# FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E

# TEST REPORT

**For**

**Fixed Wireless Terminal**

**Model: NEOS3000A**

**Trade Name: Gainwise**

*Issued to*

**Gainwise Technology Co. Ltd.**
**10F-4, NO.12, Chung Hua Rd., Yung Kang City,**
**Tainan Hsien, Taiwan, R.O.C**

*Issued by*

**Compliance Certification Services Inc.**
**No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,**
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ACCREDITED
No. 0824-01

TAF
Testing Laboratory
0363

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# 1. TEST RESULT CERTIFICATION

| | |
|---|---|
| **Applicant:** | Gainwise Technology Co. Ltd.<br>10F-4, NO.12, Chung Hua Rd., Yung Kang City,<br>Tainan Hsien, Taiwan, R.O.C |
| **Equipment Under Test:** | Fixed Wireless Terminal |
| **Trade Name:** | Gainwise |
| **Model Number:** | NEOS3000A |
| **Date of Test:** | June 17, 2006 |

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULT** |
| FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E | No non-compliance noted |

## We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI/TIA/EIA-603-A-2001 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rule FCC PART 22 Subpart H and PART 24 Subpart E.

The test results of this report relate only to the tested sample identified in this report.

*Approved by:*

Gavin Lim
Section Manager
Compliance Certification Services Inc.

*Reviewed by:*

Amanda Wu
Section Manager
Compliance Certification Services Inc.

# 2. EUT DESCRIPTION

| | |
|---|---|
| **Product** | Fixed Wireless Terminal |
| **Trade Name** | Gainwise |
| **Model Number** | NEOS3000A |
| **Model Discrepancy** | N/A |
| **Power Supply** | MODEL: SP120180SA<br>I/P: 100-240V ~ 47, 63Hz 1A<br>O/P: 12V, 1.5A 18W MAX |
| **Frequency Range** | TX: 824 ~ 849 MHz / 1850 ~ 1909.8 MHz<br>RX: 869 ~ 894 MHz / 1930 ~ 1989.8 MHz |
| **Transmit Power (ERP & EIRP Power)** | 850 MHz: 28.90 dBm<br>1900 MHz: 23.60 dBm |
| **Cellular Phone Protocol** | GSM |
| **Type of Emission** | 250KGXW |
| **Antenna Gain** | 850 MHz: - 4.21 dBi (including cable loss)<br>1900 MHz: -4.67 dBi (including cable loss) |
| **Antenna Type** | Monopole Antenna |

***Remark:***

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: UEGNEOSMC56 filing to comply with Part 22 and Part 24 of the FCC 47 CFR Rules.*

# 3. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures document on chapter 13 of ANSI C63.4 and FCC CFR 47, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

## 3.3 GENERAL TEST PROCEDURES

**Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

**Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

## 3.4 DESCRIPTION OF TEST MODES

The EUT (model: NEOS3000A) had been tested under operating condition.

EUT staying in continuous transmitting mode was programmed.

GSM850: Channel Low (CH128), Channel Mid (CH190) and Channel High (CH251) were chosen for full testing.

GSM1900: Channel Low (CH512), Channel Mid (CH661) and Channel High (CH810) were chosen for full testing.

After verification, all tests were carried out with the worst case test modes as shown below except powerline conducted emissions below 30MHz , which worst case was in normal link mode only.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

# 4. INSTRUMENT CALIBRATION

## 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

## 4.2 MEASUREMENT EQUIPMENT USED

**Equipment Used for Emissions Measurement**

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

| Conducted Emissions Test Site | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | R&S | FSEK30 | 10026 | 03/22/2007 |
| Spectrum Analyzer | Agilent | E4446A | MY43360131 | 01/10/2007 |
| Power Meter | Agilent | E4416A | GB41291611 | 06/02/2007 |
| Power Sensor | Agilent | E9327A | US40441097 | 06/02/2007 |
| Temp. / Humidity Chamber | TERCHY | MHG-150LF | 930619 | 07/26/2006 |
| DC Power Source | Agilent | E3640A | MY40001774 | 01/12/2007 |

| 3M Semi Anechoic Chamber | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 07/25/2006 |
| Test Receiver | Rohde&Schwarz | ESCI | 100064 | 06/28/2006 |
| Switch Controller | TRC | Switch Controller | SC94050010 | 05/05/2007 |
| 4 Port Switch | TRC | 4 Port Switch | SC94050020 | 05/05/2007 |
| Horn-Antenna | TRC | HA-0502 | 06 | 06/02/2007 |
| Horn-Antenna | TRC | HA-0801 | 04 | 05/05/2007 |
| Bilog- Antenna | Sunol Sciences | JB3 | A030205 | 03/09/2007 |
| Turn Table | Max-Full | MFT-120S | T120S940302 | N.C.R. |
| Antenna Tower | Max-Full | MFA-430 | A440940302 | N.C.R. |
| Controller | Max-Full | MF-CM886 | CC-C-1F-13 | N.C.R. |
| Site NSA | CCS | N/A | FCC: 965860<br>IC: IC 6106 | 09/26/2008 |
| High Pass Filter | Micro-Tronics | HPM13193 | 003 | N.C.R. |
| High Pass Filter | Micro-Tronics | HPM13194 | 003 | N.C.R. |
| S.G. | HP | 83630B | 3844A01022 | 01/14/2007 |
| Substituted Dipole | SCHWAZBECK | VHAP/UHAP | 998 +999/<br>981+982 | 06/12/2007 |
| Substituted Horn | EMCO | 3115 | 00022257 | 12/12/2006 |
| Test S/W | LABVIEW (V 6.1) | | | |

***Remark:*** *The measurement uncertainty is less than +/-2.0065dB (30MHz ~ 1GHz), +/-3.0958dB (Above 1GHz) which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

| Powerline Conducted Emissions Test Site | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| EMI TEST RECEIVER 9kHz-30MHz | ROHDE & SCHWARZ | ESHS30 | 828144/003 | 09/24/2006 |
| TWO-LINE V-NETWORK 9kHz-30MHz | SCHAFFNER | NNB41 | 03/10013 | 06/11/2007 |
| LISN 10kHz-100MHz | EMCO | 3825/2 | 9106-1809 | 02/17/2007 |
| Test S/W | LABVIEW (V 6.1) | | | |

***Remark:*** *The measurement uncertainty is less than +/- 2.81dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

# 5. FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

## 5.3 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---|---|---|---|
| USA | A2LA | EN 55011, EN 55014-1/2, CISPR 11, CISPR 14-1/2, EN 55022, EN 55015, CISPR 22, CISPR 15, AS/NZS 3548, VCCI V3 (2001), CFR 47, FCC Part 15/18, CNS 13783-1, CNS 13439, CNS 13438, CNS 13803, CNS 14115, EN 55024, IEC 801-2, IEC 801-3, IEC 801-4, IEC/EN 61000-3-2, EIC/EN 61000-3-3, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 50081-1/ EN 61000-6-3, EN 50081-2/EN 61000-6-4, EN 50081-2/EN 61000-6-1: 2001 | ACCREDITED<br>0824-01 |
| USA | FCC | 3/10 meter Open Area Test Sites (93105, 90471) / 3M Semi Anechoic Chamber (965860) to perform FCC Part 15/18 measurements | 93105, 90471<br>965860 |
| Japan | VCCI | 3/10 meter Open Area Test Sites to perform conducted/radiated measurements | R-393/1066/725/879<br>C-402/747/912 |
| Norway | NEMKO | EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2 | ELA 124a<br>ELA 124b<br>ELA 124c |
| Taiwan | TAF | EN 300 328, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3 | Testing Laboratory<br>0363 |
| Taiwan | BSMI | CNS 13438, CNS 13783-1, CNS 13439, CNS 14115 | SL2-IS-E-0014<br>SL2-IN-E-0014<br>SL2-A1-E-0014<br>SL2-R1-E-0014<br>SL2-R2-E-0014<br>SL2-L1-E-0014 |
| Canada | Industry Canada | 3/10 meter Open Area Test Sites (IC 3991-3, IC 3991-4) / 3M Semi Anechoic Chamber (IC 6106) to perform RSS 212 Issue 1 | IC 3991-3<br>IC 3991-4<br>IC 6106 |

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

# 6. SETUP OF EQUIPMENT UNDER TEST

## 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

## 6.2 SUPPORT EQUIPMENT

| No. | Device Type | Brand | Model | FCC ID | Series No. | Data Cable | Power Cord |
|---|---|---|---|---|---|---|---|
| 1. | Telephone | ISITO | IS-333 | N/A | IK09874 | N/A | N/A |
| 2 | Universal Radio Communication tester | R&S | CMU 200 | 1100.000.8.02 | N/A | N/A | Unshielded, 1.8m |

***Remark:***

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

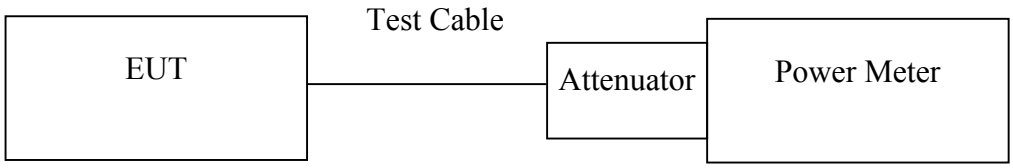
# 7. FCC PART 22 & 24 REQUIREMENTS

## 7.1 AVERAGE POWER

### LIMIT

According to FCC §2.1046.

**Test Configuration**




***Remark:*** *Measurement setup for testing on Antenna connector*

### TEST PROCEDURE

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

# TEST RESULTS

*No non-compliance noted.*

**Test Data**

| Test Mode | CH | Frequency (MHz) | Power Meter Reading (dBm) | Attenuator (dB) | Average Power (dBm) |
|---|---|---|---|---|---|
| GSM 850 | 128 | 824.20 | 11.60 | 20 | 31.60 |
| | 190 | 836.60 | 11.80 | | 31.80 |
| | 251 | 848.80 | 12.00 | | 32.00 |

***Remark:*** *The value of factor includes both the loss of cable and external attenuator*

| Test Mode | CH | Frequency (MHz) | Power Meter Reading (dBm) | Attenuator (dB) | Average Power (dBm) |
|---|---|---|---|---|---|
| GSM 1900 | 512 | 1850.20 | 9.40 | 20 | 29.40 |
| | 661 | 1880.00 | 8.30 | | 28.30 |
| | 810 | 1909.8.00 | 9.00 | | 29.00 |

***Remark:*** *The value of factor includes both the loss of cable and external attenuator*

## 7.2 ERP & EIRP MEASUREMENT

## LIMIT

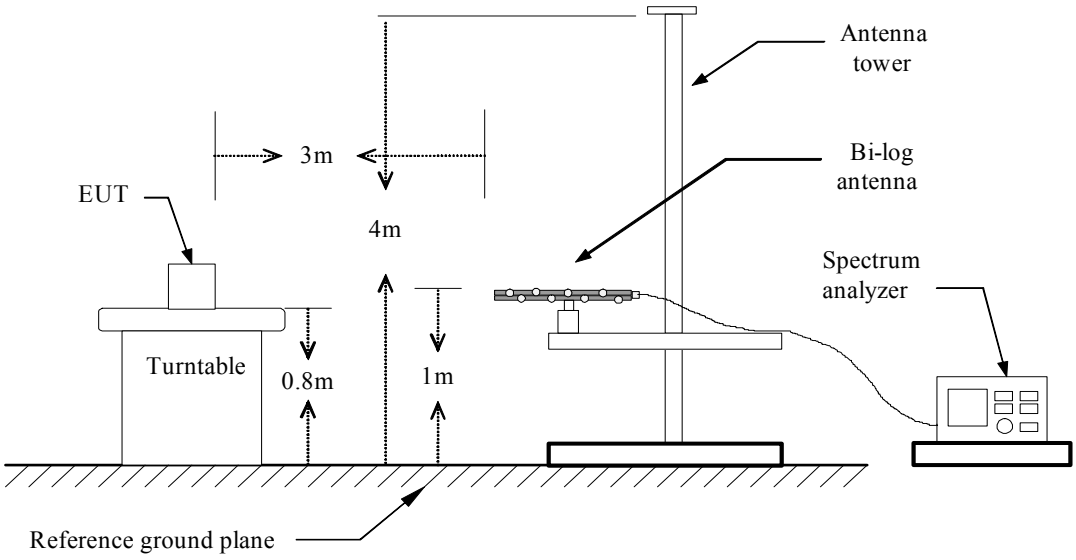
According to FCC §2.1046

FCC 22.913(b): The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.

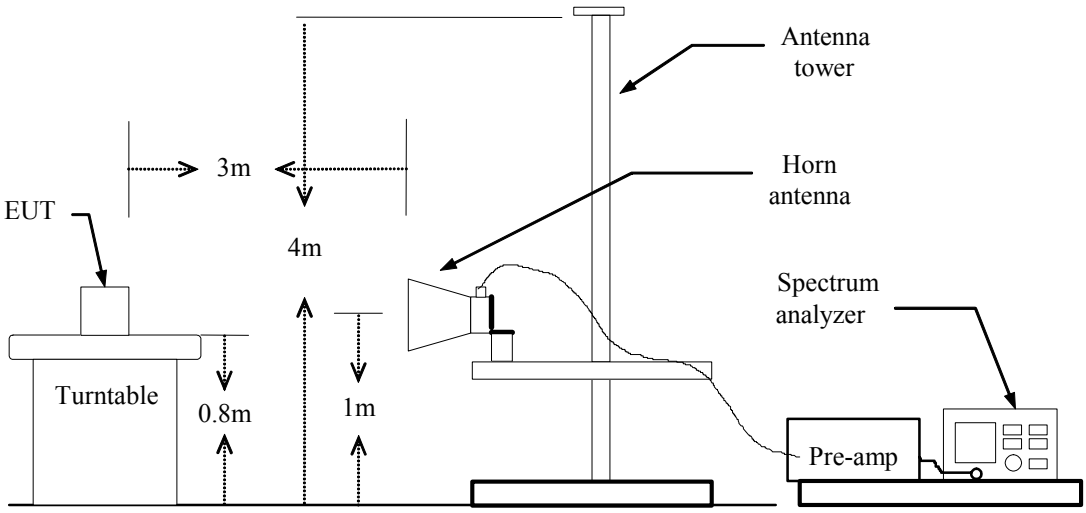
FCC 24.232(b): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

## TEST CONFIGURATION

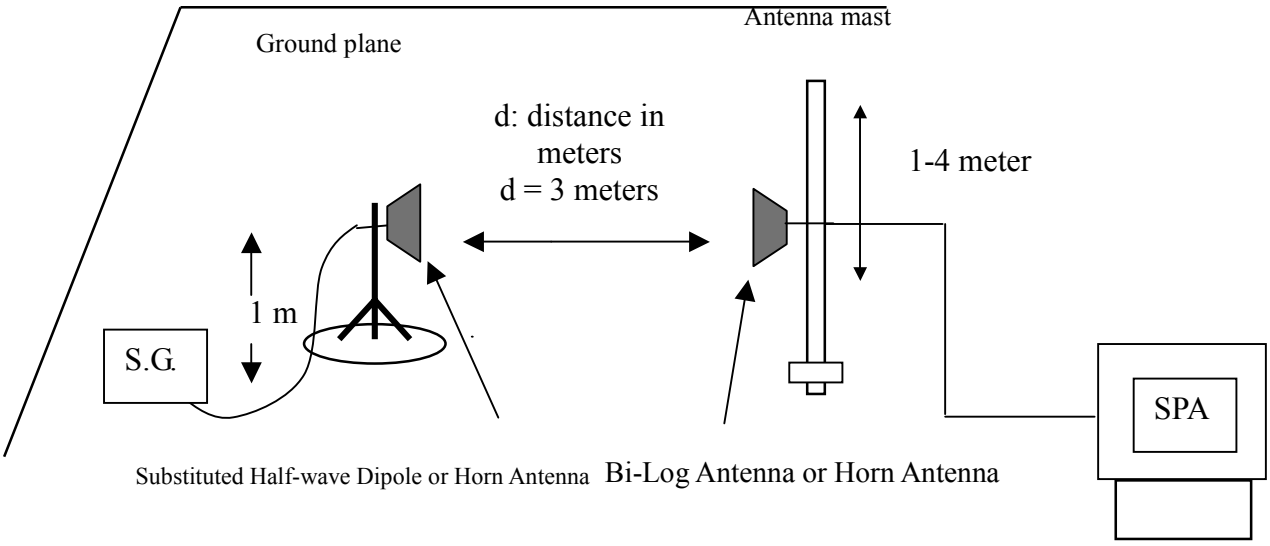
**Below 1 GHz**




**Above 1 GHz**



**For Substituted Method Test Set-UP**




## TEST PROCEDURE

The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.

