Lab Code: 200167-0

FCC PART 27

TEST AND MEASUREMENT REPORT

For

ADC Telecommunications Inc.

P.O. Box 1101, Minneapolis,

Minnesota United States 55440-1101

FCC ID: NOO-F0693-011

Report Type:	**Product Type:**
Original Report	Wireless Network System

Test Engineer:	Victor Zhang
Report Number:	R0908317-27
Report Date:	2009-09-29
Reviewed By:	Boni Baniqued Senior RF Engineer
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0908317-27	Original Report	2009-09-29

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *ADC Telecommunications, Inc.* FCC ID: NOO-F0693-011, Models: Main Hub (FSN-W2-MH-2), EHUB (FSN-W1-EH-2), RAU (FSN-W2-7021-1) or the "EUT" as referred to in this report is a wireless network system. It is an intelligent fiber optics/CATV, multi-band (frequencies) wireless networking system designed to handle both wireless voice and data communications over licensed frequencies. It provides high-quality, ubiquitous, seamless access to the wireless network in larger buildings.
It is an easy-to-deploy Double-star architecture with just three types of components: A Main Hub that receives its radio frequency (RF) signals from a Flex Wave™ Focus system, a base station or a repeater; up to 4- Expansion Hubs that connect to the Main Hub via single mode or multimode fiber optics; and up to 32- Remote Access Units (RAUs) that connect to the Expansion Hub via CATV cabling. Each RAU sends and receives RF signals to wireless devices located within its coverage area. Administration is web-based. And the system is operating in the frequency bands listed below with the protocol of LTE and WCDMA:

1. DL:746-757 MHz; UL:776-787 MHz
2. DL:728-746 MHz; UL:698-716 MHz
3. DL:2100-2155 MHz; UL:1710-1755 MHz

1.2 Mechanical Description

Model: FSN-W2-MH-2 (Main Hub) measures approximately 381 mm **(L)** x 438 mm **(W)** x 89 mm **(H)**, and weighs approximately 5.5 kg.

Model: FSN-W1-EH-2 (EHUB) measures approximately 381 mm **(L)** x 438 mm **(W)** x 89 mm **(H)**, and weighs approximately 6.6 kg.

Model: FSN-W2-7021-1 (RAU) measures approximately 281 mm **(L)** x 286 mm **(W)** x 54 mm **(H)**, and weighs approximately 2.1 kg.

**The test data gathered are from production sample, serial number: MR220X3L (Main Hub), MR2200M0 (Expansion Hub), and MR220XLG (RAU) provided by the manufacturer.*

1.3 EUT Photo

FSN-W2-MH-2 (Main Hub)

FSN-W1-EH-2 (Expansion HUB)

Please refer to Exhibit C for more EUT photographs.

1.4 Objective

This type approval report is prepared on behalf of ADC Telecommunications, Inc. in accordance with Part 2, Subpart J, Part 27, Subpart E, of the Federal Communication Commissions rules.

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

1.5 Related Submittal(s)/Grant(s)

No Related Submittals

1.6 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 27 - Miscellaneous Wireless Communications Services

Applicable Standards: TIA EIA 98-C, TIA/EIA-603-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.

1.7 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.

1.8 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 sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and

December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

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 Local Support Equipment and Software List and Details

Manufacturer	Description	Model	Serial Number
Agilent	Vector Signal Generator	E4438C	MY47271125
Agilent	Signal Studio for 3GPP LTE	N7624B	-

2.5 Internal Configurations of EUT

RAU (FSN-W2-7021-1):

Manufacturer	Description	Model	Serial Number
LGC Wireless Inc.	PCB Assembly	740693-0 Rev: A	R0921M0473NC

Main Hub (FSN-W2-MH-2):

Manufacturer	Description	Model	Serial Number
LGC Wireless Inc.	PCB Board -1	720621-2 Rev: A	-
LGC Wireless Inc.	PCB Board -1	710622-1 Rev: A	R0905G0001NC
The Power Solution	AC/DC Power Supply	UP120PA-Q / Rev RD	-

EHUB (FSN-W1-EH-2):

Manufacturer	Description	Model	Serial Number
LGC Wireless Inc.	PCB Assembly	710640-0 / Rev D	R0824M0102NC
The Power Solution	AC/DC Power Supply	0815R0ZC-NTS359	-

2.6 Interface Ports and Cables

Cable Description	Length (m)	To	From
Shielded Cable (Fiber Optic)	1.5	Main Hub	Expansion Hub
75 ohm CATV cable	< 1	Main Hub	RAU
RF Cable	< 1	Main Hub/RAU	Spectrum Analyzer
RF Cable	< 1	Main Hub/RAU	Signal Generator

3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§ 2.1046, § 27.50 (i)	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	N/A
§ 2.1049 (h), § 27.53 (c)	Occupied Bandwidth	Compliant
§ 2.1053, § 27.53 (c)	Spurious Radiated Emissions	Compliant
§ 2.1051, § 27.53 (c)	Spurious Emissions at Antenna Terminals	Compliant
§ 27.53 (c)	Band Edge	Compliant
§ 2.1055, § 27.54	Frequency Stability	Compliant
§2.1091, §27.52	RF Exposure	Compliant

4 FCC §2.1046 & §27.50 – RF OUTPUT POWER

4.1 Applicable Standard

According to §27.50, the maximum effective radiated power (ERP) of fixed and base station must not exceed 1000 Watts.

4.2 Test Procedure

Conducted:

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

4.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	40-43 %
ATM Pressure:	101-103 kPa

** The testing was performed by Victor Zhang on from 2009-09-08 to 2009-09-18 in RF Site.*

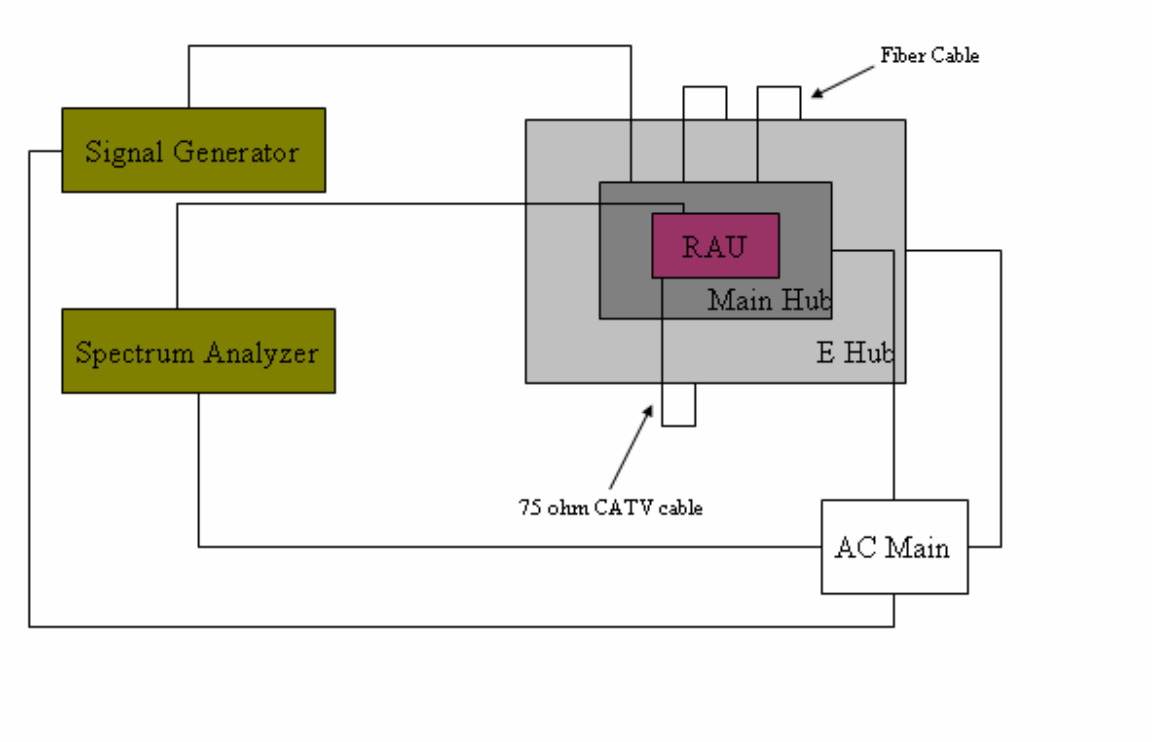
4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY45094317	2009-09-01

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

4.5 Test Setup Block Diagram

Bench Testing



4.6 Summary of Test Results

746-757 MHz / 776-787 MHz Band

Maximum Output Power (LTE)

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 746-757 MHz	QPSK	752	-2.97	11.19
	16QAM	752	-2.96	10.88
	64QAM	752	-2.86	11.06
Uplink 776-787 MHz	QPSK	782	-35	-21.56
	16QAM	782	-35	-22.46
	64QAM	782	-35	-22.72

728-746 MHz / 698-716 MHz Band

Maximum Output Power (LTE)

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 728-746 MHz	QPSK	733	-4.53	10.98
	QPSK	741	-4.49	10.84
	16QAM	733	-4.40	10.58
	16QAM	741	-4.43	10.43
	64QAM	733	-4.32	10.57
	64QAM	741	-4.33	10.49
Uplink 698-716 MHz	QPSK	703	-35.00	-20.78
	QPSK	711	-35.01	-20.62
	16QAM	703	-35.01	-21.77
	16QAM	711	-35.03	-21.55
	64QAM	703	-35.01	-22.04
	64QAM	711	-35.08	-21.77

Maximum Output Power (WCDMA)

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 728-746 MHz	WCDMA	730.4	-3.66	10.92
	WCDMA	737.0	-4.69	10.61
	WCDMA	743.6	-3.80	10.98
Uplink 698-716 MHz	WCDMA	700.4	-33.78	-19.85
	WCDMA	707.0	-33.63	-19.26
	WCDMA	713.6	-33.68	-19.43

2110-2155 MHz / 1710-1755 MHz Band

Maximum Output Power (LTE)

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 2110-2155 MHz	QPSK	2115	1.75	14.91
	QPSK	2125	1.76	15.11
	QPSK	2150	-0.45	14.72
	16QAM	2115	1.73	15.05
	16QAM	2125	1.69	15.34
	16QAM	2150	-0.50	14.64
	64QAM	2115	1.80	14.57
	64QAM	2125	1.82	15.17
	64QAM	2150	-0.31	14.74
Uplink 1710-1755 MHz	QPSK	1715	-33.24	-20.78
	QPSK	1725	-34.31	-20.65
	QPSK	1750	-34.38	-22.90
	16QAM	1715	-33.26	-21.63
	16QAM	1725	-34.37	-21.47
	16QAM	1750	-34.39	-23.76
	64QAM	1715	-33.32	-22.04
	64QAM	1725	-34.35	-22.12
	64QAM	1750	-34.40	-24.06

Maximum Output Power (WCDMA)

Mode	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Downlink 2110-2155 MHz	WCDMA	2112.4	1.09	14.85
	WCDMA	2132.4	0.10	14.83
	WCDMA	2152.6	-0.98	14.31
Uplink 1710-1755 MHz	WCDMA	1712.4	-32.15	-19.88
	WCDMA	1732.4	-32.16	-19.85
	WCDMA	1752.6	-32.09	-21.67

5 FCC §2.1047 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to FCC § 2.1047(d) and part 25, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

5.2 Test Result

N/A

6 FCC §2.1049 & §27.53 - OCCUPIED BANDWIDTH

6.1 Applicable Standard

Requirements: CFR 47, Section 2.1049 and Section 27.53.

6.2 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 at 100 kHz and the 26 dB & 99% bandwidth was recorded.

6.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	40-43 %
ATM Pressure:	101-103 kPa

** The testing was performed by Victor Zhang on from 2009-09-08 to 2009-09-18 in RF Site.*

6.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY45094317	2009-09-01

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

6.5 Summary of Test Results

746-757 MHz / 776-787 MHz Band

Occupied Bandwidth (LTE)

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 746-757 MHz	QPSK	752	9.289	9.285
	16QAM	752	9.289	9.286
	64QAM	752	9.290	9.286
Uplink 776-787 MHz	QPSK	782	9.283	9.279
	16QAM	782	9.284	9.279
	64QAM	782	9.282	9.279

728-746 MHz / 698-716 MHz Band

Occupied Bandwidth (LTE)

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 728-746 MHz	QPSK	733	9.289	9.286
	QPSK	741	9.289	9.288
	16QAM	733	9.289	9.286
	16QAM	741	9.289	9.287
	64QAM	733	9.289	9.287
	64QAM	741	9.289	9.288
Uplink 698-716 MHz	QPSK	703	9.284	9.280
	QPSK	711	9.282	9.280
	16QAM	703	9.283	9.280
	16QAM	711	9.283	9.280
	64QAM	703	9.281	9.279
	64QAM	711	9.282	9.280

Occupied Bandwidth (WCDMA)

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 728-746 MHz	WCDMA	730.4	4.732	4.725
	WCDMA	737.0	4.732	4.730
	WCDMA	743.6	4.731	4.730
Uplink 698-716 MHz	WCDMA	700.4	4.732	4.727
	WCDMA	707.0	4.732	4.726
	WCDMA	713.6	4.732	4.720

2110-2155 MHz / 1710-1750 MHz Band

Occupied Bandwidth (LTE)

Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 2110-2155 MHz	QPSK	2115	9.289	9.290
	QPSK	2125	9.289	9.291
	QPSK	2150	9.289	9.290
	16QAM	2115	9.289	9.289
	16QAM	2125	9.289	9.289
	16QAM	2150	9.290	9.289
	64QAM	2115	9.289	9.290
	64QAM	2125	9.289	9.290
	64QAM	2150	9.290	9.290
Uplink 1710-1755 MHz	QPSK	1715	9.282	9.276
	QPSK	1725	9.283	9.282
	QPSK	1750	9.284	9.282
	16QAM	1715	9.283	9.278
	16QAM	1725	9.283	9.281
	16QAM	1750	9.283	9.282
	64QAM	1715	9.281	9.277
	64QAM	1725	9.283	9.282
	64QAM	1750	9.281	9.281

Occupied Bandwidth (WCDMA)

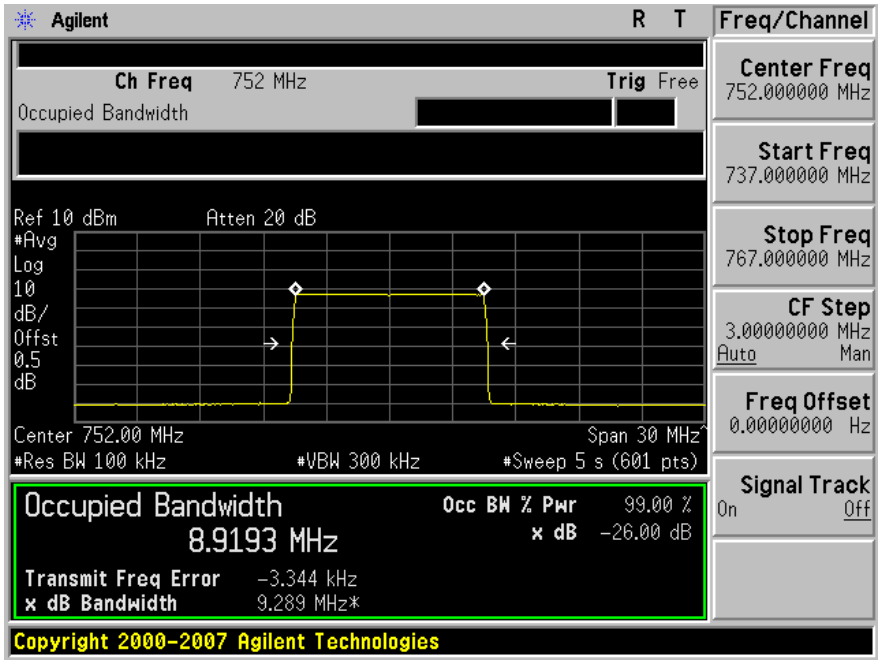
Mode	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 2110-2155 MHz	WCDMA	2112.4	4.732	4.735
	WCDMA	2132.4	4.732	4.732
	WCDMA	2152.6	4.732	4.732
Uplink 1710-1755 MHz	WCDMA	1712.4	4.733	4.730
	WCDMA	1732.4	4.733	4.732
	WCDMA	1752.6	4.733	4.732

Please refer to the following plots for details.

