



FCC PART 22H, 24E & 27

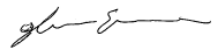

# TEST AND MEASUREMENT REPORT

For

## ADC Telecommunications, Inc.

1187 Park Place, Shakopee, MN 55379, USA

**FCC ID: NOO-F0674-011**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Remote Access Unit (RAU)
<b>Test Engineer:</b> <u>Glenn Escano</u> 	
<b>Report Number:</b> <u>R1308212-222427</u>	
<b>Report Date:</b> <u>2013-10-07</u>	
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## TABLE OF CONTENTS

<b>1</b>	<b>GENERAL DESCRIPTION .....</b>	<b>5</b>
1.1	PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
1.2	MECHANICAL DESCRIPTION .....	5
1.3	OBJECTIVE.....	5
1.4	RELATED SUBMITTAL(S)/GRANT(S).....	5
1.5	TEST METHODOLOGY .....	5
1.6	MEASUREMENT UNCERTAINTY.....	6
1.7	TEST FACILITY.....	6
<b>2</b>	<b>EUT TEST CONFIGURATION.....</b>	<b>7</b>
2.1	JUSTIFICATION.....	7
2.2	EUT EXERCISE SOFTWARE.....	7
2.3	EQUIPMENT MODIFICATIONS .....	7
2.4	SPECIAL EQUIPMENT .....	7
2.5	LOCAL SUPPORT EQUIPMENT.....	7
2.6	EUT INTERNAL CONFIGURATION DETAILS.....	7
2.7	EXTERNAL I/O CABLING LIST AND DETAILS .....	7
2.8	TEST SETUP BLOCK DIAGRAM.....	8
<b>3</b>	<b>SUMMARY OF TEST RESULTS.....</b>	<b>9</b>
<b>4</b>	<b>FCC §22.913(A), §24.232 &amp; §27.50 – RF OUTPUT POWER .....</b>	<b>10</b>
4.1	APPLICABLE STANDARDS .....	10
4.2	TEST PROCEDURE .....	10
4.3	TEST EQUIPMENT LIST AND DETAILS .....	10
4.4	TEST ENVIRONMENTAL CONDITIONS.....	10
4.5	TEST RESULTS .....	11
<b>5</b>	<b>FCC §2.1049, §22.917, §24.238 &amp; §27.53 – EMISSION BANDWIDTH .....</b>	<b>16</b>
5.1	APPLICABLE STANDARDS .....	16
5.2	TEST PROCEDURE .....	16
5.3	TEST EQUIPMENT LIST AND DETAILS .....	16
5.4	TEST ENVIRONMENTAL CONDITIONS.....	16
5.5	TEST RESULTS .....	17
<b>6</b>	<b>FCC §2.1053, §22.917, §24.238 &amp; §27.53 - SPURIOUS RADIATED EMISSIONS.....</b>	<b>43</b>
6.1	APPLICABLE STANDARDS .....	43
6.2	TEST PROCEDURE .....	43
6.3	TEST EQUIPMENT LIST AND DETAILS .....	43
6.4	TEST ENVIRONMENTAL CONDITIONS.....	44
6.5	TEST RESULTS .....	44
<b>7</b>	<b>FCC §2.1051, §22.917, §24.238 &amp; §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....</b>	<b>45</b>
7.1	APPLICABLE STANDARDS .....	45
7.2	TEST PROCEDURE .....	45
7.3	TEST EQUIPMENT LIST AND DETAILS .....	45
7.4	TEST ENVIRONMENTAL CONDITIONS.....	45
7.5	TEST RESULTS .....	45
<b>8</b>	<b>FCC §22.917, §24.238 &amp; §27.53 – BAND EDGE.....</b>	<b>119</b>
8.1	APPLICABLE STANDARDS .....	119
8.2	TEST PROCEDURE .....	119

8.3	TEST EQUIPMENT LIST AND DETAILS .....	119
8.4	TEST ENVIRONMENTAL CONDITIONS .....	119
8.5	TEST RESULTS .....	119
<b>9</b>	<b>FCC §2.1055, §22.355, §24.235 &amp; §27.54 – FREQUENCY STABILITY.....</b>	<b>143</b>
9.1	APPLICABLE STANDARDS .....	143
9.2	TEST PROCEDURE .....	143
9.3	TEST EQUIPMENT LIST AND DETAILS .....	143
9.4	TEST ENVIRONMENTAL CONDITIONS .....	143
9.5	TEST RESULTS .....	144
<b>10</b>	<b>FCC §2.1091 - RF EXPOSURE INFORMATION.....</b>	<b>146</b>
10.1	APPLICABLE STANDARDS .....	146
10.2	MPE PREDICTION .....	146
10.3	RESULTS .....	146
<b>11</b>	<b>EXHIBIT – FCC LABELING REQUIREMENTS.....</b>	<b>148</b>
11.1	FCC ID LABEL REQUIREMENTS.....	148
11.2	FCC ID LABEL CONTENTS AND LOCATION .....	149
<b>12</b>	<b>EXHIBIT B - TEST SETUP PHOTOGRAPHS.....</b>	<b>150</b>
12.1	RADIATED EMISSIONS - FRONT VIEW (BELOW 1 GHZ).....	150
12.2	RADIATED EMISSIONS - REAR VIEW (BELOW 1 GHZ).....	150
12.3	RADIATED EMISSIONS - FRONT VIEW (ABOVE 1 GHZ).....	151
12.4	RADIATED EMISSIONS - REAR VIEW (ABOVE 1 GHZ).....	151
<b>13</b>	<b>EXHIBIT C – EUT PHOTOGRAPHS.....</b>	<b>152</b>
13.1	EUT - FRONT VIEW .....	152
13.2	EUT - REAR VIEW .....	152
13.3	EUT - SIDE VIEW.....	153
13.4	EUT - BOTTOM VIEW .....	153
13.5	EUT – OPEN CHASSIS VIEW .....	154
13.6	EUT – PCB BOARD ASSEMBLY TOP VIEW .....	154
13.7	EUT – PCB BOARD ASSEMBLY BOTTOM VIEW .....	155
13.8	EUT – PCB BOARD LABEL VIEW .....	155

**DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	R1308212-222427	Original Report	2013-09-23
1	R1308212-222427	Delete IC rules/items	2013-10-07

# 1 General Description

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

The ADC Telecommunications Inc. product, FCC ID: NOO-F0674-011, model: FSN-W5-851921-1-HP or the "EUT" as referred to in this report, is a RAU for Indoor Wireless Repeater System. The system consists three modular components, the Main Hub (model number: FSN-W5-MH-1), Expansion Hub (model: FSN-W5-EH-2) and RAU-EUT (model: FSN-W5-851921-1-HP). For RAU the downlink frequency bands are 869-894 MHz, 1930-1995 MHz, and 2110-2155 MHz. Modulation types are CDMA/EVDO, GSM, EDGE, WCDMA/HSPA, QPSK, 16QAM and 64QAM.

## 1.2 Mechanical Description

The EUT dimension is approximately 28.1cm (L) x 28.6cm (W) x 5.4cm (H) and weighs approximately 2.83 kg.

*The test data gathered are from production sample. Serial number: MR2293FQ, assigned by ADC Telecommunication.*

## 1.3 Objective

This type approval report is prepared on behalf of ADC Telecommunication in accordance with Part 2, Subpart J, Part 22 Subpart H, Part 24 Subpart E and Part 27 of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, 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, Part 22H, Part 24E and Part 27.

Applicable Standards: TIA EIA 98-C, TIA/EIA 603-C, ANSI C63.4-2009.

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.: R-3729, C-4176, G-469, and T-1206. 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 EUT 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

EUT is in normal working condition, the signal was provided to the Main hub through the system to the RAU (Equipment under test).

### 2.3 Equipment Modifications

No modifications were made to the EUT.

### 2.4 Special Equipment

No special equipment used during testing.

### 2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
ADC Telecommunication	InterReach Fusion Main Hub	FSN-W5-MH-1	-
ADC Telecommunication	InterReach Fusion Expansion Hub	FSN-W5-EH-2	-

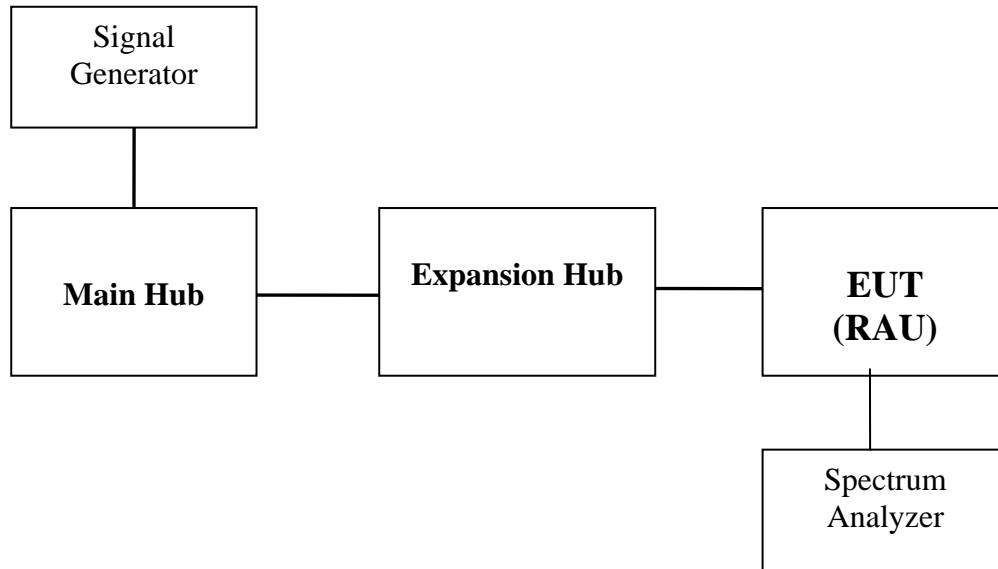
### 2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
ADC Telecommunication	Main PCB	740674-0 Rev: A	MR2293FK

### 2.7 External I/O Cabling List and Details

Cable Description	Length (m)	From	To
Shielded Detachable K/B Cable	15	Expansion Hub	RAU (EUT)
Fiber Cable	2.0	Main Hub	Expansion Hub

## 2.8 Test Setup Block Diagram





### 3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1046, §22.913(a), §24.232, §27.50	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A <sup>1</sup>
§2.1049, §22.917, §24.238, §27.53	Emission 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, §22.355, §24.235, §27.54	Frequency Stability	Compliant
§2.1091	RF Exposure Information	Compliant

*N/A<sup>1</sup>: Testing not required, EUT is processing the digital modulation signal.*

## 4 FCC §22.913(a), §24.232 & §27.50 – RF Output Power

### 4.1 Applicable Standards

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, the maximum effective radiated power (ERP) of fixed and base station must not exceed 1000 Watts.

### 4.2 Test Procedure

*Conducted:*

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

### 4.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	PSA, Series Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Agilent	Generator, Signal	E4438C	MY45091309	2013-05-30	1 year

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

### 4.4 Test Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	41%
<b>ATM Pressure:</b>	101.72 kPa

*The testing was performed by Glenn Escano from 2013-09-06 at 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 Downlink	Low	869.2	14	25.13
		Middle	881.6	12	25.69
		High	893.8	13	25.81
	1900 MHz Downlink	Low	1930.2	9	25.88
		Middle	1960.0	5	25.66
		High	1989.8	5	25.48

#### EDGE

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
EDGE	850 MHz Downlink	Low	869.2	7	22.75
		Middle	881.6	5	22.35
		High	893.8	6	22.73
	1900 MHz Downlink	Low	1930.2	2	22.36
		Middle	1960.0	-1	22.78
		High	1989.8	0	22.89

#### CDMA/EVDO

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
CDMA/EVDO	850 MHz Downlink	Low	869.88	5	17.42
		Middle	881.52	4	17.57
		High	893.10	4	17.38
	1900 MHz Downlink	Low	1930.8	6	22.74
		Middle	1960.0	3	22.49
		High	1989.2	3	22.94

**WCDMA/HSPA**

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA/HSPA	850 MHz Downlink	Low	871.4	5	17.79
		Middle	881.4	4	17.50
		High	891.6	5	17.69
	1900 MHz Downlink	Low	1932.4	4	22.54
		Middle	1960.0	3	22.60
		High	1987.6	2	22.89
	2100 MHz Downlink	Low	2112.4	3	22.72
		Middle	2132.4	3	22.62
		High	2152.6	4	22.45

## Cell LTE Band – Downlink

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 869-894 MHz	QPSK (1.4 MHz)	870	6	17.20
	QPSK (1.4 MHz)	881.5	5	17.49
	QPSK (1.4 MHz)	893	5	17.41
	16QAM (1.4 MHz)	870	6	17.90
	16QAM (1.4 MHz)	881.5	5	17.36
	16QAM (1.4 MHz)	893	6	17.29
	64QAM (1.4 MHz)	870	6	17.72
	64QAM (1.4 MHz)	881.5	5	17.73
	64QAM (1.4 MHz)	893	5	17.61
	QPSK (3 MHz)	871	6	17.99
	QPSK (3 MHz)	881.5	5	17.46
	QPSK (3 MHz)	892	6	17.71
	16QAM (3 MHz)	871	6	17.62
	16QAM (3 MHz)	881.5	5	17.64
	16QAM (3 MHz)	892	6	17.96
	64QAM (3 MHz)	871	6	17.86
	64QAM (3 MHz)	881.5	5	17.79
	64QAM (3 MHz)	892	6	17.98
	QPSK (5 MHz)	872	6	17.82
	QPSK (5 MHz)	881.5	5	17.67
	QPSK (5 MHz)	891	5	17.30
	16QAM (5 MHz)	872	6	17.82
	16QAM (5 MHz)	881.5	5	17.24
	16QAM (5 MHz)	891	6	17.72
	64QAM (5 MHz)	872	5	17.11
	64QAM (5 MHz)	881.5	5	17.70
	64QAM (5 MHz)	891	6	17.73
	QPSK (10 MHz)	874	6	17.78
	QPSK (10 MHz)	881.5	5	17.20
	QPSK (10 MHz)	889	6	17.87
	16QAM (10 MHz)	874	5	17.10
	16QAM (10 MHz)	881.5	5	17.18
	16QAM (10 MHz)	889	6	17.72
64QAM (10 MHz)	874	5	17.39	
64QAM (10 MHz)	881.5	5	17.52	
64QAM (10 MHz)	889	5	17.31	

## PCS LTE Band – Downlink

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 1930-1990 MHz	QPSK (1.4 MHz)	1931	5	22.64
	QPSK (1.4 MHz)	1960	2	22.75
	QPSK (1.4 MHz)	1994	2	22.83
	16QAM (1.4 MHz)	1931	5	22.86
	16QAM (1.4 MHz)	1960	2	22.77
	16QAM (1.4 MHz)	1994	2	22.82
	64QAM (1.4 MHz)	1931	5	22.97
	64QAM (1.4 MHz)	1960	2	22.96
	64QAM (1.4 MHz)	1994	1	22.25
	QPSK (3 MHz)	1932	4	22.12
	QPSK (3 MHz)	1960	2	22.82
	QPSK (3 MHz)	1993	2	22.98
	16QAM (3 MHz)	1932	4	22.29
	16QAM (3 MHz)	1960	2	22.92
	16QAM (3 MHz)	1993	2	22.97
	64QAM (3 MHz)	1932	4	22.38
	64QAM (3 MHz)	1960	2	23
	64QAM (3 MHz)	1993	1	22.16
	QPSK (5 MHz)	1933	6	22.94
	QPSK (5 MHz)	1960	3	22.49
	QPSK (5 MHz)	1992	3	22.72
	16QAM (5 MHz)	1933	5	22.64
	16QAM (5 MHz)	1960	3	22.98
	16QAM (5 MHz)	1992	3	22.79
	64QAM (5 MHz)	1933	5	22.76
	64QAM (5 MHz)	1960	2	22.49
	64QAM (5 MHz)	1992	2	22.43
	QPSK (10 MHz)	1935	4	22.64
	QPSK (10 MHz)	1960	2	22.76
	QPSK (10 MHz)	1990	2	22.49
	16QAM (10 MHz)	1935	4	22.22
	16QAM (10 MHz)	1960	2	22.39
	16QAM (10 MHz)	1990	2	22.50
64QAM (10 MHz)	1935	4	22.75	
64QAM (10 MHz)	1960	2	22.97	
64QAM (10 MHz)	1990	2	22.81	

## AWS LTE Band – Downlink

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 2110-2155 MHz	QPSK (1.4 MHz)	2111	4	22.65
	QPSK (1.4 MHz)	2132	4	22.33
	QPSK (1.4 MHz)	2154	6	22.48
	16QAM (1.4 MHz)	2111	4	22.87
	16QAM (1.4 MHz)	2132	4	22.89
	16QAM (1.4 MHz)	2154	4	22.86
	64QAM (1.4 MHz)	2111	6	22.80
	64QAM (1.4 MHz)	2132	4	22.38
	64QAM (1.4 MHz)	2154	5	22.86
	QPSK (3 MHz)	2112	3	22.29
	QPSK (3 MHz)	2132	4	22.75
	QPSK (3 MHz)	2153	4	22.59
	16QAM (3 MHz)	2112	3	22.42
	16QAM (3 MHz)	2132	3	22.42
	16QAM (3 MHz)	2153	4	22.76
	64QAM (3 MHz)	2112	3	22.60
	64QAM (3 MHz)	2132	3	22.52
	64QAM (3 MHz)	2153	4	22.80
	QPSK (5 MHz)	2113	3	22.71
	QPSK (5 MHz)	2132	3	22.68
	QPSK (5 MHz)	2152	3	22.18
	16QAM (5 MHz)	2113	3	22.69
	16QAM (5 MHz)	2132	3	22.61
	16QAM (5 MHz)	2152	3	22.13
	64QAM (5 MHz)	2113	3	22.66
	64QAM (5 MHz)	2132	3	22.63
	64QAM (5 MHz)	2152	3	22.12
	QPSK (10 MHz)	2115	3	22.78
	QPSK (10 MHz)	2132	3	22.71
	QPSK (10 MHz)	2150	3	22.48
	16QAM (10 MHz)	2115	3	22.60
	16QAM (10 MHz)	2132	3	22.67
	16QAM (10 MHz)	2150	3	22.35
64QAM (10 MHz)	2115	3	22.76	
64QAM (10 MHz)	2132	3	22.72	
64QAM (10 MHz)	2150	3	22.26	

## 5 FCC §2.1049, §22.917, §24.238 & §27.53 – Emission Bandwidth

### 5.1 Applicable Standards

Requirements: FCC §2.1049, §22.917, §24.238 & §27.

### 5.2 Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 30 kHz (Cellular/PCS) and the 26 dB & 99% bandwidth was recorded.

### 5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	PSA, Series Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Agilent	Generator, Signal	E4438C	MY45091309	2013-05-30	1 year

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

### 5.4 Test Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	44 %
<b>ATM Pressure:</b>	101-102 kPa

*The testing was performed by Glenn Escano from 2013-09-06 at RF Site.*



## 5.5 Test Results

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
GSM	850 MHz Downlink	Middle	881.6	245.6328	243.3866
	1900 MHz Downlink	Middle	1960.0	245.2589	243.4788

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
EDGE	850 MHz Downlink	Middle	881.6	245.3762	246.3802
	1900 MHz Downlink	Middle	1960.0	245.2572	246.2293

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
CDMA/EVDO	850 MHz Downlink	Middle	881.52	1.2616	1.2583
	1900 MHz Downlink	Middle	1960.0	1.2623	1.2574

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
WCDMA/HSPA	850 MHz Downlink	Middle	881.4	4.1799	4.1730
	1900 MHz Downlink	Middle	1960.0	4.1557	4.1776
	2100 MHz Downlink	Middle	2132.4	4.1699	4.1849

**LTE Cellular Band – Downlink**

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 869-894 MHz	QPSK (1.4 MHz)	881.5	1.0966	1.0936
	16QAM (1.4 MHz)	881.5	1.0939	1.0978
	64QAM (1.4 MHz)	881.5	1.0961	1.0929
	QPSK (3 MHz)	881.5	2.6953	2.7016
	16QAM (3 MHz)	881.5	2.7035	2.7036
	64QAM (3 MHz)	881.5	2.7029	2.6987
	QPSK (5 MHz)	881.5	4.4891	4.4861
	16QAM (5 MHz)	881.5	4.4934	4.4909
	64QAM (5 MHz)	881.5	4.4931	4.4874
	QPSK (10 MHz)	881.5	8.9556	8.9495
	16QAM (10 MHz)	881.5	8.9633	8.9499
	64QAM (10 MHz)	881.5	8.9517	8.9446

**LTE PCS Band – Downlink**

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 1930-1990 MHz	QPSK (1.4 MHz)	1960	1.0987	1.0923
	16QAM (1.4 MHz)	1960	1.0955	1.0946
	64QAM (1.4 MHz)	1960	1.0989	1.0952
	QPSK (3 MHz)	1960	2.6948	2.6948
	16QAM (3 MHz)	1960	2.7036	2.7048
	64QAM (3 MHz)	1960	2.7033	2.6973
	QPSK (5 MHz)	1960	4.4871	4.4879
	16QAM (5 MHz)	1960	4.4944	4.4920
	64QAM (5 MHz)	1960	4.4923	4.4920
	QPSK (10 MHz)	1960	8.9659	8.9699
	16QAM (10 MHz)	1960	8.9661	8.9665
	64QAM (10 MHz)	1960	8.9445	8.9537

**LTE AWS Band – Downlink**

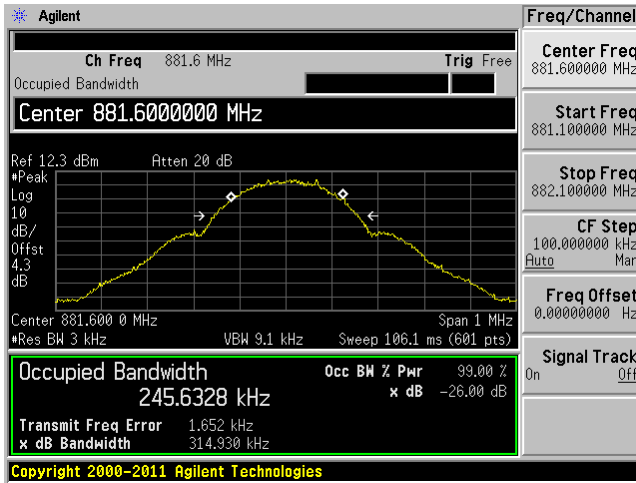
<b>Mode</b>	<b>Modulation</b>	<b>Frequency (MHz)</b>	<b>Emission Bandwidth Input (MHz)</b>	<b>Emission Bandwidth Output (MHz)</b>
Downlink 2110-2155 MHz	QPSK (1.4 MHz)	2132	1.0955	1.0971
	16QAM (1.4 MHz)	2132	1.0961	1.0973
	64QAM (1.4 MHz)	2132	1.0974	1.0971
	QPSK (3 MHz)	2132	2.6926	2.7016
	16QAM (3 MHz)	2132	2.7042	2.7023
	64QAM (3 MHz)	2132	2.7044	2.7044
	QPSK (5 MHz)	2132	4.4897	4.4955
	16QAM (5 MHz)	2132	4.4947	4.4990
	64QAM (5 MHz)	2132	4.4911	4.4985
	QPSK (10 MHz)	2132	8.9604	8.9782
	16QAM (10 MHz)	2132	8.9595	8.9702
	64QAM (10 MHz)	2132	8.9559	8.9662

Please refer to the following plots.

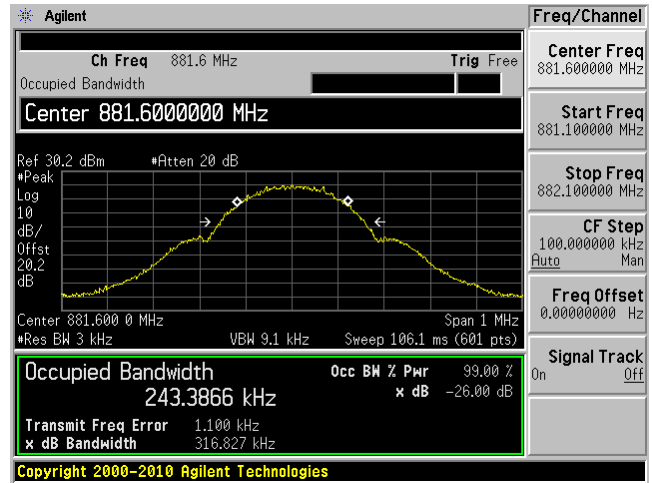
Cell Band Downlink (GSM/GPRS/EDGE/WCDMA/HSPA)

GSM/GPRS (Middle Channel)

Input

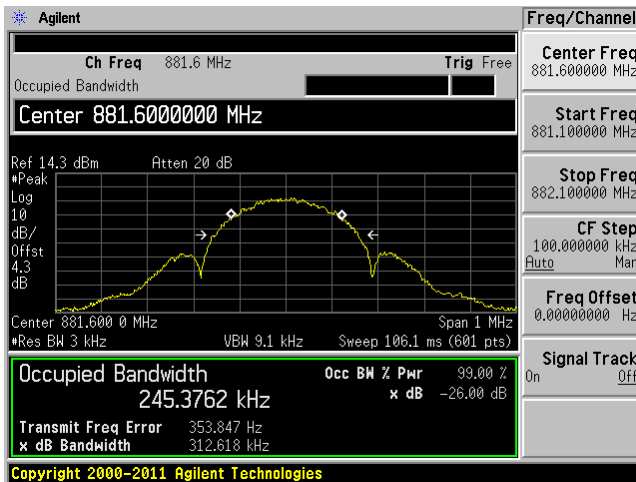


Output

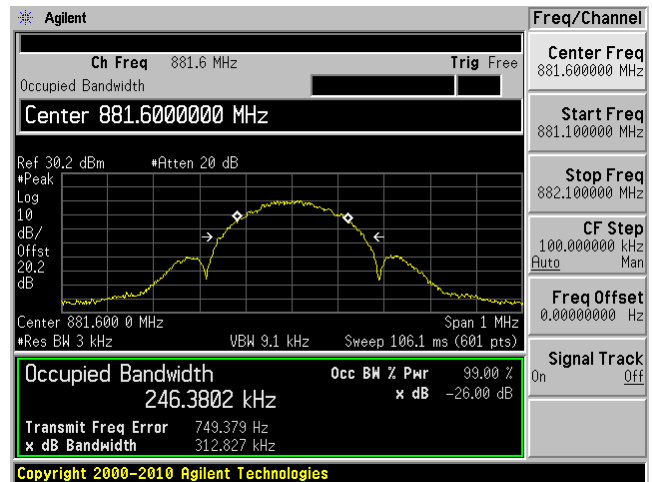


EDGE (Middle Channel)

Input

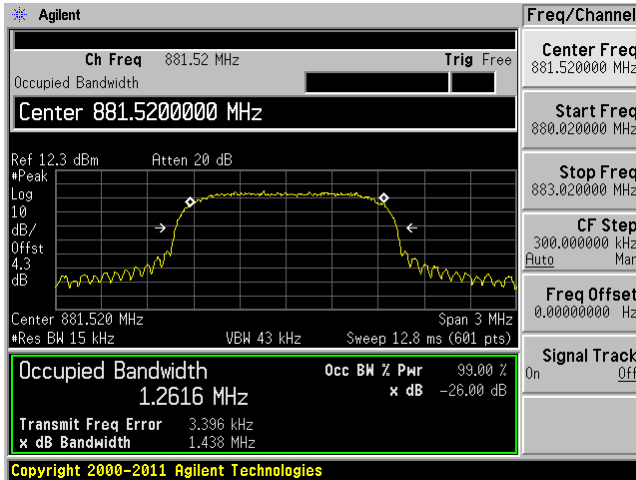


Output

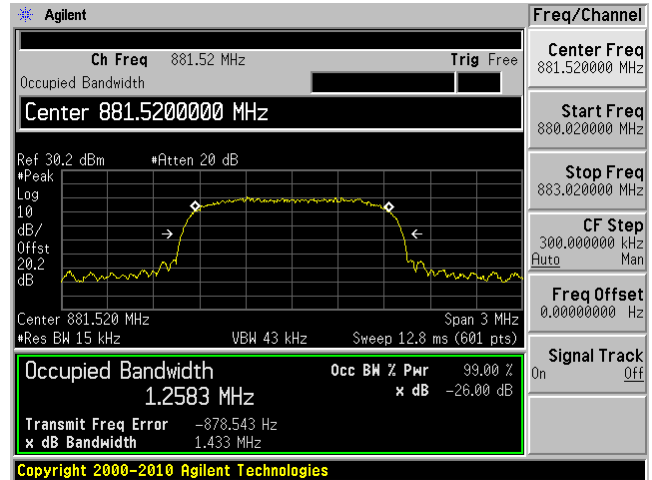


CDMA/EVDO (Middle Channel)

Input

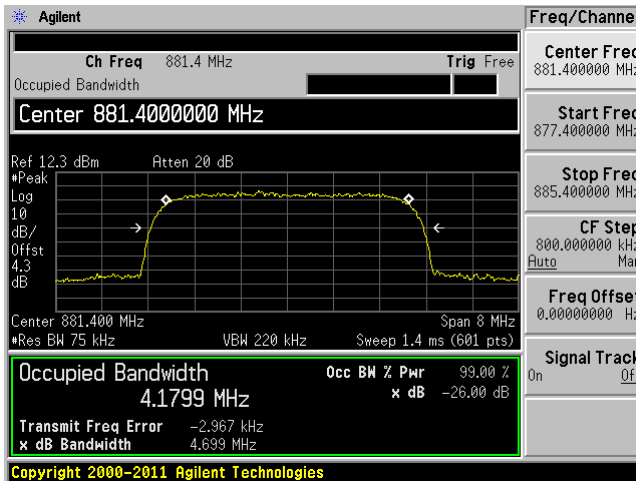


Output

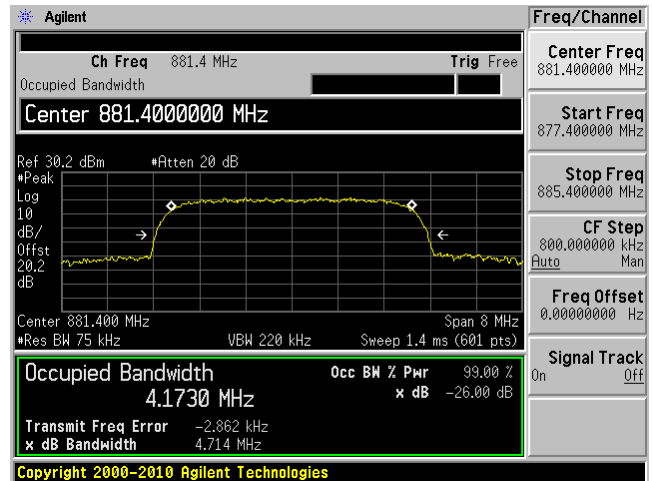


WCDMA/HSPA (Middle Channel)

Input



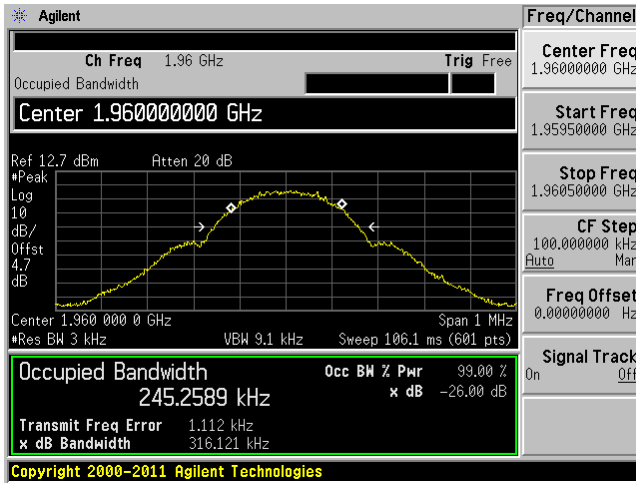
Output



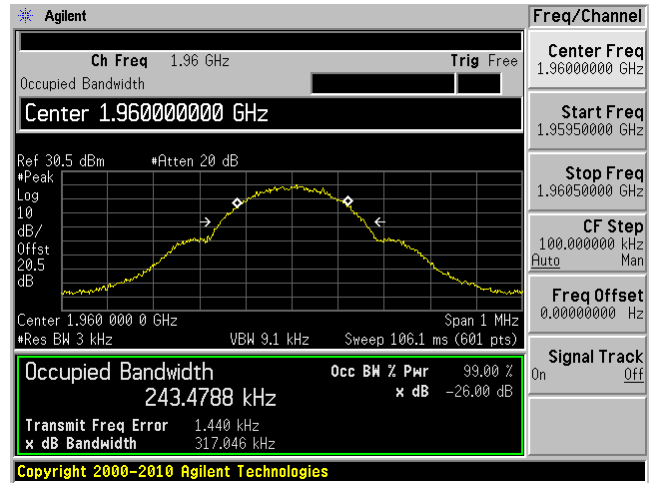
**PCS Band Downlink (GSM/GPRS/EDGE/WCDMA/HSPA)**

**GSM/GPRS (Middle Channel)**

Input

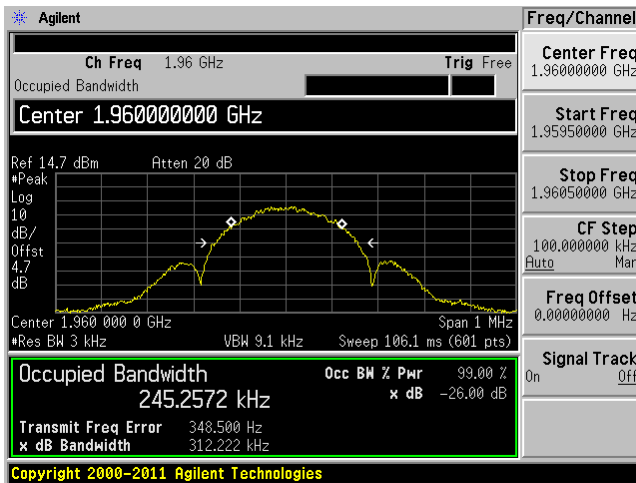


Output

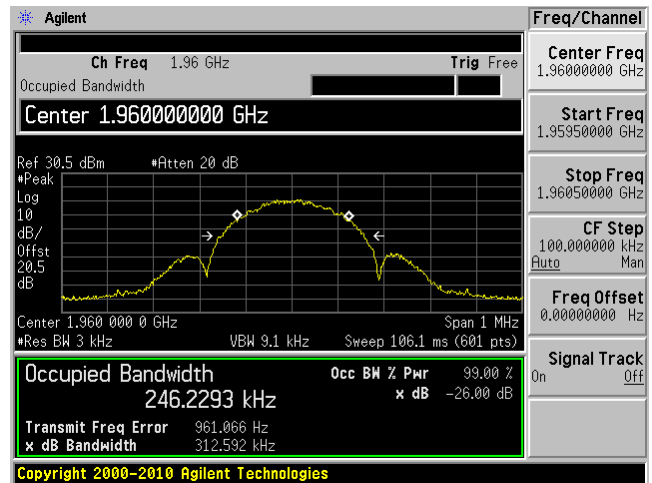


**EDGE (Middle Channel)**

Input

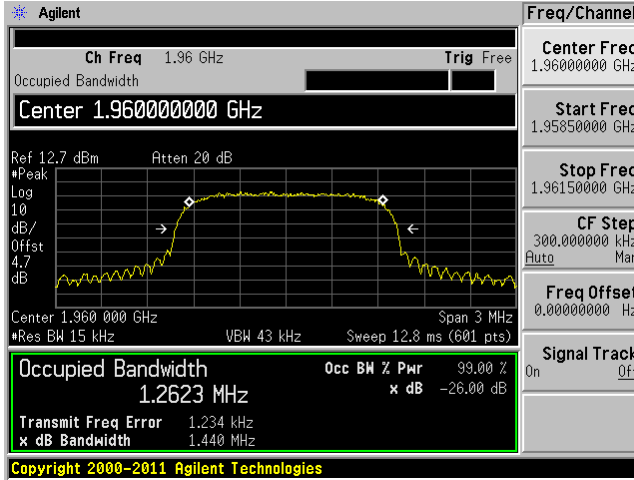


Output

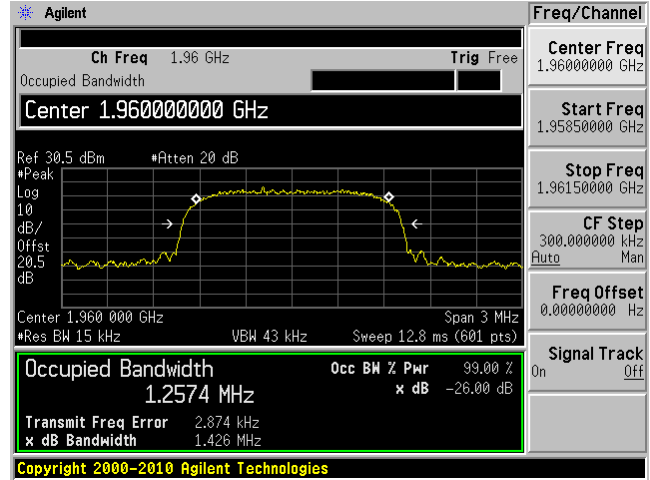


CDMA/EVDO (Middle Channel)

Input

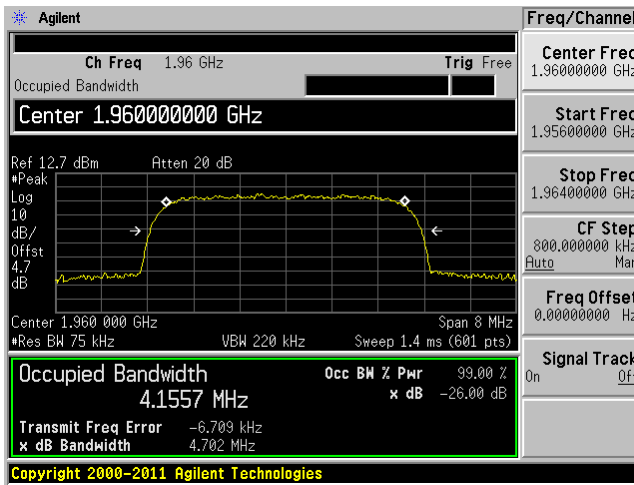


Output

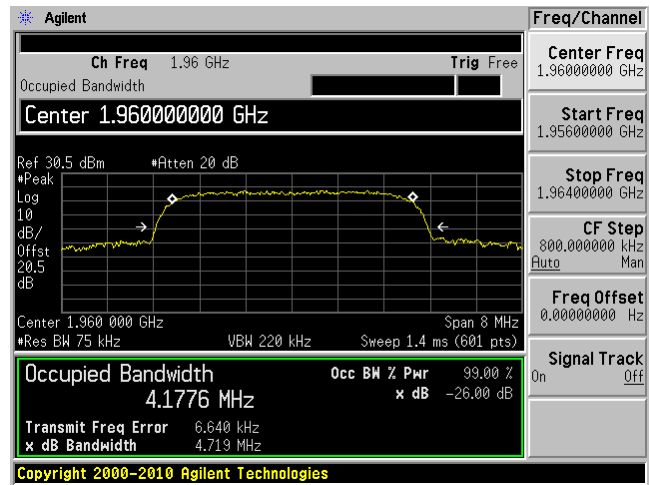


WCDMA/HSPA (Middle Channel)

Input



Output

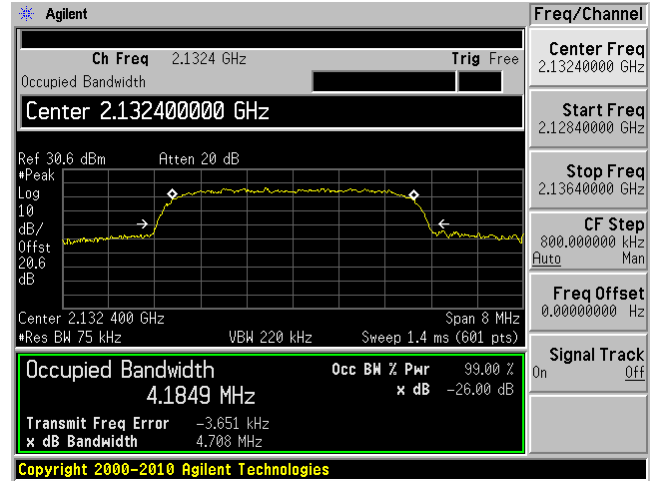
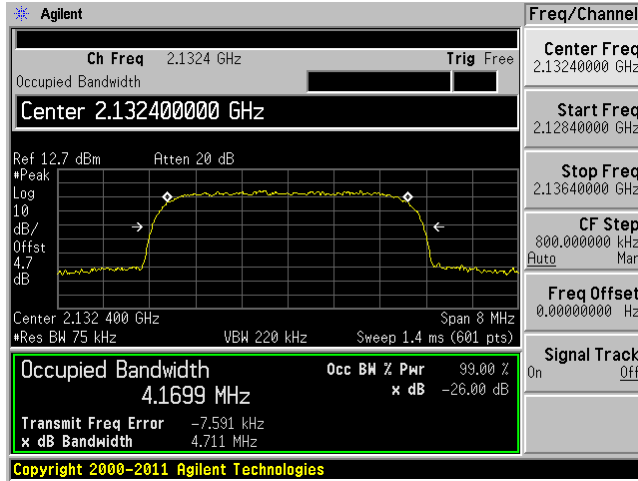


**AWS Band Downlink (WCDMA/HSPA)**

**WCDMA/HSPA (Middle Channel)**

Input

Output

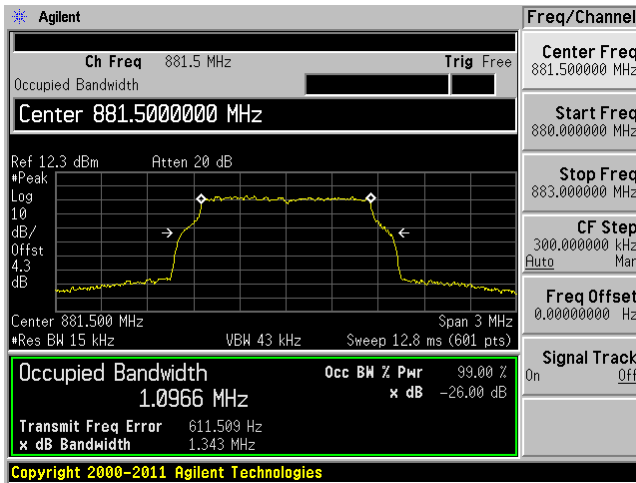




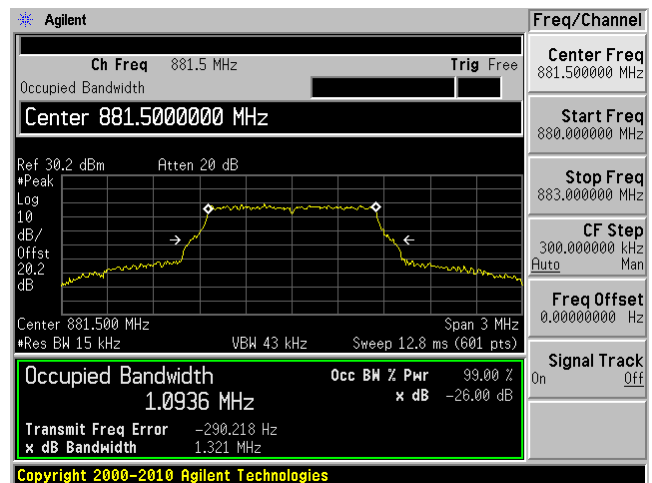
### LTE Cellular Band Downlink

#### QPSK (1.4 MHz), (Middle Channel)

Input

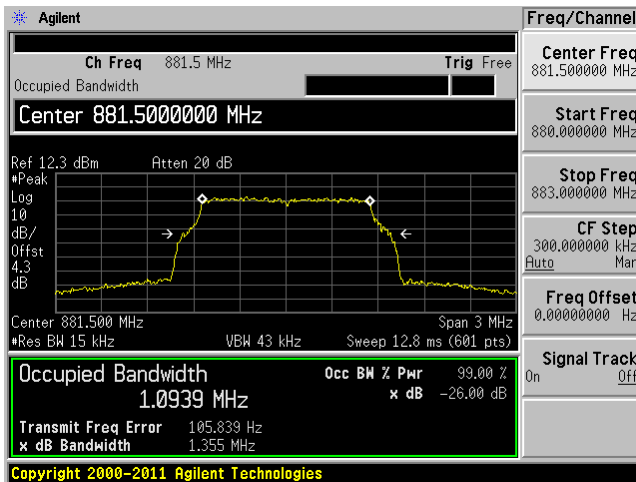


Output

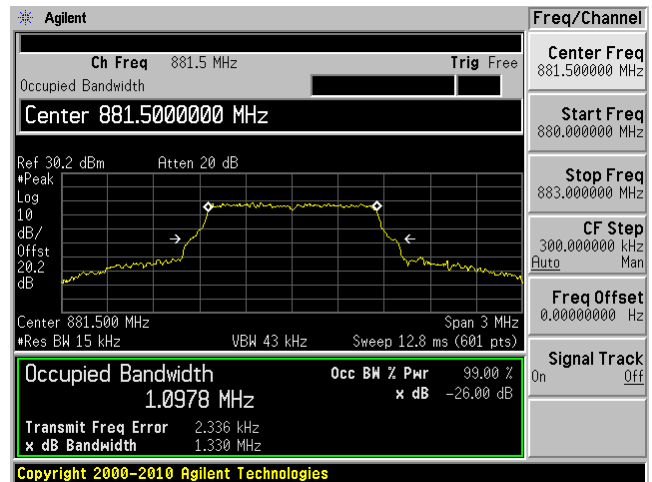


#### 16QAM (1.4 MHz), (Middle Channel)

Input

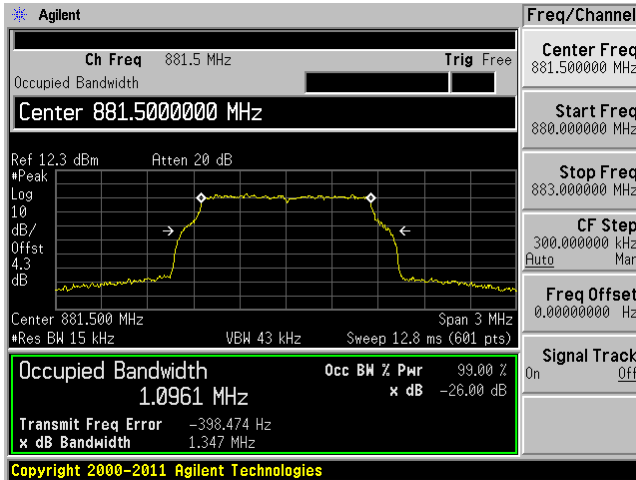


Output

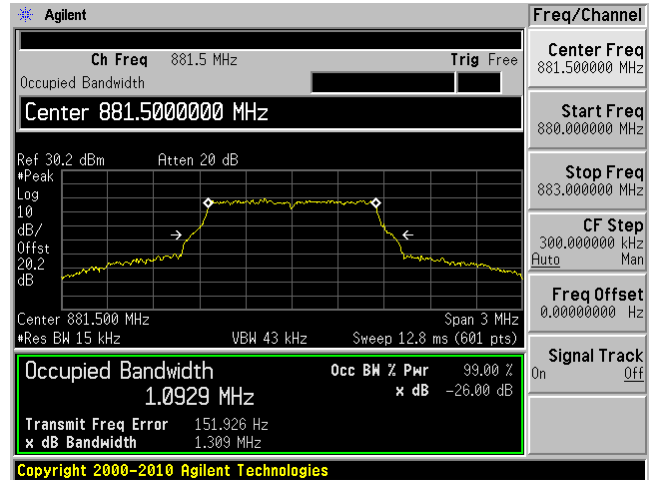


64QAM (1.4 MHz), (Middle Channel)

Input

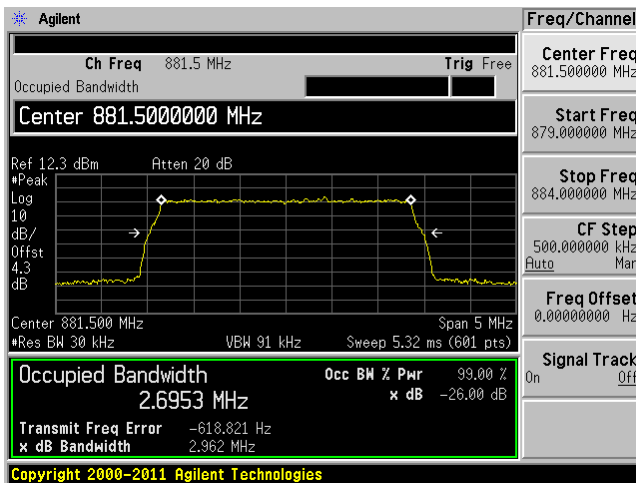


Output

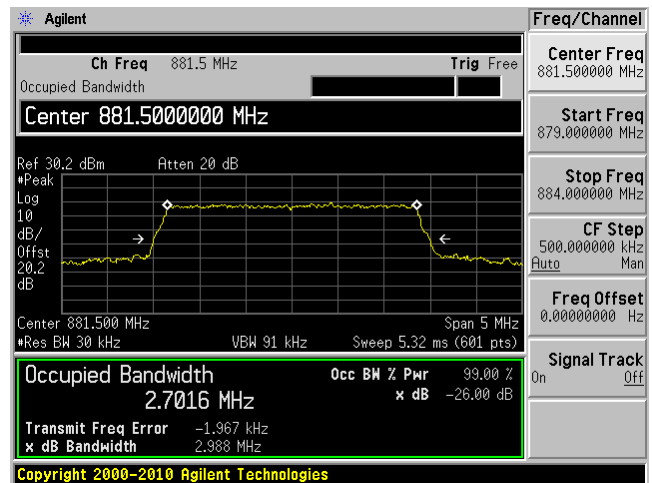


QPSK (3 MHz), (Middle Channel)

Input

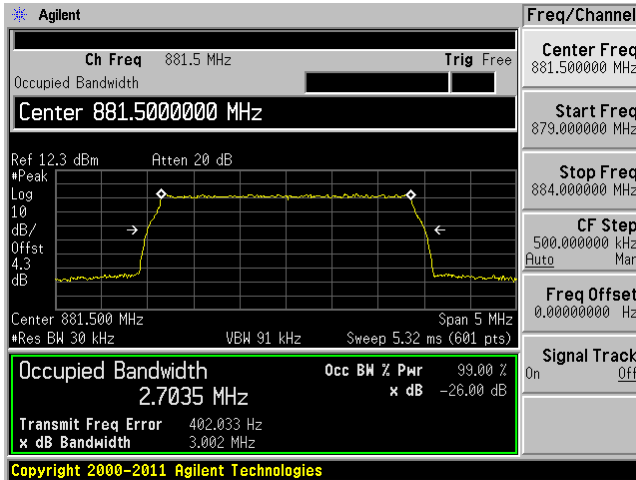


Output

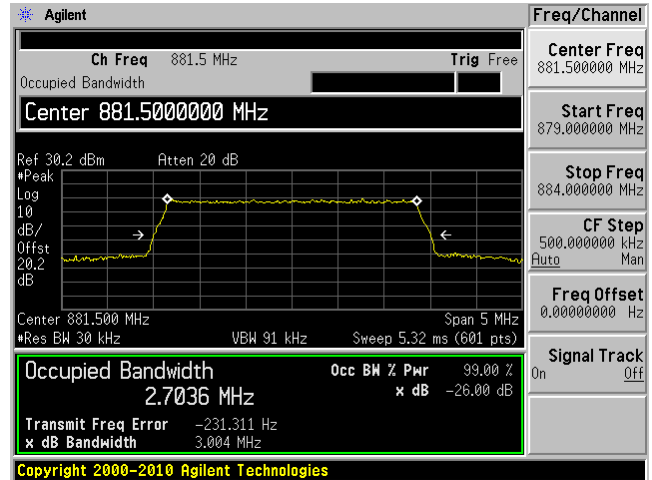


16QAM (3 MHz), (Middle Channel)

Input

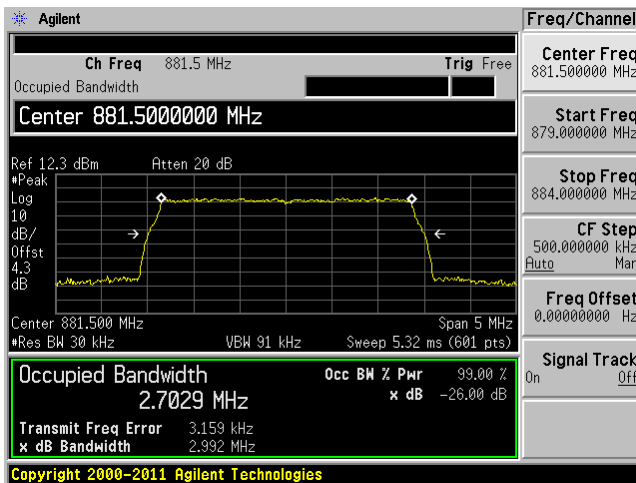


Output

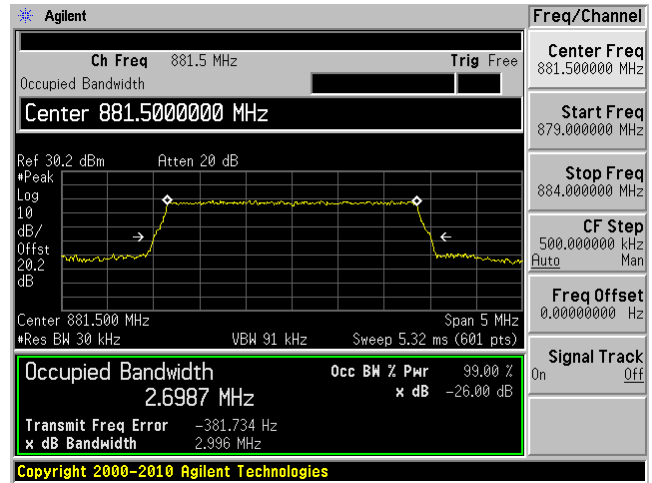


64QAM (3 MHz), (Middle Channel)

Input

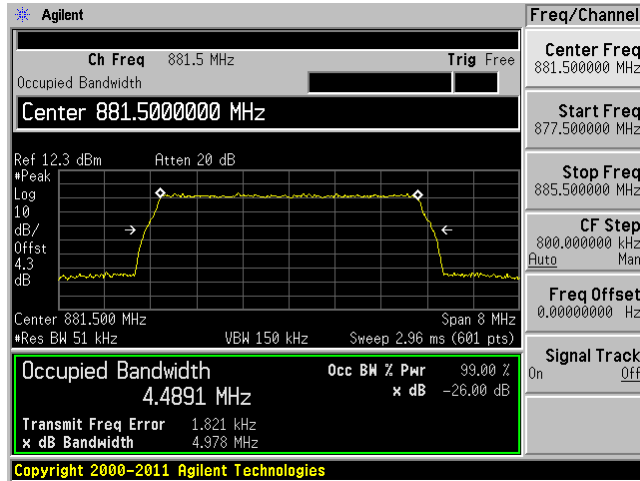


Output

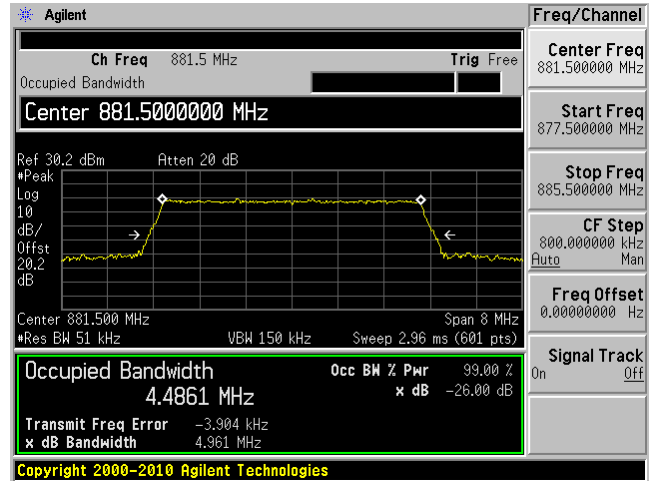


QPSK (5 MHz), (Middle Channel)

Input

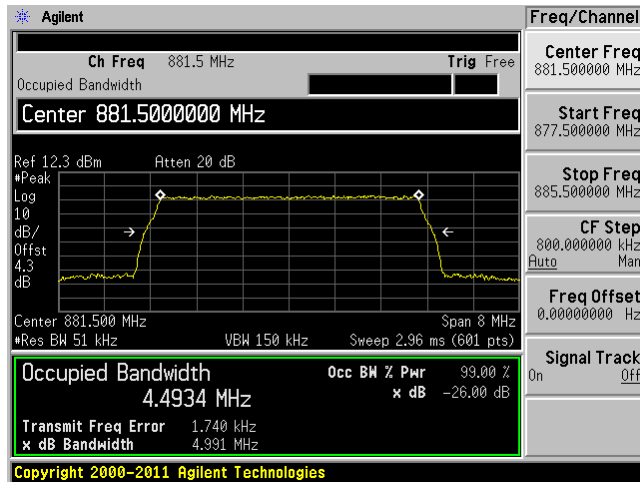


Output

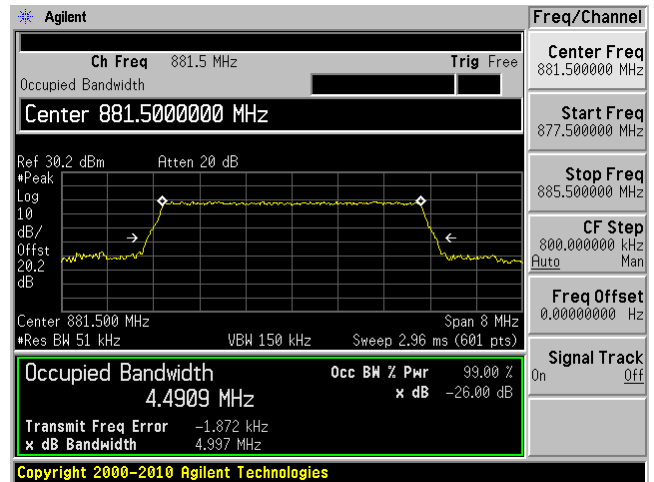


16QAM (5 MHz), (Middle Channel)

Input

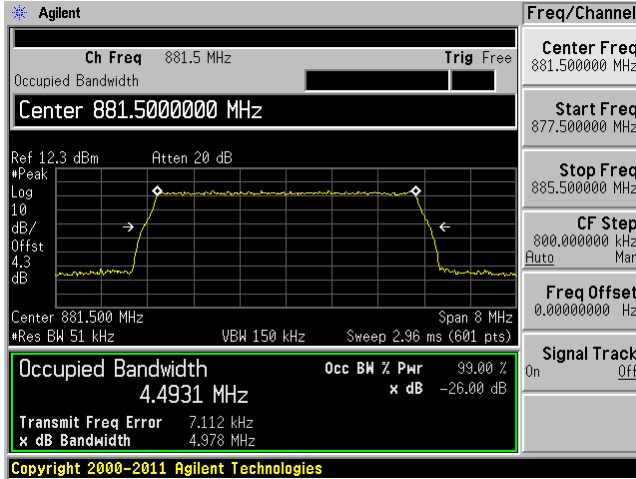


Output

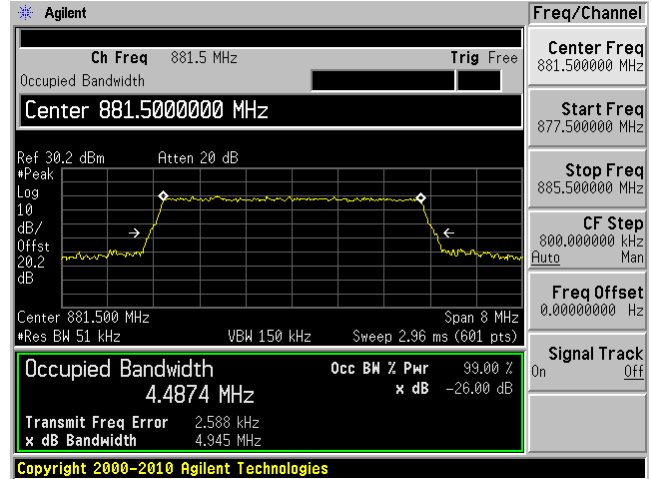


64QAM (5 MHz), (Middle Channel)

Input

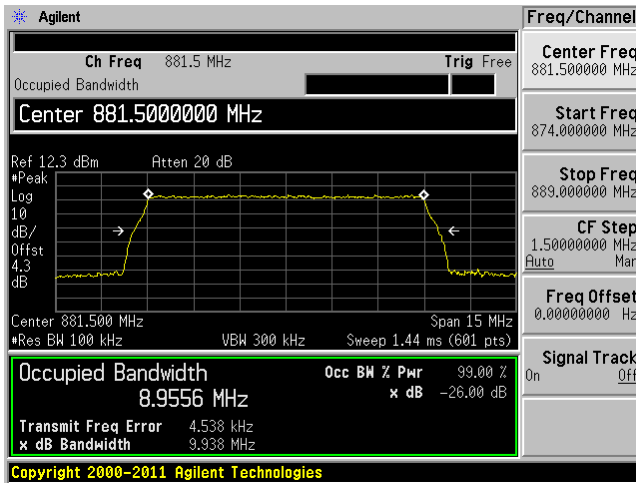


Output

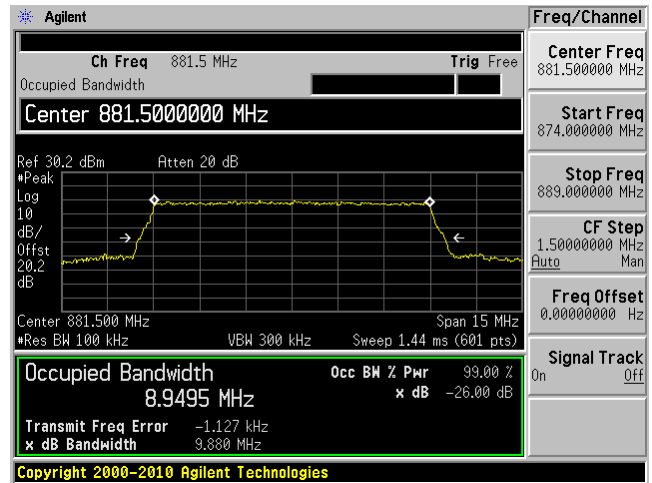


QPSK (10 MHz), (Middle Channel)

Input

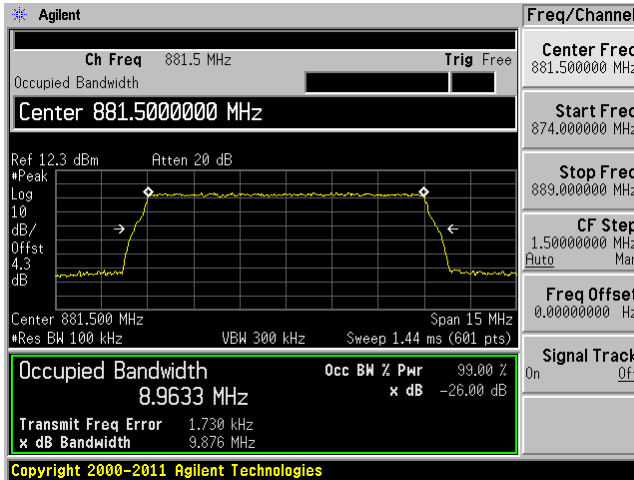


Output

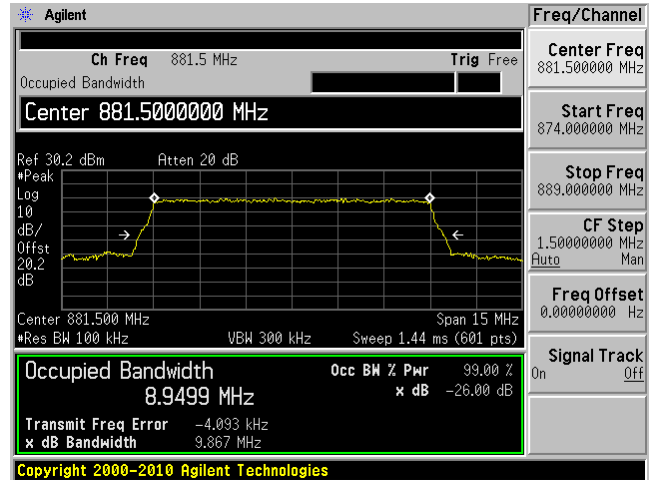


16QAM (10 MHz), (Middle Channel)