During the measurement of the EUT, the resolution bandwidth was set to 3MHz and the average bandwidth was set to 3MHz. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna. The reading was recorded and the field strength (E in dBuV/m) was calculated.

ERP in frequency band 824-849MHz, and EIRP in frequency band 1851.25 –1910MHz were measured using a substitution method. The EUT was replaced by half-wave dipole (824-849MHz) or horn antenna (1851.25-1910MHz) connected to a signal generator. The spectrum analyzer reading was recorded and ERP/EIRP was calculated as follows:

ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable (dB)
EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

# TEST RESULTS

*No non-compliance noted.*

## GSM 850 Test Data

| Channel | Frequency (MHz) | Antenna Pol. | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 128 | 824.20 | V | 18.26 | 8.19 | 26.45 | 38.45 | -12.00 |
| | | H | 13.51 | 8.05 | 21.57 | 38.45 | -16.88 |
| 190 | 836.60 | V | 17.86 | 8.41 | 26.27 | 38.45 | -12.18 |
| | | H | 13.70 | 8.25 | 21.95 | 38.45 | -16.50 |
| 251 | 848.80 | V | 20.41 | 8.50 | 28.90 | 38.45 | -9.55 |
| | | H | 16.23 | 8.45 | 24.68 | 38.45 | -13.77 |

## GSM 1900 Test Data

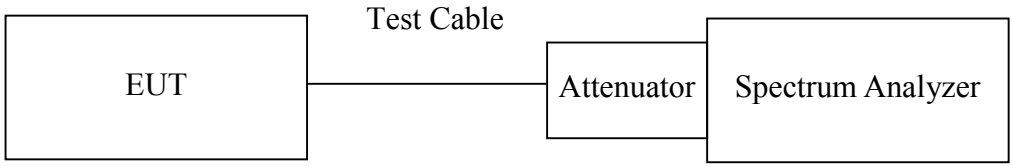
| Channel | Frequency (MHz) | Antenna Pol. | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 512 | 1850.20 | V | 17.80 | 4.02 | 21.82 | 33.00 | -11.18 |
| | | H | 12.91 | 3.17 | 16.08 | 33.00 | -16.92 |
| 661 | 1880.00 | V | 17.80 | 4.25 | 22.05 | 33.00 | -10.95 |
| | | H | 11.73 | 3.40 | 15.13 | 33.00 | -17.87 |
| 810 | 1909.8.00 | V | 19.01 | 4.49 | 23.50 | 33.00 | -9.50 |
| | | H | 12.65 | 3.62 | 16.27 | 33.00 | -16.73 |

## 7.3 OCCUPIED BANDWIDTH MEASUREMENT

## LIMIT

According to §FCC 2.1049.

**Test Configuration**




***Remark:*** *Measurement setup for testing on Antenna connector*

## TEST PROCEDURE

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW is set to 3 times the RBW, -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

# TEST RESULTS

*No non-compliance noted*

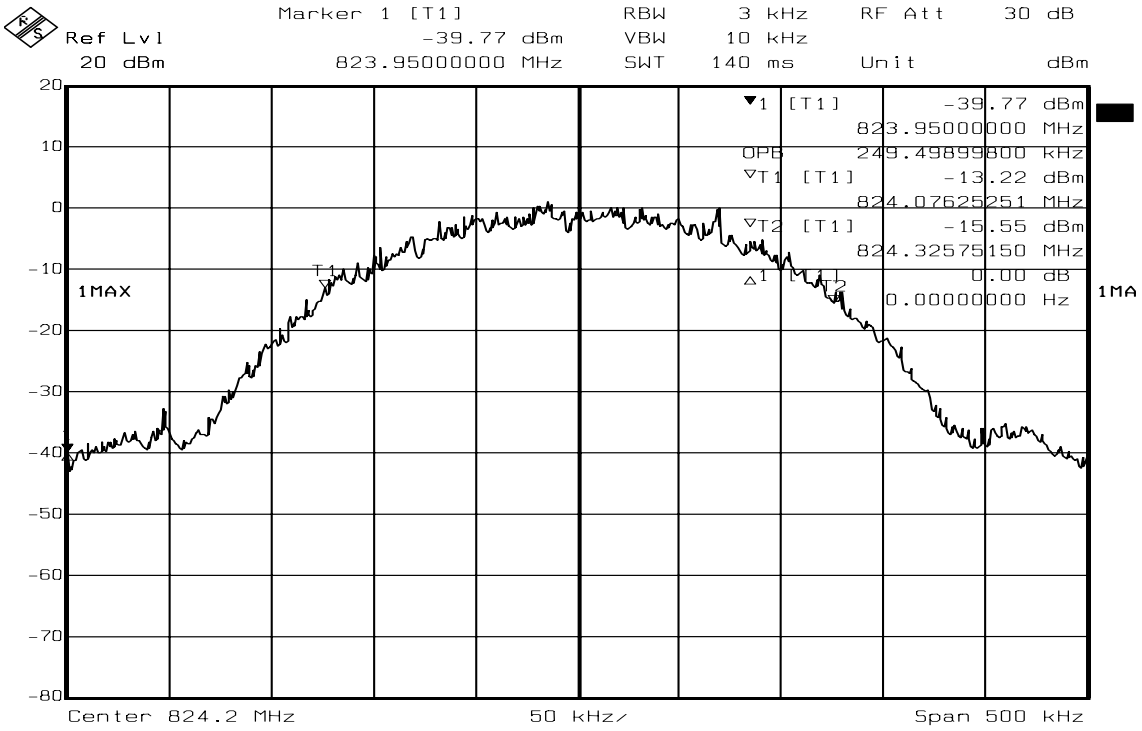
**Test Data**

| Test Mode | CH | Frequency (MHz) | Bandwidth (kHz) |
|---|---|---|---|
| GSM 850 | 128 | 824.20 | 249.49 |
| | 190 | 836.60 | 247.49 |
| | 251 | 848.80 | 250.50 |

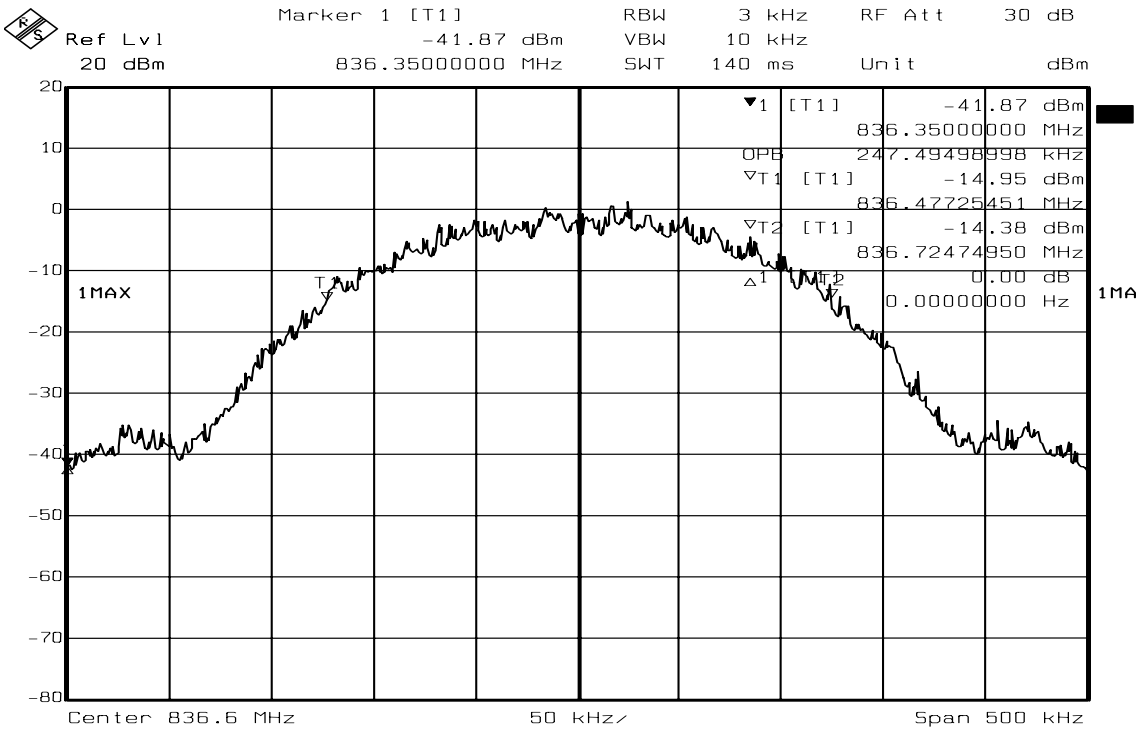
| Test Mode | CH | Frequency (MHz) | Bandwidth (kHz) |
|---|---|---|---|
| GSM 1900 | 512 | 1850.20 | 248.49 |
| | 661 | 1880.00 | 249.49 |
| | 810 | 1909.80 | 248.49 |

## Test Plot

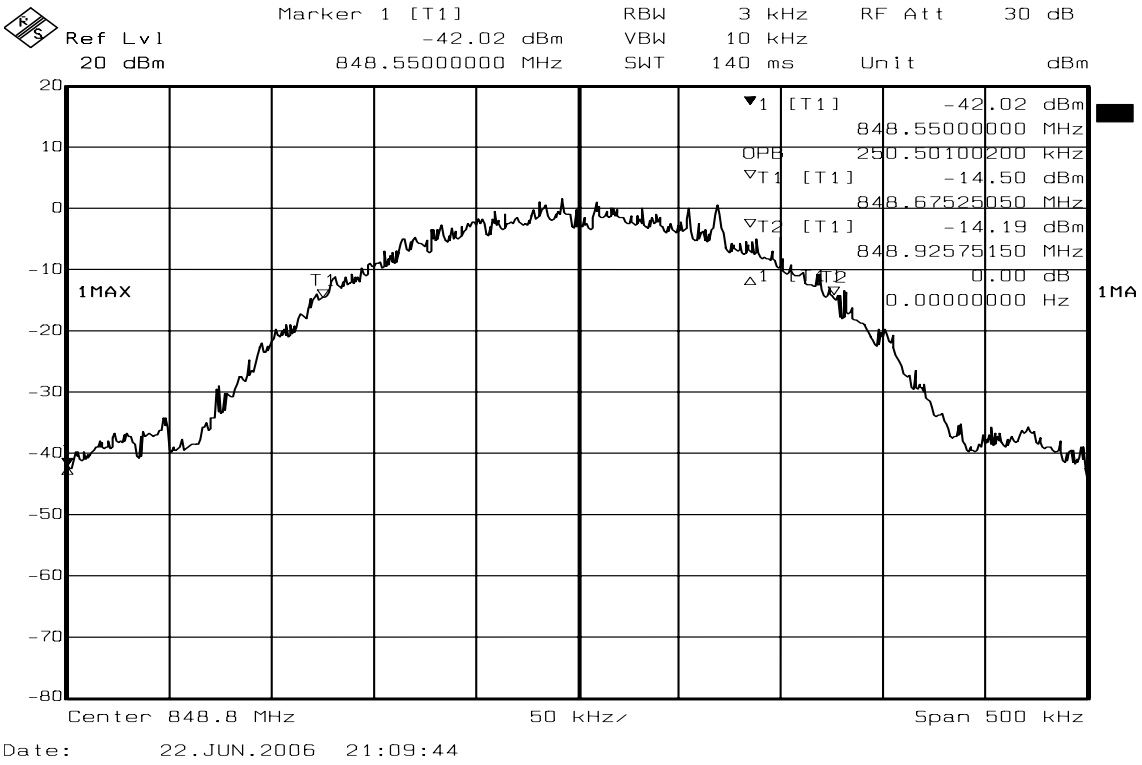
### GSM 850 (CH Low)



