FCC PART 24E

TEST AND MEASUREMENT REPORT

For

SYM Technology, Inc.

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

FCC ID: W74-V308919

Report Type:	**Product Type:**
Original Report	Bi-Directional Amplifier

Test Engineer: Jeffrey Wu

Report Number: R12043013-24

Report Date: 2012-08-07

Reviewed By: Victor Zhang
EMC/RF Lead

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R12043014-24	Original Report	2012-08-07

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-V308919*, model: *Vision30, o*r 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: R12043014 assigned by BACL.

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, ANSI C63.4-2003.

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

1.6 Measurement Uncertainty

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

Based on 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

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

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 EUT 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 30dBm HPA	V3019HPA	-

2.5 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude D600	-

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[1]
§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[1]
§1.1310, §2.1091	RF Exposure	Compliant

Note[1]: 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

Temperature:	21 °C
Relative Humidity:	49 %
ATM Pressure:	101.3 kPa

The testing was performed by Jeffrey Wu on 2012-05-22 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	30.26
		Middle	1880.0	-58	30.46
		High	1914.2	-60	30.10
	1900 MHz Downlink	Low	1930.8	-58	30.04
		Middle	1960.0	-58	30.62
		High	1994.2	-60	30.05

LTE

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 1930-1995 MHz	QPSK (1.4 MHz)	1931	-57	30.02
	QPSK (1.4 MHz)	1960	-58	30.11
	QPSK (1.4 MHz)	1994	-58	30.18
	16QAM (1.4 MHz)	1931	-58	29.54
	16QAM (1.4 MHz)	1960	-58	30.10
	16QAM (1.4 MHz)	1994	-58	30.23
	64QAM (1.4 MHz)	1931	-58	30.15
	64QAM (1.4 MHz)	1960	-58	30.13
	64QAM (1.4 MHz)	1994	-58	30.33
	QPSK (3 MHz)	1932	-57	30.36
	QPSK (3 MHz)	1960	-58	29.76
	QPSK (3 MHz)	1993	-58	30.11
	16QAM (3 MHz)	1932	-57	29.86
	16QAM (3 MHz)	1960	-58	29.69
	16QAM (3 MHz)	1993	-58	30.18
	64QAM (3 MHz)	1932	-57	30.26
	64QAM (3 MHz)	1960	-58	29.65
	64QAM (3 MHz)	1993	-58	30.03
	QPSK (5 MHz)	1933	-57	30.20
	QPSK (5 MHz)	1960	-58	29.56
	QPSK (5 MHz)	1992	-58	30.11
	16QAM (5 MHz)	1933	-57	30.19
	16QAM (5 MHz)	1960	-57	30.11
	16QAM (5 MHz)	1992	-58	30.12
	64QAM (5 MHz)	1933	-57	30.11
	64QAM (5 MHz)	1960	-58	29.51
	64QAM (5 MHz)	1992	-58	30.03
	QPSK (10 MHz)	1935	-56	30.49
	QPSK (10 MHz)	1960	-58	29.55
	QPSK (10 MHz)	1990	-58	29.88
	16QAM (10 MHz)	1935	-57	29.94
	16QAM (10 MHz)	1960	-57	30.56
	16QAM (10 MHz)	1990	-58	29.86
	64QAM (10 MHz)	1935	-57	29.91
	64QAM (10 MHz)	1960	-58	29.50
	64QAM (10 MHz)	1990	-58	29.74

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Uplink 1850-1915 MHz	QPSK (1.4 MHz)	1851	-58	29.80
	QPSK (1.4 MHz)	1880	-59	29.75
	QPSK (1.4 MHz)	1914	-60	30.35
	16QAM (1.4 MHz)	1851	-58	29.76
	16QAM (1.4 MHz)	1880	-59	29.72
	16QAM (1.4 MHz)	1914	-60	30.33
	64QAM (1.4 MHz)	1851	-58	29.78
	64QAM (1.4 MHz)	1880	-59	29.73
	64QAM (1.4 MHz)	1914	-60	30.31
	QPSK (3 MHz)	1852	-58	30.11
	QPSK (3 MHz)	1880	-59	29.85
	QPSK (3 MHz)	1913	-60	30.18
	16QAM (3 MHz)	1852	-58	30.05
	16QAM (3 MHz)	1880	-59	29.85
	16QAM (3 MHz)	1913	-60	30.17
	64QAM (3 MHz)	1852	-58	29.96
	64QAM (3 MHz)	1880	-59	29.75
	64QAM (3 MHz)	1913	-60	30.16
	QPSK (5 MHz)	1853	-58	30.17
	QPSK (5 MHz)	1880	-59	29.69
	QPSK (5 MHz)	1912	-60	30.11
	16QAM (5 MHz)	1853	-58	30.12
	16QAM (5 MHz)	1880	-59	29.61
	16QAM (5 MHz)	1912	-60	30.11
	64QAM (5 MHz)	1853	-58	30.10
	64QAM (5 MHz)	1880	-59	29.60
	64QAM (5 MHz)	1912	-60	30.10
	QPSK (10 MHz)	1855	-58	30.12
	QPSK (10 MHz)	1880	-58	30.41
	QPSK (10 MHz)	1910	-60	29.92
	16QAM (10 MHz)	1855	-58	30.11
	16QAM (10 MHz)	1880	-58	30.38
	16QAM (10 MHz)	1910	-60	29.91
	64QAM (10 MHz)	1855	-59	29.69
	64QAM (10 MHz)	1880	-59	29.97
	64QAM (10 MHz)	1910	-60	29.91

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

Temperature:	21 °C
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Jeffrey Wu on 2012-05-23 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	1274.3	1255.3
	Downlink	CDMA/EVDO	1960	1270.0	1261.6

LTE:

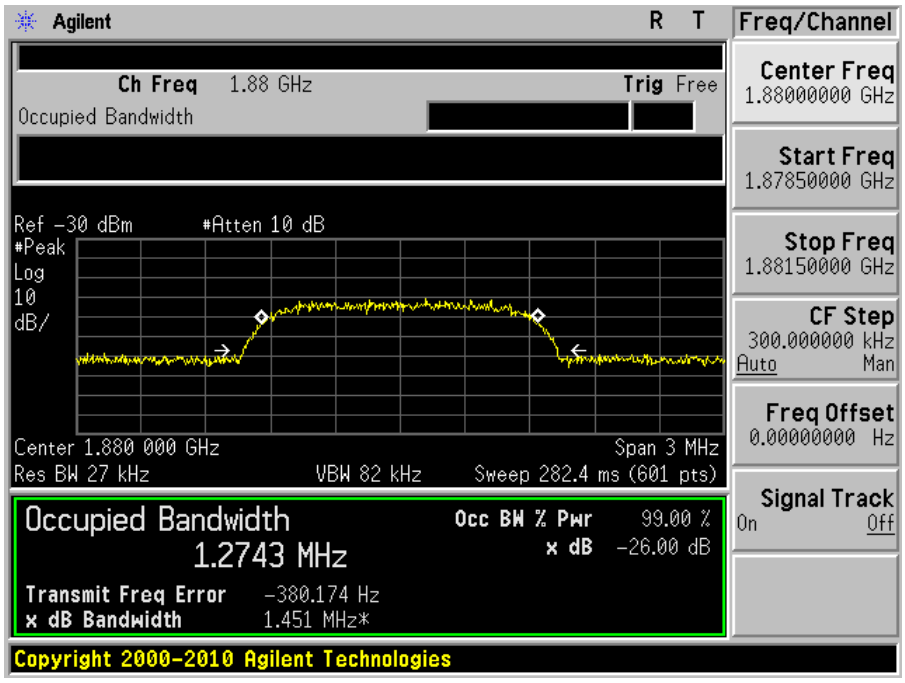
Mode	Modulation	Frequency (MHz)	Emission Bandwidth	
			Input (kHz)	Output (kHz)
Downlink 1930-1995 MHz	QPSK (1.4 MHz)	1960	1147.9	1128.9
	16QAM (1.4 MHz)	1960	1143.4	1129.7
	64QAM (1.4 MHz)	1960	1137.0	1117.8
	QPSK (3 MHz)	1960	2731.9	2723.0
	16QAM (3 MHz)	1960	2731.1	2713.6
	64QAM (3 MHz)	1960	2726.6	2715.2
	QPSK (5 MHz)	1960	4523.0	4497.8
	16QAM (5 MHz)	1960	4539.4	4511.8
	64QAM (5 MHz)	1960	4523.9	4500.5
	QPSK (10 MHz)	1960	9019.3	9000.8
	16QAM (10 MHz)	1960	9073.7	9016.1
	64QAM (10 MHz)	1960	9039.9	9002.2

Mode	Modulation	Frequency (MHz)	Emission Bandwidth	
			Input (kHz)	Output (kHz)
Uplink 1850-1915 MHz	QPSK (1.4 MHz)	1880	1123.8	1110.1
	16QAM (1.4 MHz)	1880	1133.3	1110.6
	64QAM (1.4 MHz)	1880	1127.4	1110.8
	QPSK (3 MHz)	1880	2717.7	2681.6
	16QAM (3 MHz)	1880	2715.6	2682.0
	64QAM (3 MHz)	1880	2711.8	2680.0
	QPSK (5 MHz)	1880	4535.9	4459.4
	16QAM (5 MHz)	1880	4520.9	4470.2
	64QAM (5 MHz)	1880	4535.9	4469.5
	QPSK (10 MHz)	1880	9016.7	8928.0
	16QAM (10 MHz)	1880	9041.8	8908.4
	64QAM (10 MHz)	1880	9028.0	8894.0

Please refer to the following plots.

CDMA/EVDO, Uplink

Input



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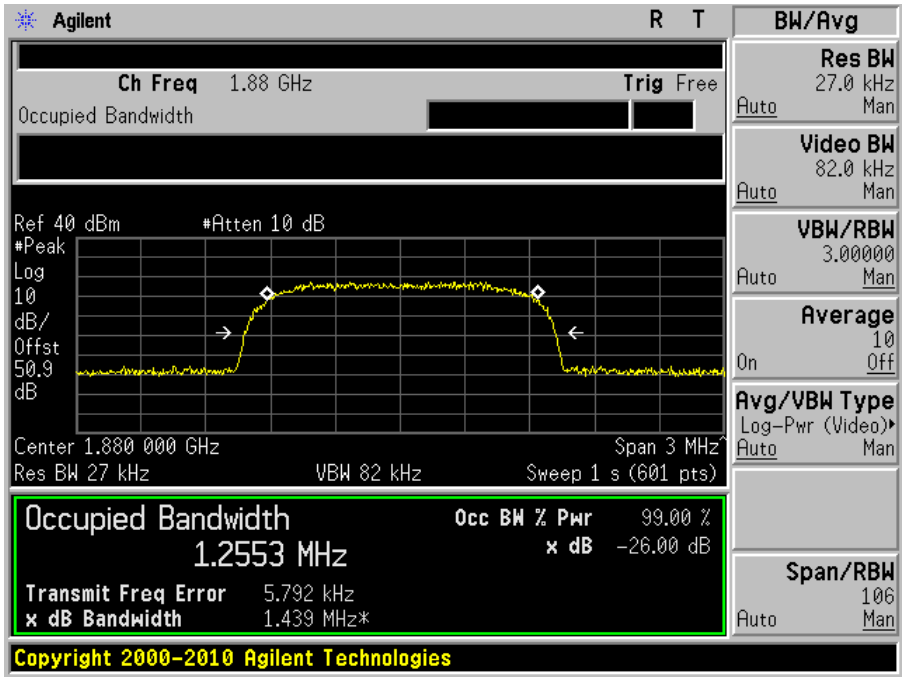
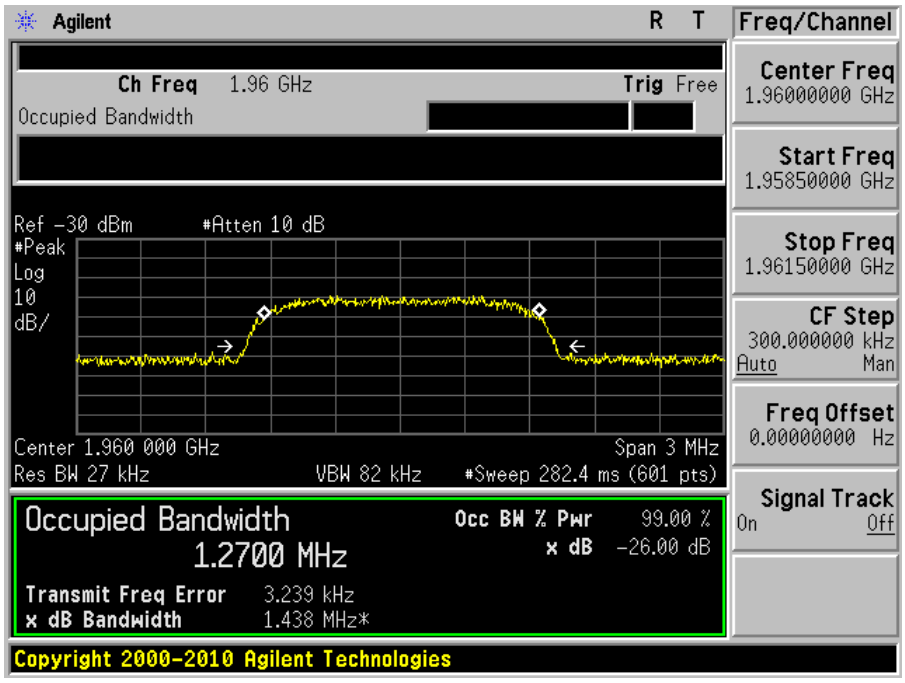


CDMA/EVDO, Downlink

Input



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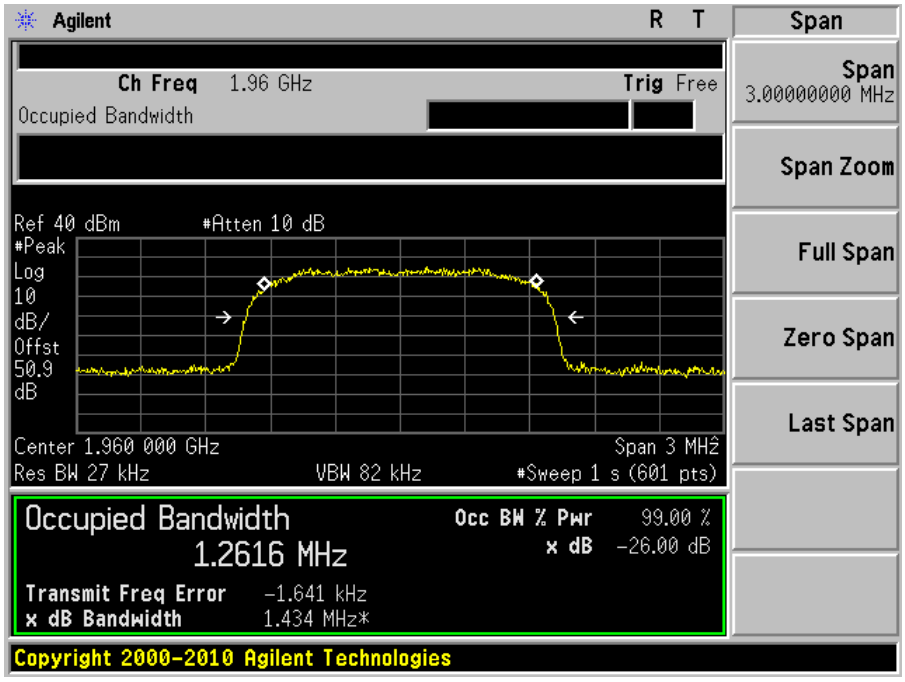
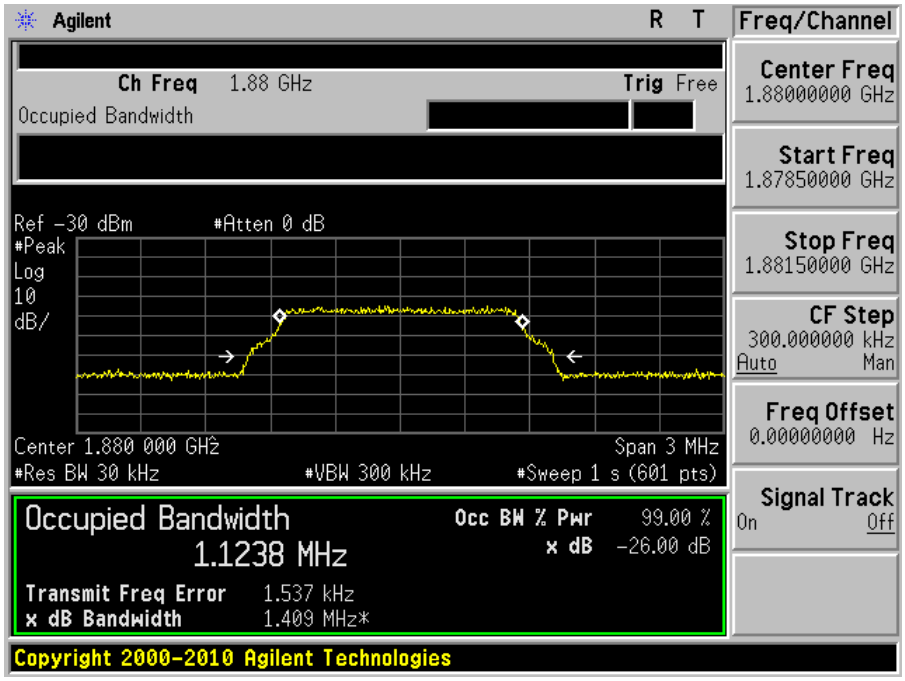


LTE, Uplink

LTE-QPSK (1.4 MHz)

Input



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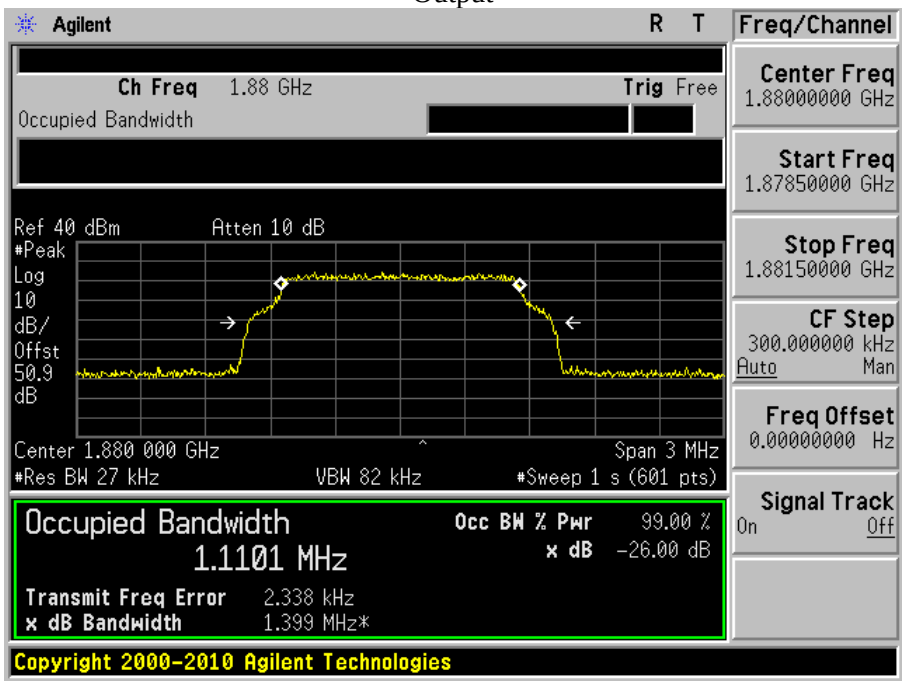
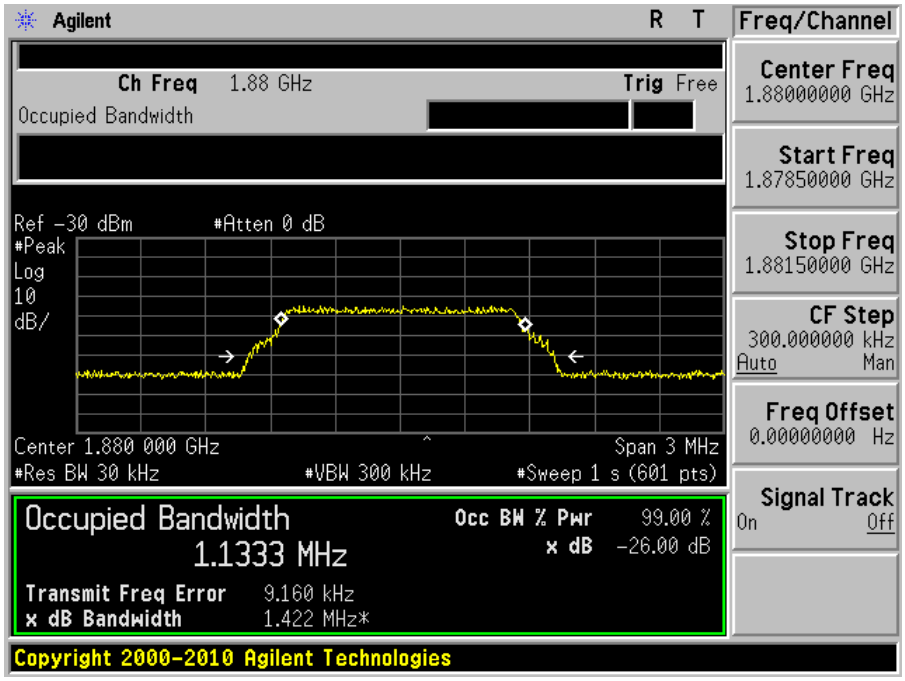


LTE-16QAM (1.4 MHz)

Input



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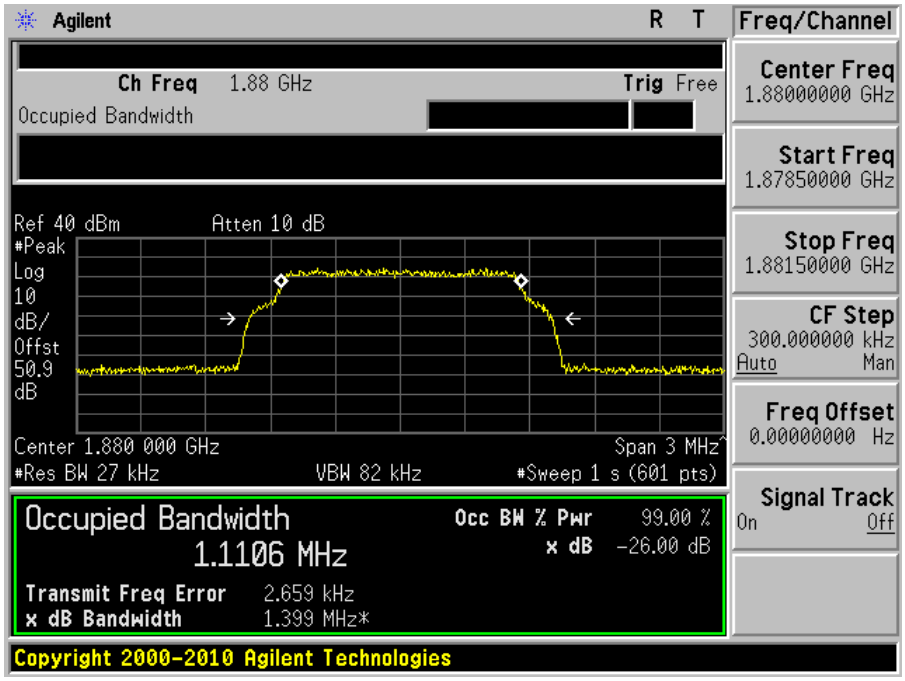
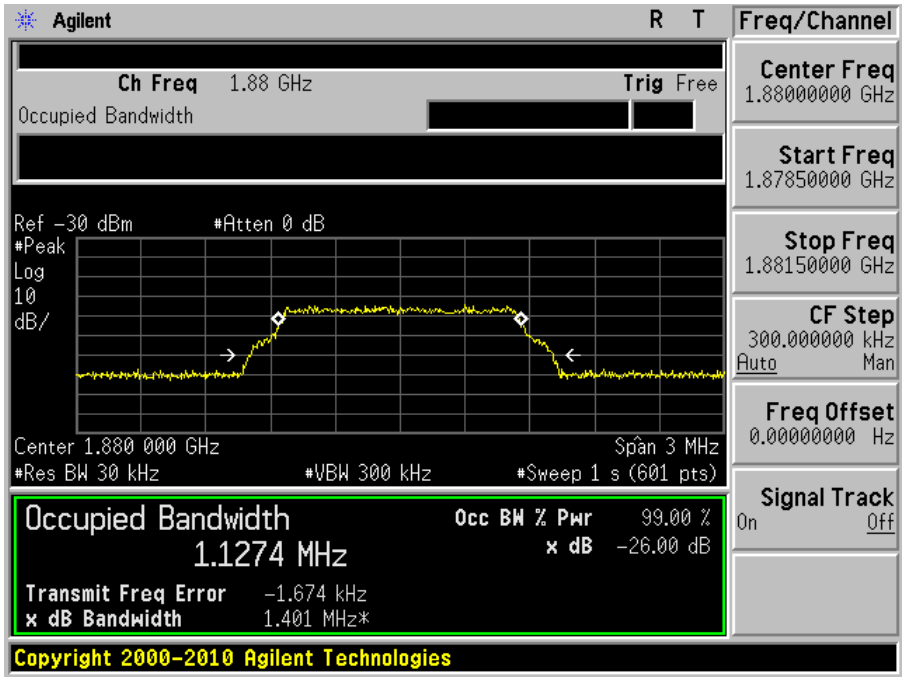
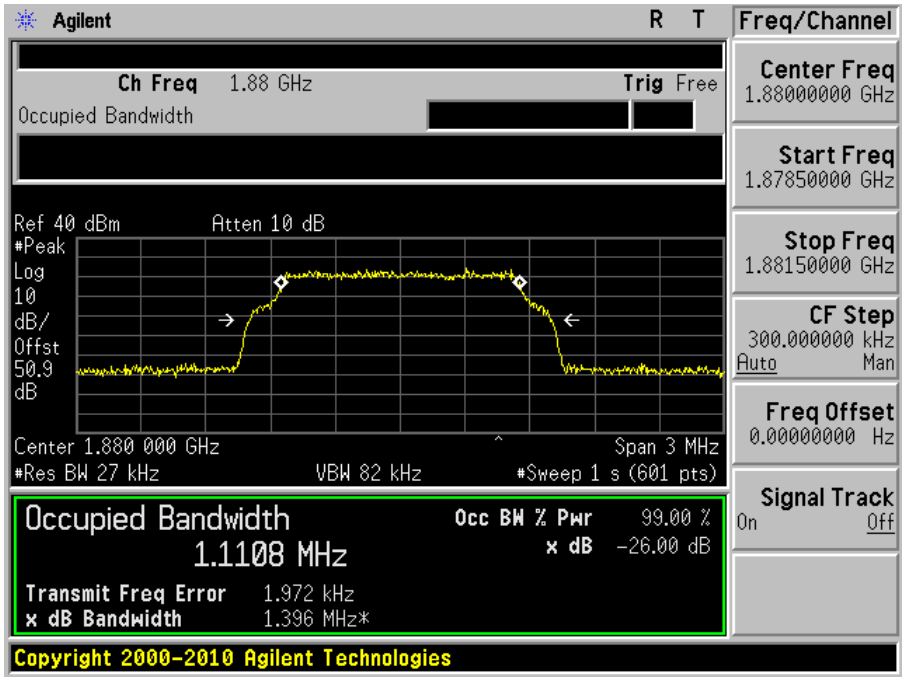


LTE-64QAM (1.4 MHz)

Input

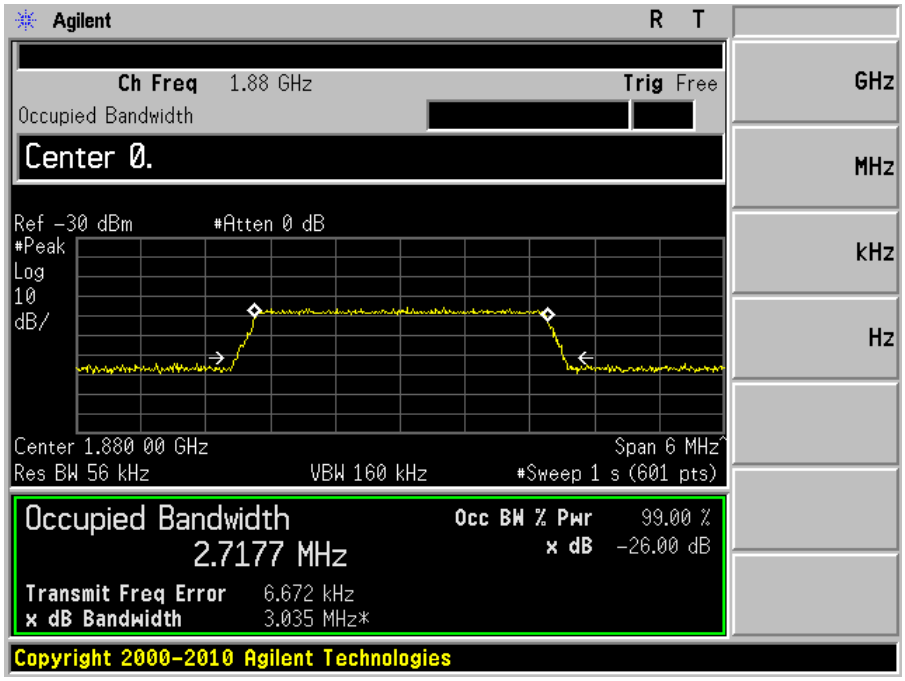


Output



LTE-QPSK (3 MHz)

Input



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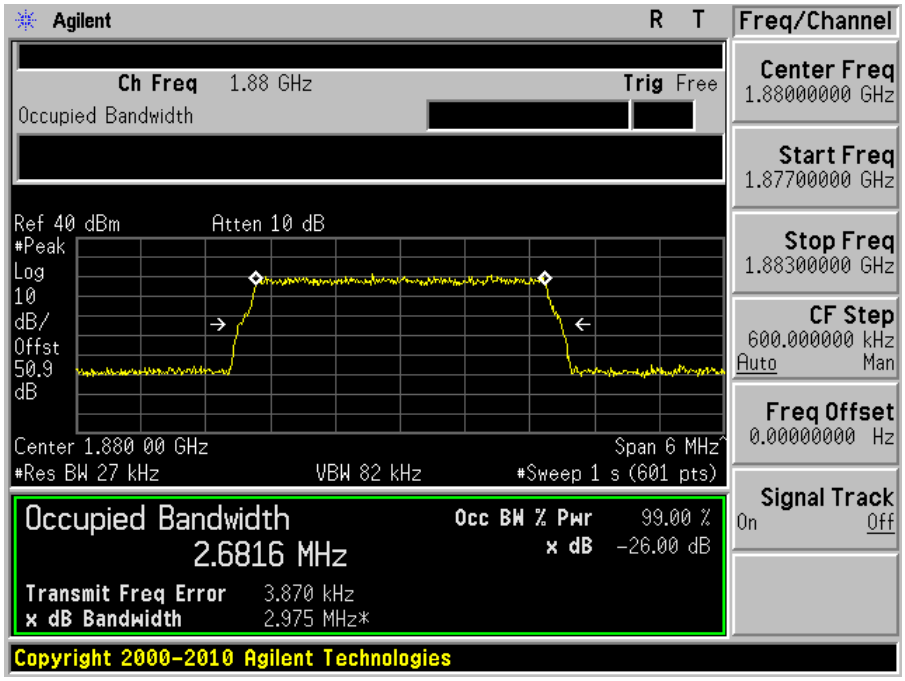
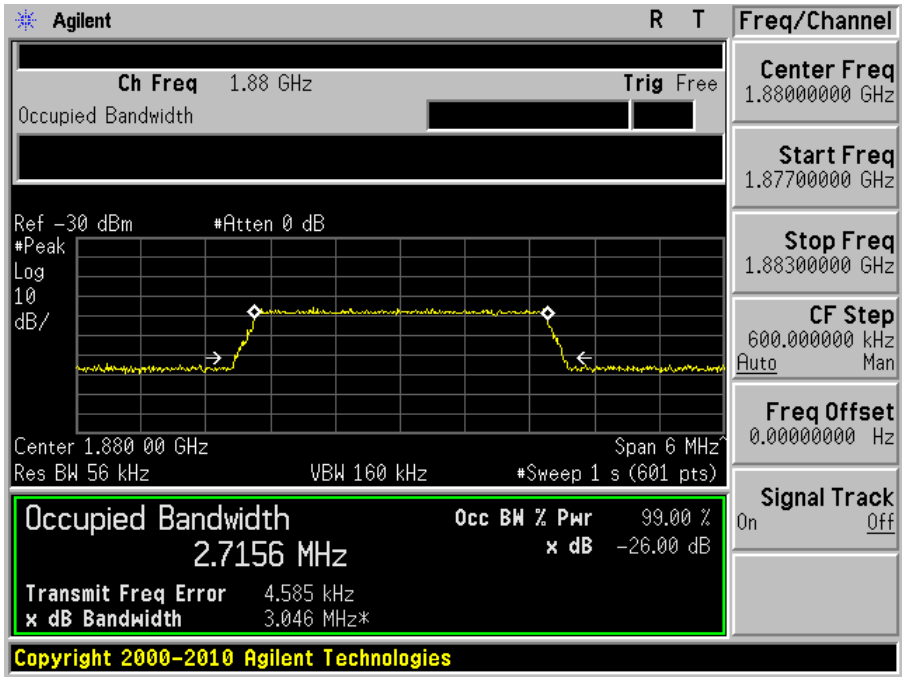


LTE-16QAM (3 MHz)

Input



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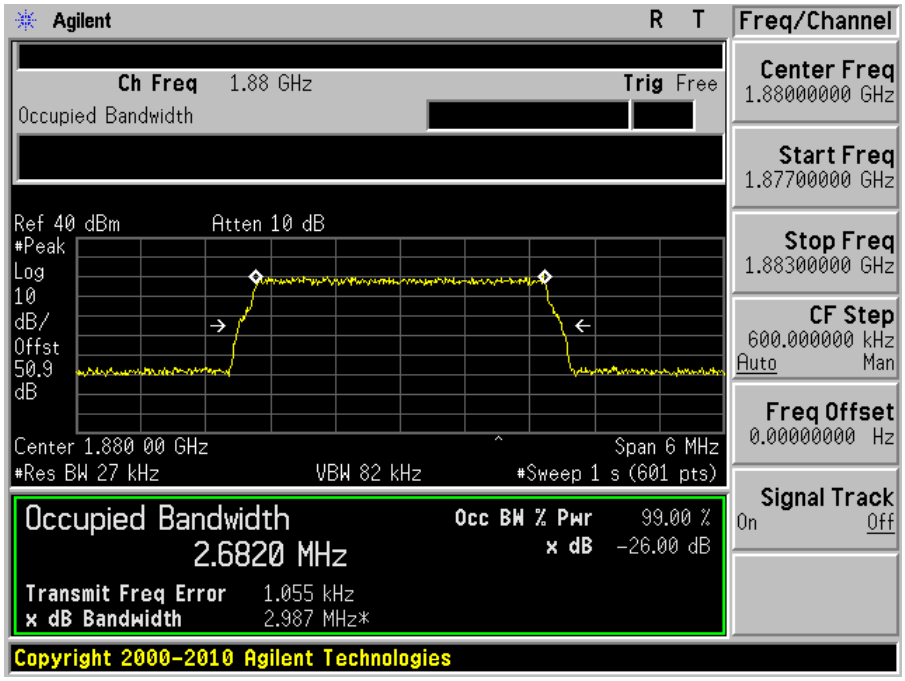
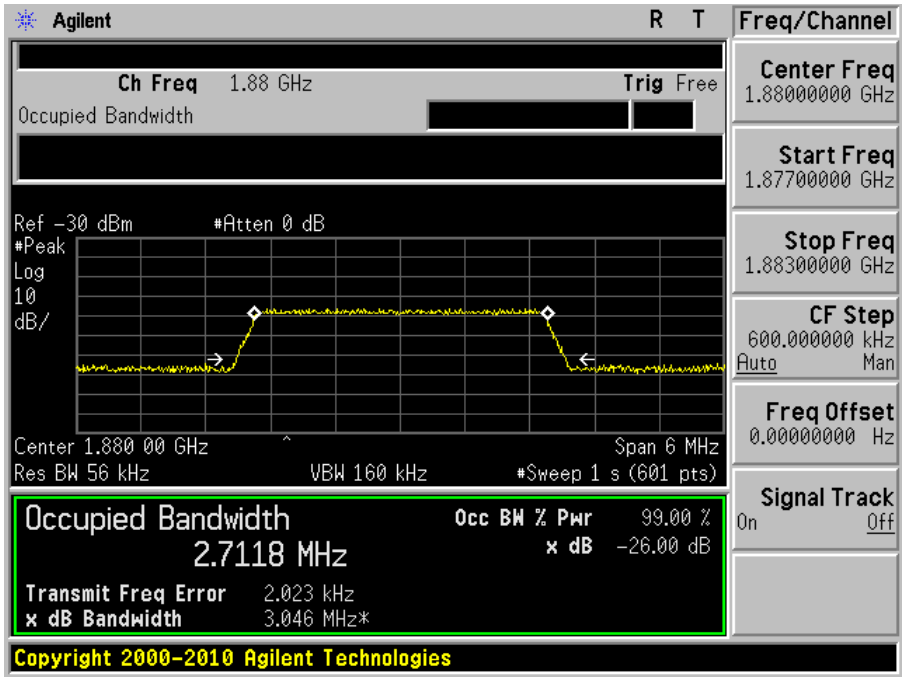


LTE-64QAM (3 MHz)

