



# FCC PART 24E



## TEST AND MEASUREMENT REPORT

For

**SYM Technology, Inc.**

234 E. Colorado Blvd., STE 410  
Pasadena, CA 91101

**FCC ID: W74-V248919**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Bi-Directional Amplifier
<b>Test Engineer:</b> Lionel Lara 	
<b>Report Number:</b> R12043013-24	
<b>Report Date:</b> 2012-08-06	
<b>Reviewed By:</b> Victor Zhang  EMC/RF Lead	
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164	

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA\* or any agency of the Federal Government. \* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "\*" (Rev. 3)

# TABLE OF CONTENTS

<b>1</b>	<b>GENERAL INFORMATION .....</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>SYSTEM TEST CONFIGURATION .....</b>	<b>7</b>
2.1	JUSTIFICATION .....	7
2.2	EUT EXERCISE SOFTWARE .....	7
2.3	EQUIPMENT MODIFICATIONS .....	7
2.4	EUT HOST INTERNAL CONFIGURATION .....	7
2.5	LOCAL SUPPORT EQUIPMENT LIST AND DETAILS .....	7
2.6	INTERFACE PORTS AND CABLING .....	8
<b>3</b>	<b>SUMMARY OF TEST RESULTS .....</b>	<b>9</b>
<b>4</b>	<b>FCC §2.1046 &amp; §24.232 – RF OUTPUT POWER .....</b>	<b>10</b>
4.1	APPLICABLE STANDARD .....	10
4.2	TEST PROCEDURE .....	10
4.3	TEST ENVIRONMENTAL CONDITIONS .....	10
4.4	TEST EQUIPMENT LIST AND DETAILS .....	10
4.5	TEST RESULTS .....	11
<b>5</b>	<b>FCC §2.1049 &amp; §24.238 - OCCUPIED BANDWIDTH .....</b>	<b>14</b>
5.1	APPLICABLE STANDARD .....	14
5.2	TEST PROCEDURE .....	14
5.3	TEST ENVIRONMENTAL CONDITIONS .....	14
5.4	TEST EQUIPMENT LIST AND DETAILS .....	14
5.5	TEST RESULTS .....	15
<b>6</b>	<b>FCC §2.1053 &amp; §24.238 - SPURIOUS RADIATED EMISSIONS .....</b>	<b>43</b>
6.1	APPLICABLE STANDARD .....	43
6.2	TEST PROCEDURE .....	43
6.3	TEST ENVIRONMENTAL CONDITIONS .....	43
6.4	TEST EQUIPMENT LIST AND DETAILS .....	44
6.5	TEST RESULTS .....	44
<b>7</b>	<b>FCC §2.1051 &amp; §24.238 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS .....</b>	<b>45</b>
7.1	APPLICABLE STANDARD .....	45
7.2	TEST PROCEDURE .....	45
7.3	TEST ENVIRONMENTAL CONDITIONS .....	45
7.4	TEST EQUIPMENT LIST AND DETAILS .....	45
7.5	TEST RESULTS .....	46
<b>8</b>	<b>FCC §24.238 – BAND EDGE .....</b>	<b>54</b>
8.1	APPLICABLE STANDARD .....	54
8.2	TEST PROCEDURE .....	54
8.3	TEST ENVIRONMENTAL CONDITIONS .....	54
8.4	TEST EQUIPMENT LIST AND DETAILS .....	54
8.5	TEST RESULTS .....	55
<b>9</b>	<b>FCC §1.1310 &amp; §2.1091 - RF EXPOSURE .....</b>	<b>81</b>
9.1	APPLICABLE STANDARD .....	81

9.2	MPE PREDICTION .....	81
9.3	TEST RESULT .....	81
<b>10</b>	<b>EXHIBIT A - FCC ID LABELING REQUIREMENTS .....</b>	<b>83</b>
10.1	FCC ID LABEL REQUIREMENT .....	83
10.2	FCC ID LABEL CONTENT .....	83
10.3	FCC LABEL LOCATION ON EUT .....	83
<b>11</b>	<b>EXHIBIT B - TEST SETUP PHOTOGRAPHS.....</b>	<b>84</b>
11.1	RADIATED EMISSIONS – REAR VIEW (BELOW 1 GHz).....	84
11.2	RADIATED EMISSIONS - FRONT VIEW (BELOW 1 GHz).....	84
11.3	RADIATED EMISSIONS - REAR VIEW (ABOVE 1 GHz).....	85
11.4	RADIATED EMISSIONS - FRONT VIEW (ABOVE 1 GHz).....	85
11.5	BENCH SETUP VIEW .....	86
<b>12</b>	<b>EXHIBIT C - EUT PHOTOGRAPHS .....</b>	<b>87</b>
12.1	EUT-MAIN FRAME ENCLOSURE FRONT VIEW.....	87
12.2	EUT-MAIN FRAME ENCLOSURE REAR VIEW.....	87
12.3	EUT-MAIN FRAME ENCLOSURE TOP VIEW .....	88
12.4	EUT-MAIN FRAME ENCLOSURE BOTTOM VIEW.....	88
12.5	EUT-MAIN FRAME ENCLOSURE LEFT SIDE VIEW .....	89
12.6	EUT-MAIN FRAME ENCLOSURE RIGHT SIDE VIEW .....	89
12.7	EUT-MAIN FRAME ENCLOSURE OPEN VIEW 1 .....	90
12.8	EUT-MAIN FRAME ENCLOSURE OPEN VIEW 2 .....	90
12.9	VISION24 1900MHz SERVICE CARD FRONT VIEW .....	91
12.10	VISION24 1900MHz SERVICE CARD REAR VIEW .....	91
12.11	VISION24 1900MHz SERVICE CARD TOP VIEW .....	92
12.12	VISION24 1900MHz SERVICE CARD BOTTOM VIEW .....	92
12.13	VISION24 FILTER AND COMBINER BTS FRONT VIEW .....	93
12.14	VISION24 FILTER AND COMBINER BTS REAR VIEW .....	93
12.15	VISION24 FILTER AND COMBINER MOBILE FRONT VIEW .....	94
12.16	VISION24 FILTER AND COMBINER MOBILE REAR VIEW .....	94
12.17	VISION24 RECTIFIER (POWER SUPPLY) FRONT VIEW .....	95
12.18	VISION24 NETWORK CONTROLLER FRONT VIEW .....	95
12.19	VISION24 1900MHz SERVICE CARD DIGITAL UNIT PCB TOP VIEW .....	96
12.20	VISION24 1900MHz SERVICE CARD DIGITAL UNIT PCB BOTTOM VIEW.....	96
12.21	VISION24 1900MHz SERVICE CARD RF UNIT SHIELDED VIEW .....	97
12.22	VISION24 1900MHz SERVICE CARD RF UNIT PCB TOP VIEW.....	97
12.23	VISION24 1900MHz SERVICE CARD RF UNIT PCB BOTTOM VIEW .....	98
12.24	VISION24 1900MHz SERVICE CARD HPA SHIELDED VIEW .....	98
12.25	VISION24 1900MHz SERVICE CARD HPA PCB TOP VIEW .....	99
12.26	VISION24 1900MHz SERVICE CARD HPA PCB BOTTOM VIEW .....	99
12.27	MAIN FRAME PCB 1 TOP VIEW .....	100
12.28	MAIN FRAME PCB 1 BOTTOM VIEW.....	100
12.29	MAIN FRAME PCB 2 TOP VIEW .....	101
12.30	MAIN FRAME PCB 2 BOTTOM VIEW.....	101
12.31	VISION24 RECTIFIER PCB TOP VIEW .....	102
12.32	VISION24 RECTIFIER PCB BOTTOM VIEW .....	102
12.33	VISION24 NETWORK CONTROLLER PCB TOP VIEW .....	103
12.34	VISION24 NETWORK CONTROLLER PCB BOTTOM VIEW .....	103

**DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	R12043013-24	Original Report	2012-08-06

## 1 GENERAL INFORMATION

---

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

This test and measurement report was prepared on behalf of *SYM Technology, Inc.* and their product *FCC ID: W74-V248919*, model: *Vision24*, or the "EUT" as referred to in this report. The EUT is a bi-directional amplifier with removable service cards operating in the PCS and SMR bands. The frequency bands are: 806-824/ 896-901/ 1850-1915 MHz for uplink and 851-869/ 935-940/ 1930-1995 MHz for downlink. Modulation types are iDEN, CDMA and LTE.

### 1.2 Mechanical Description

The EUT Approximate measurement is: 48 cm (L) x 29 cm (W) x 50 cm (H). Weight: 40823g.

*The test data gathered are from typical production sample, serial number: R12043013 assigned by the manufacturer.*

### 1.3 Objective

This type approval report is prepared on behalf of *SYM Technology, Inc.* in accordance with Part 2, Subpart J, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristics, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin.

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

No Related Submittals

### 1.5 Test Methodology

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

Part 24 Subpart E – PCS

Applicable Standards: TIA/EIA603-C

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

## 1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from +2.0 dB for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

## 1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at <http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionId=8430d44f1f47cf2996124343c704b367816b>

## 2 SYSTEM TEST CONFIGURATION

### 2.1 Justification

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

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

### 2.2 EUT Exercise Software

The software used was web based GUI via LAN Port (Http://192.168.2.1) provided by SYM Technology and was verified by BACL to comply with the standard requirements being tested against.

### 2.3 Equipment Modifications

No modifications were made to the EUT.

### 2.4 EUT Host Internal Configuration

Manufacturer	Description	Model	Serial Number
SYM Technology, Inc.	Vision Rectifier (Power Supply)	VS-RET	-
SYM Technology, Inc.	Vision Network Controller	VS-CTR	-
SYM Technology, Inc.	Vision Main Frame Enclosure	VS-MF	-
SYM Technology, Inc.	Vision 1900MHz Digital Unit	V19DTU	-
SYM Technology, Inc.	Vision 1900MHz RF Unit	V19RFM	-
SYM Technology, Inc.	Vision 1900MHz 24dBm HPA	V2419HPA	-

### 2.5 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Lenovo	Laptop	0679	CB08585694

## 2.6 Interface Ports and Cabling

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



### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§2.1046, §24.232	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A <sup>1</sup>
§2.1049, §24.238	Occupied Bandwidth / Out of Band Emissions	Compliant
§2.1053, §24.238	Spurious Radiated Emissions	Compliant
§2.1051, §24.238	Spurious Emissions at Antenna Terminals	Compliant
§24.238	Band Edge	Compliant
§2.1055	Frequency Stability	N/A <sup>1</sup>
§1.1310, §2.1091	RF Exposure	Compliant

Note<sup>1</sup>: Not applicable, the EUT is an amplifier; there is no oscillator circuit in the EUT, and there are no modulation characteristics.

## 4 FCC §2.1046 & §24.232 – RF OUTPUT POWER

### 4.1 Applicable Standard

FCC §24.232.

### 4.2 Test Procedure

*Conducted:*

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

### 4.3 Test Environmental Conditions

<b>Temperature:</b>	20 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.2 kPa

*The testing was performed by Lionel Lara on 2012-05-17 in RF Site.*

### 4.4 Test Equipment List and Details

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

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

## 4.5 Test Results

### Maximum Output Power – Modulated Signal

#### CDMA/EVDO

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
CDMA	1900 MHz Uplink	Low	1850.8	-57	24.58
		Middle	1880.0	-58	24.55
		High	1914..2	-58	24.81
	1900 MHz Downlink	Low	1930.8	-56	24.70
		Middle	1960.0	-58	24.32
		High	1994.2	-58	24.01

**LTE**

<b>Mode</b>	<b>Modulation</b>	<b>Frequency (MHz)</b>	<b>Input Power (dBm)</b>	<b>Output Power (dBm)</b>
Downlink 1930-1995 MHz	QPSK (1.4 MHz)	1931	-56	24.72
	QPSK (1.4 MHz)	1960	-57	24.84
	QPSK (1.4 MHz)	1994	-56	24.20
	16QAM (1.4 MHz)	1931	-56	24.71
	16QAM (1.4 MHz)	1960	-57	24.85
	16QAM (1.4 MHz)	1994	-56	24.13
	64QAM (1.4 MHz)	1931	-57	24.68
	64QAM (1.4 MHz)	1960	-57	24.83
	64QAM (1.4 MHz)	1994	-56	24.25
	QPSK (3 MHz)	1932	-56	24.67
	QPSK (3 MHz)	1960	-57	24.59
	QPSK (3 MHz)	1993	-56	24.45
	16QAM (3 MHz)	1932	-56	24.66
	16QAM (3 MHz)	1960	-57	24.54
	16QAM (3 MHz)	1993	-56	24.31
	64QAM (3 MHz)	1932	-56	24.70
	64QAM (3 MHz)	1960	-57	24.55
	64QAM (3 MHz)	1993	-56	24.32
	QPSK (5 MHz)	1933	-56	24.80
	QPSK (5 MHz)	1960	-57	24.62
	QPSK (5 MHz)	1992	-56	24.46
	16QAM (5 MHz)	1933	-57	24.01
	16QAM (5 MHz)	1960	-57	24.75
	16QAM (5 MHz)	1992	-56	24.49
	64QAM (5 MHz)	1933	-57	24.00
	64QAM (5 MHz)	1960	-57	24.76
	64QAM (5 MHz)	1992	-56	24.37
	QPSK (10 MHz)	1935	-57	24.08
	QPSK (10 MHz)	1960	-57	24.86
	QPSK (10 MHz)	1990	-56	24.60
	16QAM (10 MHz)	1935	-57	24.09
	16QAM (10 MHz)	1960	-57	24.88
	16QAM (10 MHz)	1990	-56	24.67
	64QAM (10 MHz)	1935	-57	24.09
	64QAM (10 MHz)	1960	-57	24.87
	64QAM (10 MHz)	1990	-56	24.73

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Uplink 1850-1915 MHz	QPSK (1.4 MHz)	1851	-57	24.26
	QPSK (1.4 MHz)	1880	-57	24.44
	QPSK (1.4 MHz)	1914	-58	24.14
	16QAM (1.4 MHz)	1851	-57	24.40
	16QAM (1.4 MHz)	1880	-57	24.54
	16QAM (1.4 MHz)	1914	-58	24.09
	64QAM (1.4 MHz)	1851	-57	24.31
	64QAM (1.4 MHz)	1880	-57	24.47
	64QAM (1.4 MHz)	1914	-58	24.10
	QPSK (3 MHz)	1852	-57	24.65
	QPSK (3 MHz)	1880	-57	24.45
	QPSK (3 MHz)	1913	-58	23.89
	16QAM (3 MHz)	1852	-57	24.67
	16QAM (3 MHz)	1880	-57	24.57
	16QAM (3 MHz)	1913	-58	23.78
	64QAM (3 MHz)	1852	-57	24.68
	64QAM (3 MHz)	1880	-57	24.47
	64QAM (3 MHz)	1913	-57	24.65
	QPSK (5 MHz)	1853	-58	23.91
	QPSK (5 MHz)	1880	-57	24.49
	QPSK (5 MHz)	1912	-57	24.50
	16QAM (5 MHz)	1853	-58	23.92
	16QAM (5 MHz)	1880	-57	24.50
	16QAM (5 MHz)	1912	-57	24.38
	64QAM (5 MHz)	1853	-58	24.23
	64QAM (5 MHz)	1880	-57	24.83
	64QAM (5 MHz)	1912	-57	24.40
	QPSK (10 MHz)	1855	-58	24.38
	QPSK (10 MHz)	1880	-57	24.85
	QPSK (10 MHz)	1910	-57	24.15
	16QAM (10 MHz)	1855	-58	24.14
	16QAM (10 MHz)	1880	-57	24.61
	16QAM (10 MHz)	1910	-57	24.14
	64QAM (10 MHz)	1855	-58	24.05
	64QAM (10 MHz)	1880	-57	24.55
	64QAM (10 MHz)	1910	-57	24.15

## 5 FCC §2.1049 & §24.238 - OCCUPIED BANDWIDTH

### 5.1 Applicable Standard

Requirements: FCC §2.1049 and §24.238.

### 5.2 Test Procedure

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

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

### 5.3 Test Environmental Conditions

<b>Temperature:</b>	20 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.3kPa

*The testing was performed by Lionel Lara on 2012-05-18 in RF Site.*

### 5.4 Test Equipment List and Details

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

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

## 5.5 Test Results

### CDMA/EVDO:

Mode		Modulation	Frequency (MHz)	Emission Bandwidth	
				Input (kHz)	Output (kHz)
PCS	Uplink	CDMA/EVDO	1880	1259.9	1260.1
	Downlink	CDMA/EVDO	1960	1259.5	1258.1

### LTE:

Mode	Modulation	Frequency (MHz)	Emission Bandwidth	
			Input (kHz)	Output (kHz)
Downlink 1930-1995 MHz	QPSK (1.4 MHz)	1960	1112.9	1089.8
	16QAM (1.4 MHz)	1960	1114.0	1092.0
	64QAM (1.4 MHz)	1960	1113.1	1088.6
	QPSK (3 MHz)	1960	2712.0	2698.0
	16QAM (3 MHz)	1960	2714.9	2700.1
	64QAM (3 MHz)	1960	2715.3	2688.8
	QPSK (5 MHz)	1960	4519.1	4496.2
	16QAM (5 MHz)	1960	4526.8	4496.0
	64QAM (5 MHz)	1960	4512.8	4503.5
	QPSK (10 MHz)	1960	9018.6	8966.8
	16QAM (10 MHz)	1960	9031.6	8980.5
	64QAM (10 MHz)	1960	9030.7	8965.8

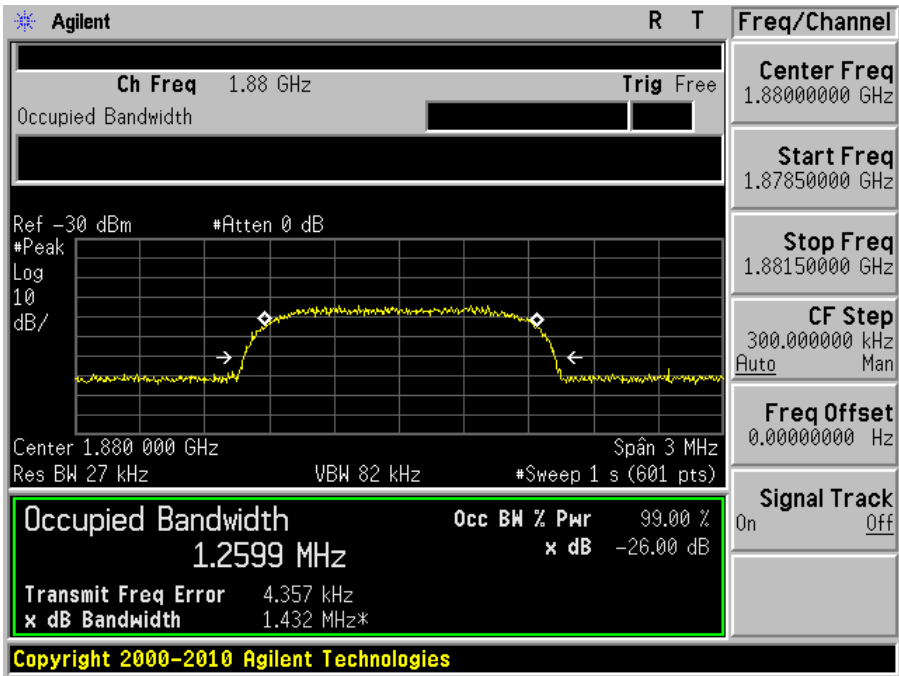
Mode	Modulation	Frequency (MHz)	Emission Bandwidth	
			Input (kHz)	Output (kHz)
Uplink 1850-1915 MHz	QPSK (1.4 MHz)	1880	1090.3	1087.9
	16QAM (1.4 MHz)	1880	1093.3	1091.0
	64QAM (1.4 MHz)	1880	1093.8	1087.2
	QPSK (3 MHz)	1880	2710.3	2699.9
	16QAM (3 MHz)	1880	2706.8	2698.8
	64QAM (3 MHz)	1880	2699.2	2694.1
	QPSK (5 MHz)	1880	4503.4	4495.9
	16QAM (5 MHz)	1880	4514.8	4499.4
	64QAM (5 MHz)	1880	4519.2	4500.0
	QPSK (10 MHz)	1880	9009.9	8953.7
	16QAM (10 MHz)	1880	9021.5	8980.5
	64QAM (10 MHz)	1880	9023.7	8957.6

Please refer to the following plots.

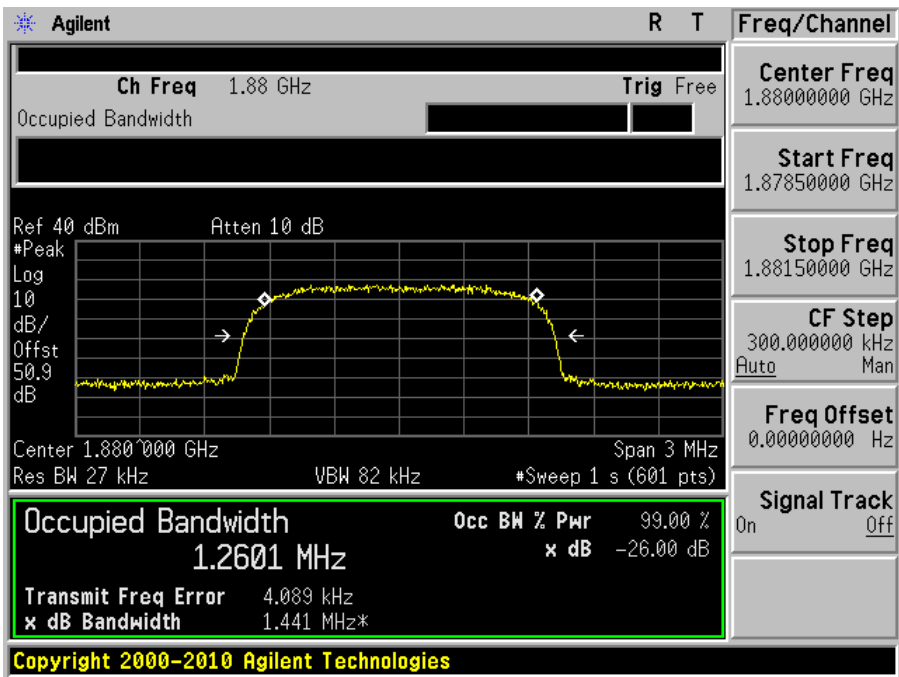


CDMA/EVDO, Uplink

Input

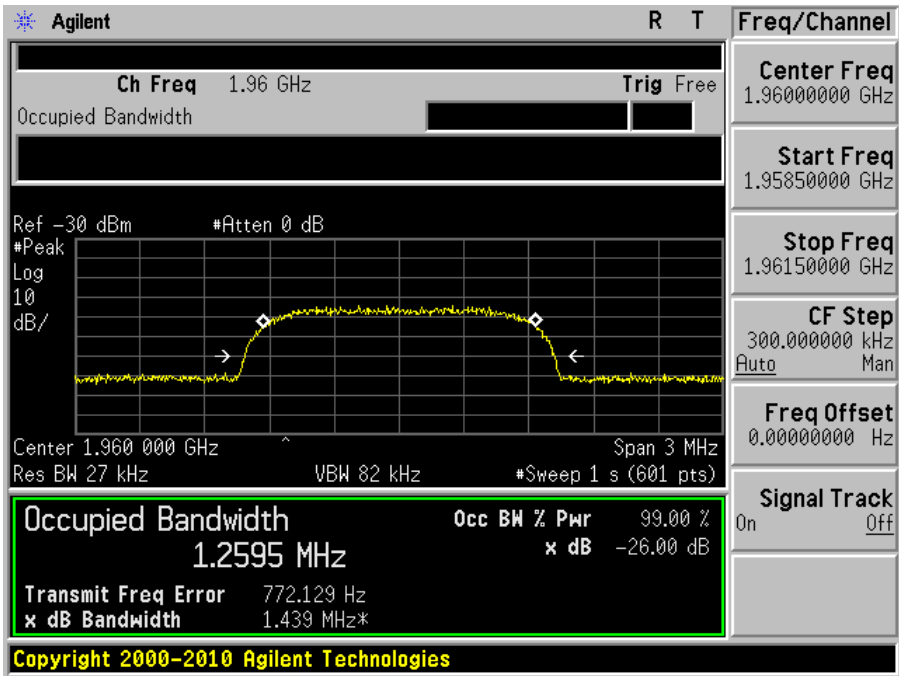


Output

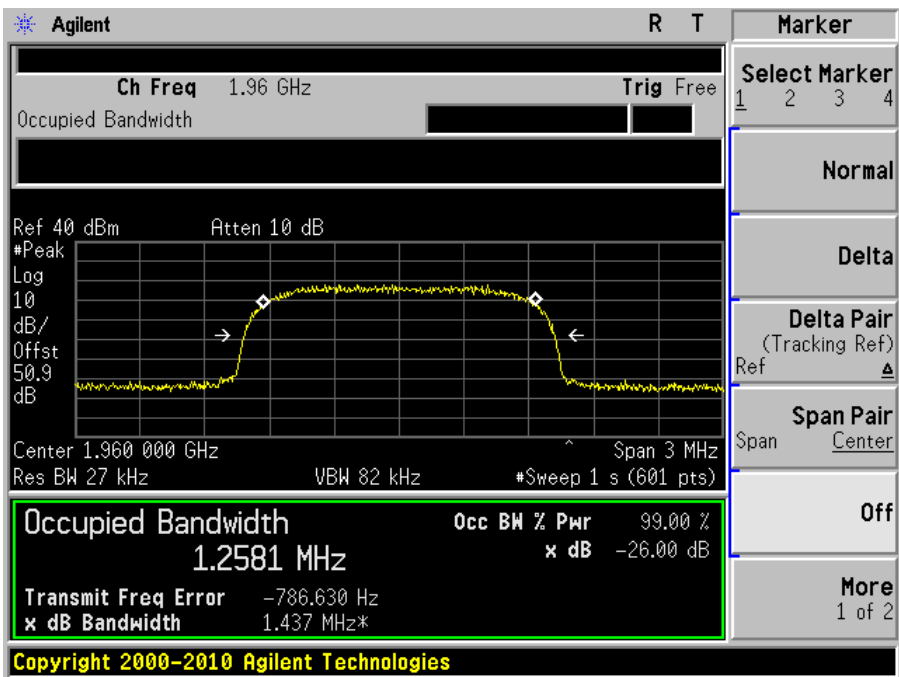


CDMA/EVDO, Downlink

Input



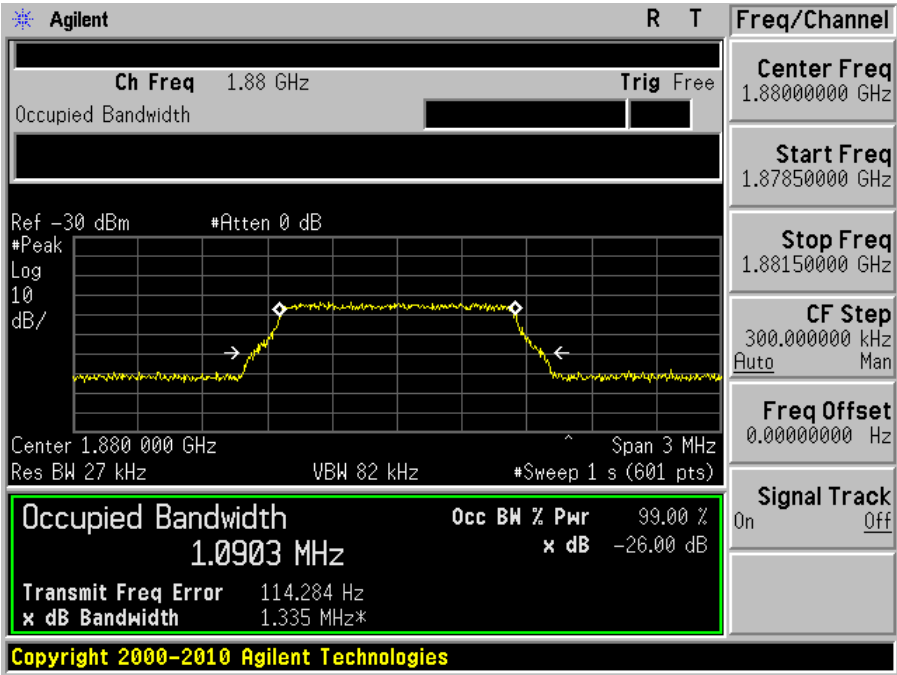
Output



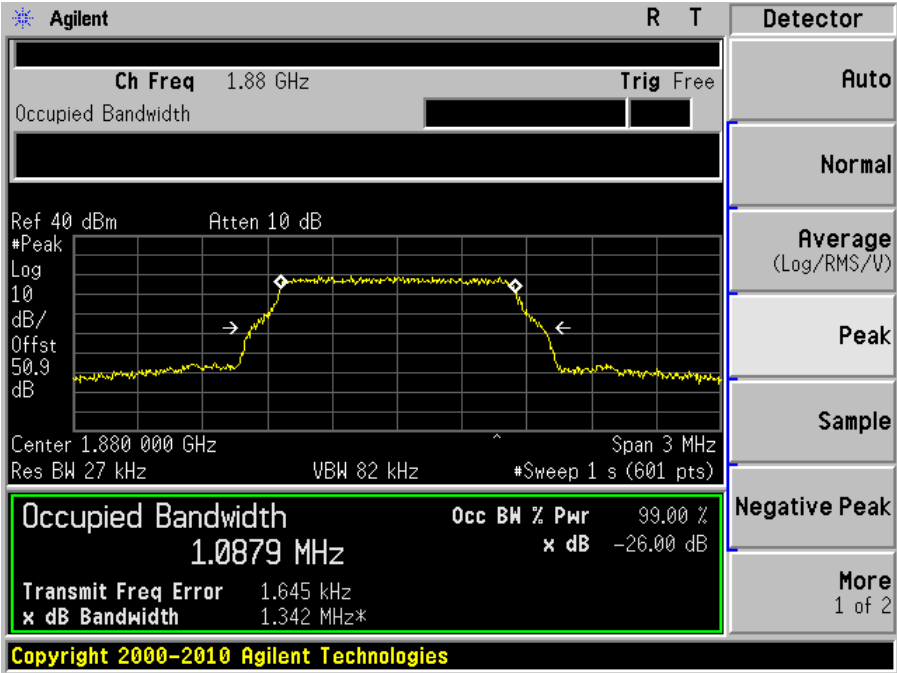
LTE, Uplink

LTE-QPSK (1.4 MHz)

Input

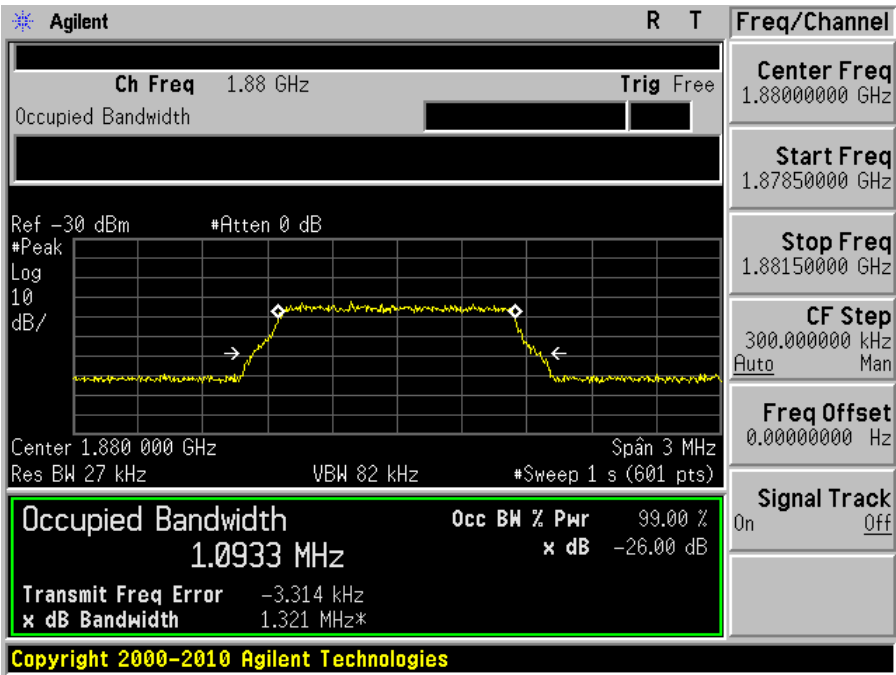


Output

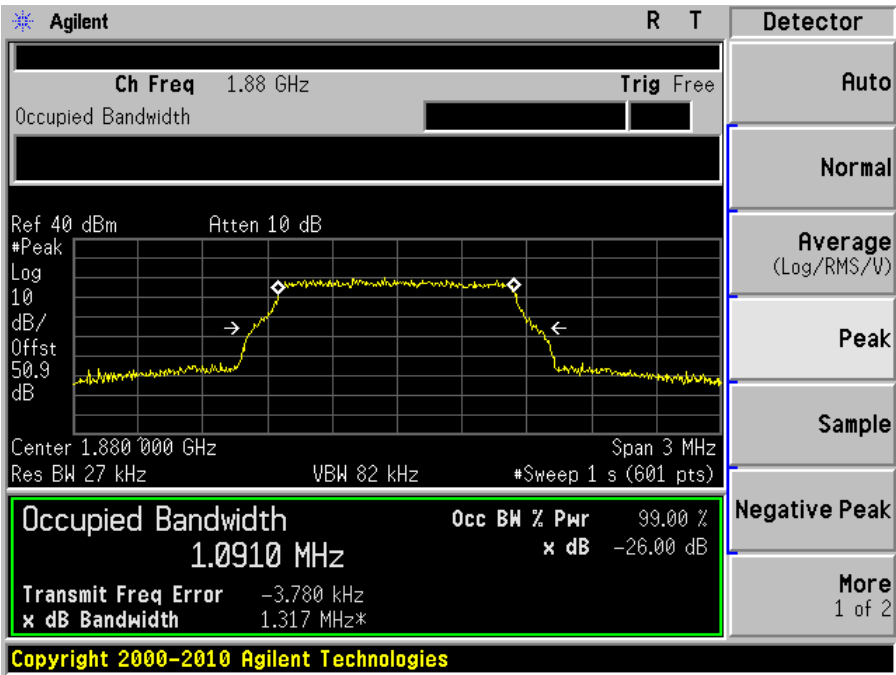


LTE-16QAM (1.4 MHz)

Input

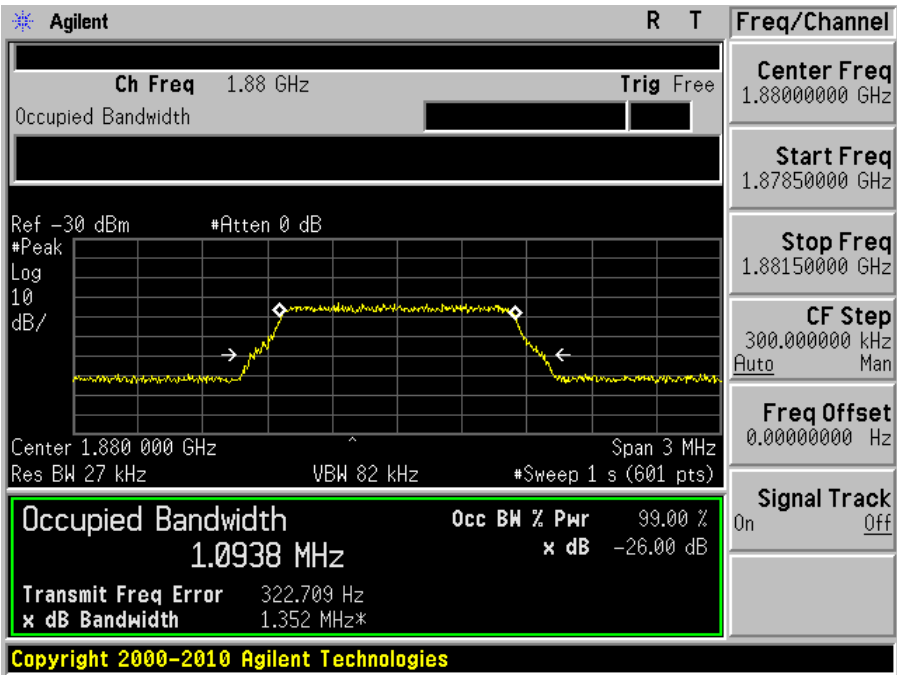


Output

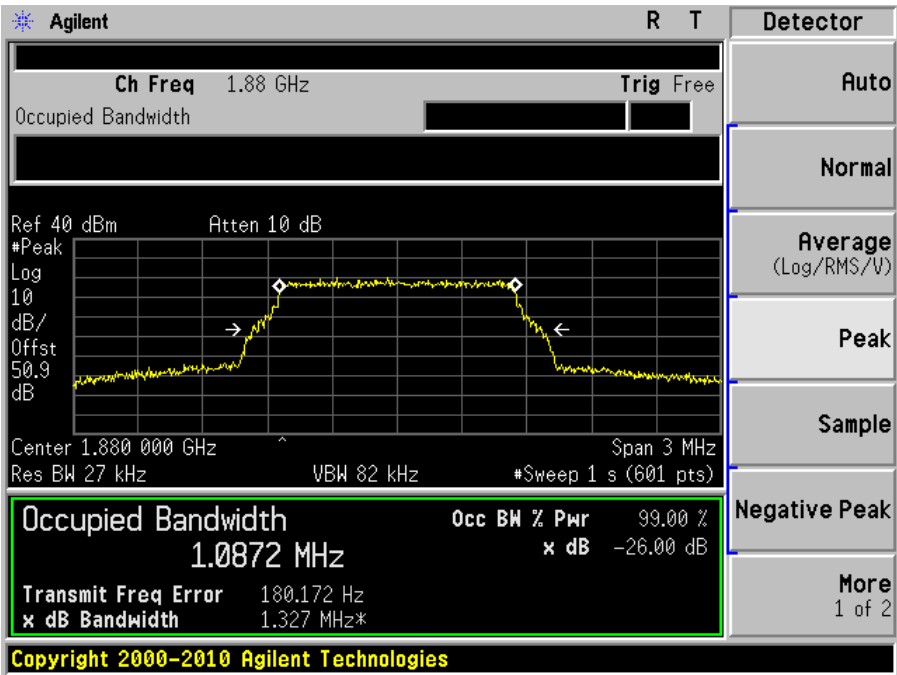


LTE-64QAM (1.4 MHz)

