FCC PART 22H, 24E & 27

TEST AND MEASUREMENT REPORT

For

Cellphone-Mate, Inc.

48346 Milmont Drive,
Fremont, CA 94538, USA

FCC ID: RSNCMFLEX-T

Report Type:	Product Type:
Original Report	Cellular Amplifier

Prepared By: Lionel Lara

Report Number: R12102614-222427

Report Date: 2013-02-04

Reviewed By: Quinn Jiang, Test Engineer

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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R12102614-222427	Original Report	2013-02-04

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Cellphone-Mate, Inc.* and their product *FCC ID: RSNCMFLEX-T*, model: *CM-TriFlex-T,* which will henceforth be referred to as the EUT (Equipment Under Test). The EUT is a tri-band, bi-directional amplifier for enhancing the range of cell phones. A 50 Ω n-type connector is used for connecting both outside and inside antenna to the amplifier. The uplink frequency bands are: 824-849 MHz, 1850-1910 MHz, and 1710-1755 MHz. The downlink frequency bands are 869-894 MHz, 1930-1990 MHz, and 2110-2155 MHz. Modulation types are GSM, EDGE, CDMA/EVDO, WCDMA/HSPA, QPSK, 16QAM and 64QAM. The amplifier is contained in a metal case.

1.2 Mechanical Description

The EUT measures approximately 210 mm (L) x 160 mm (W) x 38 mm (H) and weighs 1400 g.

The test data gathered are from typical production sample, serial number: R12102614 assigned by BACL.

1.3 Objective

This type approval report is prepared on behalf of *Cellphone-Mate, Inc.* in accordance with Part 2, Subpart J, Part 22 Subpart H, Part 24 Subpart E and Part 27 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristics, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, 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 22 Subpart H - Public Mobile Services
Part 24 Subpart E – PCS
Part 27 - Miscellaneous Wireless Communications Services

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

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

1.6 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 CISPR16-4-2:2003, 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.

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 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 have 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 test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. 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 Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

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

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

2.2 EUT Exercise Software

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

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Cellphone-Mate, Inc.	PCB Board	SureCall# 3 bands 65 dB V1.0 2012.7.26	-

2.5 Local Support Equipment List and Details

N/A

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
ITE Power Supply	AC Adapter	S018BU1200150	T001U087230069673

2.7 Interface Ports and Cabling

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

3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1046, §22.913, §24.232, §27.50	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049, §22.917, §24.238, §27.53	Occupied Bandwidth	Compliant
§2.1053, §22.917, §24.238, §27.53	Spurious Radiated Emissions	Compliant
§2.1051, §22.917, §24.238, §27.53	Spurious Emissions at Antenna Terminals	Compliant
§22.917, §24.238, §27.53	Band Edge	Compliant
§2.1055	Frequency Stability	N/A
§2.1091	RF Exposure	Compliant

Note: NA, the unit is amplifier only device.

4 FCC §2.1046, §22.913, §24.232 & §27.50 – RF Output Power

4.1 Applicable Standard

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

According to FCC §24.232 , Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

According to FCC §27.50(d)(4), Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band are limited to 1 watt EIRP.

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 Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

4.4 Test Environmental Conditions

Temperature:	19ºC
Relative Humidity:	56%
ATM Pressure:	101.1kPa

The testing was performed by Lionel Lara on 2012-12-22 in the RF Site.

4.5 Test Results

Maximum Output Power – Modulated Signal

GSM/GPRS

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
GSM/GPRS	850 MHz Uplink	Low	824.2	-32.5	26.42
		Middle	836.6	-32.5	26.69
		High	848.8	-32.5	26.15
	850 MHz Downlink	Low	869.2	-37.5	23.02
		Middle	881.6	-42.5	22.71
		High	893.8	-40.5	22.32
	1900 MHz Uplink	Low	1850.2	-30.5	19.50
		Middle	1880.0	-35.5	21.78
		High	1909.8	-30.5	18.71
	1900 MHz Downlink	Low	1930.2	-38.5	15.58
		Middle	1960.0	-41.5	21.83
		High	1989.8	-39.5	22.62

EDGE

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
EDGE	850 MHz Uplink	Low	824.2	-35.5	27.31
		Middle	836.6	-34.5	27.59
		High	848.8	-33.5	27.40
	850 MHz Downlink	Low	869.2	-37.5	25.48
		Middle	881.6	-40.5	25.25
		High	893.8	-39.5	24.60
	1900 MHz Uplink	Low	1850.2	-31.5	21.43
		Middle	1880.0	-36.5	23.57
		High	1909.8	-31.5	20.62
	1900 MHz Downlink	Low	1930.2	-36.5	17.52
		Middle	1960.0	-39.5	23.75
		High	1989.8	-40.5	24.41

CDMA/EVDO

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
CDMA/EVDO	850 MHz Uplink	Low	824.80	-32.5	26.93
		Middle	836.52	-31.5	26.43
		High	848.20	-31.5	26.11
	850 MHz Downlink	Low	869.80	-38.5	22.39
		Middle	881.52	-37.5	22.25
		High	893.20	-38.5	21.72
	1900 MHz Uplink	Low	1850.8	-31.5	19.51
		Middle	1880.0	-36.5	21.06
		High	1909.2	-30.5	19.06
	1900 MHz Downlink	Low	1930.8	-37.5	15.24
		Middle	1960.0	-42.5	20.88
		High	1989.2	-38.5	22.28

WCDMA/HSPA

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA/HSPA	850 MHz Uplink	Low	826.4	-34.5	27.05
		Middle	836.4	-32.5	26.65
		High	846.6	-34.5	26.00
	850 MHz Downlink	Low	871.4	-40.5	22.52
		Middle	881.4	-39.5	22.15
		High	891.6	-37.5	22.00
	1900 MHz Uplink	Low	1852.4	-31.5	20.55
		Middle	1880.0	-35.5	21.66
		High	1907.6	-31.5	19.47
	1900 MHz Downlink	Low	1932.4	-39.5	16.27
		Middle	1960.0	-38.5	21.39
		High	1987.6	-40.5	22.38

AWS Band – Uplink

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
LTE Uplink 1710-1755 MHz	QPSK (1.4 MHz)	1711	-37	23.88
	QPSK (1.4 MHz)	1732	-38	22.98
	QPSK (1.4 MHz)	1754	-38	22.76
	16QAM (1.4 MHz)	1711	-37	23.88
	16QAM (1.4 MHz)	1732	-38	23.05
	16QAM (1.4 MHz)	1754	-38	22.78
	64QAM (1.4 MHz)	1711	-37	23.82
	64QAM (1.4 MHz)	1732	-38	22.91
	64QAM (1.4 MHz)	1754	-38	22.79
	QPSK (3 MHz)	1712	-37	23.83
	QPSK (3 MHz)	1732	-37	23.48
	QPSK (3 MHz)	1753	-37	23.59
	16QAM (3 MHz)	1712	-37	23.75
	16QAM (3 MHz)	1732	-37	23.52
	16QAM (3 MHz)	1753	-37	23.61
	64QAM (3 MHz)	1712	-37	23.71
	64QAM (3 MHz)	1732	-37	23.48
	64QAM (3 MHz)	1753	-37	23.52
	QPSK (5 MHz)	1713	-37	23.68
	QPSK (5 MHz)	1732	-37	23.51
	QPSK (5 MHz)	1752	-37	23.81
	16QAM (5 MHz)	1713	-37	23.60
	16QAM (5 MHz)	1732	-37	23.59
	16QAM (5 MHz)	1752	-37	23.80
	64QAM (5 MHz)	1713	-37	23.62
	64QAM (5 MHz)	1732	-37	23.60
	64QAM (5 MHz)	1752	-37	23.73
	QPSK (10 MHz)	1715	-37	23.31
	QPSK (10 MHz)	1732	-37	23.63
	QPSK (10 MHz)	1750	-38	23.82
	16QAM (10 MHz)	1715	-37	23.34
	16QAM (10 MHz)	1732	-37	23.64
	16QAM (10 MHz)	1750	-38	23.93
	64QAM (10 MHz)	1715	-37	23.38
	64QAM (10 MHz)	1732	-37	23.58
	64QAM (10 MHz)	1750	-38	23.90

AWS Band – Downlink

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
LTE Downlink 2110-2155 MHz	QPSK (1.4 MHz)	2111	-41	23.08
	QPSK (1.4 MHz)	2132	-41	22.82
	QPSK (1.4 MHz)	2154	-40	22.11
	16QAM (1.4 MHz)	2111	-41	23.11
	16QAM (1.4 MHz)	2132	-41	22.81
	16QAM (1.4 MHz)	2154	-40	22.14
	64QAM (1.4 MHz)	2111	-41	23.05
	64QAM (1.4 MHz)	2132	-41	22.76
	64QAM (1.4 MHz)	2154	-40	22.10
	QPSK (3 MHz)	2112	-40	23.02
	QPSK (3 MHz)	2132	-41	22.83
	QPSK (3 MHz)	2153	-40	22.19
	16QAM (3 MHz)	2112	-40	23.08
	16QAM (3 MHz)	2132	-41	22.71
	16QAM (3 MHz)	2153	-40	22.10
	64QAM (3 MHz)	2112	-40	23.02
	64QAM (3 MHz)	2132	-41	22.70
	64QAM (3 MHz)	2153	-40	22.13
	QPSK (5 MHz)	2113	-40	23.16
	QPSK (5 MHz)	2132	-41	22.89
	QPSK (5 MHz)	2152	-41	22.12
	16QAM (5 MHz)	2113	-40	23.18
	16QAM (5 MHz)	2132	-41	22.85
	16QAM (5 MHz)	2152	-41	22.15
	64QAM (5 MHz)	2113	-40	23.10
	64QAM (5 MHz)	2132	-41	22.76
	64QAM (5 MHz)	2152	-41	22.21
	QPSK (10 MHz)	2115	-39	23.13
	QPSK (10 MHz)	2132	-41	22.81
	QPSK (10 MHz)	2150	-41	22.31
	16QAM (10 MHz)	2115	-39	23.05
	16QAM (10 MHz)	2132	-41	22.82
	16QAM (10 MHz)	2150	-41	22.42
	64QAM (10 MHz)	2115	-39	23.18
	64QAM (10 MHz)	2132	-41	22.79
	64QAM (10 MHz)	2150	-41	22.35

AWS Band

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA/HSPA	1700 MHz Uplink	Low	1712.4	-37	23.90
		Middle	1732.4	-37	23.74
		High	1752.6	-37	23.85
	2100 MHz Downlink	Low	2112.4	-40	23.30
		Middle	2132.4	-40	23.13
		High	2152.6	-41	22.19

5 FCC §2.1049, §22.917, §24.238 & §27.53 - Occupied Bandwidth

5.1 Applicable Standard

Requirements: FCC §2.1049, §22.917, §24.238 and §27.53.

5.2 Test Procedure

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

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

5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

5.4 Test Environmental Conditions

Temperature:	19ºC
Relative Humidity:	59%
ATM Pressure:	101.2kPa

The testing was performed by Lionel Lara on 2012-12-26 in the RF Site.

5.5 Test Results

Please refer to the following tables and plots.

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
GSM	850 MHz Uplink	Middle	836.6	247.8735	243.7385
	850 MHz Downlink	Middle	881.6	245.2798	245.1900
	1900 MHz Uplink	Middle	1880.0	245.5391	244.5796
	1900 MHz Downlink	Middle	1960.0	242.3551	243.7430

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
EDGE	850 MHz Uplink	Middle	836.6	245.8406	246.0465
	850 MHz Downlink	Middle	881.6	245.9861	245.8992
	1900 MHz Uplink	Middle	1880.0	245.1580	248.2955
	1900 MHz Downlink	Middle	1960.0	246.0830	243.6564

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
CDMA	850 MHz Uplink	Middle	836.52	1269.8	1268.2
	850 MHz Downlink	Middle	881.52	1262.7	1259.2
	1900 MHz Uplink	Middle	1880.0	1252.0	1261.6
	1900 MHz Downlink	Middle	1960.0	1266.2	1263.9

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
WCDMA	850 MHz Uplink	Middle	836.4	4166.1	4236.5
	850 MHz Downlink	Middle	881.4	4176.3	4120.6
	1900 MHz Uplink	Middle	1880.0	4167.8	4167.2
	1900 MHz Downlink	Middle	1960.0	4179.5	4185.2

AWS Band – Uplink

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Uplink 1710-1755 MHz	QPSK (1.4 MHz)	1732	1.1026	1.0907
	16QAM (1.4 MHz)	1732	1.1024	1.0920
	64QAM (1.4 MHz)	1732	1.1006	1.0892
	QPSK (3 MHz)	1732	2.7008	2.6841
	16QAM (3 MHz)	1732	2.7062	2.6997
	64QAM (3 MHz)	1732	2.7056	2.6979
	QPSK (5 MHz)	1732	4.4975	4.4782
	16QAM (5 MHz)	1732	4.4983	4.4704
	64QAM (5 MHz)	1732	4.4963	4.4796
	QPSK (10 MHz)	1732	8.9683	8.9616
	16QAM (10 MHz)	1732	8.9723	8.9620
	64QAM (10 MHz)	1732	8.9714	8.9752

AWS Band – Downlink

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 2110-2155 MHz	QPSK (1.4 MHz)	2132	1.1051	1.1130
	16QAM (1.4 MHz)	2132	1.1042	1.1120
	64QAM (1.4 MHz)	2132	1.1043	1.1094
	QPSK (3 MHz)	2132	2.7050	2.7058
	16QAM (3 MHz)	2132	2.7045	2.7092
	64QAM (3 MHz)	2132	2.7077	2.7094
	QPSK (5 MHz)	2132	4.4958	4.5008
	16QAM (5 MHz)	2132	4.4957	4.4956
	64QAM (5 MHz)	2132	4.4948	4.5042
	QPSK (10 MHz)	2132	8.9849	8.9852
	16QAM (10 MHz)	2132	8.9901	8.9954
	64QAM (10 MHz)	2132	8.9901	8.9836

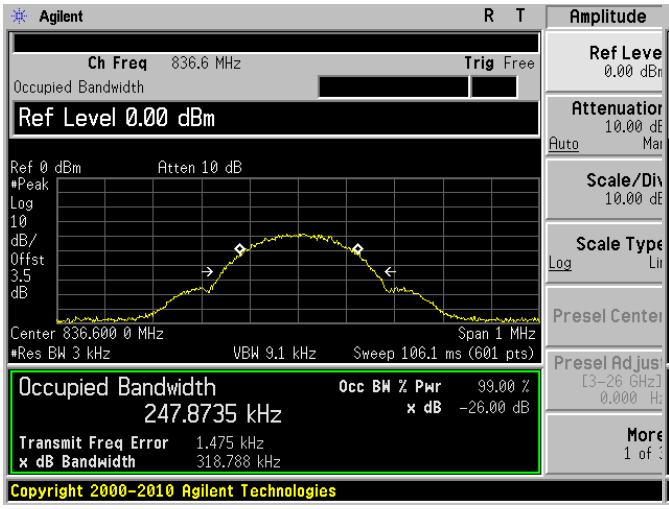
AWS Band

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
WCDMA/HSPA	1700 MHz Uplink	Middle	1732.4	4.1616	4.2000
	2100 MHz Downlink	Middle	2132.4	4.1732	4.1923

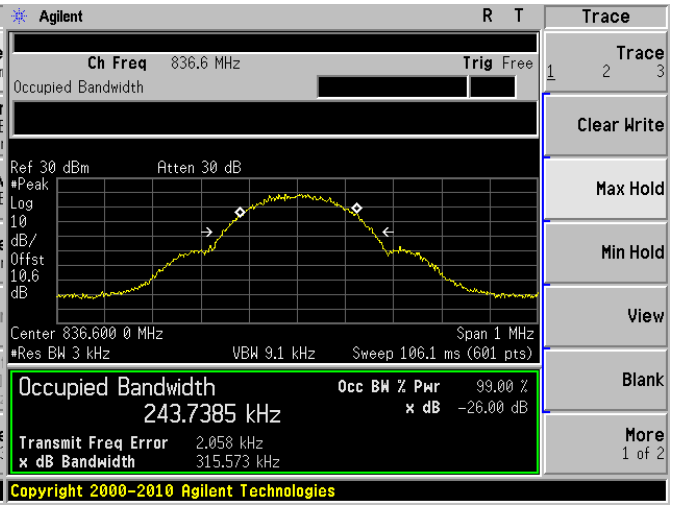
Cell Band, Uplink:

GSM/GPRS (Middle Channel)

Input

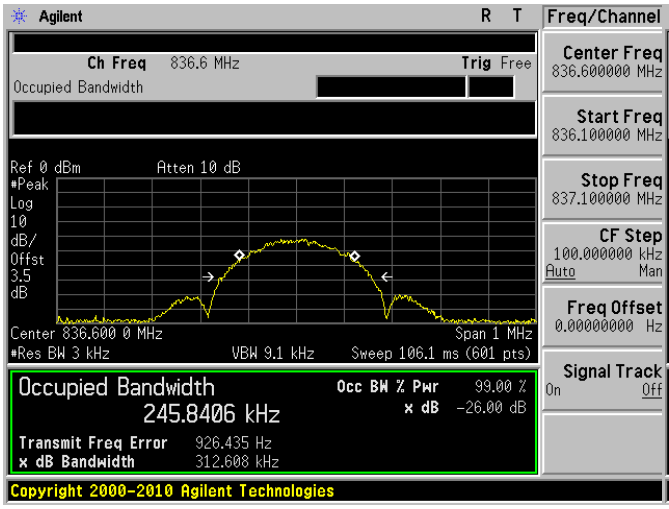


Output

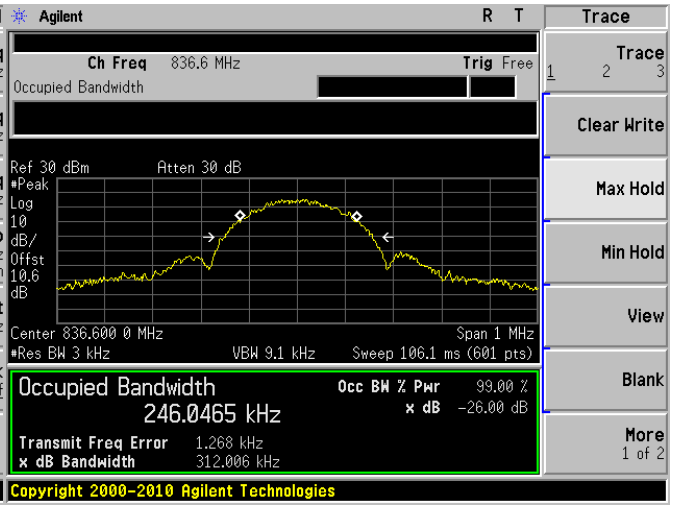


EDGE (Middle Channel)

Input

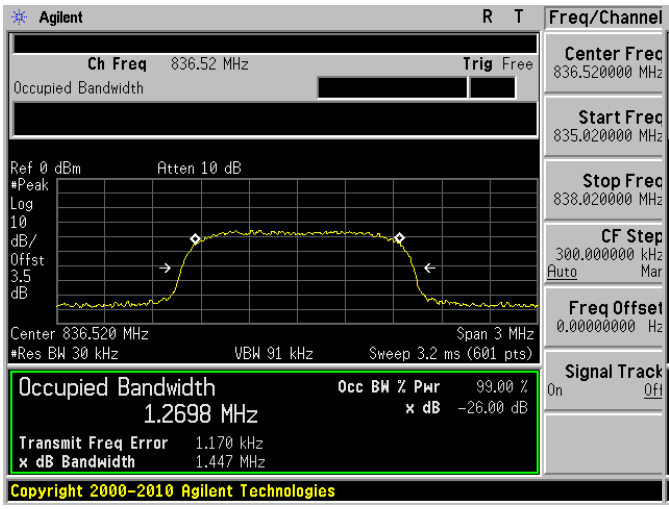


Output

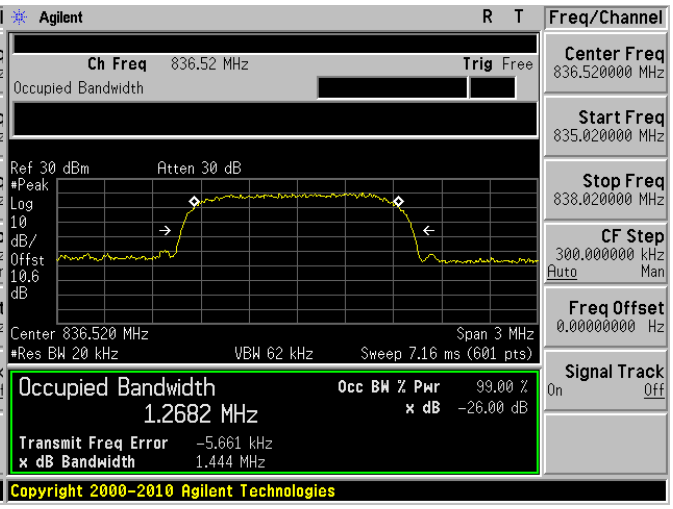


CDMA/EVDO (Middle Channel)

Input

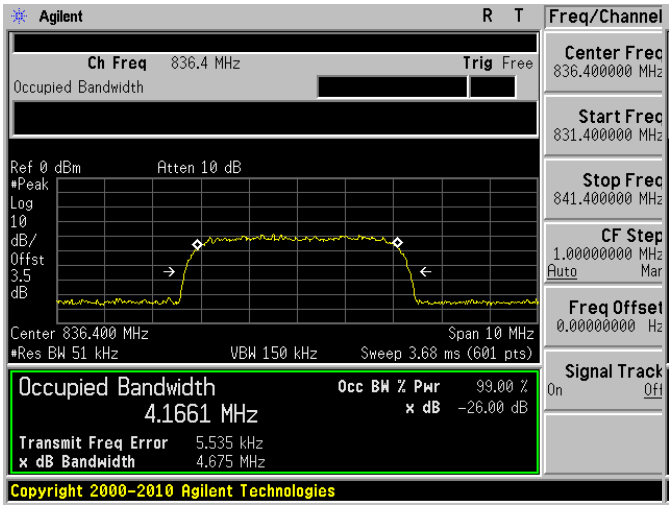


Output

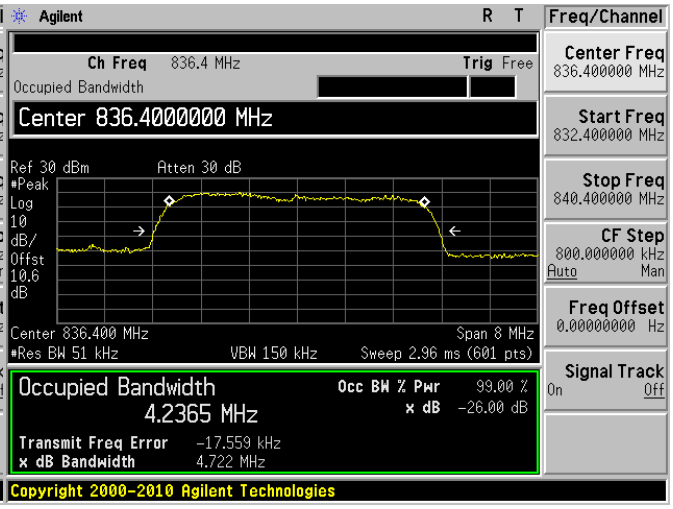


WCDMA/HSPA (Middle Channel)

Input



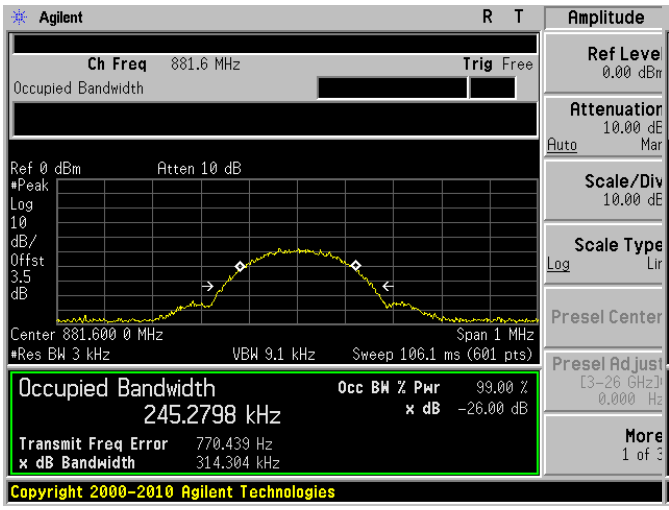
Output



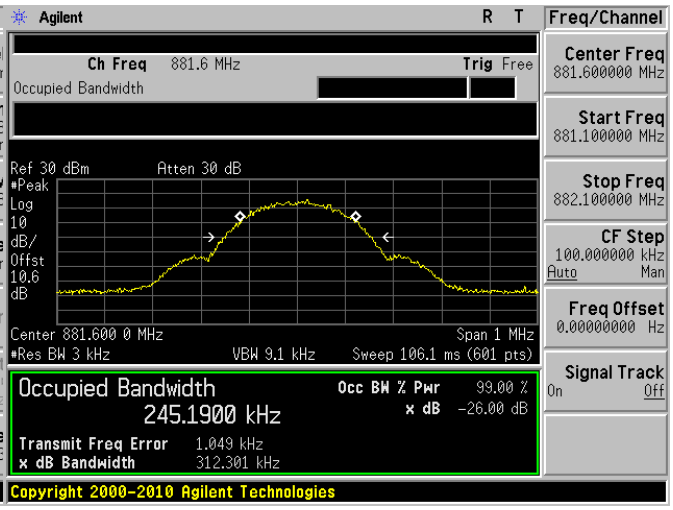
Cell Band, Downlink:

GSM/GPRS (Middle Channel)

Input

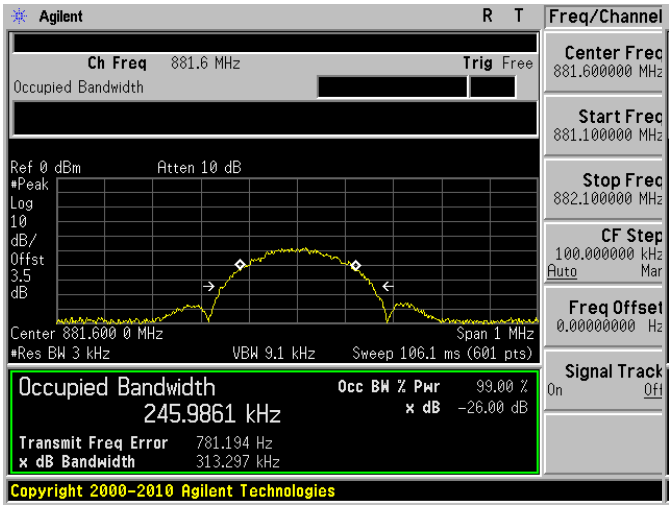


Output

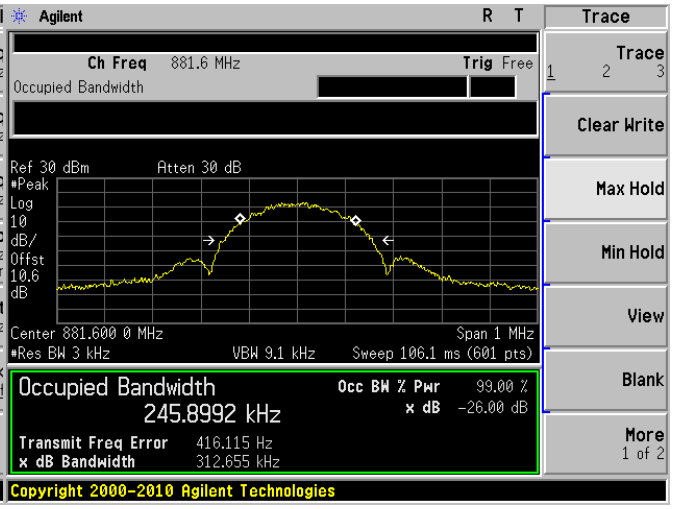


EDGE (Middle Channel)

Input

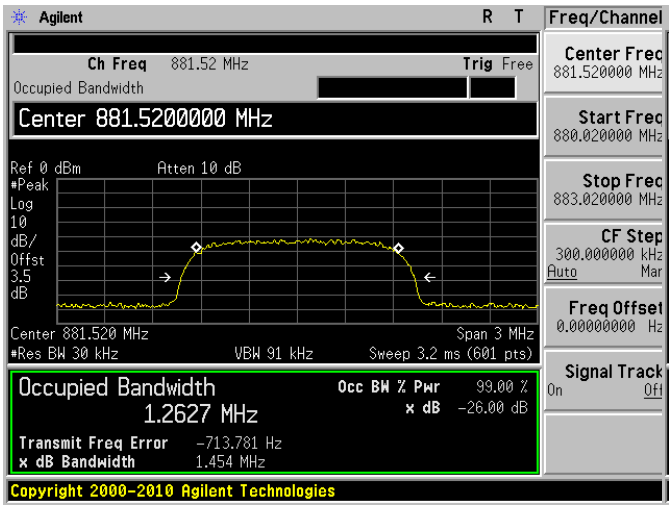


Output

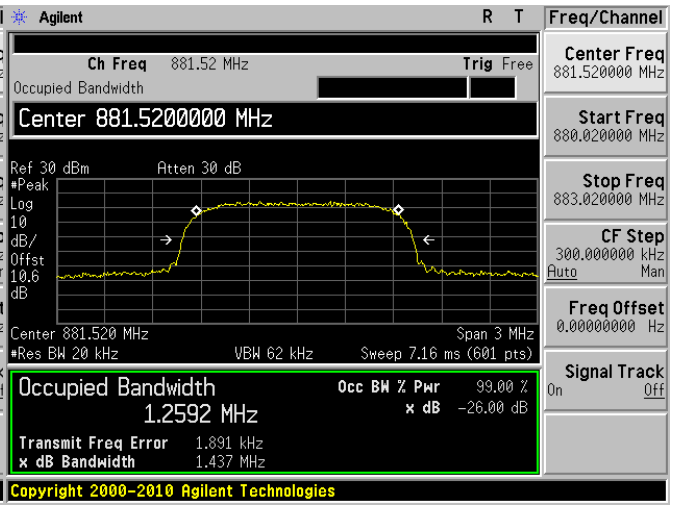


CDMA/EVDO (Middle Channel)

Input

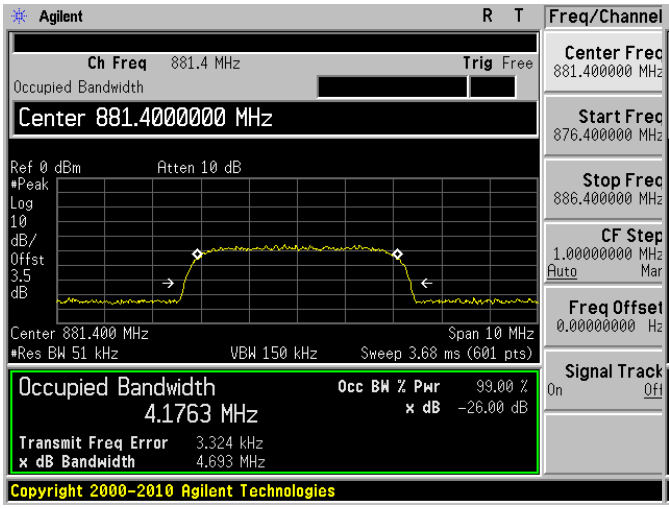


Output

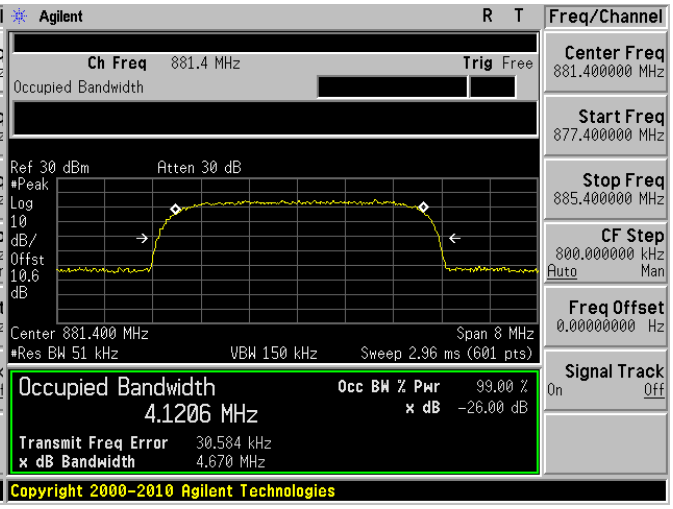


WCDMA/HSPA (Middle Channel)

Input



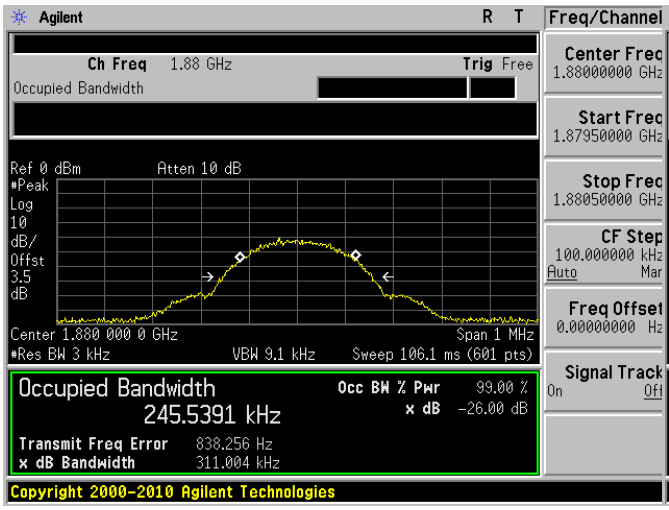
Output



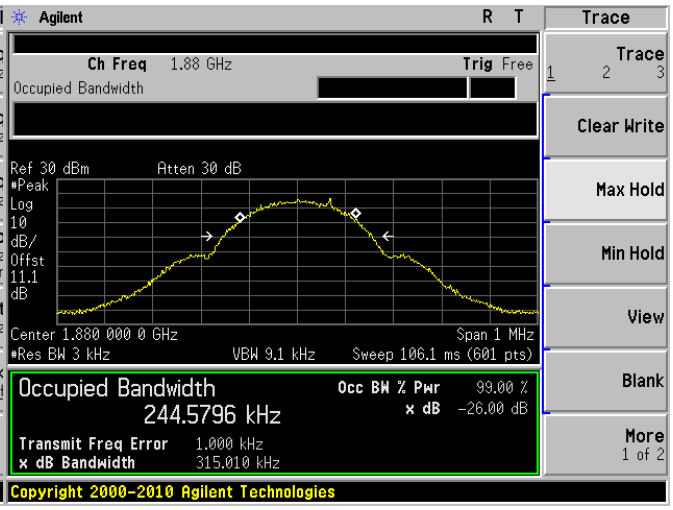
PCS Band, Uplink:

GSM/GPRS (Middle Channel)

Input

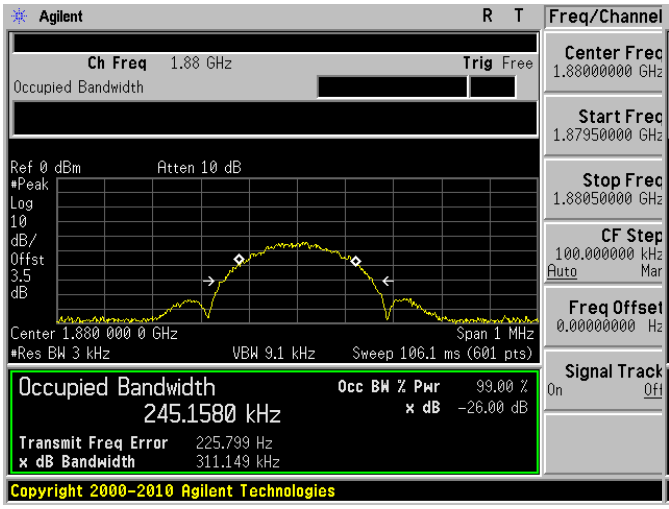


Output

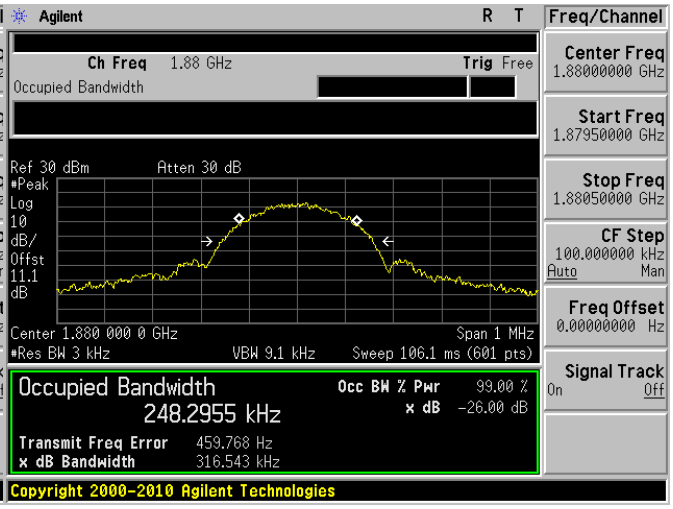


EDGE (Middle Channel)

Input

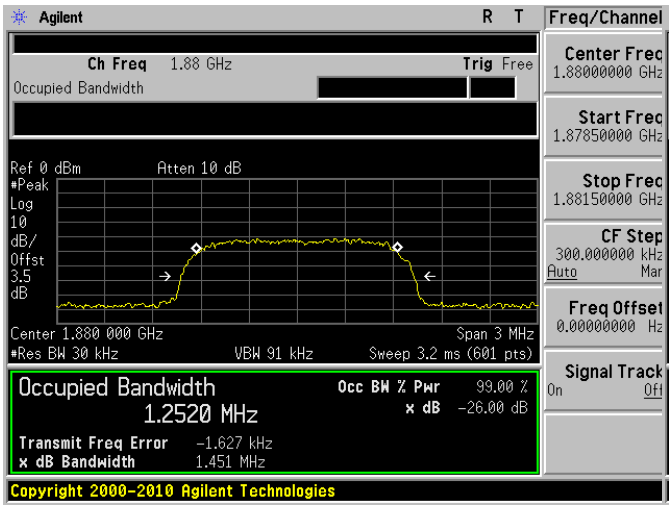


Output

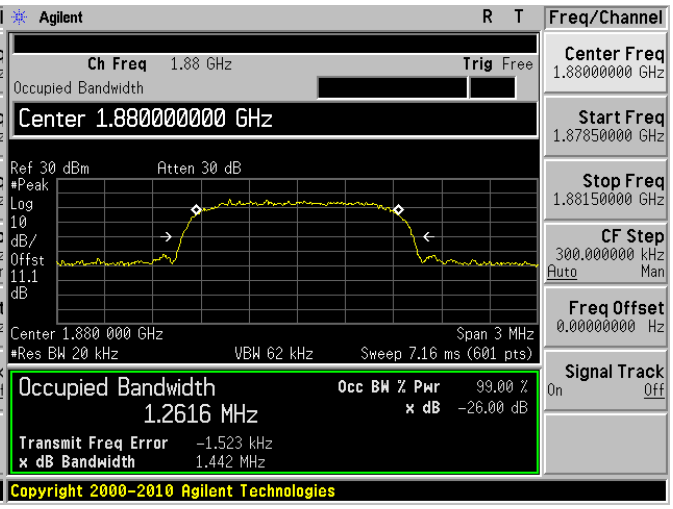


CDMA/EVDO (Middle Channel)

Input

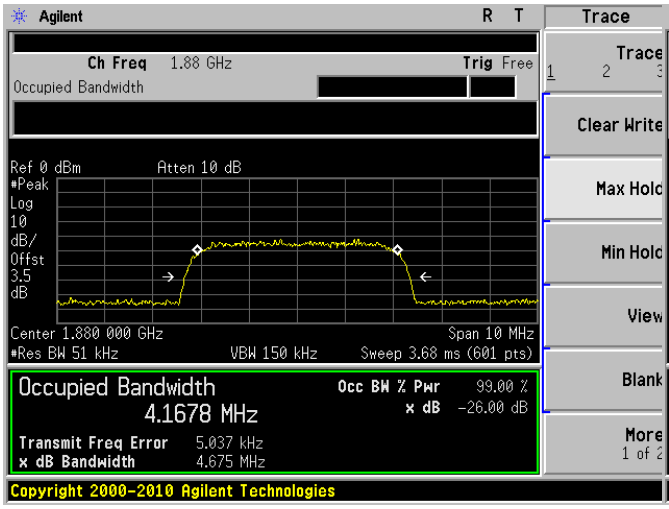


Output

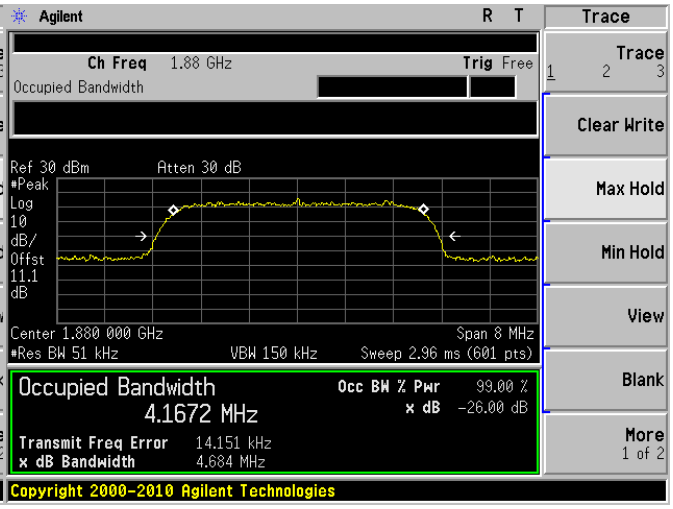


WCDMA/HSPA (Middle Channel)

Input



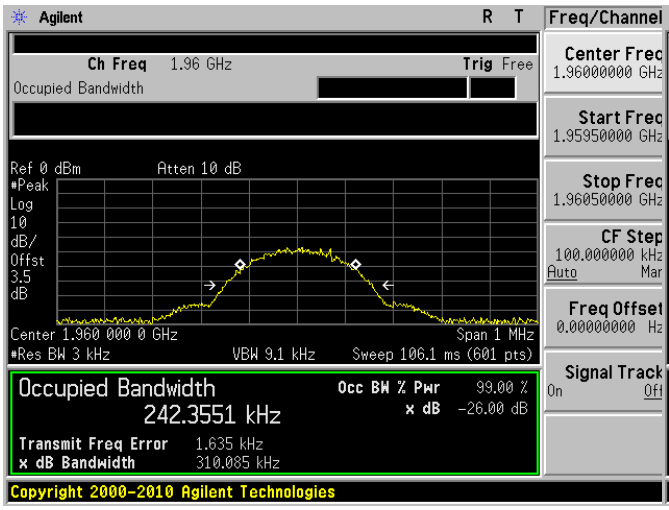
Output



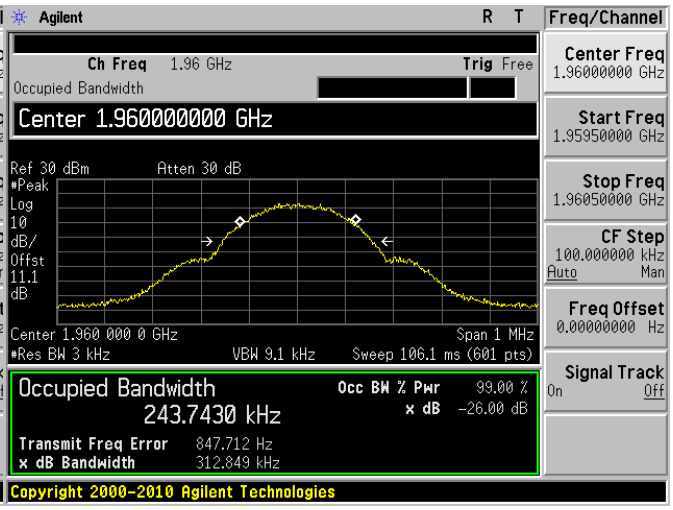
PCS Band, Downlink:

