# FCC Part 22H & 24E
# Measurement and Test Report

**For**

**DDC TRADING INC**

**2480 NW 20th Street #D Miami, Floriad 33142, USA.**

**FCC ID: 2AGF3-E5**

| | |
|---|---|
| **FCC Rules:** | FCC Part 22H, FCC Part 24E |
| **Product Description:** | Mobile phone |
| **Tested Model:** | E5 |
| **Report No.:** | STR16068113I-1 |
| **Tested Date:** | 2016-06-10 to 2016-07-06 |
| **Issued Date:** | 2016-07-09 |
| **Tested By:** | Irving Liu / Engineer |
| **Reviewed By:** | Silin Chen / EMC Manager |
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM. Test Technology Co., Ltd.

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# 1. GENERAL INFORMATION

## 1.1 Product Description for Equipment Under Test (EUT)

**Client Information**

Applicant: DDC TRADING INC
Address of applicant: 2480 NW 20th Street #D Miami, Floriad 33142, USA.

Manufacturer: DDC TRADING INC
Address of manufacturer: 2480 NW 20th Street #D Miami, Floriad 33142, USA.

| **General Description of EUT:** | |
|---|---|
| Product Name: | Mobile phone |
| Brand Name: | DDC |
| Model No.: | E5 |
| Hardware version: | H103B |
| Software version: | 1490D.K600.DDC.160505.ALPS.L1.MP6.V2_BIRD6580.WEG.A.L.MV88.B125 |
| IMEI: | 35359083042863194/359083042863202 |
| Rated Voltage: | DC 3.7V Li-ion Battery |
| Battery: | 2300mAh |
| Device Category: | Portable Device |
| | |
| *The EUT Main board support GSM850/PCS1900, WCDMA Band 1/2/5, function. It is intended for speech, Multimedia Message Service (MMS) transmission. It is equipped with GPRS class 12 for GSM850/PCS1900, GPS, FM, Bluetooth and Wi-Fi functions. For more information see the following datasheet* | |
| *Note: The test data is gathered from a production sample provided by the manufacturer.* | |

| Technical Characteristics of EUT: | |
|---|---|
| **2G** | |
| Support Networks: | GSM, GPRS |
| Support Band: | GSM850/PCS1900 |
| Uplink Frequency: | GSM/GPRS 850: 824~849MHz<br>GSM/GPRS 1900: 1850~1910MHz |
| Downlink Frequency: | GSM/GPRS 850: 869~894MHz<br>GSM/GPRS 1900: 1930~1990MHz |
| Max RF Output Power: | GSM850: 32.17dBm, GSM1900: 28.24dBm |
| Type of Emission: | GSM850: 258KGXW, GSM1900: 258KGXW |
| Type of Modulation: | GMSK |
| Type of Antenna: | Integral Antenna |
| Antenna Gain: | GSM850: -2.5dBi; GSM1900: -2dBi |
| GPRS Class: | Class 12 |
| **3G** | |
| Support Networks: | WCDMA, HSDPA, HSUPA |
| Support Band: | WCDMA Band 2, WCDMA Band 5 |
| Uplink Frequency: | WCDMA Band 2: 1850~1910MHz<br>WCDMA Band 5: 824~849MHz |
| Downlink Frequency: | WCDMA Band 2: 1930~1990MHz<br>WCDMA Band 5: 869~894MHz |
| RF Output Power: | WCDMA Band 2: 22.21dBm,<br>WCDMA Band 5: 22.33dBm |
| Type of Emission: | WCDMA Band 2: 4M15F9W<br>WCDMA Band 5: 4M26F9W |
| Type of Modulation: | BPSK |
| Antenna Type: | Integral Antenna |
| Antenna Gain: | WCDMA Band 2: -2dBi,<br>WCDMA Band 5: -2.5dBi |

## 1.2 Test Standards

The following report is prepared on behalf of the DDC TRADING INC in accordance with FCC Part 2 subpart J, FCC Part 22 subpart H and FCC Part 24 subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 2 subpart J, FCC Part 22 subpart H and FCC Part 24 subpart E of the Federal Communication Commissions rules.

***Maintenance of compliance*** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI/TIA-603-D: 2010 and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 971168 D01 Power Meas License Digital Systems v02r02 shall be performed also.

## 1.4 Test Facility

- **FCC – Registration No.: 934118**
  Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

- **Industry Canada (IC) Registration No.: 11464A**
  The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

- **CNAS Registration No.: L4062**
  Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101)

## 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

| **Test Mode List** | | |
|---|---|---|
| Test Mode | Description | Remark |
| TM1 | GSM 850 | Low, Middle, High Channels |
| TM2 | GPRS 850 | Low, Middle, High Channels |
| TM3 | GSM 1900 | Low, Middle, High Channels |
| TM4 | GPRS 1900 | Low, Middle, High Channels |
| TM5 | WCDMA Band 5 | Low, Middle, High Channels |
| TM6 | HSDPA Band 5 | Low, Middle, High Channels |
| TM7 | HSUPA Band 5 | Low, Middle, High Channels |
| TM8 | WCDMA Band 2 | Low, Middle, High Channels |
| TM9 | HSDPA Band 2 | Low, Middle, High Channels |
| TM10 | HSUPA Band 2 | Low, Middle, High Channels |

| **Testing Configure** | | | |
|---|---|---|---|
| Support Band | Support Standard | Channel Frequency | Channel Number |
| GSM 850 | GSM/GPRS | 824.2 MHz | 128 |
| | | 836.4 MHz | 190 |
| | | 848.8 MHz | 251 |
| PCS 1900 | GSM/GPRS | 1850.2 MHz | 512 |
| | | 1880.0 MHz | 661 |
| | | 1909.8 MHz | 810 |
| WCDMA Band 5 | WCDMA/HSDPA/HSUPA | 826.4 MHz | 4132 |
| | | 836.4 MHz | 4183 |
| | | 846.6 MHz | 4233 |
| WCDMA Band 2 | WCDMA/HSDPA/HSUPA | 1852.4 MHz | 9262 |
| | | 1880.0 MHz | 9400 |
| | | 1907.6 MHz | 9538 |
| Note: the transmitter has been tested on the communications mode of GSM, GPRS, WCDMA, HSDPA, HSUPA compliance test and record the worst case. | | | |

EUT Cable List and Details

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|---|---|---|---|
| USB Cable | 1.0 | Shielded | Without Ferrite |
| Earphone | 1.2 | Unshielded | Without Ferrite |

Auxiliary Equipment List and Details

| Description | Manufacturer | Model | Serial Number |
|---|---|---|---|
| / | / | / | / |

Special Cable List and Details

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|---|---|---|---|
| / | / | / | / |

## 1.6 Measurement Uncertainty

| **Measurement uncertainty** | | |
|---|---|---|
| Parameter | Conditions | Uncertainty |
| RF Output Power | Conducted | ±0.42dB |
| Occupied Bandwidth | Conducted | ±1.5% |
| Frequency Stability | Conducted | 2.3% |
| Transmitter Spurious Emissions | Radiated | ±5.1dB |
| Transmitter Spurious Emissions | Conducted | ±0.42dB |

## 1.7 Test Equipment List and Details

| No. | Description | Manufacturer | Model | Serial No. | Cal Date | Due. Date |
|---|---|---|---|---|---|---|
| SEMT-1075 | Communication Tester | Rohde & Schwarz | CMW500 | 148650 | 2015-06-17 | 2016-06-16 |
| SEMT-1034 | GSM Tester | Rohde & Schwarz | CMU200 | 104036 | 2015-06-17 | 2016-06-16 |
| SEMT-1072 | Spectrum Analyzer | Agilent | E4407B | MY41440400 | 2015-06-17 | 2016-06-16 |
| SEMT-1079 | Spectrum Analyzer | Agilent | N9020A | US47140102 | 2015-06-17 | 2016-06-16 |
| SEMT-1080 | Signal Generator | Agilent | 83752A | 3610A01453 | 2015-06-17 | 2016-06-16 |
| SEMT-1081 | Vector Signal Generator | Agilent | N5182A | MY47070202 | 2015-06-17 | 2016-06-16 |
| SEMT-1028 | Power Divider | Weinschel | 1506A | PM204 | 2015-06-17 | 2016-06-16 |
| SEMT-1082 | Power Divider | RF-Lambda | RFLT4W5M18G | 14110400027 | 2015-06-17 | 2016-06-16 |
| SEMT-1031 | Spectrum Analyzer | Rohde & Schwarz | FSP30 | 836079/035 | 2015-06-17 | 2016-06-16 |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2015-06-17 | 2016-06-16 |
| SEMT-1008 | Amplifier | Agilent | 8447F | 3113A06717 | 2015-06-17 | 2016-06-16 |
| SEMT-1043 | Amplifier | C&D | PAP-1G18 | 2002 | 2015-06-17 | 2016-06-16 |
| SEMT-1069 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2015-06-17 | 2016-06-16 |
| SEMT-1068 | Broadband Antenna | Schwarz beck | VULB9163 | 9163-333 | 2015-06-17 | 2016-06-16 |
| SEMT-1042 | Horn Antenna | ETS | 3117 | 00086197 | 2015-06-17 | 2016-06-16 |
| SEMT-1121 | Horn Antenna | ETS | 3116B | 00088203 | 2015-06-17 | 2016-06-16 |

# 2. SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test Item | Result |
|---|---|---|
| § 1.1307, § 2.1093 | RF Exposure | Compliant |
| § 22.913 (a), § 24.232 (c) | RF Output Power | Compliant |
| § 24.51 | Peak-to-average Ratio (PAR) of Transmitter | Compliant |
| § 22.917 (b), § 24.238 (b) | Emission Bandwidth | Compliant |
| § 22.917 (a), § 24.238 (a) | Spurious Emissions at Antenna Terminal | Compliant |
| § 22.917 (a), § 24.238 (a) | Spurious Radiation Emissions | Compliant |
| § 22.917 (a), § 24.238 (a) | Out of Band Emissions | Compliant |
| § 22.355, § 24.235 | Frequency Stability | Compliant |

# 3. RF Exposure

## 3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

## 3.2 Test Result

This product complied with the requirement of the RF exposure, please see the SAR report.

# 4. RF Output Power

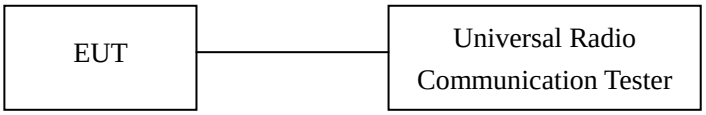
## 4.1 Standard Applicable

According to §22.913(a)(2), The ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to §24.232 (c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

## 4.2 Test Procedure

Conducted output power test method:




Radiated power test method:

1.The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 measurement procedure.

2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.

4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

## 4.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 24 °C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

## 4.4 Summary of Test Results/Plots

**Max. Radiated Power**

ERP For GSM Mode GSM850

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 22H Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 824.2 | 28.92 | 1.5 | 0 | H | 1.5 | 0 | 27.42 | 38.45 |
| 824.2 | 32.13 | 1.5 | 0 | V | 1.5 | 0 | 30.63 | 38.45 |
| Middle Channel | | | | | | | | |
| 836.4 | 28.73 | 1.5 | 0 | H | 1.5 | 0 | 27.23 | 38.45 |
| 836.4 | 31.73 | 1.5 | 0 | V | 1.5 | 0 | 30.23 | 38.45 |
| High Channel | | | | | | | | |
| 848.8 | 28.68 | 1.5 | 0 | H | 1.5 | 0 | 27.18 | 38.45 |
| 848.8 | 31.61 | 1.5 | 0 | V | 1.5 | 0 | 30.11 | 38.45 |

EIRP For GSM Mode PCS1900

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 24E Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 1850.2 | 20.64 | 1.5 | 0 | H | 1.9 | 7.7 | 26.44 | 33.00 |
| 1850.2 | 21.61 | 1.5 | 0 | V | 1.9 | 7.7 | 27.41 | 33.00 |
| Middle Channel | | | | | | | | |
| 1880.0 | 19.72 | 1.5 | 0 | H | 1.9 | 7.7 | 25.52 | 33.00 |
| 1880.0 | 21.39 | 1.5 | 0 | V | 1.9 | 7.7 | 27.19 | 33.00 |
| High Channel | | | | | | | | |
| 1909.8 | 19.75 | 1.5 | 0 | H | 1.9 | 7.7 | 25.55 | 33.00 |
| 1909.8 | 21.54 | 1.5 | 0 | V | 1.9 | 7.7 | 27.34 | 33.00 |

ERP For GPRS Mode GSM850

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 22H Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 824.2 | 28.93 | 1.5 | 0 | H | 1.5 | 0 | 27.43 | 38.45 |
| 824.2 | 31.94 | 1.5 | 0 | V | 1.5 | 0 | 30.44 | 38.45 |
| Middle Channel | | | | | | | | |
| 836.4 | 29.05 | 1.5 | 0 | H | 1.5 | 0 | 27.55 | 38.45 |
| 836.4 | 31.35 | 1.5 | 0 | V | 1.5 | 0 | 29.85 | 38.45 |
| High Channel | | | | | | | | |
| 848.8 | 28.94 | 1.5 | 0 | H | 1.5 | 0 | 27.44 | 38.45 |
| 848.8 | 31.52 | 1.5 | 0 | V | 1.5 | 0 | 30.02 | 38.45 |

EIRP For GPRS Mode PCS1900

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 24E Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 1850.2 | 20.23 | 1.5 | 0 | H | 1.9 | 7.7 | 26.03 | 33.00 |
| 1850.2 | 21.64 | 1.5 | 0 | V | 1.9 | 7.7 | 27.44 | 33.00 |
| Middle Channel | | | | | | | | |
| 1880.0 | 20.13 | 1.5 | 0 | H | 1.9 | 7.7 | 25.93 | 33.00 |
| 1880.0 | 21.53 | 1.5 | 0 | V | 1.9 | 7.7 | 27.33 | 33.00 |
| High Channel | | | | | | | | |
| 1909.8 | 20.09 | 1.5 | 0 | H | 1.9 | 7.7 | 25.89 | 33.00 |
| 1909.8 | 21.62 | 1.5 | 0 | V | 1.9 | 7.7 | 27.42 | 33.00 |

ERP For WCDMA Mode Band 5

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 22H Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dBd | dBm | dBm |
| Low Channel | | | | | | | | |
| 826.4 | 21.93 | 1.5 | 0 | H | 1.5 | 0 | 20.43 | 38.45 |
| 826.4 | 23.02 | 1.5 | 0 | V | 1.5 | 0 | 21.52 | 38.45 |
| Middle Channel | | | | | | | | |
| 836.4 | 21.94 | 1.5 | 0 | H | 1.5 | 0 | 20.44 | 38.45 |
| 836.4 | 23.05 | 1.5 | 0 | V | 1.5 | 0 | 21.55 | 38.45 |
| High Channel | | | | | | | | |
| 846.6 | 21.39 | 1.5 | 0 | H | 1.5 | 0 | 19.89 | 38.45 |
| 846.6 | 22.52 | 1.5 | 0 | V | 1.5 | 0 | 21.02 | 38.45 |

ERP For HSDPA Mode Band 5

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 22H Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dBd | dBm | dBm |
| Low Channel | | | | | | | | |
| 826.4 | 21.02 | 1.5 | 0 | H | 1.5 | 0 | 19.52 | 38.45 |
| 826.4 | 21.83 | 1.5 | 0 | V | 1.5 | 0 | 20.33 | 38.45 |
| Middle Channel | | | | | | | | |
| 836.4 | 21.14 | 1.5 | 0 | H | 1.5 | 0 | 19.64 | 38.45 |
| 836.4 | 21.91 | 1.5 | 0 | V | 1.5 | 0 | 20.41 | 38.45 |
| High Channel | | | | | | | | |
| 846.6 | 20.51 | 1.5 | 0 | H | 1.5 | 0 | 19.01 | 38.45 |
| 846.6 | 21.81 | 1.5 | 0 | V | 1.5 | 0 | 20.31 | 38.45 |

ERP For HSUPA Mode Band 5

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 22H Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dBd | dBm | dBm |
| Low Channel | | | | | | | | |
| 826.4 | 20.95 | 1.5 | 0 | H | 1.5 | 0 | 19.45 | 38.45 |
| 826.4 | 21.81 | 1.5 | 0 | V | 1.5 | 0 | 20.31 | 38.45 |
| Middle Channel | | | | | | | | |
| 836.4 | 20.83 | 1.5 | 0 | H | 1.5 | 0 | 19.33 | 38.45 |
| 836.4 | 22.01 | 1.5 | 0 | V | 1.5 | 0 | 20.51 | 38.45 |
| High Channel | | | | | | | | |
| 846.6 | 20.49 | 1.5 | 0 | H | 1.5 | 0 | 18.99 | 38.45 |
| 846.6 | 21.94 | 1.5 | 0 | V | 1.5 | 0 | 20.44 | 38.45 |

EIRP For WCDMA Mode Band 2

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 24E Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 1852.4 | 14.19 | 1.5 | 0 | H | 1.9 | 7.7 | 19.99 | 33 |
| 1852.4 | 15.30 | 1.5 | 0 | V | 1.9 | 7.7 | 21.10 | 33 |
| Middle Channel | | | | | | | | |
| 1880.0 | 13.97 | 1.5 | 0 | H | 1.9 | 7.7 | 19.77 | 33 |
| 1880.0 | 15.28 | 1.5 | 0 | V | 1.9 | 7.7 | 21.08 | 33 |
| High Channel | | | | | | | | |
| 1907.6 | 14.28 | 1.5 | 0 | H | 1.9 | 7.7 | 20.08 | 33 |
| 1907.6 | 16.02 | 1.5 | 0 | V | 1.9 | 7.7 | 21.82 | 33 |

EIRP For HSDPA Mode Band 2

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 24E Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 1852.4 | 12.96 | 1.5 | 0 | H | 1.9 | 7.7 | 18.92 | 33 |
| 1852.4 | 14.68 | 1.5 | 0 | V | 1.9 | 7.7 | 20.41 | 33 |
| Middle Channel | | | | | | | | |
| 1880.0 | 12.86 | 1.5 | 0 | H | 1.9 | 7.7 | 18.86 | 33 |
| 1880.0 | 15.07 | 1.5 | 0 | V | 1.9 | 7.7 | 20.94 | 33 |
| High Channel | | | | | | | | |
| 1907.6 | 13.33 | 1.5 | 0 | H | 1.9 | 7.7 | 19.33 | 33 |
| 1907.6 | 15.07 | 1.5 | 0 | V | 1.9 | 7.7 | 20.96 | 33 |

EIRP For HSUPA Mode Band 2

| Frequency | Substitude SG | Height | Table | Polar | Cable loss | Antenna Gain | Result | FCC Part 24E Limit |
|---|---|---|---|---|---|---|---|---|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | dBm |
| Low Channel | | | | | | | | |
| 1852.4 | 13.17 | 1.5 | 0 | H | 1.9 | 7.7 | 18.97 | 33 |
| 1852.4 | 14.63 | 1.5 | 0 | V | 1.9 | 7.7 | 20.43 | 33 |
| Middle Channel | | | | | | | | |
| 1880.0 | 12.88 | 1.5 | 0 | H | 1.9 | 7.7 | 18.68 | 33 |
| 1880.0 | 14.86 | 1.5 | 0 | V | 1.9 | 7.7 | 20.66 | 33 |
| High Channel | | | | | | | | |
| 1907.6 | 13.72 | 1.5 | 0 | H | 1.9 | 7.7 | 19.52 | 33 |
| 1907.6 | 15.14 | 1.5 | 0 | V | 1.9 | 7.7 | 20.94 | 33 |

Note: Result = Substitude - Cable loss + Antenna Gain

**Max. Conducted Output Power**

For Cellular Band (GSM850)

| Test Mode | Channel | Frequency (MHz) | Average Power (dBm) | FCC Part 22.913 Limit (dBm) |
|---|---|---|---|---|
| GSM | Low Channel | 824.2 | 31.49 | 38.45 |
| | Middle Channel | 836.4 | 31.90 | 38.45 |
| | High Channel | 848.8 | 32.31 | 38.45 |
| GPRS(1 Slot) | Low Channel | 824.2 | 31.43 | 38.45 |
| | Middle Channel | 836.4 | 31.89 | 38.45 |
| | High Channel | 848.8 | 32.27 | 38.45 |

For PCS Band (GSM1900)

| Test Mode | Channel | Frequency (MHz) | Average Power (dBm) | FCC Part 24.232 Limit (dBm) |
|---|---|---|---|---|
| GSM | Low Channel | 1850.2 | 28.55 | 33.0 |
| | Middle Channel | 1880.0 | 28.48 | 33.0 |
| | High Channel | 1909.8 | 28.36 | 33.0 |
| GPRS(1 Slot) | Low Channel | 1850.2 | 29.59 | 33.0 |
| | Middle Channel | 1880.0 | 28.92 | 33.0 |
| | High Channel | 1909.8 | 28.39 | 33.0 |

For WCDMA Band 5

| Test Mode | Channel | Frequency (MHz) | Average Power (dBm) | FCC Part 22.913 Limit (dBm) |
|---|---|---|---|---|
| WCDMA | Low Channel | 826.4 | 22.04 | 38.45 |
| | Middle Channel | 836.4 | 22.43 | 38.45 |
| | High Channel | 846.6 | 22.22 | 38.45 |
| HSDPA | Low Channel | 826.4 | 21.06 | 38.45 |
| | Middle Channel | 836.4 | 21.15 | 38.45 |
| | High Channel | 846.6 | 21.03 | 38.45 |
| HSUPA | Low Channel | 826.4 | 20.96 | 38.45 |
| | Middle Channel | 836.4 | 21.05 | 38.45 |
| | High Channel | 846.6 | 21.03 | 38.45 |

For WCDMA Band 2

| Test Mode | Channel | Frequency (MHz) | Average Power (dBm) | FCC Part 24.232 Limit (dBm) |
|---|---|---|---|---|
| WCDMA | Low Channel | 1852.4 | 23.86 | 33.00 |
| | Middle Channel | 1880.0 | 23.70 | 33.00 |
| | High Channel | 1907.6 | 22.19 | 33.00 |
| HSDPA | Low Channel | 1852.4 | 21.93 | 33.00 |
| | Middle Channel | 1880.0 | 21.54 | 33.00 |
| | High Channel | 1907.6 | 22.19 | 33.00 |
| HSUPA | Low Channel | 1852.4 | 21.04 | 33.00 |
| | Middle Channel | 1880.0 | 20.99 | 33.00 |
| | High Channel | 1907.6 | 21.05 | 33.00 |

# 5. Peak-to-average Ratio (PAR) of Transmitter

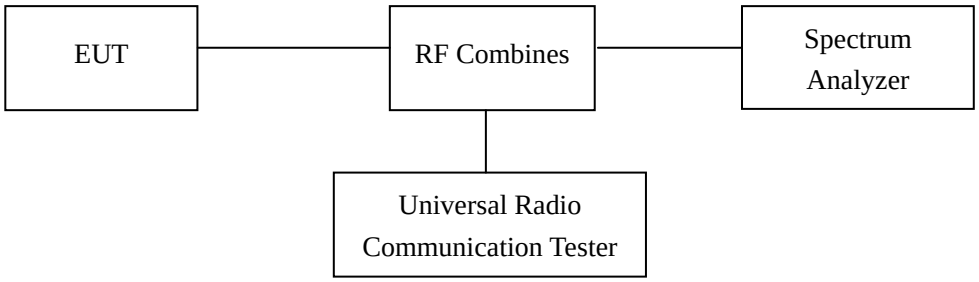
## 5.1 Standard Applicable

According to §24.232(d), Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

## 5.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 30kHz and the peak-to-average ratio (PAR) of the transmission was recorded. Record the maximum PAPR level associated with a probability of 0.1%.

Test Configuration for the emission bandwidth testing:




## 5.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 25 °C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

## 5.4 Summary of Test Results

Only the worst case was selected to record

For PCS Band

| Test Mode | Channel | Frequency (MHz) | PAR (dB) | Limit (dB) |
|---|---|---|---|---|
| GSM | 512 | 1850.2 | 9.37 | 13 |
| GPRS(1 Slot) | 512 | 1850.2 | 9.72 | 13 |

For WCDMA Band 2

| Test Mode | Channel | Frequency (MHz) | PAR (dB) | Limit (dB) |
|---|---|---|---|---|
| WCDMA | 9262 | 1852.4 | 3.06 | 13 |
| HSDPA | 9400 | 1880.0 | 3.00 | 13 |
| HSUPA | 9400 | 1880.0 | 2.95 | 13 |

# 6. Emission Bandwidth

## 6.1 Standard Applicable

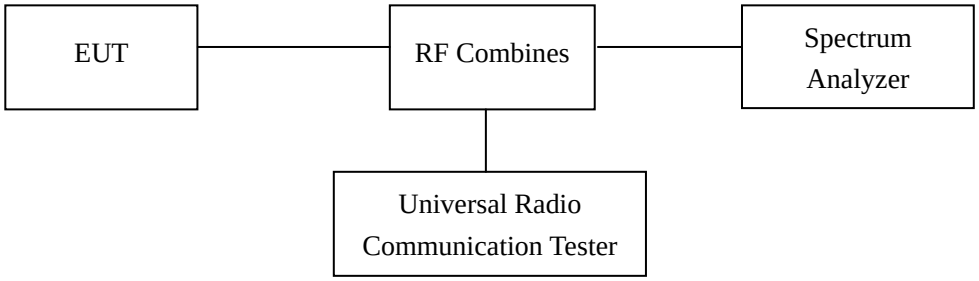
According to §22.917(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §24.238(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

## 6.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 10kHz for GSM mode and 100kHz for WCDMA mode, VBW shall be at least 3 times the RBW, and the 26dB bandwidth was recorded.

Test Configuration for the emission bandwidth testing:




## 6.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 25 °C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

## 6.4 Summary of Test Results/Plots

For Cellular Band

| Test Mode | Channel | Frequency (MHz) | 99% Emission Bandwidth (kHz) | 26 dB Emission Bandwidth (kHz) |
|---|---|---|---|---|
| GSM | 128 | 824.2 | 256.1305 | 342.592 |
| | 190 | 836.4 | 257.4109 | 336.673 |
| | 251 | 848.8 | 254.5979 | 338.481 |
| GPRS | 128 | 824.2 | 257.6007 | 341.142 |
| | 190 | 836.4 | 256.5153 | 336.989 |
| | 251 | 848.8 | 257.3812 | 341.412 |

For PCS Band

| Test Mode | Channel | Frequency (MHz) | 99% Emission Bandwidth (kHz) | 26 dB Emission Bandwidth (kHz) |
|---|---|---|---|---|
| GSM | 512 | 1850.2 | 256.6405 | 340.941 |
| | 661 | 1880.0 | 256.6038 | 338.914 |
| | 810 | 1909.8 | 258.2940 | 340.081 |
| GPRS | 512 | 1850.2 | 253.3876 | 338.146 |
| | 661 | 1880.0 | 254.6688 | 337.719 |
| | 810 | 1909.8 | 255.5171 | 339.662 |

For Band V

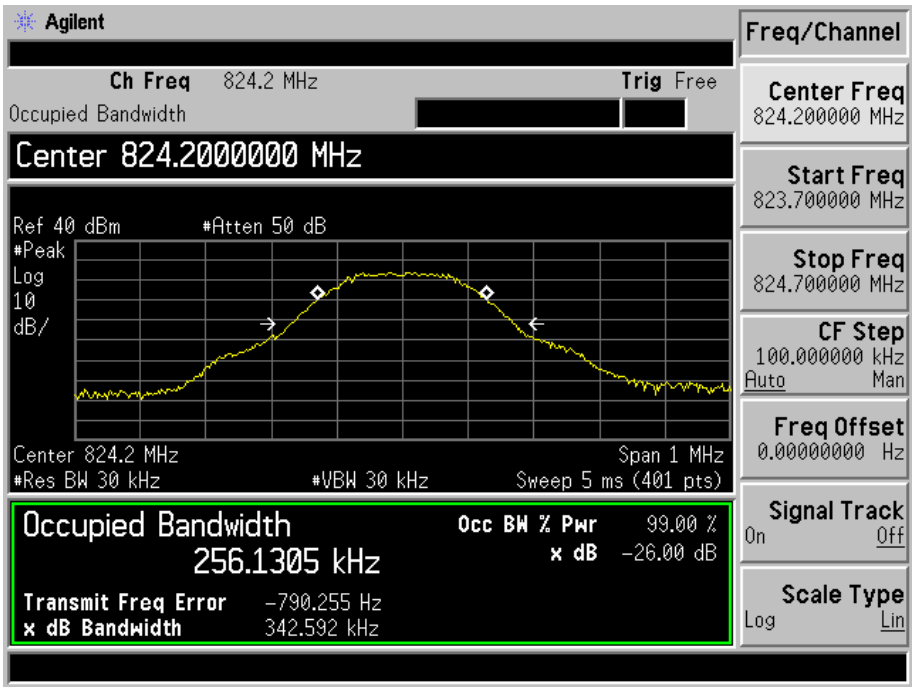
| Test Mode | Channel | Frequency (MHz) | 99% Emission Bandwidth (MHz) | 26 dB Emission Bandwidth (MHz) |
|---|---|---|---|---|
| WCDMA | 4132 | 826.4 | 4.2126 | 4.816 |
| | 4182 | 836.4 | 4.2107 | 4.745 |
| | 4233 | 846.6 | 4.1575 | 4.696 |
| HSDPA | 4132 | 826.4 | 4.2626 | 4.616 |
| | 4182 | 836.4 | 4.1571 | 4.694 |
| | 4233 | 846.6 | 4.1515 | 4.692 |
| HSUPA | 4132 | 826.4 | 4.1450 | 4.642 |
| | 4182 | 836.4 | 4.1384 | 4.635 |
| | 4233 | 846.6 | 4.1550 | 4.639 |

For Band II

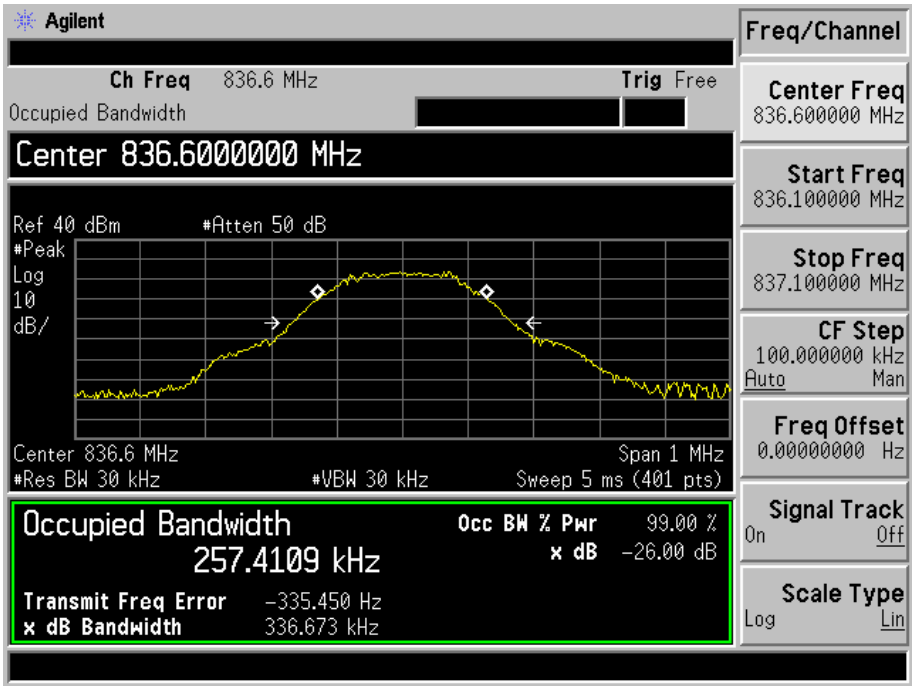
| Test Mode | Channel | Frequency (MHz) | 99% Emission Bandwidth (MHz) | 26 dB Emission Bandwidth (MHz) |
|---|---|---|---|---|
| WCDMA | 9262 | 1852.4 | 4.1411 | 4.660 |
| | 9400 | 1880.0 | 4.1498 | 4.655 |
| | 9538 | 1907.6 | 4.1494 | 4.654 |
| HSDPA | 9262 | 1852.4 | 4.1441 | 4.634 |
| | 9400 | 1880.0 | 4.1499 | 4.656 |
| | 9538 | 1907.6 | 4.1497 | 4.655 |
| HSUPA | 9262 | 1852.4 | 4.1414 | 4.639 |
| | 9400 | 1880.0 | 4.1481 | 4.647 |
| | 9538 | 1907.6 | 4.1334 | 4.623 |

