Lab Code: 200167-0

# FCC PART 22H, 24E

# TEST AND MEASUREMENT REPORT

For

## Wilson Electronics, Inc.

3301 E. Deseret Dr.,
St. George, UT 84790, USA

## FCC ID: PWO2B5225

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Bi-Directional Amplifier |

| | |
|---|---|
| **Test Engineer:** | Victor Zhang |
| **Report Number:** | R0907155-22 |
| **Report Date:** | 2009-08-25 |
| **Reviewed By:** | Boni Baniqued<br>Senior RF Engineer |
| **Prepared By:** **(84)** | Bay Area Compliance Laboratories Corp.<br>1274 Anvilwood Ave<br>Sunnyvale, CA 94089, USA<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

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## DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | R0907155-22 | Original Report | 2009-08-25 |

# 1 GENERAL INFORMATION

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

This test and measurement report was prepared on behalf of *Wilson Electronics, Inc.* and their product *FCC ID: PWO2B5225*, model: *2B5225* or the "EUT" as referred to in this report. The EUT is a wireless, mobile and fixed (in-building), dual-band bi-directional amplifier for enhancing the range of cell phones. A 50 Ω SMA connector is used for connecting the outside antenna to the amplifier. The amplifier contains an internal "inside antenna". An MS-147 connector enables connecting to the amplifier in place of its internal antenna (a type-N adapter will be provided). Power for the amplifier is obtained from either an AC power adapter (supplied) or one of two possible DC power adapters – one for connecting to a vehicle's 12V battery, and the other for connecting to a computer's USB port. The nominal gain of this amplifier is 20 dB. The uplink frequency bands are: 824~849 MHz and 1850~1910 MHz. The downlink frequency bands are 869~894 MHz and 1930~1990 MHz. Modulation types are CDMA, GSM, EDGE, EVDO and HSPA. The amplifier is contained in a plastic case.

## 1.2 Mechanical Description

The EUT Approximate measurement is: 125mm (L) x 74 mm (W) x 68 mm (H). Weight: 143g.

** The test data gathered are from typical production sample, serial number: 815225A1011282694, provided by the manufacture.*

## 1.3 EUT Photo


*Please see additional photos in Exhibit C*

## 1.4 Objective

This type approval report is prepared on behalf of *Wilson Electronics, Inc.* in accordance with Part 2, Subpart J, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin.

## 1.5 Related Submittal(s)/Grant(s)

No Related Submittals

## 1.6 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E – PCS

Applicable Standards: TIA EIA 98-C, TIA/EIA603-C, ANSI C63.4-2003.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from +2.0 dB for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

## 1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and

December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

# 2 SYSTEM TEST CONFIGURATION

## 2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with the EUT operating at normal mode.

## 2.2 EUT Exercise Software

NA, signal was sent through EUT using a signal generator, device was set to normal operating mode.

## 2.3 Equipment Modifications

No modifications were made to the EUT.

## 2.4 Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Narda | 10dB attenuator pad | 768-10 | N/A |

## 2.5 Interface Ports and Cabling

| Cable Description | Length (m) | From | To |
|---|---|---|---|
| RF cable | 0.2 | Signal Generator | Input/ EUT |
| RF cable | 0.2 | Output/ EUT | Spectrum Analyzer |

# 3 SUMMARY OF TEST RESULTS

| FCC Rules | Description of Tests | Results |
|---|---|---|
| § 2.1046, § 22.913, § 24.232 | RF Output Power | Compliant |
| § 2.1047 | Modulation Characteristics | N/A |
| § 2.1049, § 22.917, § 24.238 | Occupied Bandwidth / Out of Band Emissions | Compliant |
| § 2.1053, § 22.917, § 24.238 | Spurious Radiated Emissions | Compliant |
| § 2.1051, § 22.917, § 24.238 | Spurious Emissions at Antenna Terminals | Compliant |
| § 22.917, § 24.238 | Band Edge | Compliant |
| § 2.1055 | Frequency Stability | N/A |
| §2.1091 | RF Exposure | Compliant |

# 4 FCC §2.1046, §22.913 & §24.232 – RF OUTPUT POWER

## 4.1 Applicable Standard

According to §22.913 (a), the maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

## 4.2 Test Procedure

*Conducted:*

The RF output of the transmitter was connected to the signal generator and the spectrum analyzer through sufficient attenuation.

## 4.3 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23-24 °C |
| **Relative Humidity:** | 40-45 % |
| **ATM Pressure:** | 101-103kPa |

** The testing was performed by Victor Zhang from 2009-08-1 to 2009-08-14 in RF Site.*

## 4.4 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2009-04-27 |
| HP | Signal Generator | 8648C | 3426A00417 | 2009-07-23 |
| R & S | Signal Generator | SMIQ03 | 849192/0085 | 2007-12-03* |

* Based on two year calibration Cycle.
*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## 4.5 Summary of Test Results

Maximum Output Power – Modulated Signal

**CDMA: (Cellular 850 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 869.80 | -18.93 | -0.89 |
| Middle | 881.52 | -19.59 | -1.00 |
| High | 893.20 | -19.84 | -1.26 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 824.80 | 8.52 | 28.87 |
| Middle | 836.52 | 9.74 | 28.54 |
| High | 848.20 | 10.38 | 28.06 |

**CDMA: (PCS 1900 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1930.8 | -18.18 | -0.70 |
| Middle | 1960.0 | -18.05 | 1.09 |
| High | 1989.2 | -17.94 | 0.69 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1850.8 | 9.60 | 29.76 |
| Middle | 1880.0 | 10.85 | 31.80 |
| High | 1909.2 | 10.19 | 28.77 |

**WCDMA/HSPA: (Cellular 850 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 871.4 | -19.50 | -0.82 |
| Middle | 881.4 | -18.08 | 0.32 |
| High | 891.6 | -21.13 | -1.28 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 826.4 | 10.57 | 28.39 |
| Middle | 836.4 | 10.98 | 30.13 |
| High | 846.6 | 10.81 | 28.43 |

**WCDMA/HSPA: (PCS 1900 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1932.4 | -18.47 | 0.17 |
| Middle | 1960.0 | -17.59 | 2.29 |
| High | 1987.6 | -18.37 | 1.70 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1852.4 | 8.40 | 29.93 |
| Middle | 1880.0 | 10.56 | 31.40 |
| High | 1907.6 | 10.94 | 30.45 |

**GSM: (Cellular 850 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 869.2 | -19.74 | -2.13 |
| Middle | 881.6 | -19.68 | -1.32 |
| High | 893.8 | -19.52 | -2.61 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 824.2 | 10.98 | 30.94 |
| Middle | 836.6 | 10.95 | 30.80 |
| High | 848.8 | 10.94 | 29.47 |

**GSM: (PCS 1900 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1930.2 | -17.58 | 0.33 |
| Middle | 1960.0 | -17.59 | 1.83 |
| High | 1989.8 | -17.58 | 0.48 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1850.2 | 10.95 | 28.56 |
| Middle | 1880.0 | 10.93 | 32.56 |
| High | 1909.8 | 10.96 | 31.33 |

**EDGE: (Cellular 850 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 869.2 | -19.92 | -2.12 |
| Middle | 881.6 | -19.73 | -1.37 |
| High | 893.8 | -19.61 | -2.78 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 824.2 | 10.93 | 30.86 |
| Middle | 836.6 | 10.95 | 30.79 |
| High | 848.8 | 10.96 | 29.42 |

**EDGE: (PCS 1900 MHz Band)**

Forward (Downlink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1930.2 | -22.68 | 0.38 |
| Middle | 1960.0 | -22.32 | 2.12 |
| High | 1989.8 | -19.97 | 1.7 |

Reverse (Uplink)

| Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|
| Low | 1850.2 | 11.00 | 28.04 |
| Middle | 1880.0 | 11.00 | 31.89 |
| High | 1909.8 | 10.95 | 30.58 |

# 5 FCC §2.1047 - MODULATION CHARACTERISTIC

## 5.1 Applicable Standard

According to FCC § 2.1047(d), Part 22H and Part 24E, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## 5.2 Test Result

N/A

# 6 FCC §2.1049, §22.917 & §24.238 - OCCUPIED BANDWIDTH

## 6.1 Applicable Standard

Requirements: CFR 47, Section 2.1049, Section 22.917and Section 24.238.

## 6.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set to at least 1% of the BW (Cellular/PCS) and the 26 dB & 99% bandwidth was recorded.

## 6.3 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23-24 °C |
| **Relative Humidity:** | 40-45 % |
| **ATM Pressure:** | 101-103kPa |

** The testing was performed by Victor Zhang from 2009-08-1 to 2009-08-14 in RF Site.*

## 6.4 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2009-04-27 |
| HP | Signal Generator | 8648C | 3426A00417 | 2009-07-23 |
| R & S | Signal Generator | SMIQ03 | 849192/0085 | 2007-12-03* |

* Based on two year calibration Cycle.
*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## 6.5 Summary of Test Results

CDMA/EVDO:

| Mode | | Channel | Frequency (MHz) | Emission Bandwidth | |
|---|---|---|---|---|---|
| | | | | Input (kHz) | Output (kHz) |
| CDMA/EVDO (Cellular) | Uplink | Low | 824.80 | 1267.6 | 1289.3 |
| | | Middle | 836.52 | 1267.7 | 1288.1 |
| | | High | 848.20 | 1268.1 | 1284.6 |
| | Downlink | Low | 869.80 | 1264.3 | 1329.3 |
| | | Middle | 881.52 | 1264.5 | 1313.7 |
| | | High | 893.20 | 1264.5 | 1308.5 |
| CDMA/EVDO (PCS) | Uplink | Low | 1850.80 | 1266.2 | 1290.0 |
| | | Middle | 1880.00 | 1265.7 | 1277.8 |
| | | High | 1909.20 | 1268.5 | 1286.9 |
| | Downlink | Low | 1930.80 | 1256.6 | 1286.3 |
| | | Middle | 1960.00 | 1264.4 | 1289.3 |
| | | High | 1989.20 | 1265.0 | 1282.9 |

WCDMA/HSPA:

| Mode | | Channel | Frequency (MHz) | Emission Bandwidth | |
|---|---|---|---|---|---|
| | | | | Input (kHz) | Output (kHz) |
| WCDMA/HSPA (Cellular) | Uplink | Low | 826.4 | 4326.9 | 4330.6 |
| | | Middle | 836.4 | 4327.3 | 4341.4 |
| | | High | 846.6 | 4327.0 | 4337.3 |
| | Downlink | Low | 871.4 | 4326.0 | 4381.8 |
| | | Middle | 881.4 | 4323.9 | 4387.9 |
| | | High | 891.6 | 4323.6 | 4350.7 |
| WCDMA/HSPA (PCS) | Uplink | Low | 1852.4 | 4327.7 | 4328.6 |
| | | Middle | 1880.0 | 4327.8 | 4326.3 |
| | | High | 1907.6 | 4327.6 | 4326.8 |
| | Downlink | Low | 1932.4 | 4326.3 | 4334.9 |
| | | Middle | 1960.0 | 4326.4 | 4343.3 |
| | | High | 1987.6 | 4326.2 | 4340.3 |

GSM:

| Mode | | Channel | Frequency (MHz) | Emission Bandwidth | |
|---|---|---|---|---|---|
| | | | | Input (kHz) | Output (kHz) |
| GSM (Cellular) | Uplink | Low | 824.2 | 247.3565 | 246.9636 |
| | | Middle | 836.6 | 247.4654 | 247.8910 |
| | | High | 848.8 | 249.0345 | 248.7181 |
| | Downlink | Low | 869.2 | 248.8942 | 247.8949 |
| | | Middle | 881.6 | 245.8994 | 247.2368 |
| | | High | 893.8 | 248.2539 | 248.5438 |
| GSM (PCS) | Uplink | Low | 1850.2 | 247.1460 | 248.6878 |
| | | Middle | 1880.0 | 247.6284 | 245.7786 |
| | | High | 1909.8 | 248.6050 | 247.8534 |
| | Downlink | Low | 1930.2 | 248.0058 | 247.4320 |
| | | Middle | 1960.0 | 247.8765 | 246.3335 |
| | | High | 1989.8 | 246.8255 | 247.1569 |

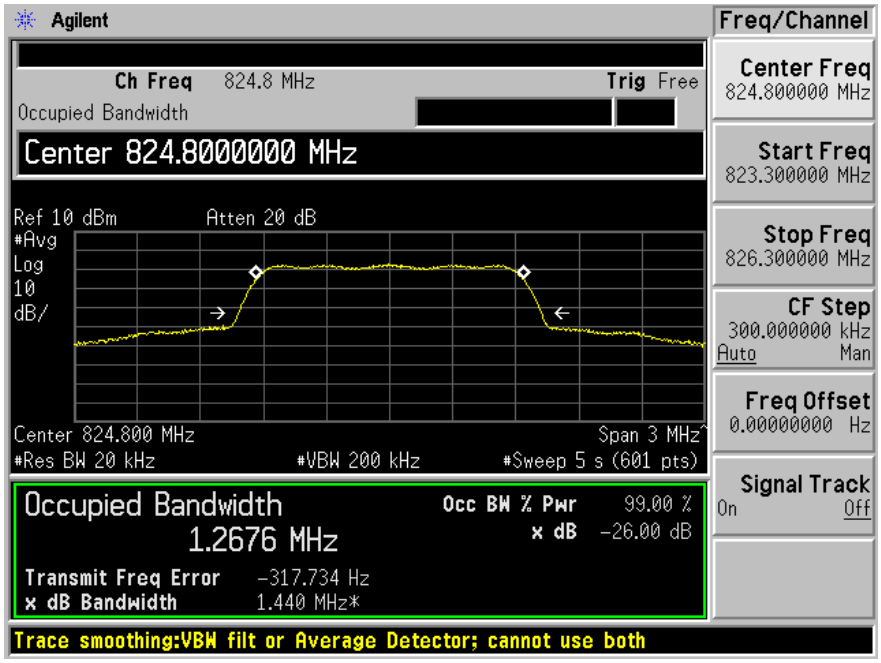
EDGE:

| Mode | | Channel | Frequency (MHz) | Emission Bandwidth | |
|---|---|---|---|---|---|
| | | | | Input (kHz) | Output (kHz) |
| EDGE (Cellular) | Uplink | Low | 824.2 | 251.3326 | 251.7163 |
| | | Middle | 836.6 | 249.9263 | 253.1537 |
| | | High | 848.8 | 250.0041 | 247.5153 |
| | Downlink | Low | 869.2 | 250.5128 | 311.7200 |
| | | Middle | 881.6 | 250.9038 | 322.2167 |
| | | High | 893.8 | 249.8457 | 316.2825 |
| EDGE (PCS) | Uplink | Low | 1850.2 | 249.6084 | 245.4682 |
| | | Middle | 1880.0 | 249.6818 | 245.2052 |
| | | High | 1909.8 | 251.1594 | 249.4894 |
| | Downlink | Low | 1930.2 | 249.4248 | 255.9911 |
| | | Middle | 1960.0 | 251.0085 | 258.2342 |
| | | High | 1989.8 | 249.7312 | 259.3584 |

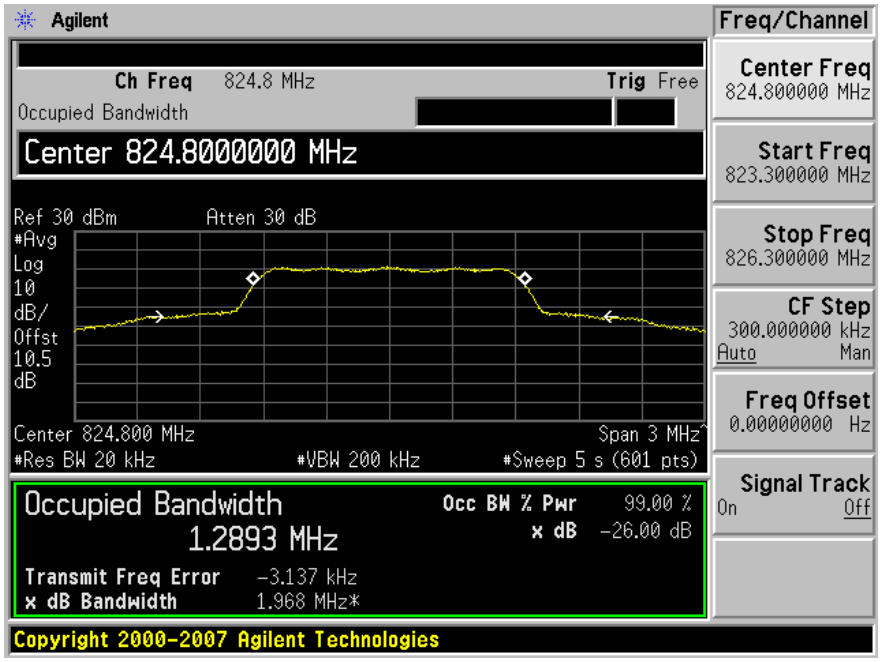
Please refer to the following plots.