Input

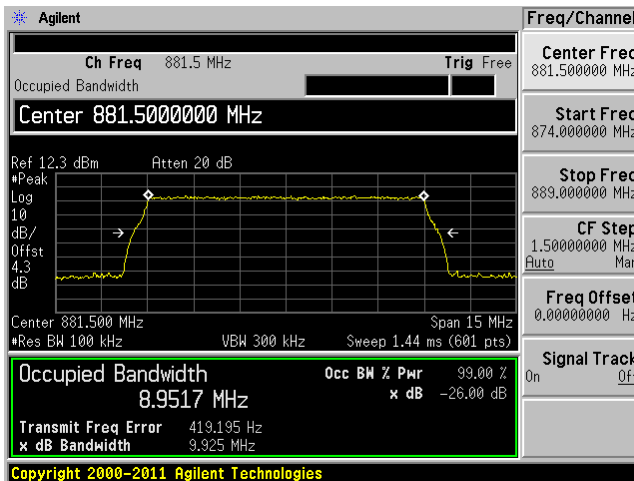


Output

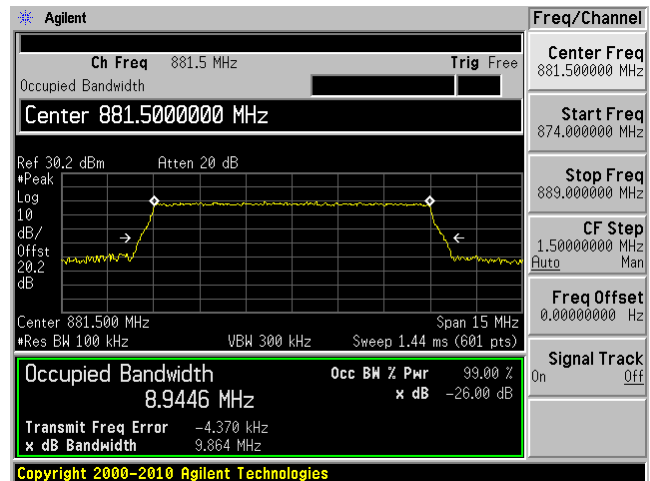


64QAM (10 MHz), (Middle Channel)

Input



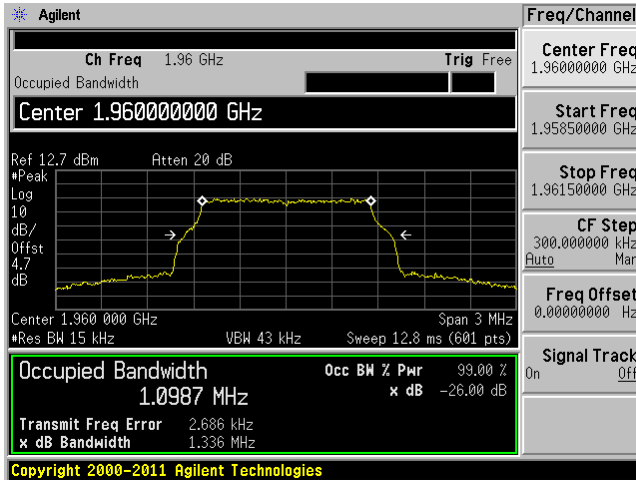
Output



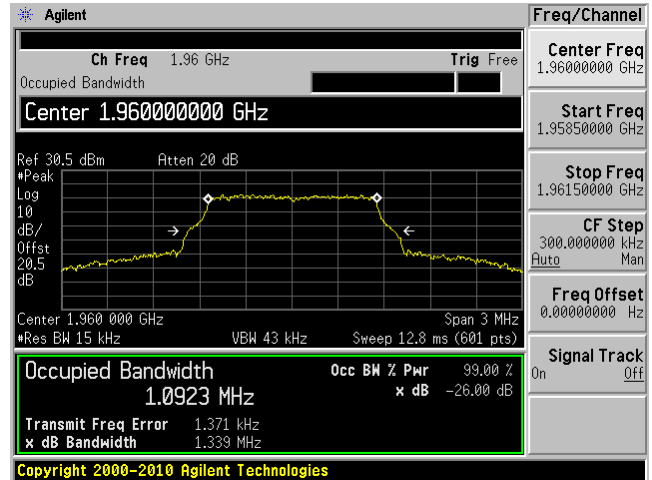
### LTE PCS Band Downlink

#### QPSK (1.4 MHz), (Middle Channel)

Input

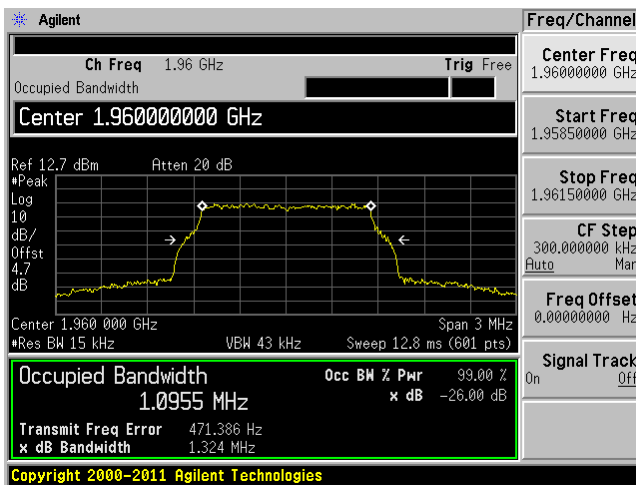


Output

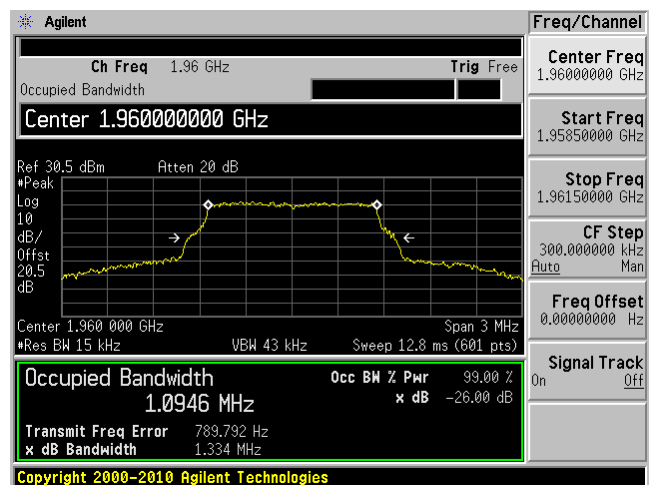


#### 16QAM (1.4 MHz), (Middle Channel)

Input

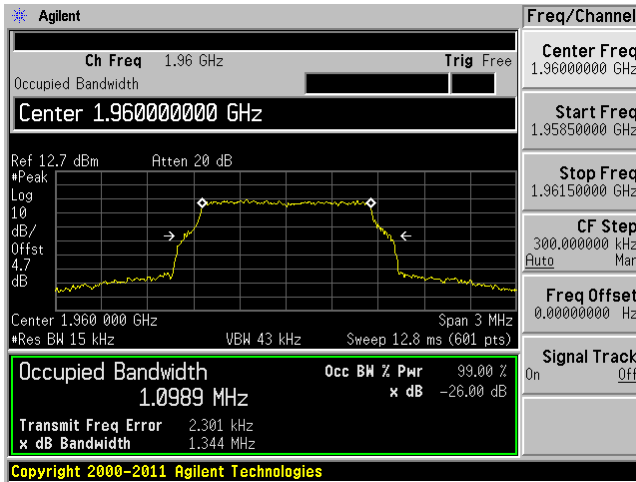


Output

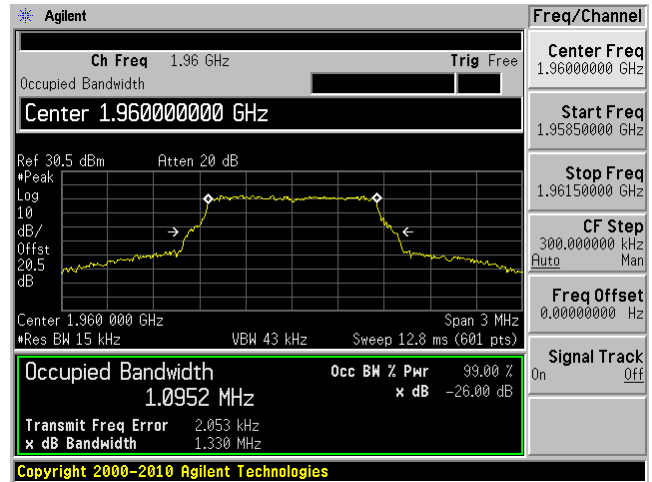


64QAM (1.4 MHz), (Middle Channel)

Input

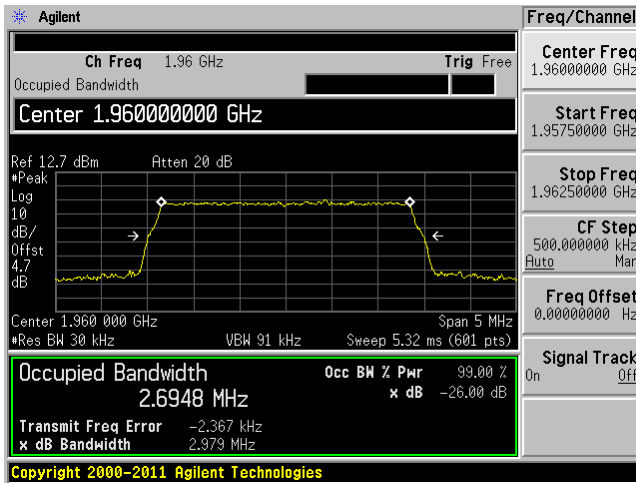


Output

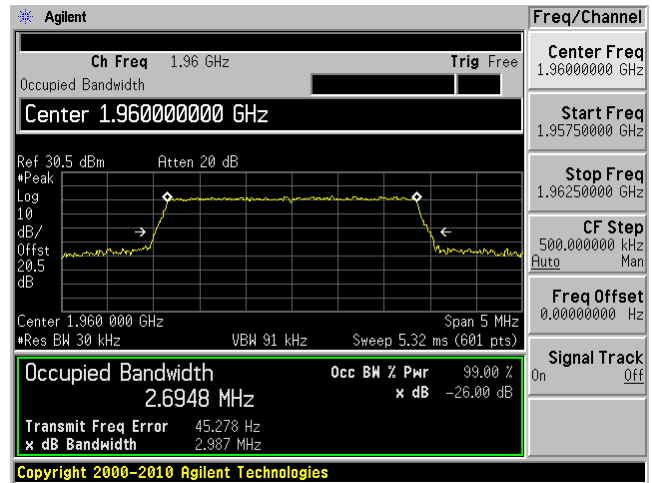


QPSK (3 MHz), (Middle Channel)

Input



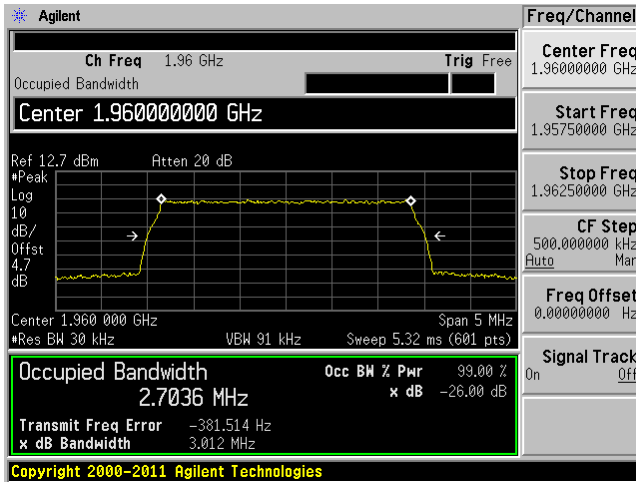
Output



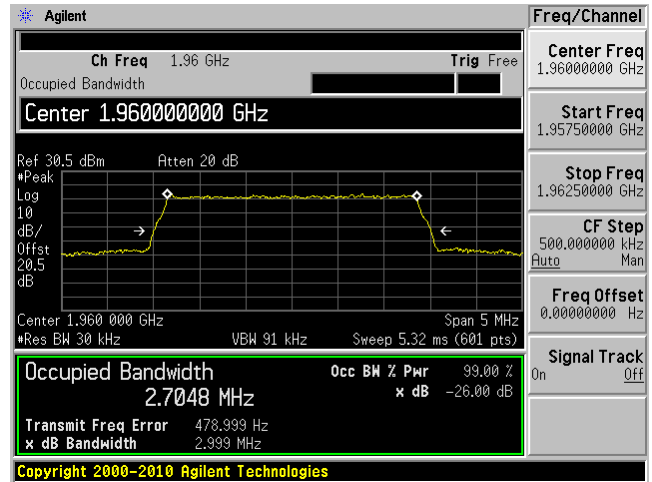


16QAM (3 MHz), (Middle Channel)

Input

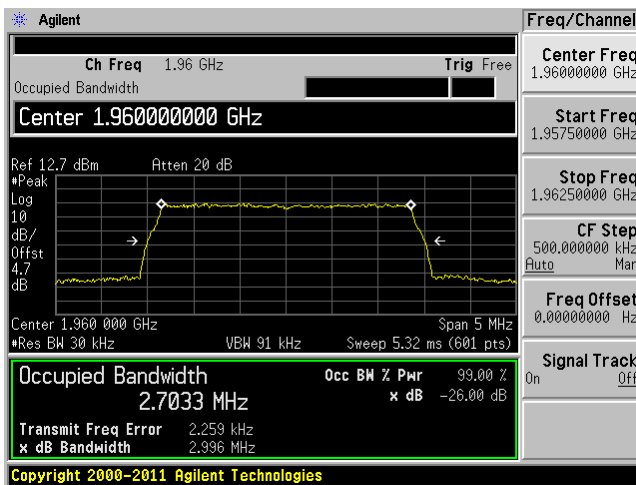


Output

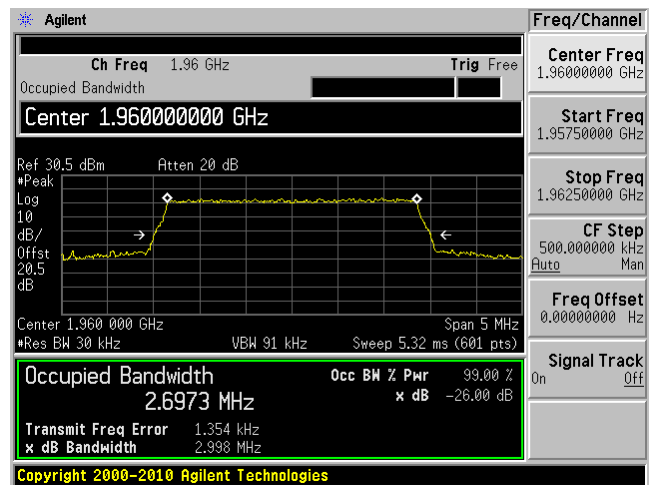


64QAM (3 MHz), (Middle Channel)

Input

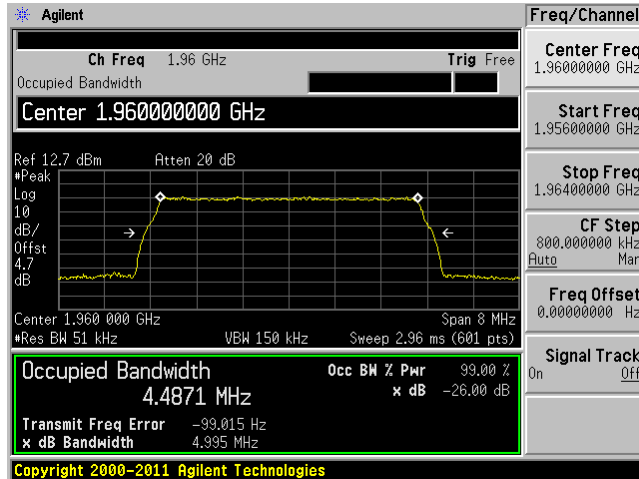


Output

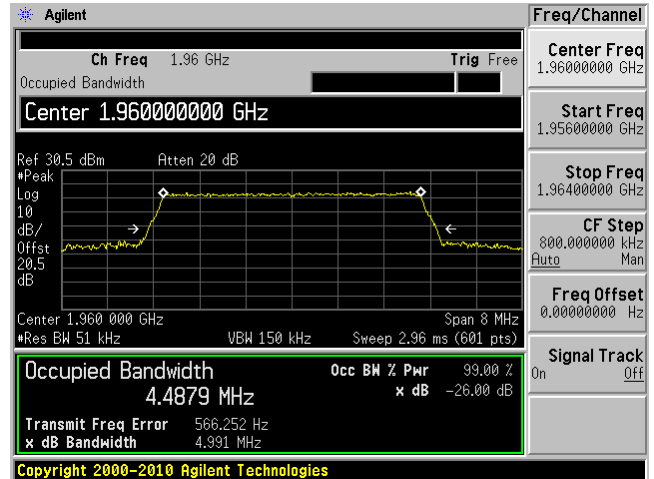


QPSK (5 MHz), (Middle Channel)

Input

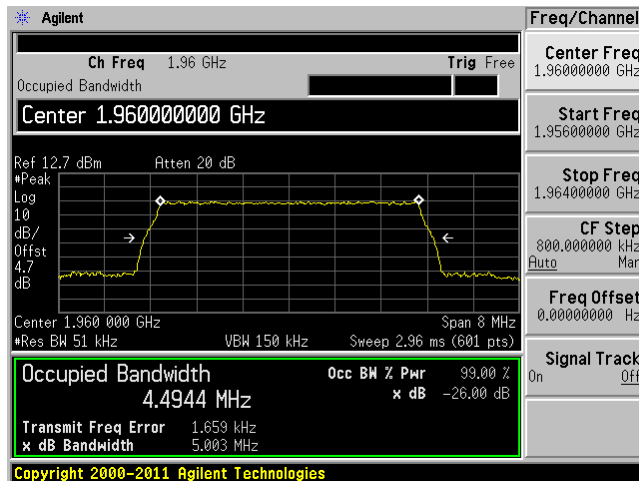


Output

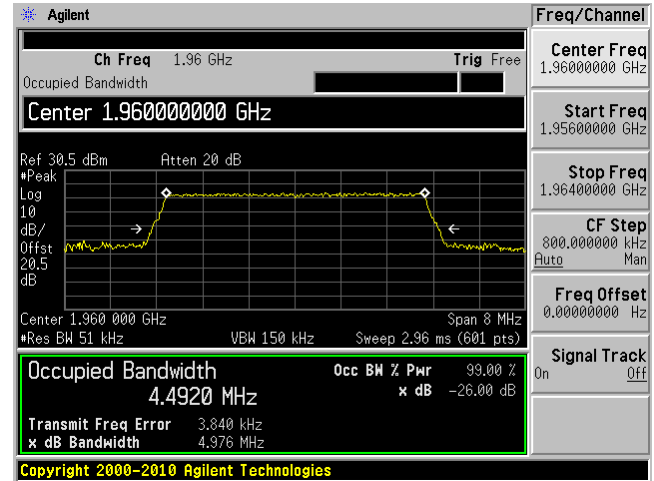


16QAM (5 MHz), (Middle Channel)

Input

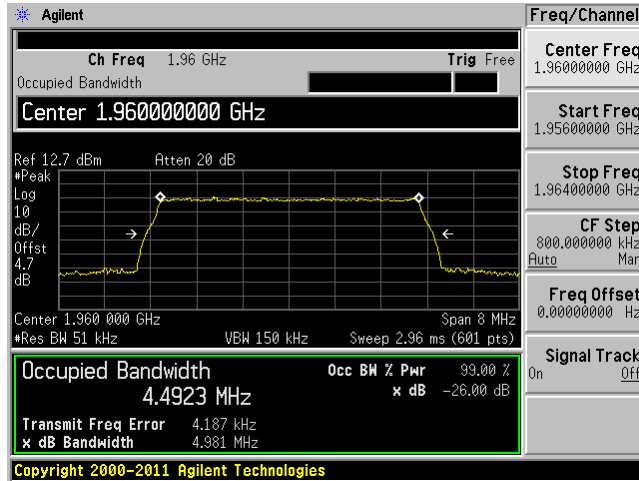


Output

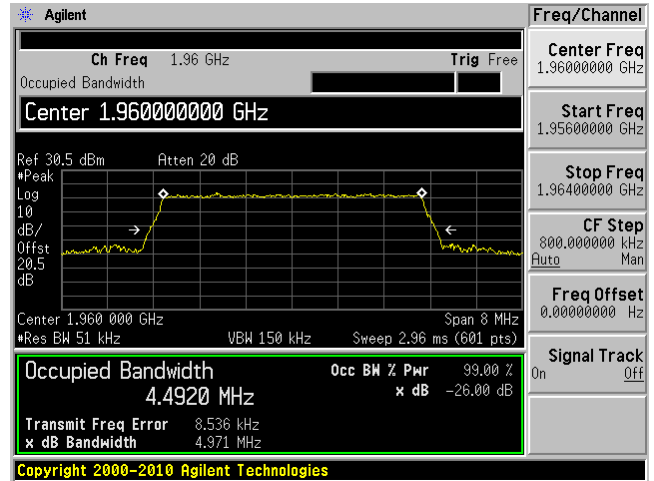


64QAM (5 MHz), (Middle Channel)

Input

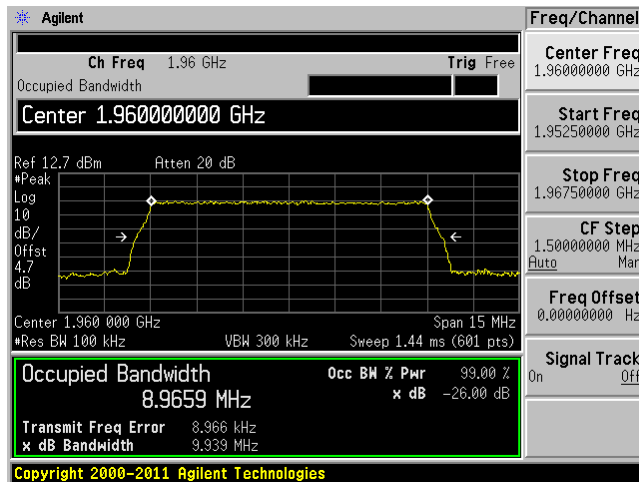


Output

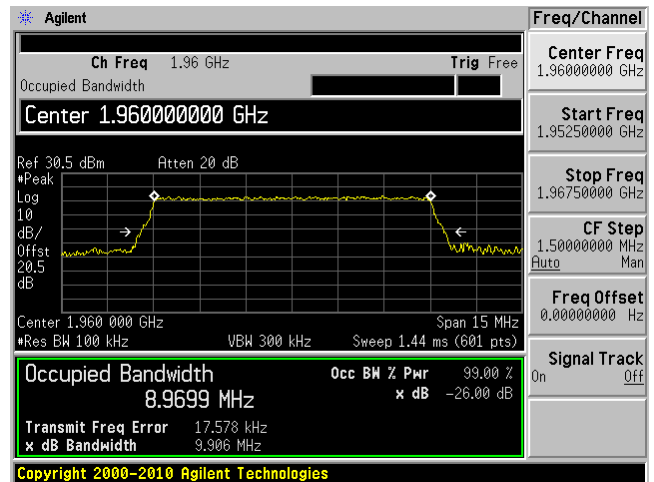


QPSK (10 MHz), (Middle Channel)

Input

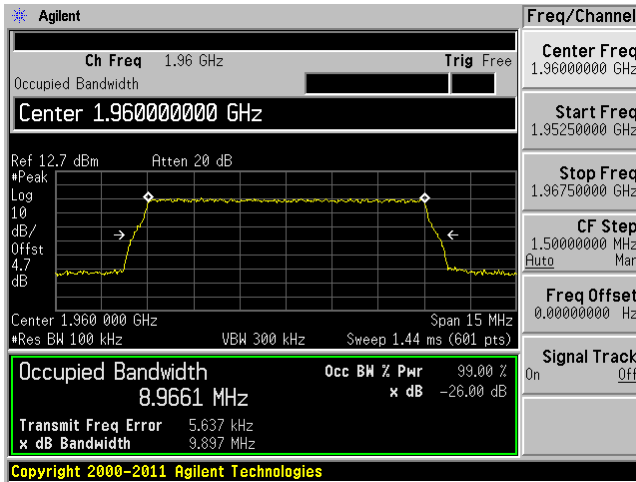


Output

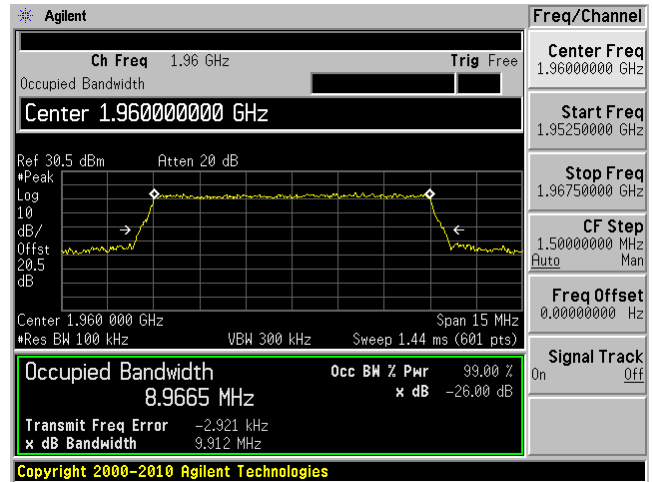


16QAM (10 MHz), (Middle Channel)

Input

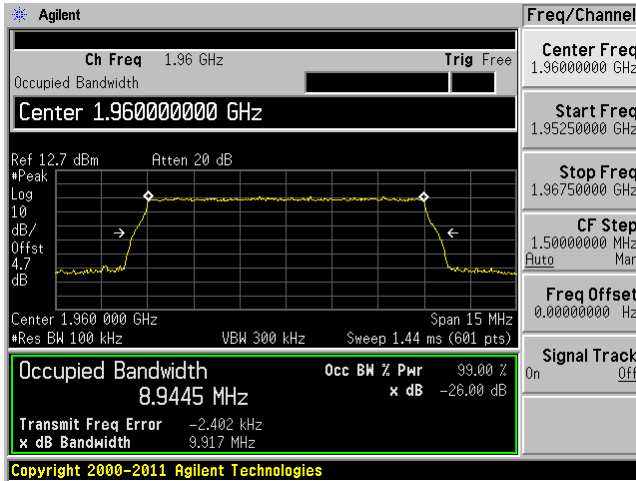


Output

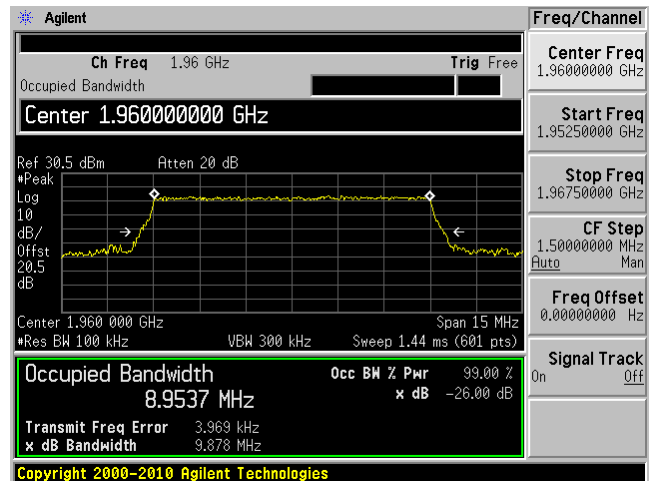


64QAM (10 MHz), (Middle Channel)

Input



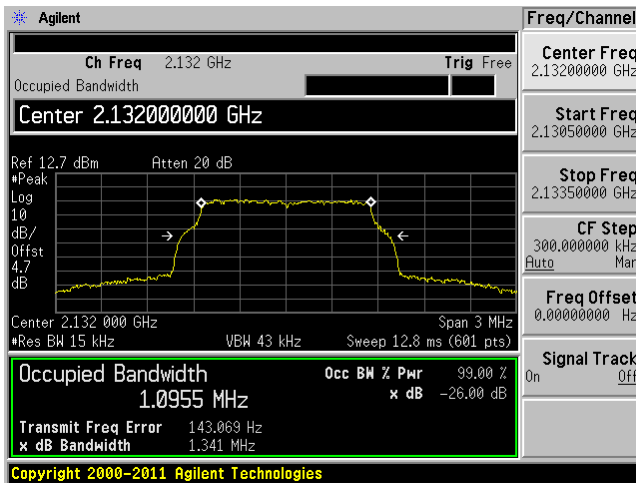
Output



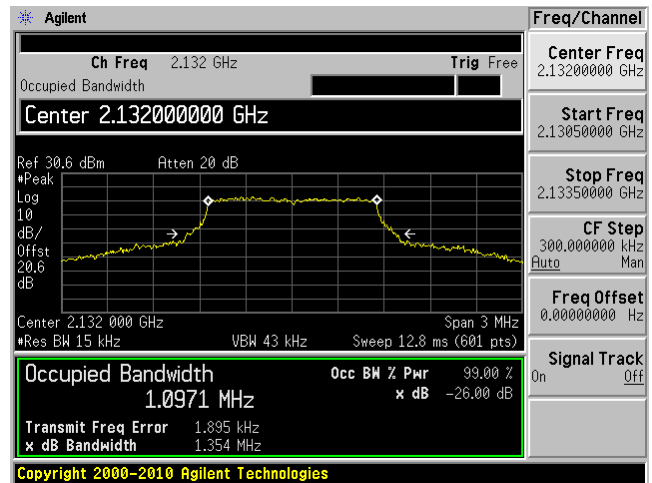
### LTE AWS Band Downlink

#### QPSK (1.4 MHz), (Middle Channel)

Input

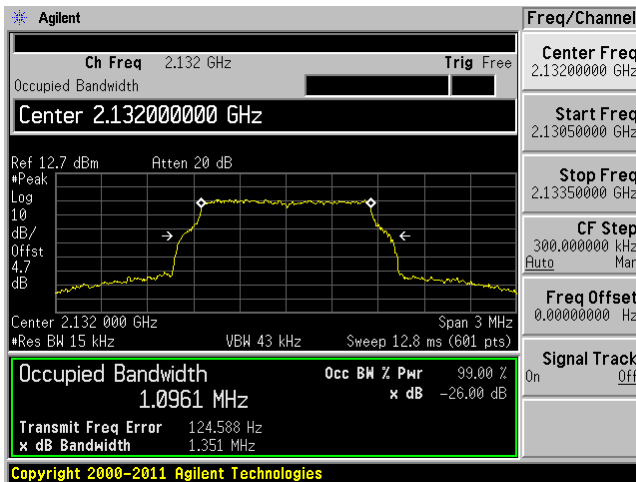


Output

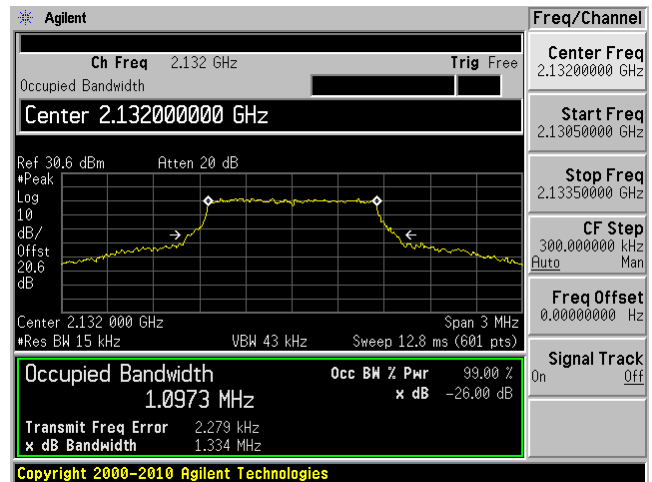


#### 16QAM (1.4 MHz), (Middle Channel)

Input

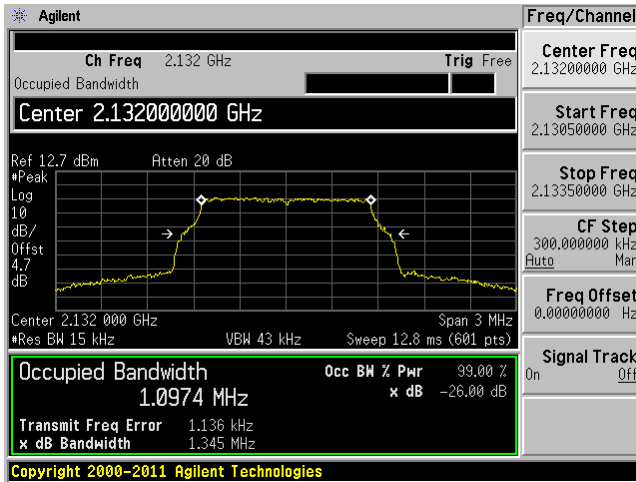


Output

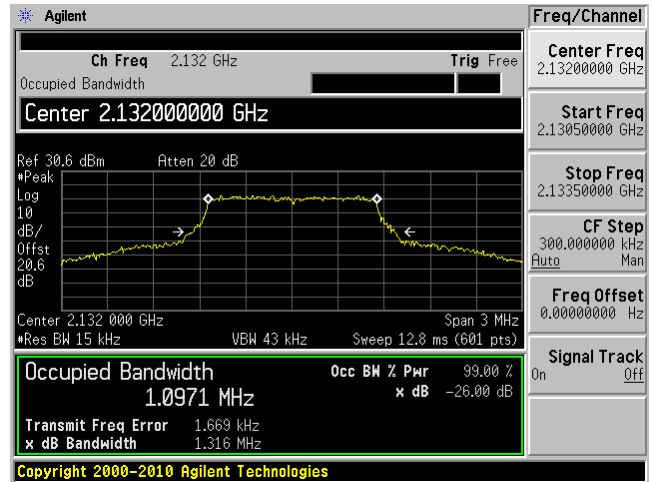


64QAM (1.4 MHz), (Middle Channel)

Input

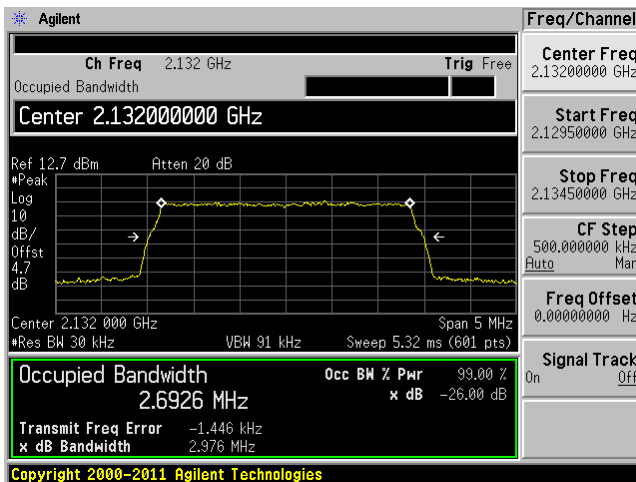


Output

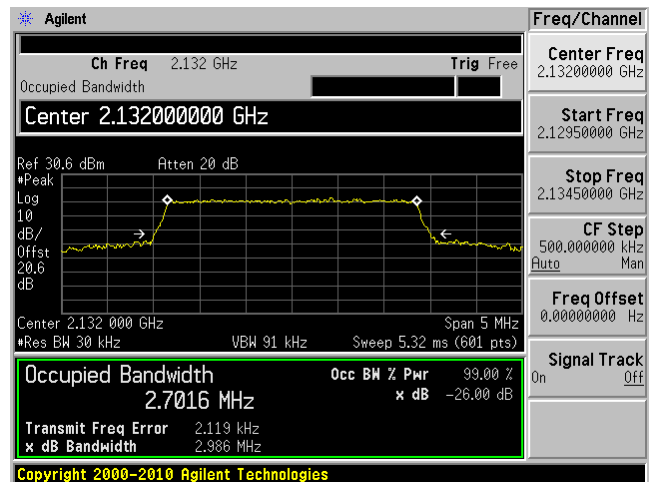


QPSK (3 MHz), (Middle Channel)

Input

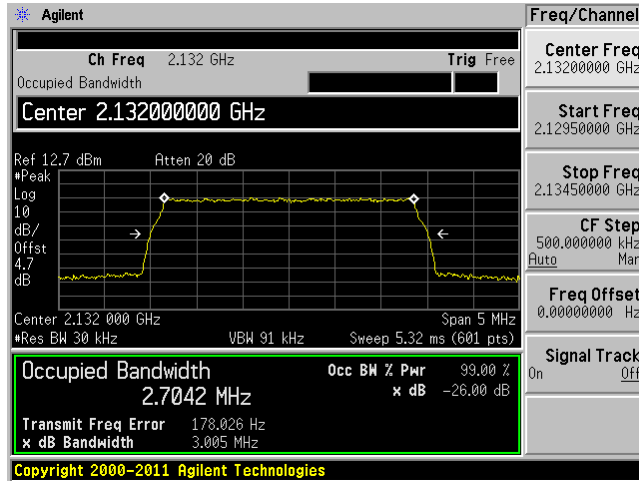


Output

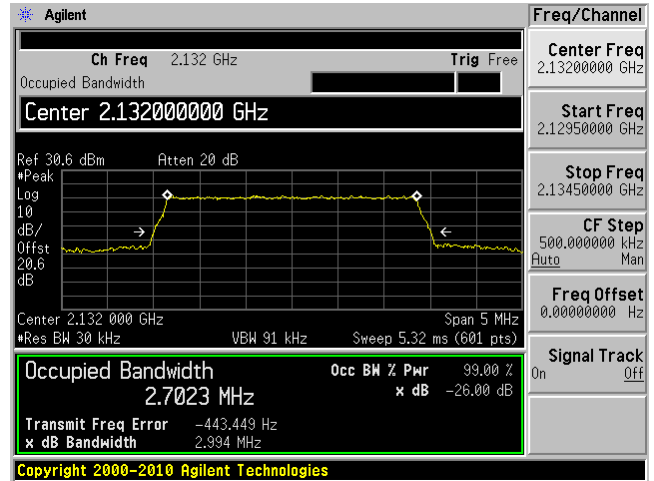


16QAM (3 MHz), (Middle Channel)

Input

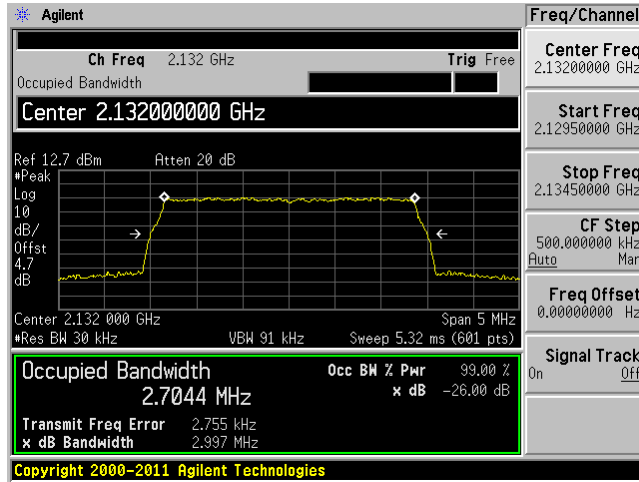


Output

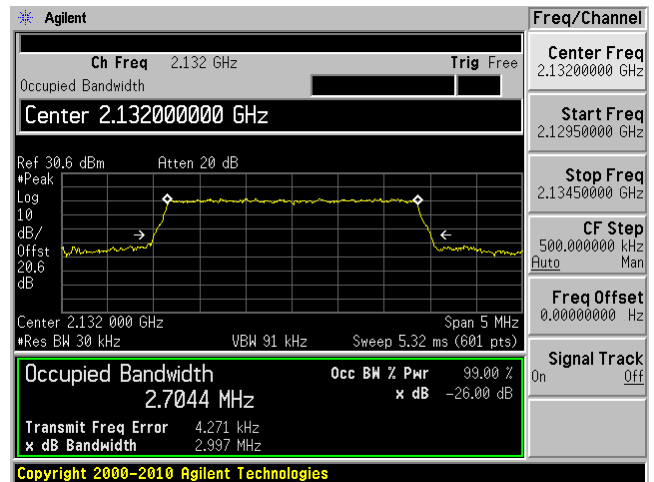


64QAM (3 MHz), (Middle Channel)

Input

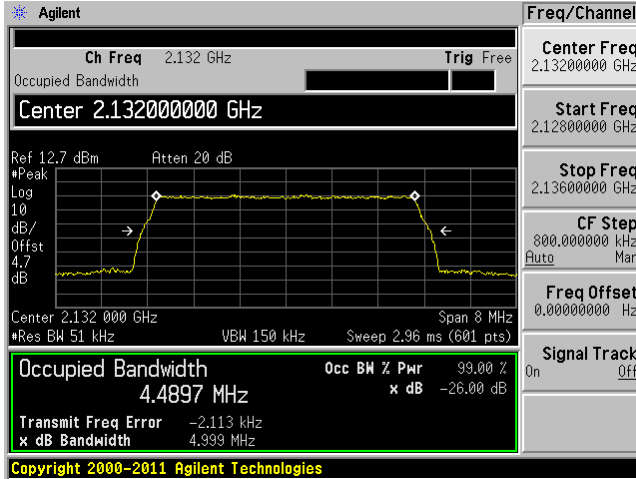


Output

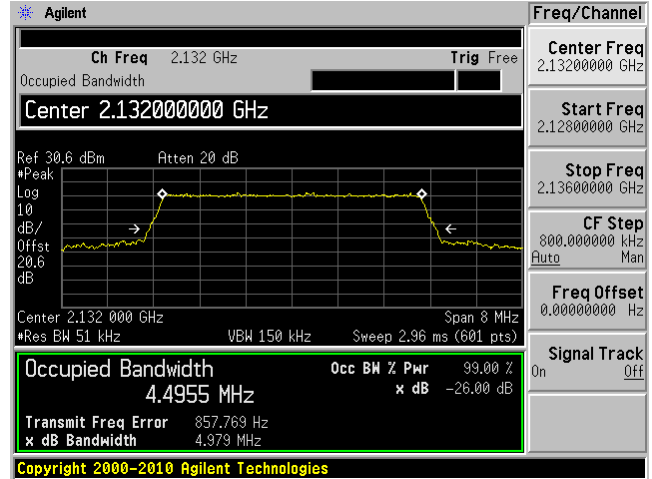


QPSK (5 MHz), (Middle Channel)

Input

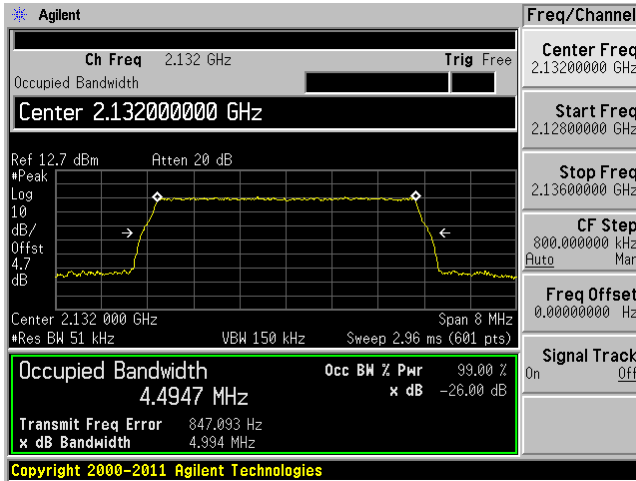


Output

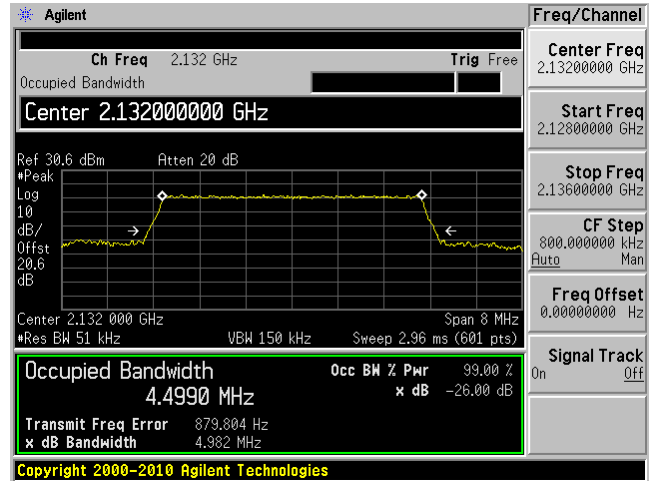


16QAM (5 MHz), (Middle Channel)

Input



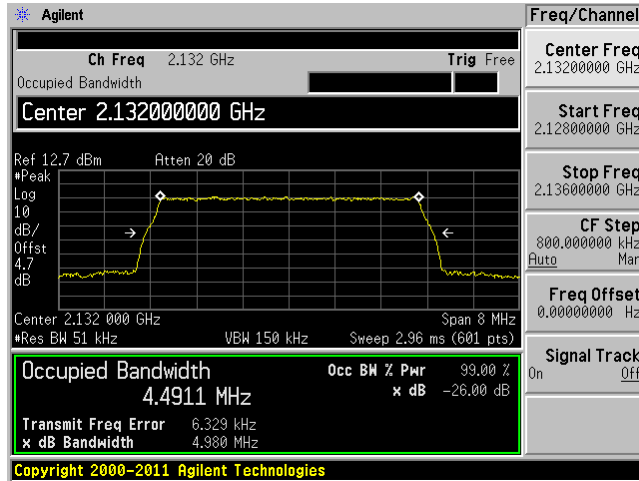
Output



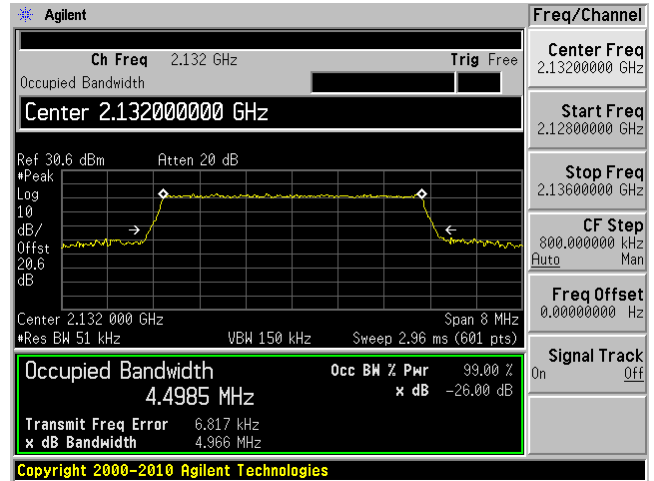


64QAM (5 MHz), (Middle Channel)

Input

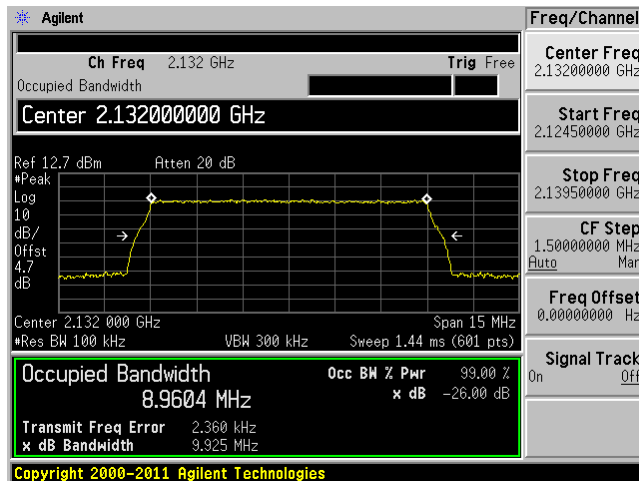


Output

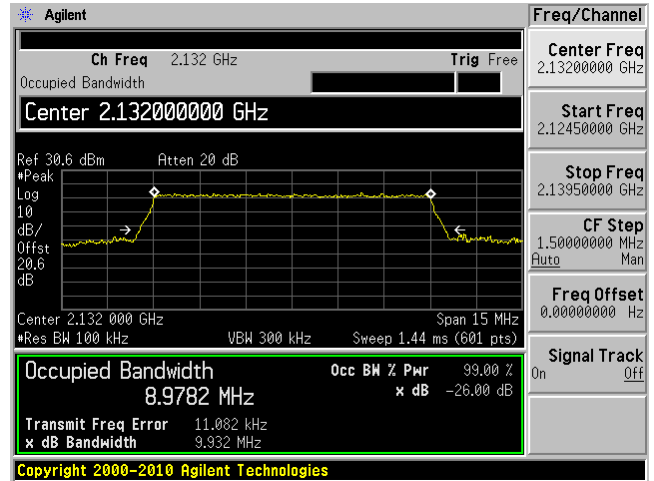


QPSK (10 MHz), (Middle Channel)

Input

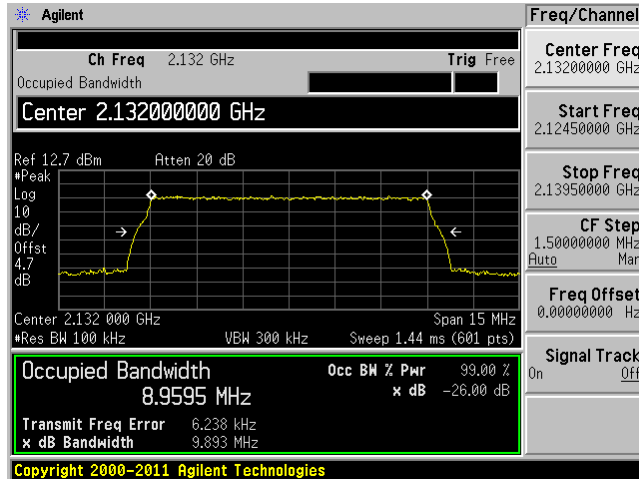


Output

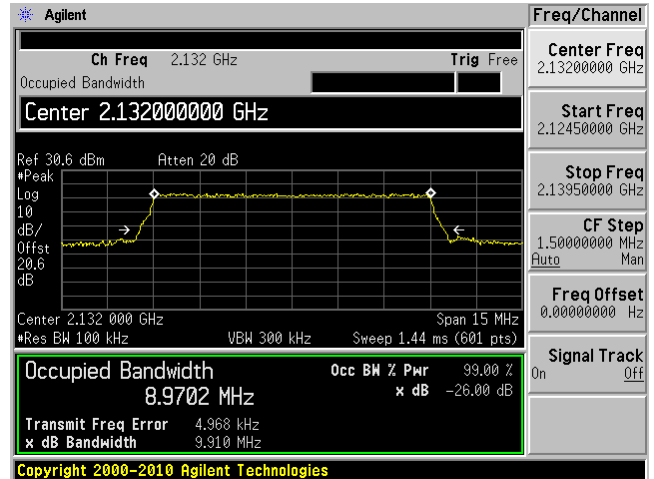


16QAM (10 MHz), (Middle Channel)

Input

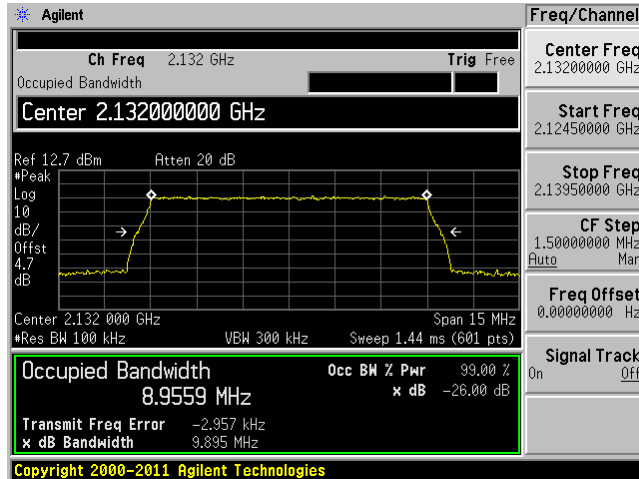


Output

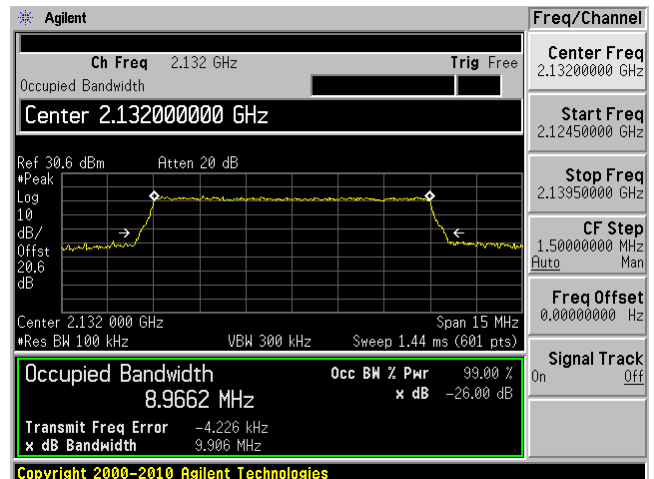


64QAM (10 MHz), (Middle Channel)

Input



Output



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

### 6.1 Applicable Standards

Requirements: FCC §2.1053, §22.917, §24.238 and §27.53.

### 6.2 Test Procedure

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

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

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

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

Spurious emissions in dB = 10 log (TX Power in Watts/0.001)–the absolute level

Spurious attenuation limit in dB = 43+10 Log10 (power out in Watts)

### 6.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
HP	Pre-Amplifier	8447D	2944A10187	2013-03-08	1 year
Sunol Sciences Corp	Antenna, Biconical Log	JB1	A013105-3	2012-07-24	2 years
Sunol Sciences Corp	System Controller	SC99V	122303-1	N/R	N/R
Agilent	Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
A.H. Systems	Horn Antenna	SAS-200/571	261	2013-01-29	1 year
A.R.A.	Horn Antenna	DRG-118/A	1132	2013-01-29	1 year
Mini-Circuits	Pre-Amplifier	ZVA-183-S	570400946	2013-05-09	1 year
HP	Generator, Signal	83650B	3614A00276	2012-07-13	2 years
Agilent	Generator, Signal	E4438C	MY45091309	2013-05-30	1 year

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

## 6.4 Test Environmental Conditions

<b>Temperature:</b>	21 °C
<b>Relative Humidity:</b>	41 %
<b>ATM Pressure:</b>	101.72 kPa

The testing was performed by Glenn Escano from 2013-09-16 at 5m Chamber3.

## 6.5 Test Results

### Cellular Band, Downlink, Input frequency = 881.5 MHz, CW

Indicated		Turntable 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. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
544.3	40.13	97	100	V	544.3	-55.42	0	0.26	-55.68	-13	-42.68
544.3	41.19	122	117	H	544.3	-57.55	0	0.26	-57.81	-13	-44.81
775	20.93	120	100	V	775	-73.71	0	0.31	-74.02	-13	-61.02
775	21.89	113	139	H	775	-74.93	0	0.31	-75.24	-13	-62.24

### PCS Band, Downlink, Input frequency = 1960 MHz, CW

Indicated		Turntable 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. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
609.9	25.34	38	137	V	609.9	-71.65	0	0.22	-71.87	-13	-58.87
609.9	28.27	141	100	H	609.9	-69.44	0	0.22	-69.66	-13	-56.66
880	22.19	341	150	V	880	-70.28	0	0.24	-70.52	-13	-57.52
880	22.92	260	101	H	880	-71.64	0	0.24	-71.88	-13	-58.88

### PCS Band, Downlink, Input frequency = 2132 MHz, CW

Indicated		Turntable 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. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
609.9	28.55	54	100	V	650	-68.44	0	0.22	-68.66	-13	-55.66
609.9	26.28	144	100	H	650	-71.43	0	0.22	-71.65	-13	-58.65
880	21.97	339	150	V	101	-70.5	0	0.24	-70.74	-13	-57.74
880	22.46	166	136	H	102	-72.1	0	0.24	-72.34	-13	-59.34

Note: - All spurious emissions are on the noise floor level

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

### 7.1 Applicable Standards

Requirements: FCC §2.1053, §22.917, §24.238 and §27.53.

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

### 7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	PSA, Series Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192	2012-04-23	2 years
Agilent	Generator, Signal	E4438C	MY45091309	2013-05-30	1 year

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

### 7.4 Test Environmental Conditions

<b>Temperature:</b>	22 °C
<b>Relative Humidity:</b>	45 %
<b>ATM Pressure:</b>	101.85 kPa

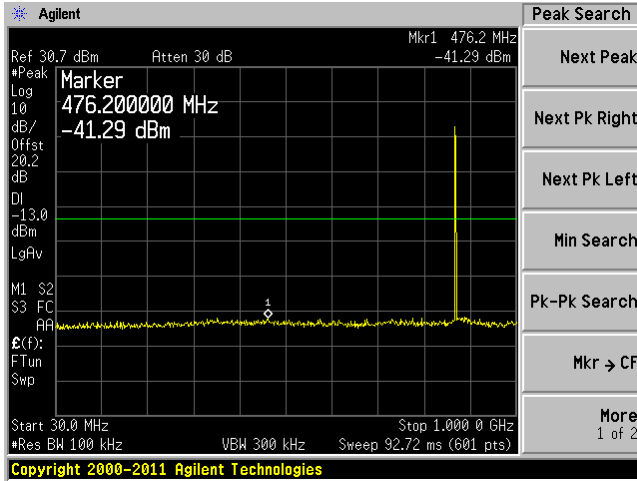
*The testing was performed by Glenn Escano from 2013-09-11 at RF Site.*

### 7.5 Test Results

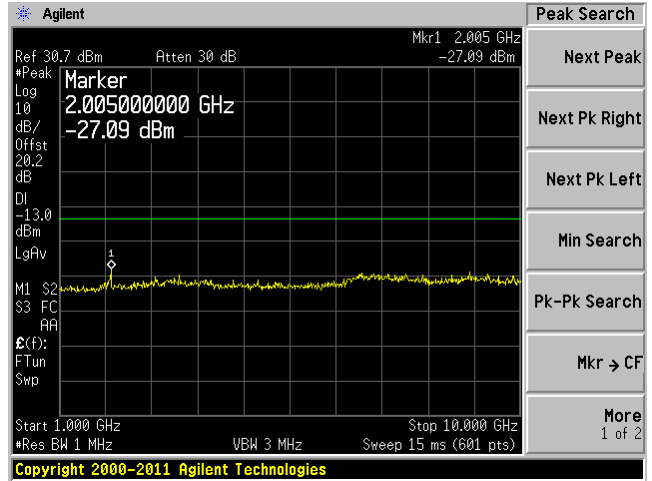
Please refer to the following plots.

