



FCC PART 90  
TEST AND MEASUREMENT REPORT

For

**Wilson Electronics, Inc.**

3301 East Deseret Drive,  
St. George, Utah 84790, USA

**FCC ID: PWO274080**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Signal Booster
<b>Test Engineer:</b> Quinn Jiang	
<b>Report Number:</b> R1109072-90	
<b>Report Date:</b> 2012-05-21	
<b>Reviewed By:</b> EMC/RF Lead	
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\* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "\*" 8000

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**DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	R1109072-90	Original Report	2012-05-21

# 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: PWO274080, Model: 274080, which will henceforth be referred to as the EUT "Equipment under Test". The EUT is an in-building, bi-directional amplifier for enhancing the range of host devices (cell phones, etc.) used in Public Safety communications. The uplink frequency range is 806-824 MHz. The downlink frequency range is 851-869 MHz. The nominal gain may be adjusted by an external control to be a maximum of approximately 70 dB in both the uplink and downlink directions. The modulation types are FM, iDEN and GSM.

### Technical Specification

Modulation	Frequency (MHz)	
	Downlink	Uplink
FM	851-869	806-824
iDEN	851-869	806-824
TDMA/GSM	851-869	806-824

## 1.2 Mechanical Description

The EUT dimension is approximately 13.5cm (L) x 10cm (W) x 3.5 cm (H) and weighs approximately 577g.

*The test data gathered are from typical production sample, serial number: 80408099999876543, assigned by Wilson Electronic, Inc.*

## 1.3 Objective

This type approval report is prepared on behalf of *Wilson Electronics, Inc.* in accordance with Part 90 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, Emission Mask, and conducted and radiated margin.

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

No Related Submittals

## 1.5 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 90 Private Land Mobile Radio Services

Applicable Standards: TIA EIA 98-C, 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.

## 1.6 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.

## 1.7 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

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 and Software List and Details

Manufacturer	Description	Model	Serial Number
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309

### 2.5 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Wilson Electronics, Inc.	Main PCB Board	804099 REV H1	-

### 2.6 Interface Ports and Cables

Cable Description	Length (m)	To	From
RF Cable	< 1	Signal Generator	EUT
RF Cable	< 1	Spectrum Analyzer	EUT

### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§2.1046; §90.205	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A <sup>1</sup>
§2.1049; § 90.209	Occupied Bandwidth	Compliant
§2.1049; §90.210, §90.691	Emission Mask	Compliant
§ 2.1051 § 90.210; § 90.669	Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §90.210	Field Strength of Spurious Radiation	Compliant
§2.1055; §90.213	Frequency Stability	N/A <sup>1</sup>
§2.1091	RF Exposure	Compliant <sup>2</sup>

Note: N/A<sup>1</sup>, the EUT is an amplifier; there is no oscillator circuit in the EUT, and there are no modulation characteristics.  
Compliant<sup>2</sup>: Please refer to the RF exposure evaluation report provided by the manufacturer.



## 4 FCC §2.1046 & §90.205 – RF OUTPUT POWER

### 4.1 Applicable Standard

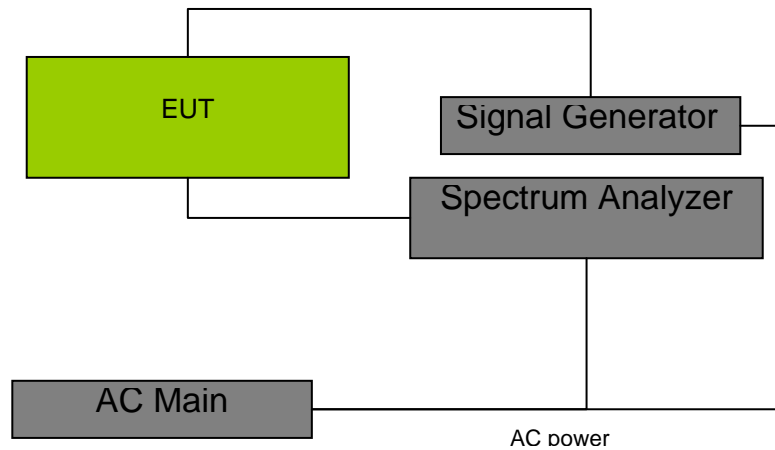
According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

### 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 Setup Block Diagram



### 4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

## 4.5 Test Environmental Conditions

<b>Temperature:</b>	22-25°C
<b>Relative Humidity:</b>	40-50 %
<b>ATM Pressure:</b>	101-102kPa

The testing was performed by Quinn Jiang from 2011-09-20 to 2011-09-21 in RF Site.

## 4.6 Test Results

Please refer to the following tables.

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
FM Voice: 12.5 kHz channel Spacing	851-869 Downlink	Low	851	-43.4	26.36
		Middle	860	-47.4	26.62
		High	869	-44.4	26.91
	806-824 Uplink	Low	806	-34.4	34.80
		Middle	815	-37.4	34.60
		High	824	-33.4	34.70
FM Voice: 25 kHz channel Spacing	851-869 Downlink	Low	851	-43.4	26.36
		Middle	860	-47.4	26.63
		High	869	-44.4	26.91
	806-824 Uplink	Low	806	-34.4	34.78
		Middle	815	-37.4	34.57
		High	824	-33.4	34.67
FM Data: 12.5 kHz Channel Spacing	851-869 Downlink	Low	851	-43.4	26.35
		Middle	860	-47.4	26.62
		High	869	-44.4	26.89
	806-824 Uplink	Low	806	-34.4	34.77
		Middle	815	-37.4	34.55
		High	824	-33.4	34.65
FM Data: 25 kHz channel Spacing	851-869 Downlink	Low	851	-43.4	26.34
		Middle	860	-47.4	26.61
		High	869	-44.4	26.87
	806-824 Uplink	Low	806	-34.4	34.76
		Middle	815	-37.4	34.53
		High	824	-33.4	34.62

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
iDEN	851-869 Downlink	Low	851	-46.4	26.29
		Middle	860	-50.4	26.59
		High	869	-47.4	26.67
	806-824 Uplink	Low	806	-38.4	34.54
		Middle	815	-40.4	34.61
		High	824	-36.4	34.70
GSM	851-869 Downlink	Low	851	-46.4	26.23
		Middle	860	-50.4	26.42
		High	869	-47.4	26.72
	806-824 Uplink	Low	806	-38.4	34.56
		Middle	815	-40.4	34.69
		High	824	-36.4	34.74

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## **5 FCC §2.1047 - MODULATION CHARACTERISTIC**

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### **5.1 Applicable Standard**

According to FCC §2.1047(d) and Part 90, the EUT is an amplifier and there is no modulating/or limiting circuit, therefore modulation characteristic is not presented.

### **5.2 Test Result**

N/A, the EUT is an amplifier; there is no oscillator circuit in the EUT,

## 6 FCC §2.1049 & §90.209 – OCCUPIED BANDWIDTH

### 6.1 Applicable Standard

Requirements: FCC §2.1049, §90.209.

### 6.2 Test Procedure

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

According to the FCC 2-11-04/EAB/RF, Input and output signals were compared to verify that there was no any degradation to the signal due to amplification and conversion from the repeater using an RBW of 300 Hz or 1% of the emission bandwidth. Then the 2 dB & 99% bandwidth was recorded.

### 6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

### 6.4 Test Environmental Conditions

<b>Temperature:</b>	22-25°C
<b>Relative Humidity:</b>	40-50 %
<b>ATM Pressure:</b>	101-102kPa

*The testing was performed by Quinn Jiang from 2011-09-29 to 2011-10-01 in RF Site.*

### 6.5 Test Results

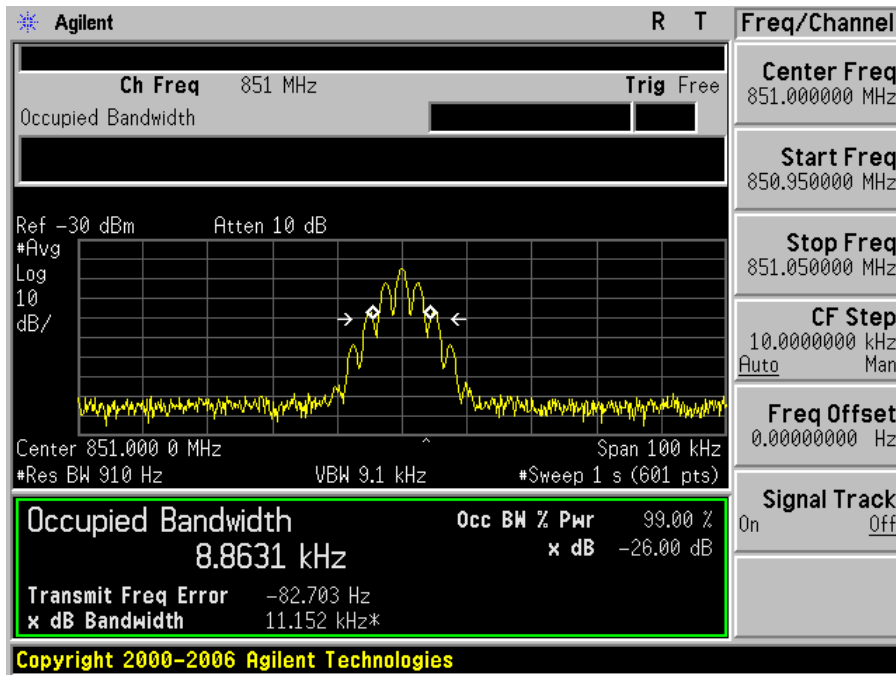
Please refer to the following table and plots.

Mode		Channel	Frequency (MHz)	26 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (kHz)
FM Voice: 12.5 KHz channel Spacing	851-869 Downlink	Low	851	11.146	8.8545
		Middle	860	11.151	8.8397
		High	869	11.147	8.8439
	806-824 Uplink	Low	806	11.160	8.9115
		Middle	815	11.157	8.9034
		High	824	11.158	8.9010
FM Voice: 25 KHz channel Spacing	851-869 Downlink	Low	851	16.571	14.4072
		Middle	860	16.565	14.4059
		High	869	16.566	14.4046
	806-824 Uplink	Low	806	16.570	14.4137
		Middle	815	16.576	14.4118
		High	824	16.574	14.4131
FM Data: 12.5 KHz Channel Spacing	851-869 Downlink	Low	851	10.613	8.3667
		Middle	860	10.617	8.3682
		High	869	10.616	8.3678
	806-824 Uplink	Low	806	10.613	8.3697
		Middle	815	10.616	8.3708
		High	824	10.161	8.3696
FM data: 25 KHz channel Spacing	851-869 Downlink	Low	851	18.325	14.5526
		Middle	860	18.325	14.5548
		High	869	18.325	14.5531
	806-824 Uplink	Low	806	18.335	14.5549
		Middle	815	18.344	14.5546
		High	824	18.320	14.5570
iDEN	851-869 Downlink	Low	851	18.193	16.2501
		Middle	860	18.484	16.2385
		High	869	18.257	16.3962
	806-824 Uplink	Low	806	18.485	16.2559
		Middle	815	18.370	16.2425
		High	824	18.450	16.3265
GSM	851-869 Downlink	Low	851	25.611	22.6237
		Middle	860	25.432	22.8792
		High	869	25.201	22.7061
	806-824 Uplink	Low	806	25.409	22.7533
		Middle	815	25.758	22.6785
		High	824	25.503	22.8579

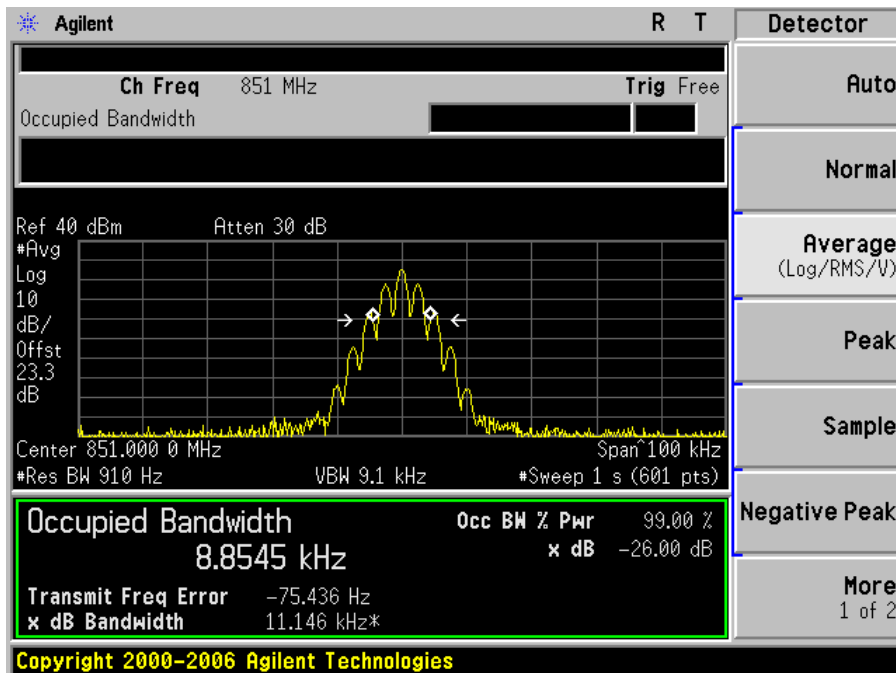
**Downlink: FM Voice, 12.5 kHz Channel Spacing**

Low Channel: 851 MHz

Input

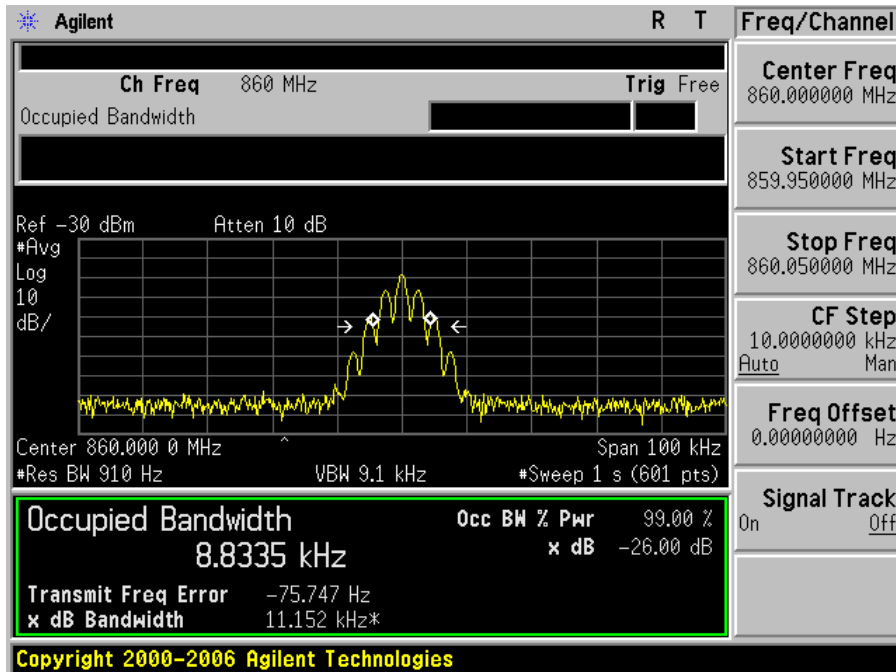


Output

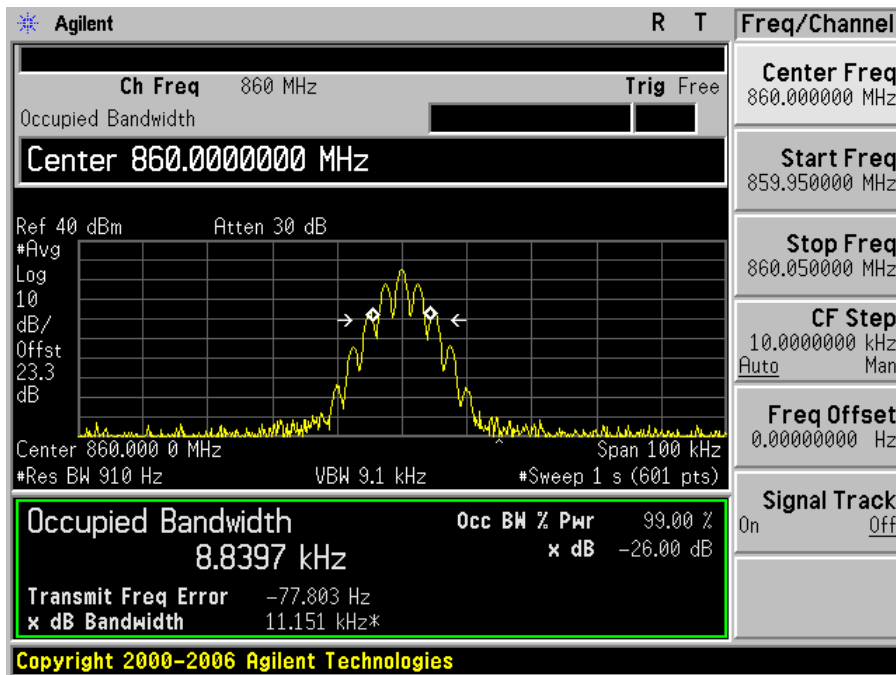


Middle Channel: 860 MHz

Input



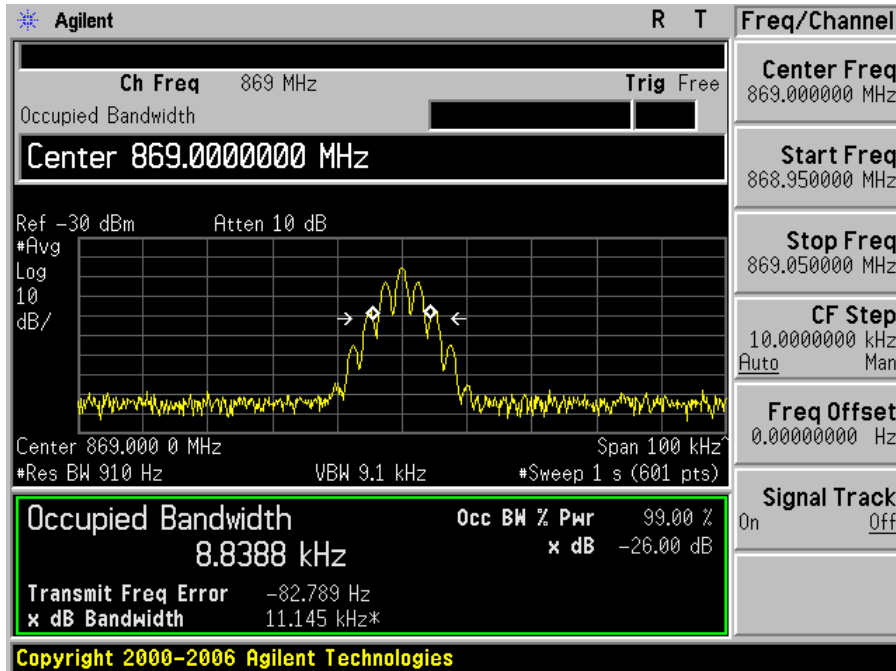
Output



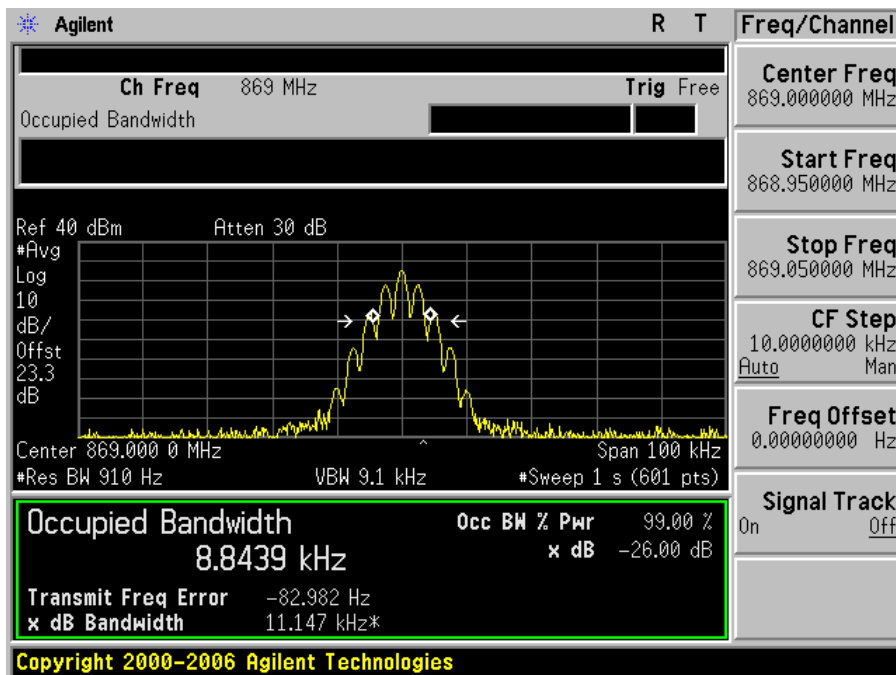


High Channel: 869MHz

Input



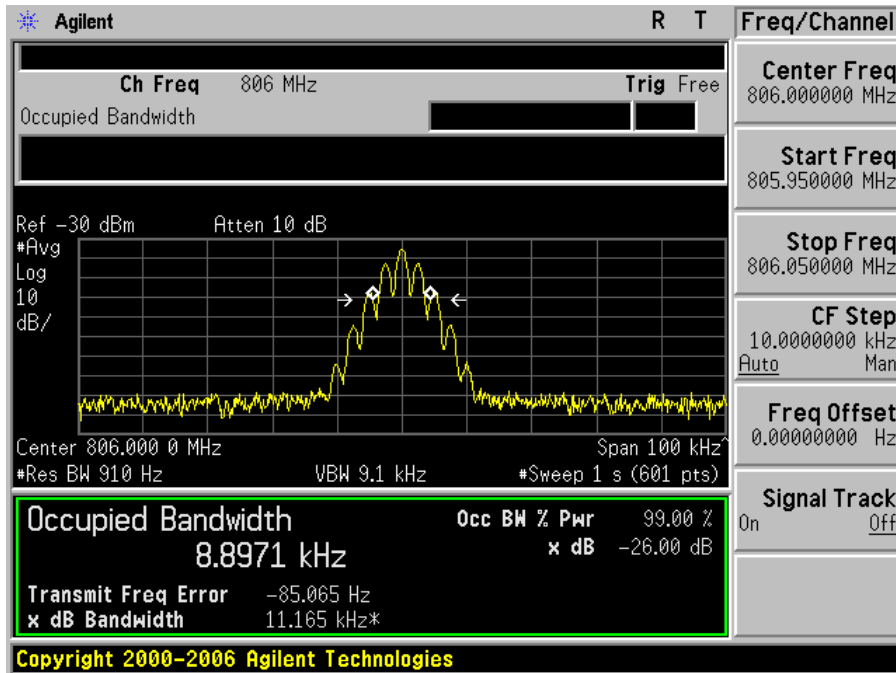
Output



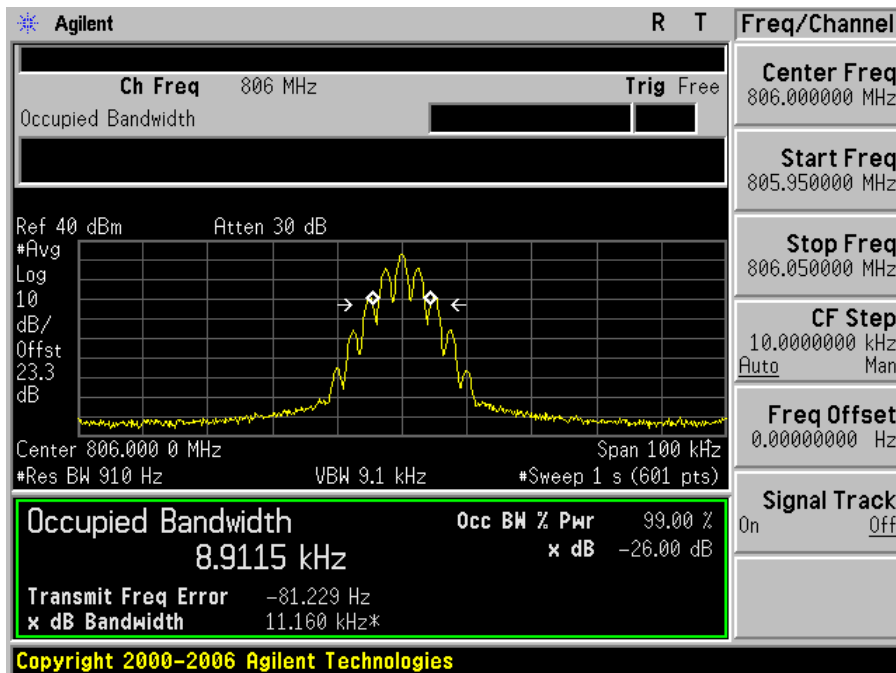
**Uplink: FM Voice, 12.5 kHz Channel Spacing**

Low Channel: 806 MHz

Input

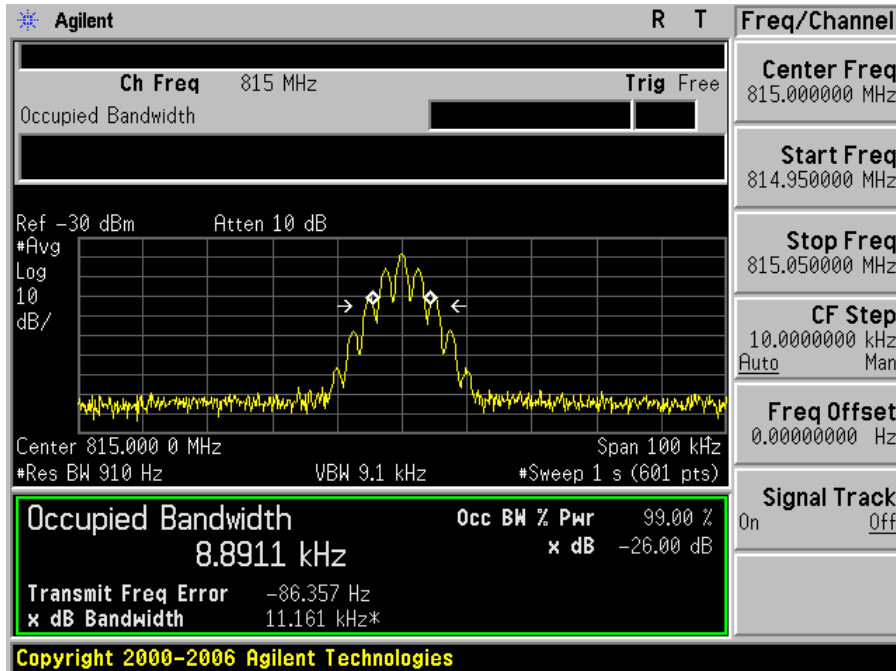


Output

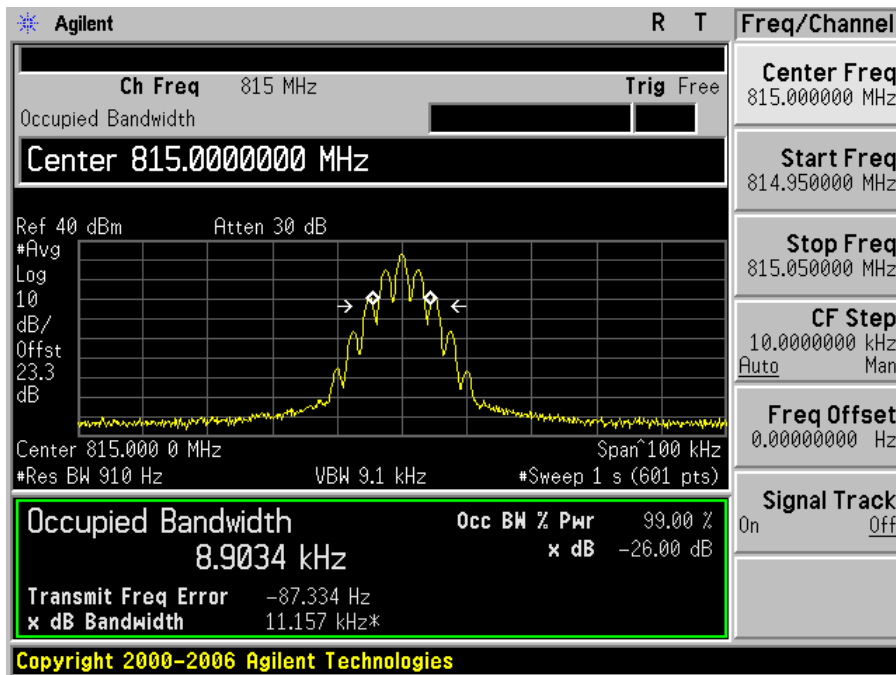


Middle Channel: 815 MHz

Input

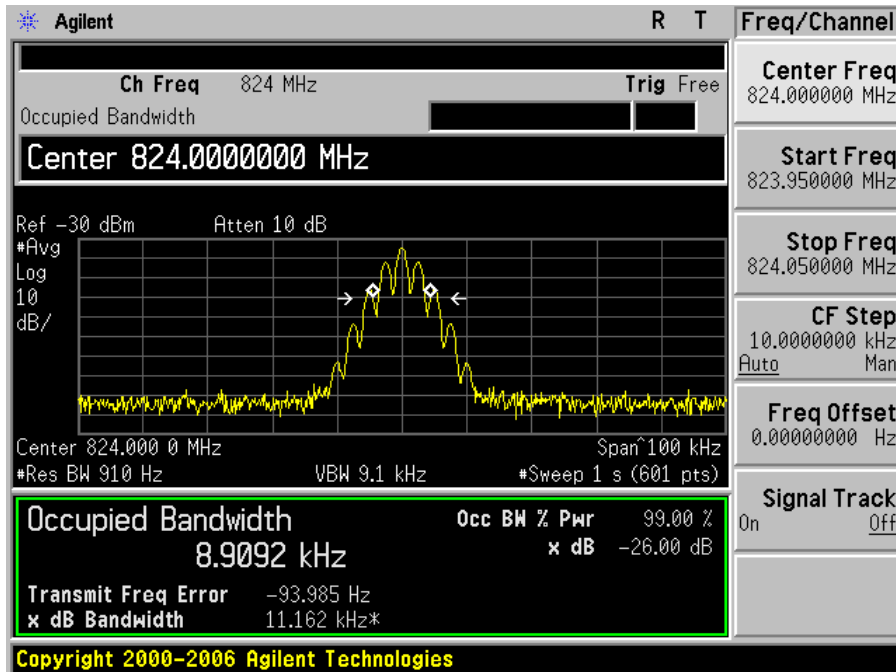


Output

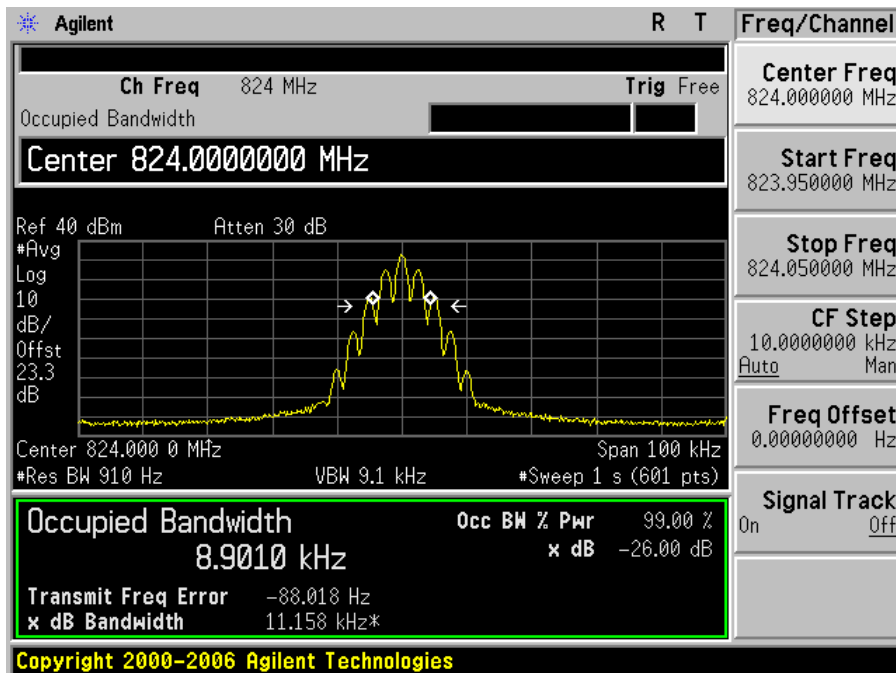


High Channel: 824 MHz

Input



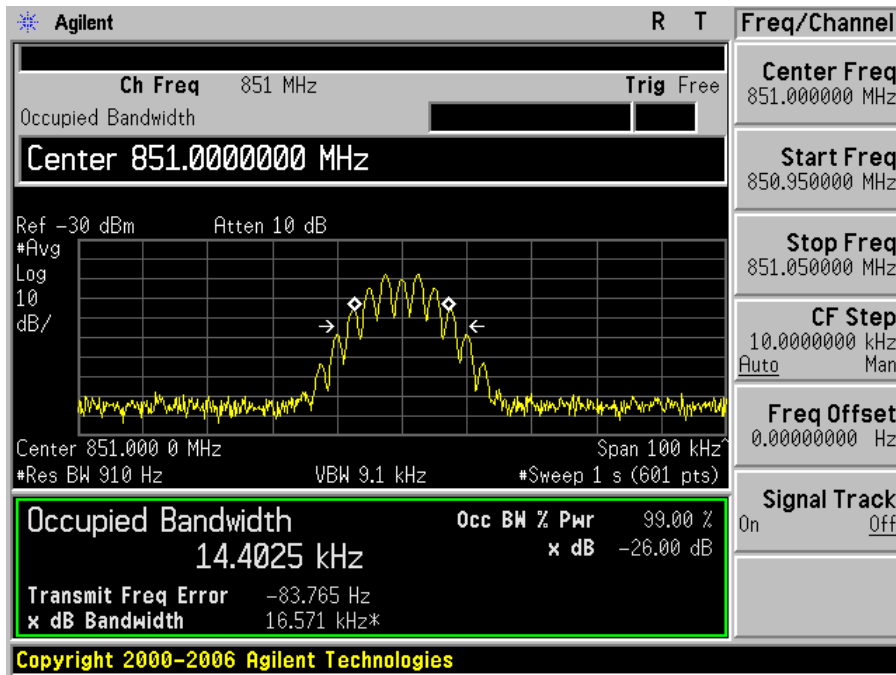
Output



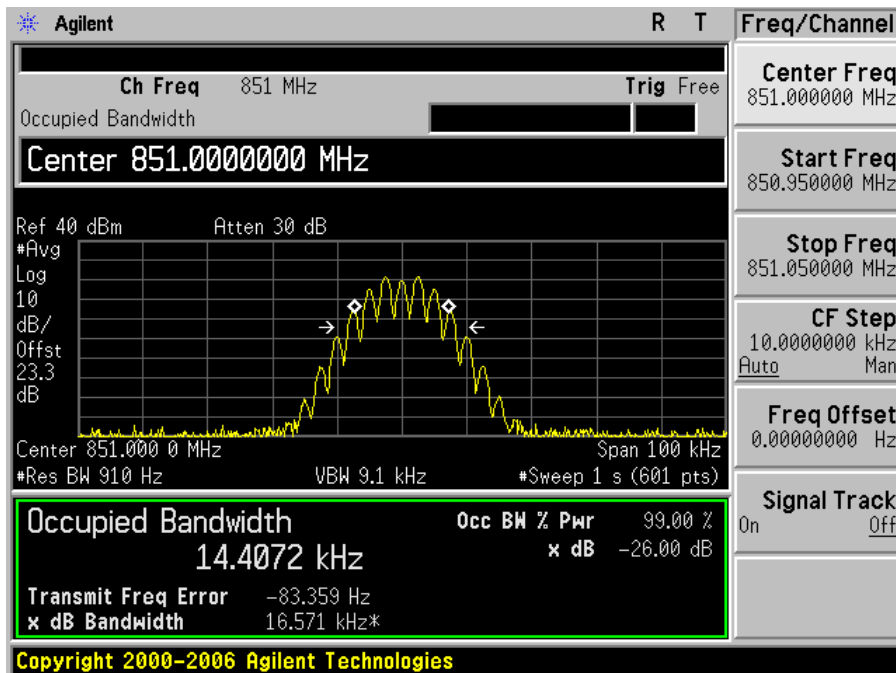
**Downlink: FM Voice, 25 kHz Channel Spacing**

