



FCC PART 24 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

OPISYS Incorporated

9201 Irvine Blvd.
Irvine, CA 92618

FCC ID: Q4EUSHR-1900H

| | |
|---|--|
| This Report Concerns: <input checked="" type="checkbox"/> Original Report | Equipment Type: 1900MHz GSM CDMA Bi-direction Amplifier |
| Test Engineer: Daniel Deng /  | |
| Report No.: R0506222 | |
| Report Date: 2005-07-18 | |
| Reviewed By: Richard Lee /  | |
| Prepared By: Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164 | |

Note: This test report is specially limited to the above client company and this particular sample only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

TABLE OF CONTENTS

| | |
|--|-----------|
| GENERAL INFORMATION..... | 3 |
| PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) | 3 |
| OBJECTIVE | 3 |
| RELATED SUBMITTAL(S)/GRANT(S)..... | 3 |
| TEST METHODOLOGY | 3 |
| TEST FACILITY | 3 |
| SYSTEM TEST CONFIGURATION..... | 5 |
| JUSTIFICATION | 5 |
| BLOCK DIAGRAM..... | 5 |
| EQUIPMENT MODIFICATIONS | 5 |
| SUPPORT EQUIPMENT LIST AND DETAILS | 5 |
| INTERFACE PORTS AND CABLING..... | 5 |
| TEST SETUP BLOCK DIAGRAM..... | 6 |
| SUMMARY OF TEST RESULTS..... | 7 |
| §2.1046 & §24.232 - RF POWER OUTPUT..... | 8 |
| APPLICABLE STANDARD | 8 |
| TEST PROCEDURE | 8 |
| TEST EQUIPMENT LIST AND DETAILS..... | 8 |
| ENVIRONMENTAL CONDITIONS | 8 |
| TEST RESULTS | 9 |
| §2.1049 & §24.238 - EMISSION BANDWIDTH | 16 |
| APPLICABLE STANDARDS | 16 |
| TEST PROCEDURE | 16 |
| TEST EQUIPMENT LIST AND DETAILS..... | 16 |
| ENVIRONMENTAL CONDITIONS | 16 |
| TEST RESULTS | 16 |
| §2.1051 & §24.238(A) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS..... | 29 |
| APPLICABLE STANDARDS | 29 |
| TEST PROCEDURE | 29 |
| TEST EQUIPMENT LIST AND DETAILS..... | 29 |
| ENVIRONMENTAL CONDITIONS | 29 |
| TEST RESULTS | 29 |
| IS-138A (3.4.4) TWO-TONE TEST | 36 |
| APPLICABLE STANDARDS | 36 |
| TEST PROCEDURE | 36 |
| TEST EQUIPMENT LIST AND DETAILS..... | 36 |
| ENVIRONMENTAL CONDITIONS | 36 |
| TEST RESULTS | 36 |
| §2.1053 - SPURIOUS RADIATED EMISSION..... | 45 |
| APPLICABLE STANDARDS | 45 |
| TEST PROCEDURE | 45 |
| TEST EQUIPMENT LIST AND DETAILS..... | 45 |
| ENVIRONMENTAL CONDITIONS | 46 |
| TEST RESULT | 46 |
| §24.238 – BAND EDGE..... | 47 |
| APPLICABLE STANDARDS | 47 |
| TEST PROCEDURE | 47 |
| TEST EQUIPMENT LIST AND DETAILS..... | 47 |
| ENVIRONMENTAL CONDITIONS | 47 |
| TEST RESULTS | 47 |

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *OPISYS Incorporated* 's product, FCC ID: *Q4EUSHR-1900H* or the "EUT" as referred to in this report is a 1900MHz GSM CDMA Bi-direction Amplifier, which measures approximately 4.7' L x 5.3' W x 2.3' H.

** The test data gathered are from typical production sample, serial number: 05-03-010 provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *OPISYS Incorporated* in accordance with Part 2, Subpart J, and Part 24 Subpart E 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 24 Subpart E - PCS

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, ANSI 63.4-2003, and TIA/EIA-603A.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters, except as noted below.

Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL 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 and Article 8 of the VCCI regulations. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234.

The test site has been approved by the FCC 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 is attached hereinafter and can also 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 603A.

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

Block Diagram

Please refer to Exhibit D.

Equipment Modifications

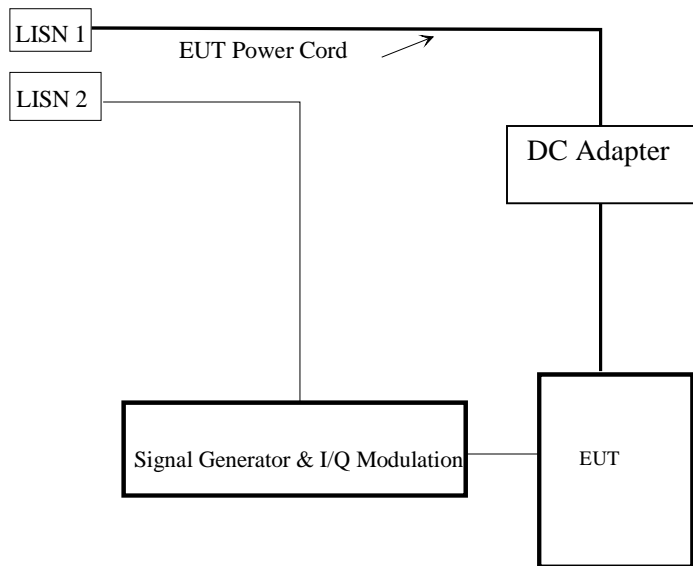
No modifications were made to the EUT.

Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number | FCC ID |
|-----------------|--------------------------|---------|---------------|--------|
| Rohde & Schwarz | Signal Generator | SMIQ 03 | DE23746 | N/A |
| Rohde & Schwarz | I/O Modulation Generator | AMIQ | DE30565 | N/A |

Interface Ports and Cabling

| Cable Description | Length (M) | From | To |
|-------------------|------------|-----------------------------|------------------|
| RF Cable | 1.5 | EUT Uplink or Downlink port | Signal generator |
| Power cable | 6 | EUT Power port | DC Power Adapter |
| RF Cable | 1.5 x 2 | SMIQ 03 | AMIQ |

Test Setup Block Diagram

SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: 05-03-010.

| FCC RULE | DESCRIPTION OF TEST | Result |
|----------------------------|---|-----------|
| §2.1046 § 24.232 | RF power output | Compliant |
| § 2.1049 § 24.238(b) | Emission Bandwidth | Compliant |
| 2.1051 § 24.238(a) | Spurious emissions at antenna terminals | Compliant |
| IS-138A (3.4.4) | Two-Tone Test | Compliant |
| 2.1053 | Spurious Radiated Emissions | Compliant |
| §24.238 | Band Edge | Compliant |
| §1.1307(b)(1) & §2.1091 | RF Exposure | Compliant |

§2.1046 & §24.232 - RF POWER OUTPUT

Applicable Standard

According to FCC §2.1046 and §24.232 (b), mobile stations are limited to 2 watts eirp peak power.

Test Procedure

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.

Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|-----------------|---------------------------|--------------------------------|---------------|------------|
| Rohde & Schwarz | Generator, Signal | SMIQ03 | 849192/0085 | 5/2/2005 |
| Rohde & Schwarz | I/O Modulation | AMIQ-K11 | 831038/0023 | 5/3/2005 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2004 |
| ETS | Antenna, Log-Periodic | 3148 | 4-1155 | 12/14/2004 |
| ETS | Antenna, Biconical | 3110B | 9603-2315 | 12/14/2004 |
| HP | Amplifier, Pre | 8447D | 2944A10198 | 8/20/2004 |
| HP | Amplifier, Pre, Microwave | 8449B | 3147A00400 | 6/14/2004 |
| A. H. Systems | Antenna, Horn, DRG | SAS-200/571 | 261 | 4/20/2005 |
| HP | Generator, Signal | 83650B | 3614A00276 | 5/10/2005 |
| A.R.A. | Antenna, Horn | DRG-118/A | 1132 | 9/30/2003 |
| Wainwright | Filter, Band Reject | WRCG823/850-813/860-40/8SS | 2 | 8/11/2004 |
| Wainwright | Filter, Band Reject | WRCG1850/1910-1835/1925-40/8SS | 5 | 8/11/2004 |

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

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 23° C |
| Relative Humidity: | 40% |
| ATM Pressure: | 1018 mbar |

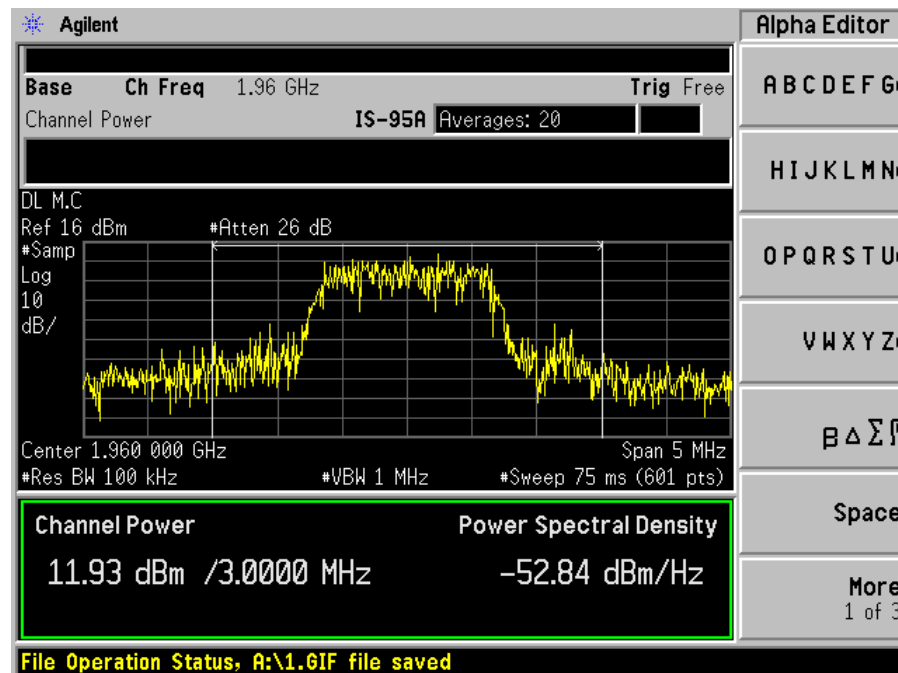
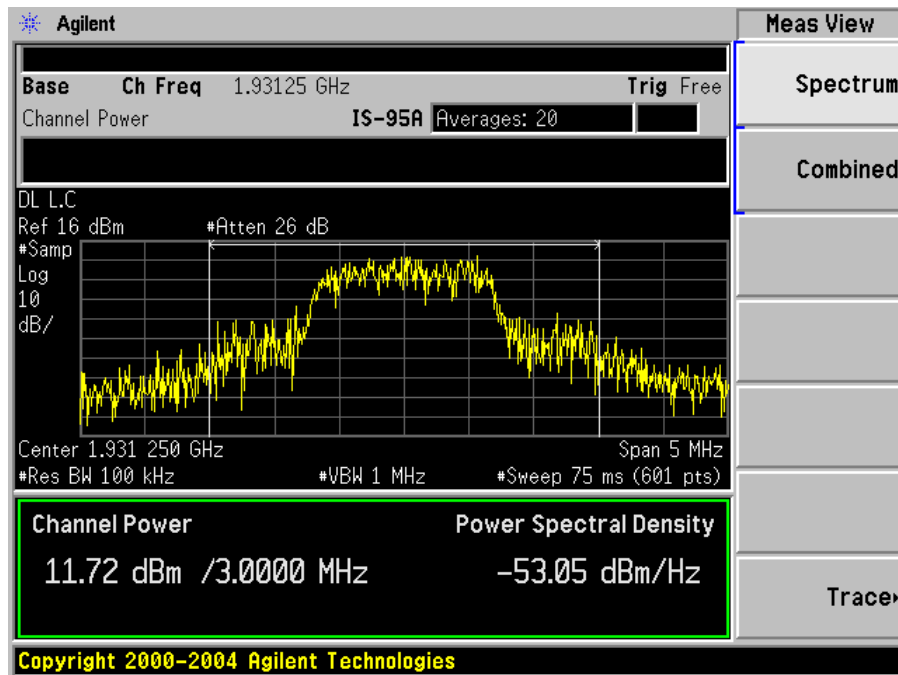
* The testing was performed by Daniel Deng on 2005-06-28.

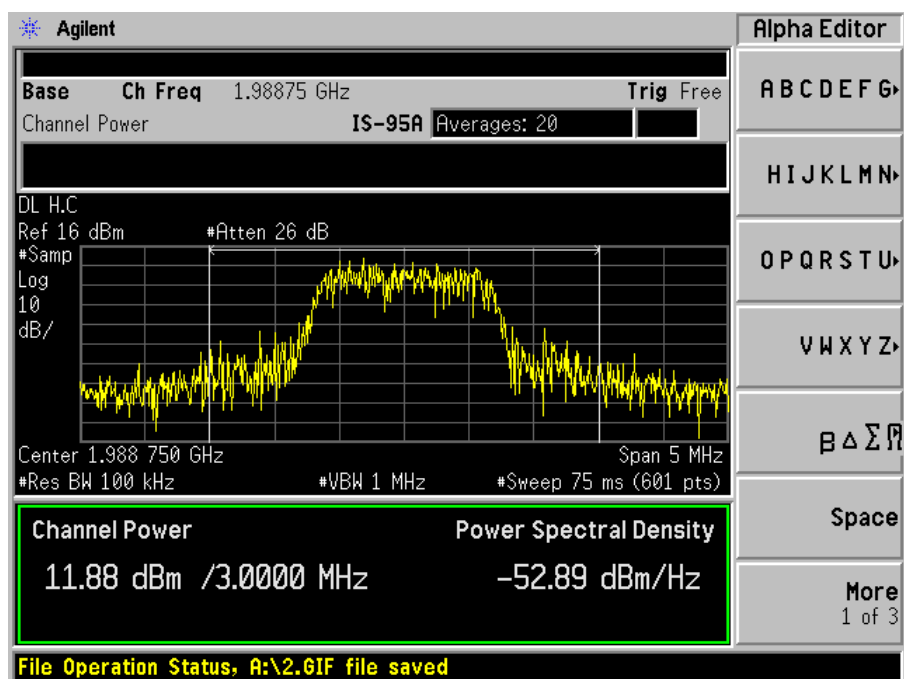
Test Results

(conducted output power)

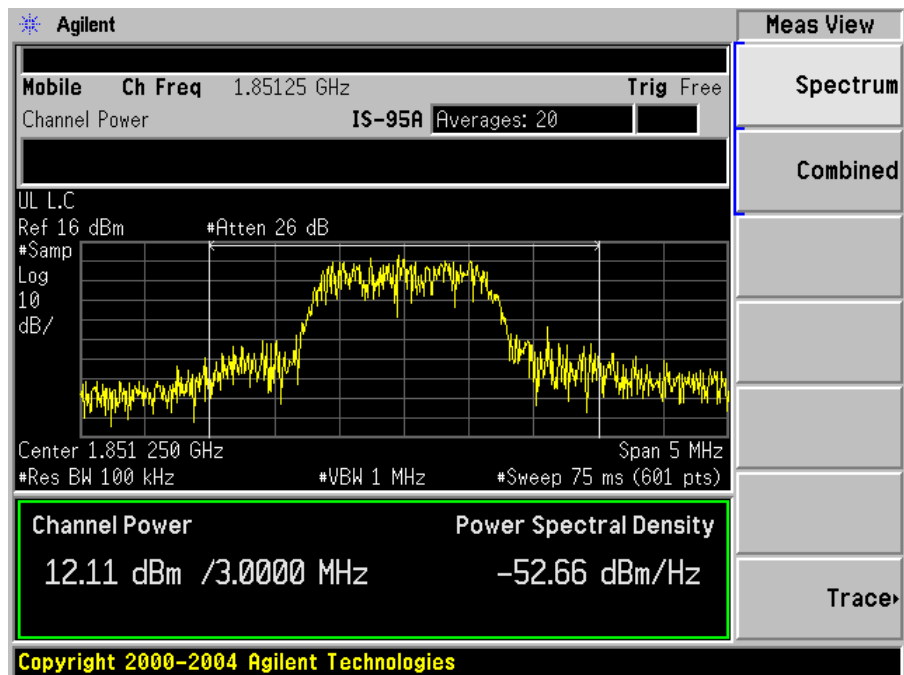
| MODE | | Channel | Frequency (MHz) | Output Power in dBm | Output Power in W | Limit in W |
|------|----------|---------|-----------------|---------------------|-------------------|------------|
| CDMA | Downlink | Low | 1931.25 | 11.72 | 0.015 | 2 |
| | | Middle | 1960.00 | 11.93 | 0.016 | 2 |
| | | High | 1988.75 | 11.88 | 0.015 | 2 |
| | Uplink | Low | 1850.25 | 12.11 | 0.016 | 2 |
| | | Middle | 1880.00 | 12.05 | 0.016 | 2 |
| | | High | 1908.75 | 11.99 | 0.016 | 2 |
| GSM | Downlink | Low | 1930.20 | 11.78 | 0.015 | 2 |
| | | Middle | 1960.00 | 11.81 | 0.015 | 2 |
| | | High | 1989.80 | 11.77 | 0.015 | 2 |
| | Uplink | Low | 1850.20 | 11.98 | 0.016 | 2 |
| | | Middle | 1880.00 | 12.21 | 0.017 | 2 |
| | | High | 1909.80 | 11.94 | 0.016 | 2 |

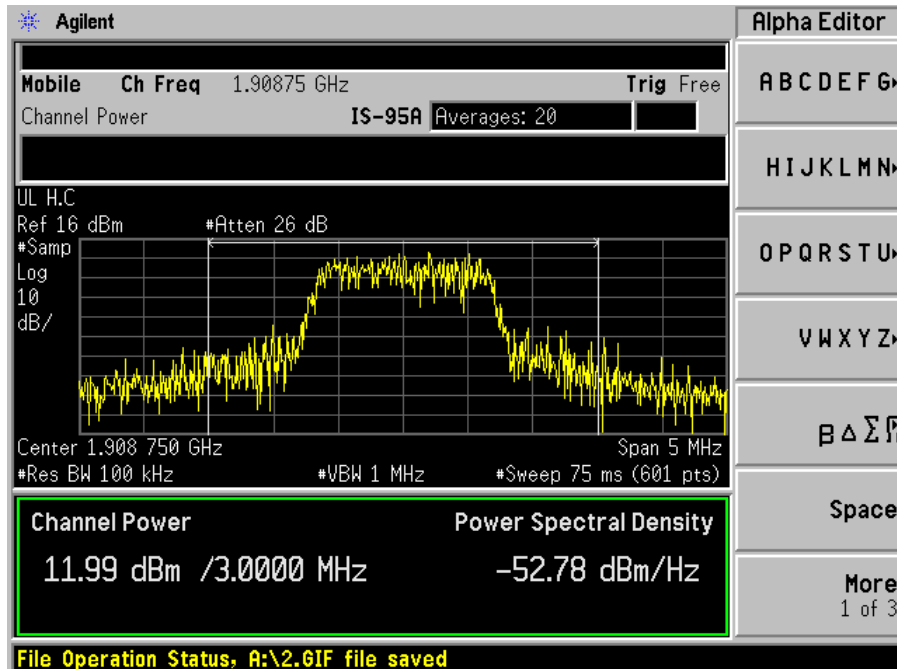
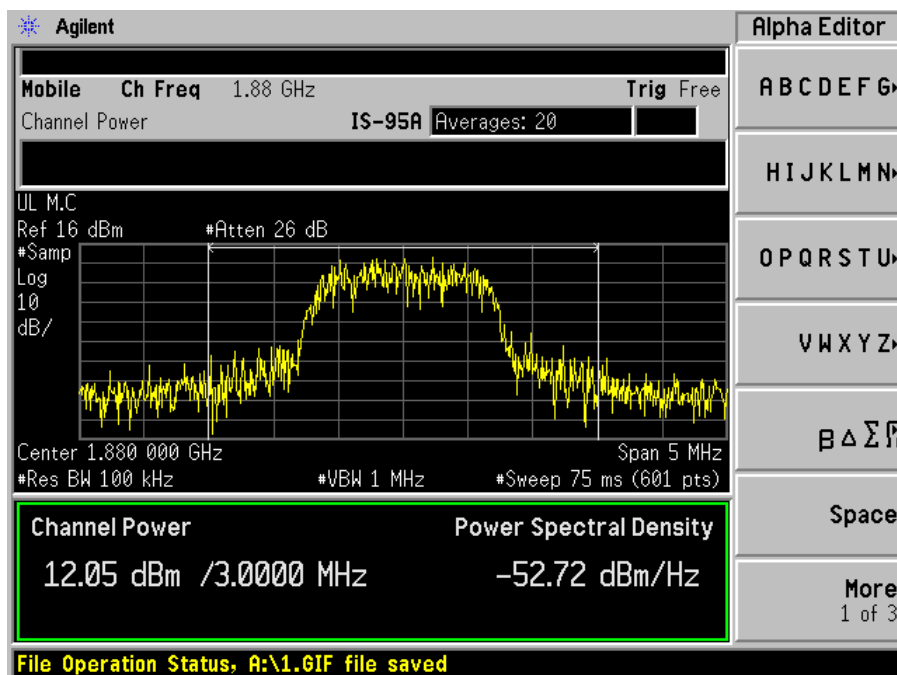
CDMA Downlink:



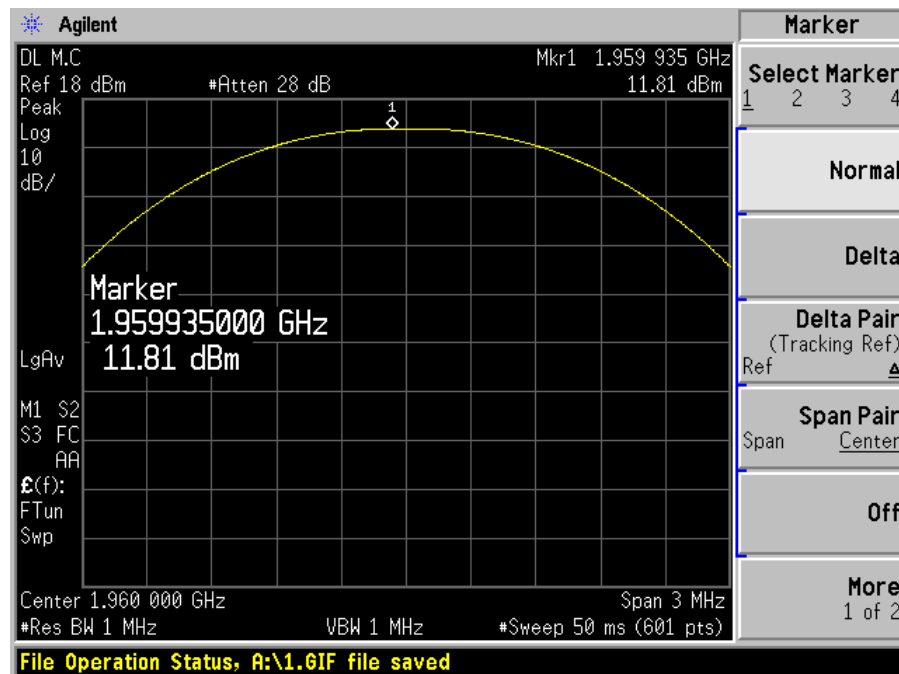
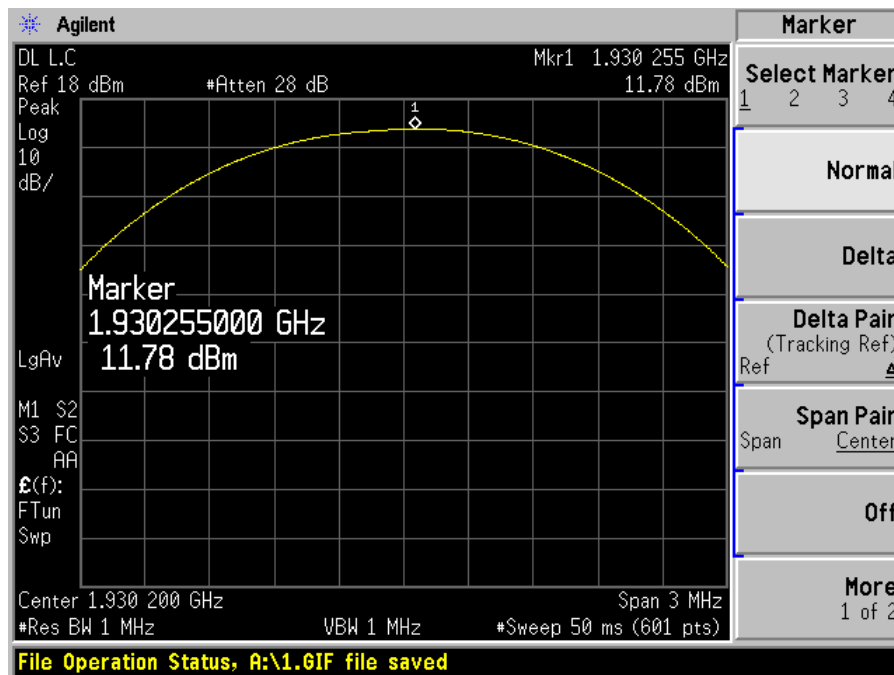


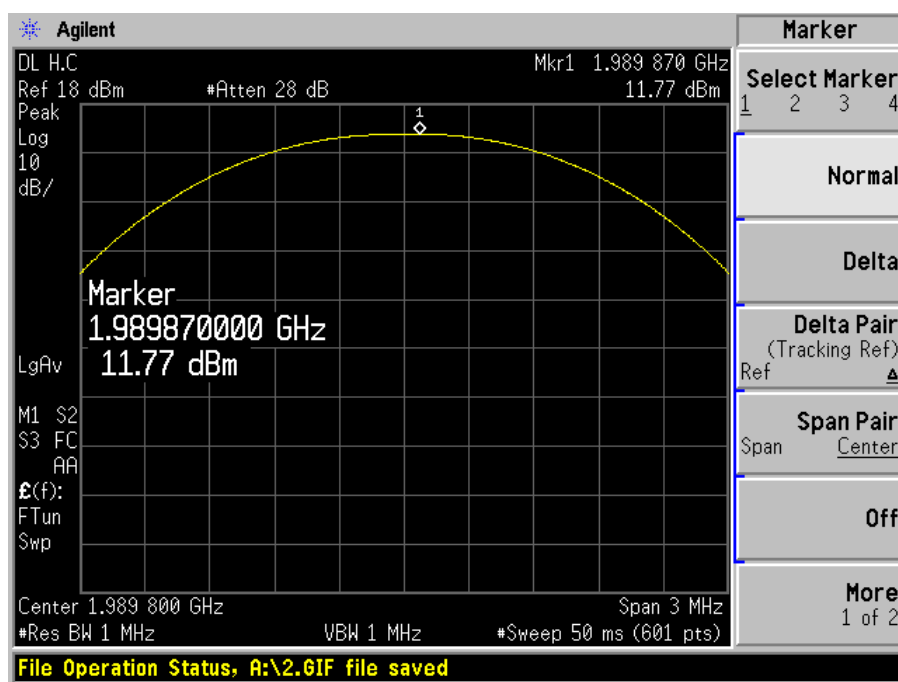
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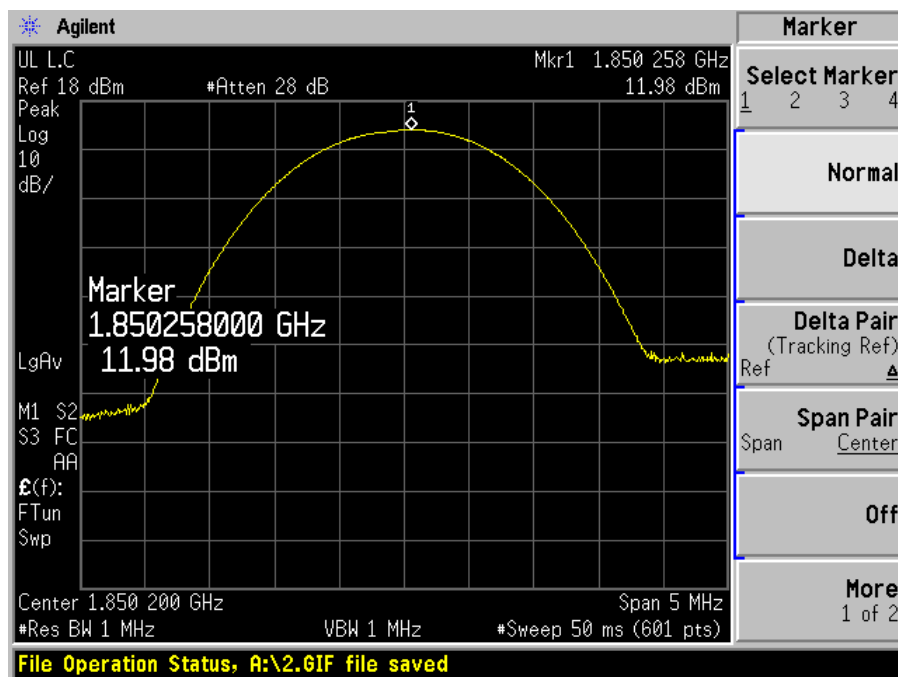


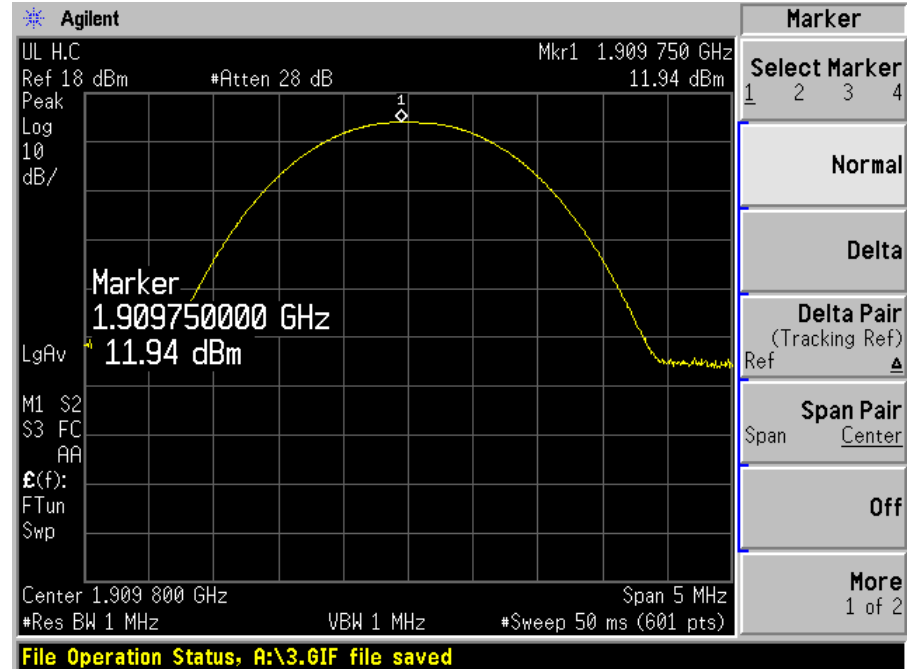
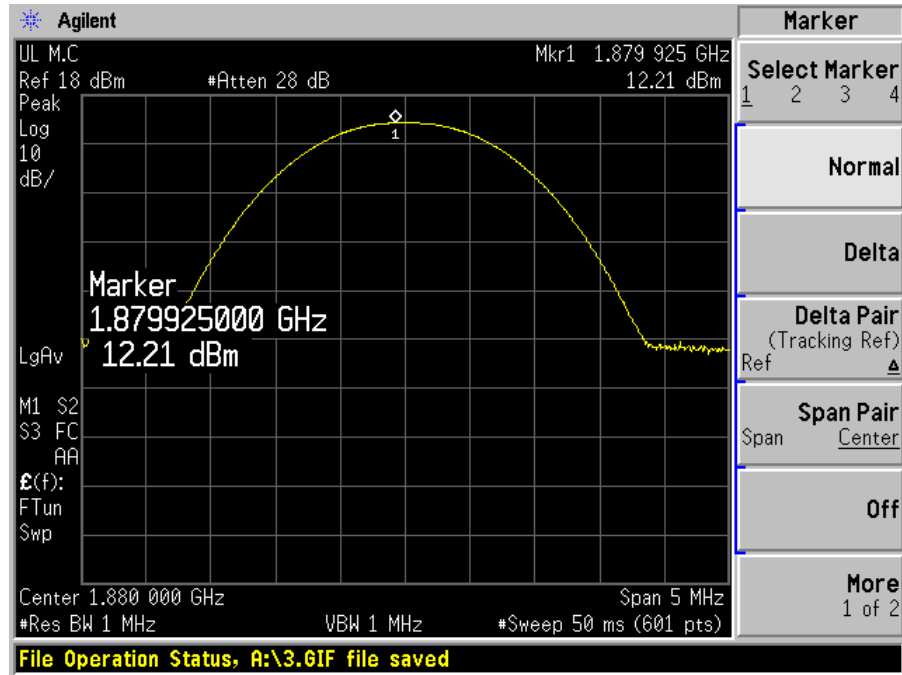
GSM Downlink:





GSM Uplink:





§2.1049 & §24.238 - EMISSION BANDWIDTH

Applicable Standards

According to FCC §2.1049 and §24.238 (b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

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 |
|-----------------|--------------------|----------|---------------|------------|
| Rohde & Schwarz | Generator, Signal | SMIQ03 | 849192/0085 | 5/2/2005 |
| Rohde & Schwarz | I/O Modulation | AMIQ-K11 | 831038/0023 | 5/3/2005 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2004 |

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

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 24° C |
| Relative Humidity: | 42% |
| ATM Pressure: | 1021 mbar |

* The testing was performed by Daniel Deng on 2005-06-29.

Test Results

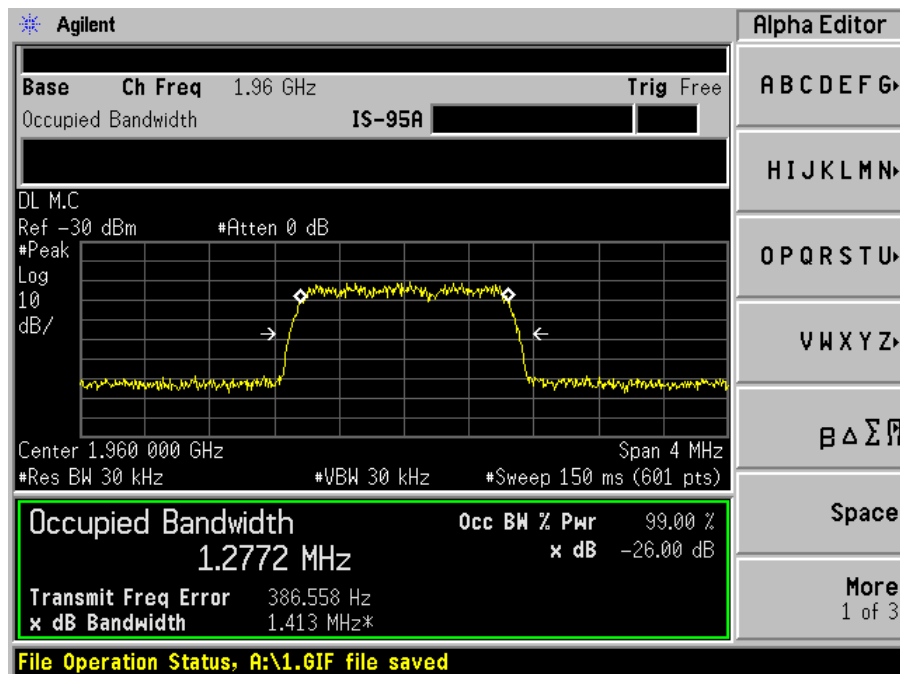
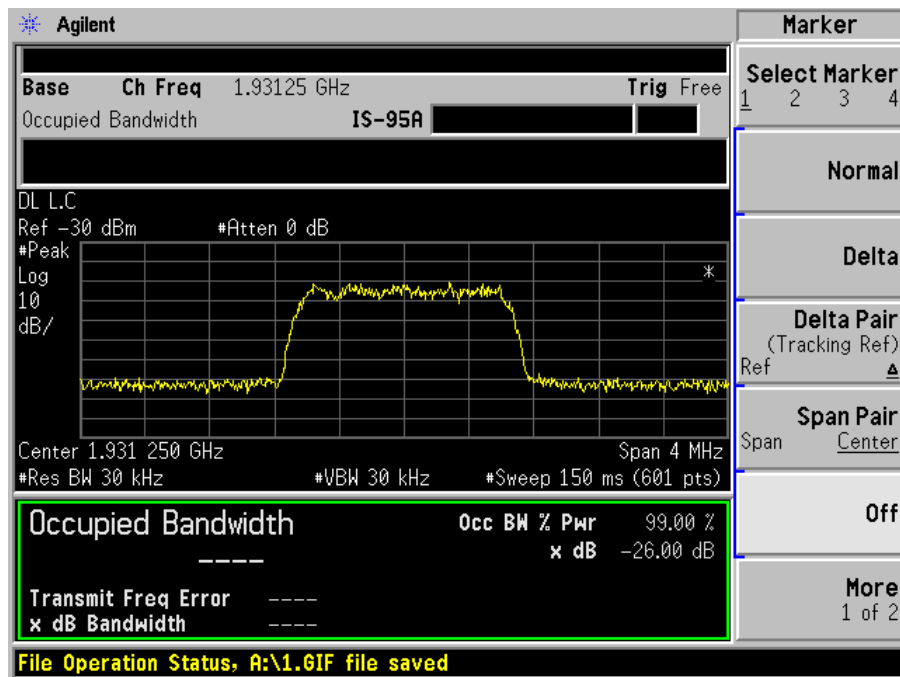
Input signal level = -50dBm

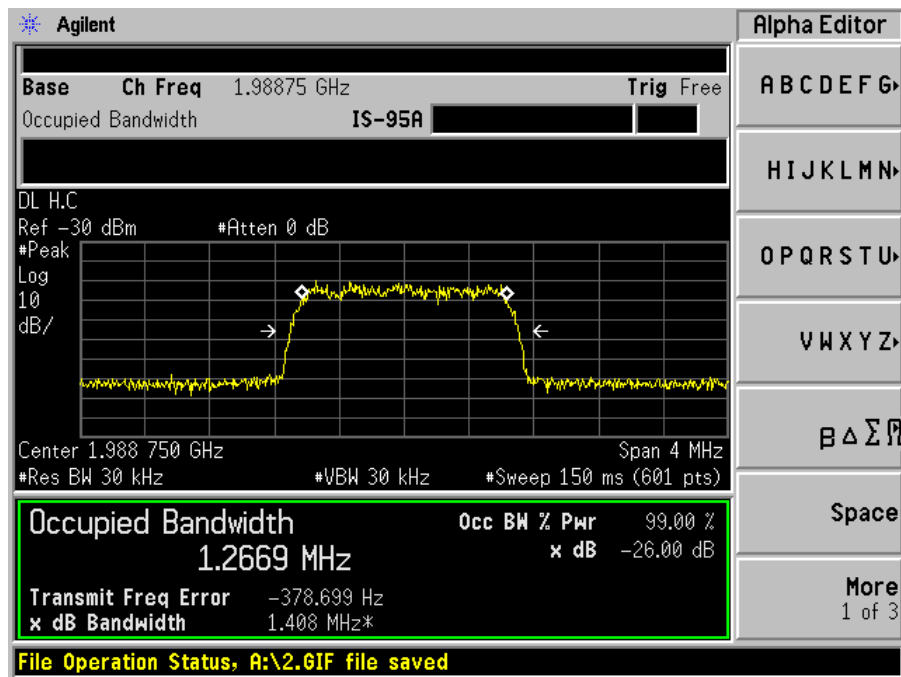
| Modulation | Mode | Channel | Frequency in MHz | Emission Bandwidth in KHz |
|------------|-----------|---------|------------------|---------------------------|
| CDMA | Down-link | Low | 1931.25 | 1269.4 |
| | | Mid | 1960.00 | 1276.4 |
| | | High | 1988.75 | 1268.3 |
| | Up-link | Low | 1851.25 | 1268.6 |
| | | Mid | 1880.00 | 1268.9 |
| | | High | 1908.75 | 1269.4 |
| GSM | Down-link | Low | 1930.20 | 250.0623 |
| | | Mid | 1960.00 | 250.2992 |
| | | High | 1989.80 | 250.5960 |
| | Up-link | Low | 1850.20 | 250.2894 |
| | | Mid | 1880.00 | 250.6681 |
| | | High | 1909.80 | 250.4510 |

Please refer to plots hereinafter.