For Cellular Band

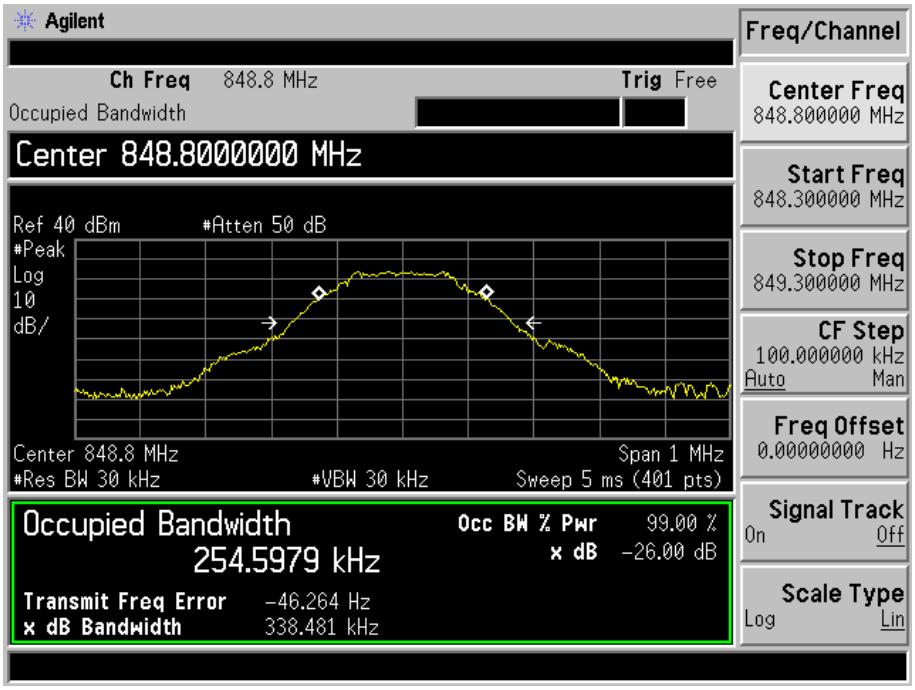
GSM Low Channel



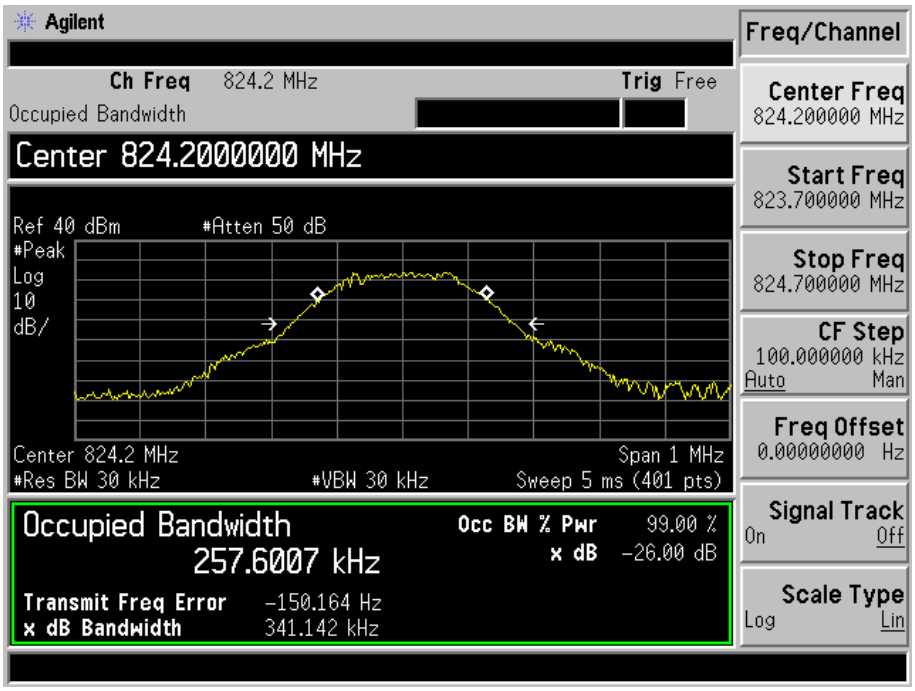

GSM Middle Channel



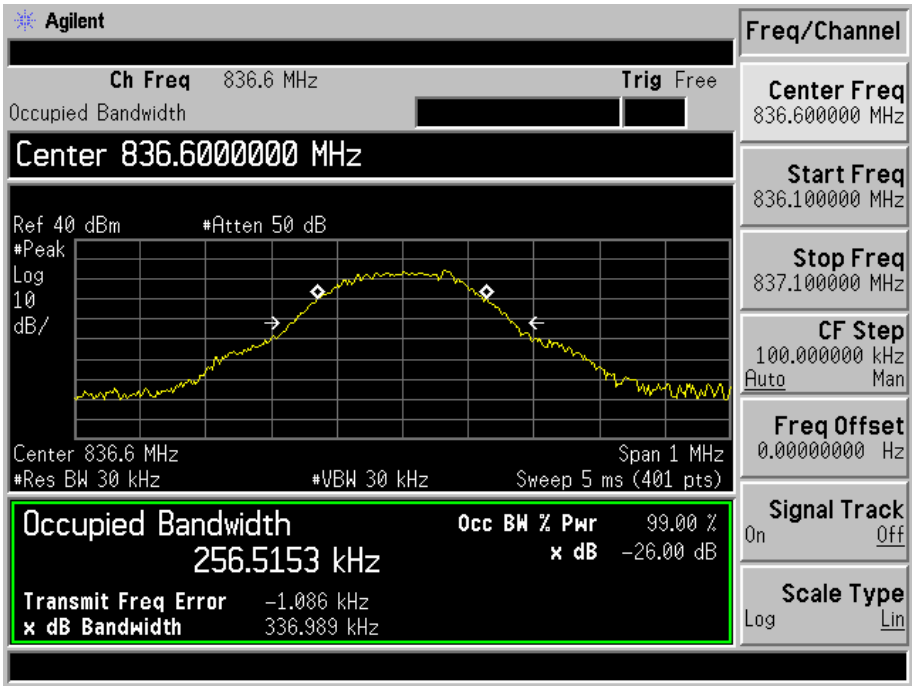
GSM High channel



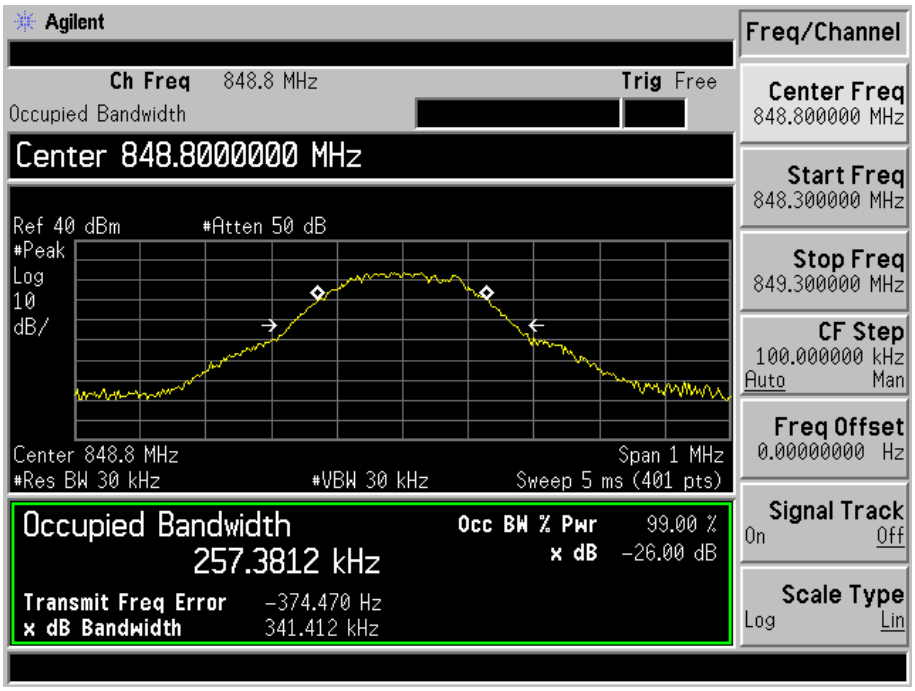

GPRS Low Channel



GPRS Middle Channel

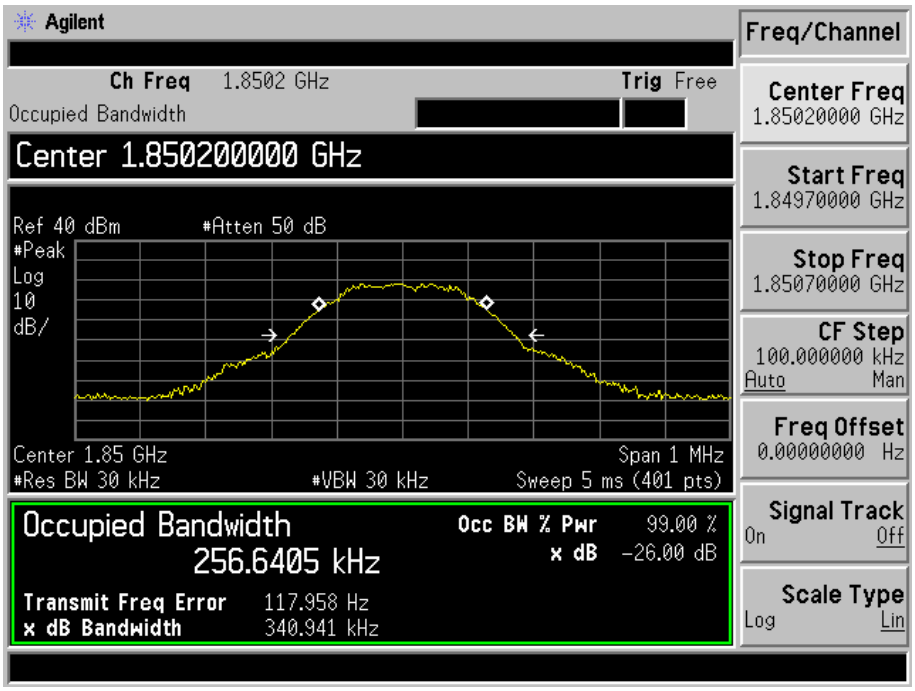



GPRS High Channel

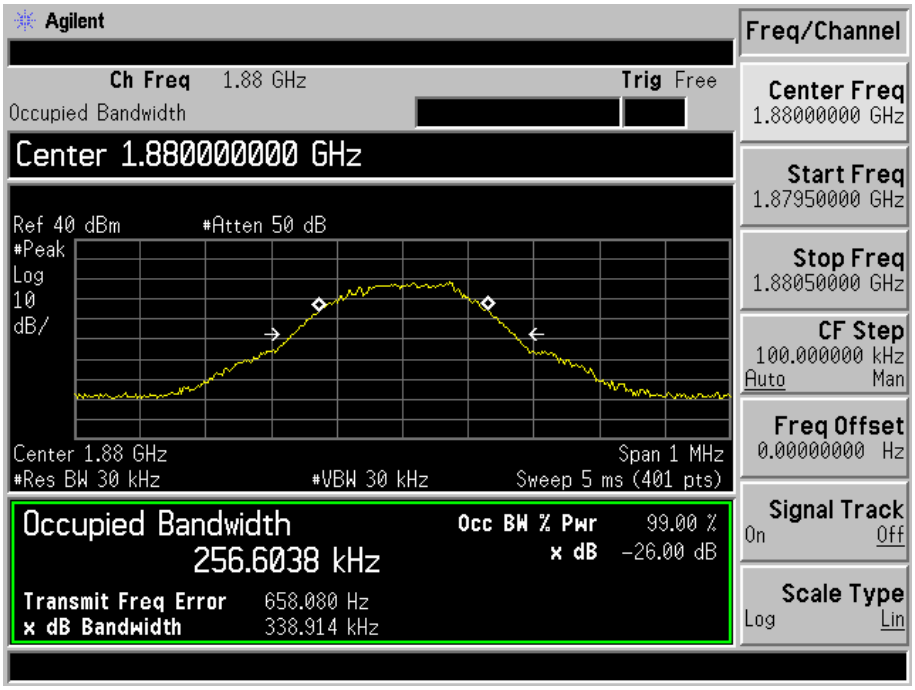


For PCS Band

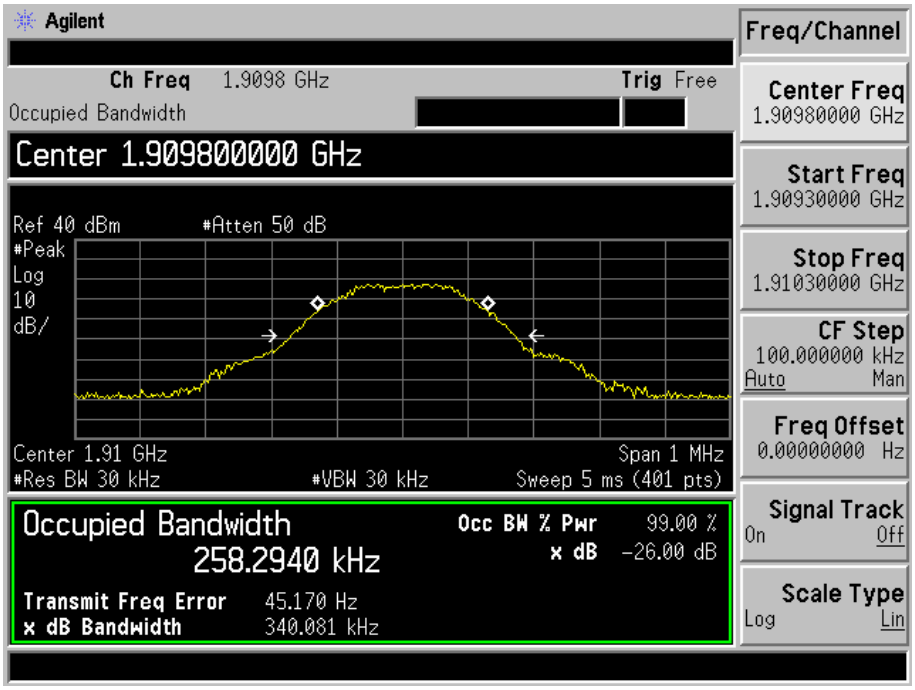
GSM Low Channel



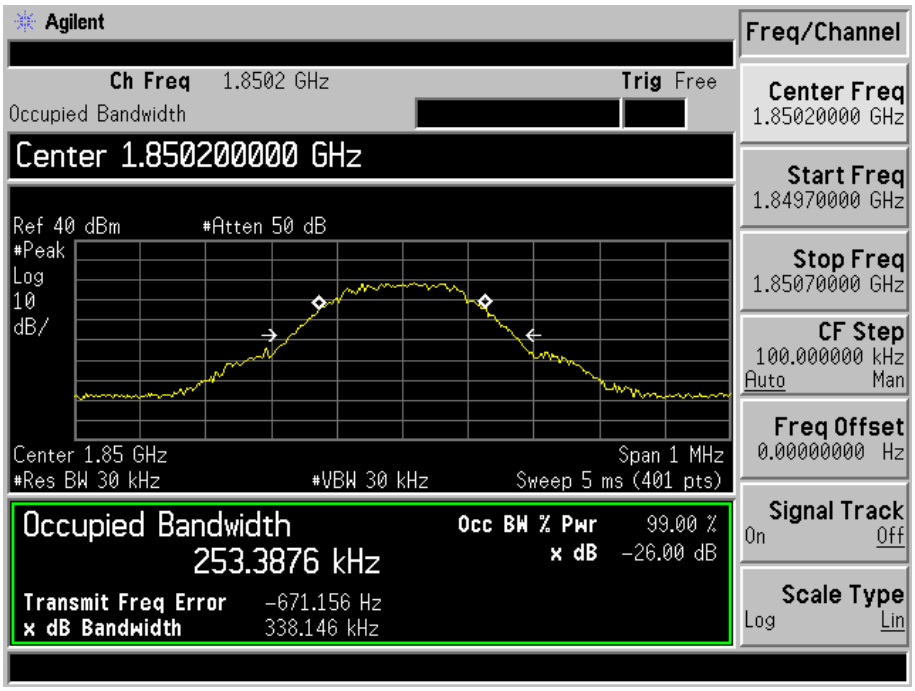

GSM Middle Channel



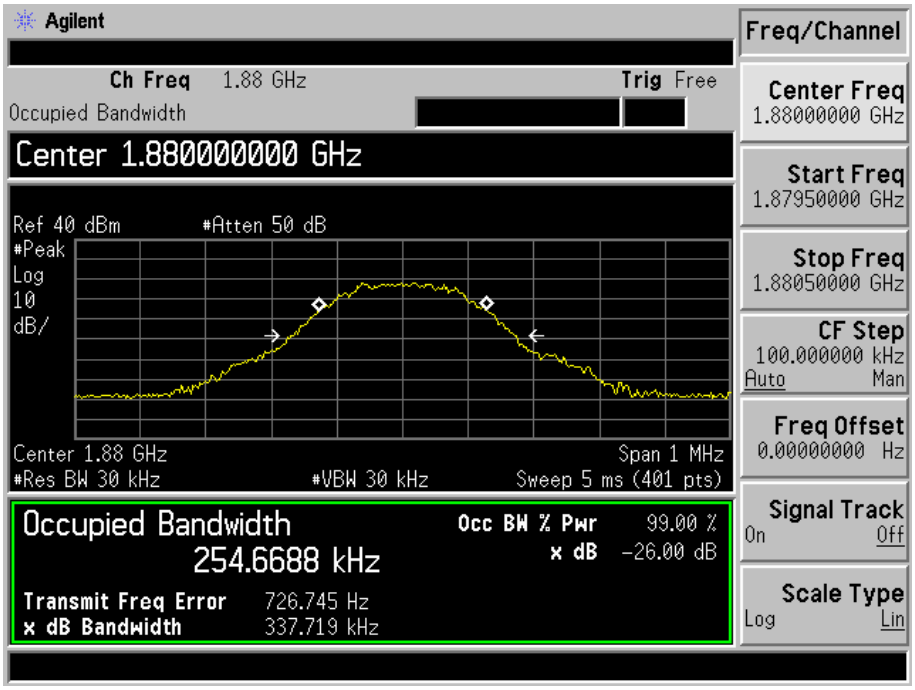
GSM High channel



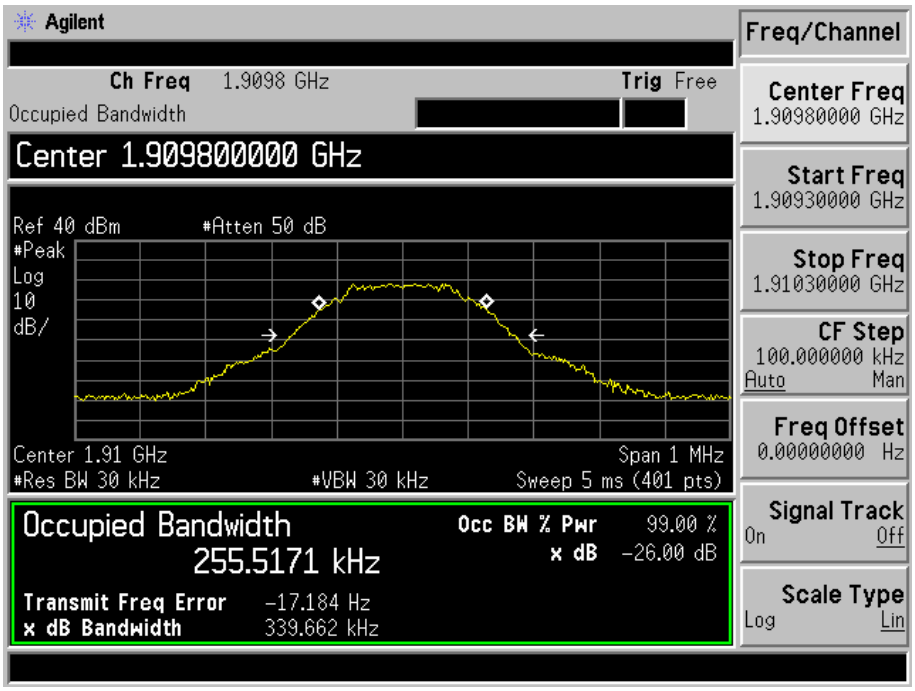

GPRS Low Channel



GPRS Middle Channel

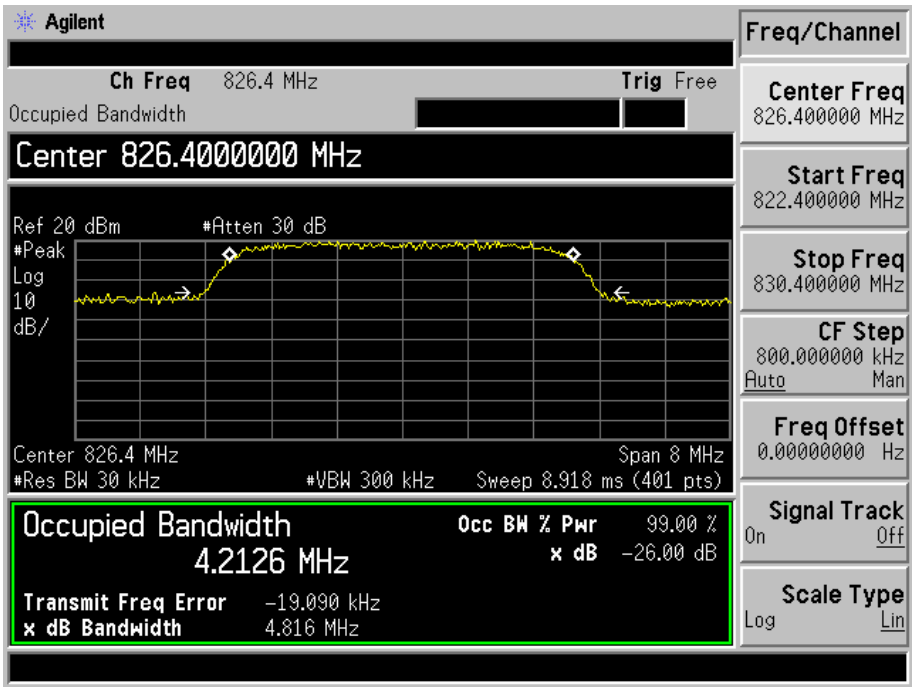



GPRS High Channel

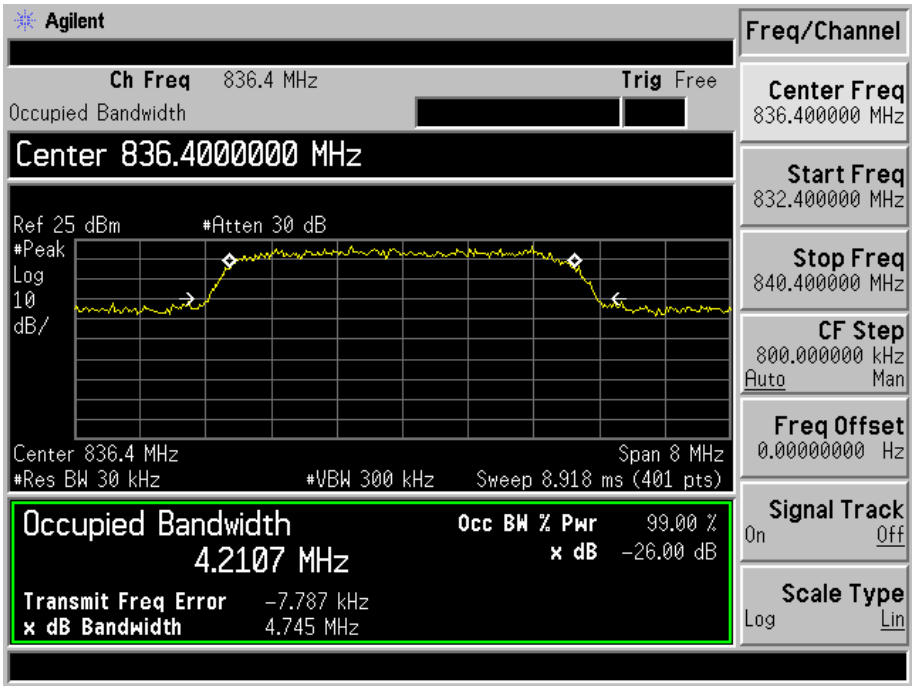


For Band V

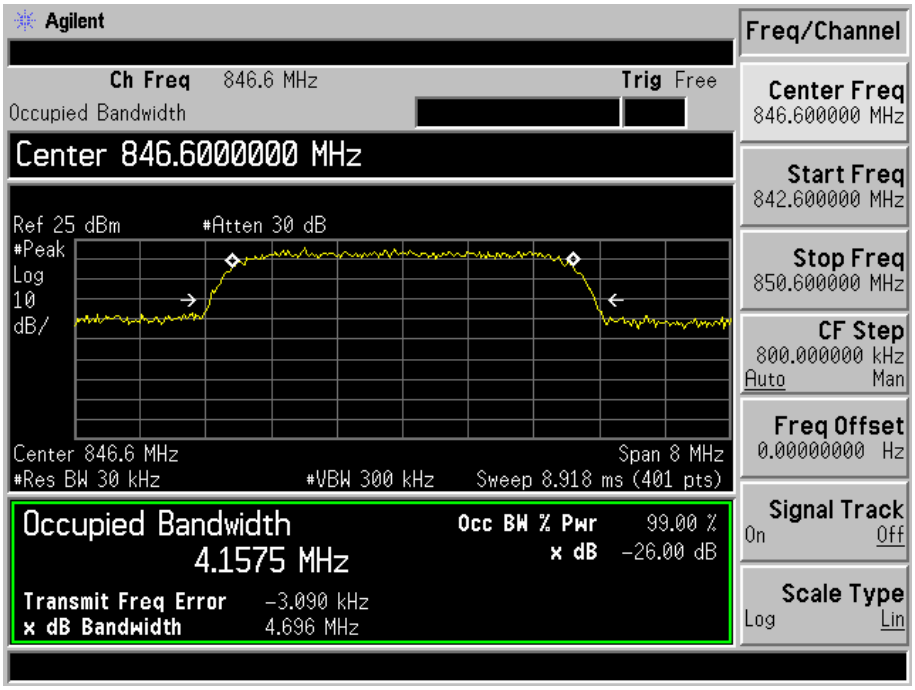
WCDMA Low Channel



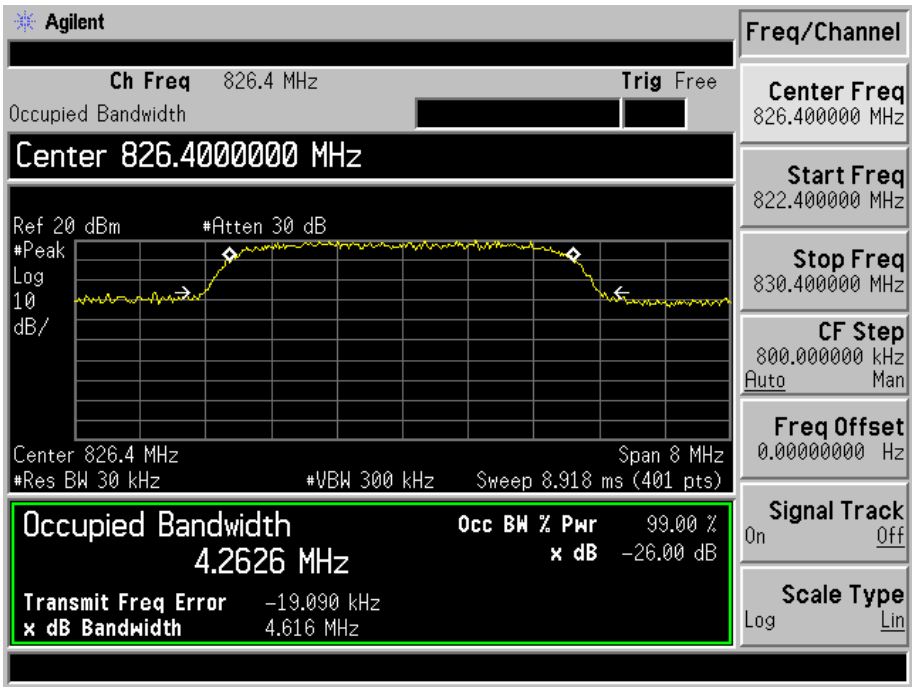

WCDMA Middle Channel



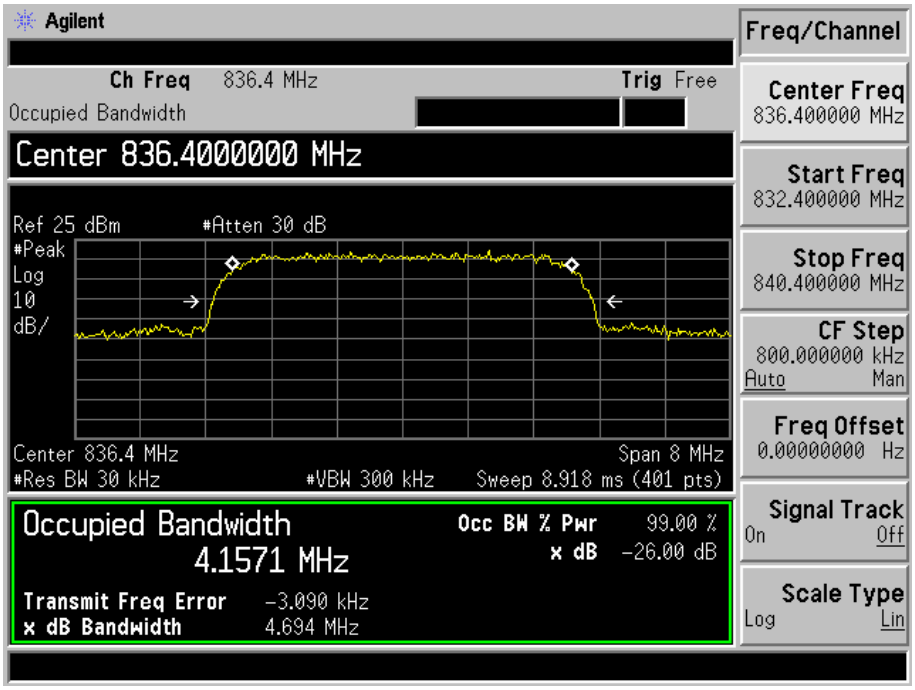
WCDMA High Channel



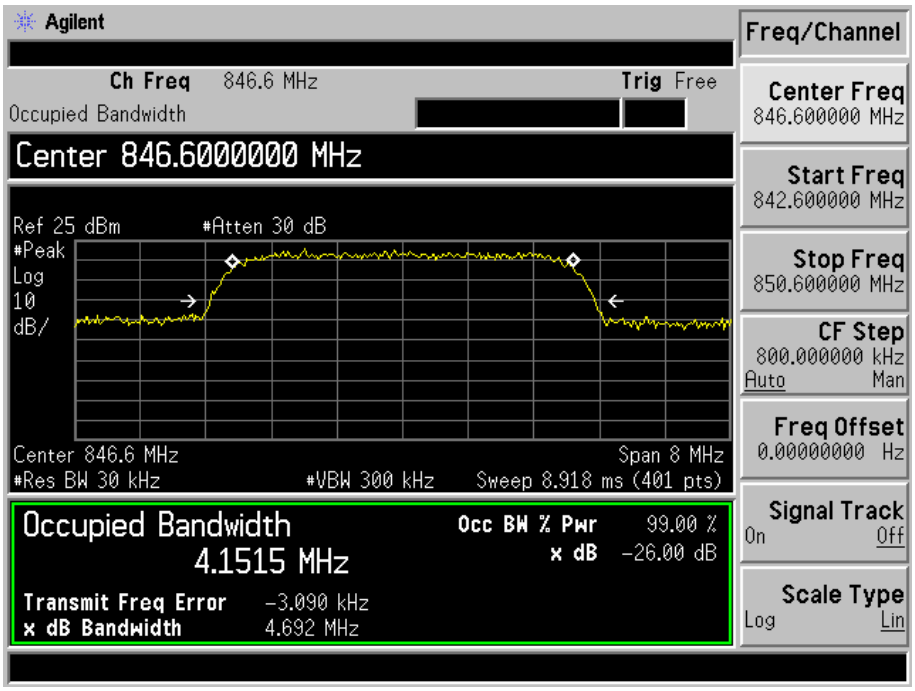

HSDPA Low Channel



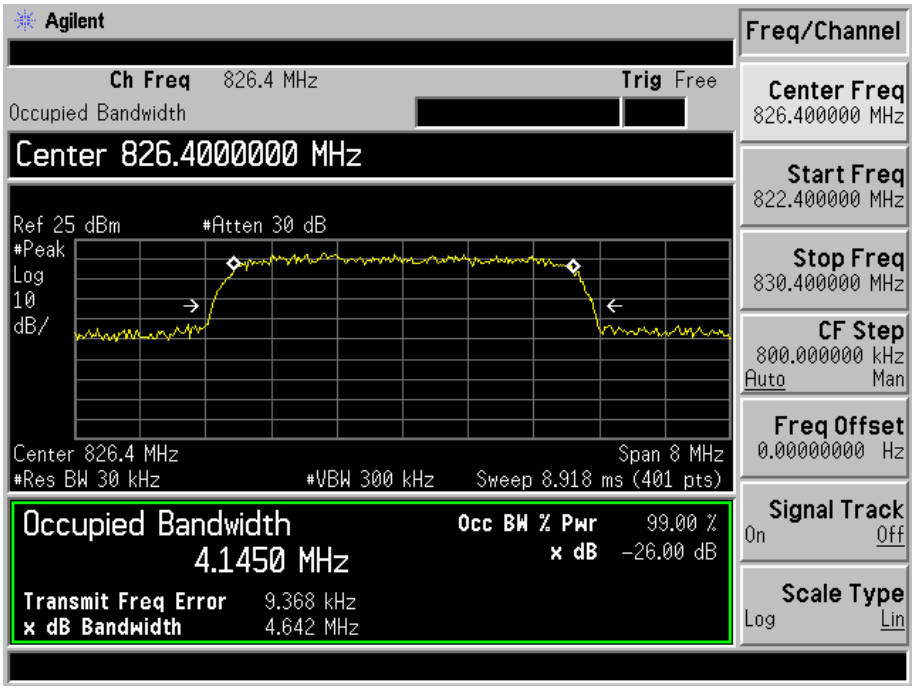
HSDPA Middle Channel



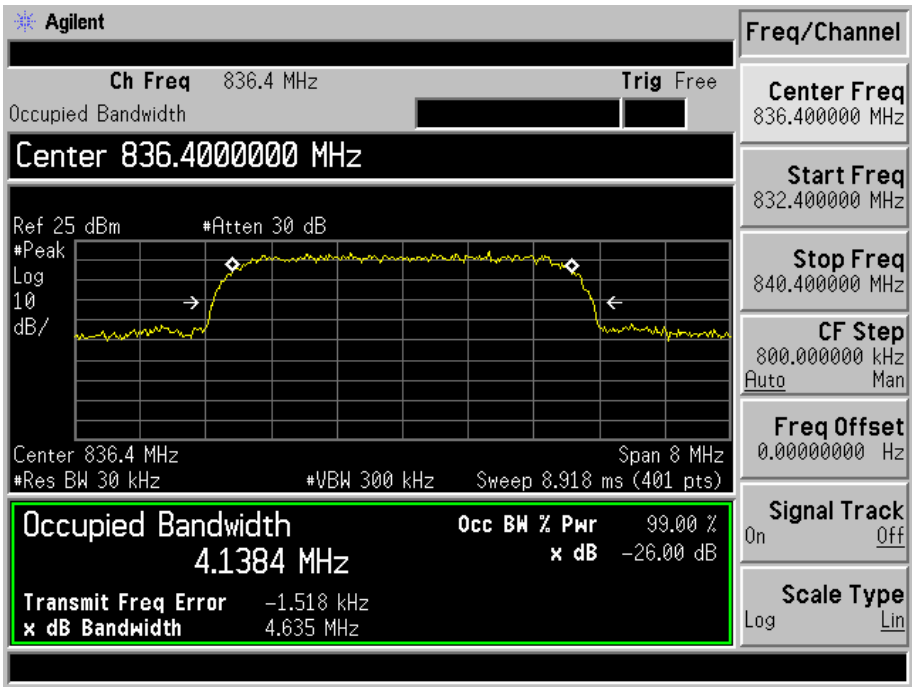

HSDPA High Channel



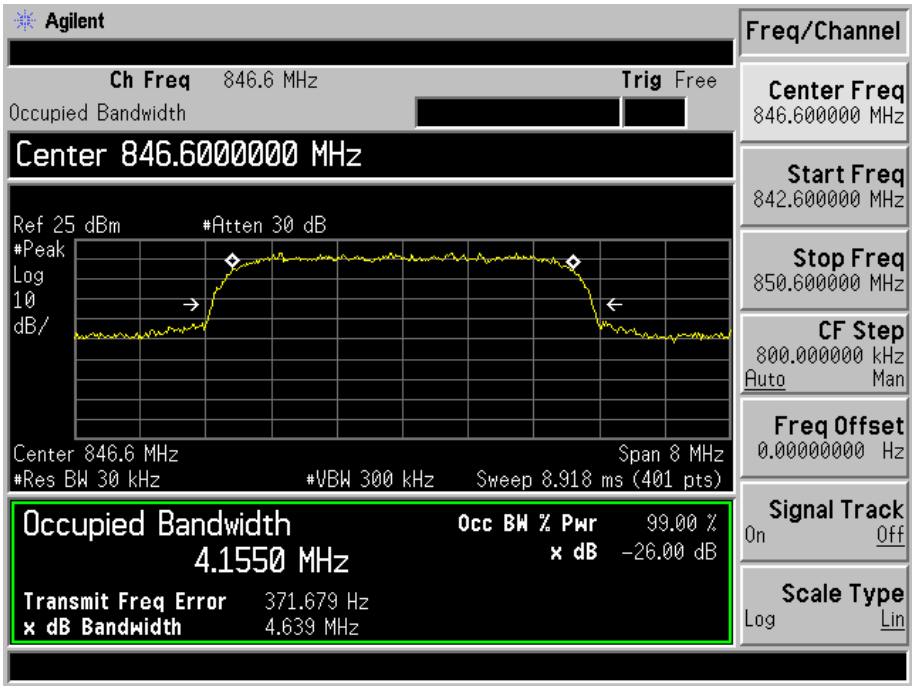
HSUPA Low Channel