Low Channel: 851 MHz

Input

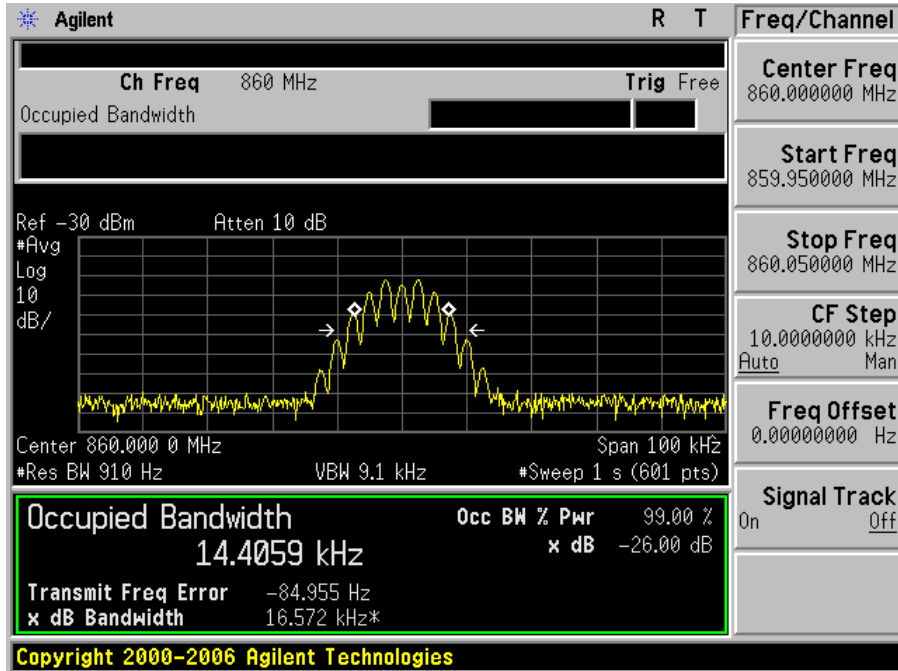


Output

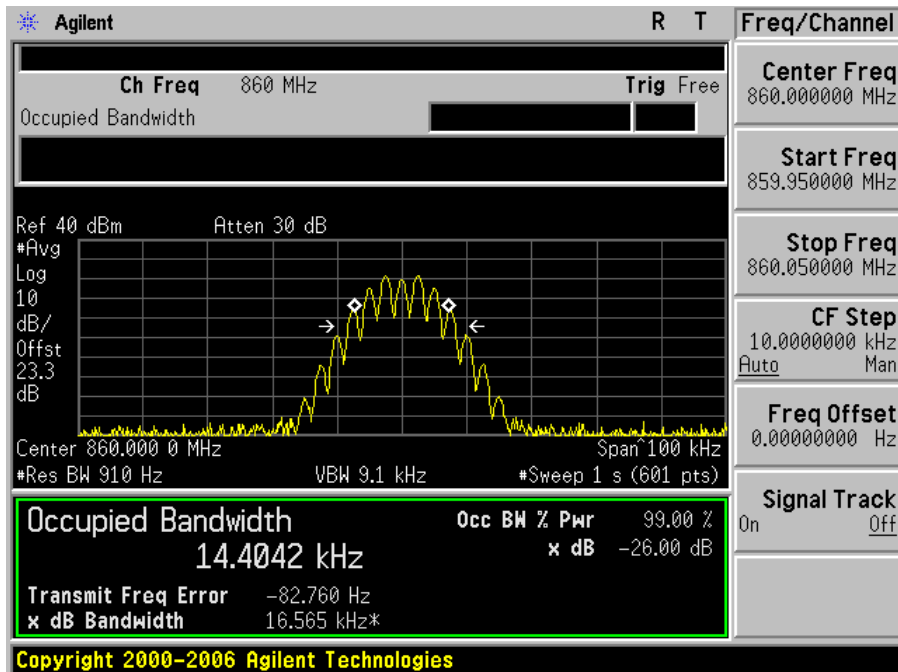


Middle Channel: 860 MHz

Input

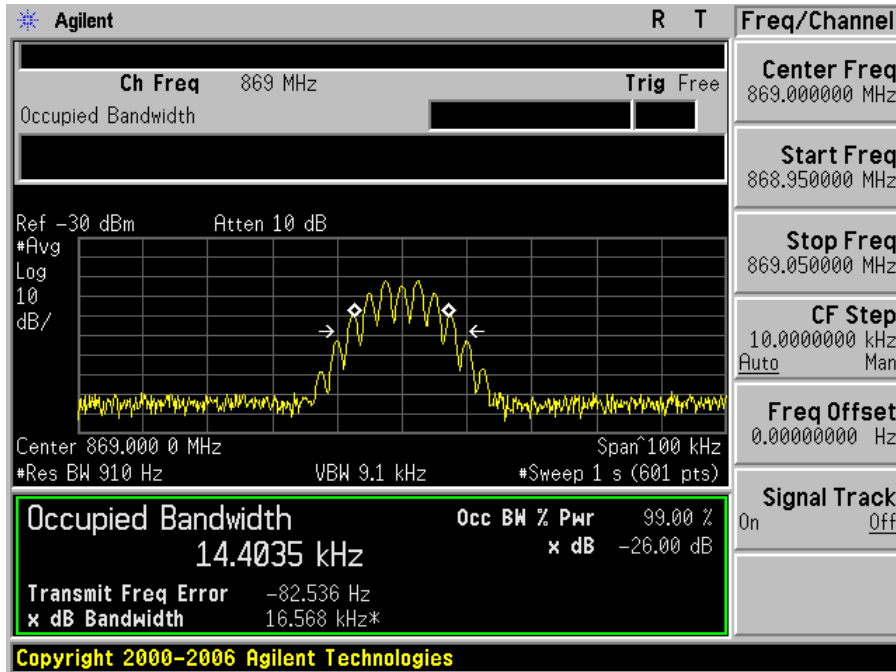


Output

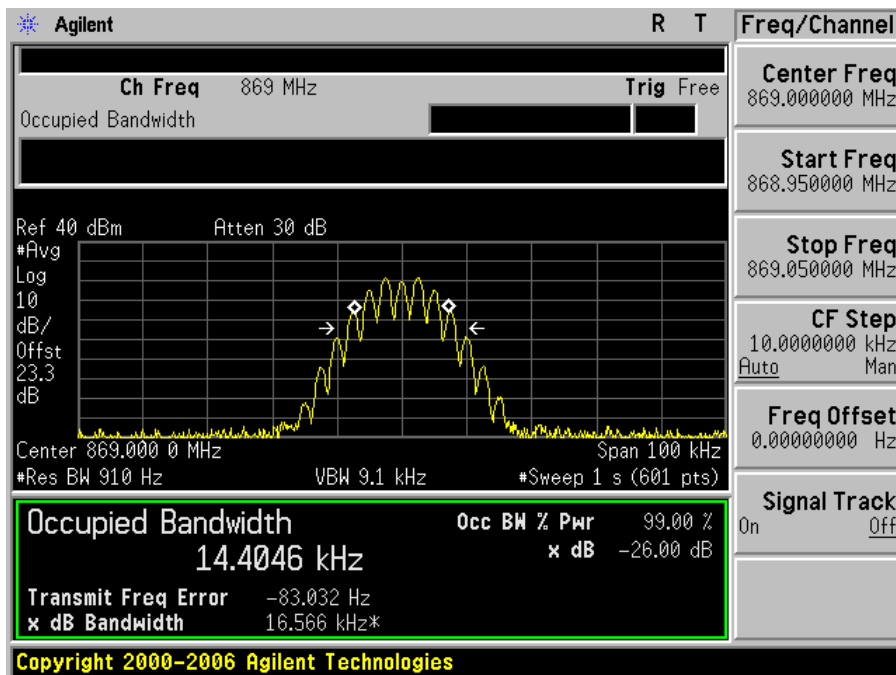


High Channel: 869MHz

Input



Output

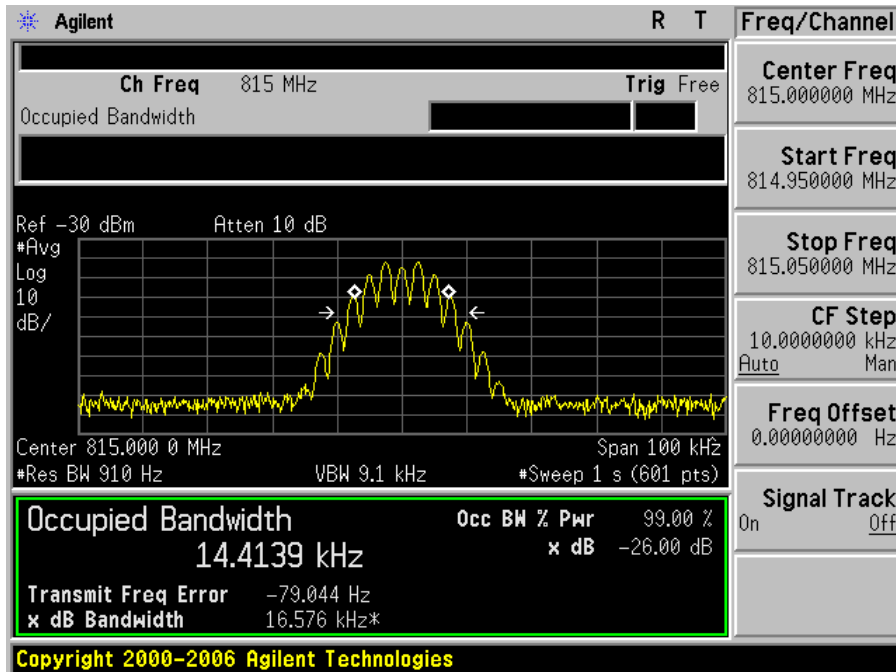




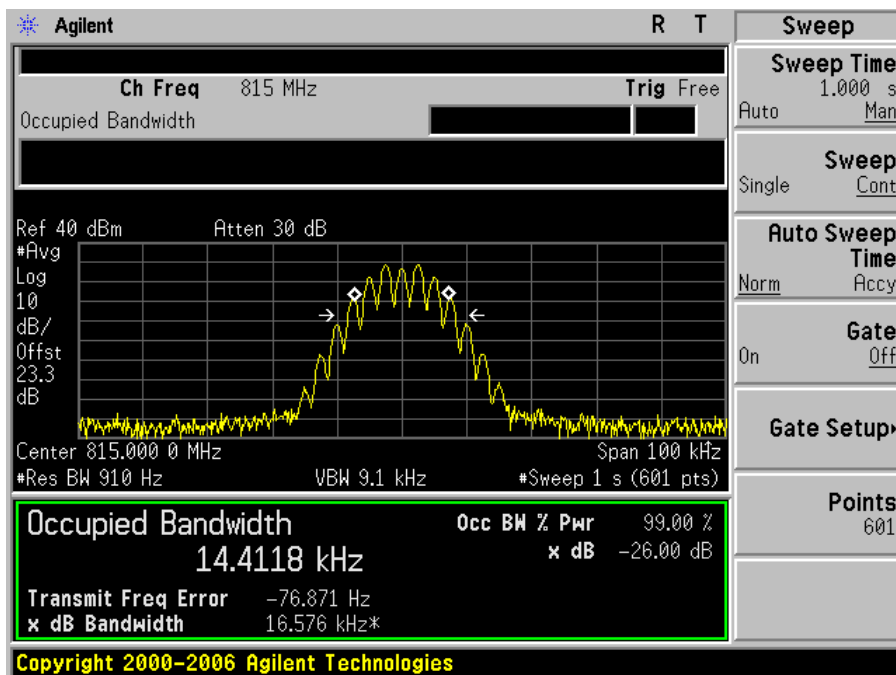


Middle Channel: 815 MHz

Input

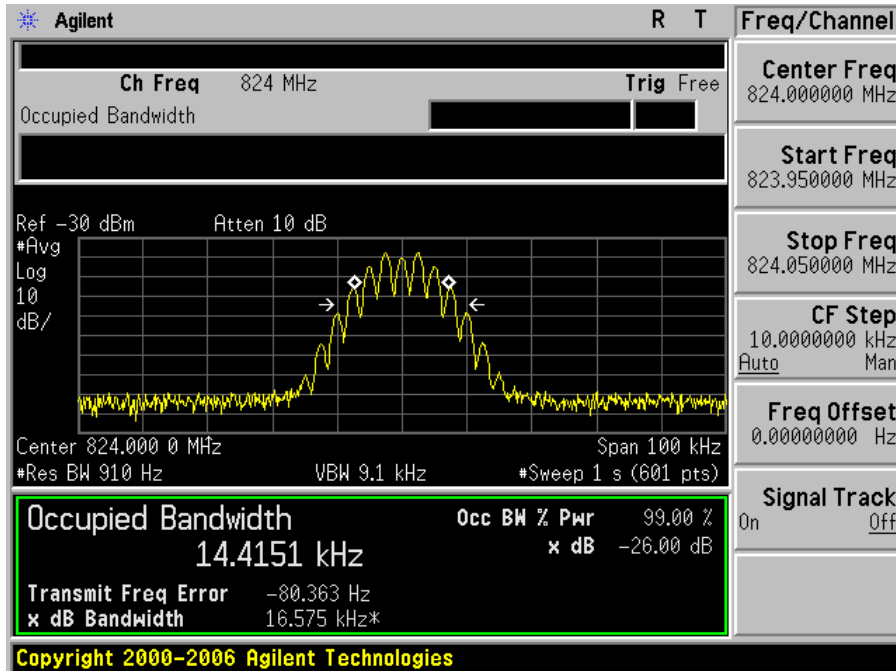


Output

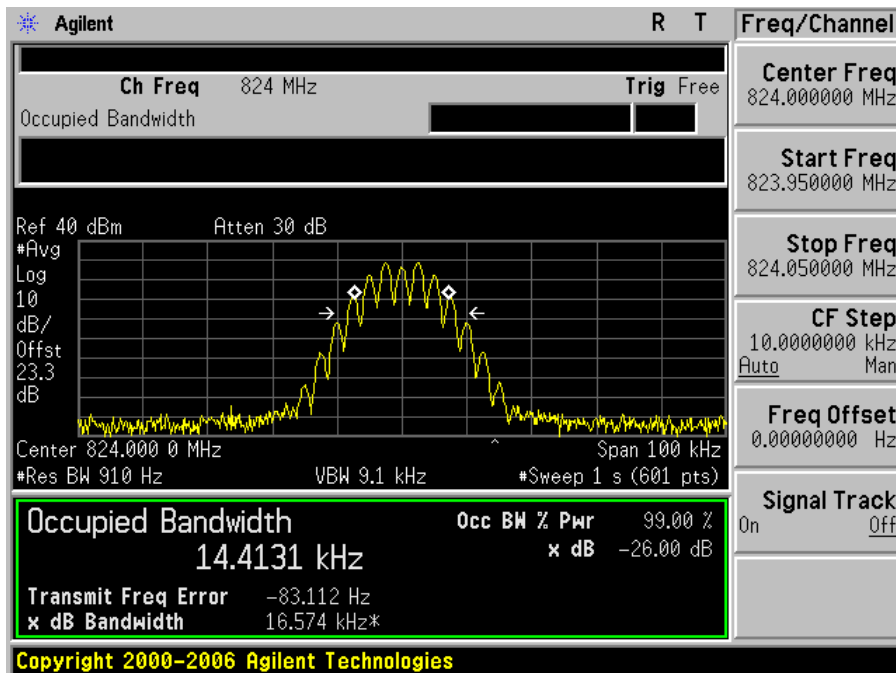


High Channel: 824 MHz

Input



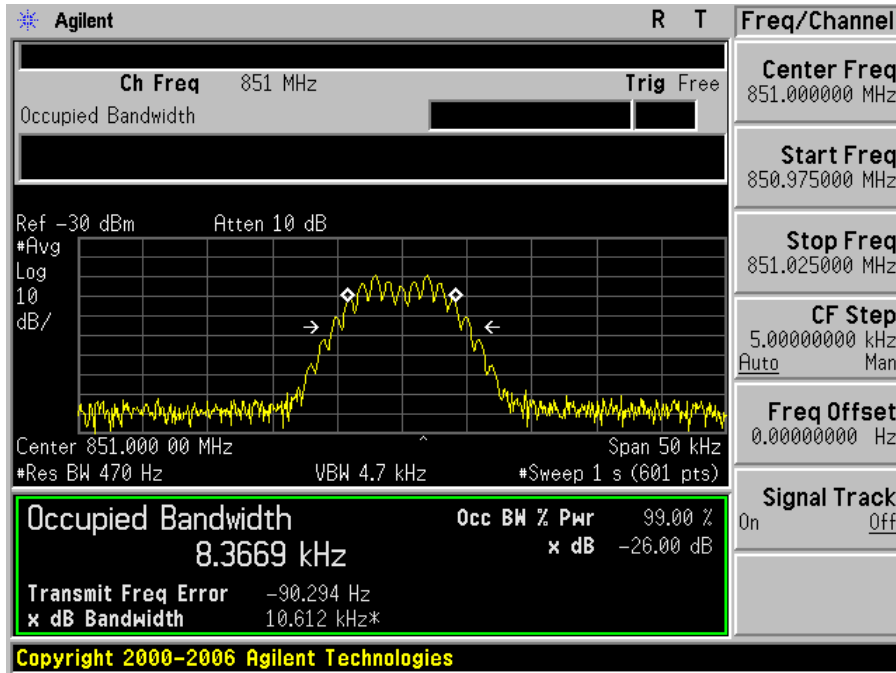
Output



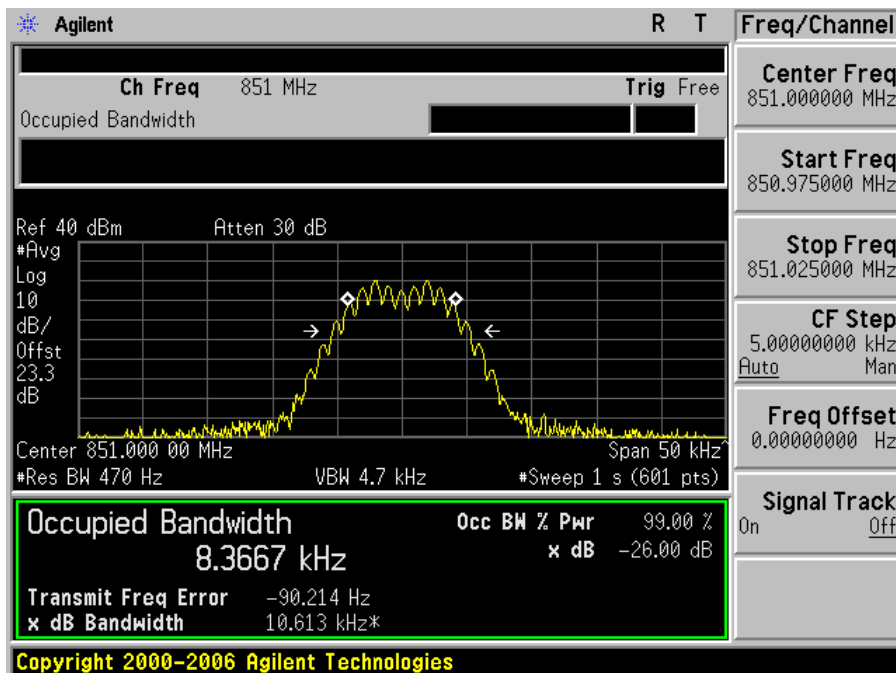
**Downlink: FM Data, 12.5 kHz Channel Spacing**

Low Channel: 851 MHz

Input

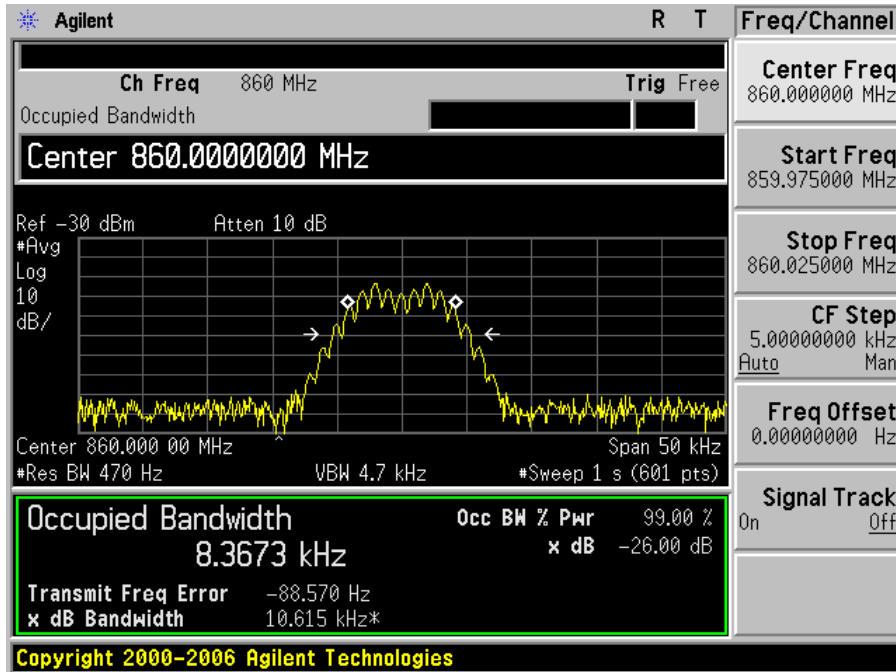


Output

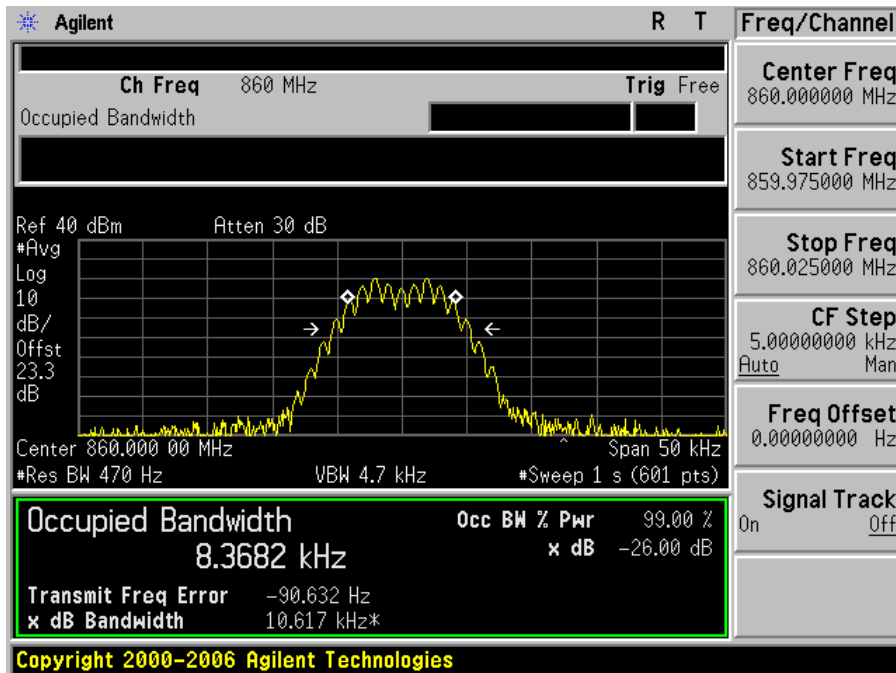


Middle Channel: 860 MHz

Input

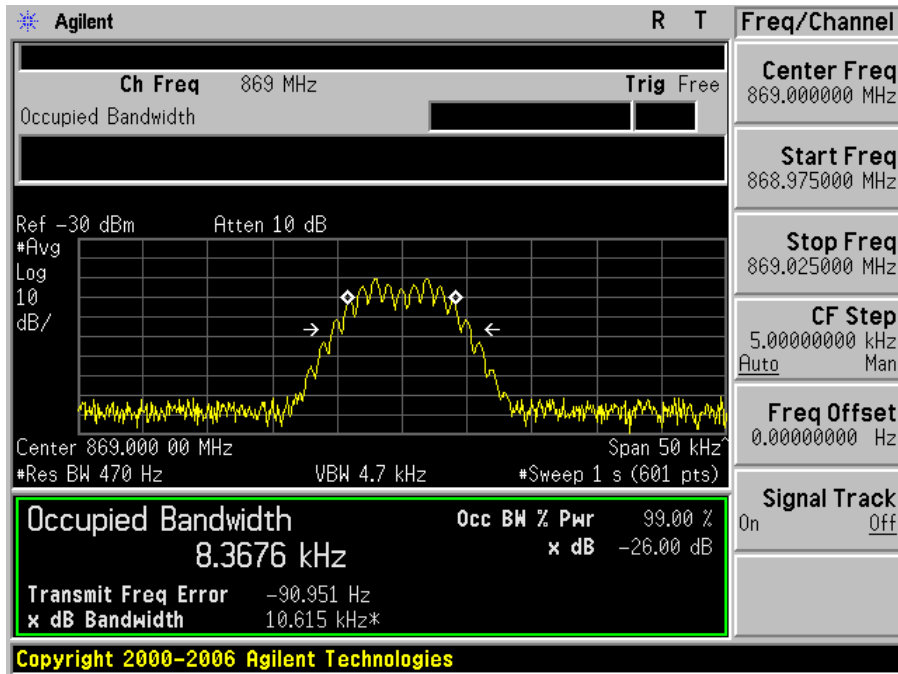


Output

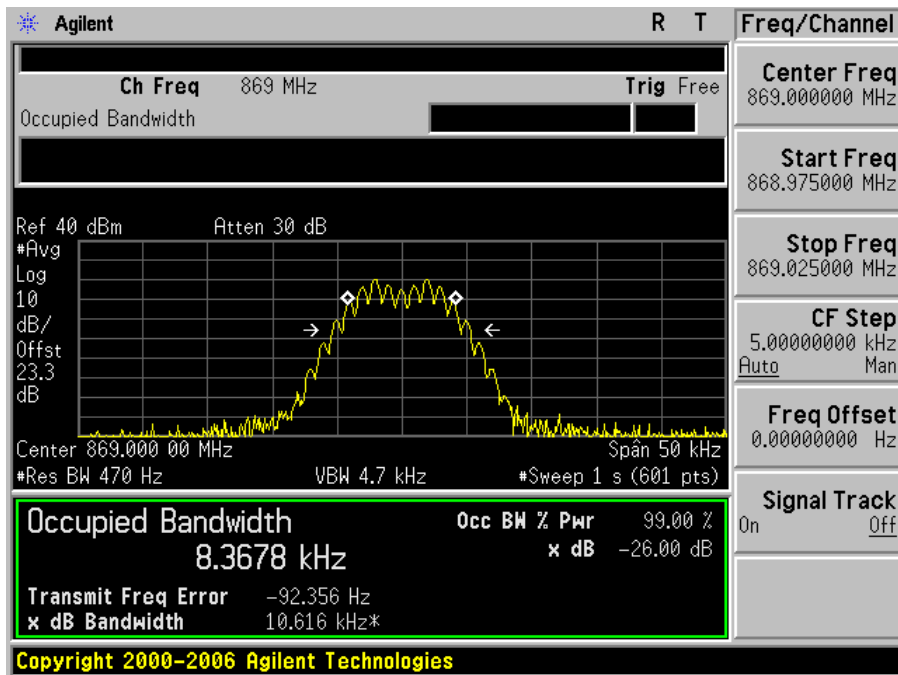


High Channel: 869MHz

Input



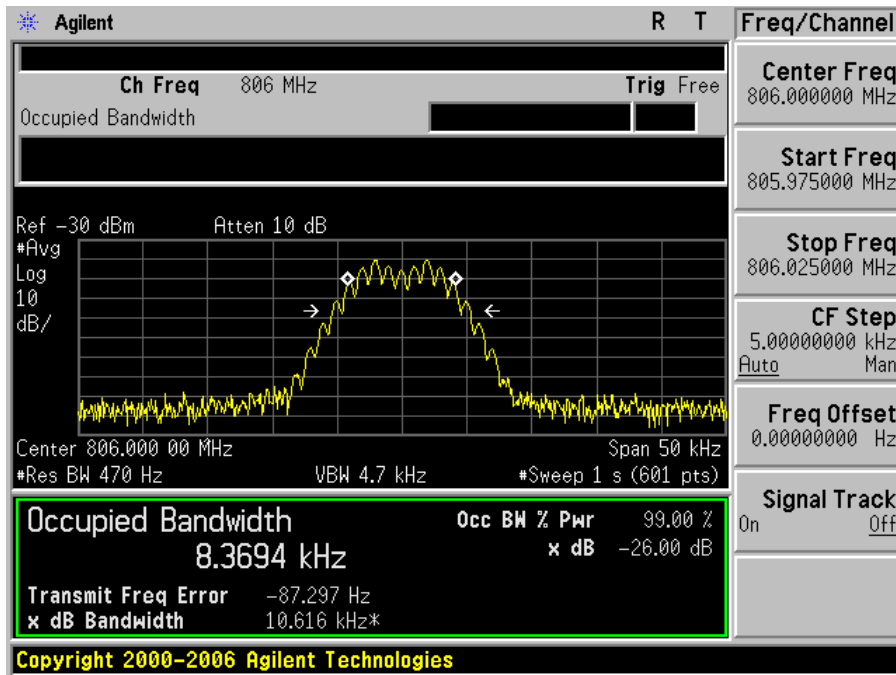
Output



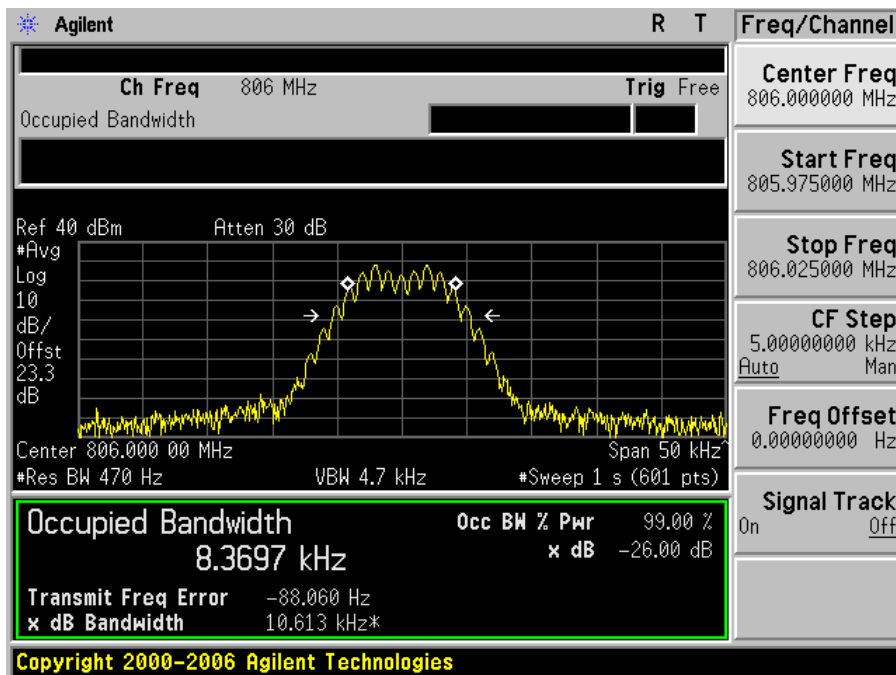
**Uplink: FM Data, 12.5 kHz Channel Spacing**