GSM/GPRS (Middle Channel)

Input

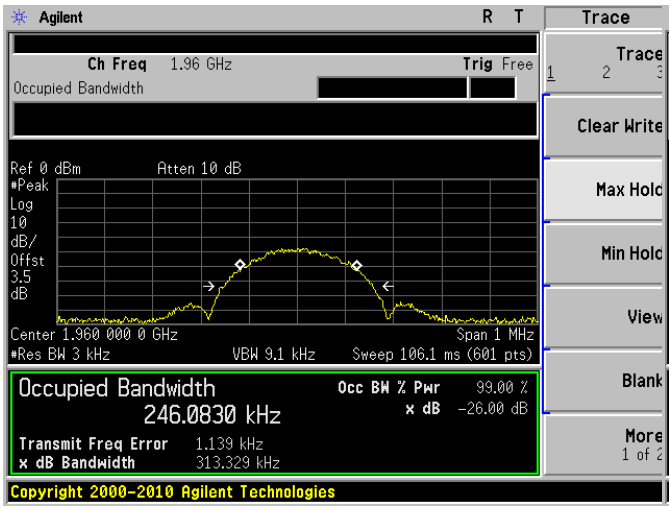


Output

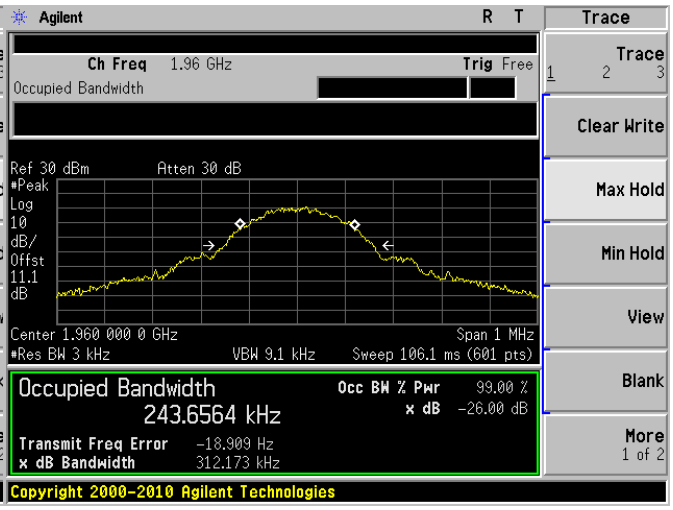


EDGE (Middle Channel)

Input

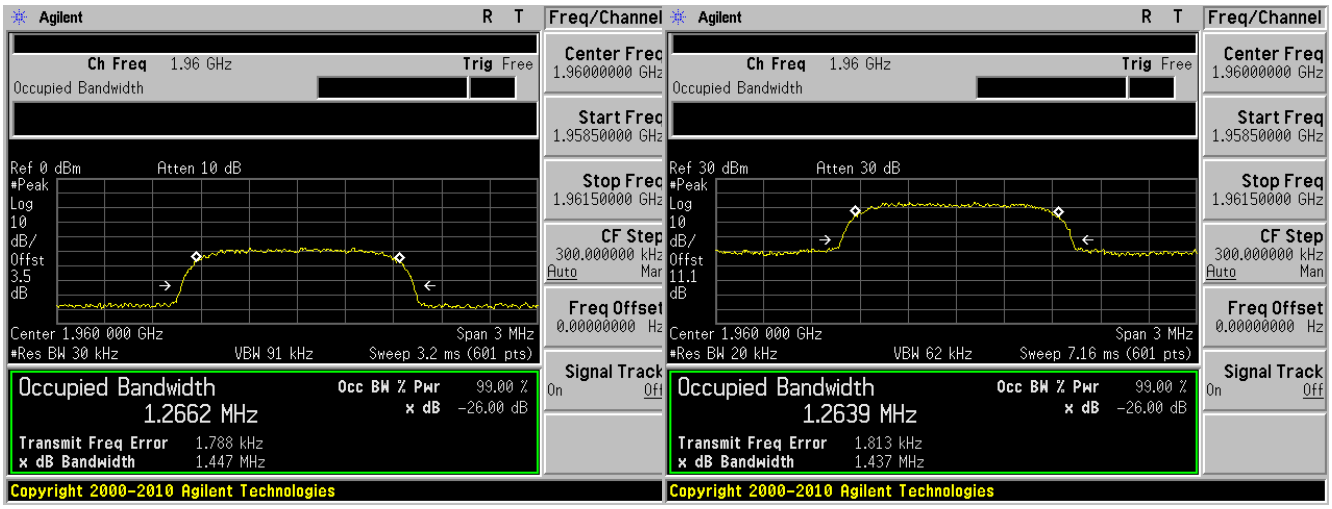


Output



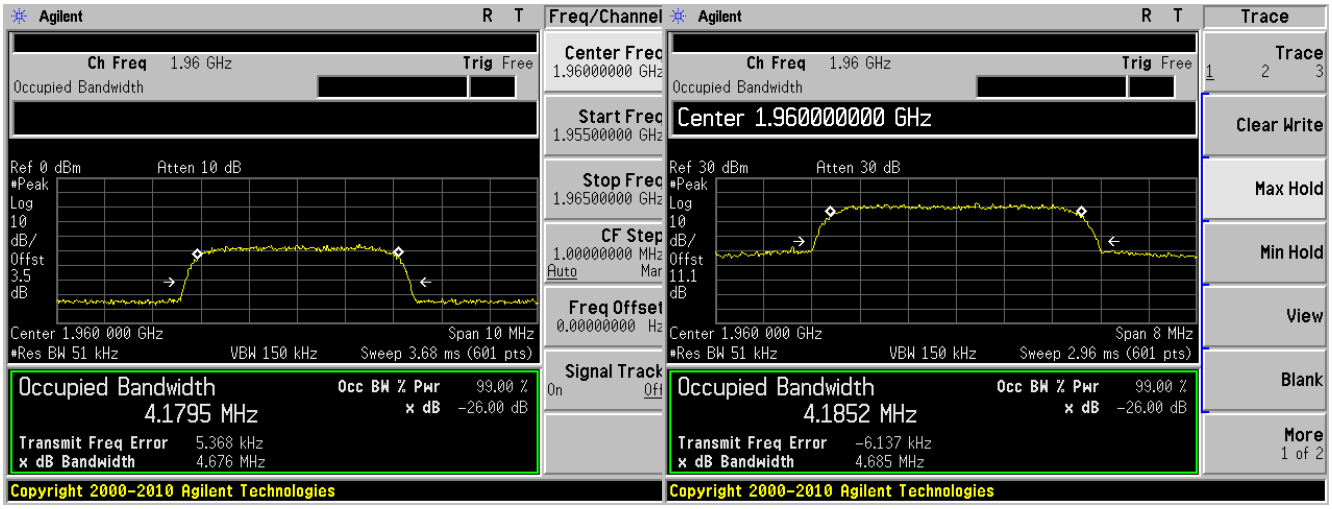
CDMA/EVDO (Middle Channel)

Input Output



WCDMA/HSPA (Middle Channel)

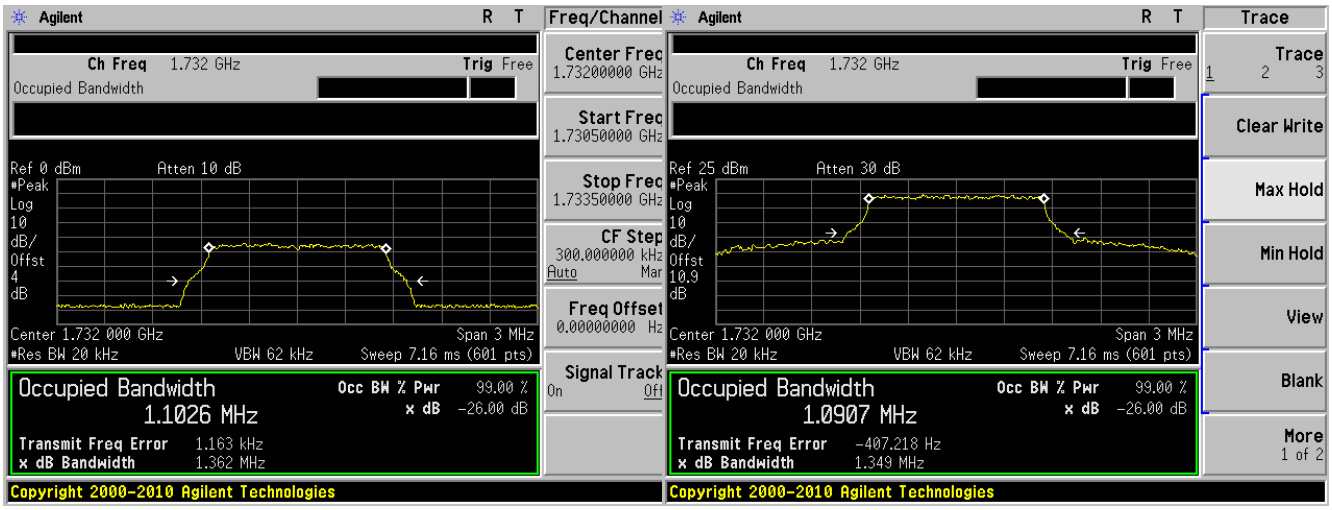
Input Output



AWS Band; UL: 1710-1755 MHz

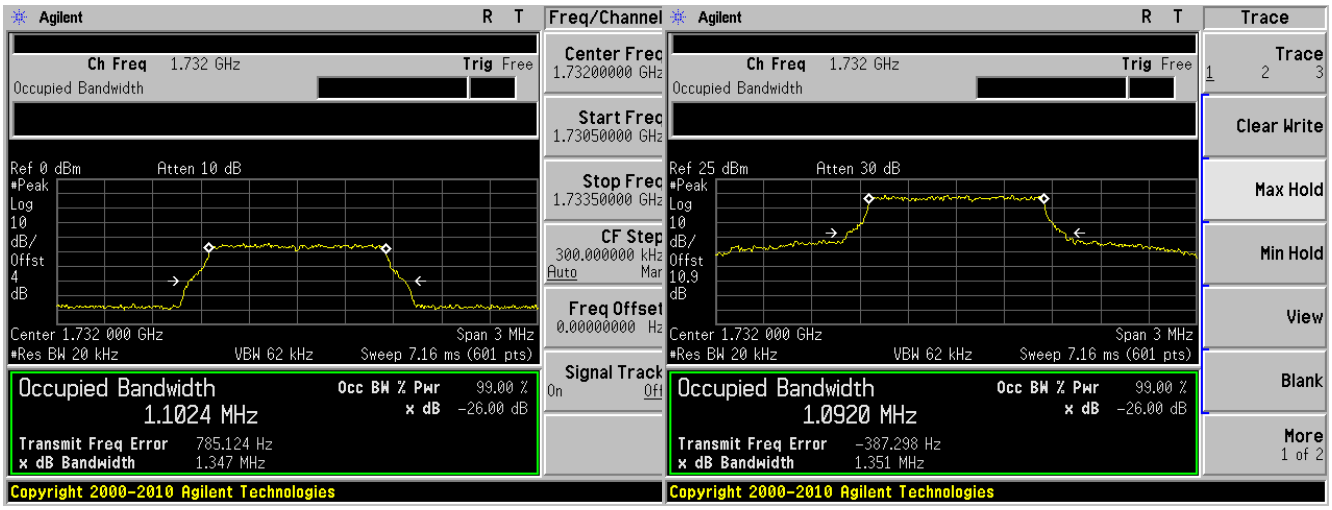
QPSK (1.4 MHz), (Middle Channel)

Input Output



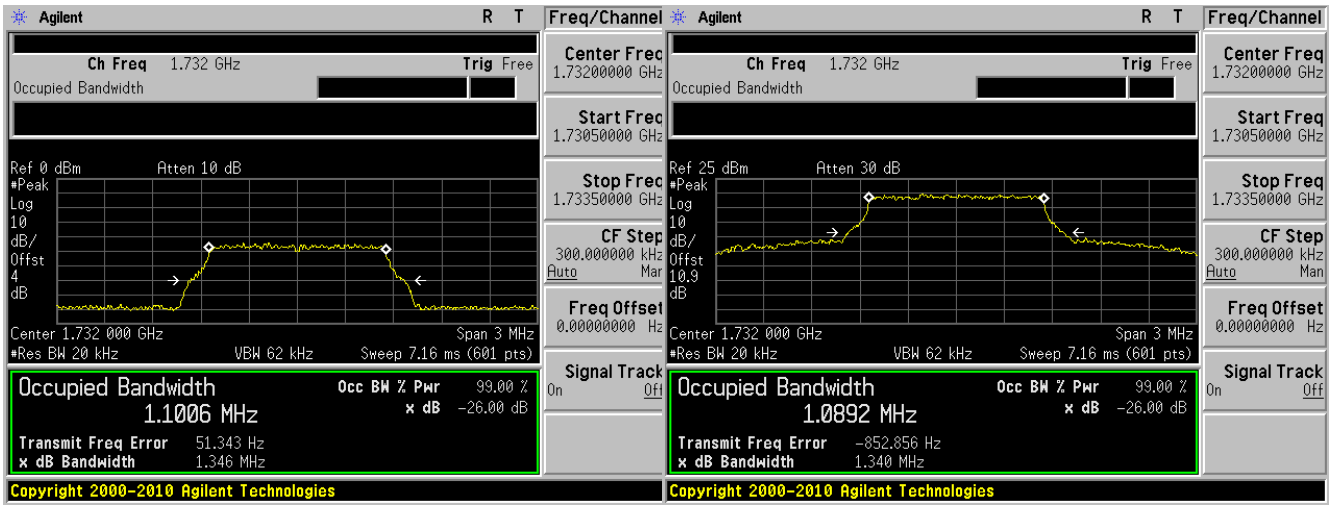
16QAM (1.4 MHz), (Middle Channel)

Input Output



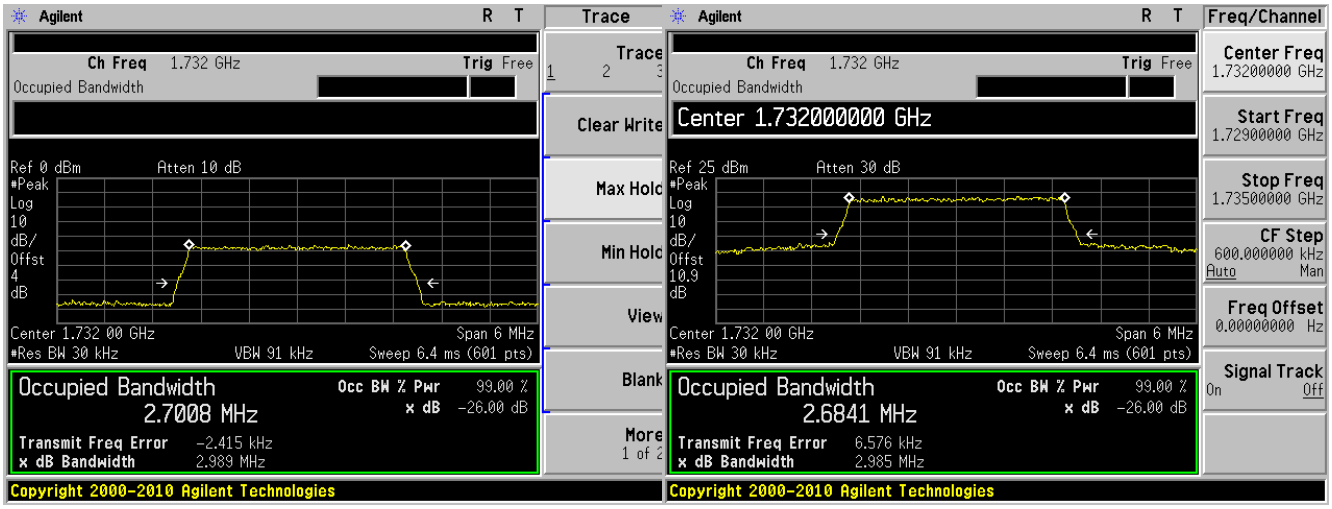
64QAM (1.4 MHz), (Middle Channel)

Input Output



QPSK (3 MHz), (Middle Channel)

Input Output

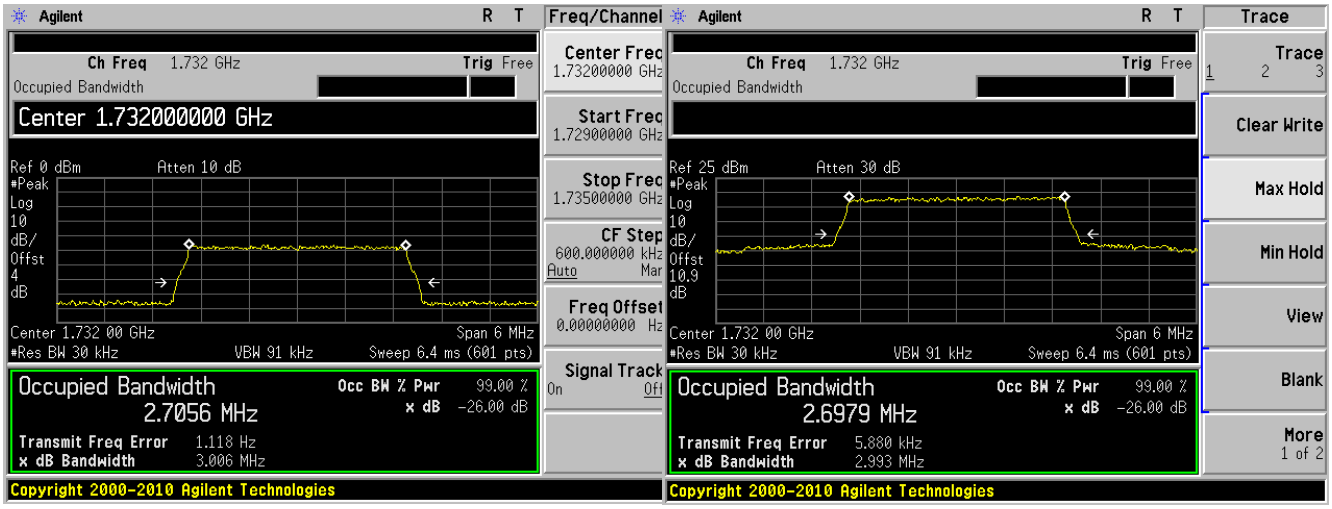


16QAM (3 MHz), (Middle Channel)

Input Output

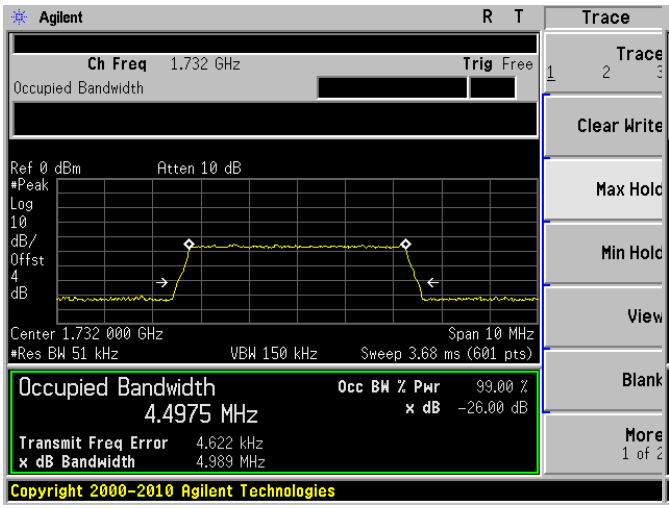
64QAM (3 MHz), (Middle Channel)

Input Output

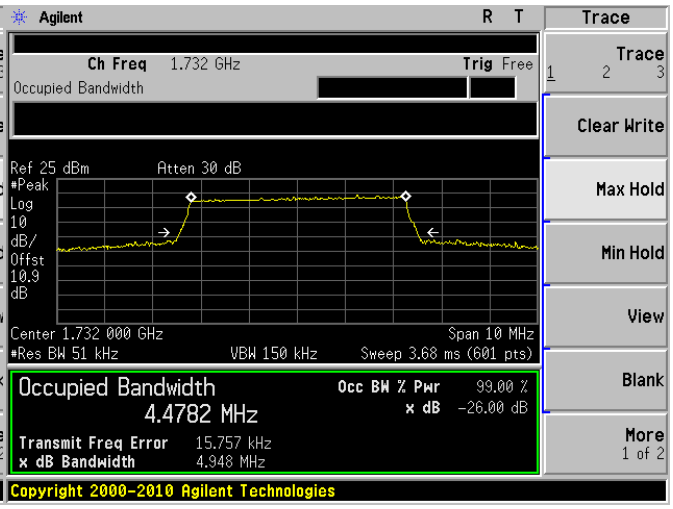


QPSK (5 MHz), (Middle Channel)

Input

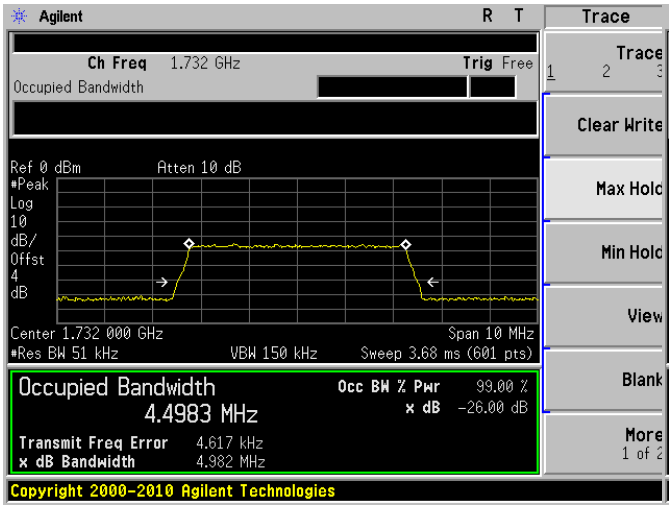


Output

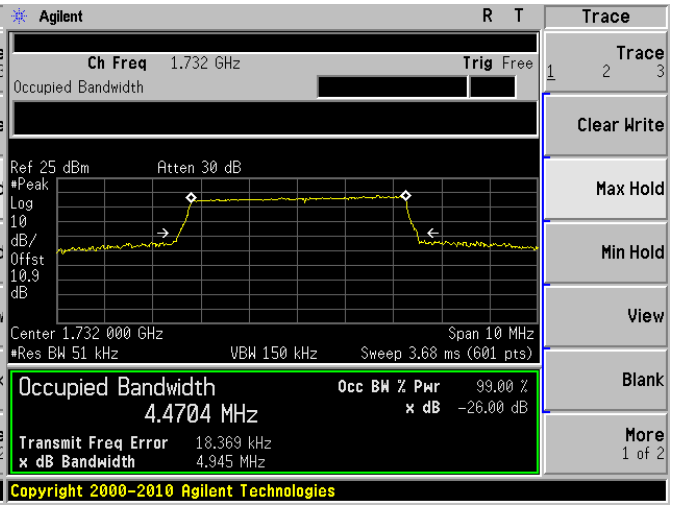


16QAM (5 MHz), (Middle Channel)

Input



Output



64QAM (5 MHz), (Middle Channel)

Input Output

QPSK (10 MHz), (Low Channel)

Input Output

16QAM (10 MHz), (Low Channel)

Input Output

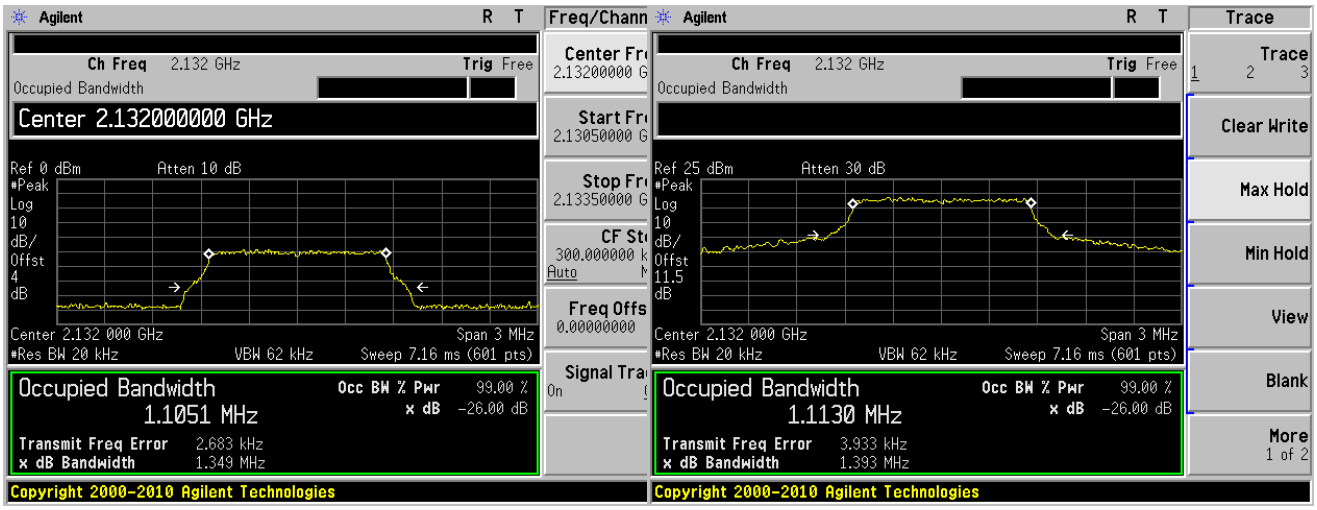
64QAM (10 MHz), (Low Channel)

Input Output

AWS Band; DL: 2110-2155 MHz

QPSK (1.4 MHz), (Middle Channel)

Input Output

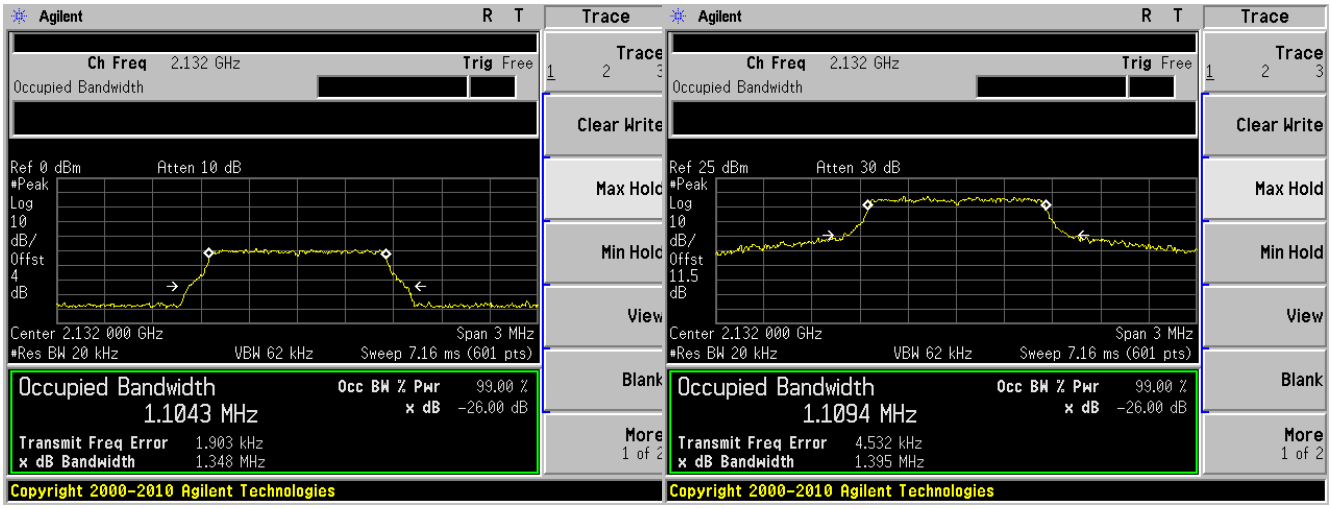


16QAM (1.4 MHz), (Middle Channel)

Input Output

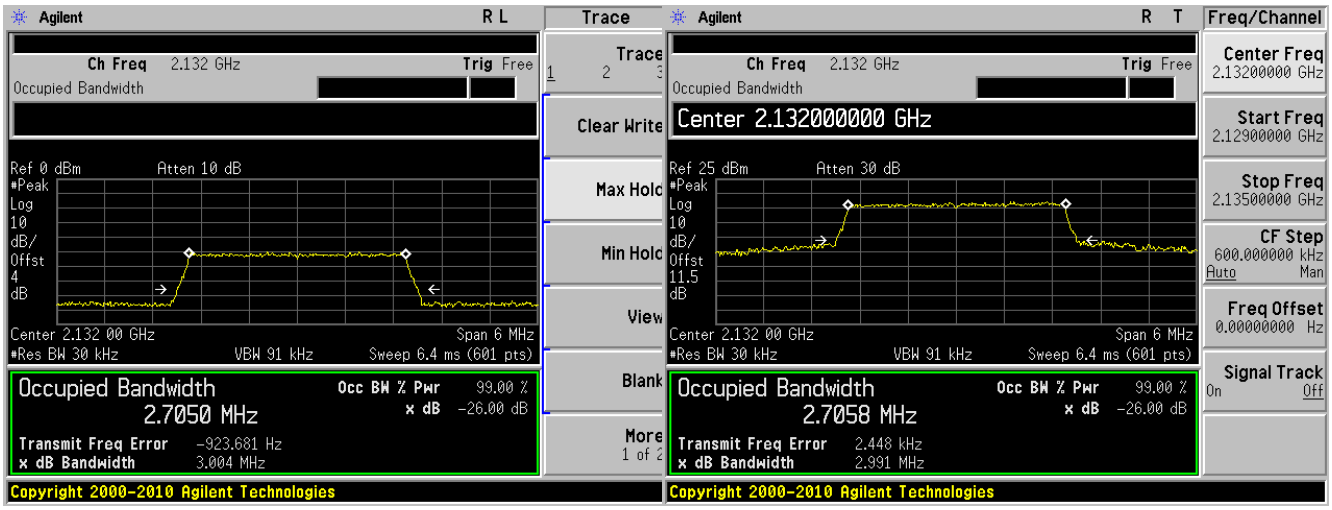
64QAM (1.4 MHz), (Middle Channel)

Input Output



QPSK (3 MHz), (Middle Channel)

Input Output



16QAM (3 MHz), (Middle Channel)

Input Output

64QAM (3 MHz), (Middle Channel)

Input Output

QPSK (5 MHz), (Middle Channel)

Input Output

16QAM (5 MHz), (Middle Channel)

Input Output

64QAM (5 MHz), (Middle Channel)

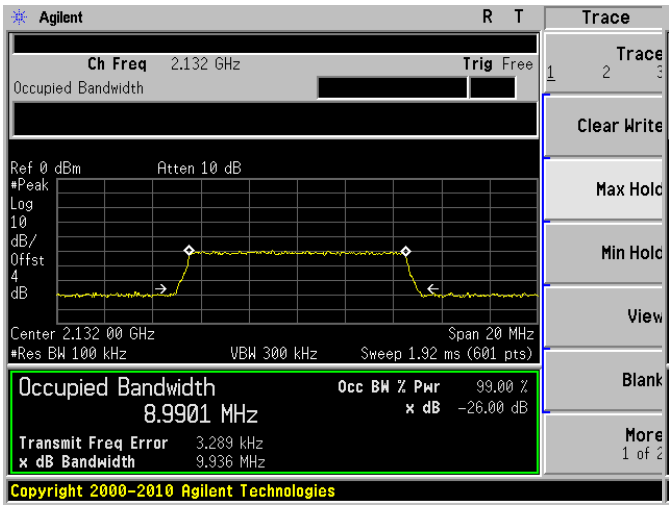
Input Output

QPSK (10 MHz), (Middle Channel)

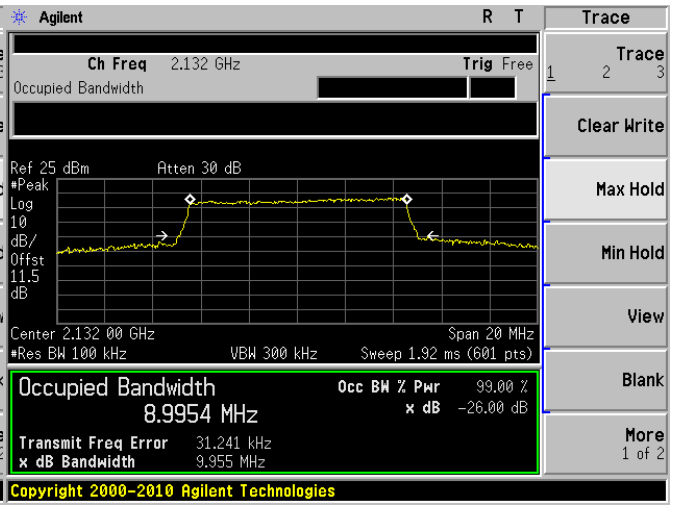
Input Output

16QAM (10 MHz), (Middle Channel)

Input

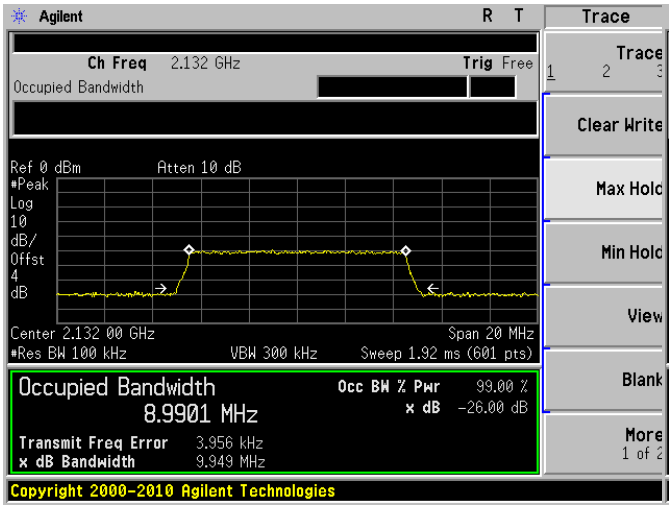


Output

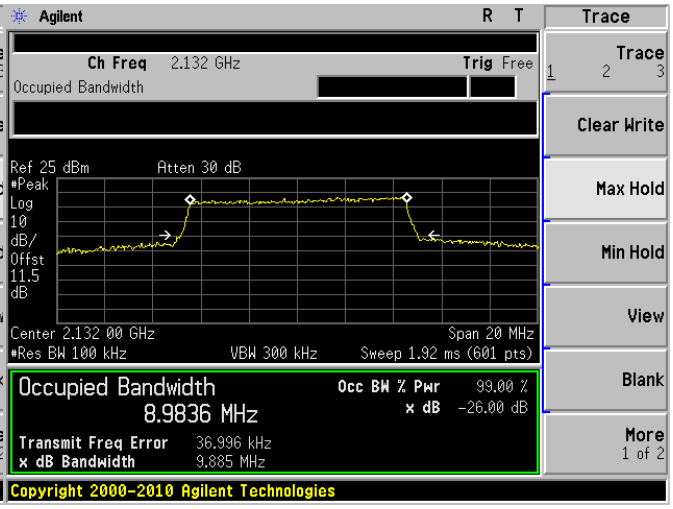


64QAM (10 MHz), (Middle Channel)

Input



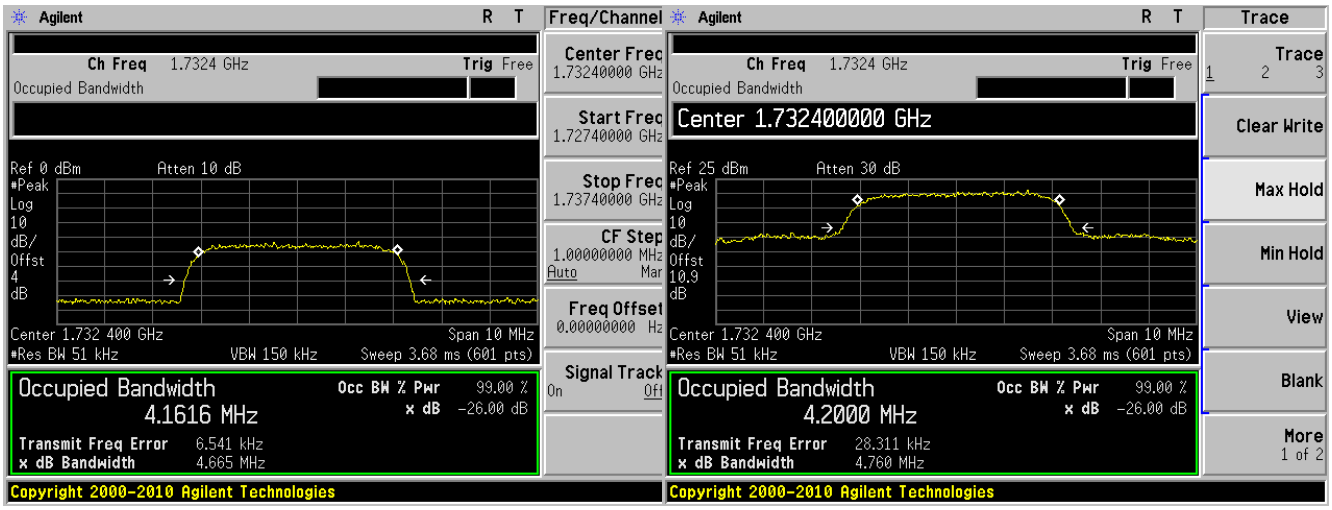
Output



AWS Band, Uplink:

WCDMA (Middle Channel)

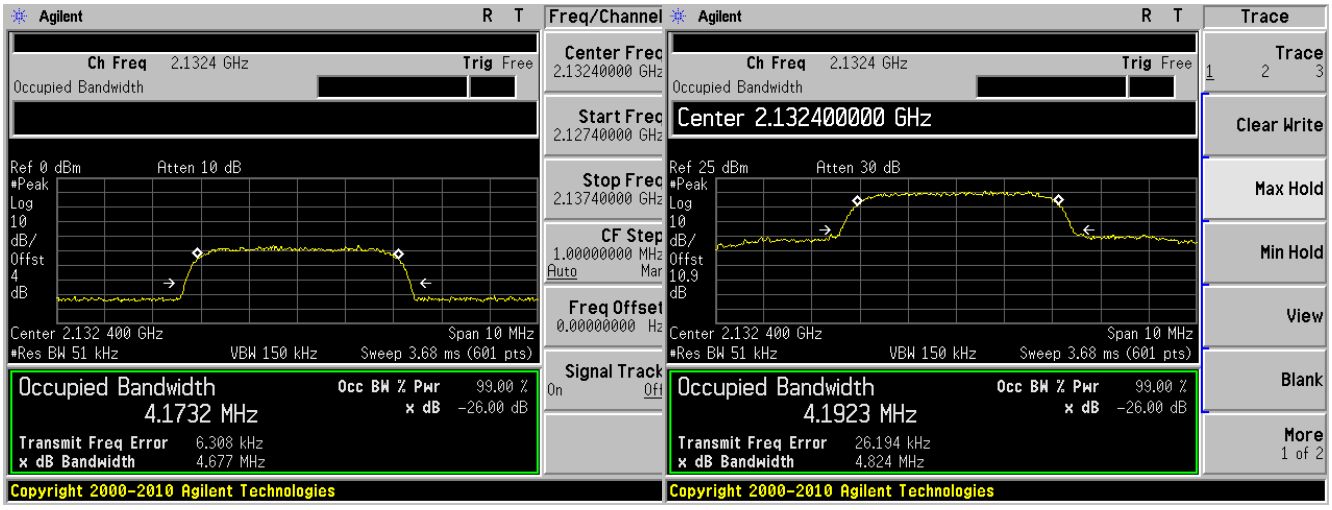
Input Output



AWS Band, Downlink:

WCDMA (Middle Channel)

Input Output



6 FCC §2.1053, §22.917, §24.238 & §27.53 - Spurious Radiated Emissions

6.1 Applicable Standard

According to FCC §22.917, §24.238 and §27.53, the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

6.2 Test Procedure

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

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

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

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TX Power in Watts/0.001) – the absolute level
Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03	1 year
Mini-Circuits	Pre Amplifier	ZVA-183-S	667400960	2011-08-10	1 year
EMCO	Horn Antenna	3115	9511-4627	2012-10-17	1 year
Hewlett Packard	Pre amplifier	8447D	2944A06639	2012-06-09	1 year
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/A	N/A

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.4 Test Environmental Conditions

Temperature:	20ºC
Relative Humidity:	48%
ATM Pressure:	101.1kPa

The testing was performed by Lionel Lara on 2012-12-29 in 5 Meter Chamber 3.

6.5 Test Results

Cell Band:

Uplink (Input frequency = 836.6 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
416.27	52.26	293	128	H	416.27	-50.48	0	1	-51.48	-13	-38.48
416.27	52.23	334	112	V	416.27	-50.51	0	1	-51.51	-13	-38.51
-	-	-	-	-	-	-	-	-	-	-	Note

Note: All other emissions are on/under noise floor level.

Downlink (Input frequency = 869.2 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
404.7	52.81	58	165	H	404.7	-49.93	0	1	-50.93	-13	-37.93
404.7	49.42	58	165	V	404.7	-53.32	0	1	-54.32	-13	-41.32
-	-	-	-	-	-	-	-	-	-	-	Note

Note: All other emissions are on/under noise floor level.

PCS Band:

Uplink (Input frequency = 1850.2 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
419.12	52.35	293	128	H	419.12	-50.39	0	1	-51.39	-13	-38.39
419.12	52.24	334	112	V	419.12	-50.5	0	1	-51.5	-13	-38.5
-	-	-	-	-	-	-	-	-	-	-	Note

Note: - All other emissions are on/under noise floor level.

Downlink (Input frequency = 1989.8 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
418.25	52.66	58	165	H	418.25	-50.08	0	1	-51.08	-13	-38.08
418.25	50.23	58	165	V	418.25	-52.51	0	1	-53.51	-13	-40.51
-	-	-	-	-	-	-	-	-	-	-	Note

Note: All other emissions are on/under noise floor level.

AWS Band:

Uplink (Input frequency = 1732 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
416.15	52.26	293	128	H	416.15	-50.48	0	1	-51.48	-13	-38.48
416.15	52.21	334	112	V	416.15	-50.53	0	1	-51.53	-13	-38.53
-	-	-	-	-	-	-	-	-	-	-	Note

Note: All other emissions are on/under noise floor level.

Downlink (Input frequency = 2111 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
417.86	52.69	58	165	H	417.86	-50.05	0	1	-51.05	-13	-38.05
417.86	49.51	58	165	V	417.86	-53.23	0	1	-54.23	-13	-41.23
-	-	-	-	-	-	-	-	-	-	-	Note

Note: All other emissions are on/under noise floor level.

7 FCC §2.1051, §22.917, §24.238 & §27.53 - Spurious Emissions at Antenna Terminals

7.1 Applicable Standard

According to FCC §22.917, §24.238 and §27.53 the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

7.2 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 10th harmonic.

7.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

7.4 Test Environmental Conditions

Temperature:	18-21ºC
Relative Humidity:	55%
ATM Pressure:	101.1kPa

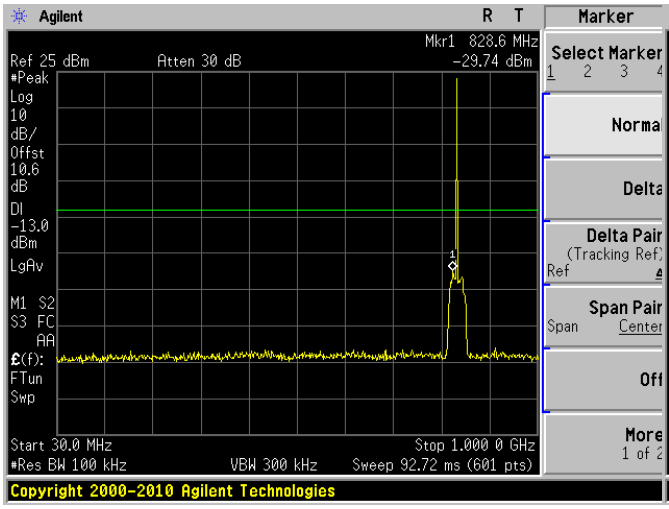
The testing was performed by Lionel Lara from 2012-12-27 to 2012-12-28 in the RF Site.

