TESTING
No. L2264

# Part 22

# TEST REPORT

| | |
|---|---|
| **Product Name** | Neptune pine |
| **FCC ID** | 2ABWUP312 |
| **Model** | P312 |
| **Client** | NEPTUNE COMPUTER INC. |
| **Manufacturer** | NEPTUNE COMPUTER INC. |
| **Date of issue** | June 10, 2014 |

**TA Technology (Shanghai) Co., Ltd.**

# GENERAL SUMMARY

| | |
|---|---|
| **Reference Standard(s)** | **FCC CFR47 Part 2 (2012)** Frequency Allocations And Radio Treaty Matters; General Rules And Regulations<br><br>**FCC CFR 47 Part 22H (2012)** Public Mobile Services(850MHz)<br><br>**ANSI/TIA-603-C(2004)** Land mobile FM or PM Communications Equipment Measurements and Performance Standards.<br><br>**KDB 971168 D01 Power Meas License Digital Systems v02r01** Measurement Guidance for Certification of Licensed Digital Transmitters |
| **Conclusion** | This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2 of this test report are below limits specified in the relevant standards.<br><br>General Judgment: **Pass** |
| **Comment** | The test result only responds to the measured sample. |

**Approved by** Weizhong Yang
Weizhong Yang
Director

**Revised by** Lingling Kang
Lingling Kang
RF Manager

**Performed by** Yiqi Chen
Yiqi Chen
RF Engineer

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# 1. General Information

## 1.1. Notes of the test report

**TA Technology (Shanghai) Co., Ltd.** has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L2264.

**TA Technology (Shanghai) Co., Ltd.** has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 428261.

**TA Technology (Shanghai) Co., Ltd.** has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 8510A.

**TA Technology (Shanghai) Co., Ltd.** guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

**TA Technology (Shanghai) Co., Ltd.** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. The sample under test was selected by the Client. This report only refers to the item that has undergone the test.

This report alone does not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

If the electronic report is inconsistent with the printed one, it should be subject to the latter.

## 1.2. Testing laboratory

| | |
|---|---|
| Company: | TA Technology (Shanghai) Co., Ltd. |
| Address: | No.145, Jintang Rd, Tangzhen Industry Park, Pudong |
| City: | Shanghai |
| Post code: | 201201 |
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| Website: | http://www.ta-shanghai.com |
| E-mail: | yangweizhong@ta-shanghai.com |

## 1.3. Applicant Information

| | |
|---|---|
| Company: | NEPTUNE COMPUTER INC. |
| Address: | 666 SHERBROOKE ST. W., SUITE 1000 |
| City: | MONTREAL |
| Postal Code: | H3A 1E7 |
| Country: | CANADA |

## 1.4. Manufacturer Information

| | |
|---|---|
| Company: | NEPTUNE COMPUTER INC. |
| Address: | 666 SHERBROOKE ST. W., SUITE 1000 |
| City: | MONTREAL |
| Postal Code: | H3A 1E7 |
| Country: | CANADA |

## 1.5. Information of EUT

**General information**

| | | | |
|---|---|---|---|
| Name of EUT: | Neptune pine | | |
| IMEI : | 354727049900715 | | |
| Hardware Version: | P1 | | |
| Software Version: | JB_V0.29 | | |
| Antenna Type: | Internal Antenna | | |
| Device Operating Configurations: | | | |
| Operating Mode(s): | GSM 850:(tested)<br>WCDMA Band V;(tested) | | |
| Test Modulation: | (GSM)GMSK,8PSK; (WCDMA)QPSK | | |
| GPRS Multislot Class: | 12 | | |
| EGPRS Multislot Class: | 12 | | |
| HSDPA UE Category: | 8 | | |
| HSUPA UE Category: | 6 | | |
| Maximum E.R.P. | GSM 850: 20.67 dBm<br>WCDMA Band V: 9.90 dBm | | |
| Power Supply: | Battery or Charger (AC adaptor) | | |
| Rated Power Supply Voltage: | 3.8V | | |
| Extreme Voltage: | Minimum: 3.5V Maximum: 4.2V | | |
| Extreme Temperature: | Lowest: -20°C Highest: +60°C | | |
| Test Channel:<br>(Low - Middle - High) | 128 - 190 - 251 (GSM 850)<br>4132 - 4183 - 4233 (WCDMA Band V) | | |
| Operating Frequency Range(s) | Band | Tx (MHz) | Rx (MHz) |
| | GSM850 | 824.2 ~ 848.8 | 869.2 ~ 893.8 |
| | WCDMA Band V | 826.4 ~ 846.6 | 871.4 ~ 891.6 |

**Auxiliary Equipment Details**

**AE1: Battery**

| | |
|---|---|
| Model: | Mini Phone |
| Manufacture: | Tian Yu Communication Technology (Kun Shan) CO.,Ltd |
| S/N: | / |

## 1.6. Test Date

The test is performed from March 6, 2014 to March 10, 2014.

# 2. Test Information

## 2.1. Summary of test results

| Number | Test Case | Clause in FCC rules | Verdict |
|---|---|---|---|
| 1 | RF power output | 2.1046 | PASS |
| 2 | Effective Radiated Power | 22.913(a)(2) | PASS |
| 3 | Occupied Bandwidth | 2.1049 | PASS |
| 4 | Band Edge Compliance | 22.917 | PASS |
| 5 | Peak-to-Average Power Ratio | KDB 971168 D01(5.7) | PASS |
| 6 | Frequency Stability | 2.1055 / 22.355 | PASS |
| 7 | Spurious Emissions at Antenna Terminals | 2.1051 / 22.917(a) | PASS |
| 8 | Radiates Spurious Emission | 2.1053 / 22.917 (a) | PASS |

PASS: The EUT complies with the essential requirements in the standard.

FAIL: The EUT does not comply with the essential requirements in the standard.

## 2.2. RF Power Output

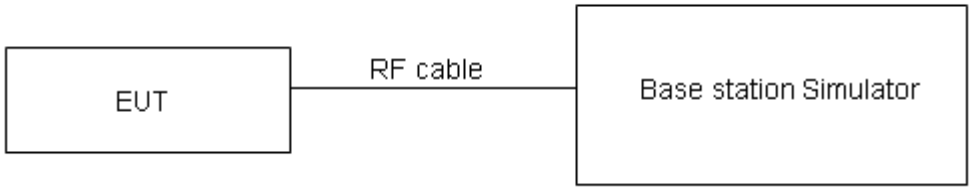
**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Methods of Measurement**

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

**Test Setup**




The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

**Limits**

No specific RF power output requirements in part 2.1046.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the

normal distribution is with the coverage factor $k$ = 2, $U$= 0.4 dB.

**Test Results**

| GSM 850 | | Conducted Power(dBm) | | |
|---|---|---|---|---|
| | | Channel 128 | Channel 190 | Channel 251 |
| | | 824.2 (MHz) | 836.6 (MHz) | 848.8 (MHz) |
| **GSM** | Results | 29.19 | 29.22 | 29.04 |
| **GPRS (GMSK)** | 1TXslot | **29.17** | **29.19** | **29.09** |
| | 2TXslots | 26.71 | 26.73 | 26.6 |
| | 3TXslots | 24.69 | 24.71 | 24.62 |
| | 4TXslots | 23.16 | 23.18 | 23.11 |
| **EGPRS (8-PSK)** | 1TXslot | **27.03** | **27.21** | **27.06** |
| | 2TXslots | 24.12 | 24.12 | 24.08 |
| | 3TXslots | 23.05 | 23.08 | 23.07 |
| | 4TXslots | 22.11 | 22.14 | 22.07 |

Note:

1) The maximum RF Output Power numbers are marks in bold.

2)The following testing in GPRS/EGPRS is set to 1TXslot based on the maximum RF Output Power.

| WCDMA Band V | | Conducted Power(dBm) | | |
|---|---|---|---|---|
| | | Channel 4132 | Channel 4183 | Channel 4233 |
| | | 826.4(MHz) | 836.6(MHz) | 846.6(MHz) |
| **RMC** | | 20.20 | 20.39 | 20.45 |
| **HSDPA** | Sub - Test 1 | **20.00** | **20.36** | **20.54** |
| | Sub - Test 2 | 19.90 | 20.31 | 20.50 |
| | Sub - Test 3 | 19.40 | 19.83 | 19.96 |
| | Sub - Test 4 | 19.47 | 19.82 | 19.96 |
| **HSUPA** | Sub - Test 1 | **19.19** | **19.60** | **19.87** |
| | Sub - Test 2 | 18.03 | 18.33 | 18.50 |
| | Sub - Test 3 | 18.30 | 18.69 | 18.86 |
| | Sub - Test 4 | 18.05 | 18.44 | 18.63 |
| | Sub - Test 5 | 18.96 | 19.34 | 19.52 |

Note:

1) The maximum RF Output Power numbers are marks in bold.

2)The following testing in HSDPA/HSUPA is set to Sub - Test 1 /Sub – Test1 based on the maximum RF Output Power.

## 2.3. Effective Radiated Power

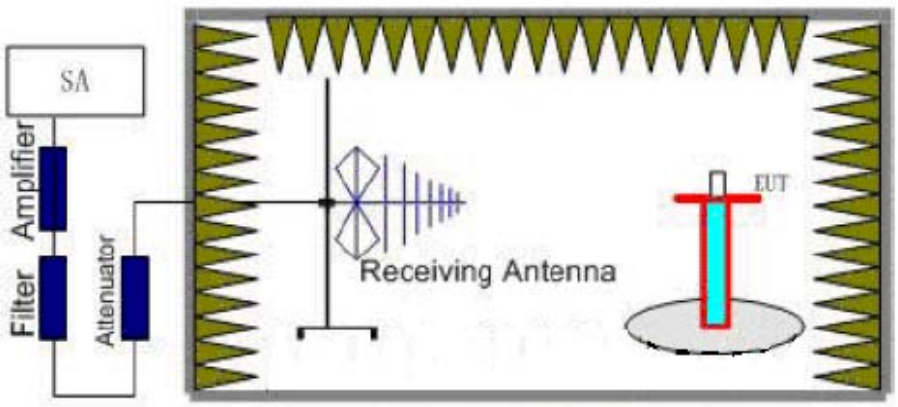
**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Methods of Measurement**

The measurement procedures in TIA- 603C are used.
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 meters 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.

**Test Setup**



**Limits**

Rule Part 22.913(a) specifies that "Mobile/portable stations are limited to 7 watts ERP”.

| | |
|---|---|
| Limit | ≤ 7 W (38.45 dBm) |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 2, $U$= 1.19 dB

**Test Results:Pass**

| GSM850 | | | | | |
|---|---|---|---|---|---|
| **Horizontal Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 824.2 | -28.80 | -45.53 | 0 | -1.09 | 15.65 |
| 836.6 | -27.76 | -45.38 | 0 | -0.91 | 16.71 |
| 848.8 | -27.79 | -45.37 | 0 | -0.77 | 16.82 |
| **Vertical Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 824.2 | -25.11 | -45.65 | 0 | -1.09 | 19.44 |
| 836.6 | -23.96 | -45.46 | 0 | -0.91 | 20.59 |
| 848.8 | -24.32 | -45.49 | 0 | -0.77 | 20.40 |
| **GPRS 850** | | | | | |
| **Horizontal Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 824.2 | -28.81 | -45.53 | 0 | -1.09 | 15.63 |
| 836.6 | -28.00 | -45.38 | 0 | -0.91 | 16.47 |
| 848.8 | -27.64 | -45.37 | 0 | -0.77 | 16.96 |
| **Vertical Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 824.2 | -24.99 | -45.65 | 0 | -1.09 | 19.57 |
| 836.6 | -23.88 | -45.46 | 0 | -0.91 | 20.67 |
| 848.8 | -24.18 | -45.49 | 0 | -0.77 | 20.54 |
| **EGPRS 850** | | | | | |
| **Horizontal Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 824.2 | -30.49 | -45.53 | 0 | -1.09 | 13.95 |
| 836.6 | -29.69 | -45.38 | 0 | -0.91 | 14.78 |
| 848.8 | -29.54 | -45.37 | 0 | -0.77 | 15.06 |
| **Vertical Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 824.2 | -26.60 | -45.65 | 0 | -1.09 | 17.96 |
| 836.6 | -26.05 | -45.46 | 0 | -0.91 | 18.50 |
| 848.8 | -26.10 | -45.49 | 0 | -0.77 | 18.62 |

| WCDMA Band V | | | | | |
|---|---|---|---|---|---|
| **Horizontal Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 826.4 | -38.75 | -45.44 | 0 | -1.09 | 5.67 |
| 836.6 | -39.69 | -45.38 | 0 | -0.91 | 4.78 |
| 846.6 | -39.66 | -45.38 | 0 | -0.77 | 4.92 |
| **Vertical Polarization** | | | | | |
| **Frequency(MHz)** | **Rt(dBm)** | **Rs(dBm)** | **Ps(dBm)** | **Gs(dBd)** | **ERP(dBm)** |
| 826.4 | -34.62 | -45.54 | 0 | -1.09 | 9.90 |
| 836.6 | -35.72 | -45.46 | 0 | -0.91 | 8.83 |
| 846.6 | -35.65 | -45.49 | 0 | -0.77 | 9.04 |

**Note: ERP = EIRP - 2.15**

## 2.4. Occupied Bandwidth

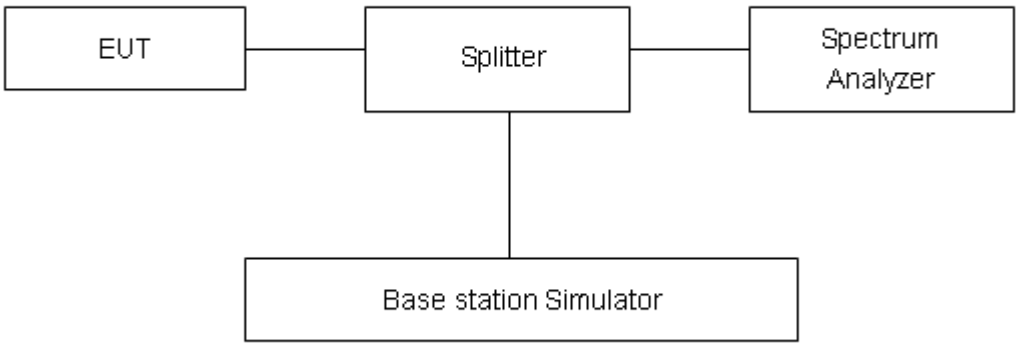
**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Method of Measurement**

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz,VBW is set to 10kHz for GSM 850 and RBW is set to 51kHz,VBW is set to 100kHz for WCDMA Band V. 99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

**Test Setup**




**Limits**

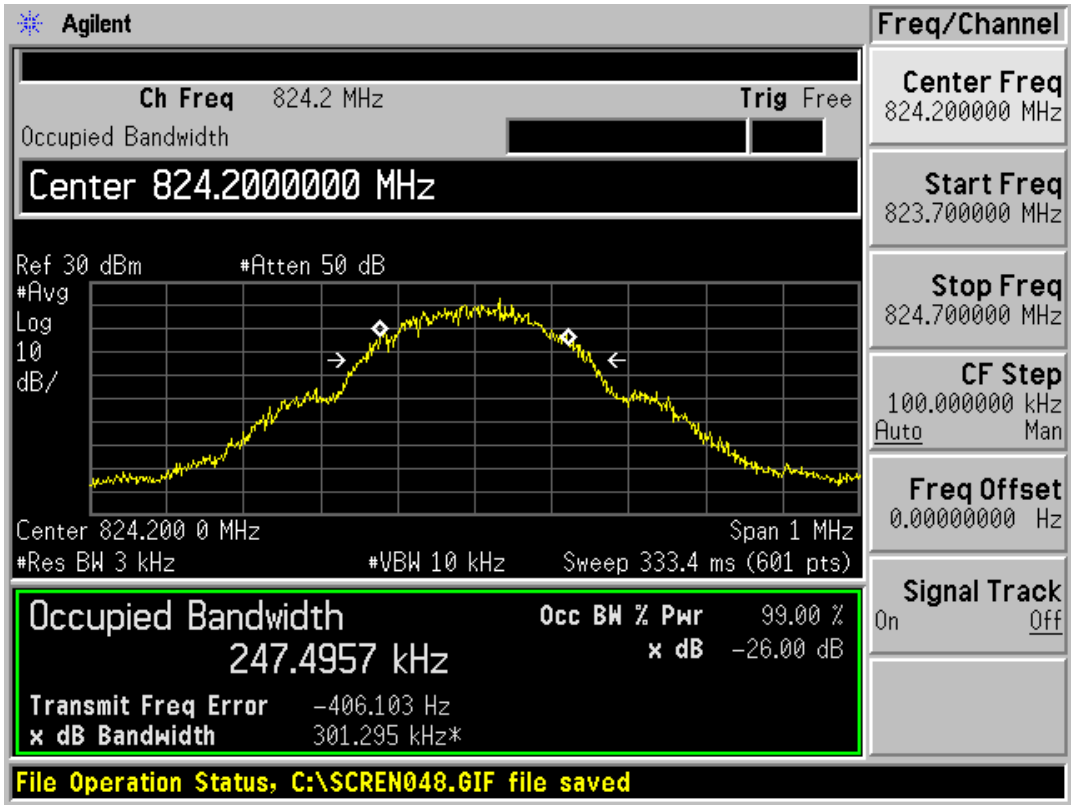
No specific occupied bandwidth requirements in part 2.1049.