Input

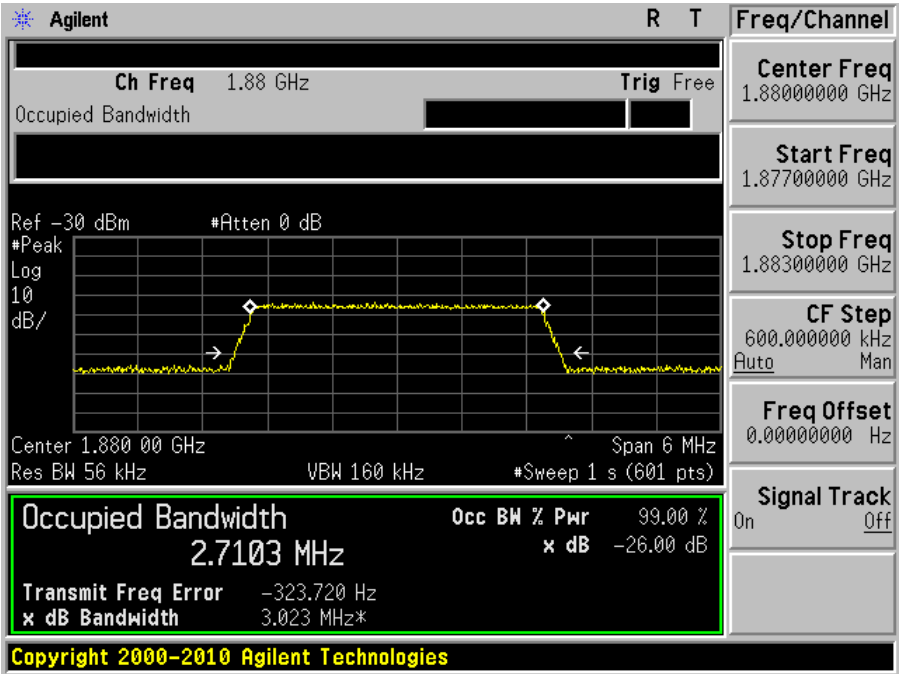


Output

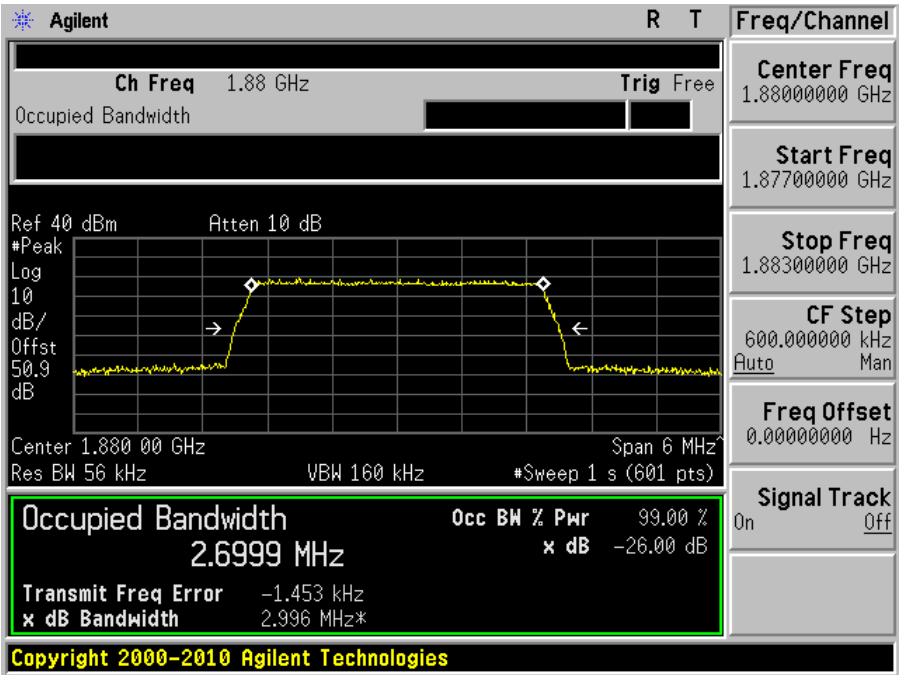


LTE-QPSK (3 MHz)

Input

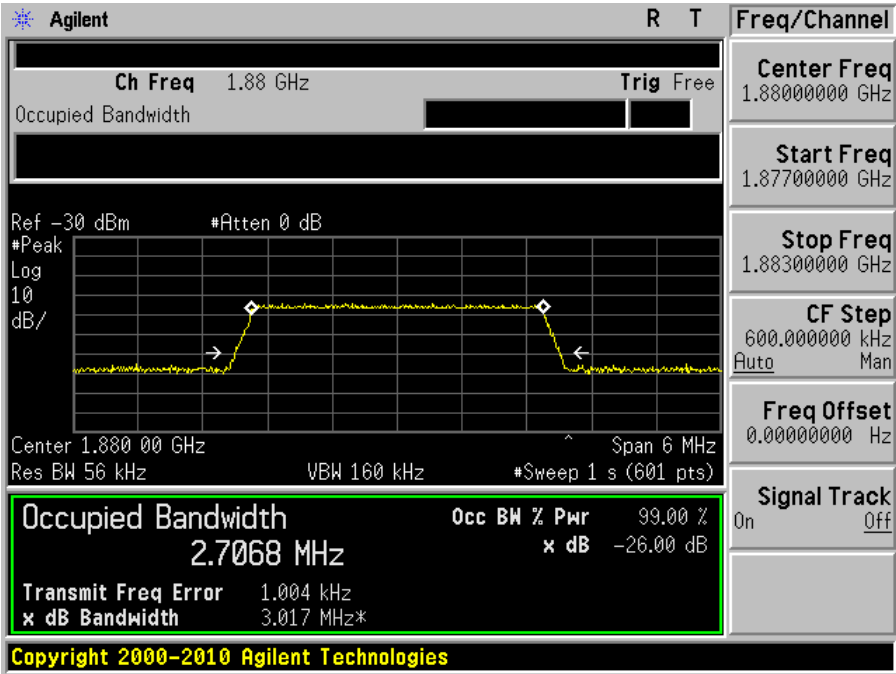


Output

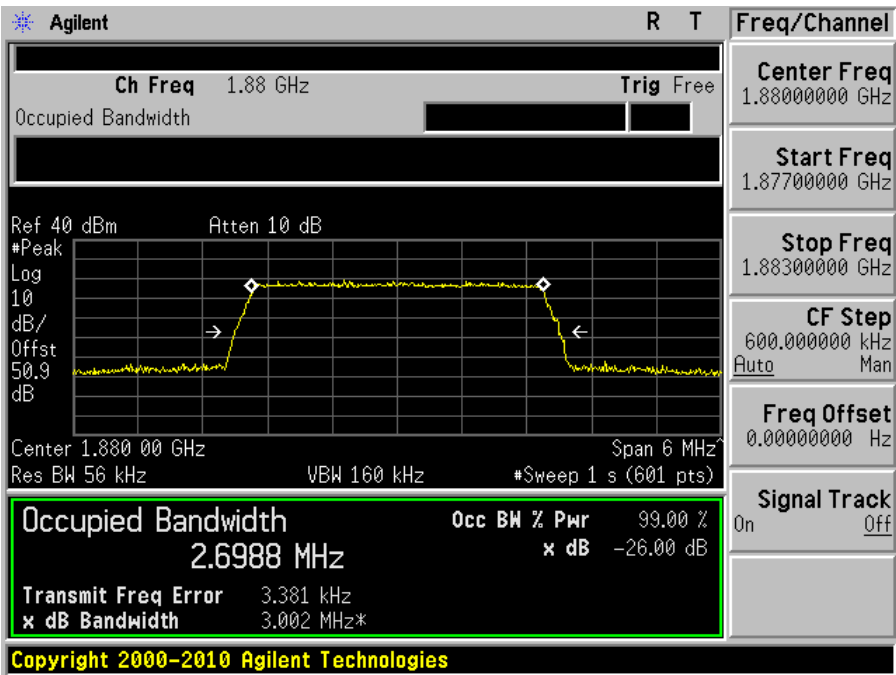


LTE-16QAM (3 MHz)

Input

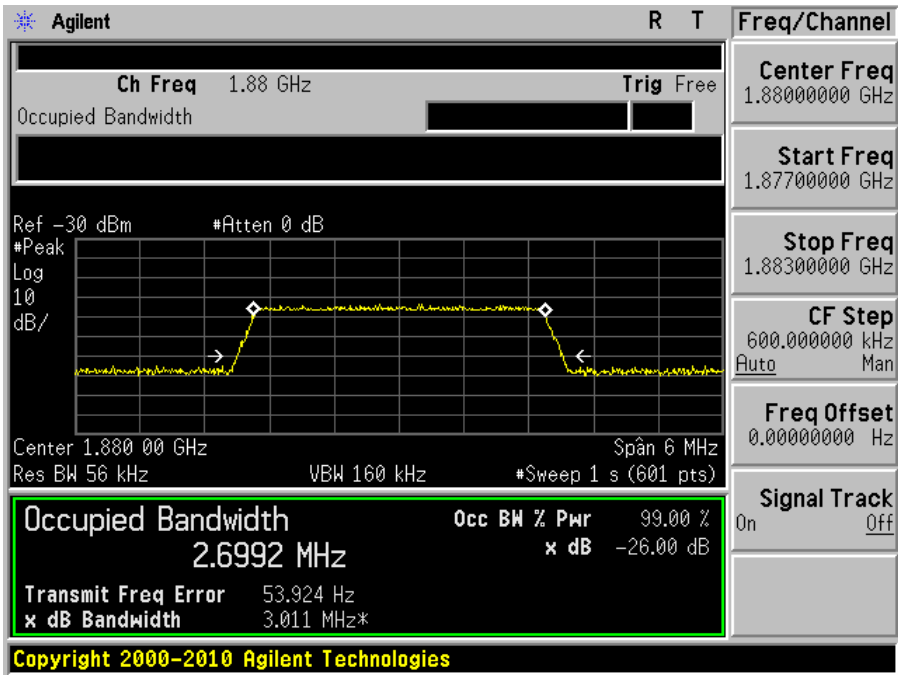


Output

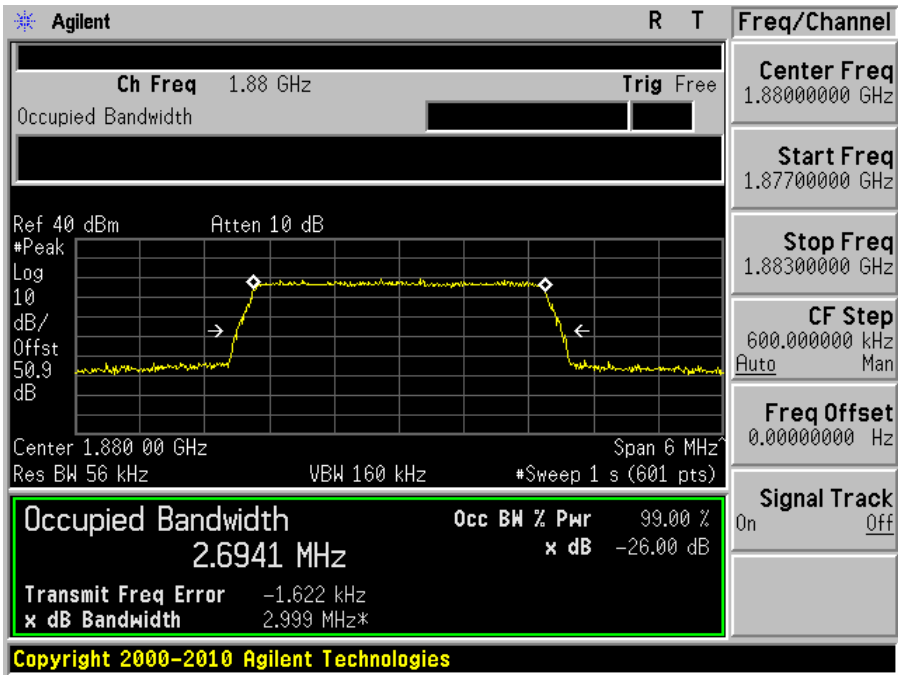


LTE-64QAM (3 MHz)

Input



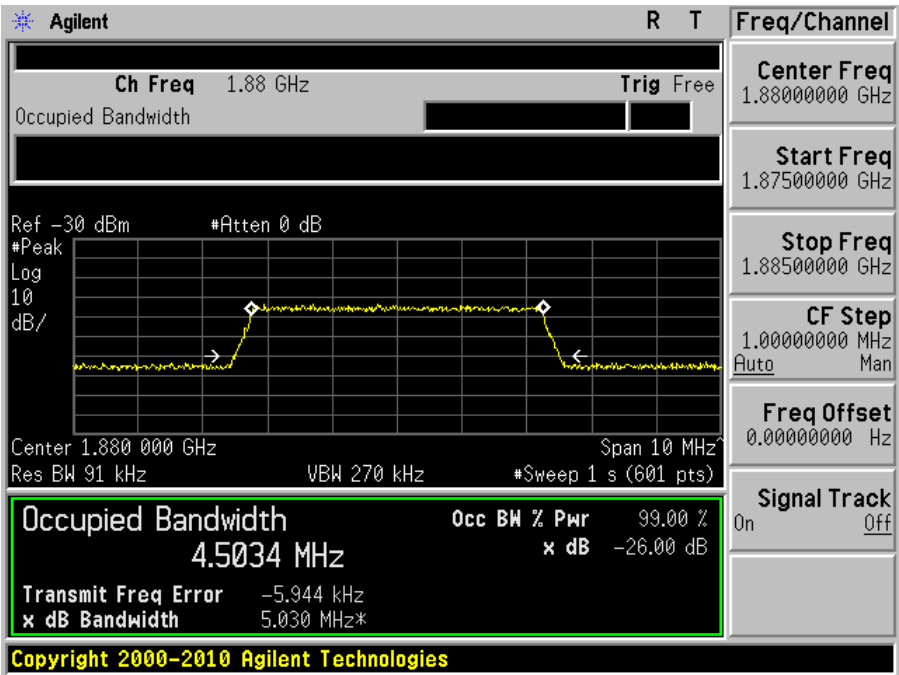
Output



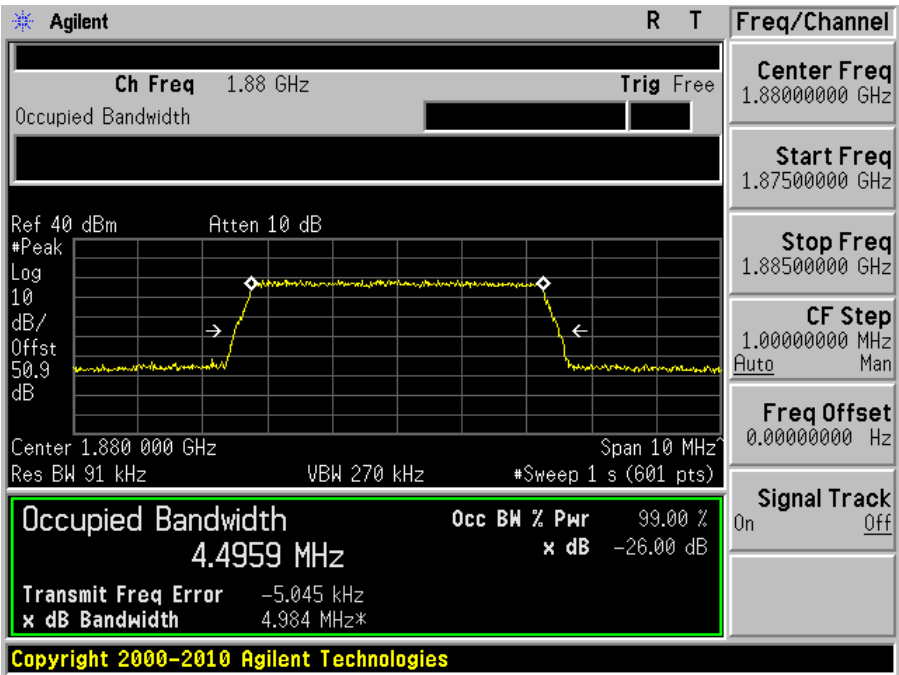


LTE-QPSK (5 MHz)

Input

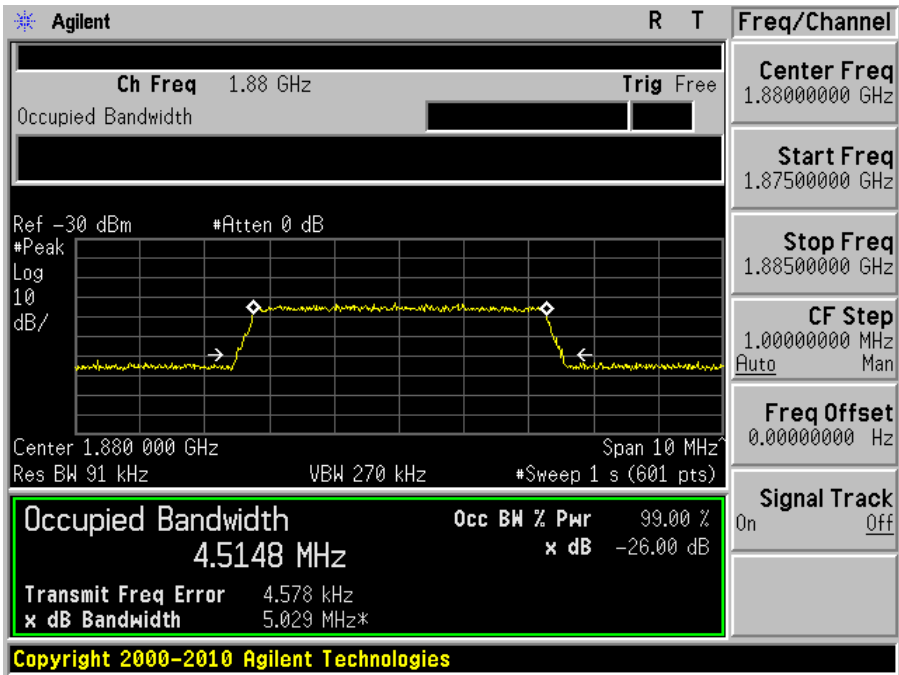


Output

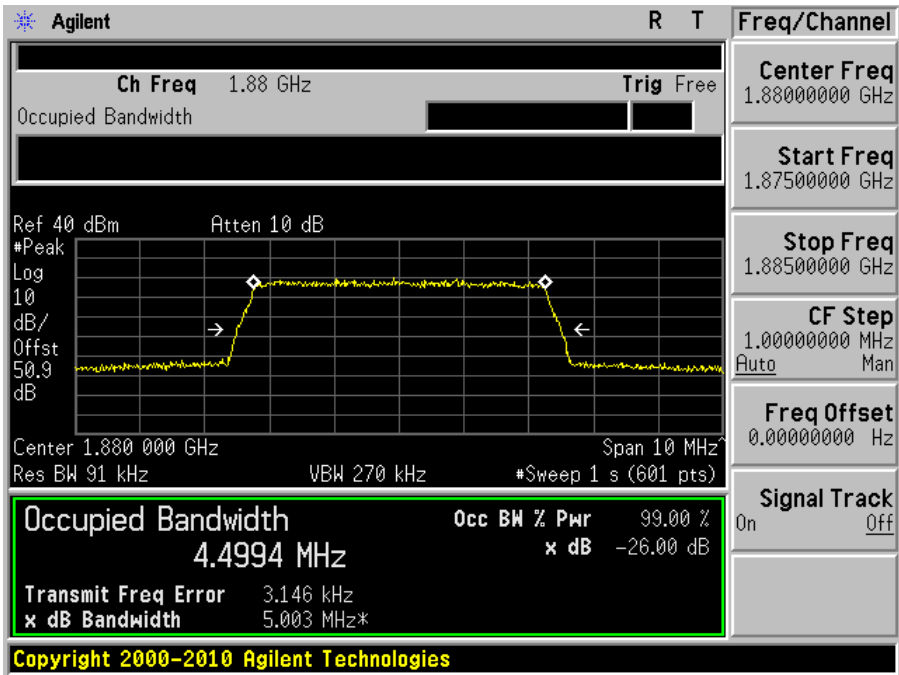


LTE-16QAM (5 MHz)

Input

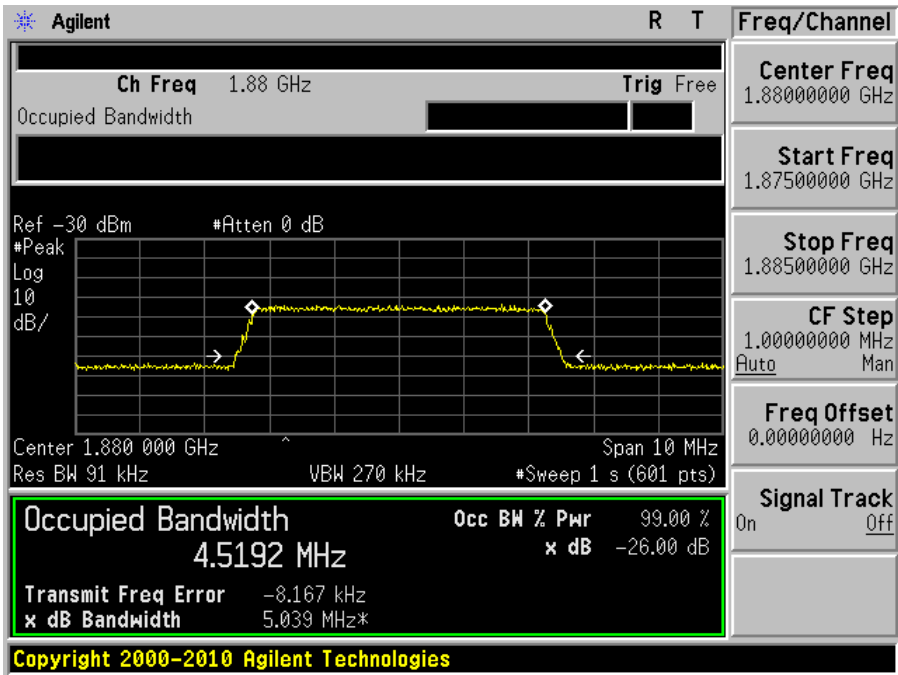


Output

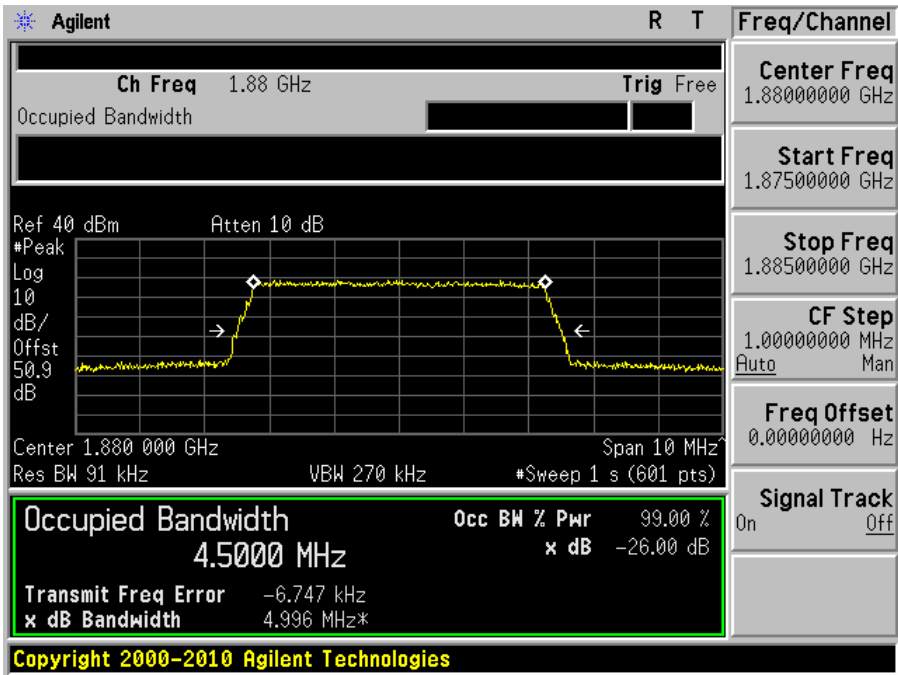


LTE-64QAM (5 MHz)

Input

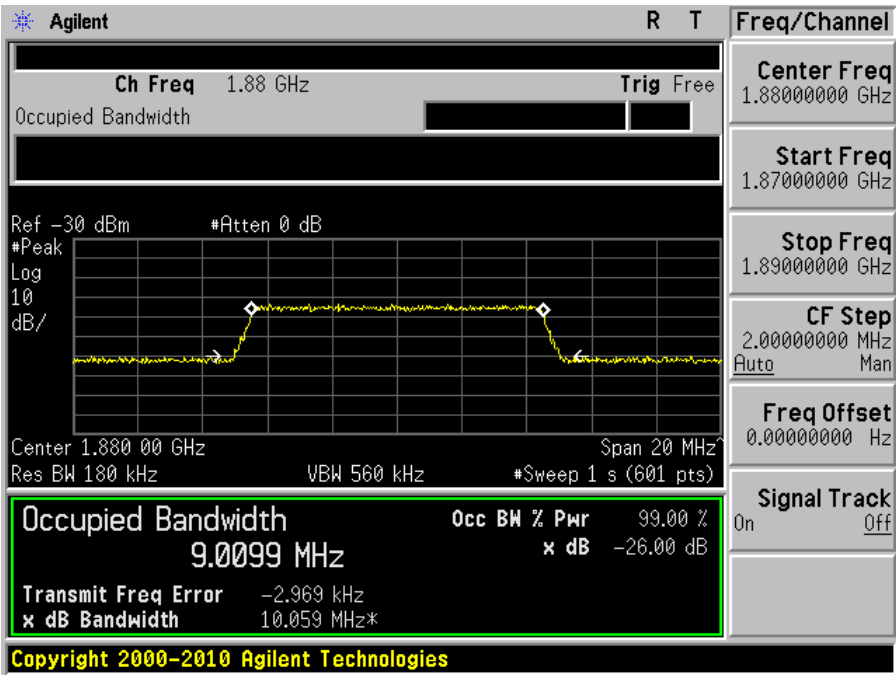


Output

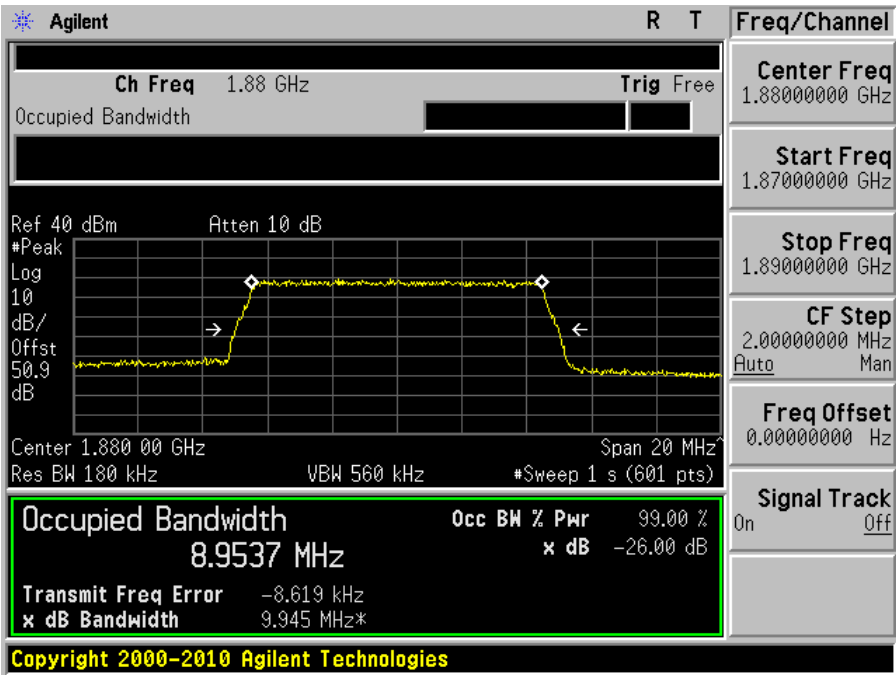


LTE-QPSK (10 MHz)

Input

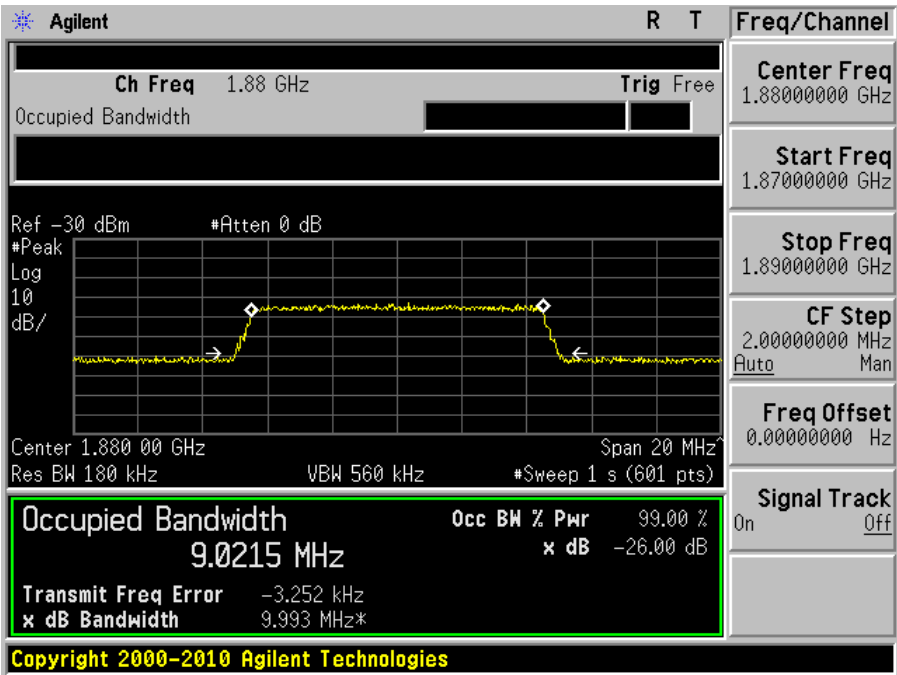


Output

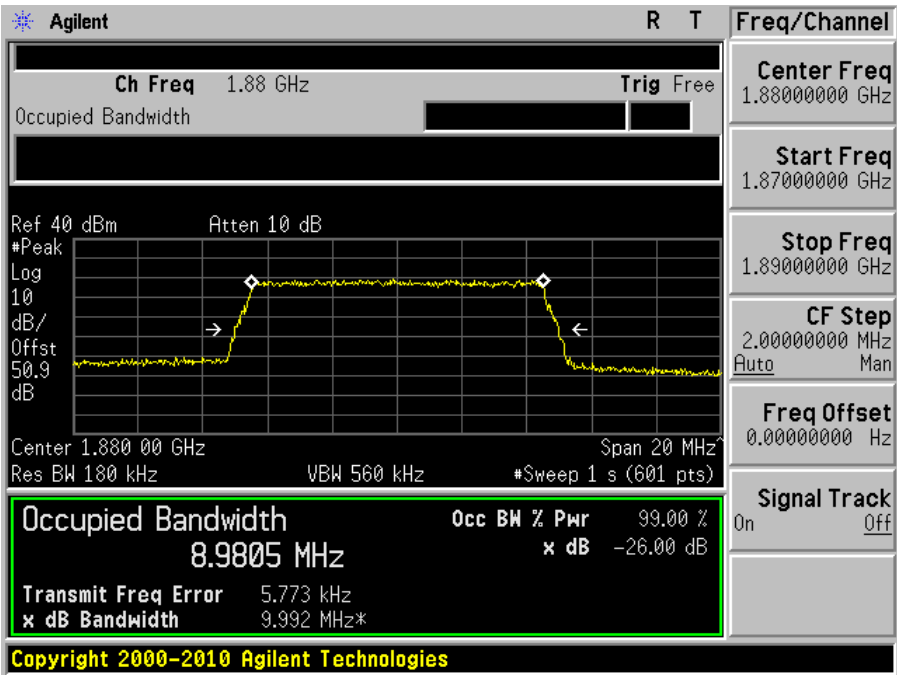


LTE-16QAM (10 MHz)

Input

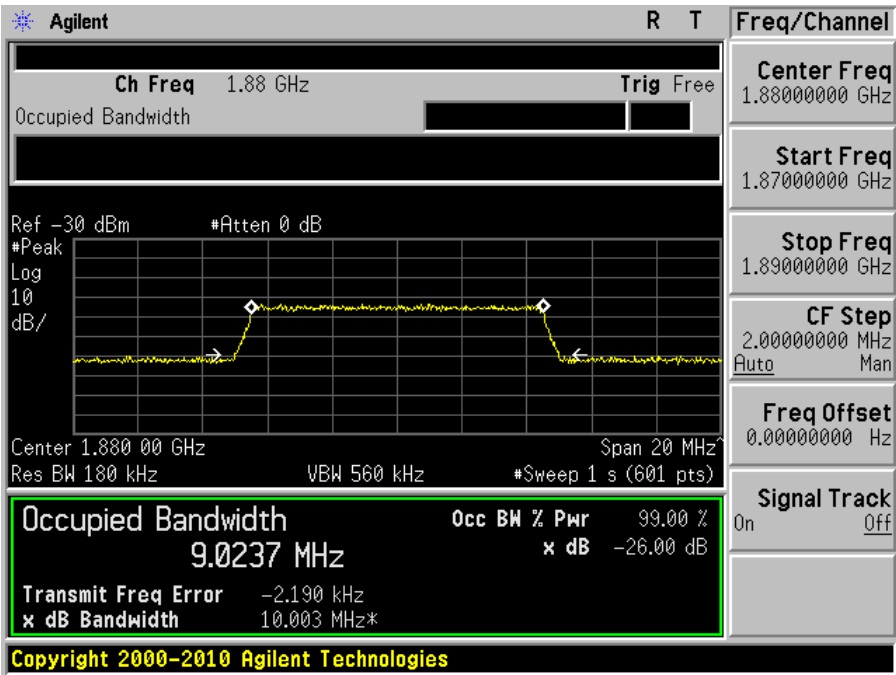


Output

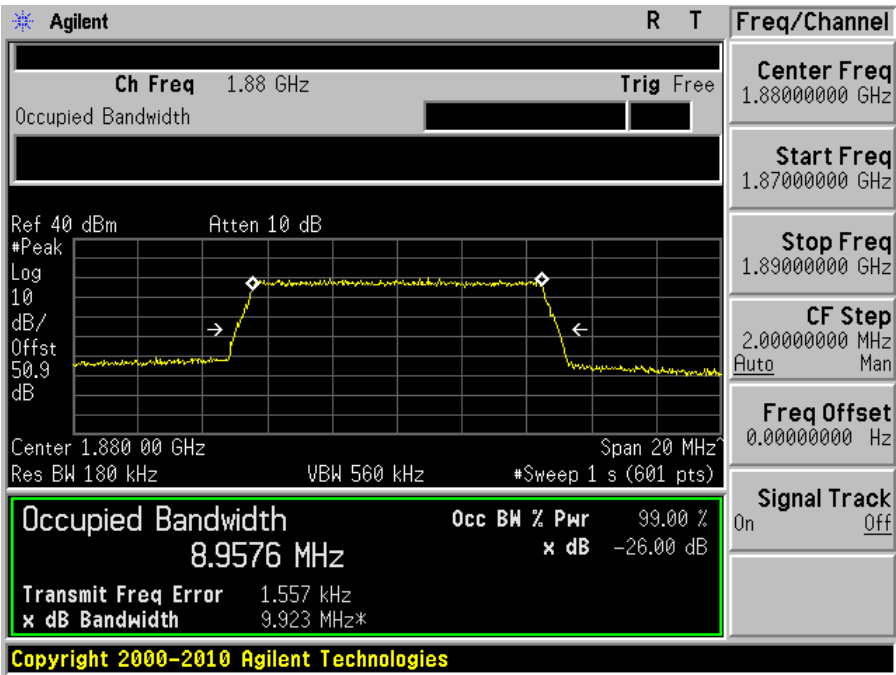


LTE-64QAM (10 MHz)

Input



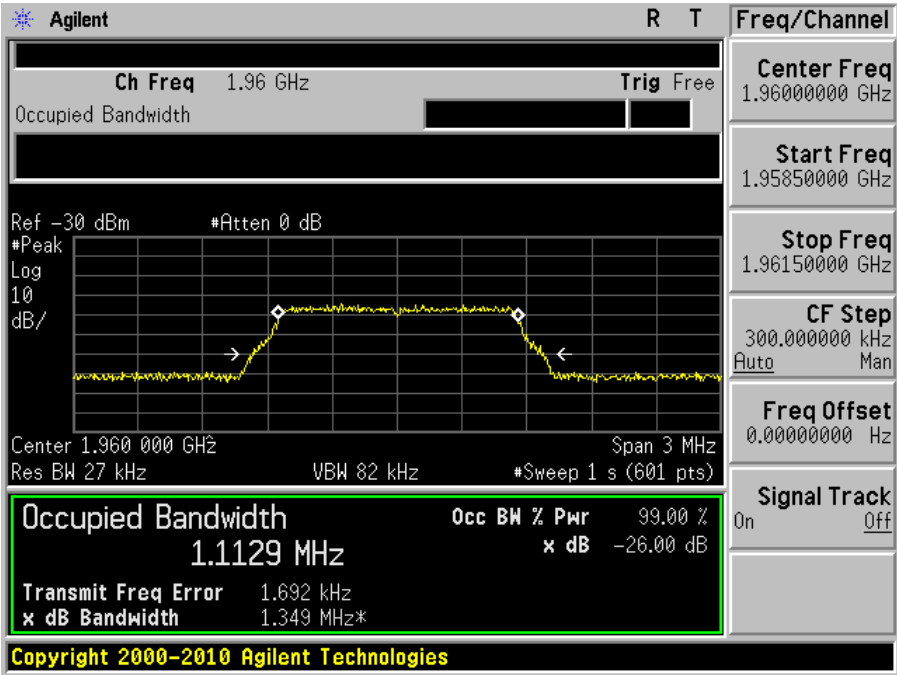
Output



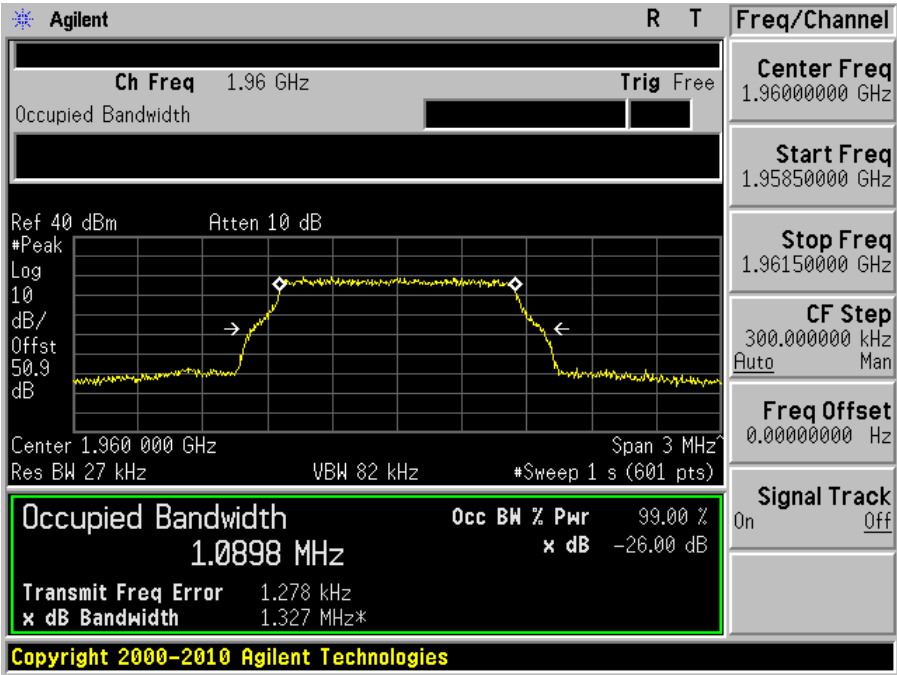
LTE, Downlink

LTE-QPSK (1.4 MHz)