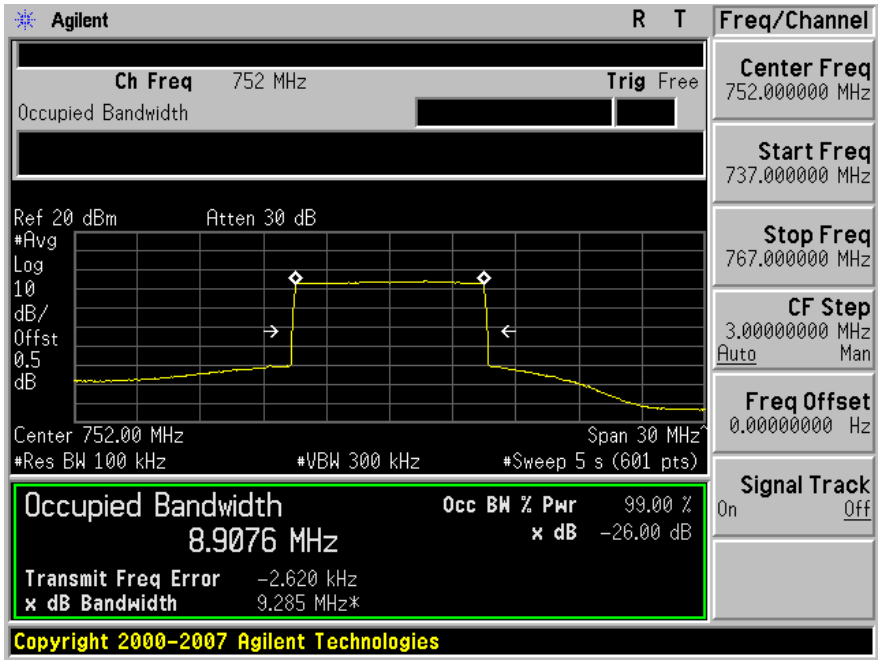
DL: 746-757 MHz

LTE-QPSK, Frequency: 752 MHz

Input

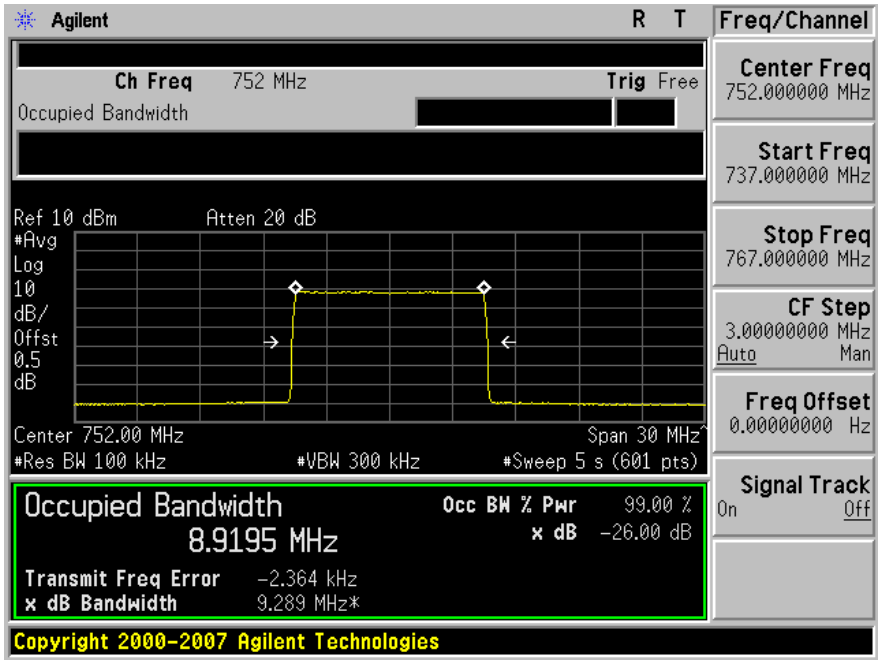


Output

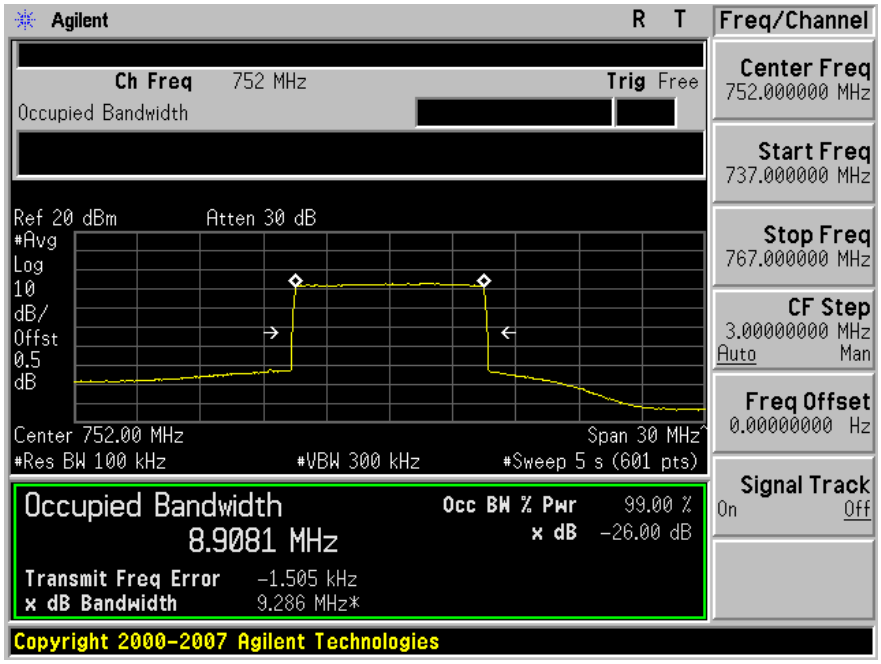


LTE-16QAM, Frequency: 752 MHz

Input

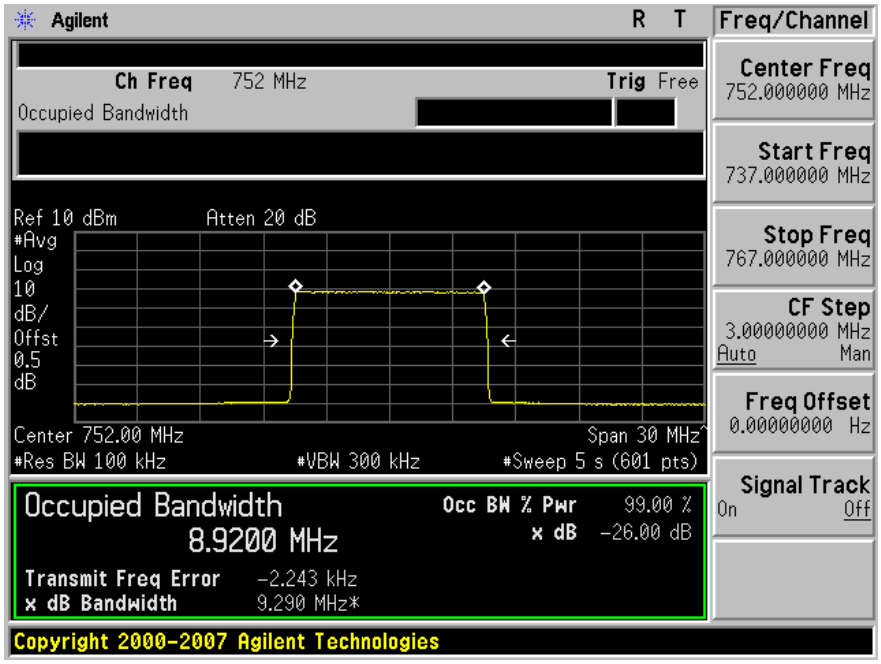


Output

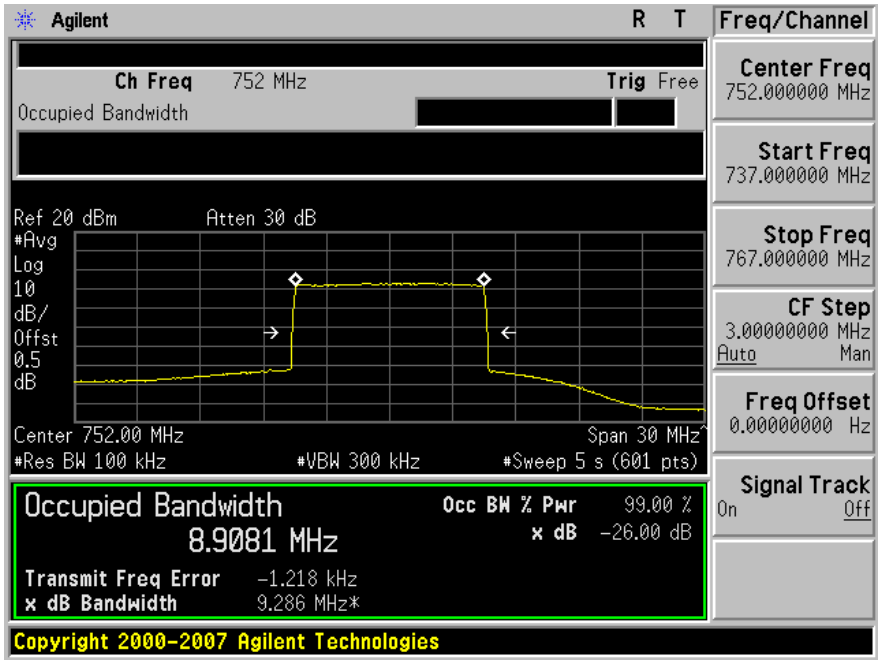


LTE-64QAM, Frequency: 752 MHz

Input



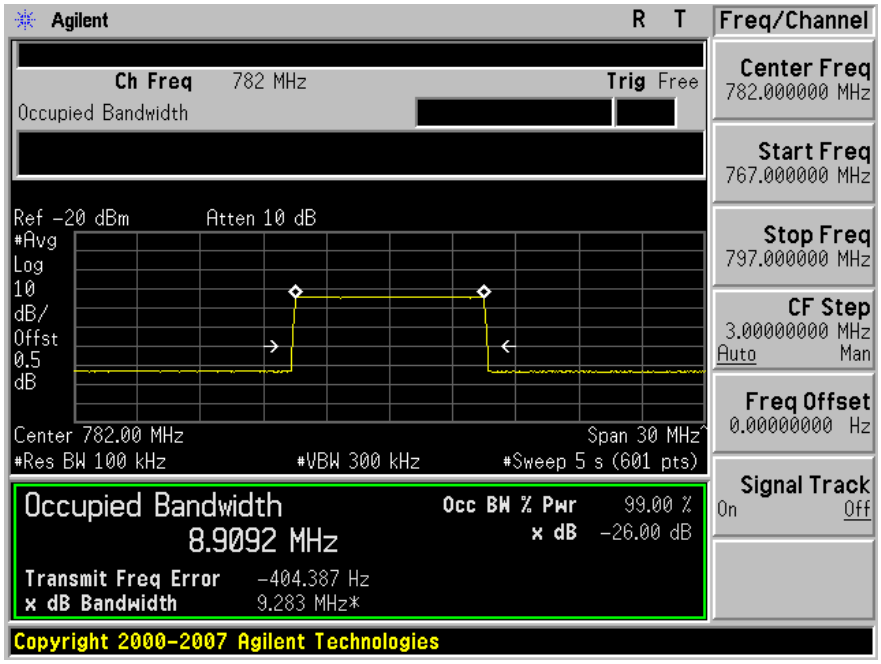
Output



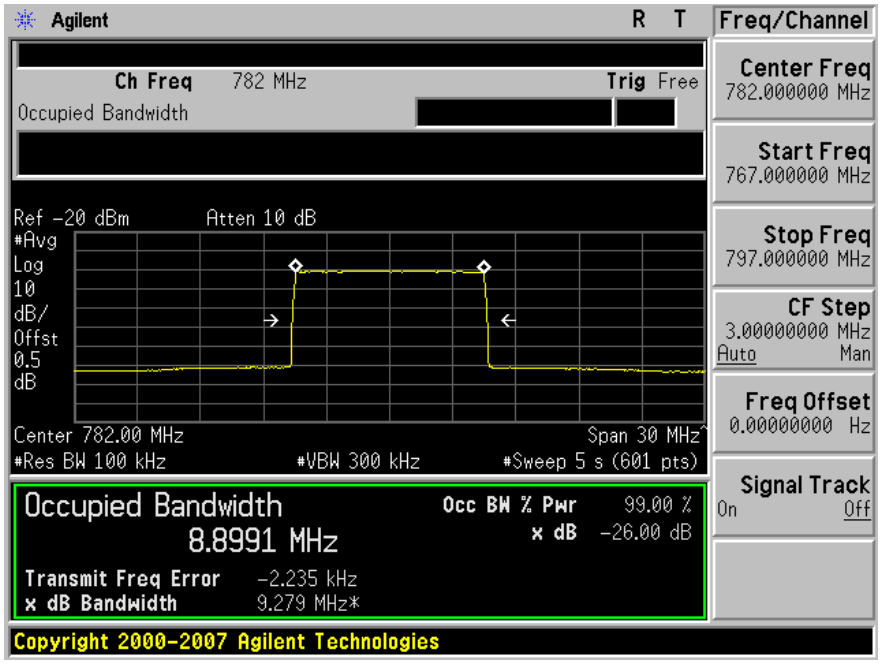
UL: 776-787 MHz

LTE-QPSK, Frequency: 782 MHz

Input

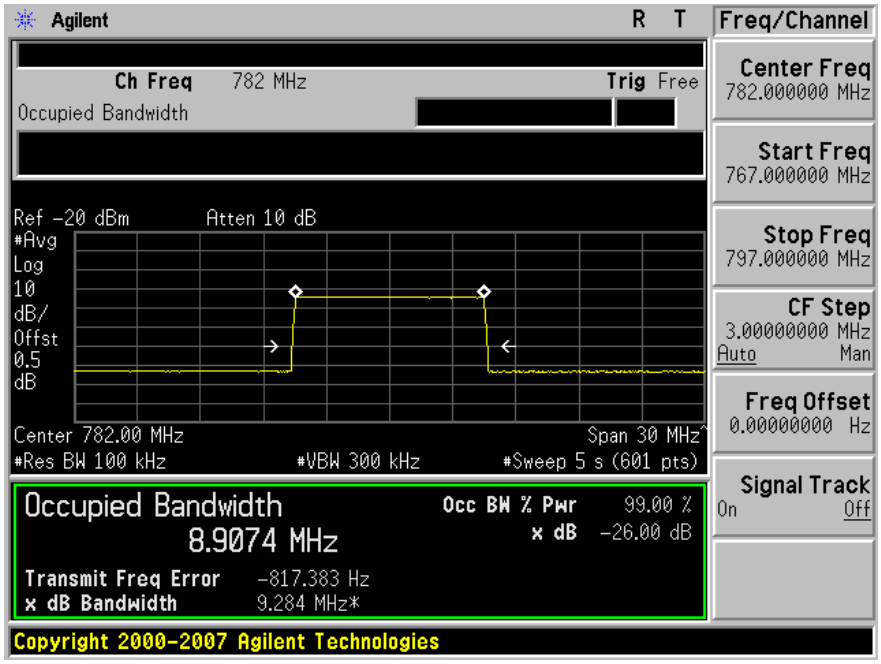


Output

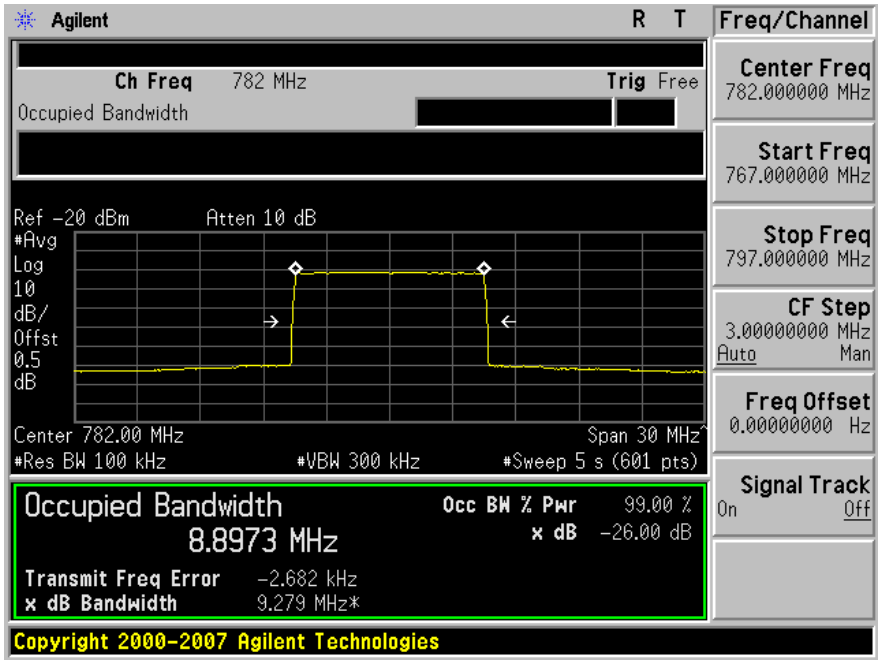


LTE-16QAM, Frequency: 782 MHz

Input

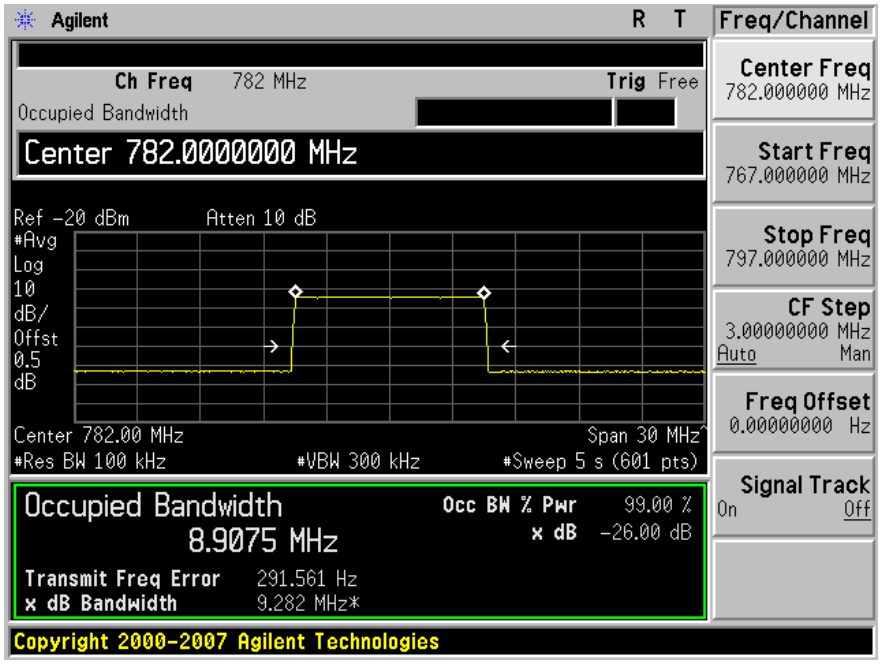


Output

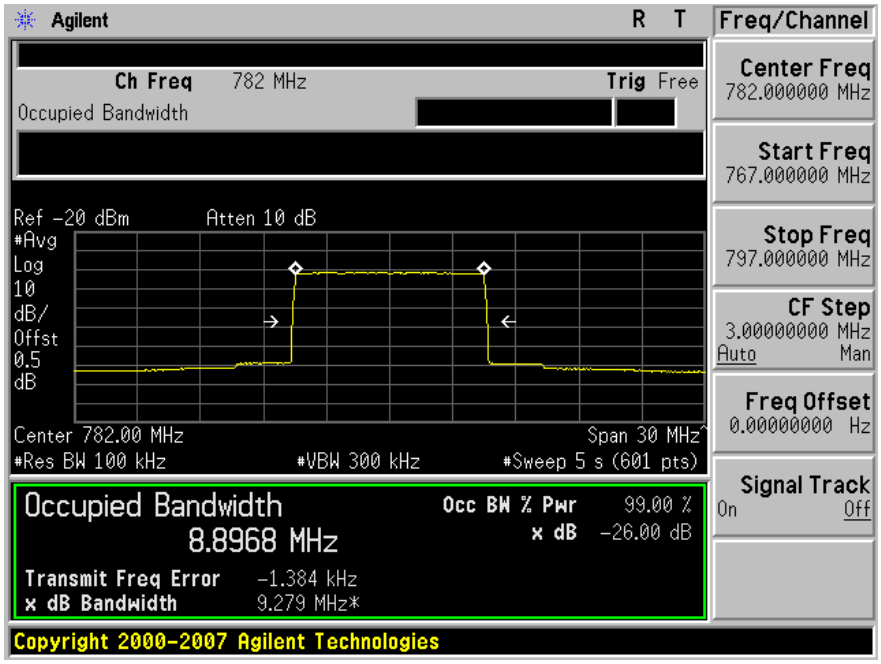


LTE-64QAM, Frequency: 782 MHz

