Lab Code: 200167-0

# FCC PART 22, 24
# INDUSTRY CANADA RSS-131
# MEASUREMENT AND TEST REPORT

For

## Celluteq Electronics, LLC.

32108 Alvarado Blvd., Suite 353
Union City, CA 94587, USA

**FCC ID: VOR-CE0501A**
**IC: 7371A-CE0501A**
**Model: CE0501A**

| **Product Type:** ☒ Original Report | | **Product Type:** Cellular Phone Signal Amplifier |
|---|---|---|
| **Test Engineer:** | Dan Coronia | |
| **Report Number:** | R0707233 | |
| **Report Date:** | 2008-01-16 | |
| **Reviewed By:** | Boni Baniqued, Test Engineer | |
| **Prepared By: (dc)** | 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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# 1 GENERAL INFORMATION

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

The *Celluteq Electronics, LLC.* Product, *FCC ID: VOR-CE0501A, IC: 7371A-CE0501A, model: CE0501A* or the "EUT" as referred to in this report is a dual-band (Cellular and PCS) and bi-directional cellular phone signal amplifier. In combination with outside and inside antennas, the amplifier provides a wireless signal enhance system. It operates at 5VDC power supply that employs AMPS, GSM, TDMA and Code Division Multiple Access (CDMA) frequencies: cellular services at 800 MHz, and Personal Communication Services (PCS) at 1900 MHz.

## 1.2 Mechanical Description

The EUT Approximate measurement is: 120mm (L) x 105 mm (W) x 27 mm (H). It is of metallic construction.

** The test data gathered are from typical production sample, serial number: 001, provided by the manufacturer.*

## 1.3 EUT Photo


*Please see additional photos in Exhibit C*

## 1.4 Objective

This type approval report is prepared on behalf of *Celluteq Electronics, LLC.* in accordance with Part 2, Subpart J, Part 22 & 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, band edge, 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 H - Public Mobile Services
Part 24 E – PCS

Industry Canada RSS-131 issue 2, July 2003

Applicable Standards: TIA/EIA 603-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/Standards/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 Power Supply and Line Filters

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| SL | AC-DC Adaptor | PW117RA0503B01 | N/A |

## 2.5 Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Midwest Microwave | 10dB attenuator pad | ATT-0263-10-000-02 | N/A |
| Agilent | DC Block | 11742A | N/A |

## 2.6 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/IC Rules | Description of Test | Result |
|---|---|---|
| FCC §1.1307, §2.1091<br>RSS-131 §5.5 | RF Exposure | Compliant |
| FCC § 2.1053, § 22.917, § 24.238<br>IC RSS-131 §6.4 | Spurious Emissions | Compliant |
| FCC §2.1046, § 22.913, § 24.232<br>IC RSS-131 §6.2 | RF Output Power | Compliant |
| FCC § 2.1049, § 22.917, § 24.238<br>IC RSS-131 §6.1 | Occupied Bandwidth | Compliant |
| FCC § 2.1051, §22.917, § 24.238,<br>IC RSS-131 §6.3 | Spurious Emissions at Antenna Terminals & Two- Tone Test | Compliant |
| FCC § 2.1055, § 22.355, § 24.235<br>IC RSS-131 §6.5 | Frequency Stability | N/A |
| FCC §2.1051, § 22.917, § 24.238,<br>IC RSS-131 §6.4 | Band Edge | Compliant |

# 4 §1.1307(b) (1) & 2.1091 - RF EXPOSURE

## 4.1 Applicable Standard

According to §1.1307 & 2.1091 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 |

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

## 4.2 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

**AMPS Cellular Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 11.94 |
| Maximum peak output power at antenna input terminal (mW): | 15.63 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 881.50 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.004 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.588 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 29.80 |
| Maximum peak output power at antenna input terminal (mW): | 954.99 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 836.50 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.247 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.558 |

**TDMA Cellular Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 12.57 |
| Maximum peak output power at antenna input terminal (mW): | 18.07 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 881.50 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.005 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.588 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 29.31 |
| Maximum peak output power at antenna input terminal (mW): | 853.10 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 836.50 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.221 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.558 |

**TDMA PCS Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 10.99 |
| Maximum peak output power at antenna input terminal (mW): | 12.56 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 1960.0 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.003 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 1.000 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 29.83 |
| Maximum peak output power at antenna input terminal (mW): | 961.11 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 1880.0 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.249 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 1.000 |

**GSM Cellular Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 14.68 |
| Maximum peak output power at antenna input terminal (mW): | 29.38 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 881.6 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.008 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.588 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 32.83 |
| Maximum peak output power at antenna input terminal (mW): | 1918.67 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 836.6 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.496 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.558 |

**GSM PCS Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 12.59 |
| Maximum peak output power at antenna input terminal (mW): | 18.16 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 1960.0 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.005 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 1.000 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 30.18 |
| Maximum peak output power at antenna input terminal (mW): | 1042.32 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 1880.0 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.269 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 1.000 |

**CDMA Cellular Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 10.08 |
| Maximum peak output power at antenna input terminal (mW): | 10.19 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 881.40 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.003 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.588 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 25.64 |
| Maximum peak output power at antenna input terminal (mW): | 366.44 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 836.40 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.095 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 0.558 |

**CDMA PCS Band**

**Downlink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 10.13 |
| Maximum peak output power at antenna input terminal (mW): | 10.30 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 1960.00 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.003 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 1.000 |

**Uplink:**

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 24.03 |
| Maximum peak output power at antenna input terminal (mW): | 252.93 |
| Prediction distance (cm): | 35 |
| Prediction frequency (MHz): | 1880.00 |
| Antenna Gain, typical (dBi): | 6 |
| Maximum Antenna Gain (numeric): | 3.98 |
| Power density at predication frequency and distance ($mW/cm^2$): | 0.065 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 1.000 |

## 4.3 Test Result

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 1.0 $mW/cm^2$ .The maximum power density at the distance of 35 cm was 0.496 $mW/cm^2$. Thus, the requirement of at least 35 cm required by the manufacturer is in compliance with the MPE requirement.

# 5 FCC §2.1053, §22.917 & §24.238 & IC RSS-131 §6.4 – Transmitter Field Strength of Spurious Radiation

## 5.1 Applicable Standard

As per FCC § 2.1053, § 22.917, § 24.238:

According to FCC § 2.1053, § 22.917, § 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."

As per RSS-131 §6.4:

Spurious emissions of zone enhancers and translators shall be suppressed as much as possible.
Spurious emissions shall be attenuated below the rated power of the enhancer by at least:
43 + 10 Log10(Prated in watts), or 70 dB, whichever is less stringent.

## 5.2 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 Log10 (power out in Watts)

## 5.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 24 °C |
| Relative Humidity: | 58 % |
| ATM Pressure: | 102.2 kPa |

** The testing was performed by Dan Coronia on 2007-07-30 to 08-16.*

## 5.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2007-04-26 |
| HP | Amplifier, Pre, Microwave | 8449B | 3147A00400 | 2006-08-21 |
| A. H. Systems | Antenna, Horn, DRG | SAS-200/571 | 261 | 2007-04-20 |
| HP | Generator, Signal | 83650B | 3614A00276 | 2006-10-10 |
| A.R.A. | Antenna, Horn | DRG-118/A | 1132 | 2006-08-17 |

- **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## 5.5 Summary of Test Results

Worst case reading as follows:

| Mode: Cellular Band Downlink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -5.7 | 1763.20 | Vertical | 881.60 MHz |

| Mode: Cellular Band Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -6.9 | 1673.20 | Horizontal | 836.600 MHz |

| Mode: PCS Band Downlink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -16.56 | 3920.00 | Vertical | 1960 MHz |

| Mode: PCS Band Uplink | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Input Frequency** |
| -18.68 | 5640.00 | Vertical | 1880 MHz |

## 5.6 Test Data

### Cellular Band Downlink

Input frequency = 881.600 MHz

| Indicated | | Azimuth | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | (Degrees) | Height (m) | Polar (H/V) | Freq. (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1763.20 | 56.17 | 163 | 1.2 | v | 1763.20 | -26.60 | 9.25 | 1.36 | -18.7 | -13 | -5.7 |
| 1763.20 | 56.67 | 178 | 1.2 | h | 1763.20 | -27.80 | 9.25 | 1.36 | -19.9 | -13 | -6.9 |
| 2644.80 | 45.17 | 162 | 1.4 | v | 2644.80 | -31.70 | 9.24 | 1.58 | -24.0 | -13 | -11.0 |
| 2644.80 | 44.50 | 308 | 1.3 | h | 2644.80 | -35.30 | 9.24 | 1.58 | -27.6 | -13 | -14.6 |
| 3526.40 | 53.17 | 216 | 1.6 | v | 3526.40 | -45.20 | 11.09 | 1.84 | -36.0 | -13 | -23.0 |
| 3526.40 | 51.50 | 340 | 1.0 | h | 3526.40 | -53.10 | 11.09 | 1.84 | -43.9 | -13 | -30.9 |
| 4408.00 | 54.33 | 300 | 1.2 | v | 4408.00 | -52.93 | 10.86 | 2.31 | -44.4 | -13 | -31.4 |
| 4408.00 | 52.17 | 91 | 1.5 | h | 4408.00 | -56.11 | 10.86 | 2.31 | -47.6 | -13 | -34.6 |

### Cellular Band Uplink

Input frequency = 836.600 MHz

| Indicated | | Azimuth | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | (Degrees) | Height (m) | Polar (H/V) | Freq. (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1673.20 | 68.67 | 212 | 1.0 | h | 1673.20 | -27.80 | 9.27 | 1.40 | -19.9 | -13 | -6.9 |
| 4183.00 | 61.17 | 289 | 1.1 | v | 4183.00 | -32.76 | 10.70 | 2.30 | -24.4 | -13 | -11.4 |
| 2509.80 | 70.83 | 68 | 1.5 | v | 2509.80 | -35.00 | 9.25 | 1.50 | -27.3 | -13 | -14.3 |
| 2509.80 | 68.83 | 82 | 1.5 | h | 2509.80 | -35.30 | 9.25 | 1.50 | -27.6 | -13 | -14.6 |
| 1673.20 | 73.67 | 224 | 1.0 | v | 1673.20 | -38.50 | 9.27 | 1.40 | -30.6 | -13 | -17.6 |
| 3346.40 | 54.67 | 158 | 1.4 | v | 3346.40 | -45.20 | 9.99 | 1.90 | -37.1 | -13 | -24.1 |
| 3346.40 | 50.83 | 216 | 1.1 | h | 3346.40 | -53.10 | 9.99 | 1.90 | -45.0 | -13 | -32.0 |
| 4183.00 | 55.50 | 47 | 1.1 | h | 4183.00 | -57.38 | 10.70 | 2.30 | -49.0 | -13 | -36.0 |

**PCS Band Downlink**

Input frequency = 1960 MHz

| Indicated | | Azimuth | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amplitude (dBuV) | (Degrees) | Height (m) | Polar (H/V) | Freq. (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3920.00 | 68.90 | 80 | 1.3 | v | 3920.00 | -37.85 | 10.37 | 2.08 | -29.6 | -13 | -16.56 |
| 3920.00 | 67.65 | 190 | 1.6 | h | 3920.00 | -38.60 | 10.37 | 2.08 | -30.3 | -13 | -17.31 |
| 5880.00 | 49.40 | 160 | 1.0 | v | 5880.00 | -44.86 | 11.42 | 2.85 | -36.3 | -13 | -23.29 |
| 5880.00 | 46.57 | 220 | 1.1 | h | 5880.00 | -46.99 | 11.42 | 2.85 | -38.4 | -13 | -25.42 |
| 7840.00 | 35.90 | 100 | 1.5 | v | 7840.00 | -51.95 | 11.02 | 2.89 | -43.82 | -13 | -30.82 |
| 7840.00 | 33.73 | 90 | 1.7 | h | 7840.00 | -54.35 | 11.02 | 2.89 | -46.22 | -13 | -33.22 |

**PCS Band Uplink**

Input frequency = 1880 MHz

| Indicated | | Azimuth | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amplitude (dBuV) | (Degrees) | Height (m) | Polar (H/V) | Freq. (MHz) | Level (dBm) | Ant. Gain Correction (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 3760.00 | 59.00 | 164 | 1.9 | v | 3760.00 | -47.85 | 11.40 | 1.96 | -38.4 | -13 | -25.41 |
| 3760.00 | 57.83 | 126 | 2.2 | h | 3760.00 | -48.60 | 11.40 | 1.96 | -39.2 | -13 | -26.16 |
| 5640.00 | 44.83 | 181 | 1.6 | v | 5640.00 | -40.34 | 11.22 | 2.56 | -31.7 | -13 | -18.68 |
| 5640.00 | 44.33 | 171 | 1.6 | h | 5640.00 | -42.12 | 11.22 | 2.56 | -33.5 | -13 | -20.46 |
| 7520.00 | 43.17 | 160 | 2.1 | v | 7520.00 | -41.54 | 11.14 | 2.94 | -33.34 | -13 | -20.34 |
| 7520.00 | 42.50 | 167 | 2.2 | h | 7520.00 | -41.78 | 11.10 | 2.94 | -33.62 | -13 | -20.62 |

# 6 FCC §2.1046, §22.913, §24.232 & IC RSS-131 §6.2 – RF OUTPUT POWER

## 6.1 Applicable Standard

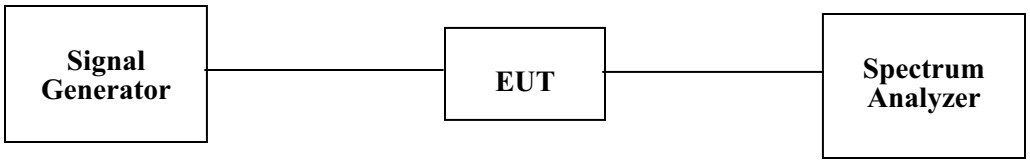
FCC §2.1046, §22.913, §24.232.

RSS-131 §6.2.

## 6.2 Test Procedure

*Conducted method:*

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




## 6.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 24 °C |
| Relative Humidity: | 58 % |
| ATM Pressure: | 102.2 kPa |

** The testing was performed by Dan Coronia on 2007-07-30 to 08-16.*

## 6.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2007-04-26 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | 849192/0085 | 2006-10-18 |

*** 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

**AMPS (Cellular Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 869.03 | AMPS | 11.68 |
| Middle | 881.50 | AMPS | 11.94 |
| High | 893.97 | AMPS | 11.84 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 824.03 | AMPS | 27.20 |
| Middle | 836.50 | AMPS | 29.80 |
| High | 848.97 | AMPS | 27.54 |

**TDMA (Cellular Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 869.10 | TDMA | 12.21 |
| Middle | 881.50 | TDMA | 12.57 |
| High | 893.90 | TDMA | 12.24 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 824.10 | TDMA | 26.06 |
| Middle | 836.50 | TDMA | 29.31 |
| High | 848.90 | TDMA | 26.92 |

**TDMA (PCS Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 1930.10 | TDMA | 10.59 |
| Middle | 1960.00 | TDMA | 10.99 |
| High | 1989.90 | TDMA | 10.04 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 1850.10 | TDMA | 29.11 |
| Middle | 1880.00 | TDMA | 29.83 |
| High | 1909.90 | TDMA | 22.63 |

**GSM (Cellular Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 869.20 | GSM | 12.71 |
| Middle | 881.60 | GSM | 14.68 |
| High | 893.80 | GSM | 12.89 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 824.20 | GSM | 30.95 |
| Middle | 836.60 | GSM | 32.83 |
| High | 848.80 | GSM | 29.07 |

**GSM (PCS Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 1930.20 | GSM | 7.53 |
| Middle | 1960.00 | GSM | 12.59 |
| High | 1989.80 | GSM | 11.27 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 1850.20 | GSM | 29.88 |
| Middle | 1880.00 | GSM | 30.18 |
| High | 1909.80 | GSM | 23.04 |

**CDMA (Cellular Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 869.73 | CDMA | 10.08 |
| Middle | 881.40 | CDMA | 10.11 |
| High | 893.19 | CDMA | 10.05 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 824.73 | CDMA | 24.12 |
| Middle | 836.40 | CDMA | 25.64 |
| High | 848.19 | CDMA | 23.80 |

**CDMA (PCS Band)**

**Downlink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 1931.25 | CDMA | 10.08 |
| Middle | 1960.00 | CDMA | 10.13 |
| High | 1989.75 | CDMA | 9.05 |

**Uplink**

| Channel | Frequency (MHz) | Modulation | Output Power (dBm) |
|---|---|---|---|
| Low | 1851.25 | CDMA | 23.83 |
| Middle | 1880.00 | CDMA | 24.03 |
| High | 1908.75 | CDMA | 21.28 |

# 7 FCC §2.1049, §22.917, §24.238 & RSS-131 §6.1 - OCCUPIED BANDWIDTH

## 7.1 Applicable Standard

Requirements: CFR 47, § 2.1049, §22.917(b) & §24.238.
IC RSS-131 § 6.1

## 7.2 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 at 30 kHz (Cellular /PCS) and the 26 dB & 99% bandwidth was recorded.

## 7.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 24 °C |
| Relative Humidity: | 58 % |
| ATM Pressure: | 102.2 kPa |

** The testing was performed by Dan Coronia on 2007-07-30 to 08-16.*

## 7.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2007-04-26 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | 849192/0085 | 2006-10-18 |

*** 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

### 7.5.1 AMPS:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 869.03 | 33.2574 |
| Middle | 881.50 | 33.2730 |
| High | 893.97 | 33.2776 |

**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 824.03 | 33.2661 |
| Middle | 836.50 | 33.3500 |
| High | 848.97 | 33.2724 |

### 7.5.2 TDMA 800 MHz:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 869.10 | 33.1427 |
| Middle | 881.50 | 33.2889 |
| High | 893.90 | 33.5596 |

**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 824.10 | 33.5940 |
| Middle | 836.50 | 33.2487 |
| High | 848.90 | 33.5786 |

### 7.5.3 TDMA 1900:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 1930.10 | 33.6219 |
| Middle | 1960.00 | 33.1888 |
| High | 1989.90 | 33.6093 |

**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 1850.10 | 33.2396 |
| Middle | 1880.00 | 33.1969 |
| High | 1909.90 | 33.5942 |

### 7.5.4 GSM 800:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 869.20 | 243.3076 |
| Middle | 881.60 | 242.9681 |
| High | 893.80 | 243.7313 |

**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 824.20 | 245.6566 |
| Middle | 836.60 | 244.9655 |
| High | 848.80 | 245.9868 |

### 7.5.5 GSM 1900:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 1930.20 | 244.0666 |
| Middle | 1960.00 | 244.2256 |
| High | 1989.80 | 243.8597 |

**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (kHz) |
|---|---|---|
| Low | 1850.20 | 245.1227 |
| Middle | 1880.00 | 244.9683 |
| High | 1909.80 | 244.2660 |

### 7.5.6 CDMA 800:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |
|---|---|---|
| Low | 869.73 | 1.2648 |
| Middle | 881.40 | 1.2659 |
| High | 893.19 | 1.2650 |

**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |
|---|---|---|
| Low | 824.73 | 1.2653 |
| Middle | 836.40 | 1.2655 |
| High | 848.19 | 1.2656 |

### 7.5.7 CDMA 1900:

**Downlink**

| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |
|---|---|---|
| Low | 1931.25 | 1.2650 |
| Middle | 1960.00 | 1.2640 |
| High | 1988.75 | 1.2659 |

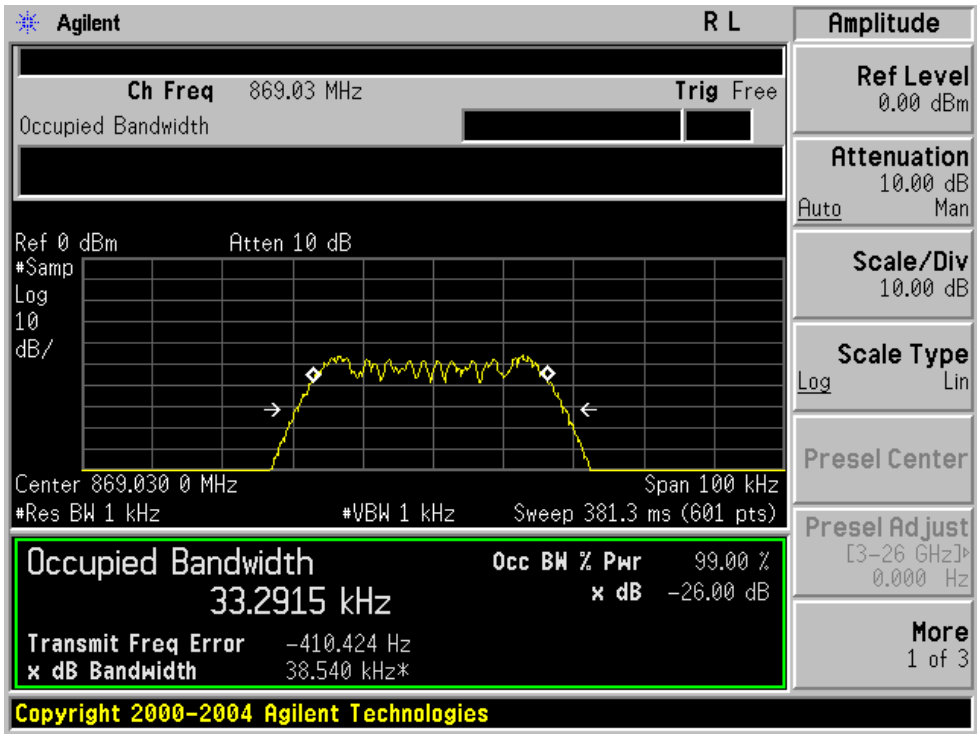
**Uplink**

| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |
|---|---|---|
| Low | 1851.25 | 1.2641 |
| Middle | 1880.00 | 1.2635 |
| High | 1908.75 | 1.2644 |