**Measurement Uncertainty**

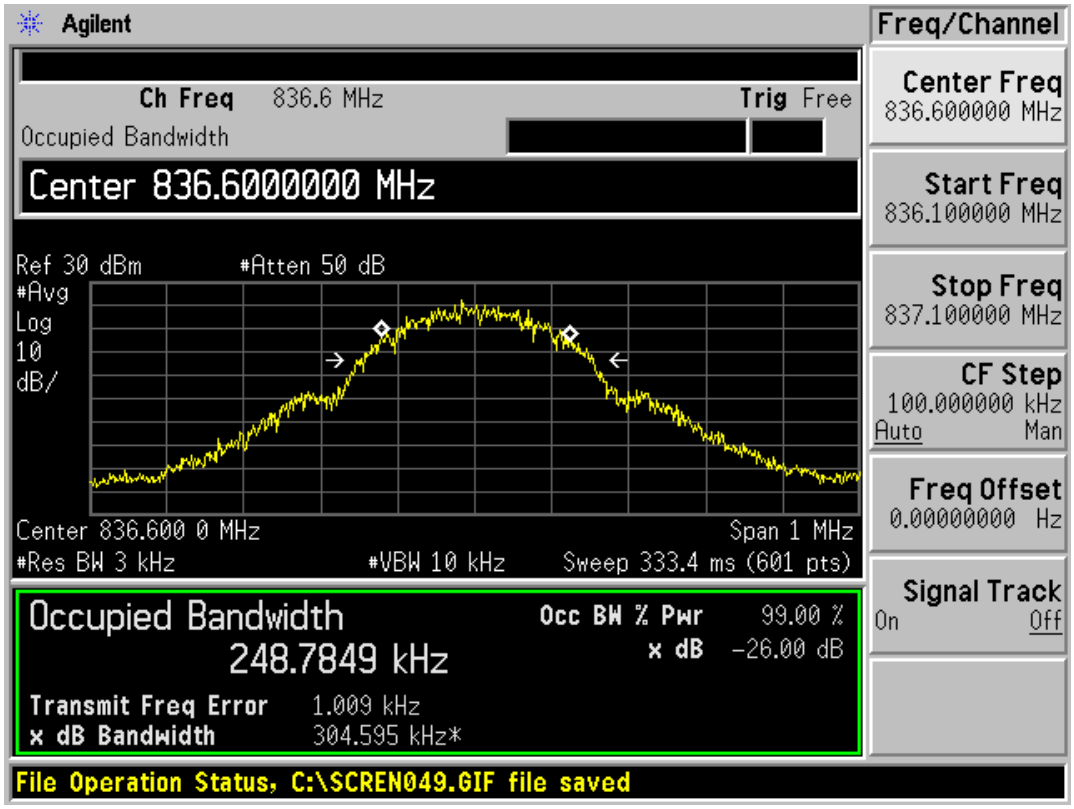
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 2, $U$= 624Hz.

**Test Result**

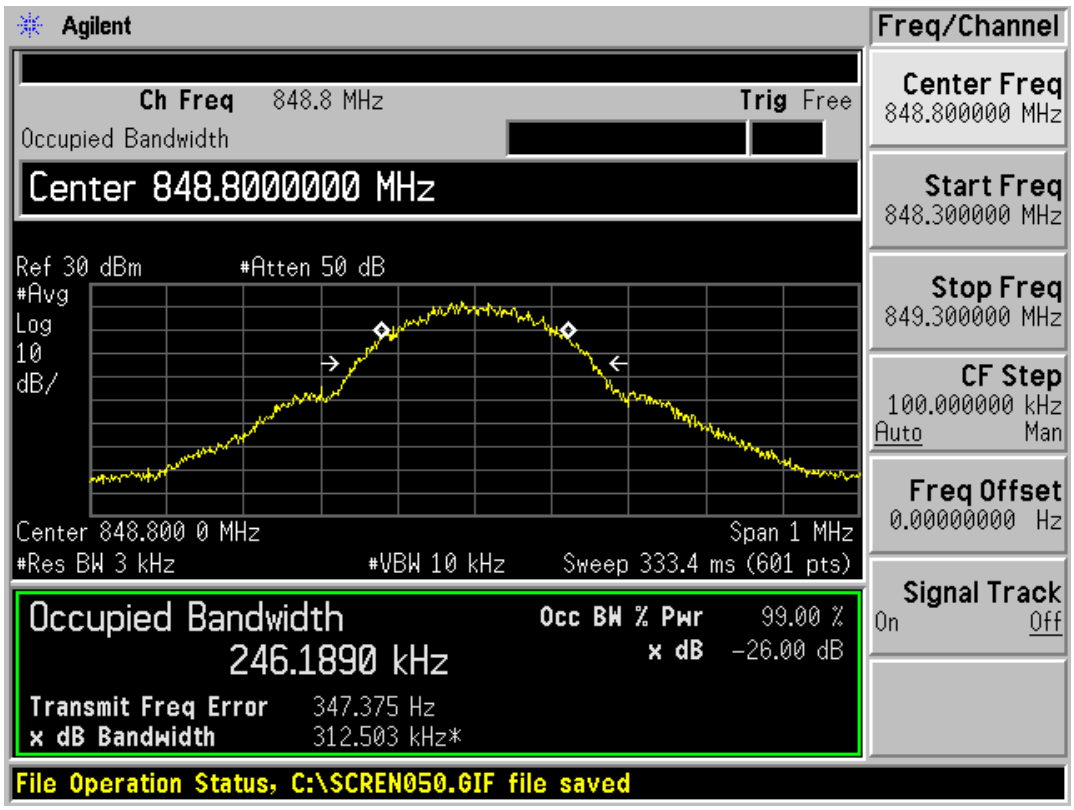
| GSM 850 | Channel | Frequency (MHz) | 99% Power Bandwidth (kHz) | -26dBc Bandwidth(kHz) |
|---|---|---|---|---|
| GSM | 128 | 824.2 | 247.4957 | 301.295 |
| | 190 | 836.6 | 248.7849 | 304.595 |
| | 251 | 848.8 | 246.1890 | 312.503 |
| GPRS (GMSK) | 128 | 824.2 | 243.9748 | 318.687 |
| | 190 | 836.6 | 246.1776 | 313.107 |
| | 251 | 848.8 | 245.8903 | 311.558 |
| EGPRS (8-PSK) | 128 | 824.2 | 241.7510 | 307.230 |
| | 190 | 836.6 | 241.1495 | 305.040 |
| | 251 | 848.8 | 242.6392 | 293.457 |