CDMA/EVDO Cellular Band Uplink, Low Channel: 824.8 MHz

Input

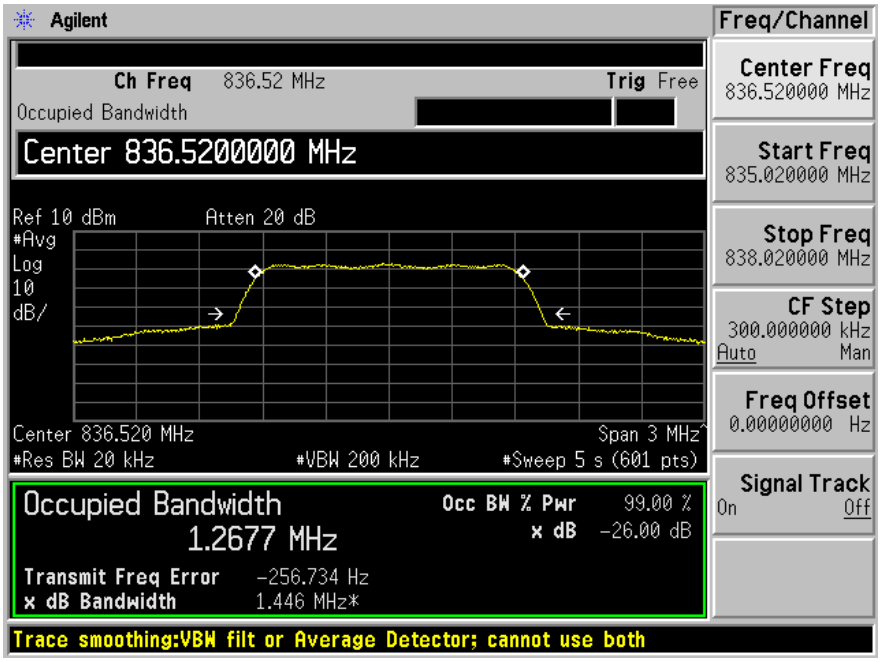



Output

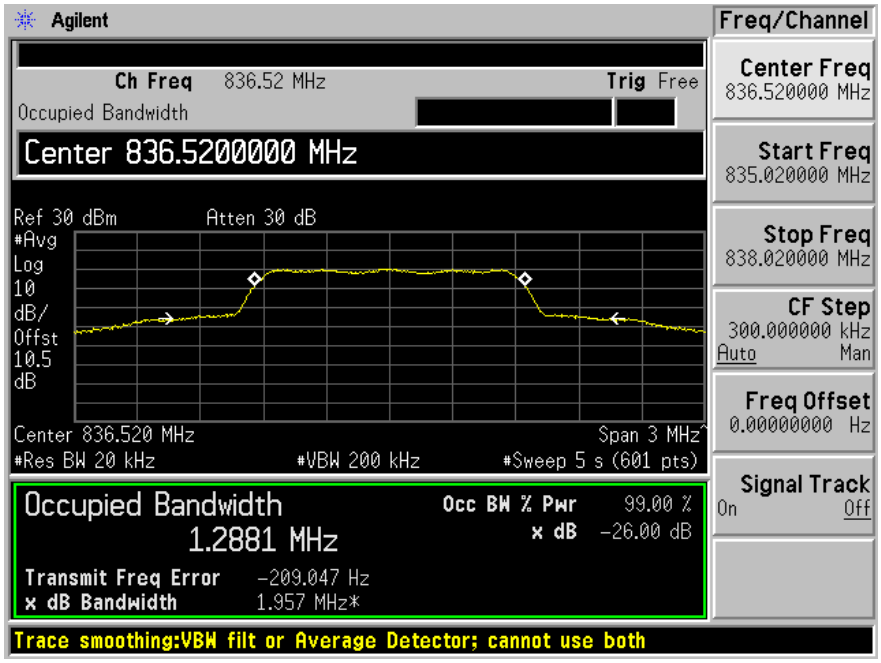


CDMA/EVDO Cellular Band Uplink, Middle Channel: 836.52 MHz

Input

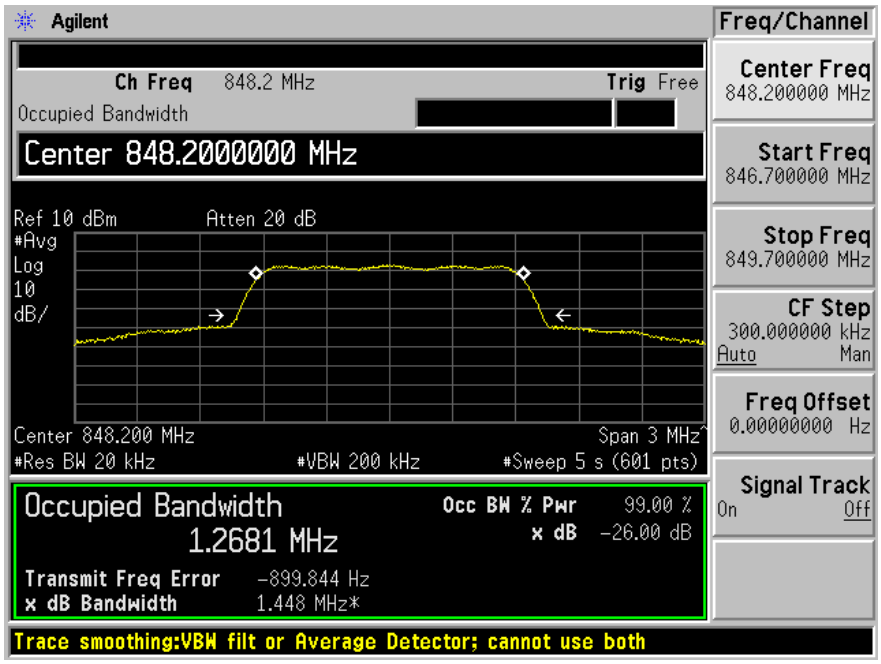



Output

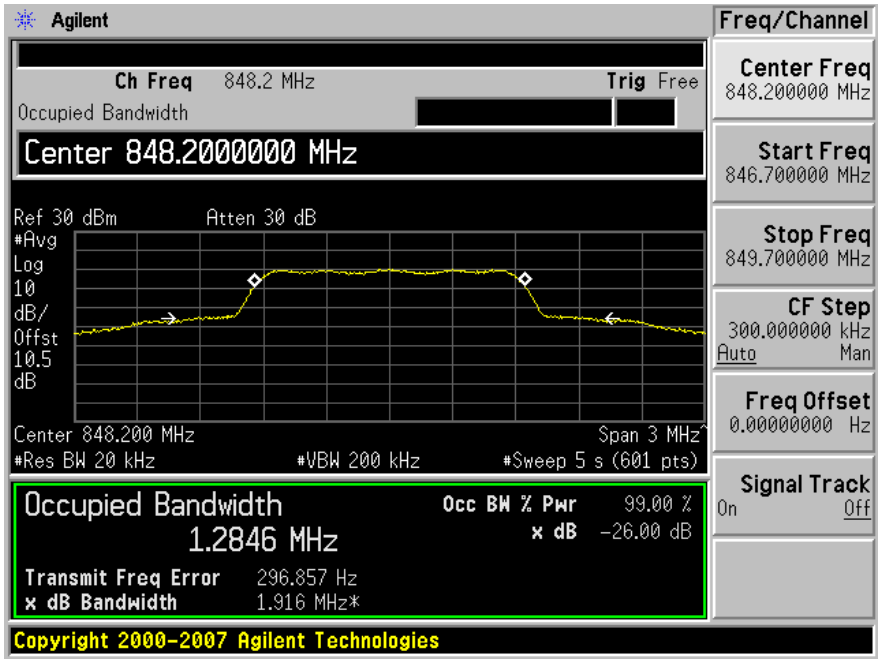


CDMA/EVDO Cellular Band Uplink, High Channel: 848.2 MHz

Input

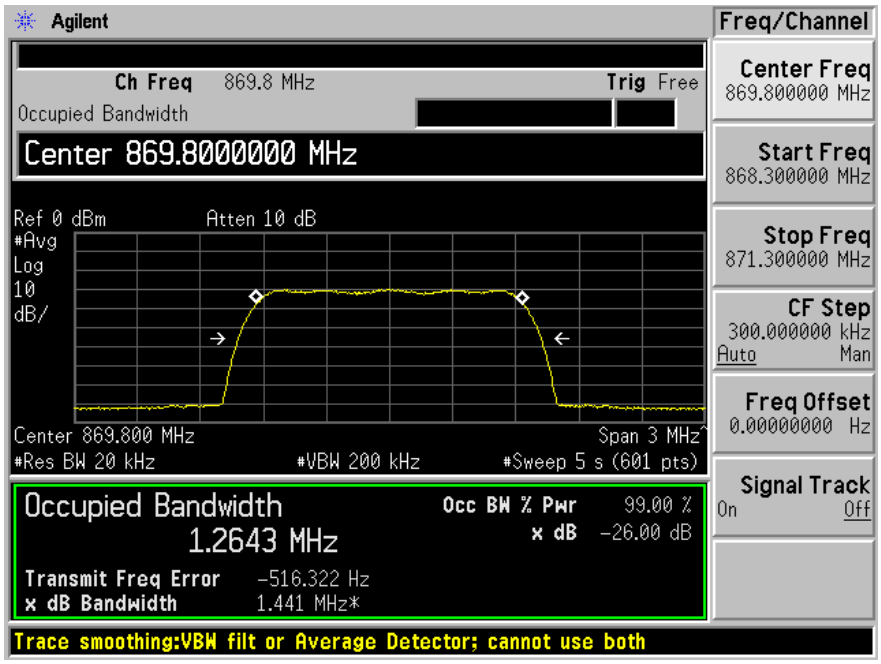



Output

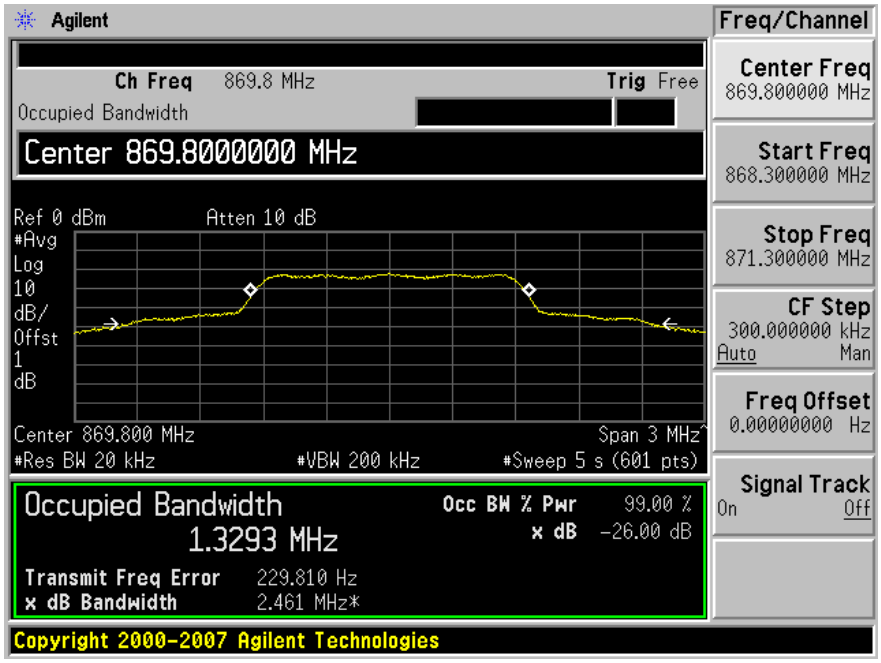


CDMA/EVDO Cellular Band Downlink, Low Channel: 869.8 MHz

Input

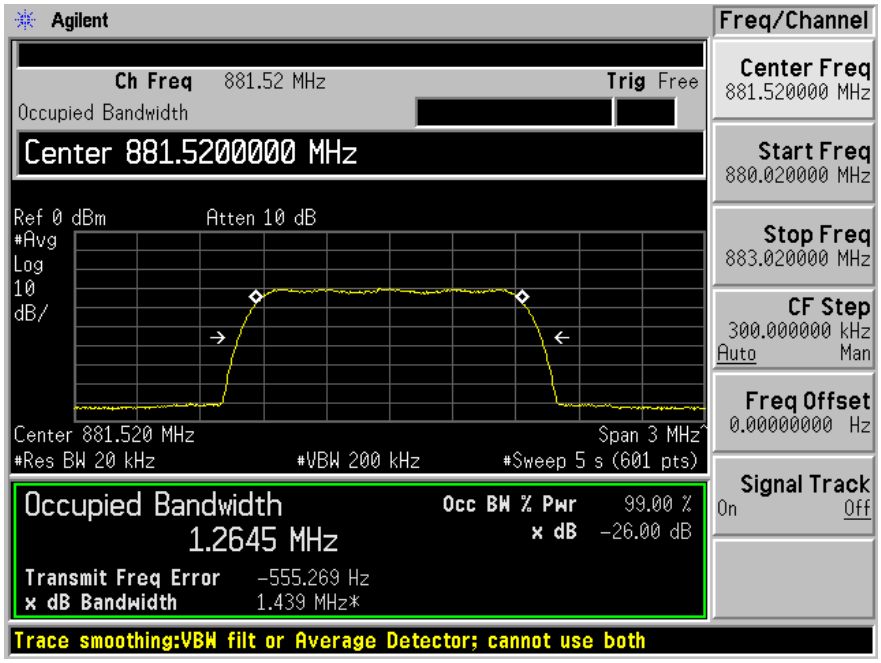



Output

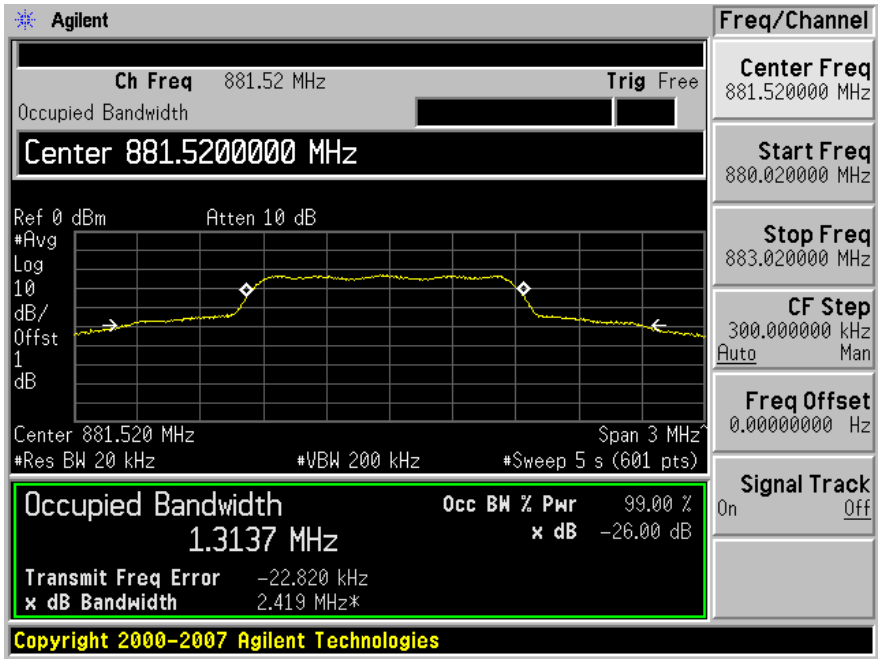


CDMA/EVDO Cellular Band Downlink, Middle Channel: 881.52 MHz

Input

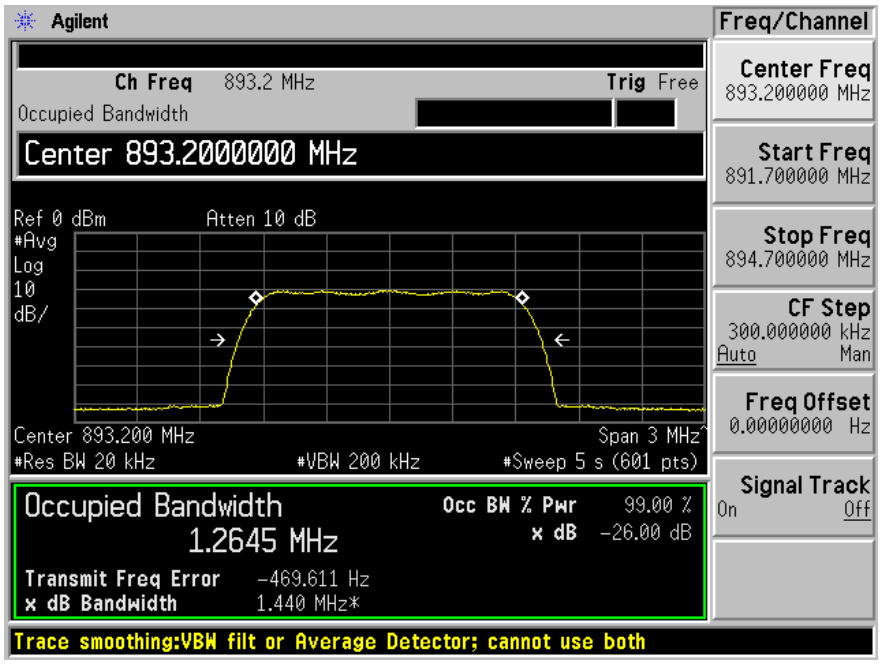



Output

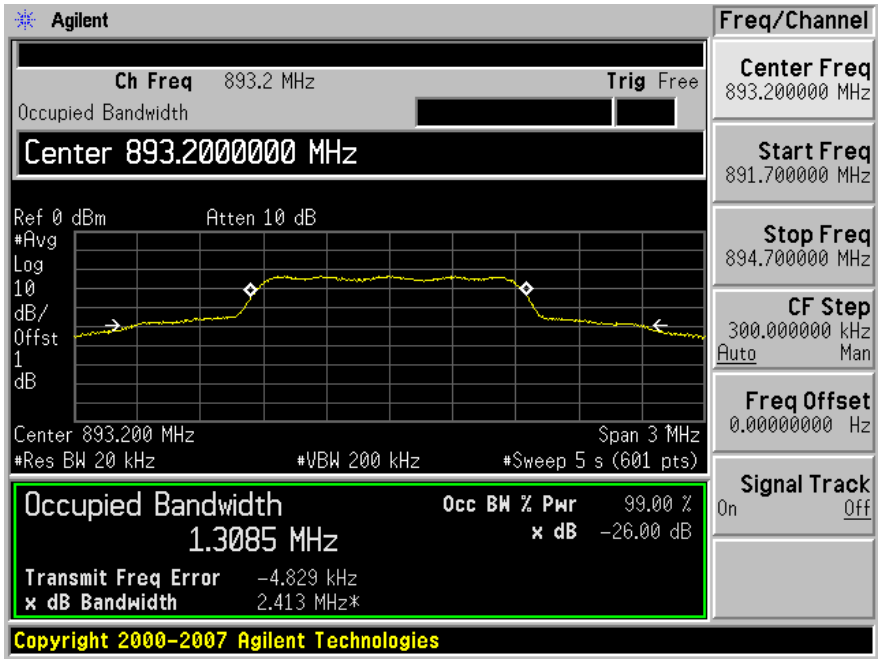


CDMA/EVDO Cellular Band Downlink, High Channel: 893.2 MHz

Input

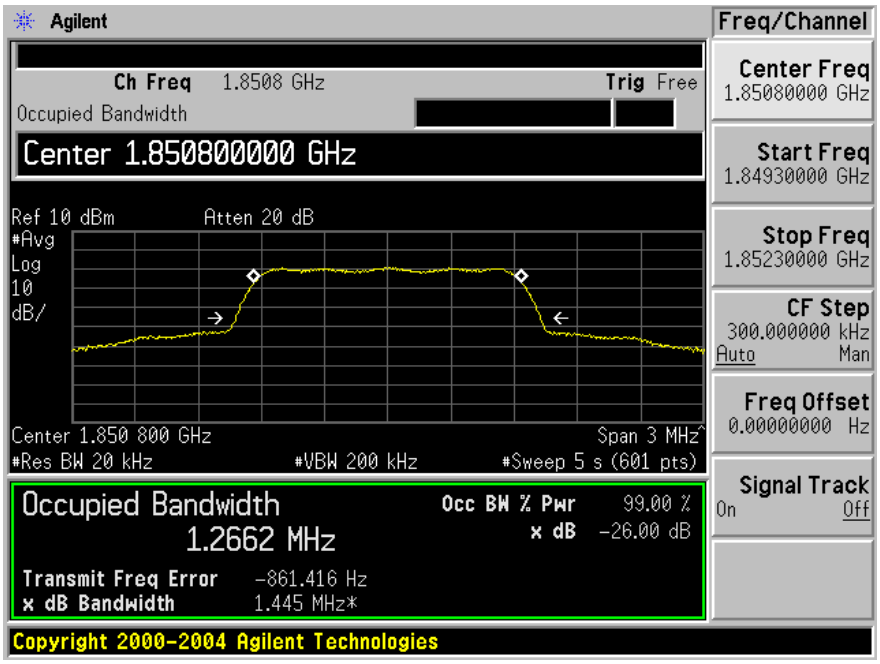



Output

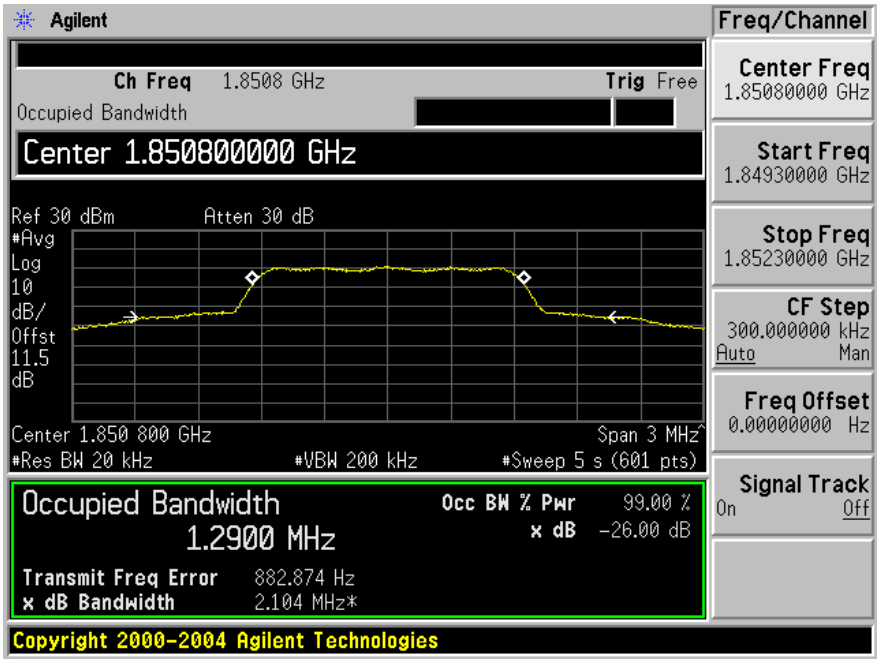


CDMA/EVDO PCS Band Uplink, Low Channel: 1850.8 MHz

Input

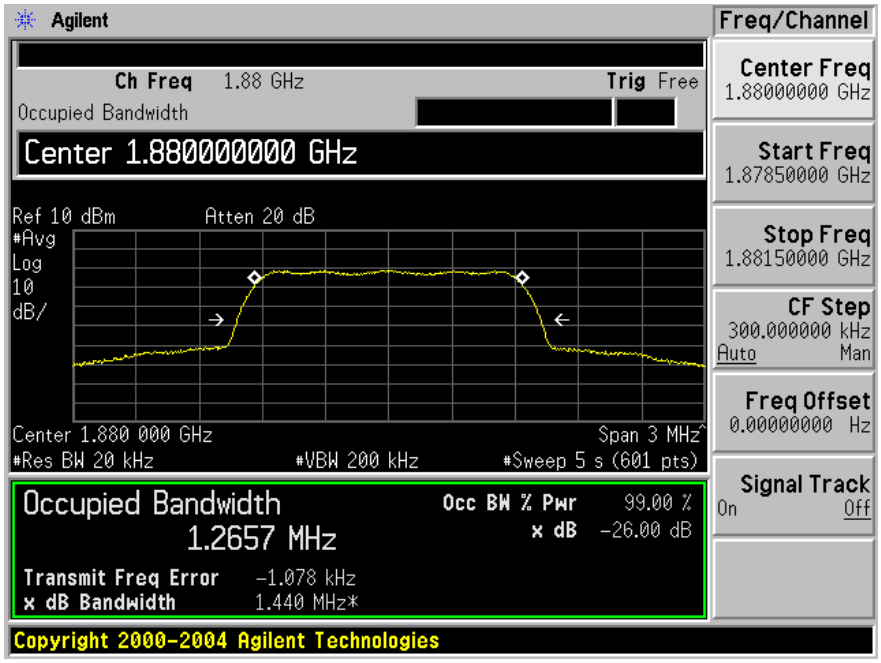



Output

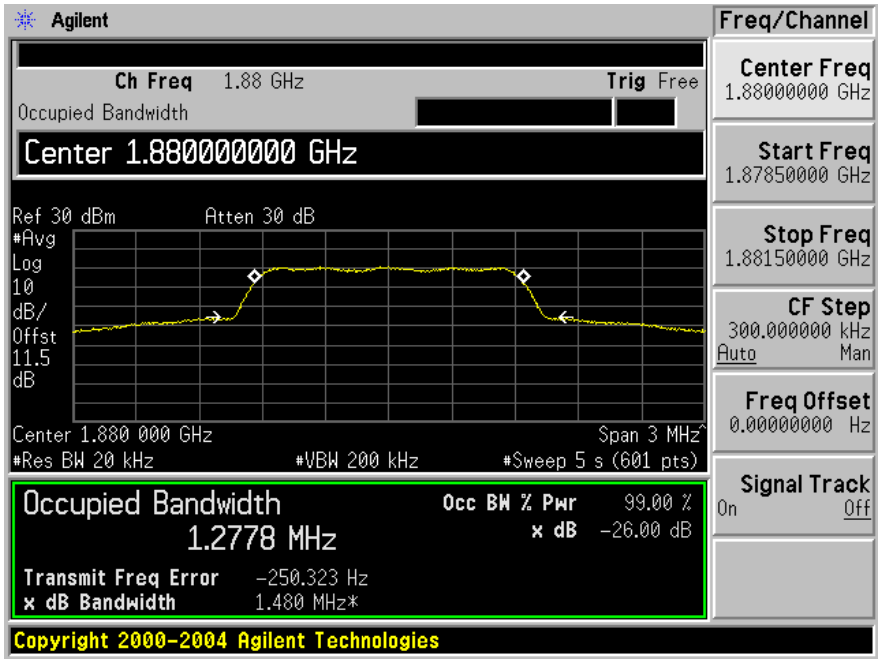


CDMA/EVDO PCS Band Uplink, Middle Channel: 1880 MHz

Input

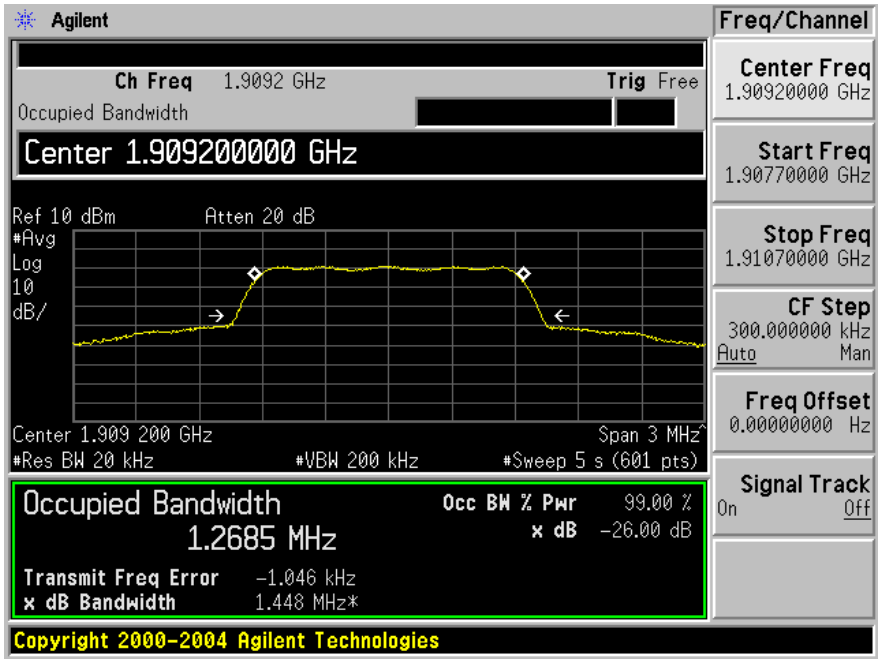



Output

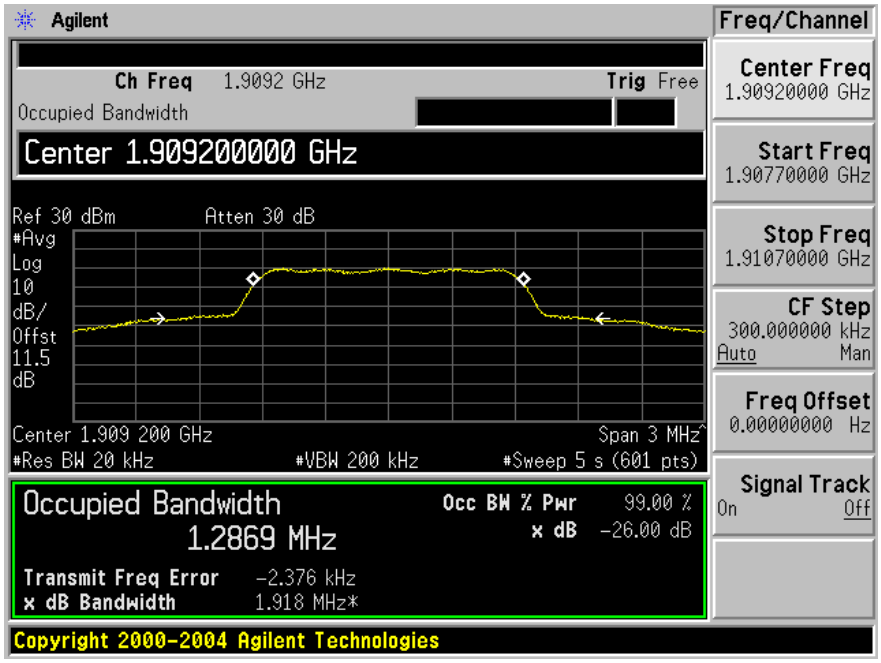


CDMA/EVDO PCS Band Uplink, High Channel: 1909.2 MHz

Input

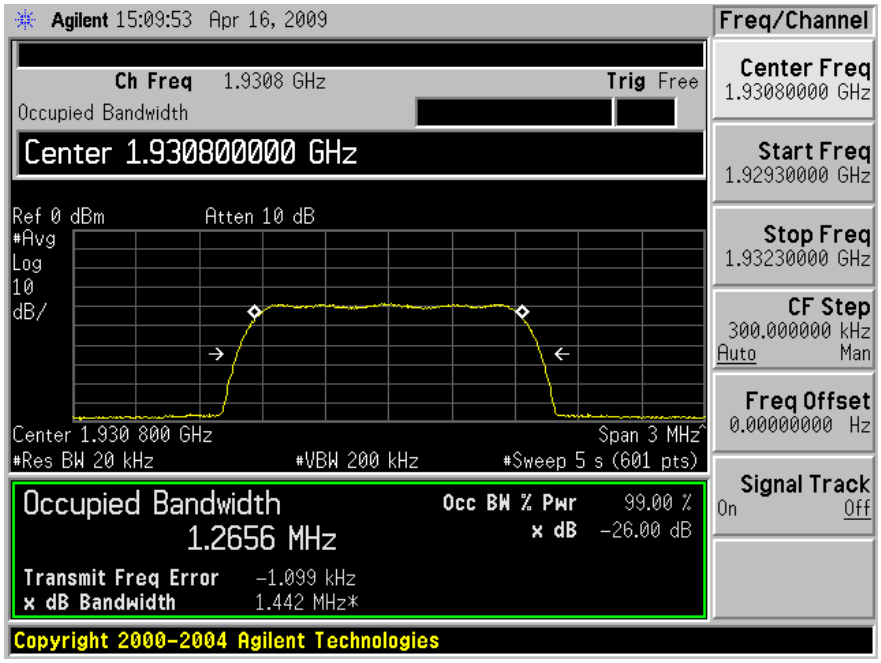



Output

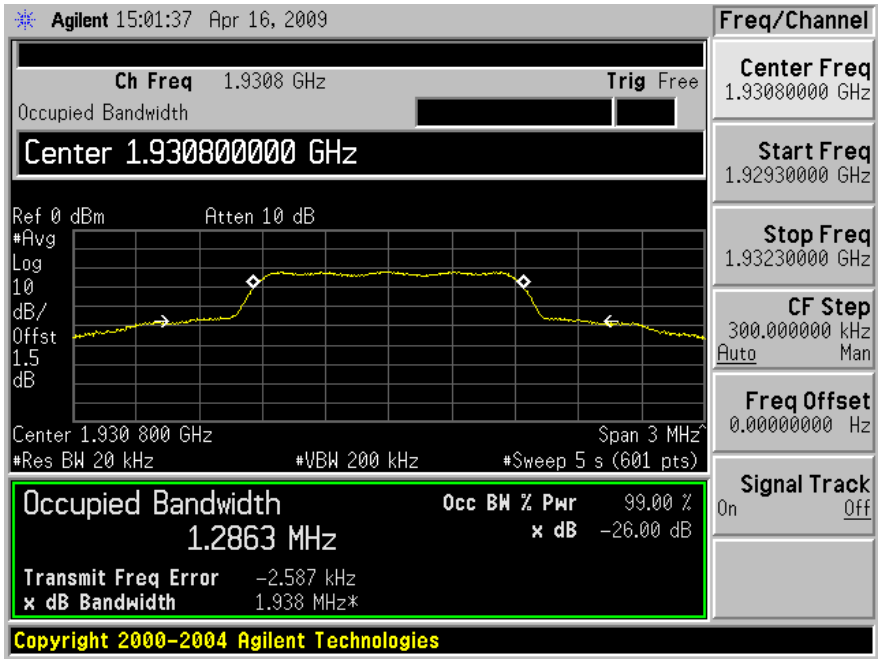


CDMA/EVDO PCS Band Downlink, Low Channel: 1930.8 MHz

Input

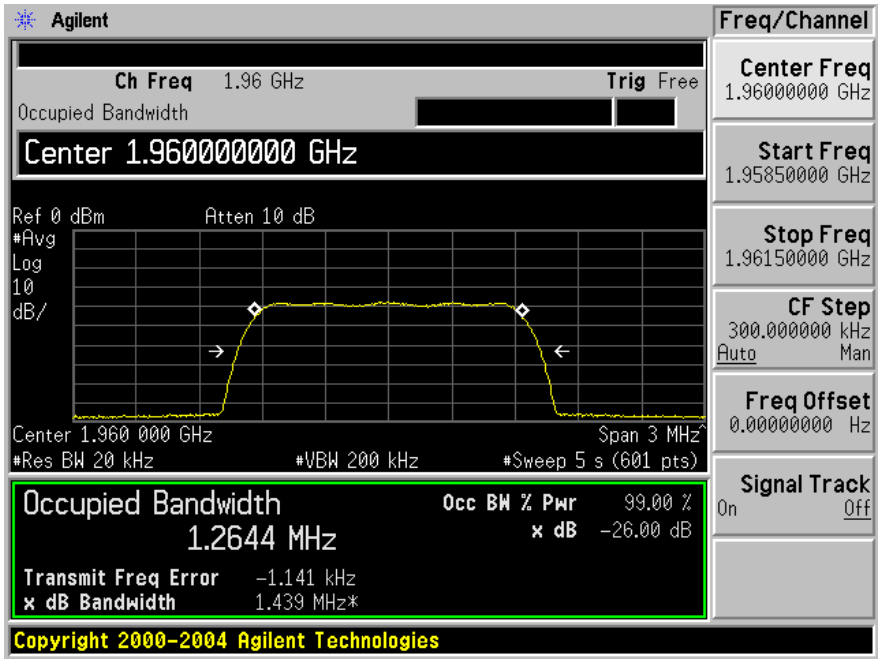



Output

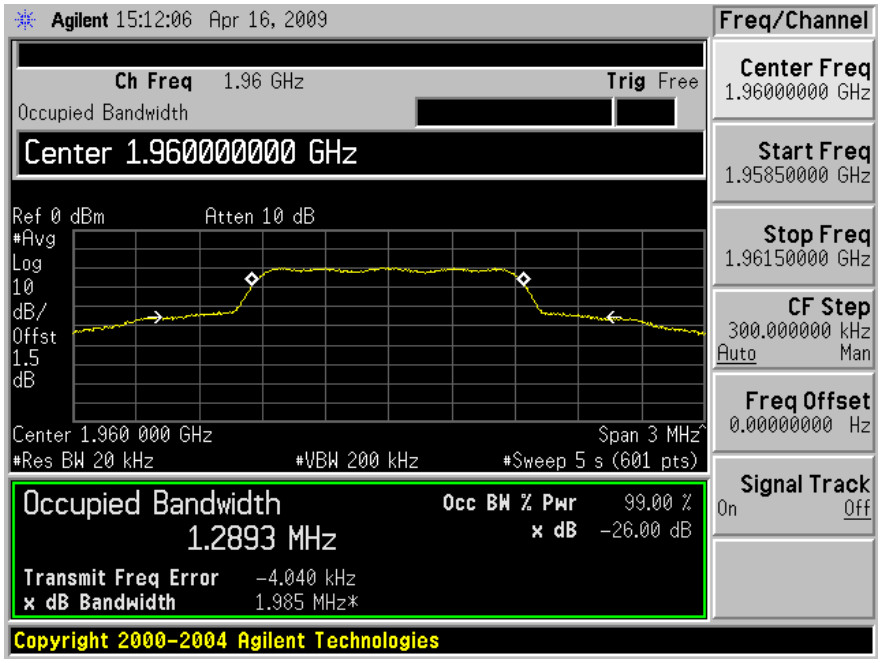


CDMA/EVDO PCS Band Downlink, Middle Channel: 1960 MHz

Input

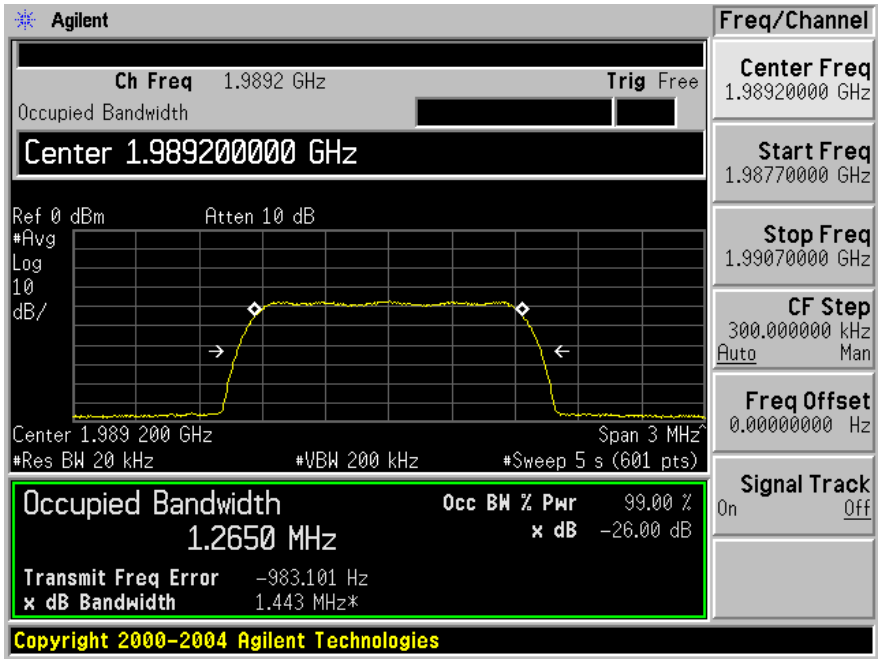



Output

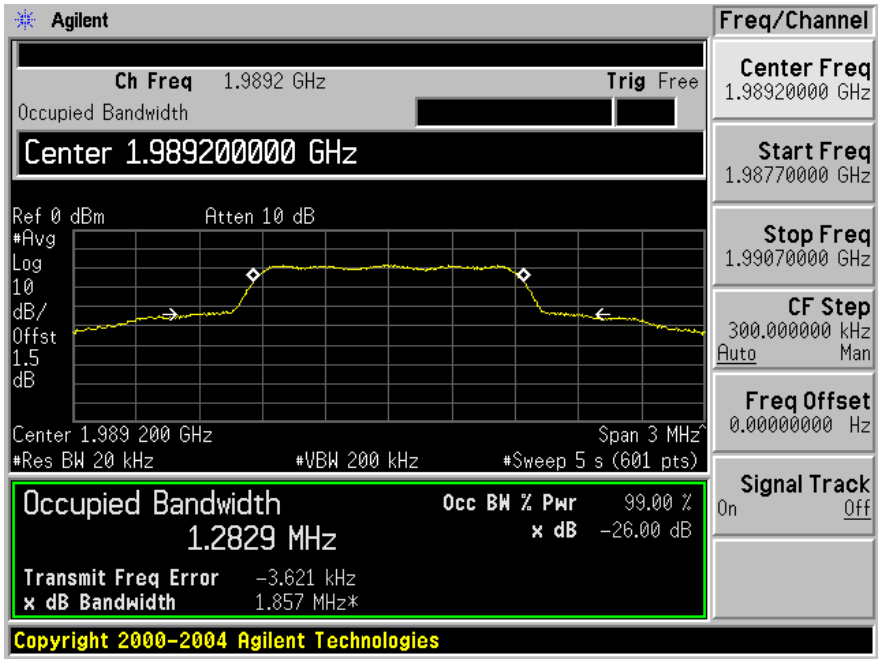


CDMA/EVDO PCS Band Downlink, High Channel: 1989.2 MHz

Input

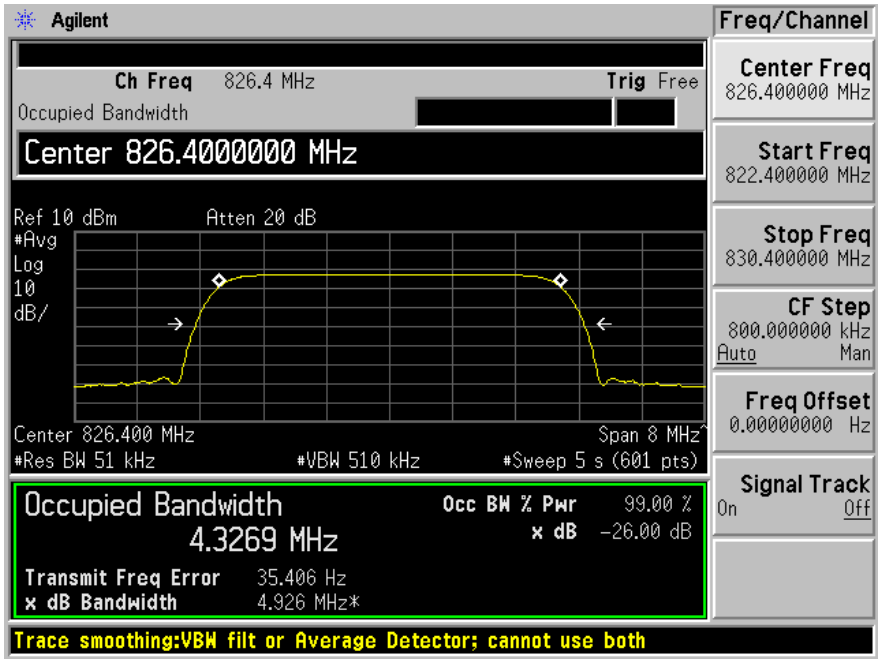



Output

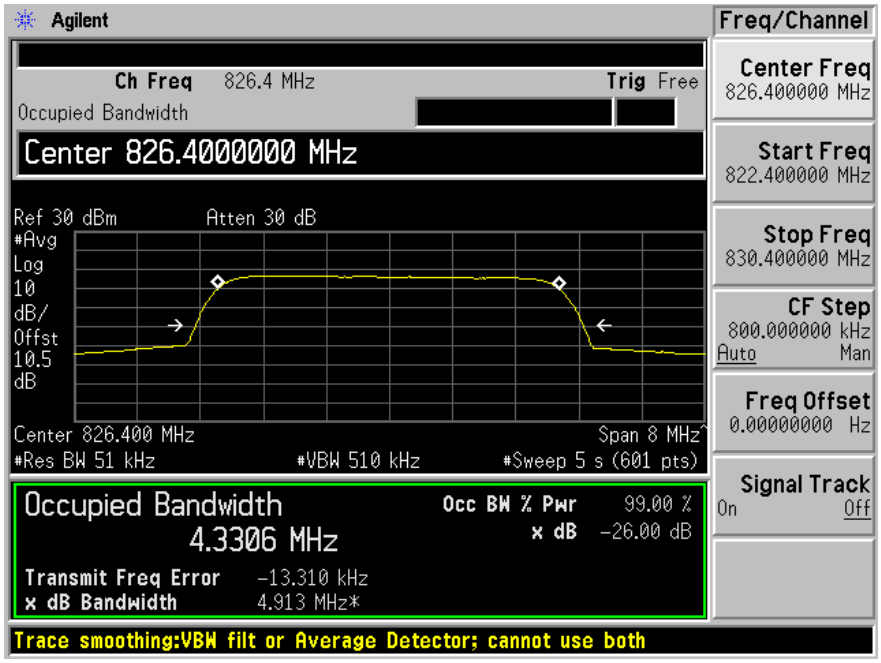


WCDMA/HSPA Cellular Band Uplink, Low Channel: 826.4 MHz

Input

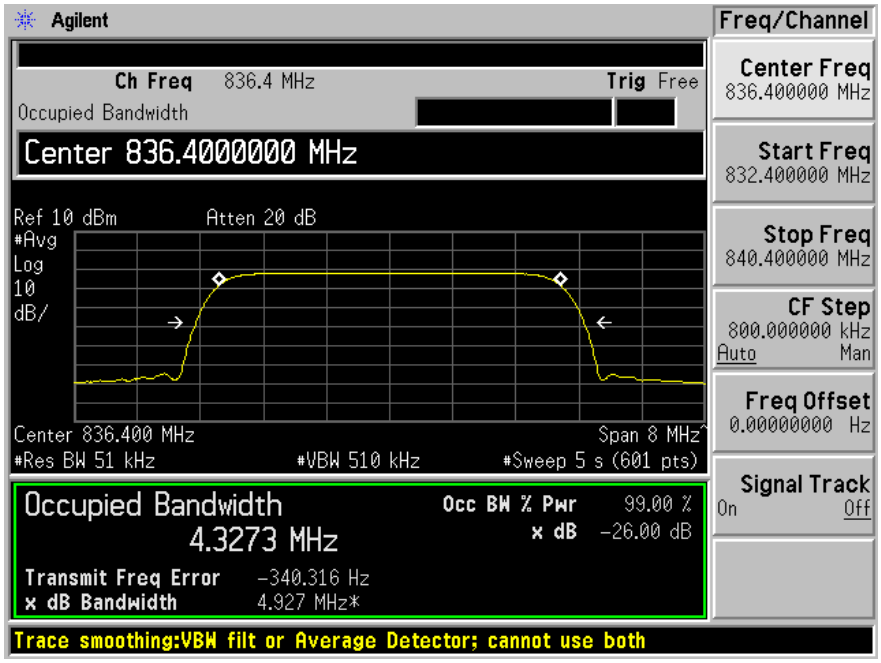



Output

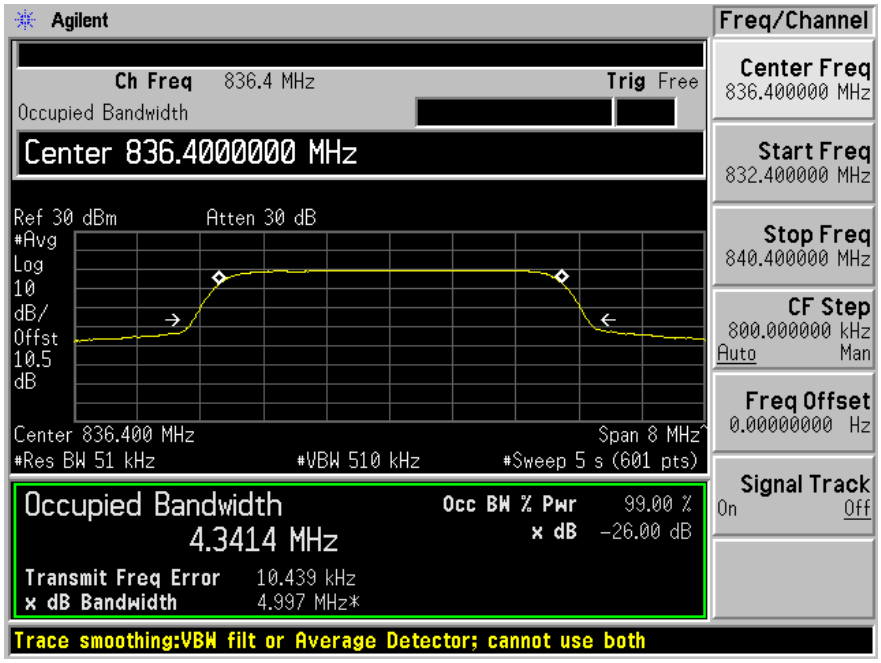


WCDMA/HSPA Cellular Band Uplink, Middle Channel: 836.4 MHz

Input

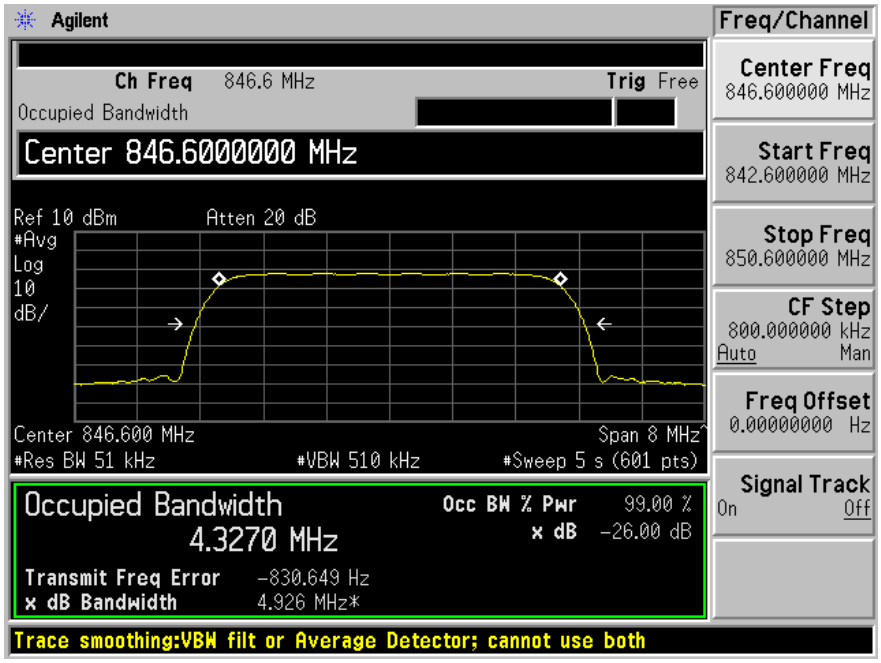



Output

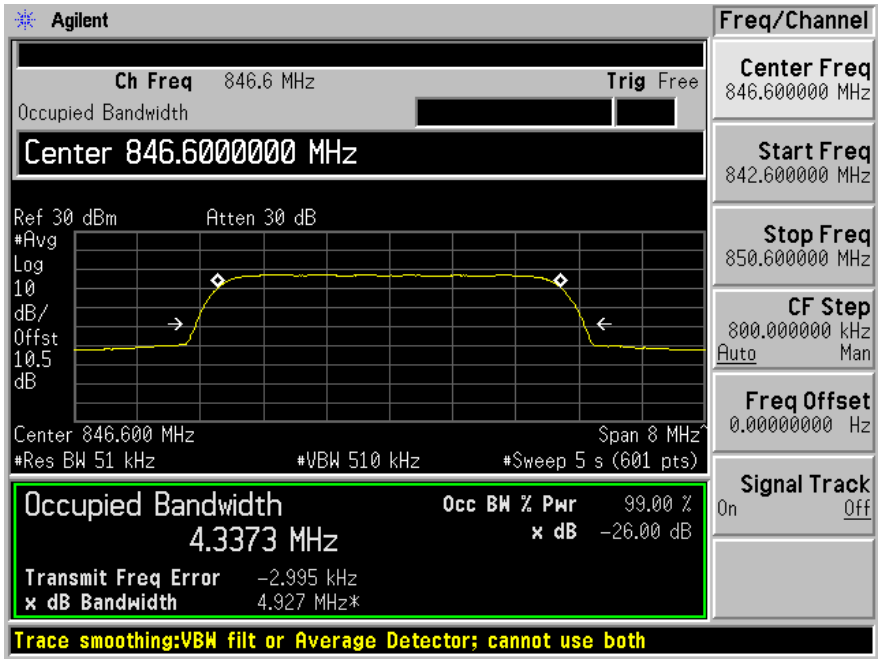


WCDMA/HSPA Cellular Band Uplink, High Channel: 846.6 MHz

Input

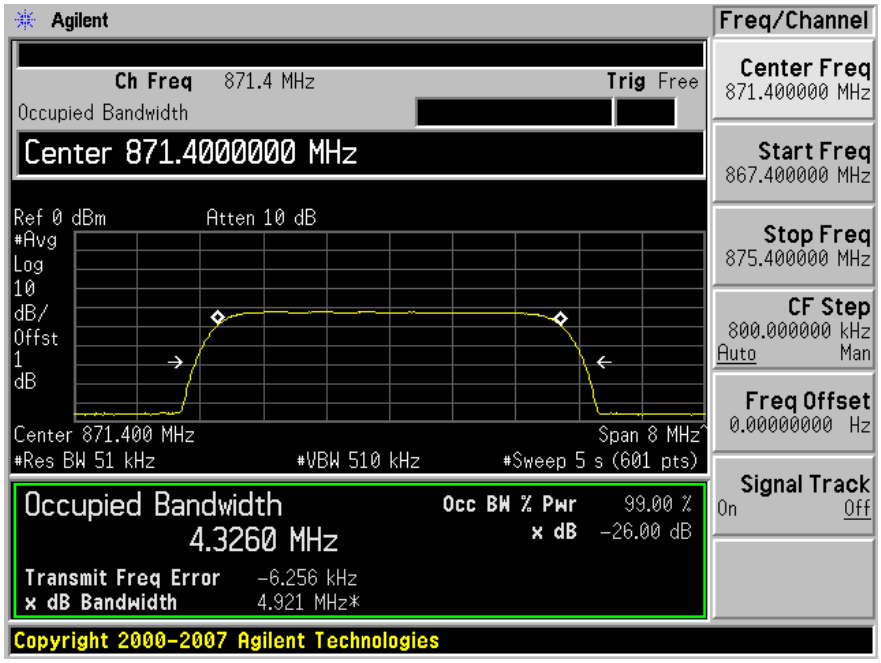



Output

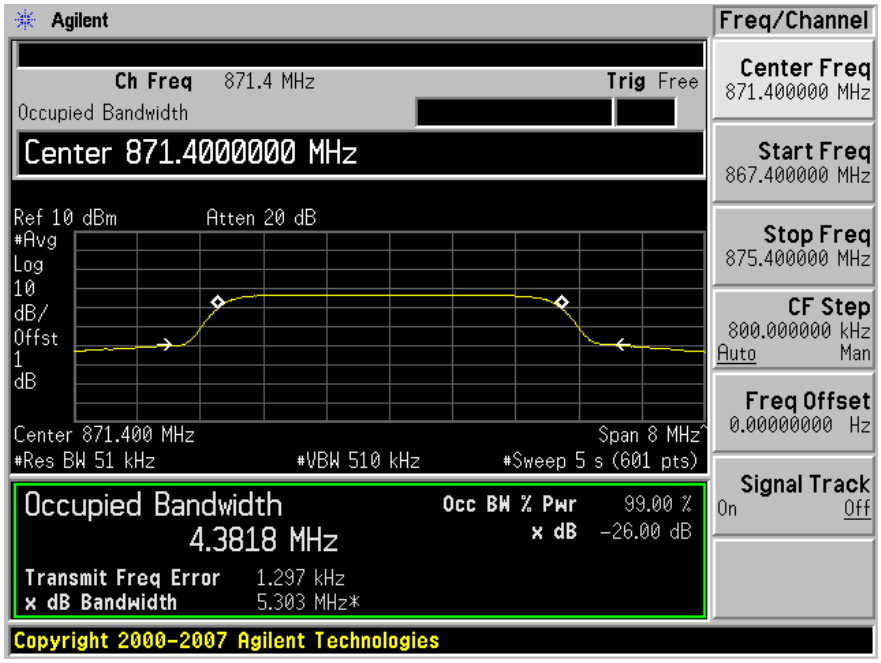


WCDMA/HSPA Cellular Band Downlink, Low Channel: 871.4 MHz

Input

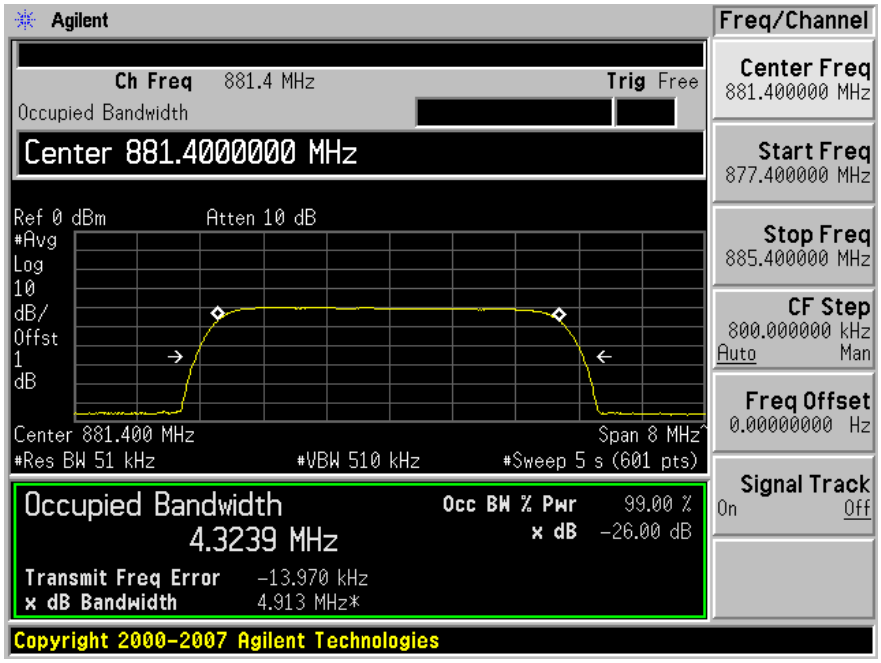



Output

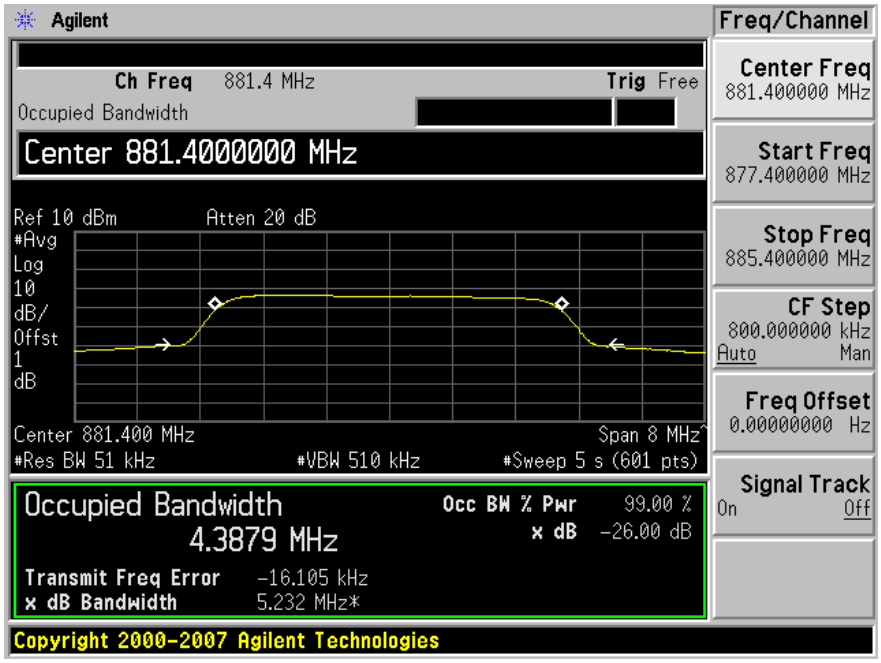


WCDMA/HSPA Cellular Band Downlink, Middle Channel: 881.4 MHz

Input

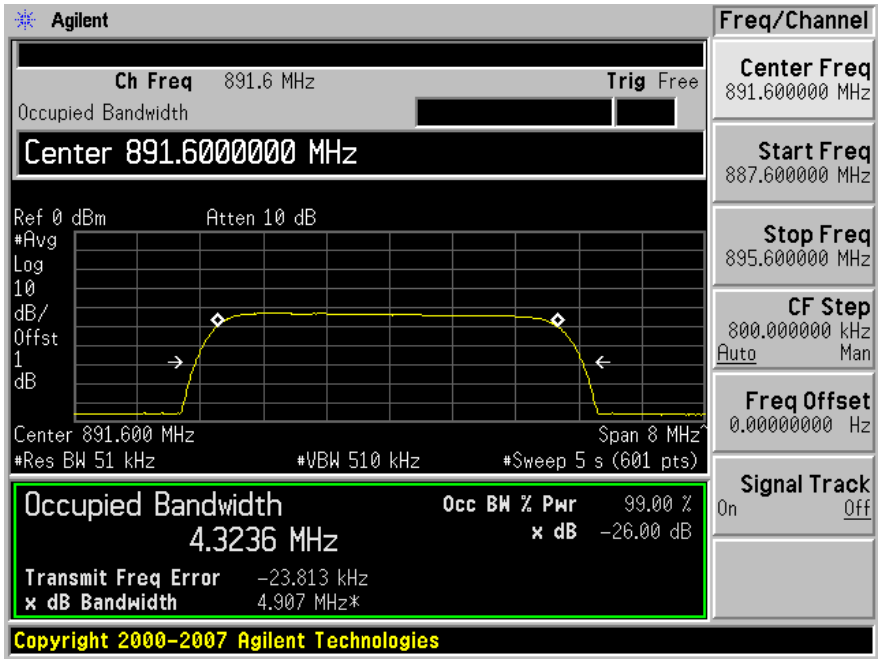



Output

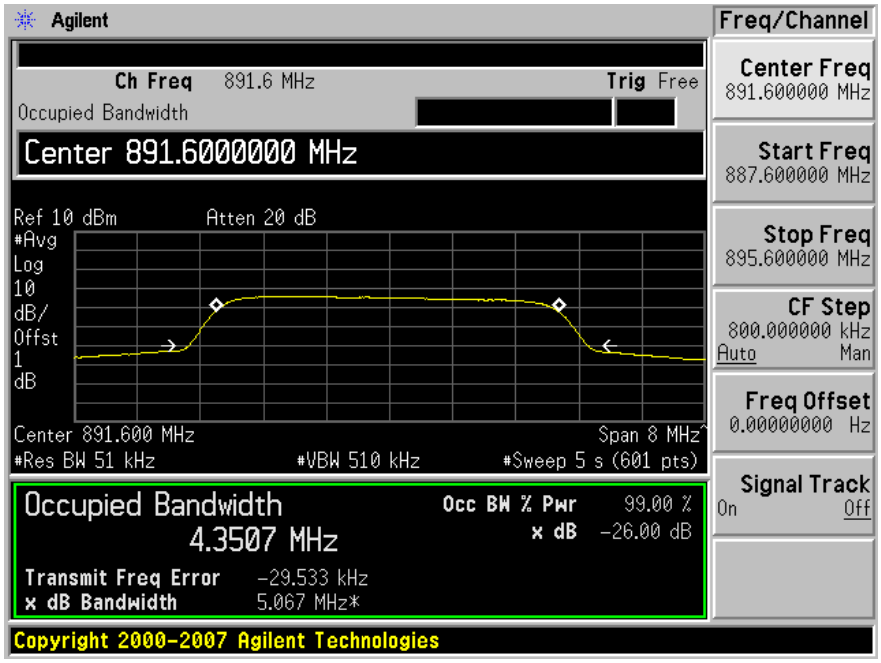


WCDMA/HSPA Cellular Band Downlink, High Channel: 891.6 MHz

Input

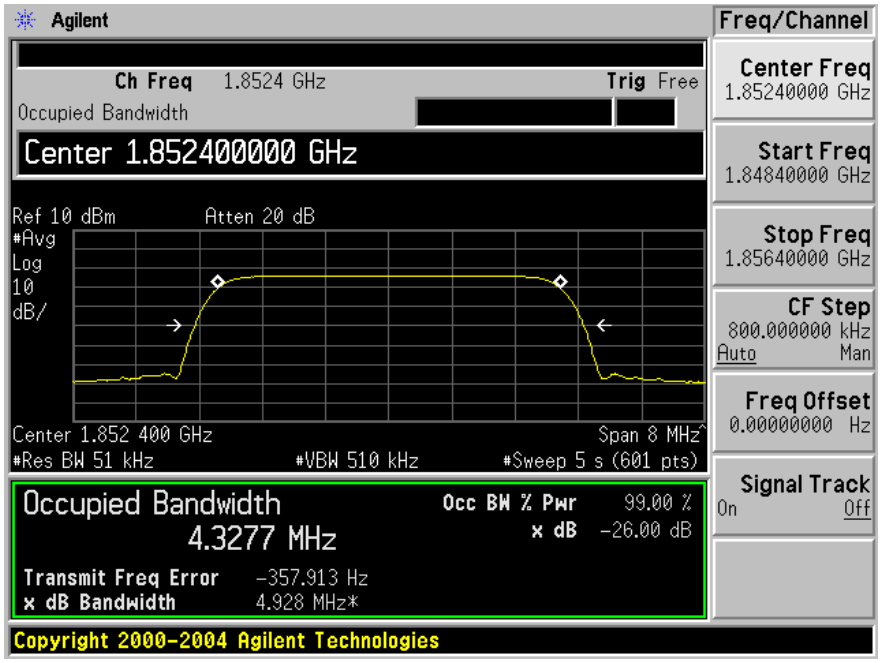



Output

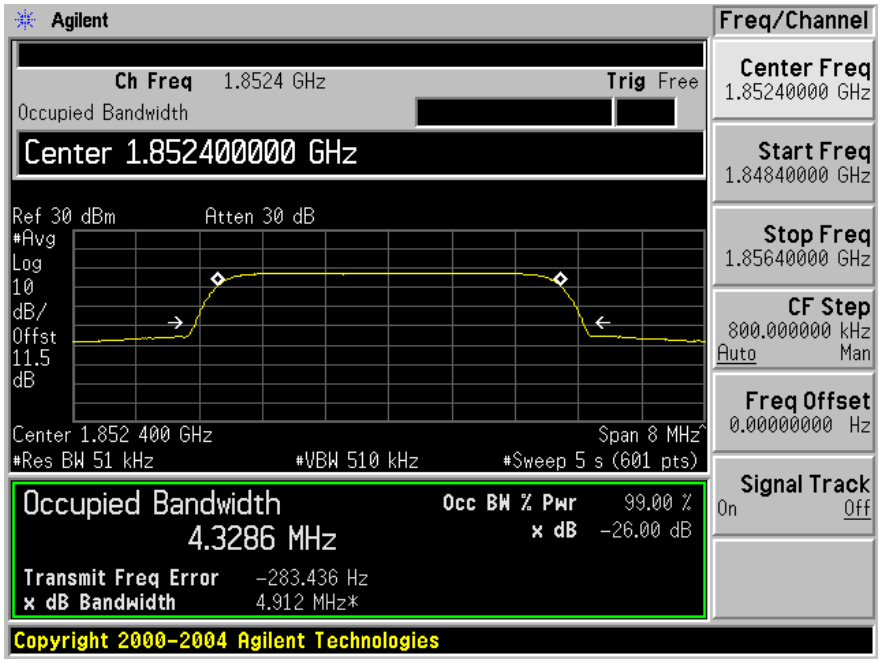


WCDMA/HSPA PCS Band Uplink, Low Channel: 1852.4 MHz

Input

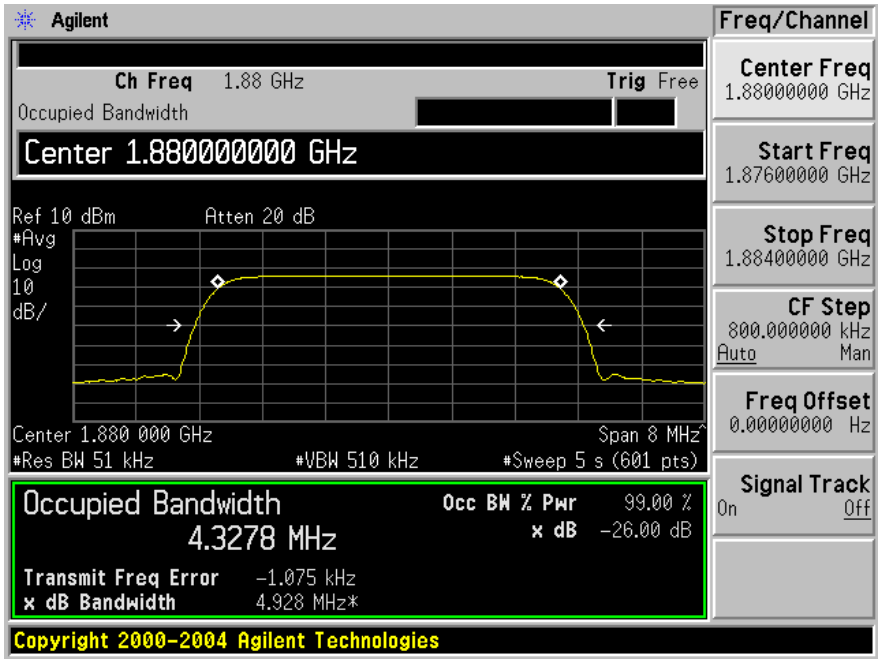



Output

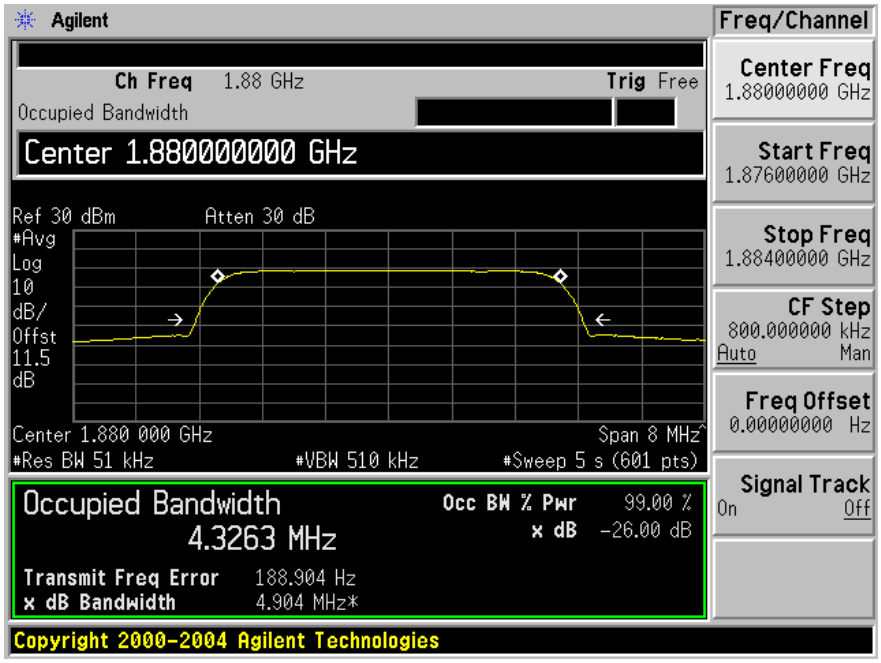


WCDMA/HSPA PCS Band Uplink, Middle Channel: 1880 MHz

Input

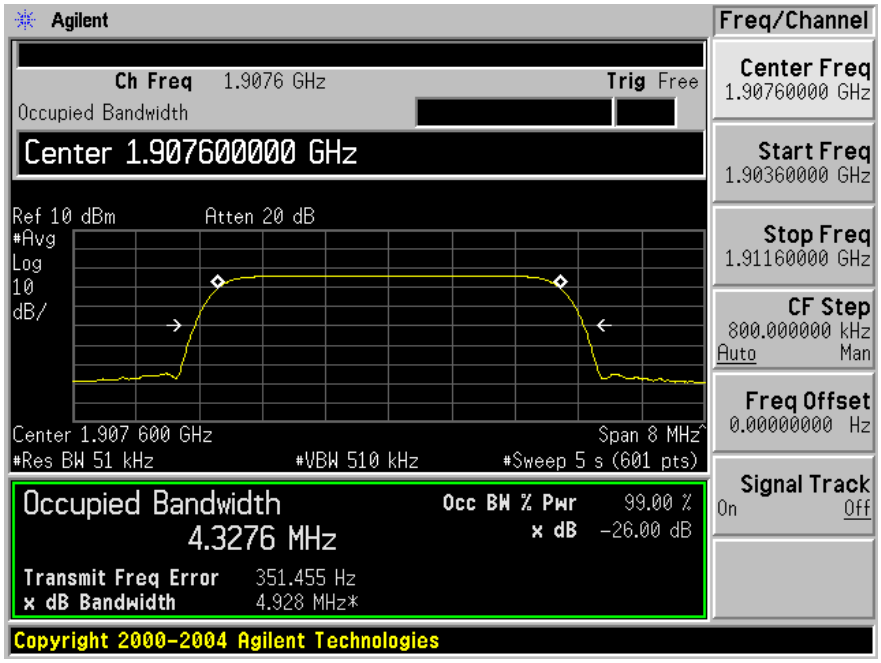



Output

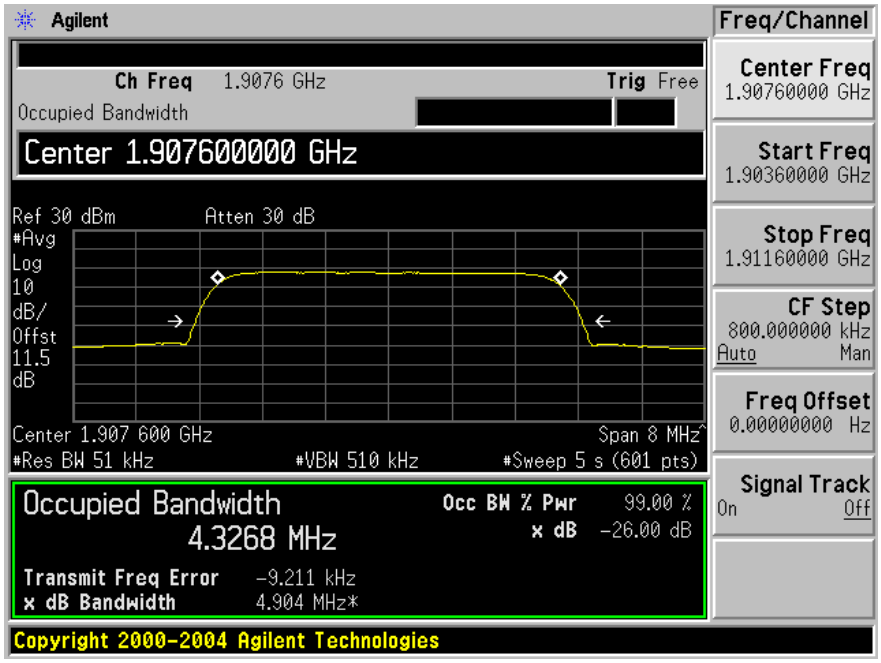


WCDMA/HSPA PCS Band Uplink, High Channel: 1907.6 MHz

Input

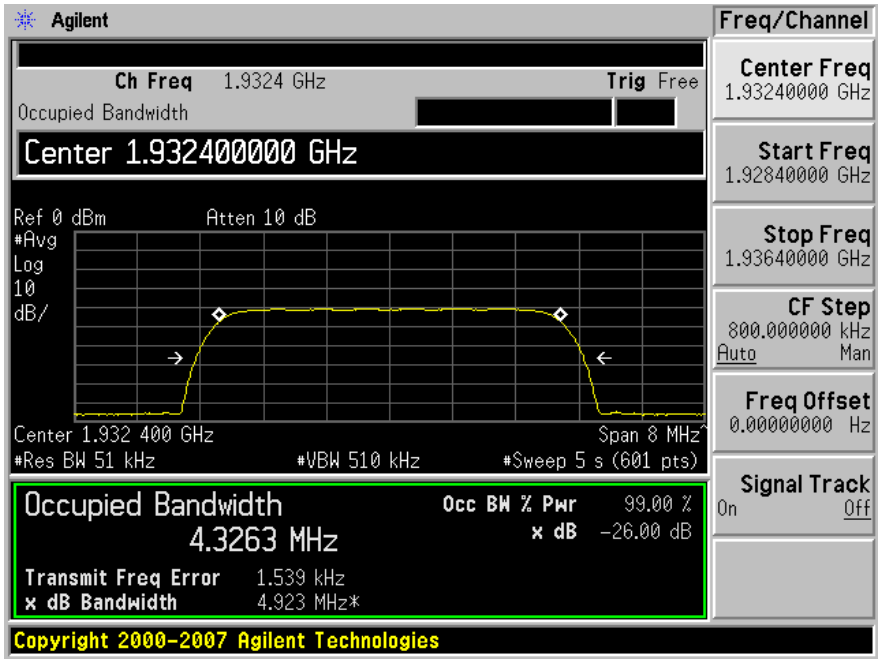



Output

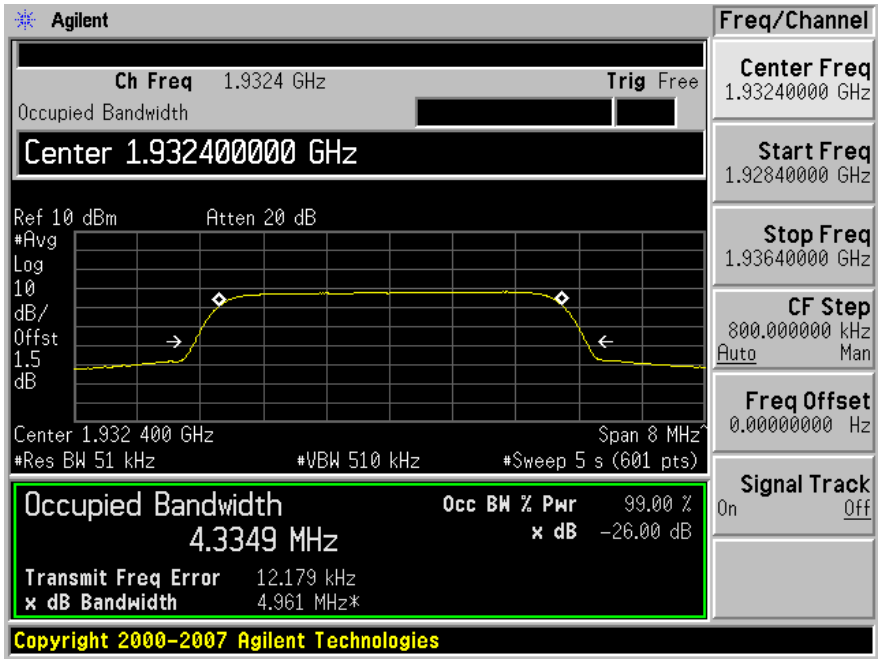


WCDMA/HSPA PCS Band Downlink, Low Channel: 1932.4 MHz

Input

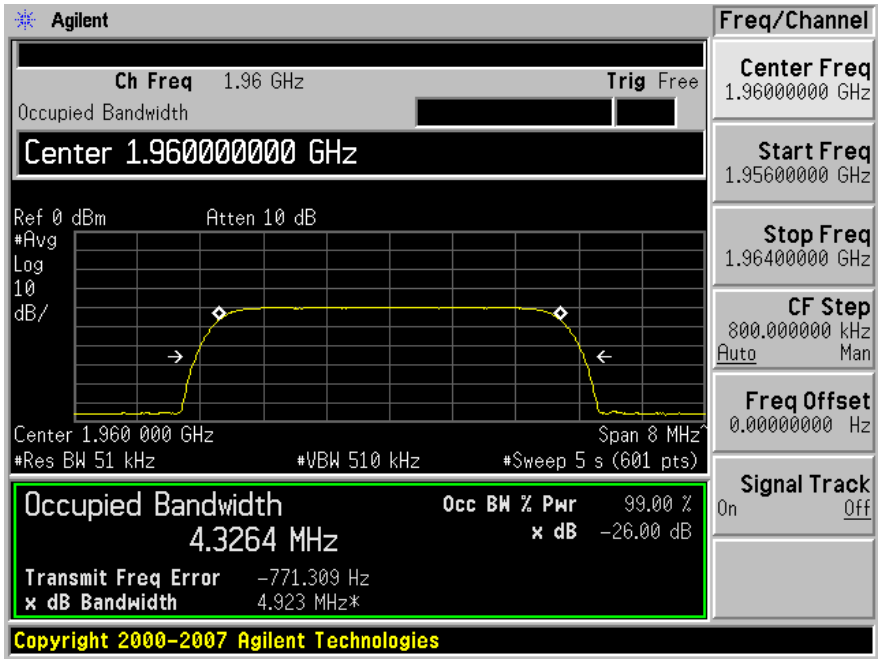



Output

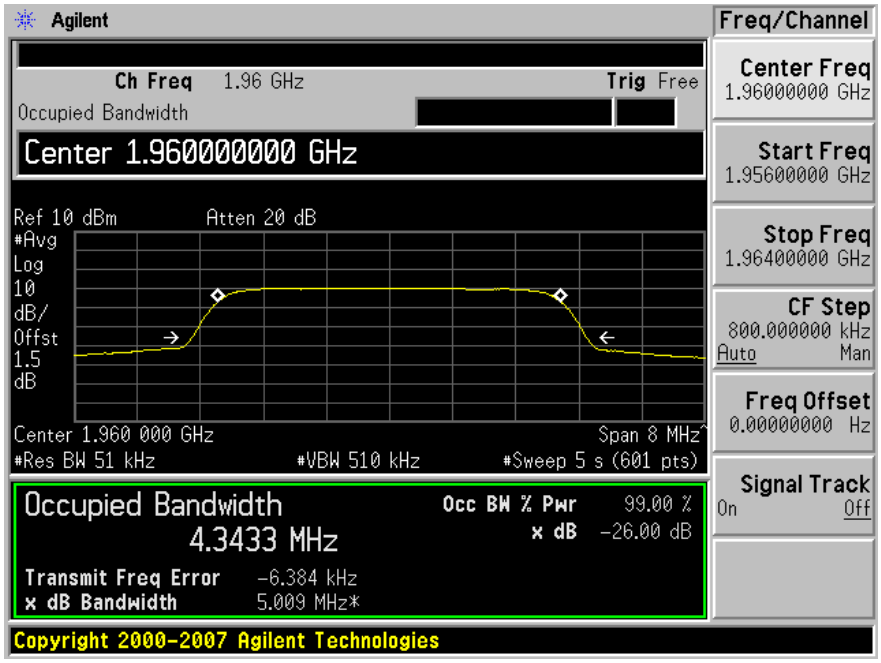


WCDMA/HSPA PCS Band Downlink, Middle Channel: 1960 MHz

Input

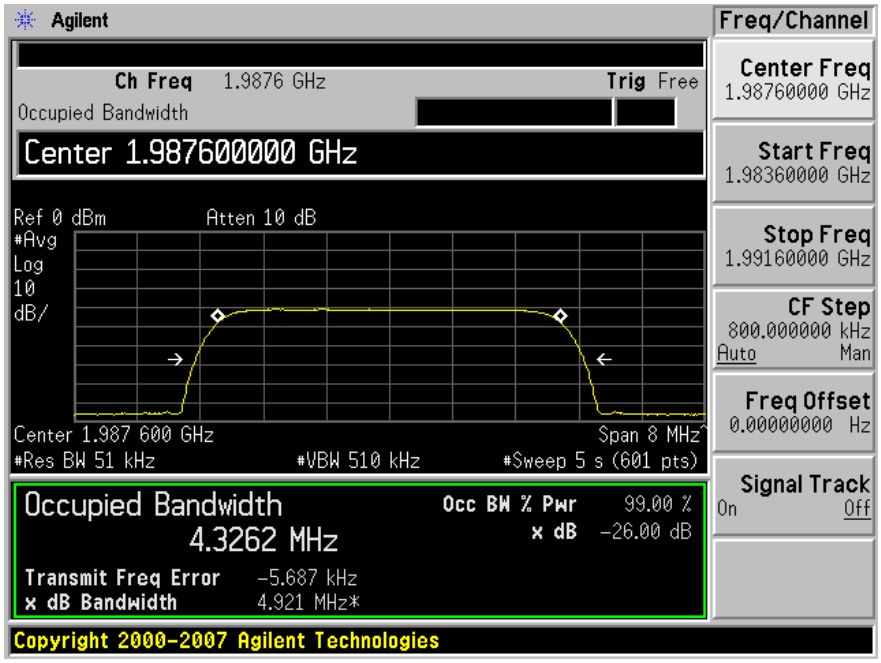



Output

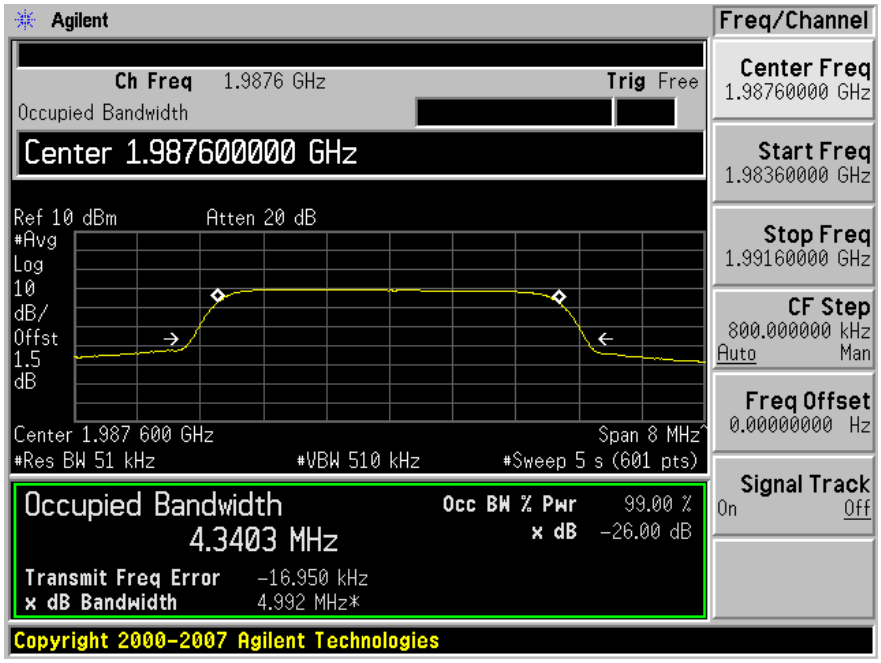


WCDMA/HSPA PCS Band Downlink, High Channel: 1987.6 MHz

Input

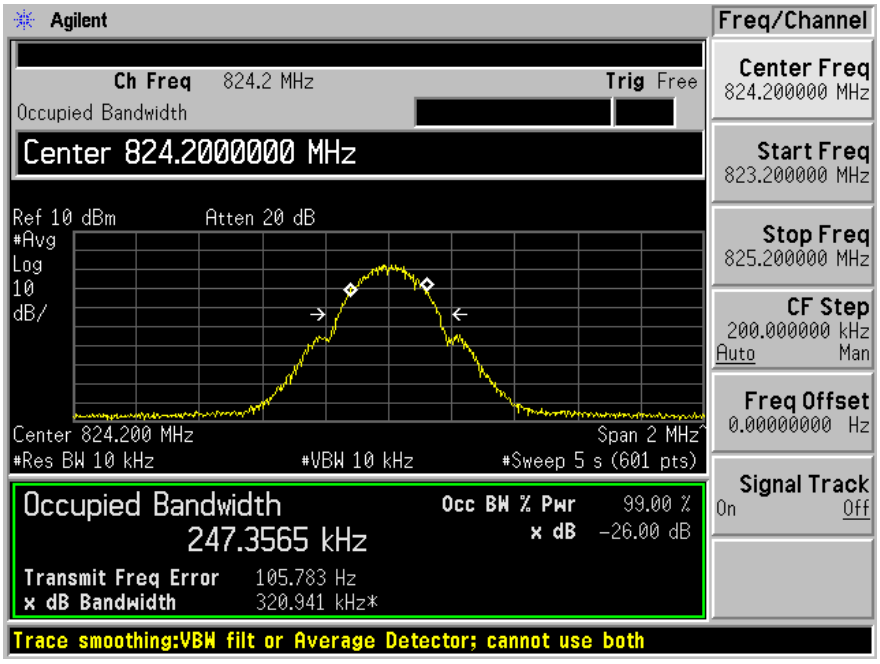



Output

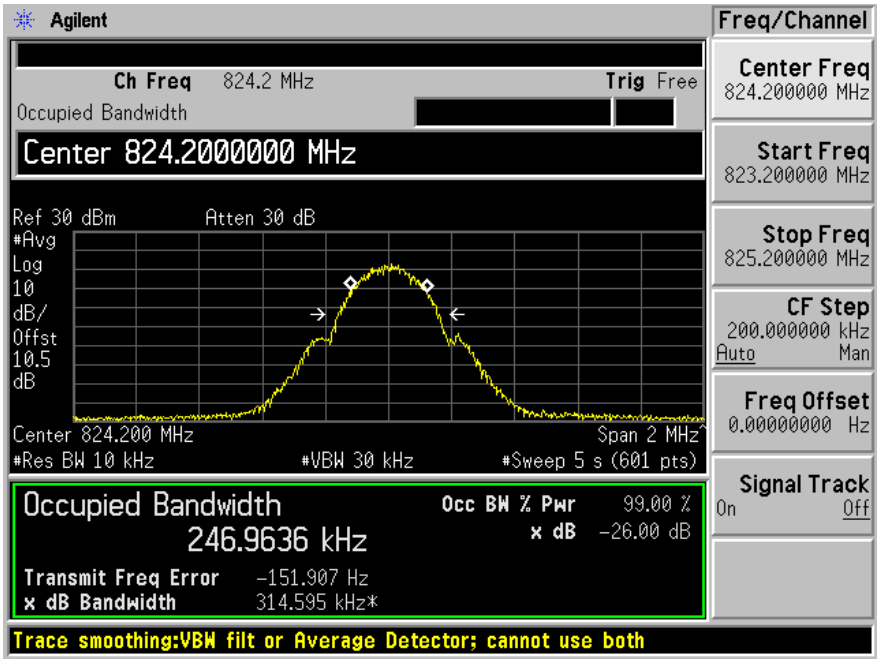


GSM Cellular Band Uplink, Low Channel: 824.2 MHz

Input

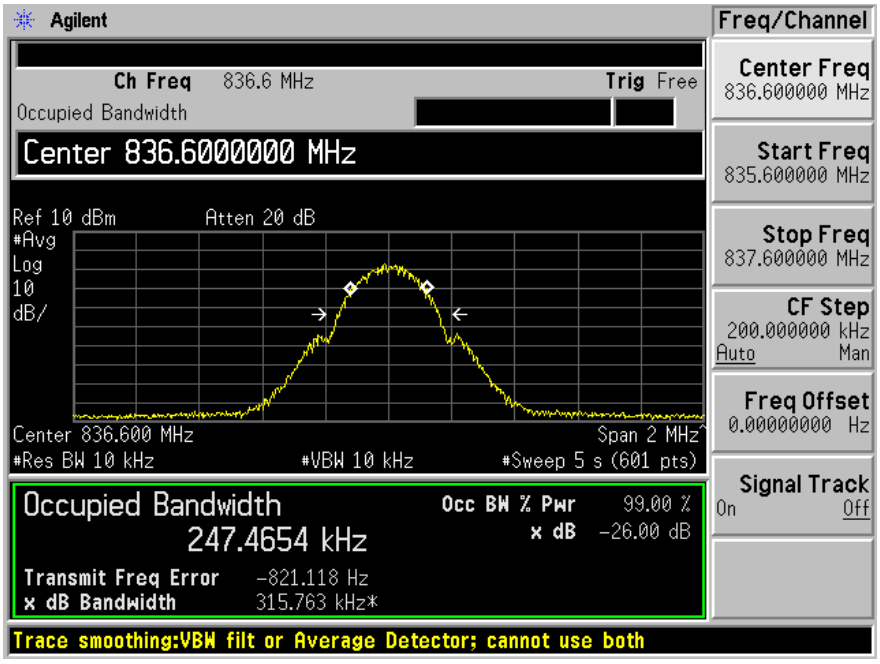



Output

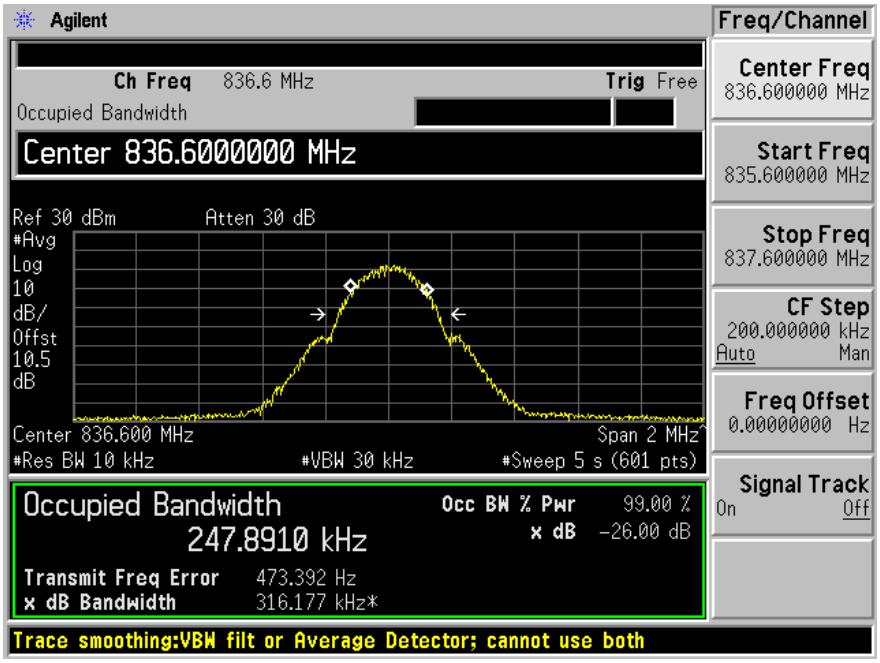


GSM Cellular Band Uplink, Middle Channel: 836.6 MHz

Input

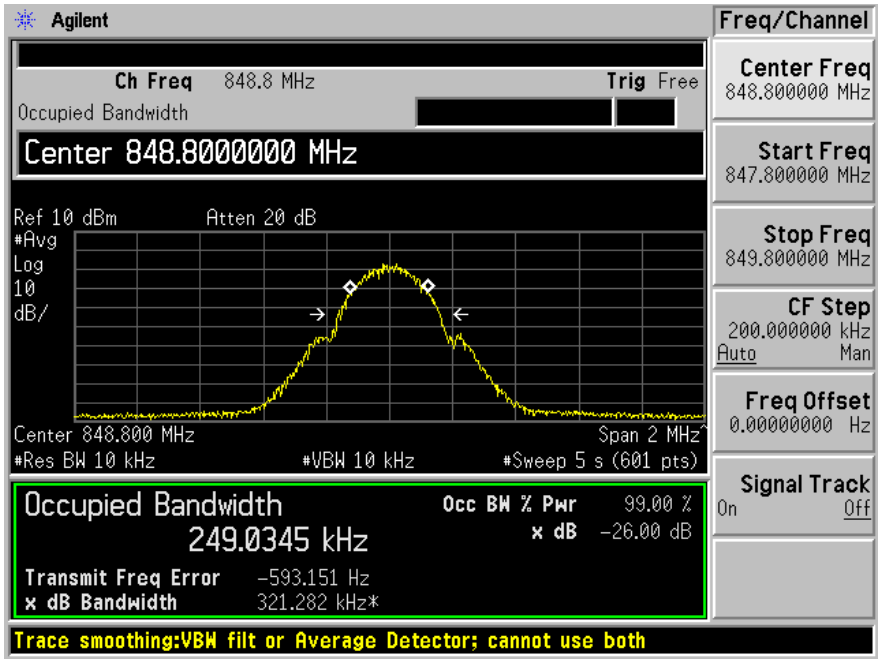



Output

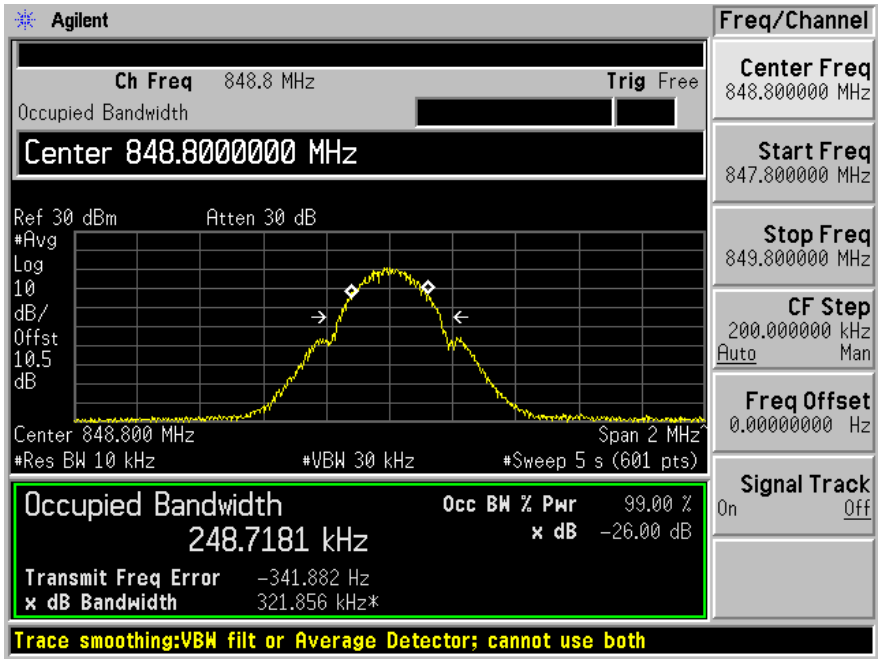


GSM Cellular Band Uplink, High Channel: 848.8 MHz

Input

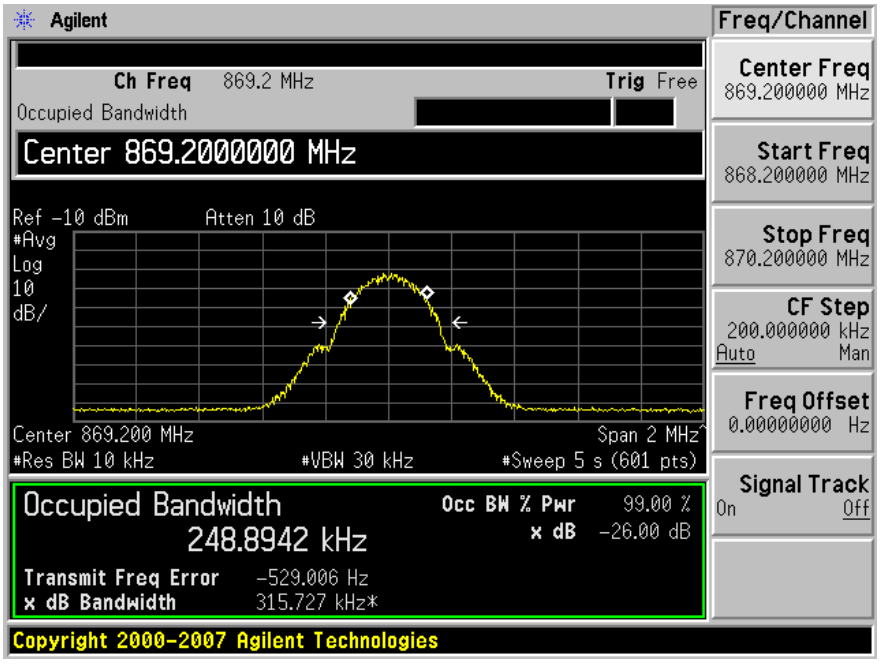



Output

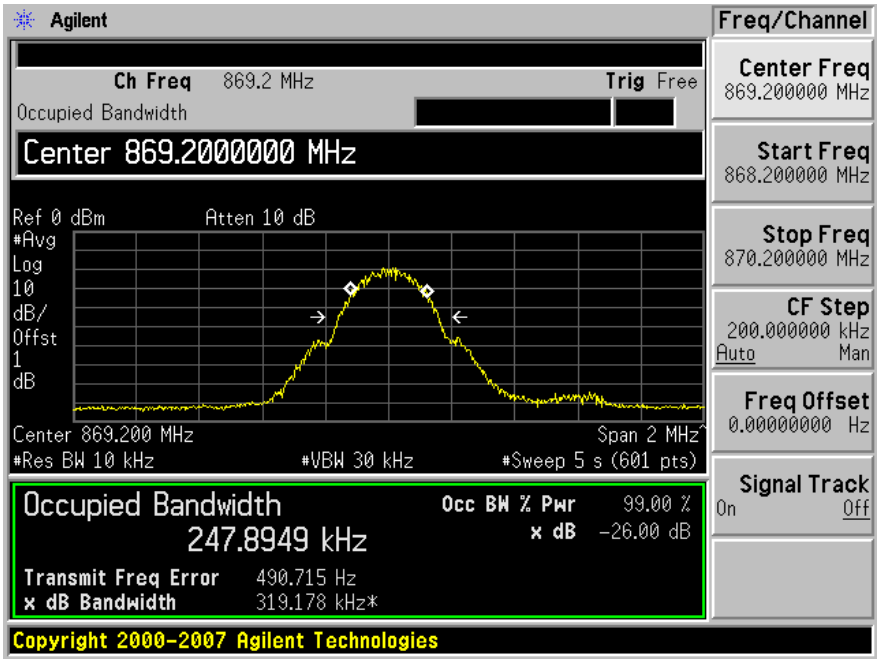


GSM Cellular Band Downlink, Low Channel: 869.2 MHz

Input

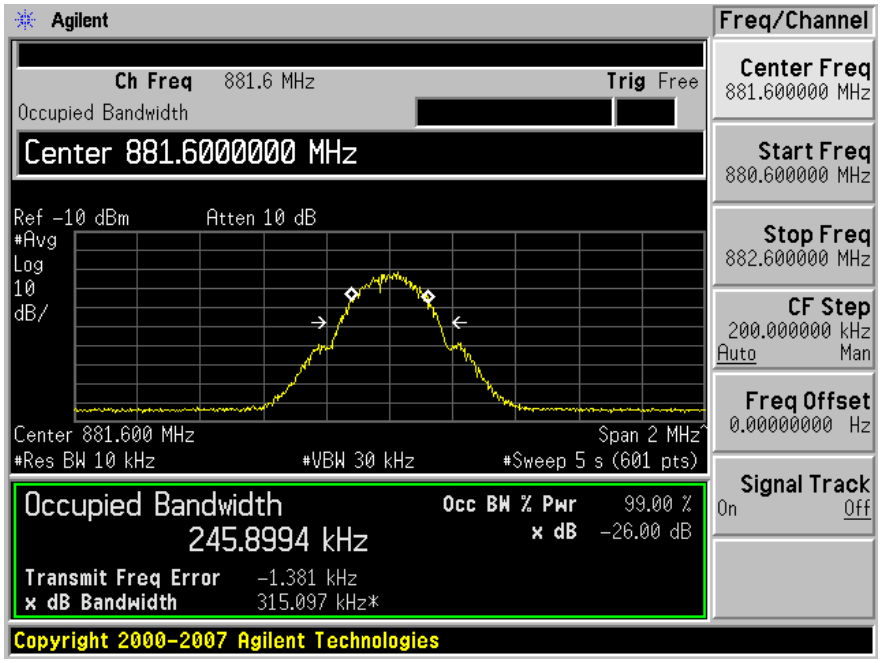



Output

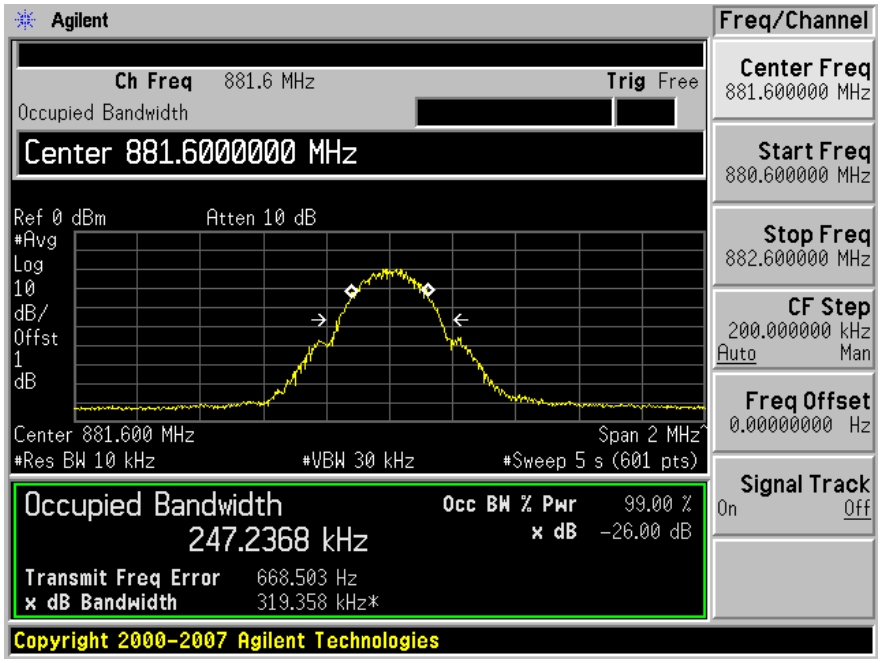


GSM Cellular Band Downlink, Middle Channel: 881.6 MHz

Input

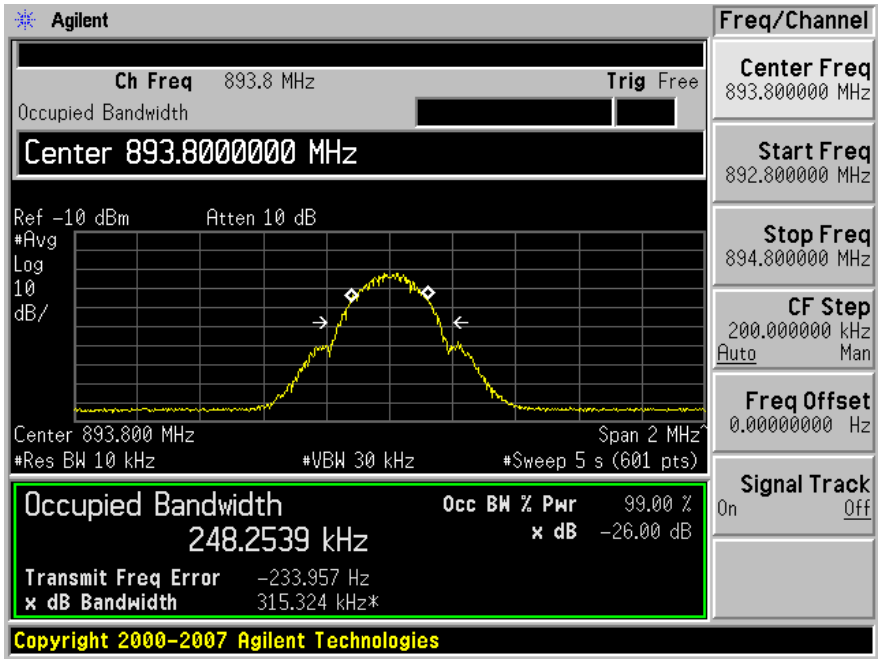



Output

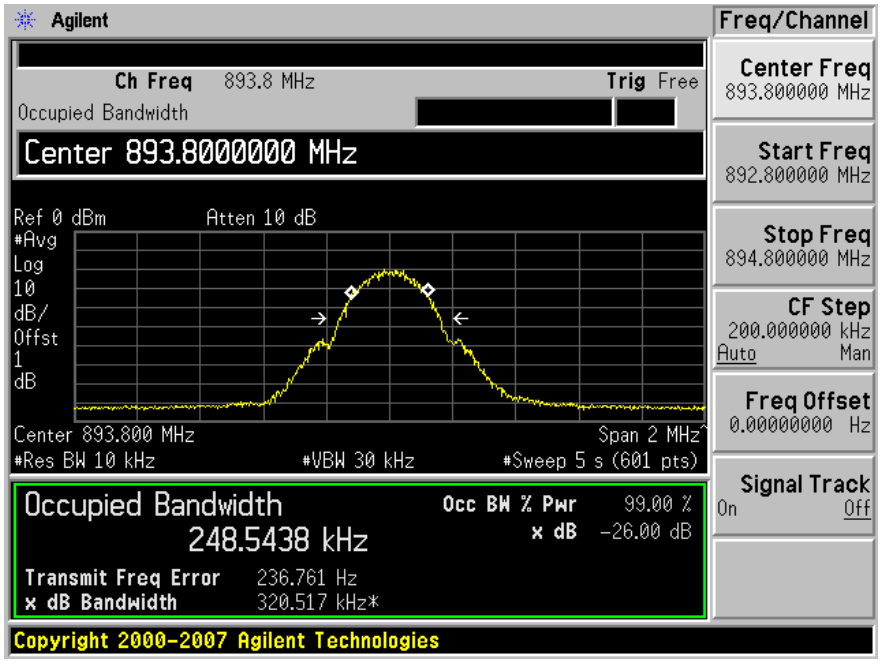


GSM Cellular Band Downlink, High Channel: 893.8 MHz

Input

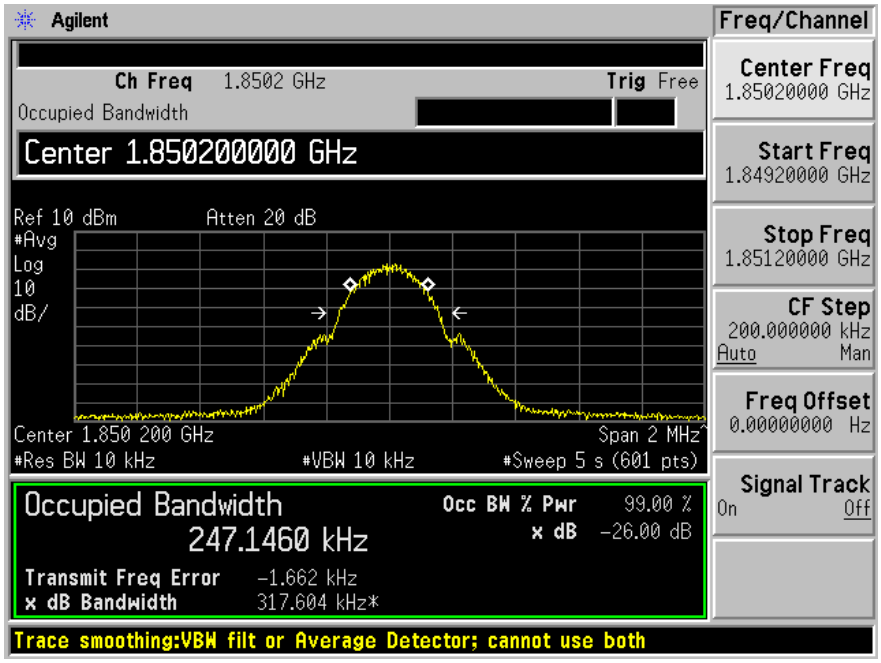



Output

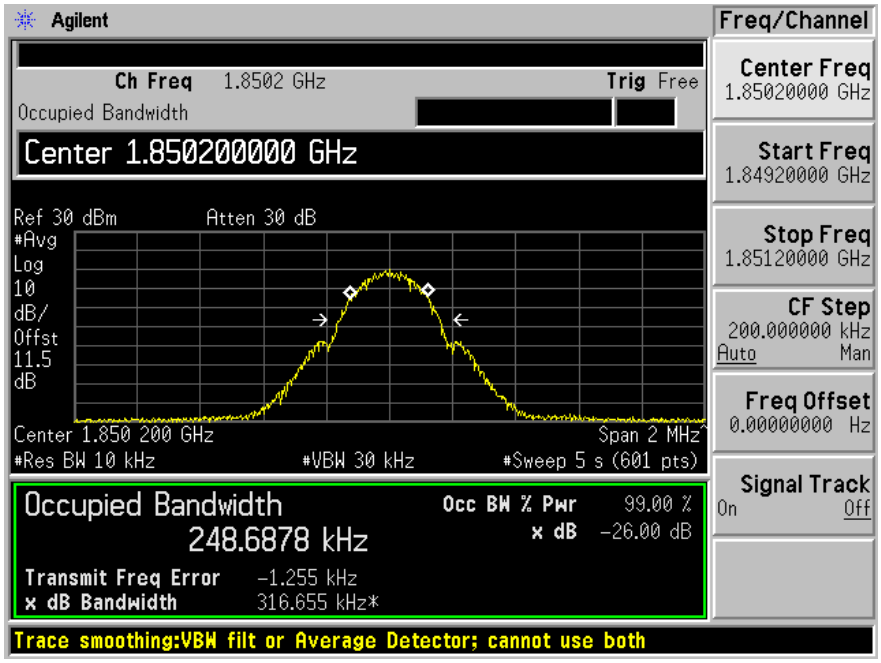


GSM PCS Band Uplink, Low Channel: 1850.2 MHz

Input

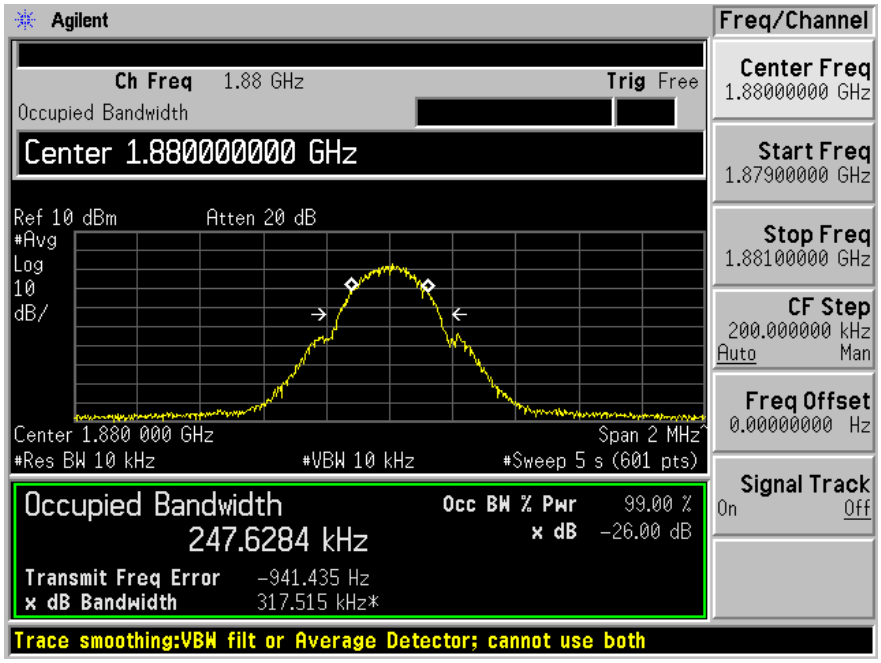



Output

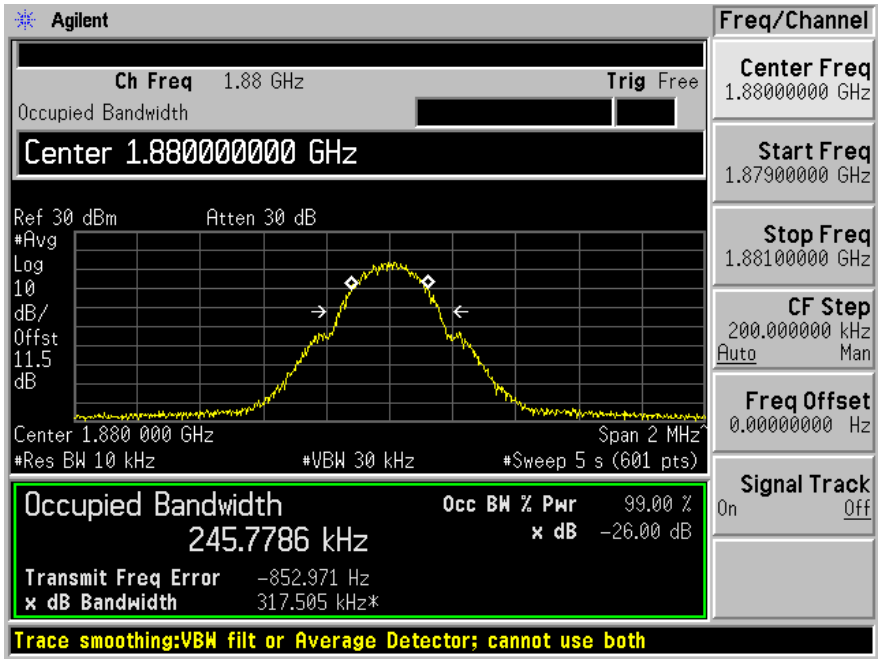


GSM PCS Band Uplink, Middle Channel: 1880 MHz

Input

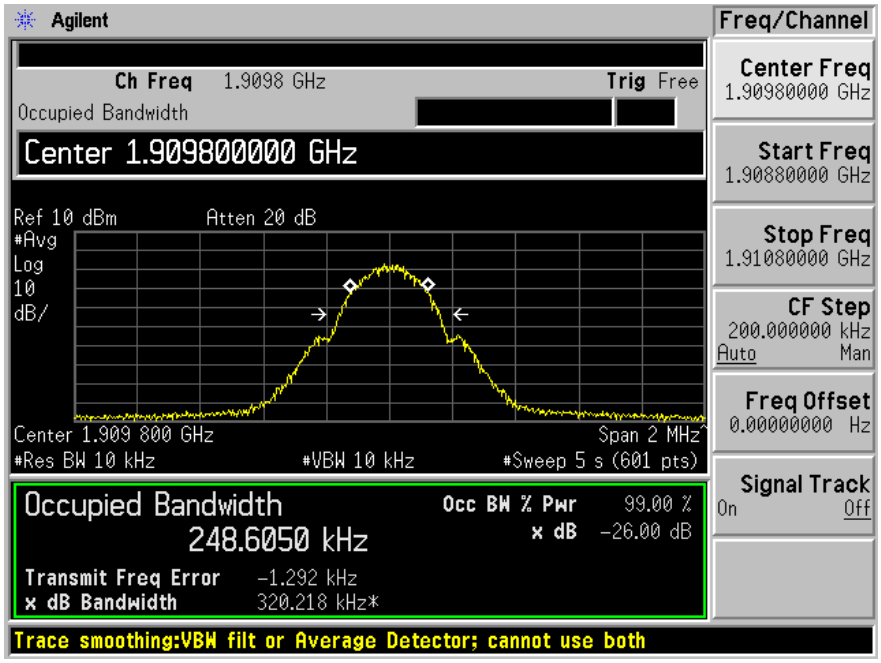



Output

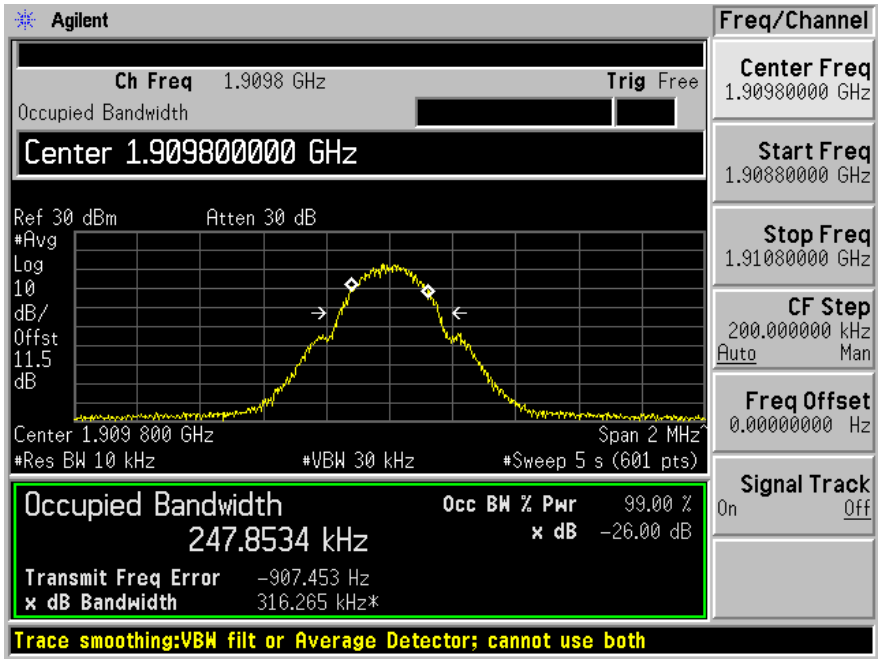


GSM PCS Band Uplink, High Channel: 1909.8 MHz

Input

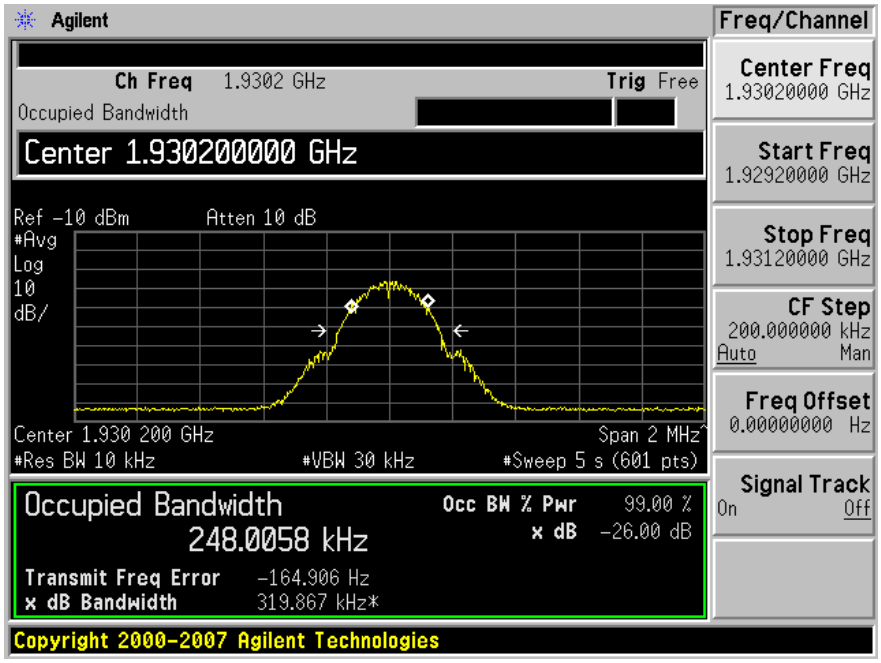



Output

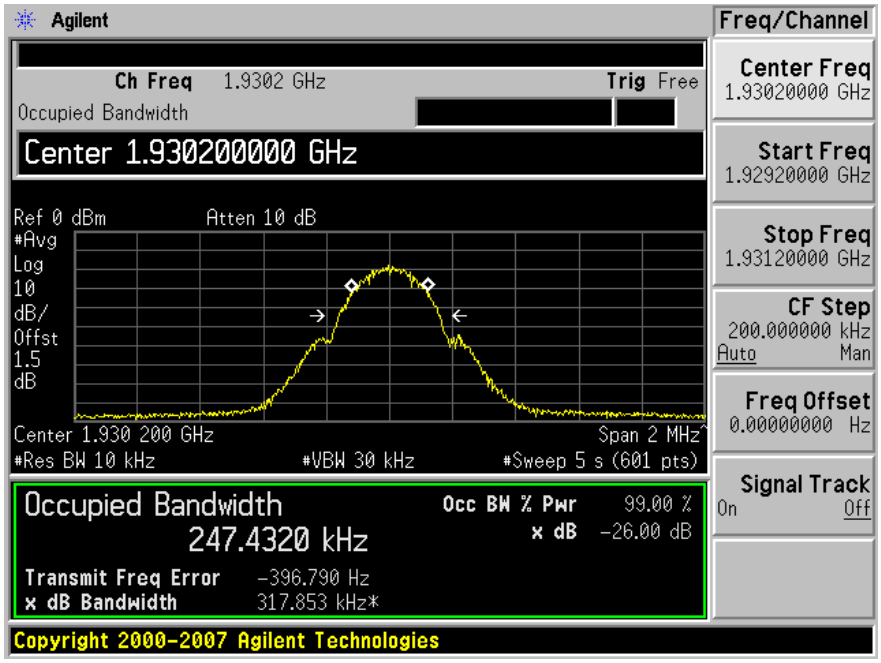


GSM PCS Band Downlink, Low Channel: 1930.2 MHz

Input

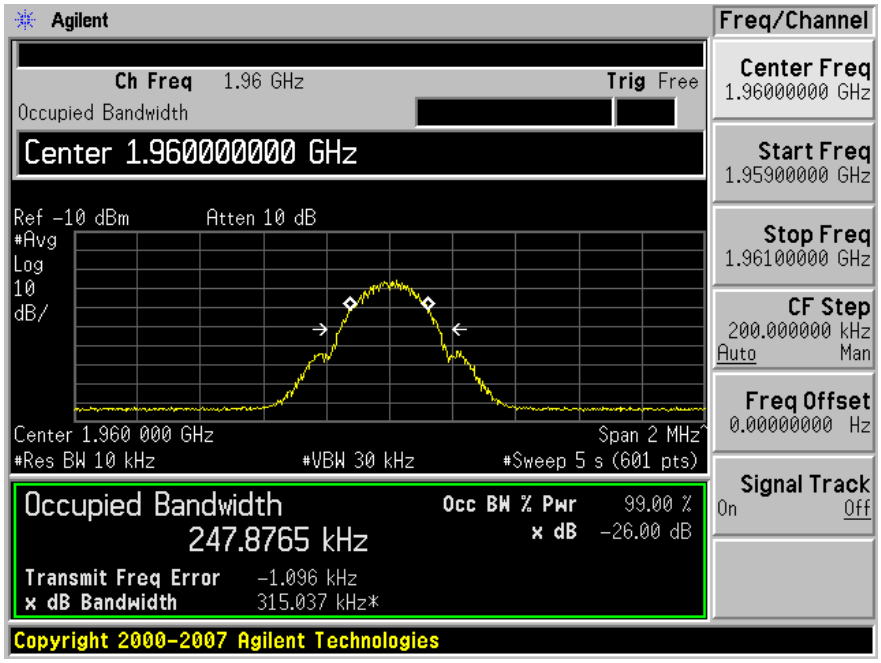



Output

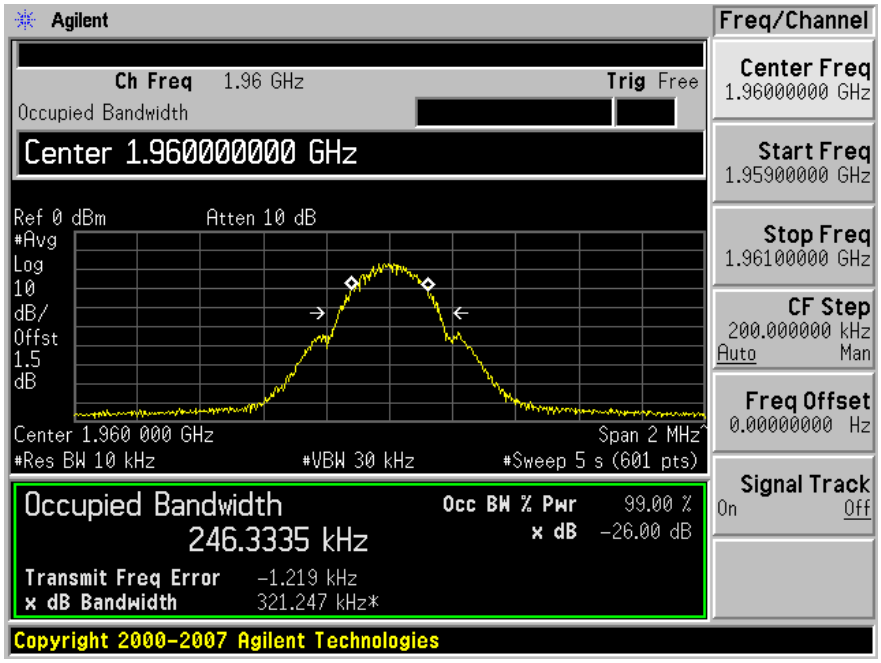


GSM PCS Band Downlink, Middle Channel: 1960 MHz

Input

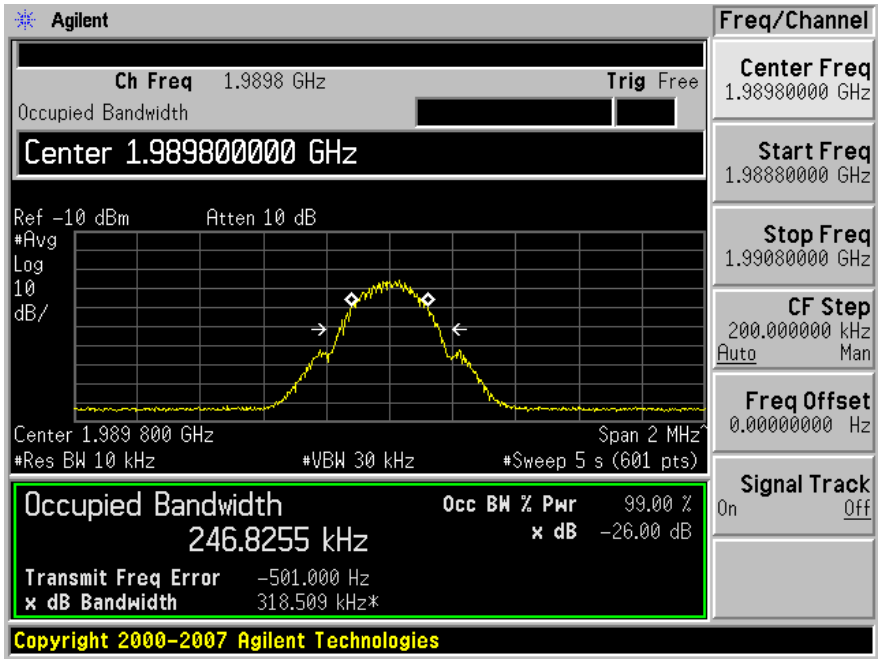



Output

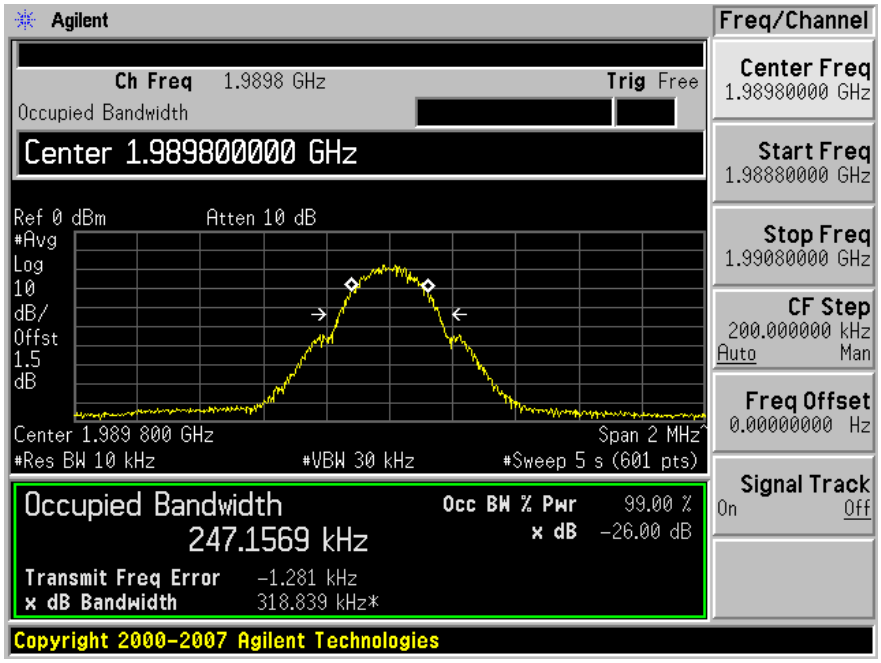


GSM PCS Band Downlink, High Channel: 1989.8 MHz

Input

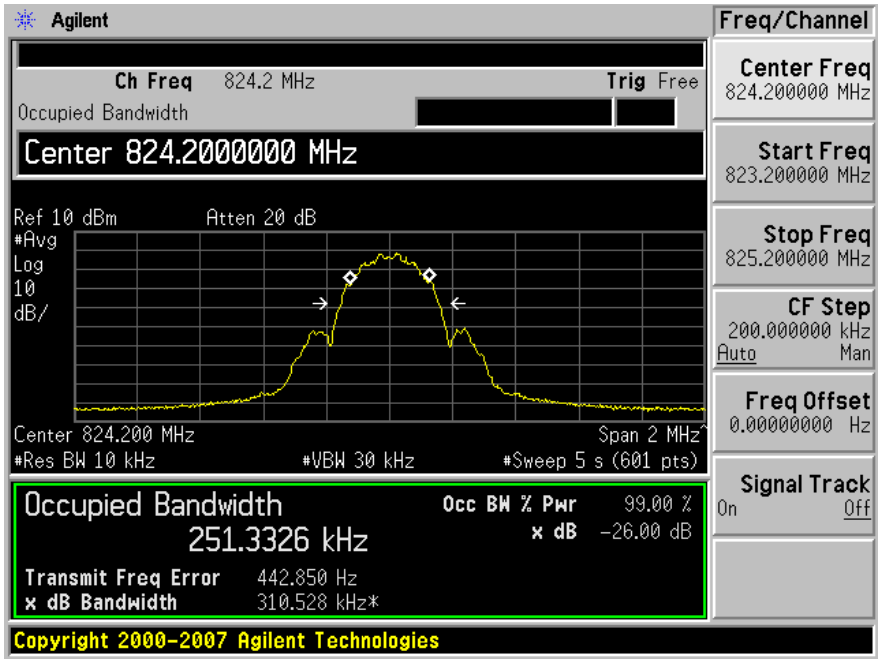



Output

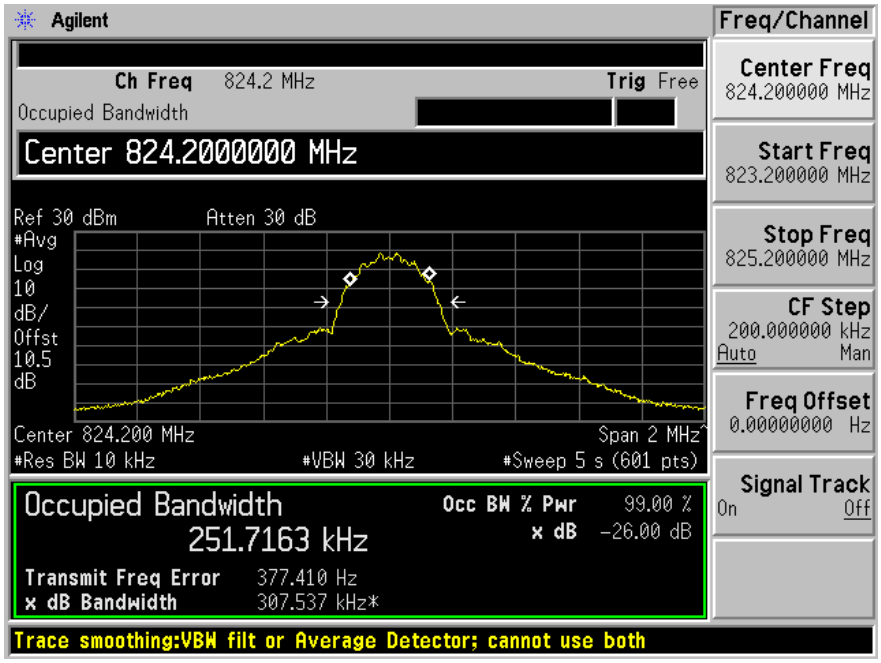


EDGE Cellular Band Uplink, Low Channel: 824.2 MHz

Input