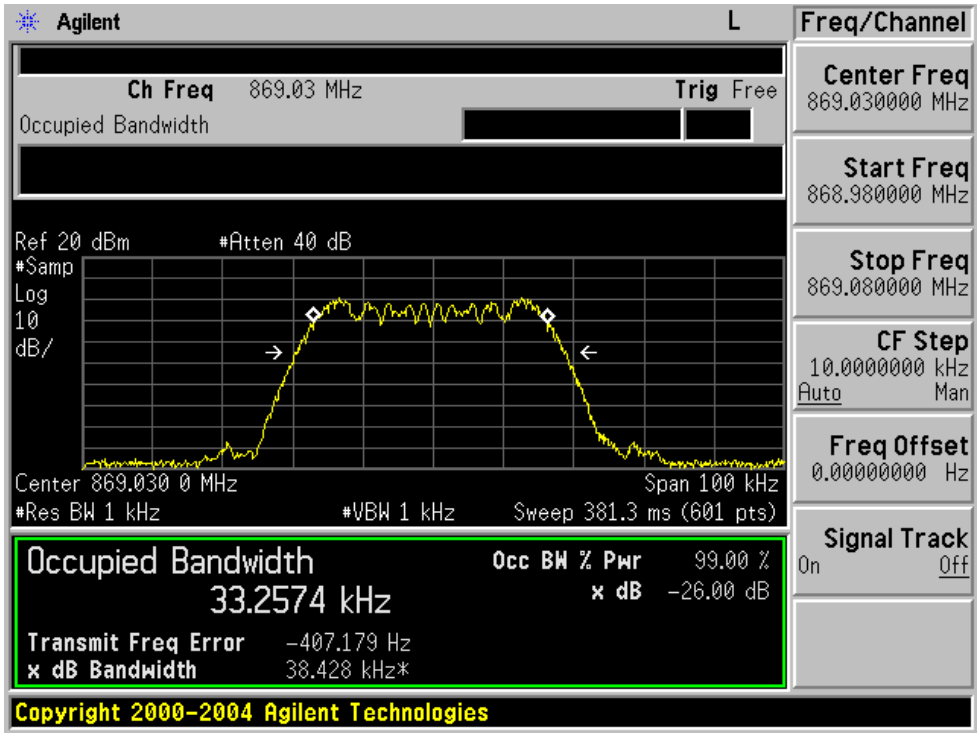
## 7.6 Test Data

### 7.6.1 AMPS: Forward (Downlink): Low Channel

**Input**

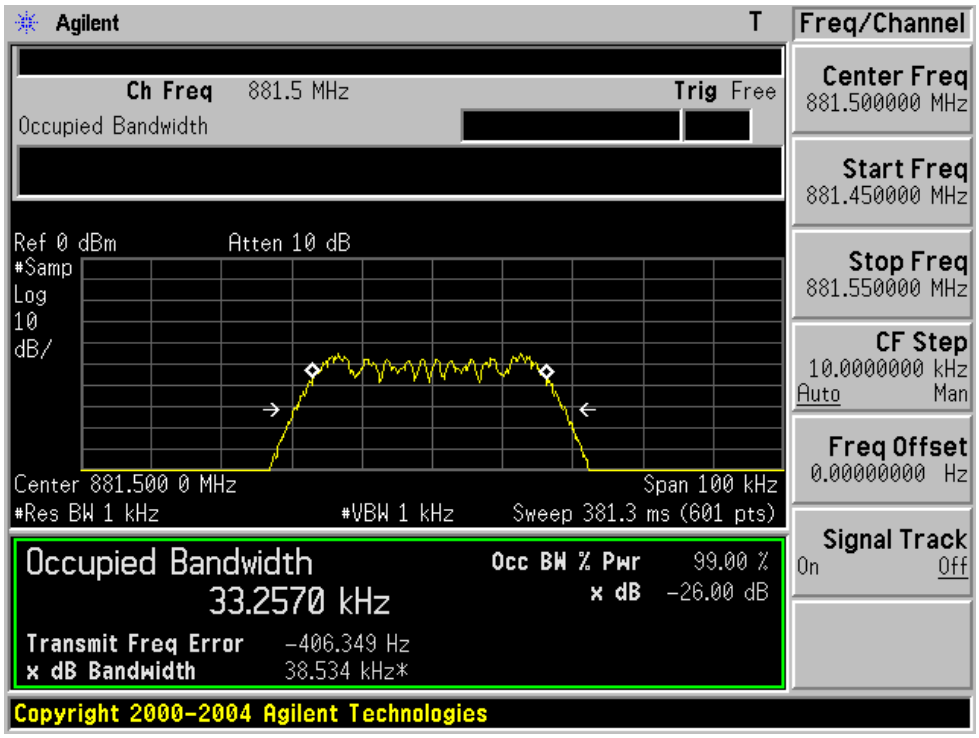



**Output**

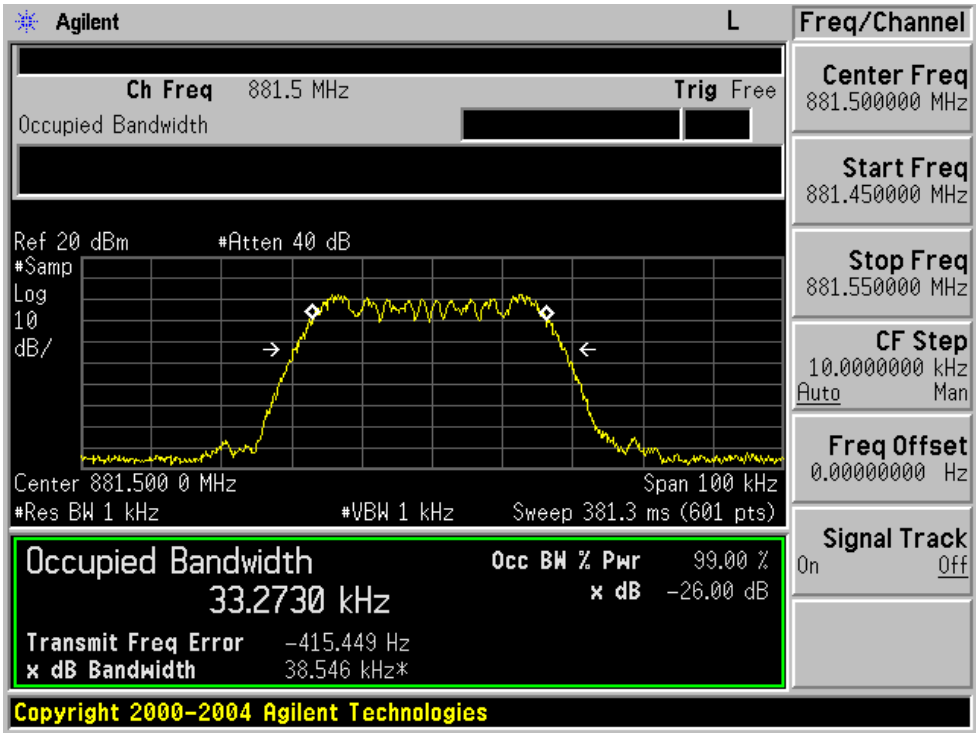


### 7.6.2 AMPS: Forward (Downlink): Middle Channel

**Input**

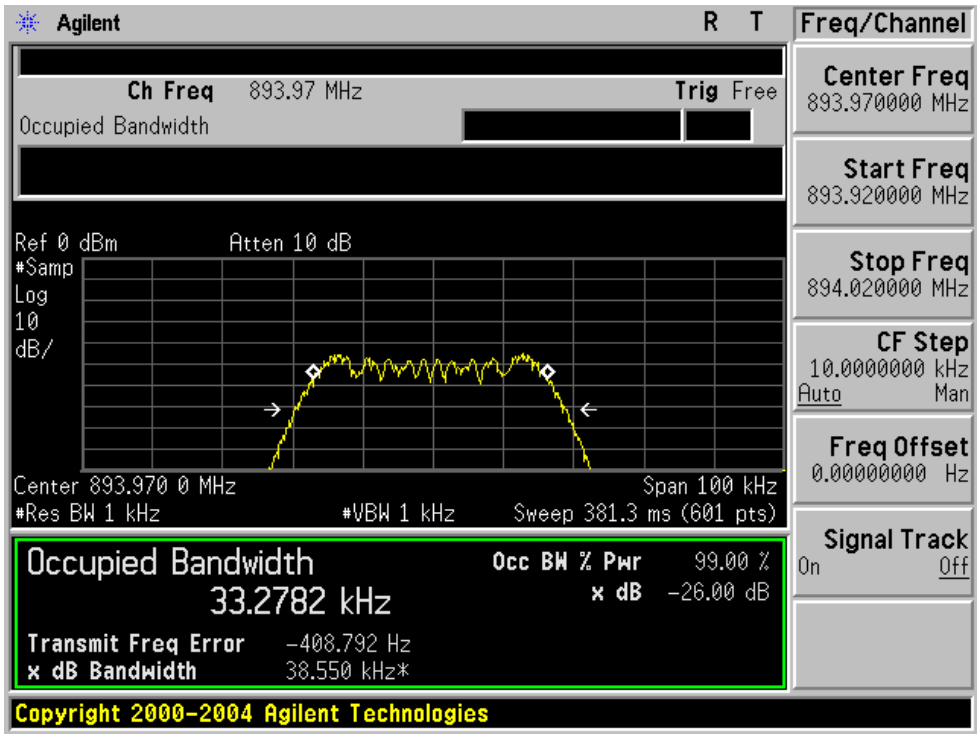



**Output**

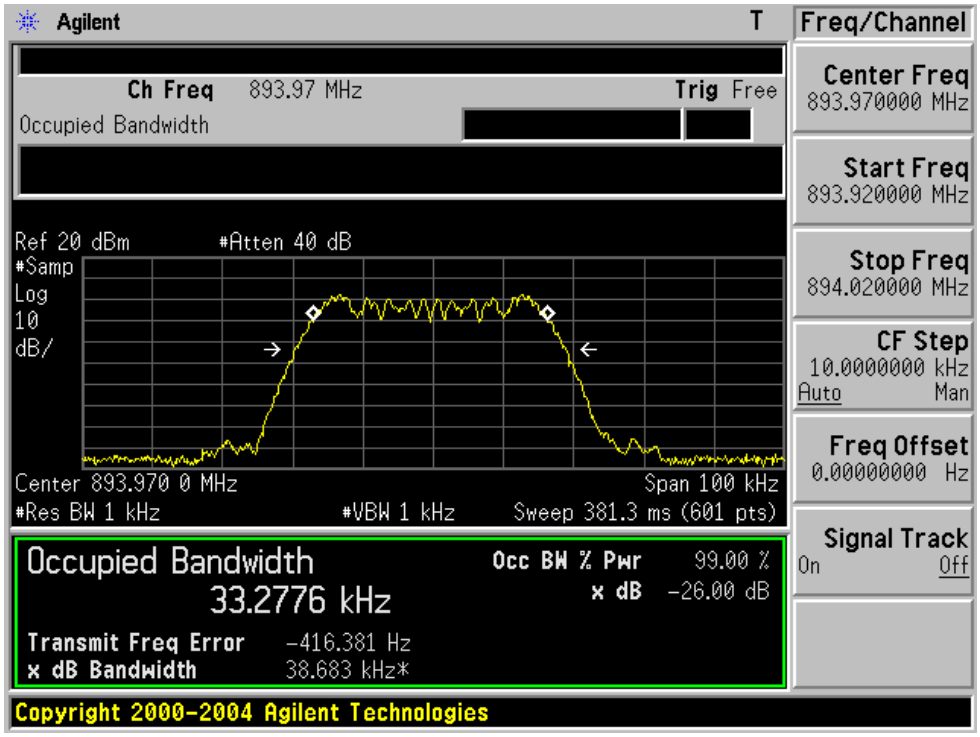


### 7.6.3 AMPS: Forward (Downlink): High Channel

**Input**

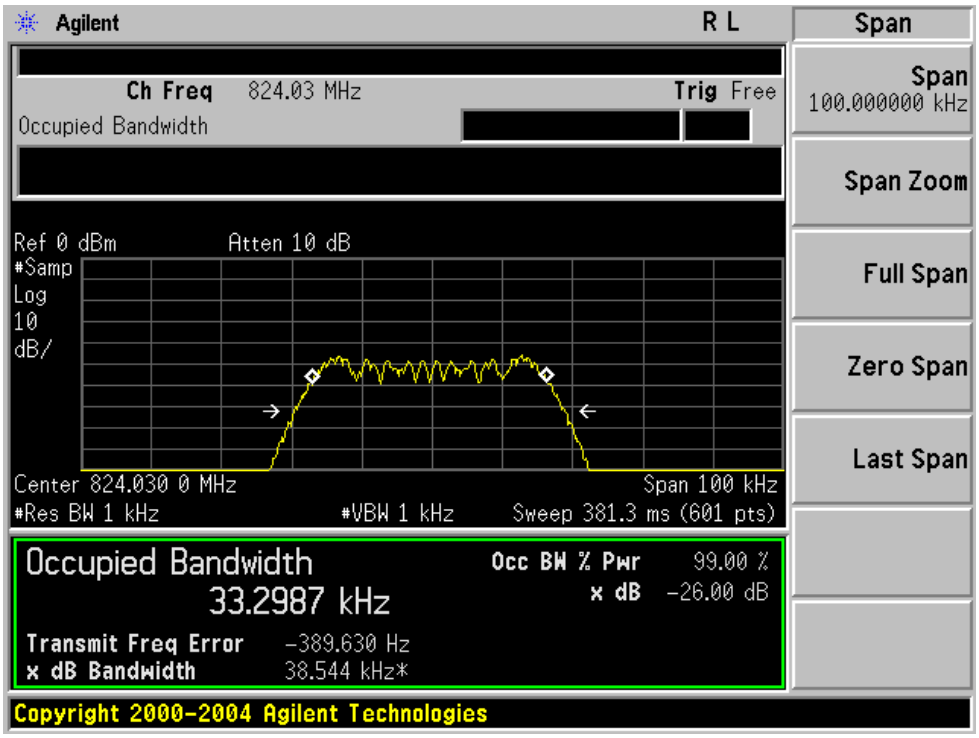



**Output**

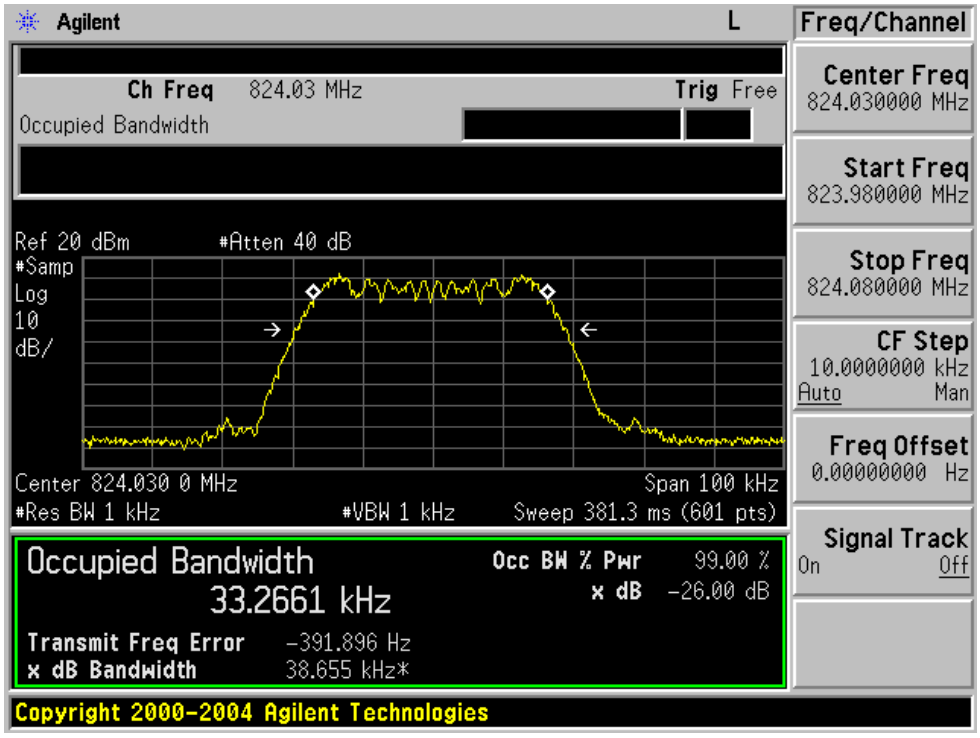


### 7.6.4 AMPS: Reverse (Uplink): Low Channel

**Input**

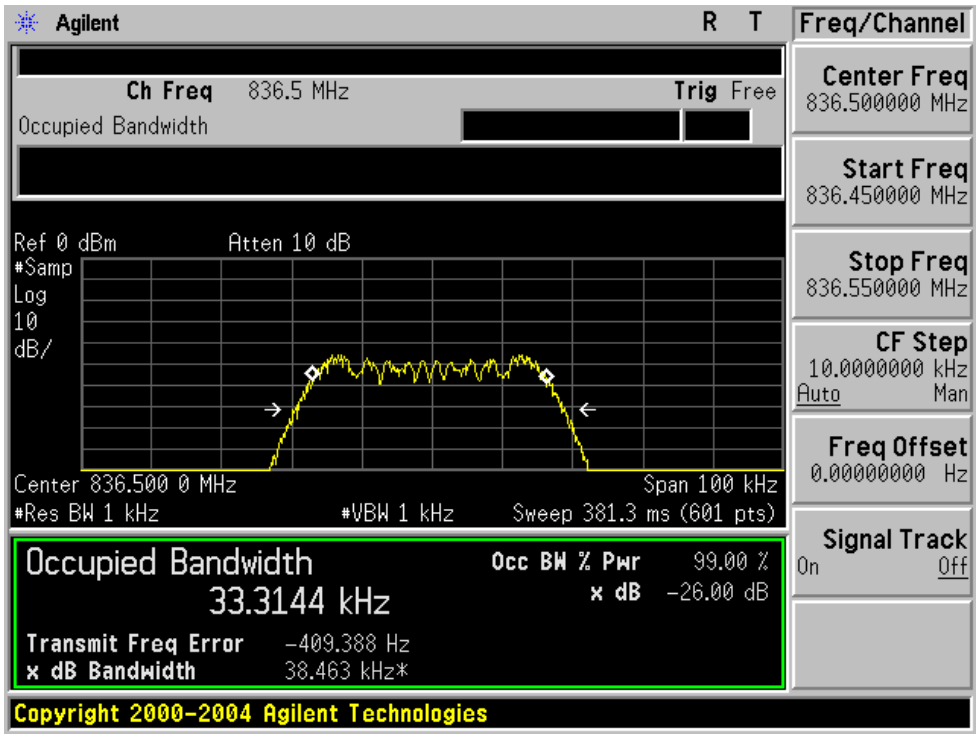



**Output**

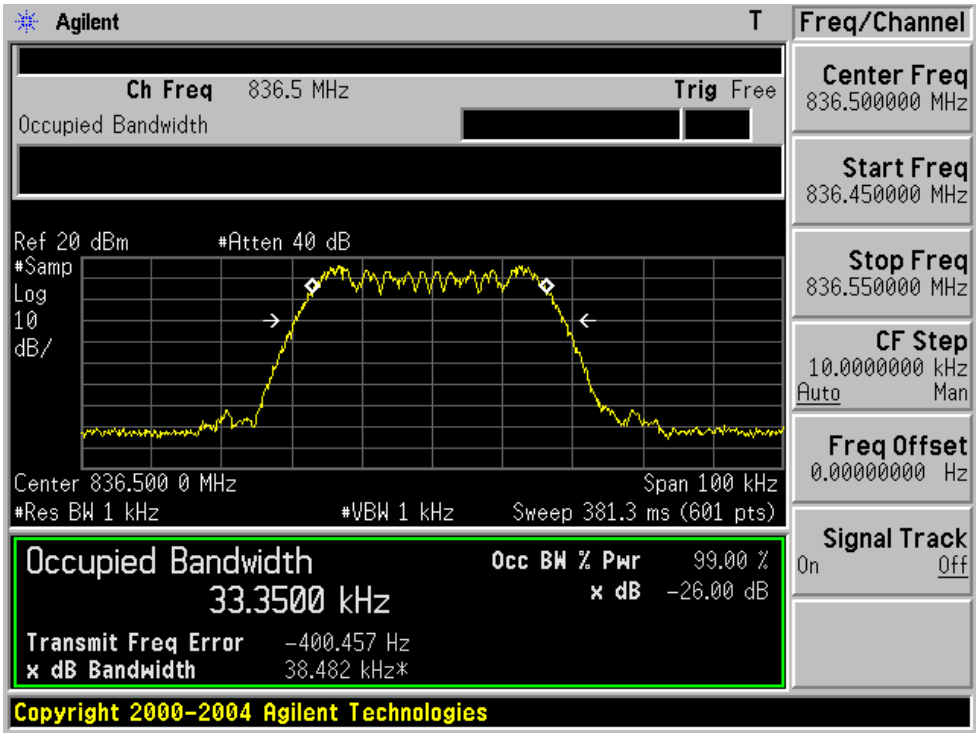


### 7.6.5 AMPS: Reverse (Uplink): Middle Channel

**Input**

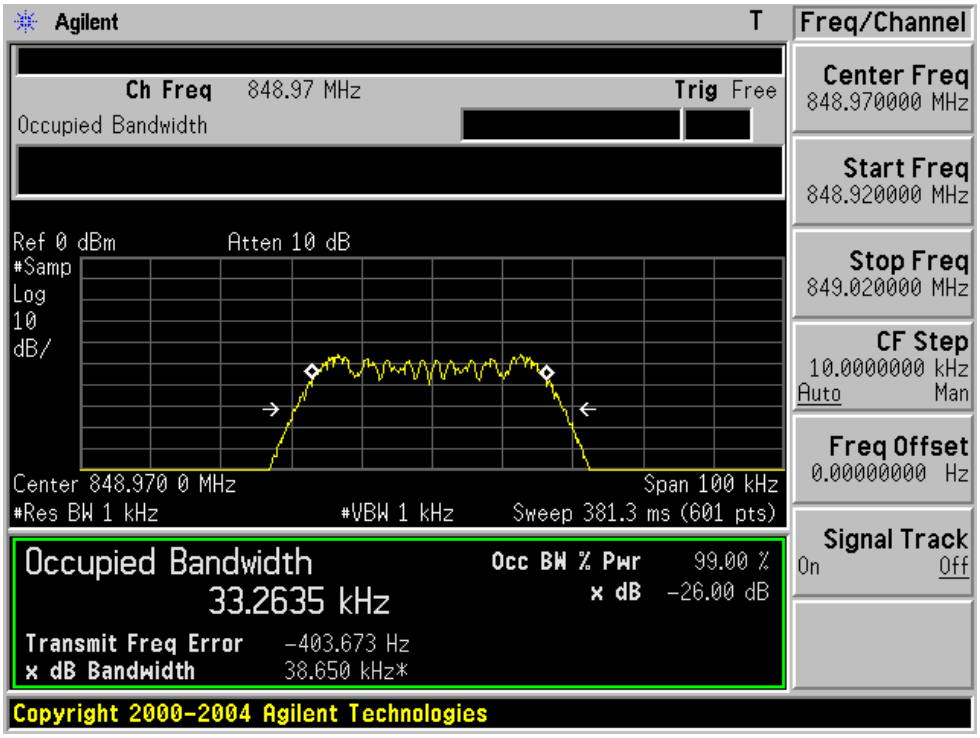



