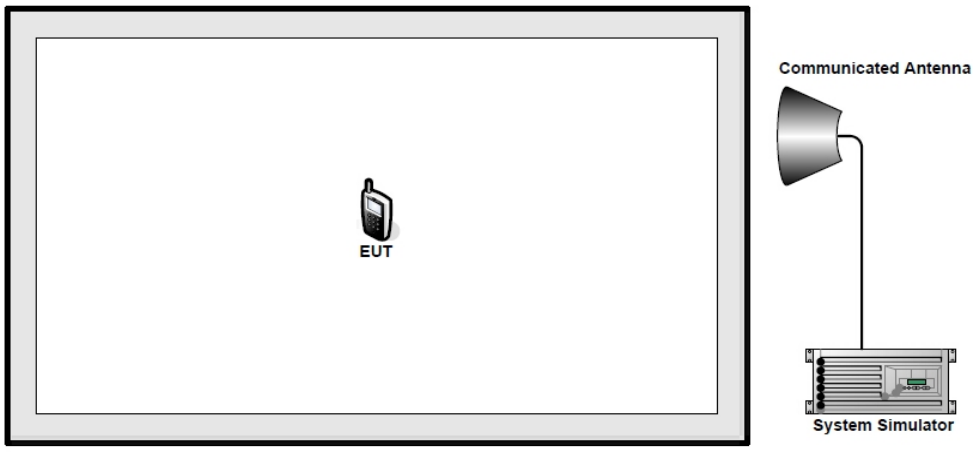
| Test Modes | | |
|---|---|---|
| **Band** | **Radiated TCs** | **Conducted TCs** |
| **GSM 850** | ■ GSM Link | ■ GSM Link |
| **GSM 1900** | ■ GSM Link | ■ GSM Link |

**Note:**

1. The maximum power levels are GSM for GMSK Link. only these modes were used for all tests.
2. The radiated emission testing was performed together with Adapter.

## 2.3 Connection Diagram of Test System

The EUT with adapter was placed on the turn table in a semi-anechoic chamber, and it was coupled to the supporting unit, system simulator, which was located outside the chamber.



# 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.

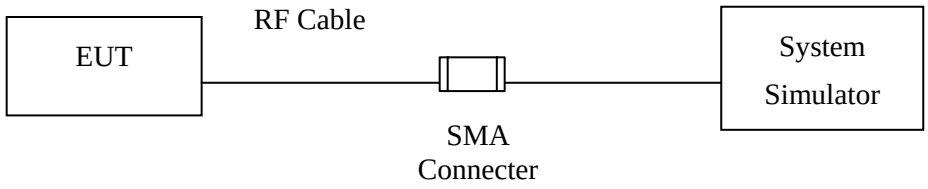
### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.1.3 Test Procedure

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.

### 3.1.4 Test Setup



### 3.1.5 Test Result of Conducted Output Power

| Cellular Band | | | | |
|---|---|---|---|---|
| **Modes** | **Channel** | **Frequency (MHz)** | **Conducted Power (dBm)** | **Conducted Power (Watts)** |
| GSM850 (GSM) | 128 (Low) | 824.2 | 31.35 | 1.364 |
| | 189 (Mid) | 836.4 | 31.49 | 1. 409 |
| | 251 (High) | 848.8 | 31.42 | 1. 386 |
| GSM850 (GPRS 8) | 128 (Low) | 824.2 | 30.54 | 1.132 |
| | 189 (Mid) | 836.4 | 30.60 | 1.148 |
| | 251 (High) | 848.8 | 30.57 | 1.137 |
| GSM850 (GPRS 10) | 128 (Low) | 824.2 | 30.59 | 1.146 |
| | 189 (Mid) | 836.4 | 30.64 | 1.159 |
| | 251 (High) | 848.8 | 30.61 | 1.151 |

| PCS Band | | | | |
|---|---|---|---|---|
| **Modes** | **Channel** | **Frequency (MHz)** | **Conducted Power (dBm)** | **Conducted Power (Watts)** |
| GSM1900 (GSM) | 512 (Low) | 1850.2 | 29.64 | 0.920 |
| | 661 (Mid) | 1880.0 | 29.71 | 0.935 |
| | 810 (High) | 1909.8 | 29.70 | 0.933 |
| GSM1900 (GPRS 8) | 512 (Low) | 1850.2 | 29.43 | 0.877 |
| | 661 (Mid) | 1880.0 | 29.55 | 0.902 |
| | 810 (High) | 1909.8 | 29.51 | 0.893 |
| GSM1900 (GPRS 10) | 512 (Low) | 1850.2 | 28.42 | 0.695 |
| | 661 (Mid) | 1880.0 | 28.57 | 0.719 |
| | 810 (High) | 1909.8 | 28.55 | 0.716 |

## 3.2 Effective Radiated Power and Effective Isotropic Radiated Power Measurement

### 3.2.1 Description of the ERP/EIRP Measurement

ERP/EIRP is measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The ERP of mobile transmitters must not exceed 7 Watts and the EIRP of mobile transmitters are limited to 2 Watts.

### 3.2.2 Measuring Instruments

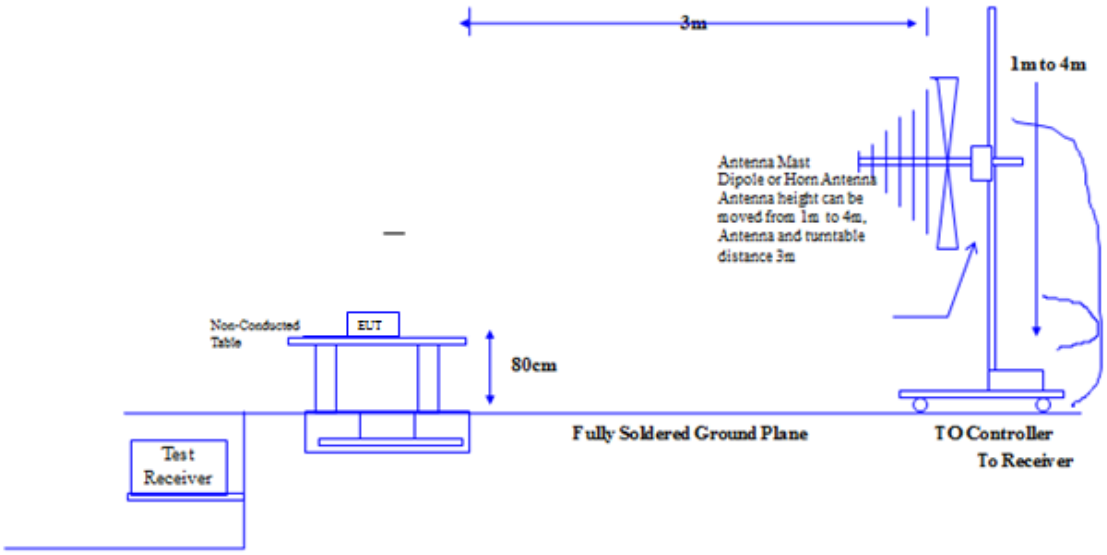
See list of measuring instruments of this test report.

### 3.2.3 Test Procedure

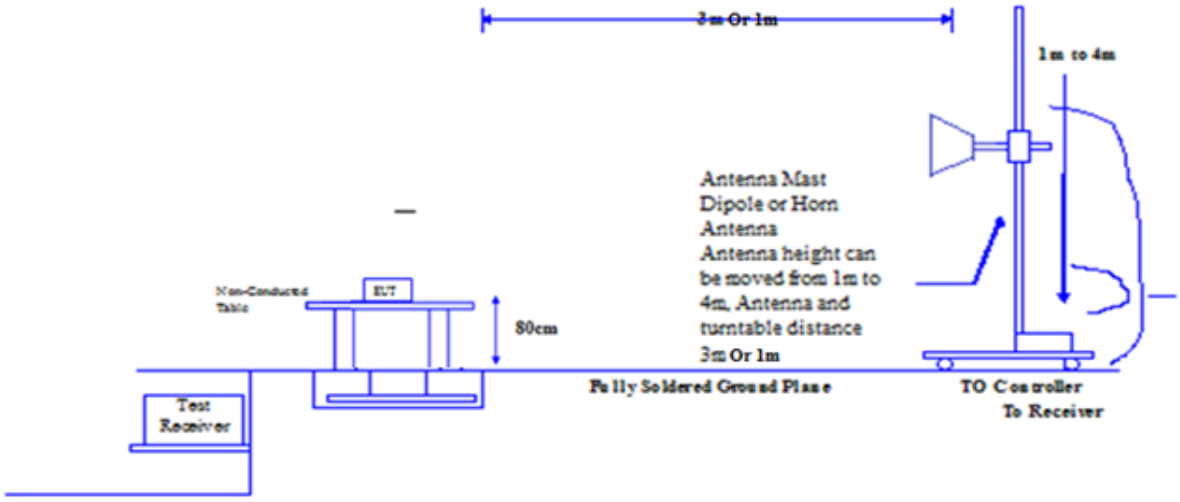
1. The EUT was placed on an non-conductive rotating platform with 0.8 meter height in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RBW= 3MHz,VBW= 3MHz, and peak detector settings.
2. During the measurement, 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 Path Loss(dB)= S.G. Power-TX Cable loss+ TX Antenna Gain-SPA. Reading. Then the EUT's EIRP was calculated with the Path Loss(dB), EIRP=SPA. Reading+ Path Loss. ERP= SPA. Reading+ Path Loss-2.15

### 3.2.4 Test Setup

30MHz~1GHz




Above 1GHz



### 3.2.5 Test Result of ERP

| GSM850 (GSM) Radiated Power ERP | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **SPA. Reading (dBm)** | **S.G. Power (dBm)** | **TX Cable loss (dB)** | **TX Antenna Gain (dBi)** | **ERP(dBm)** | **ERP(W)** | **Polarization (H/V)** |
| 824.2 | -0.58 | 31.03 | 0.85 | 0.23 | **28.26** | **0.67** | H |
| 836.4 | -0.20 | 31.03 | 0.85 | 0.51 | **28.54** | **0.71** | H |
| 848.8 | -0.42 | 30.92 | 0.86 | 0.74 | **28.65** | **0.73** | H |
| 824.2 | -8.83 | 26.46 | 0.85 | 0.23 | **23.69** | **0.23** | V |
| 836.4 | -10.10 | 25.12 | 0.85 | 0.51 | **22.63** | **0.18** | V |
| 848.8 | -8.97 | 25.89 | 0.86 | 0.74 | **23.62** | **0.23** | V |

| Path Loss | | | | | | |
|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Path Loss(dB)** | **SPA. Reading (dBm)** | **S.G. Power (dBm)** | **TX Cable loss (dB)** | **TX Antenna Gain (dBi)** | **Polarization (H/V)** |
| 824.2 | 30.99 | -31.61 | 0 | 0.85 | 0.23 | H |
| 836.4 | 30.89 | -31.23 | 0 | 0.85 | 0.51 | H |
| 848.8 | 31.22 | -31.34 | 0 | 0.86 | 0.74 | H |
| 824.2 | 34.67 | -35.29 | 0 | 0.85 | 0.23 | V |
| 836.4 | 34.88 | -35.22 | 0 | 0.85 | 0.51 | V |
| 848.8 | 34.74 | -34.86 | 0 | 0.86 | 0.74 | V |