HSUPA Middle Channel

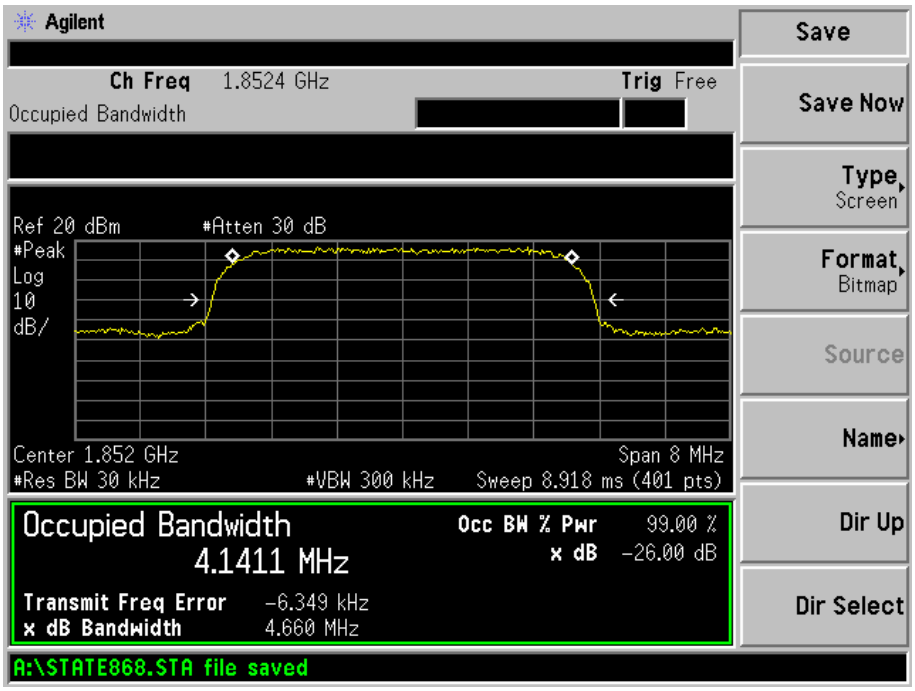


HSUPA High Channel

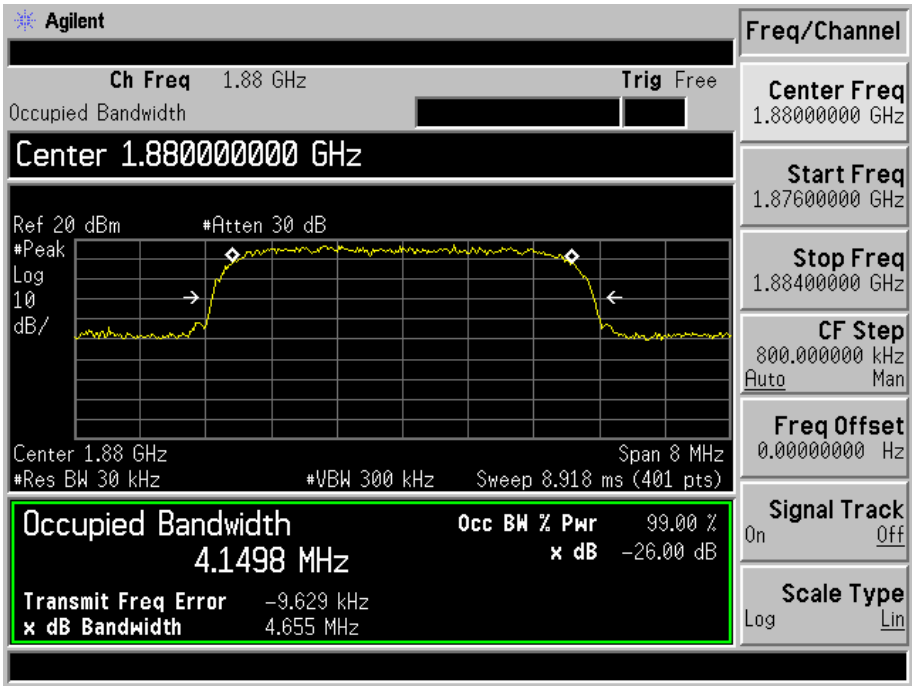



For Band II

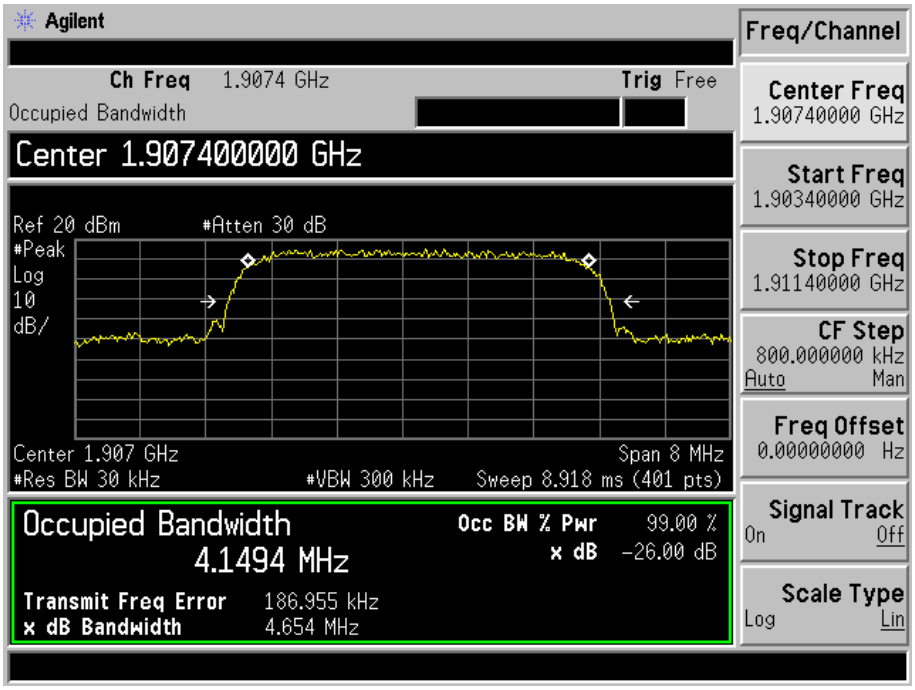
WCDMA Low Channel



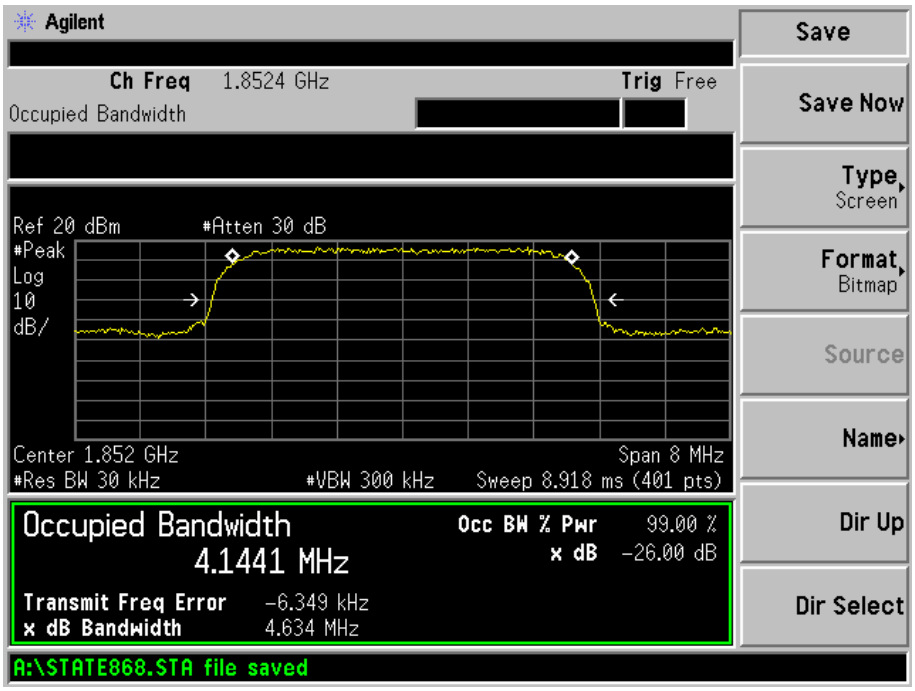
WCDMA Middle Channel



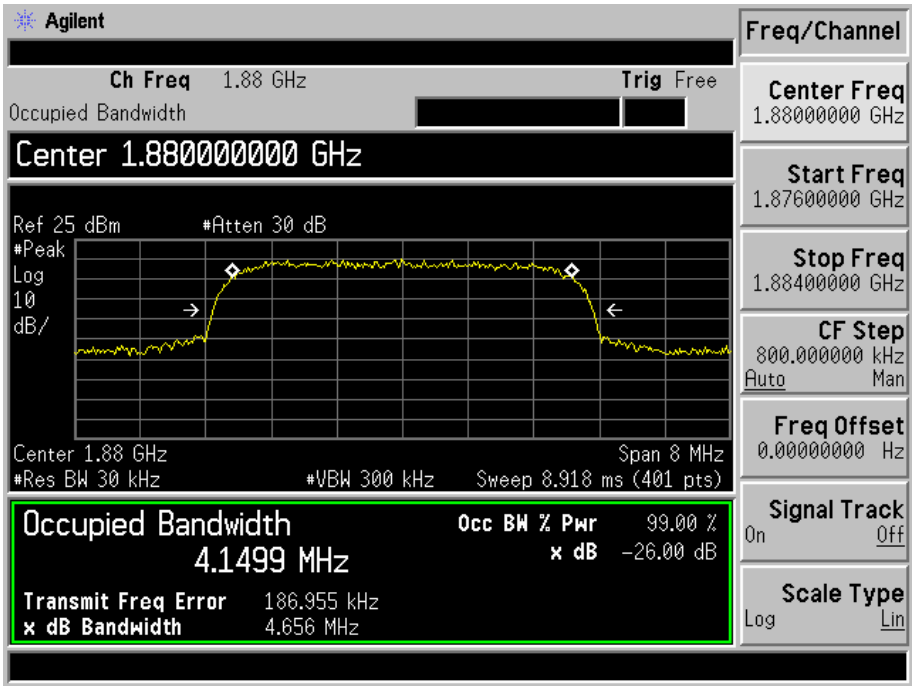

WCDMA High Channel



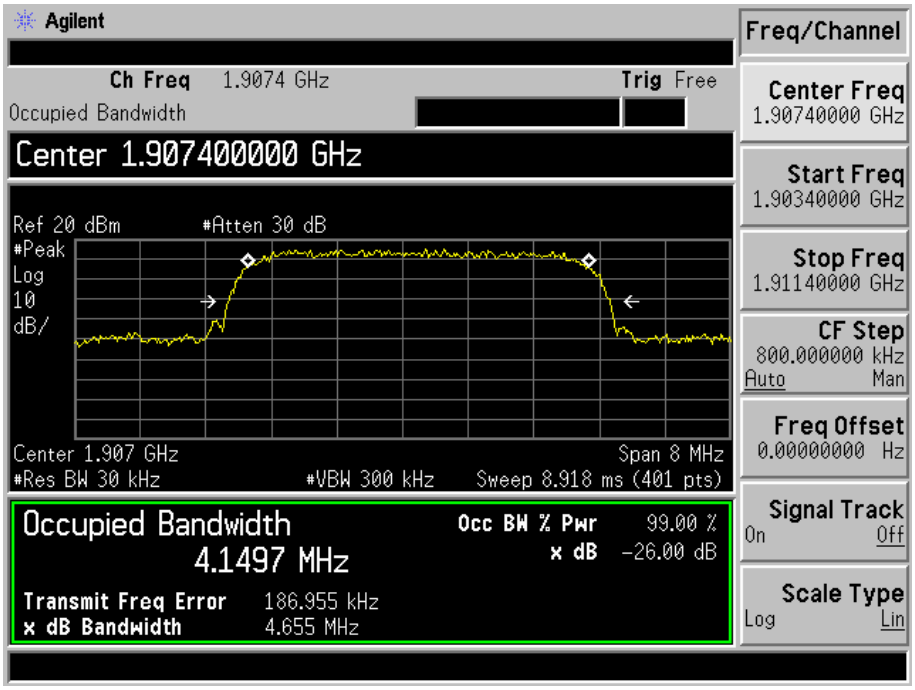
HSDPA Low Channel



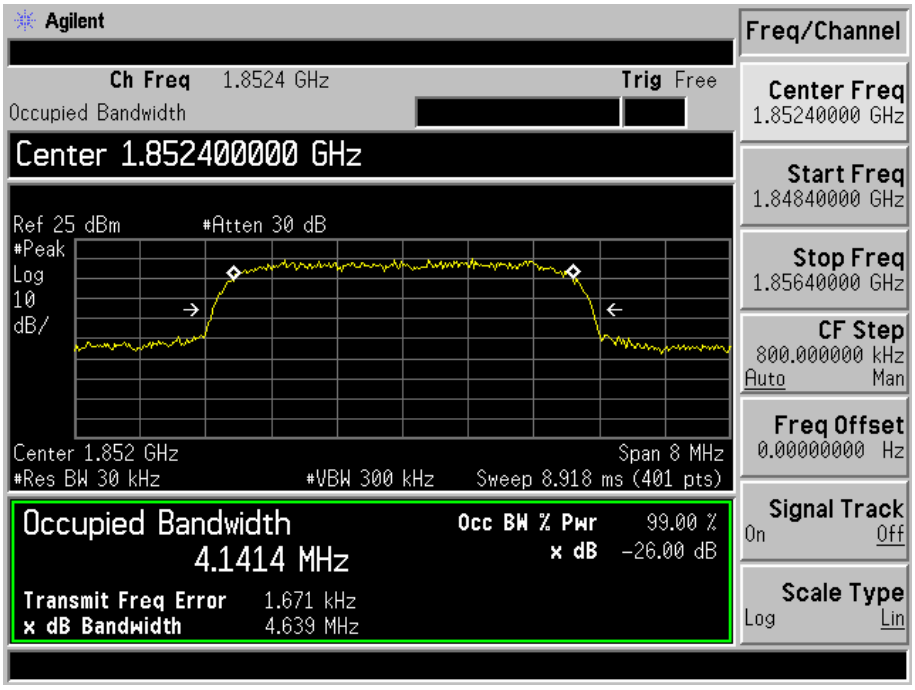

HSDPA Middle Channel



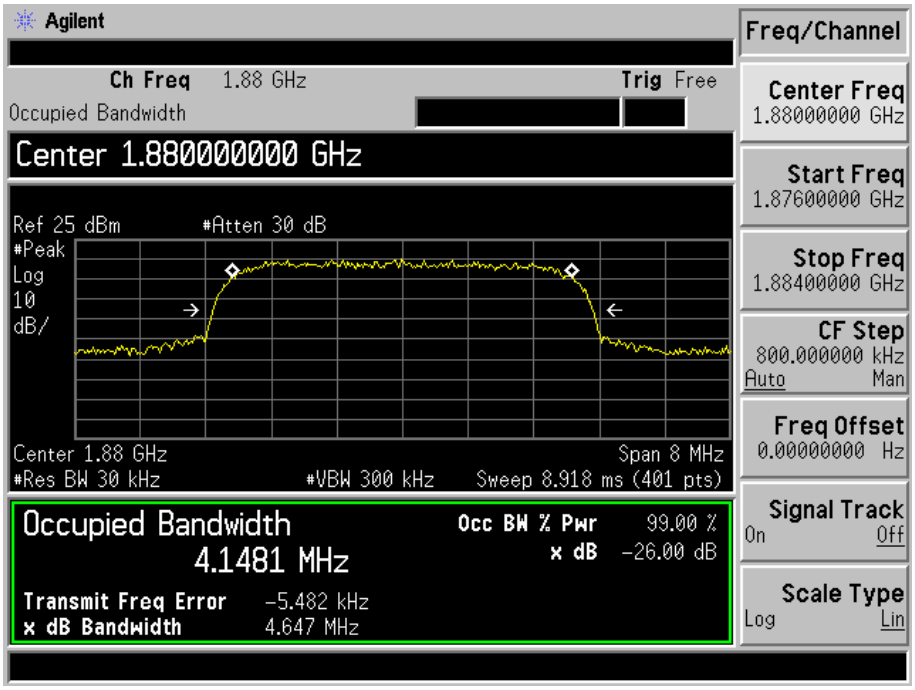
HSDPA High Channel



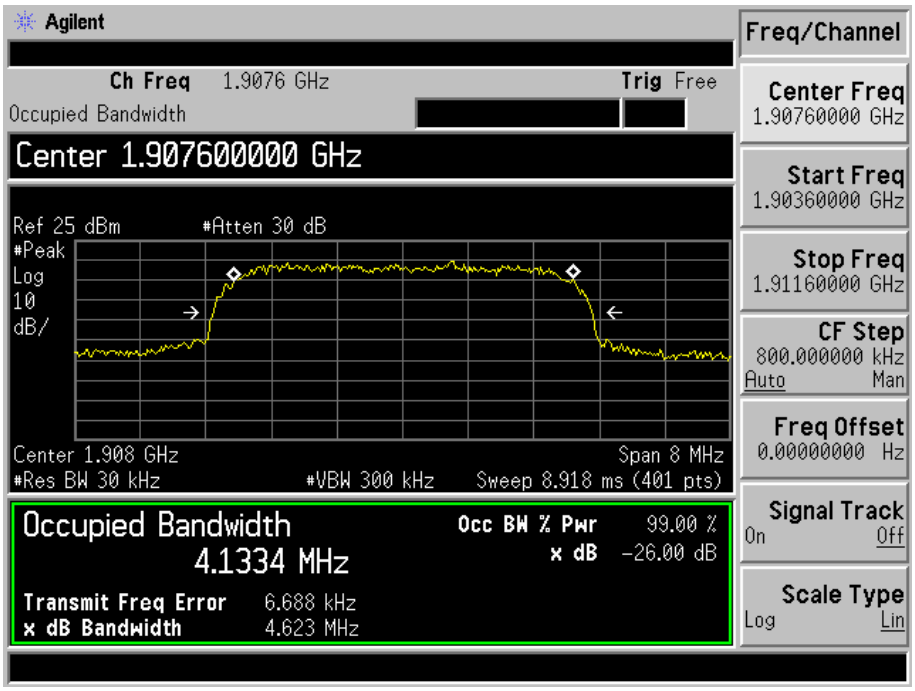

HSUPA Low Channel



HSUPA Middle Channel




HSUPA High Channel



# 7. Out of Band Emissions at Antenna Terminal

## 7.1 Standard Applicable

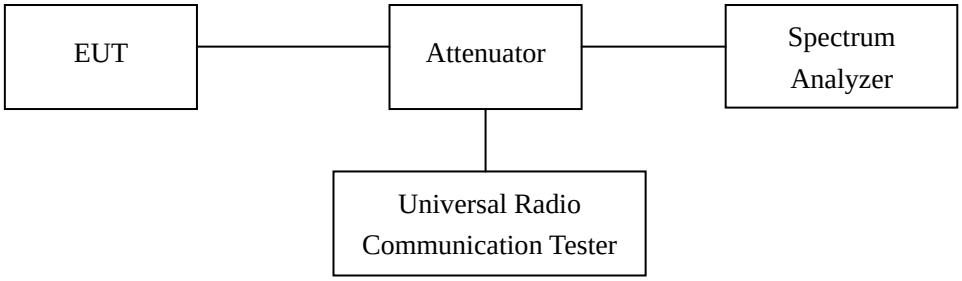
According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §24.238(a), the power of any emissions 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.

## 7.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to $10^{th}$ harmonic.

Test Configuration for the out of band emissions testing:



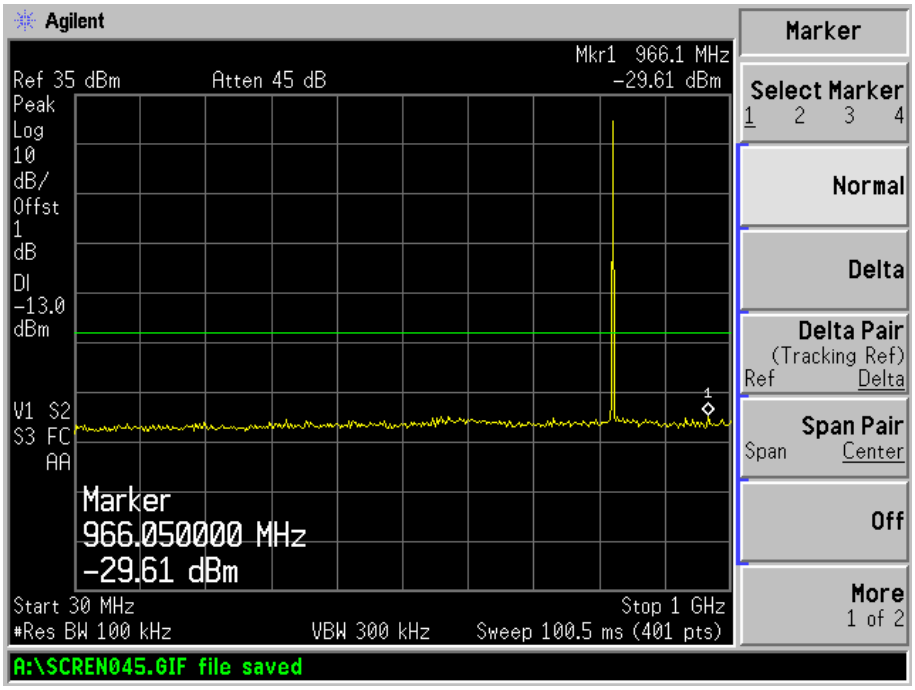

## 7.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 25 °C |
| Relative Humidity: | 53% |
| ATM Pressure: | 1018 mbar |