**Output**

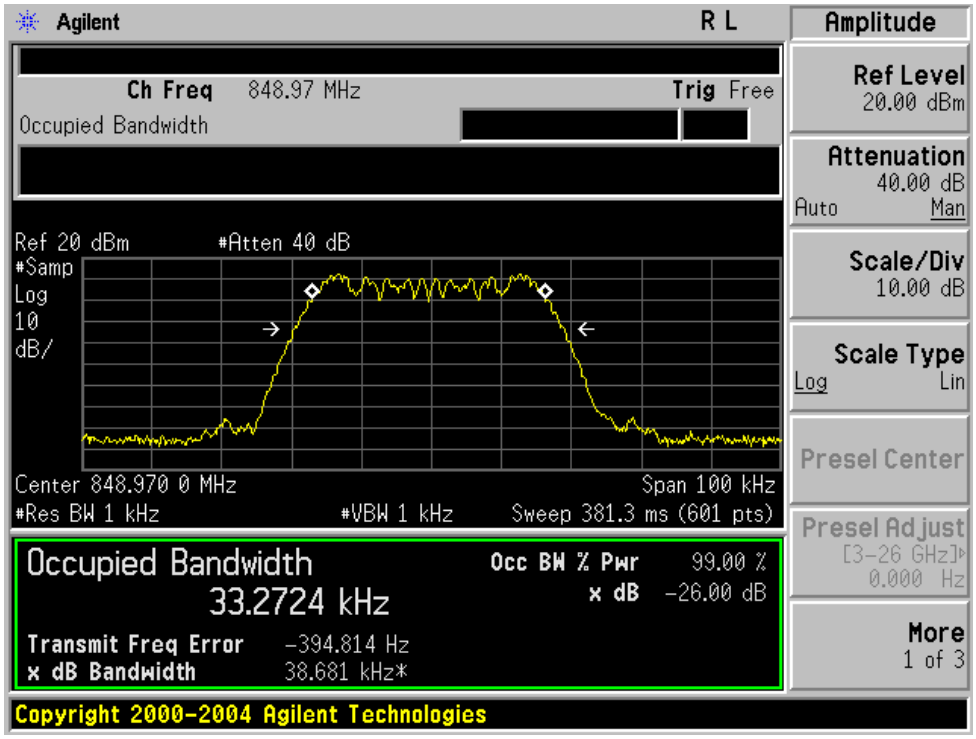


### 7.6.6 AMPS: Reverse (Uplink): High Channel

**Input**

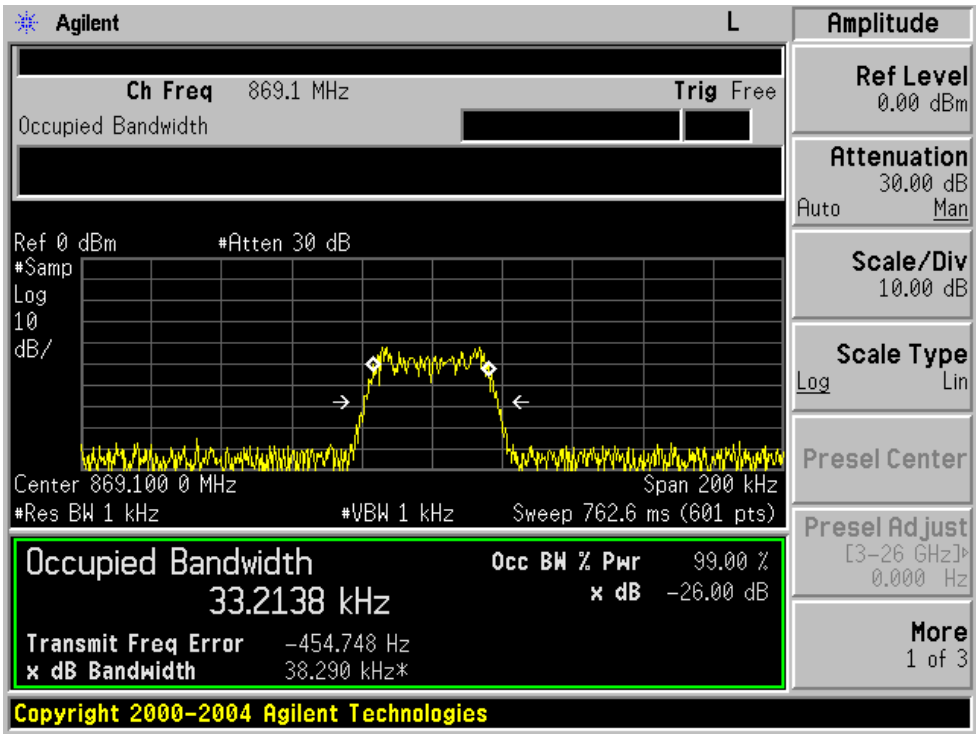



**Output**

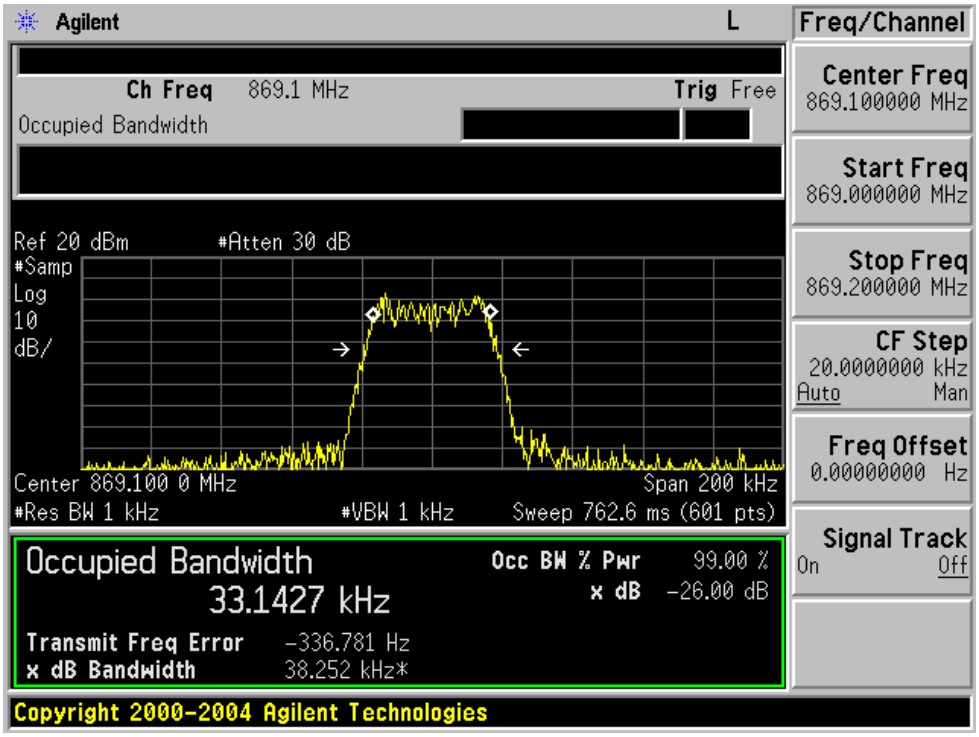


### 7.6.7 TDMA 800: Forward (Downlink): Low Channel

**Input**

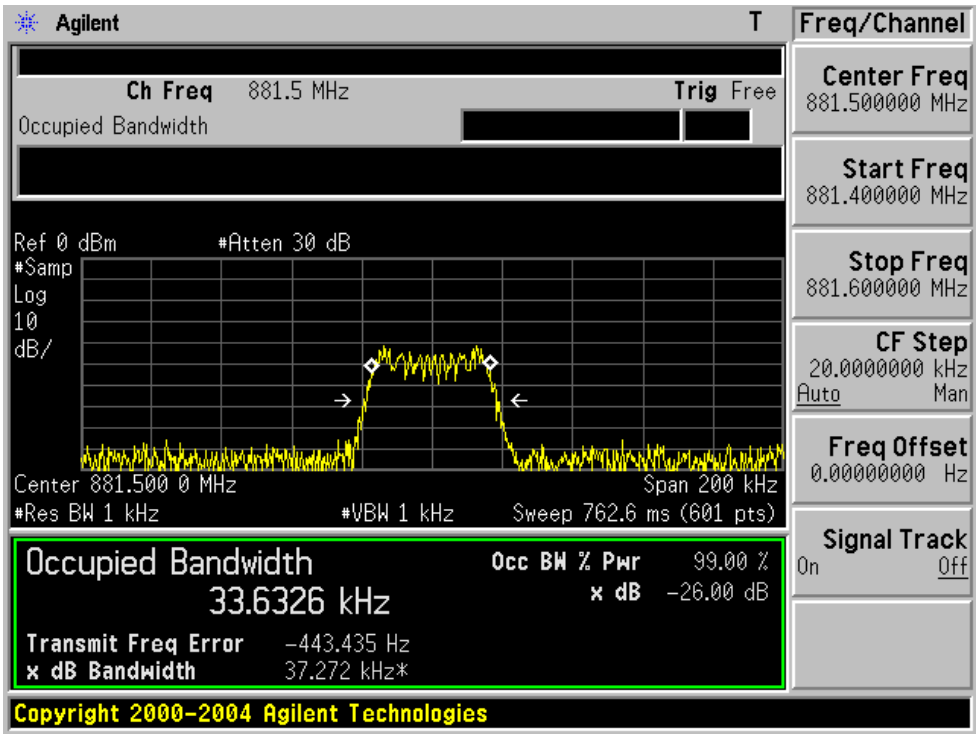



**Output**

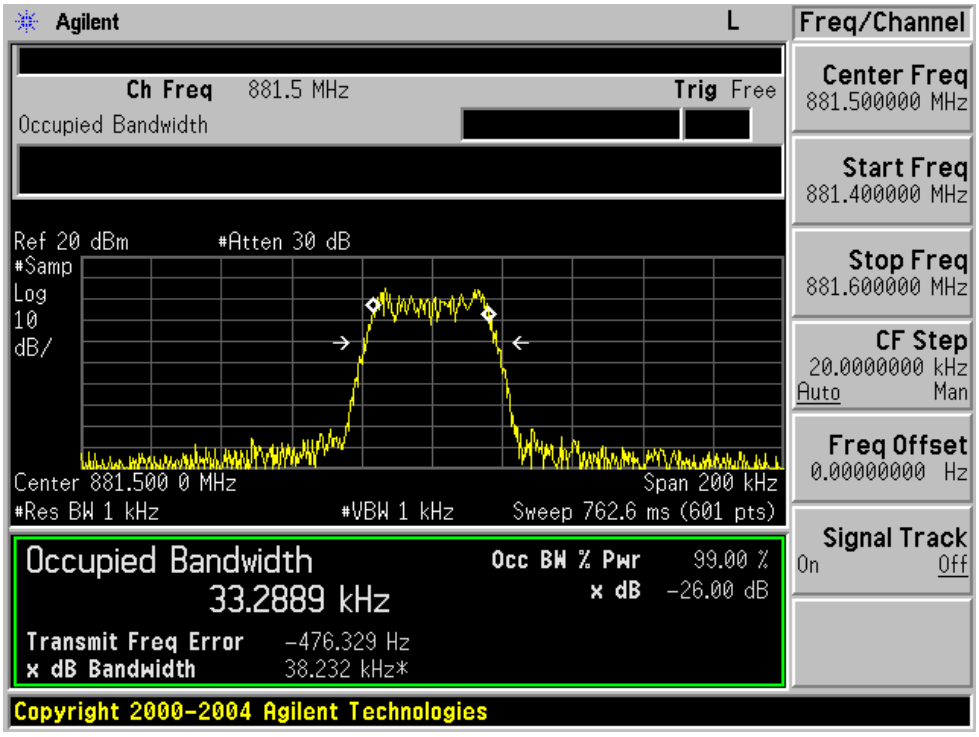


### 7.6.8 TDMA 800: Forward (Downlink): Middle Channel

**Input**

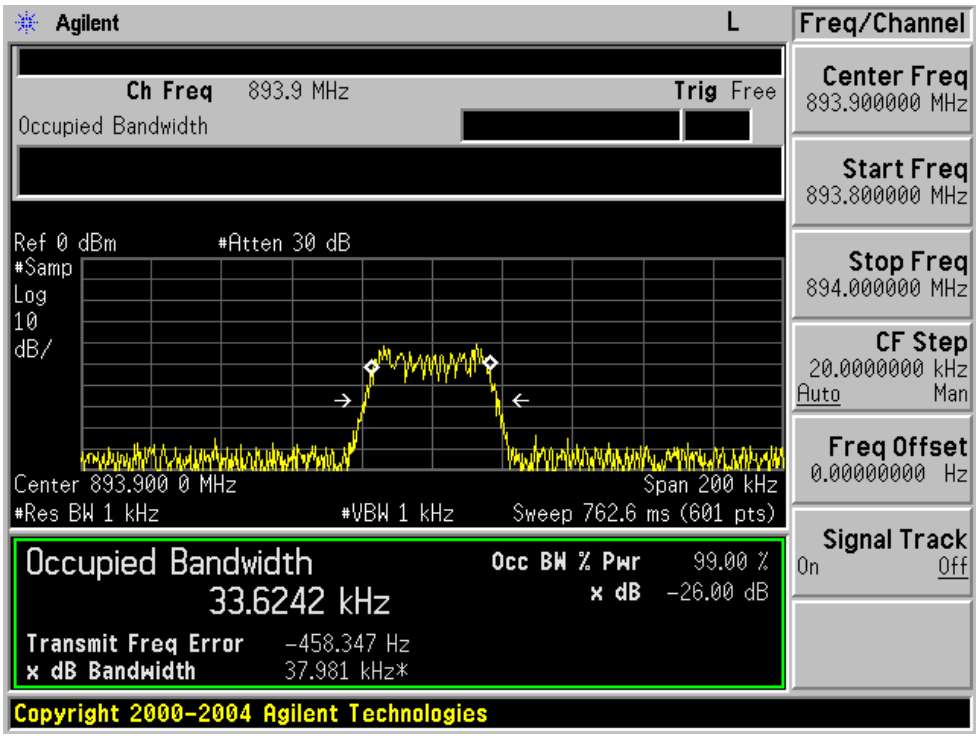



**Output**

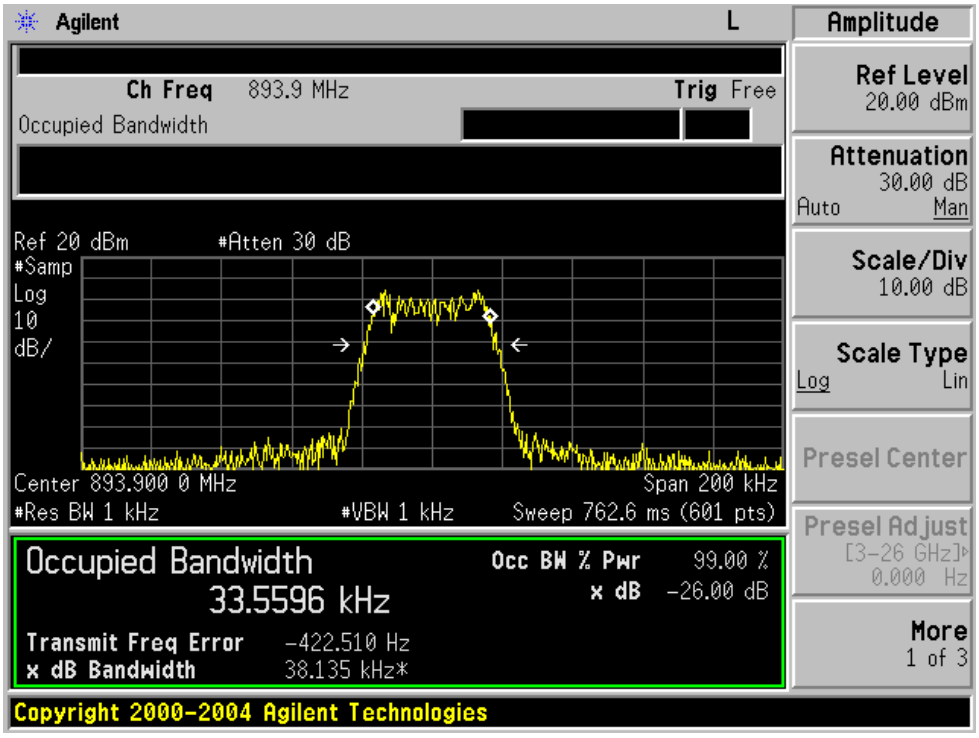


### 7.6.9 TDMA 800: Forward (Downlink): High Channel

**Input**

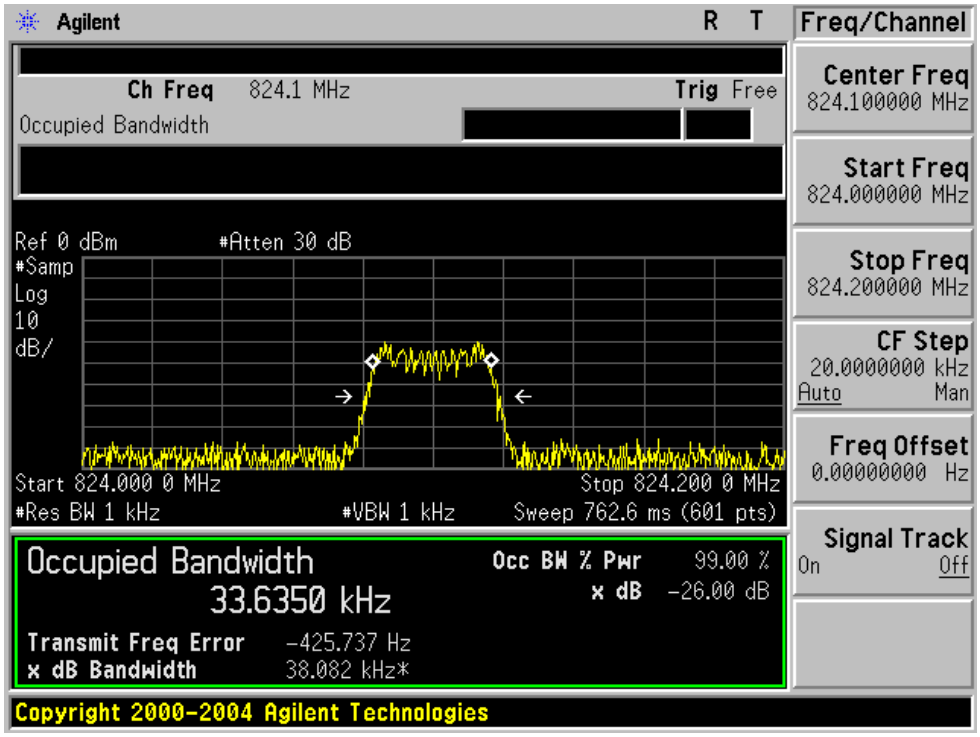



**Output**

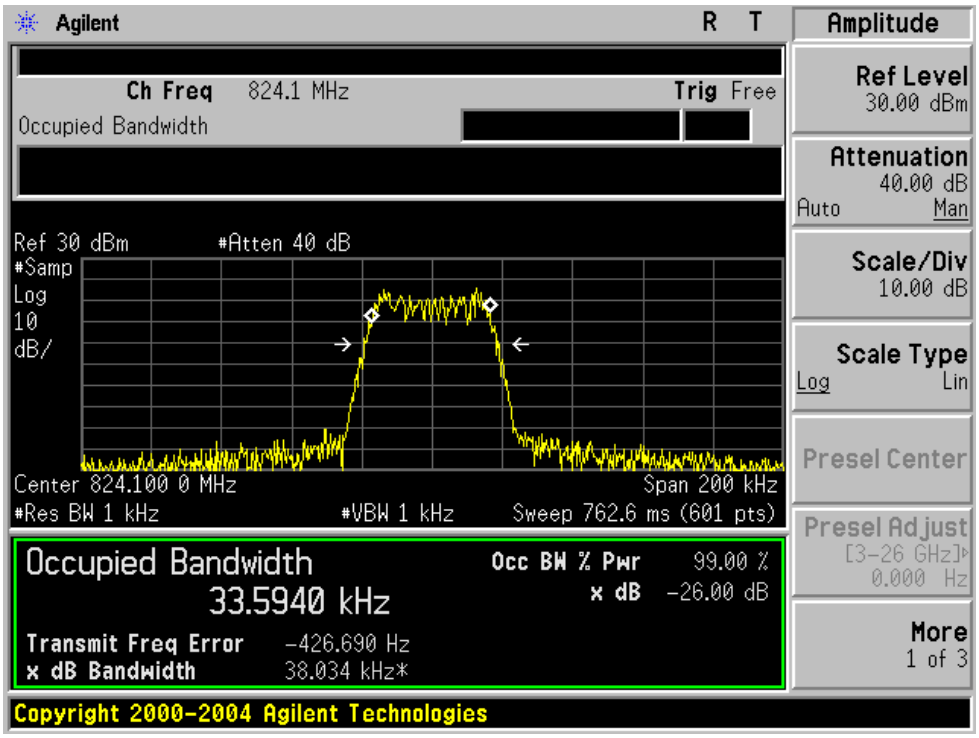


### 7.6.10 TDMA 800: Reverse (Uplink): Low Channel

**Input**

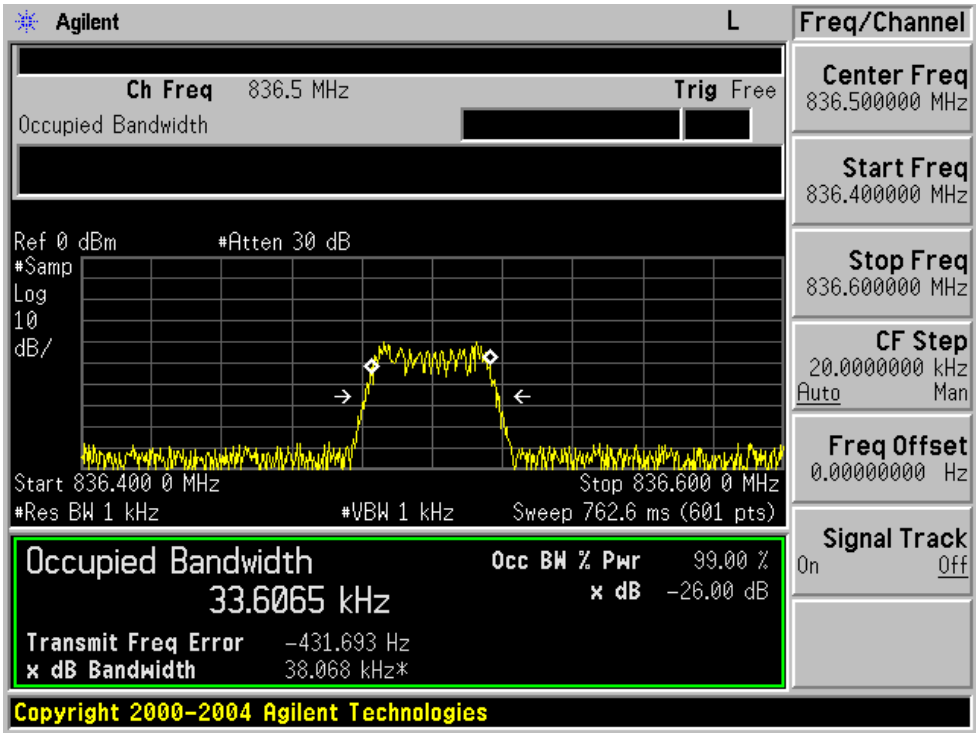