Path Loss(dB)= S.G. Power-TX Cable loss+ TX Antenna Gain-SPA. Reading

### 3.2.6 Test Result of EIRP

| GSM1900(GSM) Radiated Power EIRP | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **SPA. Reading (dBm)** | **S.G. Power (dBm)** | **TX Cable loss (dB)** | **TX Antenna Gain (dBi)** | **EIRP(dBm)** | **EIRP(W)** | **Polarization (H/V)** |
| 1850.2 | -1.62 | 31.34 | 1.64 | 1.25 | **27.32** | **0.54** | H |
| 1880 | -2.74 | 30.65 | 1.64 | 1.56 | **27.36** | **0.54** | H |
| 1909.8 | -3.66 | 30.91 | 1.64 | 1.79 | **27.26** | **0.53** | H |
| 1850.2 | -10.45 | 26.96 | 1.64 | 1.25 | **24.53** | **0.28** | V |
| 1880 | -10.54 | 27.26 | 1.64 | 1.56 | **24.80** | **0.30** | V |
| 1909.8 | -10.38 | 26.37 | 1.64 | 1.79 | **24.16** | **0.26** | V |

| Path Loss | | | | | | |
|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Path Loss(dB)** | **SPA. Reading (dBm)** | **S.G. Power (dBm)** | **TX Cable loss (dB)** | **TX Antenna Gain (dBi)** | **Polarization (H/V)** |
| 1850.2 | 30.51 | -31.92 | 0 | 1.64 | 1.25 | H |
| 1880 | 31.23 | -32.36 | 0 | 1.64 | 1.56 | H |
| 1909.8 | 31.63 | -32.53 | 0 | 1.64 | 1.79 | H |
| 1850.2 | 34.98 | -36.39 | 0 | 1.64 | 1.25 | V |
| 1880 | 35.34 | -36.47 | 0 | 1.64 | 1.56 | V |
| 1909.8 | 34.54 | -35.44 | 0 | 1.64 | 1.79 | V |

Path Loss(dB)= S.G. Power-TX Cable loss+ TX Antenna Gain-SPA. Reading

## 3.3 Occupied Bandwidth Measurement

### 3.3.1 Description of Occupied Bandwidth Measurement

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.

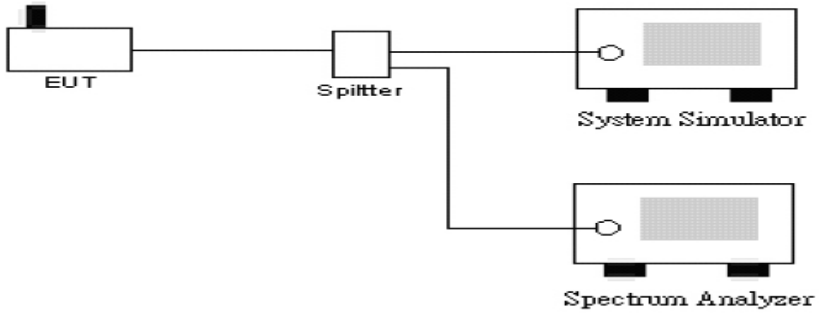
### 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.3.3 Test Procedure

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers were measured.

### 3.3.4 Test Setup

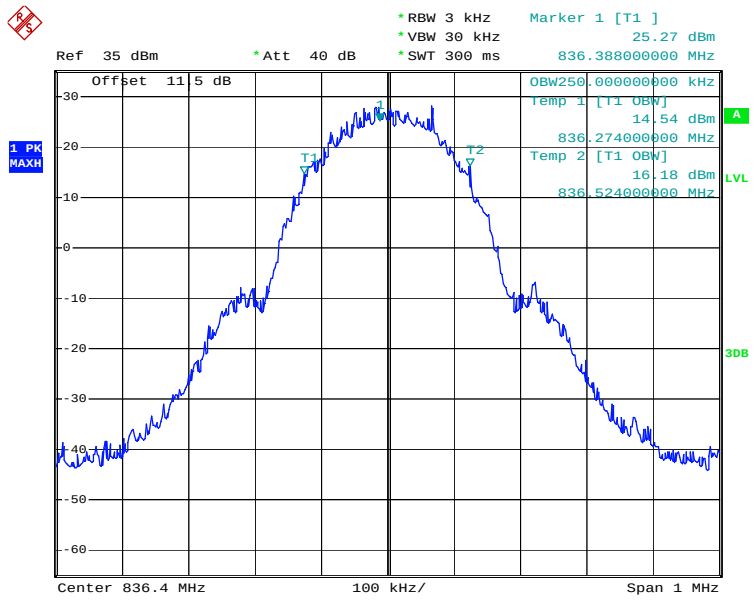


### 3.3.5 Test Result (Plots) of Occupied Bandwidth

GSM 850

GSM Link

**99% Occupied Bandwidth Plot on Channel 189**

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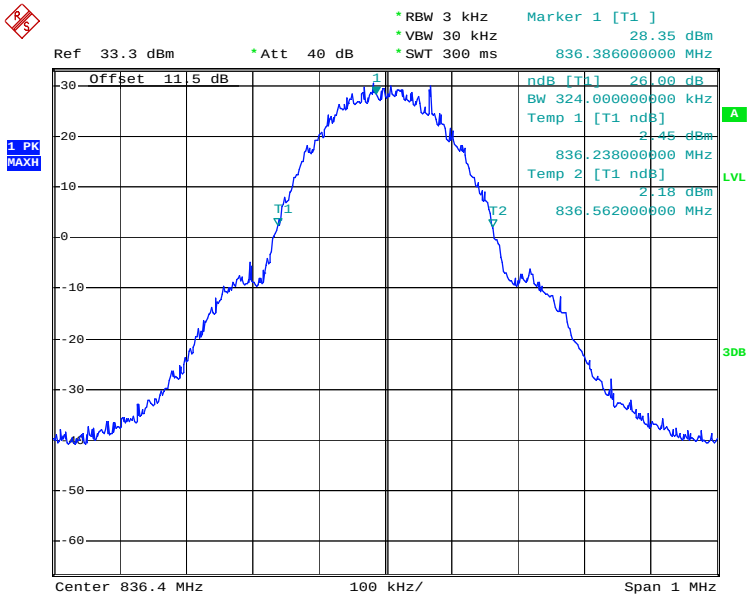
**26dB Bandwidth Plot on Channel 189**

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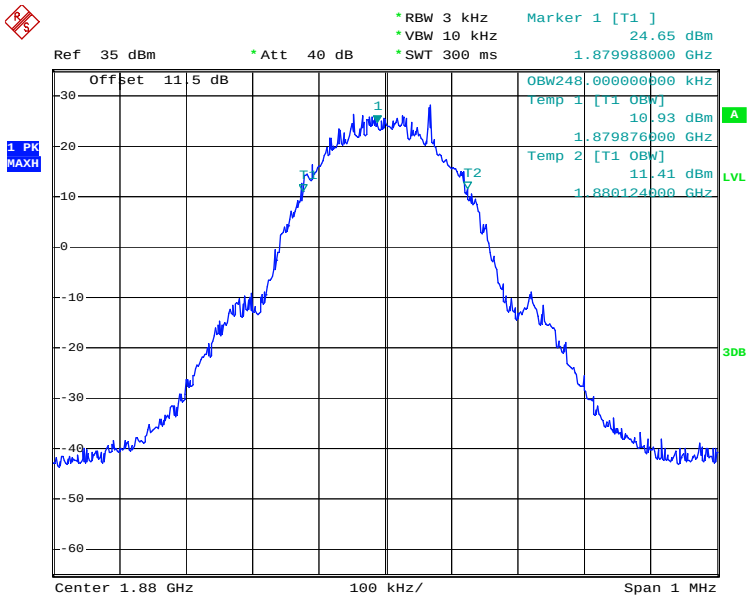
GSM1900

GSM Link

**99% Occupied Bandwidth Plot on Channel 661**

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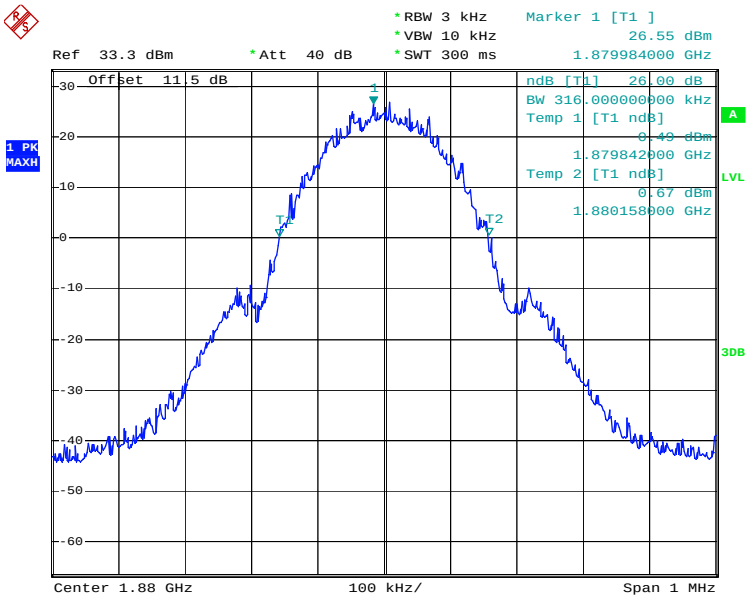
**26dB Bandwidth Plot on Channel 661**




Date: 8.MAR.2012 07:42:19

## 3.4 Band Edge Measurement

### 3.4.1 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

### 3.4.2 Measuring Instruments

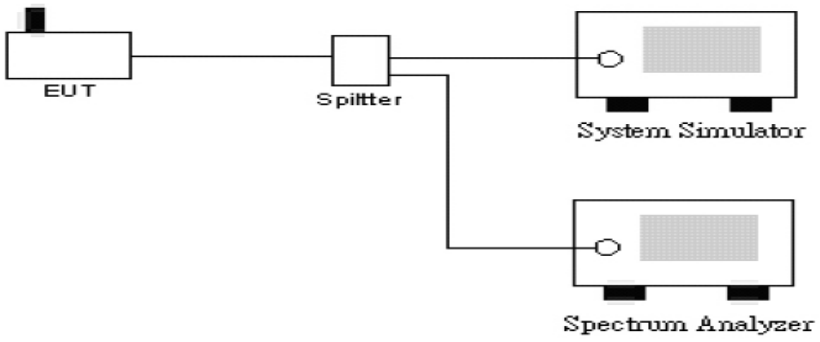
See list of measuring instruments of this test report.