Low Channel: 806 MHz

Input

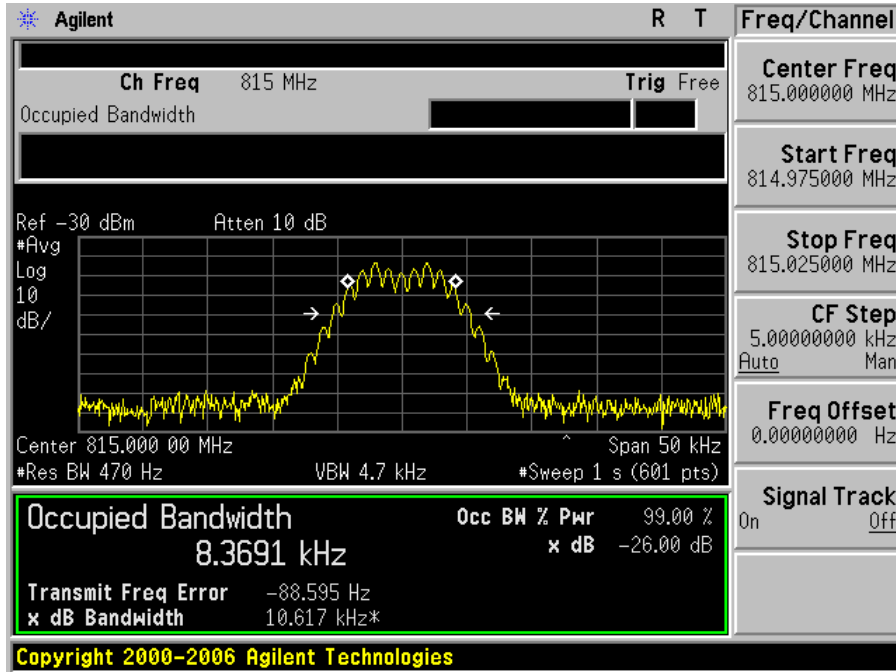


Output

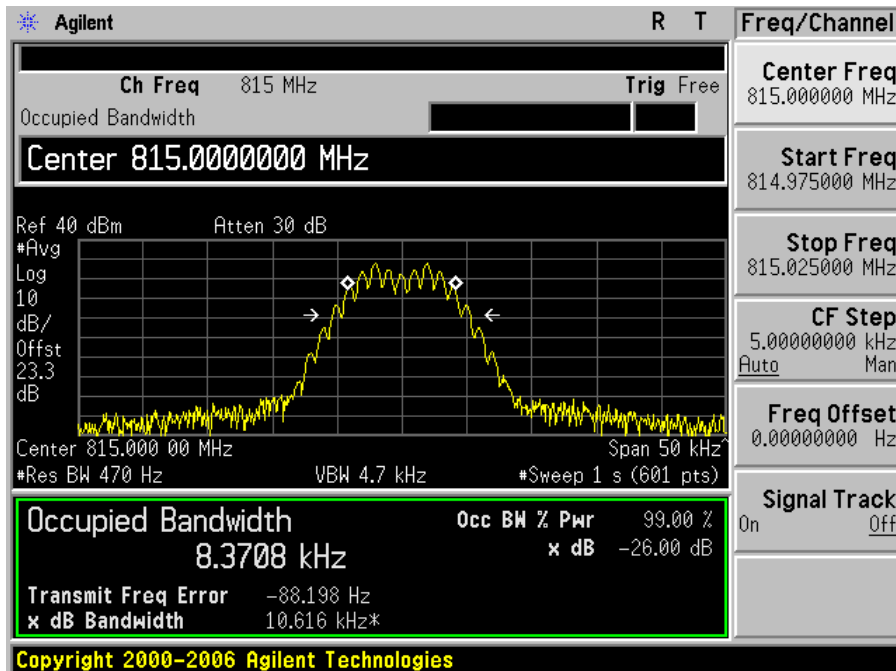


Middle Channel: 815 MHz

Input

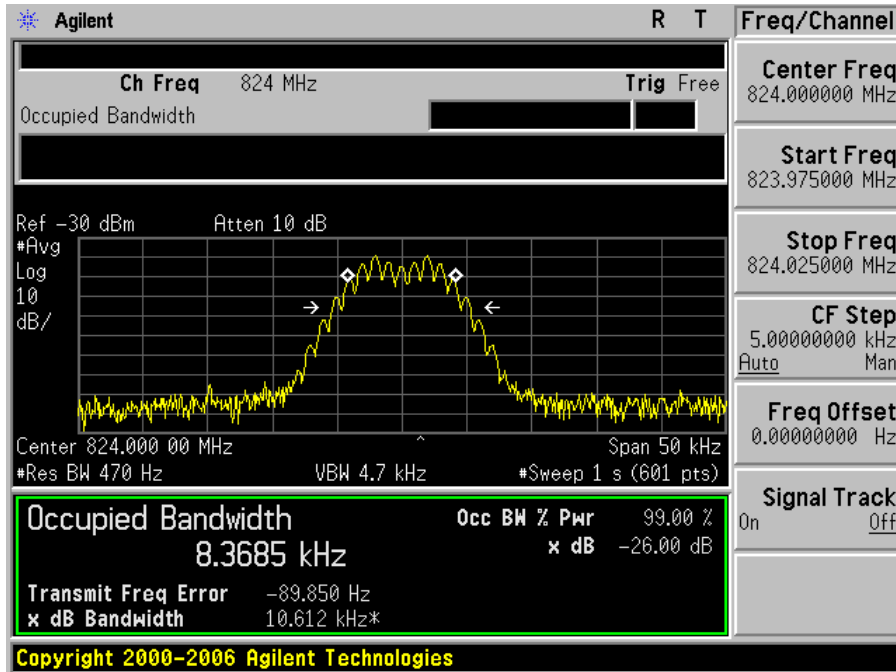


Output

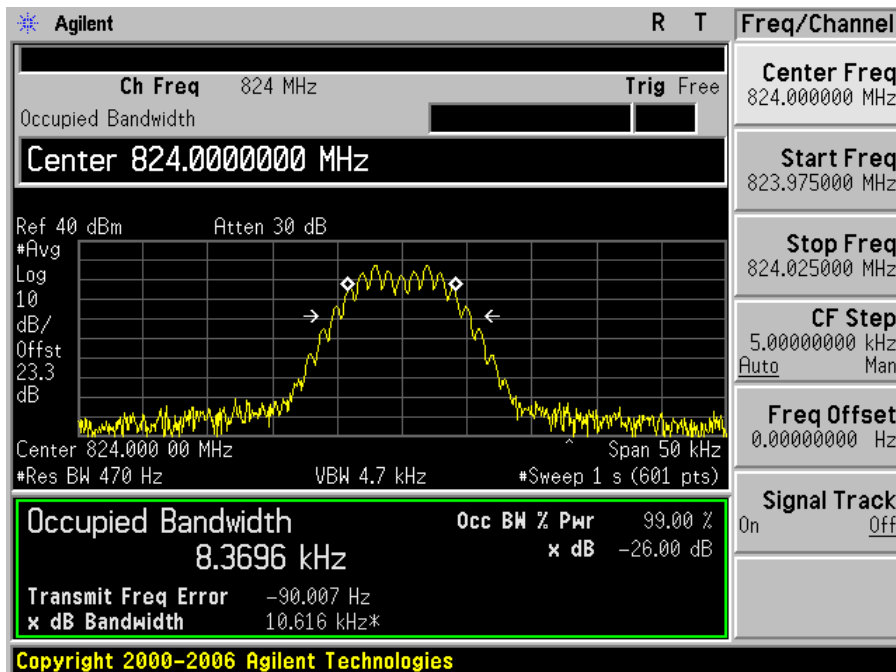


High Channel: 824 MHz

Input



Output

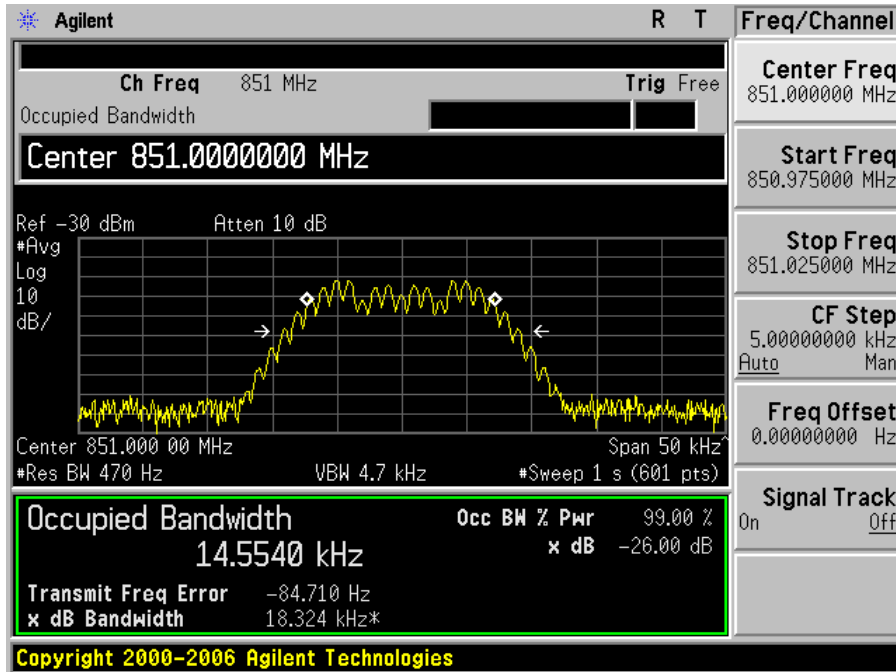




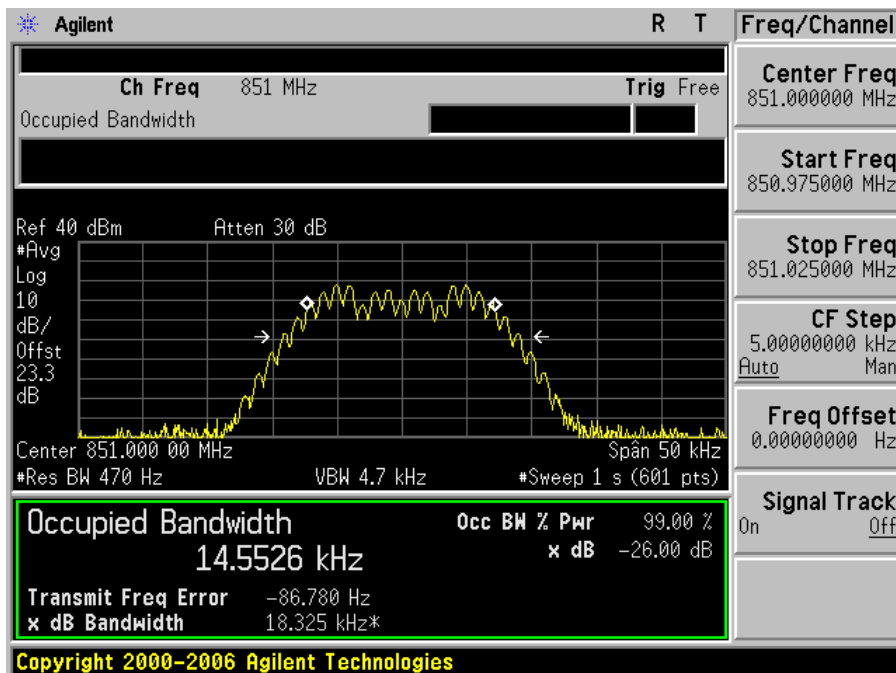
**Downlink: FM Data, 25 kHz Channel Spacing**

Low Channel: 851 MHz

Input

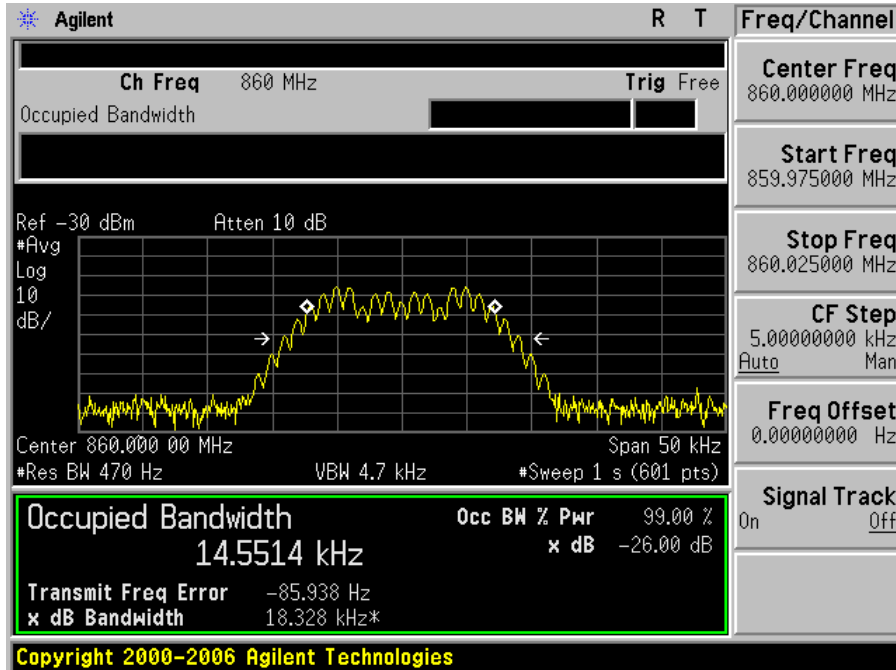


Output

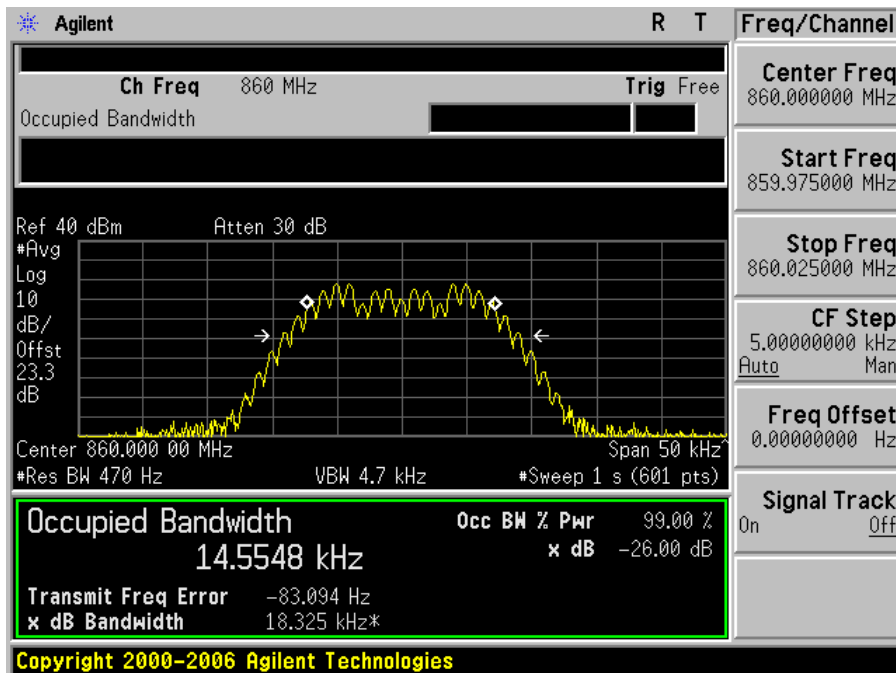


Middle Channel: 860 MHz

Input

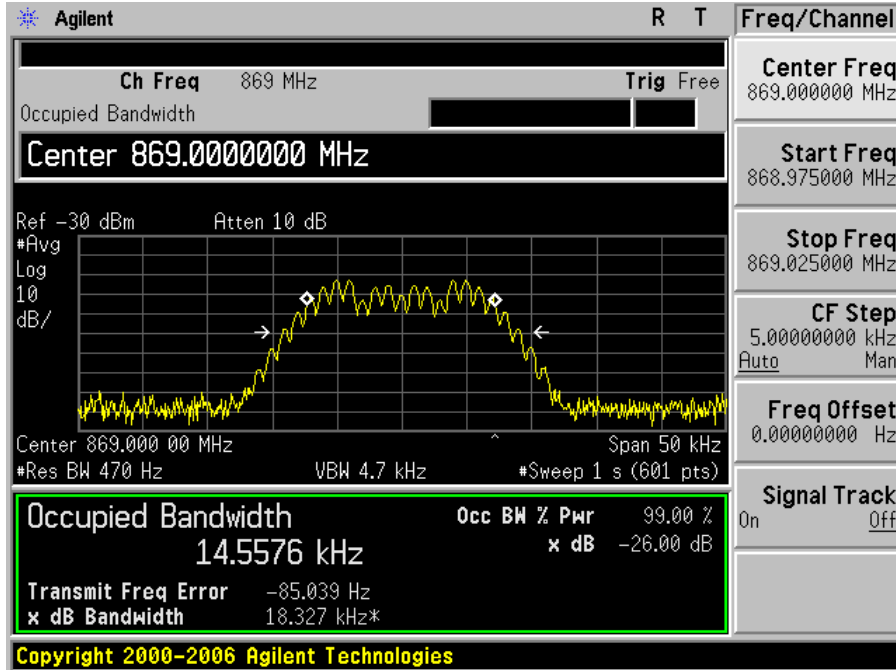


Output

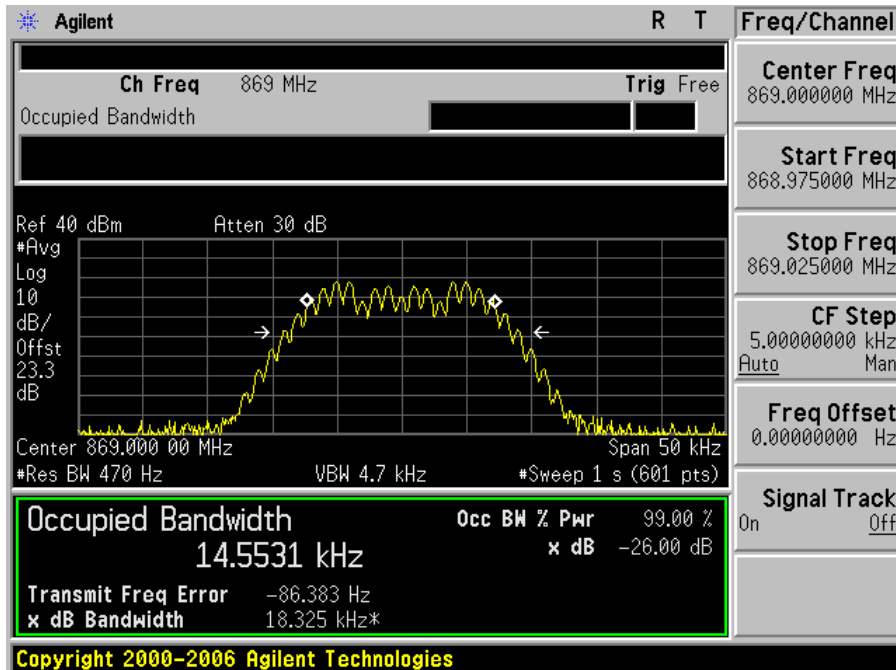


High Channel: 869MHz

Input



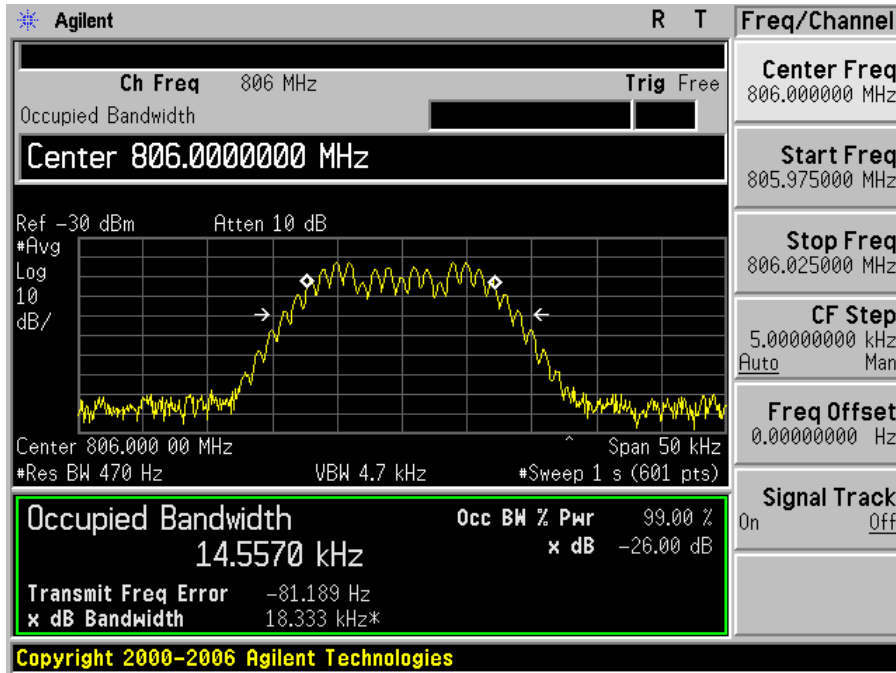
Output



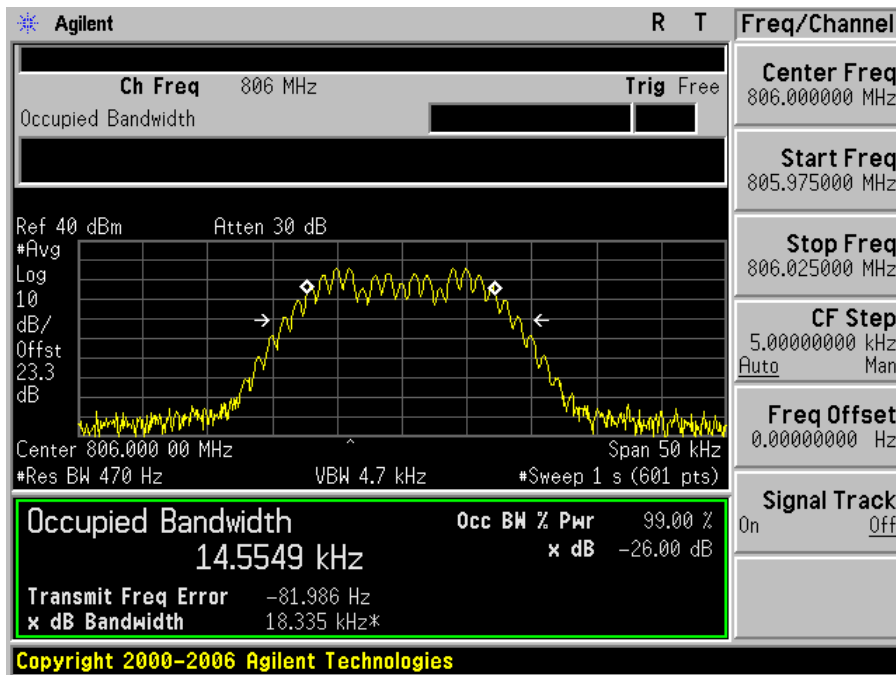
**Uplink: FM Data, 25 kHz Channel Spacing**