**Output**

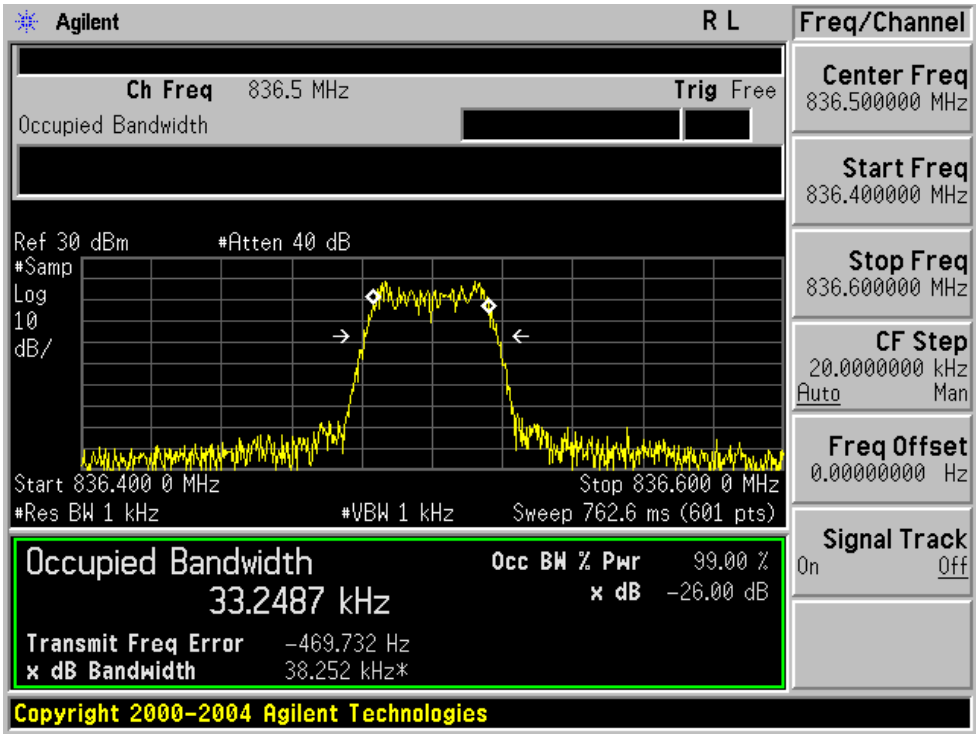


### 7.6.11 TDMA 800: Reverse (Uplink): Middle Channel

**Input**

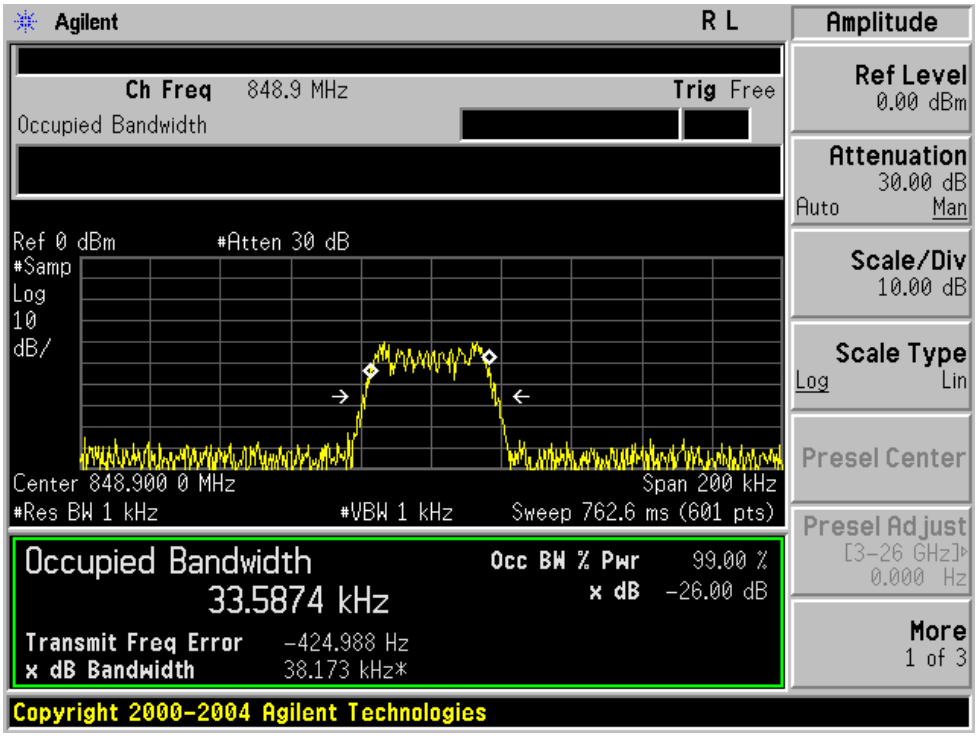



**Output**

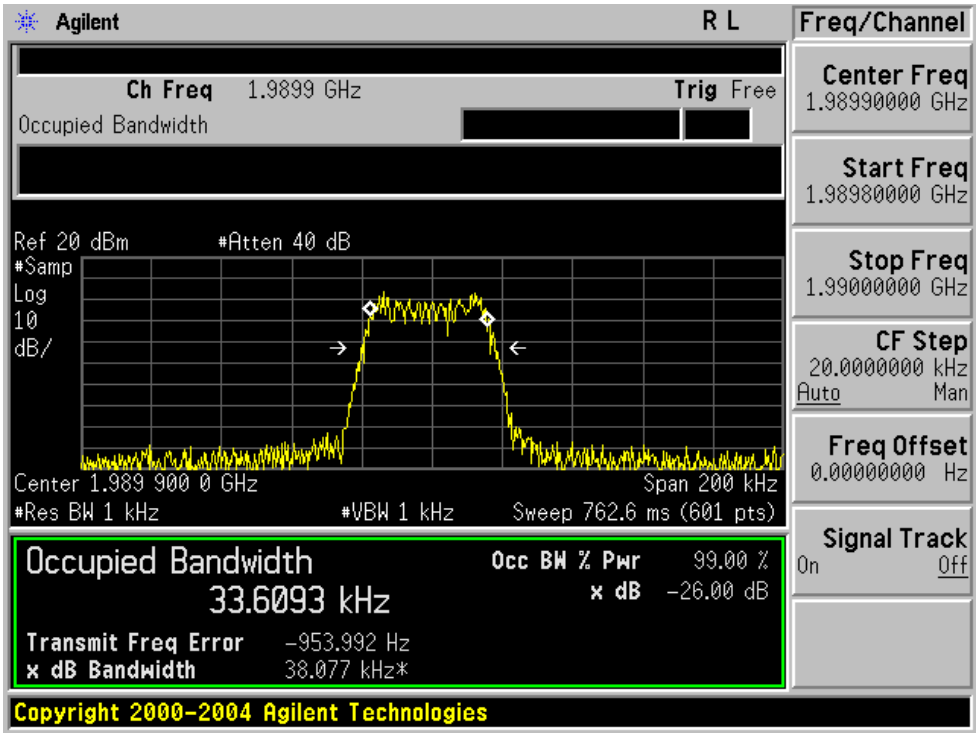


### 7.6.12 TDMA 800: Reverse (Uplink): High Channel

**Input**

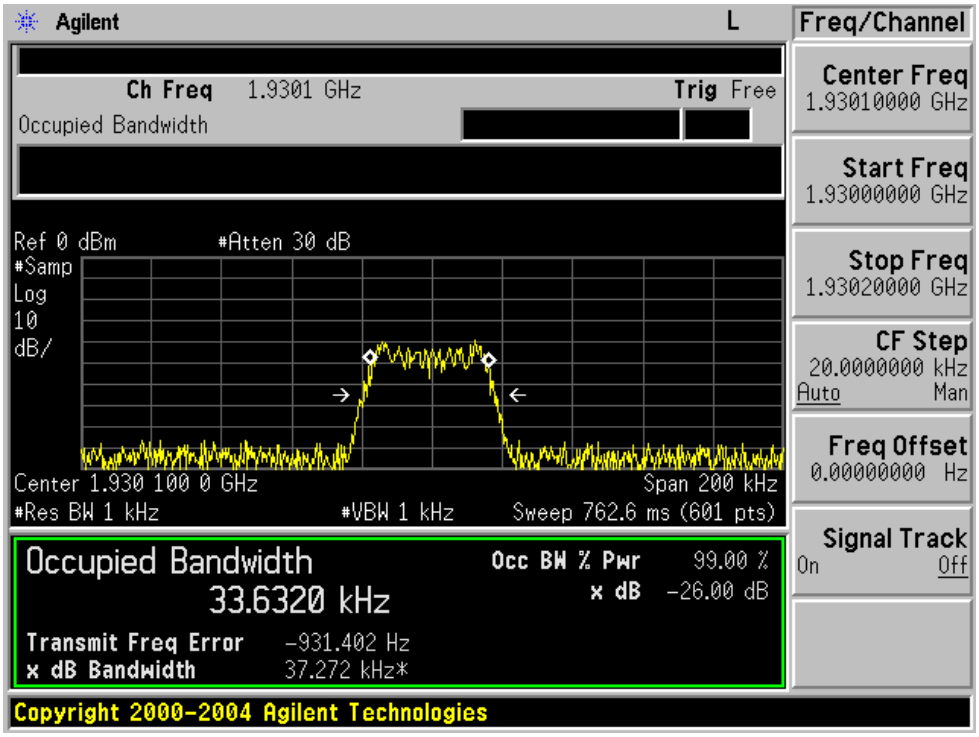



**Output**

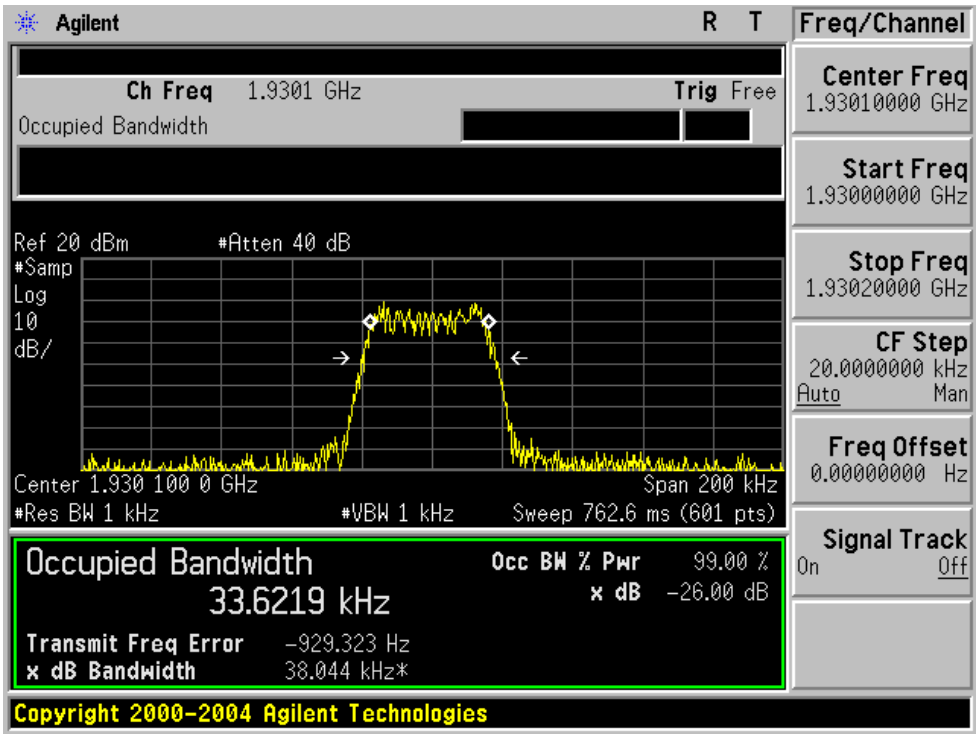


### 7.6.13 TDMA 1900: Forward (Downlink): Low Channel

**Input**

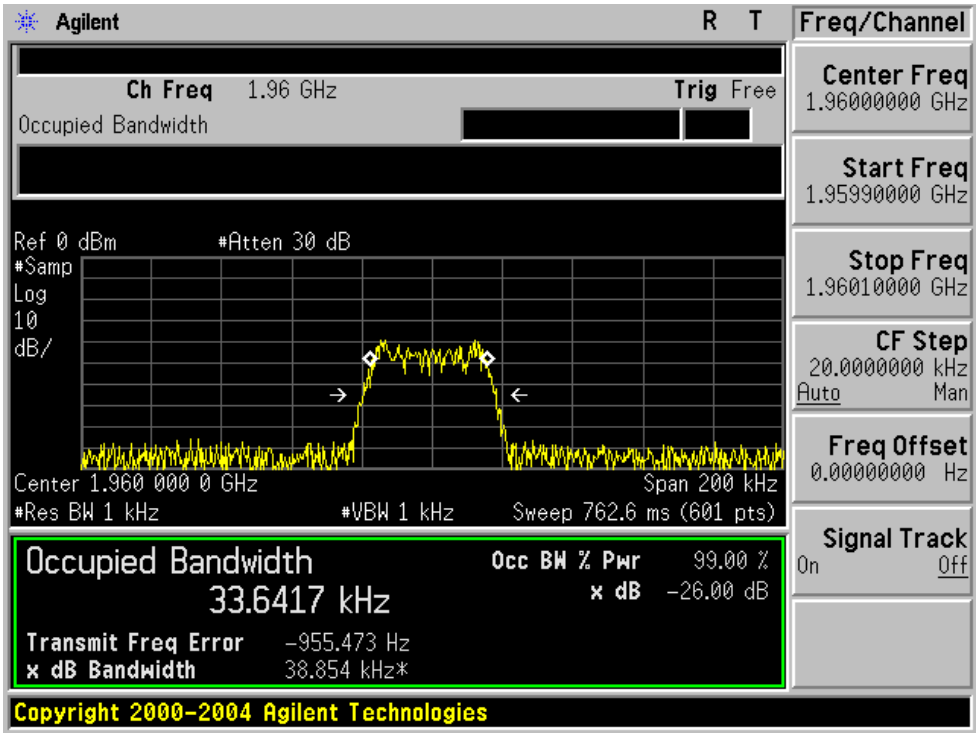



**Output**

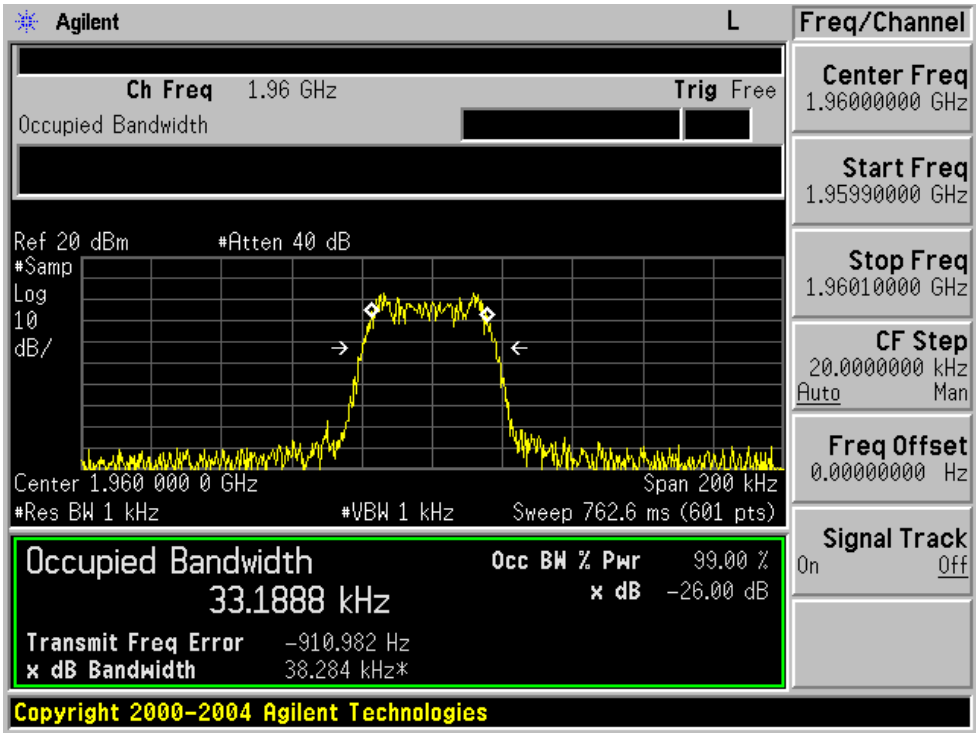


### 7.6.14 TDMA 1900: Forward (Downlink): Middle Channel

**Input**

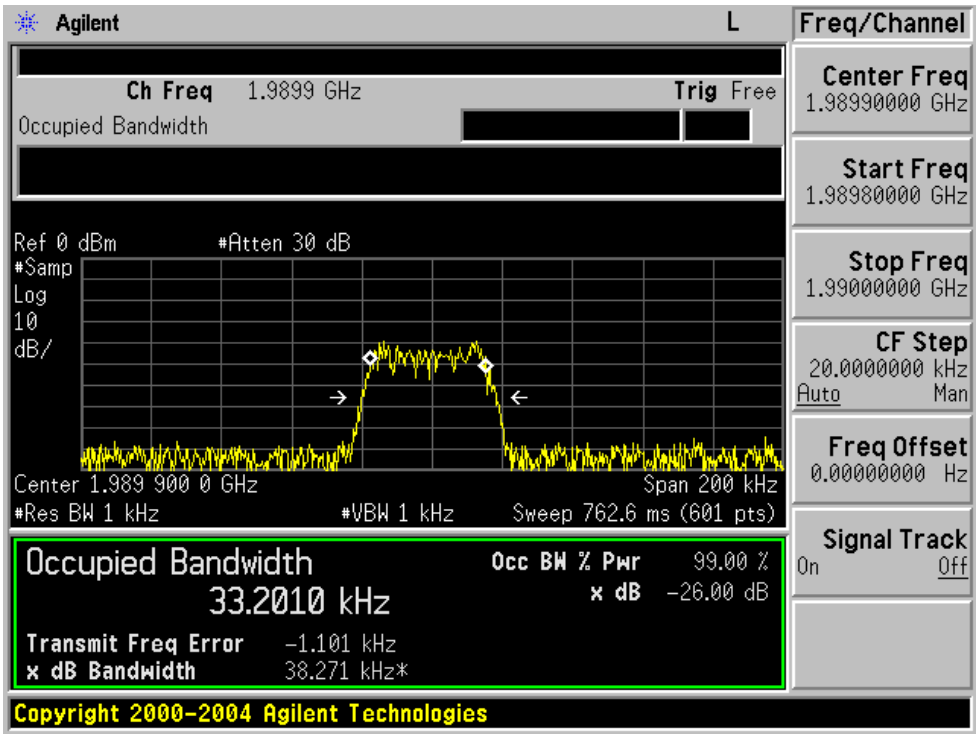



**Output**

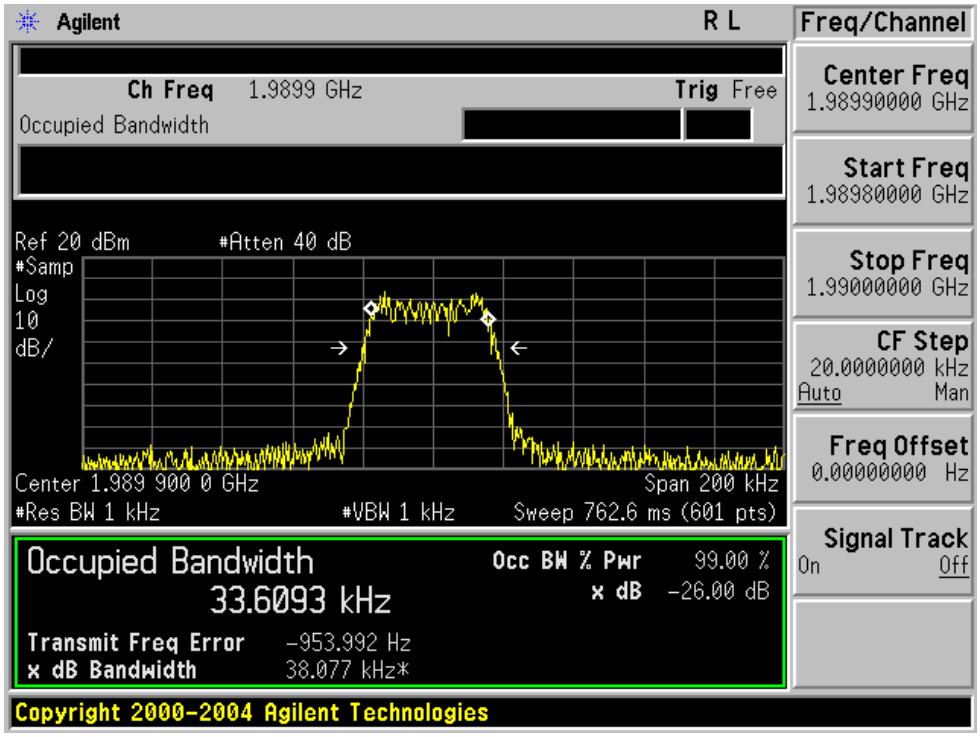