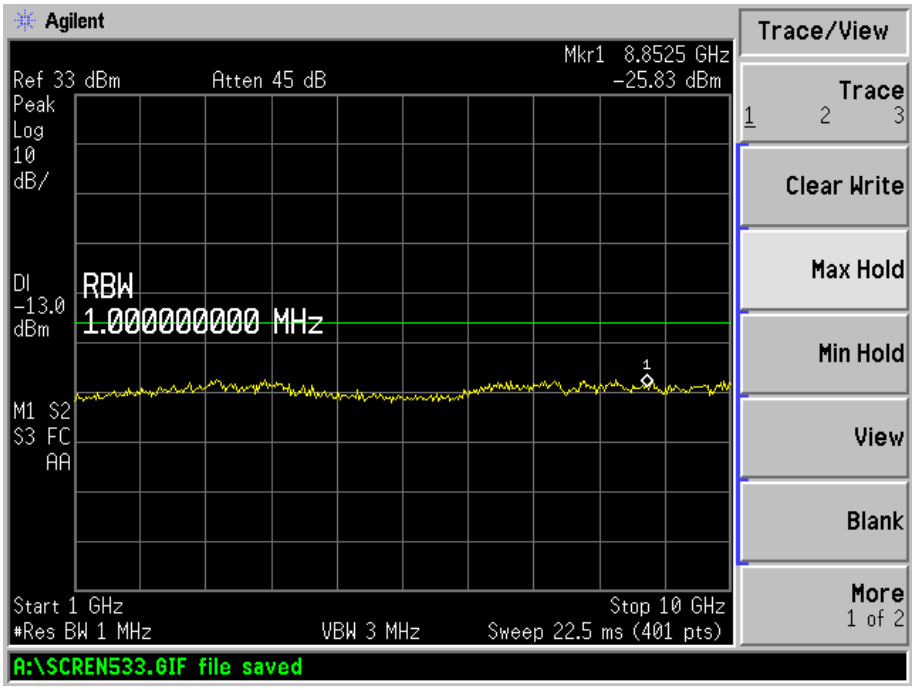
## 7.4 Summary of Test Results/Plots

*Please refer to the following test plots* For Cellular Band

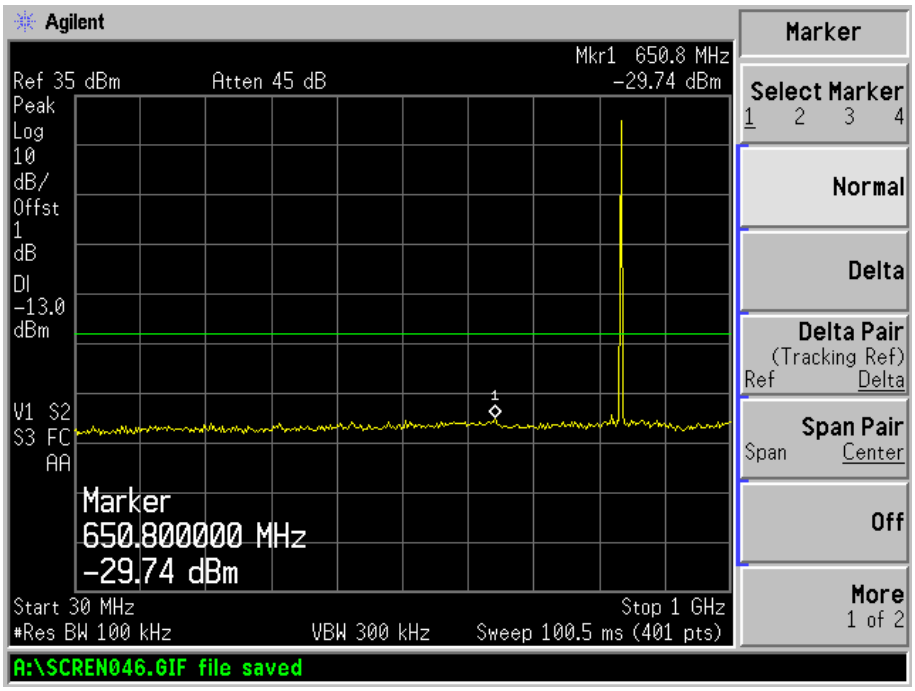
GSM Low Channel 30MHz to 1GHz



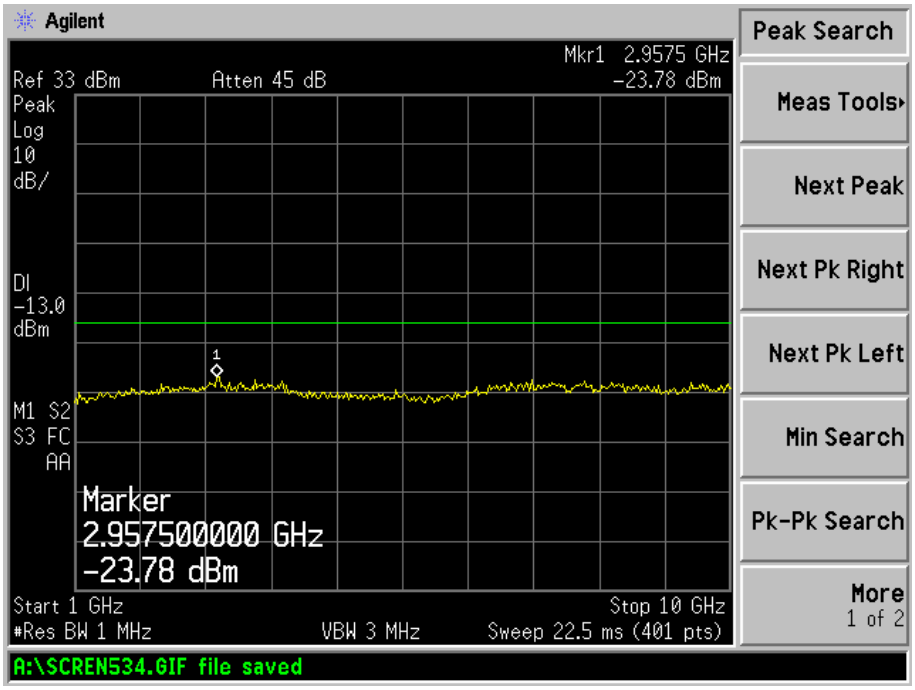

Above 1GHz



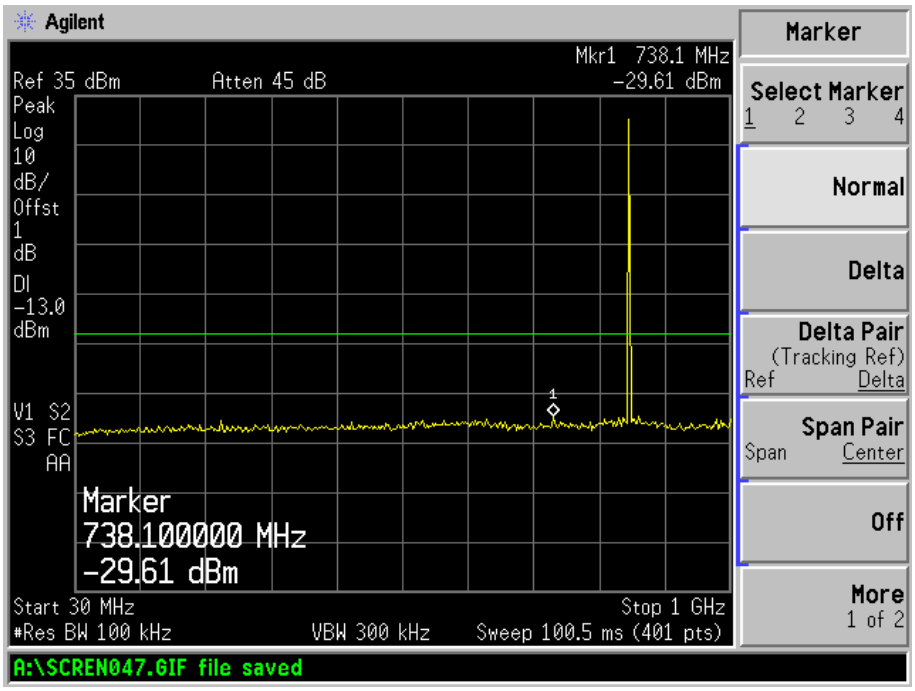
GSM Middle Channel
30MHz to 1GHz



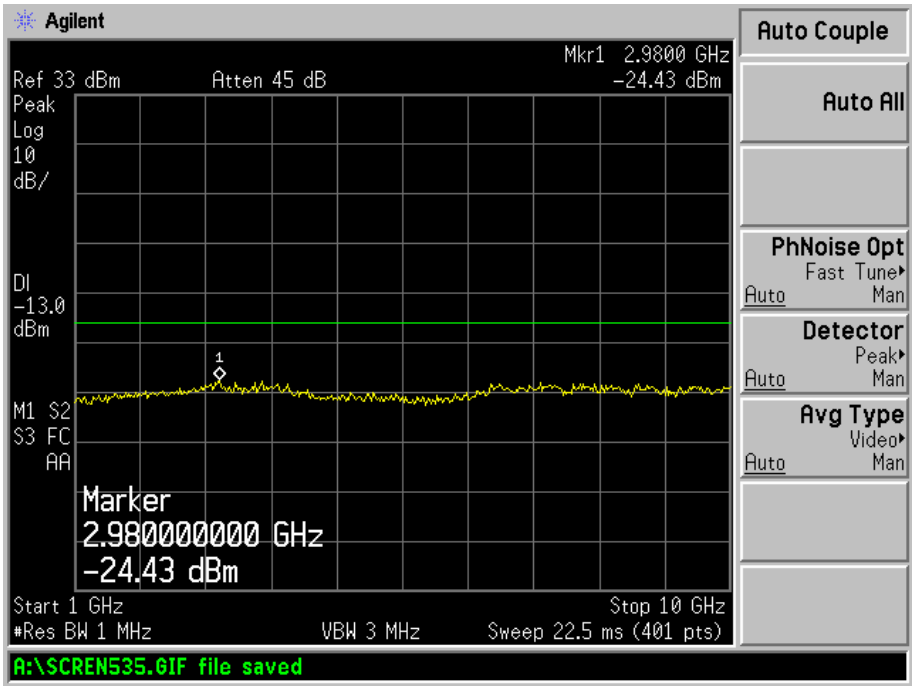

Above 1GHz



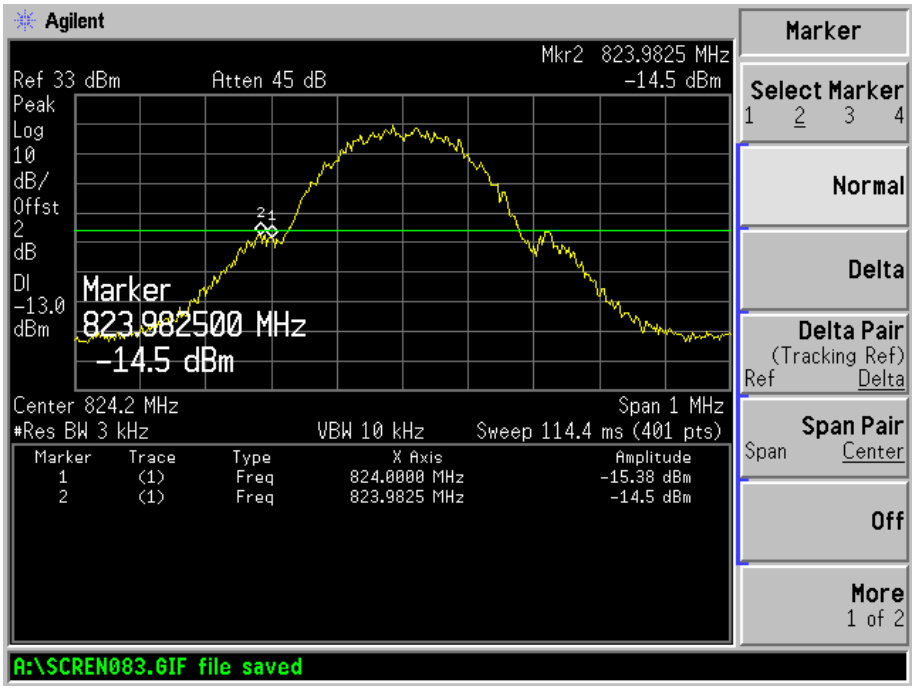
GSM High Channel
30MHz to 1GHz



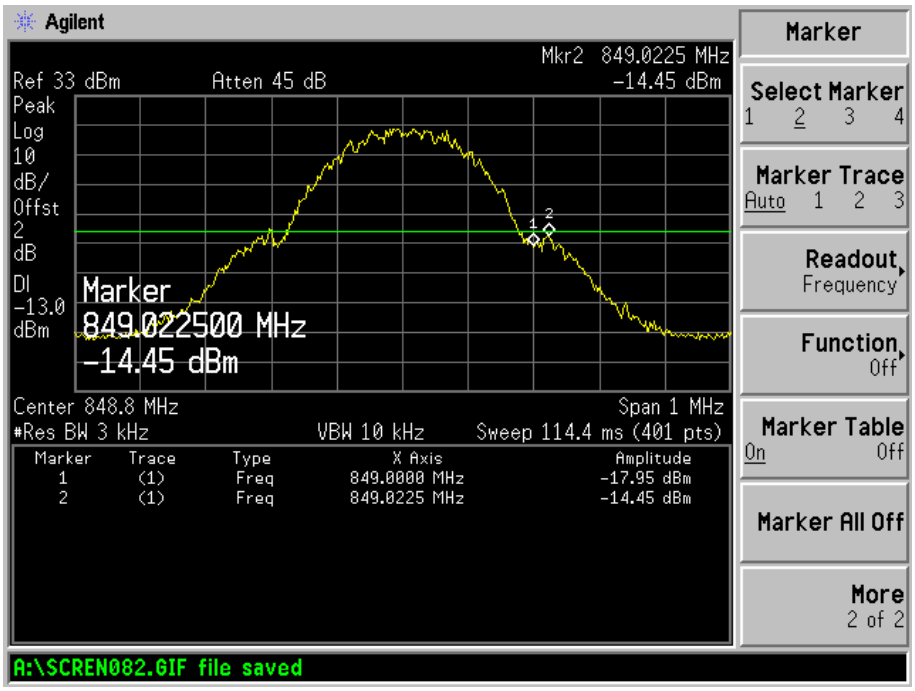

Above 1GHz



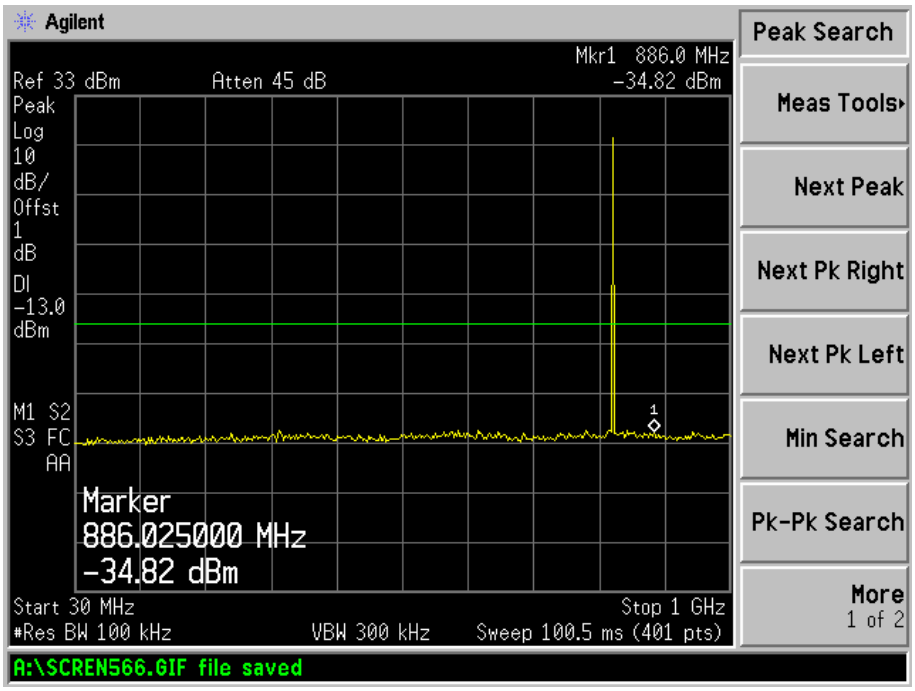
GSM Low Band Emission



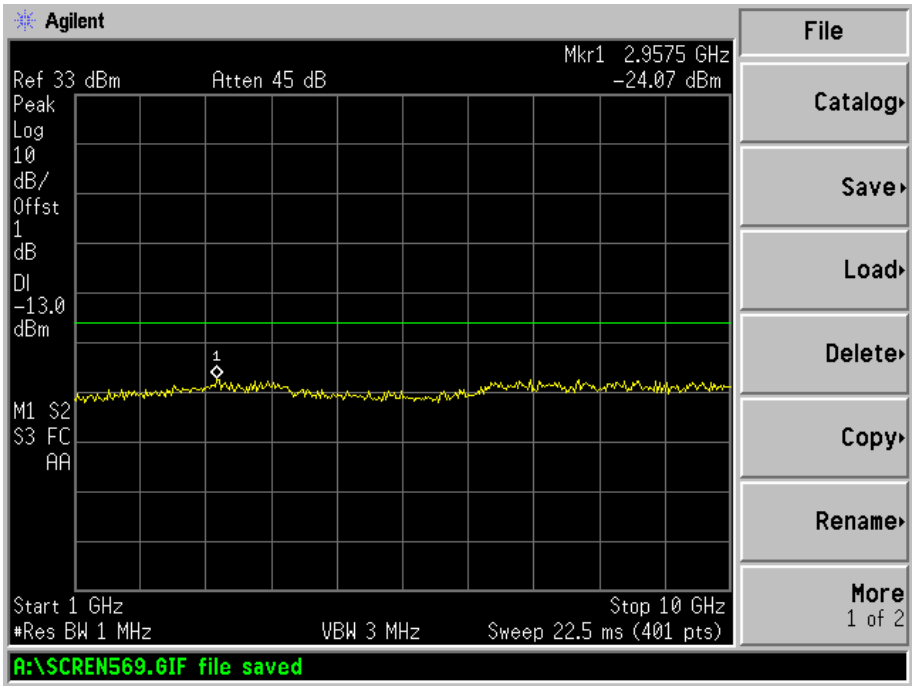

GSM High Band Emission



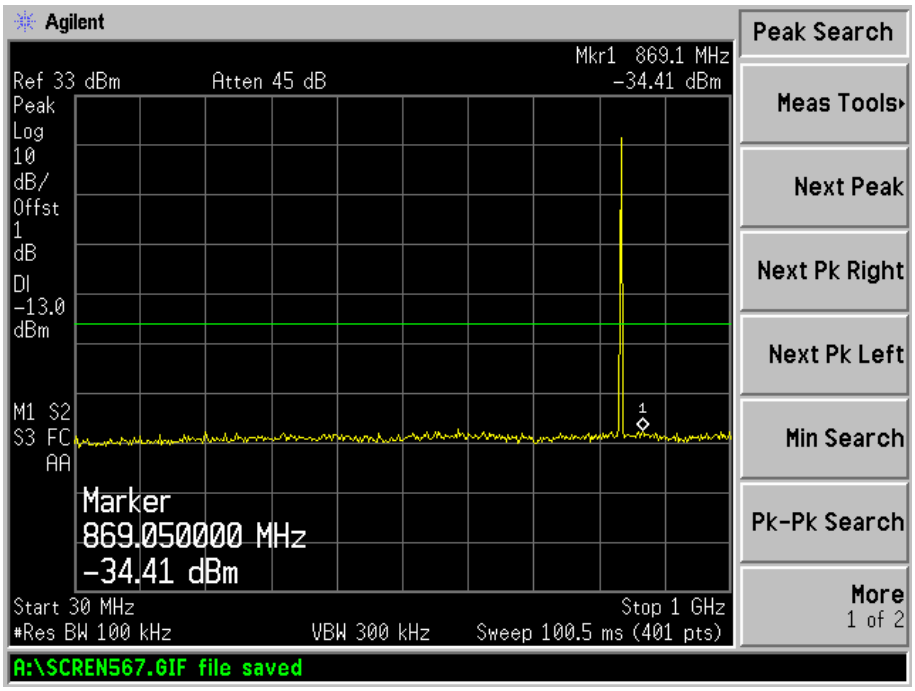
GPRS Low Channel
30MHz to 1GHz



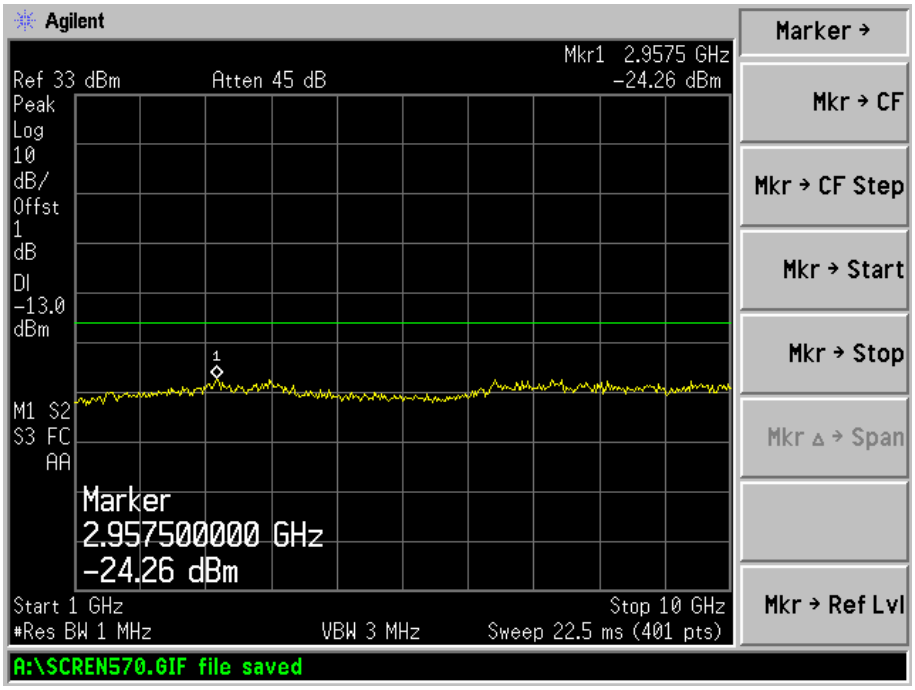

Above 1GHz



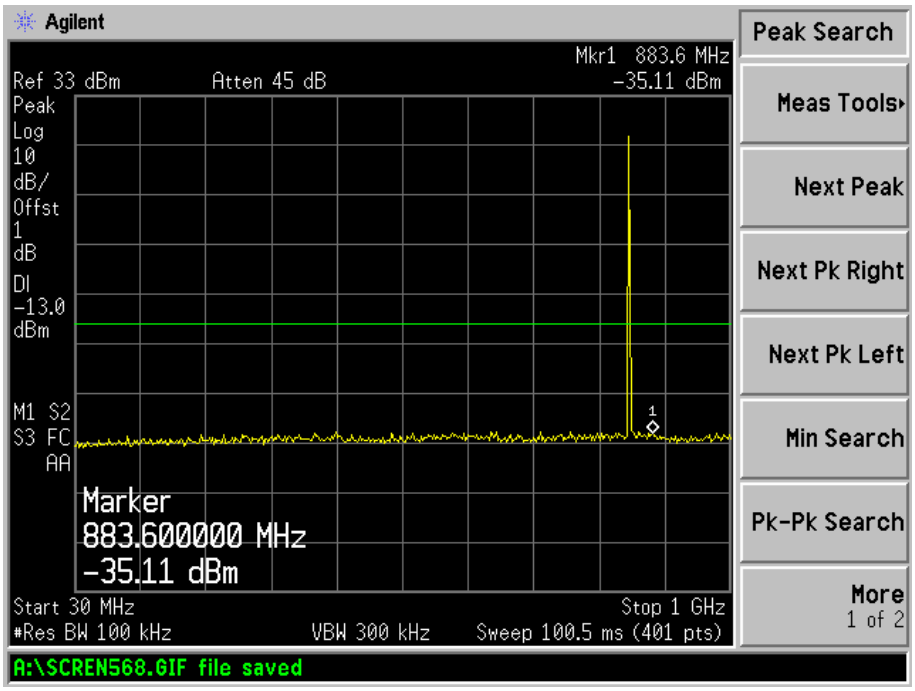
GPRS Middle Channel
30MHz to 1GHz



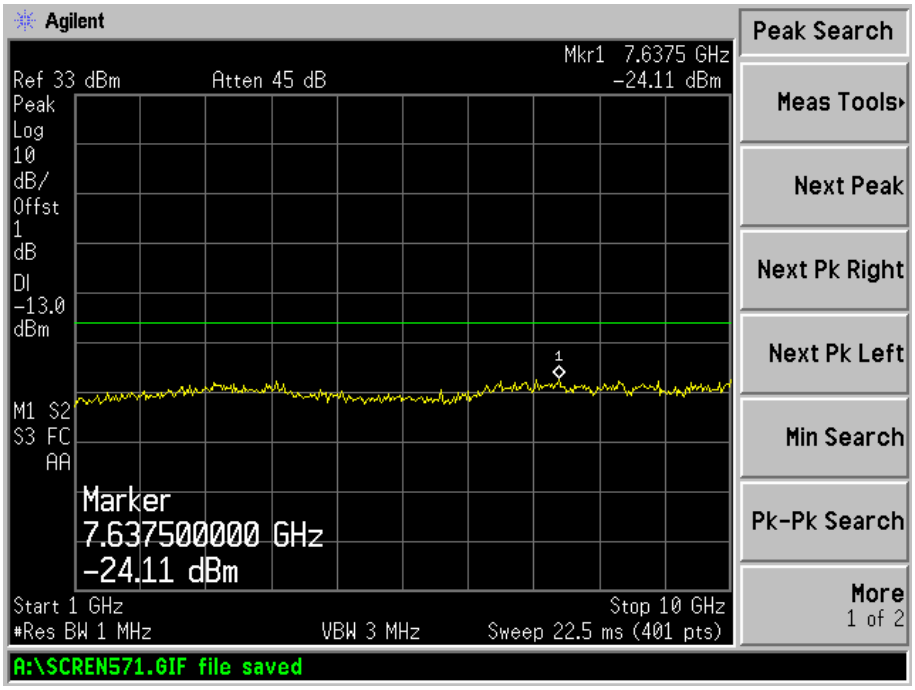

Above 1GHz



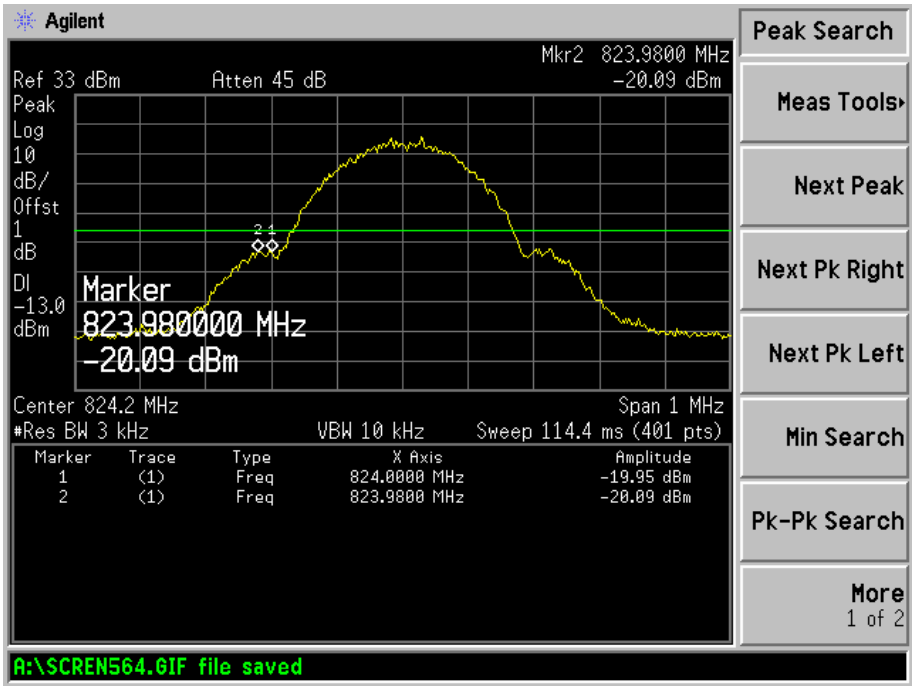
GPRS High Channel
30MHz to 1GHz



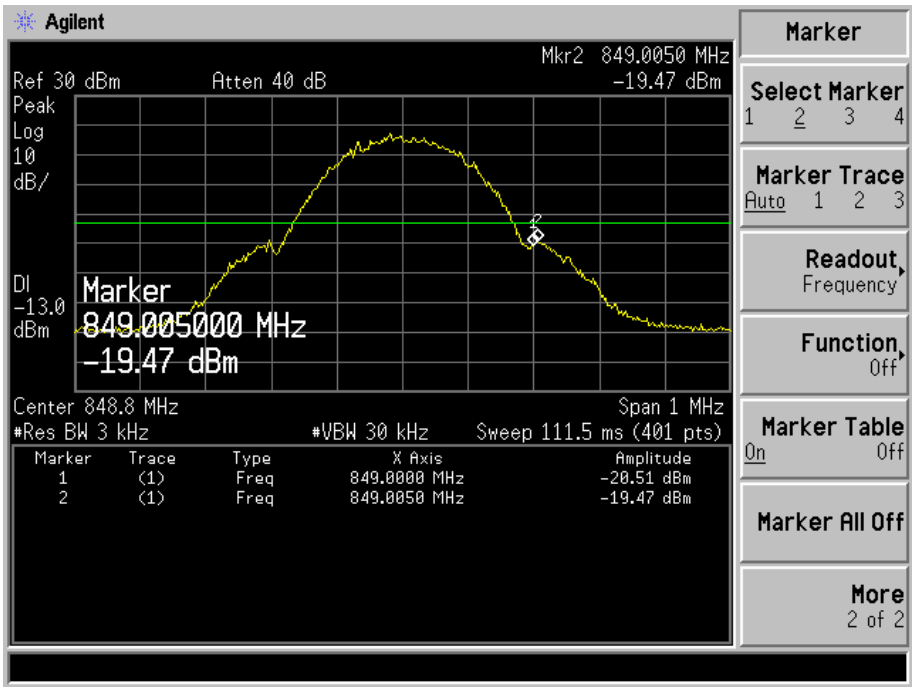

Above 1GHz



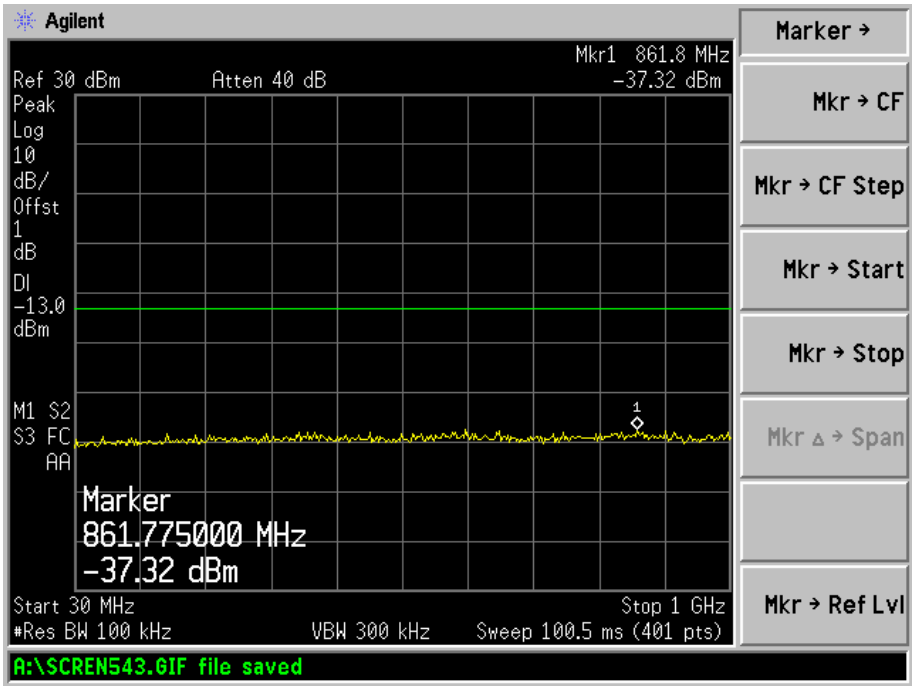
GPRS Low Band Emission



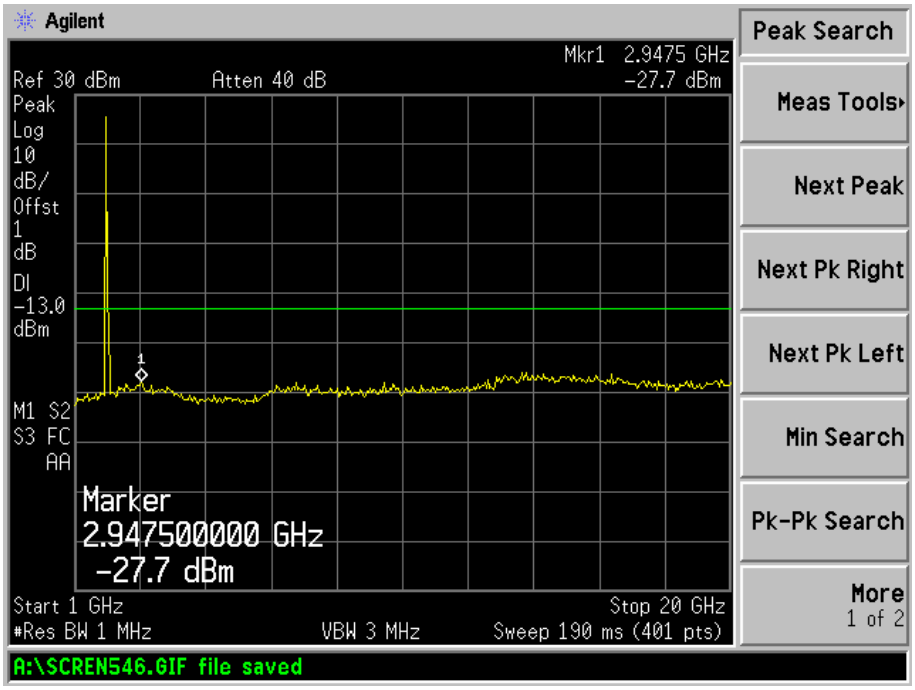

GPRS High Band Emission



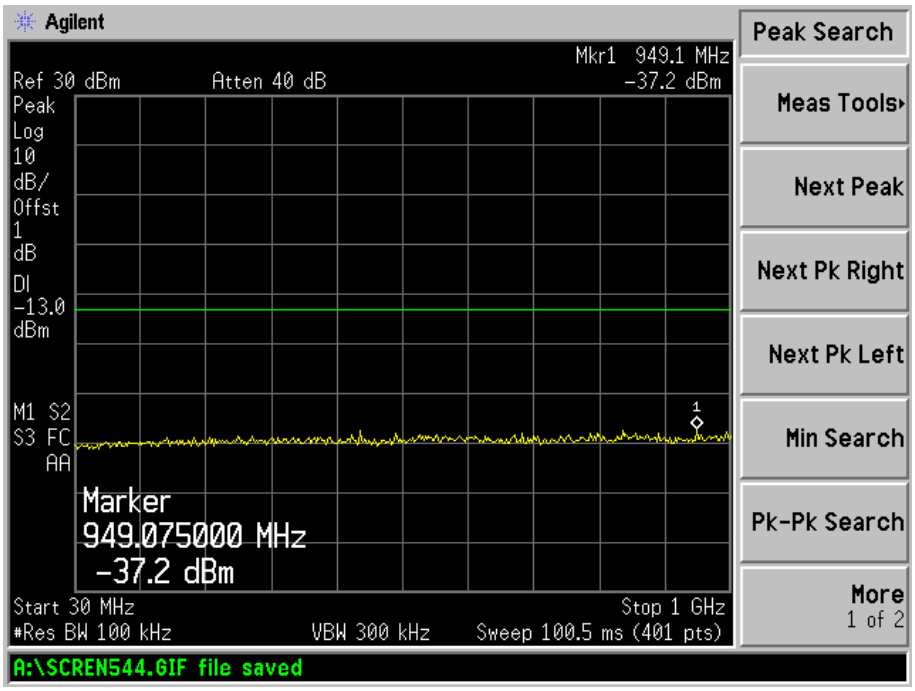
For PCS Band
GSM Low Channel
30MHz to 1GHz