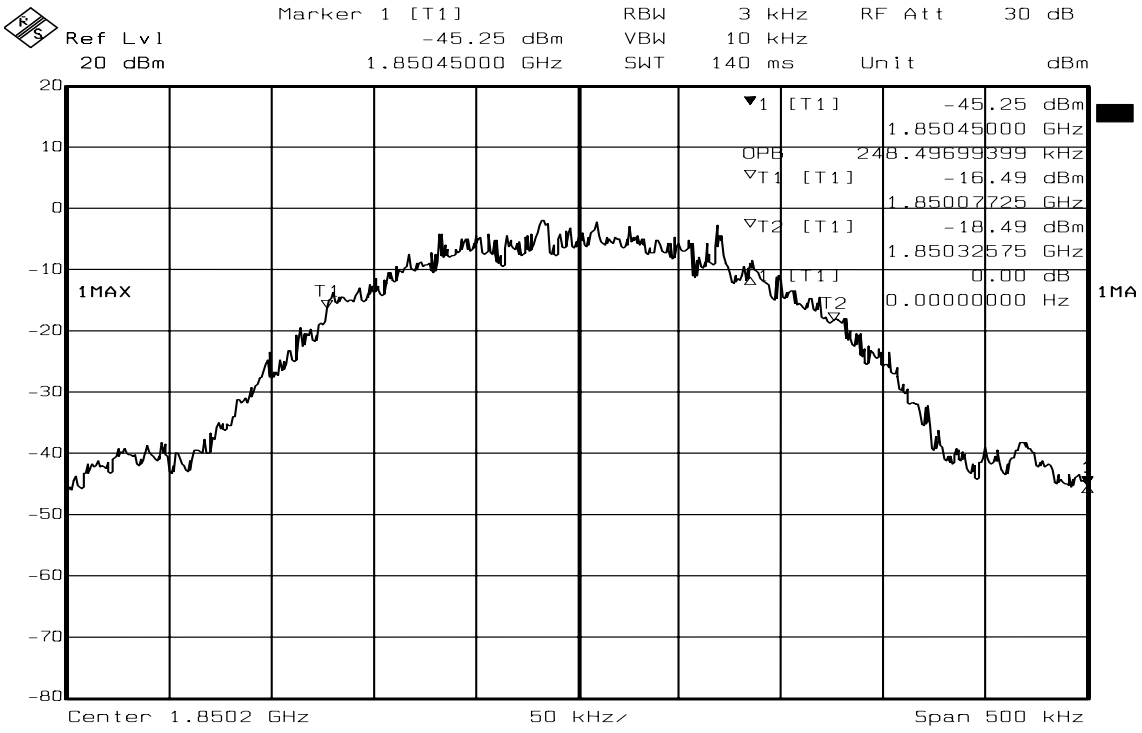

### GSM 850 (CH Mid)



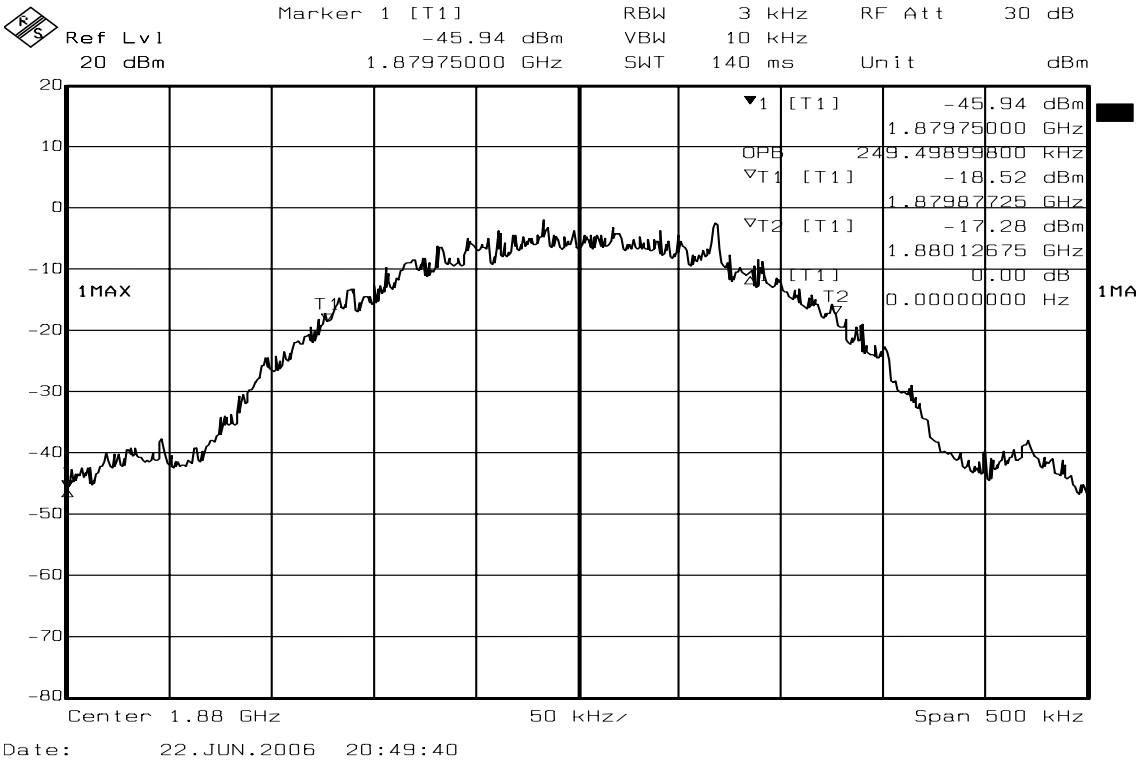
## GSM 850 (CH High)



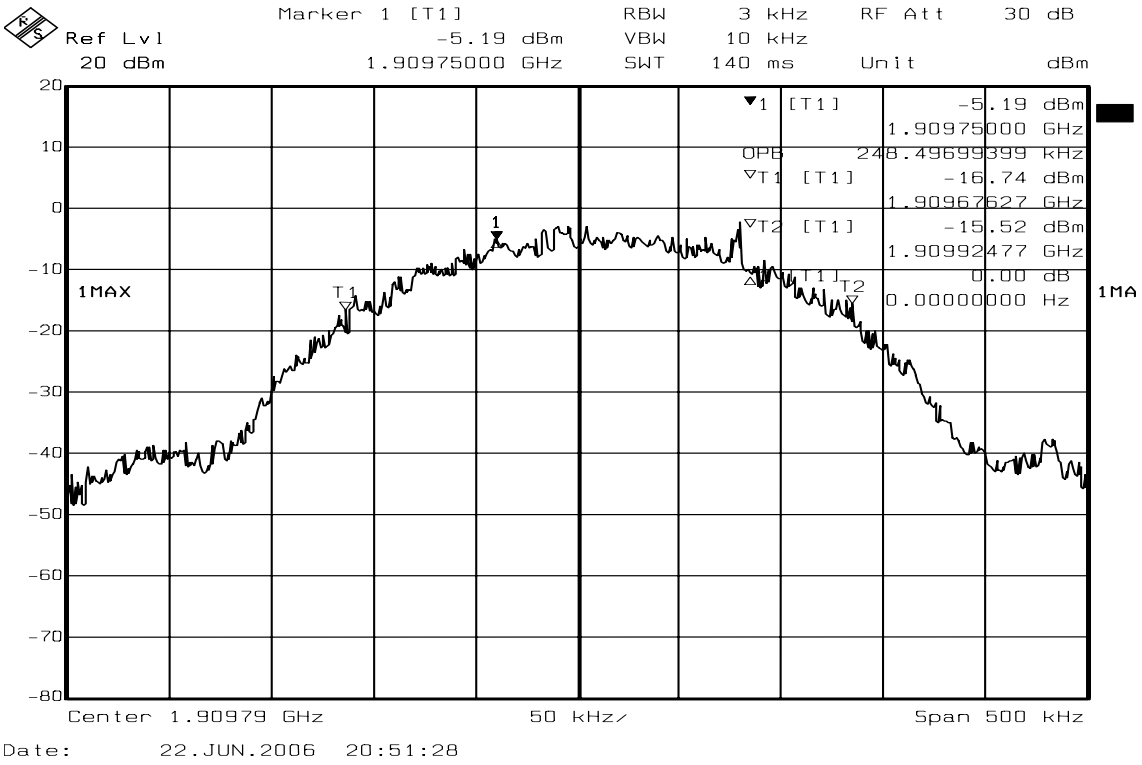
## GSM 1900 (CH Low)




## GSM 1900 (CH Mid)



## GSM 1900 (CH High)



## 7.4 OUT OF BAND EMISSION AT ANTENNA TERMINALS

## LIMIT

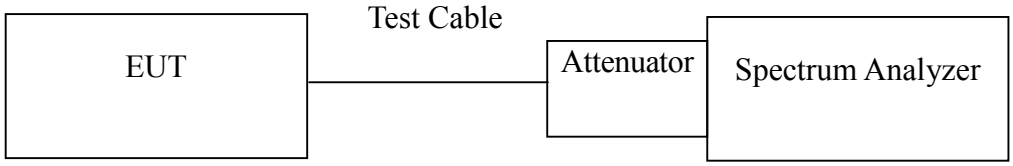
According to FCC §2.1051, FCC §22.917, FCC §24.238(a).

**Out of Band Emissions:** The mean power of emission must be attenuated below the mean power of the non-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at lease 43 + 10 log P dB.

**Mobile Emissions in Base Frequency Range:** The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not exceed –80 dBm at the transmit antenna connector.
**Band Edge Requirements:** In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at lease 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the Out of band Emission

## TEST CONFIGURATION

**Out of band emission at antenna terminals:**




## TEST PROCEDURE

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10 th harmonic. Limit = -13dBm

Band Edge Requirements (824 MHz and 849 MHz /1850MHz and 1910MHz): In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

# TEST RESULTS

*No non-compliance noted.*

**Test Data**

| Mode | CH | Location | Description |
|---|---|---|---|
| GSM 850 | 128 | Figure 7-1 | Conducted spurious emissions, 30MHz - 2.5GHz |
| | | Figure 7-2 | Conducted spurious emissions, 2.5GHz - 20GHz |
| | 190 | Figure 7-3 | Conducted spurious emissions, 30MHz - 2.5GHz |
| | | Figure 7-4 | Conducted spurious emissions, 2.5GHz - 20GHz |
| | 251 | Figure 7-5 | Conducted spurious emissions, 30MHz - 2.5GHz |
| | | Figure 7-6 | Conducted spurious emissions, 2.5GHz - 20GHz |

| Mode | CH | Location | Description |
|---|---|---|---|
| GSM 1900 | 512 | Figure 8-1 | Conducted spurious emissions, 30MHz - 2.5GHz |
| | | Figure 8-2 | Conducted spurious emissions, 2.5GHz - 20GHz |
| | 661 | Figure 8-3 | Conducted spurious emissions, 30MHz - 2.5GHz |
| | | Figure 8-4 | Conducted spurious emissions, 2.5GHz - 20GHz |
| | 810 | Figure 8-5 | Conducted spurious emissions, 30MHz - 2.5GHz |
| | | Figure 8-6 | Conducted spurious emissions, 2.5GHz - 20GHz |

| Mode | CH | Location | Description |
|---|---|---|---|
| GSM 850 | 128 | Figure 9-1 | Band Edge emissions |
| | 251 | Figure 9-2 | Band Edge emissions |

| Mode | CH | Location | Description |
|---|---|---|---|
| GSM 1900 | 512 | Figure 10-1 | Band Edge emissions |
| | 810 | Figure 10-2 | Band Edge emissions |