### Cellular Band Downlink, Low Channel

Plot 1: 30 MHz to 1 GHz

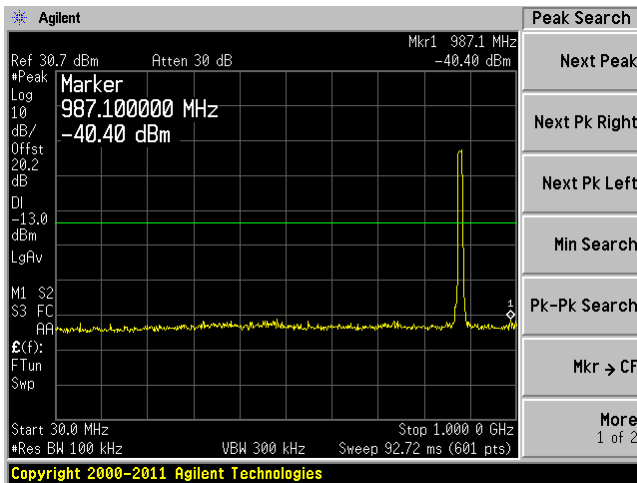


Plot 2: Above 1 GHz

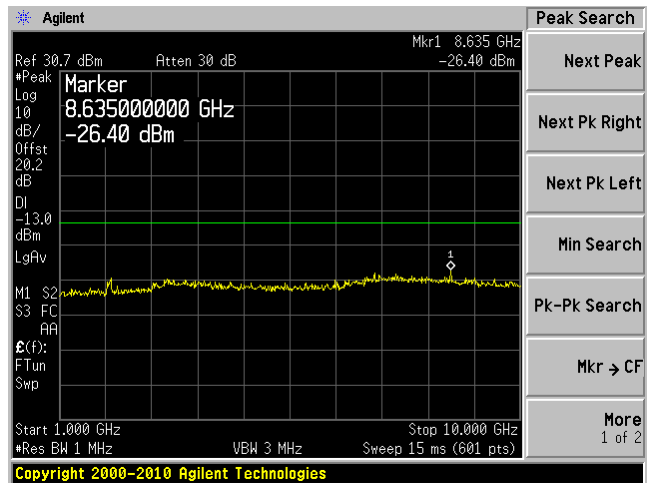


### Cellular Band Downlink, Middle Channel

Plot 1: 30 MHz to 1 GHz



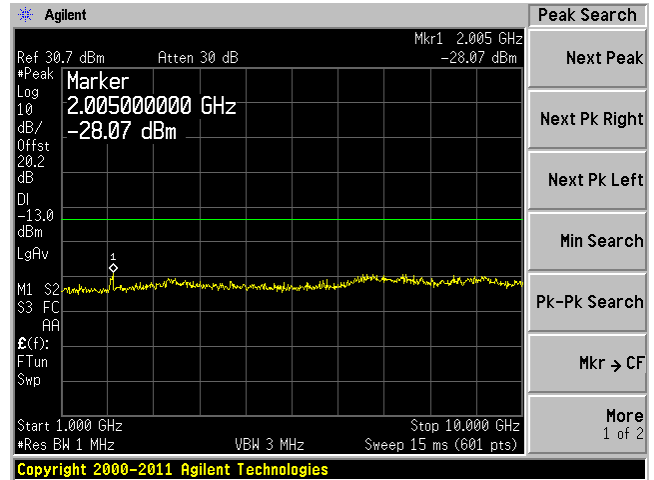
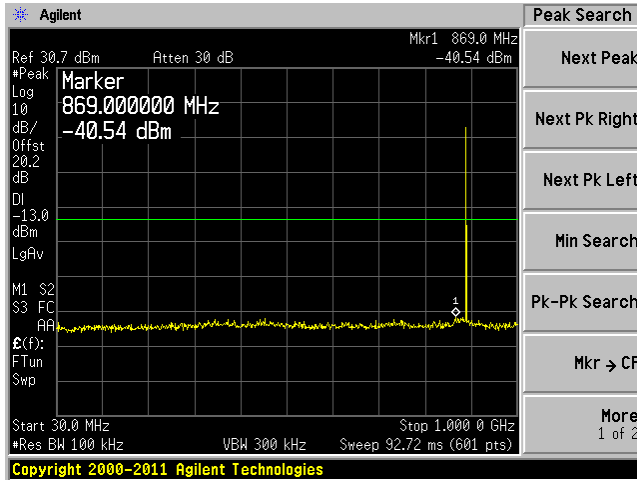
Plot 2: Above 1 GHz



### Cellular Band Downlink, High Channel

Plot 1: 30 MHz to 1 GHz

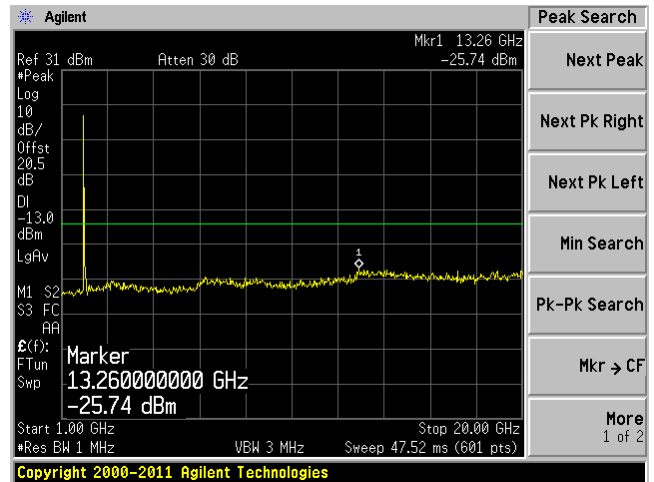
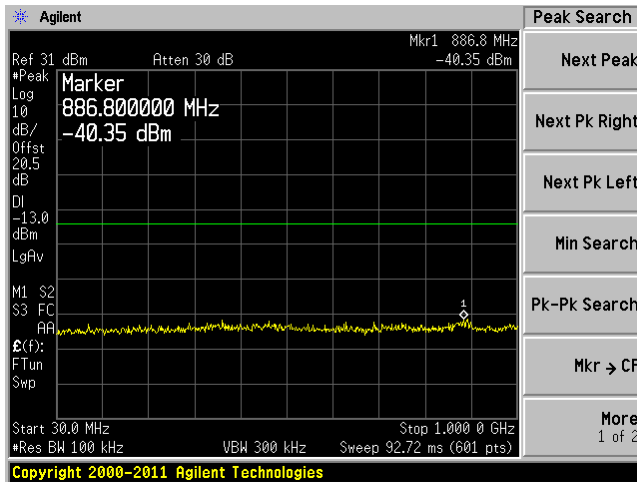
Plot 2: Above 1 GHz



### PCS Band Downlink, Low Channel

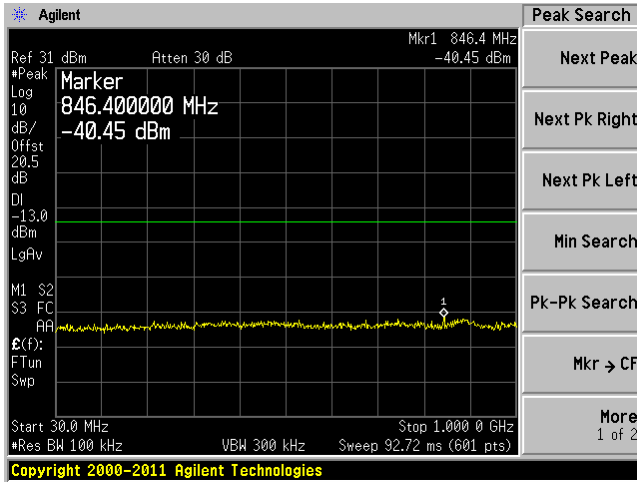
Plot 1: 30 MHz to 1 GHz

Plot 2: Above 1 GHz

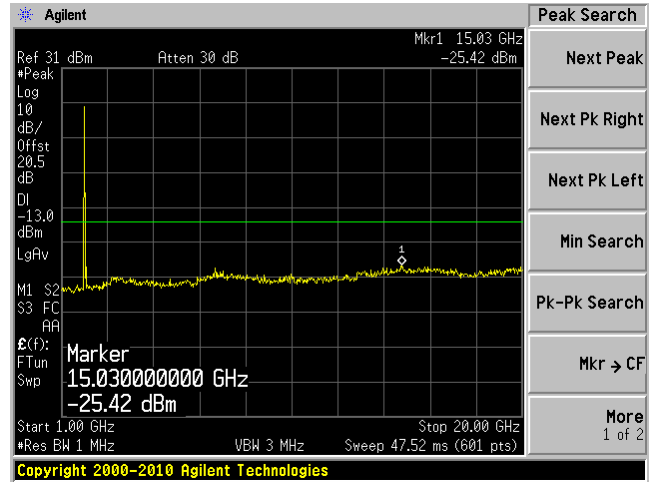


**PCS Band Downlink, Middle Channel**

Plot 1: 30 MHz to 1 GHz

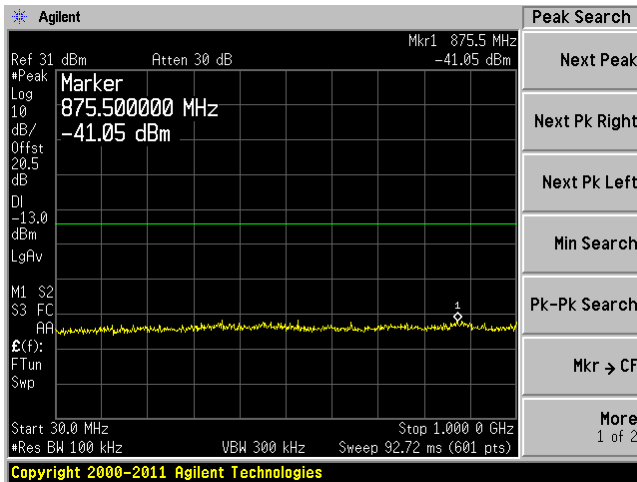


Plot 2: Above 1 GHz

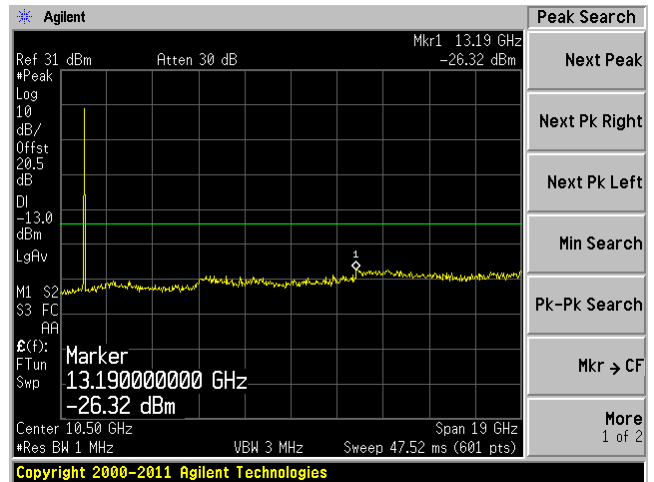


**PCS Band Downlink, High Channel**

Plot 1: 30 MHz to 1 GHz



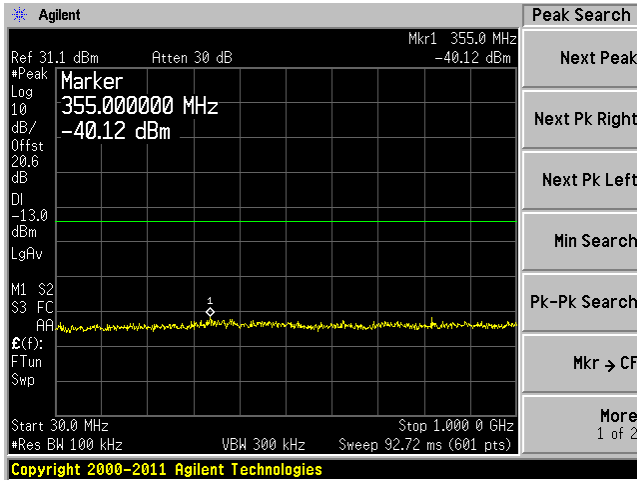
Plot 2: Above 1 GHz



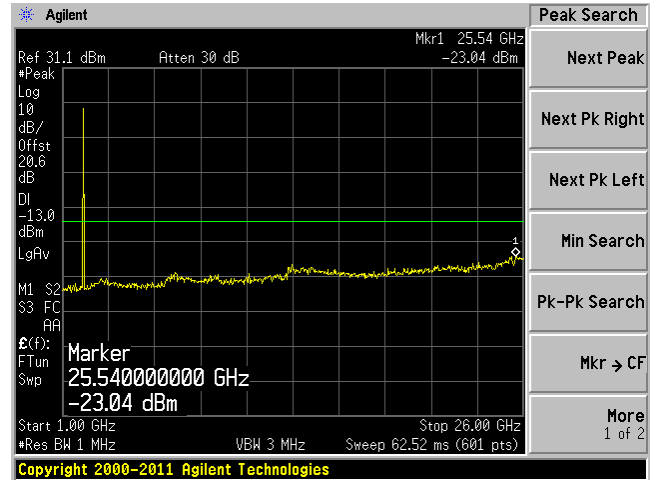


### AWS Band Downlink, Low Channel

Plot 1: 30 MHz to 1 GHz

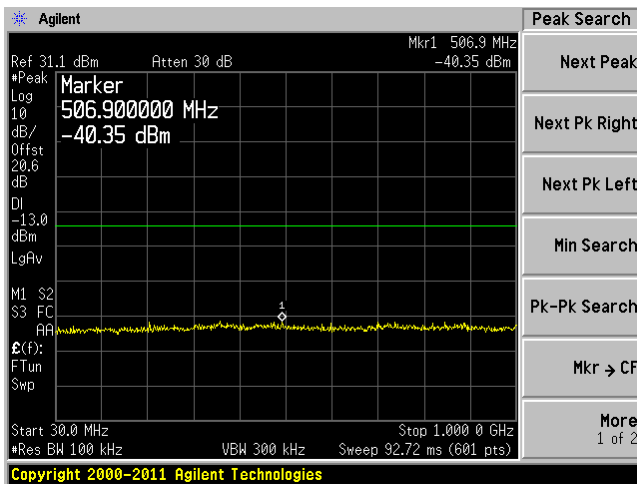


Plot 2: Above 1 GHz

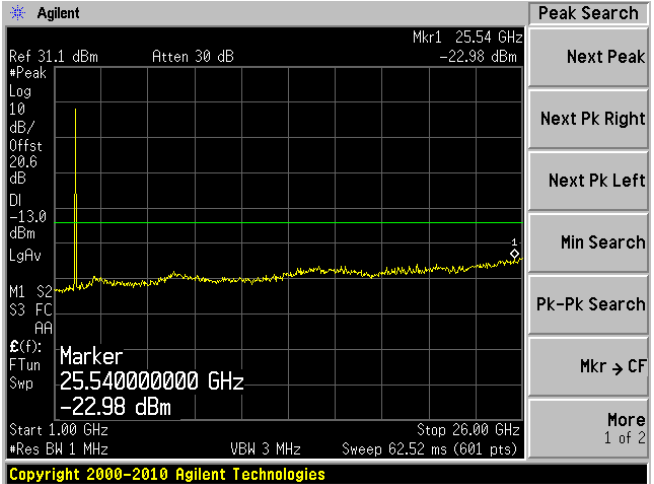


### AWS Band Downlink, Middle Channel

Plot 1: 30 MHz to 1 GHz



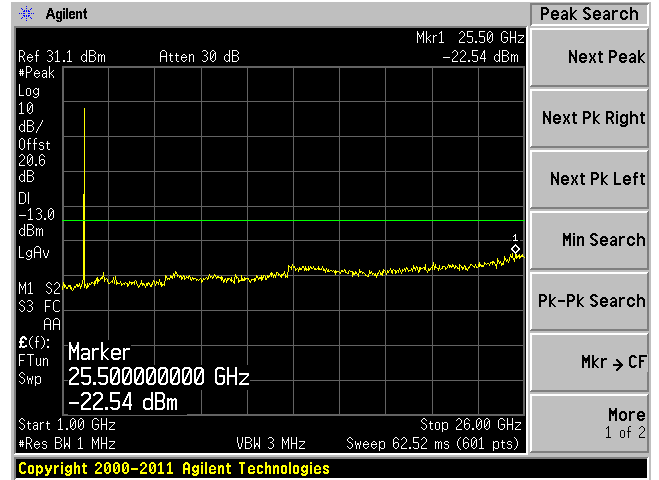
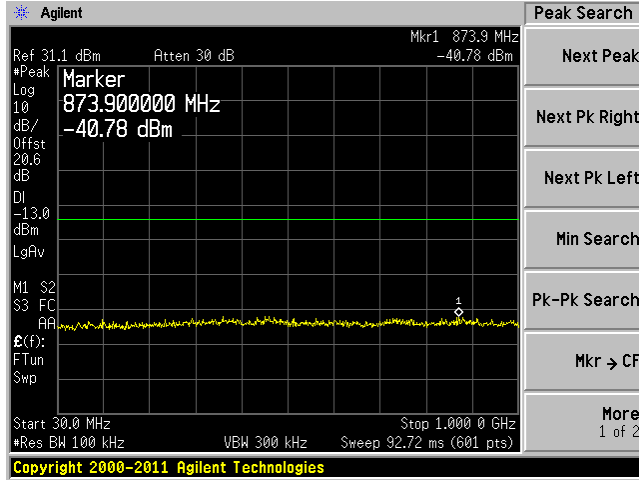
Plot 2: Above 1 GHz



### AWS Band Downlink, High Channel

Plot 1: 30 MHz to 1 GHz

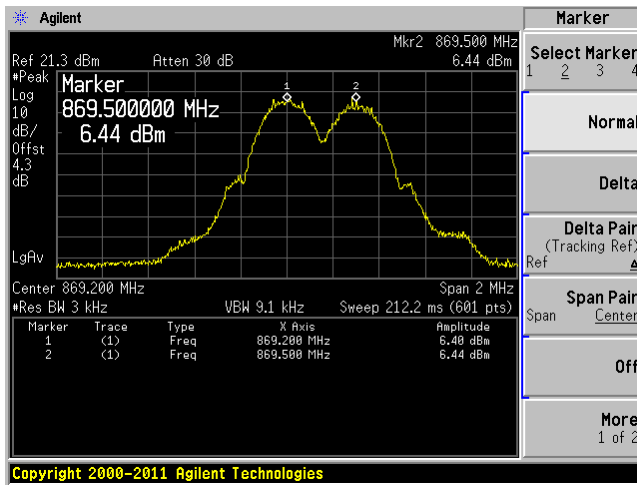
Plot 2: Above 1 GHz



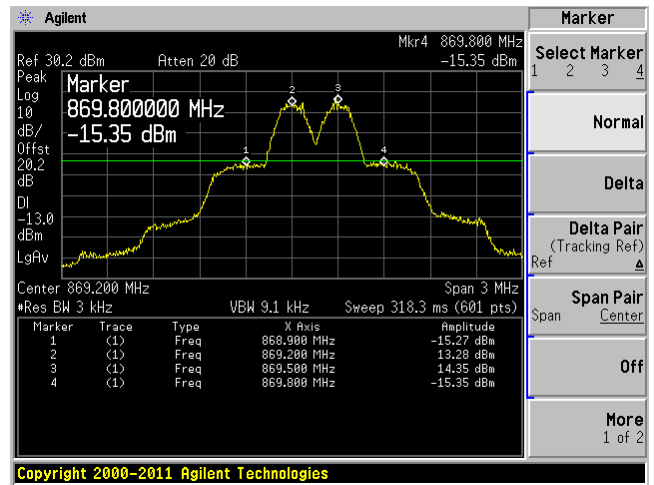
## Inter-modulation Cell Band, Downlink

### GSM/GPRS (Low Channel)

Input

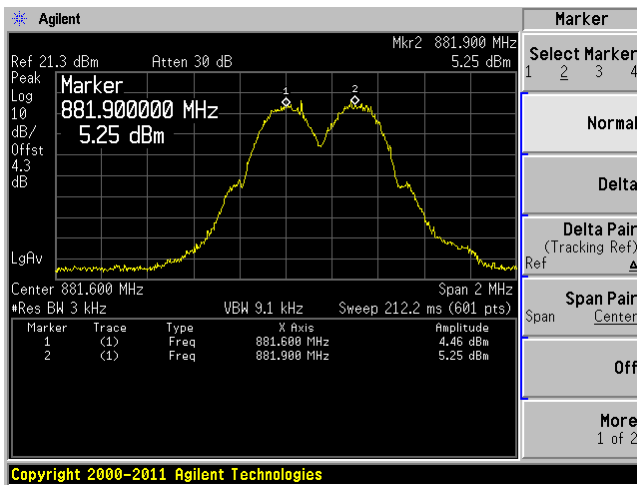


Output

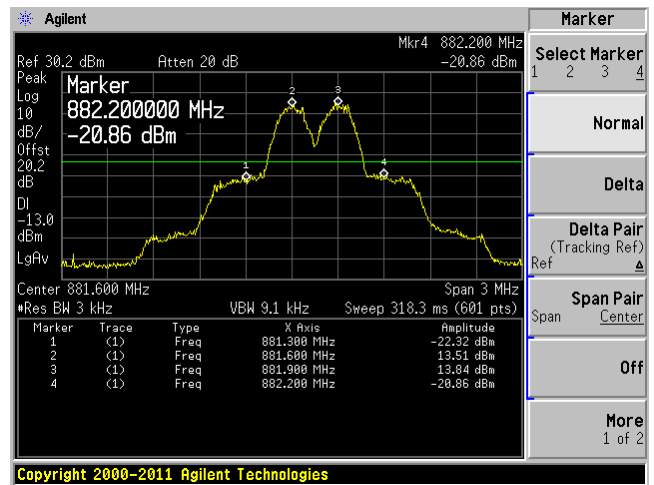


### GSM/GPRS (Middle Channel)

Input

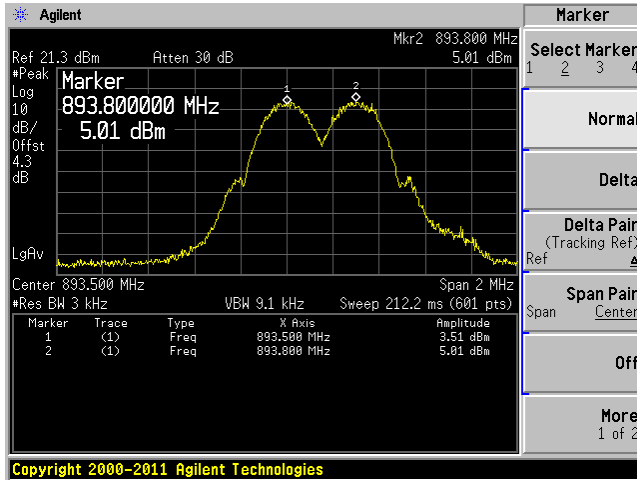


Output

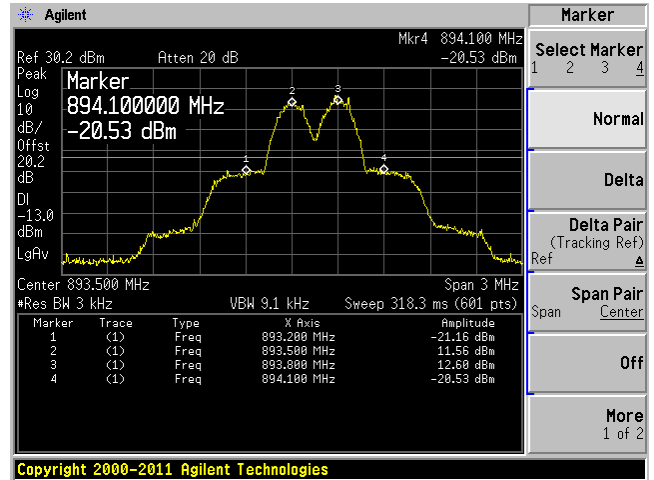


GSM/GPRS (High Channel)

Input

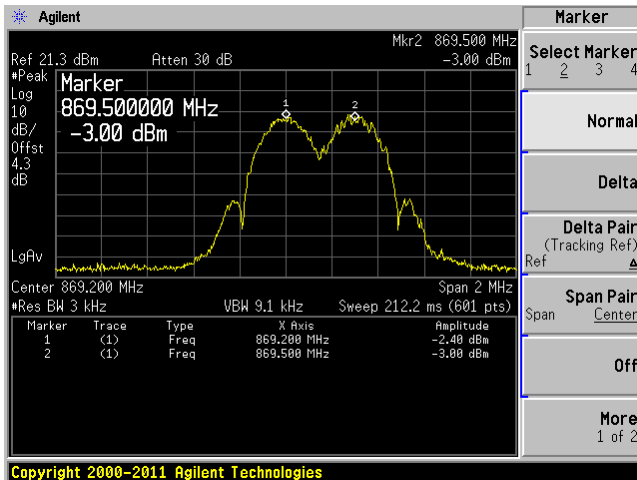


Output

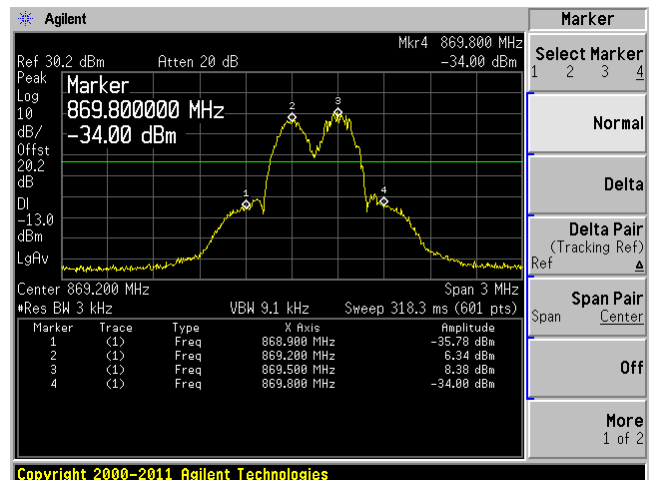


EDGE (Low Channel)

Input

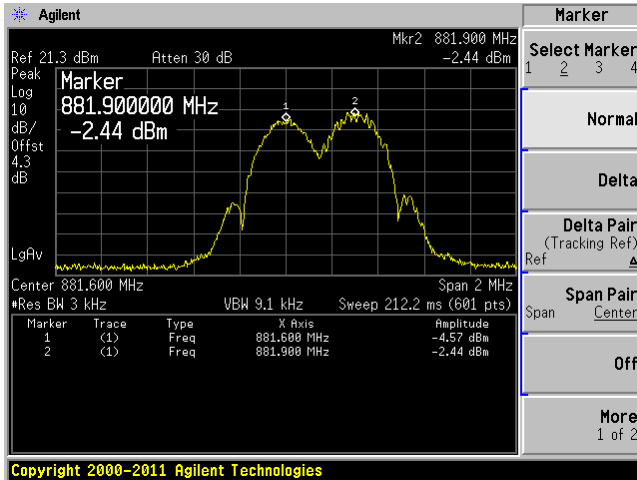


Output

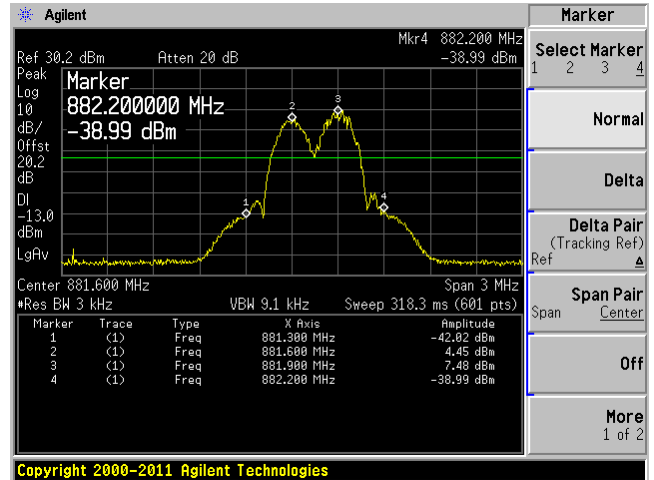


EDGE (Middle Channel)

Input

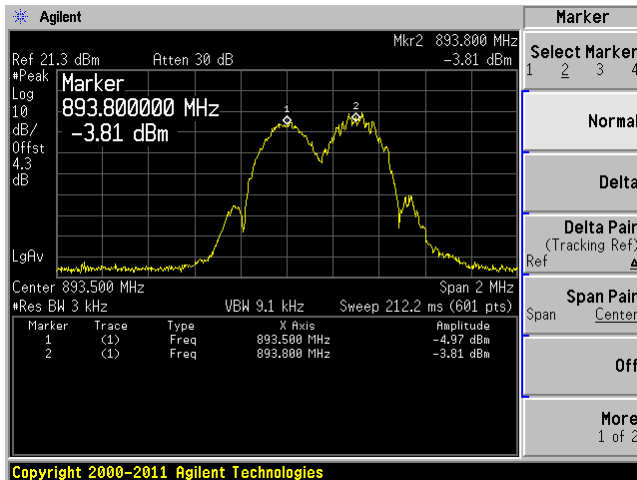


Output

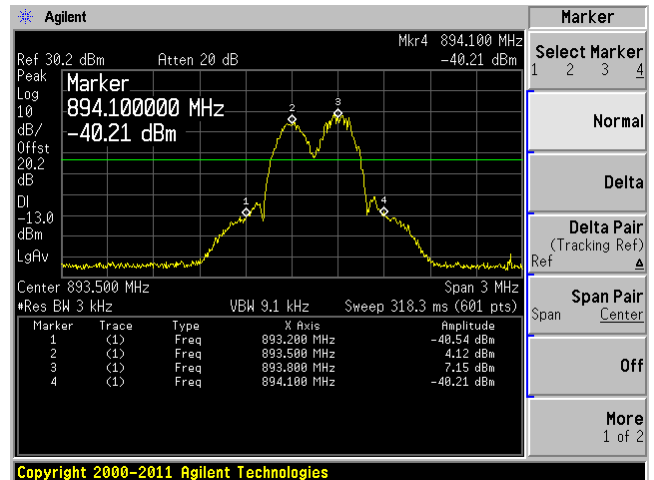


EDGE (High Channel)

Input

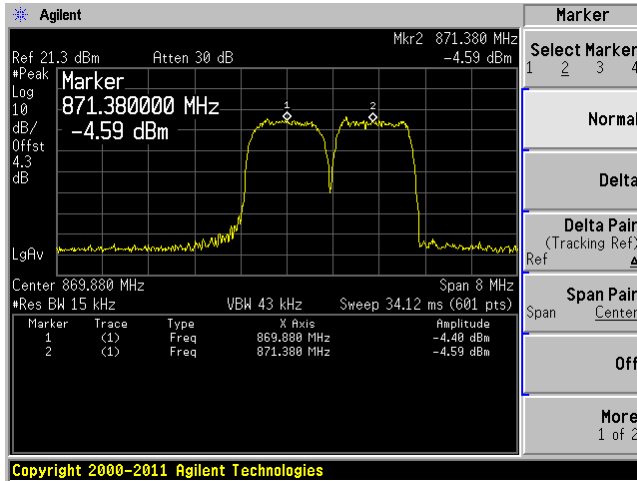


Output

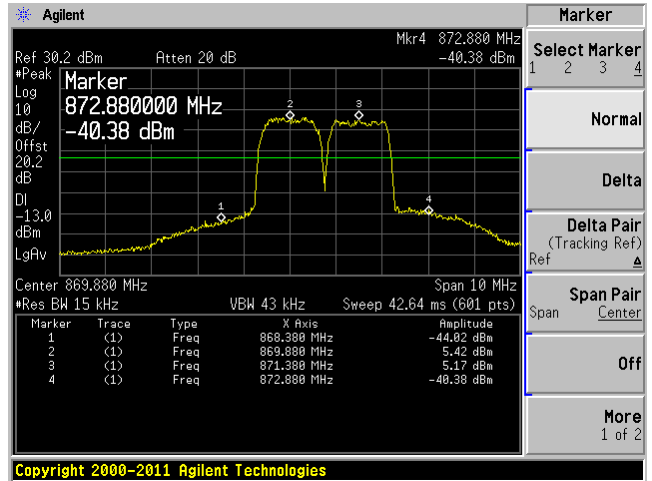


CDMA/EVDO (Low Channel)

Input

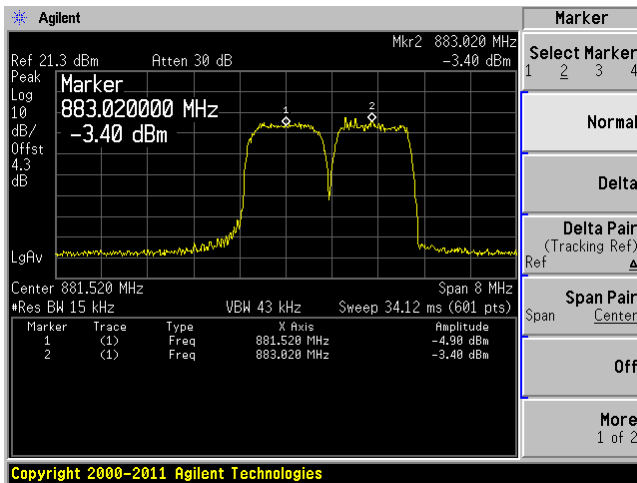


Output

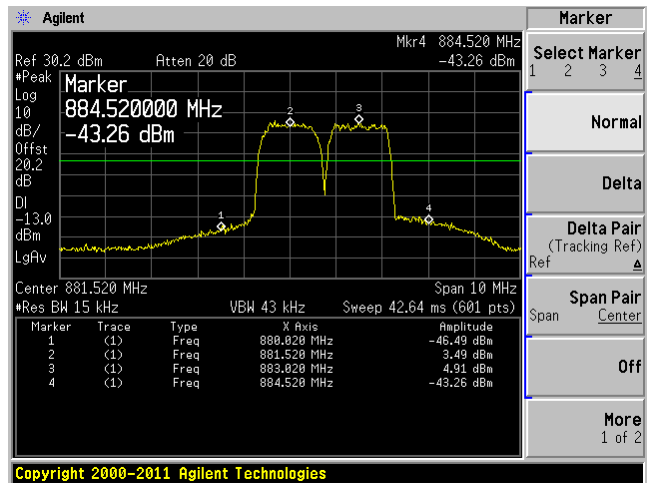


CDMA/EVDO (Middle Channel)

Input

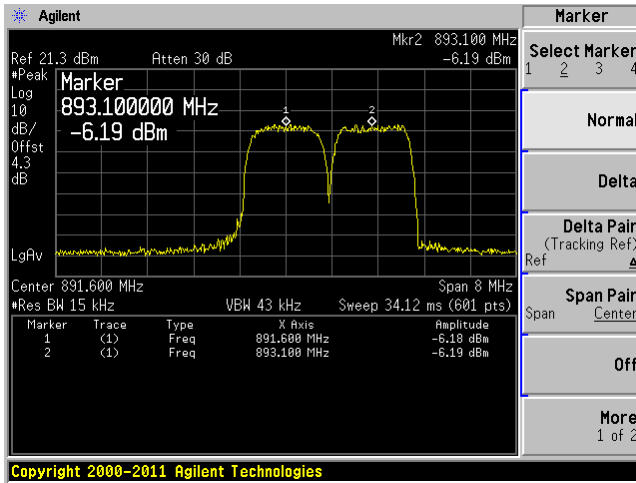


Output

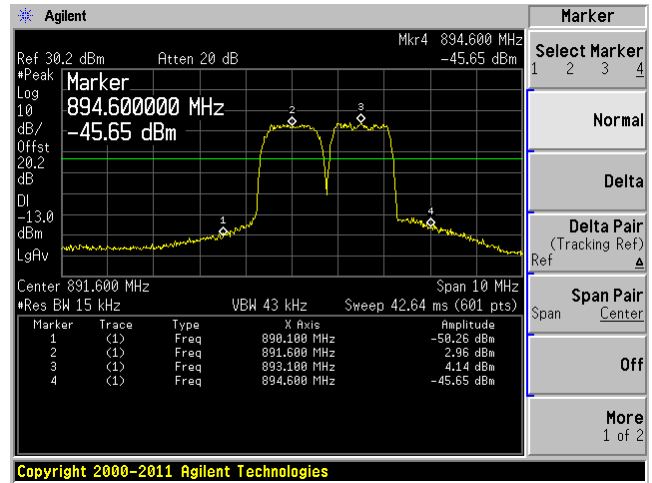


CDMA/EVDO (High Channel)

Input

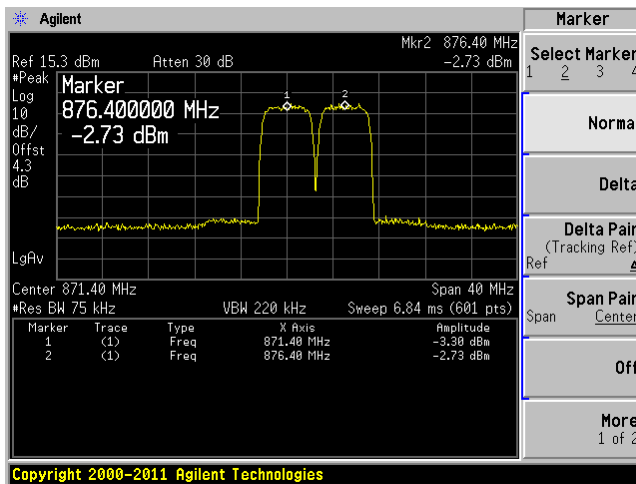


Output

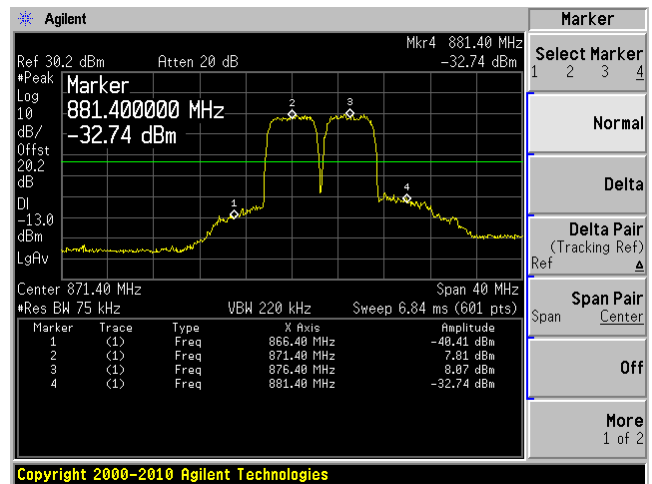


WCDMA/HSPA (Low Channel)

Input

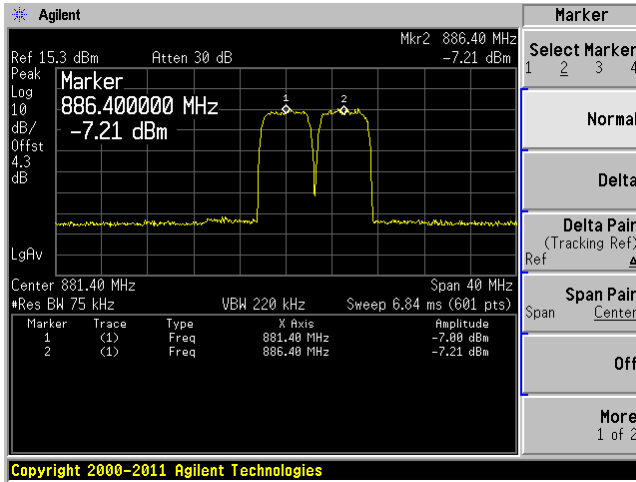


Output

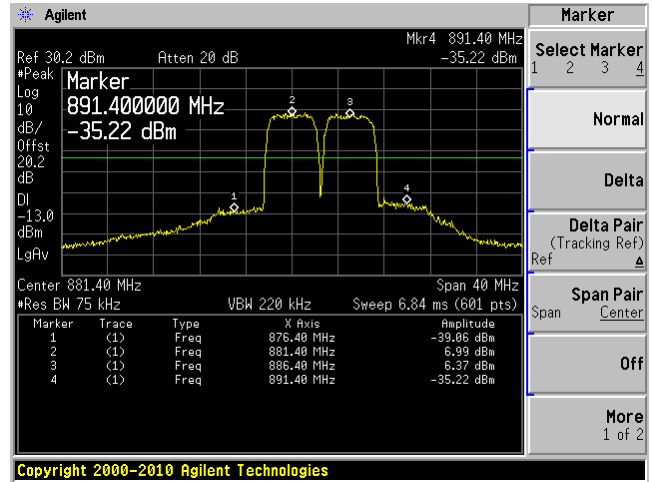


WCDMA/HSPA (Middle Channel)

Input

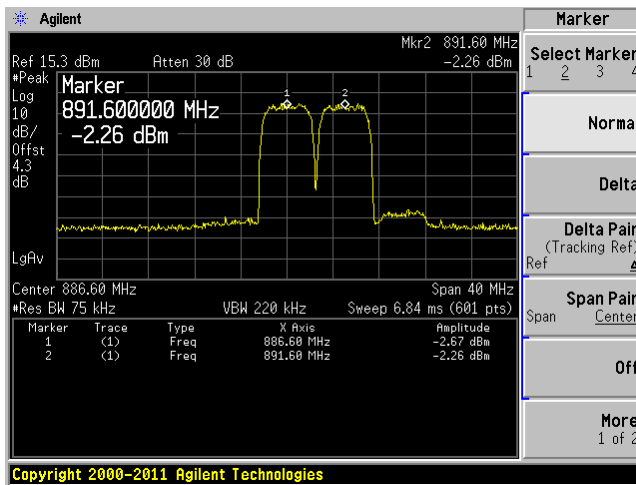


Output

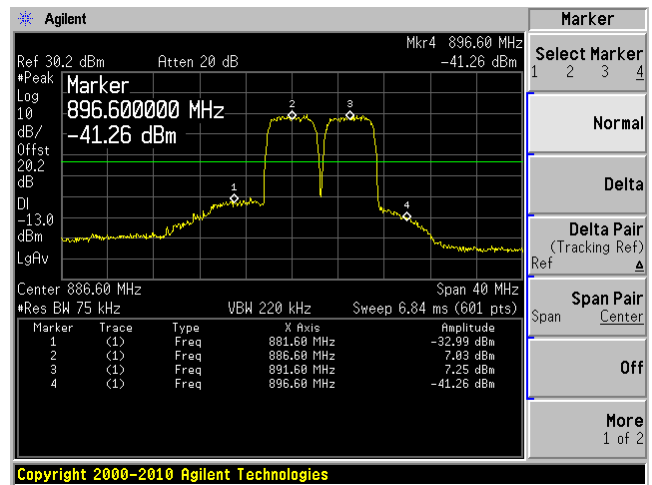


WCDMA/HSPA (High Channel)

Input



Output

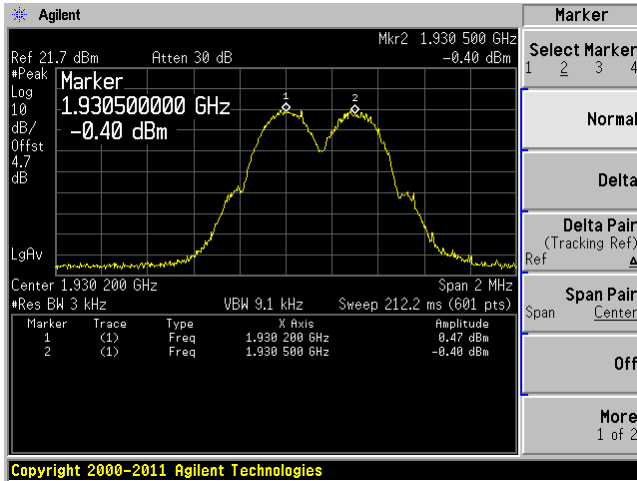




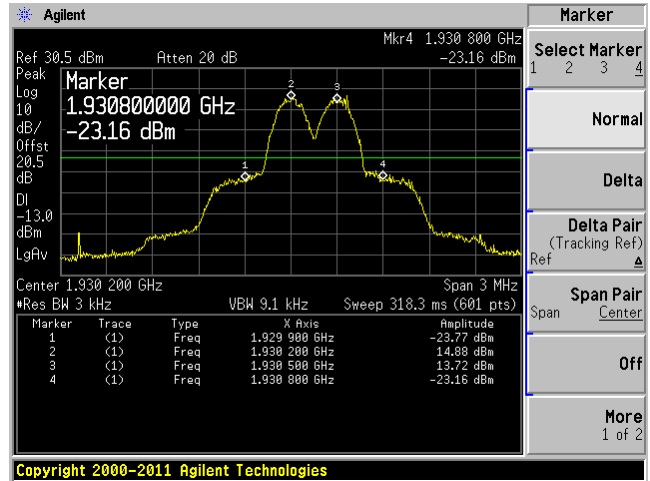
PCS Band, Downlink

GSM/GPRS (Low Channel)

Input

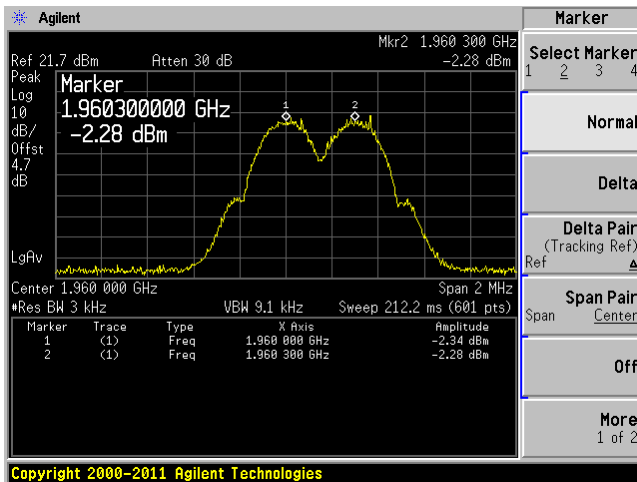


Output

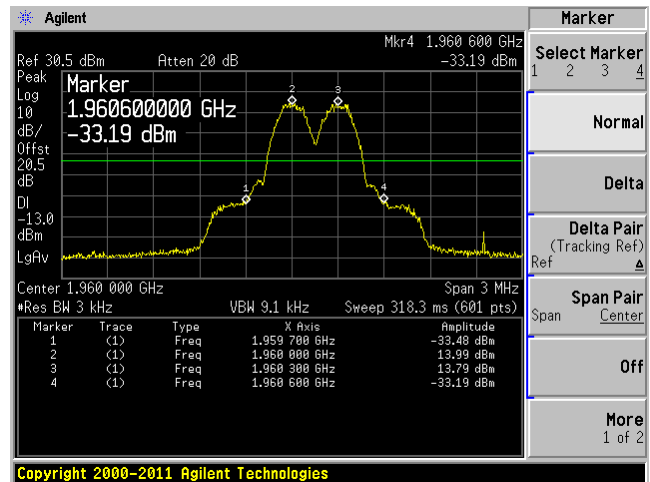


GSM/GPRS (Middle Channel)

Input

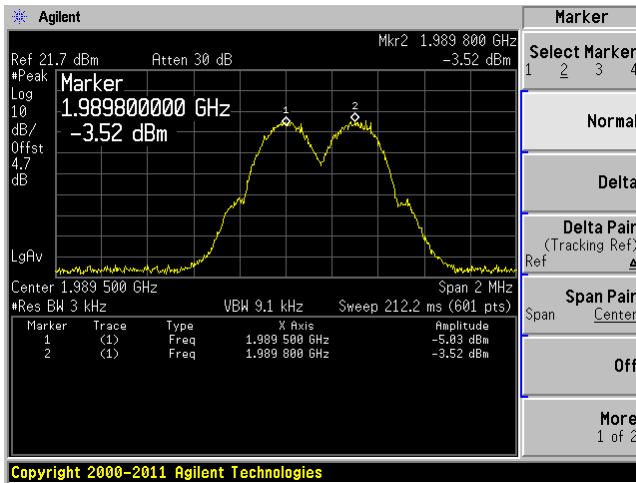


Output

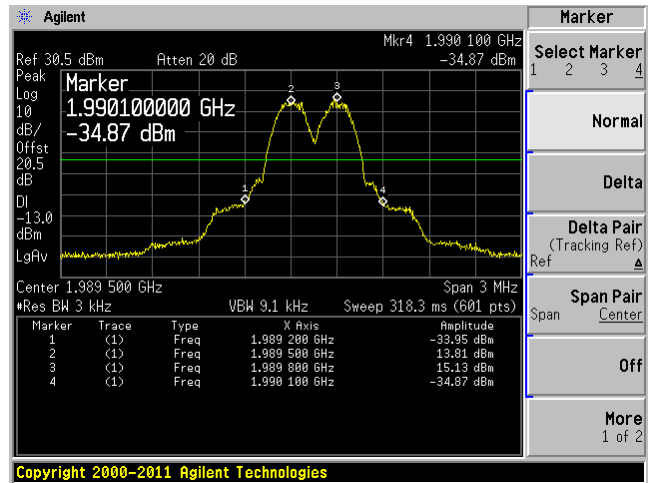


GSM/GPRS (High Channel)

Input

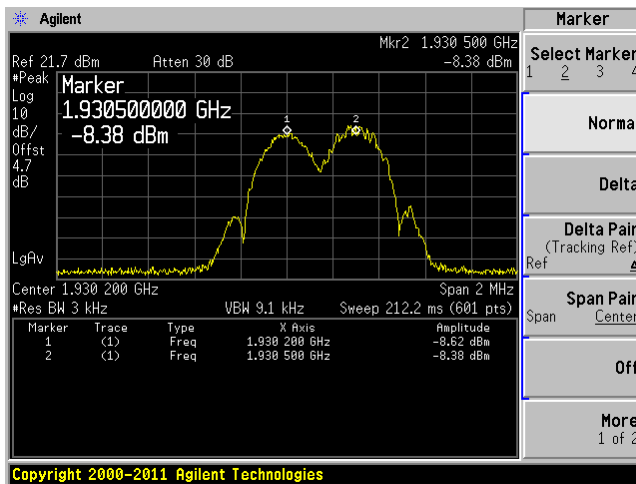


Output

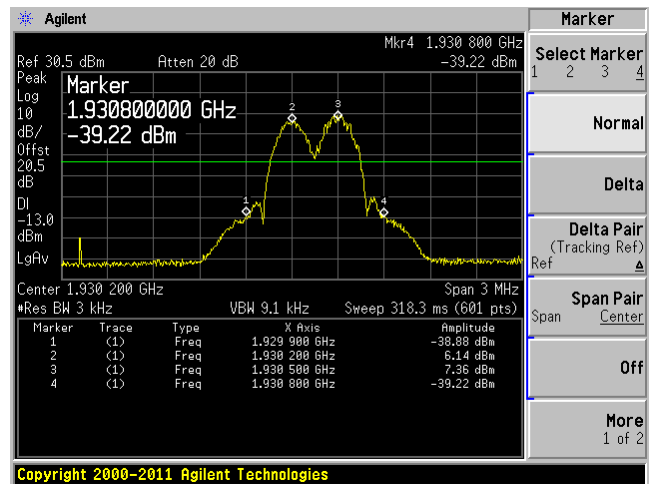


EDGE (Low Channel)

Input

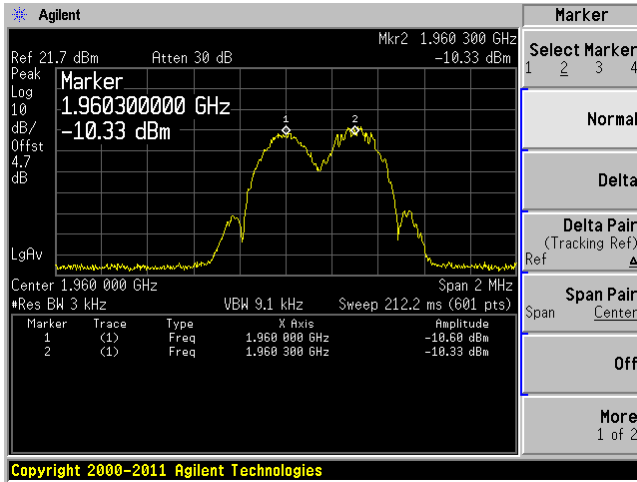


Output

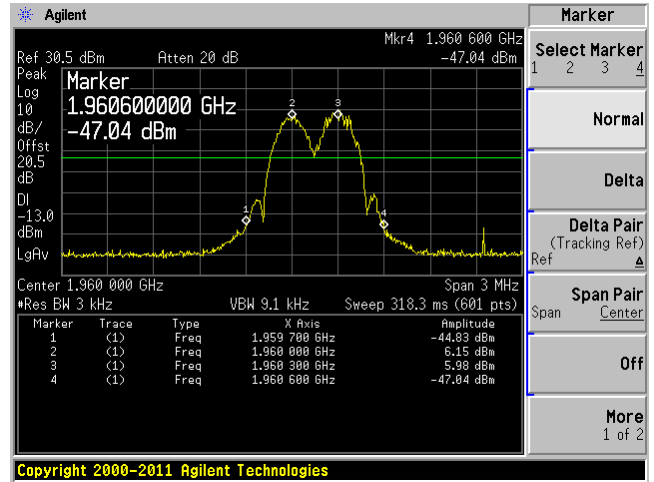


EDGE (Middle Channel)

Input

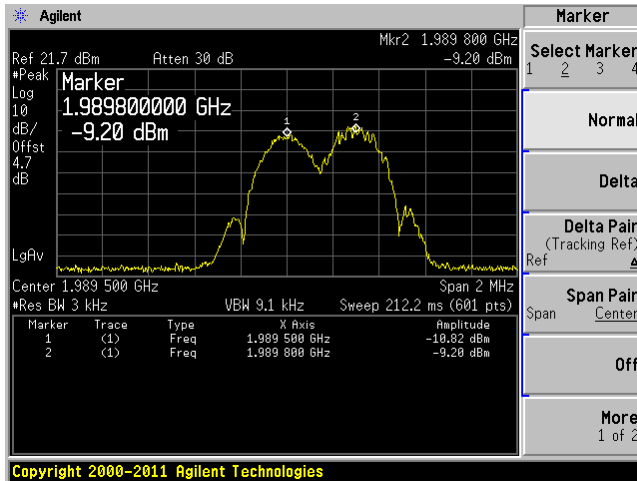


Output

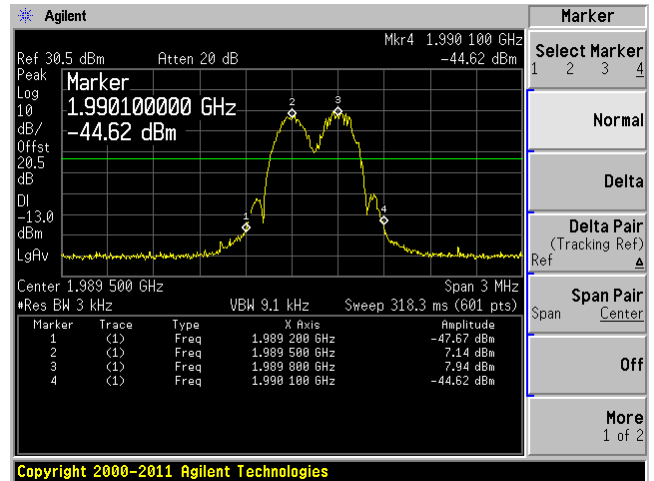


EDGE (High Channel)

Input

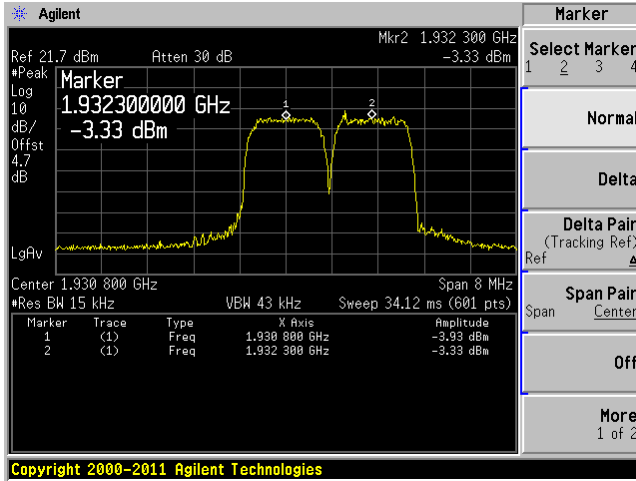


Output

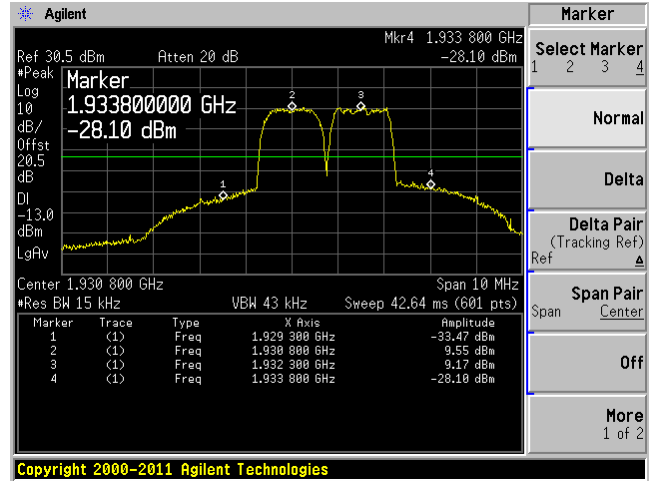


CDMA/EVDO (Low Channel)

Input

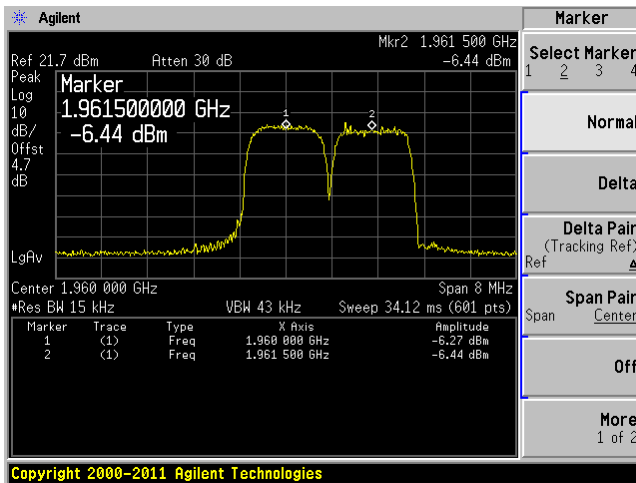


Output

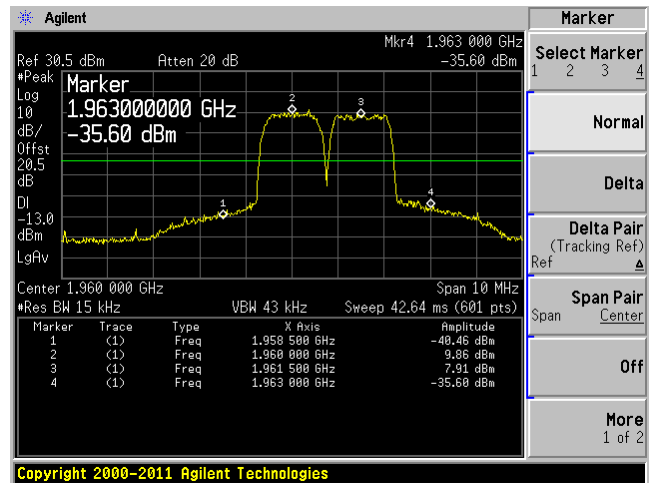


CDMA/EVDO (Middle Channel)

Input

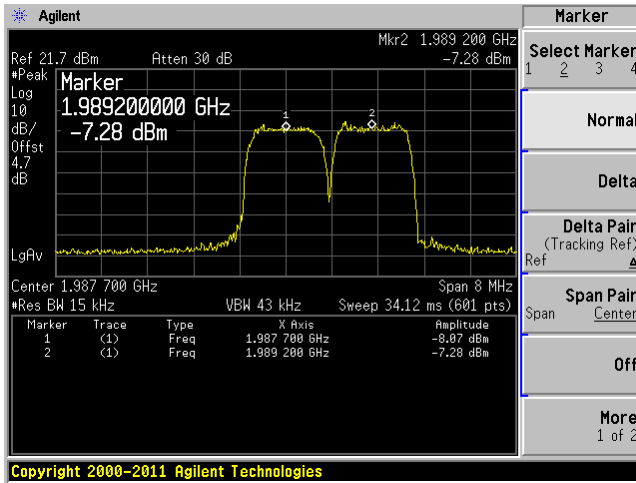


Output

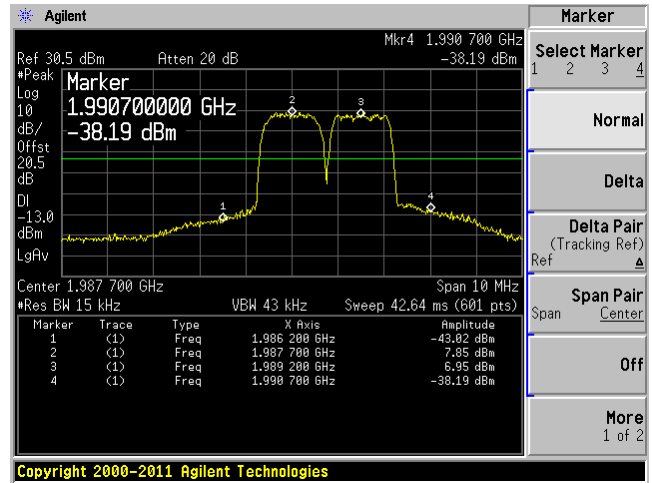


CDMA/EVDO (High Channel)

Input

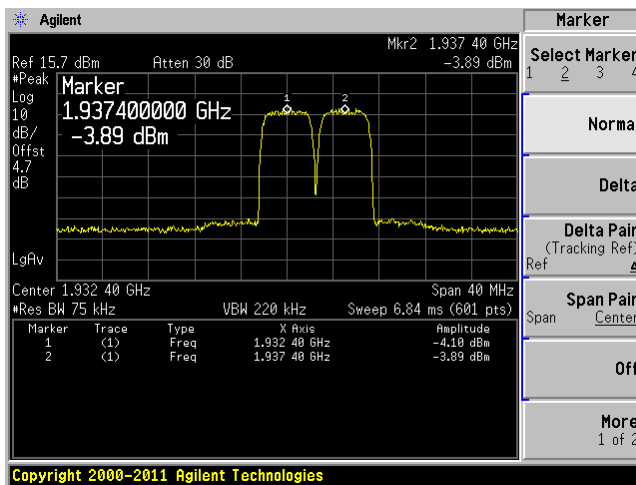


Output

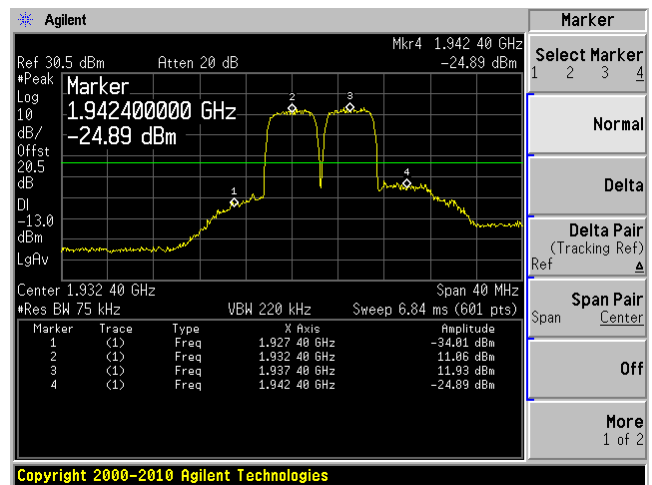


WCDMA/HSPA (Low Channel)

Input

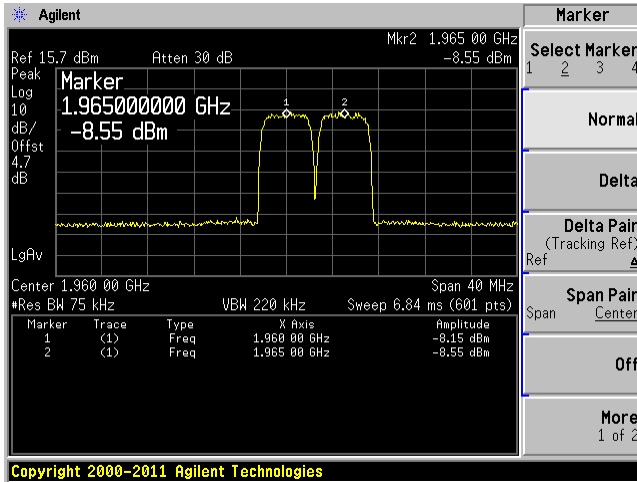


Output

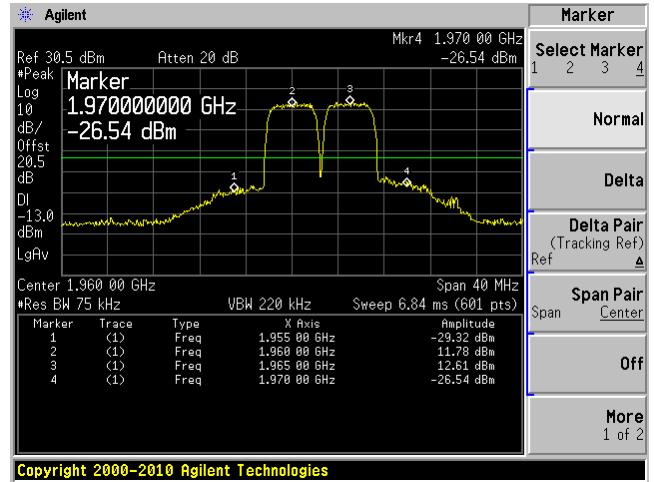


WCDMA/HSPA (Middle Channel)

Input

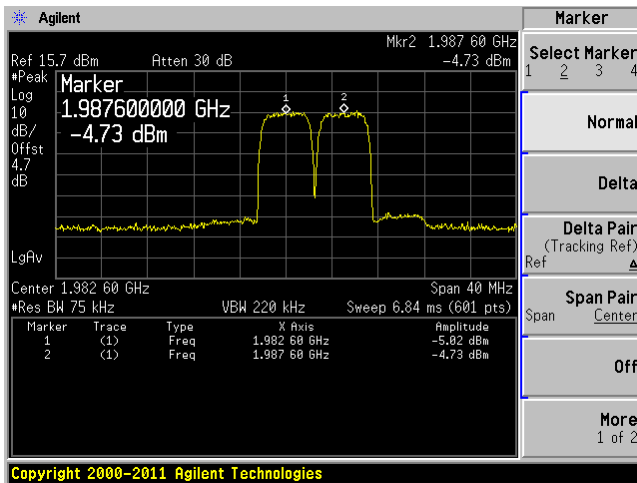


Output

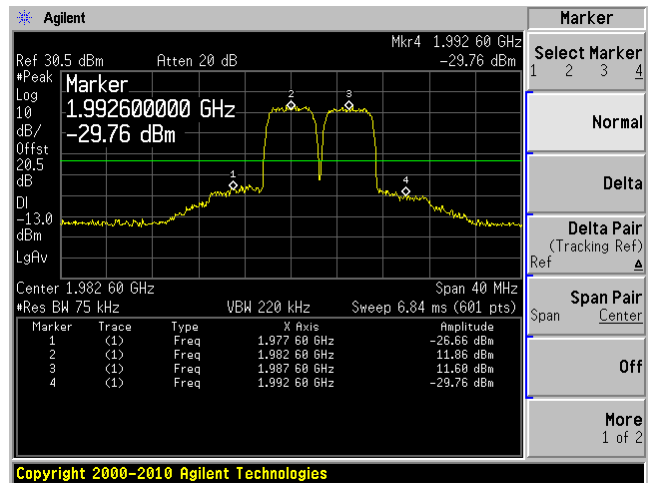


WCDMA/HSPA (High Channel)

Input



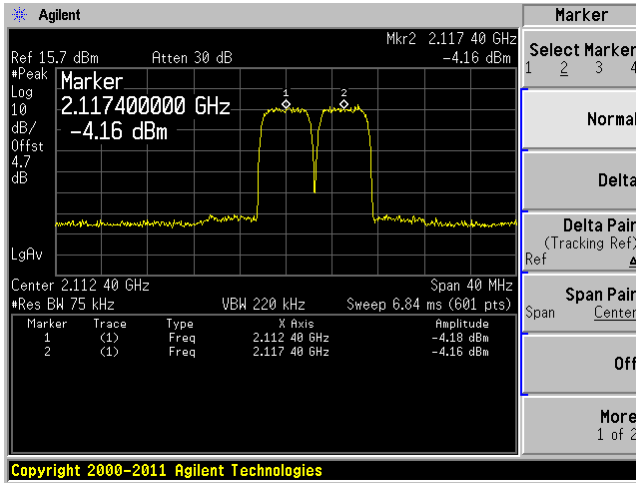
Output



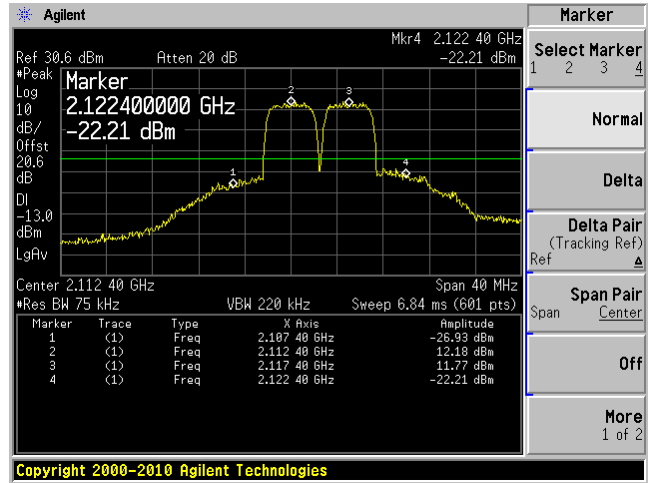
### AWS Band, Downlink

#### WCDMA/HSPA (Low Channel)

Input

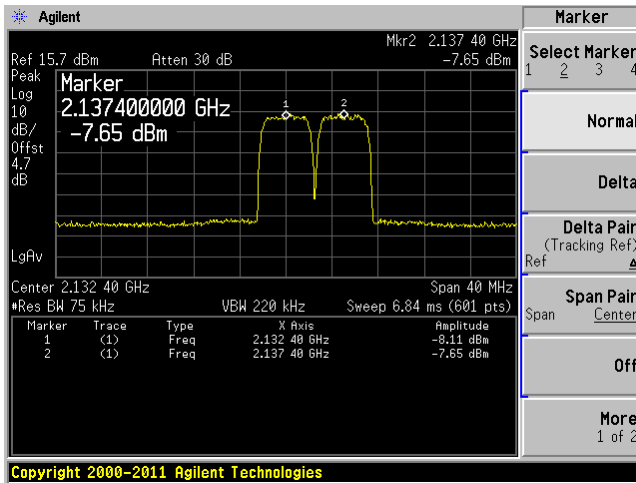


Output

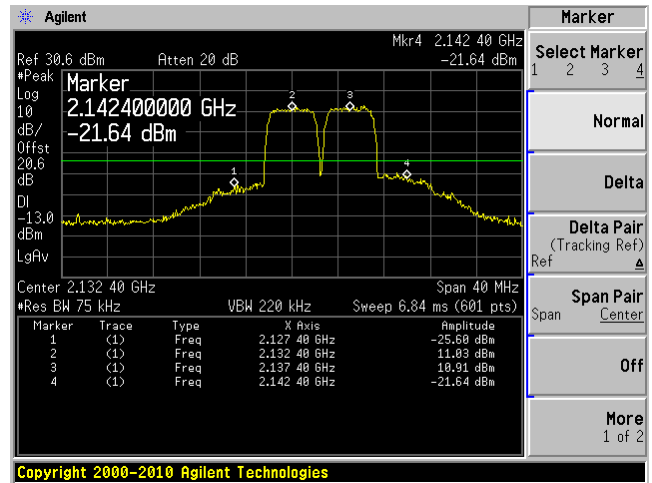


#### WCDMA/HSPA (Middle Channel)

Input

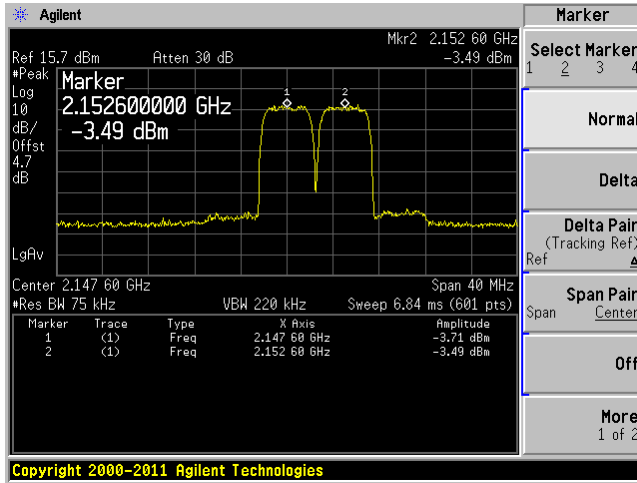


Output

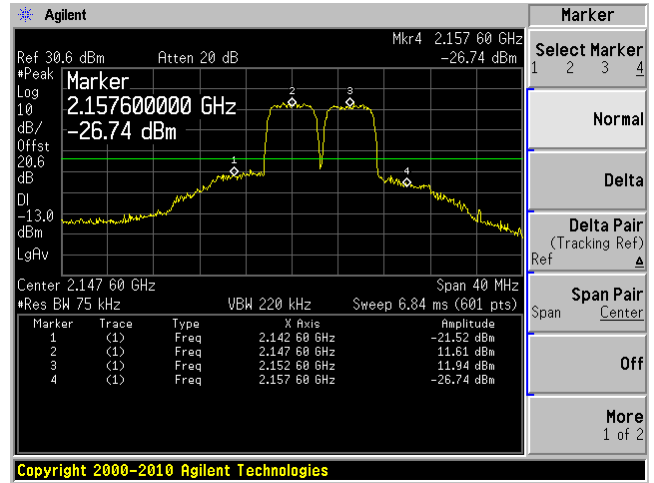


WCDMA/HSPA (High Channel)