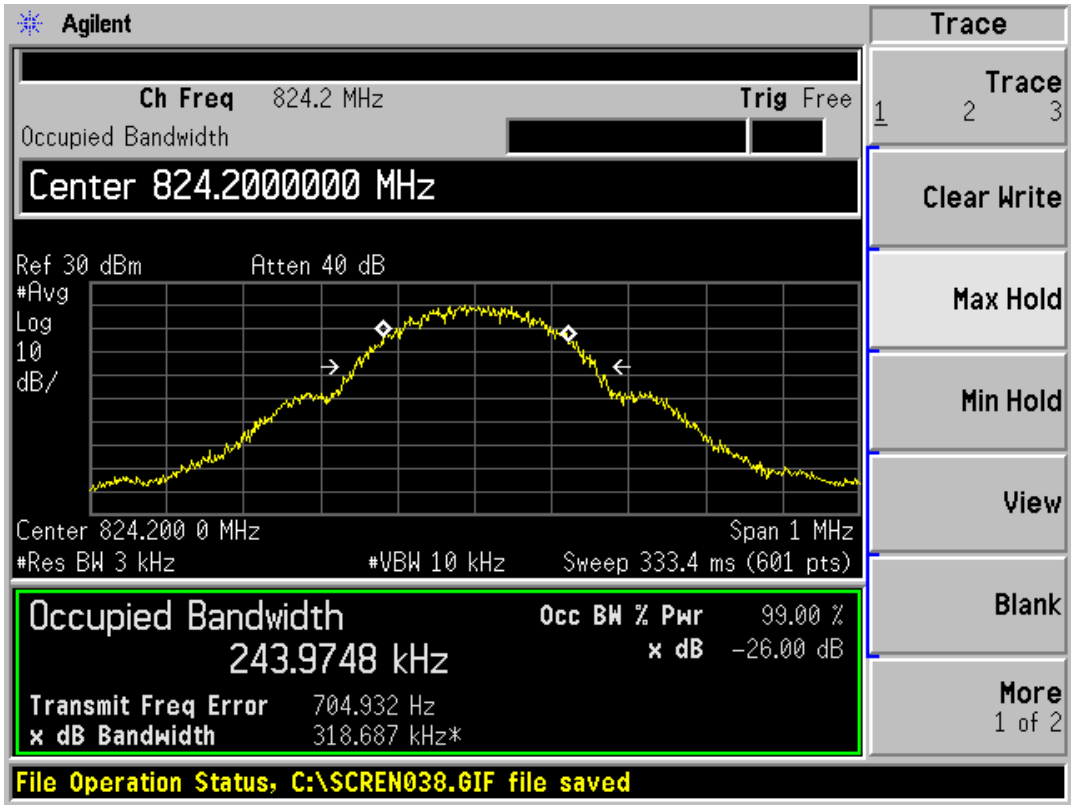

GSM 850 CH128 Occupied Bandwidth



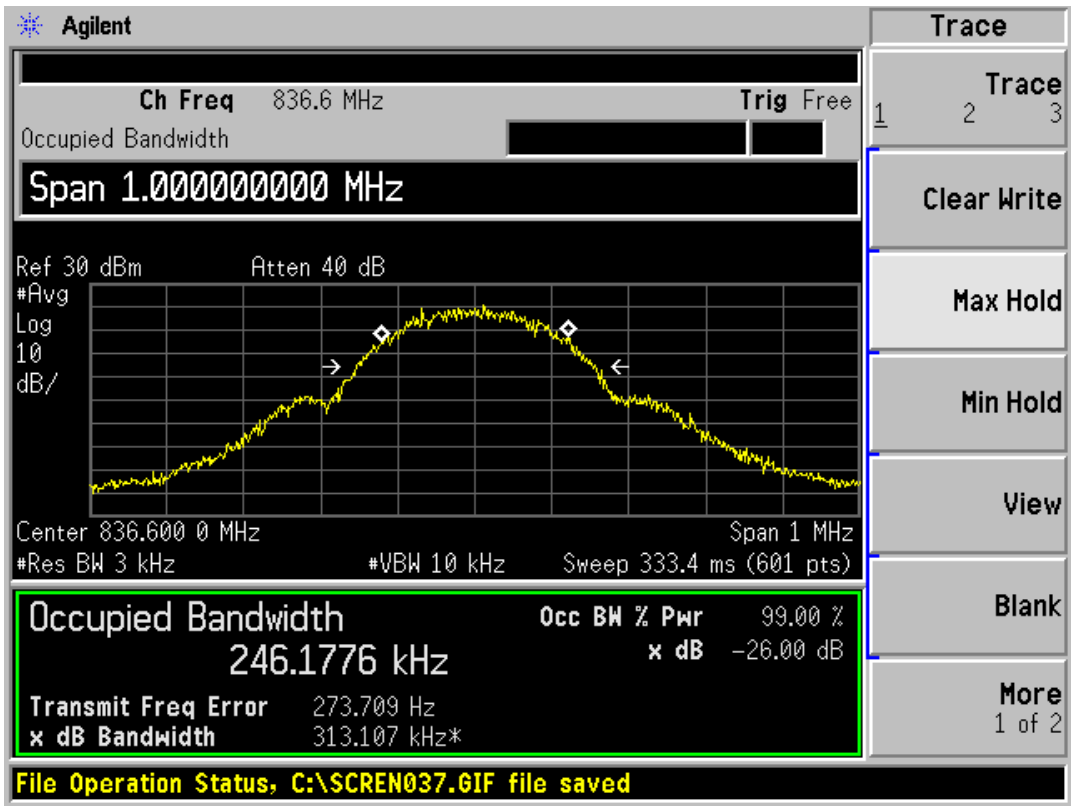

GSM 850 CH190 Occupied Bandwidth



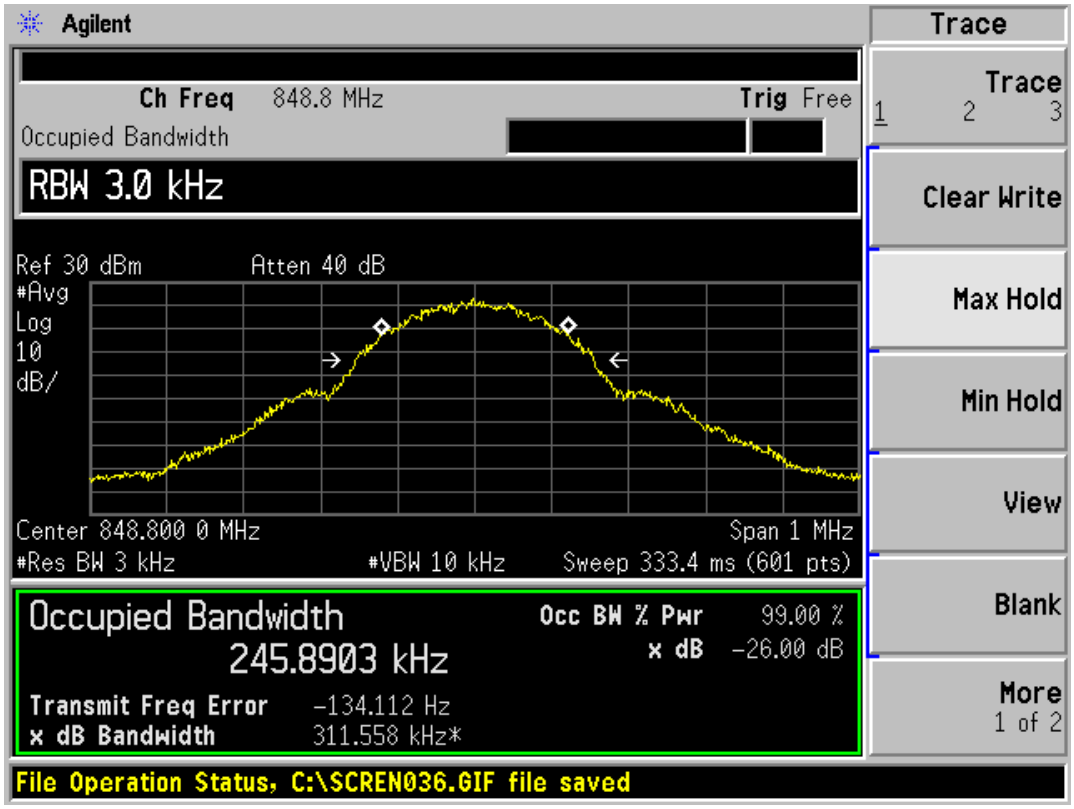

GSM 850 CH251 Occupied Bandwidth



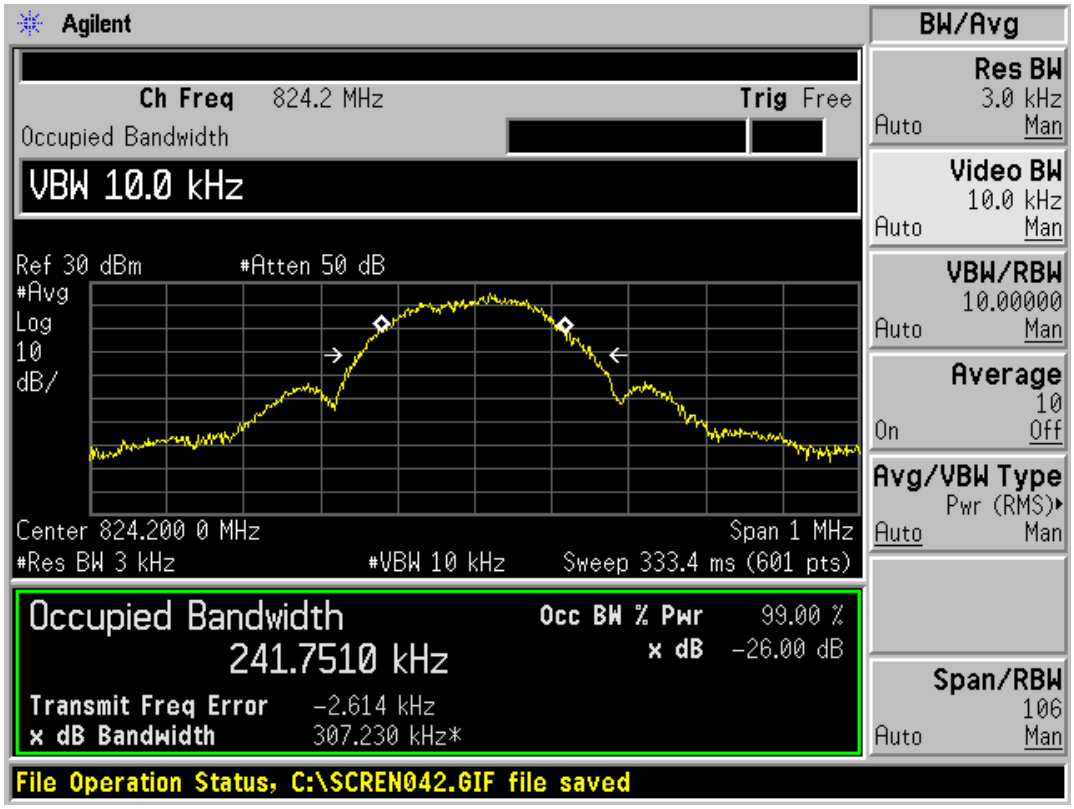

GSM 850 GPRS CH128 Occupied Bandwidth



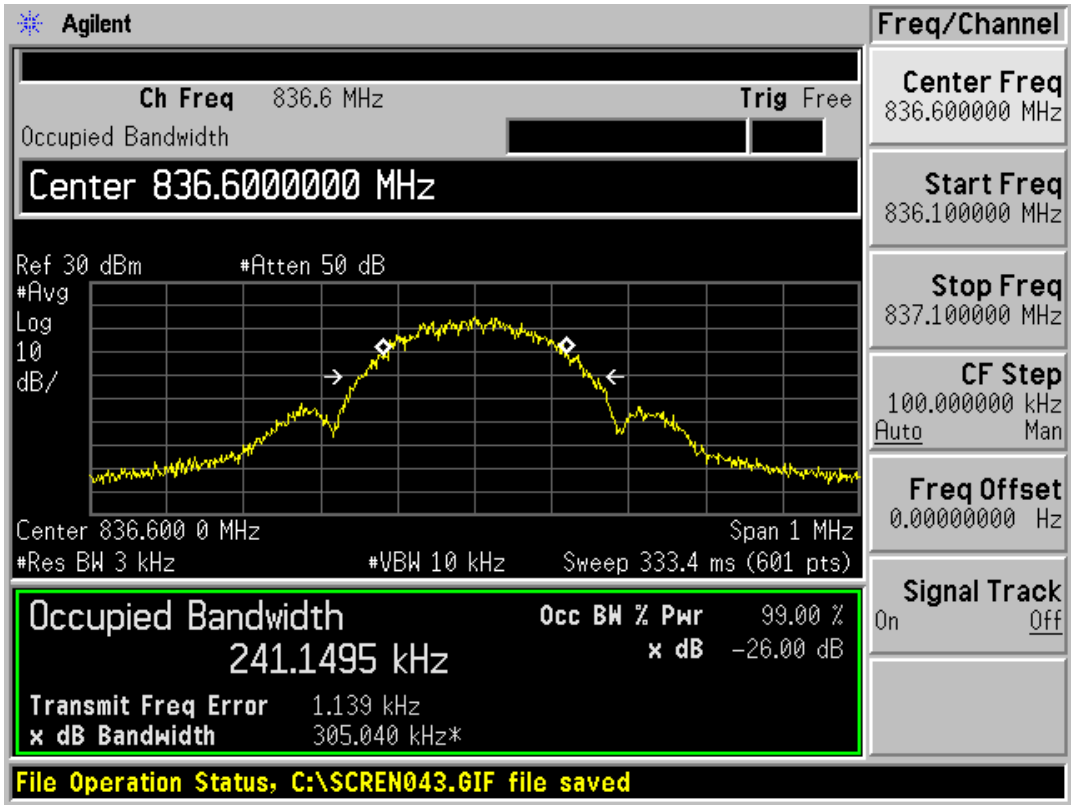

GSM 850 GPRS CH190 Occupied Bandwidth



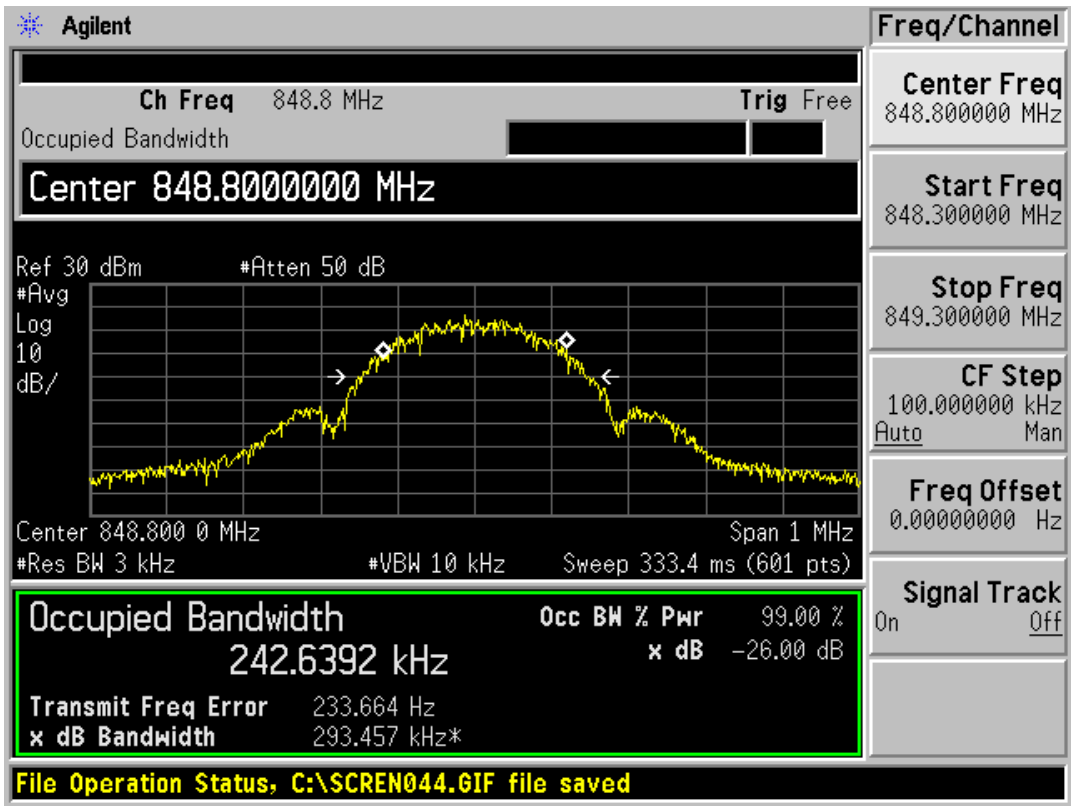

GSM 850 GPRS CH251 Occupied Bandwidth




GSM 850 EGPRS CH128 Occupied Bandwidth

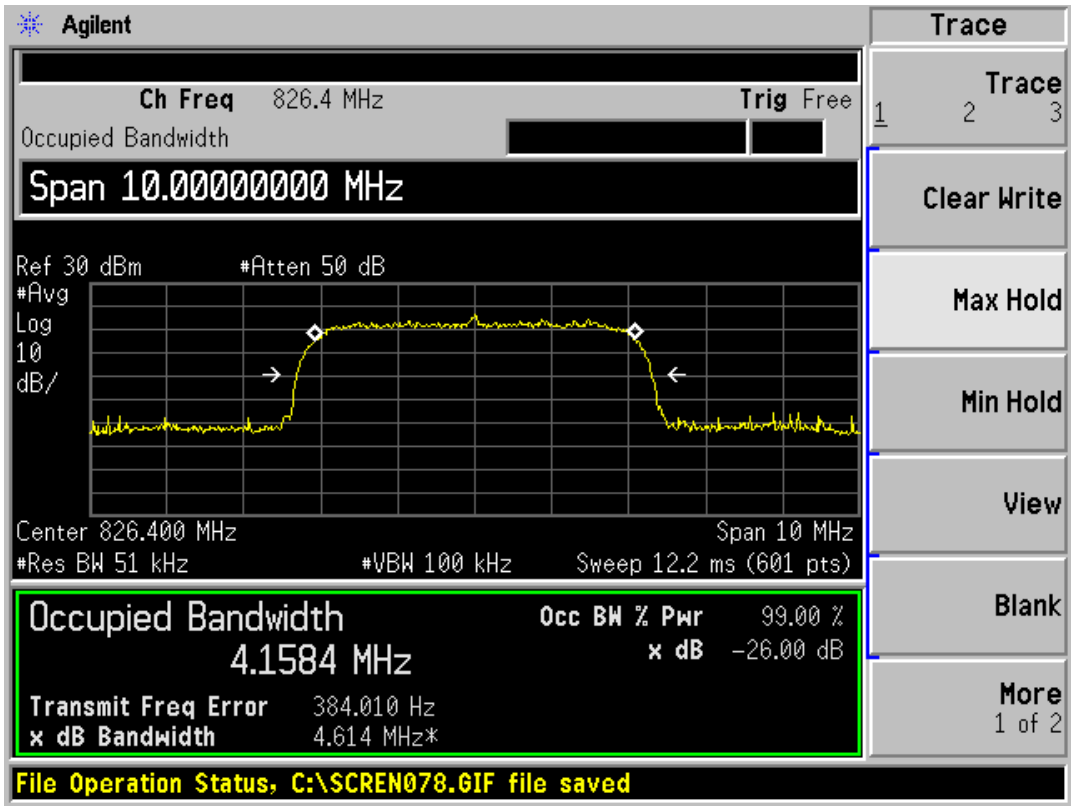



GSM 850 EGPRS CH190 Occupied Bandwidth

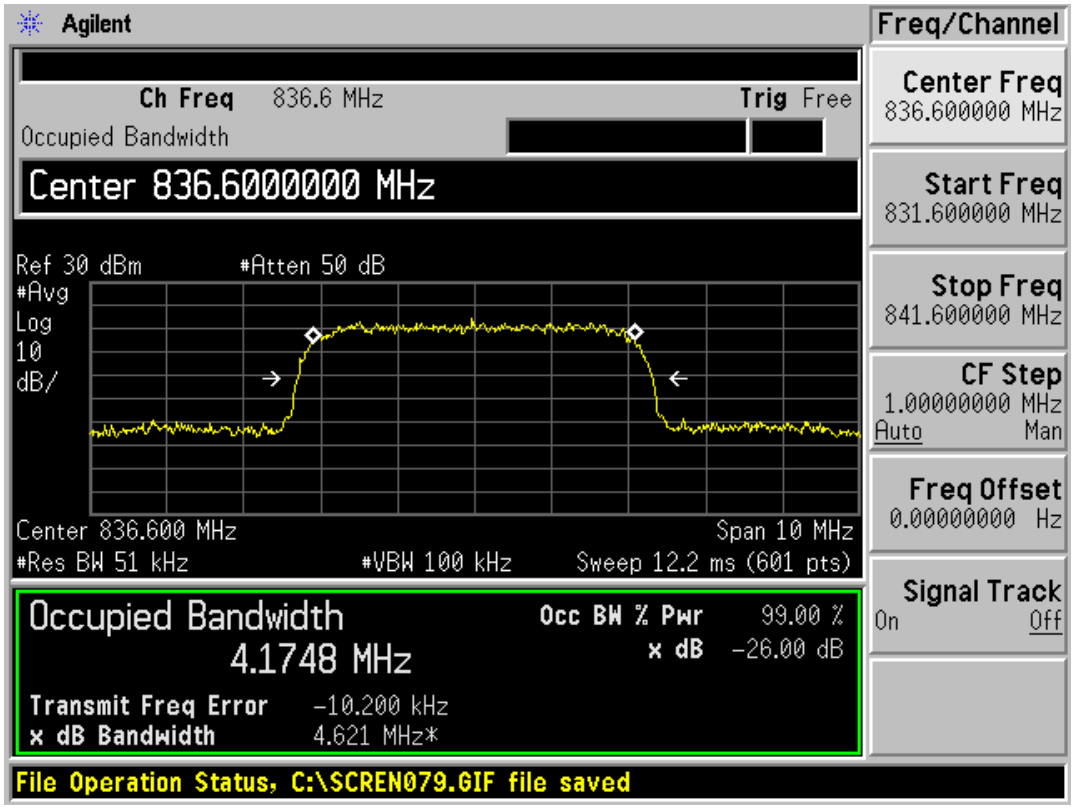



GSM 850 EGPRS CH251 Occupied Bandwidth

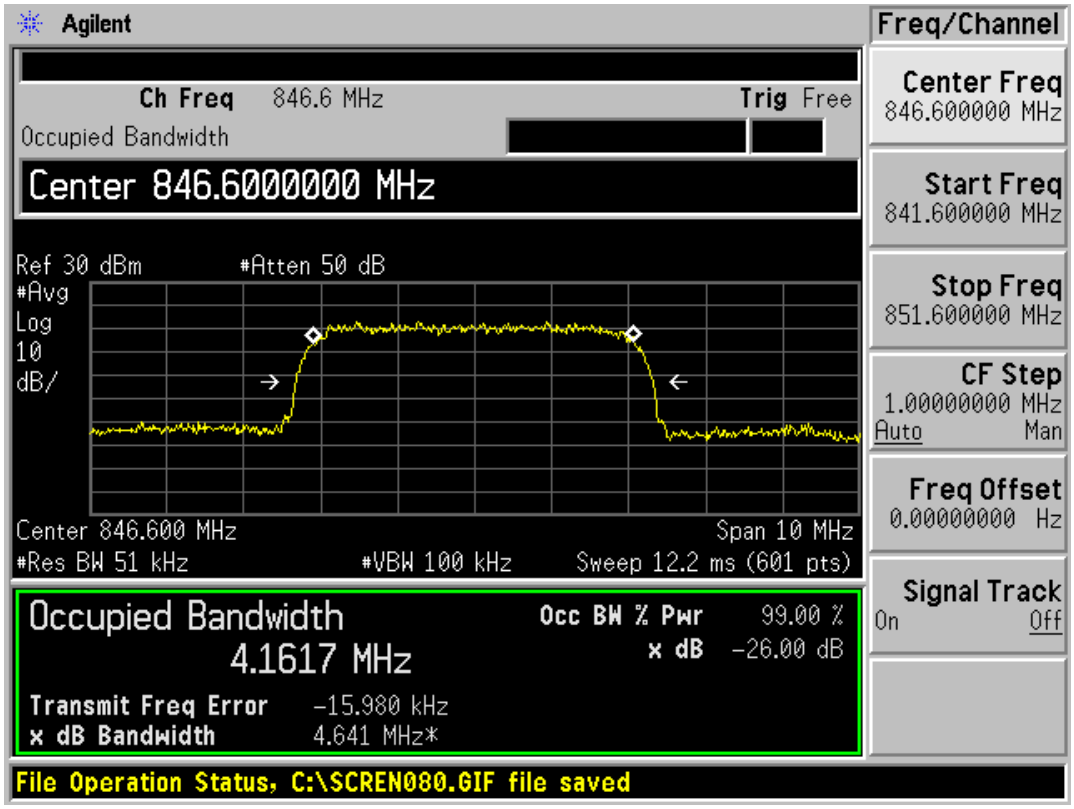
| WCDMA Band V | Channel | Frequency (MHz) | 99% Power Bandwidth (MHz) | -26dBc Bandwidth(MHz) |
|---|---|---|---|---|
| RMC | 4132 | 826.4 | 4.1584 | 4.614 |
| | 4183 | 836.6 | 4.1748 | 4.621 |
| | 4233 | 846.6 | 4.1617 | 4.641 |
| HSDPA | 4132 | 826.4 | 4.1495 | 4.633 |
| | 4183 | 836.6 | 4.1911 | 4.654 |
| | 4233 | 846.6 | 4.1606 | 4.645 |
| HSUPA | 4132 | 826.4 | 4.1544 | 4.612 |
| | 4183 | 836.6 | 4.1821 | 4.652 |
| | 4233 | 846.6 | 4.1739 | 4.651 |