### 7.6.15 TDMA 1900: Forward (Downlink): High Channel

**Input**

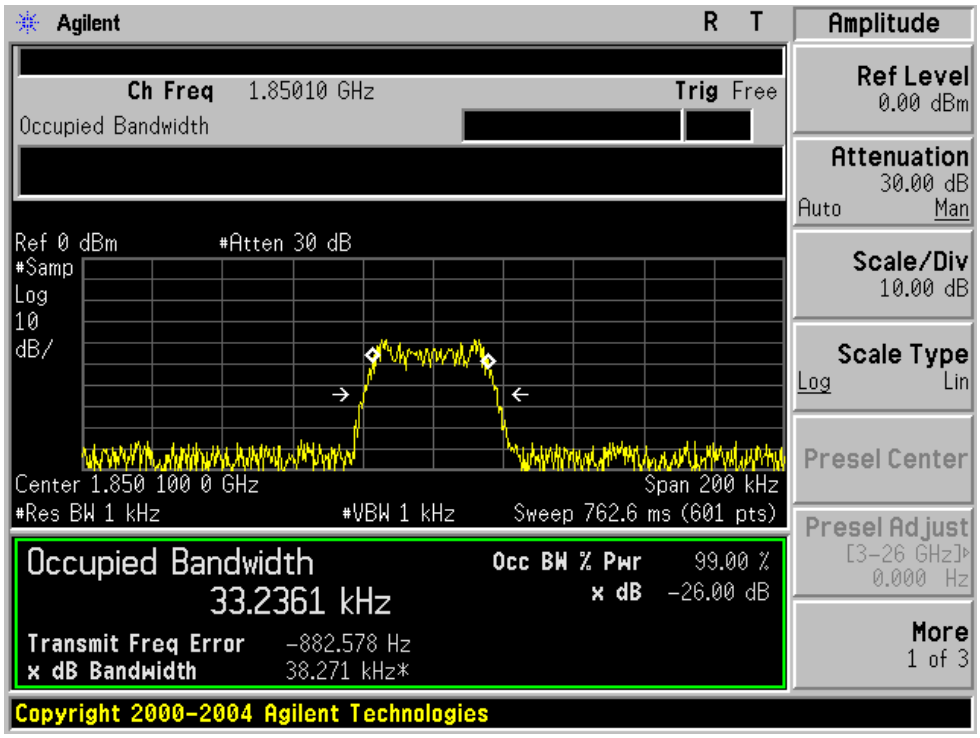



**Output**

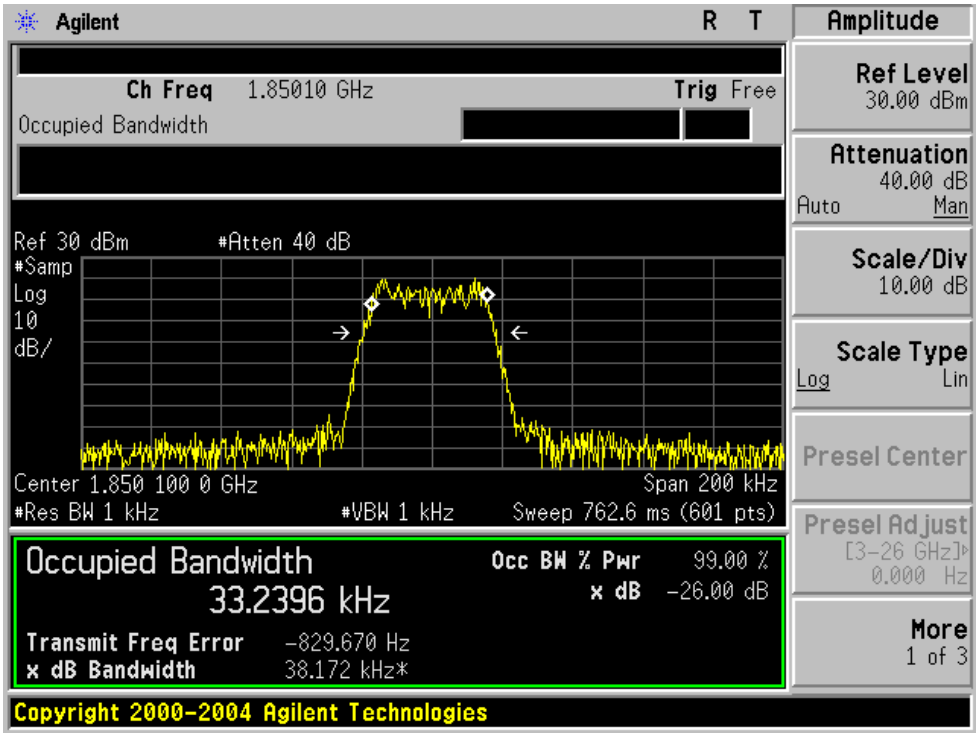


### 7.6.16 TDMA 1900: Reverse (Uplink): Low Channel

**Input**

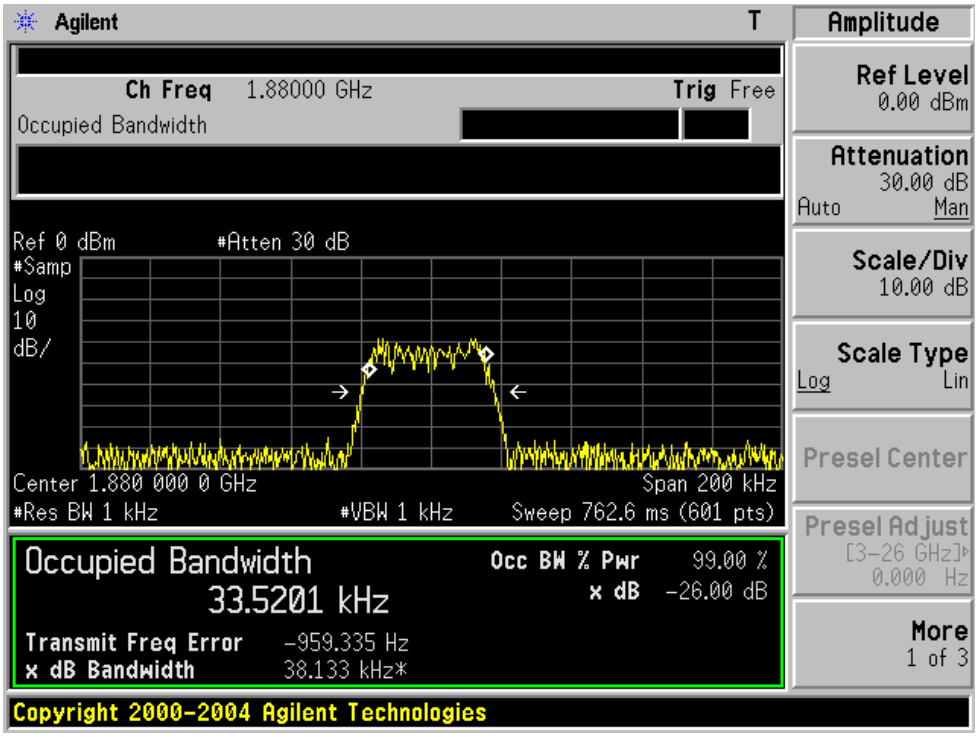



**Output**

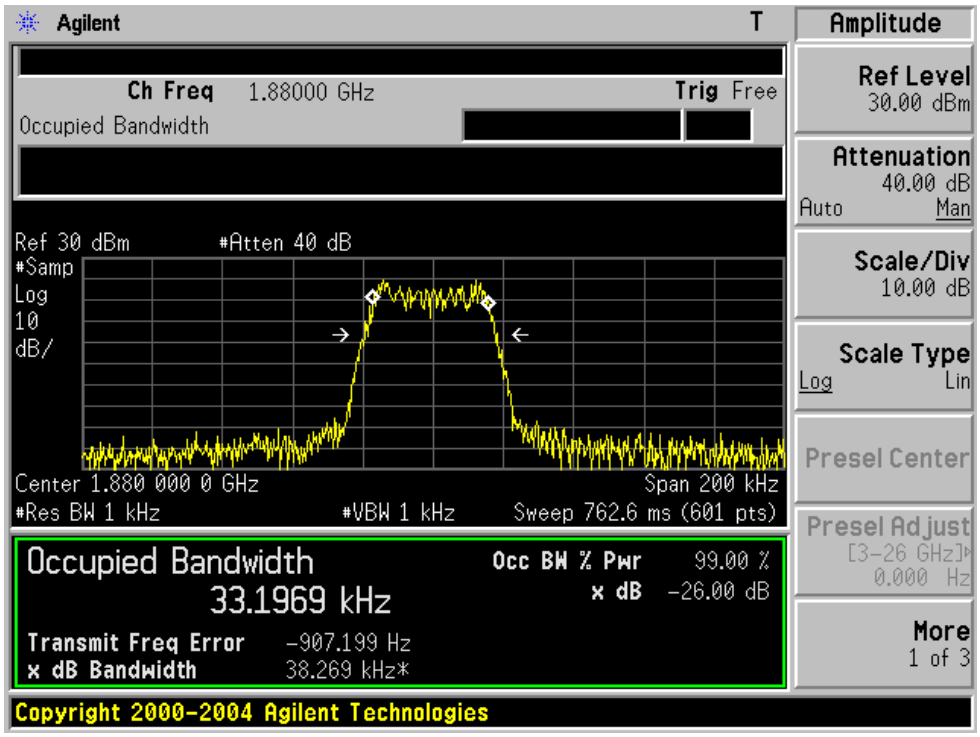


### 7.6.17 TDMA 1900: Reverse (Uplink): Middle Channel

**Input**

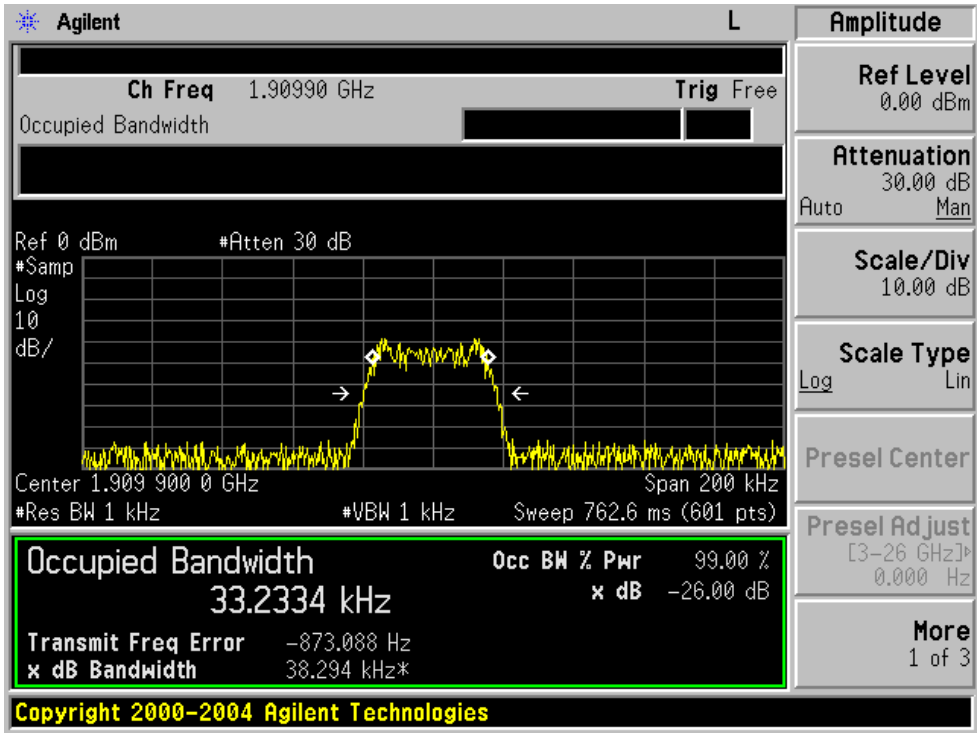



**Output**

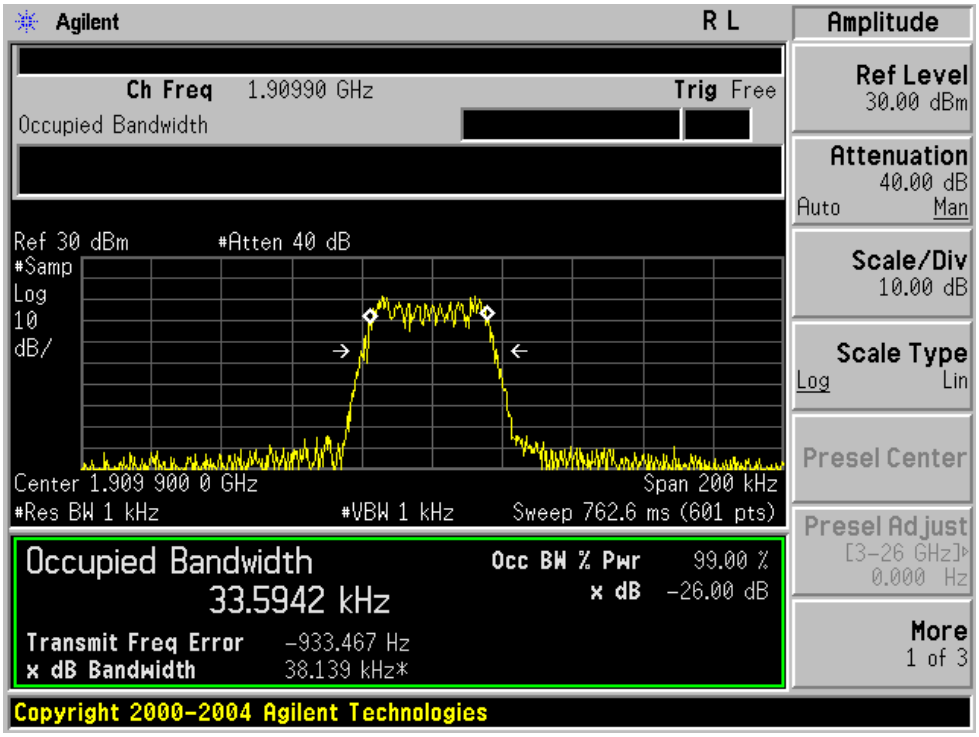


### 7.6.18 TDMA 1900: Reverse (Uplink): High Channel

**Input**

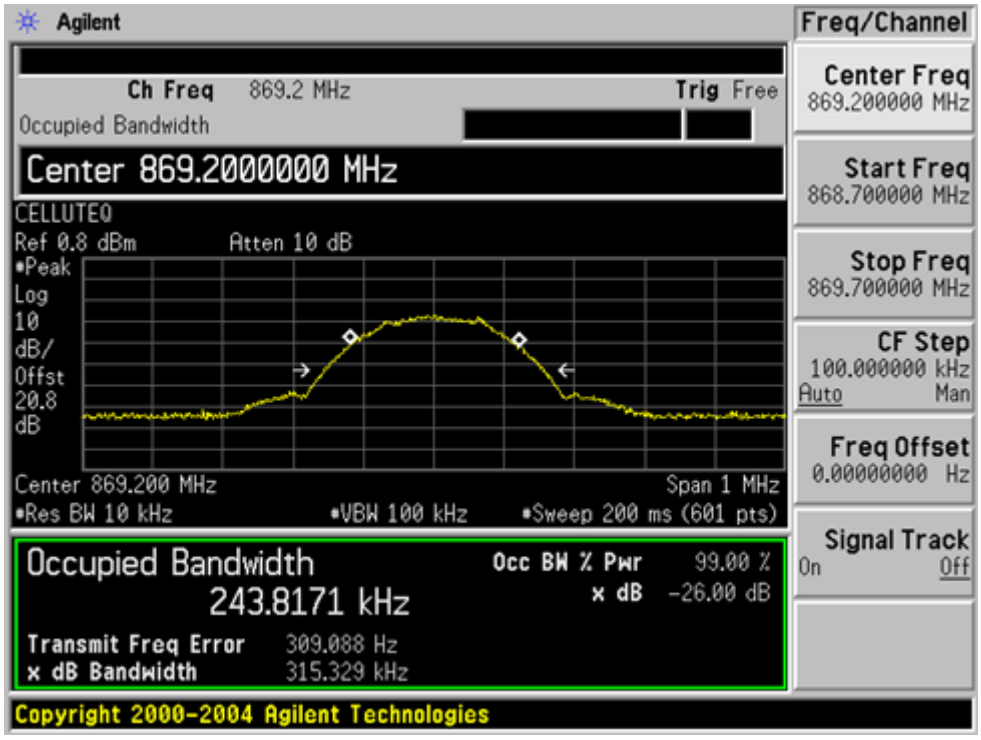



**Output**

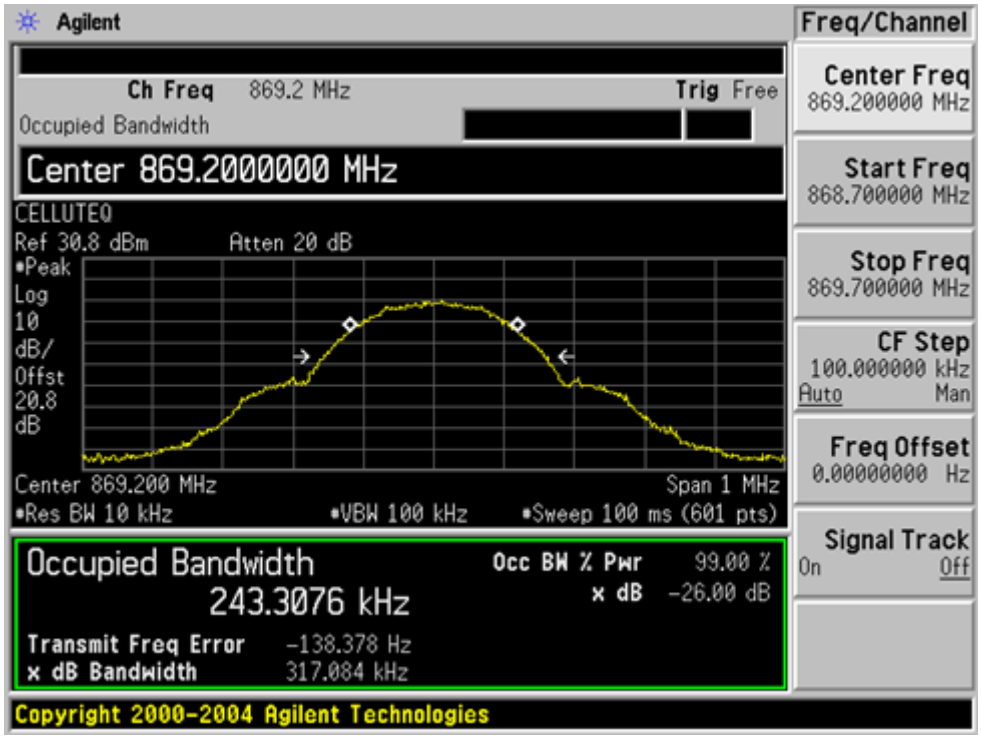


### 7.6.19 GSM 800MHz: Forward (Downlink): Low Channel

**Input**

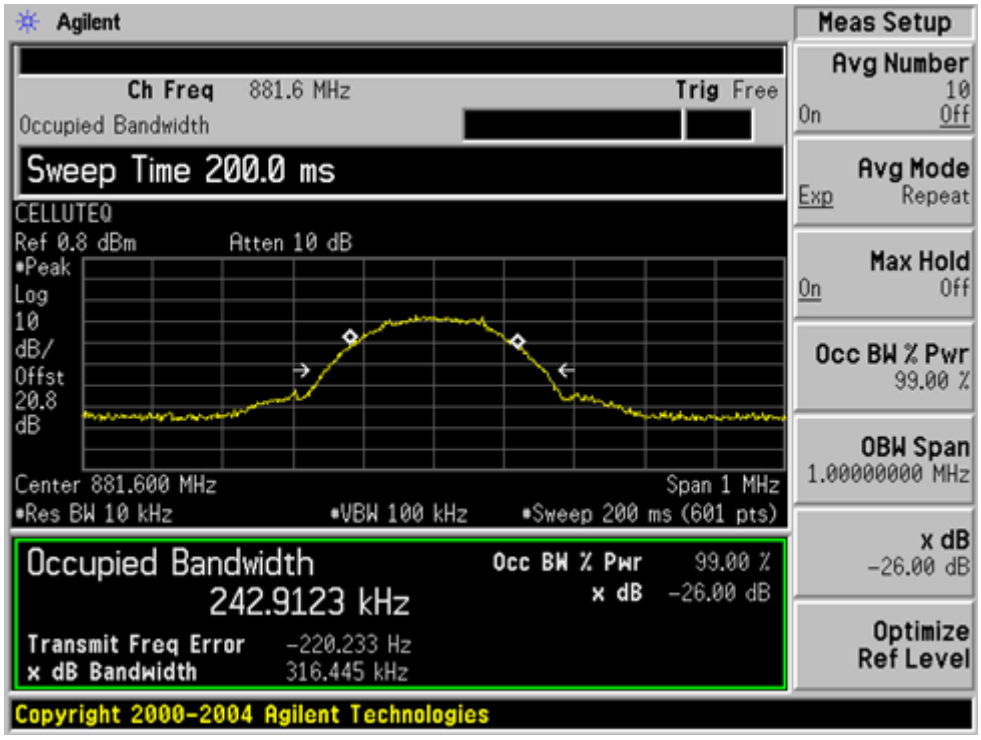



**Output**

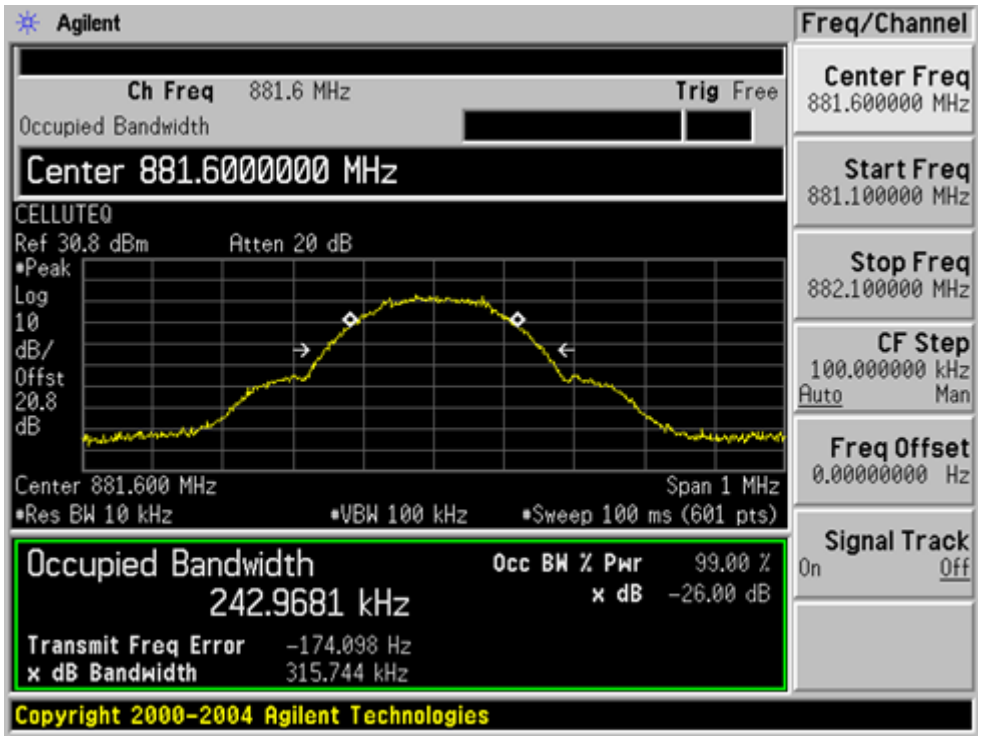