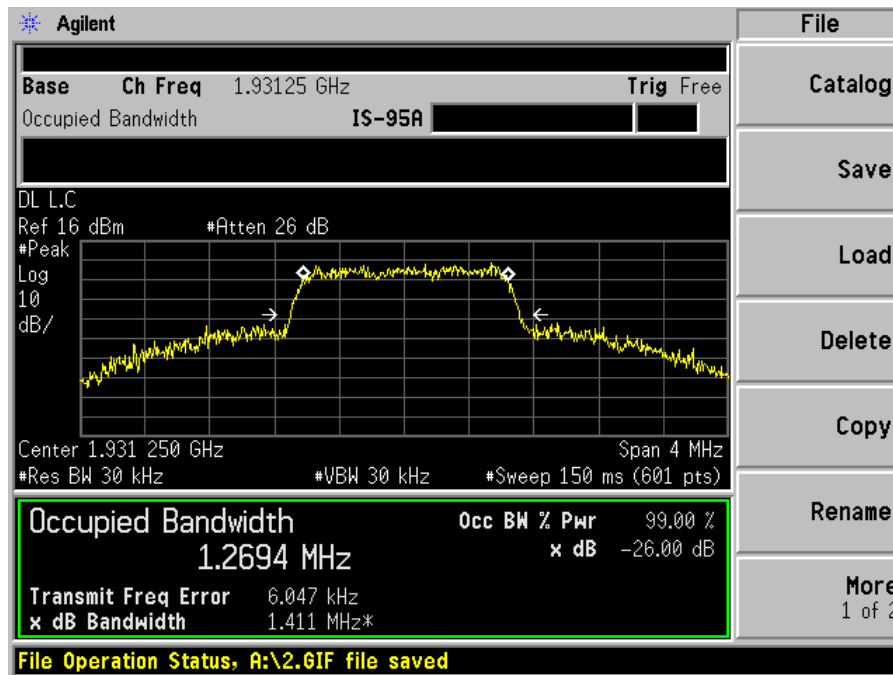
CDMA Downlink:

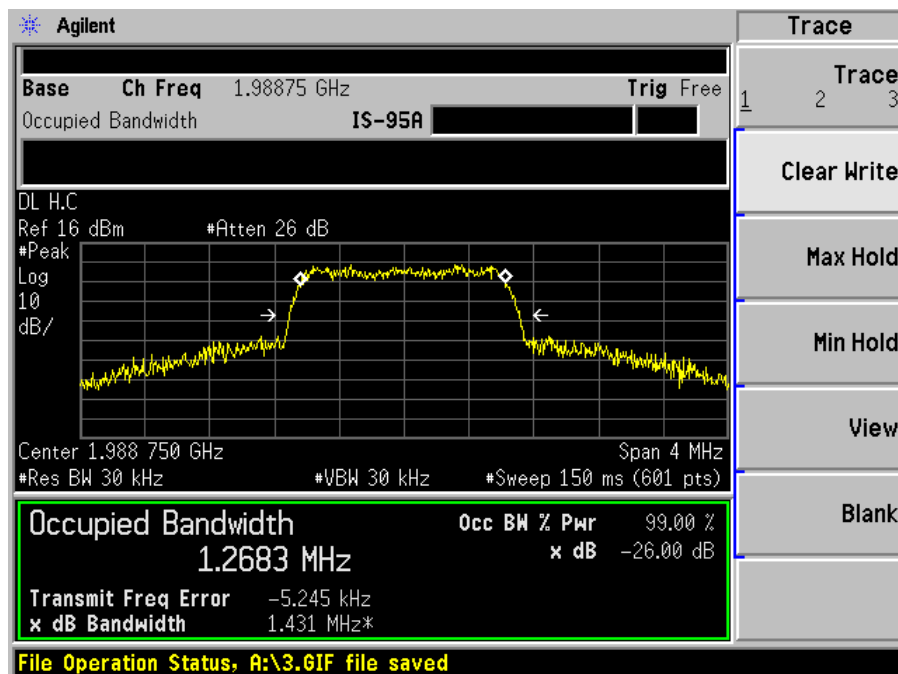
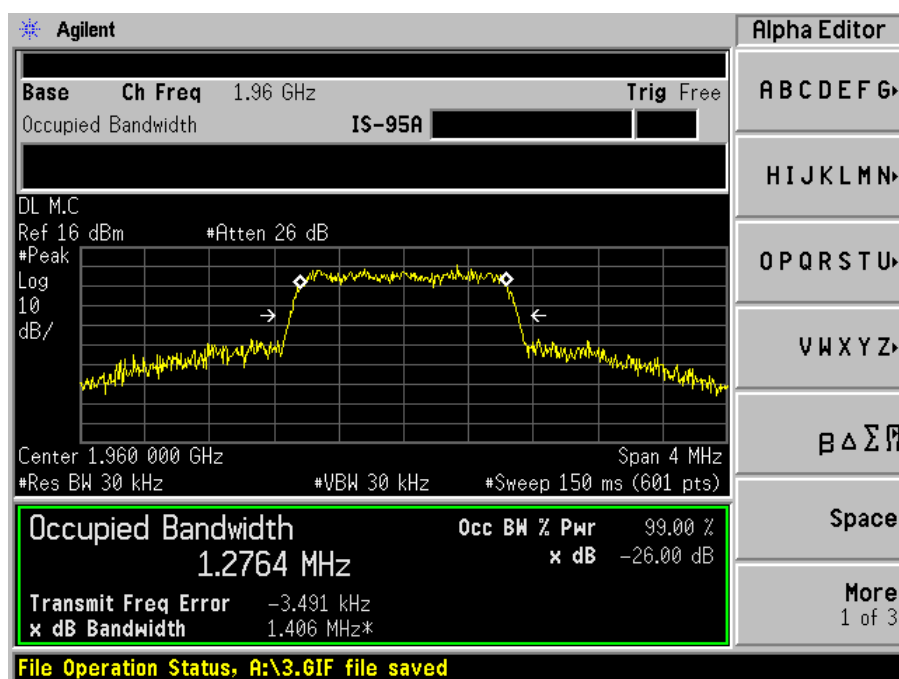
IN:





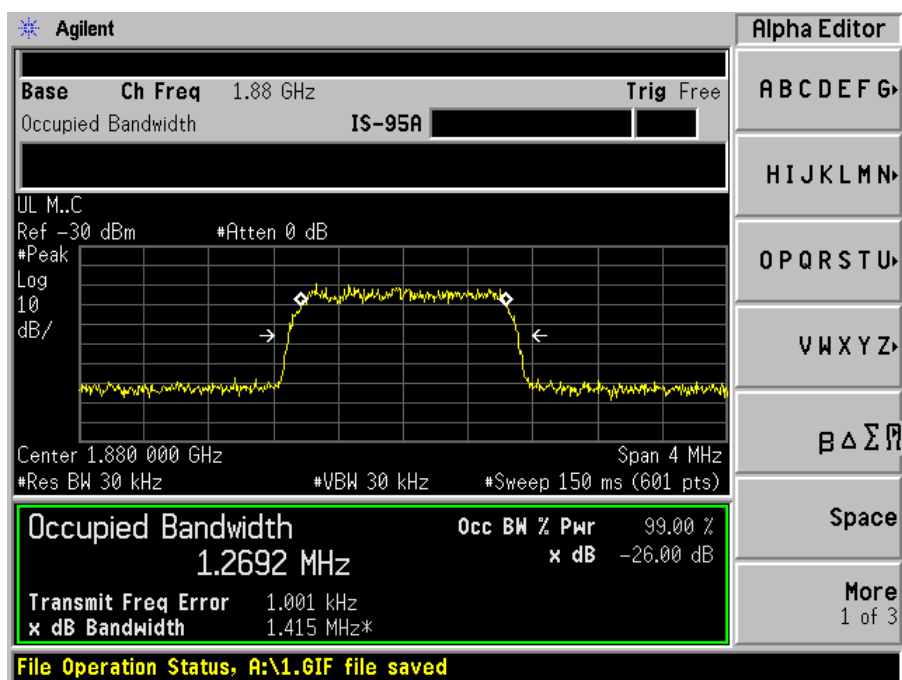
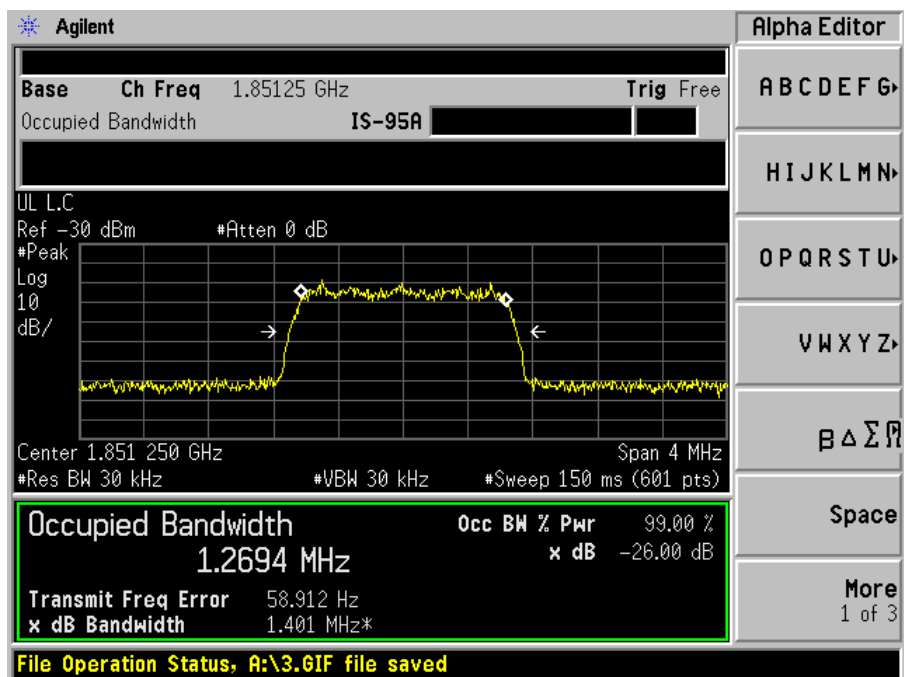
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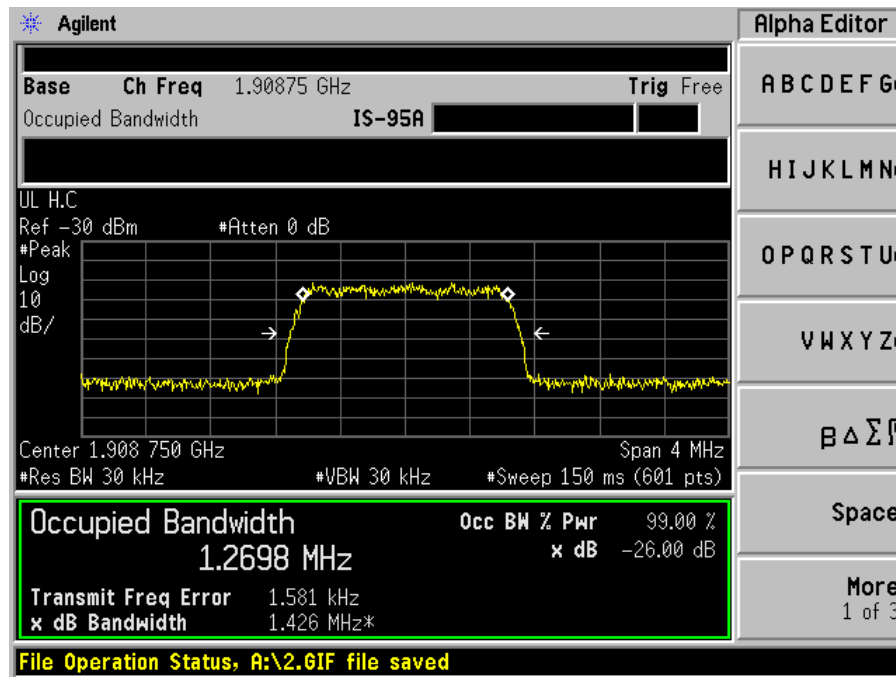




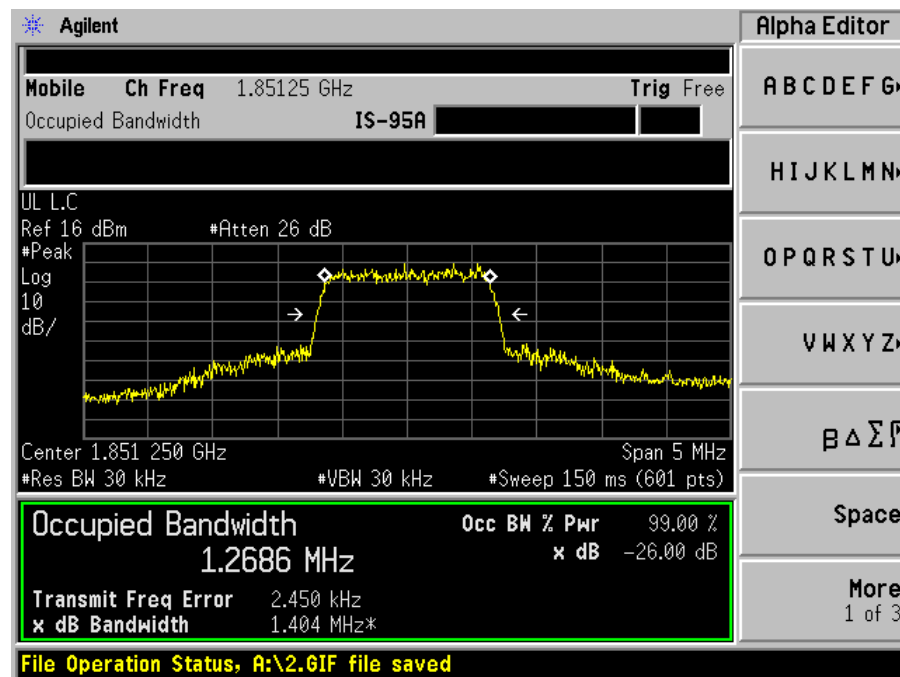
CDMA Uplink:

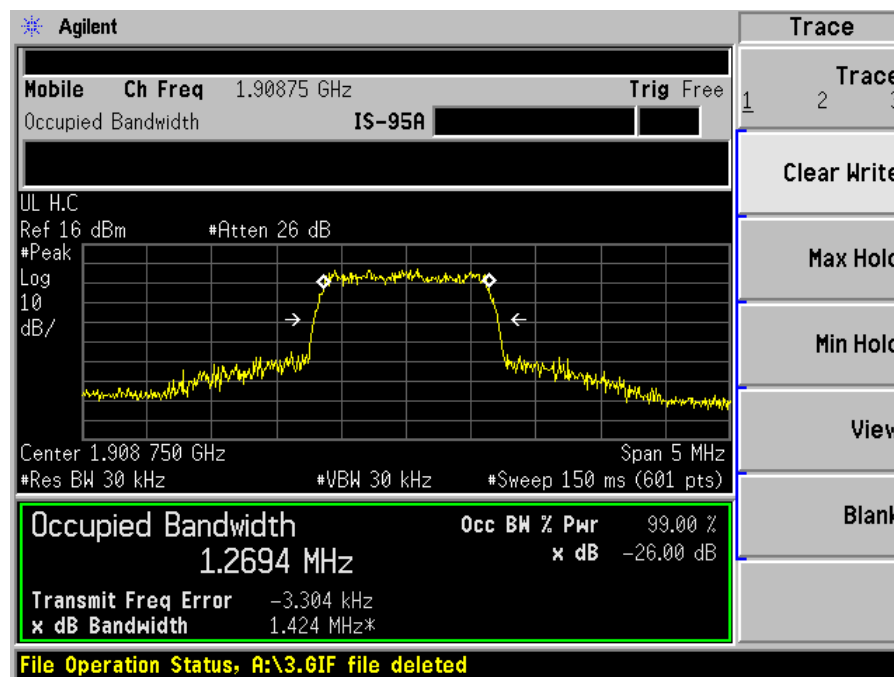
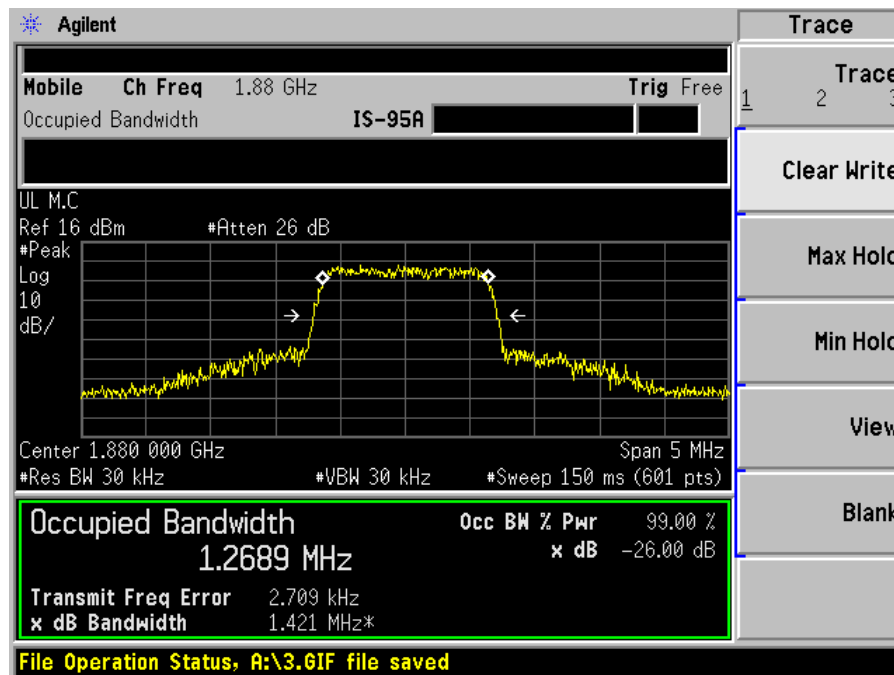
IN:





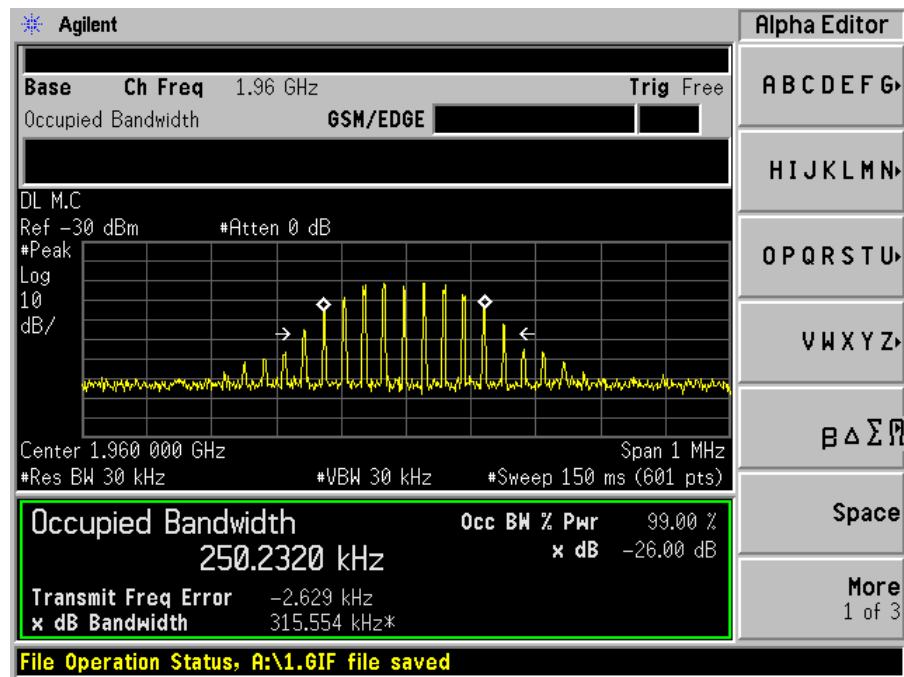
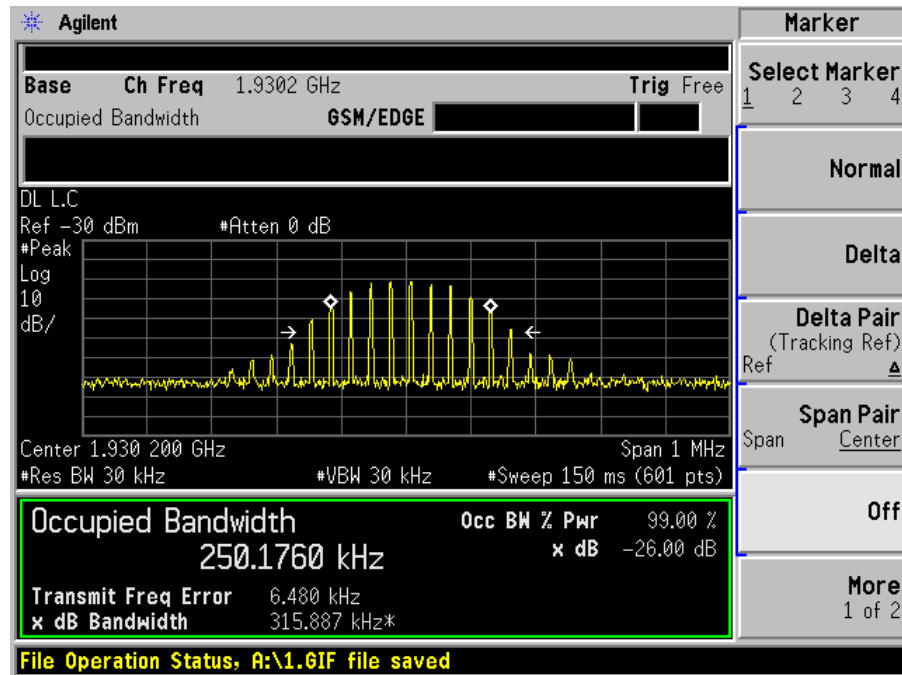
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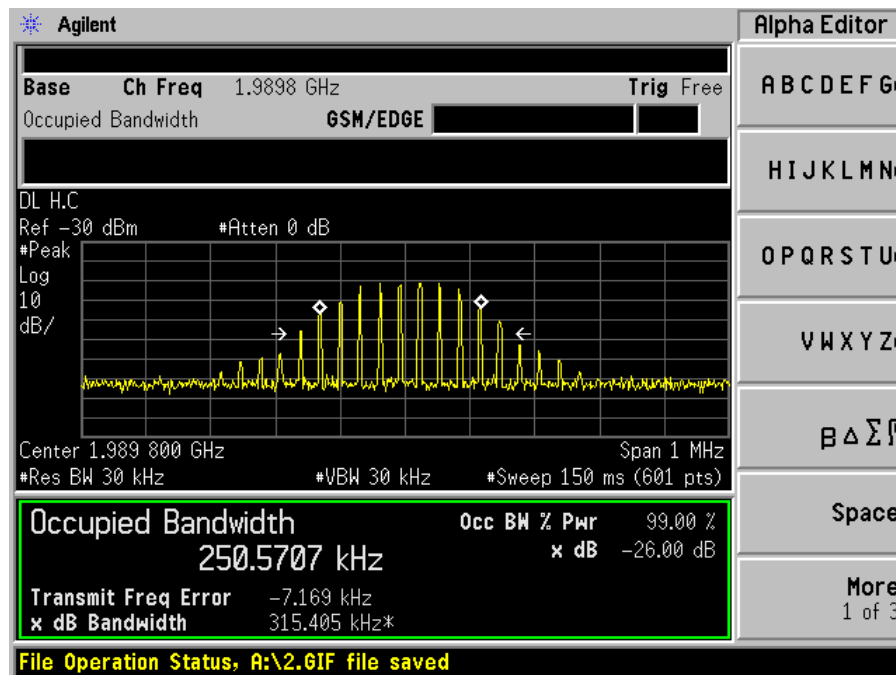




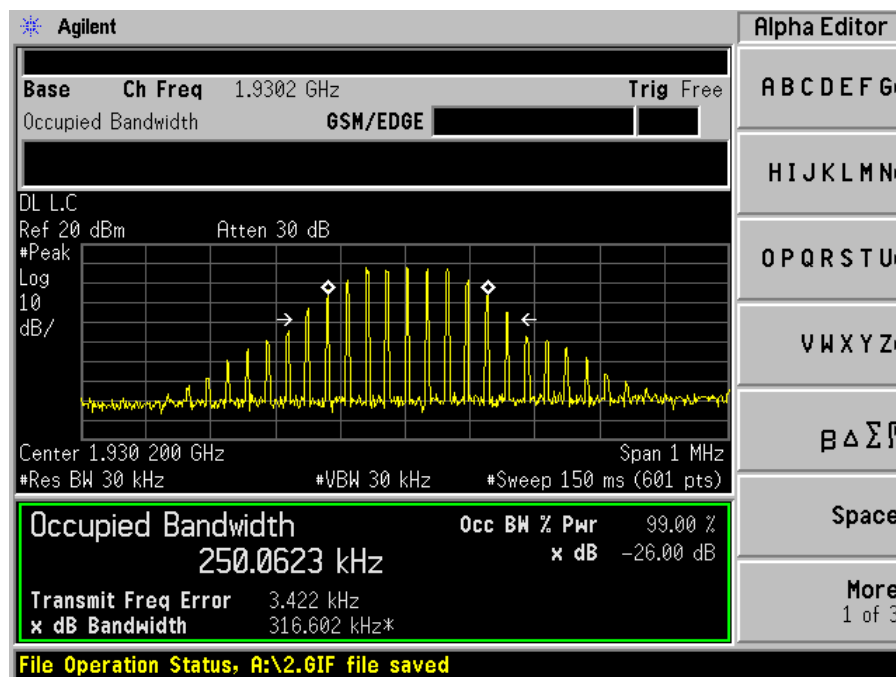
GSM Downlink:

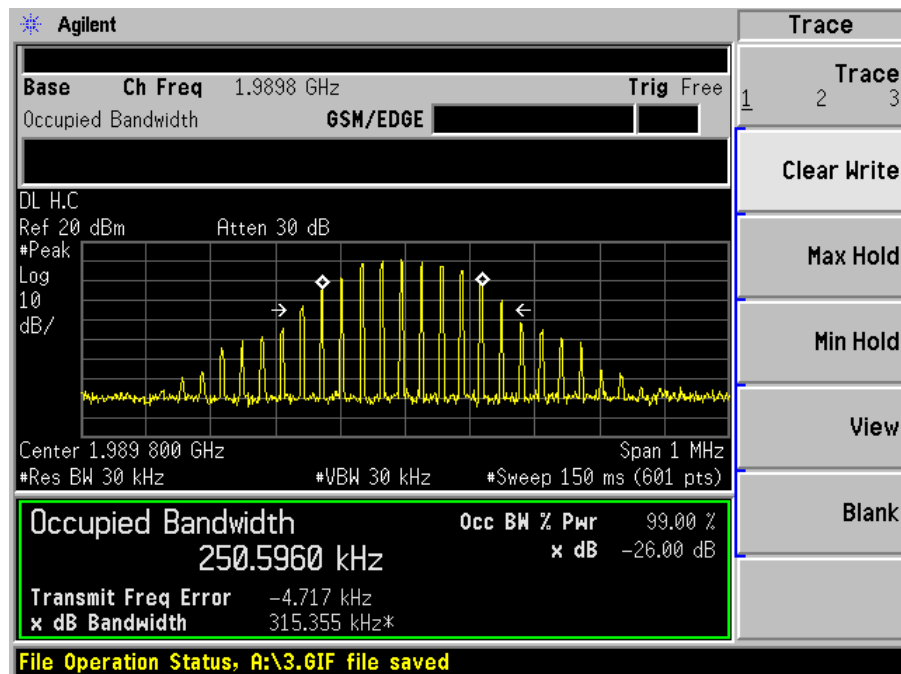
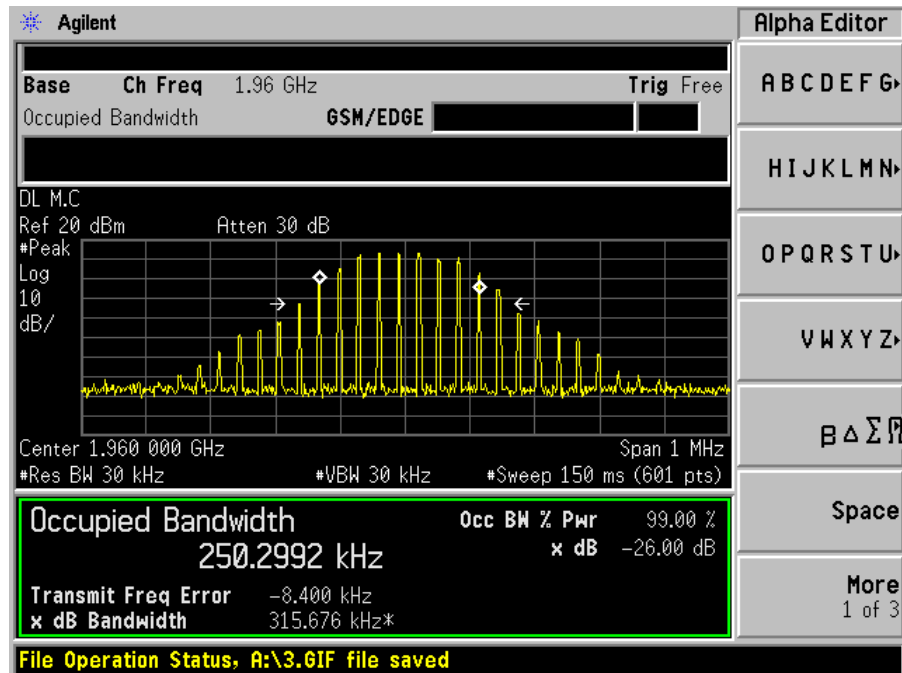
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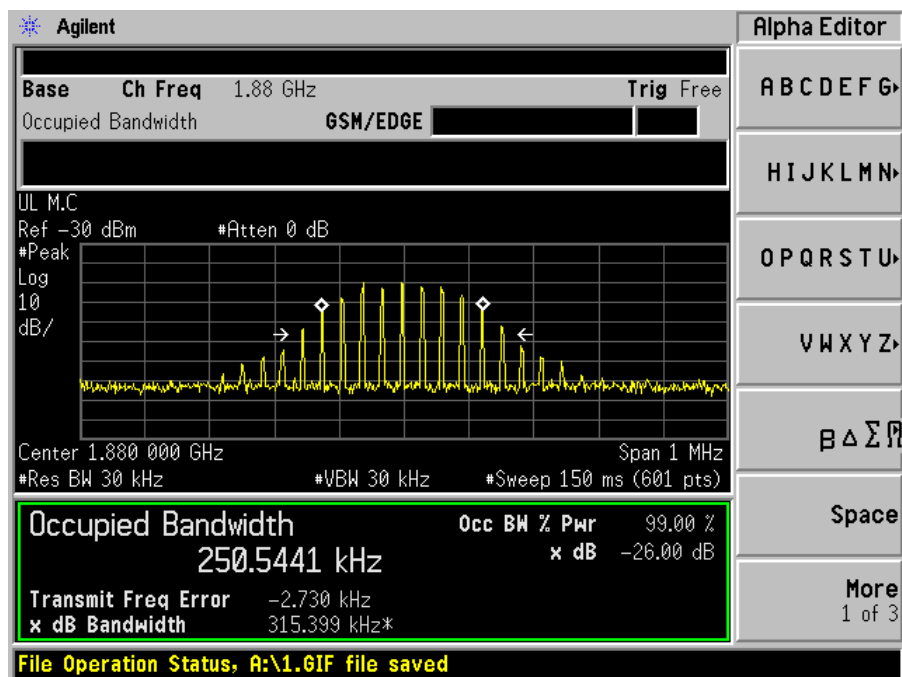
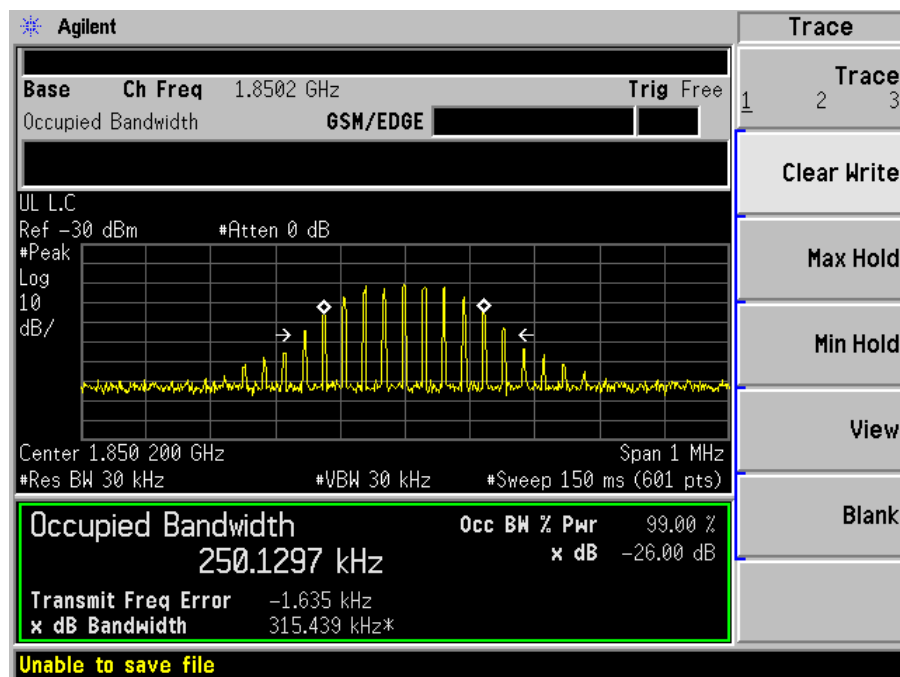
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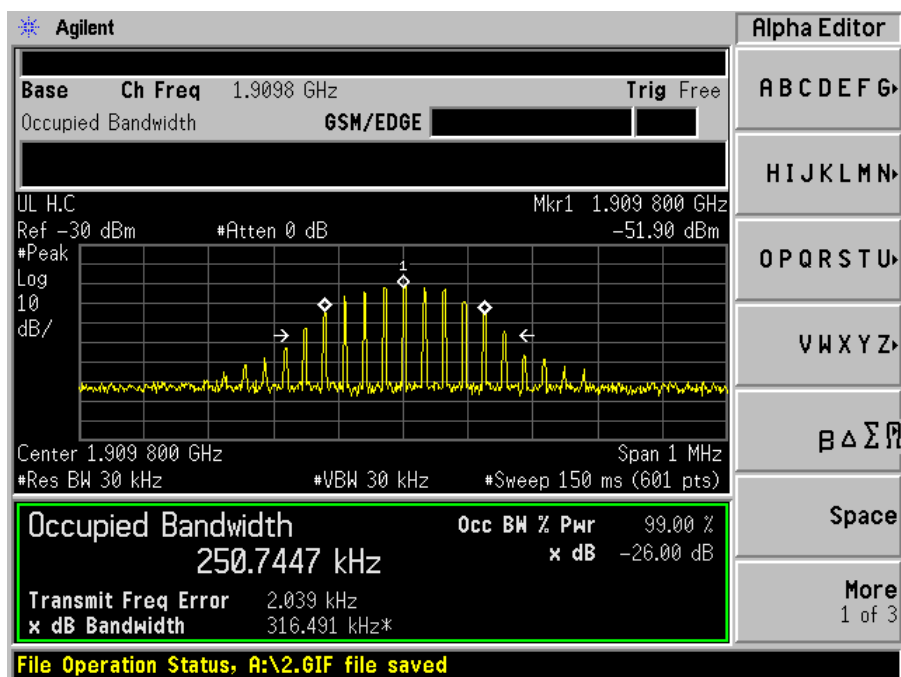




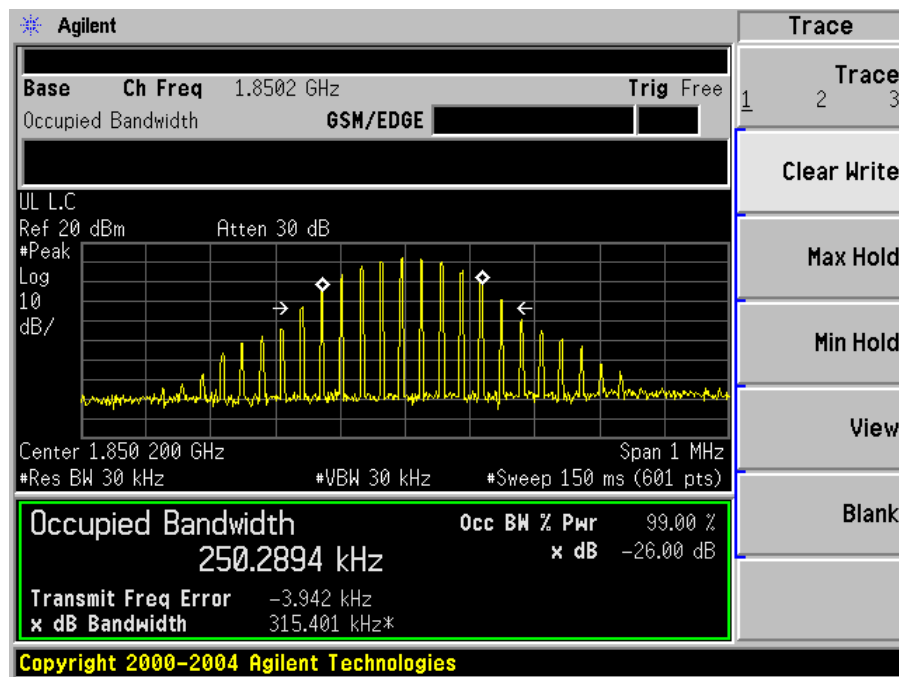
GSM Uplink:

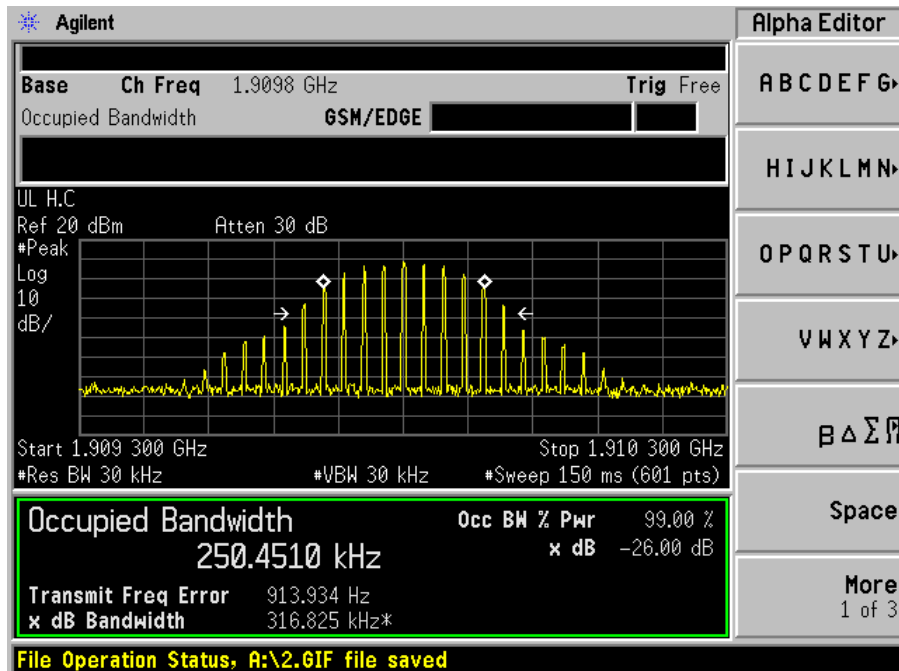
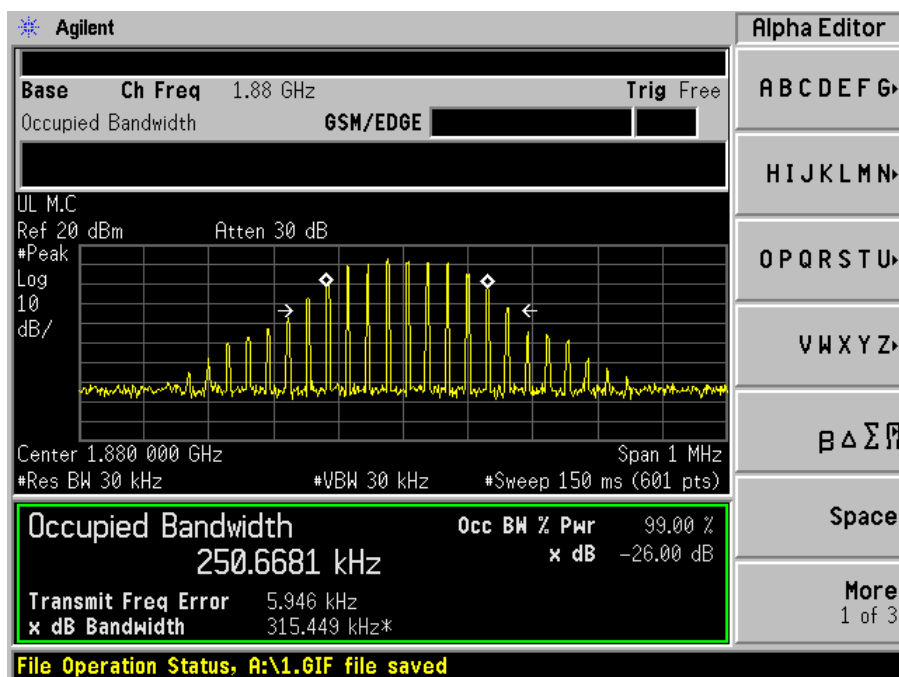
IN:





OUT:





§2.1051 & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

According to FCC §2.1049 and §24.238, on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

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 10th harmonic.

Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---------------------|--------------------|--------------|----------------------|------------------|
| Rohde & Schwarz | Generator, Signal | SMIQ03 | 849192/0085 | 5/2/2005 |
| Rohde & Schwarz | I/O Modulation | AMIQ-K11 | 831038/0023 | 5/3/2005 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2004 |

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

Environmental Conditions

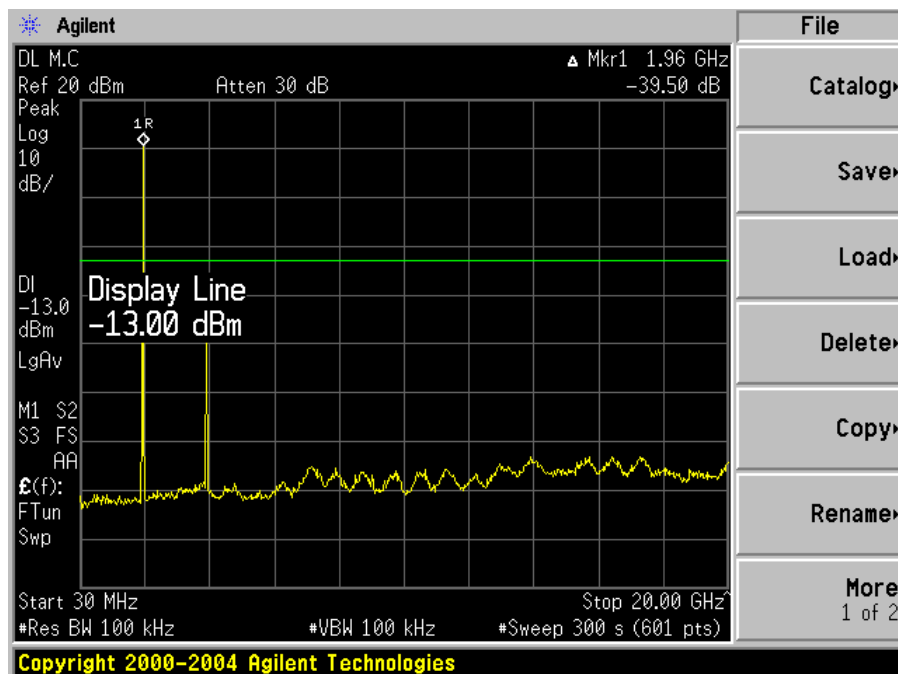
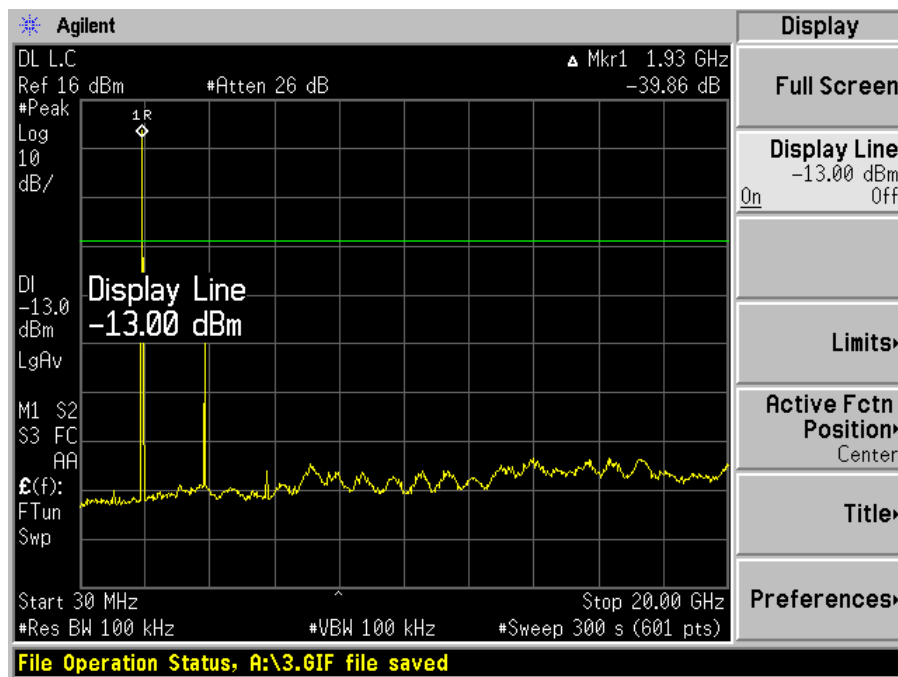
| | |
|--------------------|----------|
| Temperature: | 23° C |
| Relative Humidity: | 40% |
| ATM Pressure: | 1018mbar |

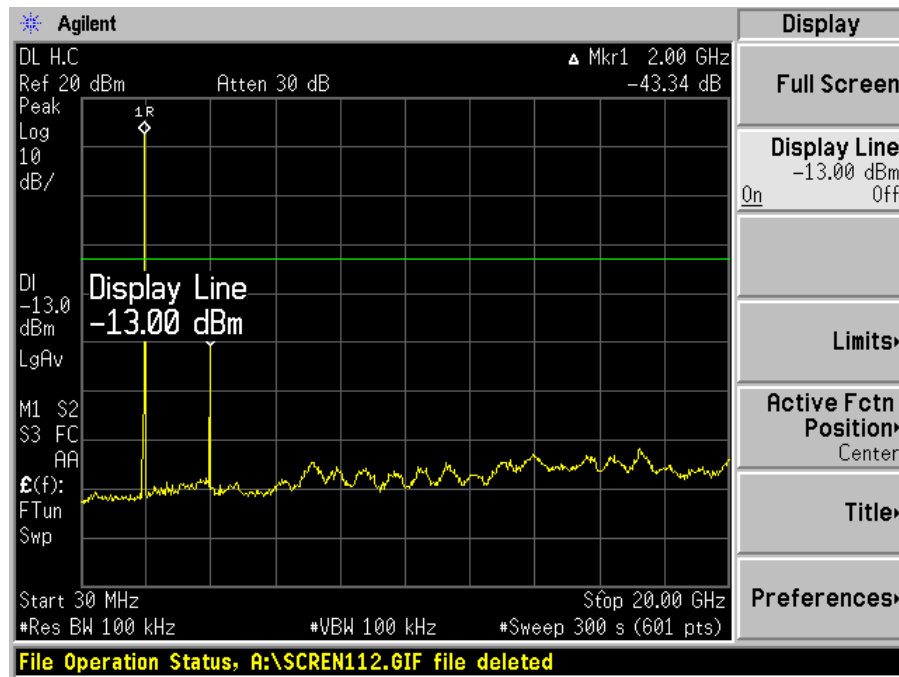
* *The testing was performed by Daniel Deng on 2005-06-28.*

Test Results

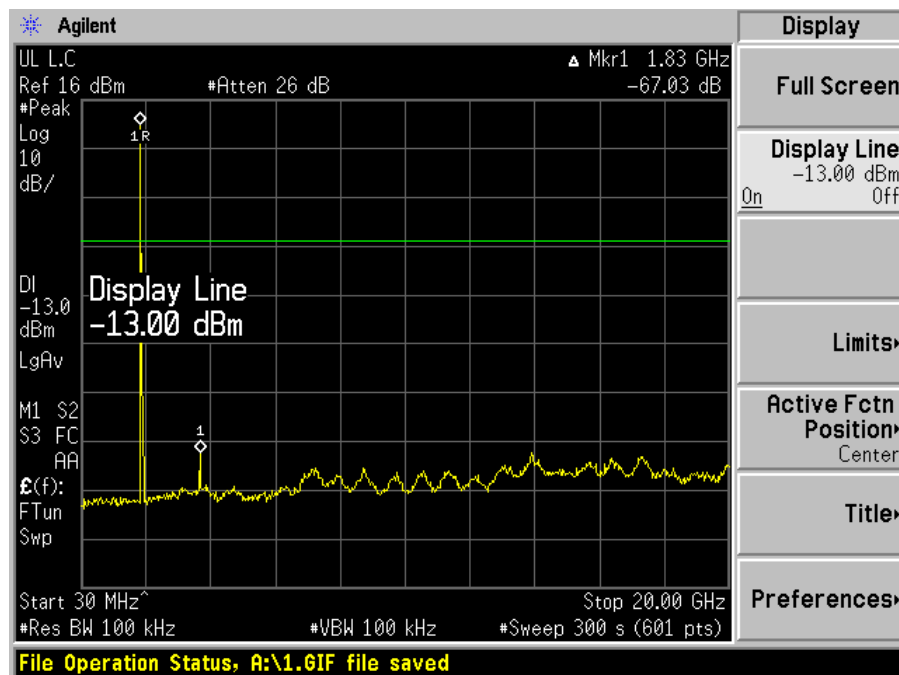
Please refer to the hereinafter plots.

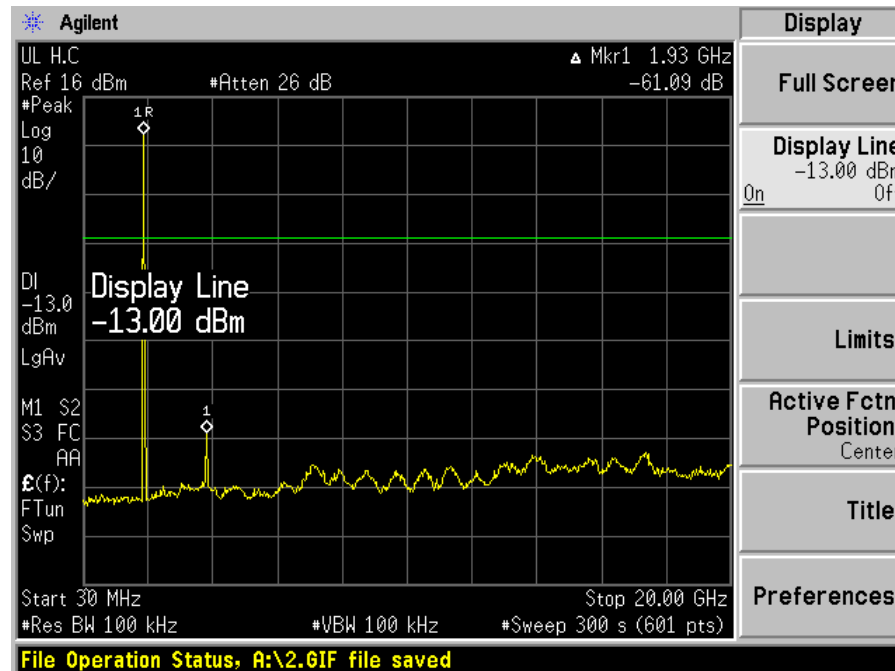
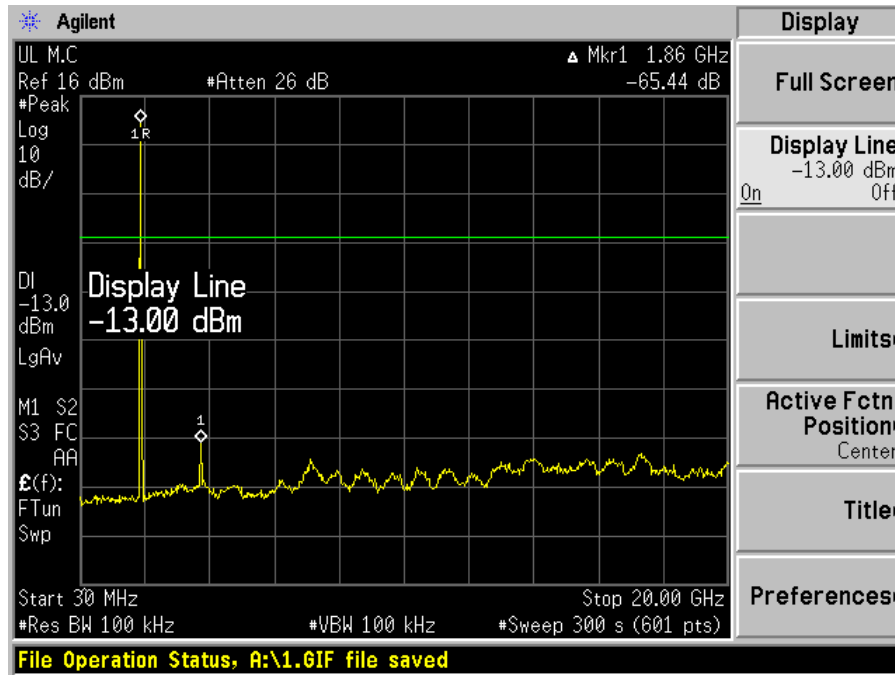
CDMA Downlink:



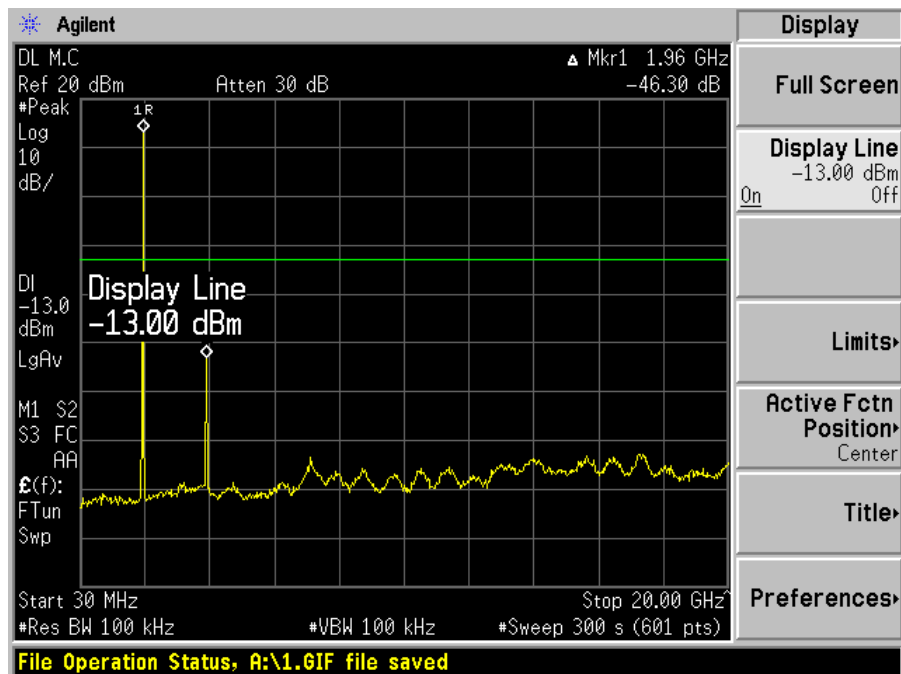
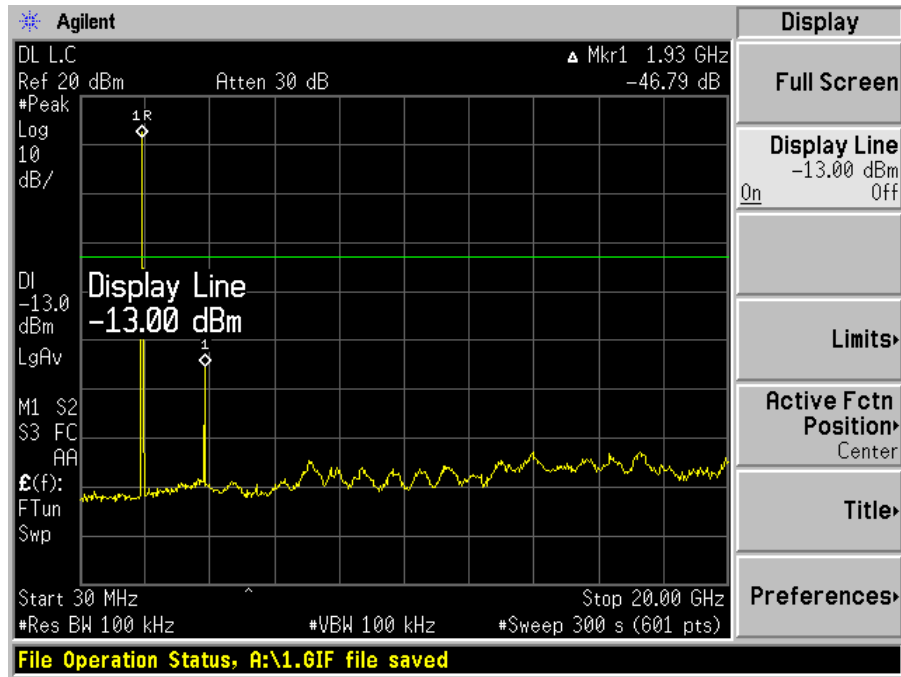