## Test Plot

## GSM 850

Figure 7-1: Out of Band emission at antenna terminals – GSM CH Low

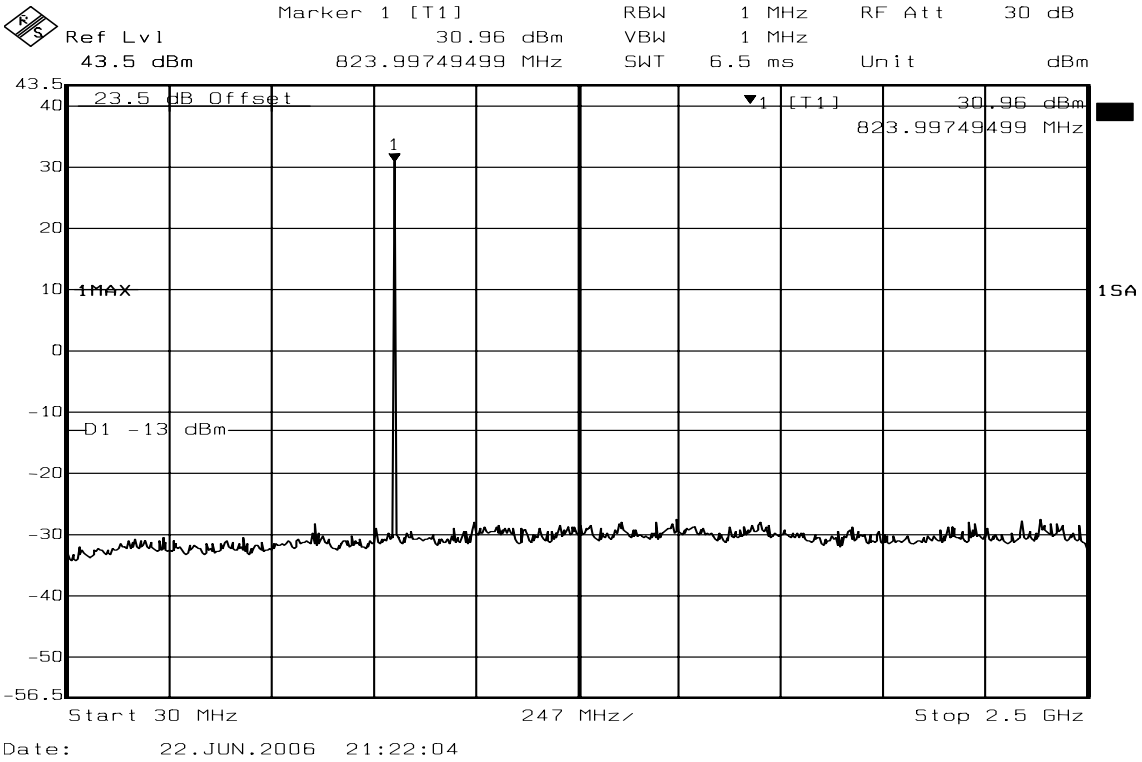



Figure 7-2: Out of Band emission at antenna terminals – GSM CH Low

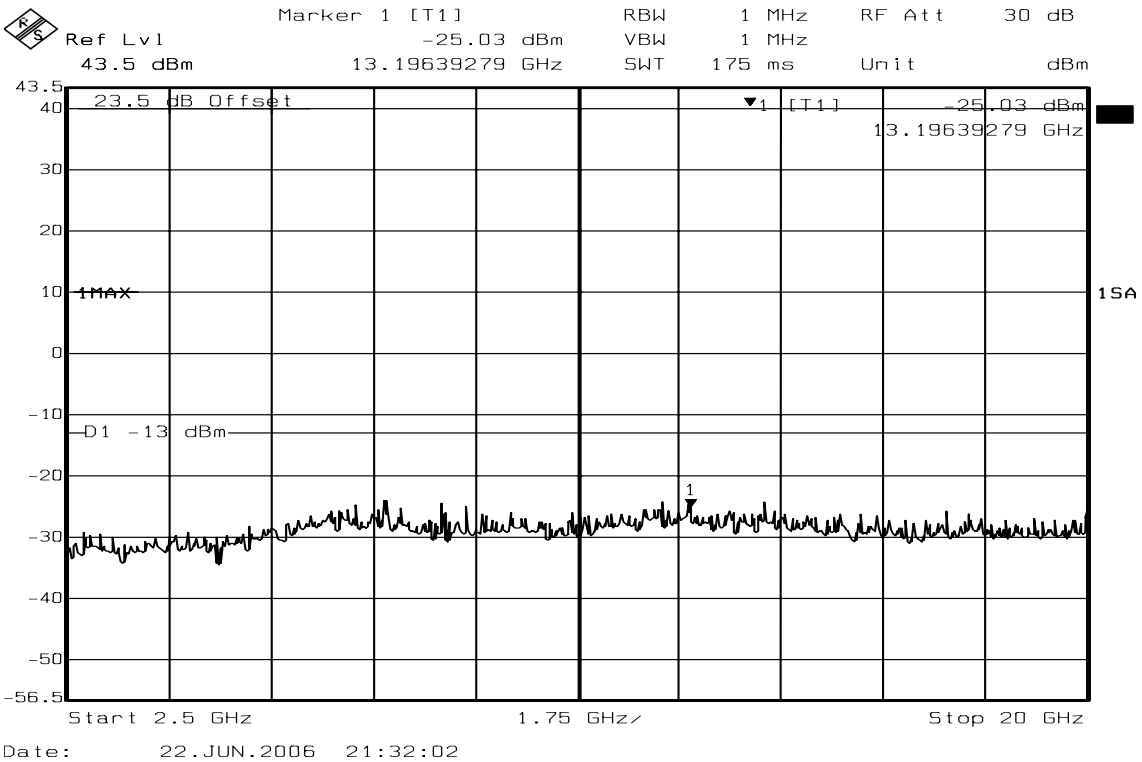


Figure 7-3: Out of Band emission at antenna terminals – GSM CH Mid

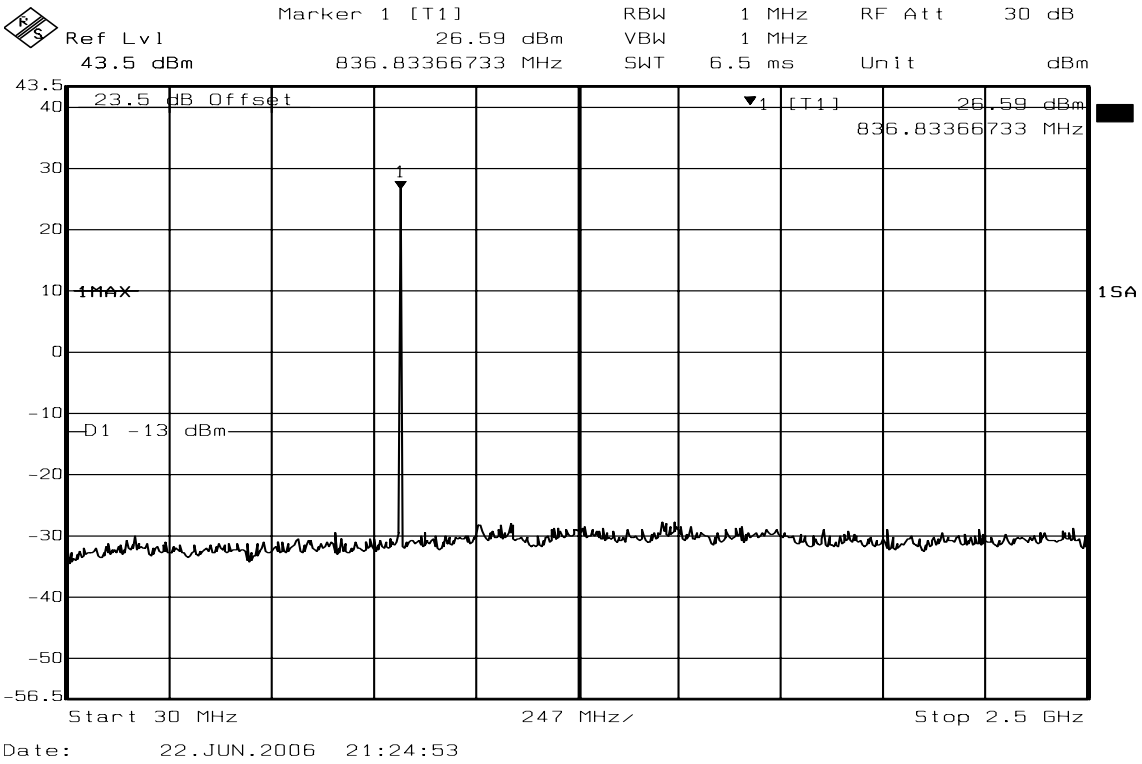



Figure 7-4: Out of Band emission at antenna terminals – GSM CH Mid

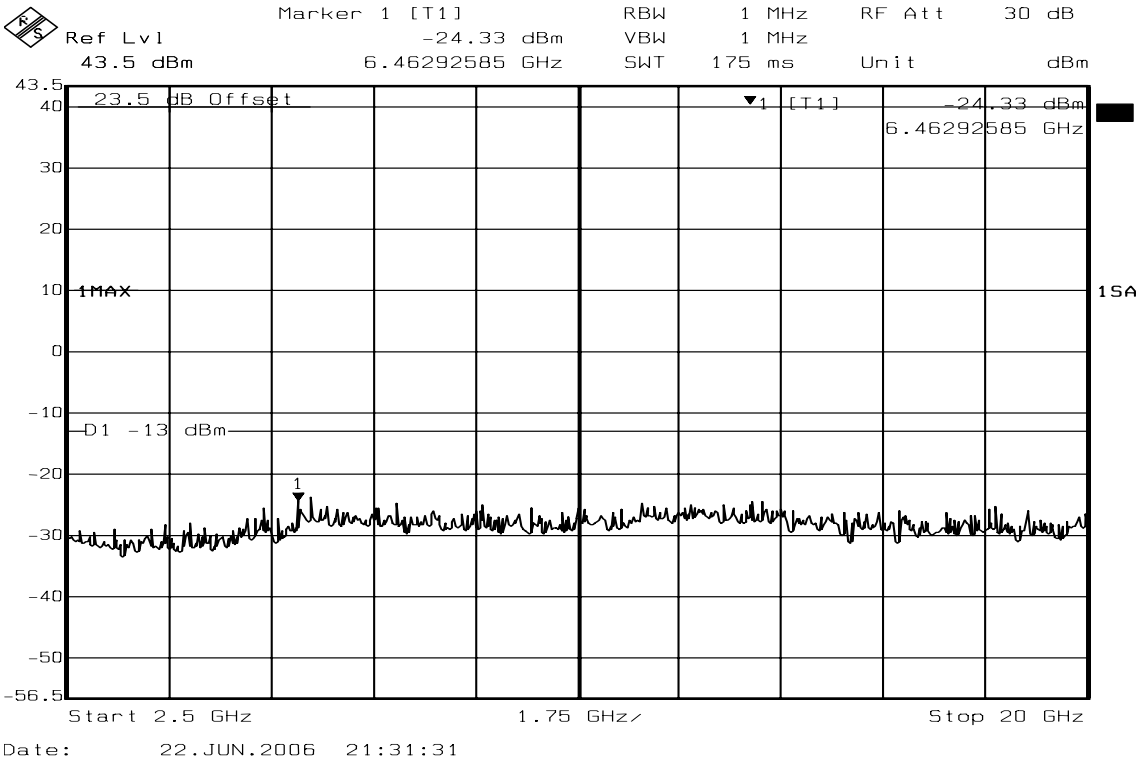


Figure 7-5: Out of Band emission at antenna terminals – GSM CH High

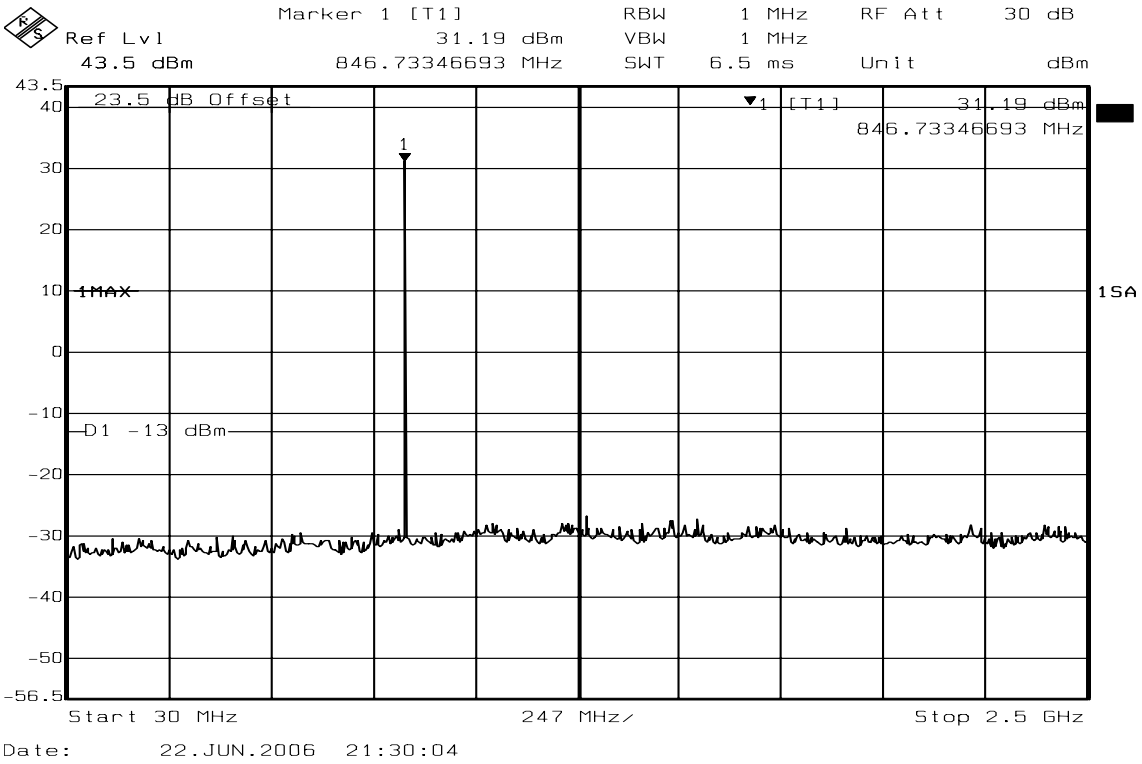
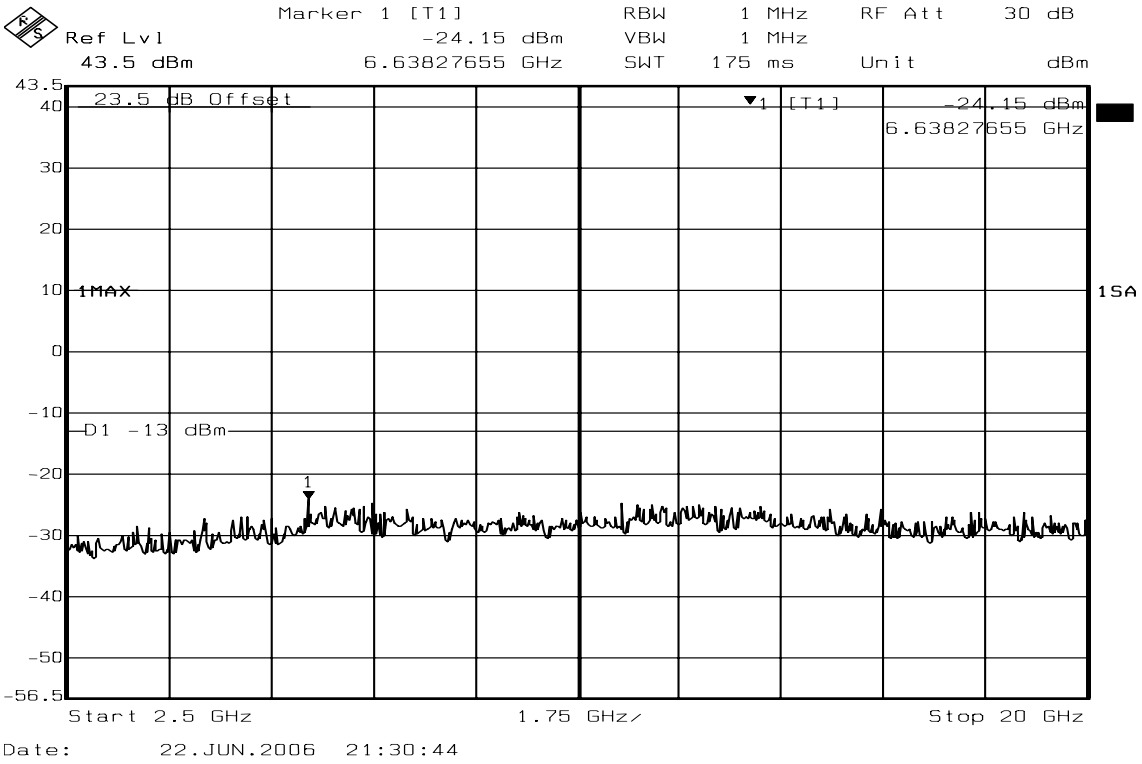