Low Channel: 806 MHz

Input

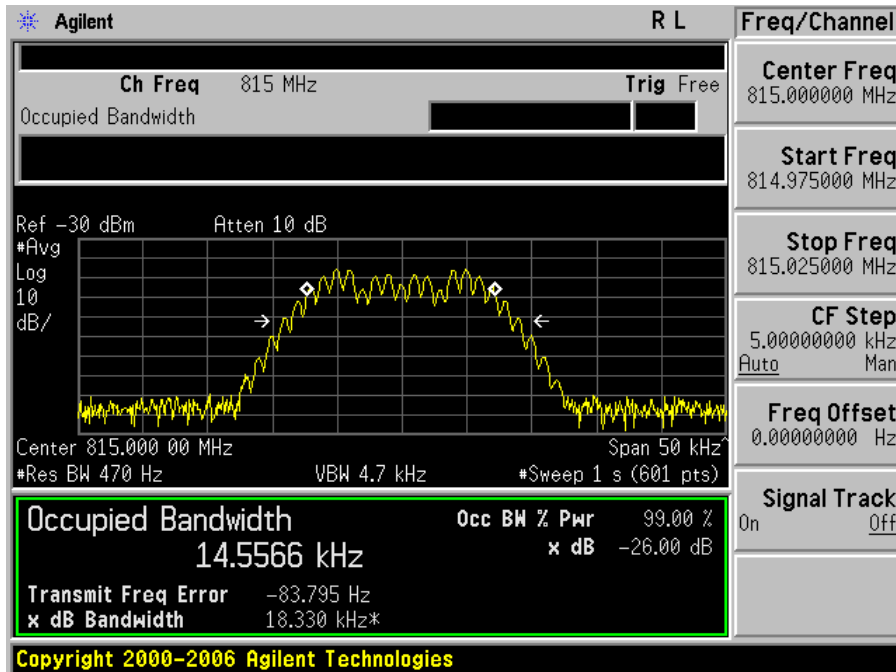


Output

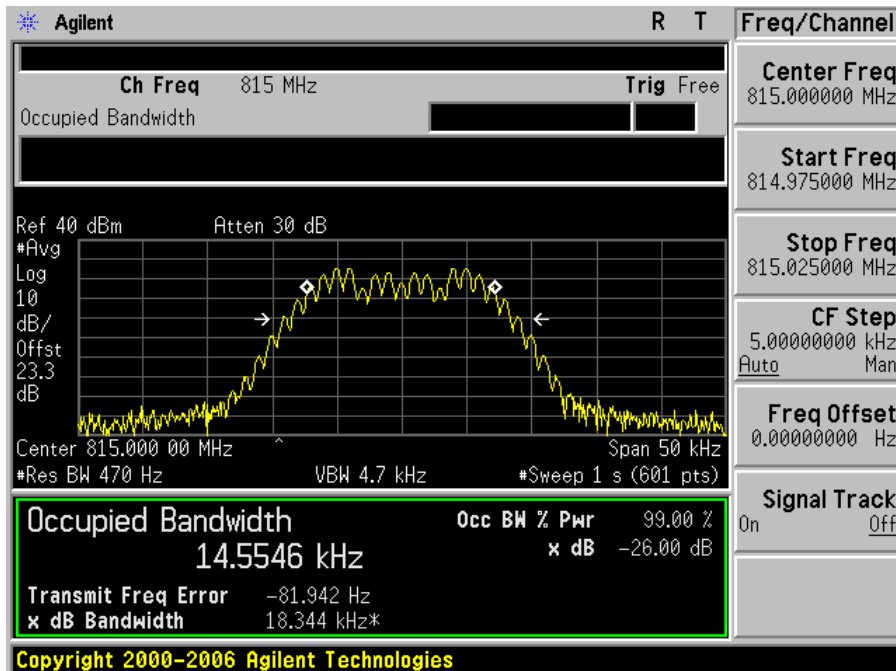


Middle Channel: 815 MHz

Input

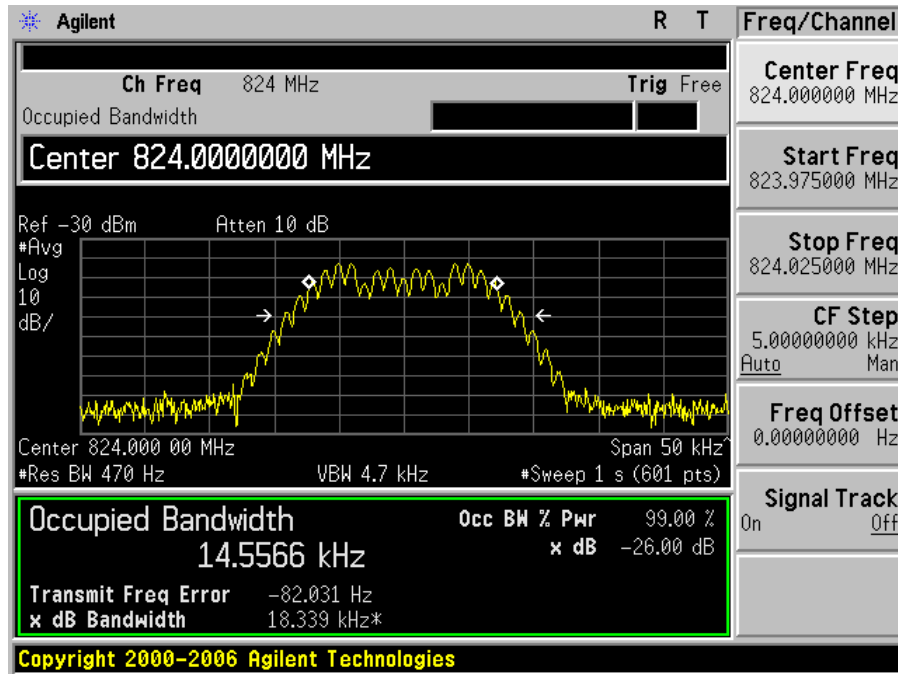


Output

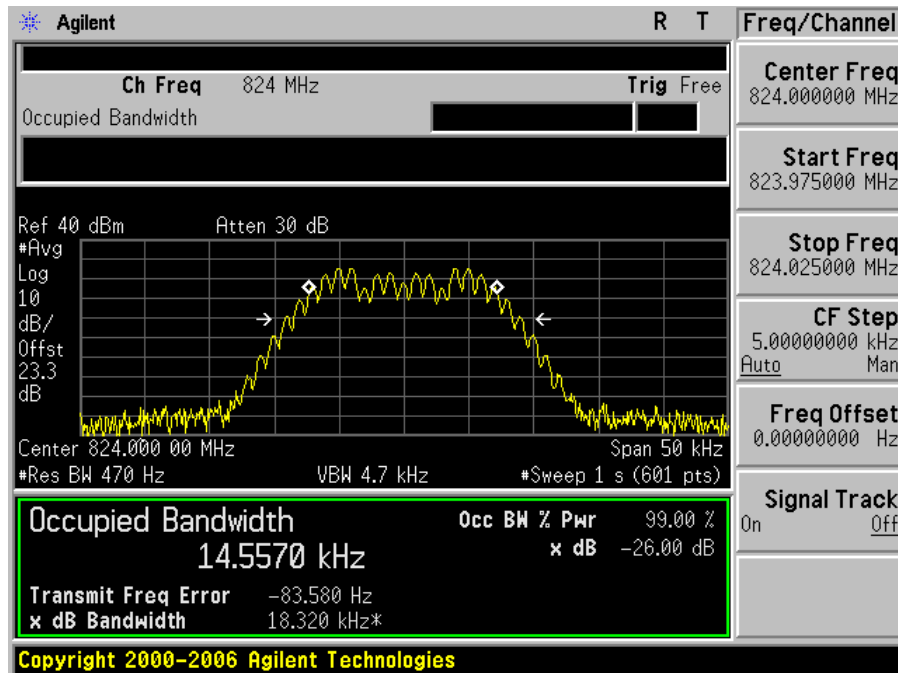


High Channel: 824 MHz

Input



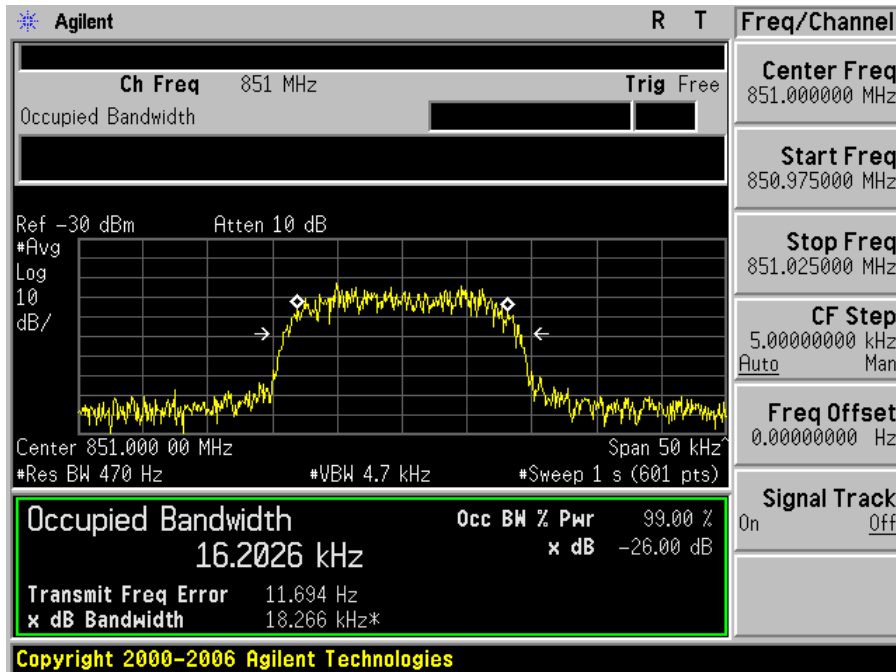
Output



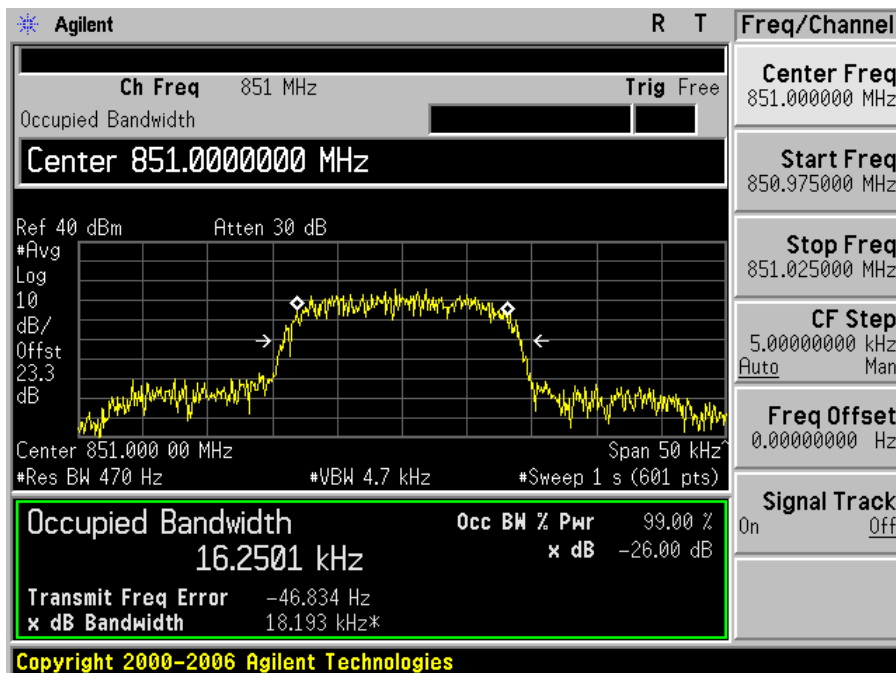
**Downlink: iDEN**

Low Channel: 851 MHz

Input

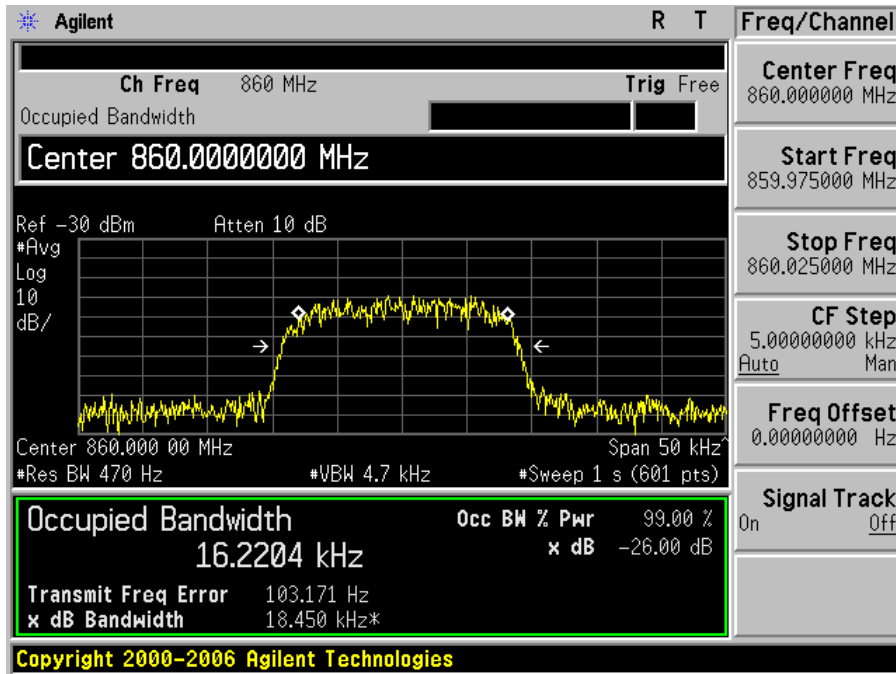


Output

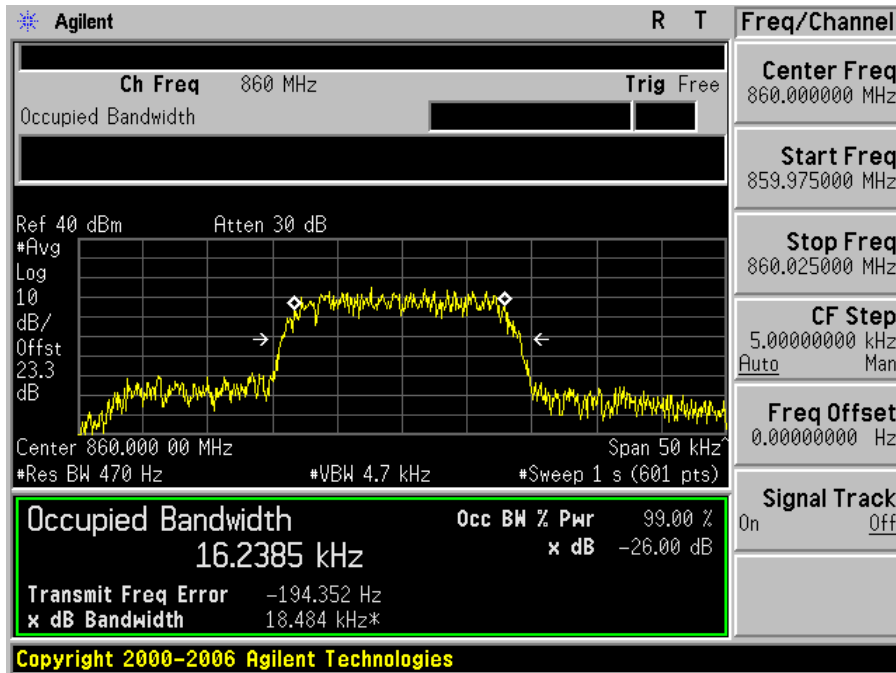


Middle Channel: 860 MHz

Input



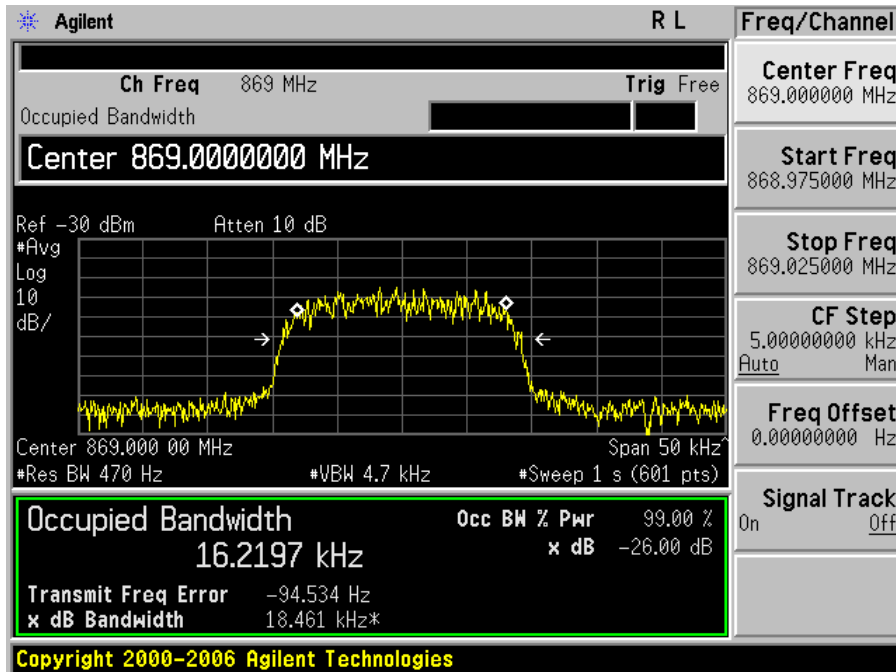
Output



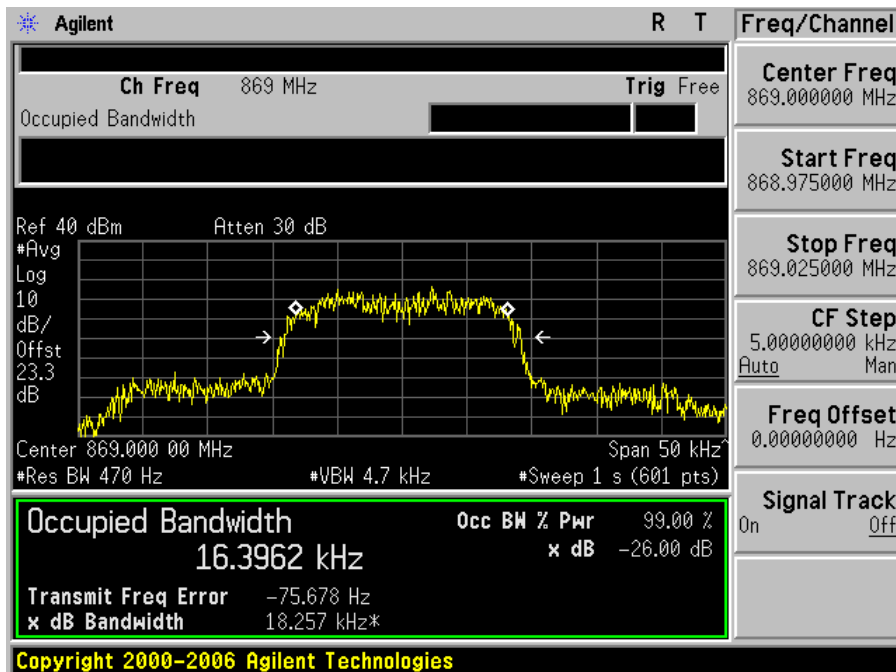


High Channel: 869MHz

Input



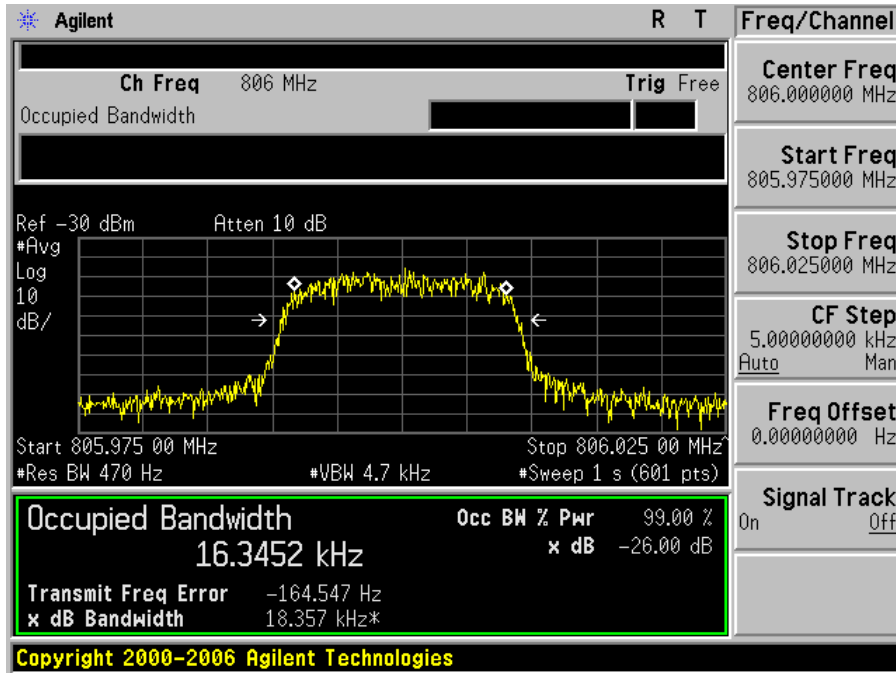
Output



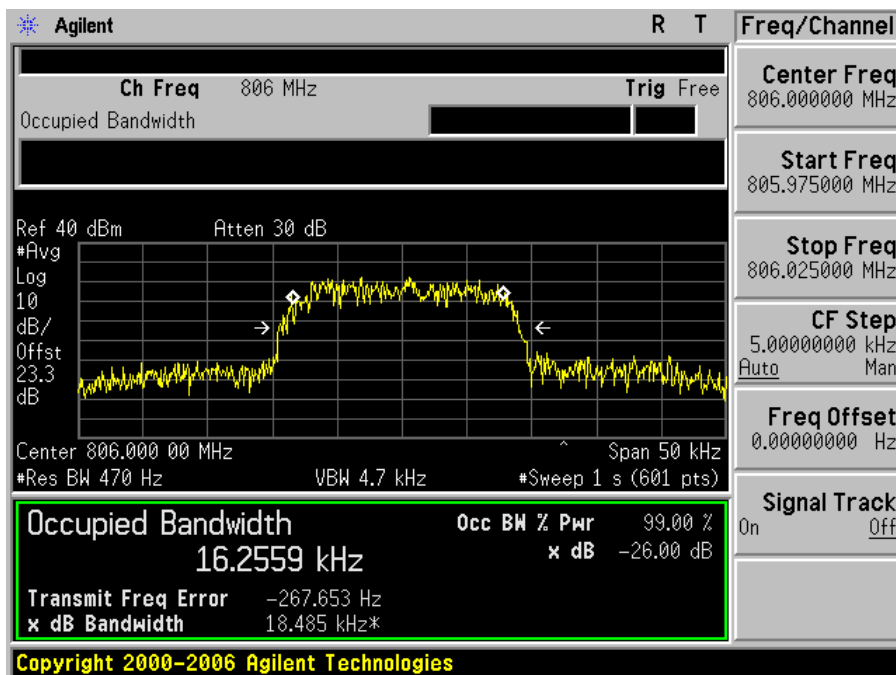
**Uplink: iDEN**

Low Channel: 806 MHz

Input

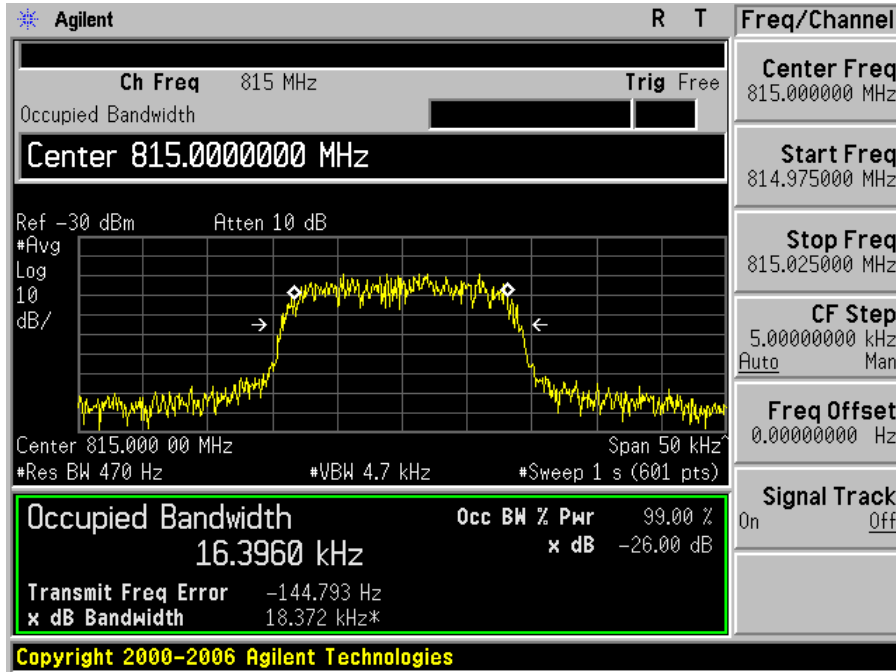


Output

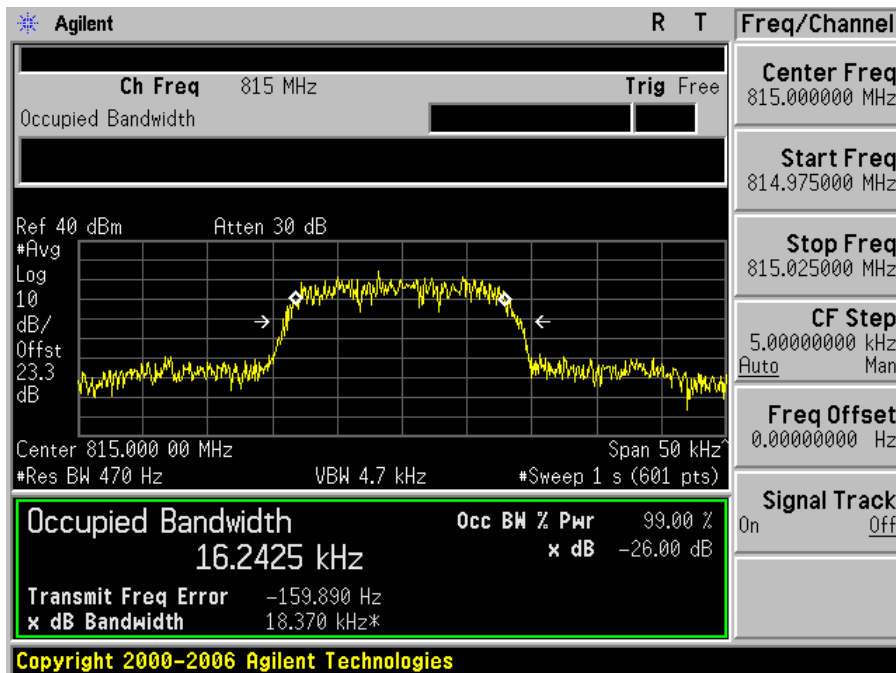


Middle Channel: 815 MHz

Input

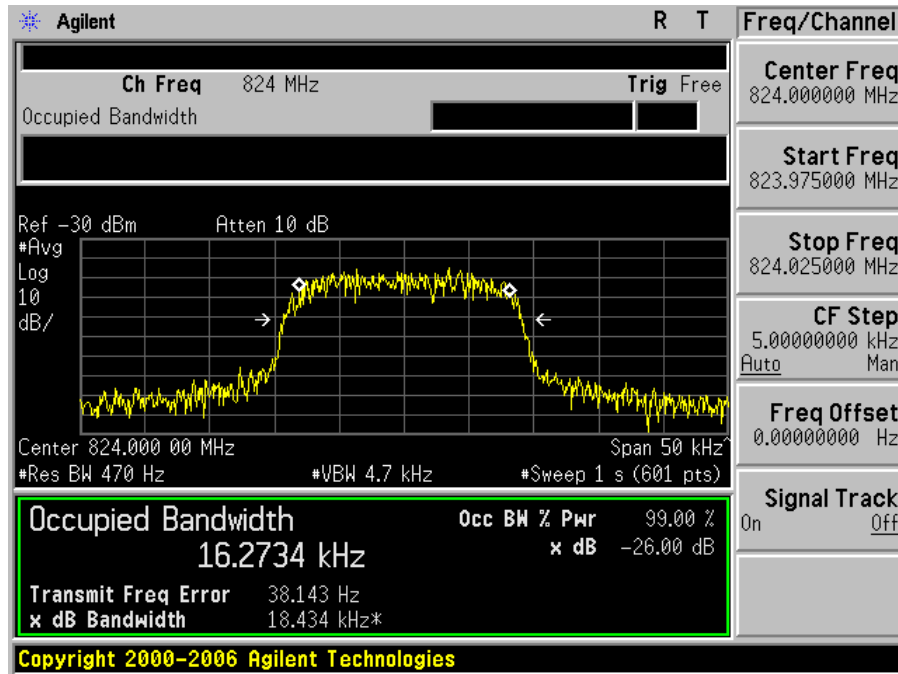


Output

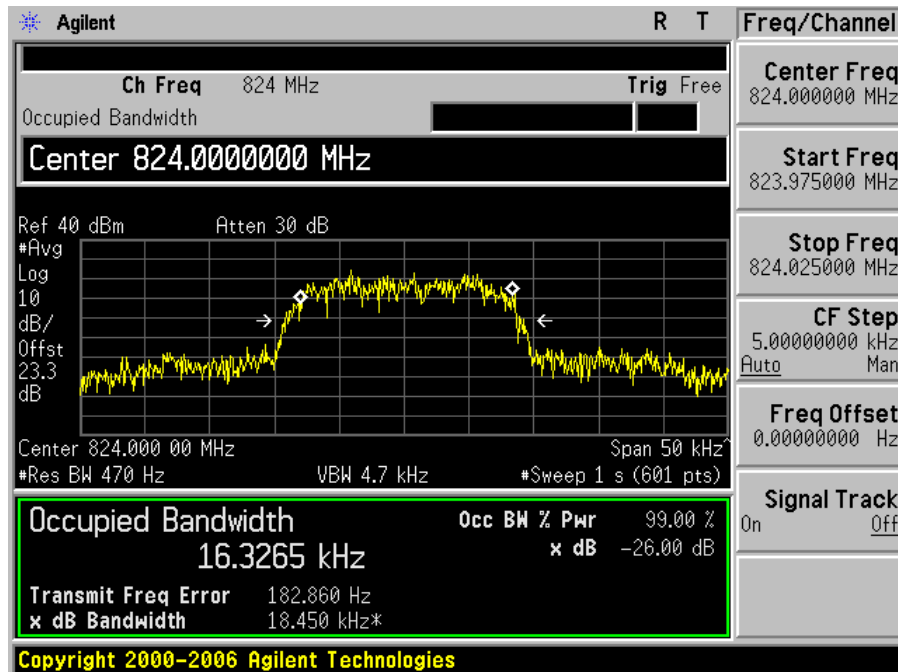


High Channel: 824 MHz

Input



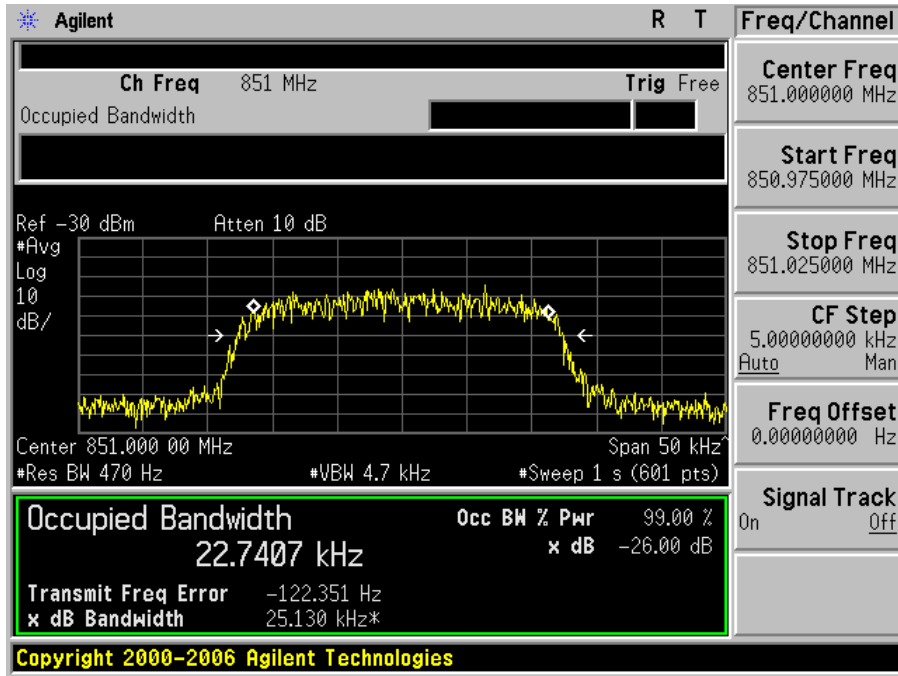
Output



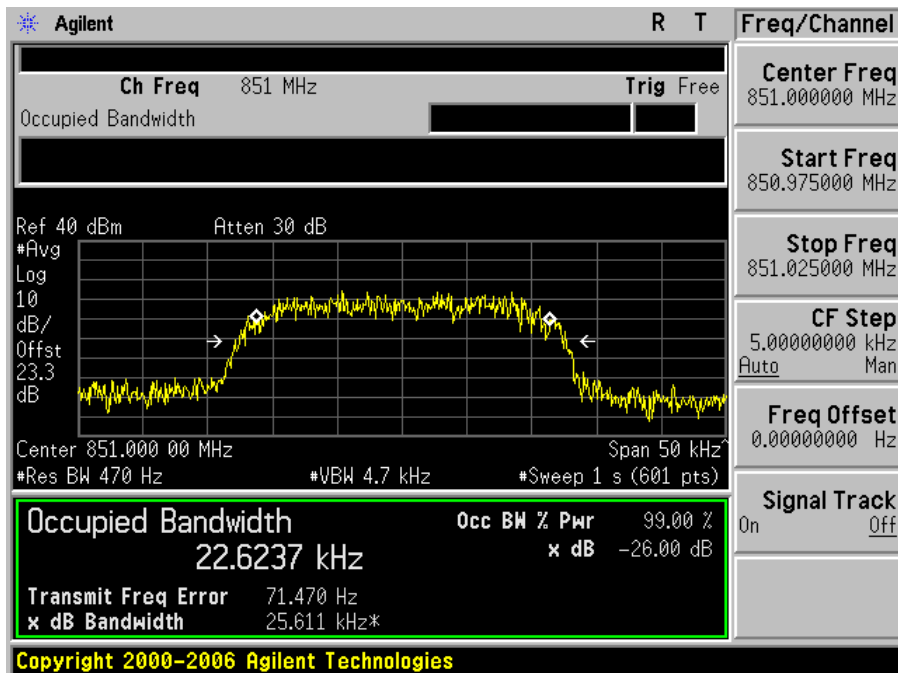
**Downlink: GSM**

Low Channel: 851 MHz

Input

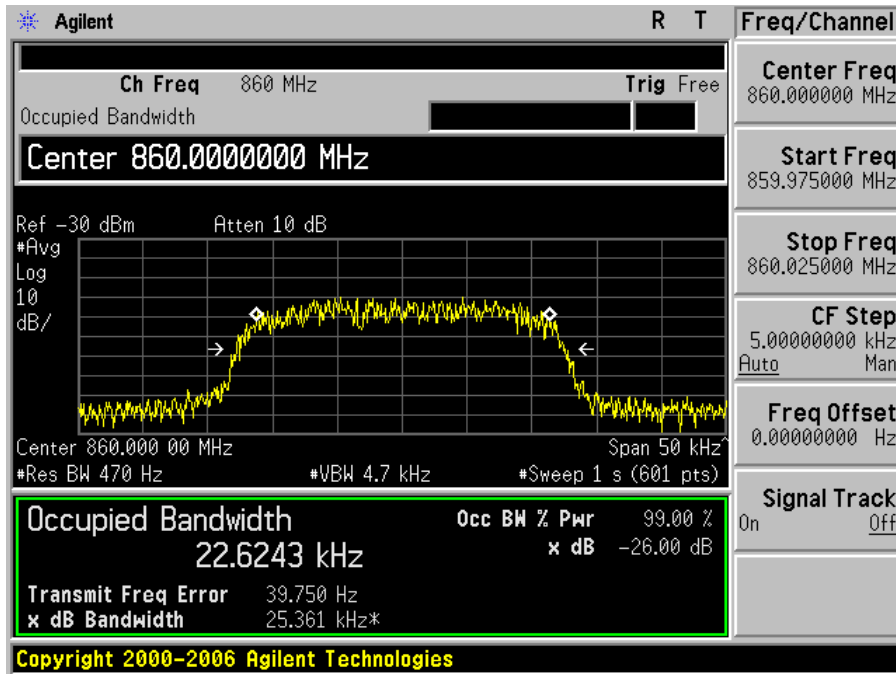


Output

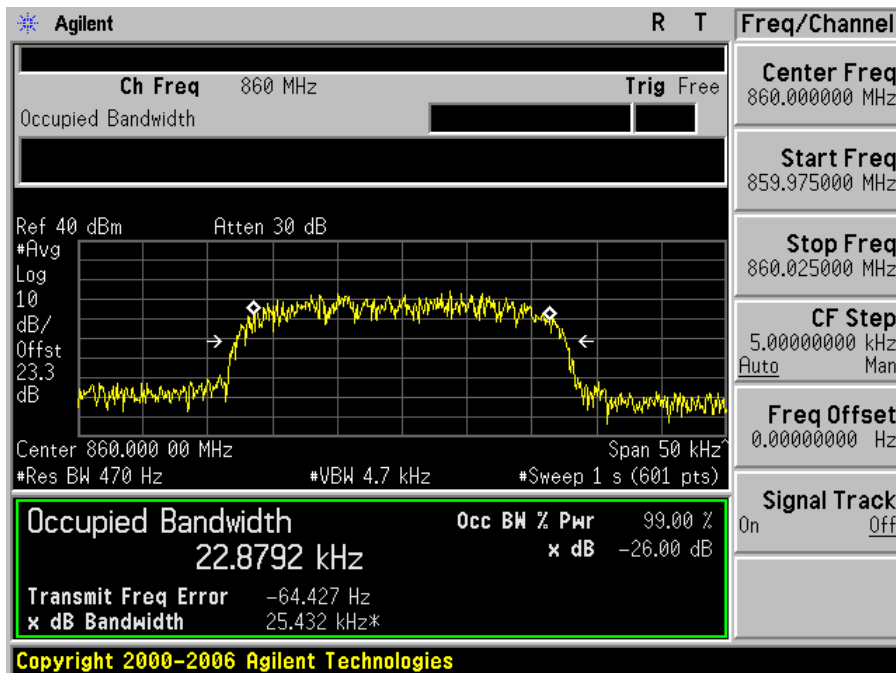


Middle Channel: 860 MHz

Input

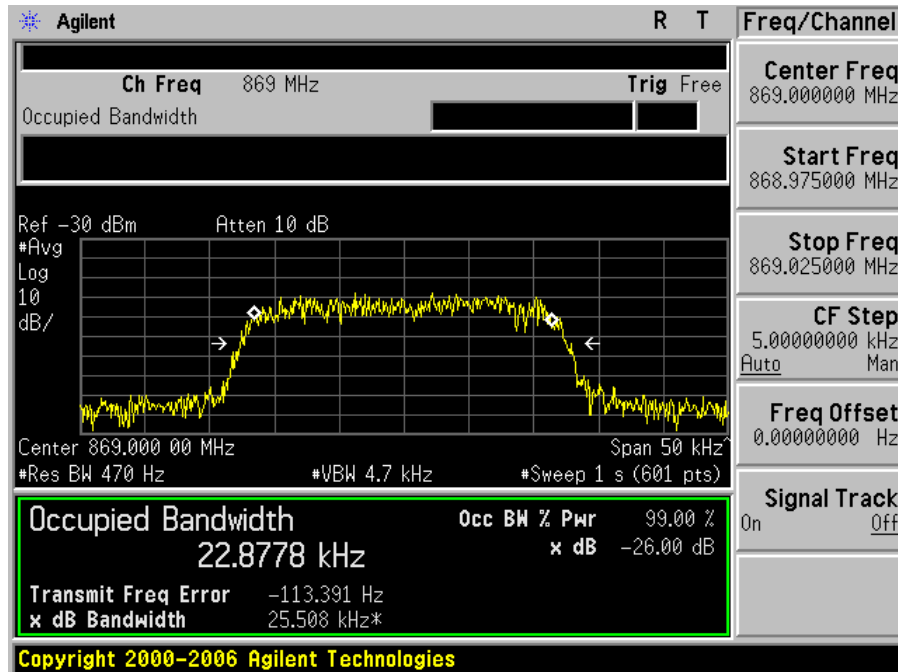


Output

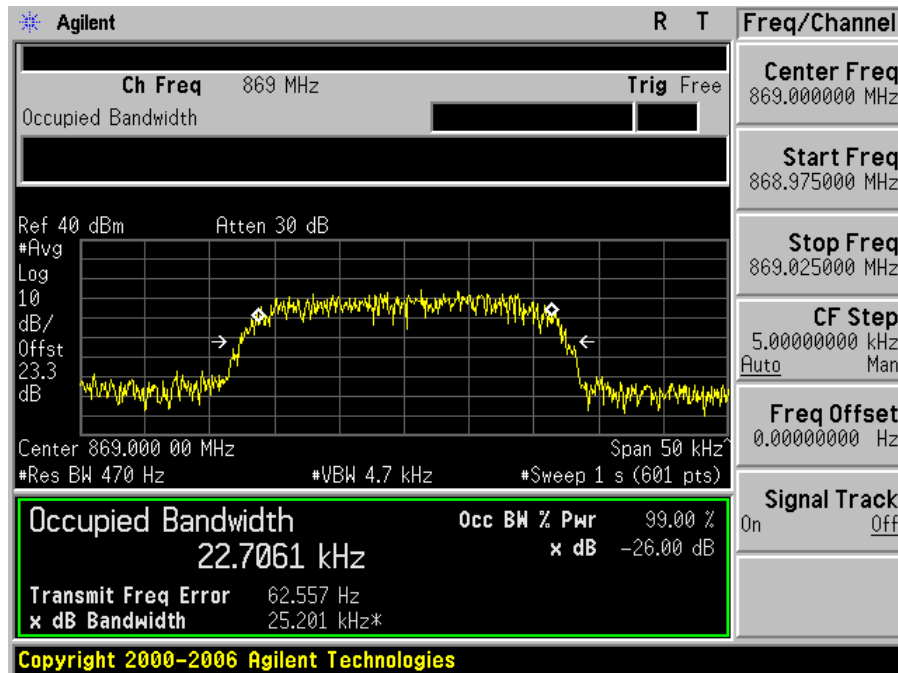


High Channel: 869MHz

Input



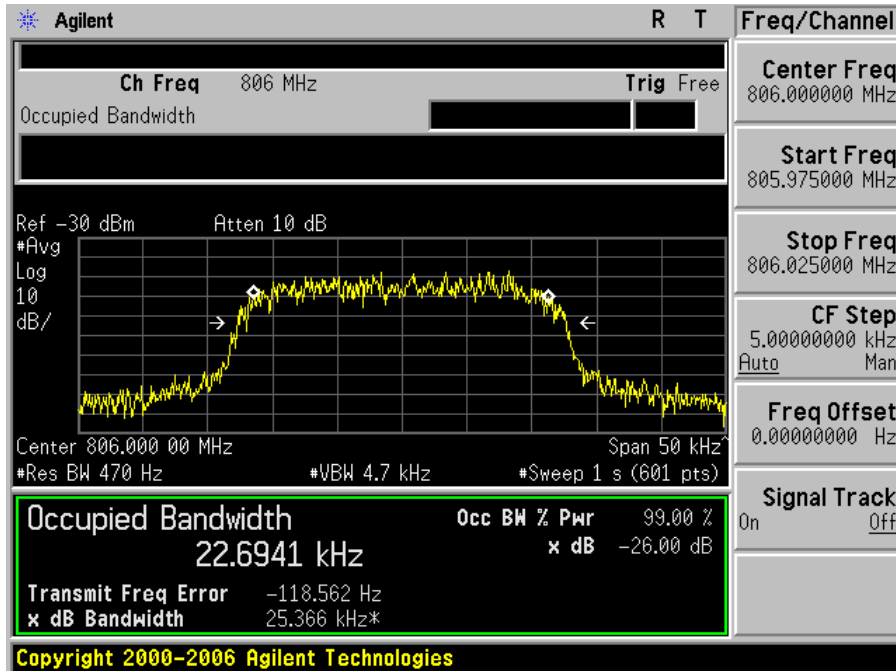
Output



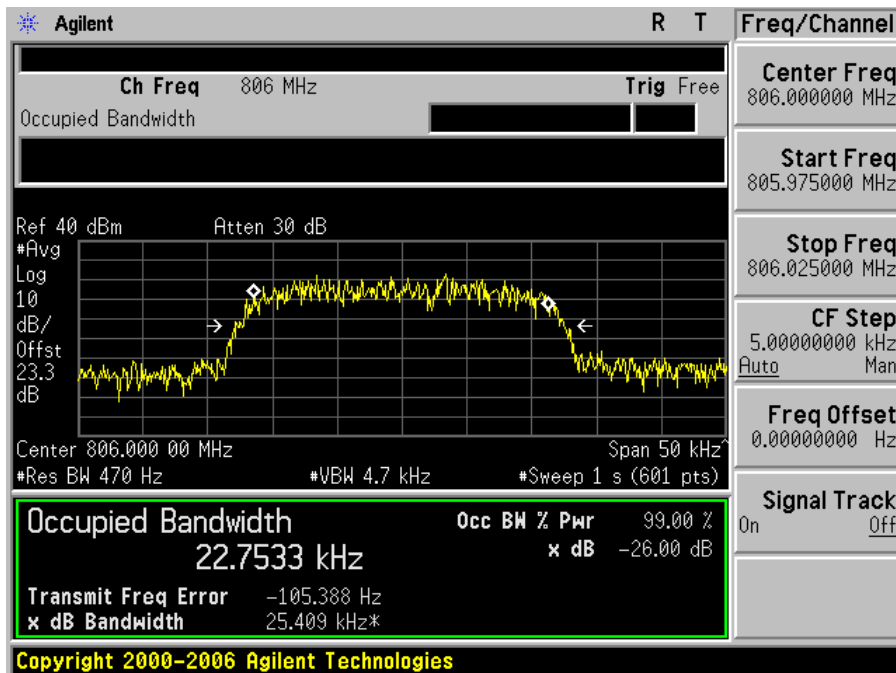
**Uplink: GSM**

Low Channel: 806 MHz

Input



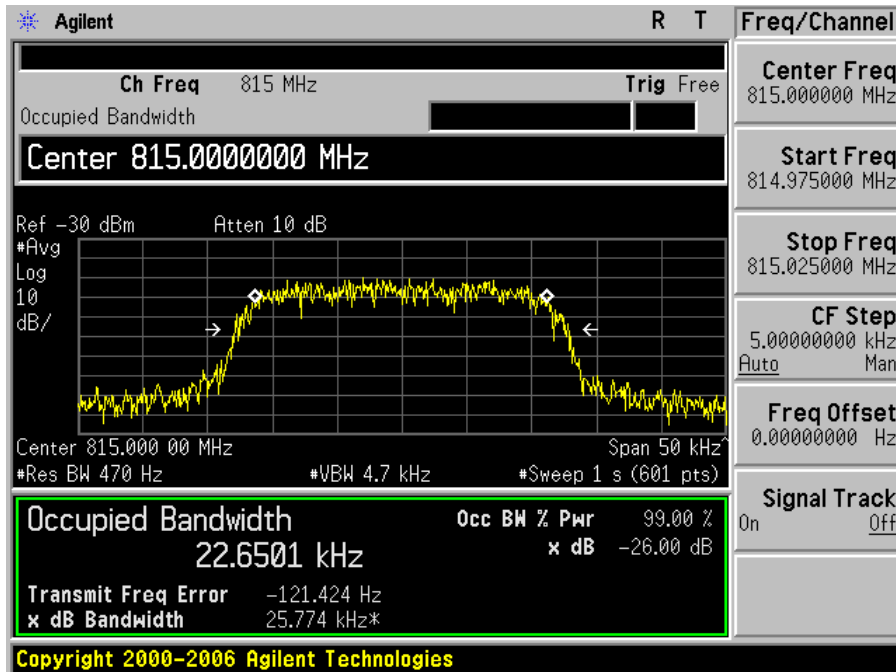
Output



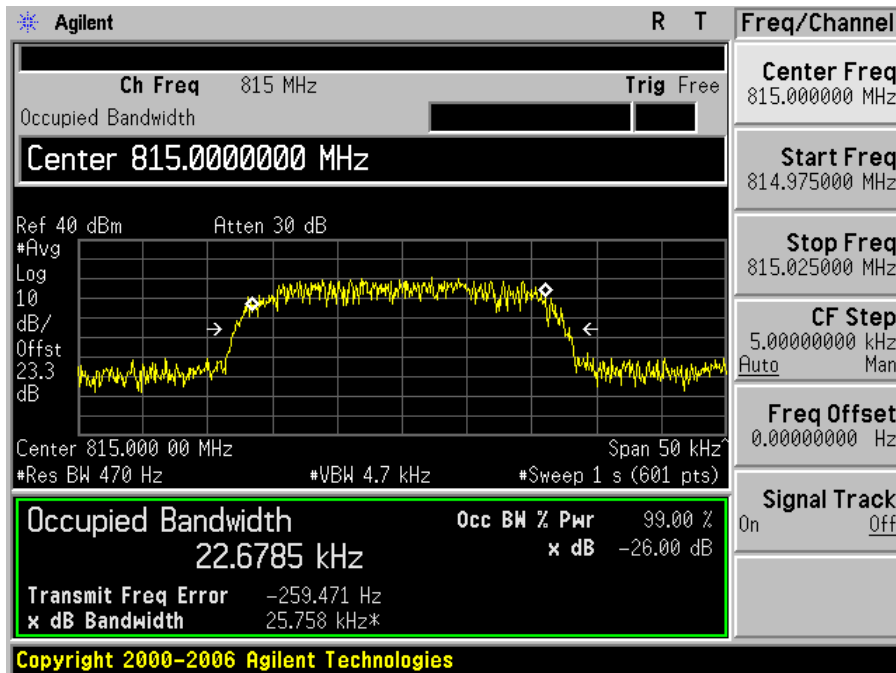


Middle Channel: 815 MHz

Input