### 3.4.3 Test Procedure

a. The EUT was connected to Spectrum Analyzer and Base Station via power divider.

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

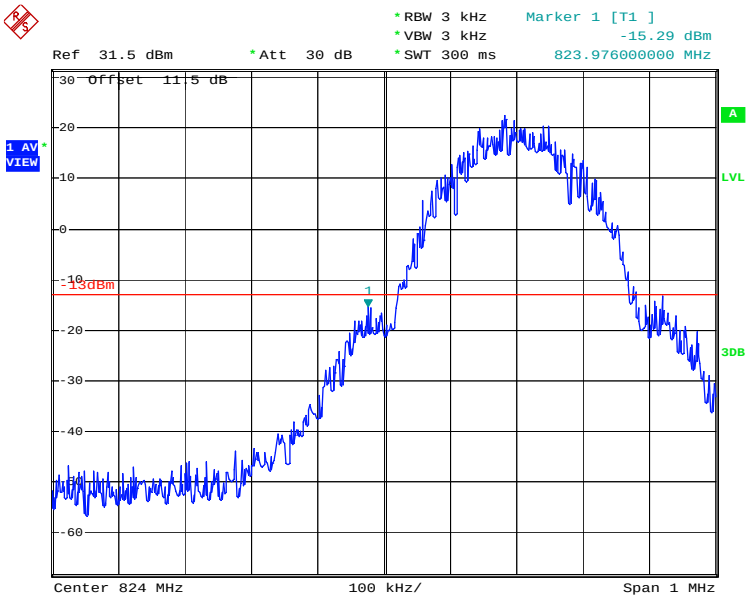
### 3.4.4 Test Setup



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

GSM850

**Lower Band Edge Plot on Channel 128**

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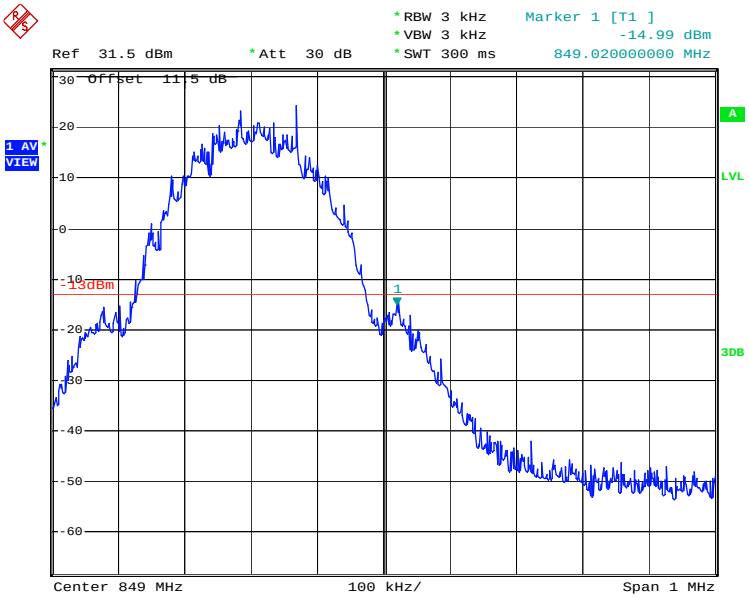
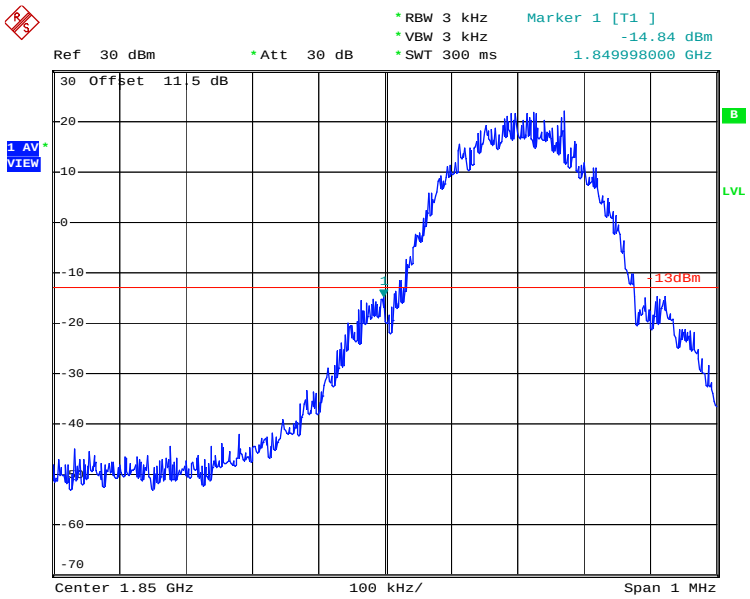
**Higher Band Edge Plot on Channel 251**




Date: 8.MAR.2012 09:38:36

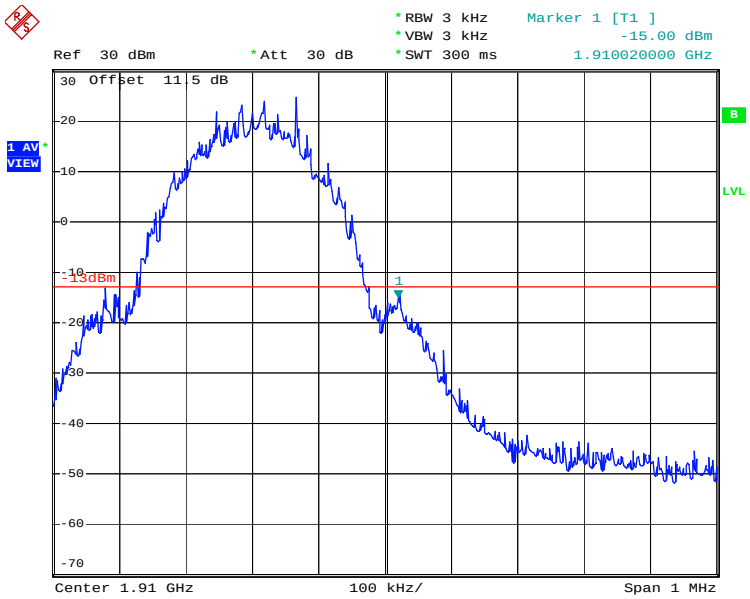
GSM1900

**Lower Band Edge Plot on Channel 512**




Date: 13.MAR.2012 08:30:14

**Higher Band Edge Plot on Channel 810**




Date: 13.MAR.2012 08:35:25

## 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

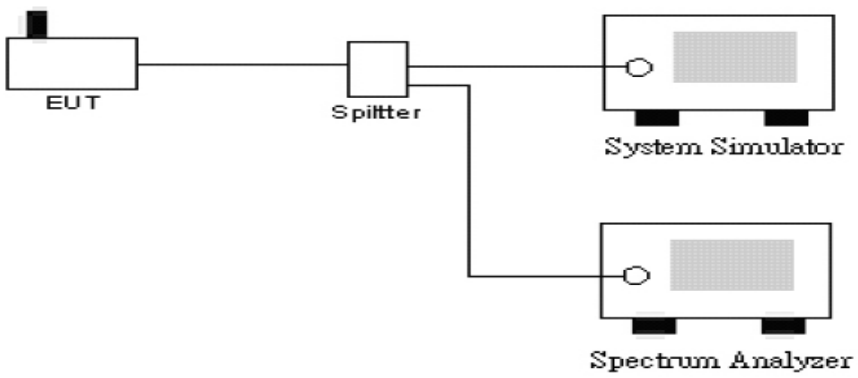
See list of measuring instruments of this test report.

### 3.5.3 Test Procedure

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.

.