Input



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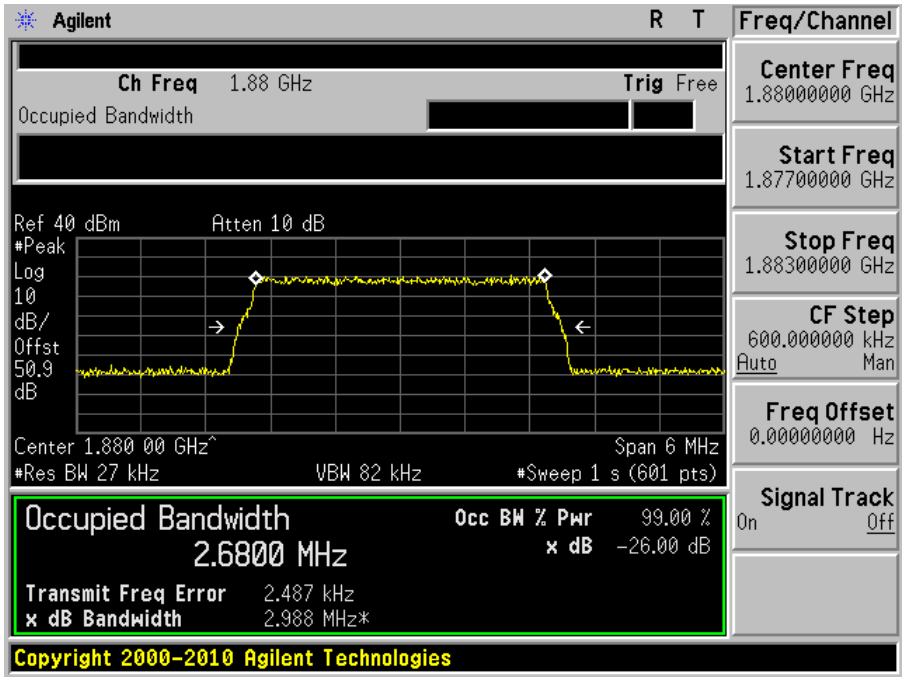
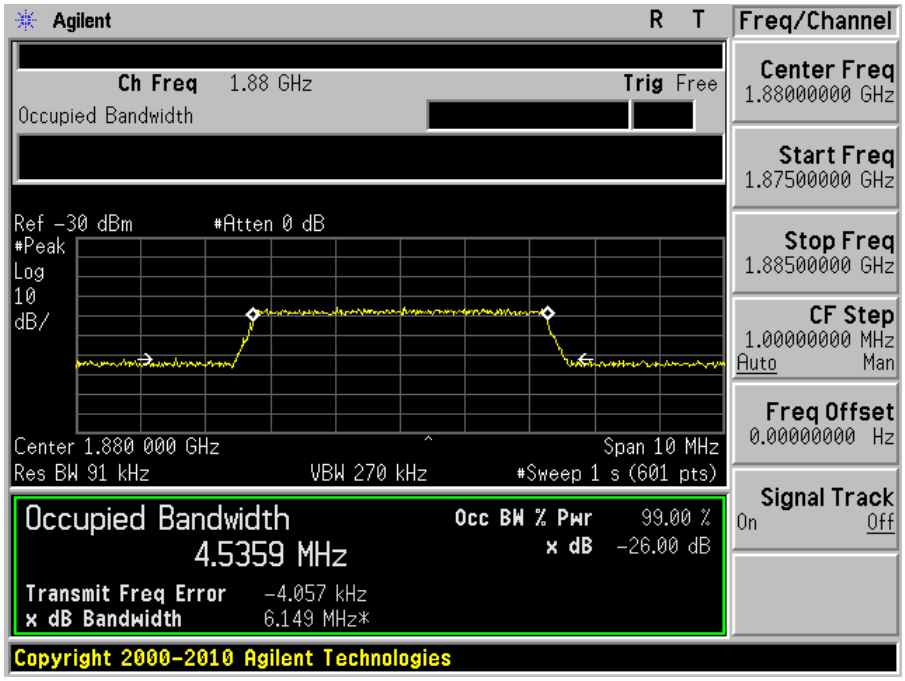


LTE-QPSK (5 MHz)

Input



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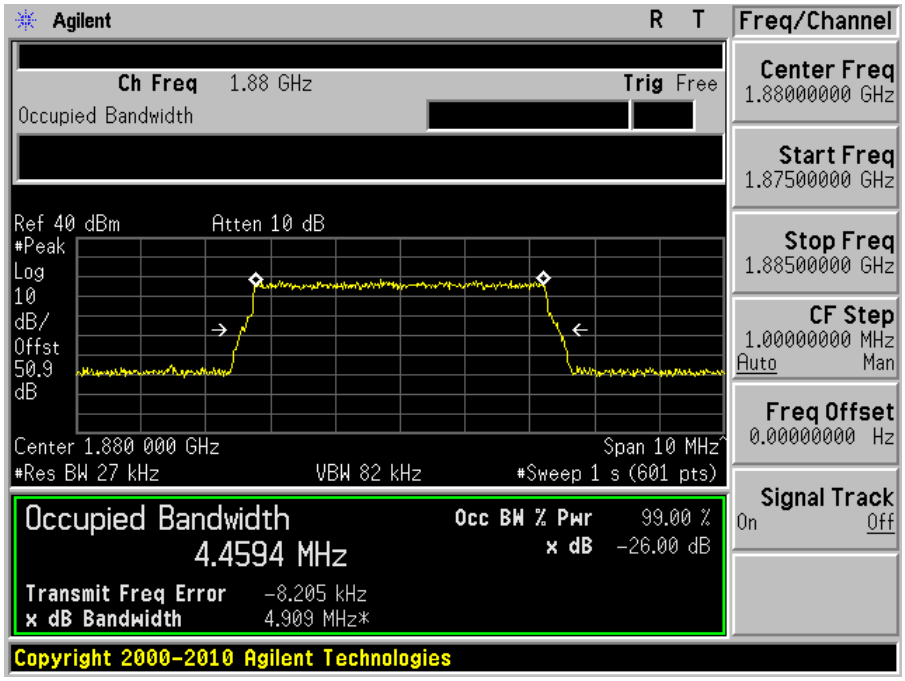
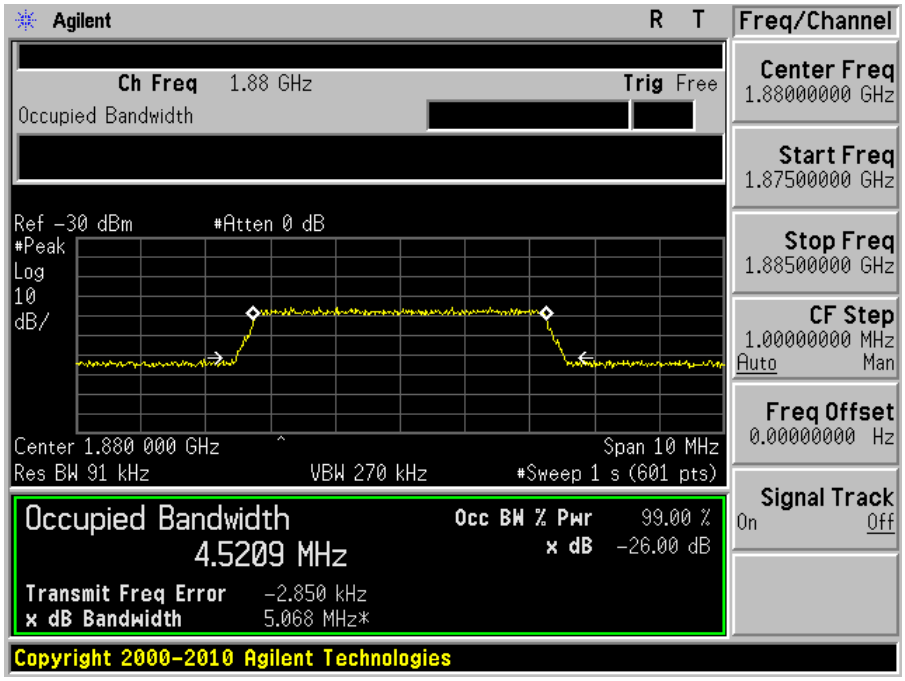


LTE-16QAM (5 MHz)

Input



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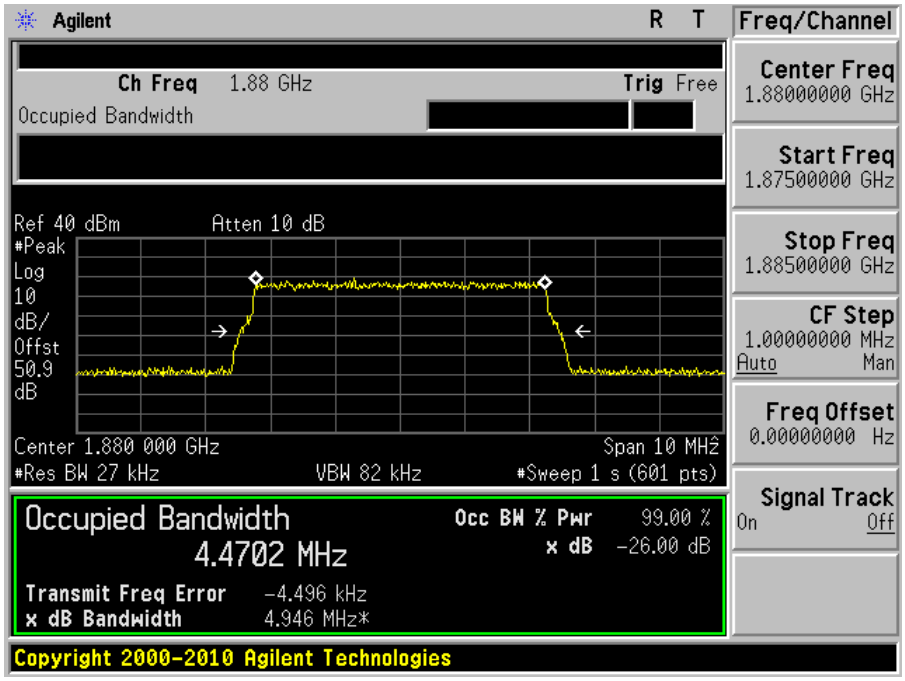
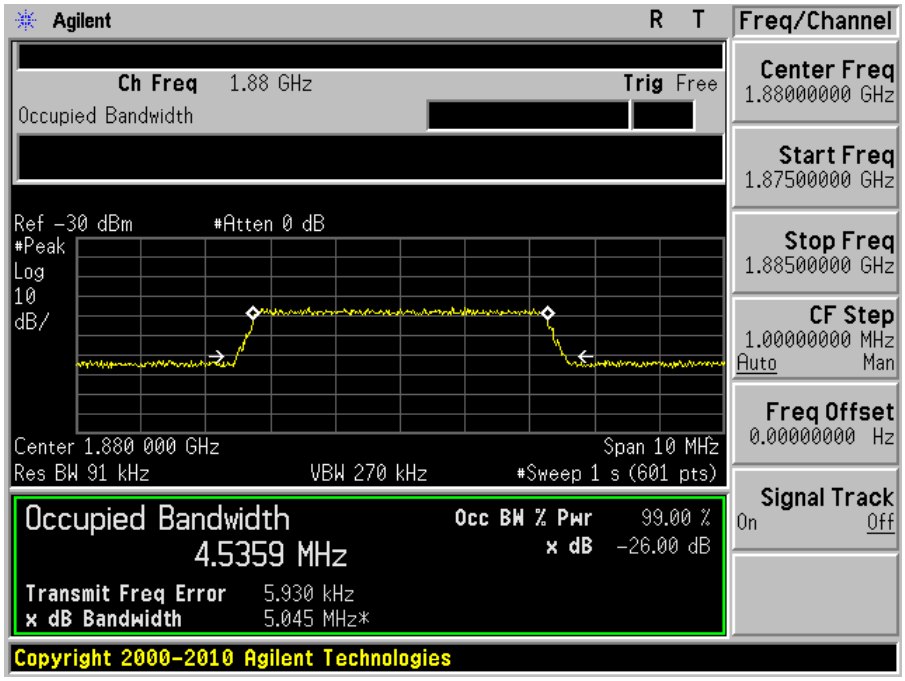


LTE-64QAM (5 MHz)

Input



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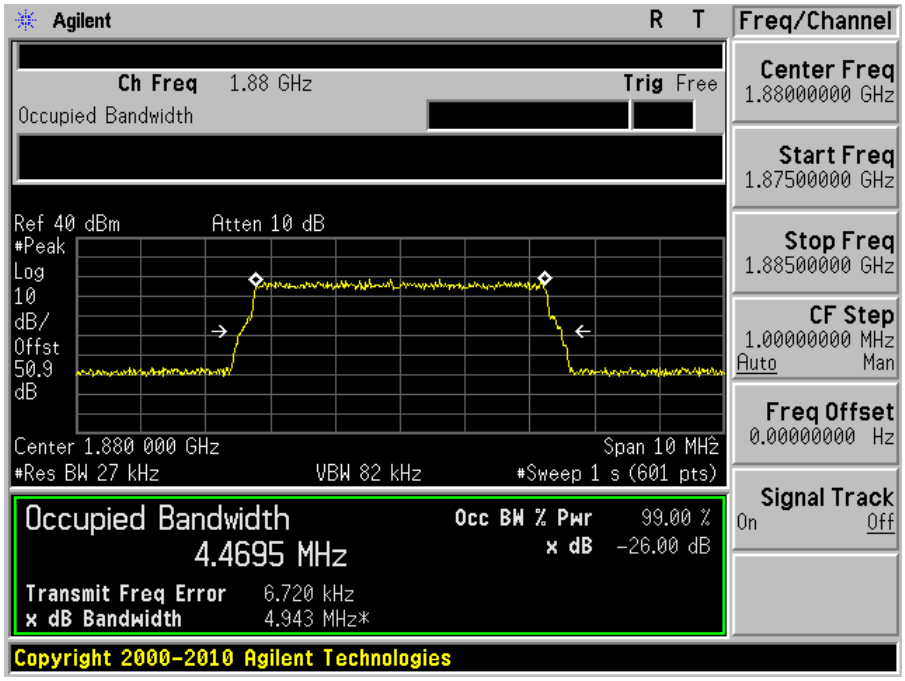

LTE-QPSK (10 MHz)

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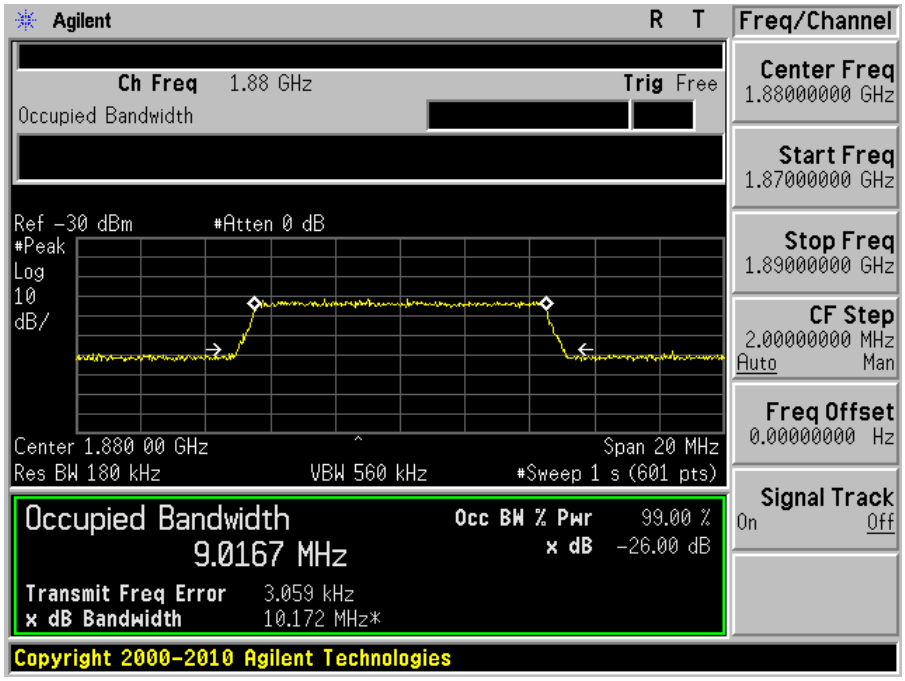

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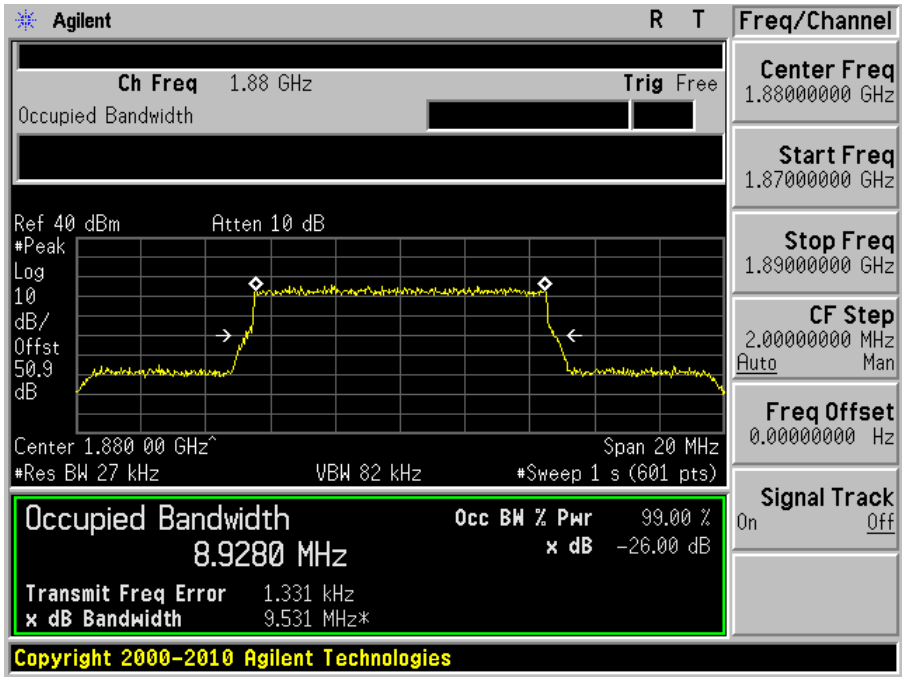
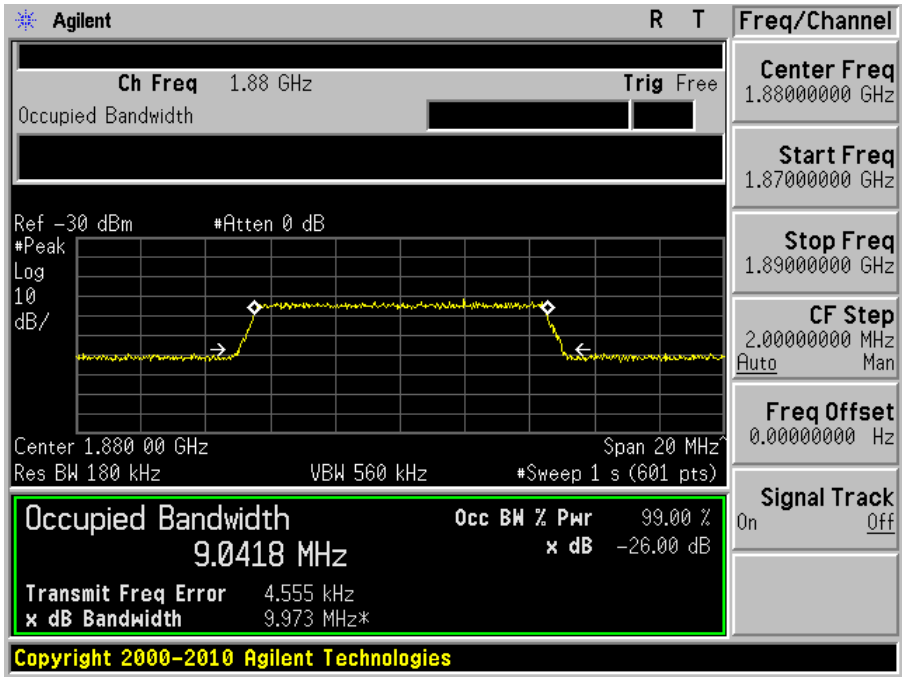
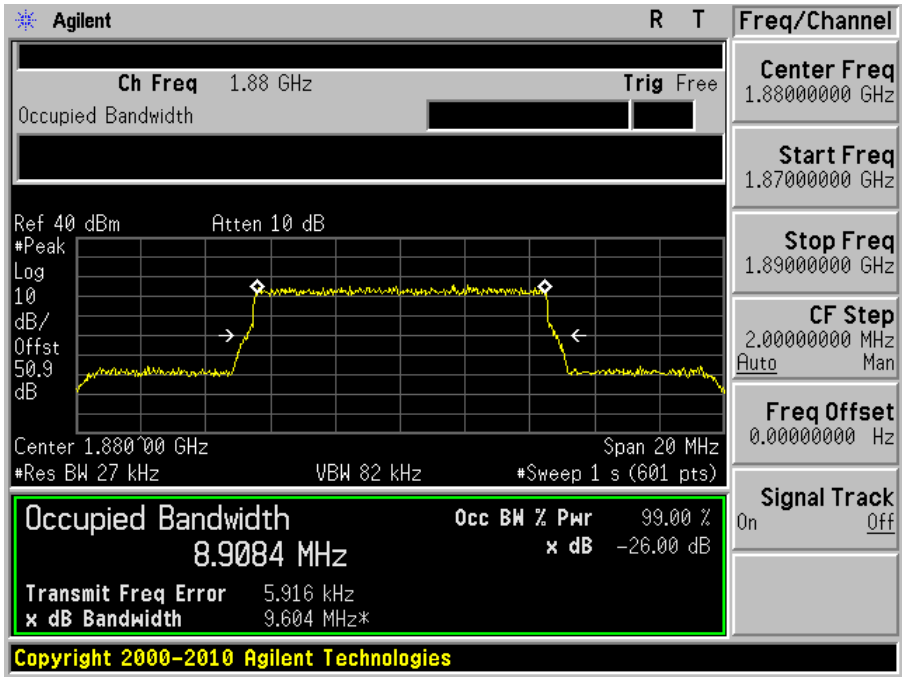


LTE-16QAM (10 MHz)

Input

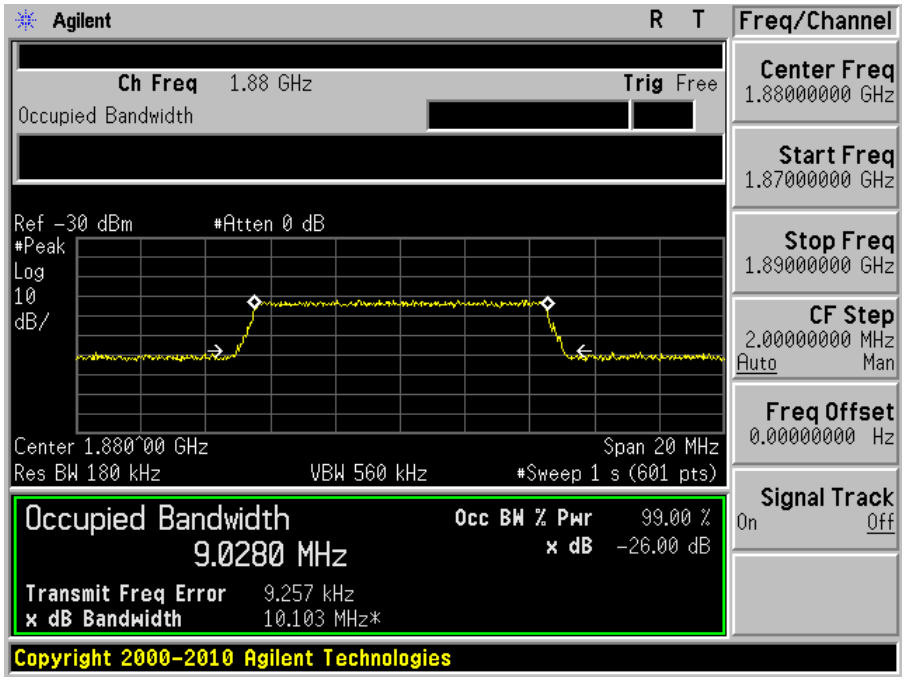


Output

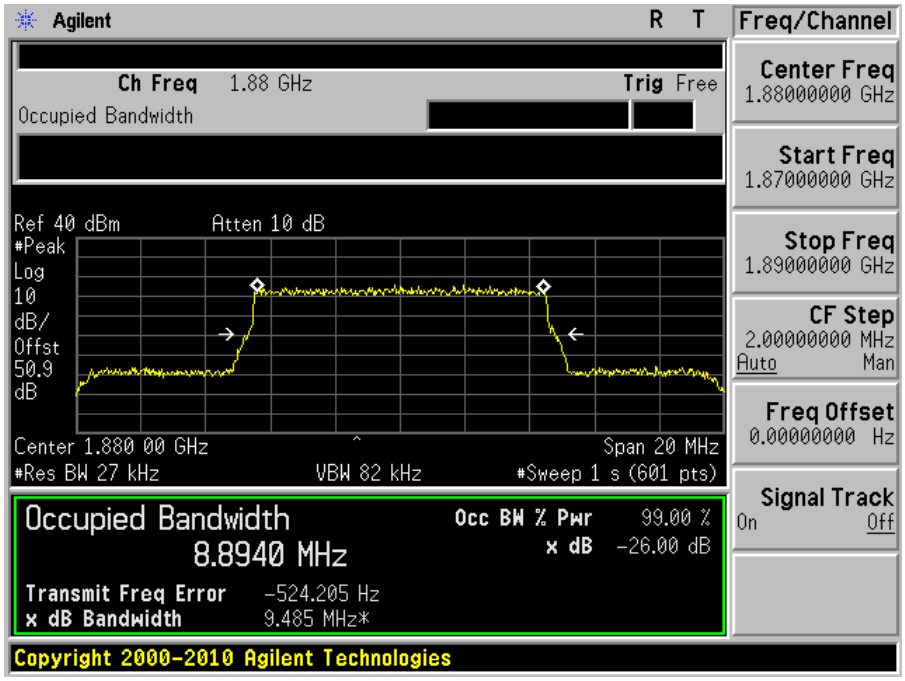


LTE-64QAM (10 MHz)

Input



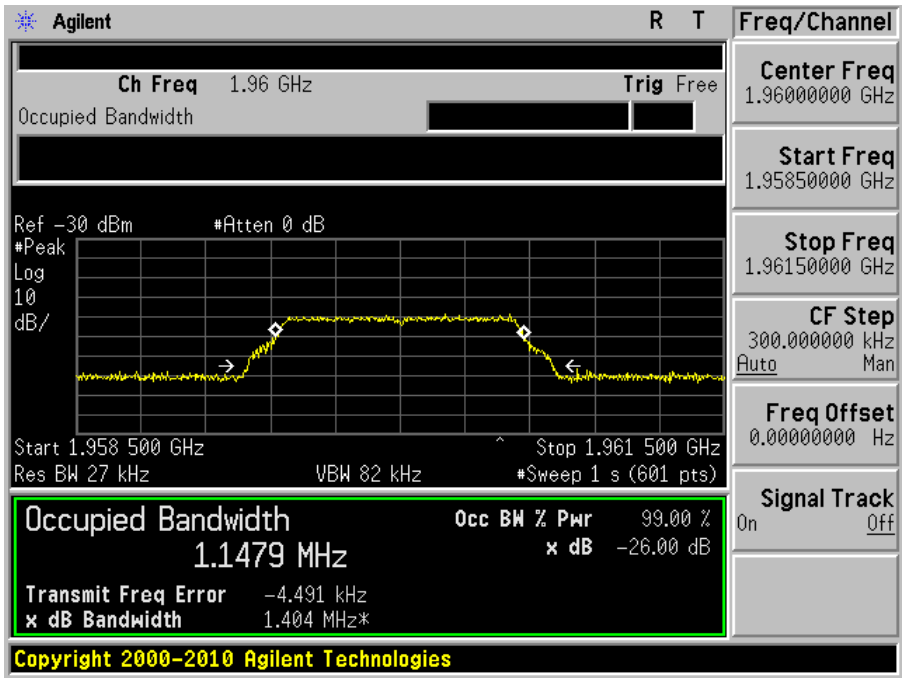
Output



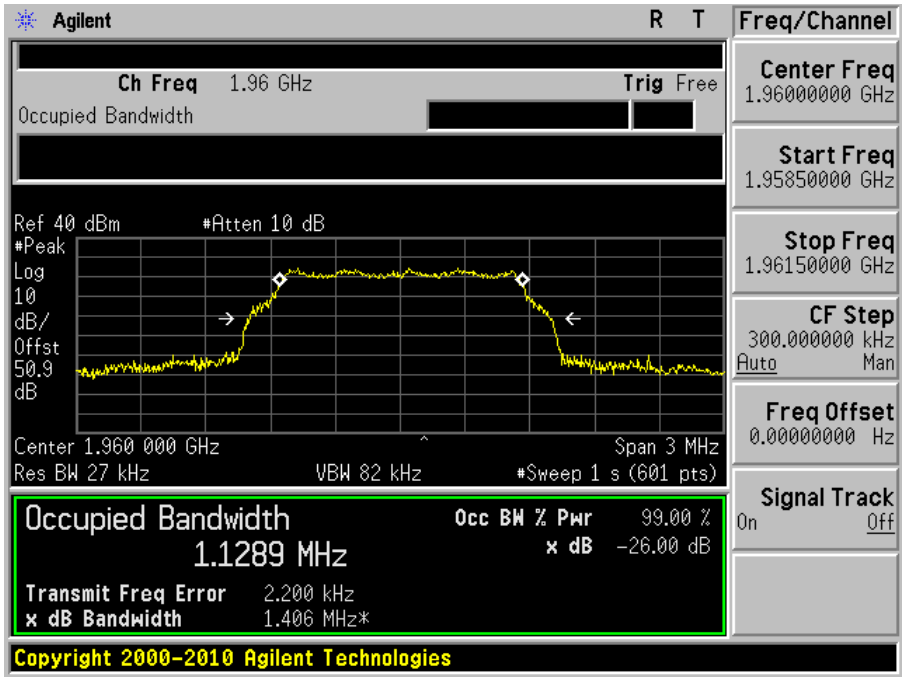
LTE, Downlink

LTE-QPSK (1.4 MHz)

Input

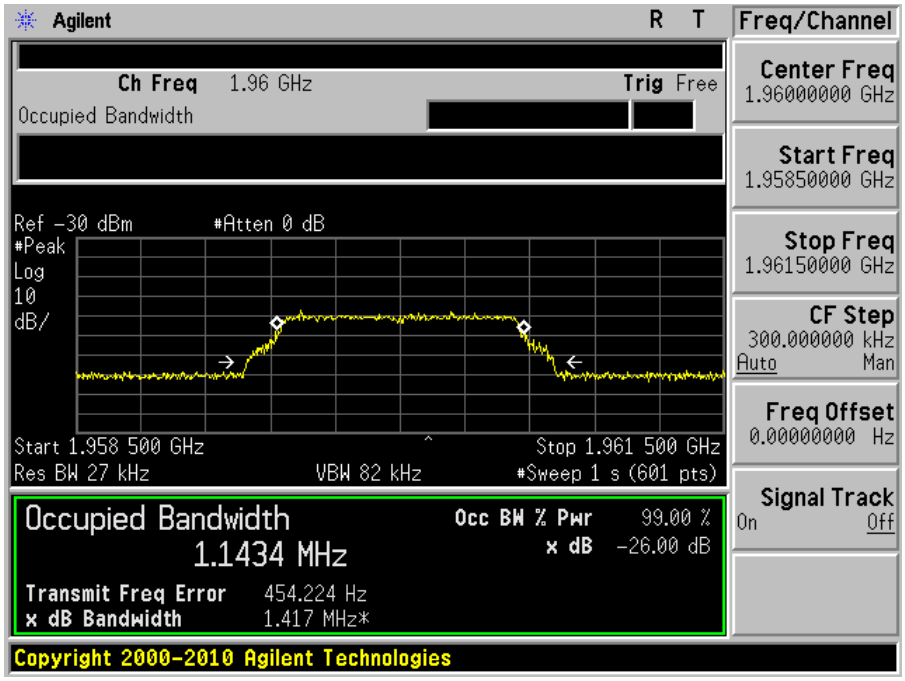


Output

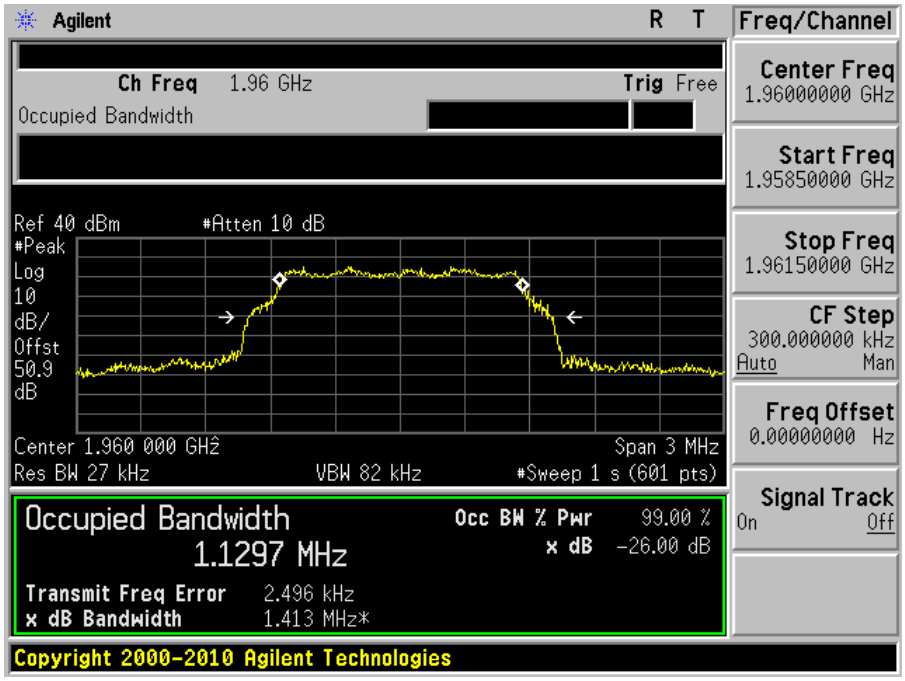


LTE-16QAM (1.4 MHz)

Input

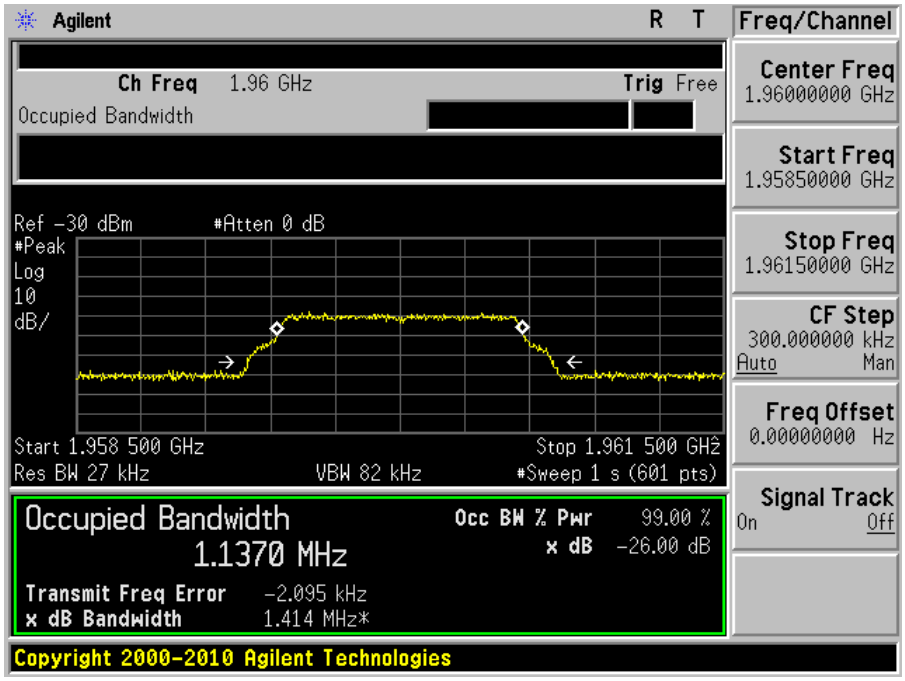


Output

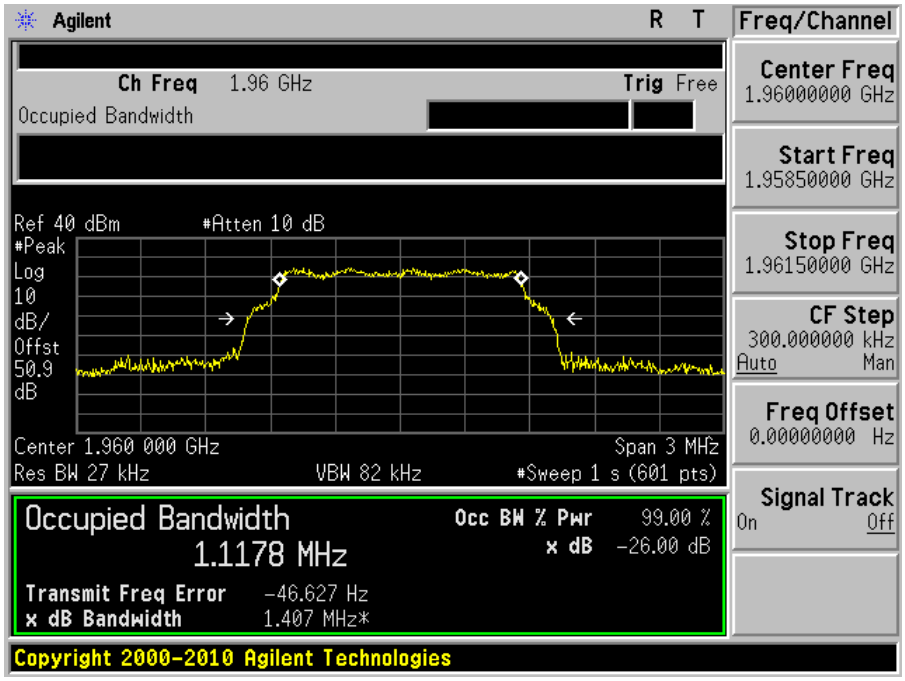


LTE-64QAM (1.4 MHz)