Input



Output

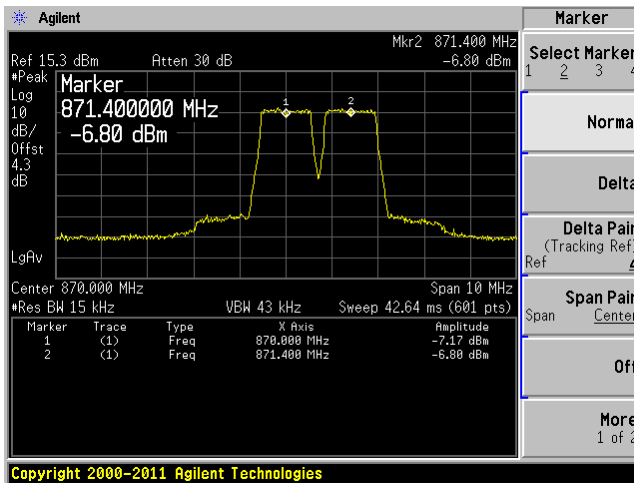




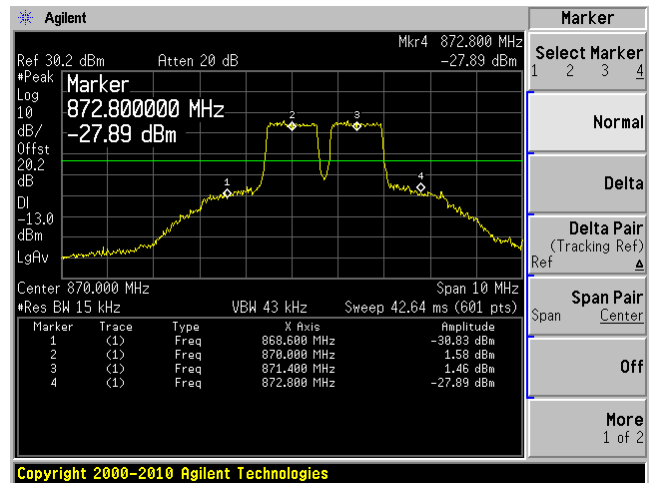
### Cell LTE Band; Download

#### QPSK (1.4 MHz), (Low Channel)

Input

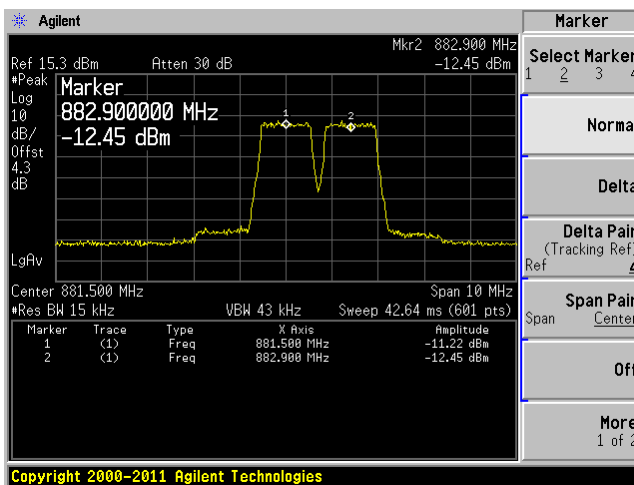


Output

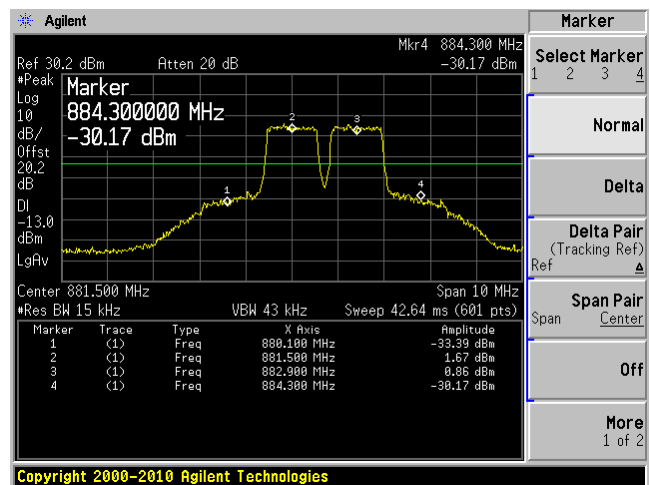


#### QPSK (1.4 MHz), (Middle Channel)

Input

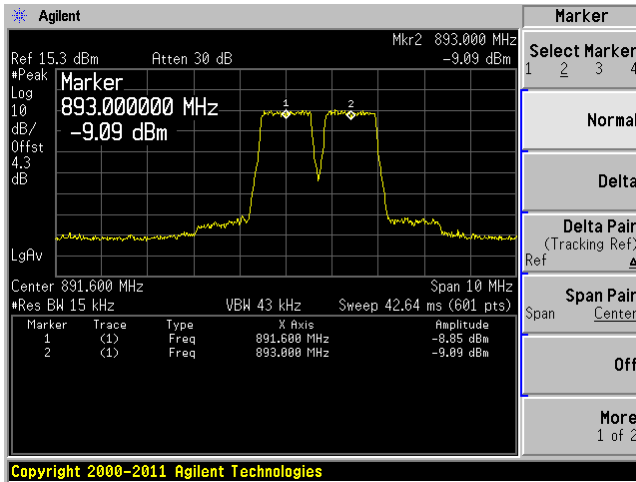


Output

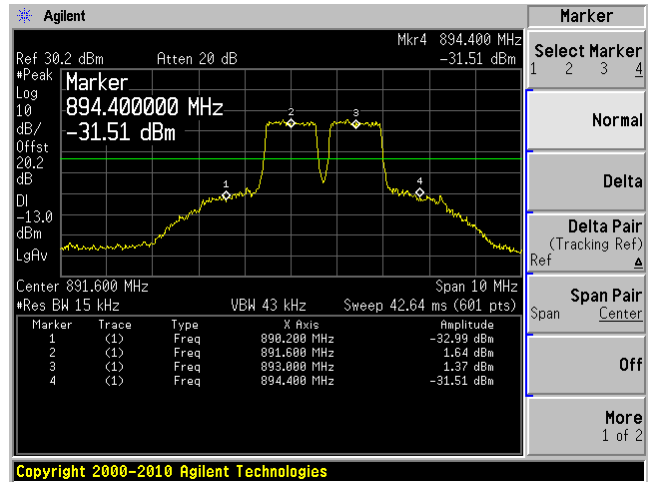


QPSK (1.4 MHz), (High Channel)

Input

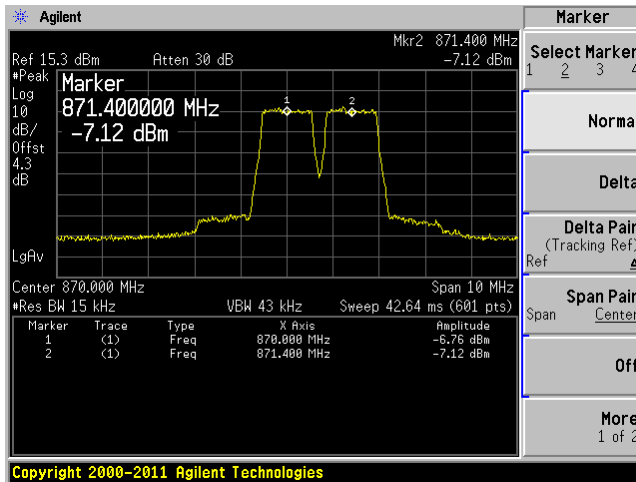


Output

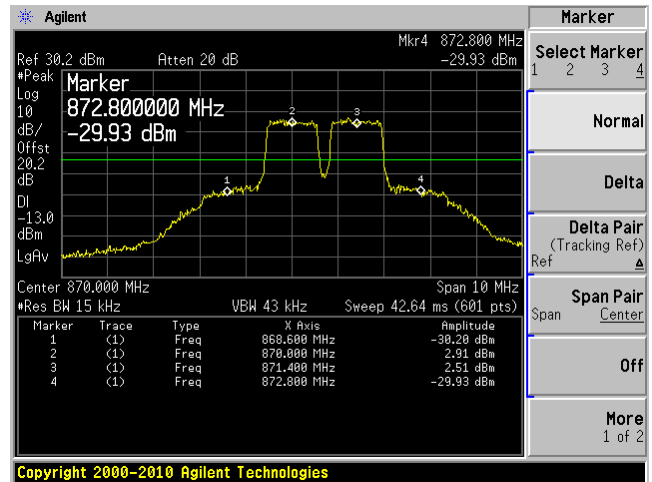


16QAM (1.4 MHz), (Low Channel)

Input

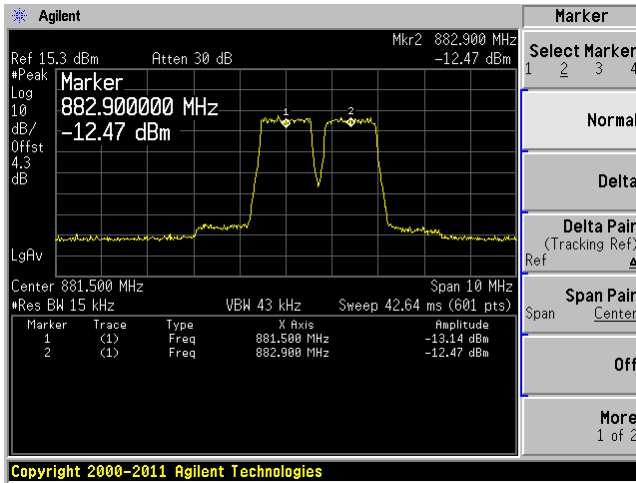


Output

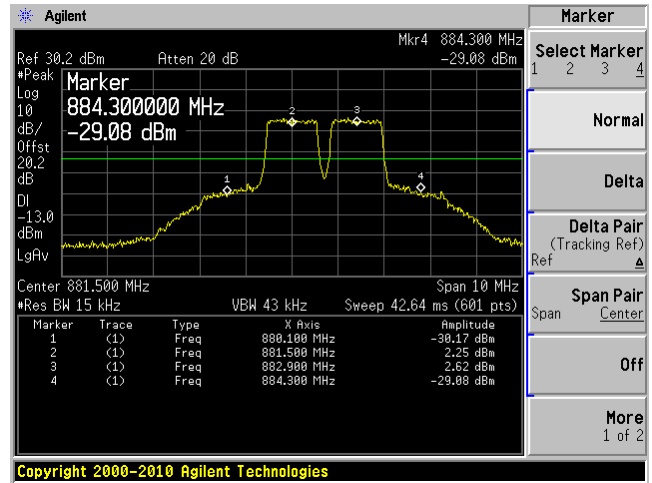


16QAM (1.4 MHz), (Middle Channel)

Input

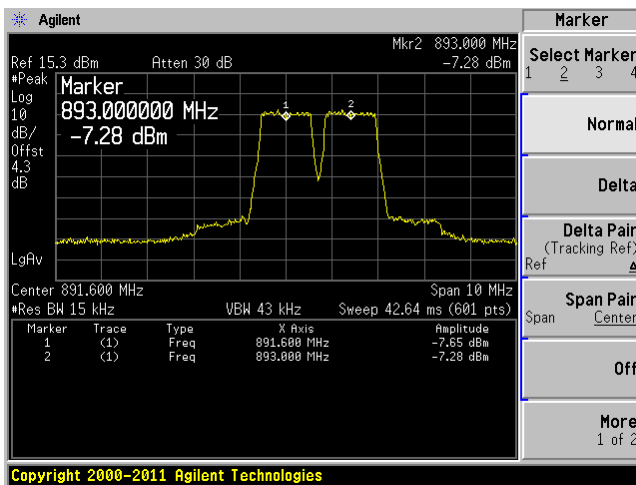


Output

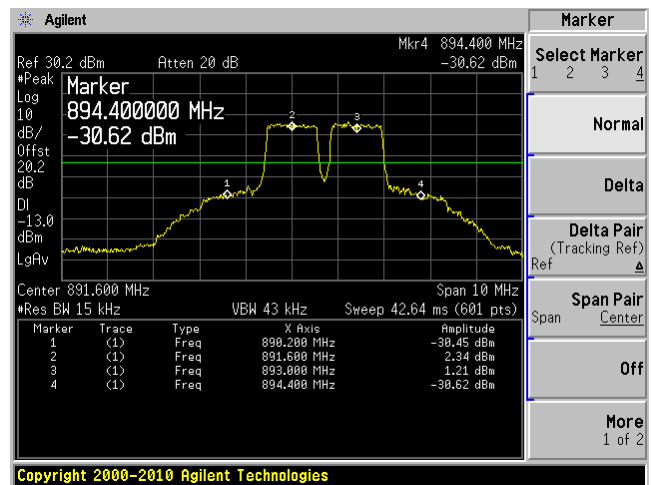


16QAM (1.4 MHz), (High Channel)

Input

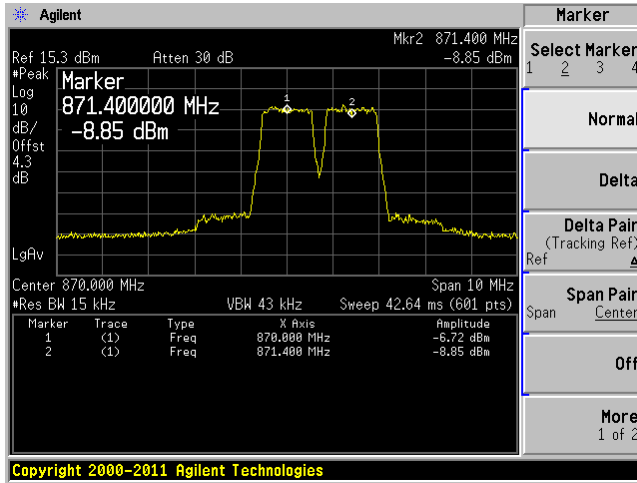


Output

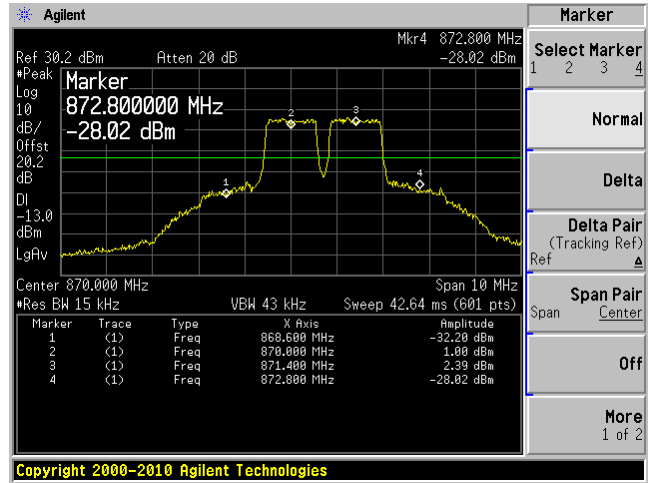


64QAM (1.4 MHz), (Low Channel)

Input

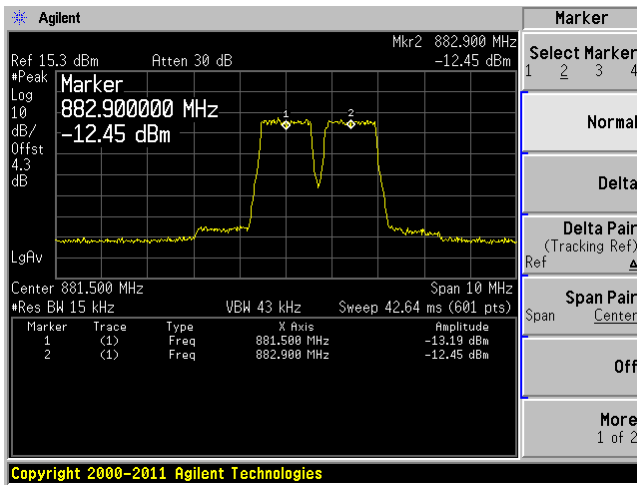


Output

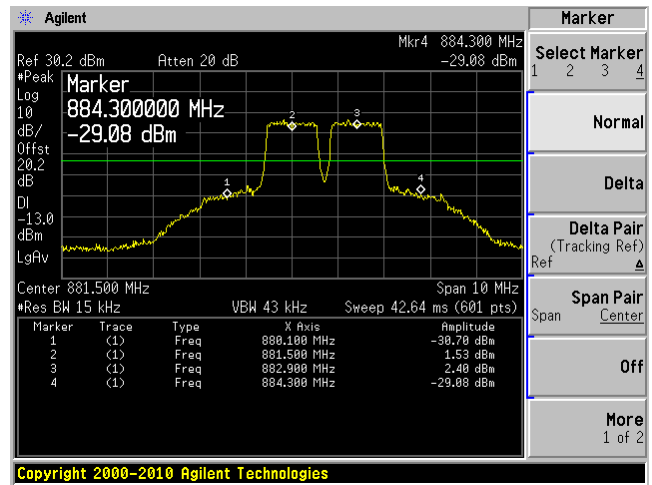


64QAM (1.4 MHz), (Middle Channel)

Input

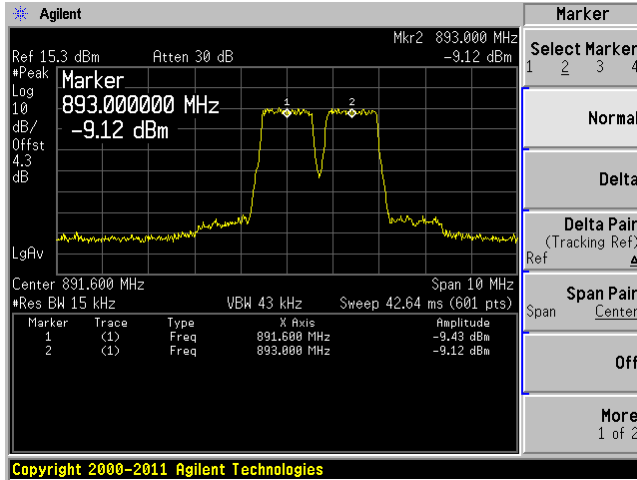


Output

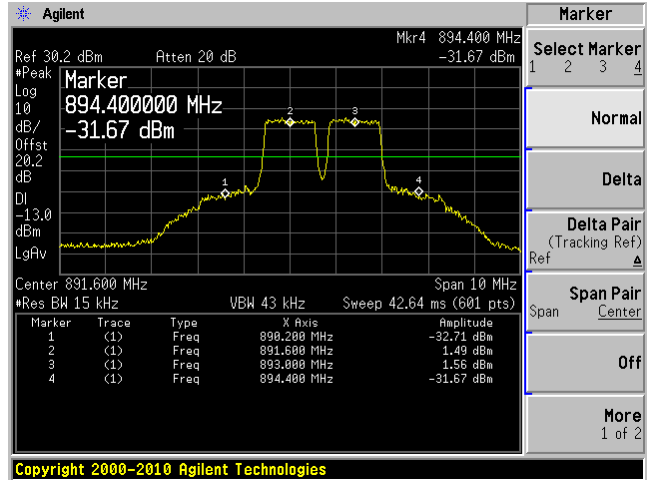


64QAM (1.4 MHz), (High Channel)

Input

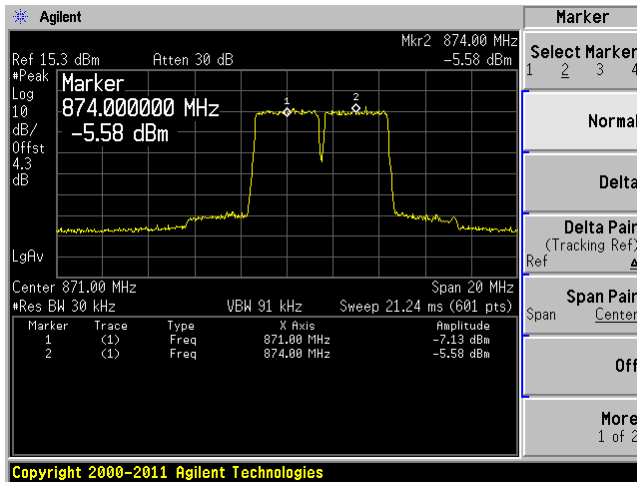


Output

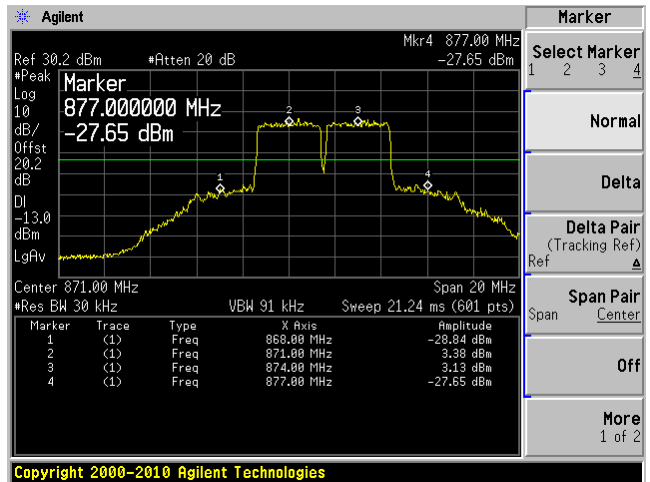


QPSK (3 MHz), (Low Channel)

Input

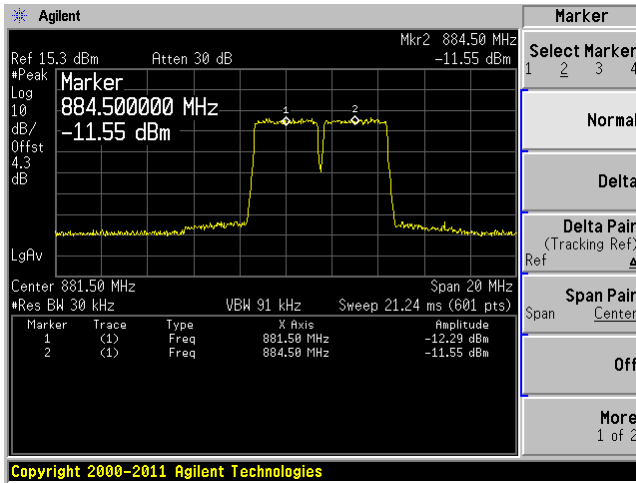


Output

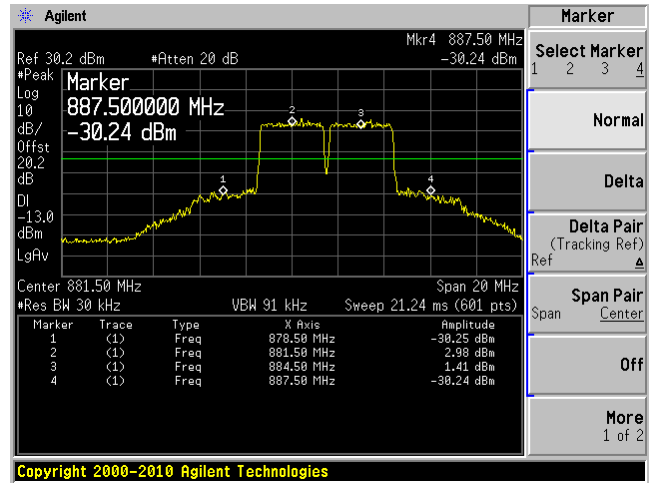


QPSK (3 MHz), (Middle Channel)

Input

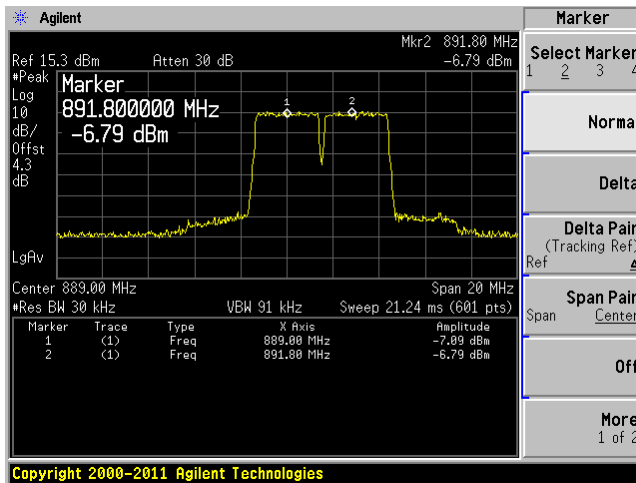


Output

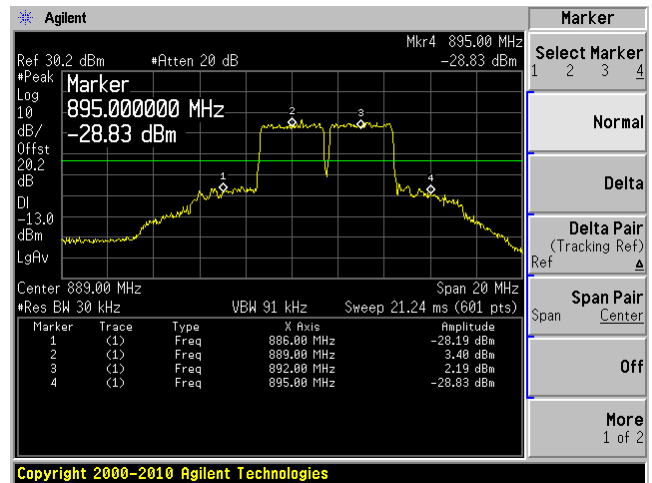


QPSK (3 MHz), (High Channel)

Input

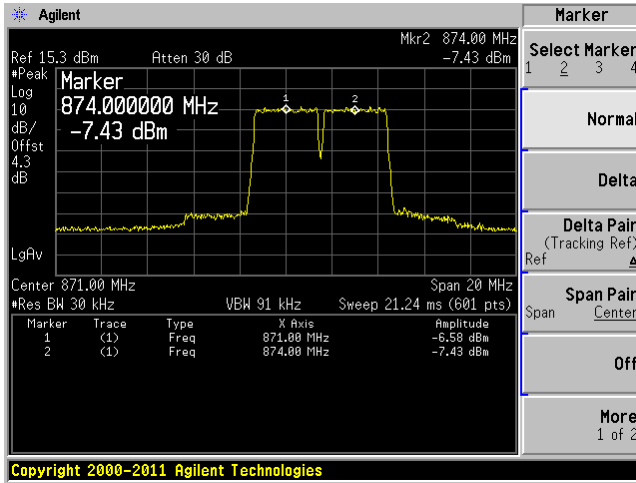


Output

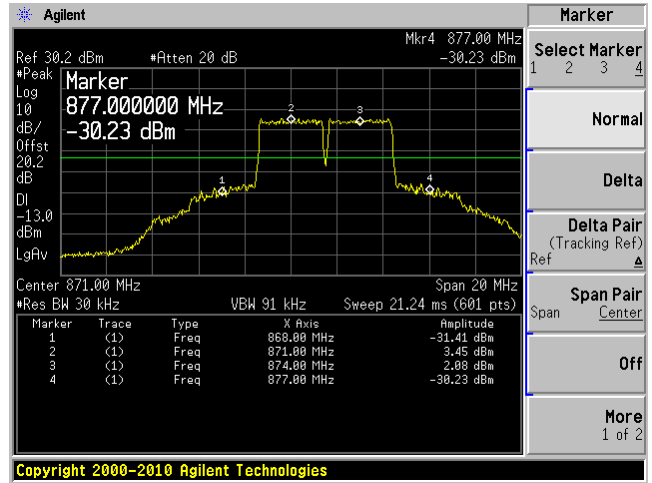


16QAM (3 MHz), (Low Channel)

Input

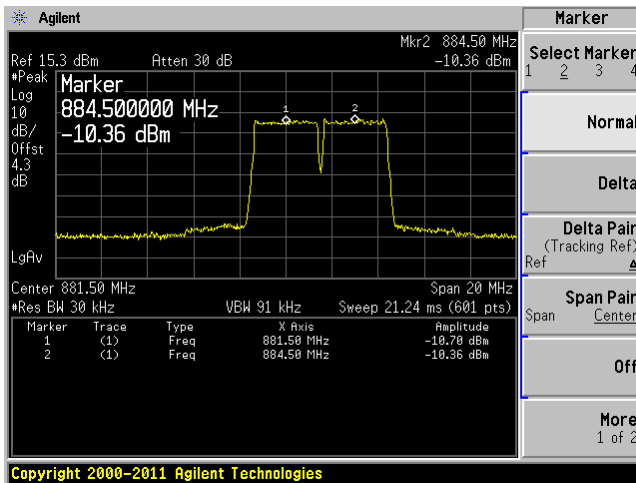


Output

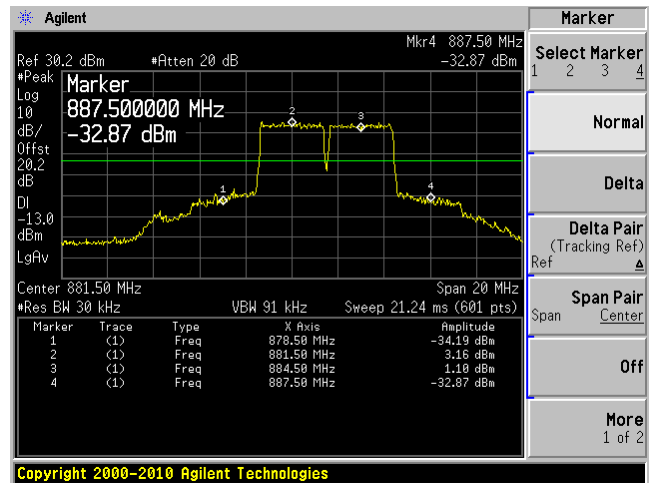


16QAM (3 MHz), (Middle Channel)

Input

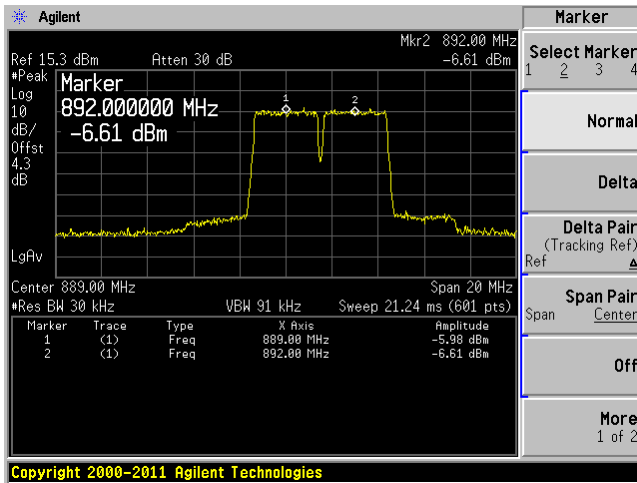


Output

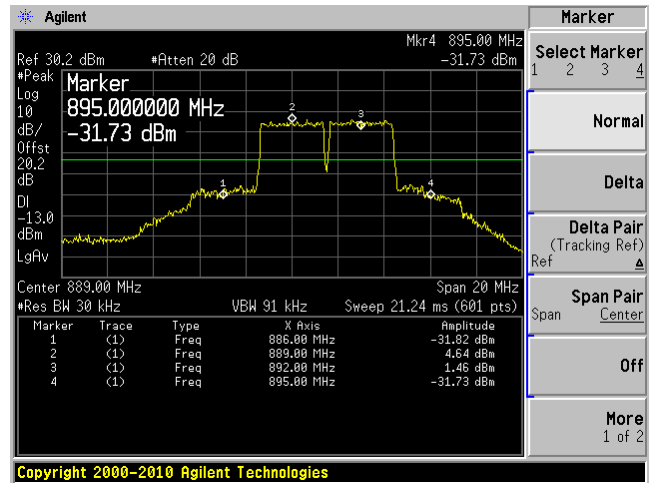


16QAM (3 MHz), (High Channel)

Input

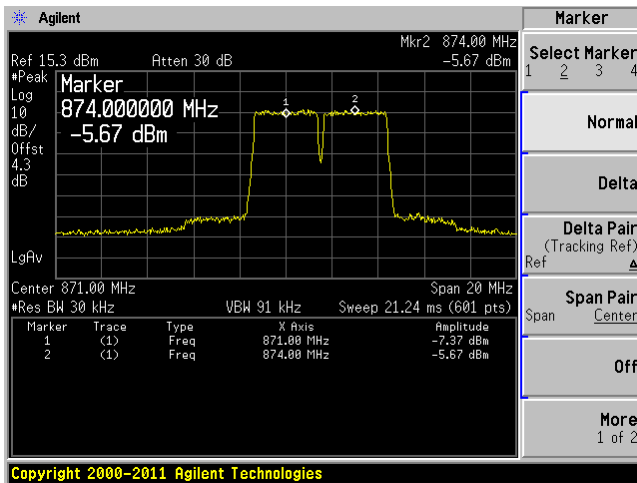


Output

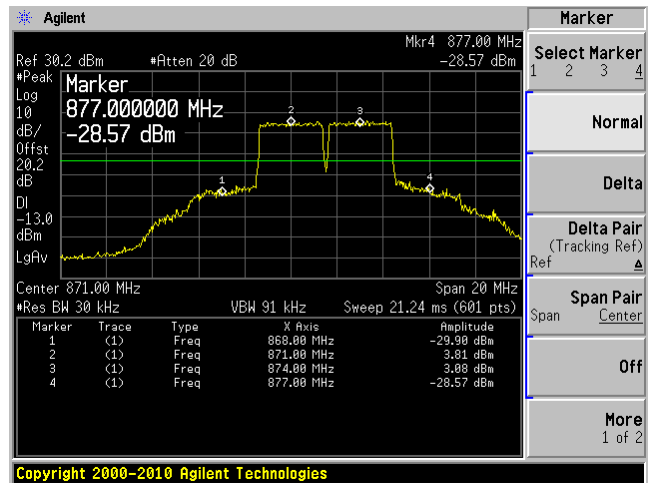


64QAM (3 MHz), (Low Channel)

Input



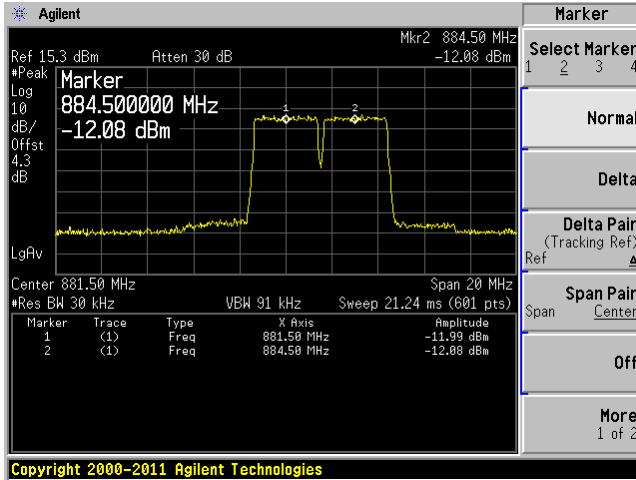
Output



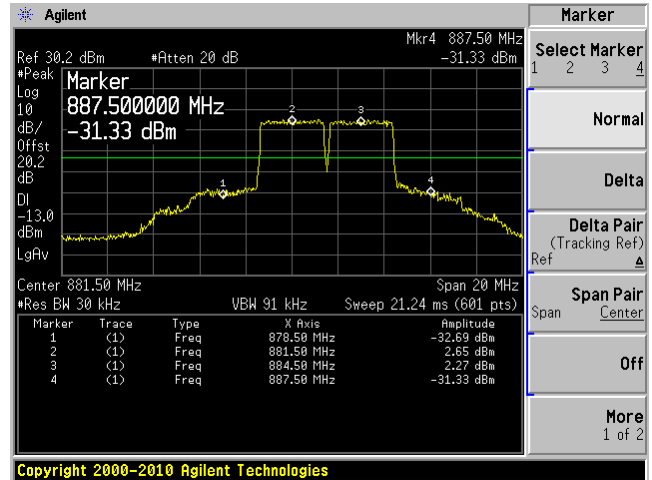


64QAM (3 MHz), (Middle Channel)

Input

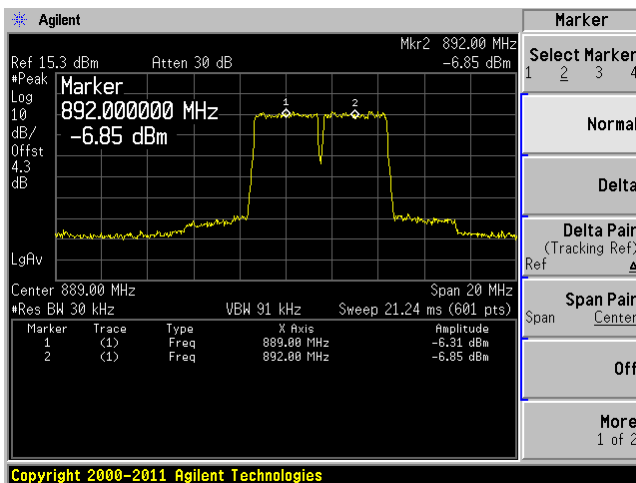


Output

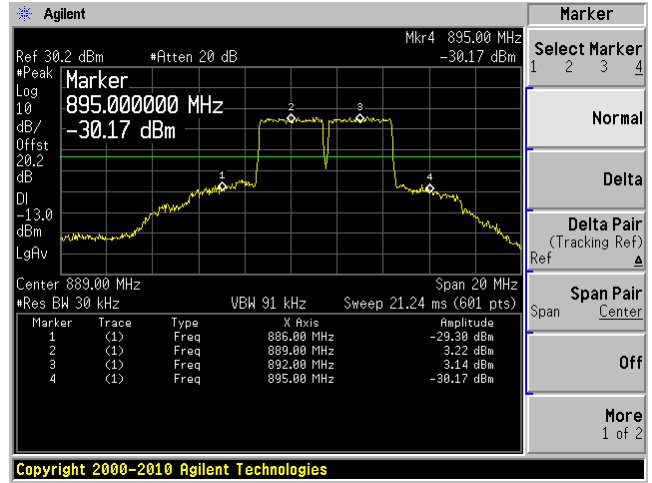


64QAM (3 MHz), (High Channel)

Input

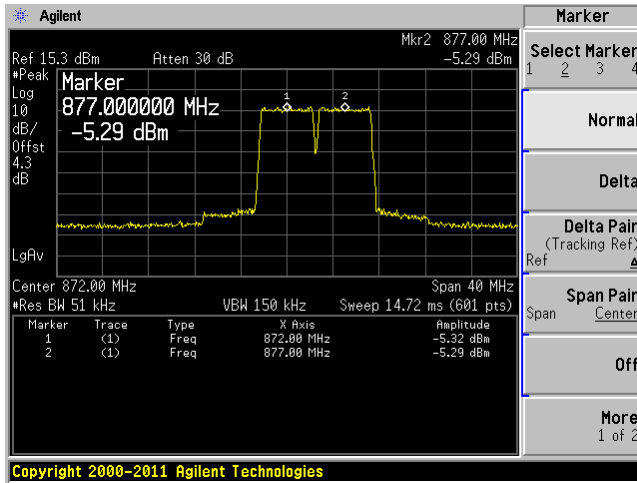


Output

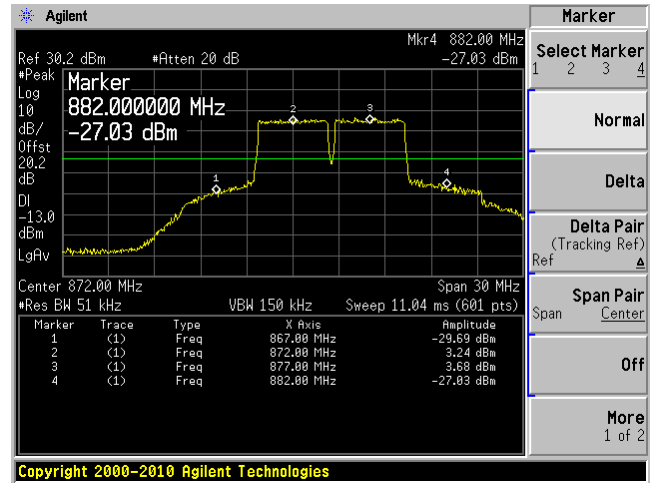


QPSK (5 MHz), (Low Channel)

Input

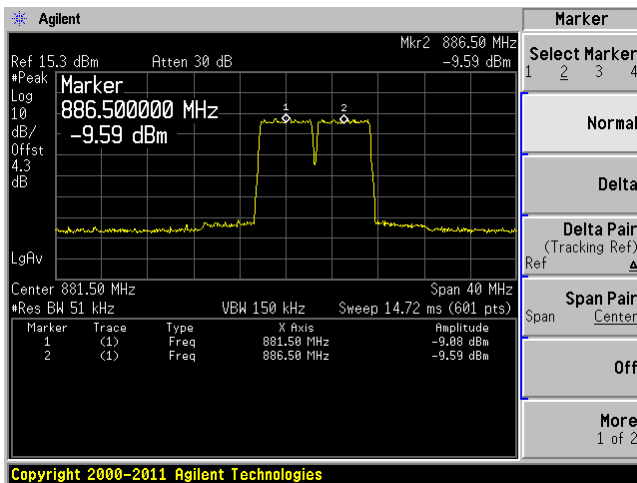


Output

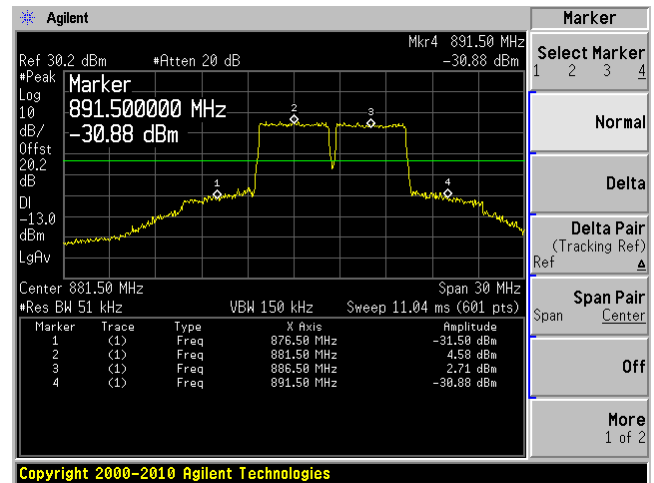


QPSK (5 MHz), (Middle Channel)

Input

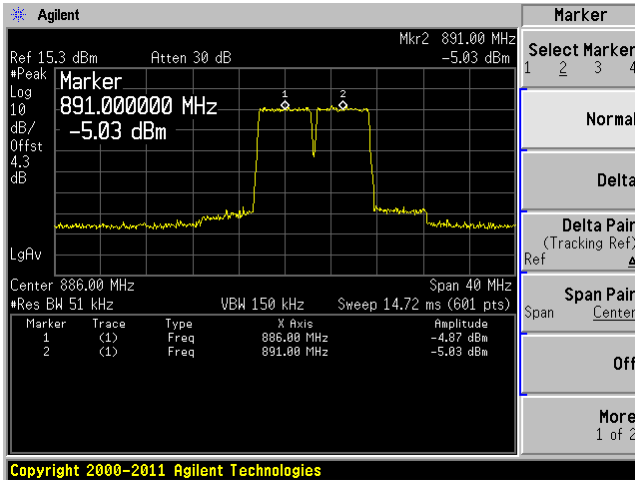


Output

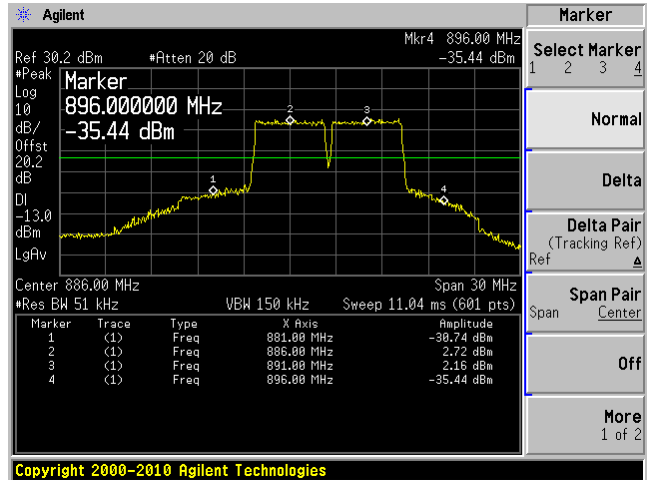


QPSK (5 MHz), (High Channel)

Input

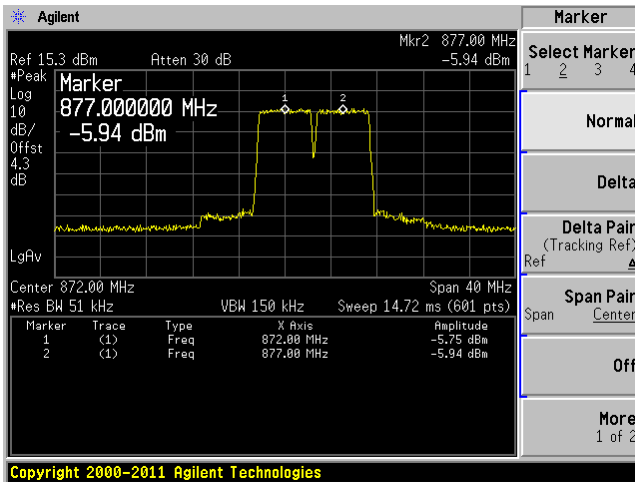


Output

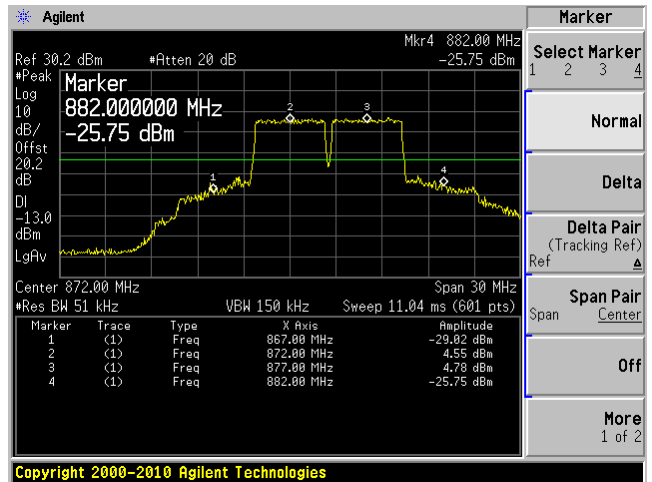


16QAM (5 MHz), (Low Channel)

Input

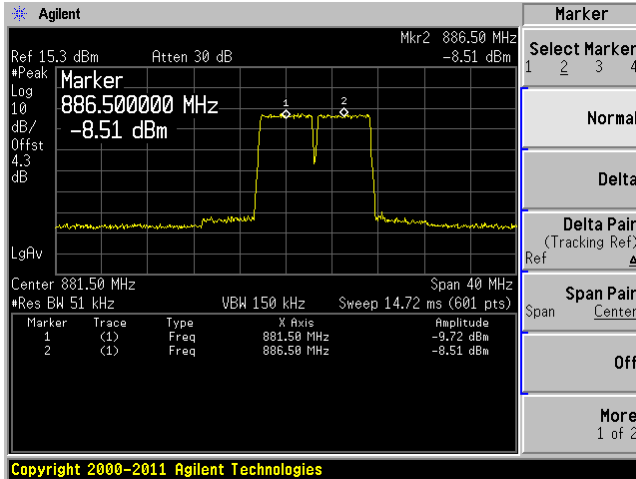


Output

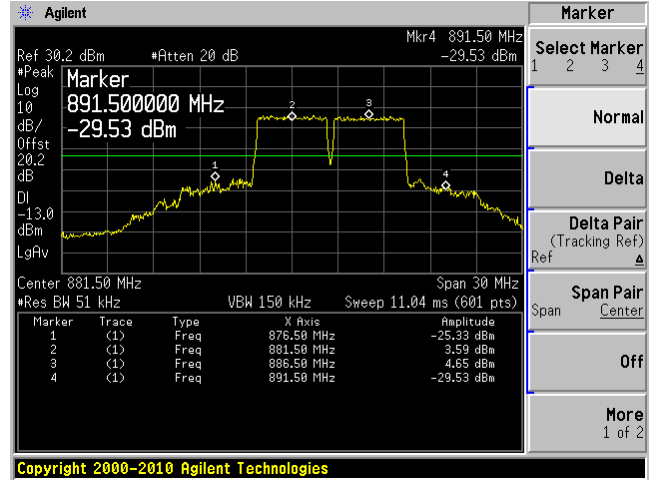


16QAM (5 MHz), (Middle Channel)

Input

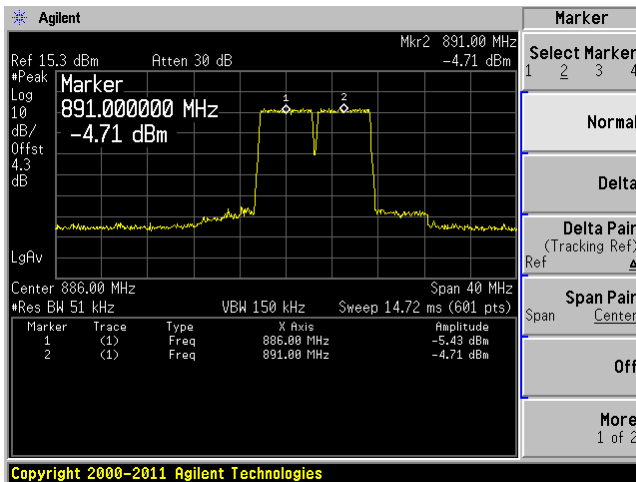


Output

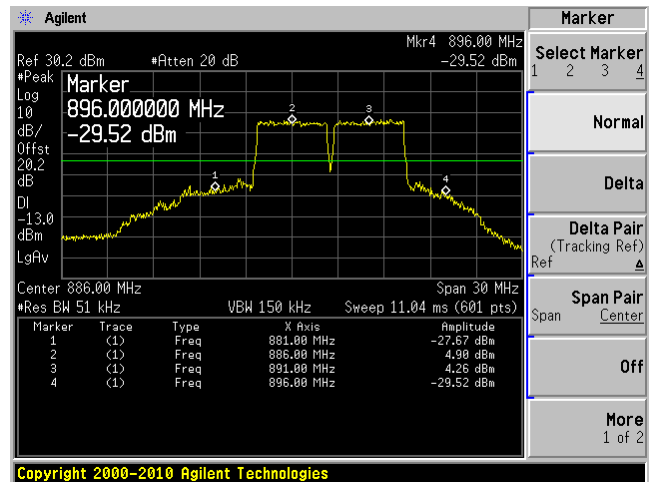


16QAM (5 MHz), (High Channel)

Input

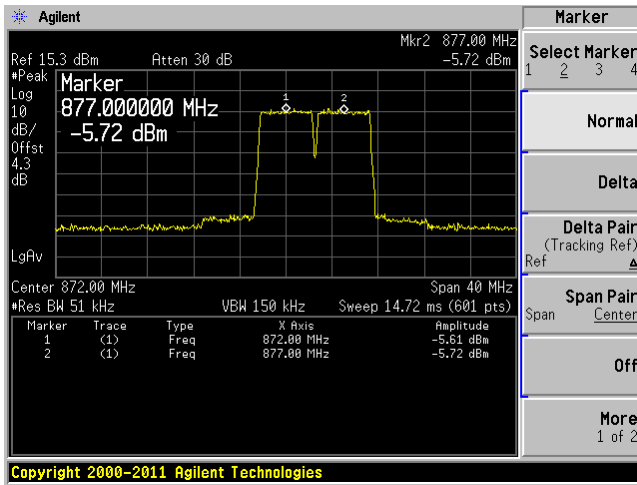


Output

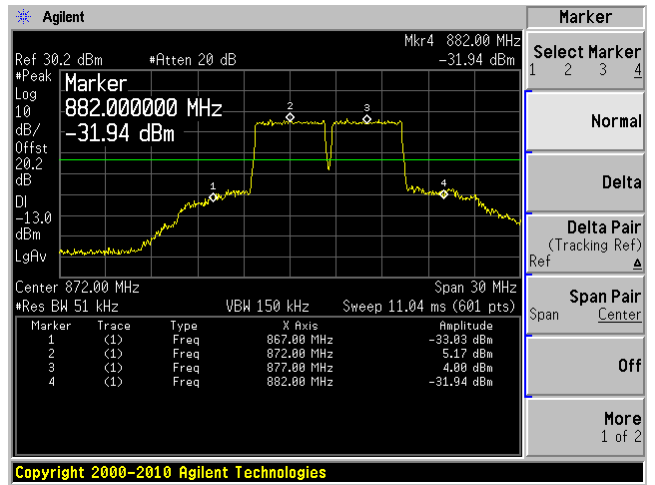


64QAM (5 MHz), (Low Channel)

Input

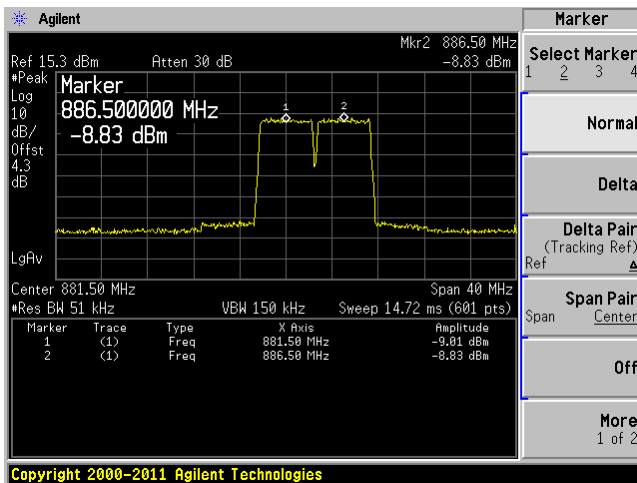


Output

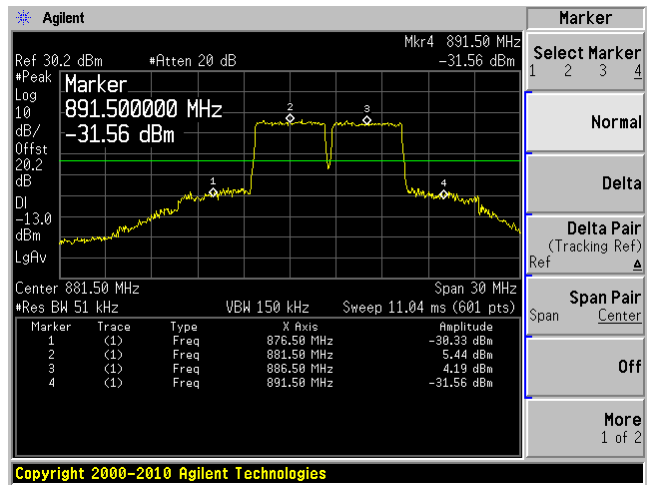


64QAM (5 MHz), (Middle Channel)

Input

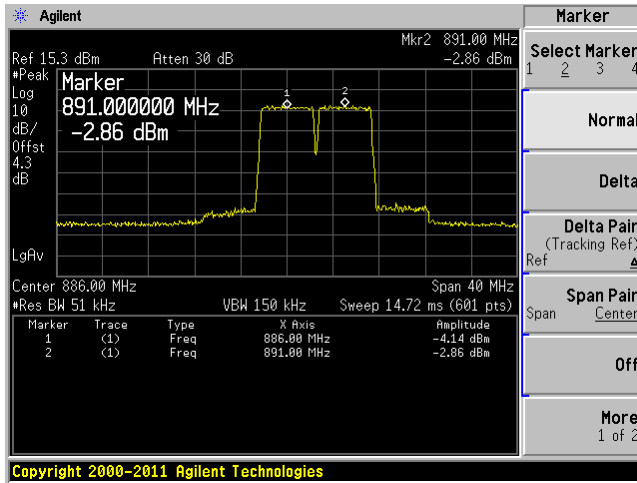


Output

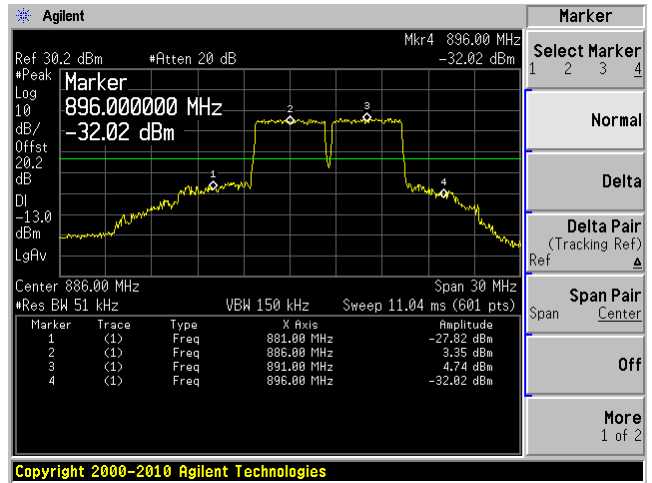


64QAM (5 MHz), (High Channel)

Input

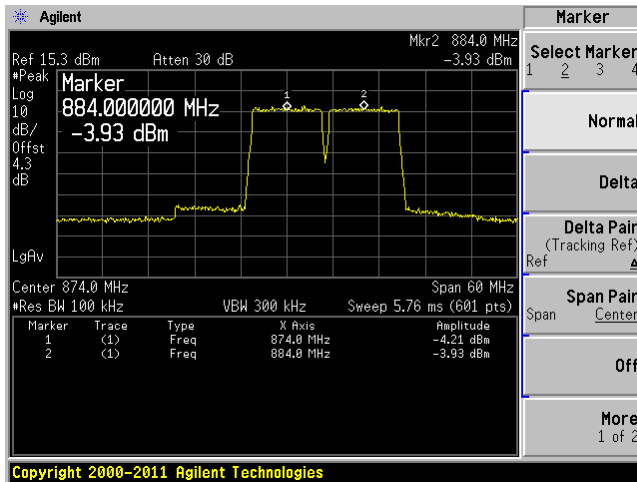


Output

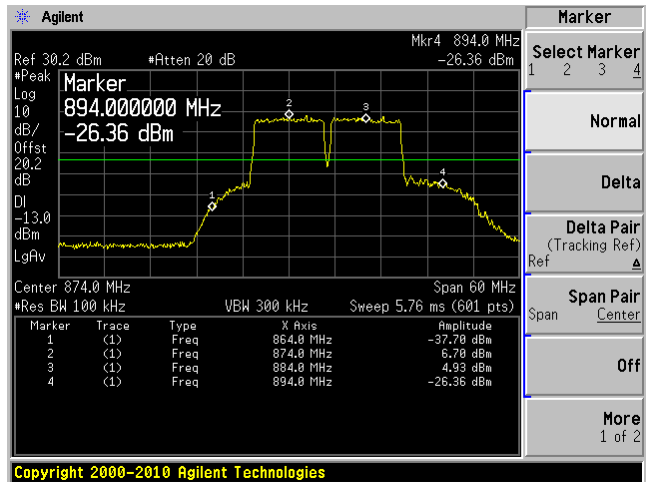


QPSK (10 MHz), (Low Channel)

Input

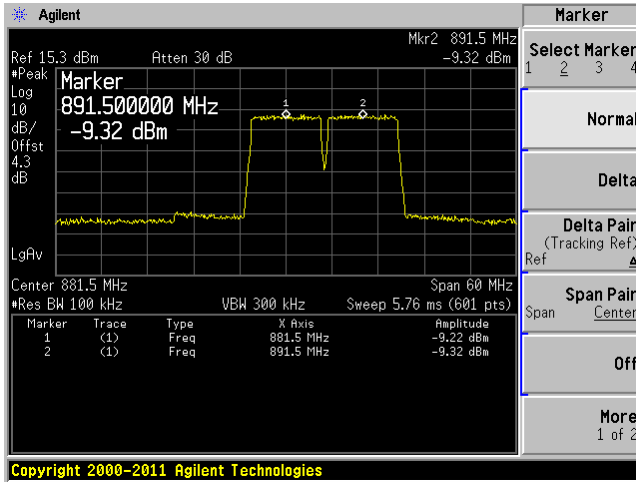


Output

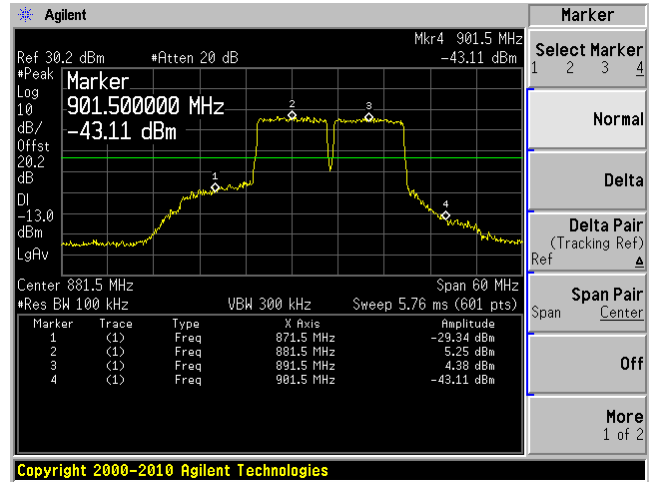


QPSK (10 MHz), (Middle Channel)

Input

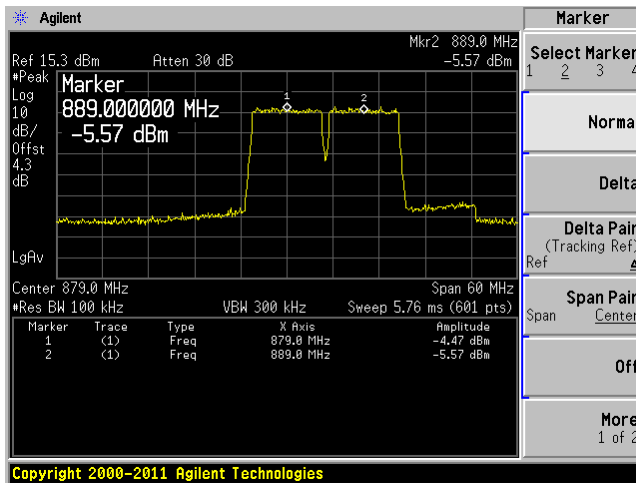


Output

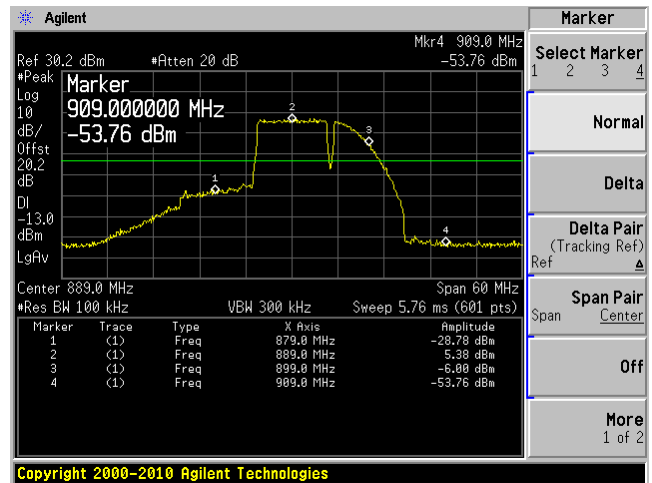


QPSK (10 MHz), (High Channel)

Input

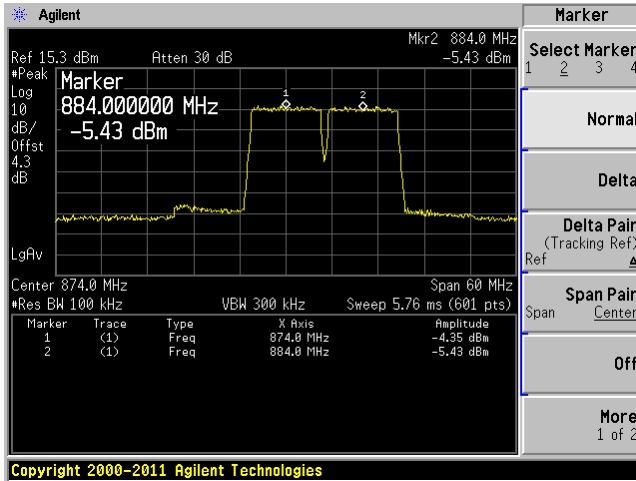


Output

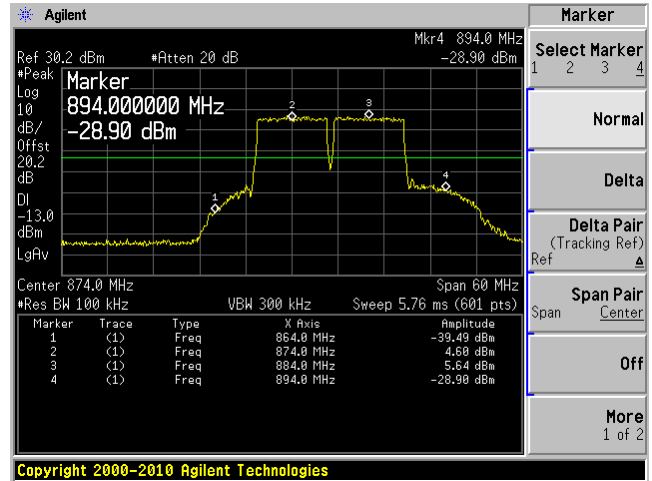


16QAM (10 MHz), (Low Channel)