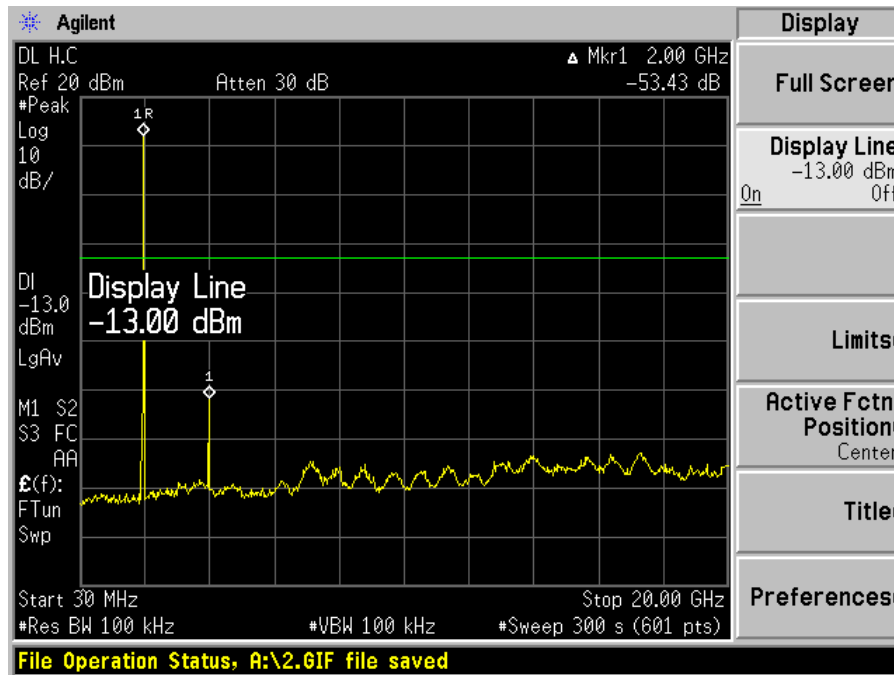
CDMA Uplink:



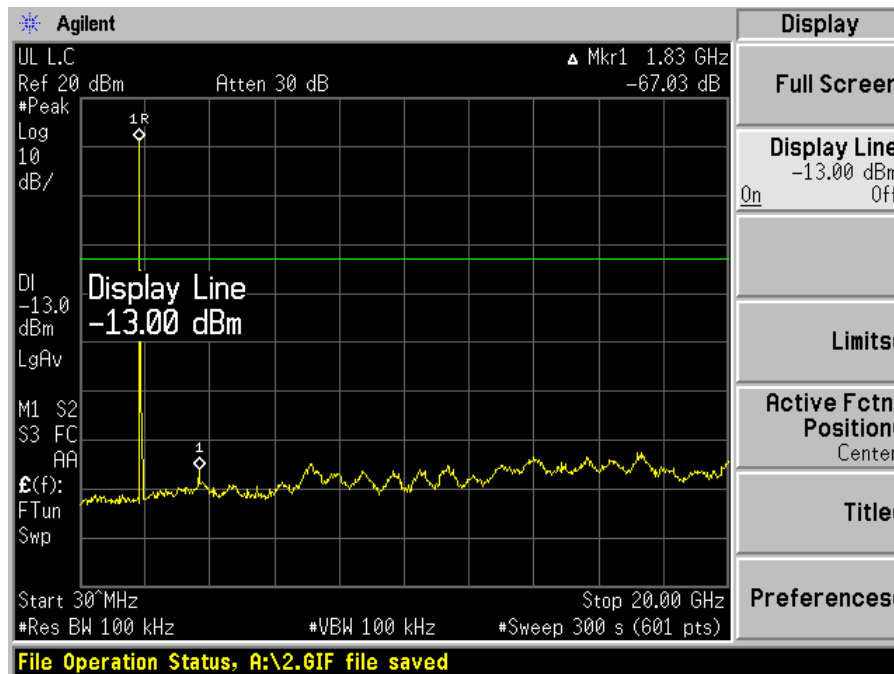


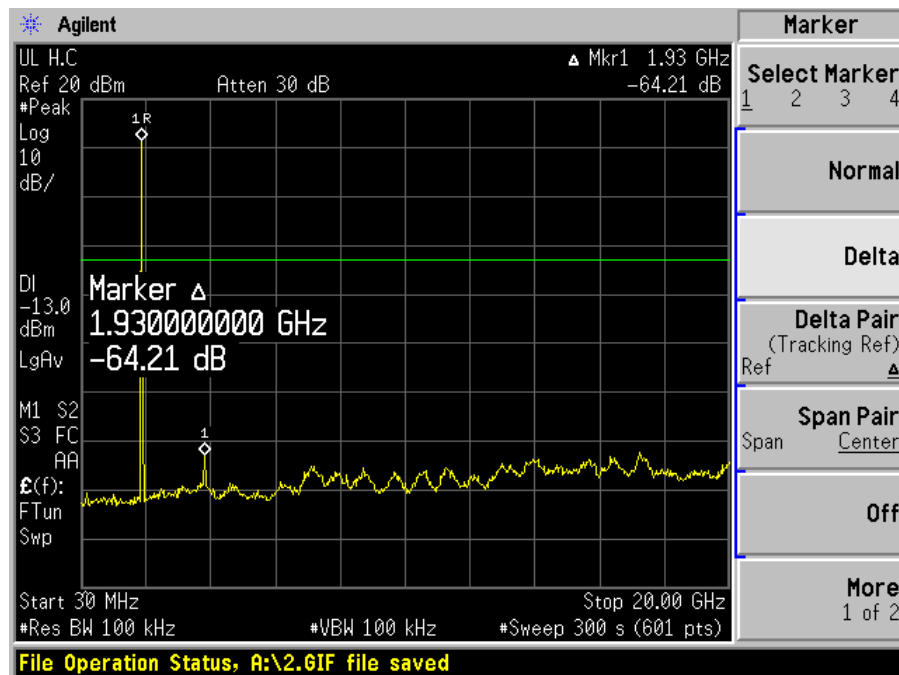
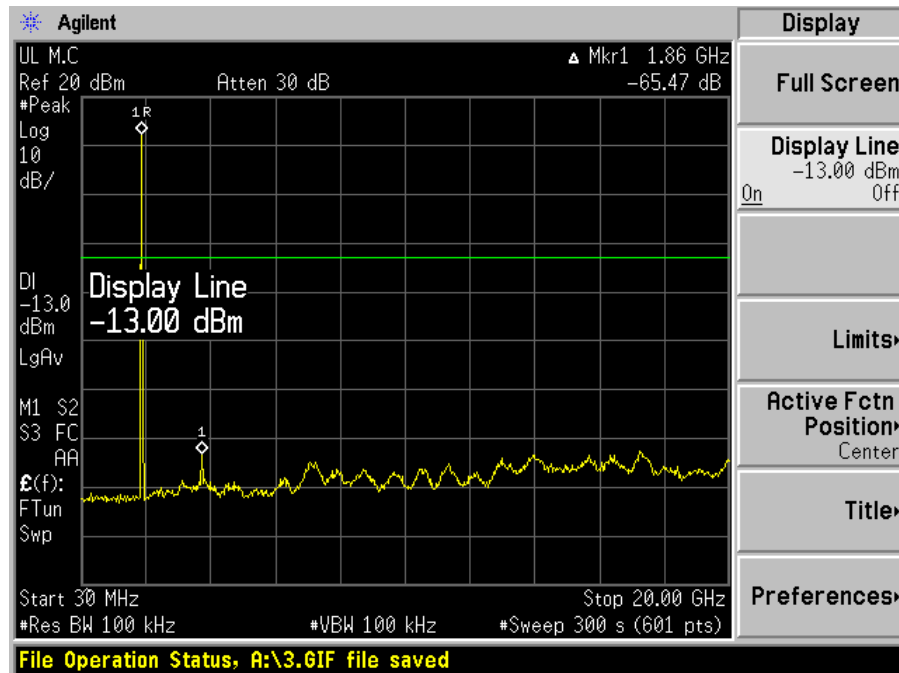
GSM Downlink:





GSM Uplink:





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 $43 + 10\log(P)$, 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 10th harmonic. Two input signals are equal in level (and can be raised equally), were sent to the EUT.

Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|-----------------|--------------------|----------|---------------|------------|
| Rohde & Schwarz | Generator, Signal | SMIQ03 | 849192/0085 | 5/2/2005 |
| Rohde & Schwarz | I/O Modulation | AMIQ-K11 | 831038/0023 | 5/3/2005 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2004 |

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

Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 23° C |
| Relative Humidity: | 40% |
| ATM Pressure: | 1018mbar |

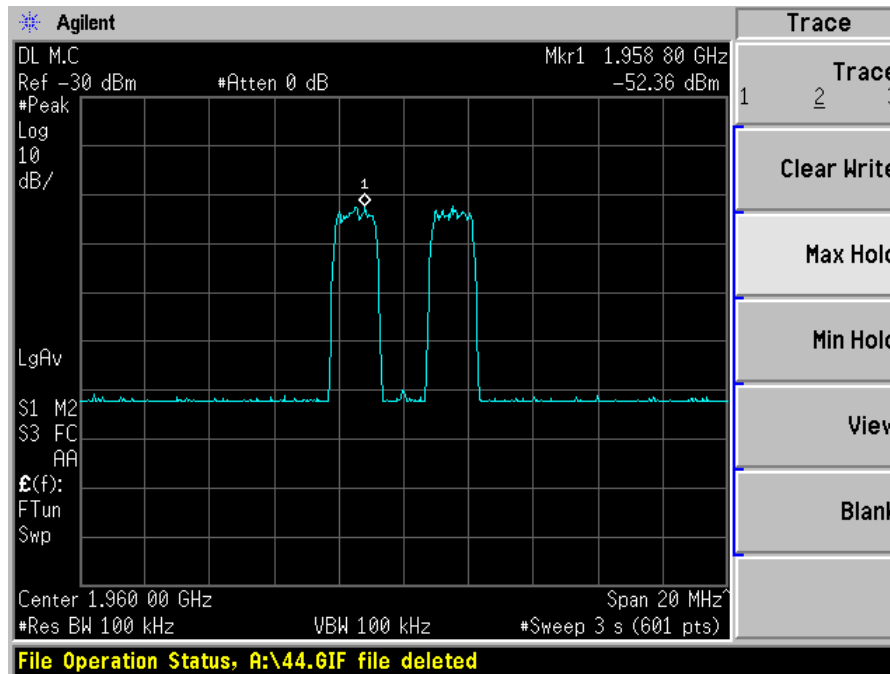
* The testing was performed by Daniel Deng on 2005-06-28.

Test Results

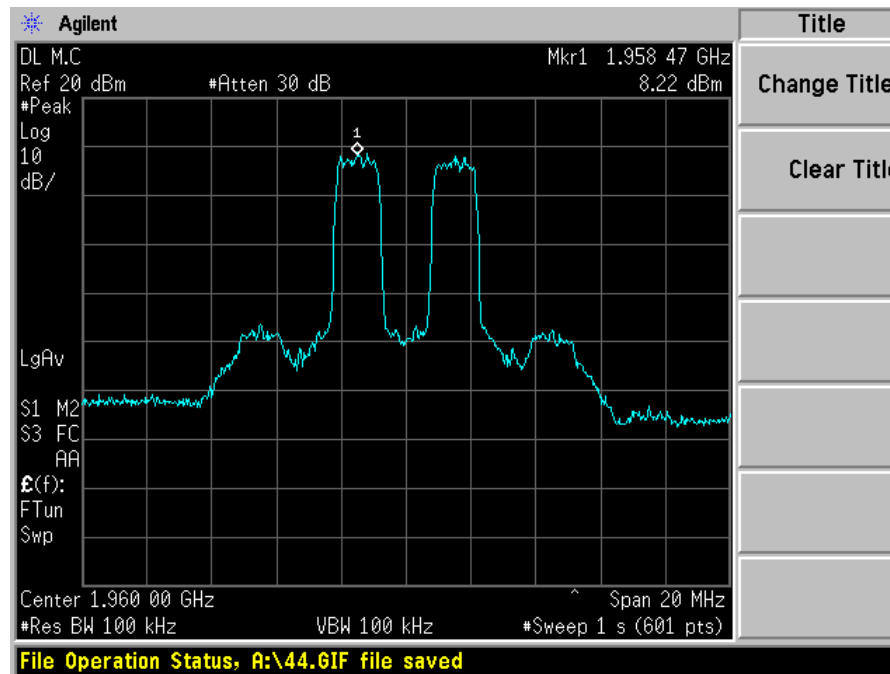
Please refer to plots hereinafter.

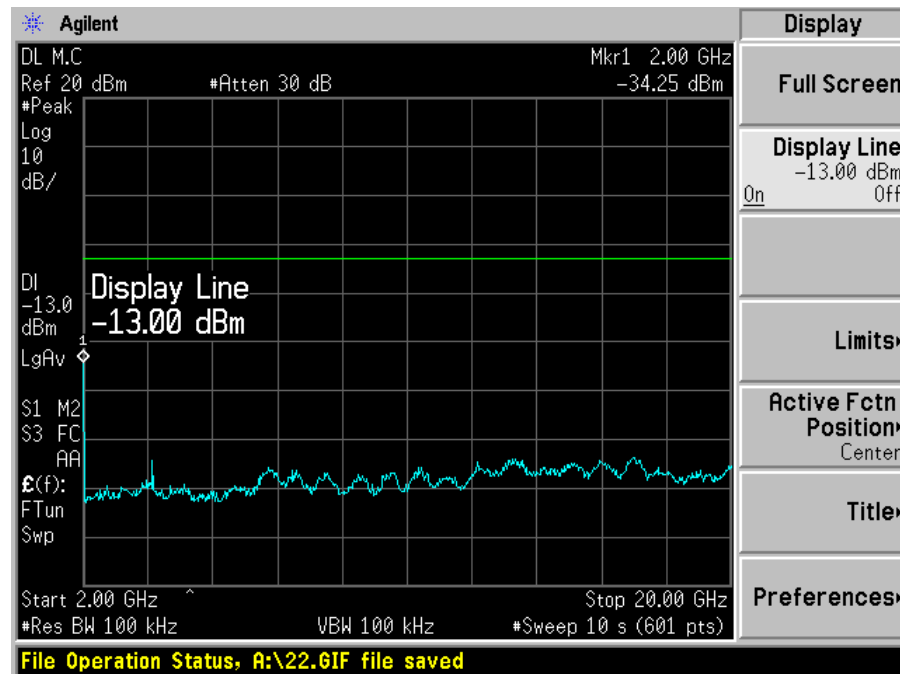
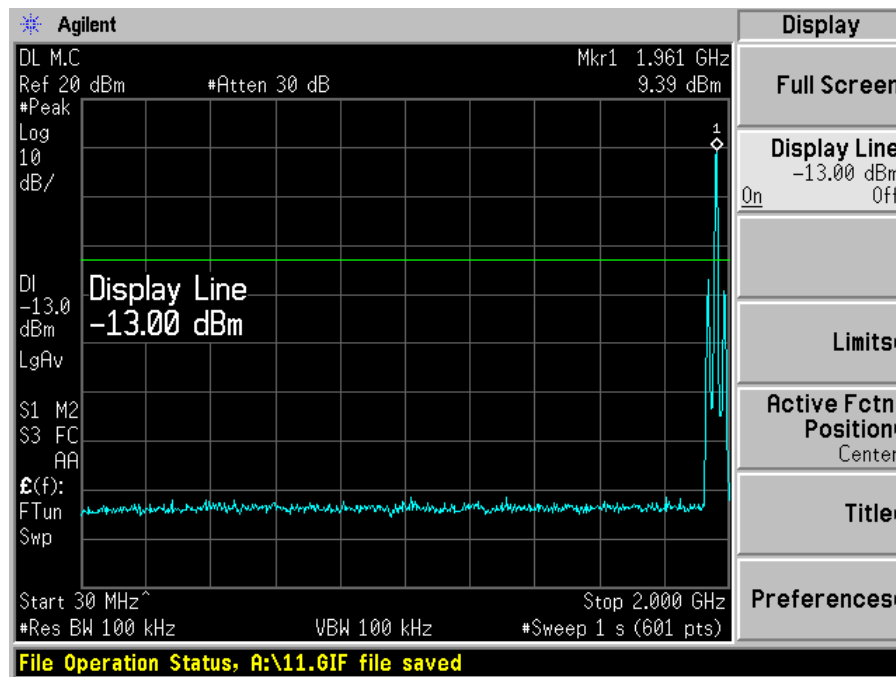
CDMA Downlink:

IN:

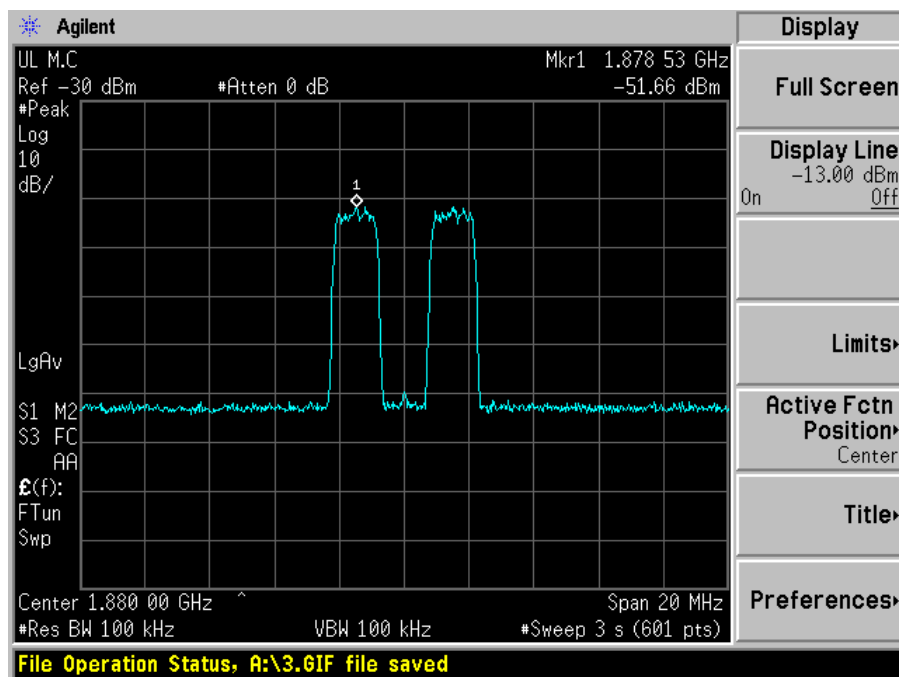


OUT:

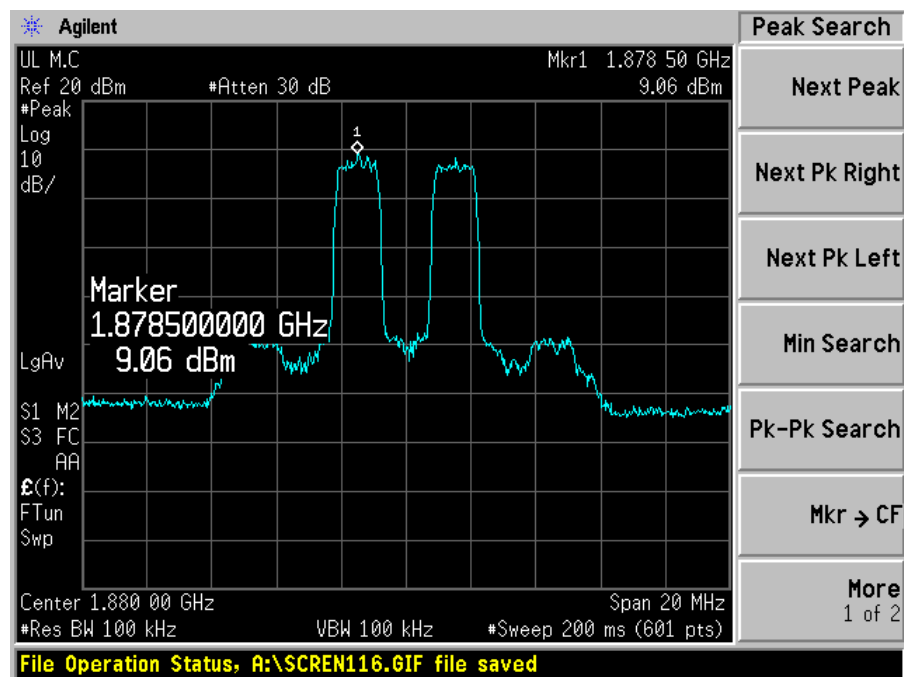


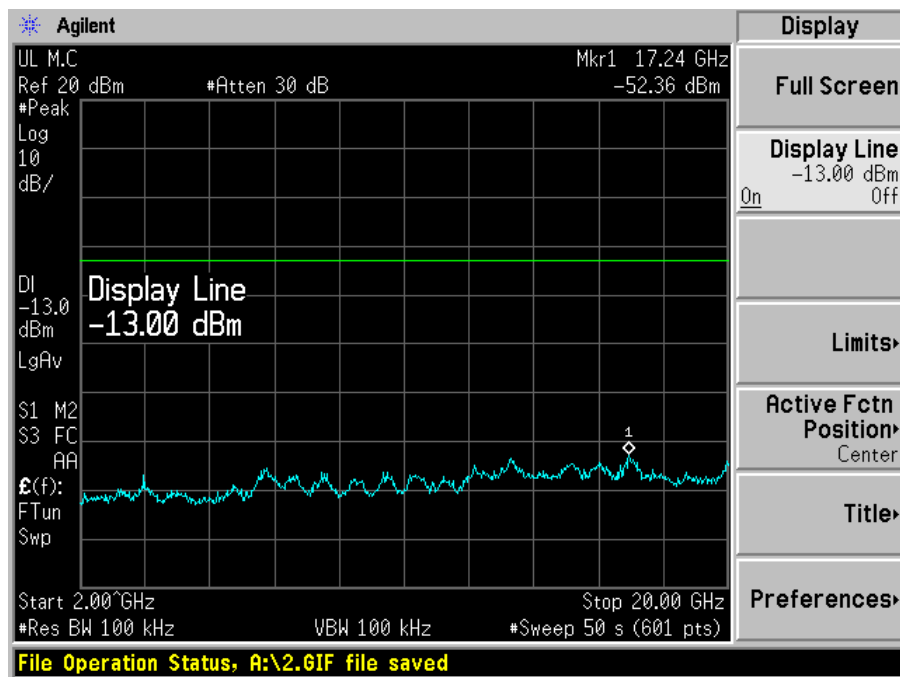
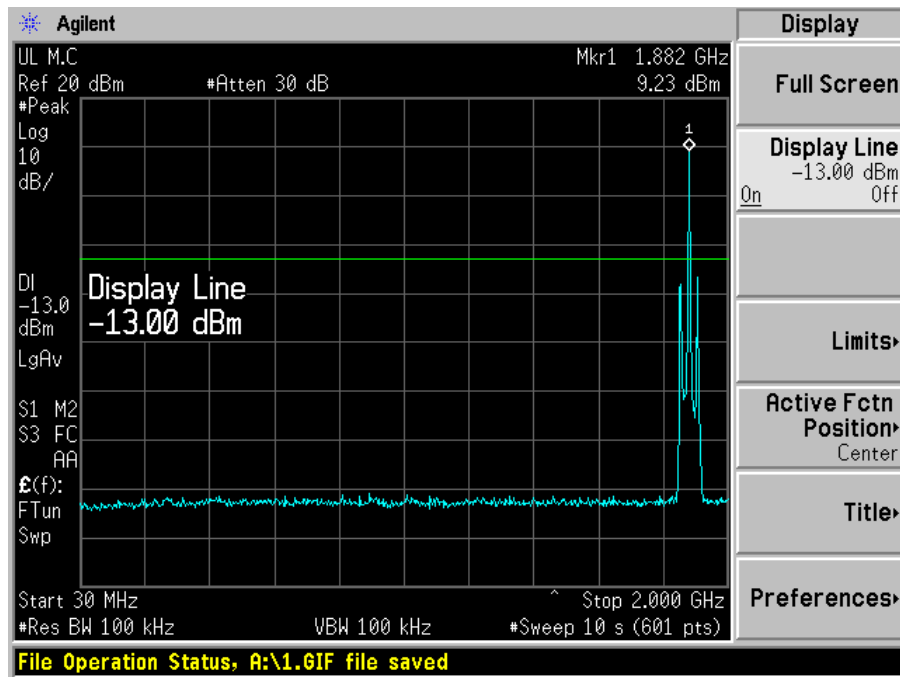


IN:



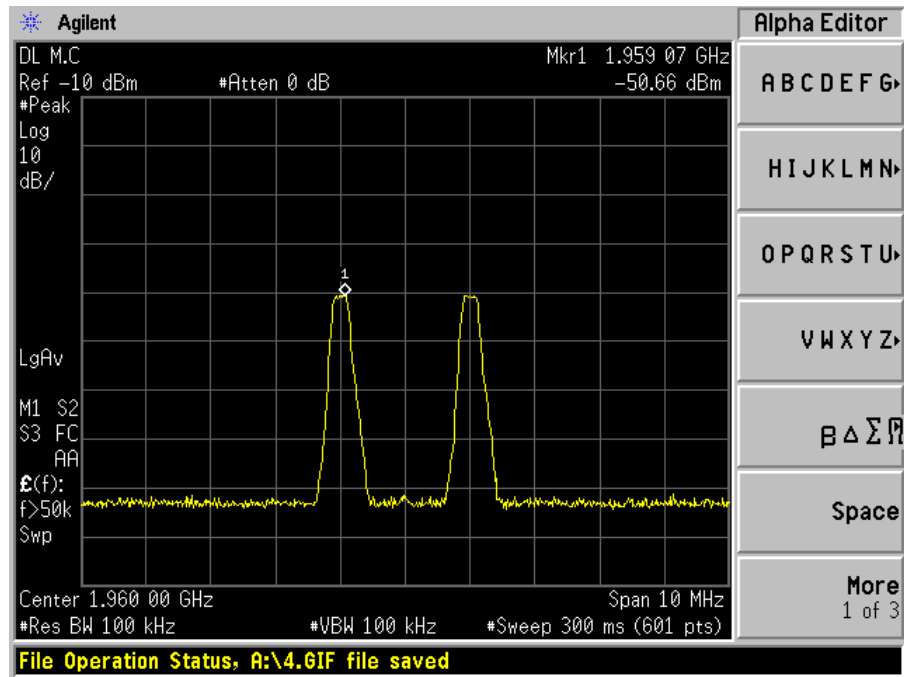
OUT:



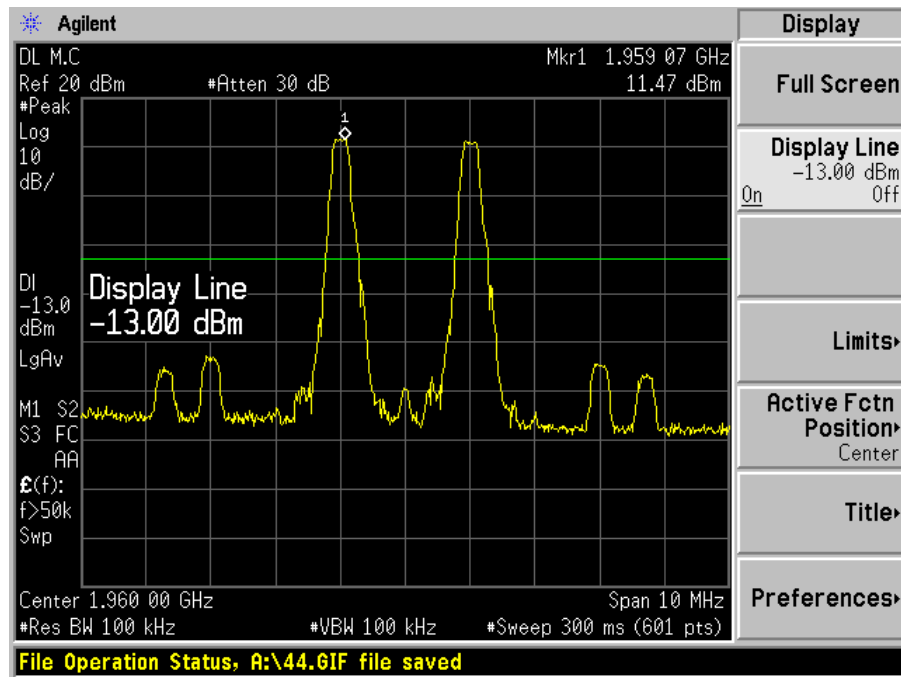


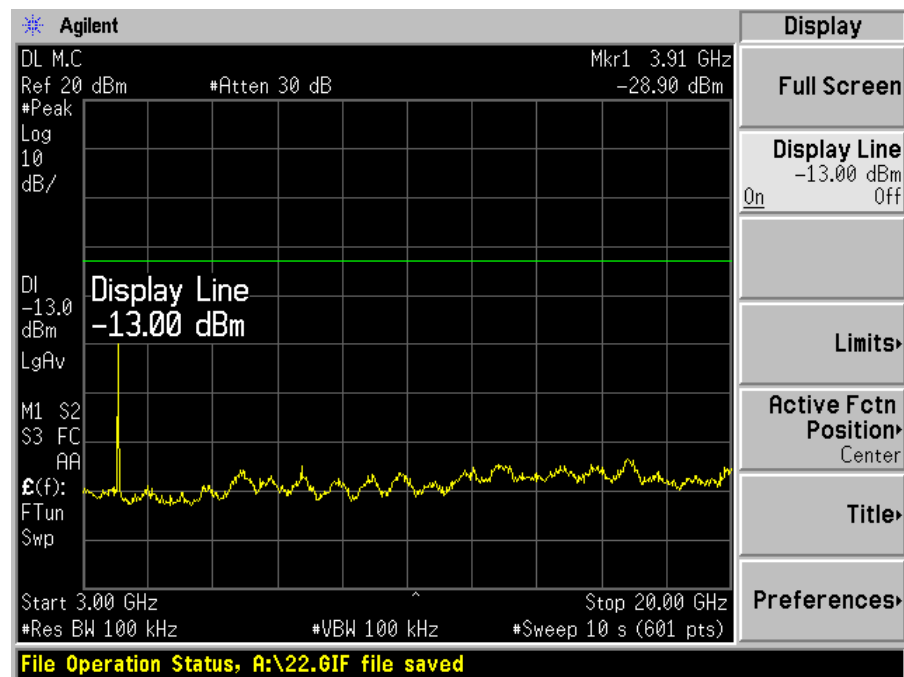
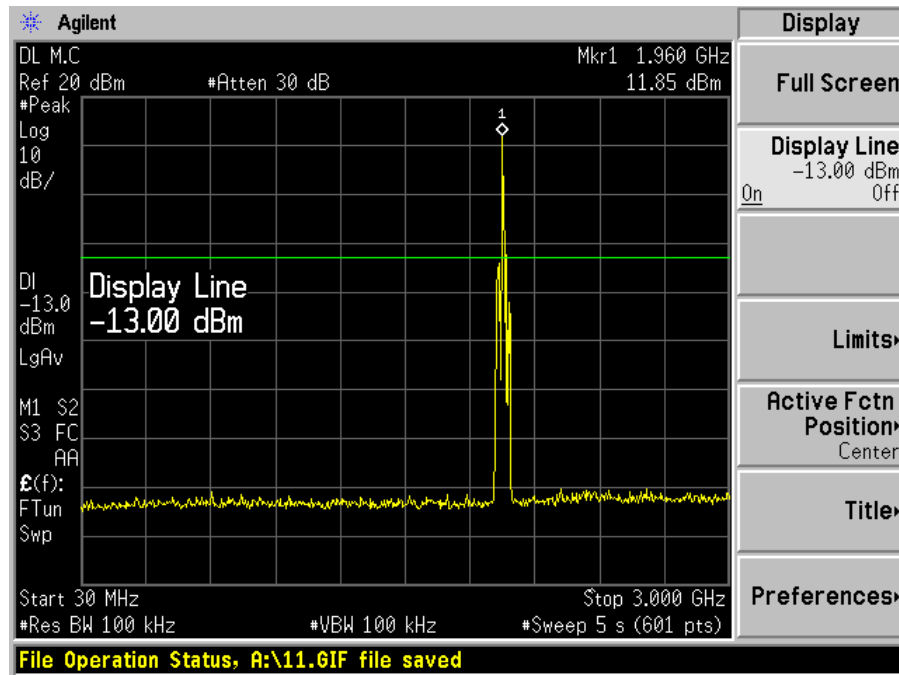
GSM Downlink:

IN:



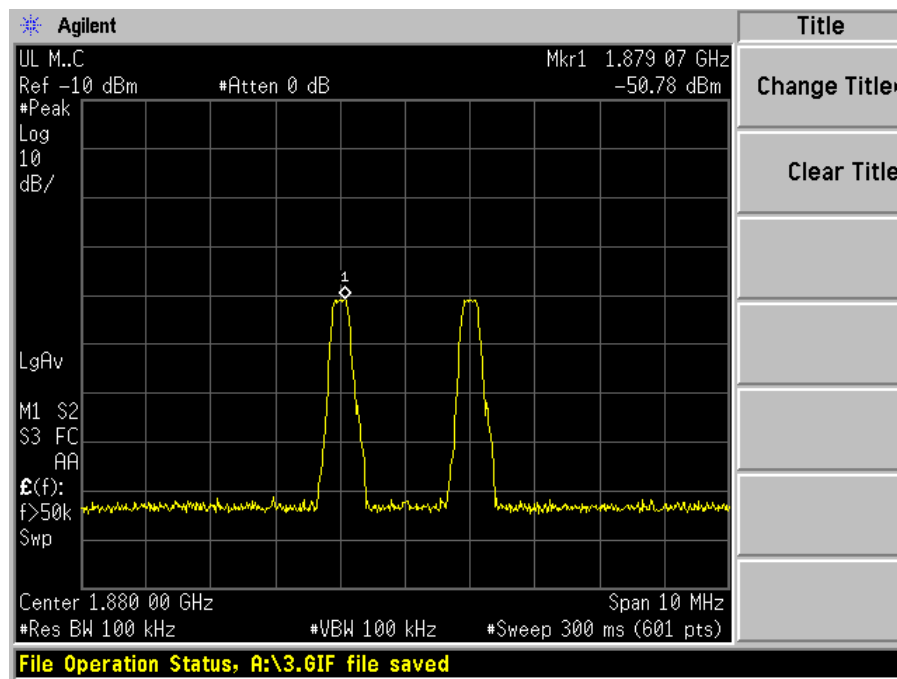
OUT:



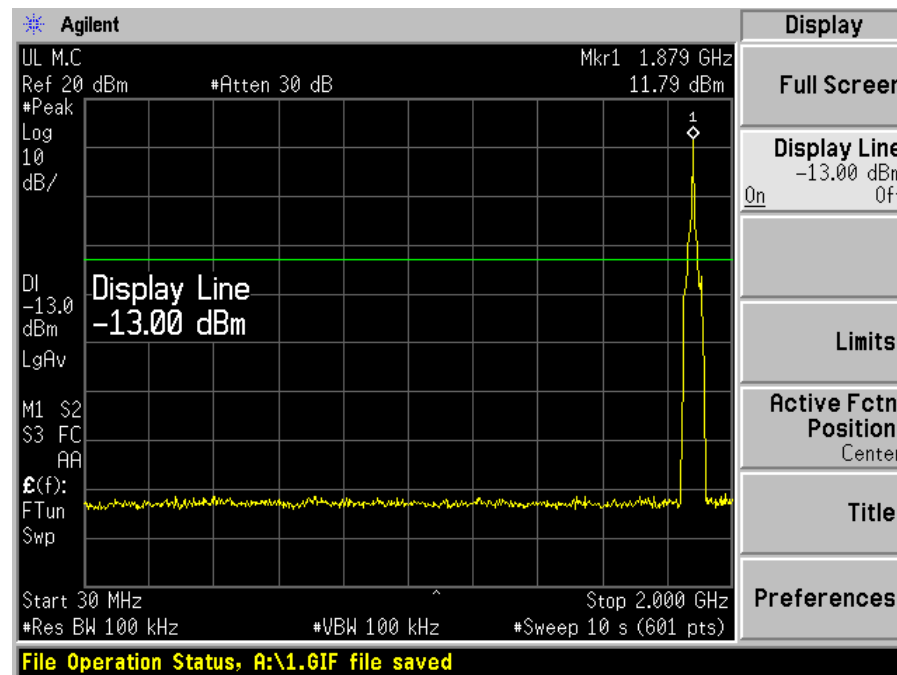


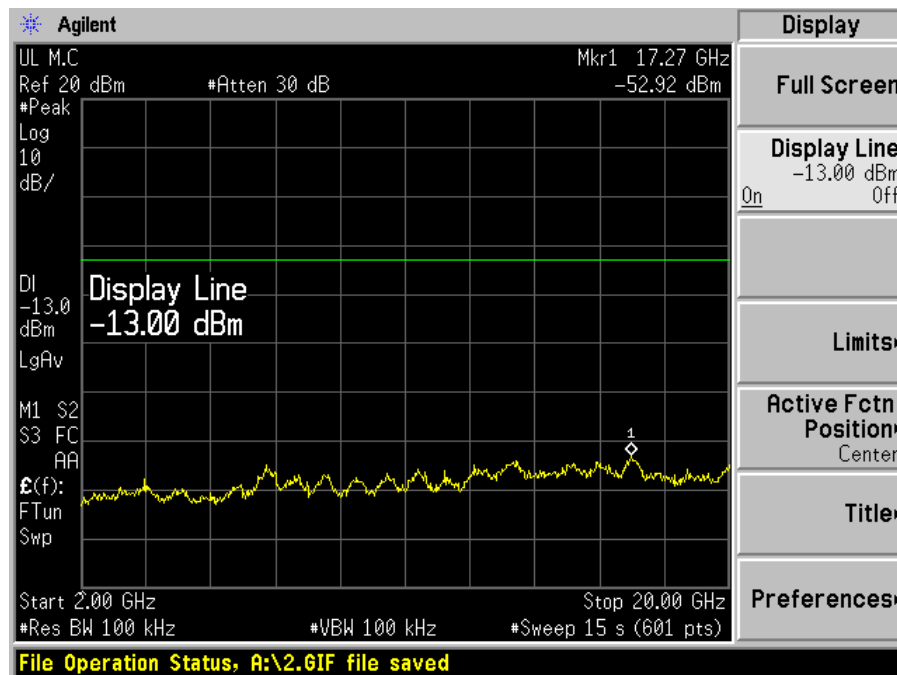
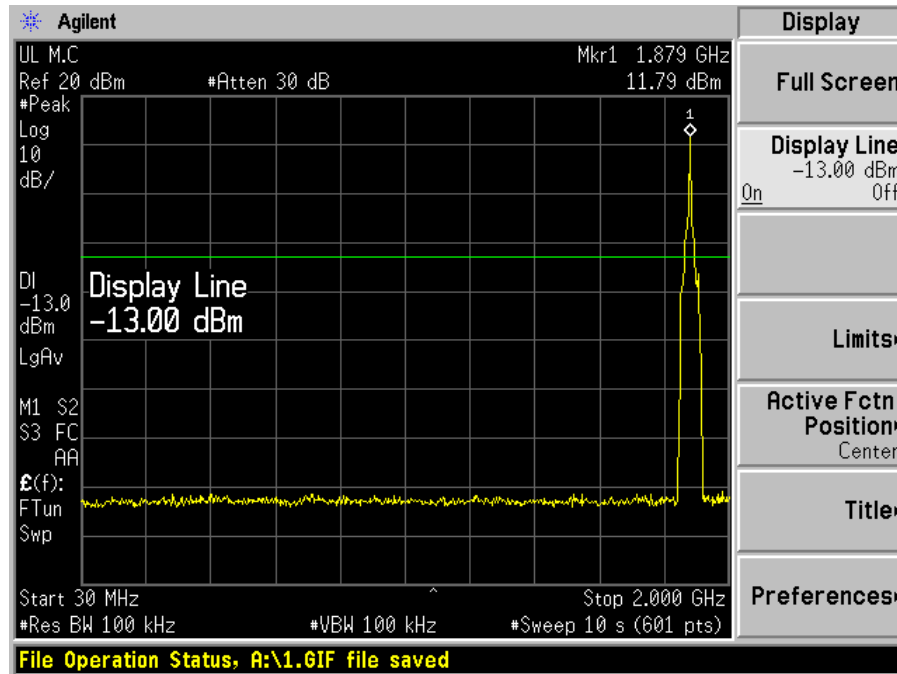
GSM Uplink:

IN:



OUT:





§2.1053 - SPURIOUS RADIATED EMISSION

Applicable Standards

Requirements: CFR 47, § 2.1053, and § 24.238 (a).