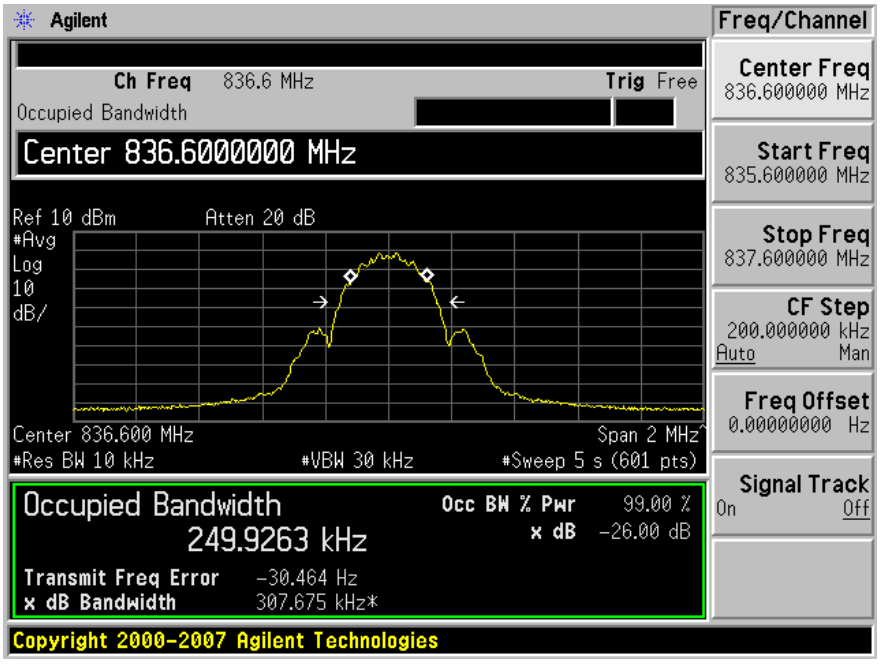



Output

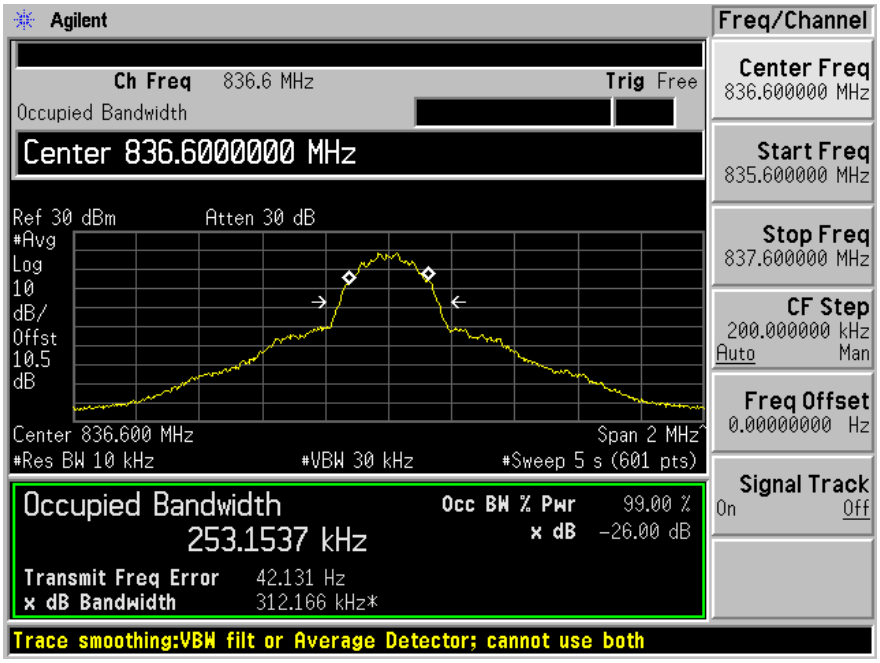


EDGE Cellular Band Uplink, Middle Channel: 836.6 MHz

Input

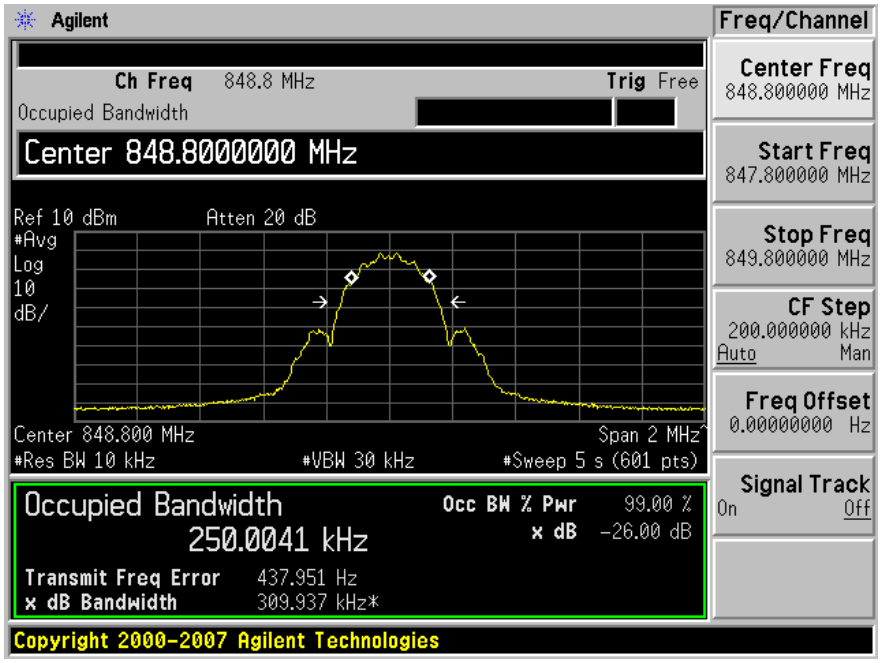



Output

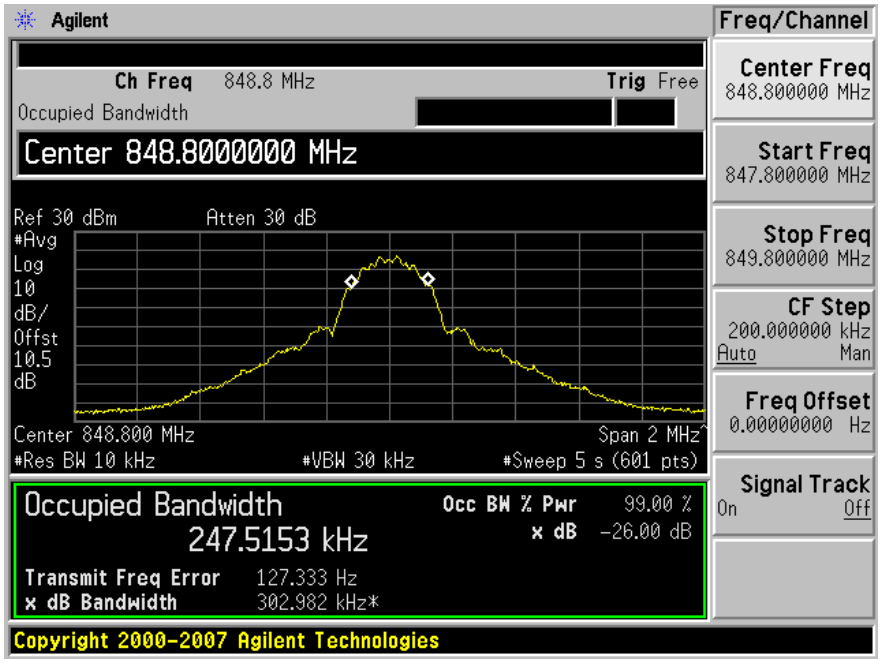


EDGE Cellular Band Uplink, High Channel: 848.8 MHz

Input

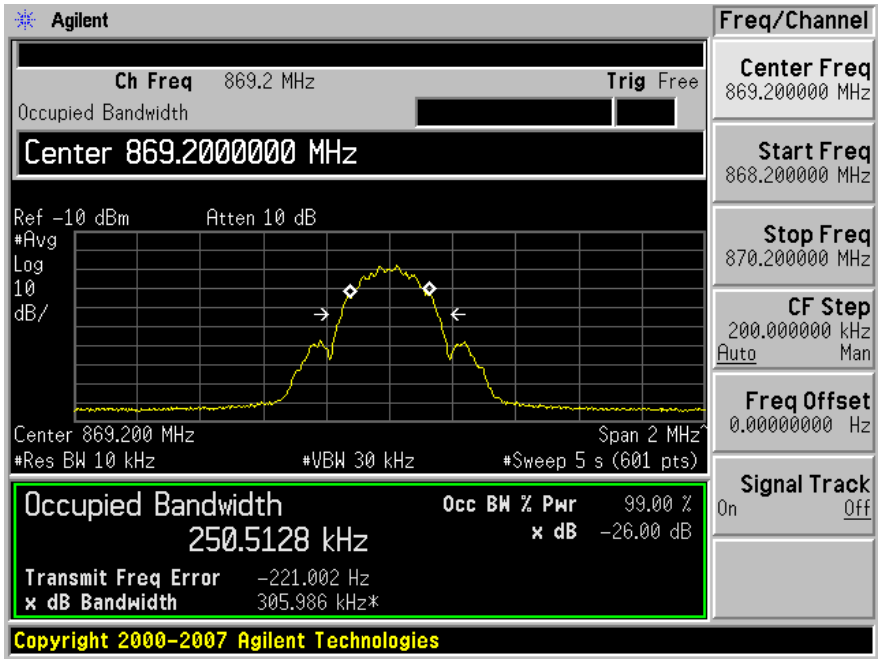



Output

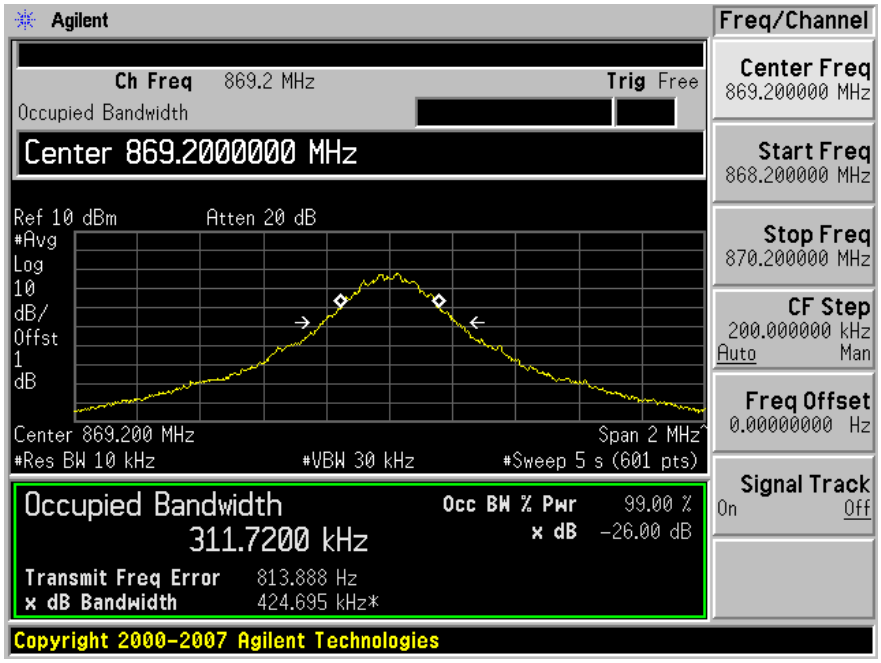


EDGE Cellular Band Downlink, Low Channel: 869.2 MHz

Input

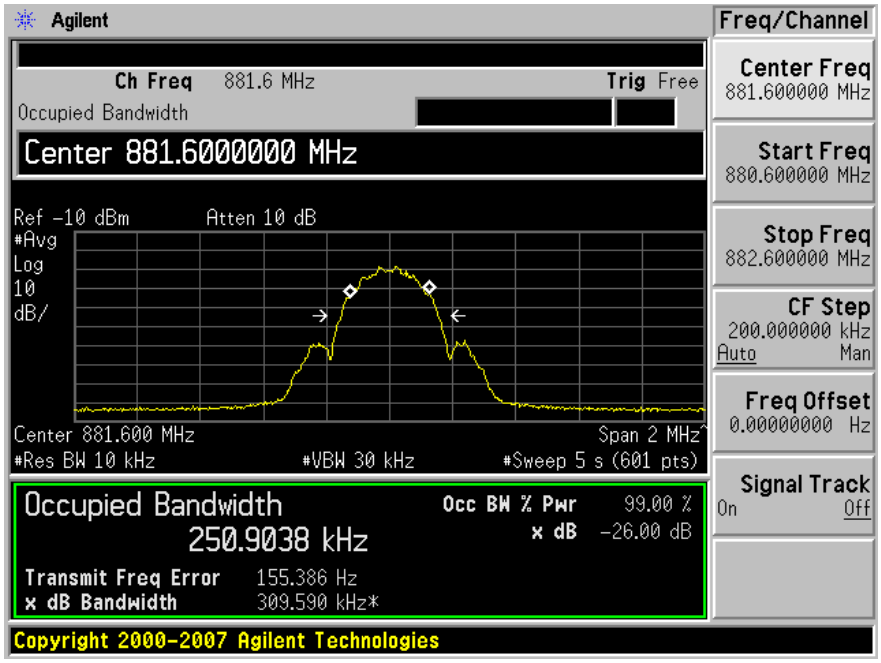



Output

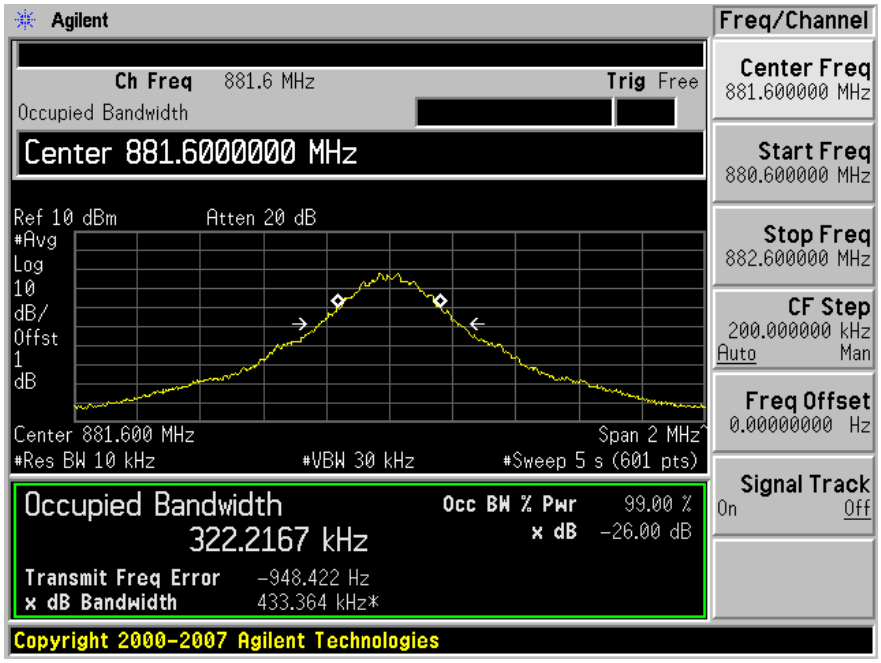


EDGE Cellular Band Downlink, Middle Channel: 881.6 MHz

Input

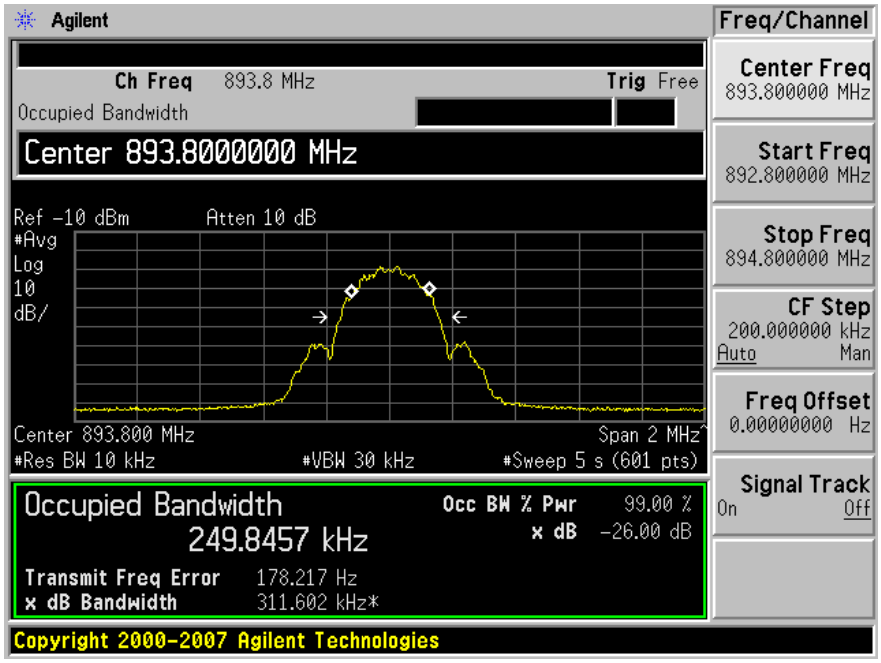



Output

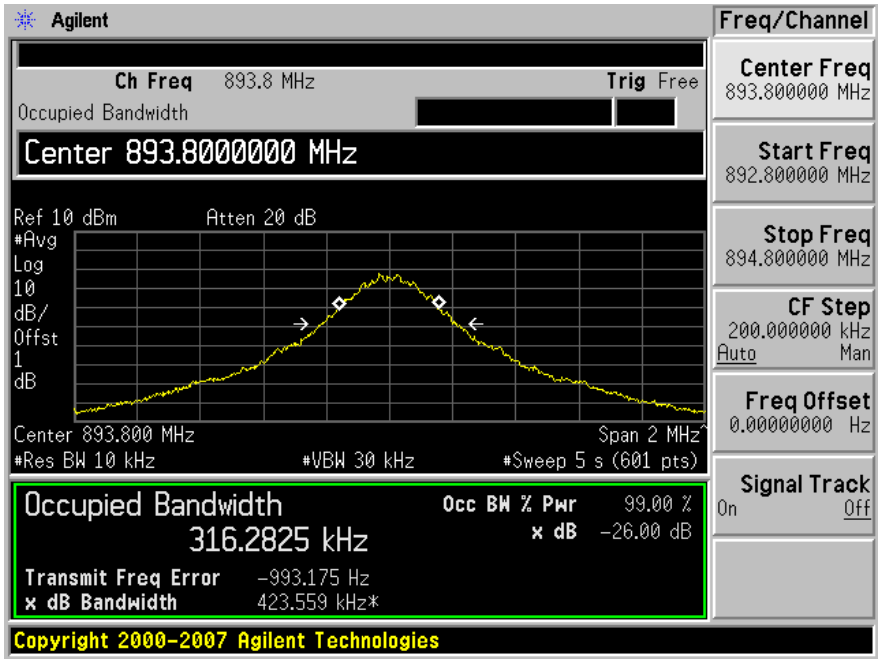


EDGE Cellular Band Downlink, High Channel: 893.8 MHz

Input

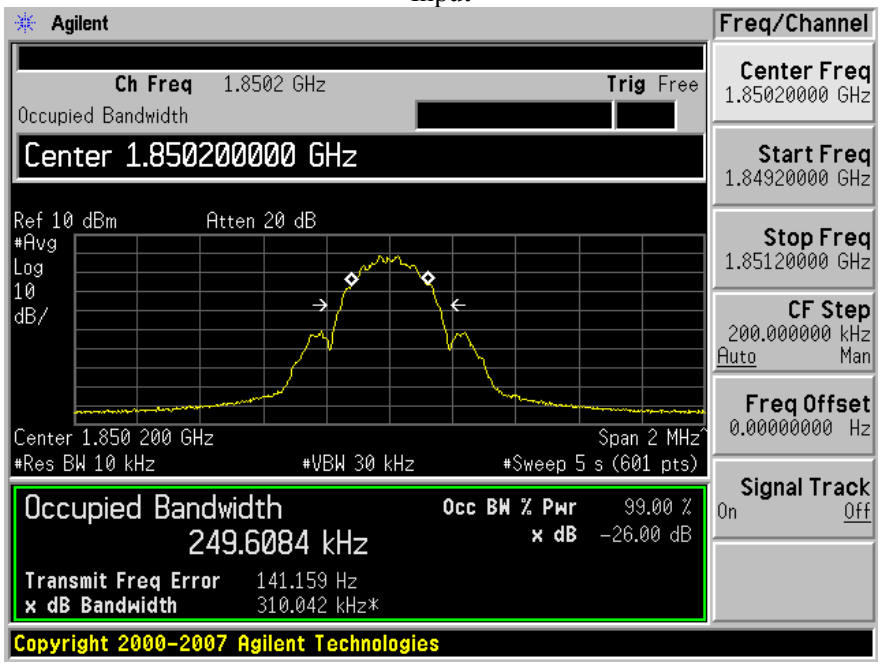



Output

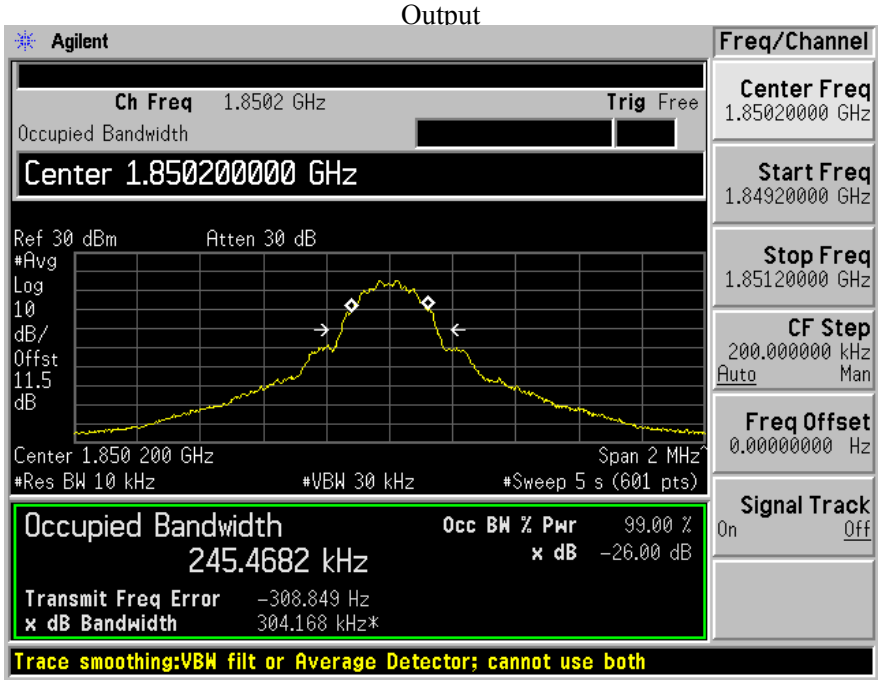


EDGE PCS Band Uplink, Low Channel: 1850.2 MHz

Input

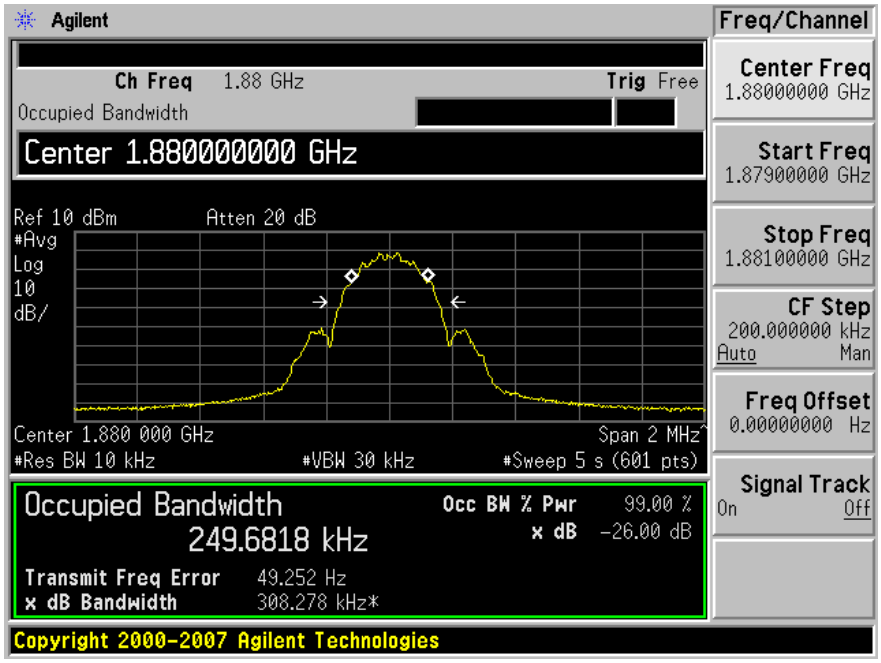



Output

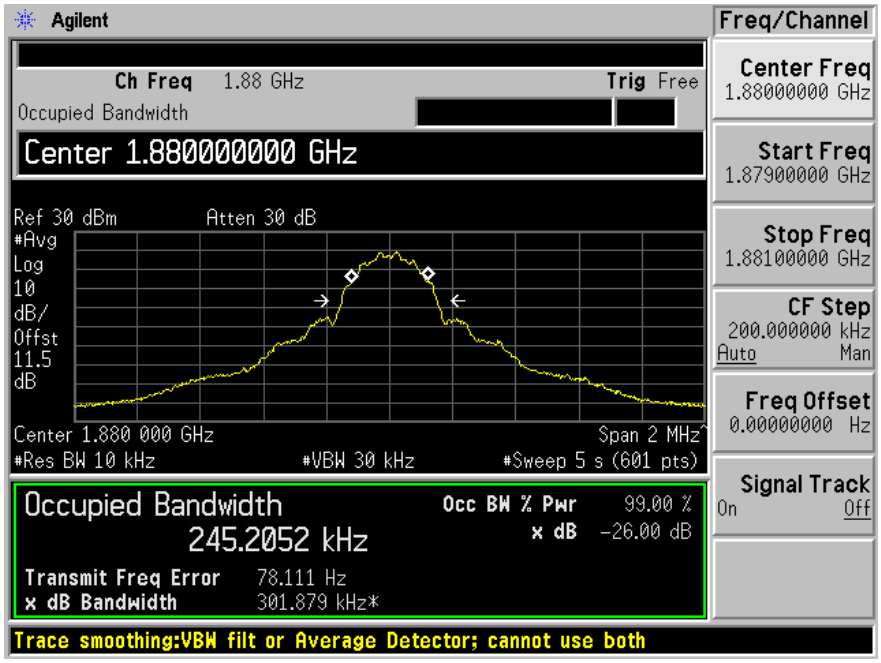


EDGE PCS Band Uplink, Middle Channel: 1880 MHz

Input

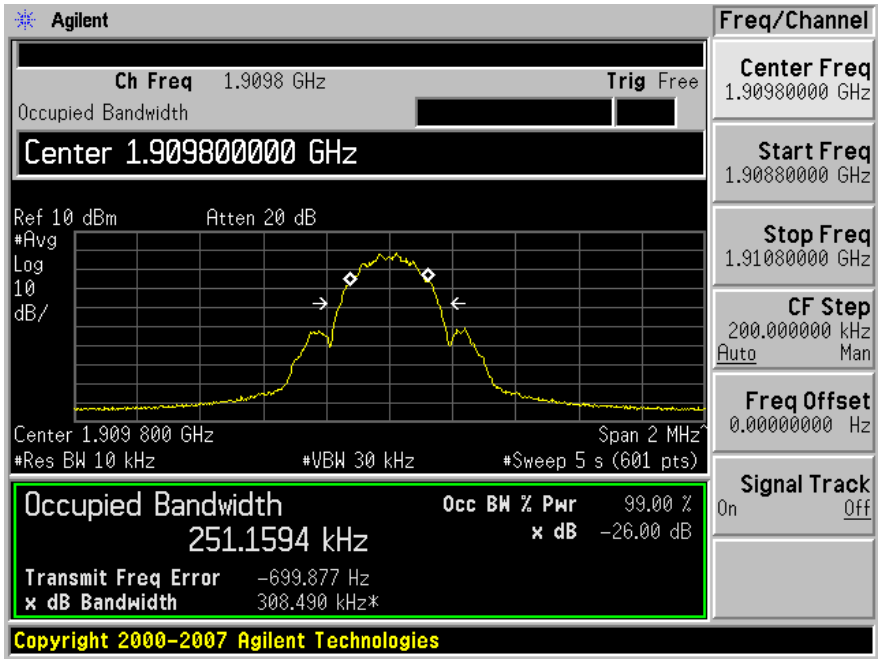



Output

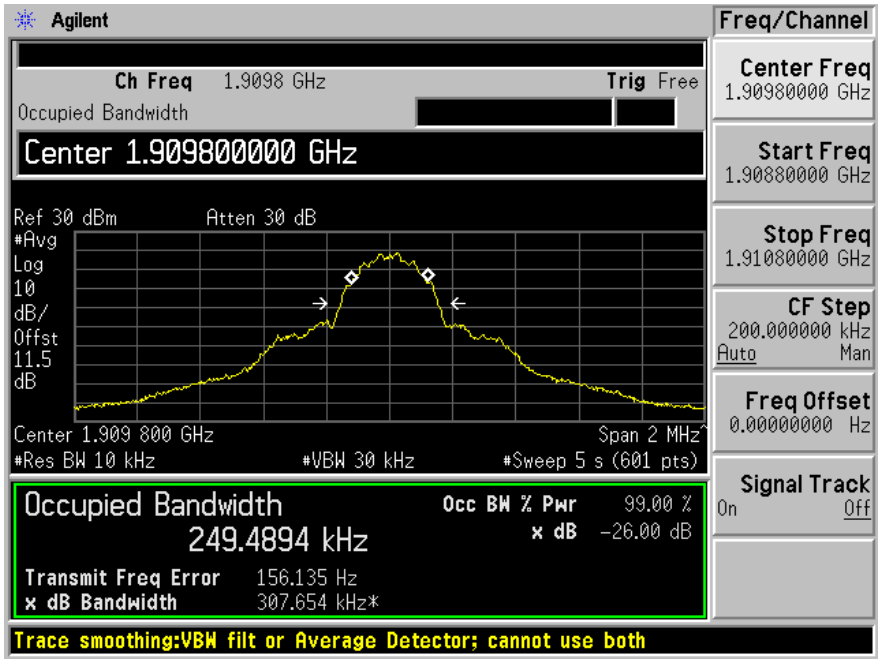


EDGE PCS Band Uplink, High Channel: 1909.8 MHz

Input

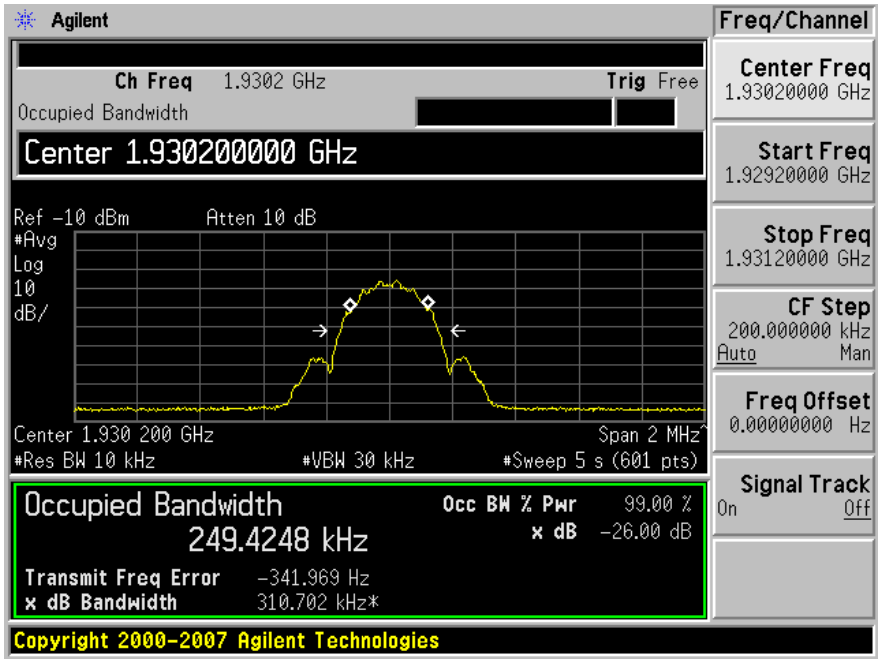



Output

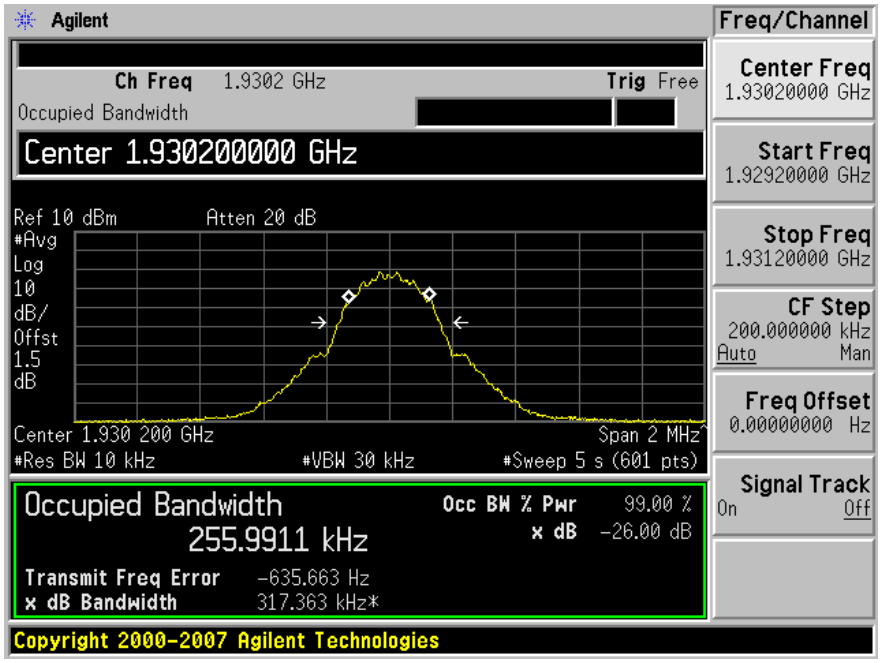


EDGE PCS Band Downlink, Low Channel: 1930.2 MHz

Input

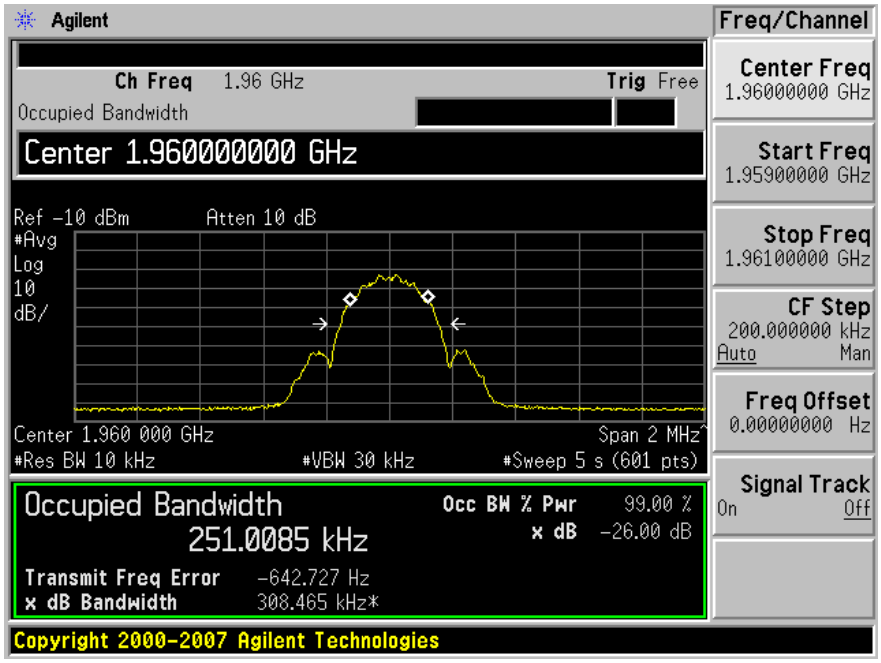



Output

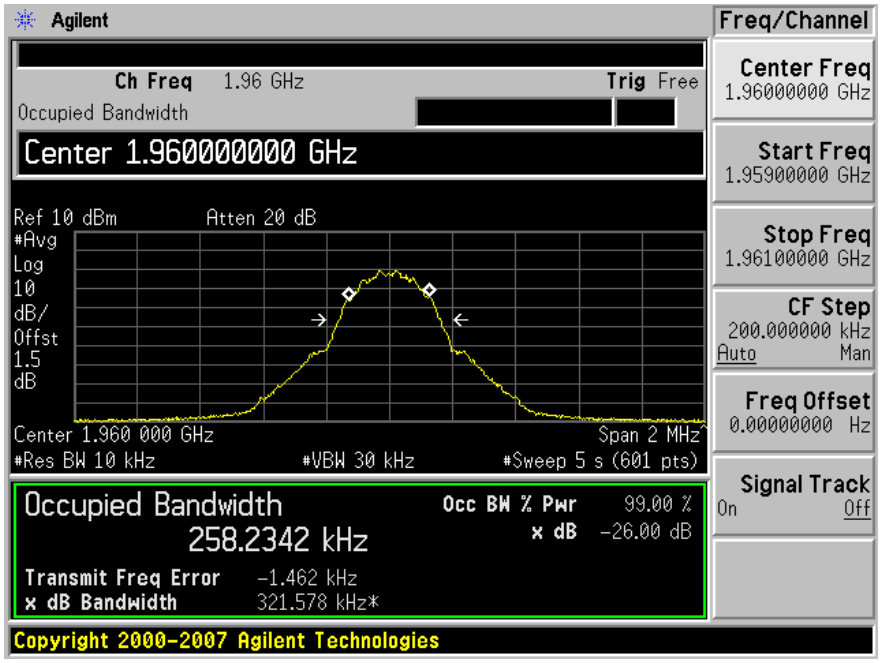


EDGE PCS Band Downlink, Middle Channel: 1960 MHz

Input

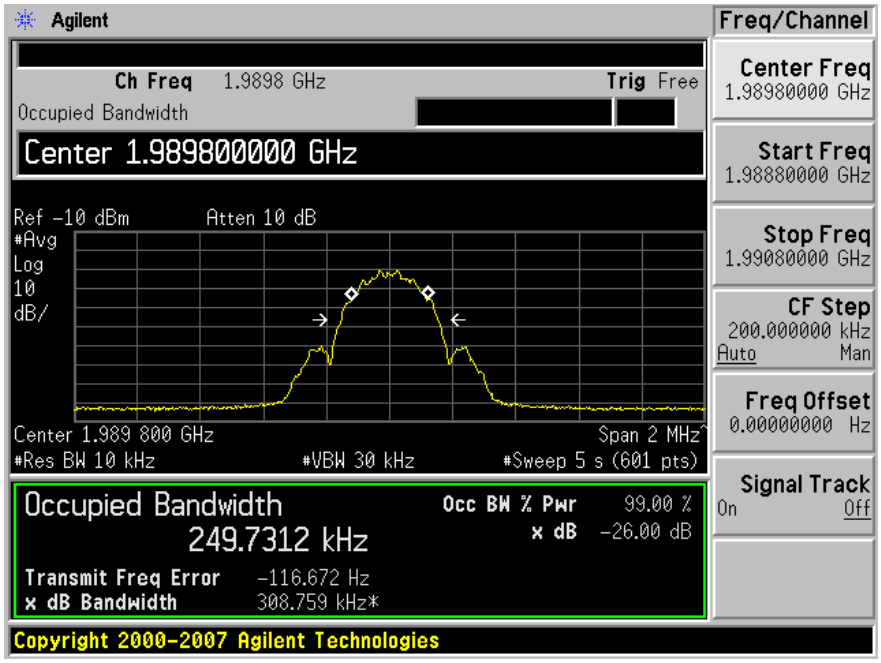



Output

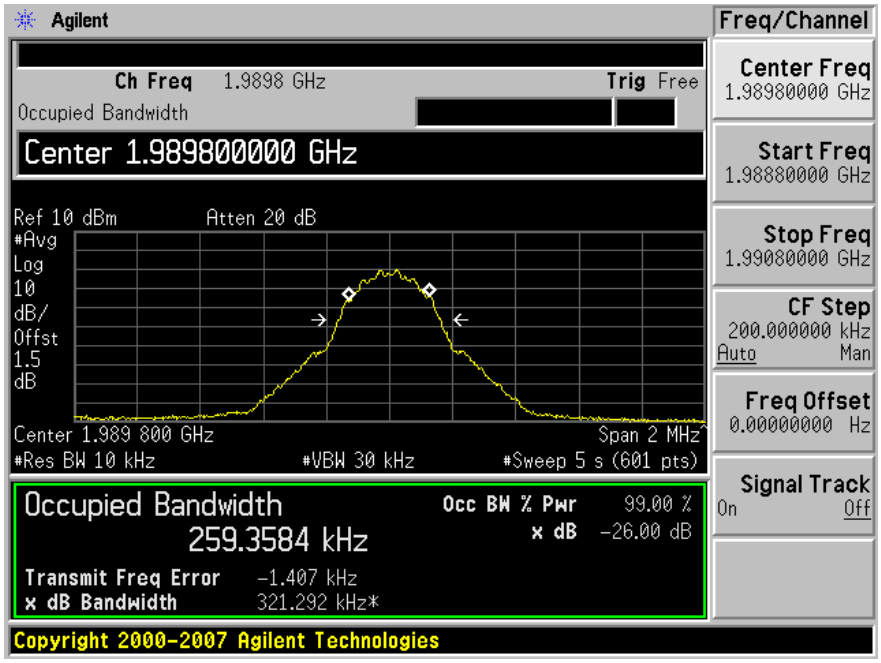


EDGE PCS Band Downlink, High Channel: 1989.8 MHz

Input




Output



# 7 FCC §2.1053, §22.917 - SPURIOUS RADIATED EMISSIONS

## 7.1 Applicable Standard

Requirements: CFR 47, § 2.1053, § 22.917 and § 22.238.

## 7.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

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.

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

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 emissions in dB = 10 log (TX Power in Watts/0.001) – the absolute level

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

## 7.3 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.5 °C |
| **Relative Humidity:** | 43 % |
| **ATM Pressure:** | 101.7kPa |

** The testing was performed by Dennis Huang on 2009-08-11 in 5 Meter Chamber #3.*

## 7.4 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2009-06-29 |
| HP | Generator, Signal | 83650B | 3614A00276 | 2009-05-28 |
| Ducommun Technologies | Amplifier, Pre | 1-18GHz | 9909297-01 | 2007-08-27* |
| A. H. Systems | Antenna, Horn, DRG | SAS-200/571 | 261 | 2008-07-01* |
| A.R.A. | Antenna, Horn | DRG-118/A | 1132 | 2009-07-28 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | 849192/0085 | 2007-12-03 |

* Based on two year Calibration Cycle.
*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## 7.5 Summary of Test Results

The worst case reading as follows:

**CDMA/EVDO:**

Cellular Band

| **Mode: Uplink** | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -3.78 | 2509.56 | Vertical | 836.52 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -24.25 | 3526.08 | Vertical | 881.52 MHz |

PCS Band

| **Mode: Uplink** | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -2.52 | 5640 | Vertical | 1880 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -16.61 | 3920 | Vertical | 1960 MHz |

**WCDMA/HSPA:**

Cellular Band

| Mode: Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -2.66 | 2509.2 | Vertical | 836.4 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -24.25 | 3525.6 | Vertical | 881.4 MHz |

PCS Band

| Mode: Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -2.14 | 5640 | Vertical | 1880 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -15.5 | 3920 | Vertical | 1960 MHz |

**GSM:**

Cellular Band

| Mode: Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -10.26 | 2509.8 | Vertical | 836.6 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -27.8 | 3526.4 | Vertical | 881.6 MHz |

PCS Band

| Mode: Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -13.64 | 3760 | Vertical | 1880 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -26.43 | 3920 | Vertical | 1960 MHz |

**EDGE:**

Cellular Band

| Mode: Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -9.29 | 1673.2 | Horizontal | 836.6 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -23.36 | 3526.4 | Vertical | 881.6 MHz |

PCS Band

| Mode: Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -13.4 | 3760 | Vertical | 1880 MHz |
| **Mode: Downlink** | | | |
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -25.5 | 3920 | Vertical | 1960 MHz |

## 7.6 Test Results

**CDMA/EVDO Cellular Band:**

Uplink (Input frequency = 836.52 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 2509.56 | 80.10 | 178 | 1.63 | V | 2509.56 | -25.24 | 8.9 | 0.44 | -16.78 | -13 | -3.78 |
| 2509.56 | 77.30 | 64 | 2.36 | H | 2509.56 | -29.96 | 8.9 | 0.44 | -21.50 | -13 | -8.50 |
| 1673.04 | 79.82 | 143 | 1.26 | H | 1673.04 | -29.72 | 8.4 | 0.36 | -21.68 | -13 | -8.68 |
| 1673.04 | 78.67 | 337 | 1.50 | V | 1673.04 | -30.47 | 8.4 | 0.36 | -22.43 | -13 | -9.43 |

Downlink (Input frequency = 881.52 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3526.08 | 51.72 | 18 | 1.00 | V | 3526.08 | -48.01 | 11.3 | 0.54 | -37.25 | -13 | -24.25 |
| 3526.08 | 53.96 | 360 | 2.50 | H | 3526.08 | -48.92 | 11.3 | 0.54 | -38.16 | -13 | -25.16 |
| 1763.04 | 59.12 | 340 | 1.65 | V | 1763.04 | -51.28 | 8.6 | 0.37 | -43.05 | -13 | -30.05 |
| 1763.04 | 56.25 | 69 | 1.20 | H | 1763.04 | -51.65 | 8.6 | 0.37 | -43.42 | -13 | -30.42 |