Input

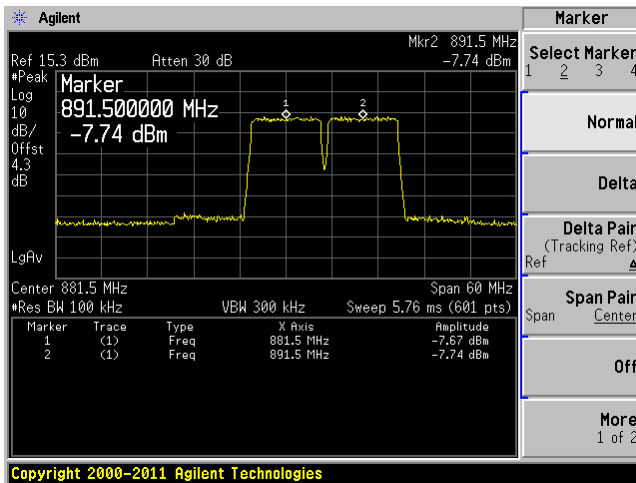


Output

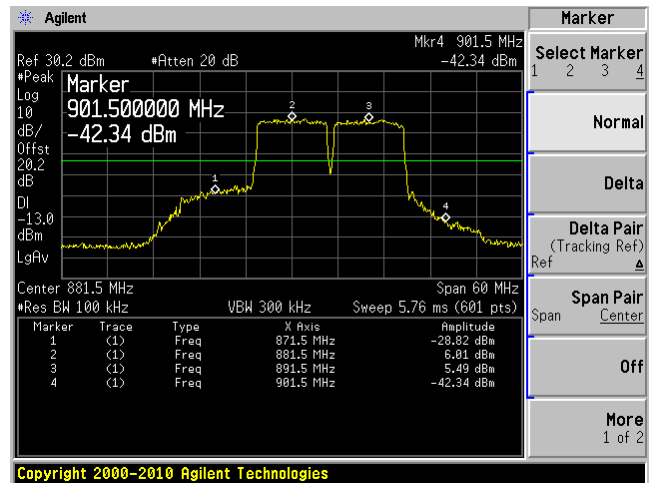


16QAM (10 MHz), (Middle Channel)

Input



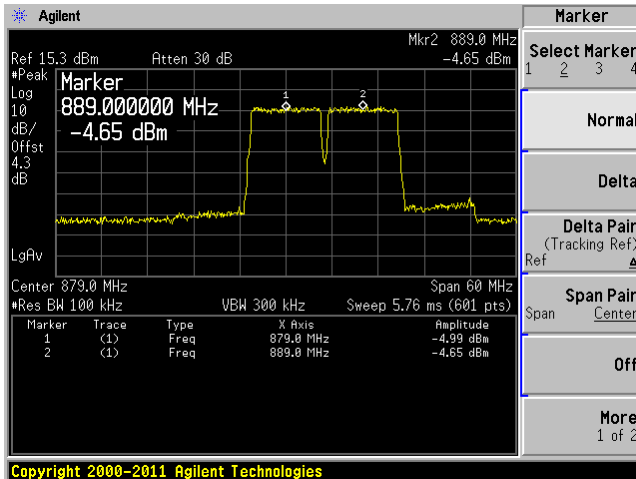
Output



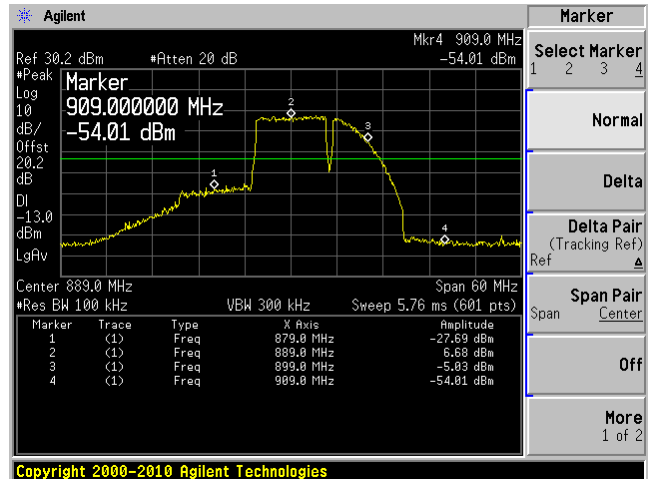


16QAM (10 MHz), (High Channel)

Input

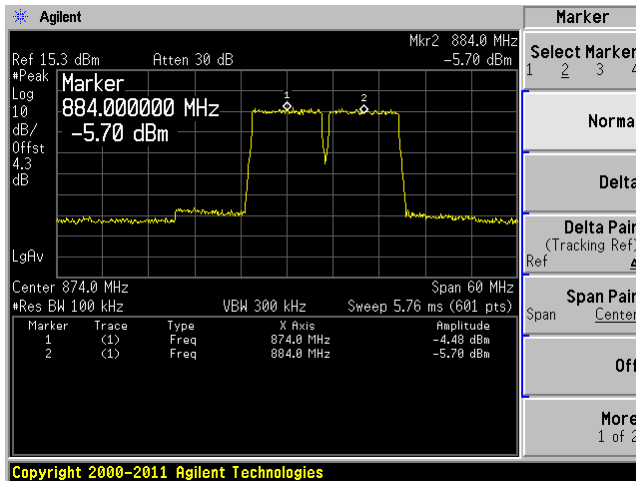


Output

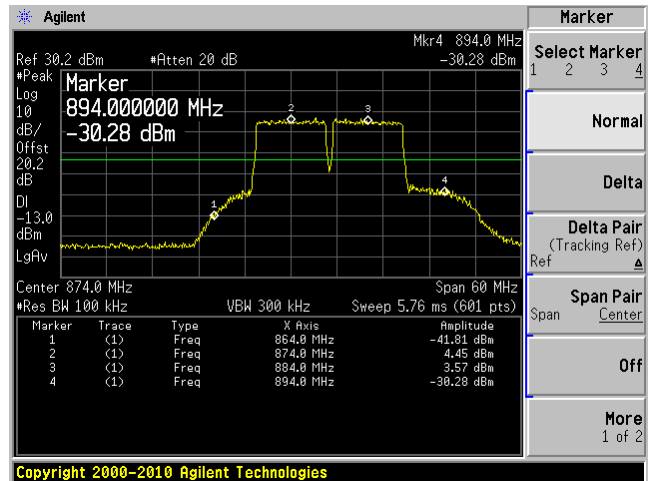


64QAM (10 MHz), (Low Channel)

Input

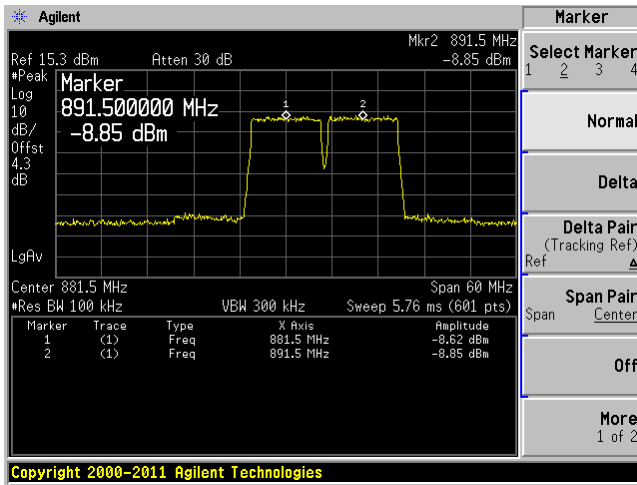


Output

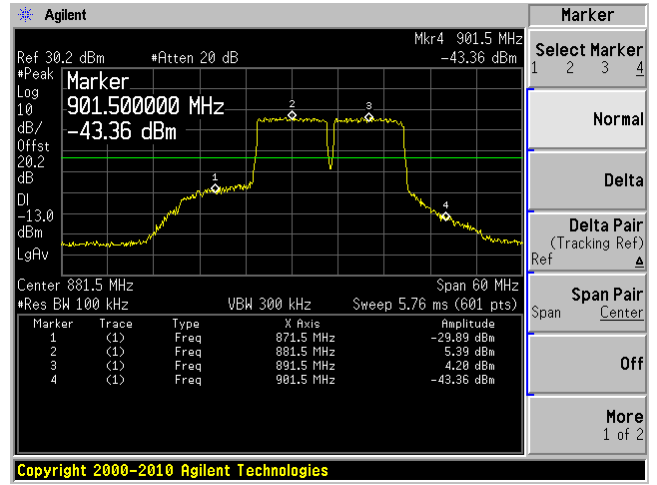


64QAM (10 MHz), (Middle Channel)

Input

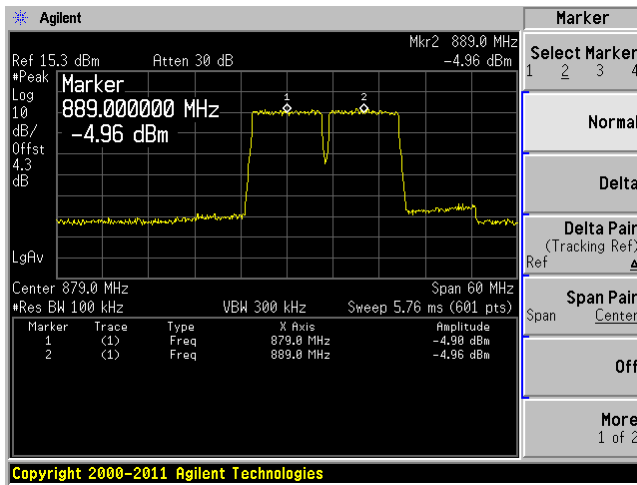


Output

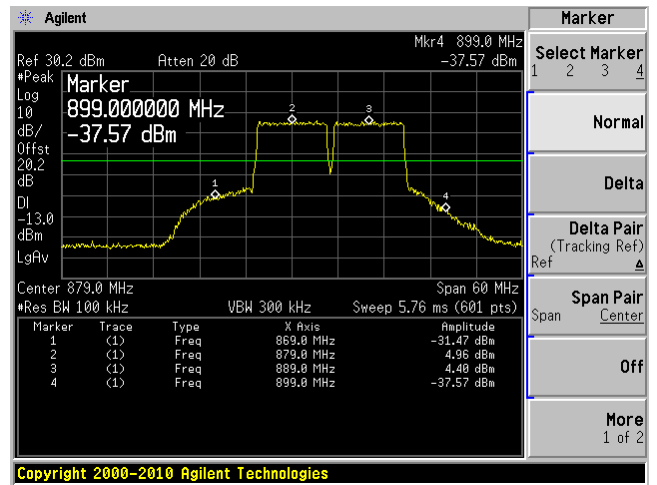


64QAM (10 MHz), (High Channel)

Input



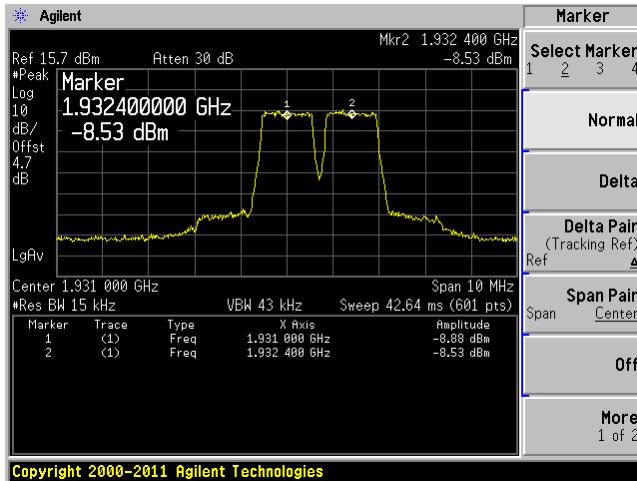
Output



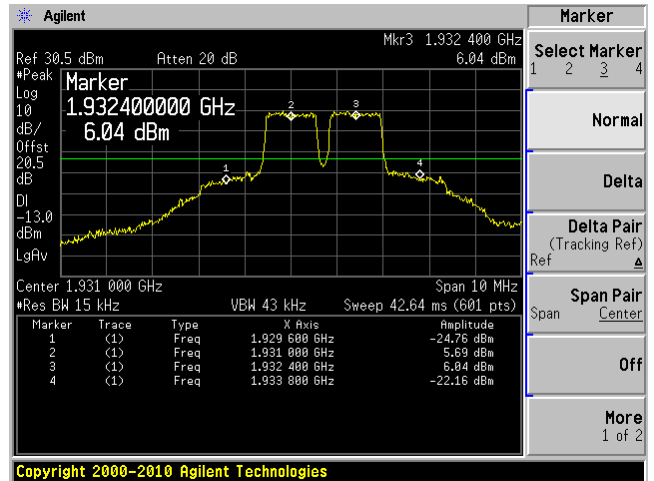
PCS LTE Band; Download

QPSK (1.4 MHz), (Low Channel)

Input

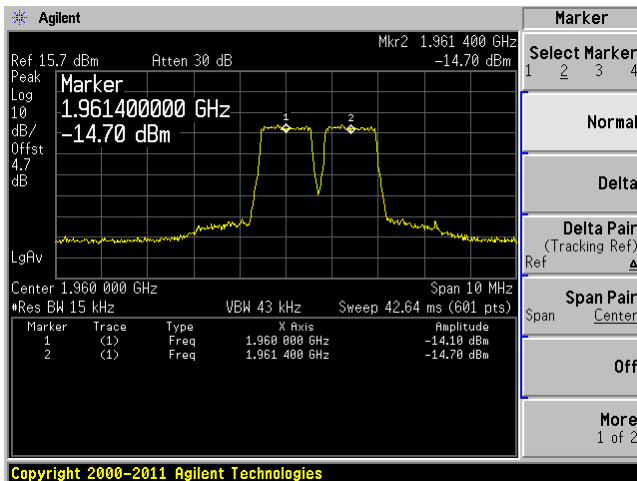


Output

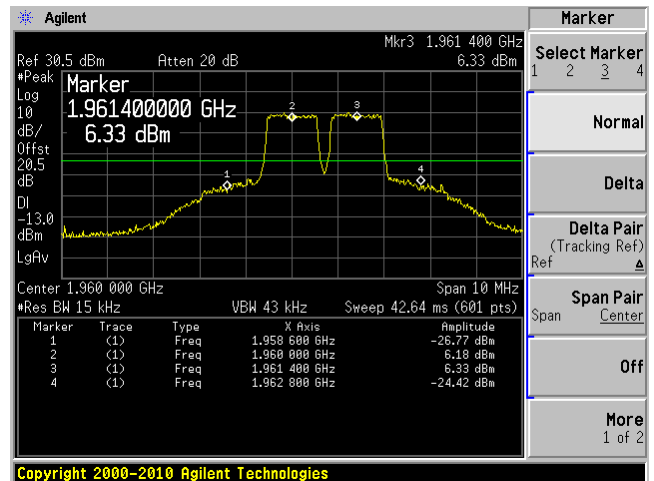


QPSK (1.4 MHz), (Middle Channel)

Input

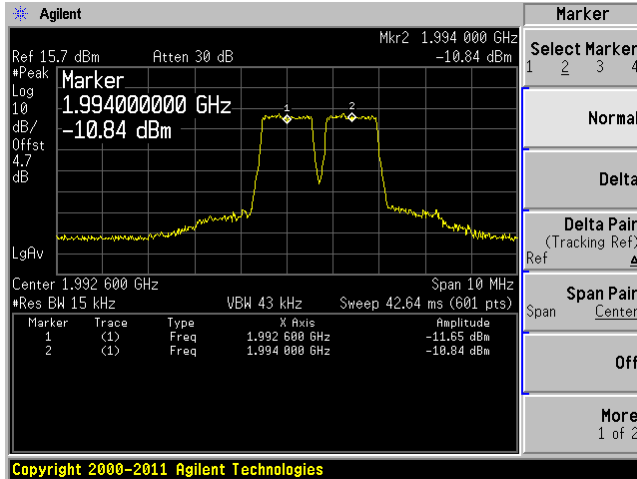


Output

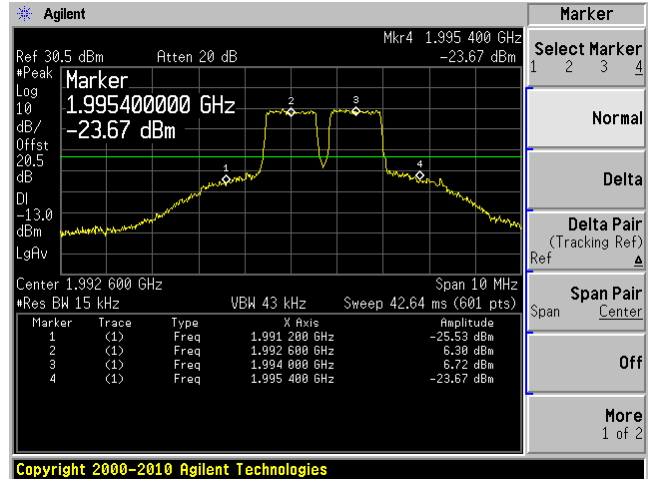


QPSK (1.4 MHz), (High Channel)

Input

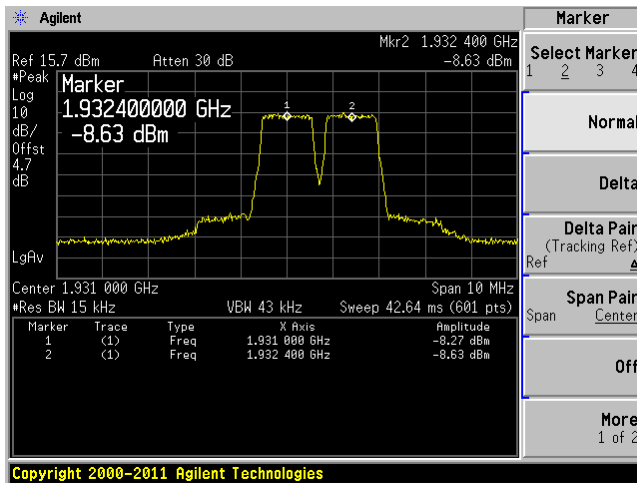


Output

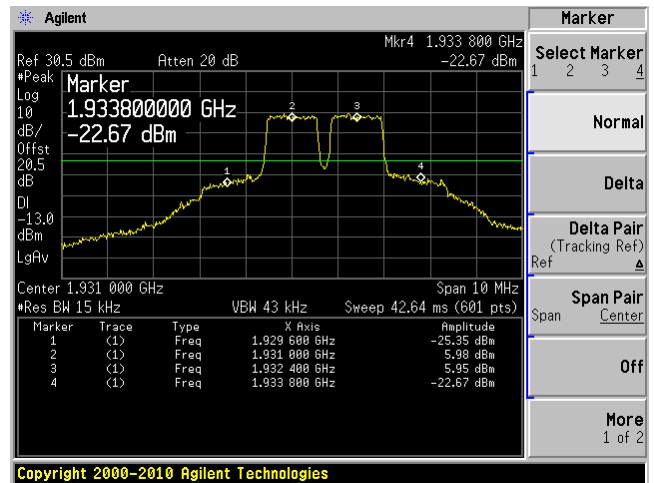


16QAM (1.4 MHz), (Low Channel)

Input

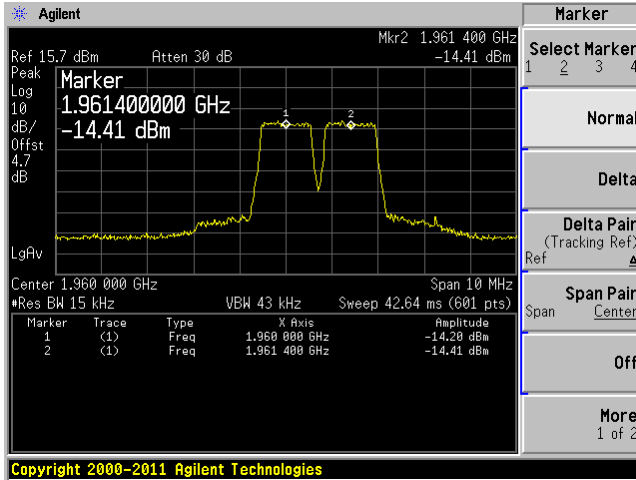


Output

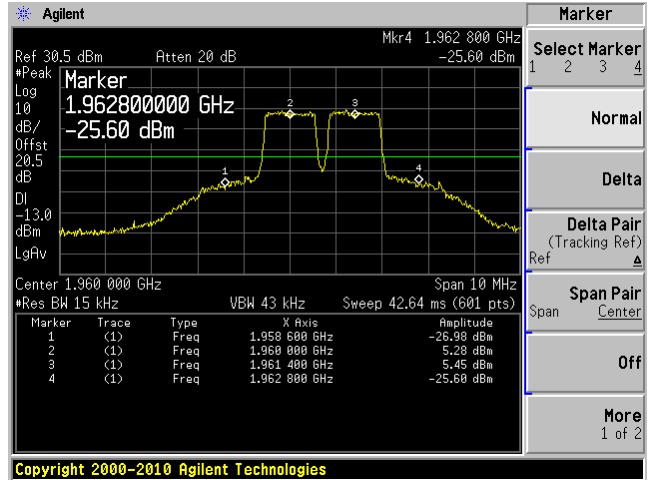


16QAM (1.4 MHz), (Middle Channel)

Input

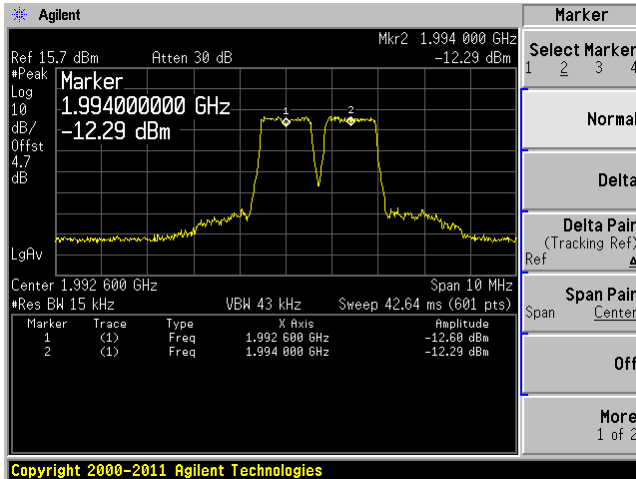


Output

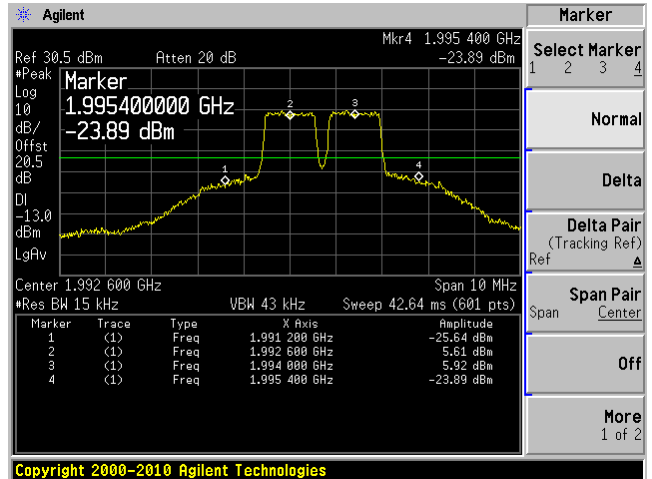


16QAM (1.4 MHz), (High Channel)

Input

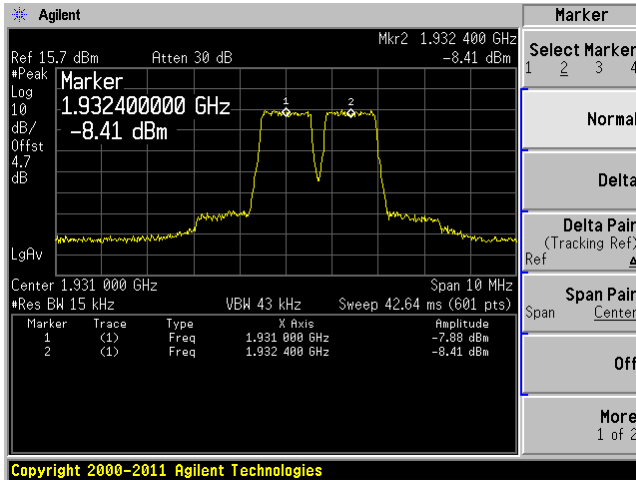


Output

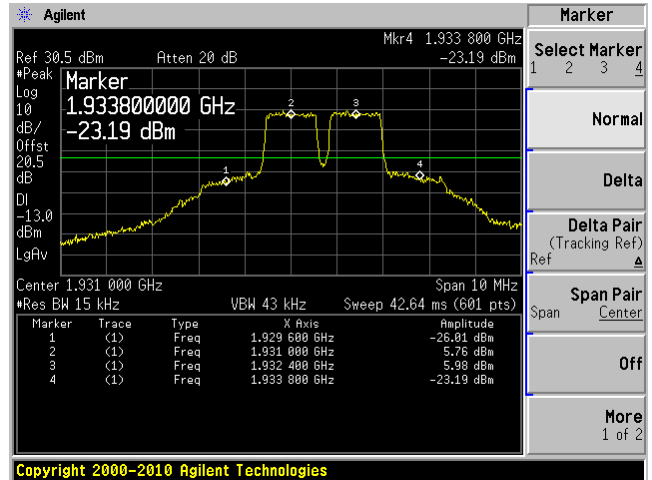


64QAM (1.4 MHz), (Low Channel)

Input

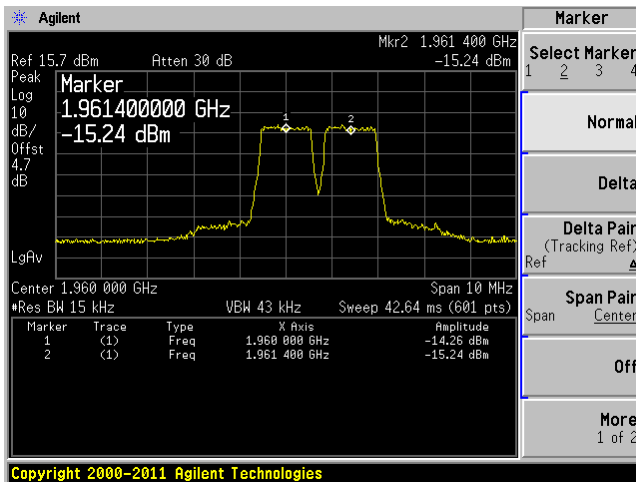


Output

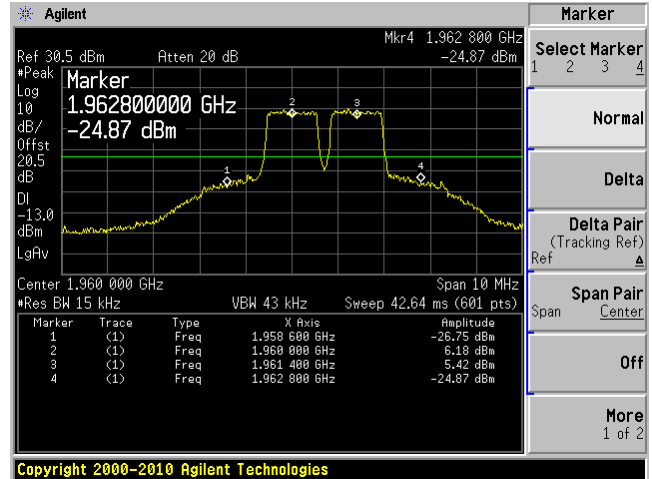


64QAM (1.4 MHz), (Middle Channel)

Input

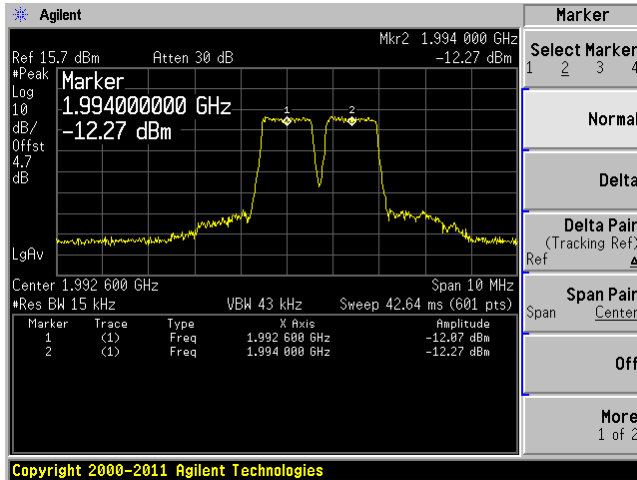


Output

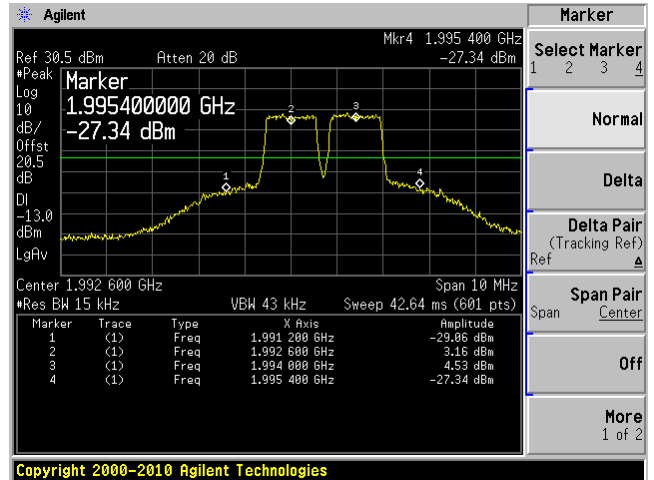


64QAM (1.4 MHz), (High Channel)

Input

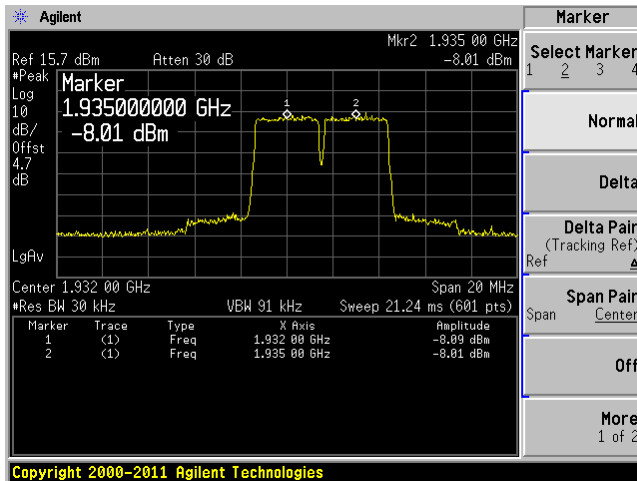


Output

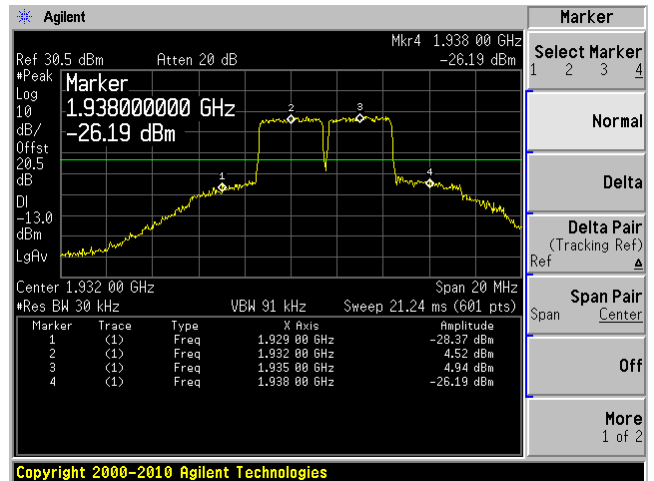


QPSK (3 MHz), (Low Channel)

Input

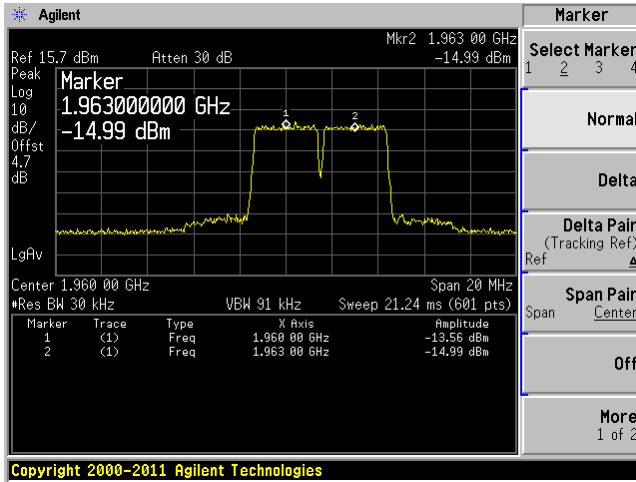


Output

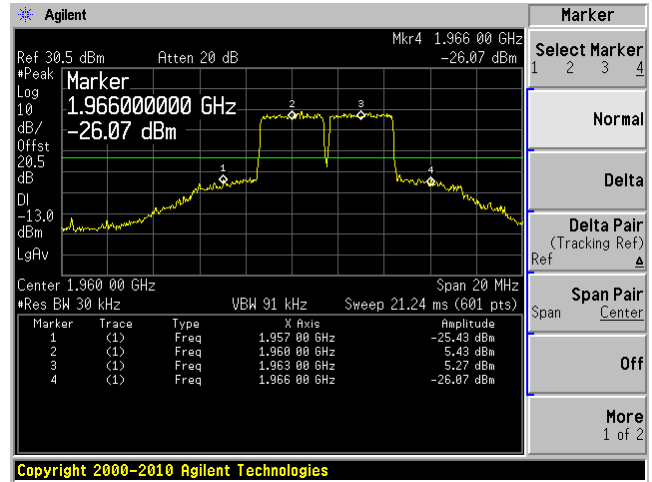


QPSK (3 MHz), (Middle Channel)

Input

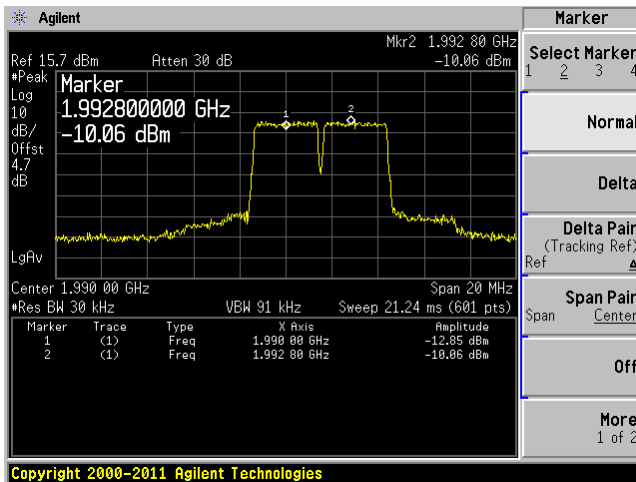


Output

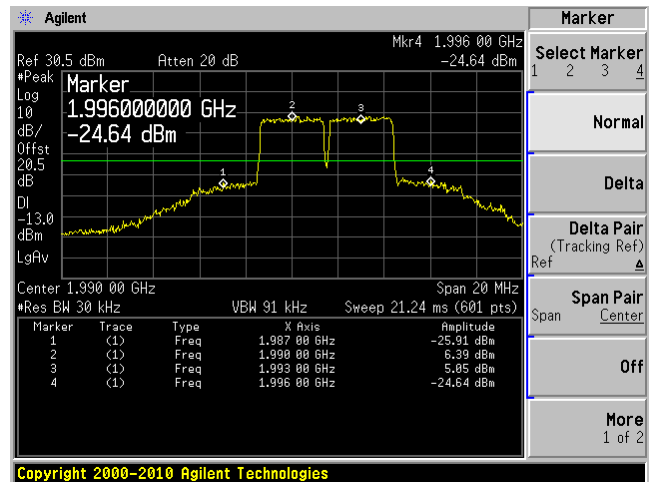


QPSK (3 MHz), (High Channel)

Input



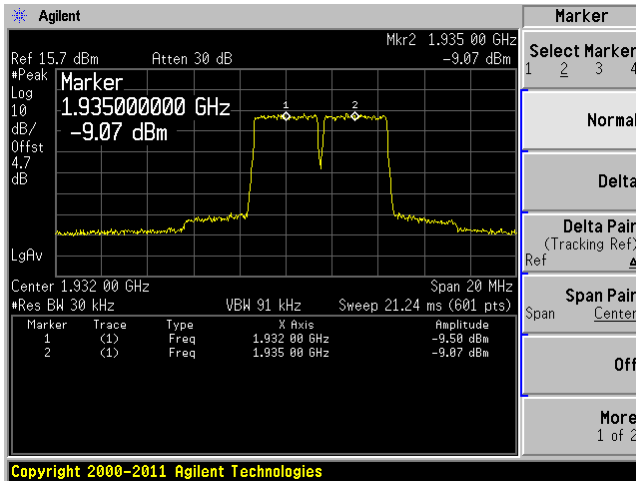
Output



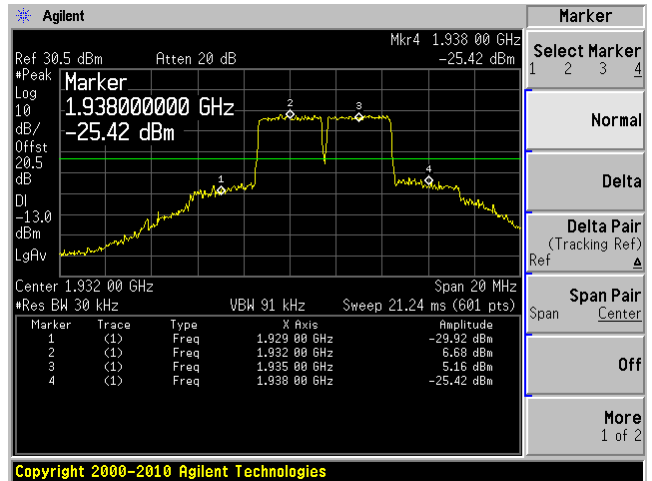


16QAM (3 MHz), (Low Channel)

Input

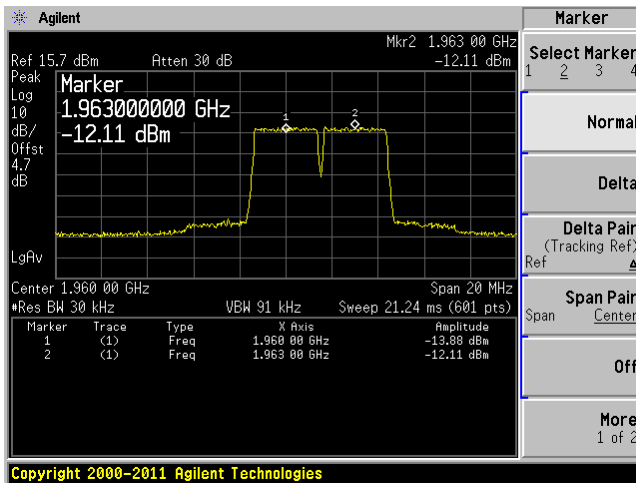


Output

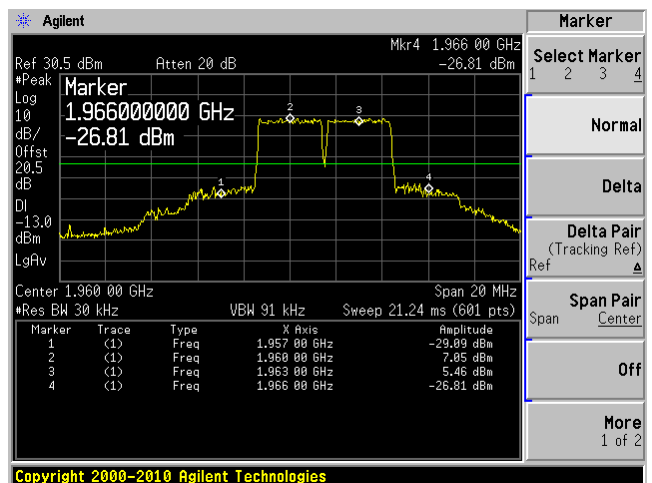


16QAM (3 MHz), (Middle Channel)

Input

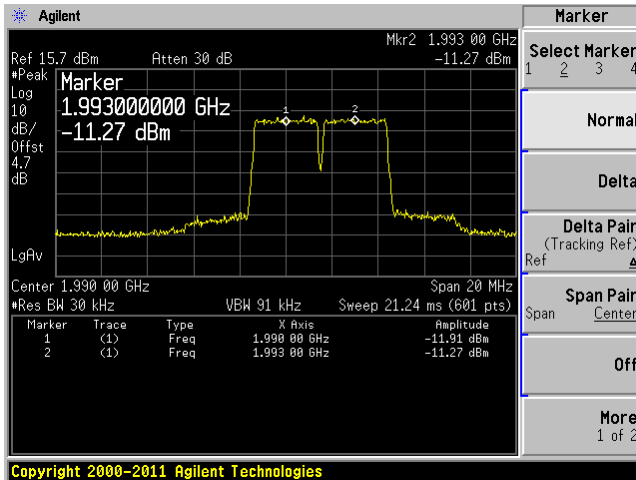


Output

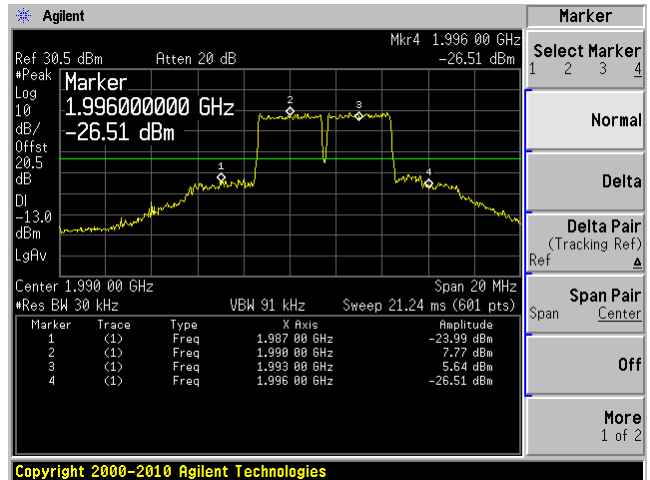


16QAM (3 MHz), (High Channel)

Input

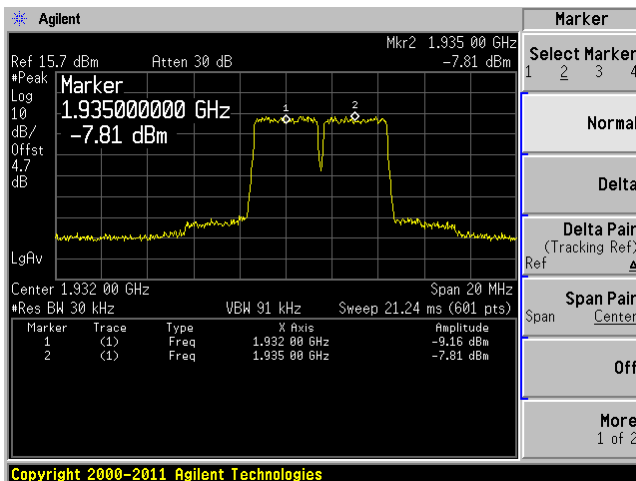


Output

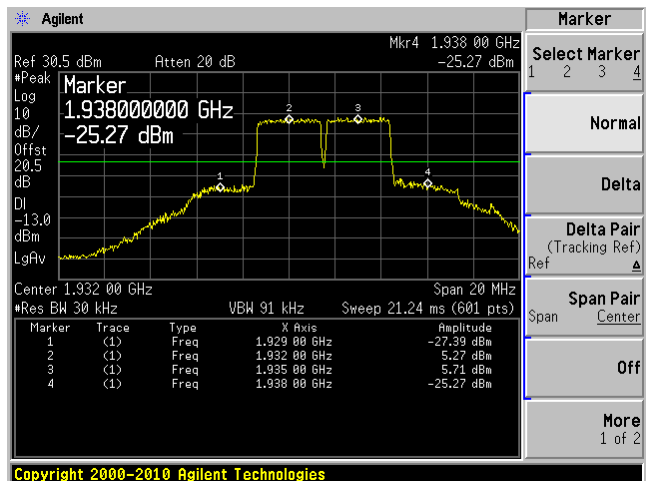


64QAM (3 MHz), (Low Channel)

Input

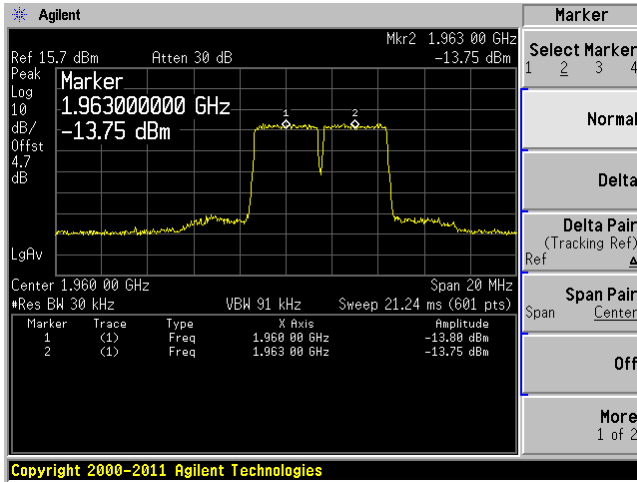


Output

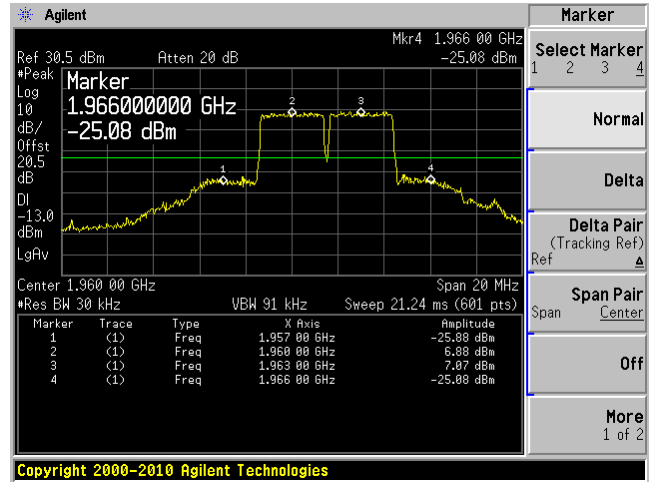


64QAM (3 MHz), (Middle Channel)

Input

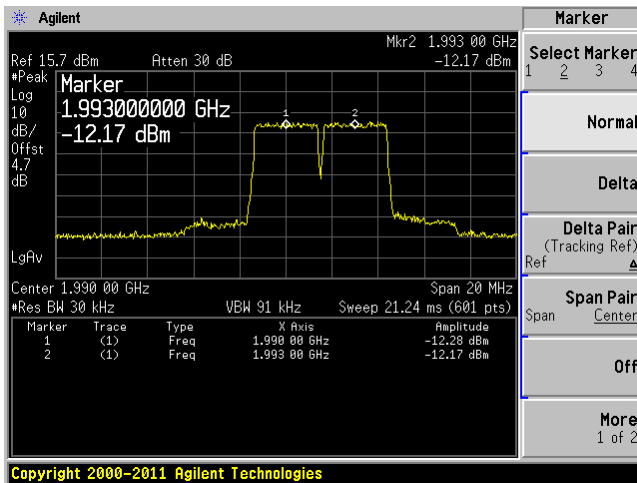


Output

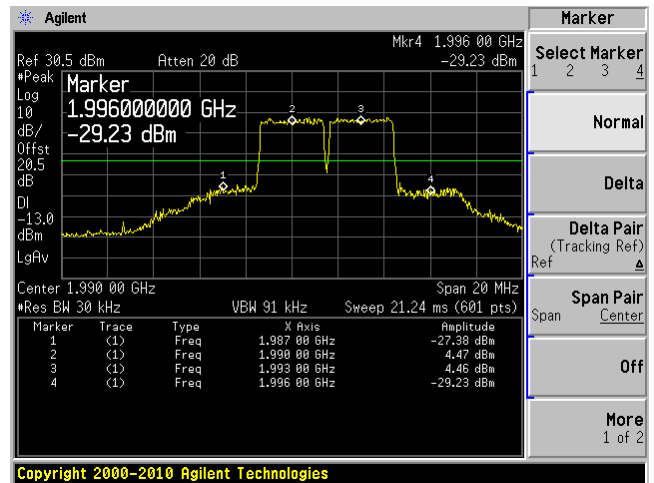


64QAM (3 MHz), (High Channel)

Input

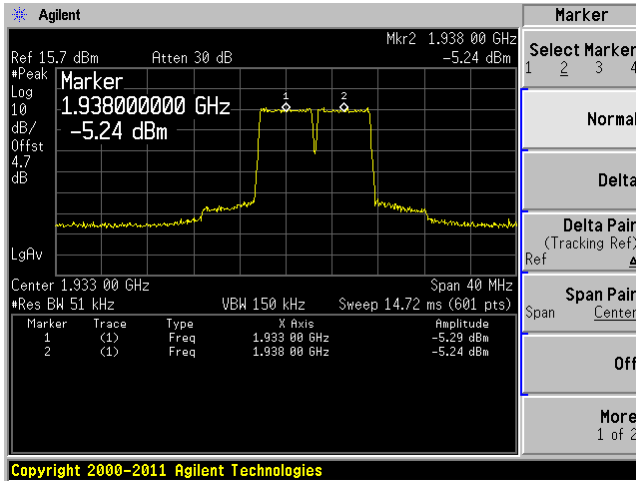


Output

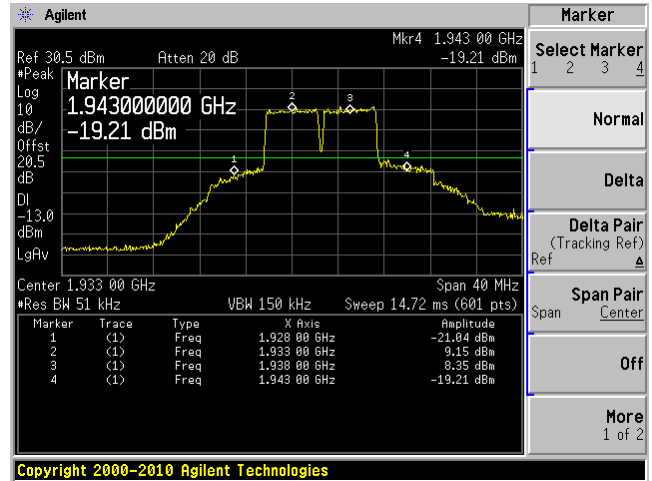


QPSK (5 MHz), (Low Channel)

Input

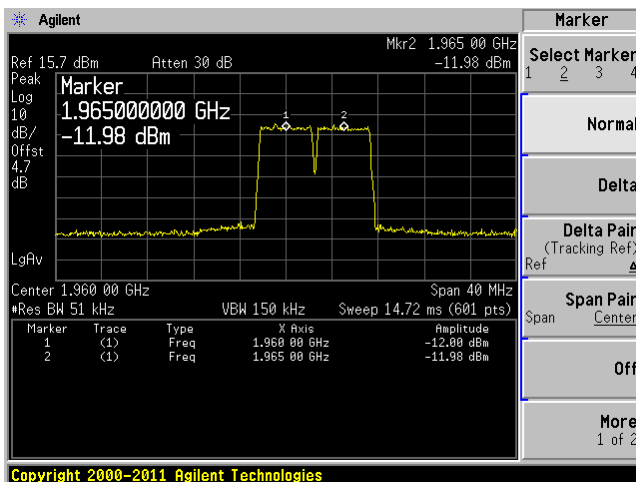


Output

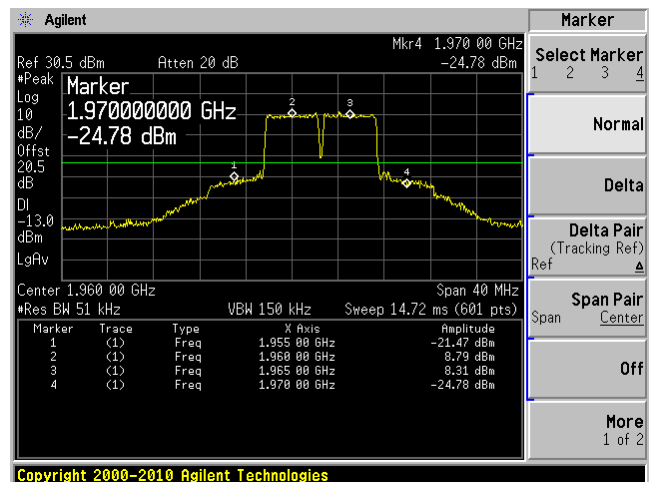


QPSK (5 MHz), (Middle Channel)

Input

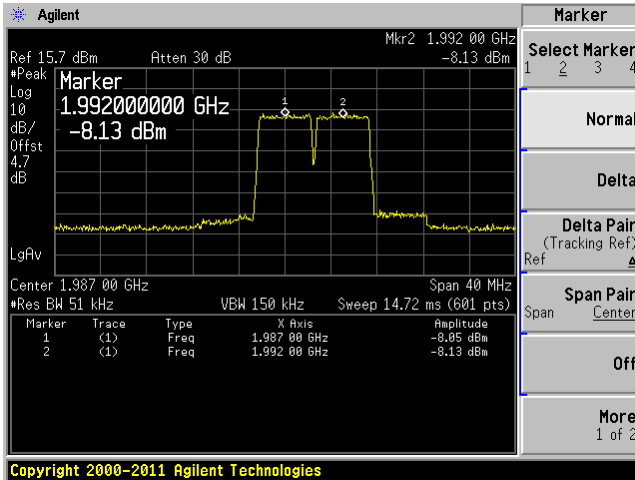


Output

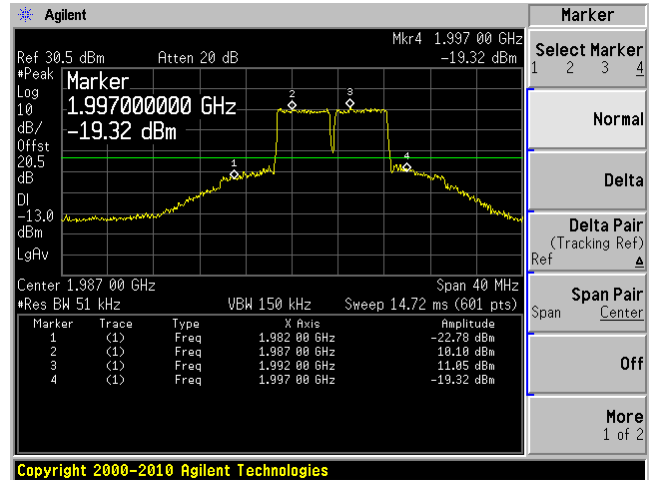


QPSK (5 MHz), (High Channel)

Input

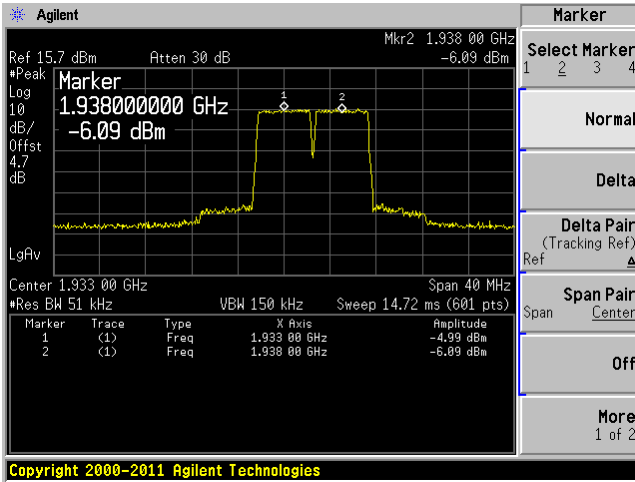


Output

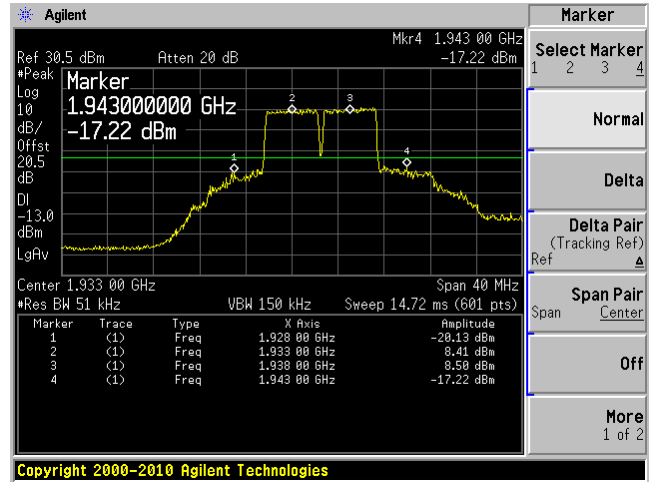


16QAM (5 MHz), (Low Channel)

Input

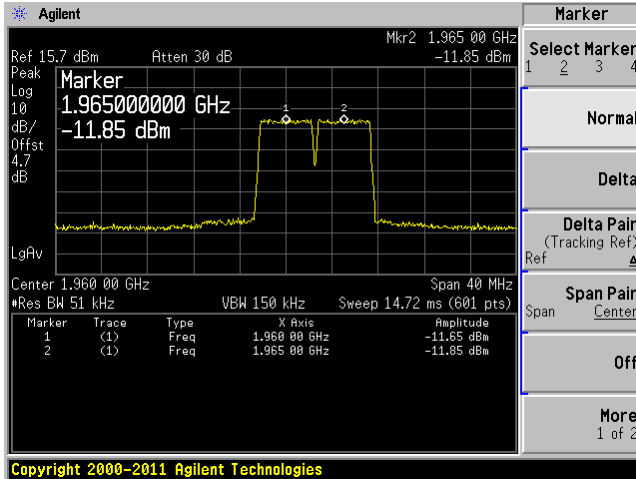


Output

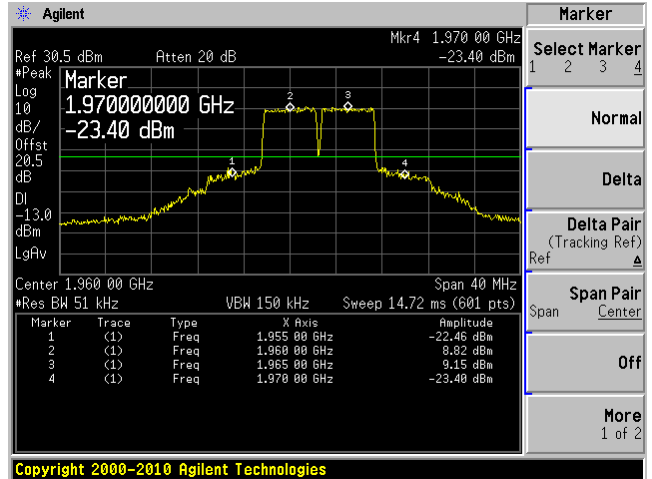


16QAM (5 MHz), (Middle Channel)

Input

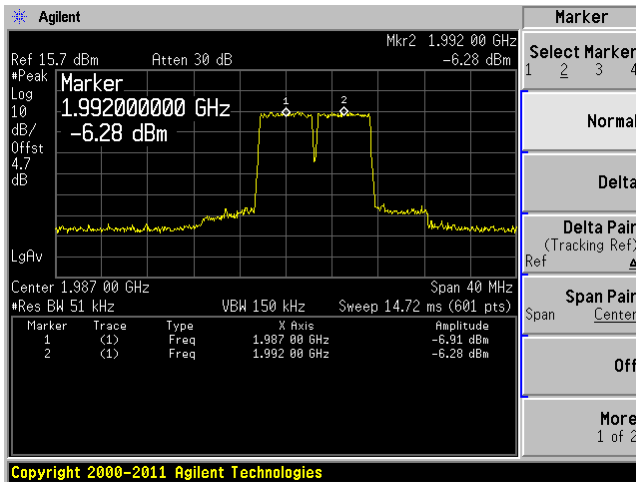


Output

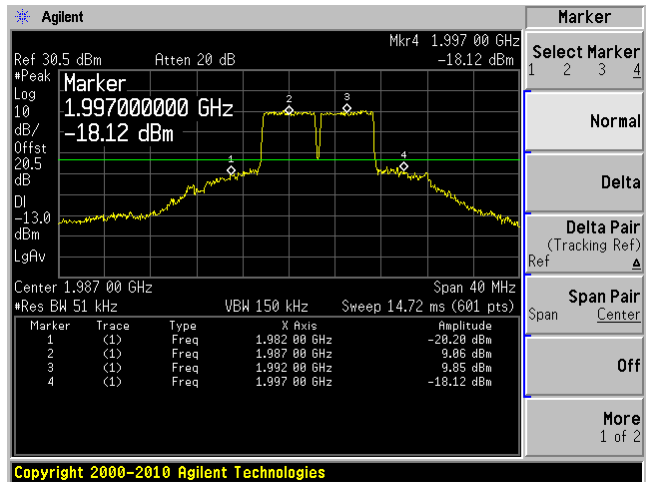


16QAM (5 MHz), (High Channel)

Input

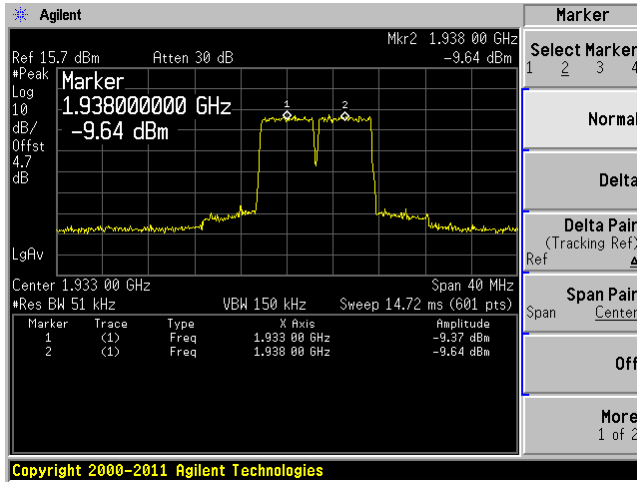


Output

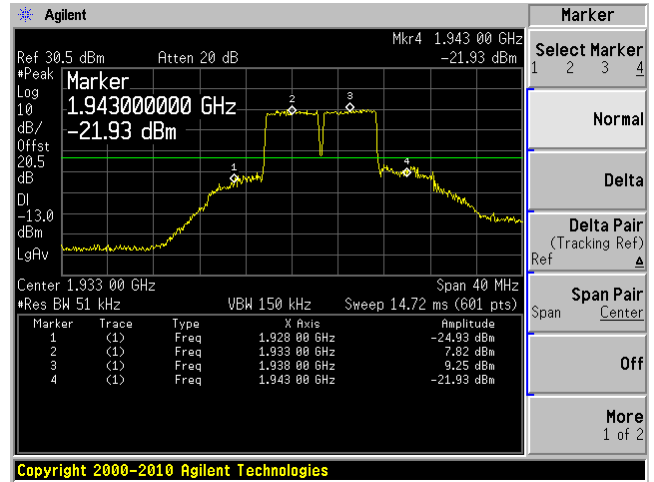


64QAM (5 MHz), (Low Channel)

Input

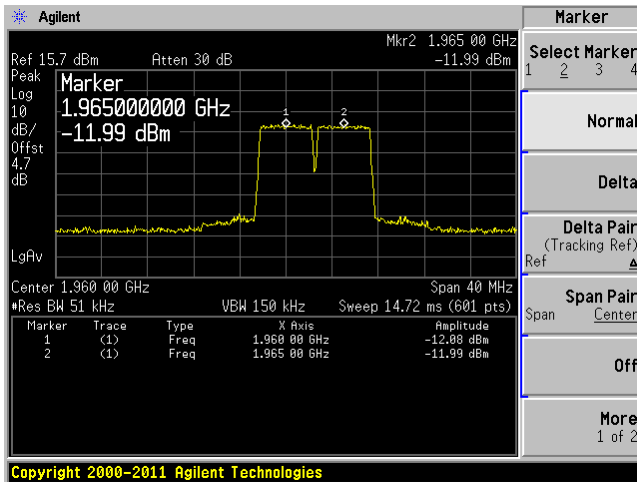


Output

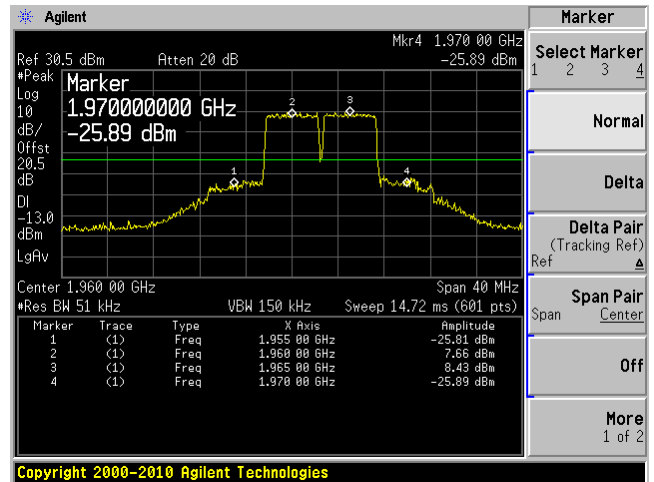


64QAM (5 MHz), (Middle Channel)