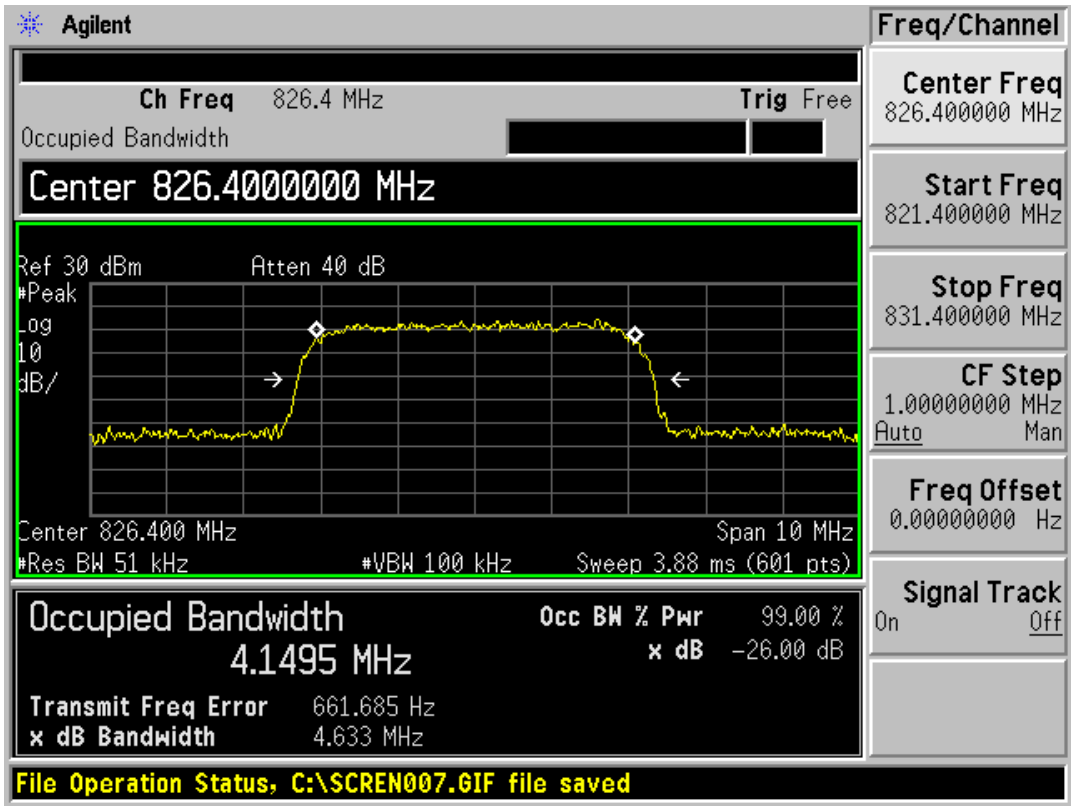

WCDMA Band V CH4132 Occupied Bandwidth



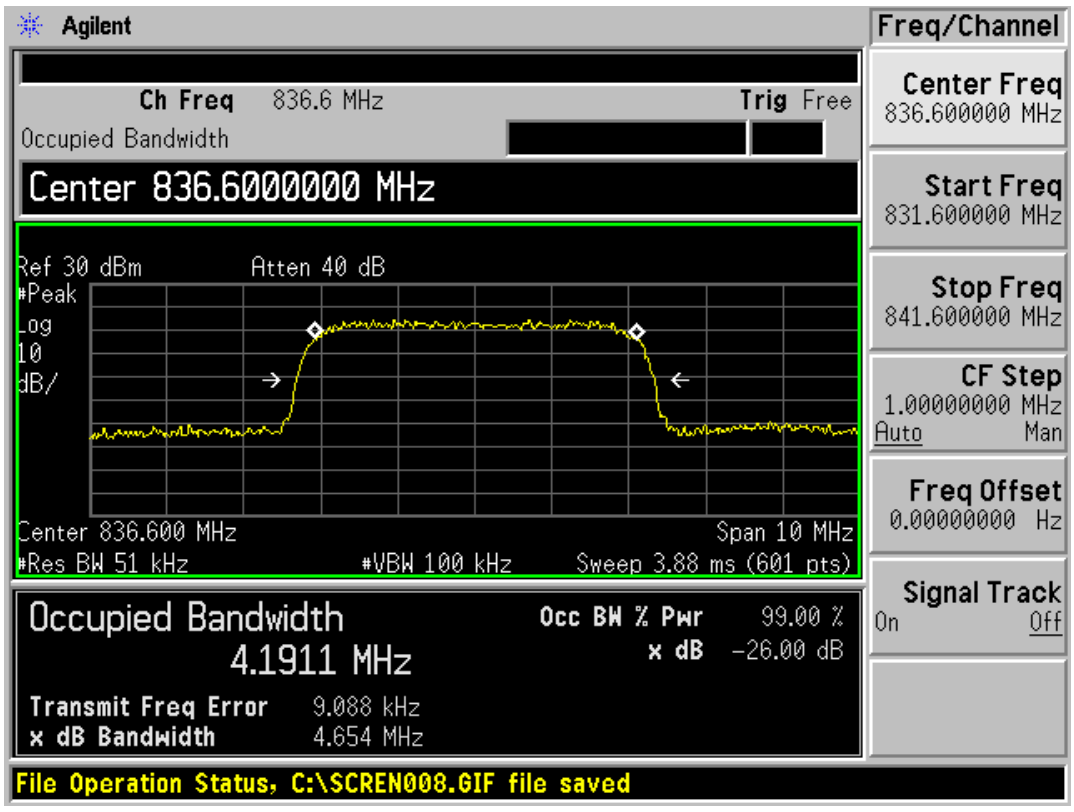

WCDMA Band V CH4183 Occupied Bandwidth



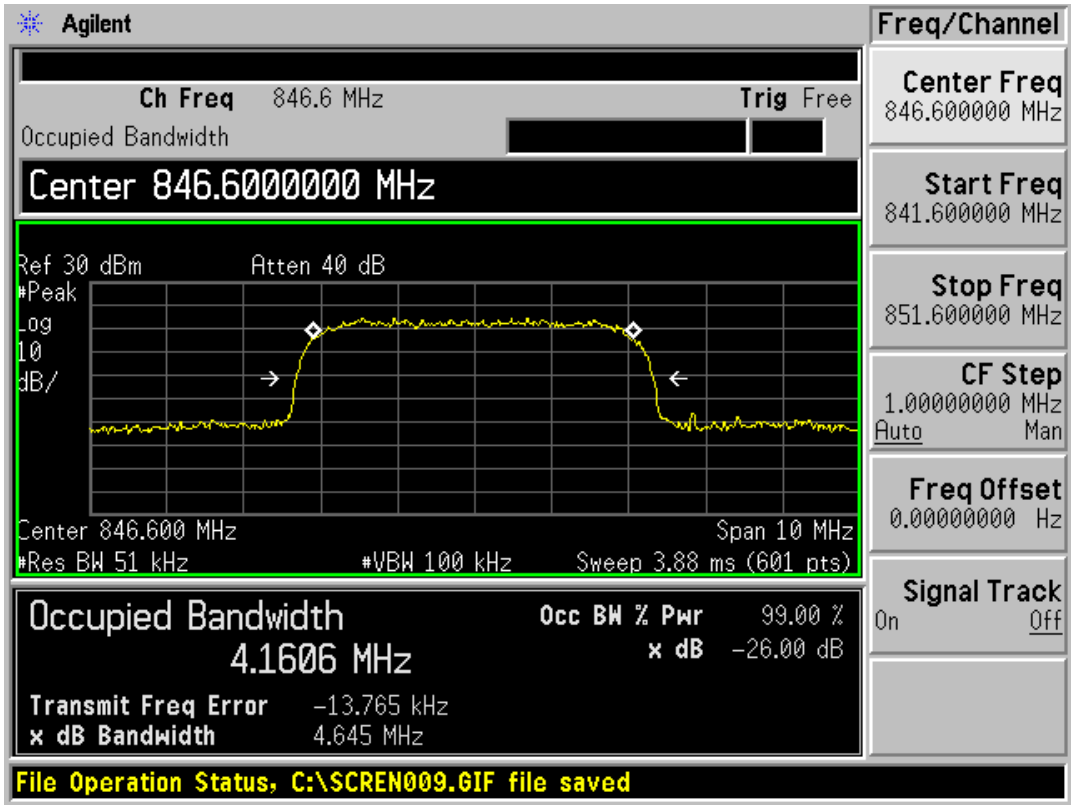

WCDMA Band V CH4233 Occupied Bandwidth



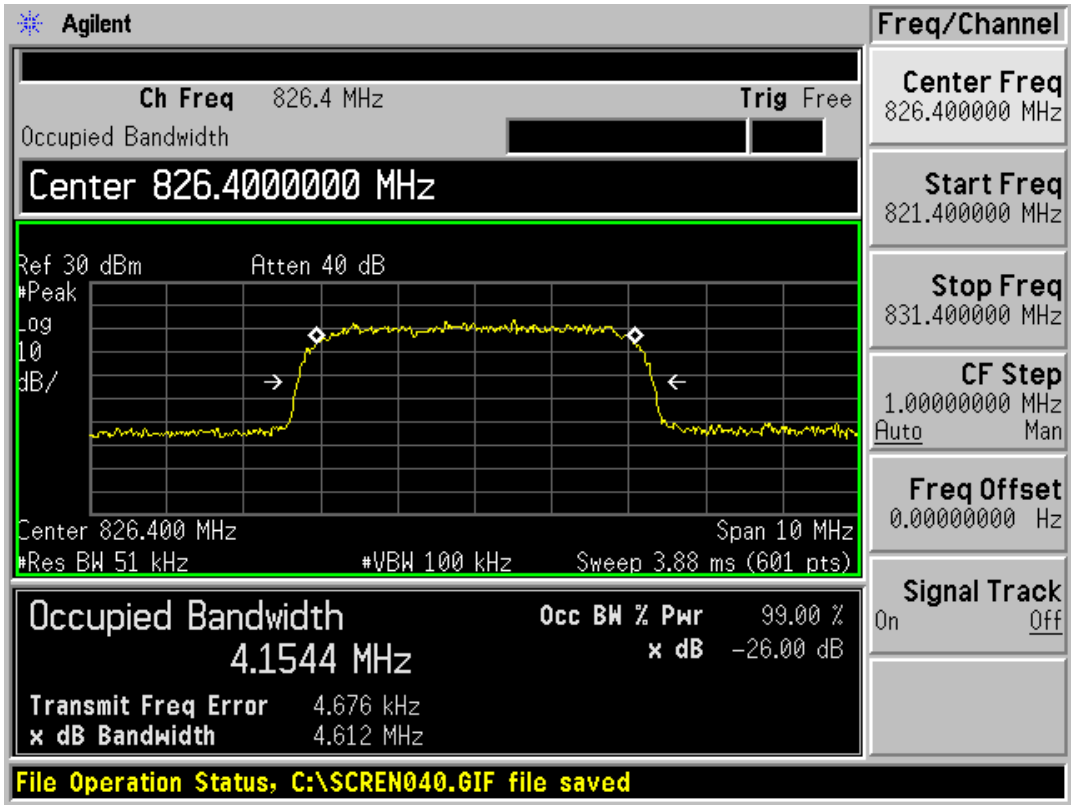

WCDMA Band V HSDPA CH4132 Occupied Bandwidth



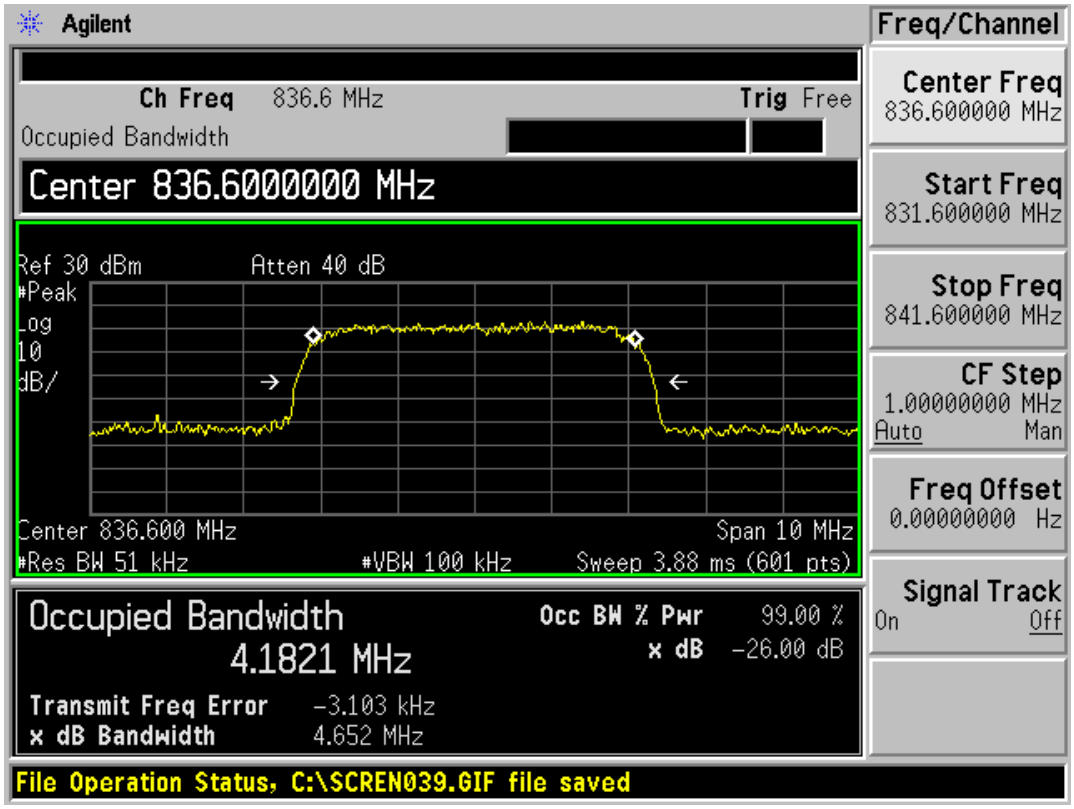

WCDMA Band V HSDPA CH4183 Occupied Bandwidth



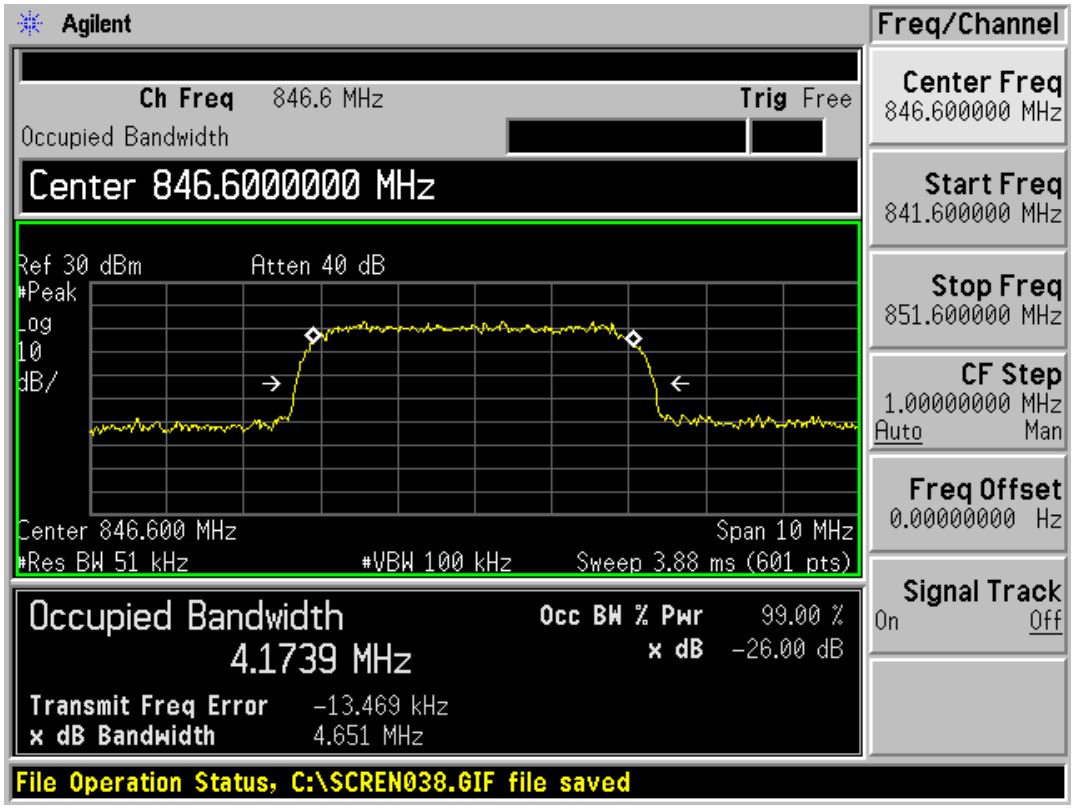

WCDMA Band V HSDPA CH4233 Occupied Bandwidth




WCDMA Band V HSUPA CH4132 Occupied Bandwidth




WCDMA Band V HSUPA CH4183 Occupied Bandwidth




WCDMA Band V HSUPA CH4233 Occupied Bandwidth

## 2.5. Band Edge Compliance

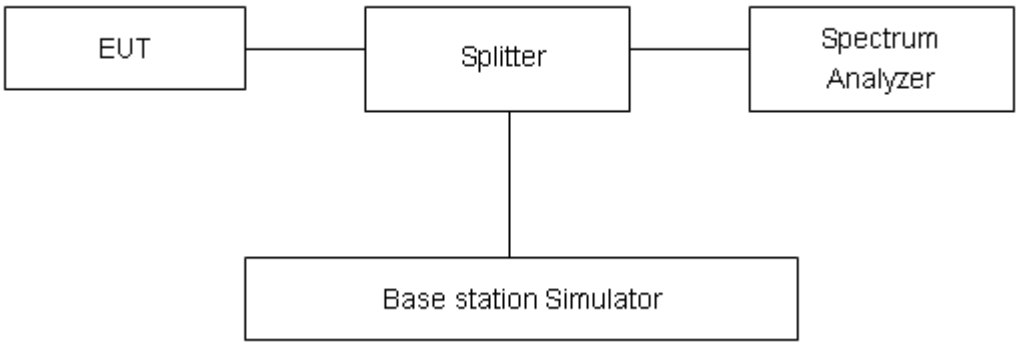
**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Method of Measurement**

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The average detector is used. RBW is set to 3kHz,VBW is set to 10kHz for GSM 850 and RBW is set to 51kHz,VBW is set to 100kHz for WCDMA Band V. Spectrum analyzer plots are included on the following pages.

**Test Setup**




**Limits**

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.”

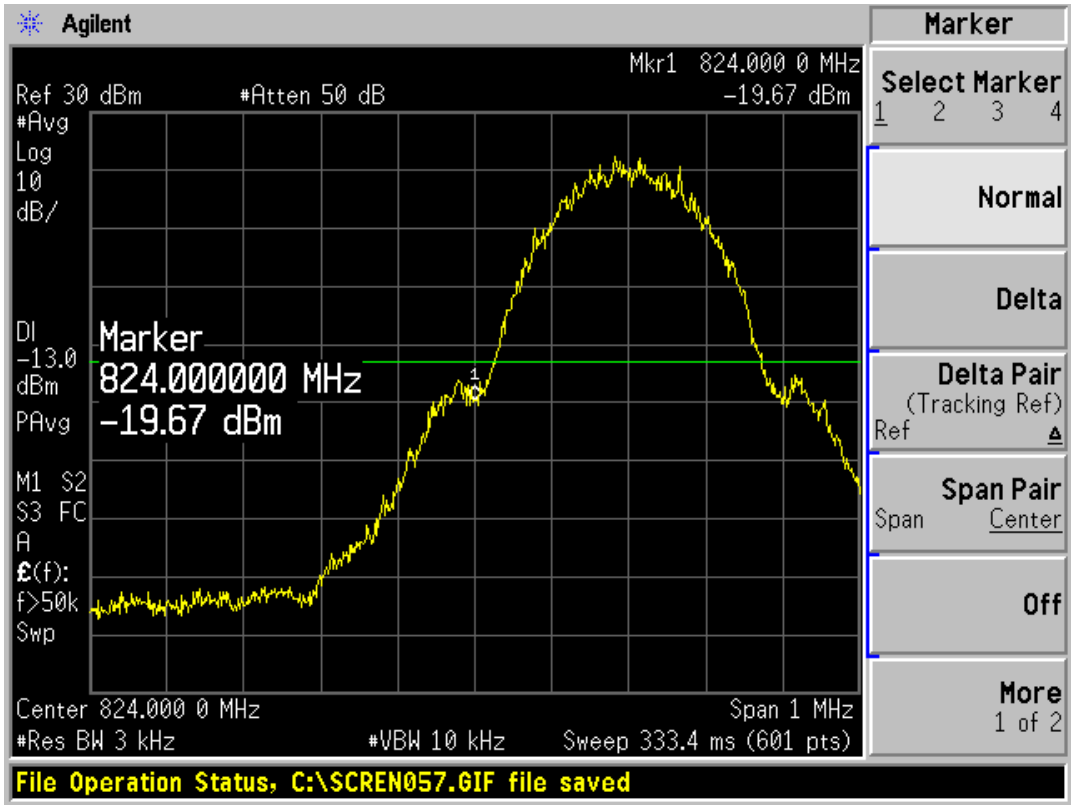
| Limit | -13 dBm |
|---|---|

**Measurement Uncertainty**

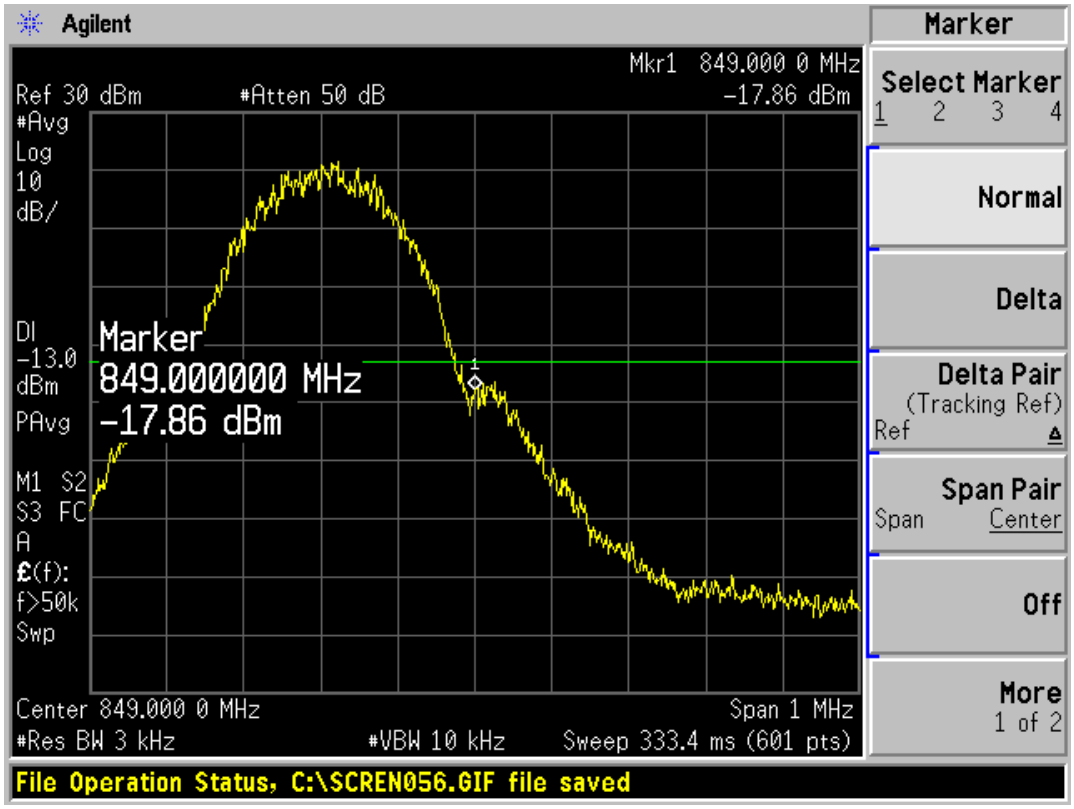
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 1.96, $U$=0.684dB.