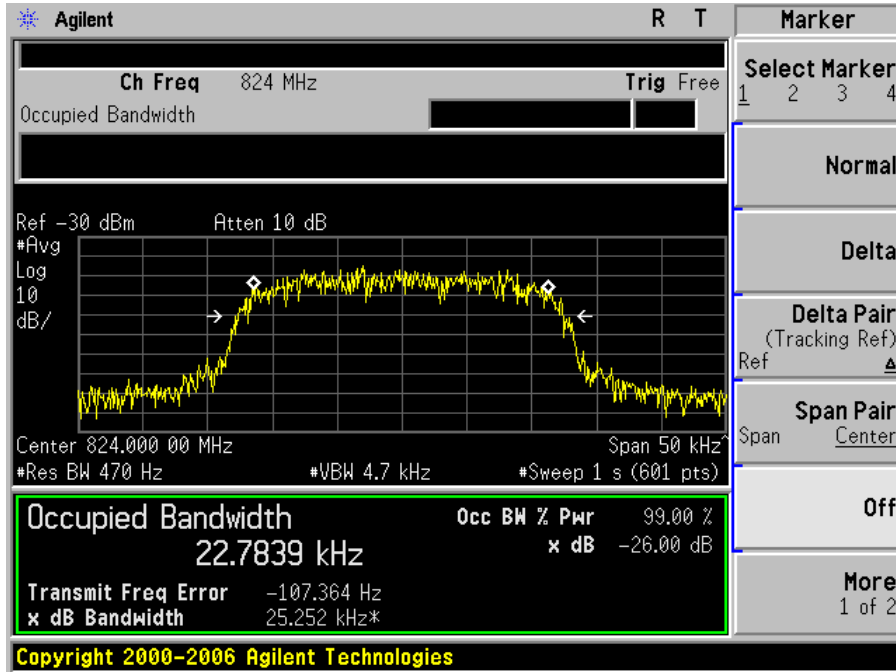


Output

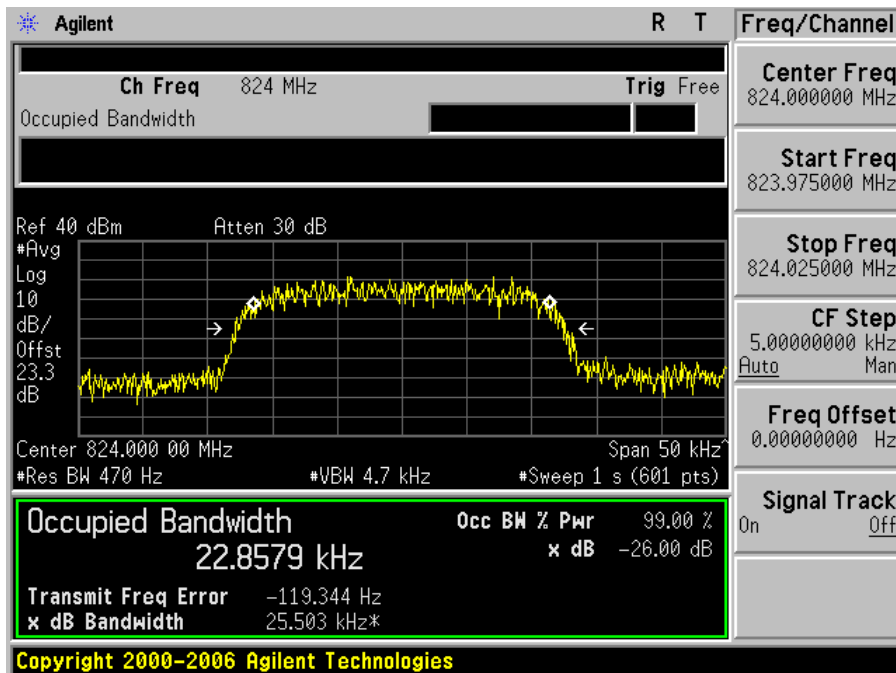


High Channel: 824 MHz

Input



Output



## 7 FCC §2.1049, §90.210 & §90.961 – EMISSION MASK

### 7.1 Applicable Standard

As per FCC §90.210. Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Applicable Emission Masks

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without Audio low pass filter
Below 25 <sup>1</sup>	A or B	A or C
25–50	B	C
72–76	B	C
150–174 <sup>2</sup>	B, D, or E	C, D, or E
150 Paging-only	B	C
220–222	F	F
421–512 <sup>2</sup>	B, D, or E	C, D, or E
450 Paging-only	B	G
806–809/851–854	B	H
809–824/854–869 <sup>3</sup>	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990 MHz	L or M	L or M.
5850–5925 <sup>4</sup>		
All other bands	B	C

Note:

- Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
- Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.
- Equipment used in this band licensed to EA or non-EA systems shall comply with the emission mask provisions of Sec. 90.691.

As per FCC §90.961.Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \text{ Log}_{10}(f/6.1)$  decibels or  $50 + 10 \text{ Log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \text{ Log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

## 7.2 Test Procedure

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

## 7.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

## 7.4 Test Environmental Conditions

<b>Temperature:</b>	22-2°C
<b>Relative Humidity:</b>	40-50 %
<b>ATM Pressure:</b>	101-102kPa

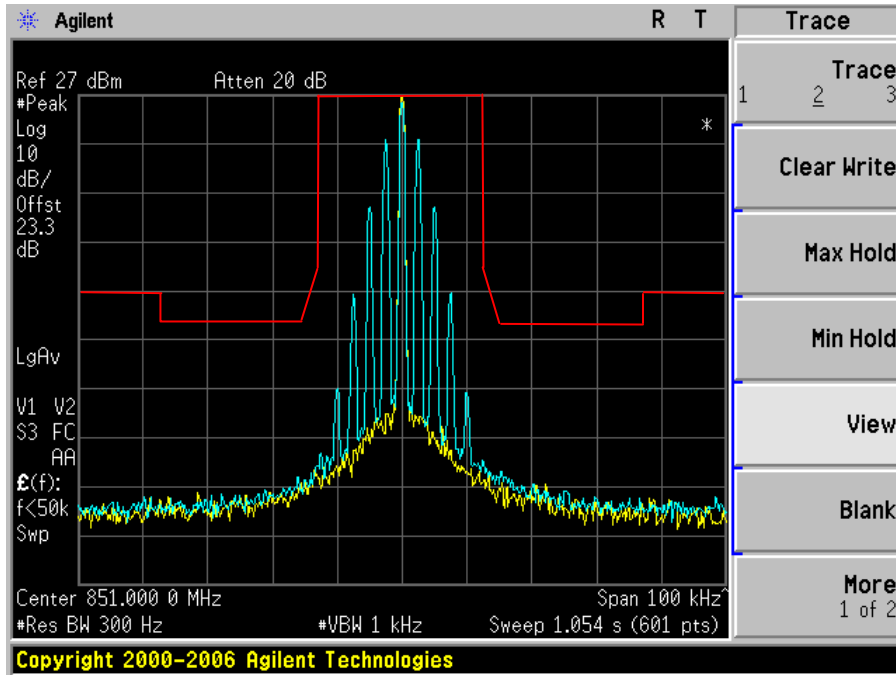
*The testing was performed by Quinn Jiang from 2011-09-29 to 2011-10-01 in RF Site.*

## 7.5 Test Results

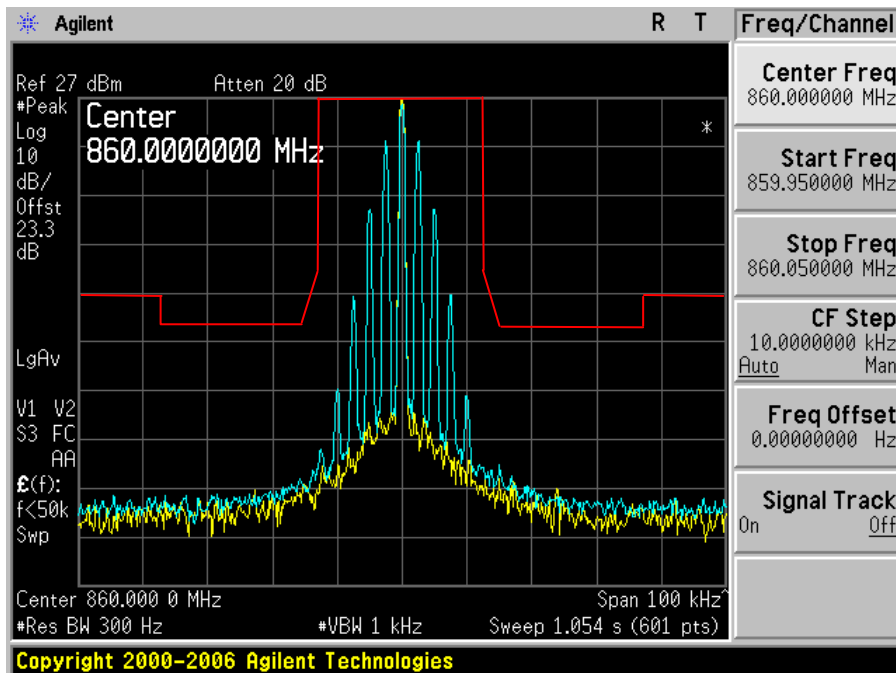
Please refer to the following plots.