Input

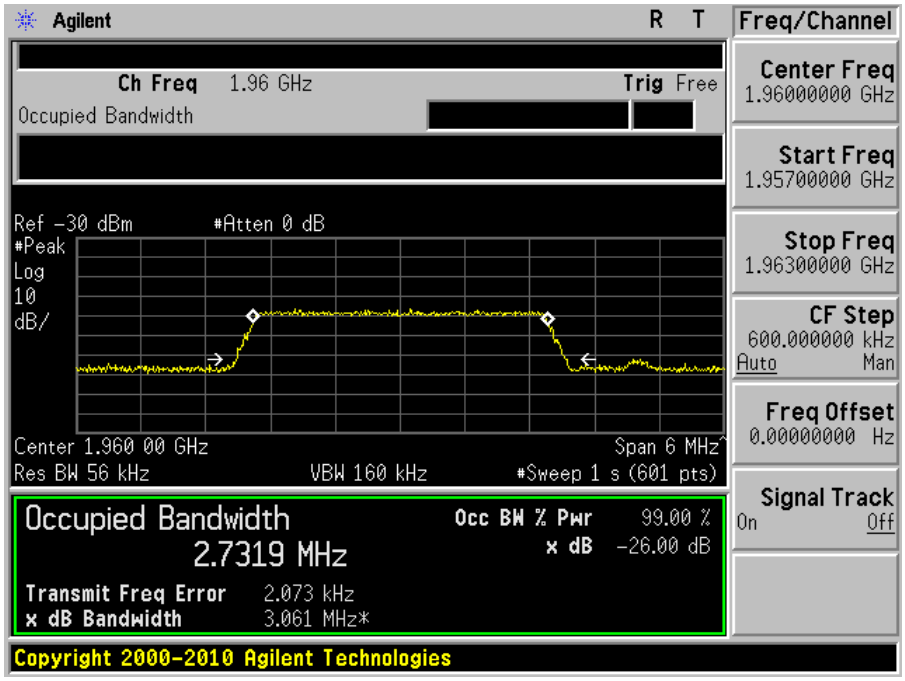


Output

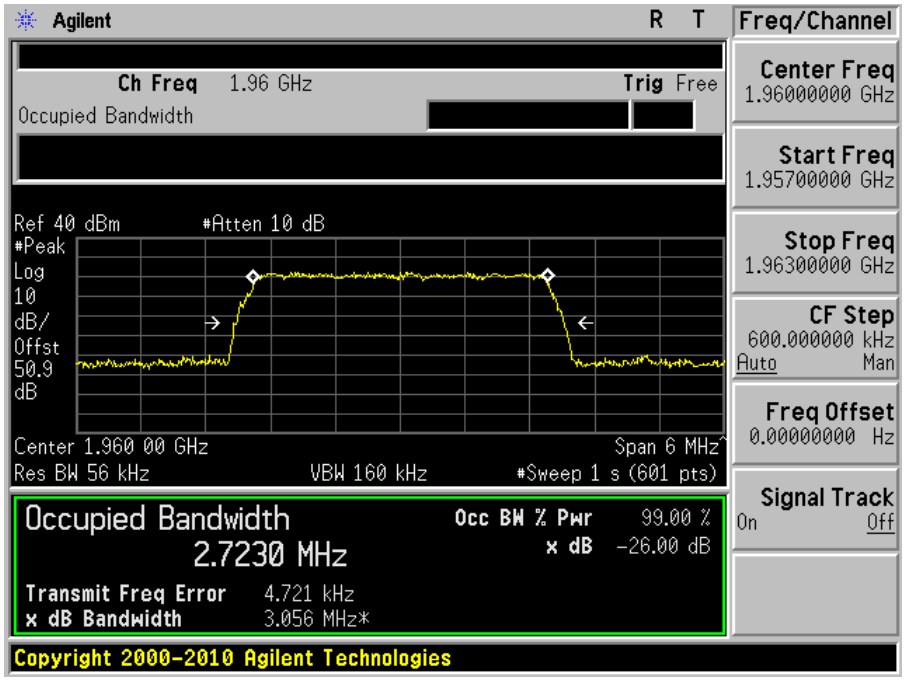


LTE-QPSK (3 MHz)

Input

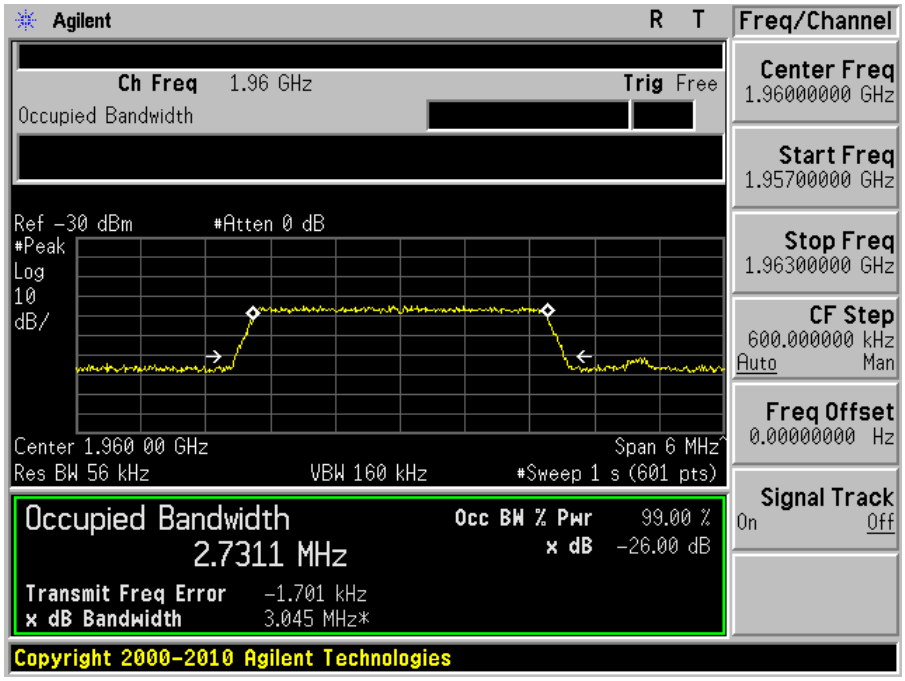


Output

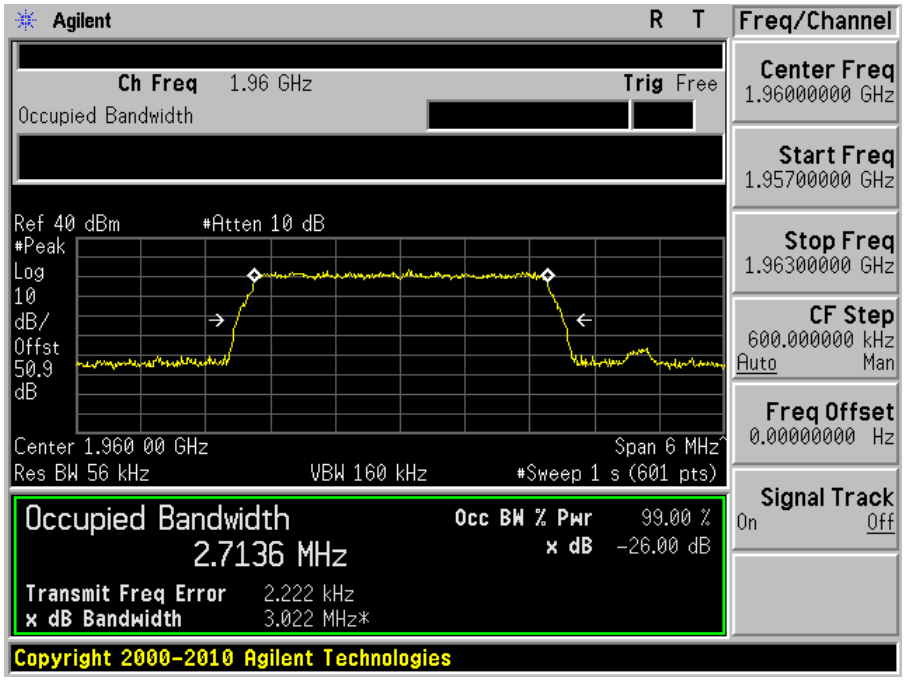


LTE-16QAM (3 MHz)

Input

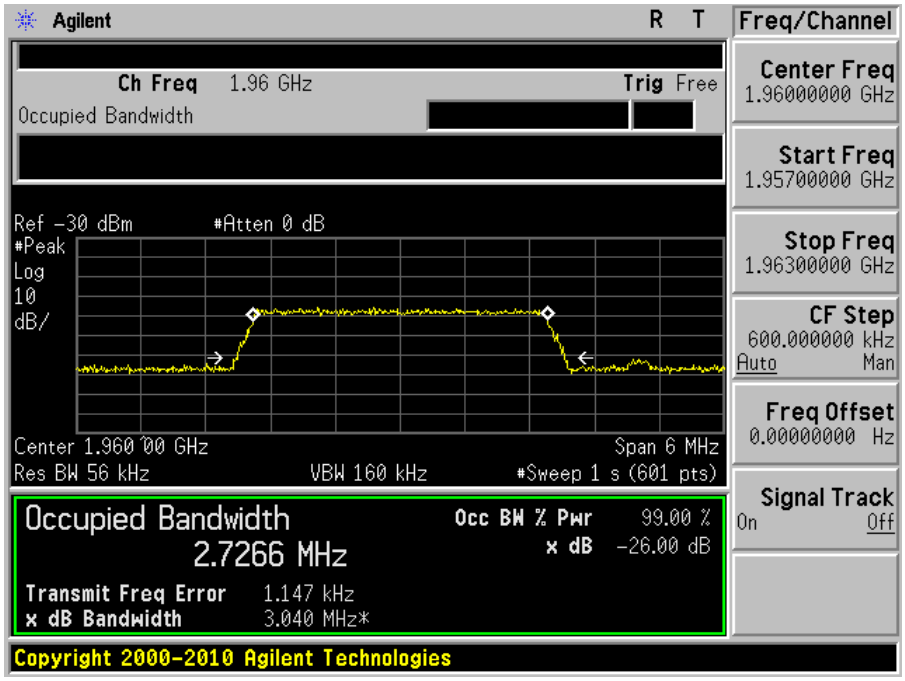


Output

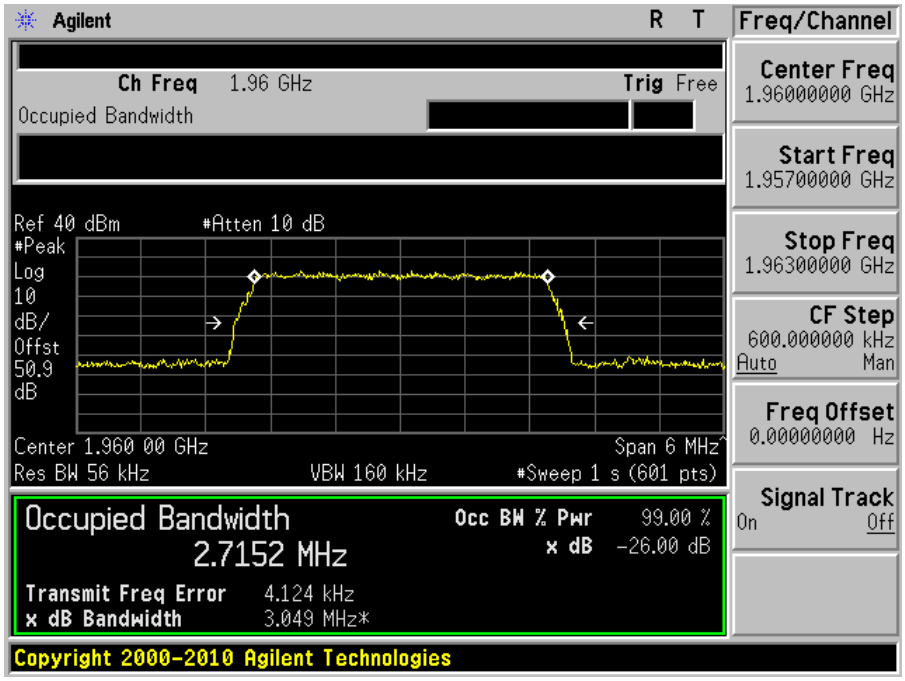


LTE-64QAM (3 MHz)

Input

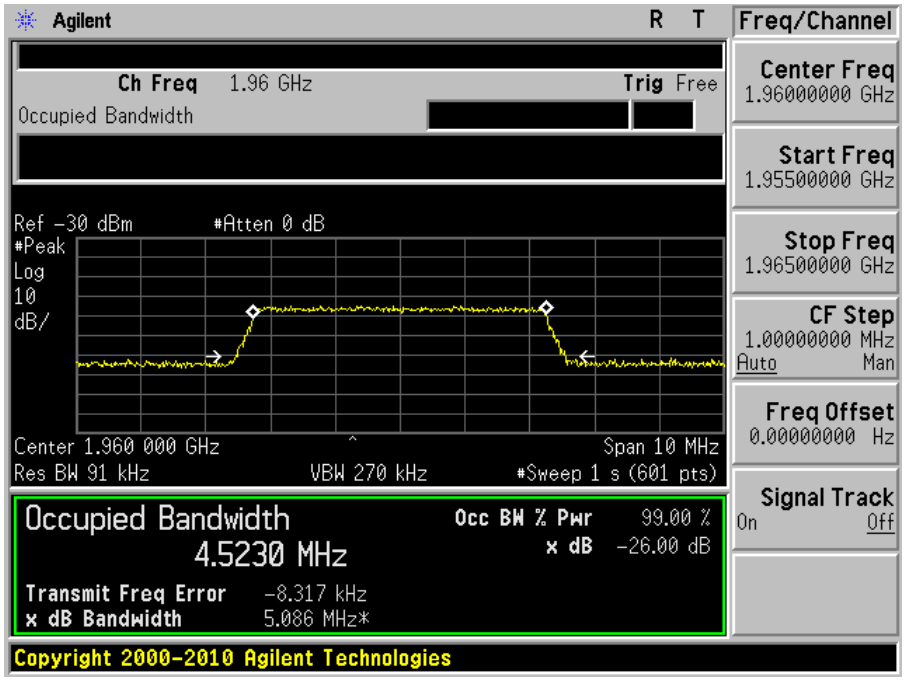


Output

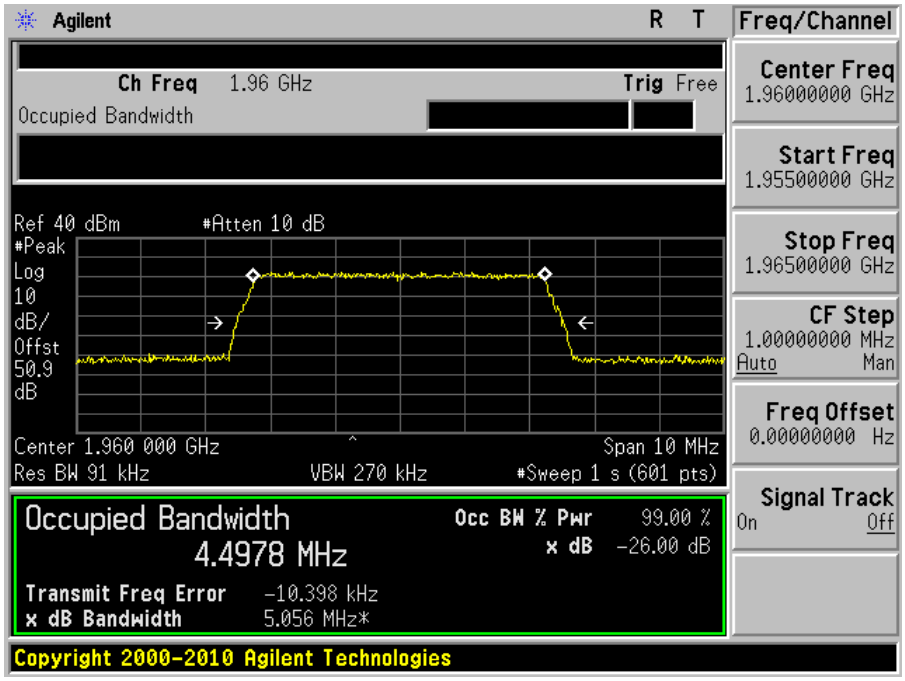


LTE-QPSK (5 MHz)

Input

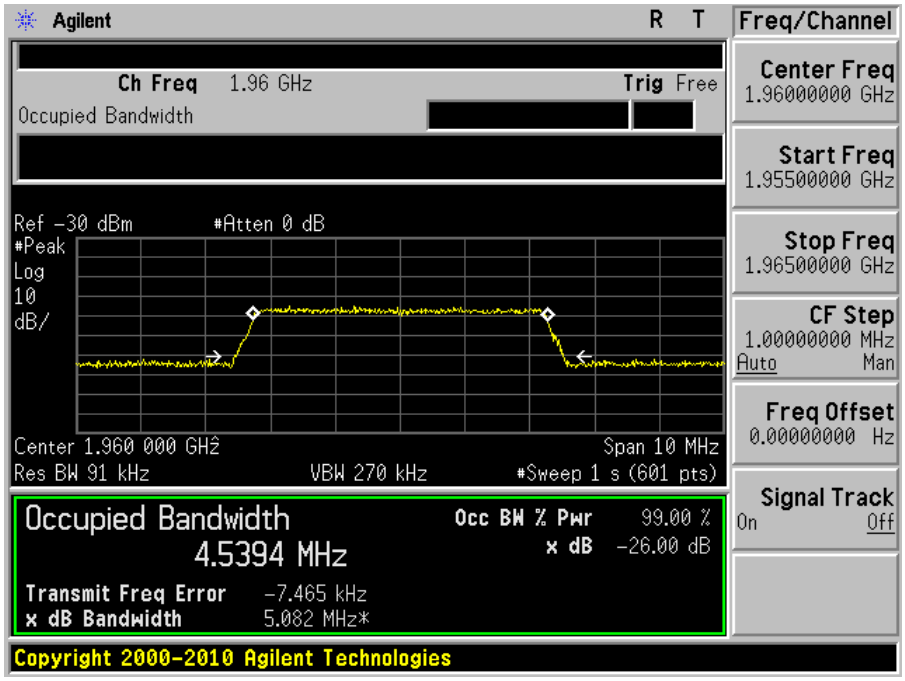


Output

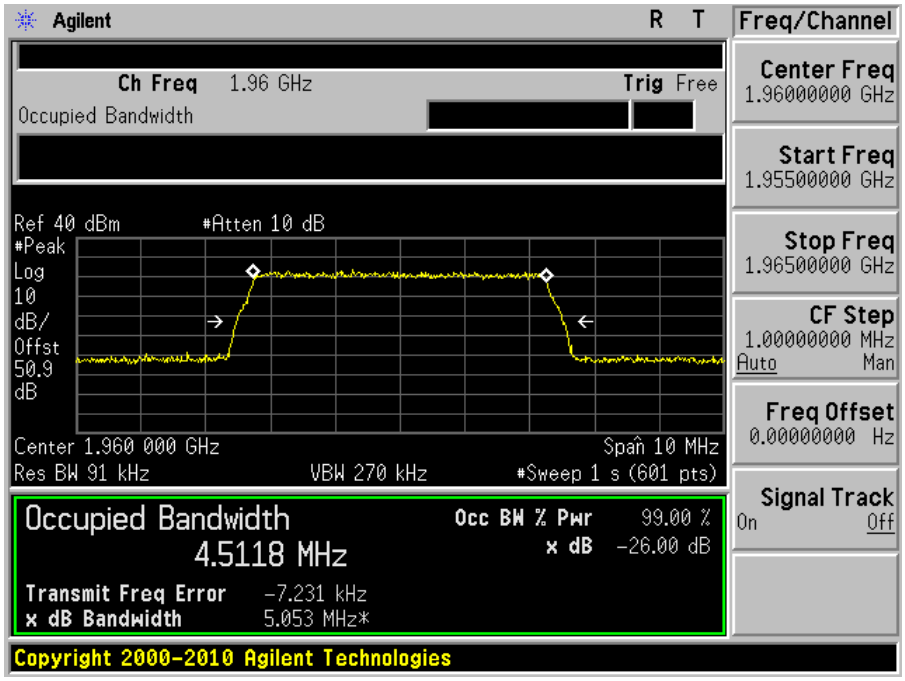


LTE-16QAM (5 MHz)

Input

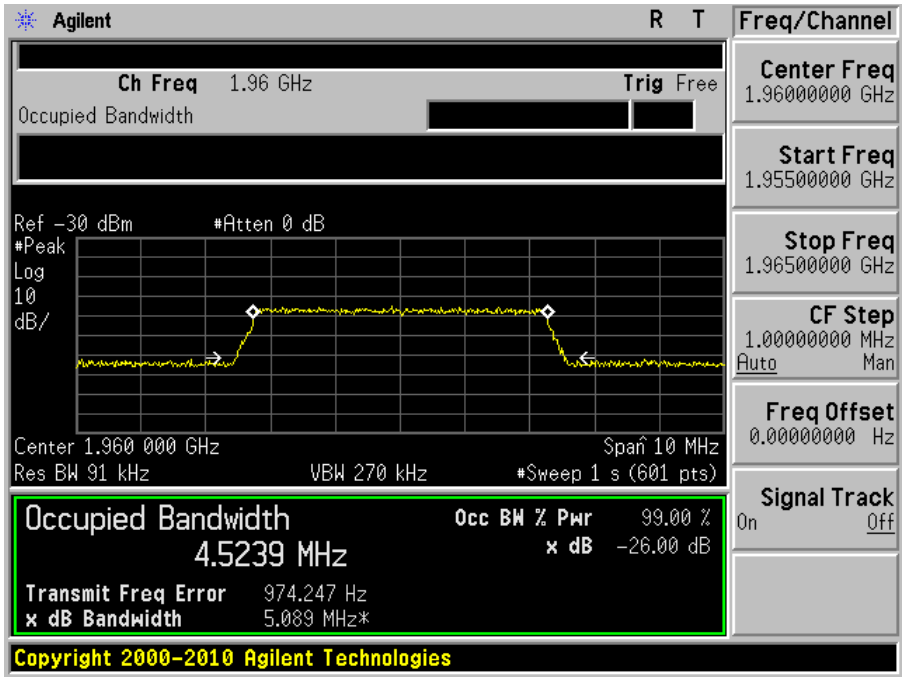


Output

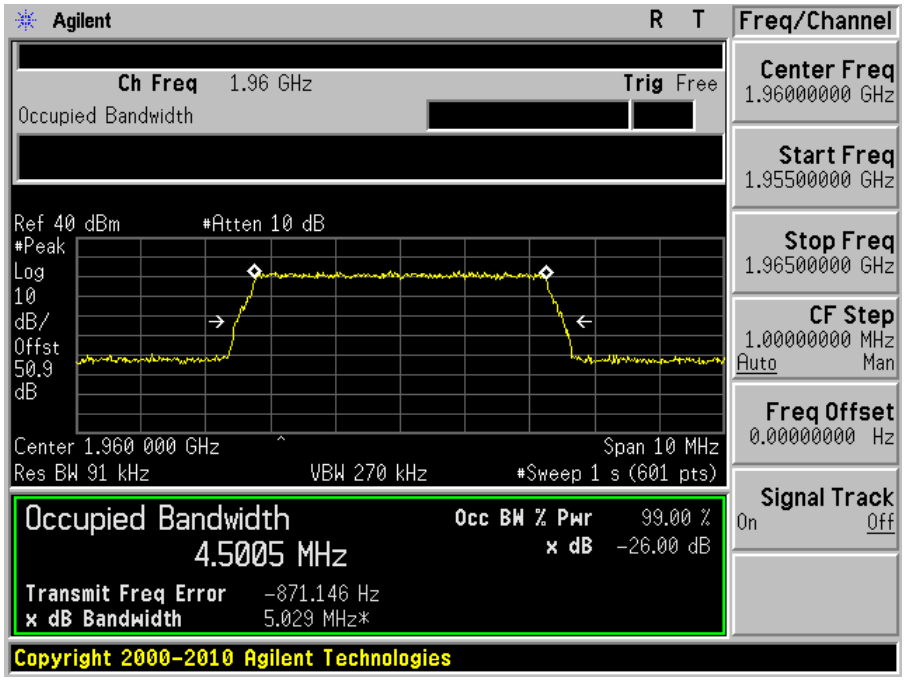


LTE-64QAM (5 MHz)

Input

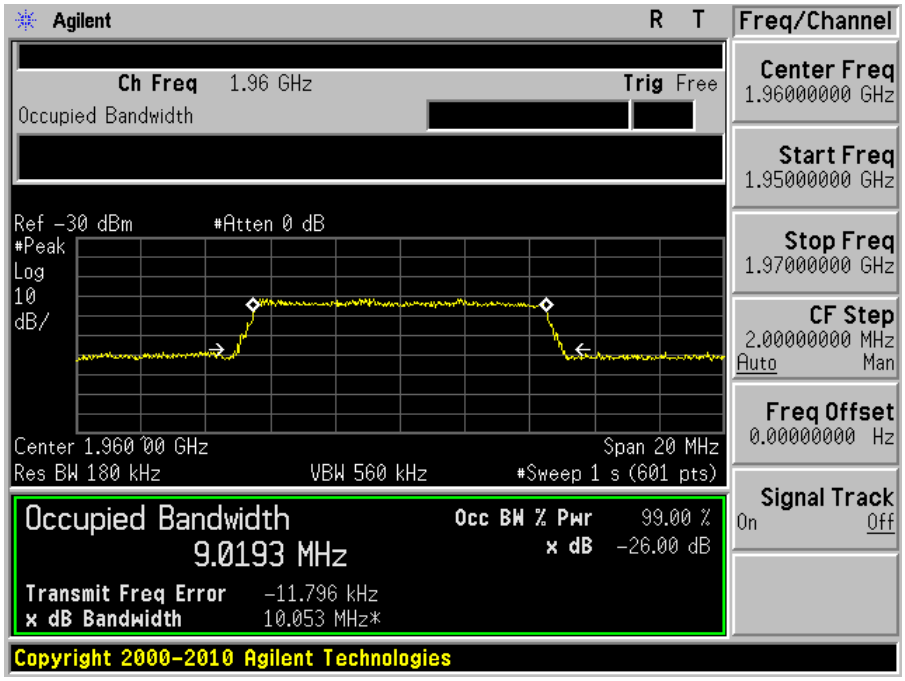


Output

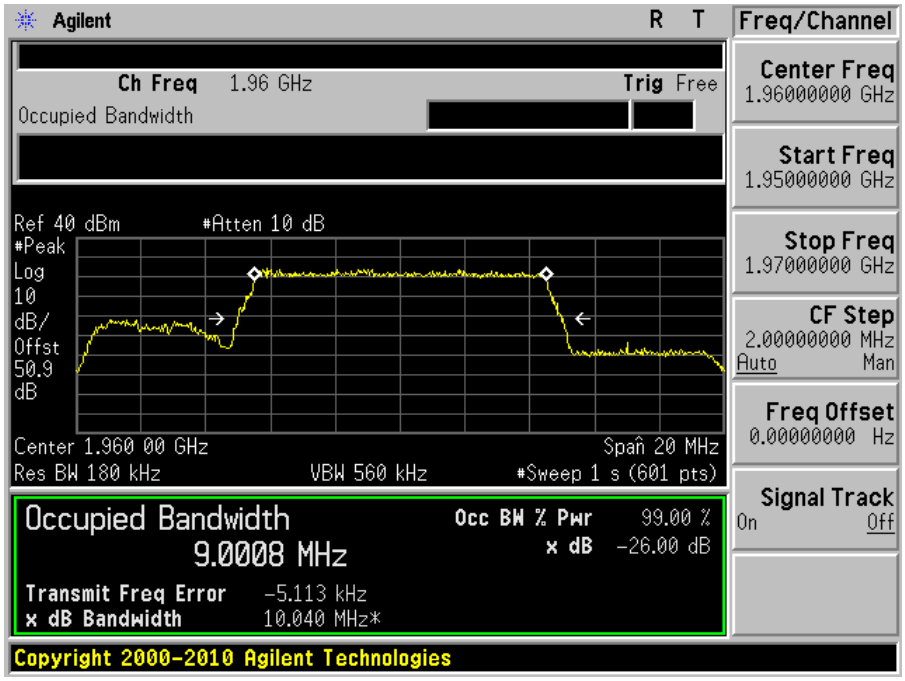


LTE-QPSK (10 MHz)

Input

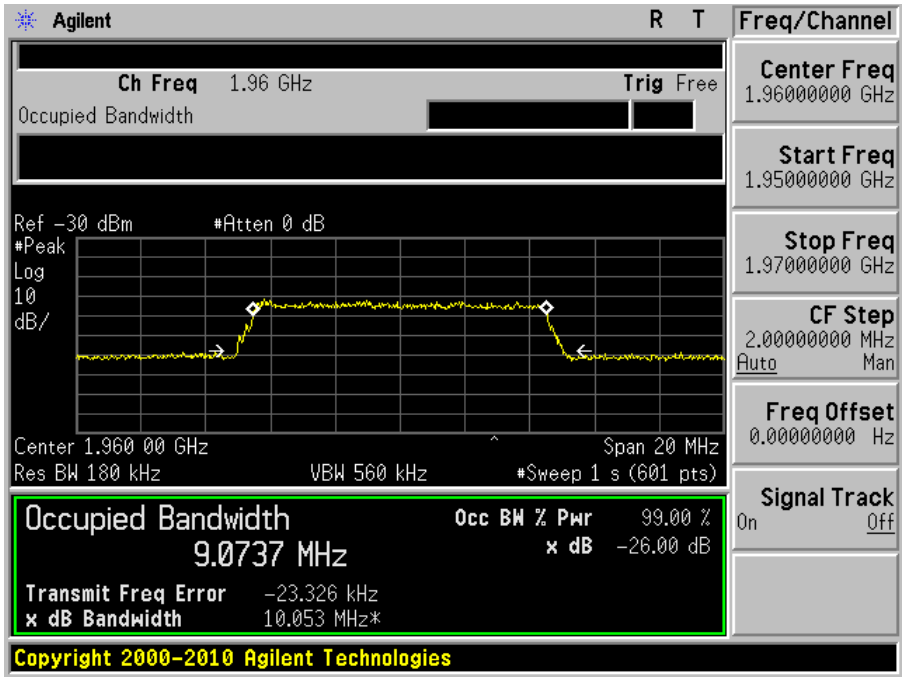


Output

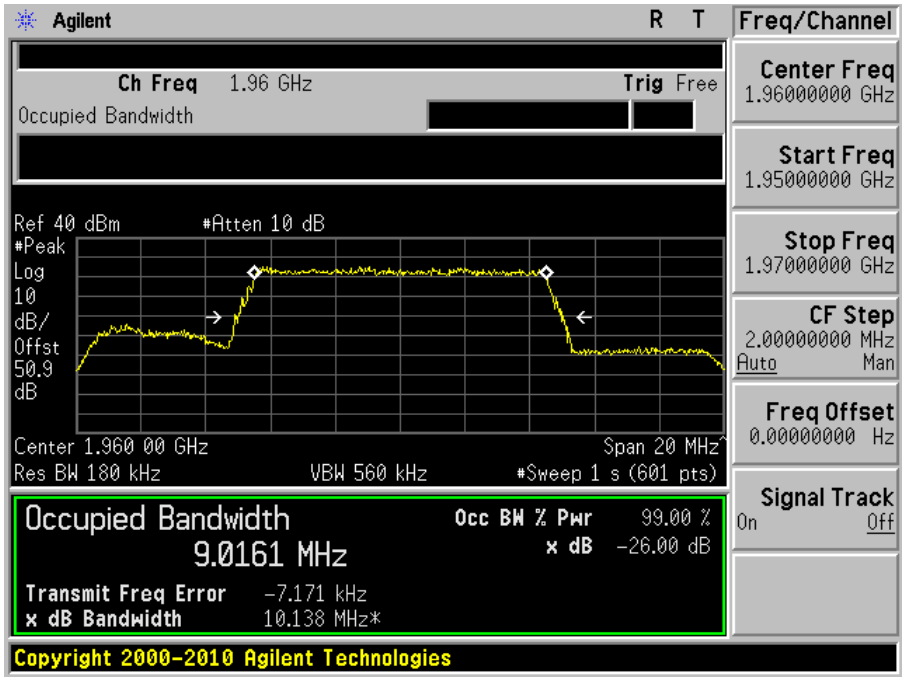


LTE-16QAM (10 MHz)

Input

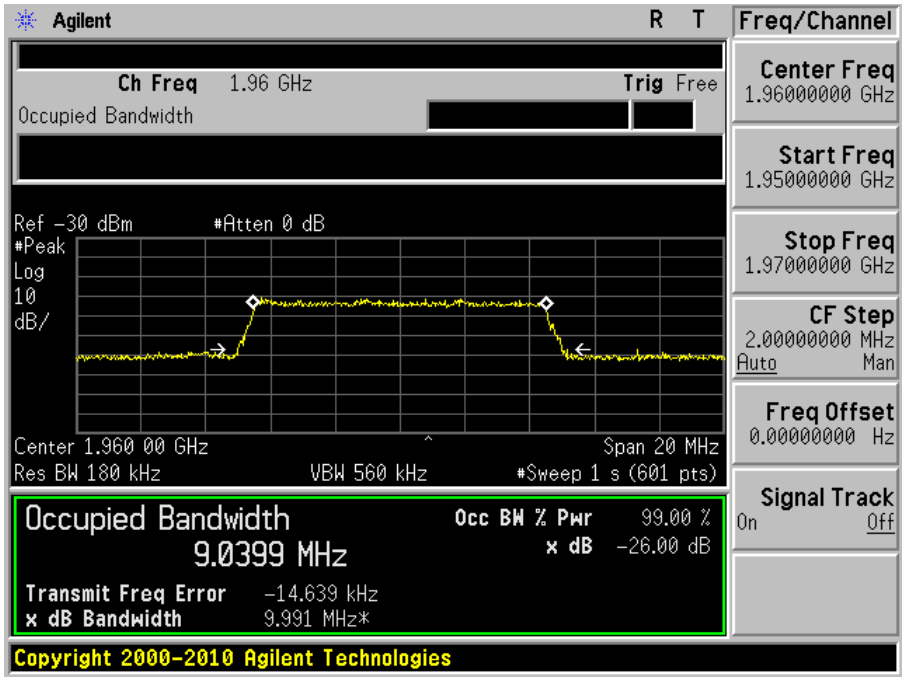


Output

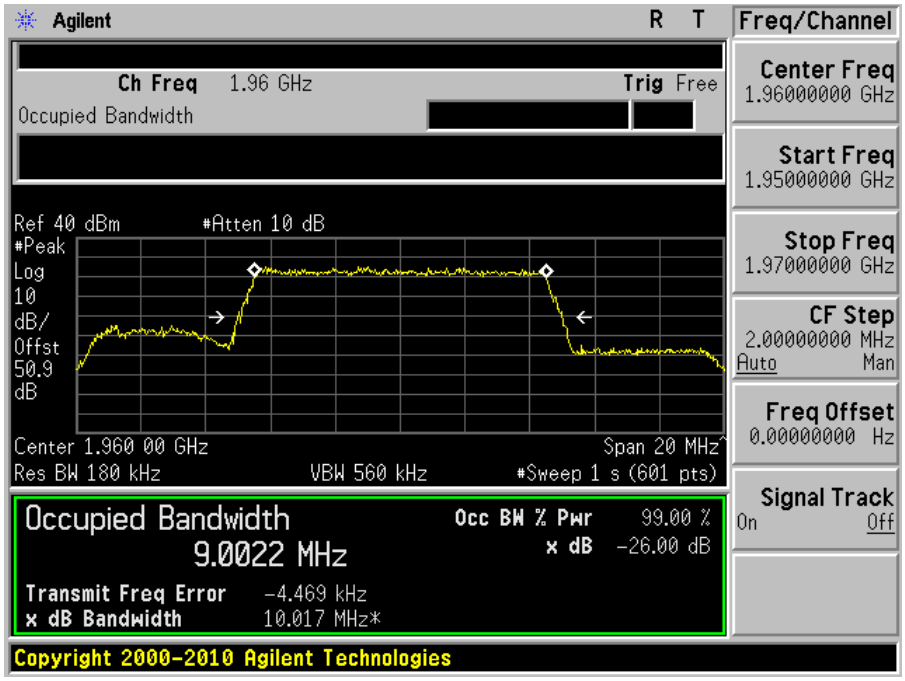


LTE-64QAM (10 MHz)

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

6.3 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	49 %
ATM Pressure:	101.2kPa

The testing was performed by Jeffrey Wu from 2012-05-25 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/A
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[1]

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	60.89	324	131	H	1200	-49.62	6.53	1.34	-44.43	-13	-31.43
1200	55.25	162	127	V	1200	-55.26	6.92	1.34	-49.68	-13	-36.68
4000	53.35	37	151	H	4000	-46.16	10.26	2	-37.9	-13	-24.9
4000	51.51	311	105	V	4000	-48	10.27	2	-39.73	-13	-26.73

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	60.45	332	102	H	1200	-50.06	6.53	1.34	-44.87	-13	-31.87
1200	53.19	222	225	V	1200	-57.32	6.92	1.34	-51.74	-13	-38.74
4000	53.08	36	202	H	4000	-46.43	10.26	2	-38.17	-13	-25.17
4000	50.88	310	184	V	4000	-48.63	10.27	2	-40.36	-13	-27.36

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 10th harmonic.

7.3 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	49 %
ATM Pressure:	101.3kPa

The testing was performed by Jeffrey Wu on 2012-05-24 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[1]

Note 1: Two year calibration cycle.