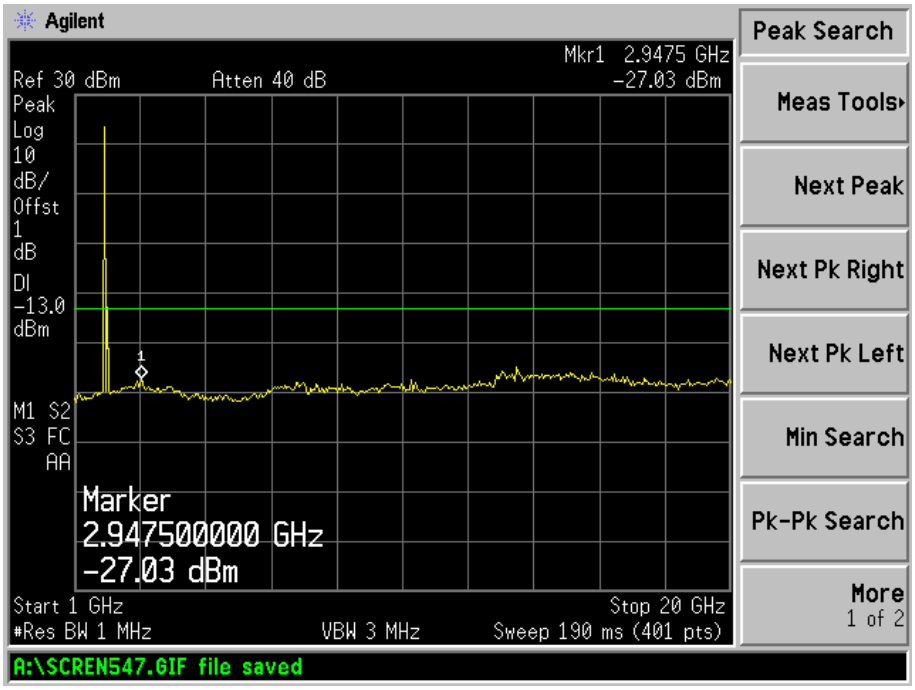

Above 1GHz



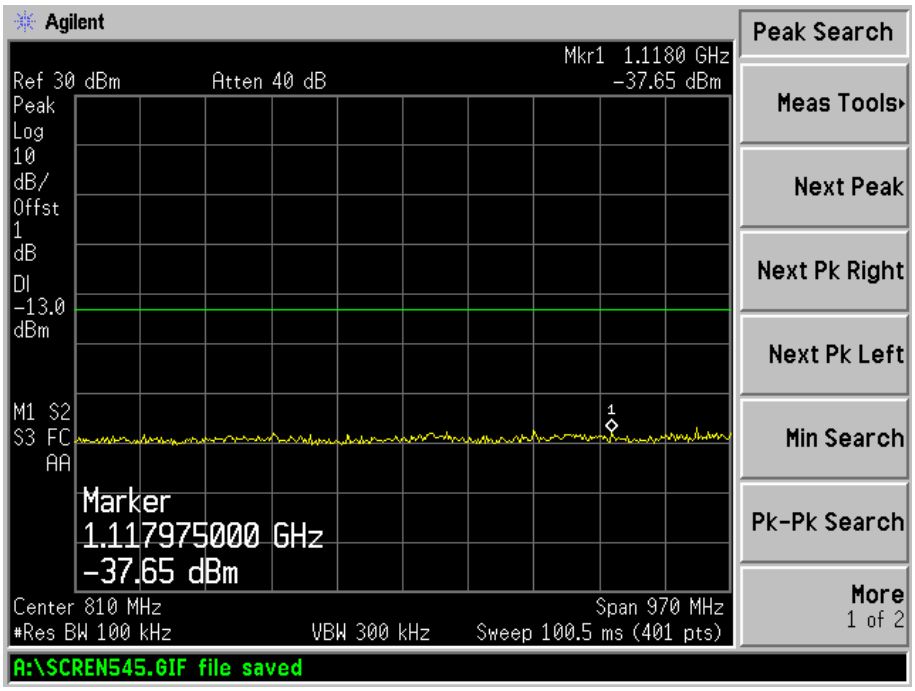
GSM Middle Channel
30MHz to 1GHz



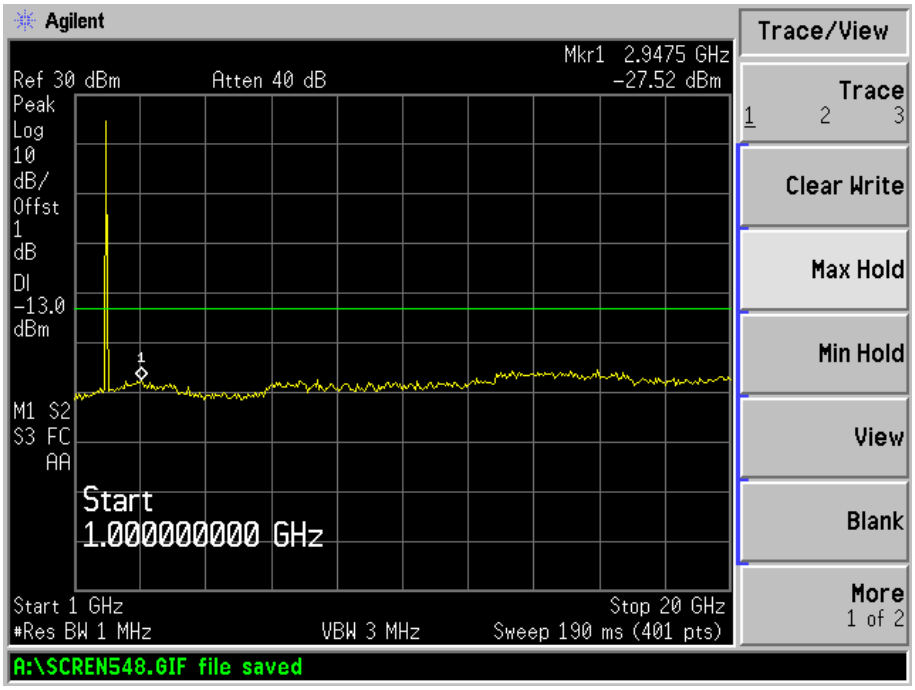

Above 1GHz



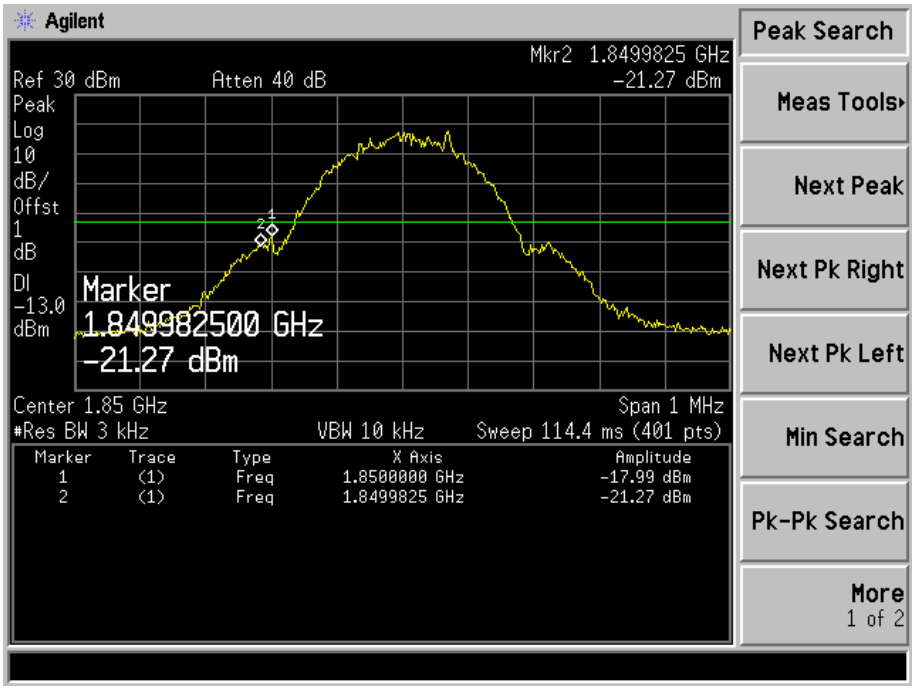
GSM High Channel
30MHz to 1GHz



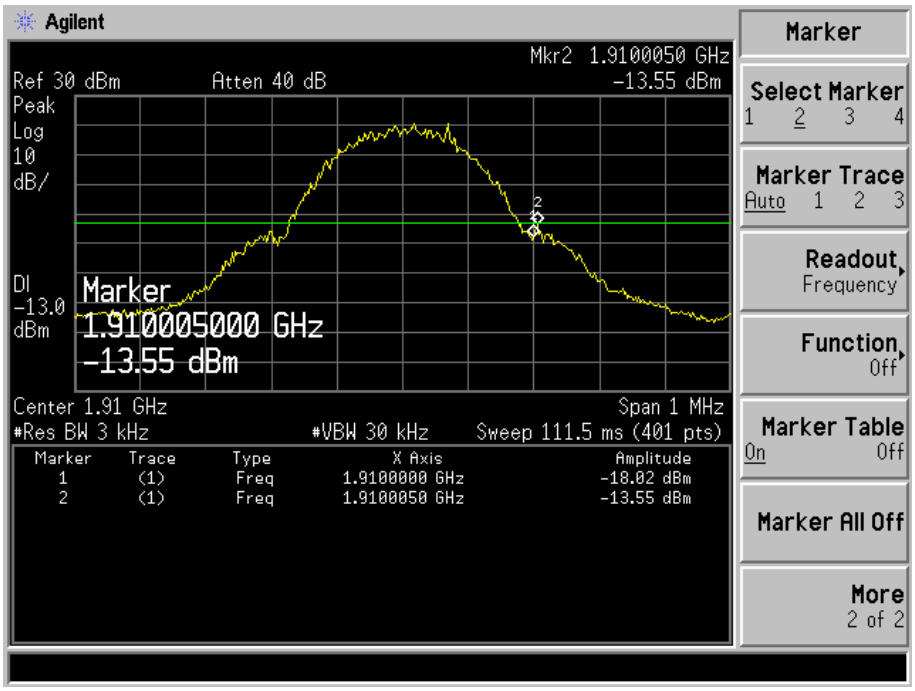

Above 1GHz



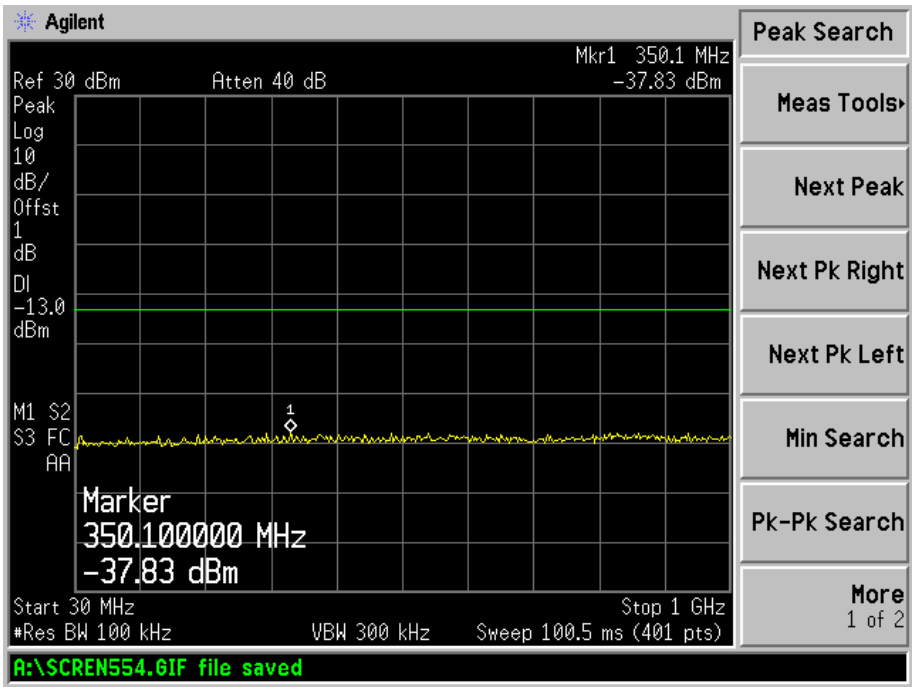
GSM Low Band Emission



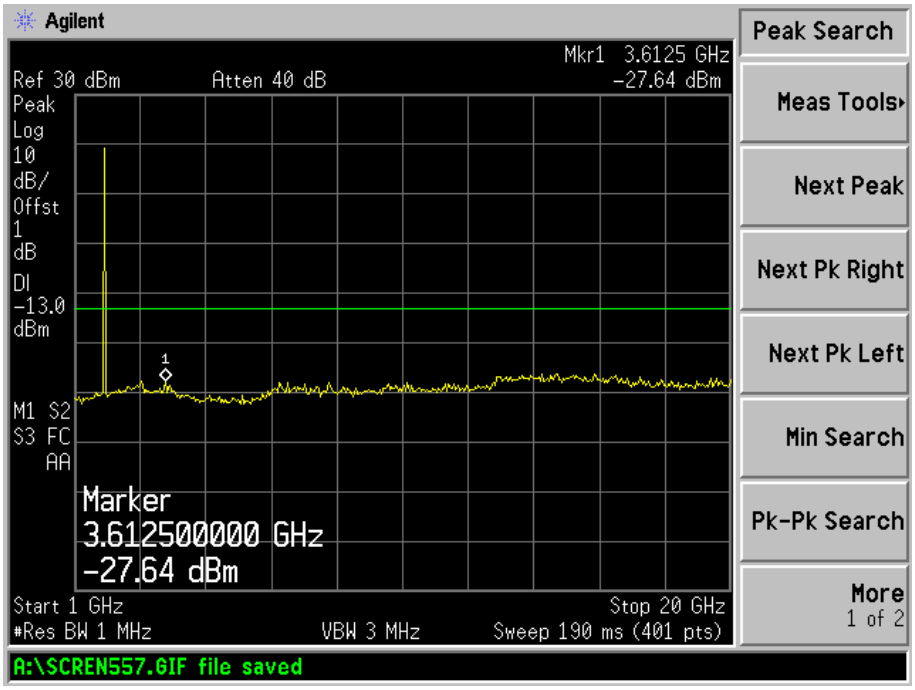

GSM High Band Emission



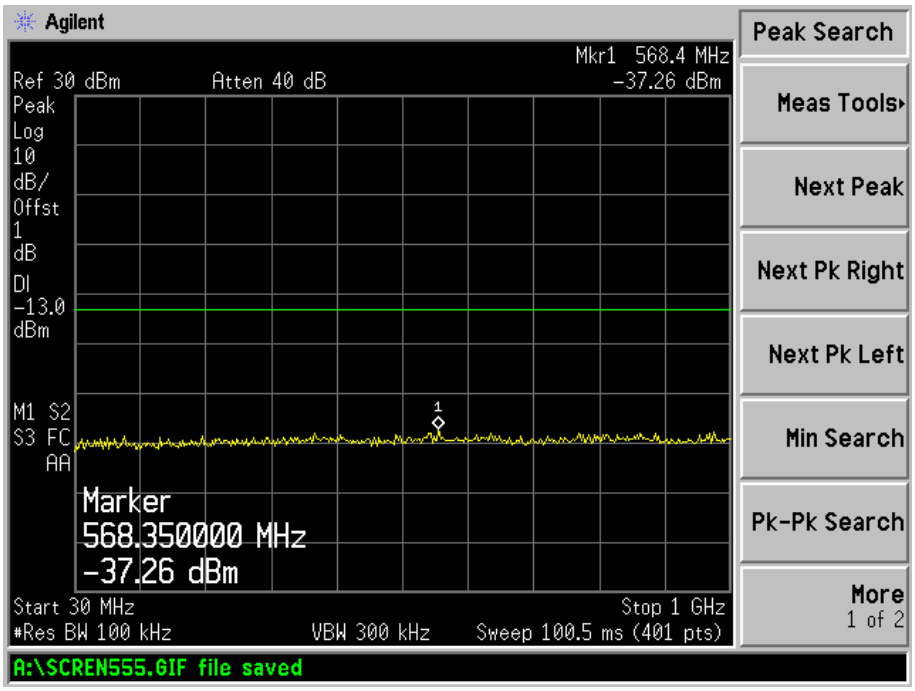
GPRS Low Channel
30MHz to 1GHz



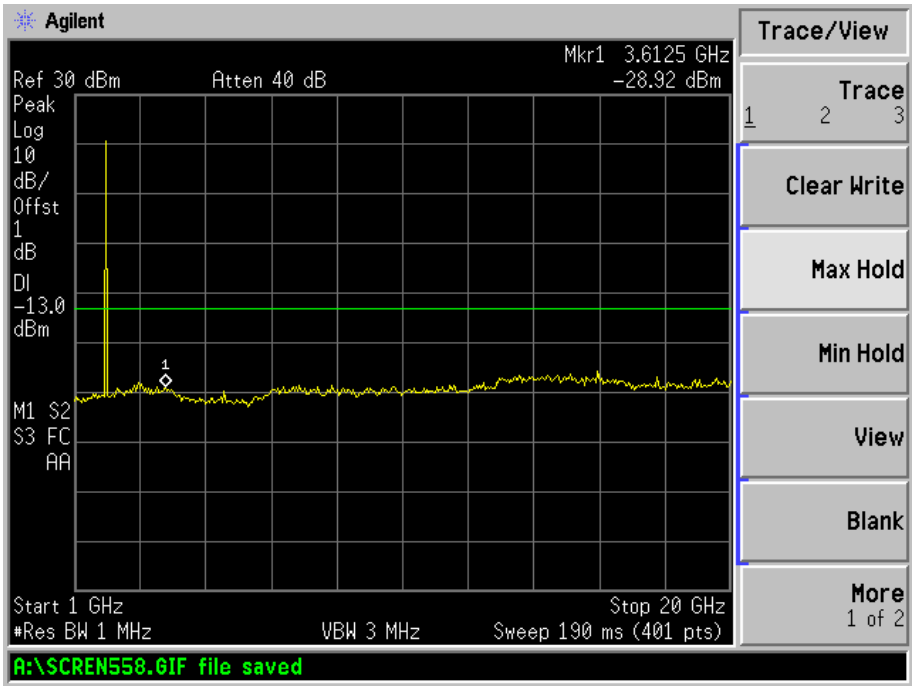

Above 1GHz



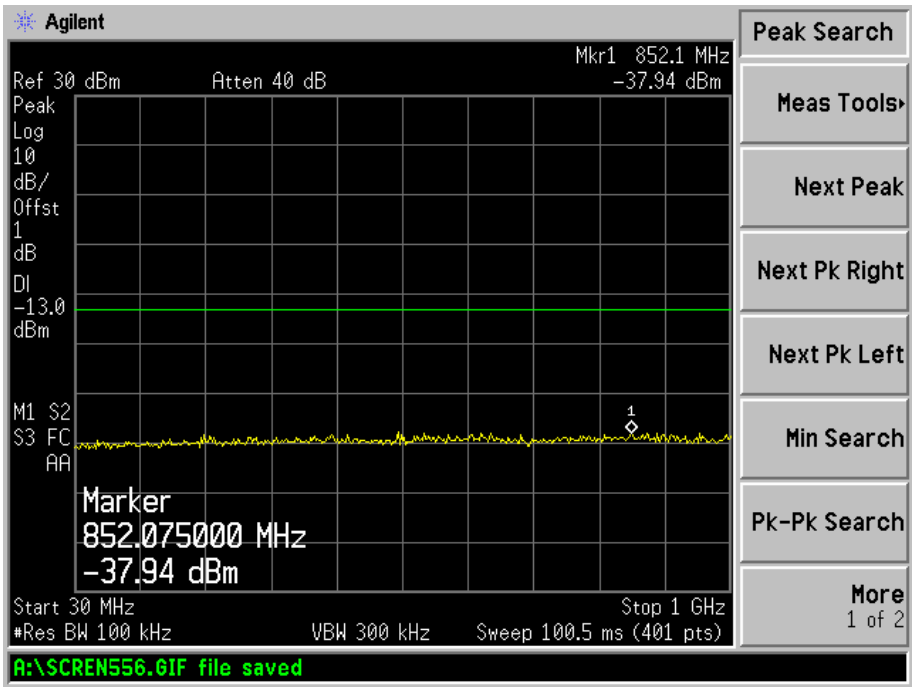
GPRS Middle Channel
30MHz to 1GHz



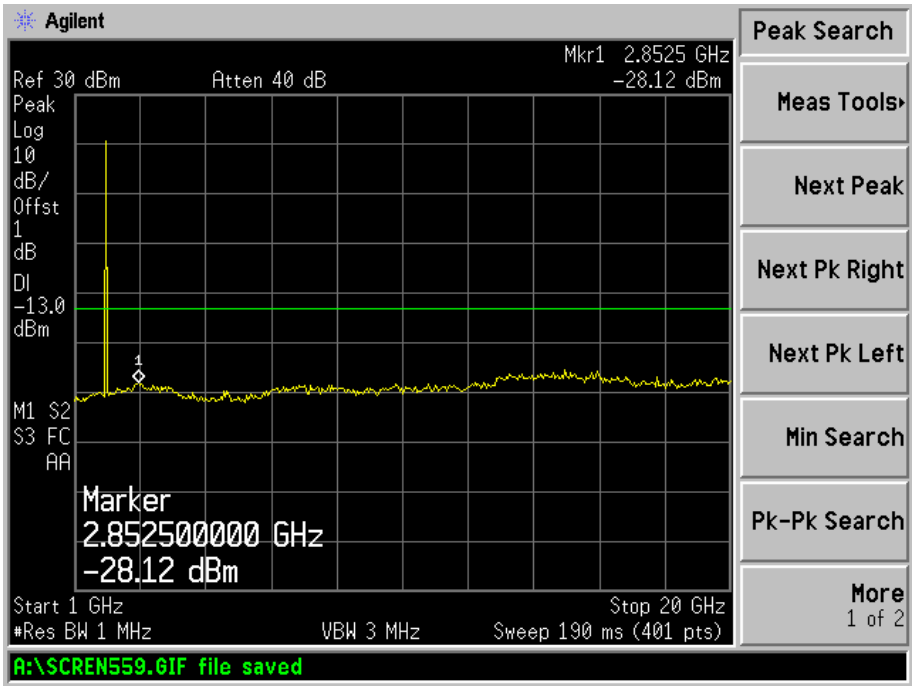

Above 1GHz



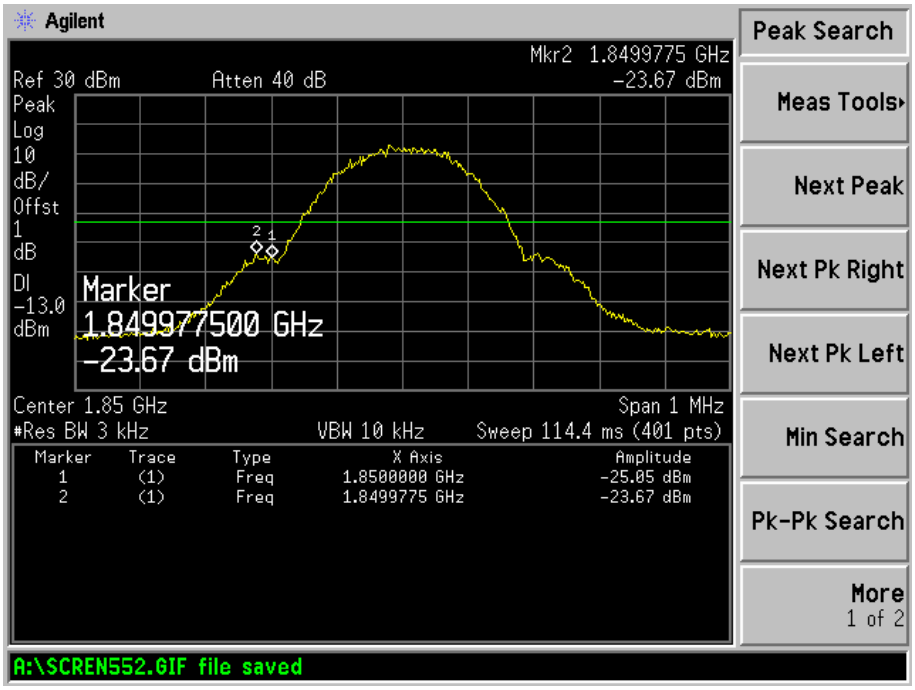
GPRS High Channel
30MHz to 1GHz



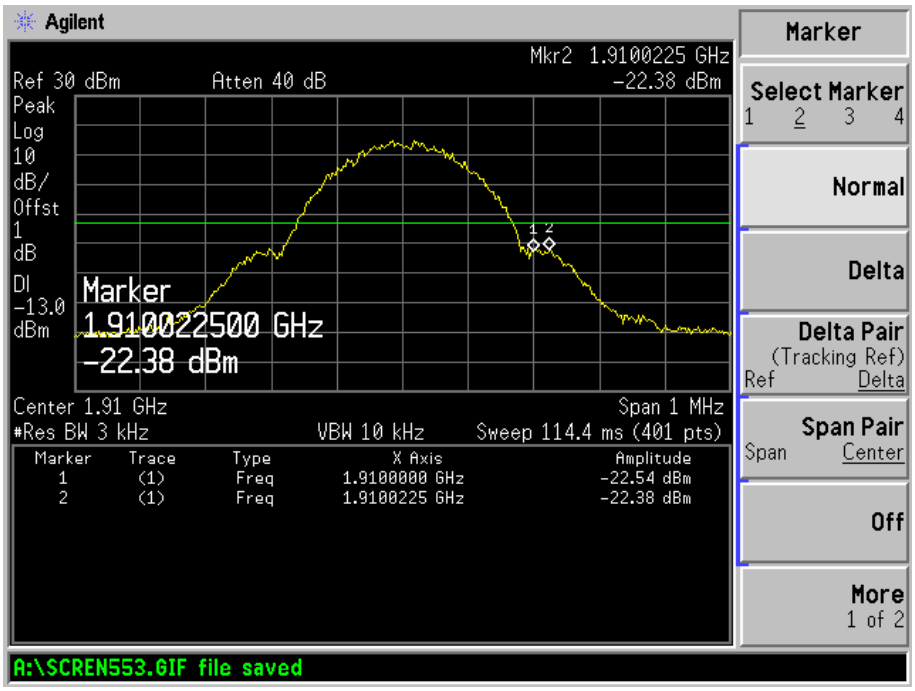

Above 1GHz



GPRS Low Band Emission



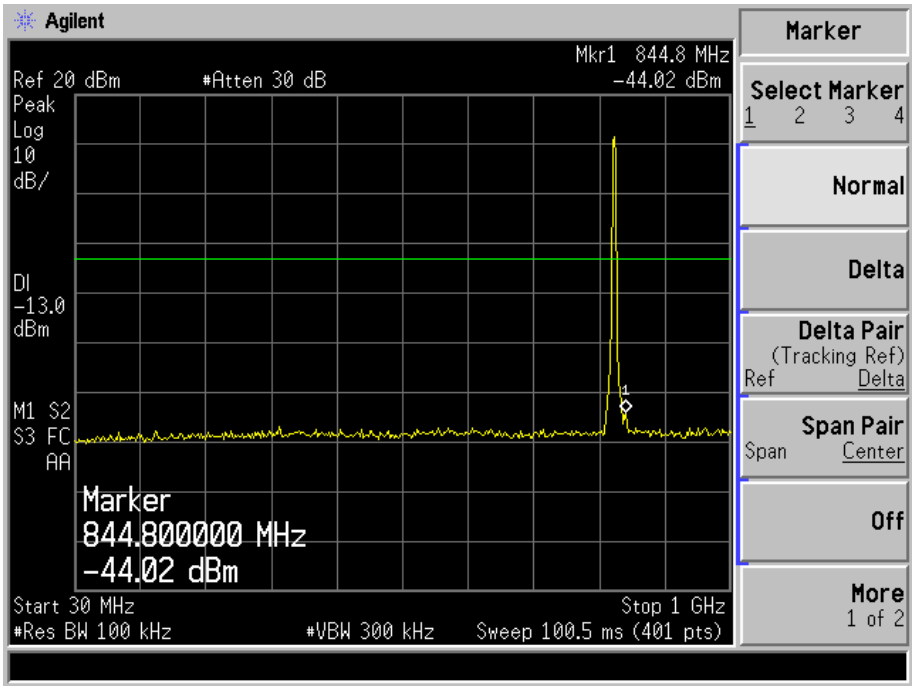

GPRS High Band Emission



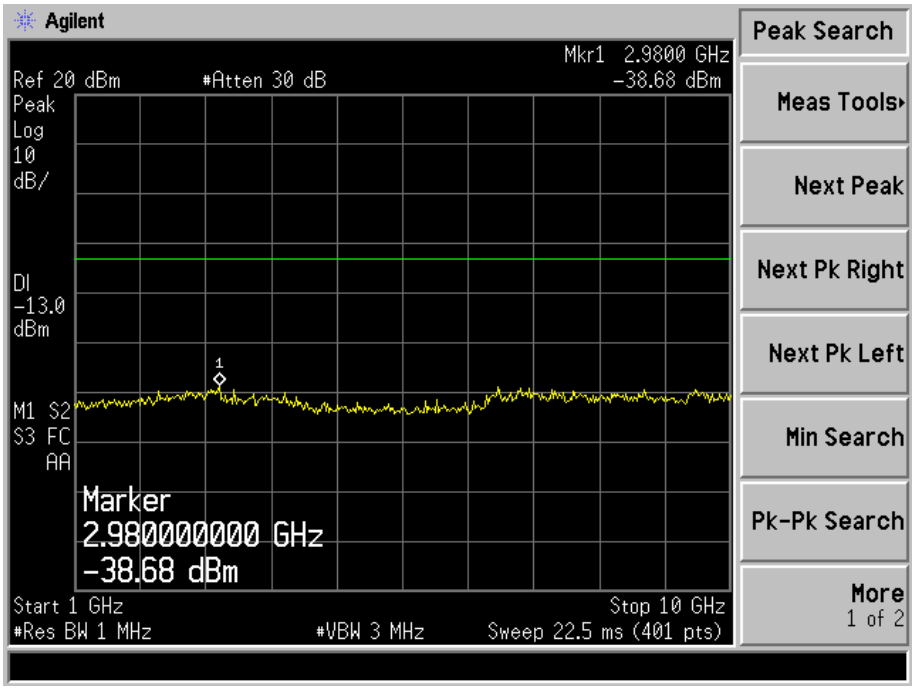
**For Band V**

WCDMA Low Channel

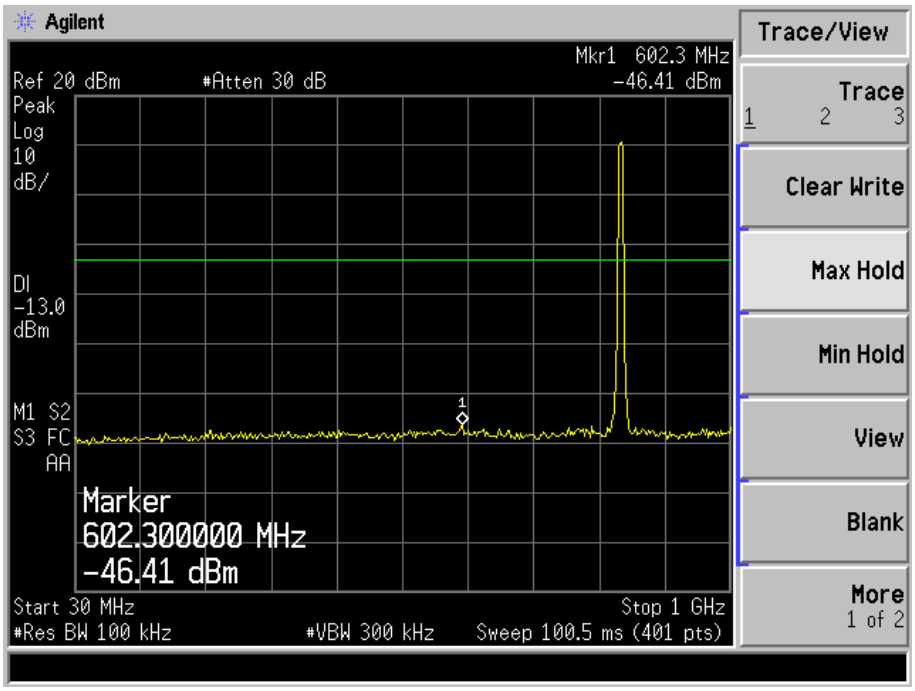
30MHz to 1GHz



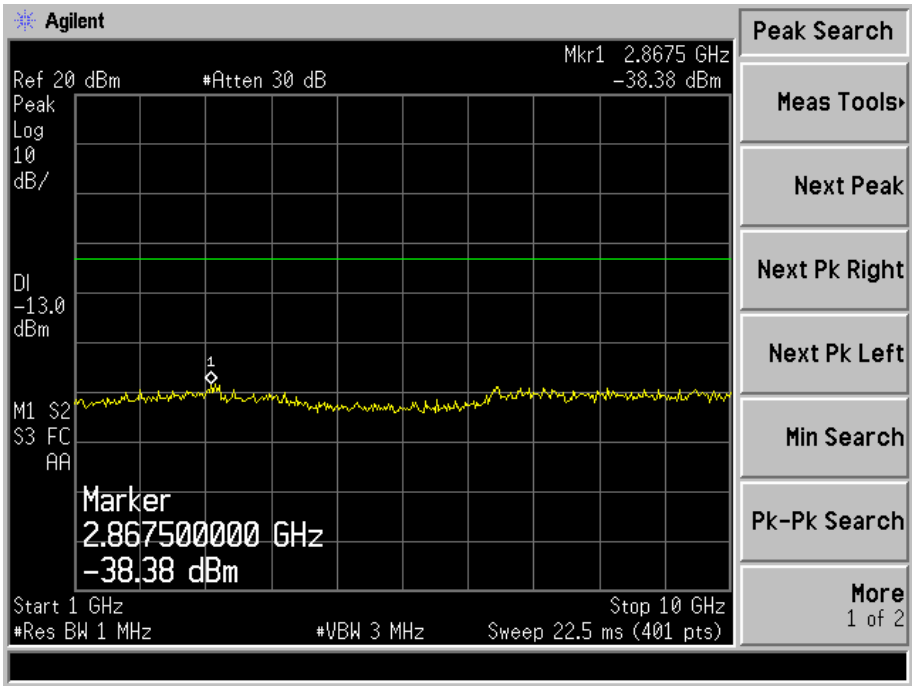

Above 1GHz



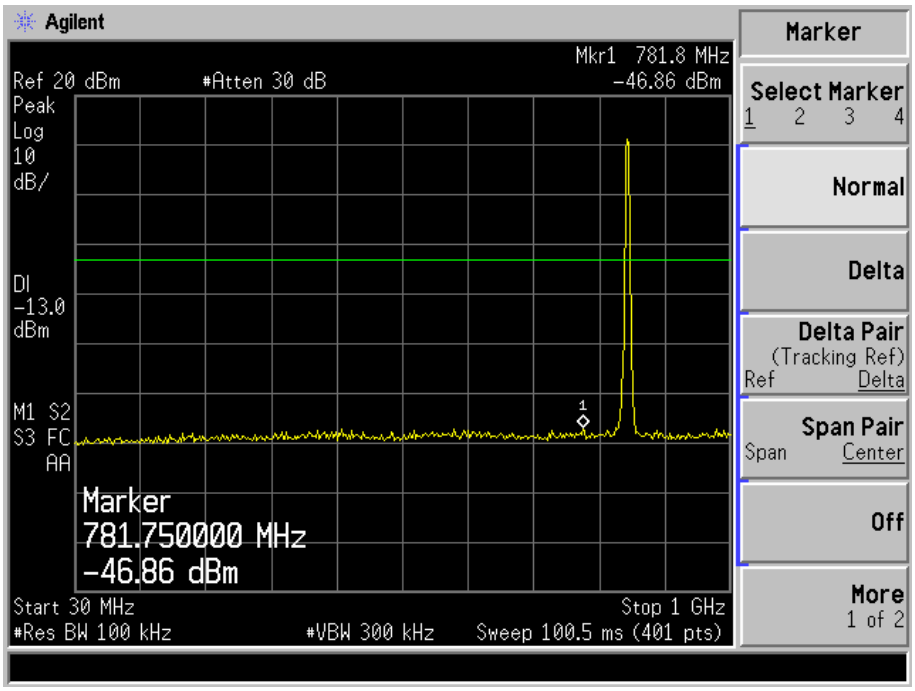
WCDMA Middle Channel
30MHz to 1GHz



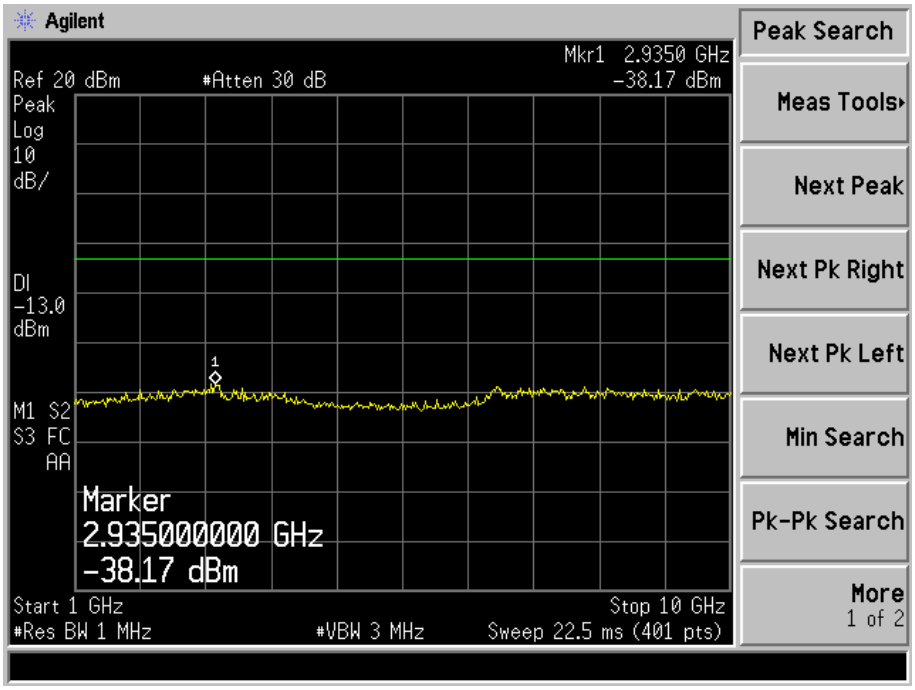

Above 1GHz



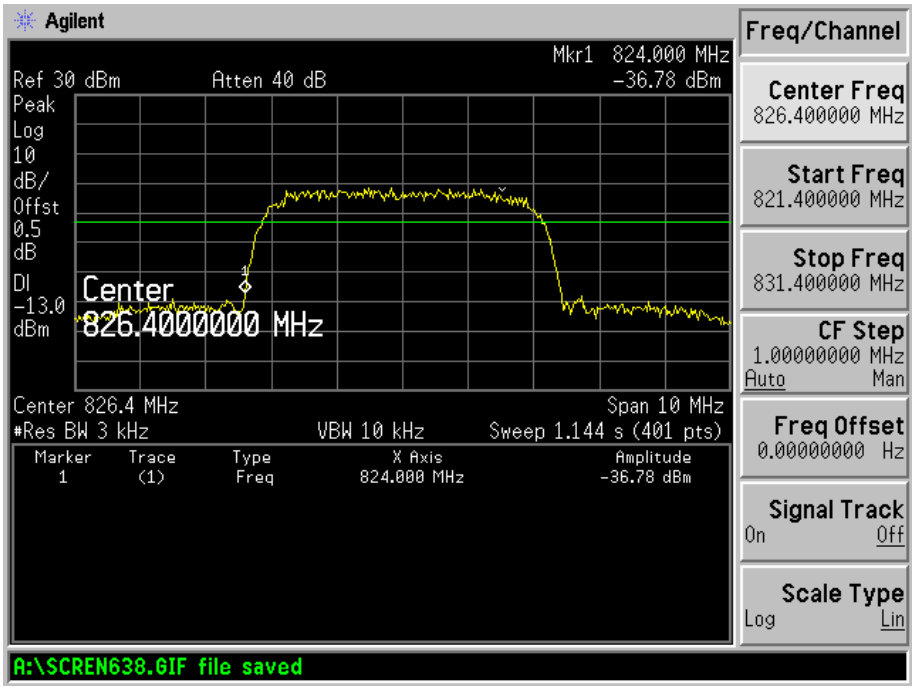
WCDMA High Channel
30MHz to 1GHz



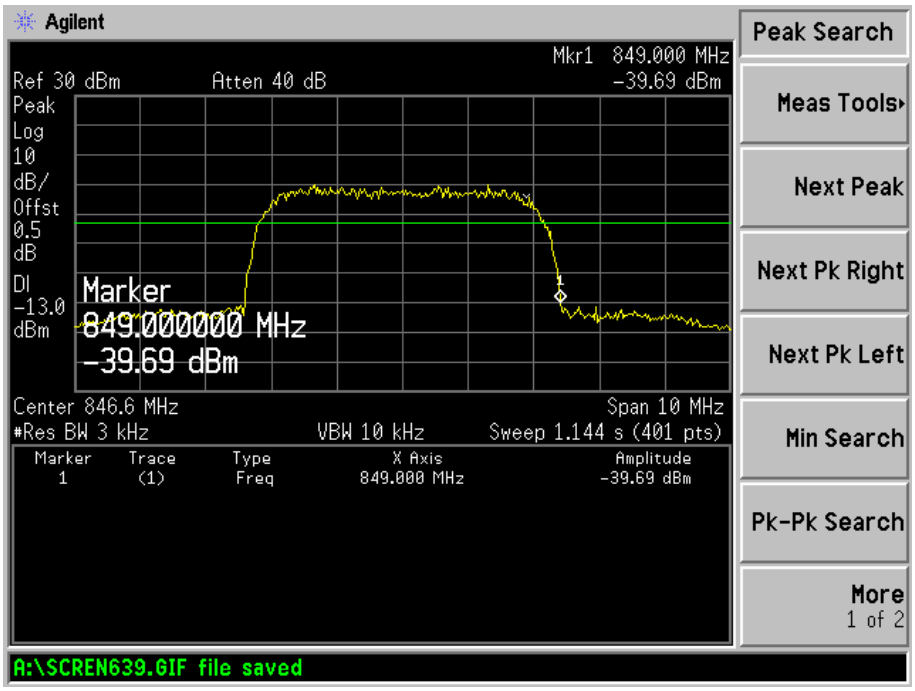

Above 1GHz



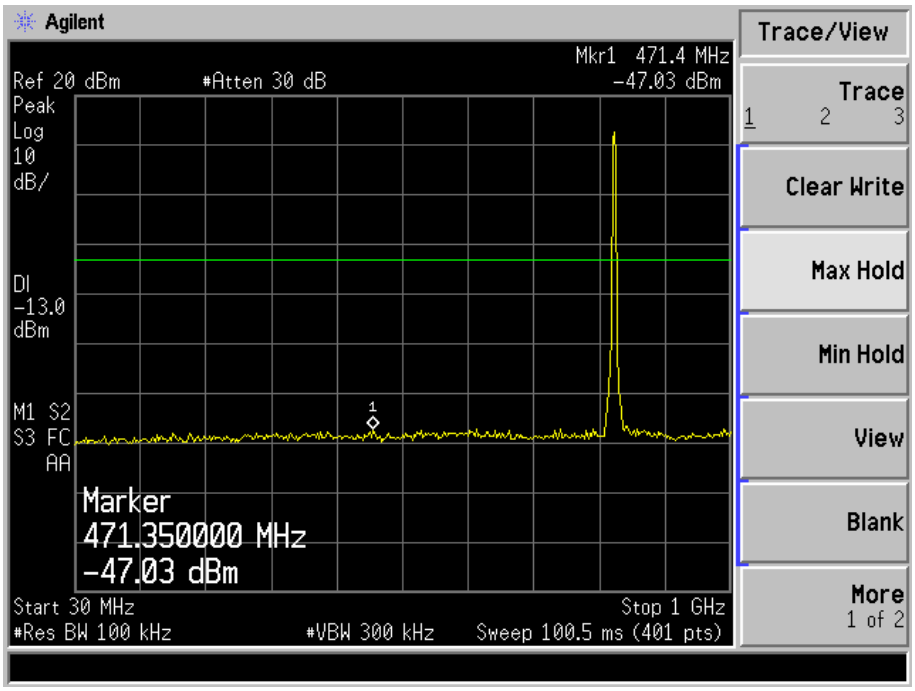
WCDMA Low Band Spurious Emission



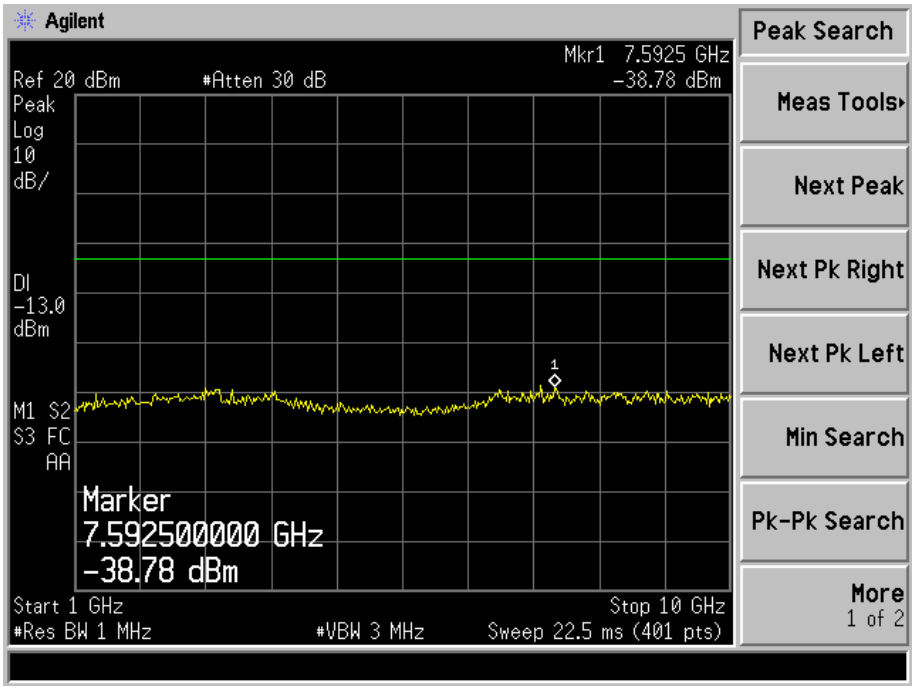

WCDMA High Band Spurious Emission



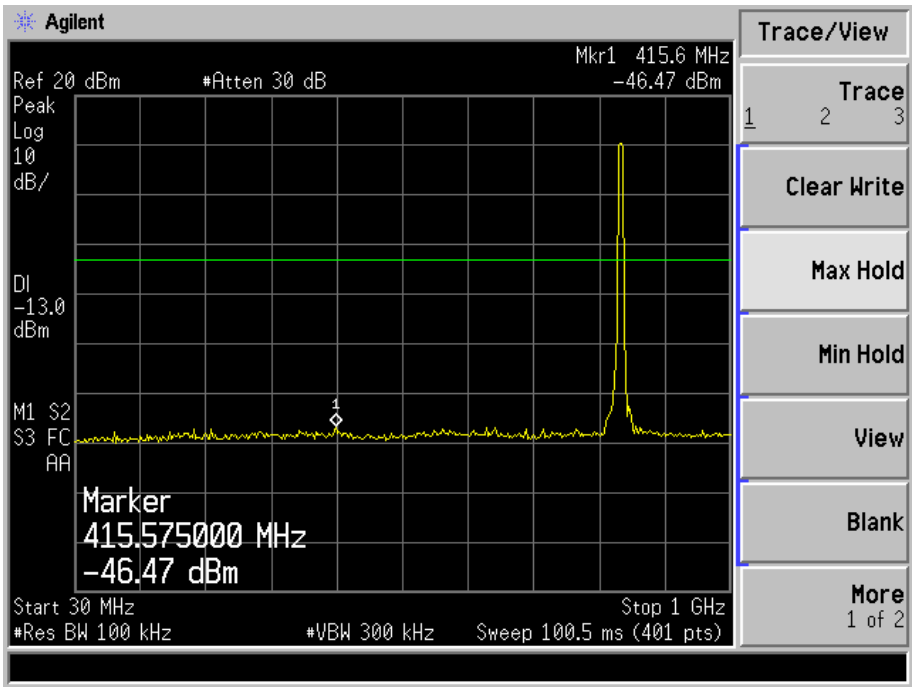
HSDPA Low Channel