Input

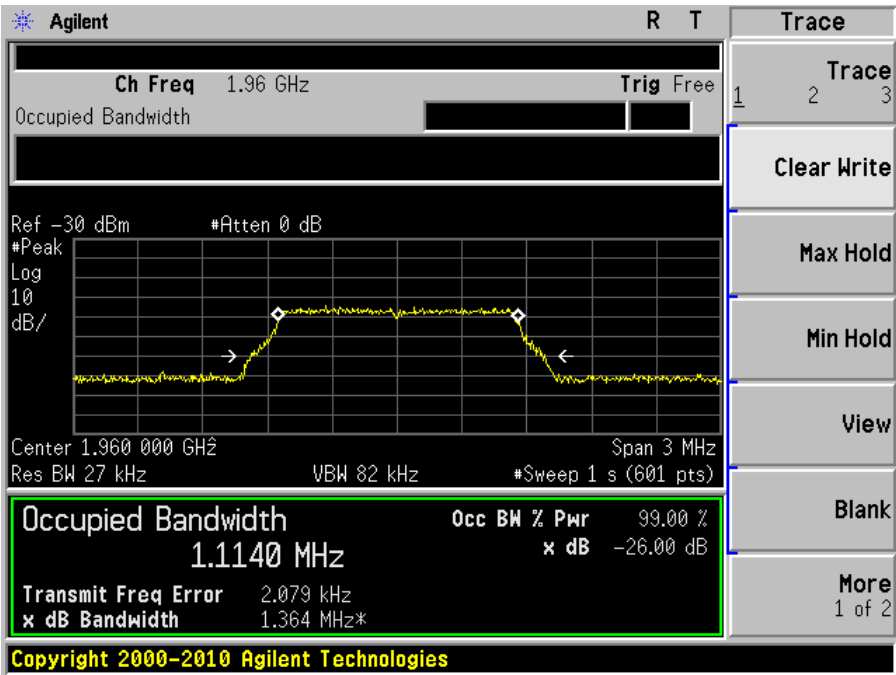


Output

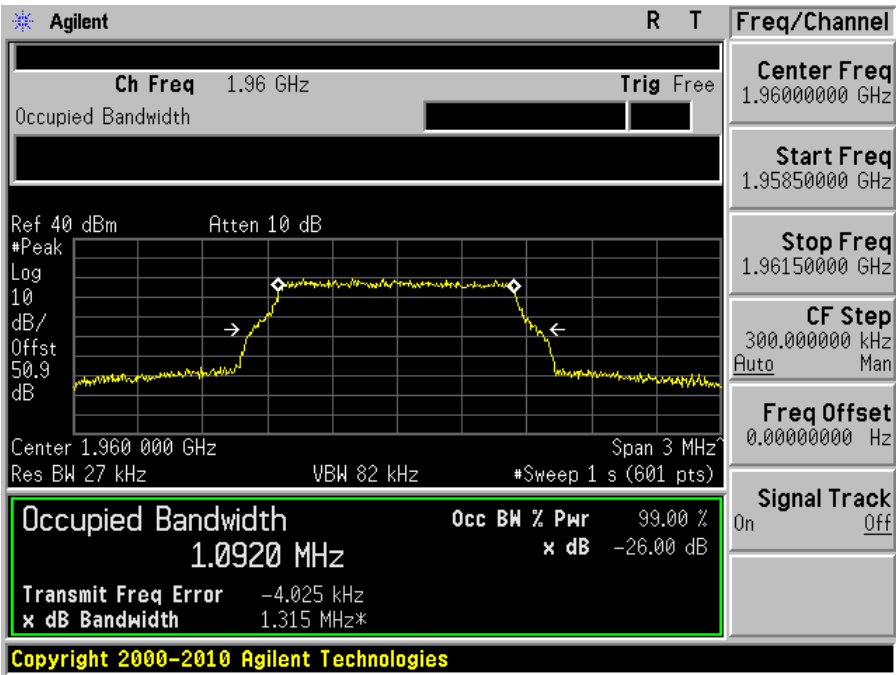


LTE-16QAM (1.4 MHz)

Input



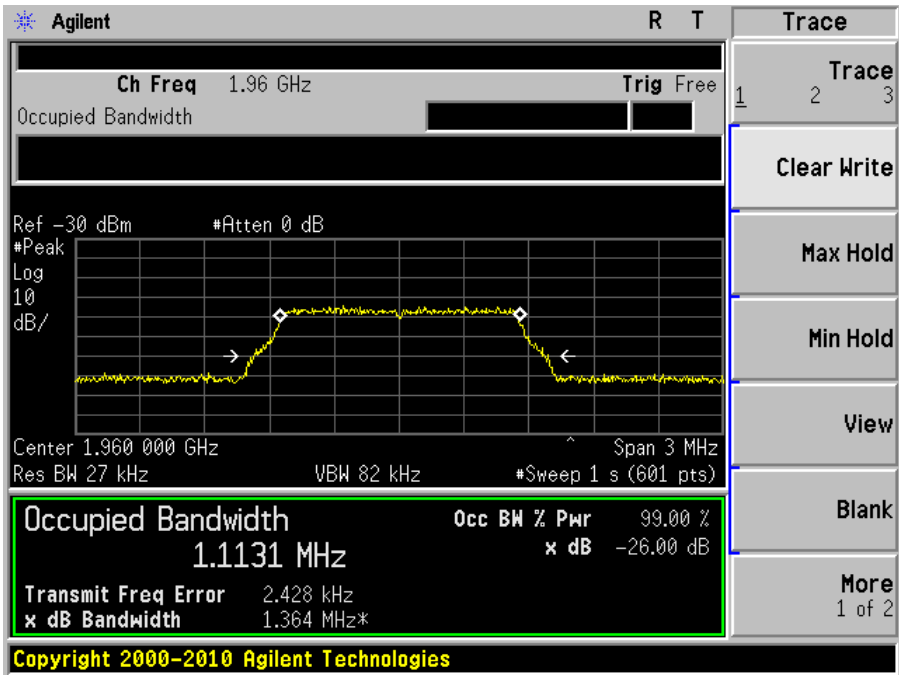
Output



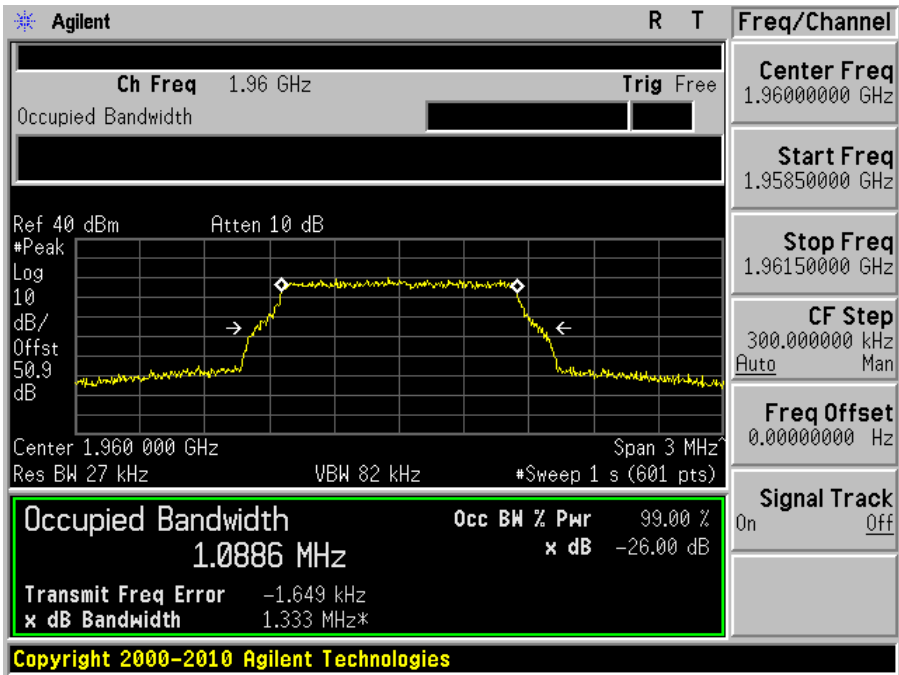


LTE-64QAM (1.4 MHz)

Input

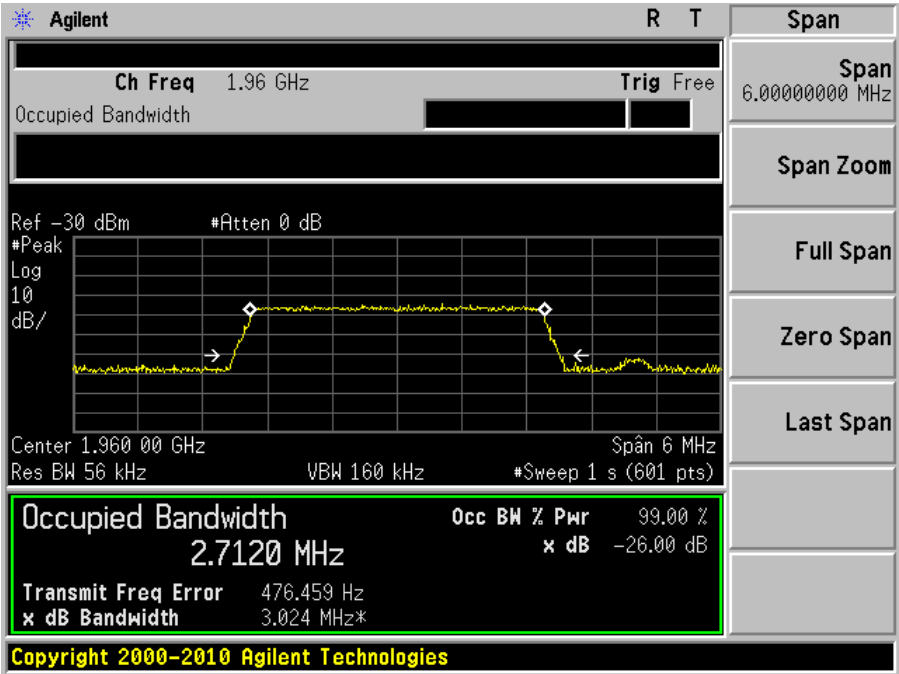


Output

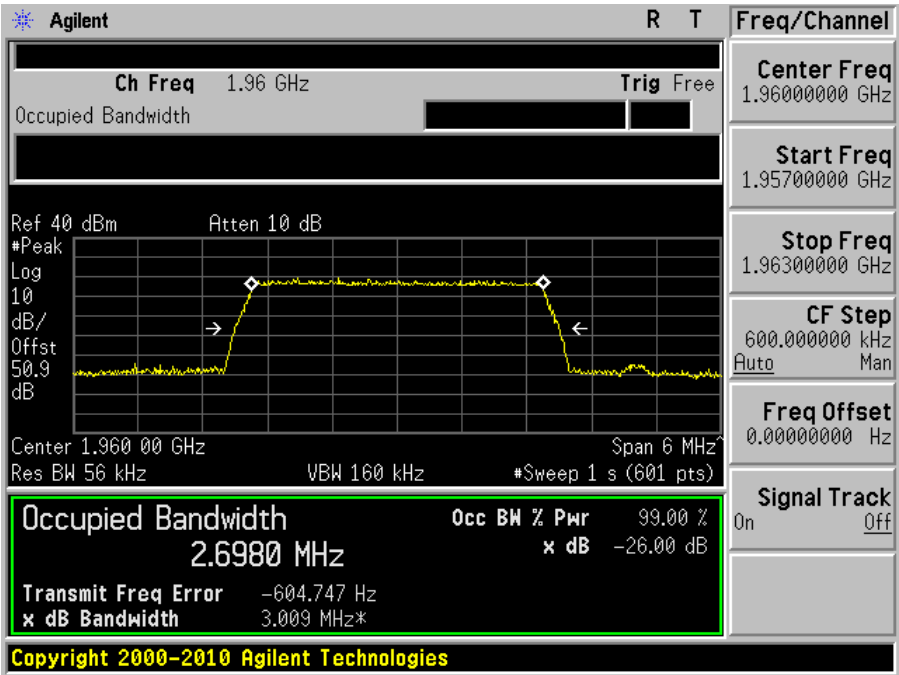


LTE-QPSK (3 MHz)

Input

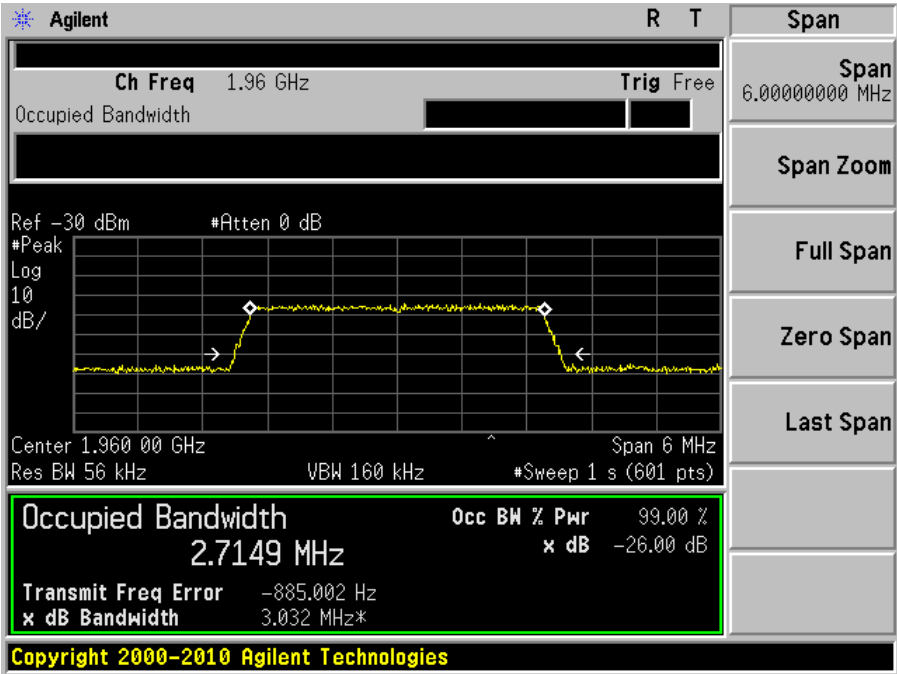


Output

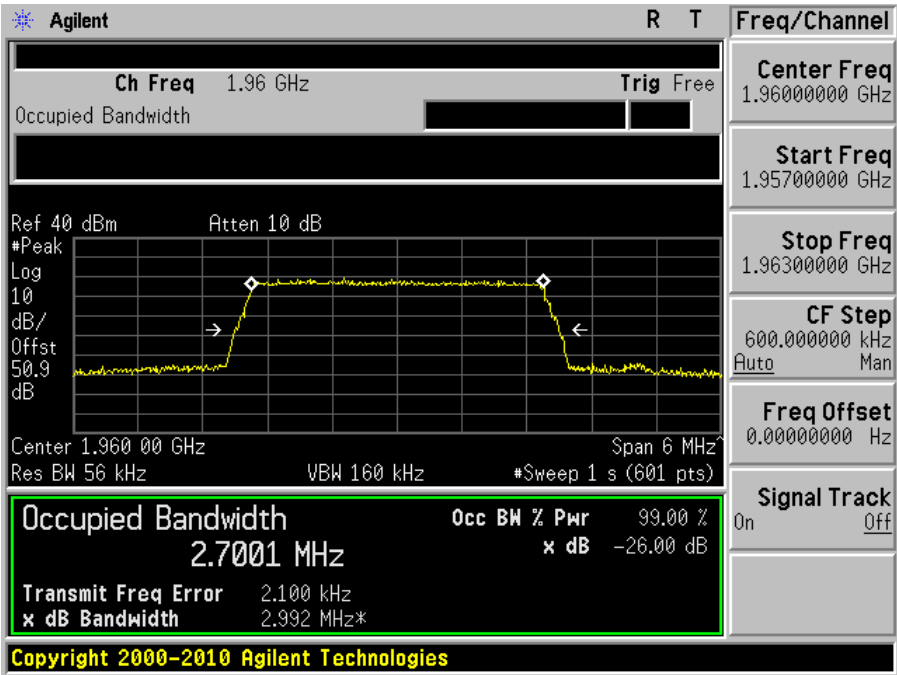


LTE-16QAM (3 MHz)

Input

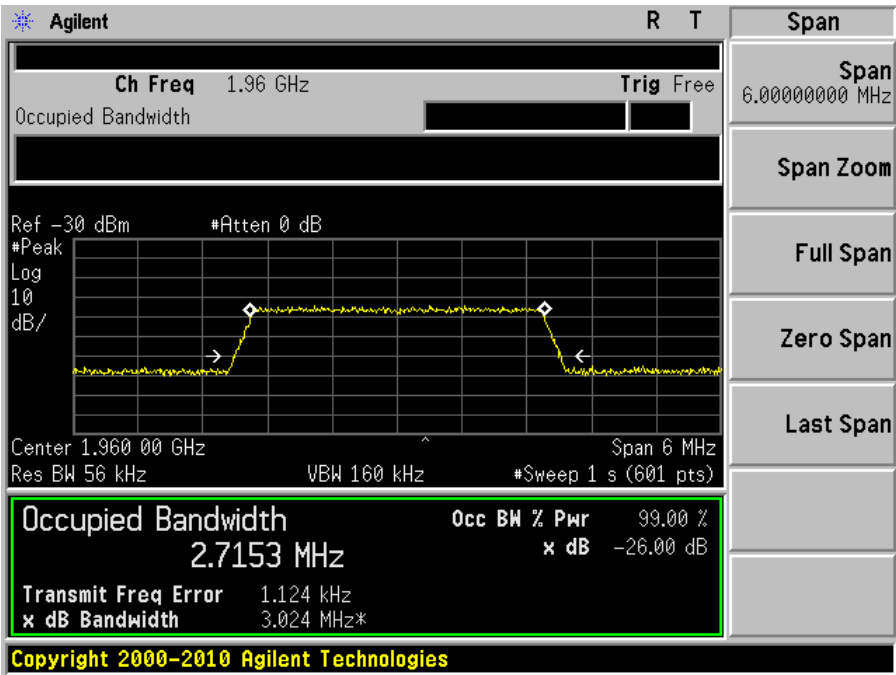


Output

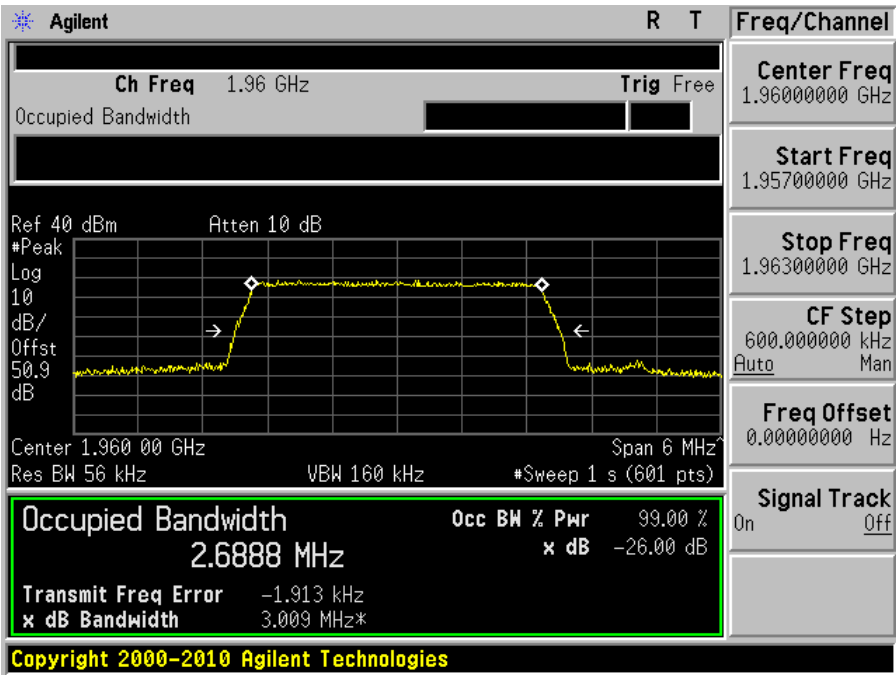


LTE-64QAM (3 MHz)

Input

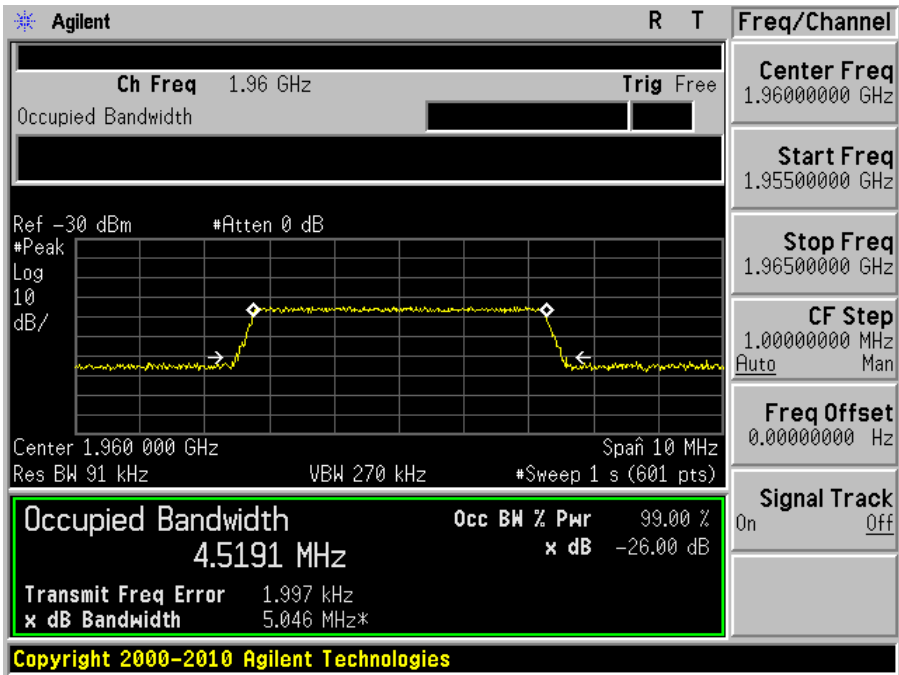


Output

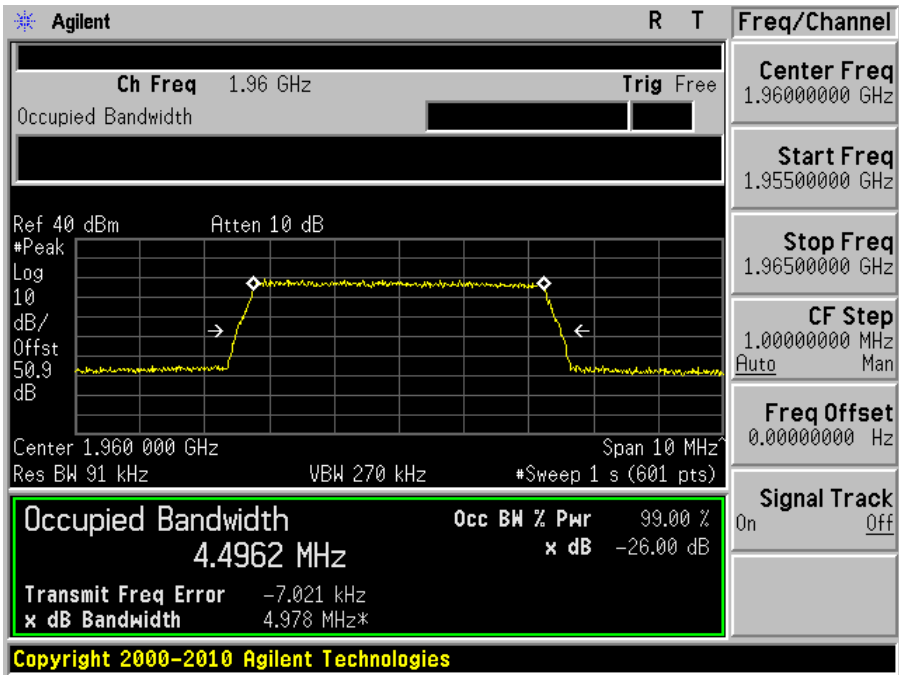


LTE-QPSK (5 MHz)

Input

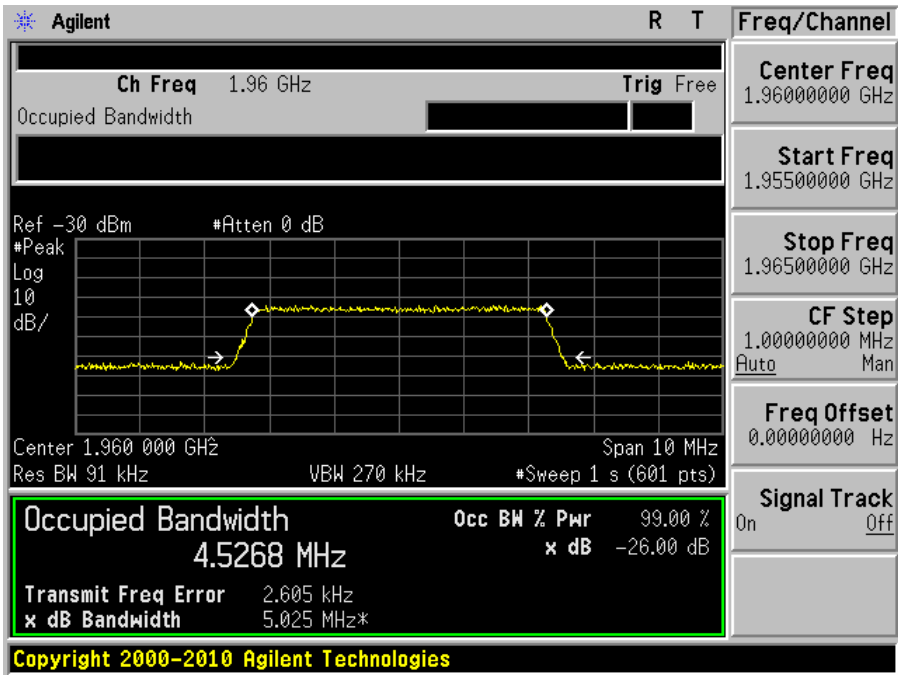


Output

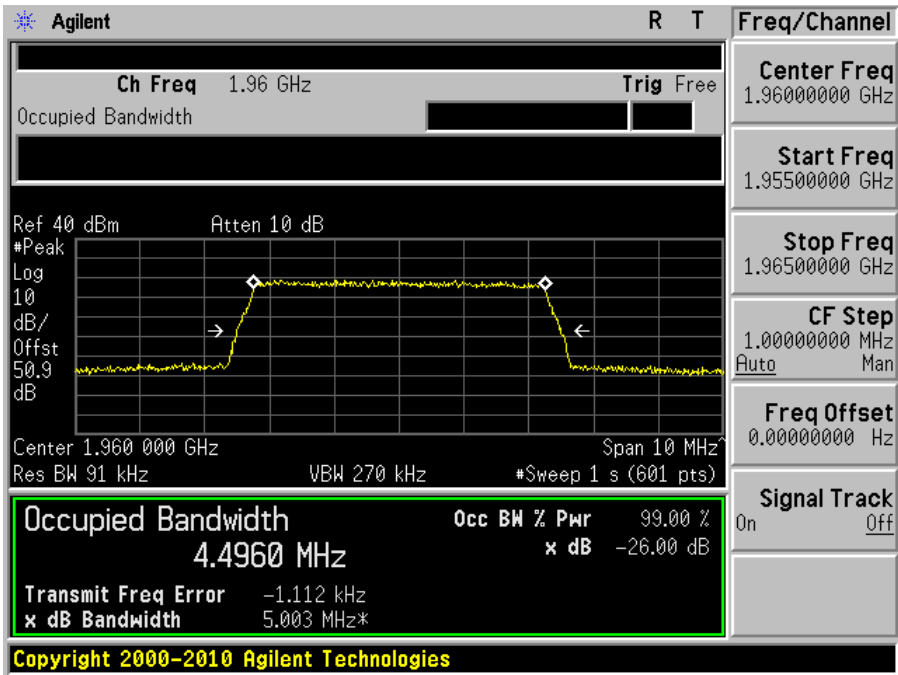


LTE-16QAM (5 MHz)

Input

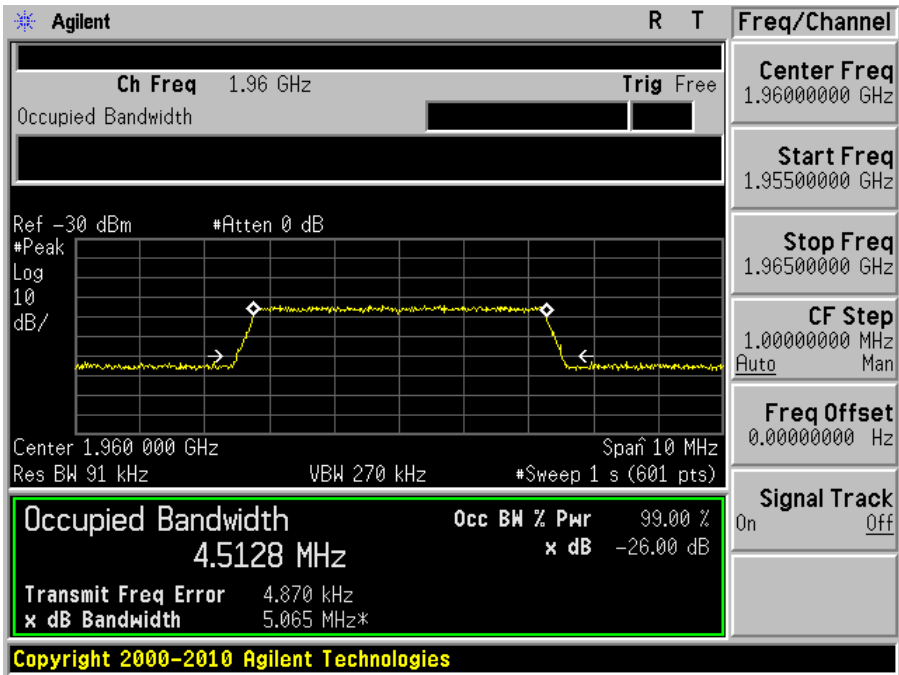


Output

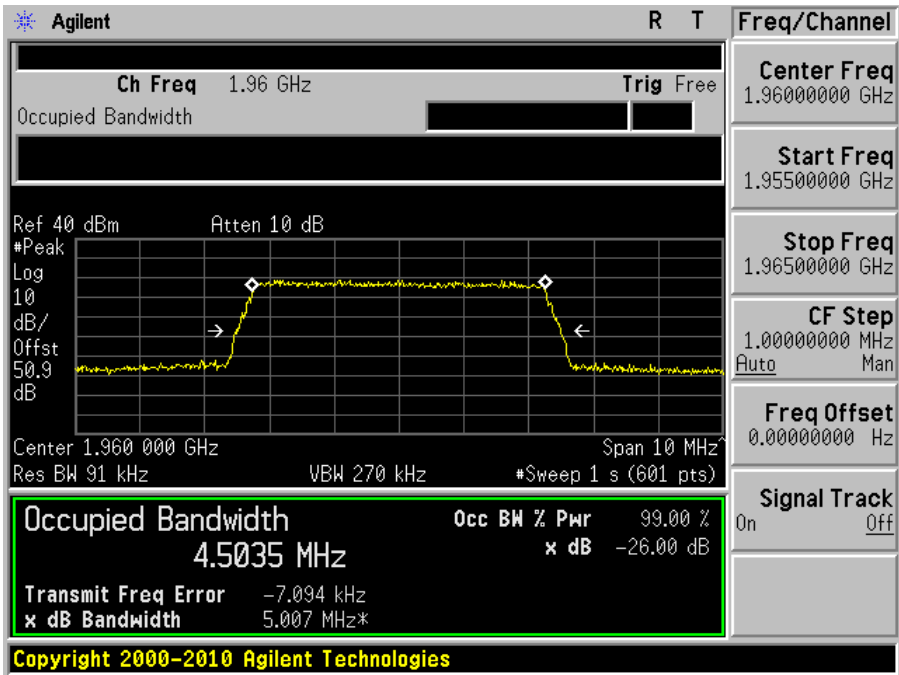


LTE-64QAM (5 MHz)

Input

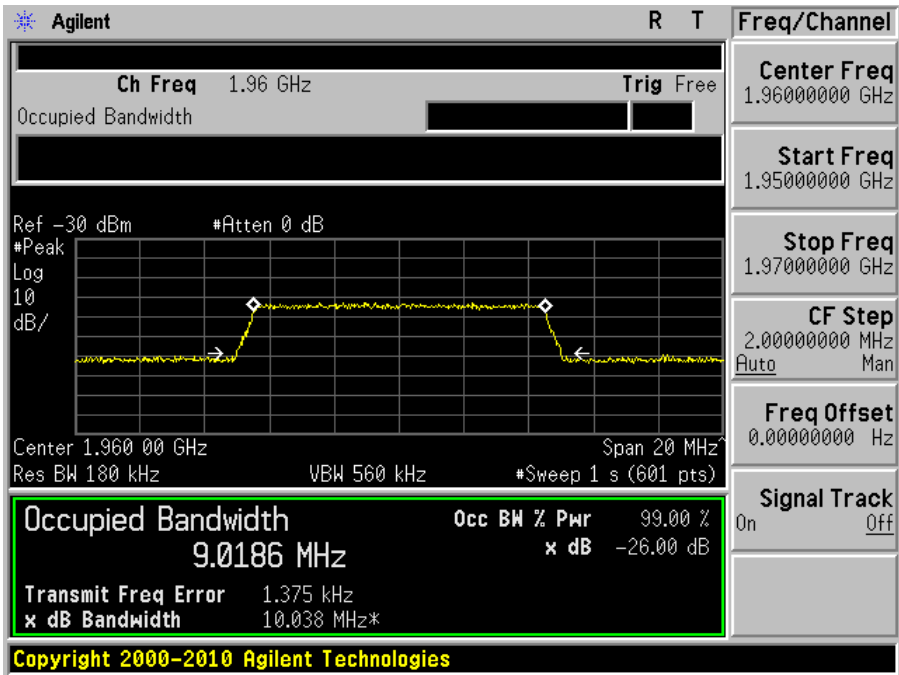


Output

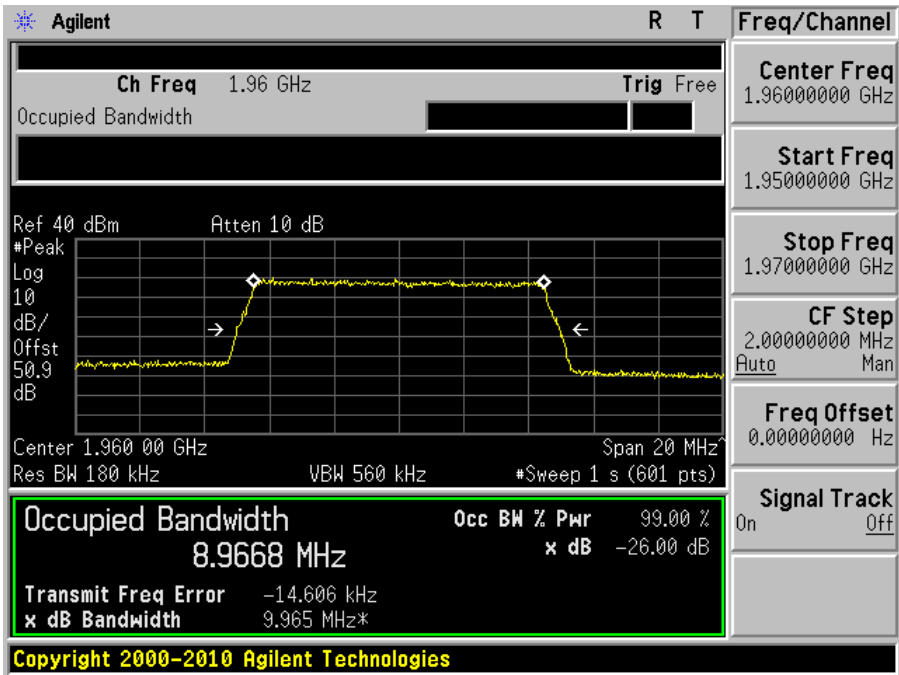


LTE-QPSK (10 MHz)