Input

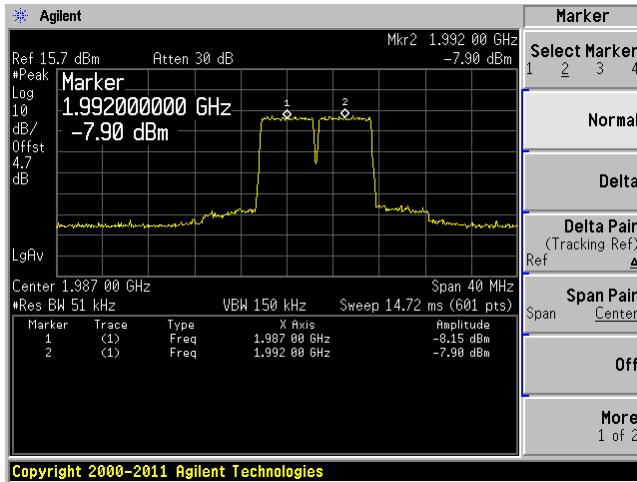


Output

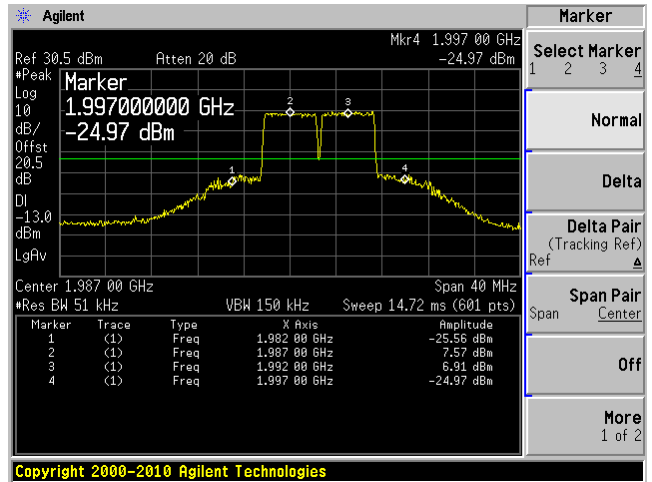


64QAM (5 MHz), (High Channel)

Input

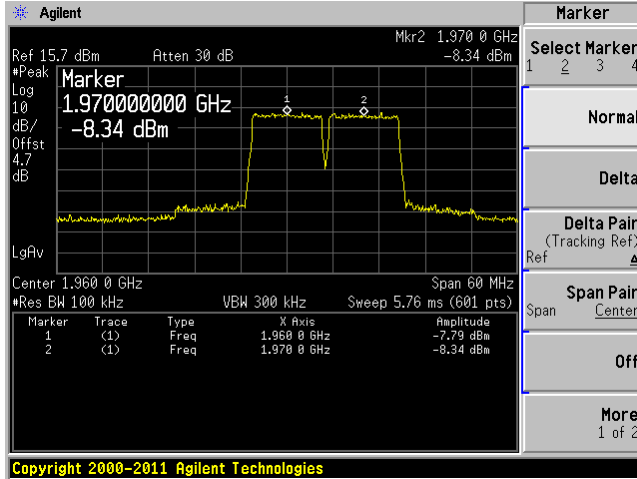


Output

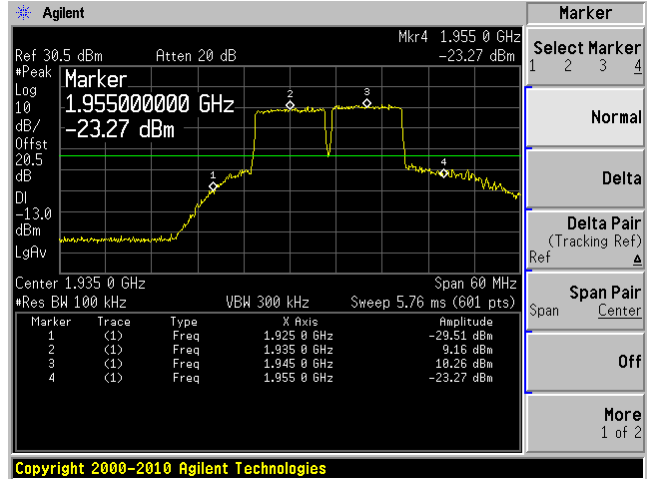


QPSK (10 MHz), (Low Channel)

Input



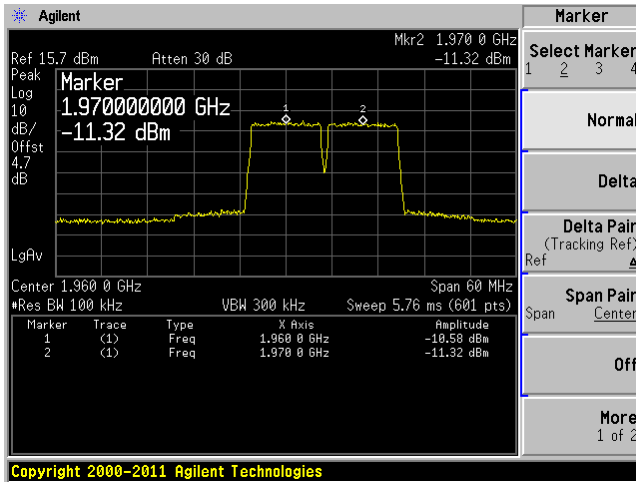
Output



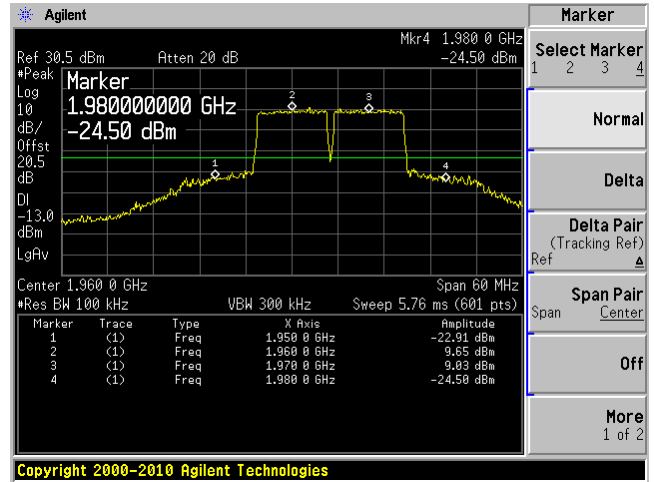


QPSK (10 MHz), (Middle Channel)

Input

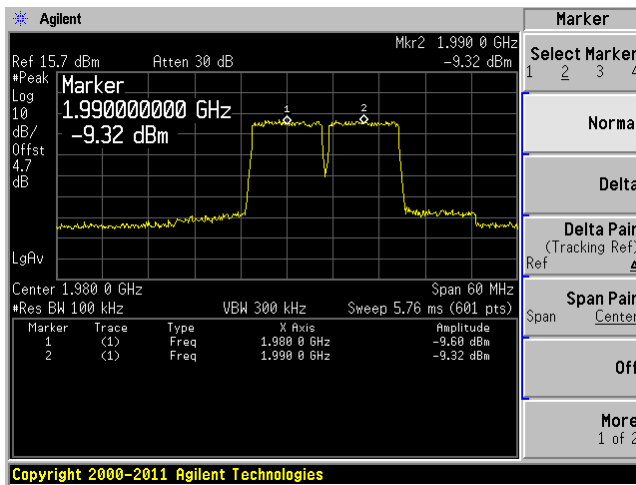


Output

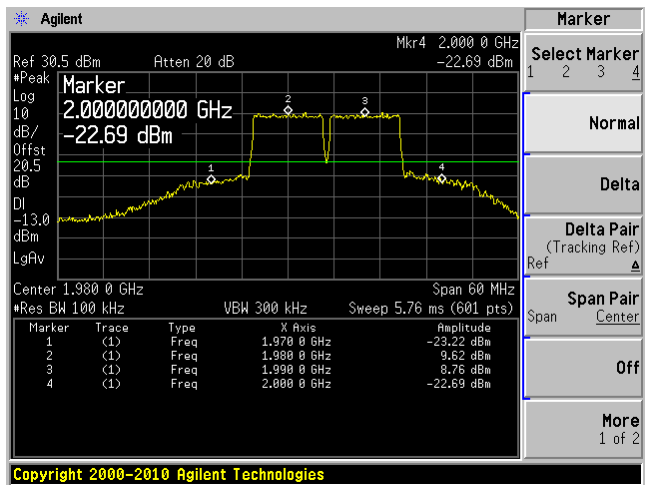


QPSK (10 MHz), (High Channel)

Input

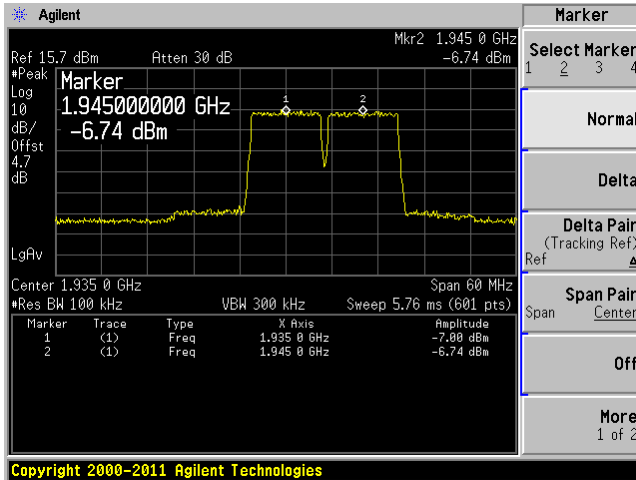


Output

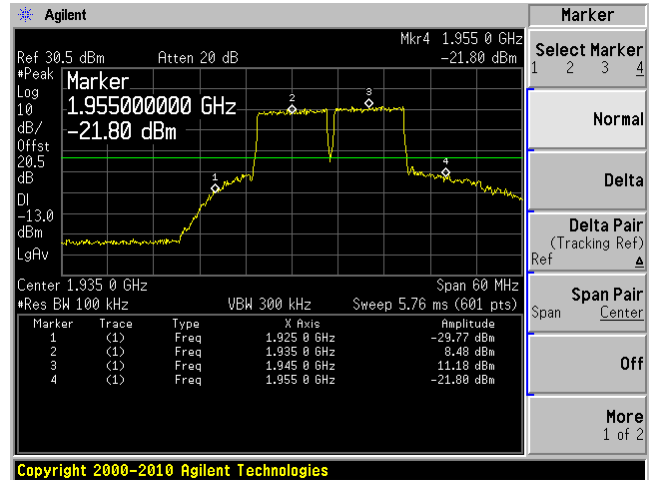


16QAM (10 MHz), (Low Channel)

Input

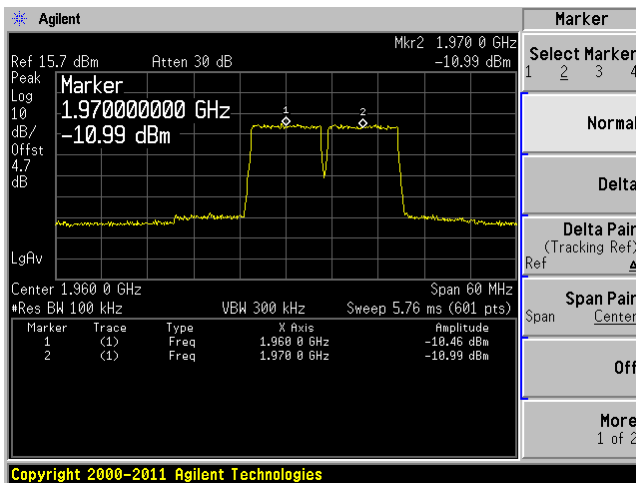


Output

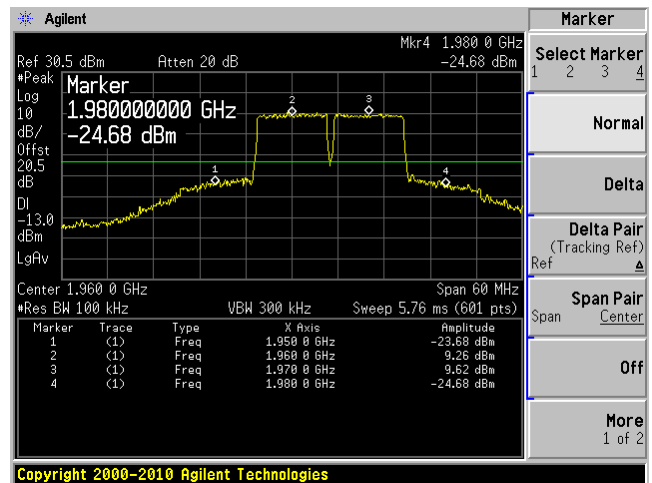


16QAM (10 MHz), (Middle Channel)

Input

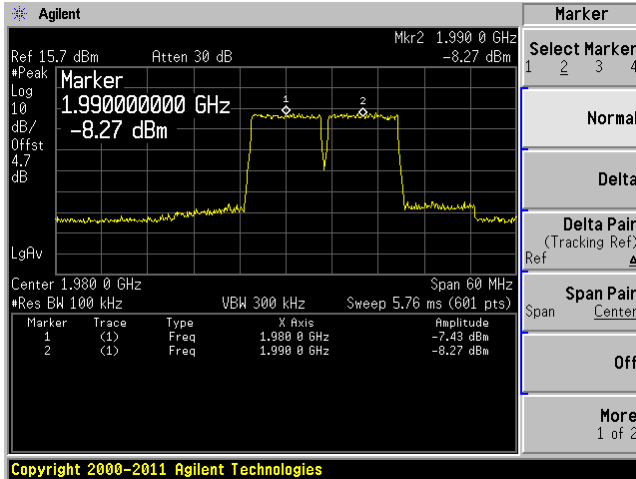


Output

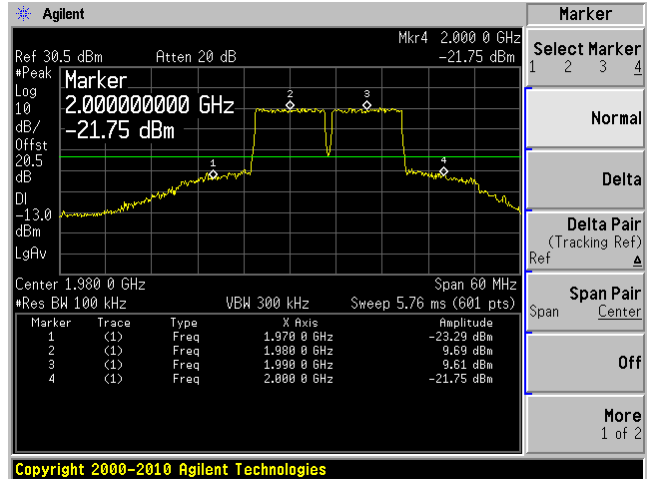


16QAM (10 MHz), (High Channel)

Input

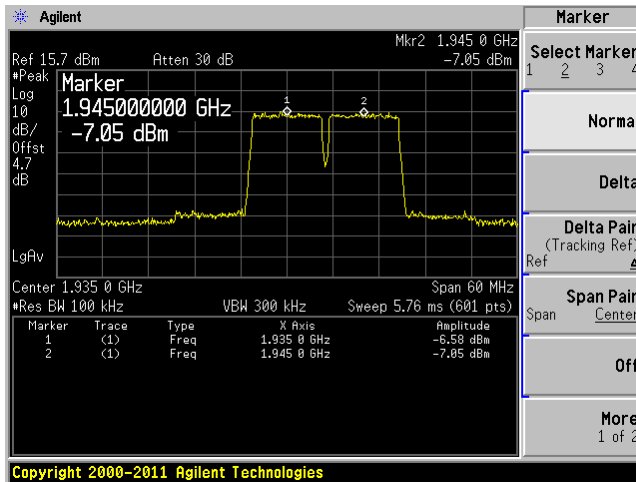


Output

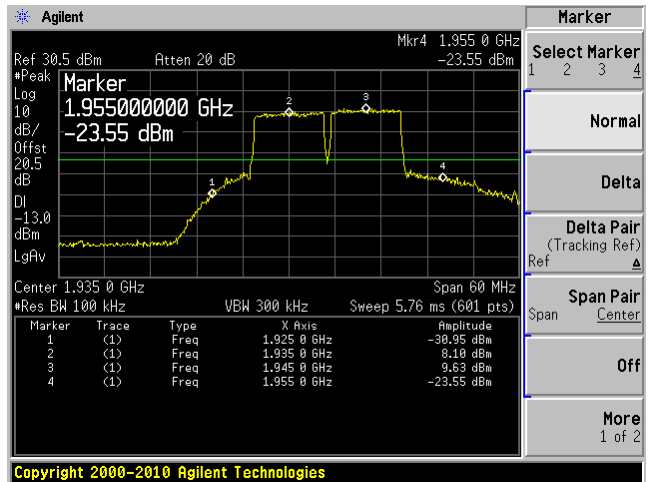


64QAM (10 MHz), (Low Channel)

Input

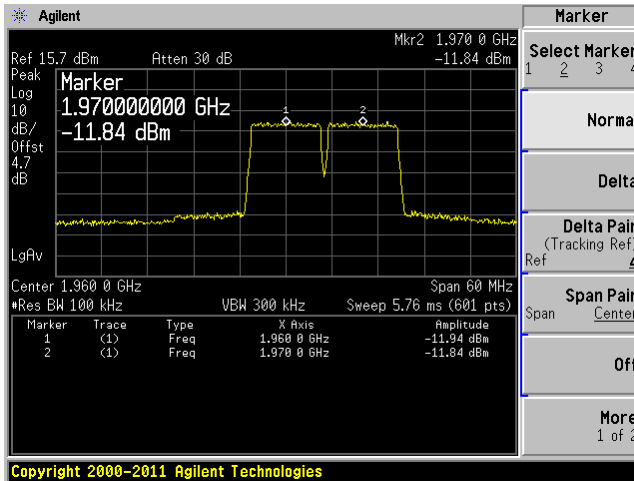


Output

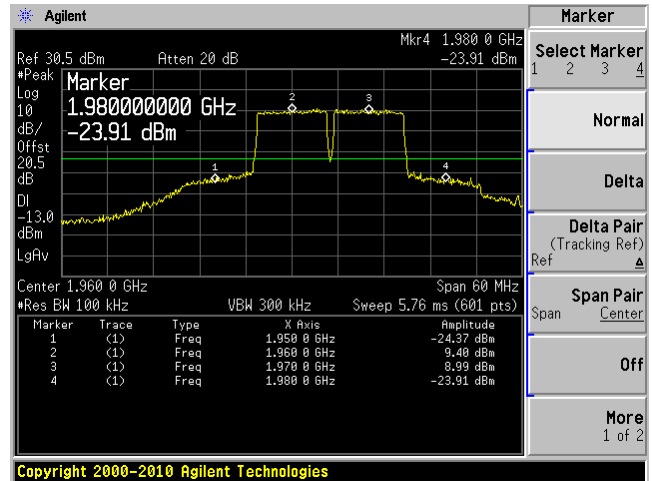


64QAM (10 MHz), (Middle Channel)

Input

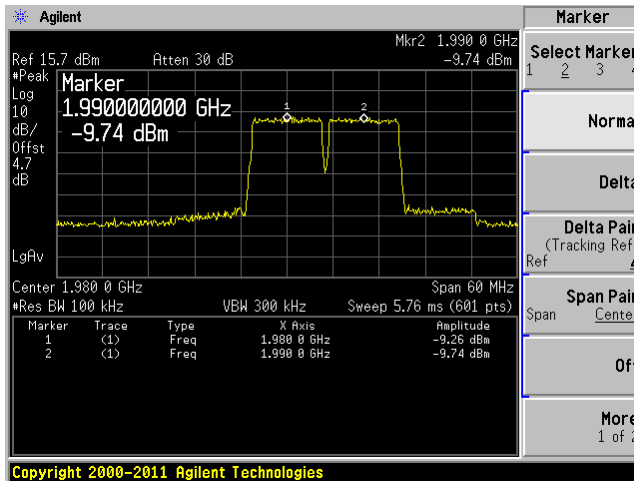


Output

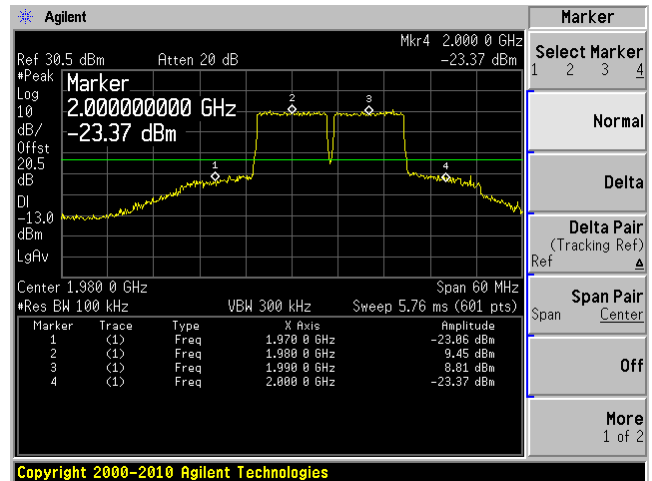


64QAM (10 MHz), (High Channel)

Input



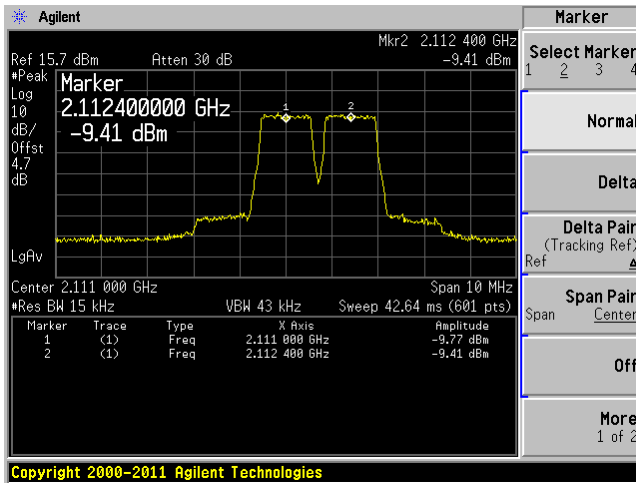
Output



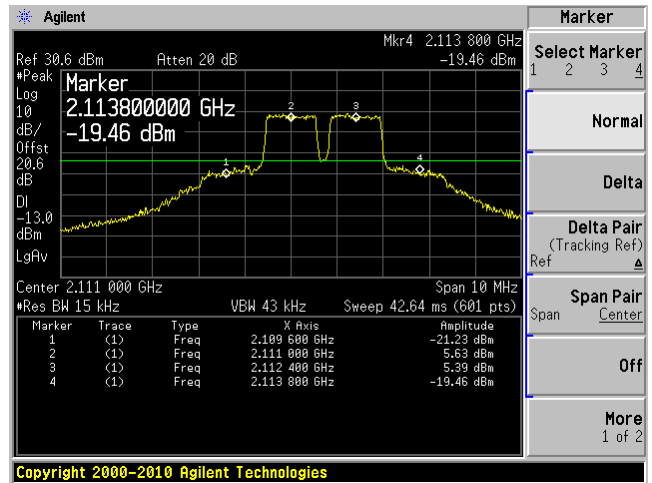
**AWS LTE Band; Download**

**QPSK (1.4 MHz), (Low Channel)**

Input

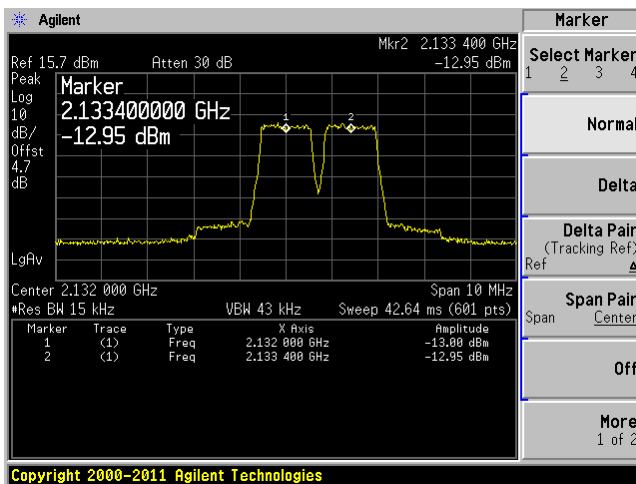


Output

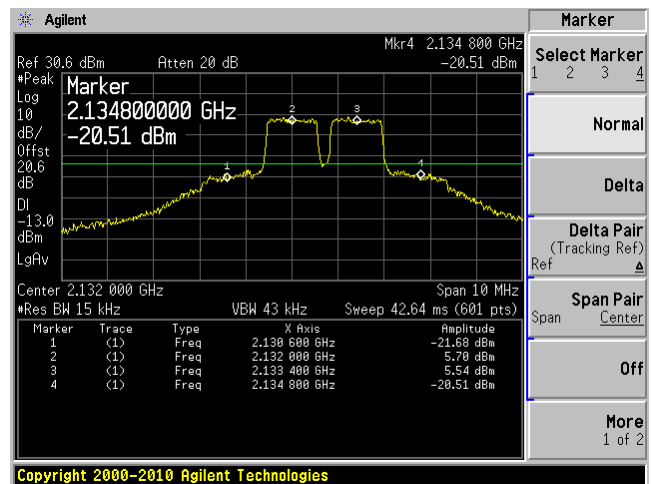


**QPSK (1.4 MHz), (Middle Channel)**

Input

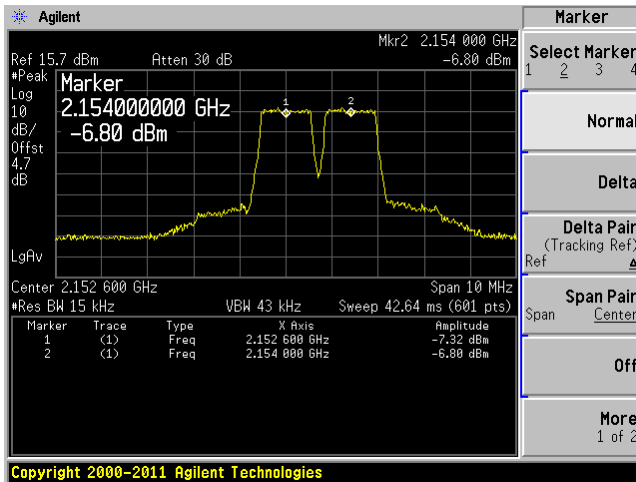


Output

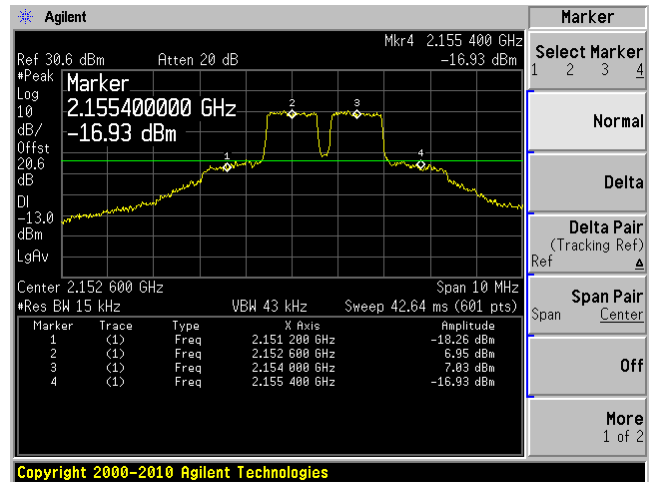


QPSK (1.4 MHz), (High Channel)

Input

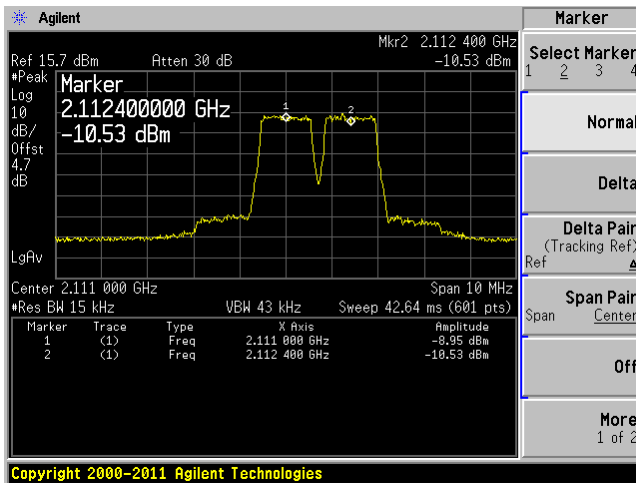


Output

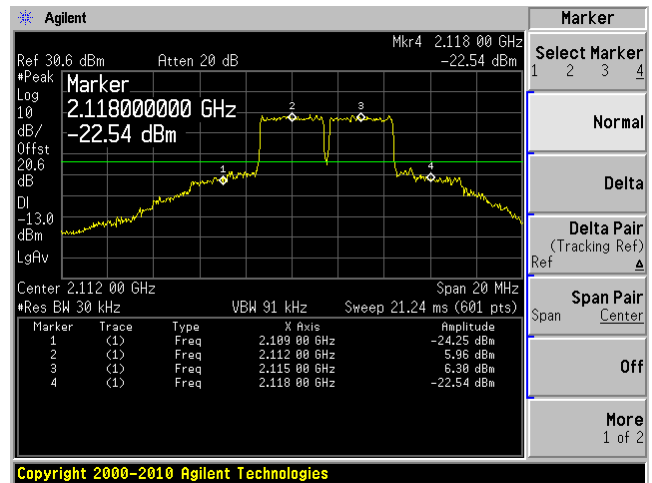


16QAM (1.4 MHz), (Low Channel)

Input

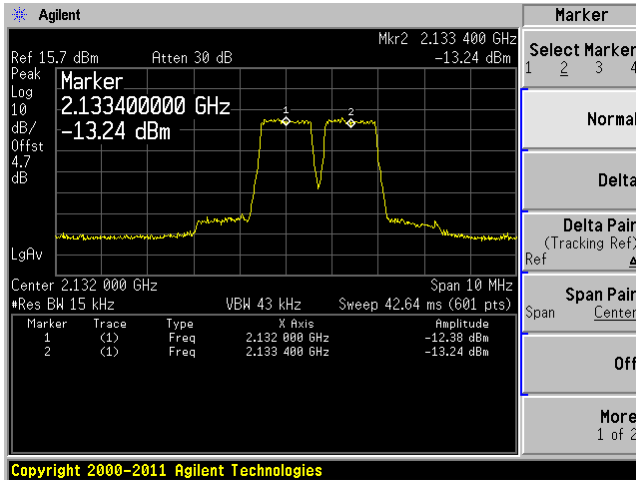


Output

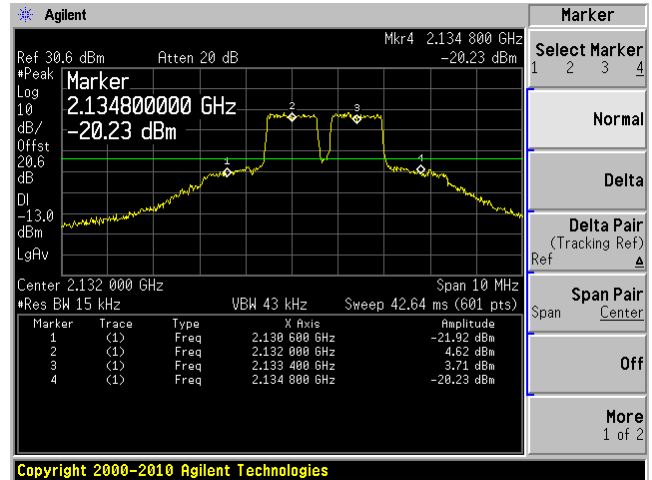


16QAM (1.4 MHz), (Middle Channel)

Input

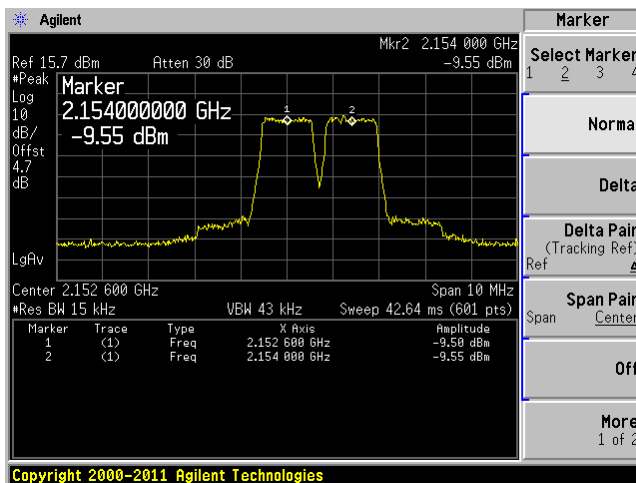


Output

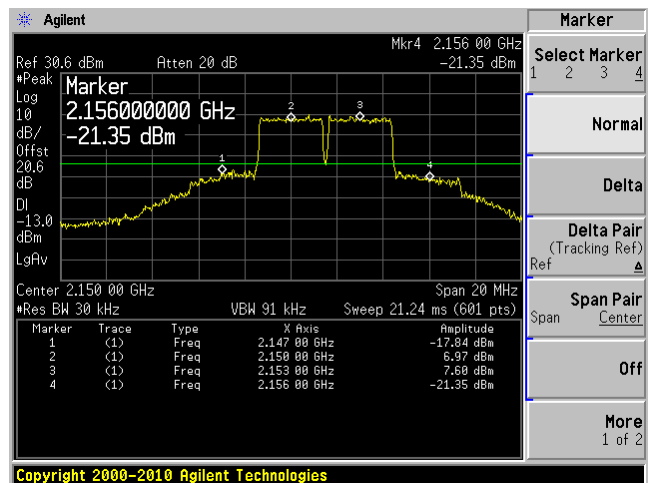


16QAM (1.4 MHz), (High Channel)

Input

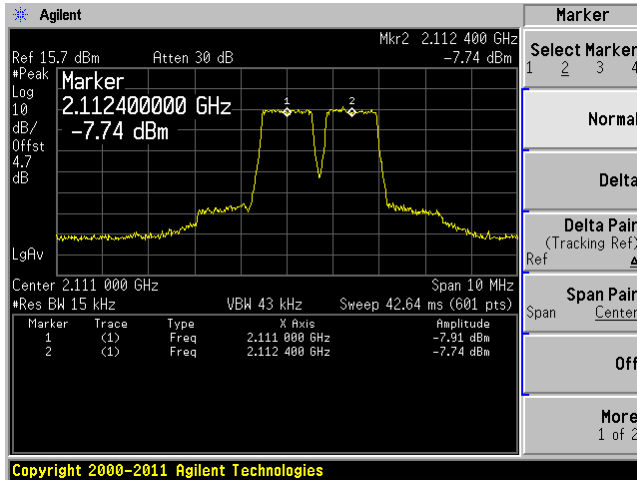


Output

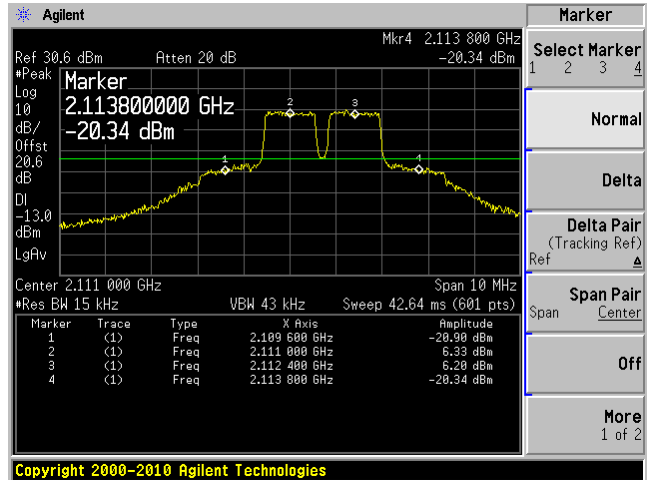


64QAM (1.4 MHz), (Low Channel)

Input

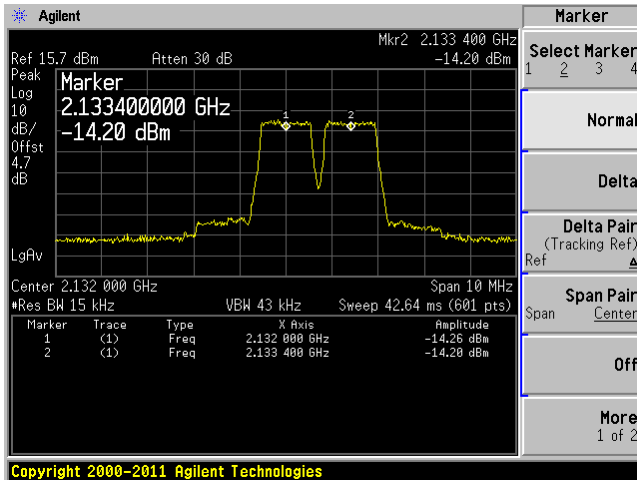


Output

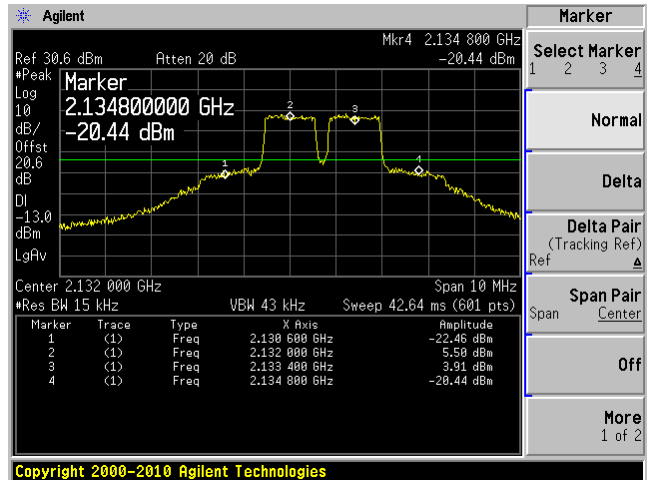


64QAM (1.4 MHz), (Middle Channel)

Input



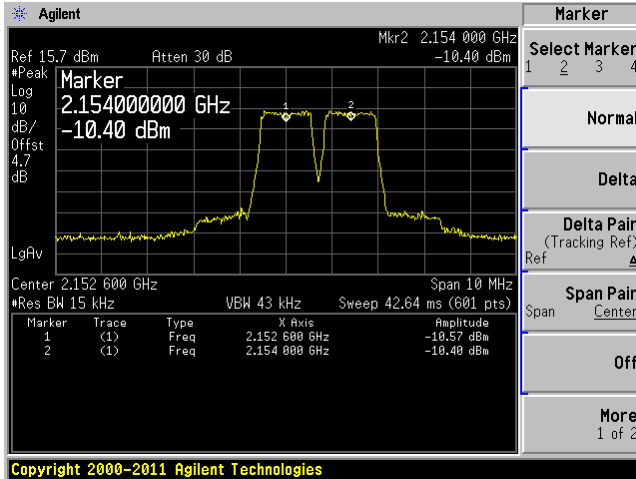
Output



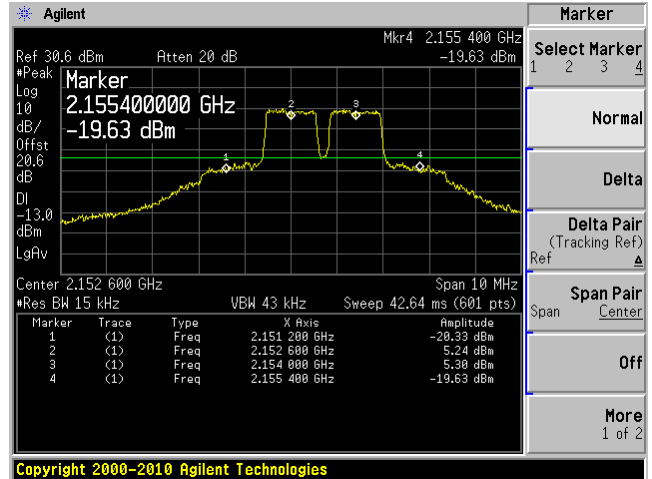


64QAM (1.4 MHz), (High Channel)

Input

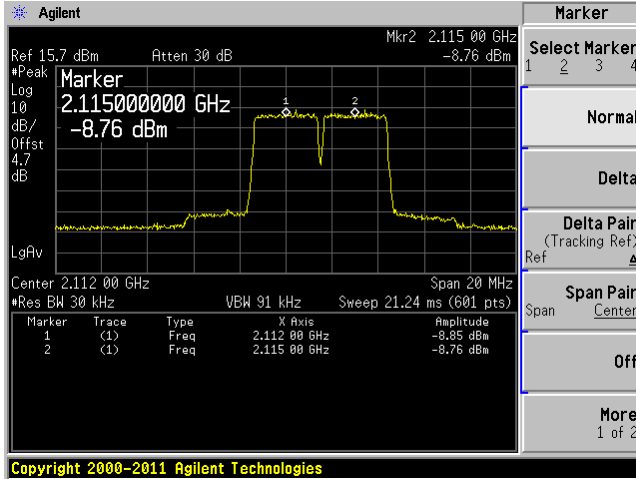


Output

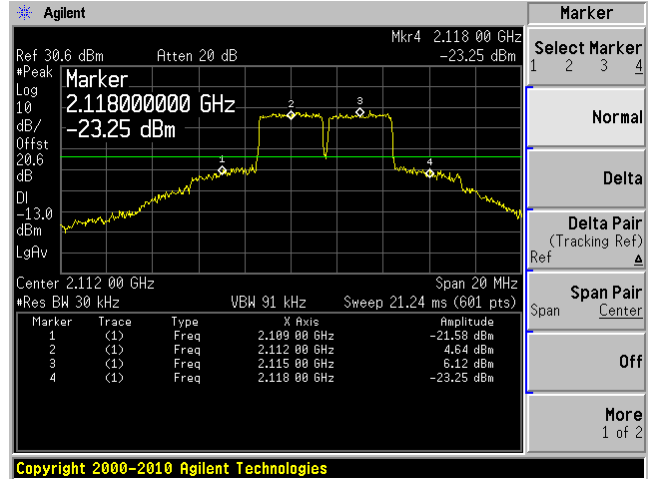


QPSK (3 MHz), (Low Channel)

Input

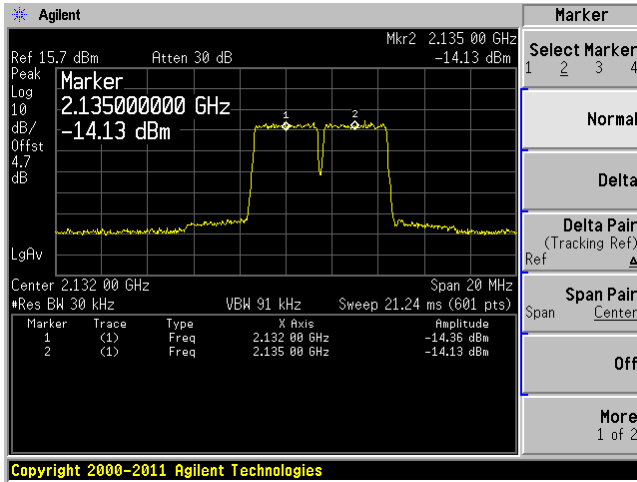


Output

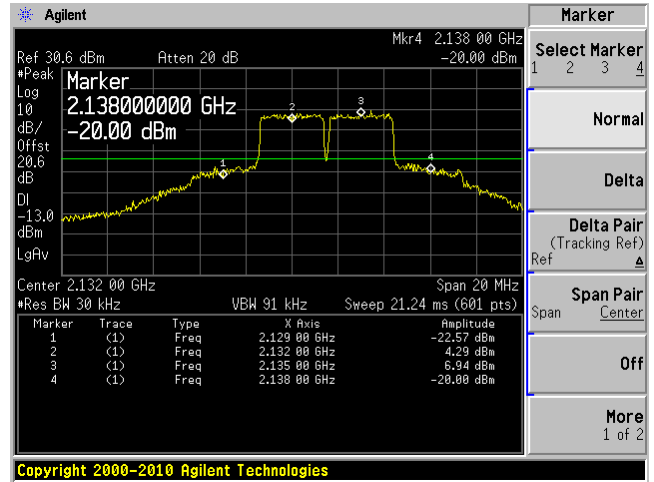


QPSK (3 MHz), (Middle Channel)

Input

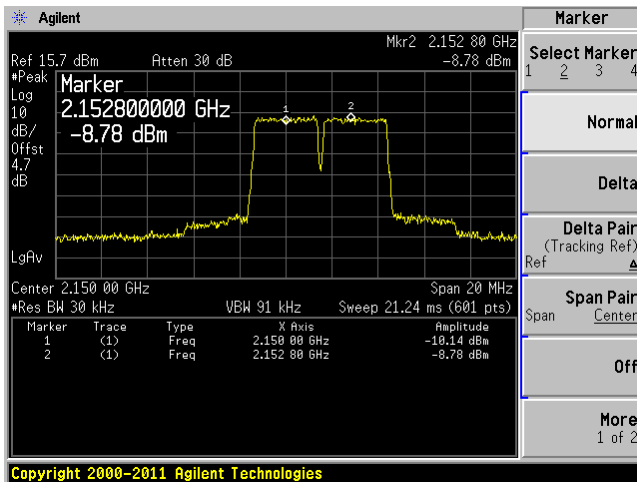


Output

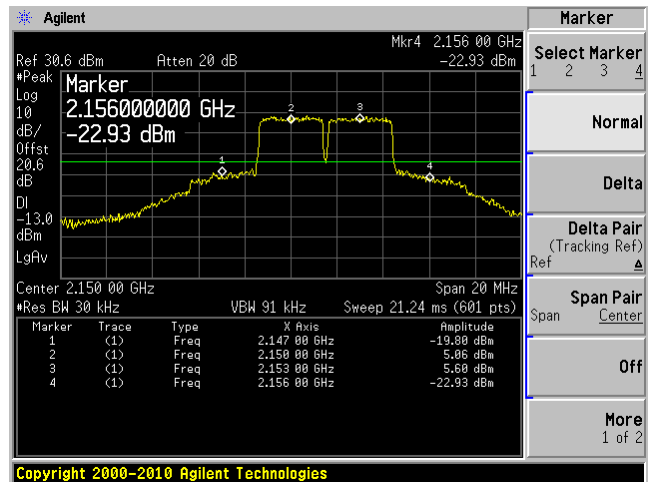


QPSK (3 MHz), (High Channel)

Input

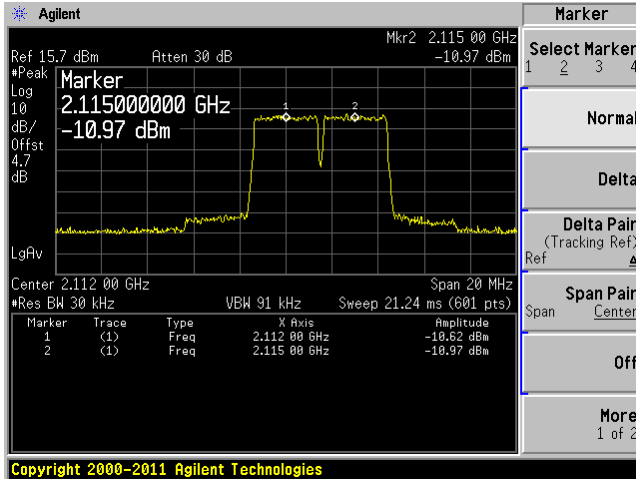


Output

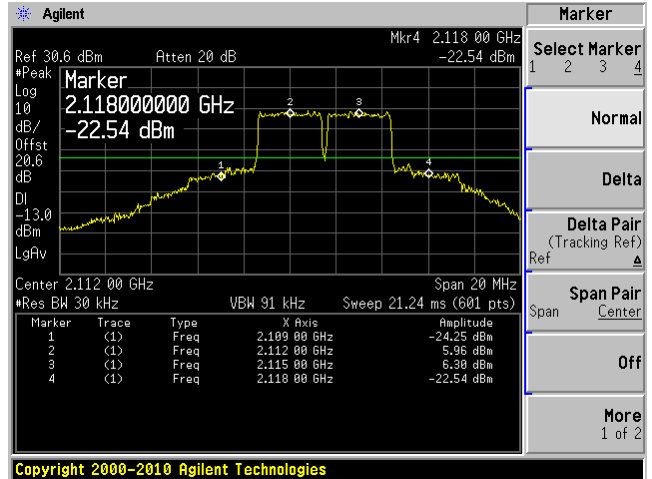


16QAM (3 MHz), (Low Channel)

Input

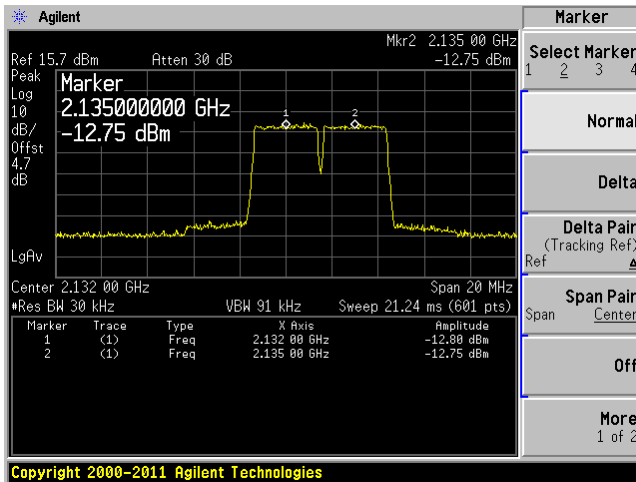


Output

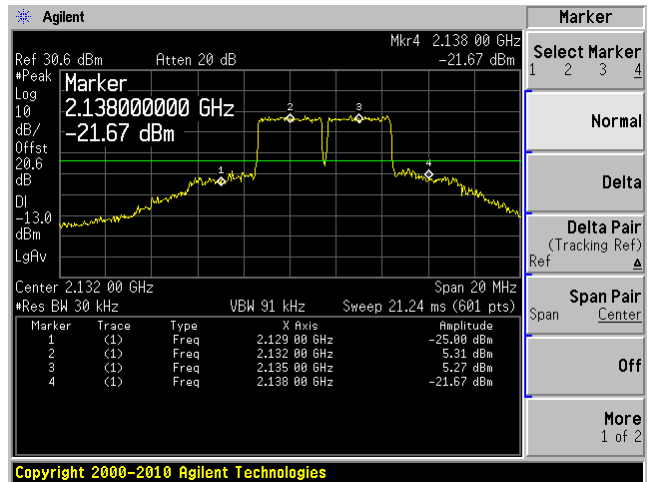


16QAM (3 MHz), (Middle Channel)

Input

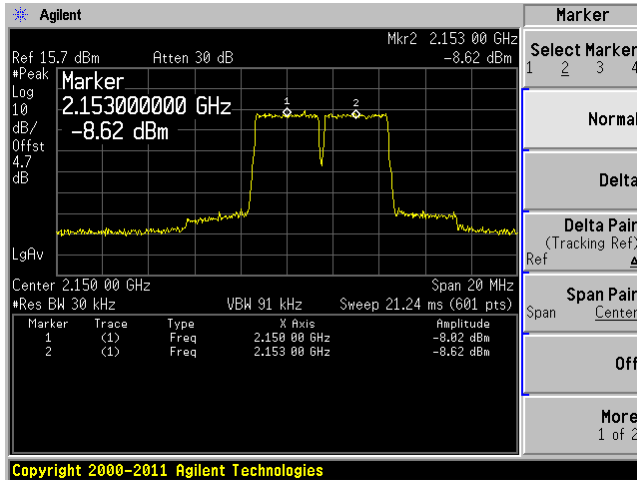


Output

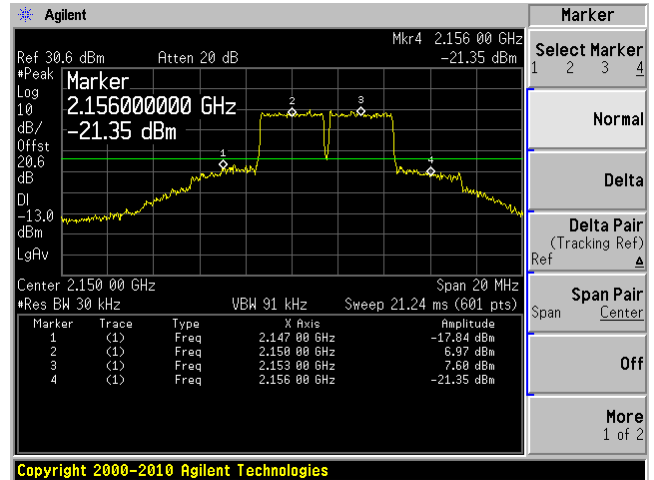


16QAM (3 MHz), (High Channel)

Input

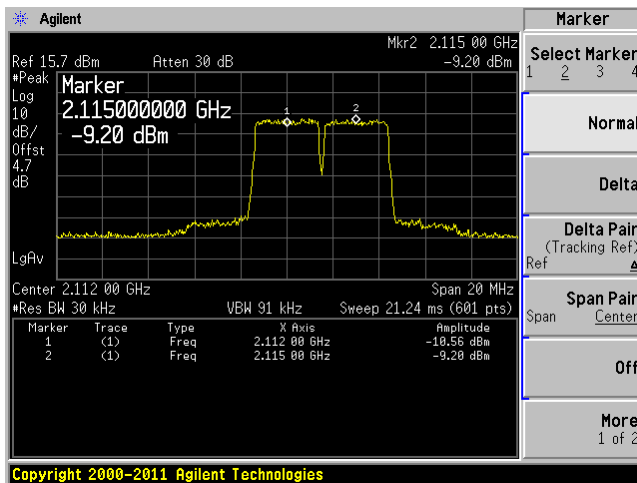


Output

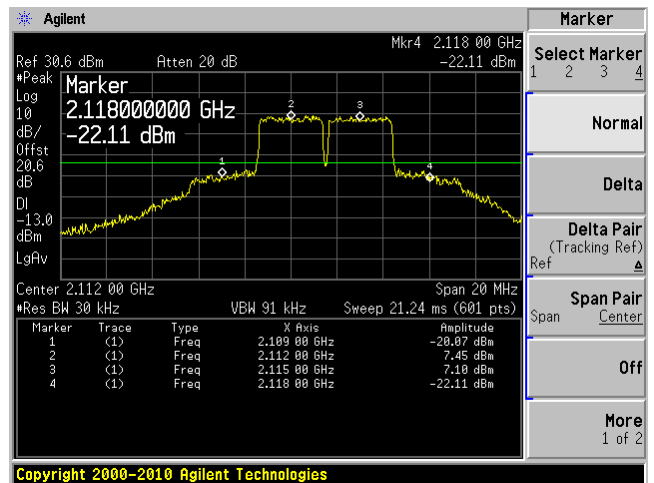


64QAM (3 MHz), (Low Channel)

Input

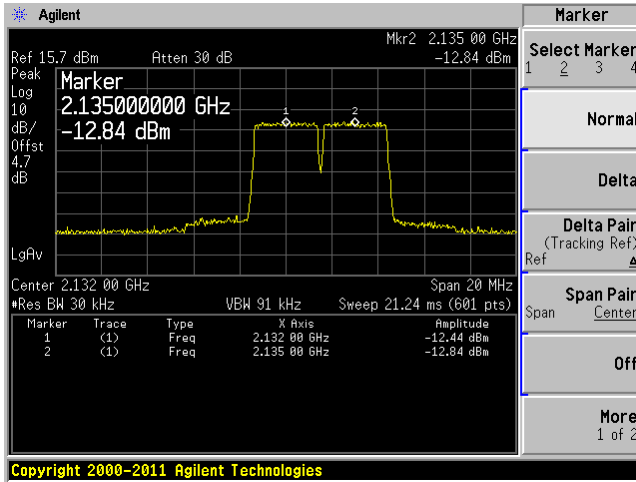


Output

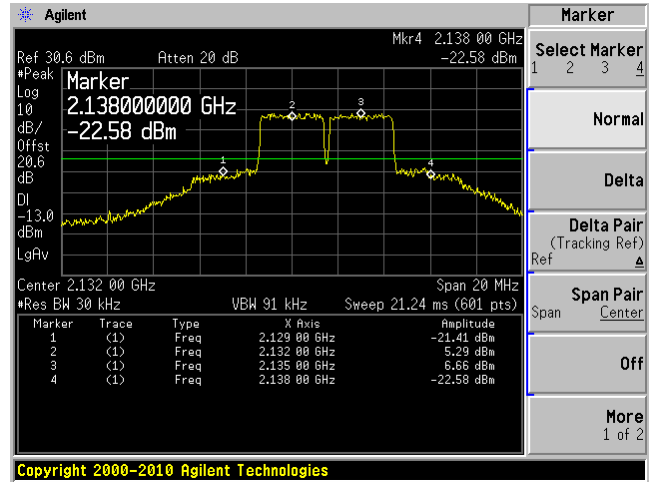


64QAM (3 MHz), (Middle Channel)

Input

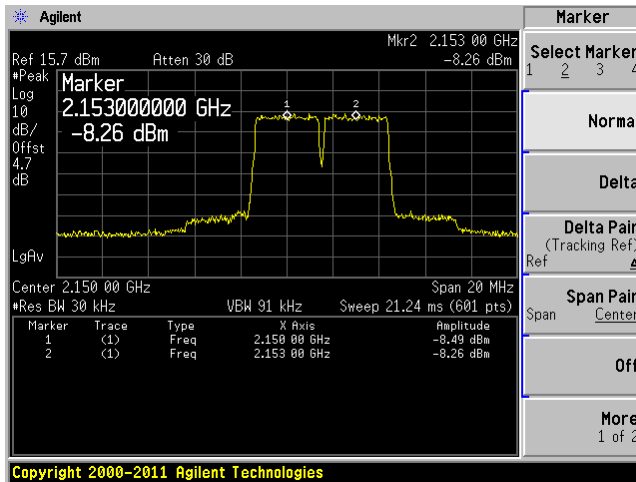


Output

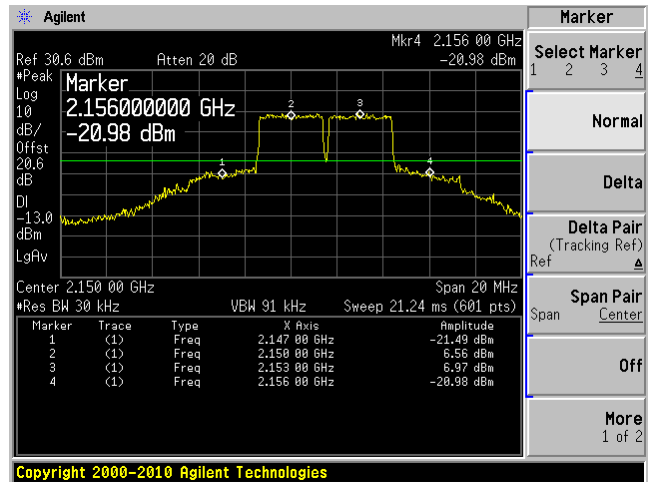


64QAM (3 MHz), (High Channel)

Input

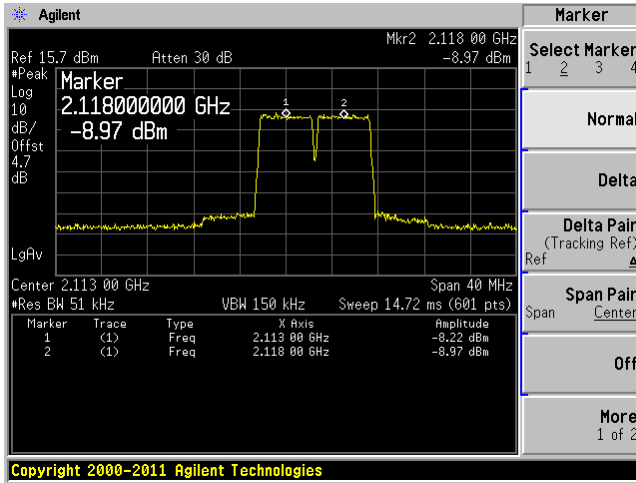


Output

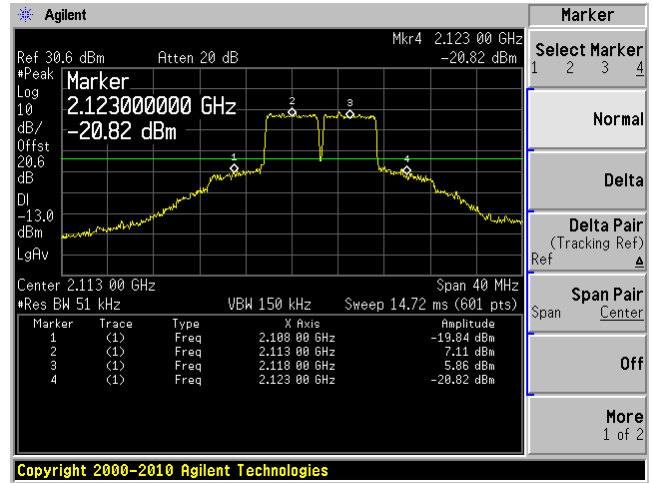


QPSK (5 MHz), (Low Channel)

Input

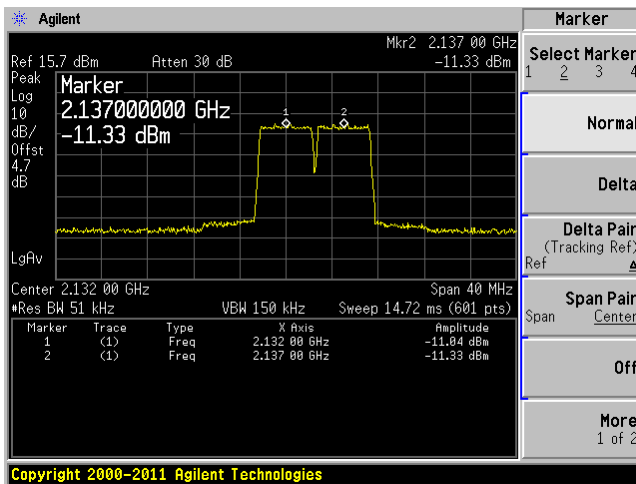


Output

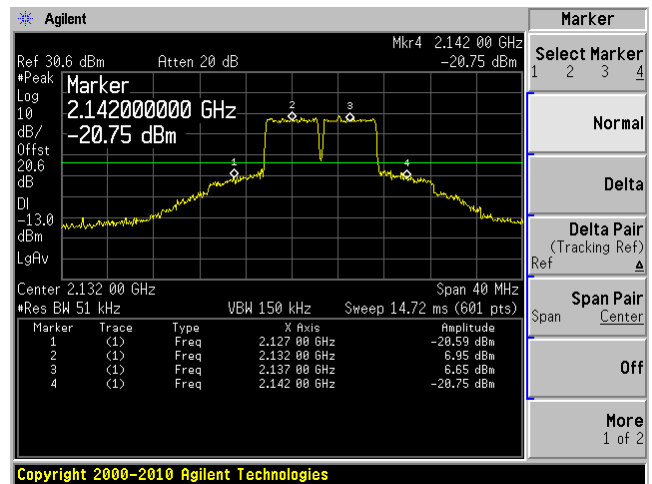


QPSK (5 MHz), (Middle Channel)

Input

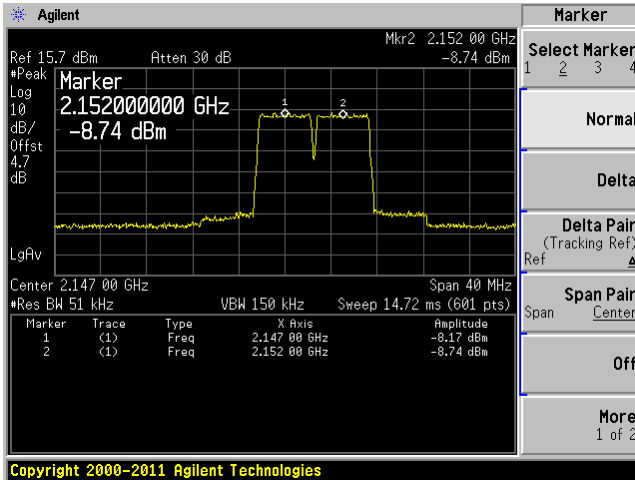


Output

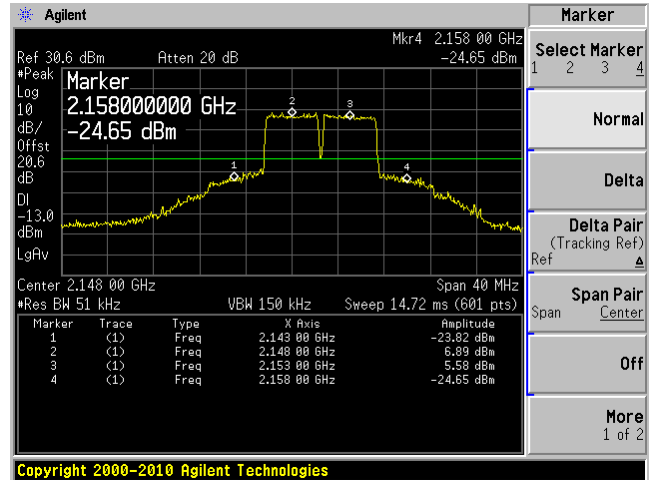


QPSK (5 MHz), (High Channel)