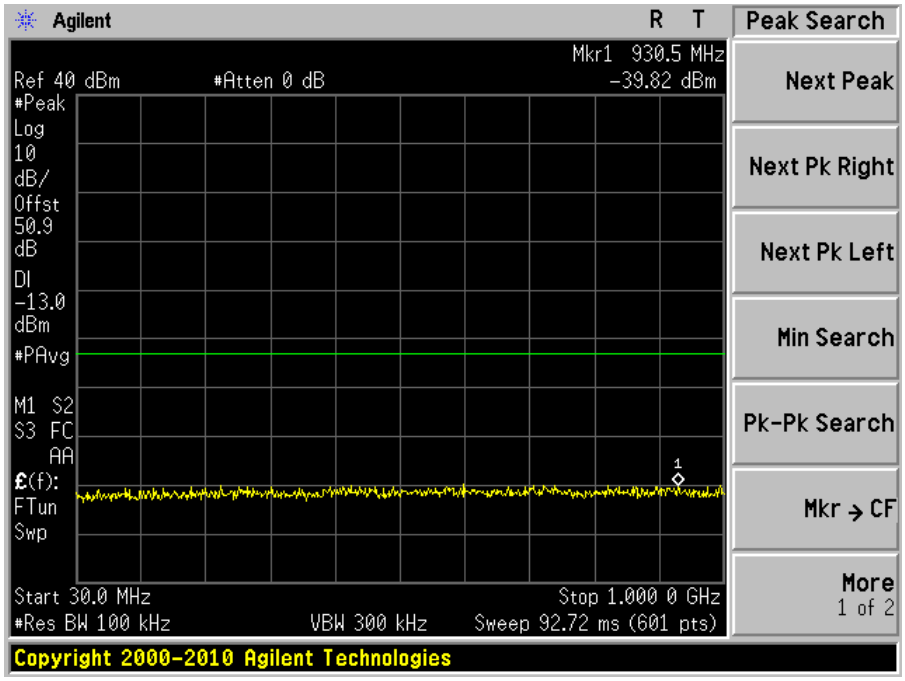
Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST

7.5 Test Results

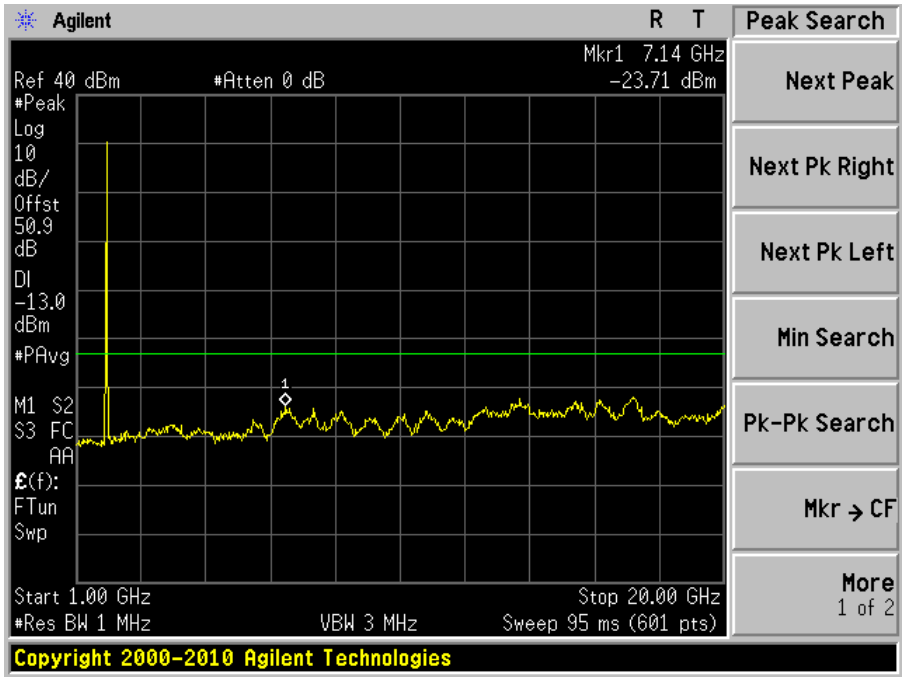
Please refer to the following plots.

PCS Band Uplink, Middle Channel: 1880 MHz:

Plot 1: 30 MHz to 1 GHz

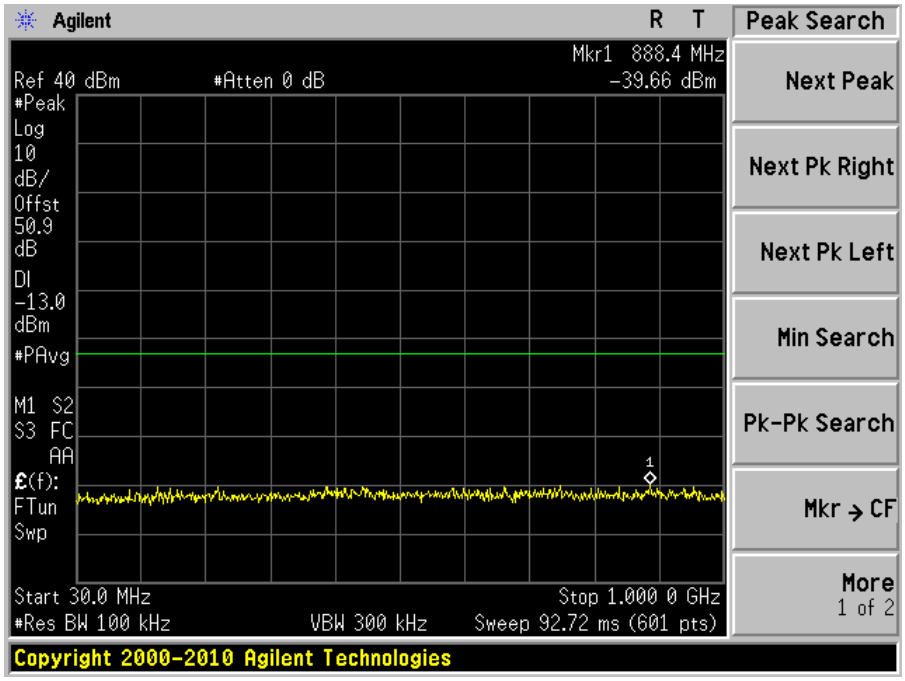


Plot 2: Above 1 GHz

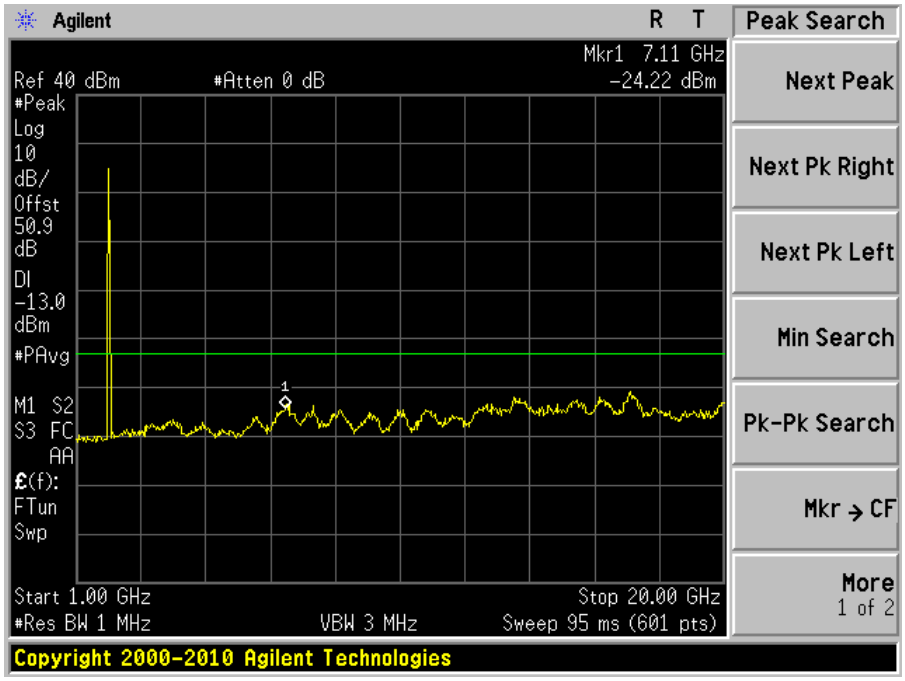


PCS Band Downlink, Middle Channel: 1960 MHz:

Plot 1: 30 MHz to 1 GHz

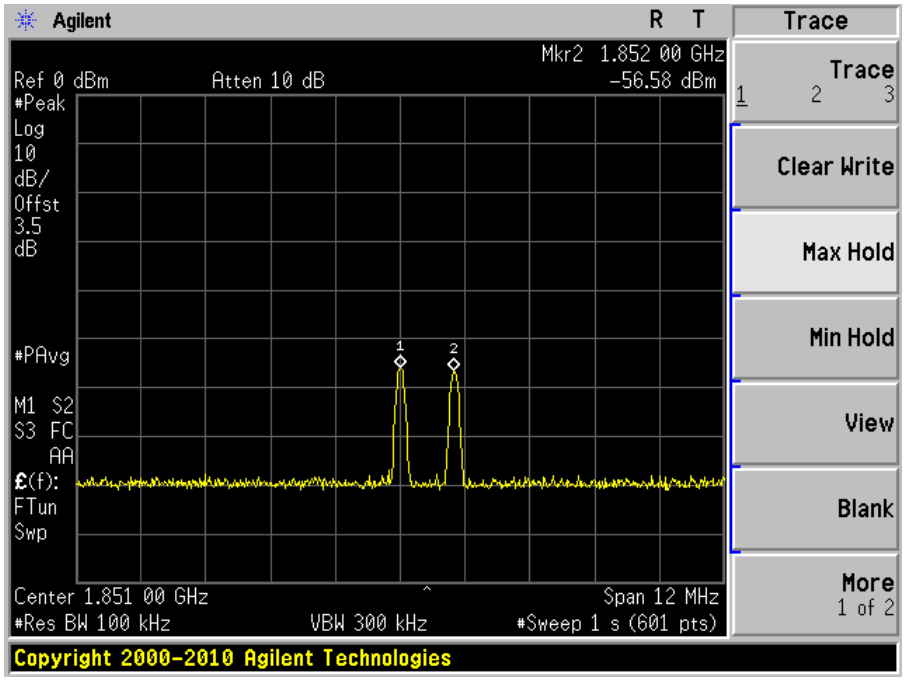


Plot 2: Above 1 GHz

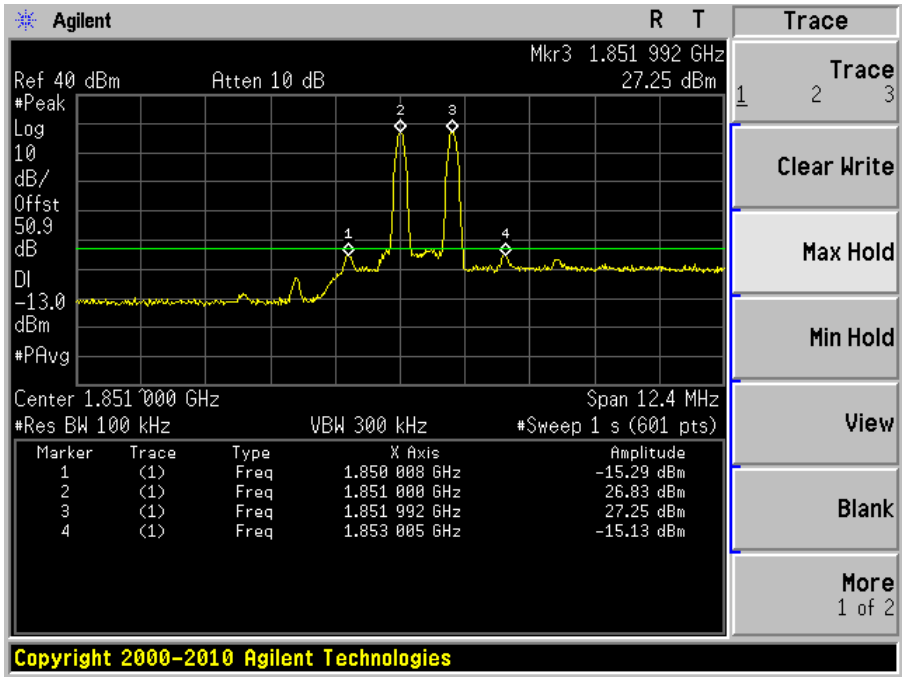


Inter-modulation

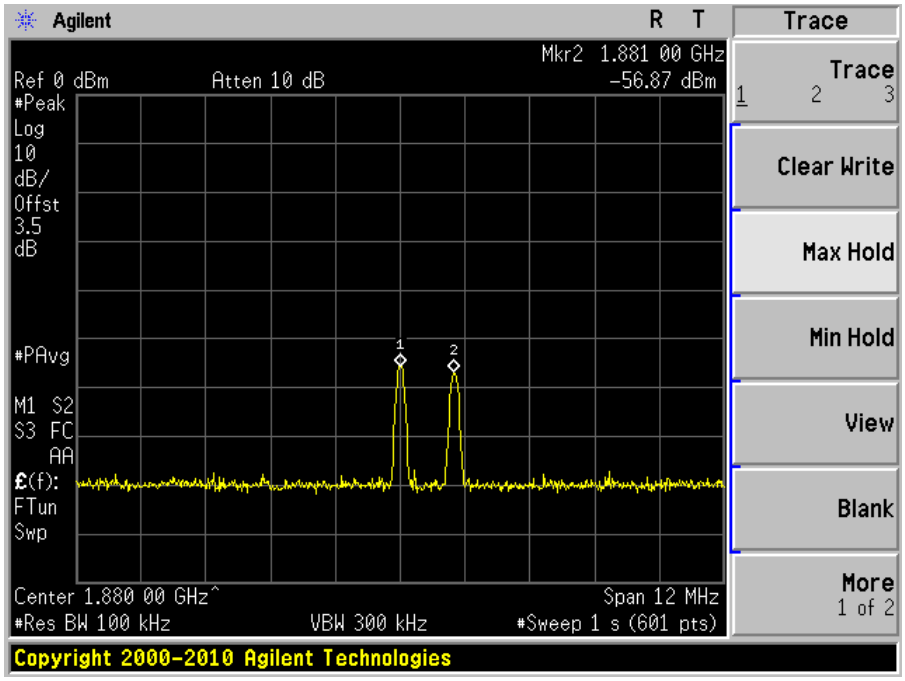
PCS Band Uplink Low Channel, Input:



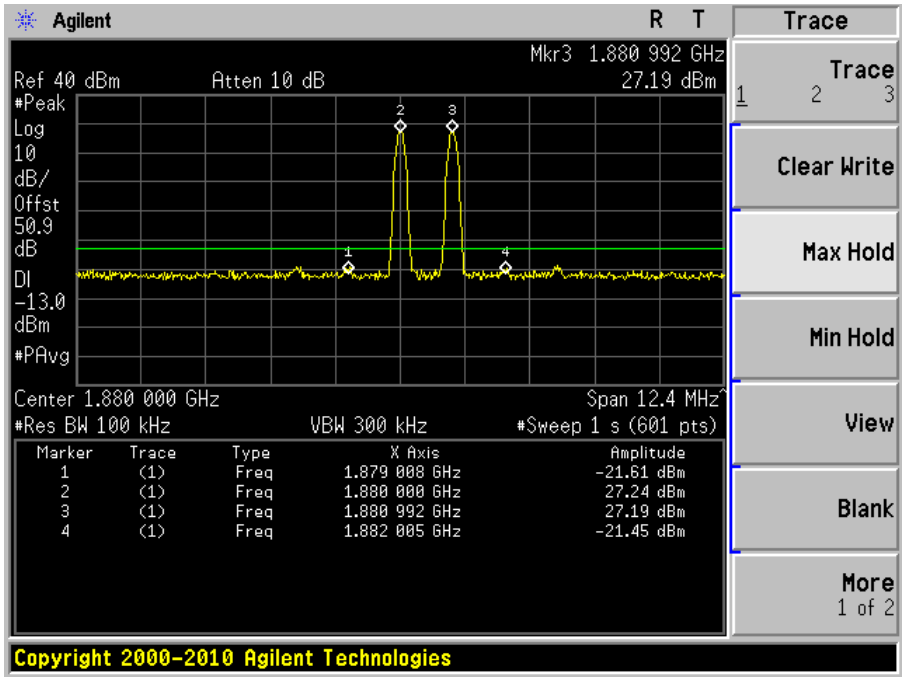
PCS Band Uplink Low Channel, Output:



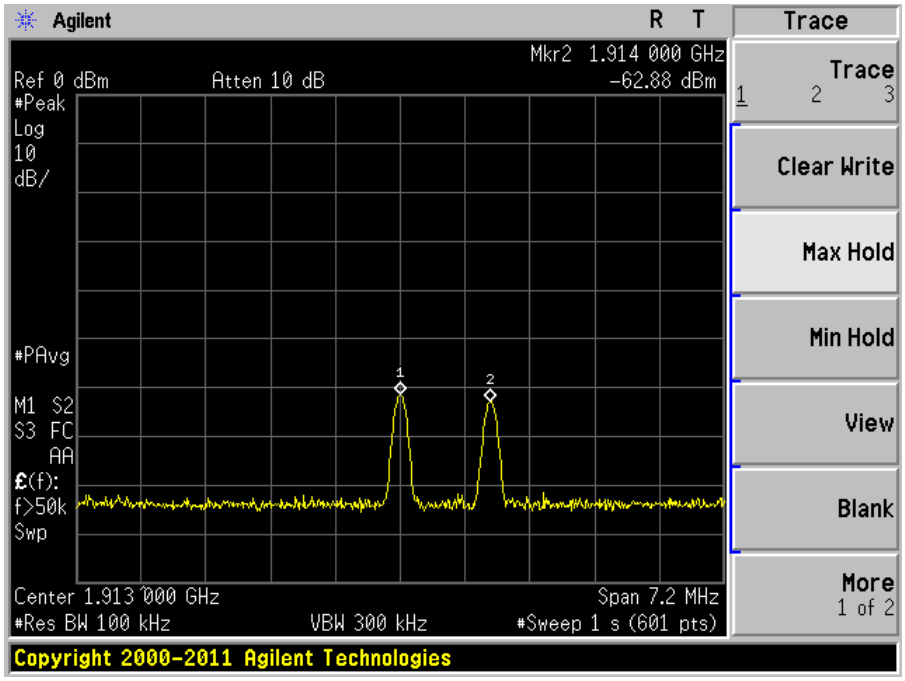
PCS Band Uplink Middle Channel, Input:



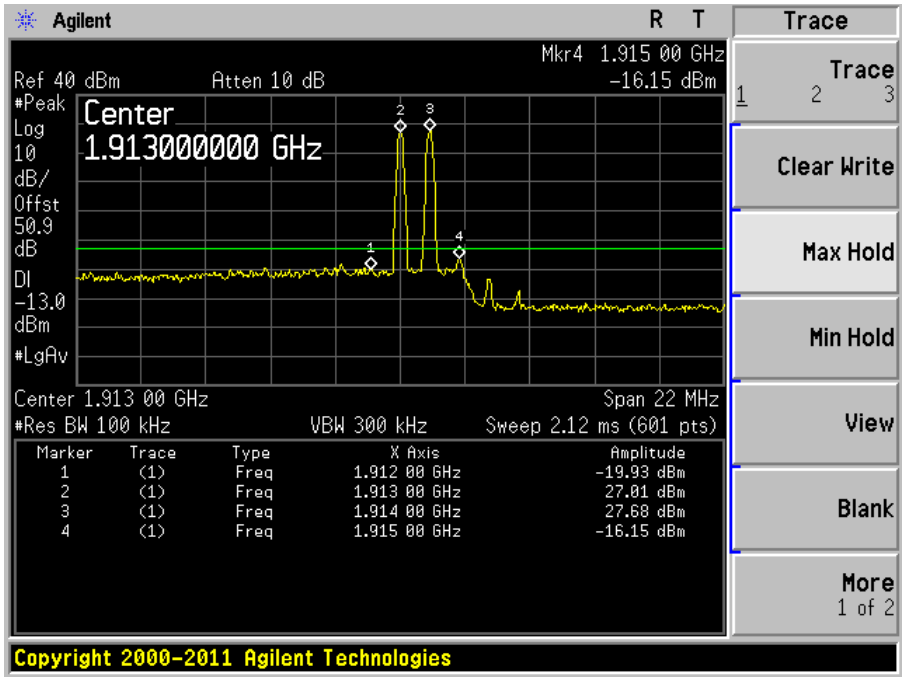
PCS Band Uplink Middle Channel, Output:



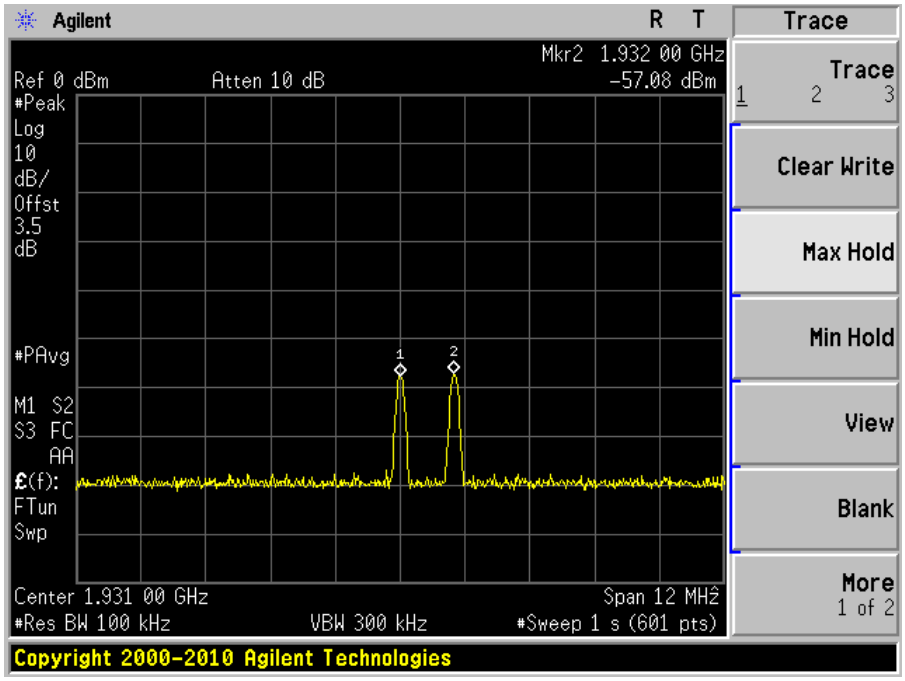
PCS Band Uplink High Channel, Input:



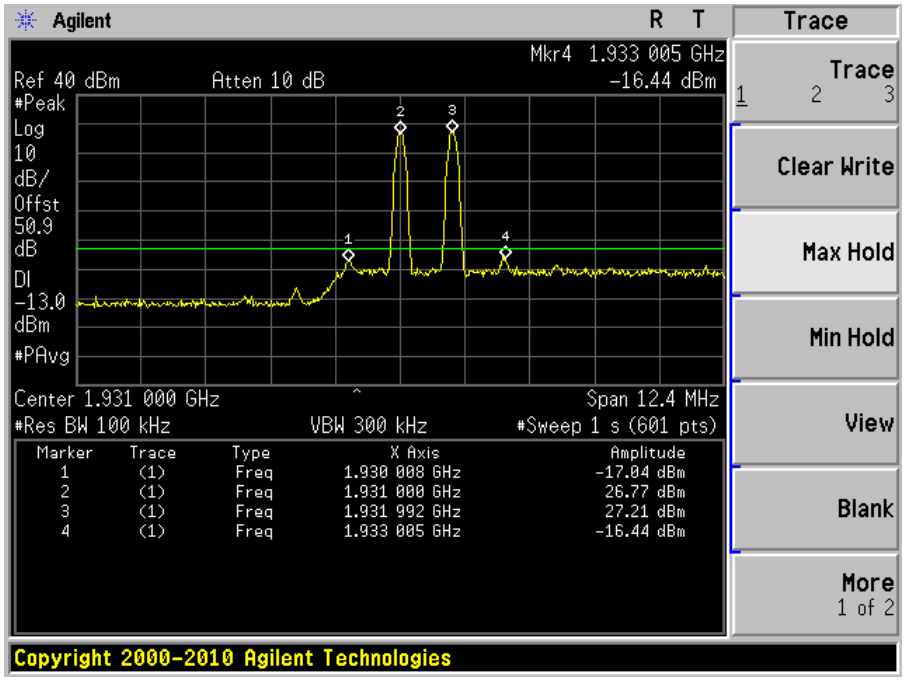
PCS Band Uplink High Channel, Output:



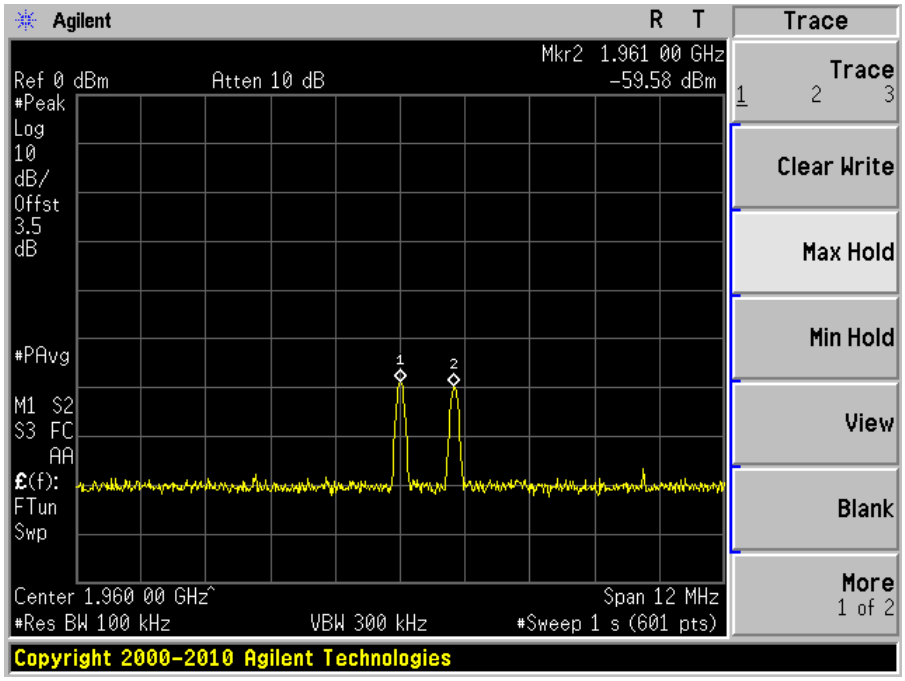
PCS Band Downlink Low Channel, Input:



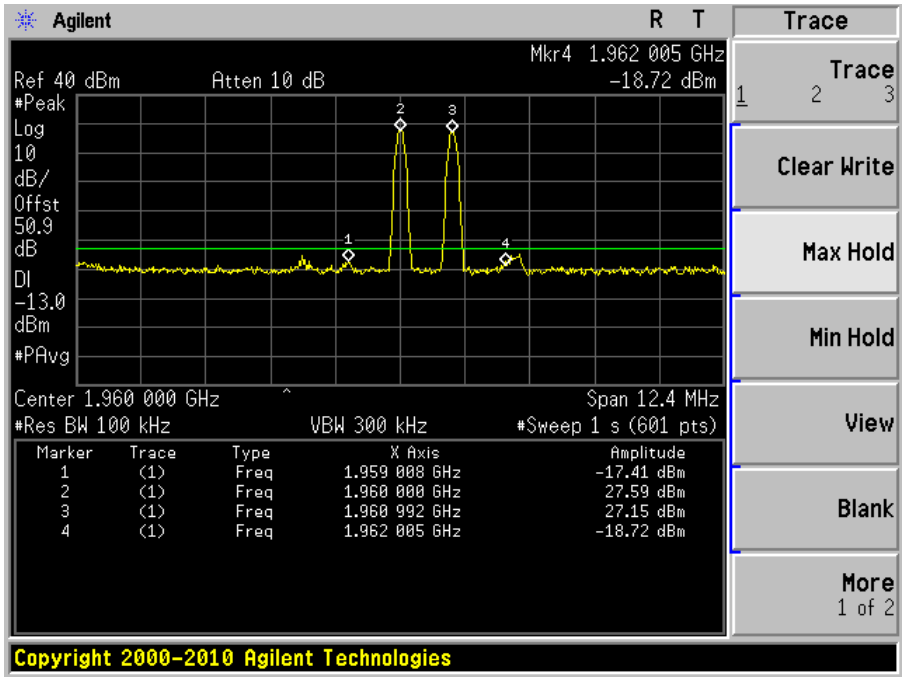
PCS Band Downlink Low Channel, Output:



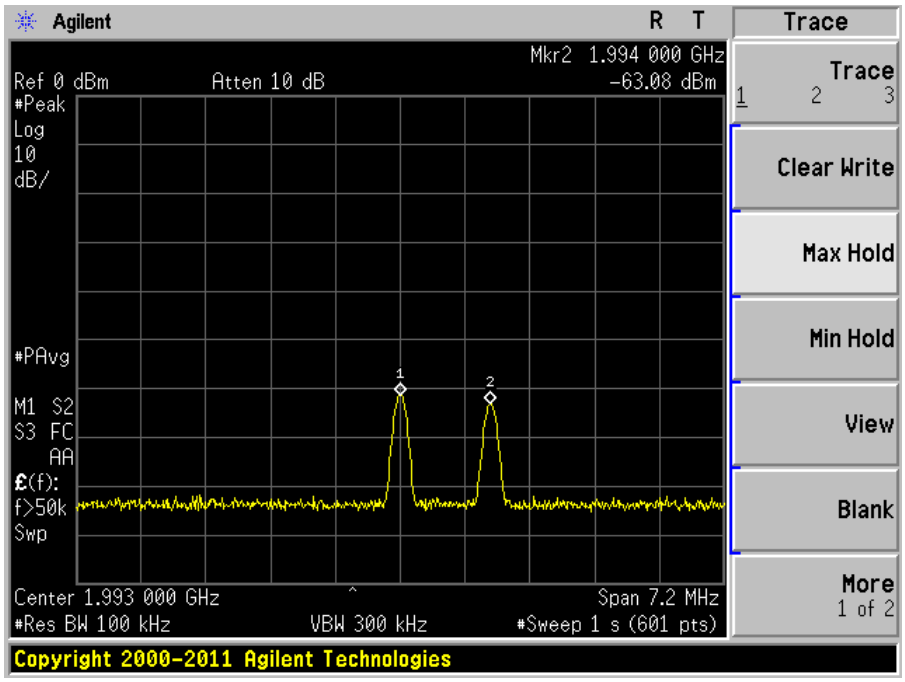
PCS Band Downlink Middle Channel, Input:



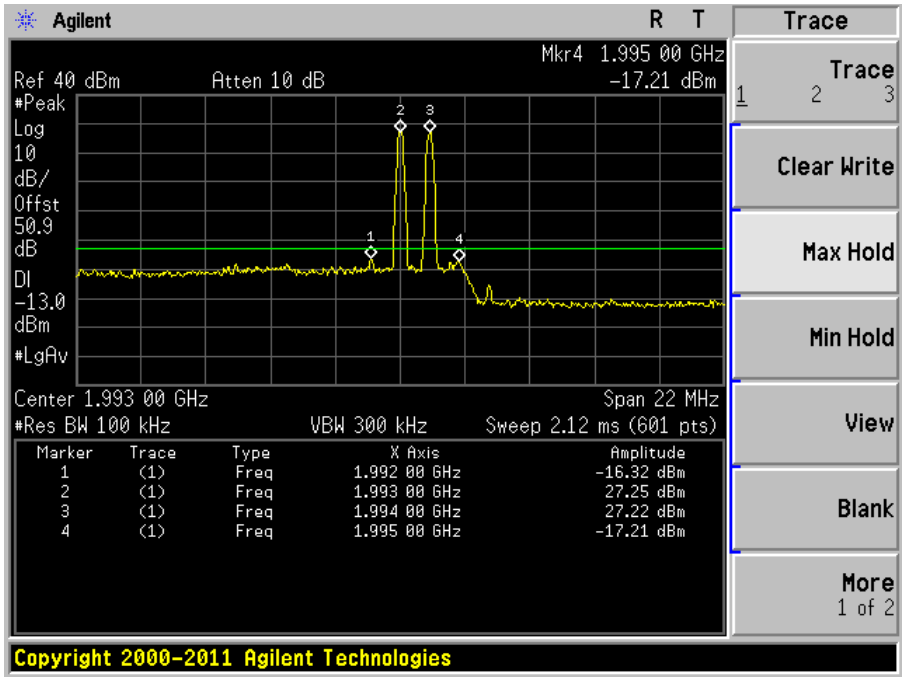
PCS Band Downlink Middle Channel, Output:



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:	49 %
ATM Pressure:	101.3kPa

The testing was performed by Jeffrey Wu on 2012-05-24 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

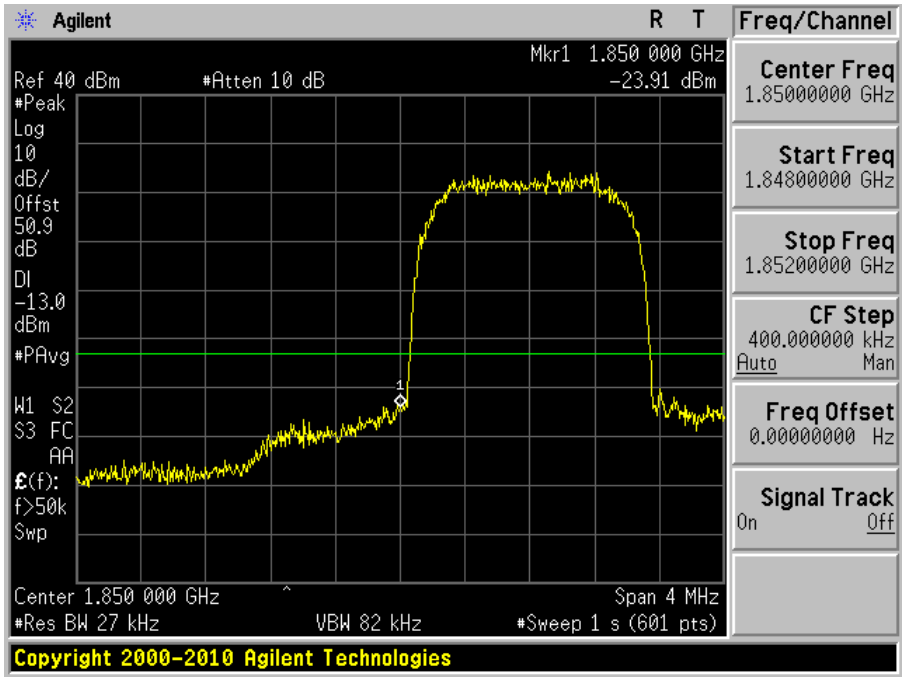
Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST

8.5 Test Results

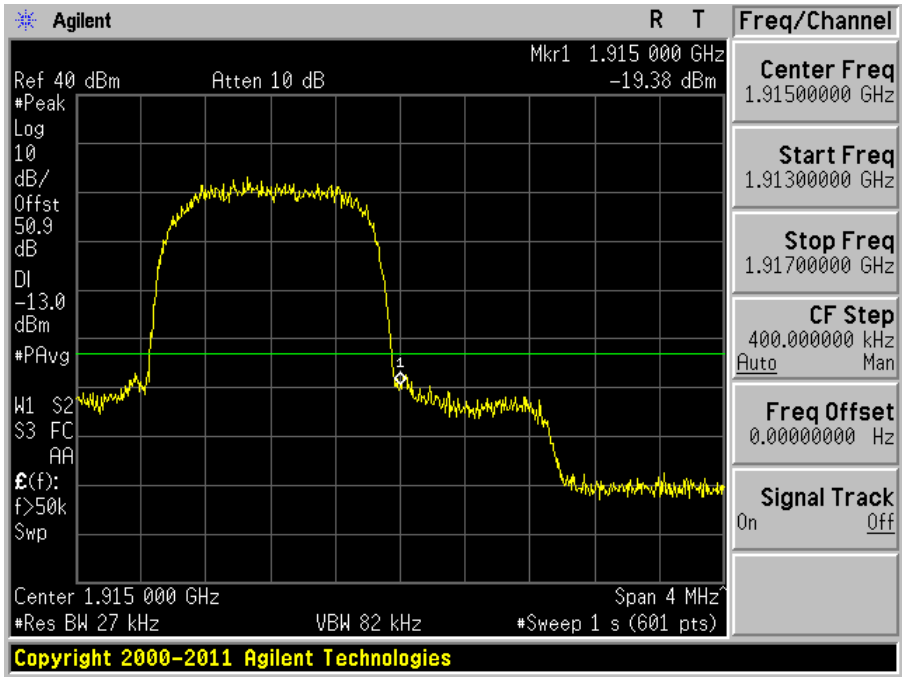
Please refer to the following plots.