**Test Result:**

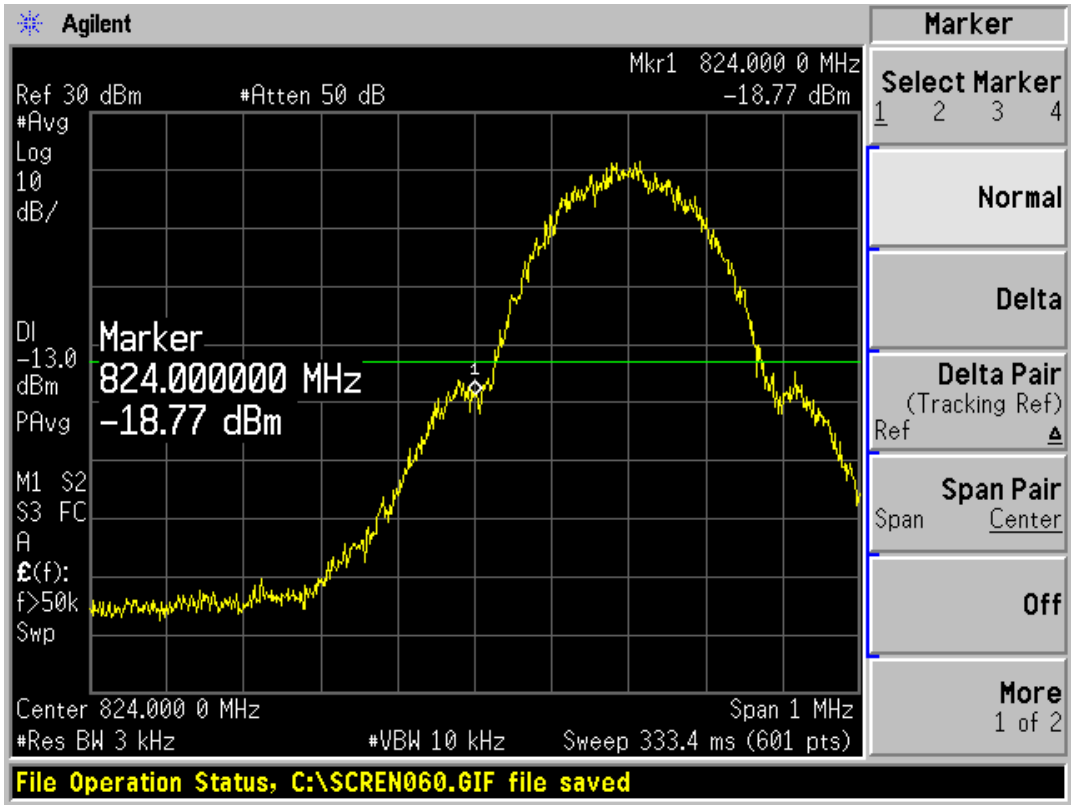
| GSM 850 | Carrier frequency (MHz) | Reference value (dBm) | Limit (dBm) | Conclusion |
|---|---|---|---|---|
| GSM | 824.0 | -19.67 | -13 | PASS |
| | 849.0 | -17.86 | -13 | PASS |
| GPRS (GMSK) | 824.0 | -18.77 | -13 | PASS |
| | 849.0 | -18.93 | -13 | PASS |
| EGPRS (8-PSK) | 824.0 | -26.73 | -13 | PASS |
| | 849.0 | -27.23 | -13 | PASS |