### 7.6.20 GSM 800MHz: Forward (Downlink): Middle Channel

**Input**

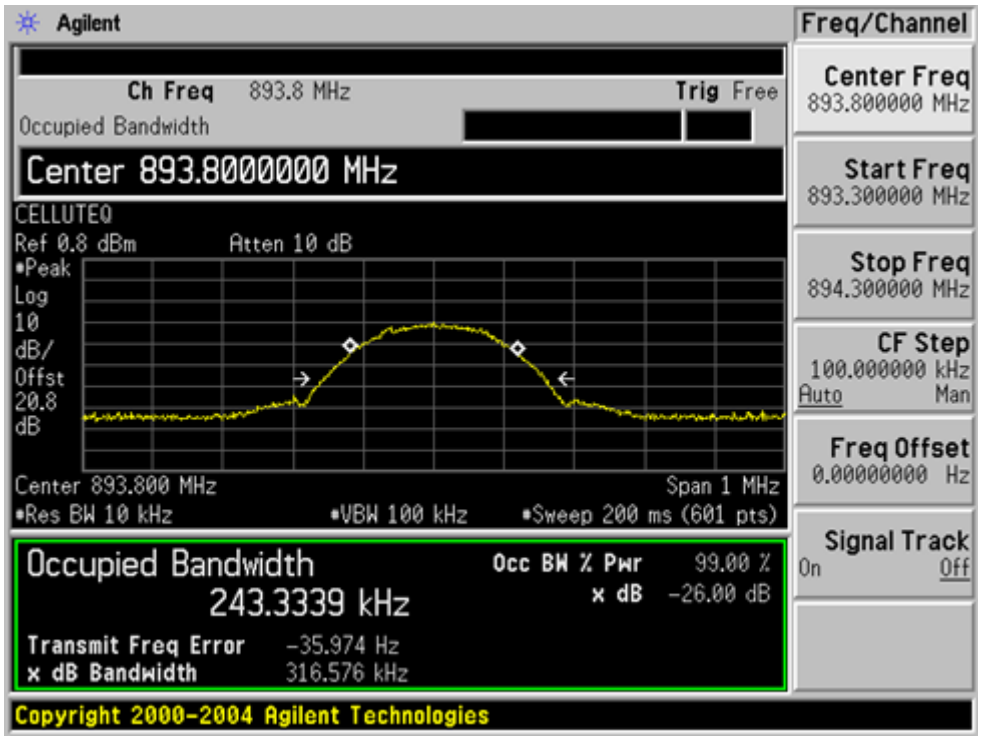



**Output**

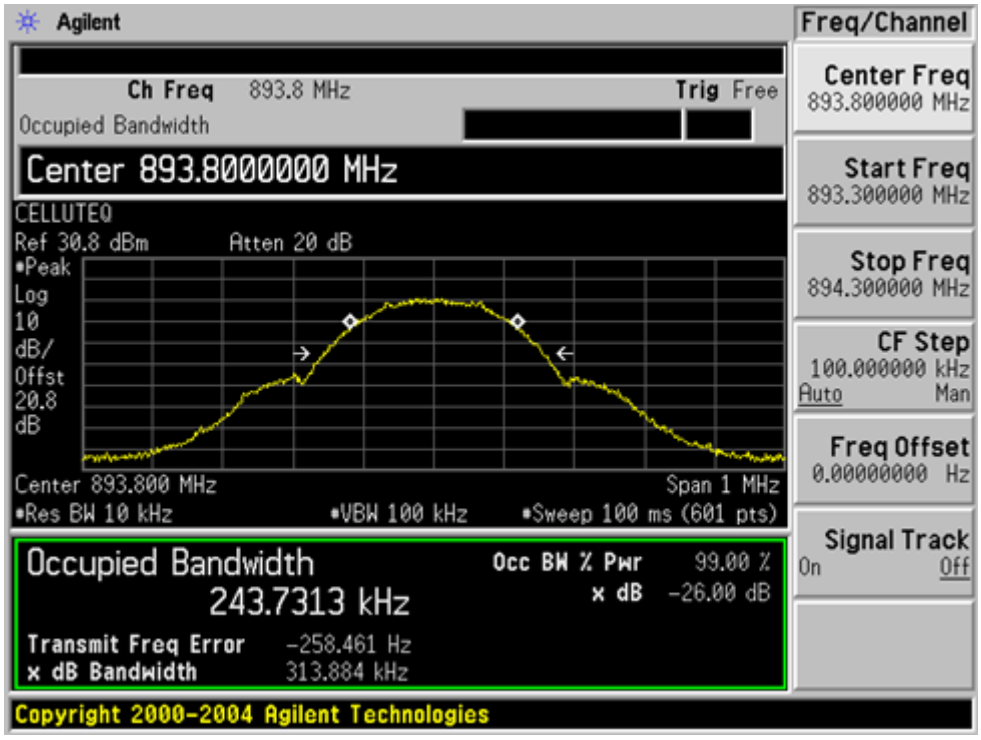


### 7.6.21 GSM 800MHz: Forward (Downlink): High Channel

**Input**

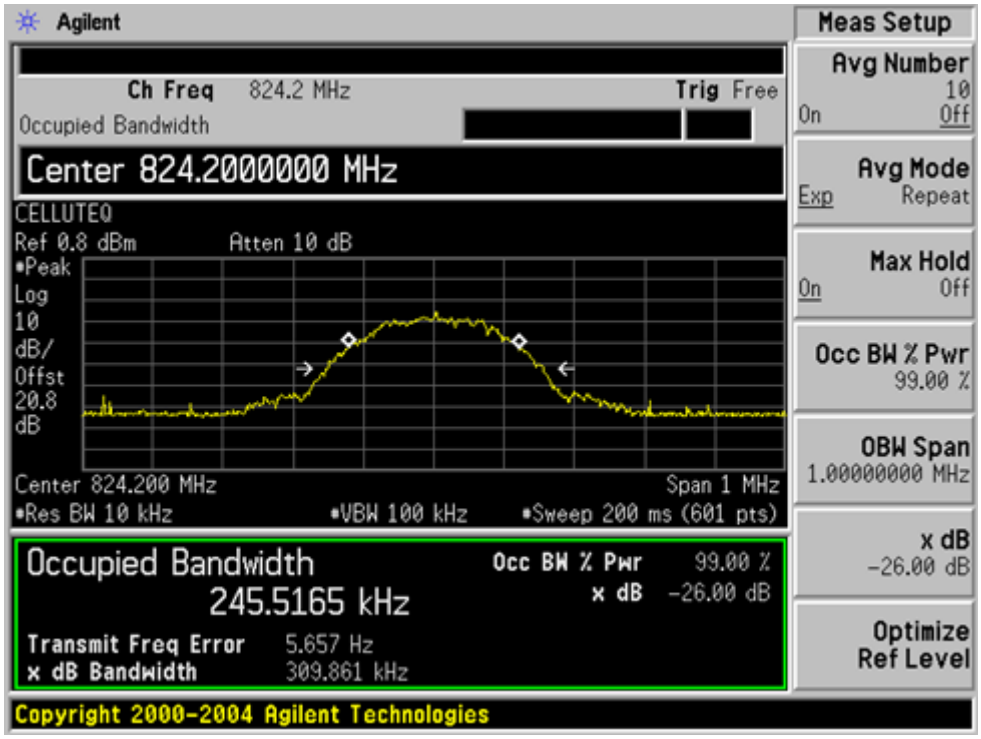



**Output**

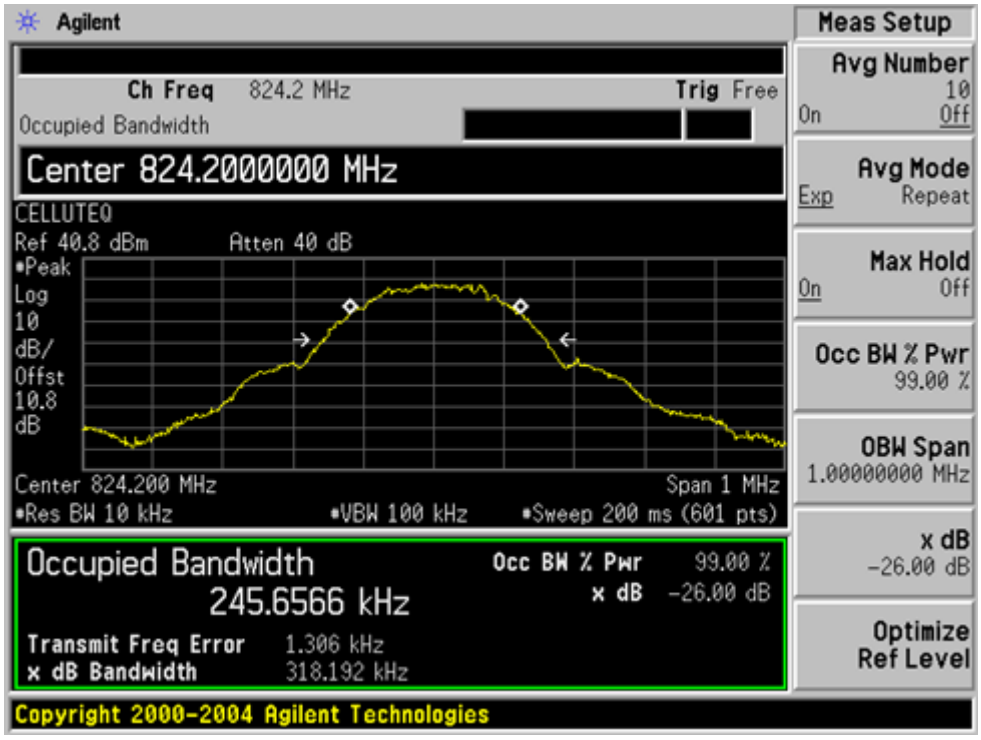


### 7.6.22 GSM 800MHz: Reverse (Uplink): Low Channel

**Input**

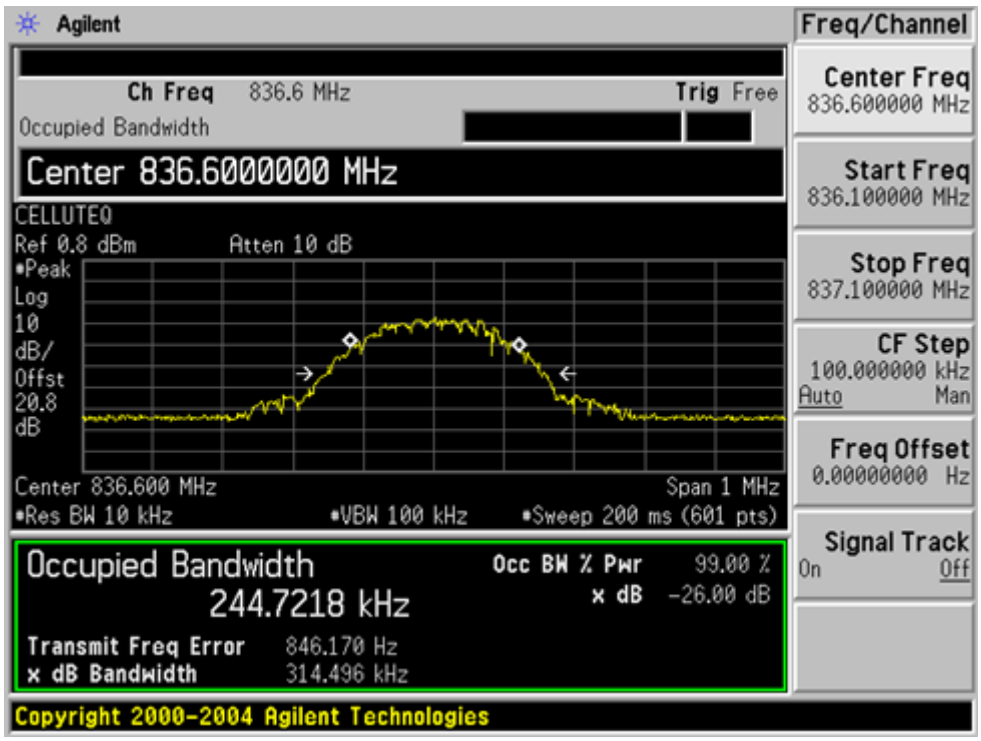



**Output**

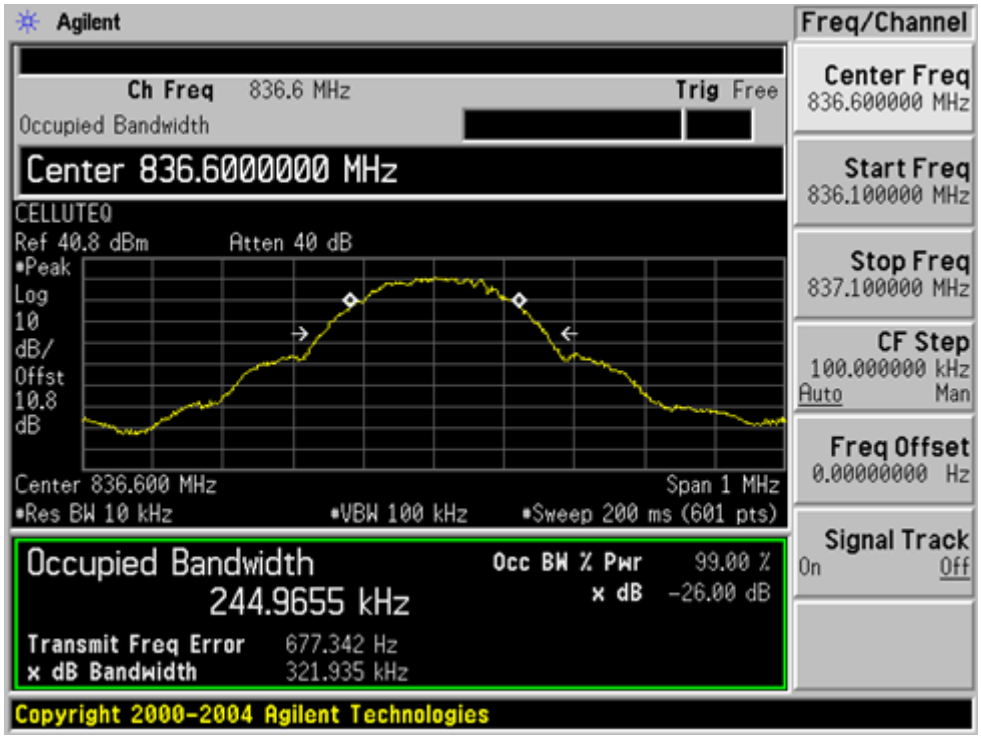


### 7.6.23 GSM 800MHz: Reverse (Uplink): Middle Channel

**Input**

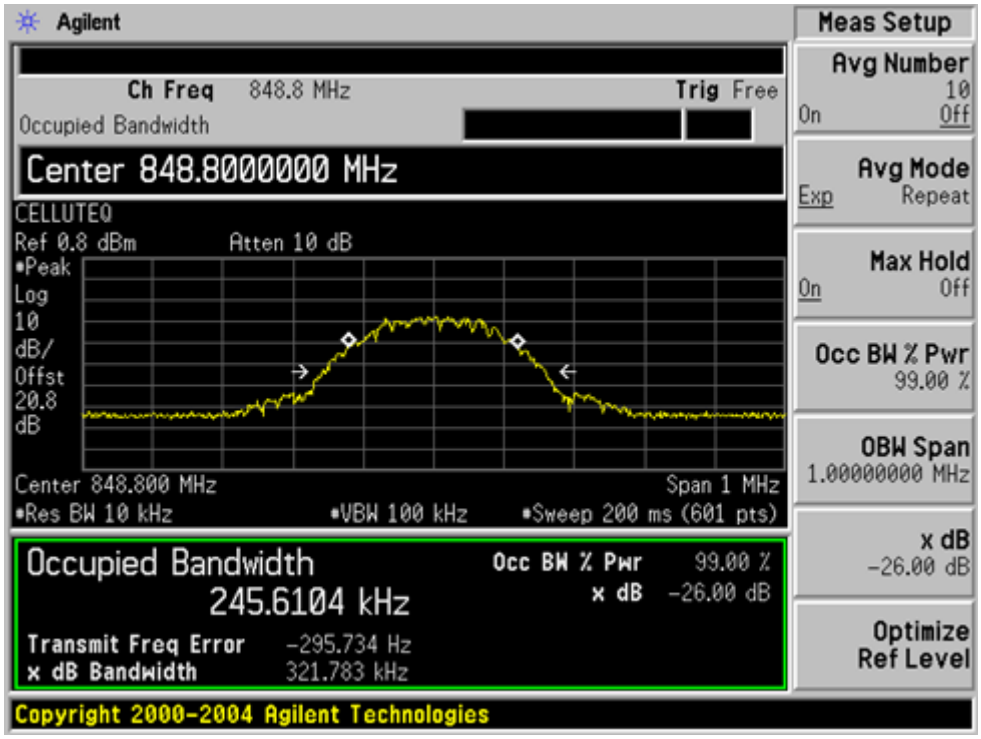



**Output**

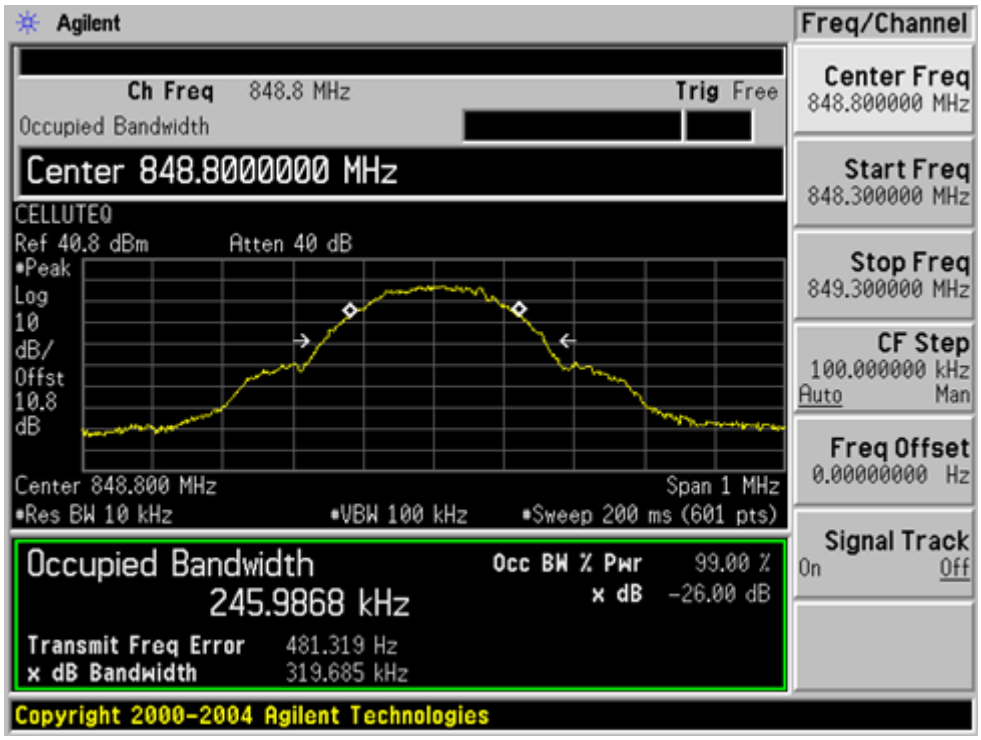


### 7.6.24 GSM 800MHz: Reverse (Uplink): High Channel

**Input**

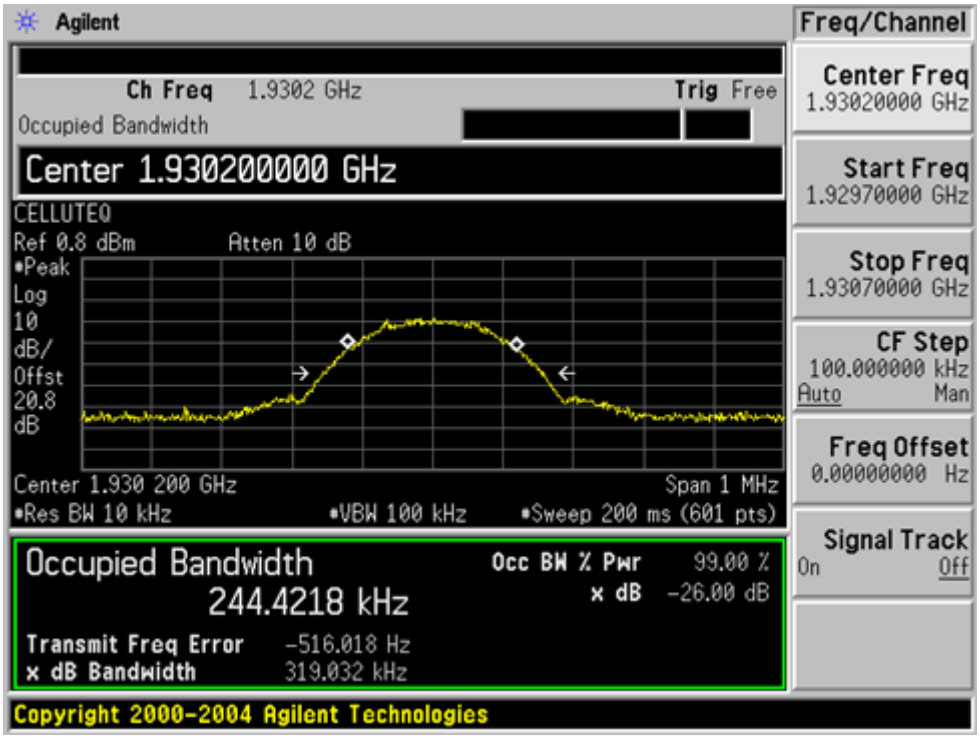