Input



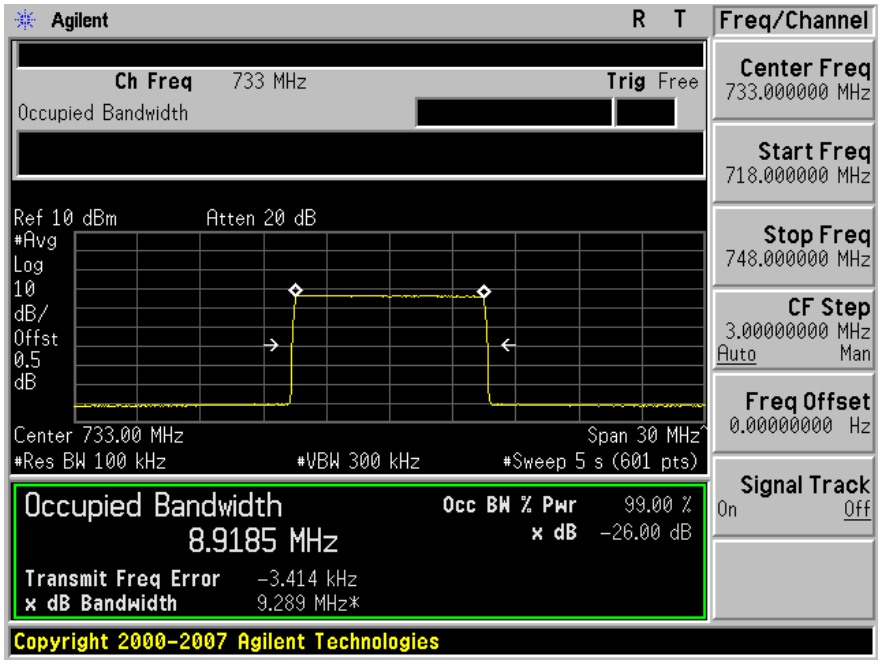
Output



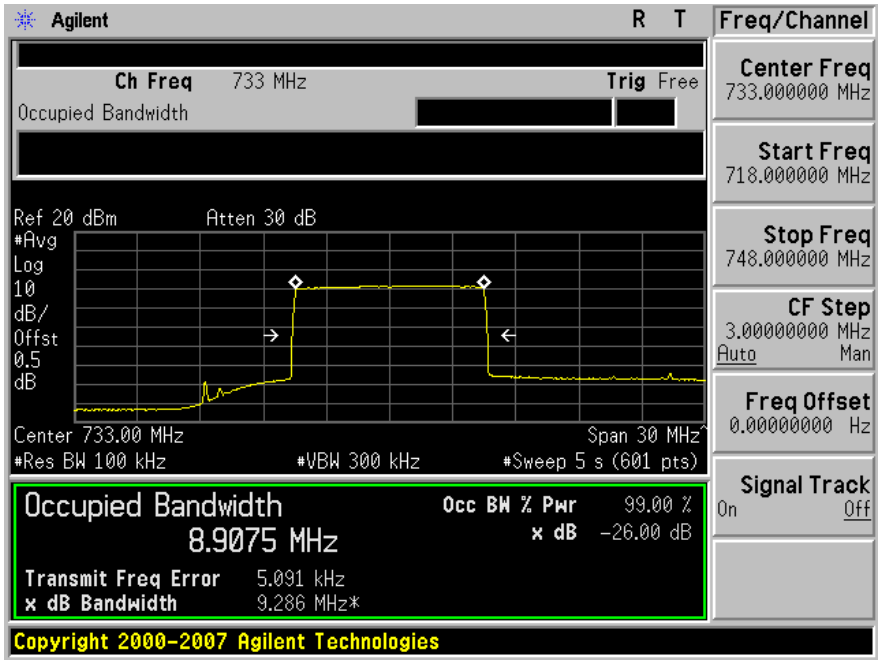
DL: 728-746 MHz

LTE-QPSK, Frequency: 733 MHz

Input

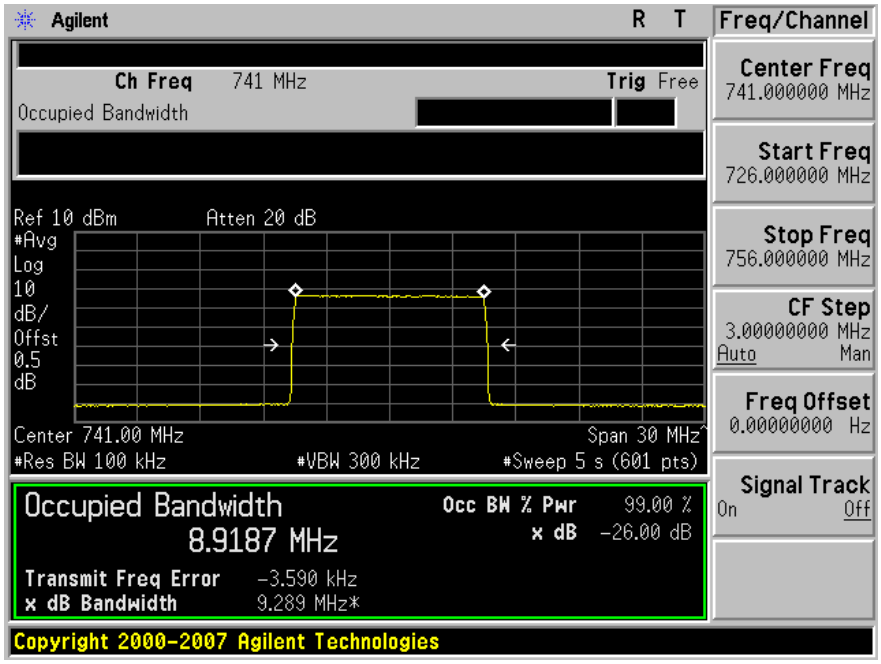


Output

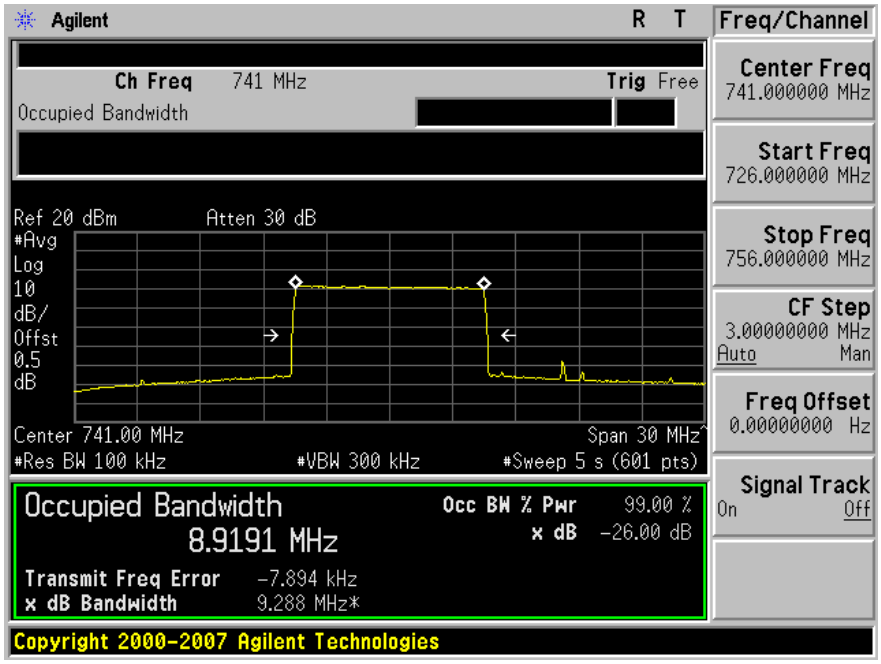


LTE-QPSK, Frequency: 741 MHz

Input

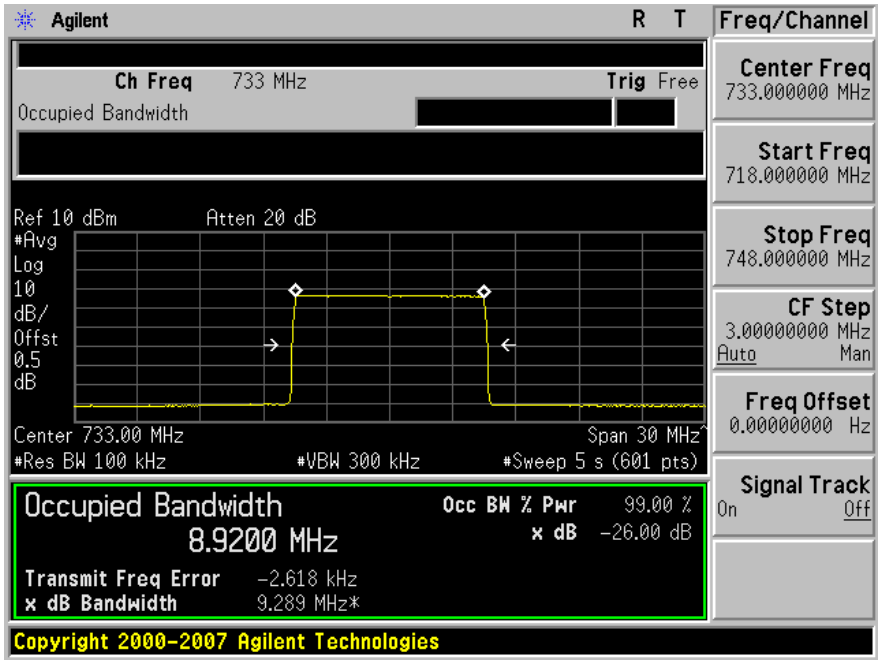


Output

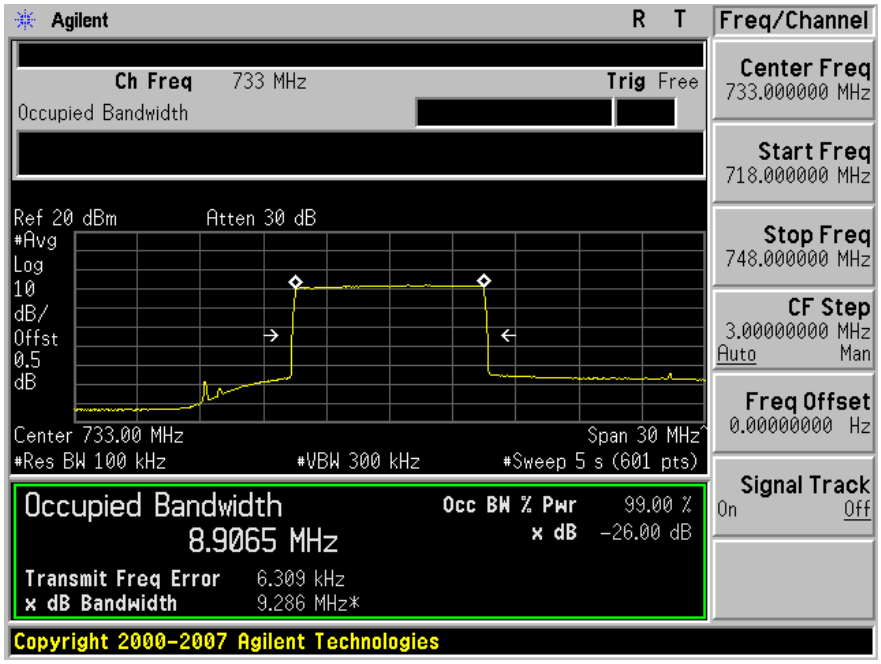


LTE-16QAM, Frequency: 733 MHz

Input

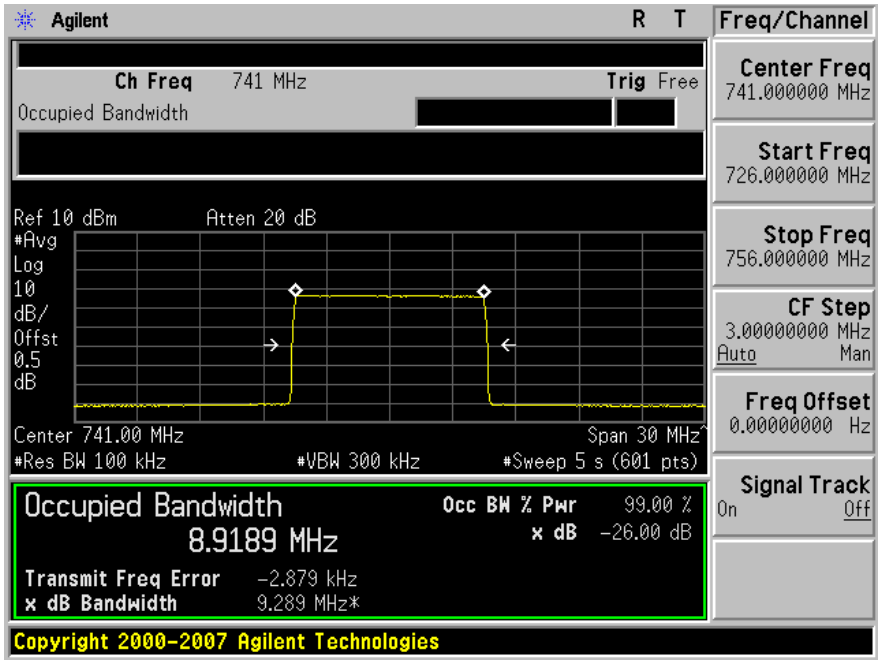


Output

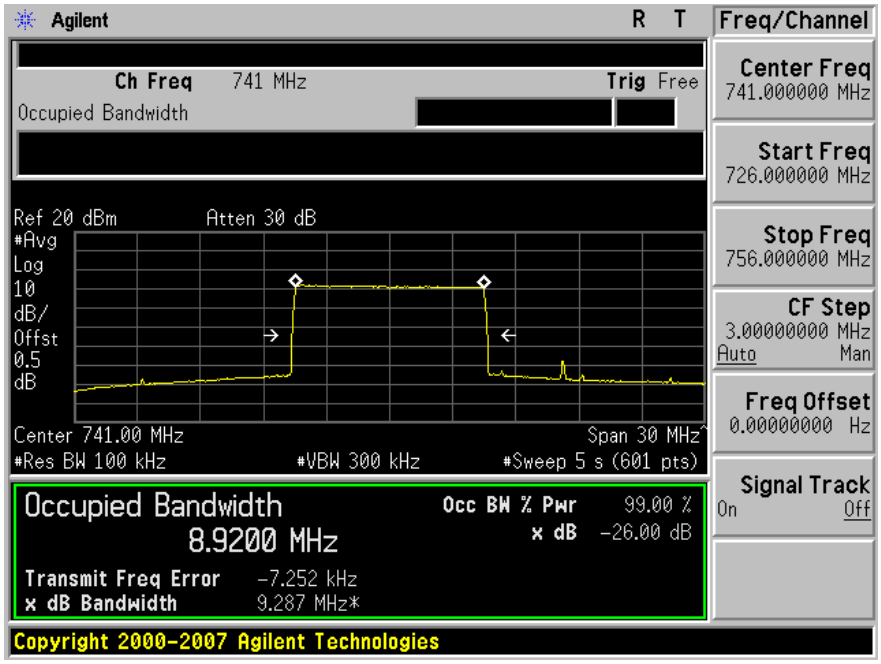


LTE-16QAM, Frequency: 741 MHz

Input

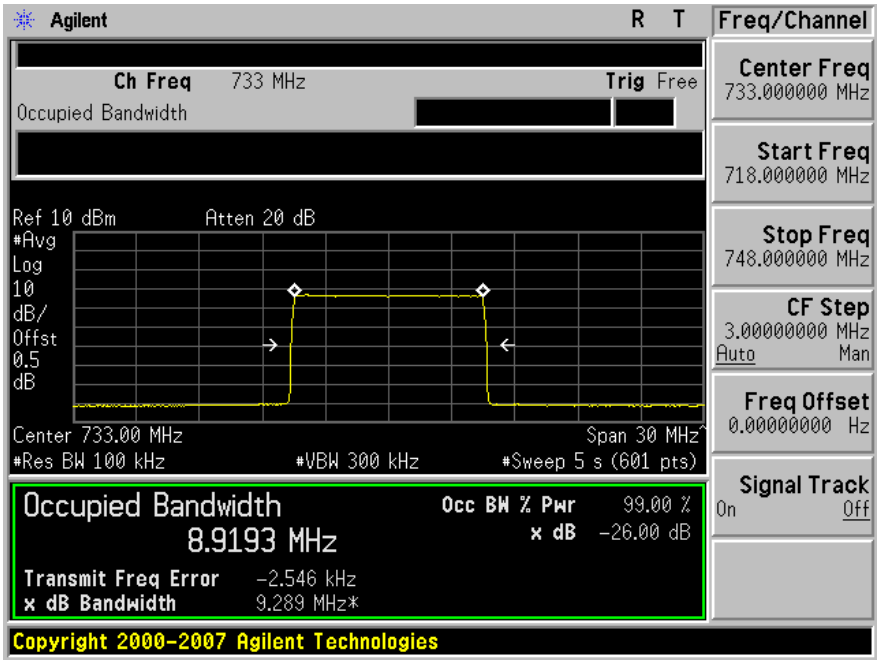


Output

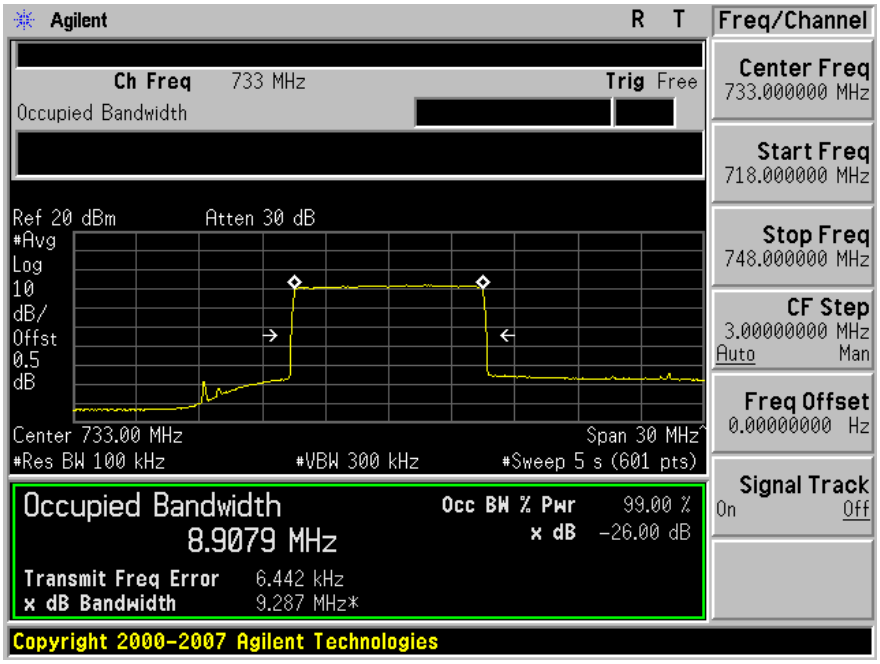


LTE-64QAM, Frequency: 733 MHz

Input

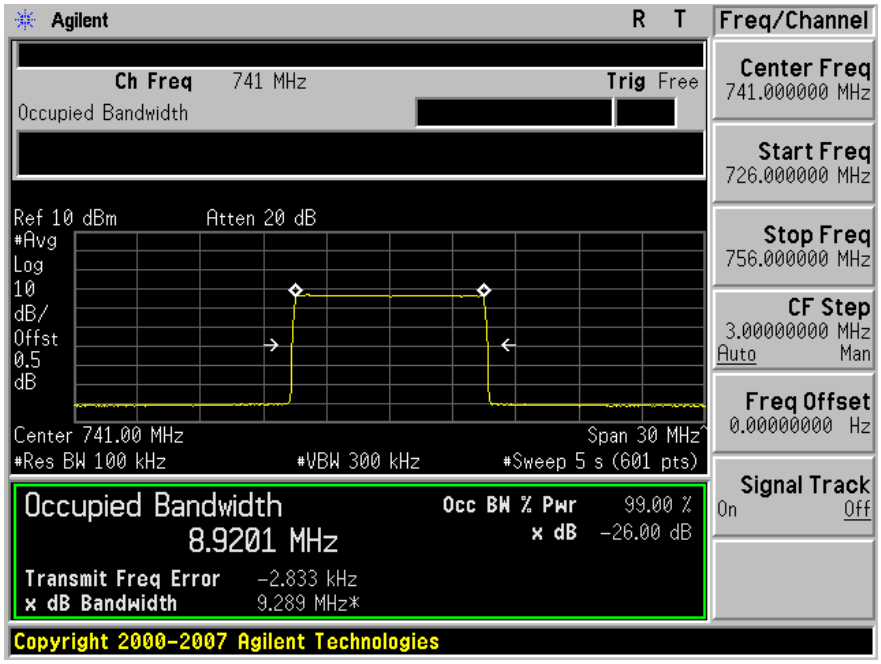


Output

