Lab Code: 200167-0

# FCC PART 22 TYPE APPROVAL
# EMI MEASUREMENT AND TEST REPORT

For

## Telecom Technologies (USA) LLC

26112 Hitching Rail Road, Laguna Hills, CA 92653, USA

**FCC ID: UM8CV800**

**Model: Clear Voice 800**

| **This Report Concerns:** ☒ Original Report | | **Product Type:** Cellular Repeater |
|---|---|---|
| **Test Engineer:** | James Ma | |
| **Report No.:** | R0607131 | |
| **Report Date:** | 2006-10-04 | |
| **Reviewed By:** | Daniel Deng | |
| **Prepared By:** | Bay Area Compliance Laboratory Corp.<br>1274 Anvilwood Ave.<br>Sunnyvale, CA 94089, U.S.A.<br>Tel: (408) 732-9162<br>Fax: (408) 732-9164 | |

**Note**: This test report is for the customer shown above and their specific product only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP or any agency of the U.S. Government

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# GENERAL INFORMATION

## Product Description for Equipment Under Test (EUT)

This repeater designed to improve the speech quality or expand the BTS Coverage in a region where BTS Signals are weak. It does so by amplifying and retransmitting the signals in the cellular (800MHz) Band.

Features:
- Amplify weak received signals
- Indicates BTS signal levels
- Auto shutdown function in high power or oscillating occasions
- Design for minimum deterioration and impact for WLAN

## Mechanical Description

The *Telecom Technologies (USA) LLC's* product, *FCCID: UM8CV800, model: Clear Voice 800,* is measured approximately *139.7mmL x 114.3mmW x 38.1mmH x 2lbs Weight.*

** The test data gathered are from production sample, serial number: TTUSA1000, provided by the manufacturer.*

## EUT Photo


*Additional photos in Exhibit C*

## Objective

This type approval report is prepared on behalf of *Telecom Technologies (USA) LLC* in accordance with Part 2, Subpart J, and Part 22 Subpart H of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, spurious radiated emission, frequency stability, band edge and radiated margin.

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

No Related Submittals

## Test Methodology

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

Part 22 Subpart H - Public Mobile Services

Applicable Standards: TIA EIA 603-C, ANSI 63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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.

## Test Facility

The Test site used by BACL Corp. to collect radiated and conducted emission measurement data is located at it's facility in Sunnyvale, California, USA.

Test site at BACL Corp. has 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 test methods and procedures set forth in ANSI C63.4-2003& TIA/EIA-603.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference have the reports on file and are listed under FCC file 31040/SIT 1300F2, IC registration number: 3062A, and VCCI Registration No.: C-1298 and R-1234. 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

# SYSTEM TEST CONFIGURATION

## 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.

## Block Diagram

Please refer to Exhibit D.

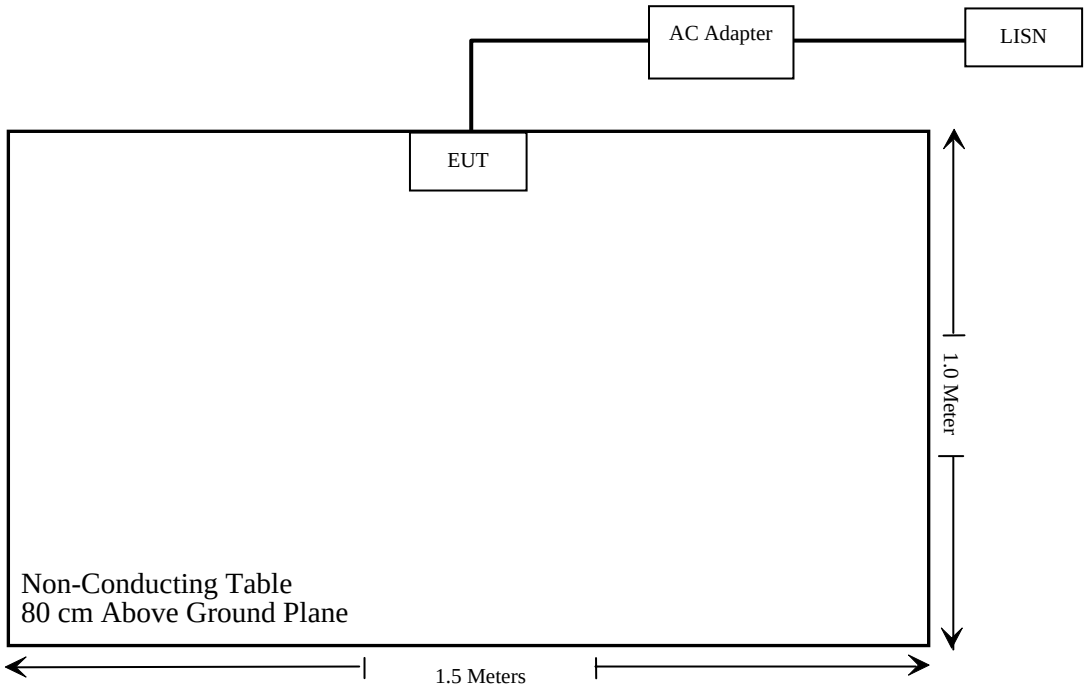
## Equipment Modifications

No modifications were made to the EUT.

## Power Supply and Line Filters

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| TERA TELECOM | Power Adaptor | TTA-5020K | T66000037A |

## Test Setup Block Diagram



# SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: *TTUSA1000*.

| FCC RULE | DESCRIPTION OF TEST | Result |
|---|---|---|
| §2.1046<br>§ 22.913 | RF power output | Compliant |
| § 2.1049<br>§ 22.917(b) | Emission Bandwidth | Compliant |
| 2.1051<br>§ 22.917(a) | Spurious emissions at antenna terminals | Compliant |
| 2.1053 | Spurious Radiated Emissions | Compliant |
| § 22.917 | Band Edge | Compliant |
| § 2.1047 | Modulation Characteristics | N/A |
| § 2.1055<br>§ 22.355 | Frequency stability | Compliant |
| IS-138a (3.4.4 ) | Two-Tone Test | Compliant |
| 2.1091 | RF Exposure | Compliant |

# §2.1046 & §22.913(a) - RF POWER OUTPUT

## Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

## Test Procedure

*Conducted Measurement:*

The antenna was removed and SMA connector was connected to the transmitter output. The transmitter output was connected to a calibrated coaxial attenuator (50 Ohm), the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter was determined by adding the value of the attenuator to the power meter reading.

The test was performed at three frequencies (low, middle, and high channels) and on all power levels which can be setup on the transmitter.

*Radiated Measurement:*

The transmitter was placed on a wooden 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.

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.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2006-03-06 |
| R&S | Generator, Signal | SMIQ03 | 849192/0085 | 2006-06-02 |

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

## Environmental Conditions

| | |
|---|---|
| Temperature: | 27° C |
| Relative Humidity: | 37% |
| ATM Pressure: | 1020 mbar |

** The testing was performed by James Ma on 2006-07-19.*

### Conducted Power: CDMA

### Forward (downlink)

| Channel | Frequency (MHz) | Output Power in dBm | Output Power in W | Antenna in dBi | Limit in ERP dBm |
|---|---|---|---|---|---|
| Low | 869.73 | 5.19 | 0.0033 | 0 | 38.45 |
| Middle | 881.40 | 7.31 | 0.00538 | 0 | 38.45 |
| High | 893.19 | 5.81 | 0.00381 | 0 | 38.45 |

### Reverse (uplink)

| Channel | Frequency (MHz) | Output Power in dBm | Output Power in W | Antenna in dBi | Limit in ERP dBm |
|---|---|---|---|---|---|
| Low | 824.73 | 7.16 | 0.00520 | 5 | 38.45 |
| Middle | 836.40 | 7.30 | 0.00537 | 5 | 38.45 |
| High | 848.19 | 3.73 | 0.00236 | 5 | 38.45 |

### Conducted Power: GSM

### Forward (downlink)

| Channel | Frequency (MHz) | Output Power in dBm | Antenna in dBi | Limit in ERP dBm |
|---|---|---|---|---|
| Low | 869.20 | 5.17 | 0 | 38.45 |
| Middle | 881.60 | 7.80 | 0 | 38.45 |
| High | 893.80 | 6.39 | 0 | 38.45 |

### Reverse (uplink)

| Channel | Frequency (MHz) | Output Power in dBm | Antenna in dBi | Limit in ERP dBm |
|---|---|---|---|---|
| Low | 824.20 | 6.51 | 5 | 38.45 |
| Middle | 836.60 | 7.15 | 5 | 38.45 |
| High | 848.80 | 4.94 | 5 | 38.45 |

**Conducted Power: TDMA**

**Forward (downlink)**

| Channel | Frequency (MHz) | Output Power in dBm | Antenna in dBi | Limit in ERP dBm |
|---|---|---|---|---|
| Low | 869.04 | 2.84 | 0 | 38.45 |
| Middle | 881.48 | 6.39 | 0 | 38.45 |
| High | 893.92 | 4.94 | 0 | 38.45 |

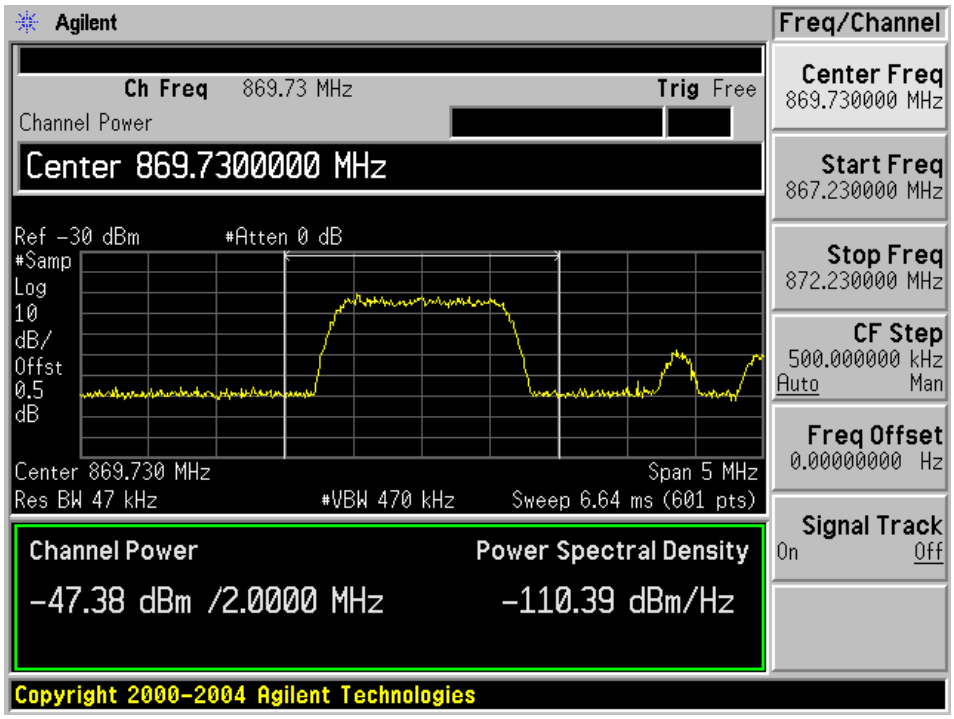
**Reverse (uplink)**

| Channel | Frequency (MHz) | Output Power in dBm | Antenna in dBi | Limit in ERP dBm |
|---|---|---|---|---|
| Low | 824.04 | 2.11 | 5 | 38.45 |
| Middle | 836.48 | 4.22 | 5 | 38.45 |
| High | 848.92 | 0.68 | 5 | 38.45 |

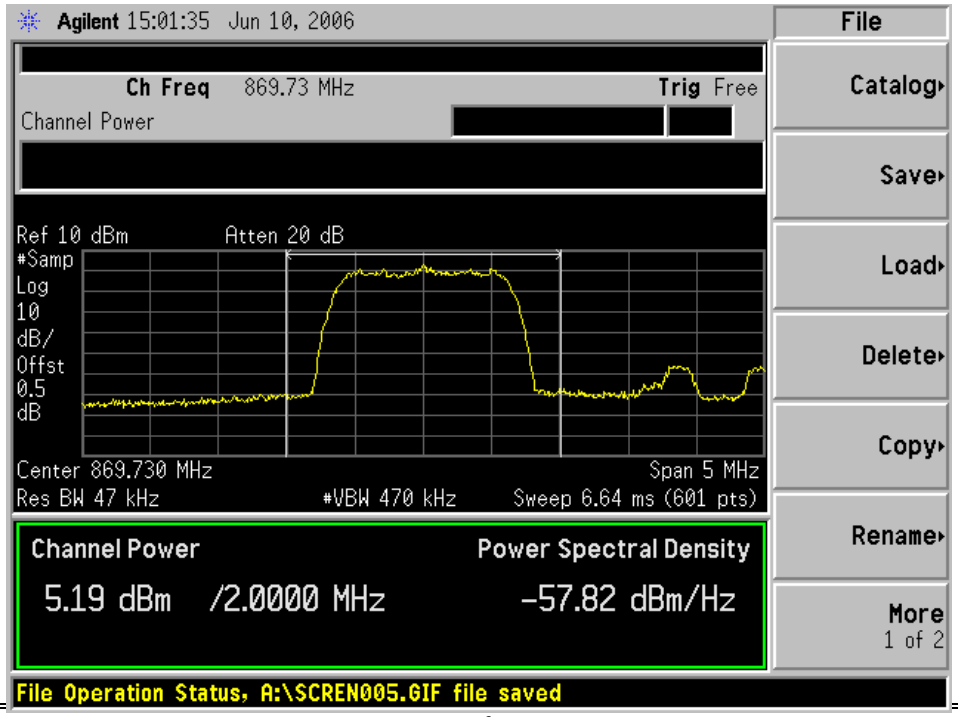
**CDMA**
**Forward (downlink):**

*Low channel*

Input:

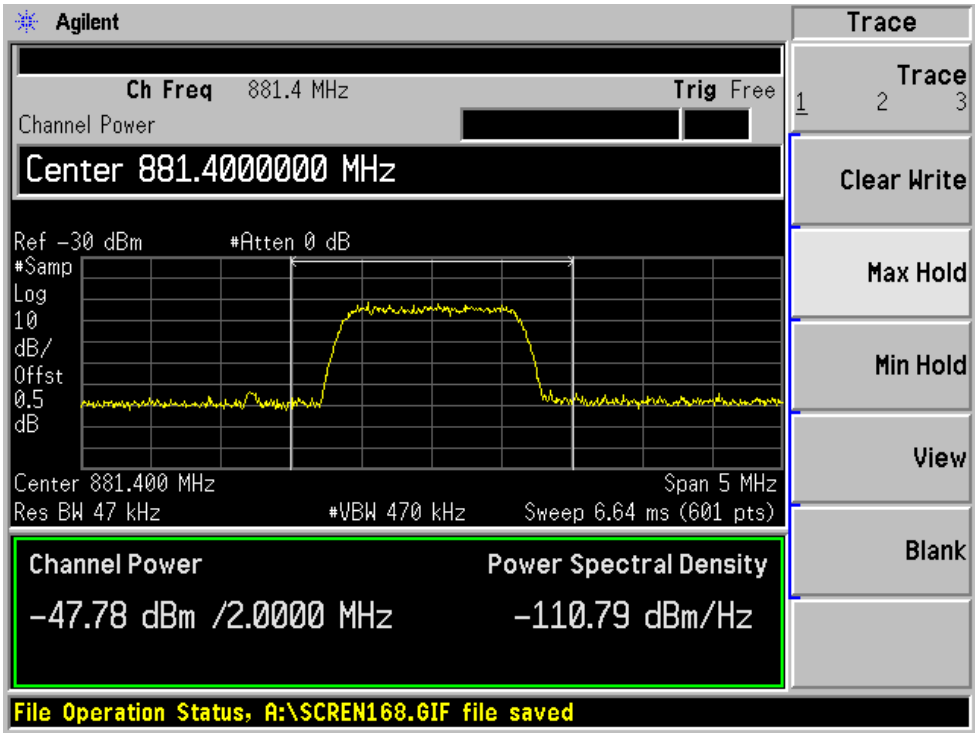



Output:

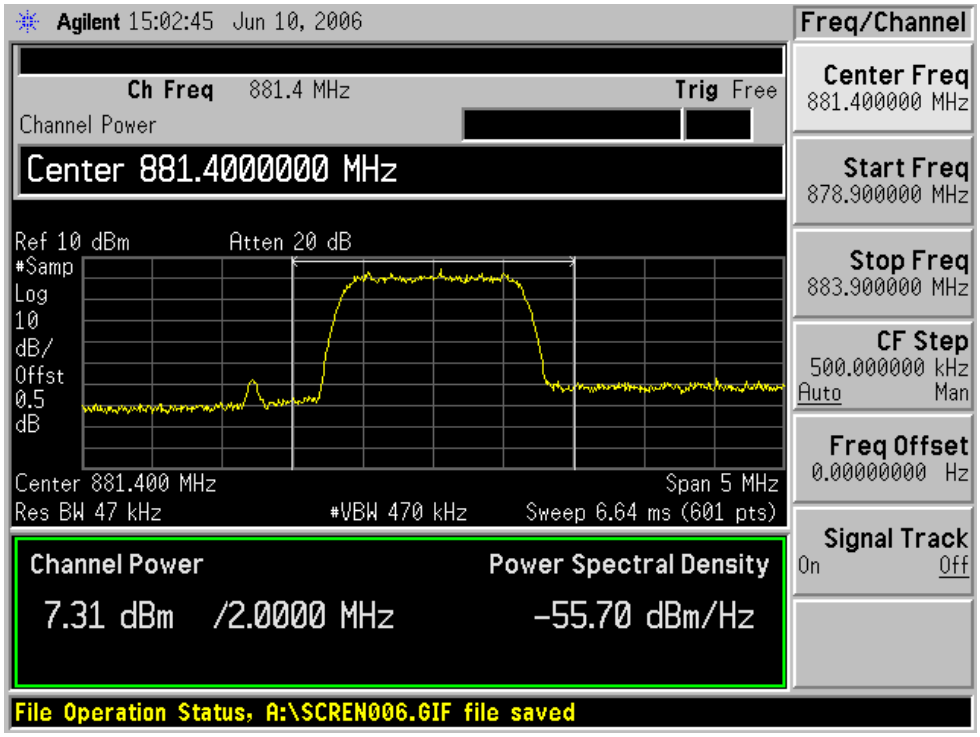


*Mid channel*

Input:

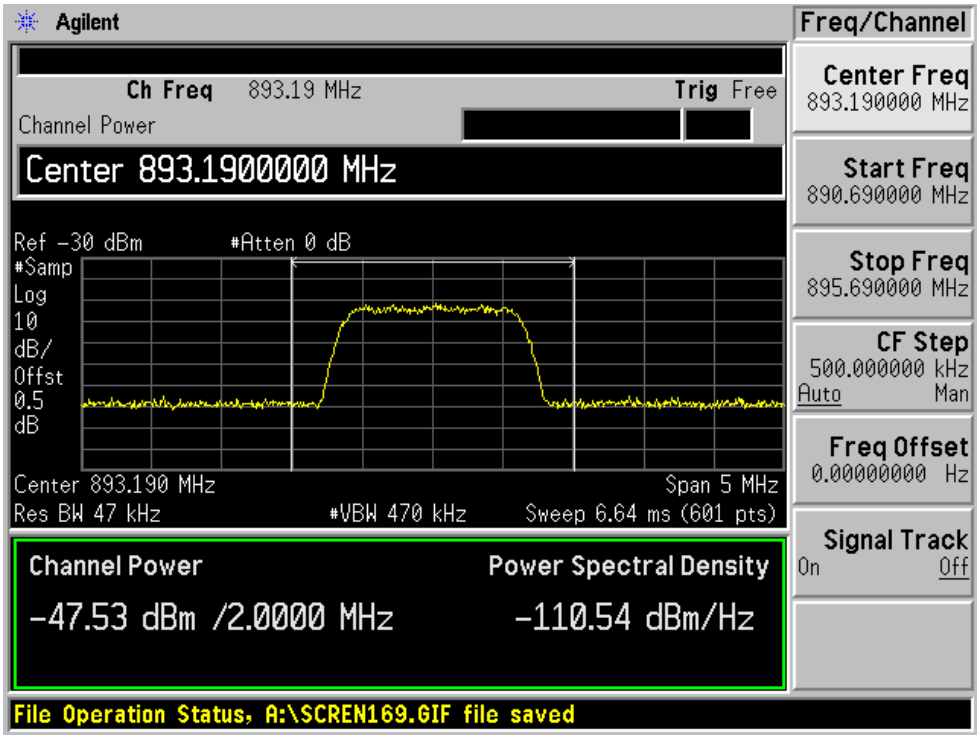



Output:

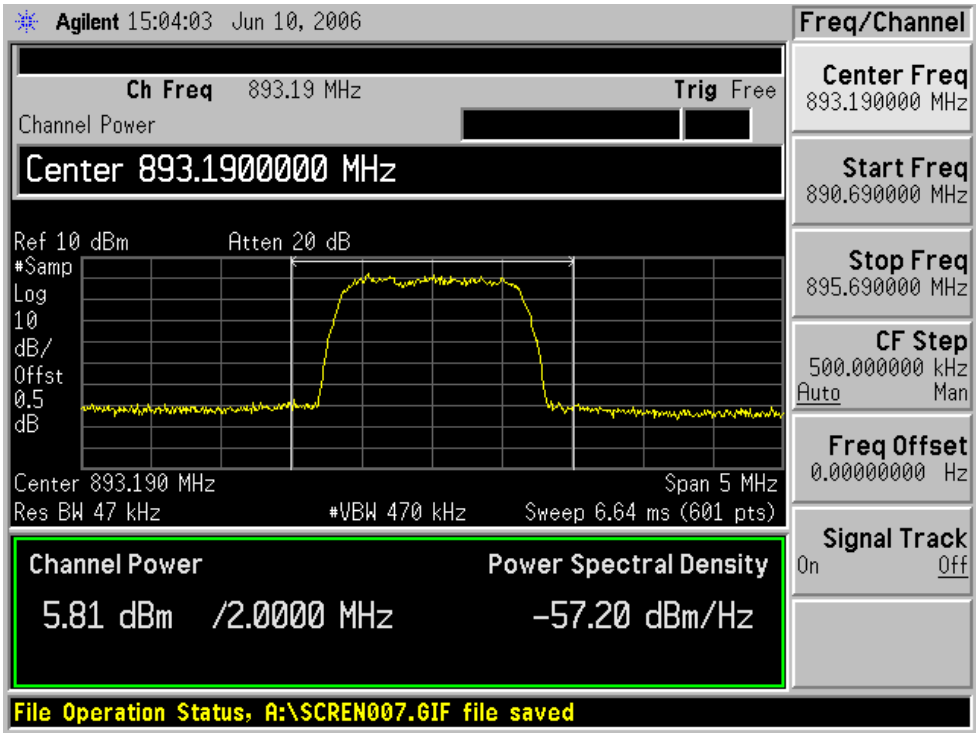


*High channel*

Input:



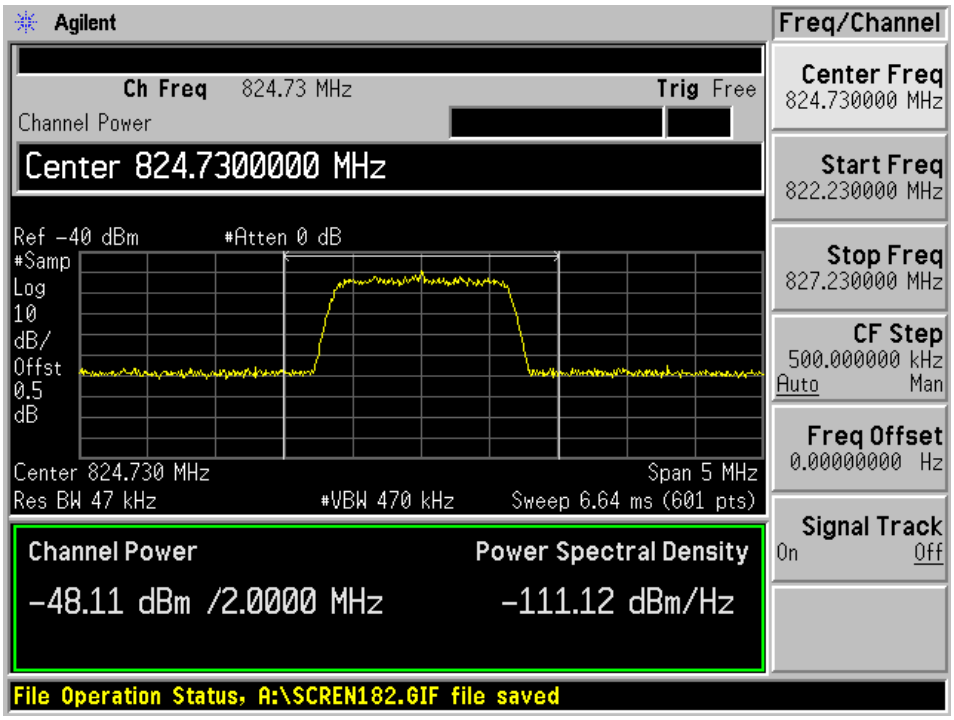

Output:



**CDMA**
**Reverse (uplink):**

*Low Channel*

Input:

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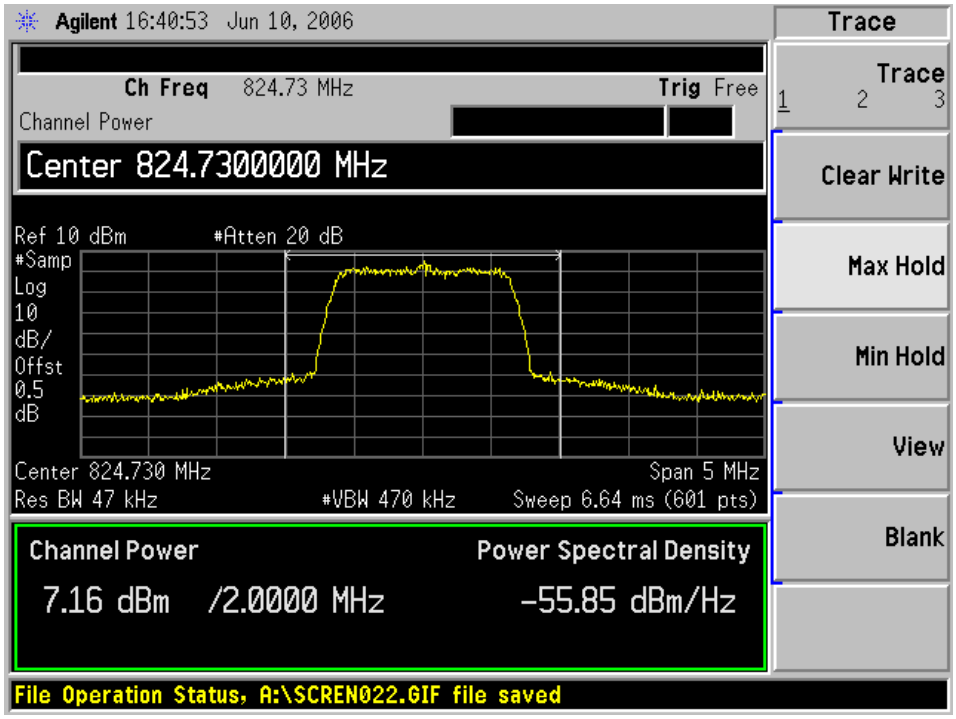
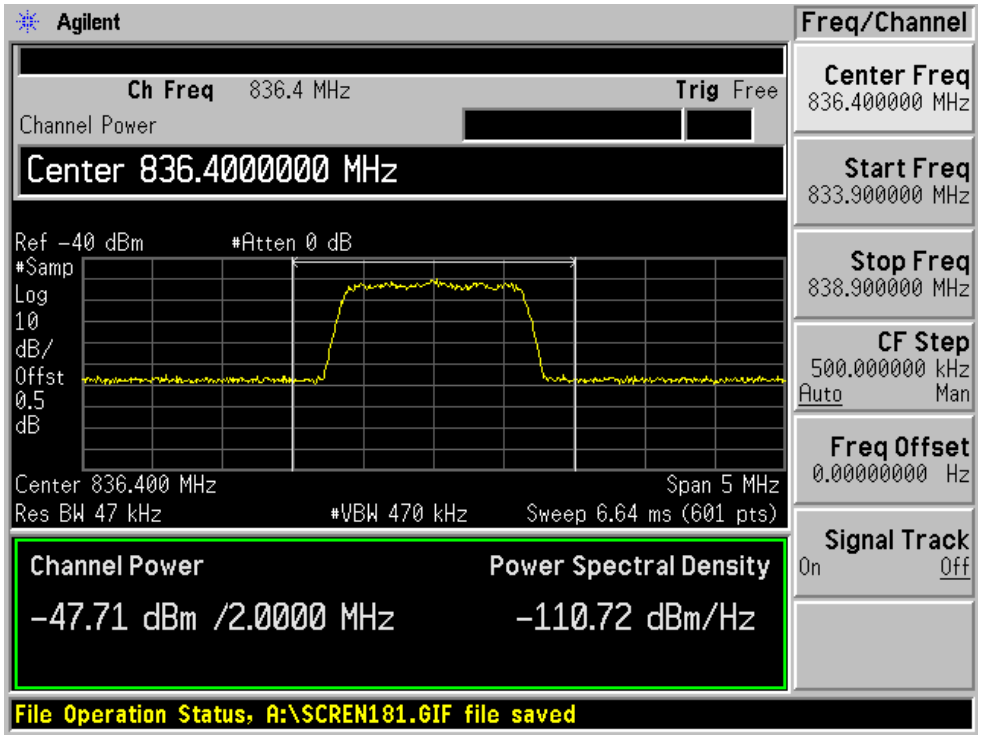