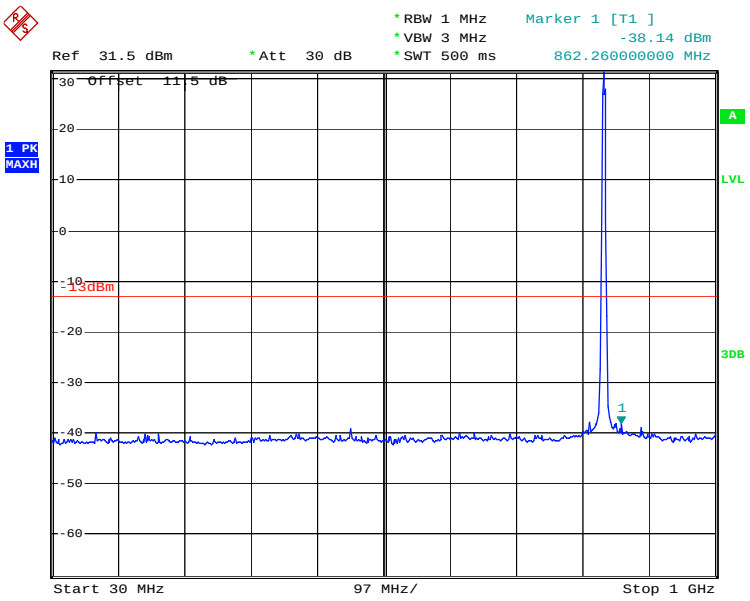
### 3.5.4 Test Setup



### 3.5.5 Test Result (Plots) of Conducted Emission

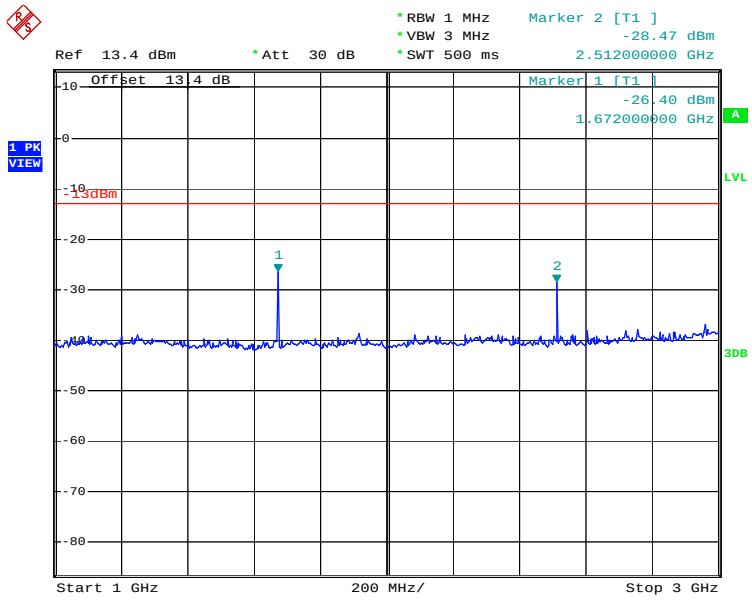
GSM850

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



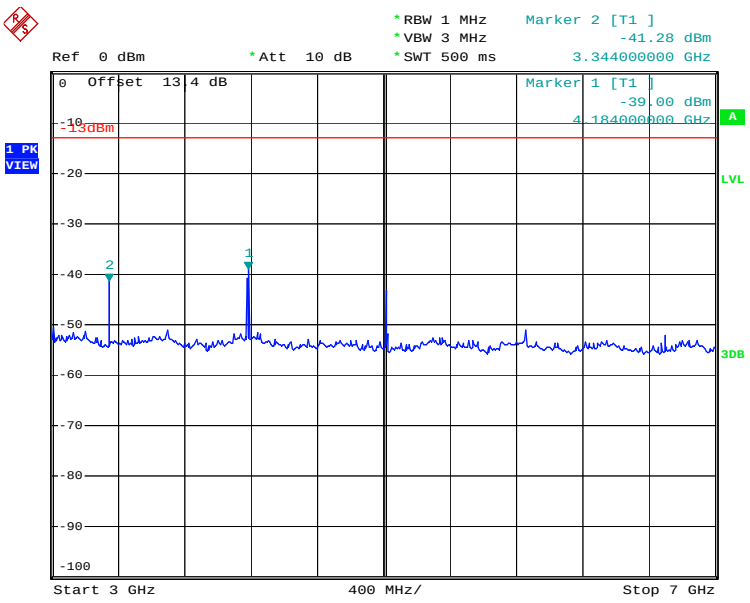

Date: 8.MAR.2012 10:31:09

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



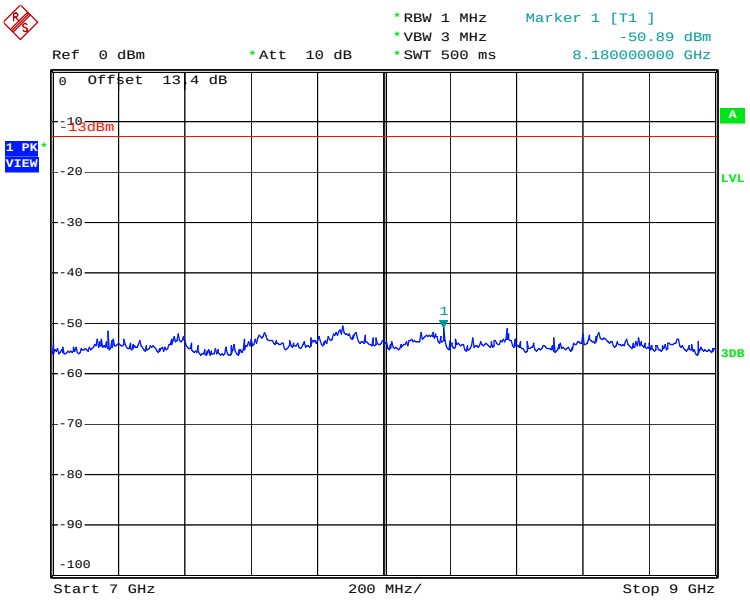

Date: 8.MAR.2012 10:29:43

**Conducted Emission Plot between 3GHz ~ 7GHz**



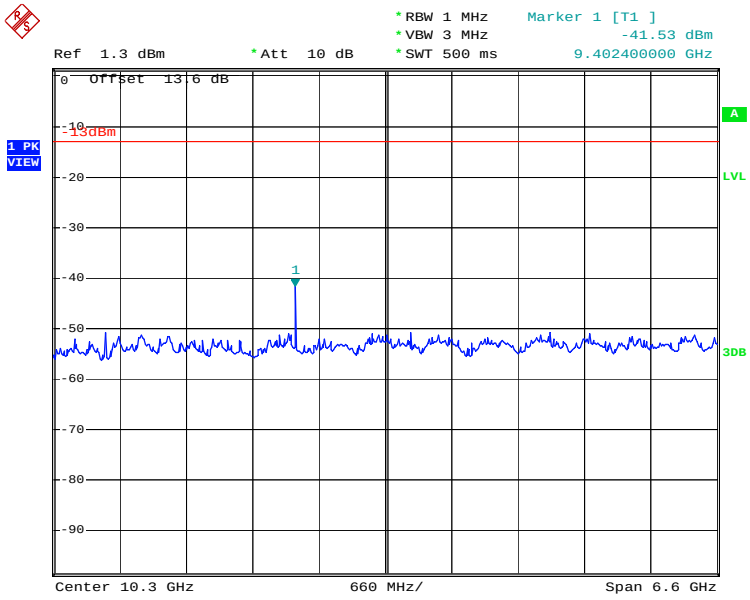

Date: 8.MAR.2012 10:28:09

**Conducted Emission Plot between 7GHz ~ 9GHz**



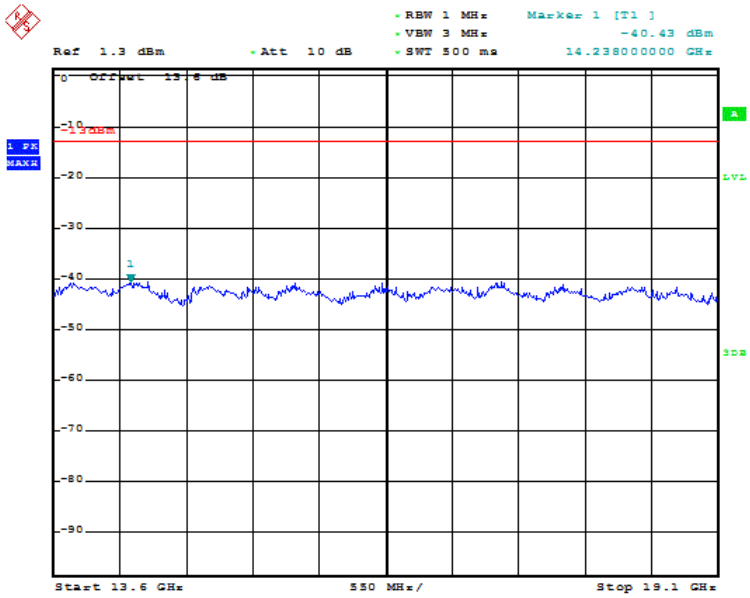

Date: 8.MAR.2012 10:26:01

**Conducted Emission Plot between 7GHz ~ 13.6GHz**




Date: 8.MAR.2012 10:56:20

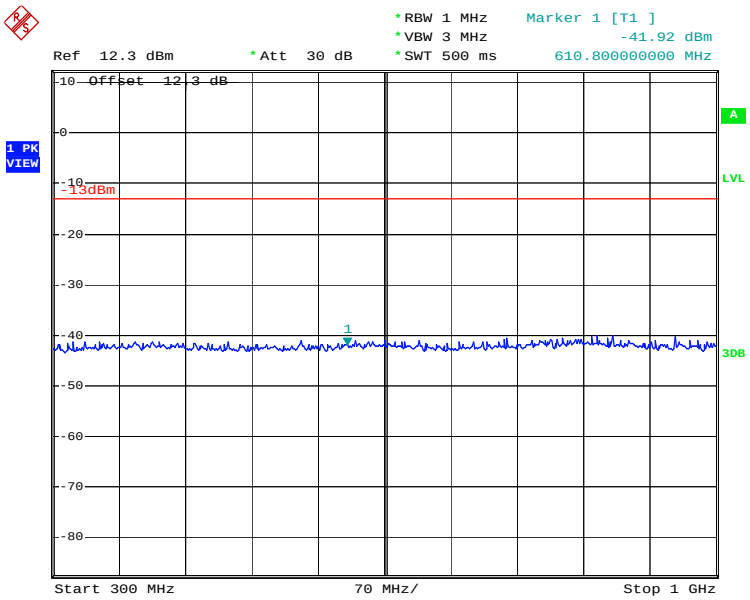
**Conducted Emission Plot between 13.6GHz ~ 19.1GHz**