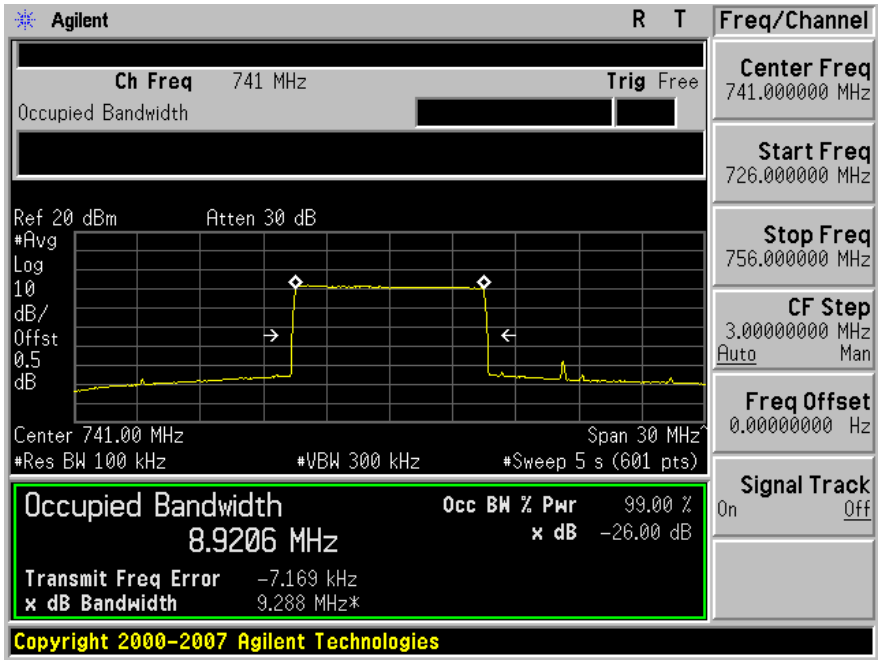


LTE-64QAM, Frequency: 741 MHz

Input

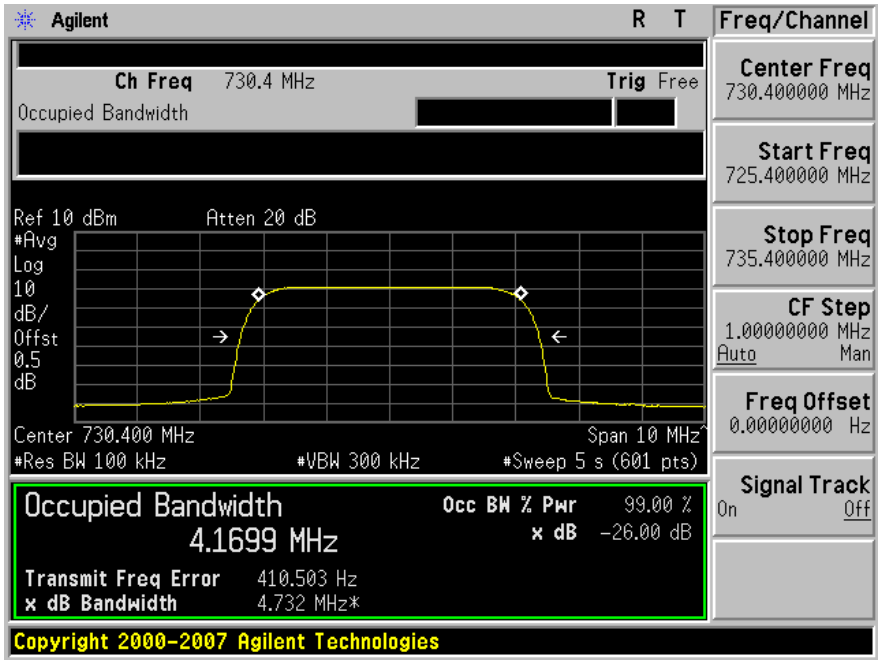


Output

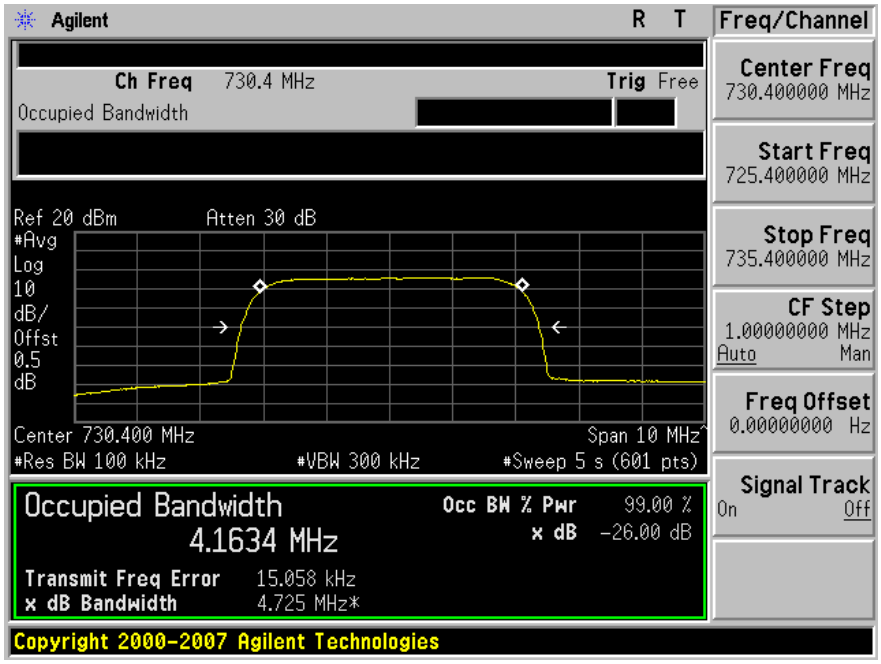


WCDMA, Frequency: 730.4 MHz

Input

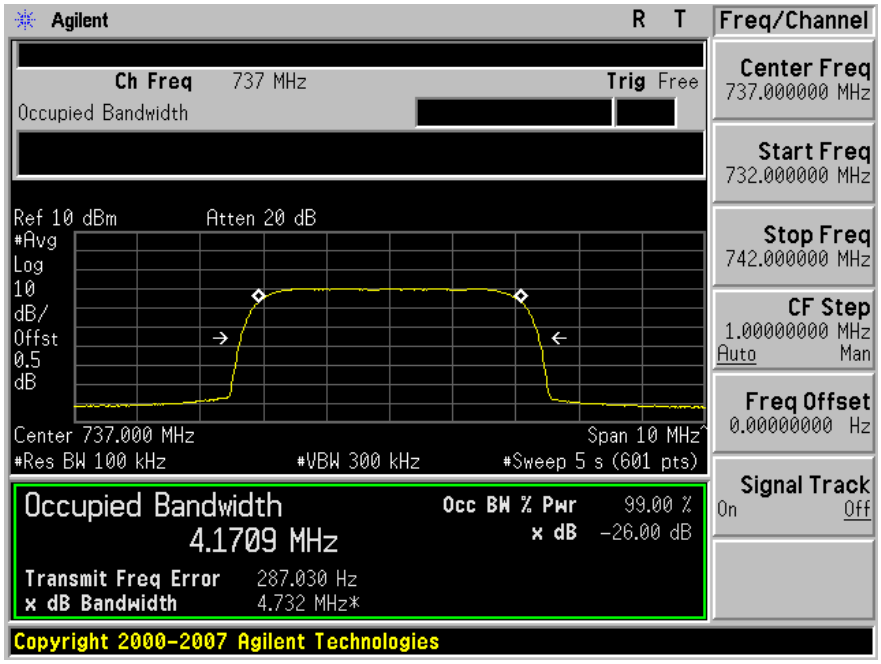


Output

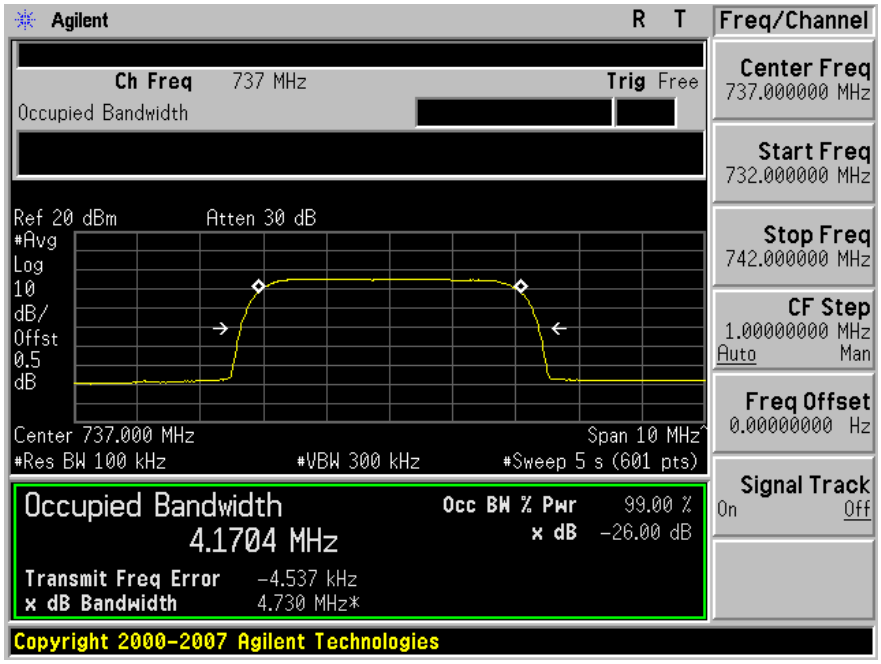


WCDMA, Frequency: 737 MHz

Input

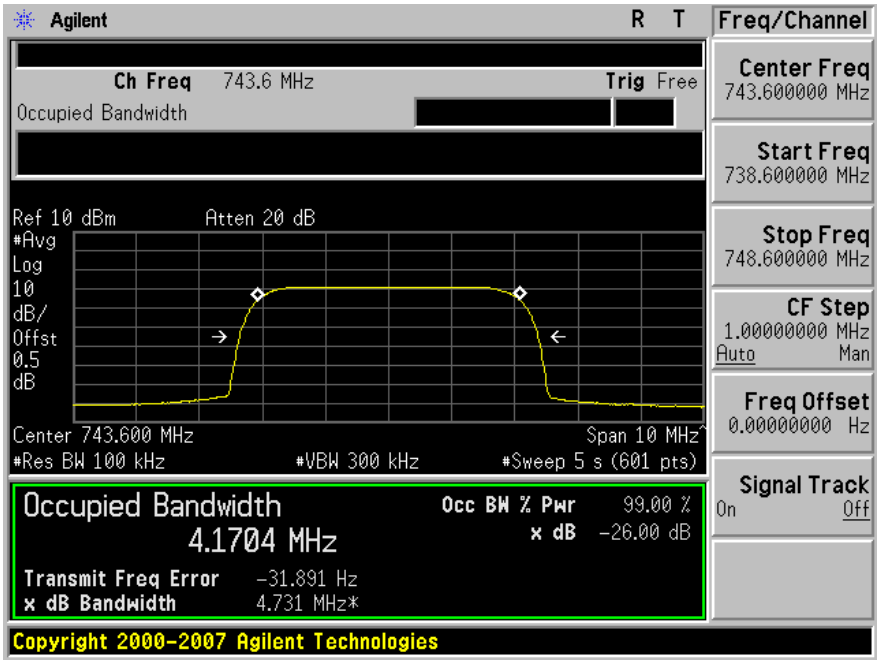


Output

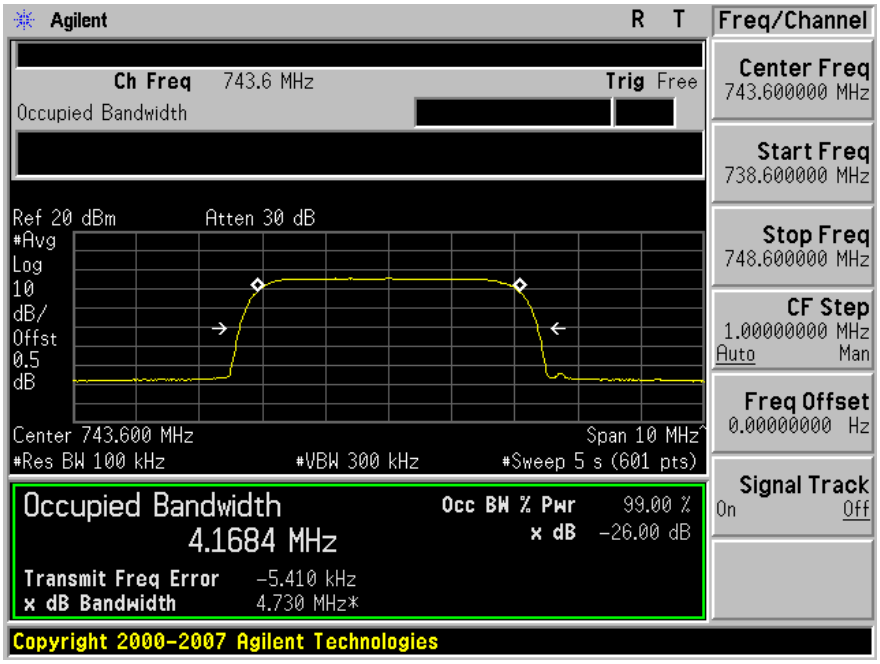


WCDMA, Frequency: 743.6 MHz

Input



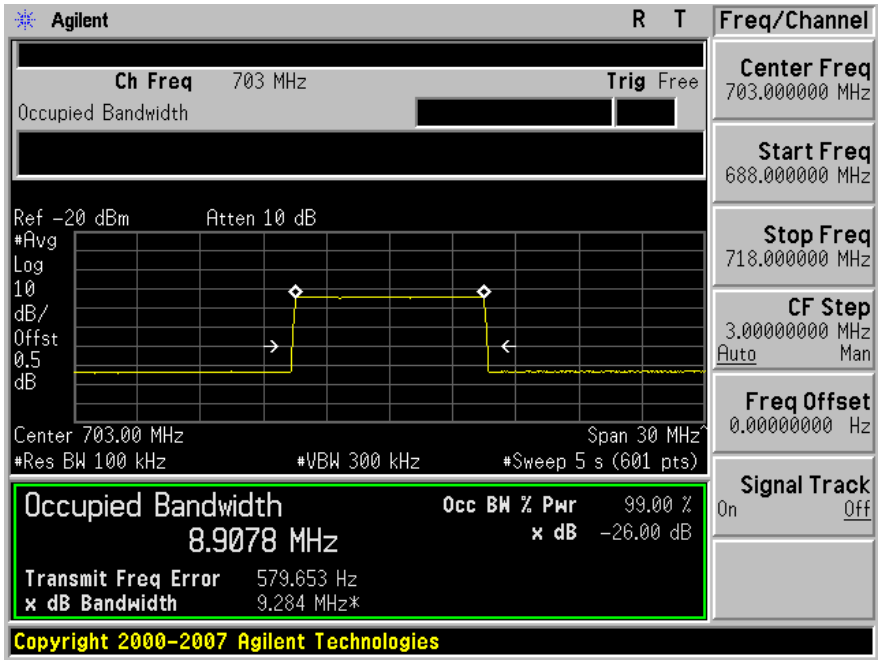
Output



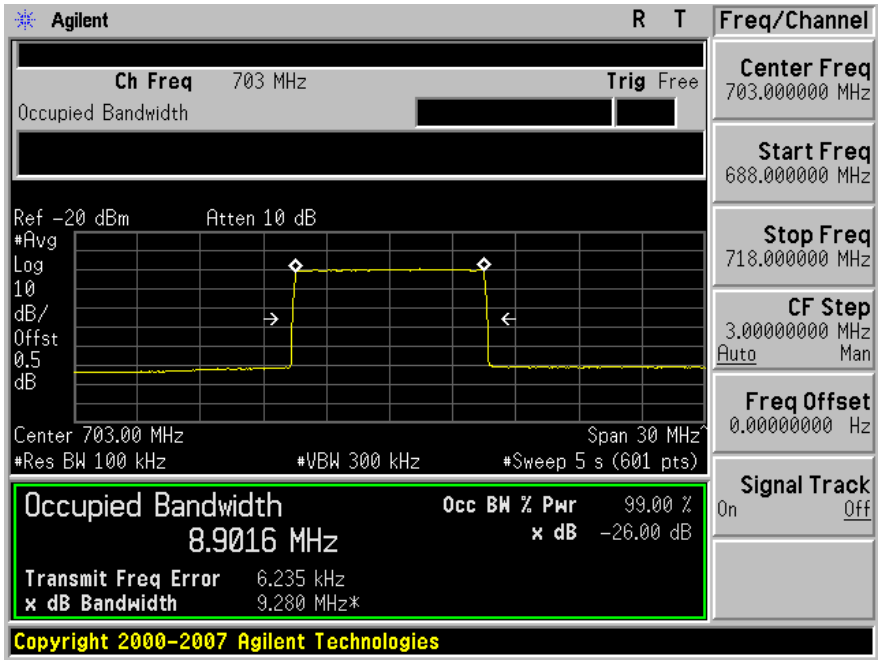
UL: 698-716 MHz

LTE-QPSK, Frequency: 703 MHz

Input

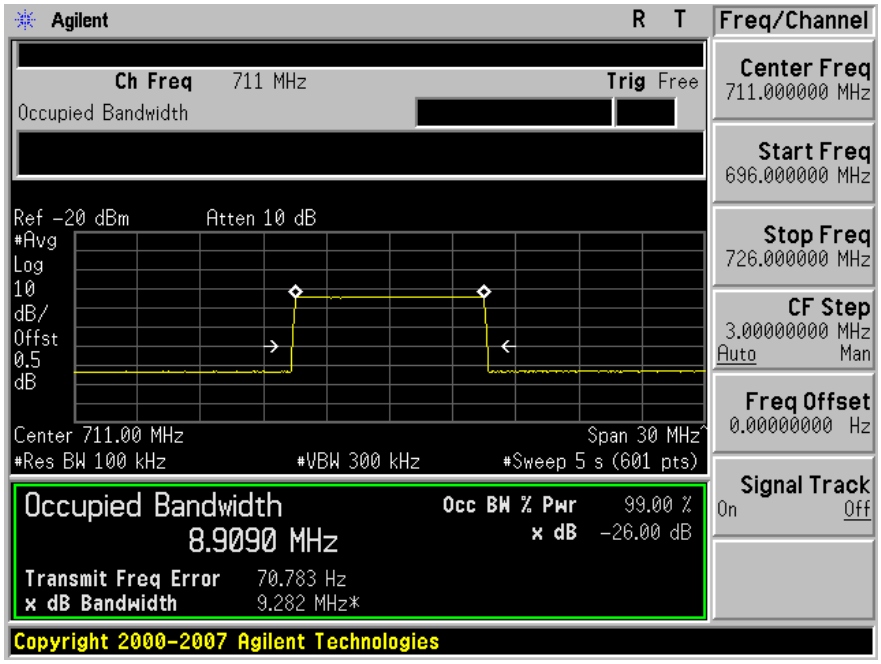


Output

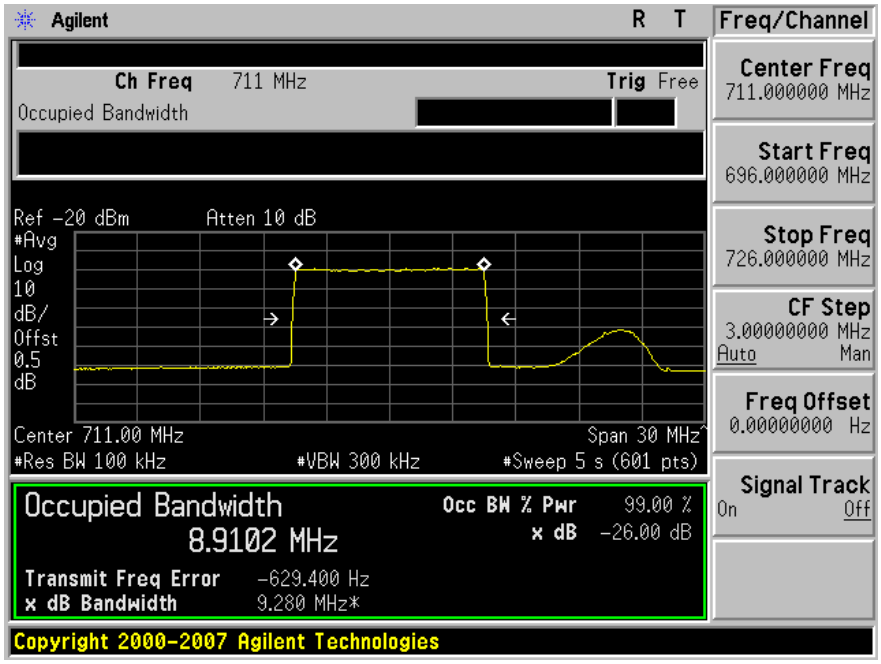


LTE-QPSK, Frequency: 711 MHz

Input

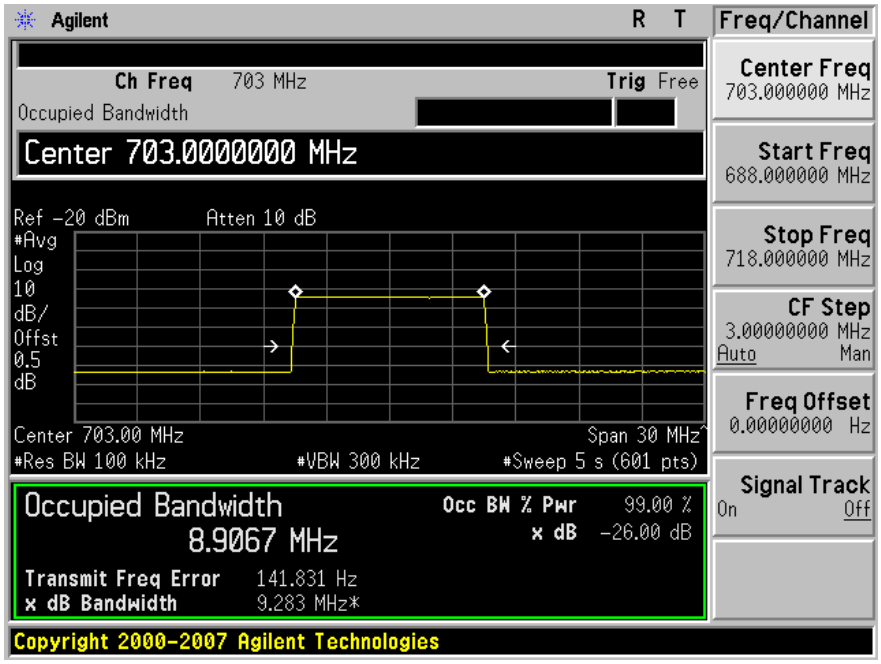