Figure 7-6: Out of Band emission at antenna terminals – GSM CH High



## GSM 1900

Figure 8-1: Out of Band emission at antenna terminals – GSM CH Low

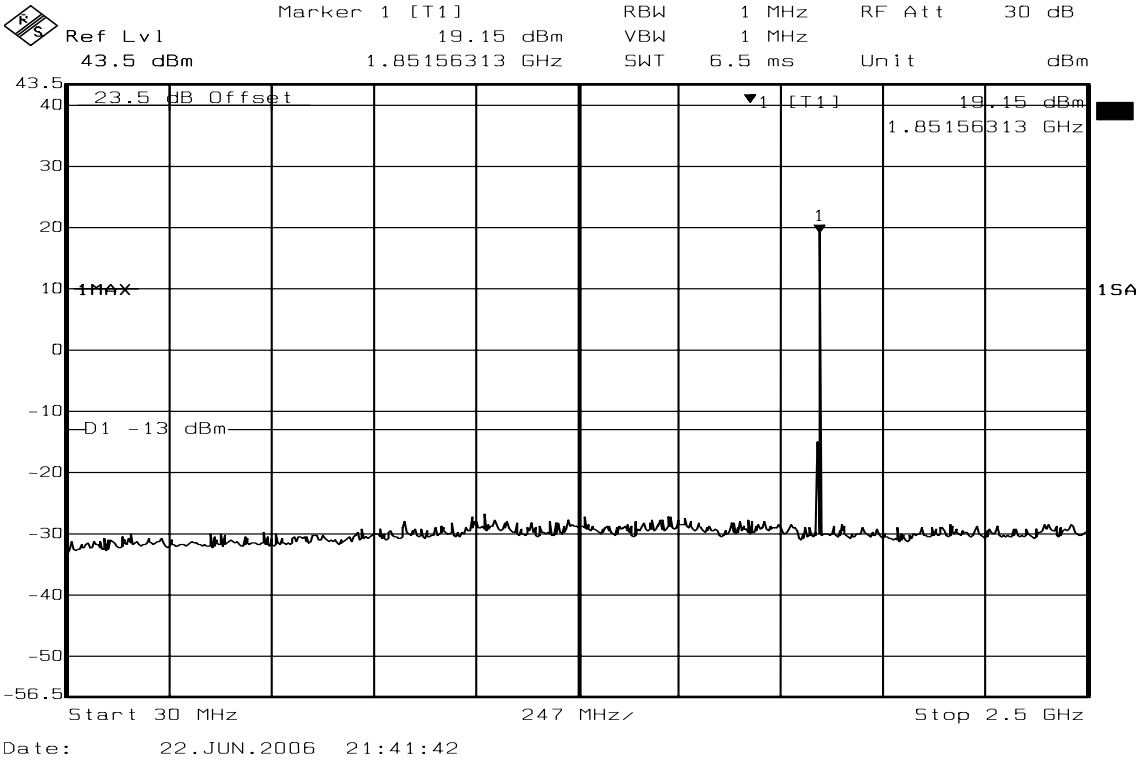



Figure 8-2: Out of Band emission at antenna terminals – GSM CH Low

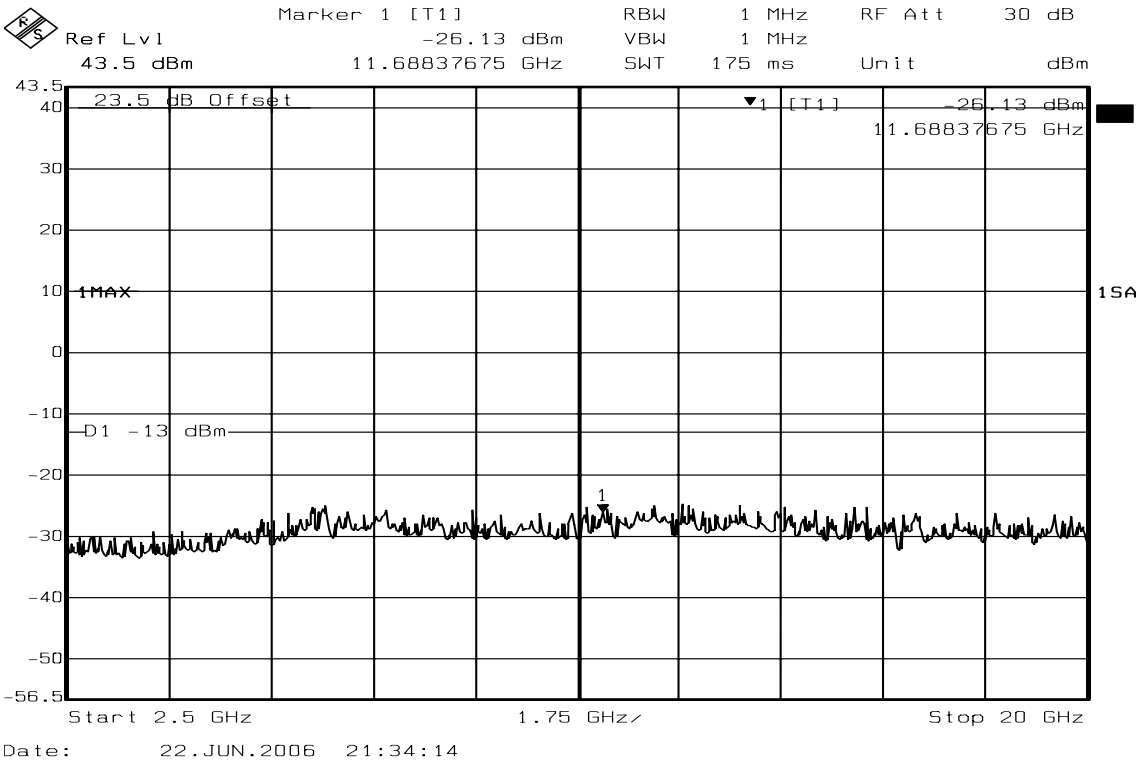


Figure 8-3: Out of Band emission at antenna terminals – GSM CH Mid

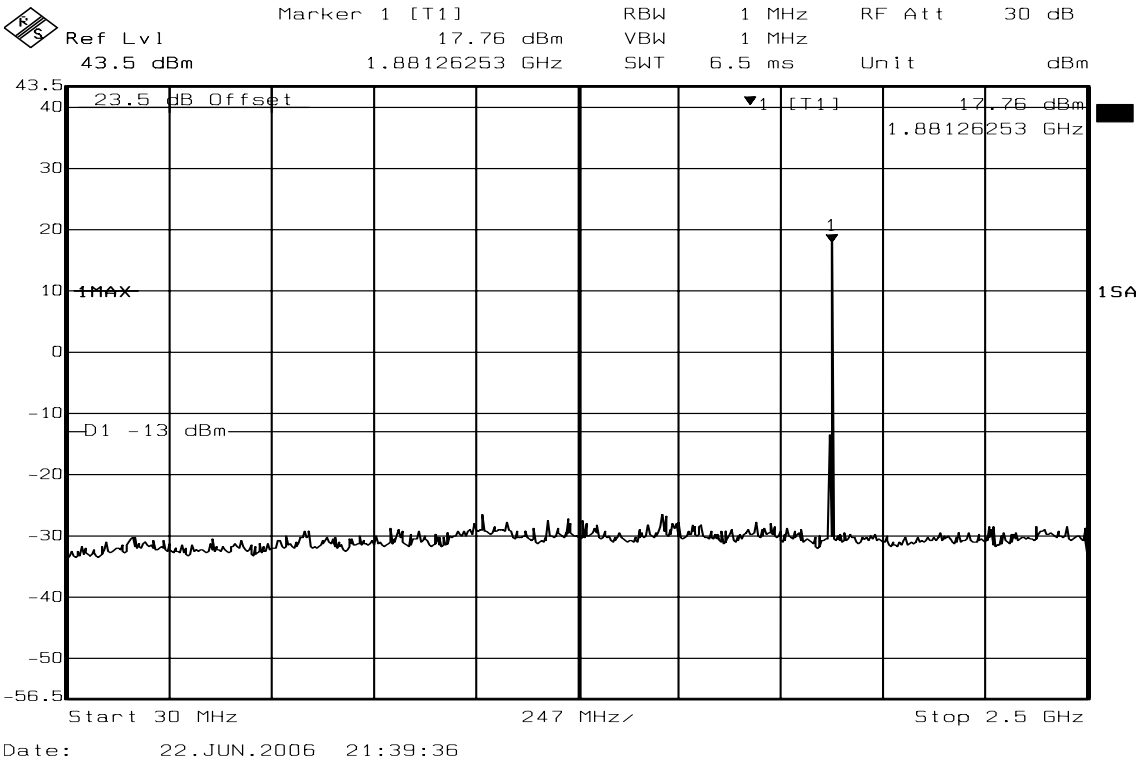



Figure 8-4: Out of Band emission at antenna terminals – GSM CH Mid

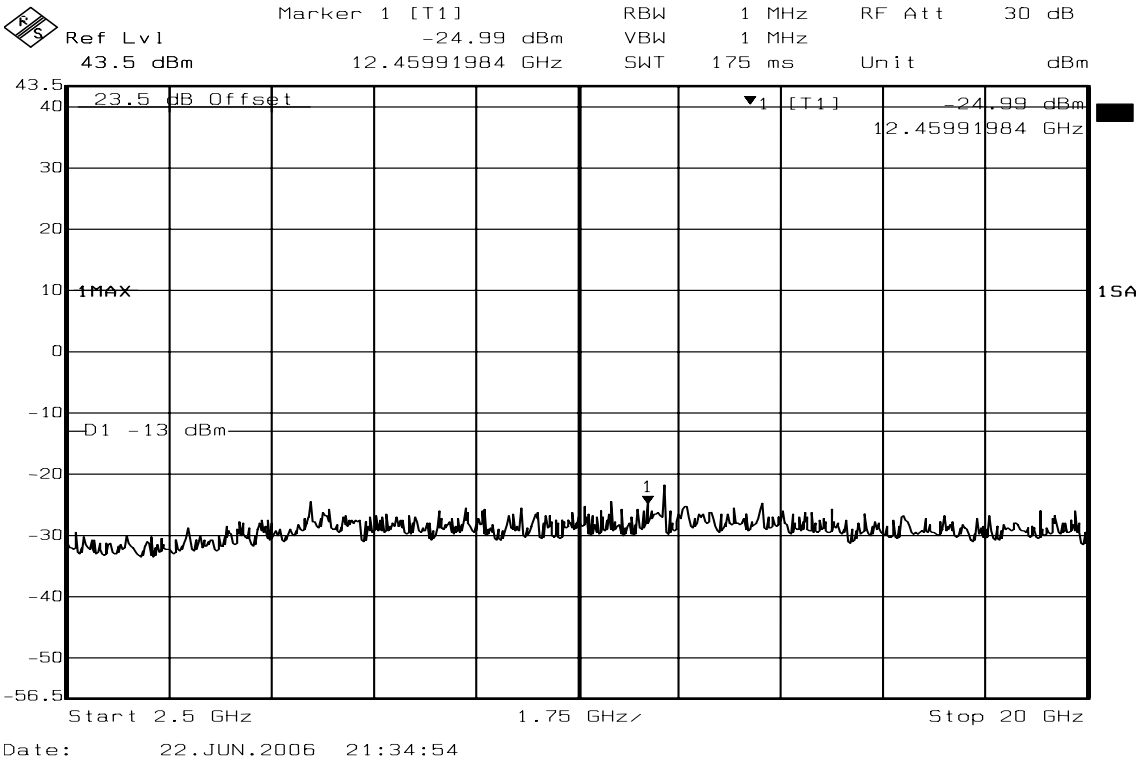


Figure 8-5: Out of Band emission at antenna terminals – GSM CH High

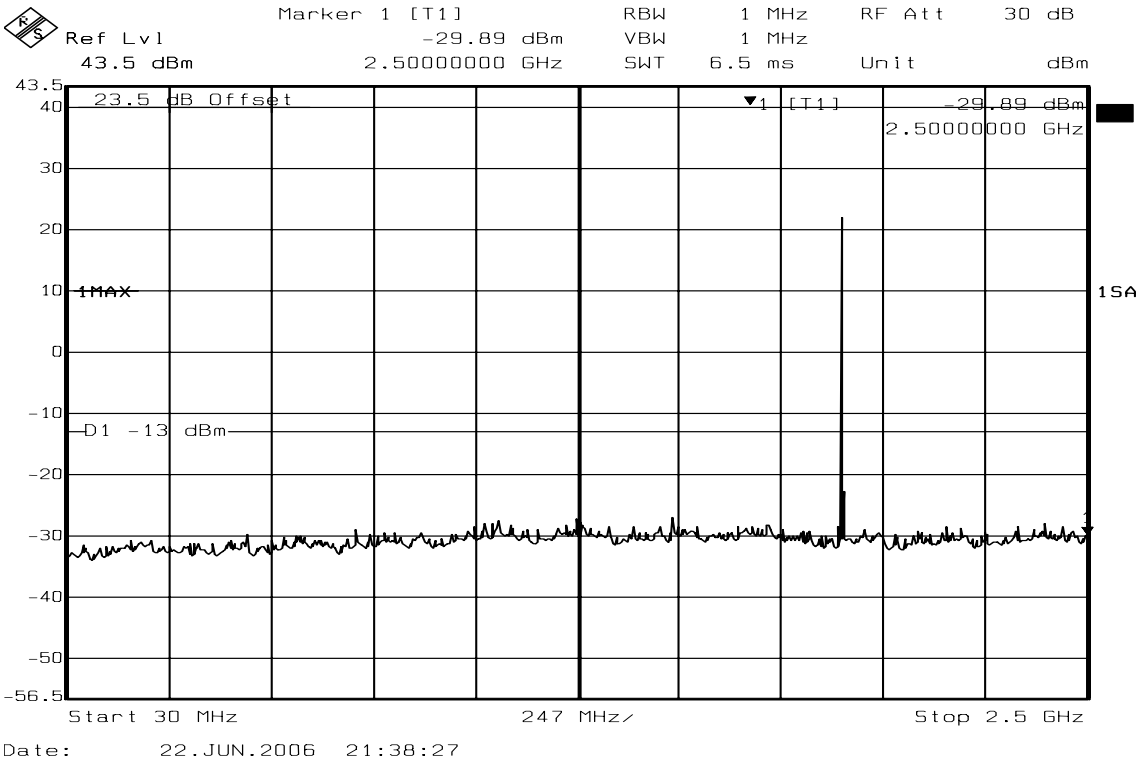
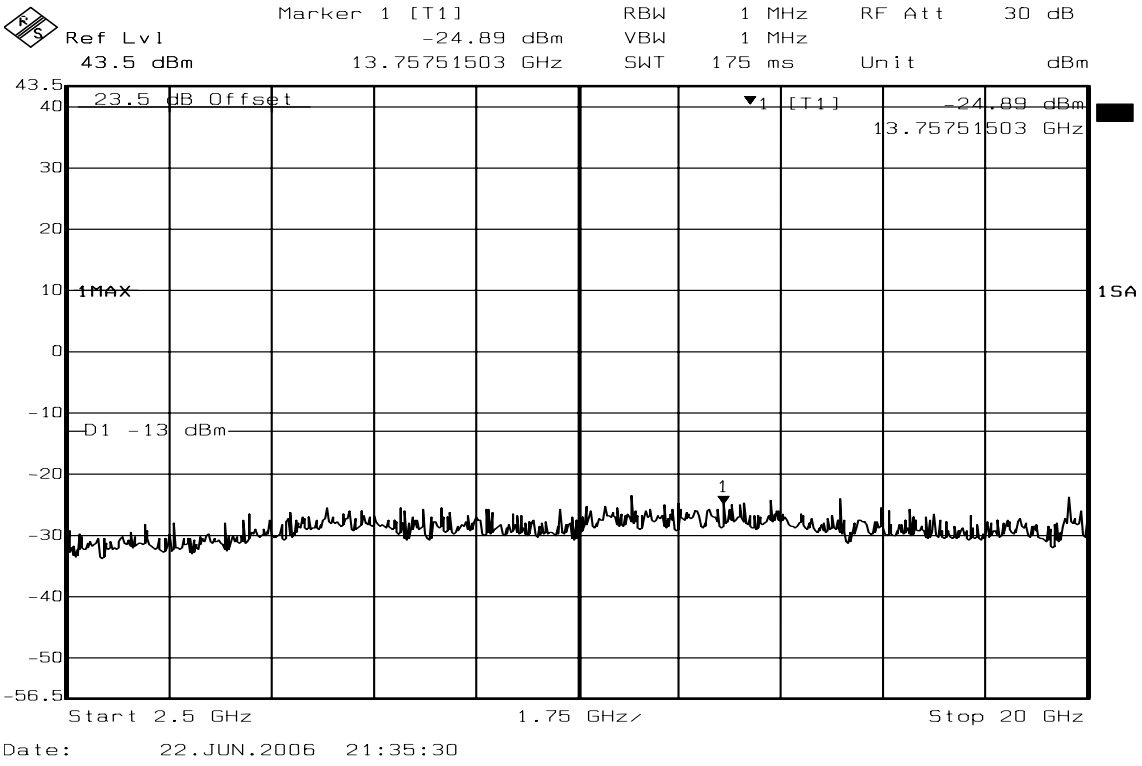



Figure 8-6: Out of Band emission at antenna terminals – GSM CH High



## GSM 850

Figure 9-1: Band Edge emissions – GSM CH Low

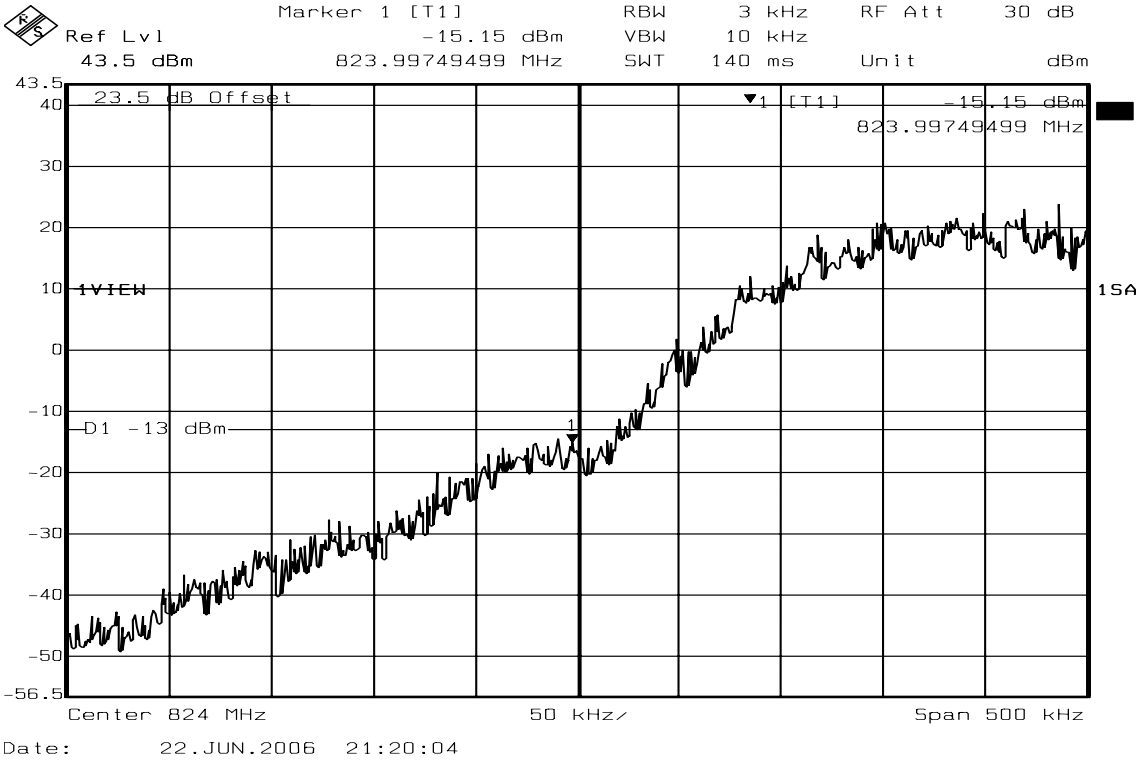
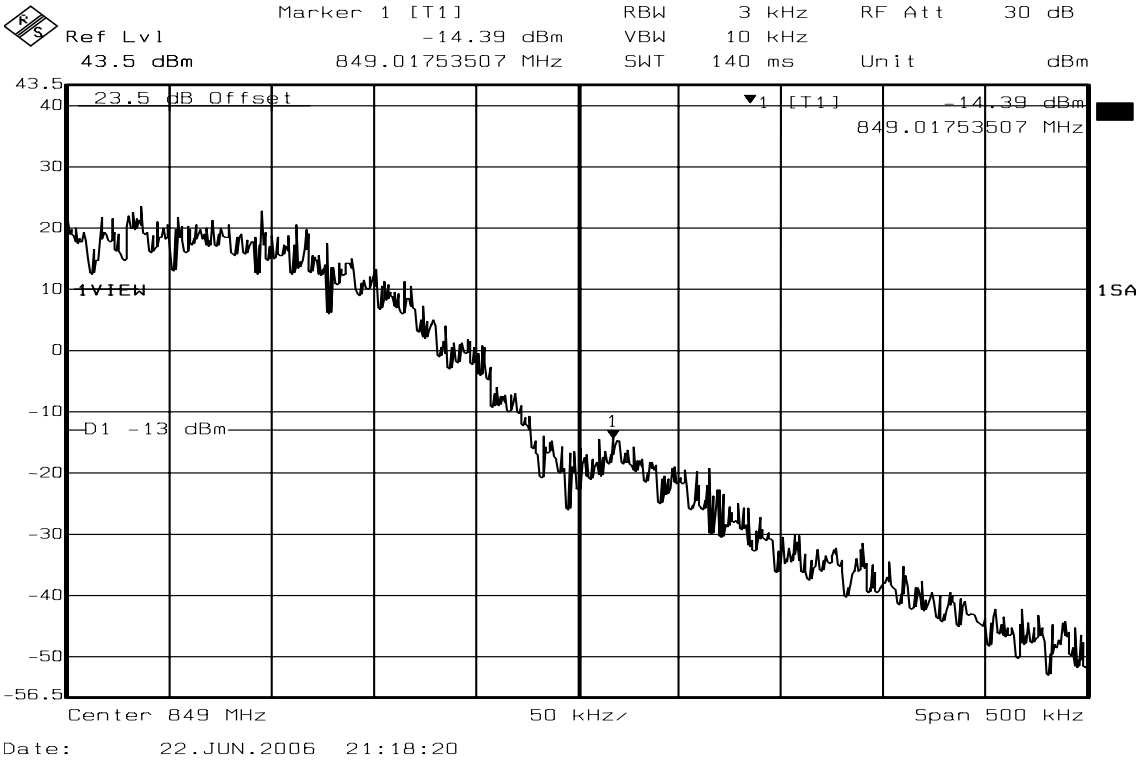