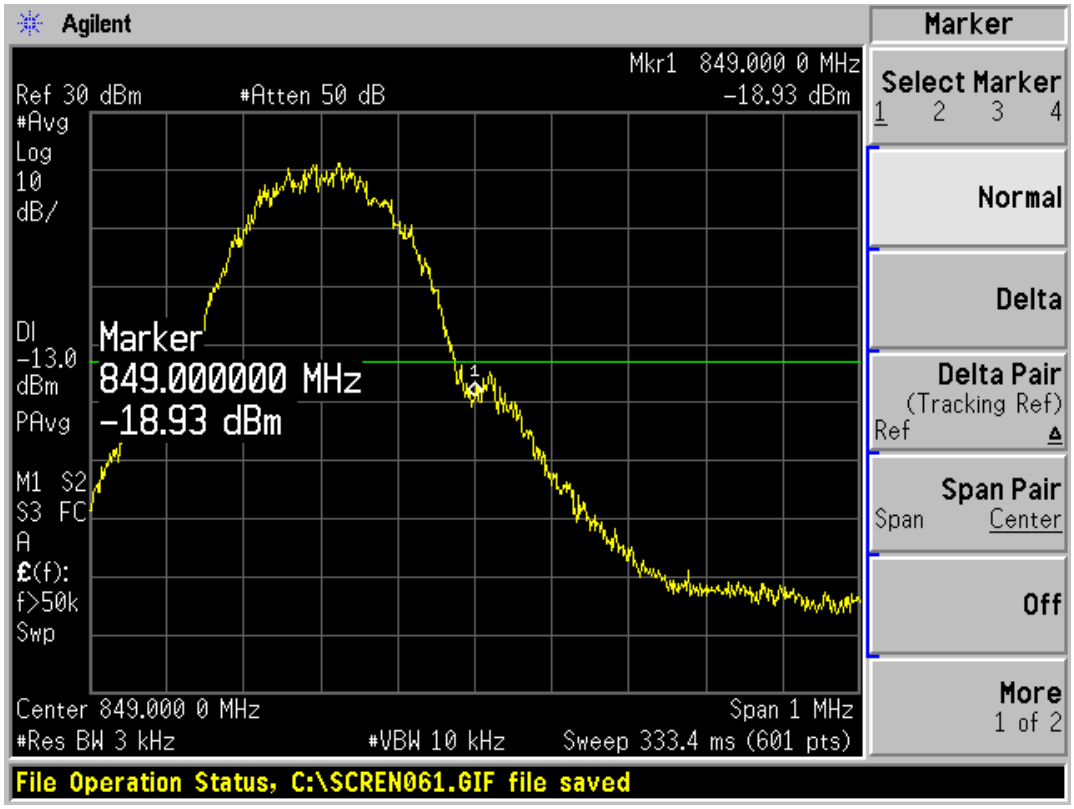

GSM 850 128 Channel



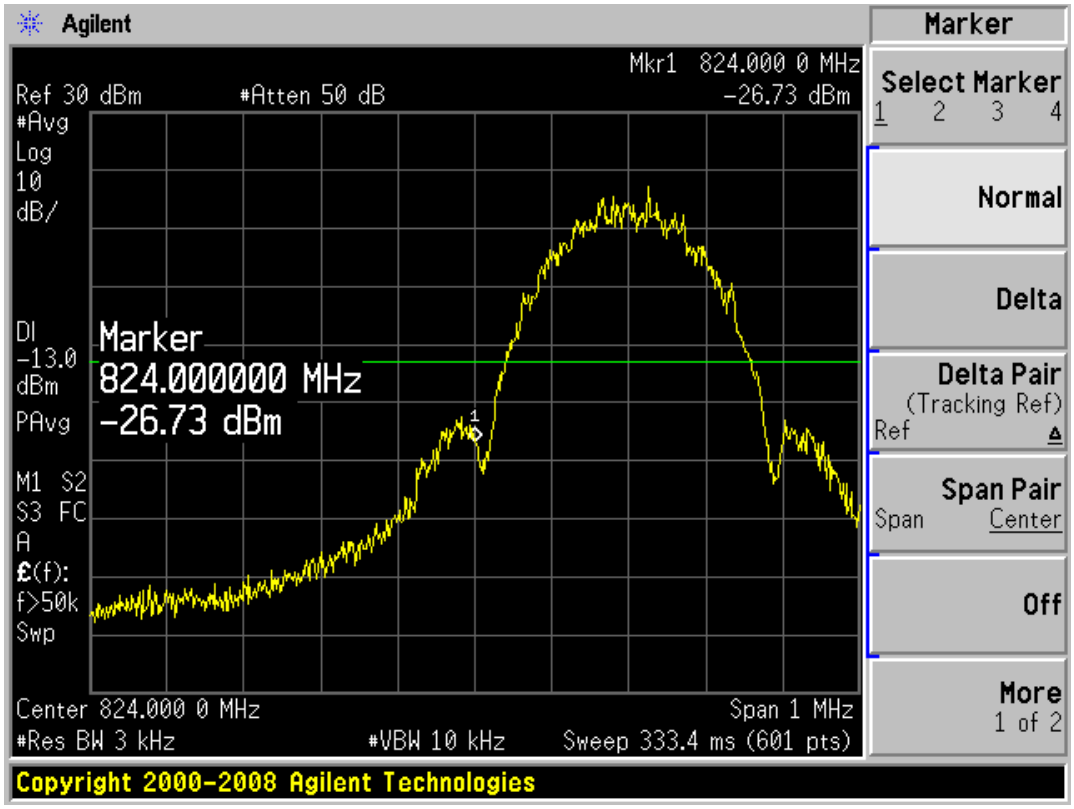

GSM 850 251 Channel



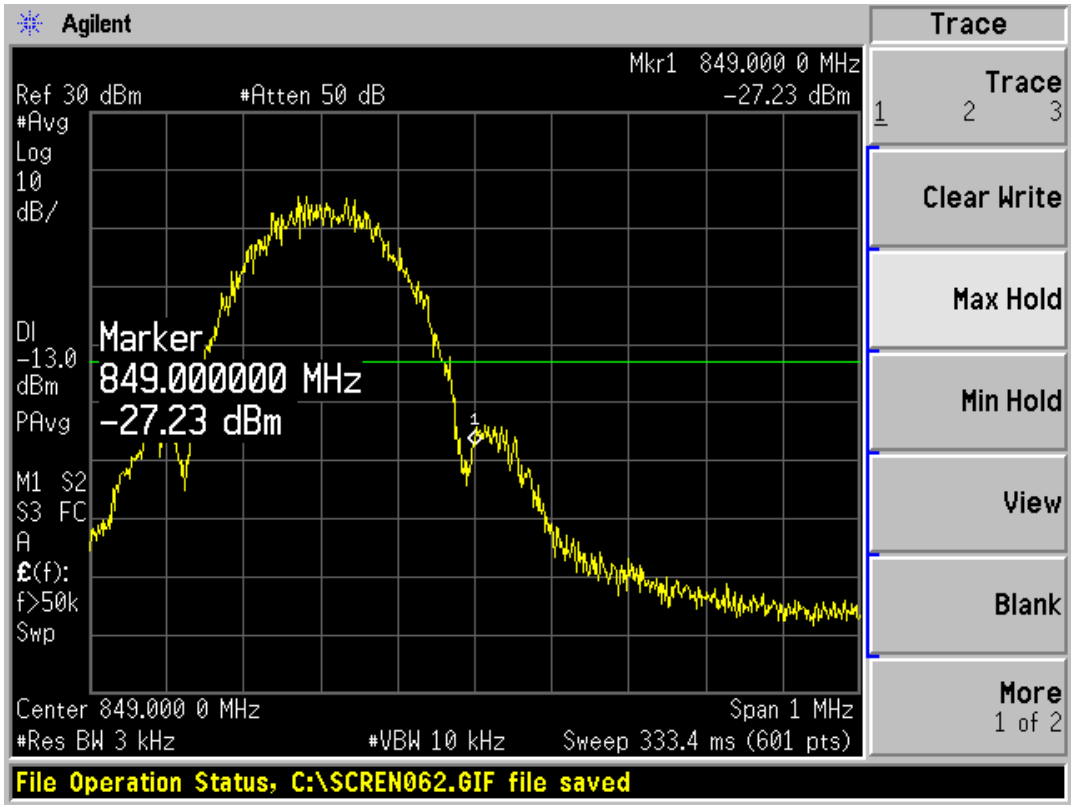

GSM 850 GPRS 128 Channel




GSM 850 GPRS 251 Channel

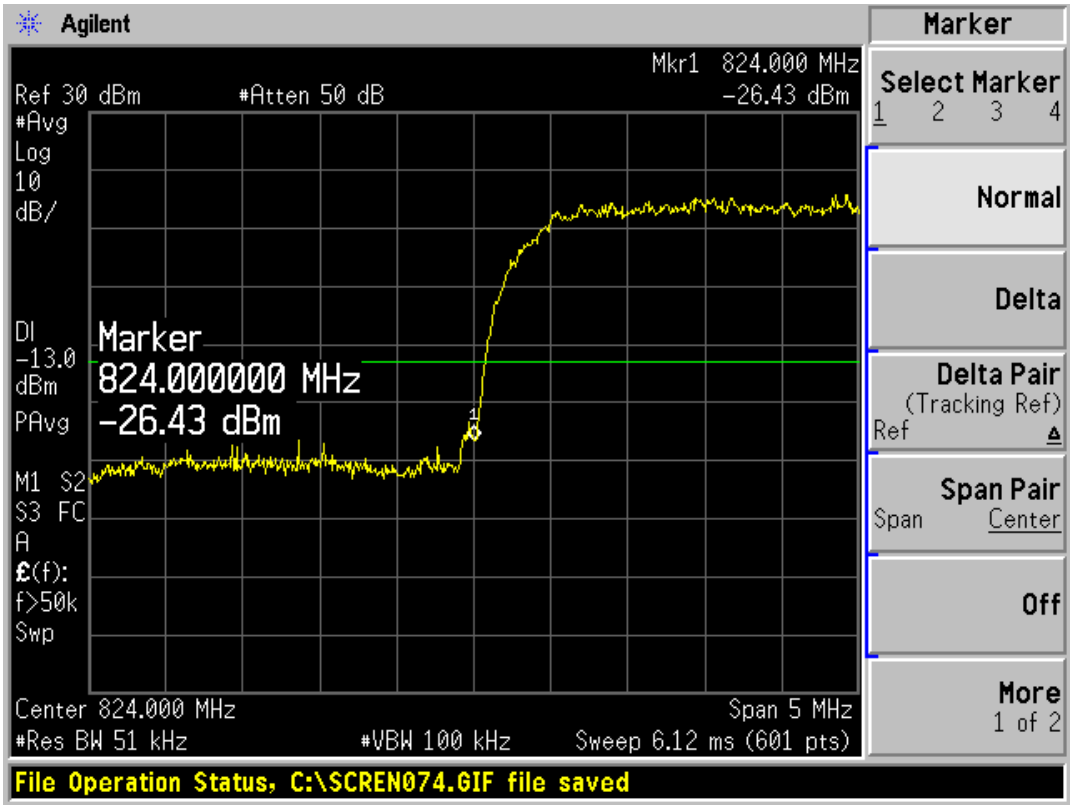



GSM 850 EGPRS 128 Channel

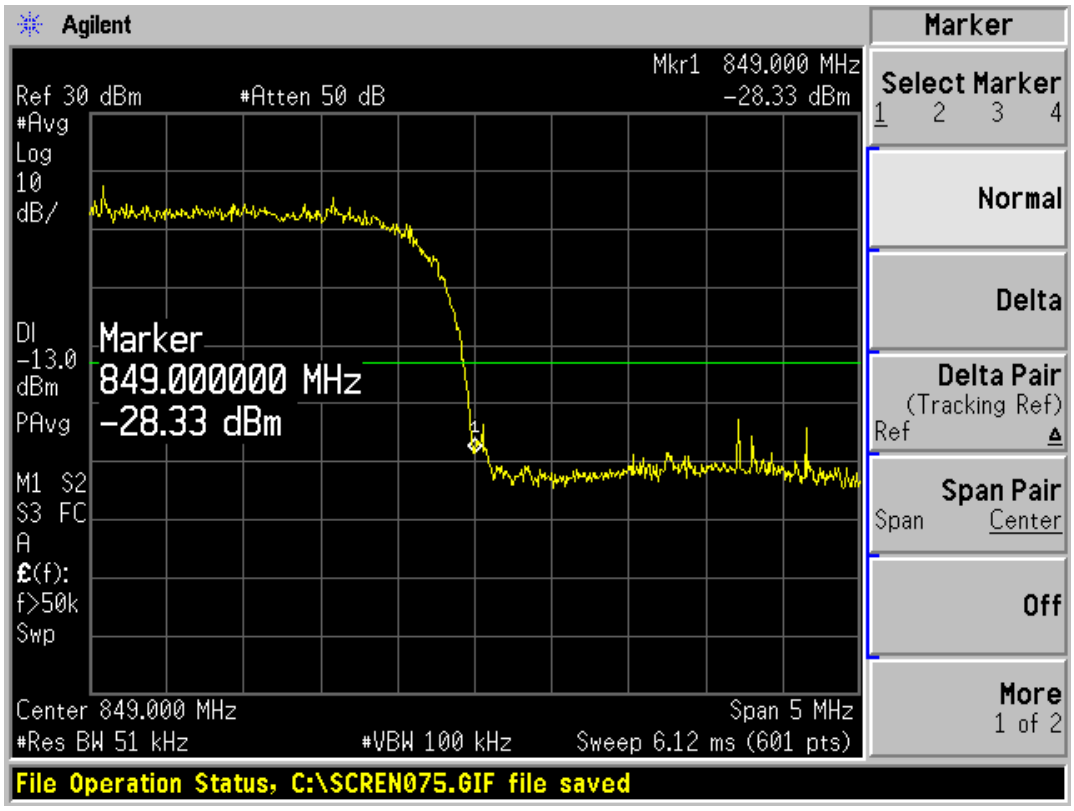



GSM 850 EGPRS 251 Channel

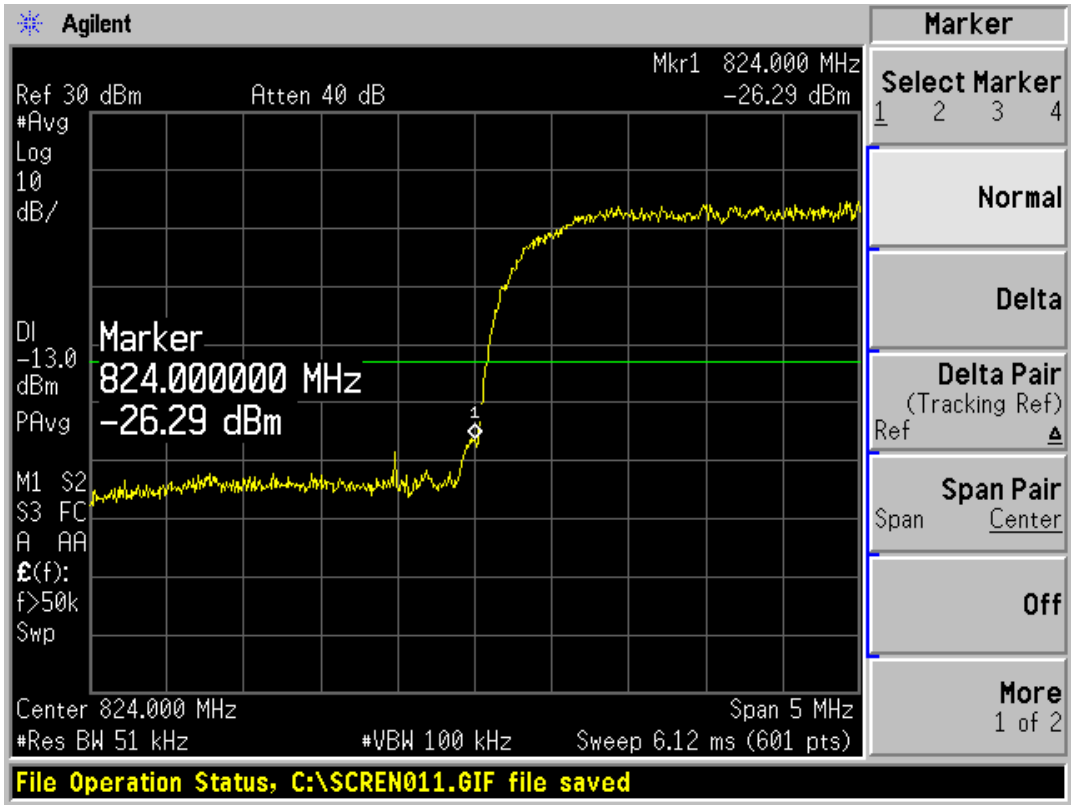
| WCDMA Band V | Carrier frequency (MHz) | Reference value (dBm) | Limit (dBm) | Conclusion |
|---|---|---|---|---|
| RMC | 824 | -26.43 | -13 | PASS |
| | 849 | -28.33 | -13 | PASS |
| HSDPA | 824 | -26.29 | -13 | PASS |
| | 849 | -26.49 | -13 | PASS |
| HSUPA | 824 | -30.16 | -13 | PASS |
| | 849 | -28.80 | -13 | PASS |



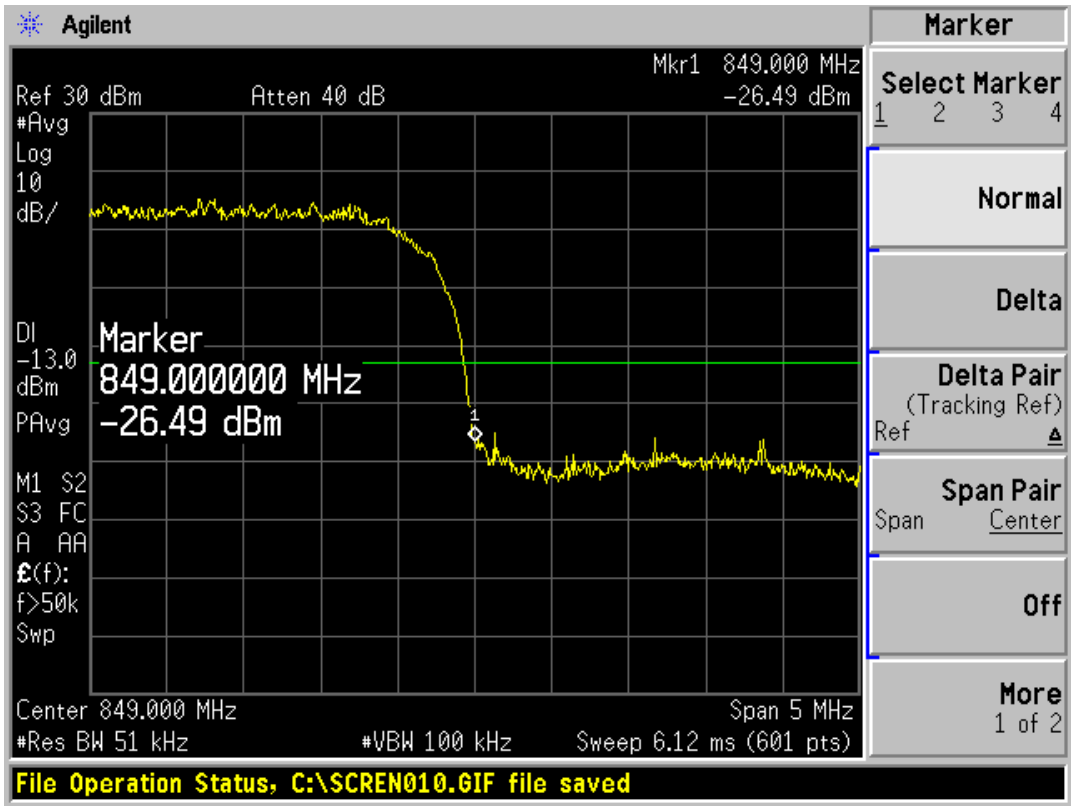

WCDMA Band V 4132 Channel



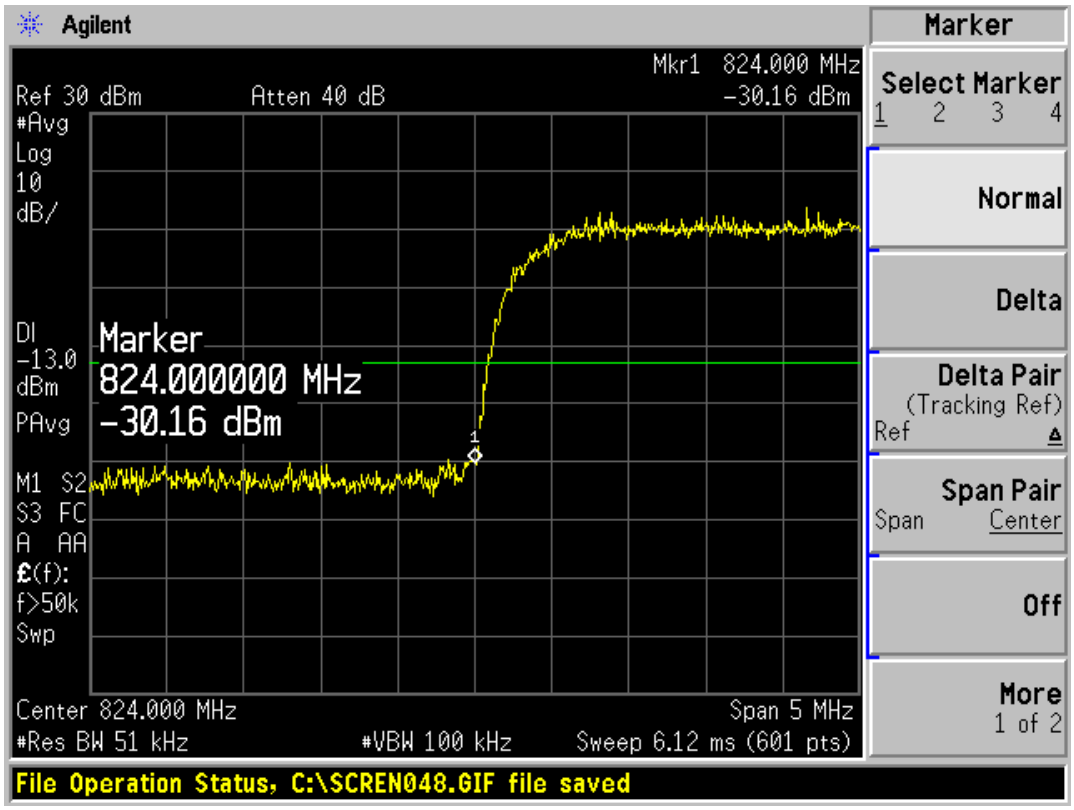

WCDMA Band V 4233 Channel



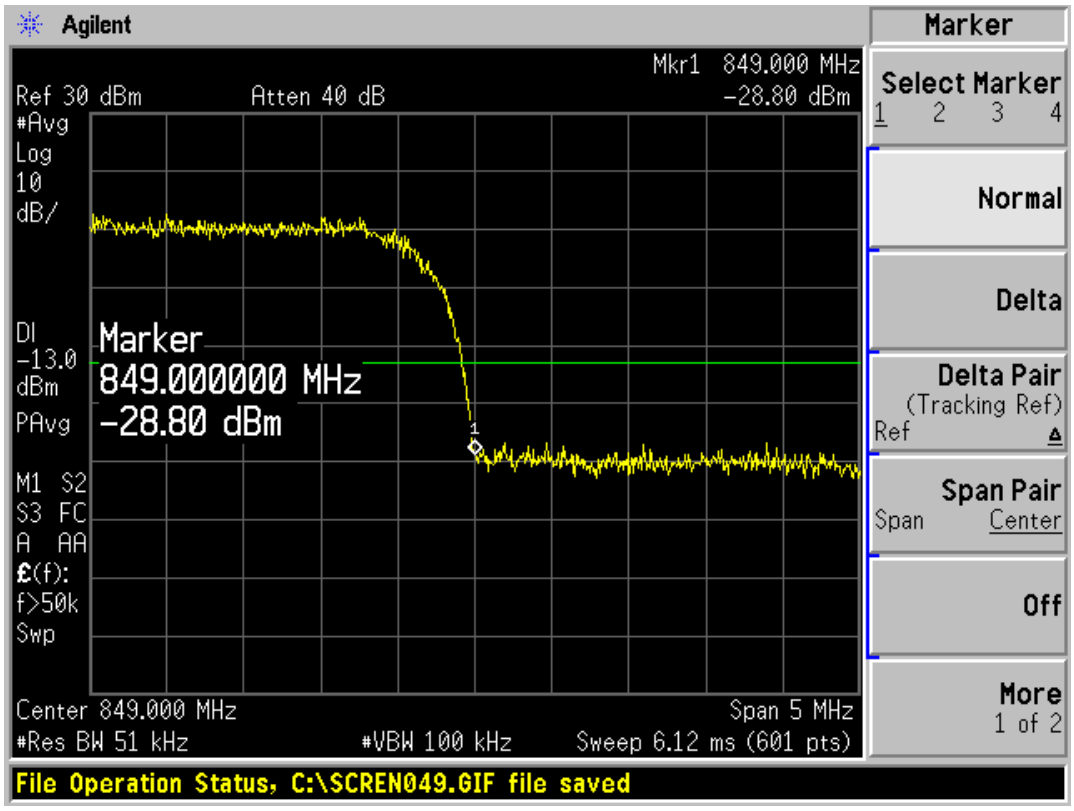

WCDMA Band V HSDPA 4132 Channel




WCDMA Band V HSDPA 4233 Channel




WCDMA Band V HSUPA 4132 Channel




WCDMA Band V HSUPA 4233 Channel

## 2.6. Peak-to-Average Power Ratio (PAPR)

**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Methods of Measurement**

For WCDMA test, which OBW is more than 1MHz, the measurement procedures in KDB971168 are used.

The inherent randomness of the power peaks in a noise-like signal makes it difficult to quantify the peak power using traditional measurement techniques for determining the peak power of an analog signal. The peak power of a digitally-modulated signal is predictable only on a statistical basis. Thus, for these types of signals, a statistical measurement of the peak power is necessary.

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.

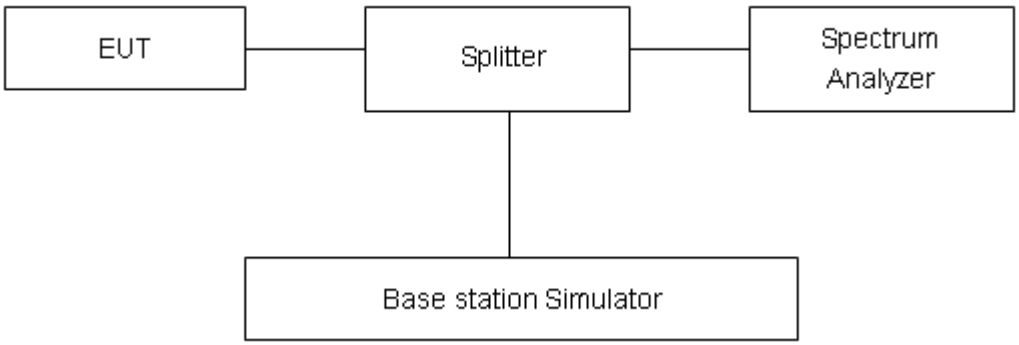
Step 1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.

Step 2. Set the CCDF option in Spectrum analyzer.

Step 3. Record the maximum PAPR level associated with a probability of 0.1%.

For GSM PAPR test, the peak power and the average power were measured separately via the spectrum analyzer.

**Test Setup**




**Limits**

No specific Peak-to-Average Ratio requirements in KDB 971168.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the

normal distribution is with the coverage factor *k* = 2, *U*= 0.4 dB.

**Test Results**

| GSM 850 | Channel | Frequency (MHz) | Peak(dBm) | Avg(dBm) | PAPR(dB) |
|---|---|---|---|---|---|
| GSM | 128 | 824.2 | 29.92 | 29.19 | 0.73 |
| | 190 | 836.6 | 29.78 | 29.22 | 0.56 |
| | 251 | 848.8 | 29.66 | 29.04 | 0.62 |
| GPRS | 128 | 824.2 | 29.72 | 29.17 | 0.55 |
| | 190 | 836.6 | 29.68 | 29.19 | 0.49 |
| | 251 | 848.8 | 29.6 | 29.09 | 0.51 |
| EGPRS(8PSK) | 128 | 824.2 | 27.4 | 27.03 | 0.37 |
| | 190 | 836.6 | 27.63 | 27.21 | 0.42 |
| | 251 | 848.8 | 27.51 | 27.06 | 0.45 |

| WCDMA Band V | Channel | Frequency (MHz) | Peak(dBm) | Avg(dBm) | PAPR(dB) |
|---|---|---|---|---|---|
| RMC | 4132 | 826.4 | 23.44 | 20.2 | 3.24 |
| | 4183 | 836.6 | 23.68 | 20.39 | 3.29 |
| | 4233 | 846.6 | 23.74 | 20.45 | 3.29 |
| HSDPA | 4132 | 826.4 | 23.29 | 20.00 | 3.29 |
| | 4183 | 836.6 | 23.67 | 20.36 | 3.31 |
| | 4233 | 846.6 | 23.83 | 20.54 | 3.29 |
| HSUPA | 4132 | 826.4 | 22.45 | 19.19 | 3.26 |
| | 4183 | 836.6 | 22.85 | 19.6 | 3.25 |
| | 4233 | 846.6 | 23.16 | 19.87 | 3.29 |

## 2.7. Frequency Stability

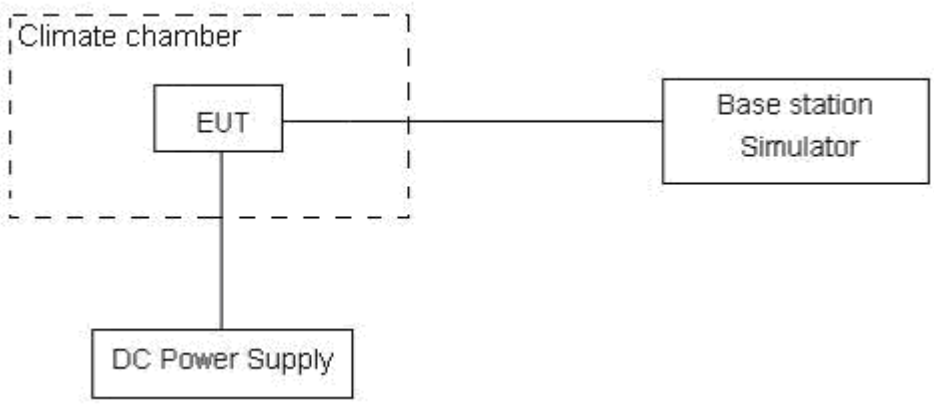
**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Method of Measurement**

1. Frequency Stability (Temperature Variation)
   The temperature inside the climate chamber is varied from -20°C to +50°C in 10°C step size,
   (1) With all power removed, the temperature was decreased to -20°C and permitted to stabilize for three hours.
   (2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.
   (3) Repeat the above measurements at 10°C increments from -20°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.
2. Frequency Stability (Voltage Variation)
   The frequency stability shall be measured with variation of primary supply voltage as follows:
   (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
   (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.
   This transceiver is specified to operate with an input voltage of between 3.5 V and 4.2 V, with a nominal voltage of 3.8V.

**Test setup**



**Limits**

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

| | |
|---|---|
| Limits | ≤ 2.5 ppm |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 3,*U*= 0.01ppm.