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 = $10 \lg (\text{TXpwr in Watts}/0.001)$ – the absolute level

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

Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|-----------------|---------------------------|--------------------------------|---------------|------------|
| Rohde & Schwarz | Generator, Signal | SMIQ03 | 849192/0085 | 5/2/2005 |
| Rohde & Schwarz | I/O Modulation | AMIQ-K11 | 831038/0023 | 5/3/2005 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2004 |
| ETS | Antenna, Log-Periodic | 3148 | 4-1155 | 12/14/2004 |
| ETS | Antenna, Biconical | 3110B | 9603-2315 | 12/14/2004 |
| HP | Amplifier, Pre | 8447D | 2944A10198 | 8/20/2004 |
| HP | Amplifier, Pre, Microwave | 8449B | 3147A00400 | 6/14/2004 |
| A. H. Systems | Antenna, Horn, DRG | SAS-200/571 | 261 | 4/20/2005 |
| HP | Generator, Signal | 83650B | 3614A00276 | 5/10/2005 |
| A.R.A. | Antenna, Horn | DRG-118/A | 1132 | 9/30/2003 |
| Wainwright | Filter, Band Reject | WRCG823/850-813/860-40/8SS | 2 | 8/11/2004 |
| Wainwright | Filter, Band Reject | WRCG1850/1910-1835/1925-40/8SS | 5 | 8/11/2004 |

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

Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 24° C |
| Relative Humidity: | 42% |
| ATM Pressure: | 1021mbar |

* The testing was performed by Daniel Deng on 2005-06-29.

Test Result

Up-link: -51.6 dB at 3760MHz

Down-link: -50.9 dB at 3920MHz

Spurious Emission : Uplink 30 MHZ - 20GHZ (TX) Mid Channel (1880 MHZ)

| Indicated | | Table | Test Antenna | | Substituted | | Antenna | Cable | Absolute | Limit | Margin |
|-----------|--------|--------|--------------|-------|-------------|-------|------------|-------|----------|-------|--------|
| Frequency | Ampl. | Angle | Height | Polar | Frequency | Level | Gain | Loss | Level | | |
| MHz | dBuV/m | Degree | Meter | H/V | MHz | dBm | Correction | dB | dBm | dBm | dB |
| 3760 | 43.5 | 0 | 1.5 | v | 3760 | -72.5 | 11.4 | 3.5 | -64.6 | -13 | -51.6 |
| 3760 | 42.8 | 0 | 1.4 | h | 3760 | -72.9 | 11.4 | 3.5 | -65.0 | -13 | -52.0 |
| 5640 | 41.4 | 0 | 1.5 | h | 5640 | -71.5 | 10.9 | 4.6 | -65.2 | -13 | -52.2 |
| 5640 | 41.6 | 30 | 1.5 | v | 5640 | -71.6 | 10.9 | 4.6 | -65.3 | -13 | -52.3 |

Spurious Emission : Downlink 30 MHZ - 20GHZ (TX) Mid Channel (1960 MHZ)

| Indicated | | Table | Test Antenna | | Substituted | | Antenna | Cable | Absolute | Limit | Margin |
|-----------|--------|--------|--------------|-------|-------------|-------|------------|-------|----------|-------|--------|
| Frequency | Ampl. | Angle | Height | Polar | Frequency | Level | Gain | Loss | Level | | |
| MHz | dBuV/m | Degree | Meter | H/V | MHz | dBm | Correction | dB | dBm | dBm | dB |
| 3920 | 44.3 | 0 | 1.4 | v | 3920 | -71.8 | 11.4 | 3.5 | -63.9 | -13 | -50.9 |
| 3920 | 44.1 | 330 | 1.5 | h | 3920 | -71.9 | 11.4 | 3.5 | -64.0 | -13 | -51.0 |
| 5880 | 41.9 | 90 | 1.5 | v | 5880 | -71.2 | 10.9 | 4.6 | -64.9 | -13 | -51.9 |
| 5880 | 41.5 | 0 | 1.5 | h | 5880 | -71.5 | 10.9 | 4.6 | -65.2 | -13 | -52.2 |

§24.238 – BAND EDGE

Applicable Standards

According to FCC §2.1049 and §24.238, when measuring the emission limits, carrier frequency shall be adjusted as close to the frequency block edges, both upper and lower.

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 |
|-----------------|--------------------|----------|---------------|------------|
| Rohde & Schwarz | Generator, Signal | SMIQ03 | 849192/0085 | 5/2/2005 |
| Rohde & Schwarz | I/O Modulation | AMIQ-K11 | 831038/0023 | 5/3/2005 |
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2004 |

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

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 23° C |
| Relative Humidity: | 40% |
| ATM Pressure: | 1018 mbar |

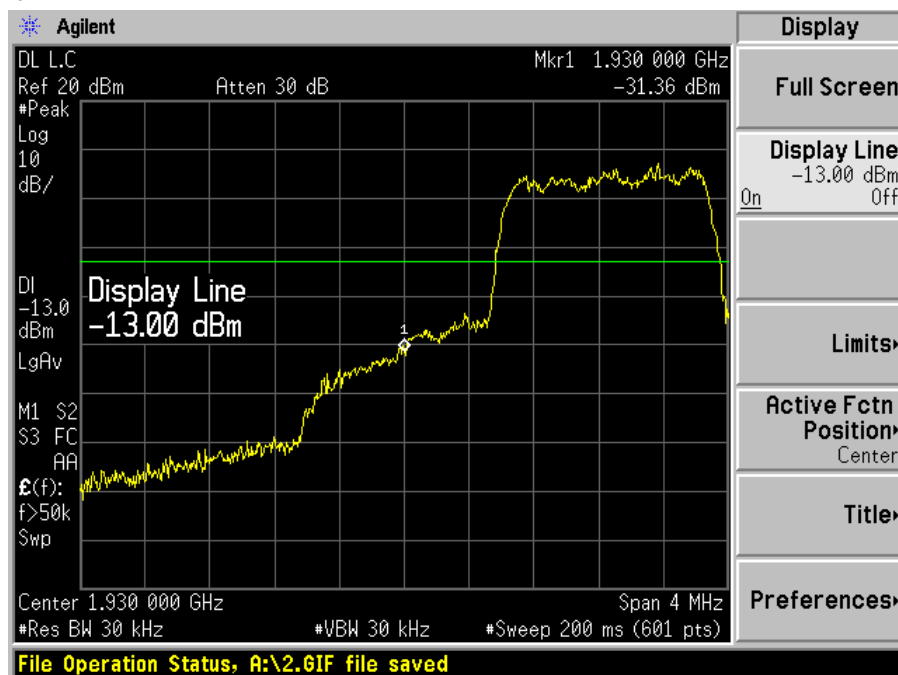
* *The testing was performed by Daniel Deng on 2005-06-28.*

Test Results

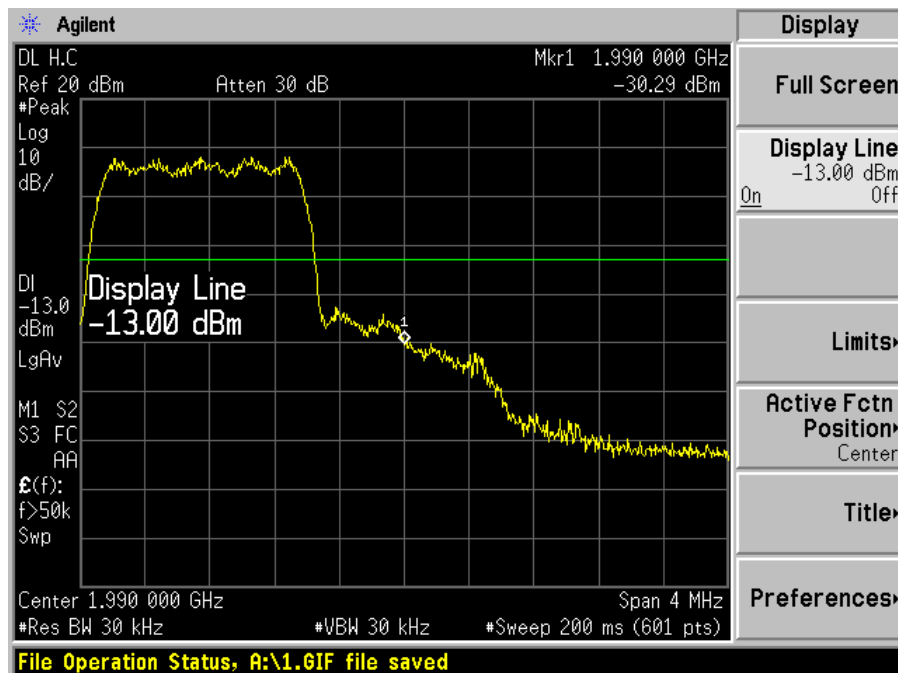
Please refer to plots hereinafter.

CDMA Downlink:

Low channel

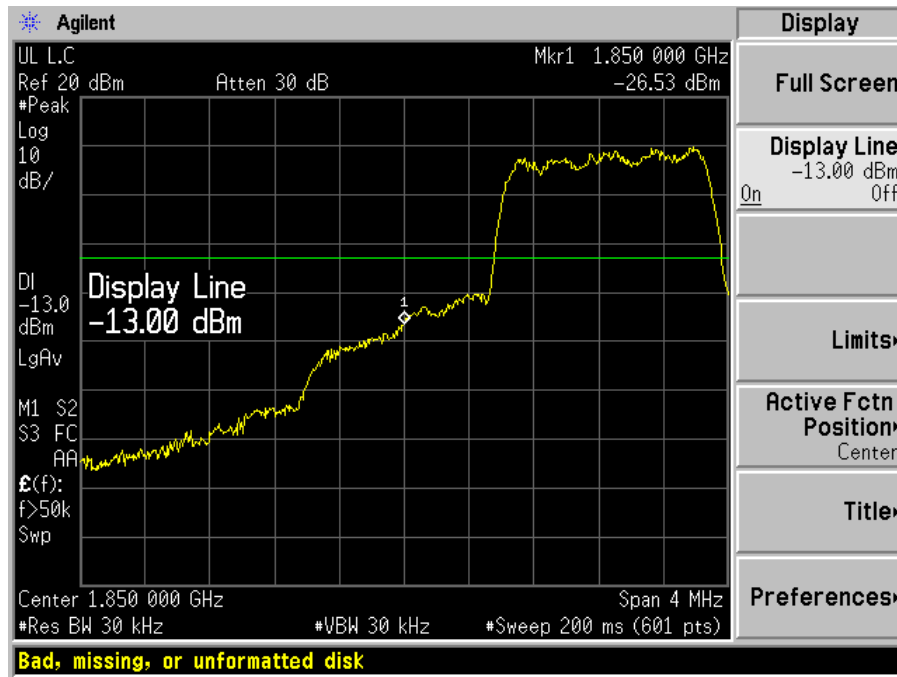


High channel

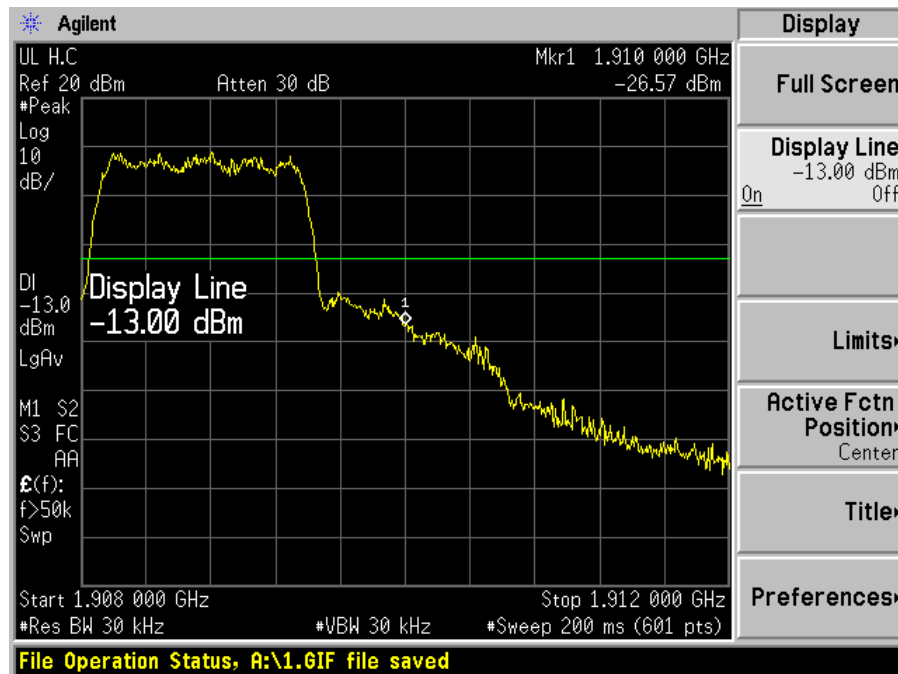


CDMA Uplink:

Low channel

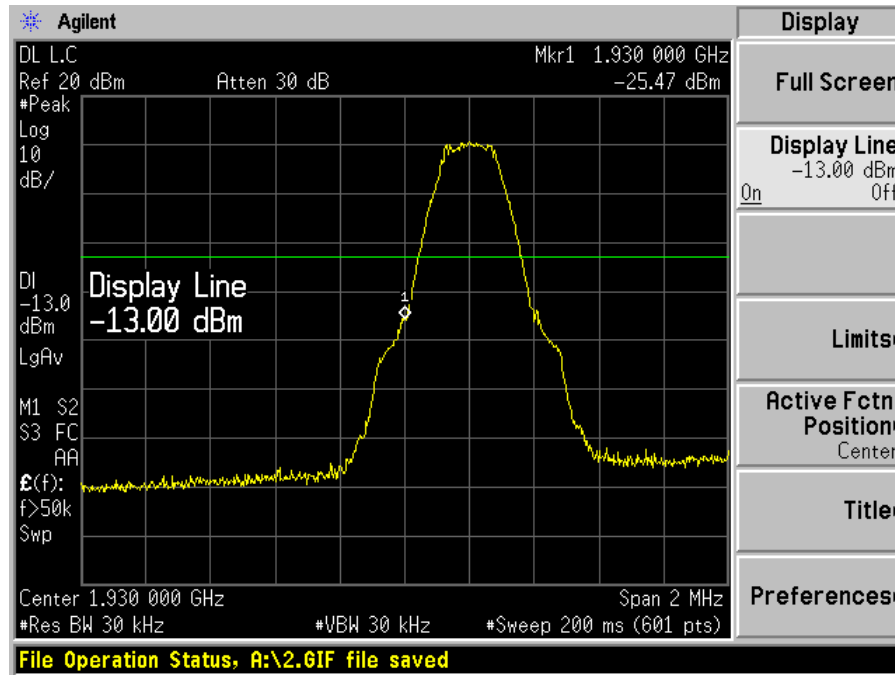


High channel

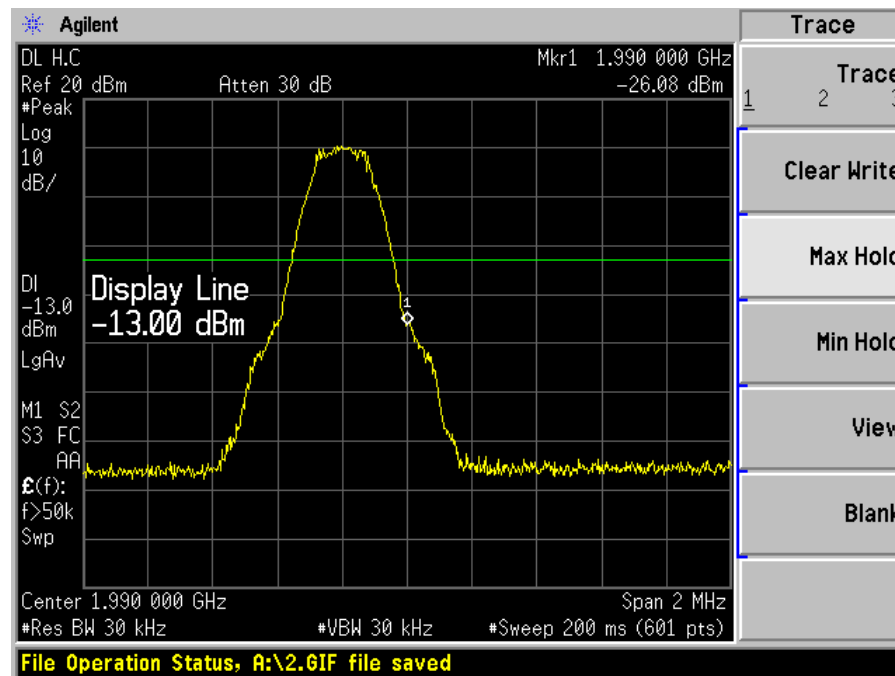


GSM Downlink:

Low Channel

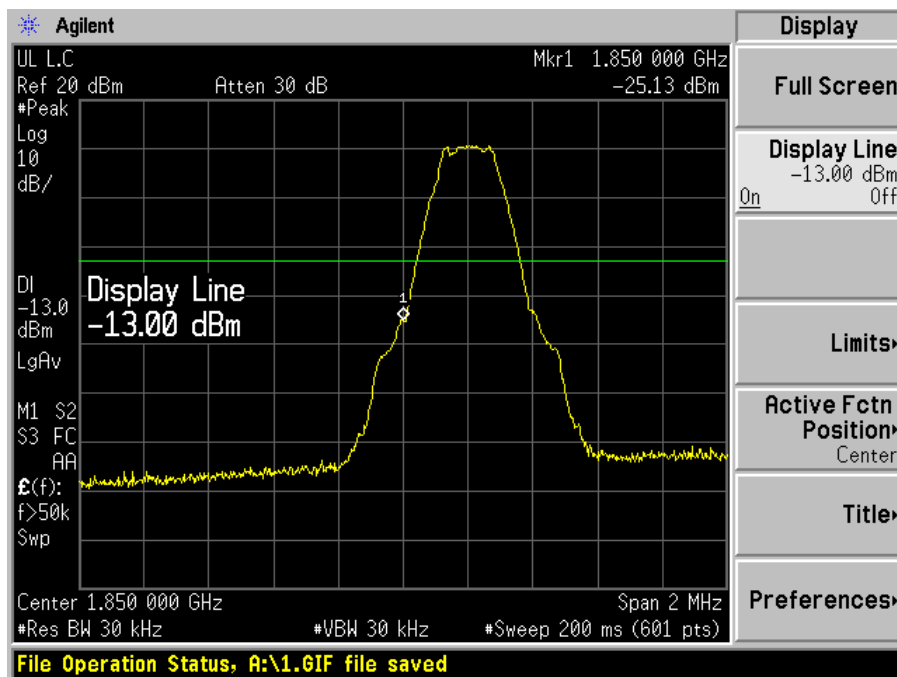


High Channel



GSM Uplink:

Low Channel



High Channel