Input

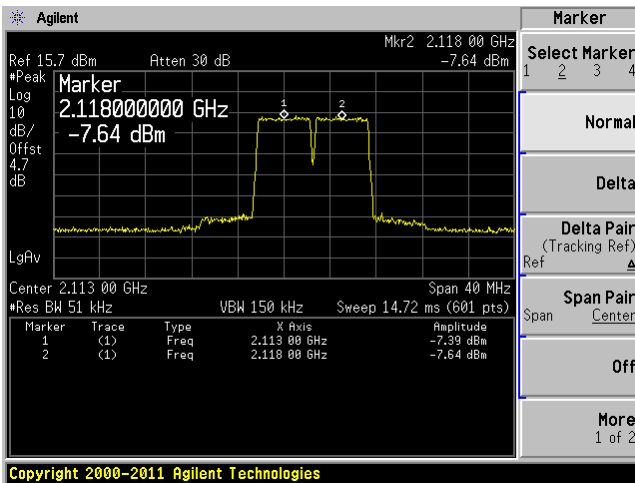


Output

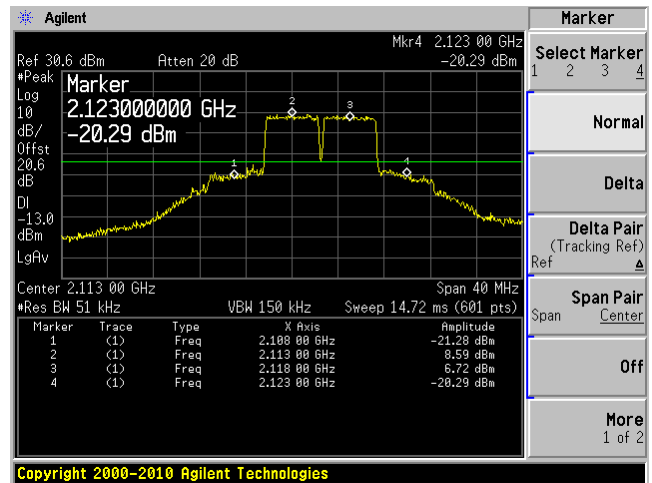


16QAM (5 MHz), (Low Channel)

Input

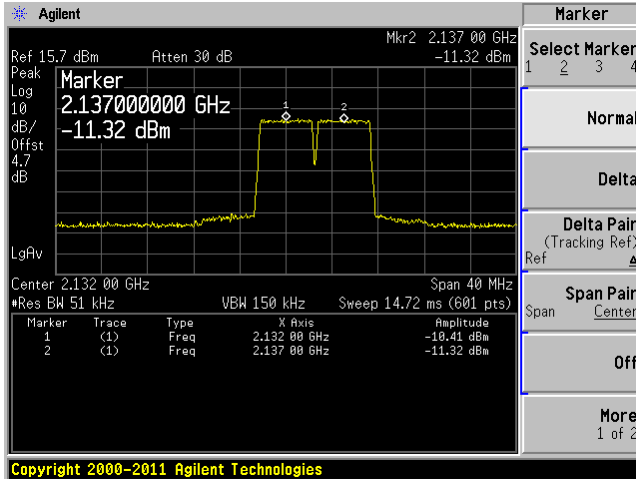


Output

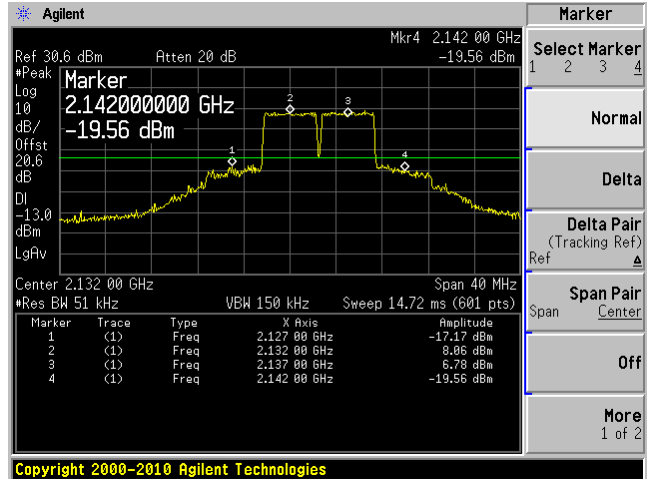


16QAM (5 MHz), (Middle Channel)

Input

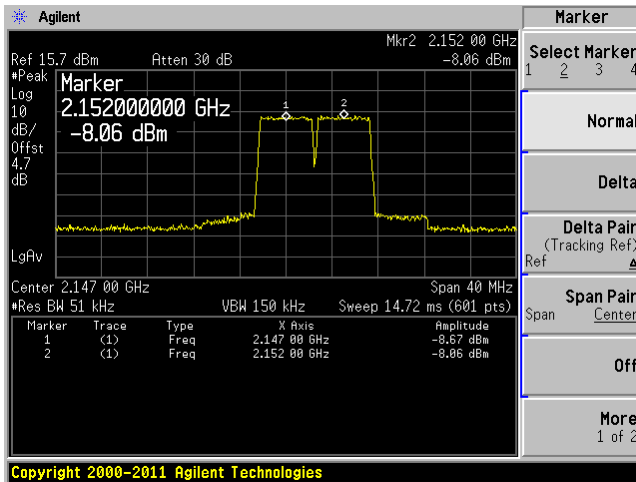


Output

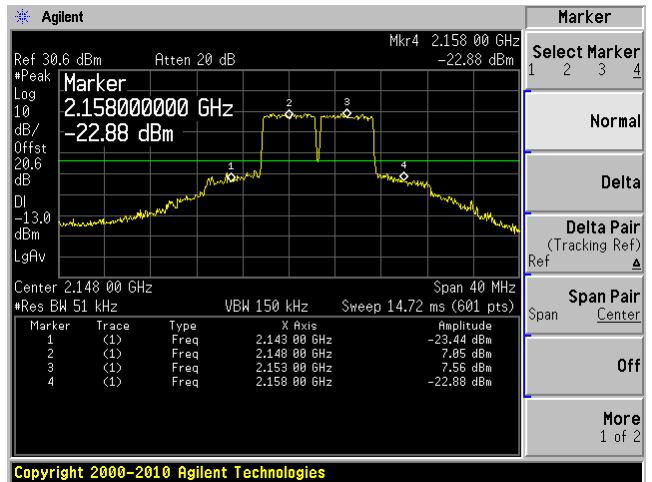


16QAM (5 MHz), (High Channel)

Input



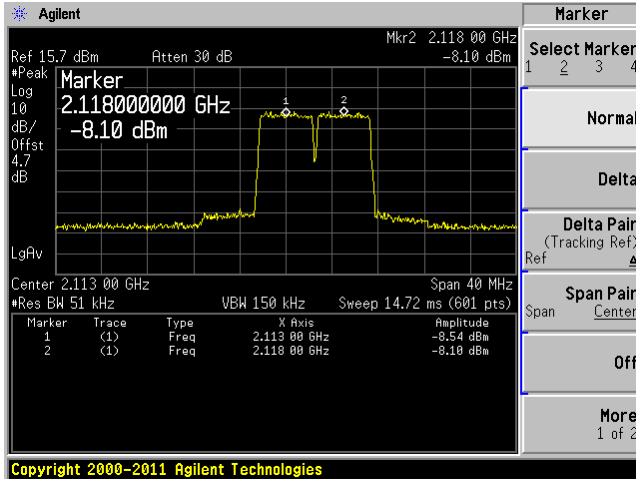
Output



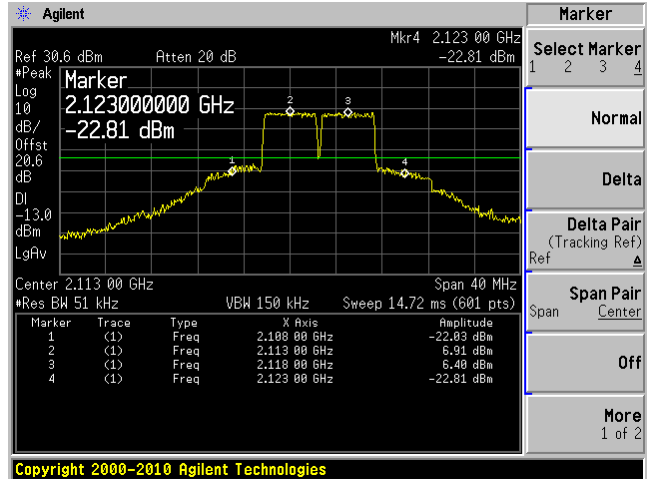


64QAM (5 MHz), (Low Channel)

Input

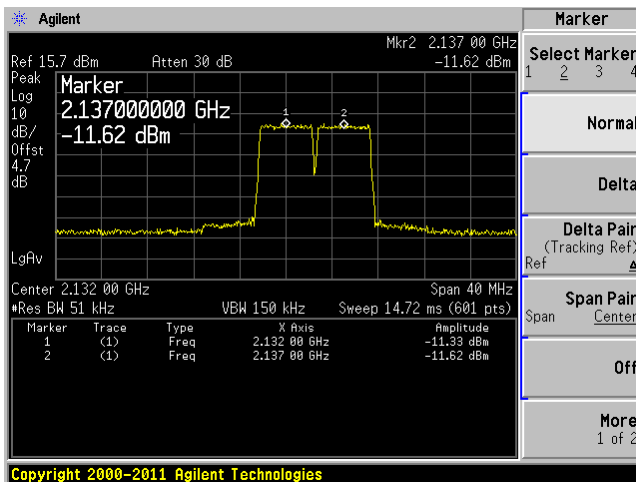


Output

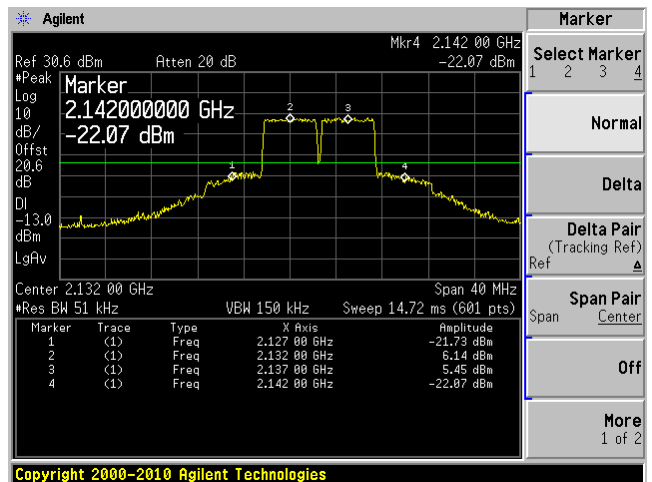


64QAM (5 MHz), (Middle Channel)

Input

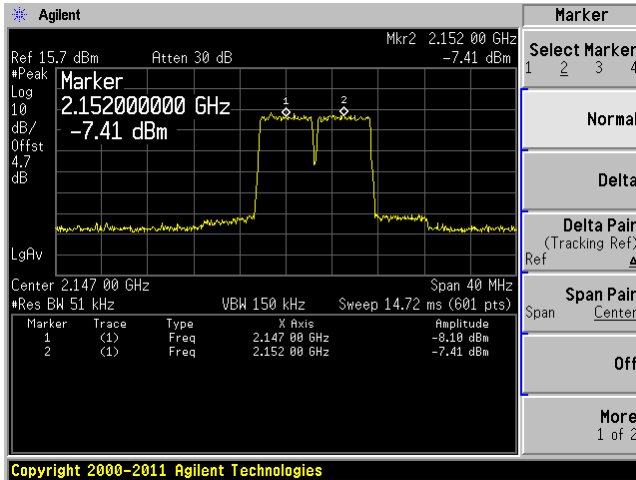


Output

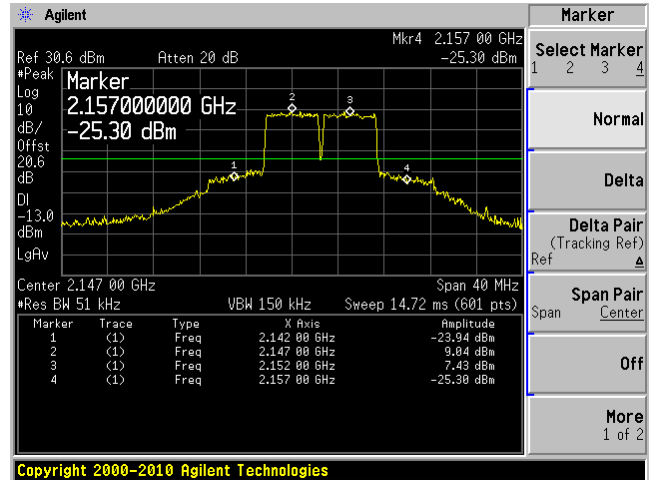


64QAM (5 MHz), (High Channel)

Input

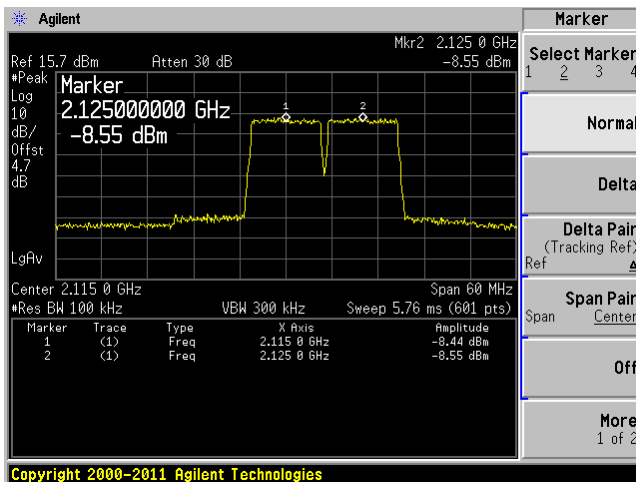


Output

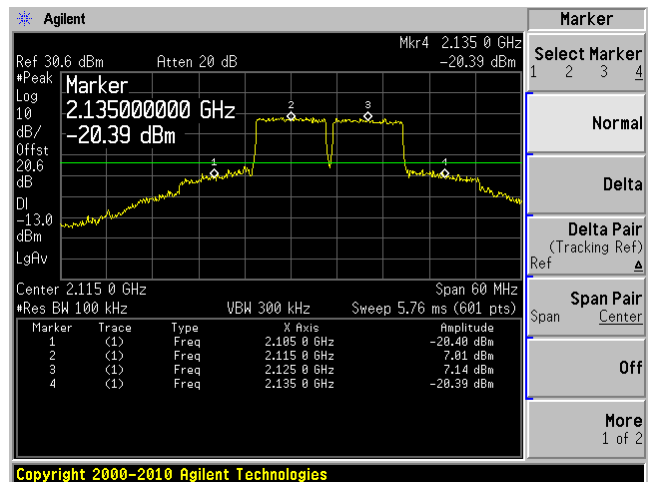


QPSK (10 MHz), (Low Channel)

Input

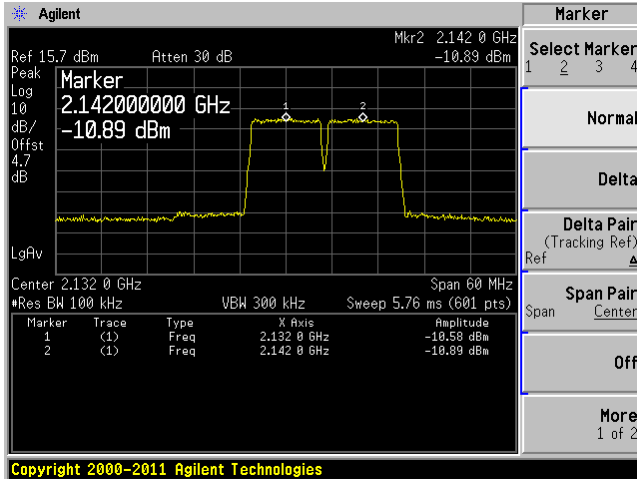


Output

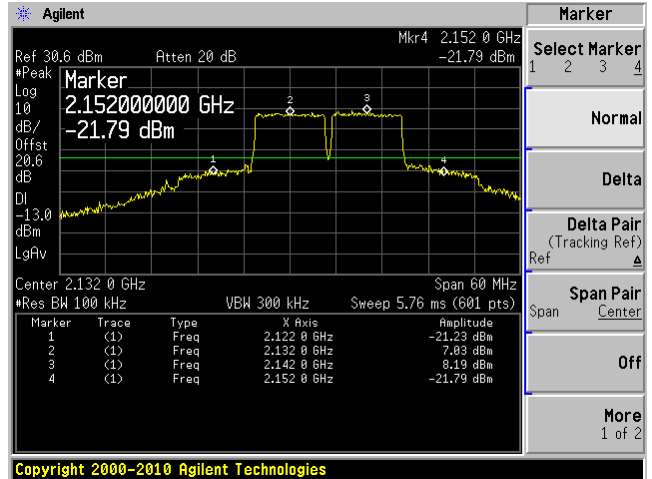


QPSK (10 MHz), (Middle Channel)

Input

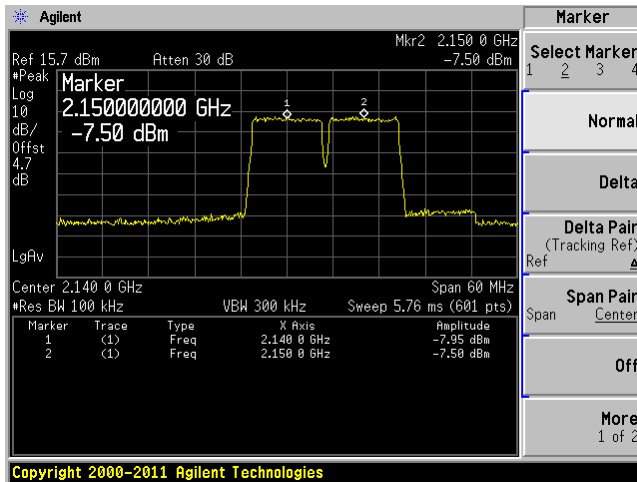


Output

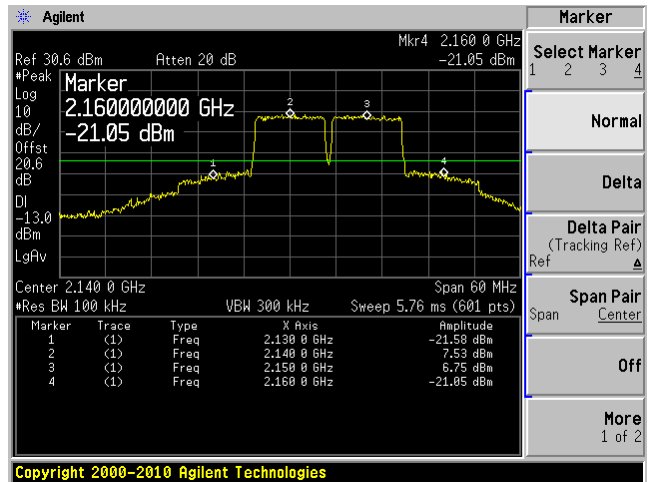


QPSK (10 MHz), (High Channel)

Input

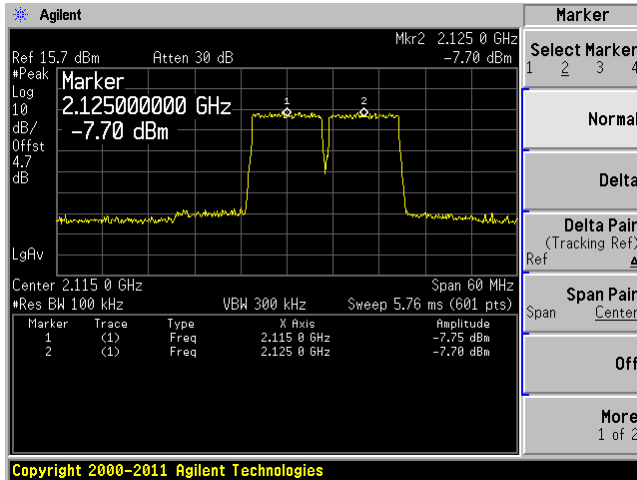


Output

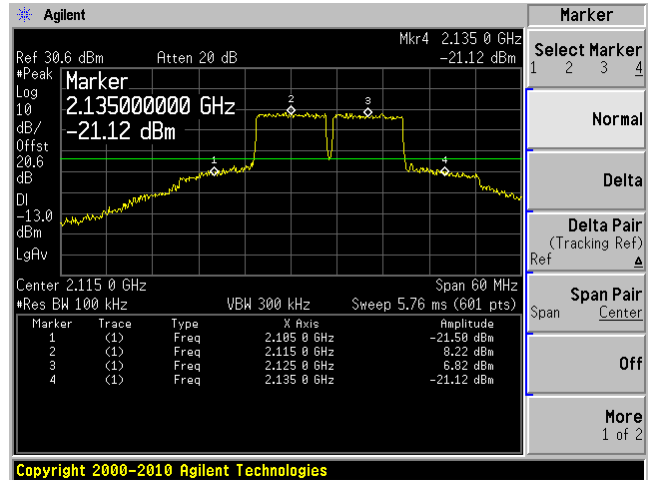


16QAM (10 MHz), (Low Channel)

Input

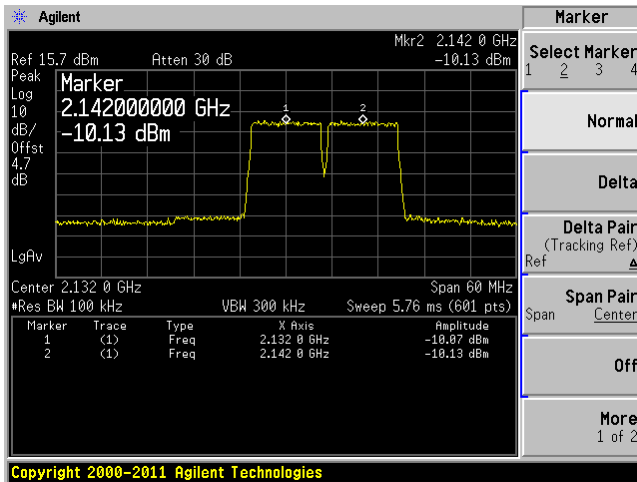


Output

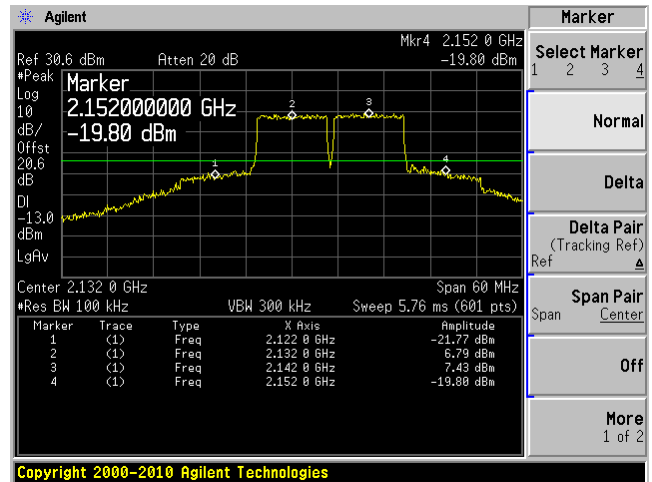


16QAM (10 MHz), (Middle Channel)

Input

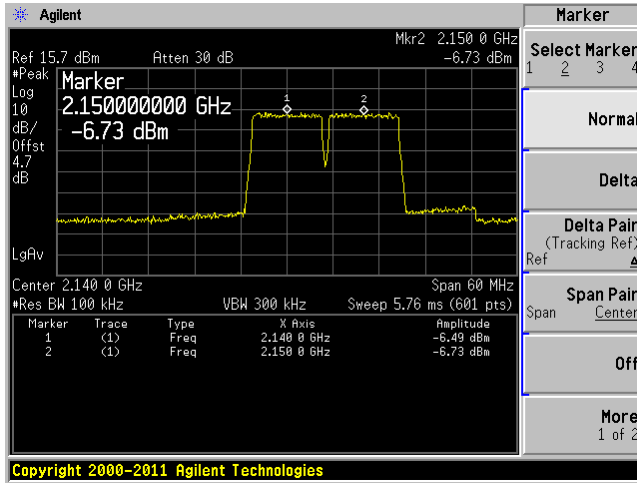


Output

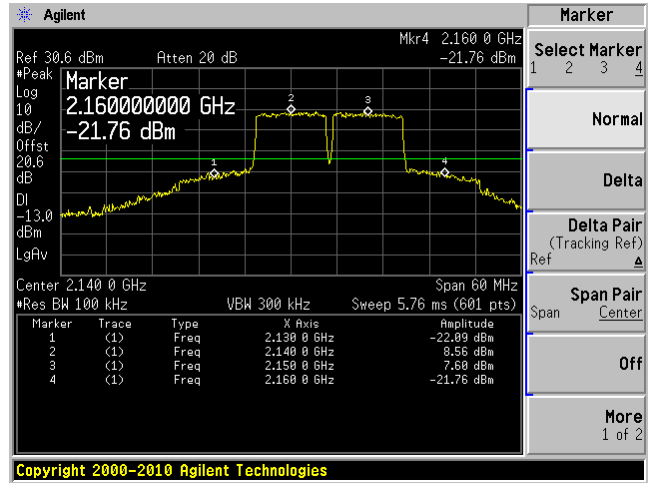


16QAM (10 MHz), (High Channel)

Input

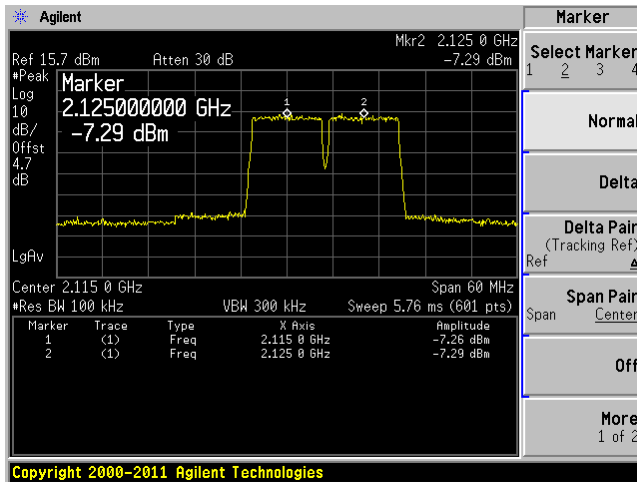


Output

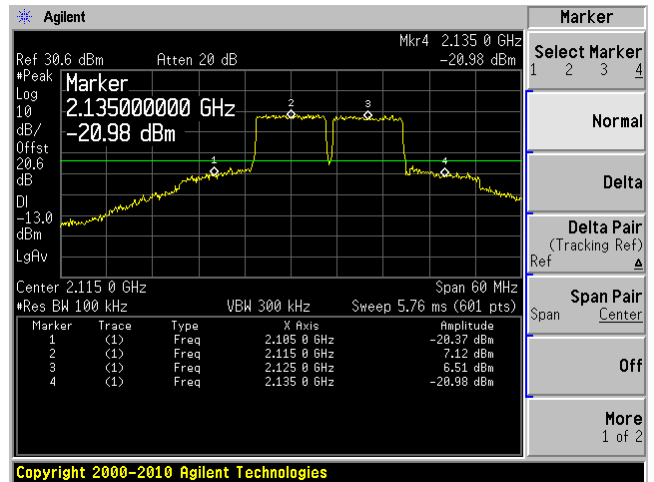


64QAM (10 MHz), (Low Channel)

Input

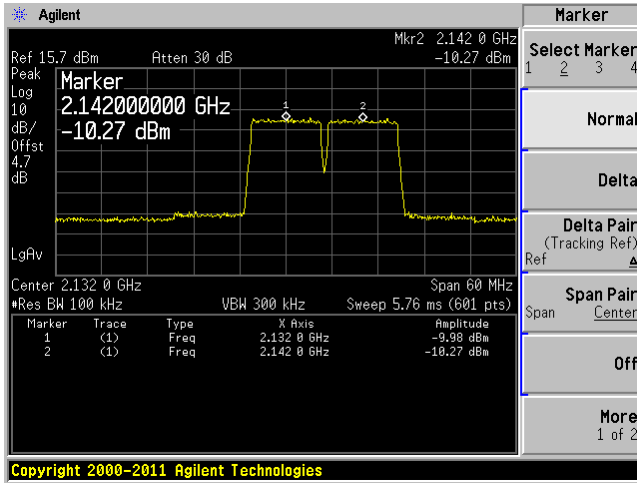


Output

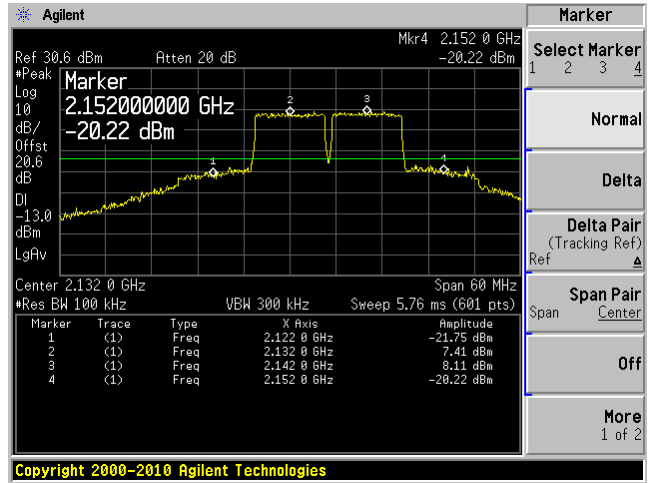


64QAM (10 MHz), (Middle Channel)

Input

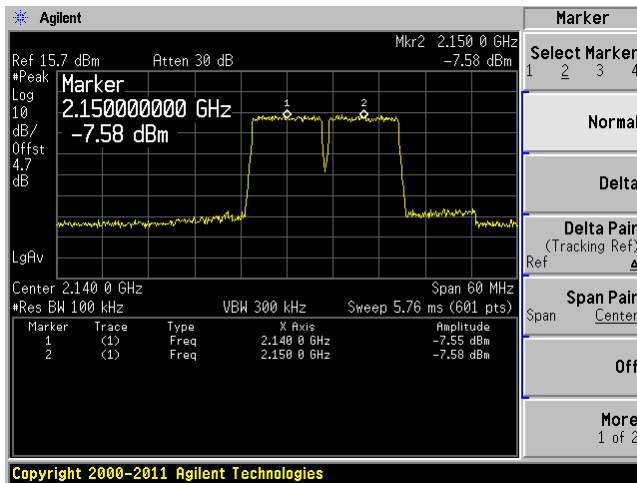


Output

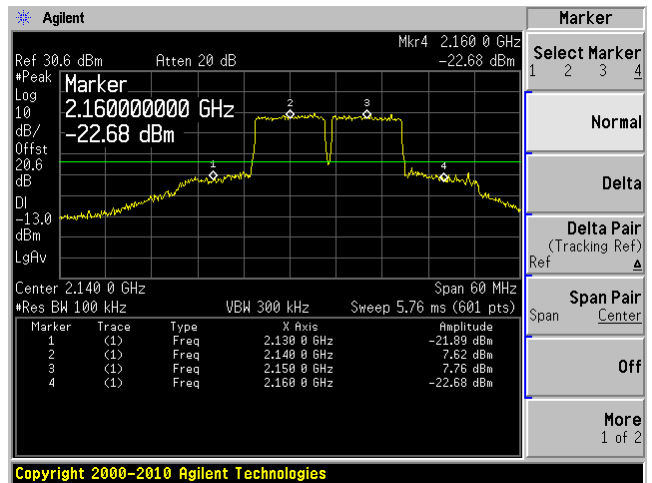


64QAM (10 MHz), (High Channel)

Input



Output



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

### 8.1 Applicable Standards

Requirements: FCC §2.1053, §22.917, §24.238 and §27.53, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 8.2 Test Procedure

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

### 8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	PSA, Series Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Agilent	Generator, Signal	E4438C	MY45091309	2013-05-30	1 year

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

### 8.4 Test Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	45 %
<b>ATM Pressure:</b>	101.92 kPa

*The testing was performed by Glenn Escano from 2013-09-04 at RF Site.*

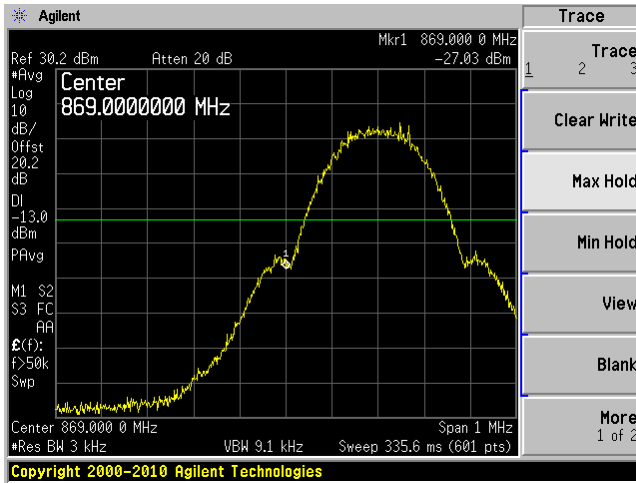
### 8.5 Test Results

Please refer to the following plots.

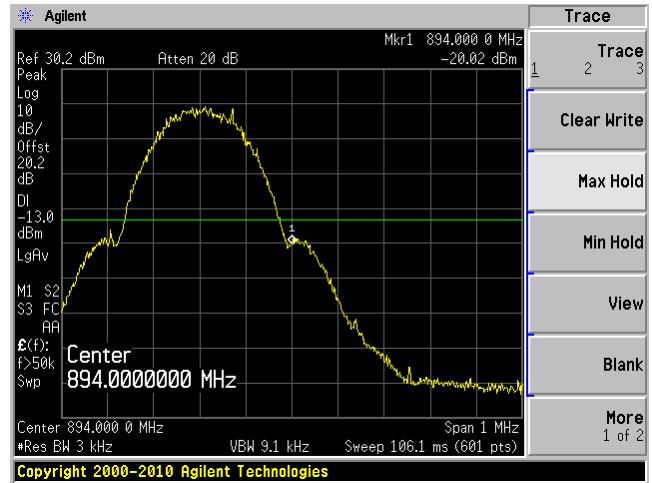
### Cell Band, Downlink

#### GSM/GPRS

Low Channel

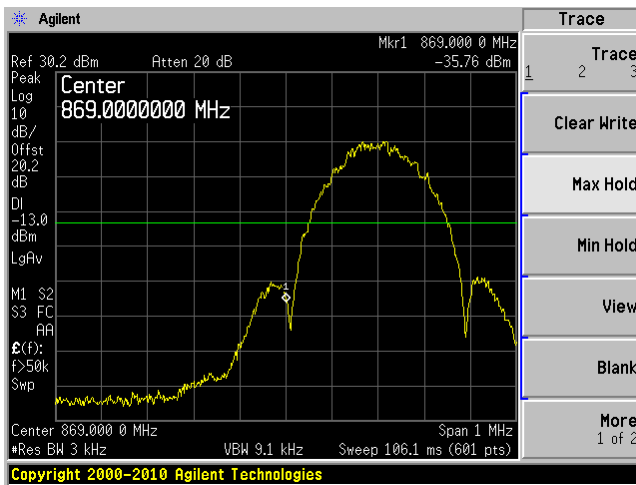


High Channel

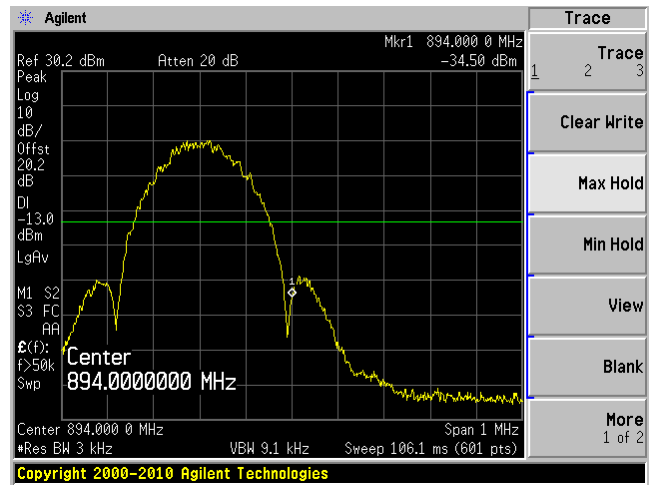


#### EDGE

Low Channel



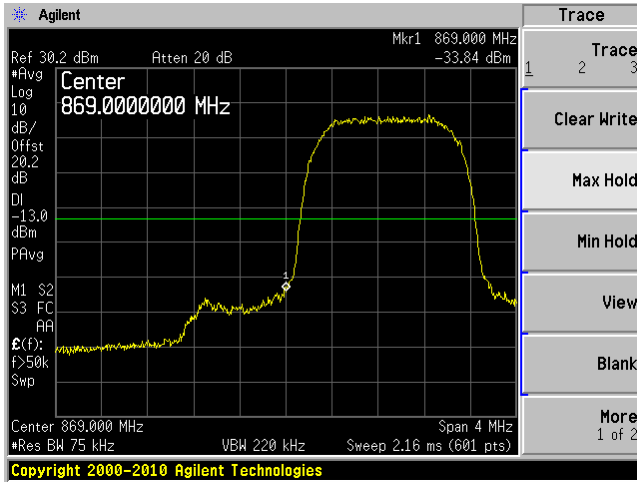
High Channel



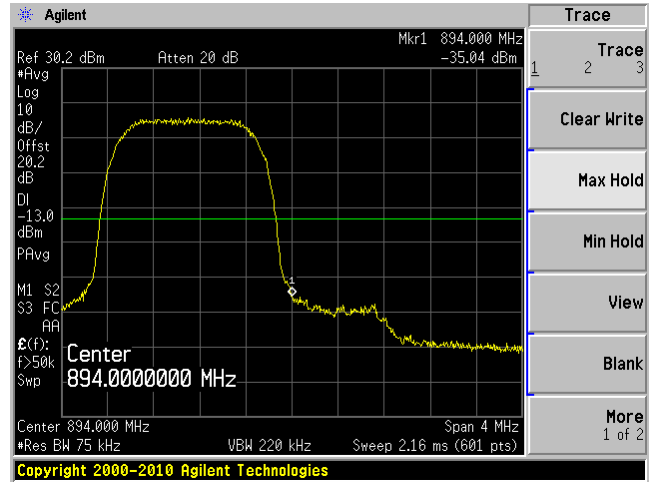


CDMA/EVDO

Low Channel

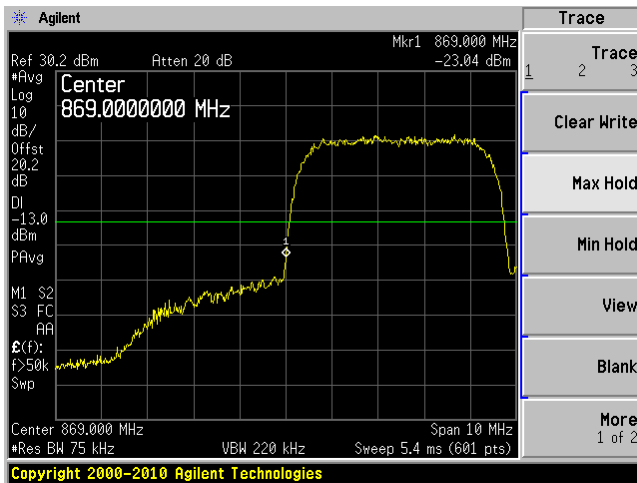


High Channel

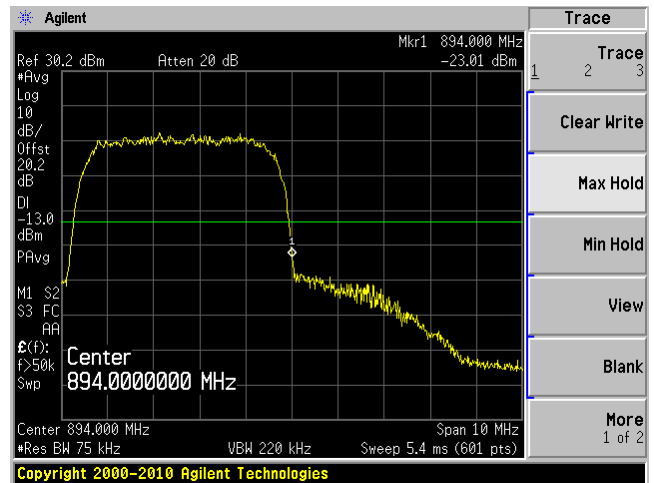


WCDMA/HSPA

Low Channel



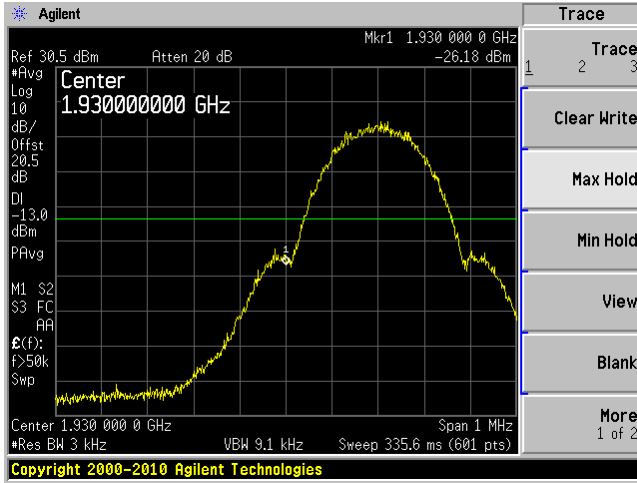
High Channel



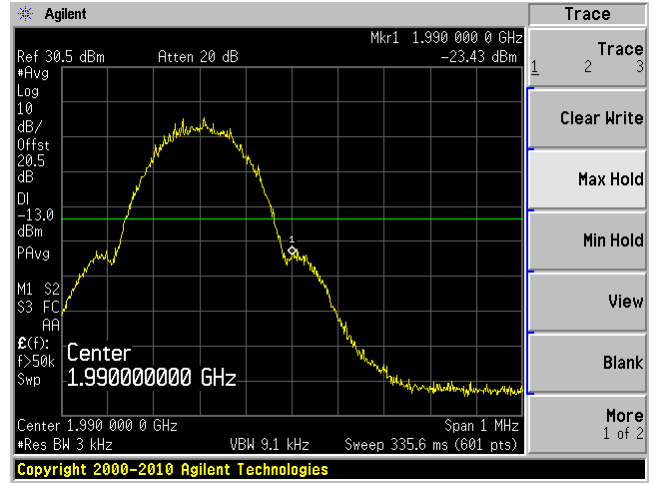
### PCS Band, Downlink

#### GSM/GPRS

Low Channel

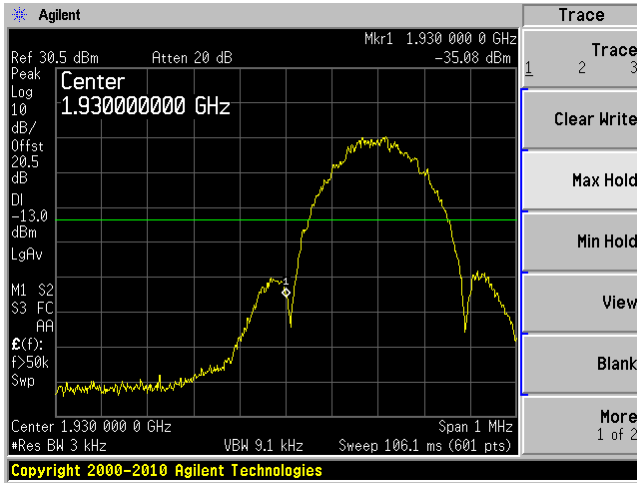


High Channel

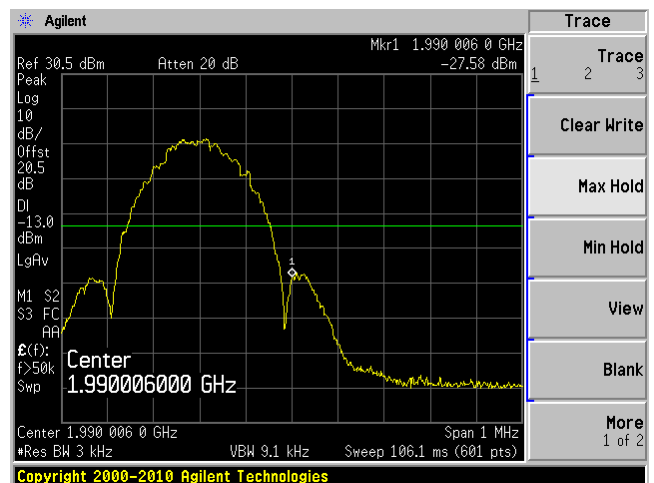


#### EDGE

Low Channel



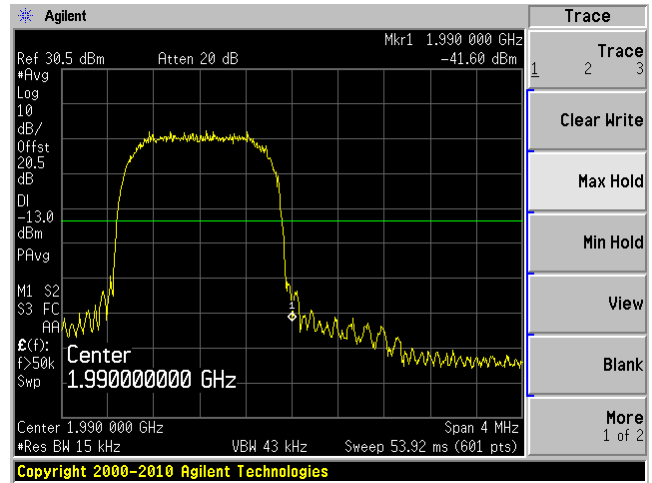
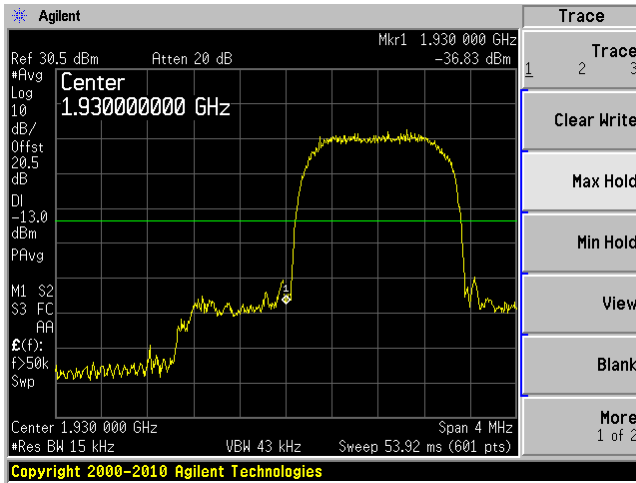
High Channel



CDMA/EVDO

Low Channel

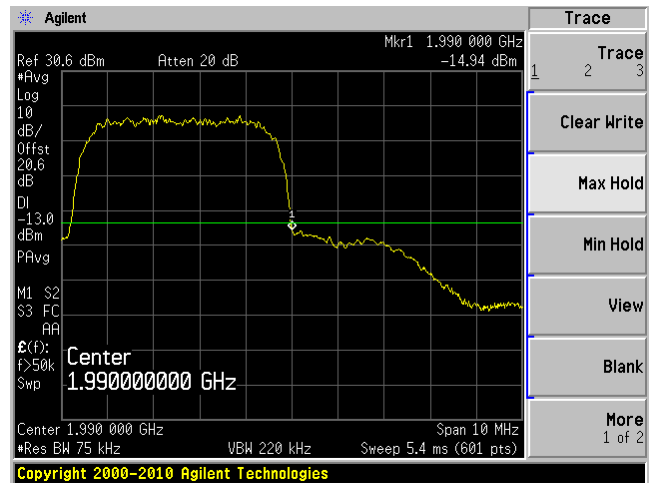
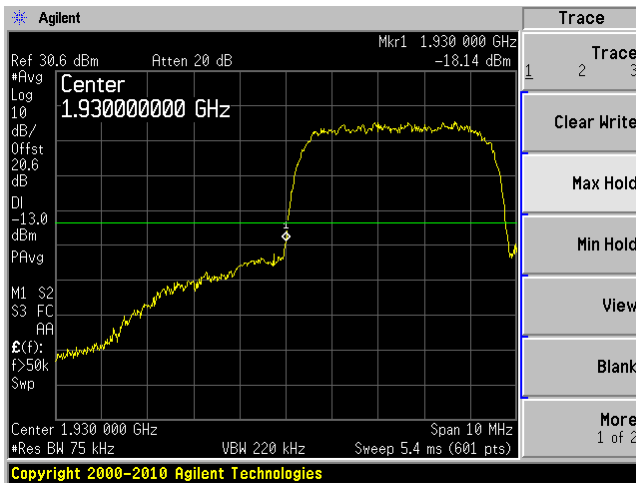
High Channel



WCDMA/HSPA

Low Channel

High Channel

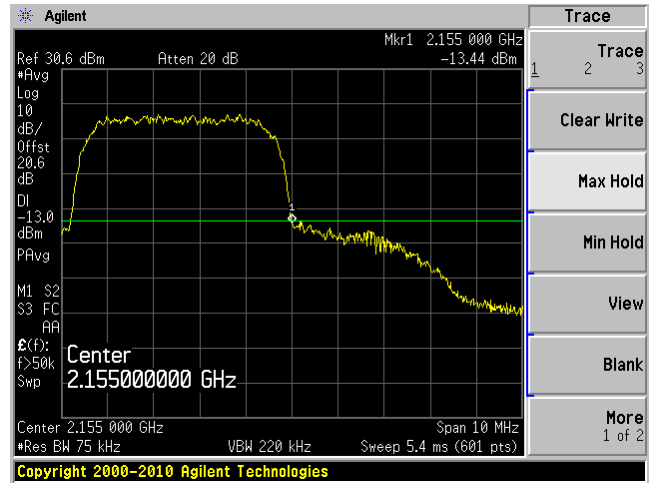
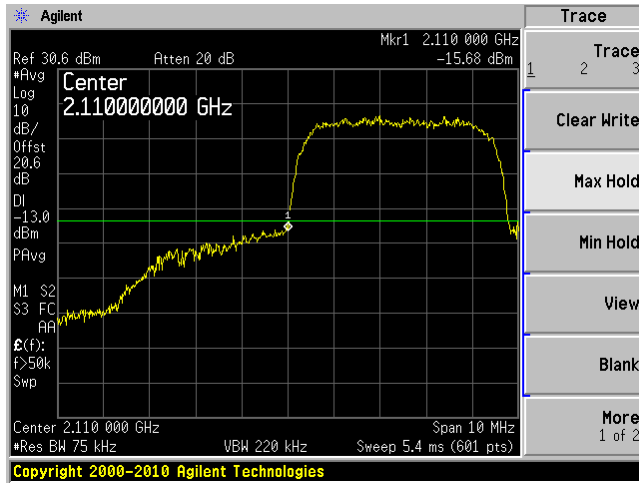


### AWS Band, Downlink

### WCDMA/HSPA

Low Channel

High Channel

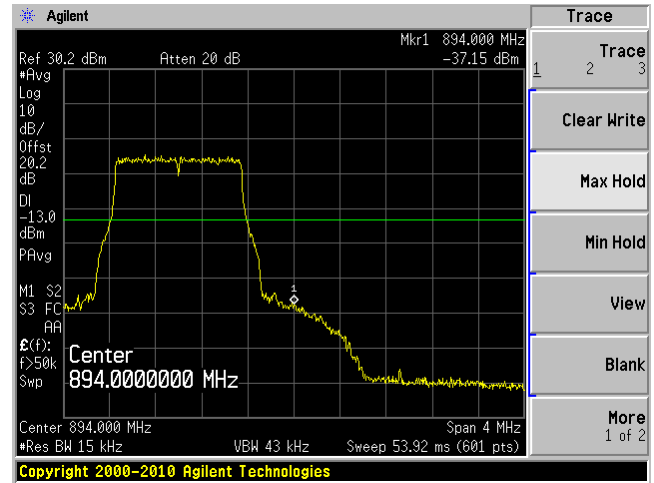
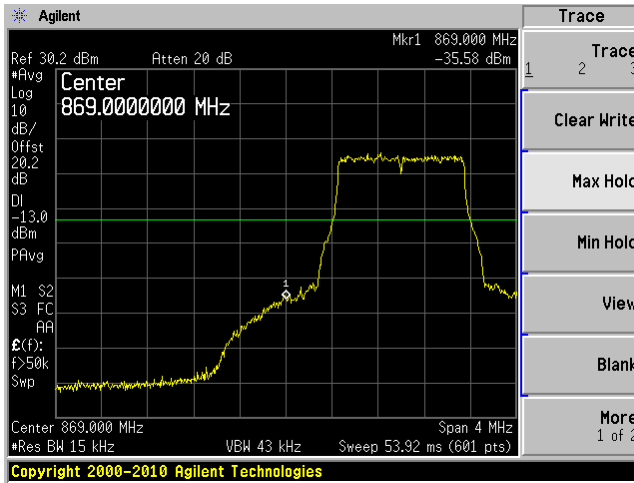


### Cell LTE Band, Downlink

#### QPSK (1.4 MHz)

Low Channel

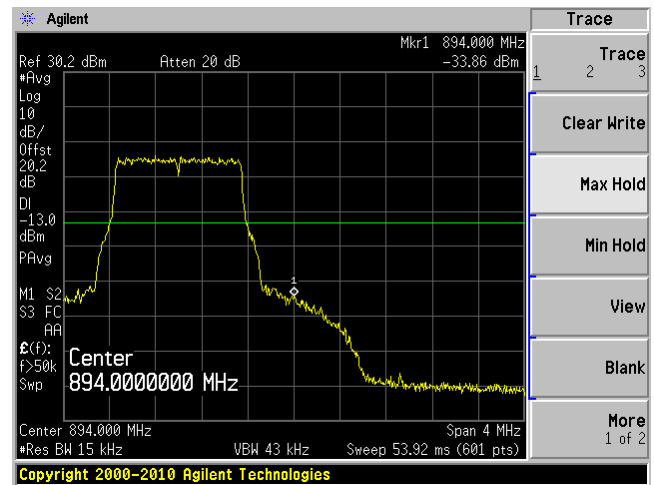
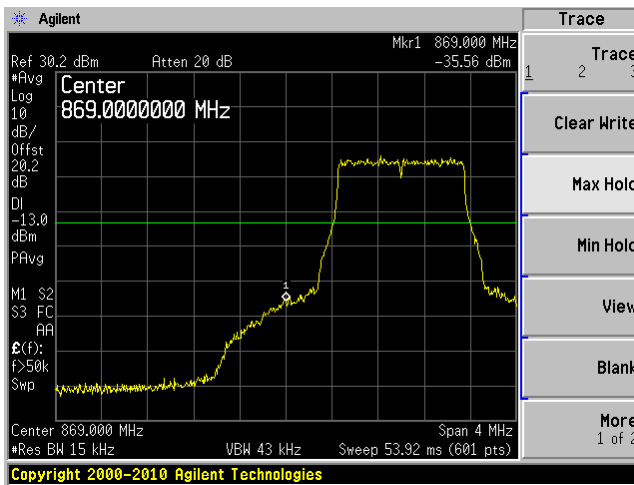
High Channel



#### 16QAM (1.4 MHz)

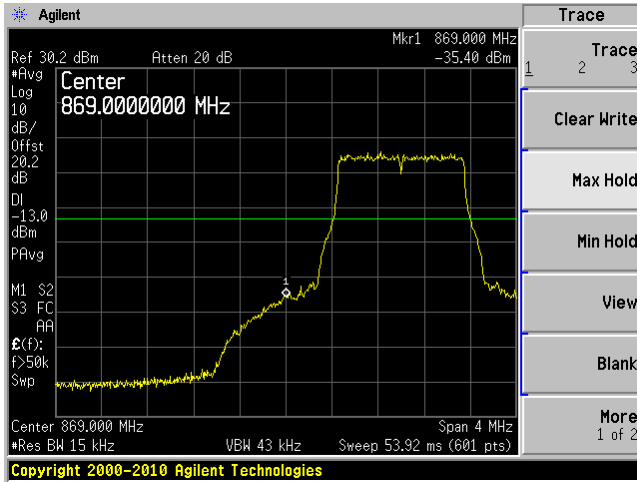
Low Channel

High Channel

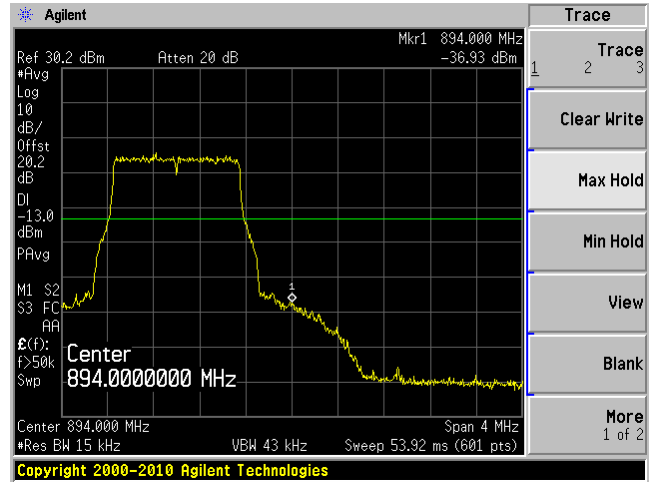


### 64QAM (1.4 MHz)

Low Channel

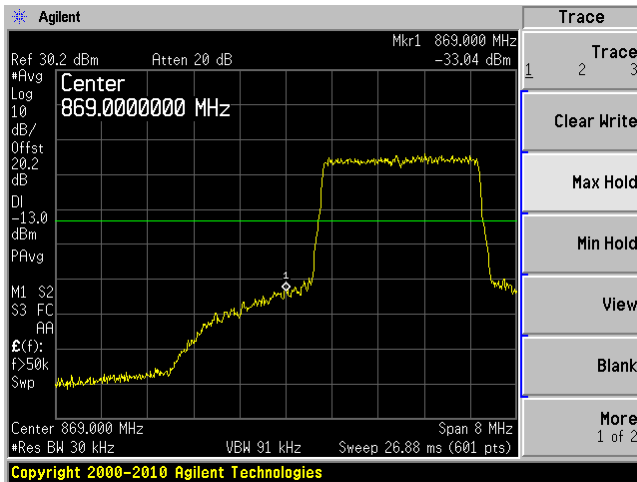


High Channel

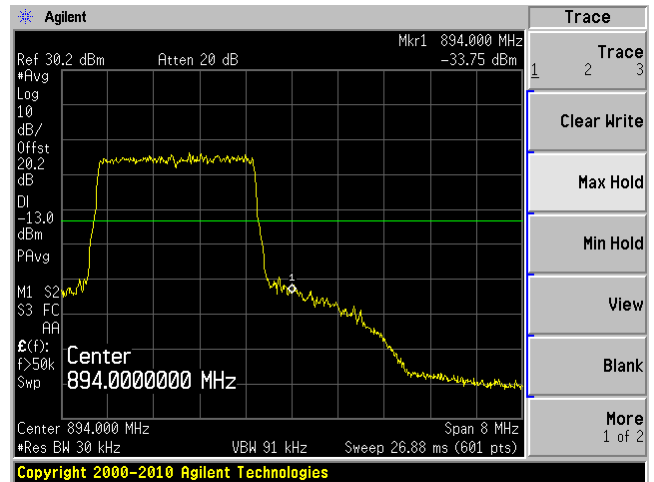


### QPSK (3 MHz)

Low Channel

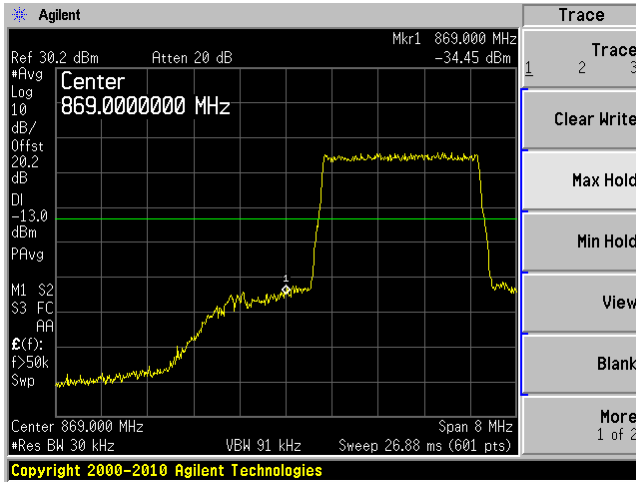


High Channel

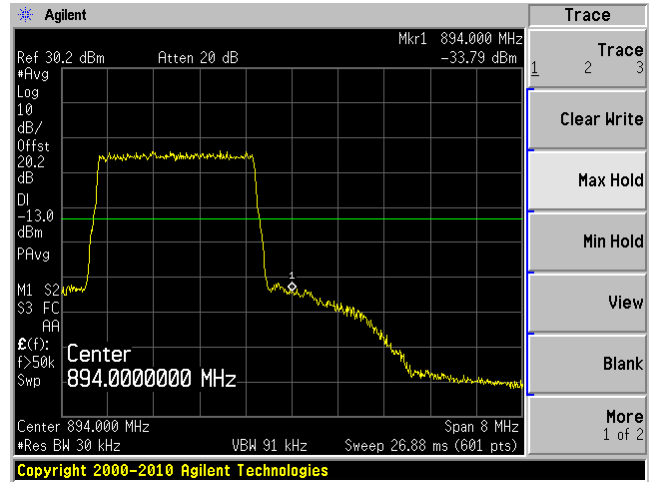


16QAM (3 MHz)

Low Channel

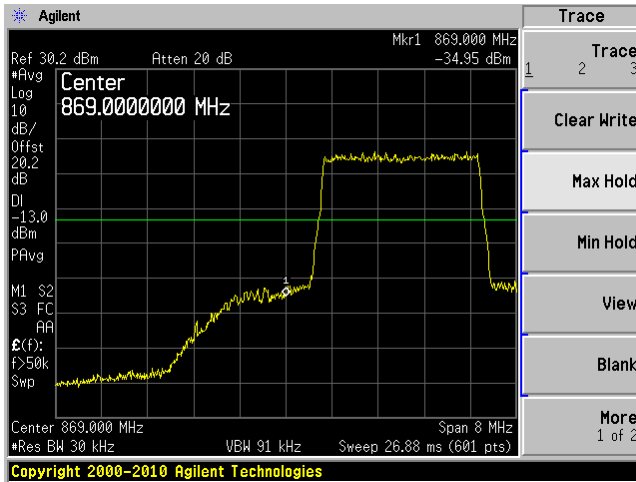


High Channel

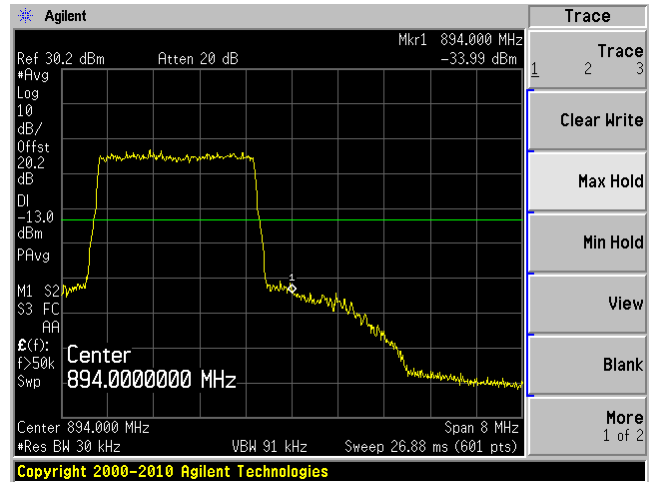


64QAM (3 MHz)

Low Channel

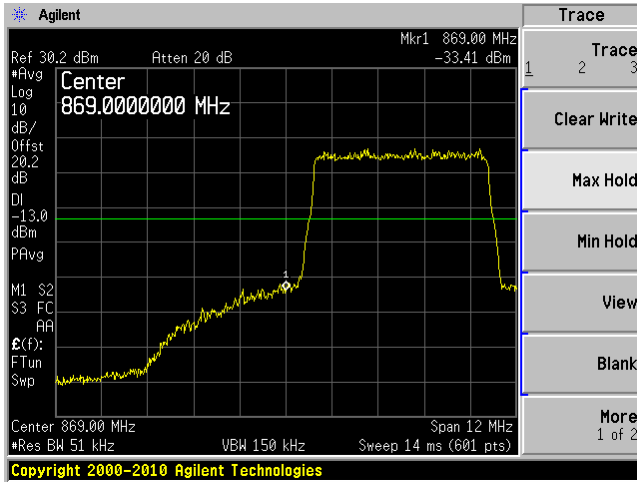


High Channel

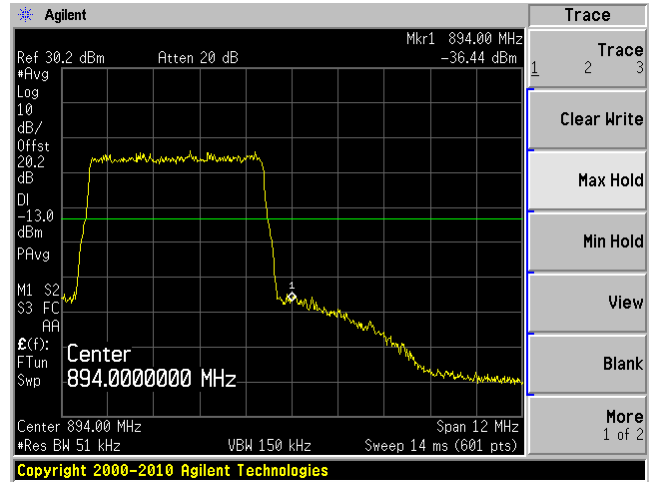


QPSK (5 MHz)