Input



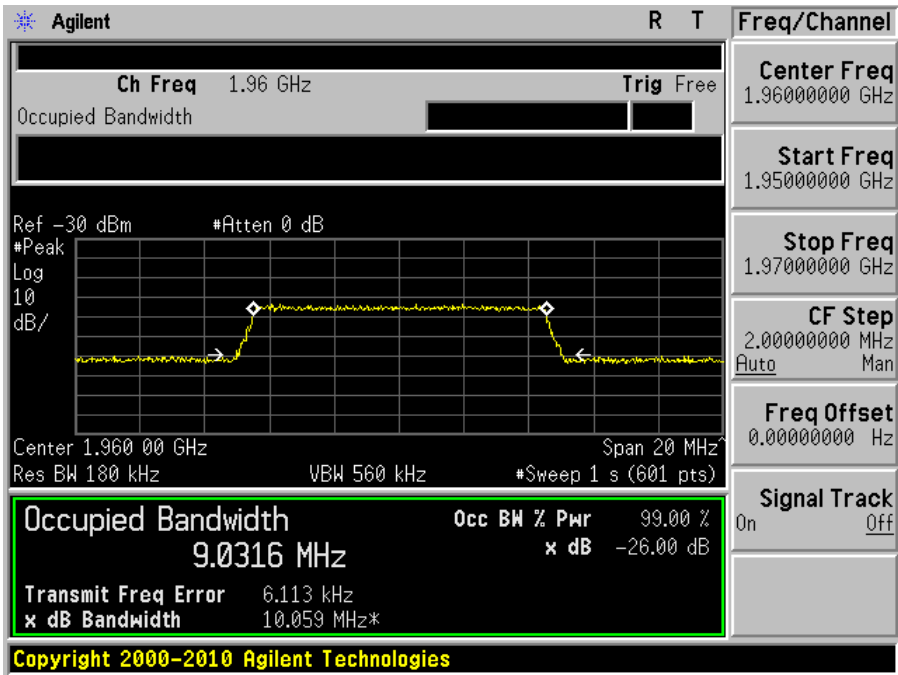
Output



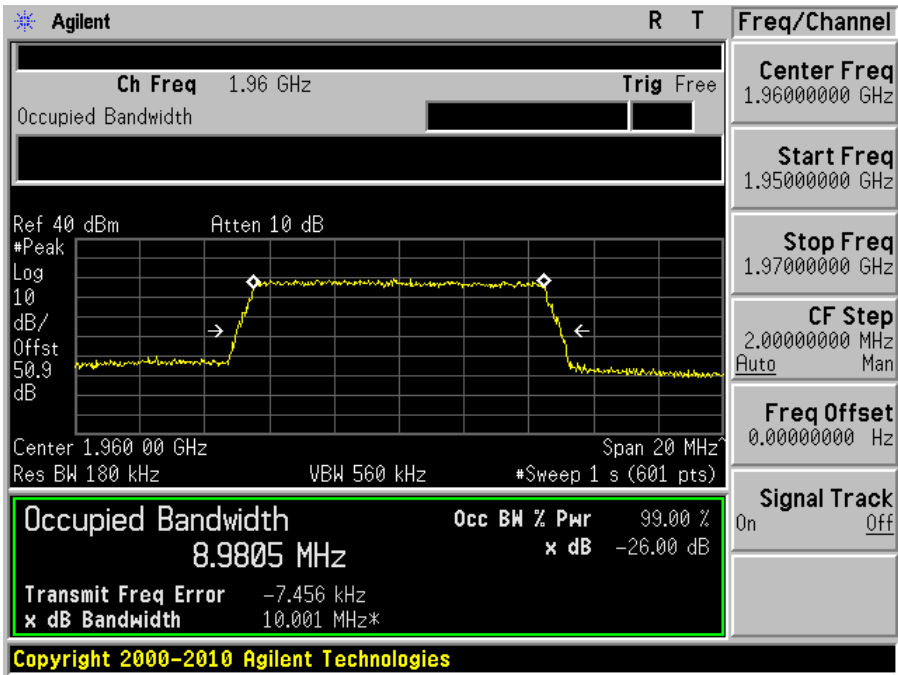


LTE-16QAM (10 MHz)

Input

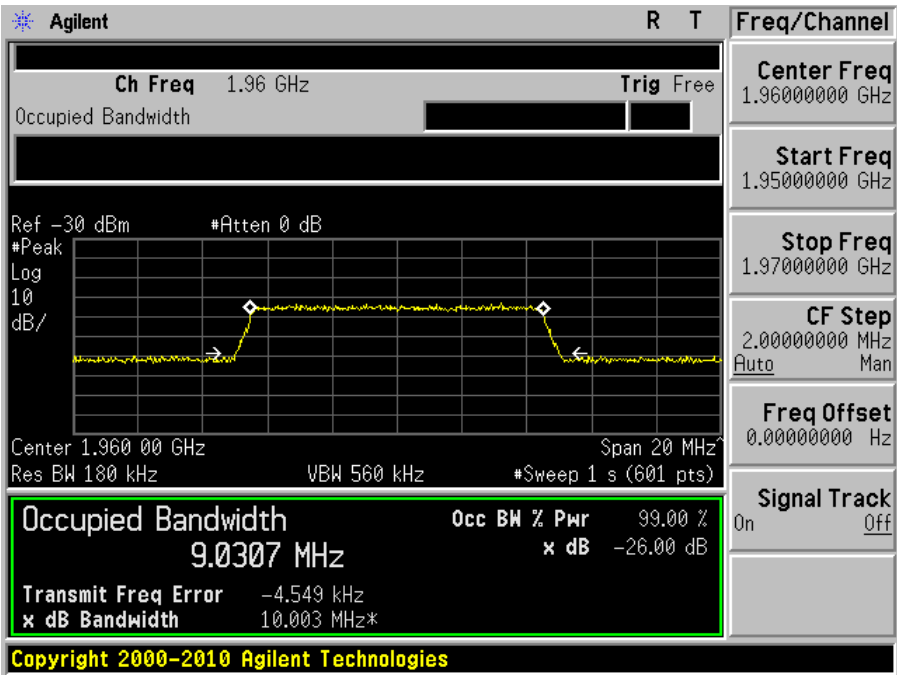


Output

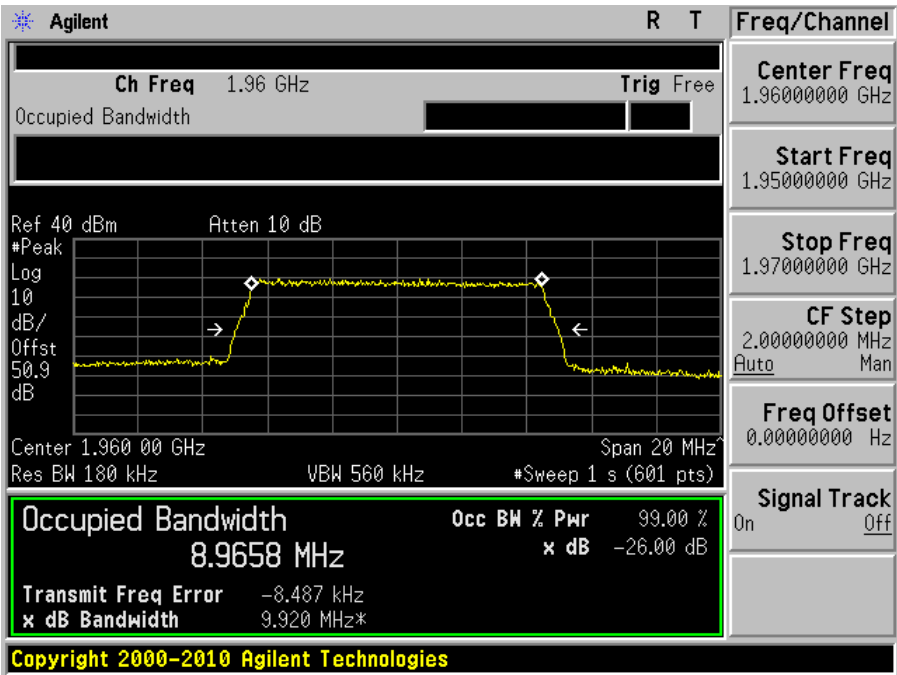


LTE-64QAM (10 MHz)

Input



Output



## 6 FCC §2.1053 & §24.238 - SPURIOUS RADIATED EMISSIONS

---

### 6.1 Applicable Standard

Requirements: FCC §2.1053 and §24.238.

### 6.2 Test Procedure

The transmitter was placed on a 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 =  $10 \log (\text{TX Power in Watts}/0.001)$  – the absolute level

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

### 6.3 Test Environmental Conditions

<b>Temperature:</b>	20-21 °C
<b>Relative Humidity:</b>	46-48 %
<b>ATM Pressure:</b>	101-102kPa

*The testing was performed by Lionel Lara from 2012-05-23 to 2012-05-24 in 5 Meter Chamber 3.*

## 6.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
Hewlett Packard	Pre amplifier	8447D	2944A06639	2011-06-09
EMCO	Horn antenna	3115	9511-4627	2011-10-03
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2012-05-09
Eaton	Horn Antenna	96001	Mar-07	2011-10-03
Rohde & Schwarz	Signal Generator	SMIQ03	849192/0085 / DE23746	2011-04-23 <sup>1</sup>

Note 1: Two year calibration cycle.

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

## 6.5 Test Results

### Uplink, Worst Channel

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1200	54.77	0	203	H	1200	-46.29	5.47	1.35	-42.17	-13	-29.17
1200	49.58	330	144	V	1200	-51.48	5.73	1.35	-47.1	-13	-34.1

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

### Downlink, Worst Channel

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1200	53.26	0	202	H	1200	-47.8	5.47	1.35	-43.68	-13	-30.68
1200	48.15	255	143	V	1200	-52.91	5.73	1.35	-48.53	-13	-35.53

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

## 7 FCC §2.1051 & §24.238 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### 7.1 Applicable Standard

Requirements: FCC §2.1051 and §24.238.

As per FCC §24.238: 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

### 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 Environmental Conditions

<b>Temperature:</b>	21 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.2kPa

*The testing was performed by Lionel Lara on 2012-05-21 in RF Site.*

### 7.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-05-10
Agilent	Signal Generator	E4438C	MY45091309	2012-05-03
Rohde & Schwarz	Signal Generator	SMIQ03	849192/0085 / DE23746	2011-04-23 <sup>1</sup>

*Note 1: Two year calibration cycle.*

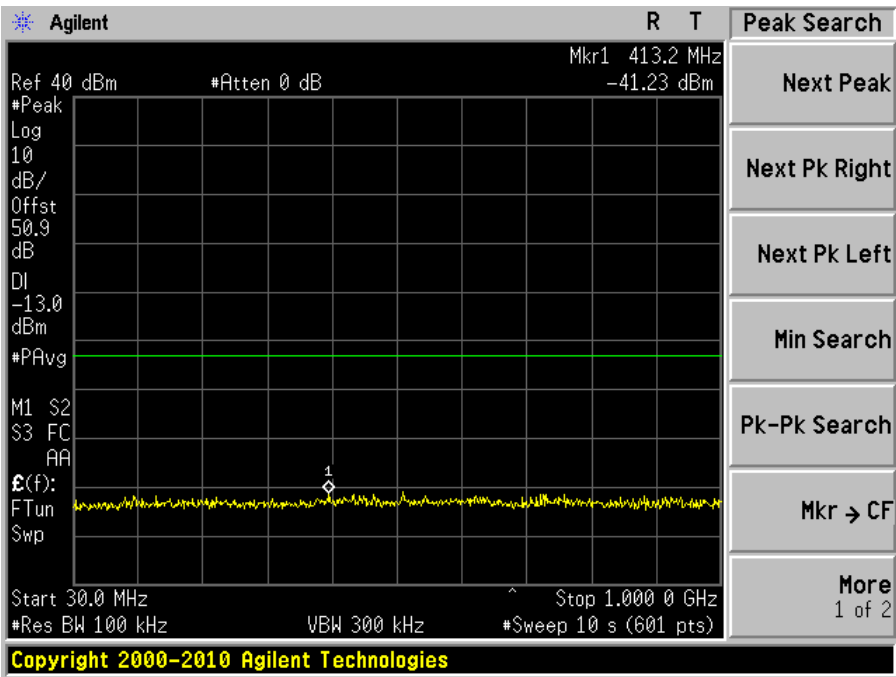
**Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.5 Test Results

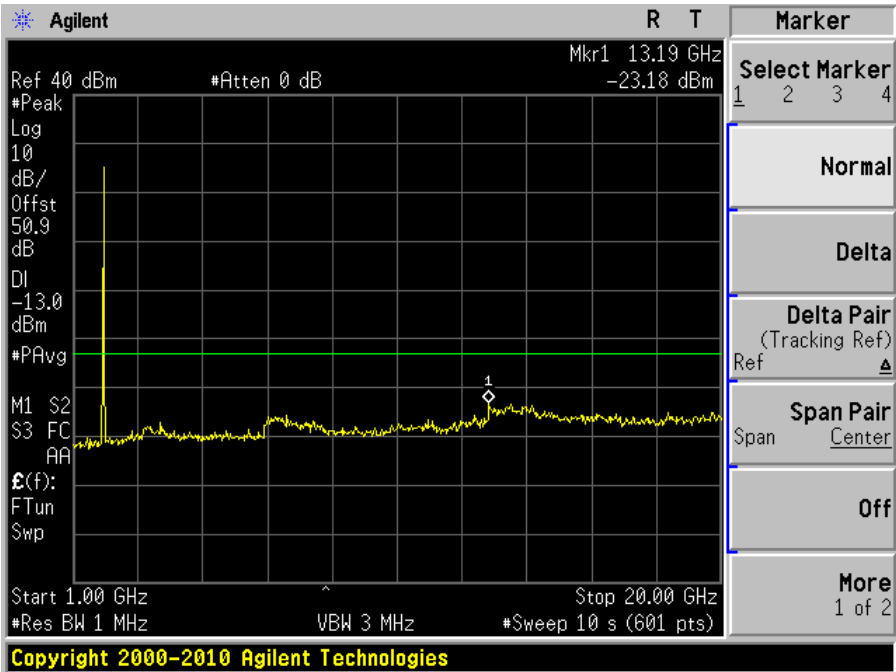
Please refer to the following plots.

PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

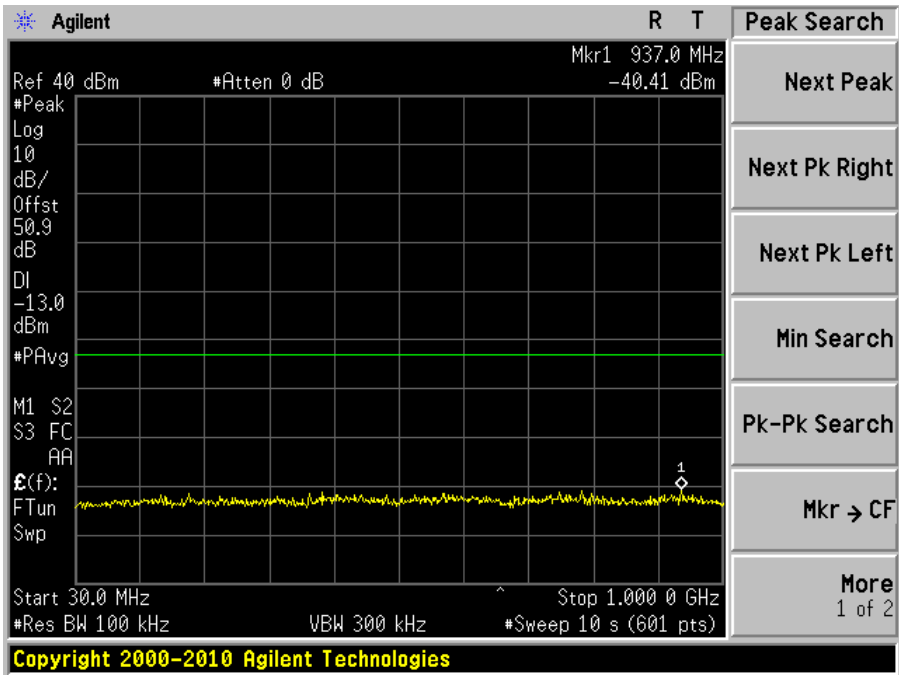


Plot 2: Above 1 GHz

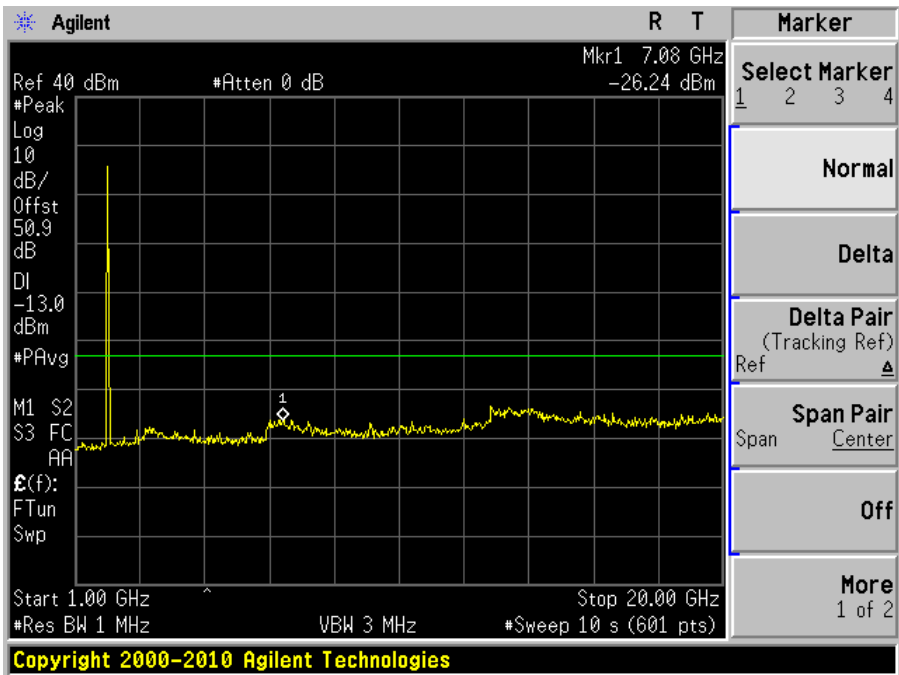


PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

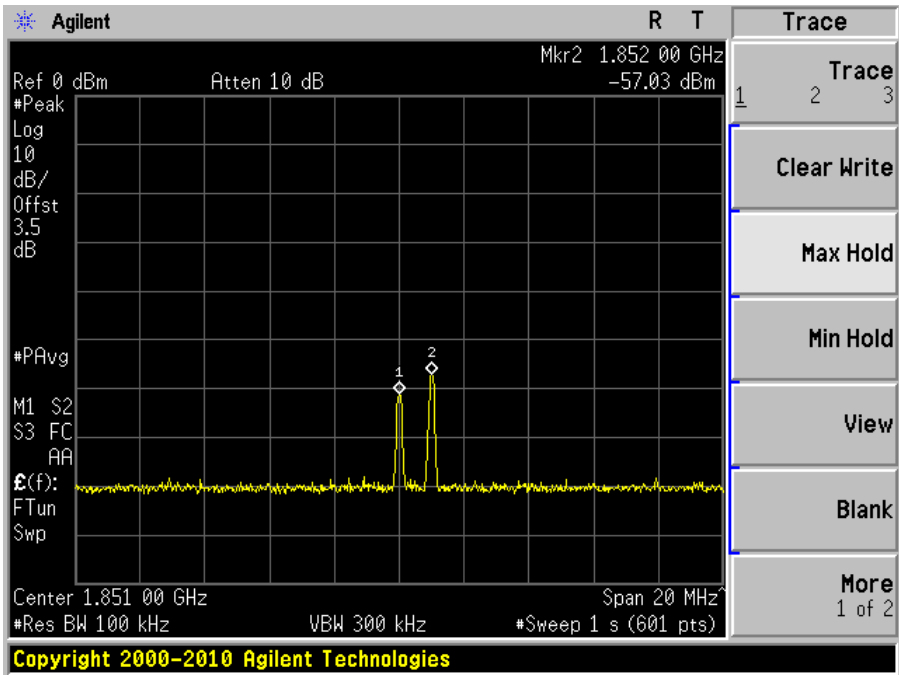


Plot 2: Above 1 GHz

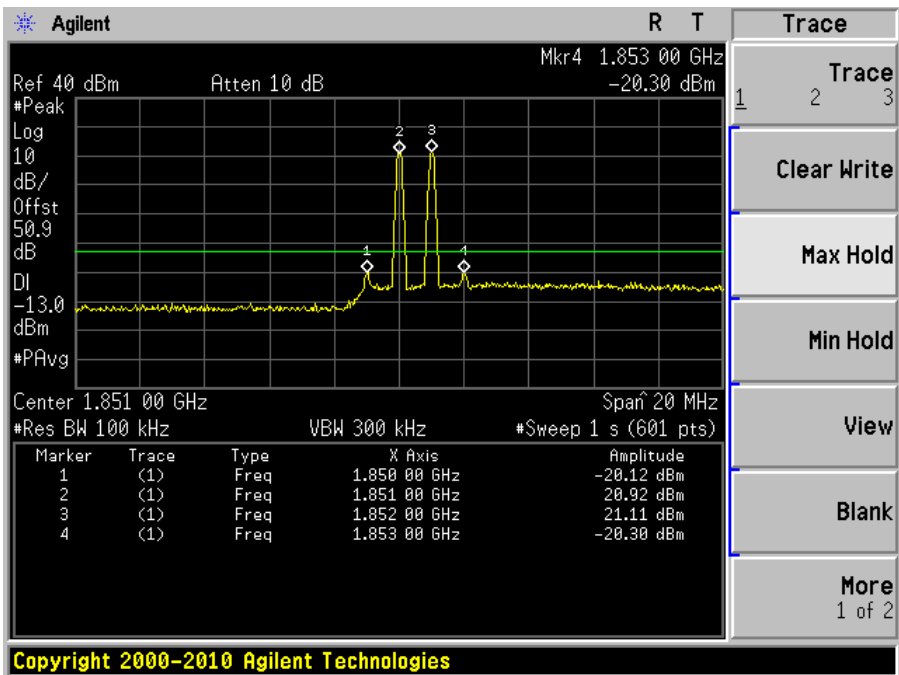


Inter-modulation

PCS Band Uplink Low Channel, Input:

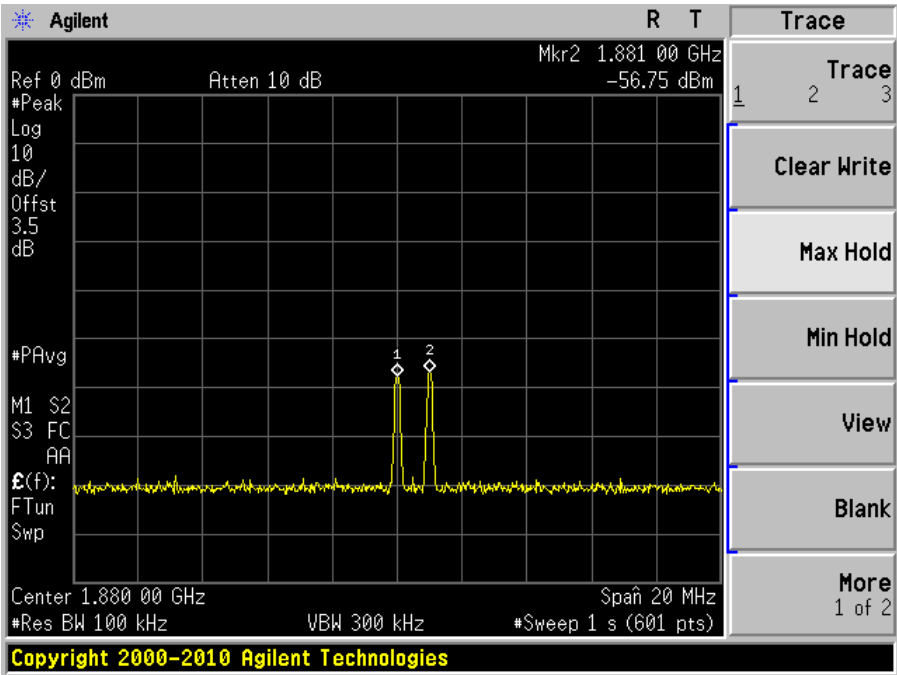


PCS Band Uplink Low Channel, Output:

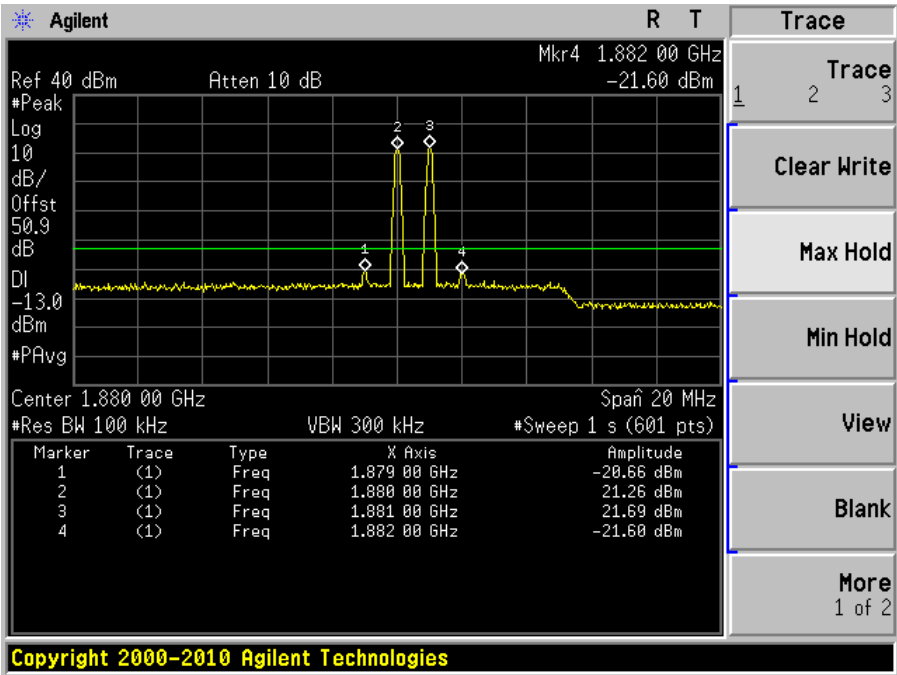




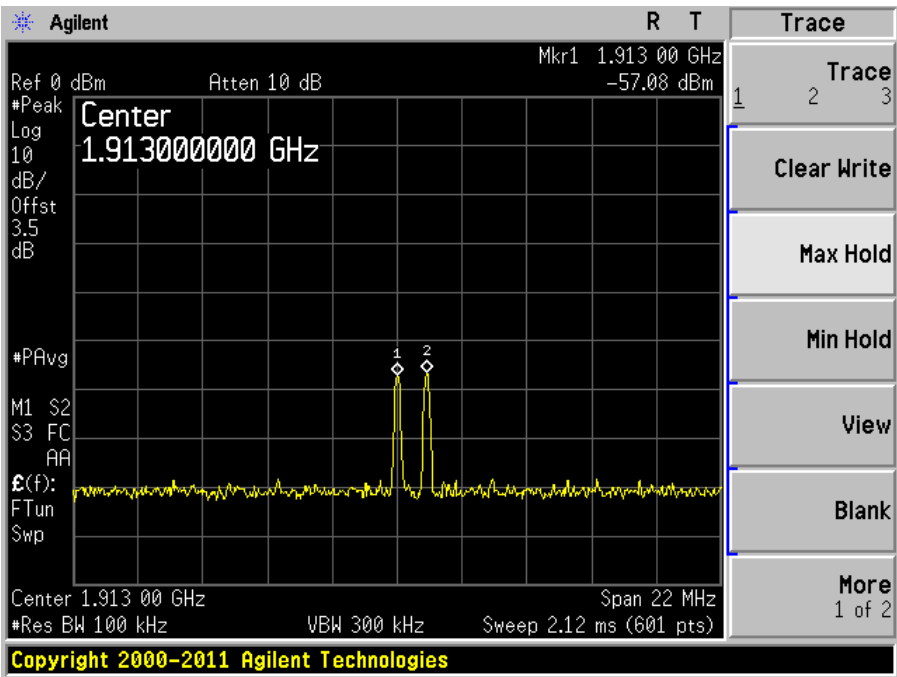
PCS Band Uplink Middle Channel, Input:



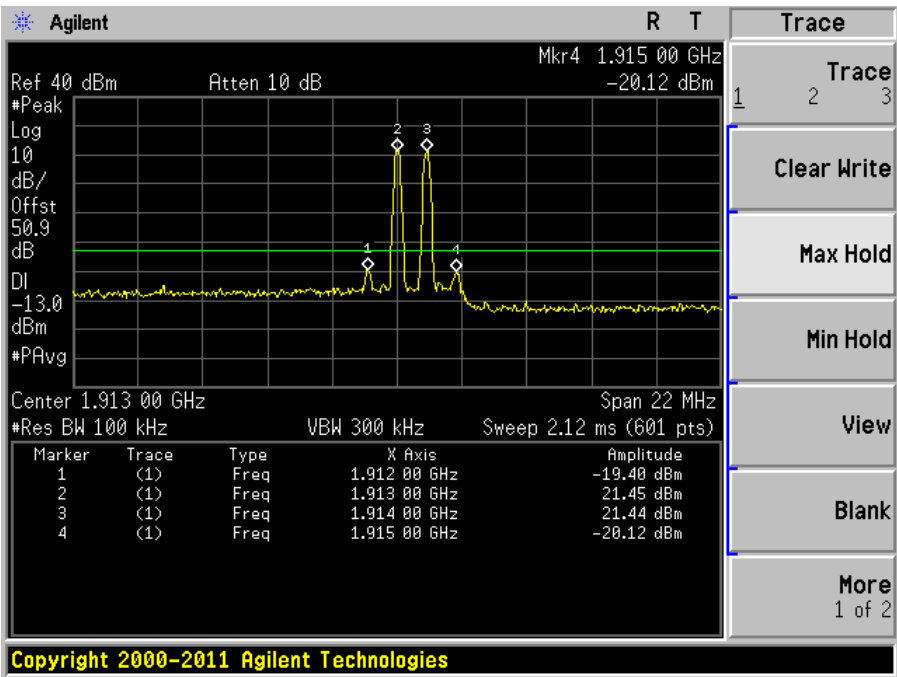
PCS Band Uplink Middle Channel, Output:



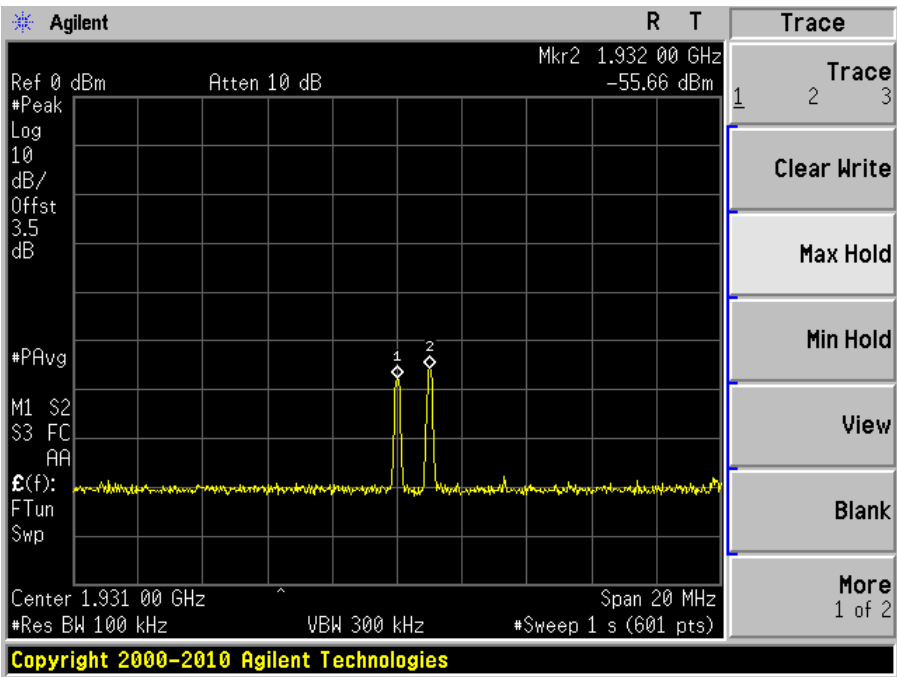
PCS Band Uplink High Channel, Input:



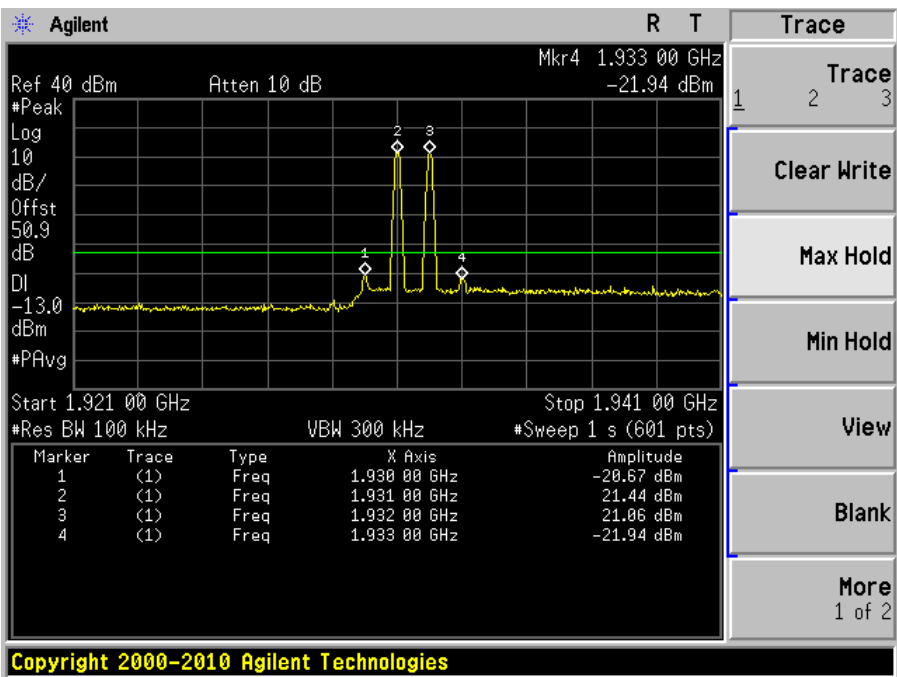
PCS Band Uplink High Channel, Output:



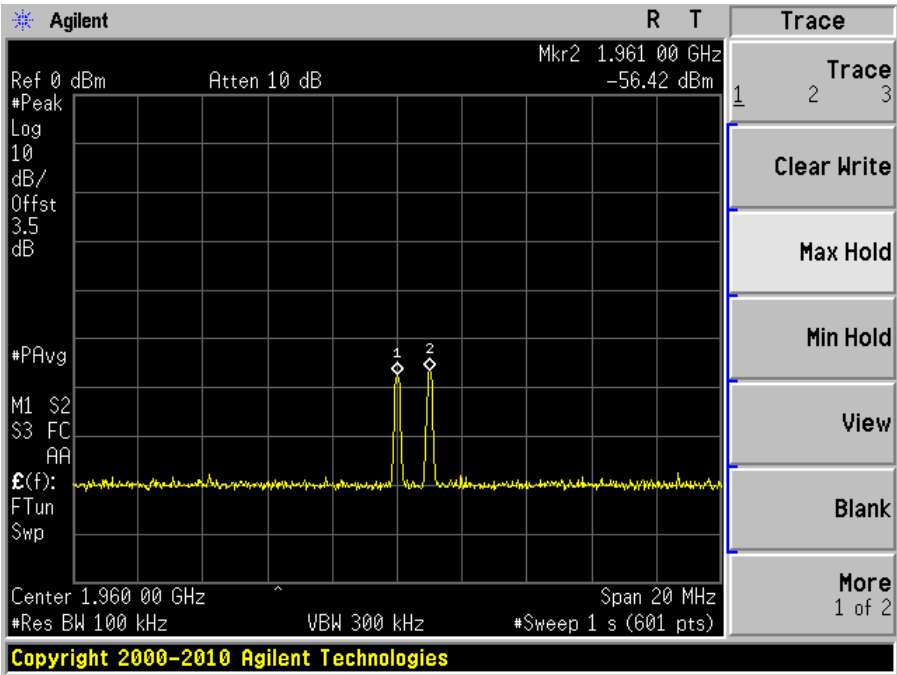
PCS Band Downlink Low Channel, Input:



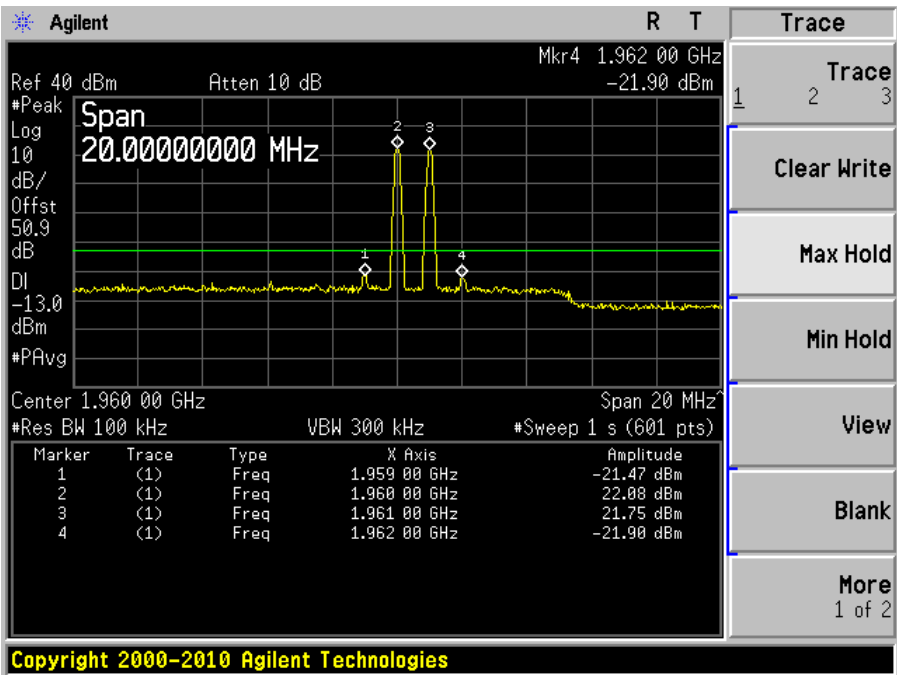
PCS Band Downlink Low Channel, Output:



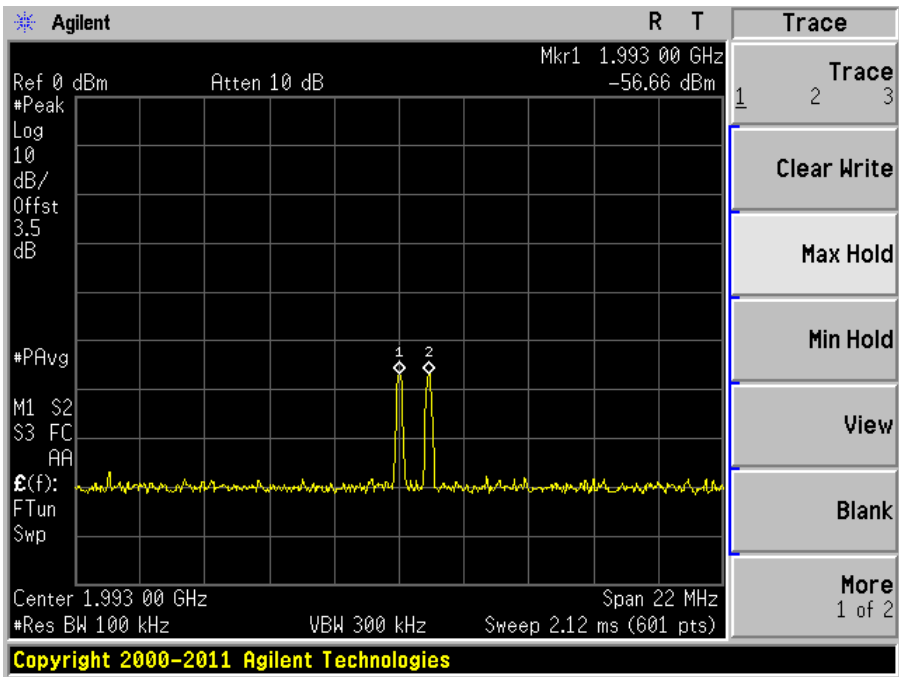
PCS Band Downlink Middle Channel, Input:



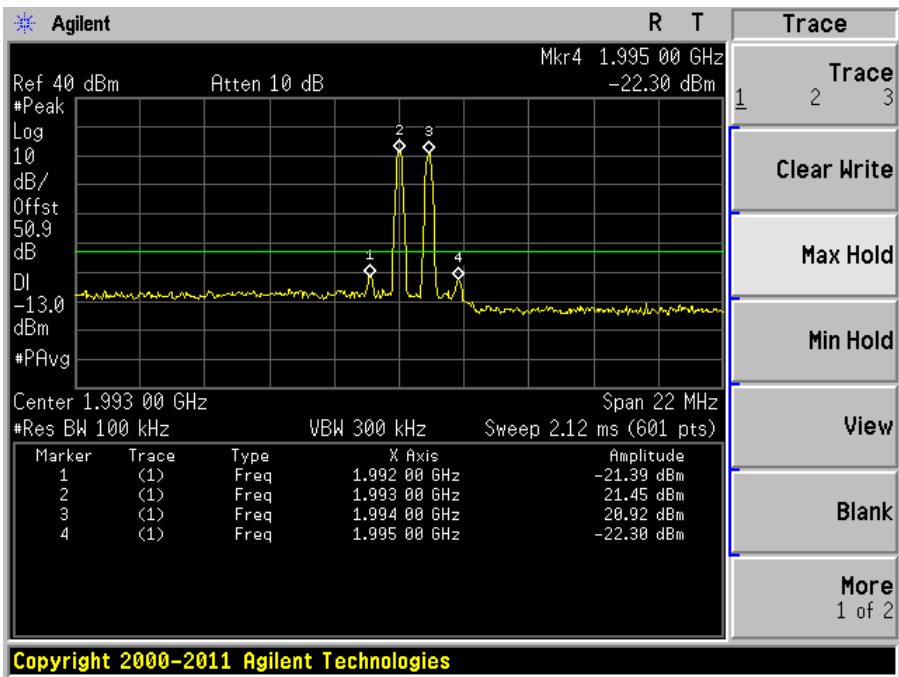
PCS Band Downlink Middle Channel, Output:



PCS Band Downlink High Channel, Input:



PCS Band Downlink High Channel, Output:



## 8 FCC §24.238 – BAND EDGE

### 8.1 Applicable Standard

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

### 8.2 Test Procedure

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

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

### 8.3 Test Environmental Conditions

Temperature:	21°C
Relative Humidity:	52 %
ATM Pressure:	101.2kPa

*The testing was performed by Lionel Lara on 2012-05-21 in RF Site.*

### 8.4 Test Equipment List and Details

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

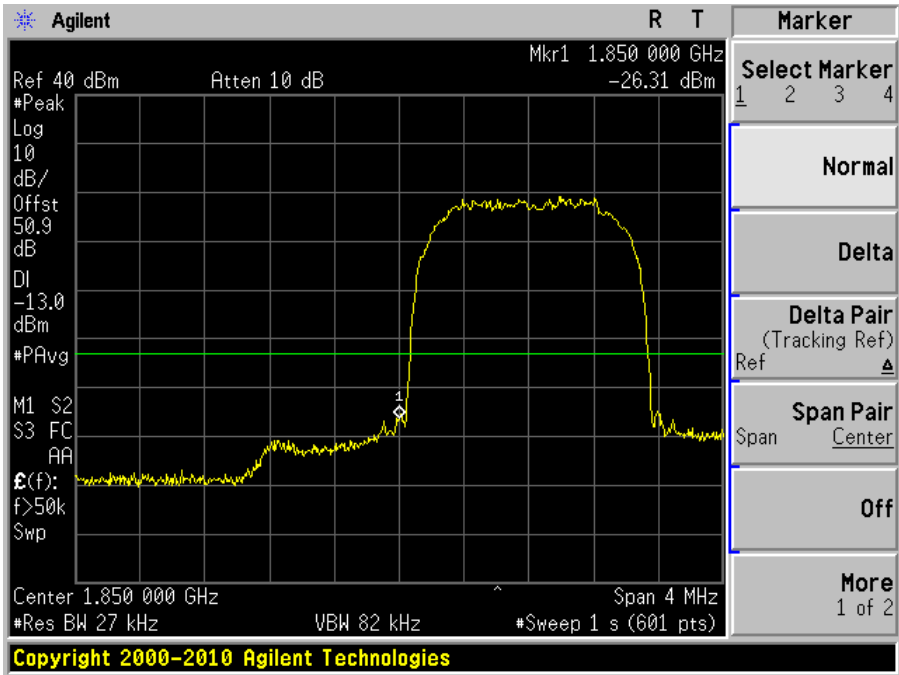
**Statement of Traceability:** BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

8.5 Test Results

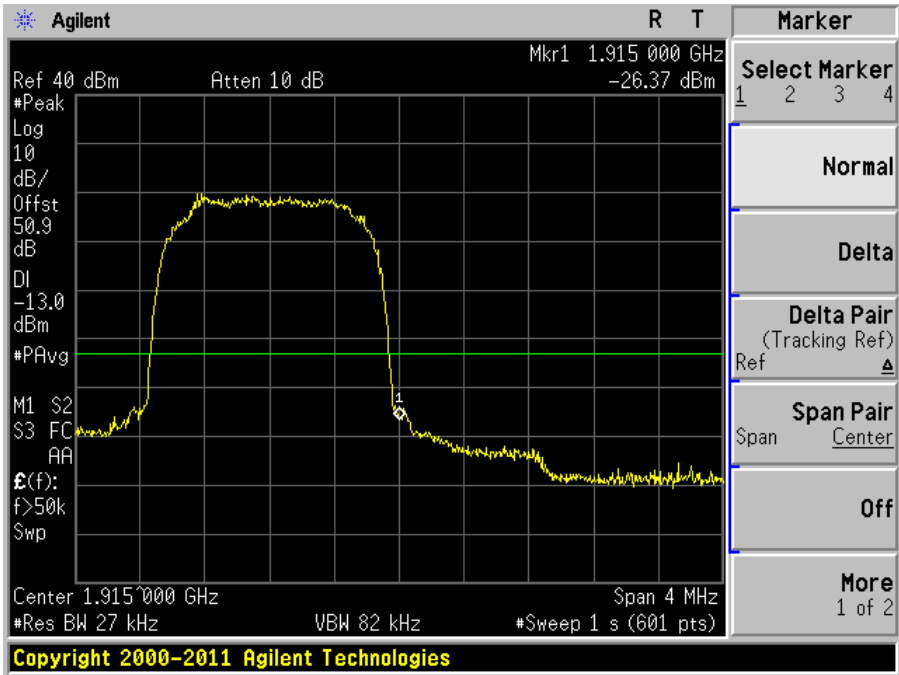
Please refer to the following plots.

CDMA/EVDO, Uplink:

Plot 1: Lowest Edge

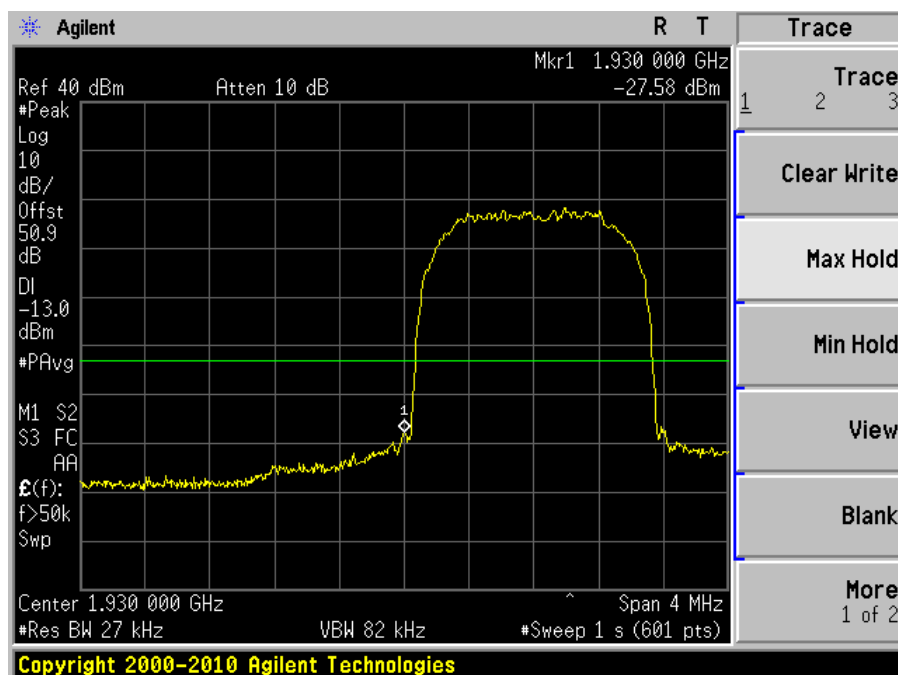


Plot 2: Highest Edge

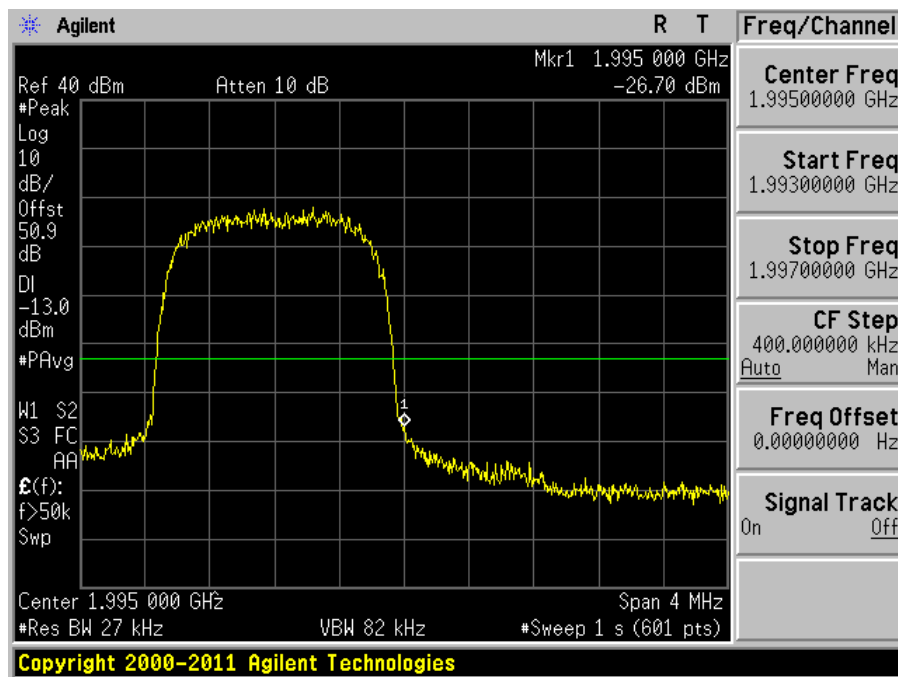


**CDMA/EVDO, Downlink:**

Plot 1: Lowest Edge



Plot 2: Highest Edge

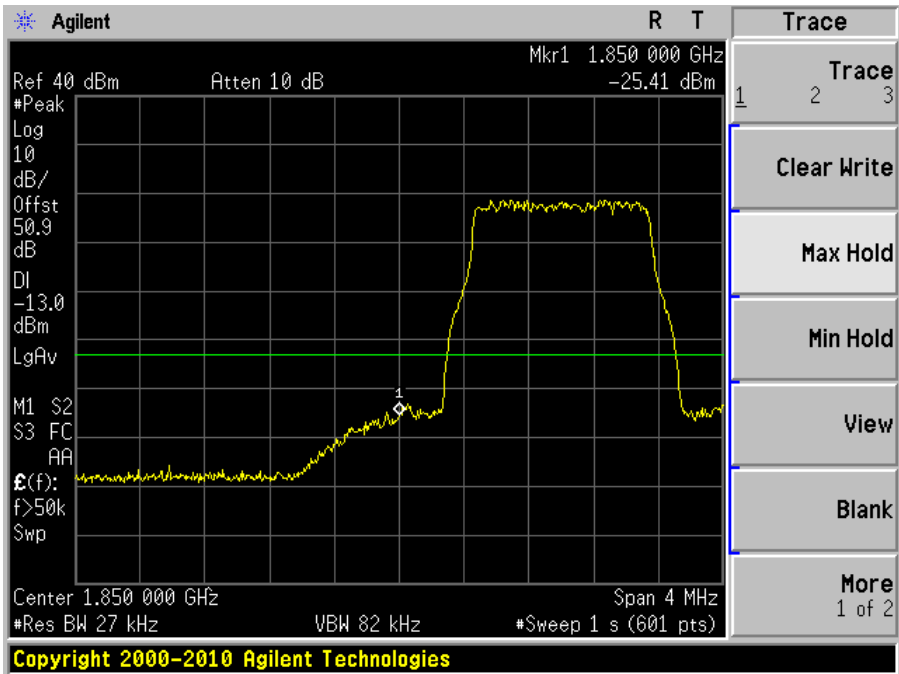




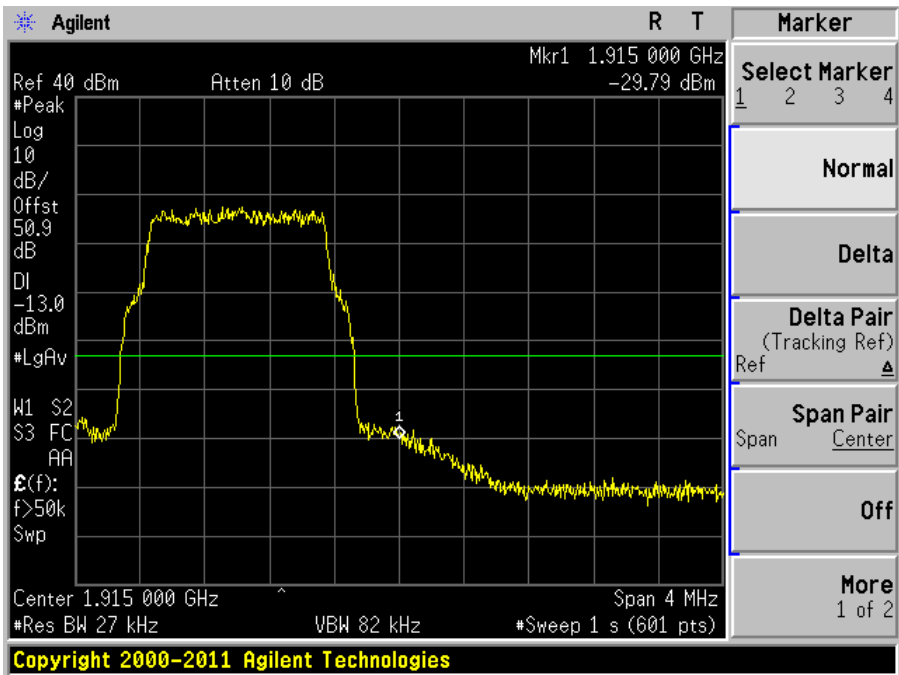
LTE, Uplink:

Modulation: QPSK (1.4 MHz):

Plot 1: Lowest Edge

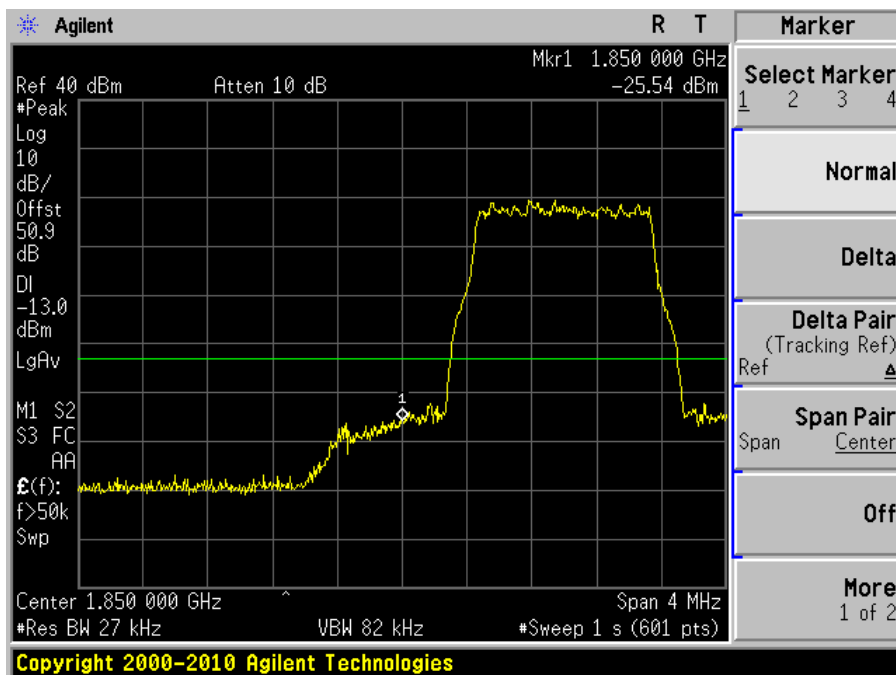


Plot 2: Highest Edge

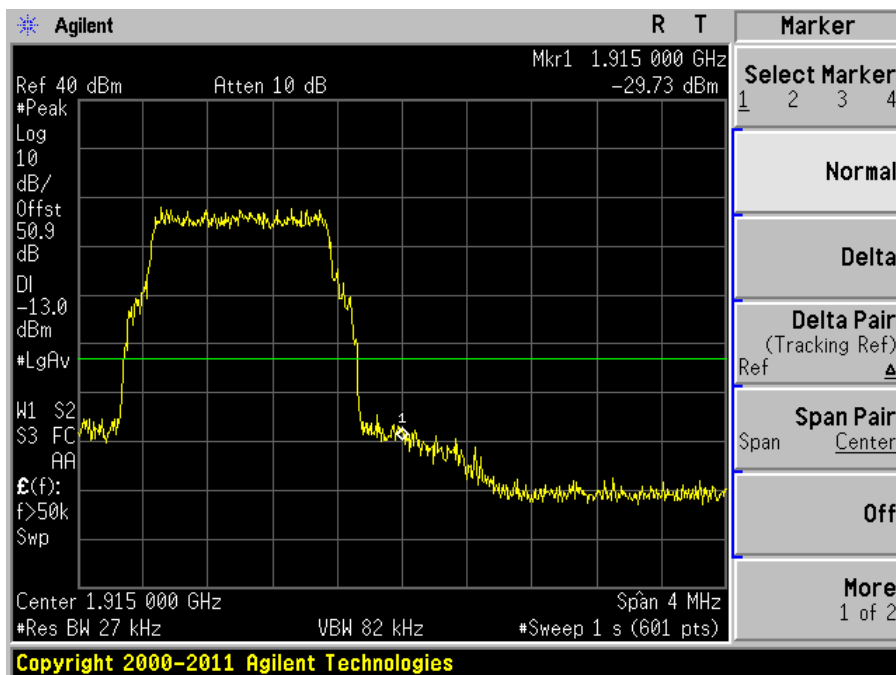


Modulation: 16QAM (1.4 MHz):

Plot 1: Lowest Edge

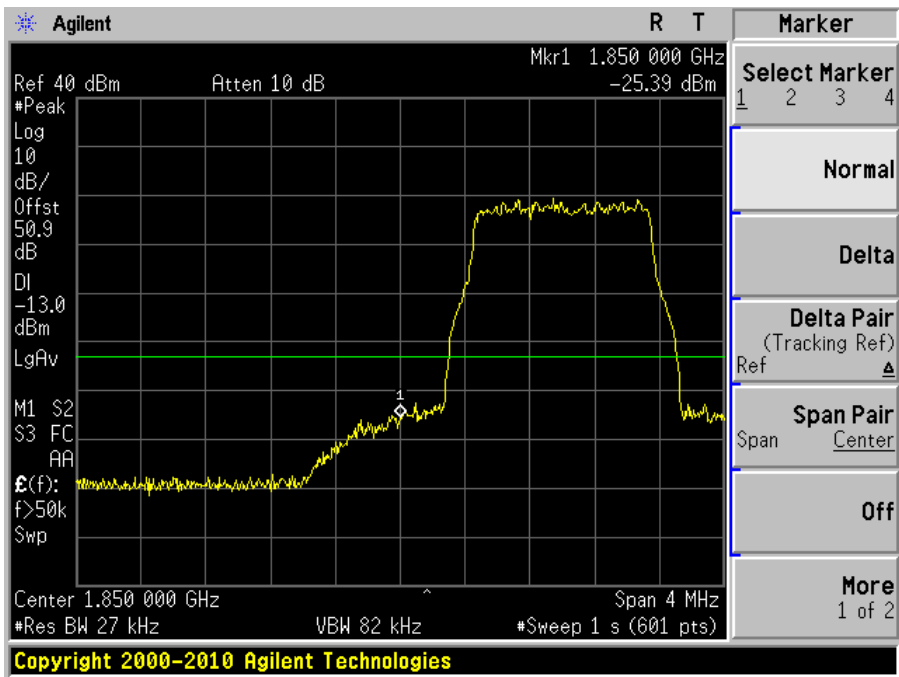


Plot 2: Highest Edge

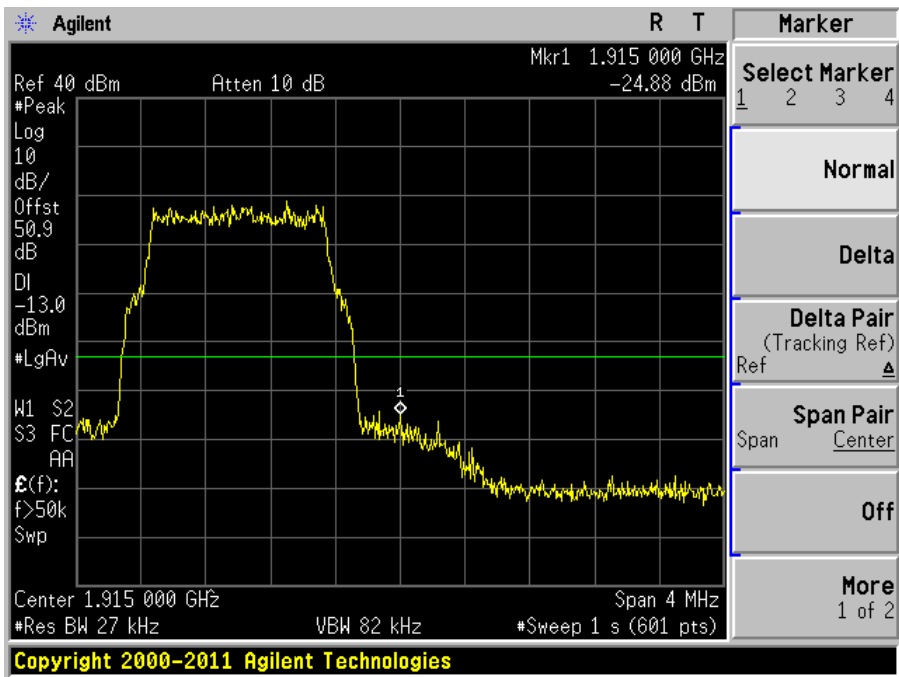


Modulation: 64QAM (1.4 MHz):

Plot 1: Lowest Edge

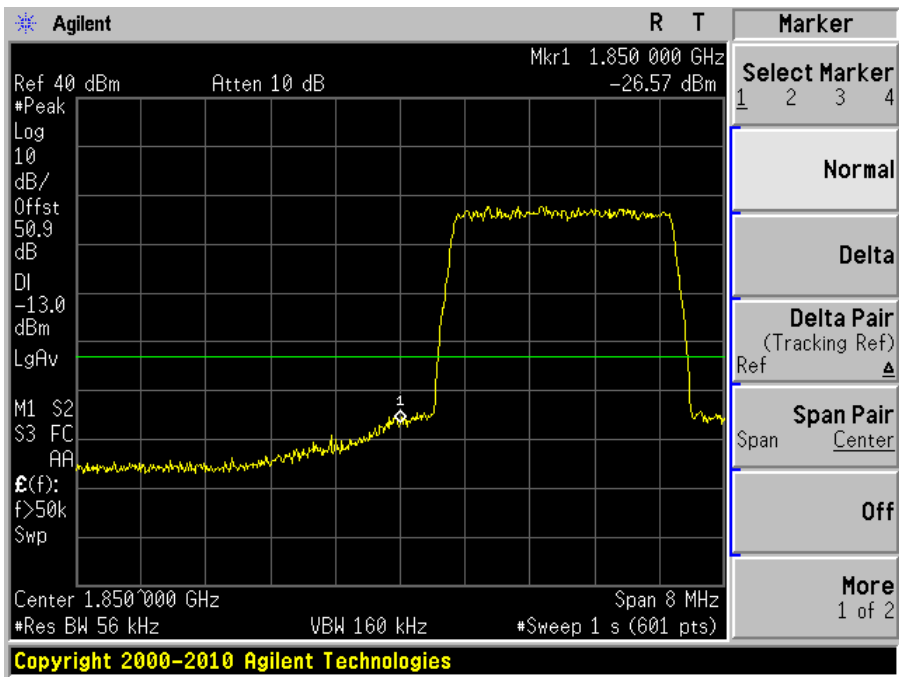


Plot 2: Highest Edge

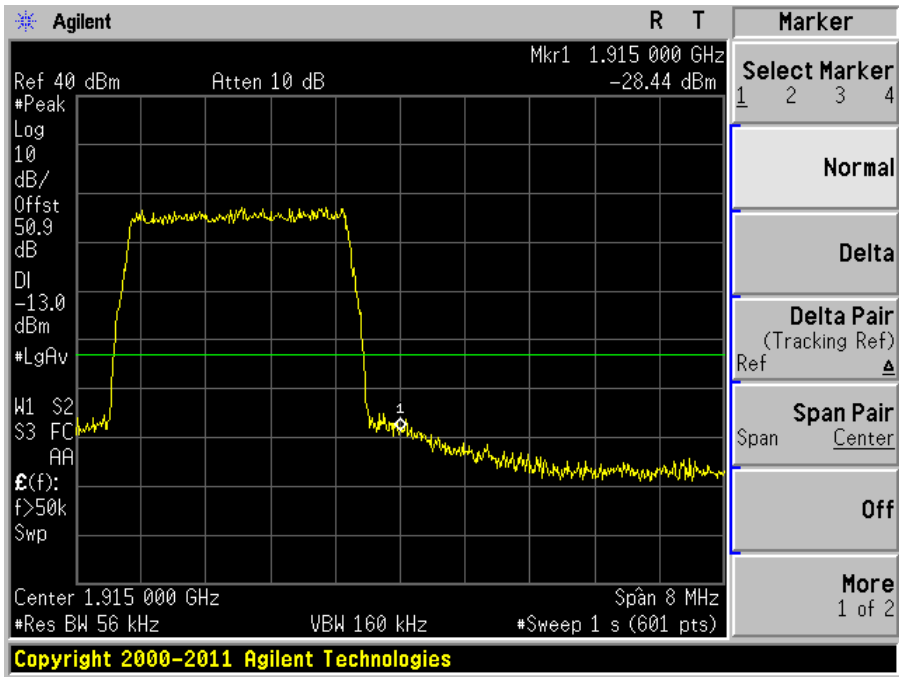


Modulation: QPSK (3 MHz):

Plot 1: Lowest Edge

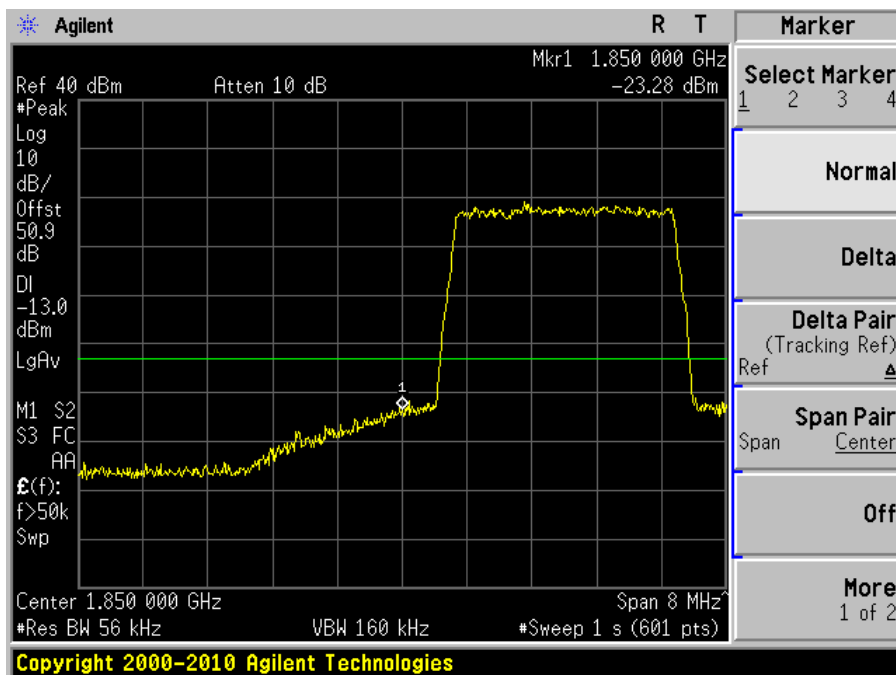


Plot 2: Highest Edge

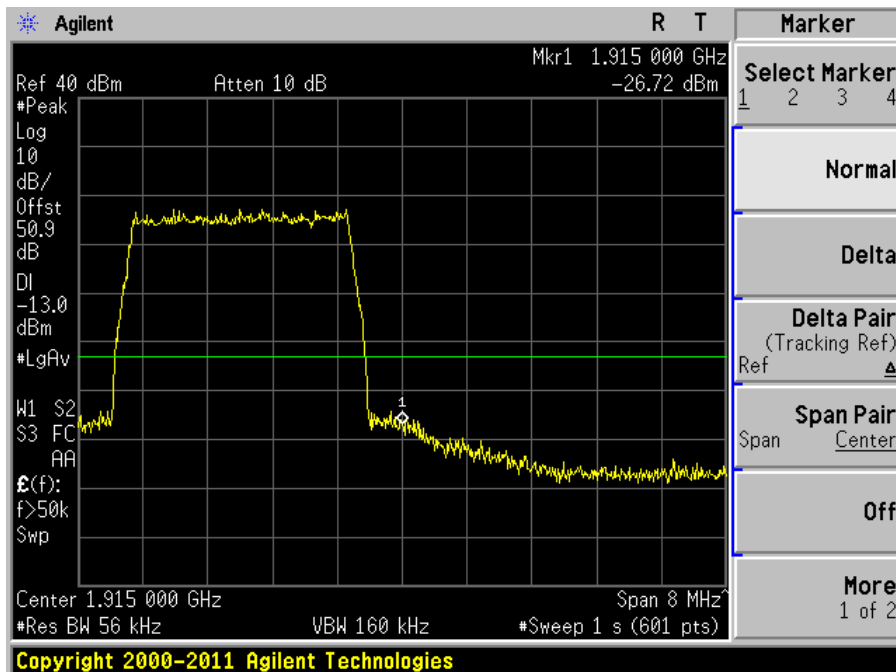


Modulation: 16QAM (3 MHz):

Plot 1: Lowest Edge

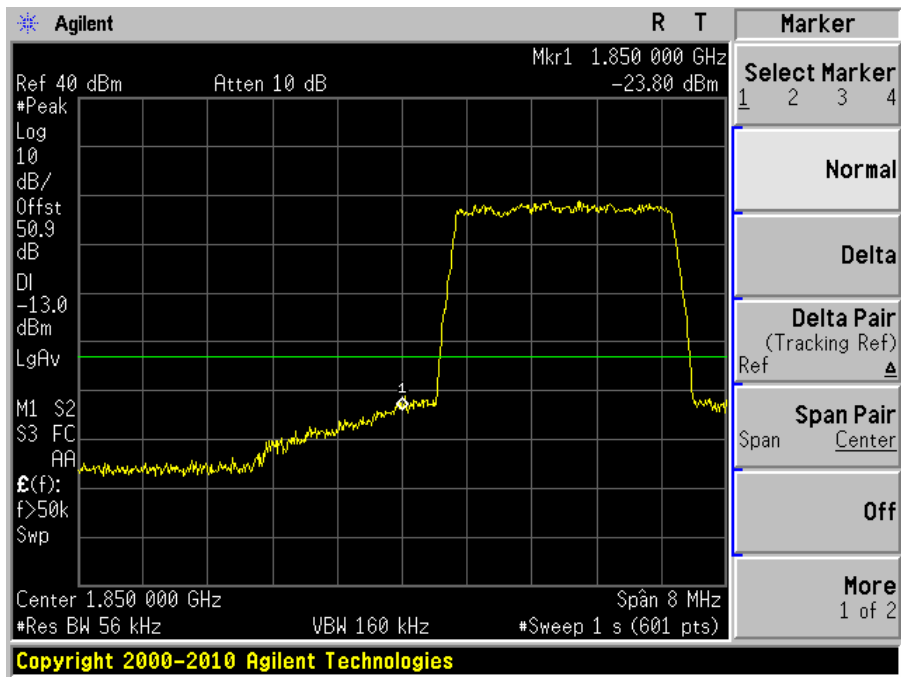


Plot 2: Highest Edge

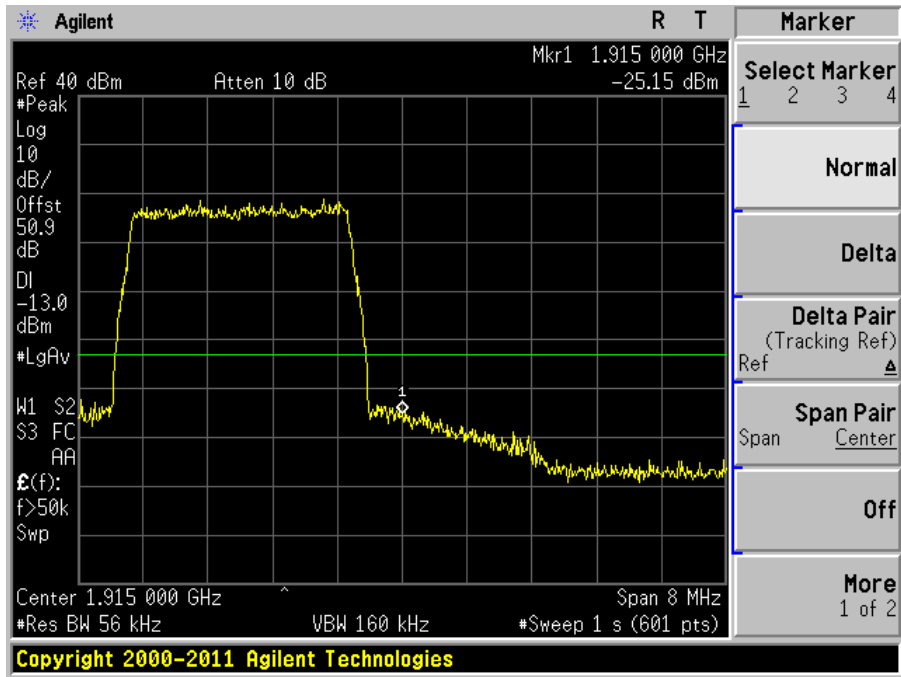


Modulation: 64QAM (3 MHz):