Figure 9-2: Band Edge emissions – GSM CH High



## GSM 1900

Figure 10-1: Band Edge emissions – GSM CH Low

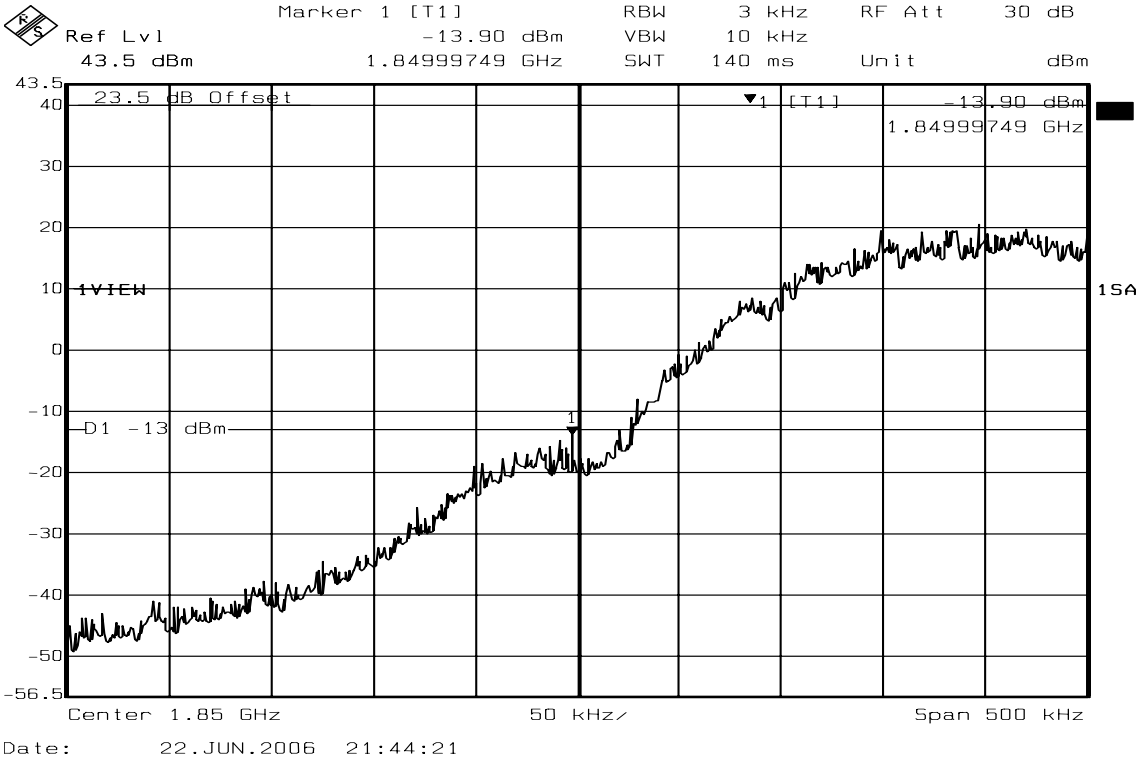
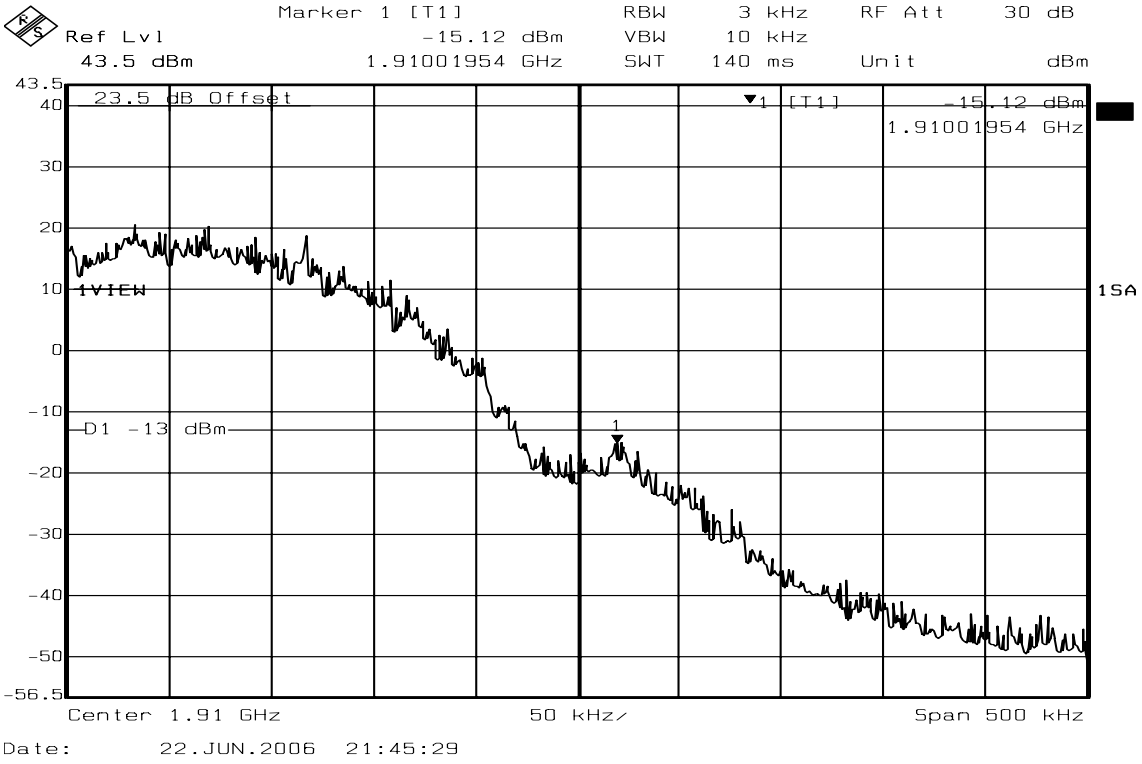



Figure 10-2: Band Edge emissions – GSM CH High



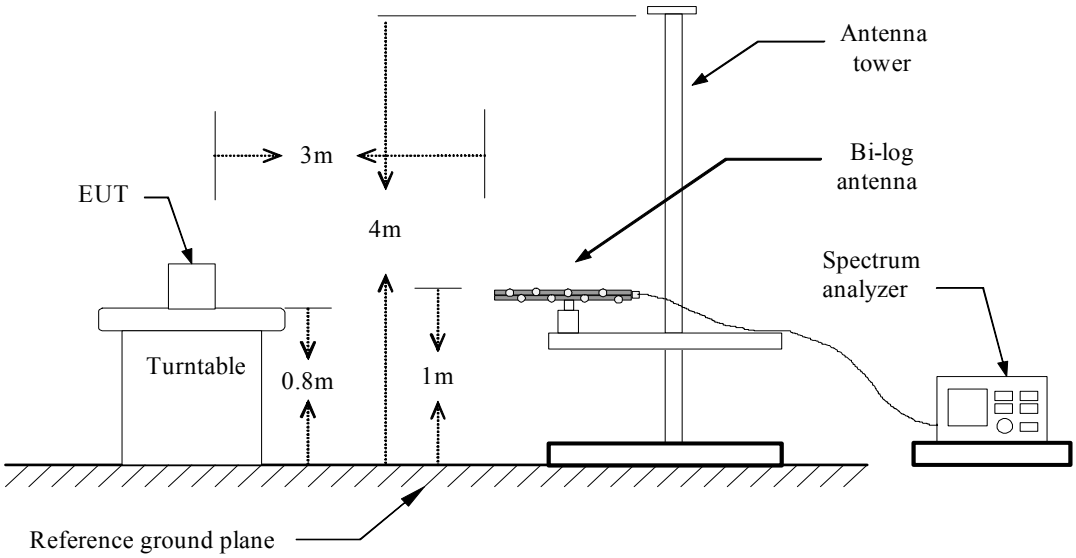
# 7.5 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

## LIMIT

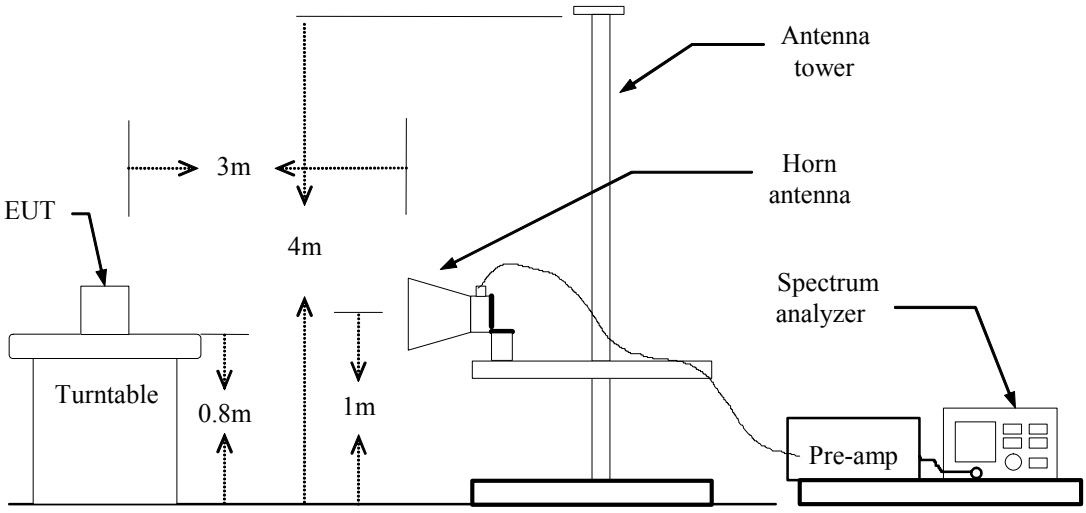
According to FCC §2.1053

**Test Configuration**

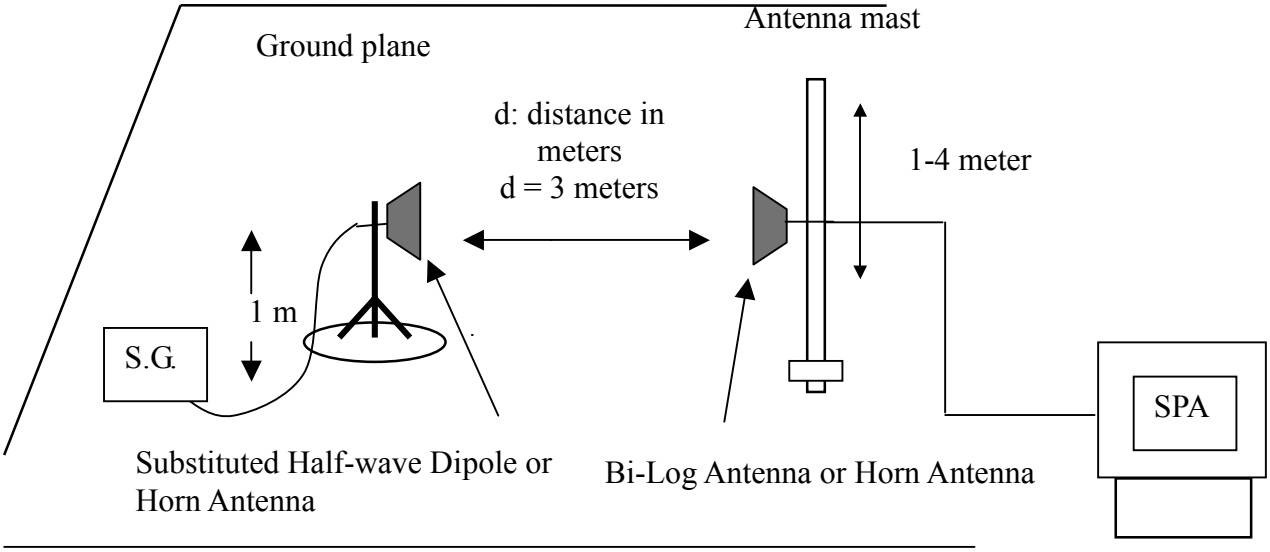
**Below 1 GHz**




**Above 1 GHz**



**Substituted Method Test Set-up**




## TEST PROCEDURE

The EUT was placed on a non-conductive, the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission were identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable (dB)

EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

## TEST RESULTS

*Refer to the attached tabular data sheets.*

**Radiated Spurious Emission Measurement Result**

**Below 1GHz**

**Operation Mode:** GSM 850 / TX / CH 128 **Test Date:** June 17, 2006

**Temperature:** 25C **Tested by:** Ivan Tsai

**Humidity:** 55% RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 32.91 | V | -56.88 | 7.12 | -49.76 | -13.00 | -36.76 |
| 53.28 | V | -68.40 | 9.45 | -58.95 | -13.00 | -45.95 |
| 140.58 | V | -51.66 | -6.15 | -57.81 | -13.00 | -44.81 |
| 338.46 | V | -65.02 | -0.19 | -65.21 | -13.00 | -52.21 |
| 408.30 | V | -64.63 | 1.28 | -63.35 | -13.00 | -50.35 |
| 512.09 | V | -64.98 | 3.48 | -61.51 | -13.00 | -48.51 |
| | | | | | | |
| 32.91 | H | -55.73 | 4.20 | -51.53 | -13.00 | -38.53 |
| 75.59 | H | -54.65 | -4.43 | -59.08 | -13.00 | -46.08 |
| 121.18 | H | -47.51 | -6.69 | -54.20 | -13.00 | -41.20 |
| 143.49 | H | -52.84 | -6.15 | -58.99 | -13.00 | -45.99 |
| 159.98 | H | -60.86 | -5.62 | -66.48 | -13.00 | -53.48 |
| 363.68 | H | -65.19 | 0.71 | -64.48 | -13.00 | -51.48 |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 850 / TX / CH 190 **Test Date:** June 17, 2006