Date: 8.MAR.2012 10:57:11

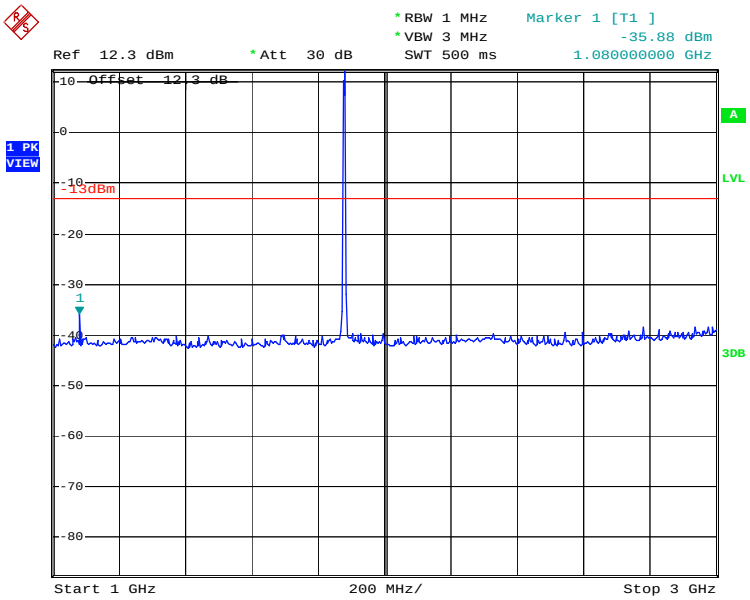
GSM1900

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



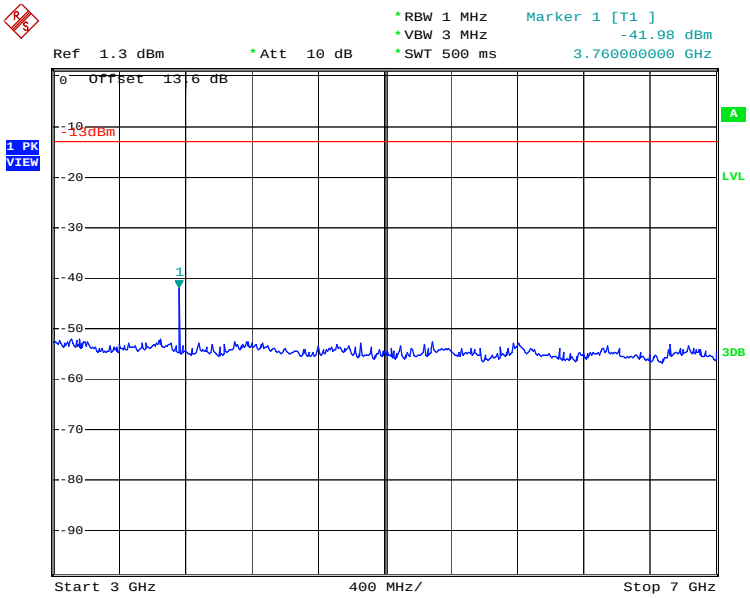

Date: 8.MAR.2012 11:03:58

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



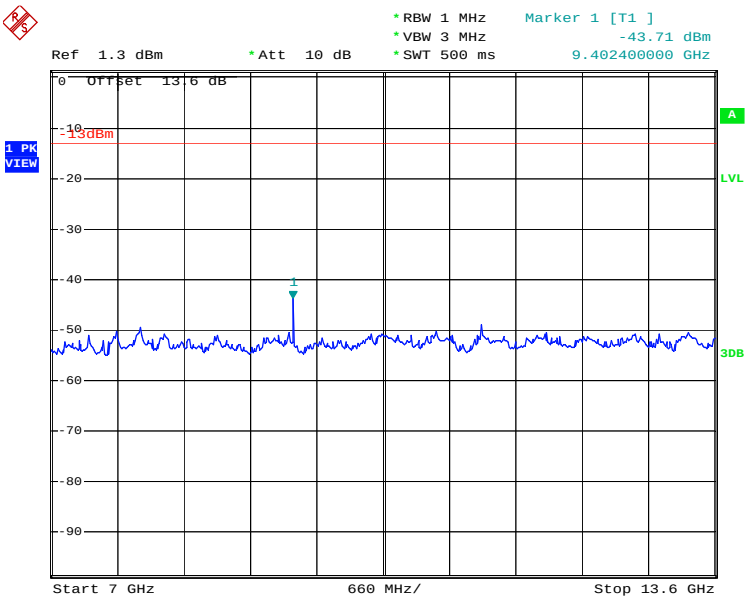

Date: 8.MAR.2012 11:02:40

## Conducted Emission Plot between 3GHz ~ 7GHz



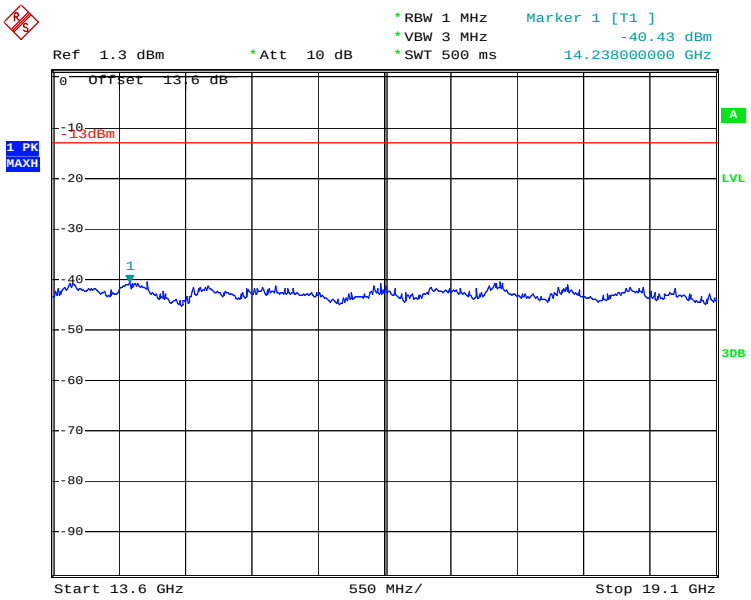

Date: 8.MAR.2012 11:01:32

## Conducted Emission Plot between 7GHz ~ 13.6GHz




Date: 8.MAR.2012 10:59:47

**Conducted Emission Plot between 13.6GHz ~ 19.1GHz**




Date: 8.MAR.2012 10:58:56

## 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.

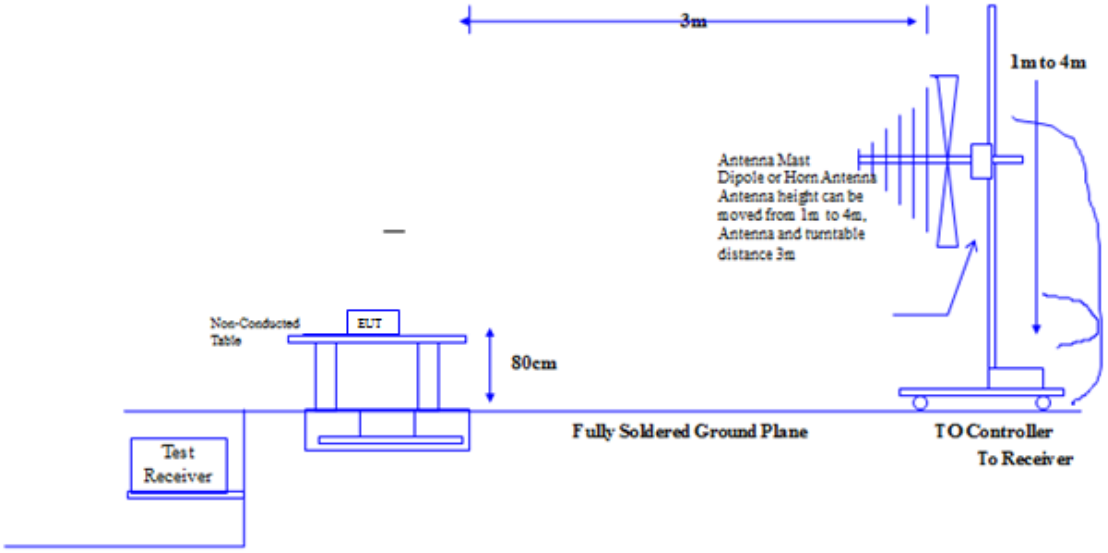
### 3.6.3 Test Procedure

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.
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, and set the test-receiver system to Peak Detect Function. 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

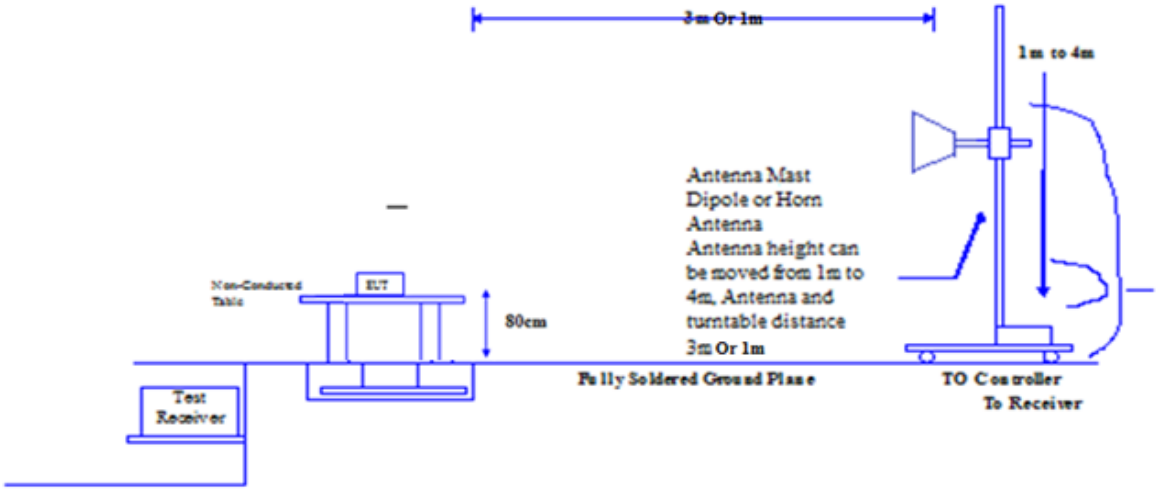
Note：The amplitude of radiated emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