Low Channel

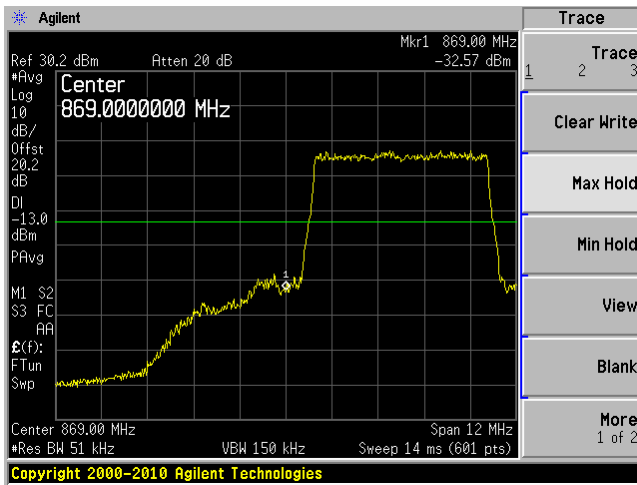


High Channel

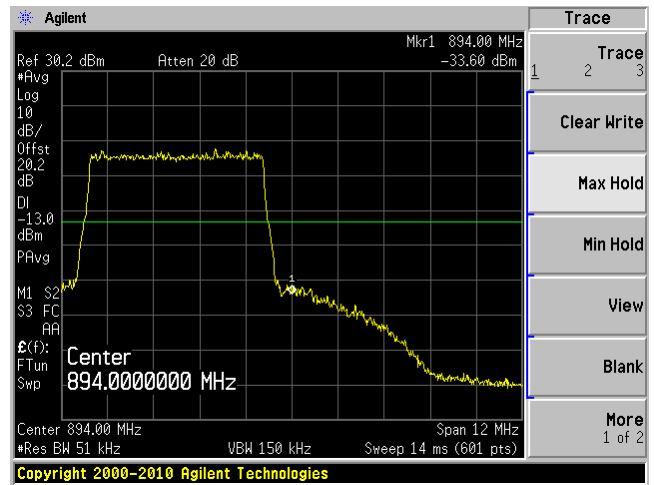


16QAM (5 MHz)

Low Channel



High Channel

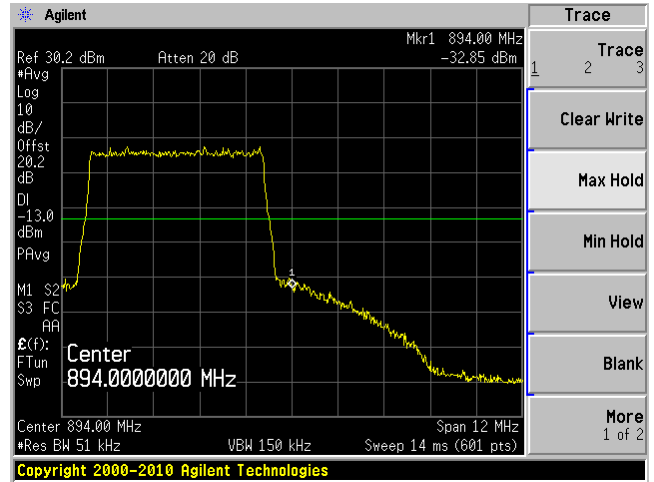
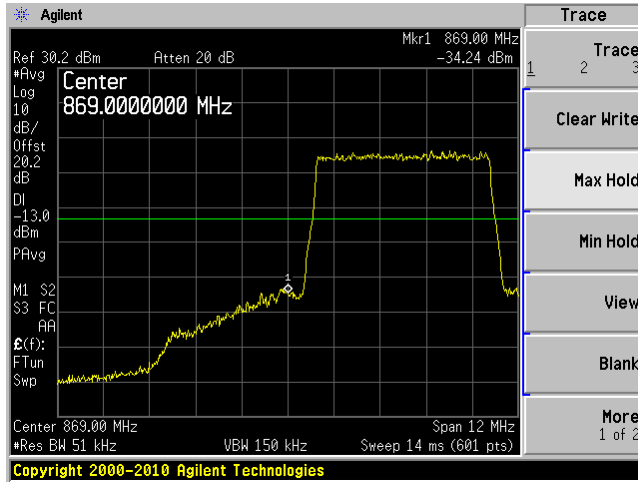




### 64QAM (5 MHz)

Low Channel

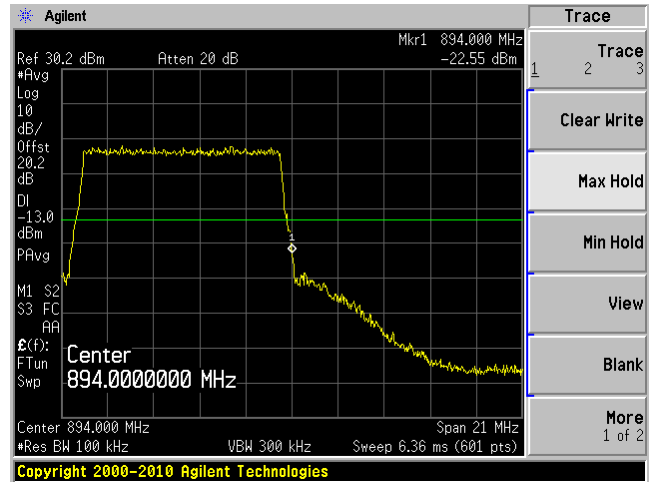
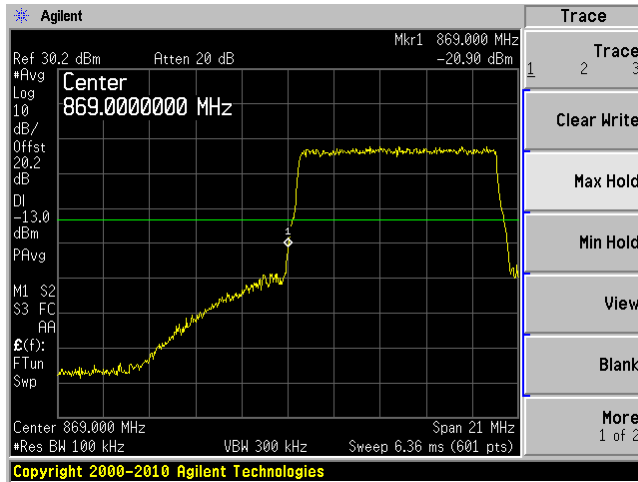
High Channel



### QPSK (10 MHz)

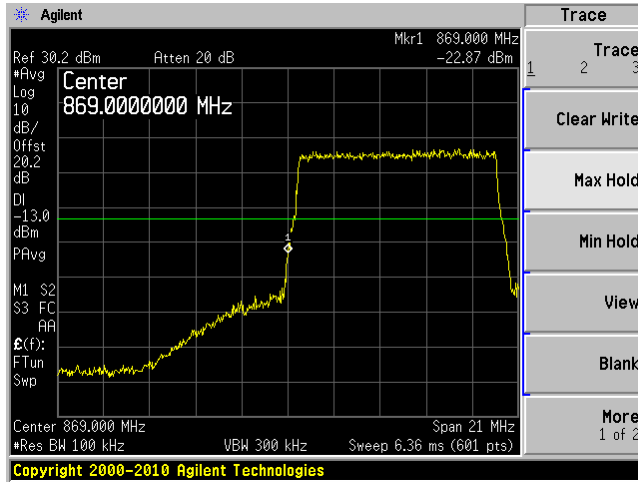
Low Channel

High Channel

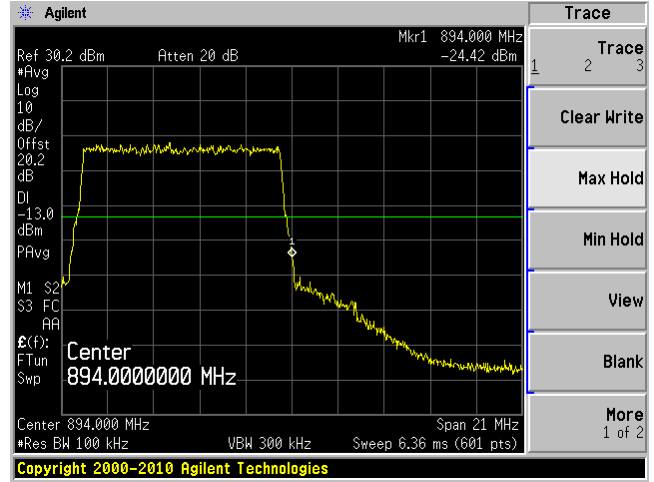


### 16QAM (10 MHz)

Low Channel

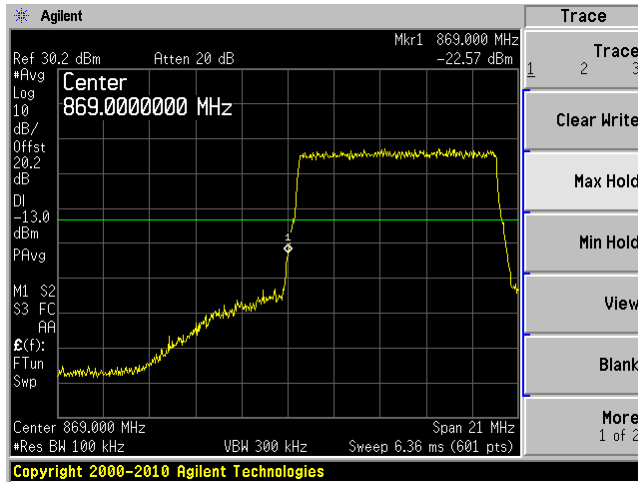


High Channel

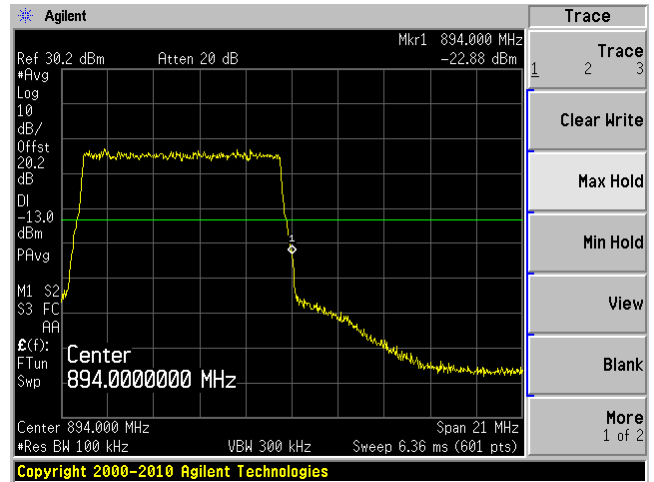


### 64QAM (10 MHz)

Low Channel



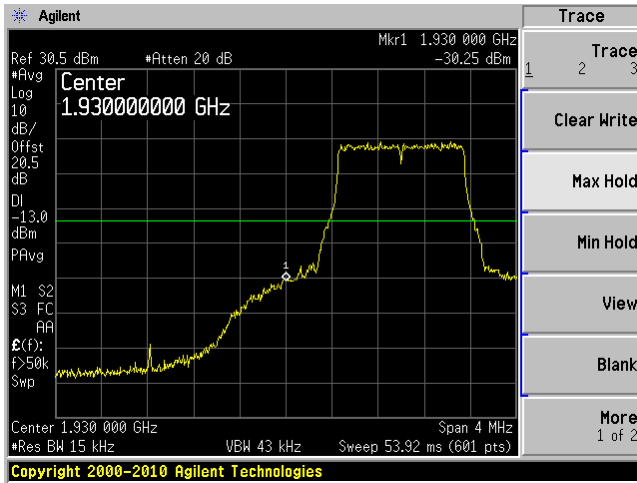
High Channel



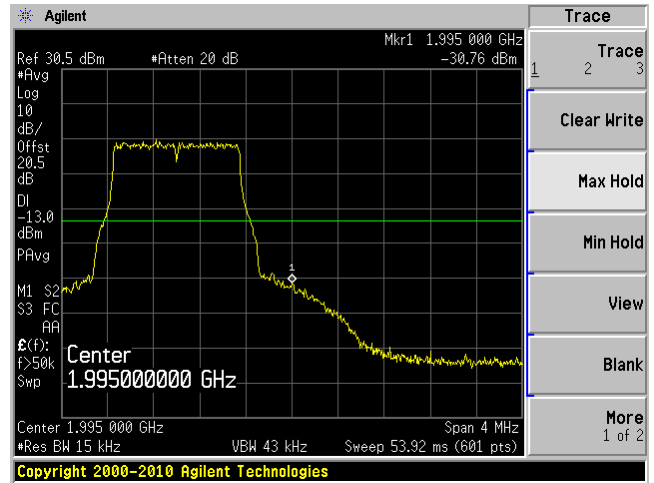
### PCS LTE Band, Downlink

#### QPSK (1.4 MHz)

Low Channel

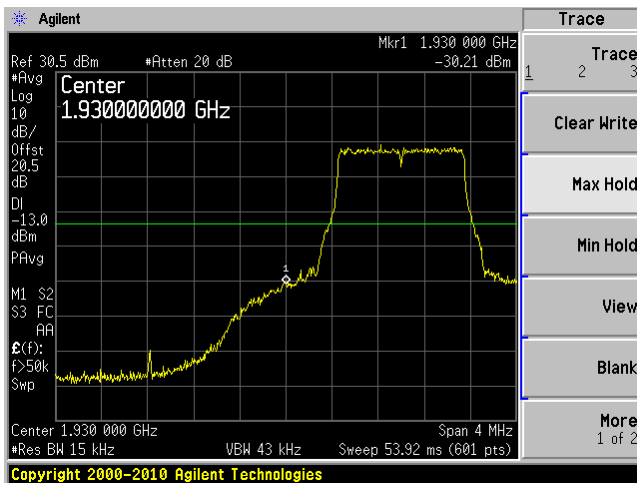


High Channel

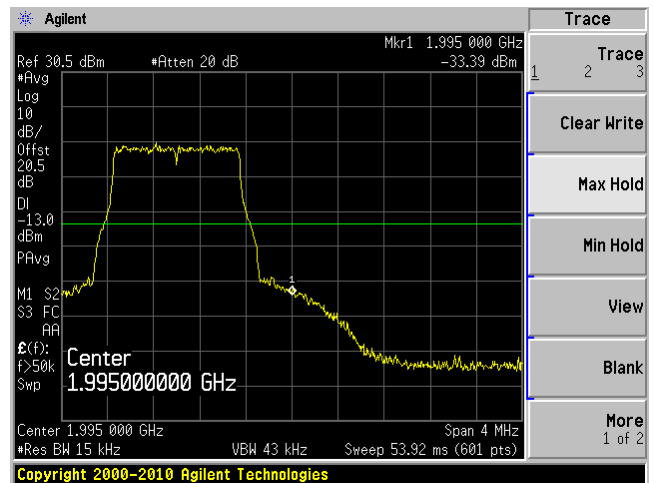


#### 16QAM (1.4 MHz)

Low Channel

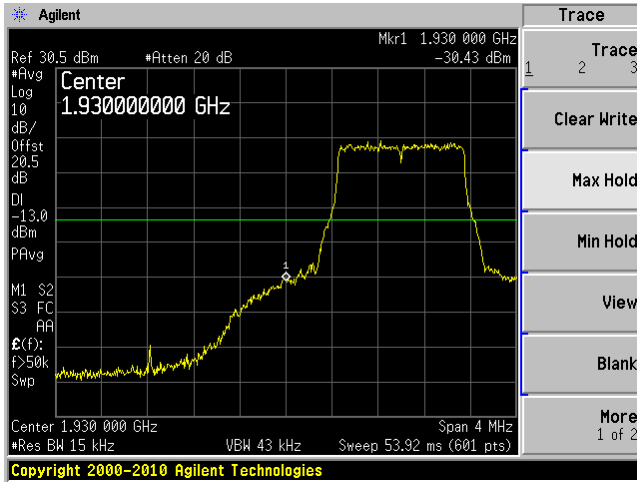


High Channel

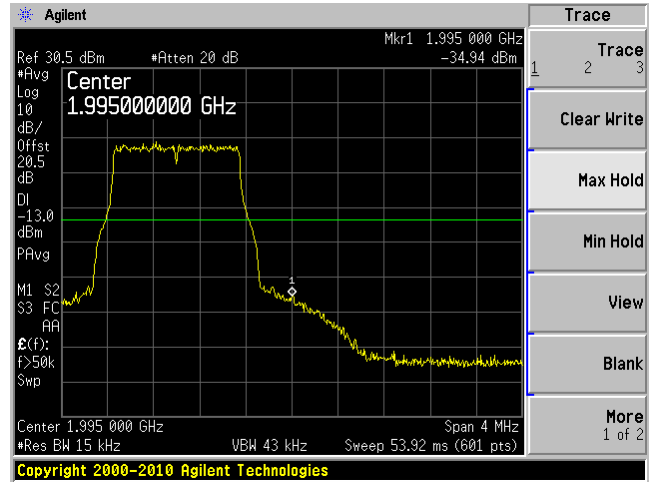


64QAM (1.4 MHz)

Low Channel

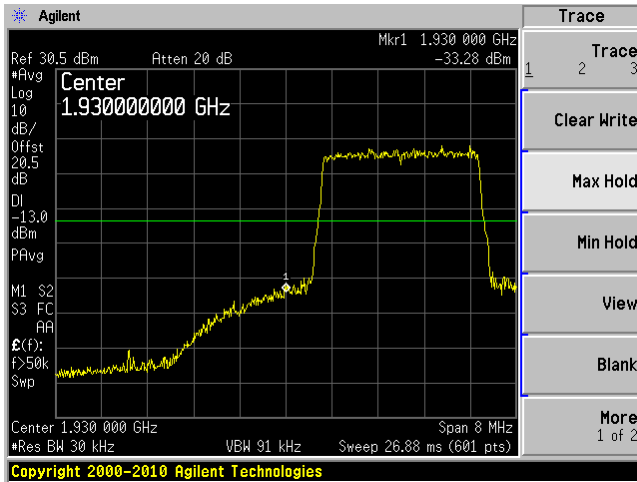


High Channel

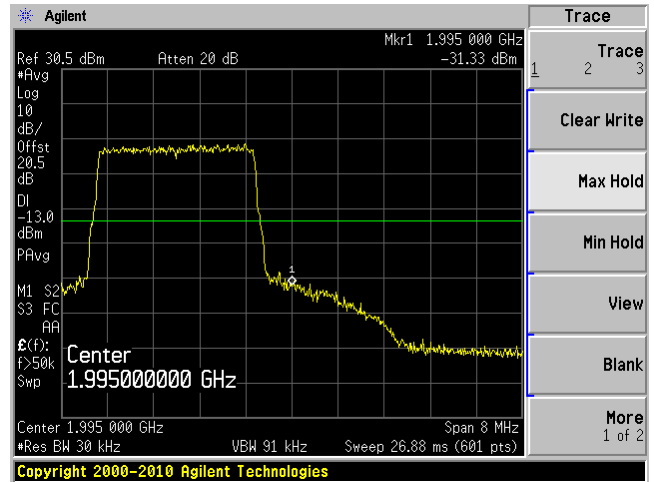


QPSK (3 MHz)

Low Channel

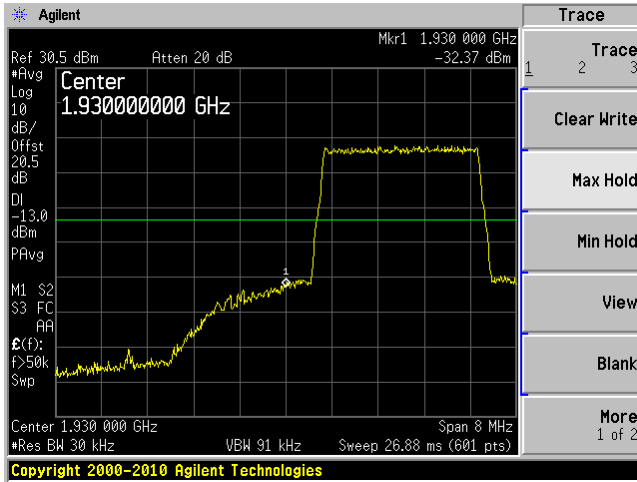


High Channel

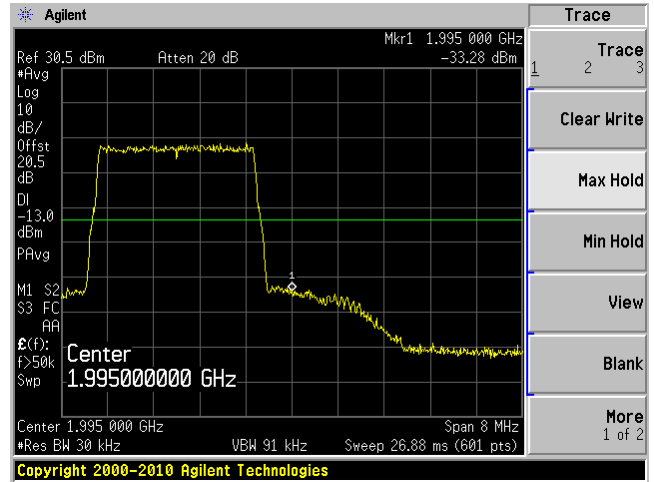


16QAM (3 MHz)

Low Channel

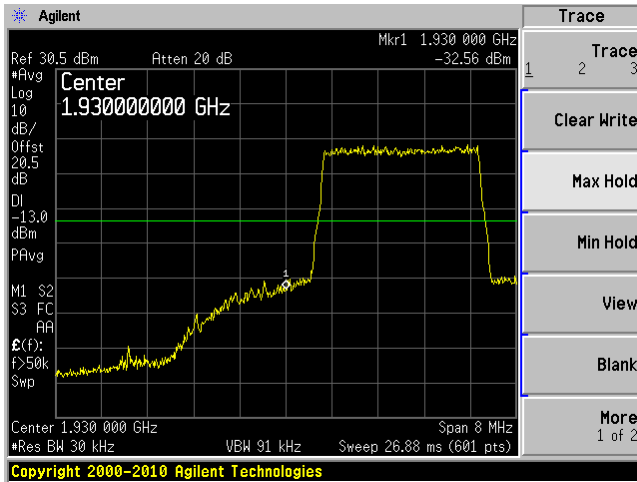


High Channel

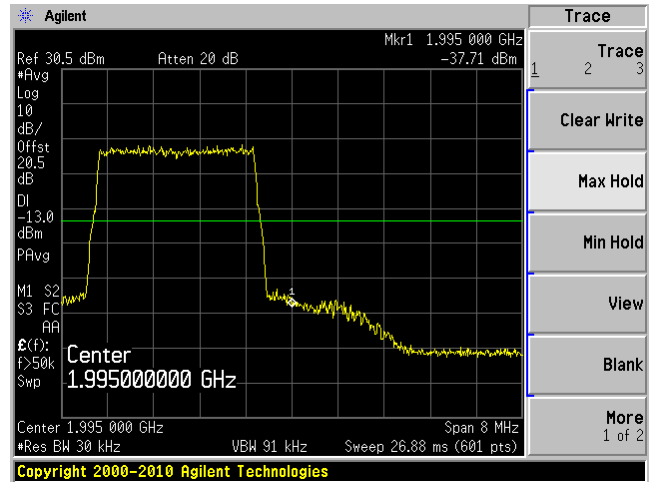


64QAM (3 MHz)

Low Channel

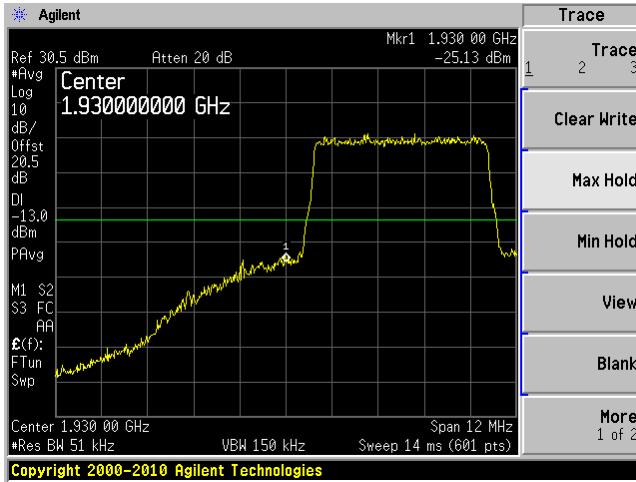


High Channel

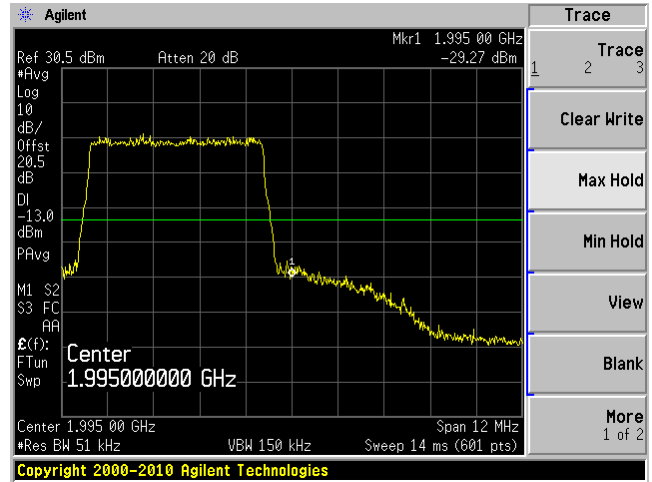


### QPSK (5 MHz)

Low Channel

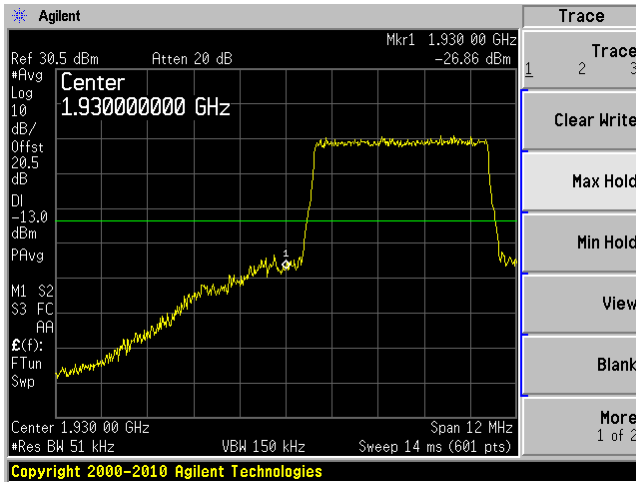


High Channel

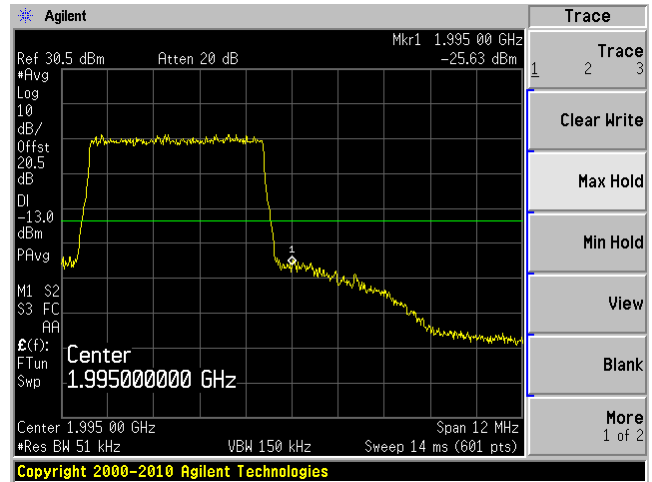


### 16QAM (5 MHz)

Low Channel

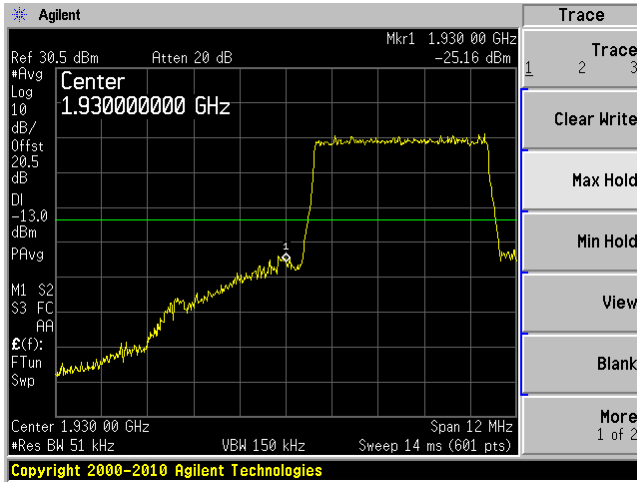


High Channel

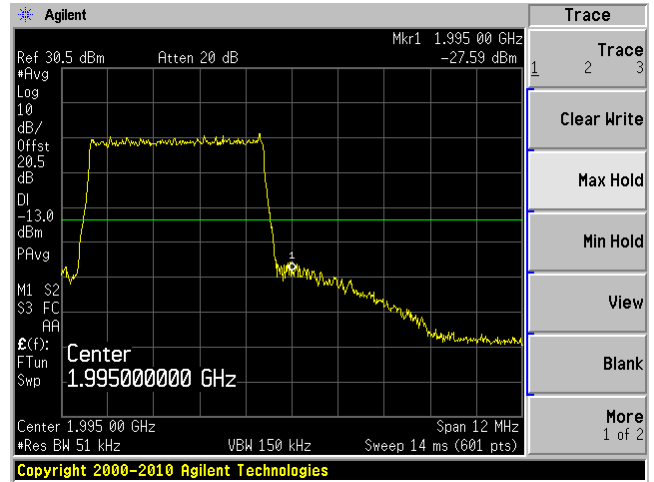


### 64QAM (5 MHz)

Low Channel

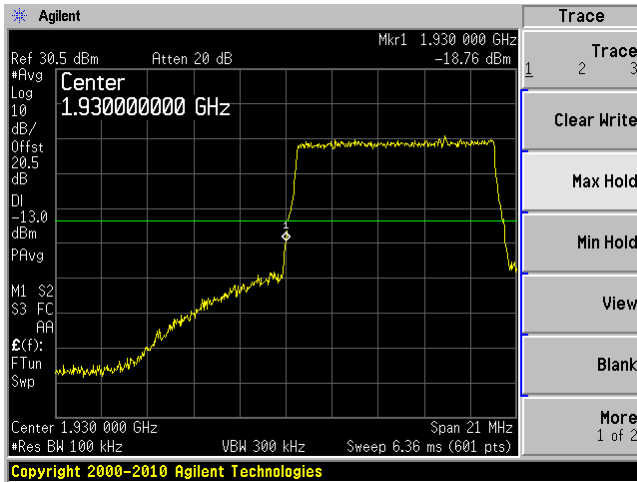


High Channel

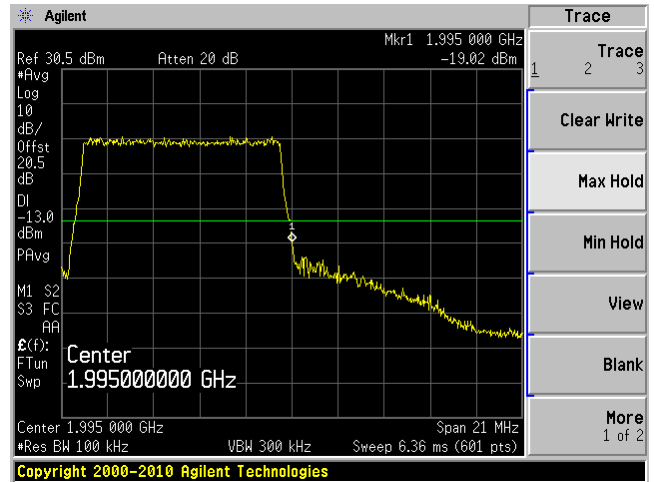


### QPSK (10 MHz)

Low Channel

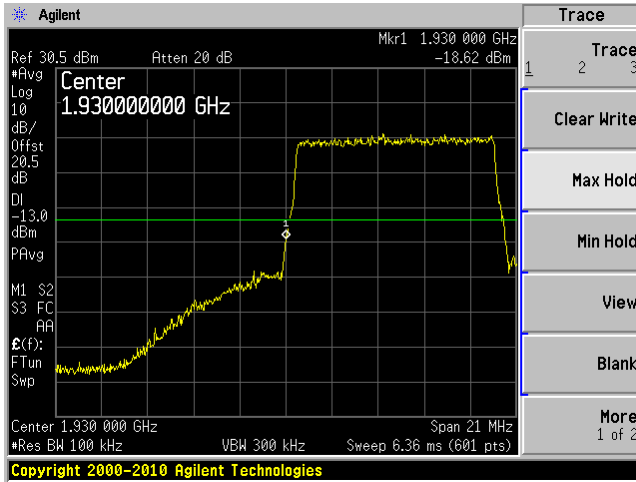


High Channel

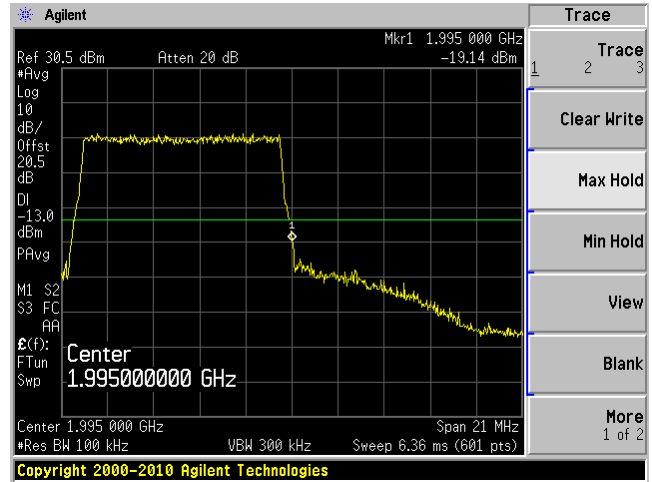


16QAM (10 MHz)

Low Channel

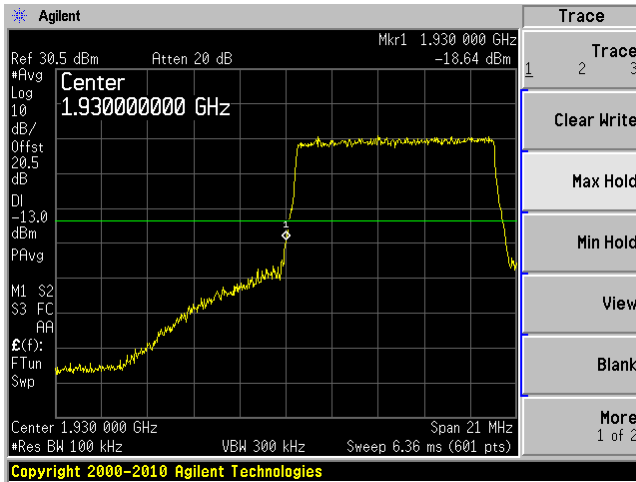


High Channel

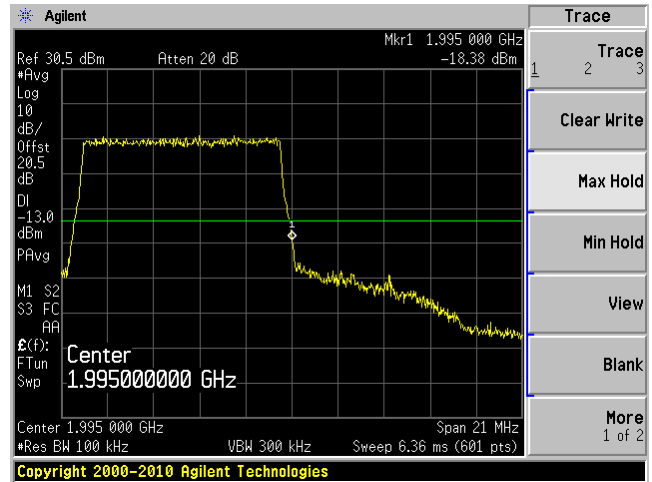


64QAM (10 MHz)

Low Channel



High Channel

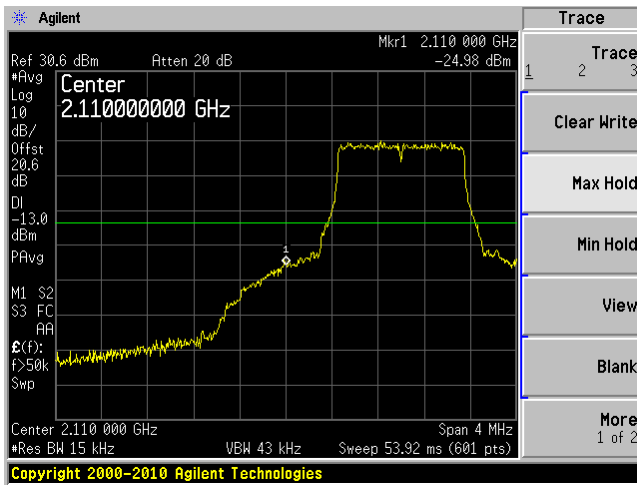




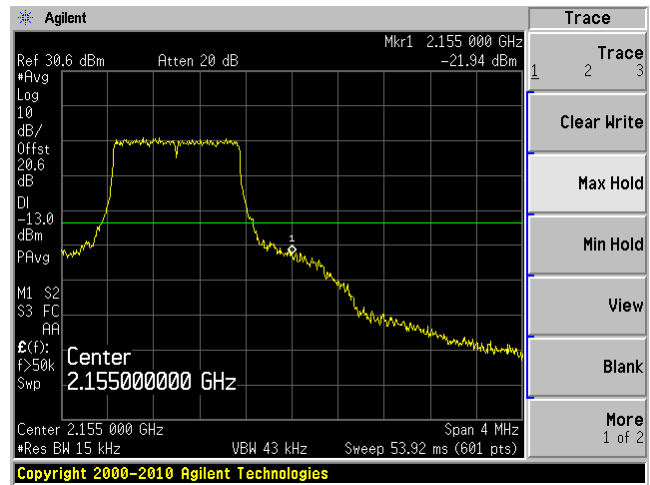
### AWS LTE Band, Downlink

QPSK (1.4 MHz)

Low Channel

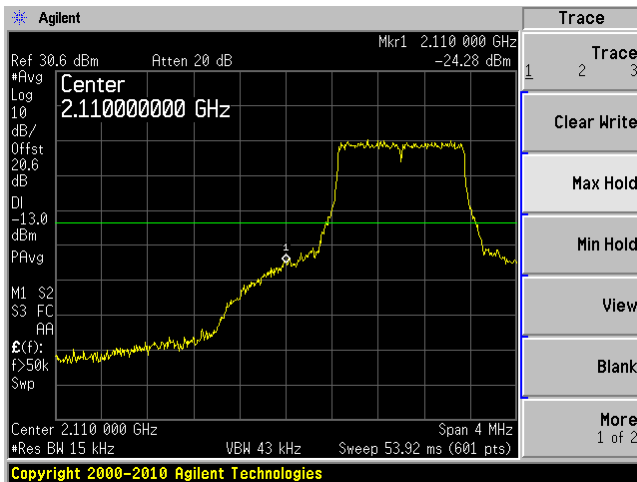


High Channel

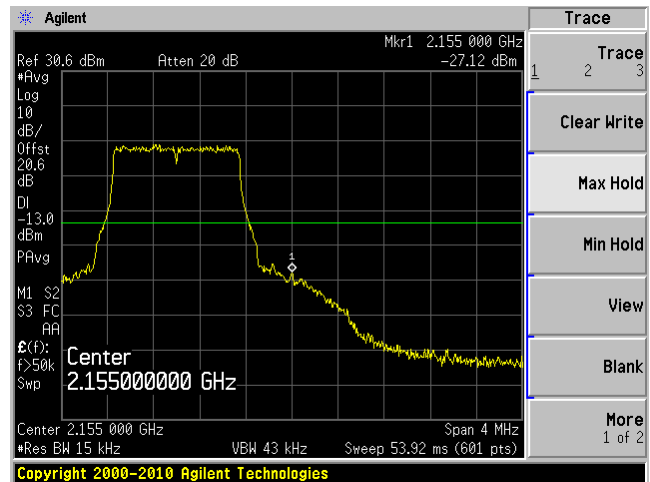


16QAM (1.4 MHz)

Low Channel

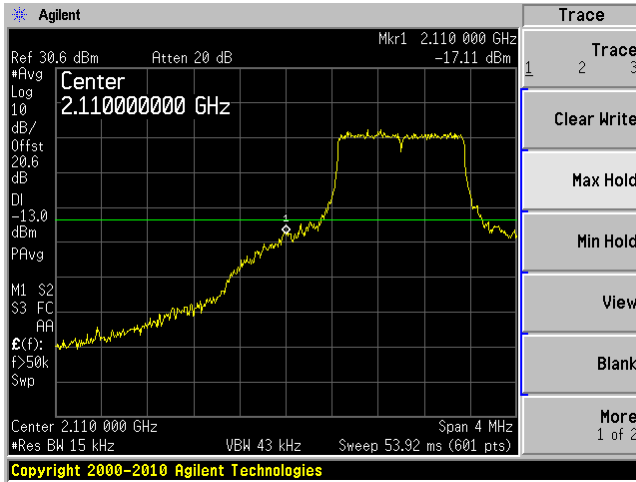


High Channel

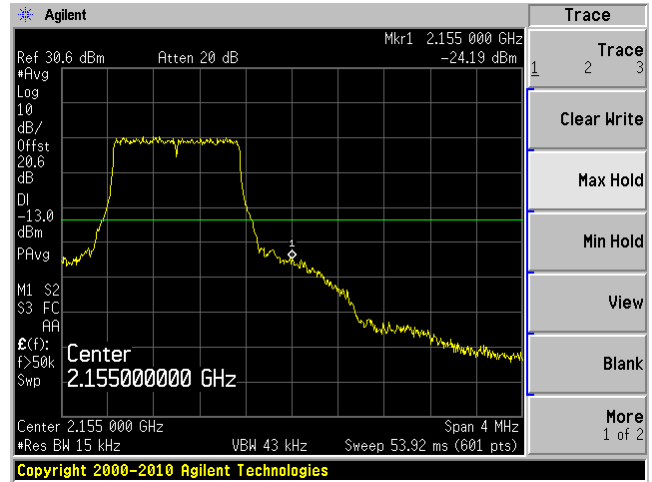


64QAM (1.4 MHz)

Low Channel

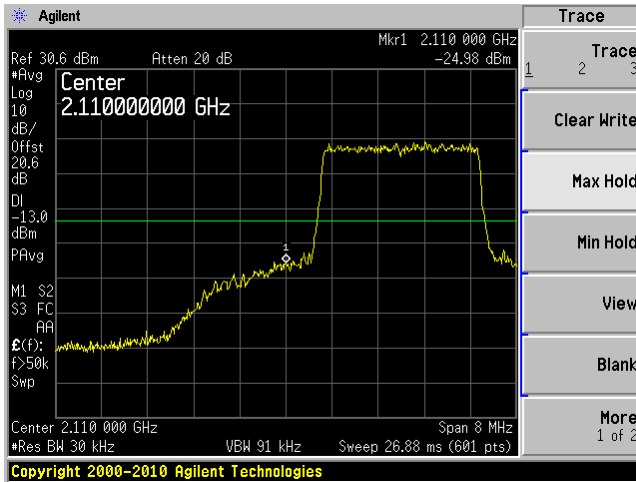


High Channel

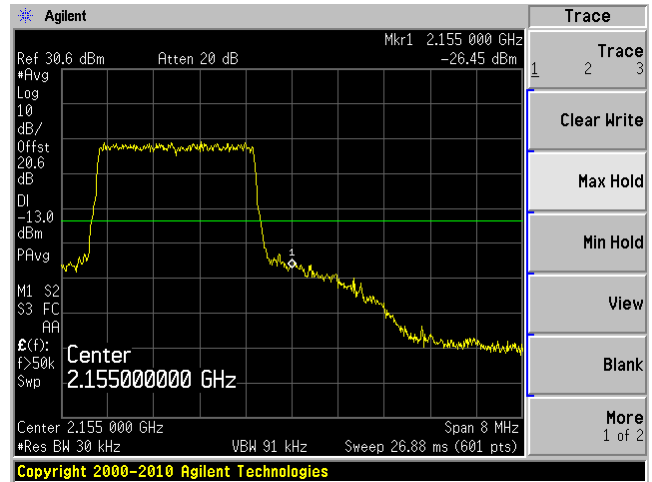


QPSK (3 MHz)

Low Channel

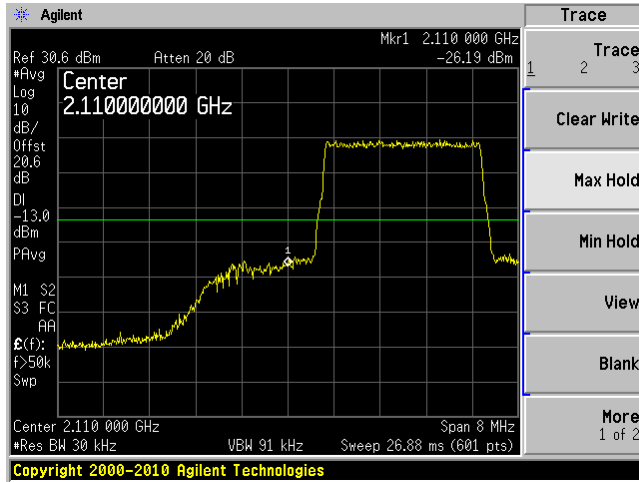


High Channel

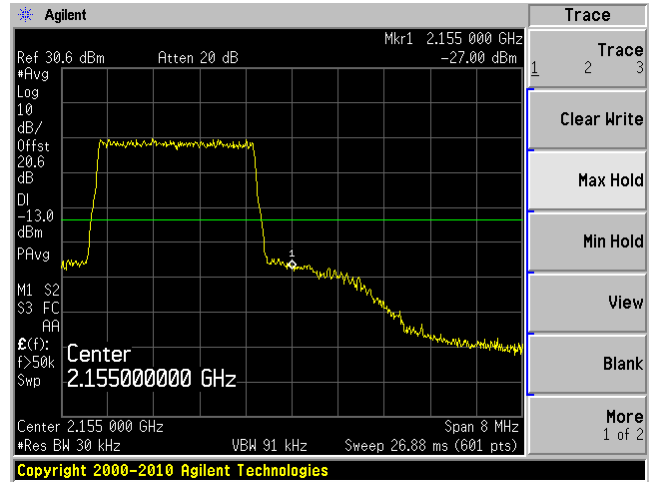


16QAM (3 MHz)

Low Channel

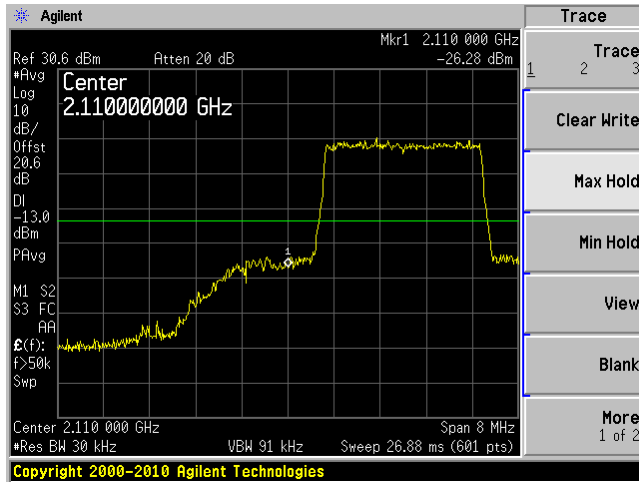


High Channel

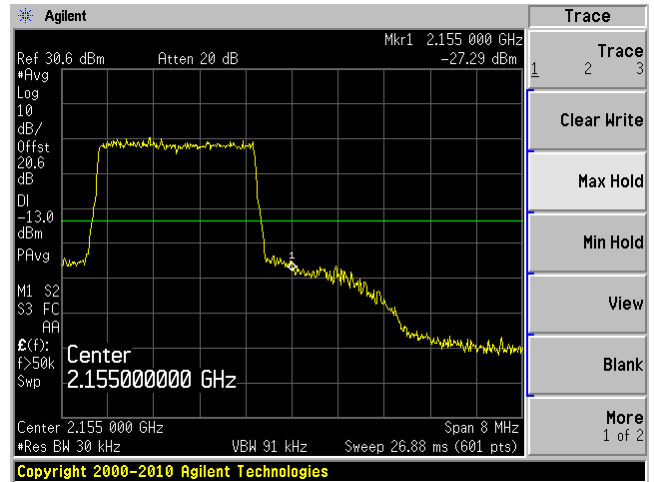


64QAM (3 MHz)

Low Channel

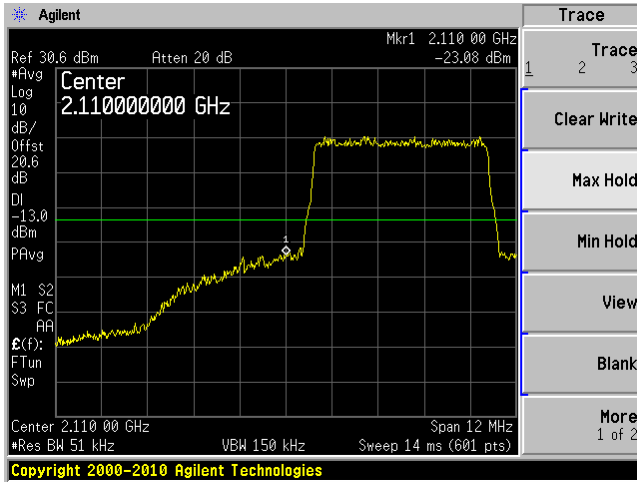


High Channel

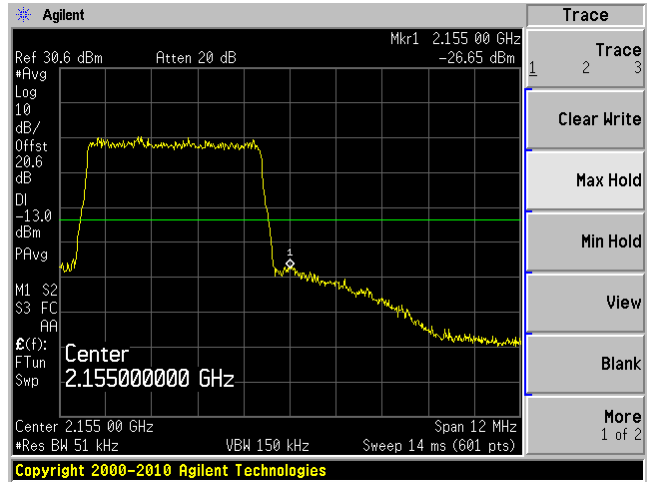


### QPSK (5 MHz)

Low Channel

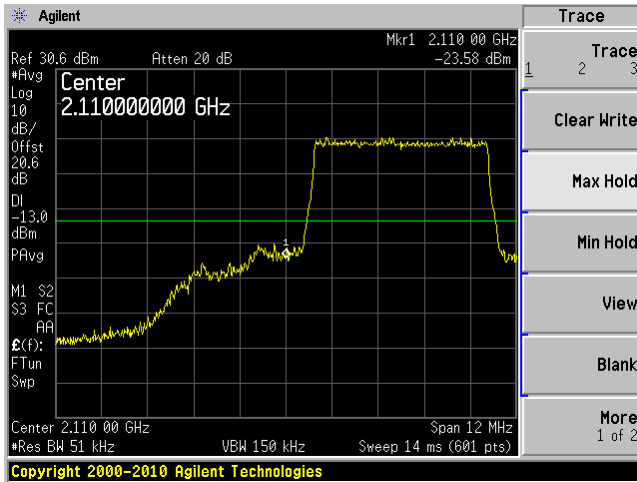


High Channel

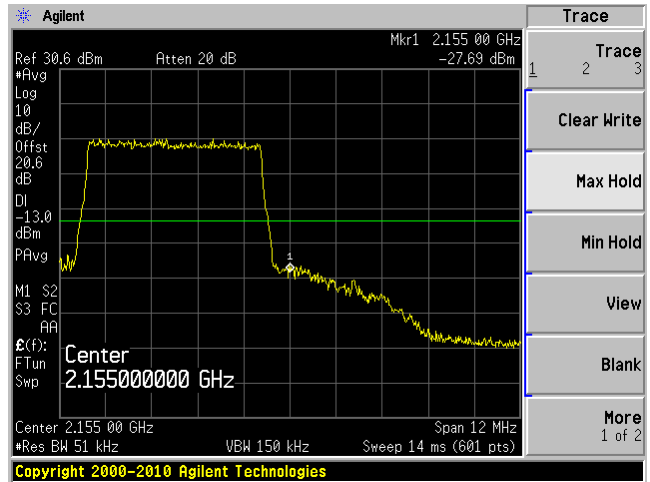


### 16QAM (5 MHz)

Low Channel

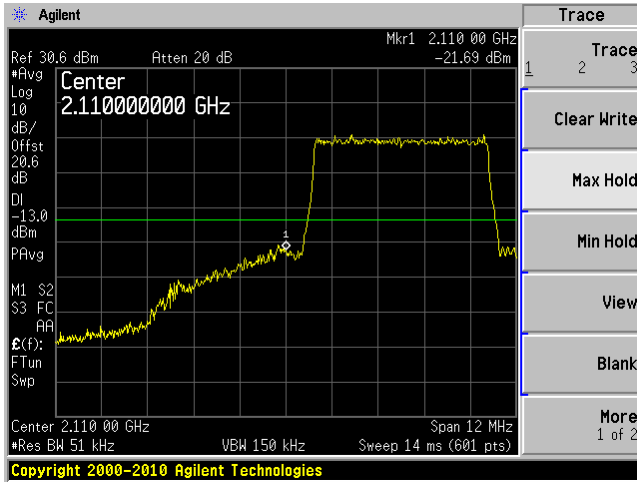


High Channel

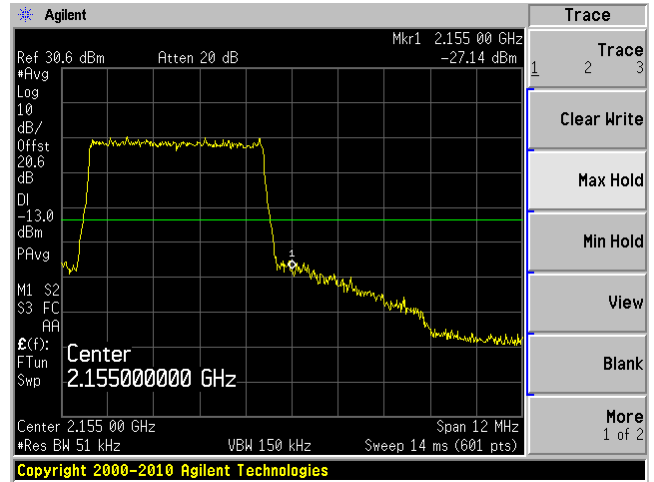


### 64QAM (5 MHz)

Low Channel

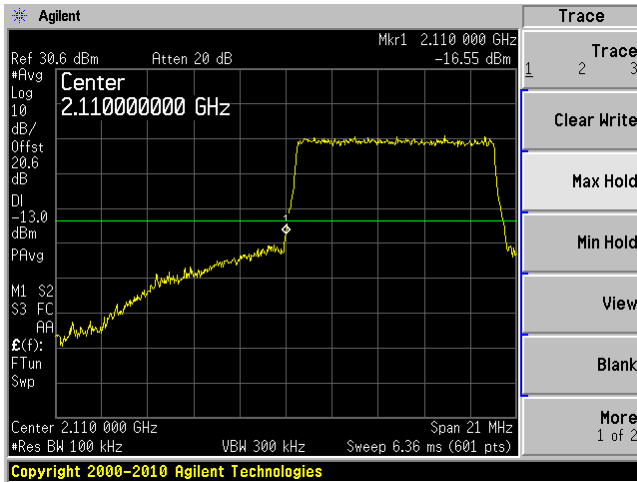


High Channel

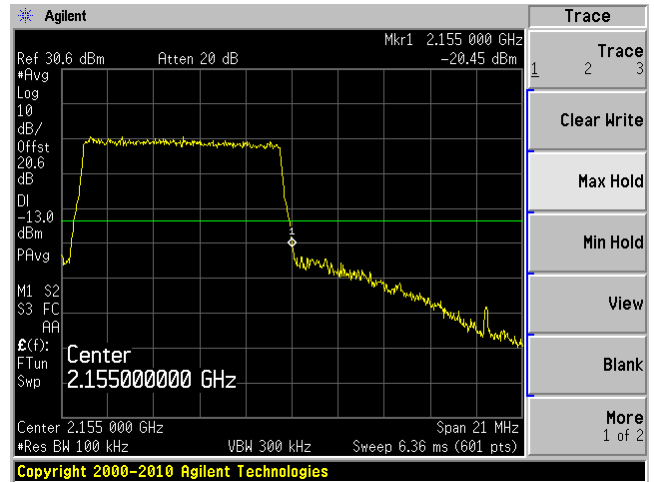


### QPSK (10 MHz)

Low Channel

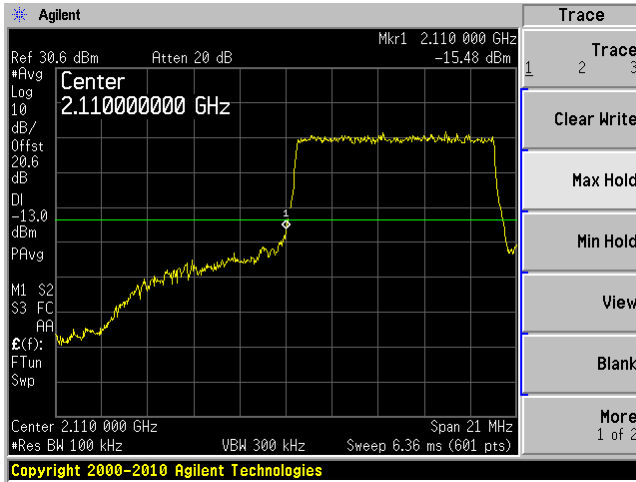


High Channel

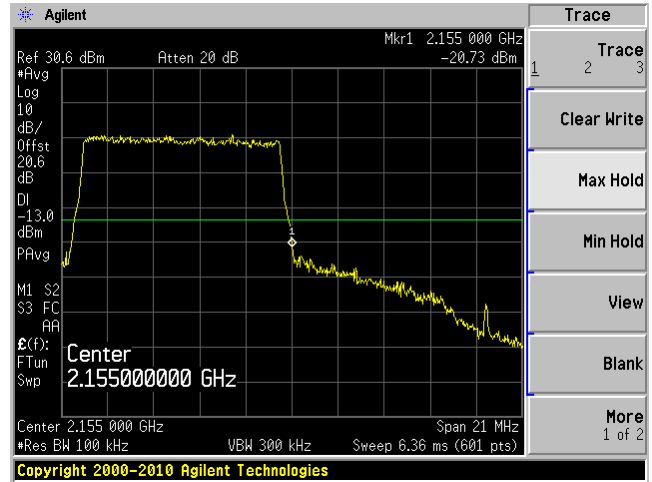


### 16QAM (10 MHz)

Low Channel

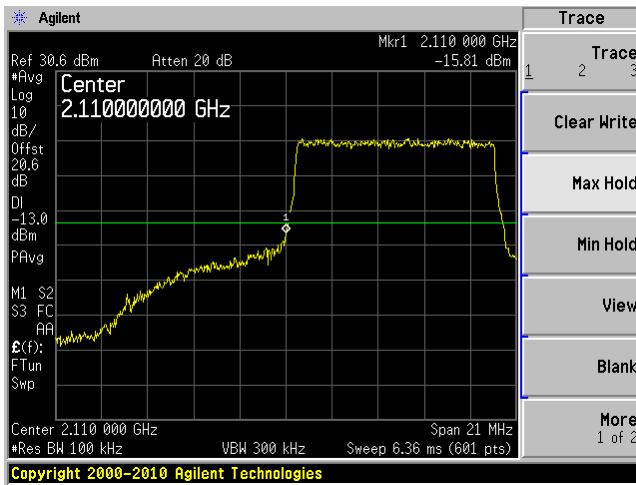


High Channel

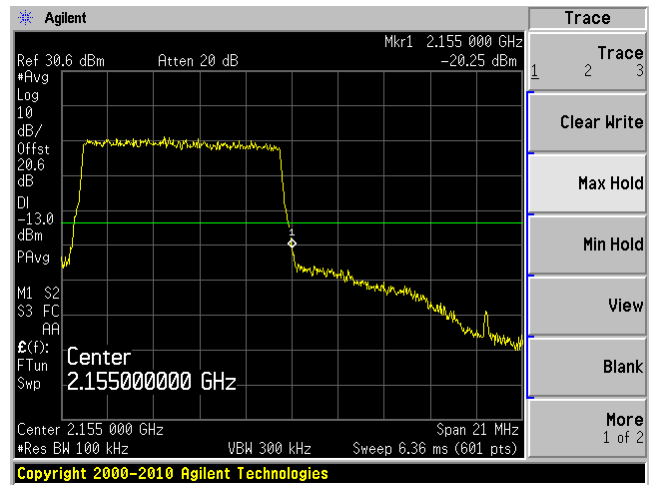


### 64QAM (10 MHz)

Low Channel



High Channel



## 9 FCC §2.1055, §22.355, §24.235 & §27.54 – Frequency Stability

### 9.1 Applicable Standards

According to FCC §2.1055, §22.355, §24.235 and §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### 9.2 Test Procedure

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from - 25 °C to + 45 °C using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

CW was tested as worst case.

### 9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	PSA, Series Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Espec	Chamber, Humidity/Temperature	ESL-4CA	456	2012-03-16	2 years
Agilent	Generator, Signal	E4438C	MY45091309	2013-05-30	1 year

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

### 9.4 Test Environmental Conditions

<b>Temperature:</b>	23 °C
<b>Relative Humidity:</b>	45 %
<b>ATM Pressure:</b>	101.96 kPa

*The testing was performed by Glenn Escano from 2013-09-11 at RF Site.*

## 9.5 Test Results

### Cellular 850 Band (869-894 MHz)

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Results
Voltage (Vac)	Temperature (°C)				
Frequency vs. Temperature					
120	45	881.5	881.50017	0.19	Compliant
120	35	881.5	881.50017	0.19	Compliant
120	25	881.5	881.50017	0.19	Compliant
120	15	881.5	881.50017	0.19	Compliant
120	5	881.5	881.50017	0.19	Compliant
120	-5	881.5	881.5	0.00	Compliant
120	-15	881.5	881.50017	0.19	Compliant
120	-25	881.5	881.50017	0.19	Compliant
Frequency vs. Voltage					
108	25	881.5	881.500170	0.19	Compliant
132	25	881.5	881.500170	0.19	Compliant

### PCS 1900 Band (1930-1995 MHz)

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Result
Voltage (Vac)	Temperature (°C)				
Frequency vs. Temperature					
120	45	1960	1960.000170	0.09	Compliant
120	35	1960	1960.000170	0.09	Compliant
120	25	1960	1960.000170	0.09	Compliant
120	15	1960	1960.000330	0.17	Compliant
120	5	1960	1960.000170	0.09	Compliant
120	-5	1960	1960.000330	0.17	Compliant
120	-15	1960	1960.000300	0.15	Compliant
120	-25	1960	1960.000500	0.26	Compliant
Frequency vs. Voltage					
108	25	1960	1960.000330	0.17	Compliant
132	25	1960	1960.000330	0.17	Compliant



**AWS 2100 Band (2110-2155 MHz)**

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Result
Voltage (Vac)	Temperature (°C)				
Frequency vs. Temperature					
120	45	2132	2132.0002	0.08	Compliant
120	35	2132	2132.0002	0.09	Compliant
120	25	2132	2132.0002	0.11	Compliant
120	15	2132	2132.0001	0.06	Compliant
120	5	2132	2132.0002	0.08	Compliant
120	-5	2132	2132	0.00	Compliant
120	-15	2132	2132.0003	0.12	Compliant
120	-25	2132	2132.0006	0.28	Compliant
Frequency vs. Voltage					
108	25	2132	2132.0003	0.12	Compliant
132	25	2132	2132	0.00	Compliant

*Note: Limit is stay in the authorized band.*

## 10 FCC §2.1091 - RF Exposure Information

### 10.1 Applicable Standards

According to FCC §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 <sup>2</sup> )	Averaging Time (minute)
<b>Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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

### 10.2 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

### 10.3 Results

#### Cellular 850 Band Downlink:

Maximum peak output power at antenna input terminal (dBm): 25.81

Maximum peak output power at antenna input terminal (mW): 381.07

Prediction distance (cm): 20

Prediction frequency (MHz): 893.6

Antenna Gain, typical (dBi): 0

Cable Loss (dB): 0.5

FCC Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0851

FCC MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 0.5667

**PCS 1900 Band Downlink:**

Maximum peak output power at antenna input terminal (dBm): 25.88  
Maximum peak output power at antenna input terminal (mW): 387.28  
Prediction distance (cm): 20  
Prediction frequency (MHz): 1930.2  
Antenna Gain, typical (dBi): 0  
Cable Loss (dB): 0.5  
FCC Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0864  
FCC MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

**AWS 2100 Band Downlink:**

Maximum peak output power at antenna input terminal (dBm): 23  
Maximum peak output power at antenna input terminal (mW): 199.53  
Prediction distance (cm): 20  
Prediction frequency (MHz): 1960  
Antenna Gain, typical (dBi): 0  
Cable Loss (dB): 1.0  
FCC Power density at predication frequency and distance (mW/cm<sup>2</sup>): 0.0499  
FCC MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>): 1.0

The highest power density level at 20 cm is below the MPE uncontrolled exposure limit.