**Output**

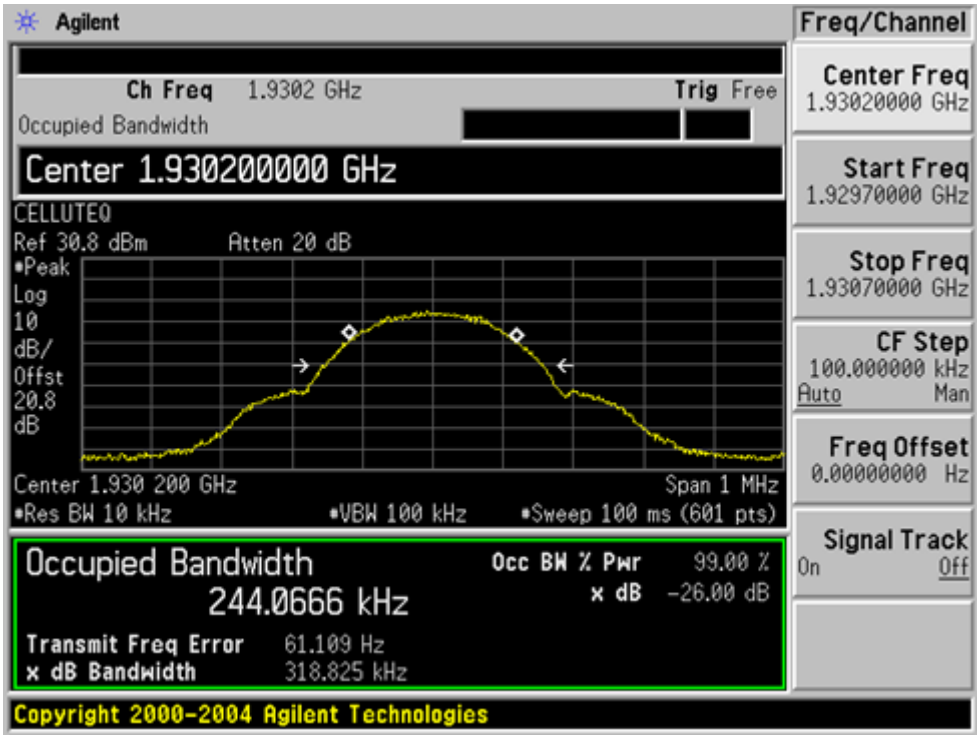


### 7.6.25 GSM 1900MHz: Forward (Downlink): Low Channel

**Input**

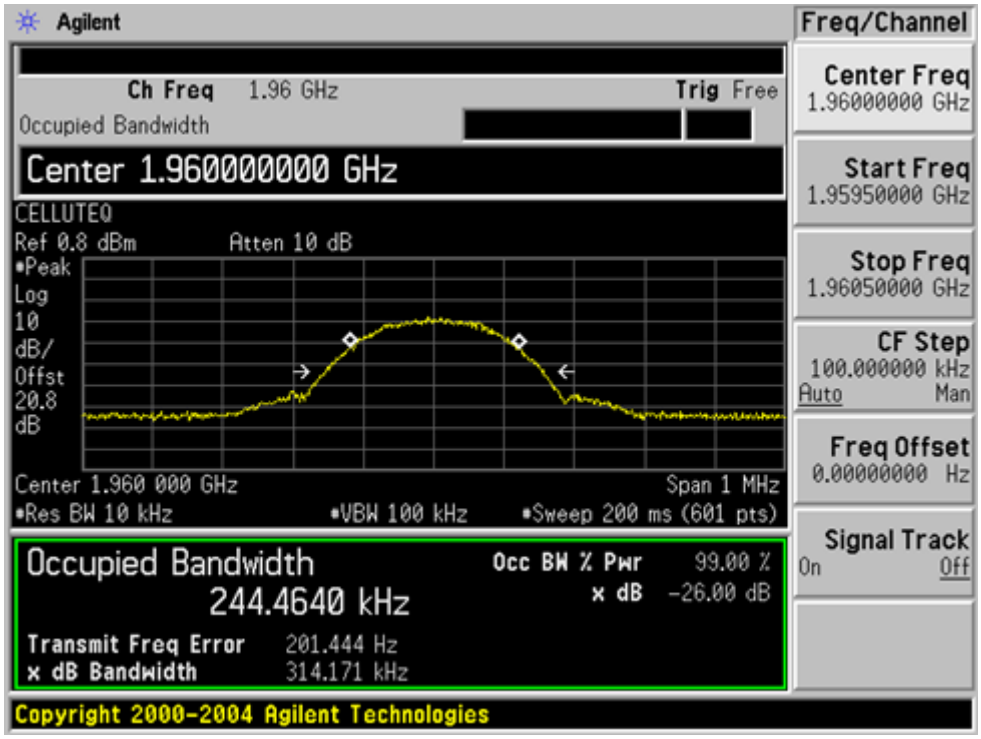



**Output**

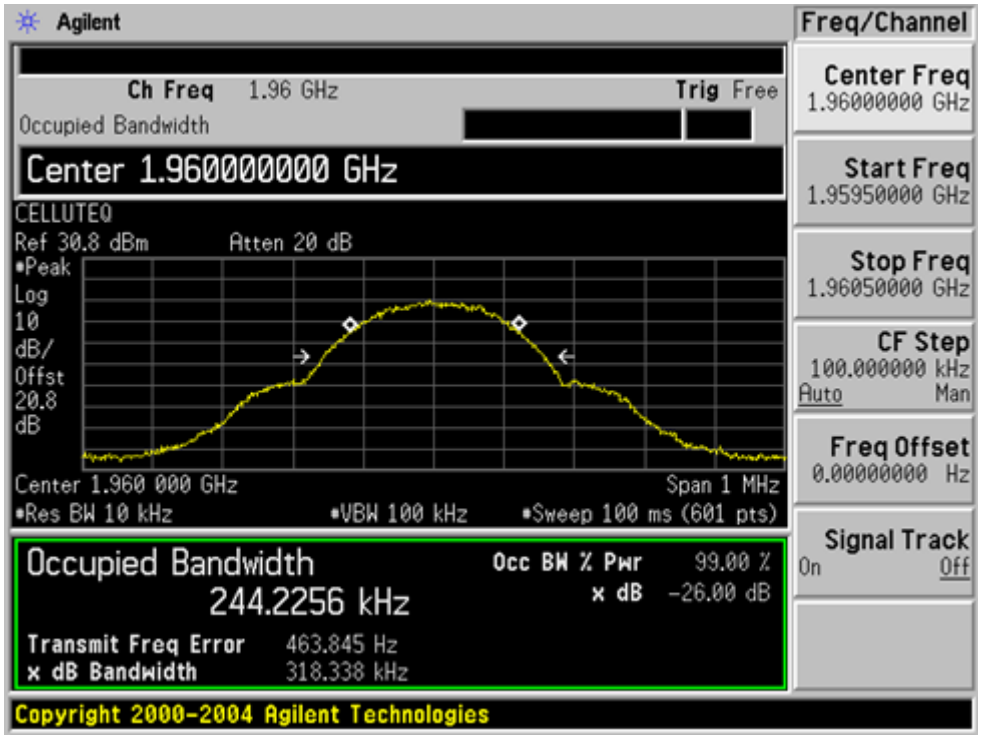


### 7.6.26 GSM 1900MHz: Forward (Downlink): Middle Channel

**Input**

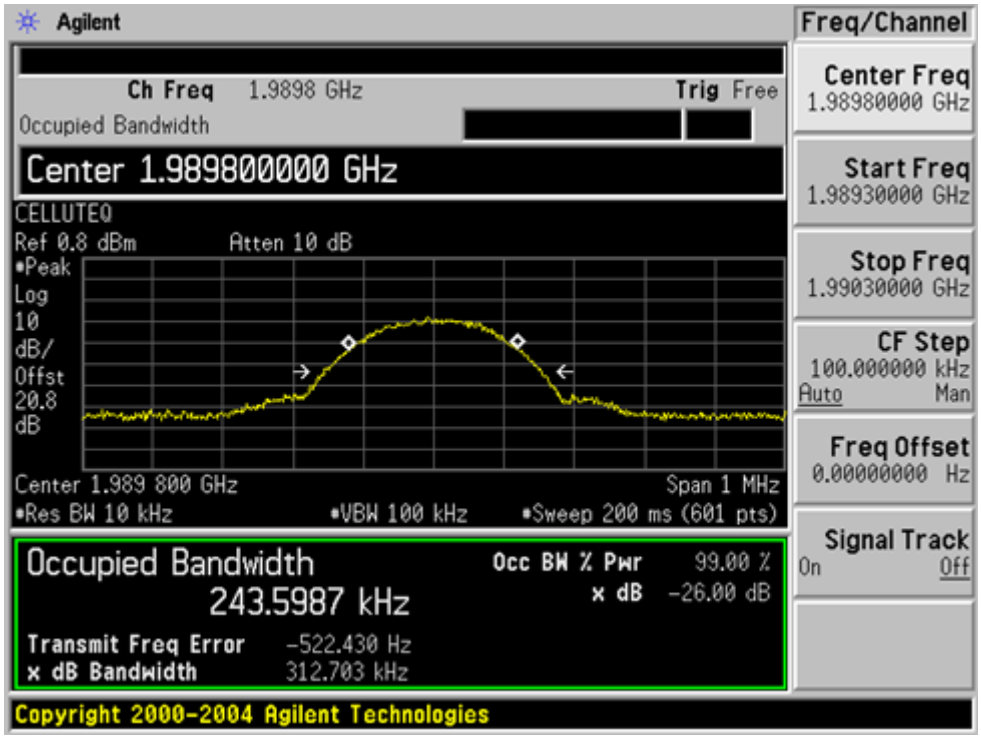



**Output**

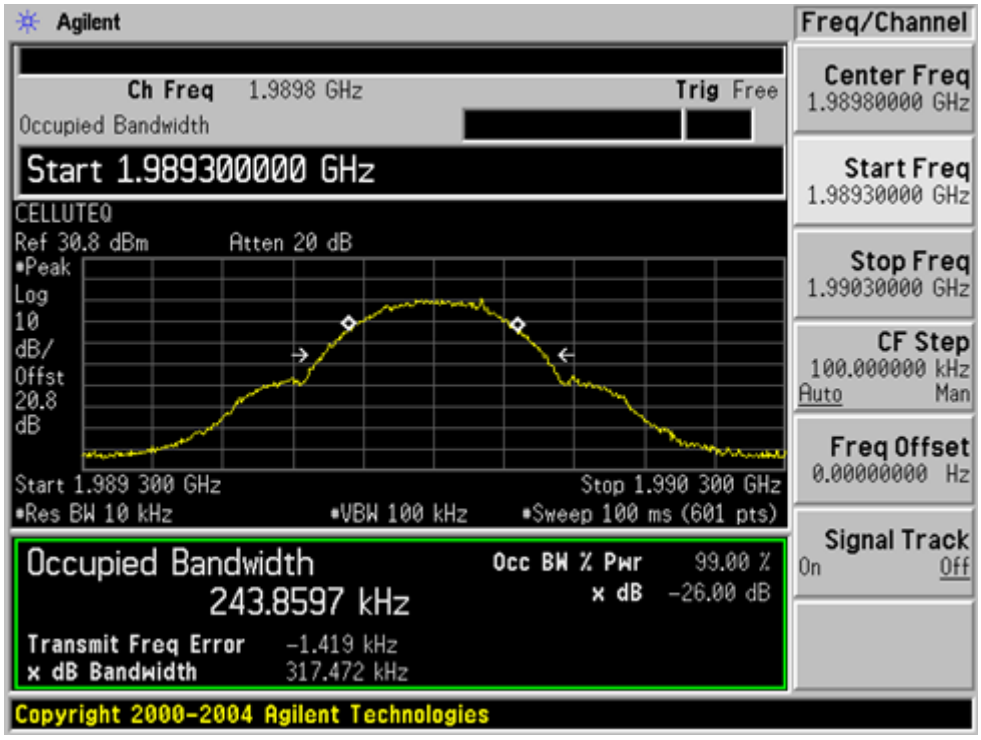


### 7.6.27 GSM 1900MHz: Forward (Downlink): High Channel

**Input**

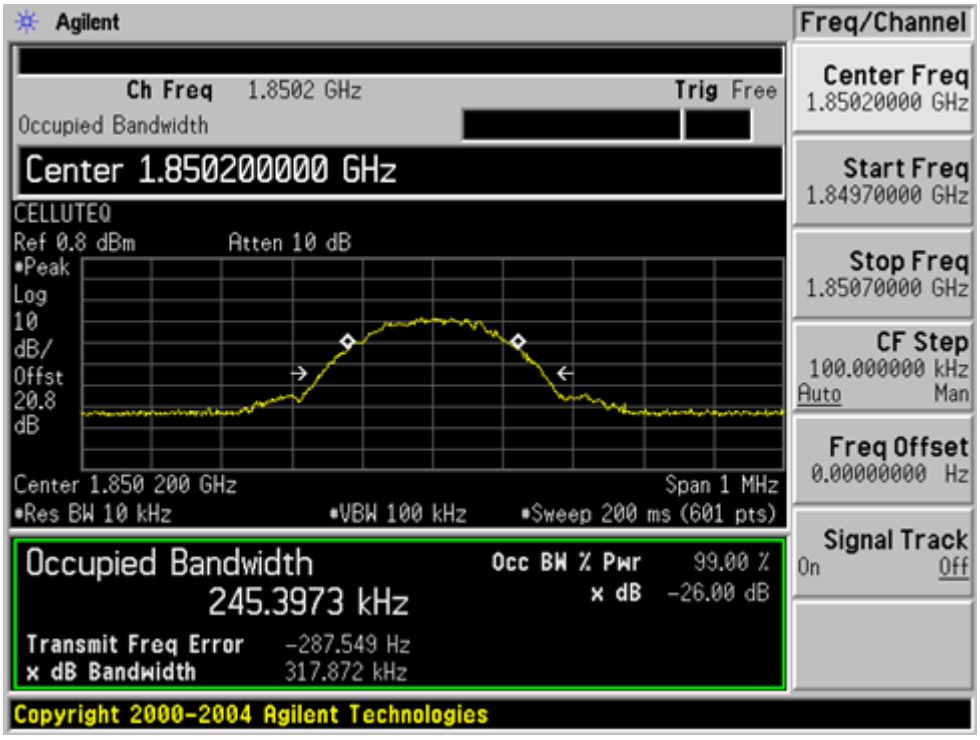



**Output**

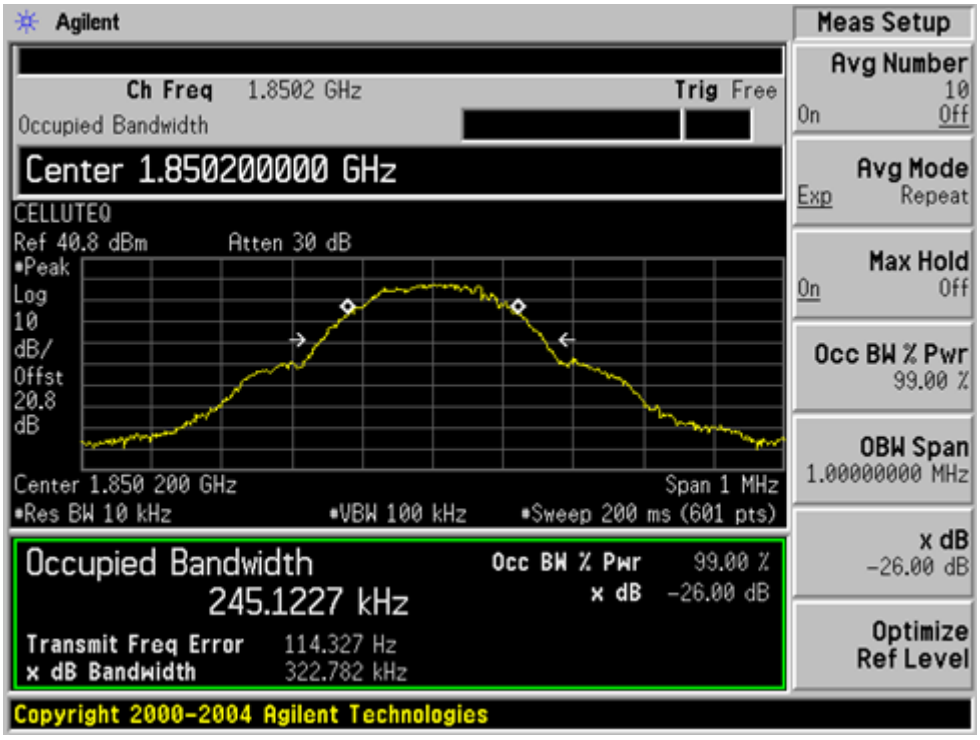


### 7.6.28 GSM 1900MHz: Reverse (Uplink): Low Channel

**Input**

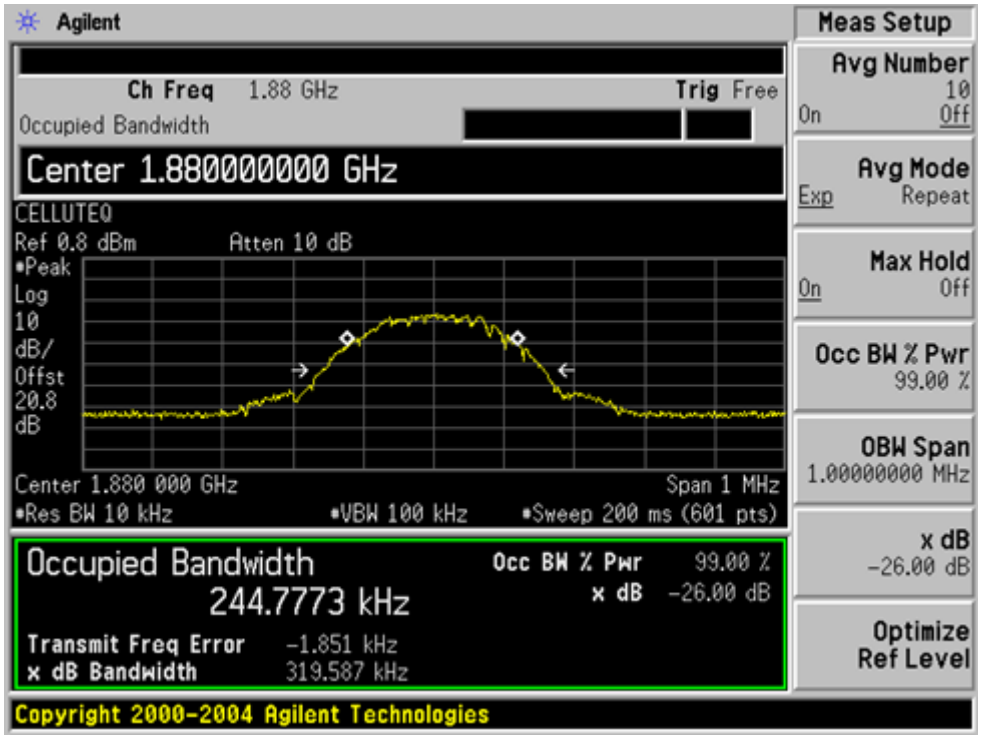



**Output**

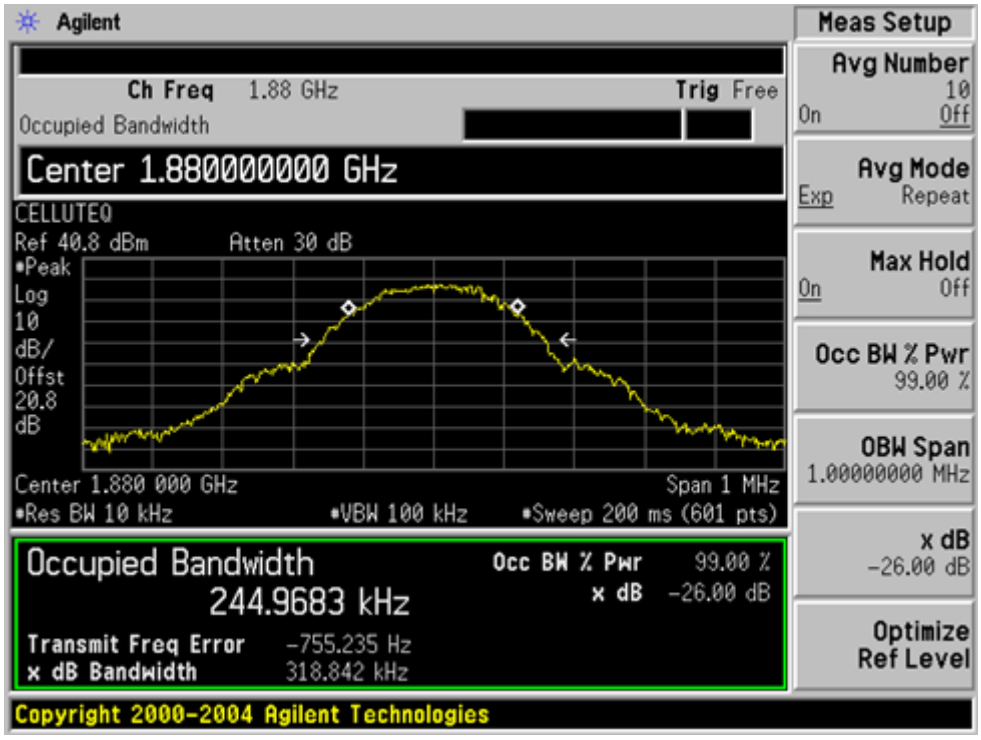


### 7.6.29 GSM 1900MHz: Reverse (Uplink): Middle Channel

**Input**

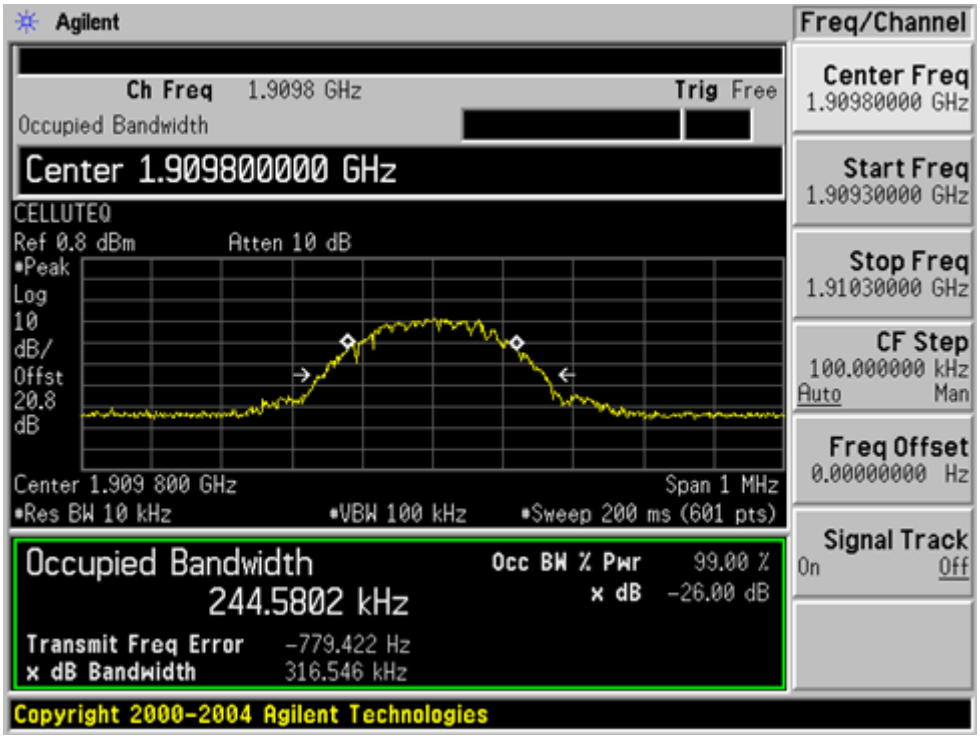