### 3.6.4 Test Setup

30MHz~1GHz



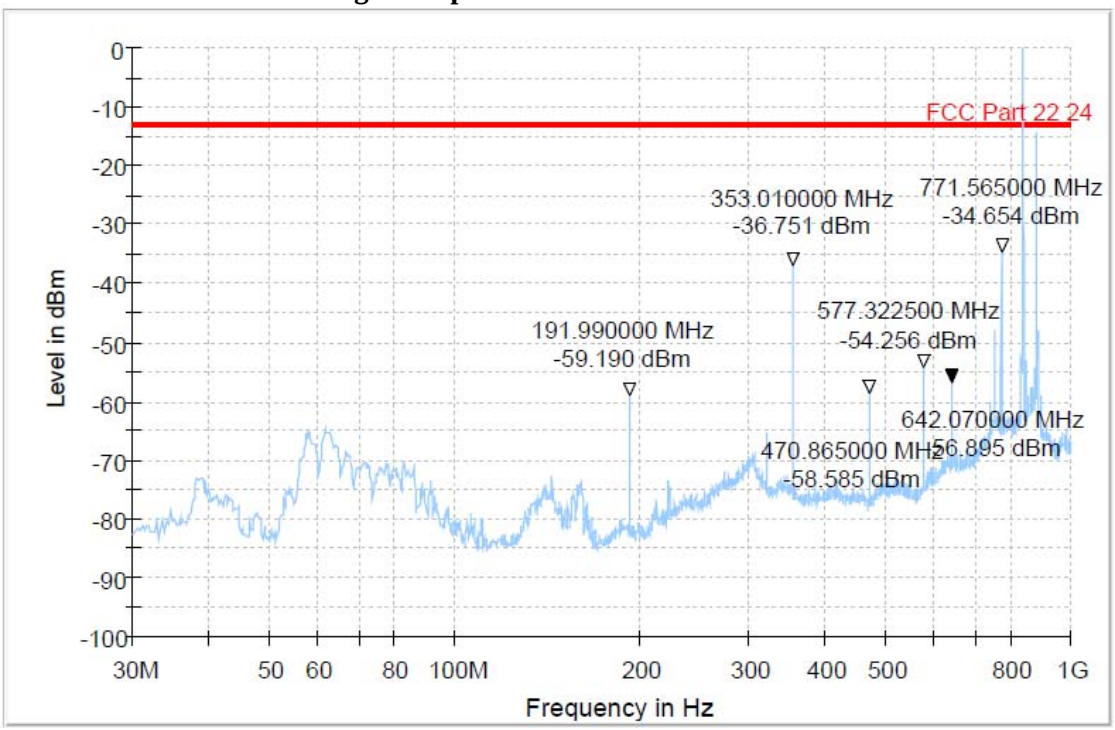

Above 1GHz



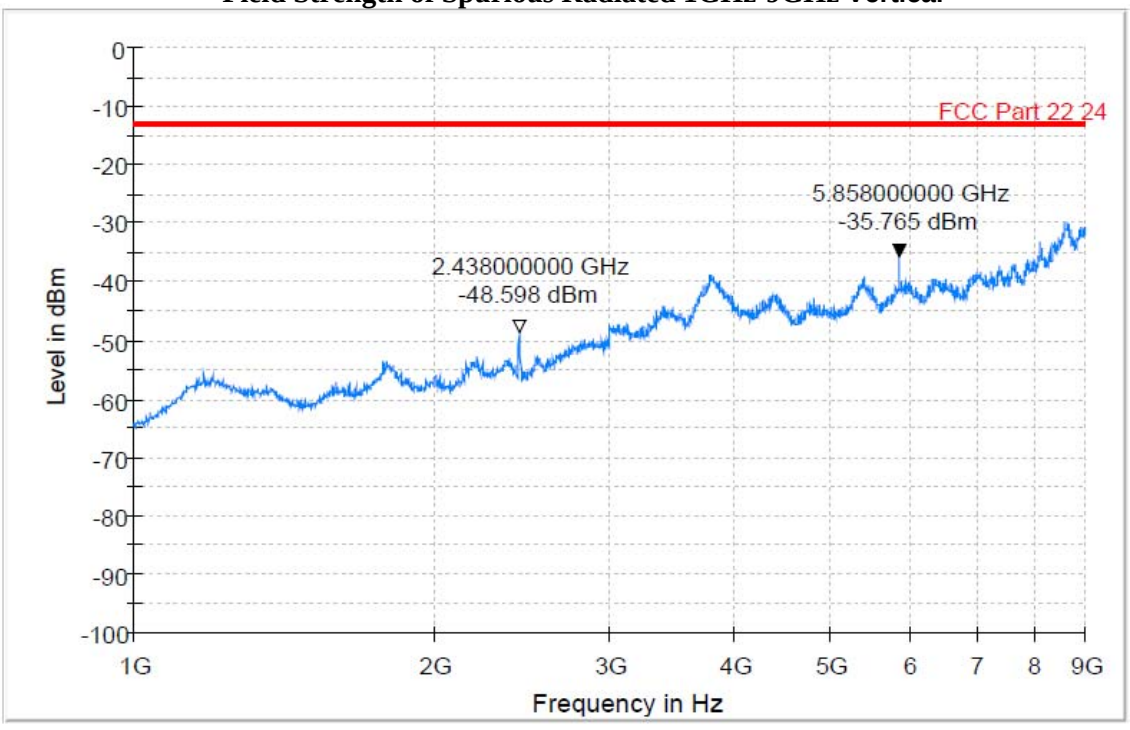
### 3.6.5 Test Result of Field Strength of Spurious Radiated (30MHz-9GHz / 30MHz-18GHz)

| | |
|---|---|
| **Band :** | GSM850 |
| **Test Mode :** | GSM850 Link + Adapter |
| **Test Voltage** | 120V/60Hz |

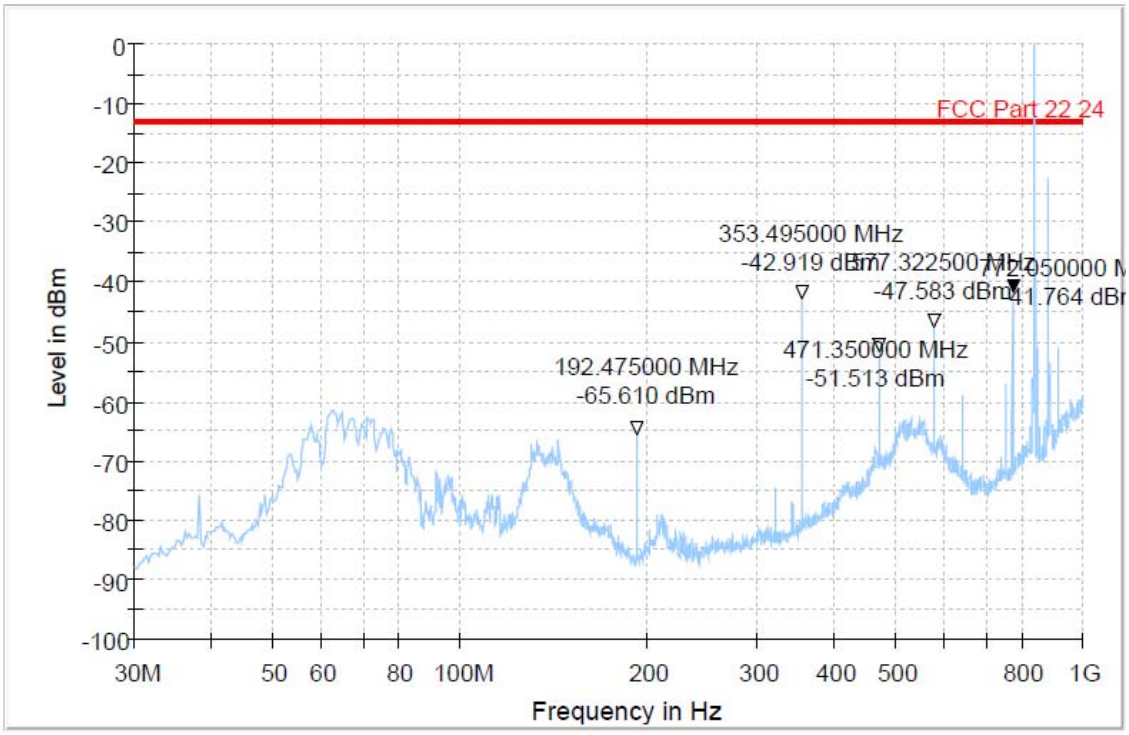
**Field Strength of Spurious Radiated 30MHz-1GHz Vertical**