Plot 1: Lowest Edge

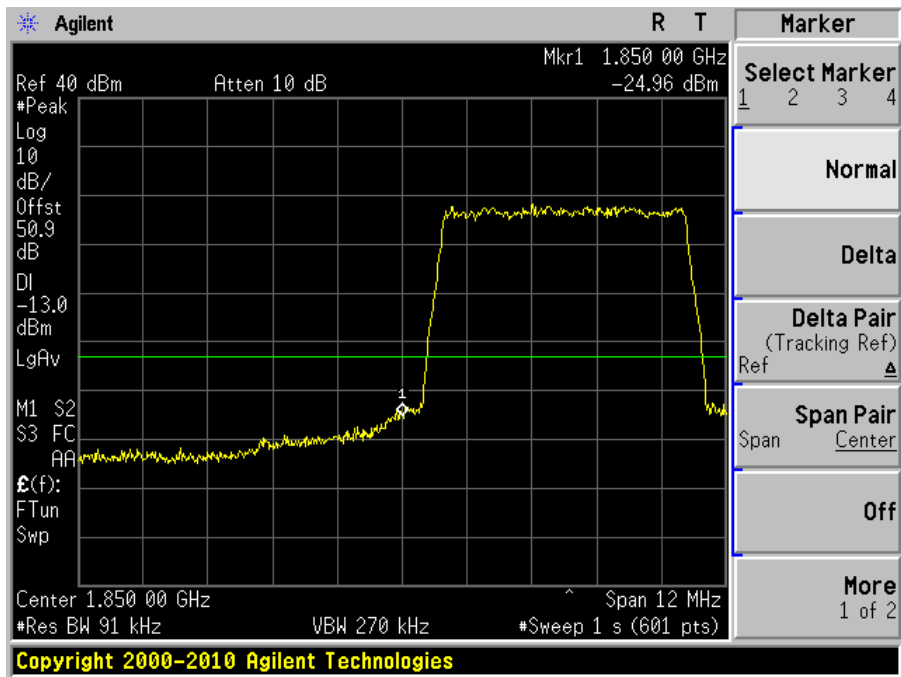


Plot 2: Highest Edge

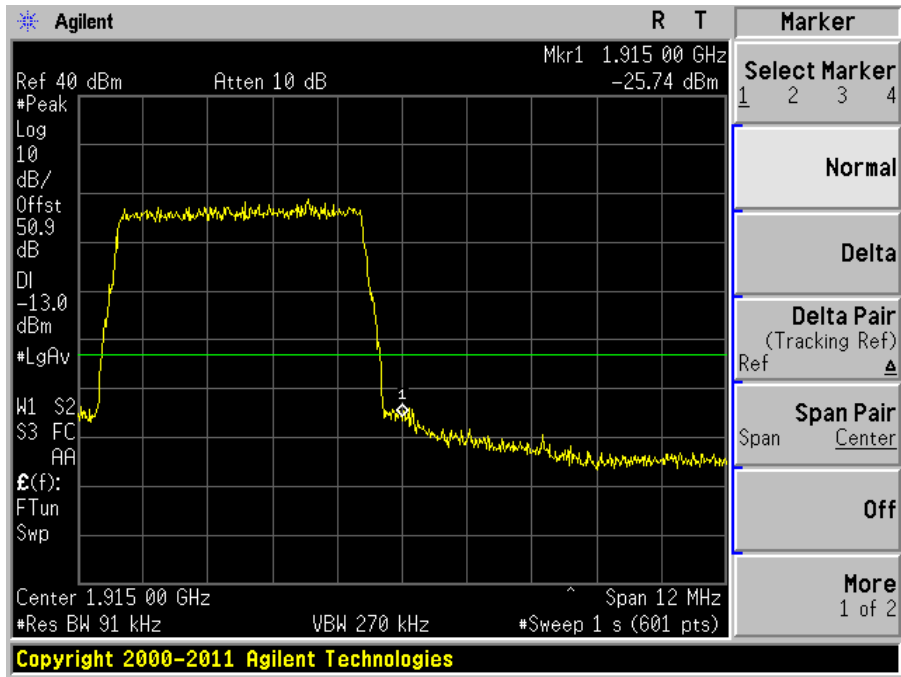


Modulation: QPSK (5 MHz):

Plot 1: Lowest Edge

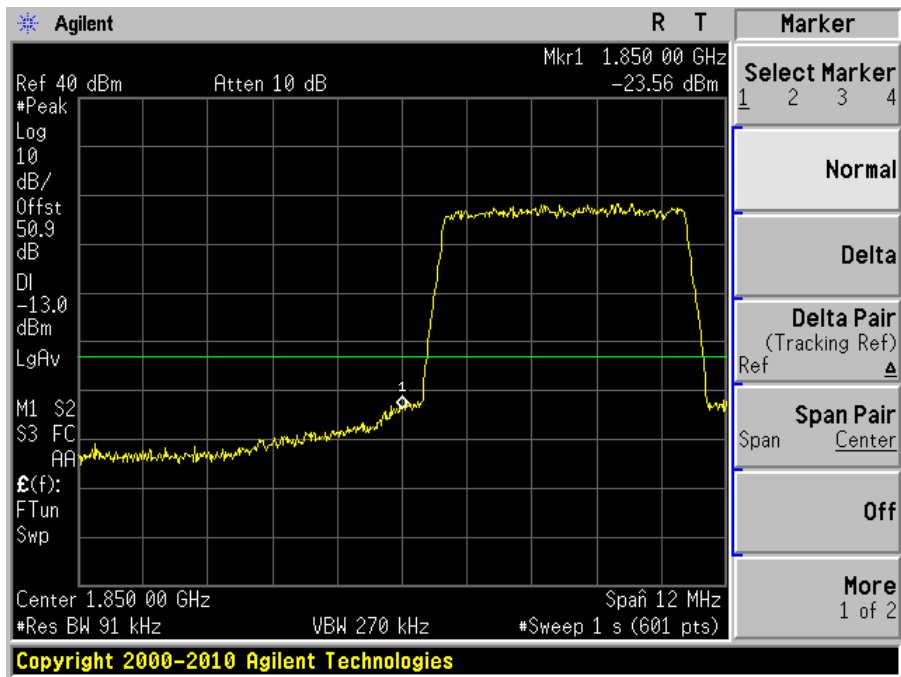


Plot 2: Highest Edge

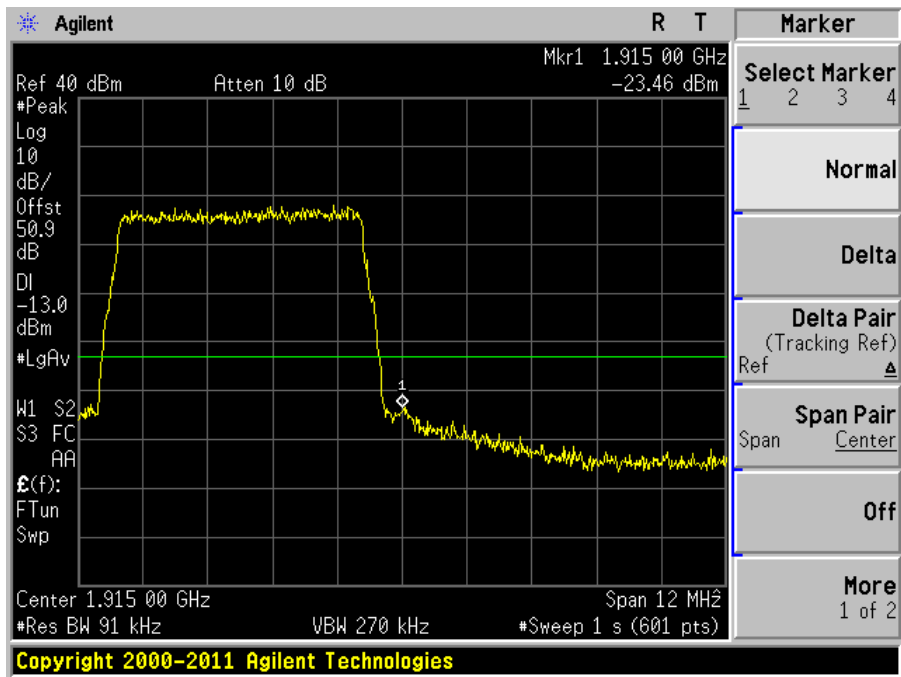


Modulation: 16QAM (5 MHz):

Plot 1: Lowest Edge



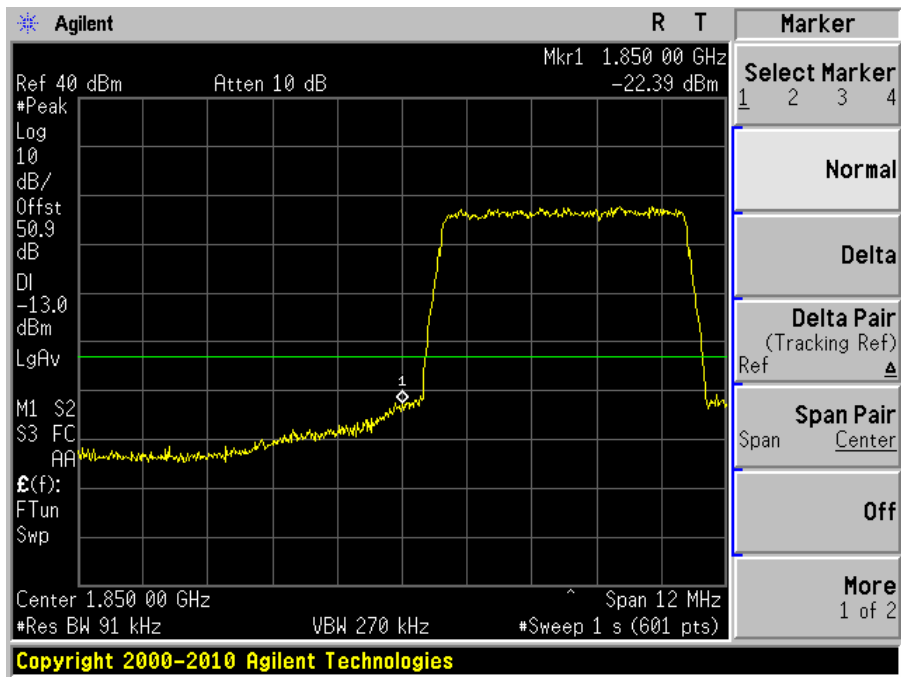
Plot 2: Highest Edge



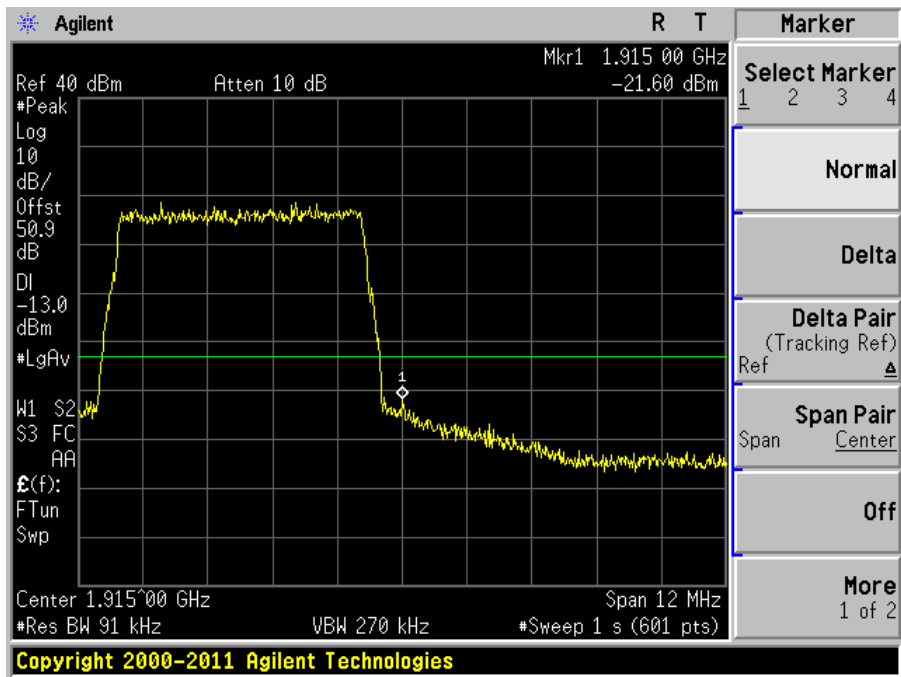


Modulation: 64QAM (5 MHz):

Plot 1: Lowest Edge

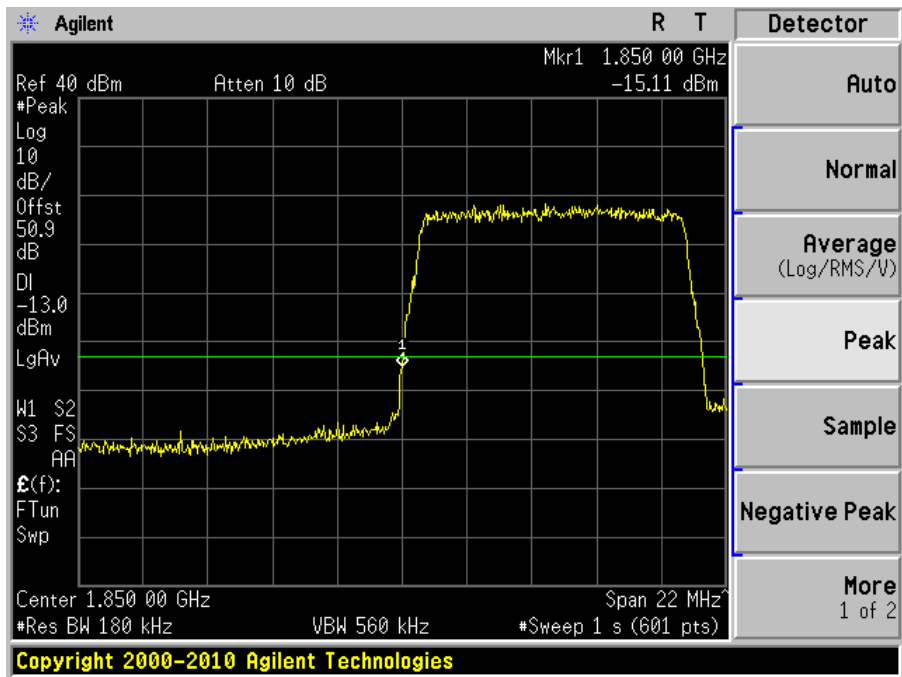


Plot 2: Highest Edge

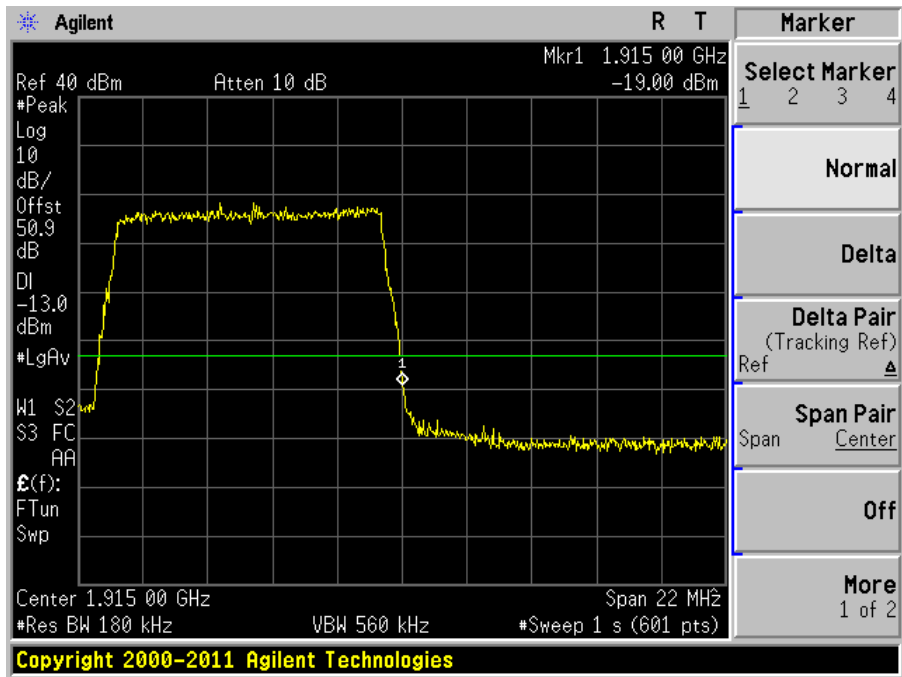


Modulation: QPSK (10 MHz):

Plot 1: Lowest Edge

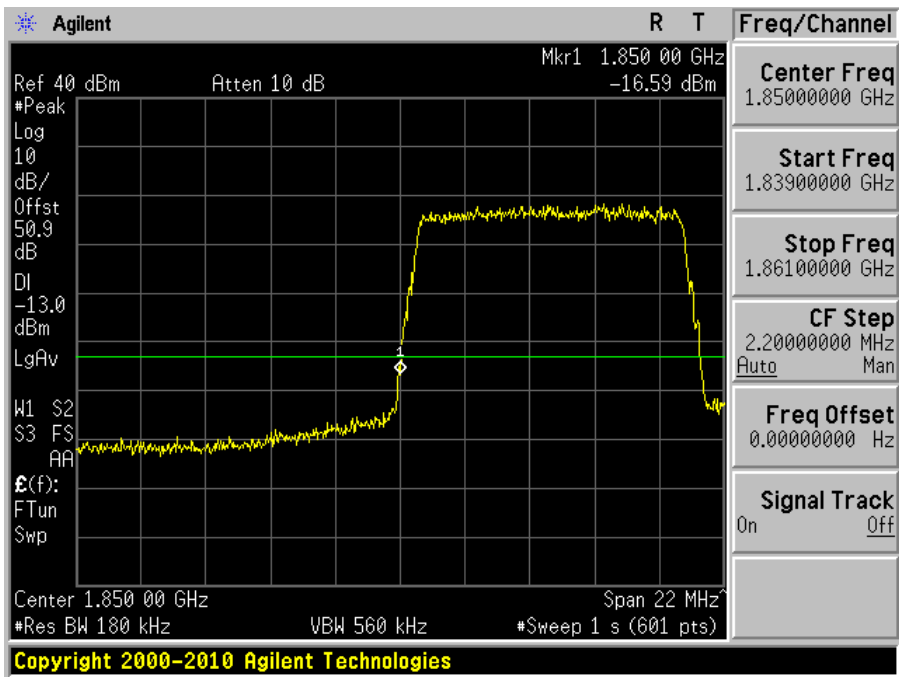


Plot 2: Highest Edge

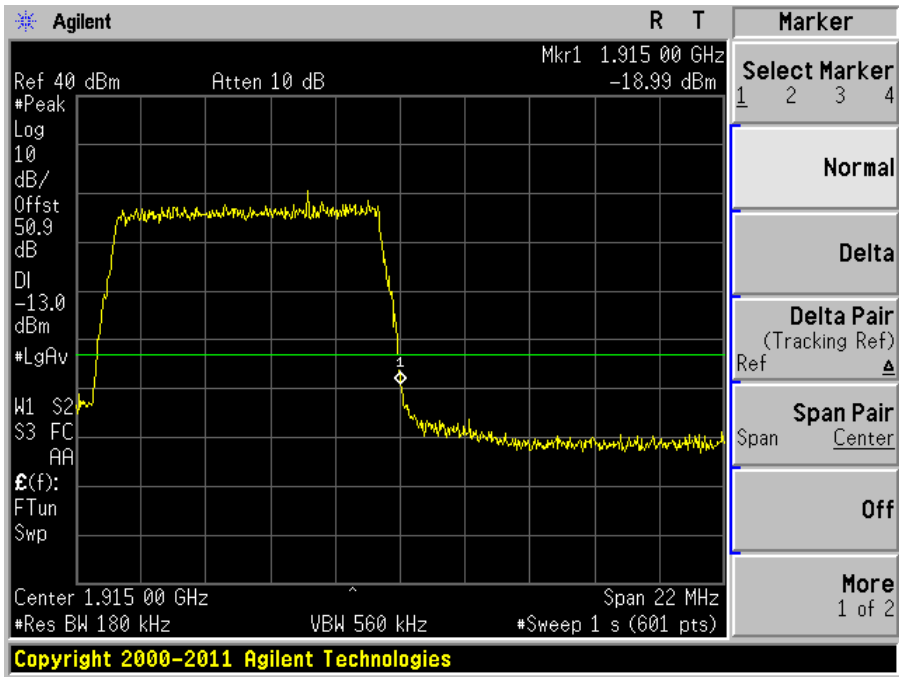


Modulation: 16QAM (10 MHz):

Plot 1: Lowest Edge

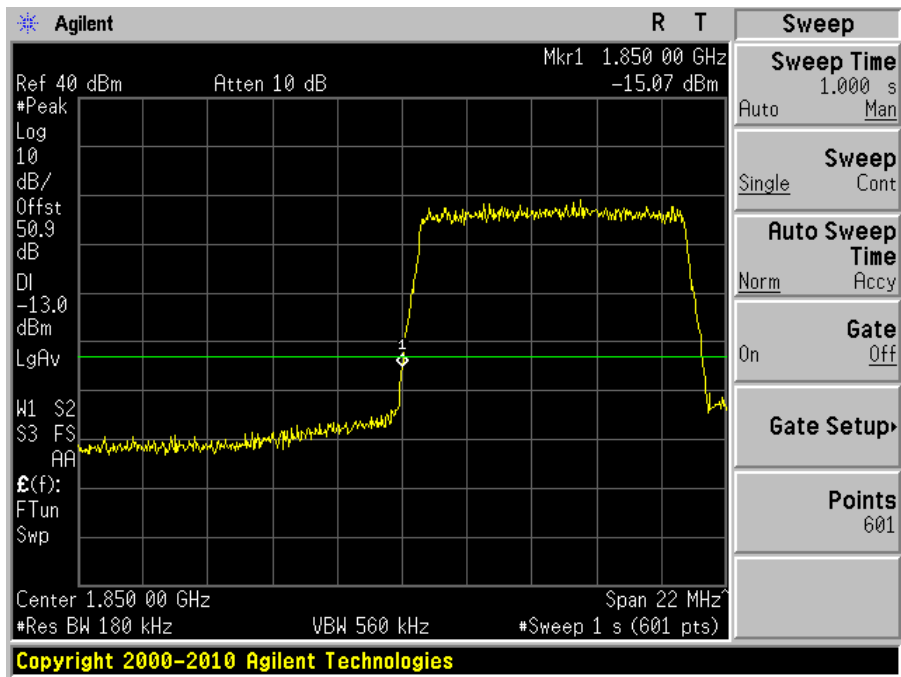


Plot 2: Highest Edge

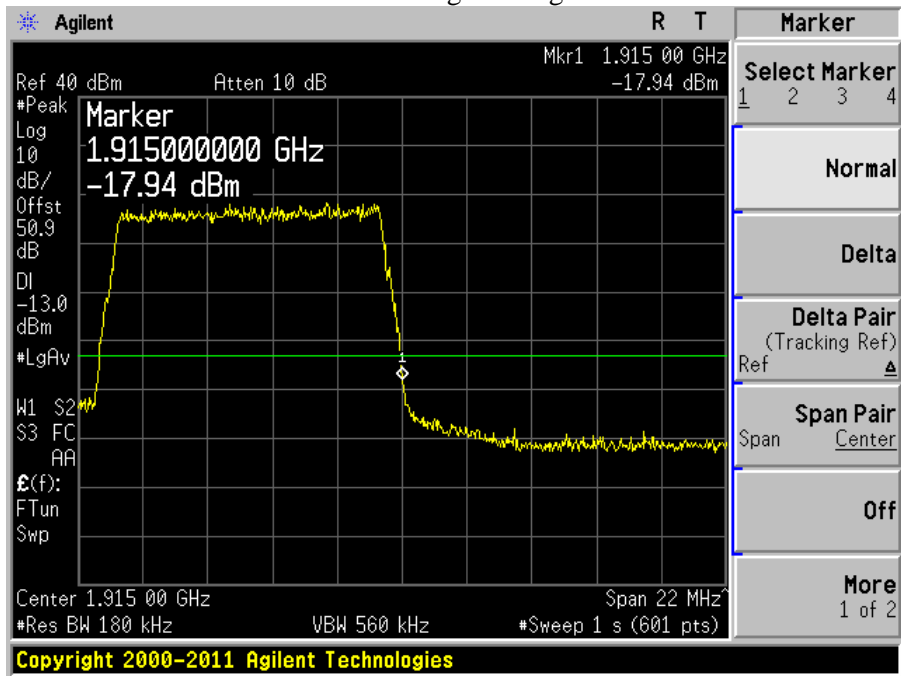


Modulation: 64QAM (10 MHz):

Plot 1: Lowest Edge



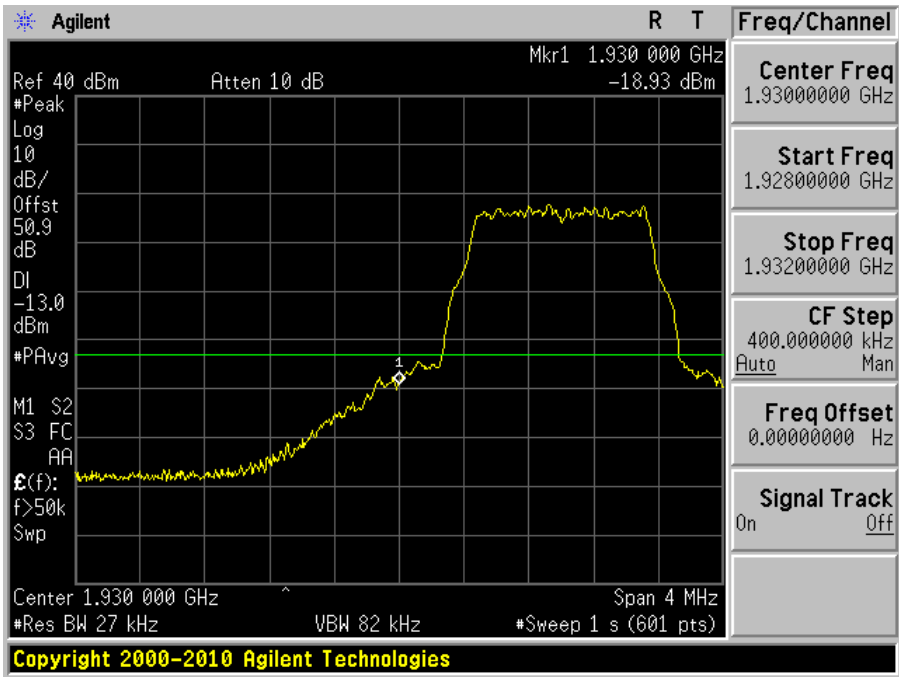
Plot 2: Highest Edge



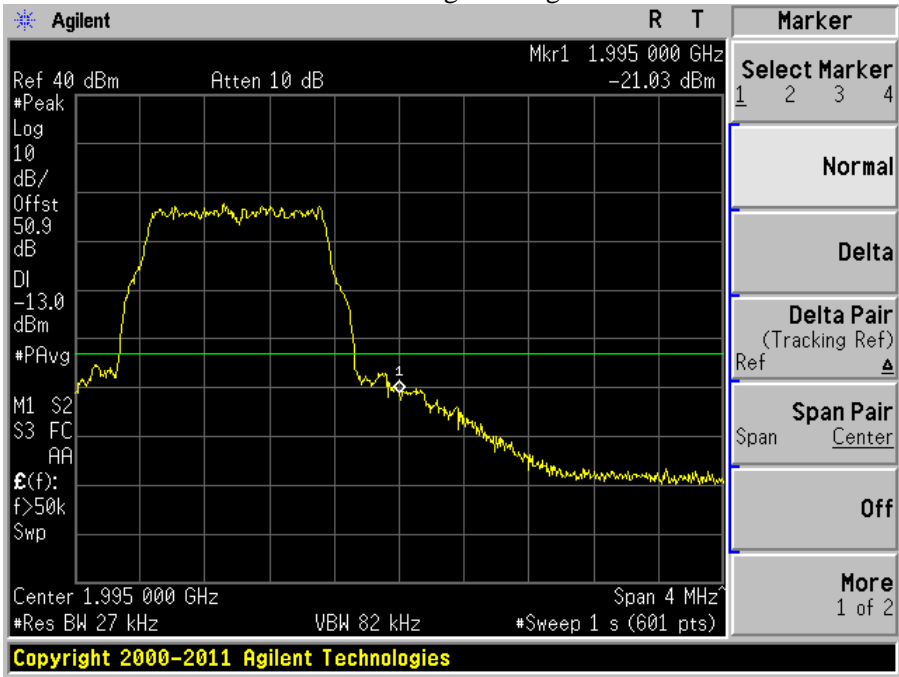
LTE, Downlink:

Modulation: QPSK (1.4 MHz):

Plot 1: Lowest Edge

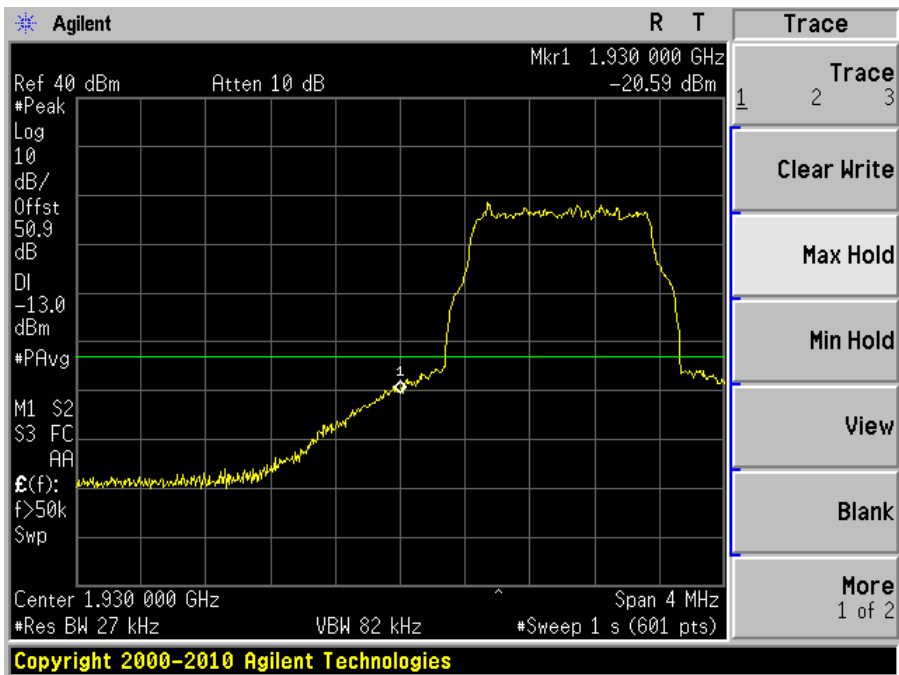


Plot 2: Highest Edge

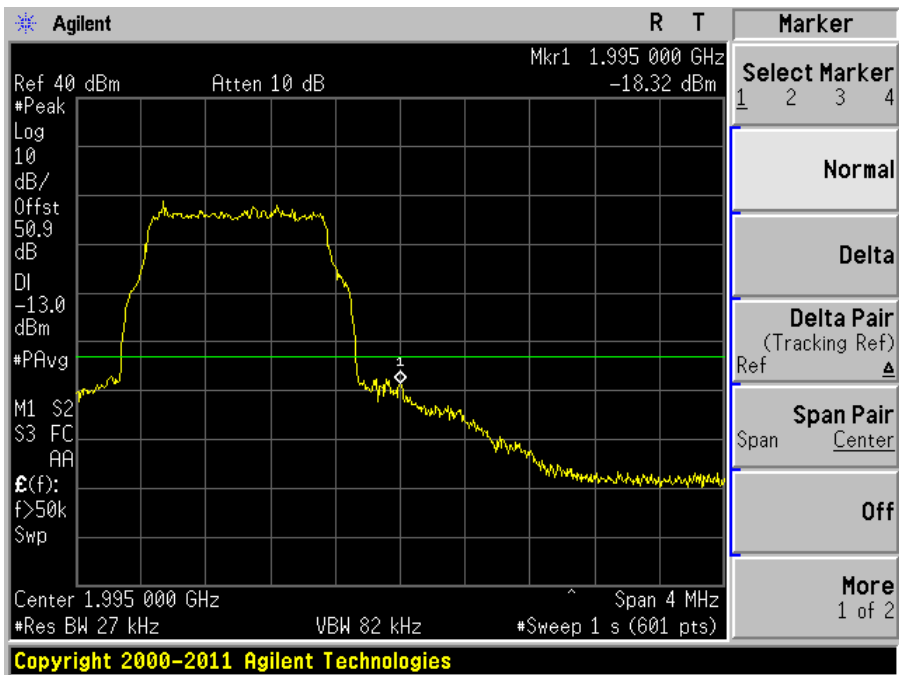


Modulation: 16QAM (1.4 MHz):

Plot 1: Lowest Edge

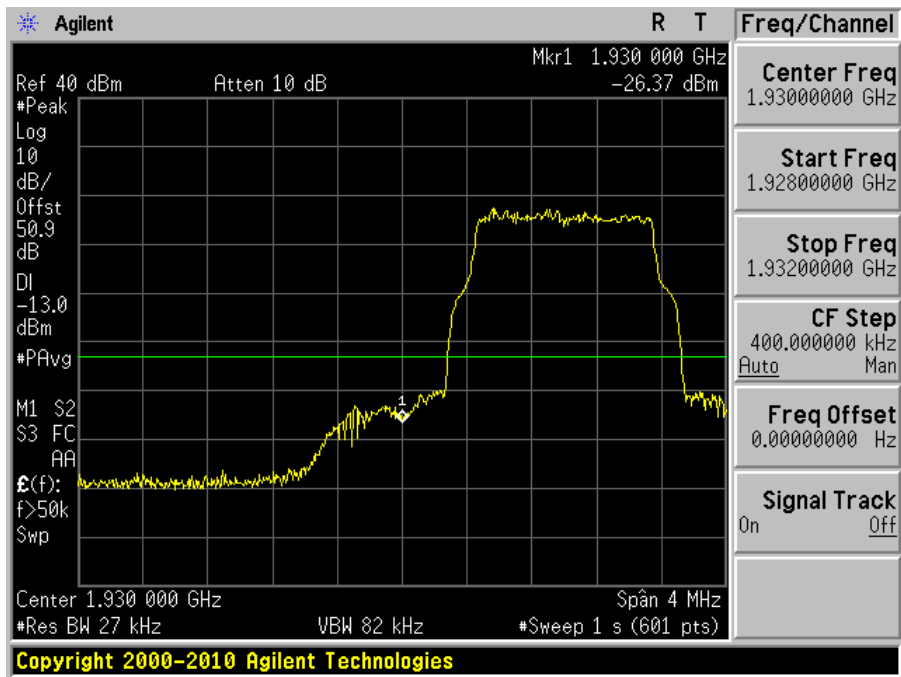


Plot 2: Highest Edge

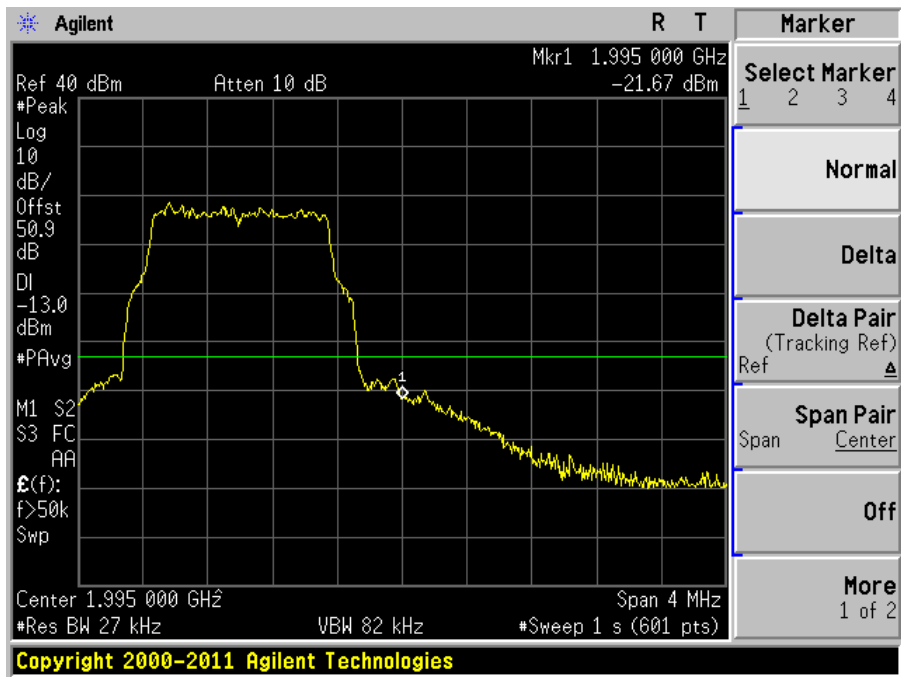


Modulation: 64QAM (1.4 MHz):

Plot 1: Lowest Edge

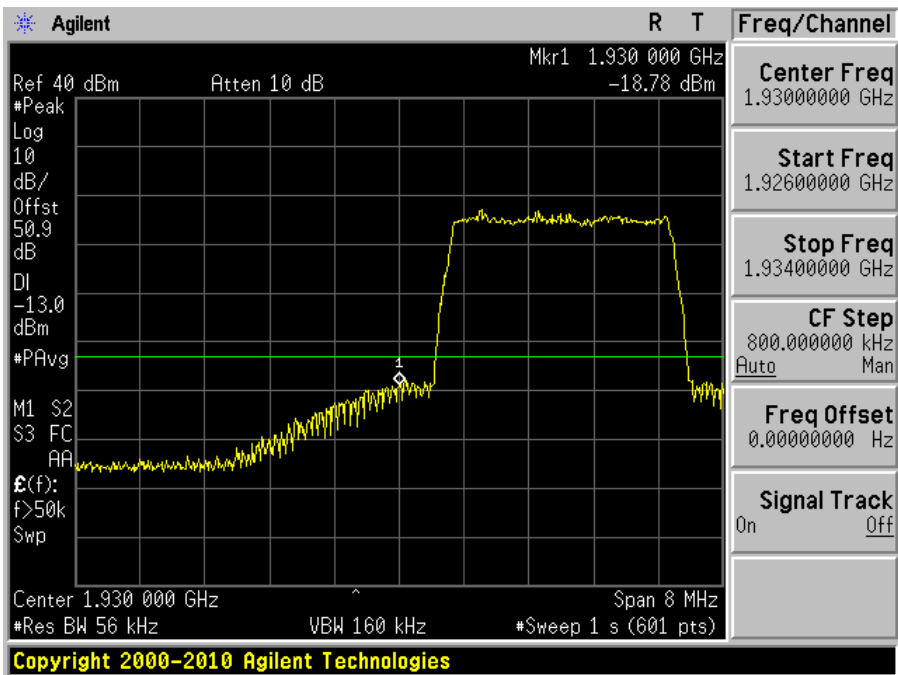


Plot 2: Highest Edge

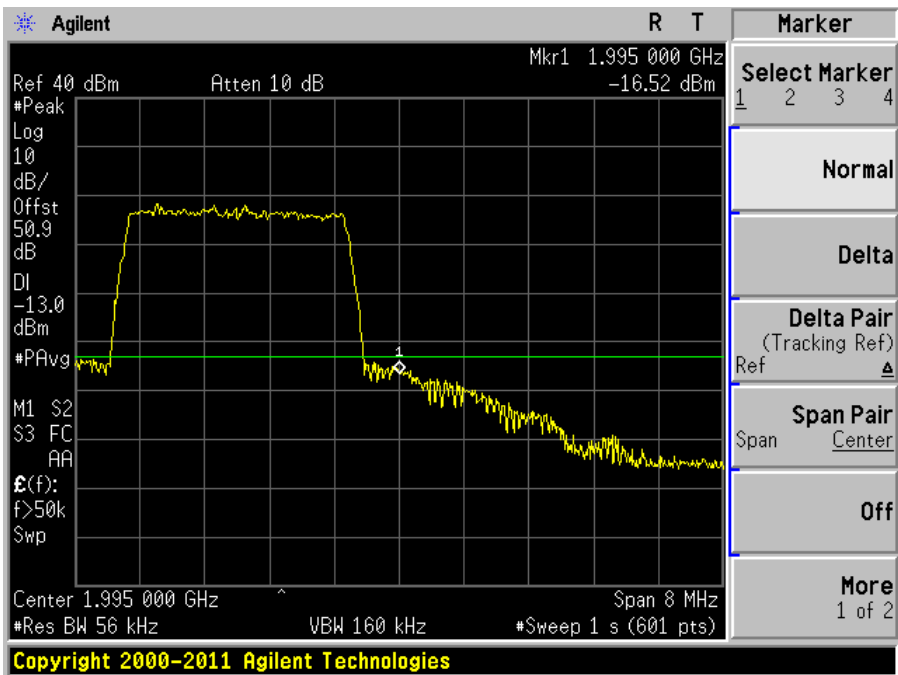


Modulation: QPSK (3 MHz):