**Temperature:** 25C **Tested by:** Ivan Tsai

**Humidity:** 55% RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 32.91 | V | -57.40 | 7.12 | -50.28 | -13.00 | -37.28 |
| 61.04 | V | -66.01 | 6.64 | -59.37 | -13.00 | -46.37 |
| 121.18 | V | -52.29 | -8.02 | -60.31 | -13.00 | -47.31 |
| 338.46 | V | -65.26 | -0.19 | -65.45 | -13.00 | -52.45 |
| 389.87 | V | -65.55 | 0.88 | -64.67 | -13.00 | -51.67 |
| 524.70 | V | -68.36 | 3.77 | -64.59 | -13.00 | -51.59 |
| | | | | | | |
| 32.91 | H | -55.49 | 4.20 | -51.29 | -13.00 | -38.29 |
| 52.31 | H | -69.91 | 7.20 | -62.71 | -13.00 | -49.71 |
| 74.62 | H | -55.29 | -3.80 | -59.10 | -13.00 | -46.10 |
| 121.18 | H | -51.10 | -6.69 | -57.79 | -13.00 | -44.79 |
| 143.49 | H | -52.28 | -6.15 | -58.43 | -13.00 | -45.43 |
| 211.39 | H | -62.72 | -3.77 | -66.49 | -13.00 | -53.49 |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 850 / TX / CH 251 **Test Date:** June 17, 2006

**Temperature:** 25C **Tested by:** Ivan Tsai

**Humidity:** 55% RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 32.91 | V | -56.75 | 7.12 | -49.63 | -13.00 | -36.63 |
| 121.18 | V | -51.80 | -8.02 | -59.82 | -13.00 | -46.82 |
| 143.49 | V | -57.93 | -5.07 | -63.00 | -13.00 | -50.00 |
| 296.75 | V | -60.44 | -1.74 | -62.17 | -13.00 | -49.17 |
| 432.55 | V | -65.91 | 2.36 | -63.55 | -13.00 | -50.55 |
| 551.86 | V | -65.72 | 4.18 | -61.54 | -13.00 | -48.54 |
| | | | | | | |
| 32.91 | H | -55.27 | 4.20 | -51.08 | -13.00 | -38.08 |
| 121.18 | H | -49.32 | -6.69 | -56.01 | -13.00 | -43.01 |
| 143.49 | H | -52.35 | -6.15 | -58.50 | -13.00 | -45.50 |
| 245.34 | H | -52.59 | -3.05 | -55.64 | -13.00 | -42.64 |
| 254.07 | H | -54.32 | -3.21 | -57.53 | -13.00 | -44.53 |
| 296.75 | H | -61.08 | -2.23 | -63.31 | -13.00 | -50.31 |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 1900 TX / CH 512 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 32.91 | V | -59.51 | 7.12 | -52.39 | -13.00 | -39.39 |
| 52.31 | V | -67.87 | 9.75 | -58.13 | -13.00 | -45.13 |
| 72.68 | V | -62.35 | -1.73 | -64.08 | -13.00 | -51.08 |
| 139.61 | V | -49.29 | -6.41 | -55.70 | -13.00 | -42.70 |
| 185.20 | V | -61.94 | -5.70 | -67.64 | -13.00 | -54.64 |
| 389.87 | V | -70.31 | 0.88 | -69.43 | -13.00 | -56.43 |
| | | | | | | |
| 32.91 | H | -59.10 | 4.20 | -54.91 | -13.00 | -41.91 |
| 72.68 | H | -58.80 | -2.55 | -61.35 | -13.00 | -48.35 |
| 123.12 | H | -53.41 | -7.27 | -60.68 | -13.00 | -47.68 |
| 143.49 | H | -51.96 | -6.15 | -58.11 | -13.00 | -45.11 |
| 173.56 | H | -62.68 | -5.49 | -68.17 | -13.00 | -55.17 |
| 389.87 | H | -70.32 | 1.31 | -69.02 | -13.00 | -56.02 |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 1900 / TX / CH 661 **Test Date:** June 17, 2006

**Temperature:** 25C **Tested by:** Ivan Tsai

**Humidity:** 55% RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 32.91 | V | -59.75 | 7.12 | -52.63 | -13.00 | -39.63 |
| 52.31 | V | -68.83 | 9.75 | -59.08 | -13.00 | -46.08 |
| 135.73 | V | -51.73 | -6.81 | -58.54 | -13.00 | -45.54 |
| 143.49 | V | -58.16 | -5.07 | -63.23 | -13.00 | -50.23 |
| 182.29 | V | -65.06 | -5.86 | -70.92 | -13.00 | -57.92 |
| 395.69 | V | -70.57 | 0.93 | -69.64 | -13.00 | -56.64 |
| | | | | | | |
| 32.91 | H | -59.05 | 4.20 | -54.85 | -13.00 | -41.85 |
| 72.68 | H | -58.25 | -2.55 | -60.80 | -13.00 | -47.80 |
| 121.18 | H | -58.59 | -6.69 | -65.28 | -13.00 | -52.28 |
| 138.64 | H | -55.19 | -8.03 | -63.22 | -13.00 | -50.22 |
| 143.49 | H | -49.52 | -6.15 | -55.66 | -13.00 | -42.66 |
| 272.50 | H | -63.61 | -2.70 | -66.31 | -13.00 | -53.31 |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 1900 / TX / CH 810 **Test Date:** June 17, 2006

**Temperature:** 25C **Tested by:** Ivan Tsai

**Humidity:** 55% RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 32.91 | V | -59.49 | 7.12 | -52.37 | -13.00 | -39.37 |
| 53.28 | V | -68.07 | 9.45 | -58.62 | -13.00 | -45.62 |
| 73.65 | V | -61.90 | -2.41 | -64.30 | -13.00 | -51.30 |
| 97.90 | V | -57.29 | -9.45 | -66.74 | -13.00 | -53.74 |
| 135.73 | V | -53.95 | -6.81 | -60.76 | -13.00 | -47.76 |
| 141.55 | V | -55.40 | -5.79 | -61.19 | -13.00 | -48.19 |
| | | | | | | |
| 32.91 | H | -58.97 | 4.20 | -54.77 | -13.00 | -41.77 |
| 72.68 | H | -57.80 | -2.55 | -60.35 | -13.00 | -47.35 |
| 121.18 | H | -60.22 | -6.69 | -66.90 | -13.00 | -53.90 |
| 143.49 | H | -49.46 | -6.15 | -55.61 | -13.00 | -42.61 |
| 149.31 | H | -60.16 | -3.36 | -63.52 | -13.00 | -50.52 |
| 271.53 | H | -66.54 | -2.66 | -69.20 | -13.00 | -56.20 |

***Remark:***

*1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Above 1GHz**

**Operation Mode:** GSM 850 / TX / CH 128 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1651.00 | V | -47.94 | 2.42 | -45.52 | -13.00 | -32.52 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 1651.00 | H | -50.12 | 1.68 | -48.45 | -13.00 | -35.45 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 850 / TX / CH 190 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1672.00 | V | -53.09 | 2.59 | -50.49 | -13.00 | -37.49 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 1672.00 | H | -52.97 | 1.83 | -51.14 | -13.00 | -38.14 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 850 / TX / CH 251 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1700.00 | V | -48.25 | 2.82 | -45.43 | -13.00 | -32.43 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 1700.00 | H | -45.03 | 2.04 | -42.98 | -13.00 | -29.98 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 1900 / TX / CH 512 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 3702.00 | V | -47.75 | 8.31 | -39.44 | -13.00 | -26.44 |
| 5550.00 | V | -52.45 | 10.86 | -41.59 | -13.00 | -28.59 |
| 7398.00 | V | -52.24 | 11.78 | -40.46 | -13.00 | -27.46 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 3702.00 | H | -49.65 | 7.79 | -41.85 | -13.00 | -28.85 |
| 5550.00 | H | -48.19 | 10.39 | -37.80 | -13.00 | -24.80 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 1900 / TX / CH 661 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 3758.00 | V | -50.87 | 8.30 | -42.57 | -13.00 | -29.57 |
| 5641.00 | V | -51.78 | 10.78 | -41.00 | -13.00 | -28.00 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 5641.00 | H | -51.67 | 10.27 | -41.41 | -13.00 | -28.41 |
| 7524.00 | H | -51.73 | 11.63 | -40.11 | -13.00 | -27.11 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** GSM 1900 / TX / CH 810 **Test Date:** June 17, 2006

**Temperature:** 25°C **Tested by:** Ivan Tsai

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Antenna Polarization | Reading level (dBm) | Correction Factor (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 5732.00 | V | -52.39 | 10.70 | -41.69 | -13.00 | -28.69 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 5732.00 | H | -52.35 | 10.14 | -42.21 | -13.00 | -29.21 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

***Remark:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

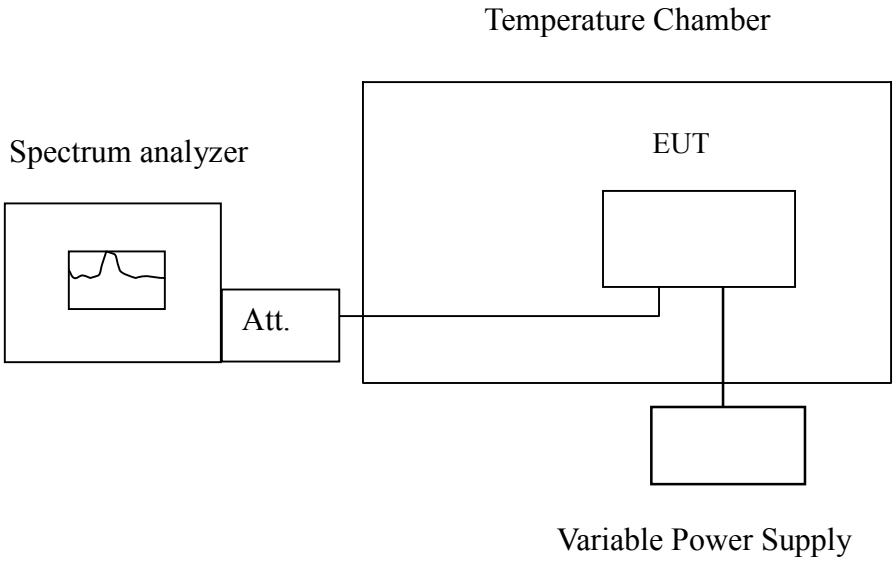
## 7.6 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

### LIMIT

According to FCC §2.1055, FCC §24.235.

Frequency Tolerance: 2.5 ppm

**Test Configuration**




***Remark:*** *Measurement setup for testing on Antenna connector*

## TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

## TEST RESULTS

*No non-compliance noted.*

| **Reference Frequency: GSM Mid Channel 836.6 MHz @ 20°C** | | | | |
|---|---|---|---|---|
| Limit: ± 2.5 ppm = 2091.5 Hz | | | | |
| Power Supply Vac | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 120 | 50 | 83600027 | 49 | 2091.5 |
| | 40 | 83600025 | 47 | |
| | 30 | 83600029 | 51 | |
| | 20 | 83599978 | 0 | |
| | 10 | 83600016 | 38 | |
| | 0 | 83600018 | 40 | |
| | -10 | 83600042 | 64 | |
| | -20 | 83600033 | 55 | |
| | -30 | 83600025 | 47 | |

| **Reference Frequency: GSM Mid Channel 1880 MHz @ 20°C** | | | | |
|---|---|---|---|---|
| Limit: ± 2.5 ppm = 4700 Hz | | | | |
| Power Supply Vdc | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 120 | 50 | 1880000013 | 36 | 4700 |
| | 40 | 1880000015 | 38 | |
| | 30 | 1880000022 | 45 | |
| | 20 | 1879999977 | 0 | |
| | 10 | 1880000021 | 44 | |
| | 0 | 1880000022 | 45 | |
| | -10 | 1880000020 | 43 | |
| | -20 | 1880000026 | 49 | |
| | -30 | 1880000027 | 50 | |

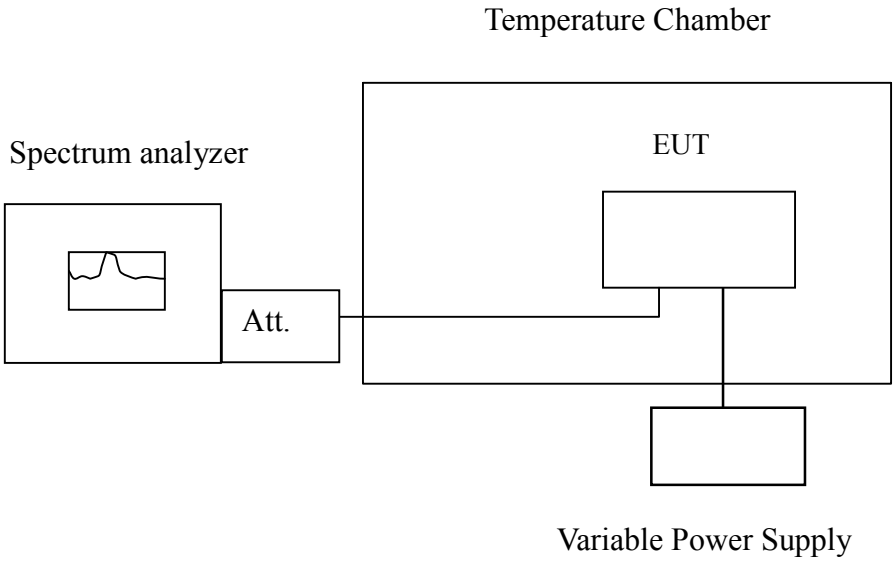
## 7.7 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

### LIMIT

According to FCC §2.1055, FCC §24.235,

Frequency Tolerance: 2.5 ppm.

**Test Configuration**




***Remark:*** *Measurement setup for testing on Antenna connector.*

## TEST PROCEDURE

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (± 15%) and endpoint, record the maximum frequency change.