Output

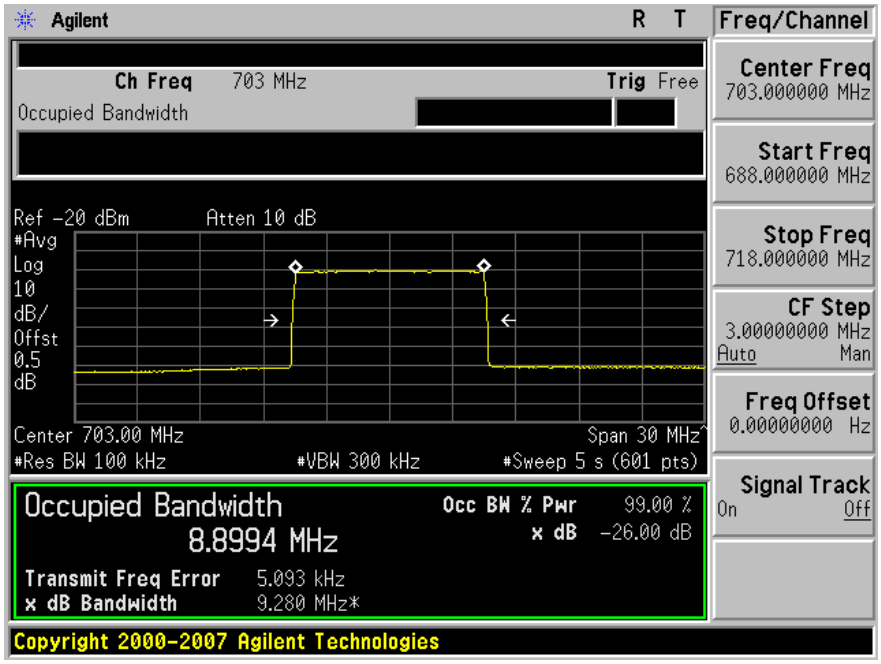


LTE-16QAM, Frequency: 703 MHz

Input

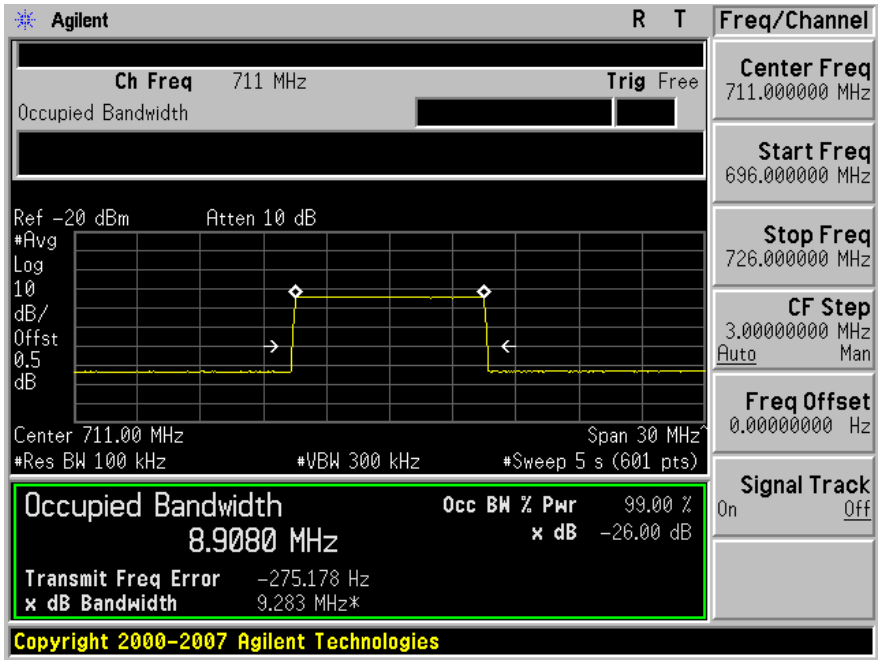


Output

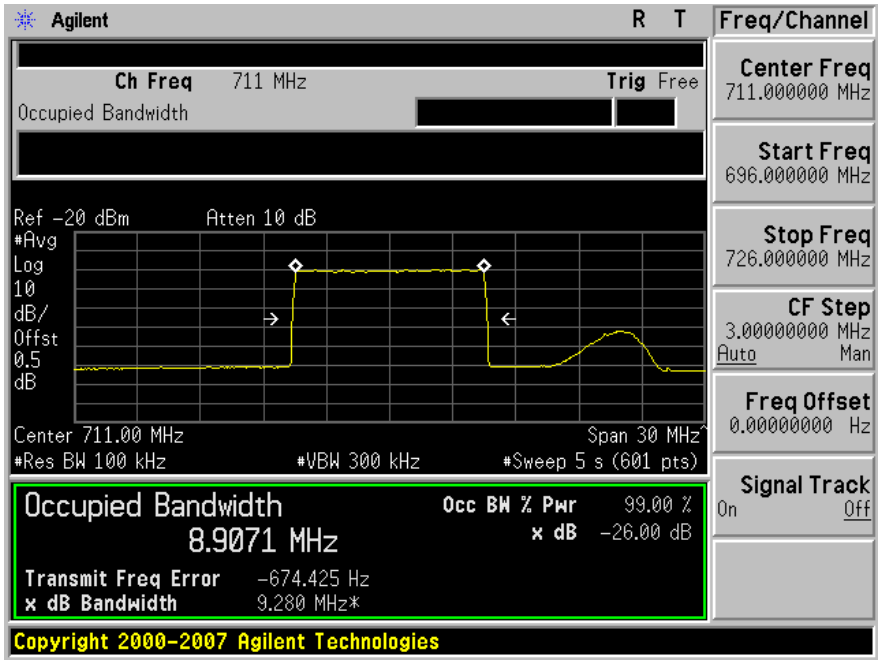


LTE-16QAM, Frequency: 711 MHz

Input

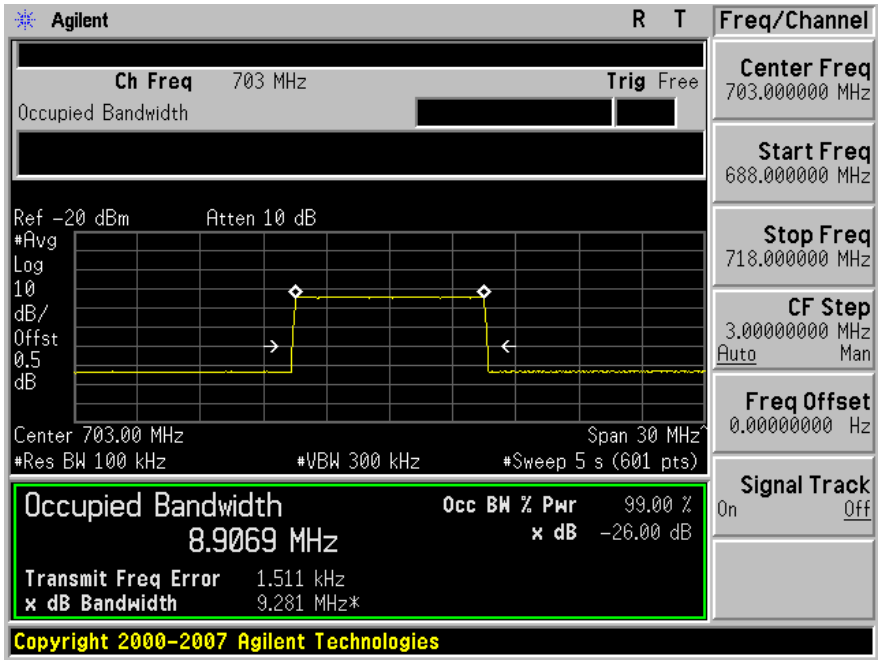


Output

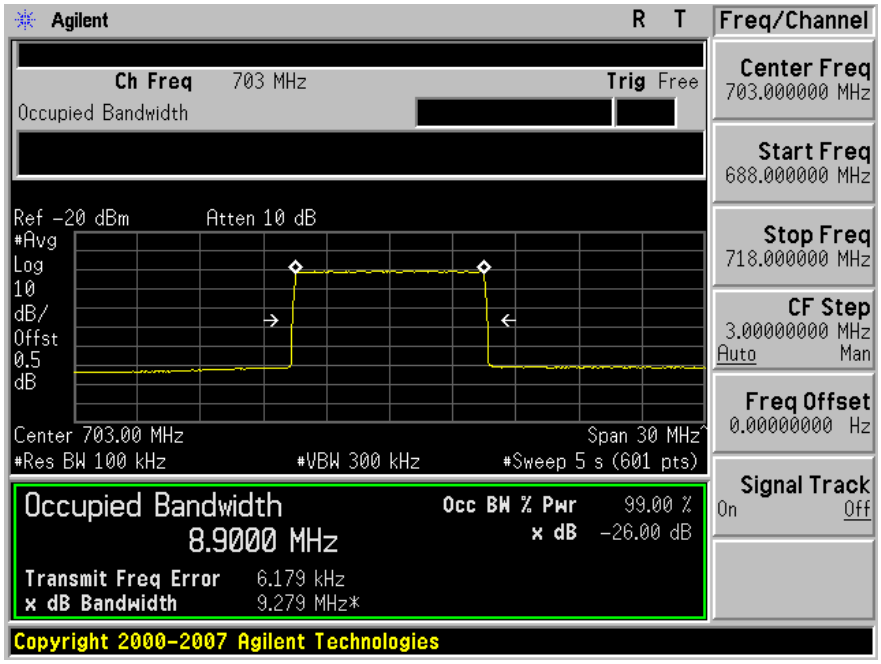


LTE-64QAM, Frequency: 703 MHz

Input

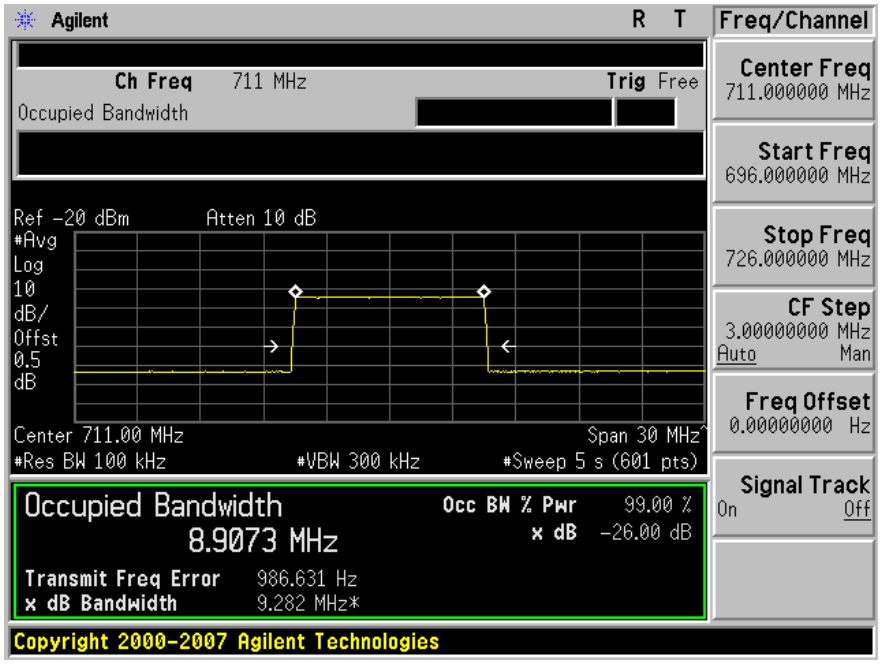


Output

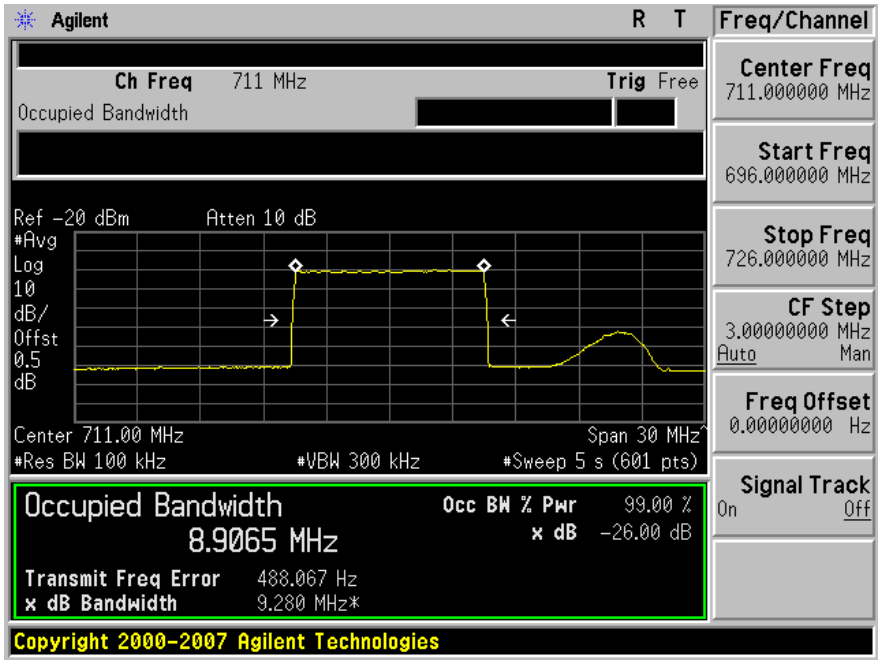


LTE-64QAM, Frequency: 711 MHz

Input

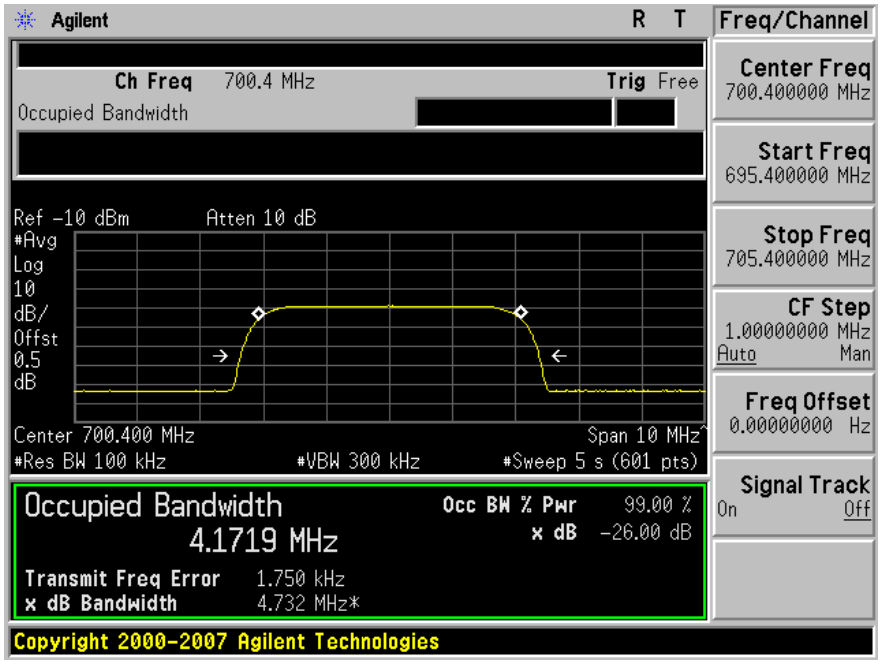


Output

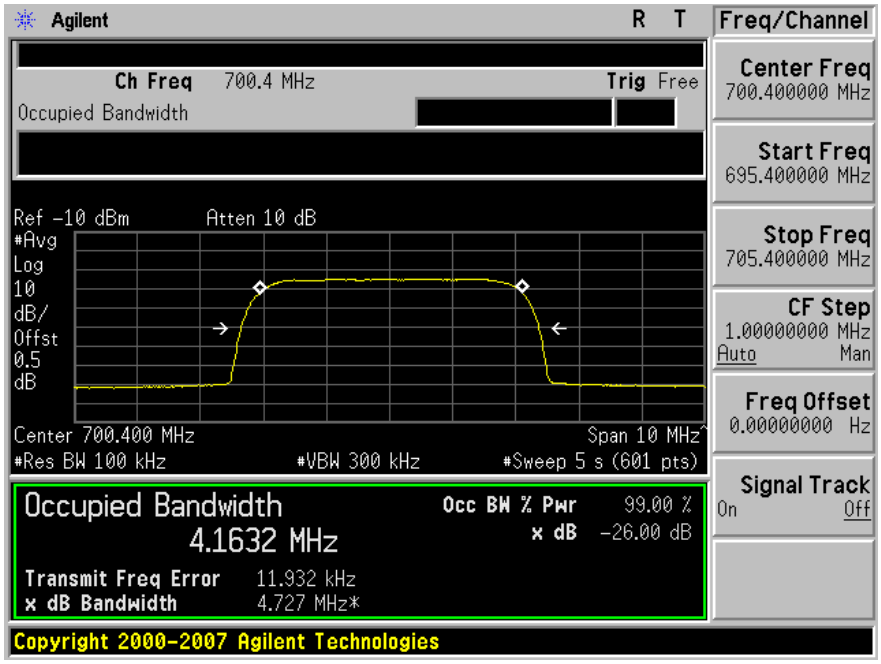


WCDMA, Frequency: 700.4 MHz

Input

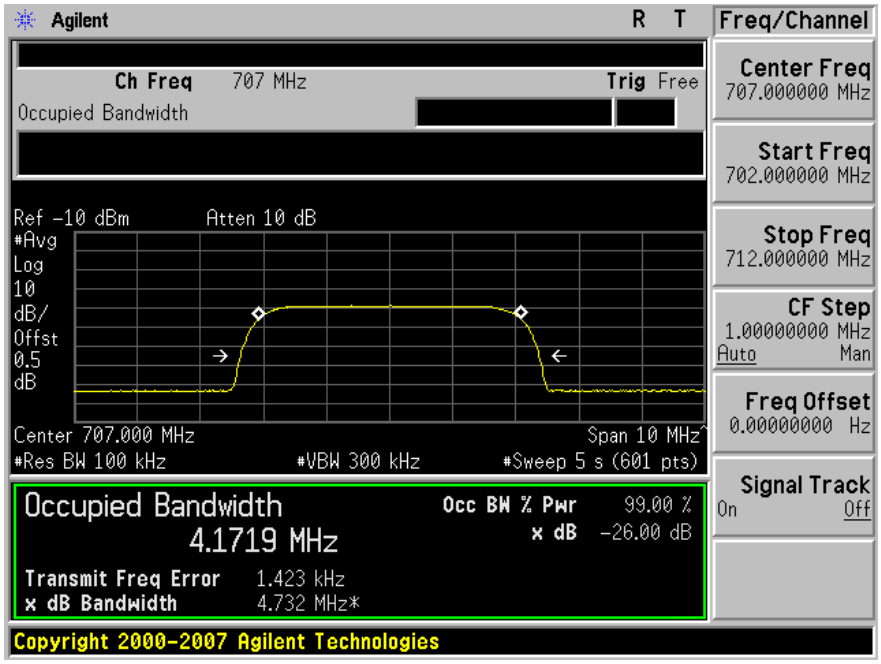


Output

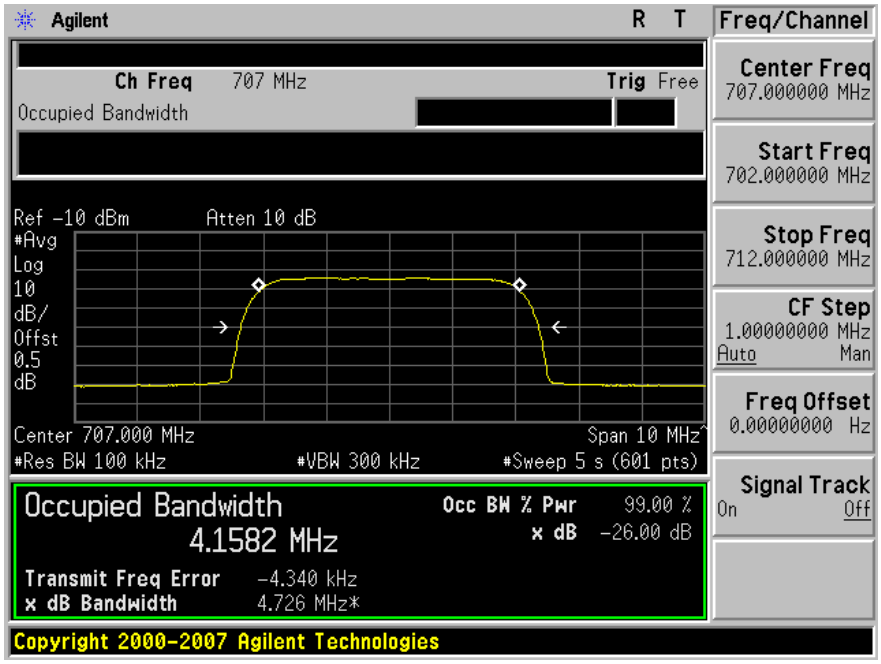


WCDMA, Frequency: 707 MHz

Input