**Downlink: FM Voice, 12.5 kHz Channel Spacing**

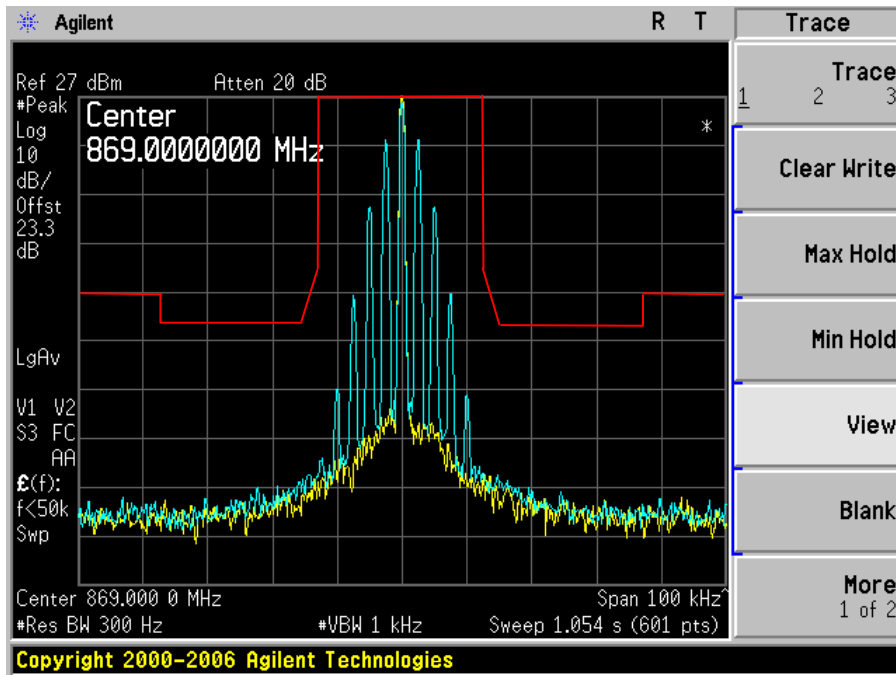
Low Channel: 851 MHz



Middle Channel: 860 MHz

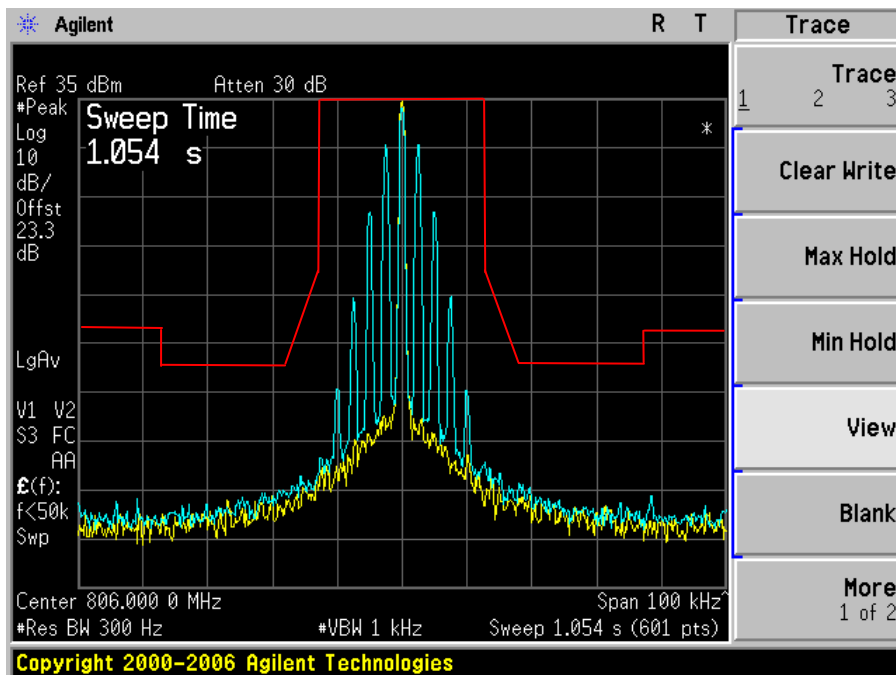


High Channel: 869 MHz

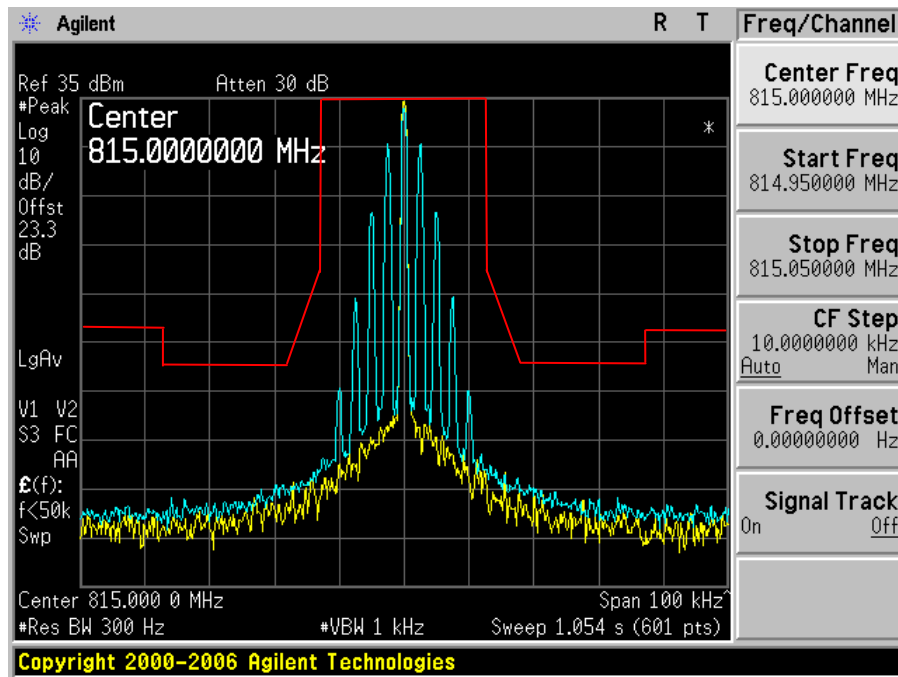


Uplink: FM Voice, 12.5 kHz Channel Spacing

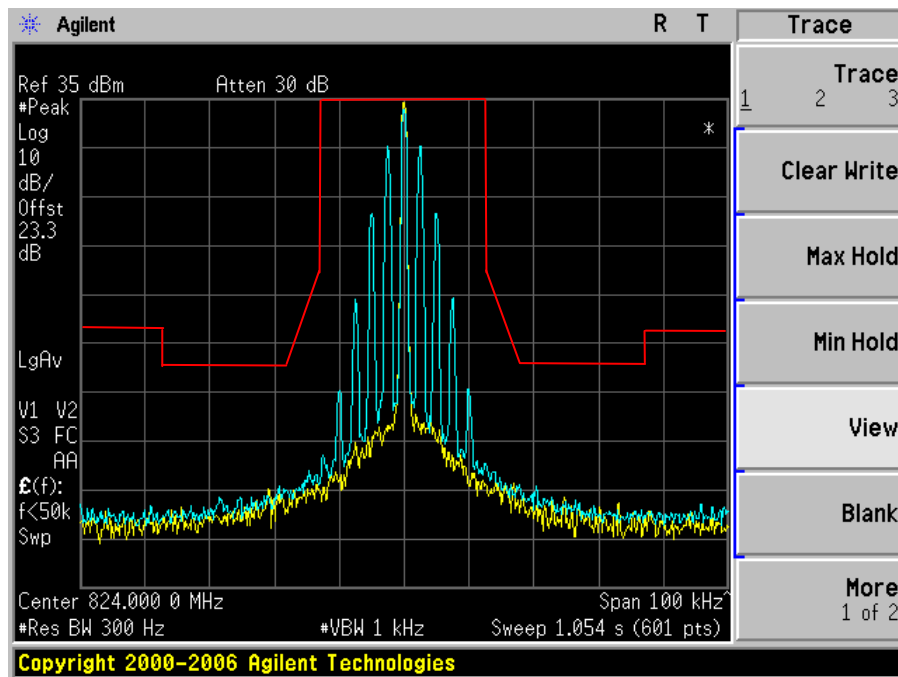
Low Channel: 806 MHz



Middle Channel: 815 MHz

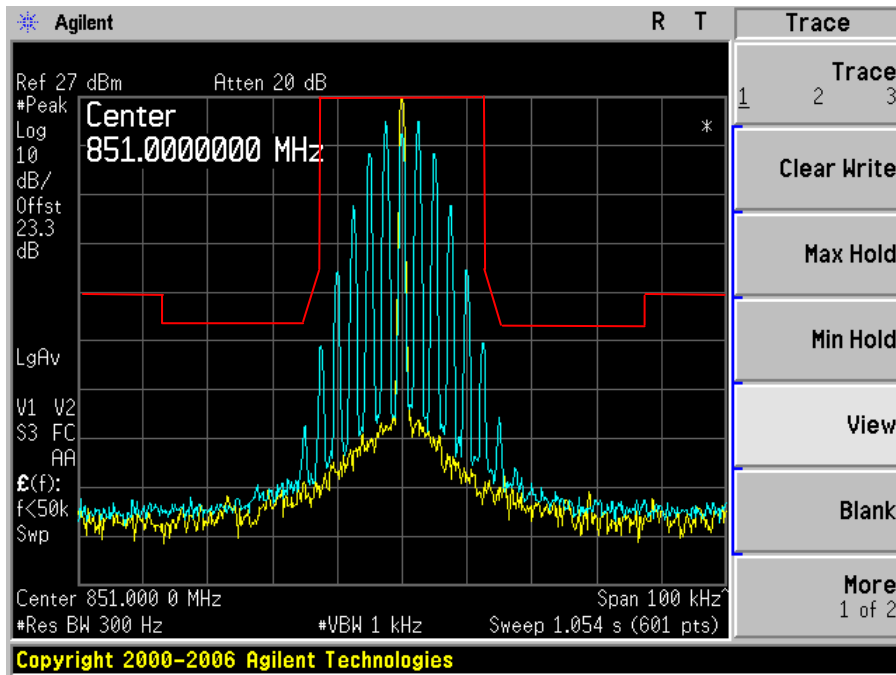


High Channel: 824 MHz

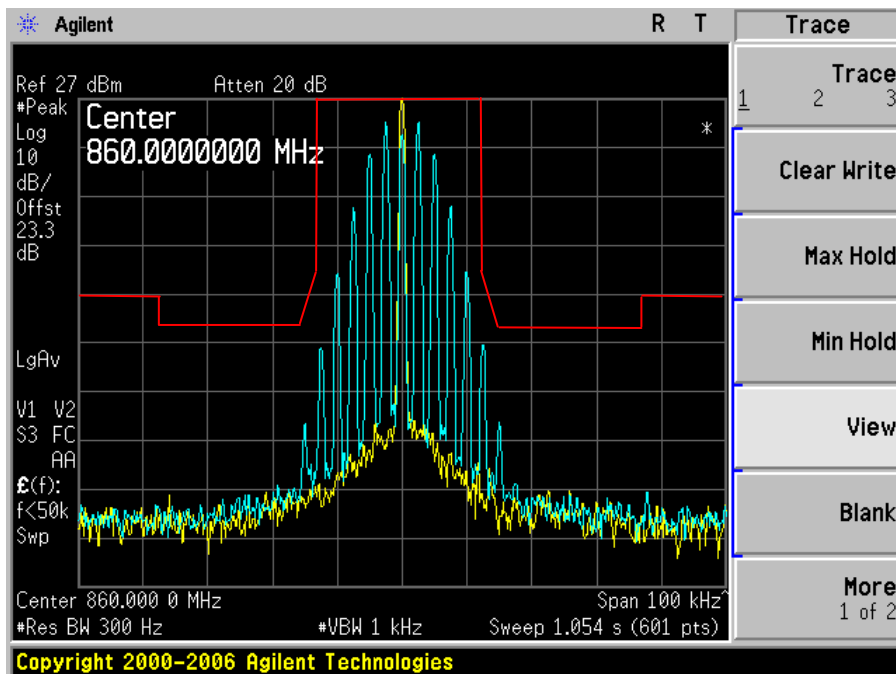


### Downlink: FM Voice, 25 kHz Channel Spacing

Low Channel: 851 MHz

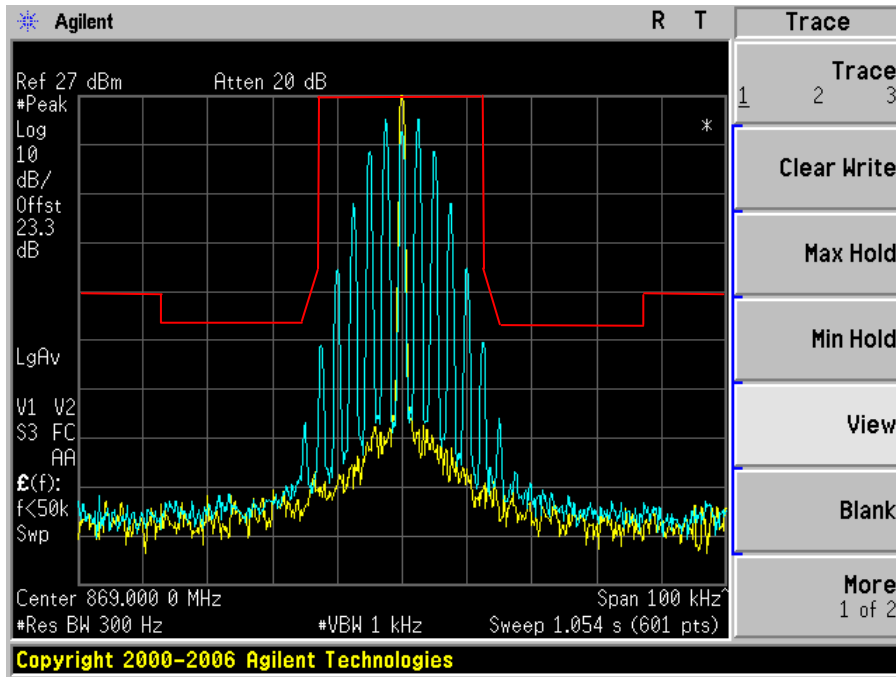


Middle Channel: 860 MHz



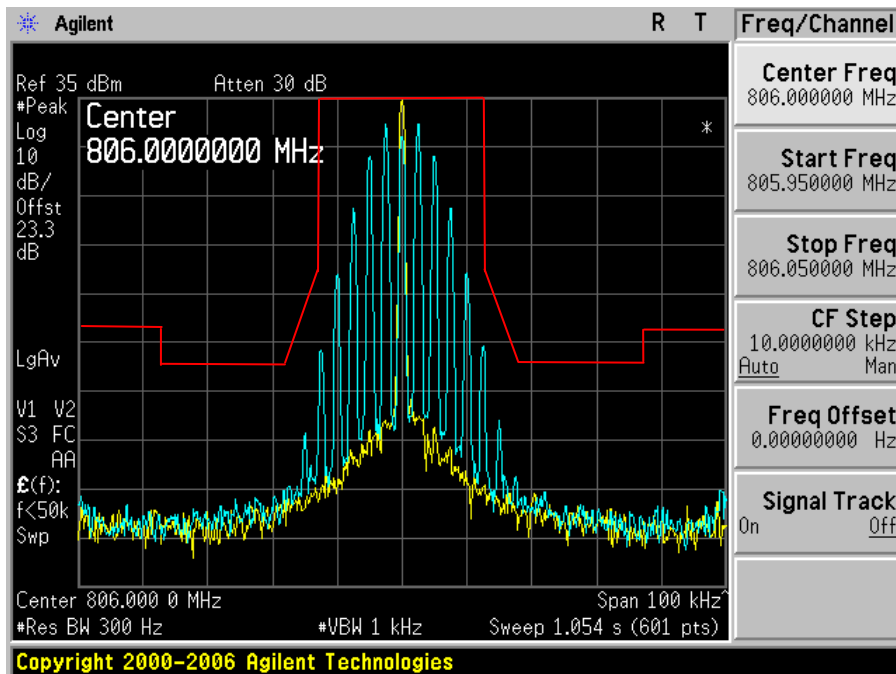


High Channel: 869 MHz

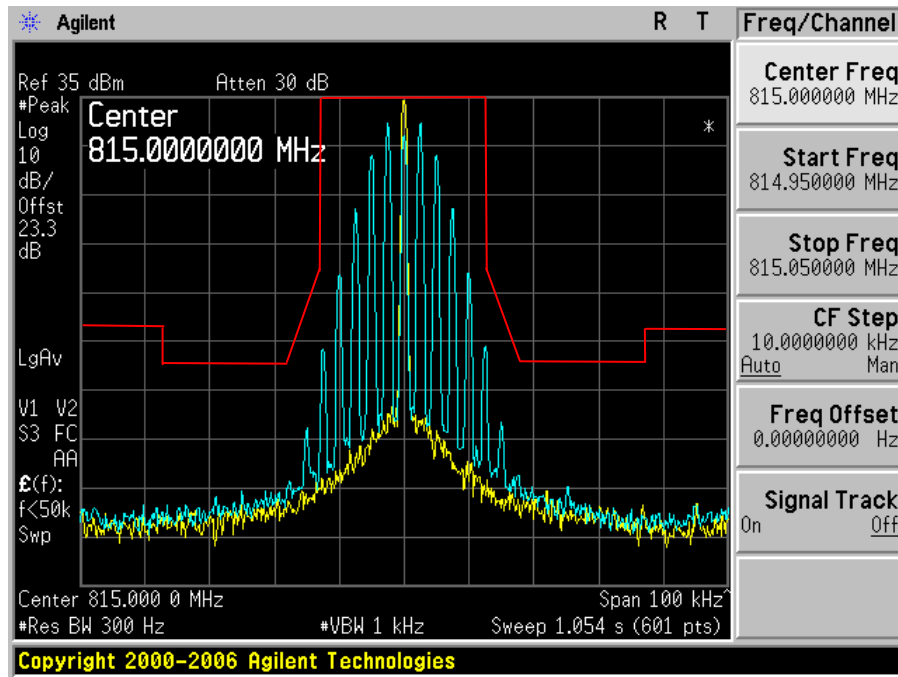


Uplink: FM Voice, 25 kHz Channel Spacing

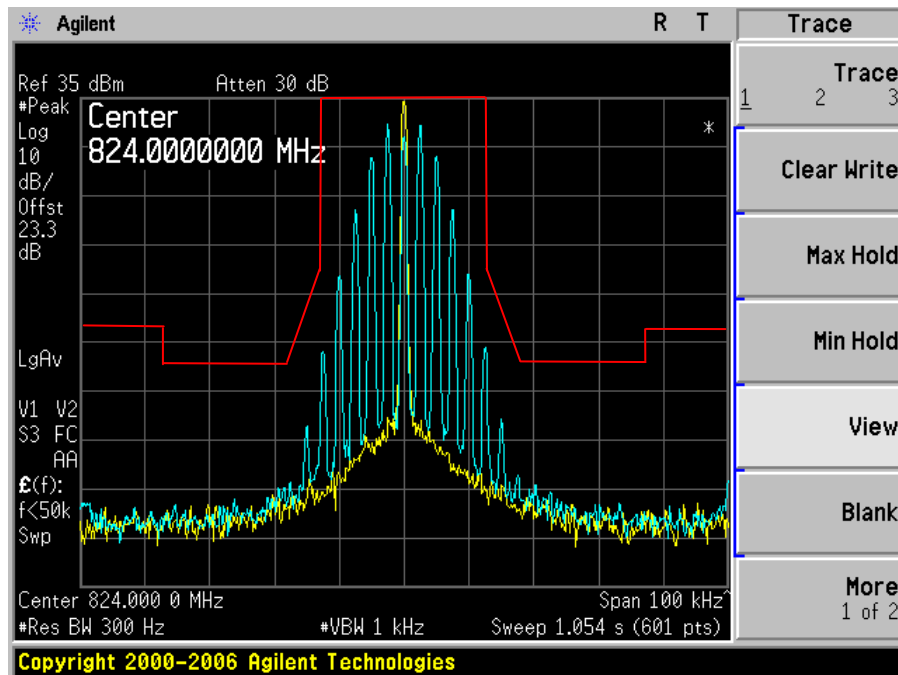
Low Channel: 806 MHz



Middle Channel: 815 MHz

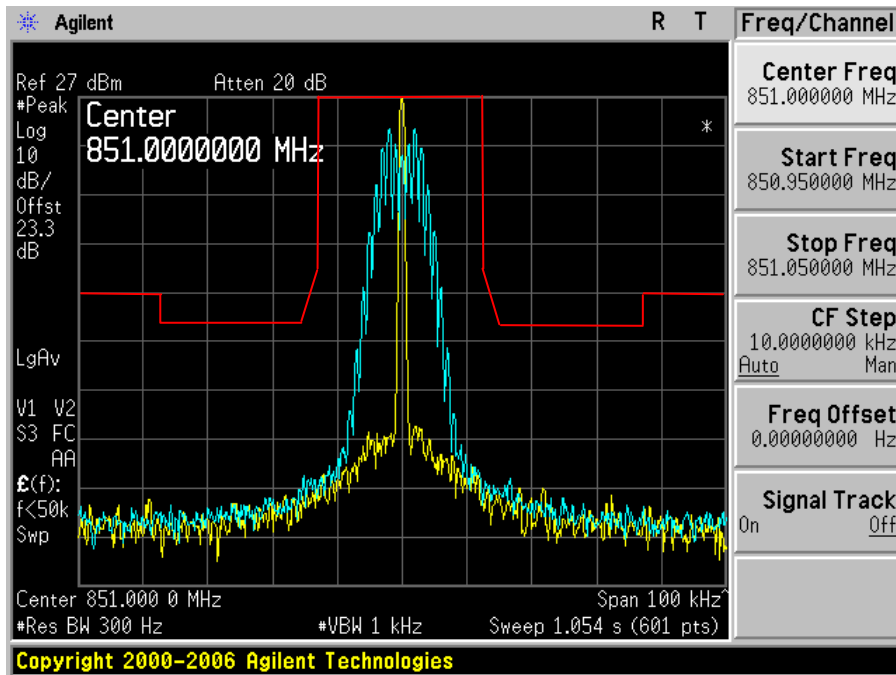


High Channel: 824 MHz

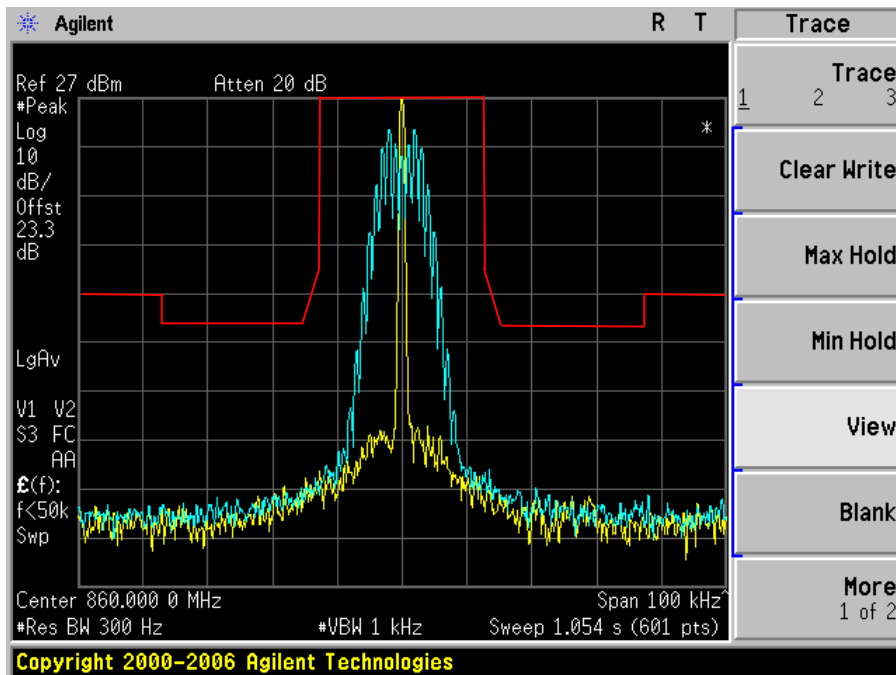


### Downlink: FM Data, 12.5 kHz Channel Spacing

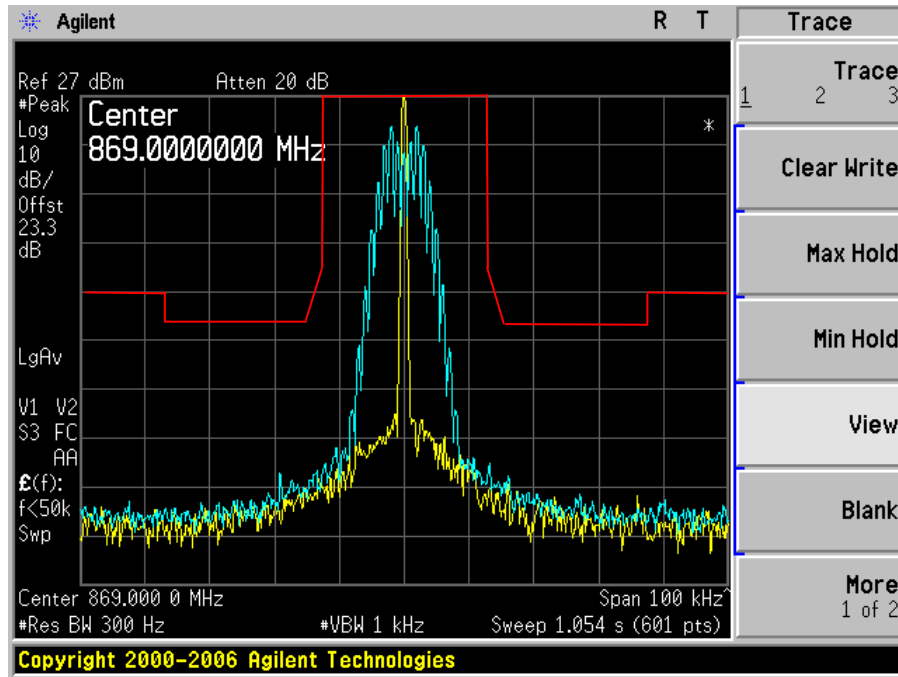
Low Channel: 851 MHz



Middle Channel: 860 MHz

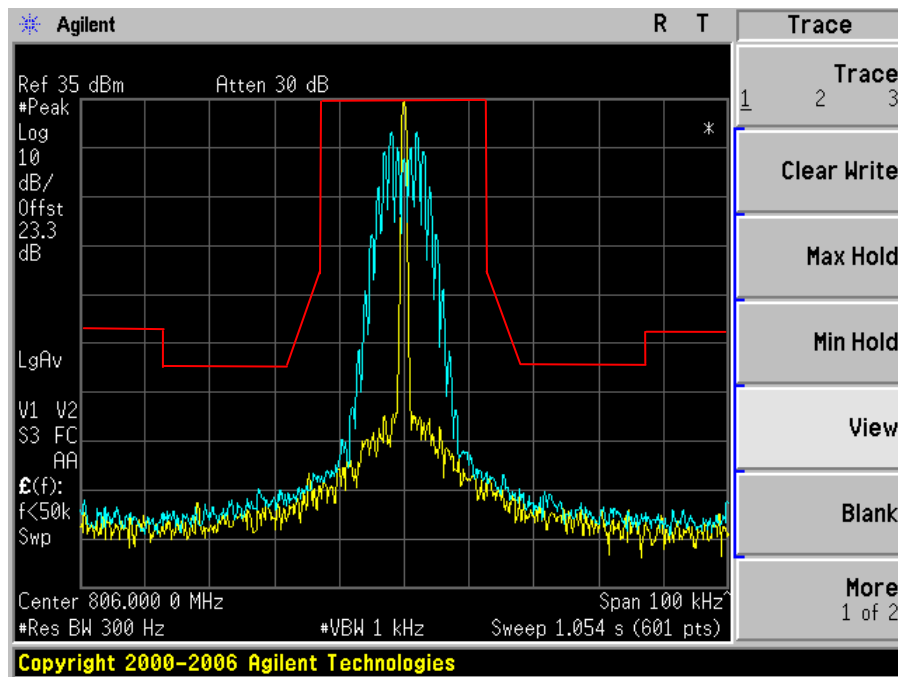


High Channel: 869 MHz

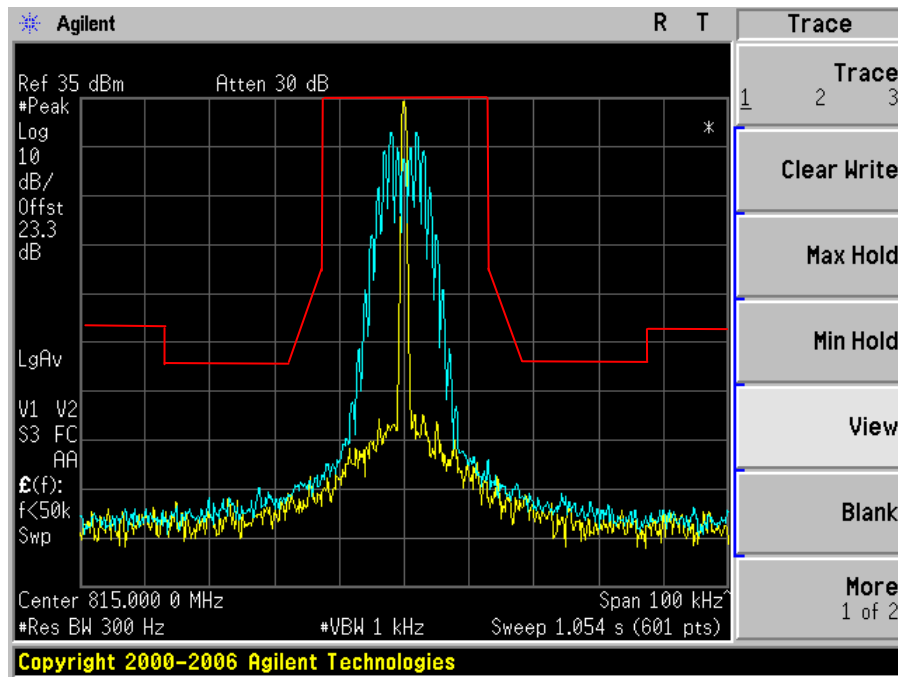


Uplink: FM Data, 12.5 kHz Channel Spacing

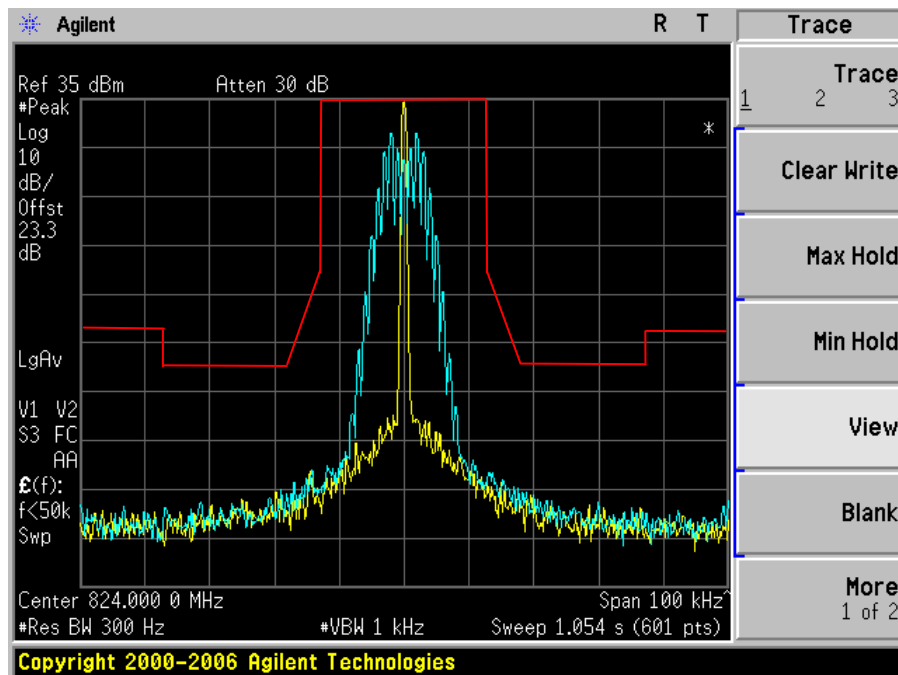
Low Channel: 806 MHz



Middle Channel: 815 MHz

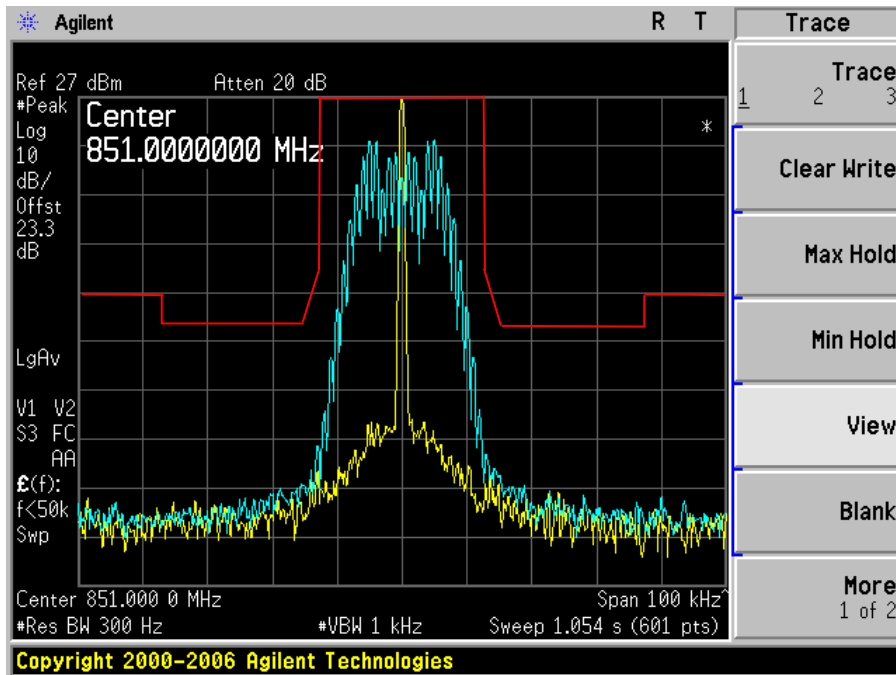


High Channel: 824 MHz

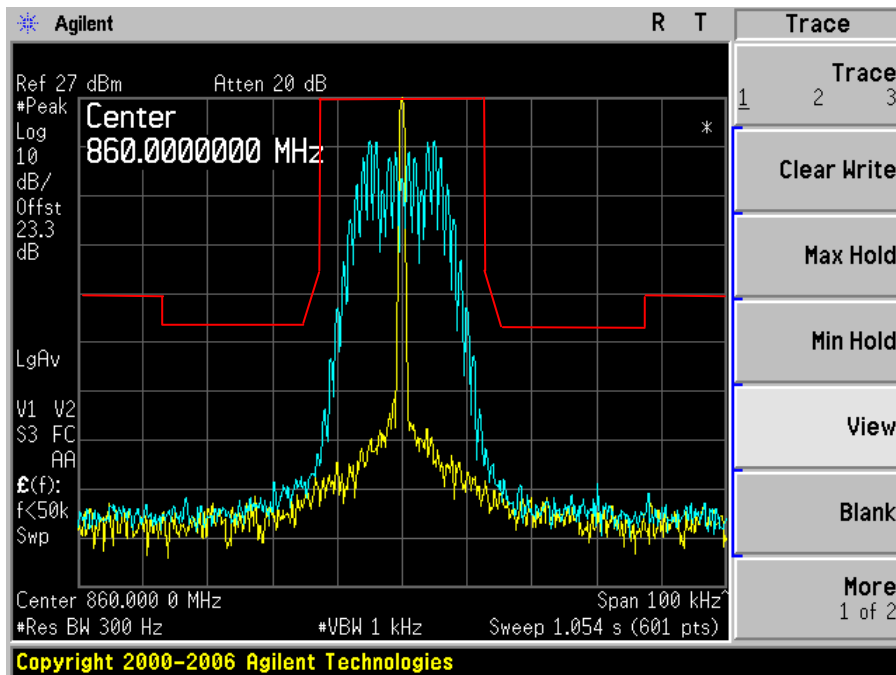


### Downlink: FM Data, 25 kHz Channel Spacing

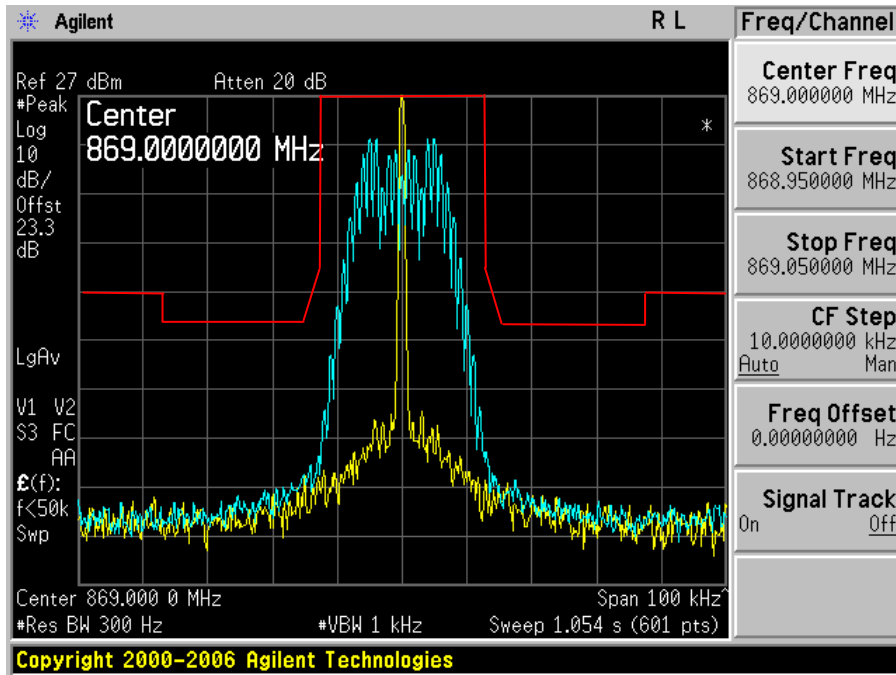
Low Channel: 851 MHz



Middle Channel: 860 MHz

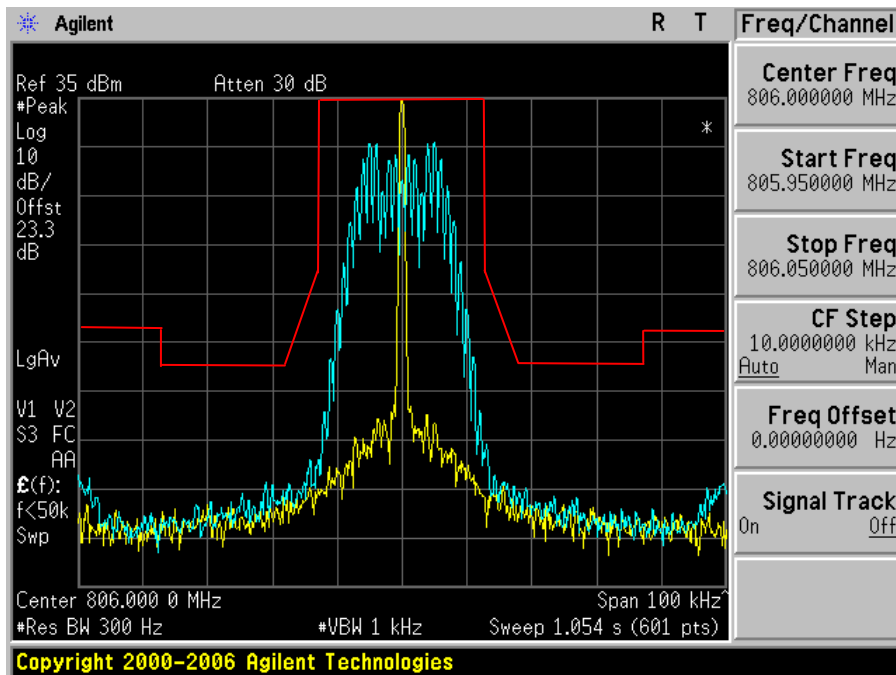


High Channel: 869 MHz

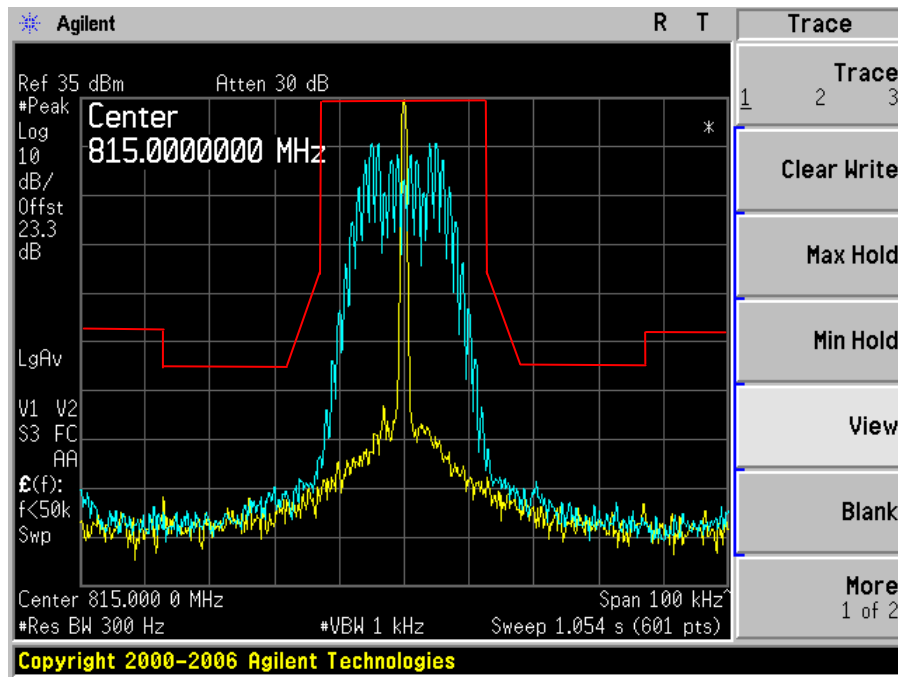


Uplink: FM Data, 25 kHz Channel Spacing

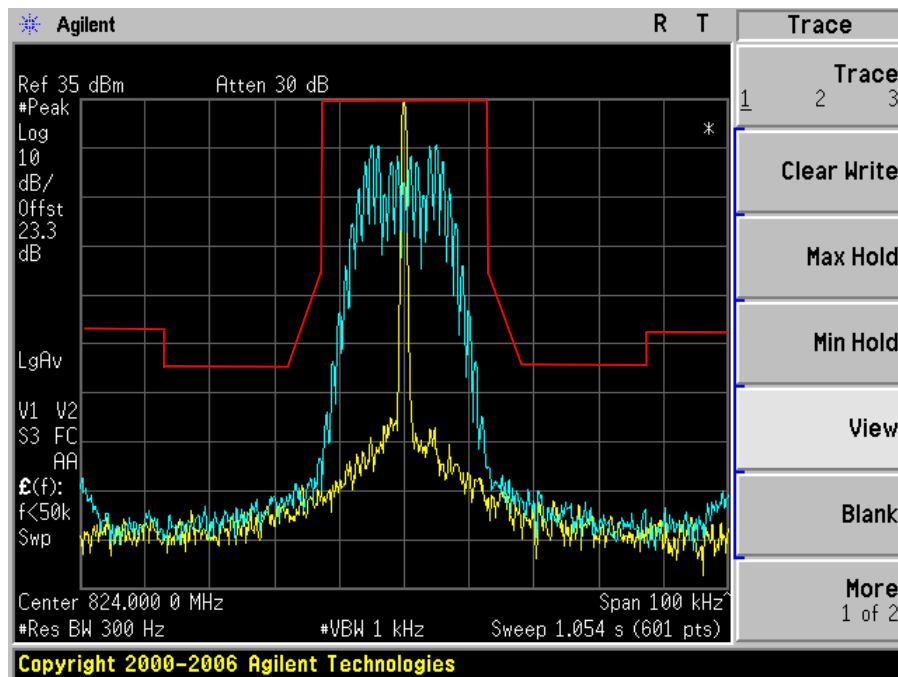
Low Channel: 806 MHz



Middle Channel: 815 MHz



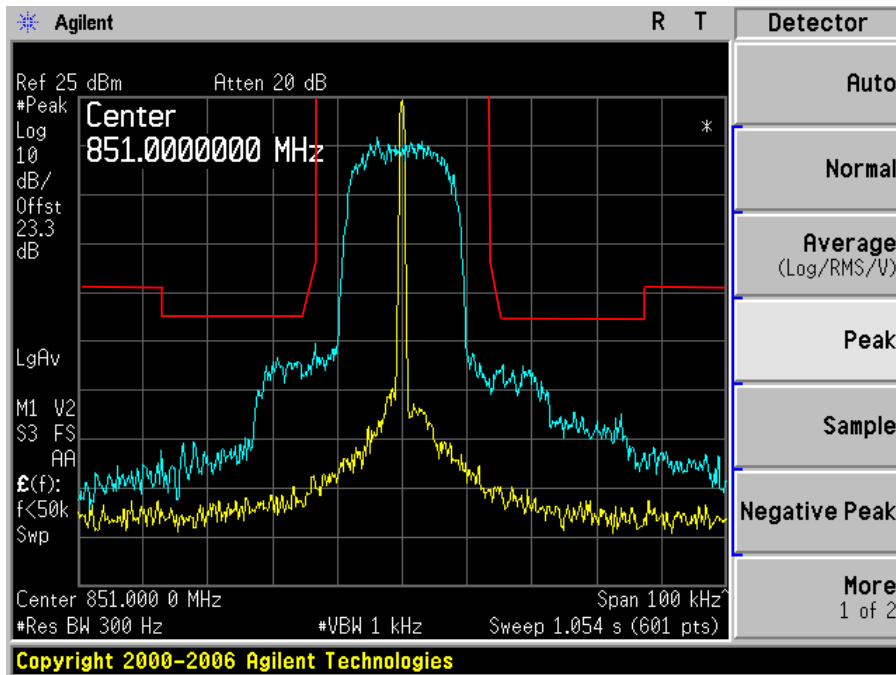
High Channel: 824 MHz



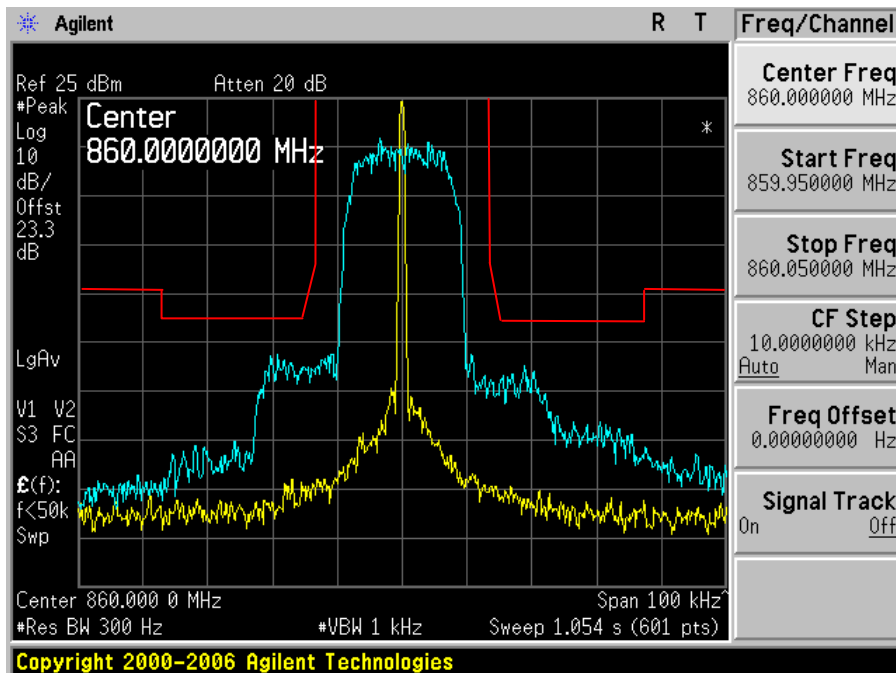