**Test Result**

**GSM850**

| Temperature (°C) | Test Results (ppm) / 3.8 V Power supply | |
|---|---|---|
| | Channel 190 | |
| | GSM(GMSK) | EGPRS(8PSK) |
| -20 | -0.027 | -0.041 |
| -10 | -0.021 | -0.039 |
| 0 | -0.022 | -0.033 |
| 10 | -0.025 | -0.034 |
| 20 | -0.028 | -0.037 |
| 30 | -0.029 | -0.031 |
| 40 | -0.025 | 0.029 |
| 50 | -0.026 | -0.030 |
| 60 | -0.024 | -0.031 |

| Voltage (V) | Test Results(ppm) / 20°C | |
|---|---|---|
| | Channel 190 | |
| | GSM(GMSK) | EGPRS(8PSK) |
| 3.5 | -0.029 | -0.027 |
| 3.8 | -0.028 | -0.031 |
| 4.2 | -0.027 | -0.029 |

**WCDMA Band V**

| Temperature (°C) | Test Results (ppm) / 3.8 V Power supply |
|---|---|
| | Channel 4183 |
| -20 | 0.004 |
| -10 | 0.001 |
| 0 | -0.002 |
| 10 | -0.002 |
| 20 | -0.002 |
| 30 | 0.004 |
| 40 | -0.003 |
| 50 | 0.003 |
| 60 | 0.004 |

| Voltage (V) | Test Results(ppm) / 20°C |
|---|---|
| | Channel 4183 |
| 3.5 | 0.002 |
| 3.8 | -0.002 |
| 4.2 | 0.001 |

## 2.8. Spurious Emissions at Antenna Terminals

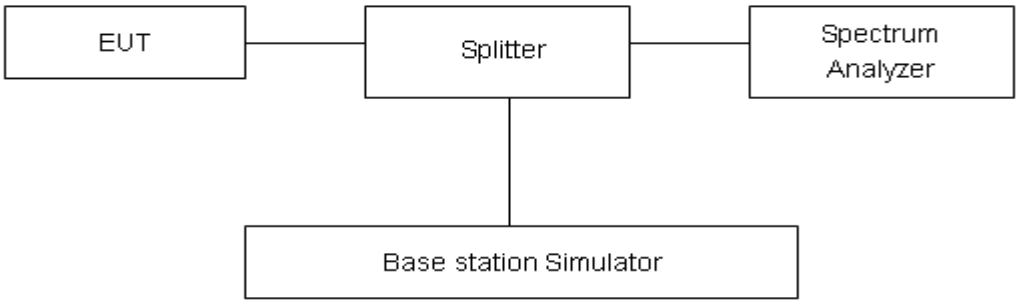
**Ambient condition**

| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Method of Measurement**

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. For GSM 850, RBW and VBW are set to 100 kHz, Sweep is set to ATUO. For WCDMA Band V, RBW and VBW are set to 100 kHz for the carrier frequency, or RBW and VBW are set to 1MHz(other frequency), Sweep is set to ATUO.

**Test setup**




**Limits**

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.”

| Limit | -13 dBm |
|---|---|

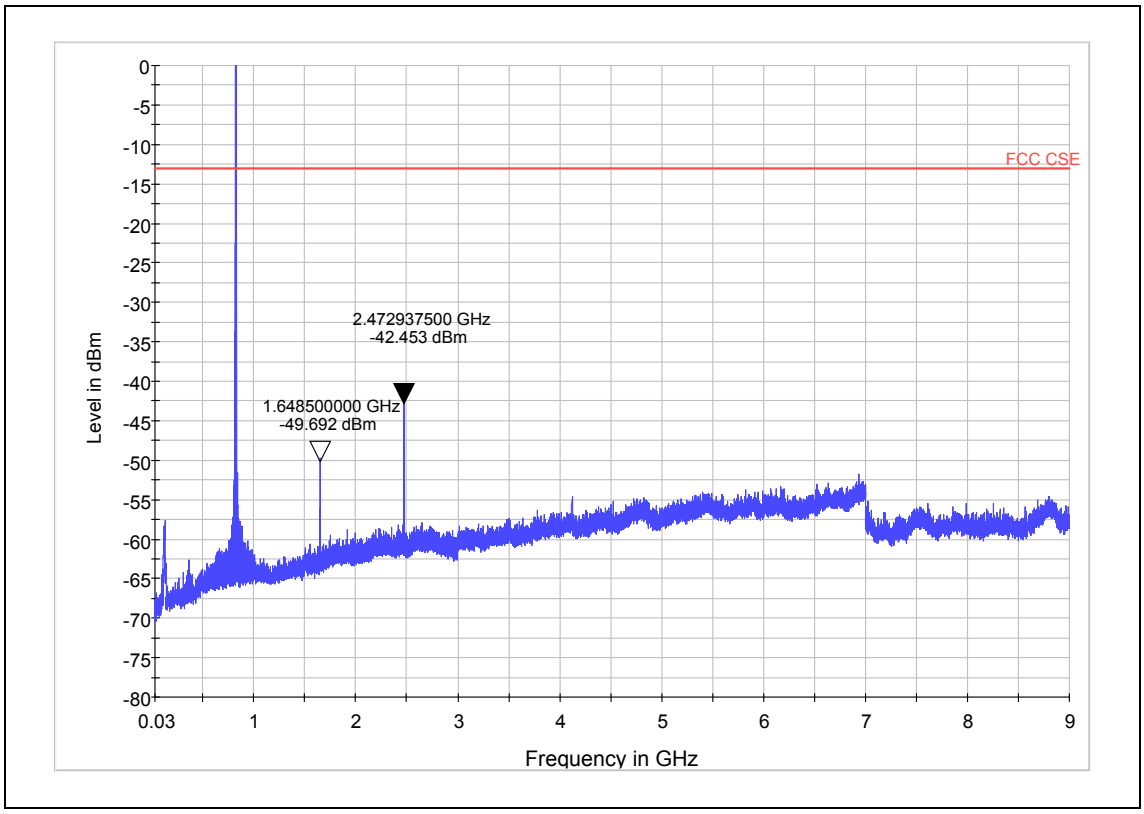
**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 1.96.

| Frequency | Uncertainty |
|---|---|
| 100kHz-2GHz | 0.684 dB |
| 2GHz-12.75GHz | 1.407 dB |

**Test Result**

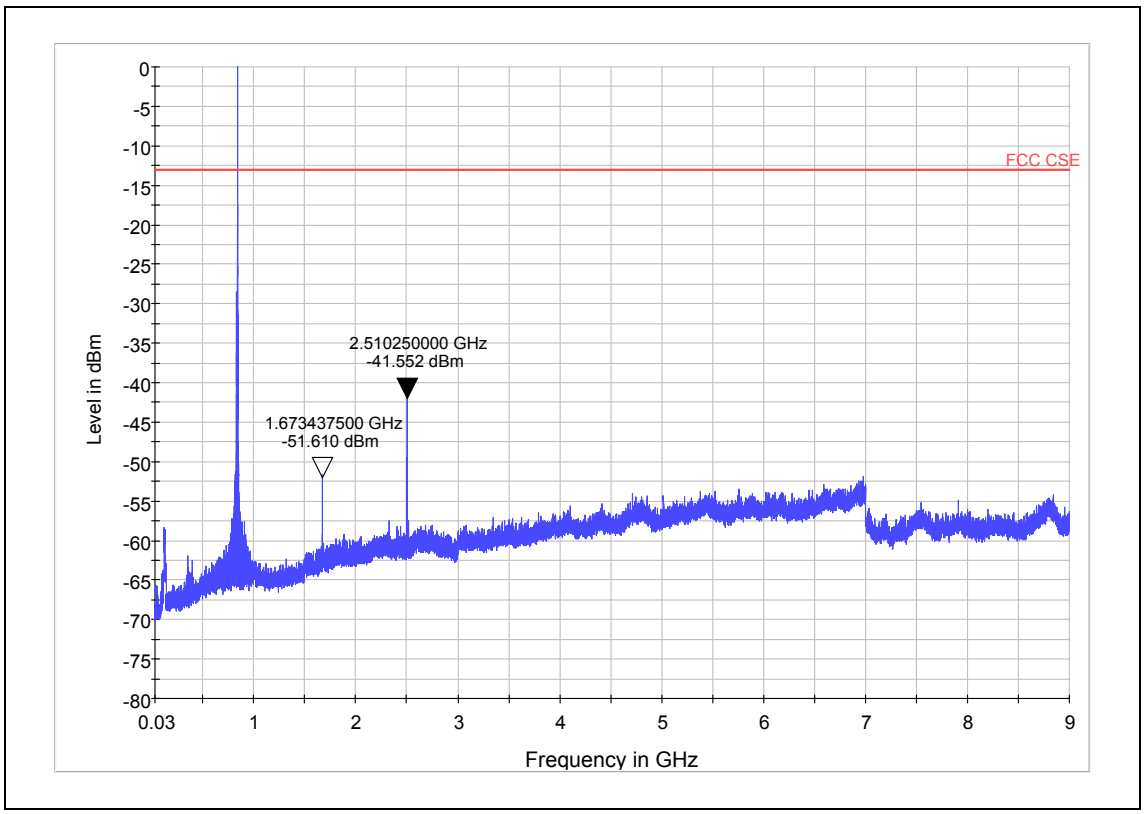
GSM 850 CH128




Note: The signal beyond the limit is carrier
GSM 850 128 Channel 30MHz~9GHz

| Harmonic | TX ch.128 Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 2 | 1648.5 | -49.692 | -13 | 36.692 |
| 3 | 2472.937 | -42.453 | -13 | 29.453 |

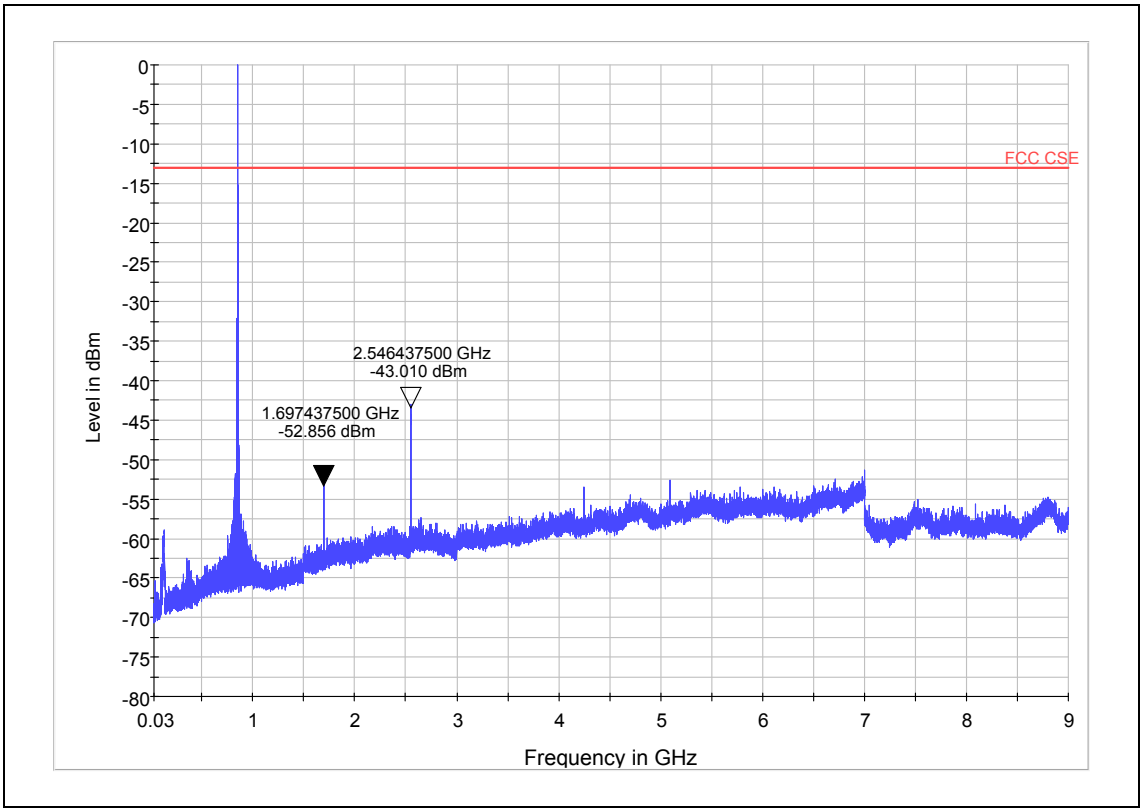
GSM 850 CH190




Note: The signal beyond the limit is carrier
GSM 850 190 Channel 30MHz~9GHz

| Harmonic | TX ch.190 Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 2 | 1673.4375 | -51.610 | -13 | 38.610 |
| 3 | 2510.25 | -41.552 | -13 | 28.552 |

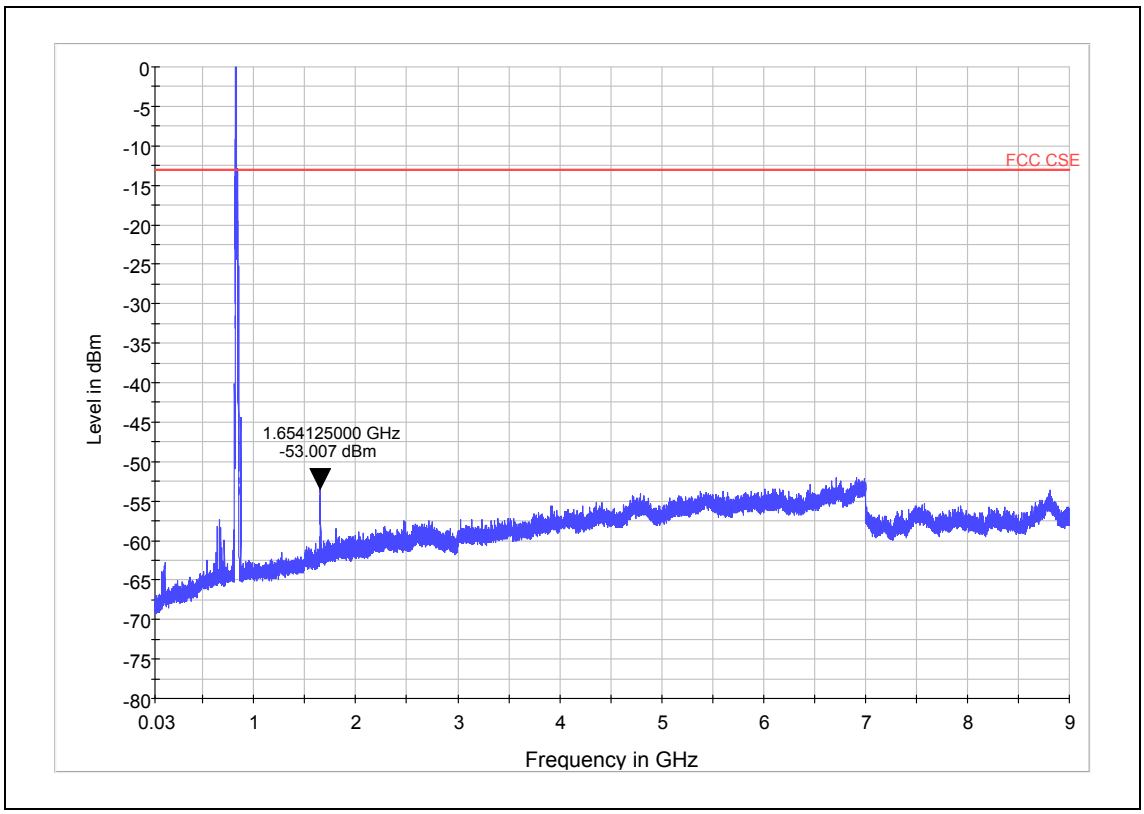
GSM 850 CH251




Note: The signal beyond the limit is carrier
GSM 850 251 Channel 30MHz~9GHz

| Harmonic | TX ch.251 Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 2 | 1697.4375 | -52.856 | -13 | 39.856 |
| 3 | 2546.4375 | -43.010 | -13 | 30.010 |

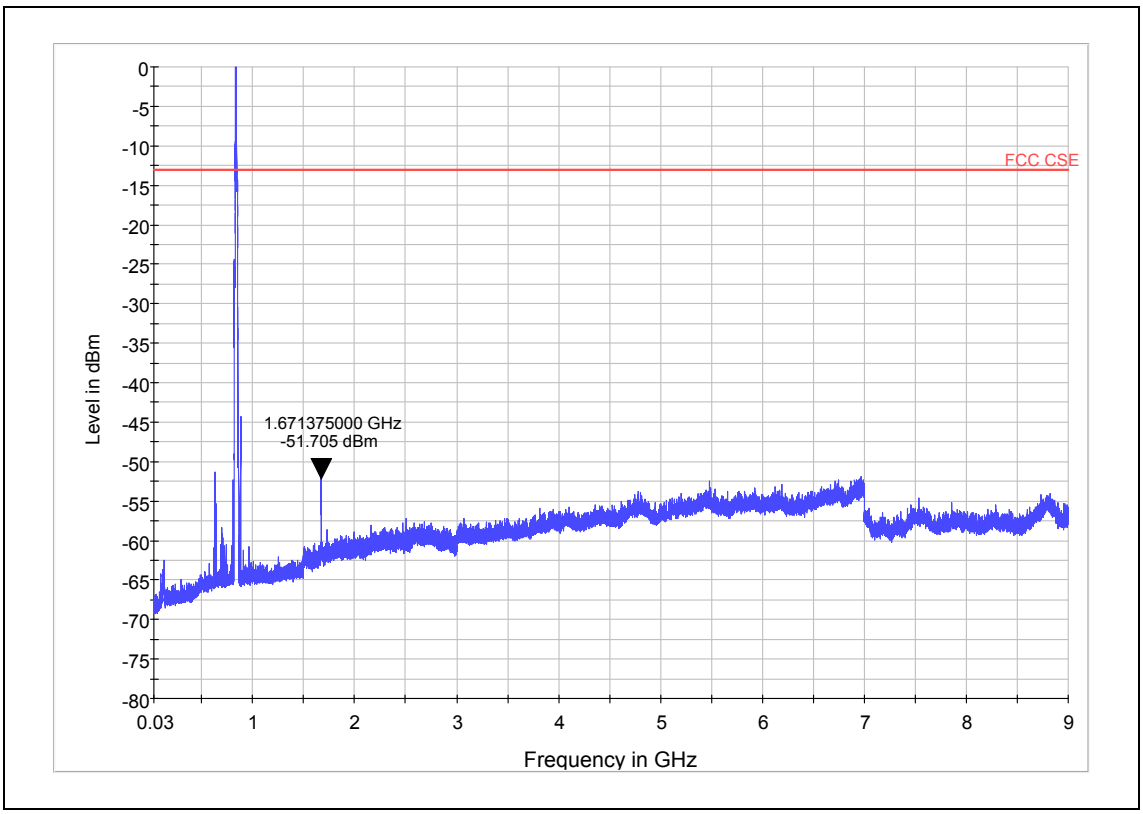
WCDMA Band V CH4132




Note: The signal beyond the limit is carrier
WCDMA Band V 4132 Channel 30MHz~9GHz

| Harmonic | TX ch.4132 Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 2 | 1654.125 | -53.007 | -13 | 40.007 |