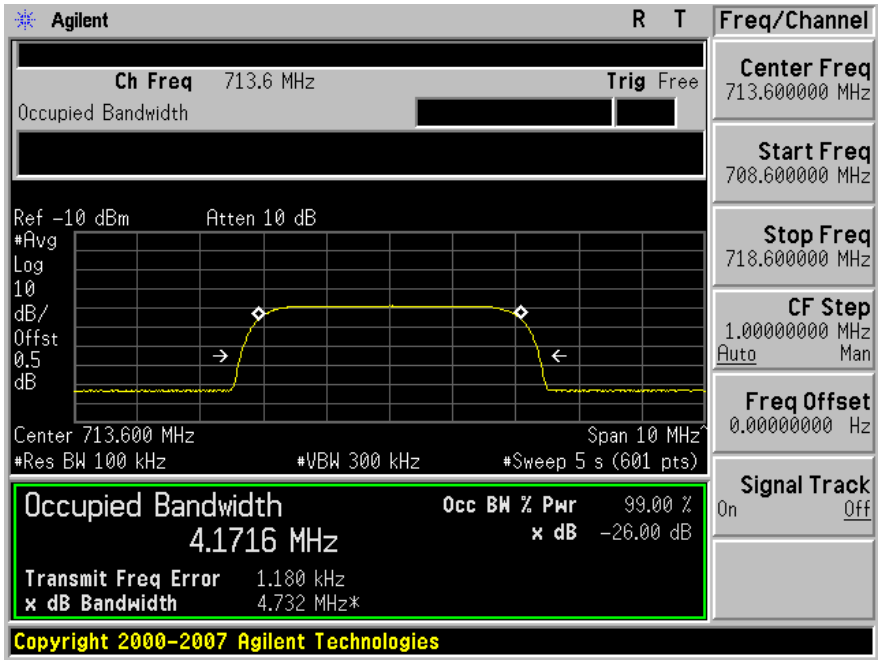


Output

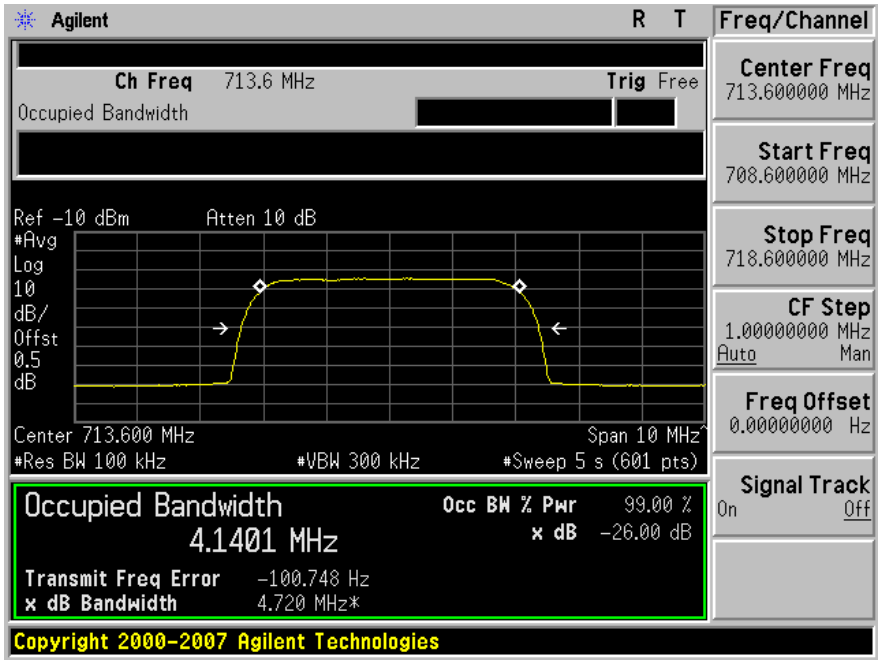


WCDMA, Frequency: 713.6 MHz

Input



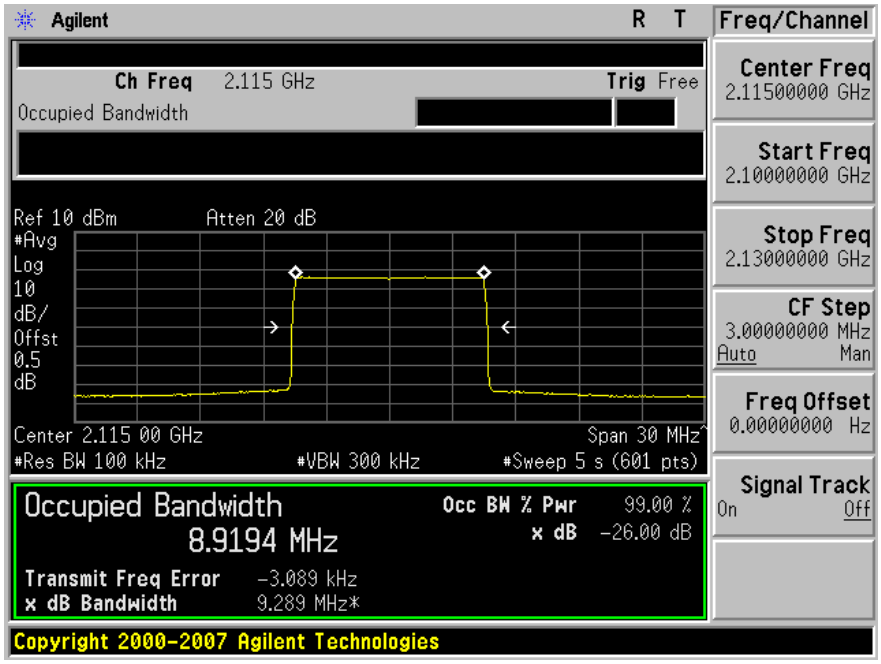
Output



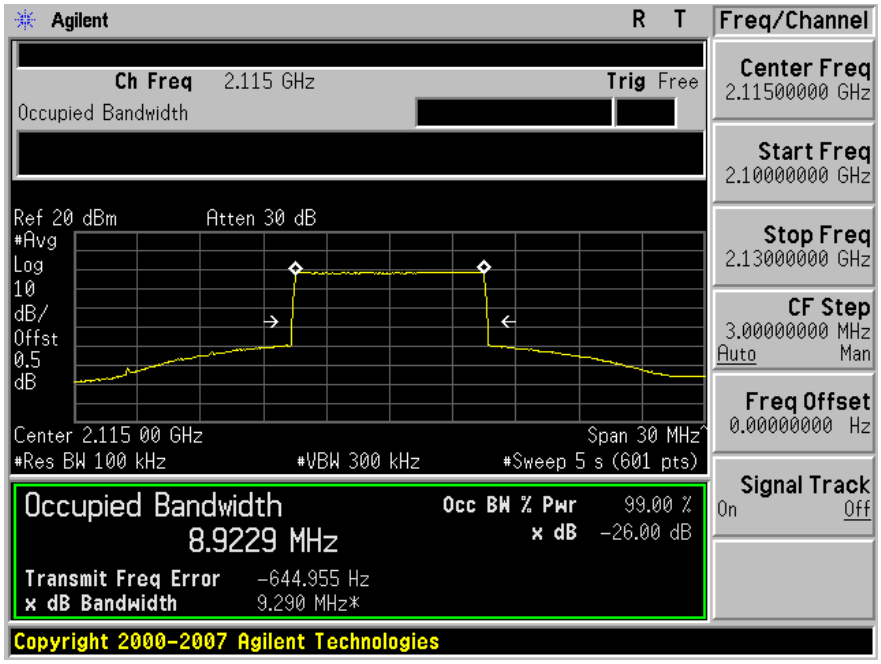
DL: 2110-2155MHz

LTE-QPSK, Frequency: 2115 MHz

Input

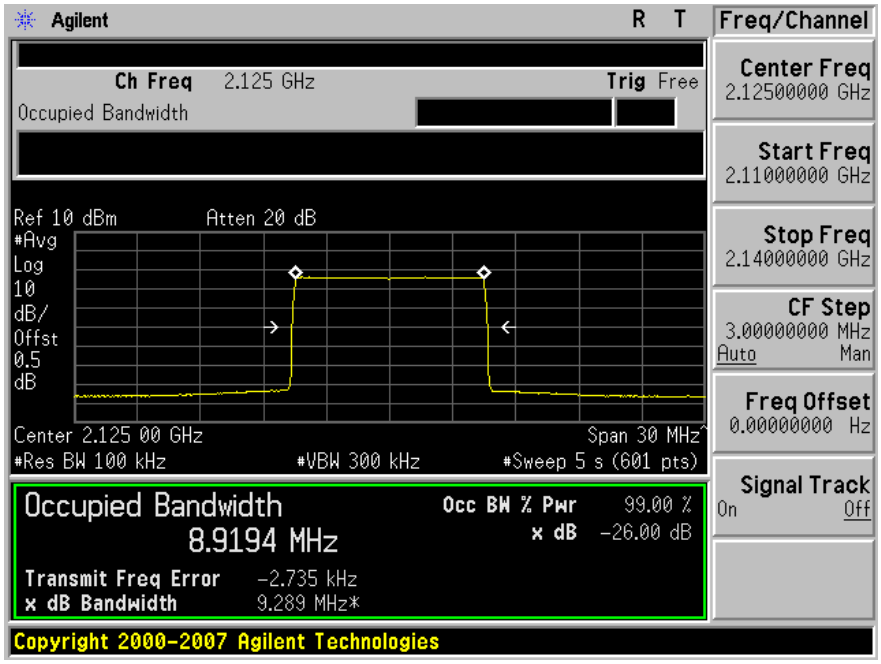


Output

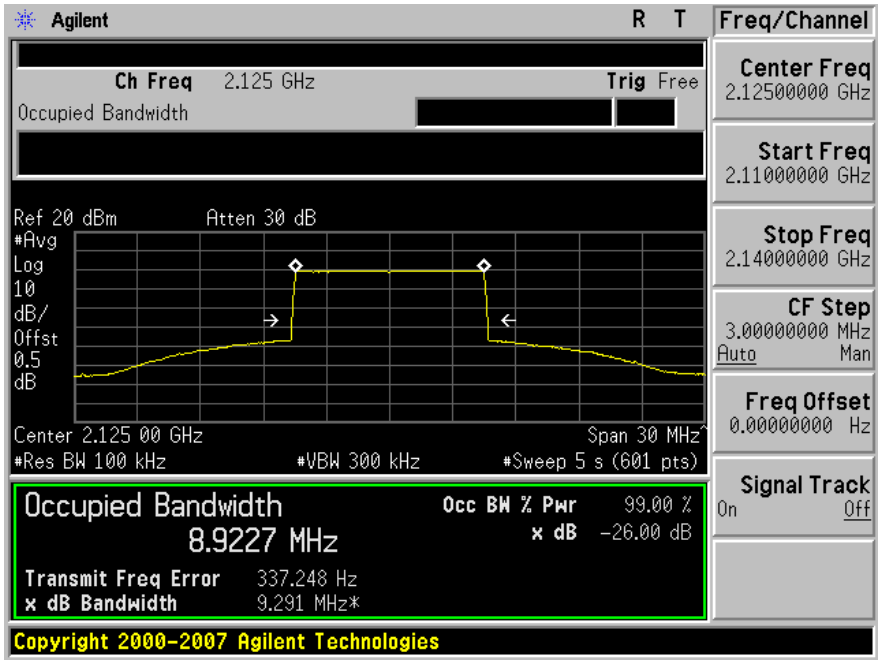


LTE-QPSK, Frequency: 2125 MHz

Input

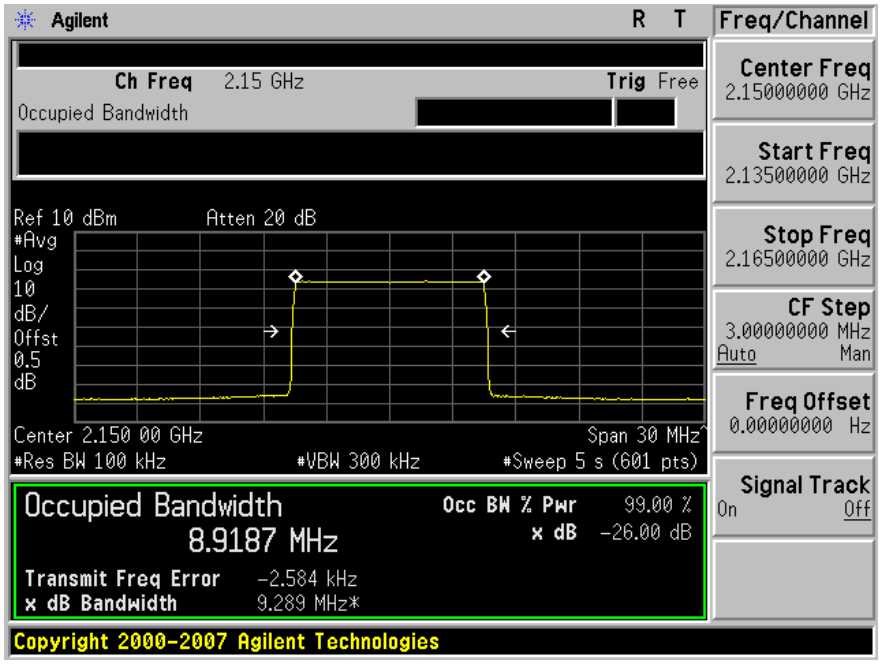


Output

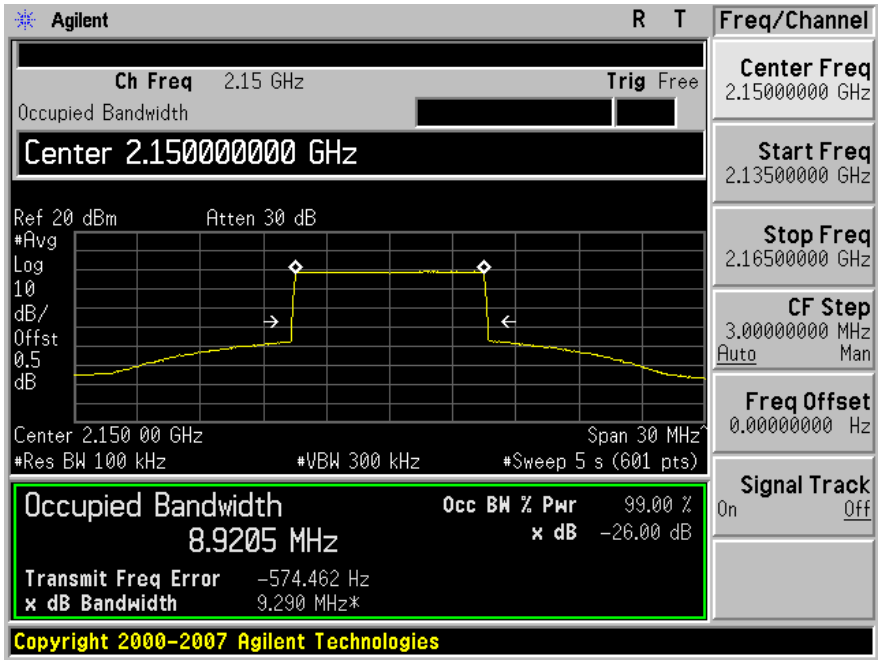


LTE-QPSK, Frequency: 2150 MHz

Input

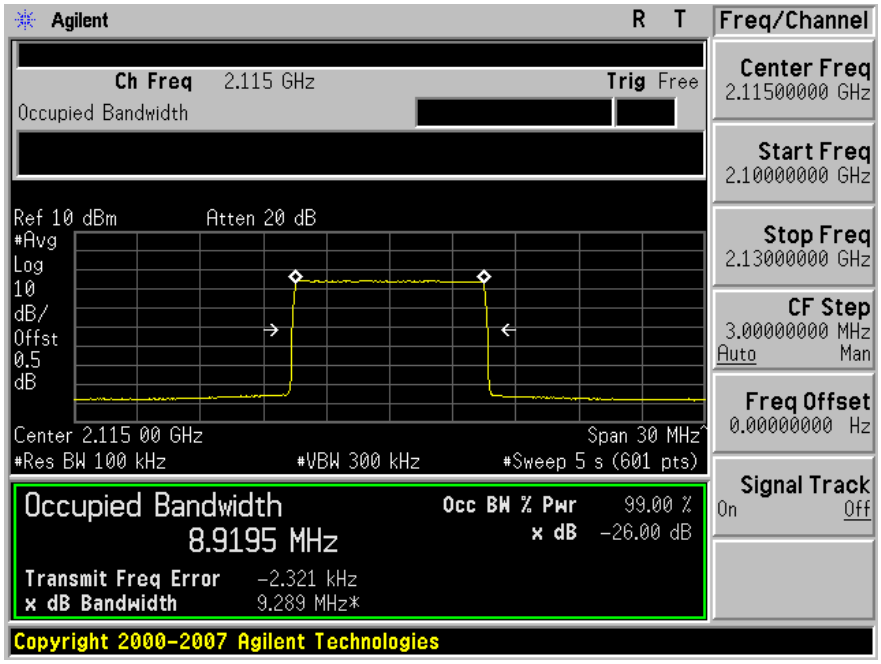


Output

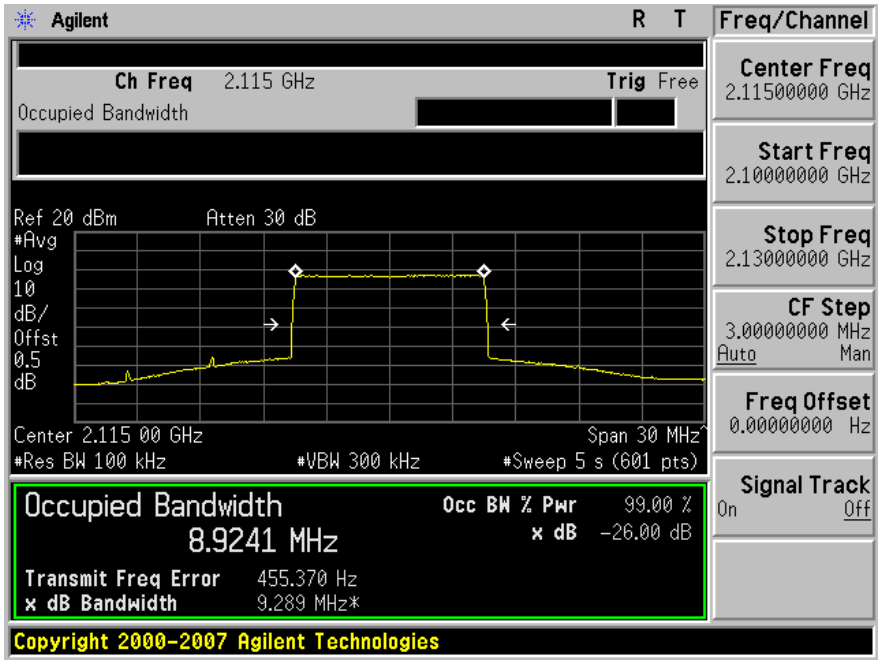


LTE-16QAM, Frequency: 2115 MHz

Input

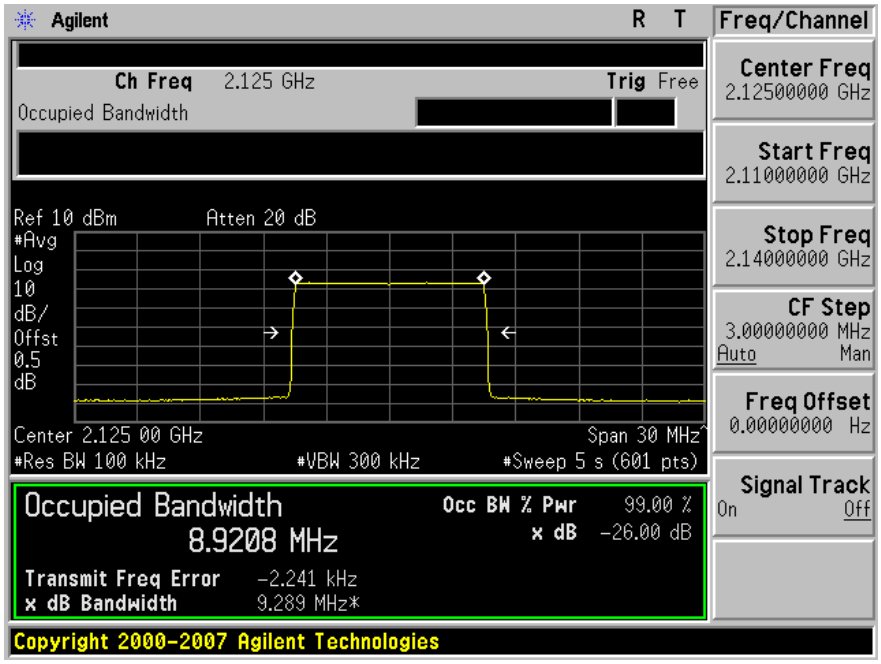


Output

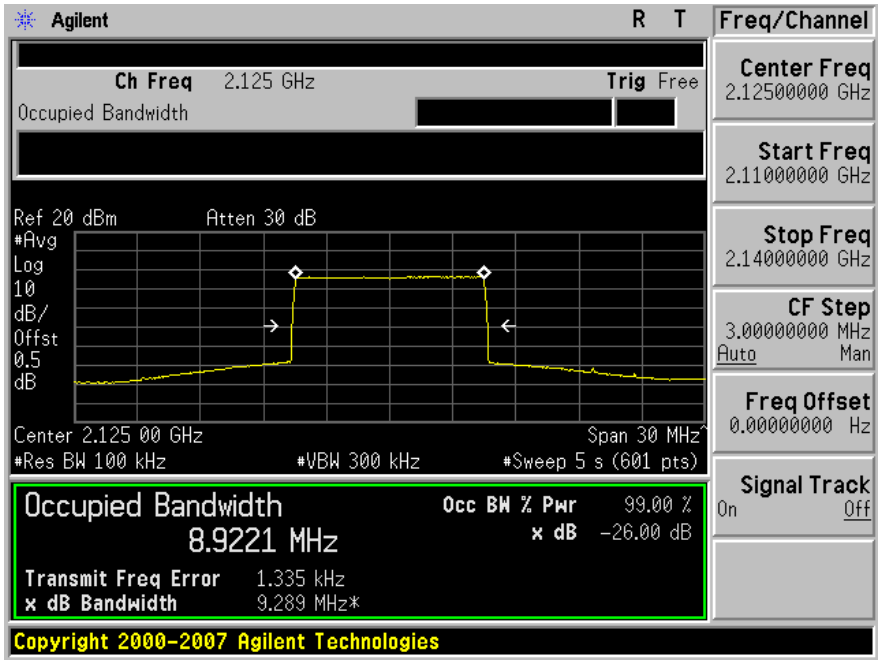