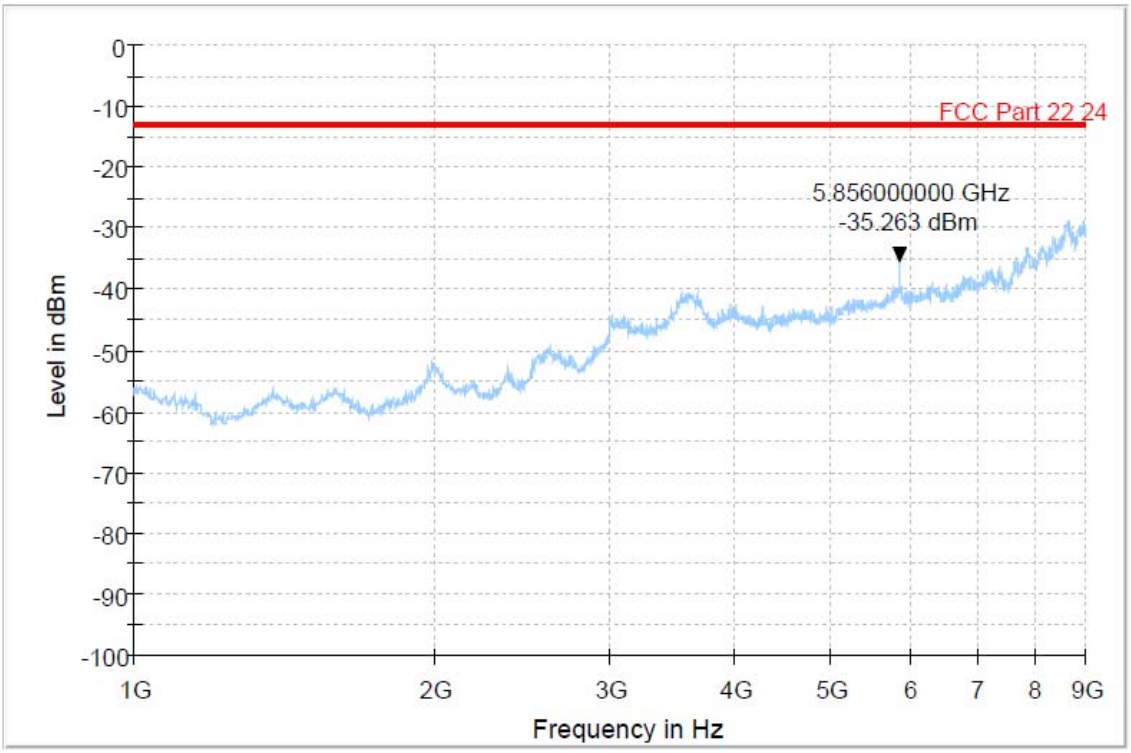

**Field Strength of Spurious Radiated 1GHz-9GHz Vertical**



**Field Strength of Spurious Radiated 30MHz-1GHz Horizontal**

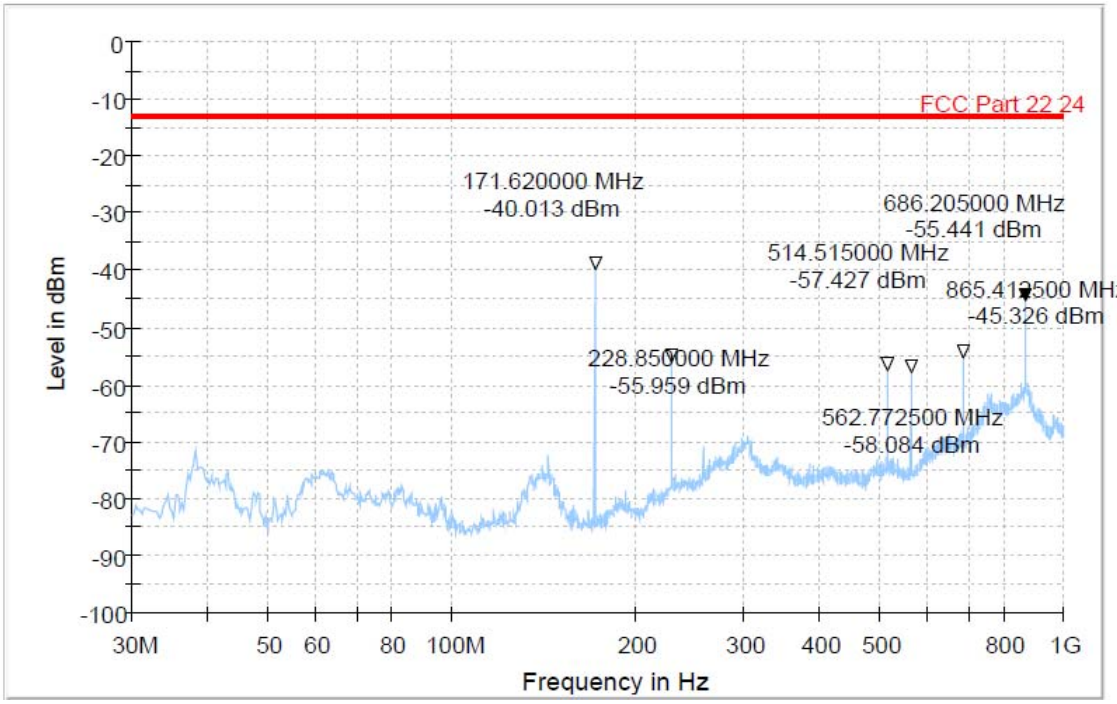



**Field Strength of Spurious Radiated 1GHz-9GHz Horizontal**

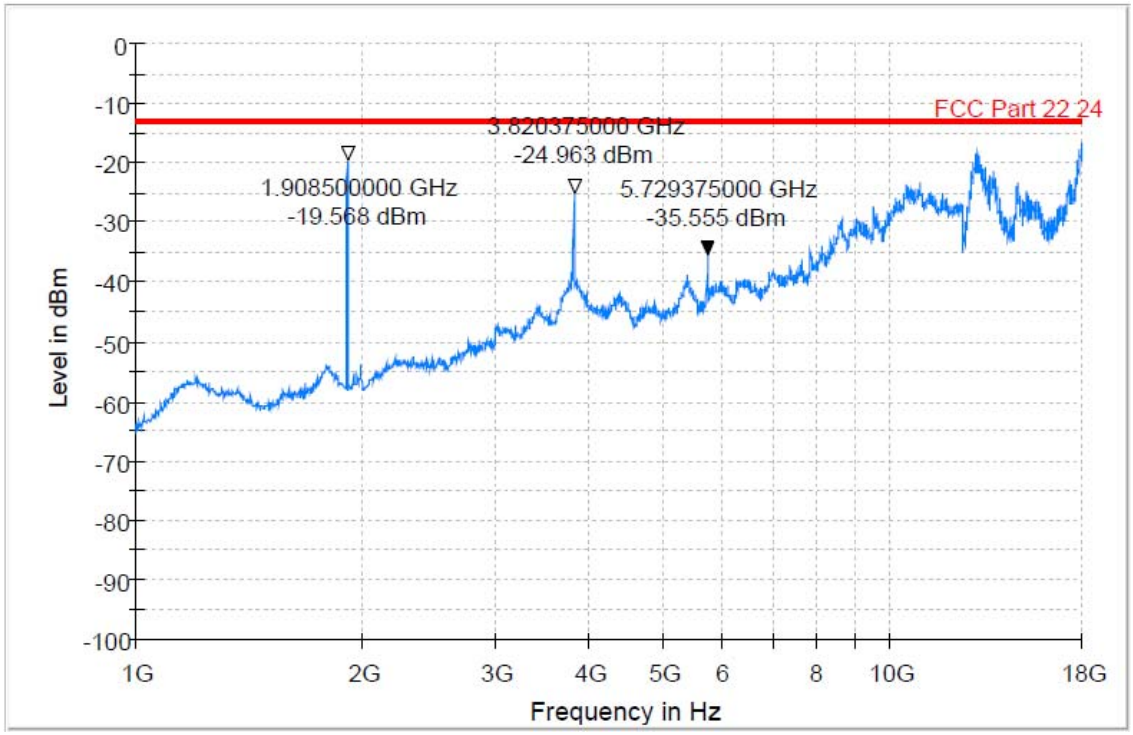


| | |
|---|---|
| **Band :** | GSM1900 |
| **Test Mode :** | GSM1900 Link + Adapter |
| **Test Voltage** | 120V/60Hz |

**Field Strength of Spurious Radiated 30MHz-1GHz Vertical**

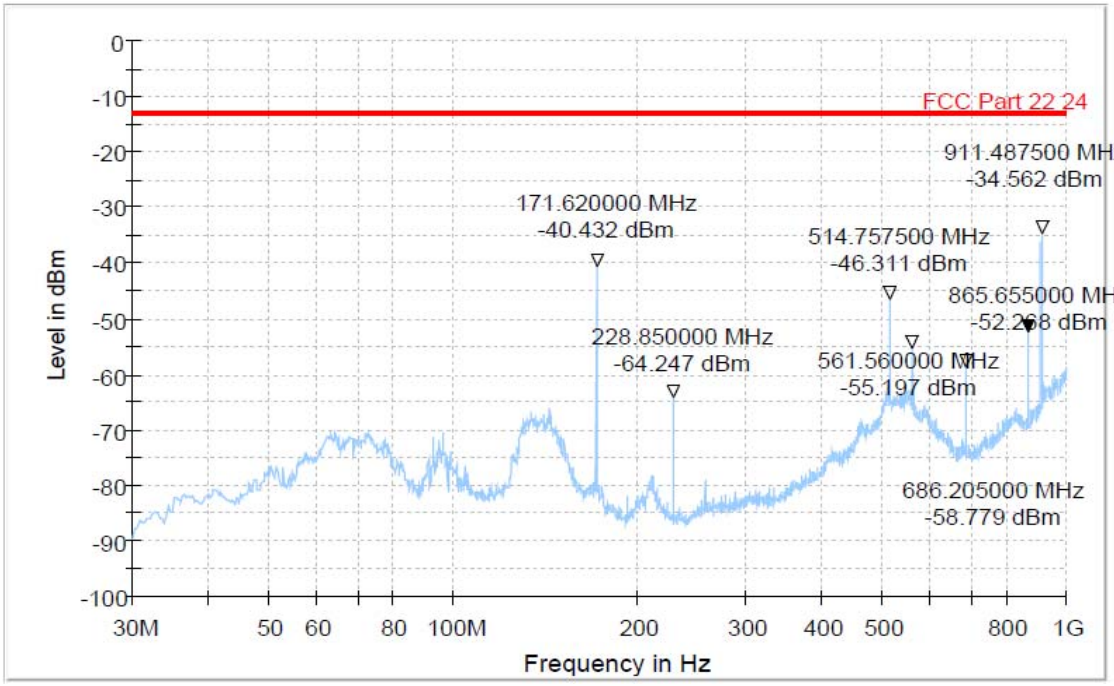



**Field Strength of Spurious Radiated 1GHz-18GHz Vertical**

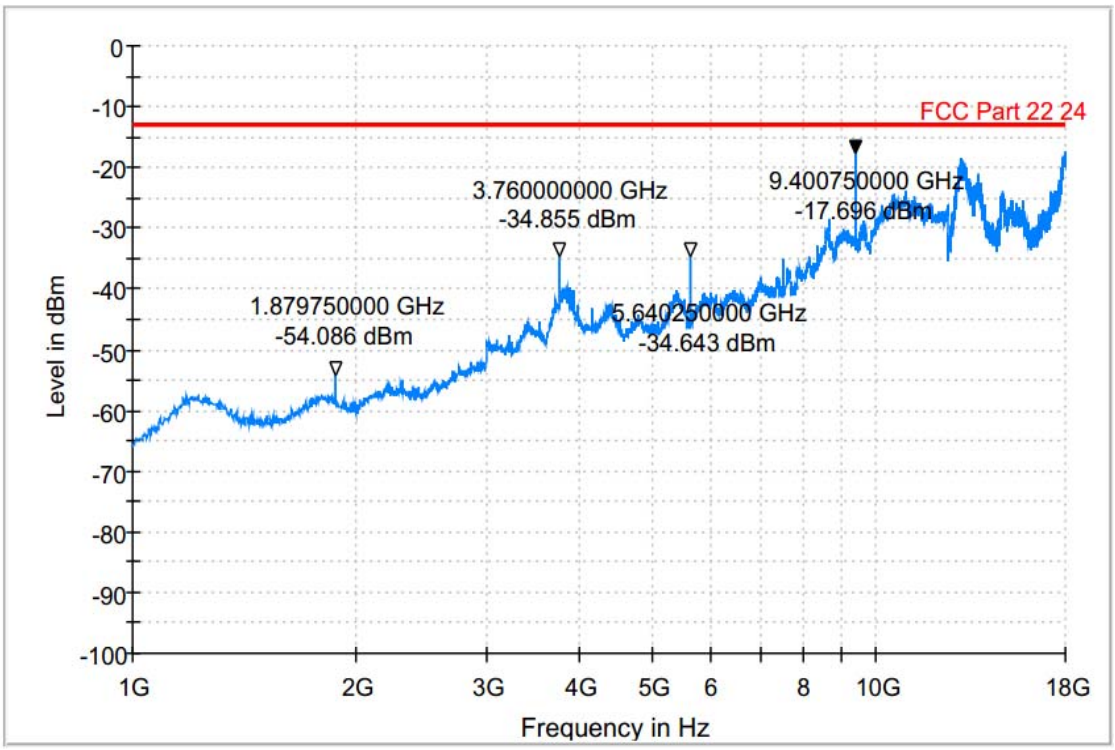


| | |
|---|---|
| **Band :** | GSM1900 |
| **Test Mode :** | GSM1900 Link + Adapter |
| **Test Voltage** | 120V/60Hz |

**Field Strength of Spurious Radiated 30MHz-1GHz Horizontal**




**Field Strength of Spurious Radiated 1GHz-18GHz Horizontal**



### 3.6.6 Radiated Emission Measurement Results (18GHz-19.1GHz)

| | | | |
|---|---|---|---|
| **Test Engineer :** | Hogan. He | **Temperature :** | 23℃~26℃ |
| | | **Relative Humidity :** | 40%~60% |

| Frequency (MHz) | Level (dBuV) | Over Limit (dB) | Limit Line (dBuV) | Remark |
|---|---|---|---|---|
| - | - | - | - | See Note |

**Notes:**

The amplitude of radiated emissions that are attenuated by more than 20dB below the permissible value has no need to be reported. The measurement performed at 1meter distance from turn table to antenna.