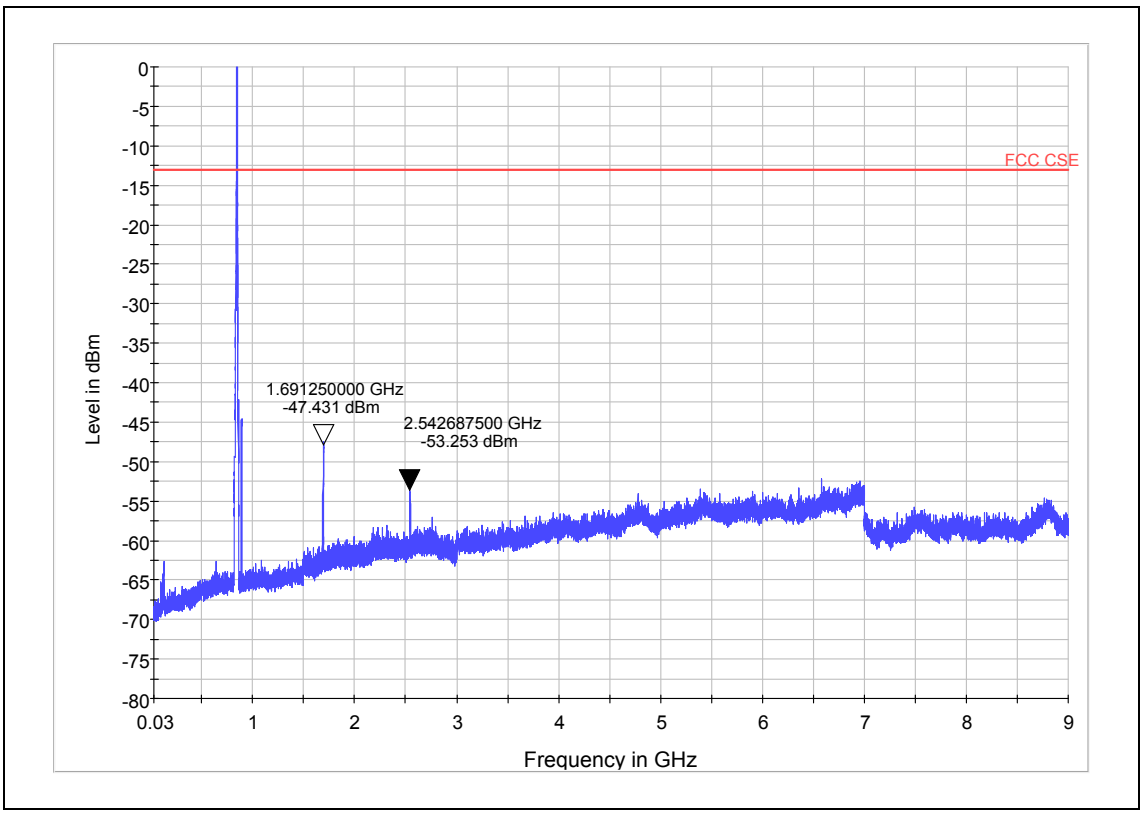
WCDMA Band V CH4183




Note: The signal beyond the limit is carrier
WCDMA Band V 4183 Channel 30MHz~9GHz

| Harmonic | TX ch.4183 Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 2 | 1671.375 | -51.705 | -13 | 38.705 |

WCDMA Band V CH4233




Note: The signal beyond the limit is carrier
WCDMA Band V 4233 Channel 30MHz~9GHz

| Harmonic | TX ch.4233 Frequency (MHz) | Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 2 | 1691.25 | -47.431 | -13 | 34.431 |
| 3 | 2542.6875 | -53.253 | -13 | 40.253 |

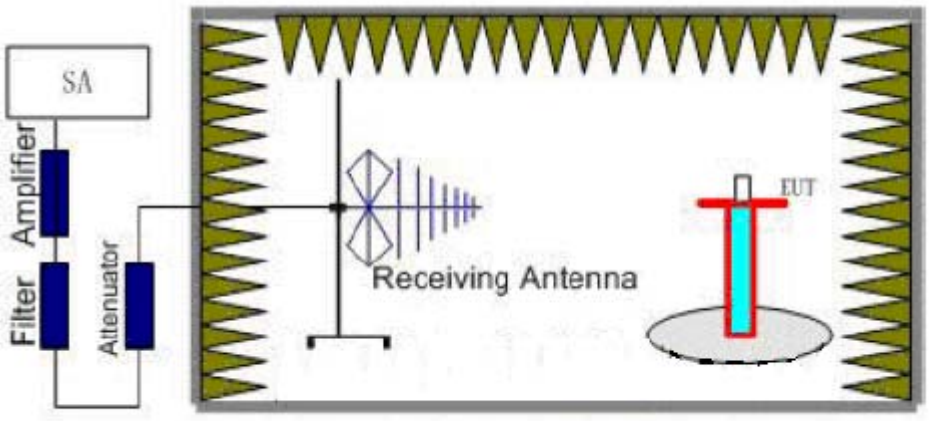
## 2.9. Radiates Spurious Emission

**Ambient condition**

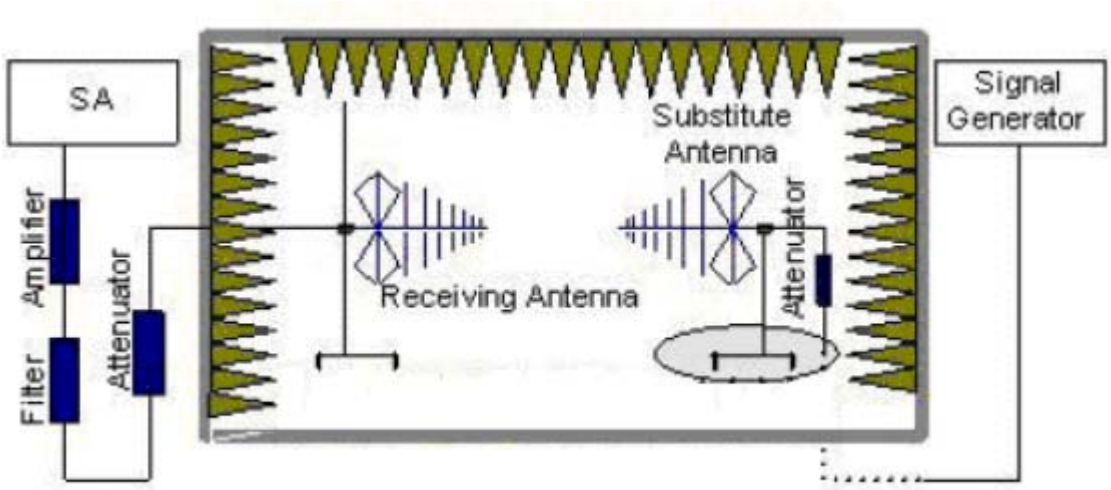
| Temperature | Relative humidity |
|---|---|
| 21°C ~25°C | 40%~60% |

**Method of Measurement**

The measurements procedures in TIA -603C are used.
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment.
The procedure of Radiates Spurious Emission is as follows:
Step 1:
The measurement is carried out in the semi-anechoic chamber. EUT was placed on a 1.5 meters high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used while RBW and VBW are both set to 3MHz. During the measurement, the highest emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna moved up and down over a range from 1 to 4 meters in both horizontally and vertically polarized orientations. The test setup refers to figure below.




Step 2:
A dipole antenna shall be substituted in place of the EUT. The antenna will be driven by a signal generator with a adjustable S.G. applied through a Tx cable. Adjust the level of the signal generator output until the value of the receiver reach the previously recorded analyzer power level (LVL).Then The E.R.P. /E.I.R.P. of the EUT can be calculated through the level of the signal generator, Tx cable loss and the gain of the substitution antenna. The test setup refers to figure below.




E.R.P（peak power）=S.G. - Tx Cable loss + Substitution antenna gain – 2.15.
EIRP= E.R.P+2.15

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 stand-up position (Z axis) and the antenna is vertical.

Of those disturbances below (limit – 20 dB), the mark is not required for the EUT

**Limits**

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.”

| | |
|---|---|
| Limit | -13 dBm |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor *k* = 1.96, *U*= 3.55 dB.

**Test Result**

GSM 850 CH128

| Harmonic | TX ch.128 Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1647.8 | -45.6 | 2 | 10.15 | Vertical | -39.60 | -13 | 26.60 | 0 |
| 3 | 2473.5 | -40.35 | 2.51 | 11.35 | Vertical | -33.66 | -13 | 20.66 | 0 |
| 4 | 3296.3 | -59.2 | 4.2 | 10.85 | Vertical | -54.70 | -13 | 41.70 | 135 |
| 5 | 4121.6 | -55.9 | 5.2 | 11.35 | Vertical | -51.90 | -13 | 38.90 | 45 |
| 6 | 4945.1 | -57.1 | 5.5 | 11.95 | Vertical | -52.80 | -13 | 39.80 | 180 |
| 7 | 5769.4 | -61.76 | 5.7 | 13.55 | Vertical | -56.06 | -13 | 43.06 | 270 |
| 8 | 6256.5 | -57.56 | 6.3 | 13.75 | Vertical | -52.26 | -13 | 39.26 | 270 |
| 9 | 7417.8 | -61.08 | 6.8 | 13.85 | Vertical | -56.18 | -13 | 43.18 | 0 |
| 10 | 8242 | -59.52 | 6.9 | 14.25 | Vertical | -54.32 | -13 | 41.32 | 180 |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

GSM 850 CH190

| Harmonic | TX ch.190 Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1673.4 | -46.78 | 2 | 10.75 | Vertical | -40.18 | -13 | 27.18 | 135 |
| 3 | 2509.7 | -39.89 | 2.51 | 11.05 | Vertical | -33.50 | -13 | 20.50 | 225 |
| 4 | 3346.4 | -64.61 | 4.2 | 11.15 | Vertical | -59.81 | -13 | 46.81 | 180 |
| 5 | 4183.125 | -56.17 | 5.2 | 11.15 | Vertical | -52.37 | -13 | 39.37 | 315 |
| 6 | 5019.6 | -61.23 | 5.5 | 11.95 | Vertical | -56.93 | -13 | 43.93 | 0 |
| 7 | 5856.2 | -62.70 | 5.7 | 13.55 | Vertical | -57.00 | -13 | 44.00 | 270 |
| 8 | 6692.8 | -61.77 | 6.3 | 13.75 | Vertical | -56.47 | -13 | 43.47 | 180 |
| 9 | 7529.4 | -60.26 | 6.8 | 13.85 | Vertical | -55.36 | -13 | 42.36 | 0 |
| 10 | 8366 | -61.88 | 6.9 | 14.25 | Vertical | -56.68 | -13 | 43.68 | 90 |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

GSM 850 CH251

| Harmonic | TX ch.251 Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1696.9 | -48.03 | 2 | 10.15 | Vertical | -42.03 | -13 | 29.03 | 180 |
| 3 | 2546.6 | -41.16 | 2.51 | 11.05 | Vertical | -34.77 | -13 | 21.77 | 225 |
| 4 | 3395.2 | -64.16 | 4.2 | 11.15 | Vertical | -59.36 | -13 | 46.36 | 0 |
| 5 | 4244.6 | -54.35 | 5.2 | 11.15 | Vertical | -50.55 | -13 | 37.55 | 225 |
| 6 | 5092.8 | -62.89 | 5.5 | 11.95 | Vertical | -58.59 | -13 | 45.59 | 90 |
| 7 | 5941.6 | -63.04 | 5.7 | 13.55 | Vertical | -57.34 | -13 | 44.34 | 0 |
| 8 | 6790.4 | -60.84 | 6.3 | 13.75 | Vertical | -55.54 | -13 | 42.54 | 270 |
| 9 | 7639.2 | -60.52 | 6.8 | 13.85 | Vertical | -55.62 | -13 | 42.62 | 180 |
| 10 | 8488 | -62.22 | 6.9 | 14.25 | Vertical | -57.02 | -13 | 44.02 | 0 |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

WCDMA Band V CH4132

| Harmonic | TX ch.4132 Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1652.8 | -69.24 | 2 | 10.15 | Vertical | -63.24 | -13 | 50.24 | 180 |
| 3 | 2479.2 | -66.74 | 2.51 | 11.35 | Vertical | -60.05 | -13 | 47.05 | 135 |
| 4 | 3305.6 | -64.45 | 4.2 | 10.85 | Vertical | -59.95 | -13 | 46.95 | 90 |
| 5 | 4132 | -62.89 | 5.2 | 11.35 | Vertical | -58.89 | -13 | 45.89 | 180 |
| 6 | 4958.4 | -63.43 | 5.5 | 11.95 | Vertical | -59.13 | -13 | 46.13 | 270 |
| 7 | 5784.8 | -61.76 | 5.7 | 13.55 | Vertical | -56.06 | -13 | 43.06 | 0 |
| 8 | 6611.2 | -61.10 | 6.3 | 13.75 | Vertical | -55.80 | -13 | 42.80 | 180 |
| 9 | 7437.6 | -61.08 | 6.8 | 13.85 | Vertical | -56.18 | -13 | 43.18 | 90 |
| 10 | 8264 | -61.86 | 6.9 | 14.25 | Vertical | -56.66 | -13 | 43.66 | 0 |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

WCDMA Band V CH4183

| Harmonic | TX ch.4183 Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1673.2 | -66.58 | 2 | 10.75 | Vertical | -59.98 | -13 | 46.98 | 0 |
| 3 | 2509.8 | -62.78 | 2.51 | 11.05 | Vertical | -56.39 | -13 | 43.39 | 90 |
| 4 | 3346.4 | -64.61 | 4.2 | 11.15 | Vertical | -59.81 | -13 | 46.81 | 180 |
| 5 | 4183 | -62.67 | 5.2 | 11.15 | Vertical | -58.87 | -13 | 45.87 | 270 |
| 6 | 5019.6 | -61.23 | 5.5 | 11.95 | Vertical | -56.93 | -13 | 43.93 | 0 |
| 7 | 5856.2 | -62.70 | 5.7 | 13.55 | Vertical | -57.00 | -13 | 44.00 | 180 |
| 8 | 6692.8 | -61.77 | 6.3 | 13.75 | Vertical | -56.47 | -13 | 43.47 | 90 |
| 9 | 7529.4 | -60.26 | 6.8 | 13.85 | Vertical | -55.36 | -13 | 42.36 | 0 |
| 10 | 8366 | -61.88 | 6.9 | 14.25 | Vertical | -56.68 | -13 | 43.68 | 270 |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

WCDMA Band V CH4233

| Harmonic | TX ch.4233 Frequency (MHz) | SG (dBm) | Cable Loss (dB) | Gain (dBi) | Antenna Polarization | ERP Level (dBm) | Limit (dBm) | Margin (dB) | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1693.2 | -60.63 | 2 | 10.15 | Vertical | -54.63 | -13 | 41.63 | 180 |
| 3 | 2539.8 | -56.6 | 2.51 | 11.05 | Vertical | -50.21 | -13 | 37.21 | 270 |
| 4 | 3386.4 | -64.16 | 4.2 | 11.15 | Vertical | -59.36 | -13 | 46.36 | 0 |
| 5 | 4233 | -61.50 | 5.2 | 11.15 | Vertical | -57.70 | -13 | 44.70 | 180 |
| 6 | 5079.6 | -62.89 | 5.5 | 11.95 | Vertical | -58.59 | -13 | 45.59 | 90 |
| 7 | 5926.2 | -63.04 | 5.7 | 13.55 | Vertical | -57.34 | -13 | 44.34 | 0 |
| 8 | 6772.8 | -60.84 | 6.3 | 13.75 | Vertical | -55.54 | -13 | 42.54 | 90 |
| 9 | 7619.4 | -60.52 | 6.8 | 13.85 | Vertical | -55.62 | -13 | 42.62 | 0 |
| 10 | 8466 | -62.22 | 6.9 | 14.25 | Vertical | -57.02 | -13 | 44.02 | 0 |

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

## 3. Main Test Instruments

| No. | Name | Type | Manufacturer | Serial Number | Calibration Date | Valid Period |
|---|---|---|---|---|---|---|
| 01 | Base Station Simulator | CMU200 | R&S | 118133 | 2013-06-29 | One year |
| 02 | Power Splitter | SHX-GF2-2-13 | Hua Xiang | 10120101 | NA | NA |
| 03 | Spectrum Analyzer | E4445A | Agilent | MY46181146 | 2013-06-29 | One year |
| 04 | Universal Radio Communication Tester | E5515C | Agilent | MY48367192 | 2013-06-29 | One year |
| 05 | Signal Analyzer | FSV30 | R&S | 100815 | 2013-06-29 | One year |
| 06 | Signal generator | SMB 100A | R&S | 102594 | 2013-06-29 | One year |
| 07 | EMI Test Receiver | ESCI | R&S | 100948 | 2013-06-29 | One year |
| 08 | Trilog Antenna | VUBL 9163 | SCHWARZBECK | 9163-201 | 2013-06-19 | Three years |
| 09 | Horn Antenna | HF907 | R&S | 100126 | 2012-07-01 | Three years |
| 10 | Climatic Chamber | PT-30B | Re Ce | 20101891 | 2013-09-09 | Three years |

*******END OF REPORT BODY*******

# ANNEX A: EUT Appearance and Test Setup

## A.1 EUT Appearance


**Picture 1 EUT and Auxiliary**

## A.2 Test Setup

**Picture 2: Radiated Spurious Emissions Test setup**