CDMA/EVDO, Uplink:

Lowest Edge

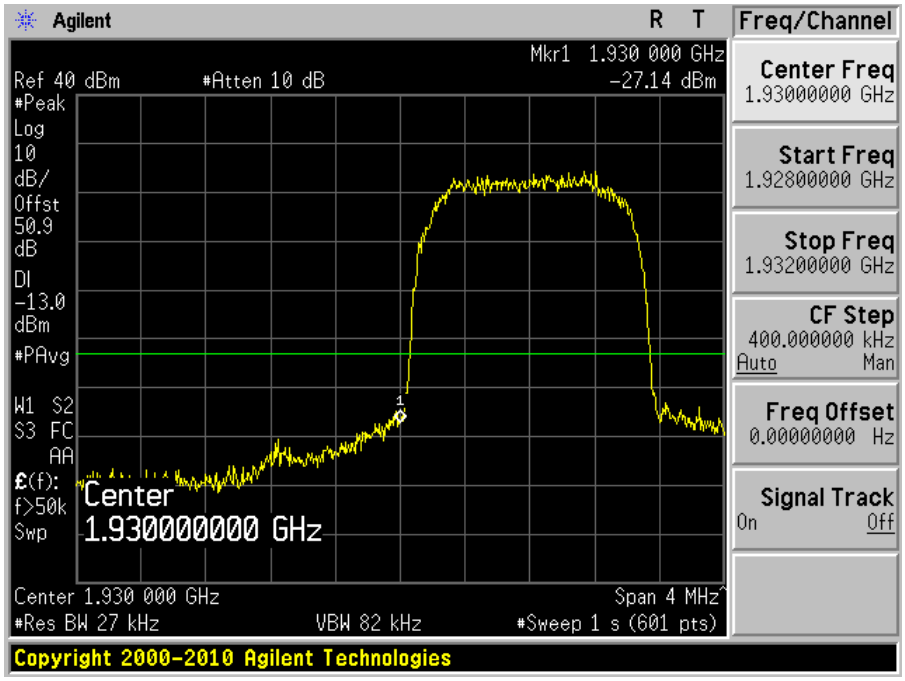


Highest Edge

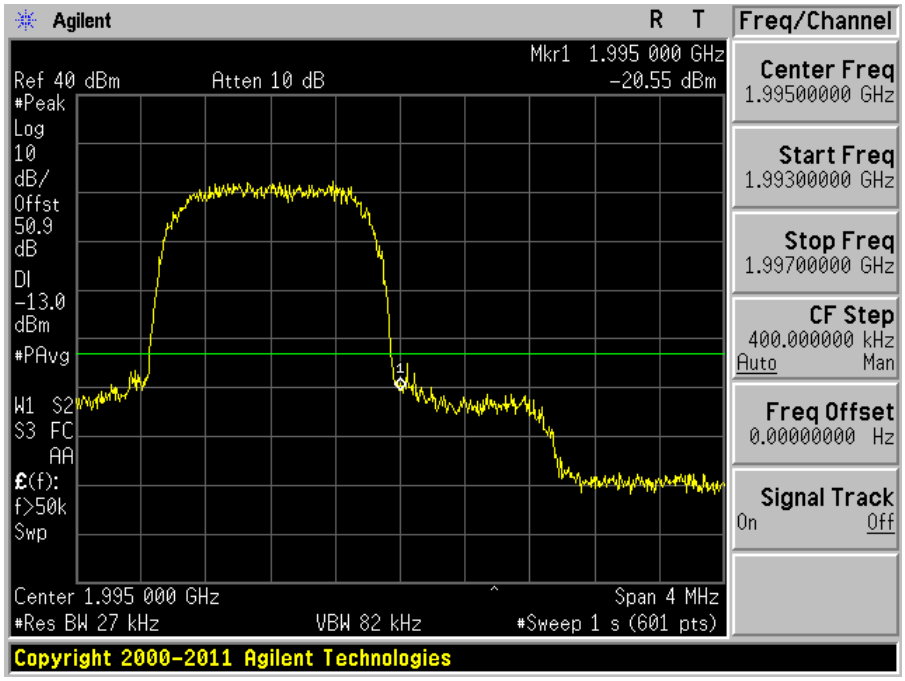


CDMA/EVDO, Downlink:

Lowest Edge



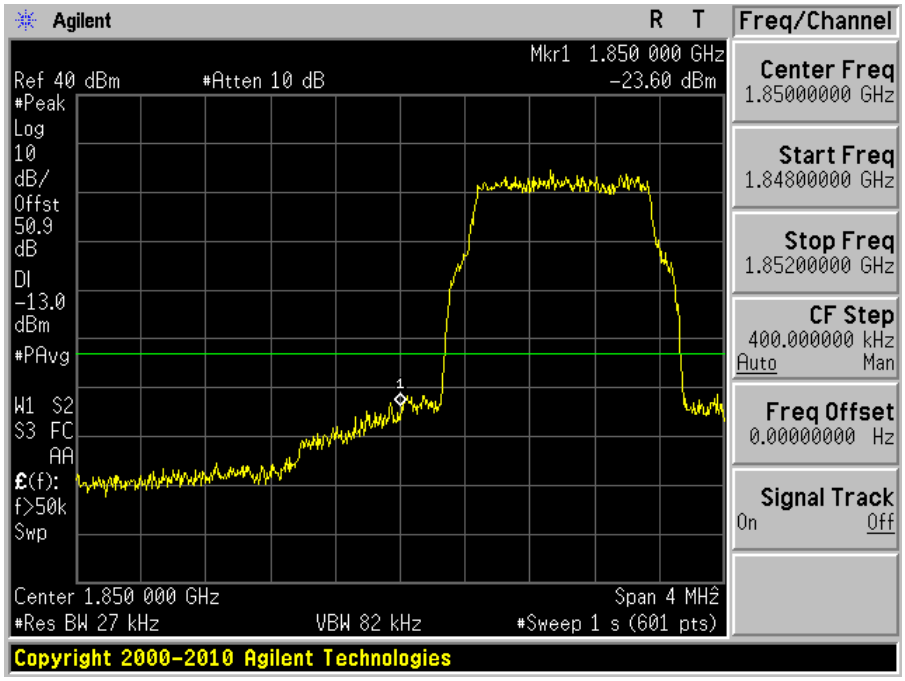
Highest Edge



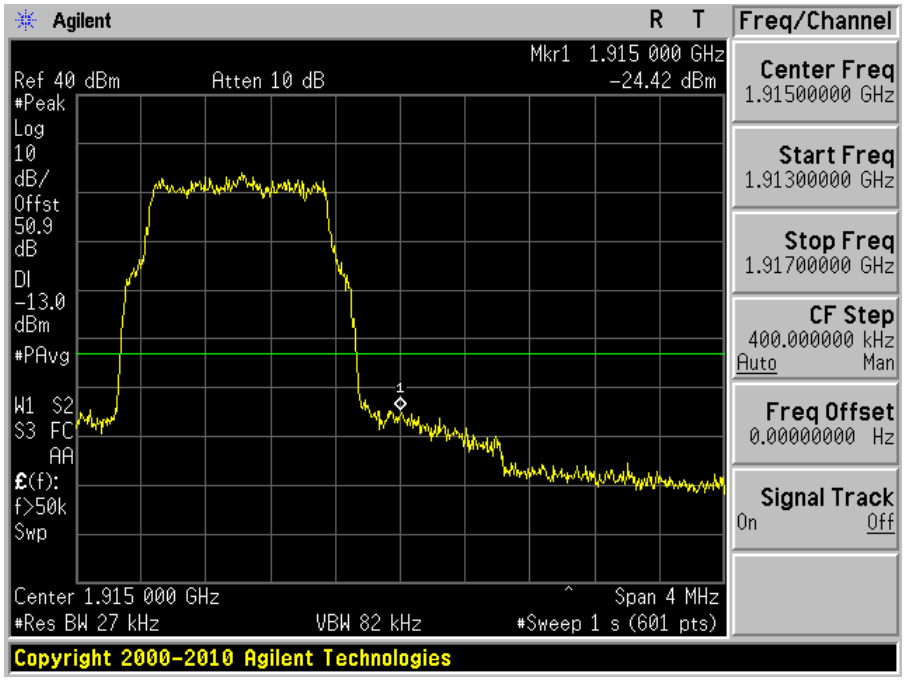
LTE, Uplink:

Modulation: QPSK (1.4 MHz):

Plot 1: Lowest Edge

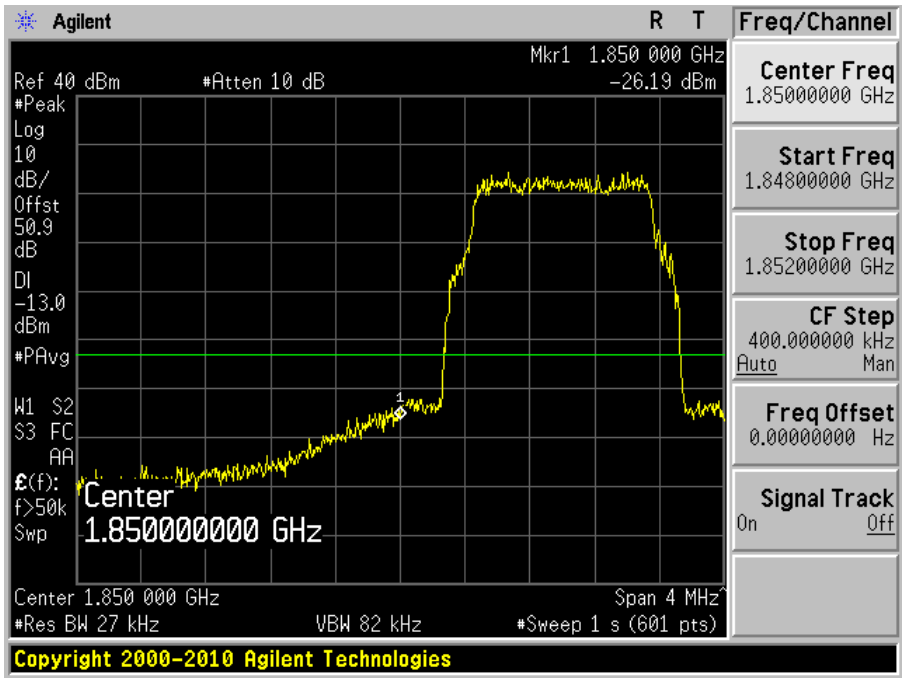


Plot 2: Highest Edge

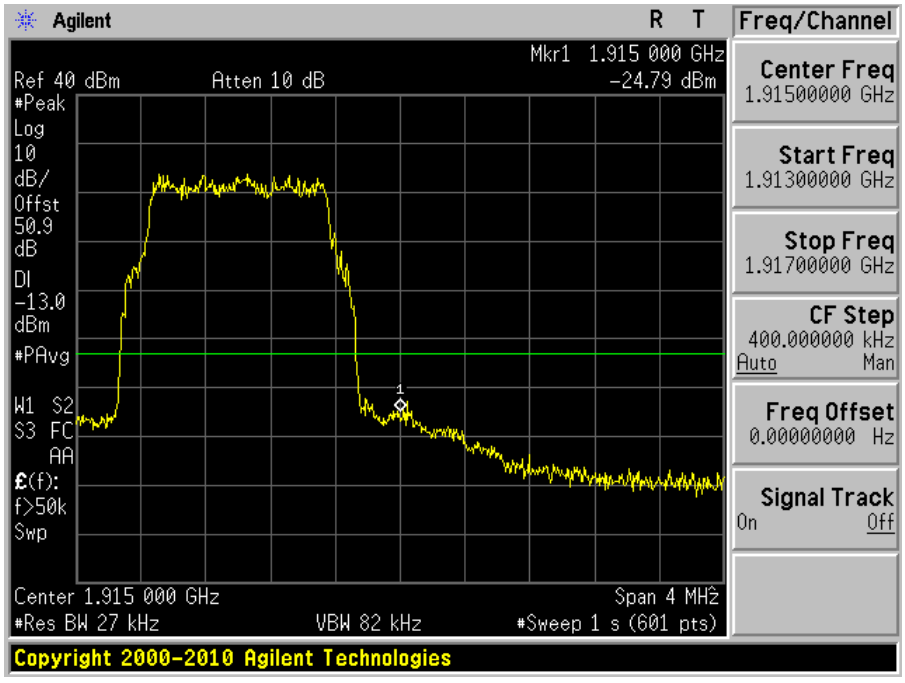


Modulation: 16QAM (1.4 MHz):

Plot 1: Lowest Edge

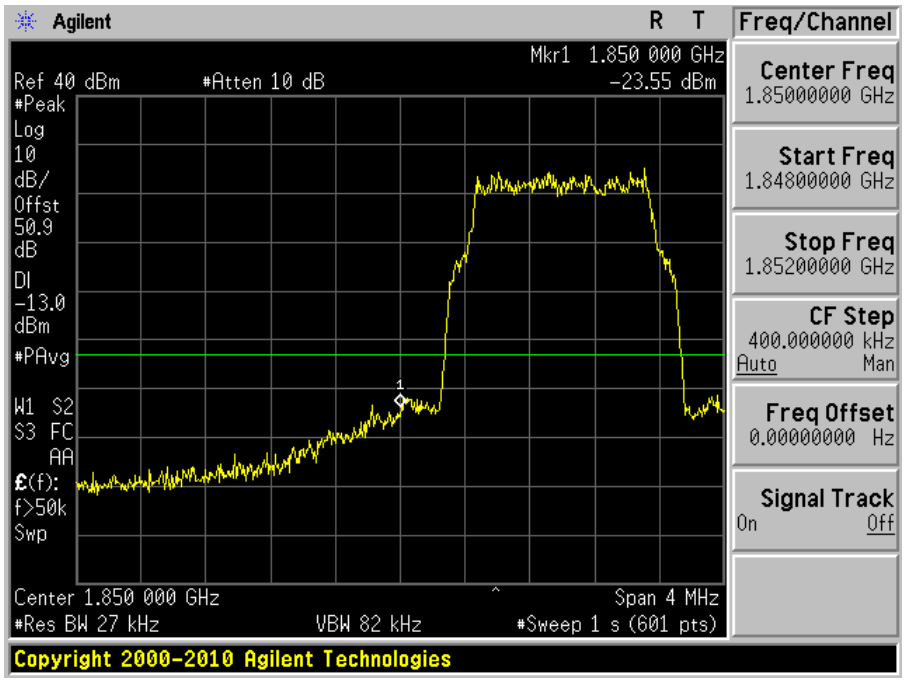


Plot 2: Highest Edge

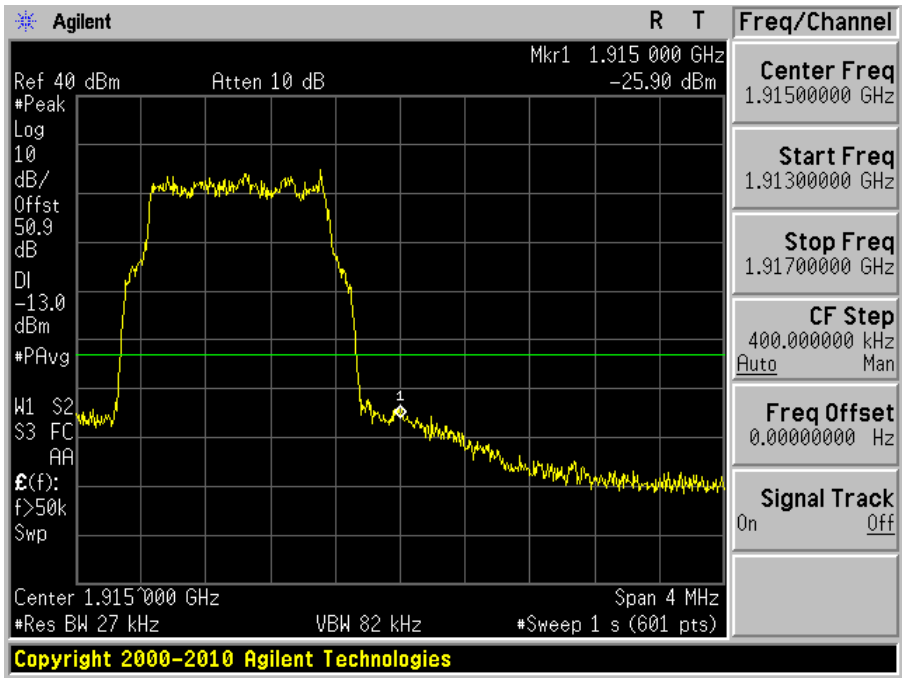


Modulation: 64QAM (1.4 MHz):

Plot 1: Lowest Edge

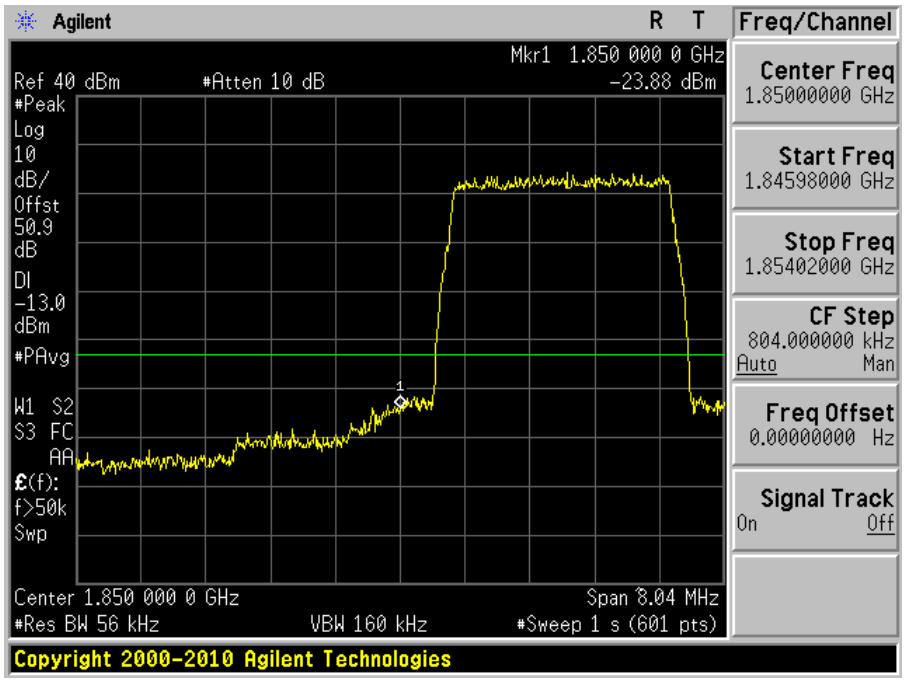


Plot 2: Highest Edge

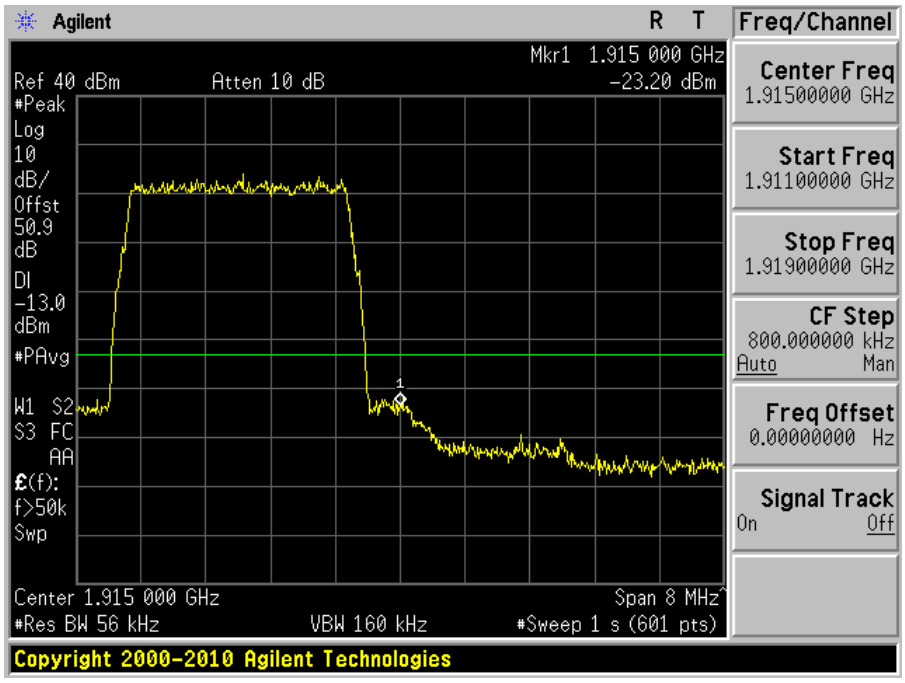


Modulation: QPSK (3 MHz):

Plot 1: Lowest Edge

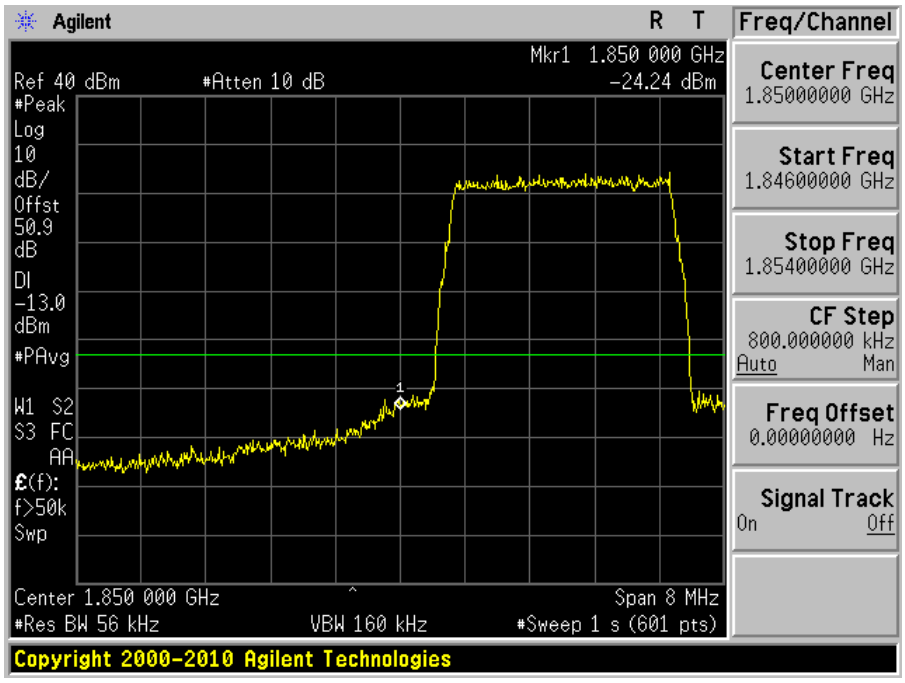


Plot 2: Highest Edge

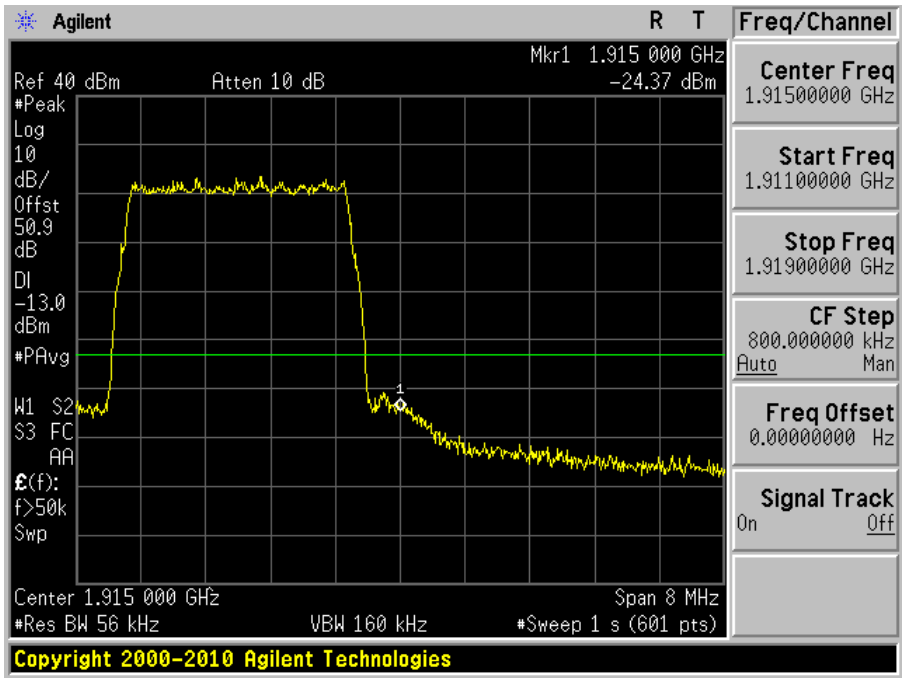


Modulation: 16QAM (3 MHz):

Plot 1: Lowest Edge

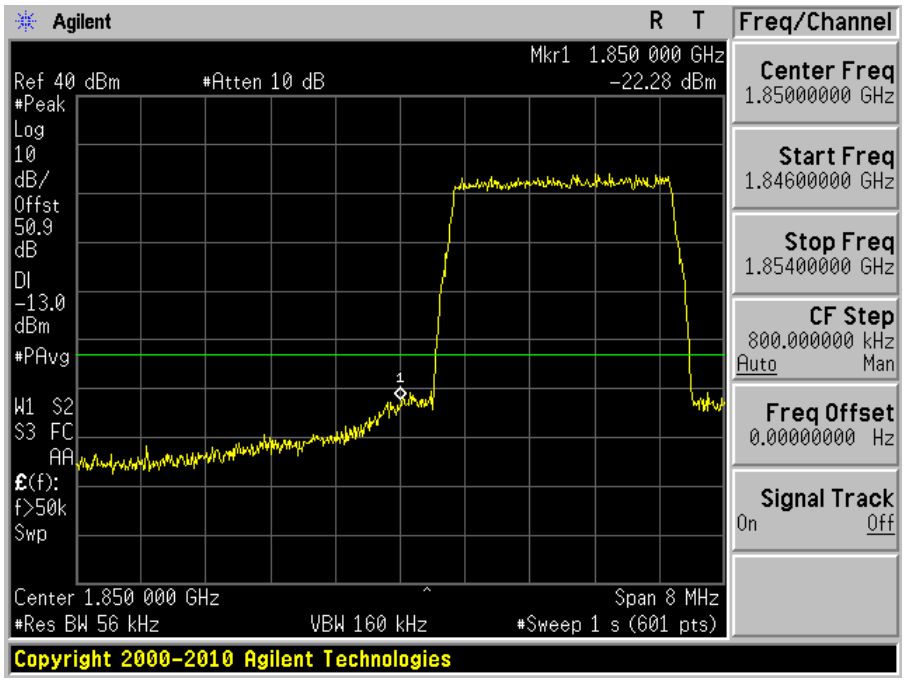


Plot 2: Highest Edge

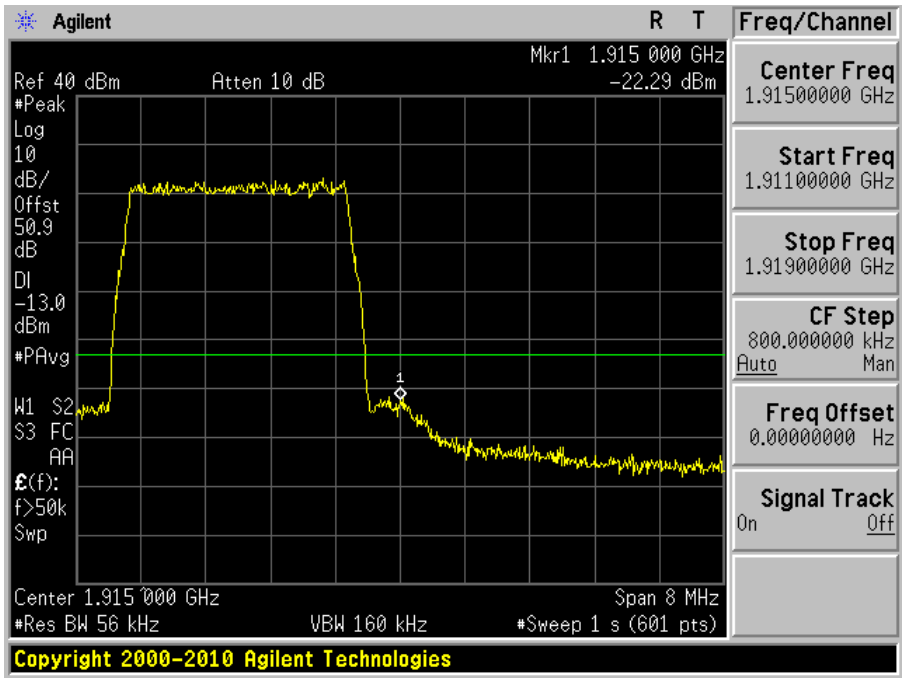


Modulation: 64QAM (3 MHz):

Plot 1: Lowest Edge

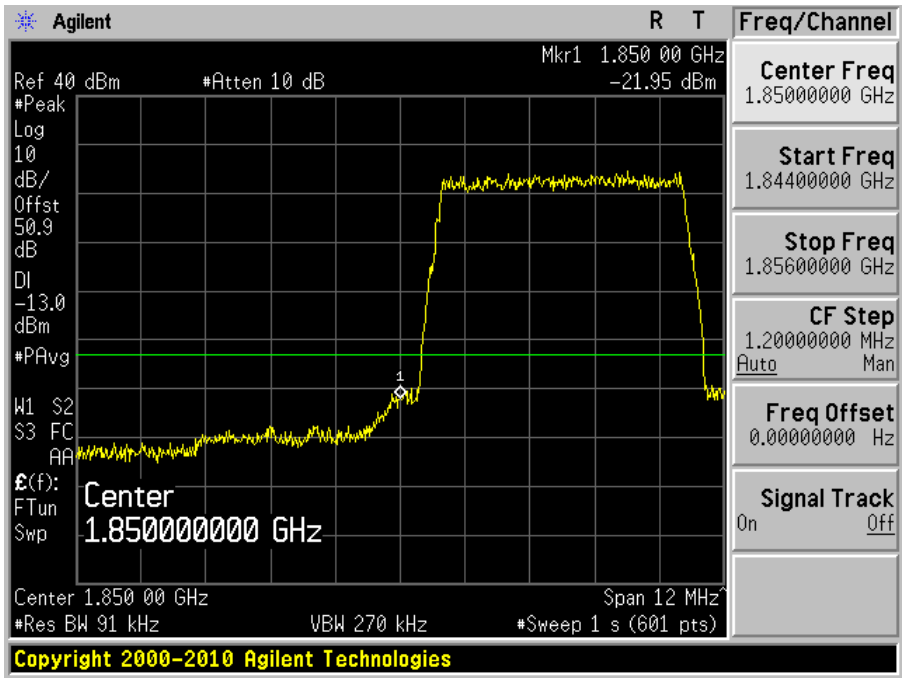


Plot 2: Highest Edge

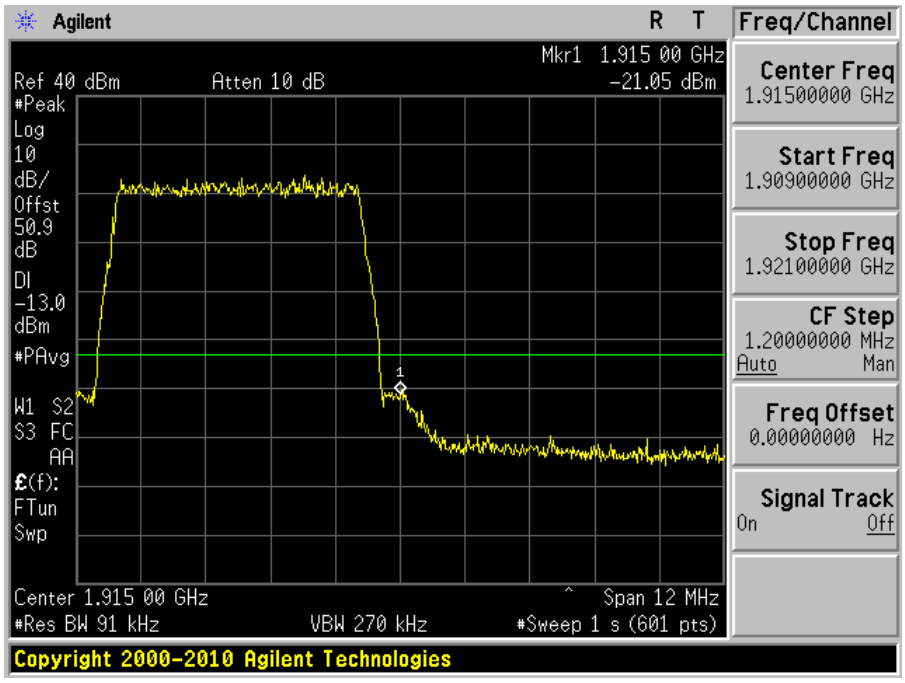


Modulation: QPSK (5 MHz):

Plot 1: Lowest Edge

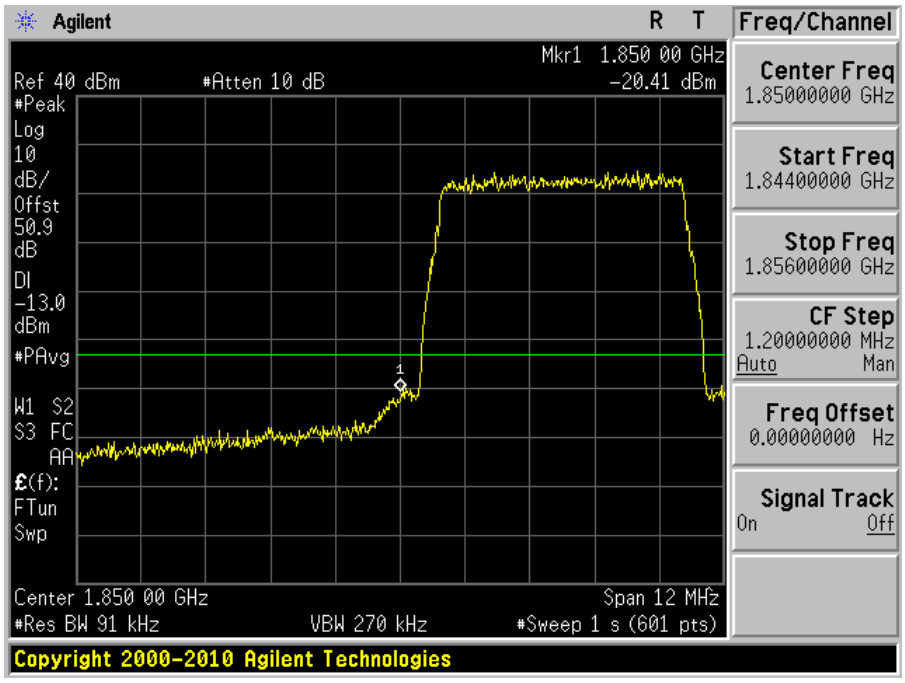


Plot 2: Highest Edge

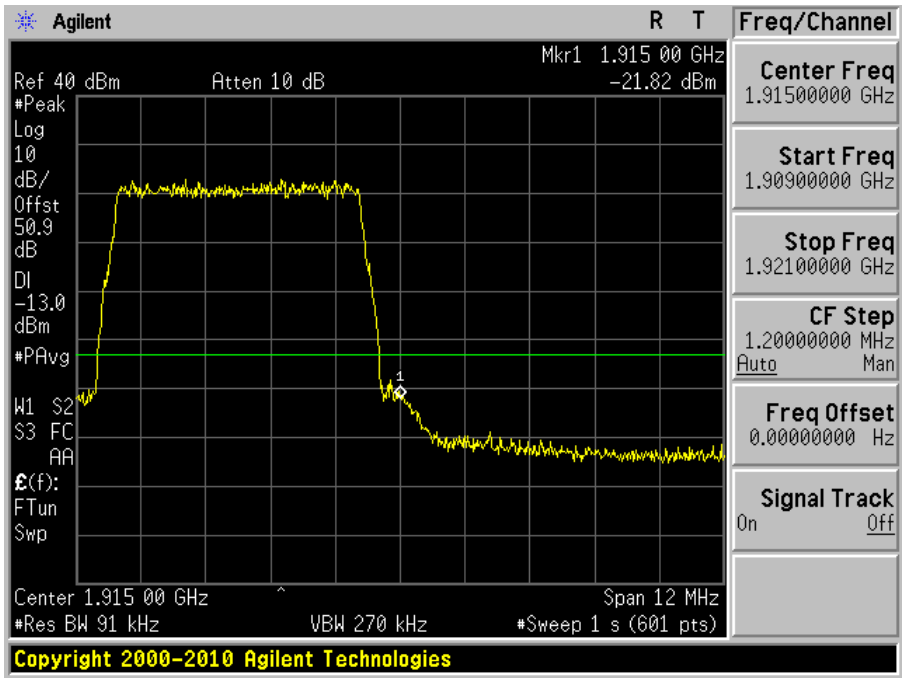


Modulation: 16QAM (5 MHz):

Plot 1: Lowest Edge

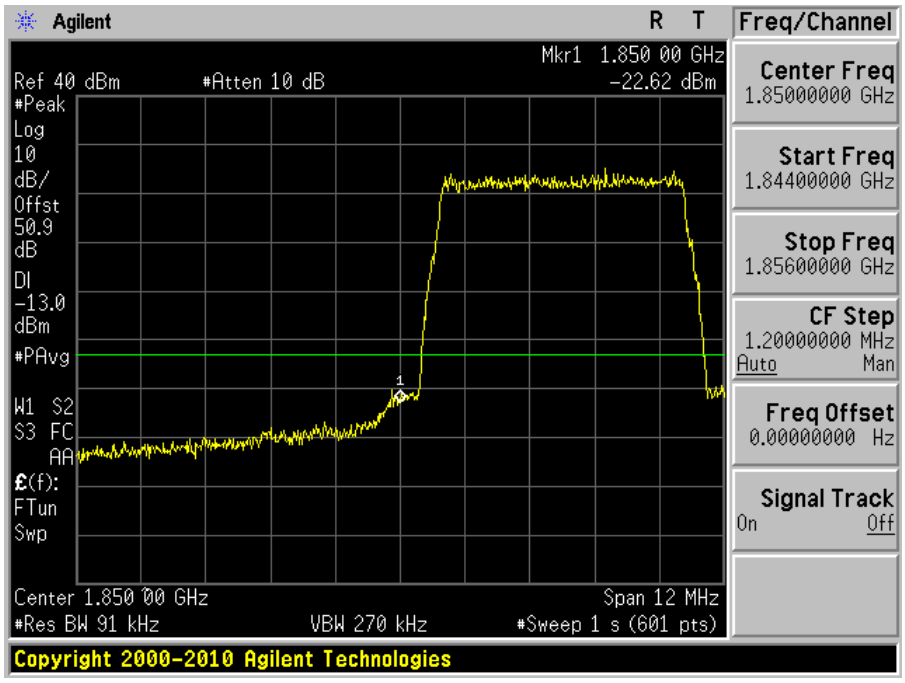


Plot 2: Highest Edge

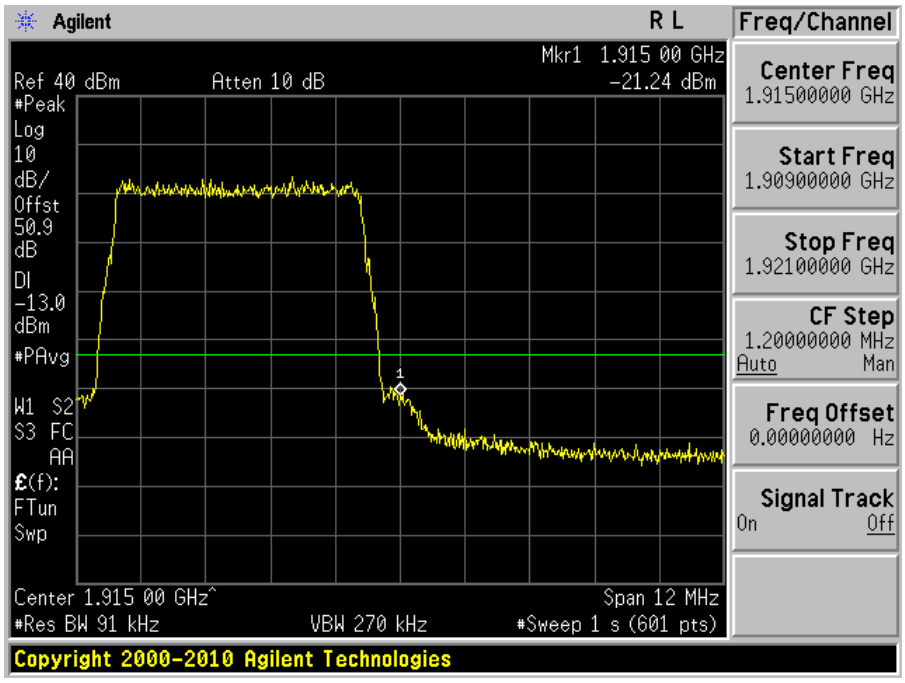


Modulation: 64QAM (5 MHz):