## TEST RESULTS

*No non-compliance noted.*

| **Reference Frequency: GSM Mid Channel 836.6 MHz @ 20°C** | | | | |
|---|---|---|---|---|
| Limit: ± 2.5 ppm = 2091.5Hz | | | | |
| Power Supply Vac | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 138 | 20 | 83599977 | -1 | 2091.5 |
| 120 | | 83599978 | 0 | |
| 102 | | 83599971 | -7 | |

| **Reference Frequency: GSM Mid Channel 1880 MHz @ 20°C** | | | | |
|---|---|---|---|---|
| Limit: ± 2.5 ppm = 4700 Hz | | | | |
| Power Supply Vac | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 138 | 20 | 1879999975 | -2 | 4700 |
| 120 | | 1879999977 | 0 | |
| 102 | | 1879999978 | 1 | |

## 7.8 POWERLINE CONDUCTED EMISSIONS

## LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

## TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete..

# TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

| | | | |
|---|---|---|---|
| **Operation Mode:** | Normal Link | **Test Date:** | June 17, 2006 |
| **Temperature:** | 25°C | **Tested by:** | Ivan Tsai |
| **Humidity:** | 55% RH | | |

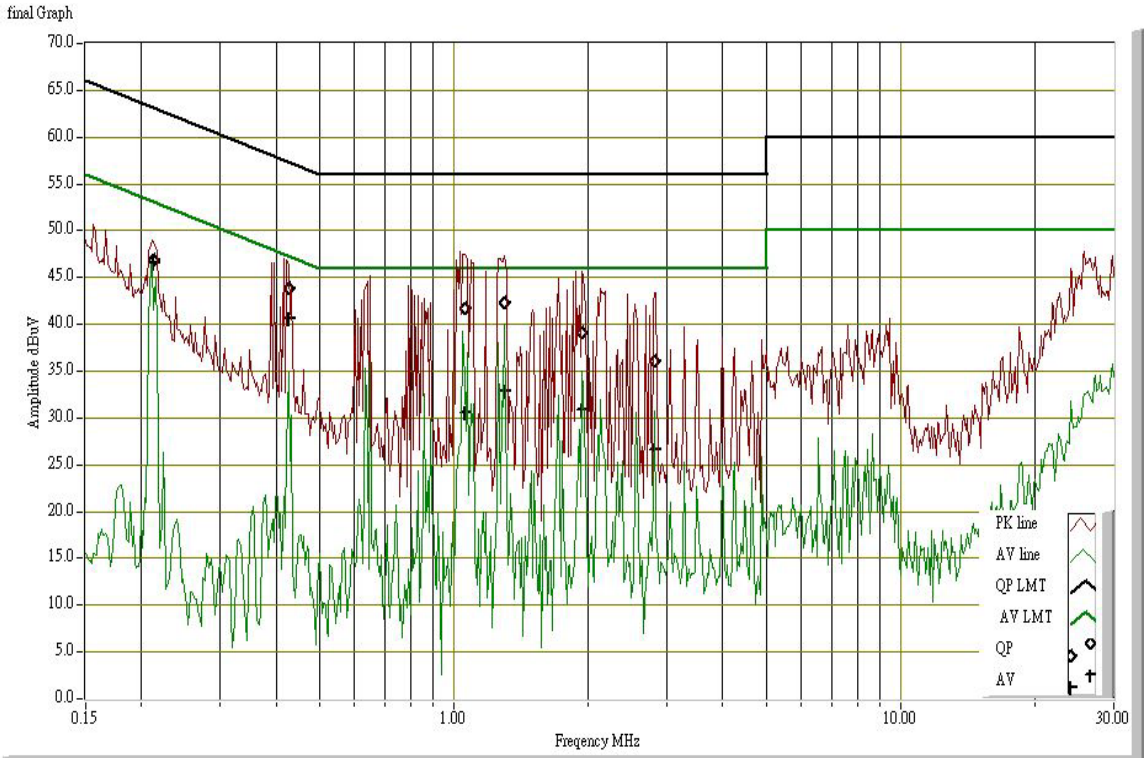
| Freq. (MHz) | QP Reading (dBuV) | AV Reading (dBuV) | Corr. factor (dB) | QP Result (dBuV) | AV Result (dBuV) | QP Limit (dBuV) | AV Limit (dBuV) | QP Margin (dB) | AV Margin (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.213 | 46.810 | 46.520 | 0.100 | 46.910 | 46.620 | 63.105 | 53.105 | -16.195 | -6.485 | L1 |
| 0.426 | 43.800 | 40.630 | 0.100 | 43.900 | 40.730 | 57.330 | 47.330 | -13.430 | -6.600 | L1 |
| 1.057 | 41.710 | 30.590 | 0.100 | 41.810 | 30.690 | 56.000 | 46.000 | -14.190 | -15.310 | L1 |
| 1.294 | 42.340 | 32.920 | 0.100 | 42.440 | 33.020 | 56.000 | 46.000 | -13.560 | -12.980 | L1 |
| 1.936 | 39.120 | 30.920 | 0.100 | 39.220 | 31.020 | 56.000 | 46.000 | -16.780 | -14.980 | L1 |
| 2.816 | 36.000 | 26.640 | 0.100 | 36.100 | 26.740 | 56.000 | 46.000 | -19.900 | -19.260 | L1 |
| | | | | | | | | | | |
| 0.210 | 46.080 | 44.380 | 0.100 | 46.180 | 44.480 | 63.205 | 53.205 | -17.025 | -8.725 | L2 |
| 0.423 | 42.000 | 33.350 | 0.100 | 42.100 | 33.450 | 57.389 | 47.389 | -15.289 | -13.939 | L2 |
| 0.697 | 43.760 | 39.630 | 0.100 | 43.860 | 39.730 | 56.000 | 46.000 | -12.140 | -6.270 | L2 |
| 1.212 | 38.780 | 29.480 | 0.100 | 38.880 | 29.580 | 56.000 | 46.000 | -17.120 | -16.420 | L2 |
| 1.700 | 36.670 | 29.080 | 0.100 | 36.770 | 29.180 | 56.000 | 46.000 | -19.230 | -16.820 | L2 |
| 1.979 | 32.090 | 22.240 | 0.100 | 32.190 | 22.340 | 56.000 | 46.000 | -23.810 | -23.660 | L2 |

***Remark:***

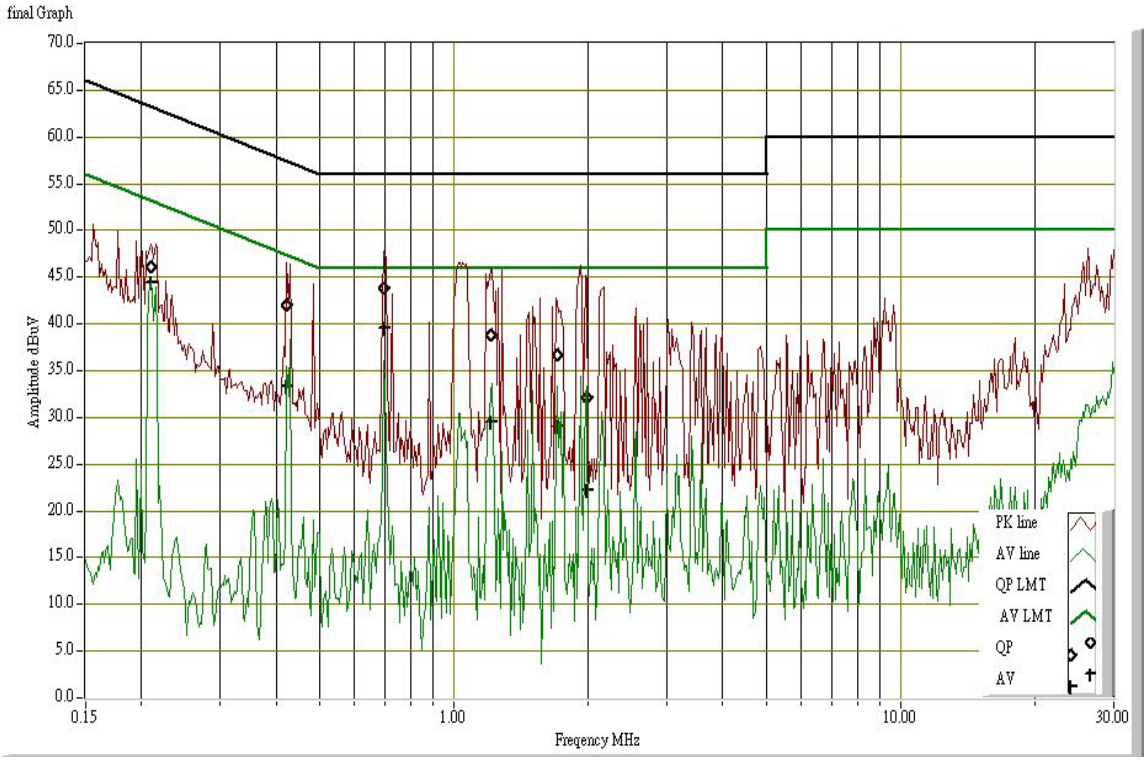
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;*
4. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

## Test Plots

### *Conducted emissions (Line 1)*

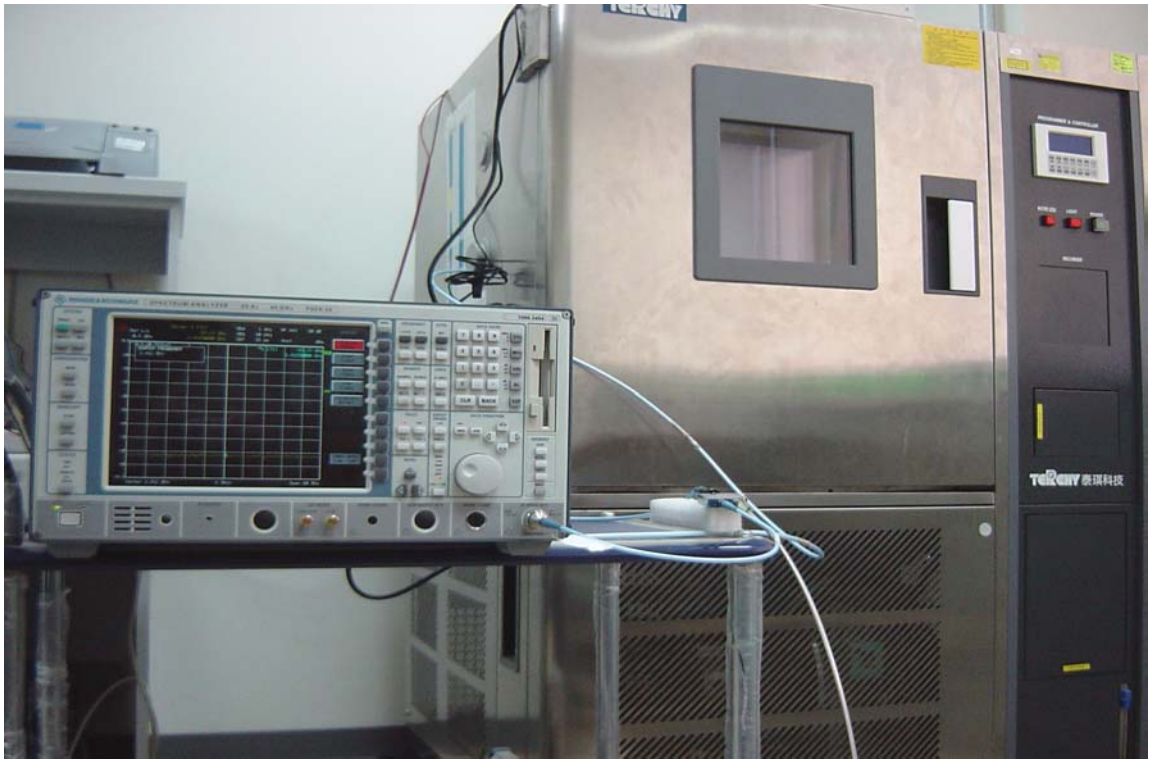



### *Conducted emissions (Line 2)*

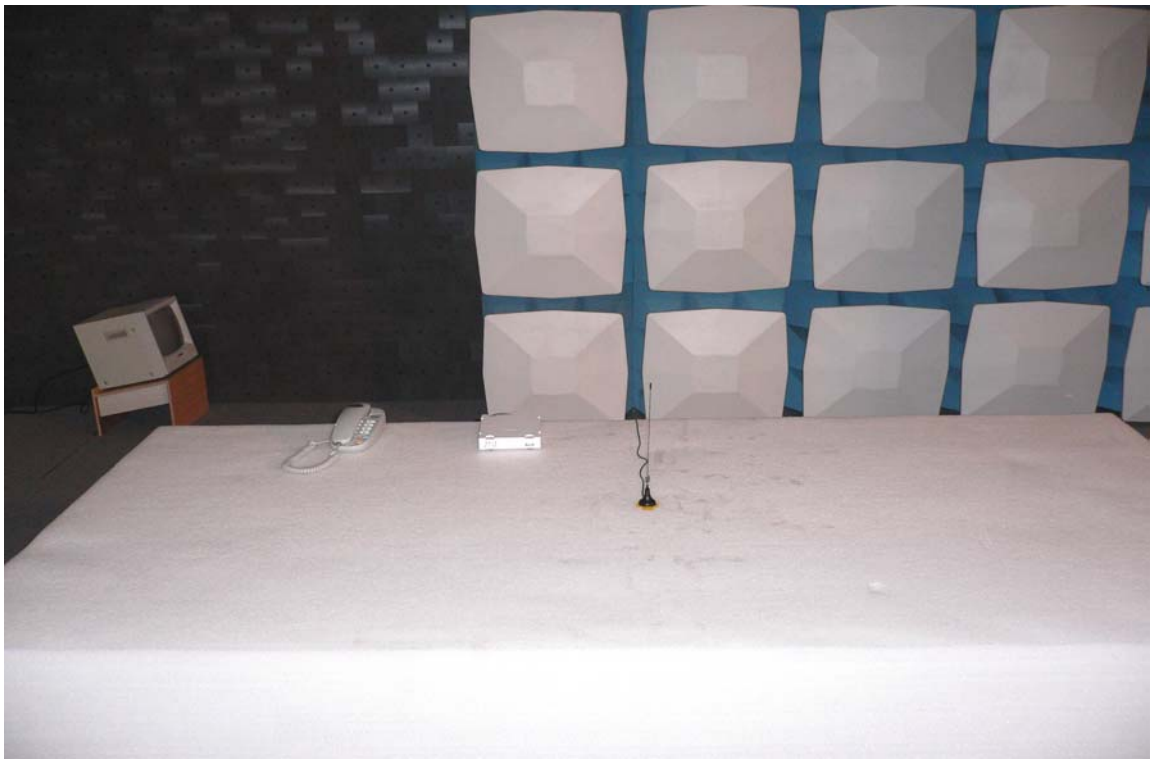


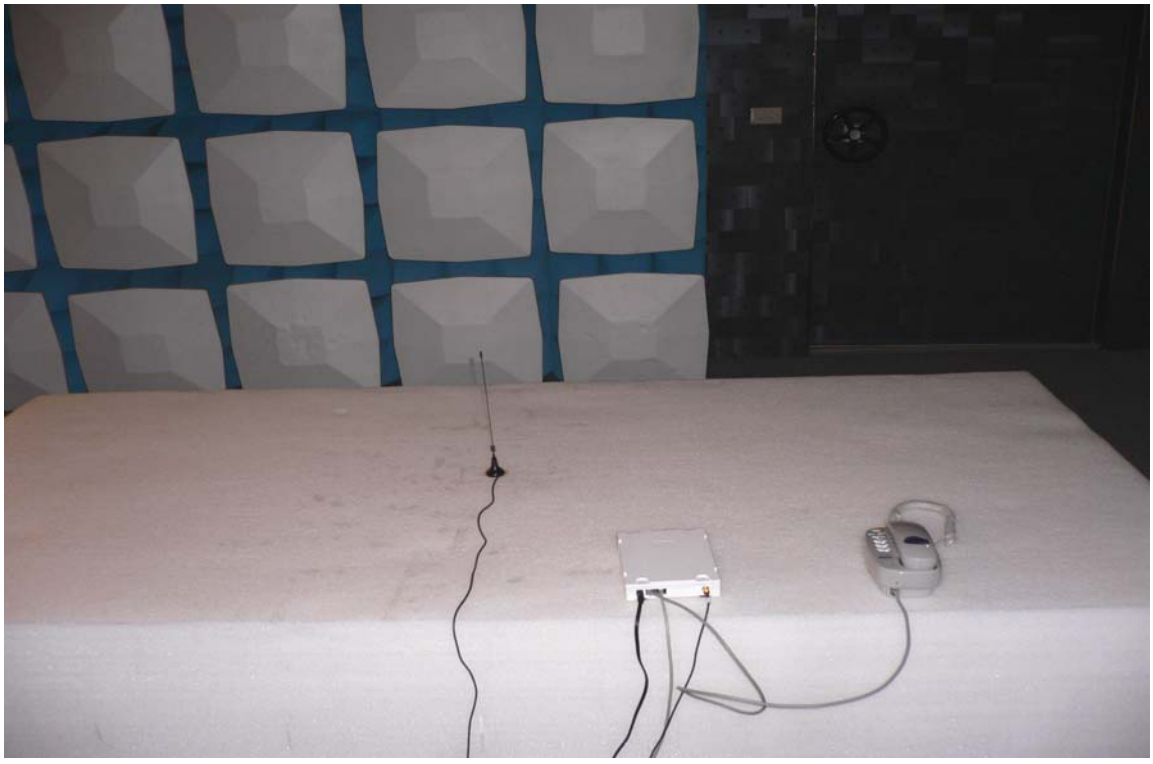
# APPENDIX I
# PHOTOGRAPHS OF TEST SETUP

## Conducted Emission Set Up Photo



## Radiated Emission Set up Photos





# Powerline Conducted Emissions Setup Photos