**Downlink: iDEN**

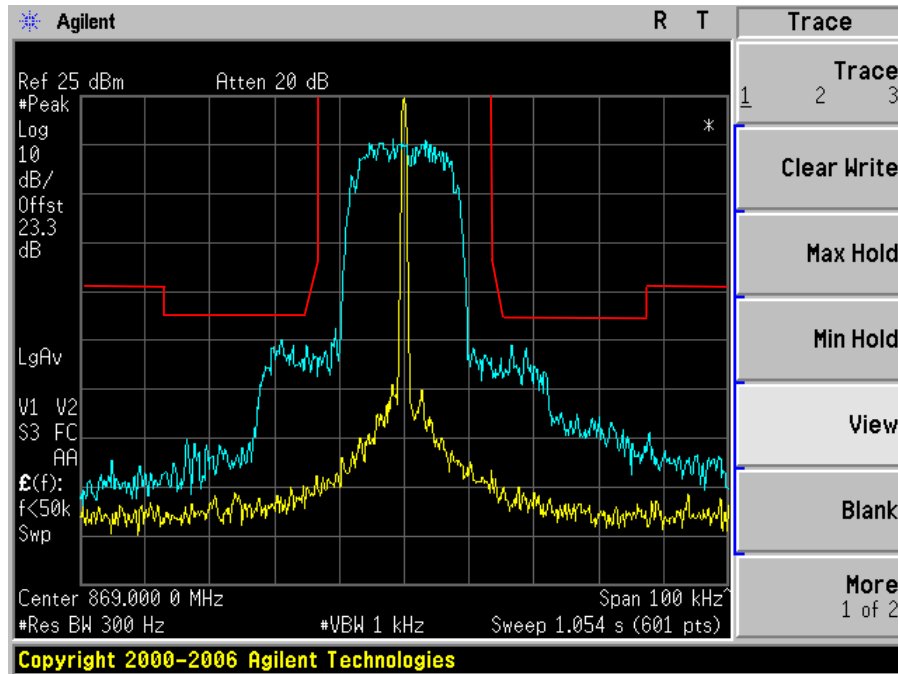
Low Channel: 851 MHz



Middle Channel: 860 MHz

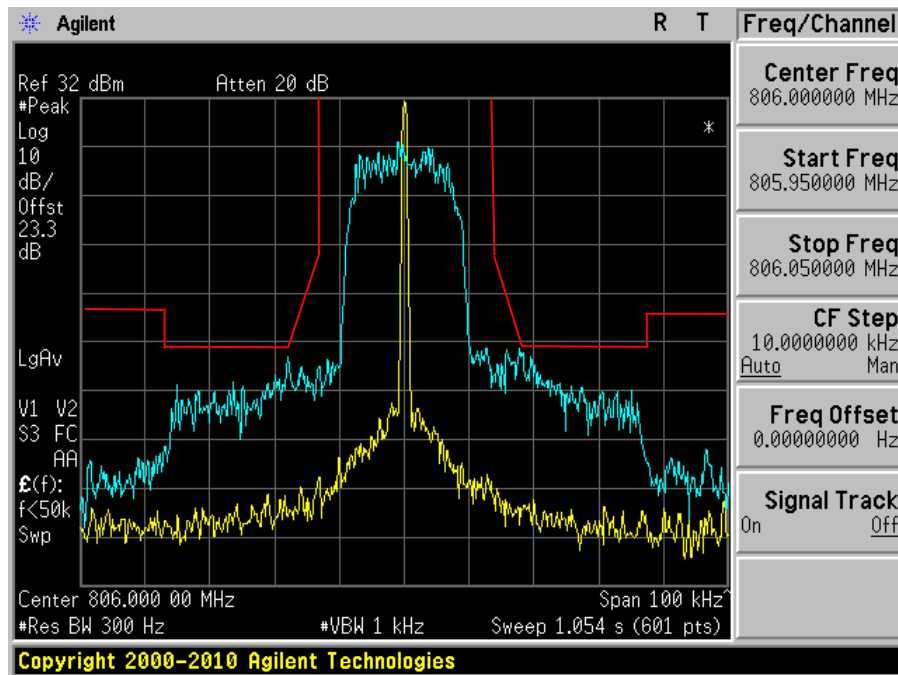


High Channel: 869 MHz

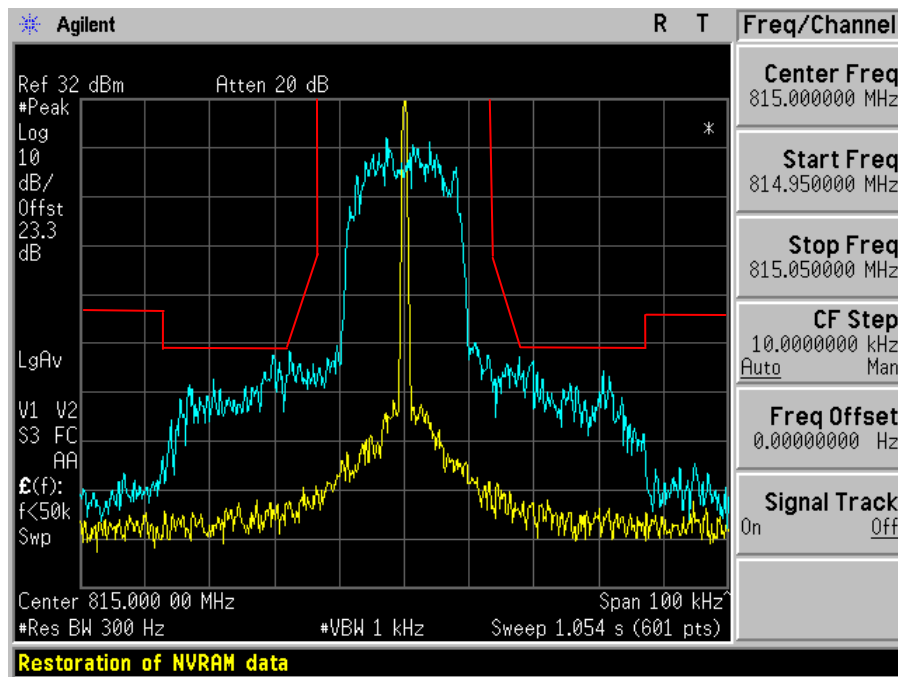


Uplink: iDEN

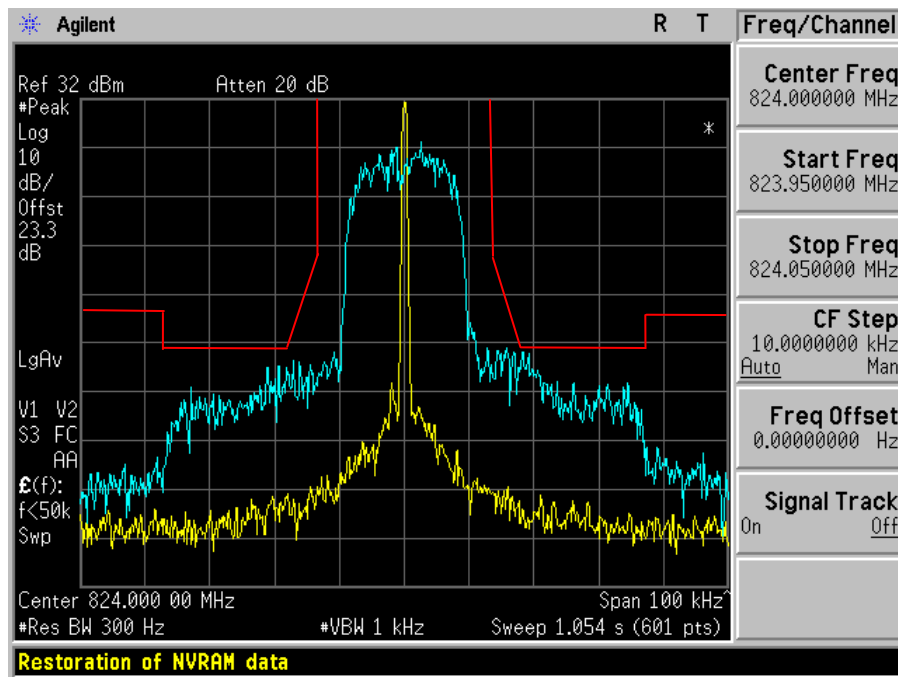
Low Channel: 806 MHz



Middle Channel: 815 MHz

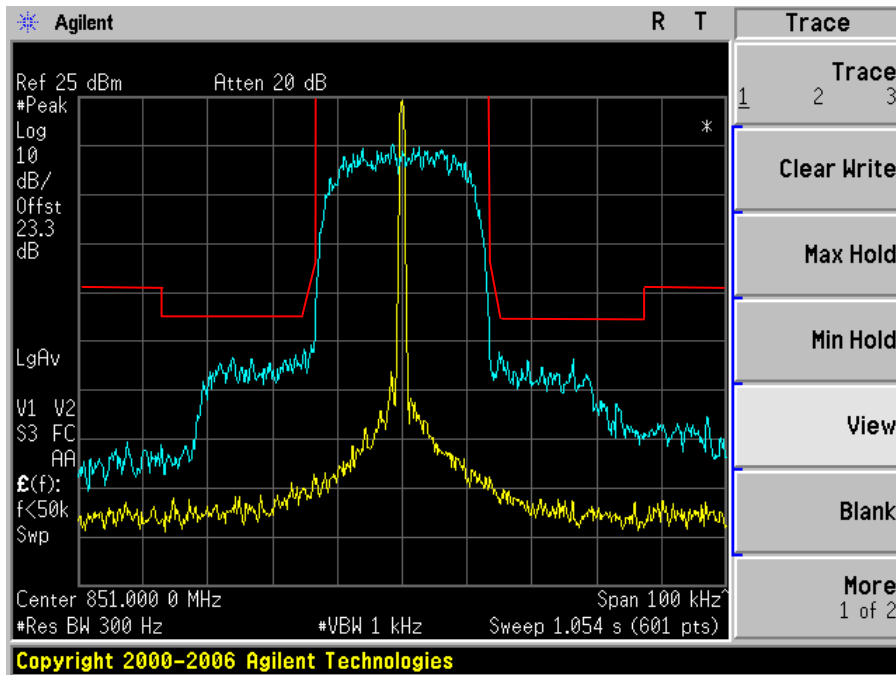


High Channel: 824 MHz

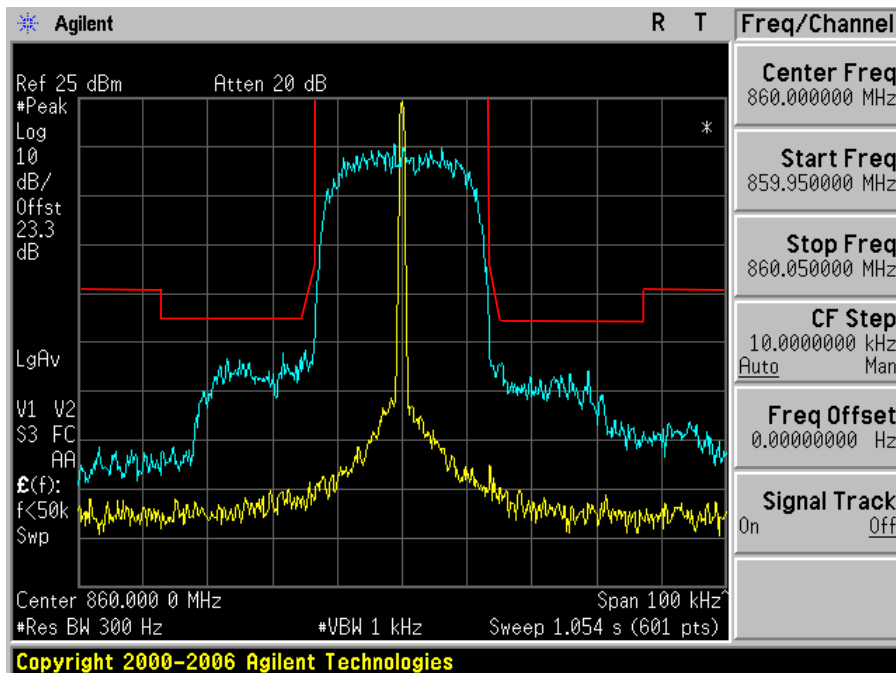


**Downlink: GSM**

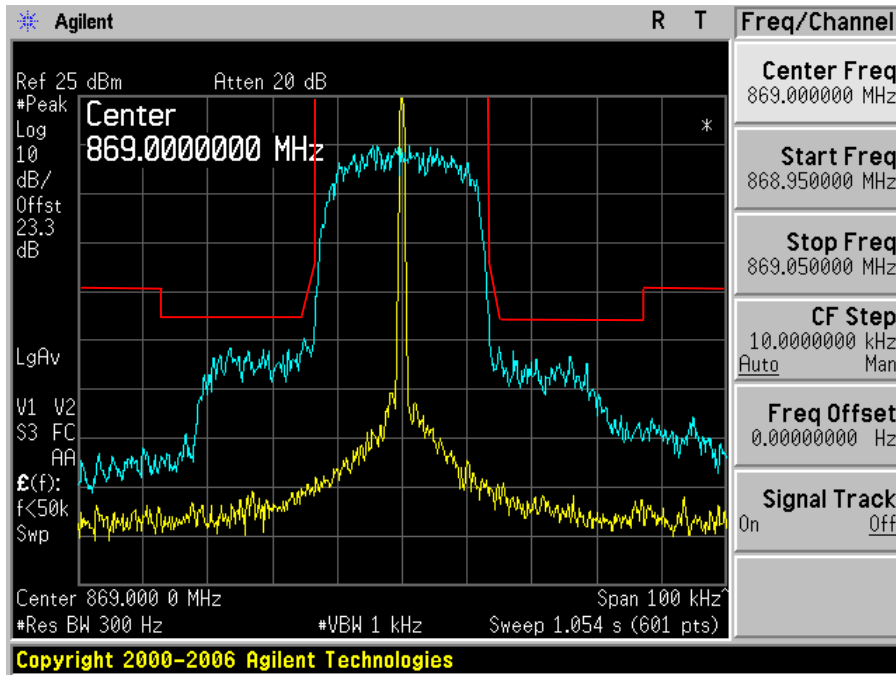
Low Channel: 851 MHz



Middle Channel: 860 MHz

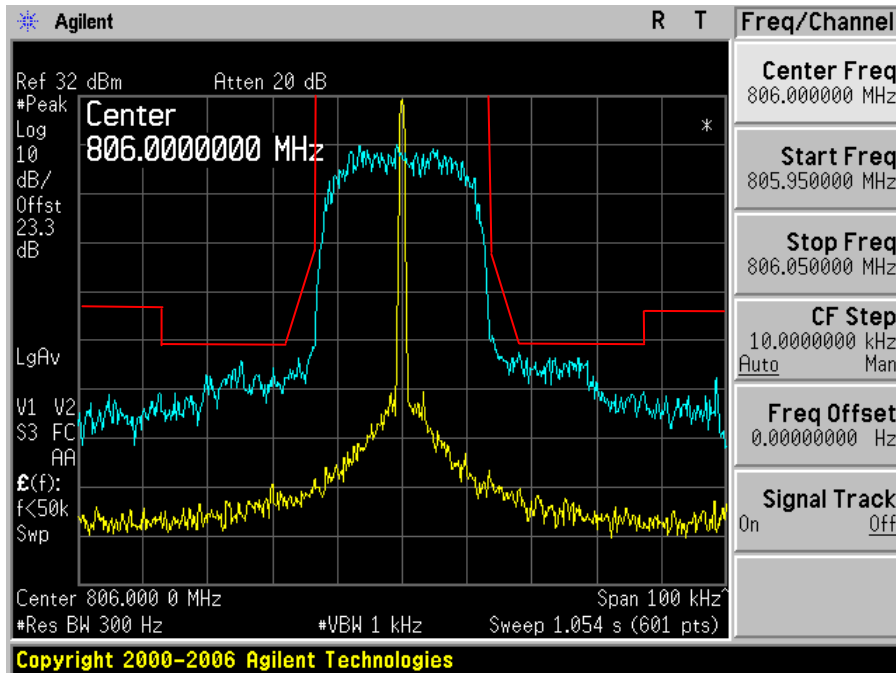


High Channel: 869 MHz

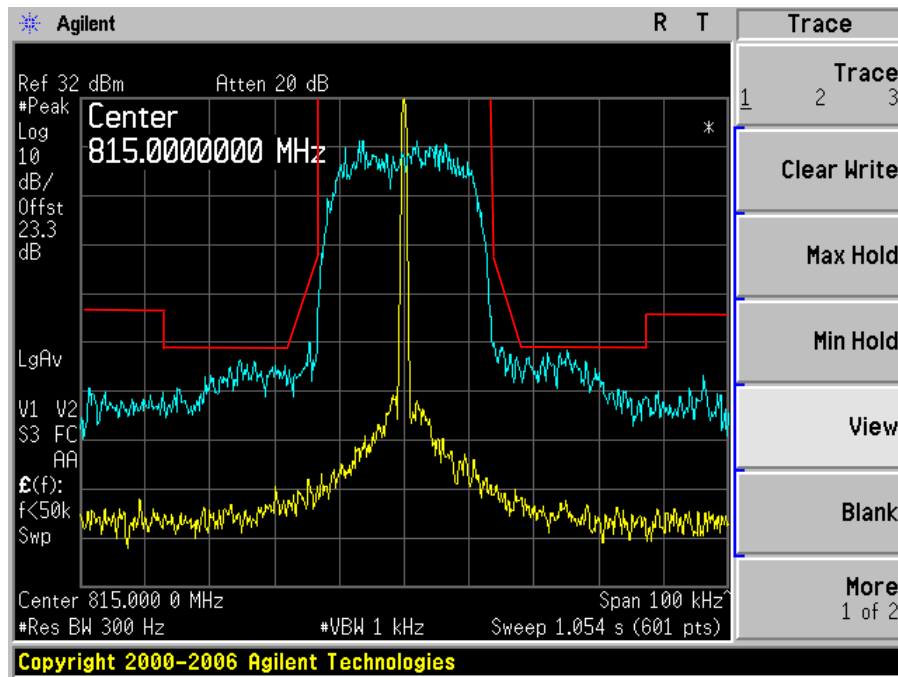


Uplink: GSM

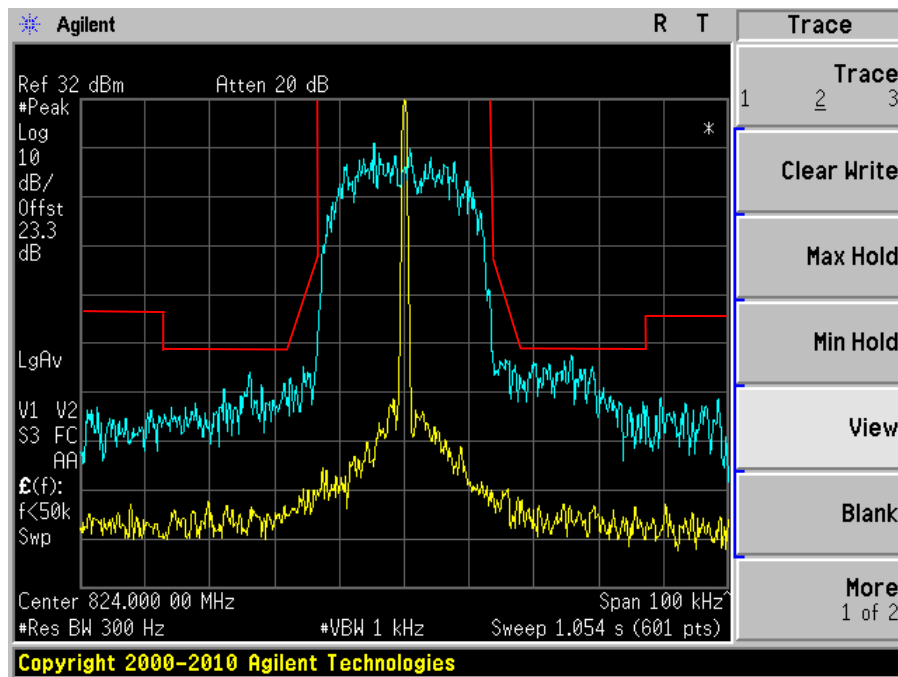
Low Channel: 806 MHz



Middle Channel: 815 MHz



High Channel: 824 MHz



## 8 FCC §2.1051, §90.210 & §90.669 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### 8.1 Applicable Standard

Requirements: FCC §2.1051, §90.210 & §90.669.

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

### 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<sup>th</sup> harmonic.

### 8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

### 8.4 Test Environmental Conditions

<b>Temperature:</b>	22-25°C
<b>Relative Humidity:</b>	40-50 %
<b>ATM Pressure:</b>	101-102kPa

*The testing was performed by Quinn Jiang from 2011-09-29 to 2011-10-01 in RF Site.*

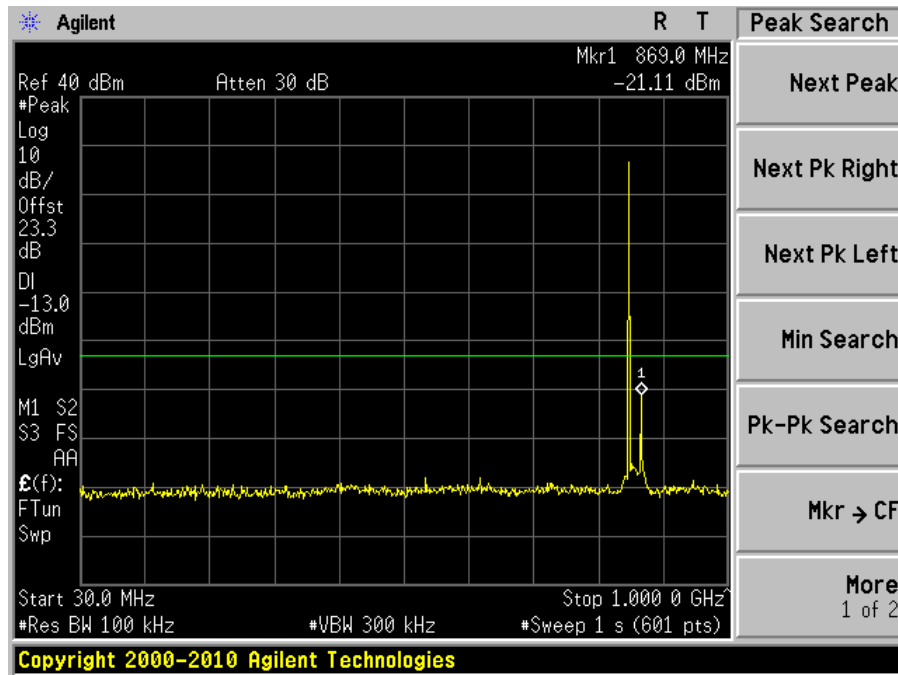
### 8.5 Test Results

Please refer to the hereinafter plots.

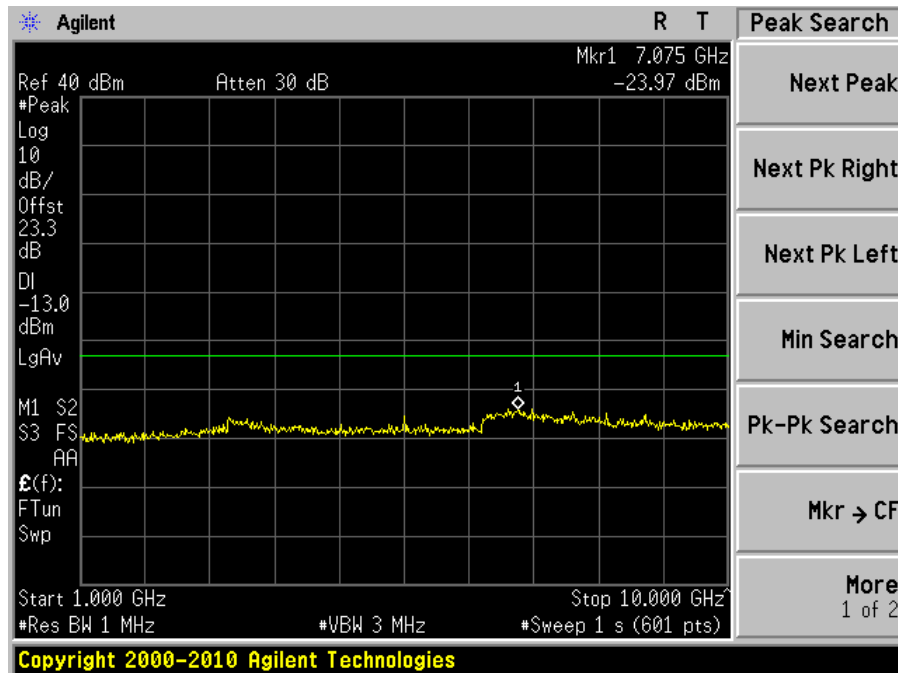
### Downlink

Low Channel (851 MHz)

30MHz ~ 1GHz



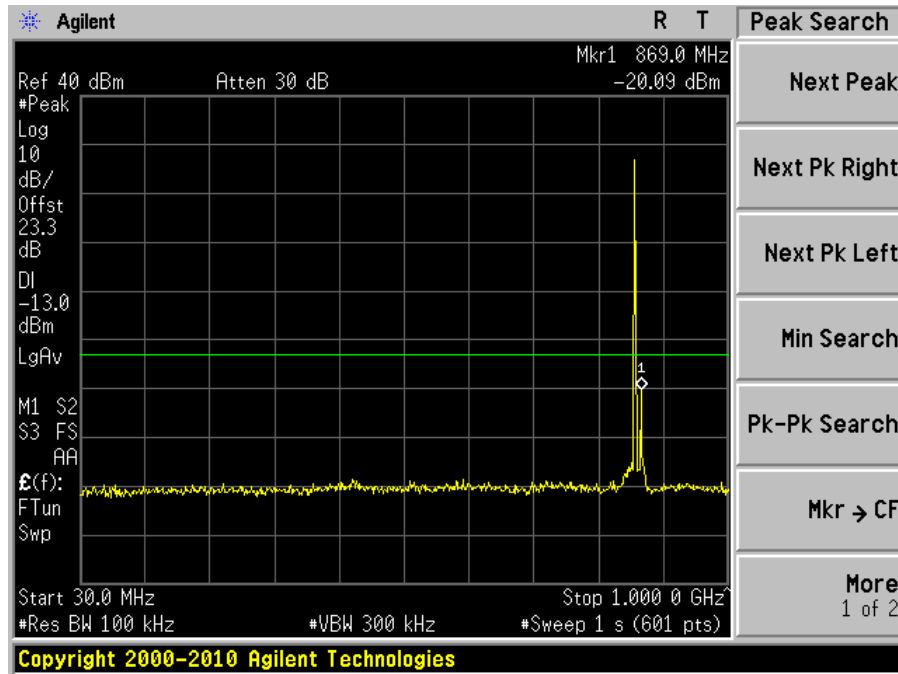
1GHz~10GHz



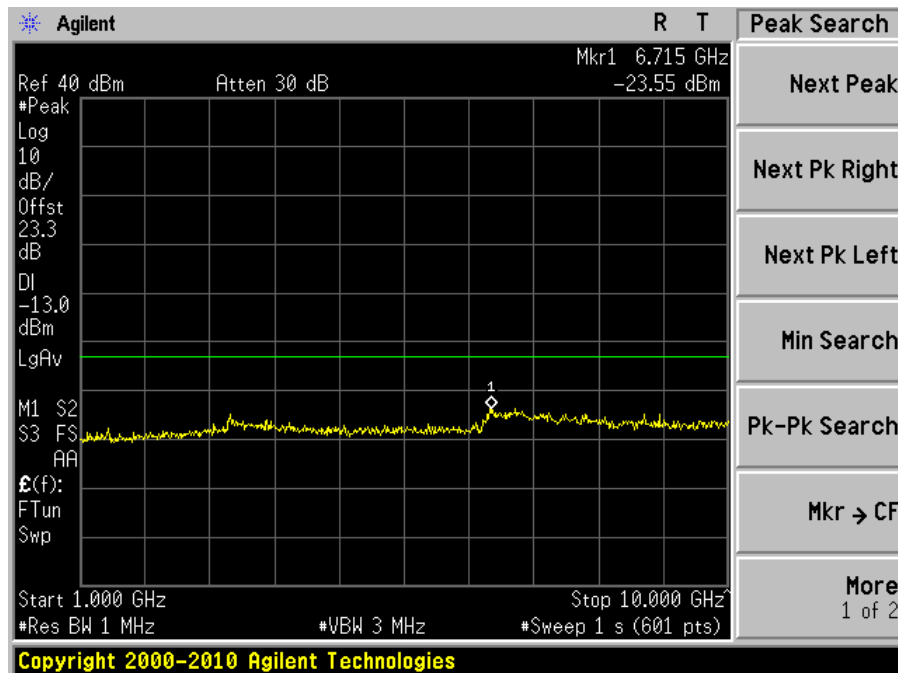


Middle Channel (860 MHz)

30MHz ~ 1GHz

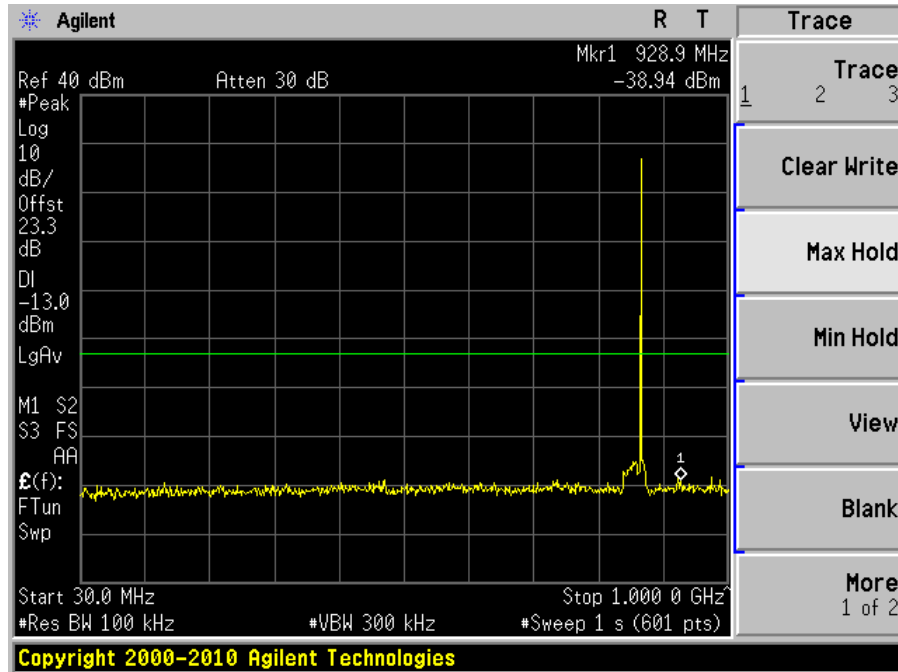


1GHz~10GHz

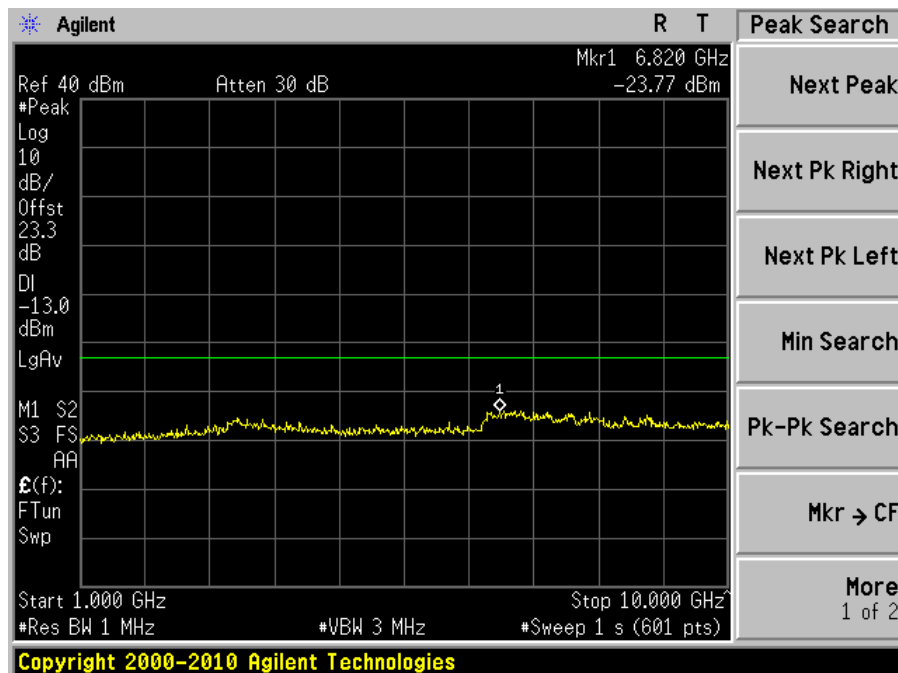


High Channel (869 MHz)

30MHz ~ 1GHz



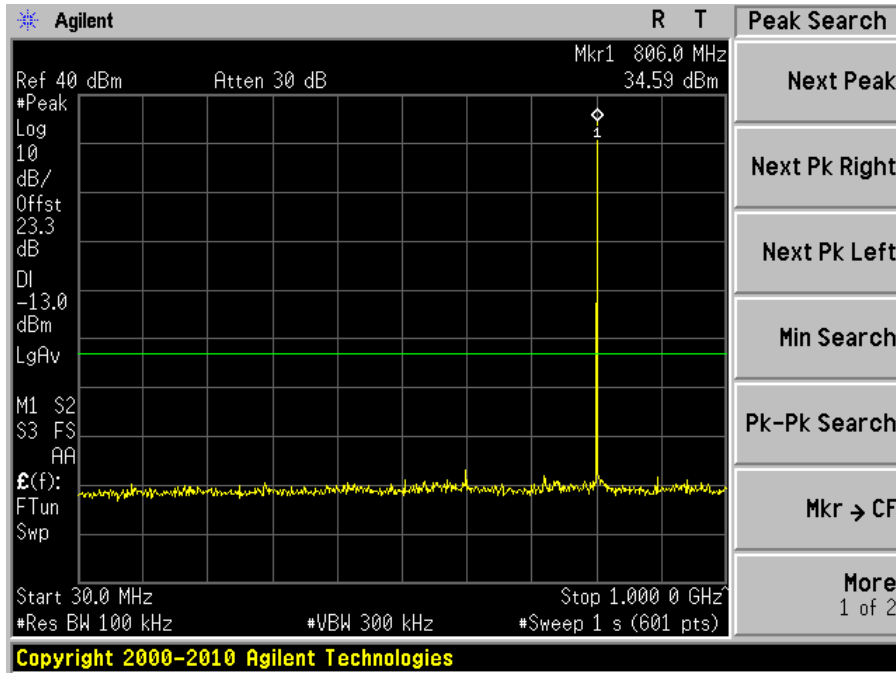
1GHz~10GHz



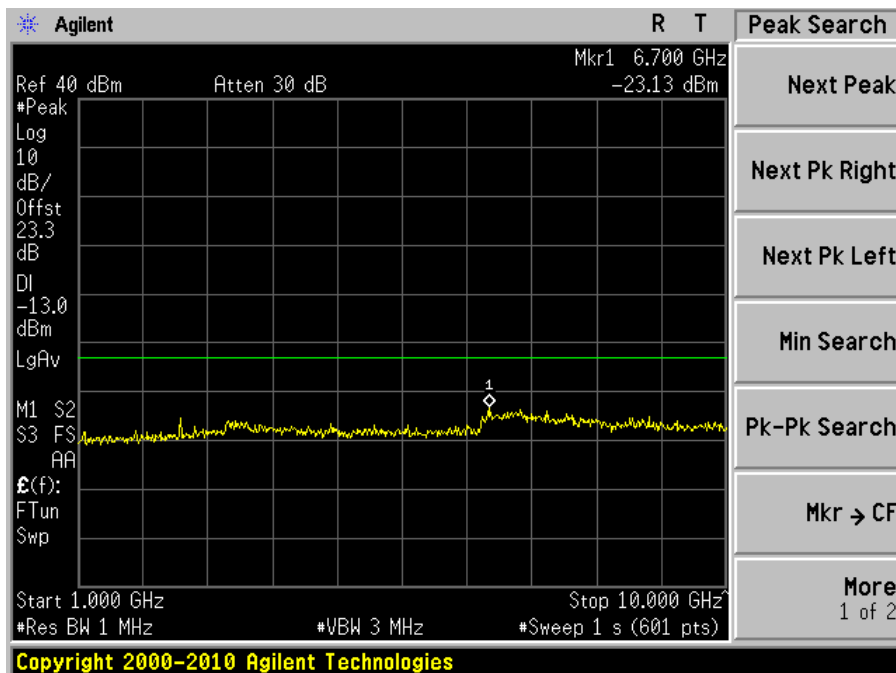
### Uplink

Low Channel (806 MHz)