Plot 1: Lowest Edge

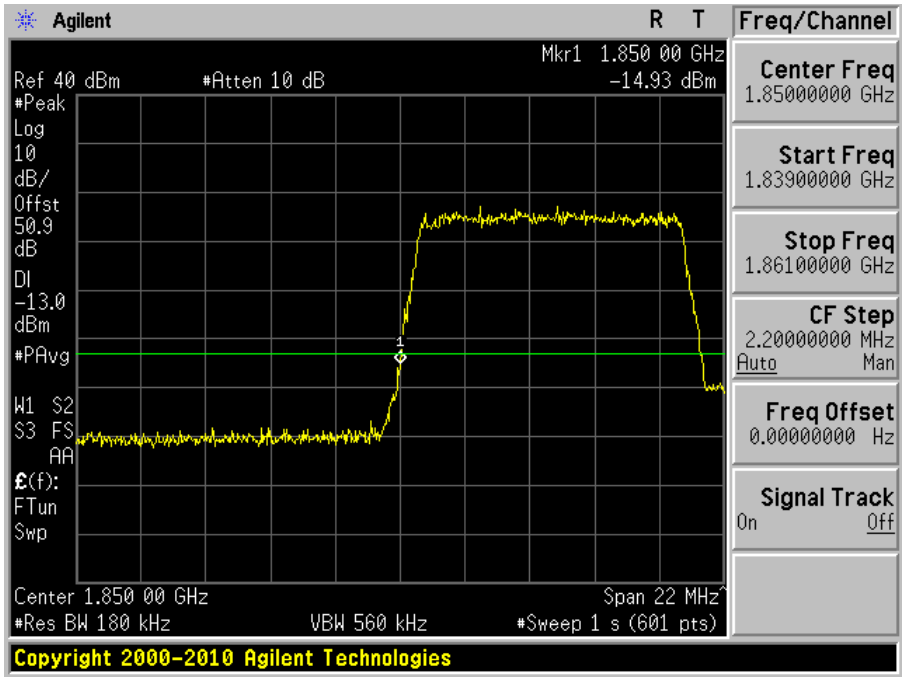


Plot 2: Highest Edge

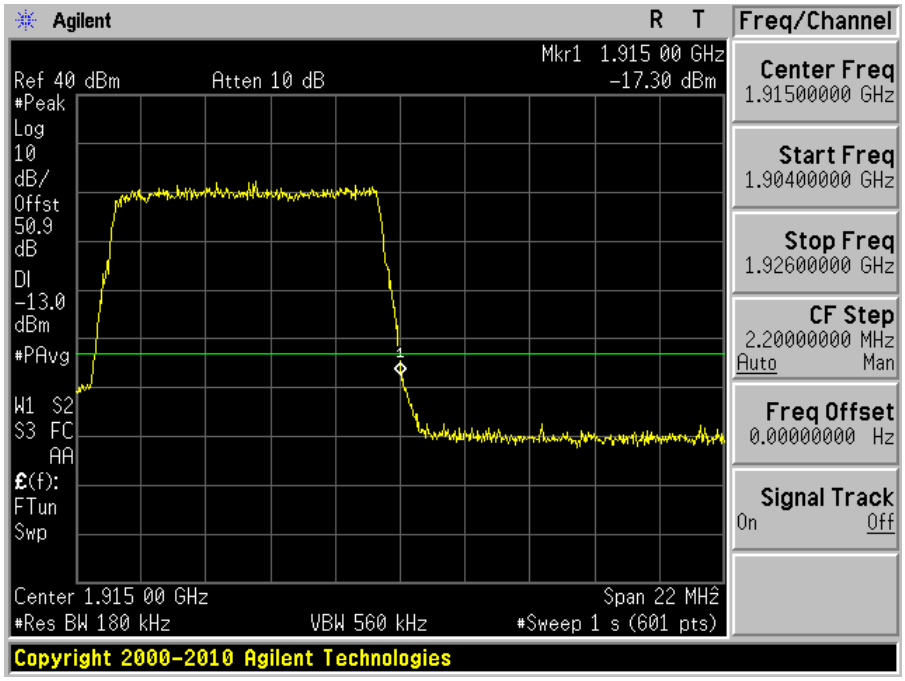


Modulation: QPSK (10 MHz):

Plot 1: Lowest Edge

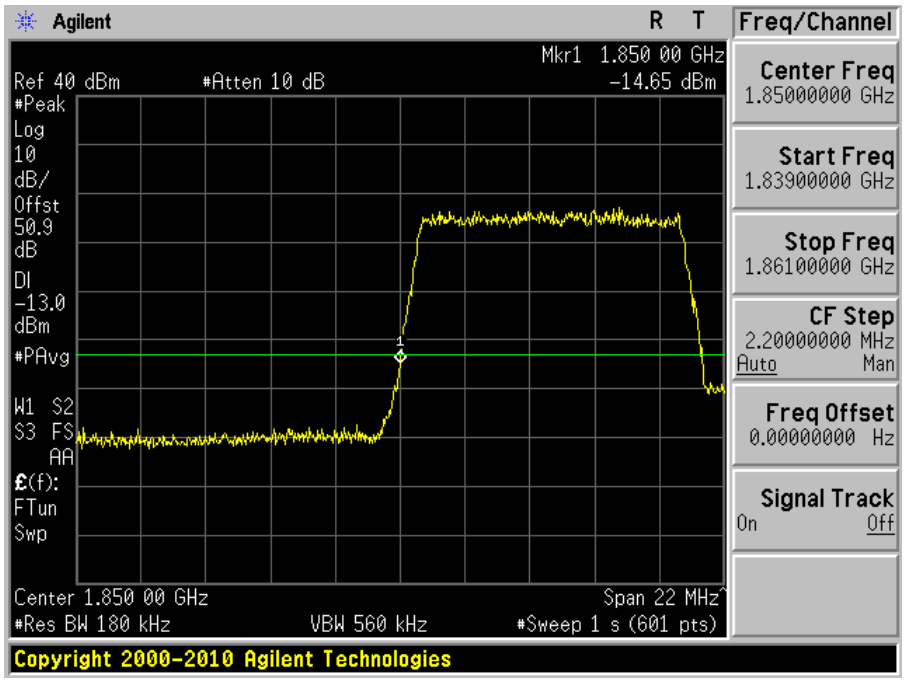


Plot 2: Highest Edge

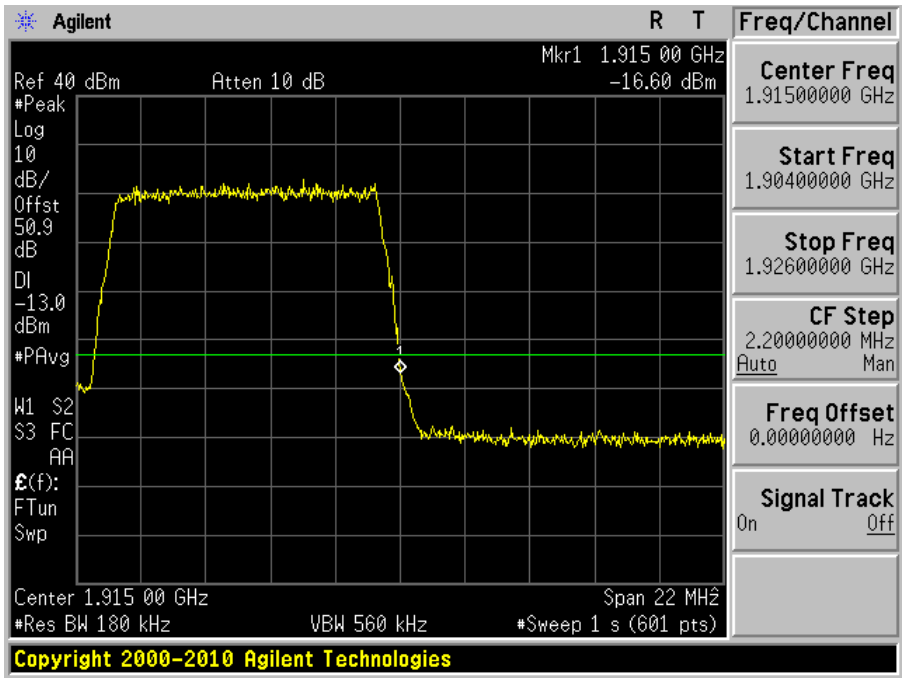


Modulation: 16QAM (10 MHz):

Plot 1: Lowest Edge

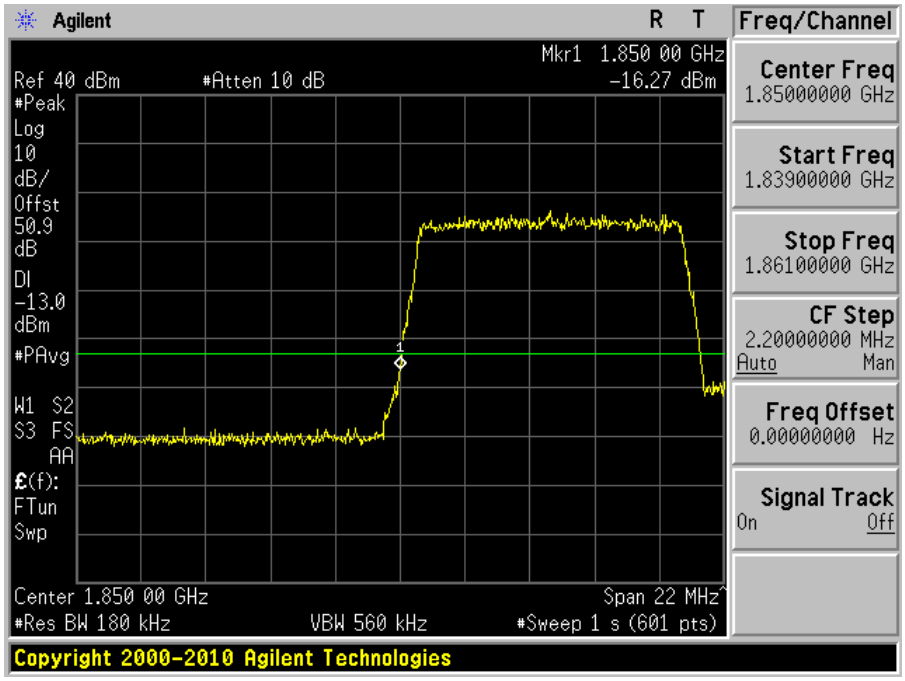


Plot 2: Highest Edge

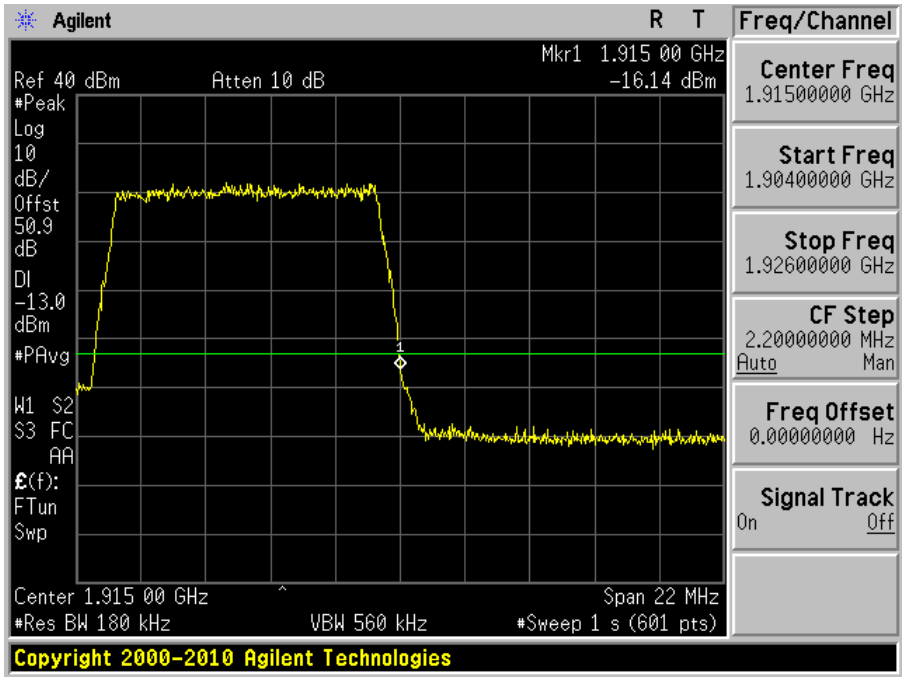


Modulation: 64QAM (10 MHz):

Plot 1: Lowest Edge



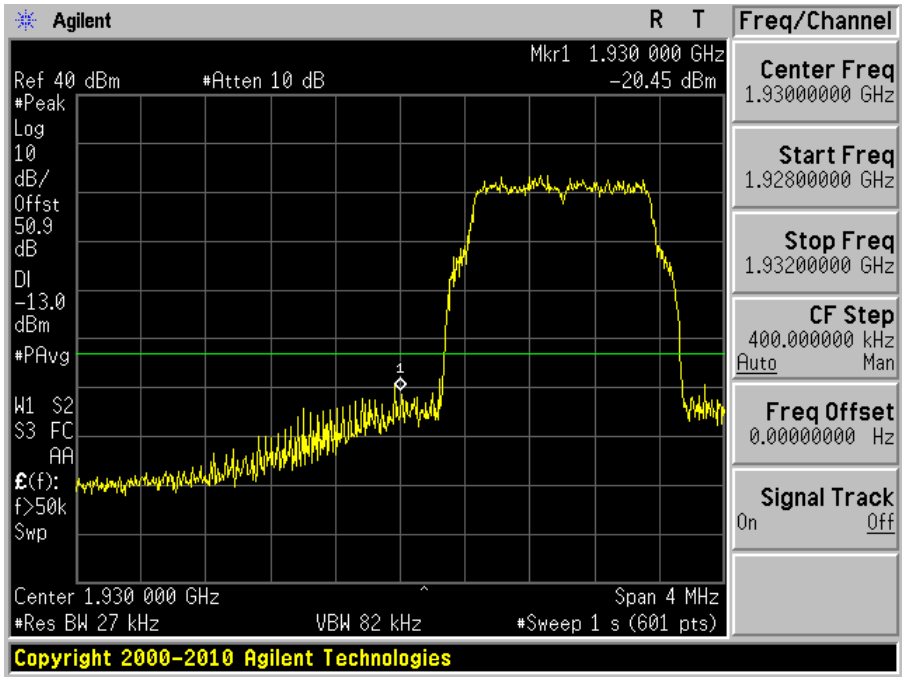
Plot 2: Highest Edge



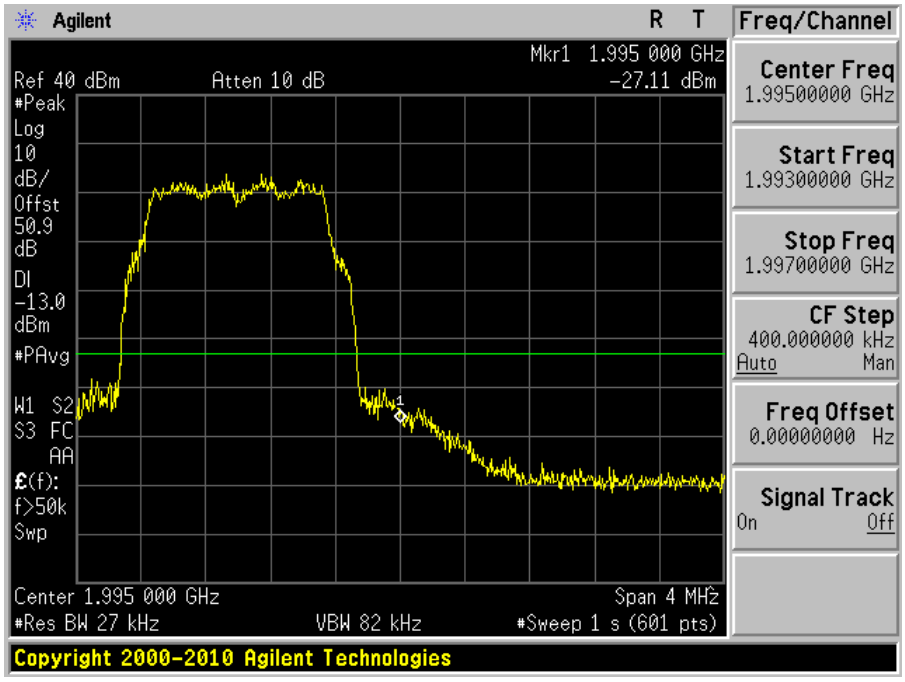
LTE, Downlink:

Modulation: QPSK (1.4 MHz):

Plot 1: Lowest Edge

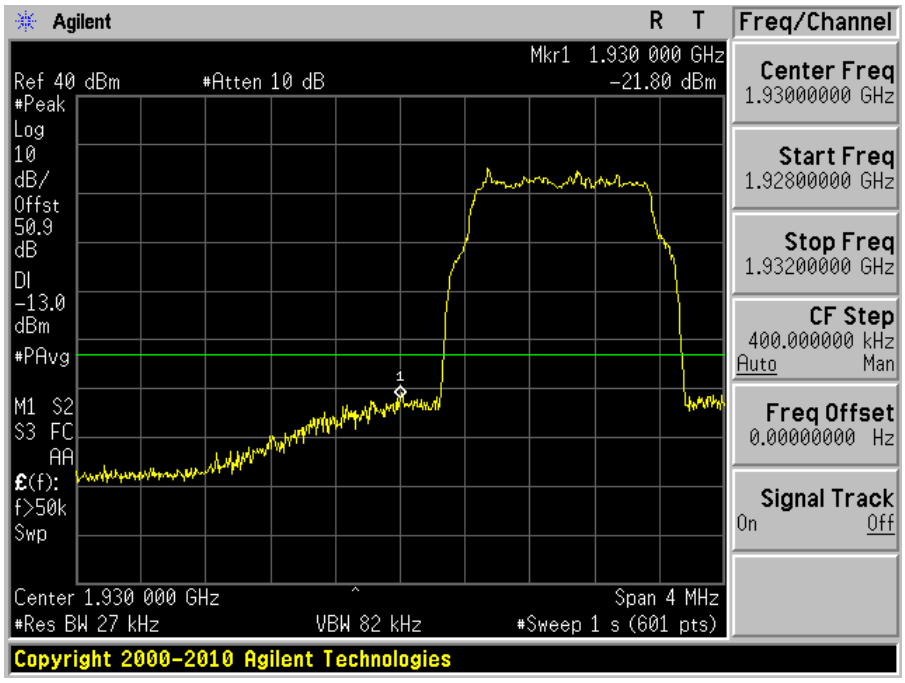


Plot 2: Highest Edge

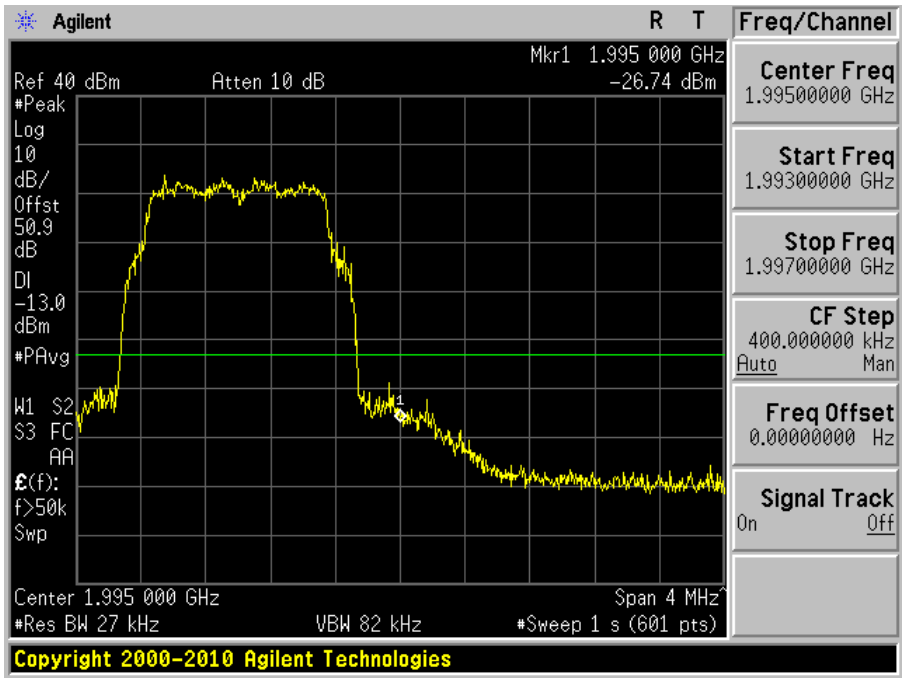


Modulation: 16QAM (1.4 MHz):

Plot 1: Lowest Edge

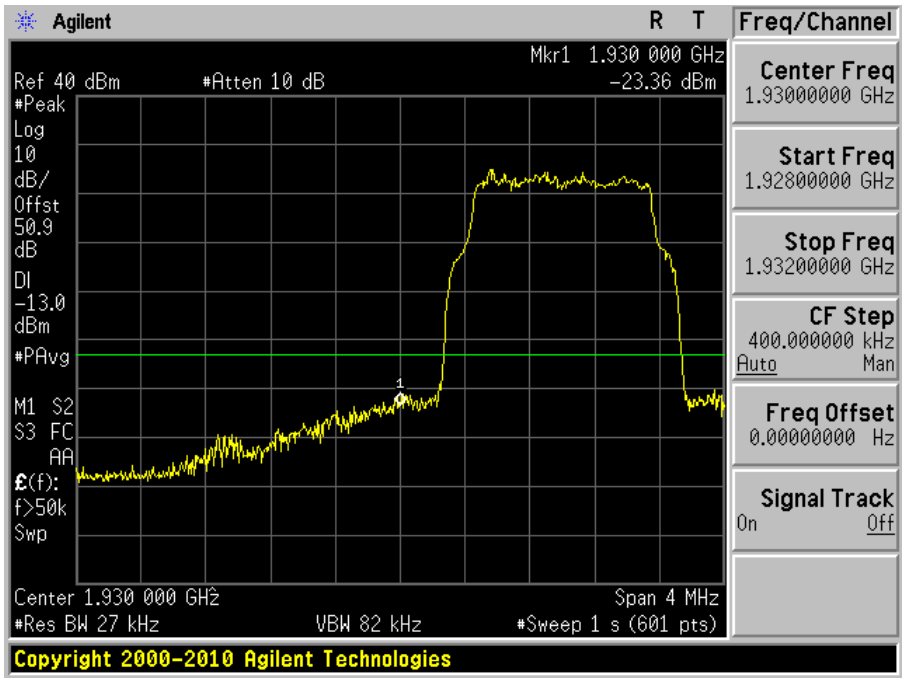


Plot 2: Highest Edge

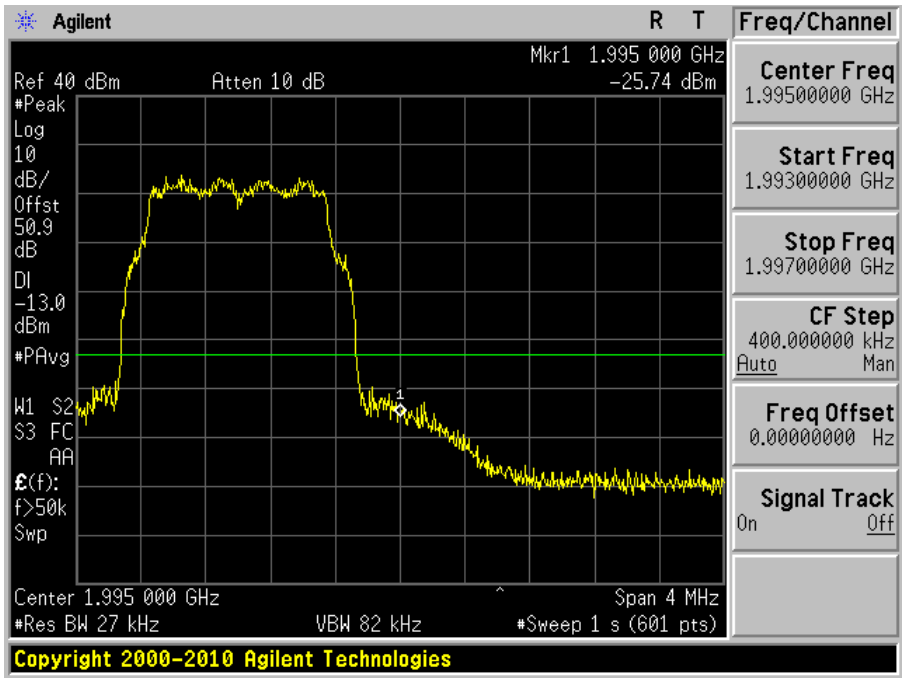


Modulation: 64QAM (1.4 MHz):

Plot 1: Lowest Edge

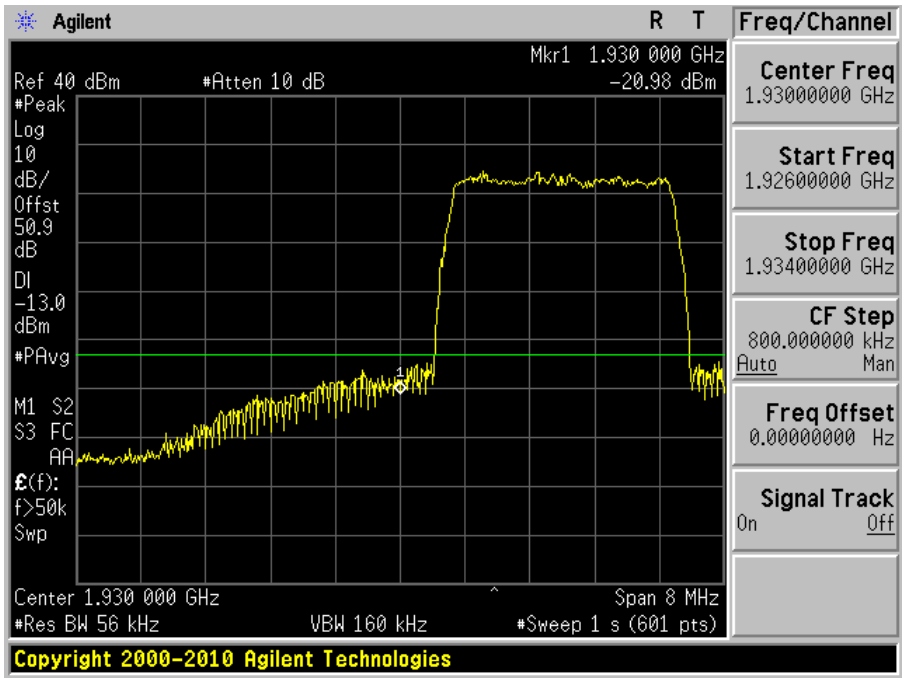


Plot 2: Highest Edge

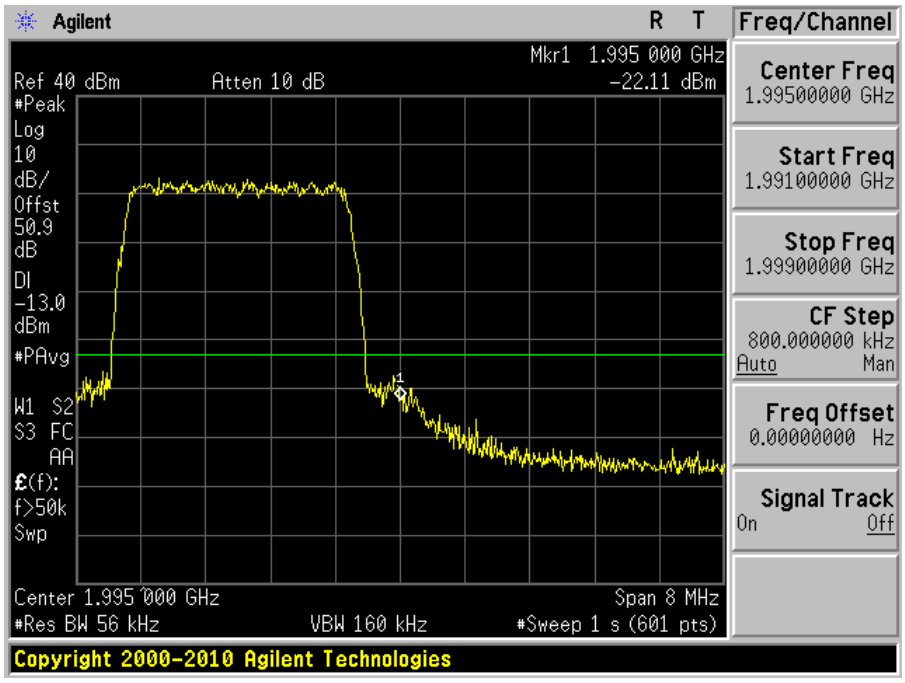


Modulation: QPSK (3 MHz):

Plot 1: Lowest Edge

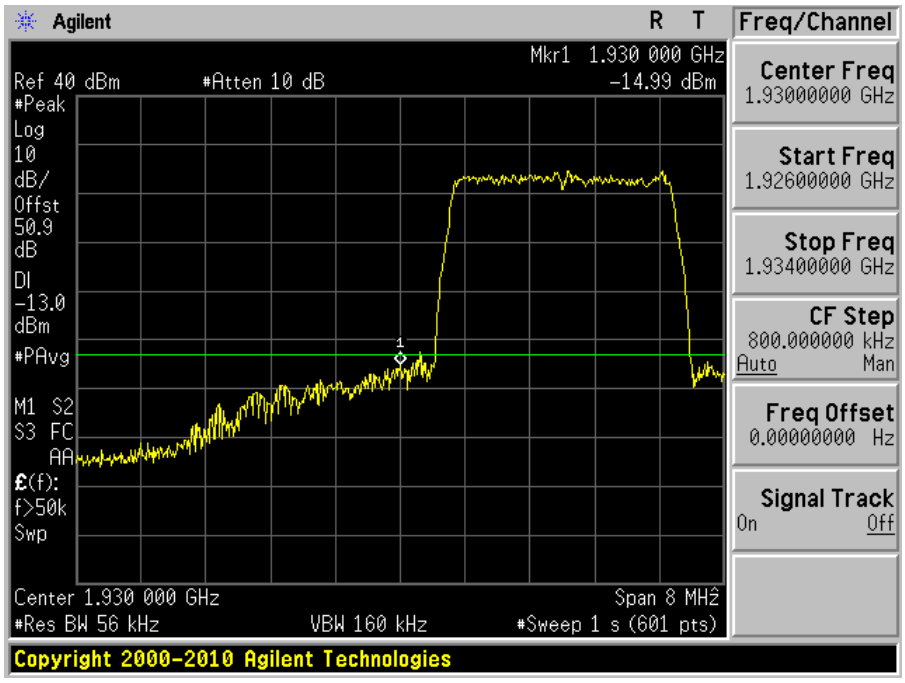


Plot 2: Highest Edge

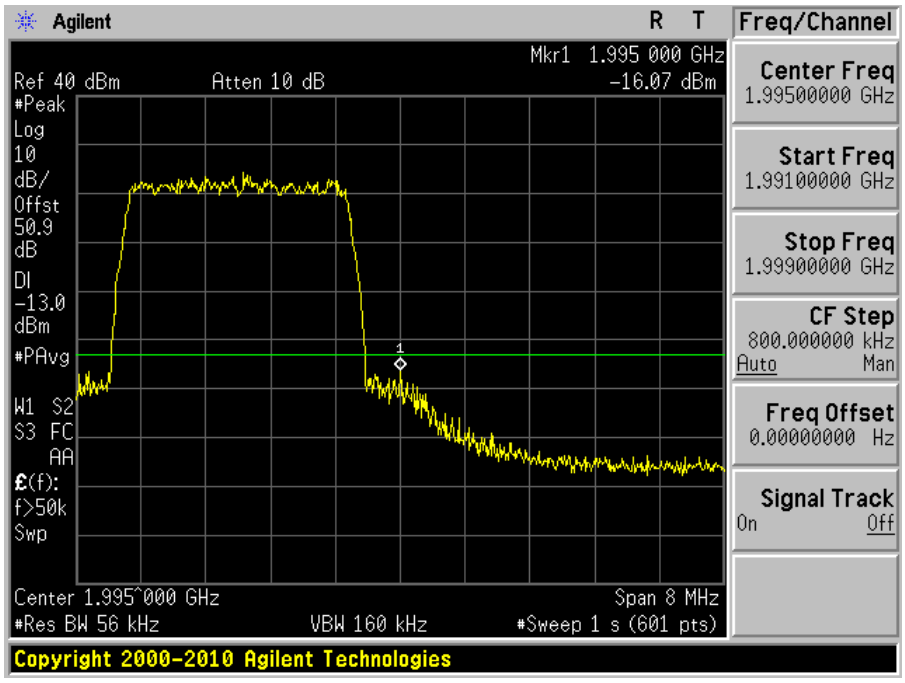


Modulation: 16QAM (3 MHz):

Plot 1: Lowest Edge

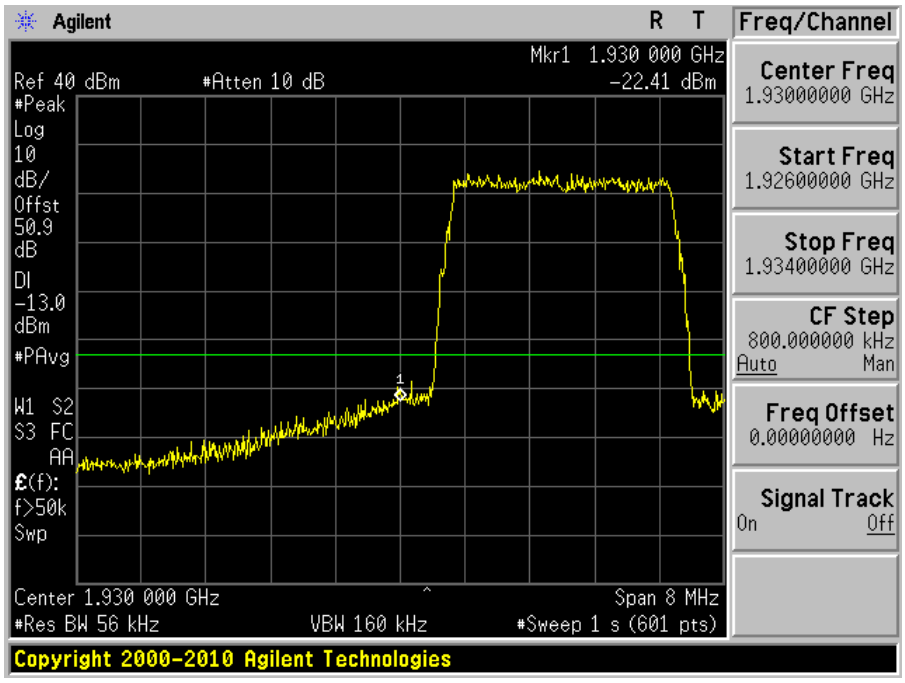


Plot 2: Highest Edge

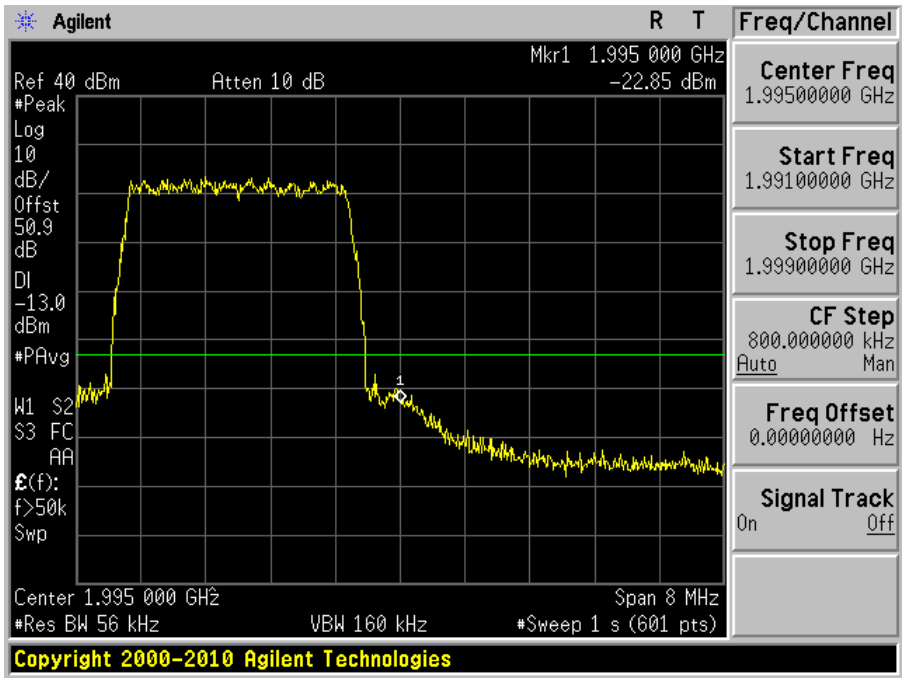


Modulation: 64QAM (3 MHz):