**CDMA/EVDO PCS Band:**

Uplink (Input frequency = 1880 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 5640 | 72.74 | 257 | 2.0 | V | 72.74 | -25.29 | 10.5 | 0.73 | -15.52 | -13 | -2.52 |
| 5640 | 67.52 | 227 | 2.0 | H | 67.52 | -29.66 | 10.5 | 0.73 | -19.89 | -13 | -6.89 |
| 3760 | 67.25 | 217 | 2.5 | V | 67.25 | -31.13 | 10.6 | 0.59 | -21.12 | -13 | -8.12 |
| 3760 | 62.92 | 184 | 2.6 | H | 62.92 | -37.95 | 10.6 | 0.59 | -27.94 | -13 | -14.94 |

Downlink (Input frequency = 1960 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3920 | 60.12 | 213 | 2.33 | V | 3920 | -39.61 | 10.6 | 0.6 | -29.61 | -13 | -16.61 |
| 3920 | 53.55 | 10 | 1.00 | H | 3920 | -51.23 | 10.6 | 0.6 | -41.23 | -13 | -28.23 |

**WCDMA/HSPA Cellular Band:**

Uplink (Input frequency = 836.4 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 2509.2 | 81.22 | 180 | 1.68 | V | 2509.56 | -24.12 | 8.9 | 0.44 | -15.66 | -13 | -2.66 |
| 2509.2 | 78.12 | 50 | 1.78 | H | 2509.56 | -29.14 | 8.9 | 0.44 | -20.68 | -13 | -7.68 |
| 1672.8 | 79.79 | 150 | 1.23 | H | 1672.8 | -29.75 | 8.4 | 0.36 | -21.71 | -13 | -8.71 |
| 1672.8 | 79.21 | 338 | 1.25 | V | 1672.8 | -29.93 | 8.4 | 0.36 | -21.89 | -13 | -8.89 |

Downlink (Input frequency = 881.4 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3525.6 | 51.72 | 20 | 1.0 | V | 3526.08 | -48.01 | 11.3 | 0.54 | -37.25 | -13 | -24.25 |
| 3525.6 | 53.96 | 320 | 2.0 | H | 3526.08 | -48.92 | 11.3 | 0.54 | -38.16 | -13 | -25.16 |
| 1762.8 | 58.21 | 0 | 1.5 | V | 1762.80 | -52.19 | 8.6 | 0.37 | -43.96 | -13 | -30.96 |
| 1762.8 | 55.32 | 72 | 1.2 | H | 1762.80 | -52.58 | 8.6 | 0.37 | -44.35 | -13 | -31.35 |

**WCDMA/HSPA PCS Band:**

Uplink (Input frequency = 1880 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 5640 | 73.12 | 241 | 2.2 | V | 72.74 | -24.91 | 10.5 | 0.73 | -15.14 | -13 | -2.14 |
| 5640 | 68.13 | 225 | 2.2 | H | 67.52 | -29.05 | 10.5 | 0.73 | -19.28 | -13 | -6.28 |
| 3760 | 68.57 | 220 | 2.2 | V | 67.25 | -29.81 | 10.6 | 0.59 | -19.8 | -13 | -6.80 |
| 3760 | 63.12 | 180 | 2.2 | H | 62.92 | -37.75 | 10.6 | 0.59 | -27.74 | -13 | -14.74 |

Downlink (Input frequency = 1960 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3920 | 61.23 | 220 | 2.2 | V | 3920 | -38.50 | 10.6 | 0.6 | -28.50 | -13 | -15.50 |
| 3920 | 54.32 | 0 | 1.0 | H | 3920 | -50.46 | 10.6 | 0.6 | -40.46 | -13 | -27.46 |

**GSM Cellular Band:**

Uplink (Input frequency = 836.6 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 2509.8 | 73.62 | 313 | 1.26 | V | 2509.8 | -31.72 | 8.9 | 0.44 | -23.26 | -13 | -10.26 |
| 1673.2 | 78.18 | 144 | 1.30 | H | 1673.2 | -31.36 | 8.4 | 0.36 | -23.32 | -13 | -10.32 |
| 1673.2 | 74.47 | 360 | 1.00 | V | 1673.2 | -34.67 | 8.4 | 0.36 | -26.63 | -13 | -13.63 |
| 2509.8 | 69.42 | 326 | 1.38 | H | 2509.8 | -37.84 | 8.9 | 0.44 | -29.38 | -13 | -16.38 |

Downlink (Input frequency = 881.6 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3526.4 | 48.17 | 19 | 1.00 | V | 3526.4 | -51.56 | 11.3 | 0.54 | -40.80 | -13 | -27.80 |
| 3526.4 | 49.64 | 360 | 2.50 | H | 3526.4 | -53.24 | 11.3 | 0.54 | -42.48 | -13 | -29.48 |
| 1763.2 | 51.27 | 73 | 1.16 | H | 1763.2 | -56.63 | 8.6 | 0.37 | -48.40 | -13 | -35.40 |
| 1763.2 | 53.40 | 341 | 1.44 | V | 1763.2 | -57.00 | 8.6 | 0.37 | -48.77 | -13 | -35.77 |

**GSM PCS Band:**

Uplink (Input frequency = 1880 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3760 | 61.73 | 214 | 2.50 | V | 3760 | -36.65 | 10.6 | 0.59 | -26.64 | -13 | -13.64 |
| 3760 | 58.06 | 190 | 2.50 | H | 3760 | -42.81 | 10.6 | 0.59 | -32.80 | -13 | -19.80 |
| 5640 | 54.82 | 314 | 2.02 | V | 5640 | -43.21 | 10.5 | 0.73 | -33.44 | -13 | -20.44 |
| 5640 | 50.60 | 224 | 2.02 | H | 5640 | -46.58 | 10.5 | 0.73 | -36.81 | -13 | -23.81 |

Downlink (Input frequency = 1930 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3920 | 50.30 | 216 | 2.37 | V | 3920 | -49.43 | 10.6 | 0.6 | -39.43 | -13 | -26.43 |
| 3920 | 46.21 | 8 | 1.00 | H | 3920 | -58.57 | 10.6 | 0.6 | -48.57 | -13 | -35.57 |

**EDGE Cellular Band:**

Uplink (Input frequency = 836.6 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1673.2 | 79.21 | 150 | 1 | H | 1673.2 | -30.33 | 8.4 | 0.36 | -22.29 | -13 | -9.29 |
| 2509.8 | 73.57 | 313 | 1.2 | V | 2509.8 | -31.77 | 8.9 | 0.44 | -23.31 | -13 | -10.31 |
| 1673.2 | 74.95 | 0 | 1 | V | 1673.2 | -34.19 | 8.4 | 0.36 | -26.15 | -13 | -13.15 |
| 2509.8 | 70.21 | 330 | 1 | H | 2509.8 | -37.05 | 8.9 | 0.44 | -28.59 | -13 | -15.59 |

Downlink (Input frequency = 881.6 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3526.4 | 52.61 | 18 | 1.00 | V | 3526.4 | -47.12 | 11.3 | 0.54 | -36.36 | -13 | -23.36 |
| 3526.4 | 54.45 | 360 | 2.73 | H | 3526.4 | -48.43 | 11.3 | 0.54 | -37.67 | -13 | -24.67 |
| 1763.2 | 52.33 | 74 | 1.18 | H | 1763.2 | -55.57 | 8.6 | 0.37 | -47.34 | -13 | -34.34 |
| 1763.2 | 54.77 | 342 | 1.44 | V | 1763.2 | -55.63 | 8.6 | 0.37 | -47.40 | -13 | -34.40 |

**EDGE PCS Band:**

Uplink (Input frequency = 1880 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3760 | 61.97 | 210 | 2.2 | V | 3760 | -36.41 | 10.6 | 0.59 | -26.4 | -13 | -13.4 |
| 3760 | 59.02 | 180 | 2.2 | H | 3760 | -41.85 | 10.6 | 0.59 | -31.84 | -13 | -18.84 |
| 5640 | 55.32 | 310 | 2.0 | V | 5640 | -42.71 | 10.5 | 0.73 | -32.94 | -13 | -19.94 |
| 5640 | 51.21 | 223 | 2.0 | H | 5640 | -45.97 | 10.5 | 0.73 | -36.20 | -13 | -23.20 |

Downlink (Input frequency = 1930 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3920 | 51.23 | 215 | 2.1 | V | 3920 | -48.50 | 10.6 | 0.6 | -38.50 | -13 | -25.50 |
| 3920 | 47.32 | 20 | 1.0 | H | 3920 | -57.46 | 10.6 | 0.6 | -47.46 | -13 | -34.46 |

# 8 FCC §2.1051, §22.917 & §24.238 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## 8.1 Applicable Standard

Requirements: CFR 47, § 2.1051. § 22.917, § 24.238.