30MHz to 1GHz



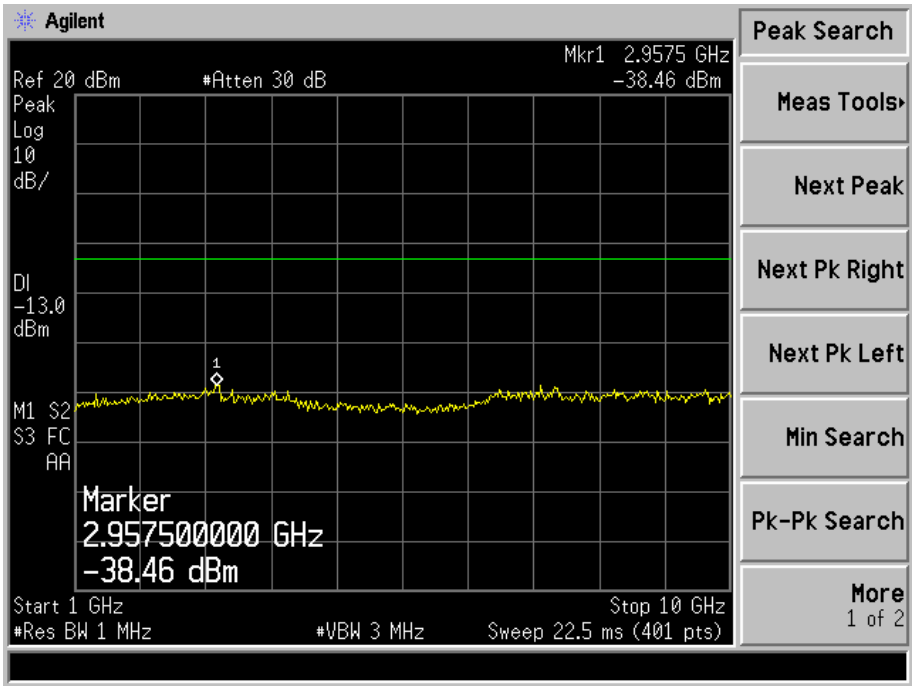

Above 1GHz



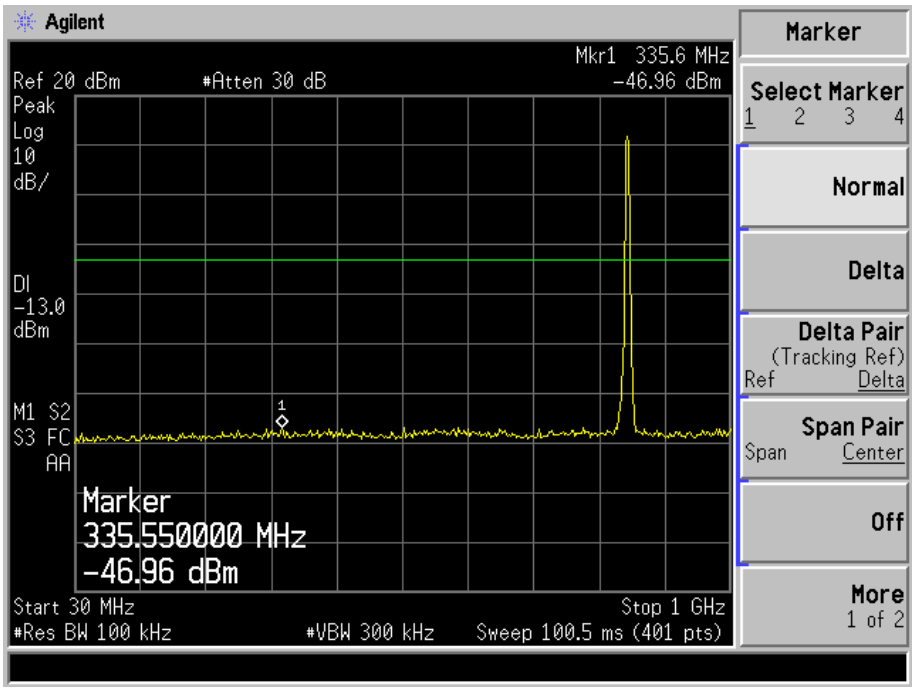
HSDPA Middle Channel
30MHz to 1GHz



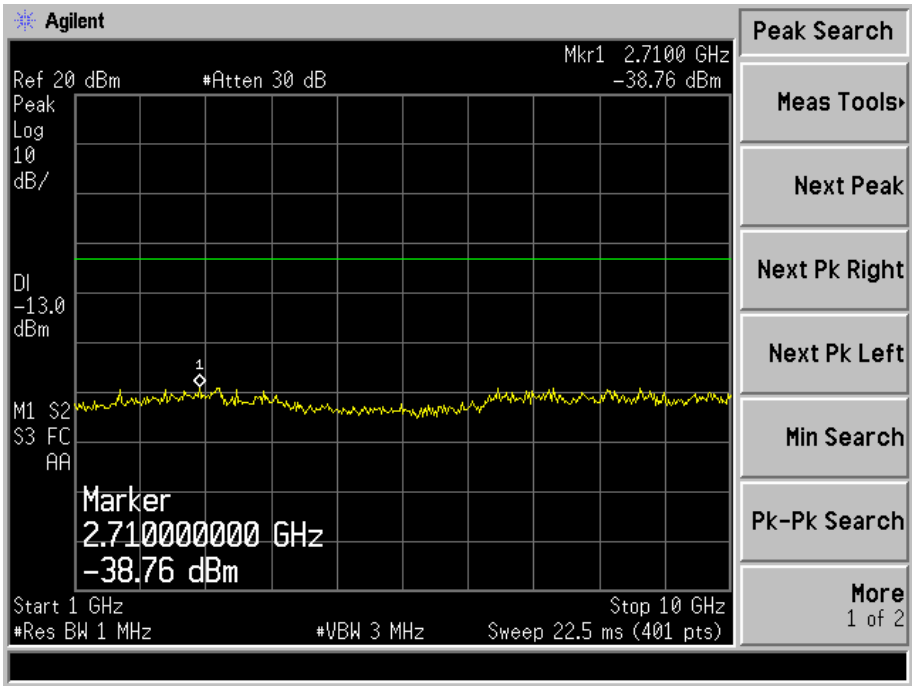

Above 1GHz



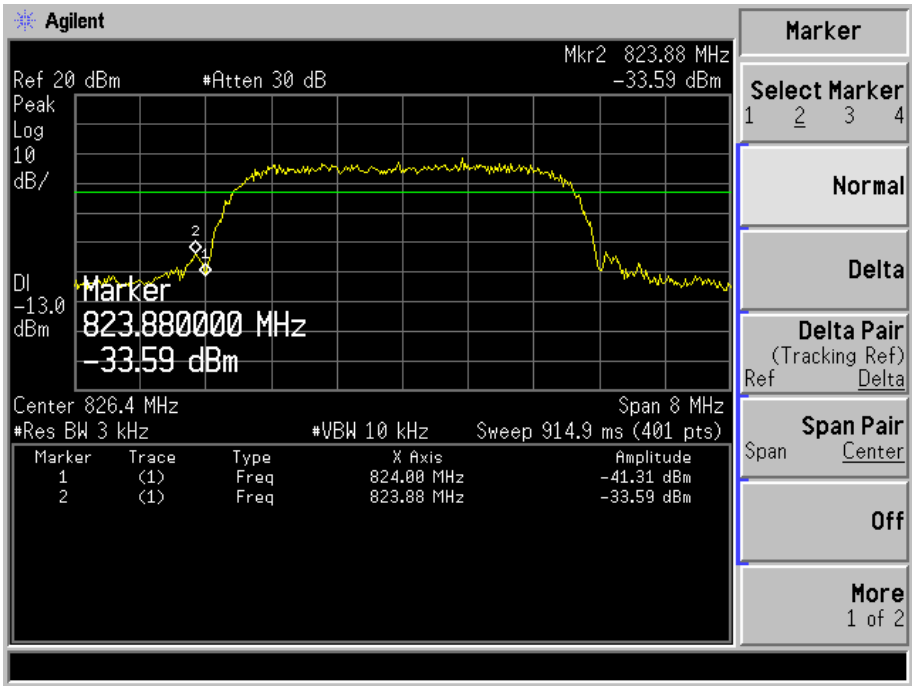
HSDPA High Channel
30MHz to 1GHz



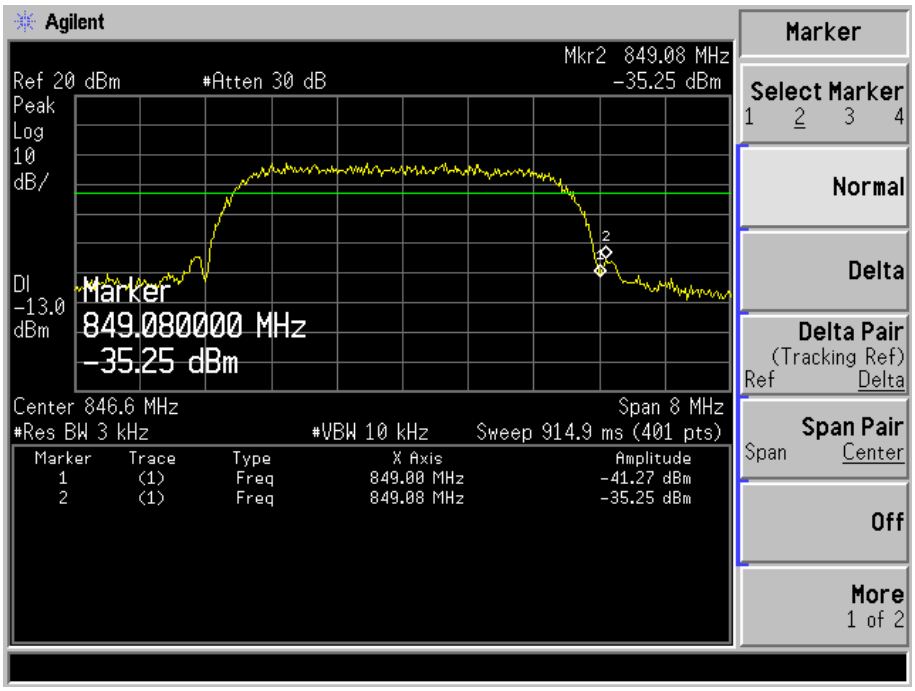

Above 1GHz



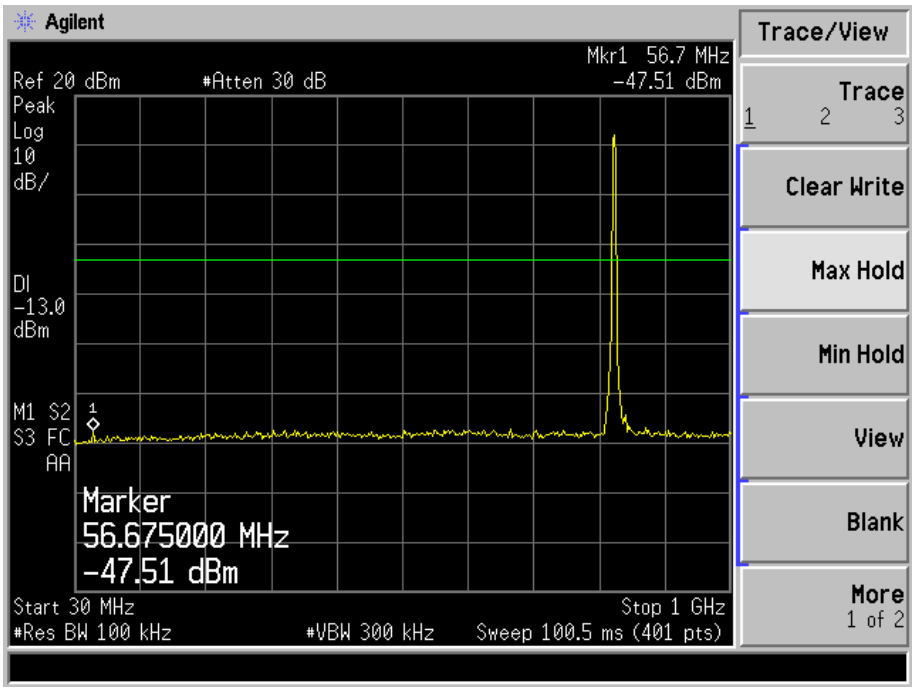
HSDPA Low Band Spurious Emission



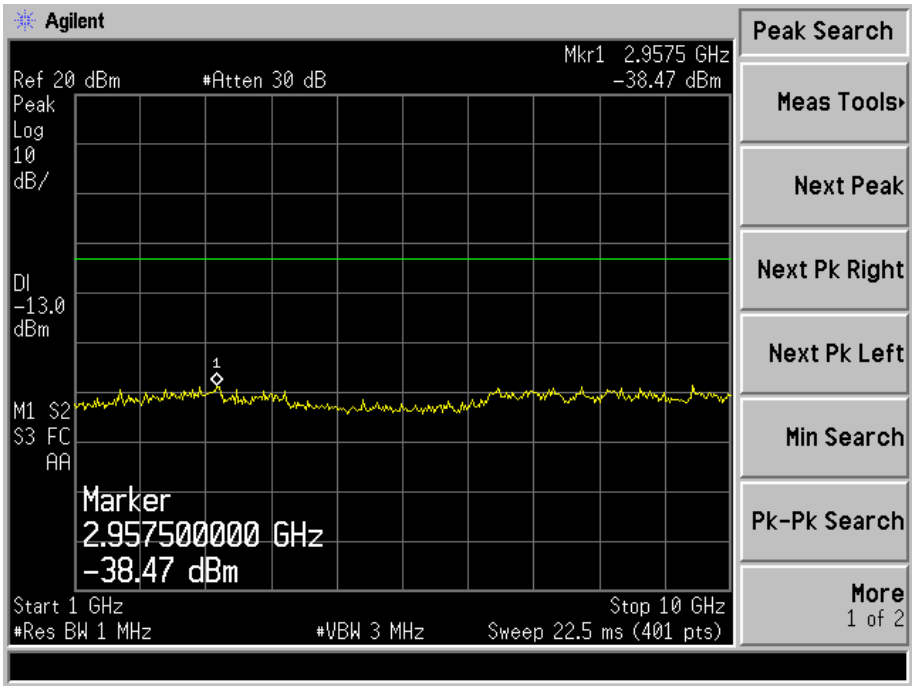

HSDPA High Band Spurious Emission



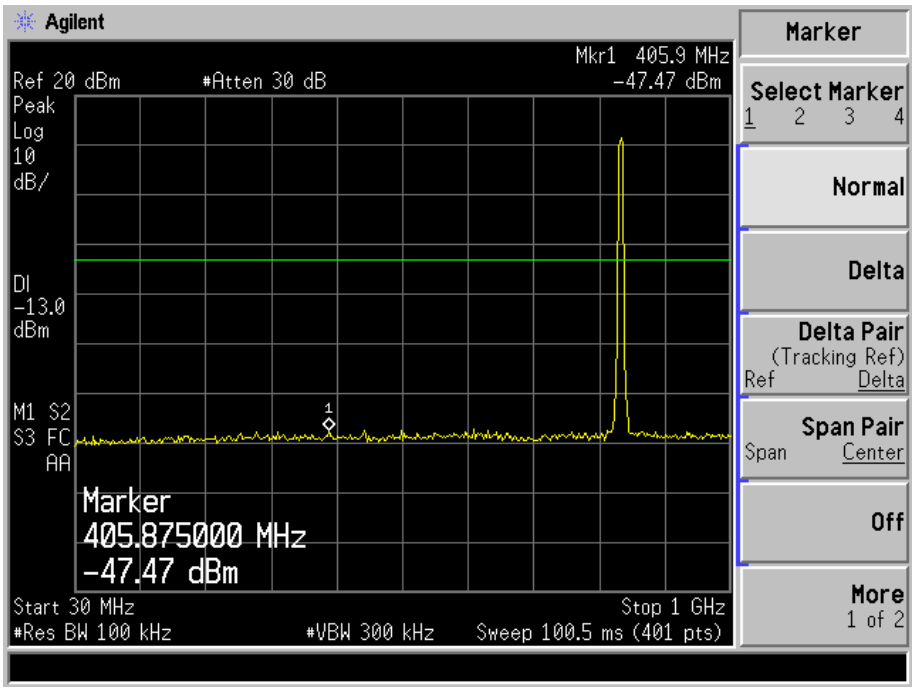
HSUPA Low Channel
30MHz to 1GHz



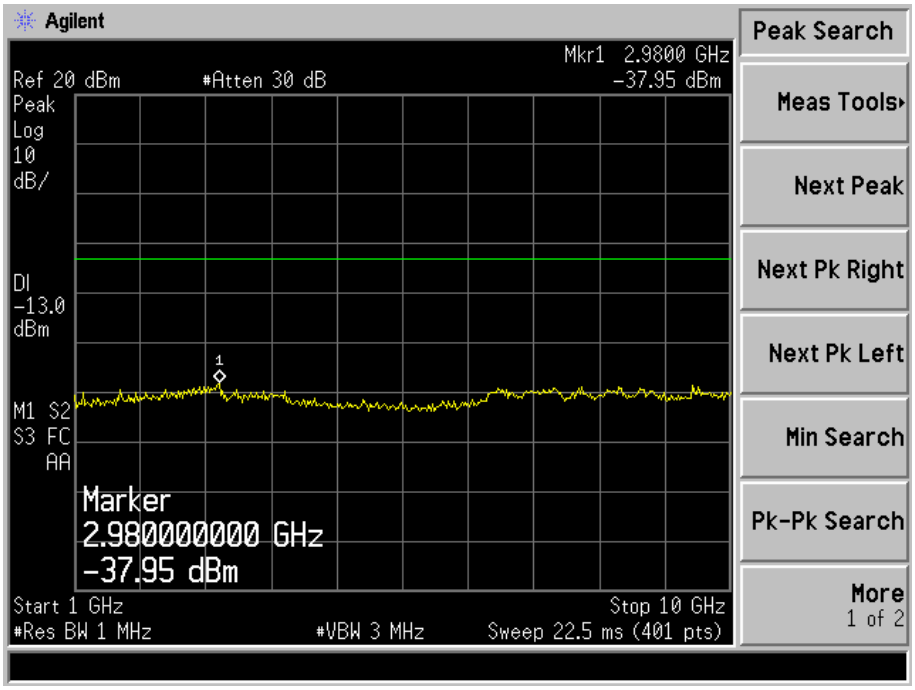

Above 1GHz



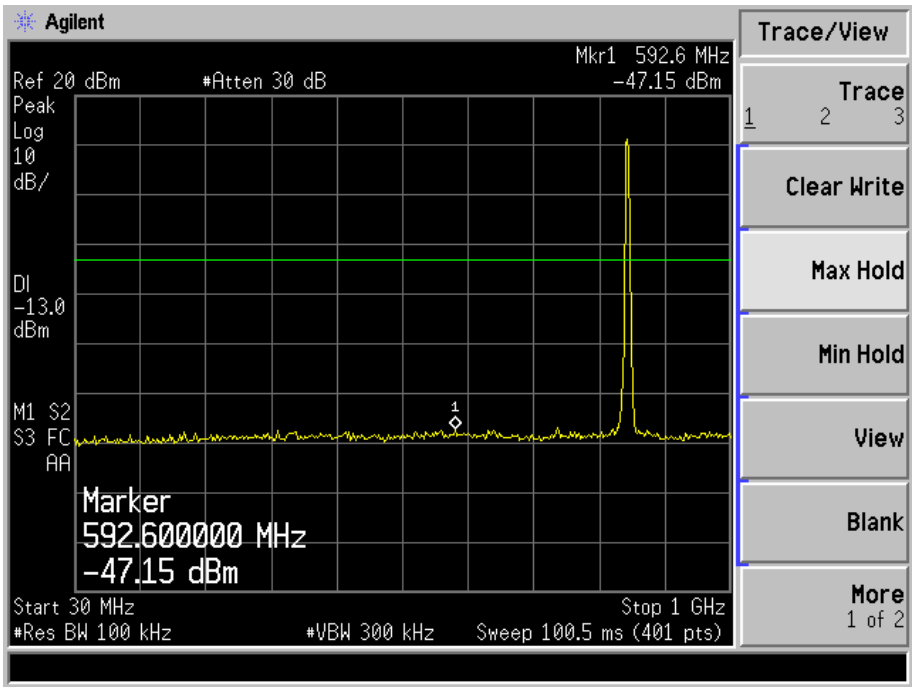
HSUPA Middle Channel
30MHz to 1GHz



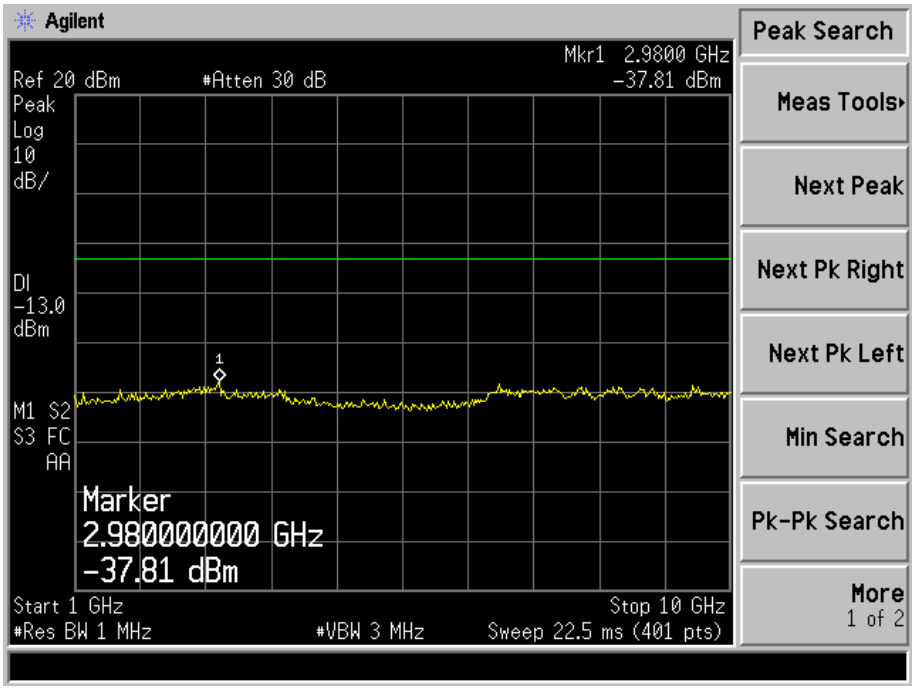

Above 1GHz



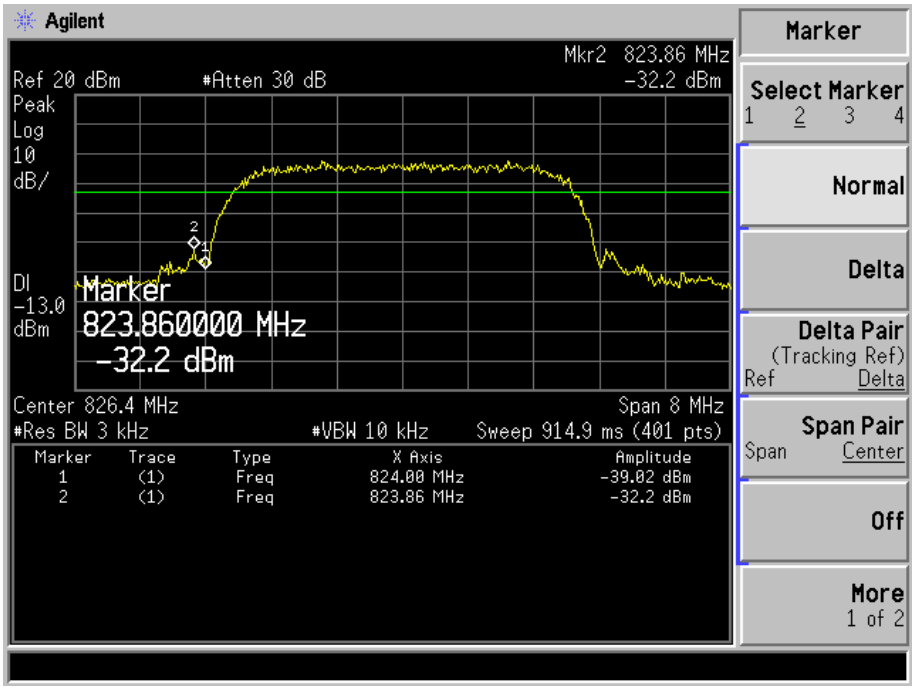
HSUPA High Channel
30MHz to 1GHz



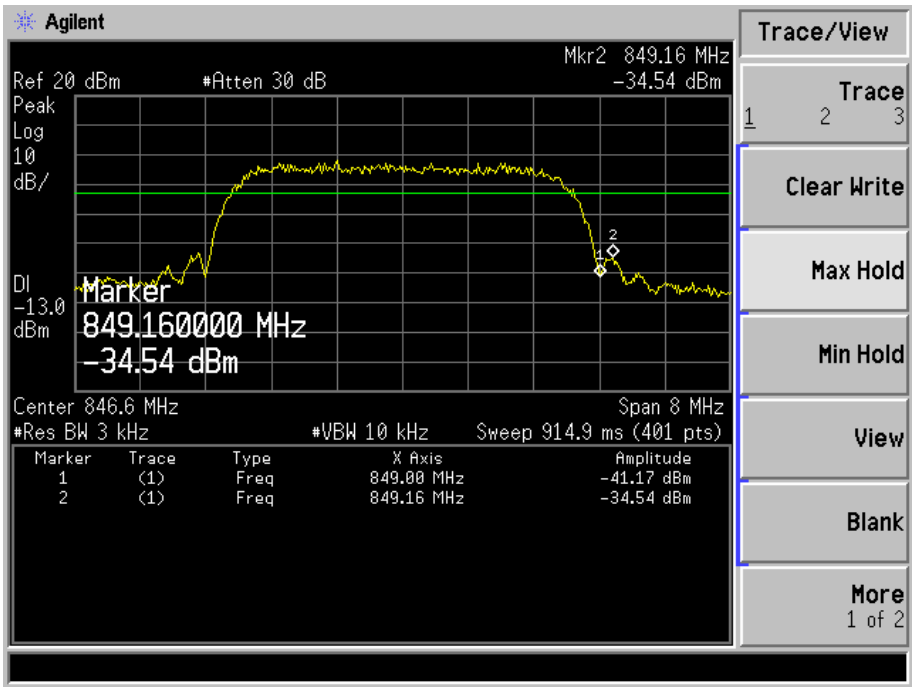

Above 1GHz



HSUPA Low Band Spurious Emission



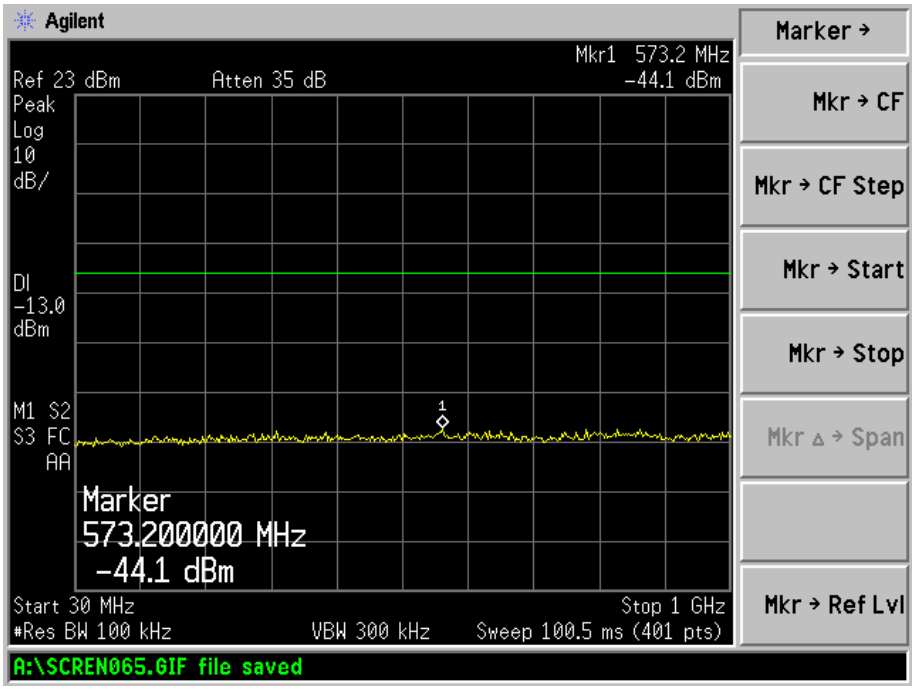

HSUPA High Band Spurious Emission



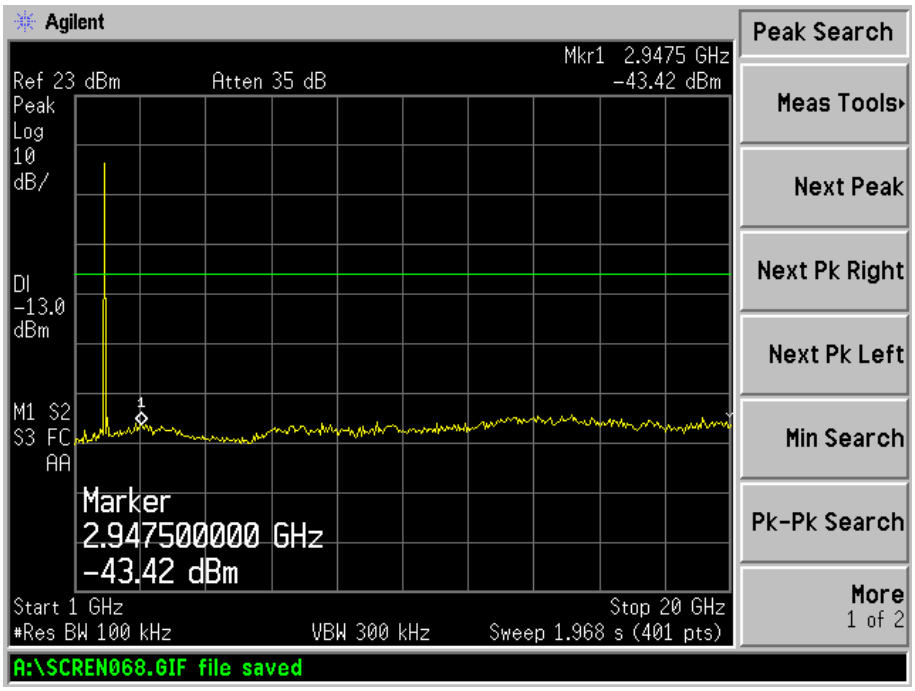
**For Band II**

WCDMA Low Channel

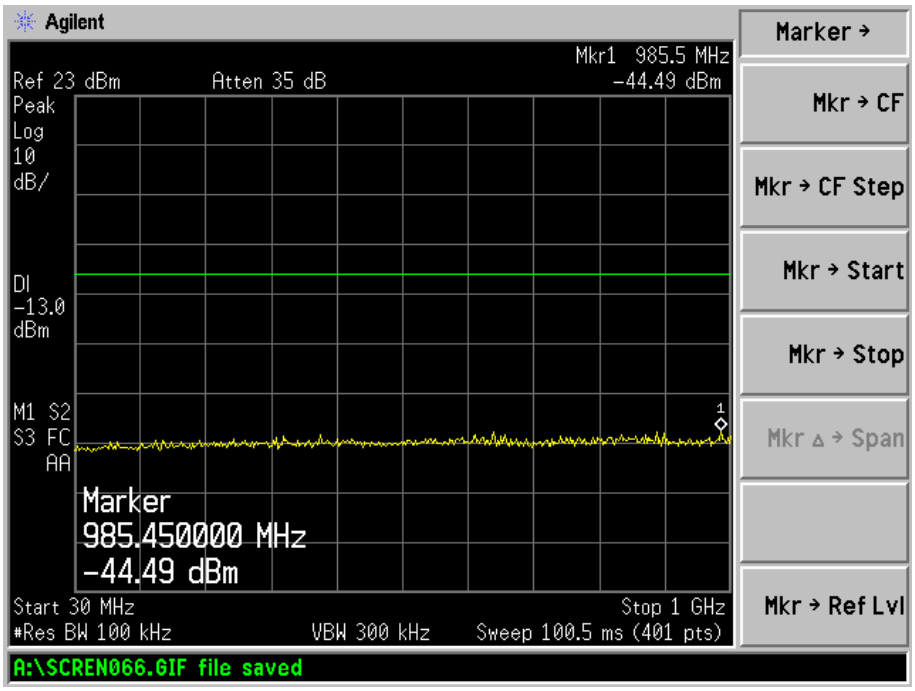
30MHz to 1GHz



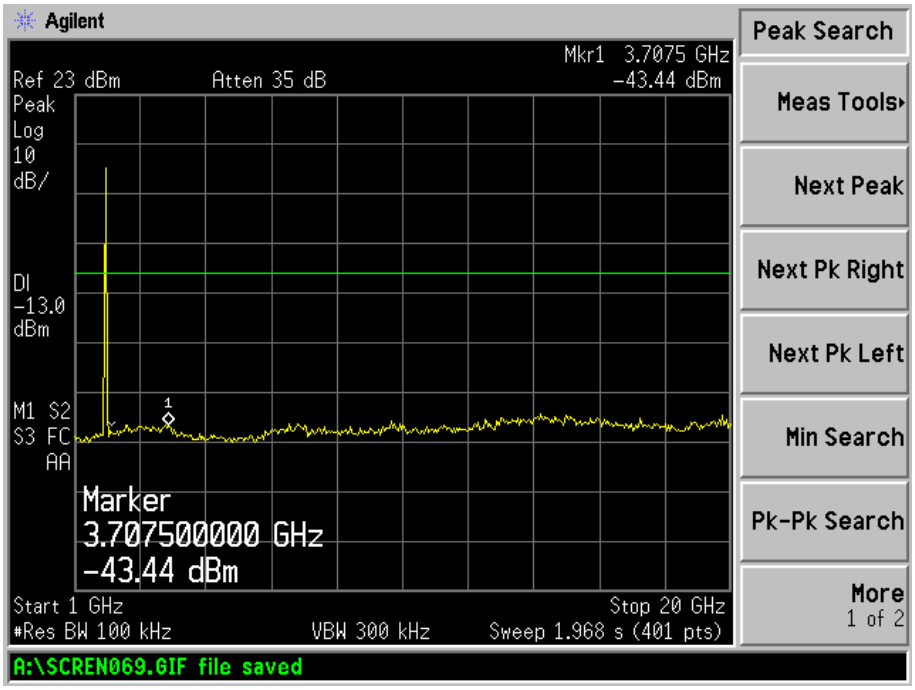

Above 1GHz



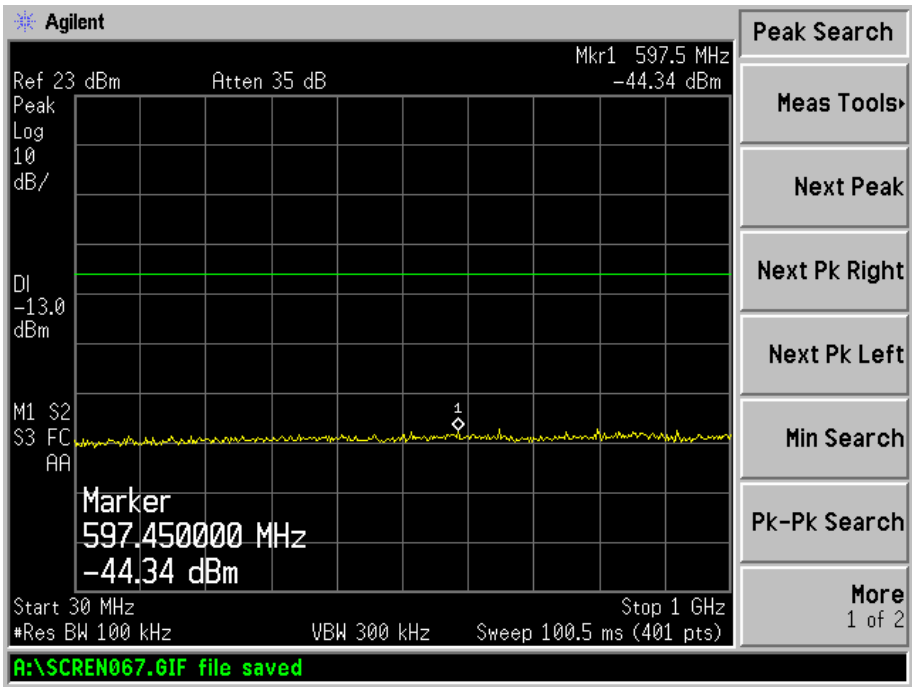
WCDMA Middle Channel
30MHz to 1GHz



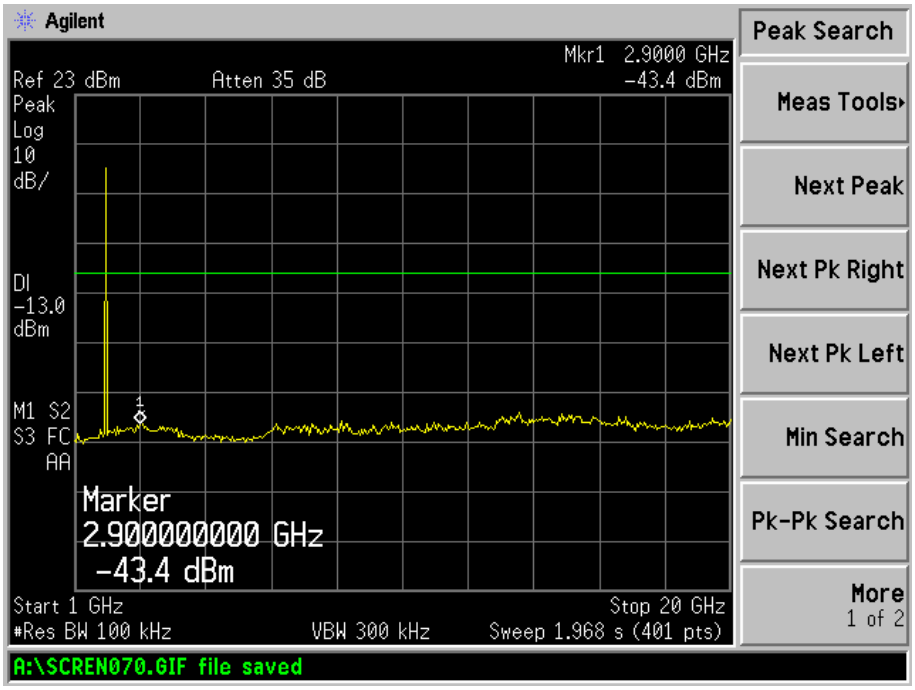

Above 1GHz



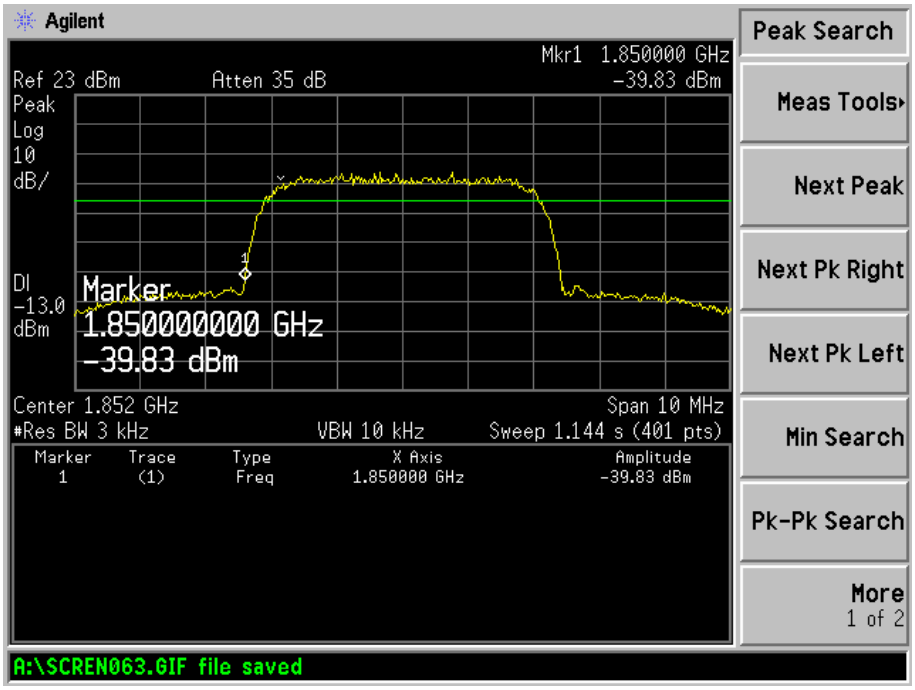
WCDMA High Channel
30MHz to 1GHz



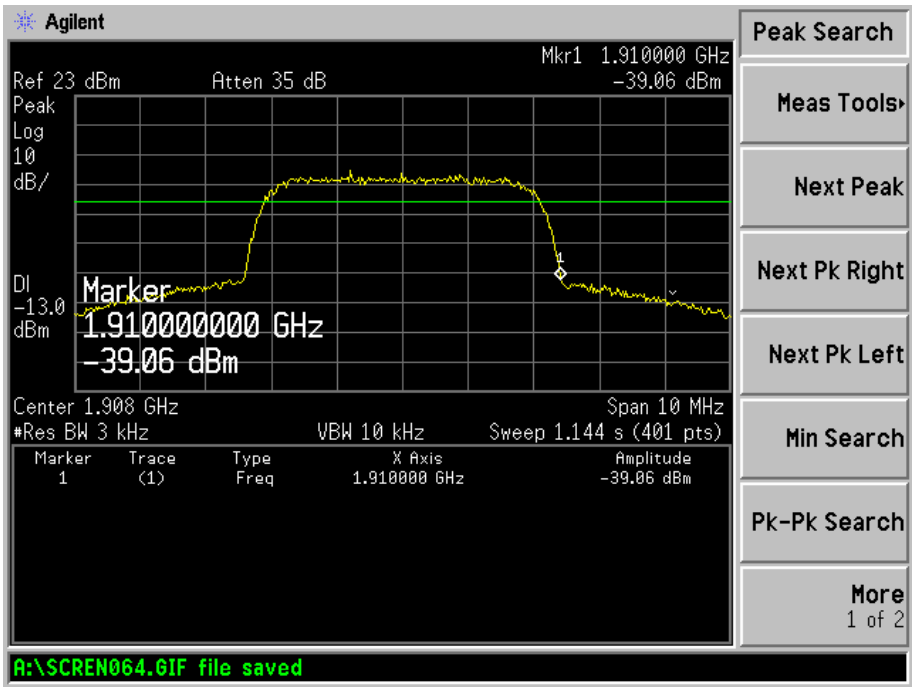

Above 1GHz



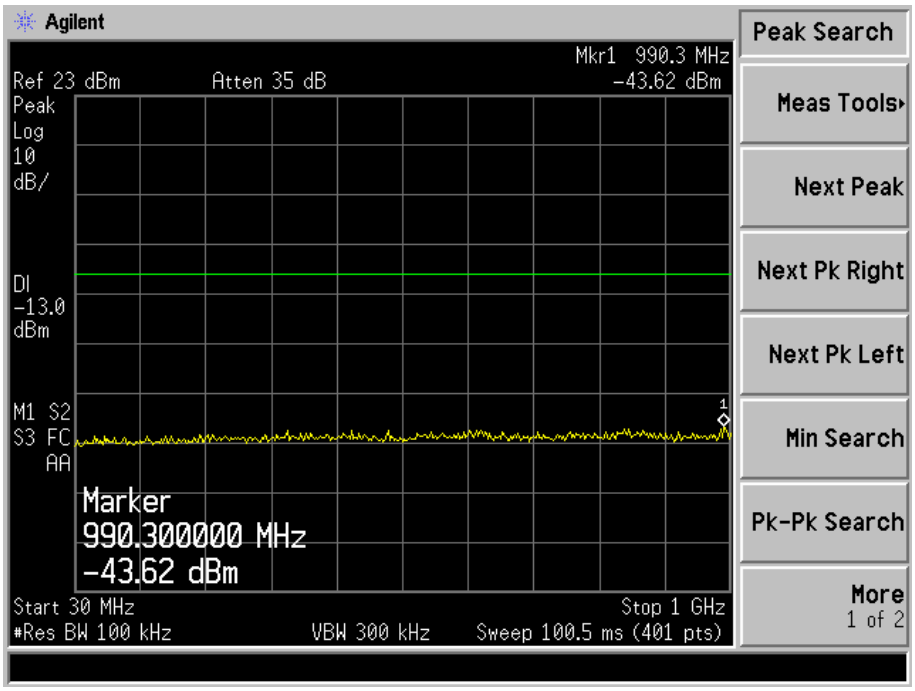
WCDMA Low Band Spurious Emission



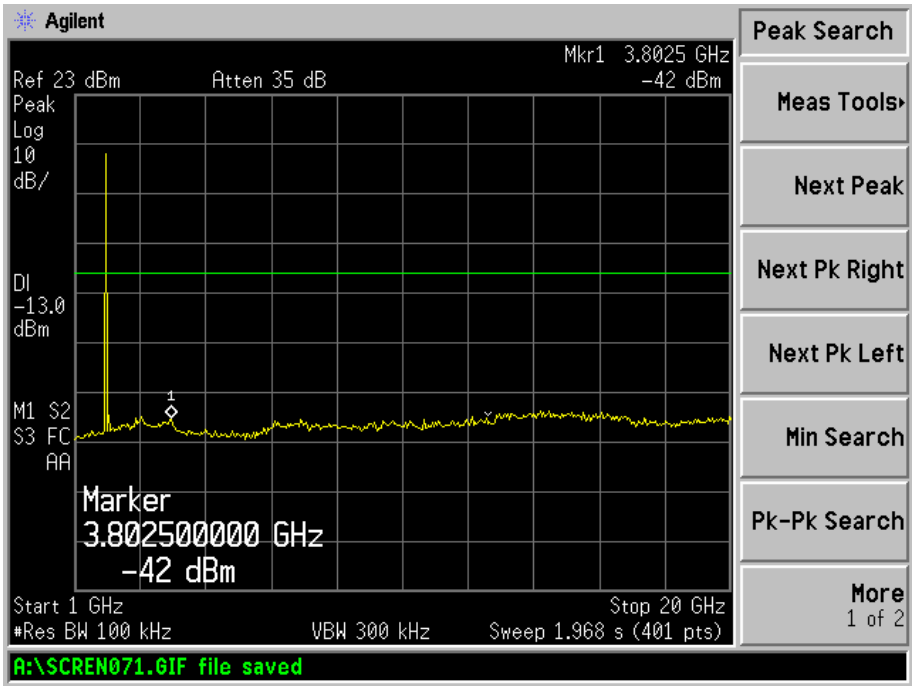

WCDMA High Band Spurious Emission