LTE-16QAM, Frequency: 2125 MHz

Input

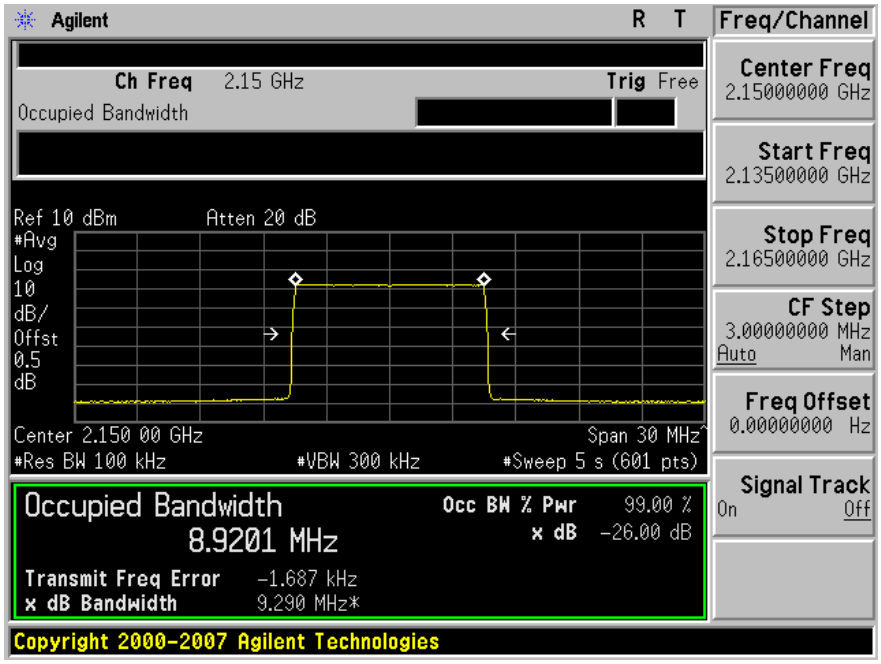


Output

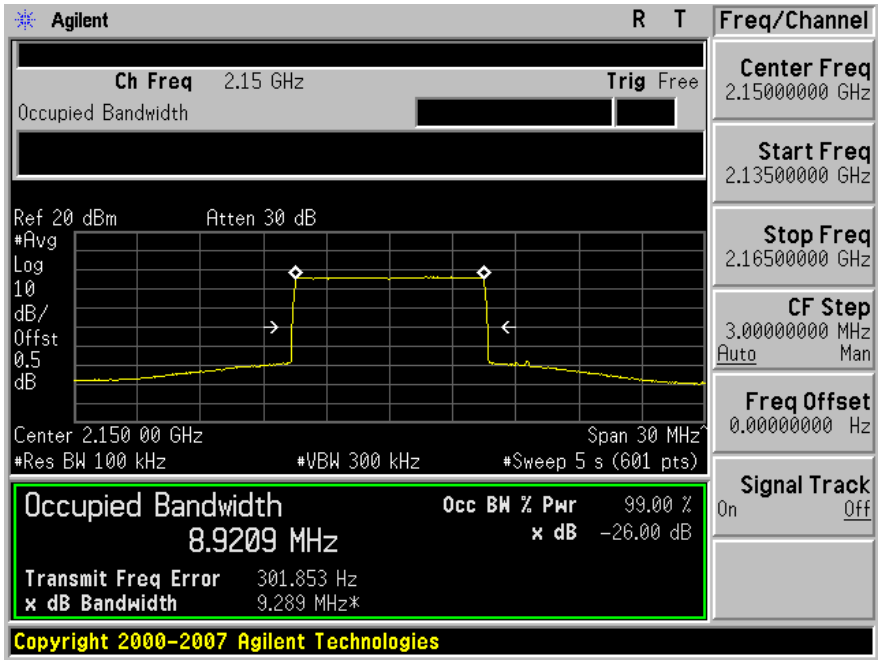


LTE-LTE, Frequency: 2150 MHz

Input

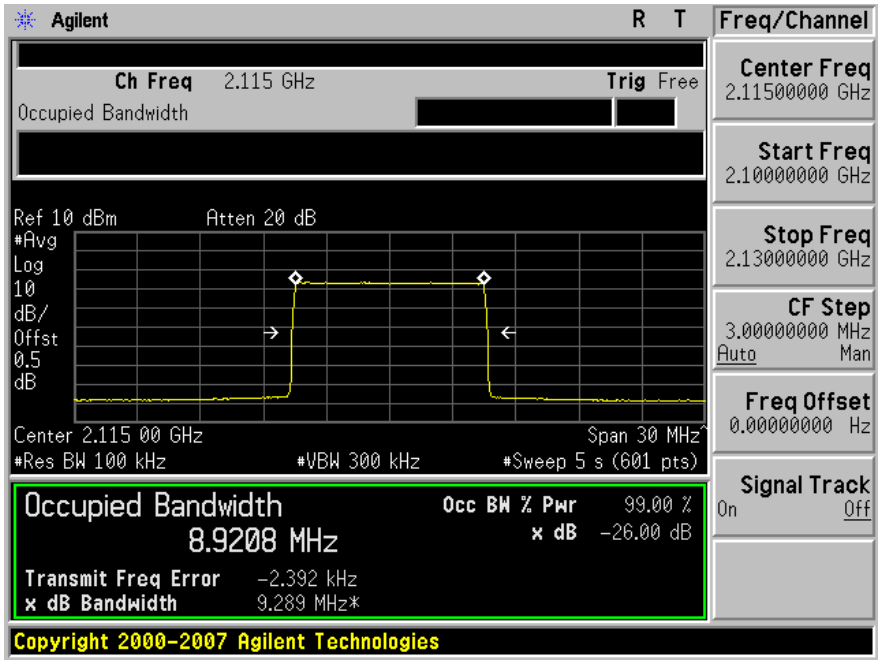


Output

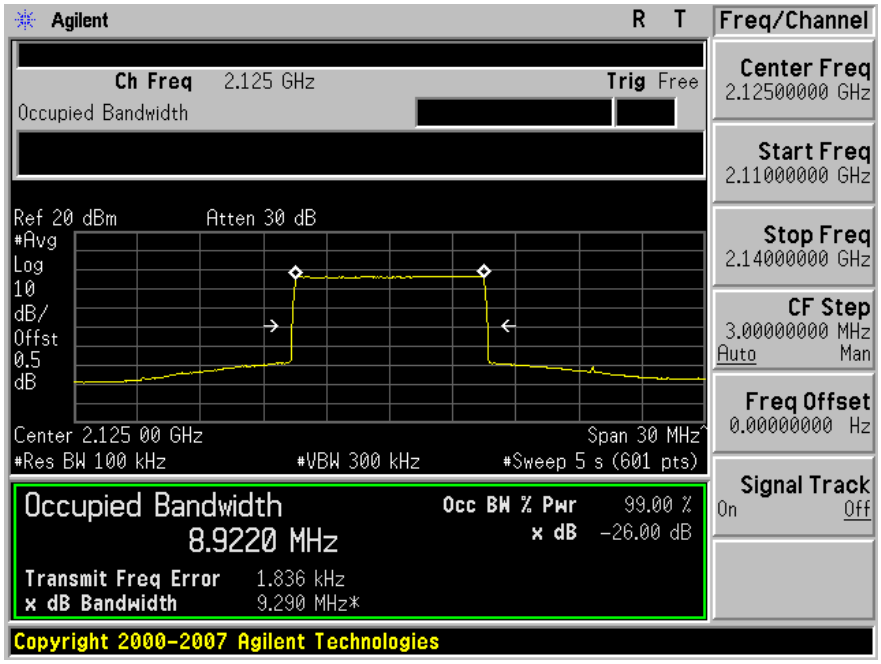


LTE-64QAM, Frequency: 2115 MHz

Input

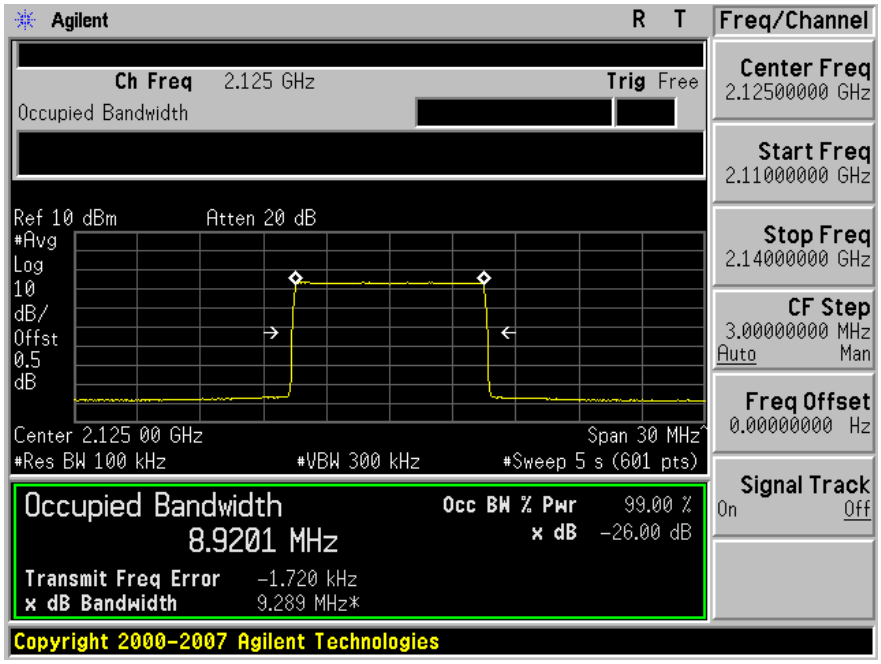


Output

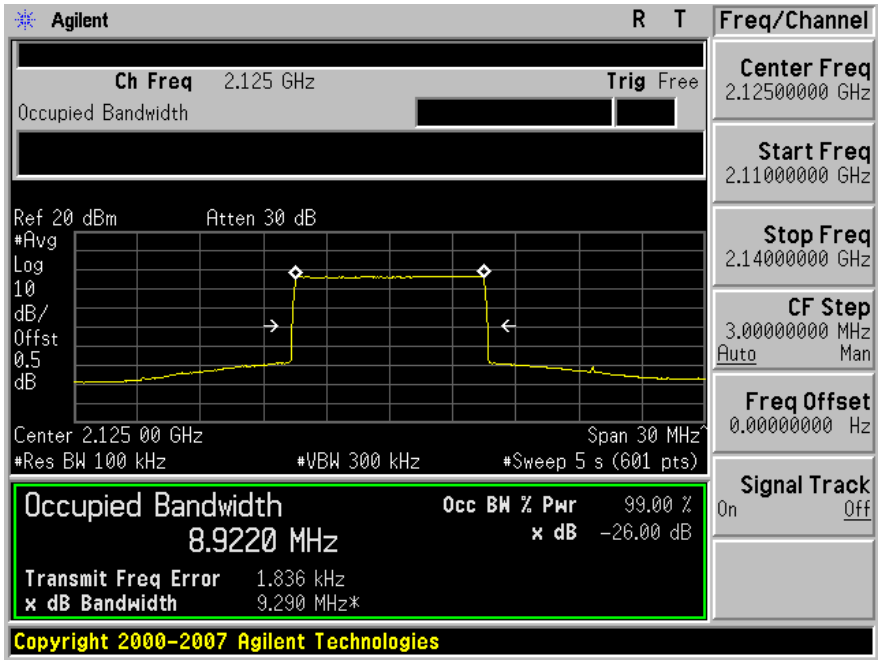


LTE-64QAM, Frequency: 2125 MHz

Input

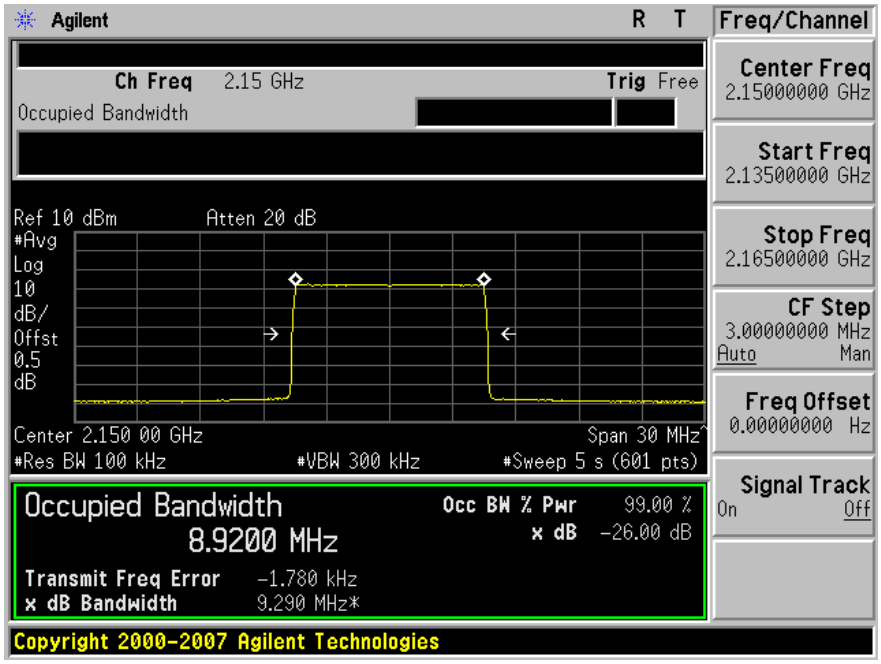


Output

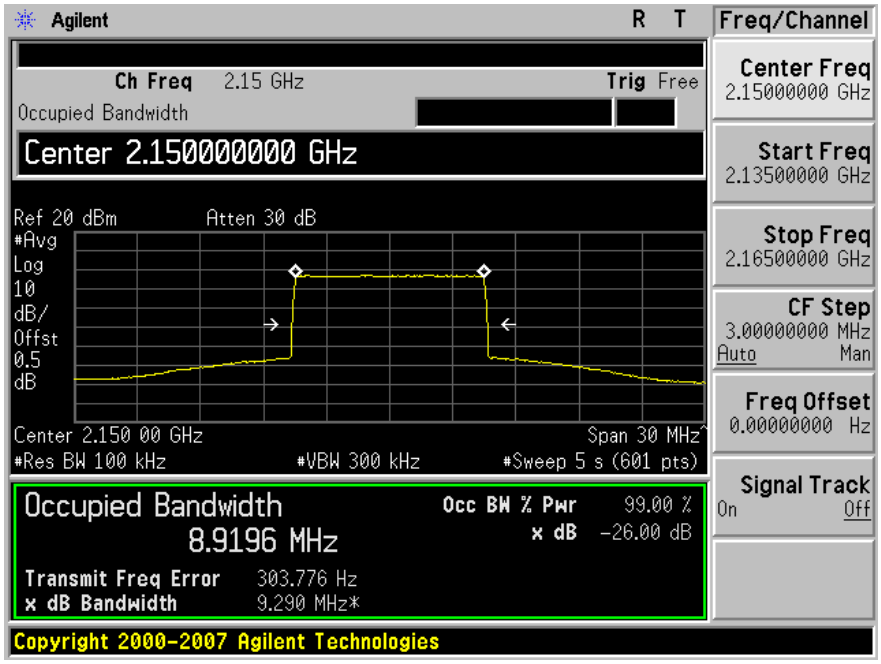


LTE-64QAM, Frequency: 2150 MHz

Input

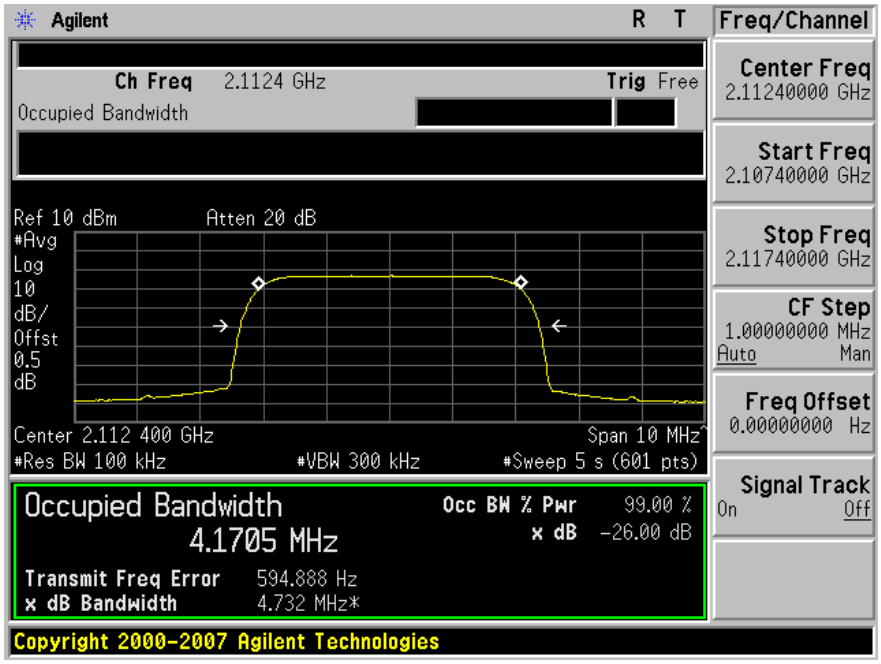


Output

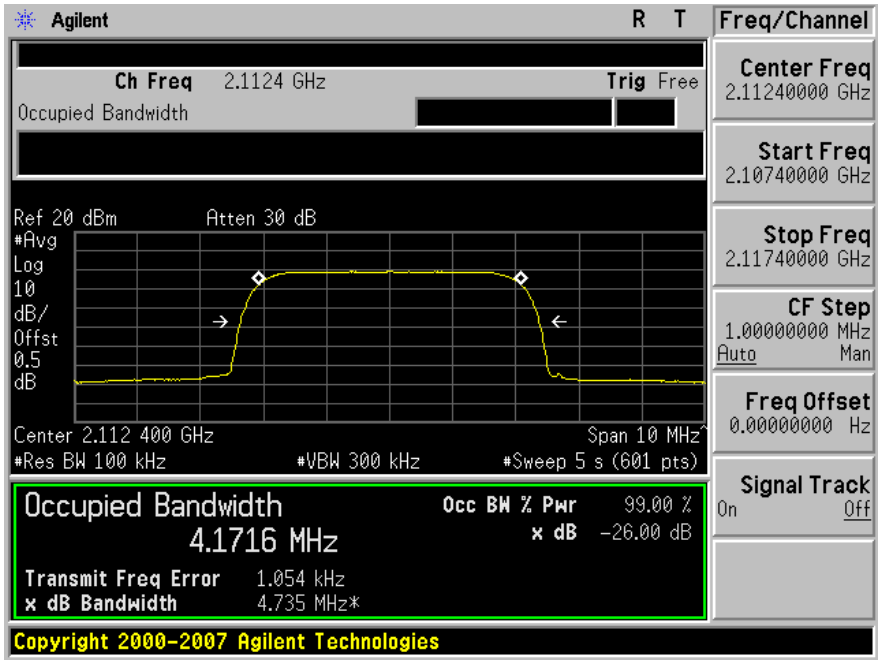


WCDMA, Frequency: 2112.4 MHz

Input

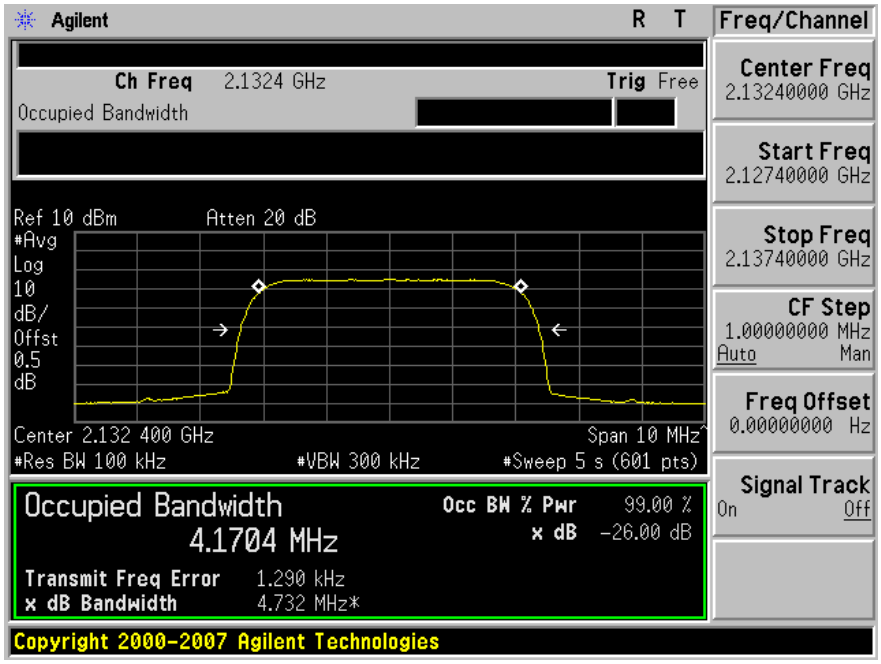


Output