The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

§ 22.917 and § 24.238**:** 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

## 8.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10$^{th}$ harmonic.

## 8.3 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23-24 °C |
| **Relative Humidity:** | 40-45 % |
| **ATM Pressure:** | 101-103kPa |

** The testing was performed by Victor Zhang from 2009-08-1 to 2009-08-14 in RF Site.*

## 8.4 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2009-04-27 |
| HP | Signal Generator | 8648C | 3426A00417 | 2009-07-23 |
| R & S | Signal Generator | SMIQ03 | 849192/0085 | 2007-12-03* |

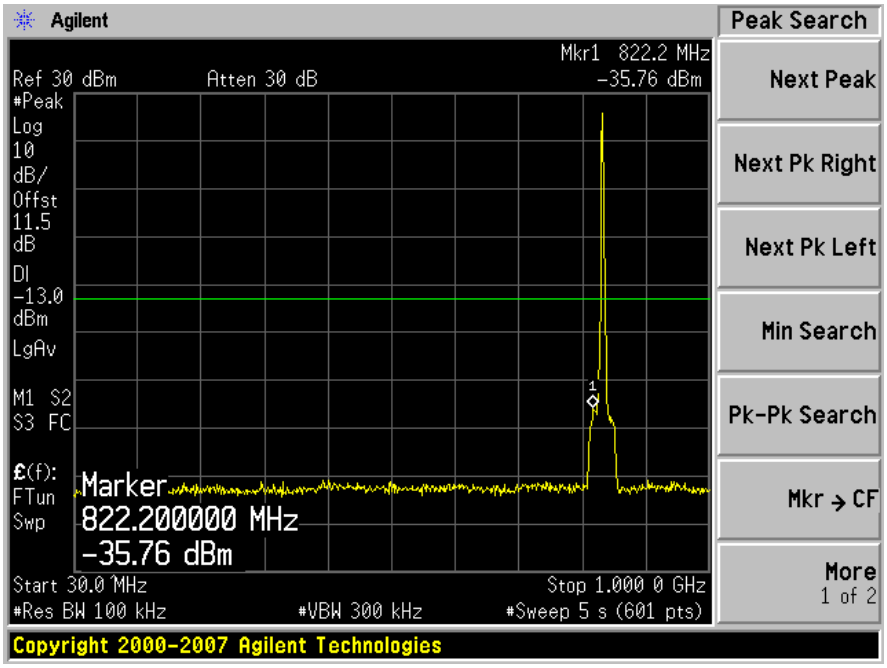
* Based on two year calibration Cycle.
*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## 8.5 Test Results

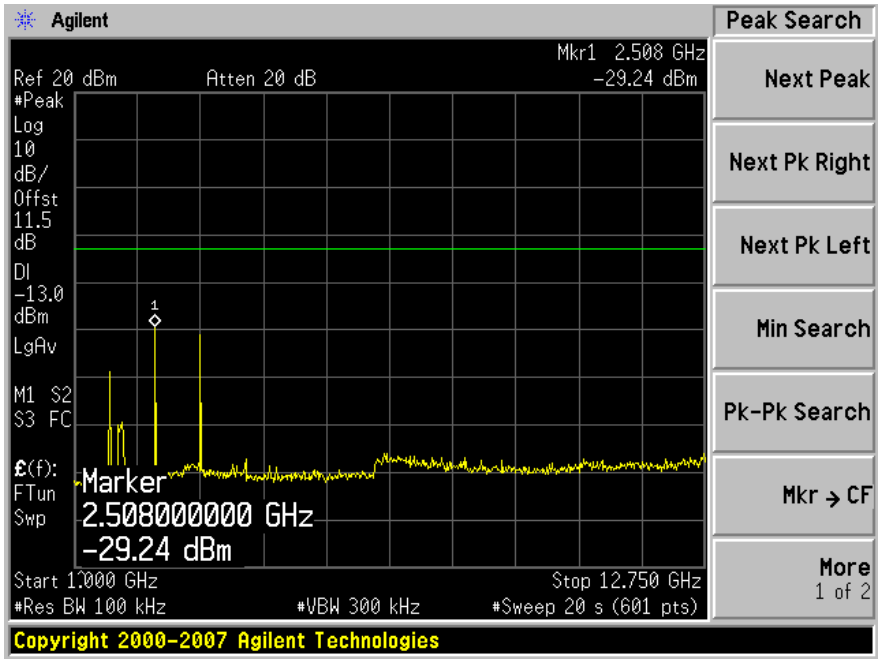
Please refer to the following plots.

CDMA/EVDO Cellular Band Uplink, Middle Channel: 836.52 MHz:

Plot 1: 30 MHz to 1 GHz

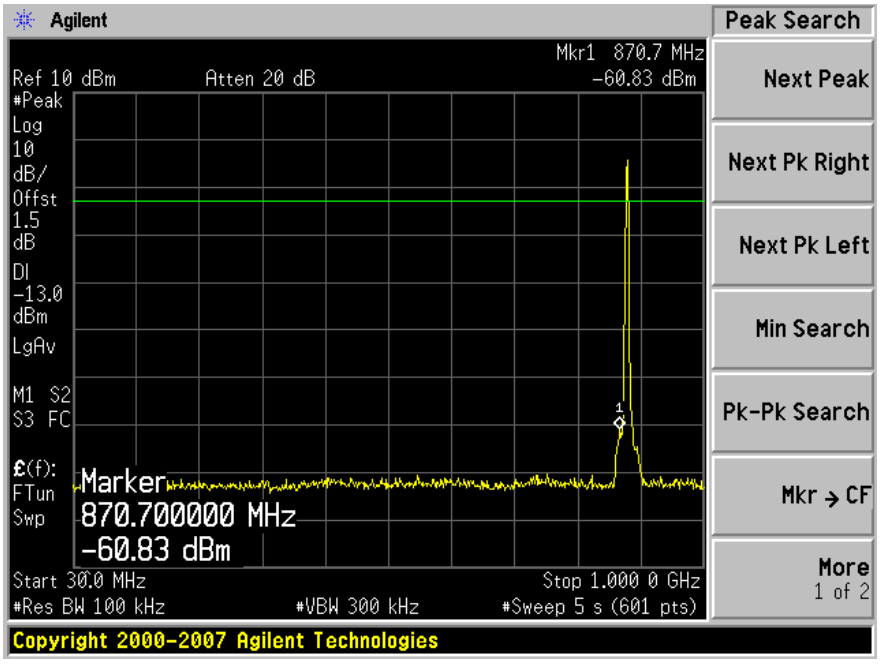



Plot 2: Above 1 GHz

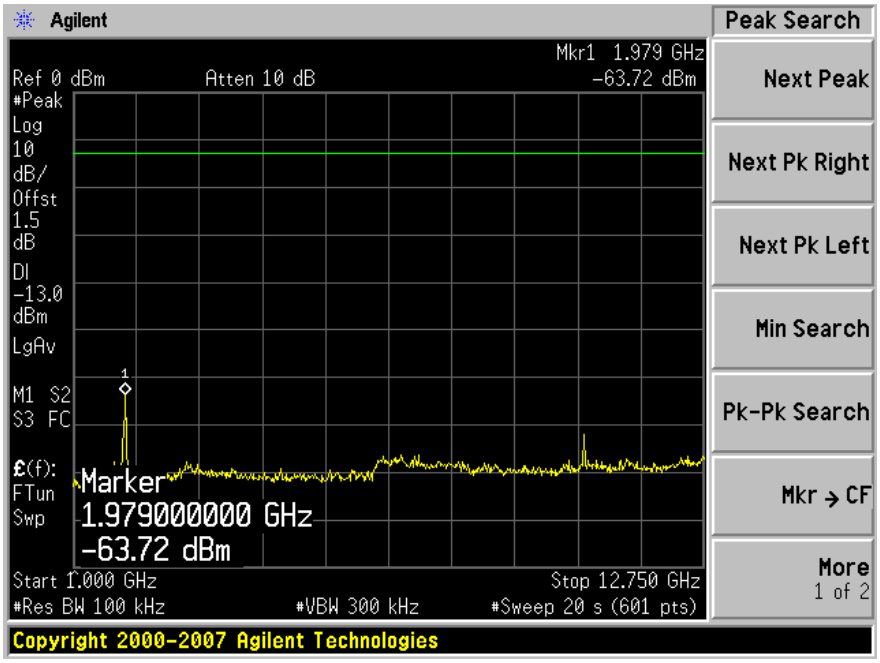


CDMA/EVDO Cellular Band Downlink, Middle Channel: 881.52 MHz:

Plot 1: 30 MHz to 1 GHz

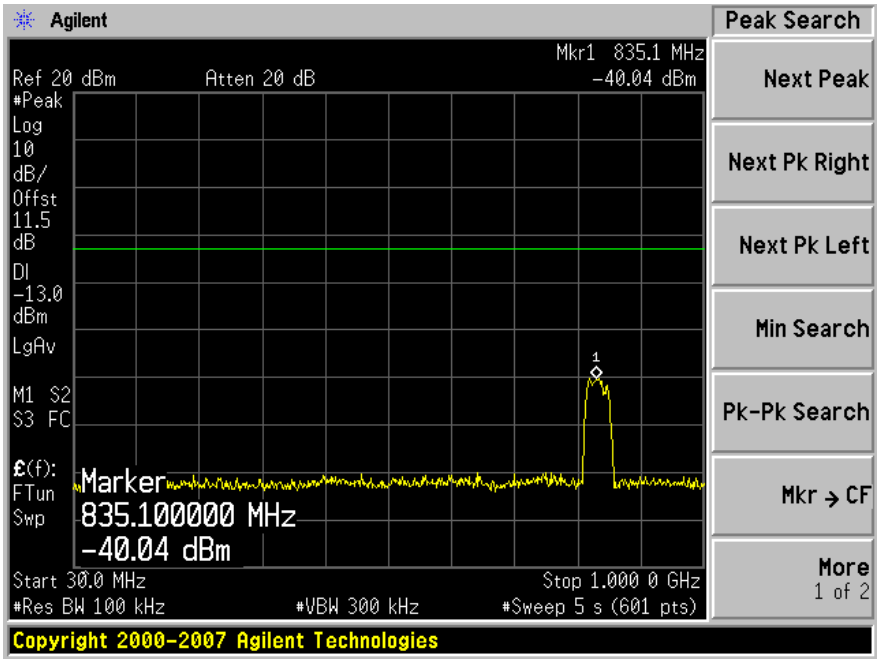



Plot 2: Above 1 GHz

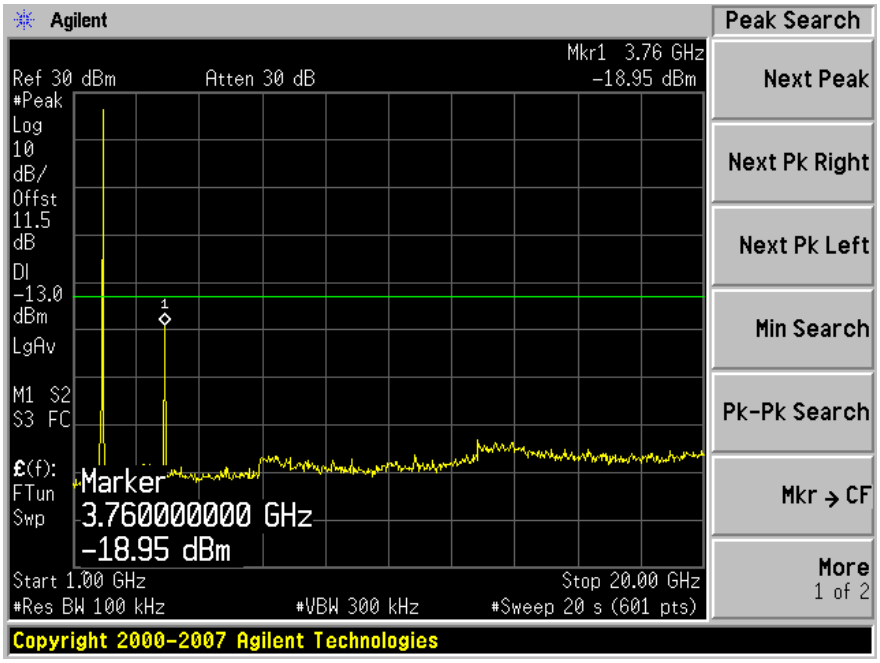


CDMA/EVDO PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

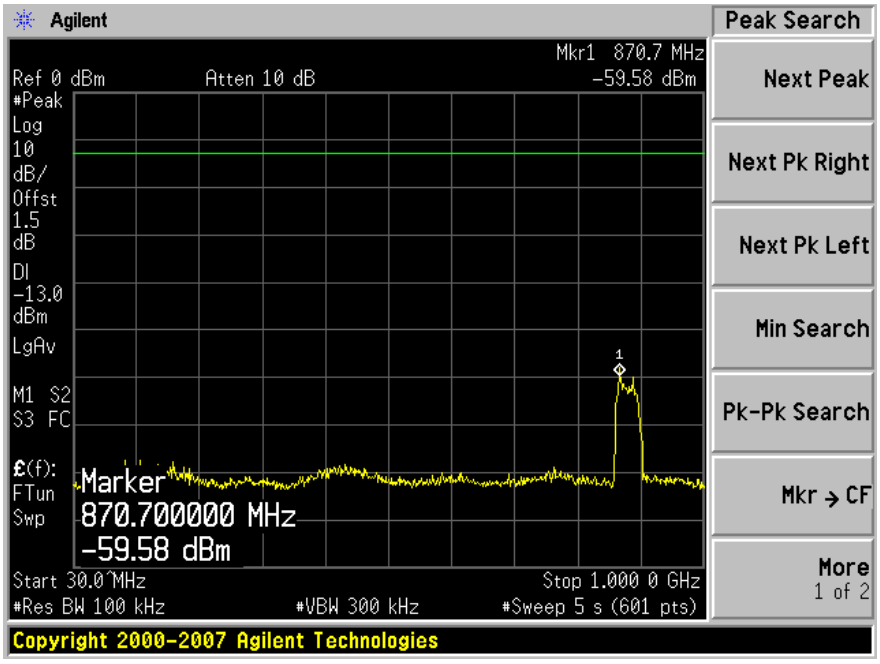



Plot 2: Above 1 GHz

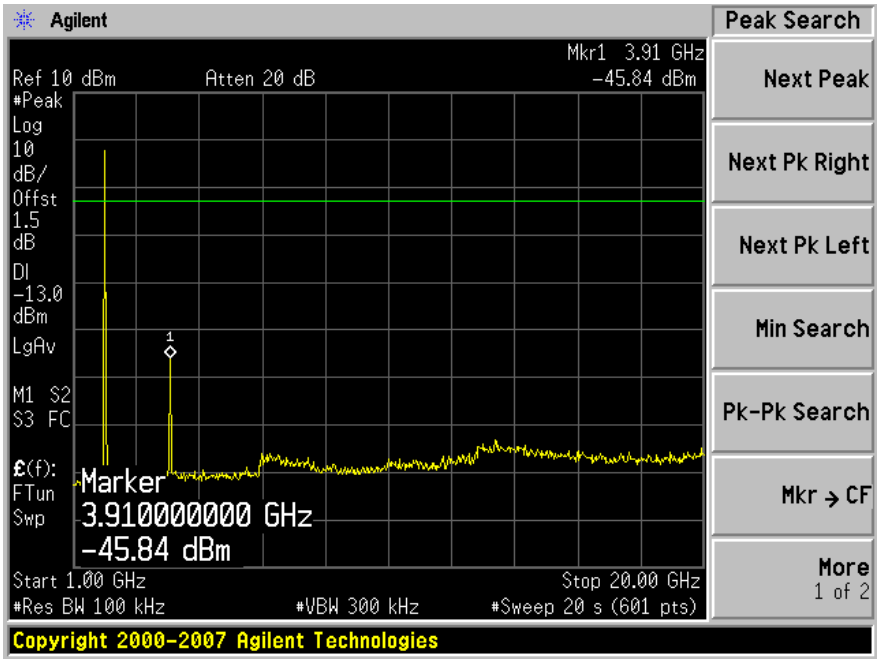


CDMA/EVDO PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

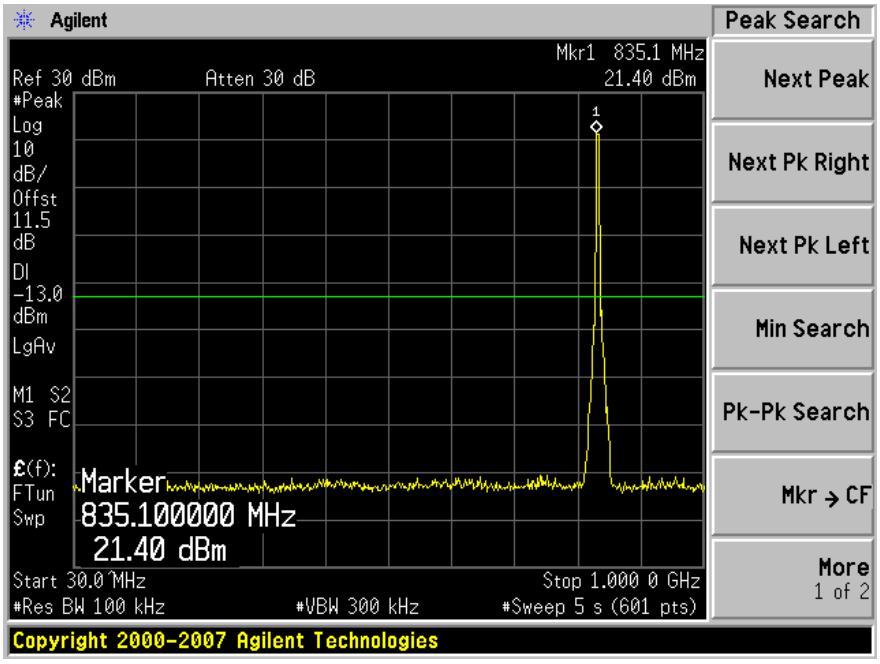



Plot 2: Above 1 GHz

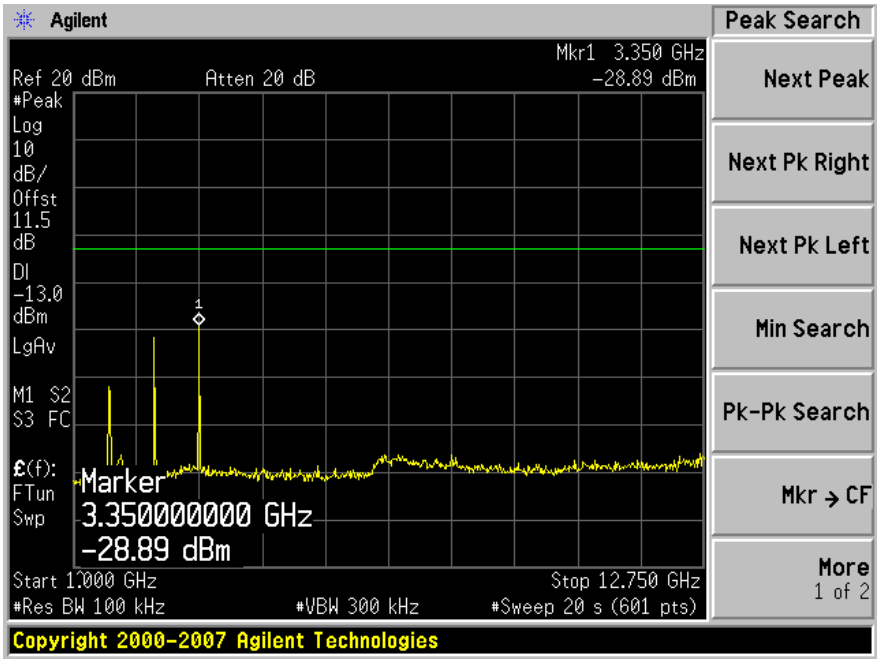


WCDMA/HSPA Cellular Band Uplink, Middle Channel: 836.42 MHz:

Plot 1: 30 MHz to 1 GHz

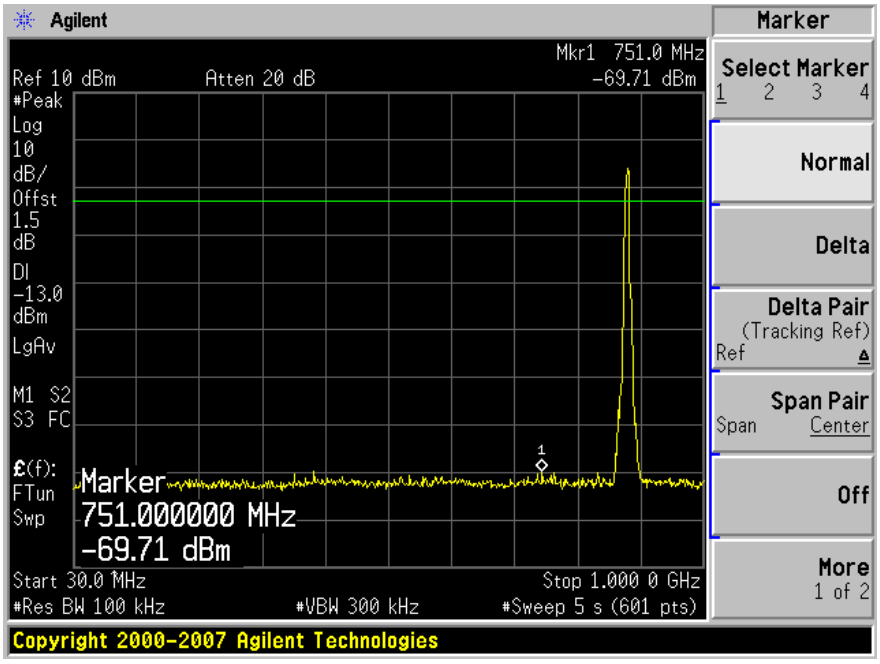



Plot 2: Above 1 GHz

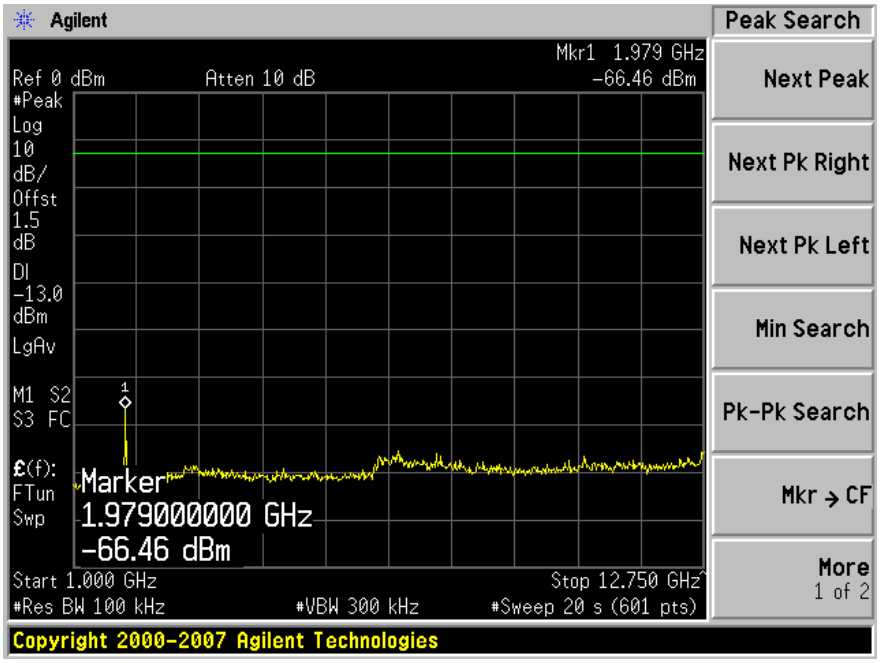


WCDMA/HSPA Cellular Band Downlink, Middle Channel: 881.4 MHz:

Plot 1: 30 MHz to 1 GHz

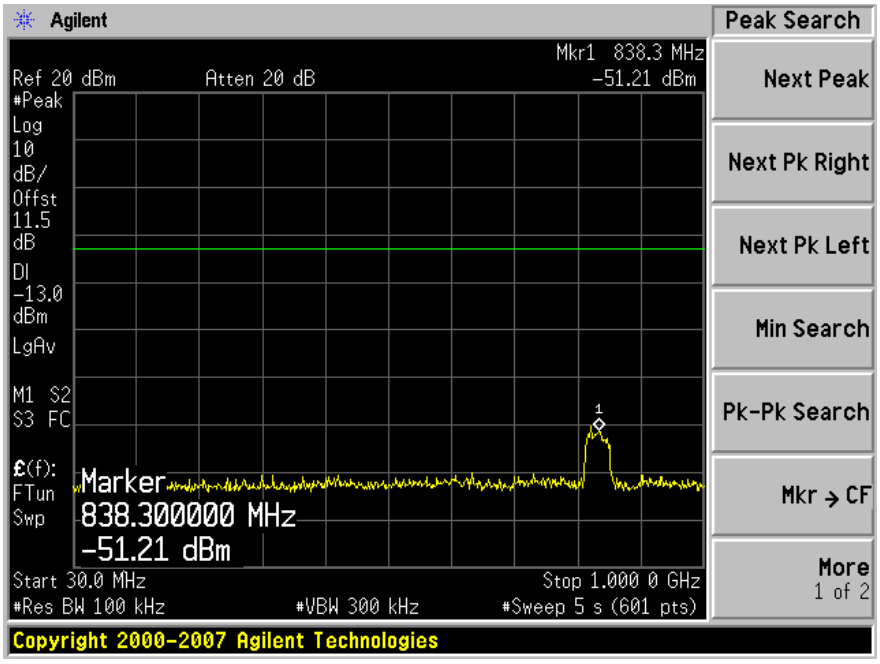



Plot 2: Above 1 GHz

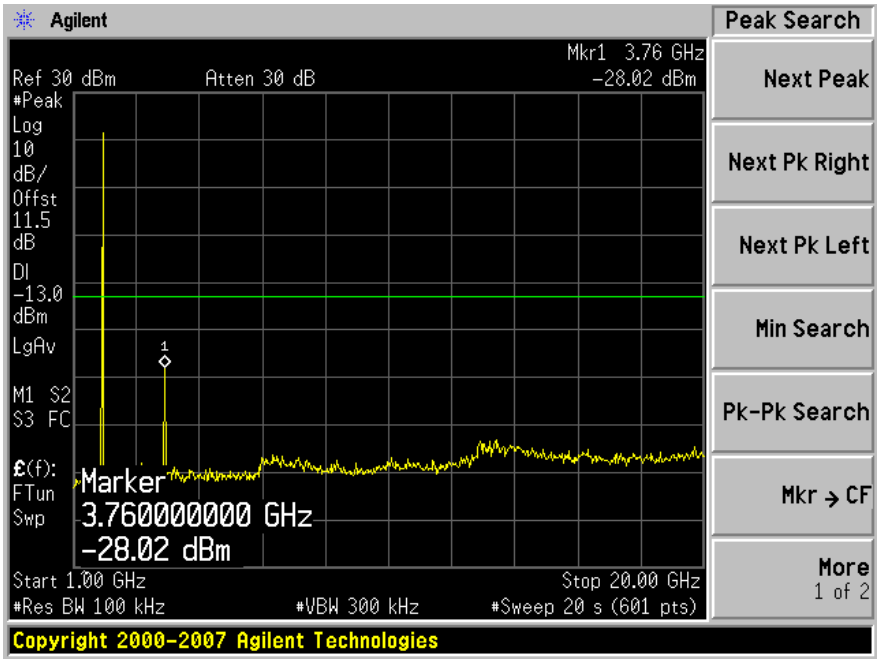


WCDMA/HSPA PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

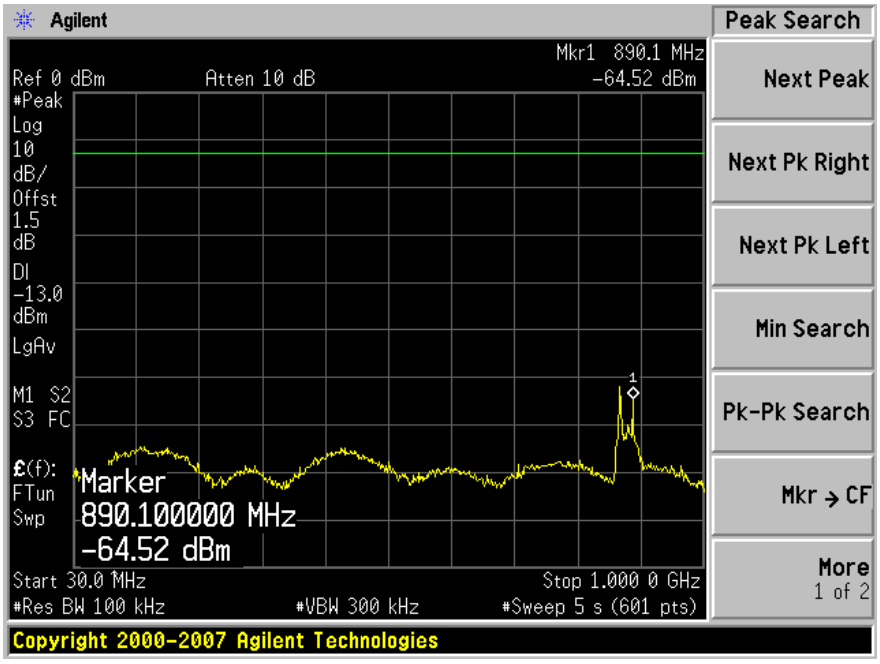



Plot 2: Above 1 GHz

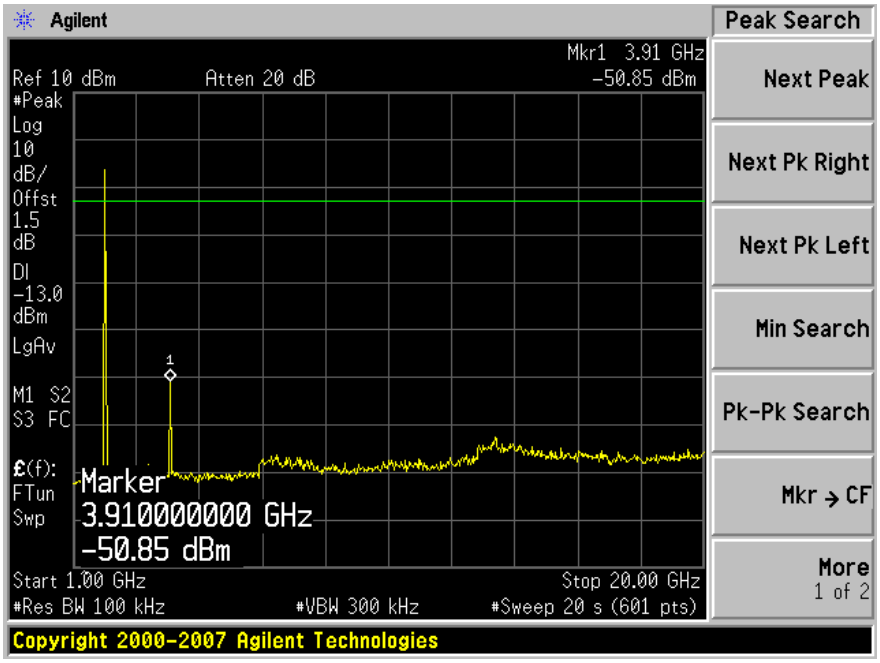


WCDMA/HSPA PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

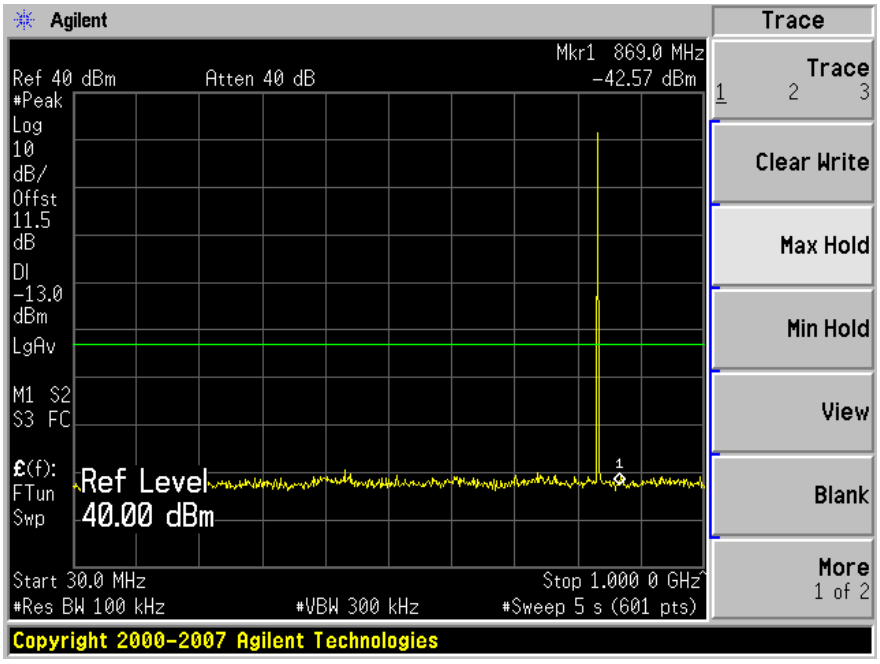



Plot 2: Above 1 GHz

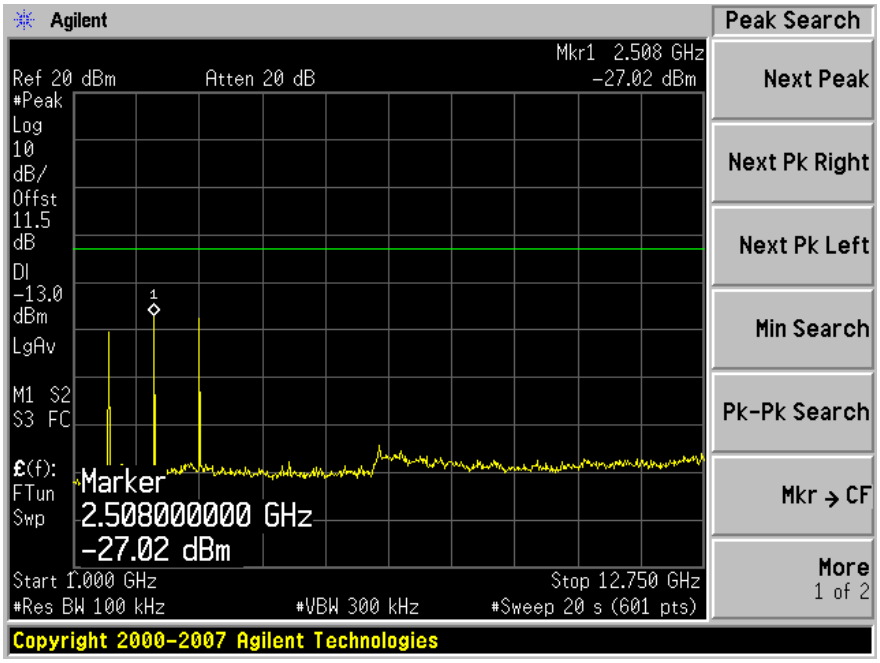


GSM Cellular Band Uplink, Middle Channel: 836.6MHz:

Plot 1: 30 MHz to 1 GHz

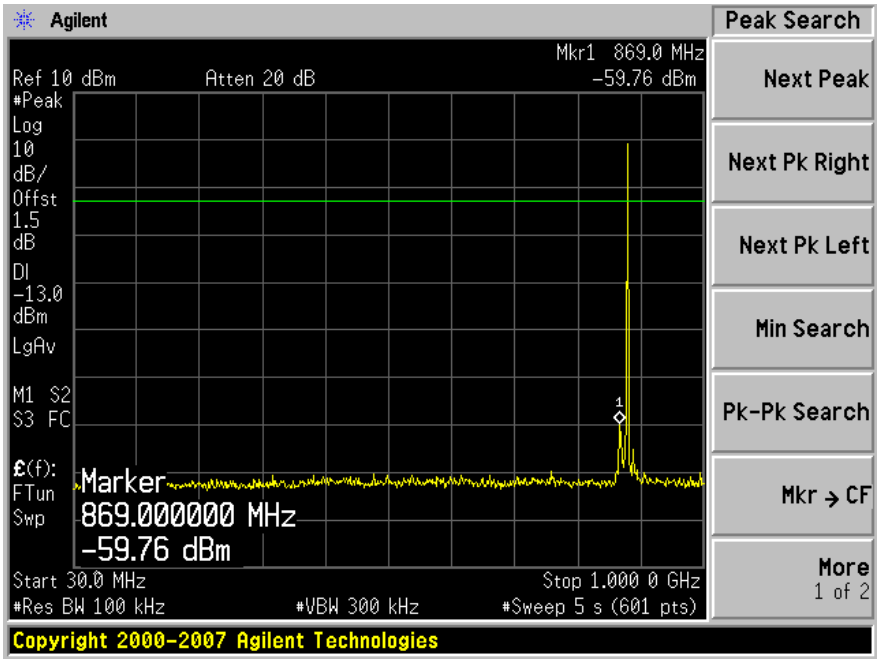



Plot 2: Above 1 GHz

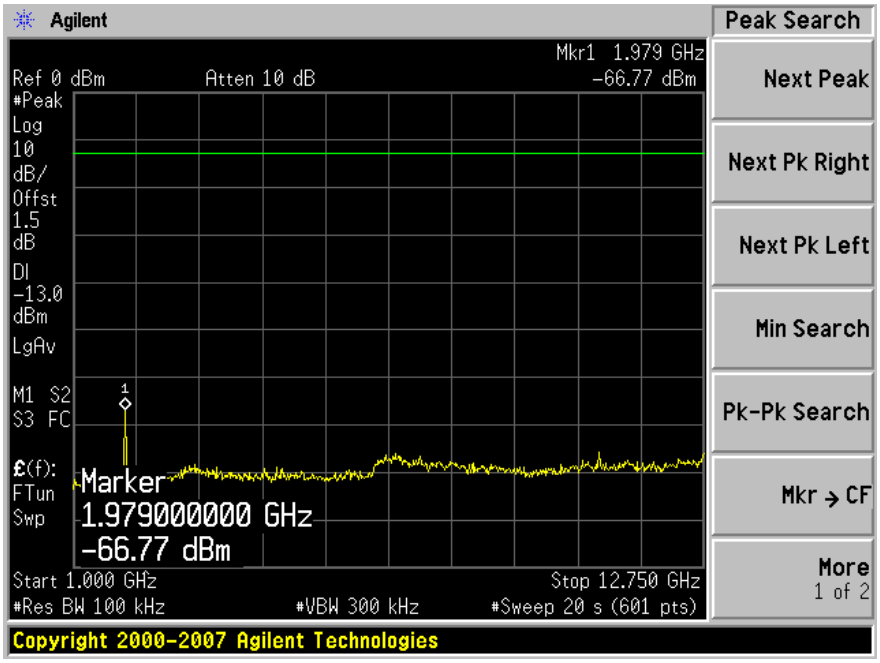


GSM Cellular Band Downlink, Middle Channel: 881.6 MHz:

Plot 1: 30 MHz to 1 GHz

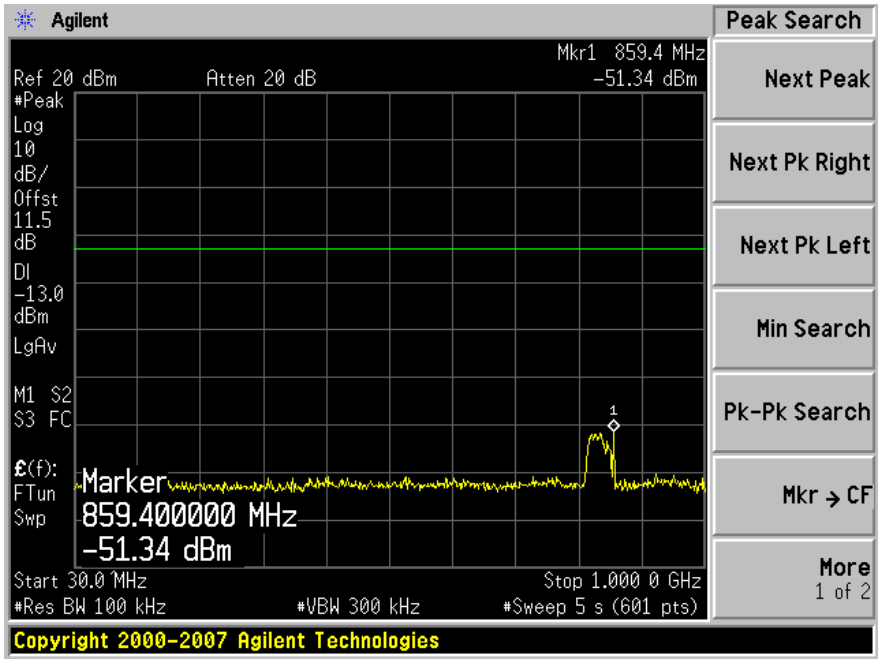



Plot 2: Above 1 GHz

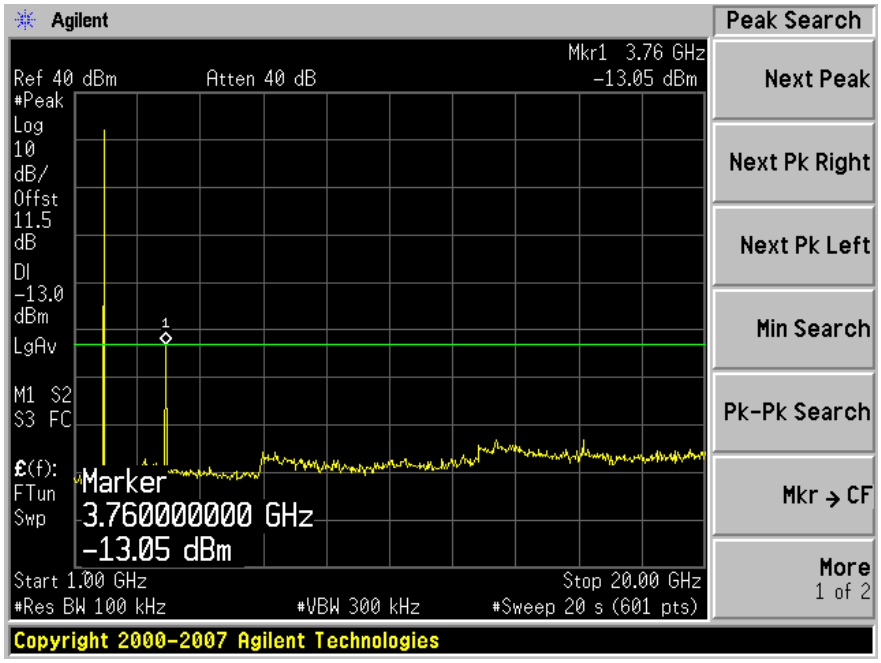


GSM PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

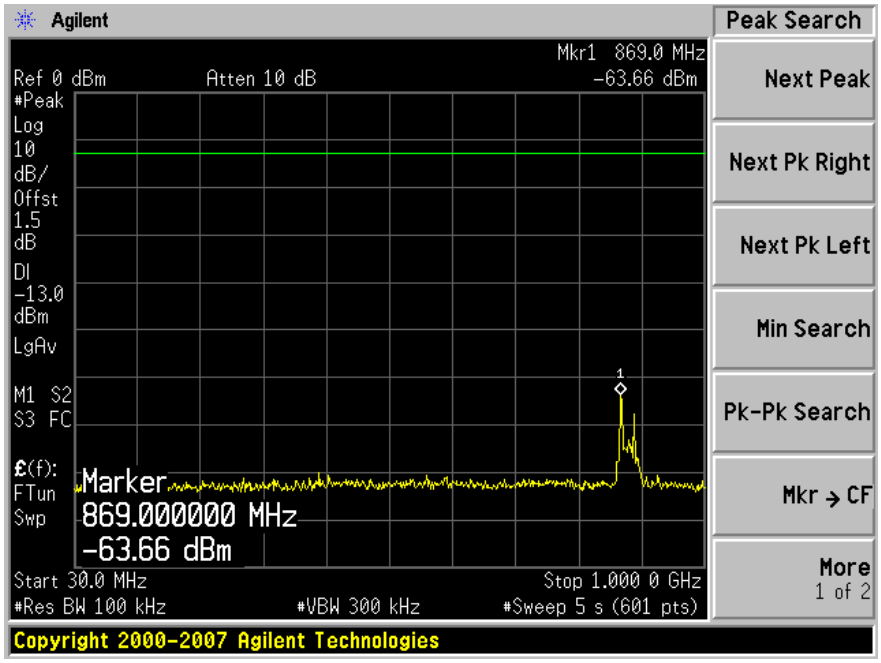



Plot 2: Above 1 GHz

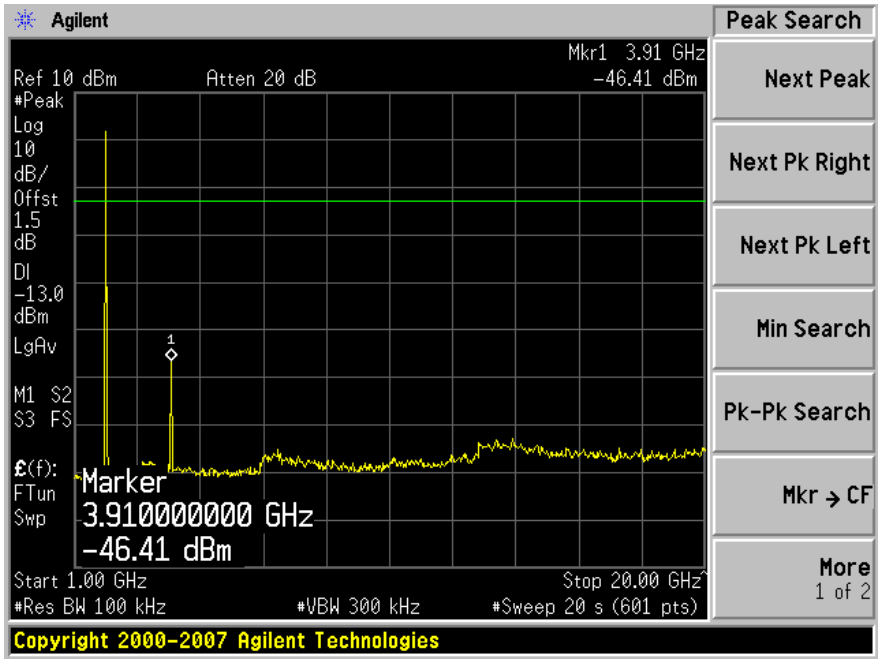


GSM PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

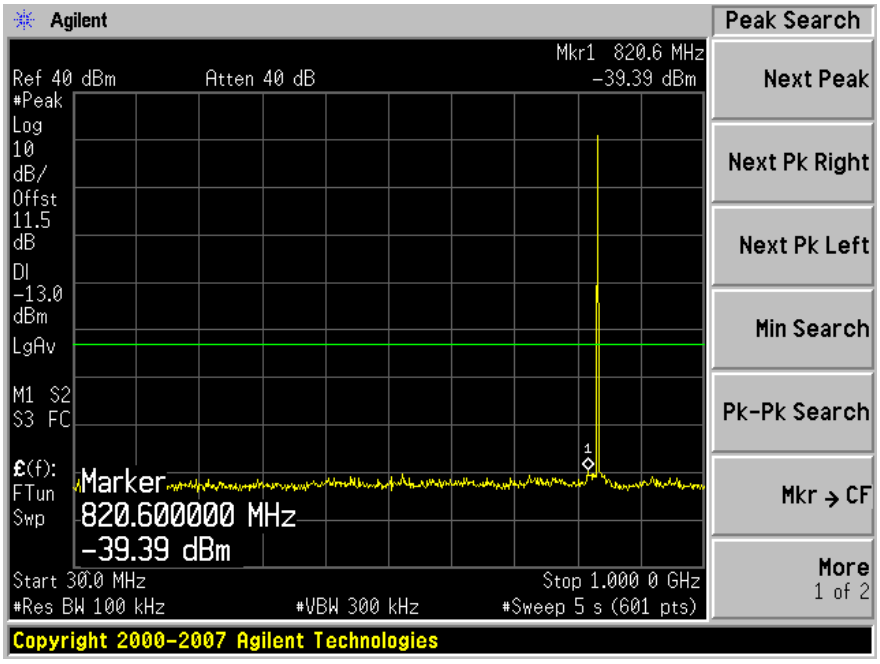



Plot 2: Above 1 GHz

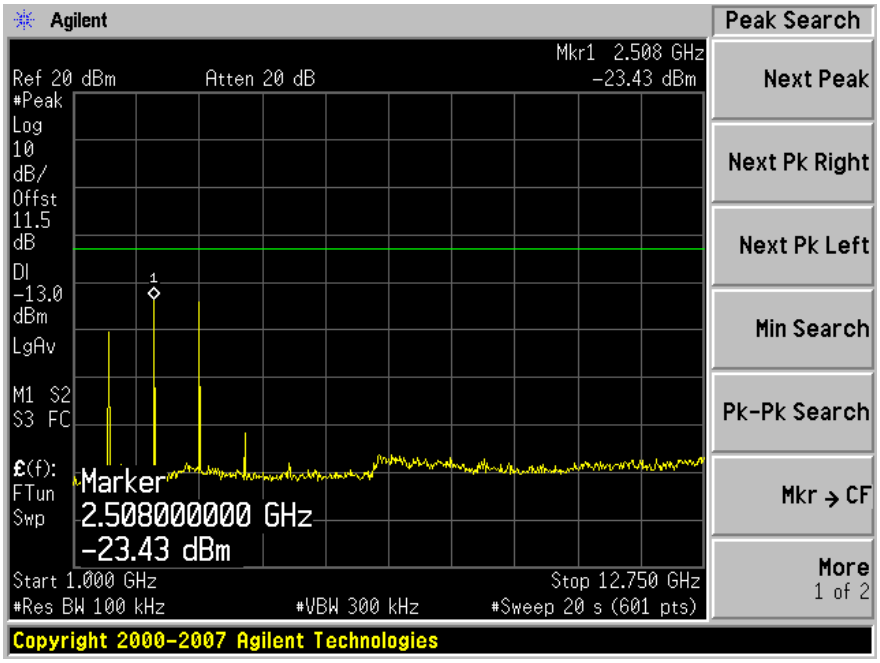


EDGE Cellular Band Uplink, Middle Channel: 836.6 MHz:

Plot 1: 30 MHz to 1 GHz

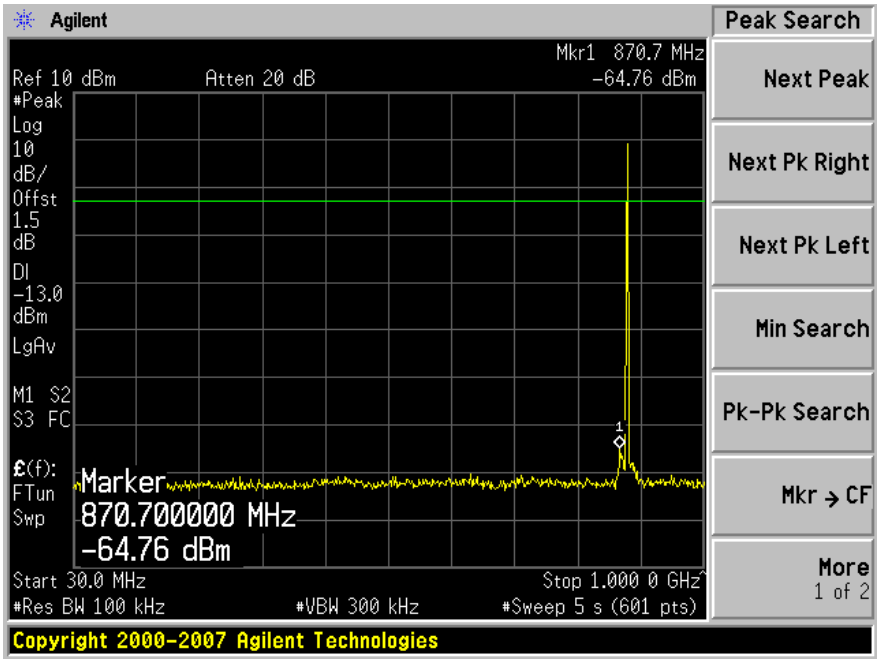



Plot 2: Above 1 GHz

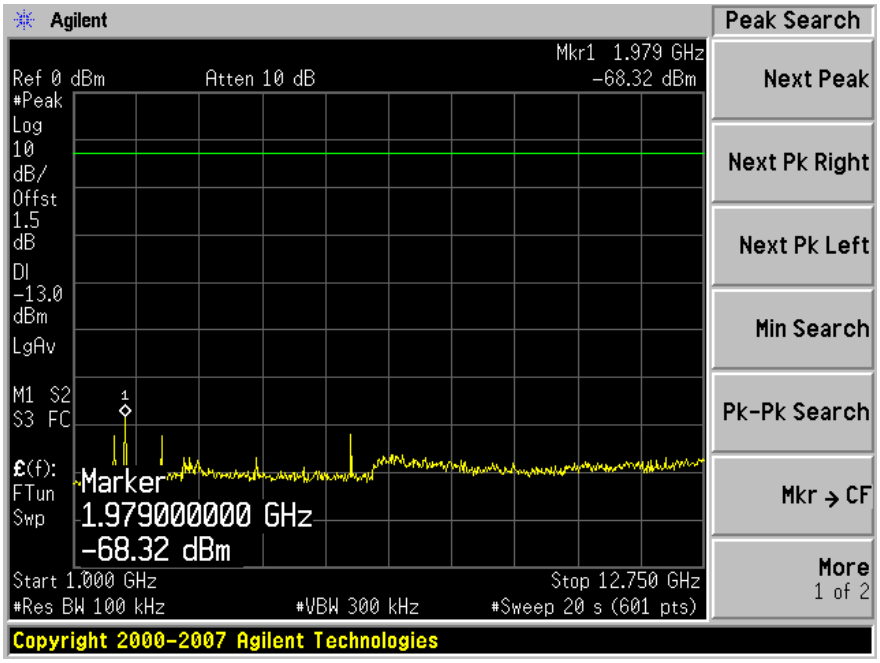


EDGE Cellular Band Downlink, Middle Channel: 881.6 MHz:

Plot 1: 30 MHz to 1 GHz

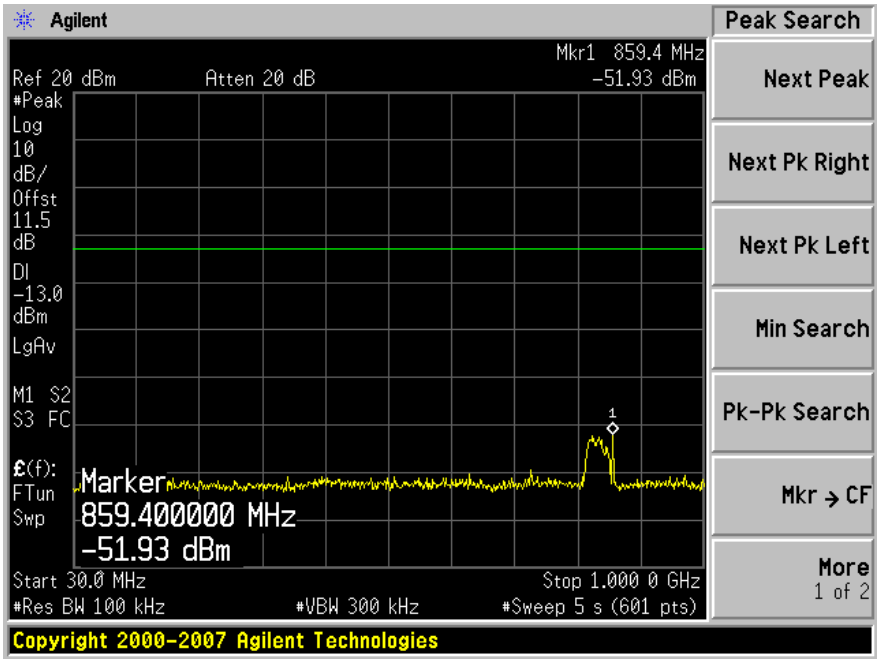



Plot 2: Above 1 GHz

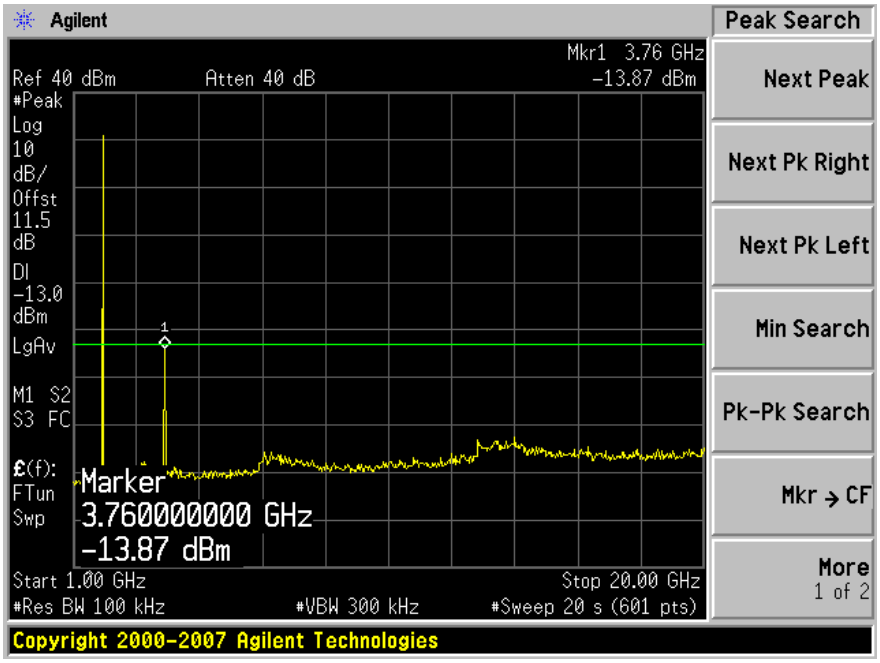


EDGE PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

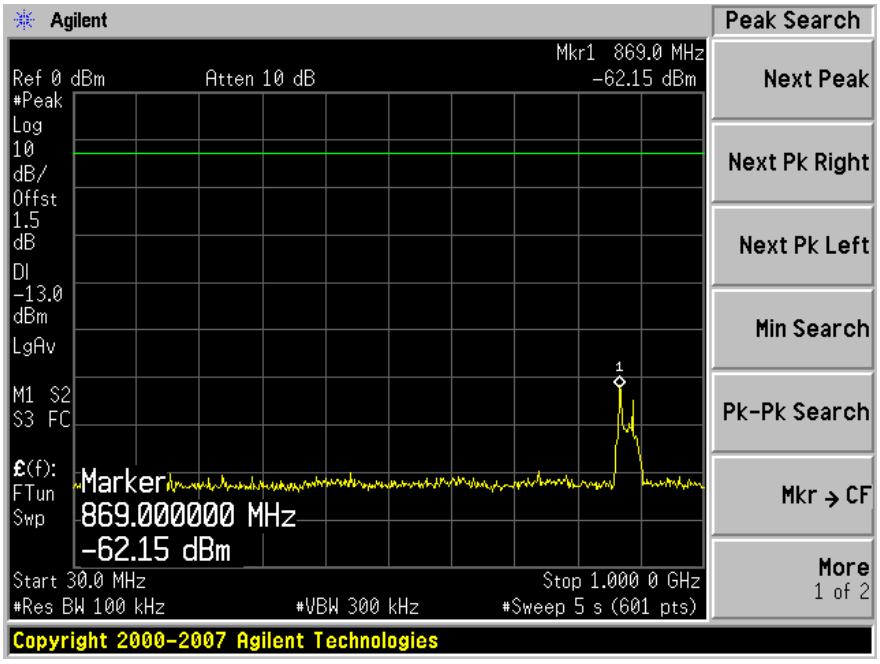



Plot 2: Above 1 GHz

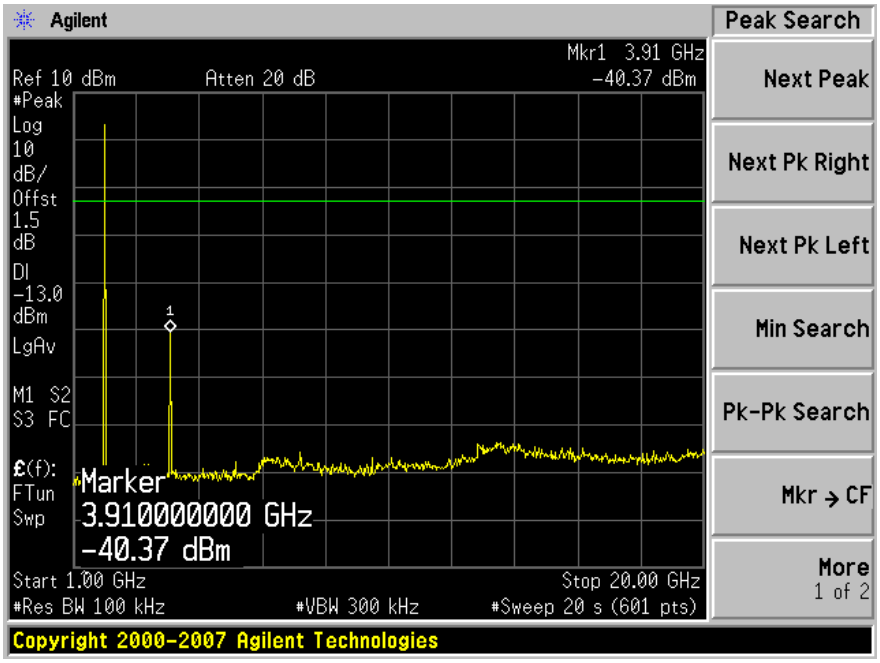


EDGE PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

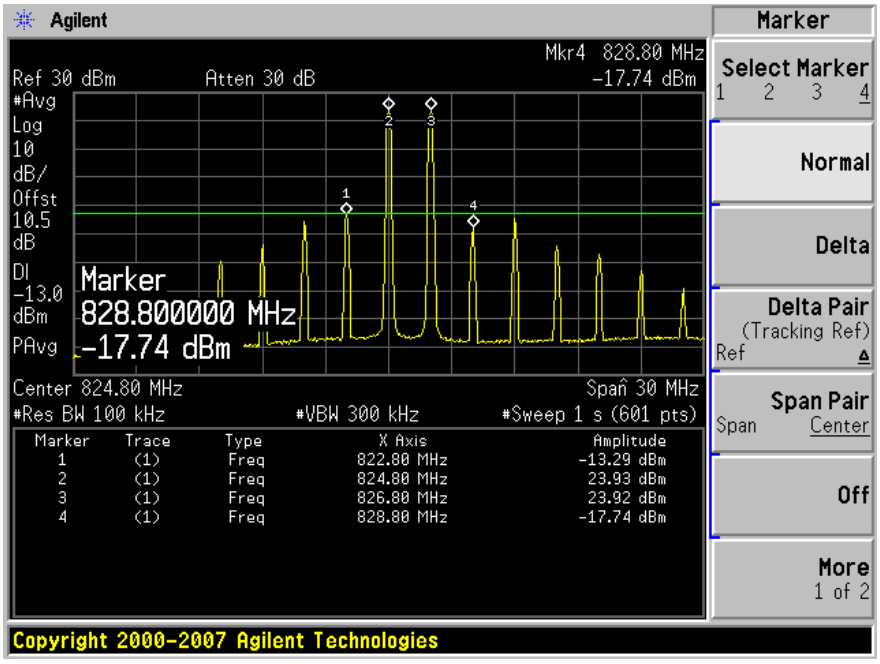



Plot 2: Above 1GHz

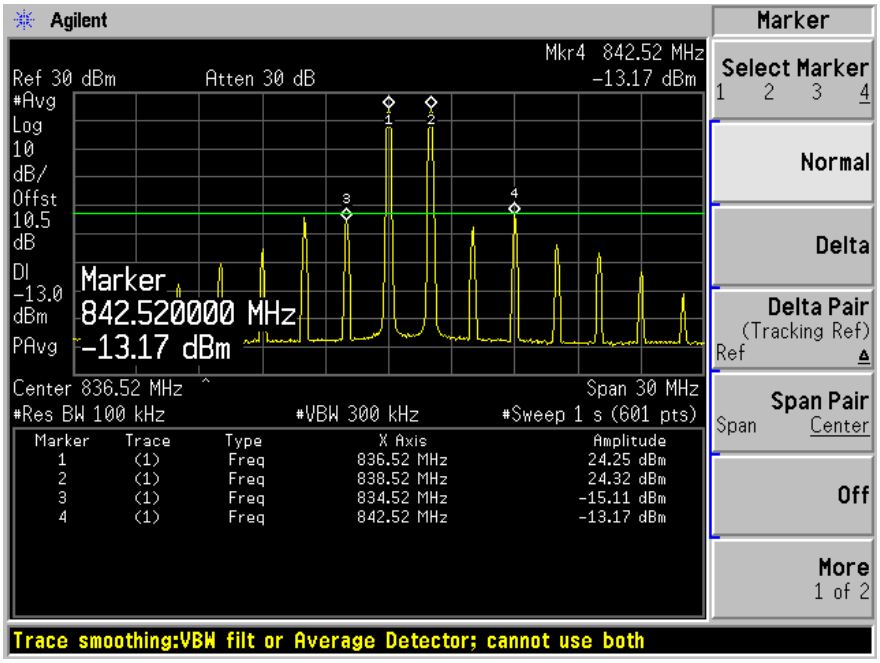


**Inter-modulation:**

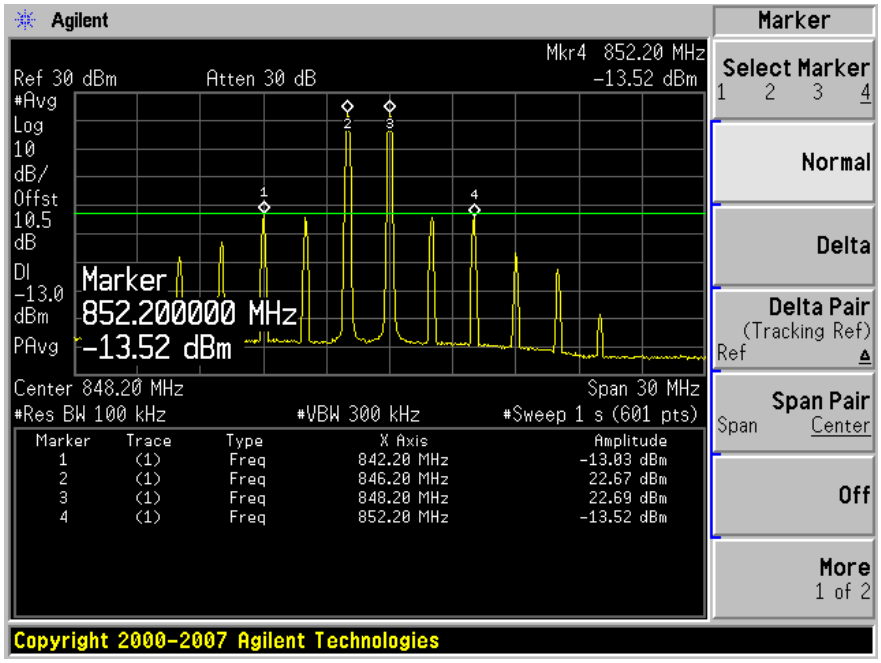
CDMA/EVDO Cellular Band Uplink, Low Channel: 824.8 MHz:



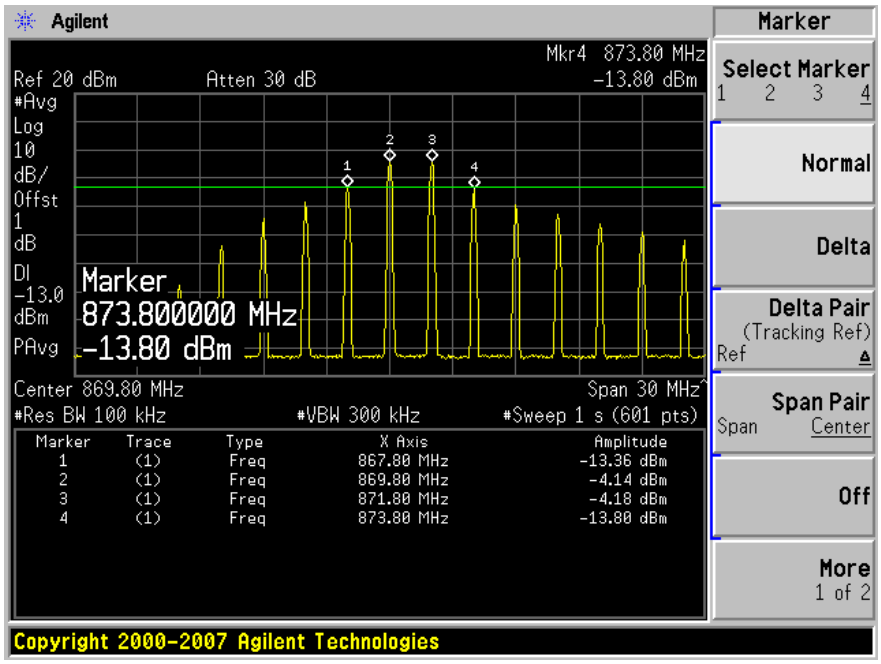

CDMA/EVDO Cellular Band Uplink, Middle Channel: 836.52 MHz:



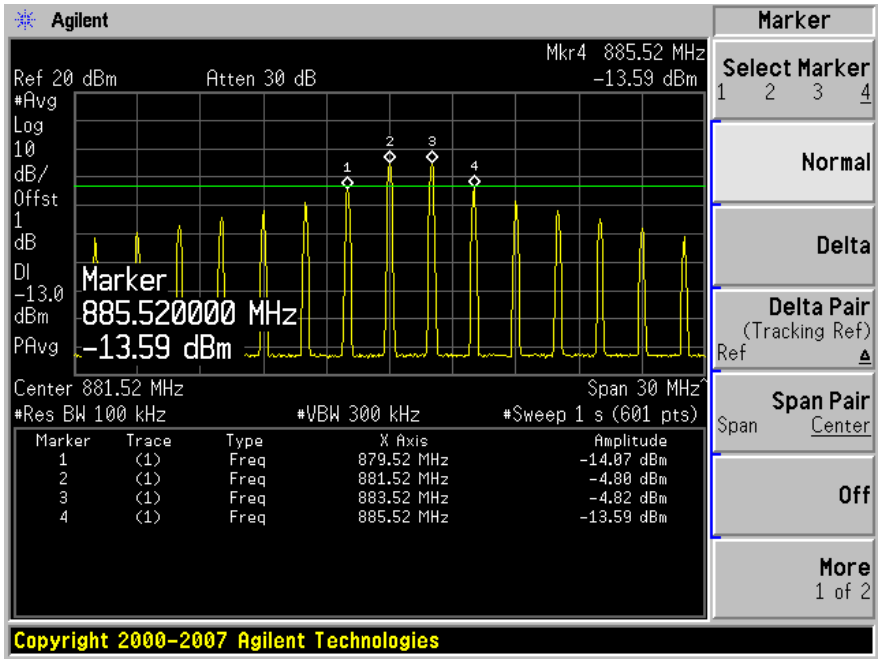
CDMA/EVDO Cellular Band Uplink, High Channel: 848.2 MHz:



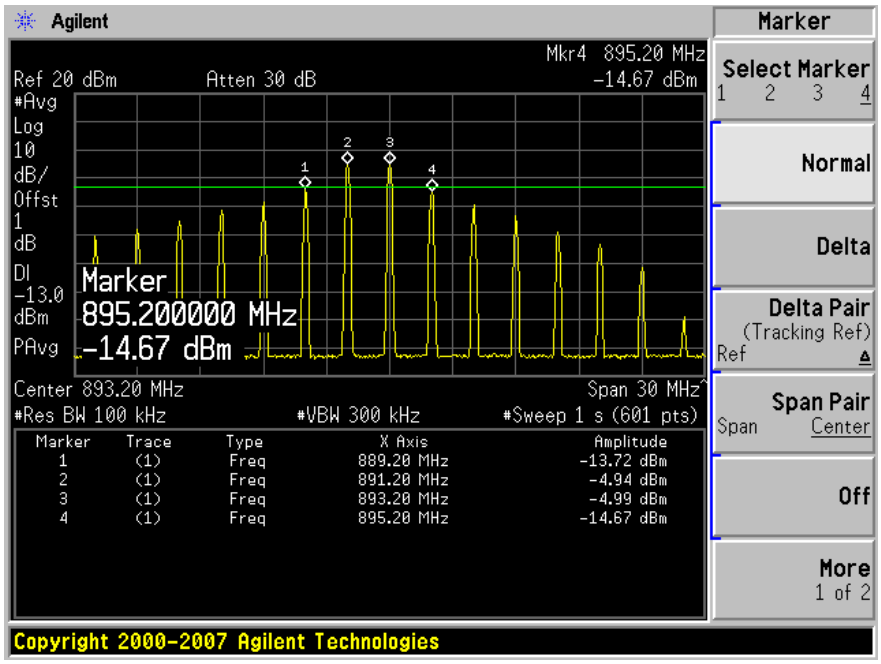

CDMA/EVDO Cellular Band Downlink, Low Channel: 869.8 MHz:



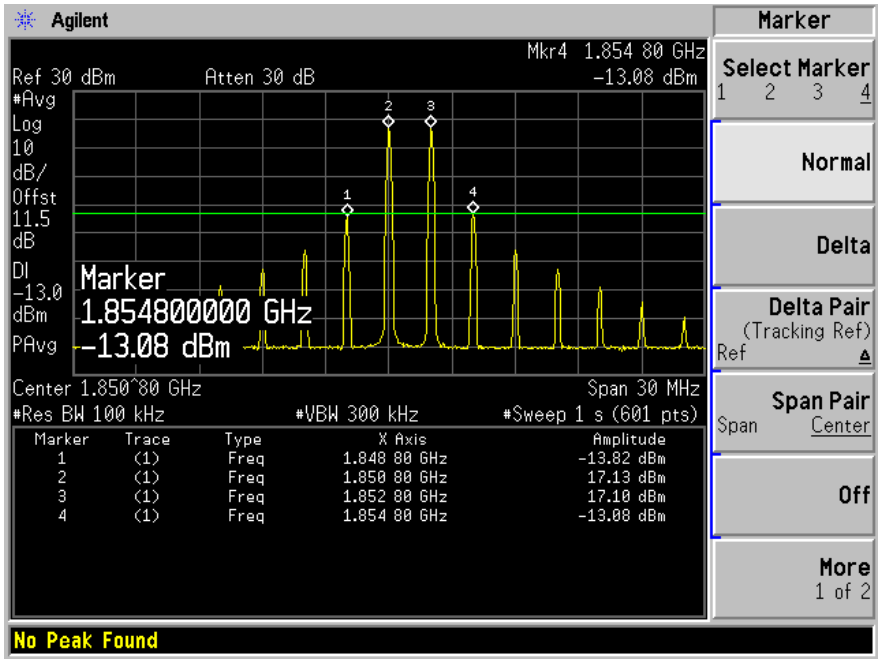
CDMA/EVDO Cellular Band Downlink, Middle Channel: 881.52 MHz:



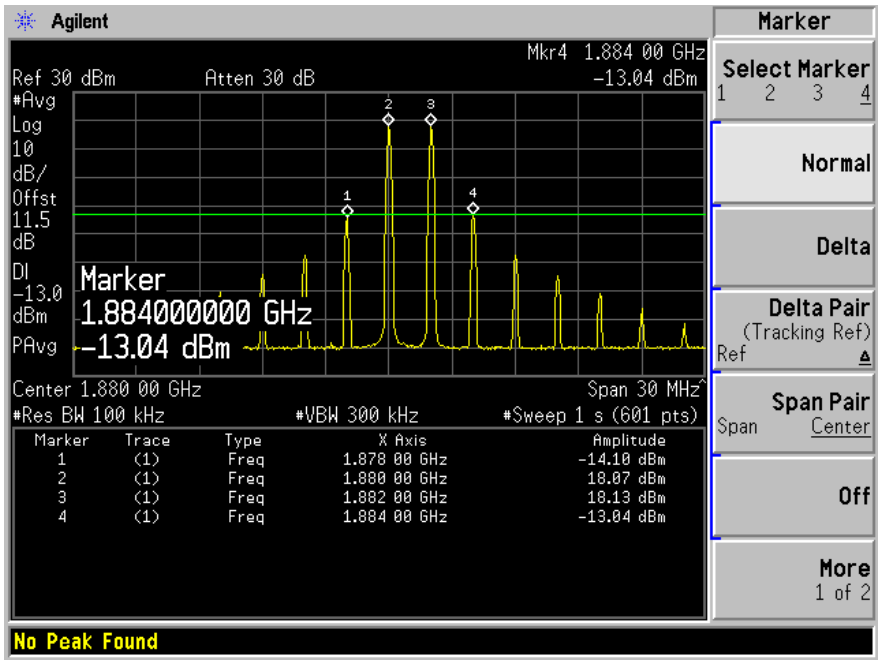

CDMA/EVDO Cellular Band Downlink, High Channel: 893.2 MHz:



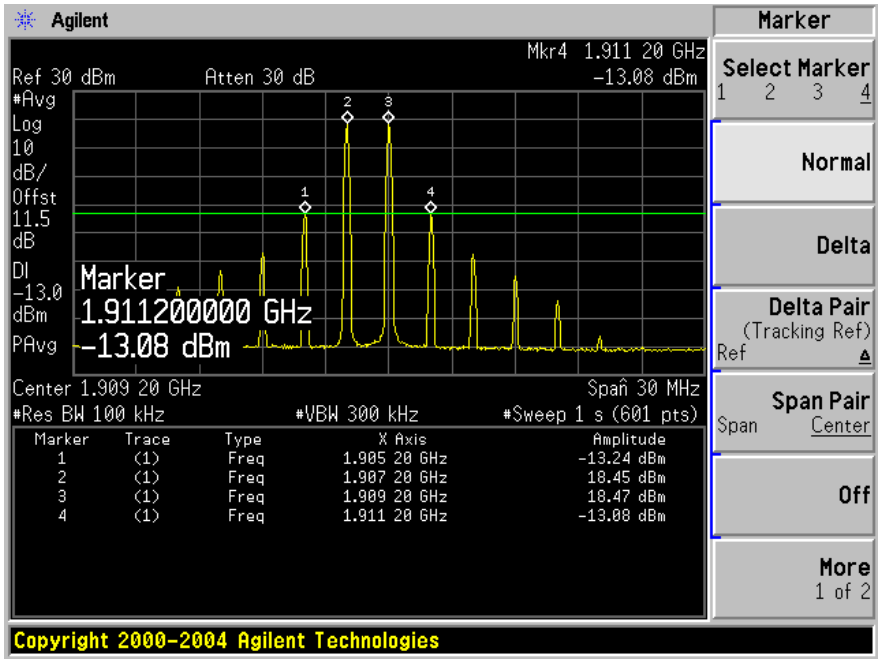
CDMA/EVDO PCS Band Uplink, Low Channel: 1850.8 MHz:



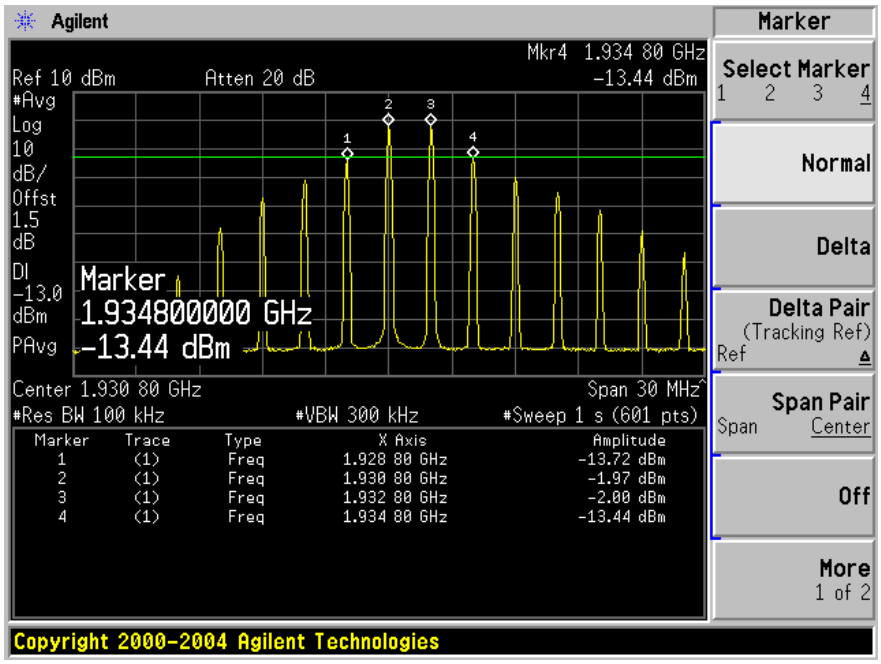

CDMA/EVDO PCS Band Uplink, Middle Channel: 1880 MHz:



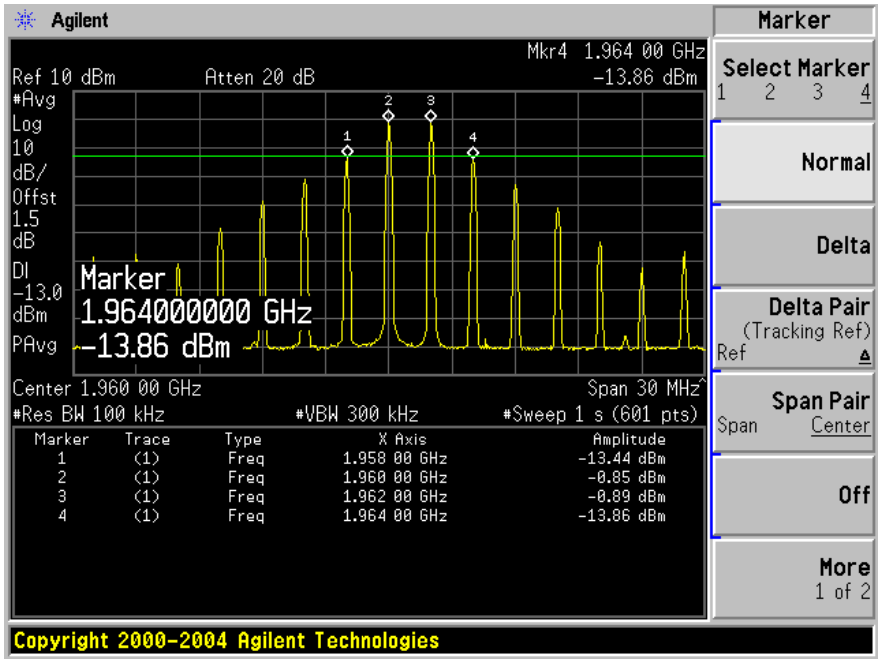
CDMA/EVDO PCS Band Uplink, High Channel: 1909.2 MHz:



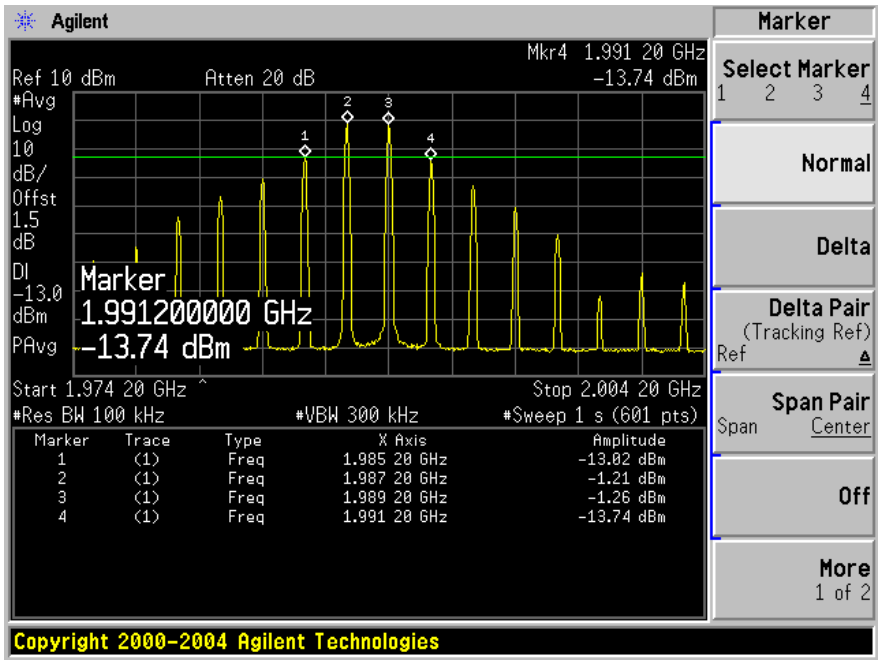

CDMA/EVDO PCS Band Downlink, Low Channel: 1930.8 MHz:



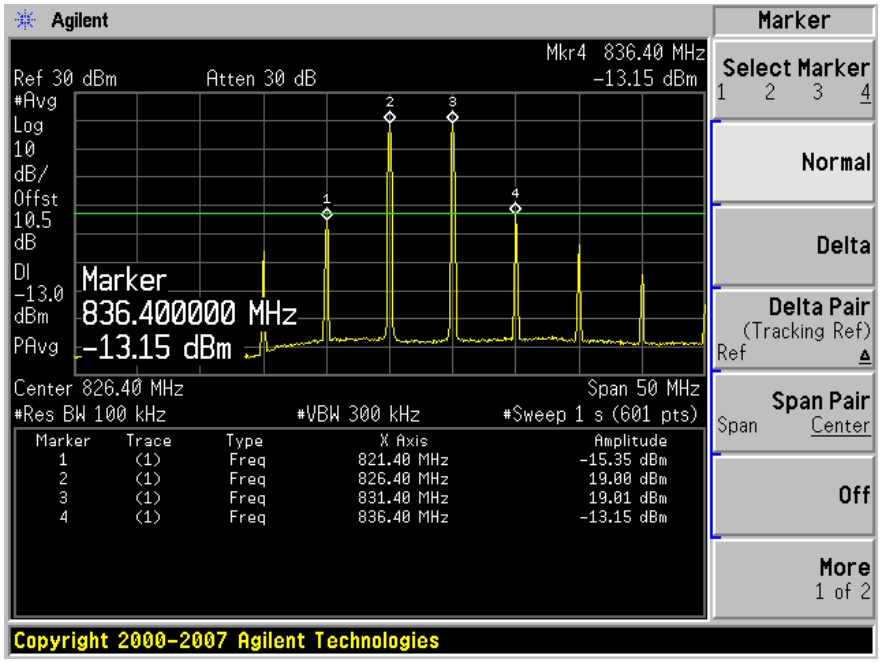
CDMA/EVDO PCS Band Downlink, Middle Channel: 1960 MHz:



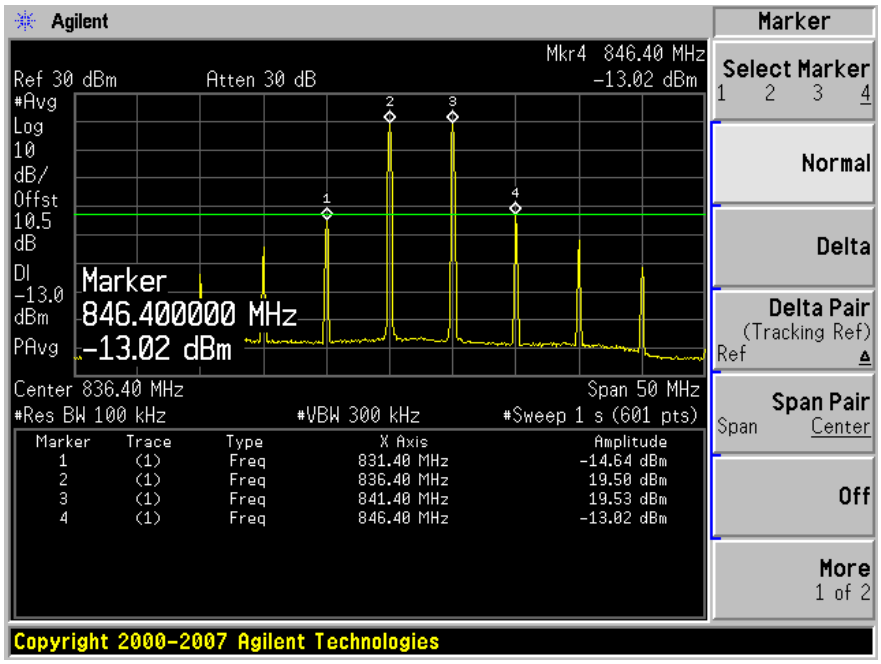

CDMA/EVDO PCS Band Downlink, High Channel: 1989.2 MHz:



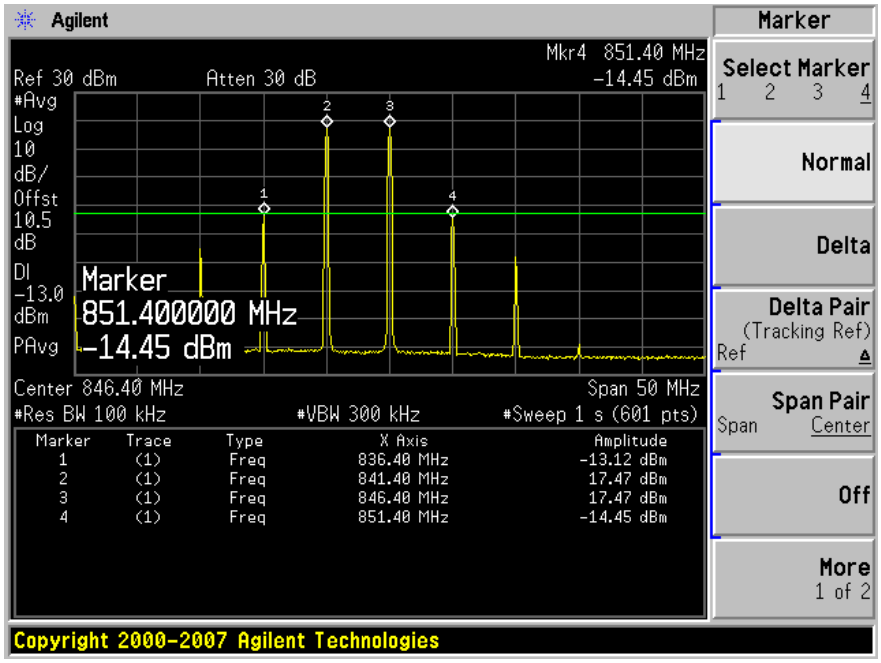
WCDMA/HSPA Cellular Band Uplink, Low Channel: 826.4 MHz:



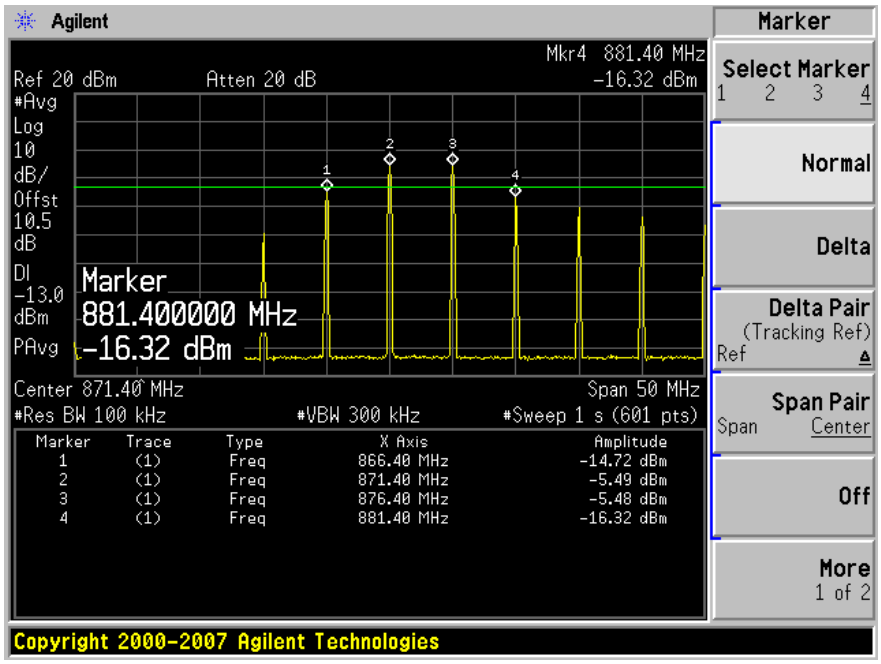

WCDMA/HSPA Cellular Band Uplink, Middle Channel: 836.4 MHz:



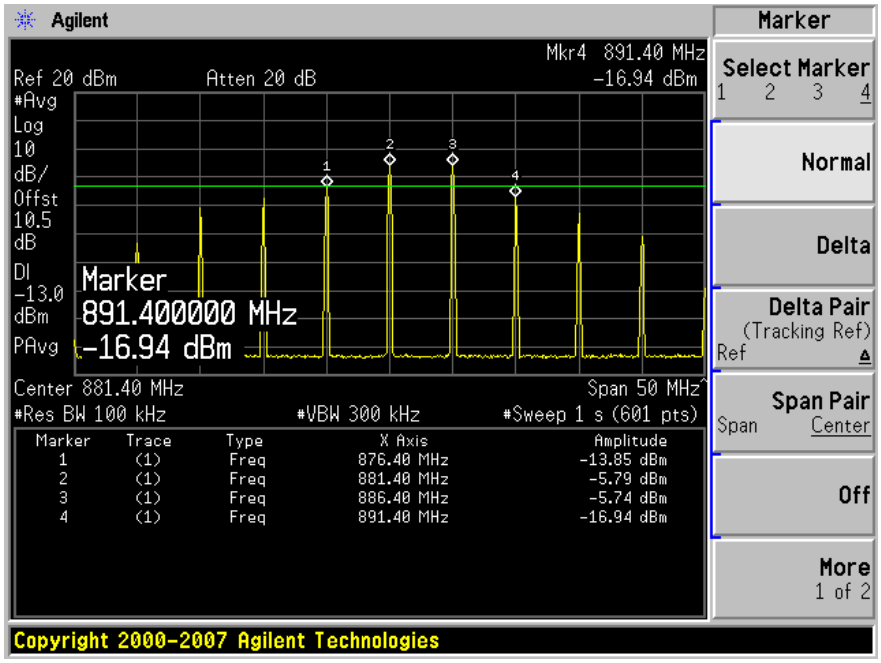
WCDMA/HSPA Cellular Band Uplink, High Channel: 846.6 MHz:



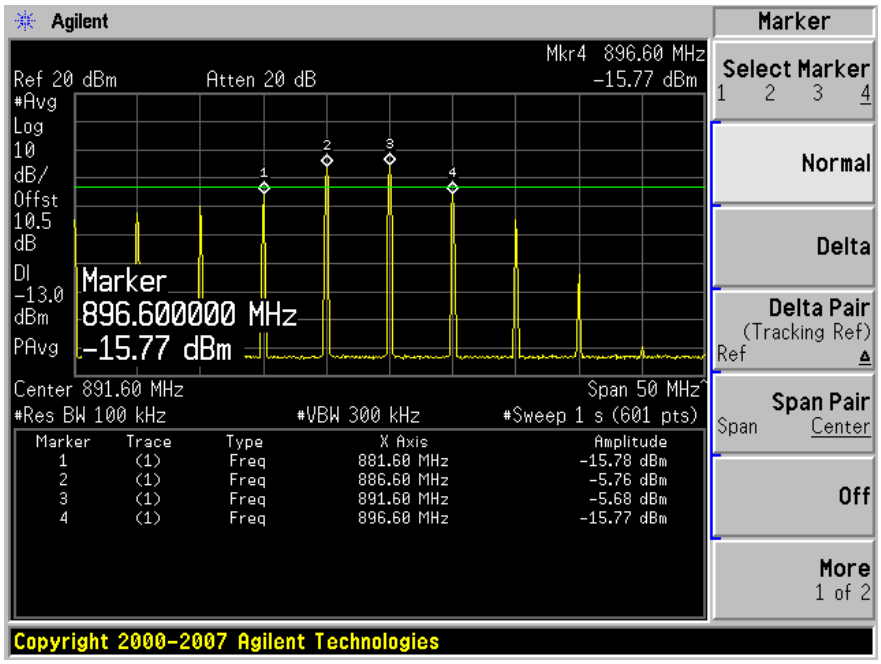

WCDMA/HSPA Cellular Band Downlink, Low Channel: 871.4 MHz:



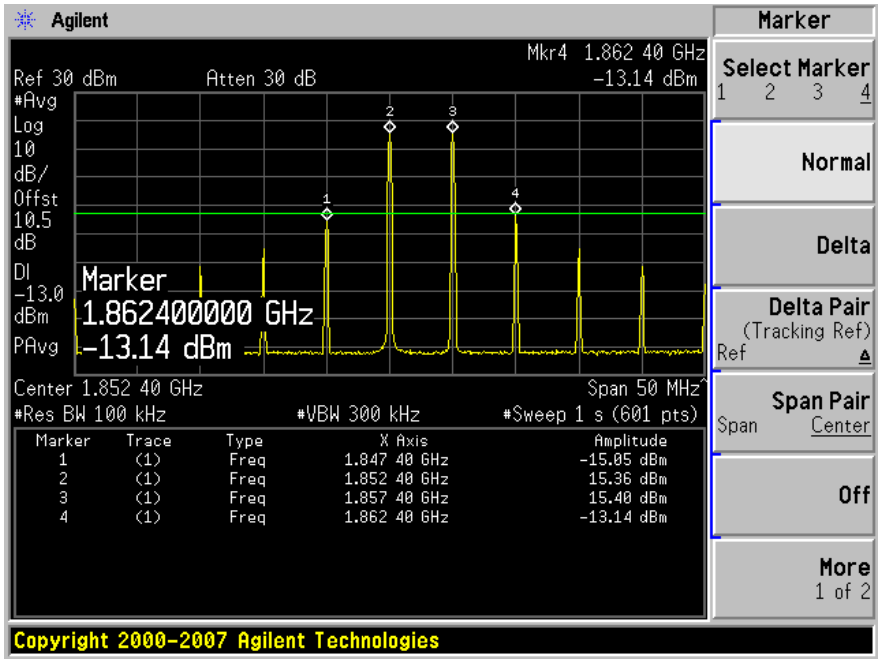
WCDMA/HSPA Cellular Band Downlink, Middle Channel: 881.4 MHz:



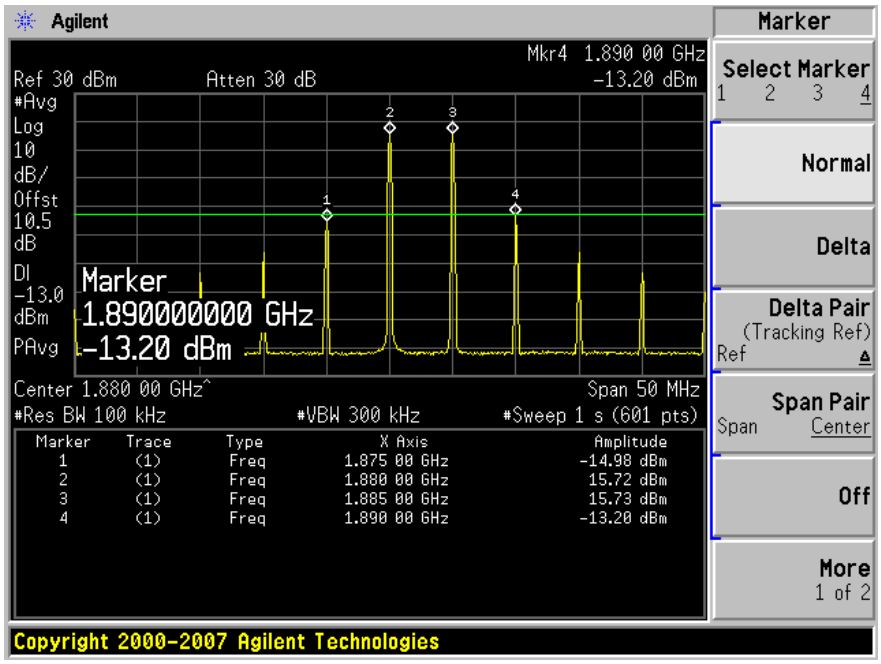

WCDMA/HSPA Cellular Band Downlink, High Channel: 891.6 MHz:



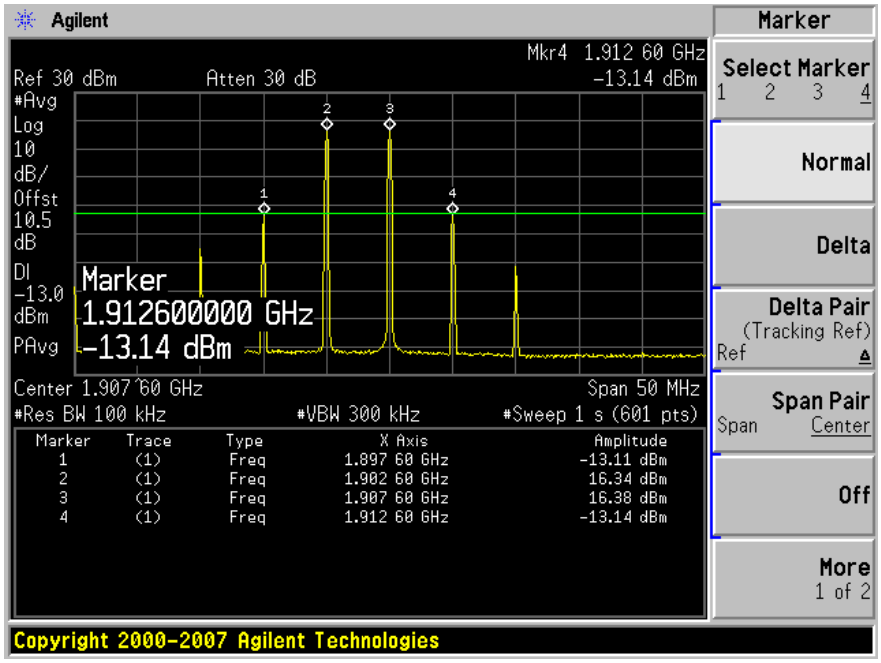
WCDMA/HSPA PCS Band Uplink, Low Channel: 1852.4 MHz:



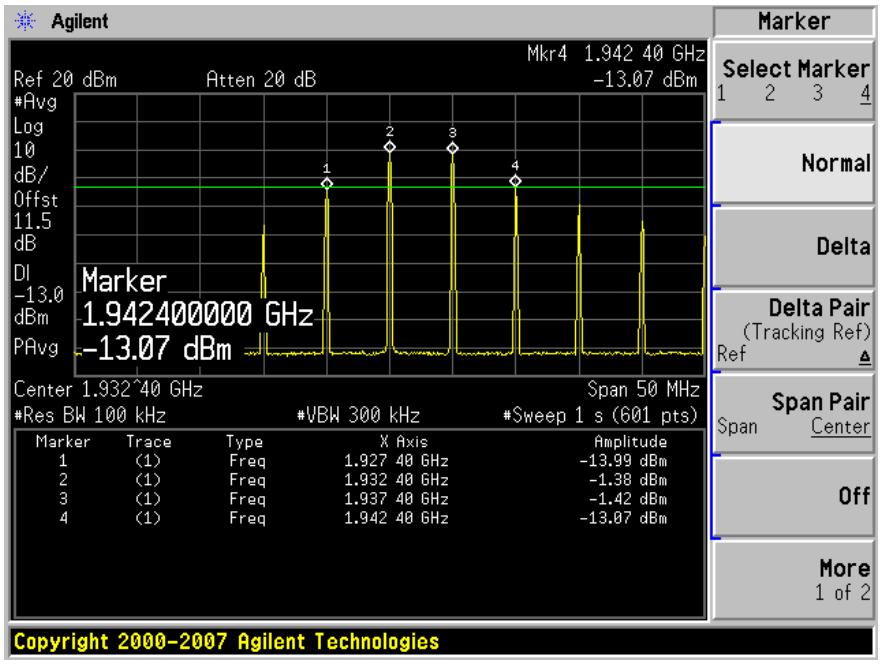

WCDMA/HSPA PCS Band Uplink, Middle Channel: 1880 MHz:



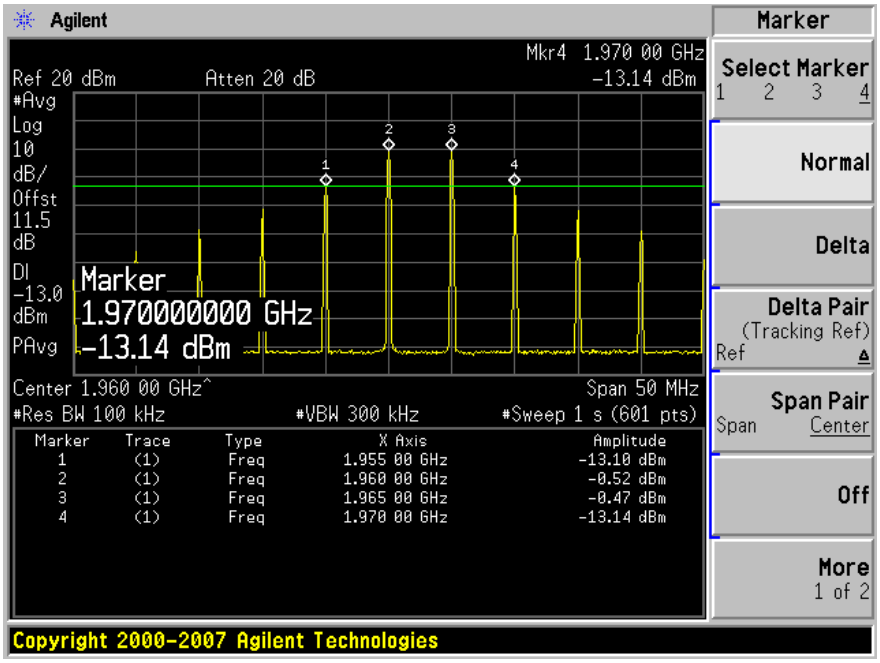
WCDMA/HSPA PCS Band Uplink, High Channel: 1907.6 MHz:



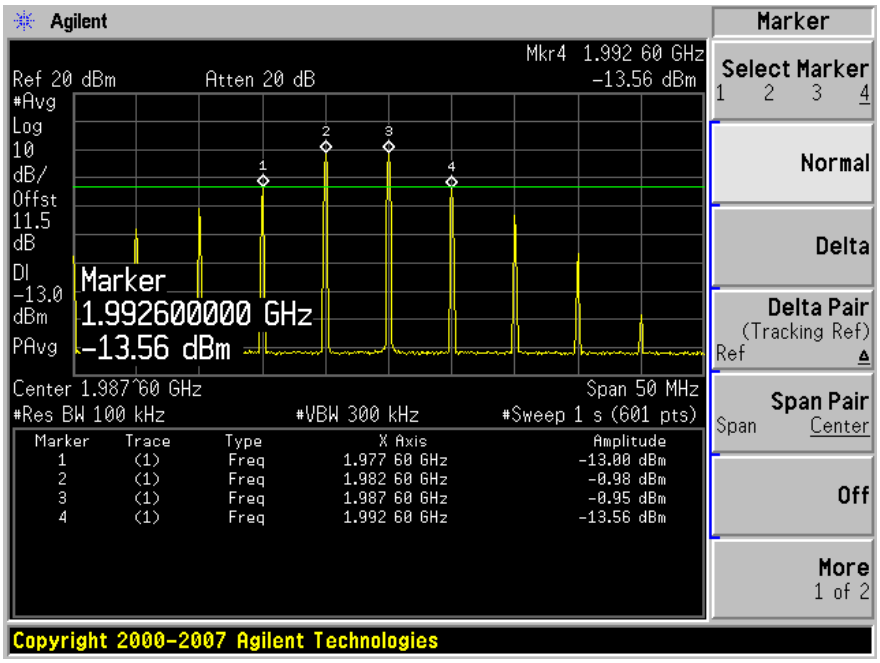

WCDMA/HSPA PCS Band Downlink, Low Channel: 1932.4 MHz:



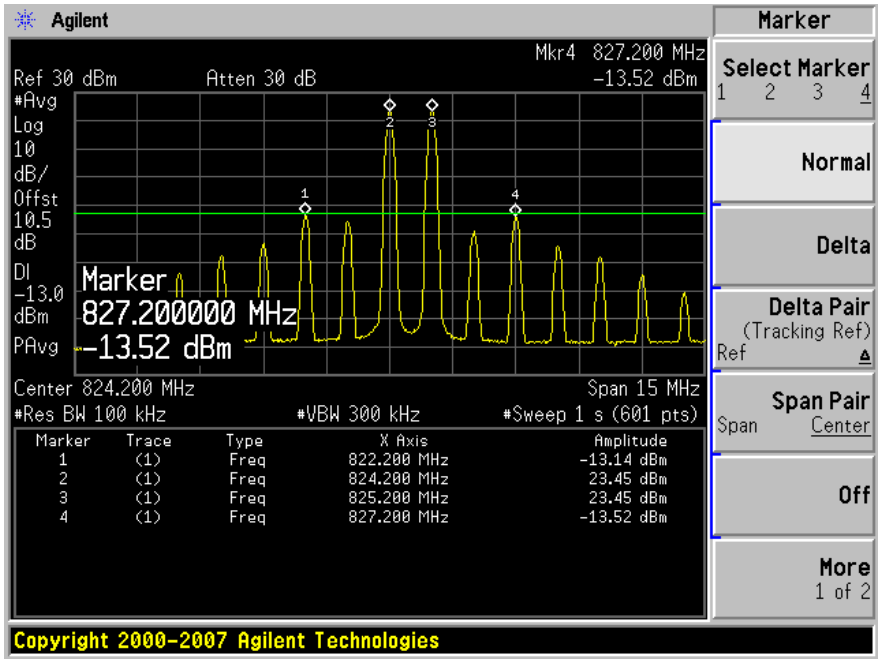
WCDMA/HSPA PCS Band Downlink, Middle Channel: 1960 MHz:



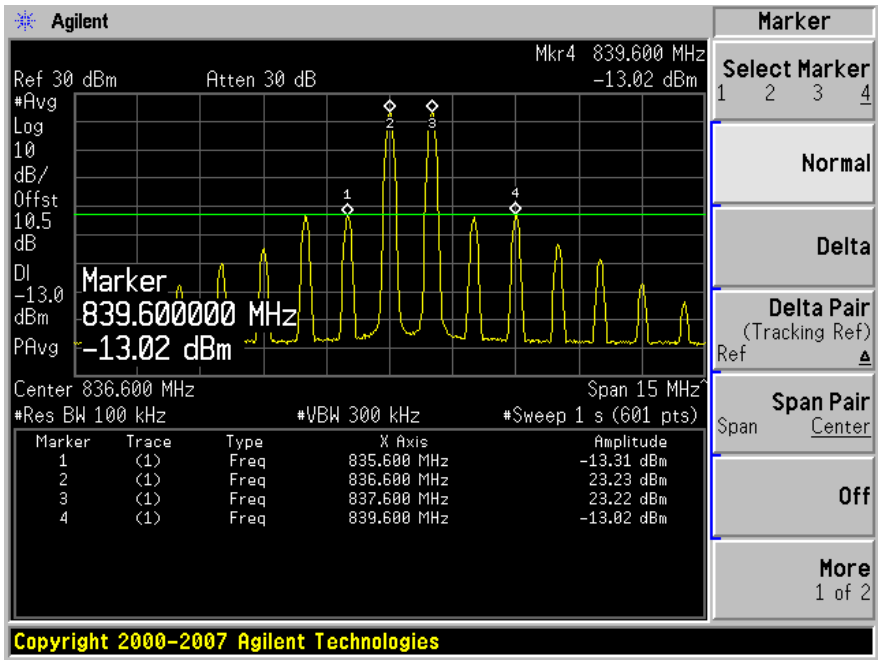

WCDMA/HSPAO PCS Band Downlink, High Channel: 1987.2 MHz:



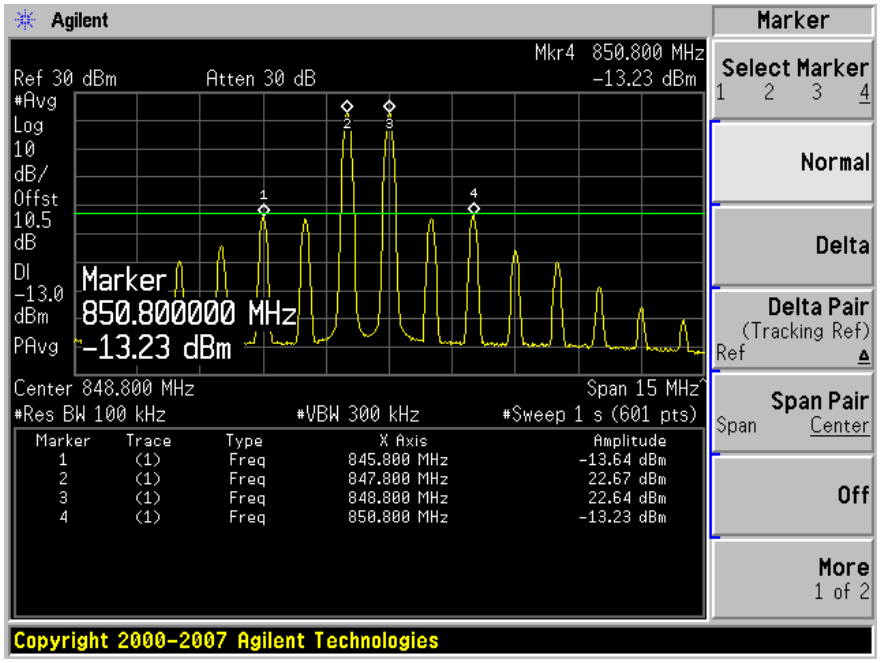
GSM/RDGE Cellular Band Uplink, Low Channel: 824.2 MHz:



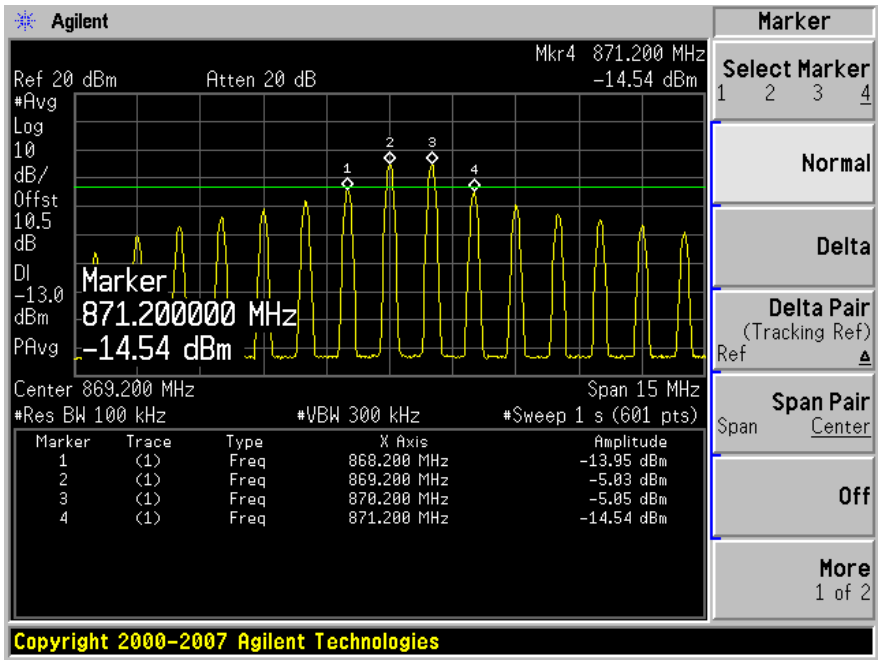

GSM/EDGE Cellular Band Uplink, Middle Channel: 836.6 MHz:



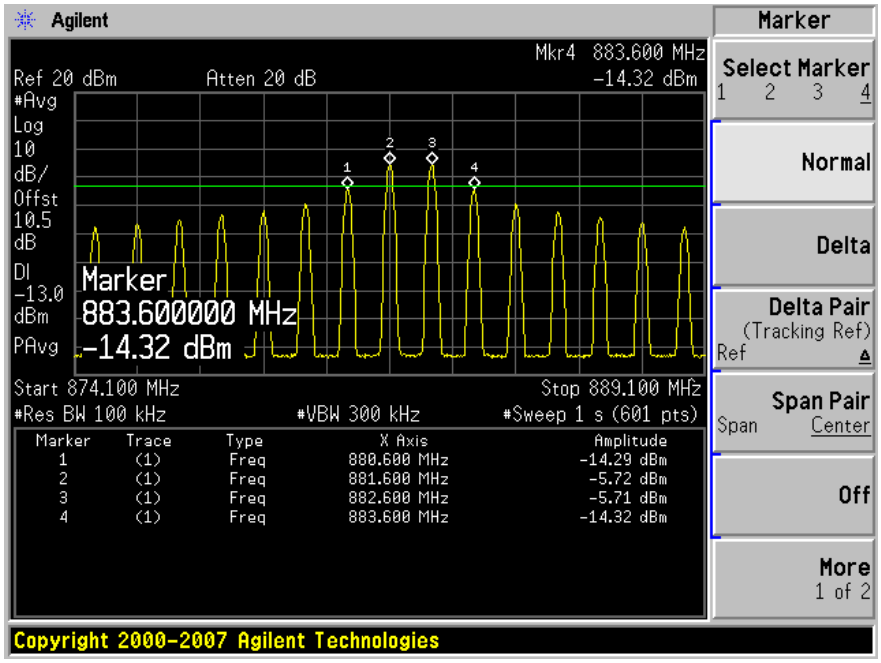
GSM/EDGE Cellular Band Uplink, High Channel: 484.8 MHz:



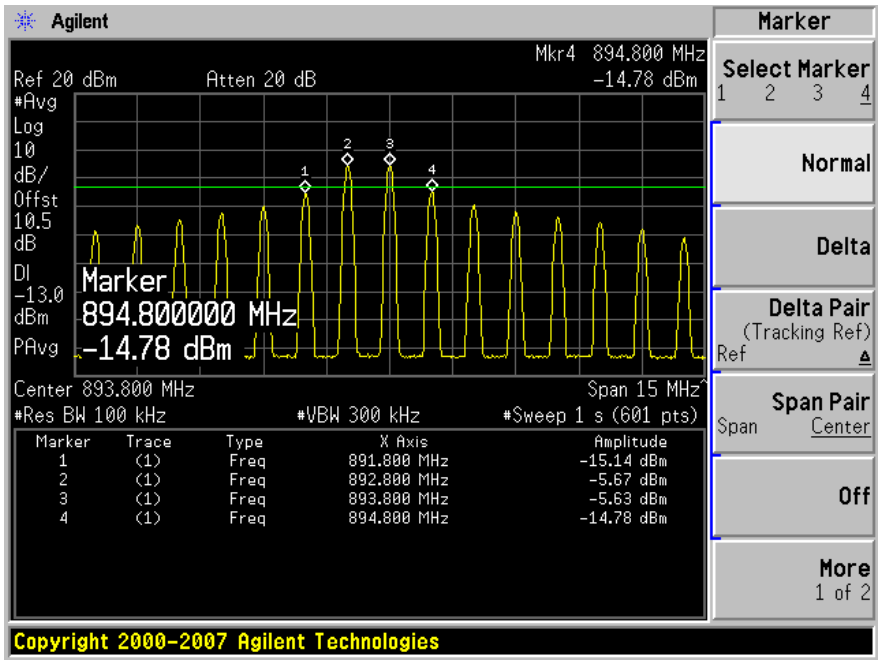

GSM/EDGE Cellular Band Downlink, Low Channel: 869.2 MHz:



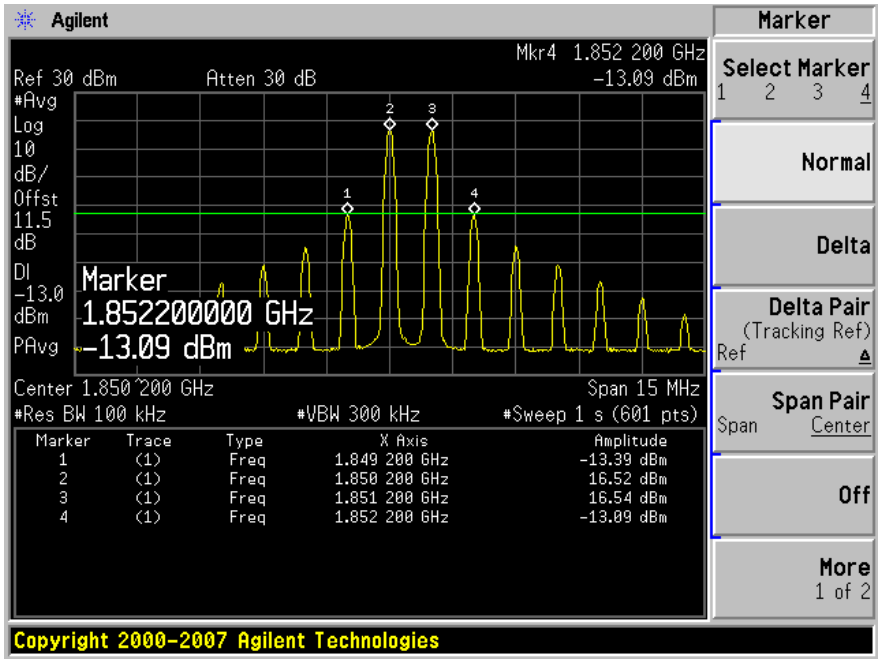
GSM/EDGE Cellular Band Downlink, Middle Channel: 881.6 MHz:



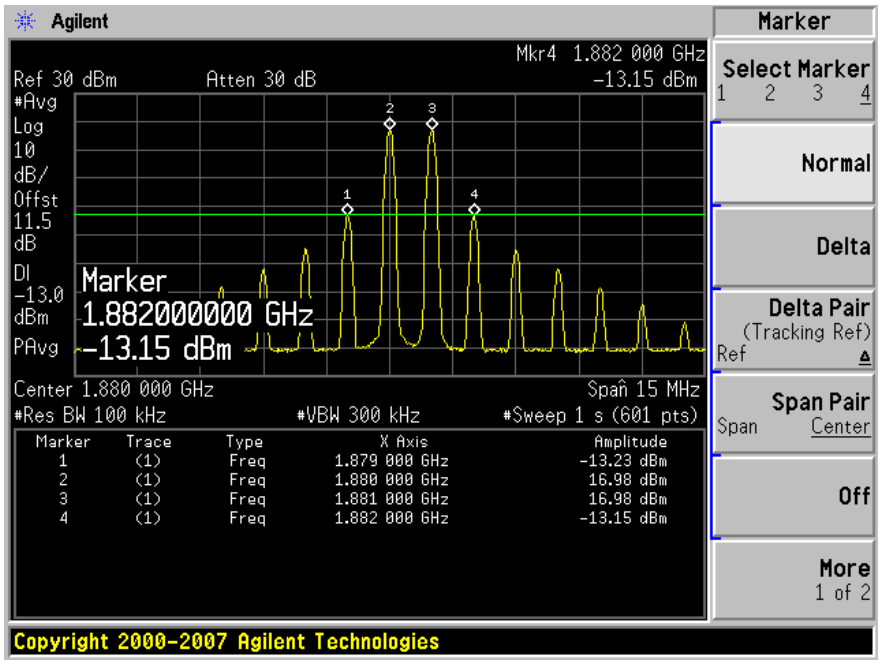

GSM/EDGE Cellular Band Downlink, High Channel: 893.8 MHz:



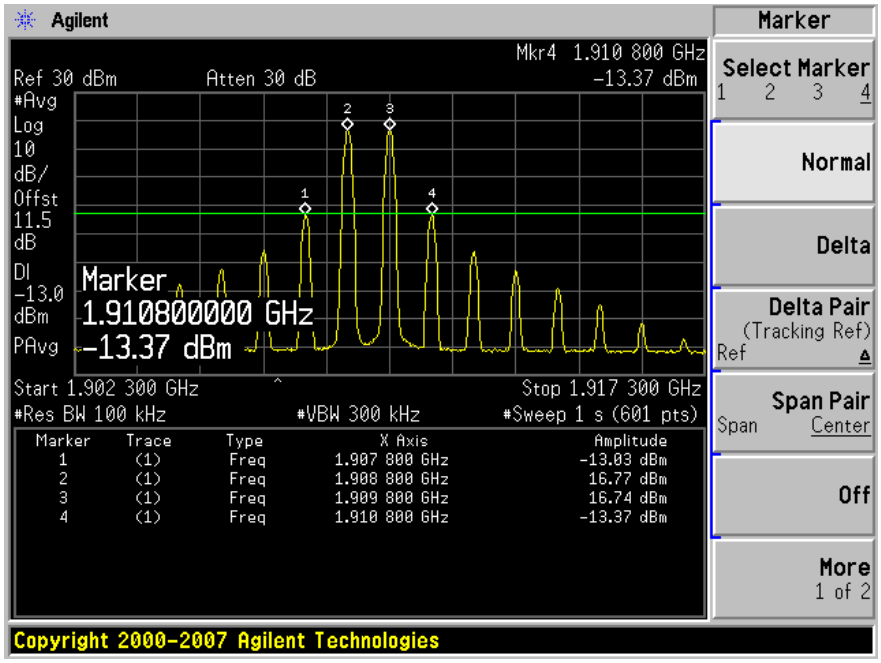
GSM/EDGE PCS Band Uplink, Low Channel: 1850.2 MHz:



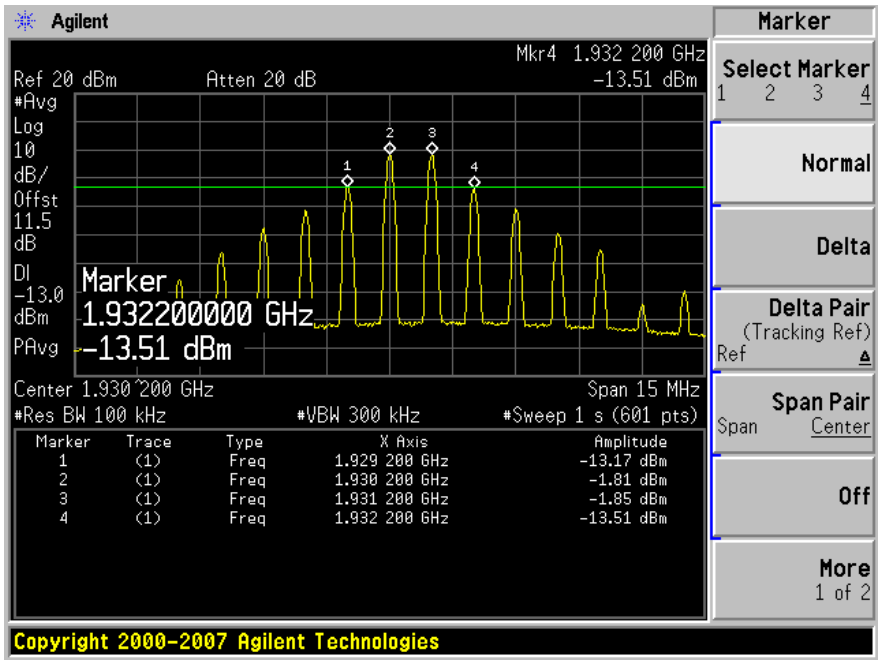

GSM/EDGE PCS Band Uplink, Middle Channel: 1880 MHz:



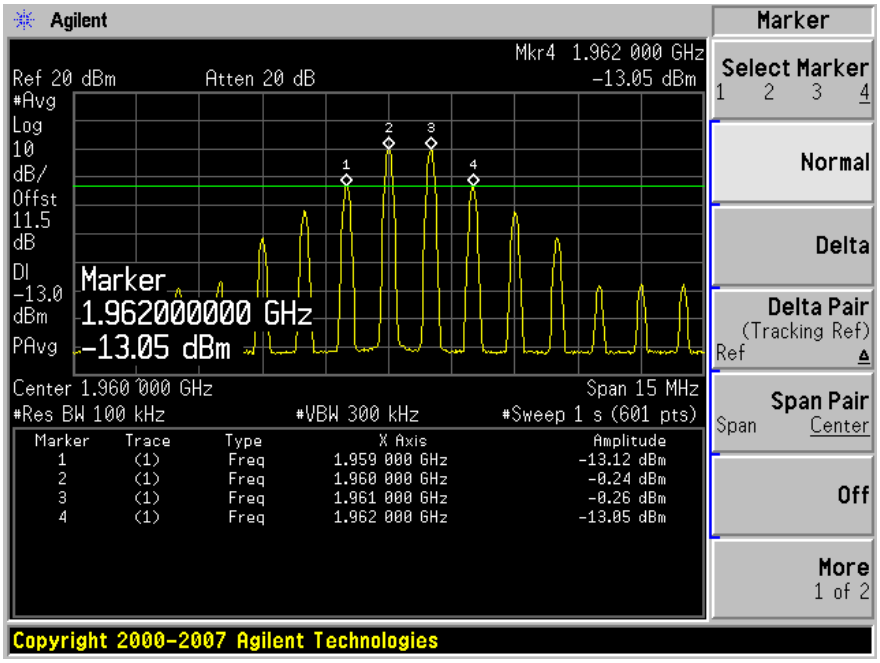
GSM/EDGE PCS Band Uplink, High Channel: 1909.8 MHz:



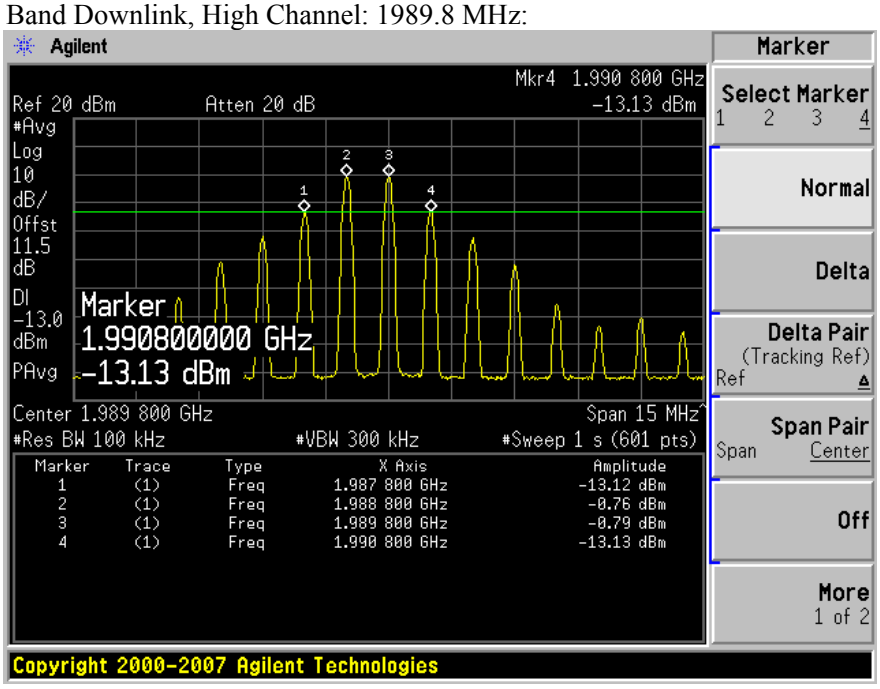

GSM/EDGE PCS Band Downlink, Low Channel: 1930.2 MHz:



GSM/EDGE PCS Band Downlink, Middle Channel: 1960 MHz:




GSM/EDGE PCS Band Downlink, High Channel: 1989.8 MHz:



# 9 FCC §22.917 & §24.238 – BAND EDGE

## 9.1 Applicable Standard

According to § 22.917 and § 24.238, 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.

## 9.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.

## 9.3 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23-24 °C |
| **Relative Humidity:** | 40-45 % |
| **ATM Pressure:** | 101-103kPa |

** The testing was performed by Victor Zhang from 2009-08-1 to 2009-08-14 in RF Site.*

## 9.4 Test Equipment List and Details

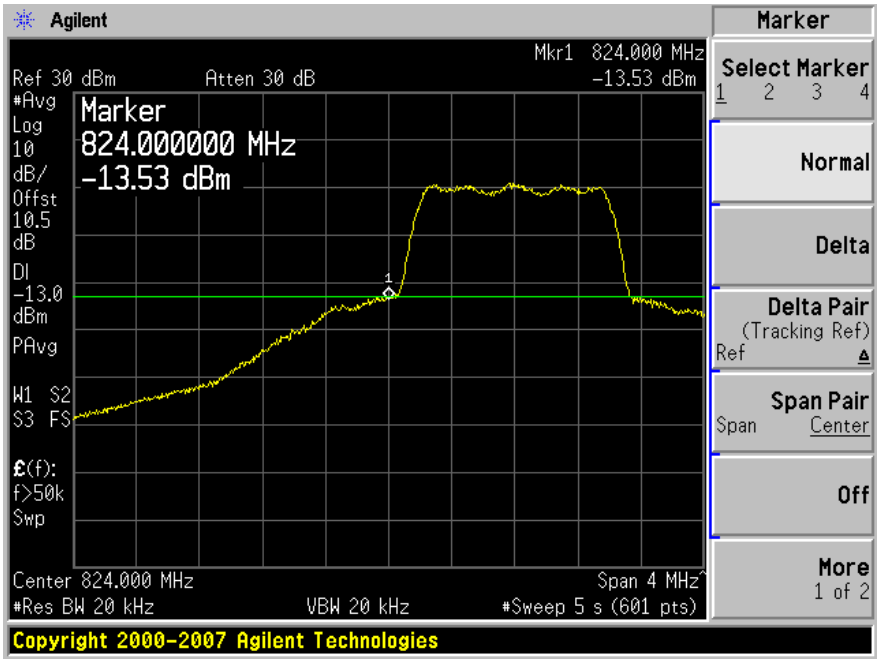
| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2009-04-27 |
| HP | Signal Generator | 8648C | 3426A00417 | 2009-07-23 |
| R & S | Signal Generator | SMIQ03 | 849192/0085 | 2007-12-03* |

* Based on two years calibration Cycle.
*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

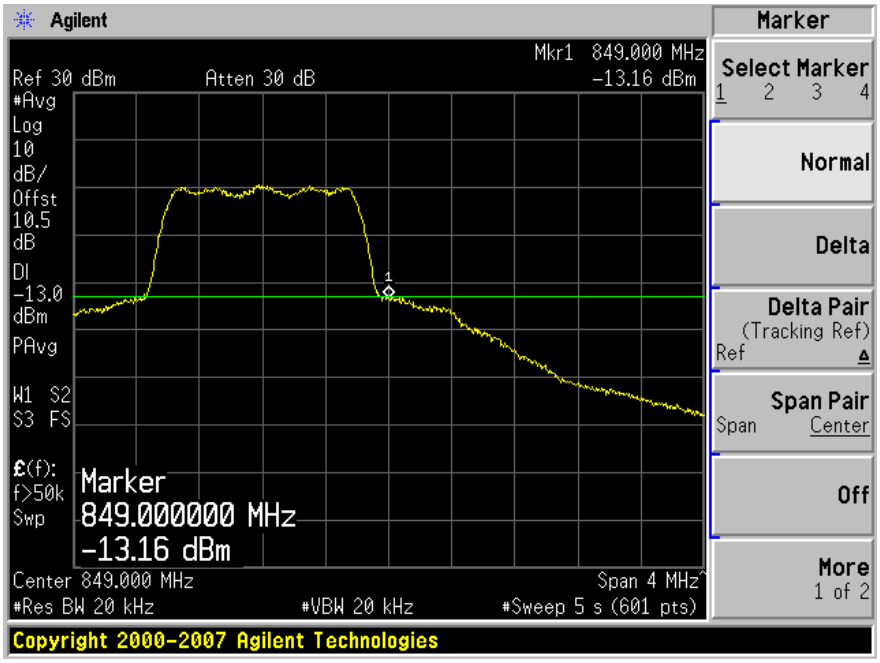
## 9.5 Test Results

Please refer to the following plots.

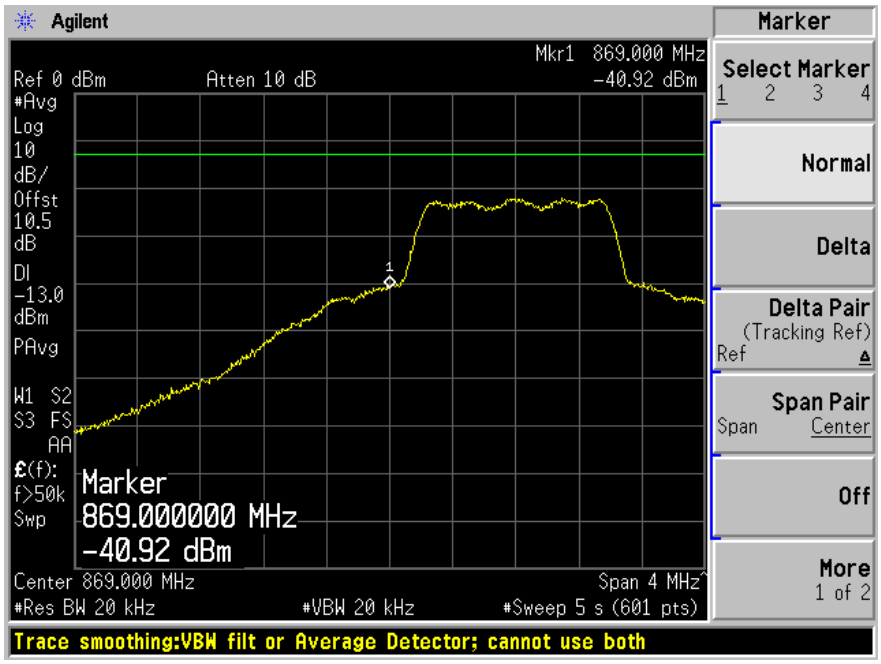
CDMA/EVDO Cellular Band Uplink: Lowest Channel



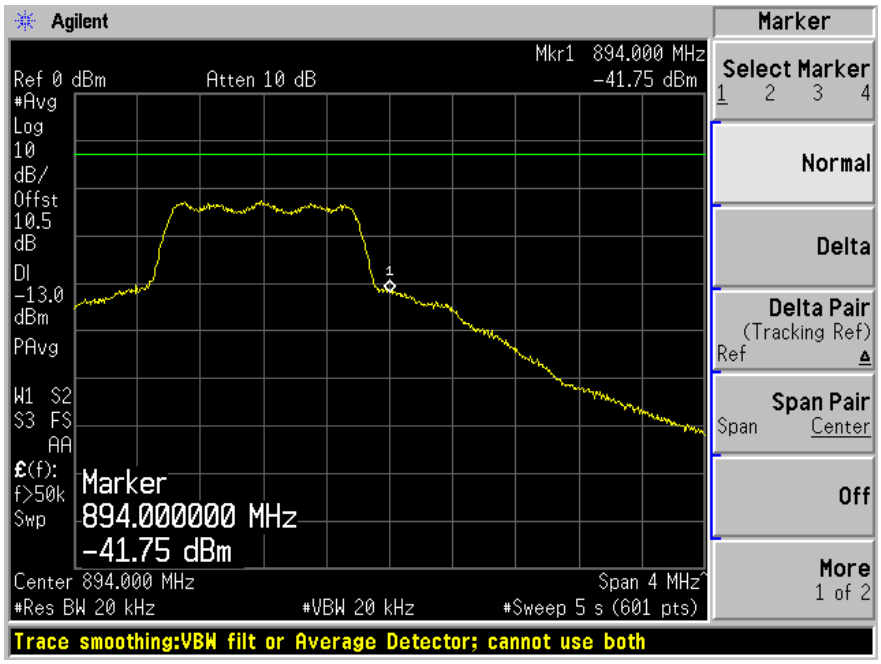

CDMA/EVDO Cellular Band Uplink: Highest Channel



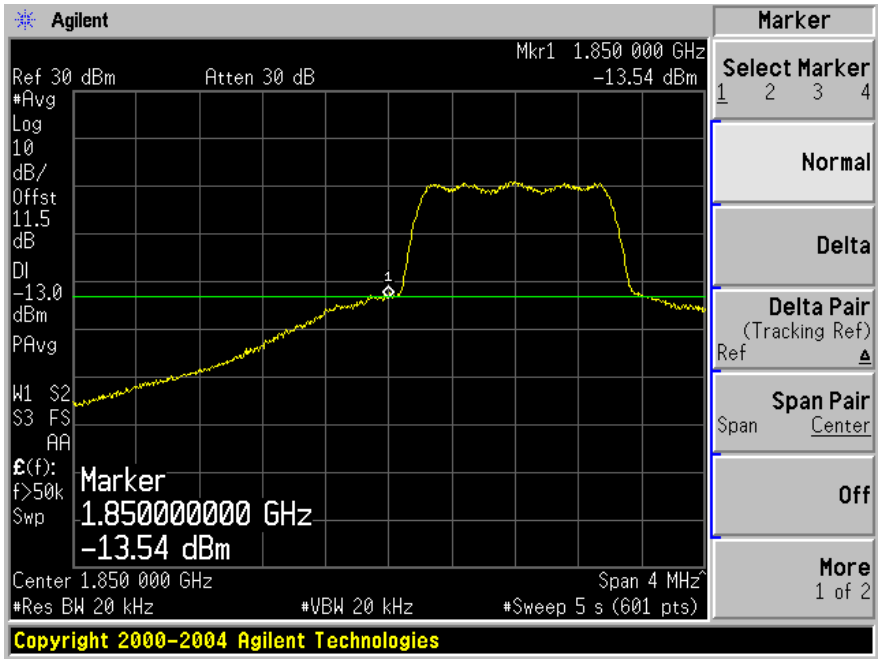
CDMA/EVDO Cellular Band Downlink: Lowest Channel



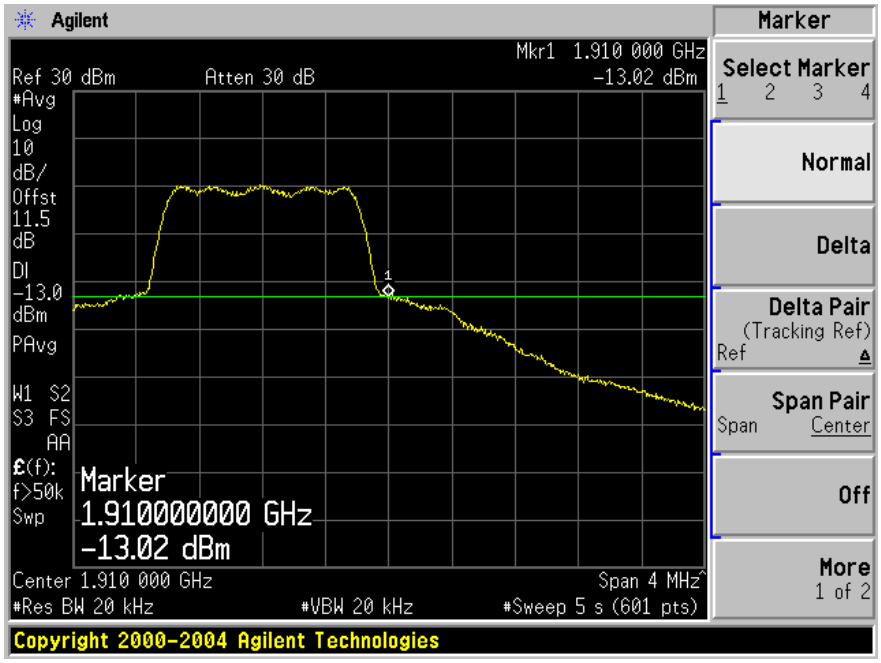

CDMA/EVDO Cellular Band Downlink: Highest Channel



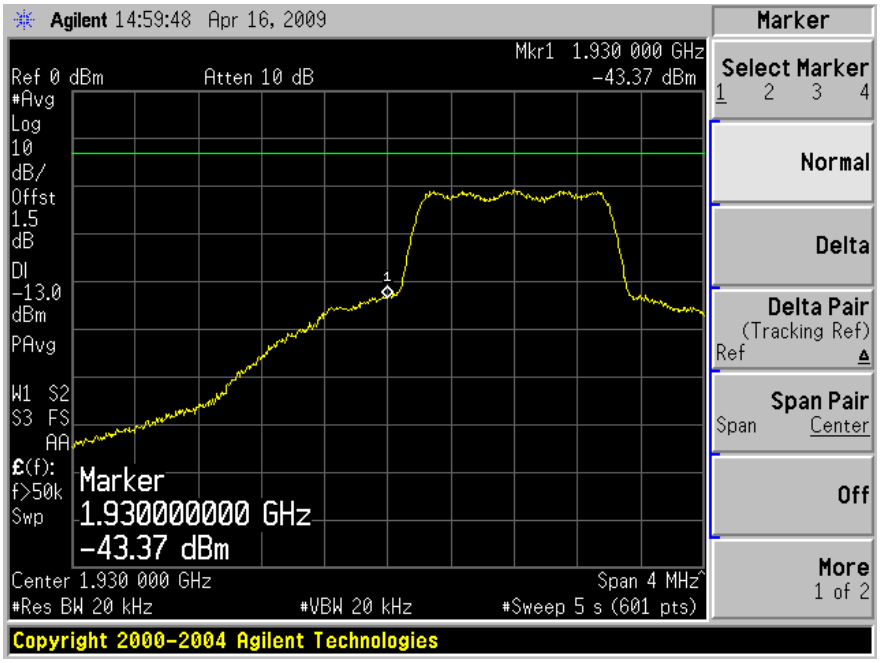
CDMA/EVDO PCS Band Uplink: Lowest Channel



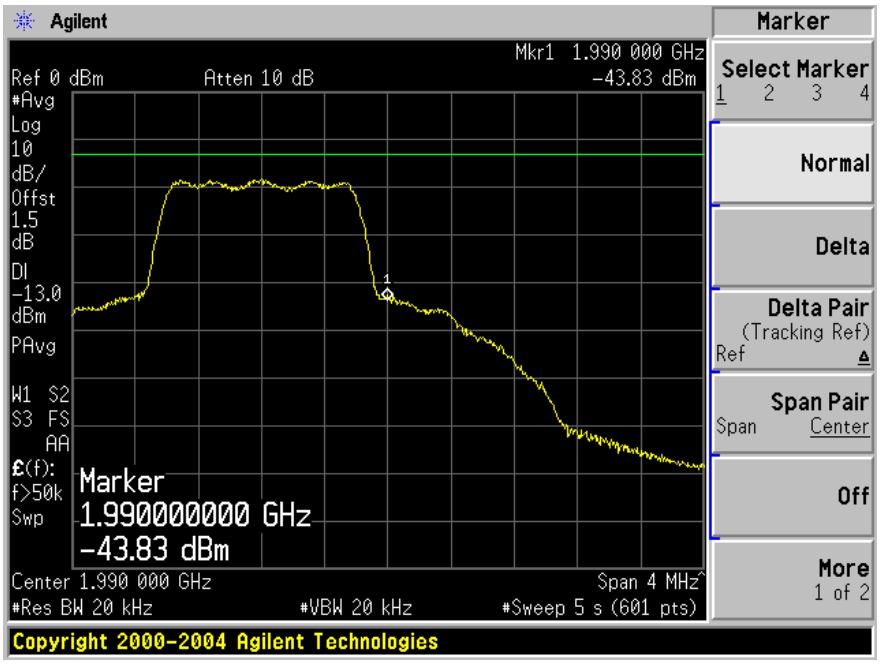

CDMA/EVDO PCS Band Uplink: Highest Channel



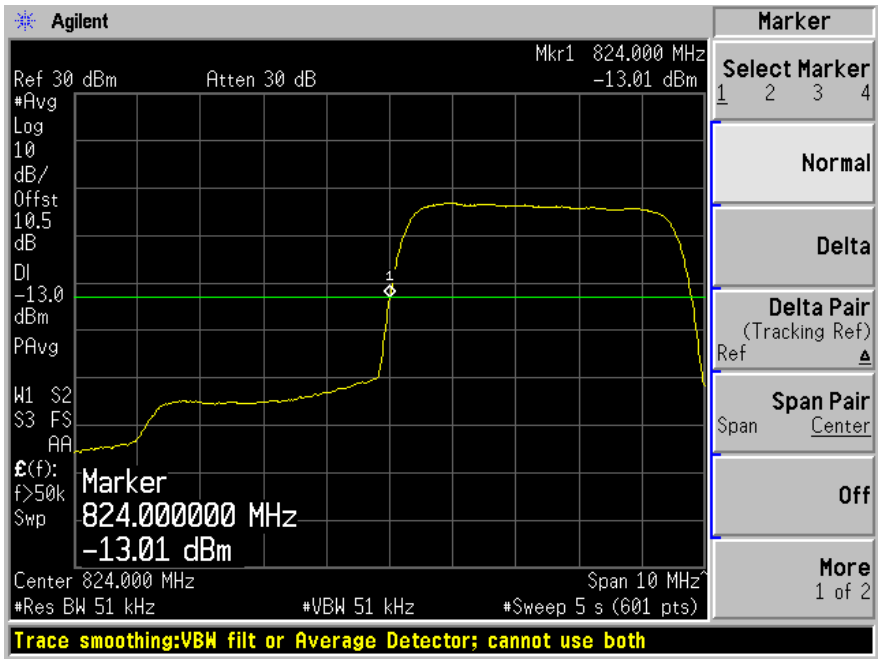
CDMA/EVDO PCS Band Downlink: Lowest Channel



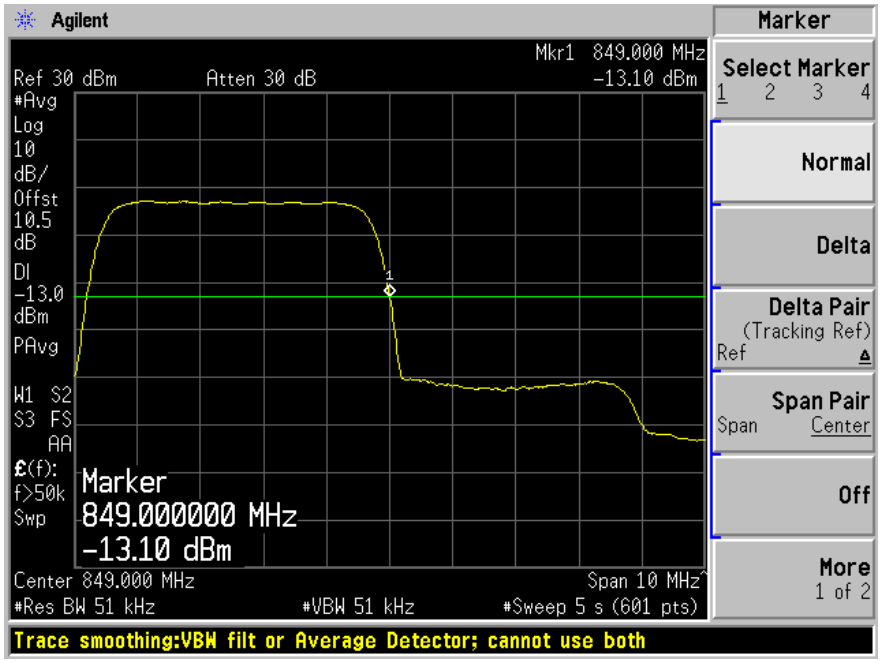

CDMA/EVDO PCS Band Downlink: Highest Channel



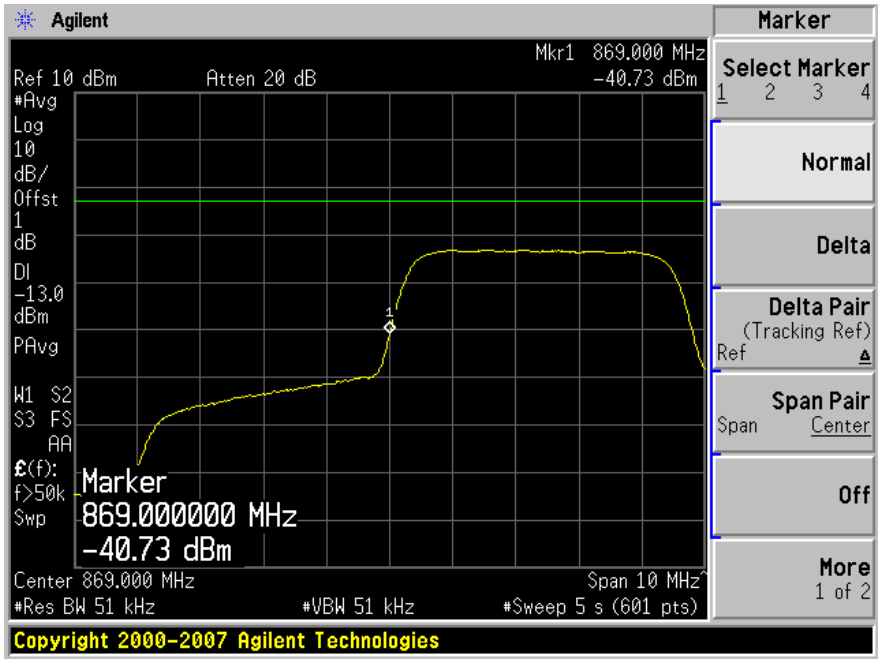
WCDMA/HSPA Cellular Band Uplink: Lowest Channel