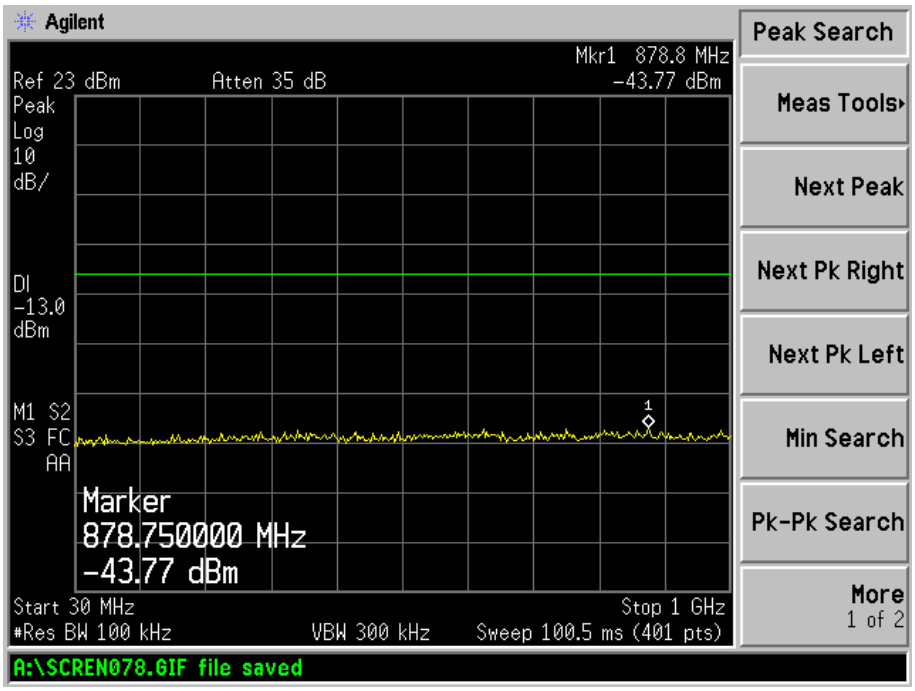
HSDPA Low Channel
30MHz to 1GHz



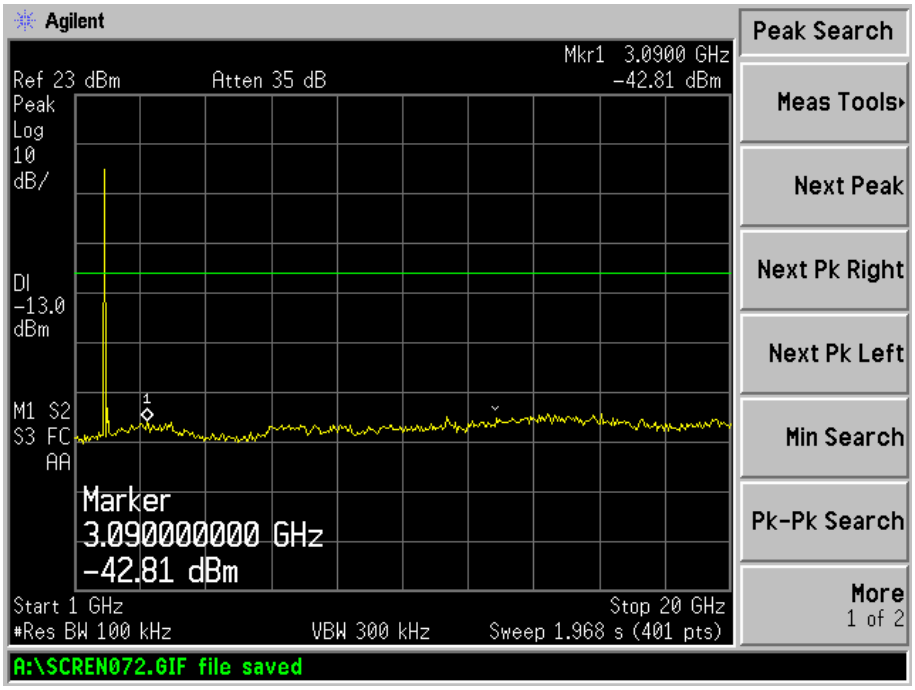

Above 1GHz



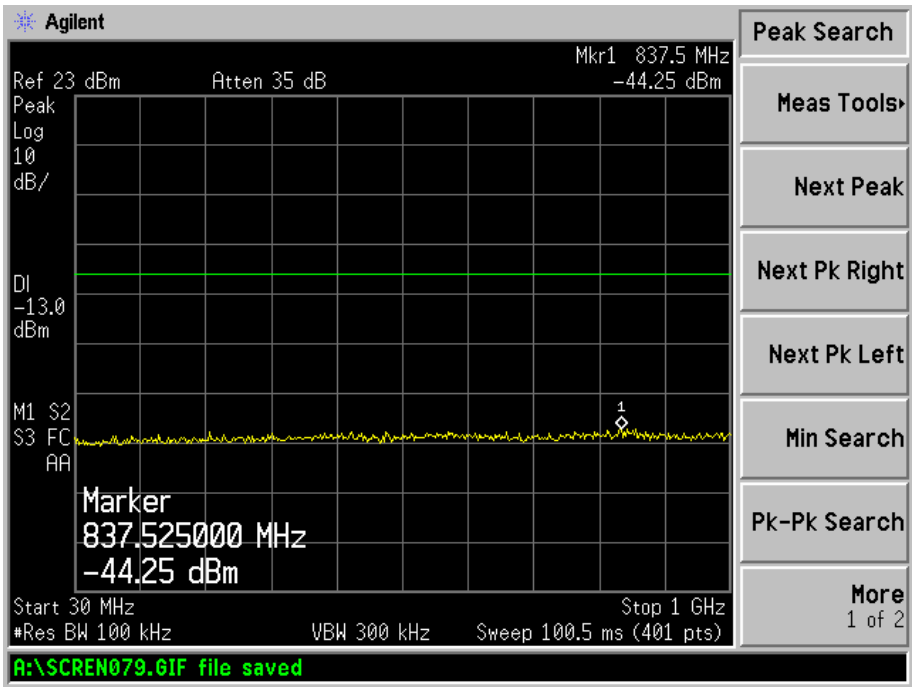
HSDPA Middle Channel
30MHz to 1GHz



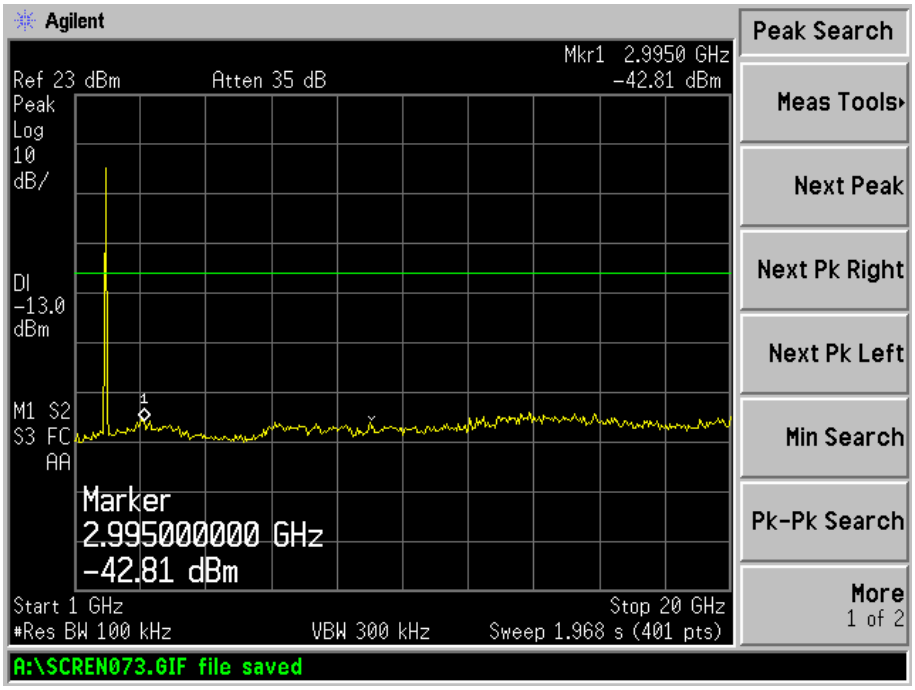

Above 1GHz



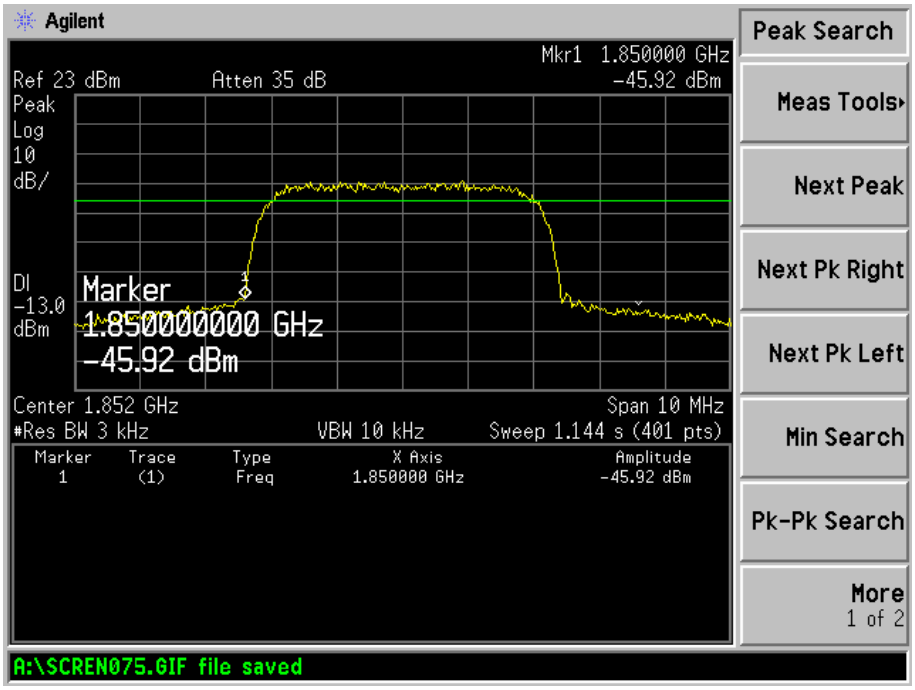
HSDPA High Channel
30MHz to 1GHz



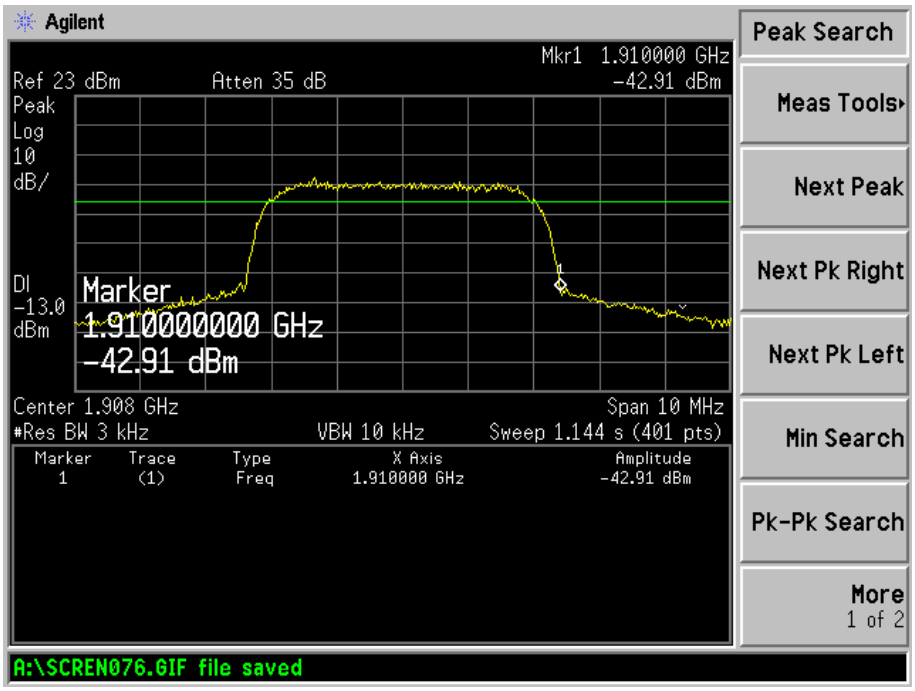

Above 1GHz



HSDPA Low Band Spurious Emission




HSDPA High Band Spurious Emission



# 8. Spurious Radiated Emissions

## 8.1 Standard Applicable

According to §22.917(a), the power of any emissions 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.

According to §24.238(a), the power of any emissions 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.

## 8.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious attenuation limit in dB =43+10 $Log_{10}$ (power out in Watts)

## 8.3 Environmental Conditions

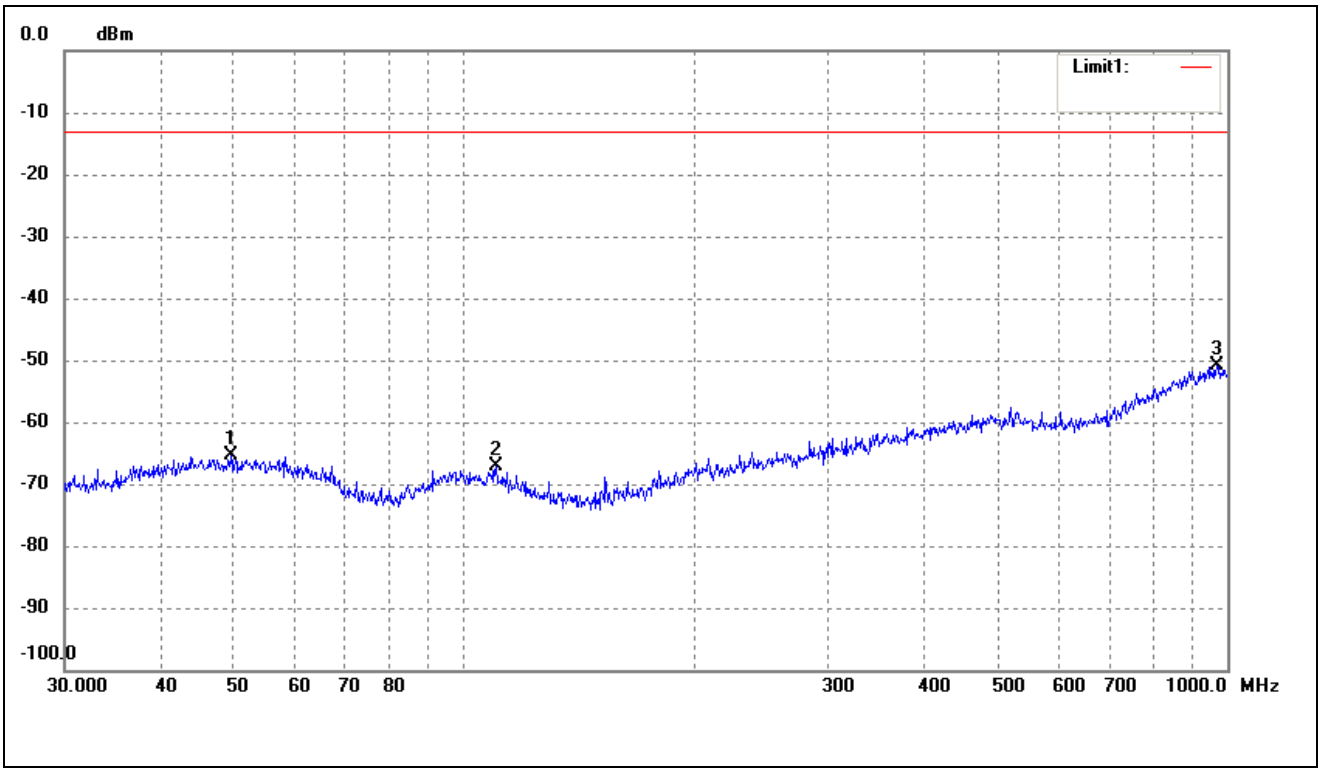
| | |
|---|---|
| Temperature: | 25 °C |
| Relative Humidity: | 52% |
| ATM Pressure: | 1012 mbar |

## 8.4 Summary of Test Results/Plots

According to the data below, the FCC Part 22.917 and 24.238 standards, and had the worst margin of:

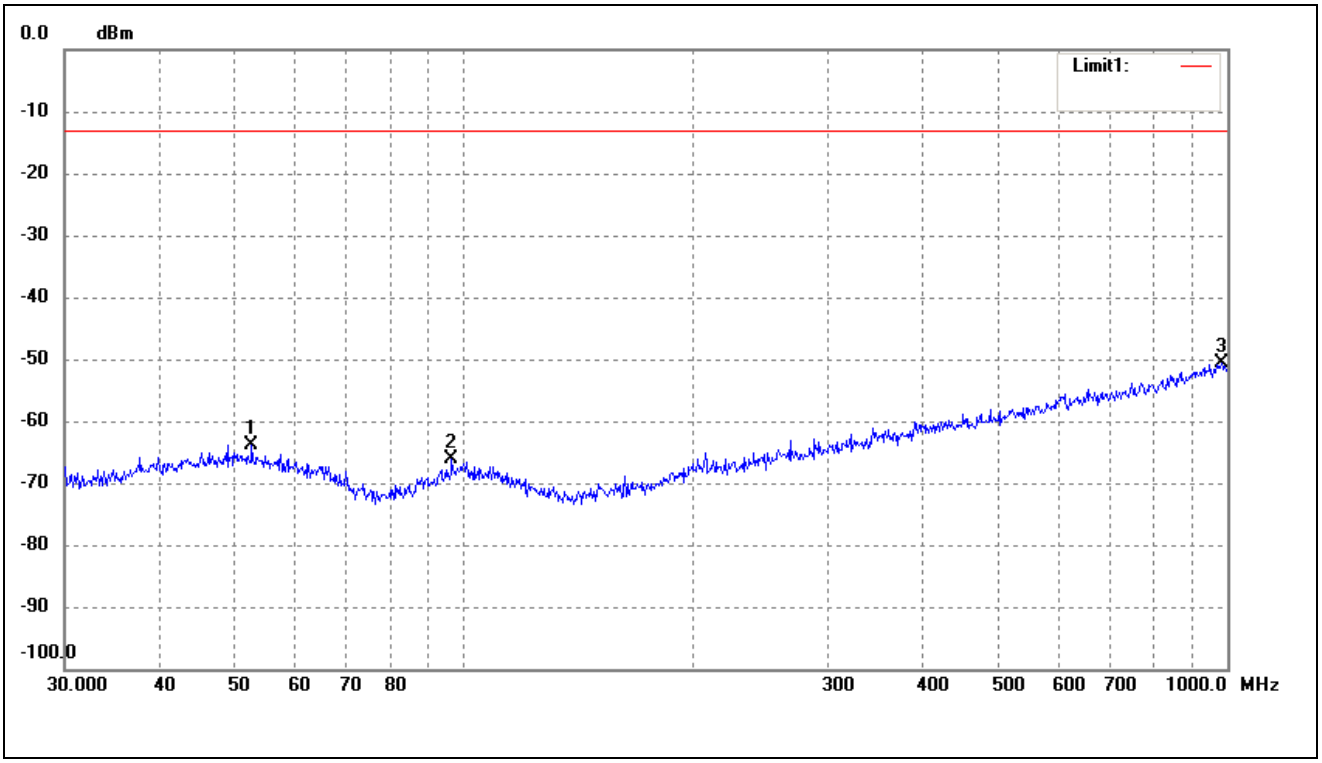
*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

*Spurious Emission From 30MHz to 1GHz*
*For Cellular Band_ GSM850 Mode*
*Horizontal:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 49.5328 | -69.71 | 4.35 | -65.36 | -13.00 | -52.36 | ERP |
| 2 | 110.1816 | -69.27 | 2.17 | -67.10 | -13.00 | -54.10 | ERP |
| 3 | 968.9338 | -68.86 | 18.01 | -50.85 | -13.00 | -37.85 | ERP |