Plot 1: Lowest Edge



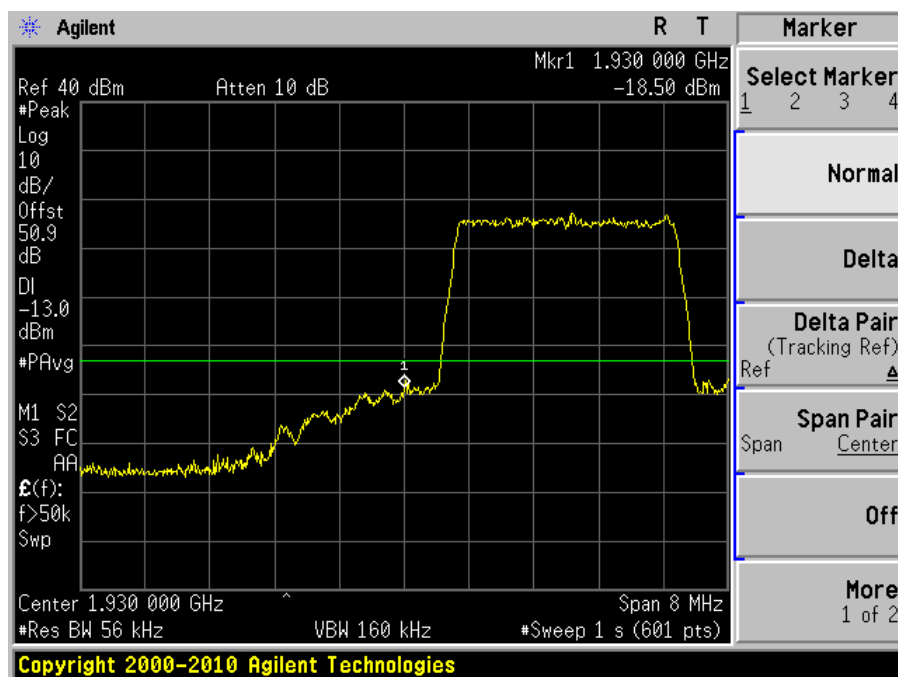
Plot 2: Highest Edge



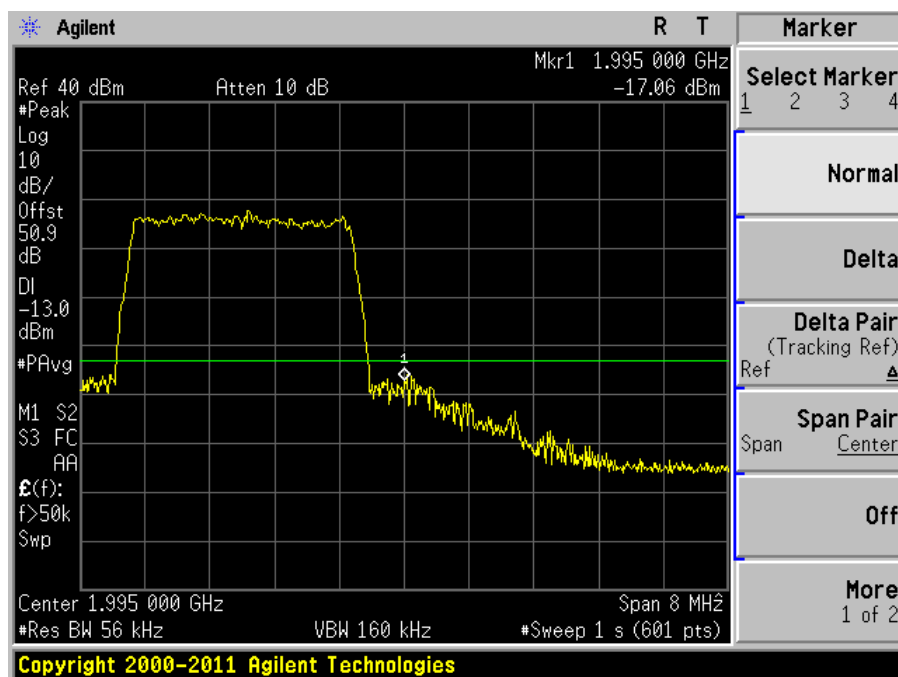


Modulation: 16QAM (3 MHz):

Plot 1: Lowest Edge

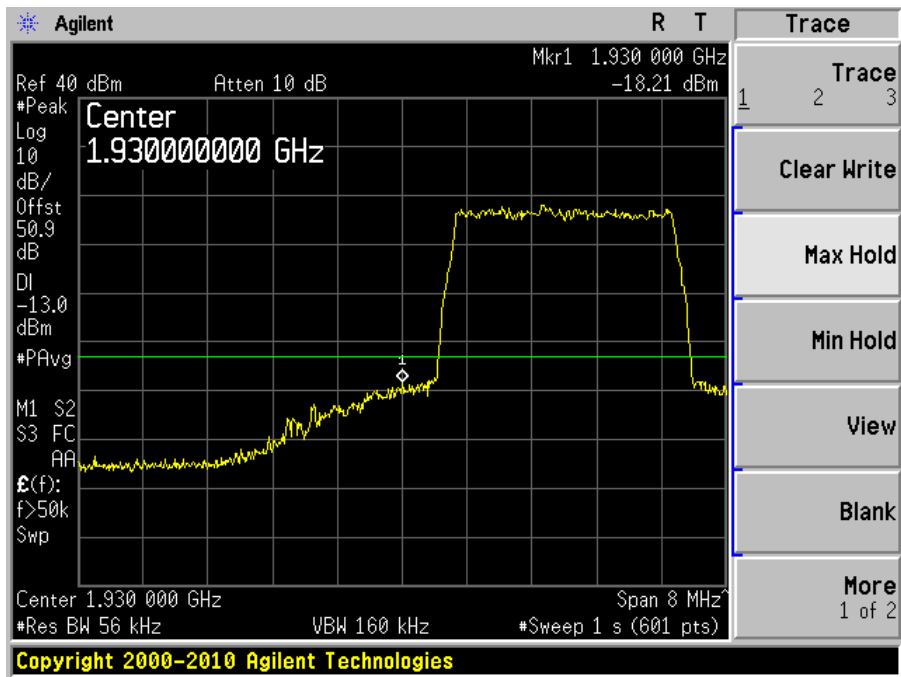


Plot 2: Highest Edge

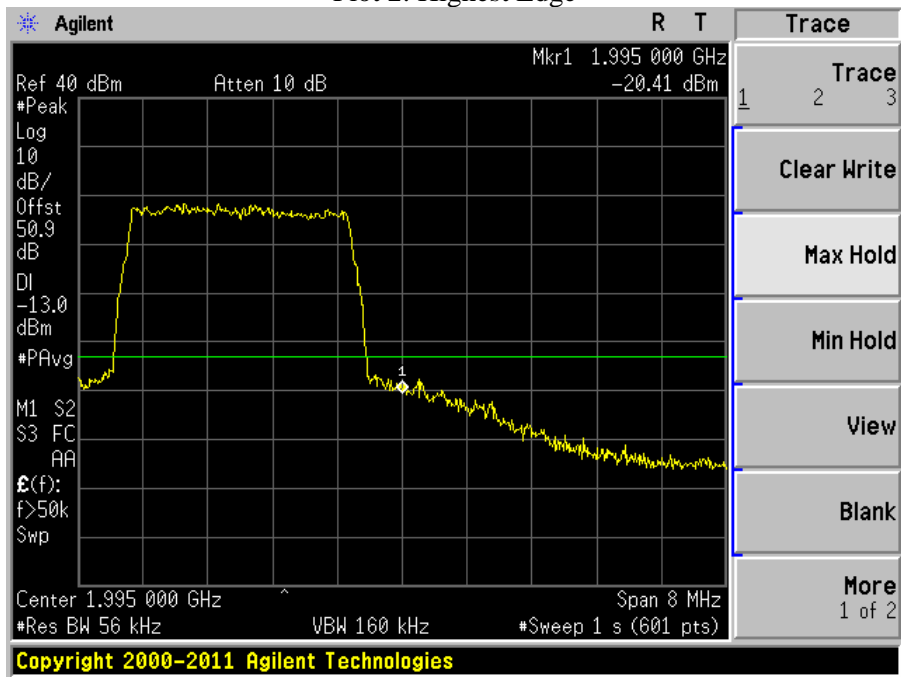


Modulation: 64QAM (3 MHz):

Plot 1: Lowest Edge

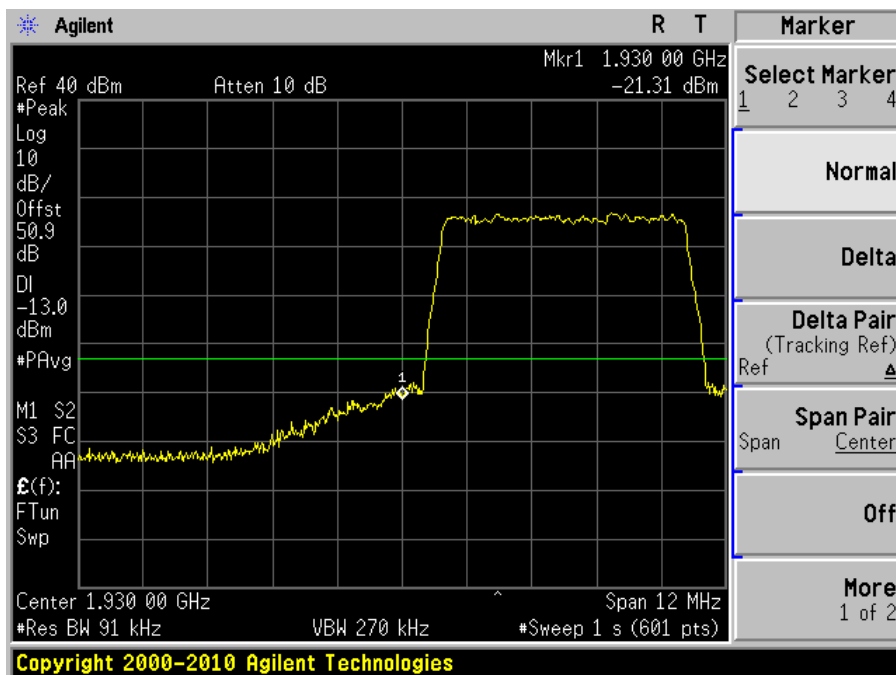


Plot 2: Highest Edge

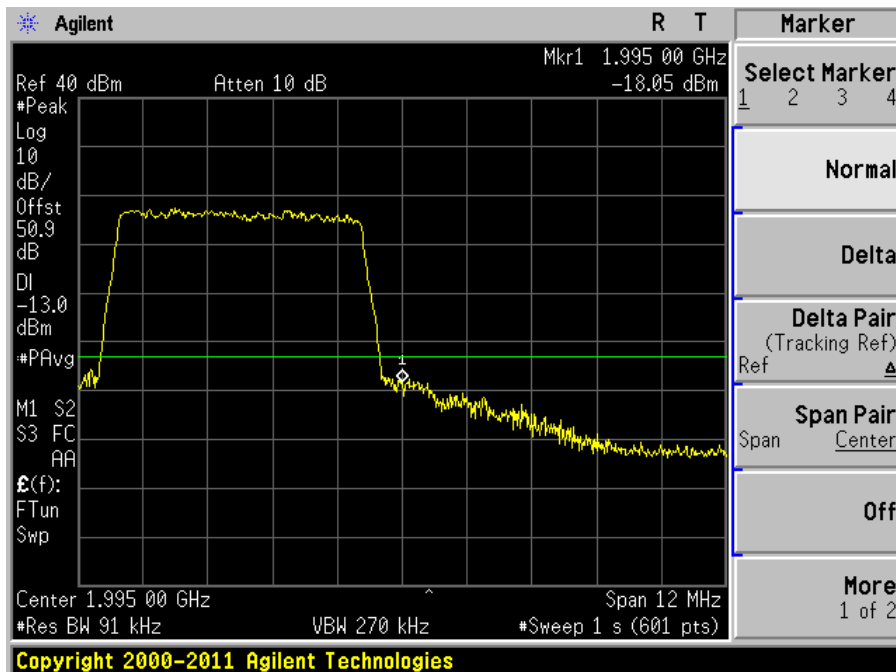


Modulation: QPSK (5 MHz):

Plot 1: Lowest Edge

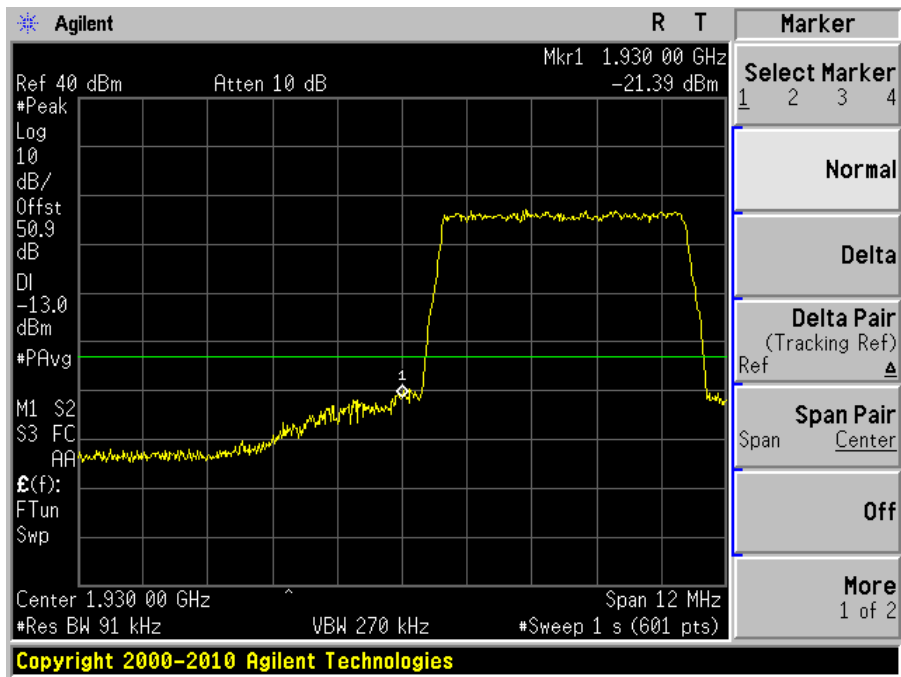


Plot 2: Highest Edge

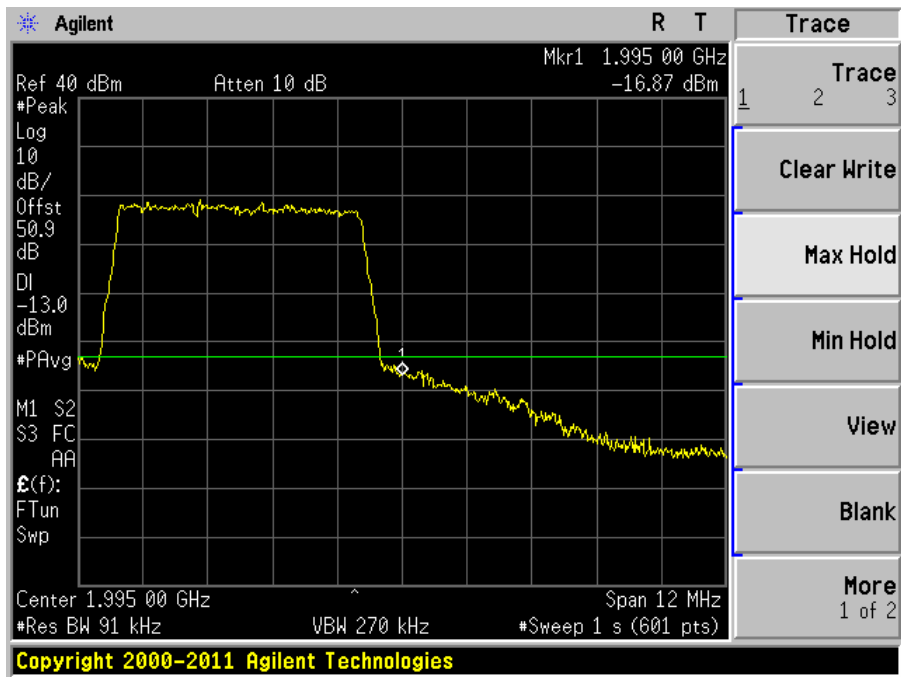


Modulation: 16QAM (5 MHz):

Plot 1: Lowest Edge

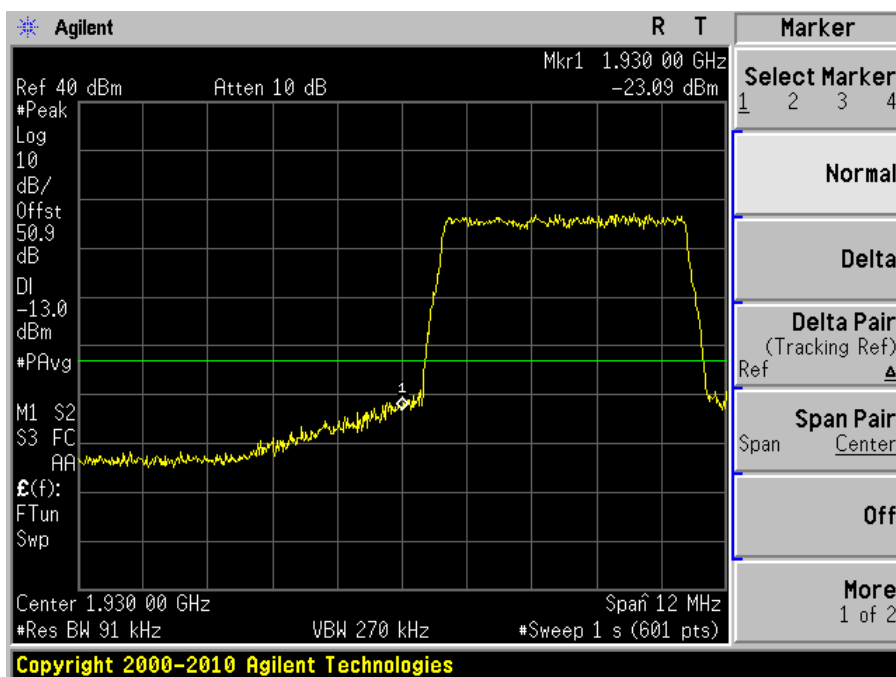


Plot 2: Highest Edge

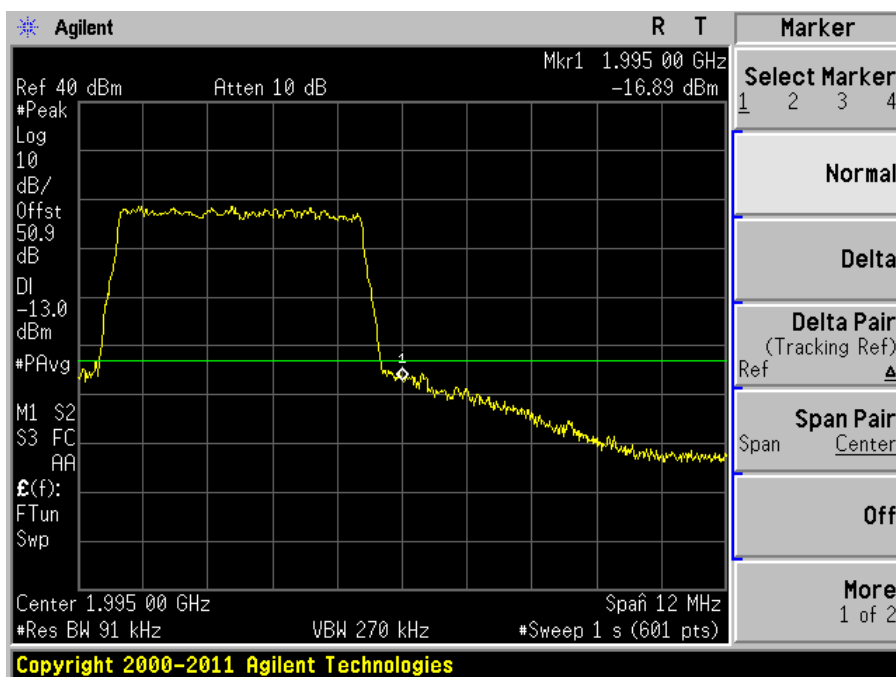


Modulation: 64QAM (5 MHz):

Plot 1: Lowest Edge

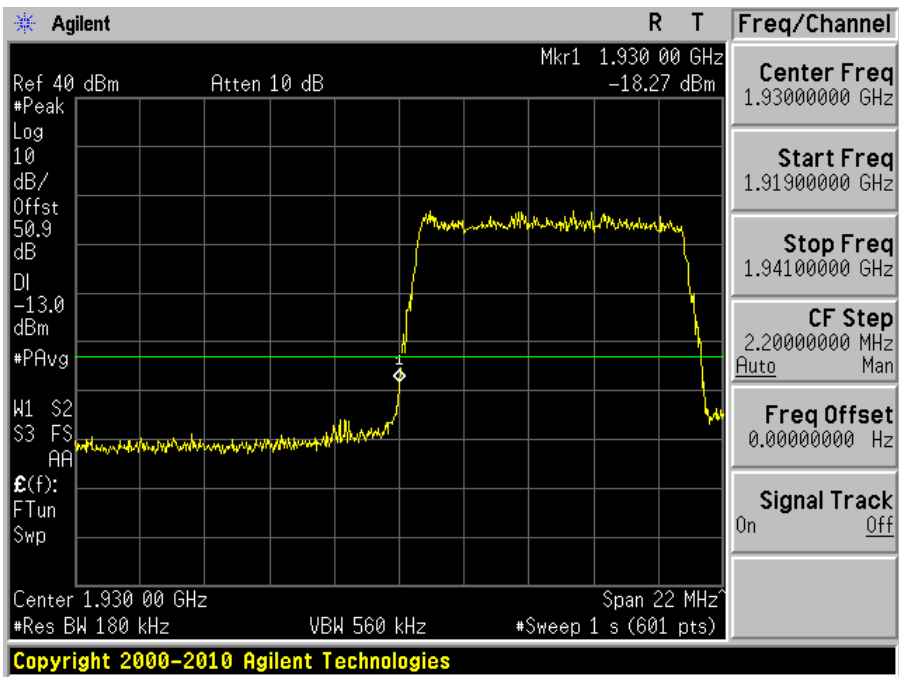


Plot 2: Highest Edge

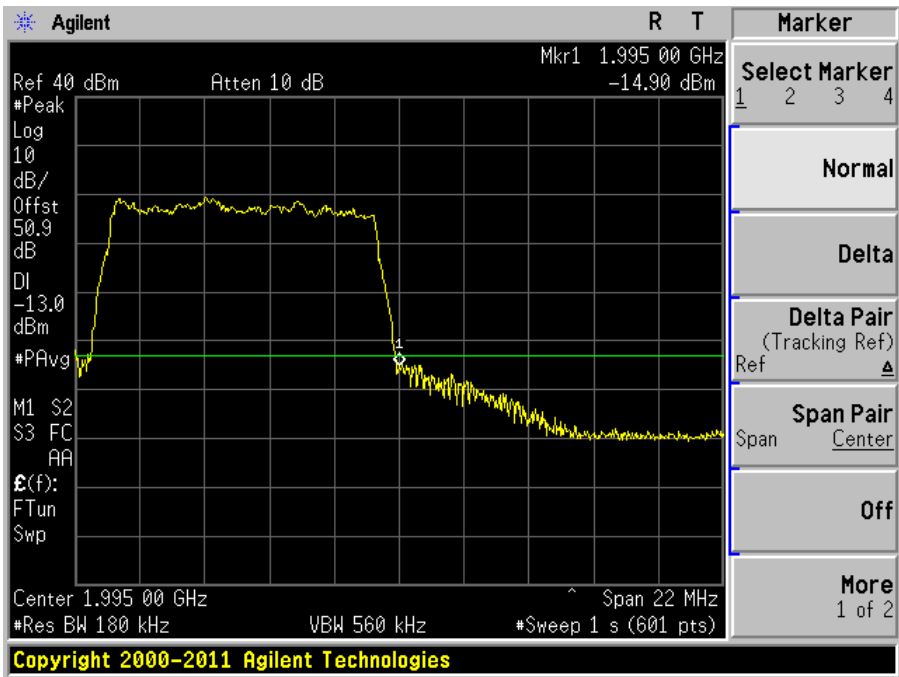


Modulation: QPSK (10 MHz):

Plot 1: Lowest Edge

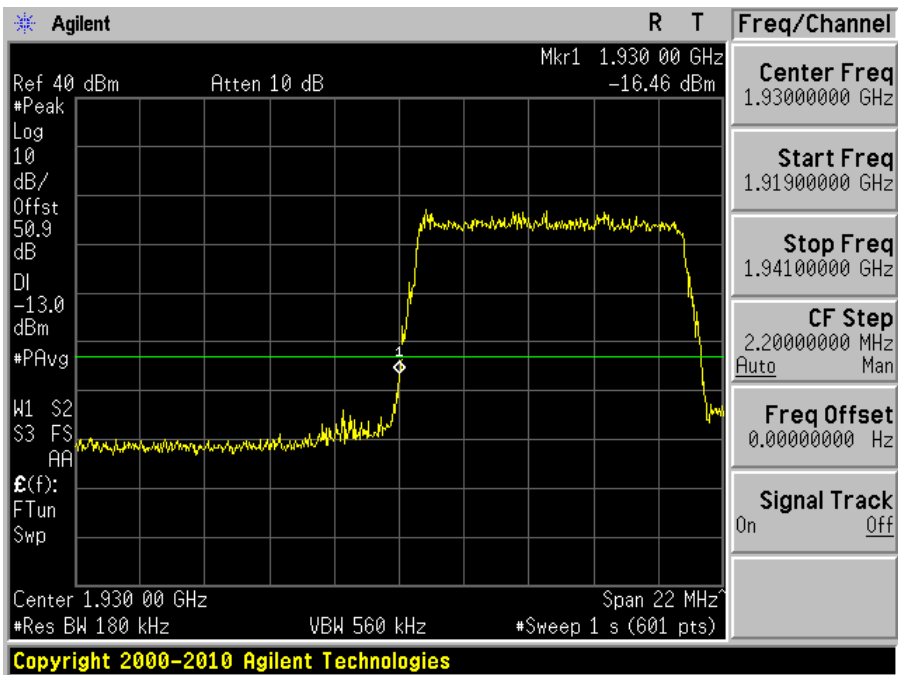


Plot 2: Highest Edge

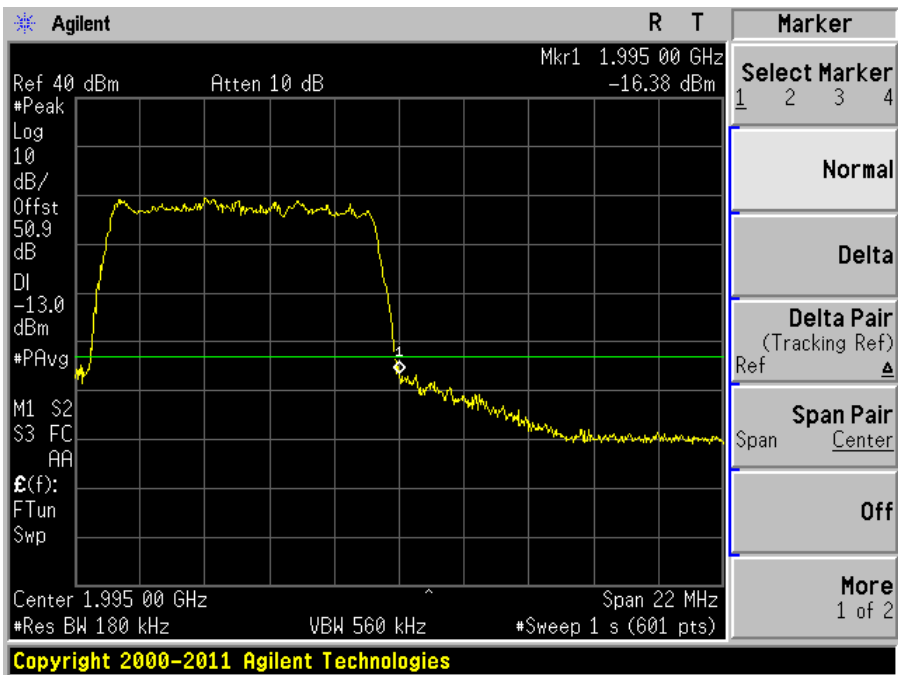


Modulation: 16QAM (10 MHz):

Plot 1: Lowest Edge

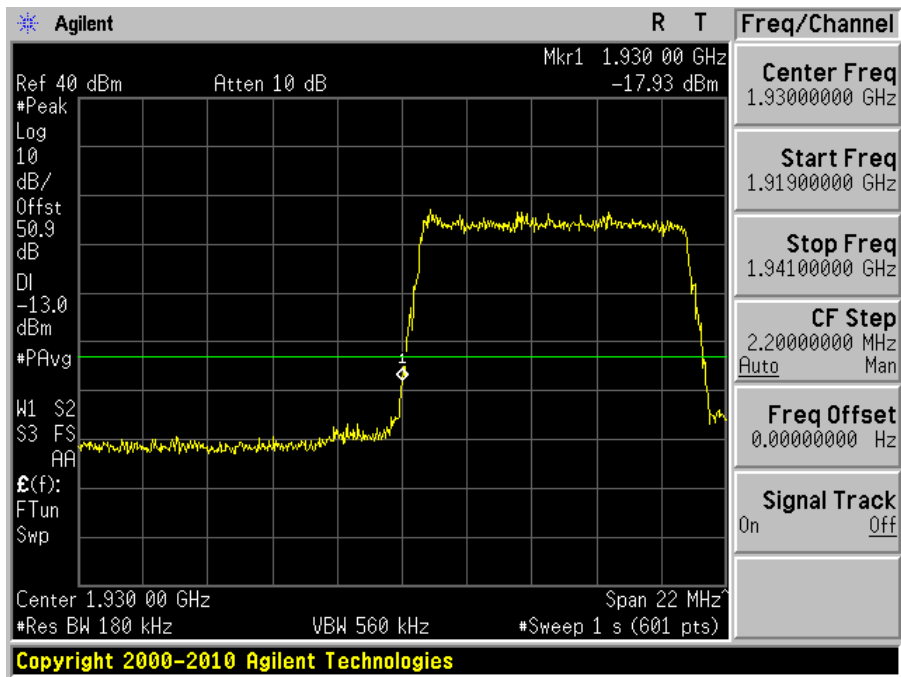


Plot 2: Highest Edge

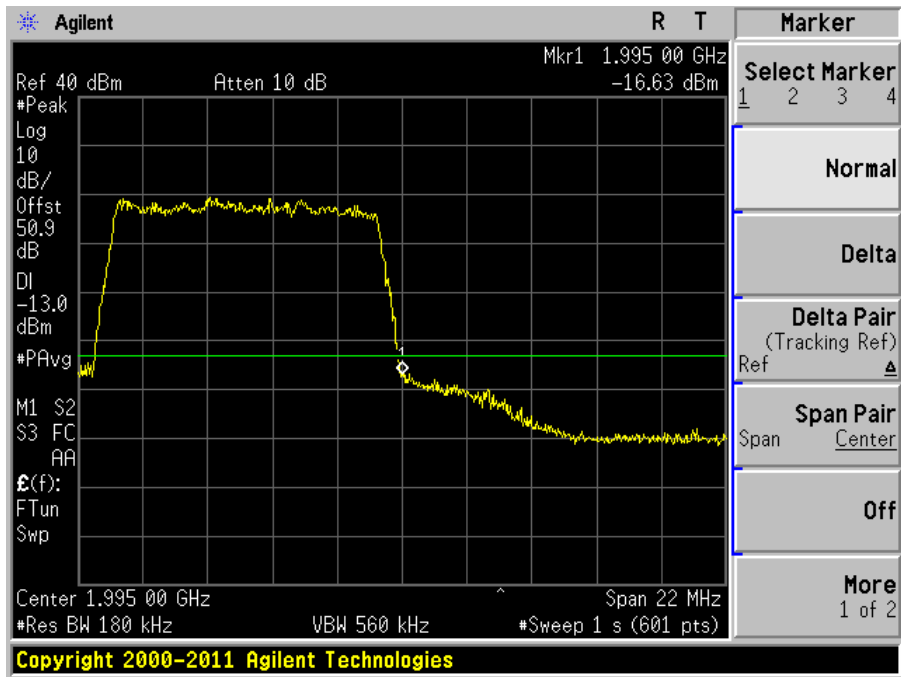


Modulation: 64QAM (10 MHz):

Plot 1: Lowest Edge



Plot 2: Highest Edge





## 9 FCC §1.1310 & §2.1091 - RF EXPOSURE

### 9.1 Applicable Standard

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

Note: f = frequency in MHz

\* = Plane-wave equivalent power density

### 9.2 MPE Prediction

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

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

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

### 9.3 Test Result

PCS Band UL:

Maximum peak output power at antenna input terminal (dBm):	<u>24.85</u>
Maximum peak output power at antenna input terminal (mW):	<u>305.5</u>
Prediction distance (cm):	<u>20</u>
Prediction frequency (MHz):	<u>1880</u>
Antenna Gain, typical (dBi):	<u>12</u>
Maximum Antenna Gain (numeric):	<u>15.85</u>
Power density at predication frequency and distance (mW/cm <sup>2</sup> ):	<u>0.963</u>
MPE limit for controlled exposure at predication frequency (mW/cm <sup>2</sup> ):	<u>5</u>

## PCS Band DL:

Maximum peak output power at antenna input terminal (dBm):	<u>24.88</u>
Maximum peak output power at antenna input terminal (mW):	<u>307.6</u>
Prediction distance (cm):	<u>20</u>
Prediction frequency (MHz):	<u>1960</u>
Antenna Gain, typical (dBi):	<u>12</u>
Maximum Antenna Gain (numeric):	<u>15.85</u>
Power density at predication frequency and distance (mW/cm <sup>2</sup> ):	<u>0.970</u>
MPE limit for controlled exposure at predication frequency (mW/cm <sup>2</sup> ):	<u>5</u>

**Result**

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

## 10 EXHIBIT A - FCC ID LABELING REQUIREMENTS

### 10.1 FCC ID Label Requirement

FCC § 2.925 Identification of equipment

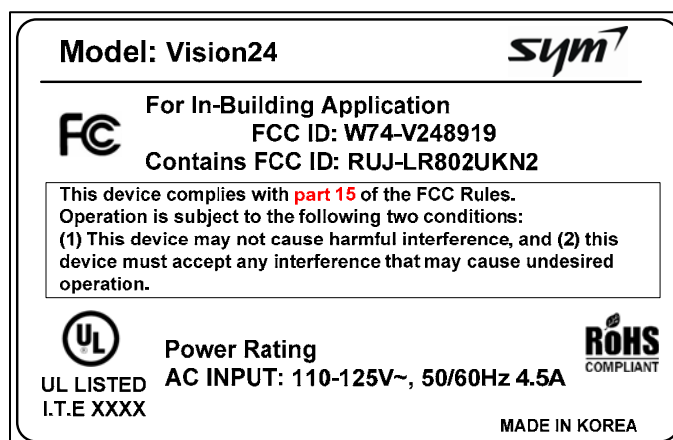
(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