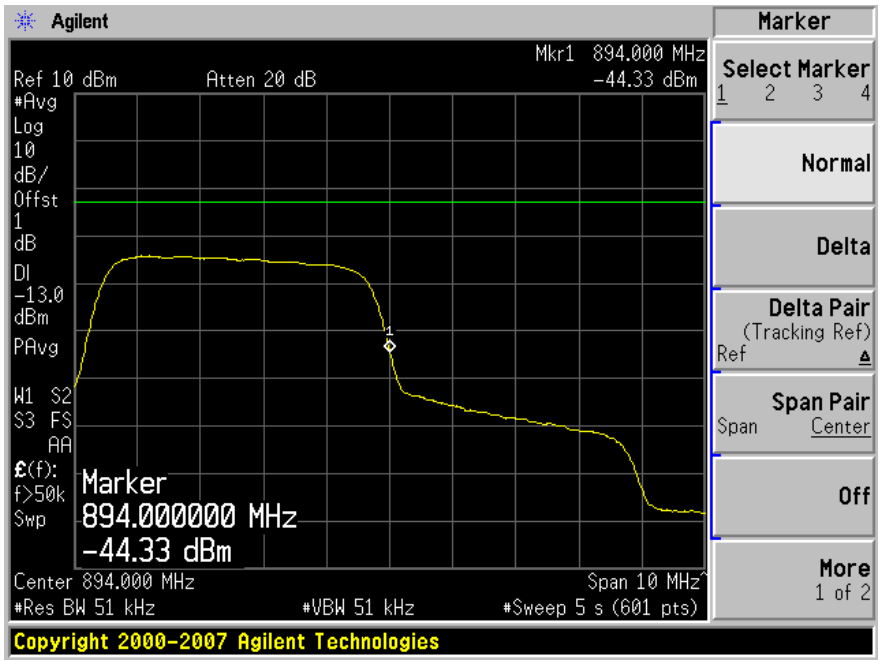

WCDMA/HSPA Cellular Band Uplink: Highest Channel



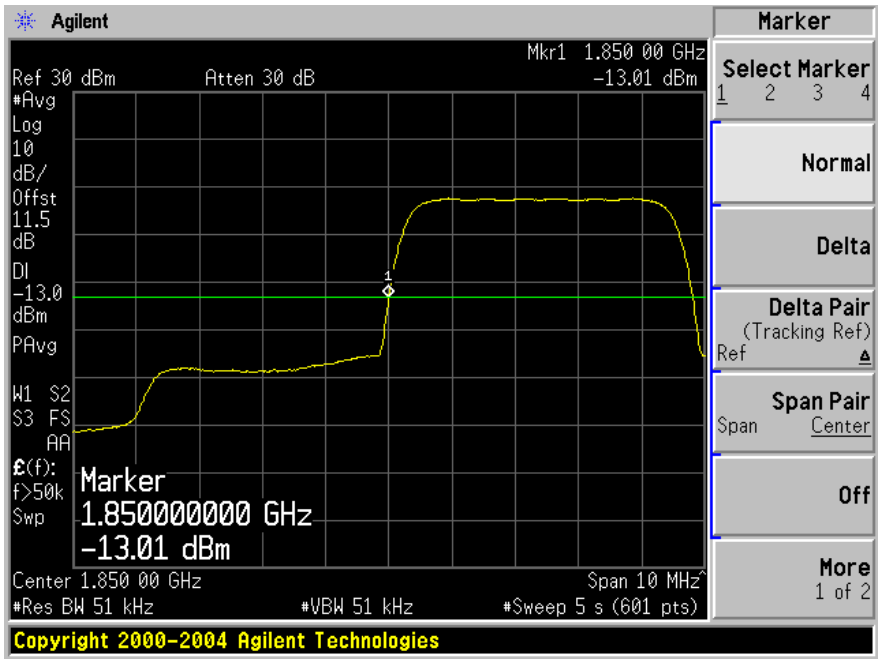
WCDMA/HSPA Cellular Band Downlink: Lowest Channel



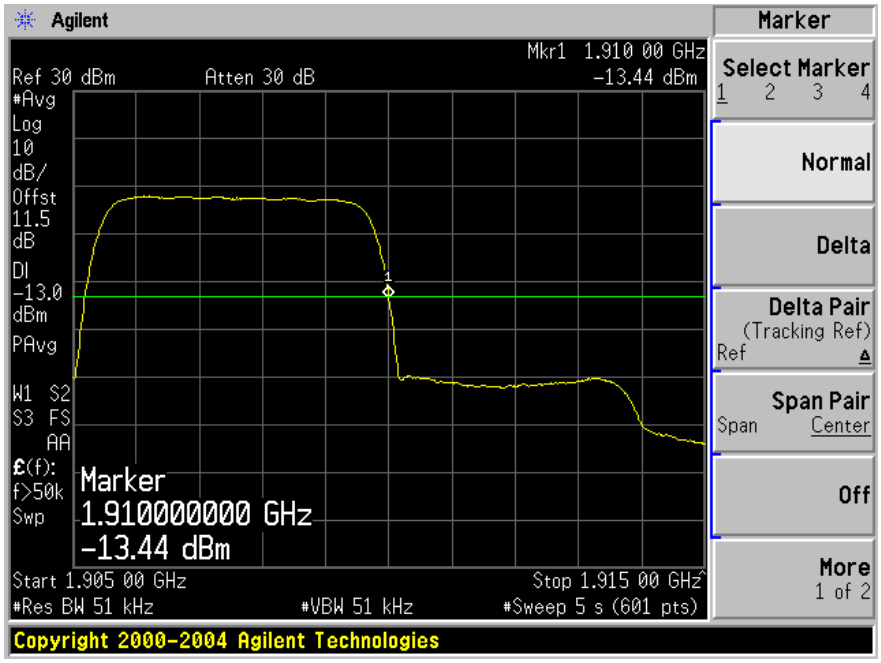

WCDMA/HSPA Cellular Band Downlink: Highest Channel



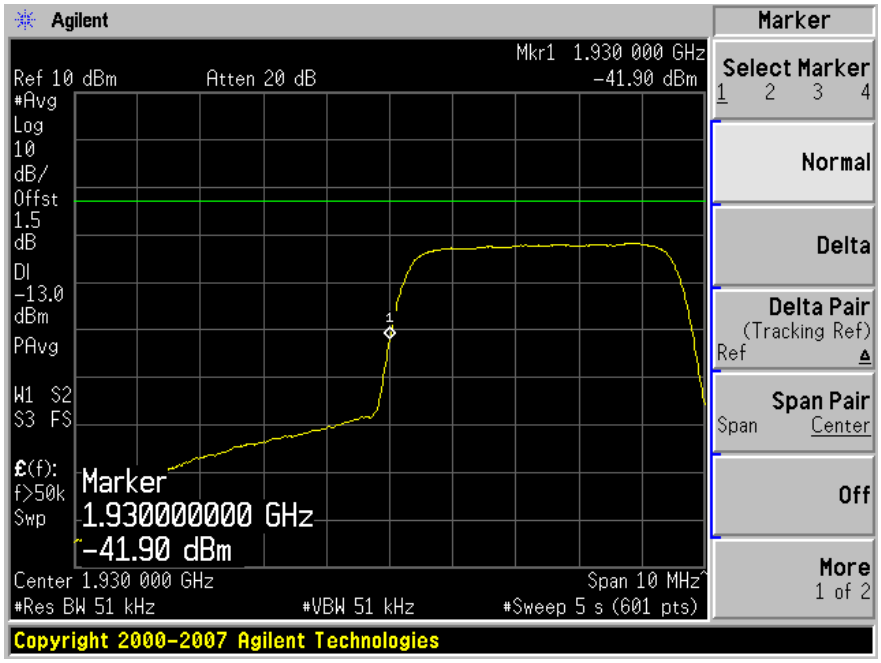
WCDMA/HSPA PCS Band Uplink: Lowest Channel



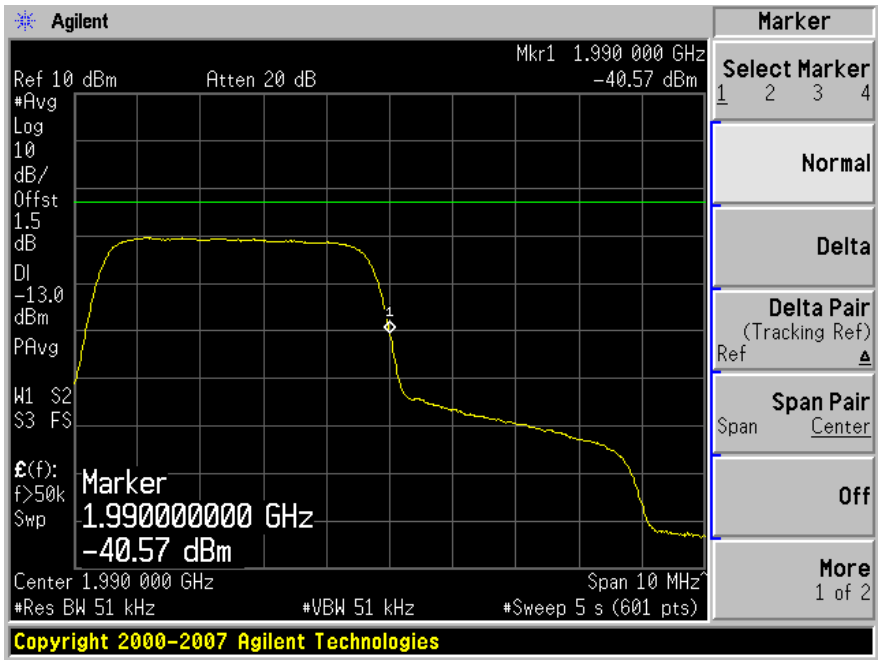

WCDMA/HSPA PCS Band Uplink: Highest Channel



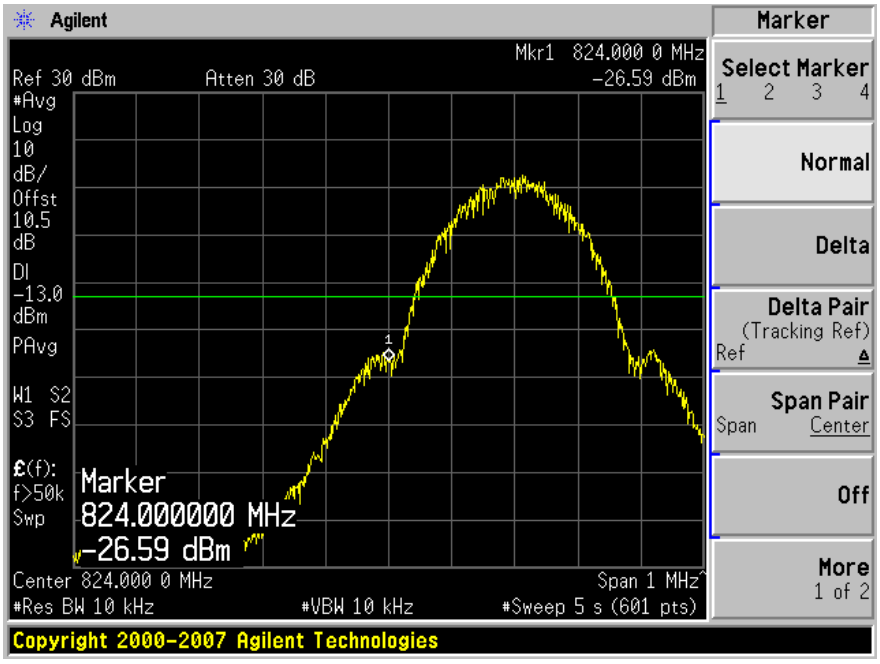
WCDMA/HSPA PCS Band Downlink: Lowest Channel



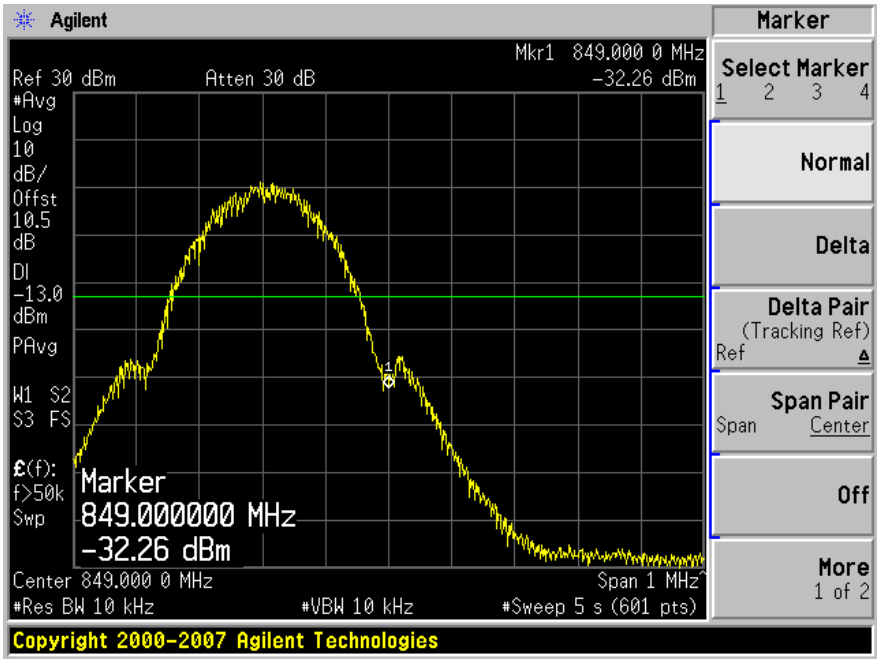

WCDMA/HSPA PCS Band Downlink: Highest Channel



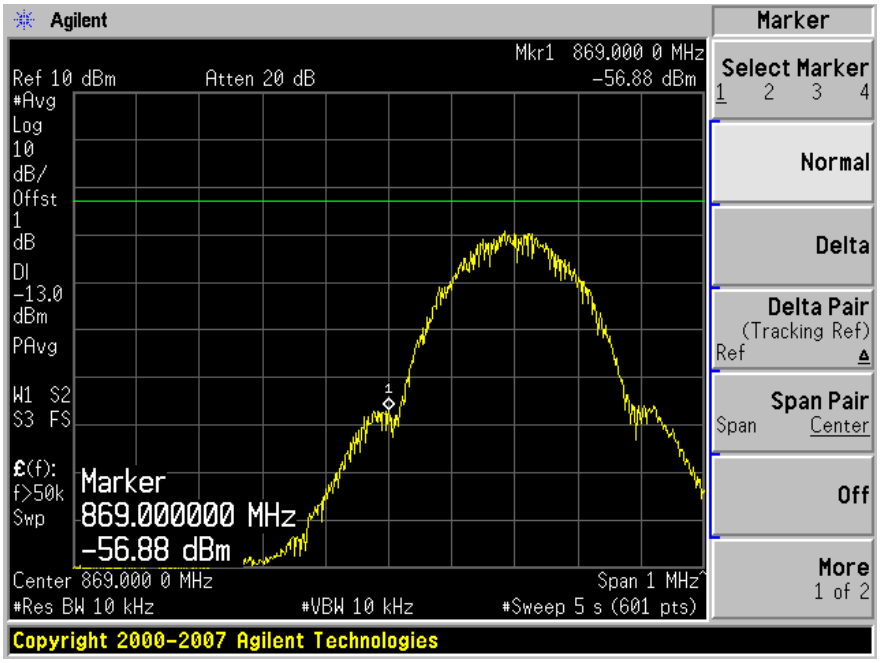
GSM Cellular Band Uplink: Lowest Channel



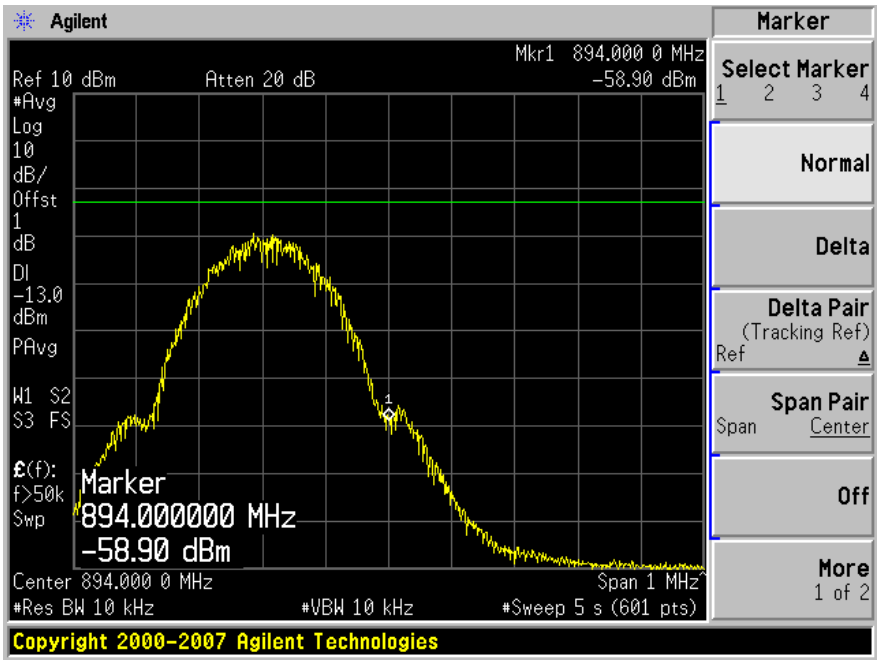

GSM Cellular Band Uplink: Highest Channel



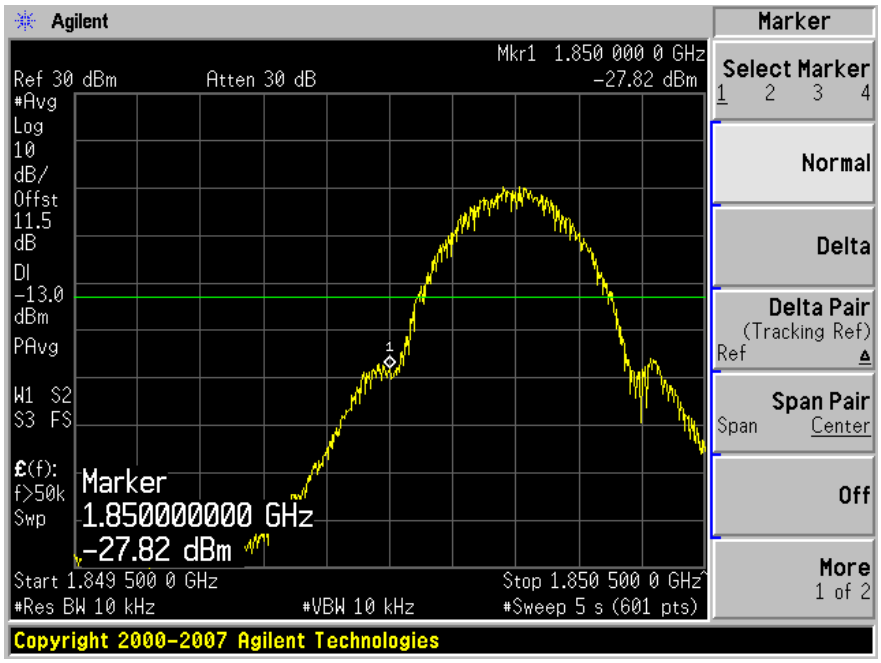
GSM Cellular Band Downlink: Lowest Channel



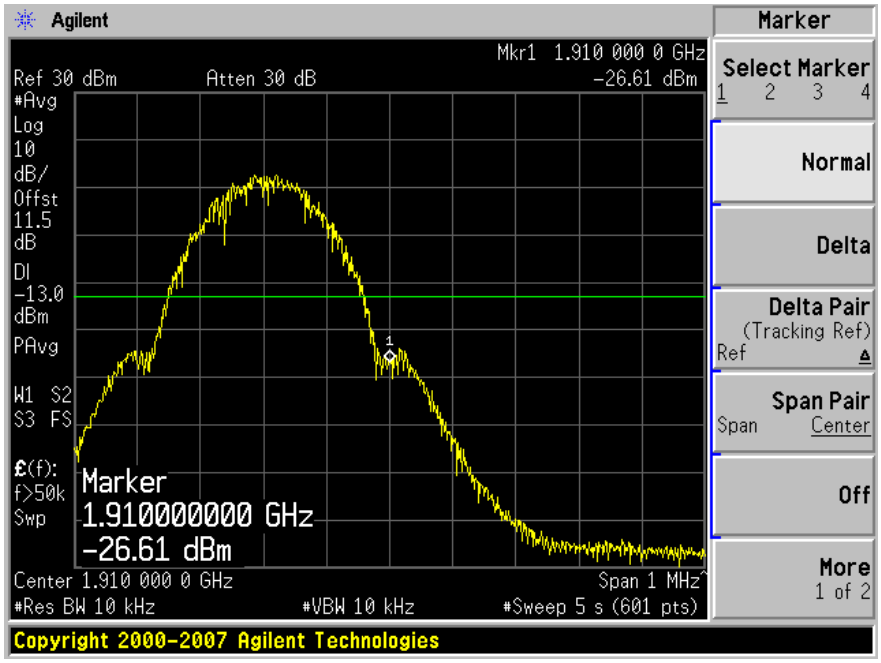

GSM Cellular Band Downlink: Highest Channel



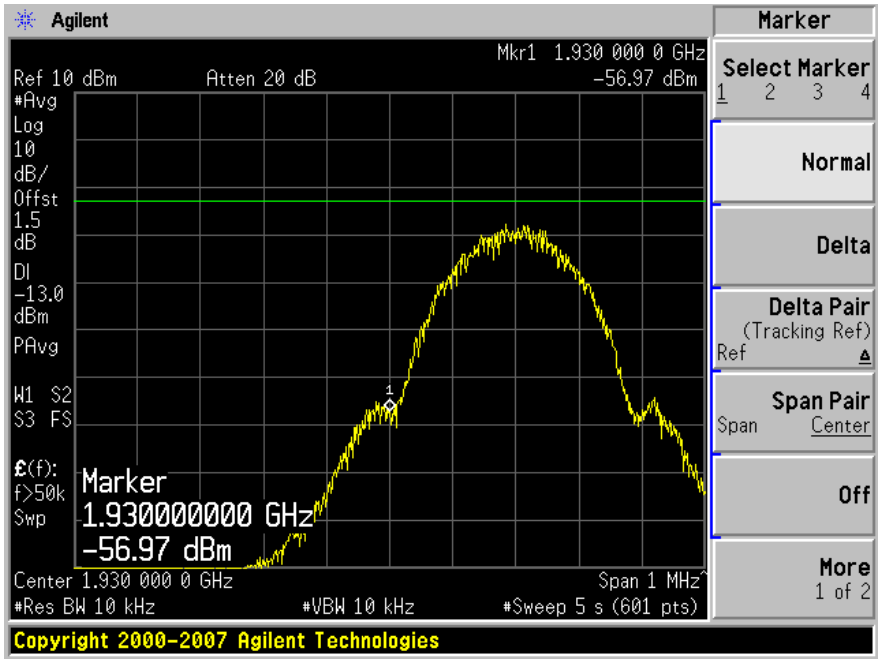
GSM PCS Band Uplink: Lowest Channel



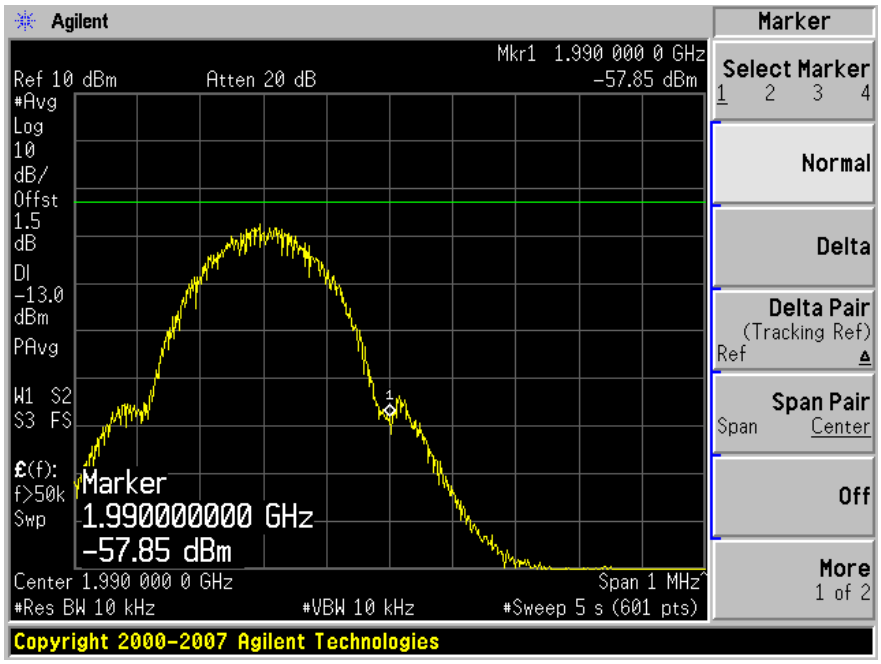

GSM PCS Band Uplink: Highest Channel



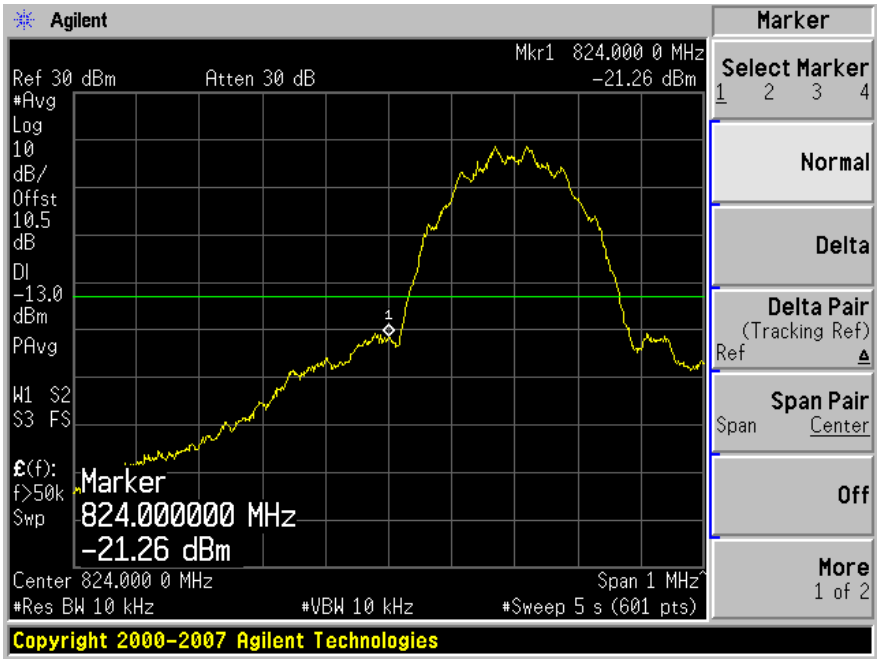
GSM PCS Band Downlink: Lowest Channel



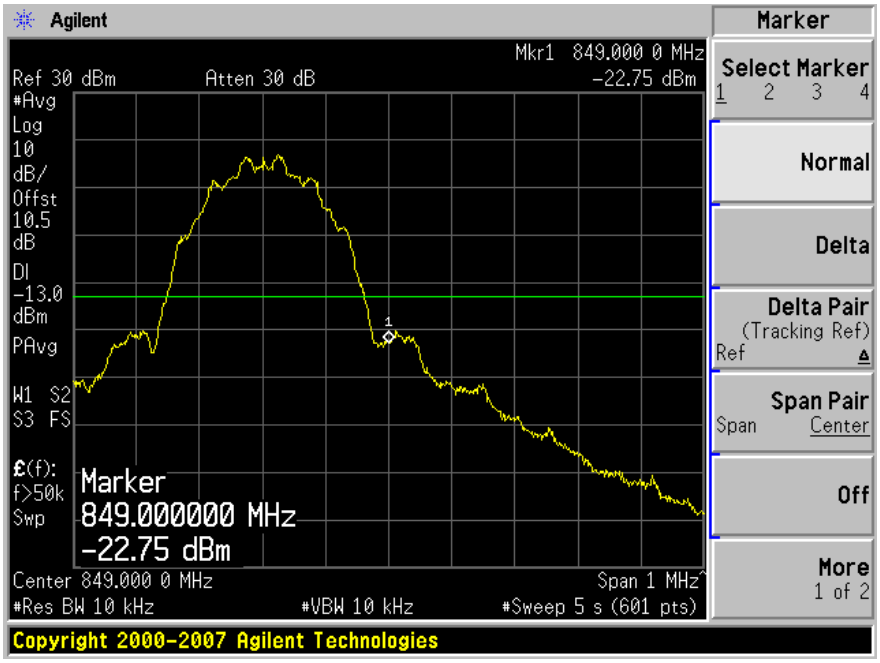

GSM PCS Band Downlink: Highest Channel



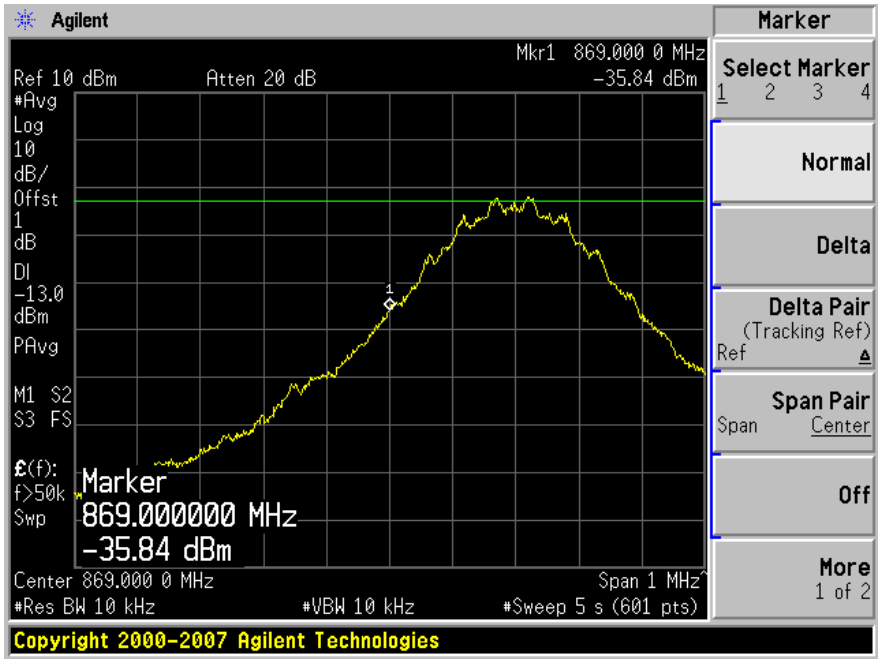
EDGE Cellular Band Uplink: Lowest Channel



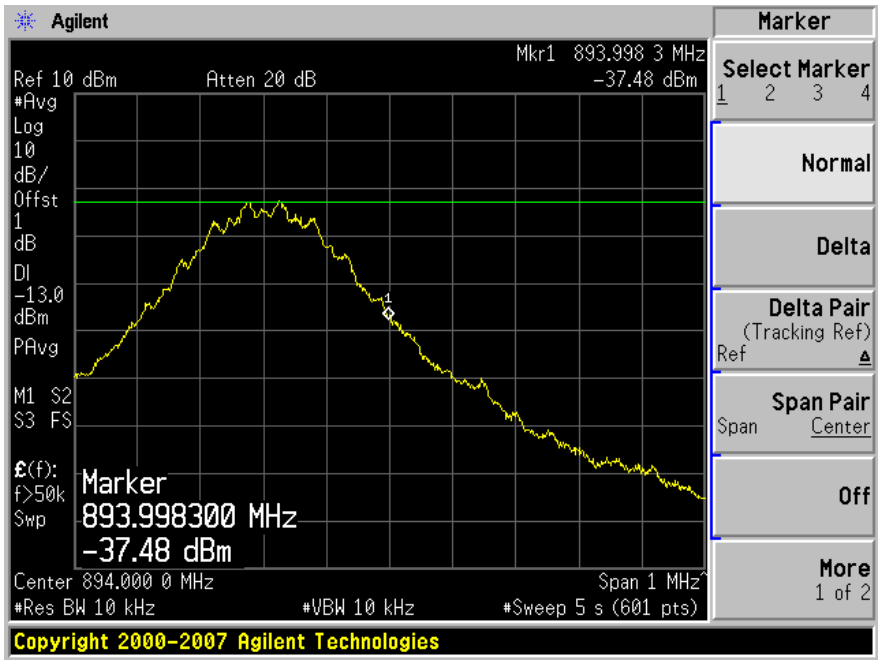

EDGE Cellular Band Uplink: Highest Channel



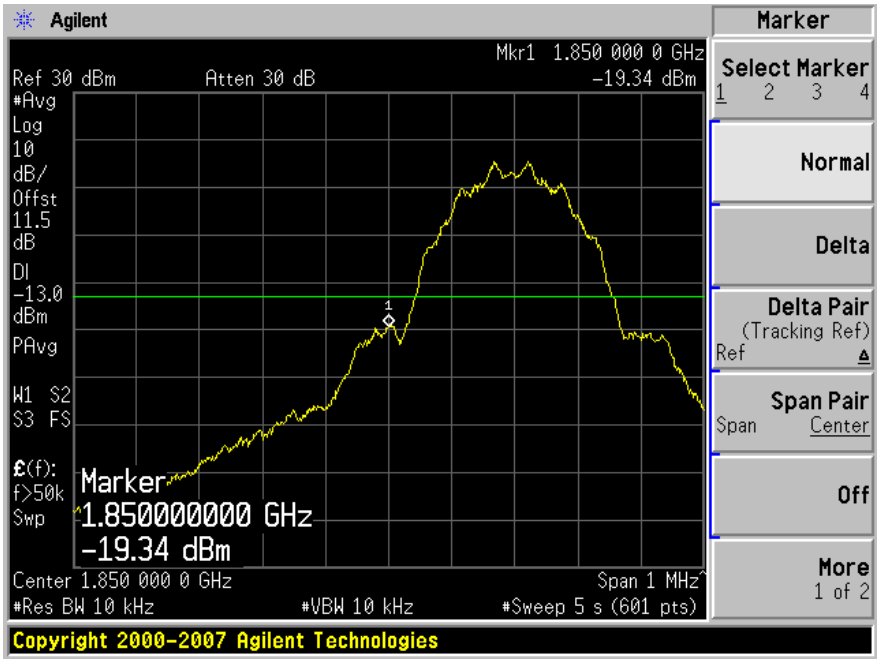
EDGE Cellular Band Downlink: Lowest Channel



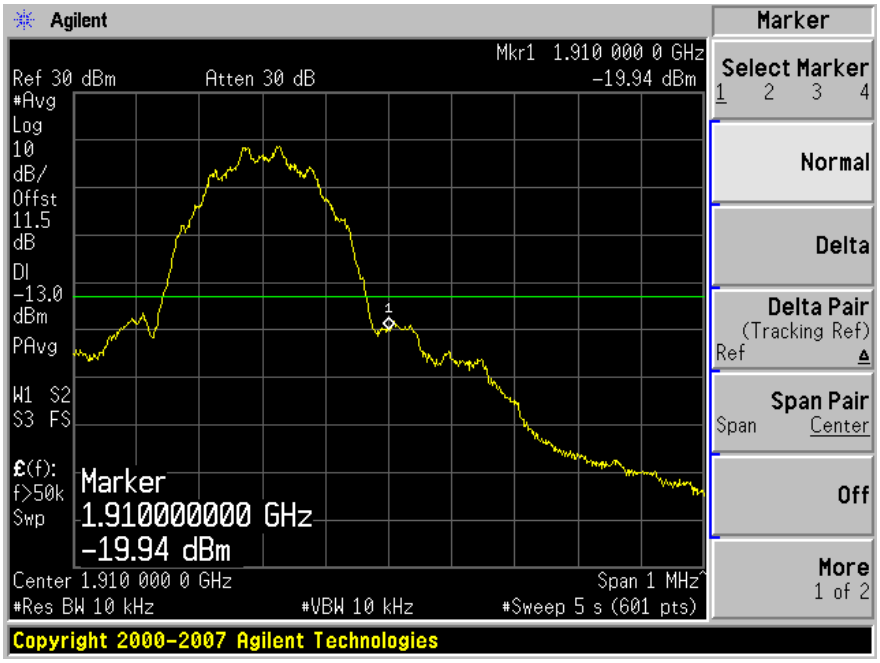

EDGE Cellular Band Downlink: Highest Channel



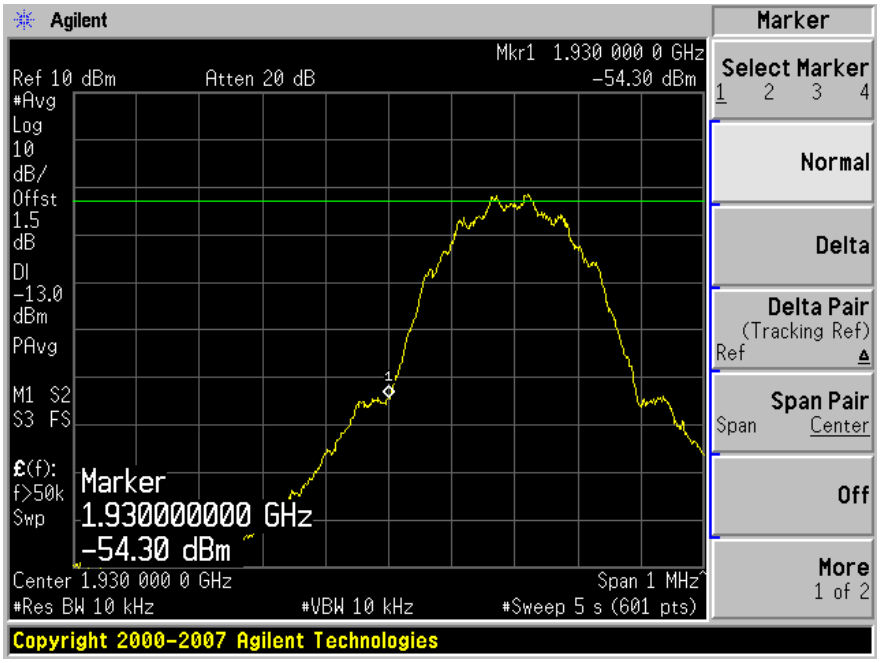
EDGE PCS Band Uplink: Lowest Channel



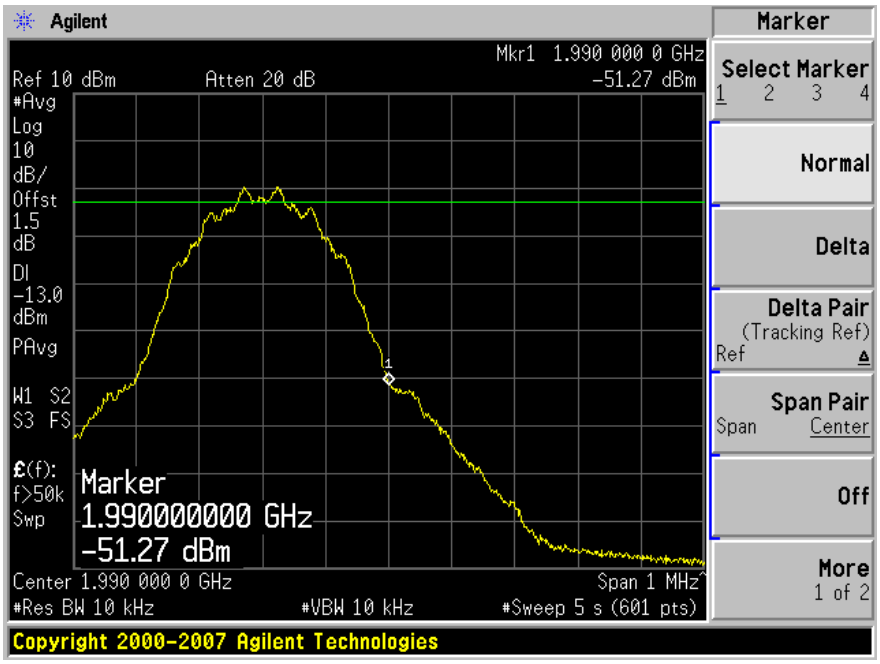

EDGE PCS Band Uplink: Highest Channel



EDGE PCS Band Downlink: Lowest Channel




EDGE PCS Band Downlink: Highest Channel



# 10 FCC §2.1055 – Frequency Stability

This EUT is an amplifier, not a transmitter. There is no oscillator circuit in the EUT, therefore there is no frequency stability measurement required.

## 10.1 Test Result

N/A

# 11 FCC §1.1307(b) (1) & §2.1091 - RF EXPOSURE

## 11.1 Applicable Standard

According to §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Averaging Time (minute) |
|---|---|---|---|---|
| **Limits for General Population/Uncontrolled Exposure** | | | | |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *($180/f^2$) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | / | f/1500 | 30 |
| 1500-100,000 | / | / | 1.0 | 30 |

Note: f = frequency in MHz
* = Plane-wave equivalent power density

## 11.2 MPE Prediction

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

**Test Result**

Please see the following MPE calculation for details.

**Cellular Band Fixed Outside:**

Wilson Electronics, Inc.

# Minimum Safe Distance From Antennas

## Based upon FCC OET Bulletin 65 and other FCC Sources

**INPUT DATA**

| | |
|---|---|
| Frequency MHz | 824 |
| Pout Watts | 1.2420 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 15.00 |
| Coax Loss dB | 0.00 |

**RESULTS OF CALCULATIONS**

| | |
|---|---|
| Min. Distance Inches | 29.70 |
| Min. Distance Centimeters | 75.43 |
| ERP (Watts) | 23.9485 |
| EIRP (Watts) | 39.2755 |

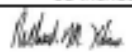
**REFERENCE DATA**

| | |
|---|---|
| Antenna Gain (non-log) | 31.62 |
| Coax loss (non-log) | 1.00 |
| Calculated limit (mw/cm2) | 0.55 |
| FCC Limit (mw/cm2) | f/1500 |

**NOTES**:

(1) Valid only between 300 MHz - 100,000 MHz.
(2) Calculations are sufficient for determining antenna safe distance for mobile antennas provided that calculated ERP < 1.5 watts for frequencies equal to or below 1.5 GHz, and calculated ERP < 3 watts for frequencies above 1.5 GHz.
(3) Mobile antenna distances shall be no less than 8 inches.
(4) There are no predefined ERP and distance limitations for fixed outside (building) antennas (see #5).
(5) Indoor building antenna criteria is the same as the criteria for mobile antennas (see #2 & #3).
(6) Mobile/portable stations are limited to 2 watts EIRP peak power in the 1900 MHz band (see 24.232[c]).

**SUMMARY FOR PUBLICATION**

| | |
|---|---|
| For Amplifier Model Number: | 2B5225 |
| Frequency Band (MHz) | 800 |
| Mobile or Fixed? | Fixed |
| Outside or Inside Antenna? | Outside |
| Antenna Type: | Any antenna whose gain less cable loss is less than 15 dBi |
| Safe Distance (inches): | 30 Inches |
| Signature: |  |
| Date: | 8/18/2009 |

2B5225 MPE 800 Fixed Outside.xls

**Cellular Band Mobile Outside:**

Wilson Electronics, Inc.

# Minimum Safe Distance From Antennas

## Based upon FCC OET Bulletin 65 and other FCC Sources

**INPUT DATA**

| | |
|---|---|
| Frequency MHz | 824 |
| Pout Watts | 1.2420 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 2.90 |
| Coax Loss dB | 0.00 |

**RESULTS OF CALCULATIONS**

| | |
|---|---|
| Min. Distance Inches | 7.37 |
| Min. Distance Centimeters | 18.73 |
| ERP (Watts) | 1.4767 |
| EIRP (Watts) | 2.4217 |

**REFERENCE DATA**

| | |
|---|---|
| Antenna Gain (non-log) | 1.95 |
| Coax loss (non-log) | 1.00 |
| Calculated limit (mw/cm2) | 0.55 |
| FCC Limit (mw/cm2) | f/1500 |

**NOTES**:

(1) Valid only between 300 MHz - 100,000 MHz.
(2) Calculations are sufficient for determining antenna safe distance for mobile antennas provided that calculated ERP < 1.5 watts for frequencies equal to or below 1.5 GHz, and calculated ERP < 3 watts for frequencies above 1.5 GHz.
(3) Mobile antenna distances shall be no less than 8 inches.
(4) There are no predefined ERP and distance limitations for fixed outside (building) antennas (see #5).
(5) Indoor building antenna criteria is the same as the criteria for mobile antennas (see #2 & #3).
(6) Mobile/portable stations are limited to 2 watts EIRP peak power in the 1900 MHz band (see 24.232[c]).

**SUMMARY FOR PUBLICATION**

| | |
|---|---|
| For Amplifier Model Number: | 2B5225 |
| Frequency Band (MHz) | 800 |
| Mobile or Fixed? | Mobile |
| Outside or Inside Antenna? | Outside |
| Antenna Type: | Any antenna whose gain less cable loss is less than 2.9 dBi |
| Safe Distance (inches): | 8 inches |
| Signature: | |
| Date: | 8/18/2009 |

2B5225 MPE 800 Mobile Outside.xls

**Cellular Band Mobile & Fixed Inside:**

Wilson Electronics, Inc.

# Minimum Safe Distance From Antennas

## Based upon FCC OET Bulletin 65 and other FCC Sources

**INPUT DATA**

| | |
|---|---|
| Frequency MHz | 869 |
| Pout Watts | 0.0011 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 20.00 |
| Coax Loss dB | 0.00 |

**RESULTS OF CALCULATIONS**

| | |
|---|---|
| Min. Distance Inches | 1.51 |
| Min. Distance Centimeters | 3.85 |
| ERP (Watts) | 0.0656 |
| EIRP (Watts) | 0.1077 |

**REFERENCE DATA**

| | |
|---|---|
| Antenna Gain (non-log) | 100.00 |
| Coax loss (non-log) | 1.00 |
| Calculated limit (mw/cm2) | 0.58 |
| FCC Limit (mw/cm2) | f/1500 |

**NOTES**:

(1) Valid only between 300 MHz - 100,000 MHz.
(2) Calculations are sufficient for determining antenna safe distance for mobile antennas provided that calculated ERP < 1.5 watts for frequencies equal to or below 1.5 GHz, and calculated ERP < 3 watts for frequencies above 1.5 GHz.
(3) Mobile antenna distances shall be no less than 8 inches.
(4) There are no predefined ERP and distance limitations for fixed outside (building) antennas (see #5).
(5) Indoor building antenna criteria is the same as the criteria for mobile antennas (see #2 & #3).
(6) Mobile/portable stations are limited to 2 watts EIRP peak power in the 1900 MHz band (see 24.232[c]).

**SUMMARY FOR PUBLICATION**

| | |
|---|---|
| For Amplifier Model Number: | 2B5225 |
| Frequency Band (MHz) | 800 |
| Mobile or Fixed? | Mobile and Fixed |
| Outside or Inside Antenna? | Inside |
| Antenna Type: | Any antenna whose gain less cable loss is less than 20 dBi |
| Safe Distance (inches): | 8 inches |
| Signature: |  |
| Date: | 8/18/2009 |

2B5225 MPE 800 Mobile & Fixed Inside.xls

**PCS Band Fixed Outside:**

# Minimum Safe Distance From Antennas

## Based upon FCC OET Bulletin 65 and other FCC Sources

**INPUT DATA**

| | |
|---|---|
| Frequency MHz | 1850 |
| Pout Watts | 1.8030 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 15.00 |
| Coax Loss dB | 0.00 |

**RESULTS OF CALCULATIONS**

| | |
|---|---|
| Min. Distance Inches | 26.52 |
| Min. Distance Centimeters | 67.36 |
| ERP (Watts) | 34.7658 |
| EIRP (Watts) | 57.0159 |

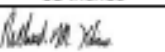
**REFERENCE DATA**

| | |
|---|---|
| Antenna Gain (non-log) | 31.62 |
| Coax loss (non-log) | 1.00 |
| Calculated limit (mw/cm2) | 1.00 |
| FCC Limit (mw/cm2) | 1.00 |

**NOTES**:

(1) Valid only between 300 MHz - 100,000 MHz.
(2) Calculations are sufficient for determining antenna safe distance for mobile antennas provided that calculated ERP < 1.5 watts for frequencies equal to or below 1.5 GHz, and calculated ERP < 3 watts for frequencies above 1.5 GHz.
(3) Mobile antenna distances shall be no less than 8 inches.
(4) There are no predefined ERP and distance limitations for fixed outside (building) antennas (see #5).
(5) Indoor building antenna criteria is the same as the criteria for mobile antennas (see #2 & #3).
(6) Mobile/portable stations are limited to 2 watts EIRP peak power in the 1900 MHz band (see 24.232[c]).

**SUMMARY FOR PUBLICATION**

| | |
|---|---|
| For Amplifier Model Number: | 2B5225 |
| Frequency Band (MHz) | 1900 |
| Mobile or Fixed? | Fixed |
| Outside or Inside Antenna? | Outside |
| Antenna Type: | Any antenna whose gain less cable loss is less than 15 dBi |
| Safe Distance (inches): | 30 Inches |
| Signature: |  |
| Date: | 8/18/2009 |

2B5225 MPE 1900 Fixed Outside.xls

**PCS Band Mobile Outside:**

Wilson Electronics, Inc.

# Minimum Safe Distance From Antennas

## Based upon FCC OET Bulletin 65 and other FCC Sources

**INPUT DATA**

| | |
|---|---|
| Frequency MHz | 1850 |
| Pout Watts | 1.8030 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 0.45 |
| Coax Loss dB | 0.00 |

**RESULTS OF CALCULATIONS**

| | |
|---|---|
| Min. Distance Inches | 4.97 |
| Min. Distance Centimeters | 12.62 |
| ERP (Watts) | 1.2194 |
| EIRP (Watts) | 1.9998 |

**REFERENCE DATA**

| | |
|---|---|
| Antenna Gain (non-log) | 1.11 |
| Coax loss (non-log) | 1.00 |
| Calculated limit (mw/cm2) | 1.00 |
| FCC Limit (mw/cm2) | 1.00 |

**NOTES**:

(1) Valid only between 300 MHz - 100,000 MHz.
(2) Calculations are sufficient for determining antenna safe distance for mobile antennas provided that calculated ERP < 1.5 watts for frequencies equal to or below 1.5 GHz, and calculated ERP < 3 watts for frequencies above 1.5 GHz.
(3) Mobile antenna distances shall be no less than 8 inches.
(4) There are no predefined ERP and distance limitations for fixed outside (building) antennas (see #5).
(5) Indoor building antenna criteria is the same as the criteria for mobile antennas (see #2 & #3).
(6) Mobile/portable stations are limited to 2 watts EIRP peak power in the 1900 MHz band (see 24.232[c]).

**SUMMARY FOR PUBLICATION**

| | |
|---|---|
| For Amplifier Model Number: | 2B5225 |
| Frequency Band (MHz) | 1900 |
| Mobile or Fixed? | Mobile |
| Outside or Inside Antenna? | Outside |
| Antenna Type: | Any antenna whose gain less cable loss is less than 0.45 dBi |
| Safe Distance (inches): | 8 inches |
| Signature: |  |
| Date: | 8/18/2009 |

2B5225 MPE 1900 Mobile Outside.xls

**PCS Band Mobile & Fixed Inside:**

Wilson Electronics, Inc.

# Minimum Safe Distance From Antennas

## Based upon FCC OET Bulletin 65 and other FCC Sources

**INPUT DATA**

| | |
|---|---|
| Frequency MHz | 1930 |
| Pout Watts | 0.0017 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 20.00 |
| Coax Loss dB | 0.00 |

**RESULTS OF CALCULATIONS**

| | |
|---|---|
| Min. Distance Inches | 1.45 |
| Min. Distance Centimeters | 3.67 |
| ERP (Watts) | 0.1033 |
| EIRP (Watts) | 0.1694 |

**REFERENCE DATA**

| | |
|---|---|
| Antenna Gain (non-log) | 100.00 |
| Coax loss (non-log) | 1.00 |
| Calculated limit (mw/cm2) | 1.00 |
| FCC Limit (mw/cm2) | 1.00 |

**NOTES**:

(1) Valid only between 300 MHz - 100,000 MHz.
(2) Calculations are sufficient for determining antenna safe distance for mobile antennas provided that calculated ERP < 1.5 watts for frequencies equal to or below 1.5 GHz, and calculated ERP < 3 watts for frequencies above 1.5 GHz.
(3) Mobile antenna distances shall be no less than 8 inches.
(4) There are no predefined ERP and distance limitations for fixed outside (building) antennas (see #5).
(5) Indoor building antenna criteria is the same as the criteria for mobile antennas (see #2 & #3).
(6) Mobile/portable stations are limited to 2 watts EIRP peak power in the 1900 MHz band (see 24.232[c]).

**SUMMARY FOR PUBLICATION**

| | |
|---|---|
| For Amplifier Model Number: | 2B5225 |
| Frequency Band (MHz) | 1900 |
| Mobile or Fixed? | Mobile and Fixed |
| Outside or Inside Antenna? | Inside |
| Antenna Type: | Any antenna whose gain less cable loss is less than 20 dBi |
| Safe Distance (inches): | 8 inches |
| Signature: |  |
| Date: | 8/18/2009 |

2B5225 MPE 1900 Mobile & Fixed Inside.xls