Plot 1: Lowest Edge

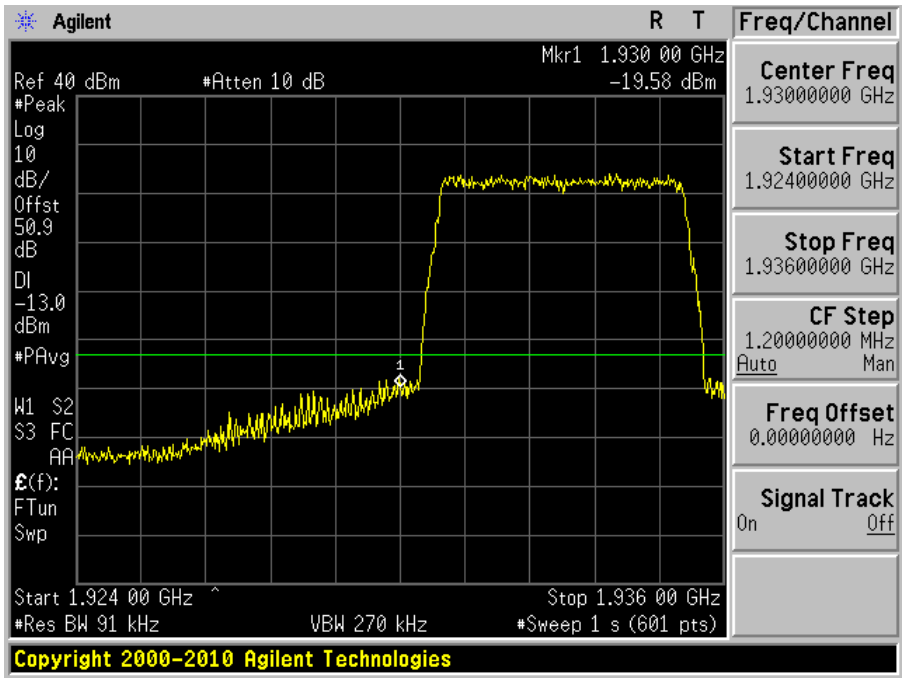


Plot 2: Highest Edge

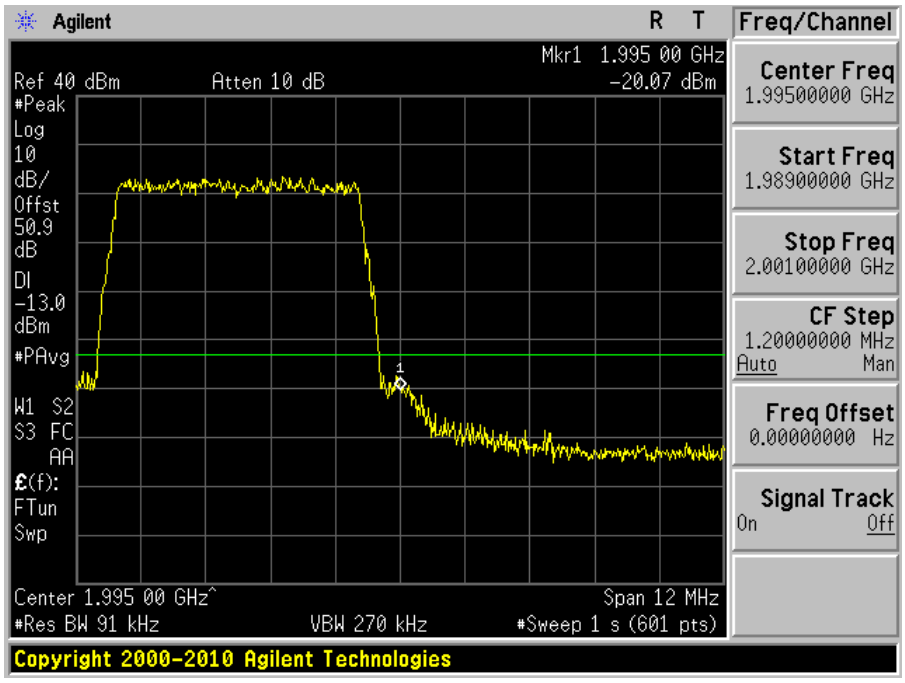


Modulation: QPSK (5 MHz):

Plot 1: Lowest Edge

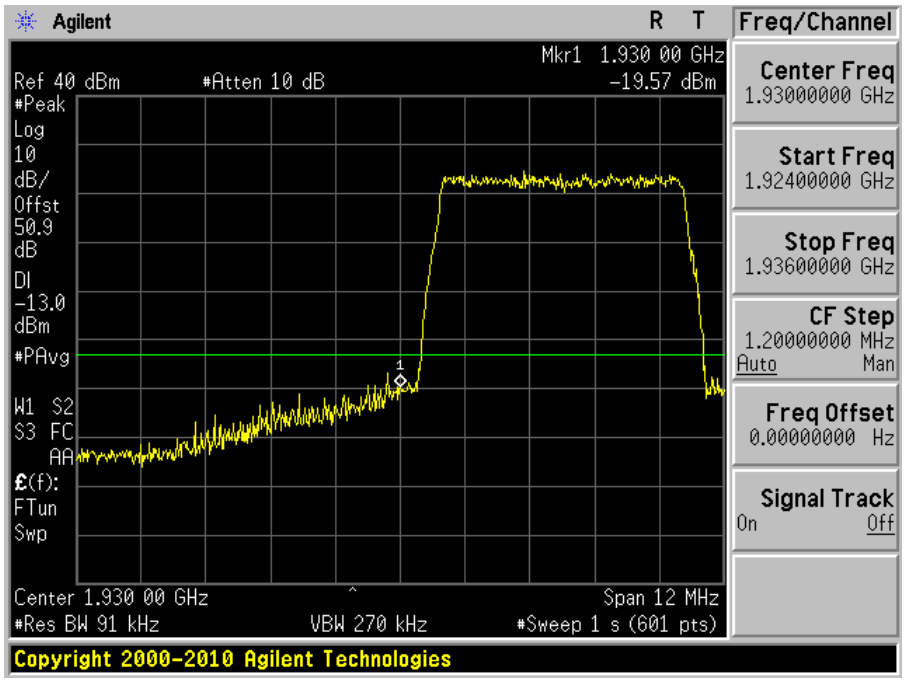


Plot 2: Highest Edge

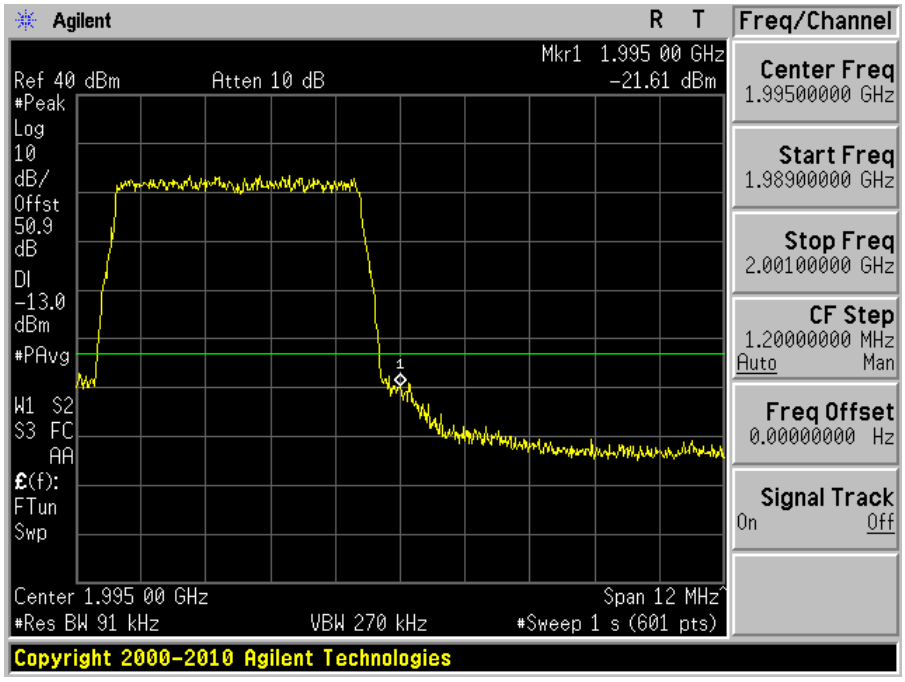


Modulation: 16QAM (5 MHz):

Plot 1: Lowest Edge

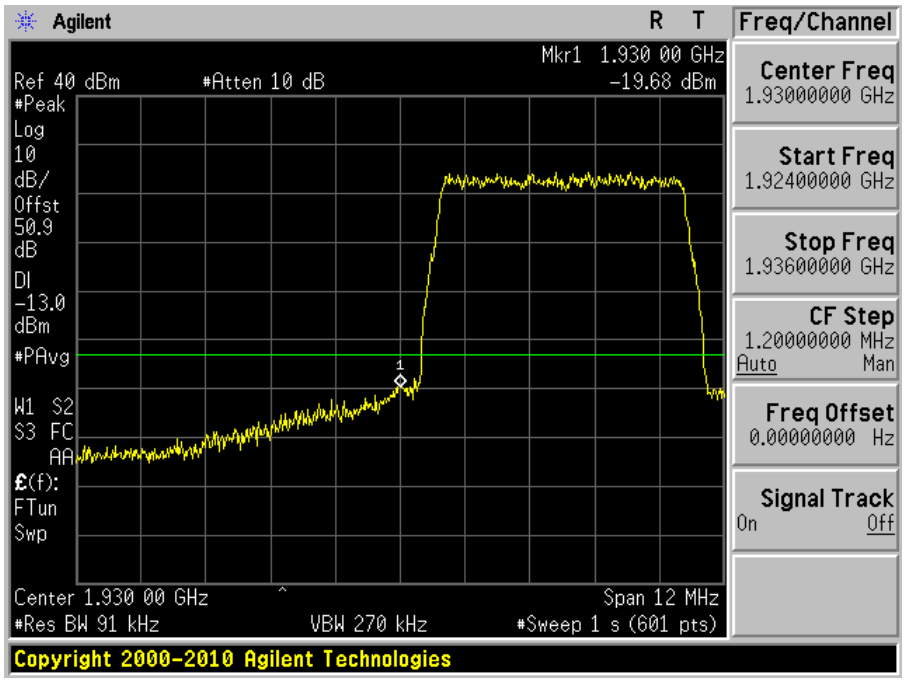


Plot 2: Highest Edge

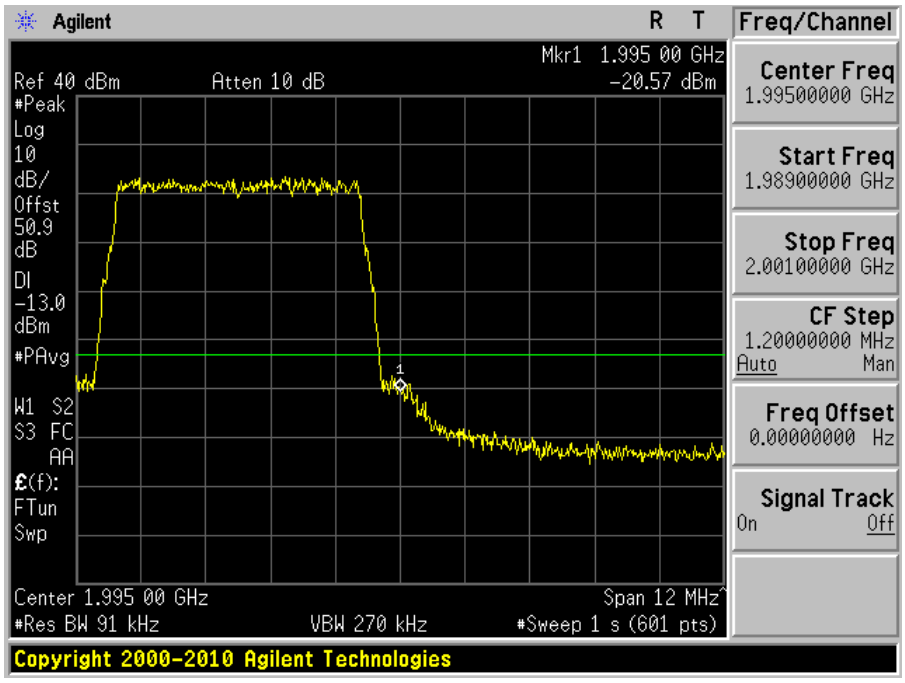


Modulation: 64QAM (5 MHz):

Plot 1: Lowest Edge

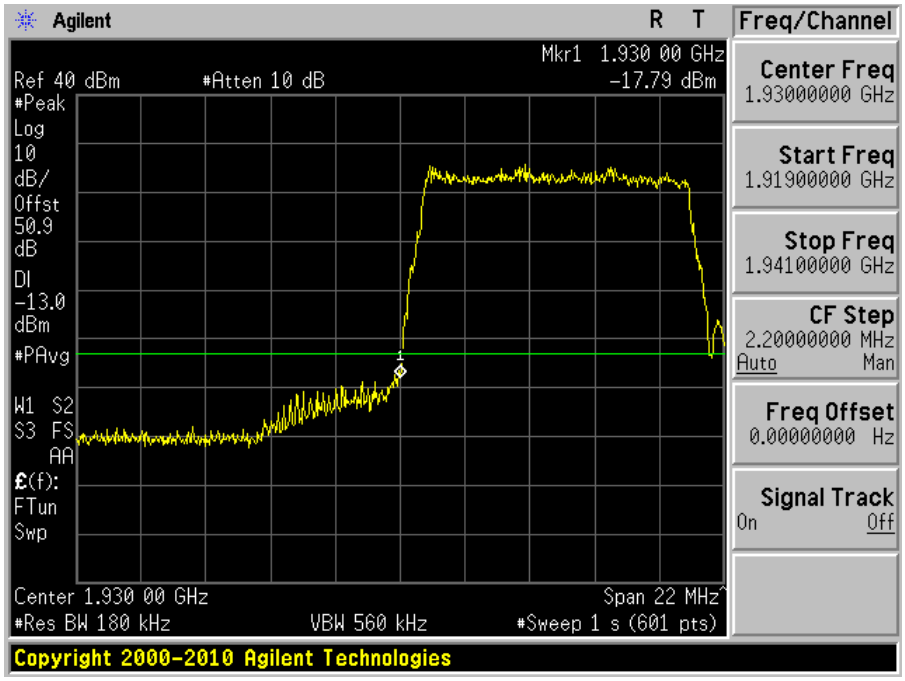


Plot 2: Highest Edge

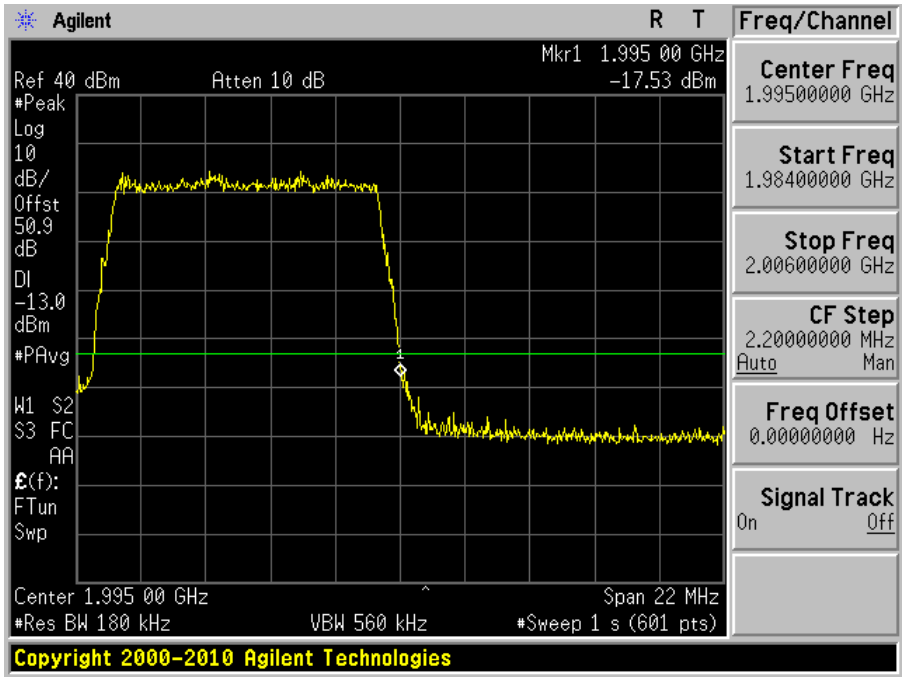


Modulation: QPSK (10 MHz):

Plot 1: Lowest Edge

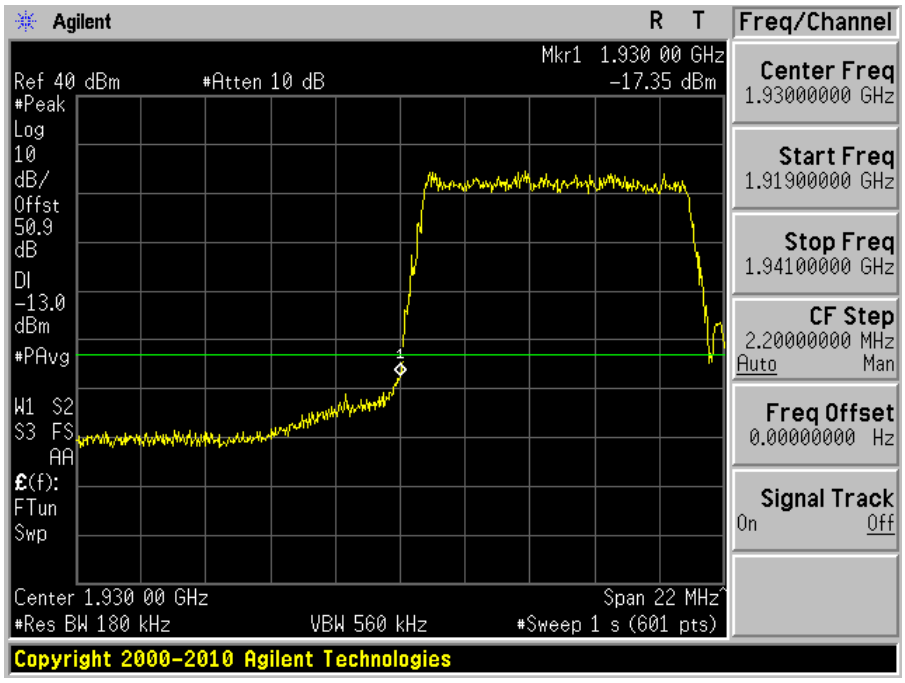


Plot 2: Highest Edge

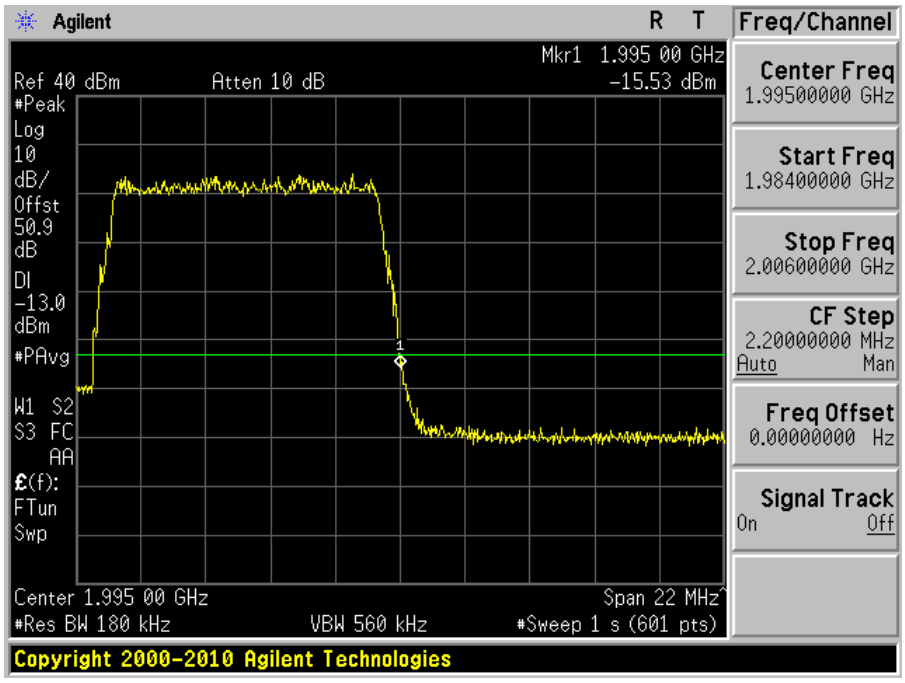


Modulation: 16QAM (10 MHz):

Plot 1: Lowest Edge

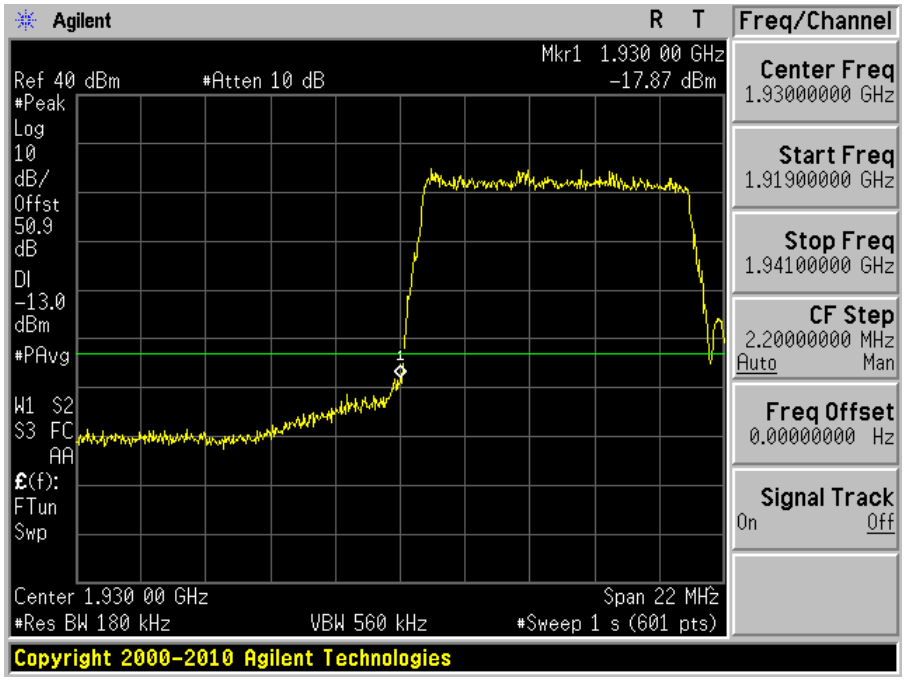


Plot 2: Highest Edge

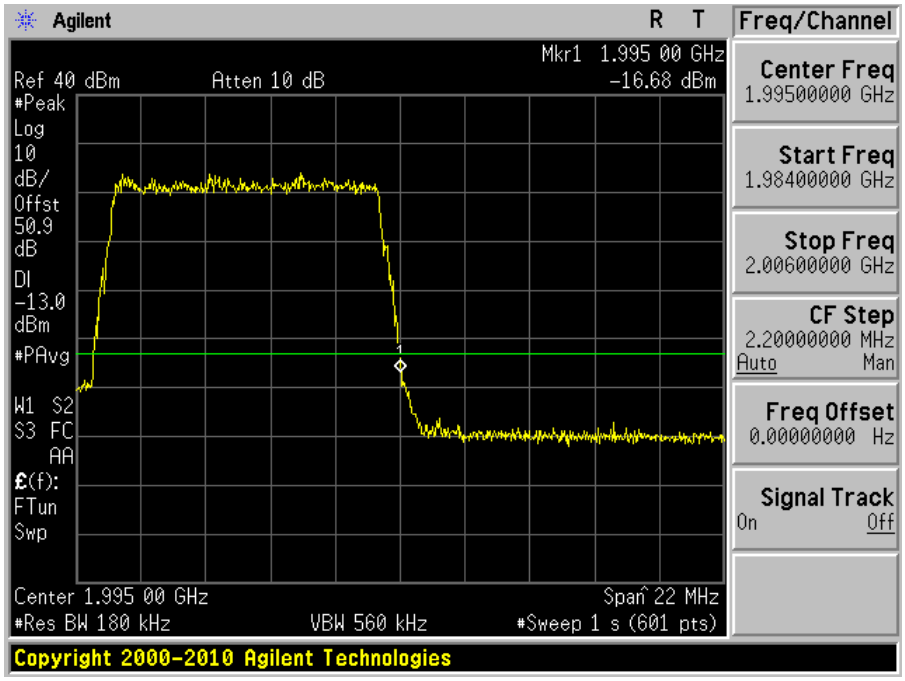


Modulation: 64QAM (10 MHz):

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^2)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*($900/f^2$)	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):	30.46
Maximum peak output power at antenna input terminal (mW):	1111.73
Prediction distance (cm):	20
Prediction frequency (MHz):	1880
Antenna Gain, typical (dBi):	12
Maximum Antenna Gain (numeric):	15.85
Power density at predication frequency and distance (mW/cm^2):	3.51
MPE limit for controlled exposure at predication frequency (mW/cm^2):	5

PCS Band DL:

Maximum peak output power at antenna input terminal (dBm):	30.62
Maximum peak output power at antenna input terminal (mW):	1153.45
Prediction distance (cm):	20
Prediction frequency (MHz):	1960
Antenna Gain, typical (dBi):	12
Maximum Antenna Gain (numeric):	15.85
Power density at predication frequency and distance (mW/cm^2):	3.64
MPE limit for controlled exposure at predication frequency (mW/cm^2):	5

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

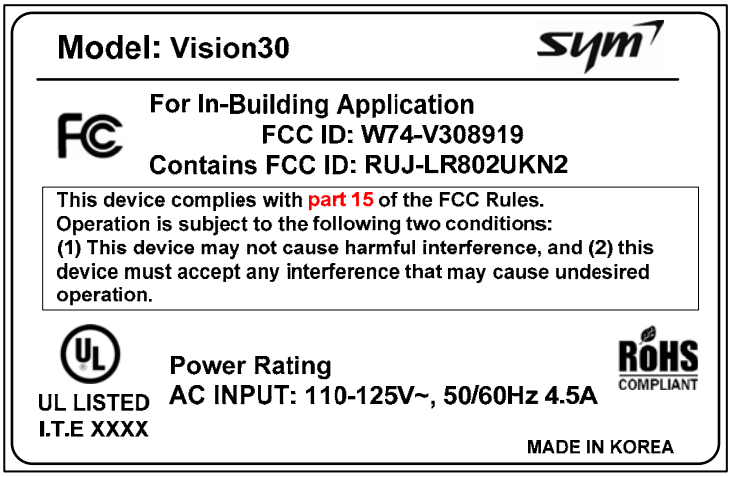
(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(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

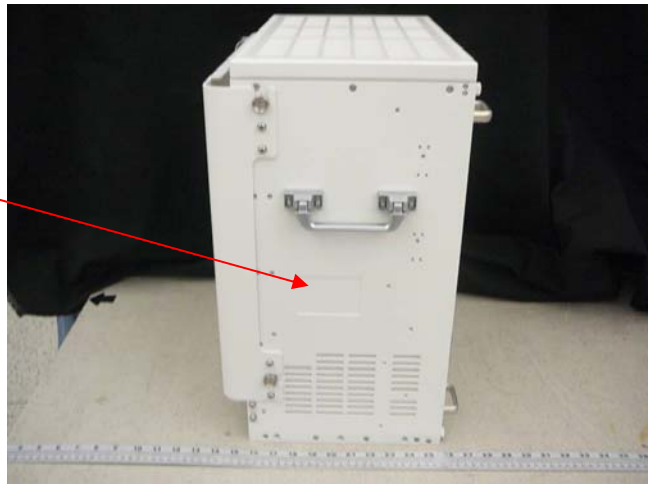
FCC ID: XXX-XXXXXX

10.2 FCC ID Label Content



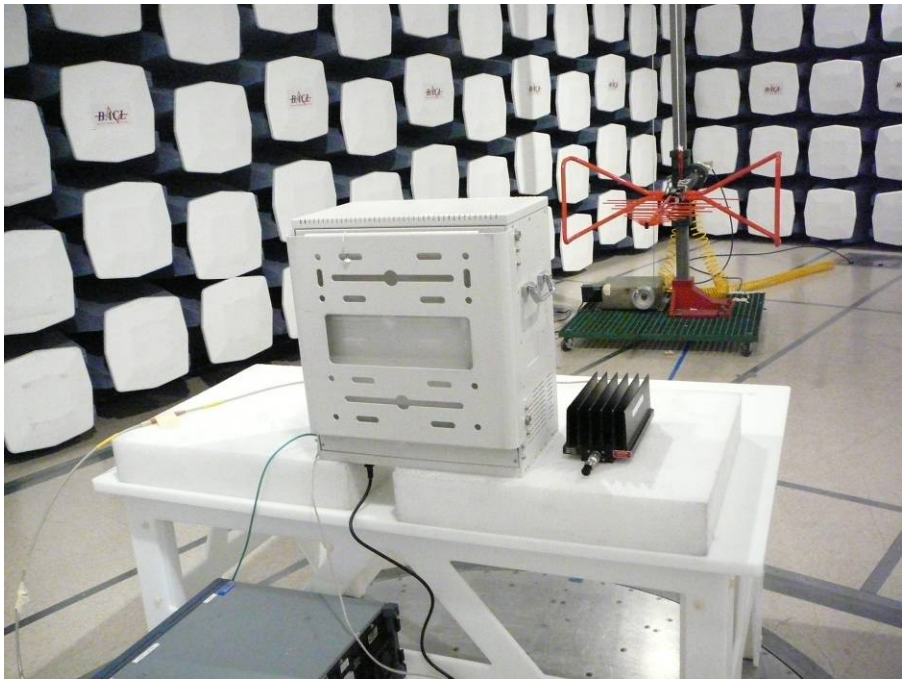
10.3 FCC Label Location on EUT

Label here

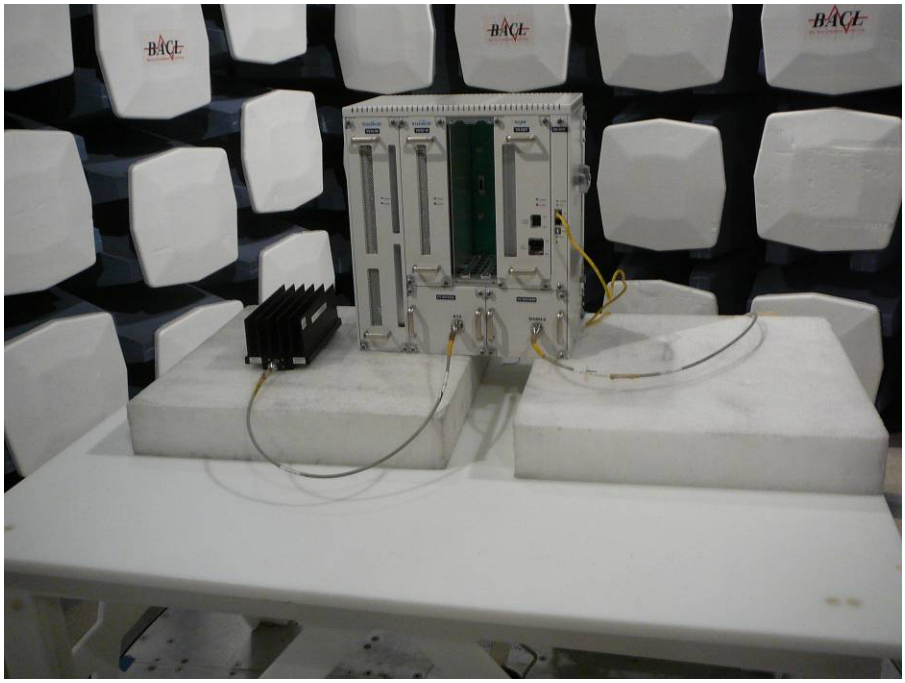


11 EXHIBIT B - TEST SETUP PHOTOGRAPHS

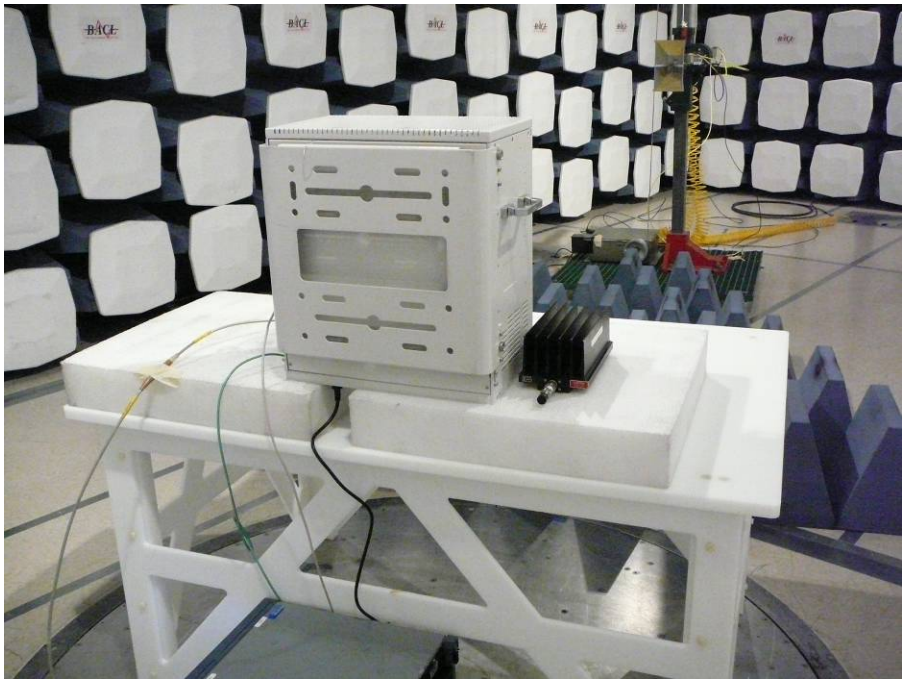
11.1 Radiated Emissions – Rear View (Below 1 GHz)



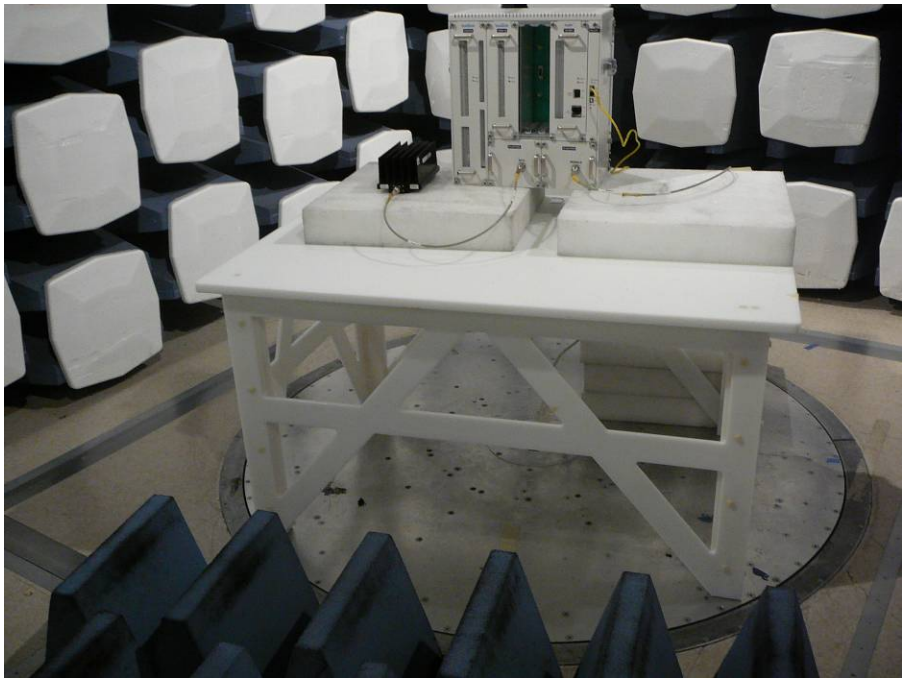
11.2 Radiated Emissions - Front View (Below 1 GHz)



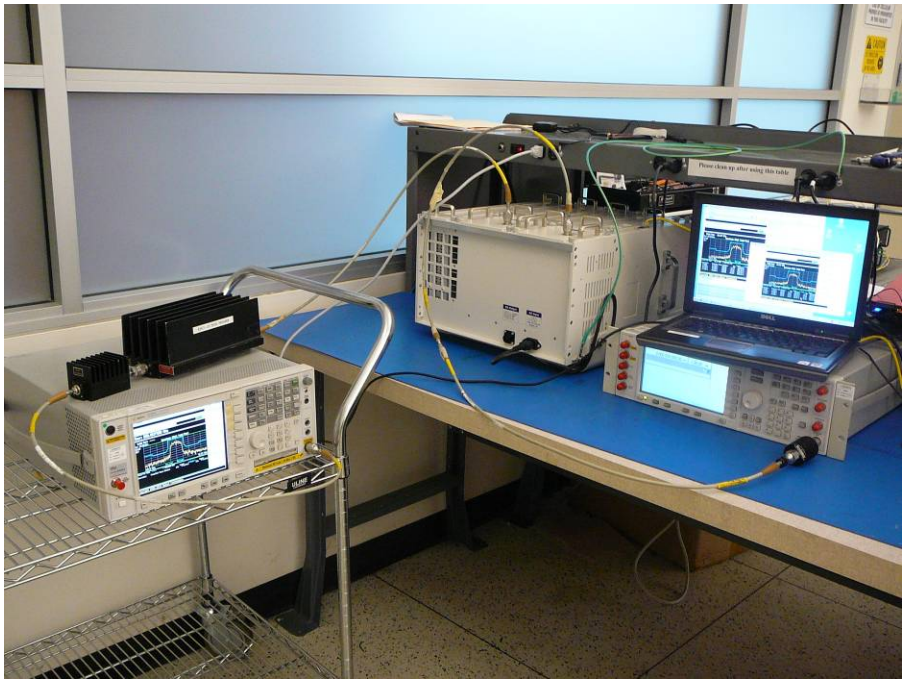
11.3 Radiated Emissions - Rear View (Above 1 GHz)