**Output**

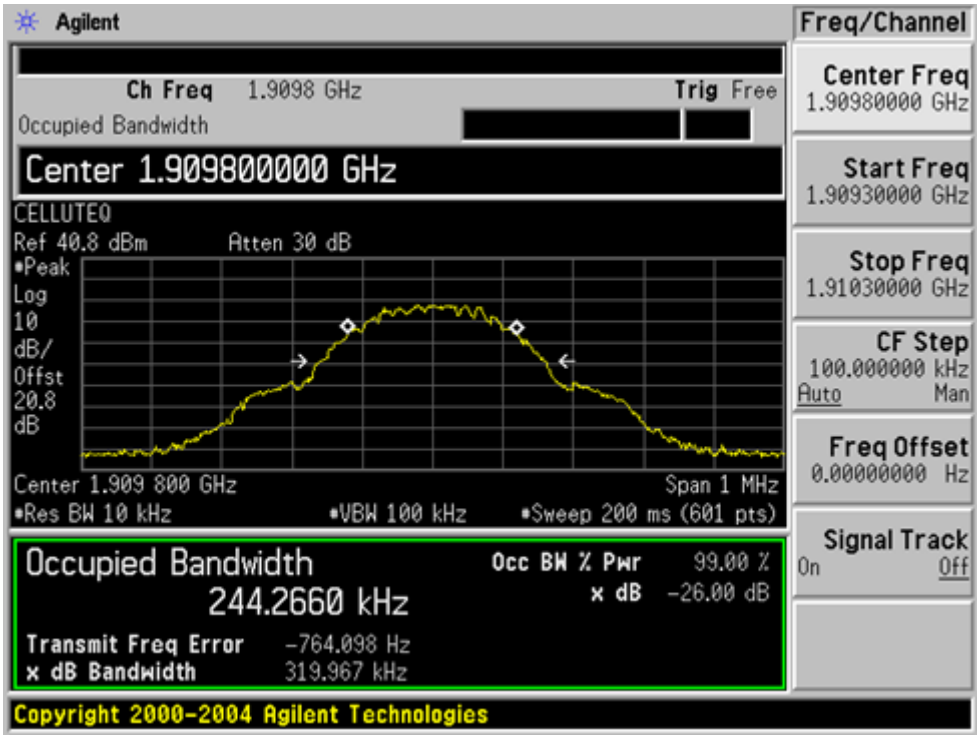


### 7.6.30 GSM 1900MHz: Reverse (Uplink): High Channel

**Input**

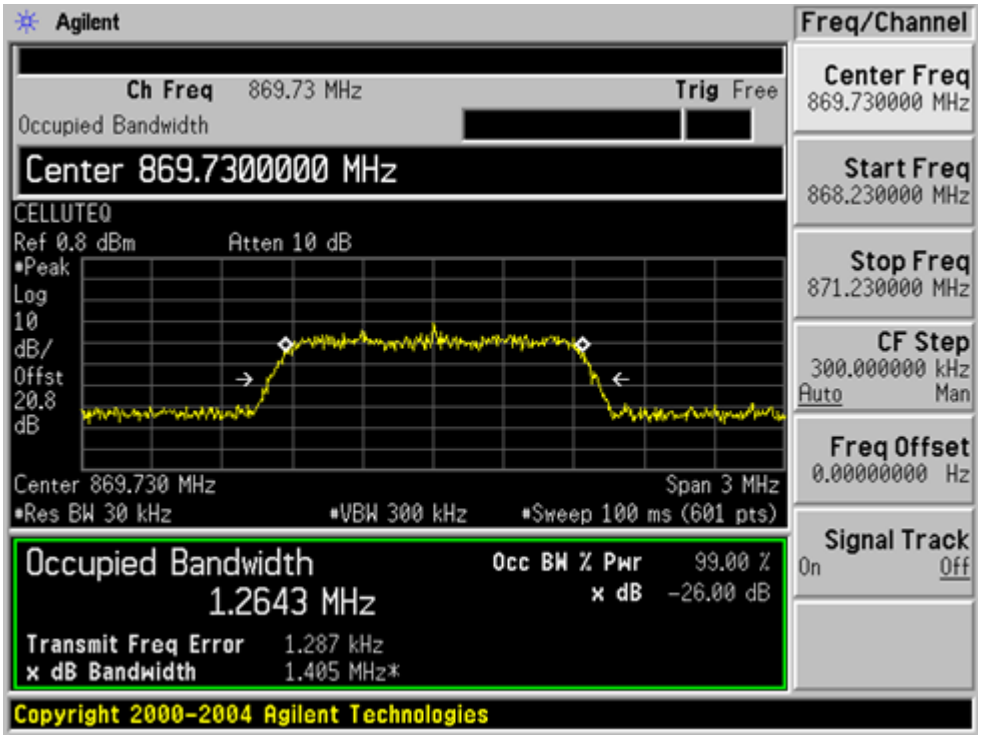



**Output**

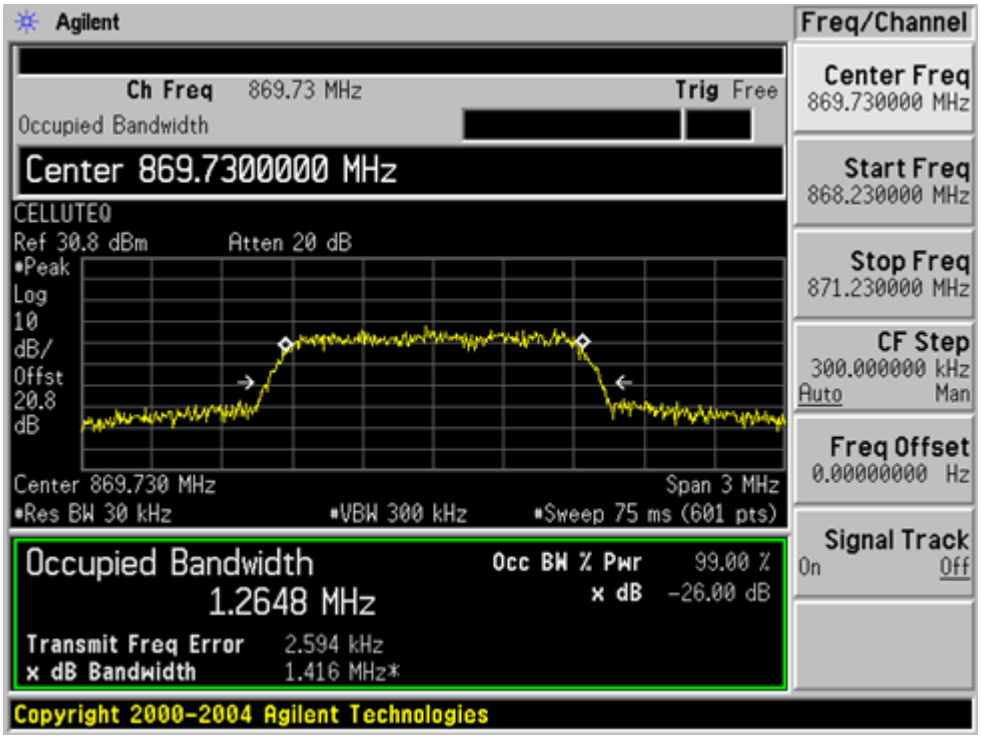


### 7.6.31 CDMA 800MHz: Forward (Downlink): Low Channel

**Input**

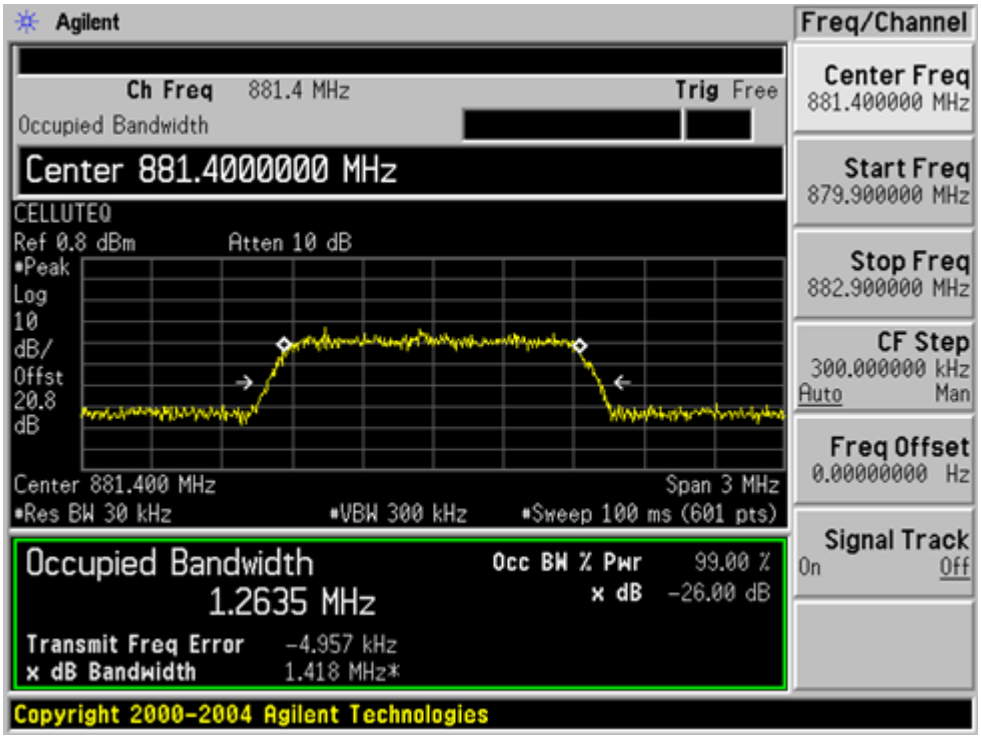



**Output**

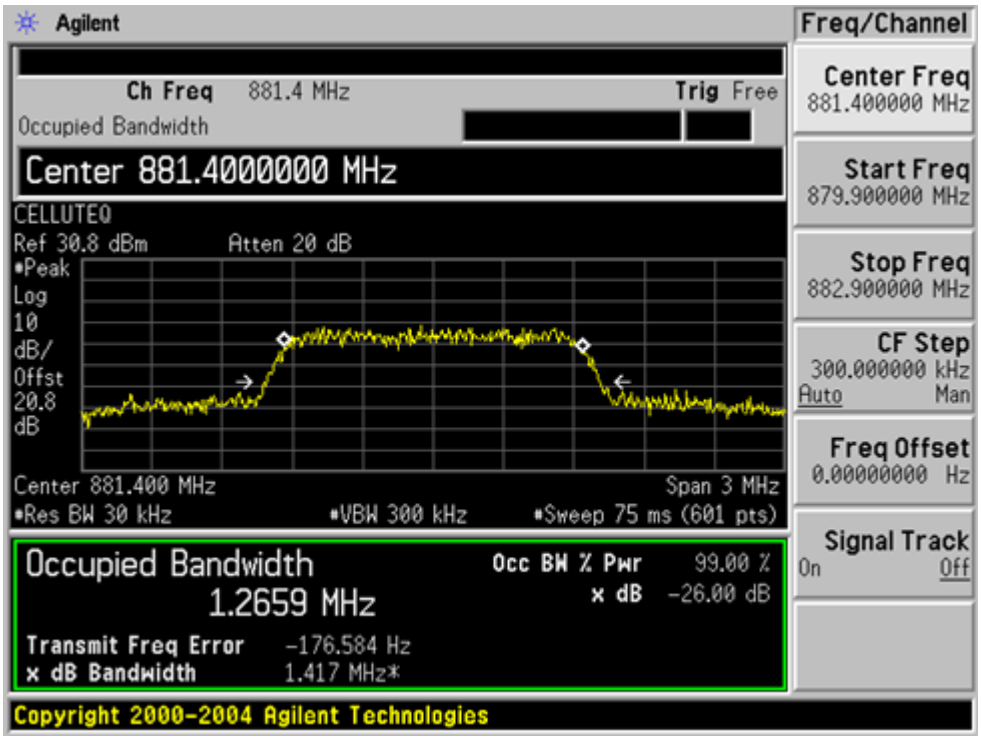


### 7.6.32 CDMA 800MHz: Forward (Downlink): Middle Channel

**Input**

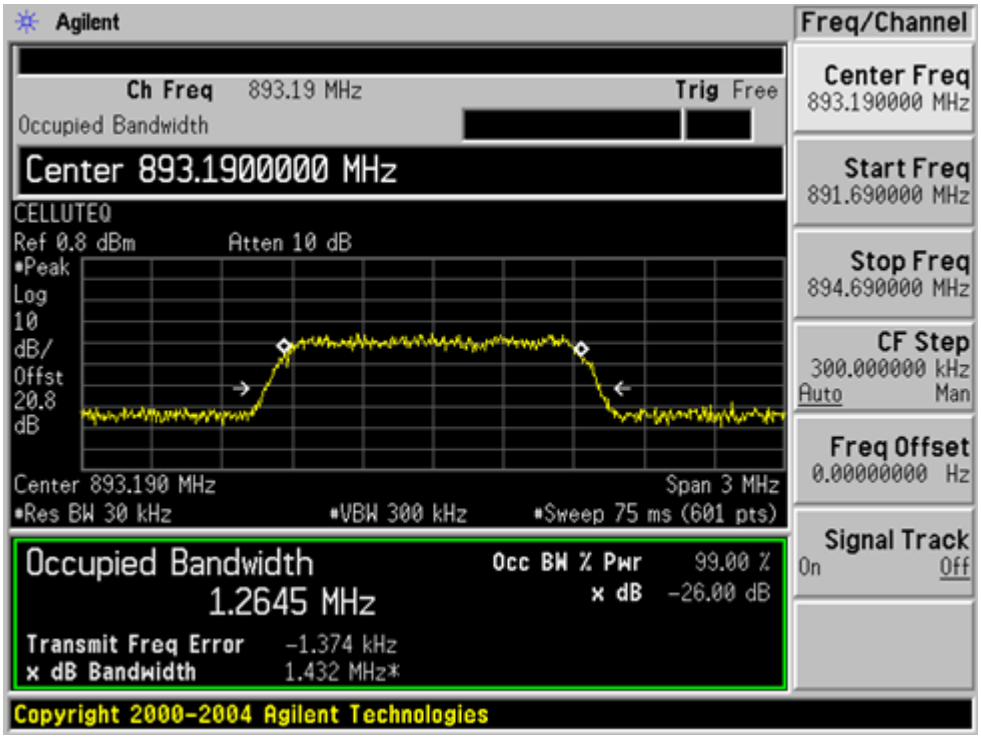



**Output**

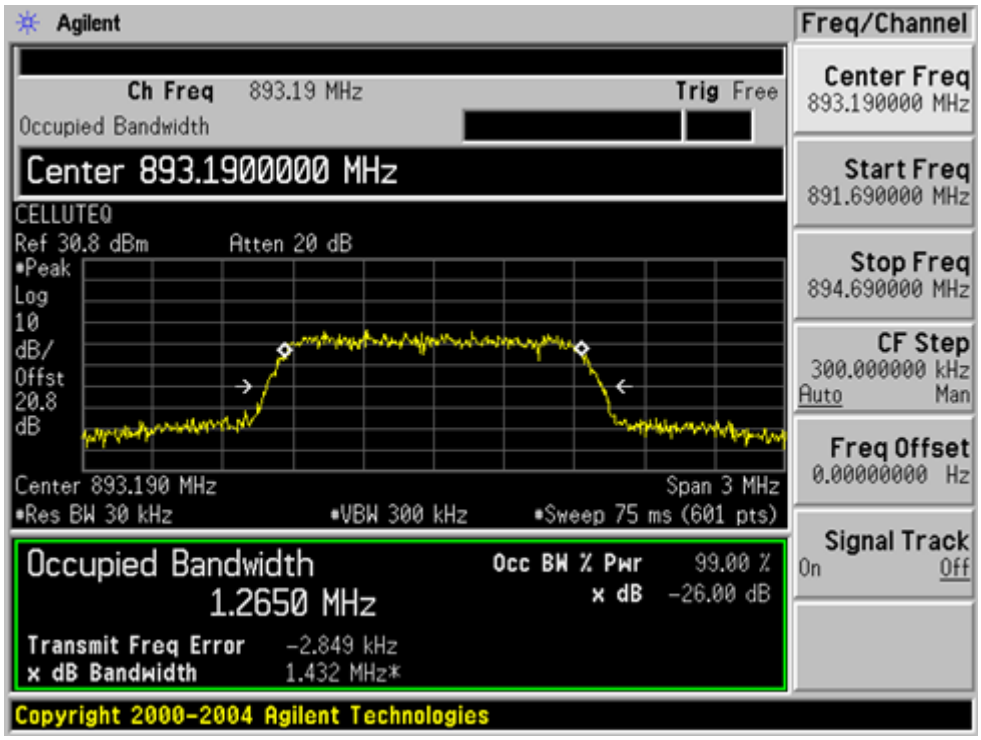


### 7.6.33 CDMA 800MHz: Forward (Downlink): High Channel

**Input**

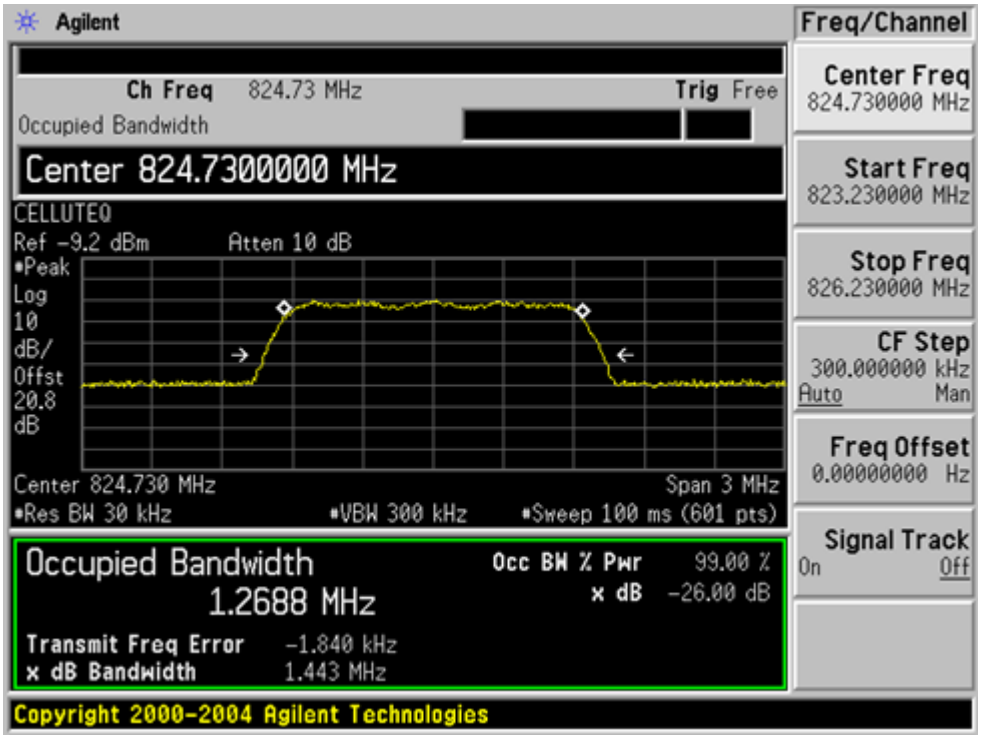



**Output**



### 7.6.34 CDMA 800MHz: Reverse (Uplink): Low Channel

**Input**




**Output**