7.5 Test Results

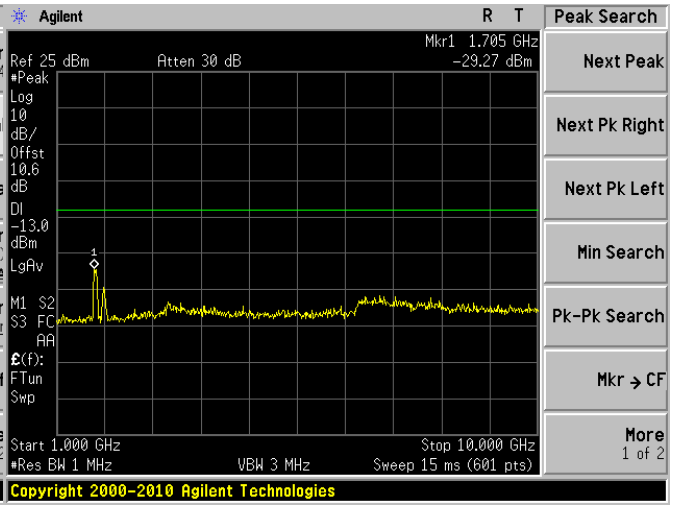
Please refer to the following plots.

Cellular Band Uplink, Middle Channel: 836.6 MHz:

Plot 1: 30 MHz to 1 GHz

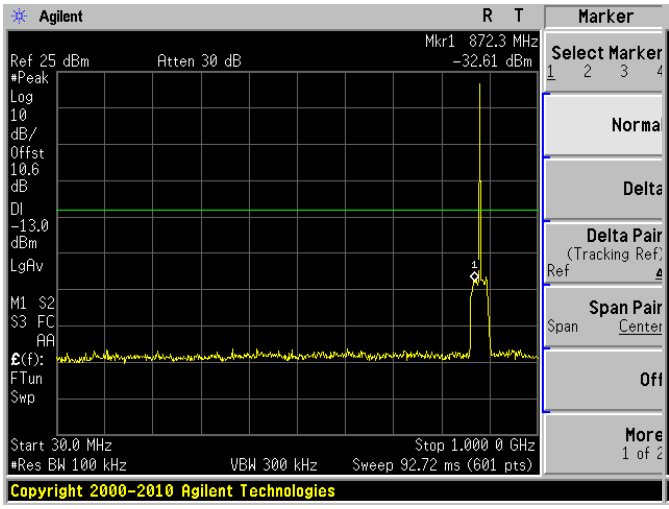


Plot 2: Above 1 GHz

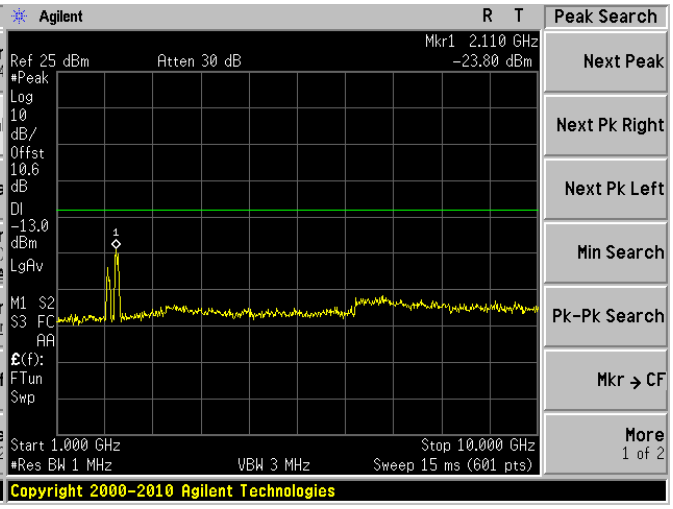


Cellular Band Downlink, Middle Channel: 881.6 MHz:

Plot 1: 30 MHz to 1 GHz

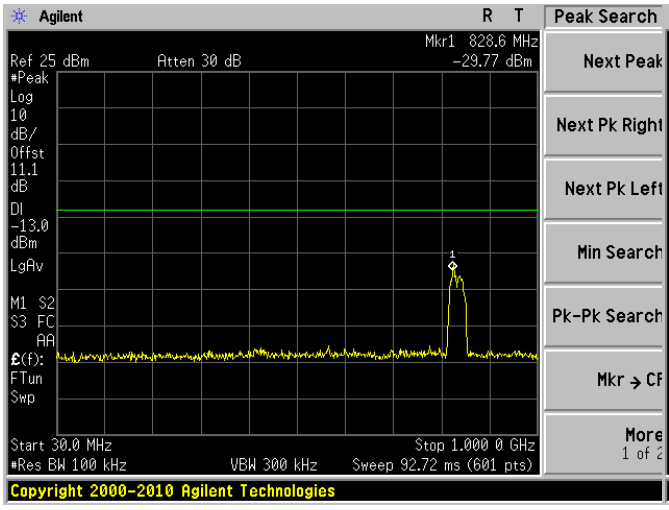


Plot 2: Above 1 GHz

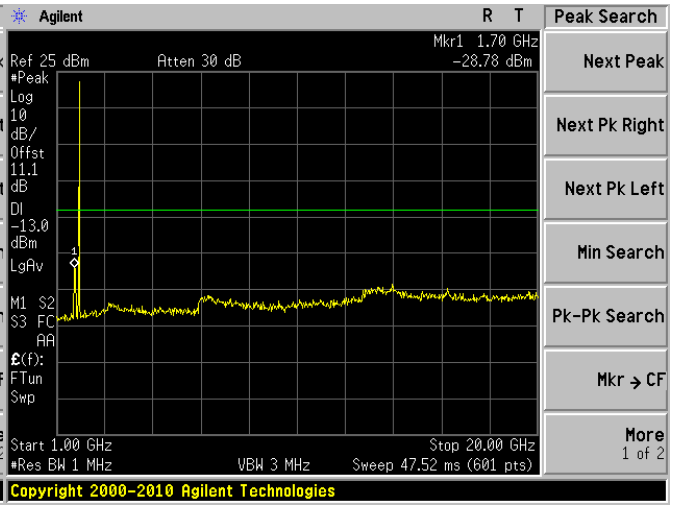


PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

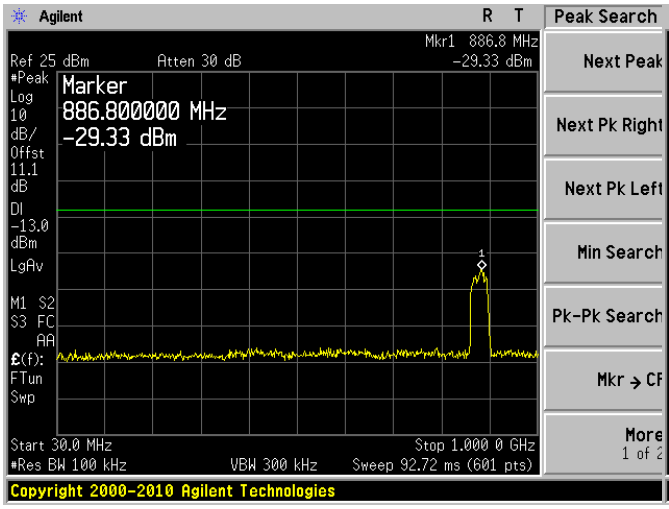


Plot 2: Above 1 GHz

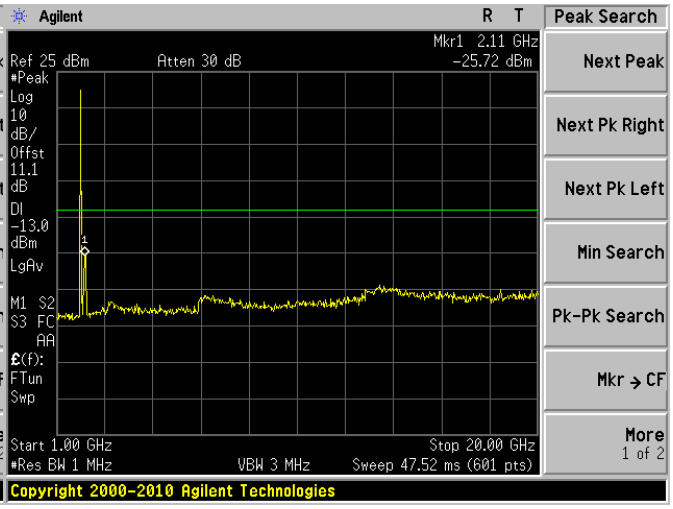


PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

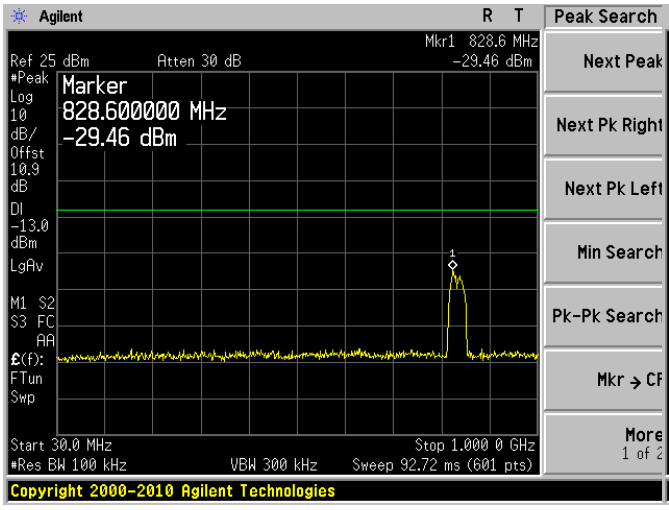


Plot 2: Above 1 GHz

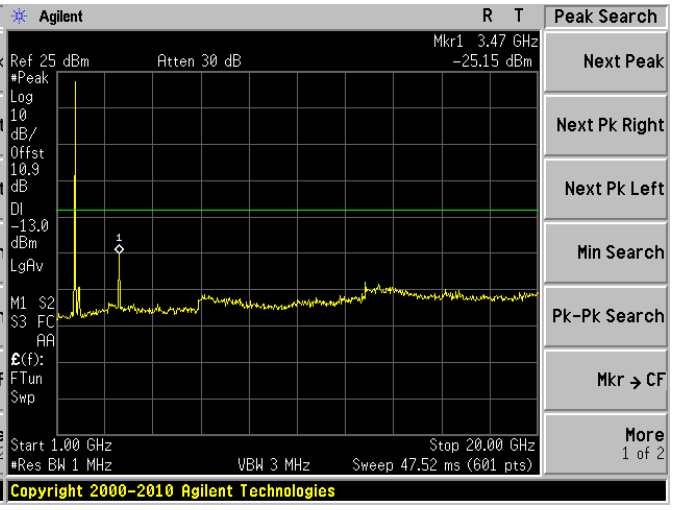


AWS Band Uplink, Middle Channel: 1732 MHz:

Plot 1: 30 MHz to 1 GHz

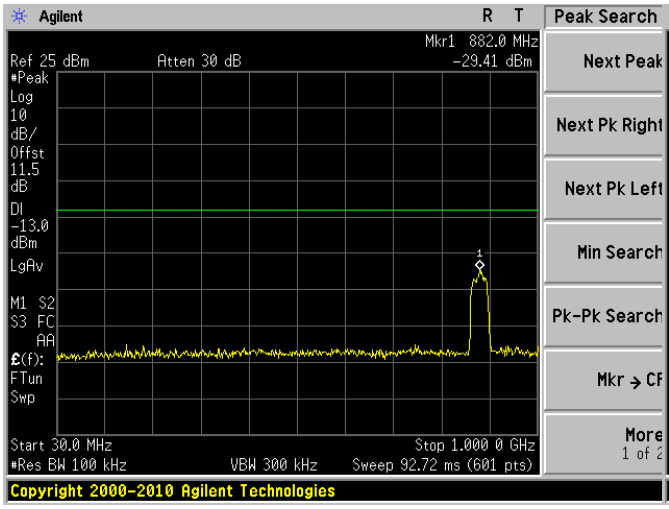


Plot 2: Above 1 GHz

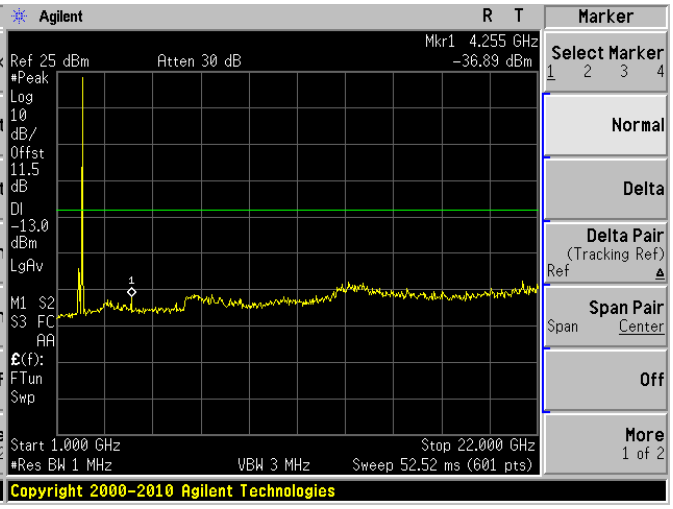


AWS Band Downlink, Middle Channel: 2132 MHz:

Plot 1: 30 MHz to 1 GHz



Plot 2: Above 1 GHz

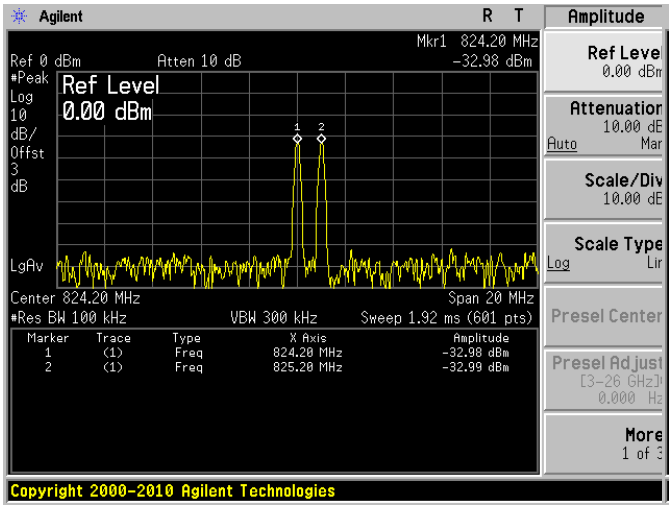


Inter-modulation

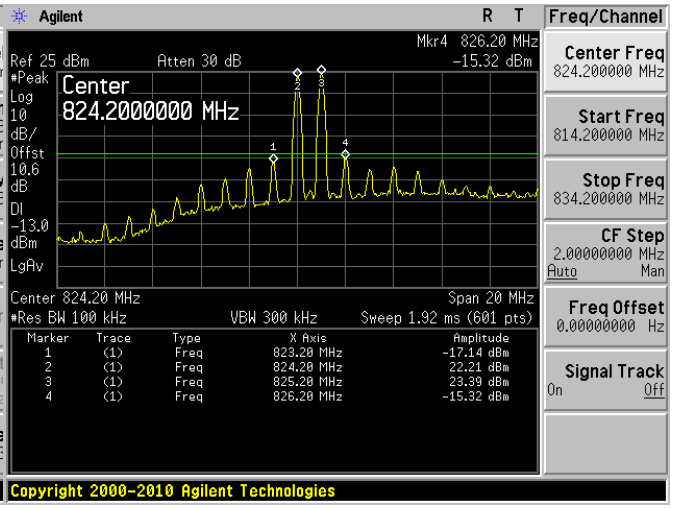
Cellular Band Uplink:

CW: GSM/EDGE

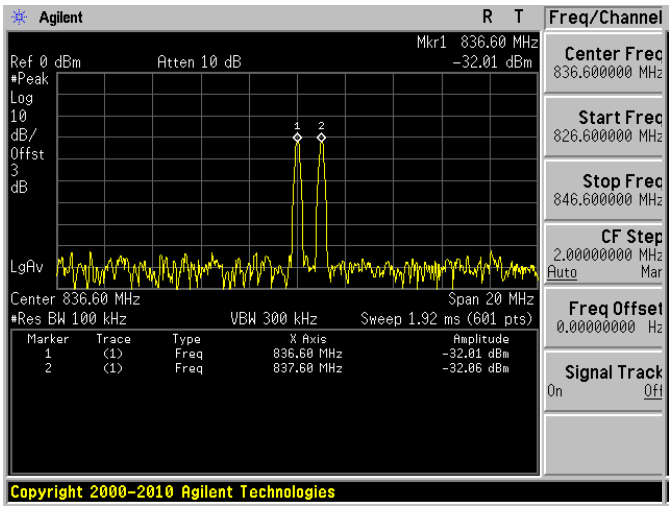
Low Channel, Input



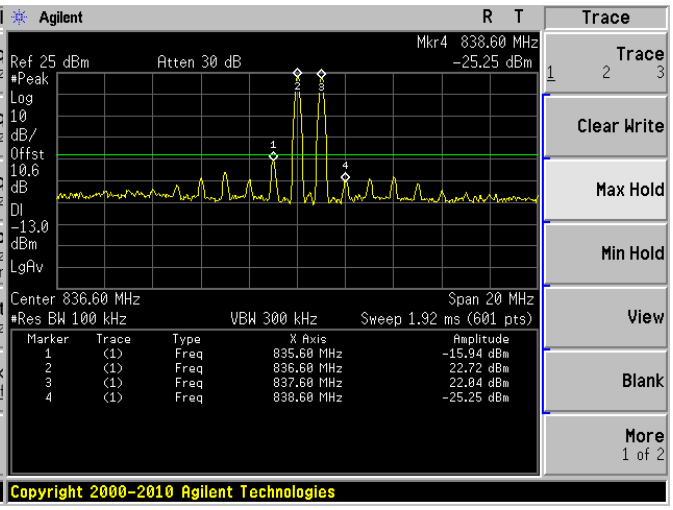
Low Channel, Output



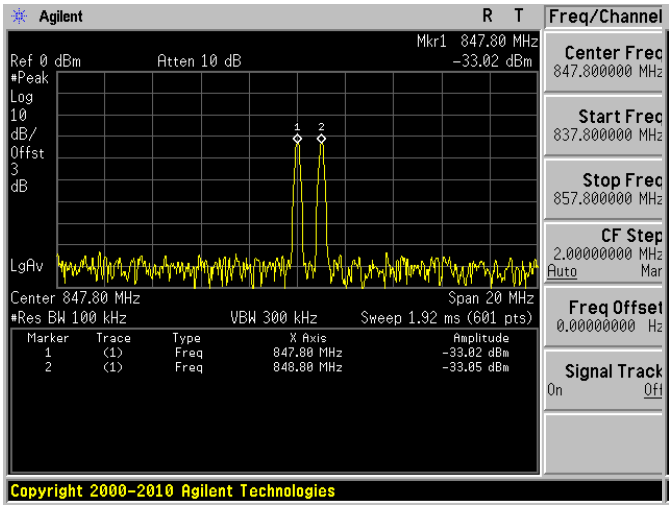
Middle Channel, Input



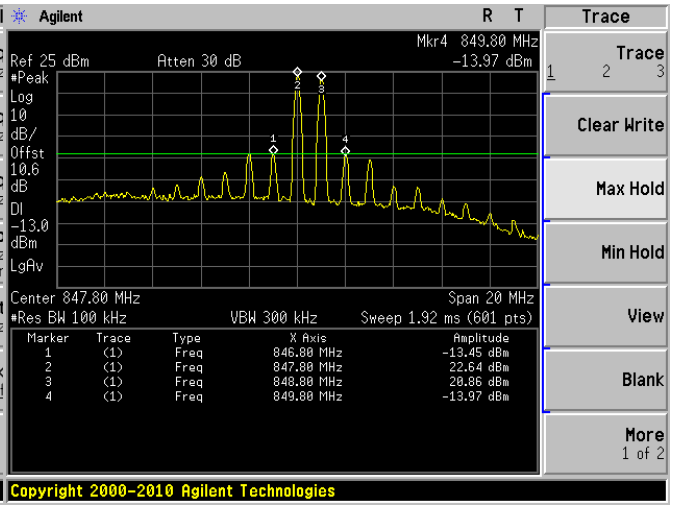
Middle Channel, Output



High Channel, Input

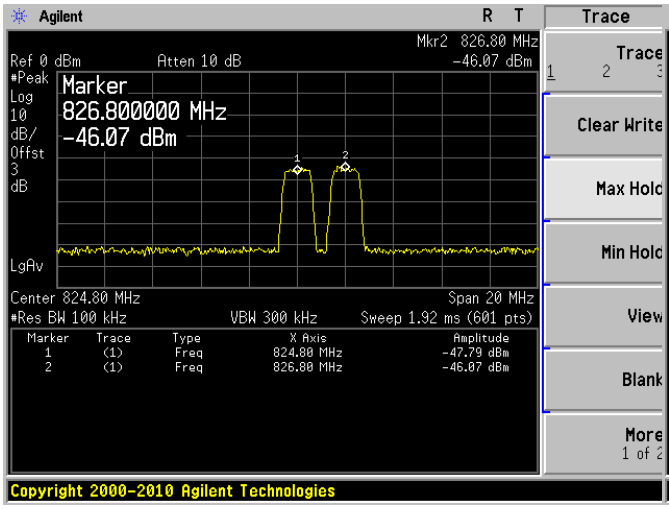


High Channel, Output

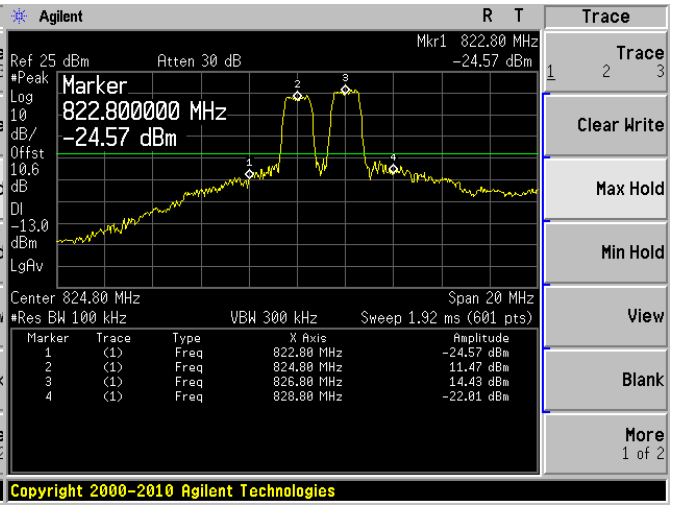


Modulation: CDMA

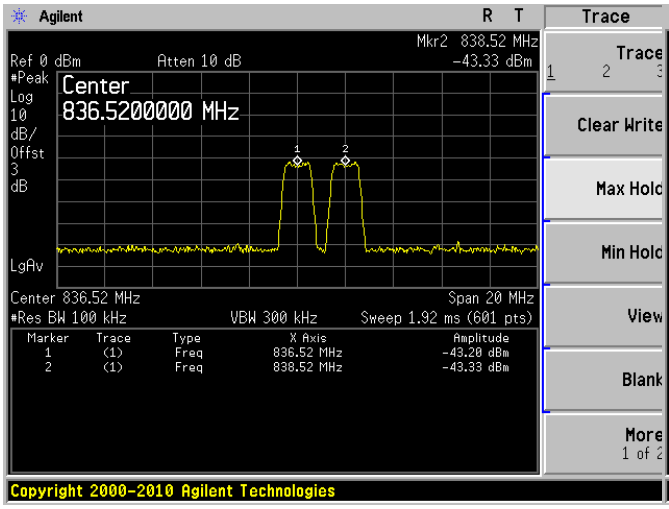
Low Channel, Input



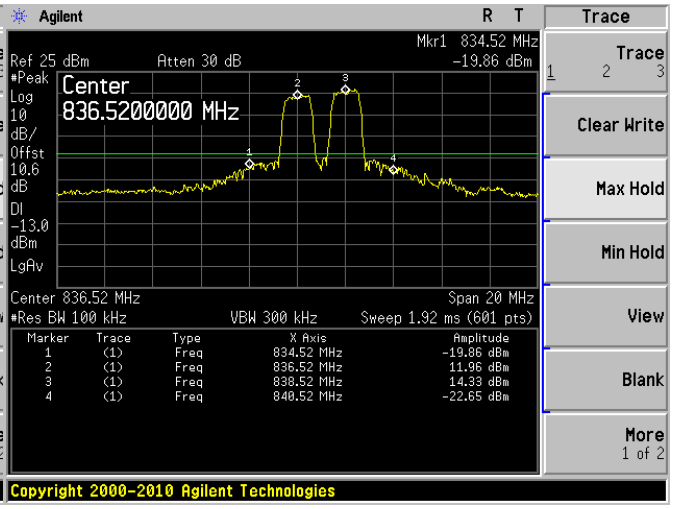
Low Channel, Output



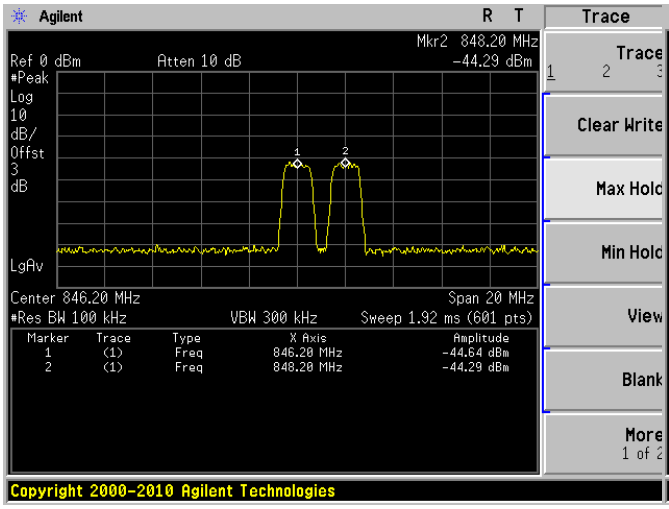
Middle Channel, Input



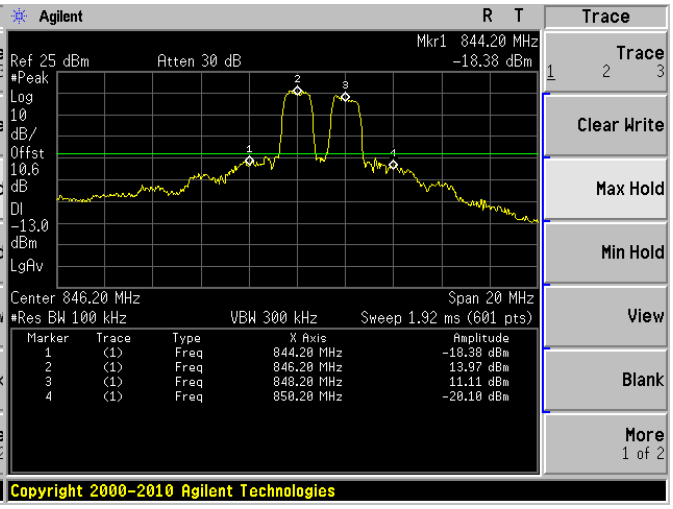
Middle Channel, Output



High Channel, Input

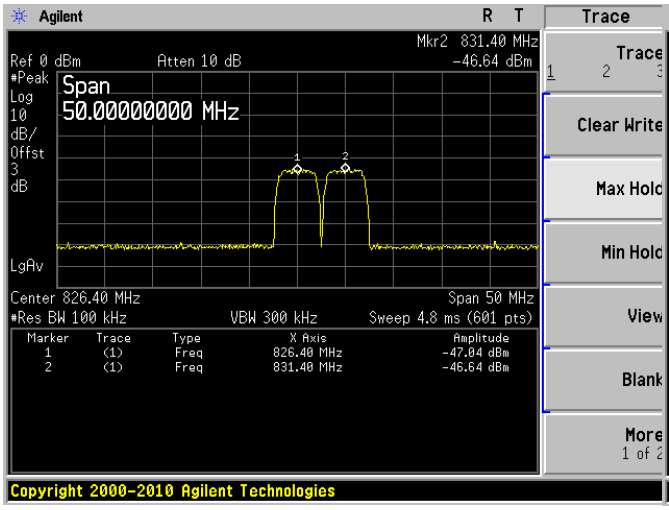


High Channel, Output

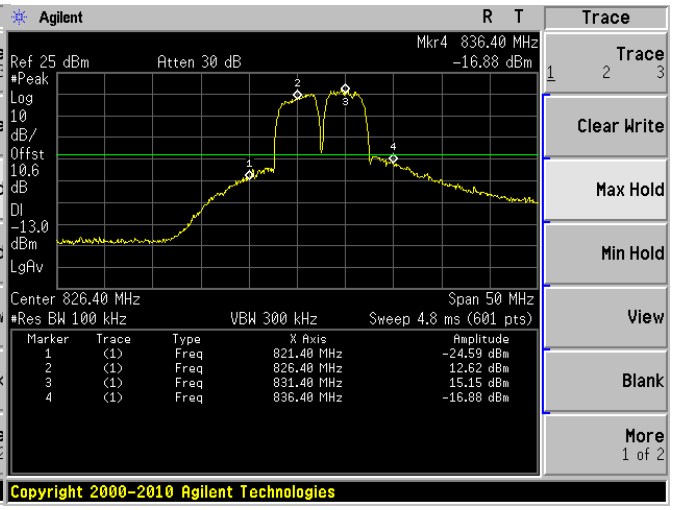


Modulation: WCDMA

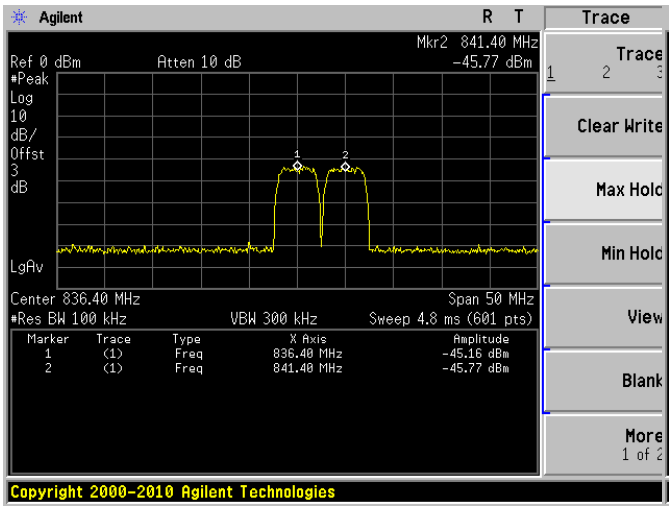
Low Channel, Input



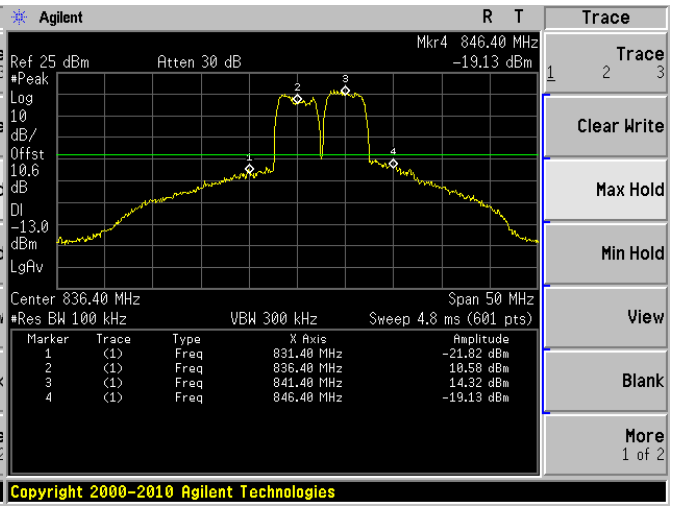
Low Channel, Output



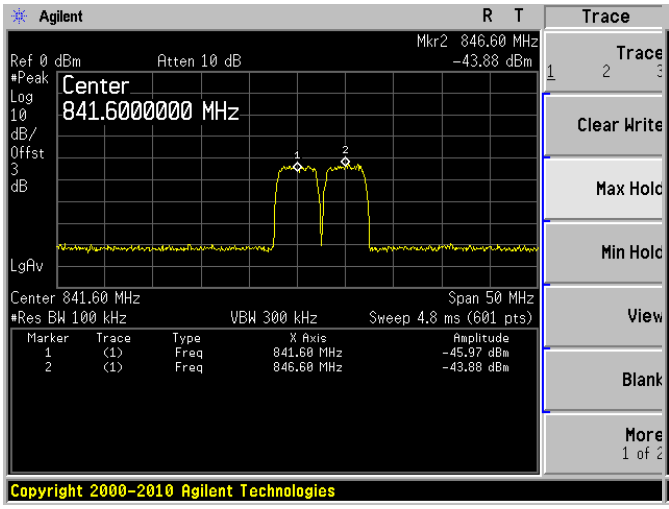
Middle Channel, Input



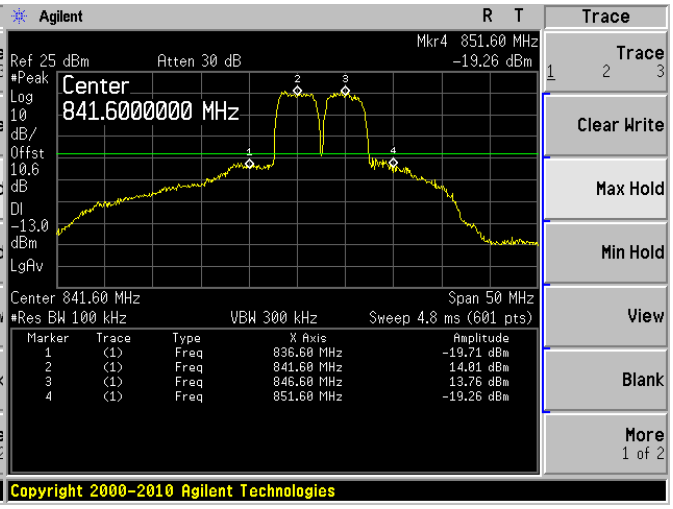
Middle Channel, Output



High Channel, Input



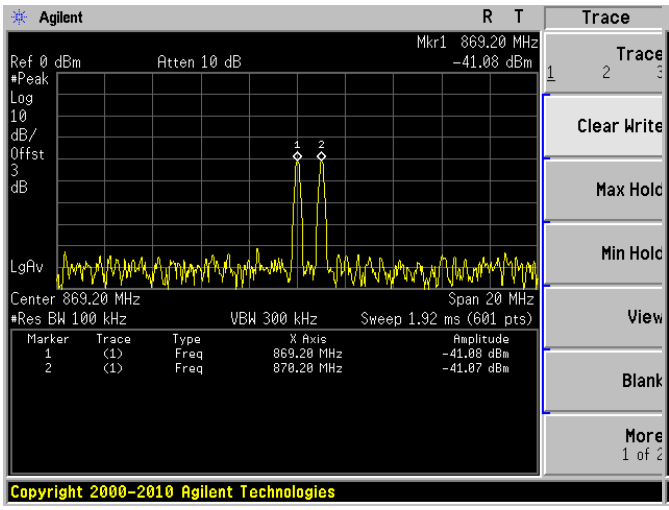
High Channel, Output



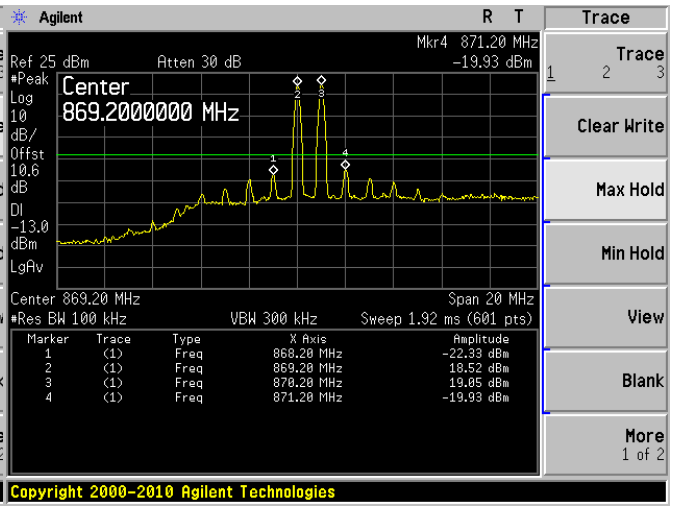
Cellular Band Downlink:

CW: GSM/EDGE

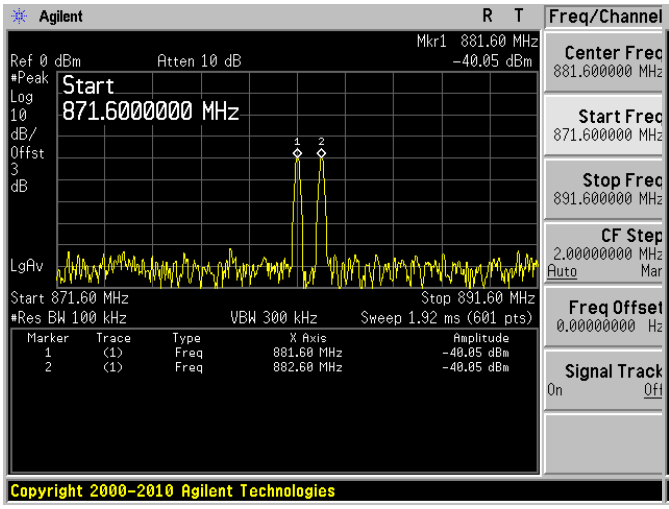
Low Channel, Input



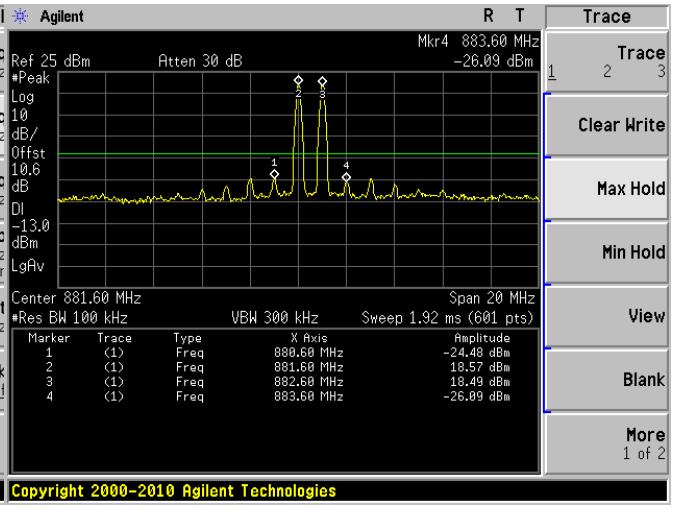
Low Channel, Output



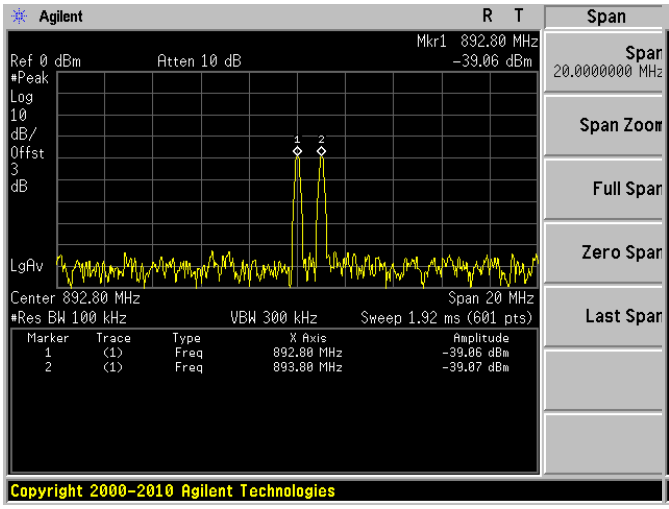
Middle Channel, Input



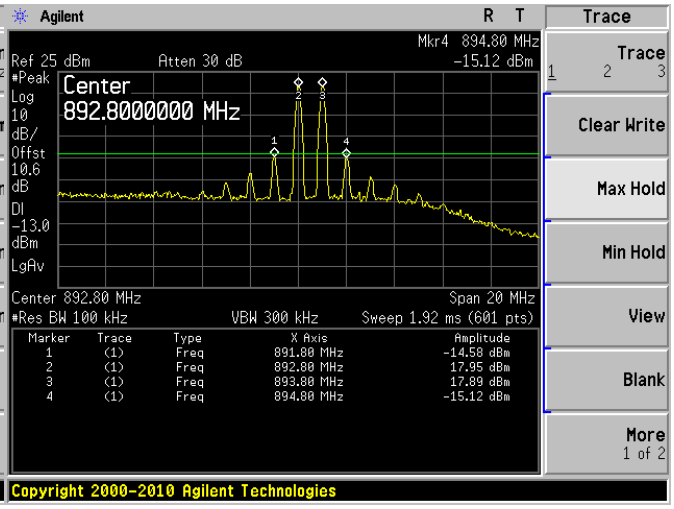
Middle Channel, Output



High Channel, Input

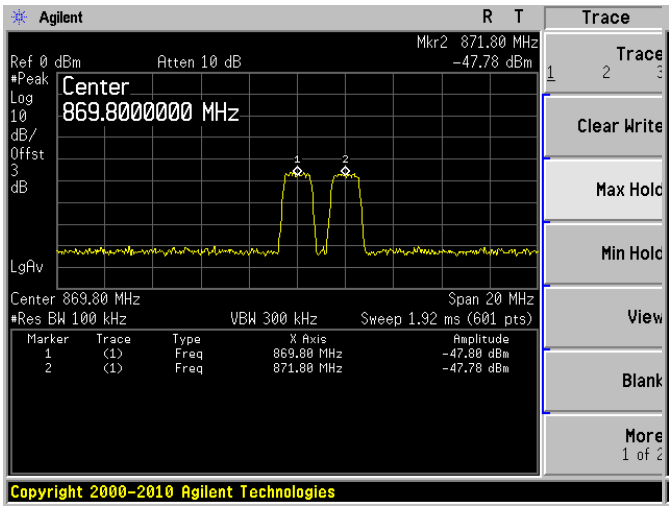


High Channel, Output

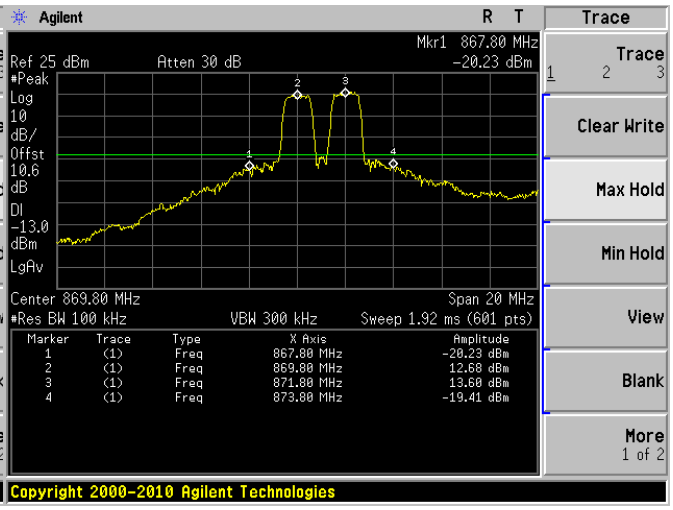


Modulation: CDMA

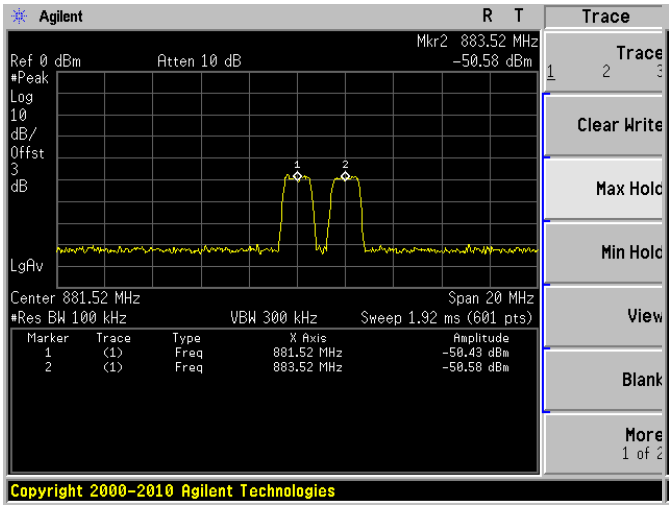
Low Channel, Input



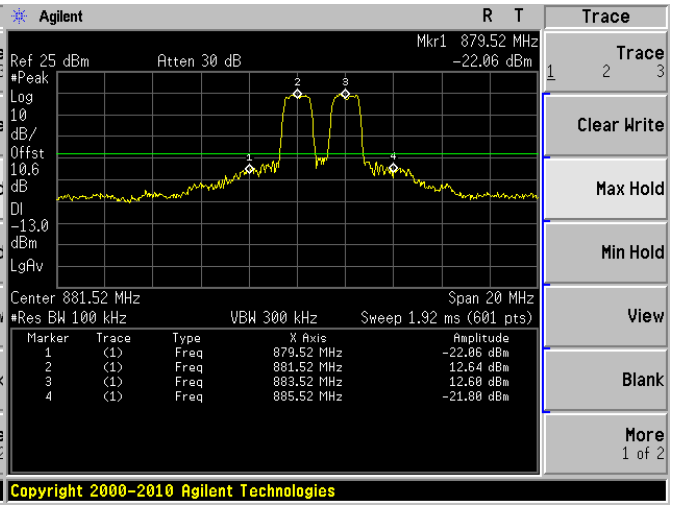
Low Channel, Output



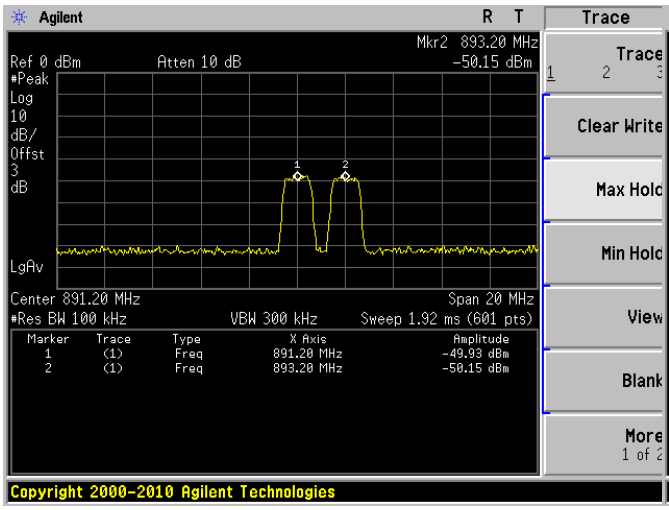
Middle Channel, Input



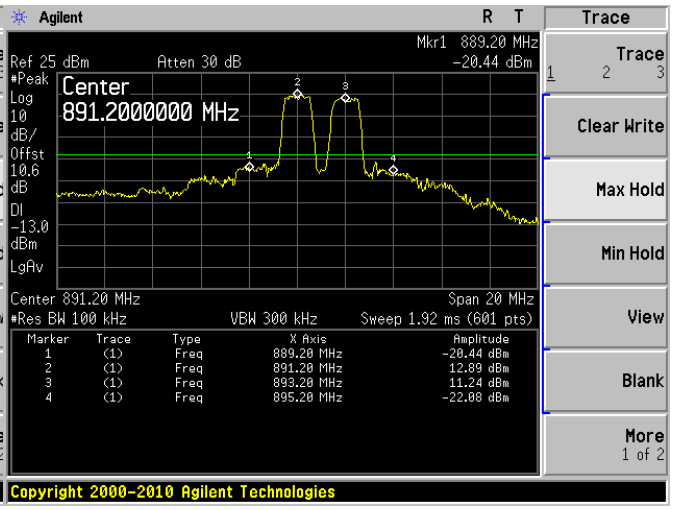
Middle Channel, Output



High Channel, Input

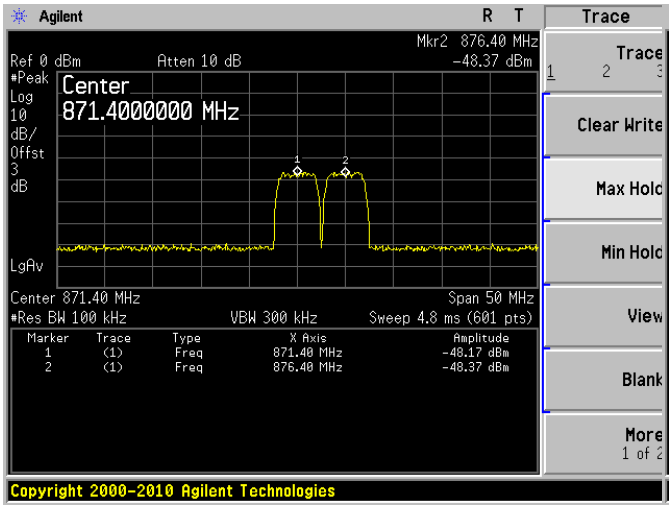


High Channel, Output

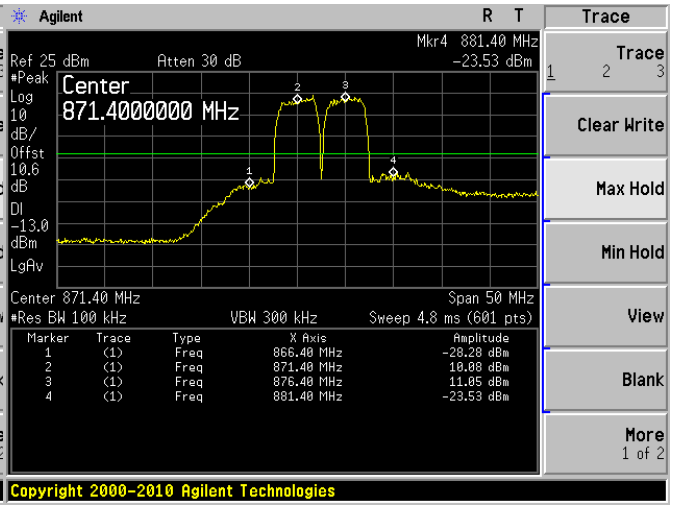


Modulation: WCDMA

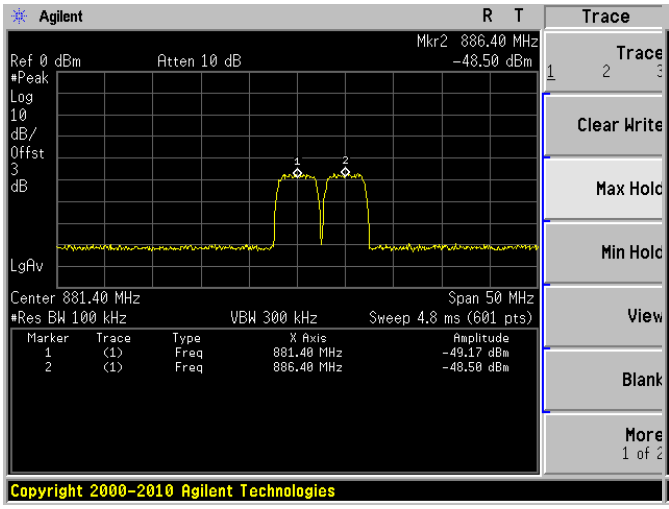
Low Channel, Input



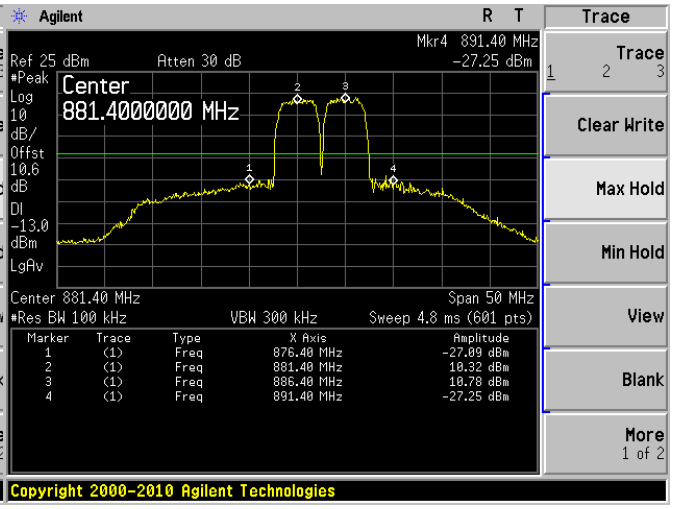
Low Channel, Output



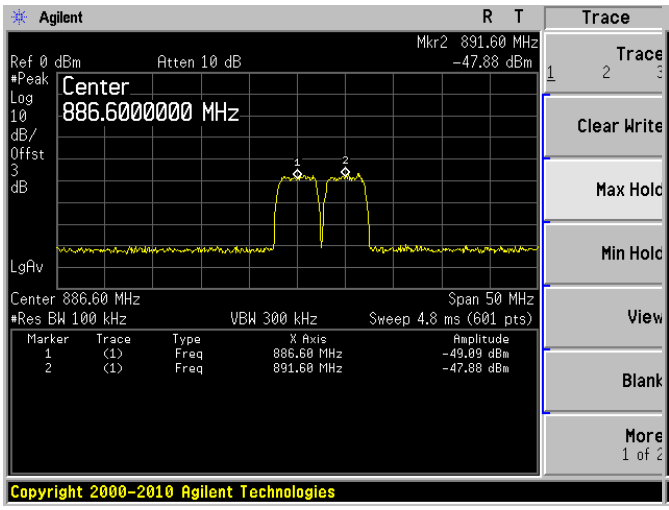
Middle Channel, Input



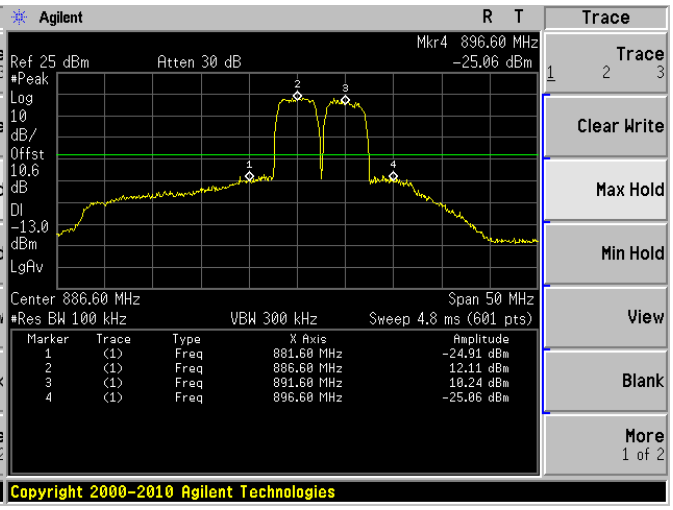
Middle Channel, Output



High Channel, Input



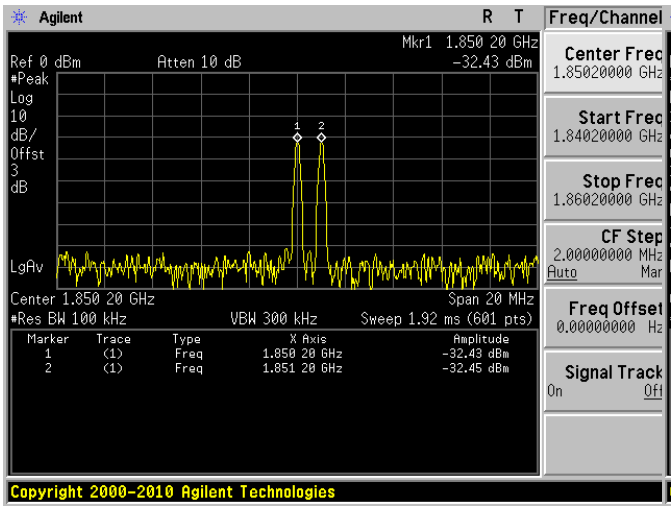
High Channel, Output



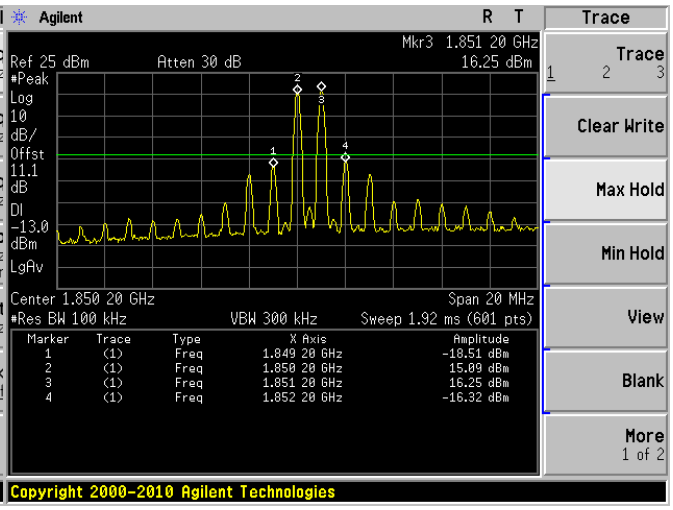
PCS Band Uplink:

CW: GSM/EDGE

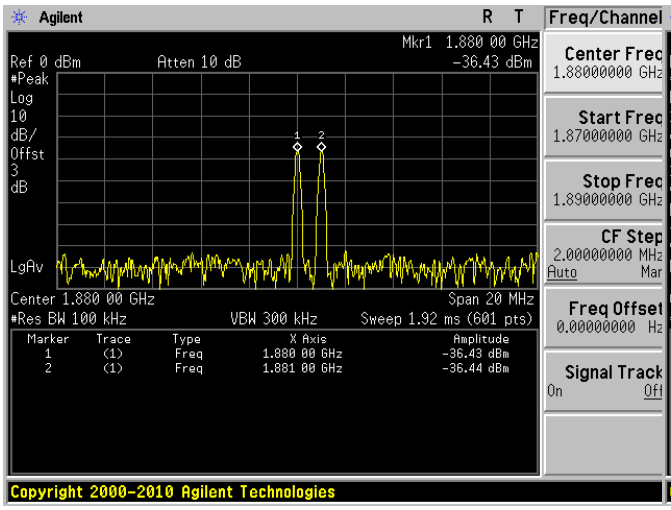
Low Channel, Input



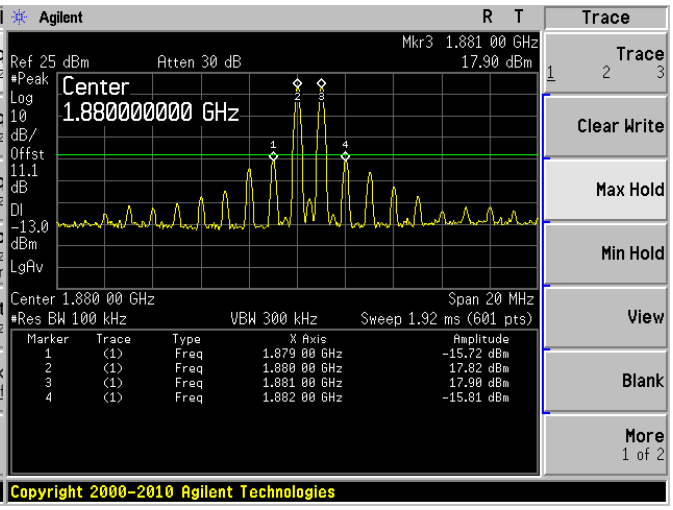
Low Channel, Output



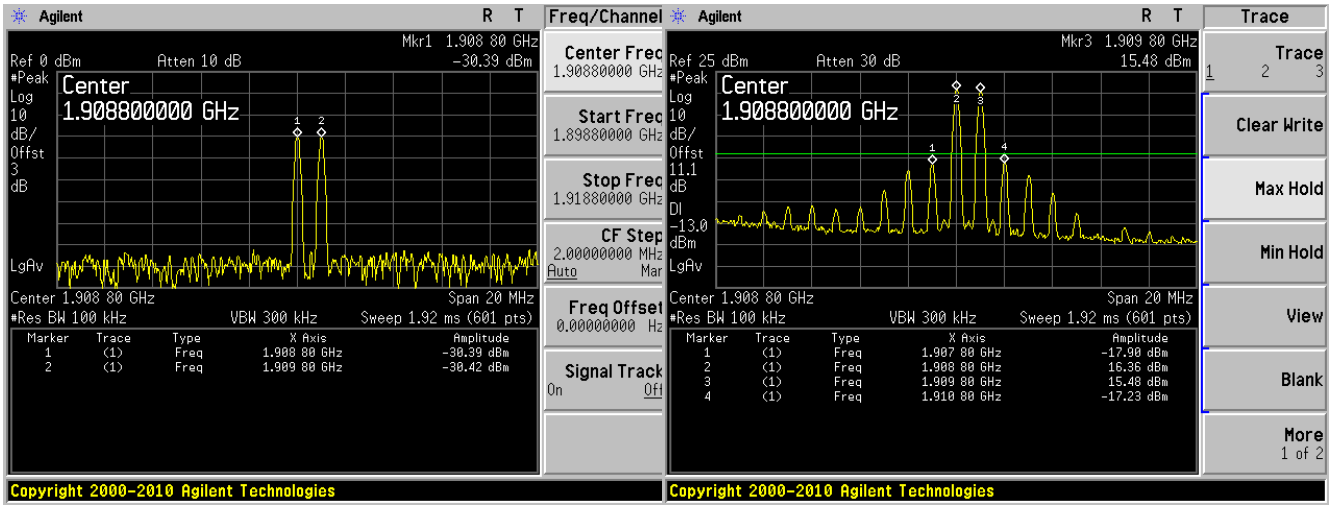
Middle Channel, Input



Middle Channel, Output

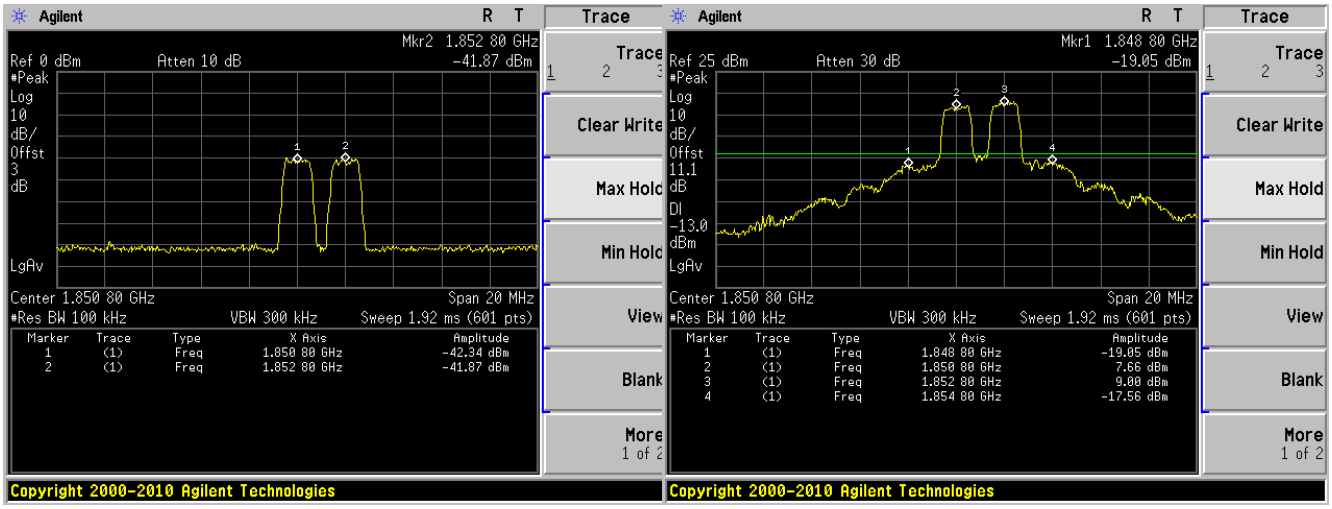


High Channel, Input High Channel, Output

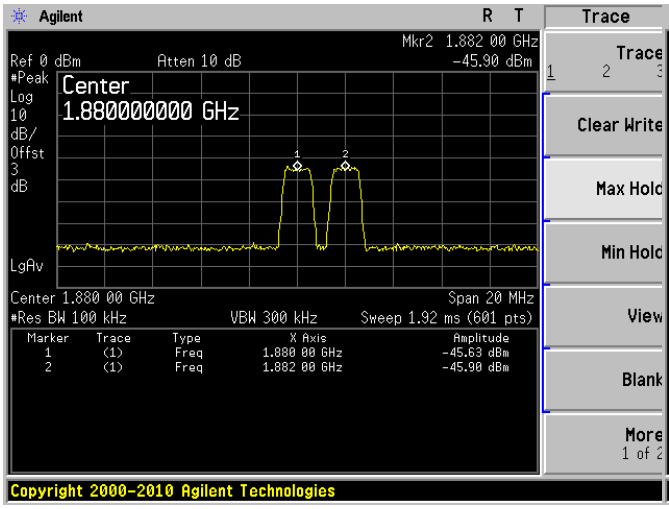


Modulation: CDMA

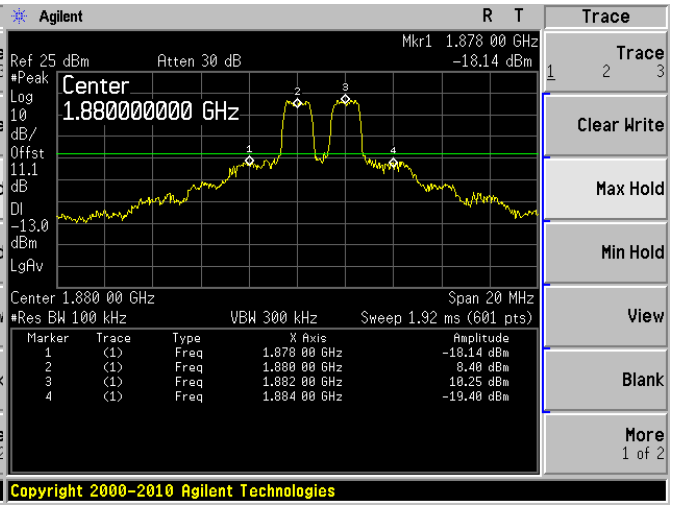
Low Channel, Input Low Channel, Output



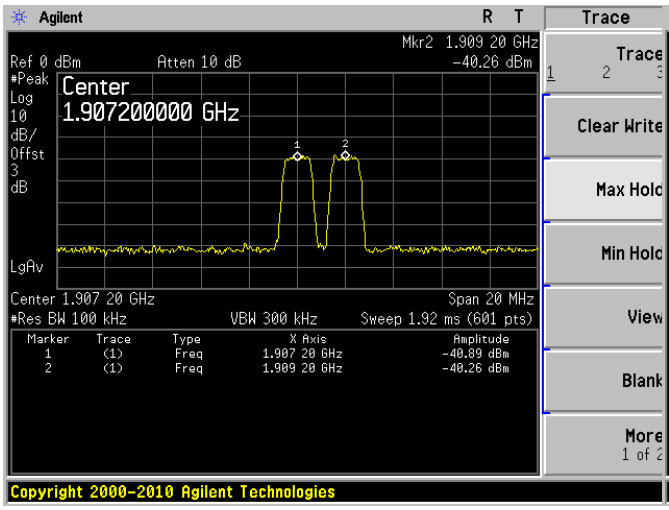
Middle Channel, Input



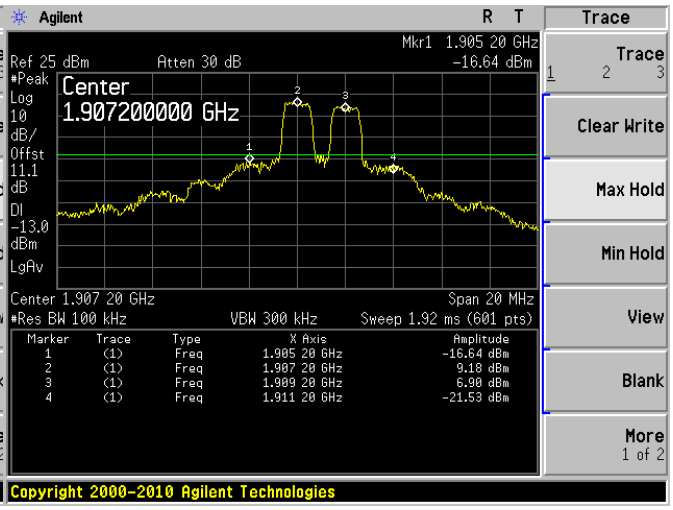
Middle Channel, Output



High Channel, Input

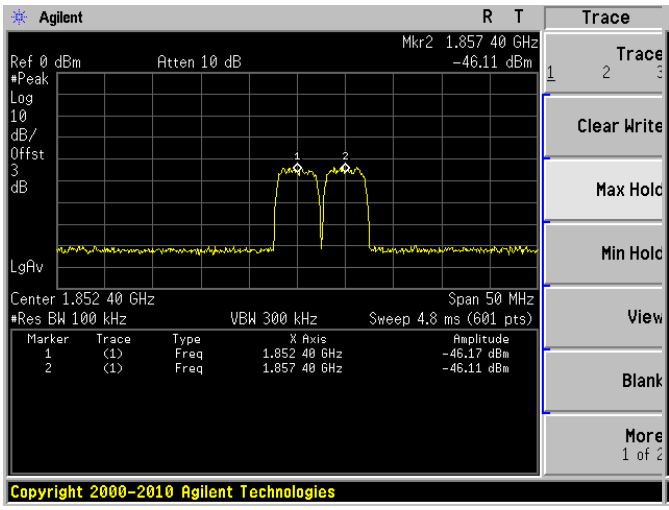


High Channel, Output

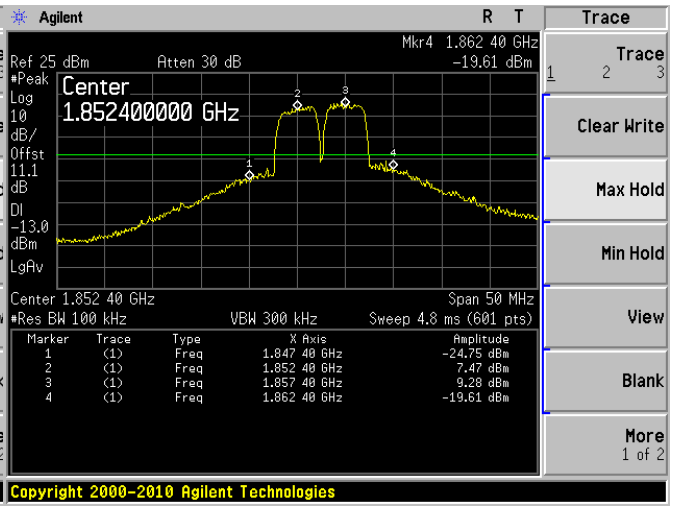


Modulation: WCDMA

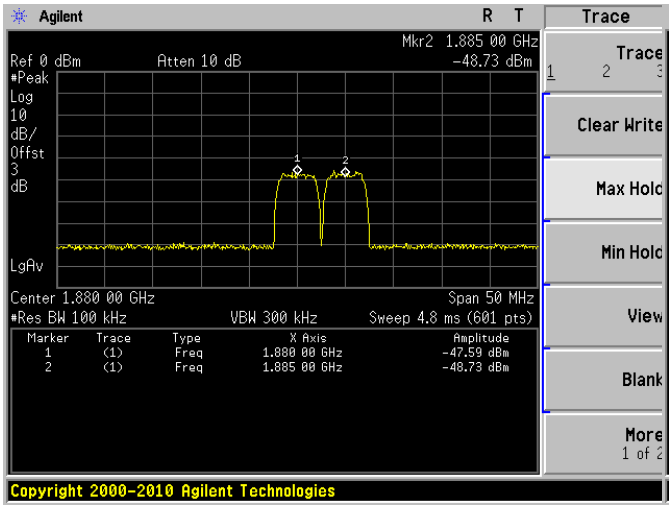
Low Channel, Input



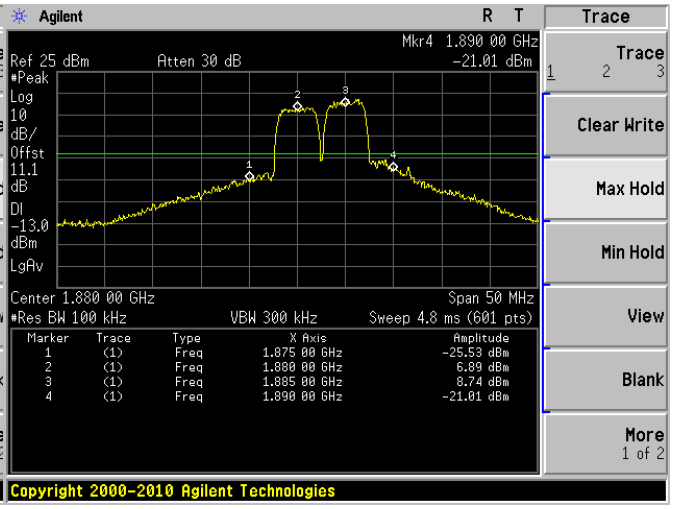
Low Channel, Output



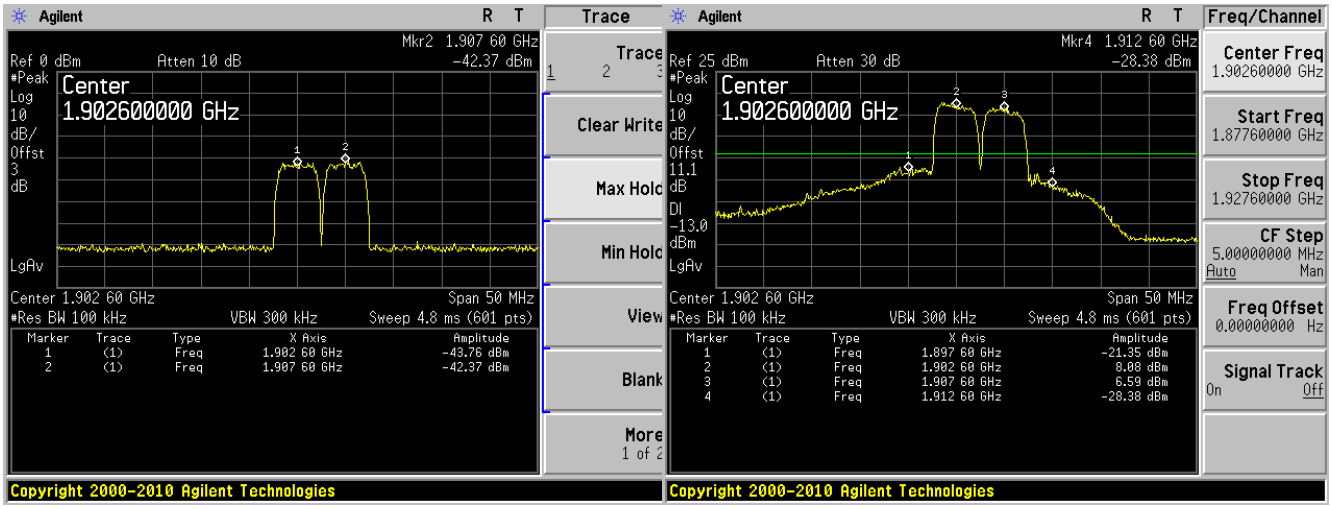
Middle Channel, Input



Middle Channel, Output



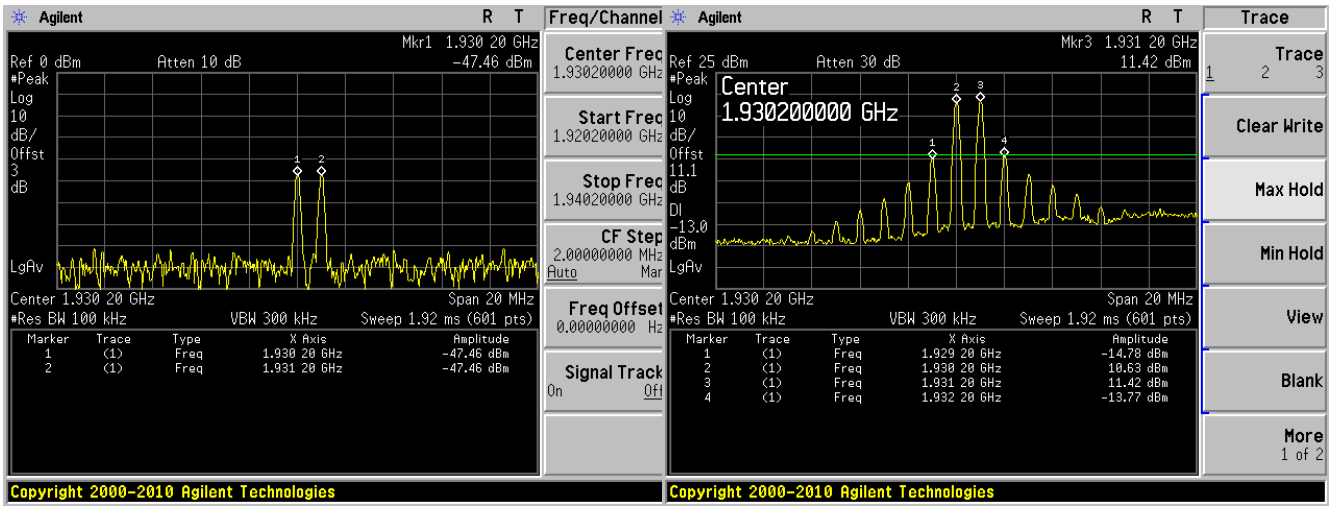
High Channel, Input High Channel, Output



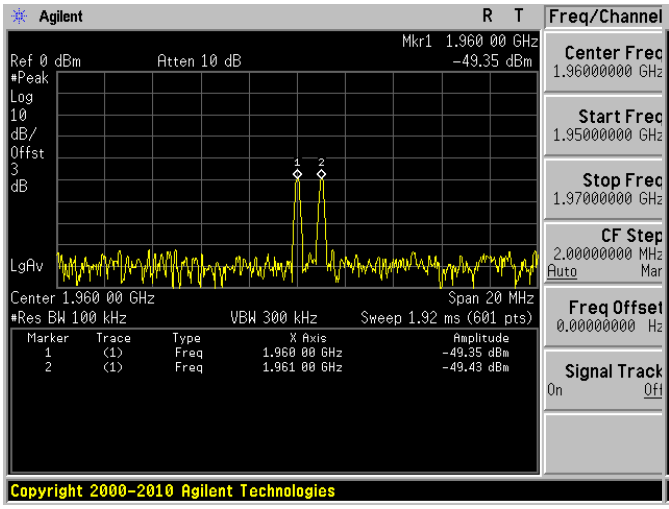
PCS Band Downlink:

CW: GSM/EDGE

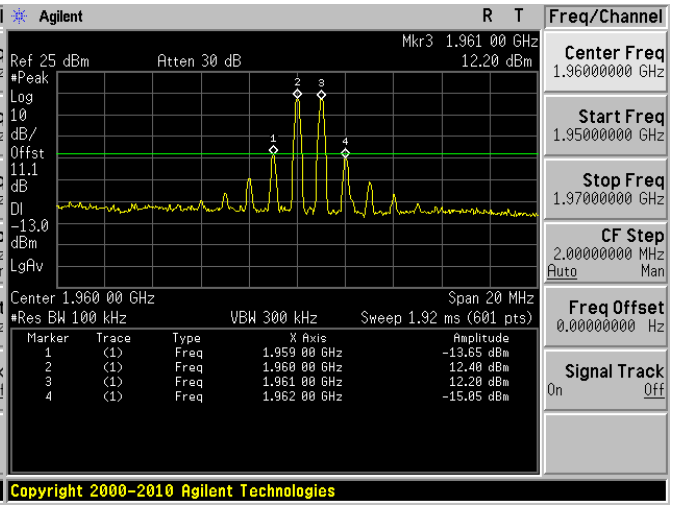
Low Channel, Input Low Channel, Output



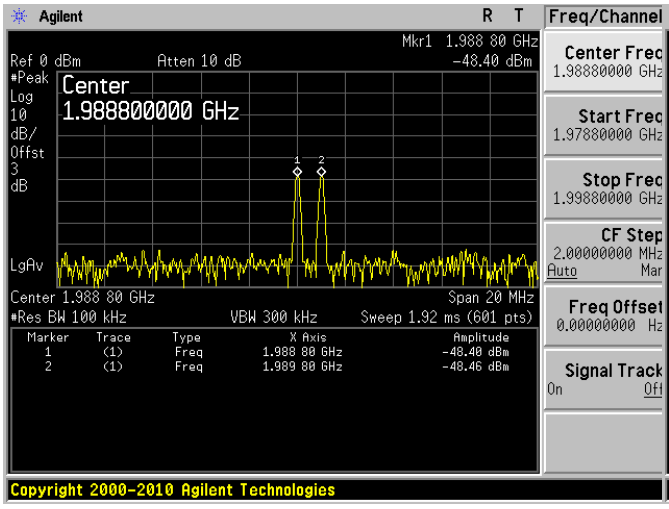
Middle Channel, Input



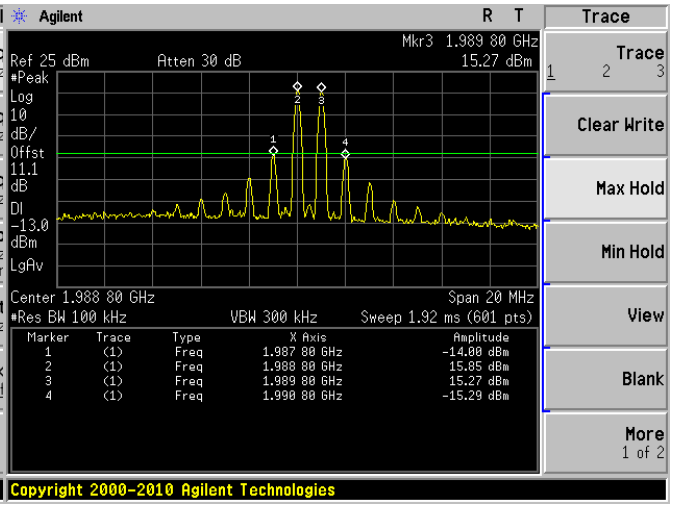
Middle Channel, Output



High Channel, Input

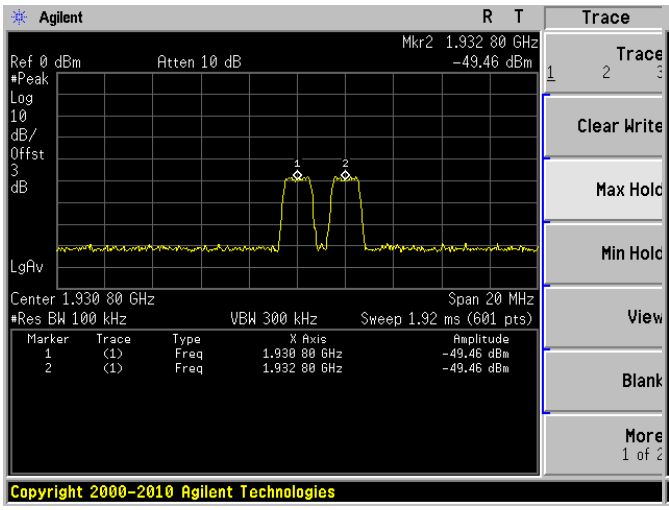


High Channel, Output

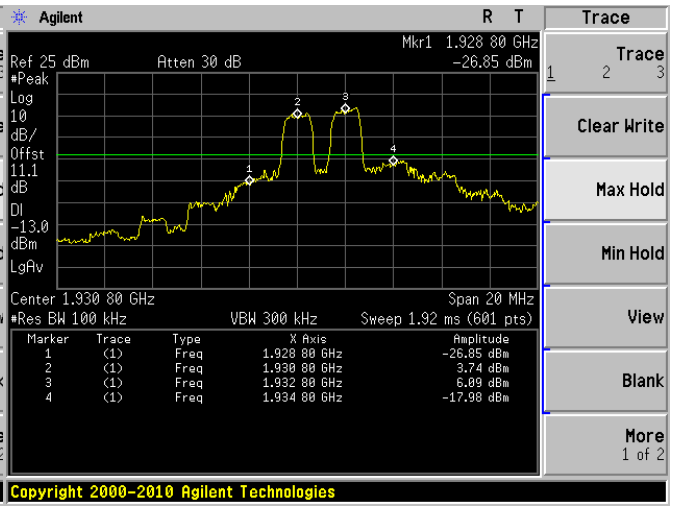


Modulation: CDMA

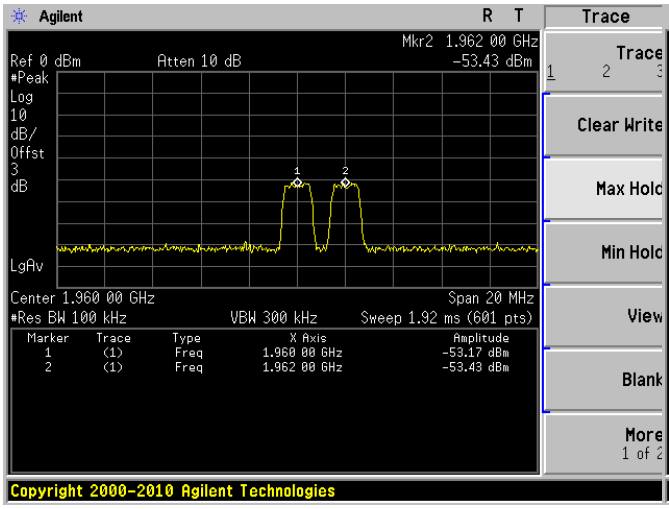
Low Channel, Input



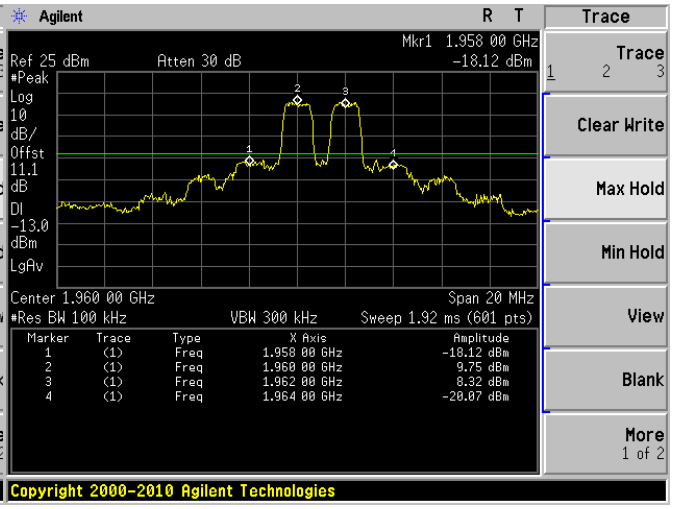
Low Channel, Output



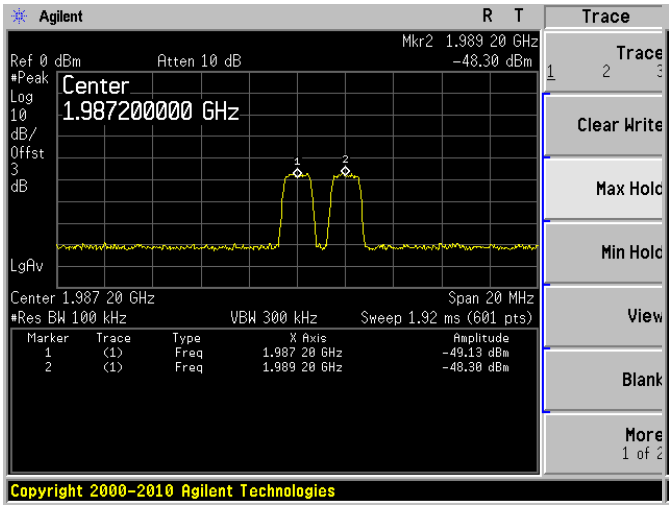
Middle Channel, Input



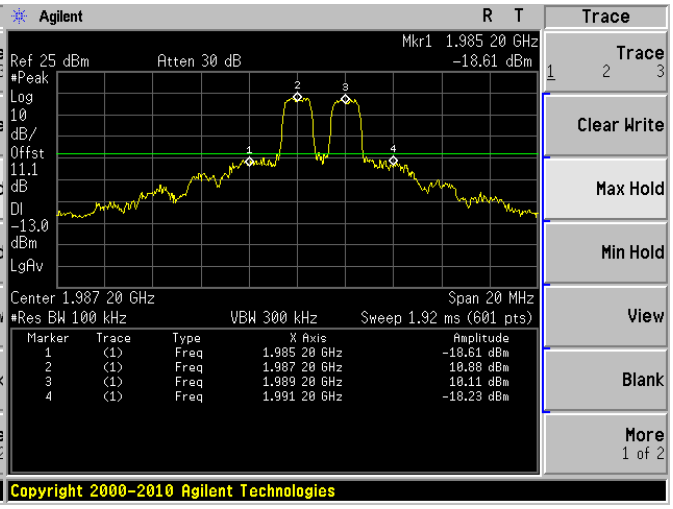
Middle Channel, Output



High Channel, Input

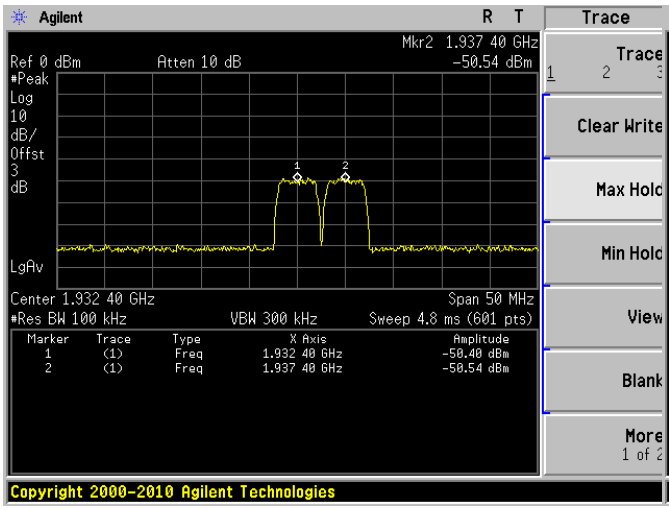


High Channel, Output

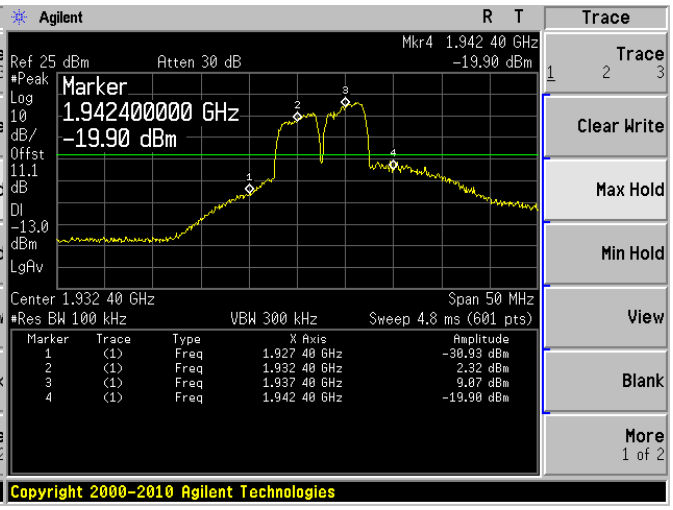


Modulation: WCDMA

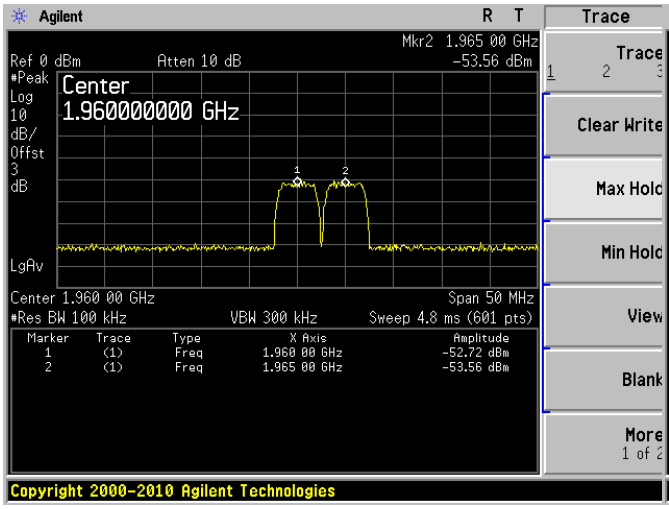
Low Channel, Input



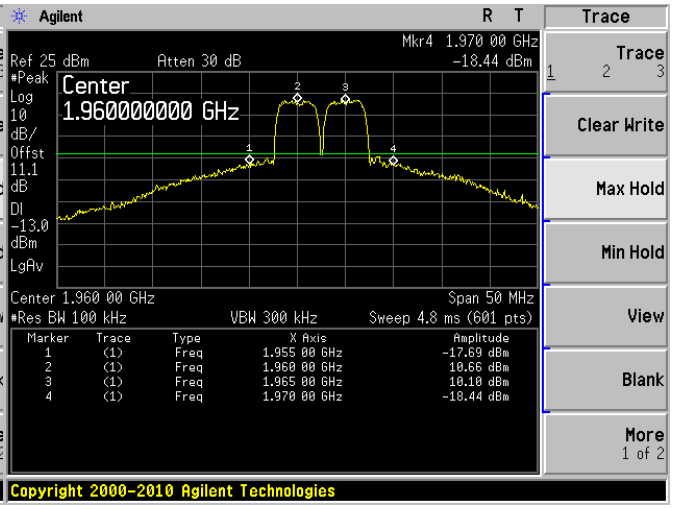
Low Channel, Output



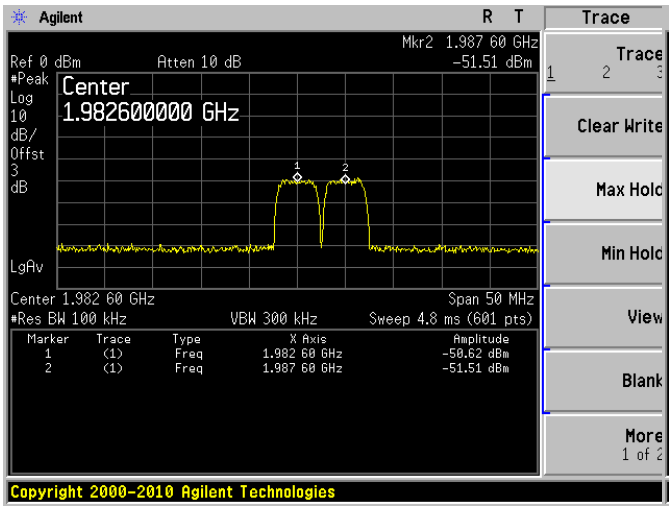
Middle Channel, Input



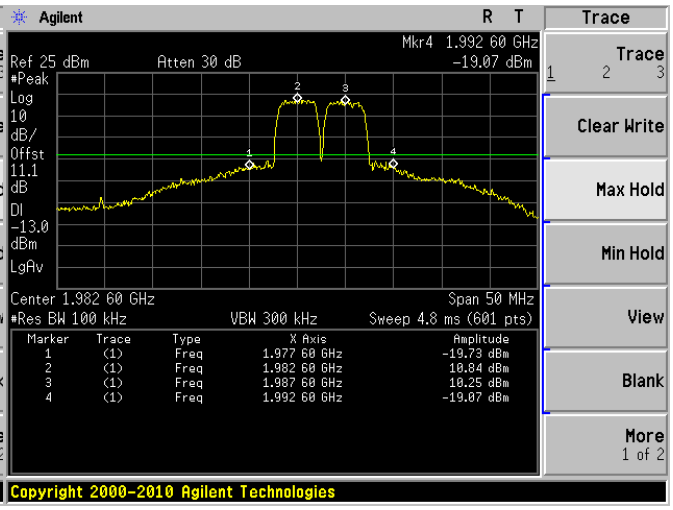
Middle Channel, Output



High Channel, Input



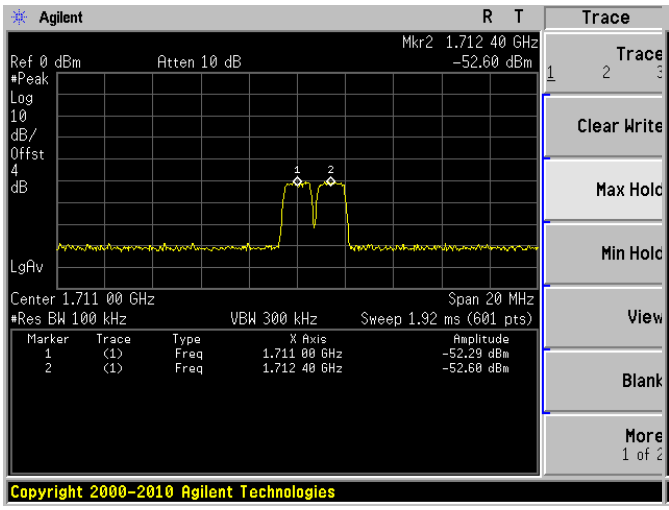
High Channel, Output



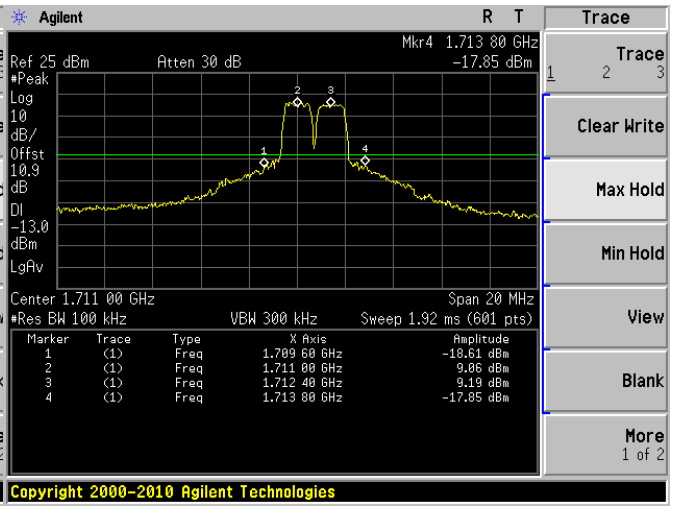
AWS Band Uplink:

Modulation: QPSK (1.4 MHz)

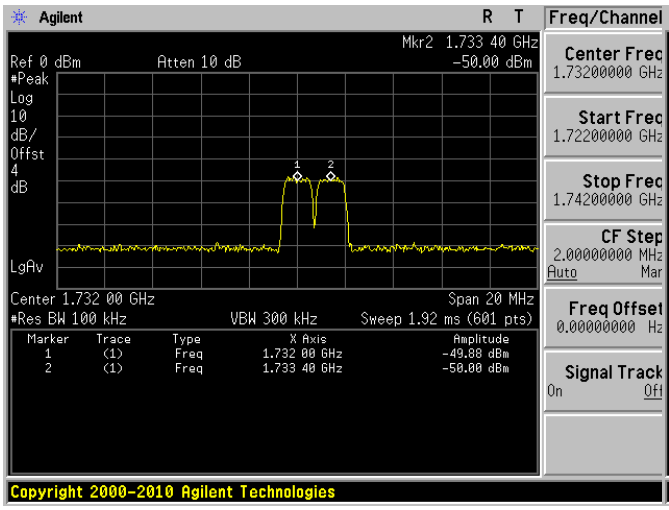
Low Channel, Input



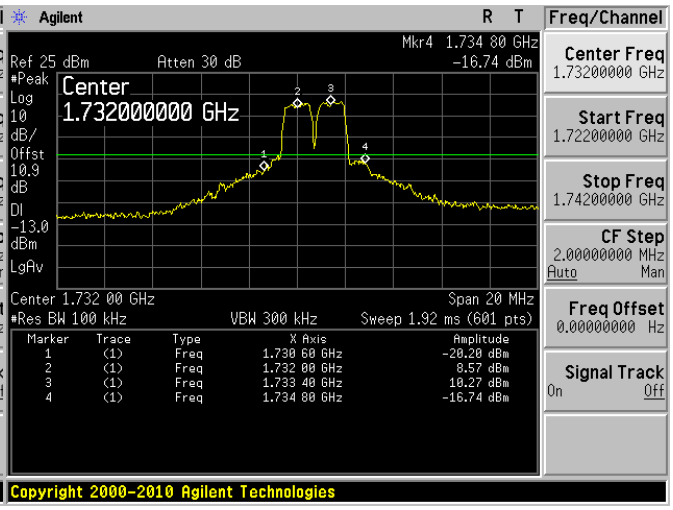
Low Channel, Output



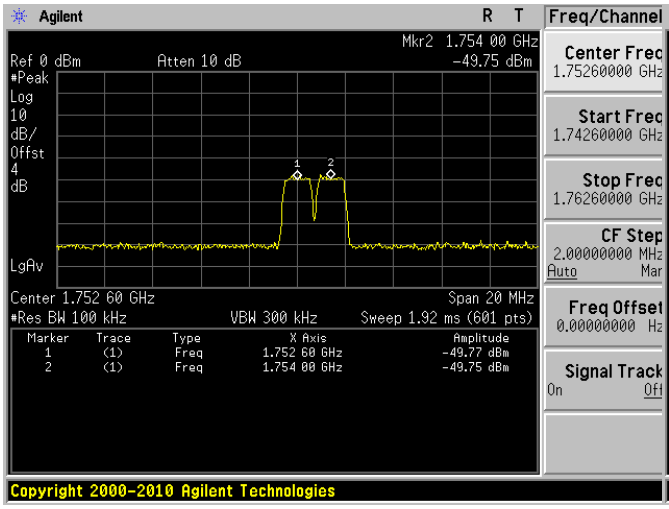
Middle Channel, Input



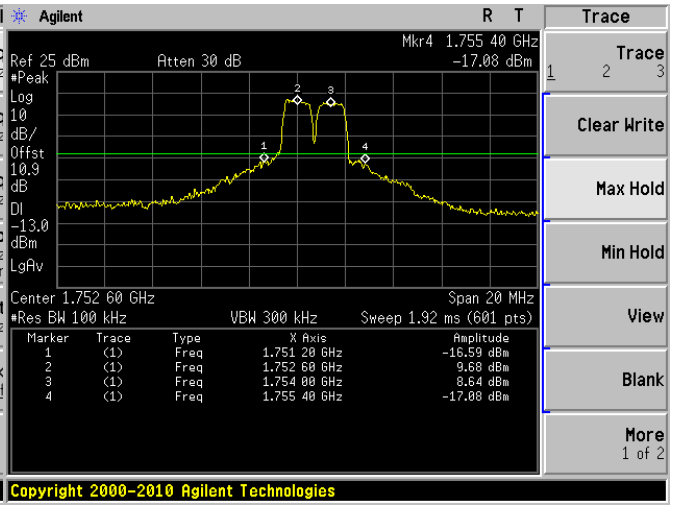
Middle Channel, Output



High Channel, Input

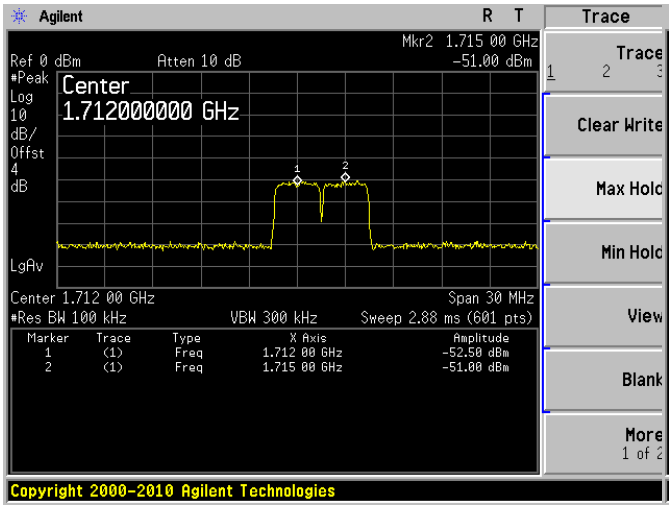


High Channel, Output

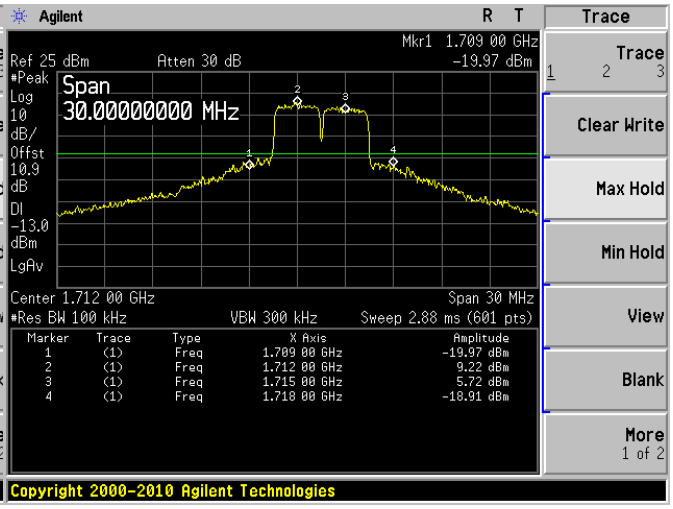


Modulation: QPSK (3 MHz)

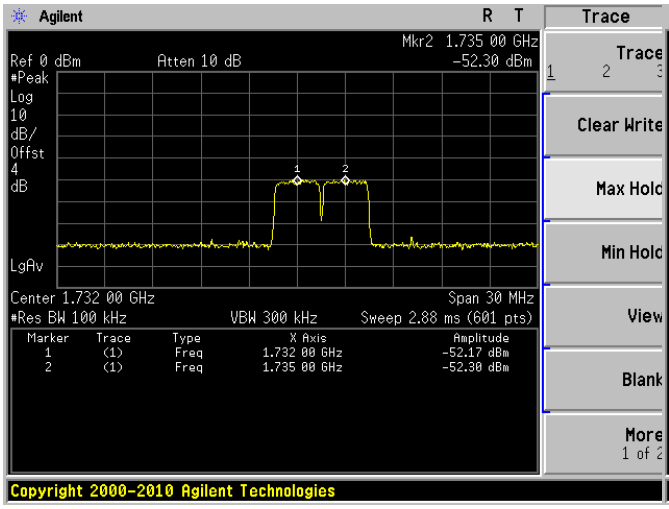
Low Channel, Input



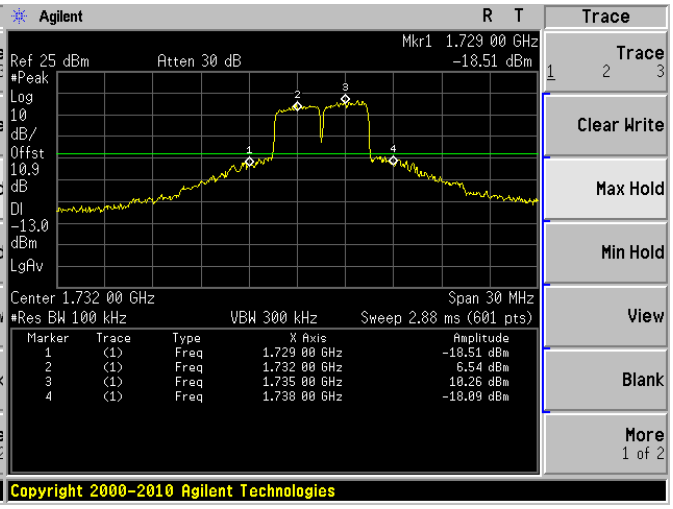
Low Channel, Output



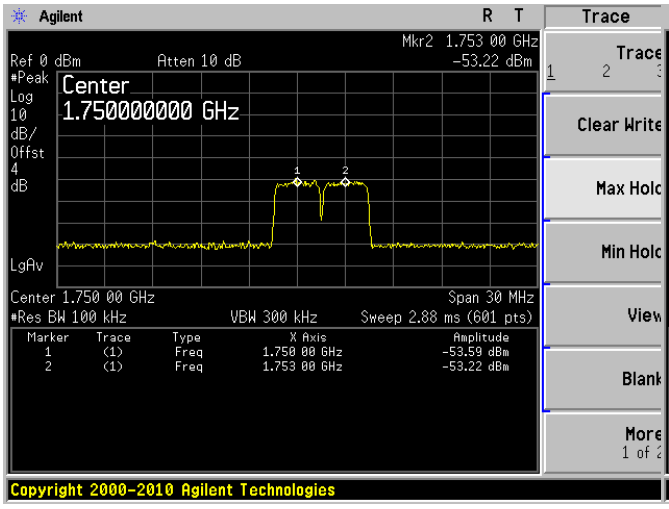
Middle Channel, Input



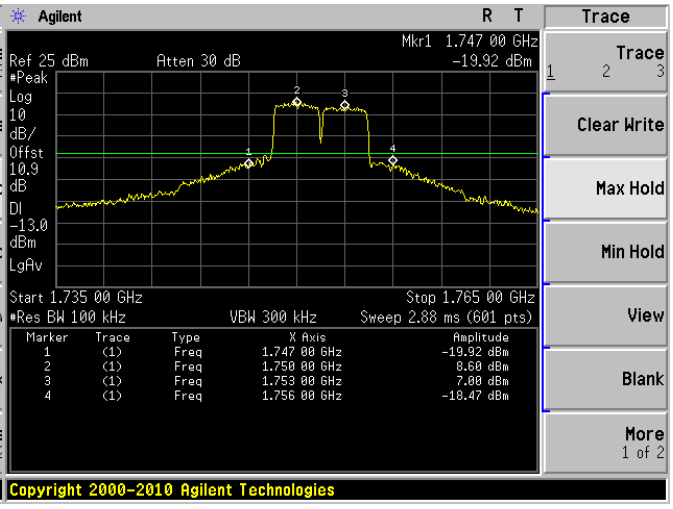
Middle Channel, Output



High Channel, Input

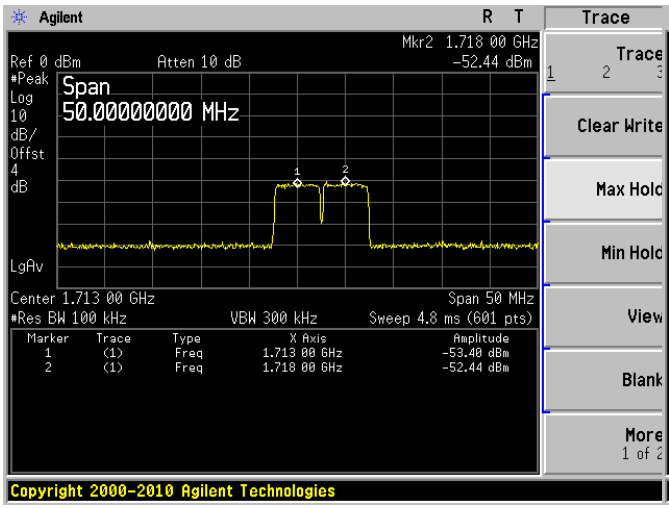


High Channel, Output

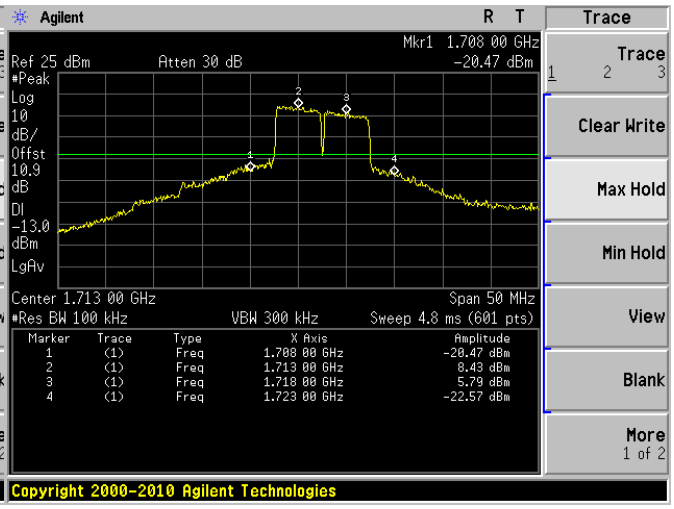


Modulation: QPSK (5 MHz)

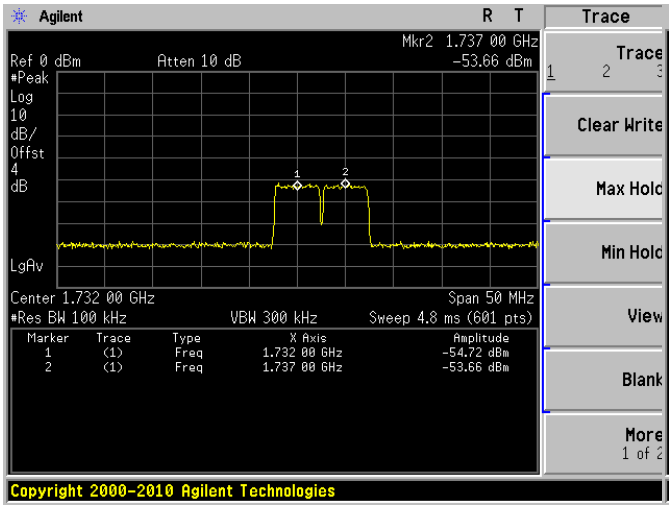
Low Channel, Input



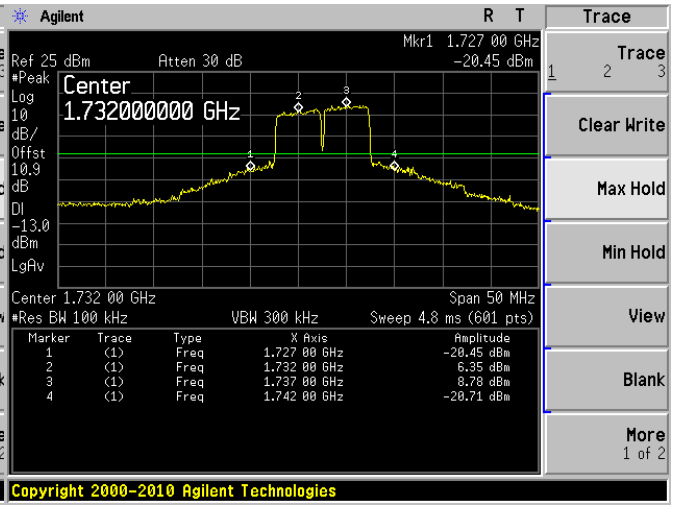
Low Channel, Output



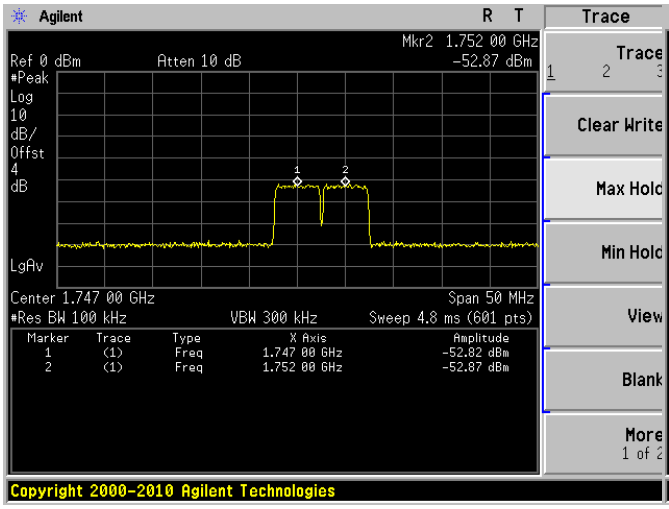
Middle Channel, Input



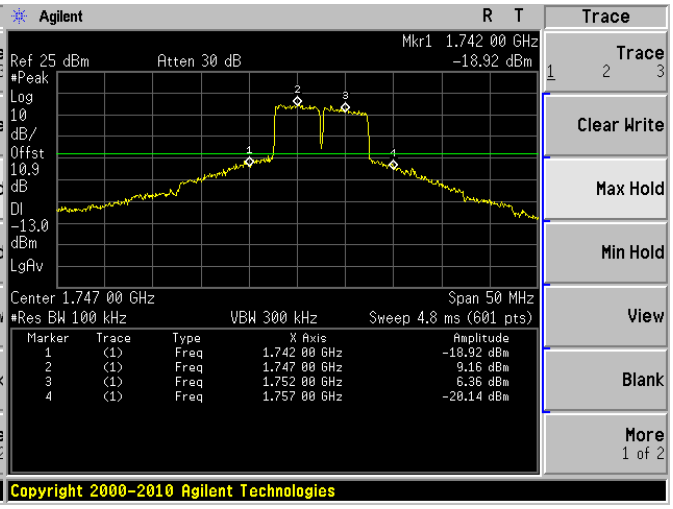
Middle Channel, Output



High Channel, Input

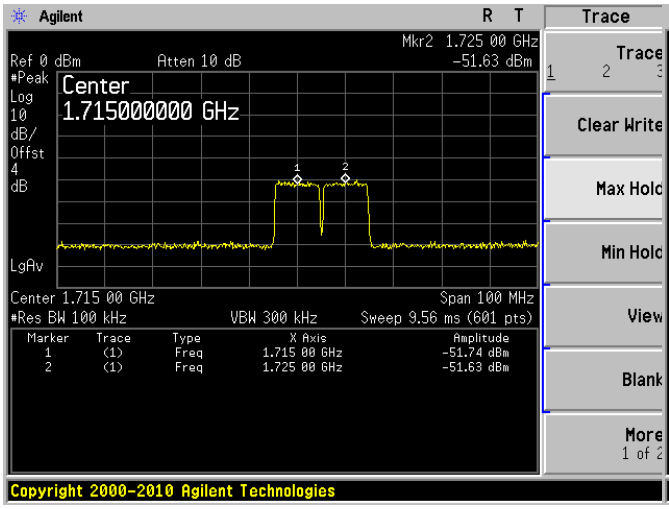


High Channel, Output

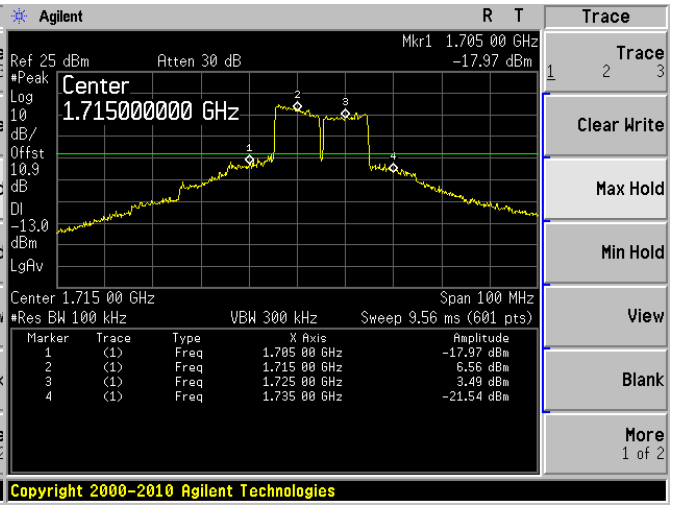


Modulation: QPSK (10 MHz)

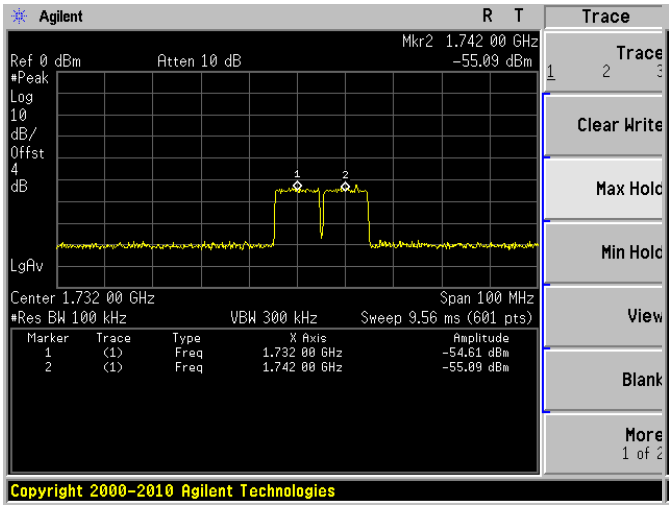
Low Channel, Input



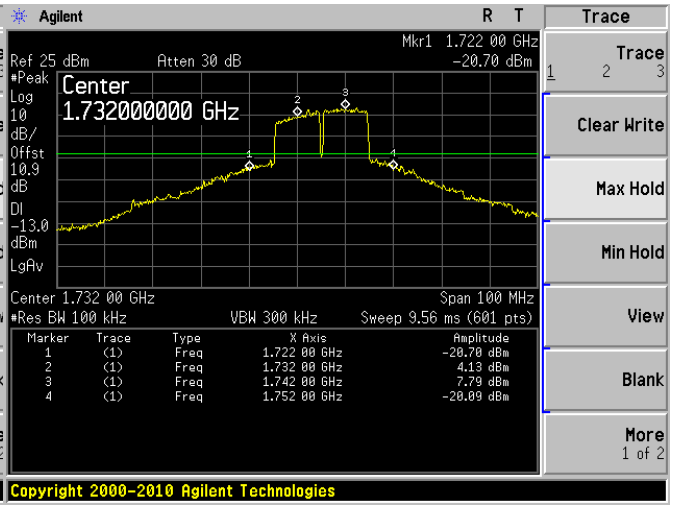
Low Channel, Output



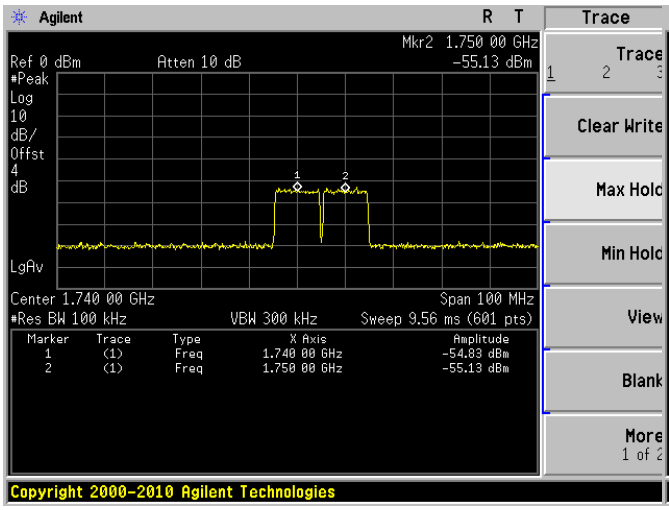
Middle Channel, Input



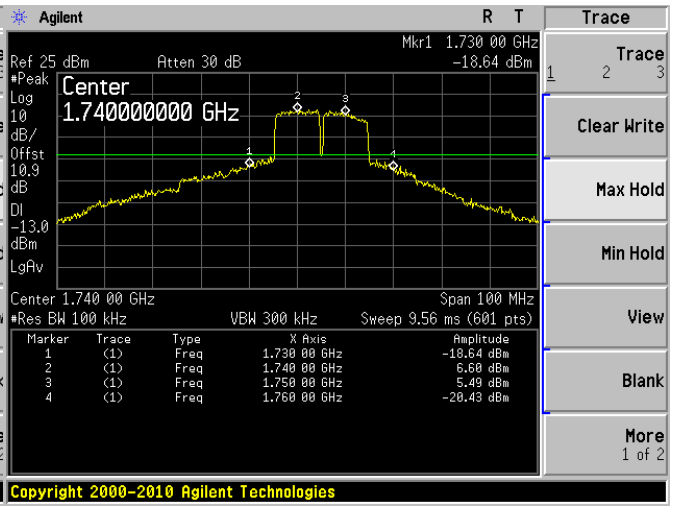
Middle Channel, Output



High Channel, Input



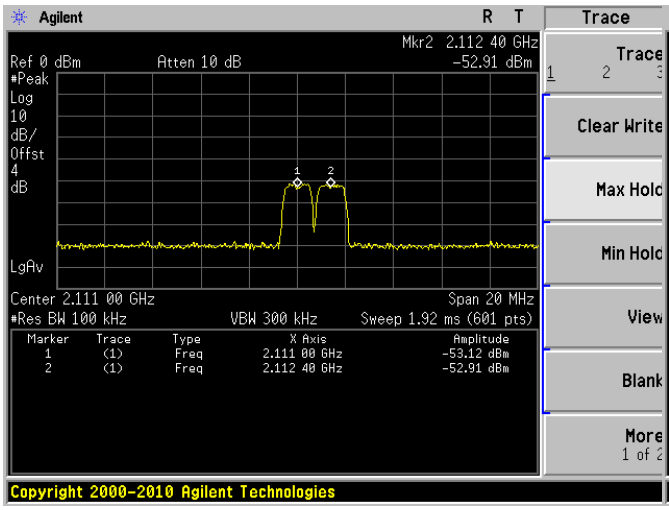
High Channel, Output



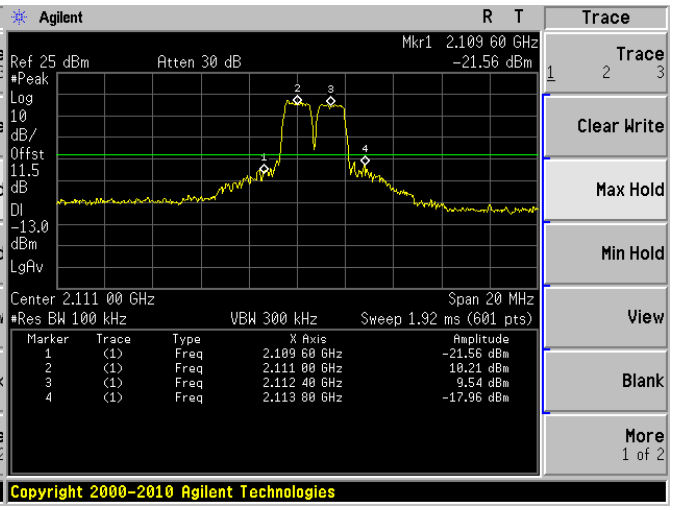
AWS Band Downlink:

Modulation: QPSK (1.4 MHz)

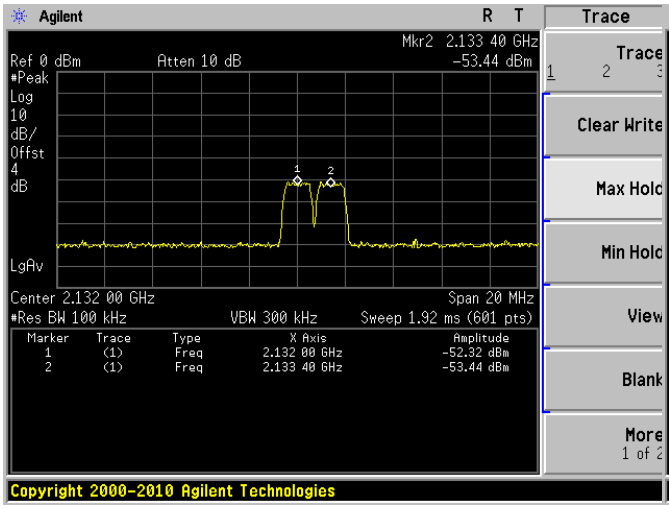
Low Channel, Input



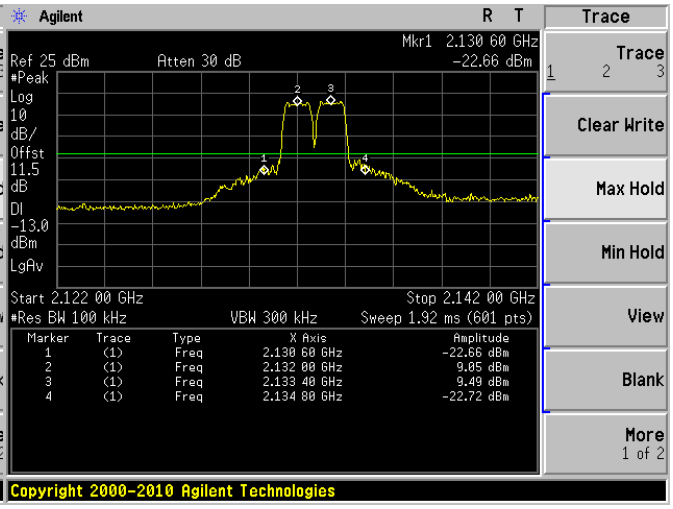
Low Channel, Output



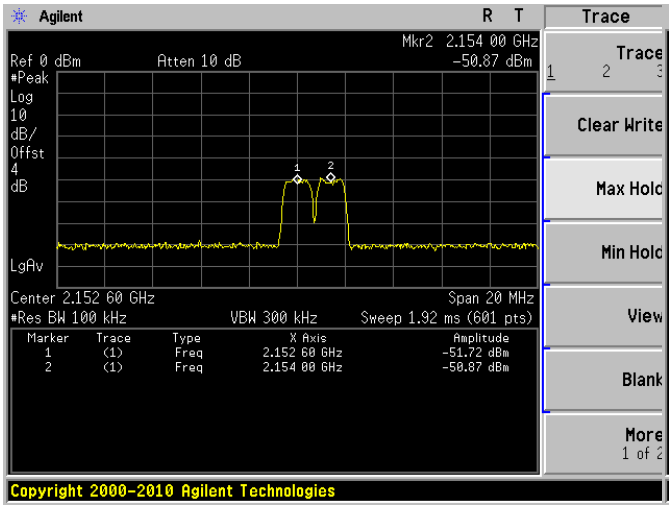
Middle Channel, Input



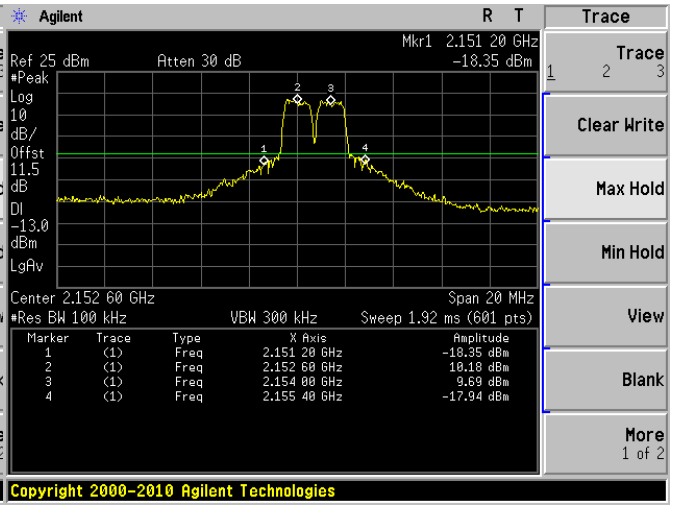
Middle Channel, Output



High Channel, Input

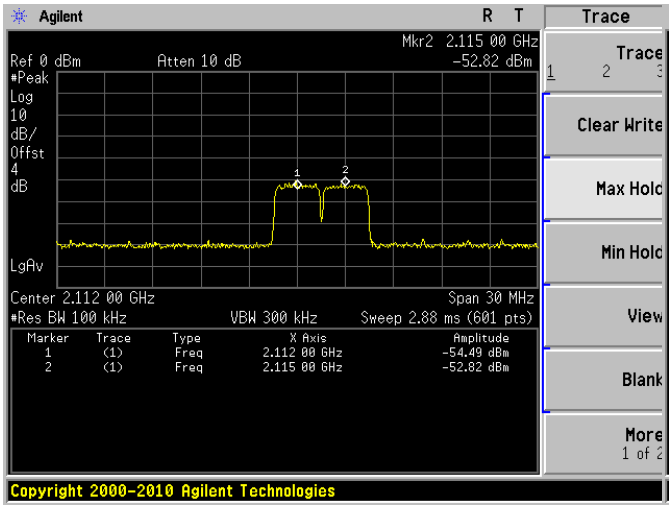


High Channel, Output

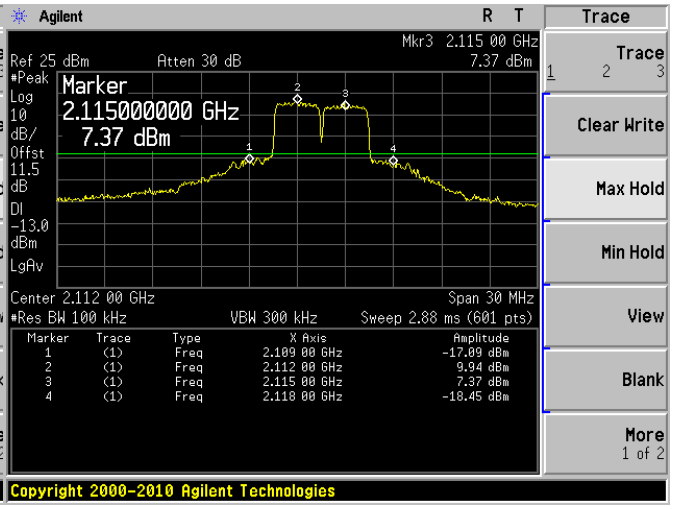


Modulation: QPSK (3 MHz)