11.4 Radiated Emissions - Front View (Above 1 GHz)



11.5 Bench Setup View

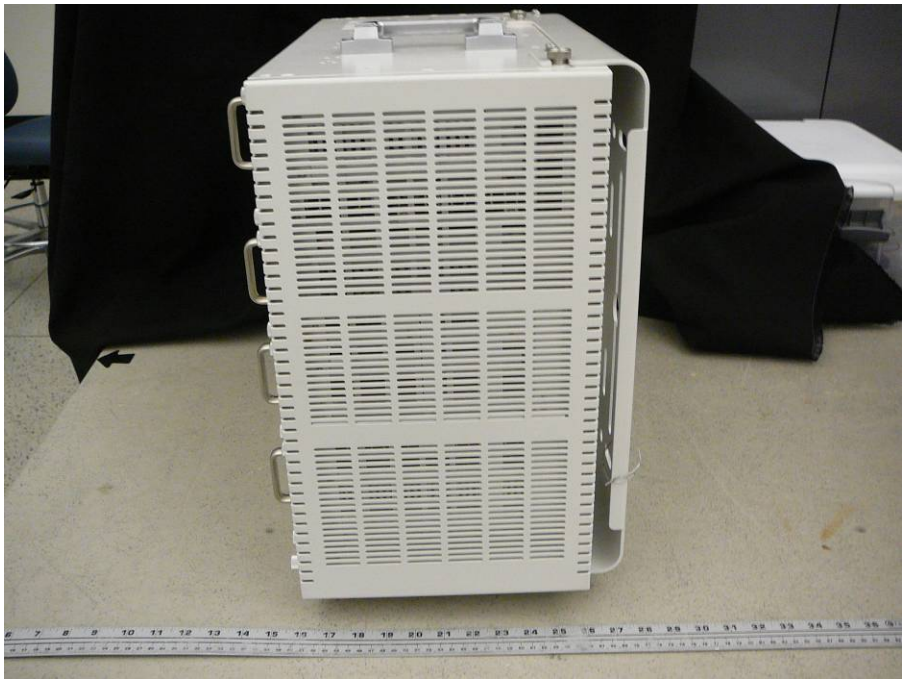


12 EXHIBIT C - EUT PHOTOGRAPHS

12.1 EUT-Main Frame Enclosure Front View

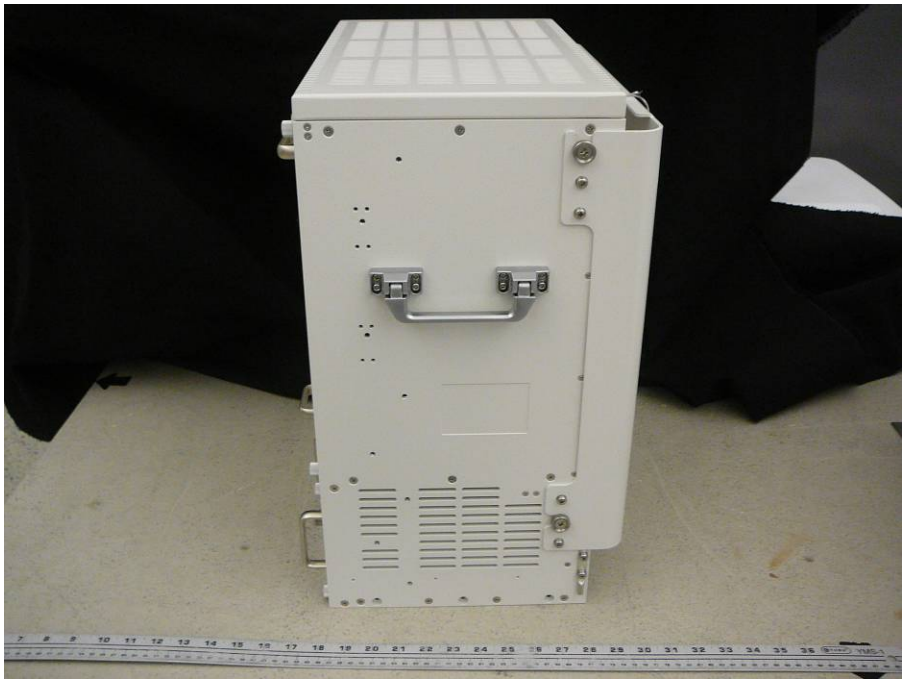
12.2 EUT-Main Frame Enclosure Rear View

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

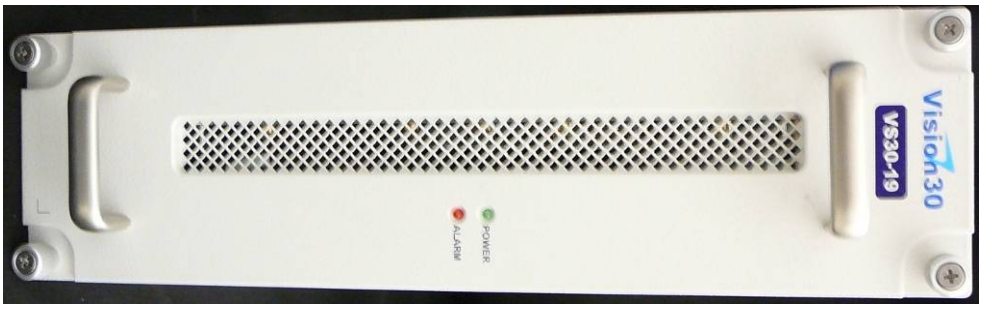


12.6 EUT-Main Frame Enclosure Right Side View

12.7 EUT-Main Frame Enclosure Open View 1

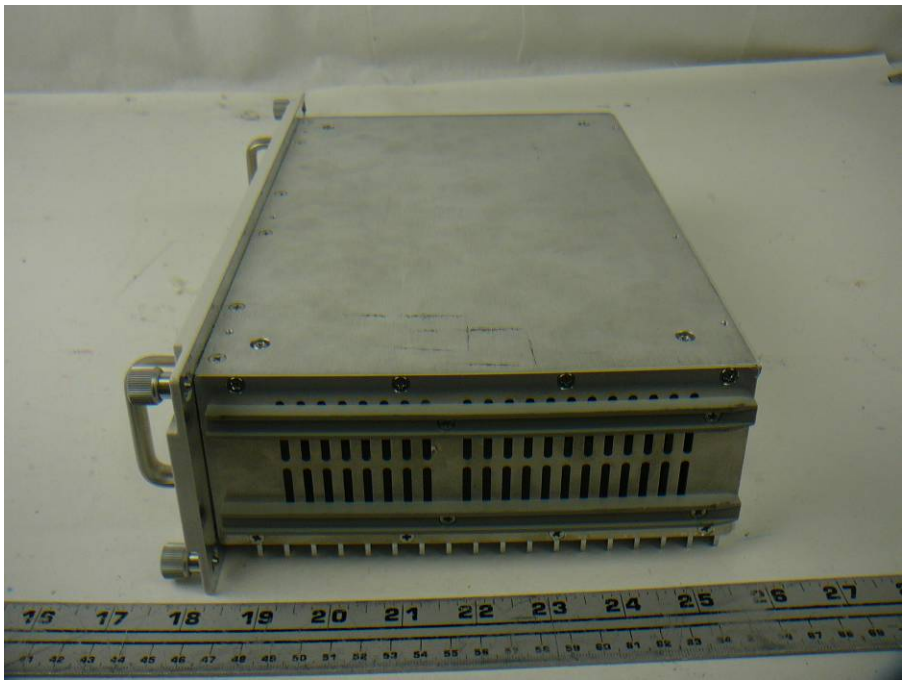
12.8 EUT-Main Frame Enclosure Open View 2

12.9 Vision30 1900MHz Service Card Front View

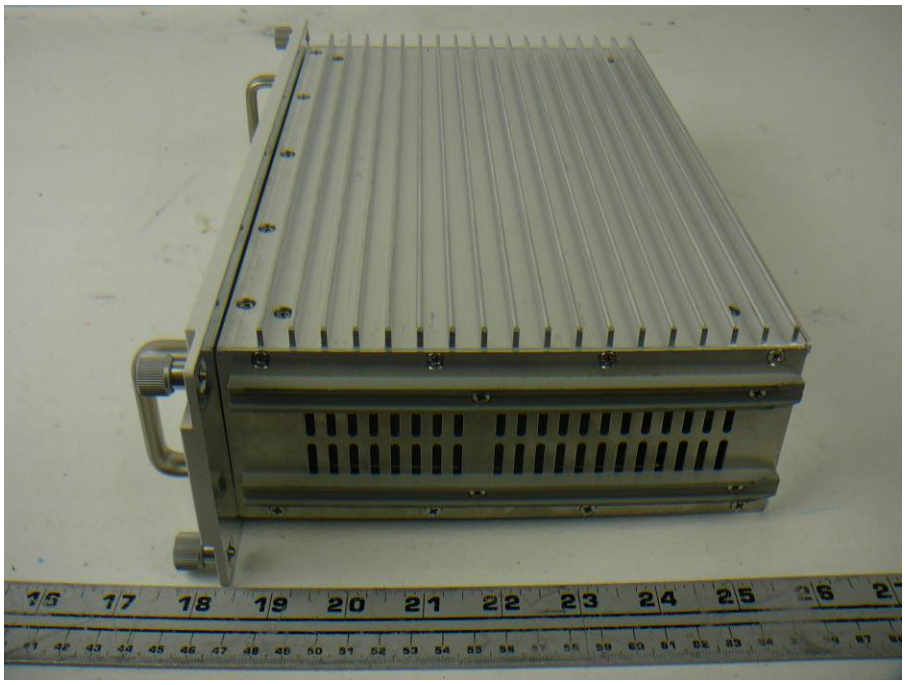


12.10 Vision30 1900MHz Service Card Rear View

12.11 Vision30 1900MHz Service Card Top View



12.12 Vision30 1900MHz Service Card Bottom View



12.13 Vision30 Filter and Combiner BTS Front View

12.14 Vision30 Filter and Combiner BTS Rear View

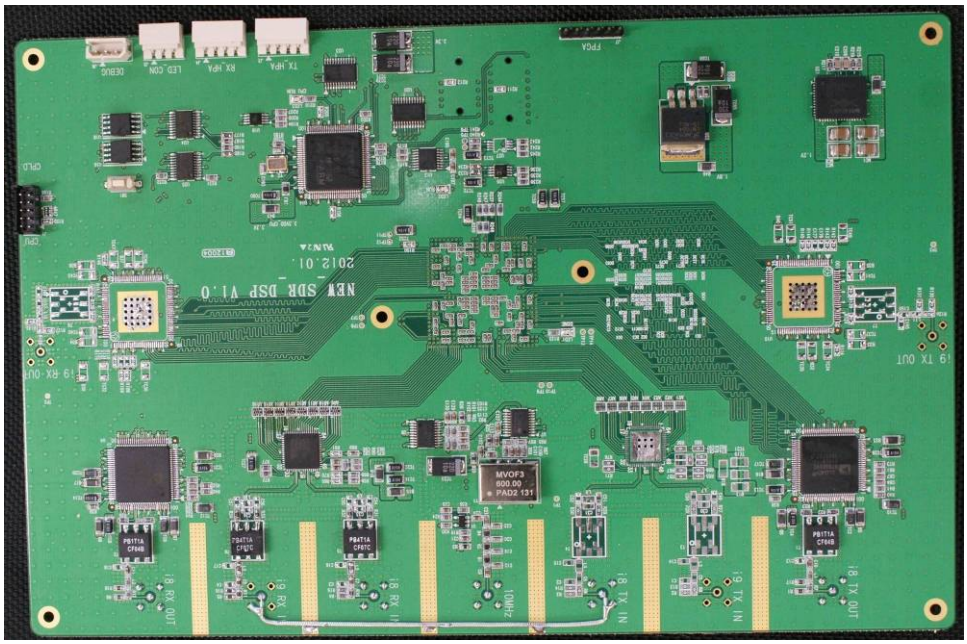
12.15 Vision30 Filter and Combiner Mobile Front View

12.16 Vision30 Filter and Combiner Mobile Rear View

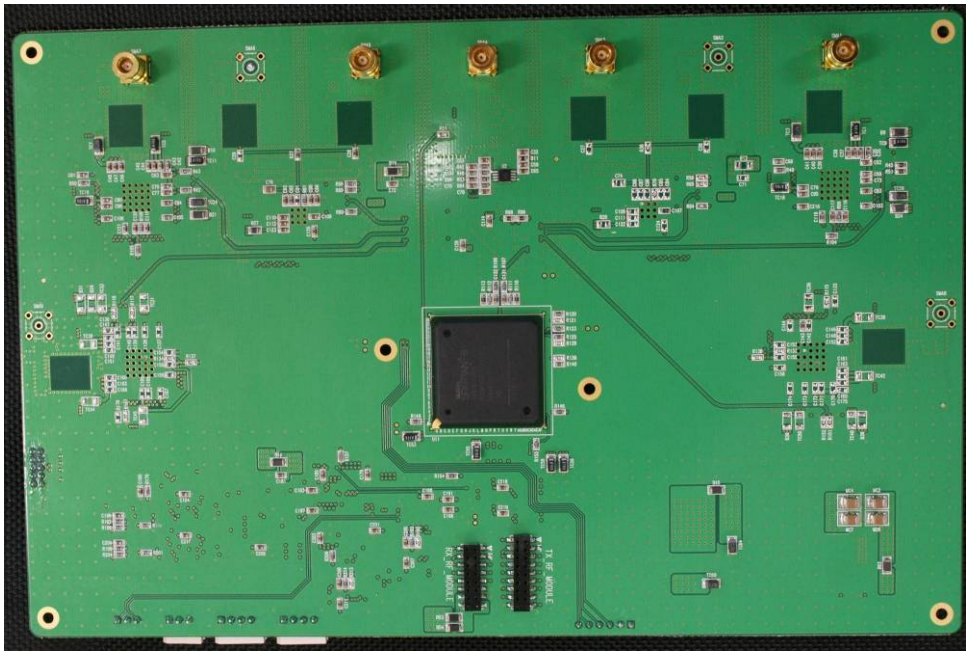
12.17 Vision30 Rectifier (Power Supply) Front View

12.18 Vision30 Network Controller Front View

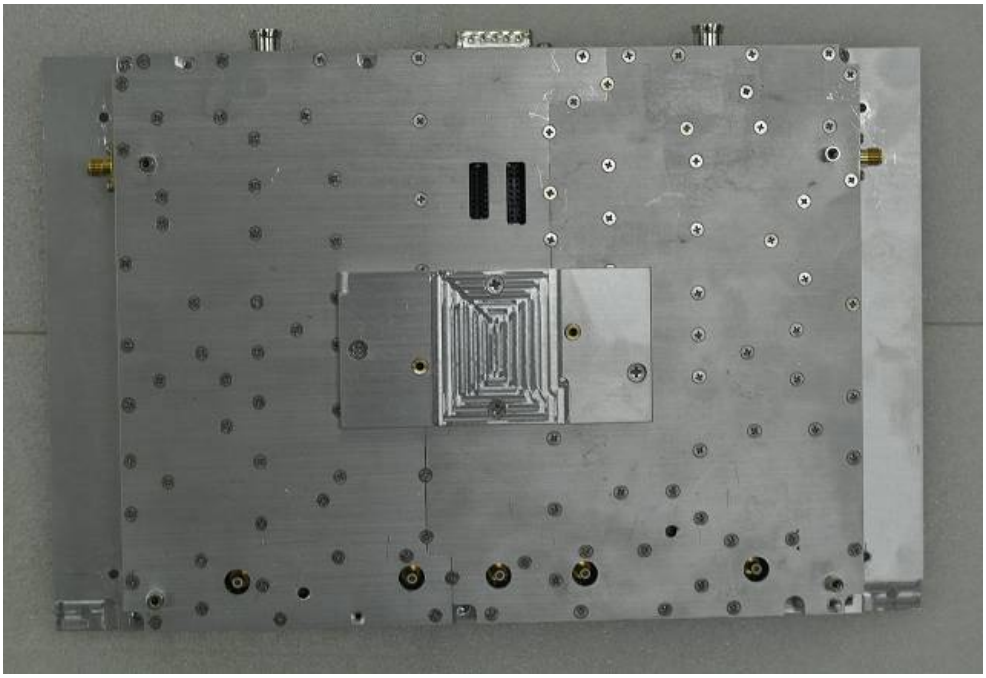
12.19 Vision30 1900MHz Service Card Digital Unit PCB Top View



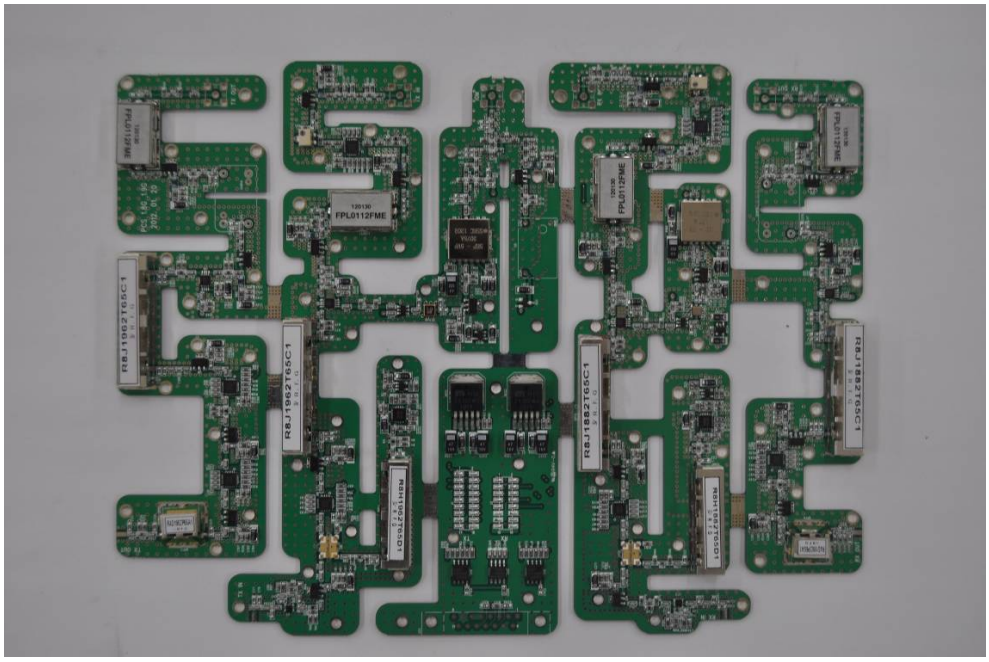
12.20 Vision30 1900MHz Service Card Digital Unit PCB Bottom View



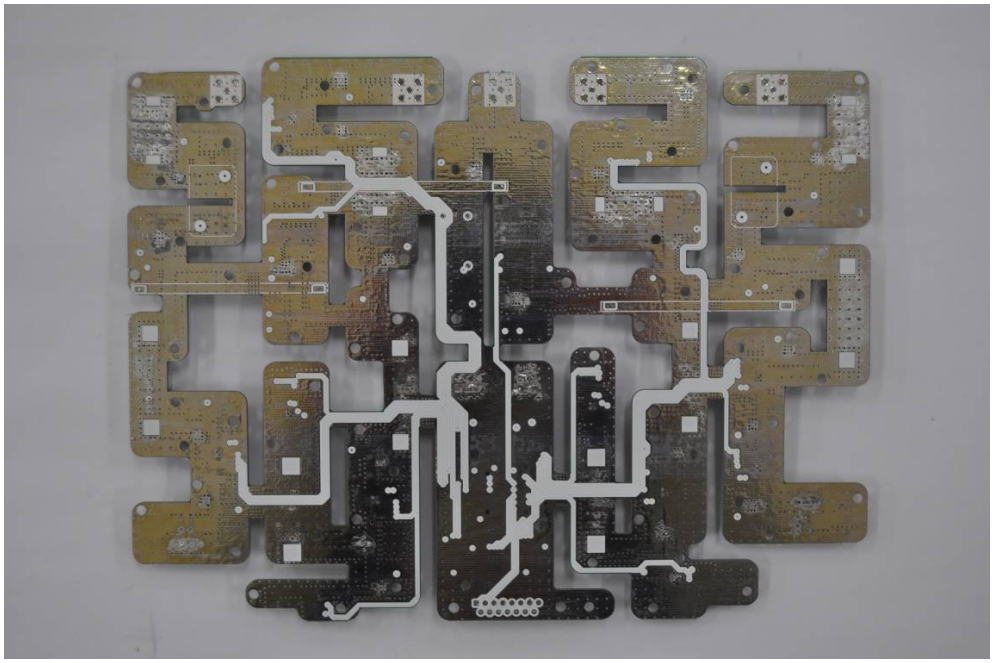
12.21 Vision30 1900MHz Service Card RF Unit Shielded View



12.22 Vision30 1900MHz Service Card RF Unit PCB Top View

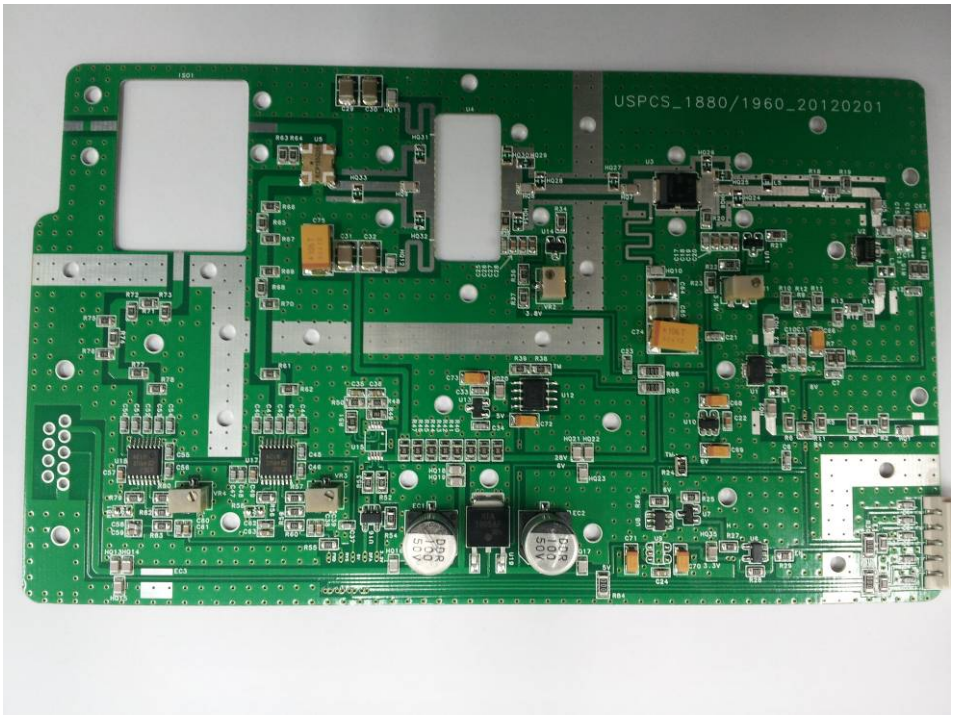


12.23 Vision30 1900MHz Service Card RF Unit PCB Bottom View

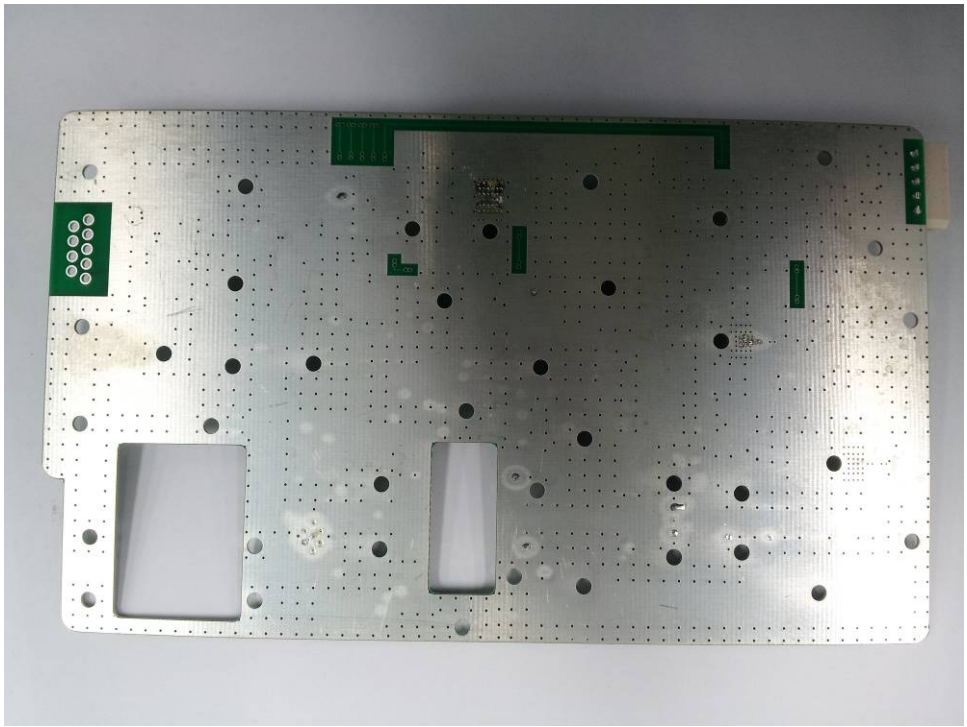


12.24 Vision30 1900MHz Service Card HPA Shielded View

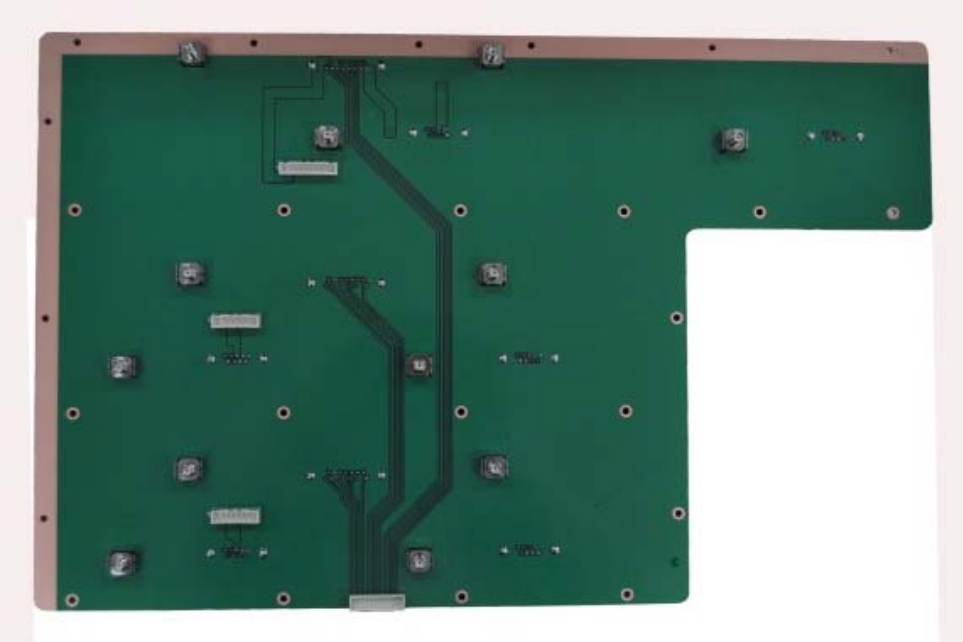
12.25 Vision30 1900MHz Service Card HPA PCB Top View



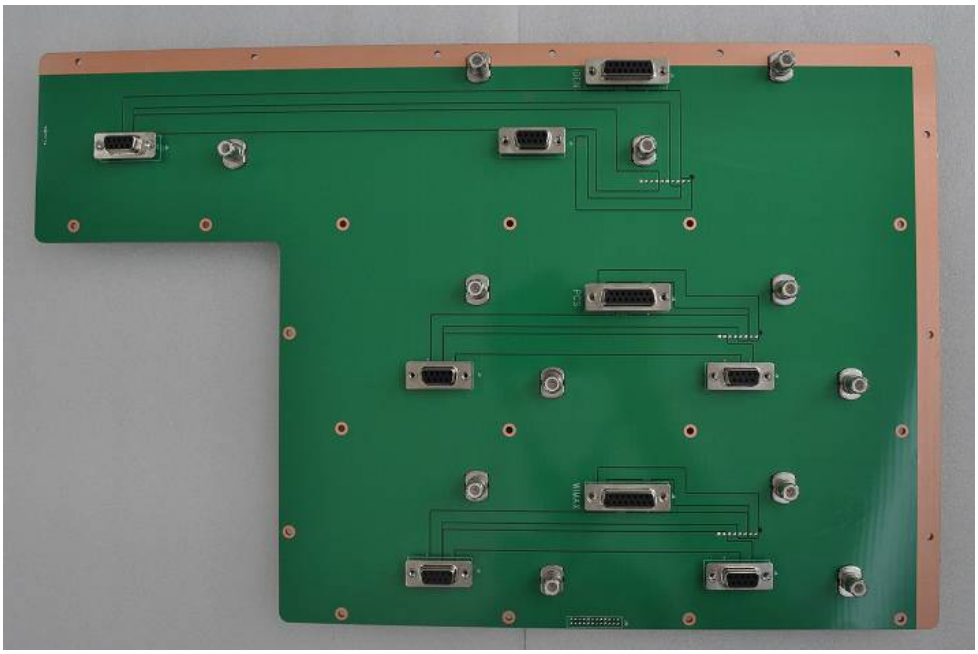
12.26 Vision30 1900MHz Service Card HPA PCB Bottom View



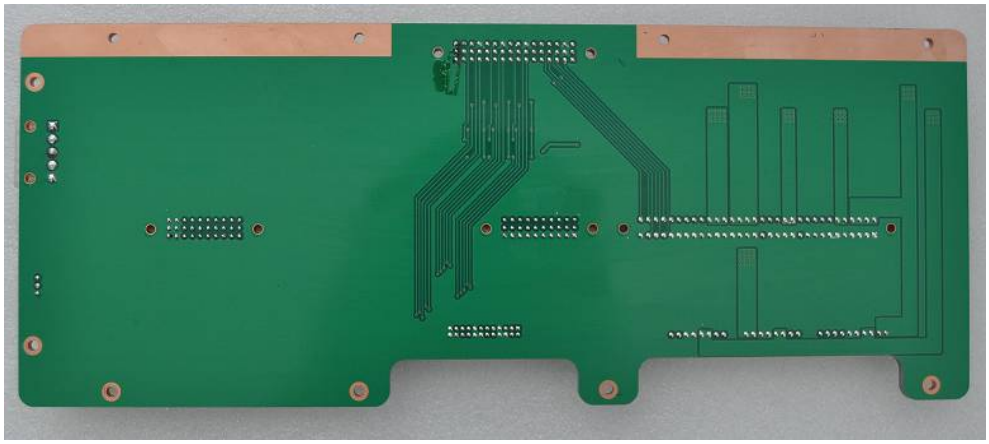
12.27 Main Frame PCB 1 Top View



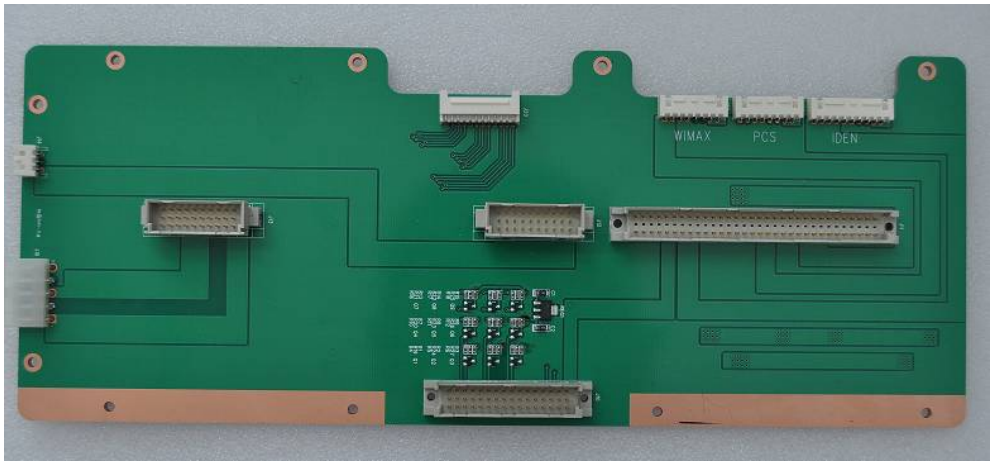
12.28 Main Frame PCB 1 Bottom View



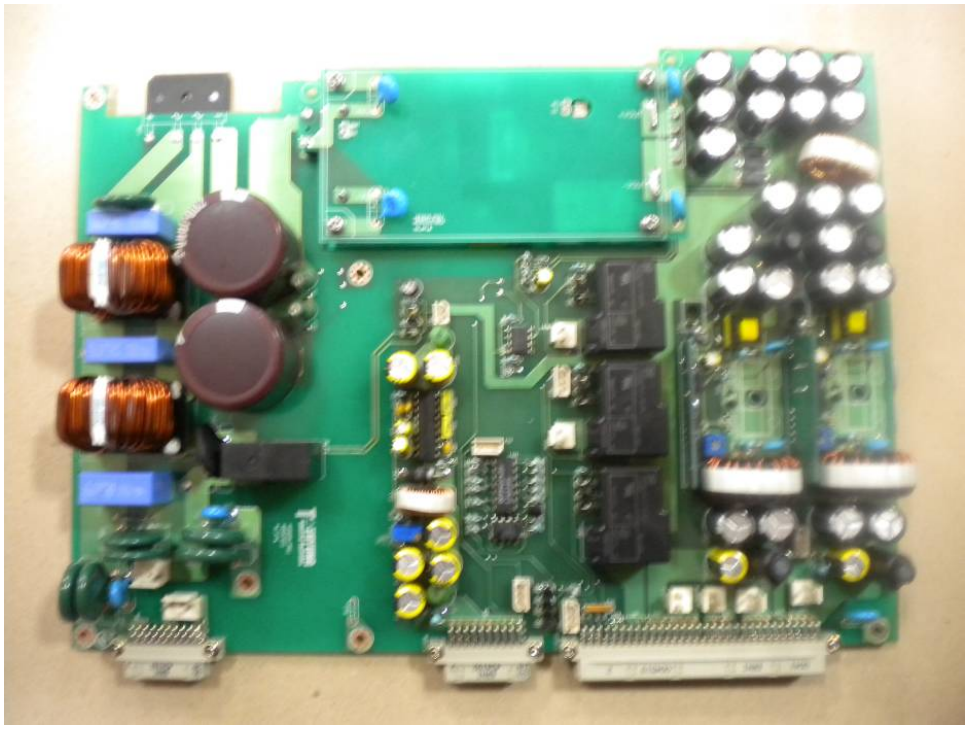
12.29 Main Frame PCB 2 Top View



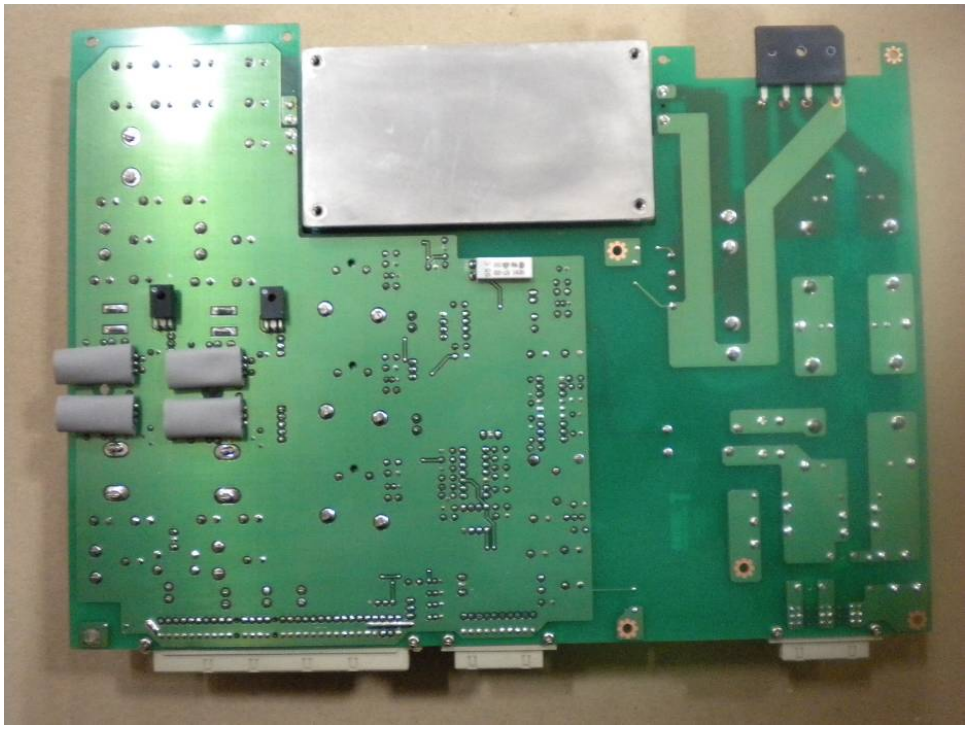
12.30 Main Frame PCB 2 Bottom View



12.31 Vision30 Rectifier PCB Top View

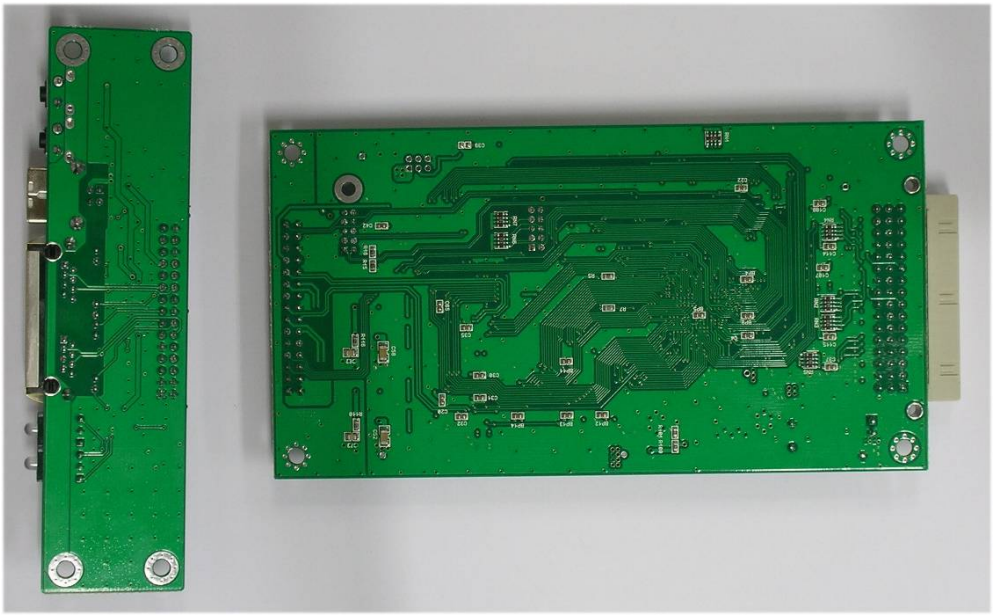


12.32 Vision30 Rectifier PCB Bottom View



12.33 Vision30 Network Controller PCB Top View

12.34 Vision30 Network Controller PCB Bottom View



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