## 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 ±0.00025% (±2.5ppm) of the center frequency.

### 3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

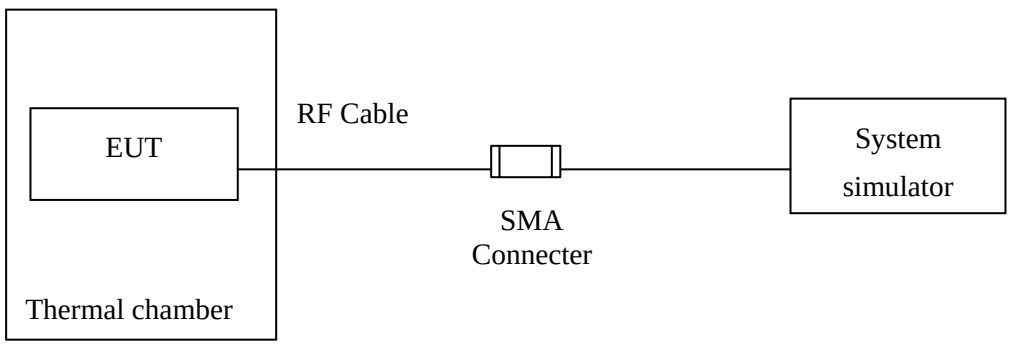
### 3.7.3 Test Procedures for Temperature Variation

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
4. step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.
5. If the EUT can not 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±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.

### 3.7.5 Test Setup



### 3.7.6 **Test Result of Temperature Variation**

| Temperature | GSM850 | | Result |
|---|---|---|---|
| | Feq. Dev. (Hz) | Deviation (ppm) | |
| -30 | -56.2 | -0.067 | PASS |
| -20 | -62.3 | -0.074 | |
| -10 | -66.4 | -0.079 | |
| 0 | -62.3 | -0.074 | |
| 10 | 43.7 | 0.052 | |
| 20 | -43.2 | -0.052 | |
| 30 | -67.3 | -0.080 | |
| 40 | -71.3 | -0.085 | |
| 50 | -69.6 | -0.083 | |

| Temperature | GSM1900 | | Result |
|---|---|---|---|
| | Feq. Dev. (Hz) | Deviation (ppm) | |
| -30 | 43.9 | 0.023 | PASS |
| -20 | 49.3 | 0.026 | |
| -10 | -67.2 | -0.036 | |
| 0 | -65.2 | -0.035 | |
| 10 | -47.2 | -0.025 | |
| 20 | -57.4 | -0.031 | |
| 30 | -63.5 | -0.034 | |
| 40 | -64.3 | -0.034 | |
| 50 | -62.4 | -0.033 | |

### 3.7.7 Test Result of Voltage Variation

| Band & Channel | Mode | Voltage (Volt) | Feq. Dev. (Hz) | Deviation (ppm) | Limit (ppm) | Result |
|---|---|---|---|---|---|---|
| GSM 850 CH189 | GSM | 3.8 | 36.73 | 0.044 | 2.5 | PASS |
| | | 3.55 | -47.3 | -0.057 | | |
| | | 4.2 | 52.1 | 0.062 | | |
| GSM 1900 CH661 | GSM | 3.8 | -52.3 | -0.028 | | |
| | | 3.55 | -42.4 | -0.023 | | |
| | | 4.2 | 37.4 | 0.020 | | |

## 4 List of Measuring Equipment

| No | Instrument/Ancillary | Provider | Type/Model | Cal. Date |
|---|---|---|---|---|
| 01 | Base Station | Agilent | E5515C | 2011.12.14 |
| 02 | Spectrum Analyzer | R&S | FSP30(9kHz~30GHz) | 2011.07.19 |
| 03 | Antenna | Schwarzbeck | VULB9165(30M-1G) | 2011.11.09 |
| 04 | Antenna | R&S | HF906(1G-18G) | 2011.08.10 |
| 05 | Antenna | Schwarzbeck | BBHA 9170 (15G-26.5G) | 2011.11.09 |
| 06 | High Pass Filter | R&S | System Integrated | 2011.11.14 |
| 07 | Thermal chamber | Hitachi | EC- 85MHP | 2011.12.25 |
| 08 | Pre-Amplifier | R&S | Pre-Amp | 2012.1.18 |
| 09 | Helical Antenna | ETS | 3102 (1G-10G ) | NCR |
| 10 | Power Meter | R&S | NRP(10MHz~8GHz) | 2011.12.05 |
| 11 | Relay Switch | R&S | TS-REMI | NCR |

## 5 Uncertainty Evaluation

**5.1 Ucertainty of Radiated Spurious Emission evaluation (30MHz~1GHz)**

| Radiated Spurious Emission Measurement Uncertainty Evaluation | | | | | |
|---|---|---|---|---|---|
| Contribution | | Probability Distribution | Partition Coefficient | u(xi) | |
| | | | | Horizontal 30-1000MHz | Vertical 30-1000MHz |
| Cable Loss Calibration | $U_{01}$ | U-Shape | 1.41 | 0.17 | 0.17 |
| Sine wave voltage accuracy of Spectrum analyzer | U02 | Triangle | 2.45 | 0.82 | 0.82 |
| Impulse response of spectrum analyzer | U03 | Triangle | 2.45 | 0.61 | 0.61 |
| Pulse repetition rate of spectrum analyzer | U04 | Triangle | 2.45 | 0.61 | 0.61 |
| Spectrum analyzer noise level | U05 | Normal | 2.00 | 0.25 | 0.25 |
| Measurement of the signal path mismatch | U06 | U-Shape | 1.41 | 0.13 | 0.13 |
| Free-space antenna factor | U07 | Normal | 2.00 | 1.00 | 1.00 |
| Antenna Factor Interpolation for Frequency | U08 | Rectangular | 1.73 | 0.17 | 0.17 |
| Antenna factor with height in the correlation | U09 | Rectangular | 1.73 | 0.17 | 0.17 |
| Measurement antenna and the absorbing material in the image of the mutual coupling effect | U10 | Rectangular | 1.73 | 0.50 | 0.50 |
| Antenna phase center variation | U11 | Rectangular | 1.73 | 0.58 | 0.58 |
| Antenna cross polarization response | U12 | Rectangular | 1.73 | 0.52 | 0.52 |
| Antenna imbalance | U13 | Rectangular | 1.73 | 0.52 | 0.52 |
| Test distance error | U14 | Rectangular | 1.73 | 0.17 | 0.17 |
| Desktop terrain clearance variation | U15 | Normal | 2.00 | 0.05 | 0.05 |
| Random uncertainty | U16 | Standard deviation | 1.00 | 0.20 | 0.19 |
| Pre-Amplifier gain Calibration | U17 | U-Shape | 1.41 | 0.13 | 0.13 |
| Combined Standard Uncertainty Uc(y) | Uc | Normal | 1.00 | 1.95 | 1.95 |
| Measuring Uncertainty for a level of Confidence of 95%(U= 2Uc(y)) | U=kUc | Normal | 2 | 3.90 | 3.89 |

**5.2 Uncertainty of Radiated Spurious Emission evaluation (1GHz~26.5GHz)**

| Radiated Spurious Emission Measurement Uncertainty Evaluation | | | | | |
|---|---|---|---|---|---|
| Contribution | | Probability Distribution | Partition Coefficient | u(xi) | |
| | | | | Horizontal 1-18GHz | Vertical 1-18GHz |
| Cable Loss Calibration | U01 | U-Shape | 1.41 | 0.17 | 0.17 |
| Sine wave voltage accuracy of Spectrum analyzer | U02 | Triangle | 2.45 | 0.82 | 0.82 |
| Impulse response of spectrum analyzer | U03 | Triangle | 2.45 | 0.61 | 0.61 |
| Pulse repetition rate of spectrum analyzer | U04 | Triangle | 2.45 | 0.61 | 0.61 |
| Spectrum analyzer noise level | U05 | Normal | 2.00 | 0.25 | 0.25 |
| Measurement of the signal path mismatch | U06 | U-Shape | 1.41 | 0.13 | 0.13 |
| Free-space antenna factor | U07 | Normal | 2.00 | 1.00 | 1.00 |
| Antenna Factor Interpolation for Frequency | U08 | Rectangular | 1.73 | 0.17 | 0.17 |
| Antenna factor with height in the correlation | U09 | Rectangular | 1.73 | NA | NA |
| Measurement antenna and the absorbing material in the image of the mutual coupling effect | U10 | Rectangular | 1.73 | 0.50 | 0.50 |
| Antenna phase center variation | U11 | Rectangular | 1.73 | 0.58 | 0.58 |
| Antenna cross polarization response | U12 | Rectangular | 1.73 | 0.52 | 0.52 |
| Antenna imbalance | U13 | Rectangular | 1.73 | 0.52 | 0.52 |
| Test distance error | U14 | Rectangular | 1.73 | 0.17 | 0.17 |
| Desktop terrain clearance variation | U15 | Normal | 2.00 | 0.05 | 0.05 |
| Random uncertainty | U16 | Standard deviation | 1.00 | 0.22 | 0.23 |
| Pre-Amplifier gain Calibration | U17 | U-Shape | 1.41 | 0.13 | 0.13 |
| Combined Standard Uncertainty Uc(y) | Uc | Normal | 1.00 | 1.94 | 1.94 |
| Measuring Uncertainty for a level of Confidence of 95%(U= 2Uc(y)) | U=kUc | Normal | 2 | 3.89 | 3.89 |