*Mid Channel*

Input:

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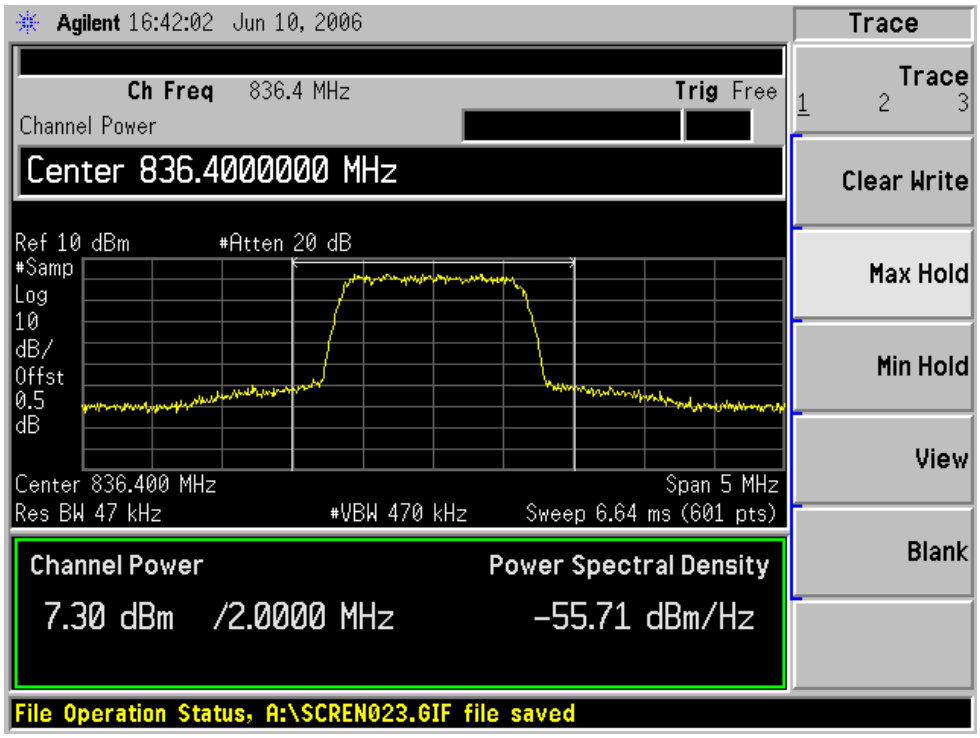
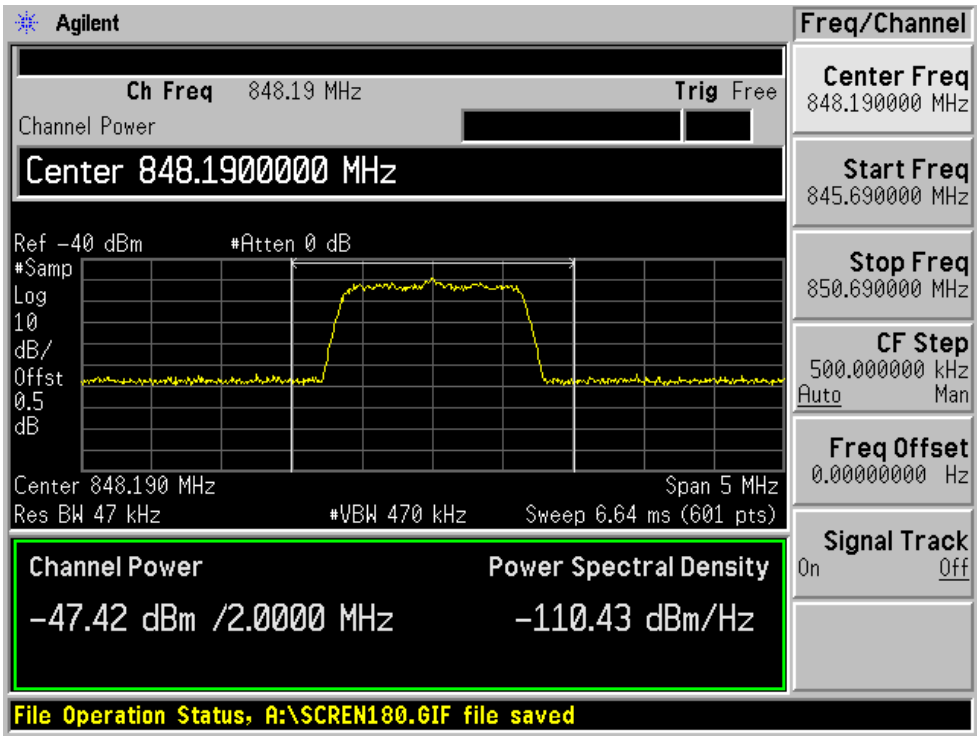


*High Channel*

Input:

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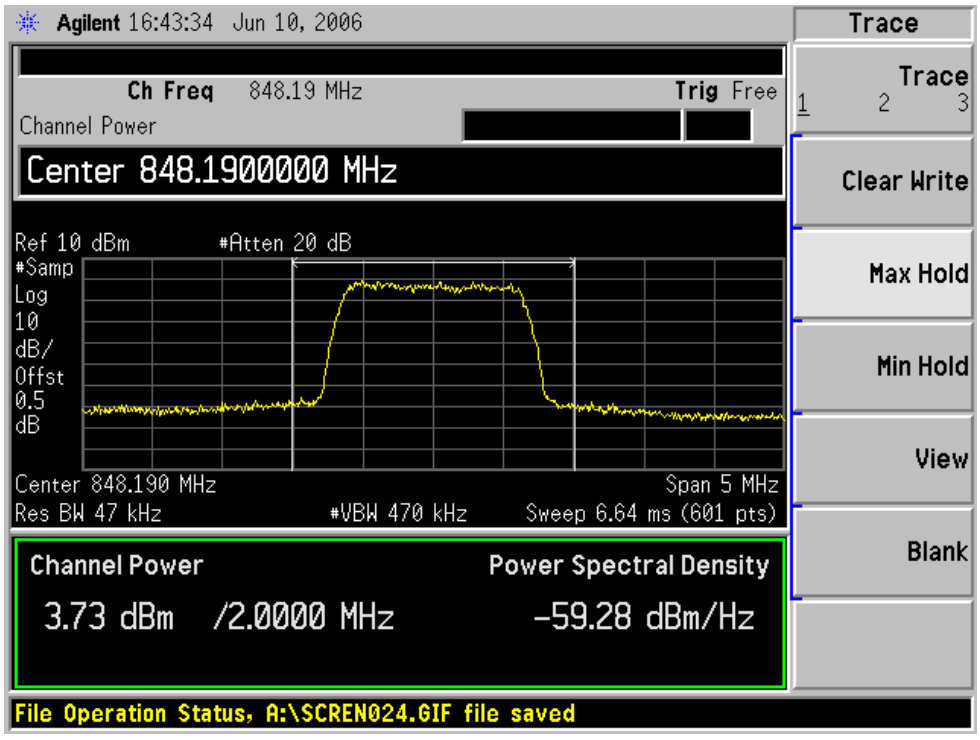
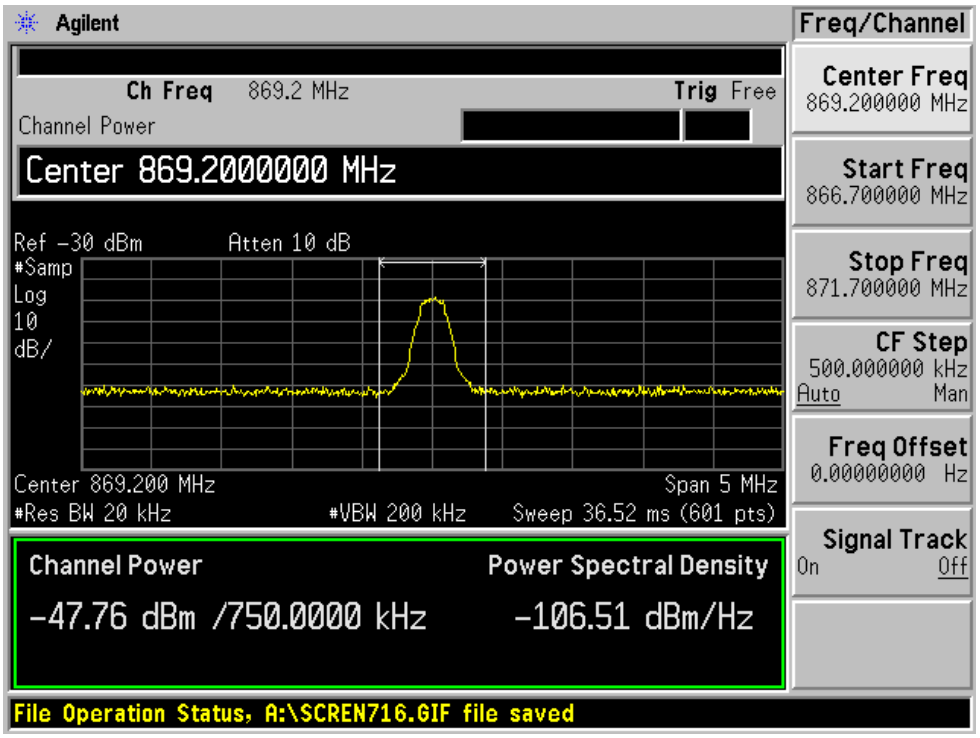


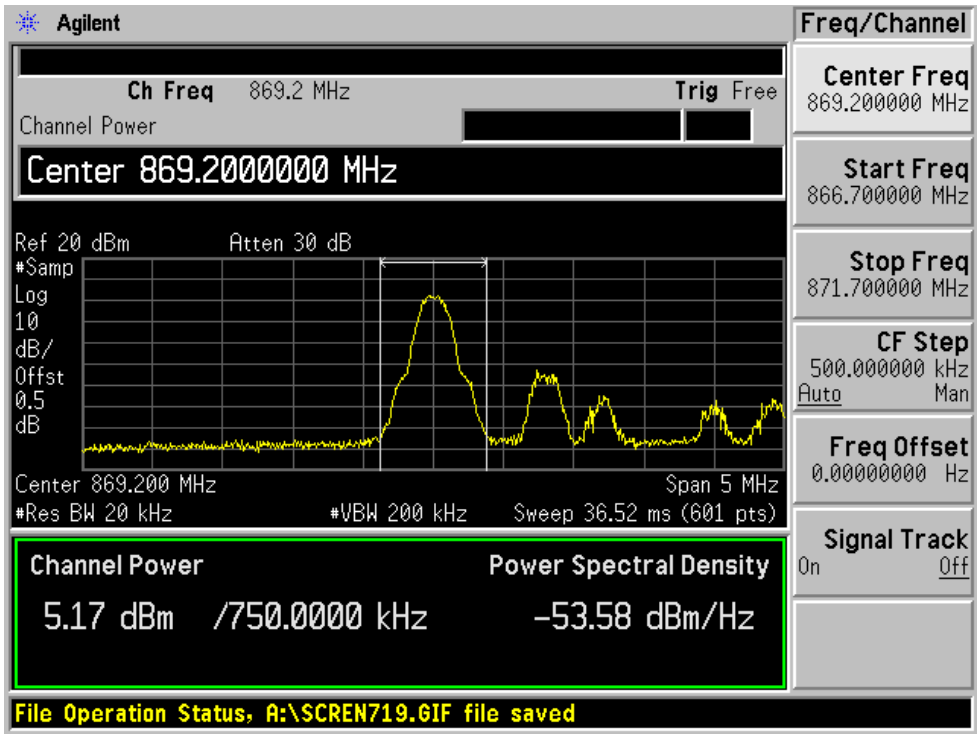
**GSM**
Forward (Down Link )

*Low Channel*

Input:

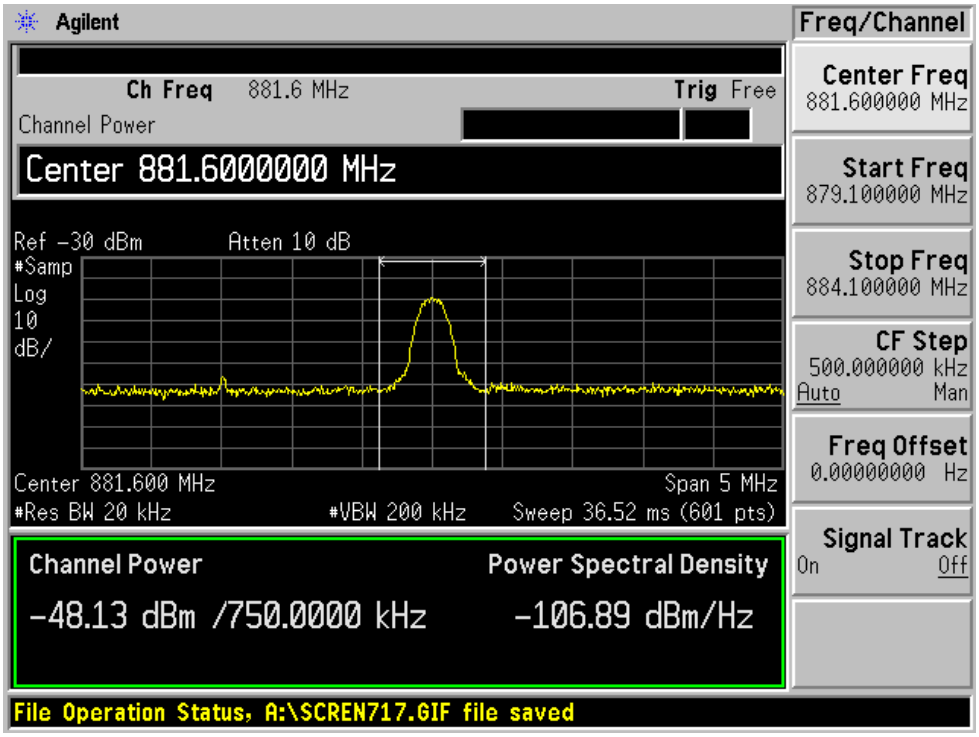



Output:

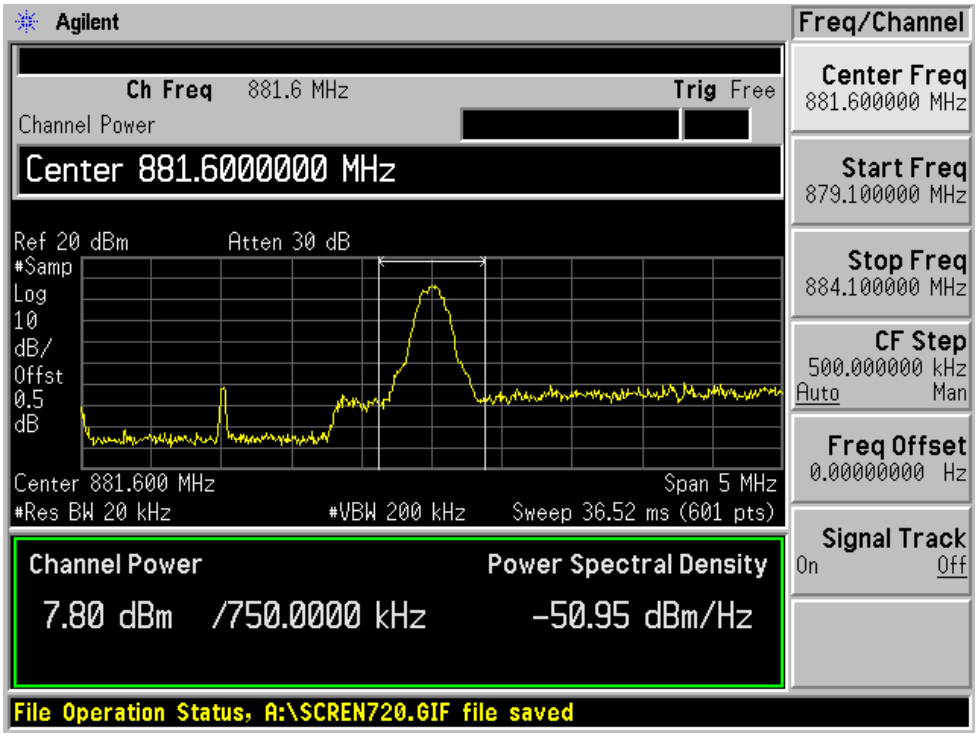


*Mid Channel*

Input:

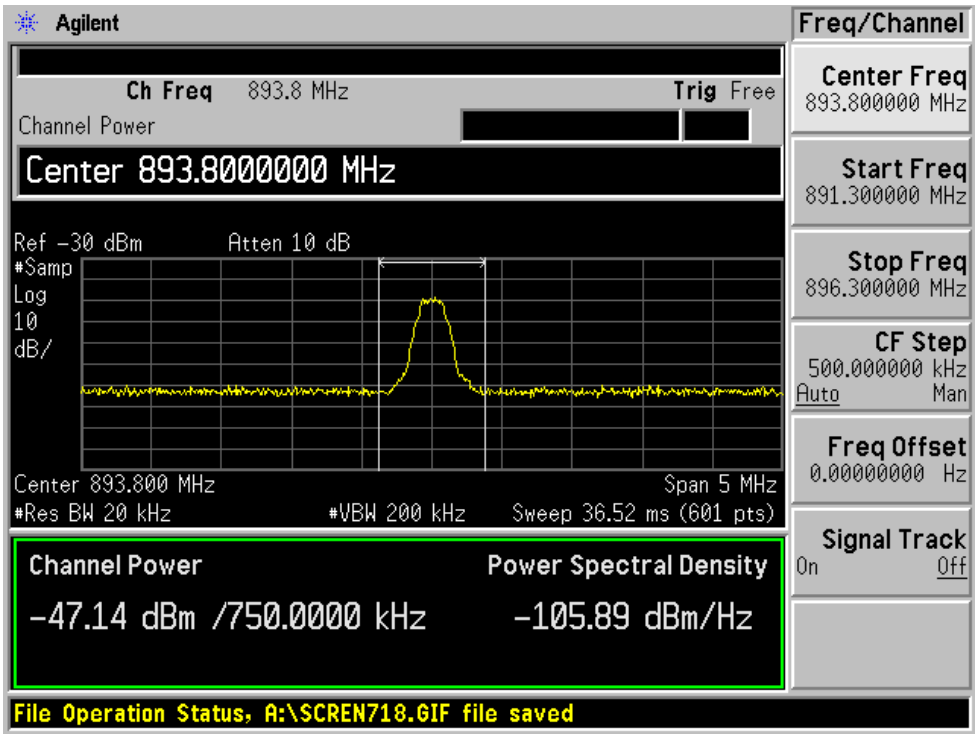



Output:

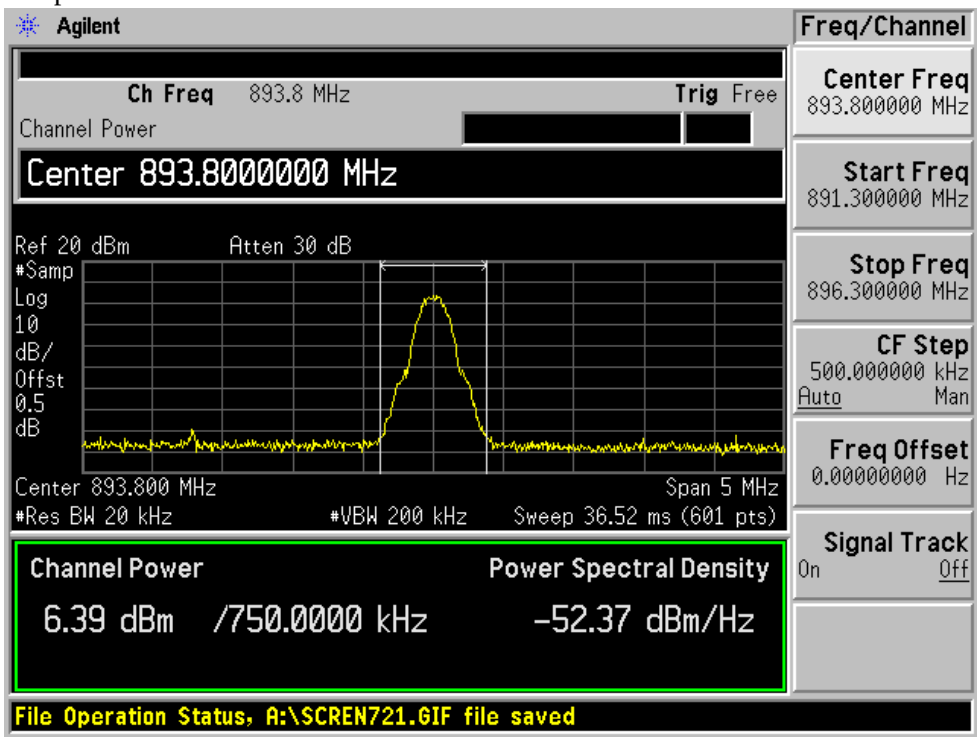


*High Channel*

Input:

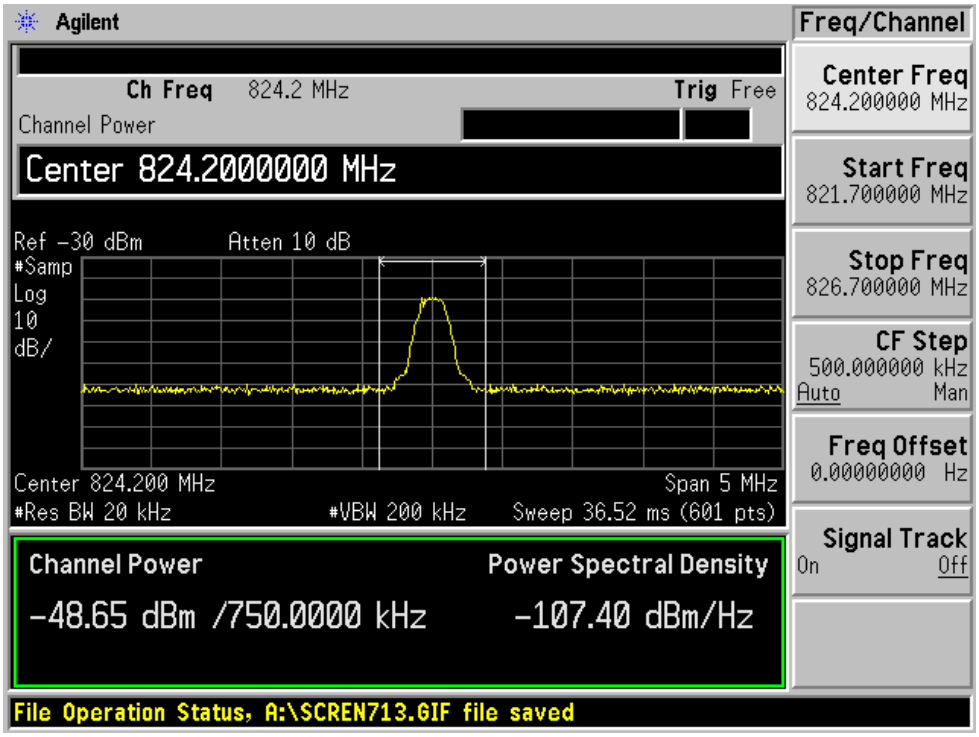



Output:

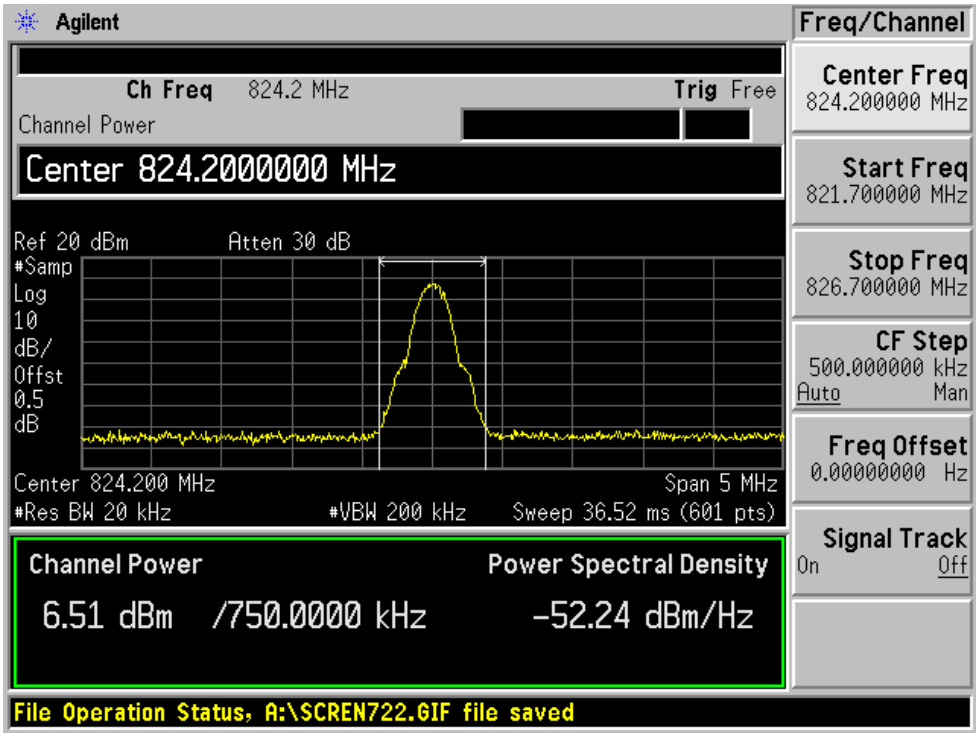


**GSM**
Reverse (Uplink )
*Low Channel*

Input:

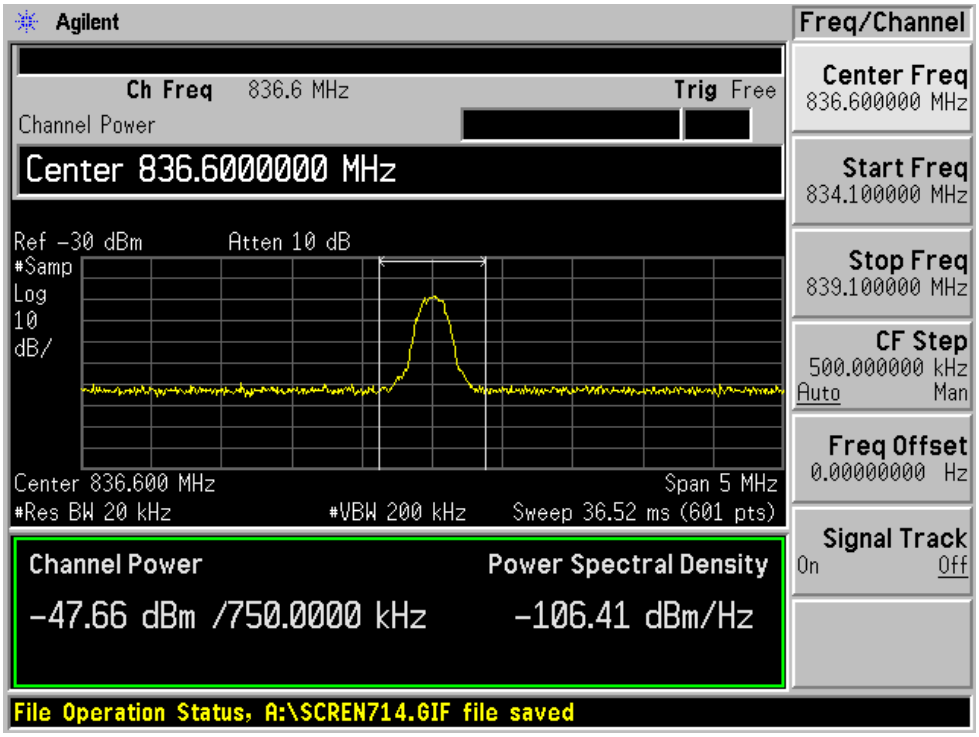



Output:

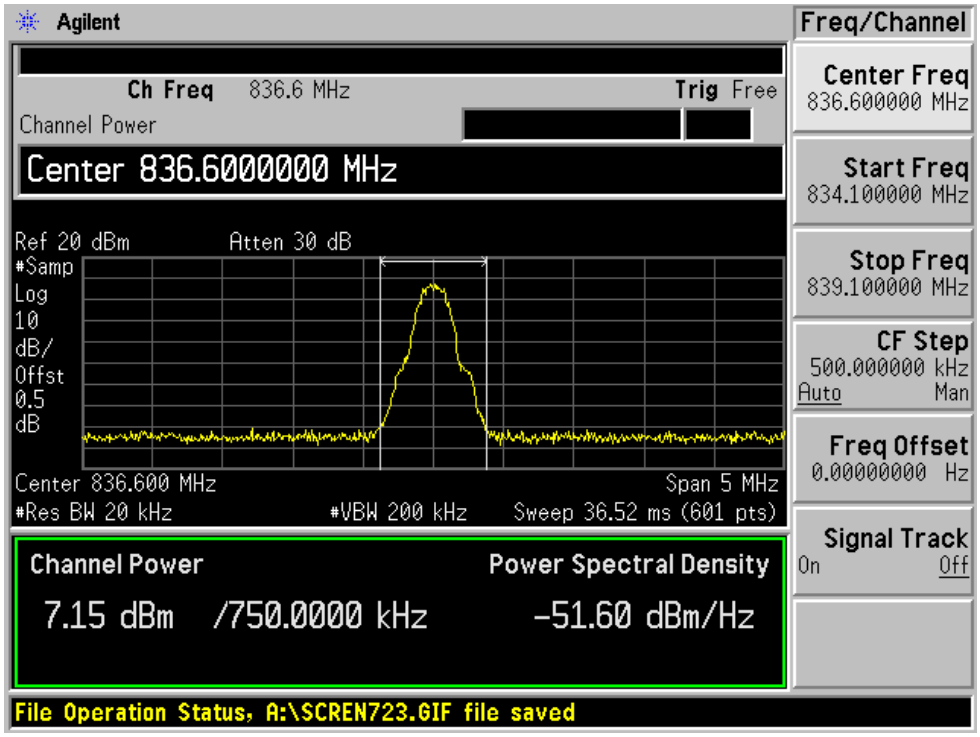


*Mid Channel*

Input:

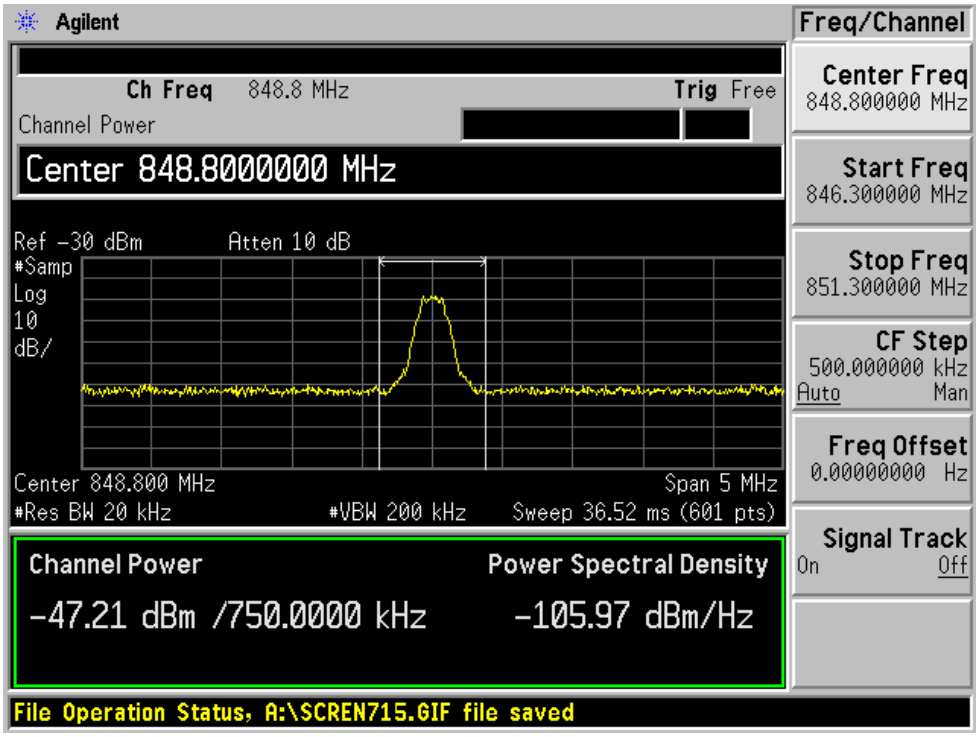



Output:

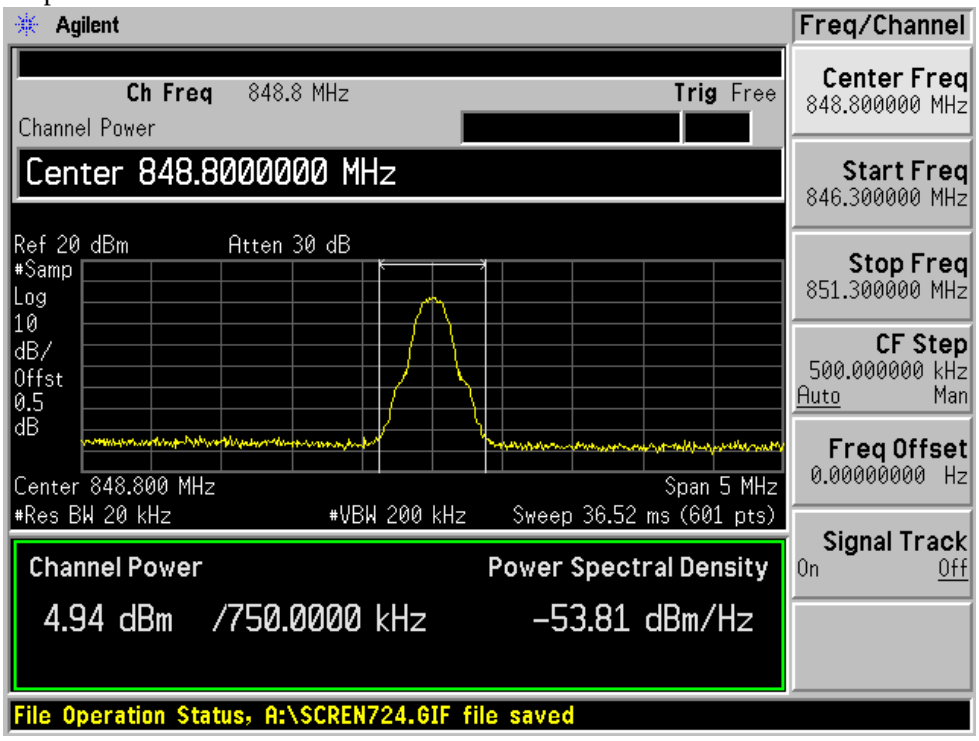


*High Channel*

Input:



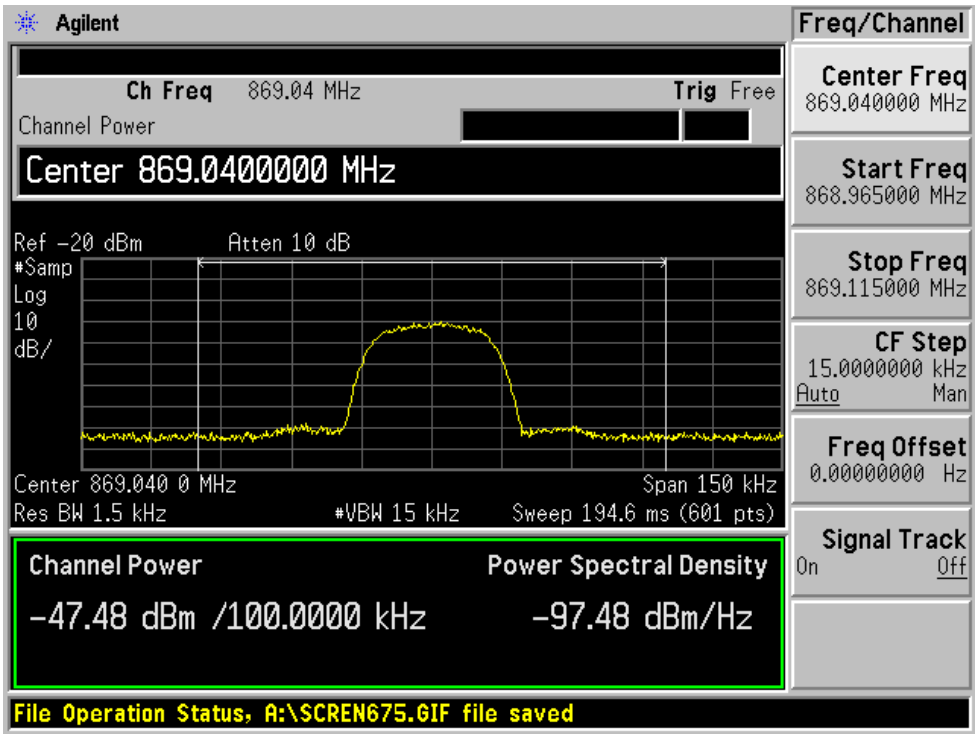

Output:



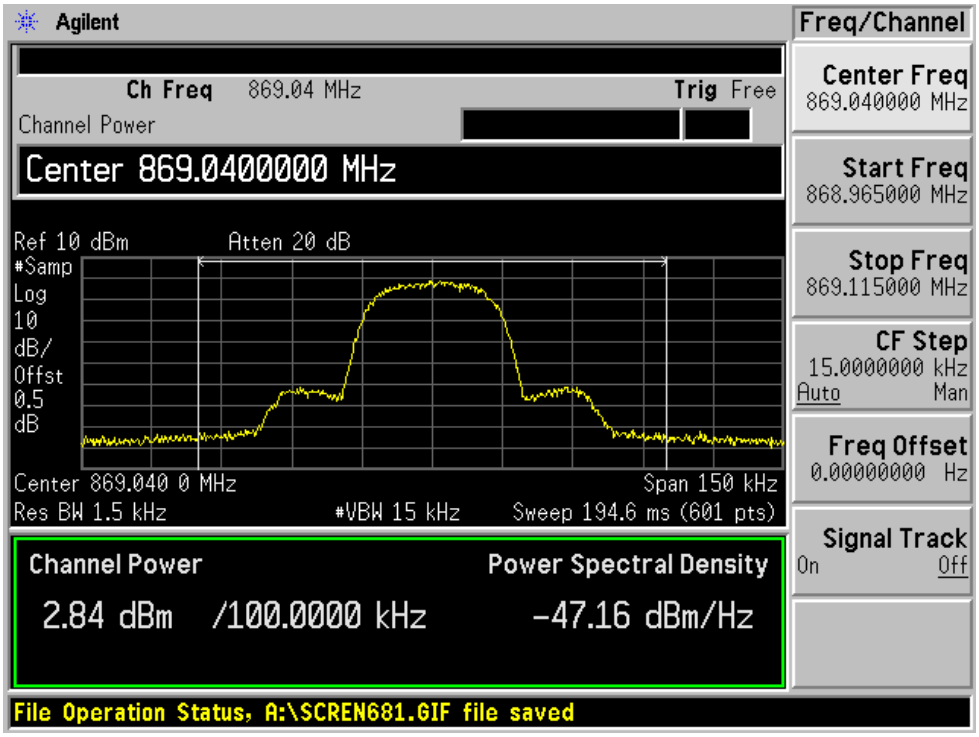
**TDMA**
Forward (Down Link )

*Low Channel*

Input:

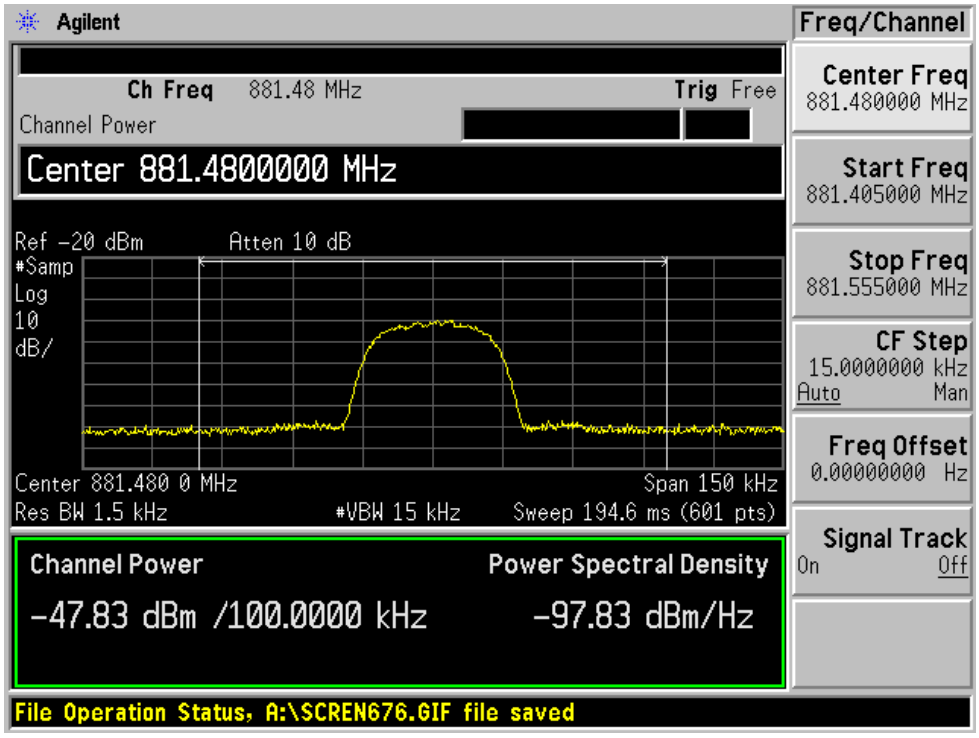



Output:

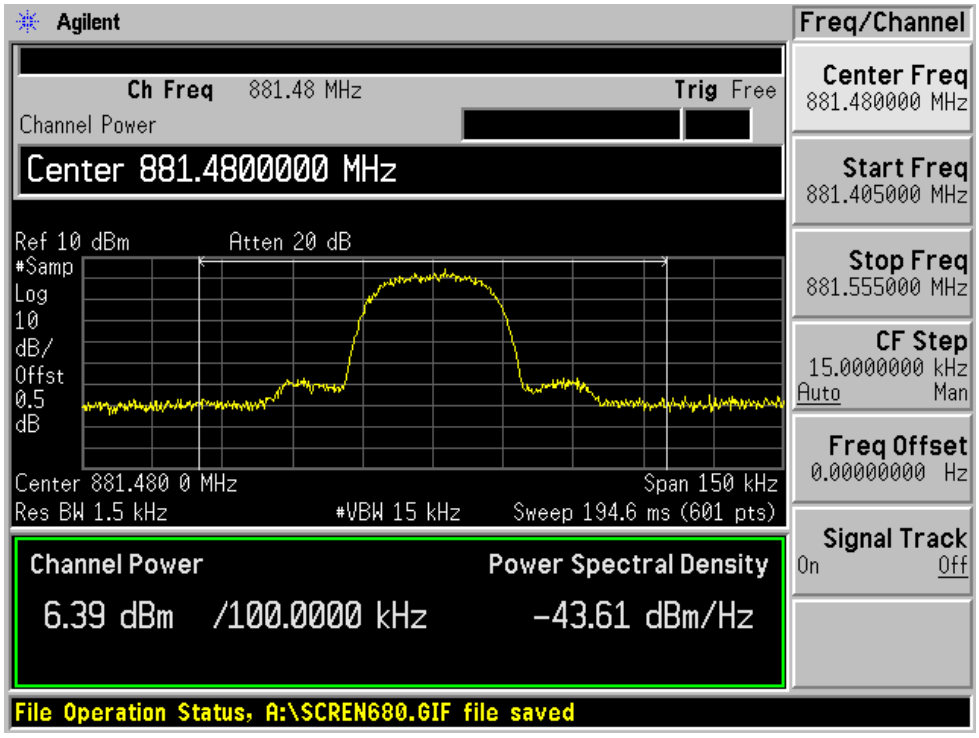


*Mid Channel*

Input:

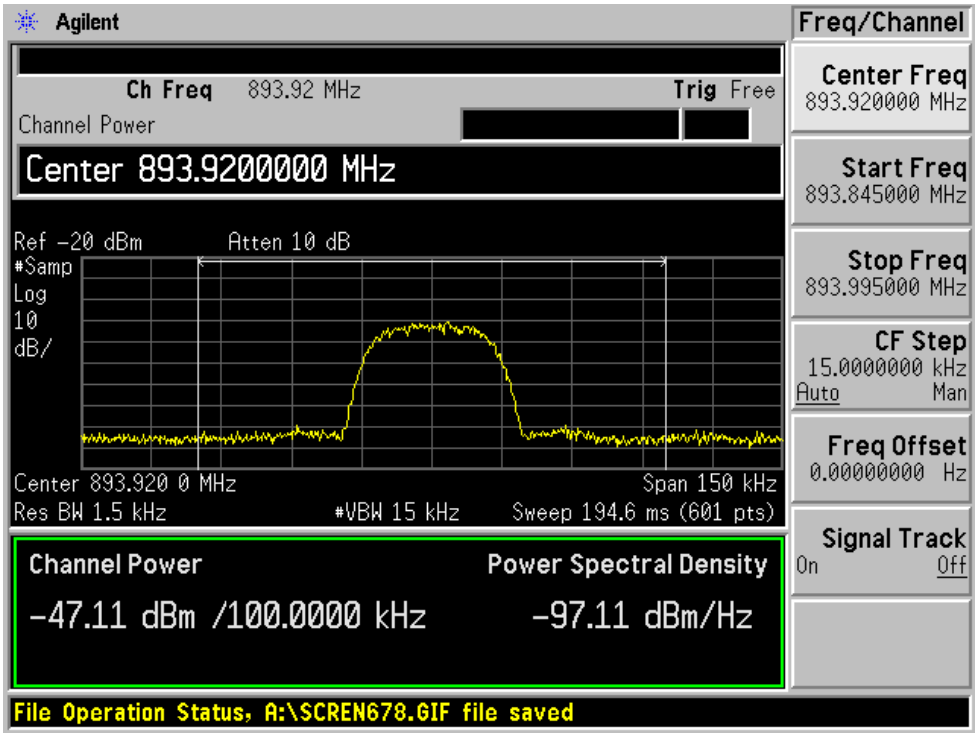



Output:

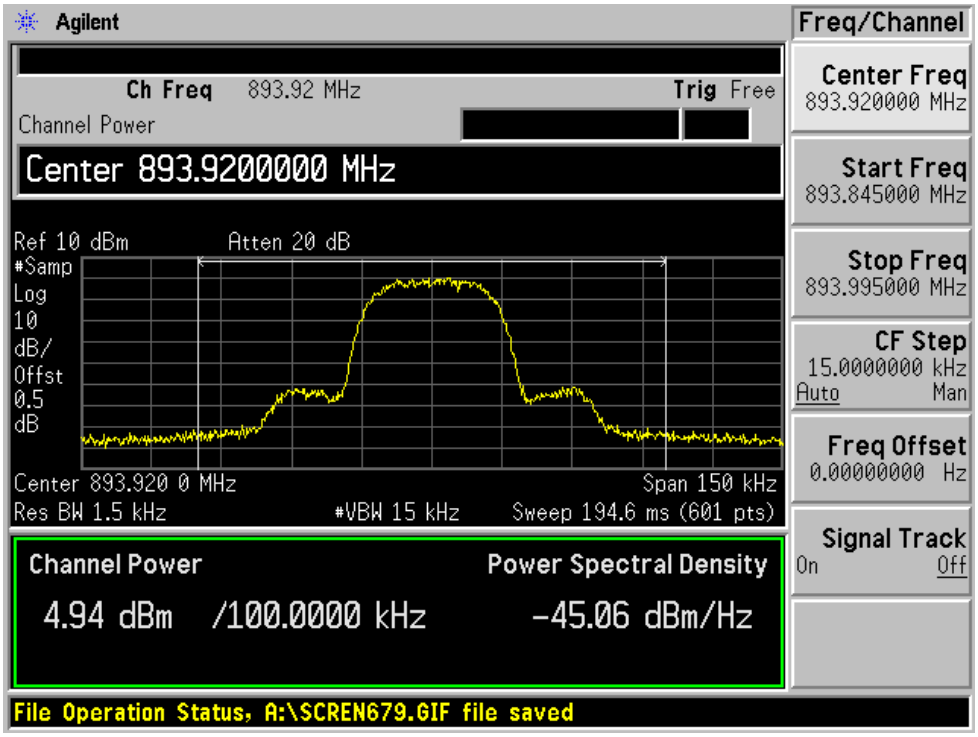


*High Channel*

Input:

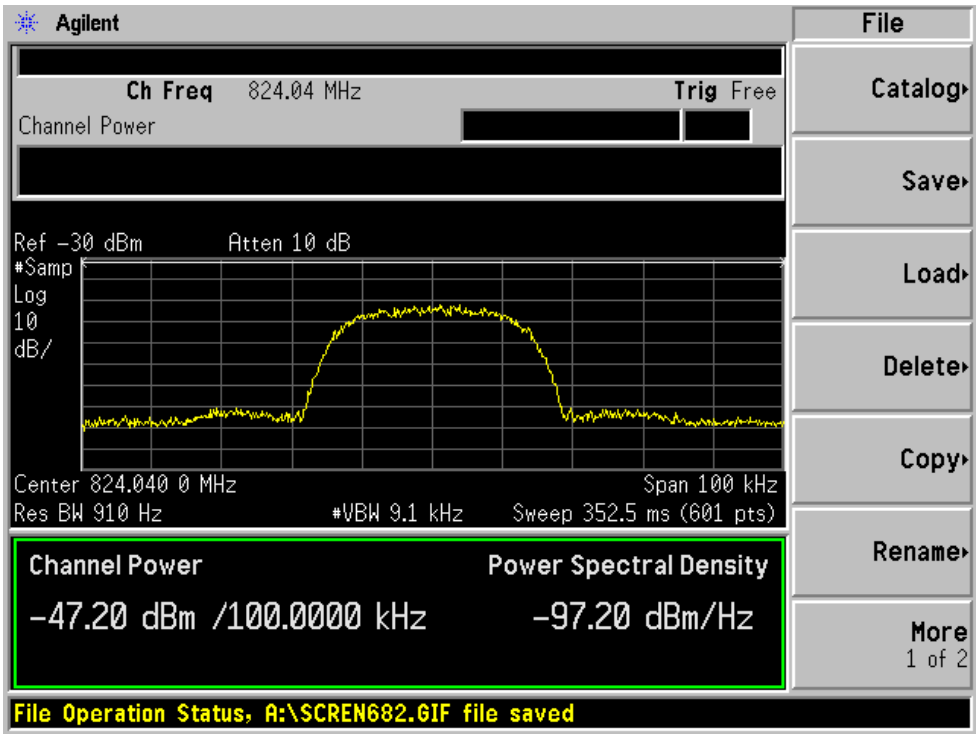



Output:

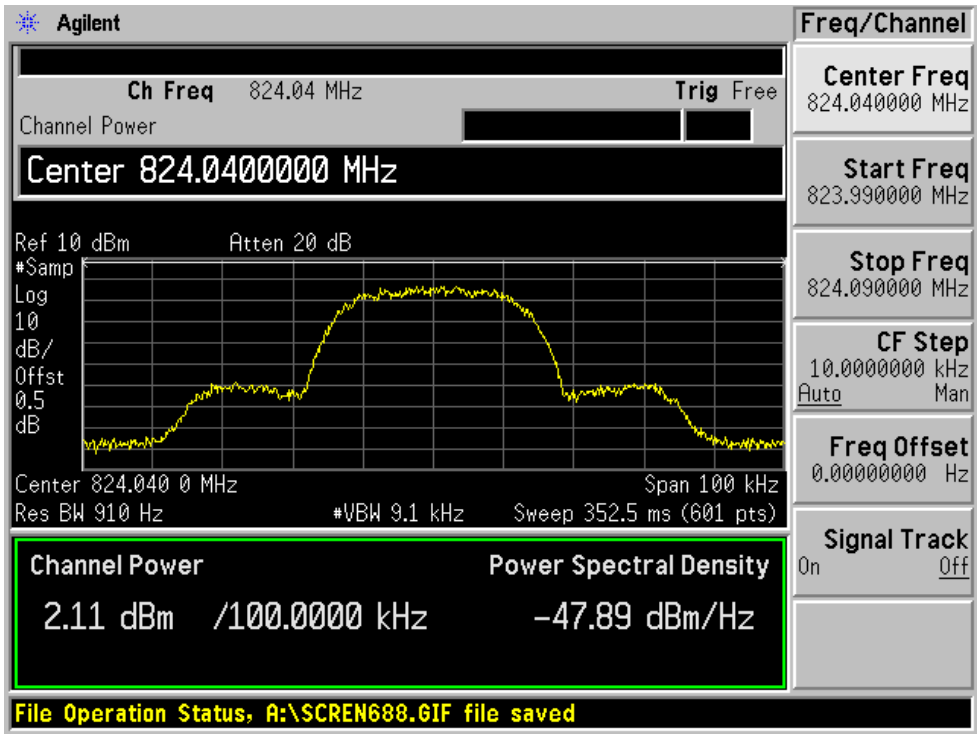


**TDMA**
Reverse (Uplink )
*Low Channel*

Input:

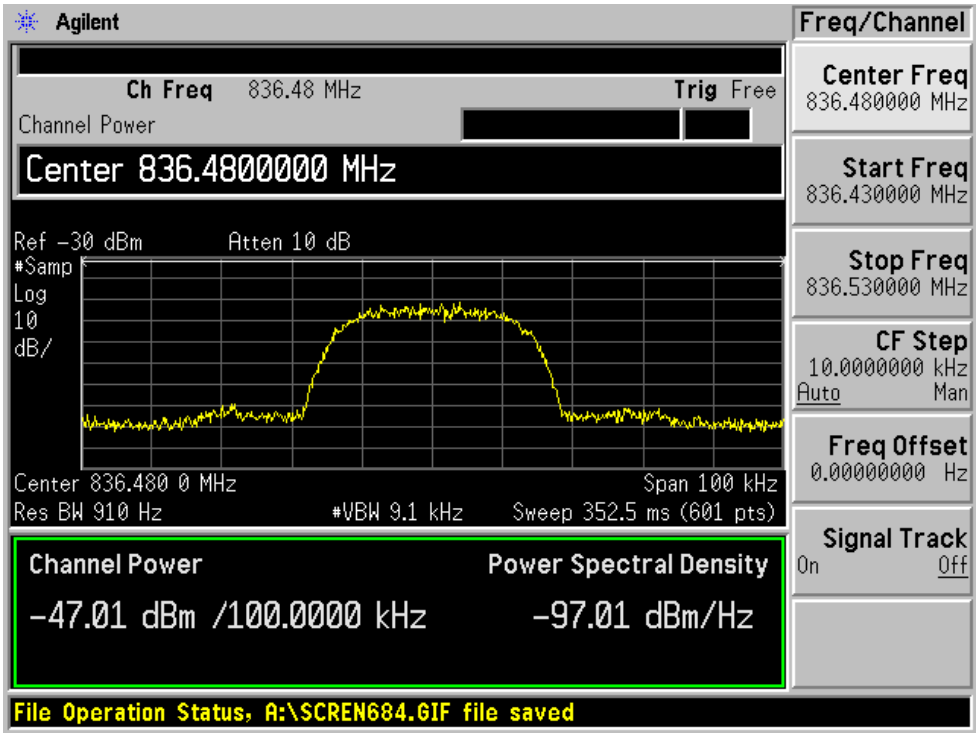



Output:

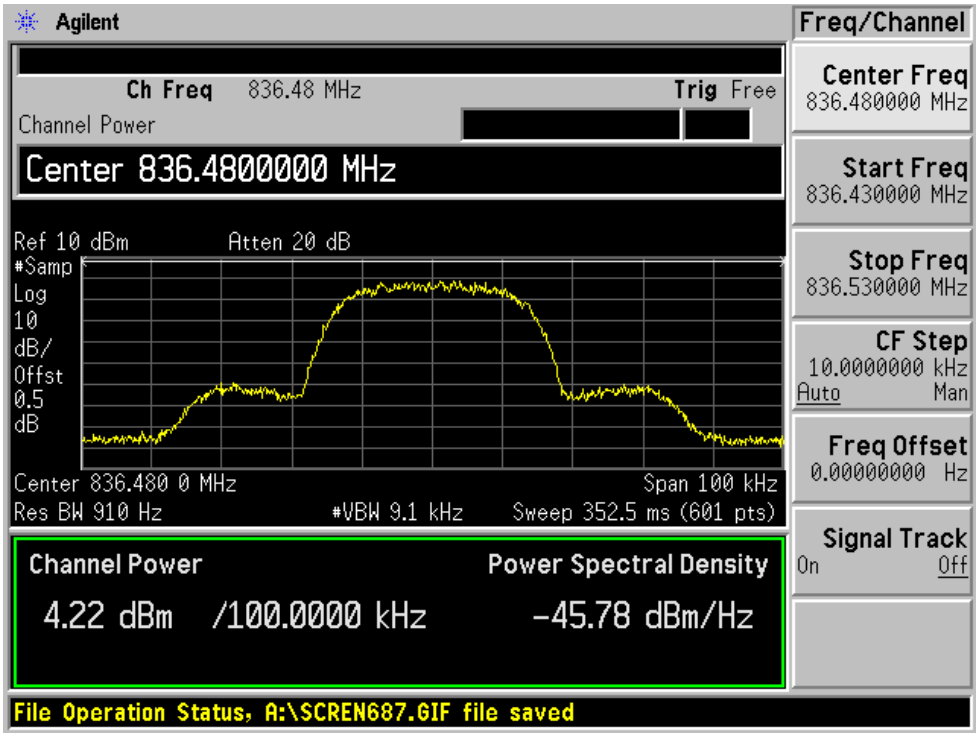


*Mid Channel*

Input:

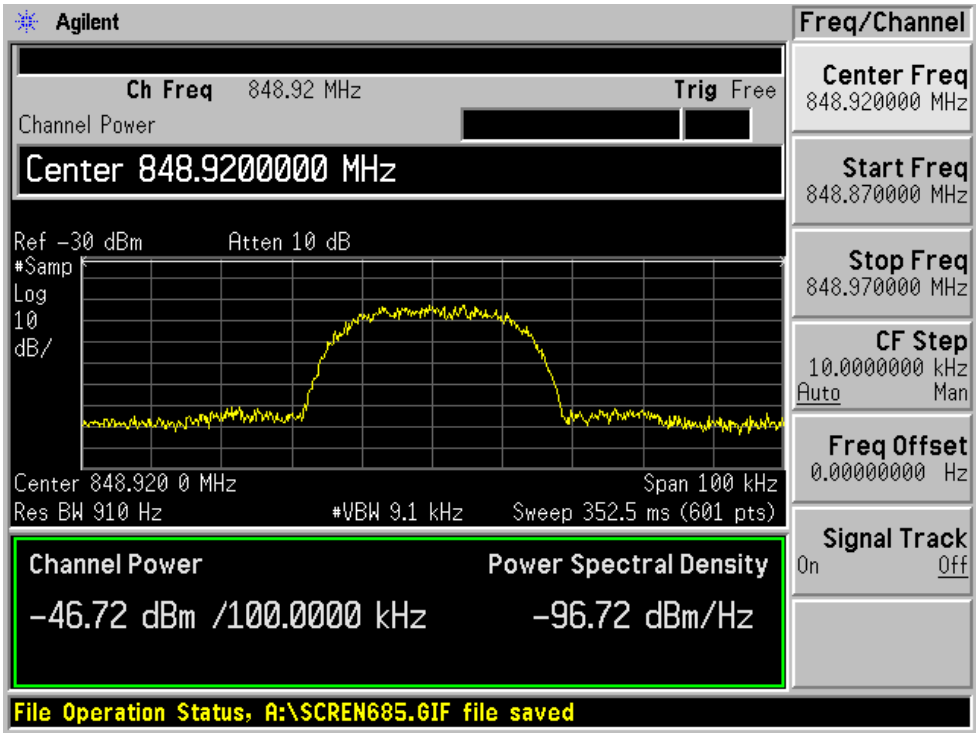



Output:

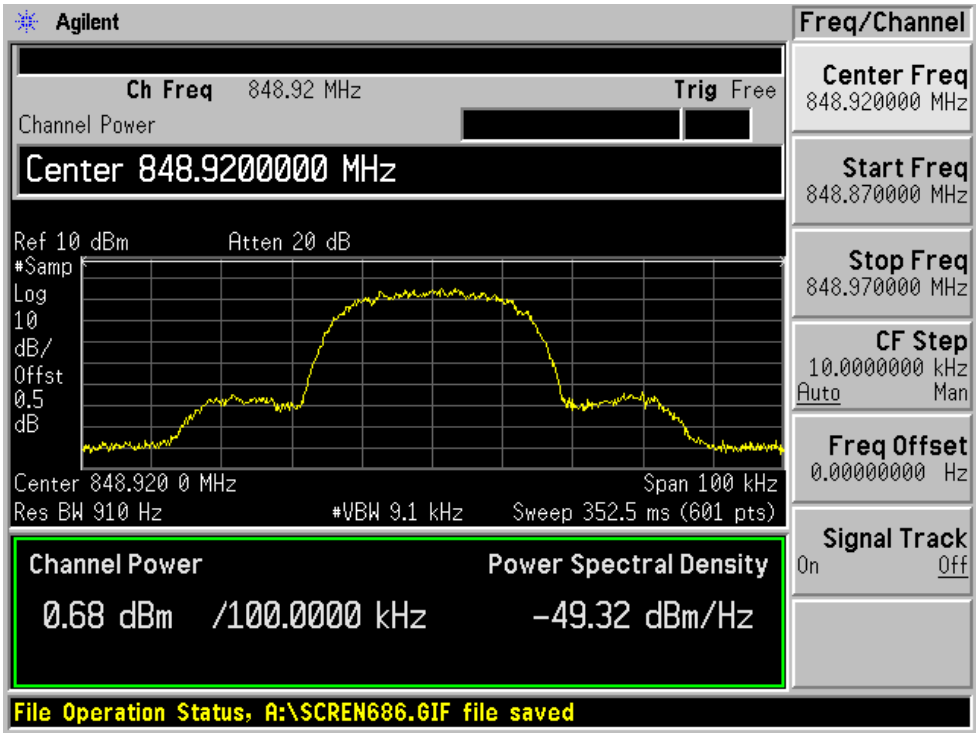


*High Channel*

Input:




Output:



# §2.1049 & §22.917(b) - OCCUPIED BANDWIDTH

## Applicable Standards

Requirements: CFR 47, Section 2.1049 and 22.917(b).

## Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the spectrum was recorded.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2006-03-06 |
| R&S | Generator, Signal | SMIQ03 | 849192/0085 | 2006-06-02 |

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

## Environmental Conditions

| | |
|---|---|
| Temperature: | 27° C |
| Relative Humidity: | 37% |
| ATM Pressure: | 1020 mbar |

** The testing was performed by James Ma on 2006-07-19.*

## Test Results

**CDMA**

*Forward (downlink)*

| Channel | Channel frequency (MHz) | 99% Power Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|---|
| Low | 869.73 | 1.264 | 1.441 |
| Middle | 881.40 | 1.269 | 1.436 |
| High | 893.19 | 1.263 | 1.433 |

*Reverse (uplink)*

| Channel | Channel frequency (MHz) | 99% Power Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|---|
| Low | 824.73 | 1.271 | 1.434 |
| Middle | 836.40 | 1.267 | 1.417 |
| High | 848.19 | 1.274 | 1.419 |

**GSM**

*Forward (downlink)*

| Channel | Channel frequency (MHz) | 99% Power Bandwidth (KHz) | 26 dB Bandwidth (KHz) |
|---|---|---|---|
| Low | 869.20 | 269.29 | 367.16 |
| Middle | 881.60 | 270.12 | 369.00 |
| High | 893.80 | 269.10 | 367.73 |

*Reverse (uplink)*

| Channel | Channel frequency (MHz) | 99% Power Bandwidth (KHz) | 26 dB Bandwidth (KHz) |
|---|---|---|---|
| Low | 824.20 | 269.83 | 369.43 |
| Middle | 836.60 | 269.33 | 368.32 |
| High | 848.80 | 268.82 | 368.51 |

**TDMA**

*Forward (downlink)*

| Channel | Channel frequency (MHz) | 99% Power Bandwidth (KHz) | 26 dB Bandwidth (KHz) |
|---|---|---|---|
| Low | 869.04 | 26.92 | 33.41 |
| Middle | 881.48 | 27.18 | 33.29 |
| High | 893.92 | 27.04 | 33.32 |

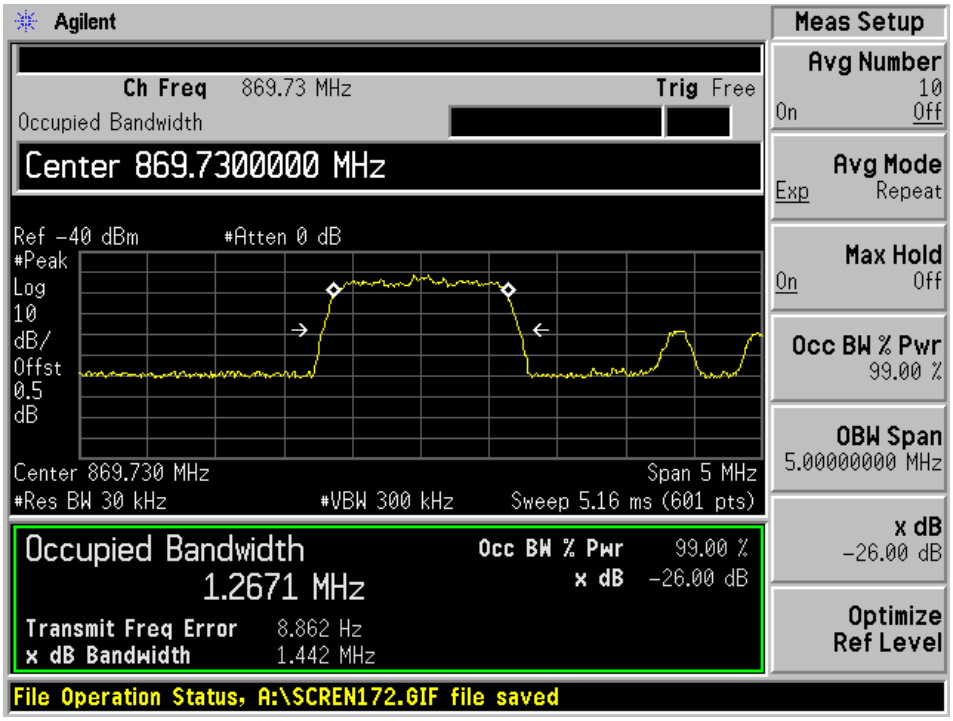
*Reverse (uplink)*

| Channel | Channel frequency (MHz) | 99% Power Bandwidth (KHz) | 26 dB Bandwidth (KHz) |
|---|---|---|---|
| Low | 824.04 | 27.37 | 33.02 |
| Middle | 836.48 | 27.18 | 32.94 |
| High | 848.92 | 27.37 | 33.36 |

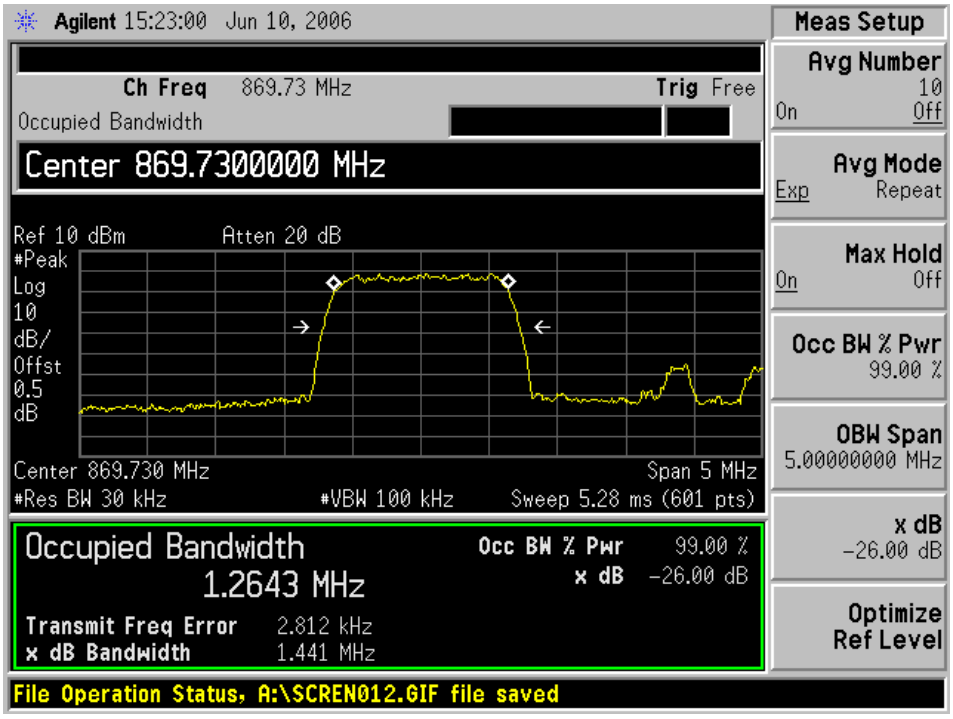
**CDMA**
**Forward (Downlink)**

*Low channel*

Input:

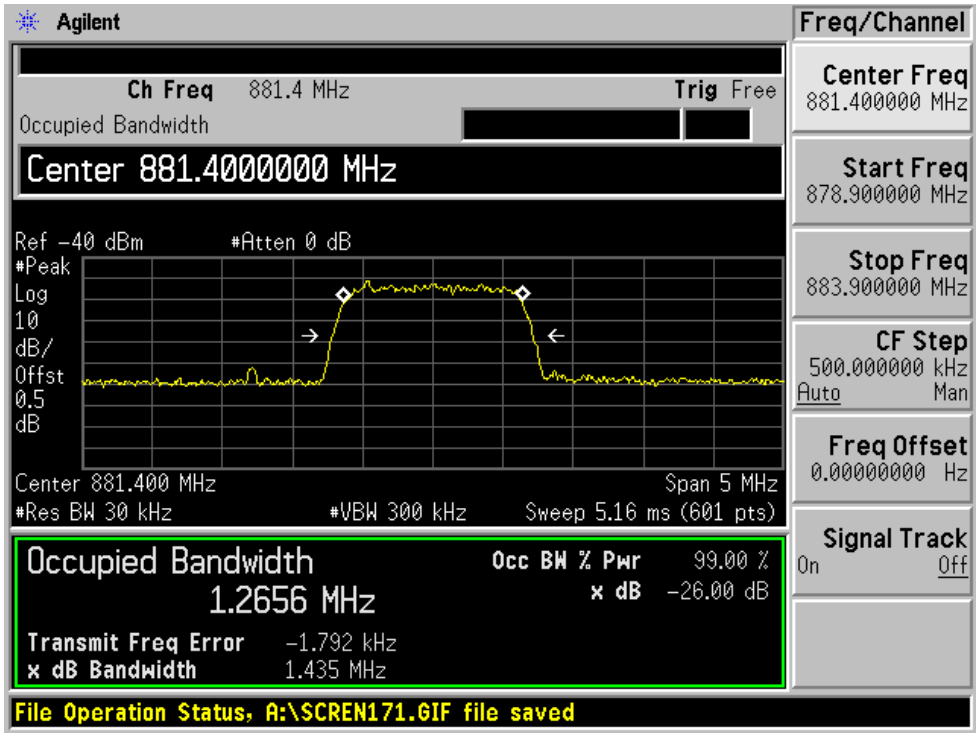



Output

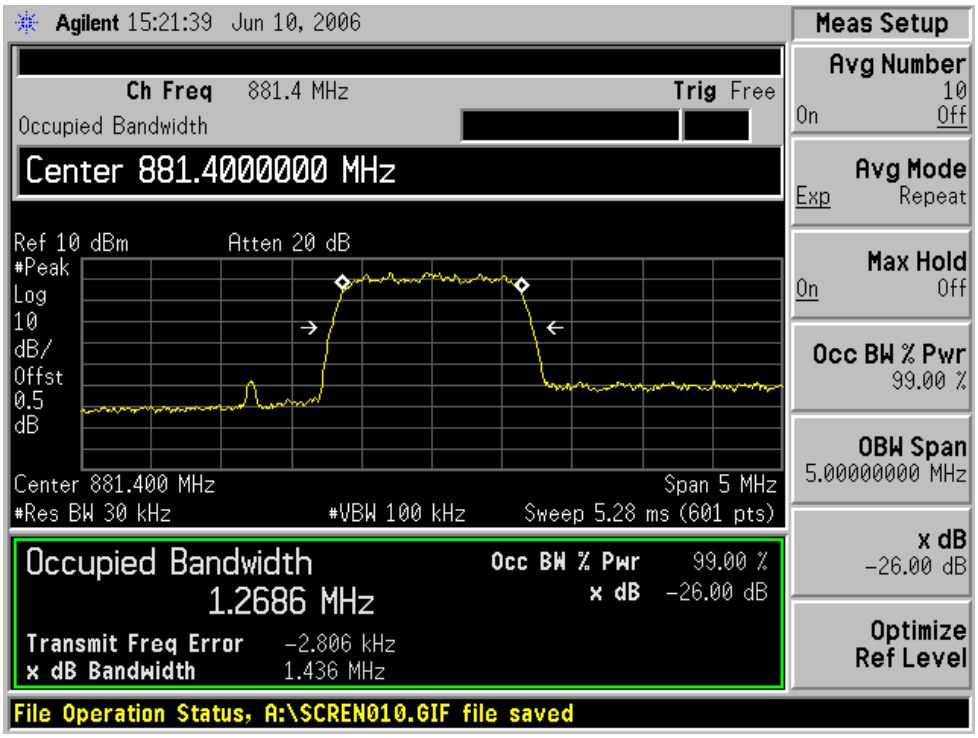


*Mid Channel*

Input:

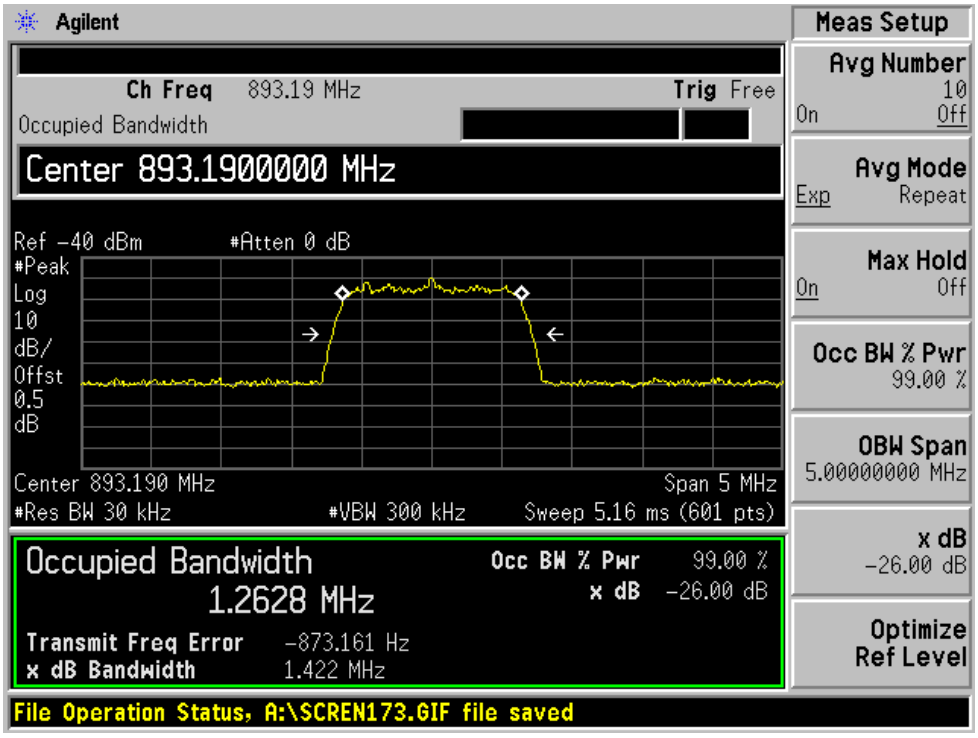



Output:

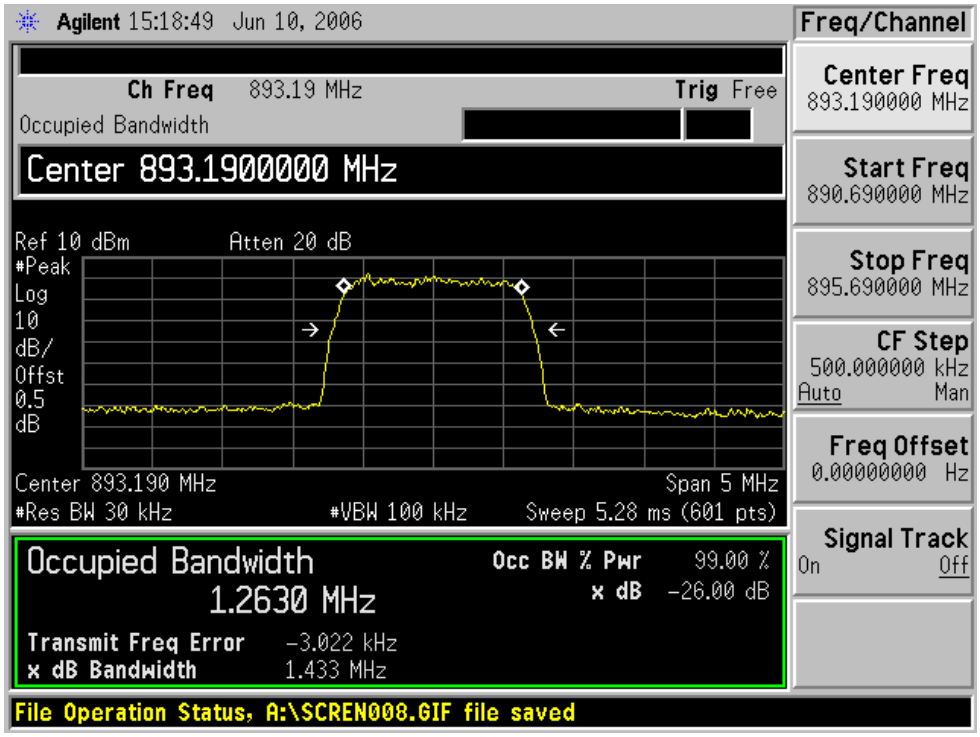


*High Channel*

Input:



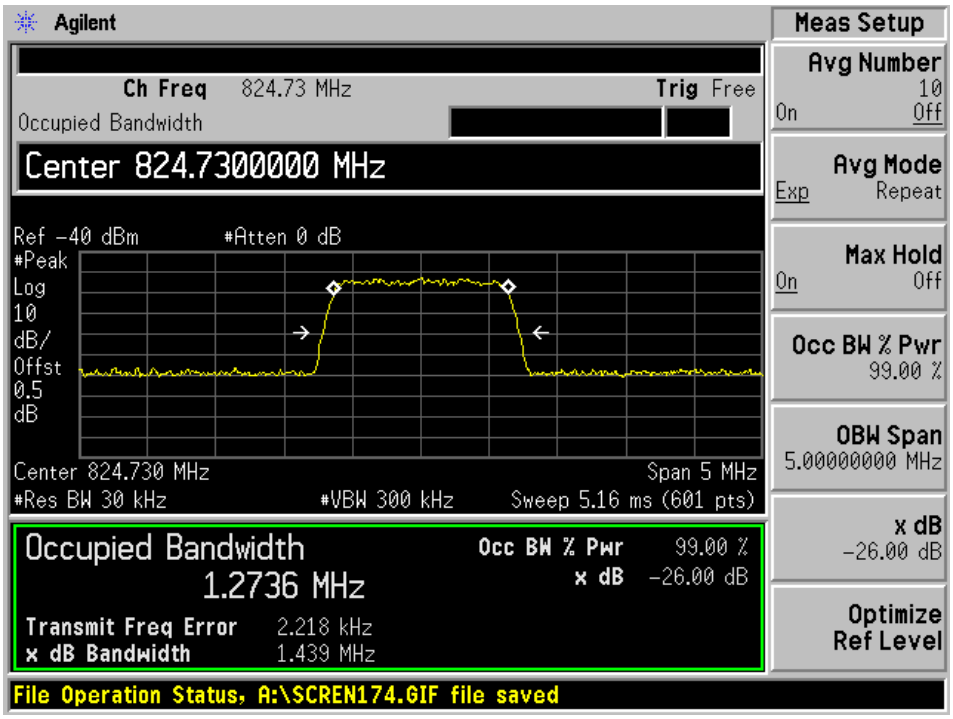

Output:



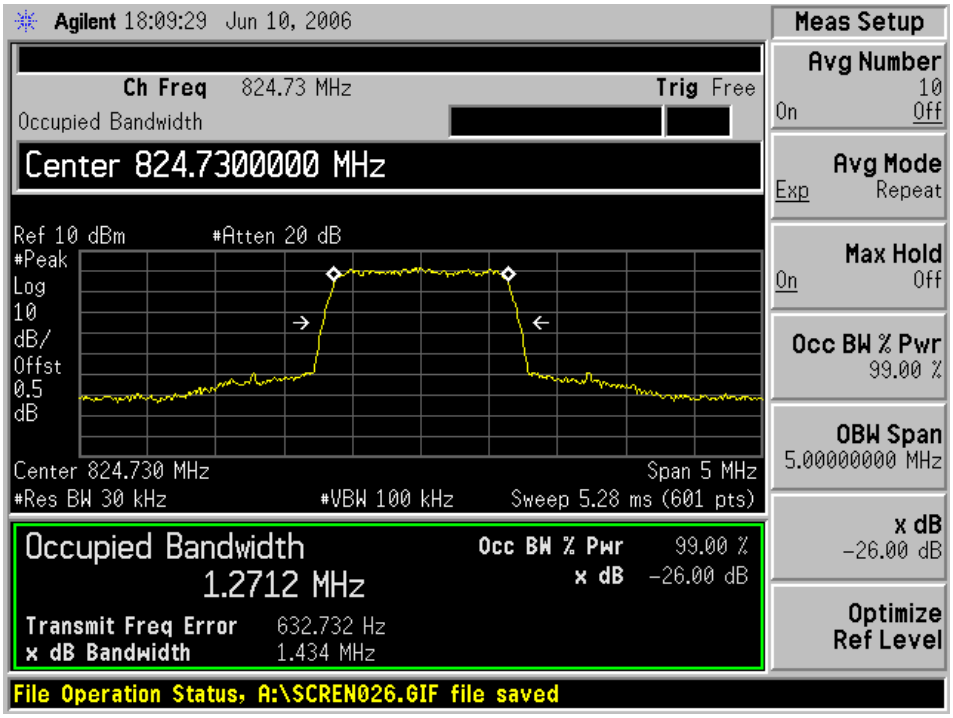
**CDMA**
**Reverse (Uplink)**

*Low Channel*

Input:

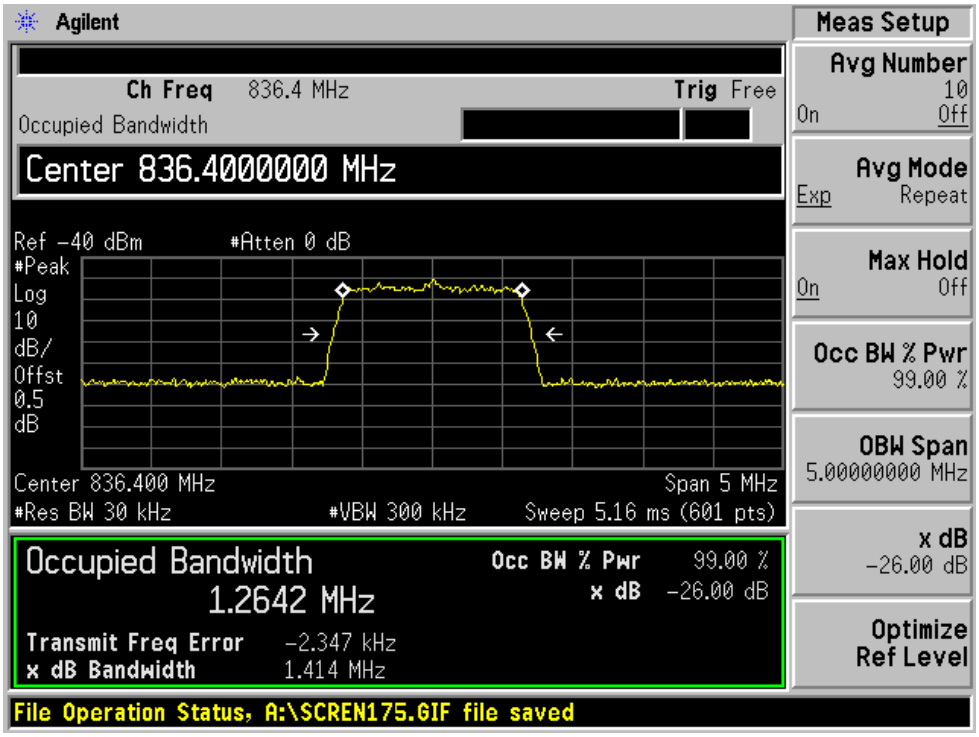



Output:

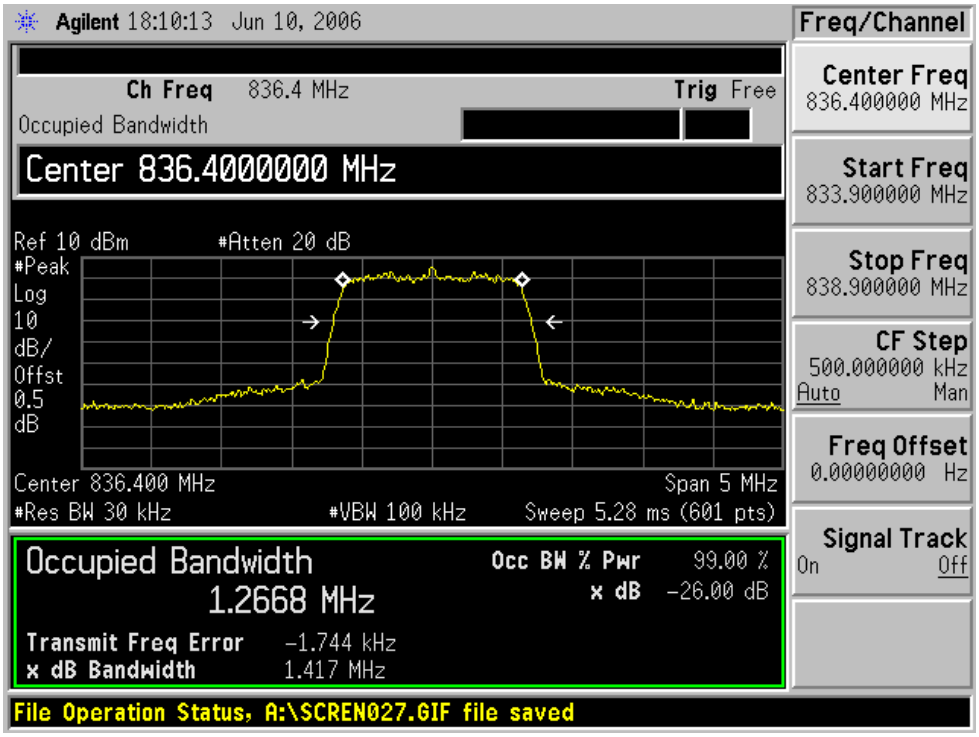


*Mid channel*

Input:

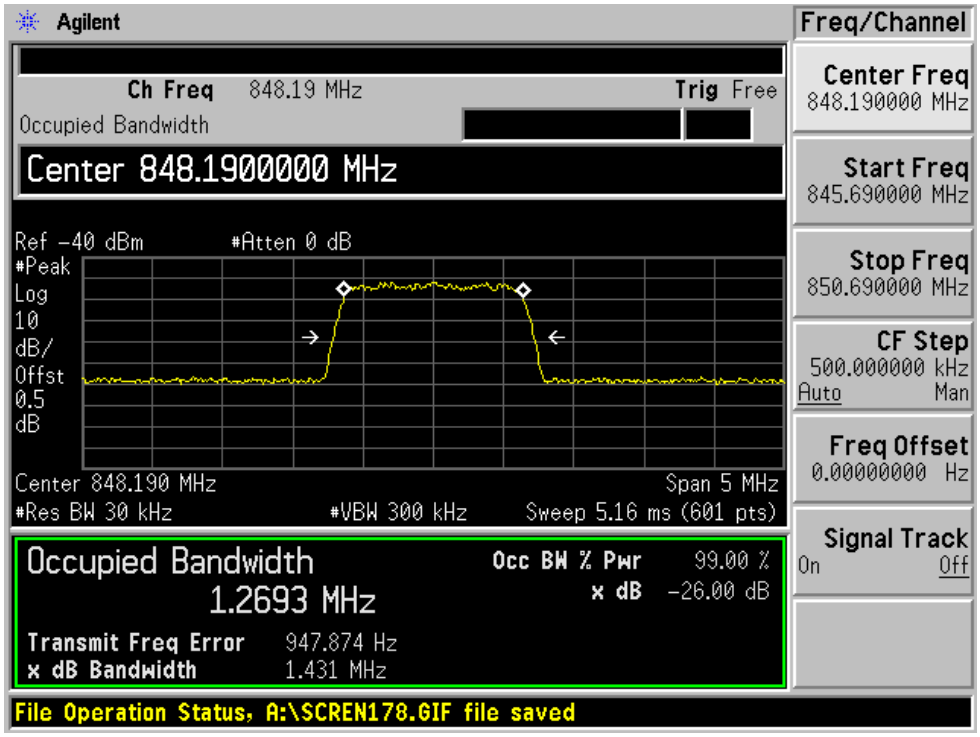



Output:

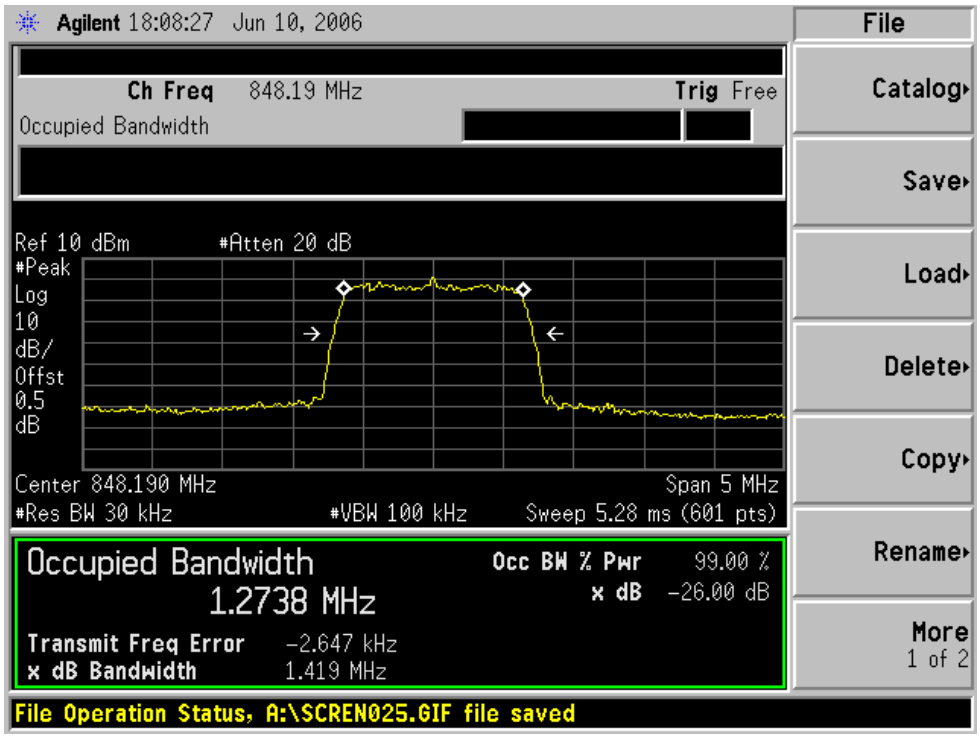


*High channel*

Input:

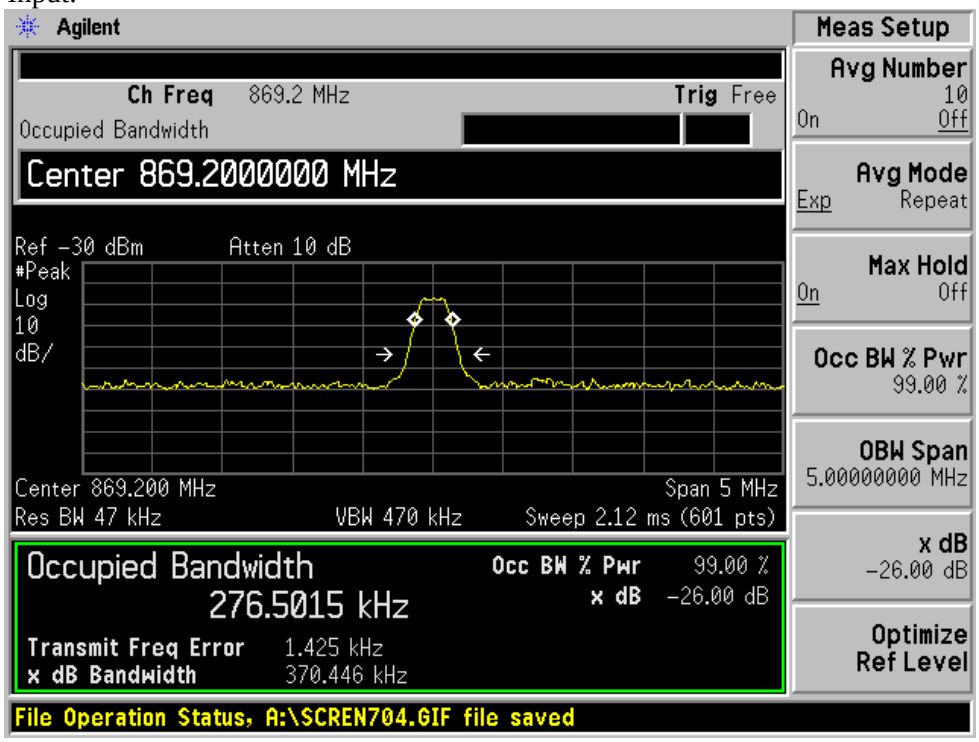



Output:

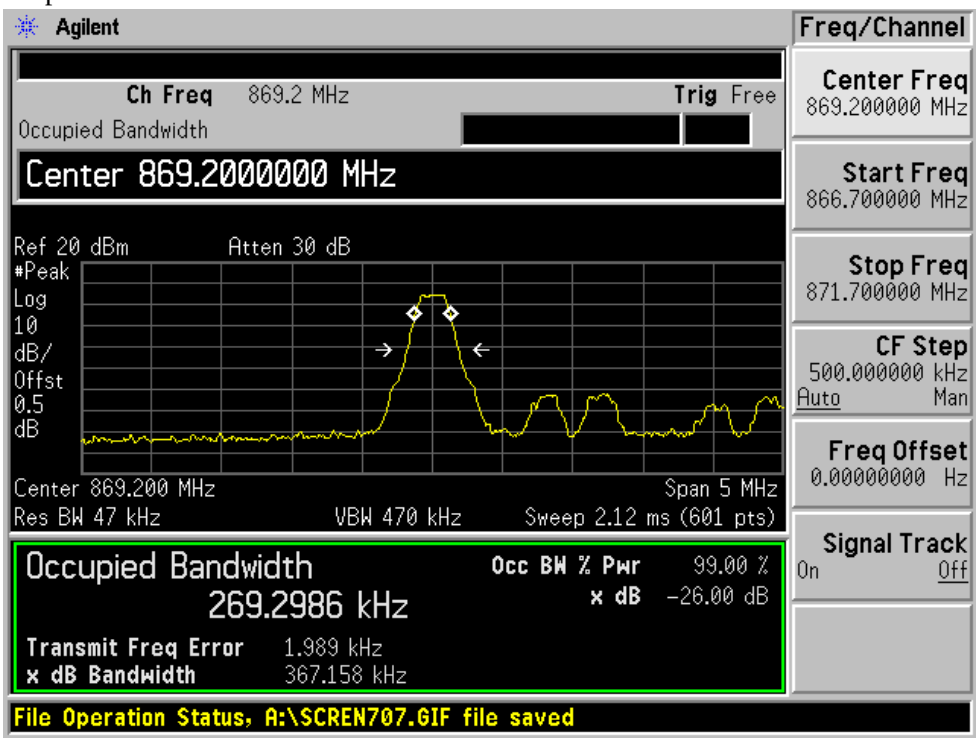


**GSM**
**Forward (Downlink)**
*Low channel*

Input:

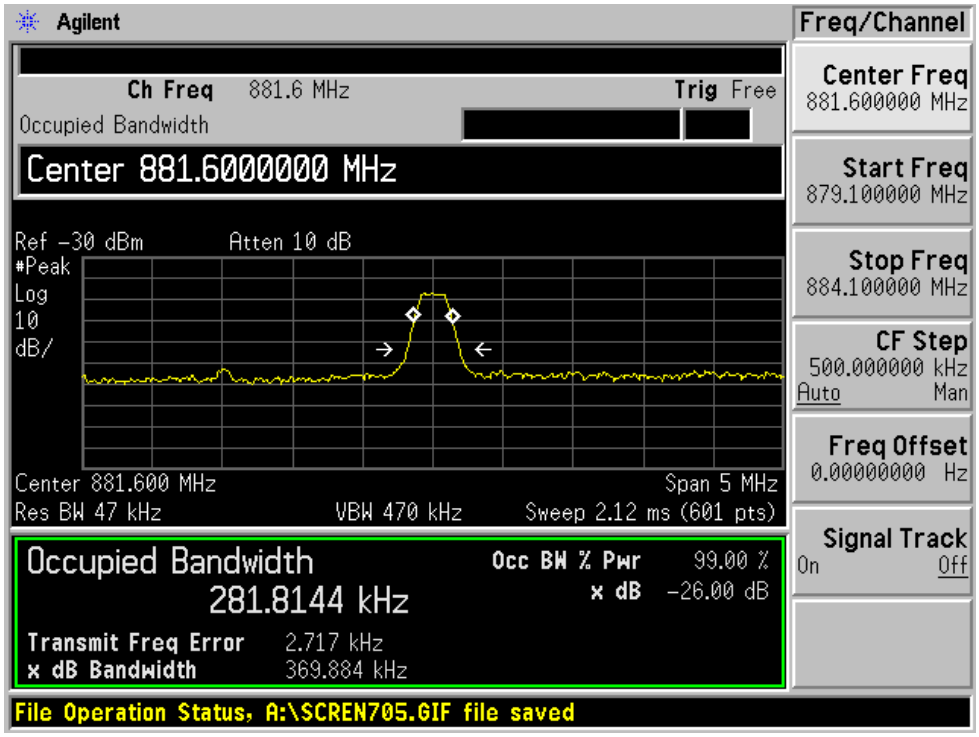



Output

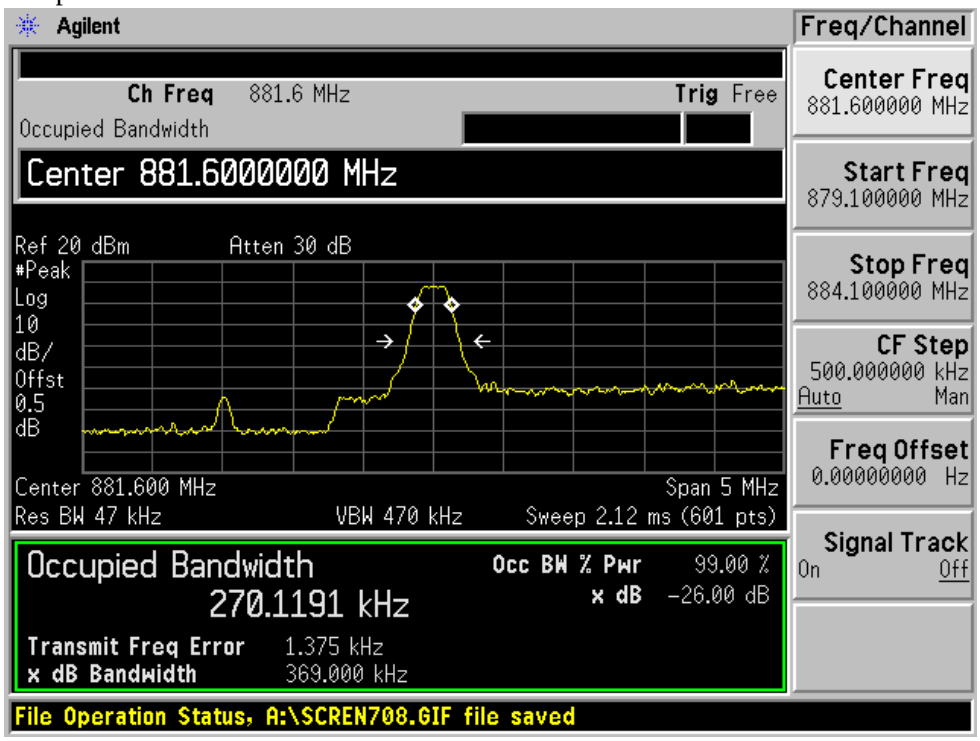


*Mid Channel*

Input:

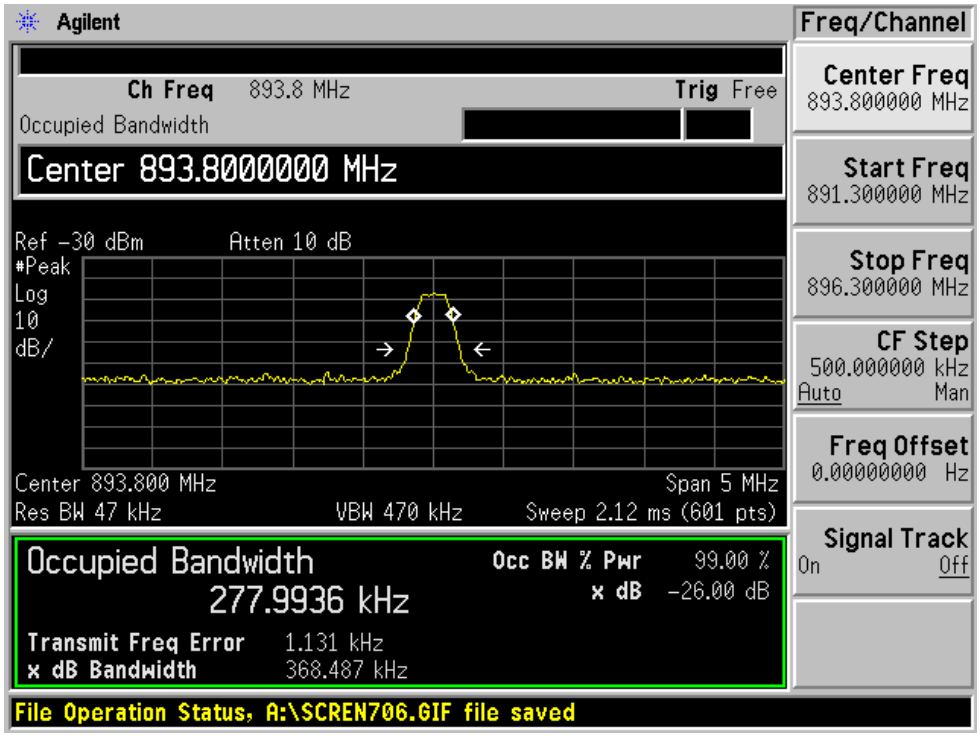



Output:

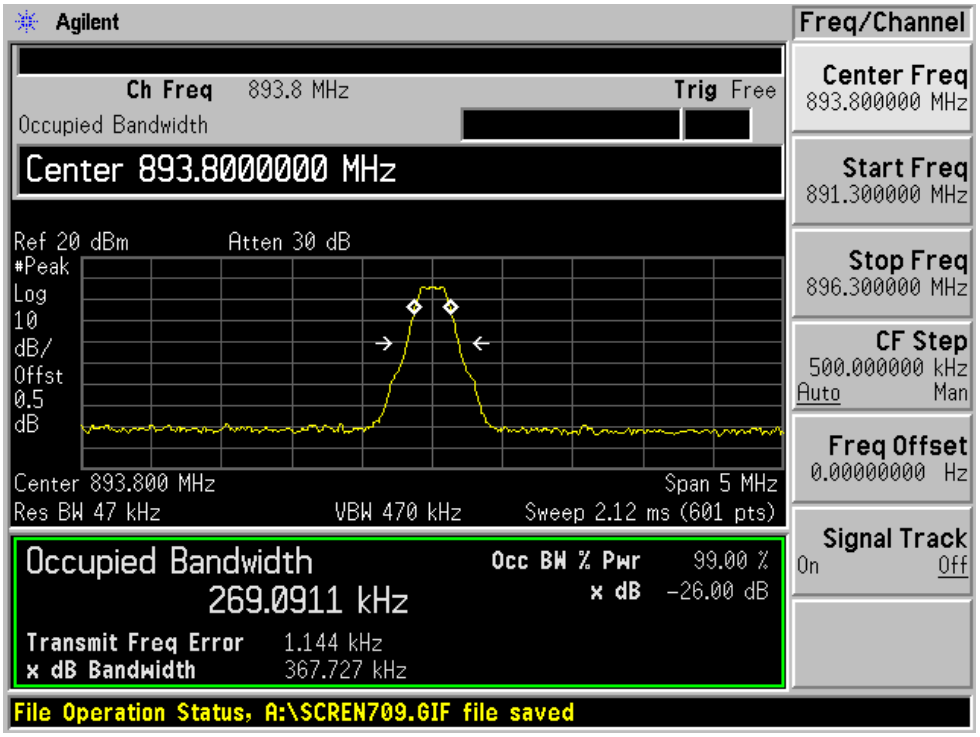


*High Channel*

Input:

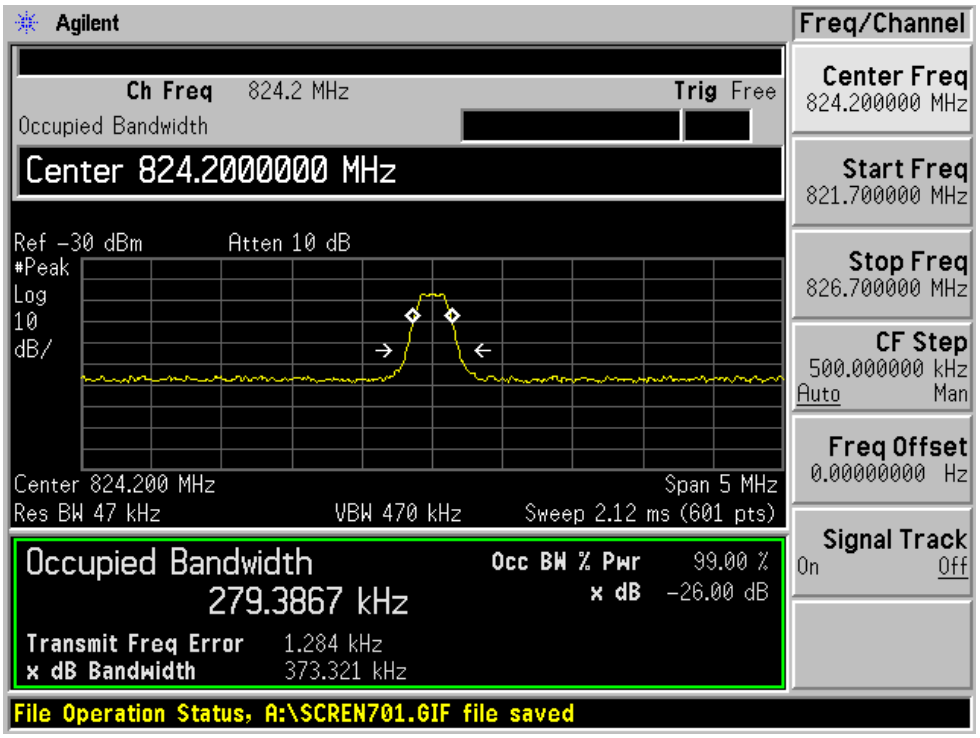



Output:

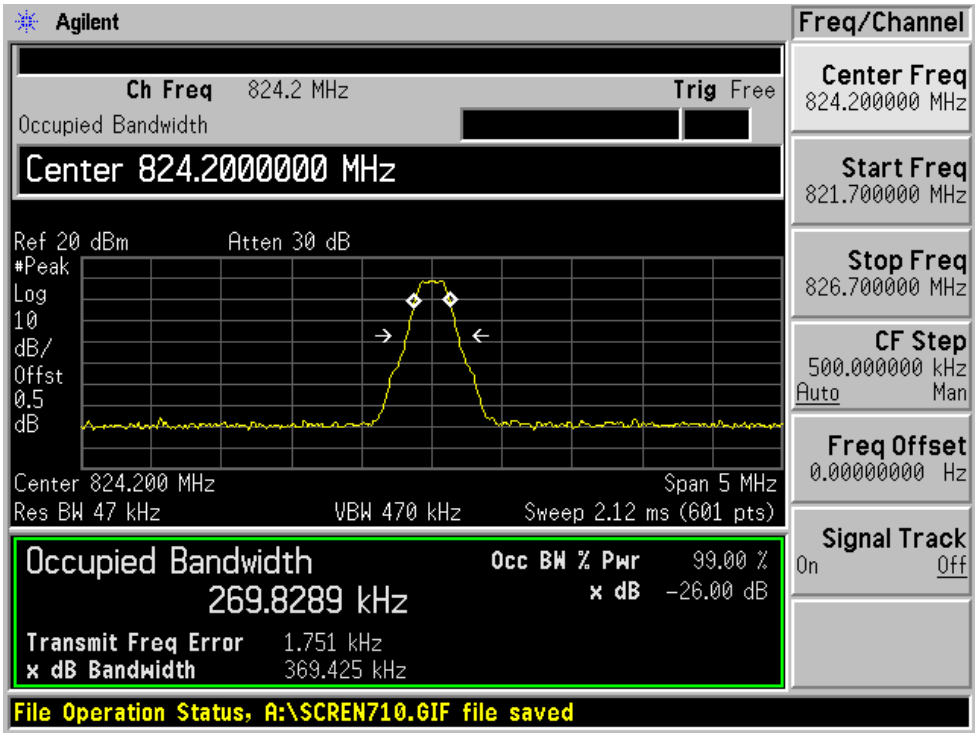


**GSM**
**Reverse (Uplink)**
*Low Channel*

Input:

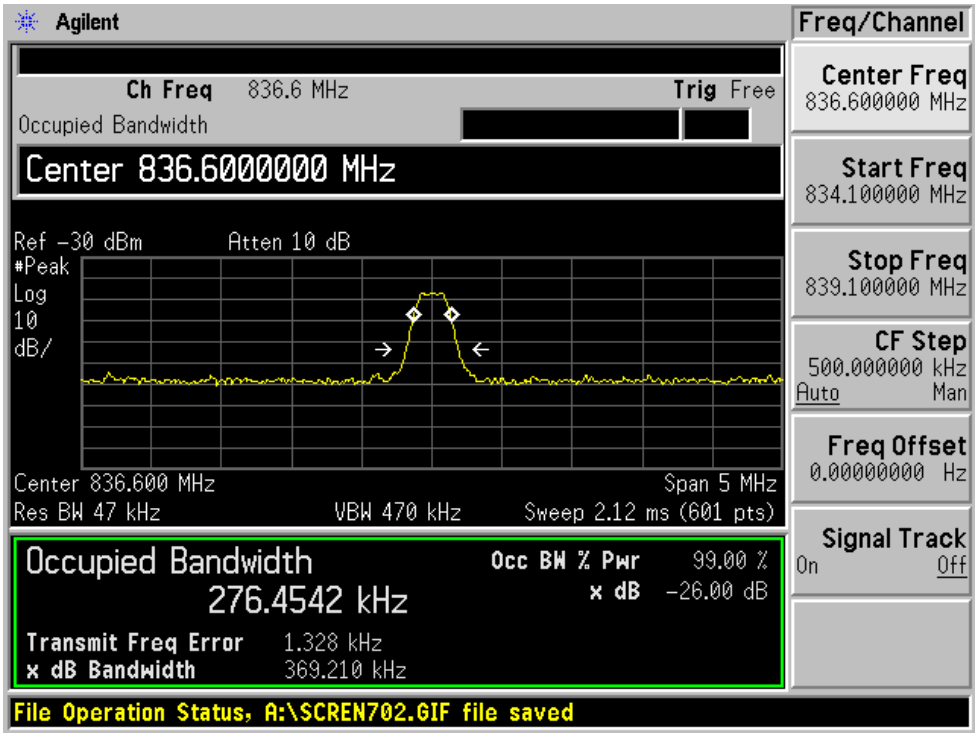



Output:

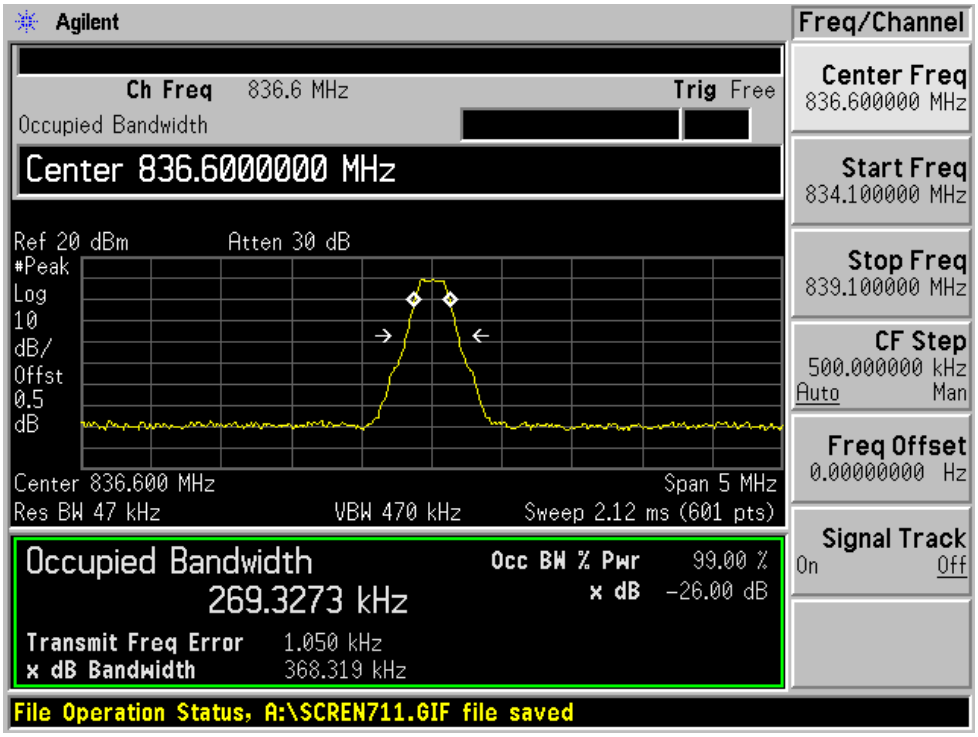


*Mid channel*

Input:

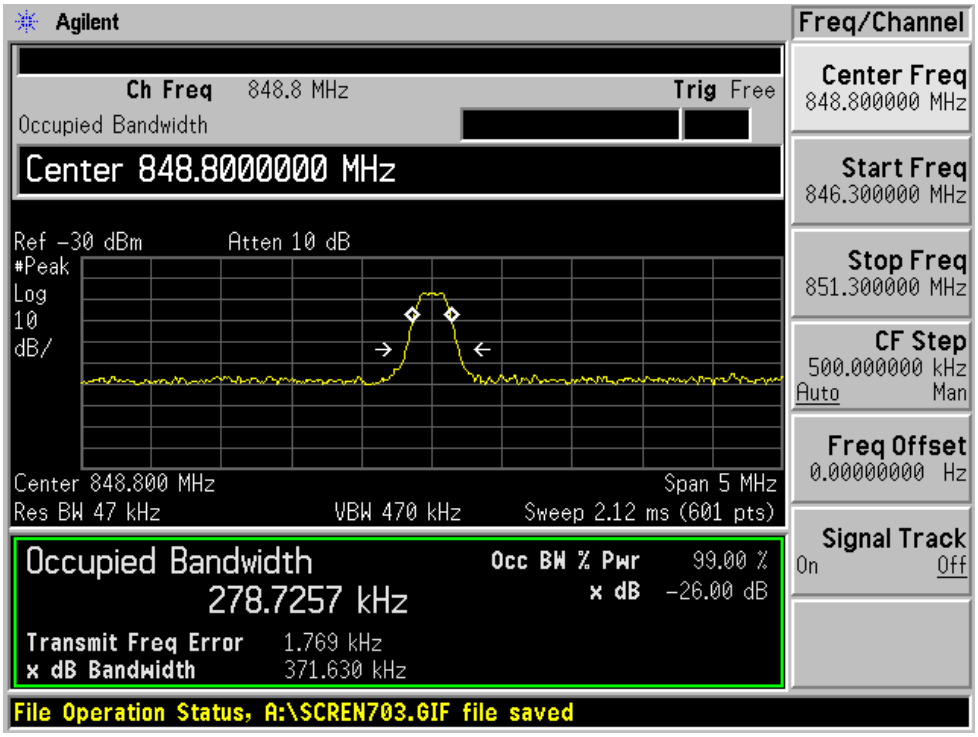



Output:

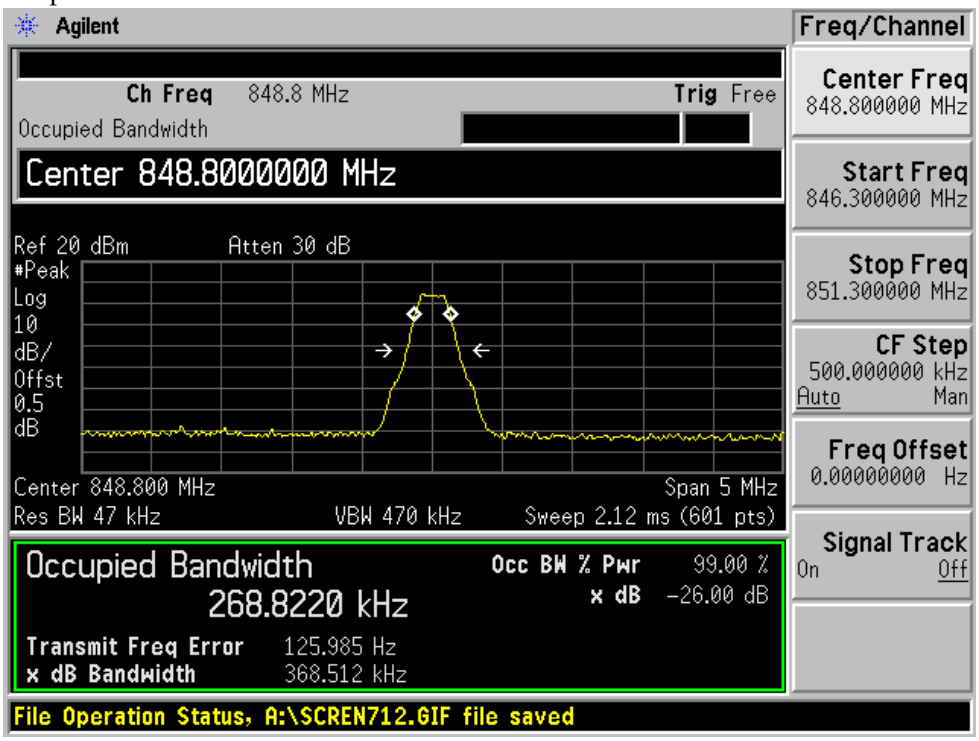


*High channel*

Input:



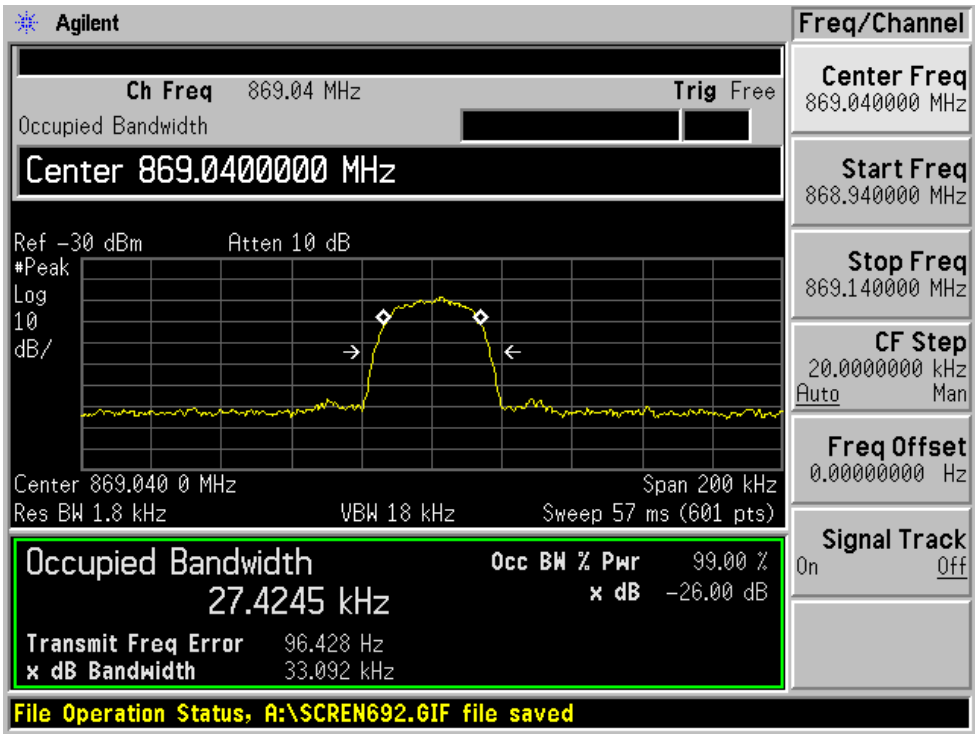

Output:



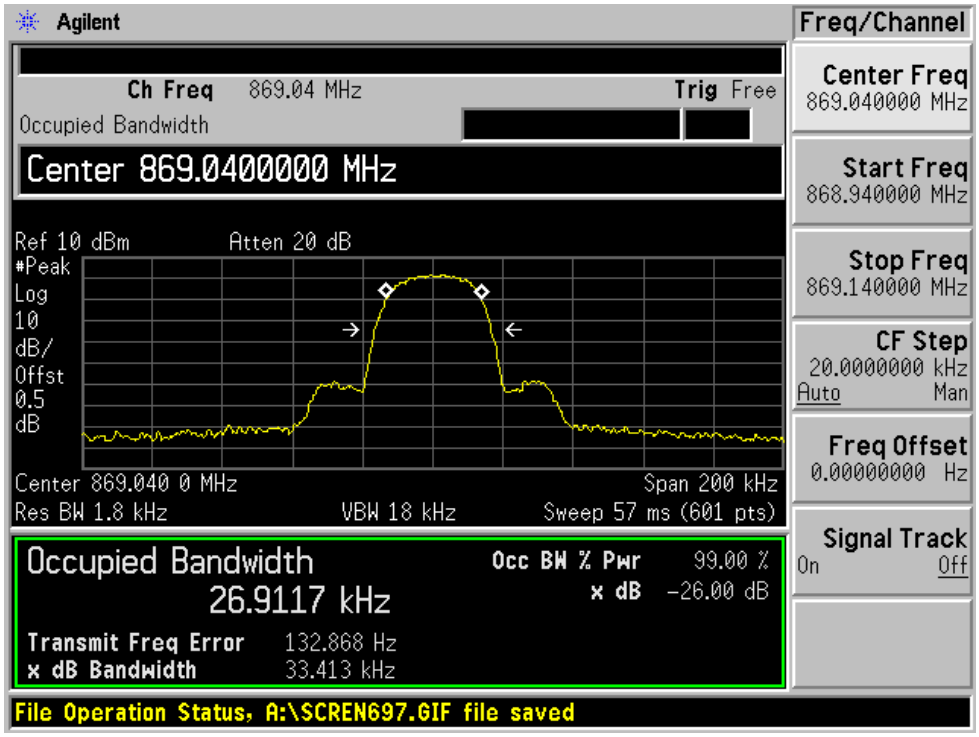
**TDMA**
**Forward (Downlink)**

*Low channel*

Input:

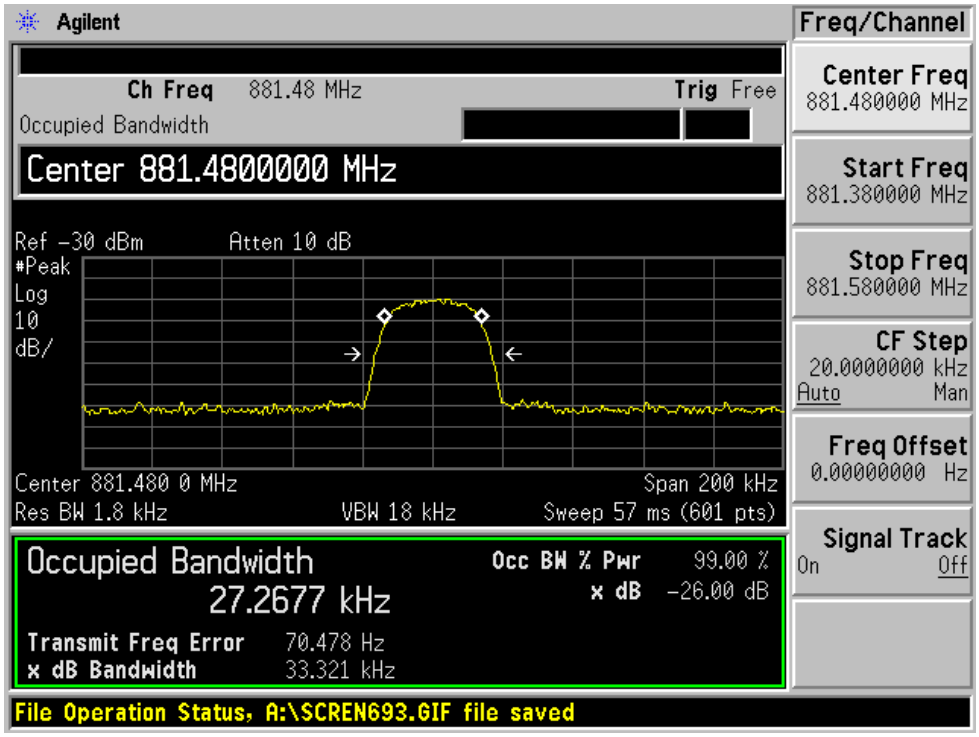



Output

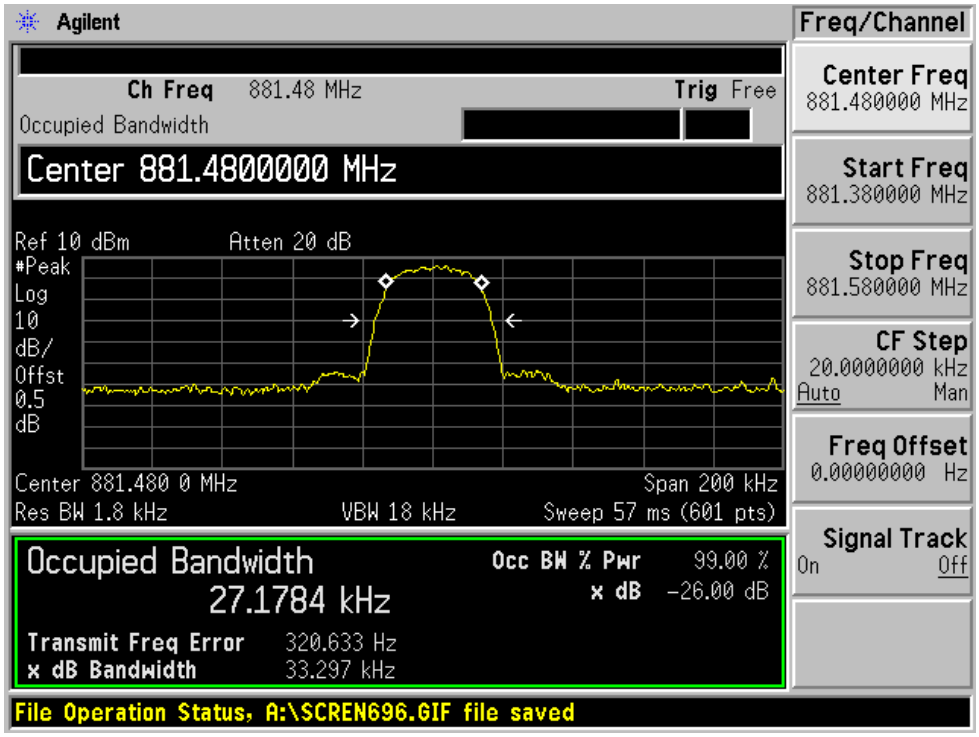


*Mid Channel*

Input:

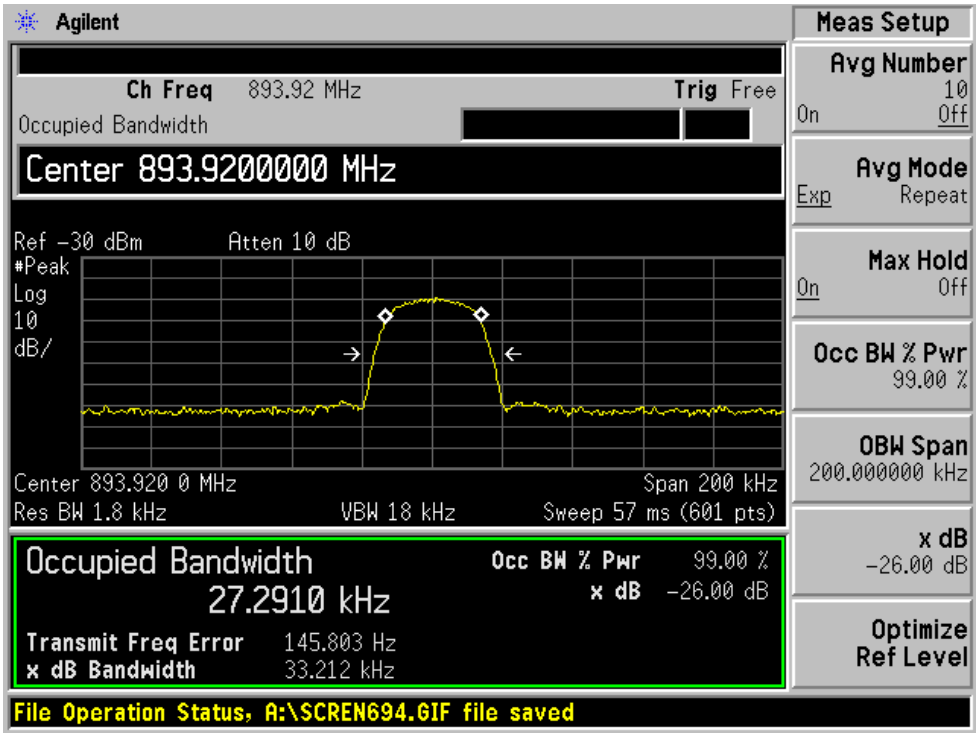



Output:

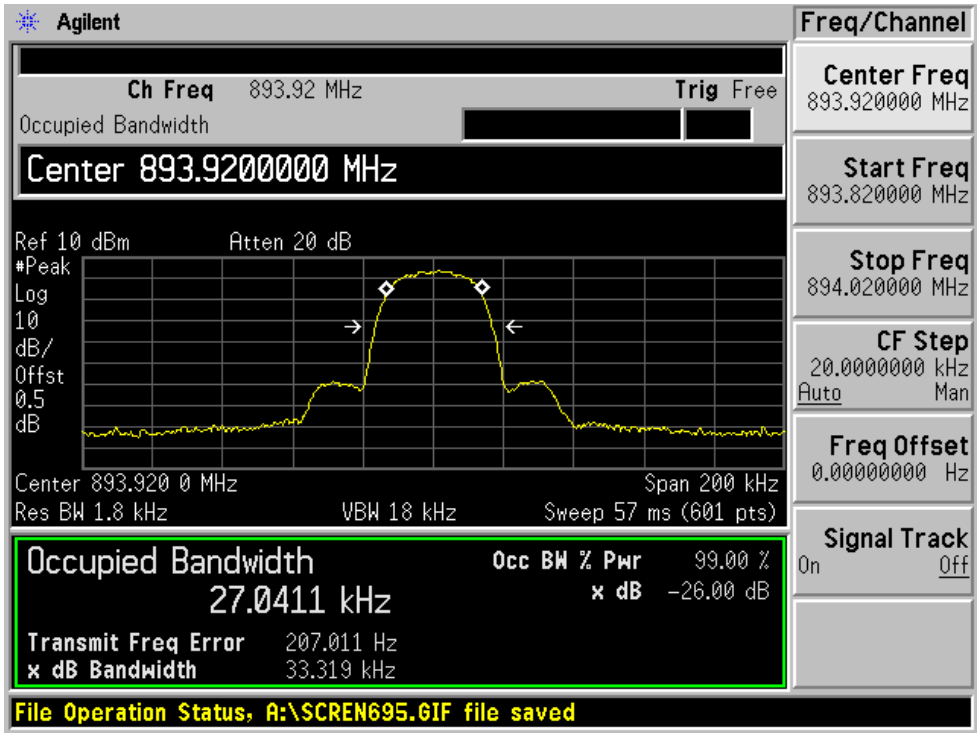


*High Channel*

Input:



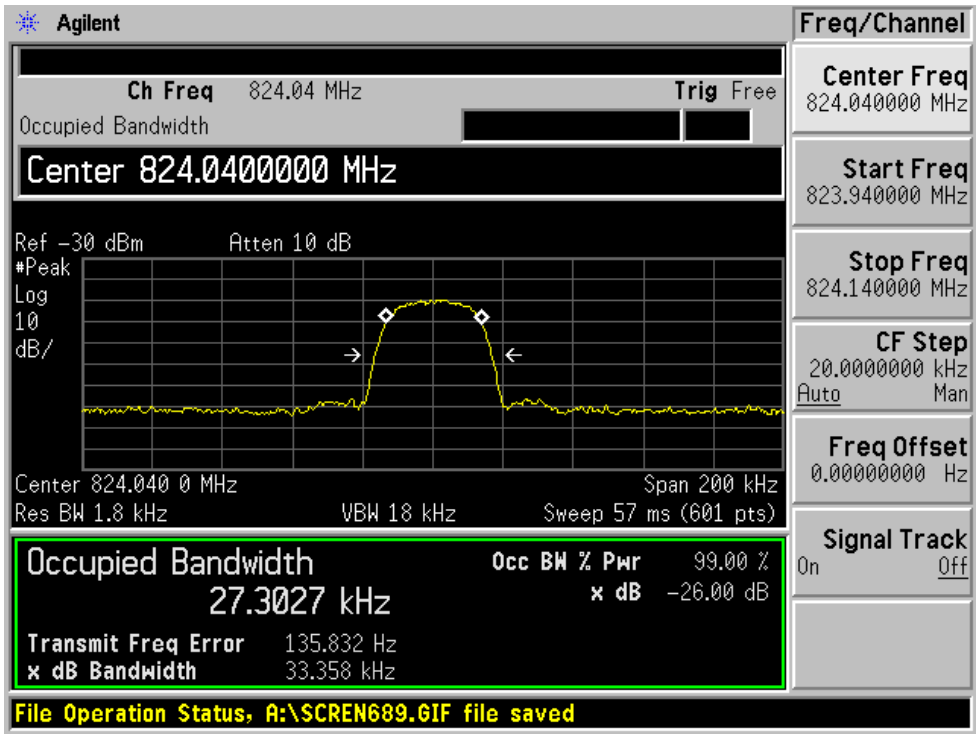

Output:



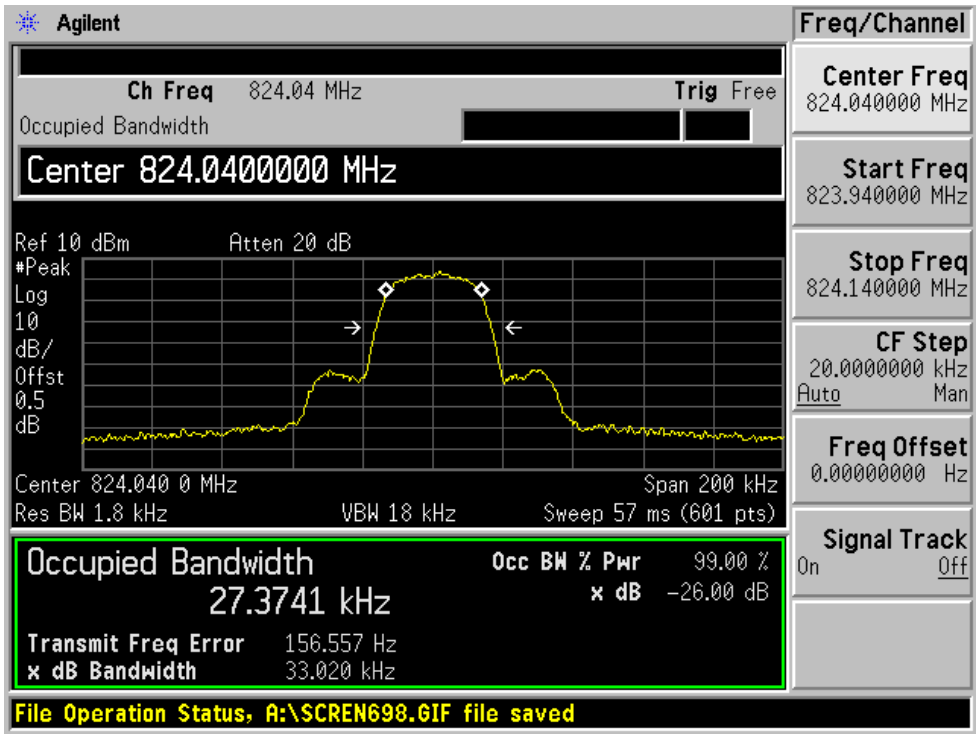
**TDMA**
**Reverse (Uplink)**

*Low Channel*

Input:

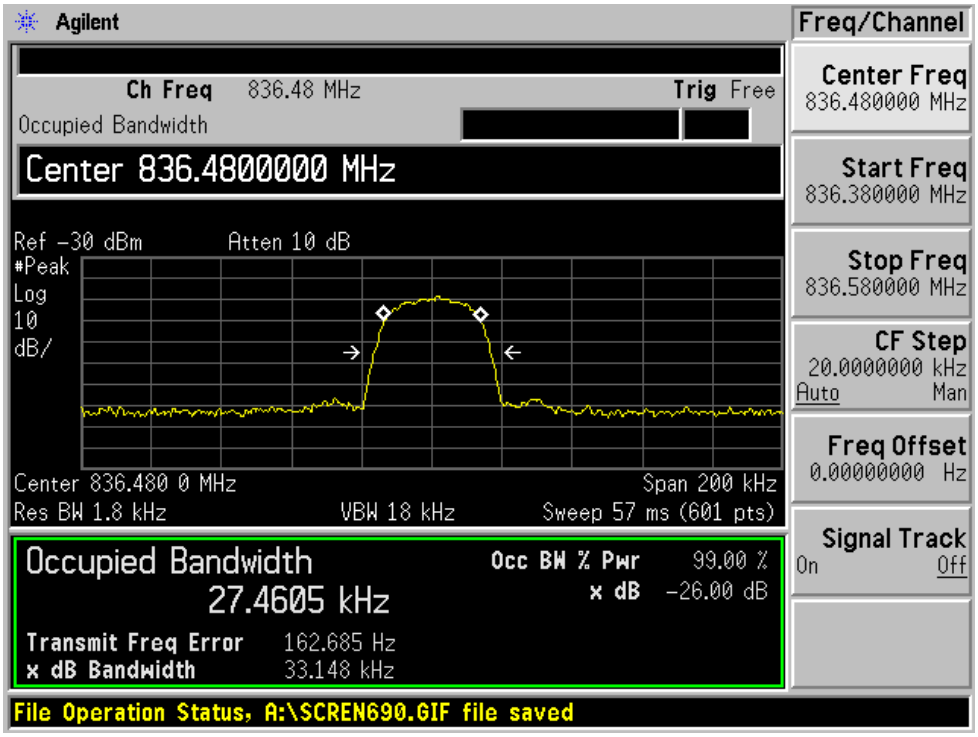



Output:

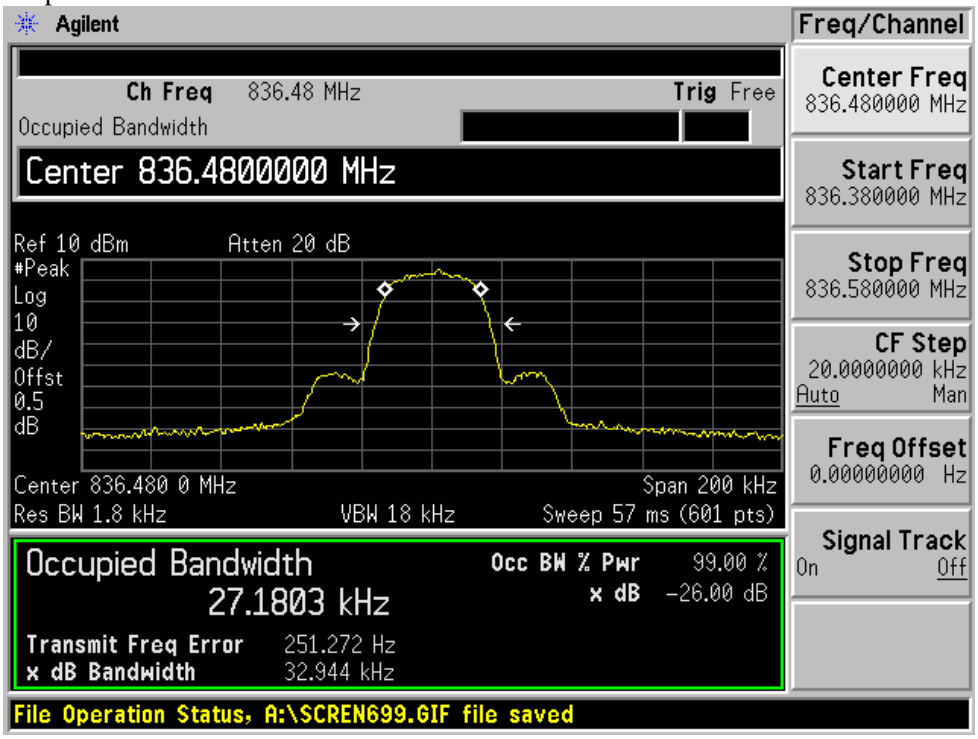


*Mid channel*

Input:

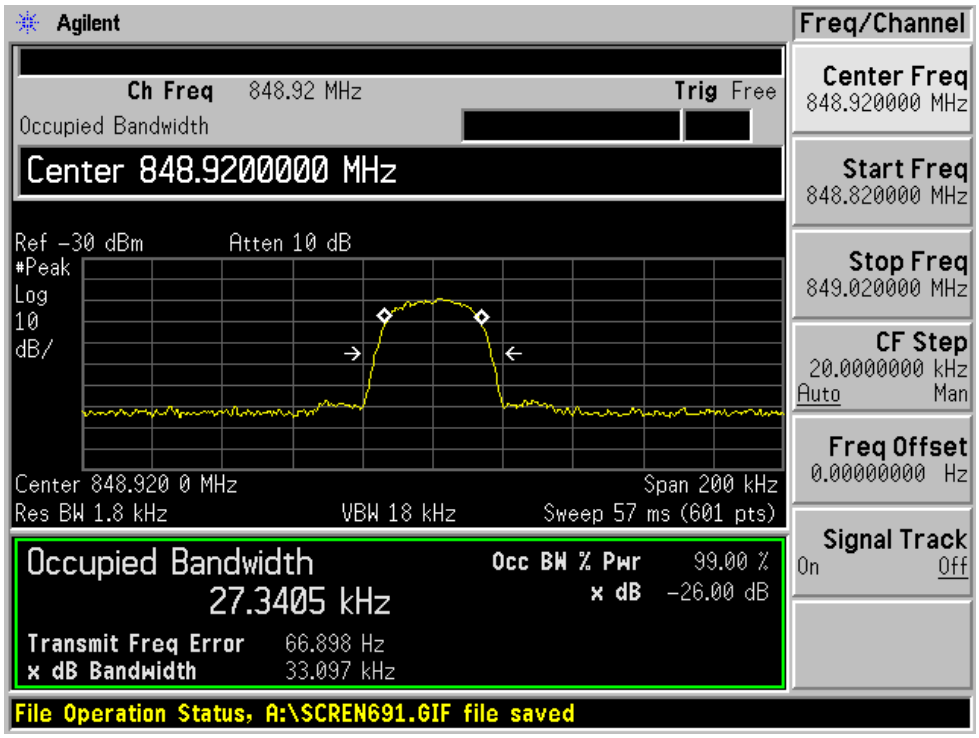



Output:

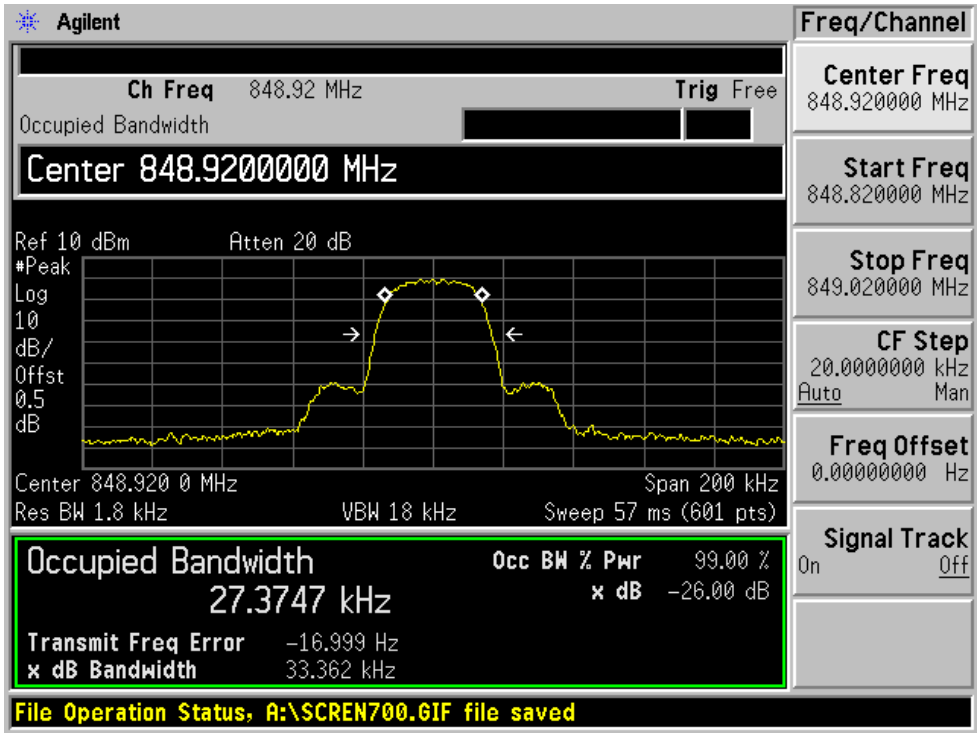


*High channel*

Input:




Output:



# §2.1051 & §22.917(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## Applicable Standards

Requirements: CFR 47, § 2.1051, § 22.917.
The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

## Test Procedure

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

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2006-03-06 |
| R&S | Generator, Signal | SMIQ03 | 849192/0085 | 2006-06-02 |

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

## Environmental Conditions

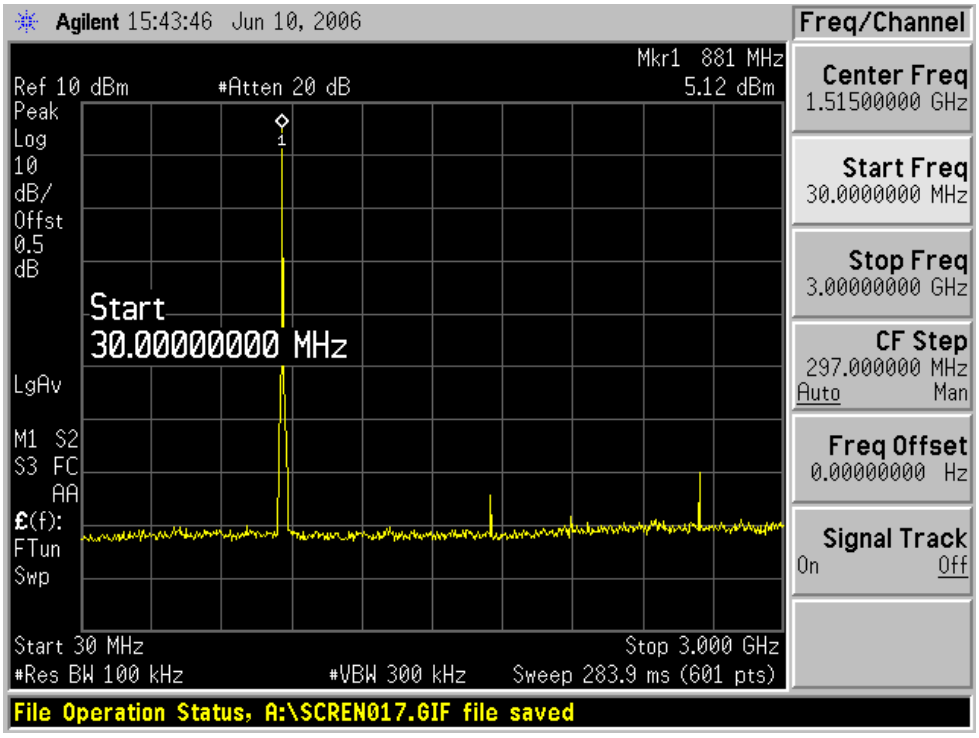
| | |
|---|---|
| Temperature: | 27° C |
| Relative Humidity: | 37% |
| ATM Pressure: | 1020 mbar |

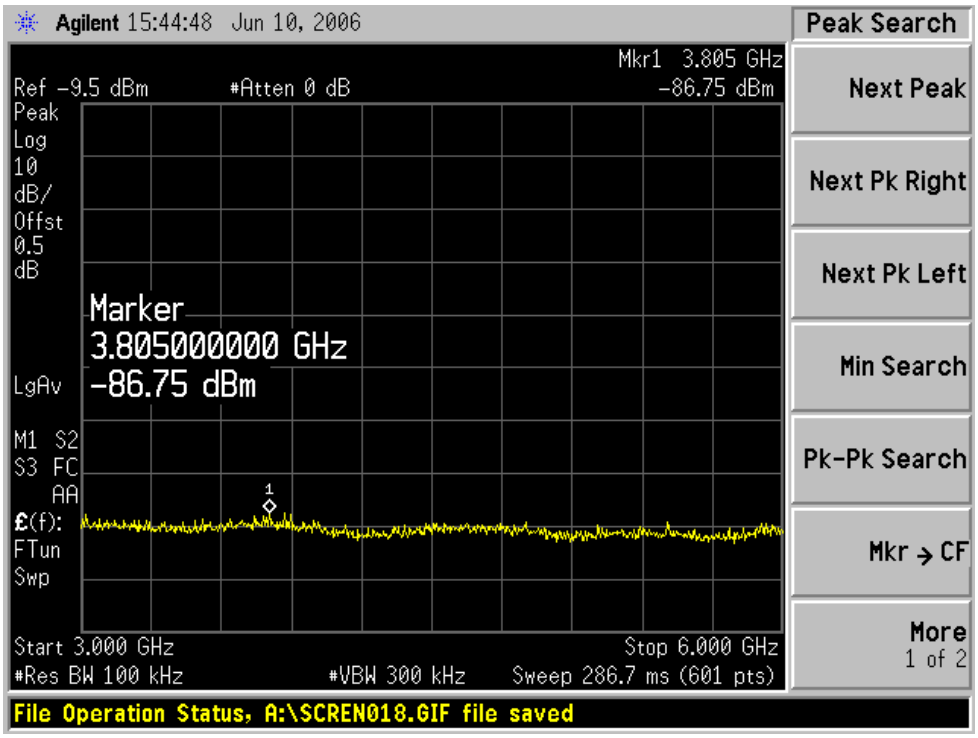
** The testing was performed by James Ma on 2006-07-19.*

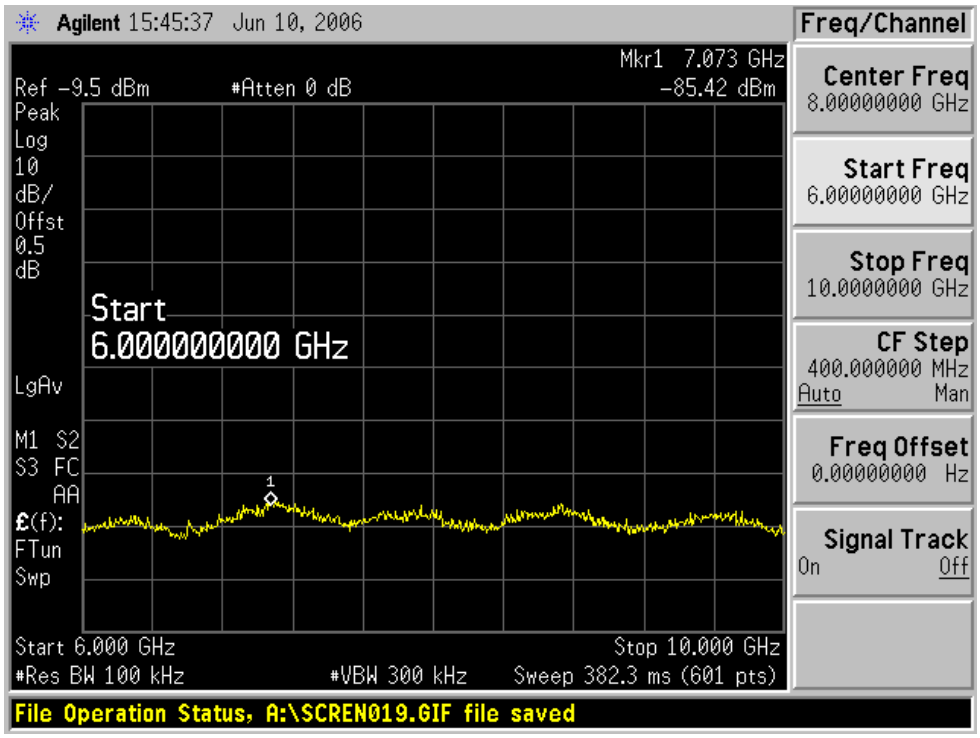
## Test Results:

Please refer to the hereinafter plots.

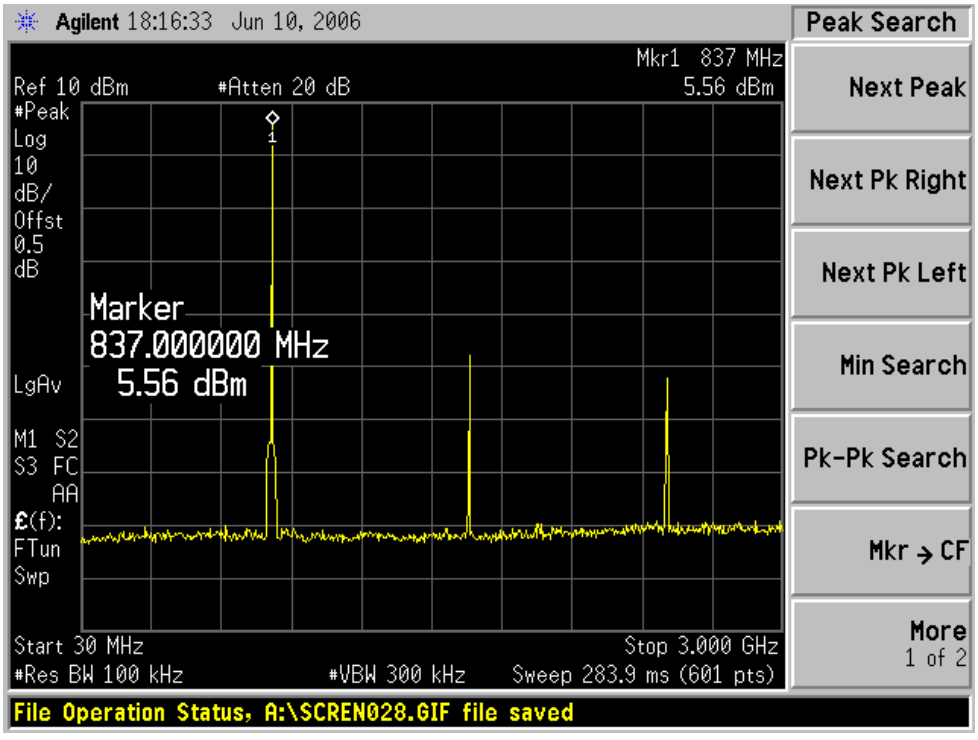
**Forward (Downlink)**

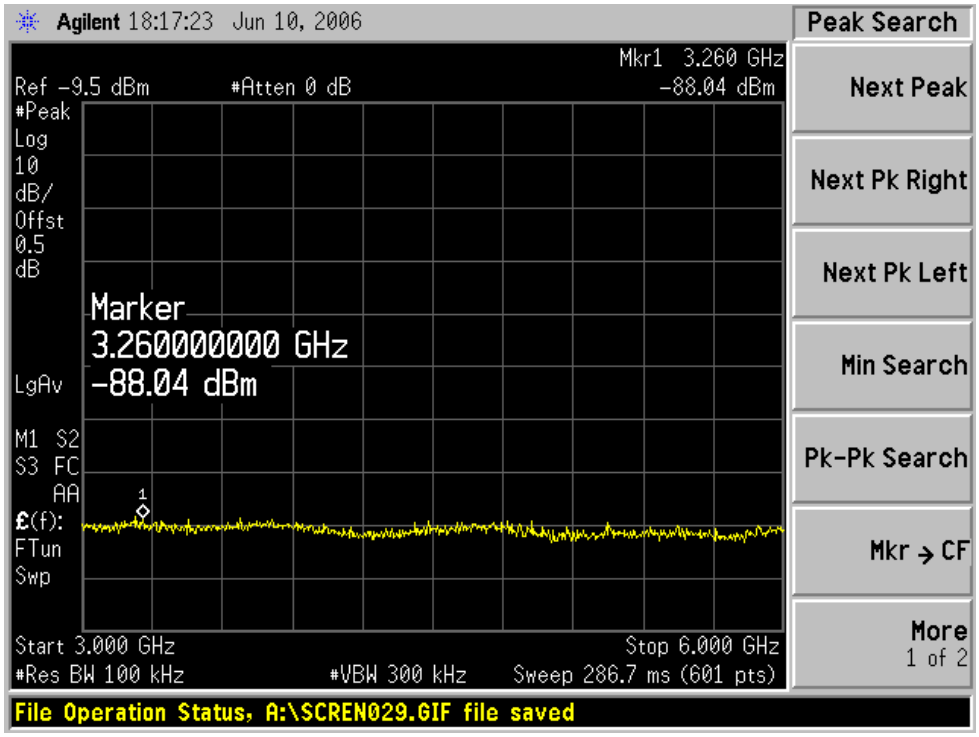


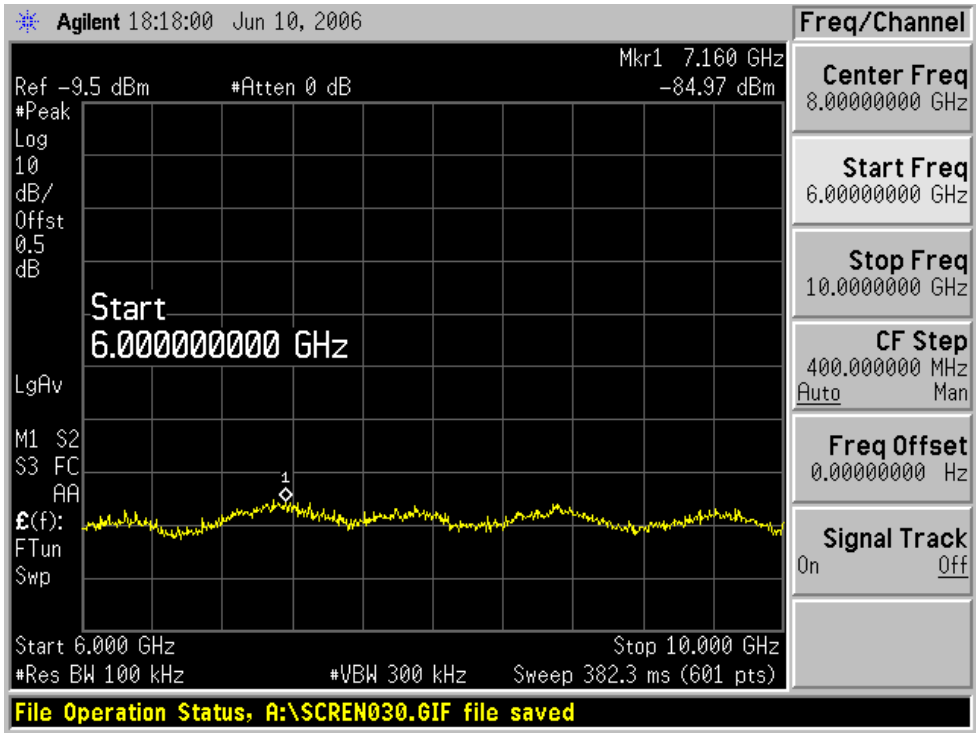






**Reverse (Uplink)**




Agilent 18:17:23 Jun 10, 2006
Peak Search
Mkr1 3.260 GHz
Ref -9.5 dBm
#Atten 0 dB
-88.04 dBm
#Peak
Log
10
dB/
Offst
0.5
dB
Marker
3.260000000 GHz
-88.04 dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 3.000 GHz
Stop 6.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 286.7 ms (601 pts)
File Operation Status, A:\SCREN029.GIF file saved


Agilent 18:18:00 Jun 10, 2006
Freq/Channel
Mkr1 7.160 GHz
Ref -9.5 dBm
#Atten 0 dB
-84.97 dBm
#Peak
Log
10
dB/
Offst
0.5
dB
Start
6.000000000 GHz
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center Freq
8.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
10.0000000 GHz
CF Step
400.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Start 6.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 382.3 ms (601 pts)
File Operation Status, A:\SCREN030.GIF file saved

# §2.1053 - SPURIOUS RADIATED EMISSION

## Applicable Standards

Requirements: CFR 47, § 2.1053.

## 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 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 $\text{Log}_{10}$ (power out in Watts)

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2006-03-06 |
| Sunol Science | 30MHz ~ 3 GHz Antenna | JB3 | A020106-3/S006628 | 2006-02-14 |
| HP | Pre, Amplifier (1 ~ 26.5 GHz) | 8449B | 3147A00400 | 2006-08-21 |
| HP | Generator, Signal | 83650B | 3614A00276 | 2006-05-10 |
| Sunol Sciences | Antenna, Horn, Std | DRH-118 | A052704 | 2005-10-02 |
| A.R.A | Antenna, Horn, DRG | DRG-118/A | 1132 | 2005-10-17 |

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

## Environmental Conditions

| | |
|---|---|
| Temperature: | 27° C |
| Relative Humidity: | 37% |
| ATM Pressure: | 1020 mbar |

** The testing was performed by James Ma on 2006-07-24.*

## Summary of Test Results

-9.7 dB margin at 2644.2 MHz Downlink
-9.7 dB margin at 1672.8MHz Uplink

### Forward (Down Link) – Omni Antenna Gain = 0 dBi

Run # 1 - 1 :Primary scan 30MHz-10GHz , Middle Channel = 881.4 MHz

| Indicated | | Table | Test Antenna | | Substituted | | Antenna | Cable | Absolute | Limit | Margin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Amp. | Angle | Height | Polar | Frequency | Level | Gain | Loss | Level | | |
| MHz | dBuV/m | Degree | Meter | H/V | MHz | dBm | Correction | dB | dBm | dBm | dB |
| 2644.2 | 38.50 | 180 | 1.8 | v | 2644.2 | -31.5 | 11.3 | 2.5 | -22.7 | -13 | -9.7 |
| 1762.8 | 38.20 | 200 | 1.5 | h | 1762.8 | -32.4 | 11.5 | 1.9 | -22.8 | -13 | -9.8 |
| 2644.2 | 38.00 | 180 | 1.8 | h | 2644.2 | -32.0 | 11.3 | 2.5 | -23.2 | -13 | -10.2 |
| 1762.8 | 40.30 | 130 | 1.2 | v | 1762.8 | -33.2 | 11.5 | 1.9 | -23.6 | -13 | -10.6 |
| 3525.6 | 35.70 | 120 | 2.0 | v | 3525.6 | -34.3 | 11.2 | 2.7 | -25.8 | -13 | -12.8 |
| 3525.6 | 35.10 | 120 | 2.0 | h | 3525.6 | -34.9 | 11.2 | 2.7 | -26.4 | -13 | -13.4 |

### Reverse (Up Link) - Patch Antenna Gain = 5 dBi

Run # 1 - 2 :Primary scan 30MHz -10GHz , Middle Channel = 836.4 MHz

| Indicated | | Table | Test Antenna | | Substituted | | Antenna | Cable | Absolute | Limit | Margin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Amp. | Angle | Height | Polar | Frequency | Level | Gain | Loss | Level | | |
| MHz | dBuV/m | Degree | Meter | H/V | MHz | dBm | Correction | dB | dBm | dBm | dB |
| 1672.8 | 43.40 | 220 | 1.2 | v | 1672.8 | -32.3 | 11.5 | 1.9 | -22.7 | -13 | -9.7 |
| 1672.8 | 34.10 | 160 | 1.2 | h | 1672.8 | -36.3 | 11.5 | 1.9 | -26.7 | -13 | -13.7 |
| 2509.2 | 37.90 | 180 | 1.8 | v | 2509.2 | -32.1 | 11.3 | 2.5 | -23.3 | -13 | -10.3 |
| 2509.2 | 32.30 | 200 | 1.8 | h | 2509.2 | -36.7 | 11.3 | 2.5 | -27.9 | -13 | -14.9 |
| 3345.6 | 31.30 | 120 | 2.0 | v | 3345.6 | -38.5 | 11.2 | 2.7 | -30 | -13 | -17.0 |
| 3345.6 | 28.80 | 120 | 2.0 | h | 3345.6 | -42.2 | 11.2 | 2.7 | -33.7 | -13 | -20.7 |

Note: Measured Without Preamplifier

# §22.917 – BAND EDGE

## Applicable Standards

According to § 22.917, 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.

## Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. Adjust the carrier frequency as close to the frequency block edges both upper and lower. Sufficient scans were taken to show any out of band-edge emission.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2006-03-06 |

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

## Environmental Conditions

| | |
|---|---|
| Temperature: | 27° C |
| Relative Humidity: | 37% |
| ATM Pressure: | 1020 mbar |

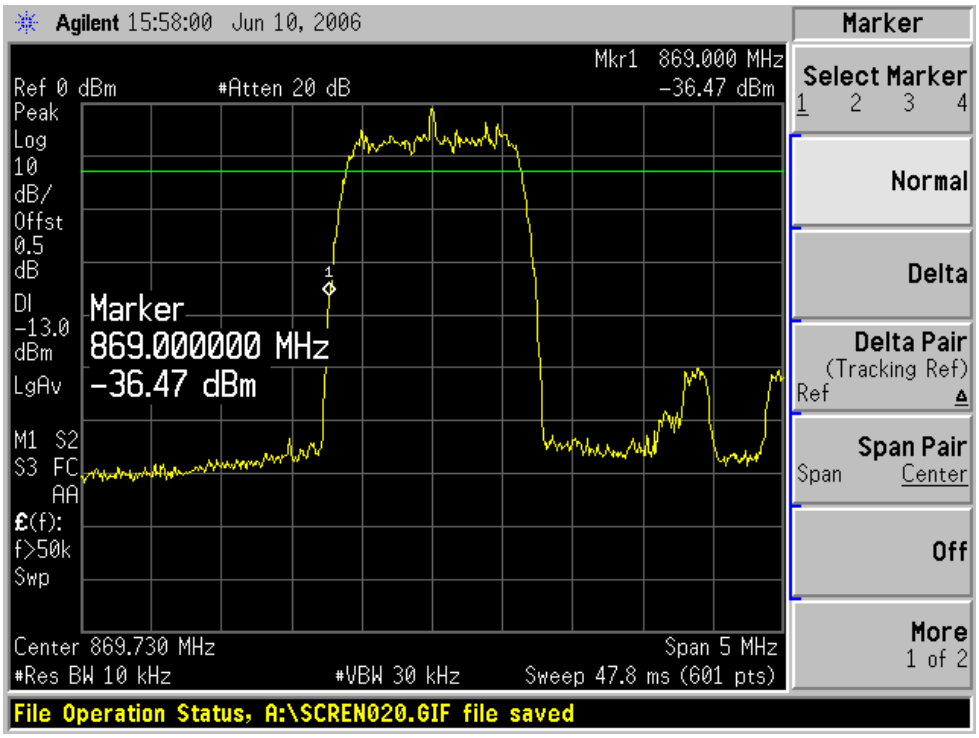
** The testing was performed by James Ma on 2006-07-19.*

## Test Results

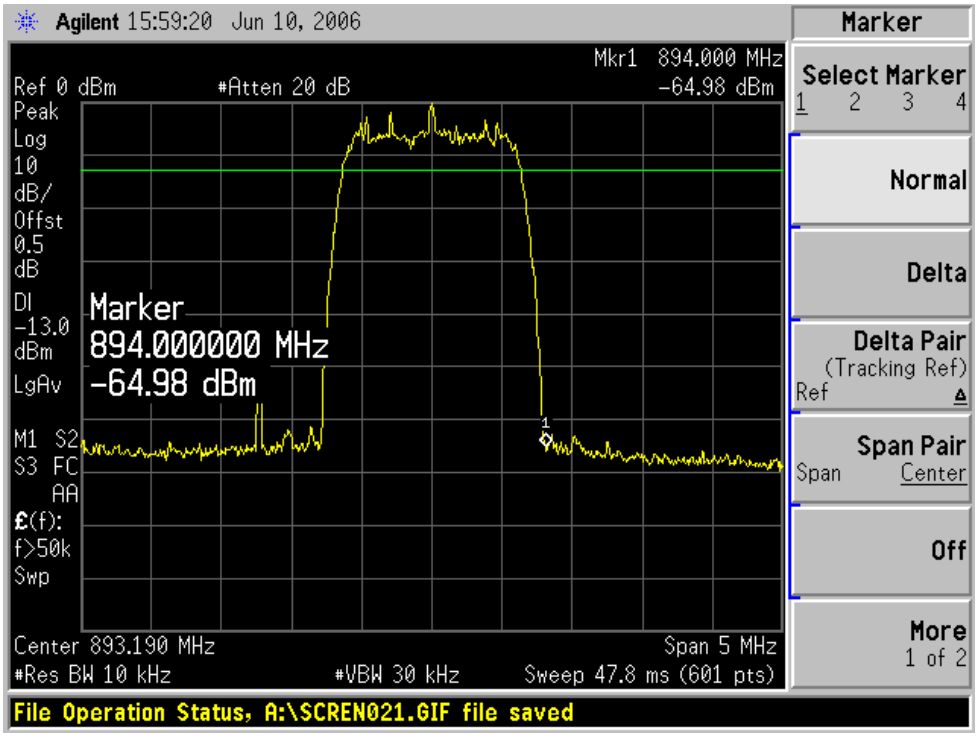
Please refer to plots hereinafter.

**Forward (Downlink)**

Lowest Channel:

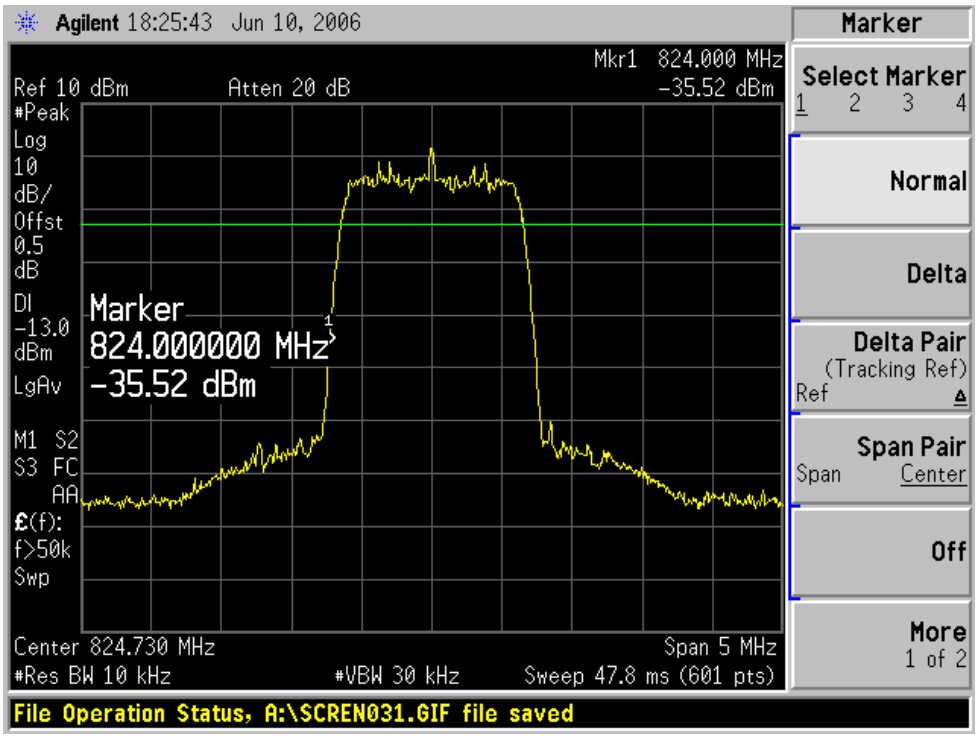



Highest Channel:

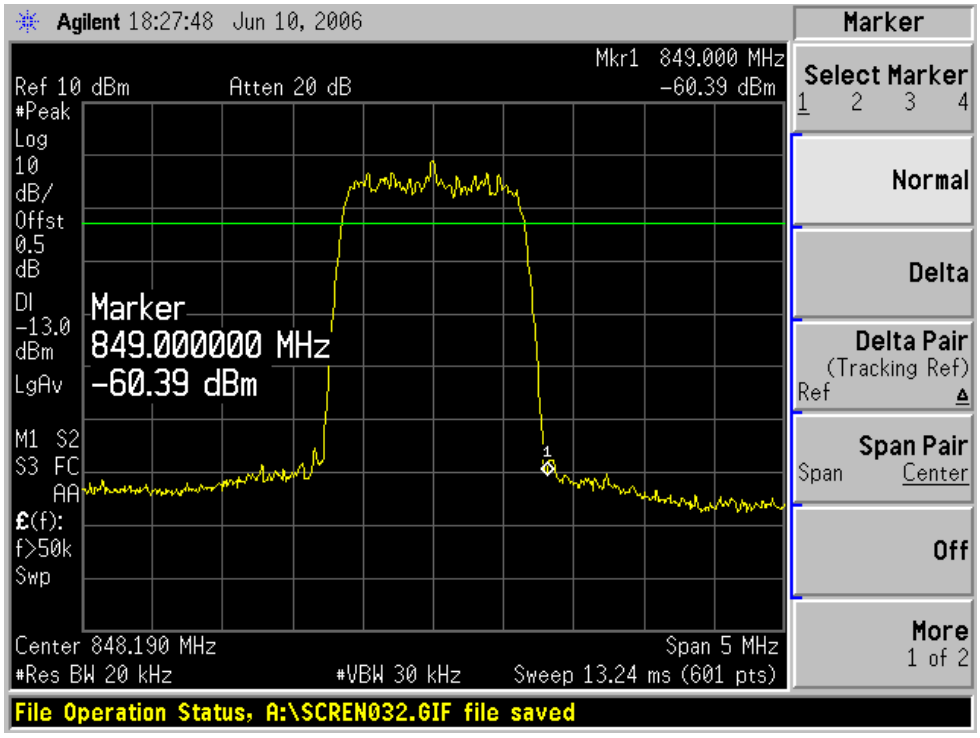


**Reverse (Uplink)**

Lowest Channel:




Highest Channel:



# §2.1055(a), §2.1055(d) & §22.355 - FREQUENCY STABILITY

## Applicable Standard

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1_Frequency Tolerance for Transmitters in the Public Mobile Services

| Frequency range (MHz) | Base, fixed (ppm) | Mobile [le]3 watts (ppm) | | Mobile [le]3 watts (ppm) |
|---|---|---|---|---|
| 25 to 50..... | 20.0 | 20.0 | | 50.0 |
| 50 to 450..... | 5.0 | 5.0 | | 50.0 |
| 450 to 512..... | 2.5 | 5.0 | | 5.0 |
| 821 to 896..... | 1.5 | 2.5 | 2.5 | |
| 928 to 929..... | 5.0 | n/a | | n/a |
| 929 to 960..... | 1.5 | n/a | n/a | |
| 2110 to 2220..... | 10.0 | n/a | n/a | |

## Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a f Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Communications | E5515C | GB44051221 | 2005-08-08 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2005-11-10 |

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

## Environmental Conditions

| | |
|---|---|
| Temperature: | 27° C |
| Relative Humidity: | 37% |
| ATM Pressure: | 1020 mbar |

** The testing was performed by James Ma on 2006-07-21.*

**Reference Frequency: Mid Channel**

**Forward ( Down Link )**

| Reference Frequency: Mid Channel = 881.40 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Condition | | Ref Freq | Measured Freq | Freq Error | Freq Error | Limit |
| Voltage (V dc) | Temperature (C ) | MHz | MHz | Hz | PPM | PPM |
| 7.5 | 50 | 881.400000 | 881.399708 | 292 | 0.3312911 | 1.5 |
| 7.5 | 40 | 881.400000 | 881.399613 | 387 | 0.4390742 | 1.5 |
| 7.5 | 30 | 881.400000 | 881.399506 | 494 | 0.5604720 | 1.5 |
| 7.5 | 20 | 881.400000 | 881.399614 | 386 | 0.4379396 | 1.5 |
| 7.5 | 10 | 881.400000 | 881.399798 | 202 | 0.2291808 | 1.5 |
| 7.5 | 0 | 881.400000 | 881.399830 | 170 | 0.1928750 | 1.5 |
| 7.5 | -10 | 881.400000 | 881.399856 | 144 | 0.1633764 | 1.5 |
| 7.5 | -20 | 881.400000 | 881.399861 | 139 | 0.1577037 | 1.5 |
| 7.5 | -30 | 881.400000 | 881.399872 | 128 | 0.1452235 | 1.5 |

**Reverse ( Up Link )**

| Reference Frequency: Mid Channel = 836.40 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Condition | | Ref Freq | Measured Freq | Freq Error | Freq Error | Limit |
| Voltage (V dc) | Temperature (C ) | MHz | MHz | Hz | PPM | PPM |
| 7.5 | 50 | 836.400000 | 836.399920 | 80 | 0.0956480 | 1.5 |
| 7.5 | 40 | 836.400000 | 836.399918 | 82 | 0.0980392 | 1.5 |
| 7.5 | 30 | 836.400000 | 836.399913 | 87 | 0.1040172 | 1.5 |
| 7.5 | 20 | 836.400000 | 836.399911 | 89 | 0.1064084 | 1.5 |
| 7.5 | 10 | 836.400000 | 836.399904 | 96 | 0.1147776 | 1.5 |
| 7.5 | 0 | 836.400000 | 836.399873 | 127 | 0.1518412 | 1.5 |
| 7.5 | -10 | 836.400000 | 836.399875 | 125 | 0.1494500 | 1.5 |
| 7.5 | -20 | 836.400000 | 836.399878 | 122 | 0.1458632 | 1.5 |
| 7.5 | -30 | 836.400000 | 836.399880 | 120 | 0.1434720 | 1.5 |

# IS-138a (3.4.4) TWO-TONE TEST

## Applicable Standards

According to IS-138A (3.4.4), Intermodulation products must be attenuated below the rated power of the EUT by at least 43 +10log (P), equivalent to –13 dBm.

## Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 KHz. Sufficient scans were taken to show any out of band emissions up to 10$^{th}$ harmonic. Two input signals are equal in level (and can be raised equally), were send to the EUT.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 2006-03-06 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | DE23746 | 2006-07-03 |

** The testing was performed by James Ma on 2006-07-20.*

## Test Results

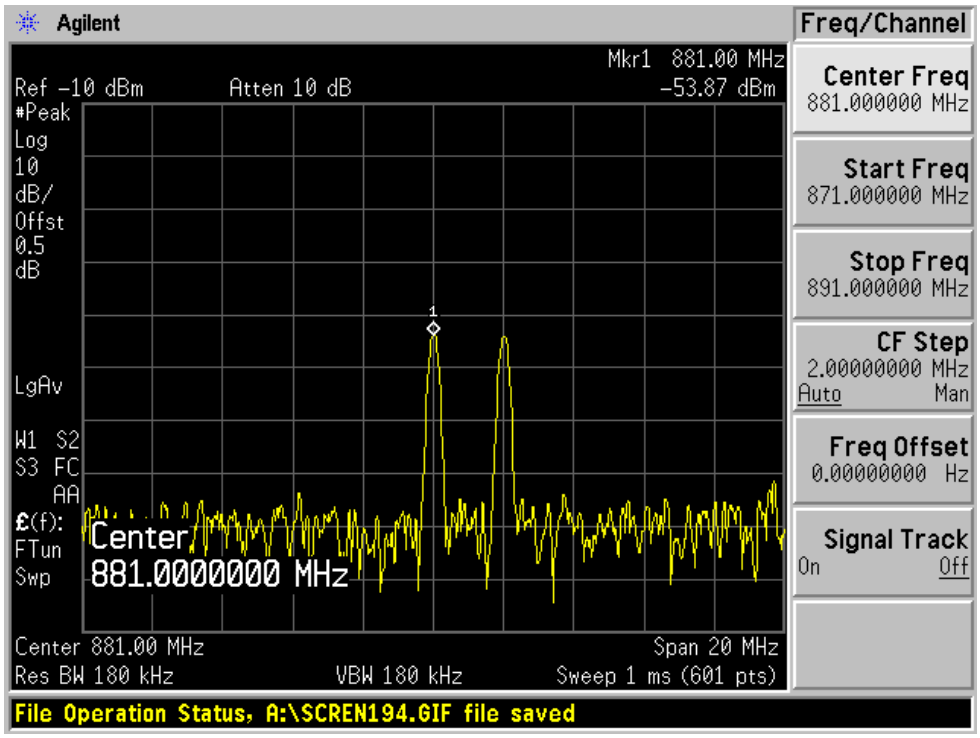
| Mode | Channel | Measured |
|---|---|---|
| Up-link | Mid | < -13dBm |
| Down-link | Mid | < -13dBm |

## Plots of Two-Tone Test Result

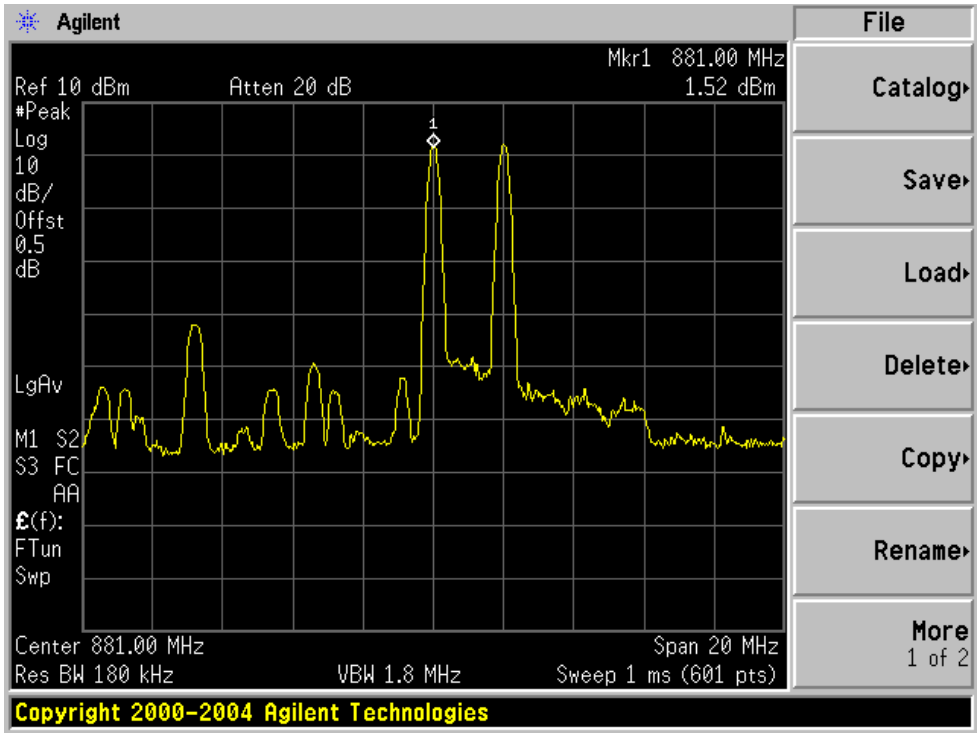
Please refer to plots hereinafter.

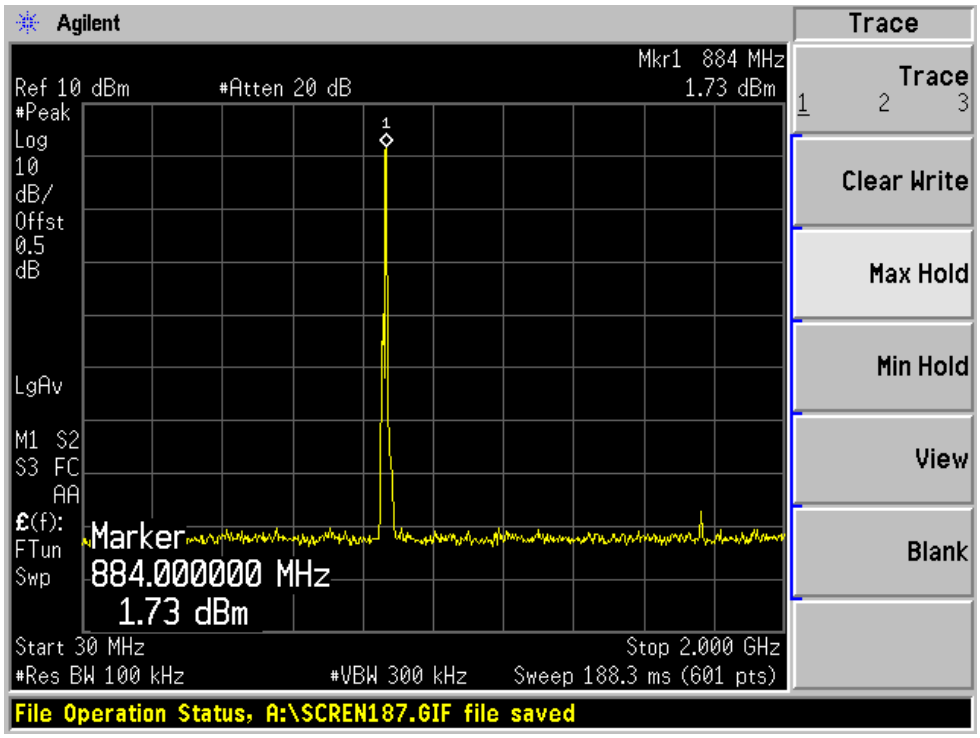
**Forward (Downlink)**

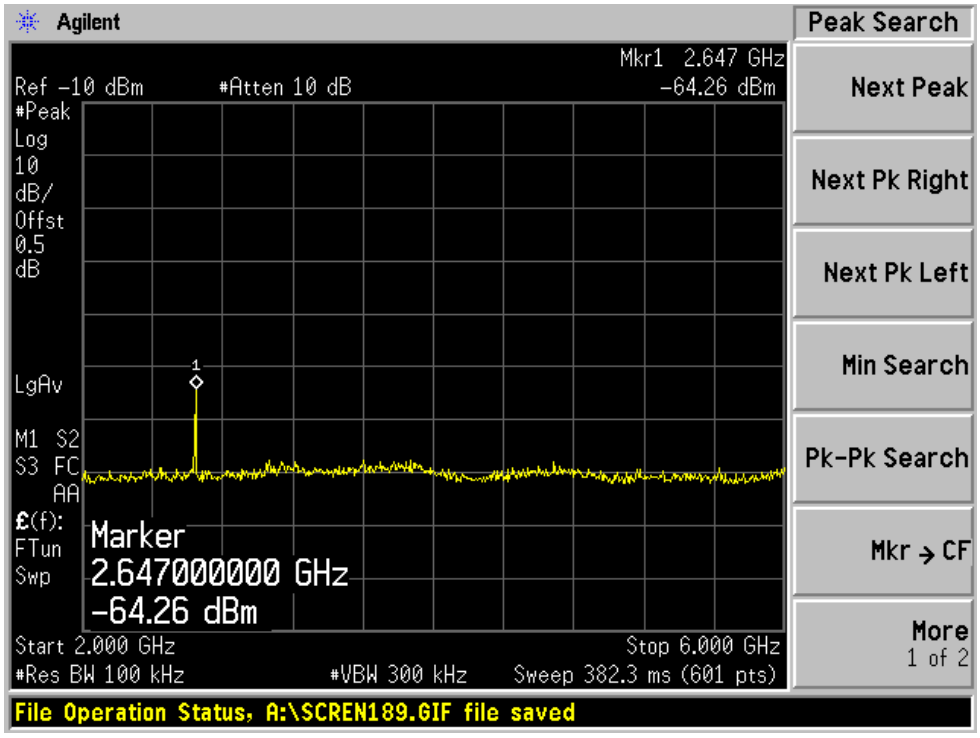
Input:

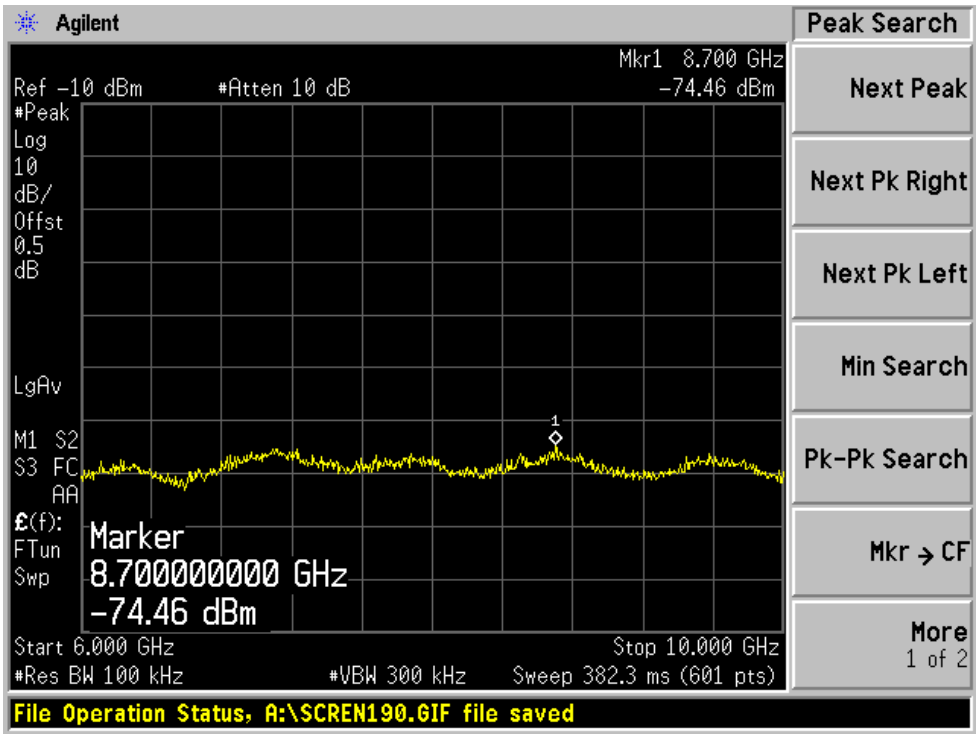



Output:



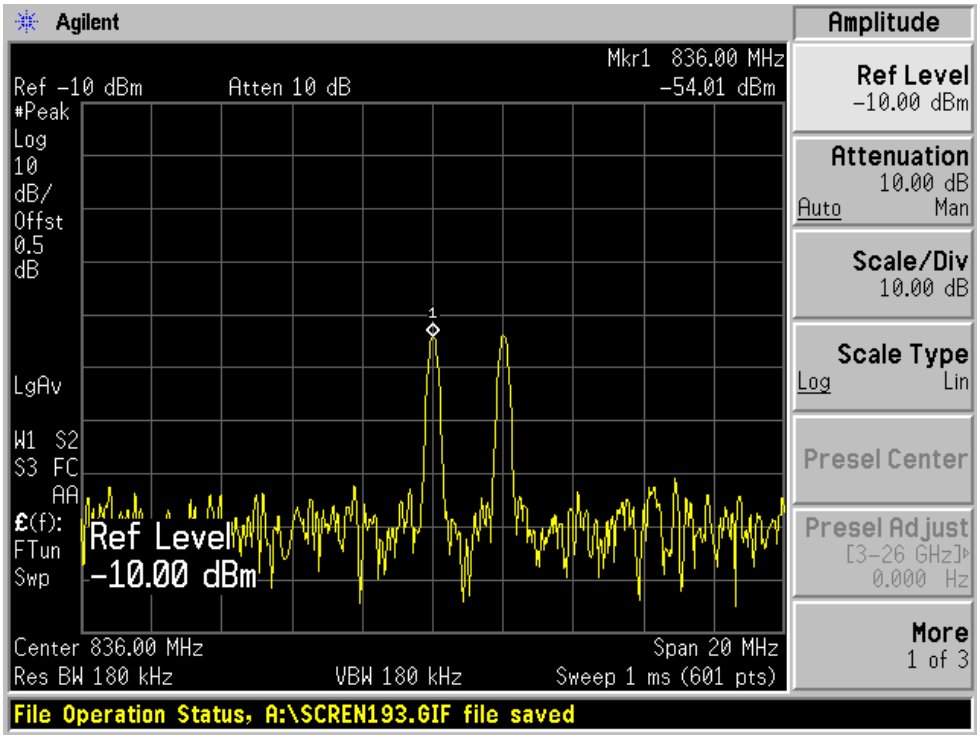

Agilent
Trace
Mkr1 884 MHz
1.73 dBm
Ref 10 dBm
#Atten 20 dB
#Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Marker
884.000000 MHz
1.73 dBm
Start 30 MHz
Stop 2.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 188.3 ms (601 pts)
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
File Operation Status, A:\SCREN187.GIF file saved


Agilent
Peak Search
Mkr1 2.647 GHz
-64.26 dBm
Ref -10 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Marker
2.647000000 GHz
-64.26 dBm
Start 2.000 GHz
Stop 6.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 382.3 ms (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\SCREN189.GIF file saved

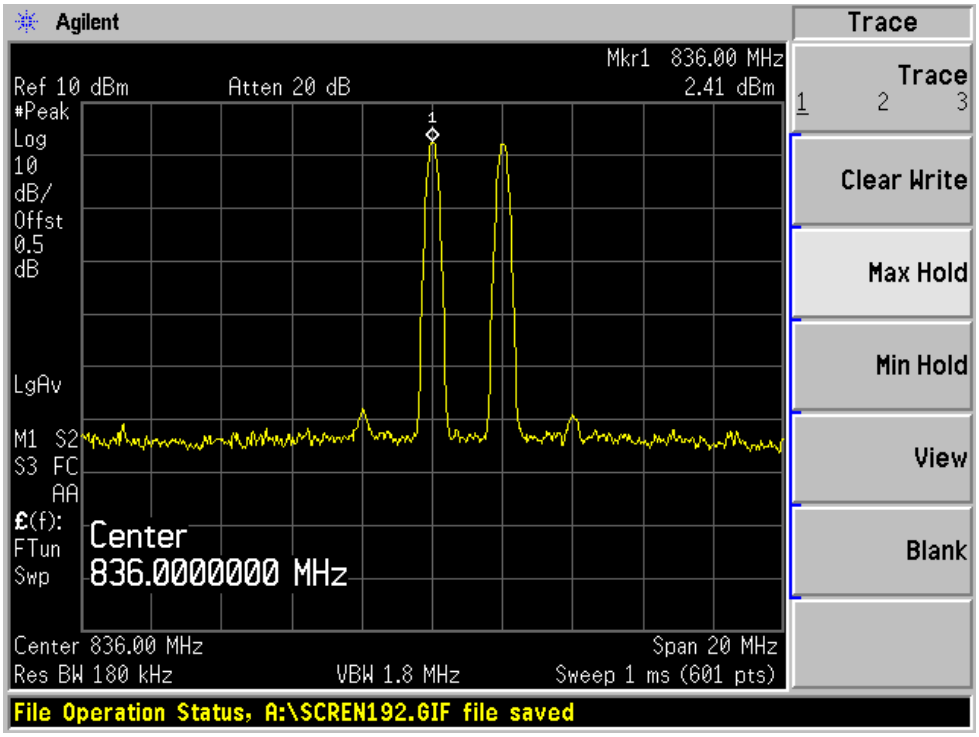


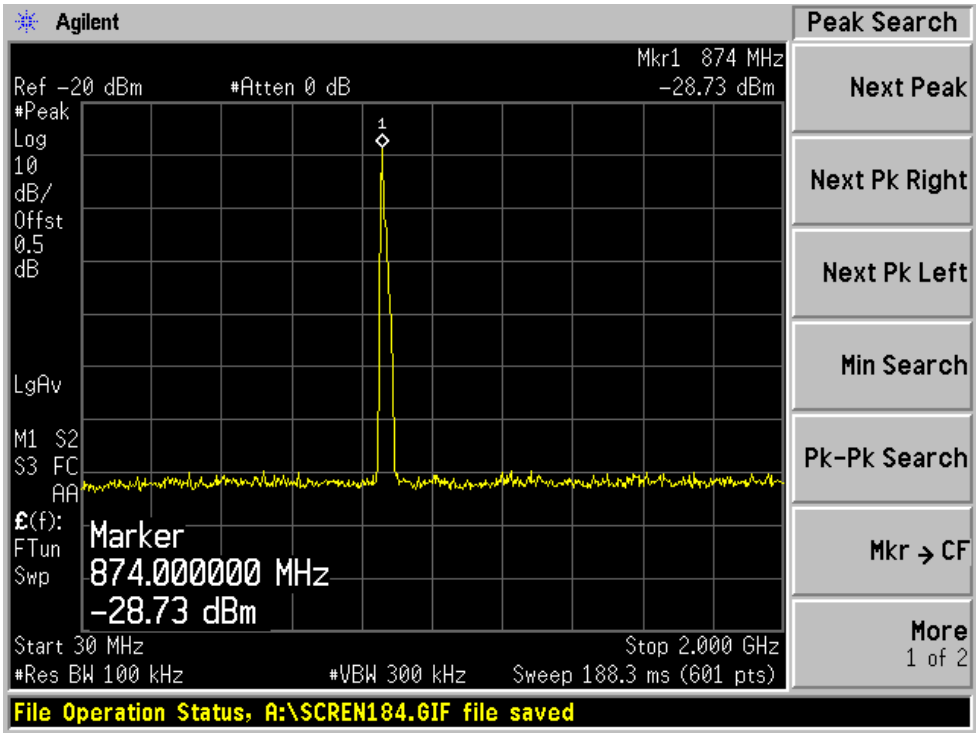

**Reverse (Uplink)**

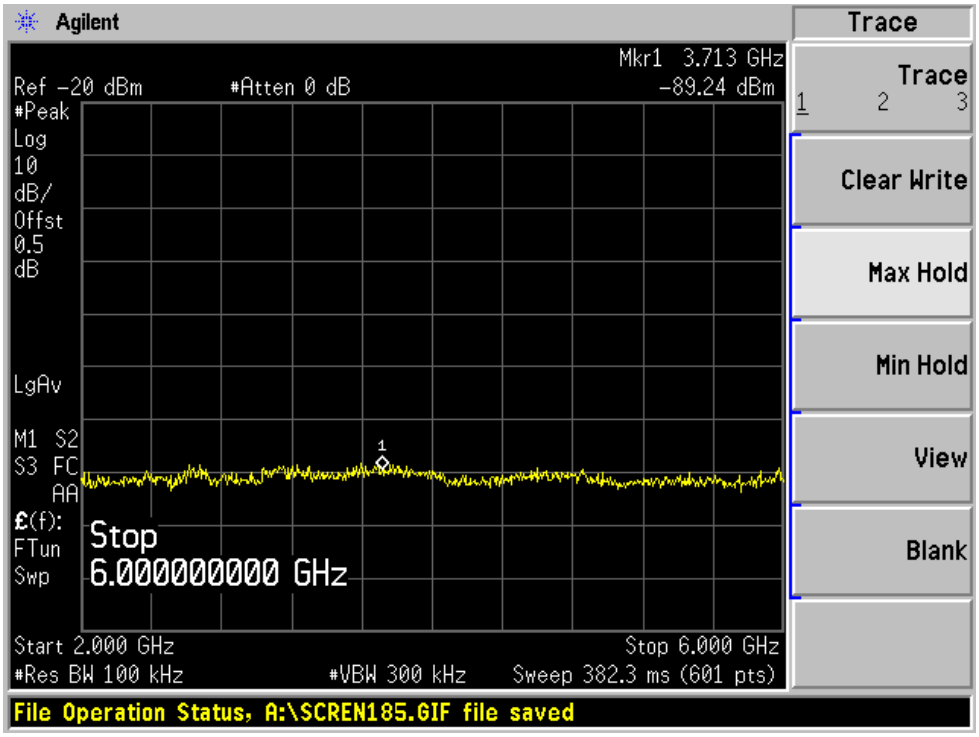
Input:

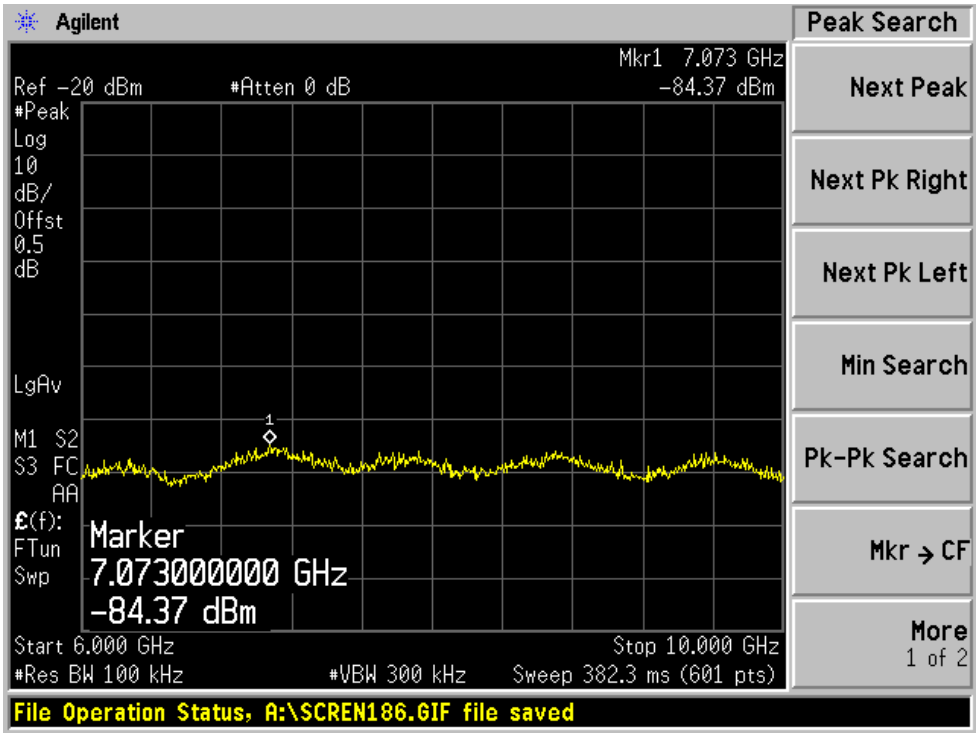


Output:


Agilent
Trace
Mkr1 836.00 MHz
Ref 10 dBm
Atten 20 dB
2.41 dBm
#Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center
836.0000000 MHz
Center 836.00 MHz
Span 20 MHz
Res BW 180 kHz
VBW 1.8 MHz
Sweep 1 ms (601 pts)
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
File Operation Status, A:\SCREN192.GIF file saved


Agilent
Peak Search
Mkr1 874 MHz
Ref -20 dBm
#Atten 0 dB
-28.73 dBm
#Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Marker
874.000000 MHz
-28.73 dBm
Start 30 MHz
Stop 2.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 188.3 ms (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\SCREN184.GIF file saved


Agilent
Trace
Mkr1 3.713 GHz
Ref -20 dBm
#Atten 0 dB
-89.24 dBm
#Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Stop
6.000000000 GHz
Start 2.000 GHz
Stop 6.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 382.3 ms (601 pts)
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
File Operation Status, A:\SCREN185.GIF file saved


Agilent
Peak Search
Mkr1 7.073 GHz
Ref -20 dBm
#Atten 0 dB
-84.37 dBm
#Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Marker
7.073000000 GHz
-84.37 dBm
Start 6.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 382.3 ms (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\SCREN186.GIF file saved