30MHz ~ 1GHz

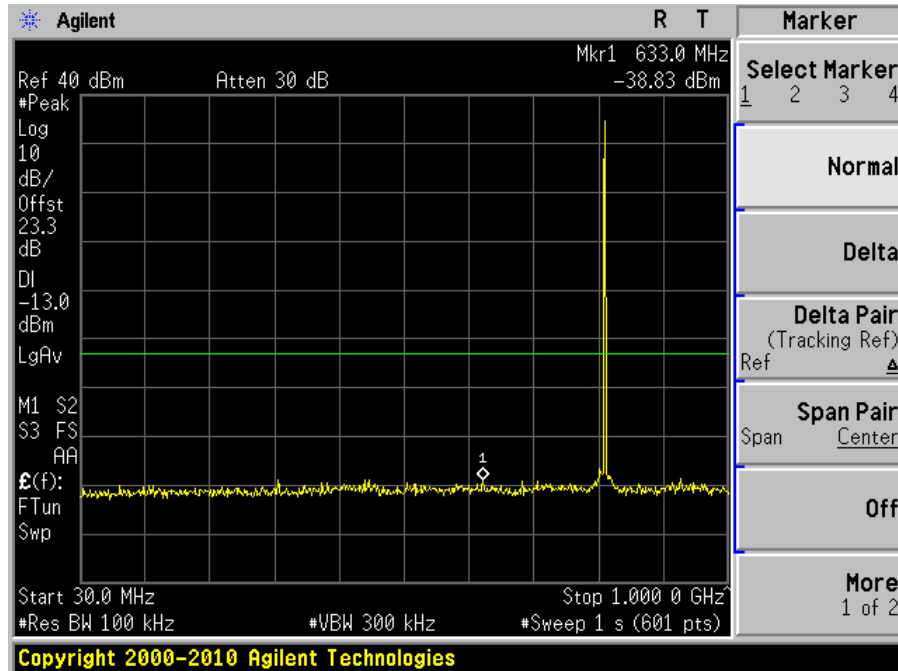


1GHz~10GHz

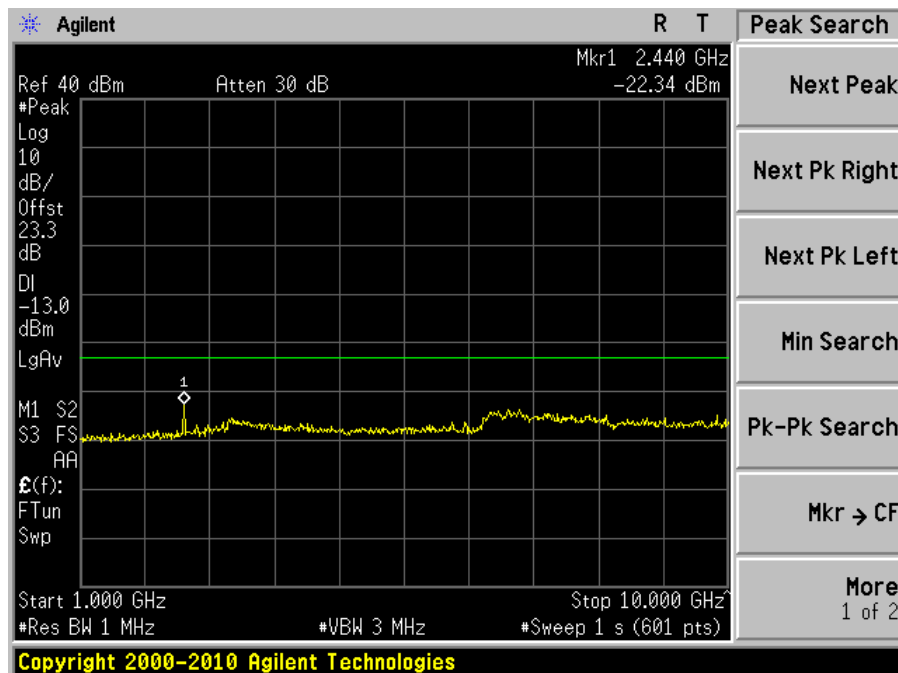


Middle Channel (815 MHz)

30MHz ~ 1GHz

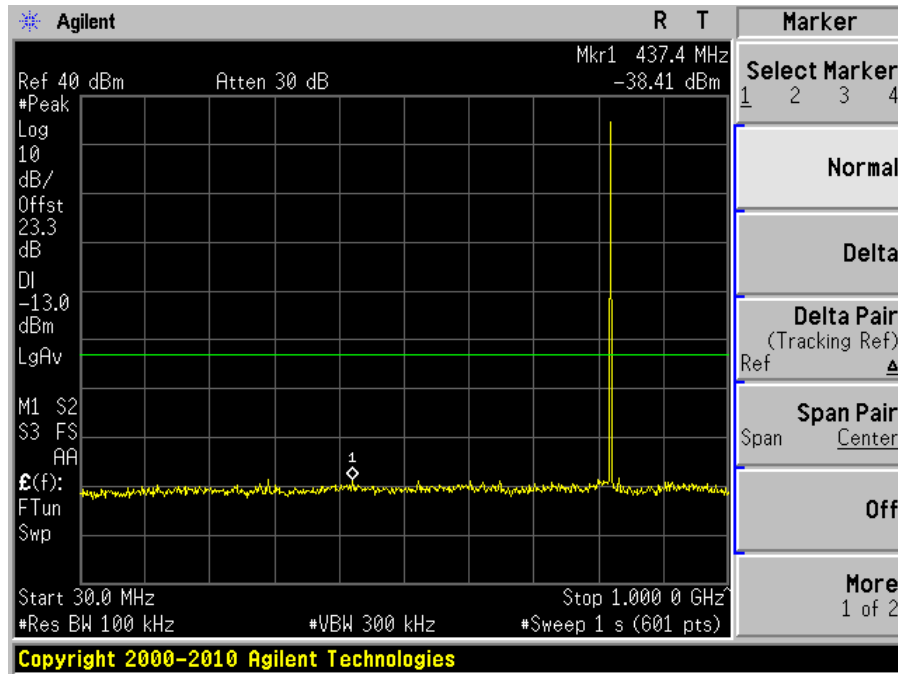


1GHz~10GHz

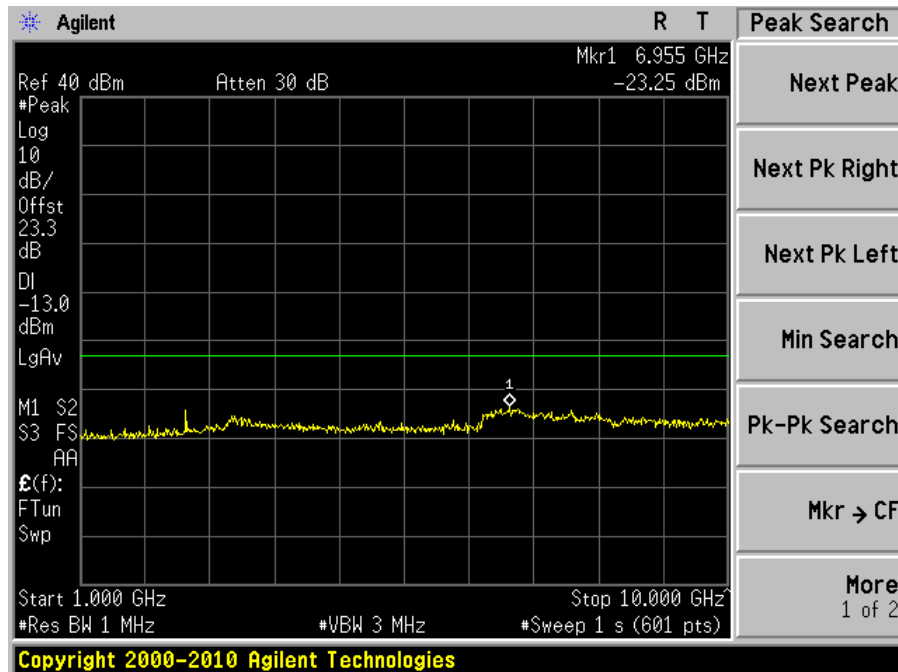


High Channel (824 MHz)

30MHz ~ 1GHz



1GHz~10GHz

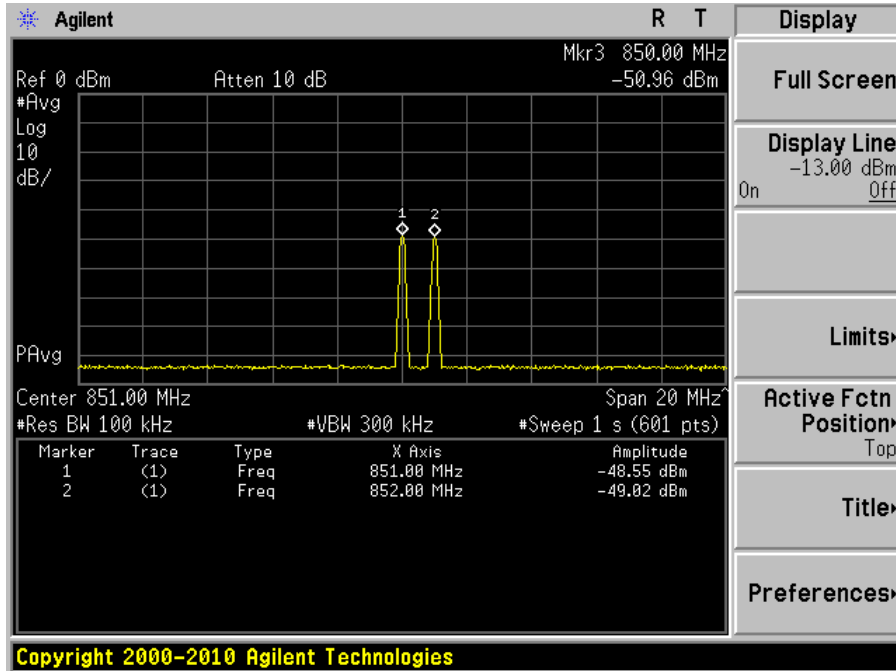


### Inter-modulation

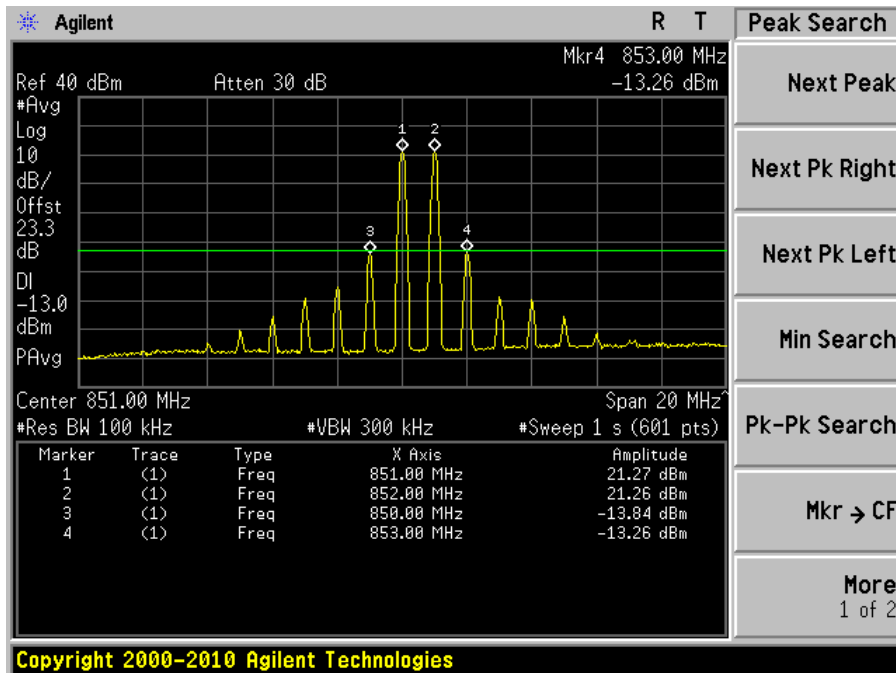
#### Downlink

Low Channel: 851 MHz

#### Input

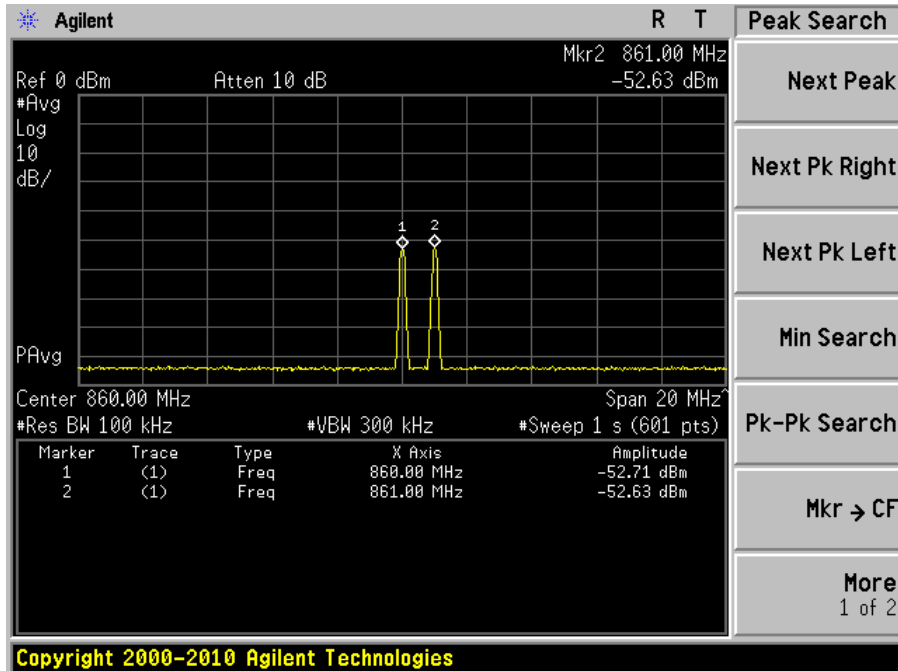


#### Output

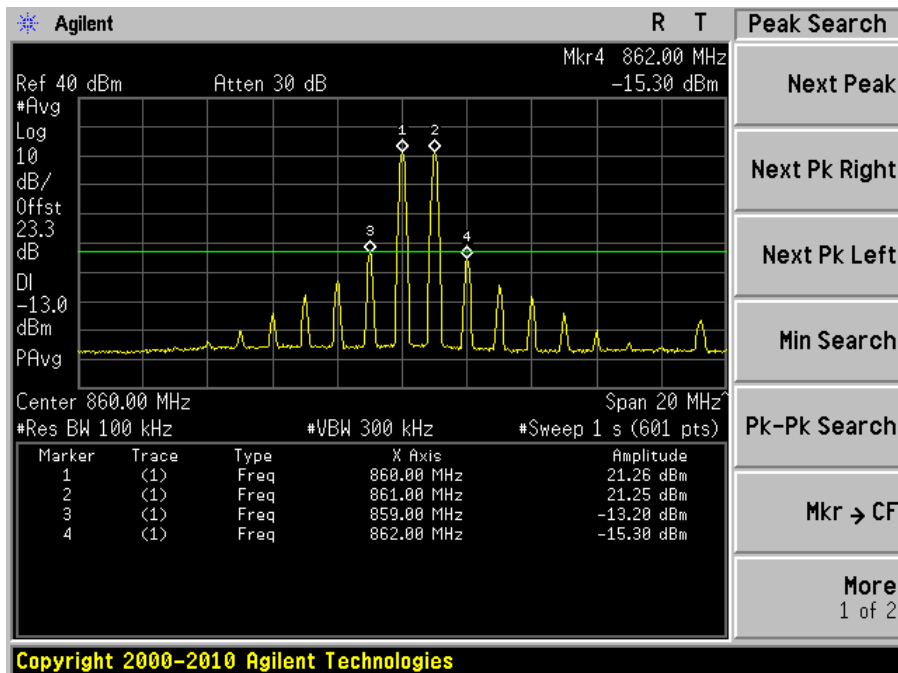


Middle Channel: 860 MHz

Input

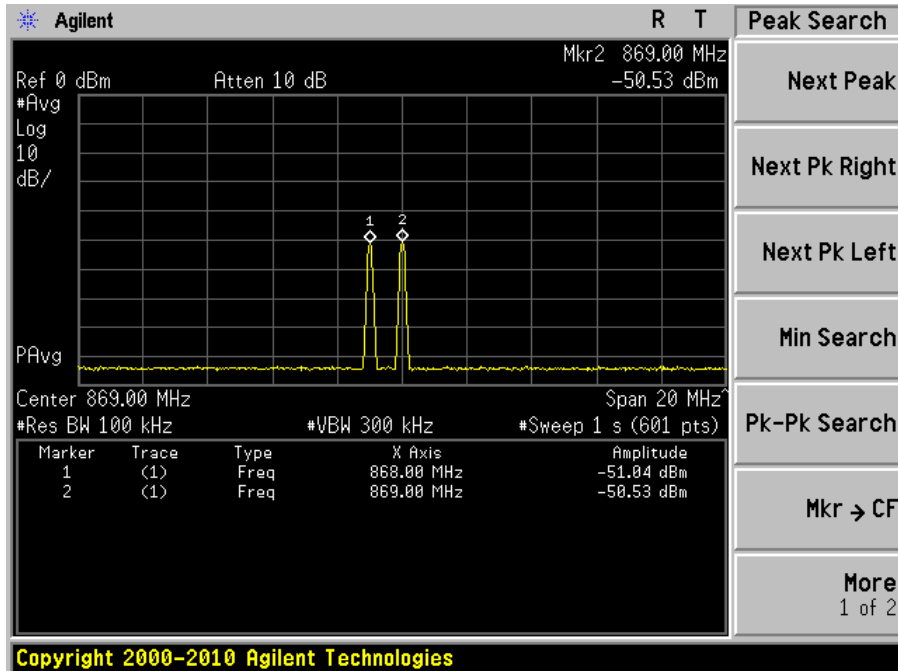


Output

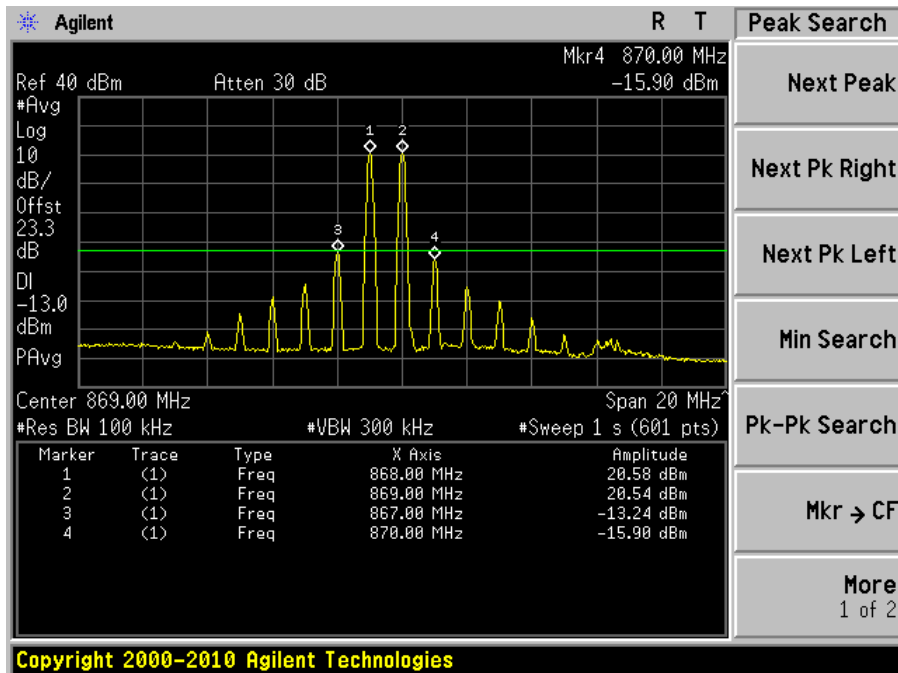


High Channel: 869 MHz

Input



Output

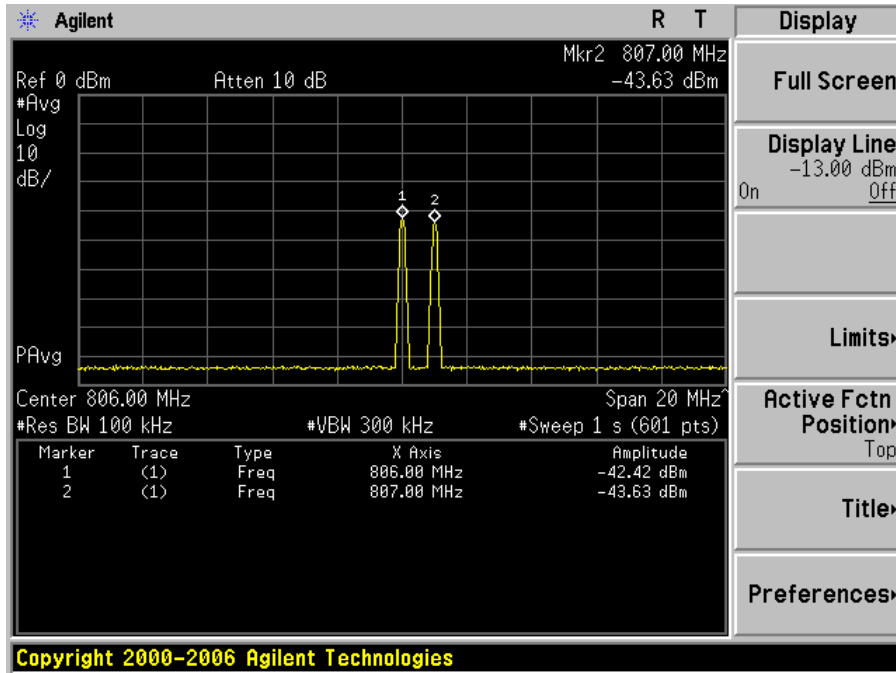




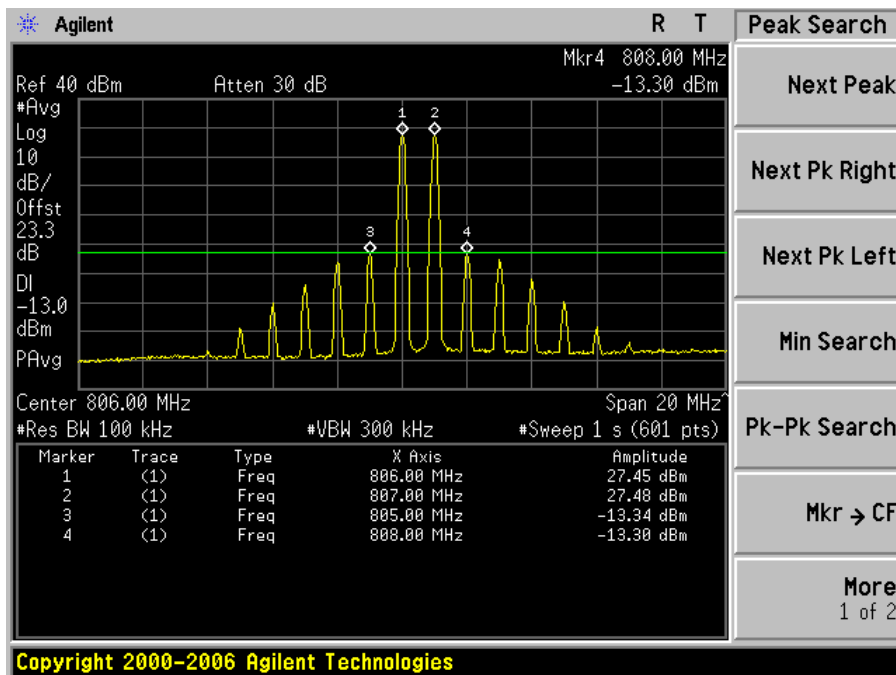
### Uplink

Low Channel: 806 MHz

#### Input

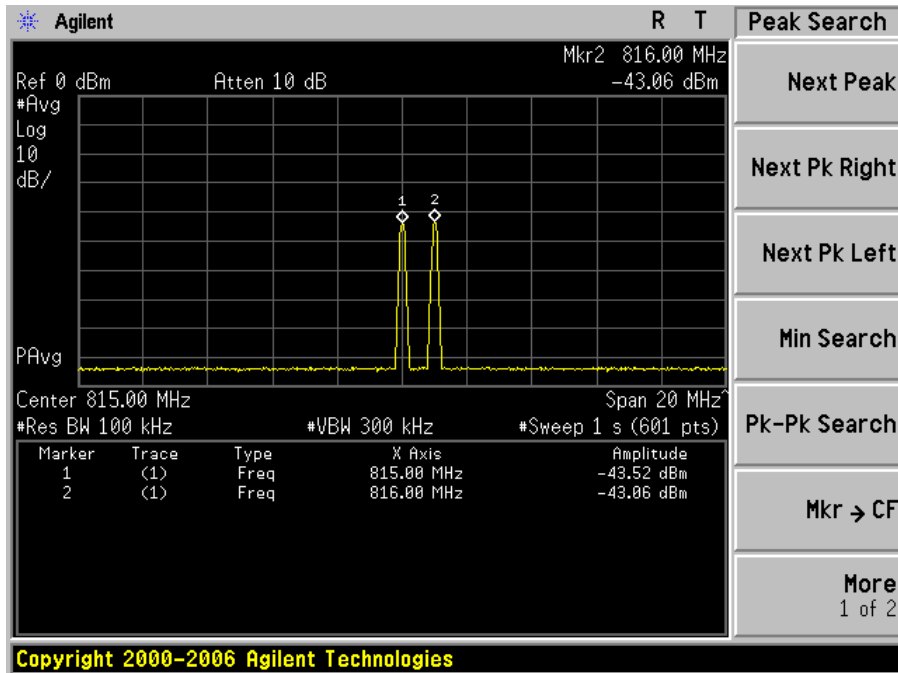


#### Output

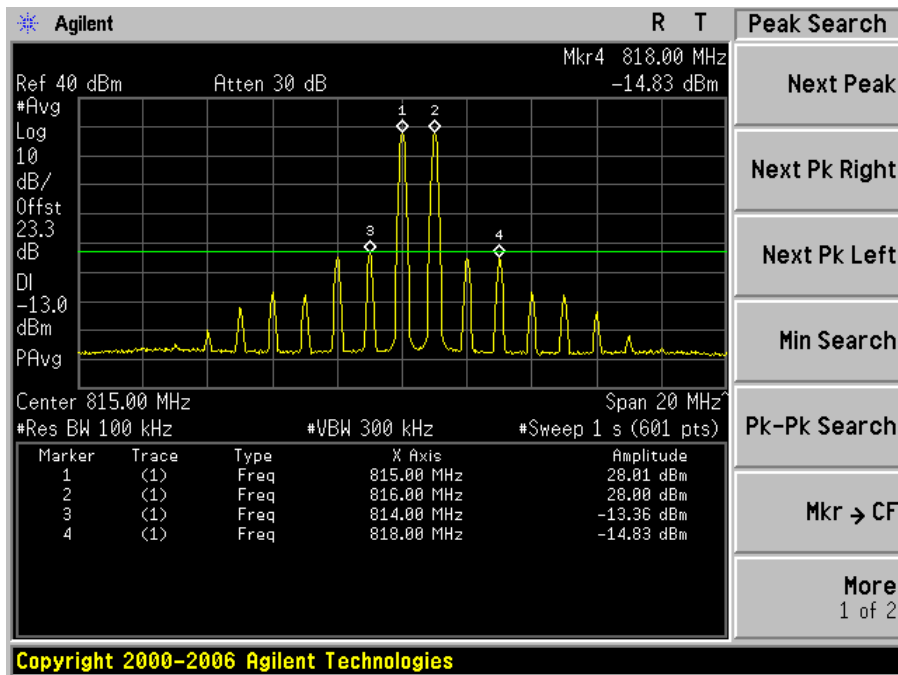


Middle Channel: 815 MHz

Input

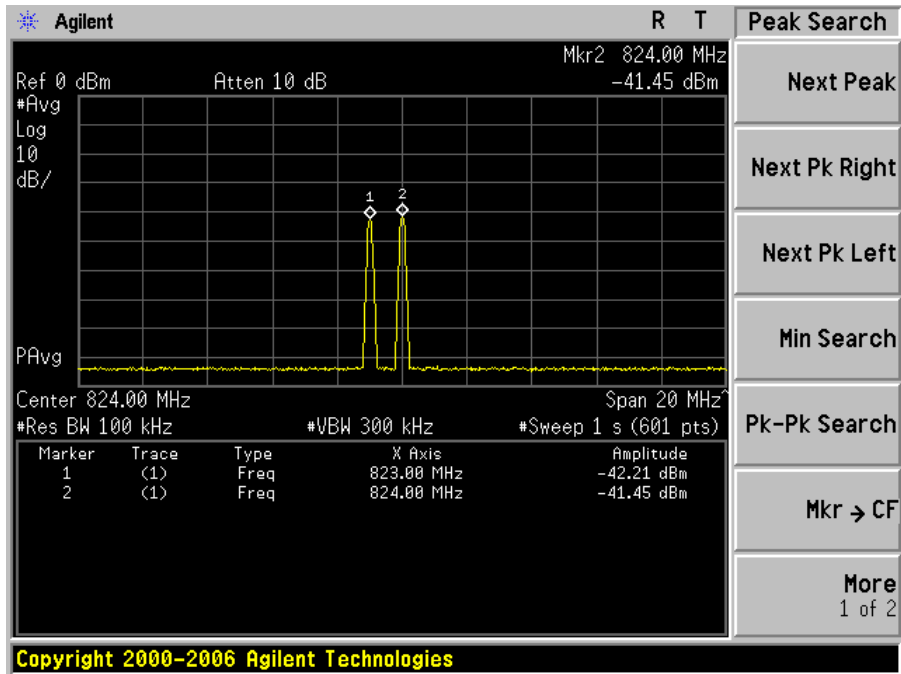


Output

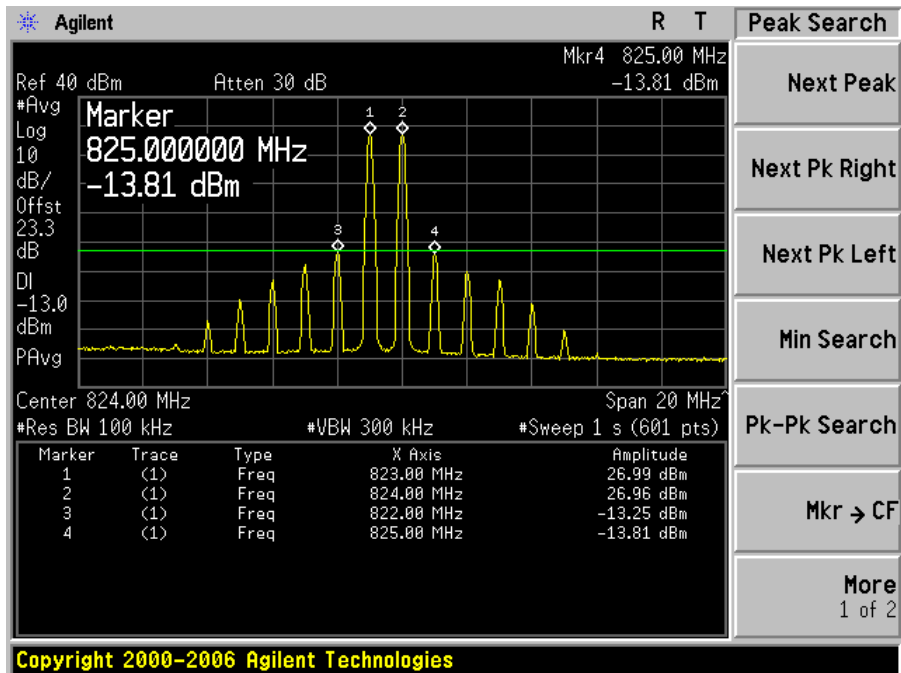


High Channel: 824 MHz

Input



Output



## 9 FCC §2.1053 - SPURIOUS RADIATED EMISSIONS

### 9.1 Applicable Standard

Requirements: FCC §2.1053.

### 9.2 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)

### 9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2011-05-17
A.R.A Inc	Horn Antenna	DRG-1181A	1132	2010-11-29
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-09
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2011-05-09

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

## 9.4 Test Environmental Conditions

<b>Temperature:</b>	22-25°C
<b>Relative Humidity:</b>	40-50 %
<b>ATM Pressure:</b>	101-102kPa

The testing was performed by Quinn Jiang from 2011-09-27 to 2011-09-28 in Chamber 3.

## 9.5 Summary of Test Results

The worst case reading as follows:

<b>Downlink</b>			
<b>Margin (dB)</b>	<b>Frequency (MHz)</b>	<b>Polarization (Horizontal/Vertical)</b>	<b>Input Frequency</b>
-28.59	3440	Vertical	860 MHz

<b>Uplink</b>			
<b>Margin (dB)</b>	<b>Frequency (MHz)</b>	<b>Polarization (Horizontal/Vertical)</b>	<b>Input Frequency</b>
-18.26	3260	Horizontal	815 MHz

## 9.6 Test Results

### Downlink- Middle Channel 860 MHz

Indicated		Turntable 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. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
3440	50.36	232	2.00	V	3440	-49.75	9.5	1.34	-41.59	-13	-28.59
3440	49.48	189	1.30	H	3440	-50.63	9.5	1.34	-42.47	-13	-29.47
1720	48.66	202	1.88	H	1720	-55.47	8.5	1.00	-47.97	-13	-34.97
1720	47.59	177	1.36	V	1720	-56.54	8.5	1.00	-49.04	-13	-36.04
106.5	43.10	296	1.56	H	106.5	-69.02	0	0.20	-69.22	-13	-56.22
106.5	42.15	209	1.00	V	106.5	-69.97	0	0.20	-70.17	-13	-57.17

### Uplink- Middle Channel 815 MHz

Indicated		Turntable 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. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
3260	60.57	209	1.62	H	3260	-39.12	9.2	1.34	-31.26	-13	-18.26
3260	60.50	207	1.76	V	3260	-39.19	9.2	1.34	-31.33	-13	-18.33
1630	61.45	227	1.82	H	1630	-43.73	8.8	1.00	-35.93	-13	-22.93
1630	61.09	178	1.61	V	1630	-44.09	8.8	1.00	-36.29	-13	-23.29
2445	54.00	196	1.63	V	2445	-47.8	9	1.34	-40.14	-13	-27.14
2445	53.92	201	1.00	H	2445	-47.88	9	1.34	-40.22	-13	-27.22
106.5	43.47	301	1.5	H	106.5	-68.65	0	0.2	-68.85	-13	-55.85
106.5	42.15	200	1.07	V	106.5	-69.97	0	0.2	-70.17	-13	-57.17