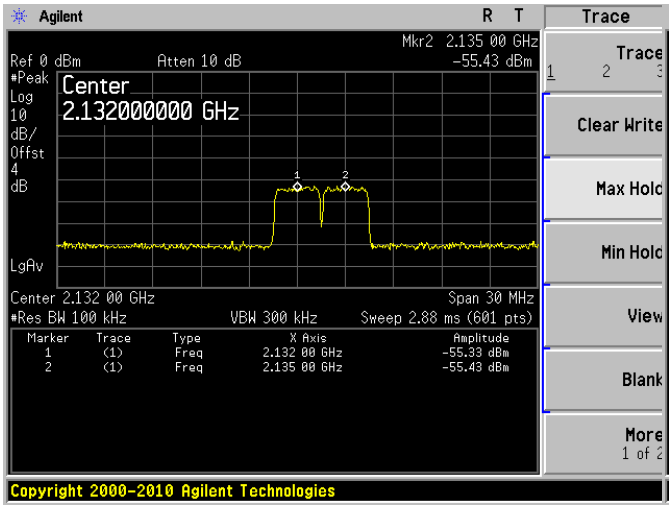
Low Channel, Input



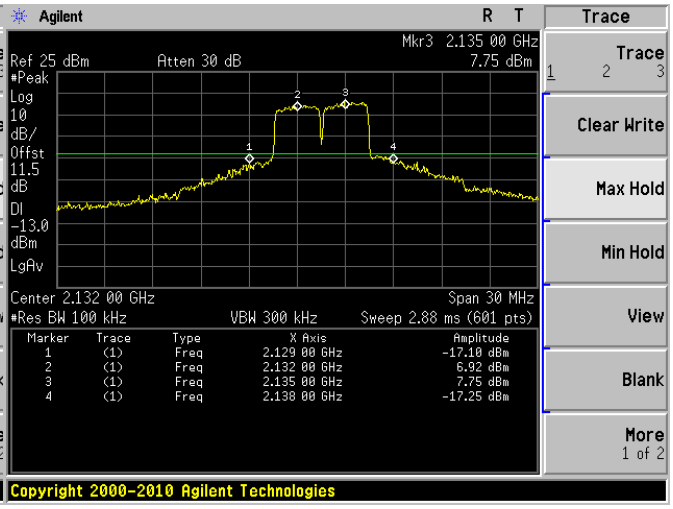
Low Channel, Output



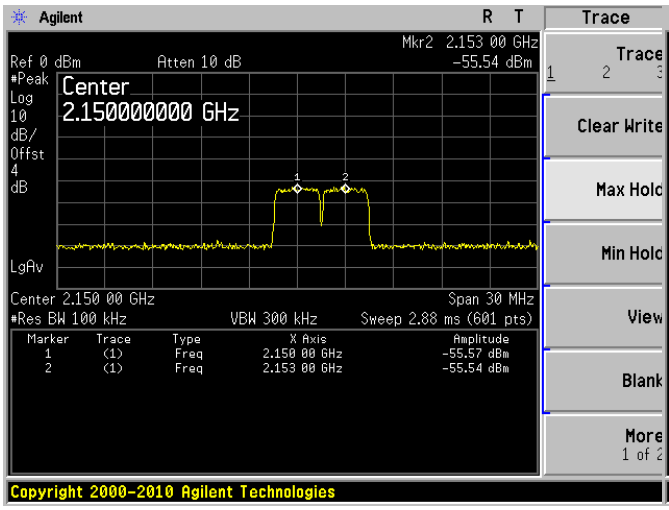
Middle Channel, Input



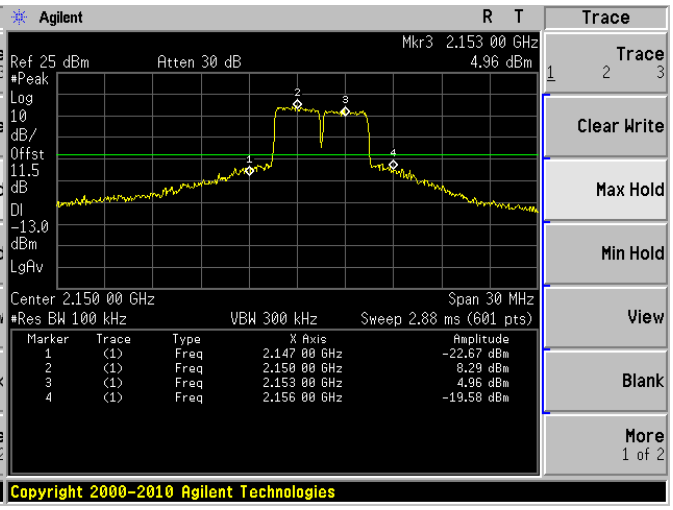
Middle Channel, Output



High Channel, Input

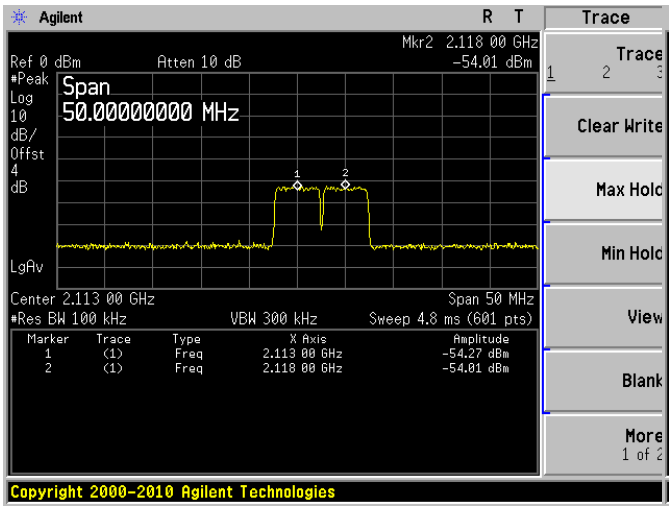


High Channel, Output

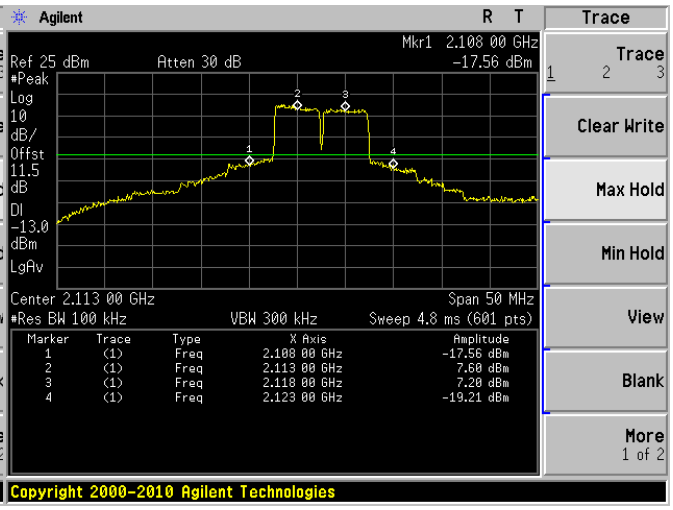


Modulation: QPSK (5 MHz)

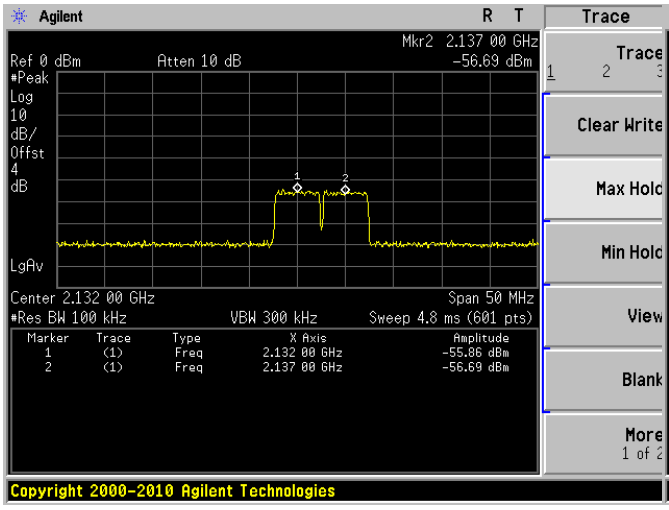
Low Channel, Input



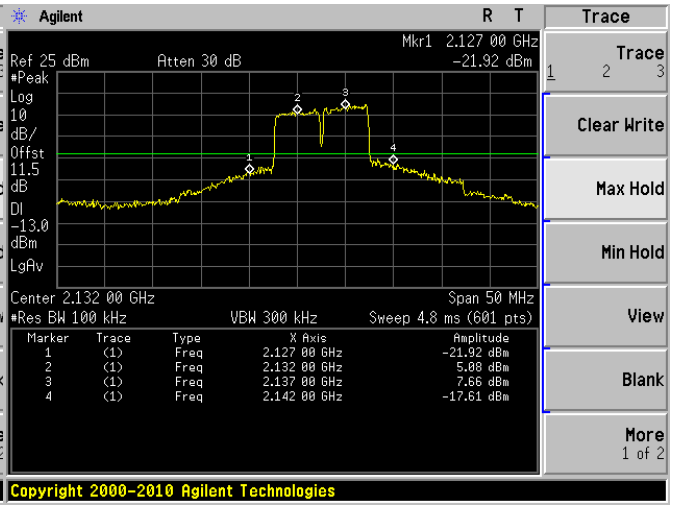
Low Channel, Output



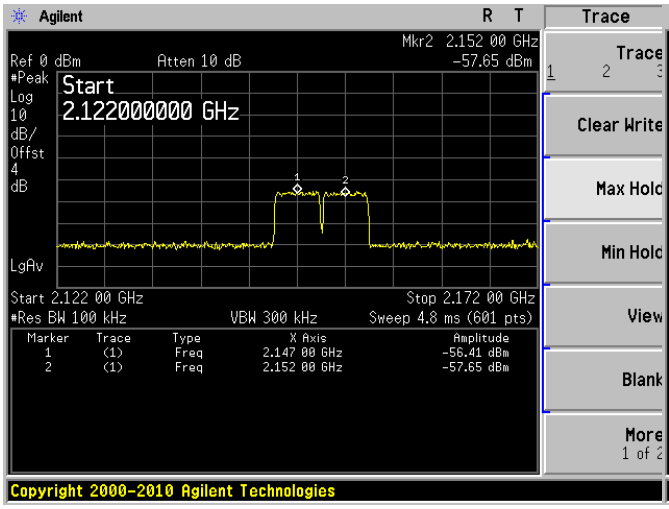
Middle Channel, Input



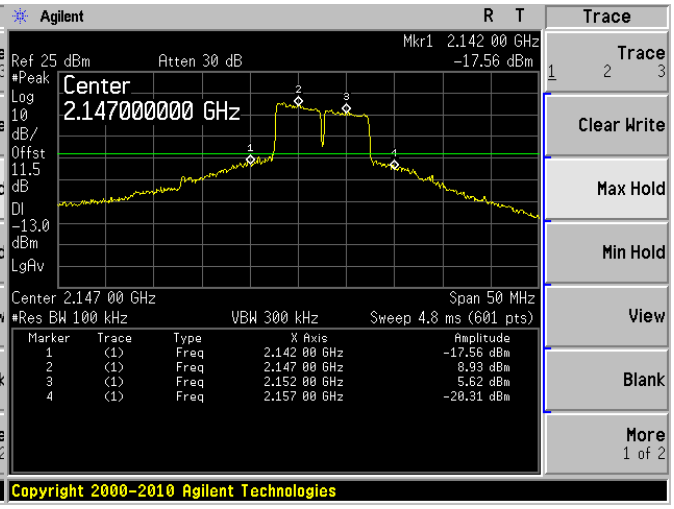
Middle Channel, Output



High Channel, Input

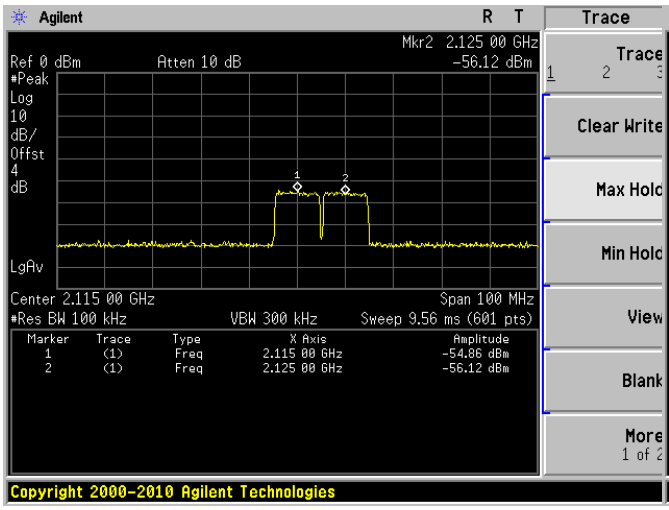


High Channel, Output

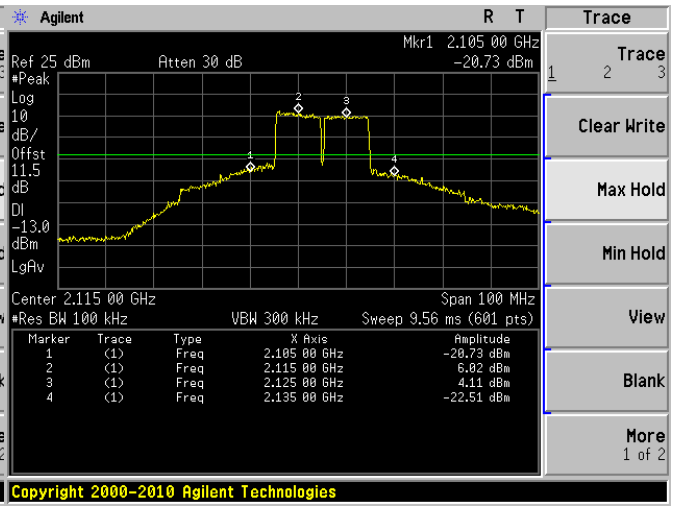


Modulation: QPSK (10 MHz)

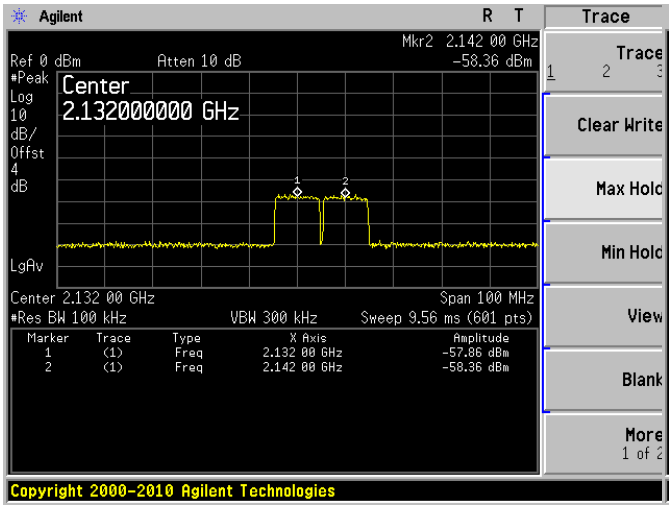
Low Channel, Input



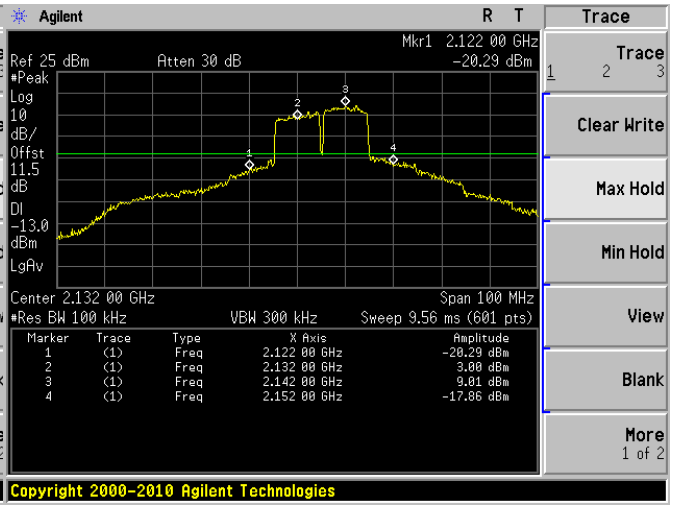
Low Channel, Output



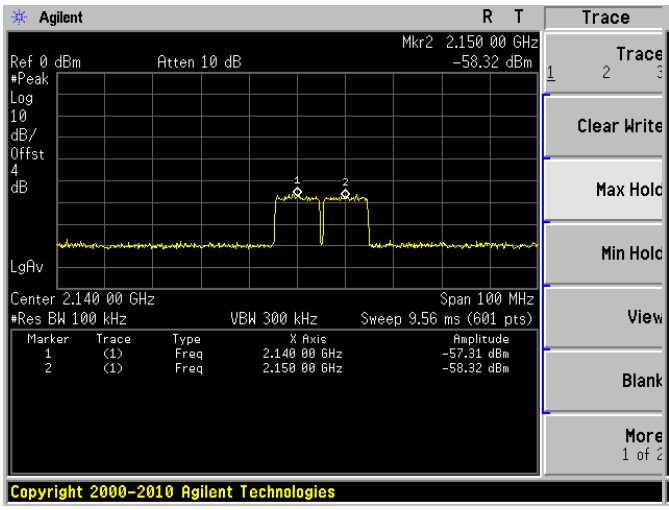
Middle Channel, Input



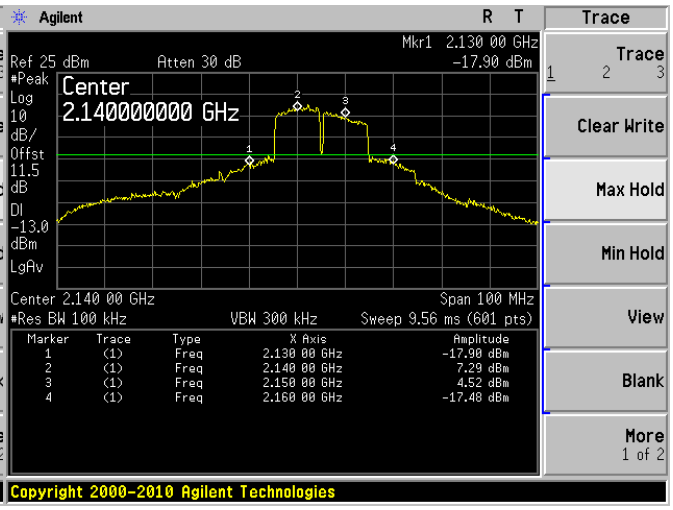
Middle Channel, Output



High Channel, Input



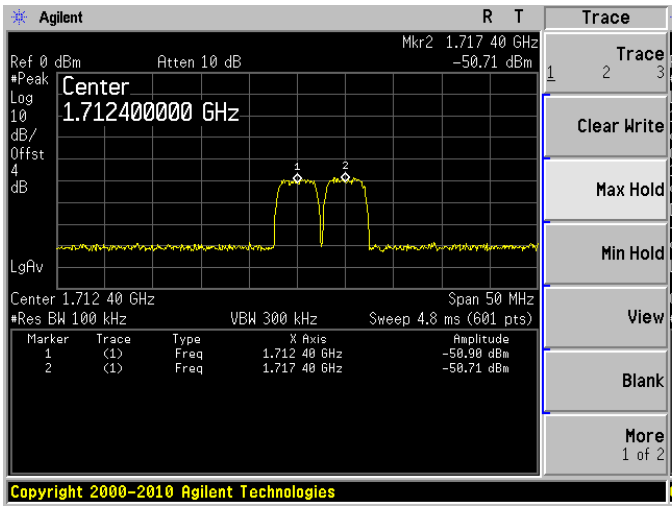
High Channel, Output



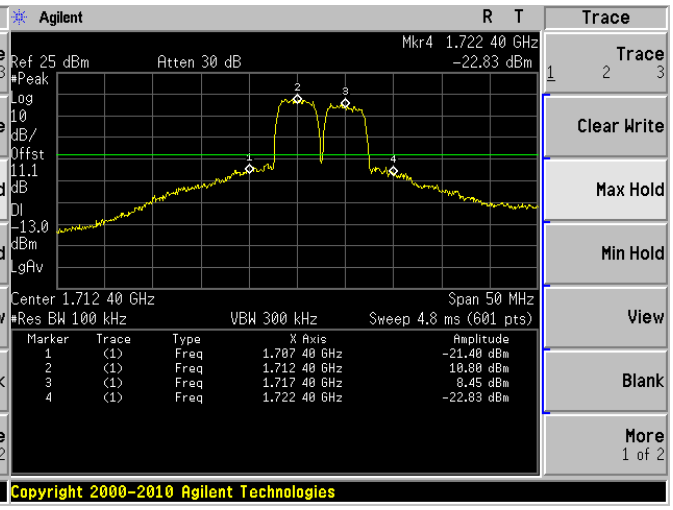
AWS Band Uplink:

Modulation: WCDMA

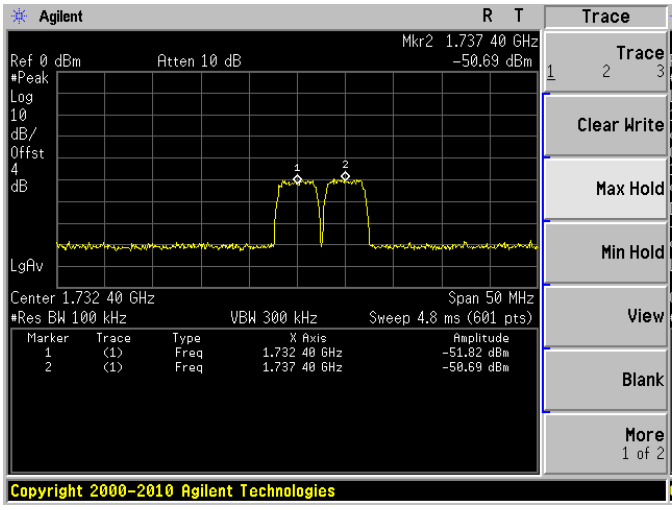
Low Channel, Input



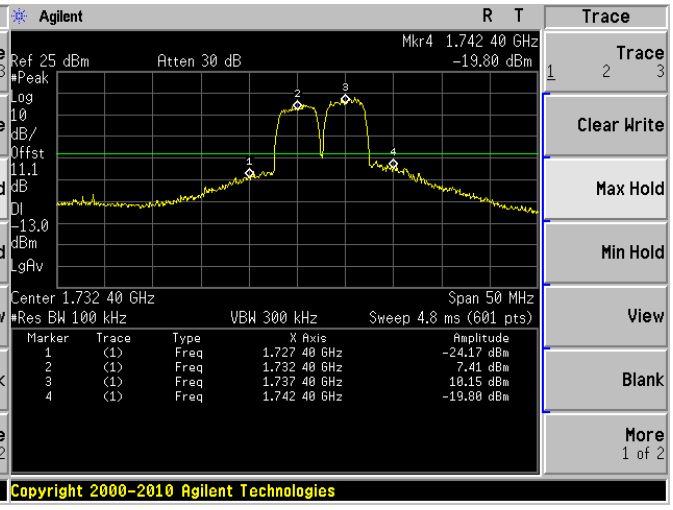
Low Channel, Output



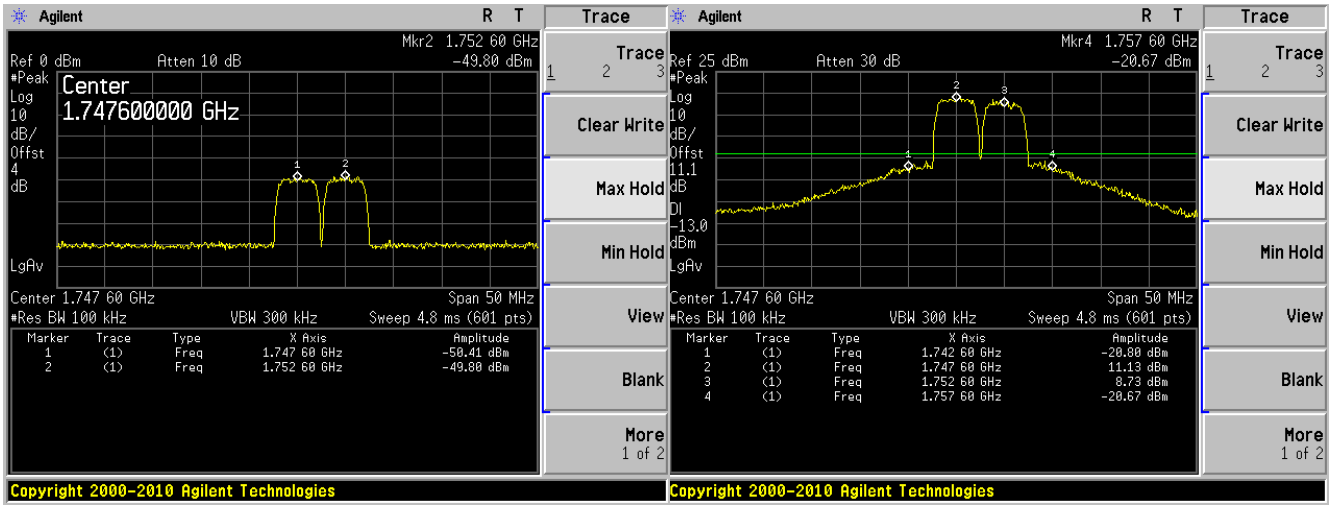
Middle Channel, Input



Middle Channel, Output



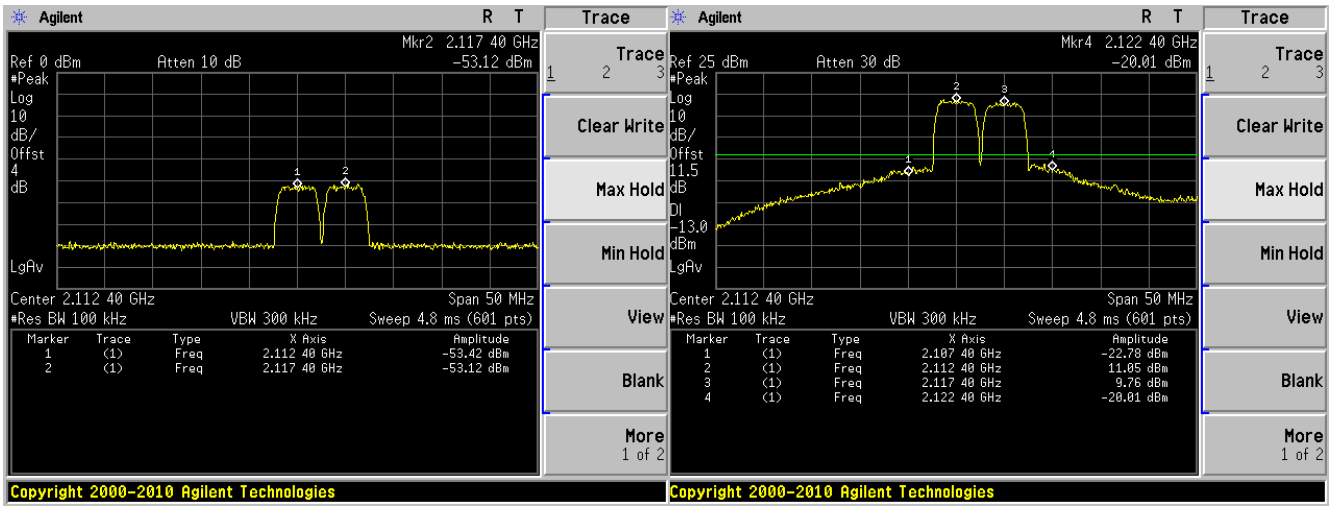
High Channel, Input High Channel, Output



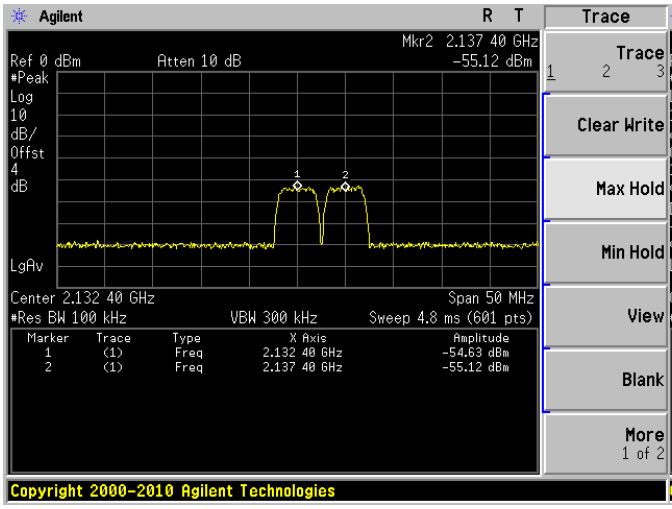
AWS Band Downlink:

Modulation: WCDMA

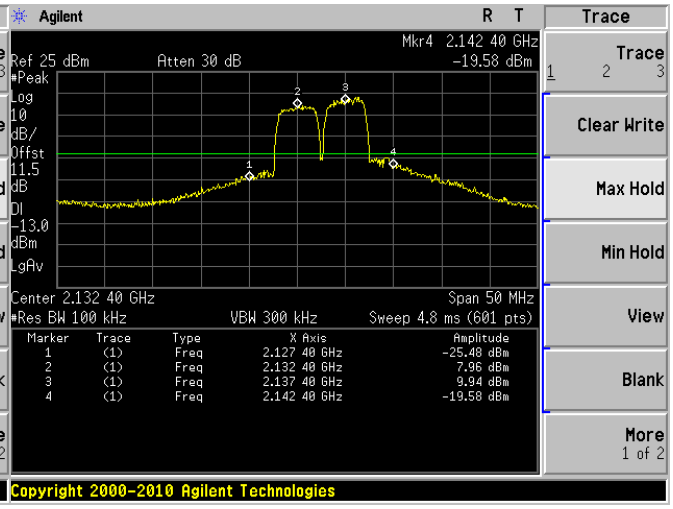
Low Channel, Input Low Channel, Output



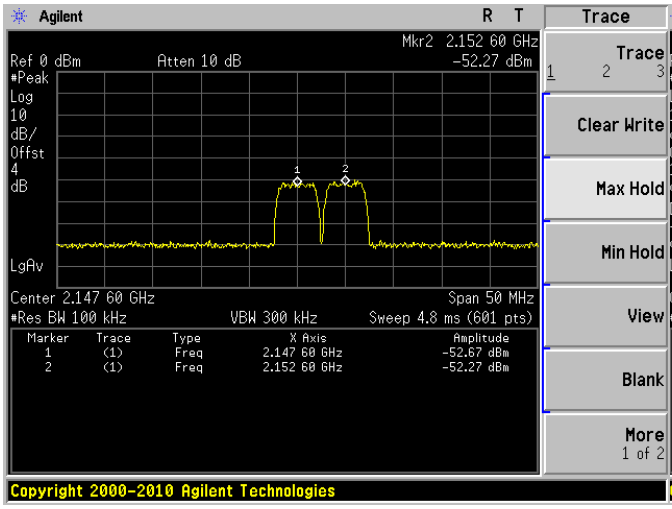
Middle Channel, Input



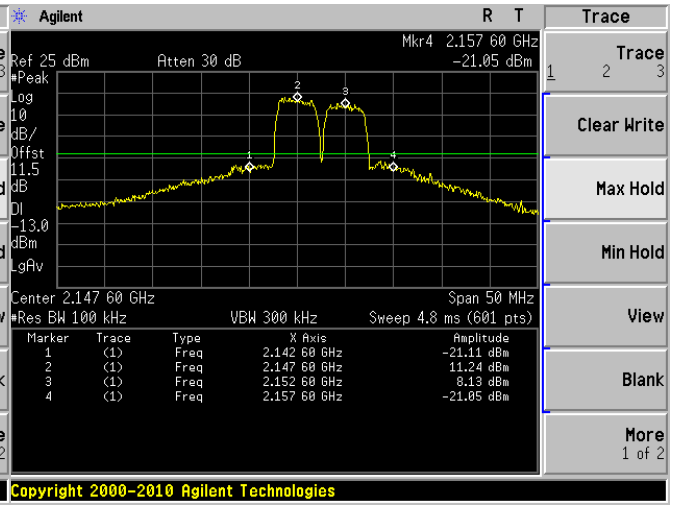
Middle Channel, Output



High Channel, Input



High Channel, Output



8 FCC §22.917 & §24.238 & §27.53 – Band Edge

8.1 Applicable Standard

According to FCC §22.917, §24.238, and §27.53, the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

8.2 Test Procedure

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

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

8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

8.4 Test Environmental Conditions

Temperature:	19ºC
Relative Humidity:	55%
ATM Pressure:	101.1kPa

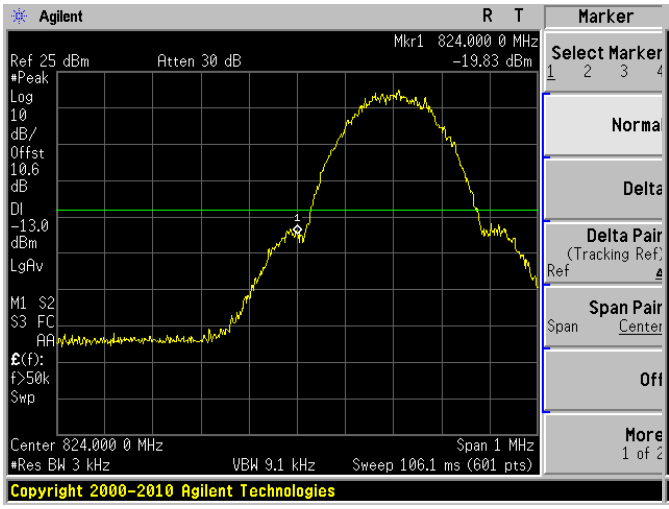
The testing was performed by Lionel Lara on 2012-12-27 in the RF Site.

8.5 Test Results

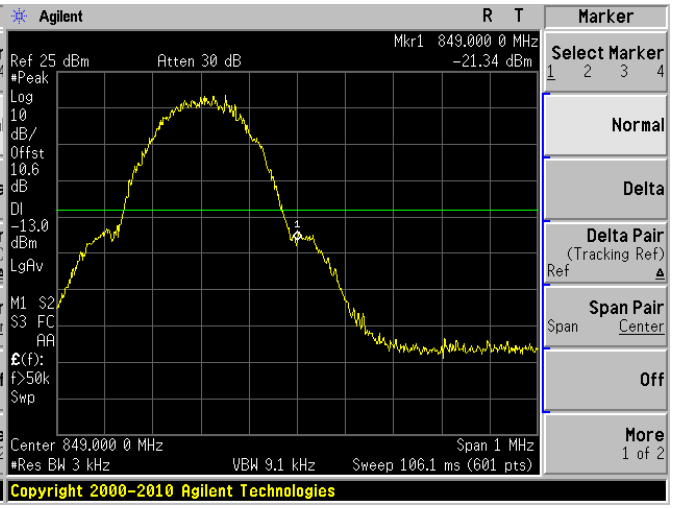
Please refer to the following plots.

Cell Band Uplink:

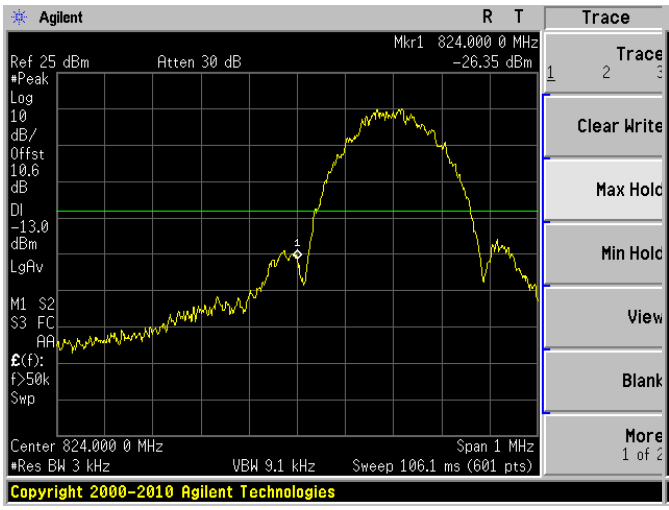
GSM - Low Channel



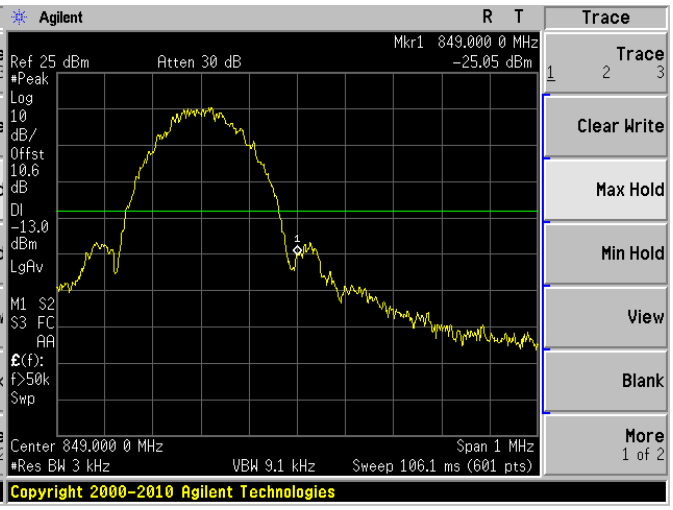
GSM - High Channel



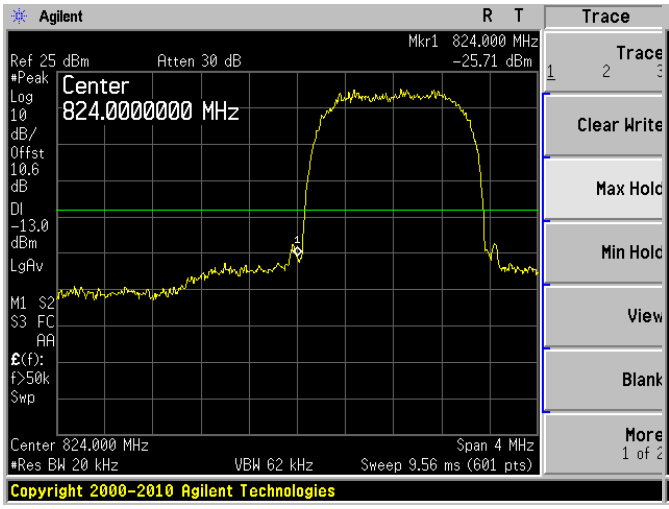
EDGE - Low Channel



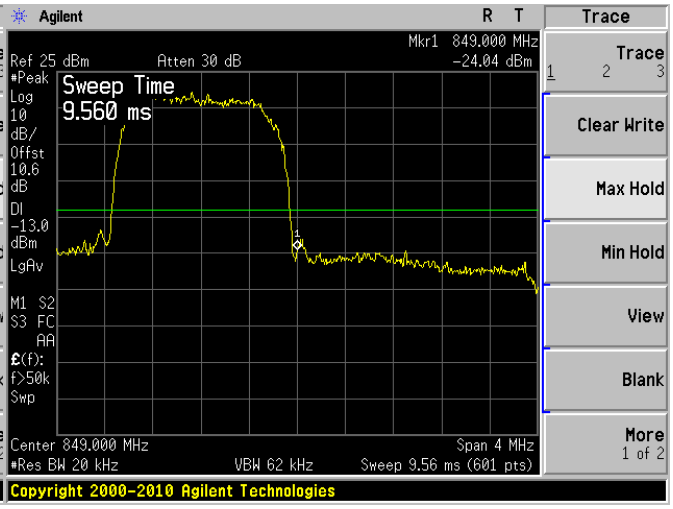
EDGE - High Channel



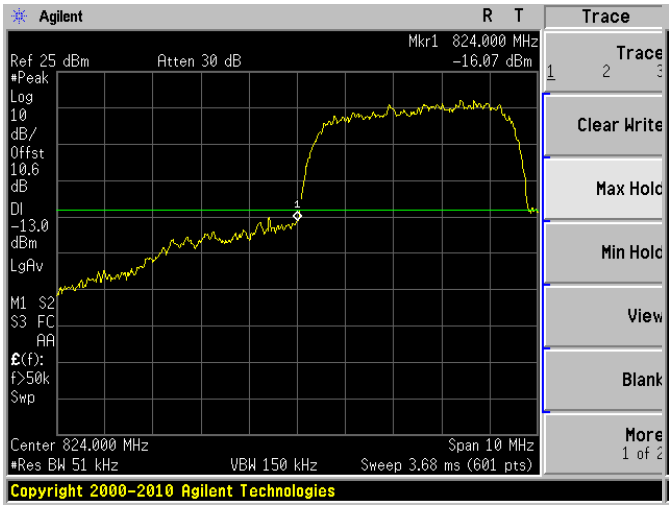
CDMA - Low Channel



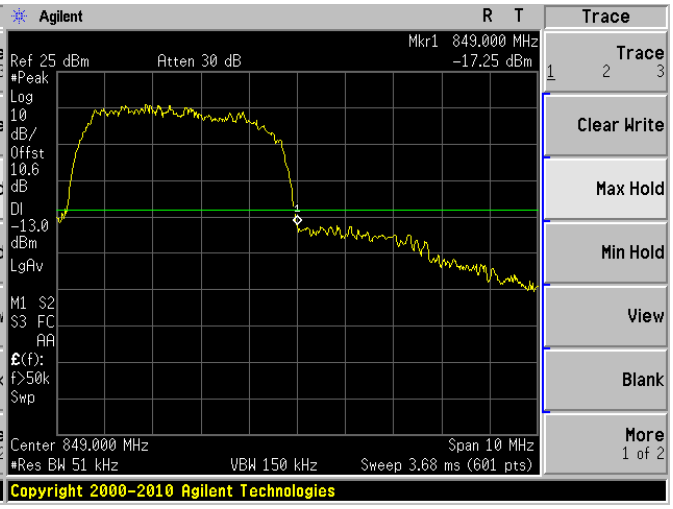
CDMA - High Channel



WCDMA - Low Channel

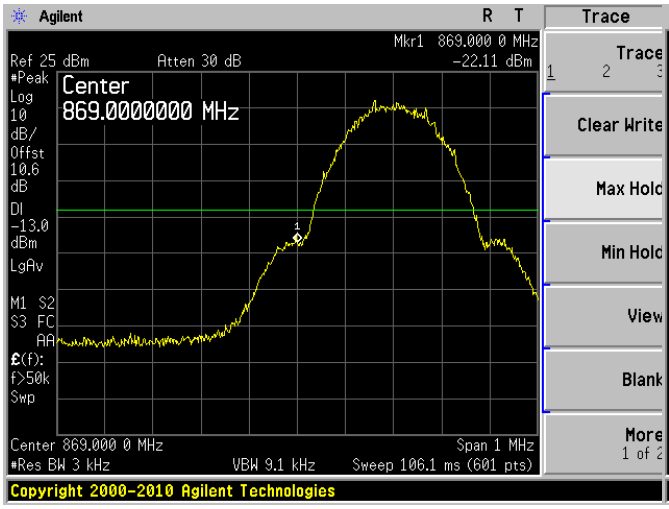


WCDMA - High Channel

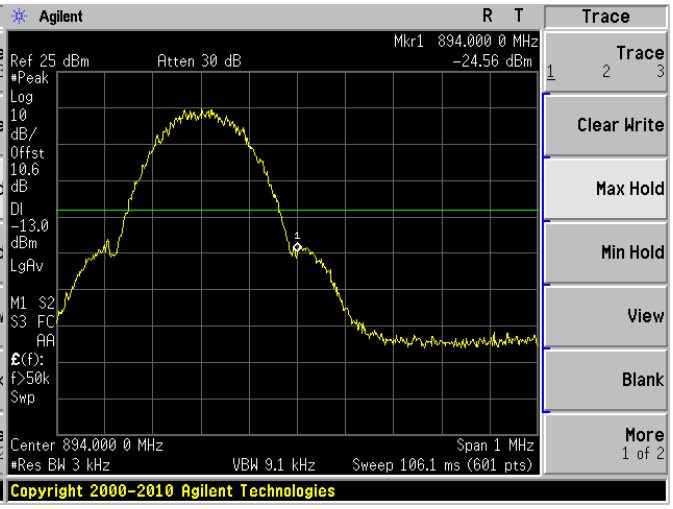


Cell Band Downlink:

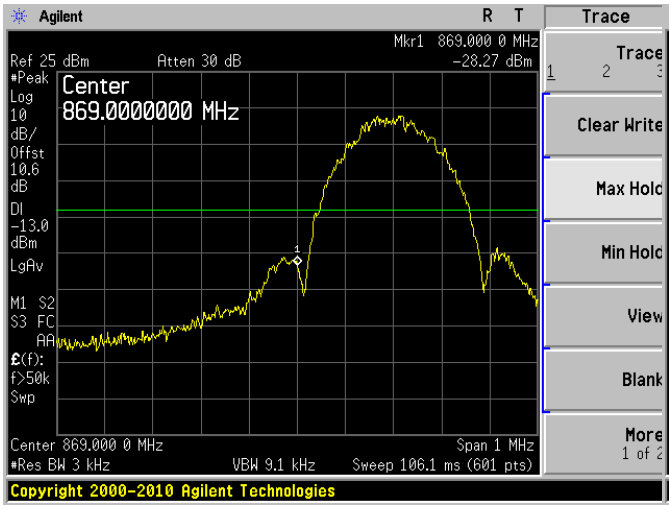
GSM - Low Channel



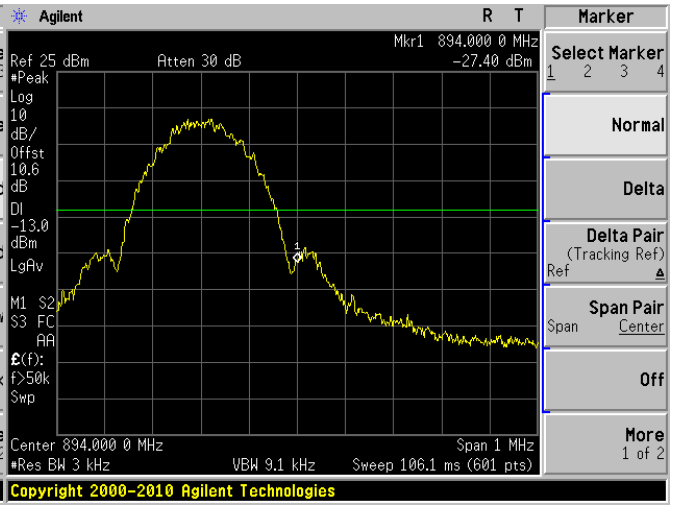
GSM - High Channel



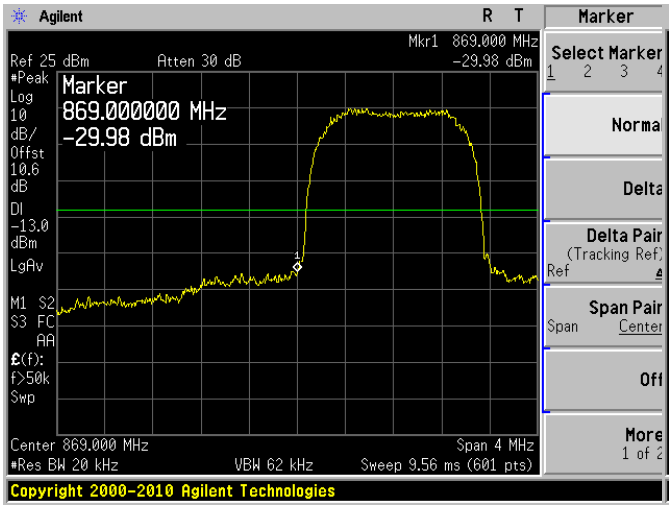
EDGE - Low Channel



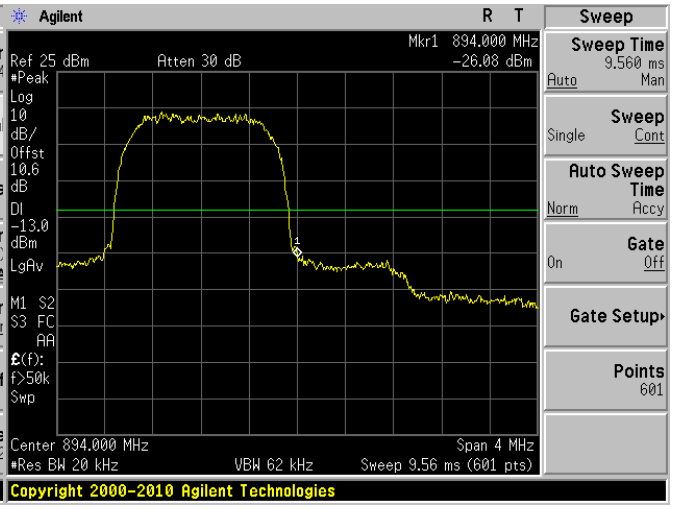
EDGE - High Channel



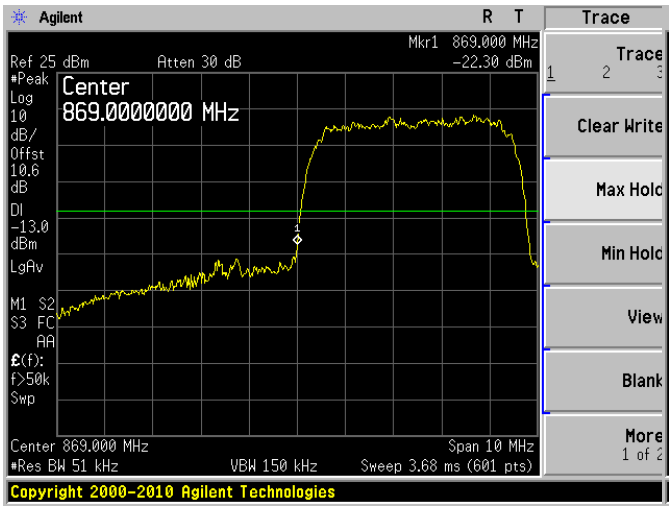
CDMA - Low Channel



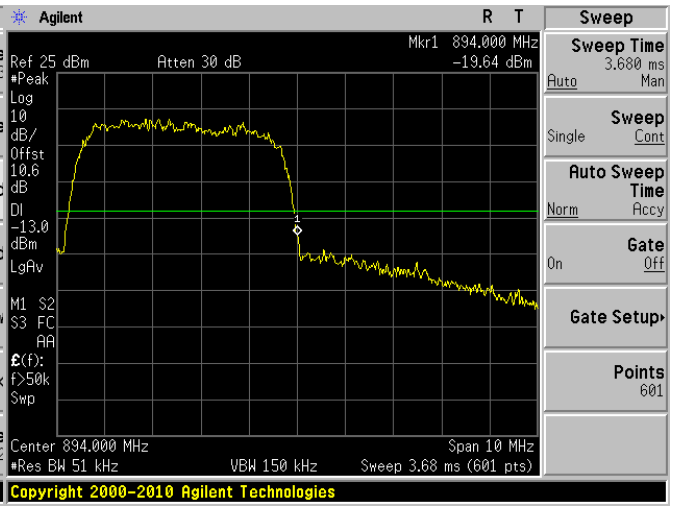
CDMA - High Channel



WCDMA - Low Channel

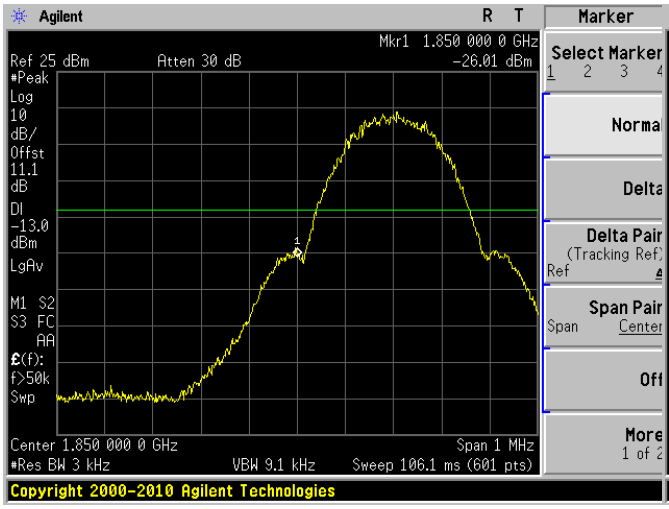


WCDMA - High Channel

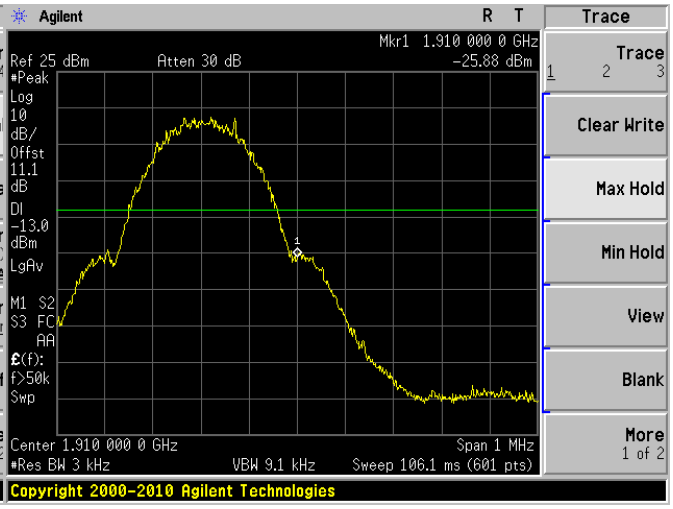


PCS Band Uplink:

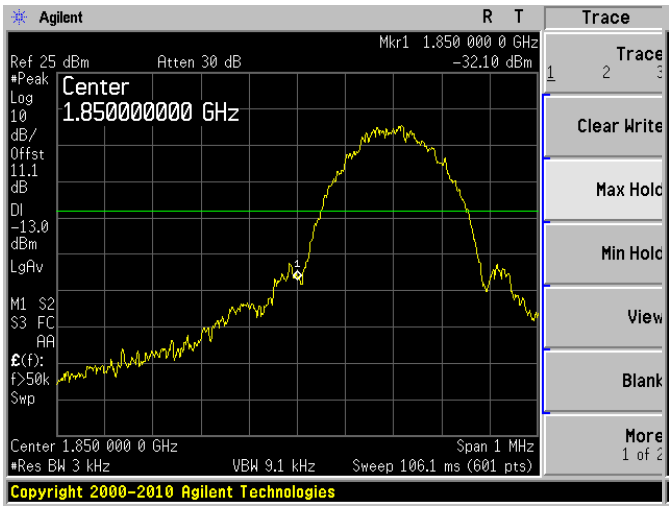
GSM - Low Channel



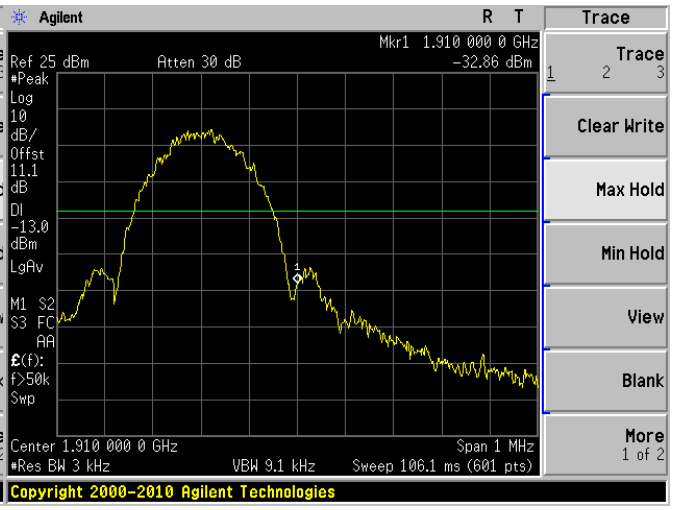
GSM - High Channel



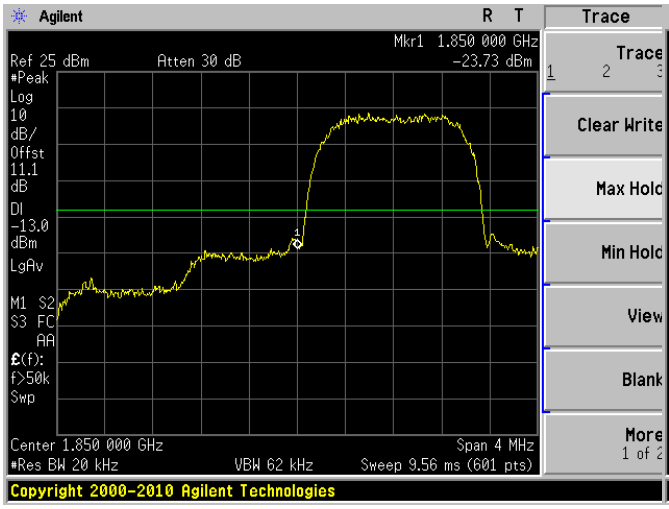
EDGE - Low Channel



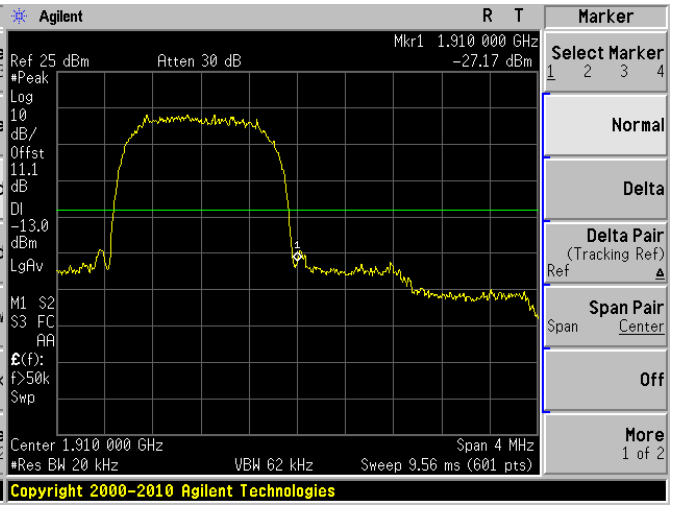
EDGE - High Channel



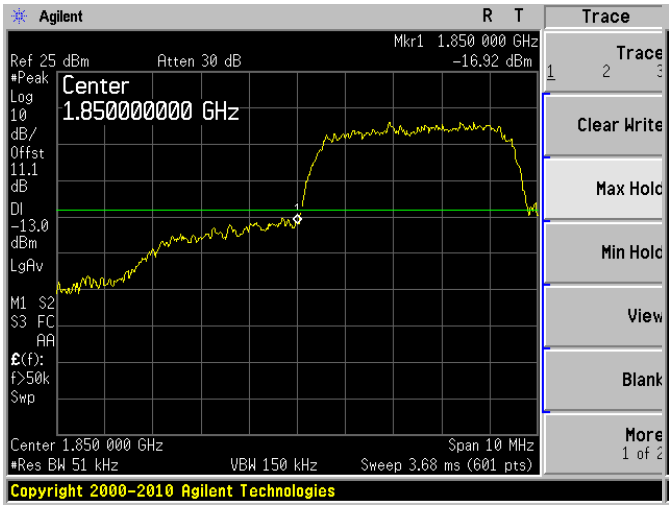
CDMA - Low Channel



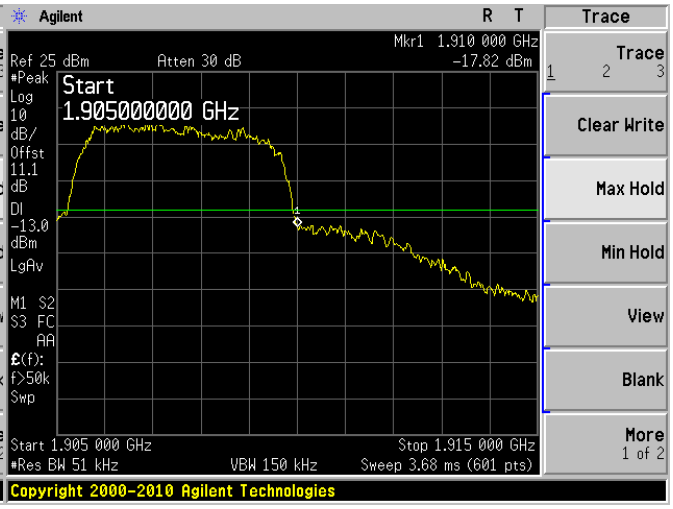
CDMA - High Channel



WCDMA - Low Channel

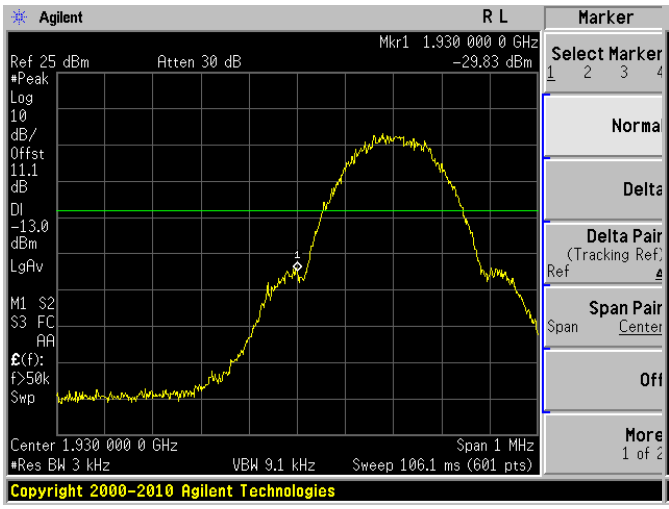


WCDMA - High Channel

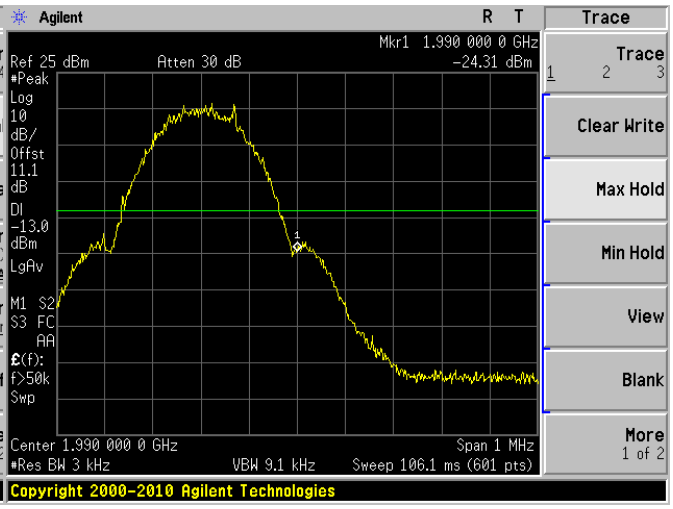


PCS Band Downlink:

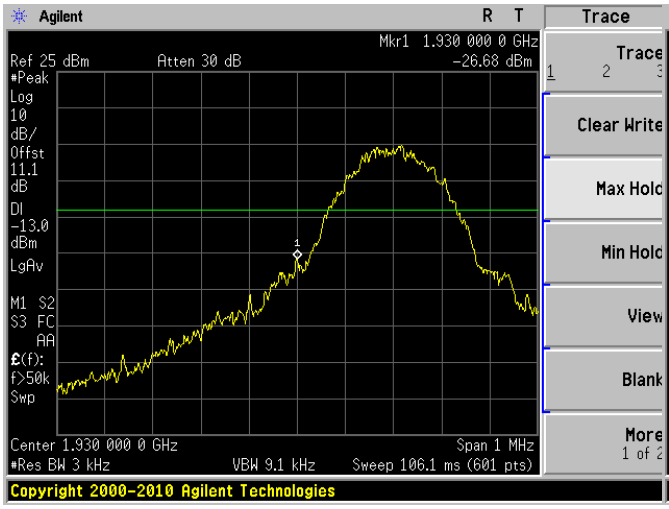
GSM - Low Channel



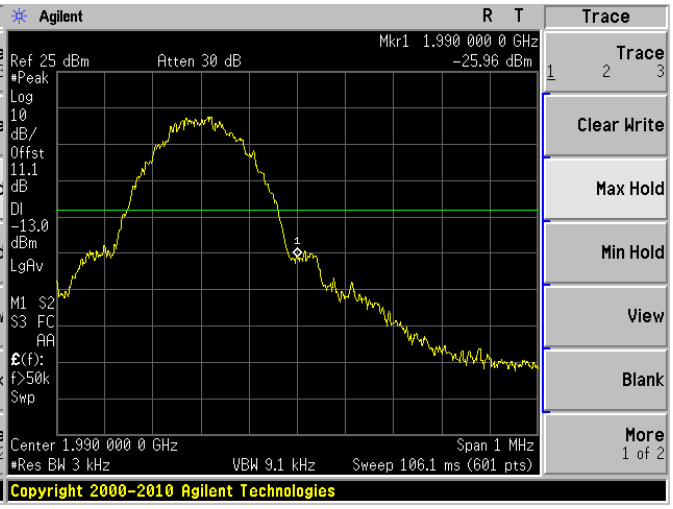
GSM - High Channel



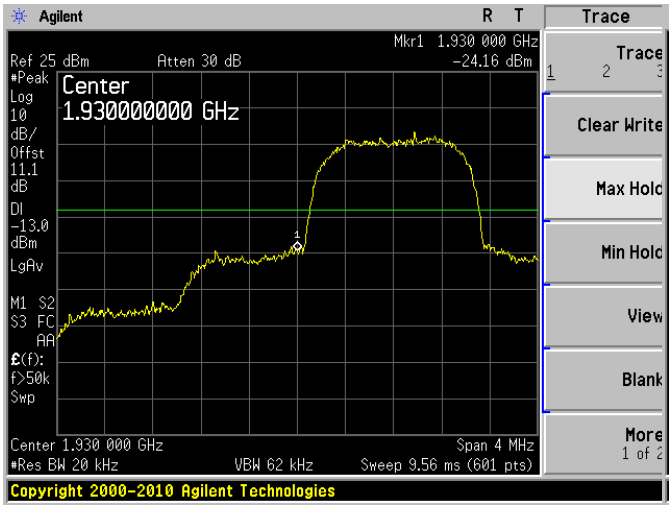
EDGE - Low Channel



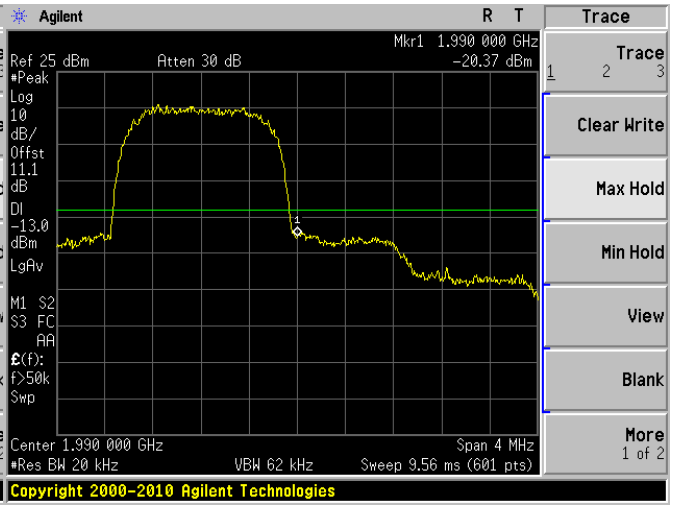
EDGE - High Channel



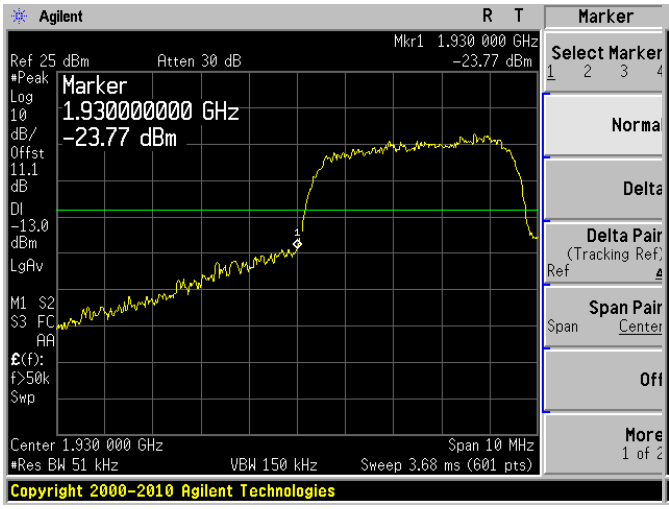
CDMA - Low Channel



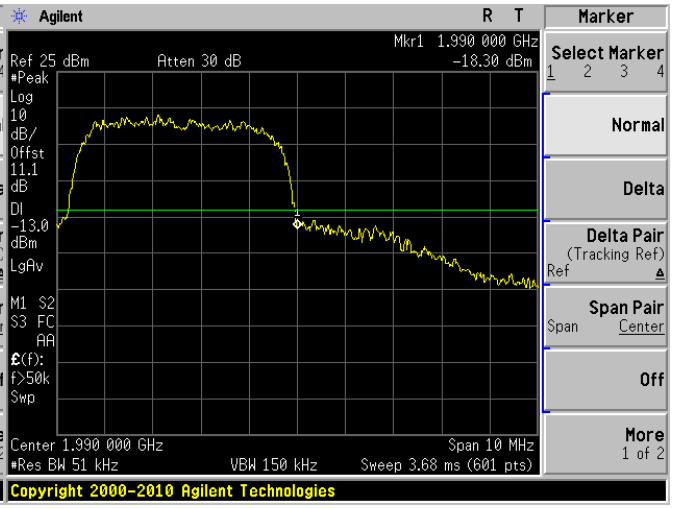
CDMA - High Channel



WCDMA - Low Channel

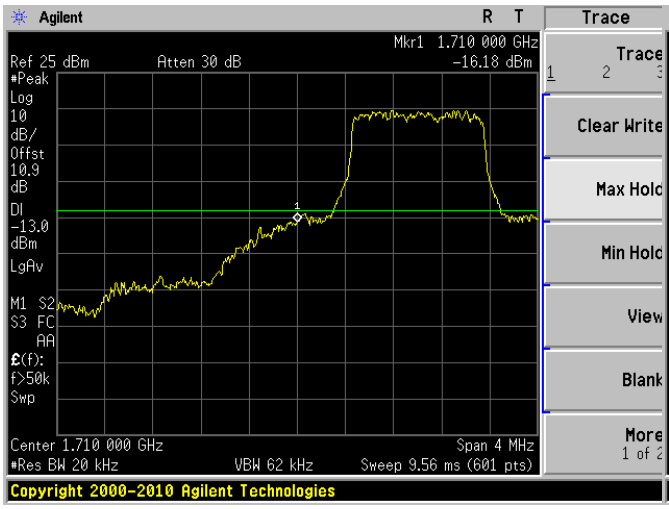


WCDMA - High Channel

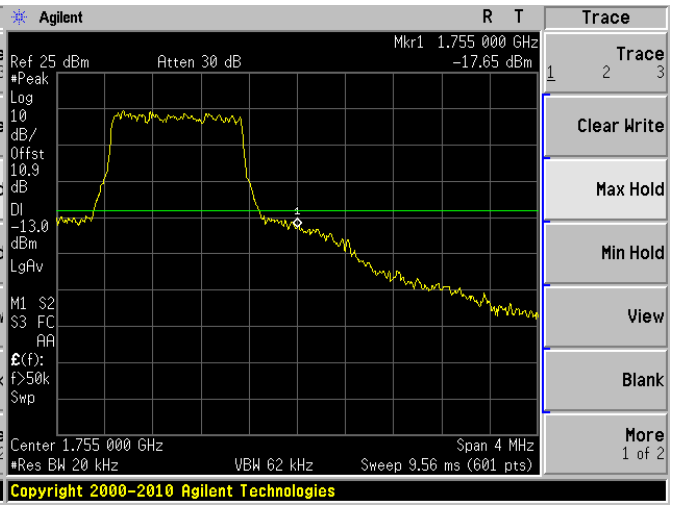


AWS Band Uplink:

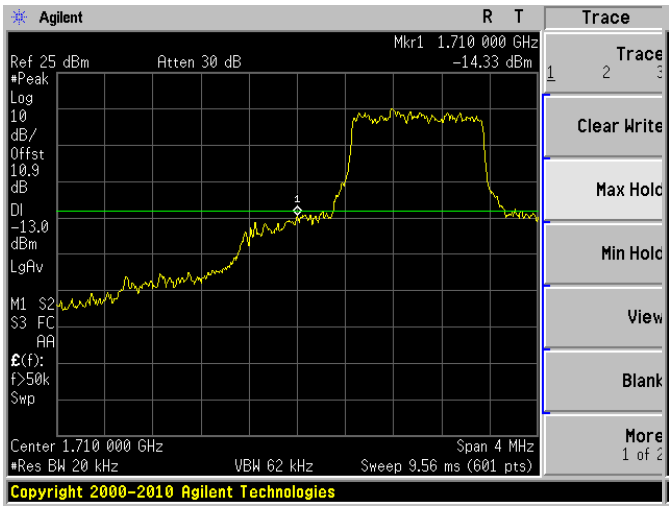
QPSK (1.4 MHz) - Low Channel



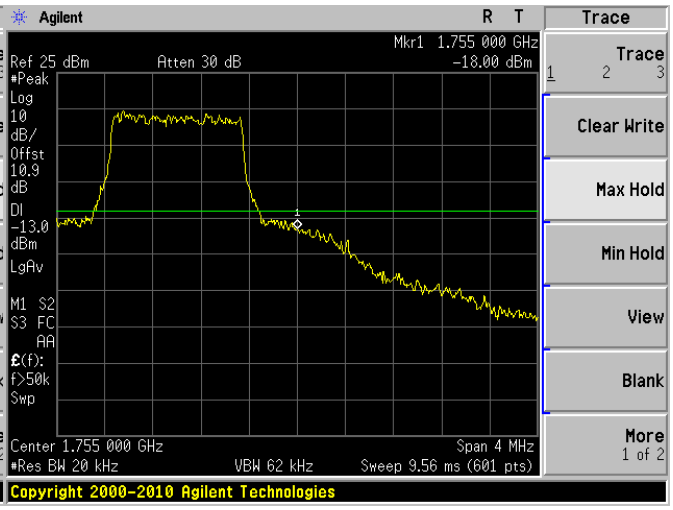
QPSK (1.4 MHz) - High Channel



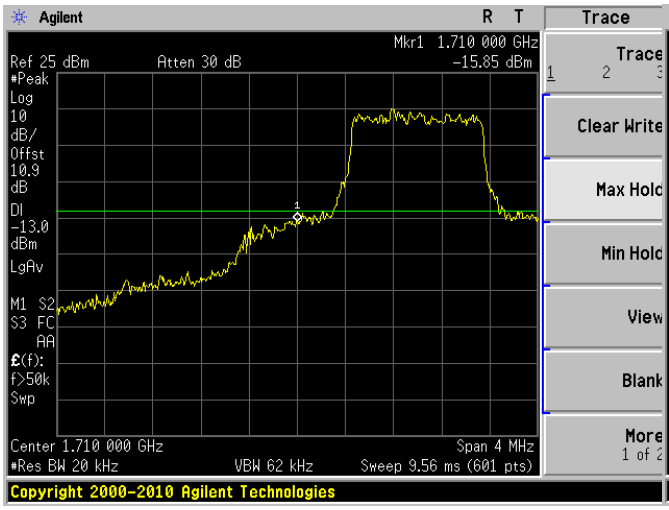
16QAM (1.4 MHz) - Low Channel



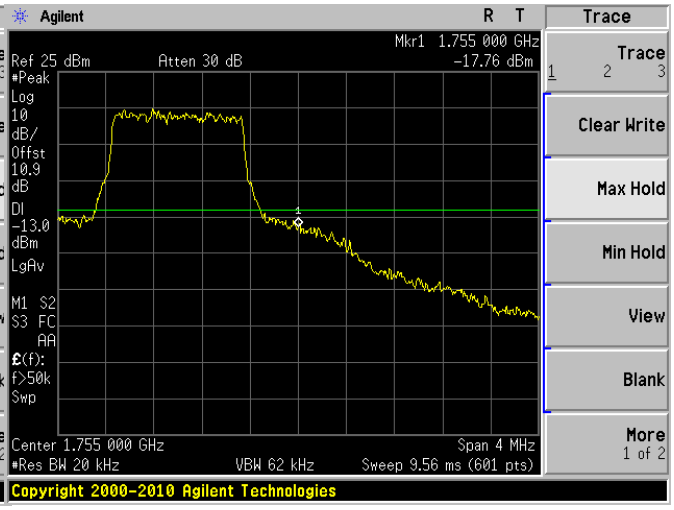
16QAM (1.4 MHz) - High Channel



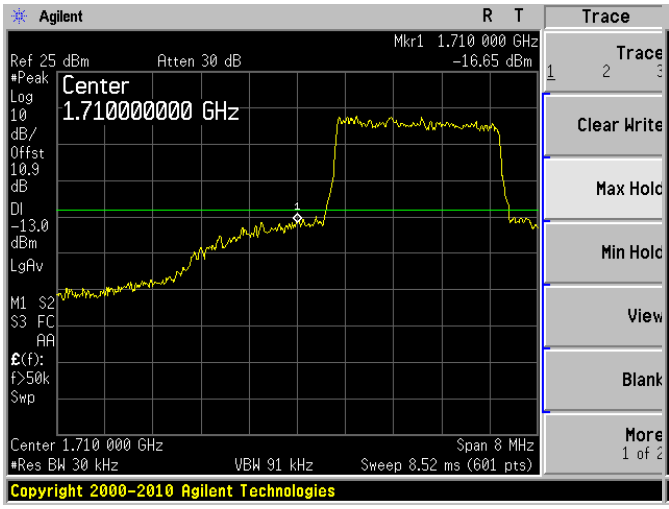
64QAM (1.4 MHz) - Low Channel



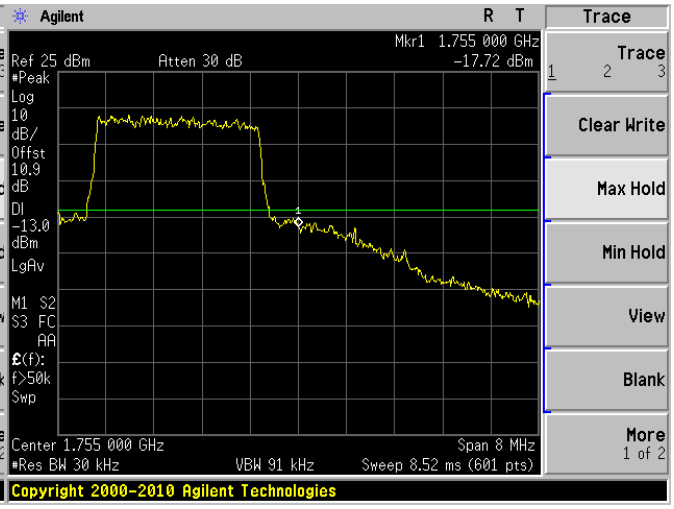
64QAM (1.4 MHz) - High Channel



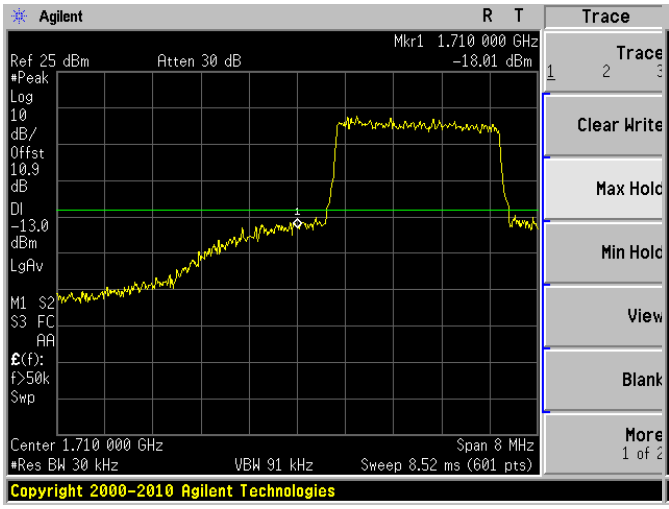
QPSK (3 MHz) - Low Channel



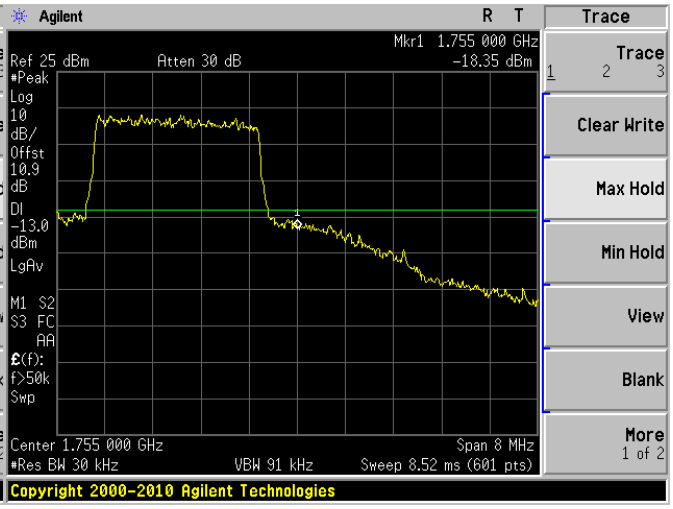
QPSK (3 MHz) - High Channel



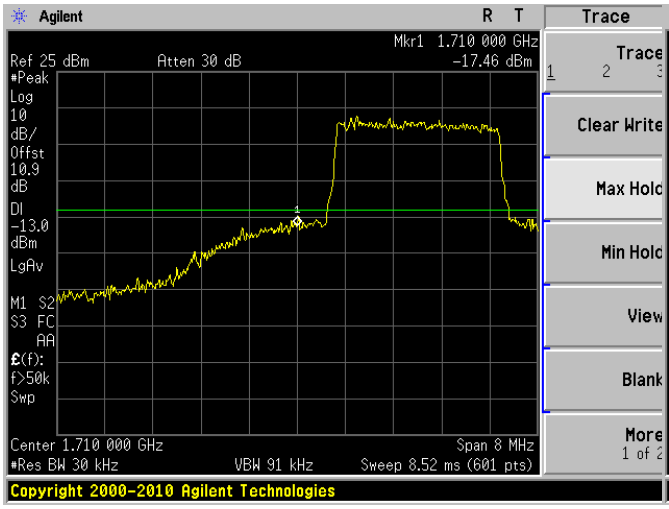
16QAM (3 MHz) - Low Channel



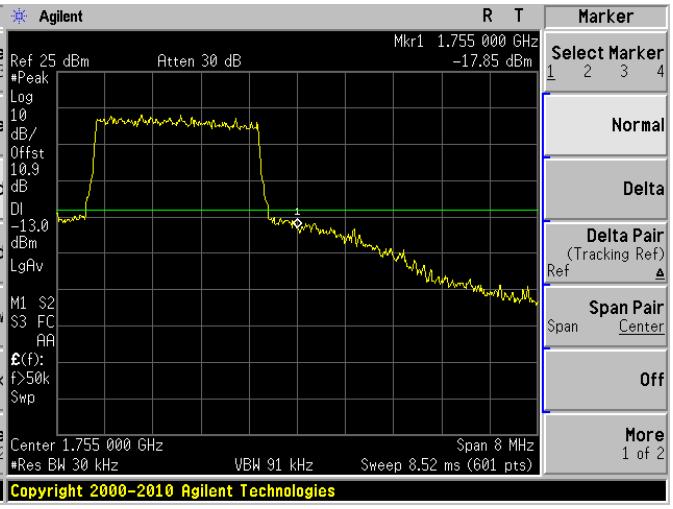
16QAM (3 MHz) - High Channel



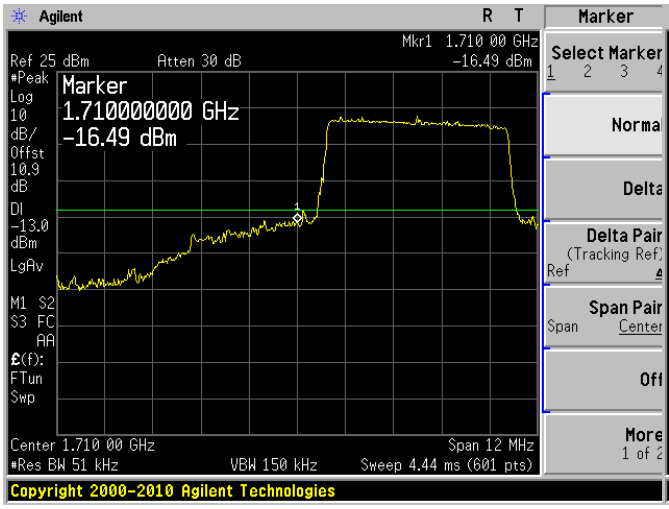
64QAM (3 MHz) - Low Channel



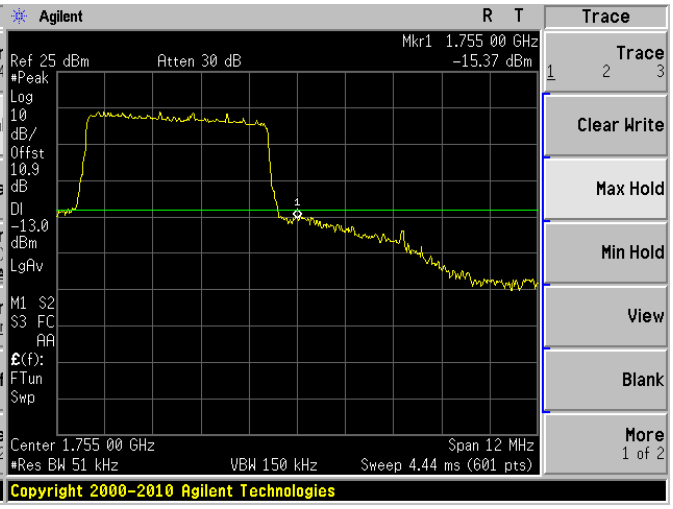
64QAM (3 MHz) - High Channel



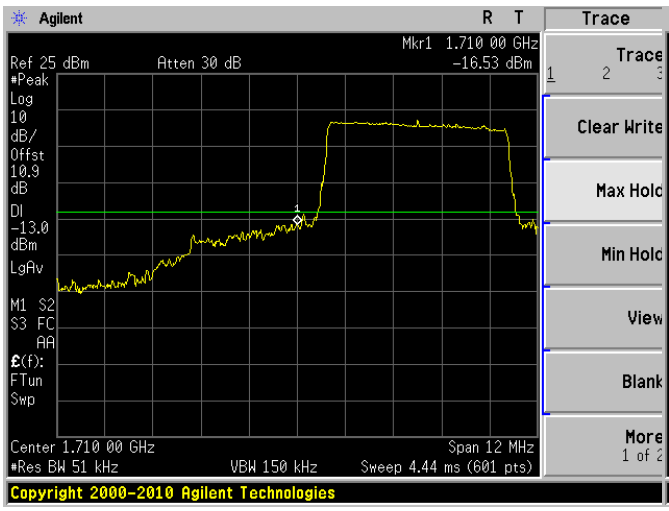
QPSK (5 MHz) - Low Channel



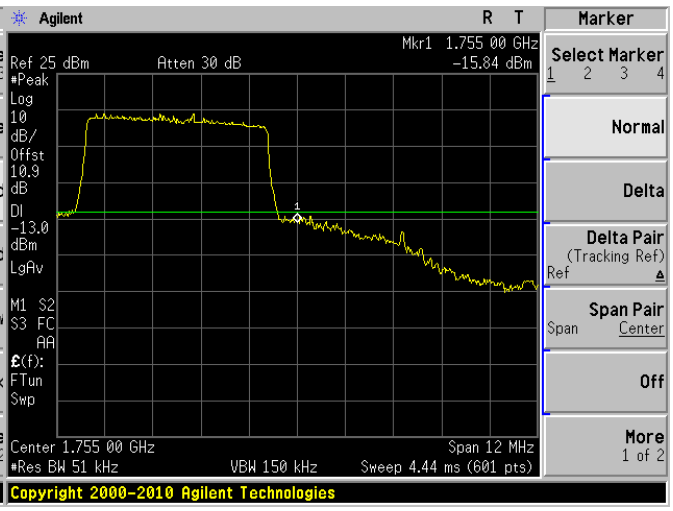
QPSK (5 MHz) - High Channel



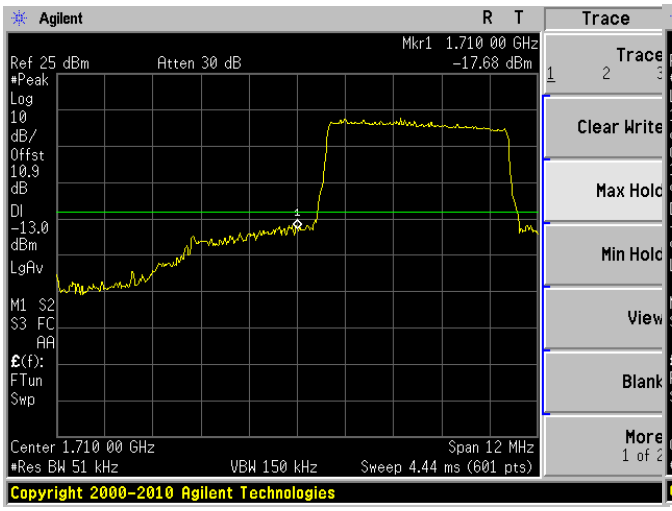
16QAM (5 MHz) - Low Channel



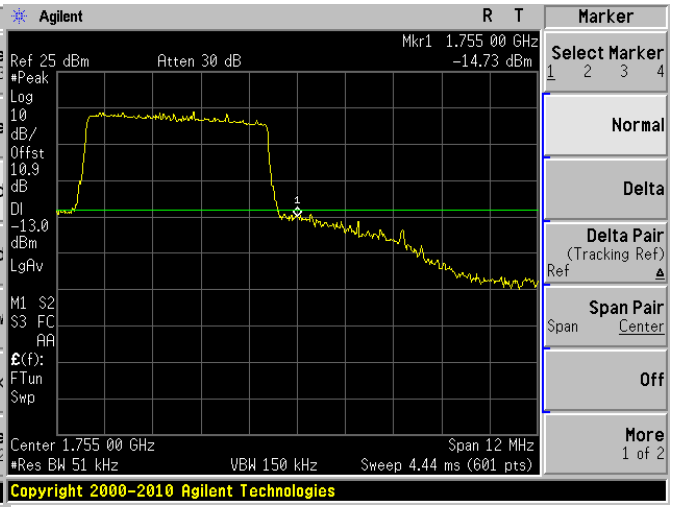
16QAM (5 MHz) - High Channel



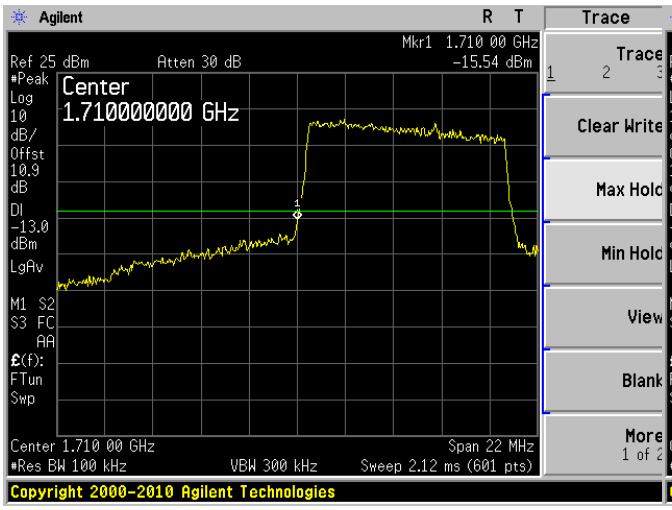
64QAM (5 MHz) - Low Channel



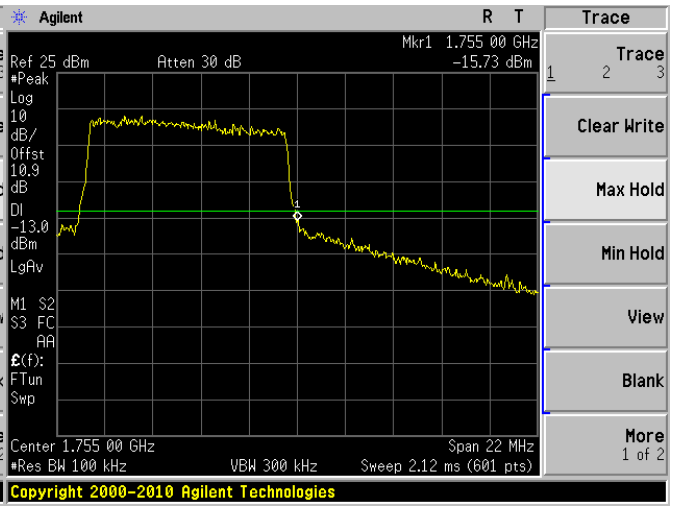
64QAM (5 MHz) - High Channel



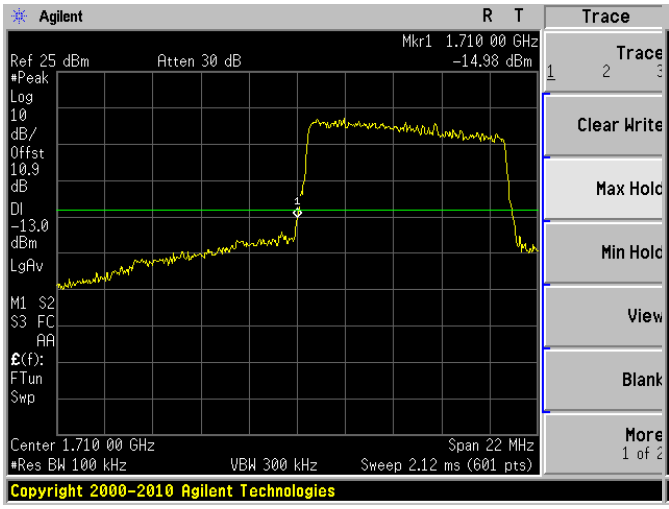
QPSK (10 MHz) - Low Channel



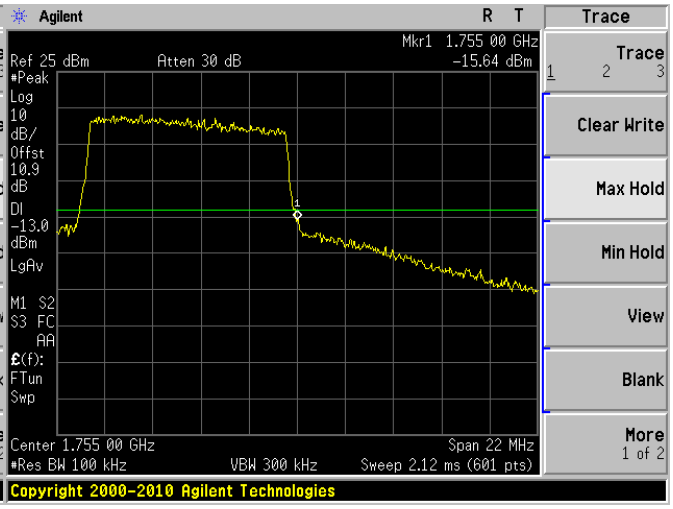
QPSK (10 MHz) - High Channel



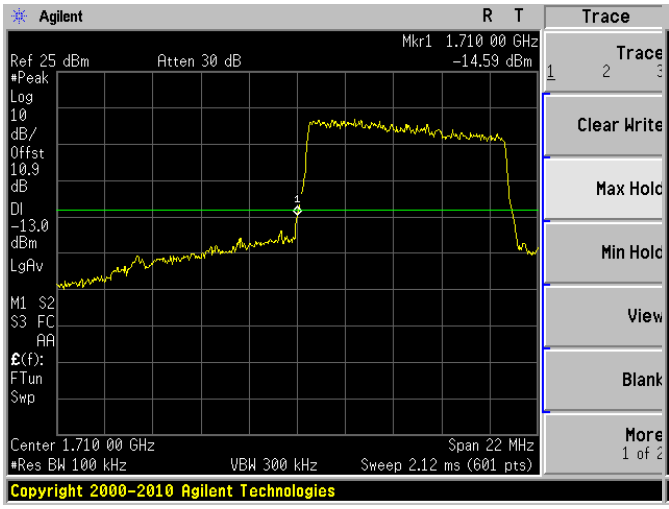
16QAM (10 MHz) - Low Channel



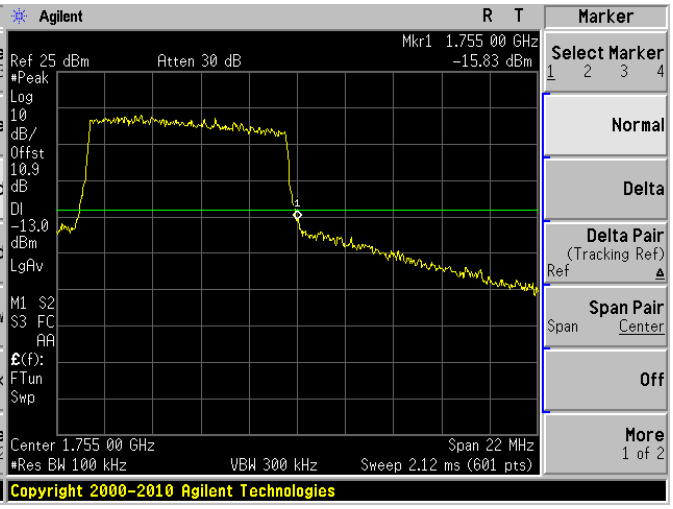
16QAM (10 MHz) - High Channel



64QAM (10 MHz) - Low Channel

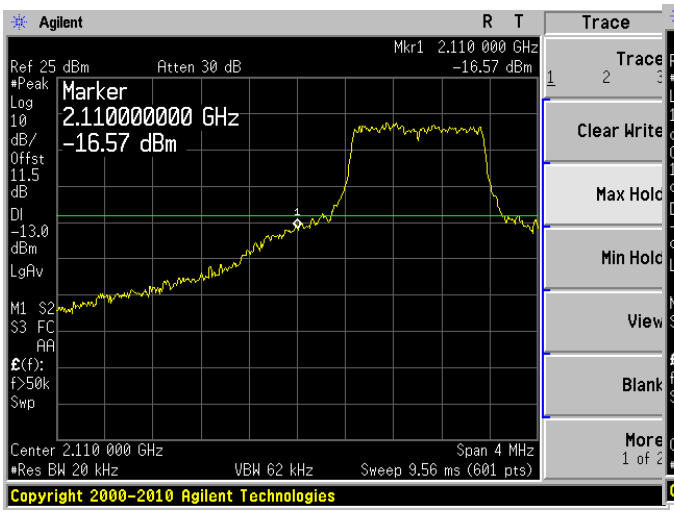


64QAM (10 MHz) - High Channel

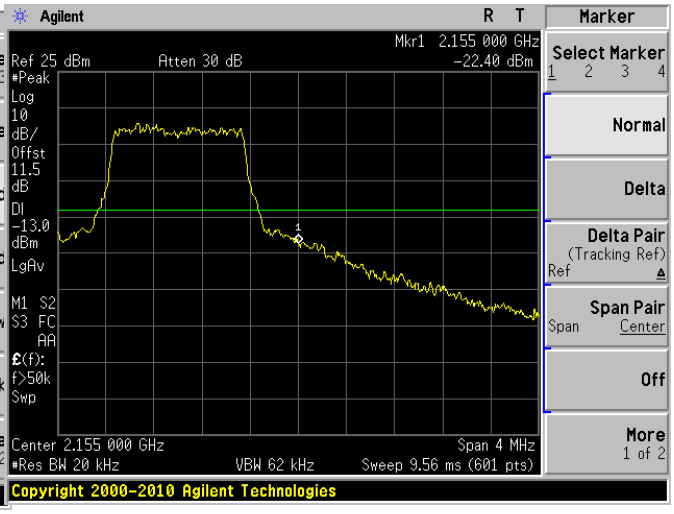


AWS Band Downlink:

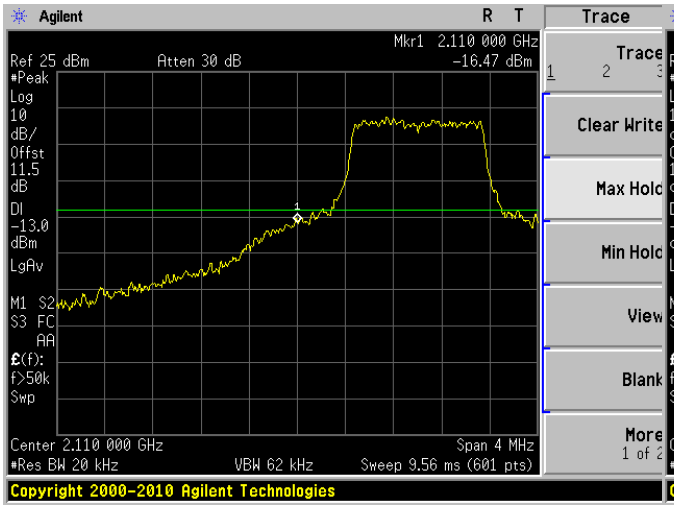
QPSK (1.4 MHz) - Low Channel



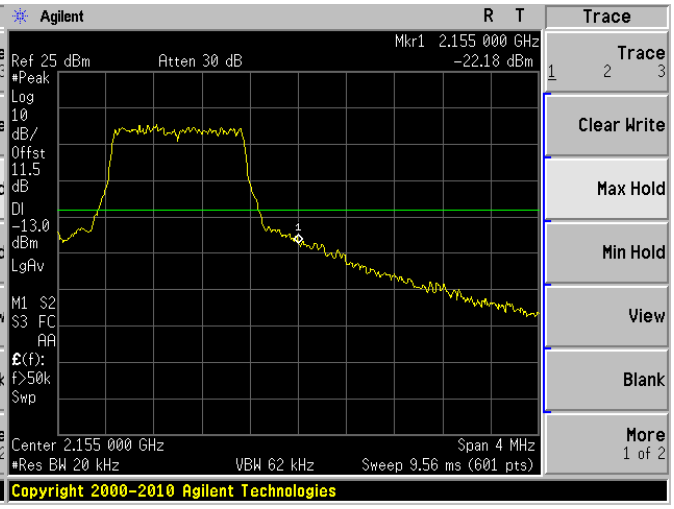
QPSK (1.4 MHz) - High Channel



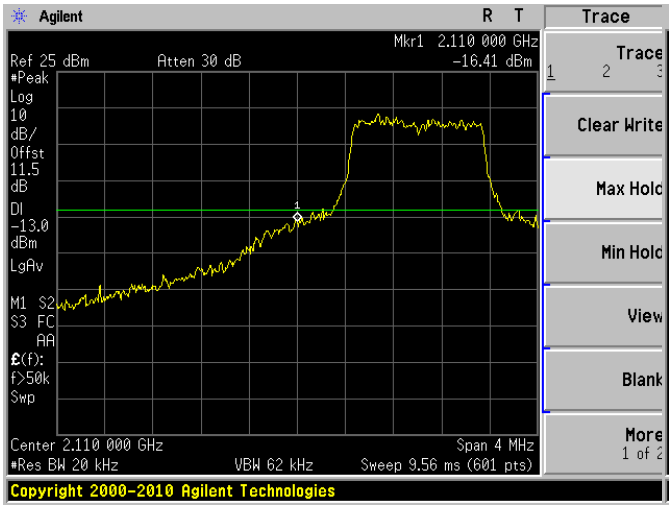
16QAM (1.4 MHz) - Low Channel



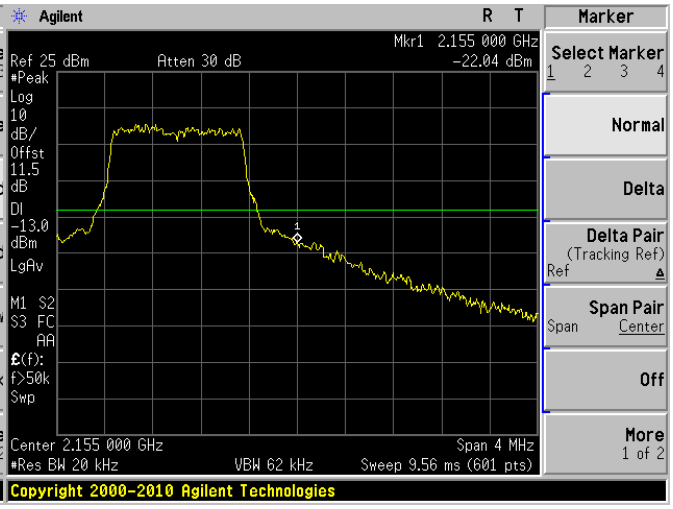
16QAM (1.4 MHz) - High Channel



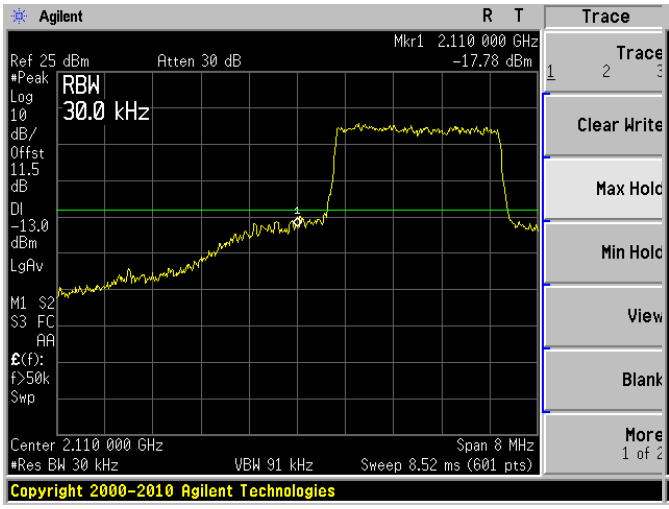
64QAM (1.4 MHz) - Low Channel



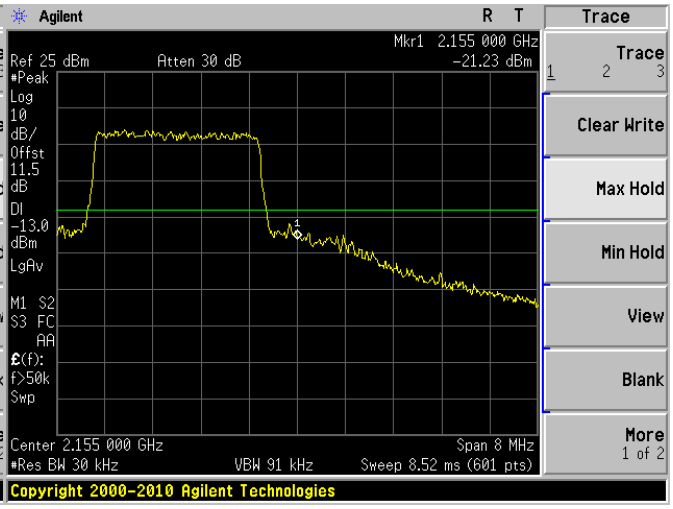
64QAM (1.4 MHz) - High Channel



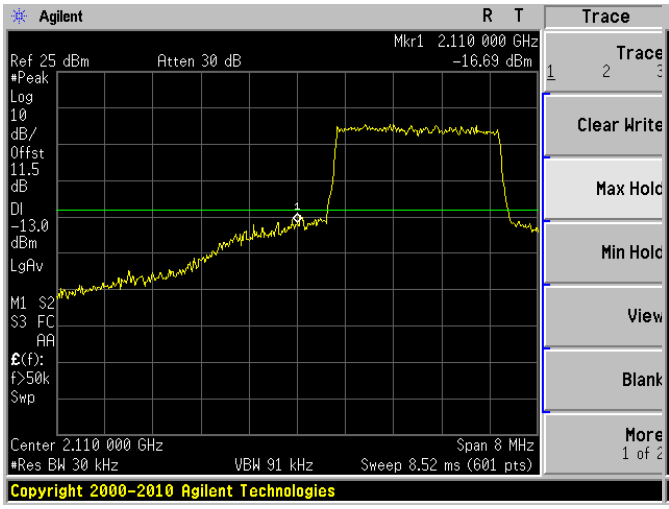
QPSK (3 MHz) - Low Channel



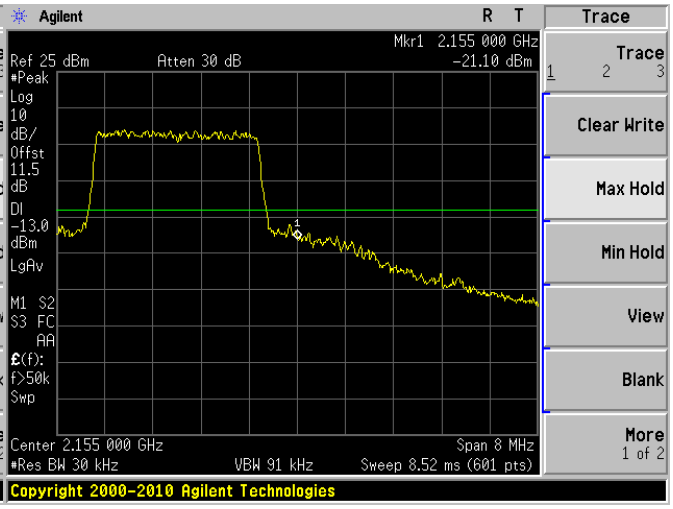
QPSK (3 MHz) - High Channel



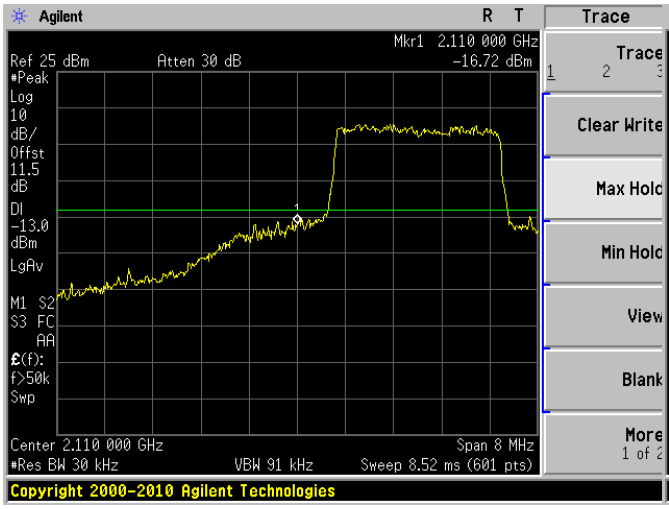
16QAM (3 MHz) - Low Channel



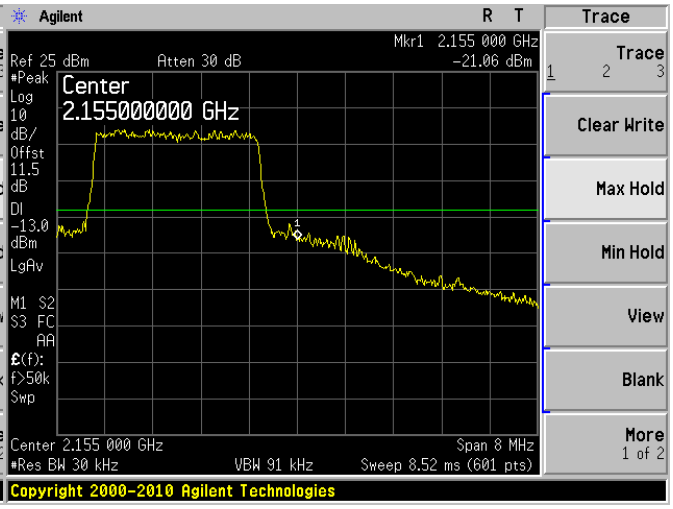
16QAM (3 MHz) - High Channel



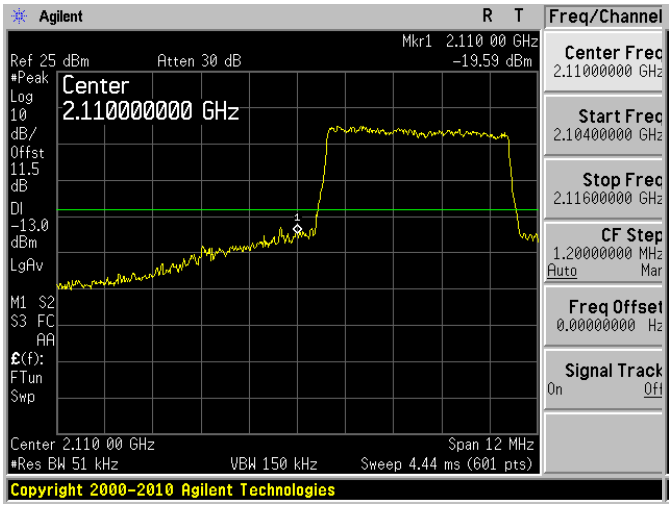
64QAM (3 MHz) - Low Channel



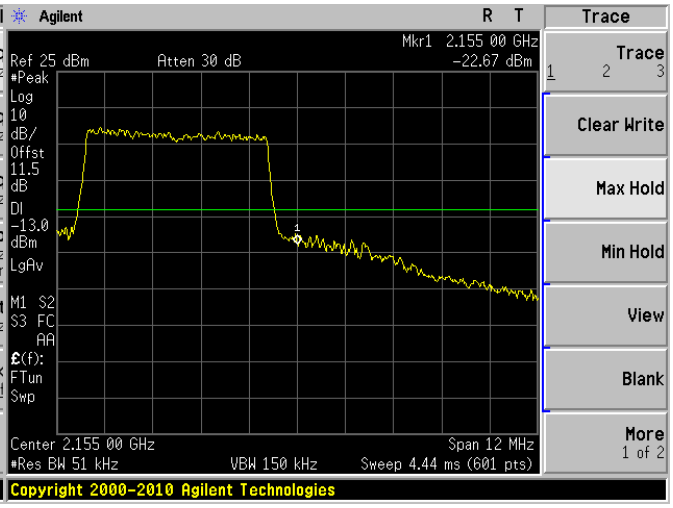
64QAM (3 MHz) - High Channel



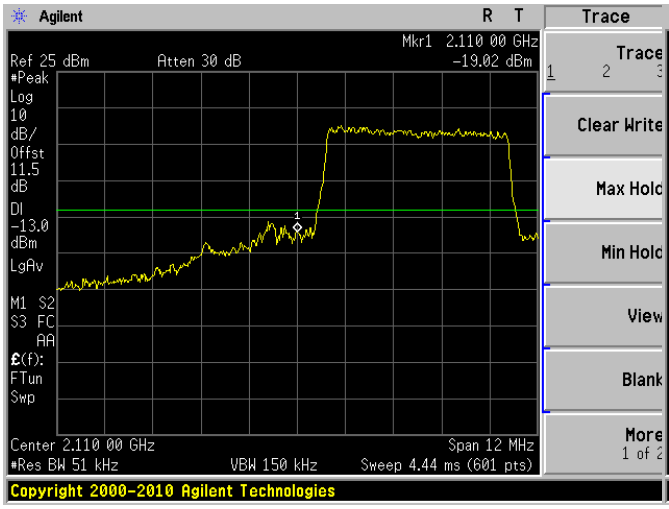
QPSK (5 MHz) - Low Channel



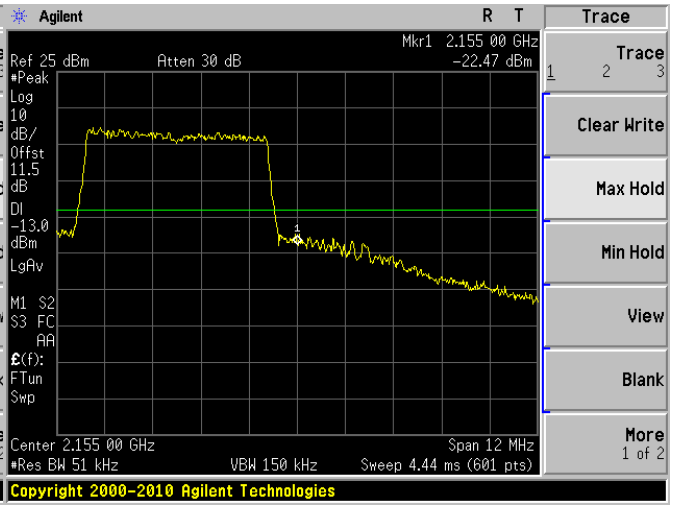
QPSK (5 MHz) - High Channel



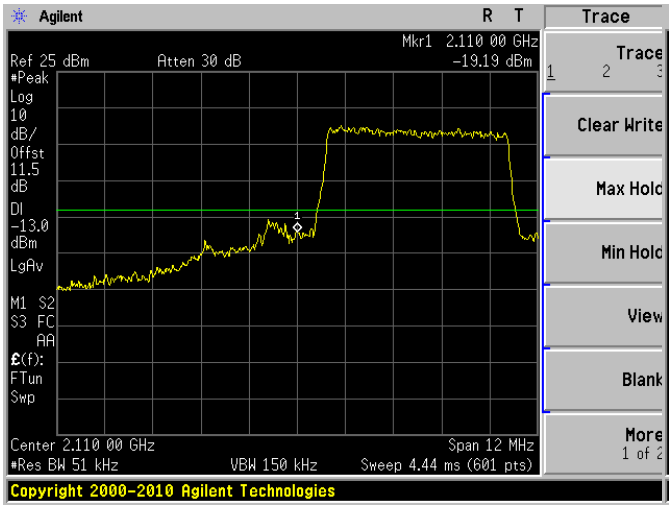
16QAM (5 MHz) - Low Channel



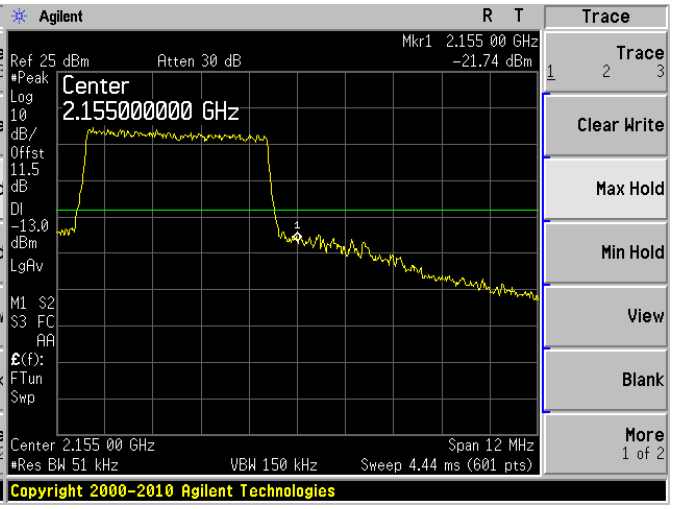
16QAM (5 MHz) - High Channel



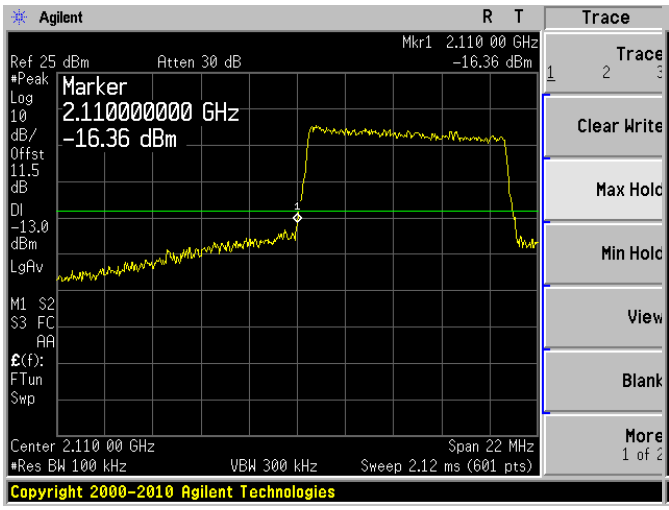
64QAM (5 MHz) - Low Channel



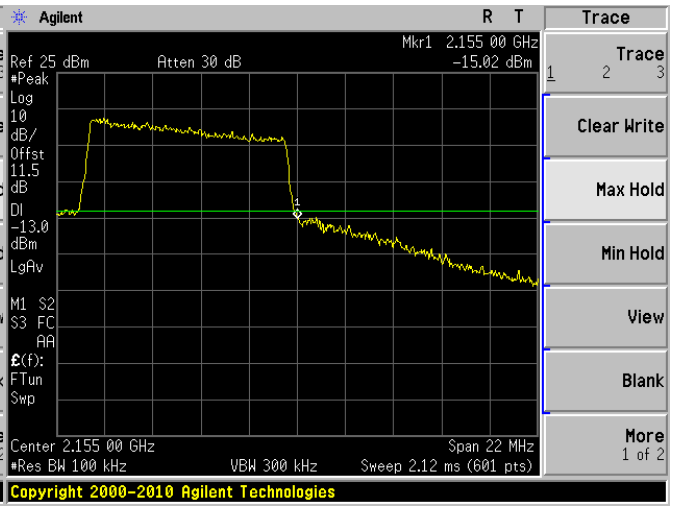
64QAM (5 MHz) - High Channel



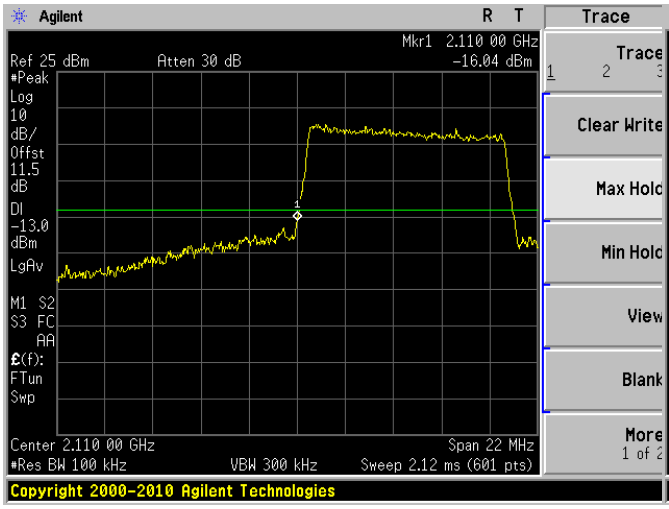
QPSK (10 MHz) - Low Channel



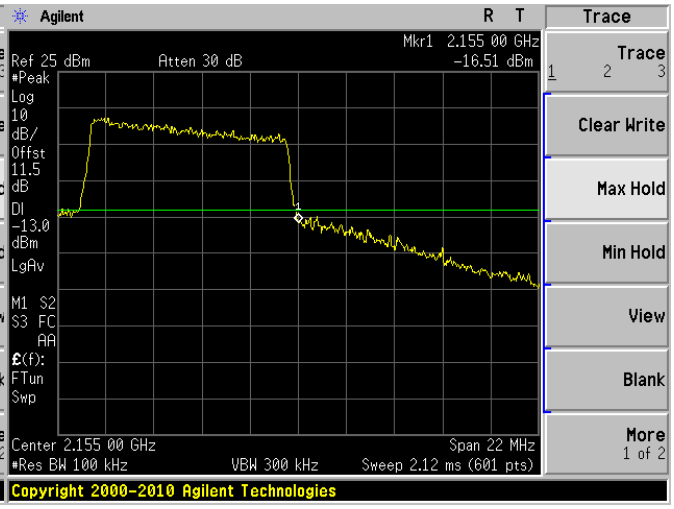
QPSK (10 MHz) - High Channel



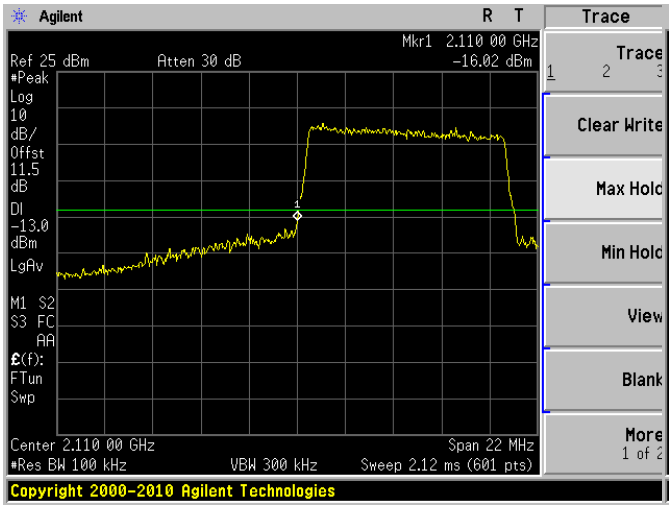
16QAM (10 MHz) - Low Channel



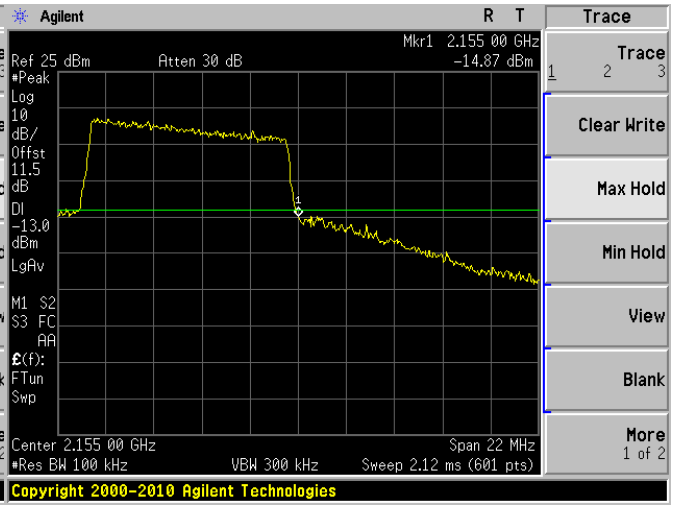
16QAM (10 MHz) - High Channel



64QAM (10 MHz) - Low Channel



64QAM (10 MHz) - High Channel



9 FCC §2.1091 - RF Exposure

9.1 Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

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

9.2 MPE Prediction

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

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

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

9.3 Test Results

Cellular Band UL:

Maximum peak output power at antenna input terminal (dBm):	27.59
Maximum peak output power at antenna input terminal (mW):	574.12
Prediction distance (cm):	20
Prediction frequency (MHz):	836.6
Antenna Gain, typical (dBi):	7
Cable Loss (dB)	2
Maximum Antenna Gain+ Cable Loss (numeric):	3.16
Power density at predication frequency and distance (mW/cm^2):	0.361
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5577

Cellular Band DL:

Maximum peak output power at antenna input terminal (dBm):	25.48
Maximum peak output power at antenna input terminal (mW):	353.18
Prediction distance (cm):	20
Prediction frequency (MHz):	869.2
Antenna Gain, typical (dBi):	7
Cable Loss (dB)	2
Maximum Antenna Gain+ Cable Loss (numeric):	3.16
Power density at predication frequency and distance (mW/cm^2):	0.222
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5795

PCS Band UL:

Maximum peak output power at antenna input terminal (dBm):	23.57
Maximum peak output power at antenna input terminal (mW):	227.51
Prediction distance (cm):	20
Prediction frequency (MHz):	1880
Antenna Gain, typical (dBi):	7
Cable Loss (dB)	4
Maximum Antenna Gain+ Cable Loss (numeric):	2
Power density at predication frequency and distance (mW/cm^2):	0.091
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

PCS Band DL:

Maximum peak output power at antenna input terminal (dBm):	24.41
Maximum peak output power at antenna input terminal (mW):	276.06
Prediction distance (cm):	20
Prediction frequency (MHz):	1989.8
Antenna Gain, typical (dBi):	7
Cable Loss (dB)	4
Maximum Antenna Gain+ Cable Loss (numeric):	2
Power density at predication frequency and distance (mW/cm^2):	0.110
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Note: To meet 33 dBm (2 watts) EIRP limit in PCS band, the gain of antenna used with this booster must be offset by coaxial cable loss such that the antenna gain less cable loss does not exceed 6 dBi.

AWS Band UL:

Maximum peak output power at antenna input terminal (dBm):	23.93
Maximum peak output power at antenna input terminal (mW):	247.17
Prediction distance (cm):	20
Prediction frequency (MHz):	1750
Antenna Gain, typical (dBi):	7
Cable Loss (dB)	4
Maximum Antenna Gain+ Cable Loss (numeric):	2
Power density at predication frequency and distance (mW/cm^2):	0.098
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

AWS Band DL:

Maximum peak output power at antenna input terminal (dBm):	23.30
Maximum peak output power at antenna input terminal (mW):	213.80
Prediction distance (cm):	20
Prediction frequency (MHz):	2112.4
Antenna Gain, typical (dBi):	7
Cable Loss (dB)	4
Maximum Antenna Gain+ Cable Loss (numeric):	2
Power density at predication frequency and distance (mW/cm^2):	0.085
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Note: To meet 30 dBm (1watts) EIRP limit in AWS band, the gain of antenna used with this booster must be offset by coaxial cable loss such that the antenna gain less cable loss does not exceed 5 dBi.

Results

For uplink and downlink, the highest power density levels at 20 cm are below the MPE uncontrolled exposure limit.