*Example:* FCC ID XXX123. XXX—Grantee Code 123—Equipment Product Code

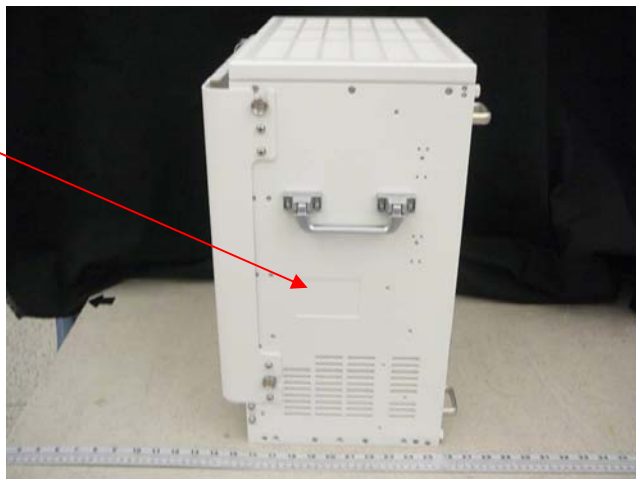
**FCC ID: XXX-XXXXXX**

### 10.2 FCC ID Label Content



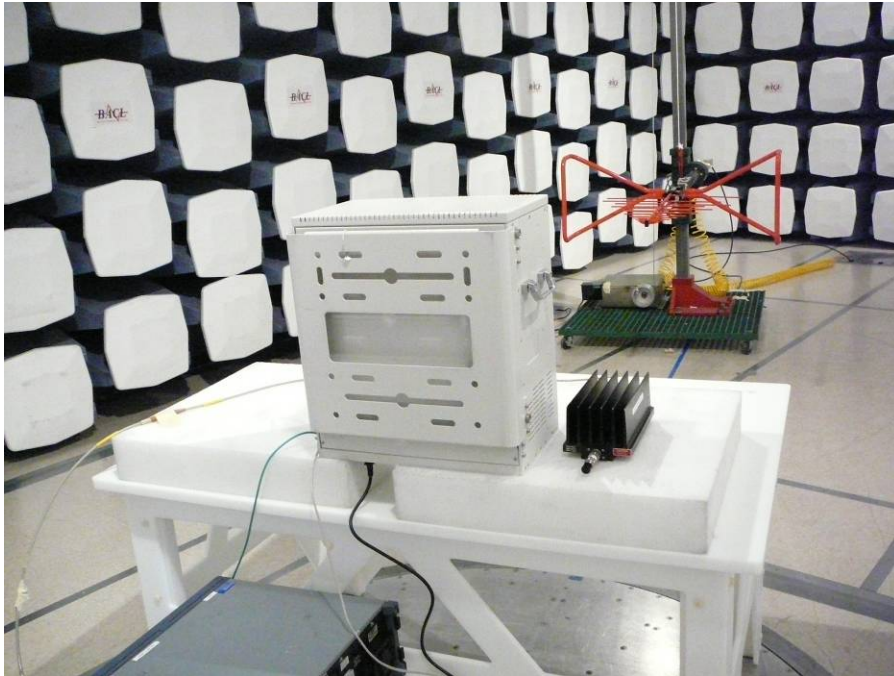
### 10.3 FCC Label Location on EUT

Label here

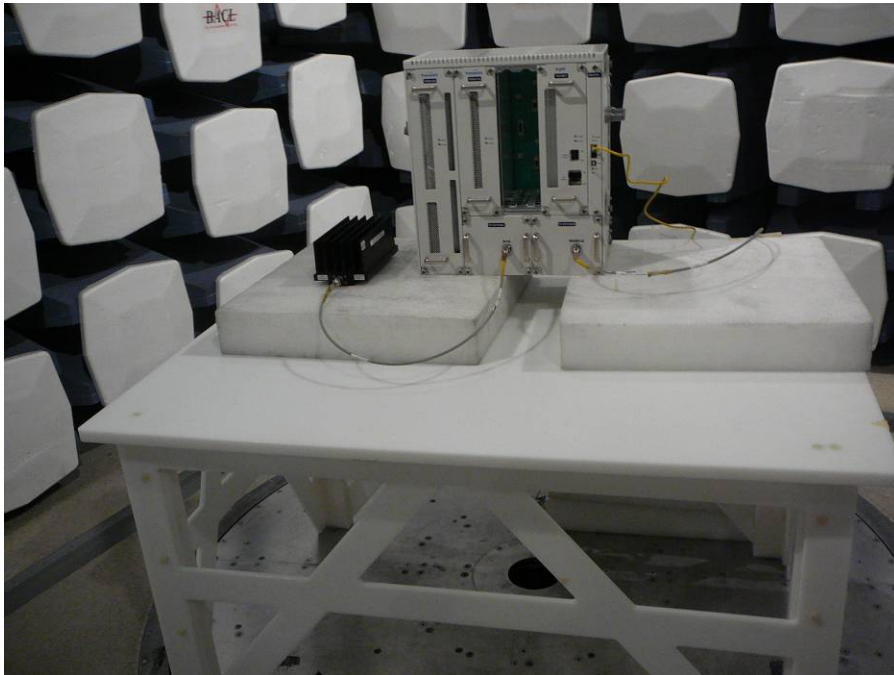


## 11 EXHIBIT B - TEST SETUP PHOTOGRAPHS

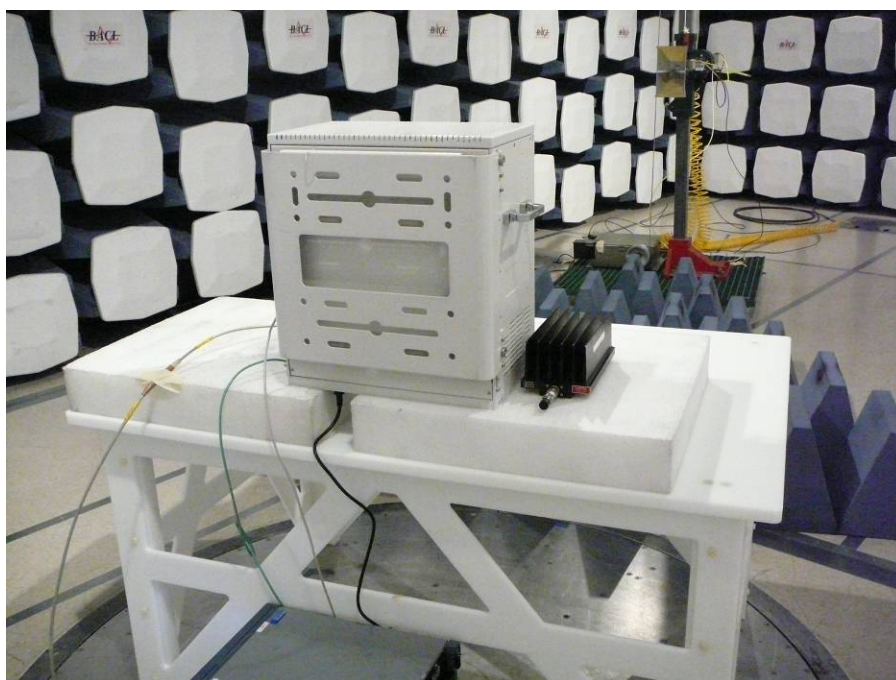
### 11.1 Radiated Emissions – Rear View (Below 1 GHz)



### 11.2 Radiated Emissions - Front View (Below 1 GHz)



### 11.3 Radiated Emissions - Rear View (Above 1 GHz)

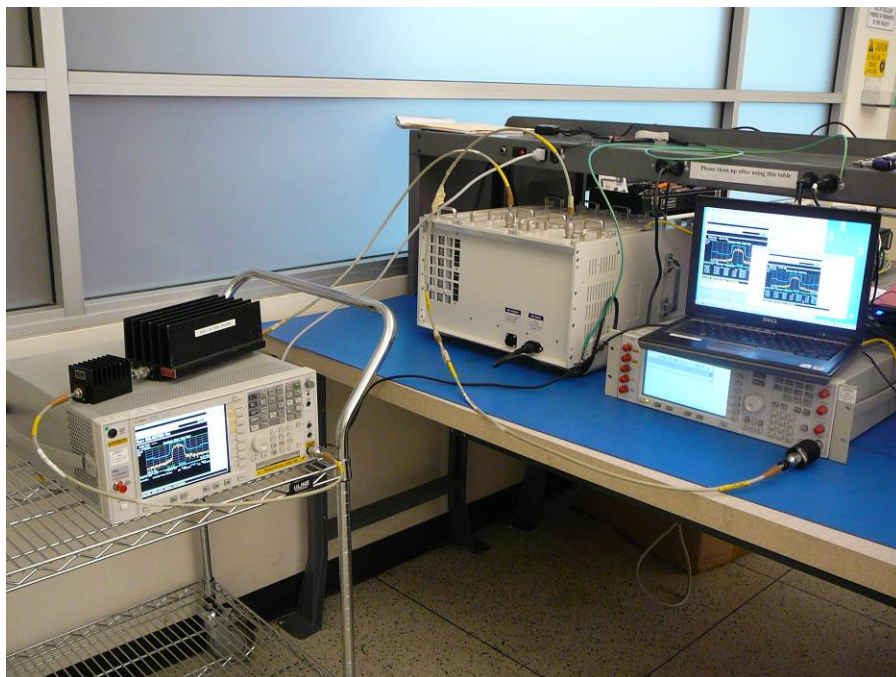


### 11.4 Radiated Emissions - Front View (Above 1 GHz)





## 11.5 Bench Setup View



## 12 EXHIBIT C - EUT PHOTOGRAPHS

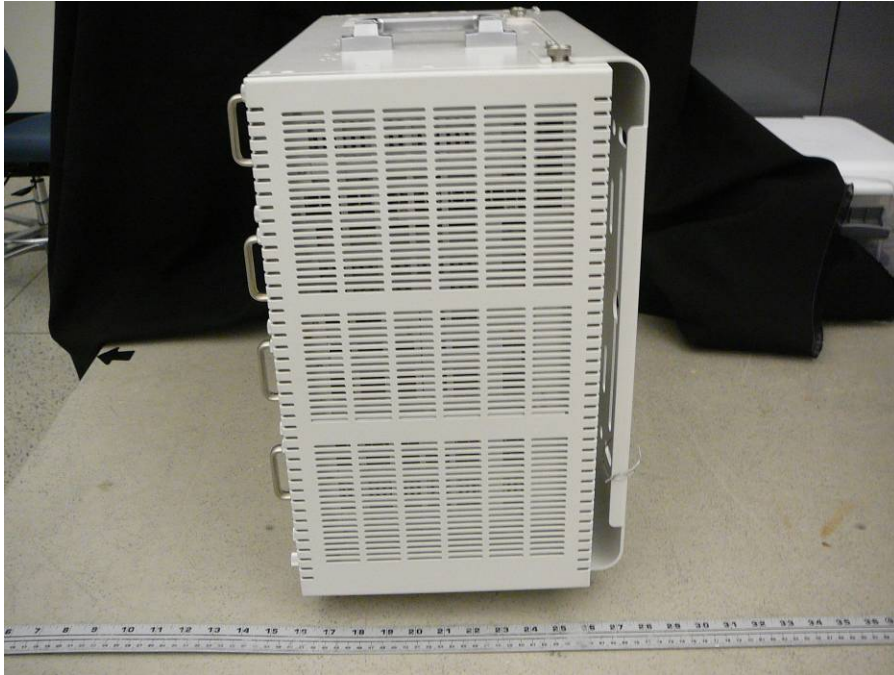
### 12.1 EUT-Main Frame Enclosure Front View



### 12.2 EUT-Main Frame Enclosure Rear View



### 12.3 EUT-Main Frame Enclosure Top View



### 12.4 EUT-Main Frame Enclosure Bottom View





## 12.5 EUT-Main Frame Enclosure Left Side View



## 12.6 EUT-Main Frame Enclosure Right Side View



## 12.7 EUT-Main Frame Enclosure Open View 1



## 12.8 EUT-Main Frame Enclosure Open View 2



## 12.9 Vision24 1900MHz Service Card Front View



## 12.10 Vision24 1900MHz Service Card Rear View



### 12.11 Vision24 1900MHz Service Card Top View



### 12.12 Vision24 1900MHz Service Card Bottom View



### 12.13 Vision24 Filter and Combiner BTS Front View



### 12.14 Vision24 Filter and Combiner BTS Rear View



**12.15 Vision24 Filter and Combiner Mobile Front View****12.16 Vision24 Filter and Combiner Mobile Rear View**



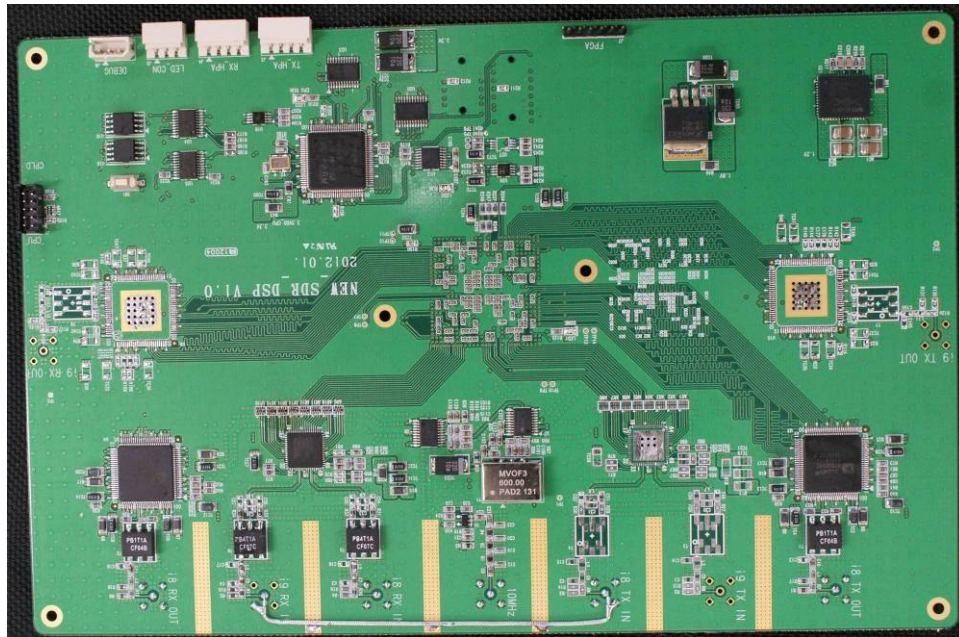
### 12.17 Vision24 Rectifier (Power Supply) Front View



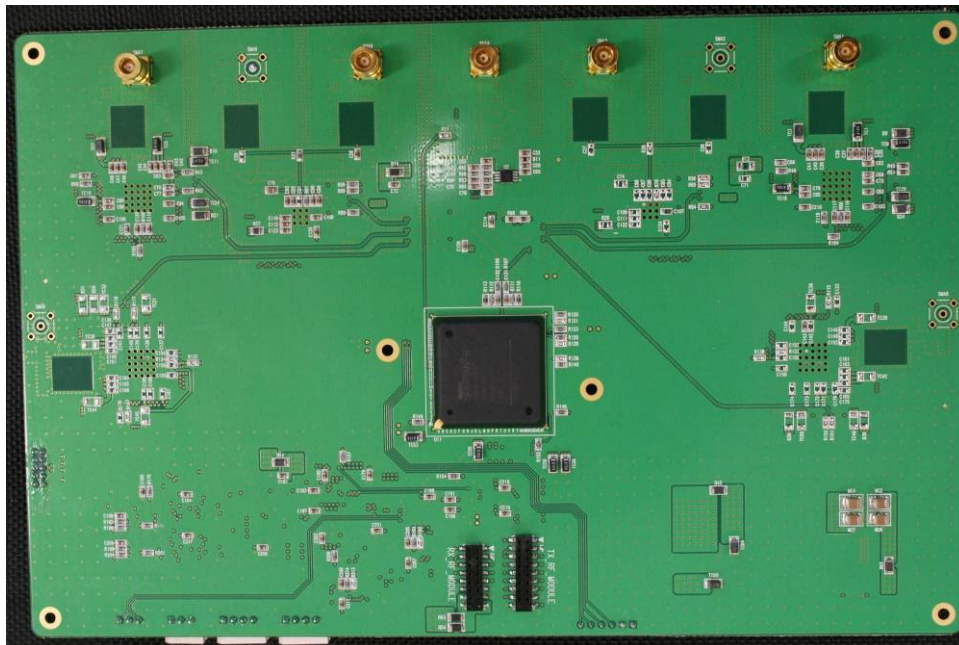
### 12.18 Vision24 Network Controller Front View



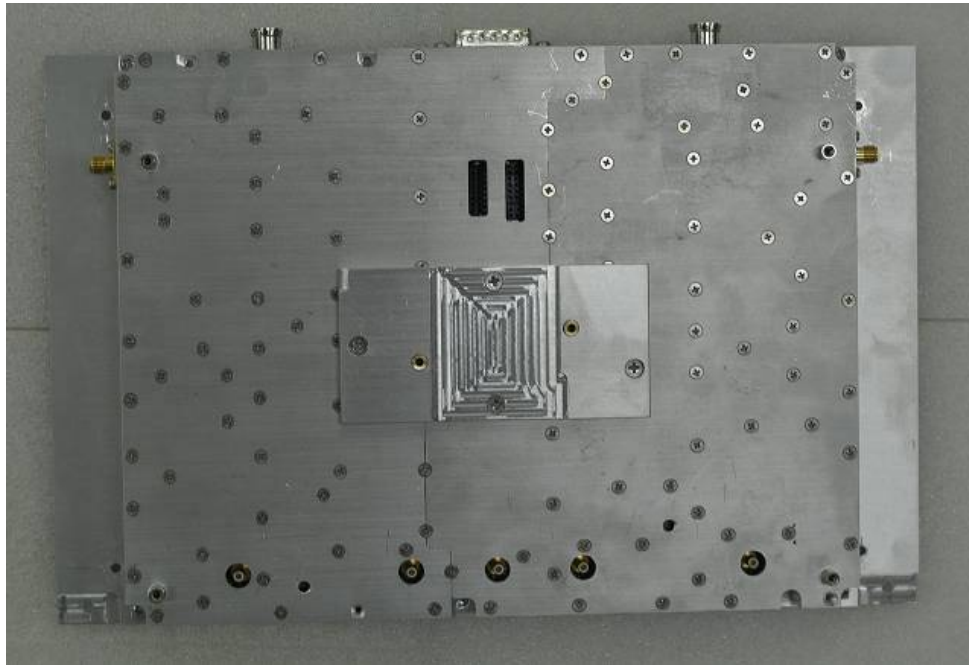
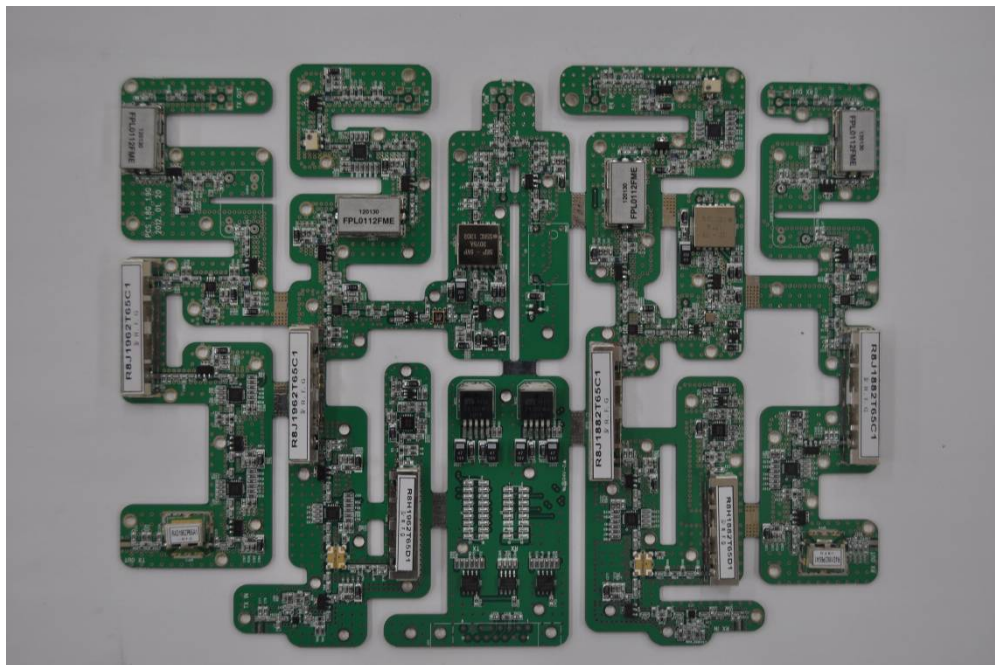
## 12.19 Vision24 1900MHz Service Card Digital Unit PCB Top View



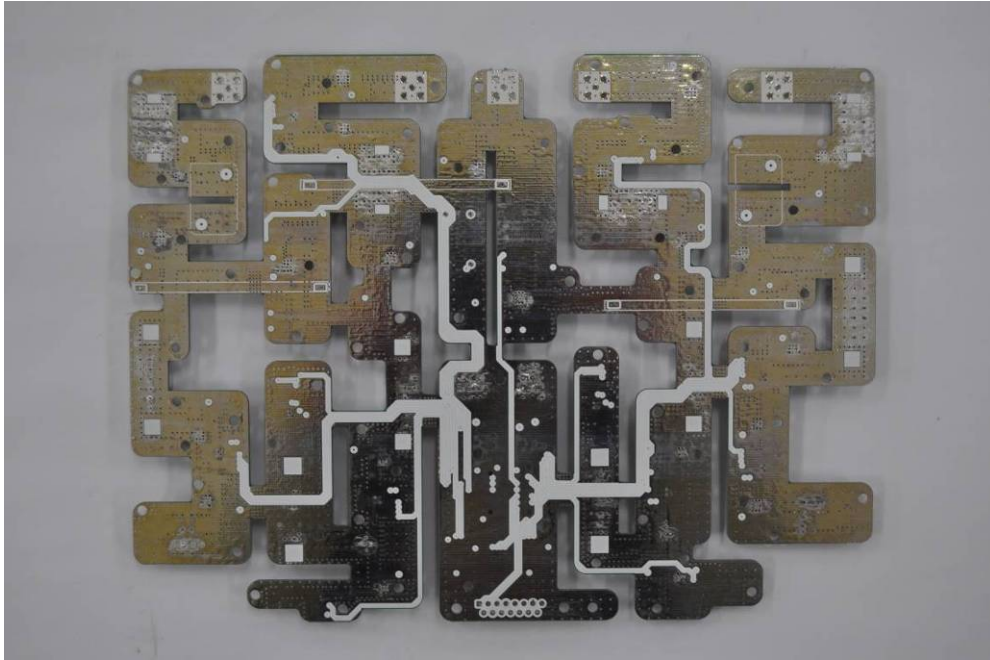
## 12.20 Vision24 1900MHz Service Card Digital Unit PCB Bottom View



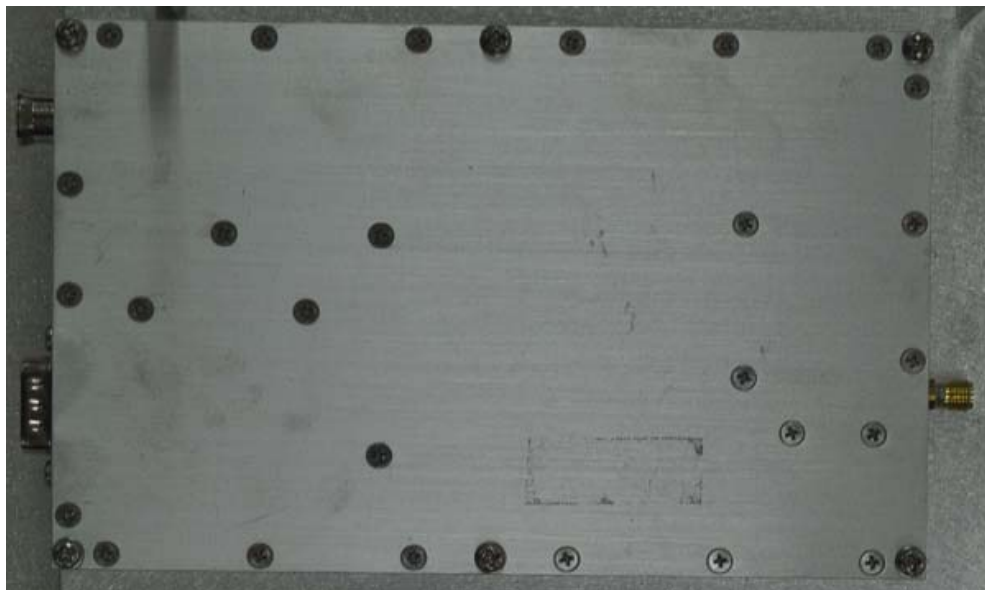


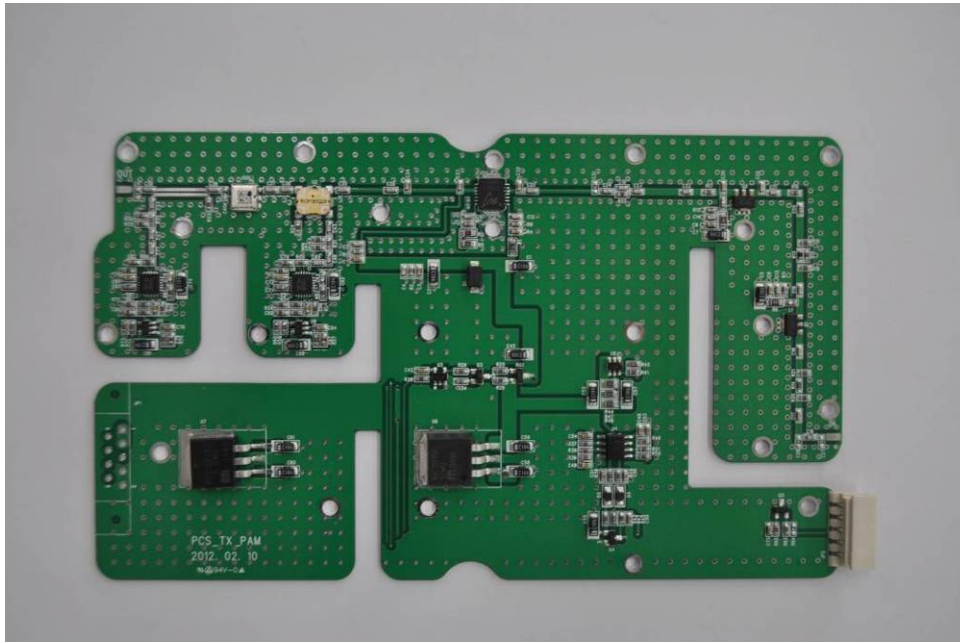
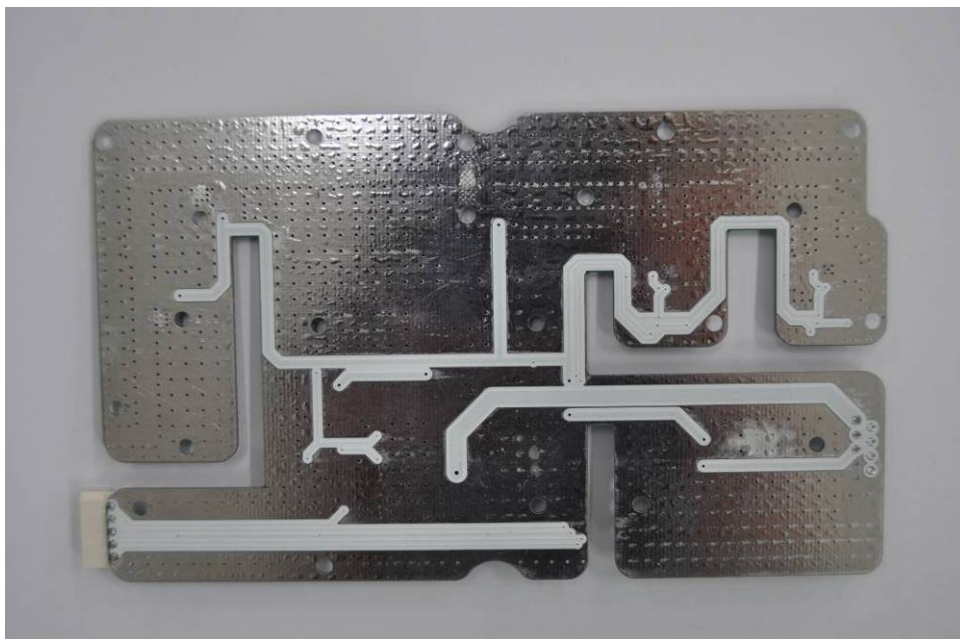
**12.21 Vision24 1900MHz Service Card RF Unit Shielded View****12.22 Vision24 1900MHz Service Card RF Unit PCB Top View**

### 12.23 Vision24 1900MHz Service Card RF Unit PCB Bottom View



### 12.24 Vision24 1900MHz Service Card HPA Shielded View

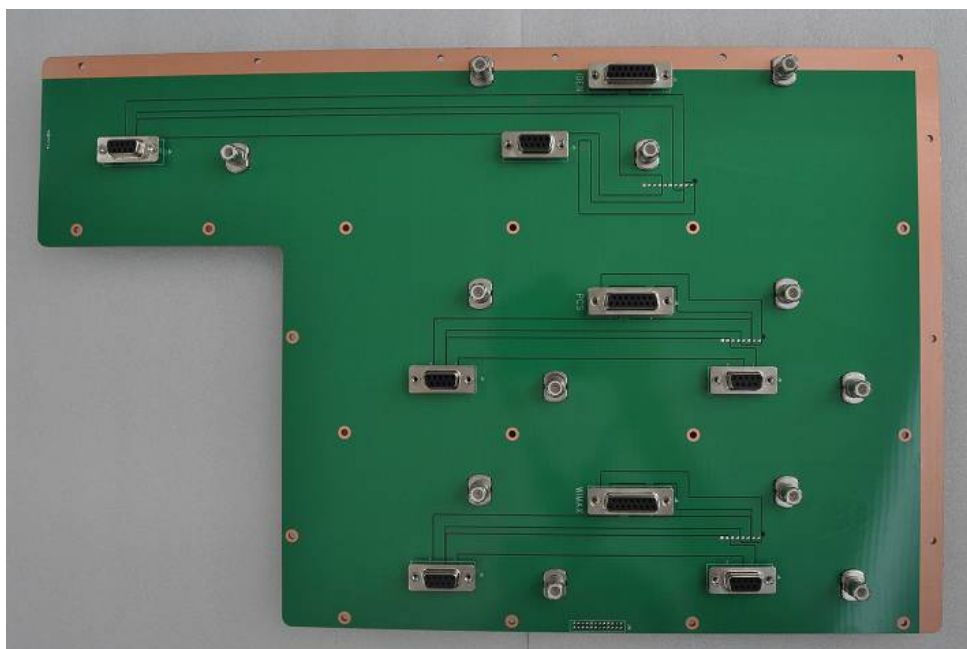


**12.25 Vision24 1900MHz Service Card HPA PCB Top View****12.26 Vision24 1900MHz Service Card HPA PCB Bottom View**

## 12.27 Main Frame PCB 1 Top View

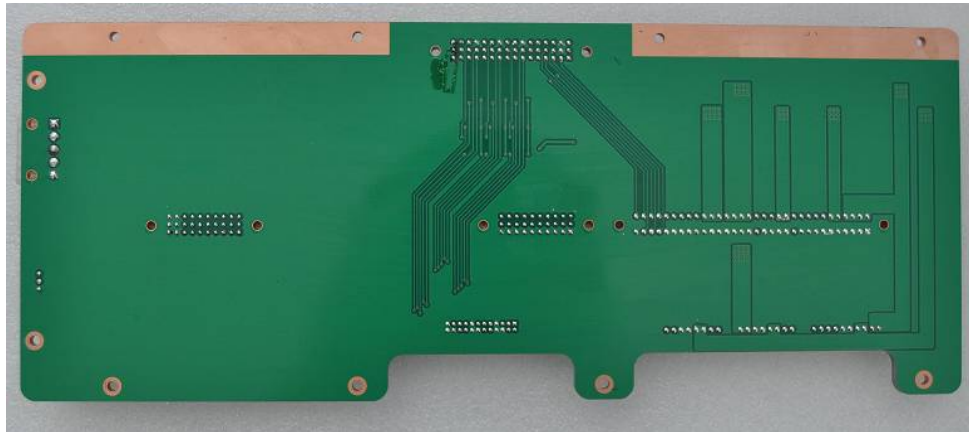


## 12.28 Main Frame PCB 1 Bottom View

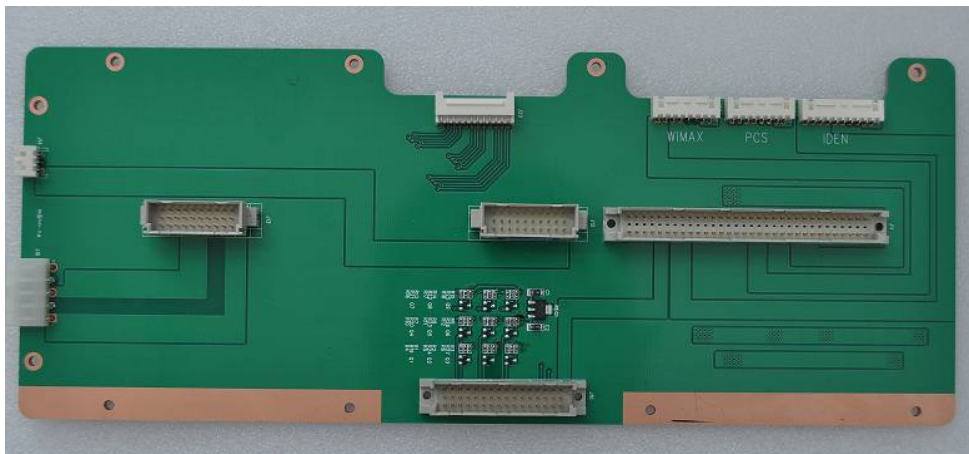




### 12.29 Main Frame PCB 2 Top View



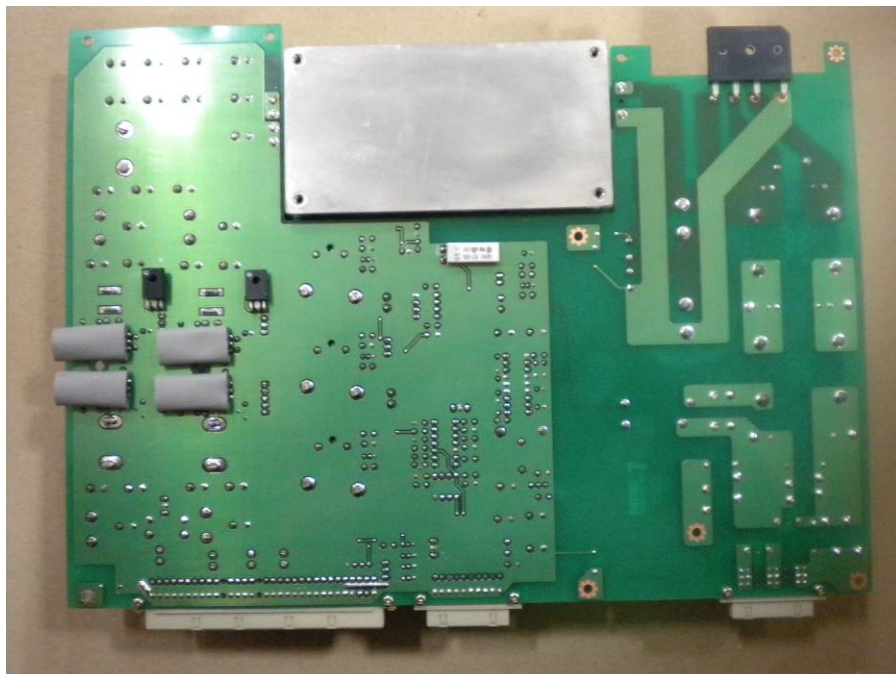
### 12.30 Main Frame PCB 2 Bottom View



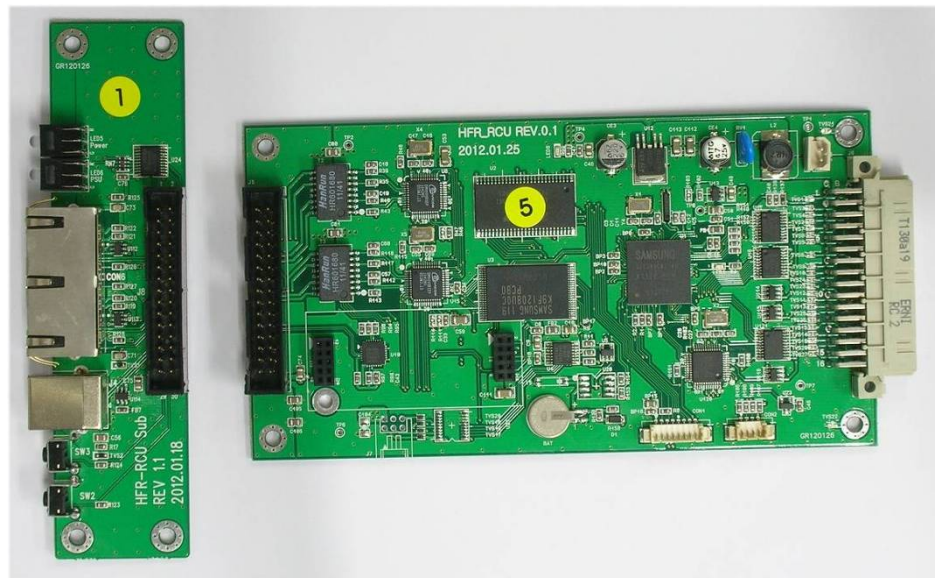
### 12.31 Vision24 Rectifier PCB Top View



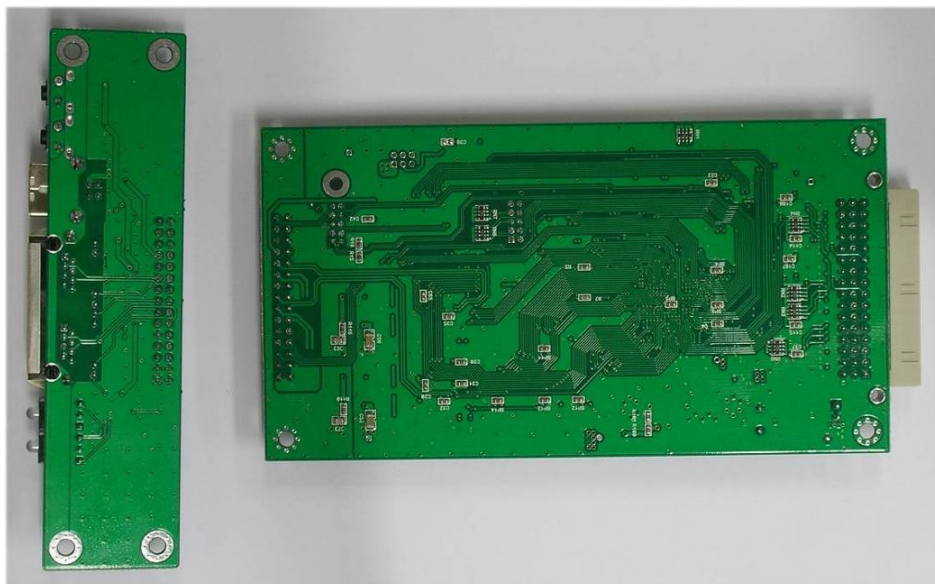
### 12.32 Vision24 Rectifier PCB Bottom View



### 12.33 Vision24 Network Controller PCB Top View



### 12.34 Vision24 Network Controller PCB Bottom View



--- END OF REPORT ---