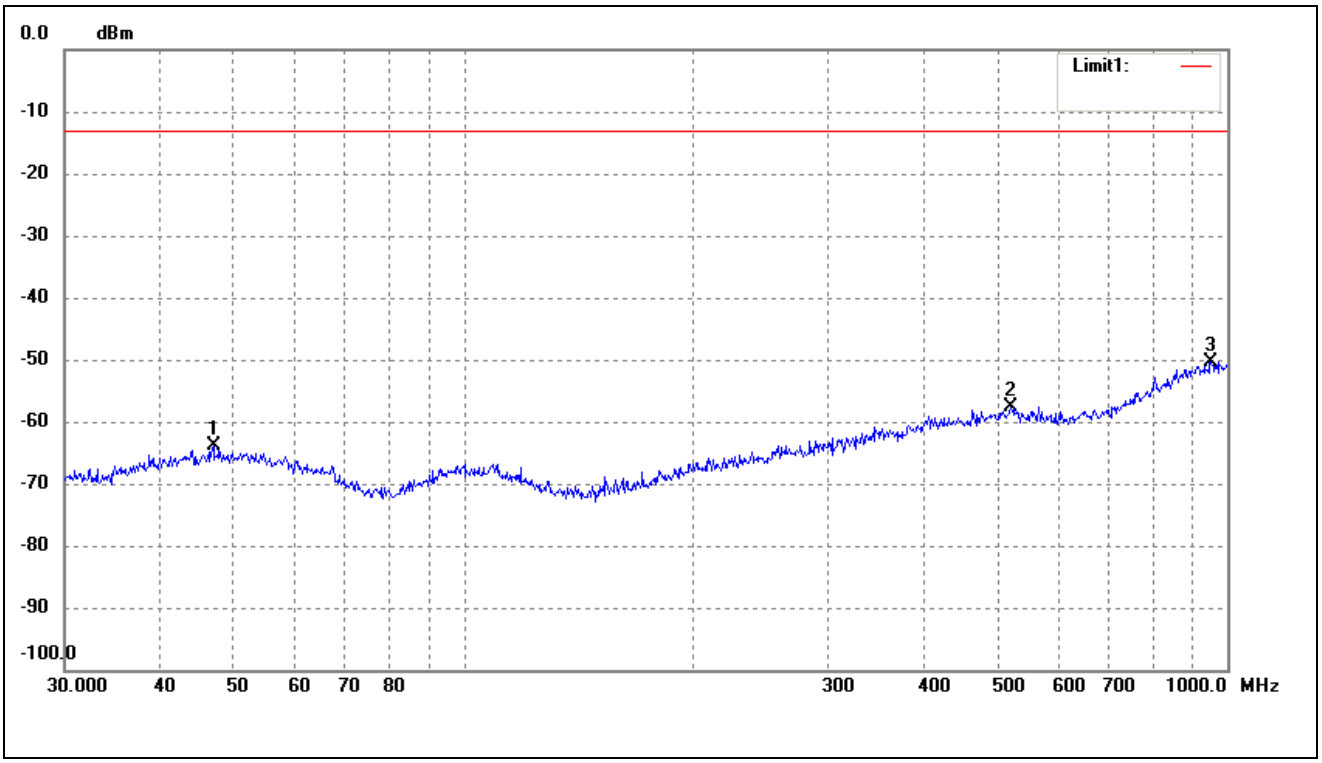
*Vertical:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 52.7600 | -67.91 | 4.07 | -63.84 | -13.00 | -50.84 | ERP |
| 2 | 96.4362 | -67.90 | 1.81 | -66.09 | -13.00 | -53.09 | ERP |
| 3 | 982.6200 | -68.92 | 18.22 | -50.70 | -13.00 | -37.70 | ERP |

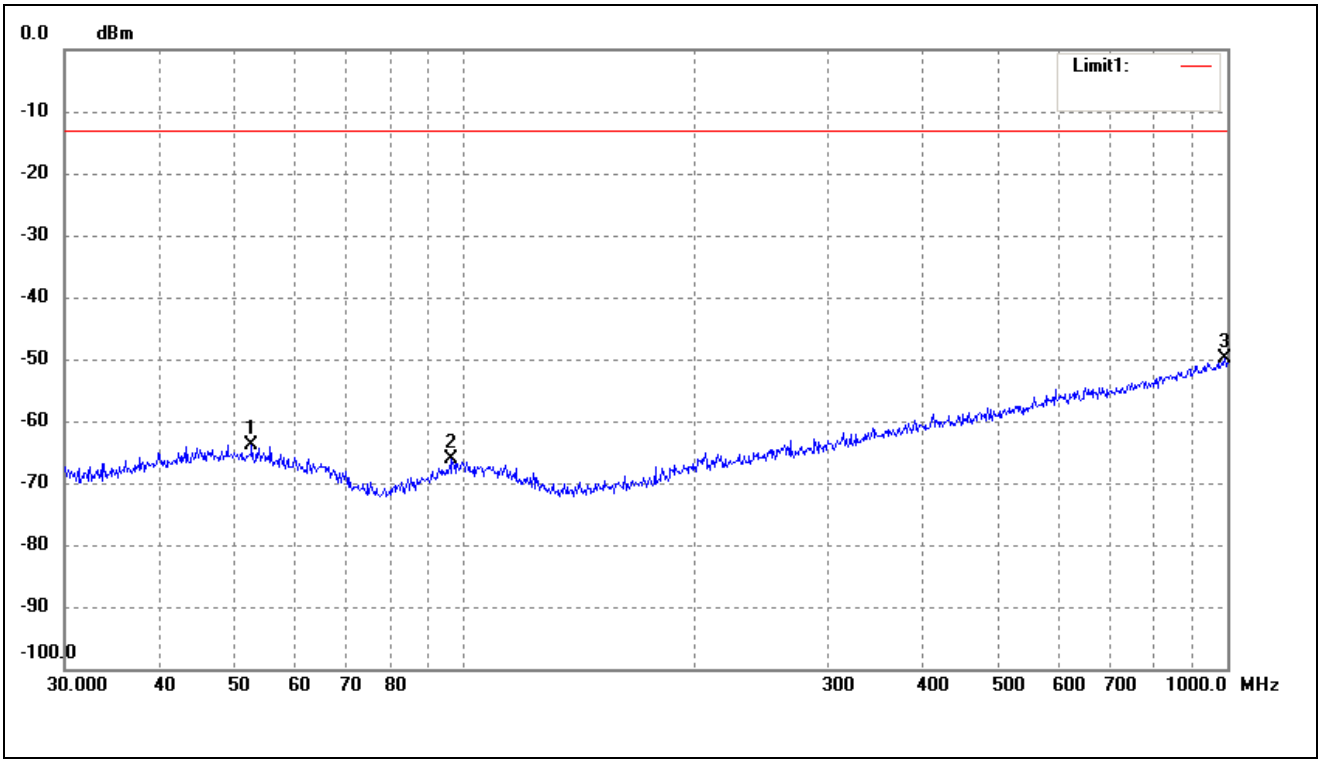
*For Cellular Band_ GSM1900 Mode*

*Horizontal:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 46.9948 | -68.28 | 4.35 | -63.93 | -13.00 | -50.93 | ERP |
| 2 | 520.8882 | -68.29 | 10.57 | -57.72 | -13.00 | -44.72 | ERP |
| 3 | 952.0937 | -68.14 | 17.76 | -50.38 | -13.00 | -37.38 | ERP |

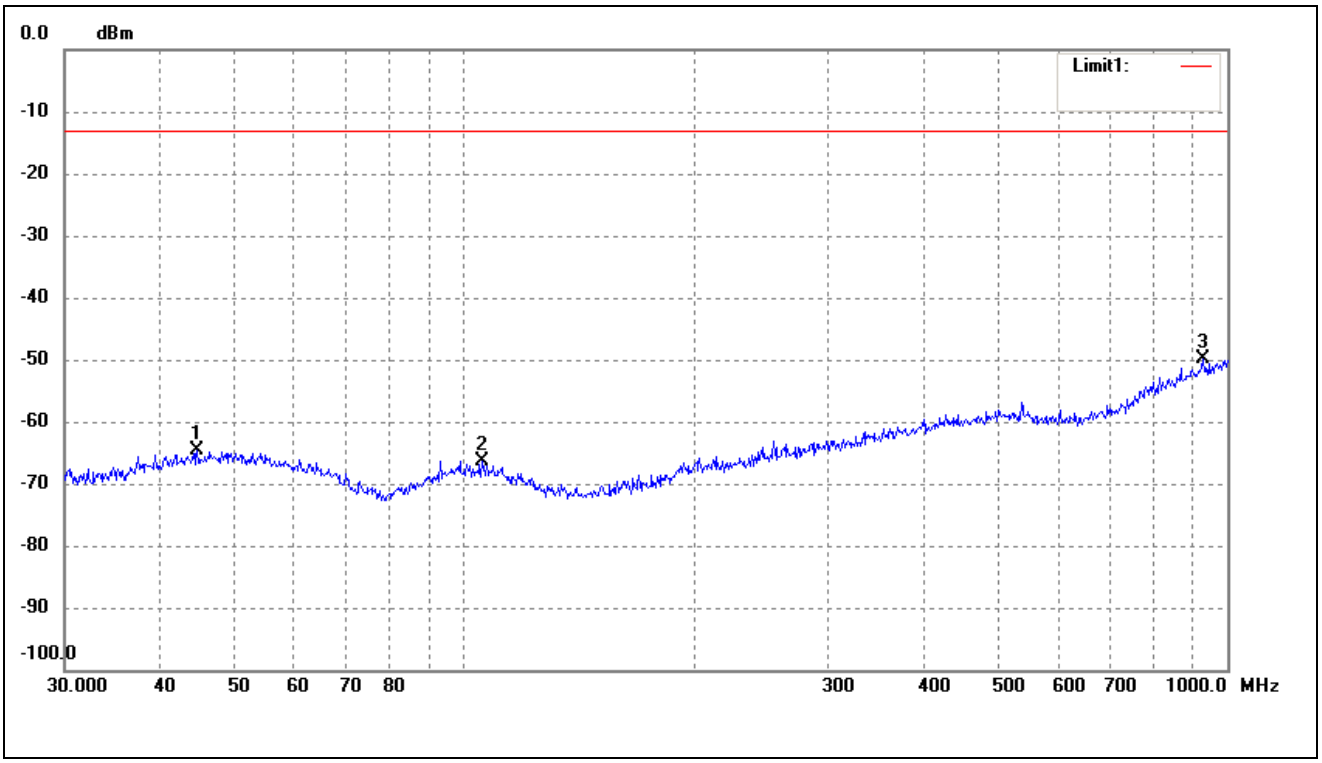
*Vertical:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 52.7600 | -67.91 | 4.07 | -63.84 | -13.00 | -50.84 | ERP |
| 2 | 96.4362 | -67.90 | 1.81 | -66.09 | -13.00 | -53.09 | ERP |
| 3 | 993.0114 | -68.26 | 18.38 | -49.88 | -13.00 | -36.88 | ERP |

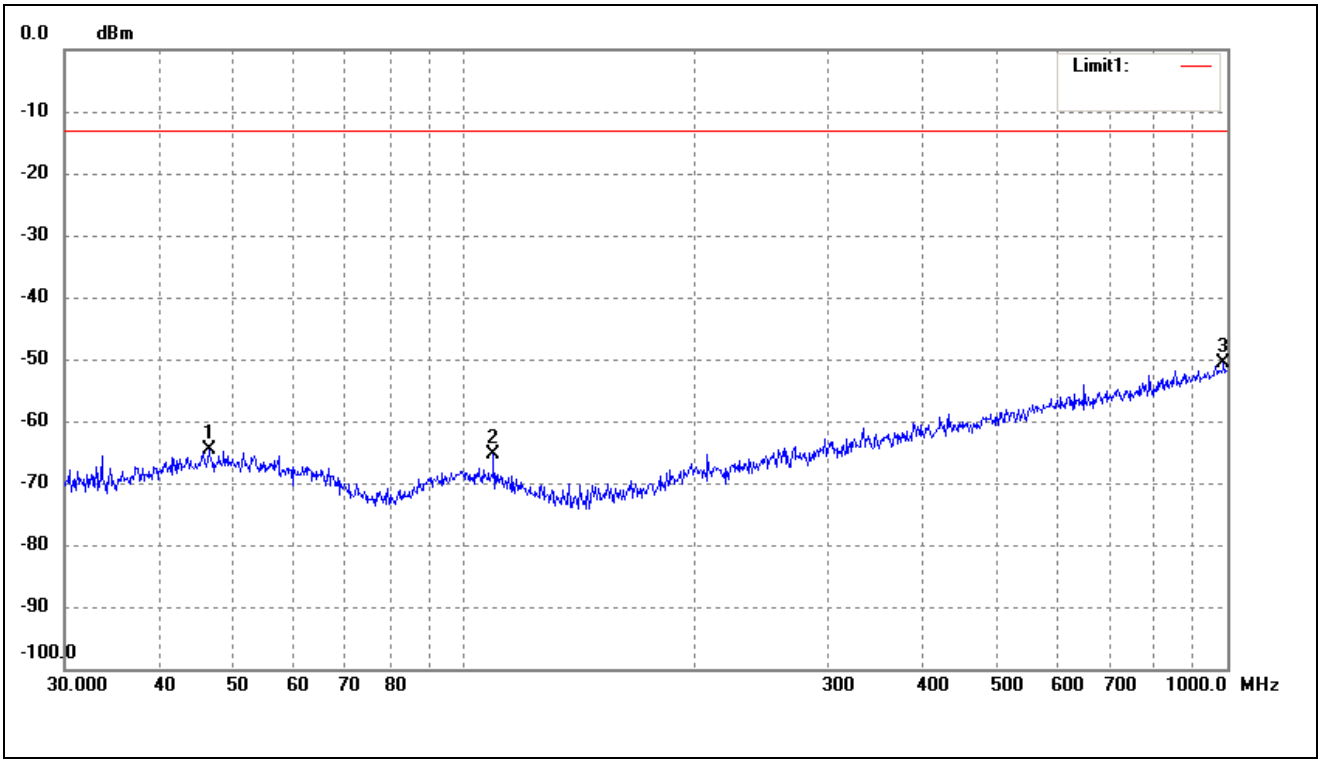
*For band V Mode*

*Horizontal:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 44.7434 | -68.86 | 4.28 | -64.58 | -13.00 | -51.58 | ERP |
| 2 | 105.6415 | -68.50 | 2.22 | -66.28 | -13.00 | -53.28 | ERP |
| 3 | 929.0082 | -67.31 | 17.50 | -49.81 | -13.00 | -36.81 | ERP |

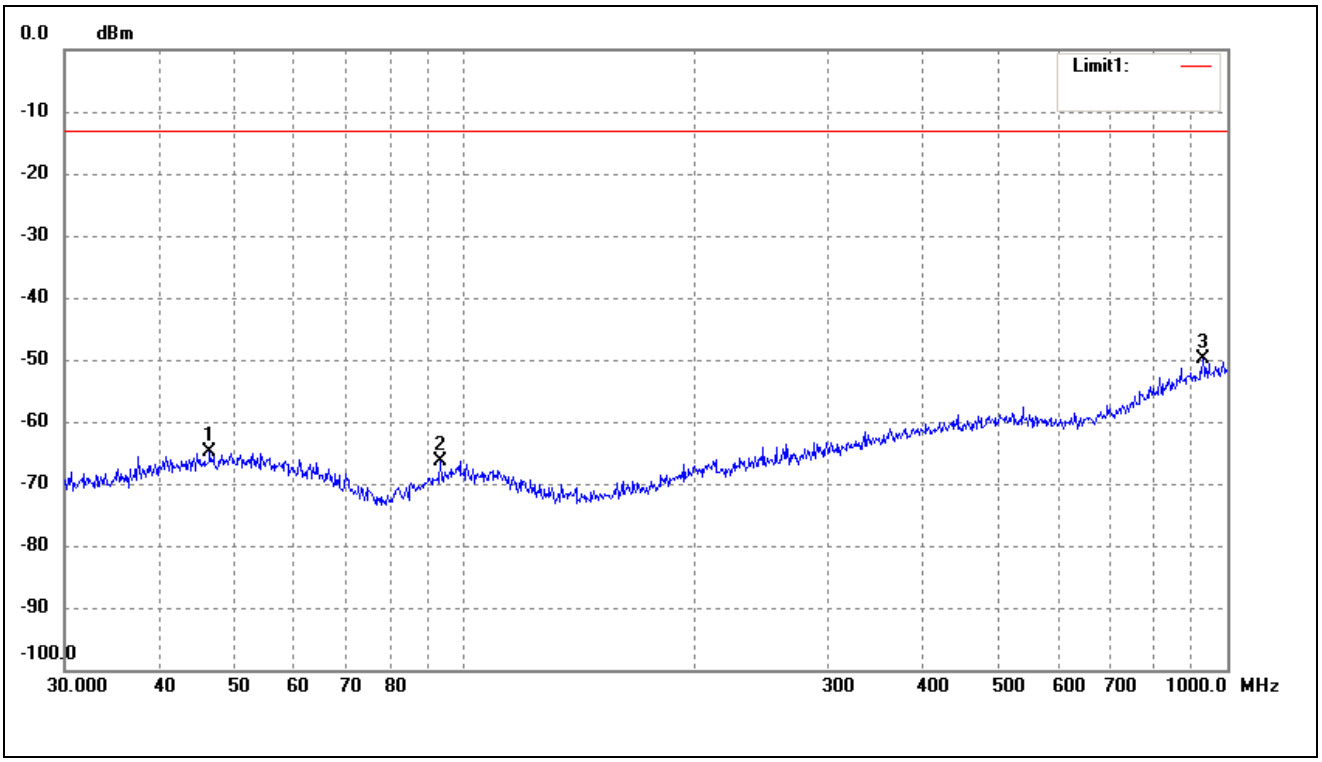
*Vertical:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 46.3402 | -69.04 | 4.34 | -64.70 | -13.00 | -51.70 | ERP |
| 2 | 109.4116 | -67.57 | 2.21 | -65.36 | -13.00 | -52.36 | ERP |
| 3 | 989.5355 | -68.85 | 18.32 | -50.53 | -13.00 | -37.53 | ERP |

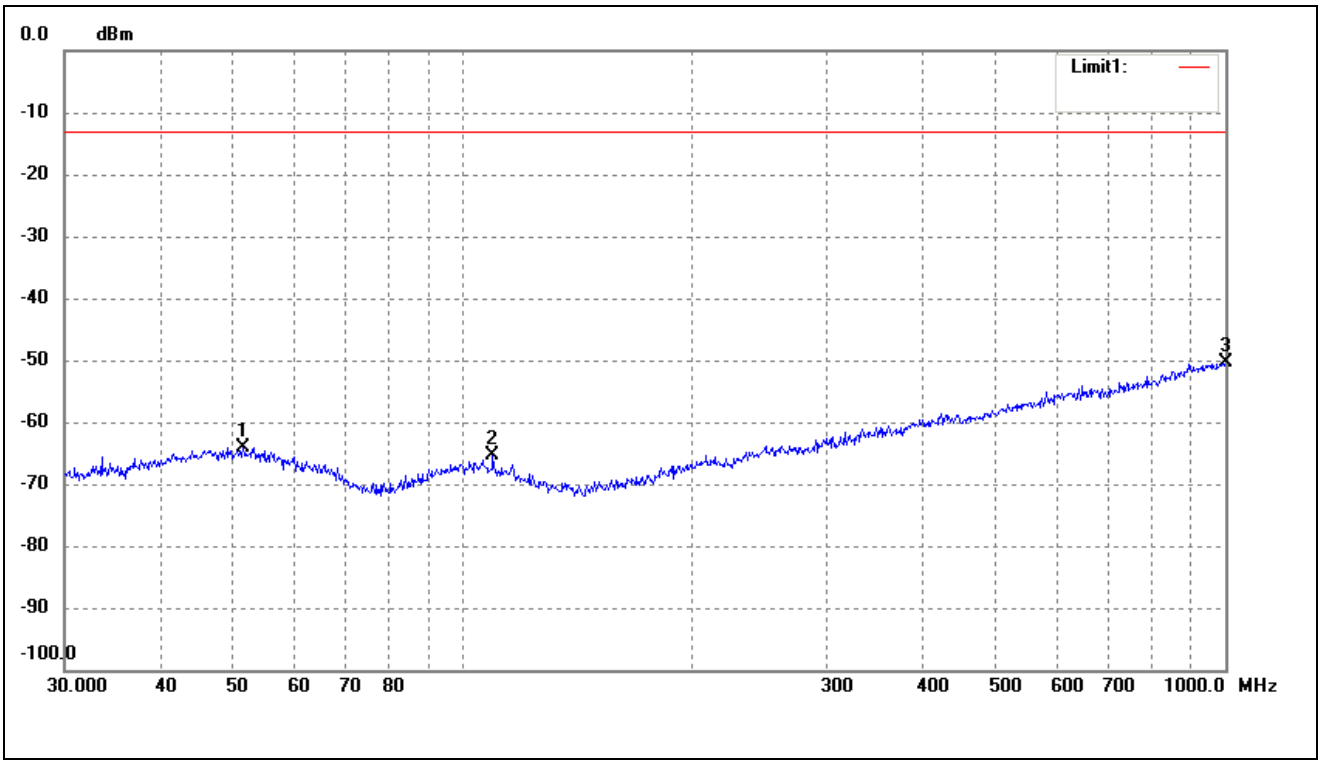
*For band II Mode*

*Horizontal:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 46.5030 | -69.18 | 4.34 | -64.84 | -13.00 | -51.84 | ERP |
| 2 | 93.1132 | -67.56 | 1.23 | -66.33 | -13.00 | -53.33 | ERP |
| 3 | 929.0082 | -67.31 | 17.50 | -49.81 | -13.00 | -36.81 | ERP |

*Vertical:*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | |
| 1 | 51.4807 | -68.27 | 4.21 | -64.06 | -13.00 | -51.06 | ERP |
| 2 | 109.4116 | -67.57 | 2.21 | -65.36 | -13.00 | -52.36 | ERP |
| 3 | 1000.0000 | -68.87 | 18.48 | -50.39 | -13.00 | -37.39 | ERP |

*Note: Margin= (Reading+ Correct)- Limit*

*Spurious Emissions Above 1GHz*

*For Cellular Band_GSM850 Mode*

| Frequency | Reading | Correct | Result | Limit | Margin | Polar |
|---|---|---|---|---|---|---|
| (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | H/V |
| Low Channel (824.2MHz) | | | | | | |
| 1648.4 | -55.45 | 4.94 | -50.51 | -13 | -37.51 | H |
| 2472.6 | -52.73 | 8.46 | -44.27 | -13 | -31.27 | H |
| 1648.4 | -42.73 | 4.94 | -37.79 | -13 | -24.79 | V |
| 2472.6 | -50.91 | 8.46 | -42.45 | -13 | -29.45 | V |
| Middle Channel (836.4MHz) | | | | | | |
| 1673.2 | -44.55 | 5.11 | -39.44 | -13 | -26.44 | H |
| 2509.8 | -45.45 | 8.54 | -36.91 | -13 | -23.91 | H |
| 1673.2 | -43.64 | 5.11 | -38.53 | -13 | -25.53 | V |
| 2509.8 | -50.00 | 8.54 | -41.46 | -13 | -28.46 | V |
| High Channel (848.8MHz) | | | | | | |
| 1697.6 | -52.73 | 5.29 | -47.44 | -13 | -34.44 | H |
| 2546.4 | -52.73 | 8.59 | -44.14 | -13 | -31.14 | H |
| 1697.6 | -49.09 | 5.29 | -43.80 | -13 | -30.80 | V |
| 2546.4 | -50.91 | 8.59 | -42.32 | -13 | -29.32 | V |

*For PCS Band_GSM1900 Mode*

| Frequency | Reading | Correct | Result | Limit | Margin | Polar |
|---|---|---|---|---|---|---|
| (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | H/V |
| Low Channel (1850.2MHz) | | | | | | |
| 3700.4 | -52.73 | 10.54 | -42.19 | -13 | -29.19 | H |
| 5550.6 | -50.91 | 13.37 | -37.54 | -13 | -24.54 | H |
| 3700.4 | -50.91 | 10.54 | -40.37 | -13 | -27.37 | V |
| 5550.6 | -48.18 | 13.37 | -34.81 | -13 | -21.81 | V |
| Middle Channel (1880MHz) | | | | | | |
| 3760.0 | -50.91 | 10.64 | -40.27 | -13 | -27.27 | H |
| 5640.0 | -44.55 | 13.54 | -31.01 | -13 | -18.01 | H |
| 3760.0 | -43.64 | 10.64 | -33.00 | -13 | -20.00 | V |
| 5640.0 | -46.36 | 13.54 | -32.82 | -13 | -19.82 | V |
| High Channel (1909.8MHz) | | | | | | |
| 3819.6 | -54.55 | 10.74 | -43.81 | -13 | -30.81 | H |
| 5729.4 | -50.00 | 13.71 | -36.29 | -13 | -23.29 | H |
| 3819.6 | -50.00 | 10.74 | -39.26 | -13 | -26.26 | V |
| 5729.4 | -47.27 | 13.71 | -33.56 | -13 | -20.56 | V |

*For Band 5 Mode*

| Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Polar H/V |
|---|---|---|---|---|---|---|
| Low Channel (826.4MHz) | | | | | | |
| 1652.8 | -50.00 | 4.94 | -45.06 | -13 | -32.06 | H |
| 2479.2 | -46.36 | 8.46 | -37.90 | -13 | -24.90 | H |
| 1652.8 | -42.73 | 4.94 | -37.79 | -13 | -24.79 | V |
| 2479.2 | -47.27 | 8.46 | -38.81 | -13 | -25.81 | V |
| Middle Channel (836.4MHz) | | | | | | |
| 1672.8 | -48.18 | 5.11 | -43.07 | -13 | -30.07 | H |
| 2509.2 | -45.45 | 8.54 | -36.91 | -13 | -23.91 | H |
| 1672.8 | -44.55 | 5.11 | -39.44 | -13 | -26.44 | V |
| 2509.2 | -50.91 | 8.54 | -42.37 | -13 | -29.37 | V |
| High Channel (846.6MHz) | | | | | | |
| 1693.2 | -47.27 | 5.29 | -41.98 | -13 | -28.98 | H |
| 2539.8 | -49.09 | 8.59 | -40.50 | -13 | -27.50 | H |
| 1693.2 | -42.73 | 5.29 | -37.44 | -13 | -24.44 | V |
| 2539.8 | -51.82 | 8.59 | -43.23 | -13 | -30.23 | V |

*For Band 2 Mode*

| Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Polar H/V |
|---|---|---|---|---|---|---|
| Low Channel (1852.4MHz) | | | | | | |
| 3704.8 | -43.64 | 10.54 | -33.10 | -13 | -20.10 | H |
| 5557.2 | -42.73 | 13.37 | -29.36 | -13 | -16.36 | H |
| 3704.8 | -44.55 | 10.54 | -34.01 | -13 | -21.01 | V |
| 5557.2 | -51.82 | 13.37 | -38.45 | -13 | -25.45 | V |
| Middle Channel (1880MHz) | | | | | | |
| 3760.8 | -45.45 | 10.64 | -34.81 | -13 | -21.81 | H |
| 5640.0 | -44.55 | 13.54 | -31.01 | -13 | -18.01 | H |
| 3760.8 | -55.45 | 10.64 | -44.81 | -13 | -31.81 | V |
| 5640.0 | -45.45 | 13.54 | -31.91 | -13 | -18.91 | V |
| High Channel (1907.6MHz) | | | | | | |
| 3815.2 | -45.45 | 10.74 | -34.71 | -13 | -21.71 | H |
| 5722.8 | -50.91 | 13.71 | -37.20 | -13 | -24.20 | H |
| 3815.2 | -46.36 | 10.74 | -35.62 | -13 | -22.62 | V |
| 5722.8 | -53.64 | 13.71 | -39.93 | -13 | -26.93 | H |

*Note: Result=Reading+ Correct, Margin= Result- Limit*

*Testing is carried out with frequency rang 9kHz to 20GHz, which above 3$^{th}$ Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so the data is not display.*

# 9. Frequency Stability

## 9.1 Standard Applicable

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Cellular Band

| Frequency range (MHz) | Base, fixed (ppm) | Mobile >3 watts (ppm) | Mobile ≤3 watts (ppm) |
|---|---|---|---|
| 25 to 50 | 20.0 | 20.0 | 50.0 |
| 50 to 450 | 5.0 | 5.0 | 50.0 |
| 450 to 512 | 2.5 | 5.0 | 5.0 |
| 821 to 896 | 1.5 | 2.5 | 2.5 |
| 928 to 929 | 5.0 | N/A | N/A |
| 929 to 960 | 1.5 | N/A | N/A |
| 2110 to 2220 | 10.0 | N/A | N/A |

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

## 9.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode

| Temperature: | Supply Voltage |
|---|---|
| 20°C | DC 3.3-4.2V of nominal voltage declared by manufacturer |
| -30°C to +50°C | Normal |

## 9.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 20°C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

## 9.4 Summary of Test Results/Plots

For Cellular Band GSM Mode

| Reference Frequency(Middle Channel): 836.4 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 58 | 0.0693 |
| 40 | 3.7 | 54 | 0.0645 |
| 30 | 3.7 | 49 | 0.0586 |
| 20 | 3.7 | 47 | 0.0562 |
| 10 | 3.7 | 52 | 0.0622 |
| 0 | 3.7 | 46 | 0.0550 |
| -10 | 3.7 | -9 | -0.0108 |
| -20 | 3.7 | -20 | -0.0239 |
| -30 | 3.7 | -24 | -0.0287 |

For PCS Band GSM Mode

| Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 64 | 0.0340 |
| 40 | 3.7 | 61 | 0.0324 |
| 30 | 3.7 | 57 | 0.0303 |
| 20 | 3.7 | 66 | 0.0351 |
| 10 | 3.7 | 62 | 0.0330 |
| 0 | 3.7 | 66 | 0.0351 |
| -10 | 3.7 | 77 | 0.0410 |
| -20 | 3.7 | 72 | 0.0383 |
| -30 | 3.7 | 79 | 0.0420 |

For Cellular Band GPRS Mode

| Reference Frequency(Middle Channel): 836.4 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 62 | 0.0741 |
| 40 | 3.7 | 58 | 0.0693 |
| 30 | 3.7 | 53 | 0.0634 |
| 20 | 3.7 | 51 | 0.0610 |
| 10 | 3.7 | 56 | 0.0669 |
| 0 | 3.7 | 50 | 0.0598 |
| -10 | 3.7 | -5 | -0.0060 |
| -20 | 3.7 | -16 | -0.0191 |
| -30 | 3.7 | -20 | -0.0239 |

For PCS Band GPRS Mode

| Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 58 | 0.0309 |
| 40 | 3.7 | 55 | 0.0293 |
| 30 | 3.7 | 51 | 0.0271 |
| 20 | 3.7 | 60 | 0.0319 |
| 10 | 3.7 | 56 | 0.0298 |
| 0 | 3.7 | 60 | 0.0319 |
| -10 | 3.7 | 71 | 0.0378 |
| -20 | 3.7 | 66 | 0.0351 |
| -30 | 3.7 | 73 | 0.0388 |

For WCDMA Band V Mode

| Reference Frequency(Middle Channel): 836.4 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | -46 | -0.0550 |
| 40 | 3.7 | -39 | -0.0466 |
| 30 | 3.7 | -36 | -0.0430 |
| 20 | 3.7 | -50 | -0.0598 |
| 10 | 3.7 | -31 | -0.0371 |
| 0 | 3.7 | -26 | -0.0311 |
| -10 | 3.7 | -37 | -0.0442 |
| -20 | 3.7 | -41 | -0.0490 |
| -30 | 3.7 | -20 | -0.0239 |

For WCDMA Band II Mode

| Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 53 | 0.0282 |
| 40 | 3.7 | 50 | 0.0266 |
| 30 | 3.7 | 46 | 0.0245 |
| 20 | 3.7 | 55 | 0.0293 |
| 10 | 3.7 | 51 | 0.0271 |
| 0 | 3.7 | 55 | 0.0293 |
| -10 | 3.7 | 66 | 0.0351 |
| -20 | 3.7 | 61 | 0.0324 |
| -30 | 3.7 | 68 | 0.0362 |

For HSUPA Band V Mode

| Reference Frequency(Middle Channel): 836.4 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | -54 | -0.0646 |
| 40 | 3.7 | -47 | -0.0562 |
| 30 | 3.7 | -44 | -0.0526 |
| 20 | 3.7 | -58 | -0.0693 |
| 10 | 3.7 | -39 | -0.0466 |
| 0 | 3.7 | -34 | -0.0407 |
| -10 | 3.7 | -45 | -0.0538 |
| -20 | 3.7 | -49 | -0.0586 |
| -30 | 3.7 | -28 | -0.0335 |

For HSUPA Band II Mode

| Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 61 | 0.0324 |
| 40 | 3.7 | 58 | 0.0309 |
| 30 | 3.7 | 54 | 0.0287 |
| 20 | 3.7 | 63 | 0.0335 |
| 10 | 3.7 | 59 | 0.0314 |
| 0 | 3.7 | 63 | 0.0335 |
| -10 | 3.7 | 74 | 0.0394 |
| -20 | 3.7 | 69 | 0.0367 |
| -30 | 3.7 | 76 | 0.0404 |

For HSDPA Band V Mode

| Reference Frequency(Middle Channel): 836.4 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | -68 | -0.0813 |
| 40 | 3.7 | -61 | -0.0729 |
| 30 | 3.7 | -58 | -0.0693 |
| 20 | 3.7 | -72 | -0.0861 |
| 10 | 3.7 | -53 | -0.0634 |
| 0 | 3.7 | -48 | -0.0574 |
| -10 | 3.7 | -59 | -0.0705 |
| -20 | 3.7 | -63 | -0.0753 |
| -30 | 3.7 | -42 | -0.0502 |

For HSDPA Band II Mode

| Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | MCF (Hz) | Error (ppm) |
| 50 | 3.7 | 68 | 0.0362 |
| 40 | 3.7 | 59 | 0.0314 |
| 30 | 3.7 | 54 | 0.0287 |
| 20 | 3.7 | 68 | 0.0362 |
| 10 | 3.7 | 62 | 0.0330 |
| 0 | 3.7 | 57 | 0.0303 |
| -10 | 3.7 | 53 | 0.0282 |
| -20 | 3.7 | 61 | 0.0324 |
| -30 | 3.7 | 69 | 0.0367 |

So, Frequency Stability Versus Input Voltage is:

| Reference Frequency(Middle Channel): GSM 836.4MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 52 | 0.0622 |
| | 3.7 | 47 | 0.0562 |
| | 4.2 | 49 | 0.0586 |
| Reference Frequency(Middle Channel): GSM 1880 MHz, Limit: 2.5ppm | | | |
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 64 | 0.0340 |
| | 3.7 | 66 | 0.0351 |
| | 4.2 | 79 | 0.0420 |
| Reference Frequency(Middle Channel): GPRS 836.4MHz, Limit: 2.5ppm | | | |
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 50 | 0.0598 |
| | 3.7 | 51 | 0.0610 |
| | 4.2 | 56 | 0.0669 |
| Reference Frequency(Middle Channel): GPRS 1880 MHz, Limit: 2.5ppm | | | |
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 69 | 0.0367 |
| | 3.7 | 60 | 0.0319 |
| | 4.2 | 74 | 0.0394 |

| Reference Frequency(Middle Channel): WCDMA 836.4MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | -55 | -0.0658 |
| | 3.7 | -50 | -0.0598 |
| | 4.2 | -45 | -0.0538 |

| Reference Frequency(Middle Channel): WCDMA 1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 46 | 0.0245 |
| | 3.7 | 55 | 0.0293 |
| | 4.2 | 51 | 0.0271 |

| Reference Frequency(Middle Channel): HSUPA 836.4MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | -45 | -0.0538 |
| | 3.7 | -58 | -0.0693 |
| | 4.2 | -40 | -0.0478 |

| Reference Frequency(Middle Channel): HSUPA1880 MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 51 | 0.0271 |
| | 3.7 | 63 | 0.0335 |
| | 4.2 | 51 | 0.0271 |

| Reference Frequency(Middle Channel): HSDPA 836.4MHz, Limit: 2.5ppm | | | |
|---|---|---|---|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | -59 | -0.0705 |
| | 3.7 | -72 | -0.0861 |
| | 4.2 | -35 | -0.0418 |
| Reference Frequency(Middle Channel): HSDPA 1880 MHz, Limit: 2.5ppm | | | |
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Measure with Time Elapsed | |
| | | Frequency (Hz) | Error (ppm) |
| 20 | 3.3 | 64 | 0.0340 |
| | 3.7 | 68 | 0.0362 |
| | 4.2 | 65 | 0.0346 |

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