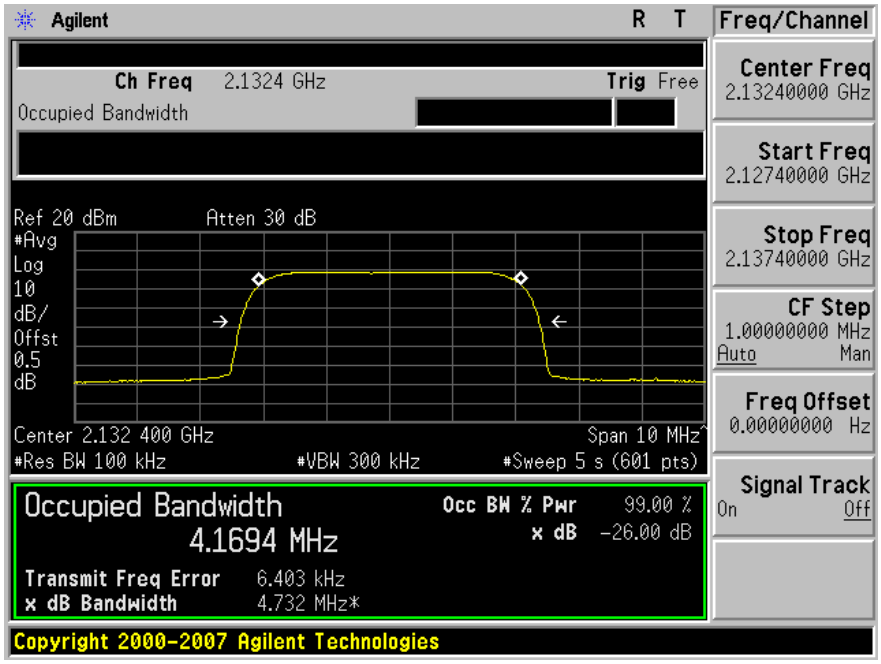


WCDMA, Frequency: 2132.4 MHz

Input

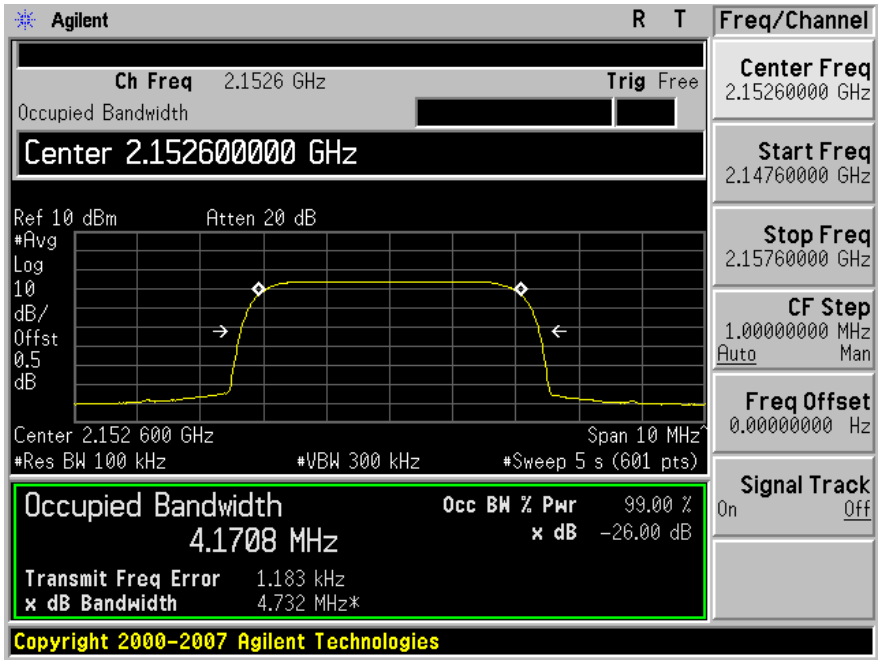


Output

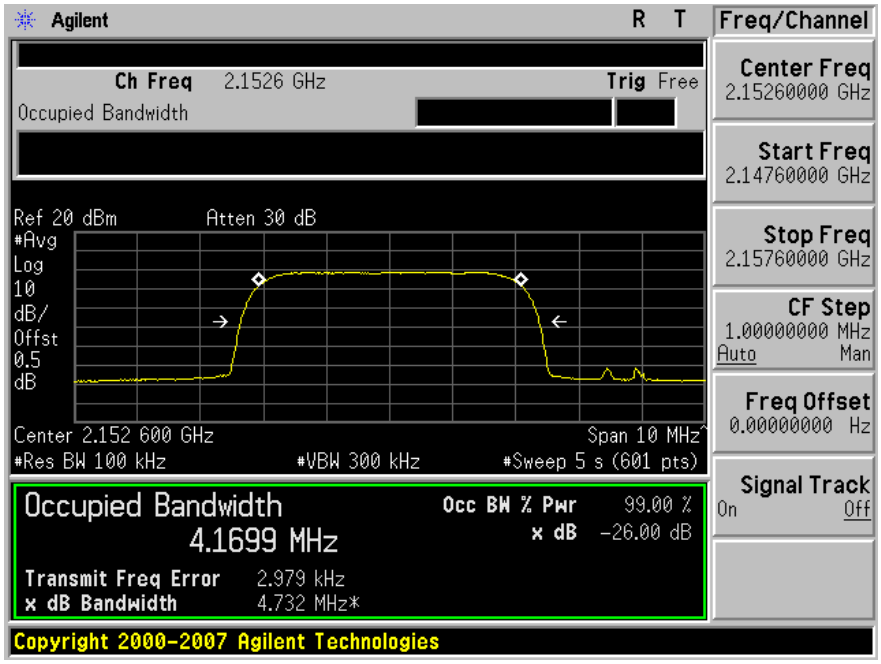


WCDMA, Frequency: 2152.6 MHz

Input



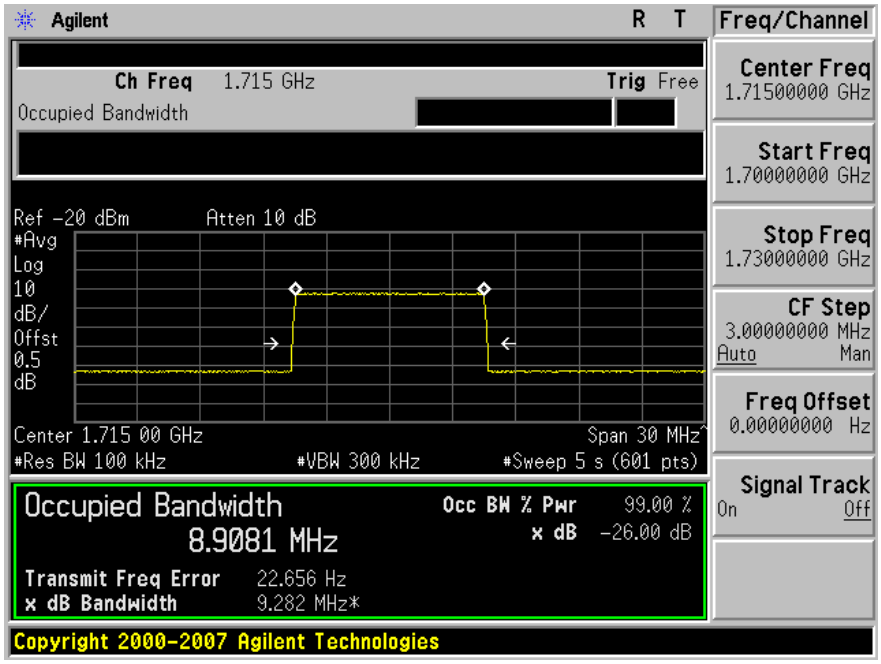
Output



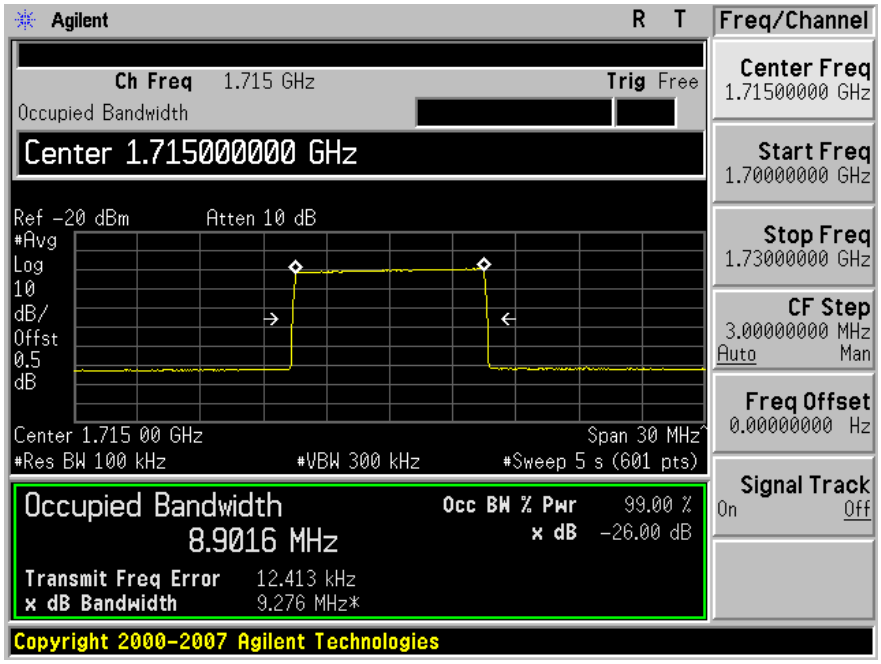
UL: 1710-1755 MHz

LTE-QPSK, Frequency: 1715 MHz

Input

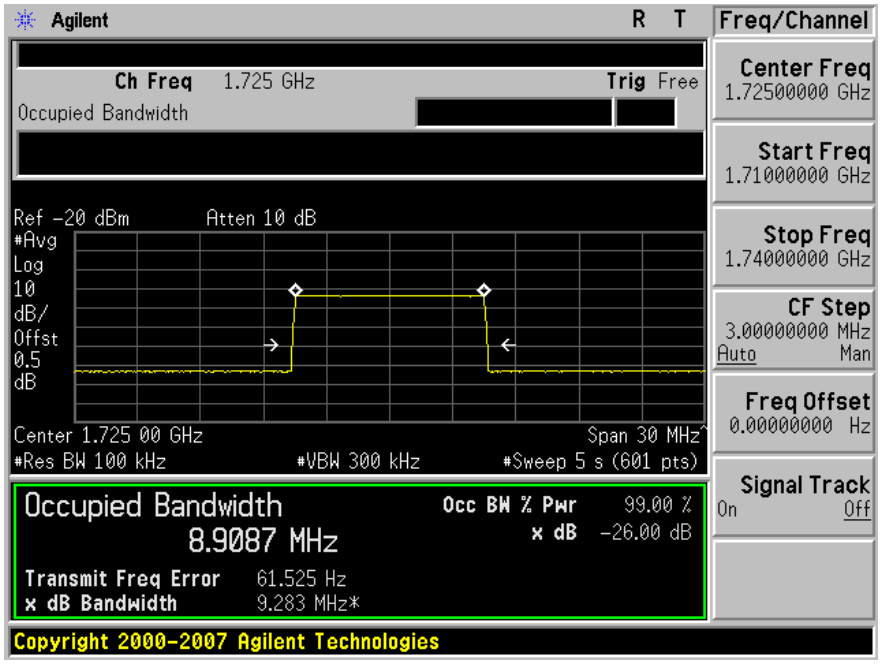


Output

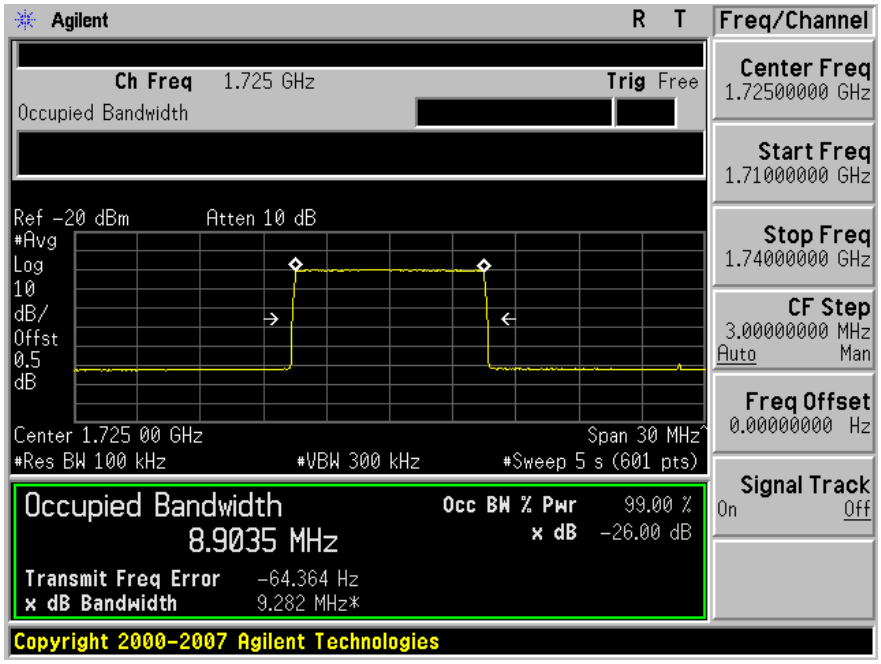


LTE-QPSK, Frequency: 1725 MHz

Input

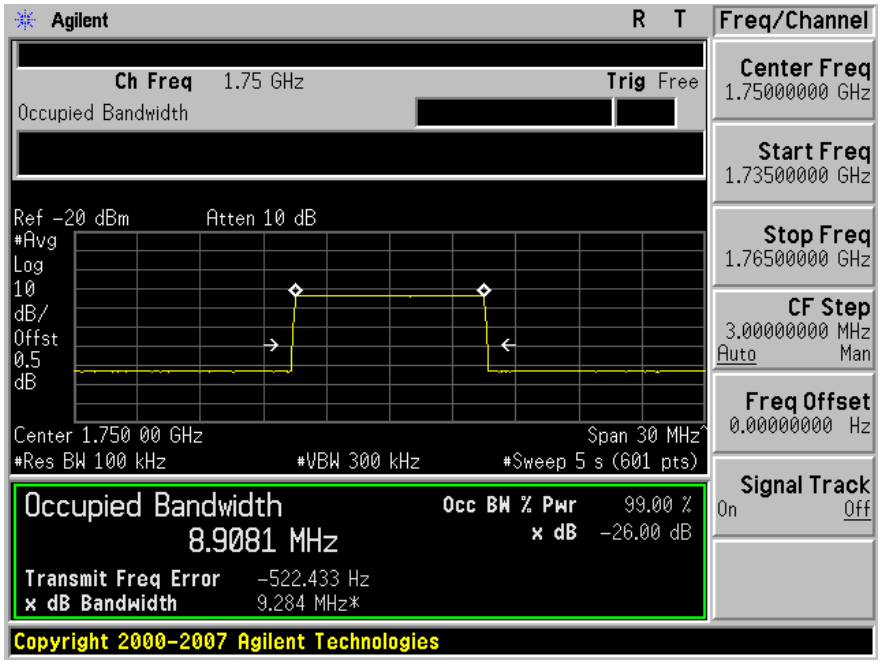


Output

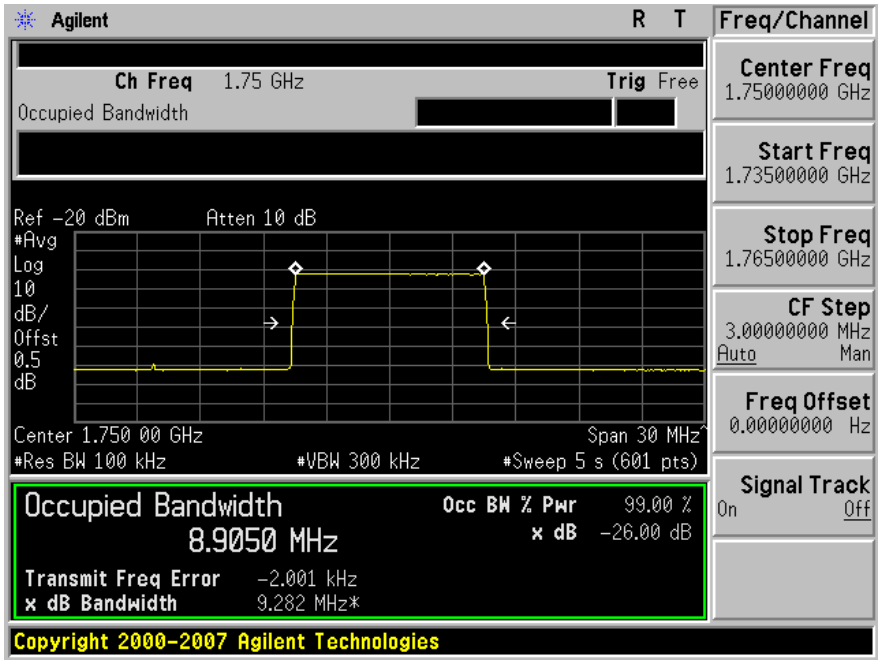


LTE-QPSK, Frequency: 1750 MHz

Input

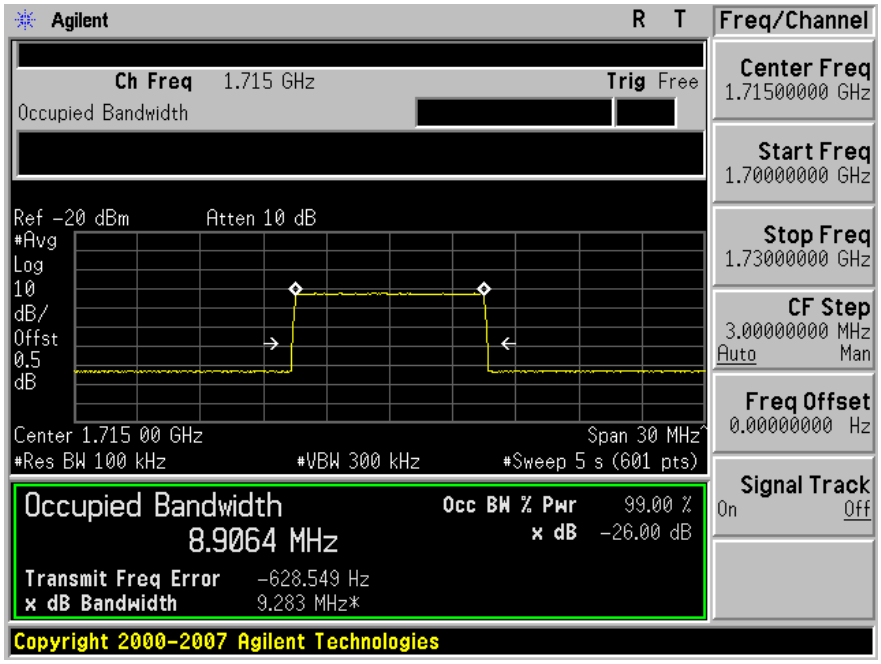


Output

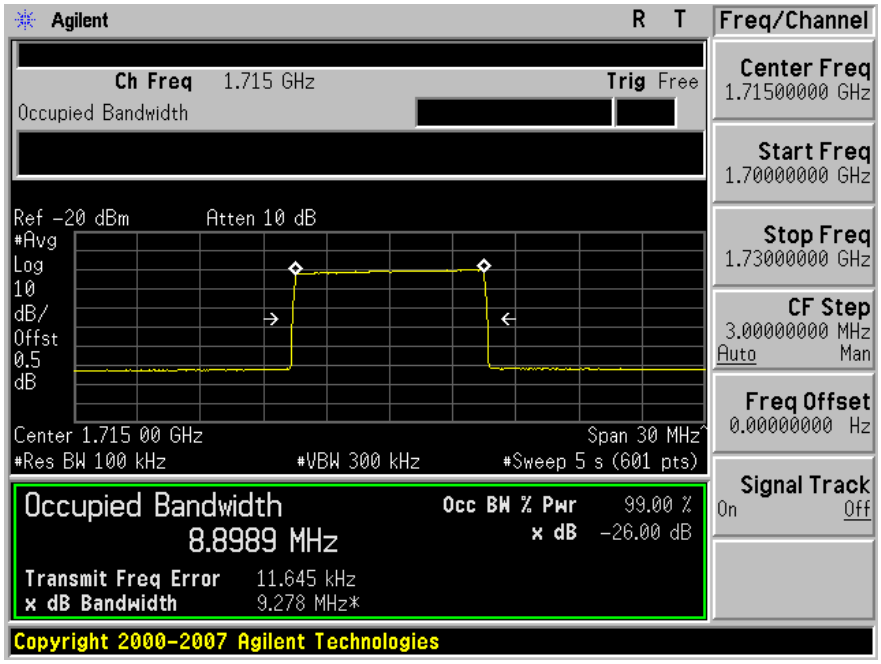


LTE-16QAM, Frequency: 1715 MHz

Input

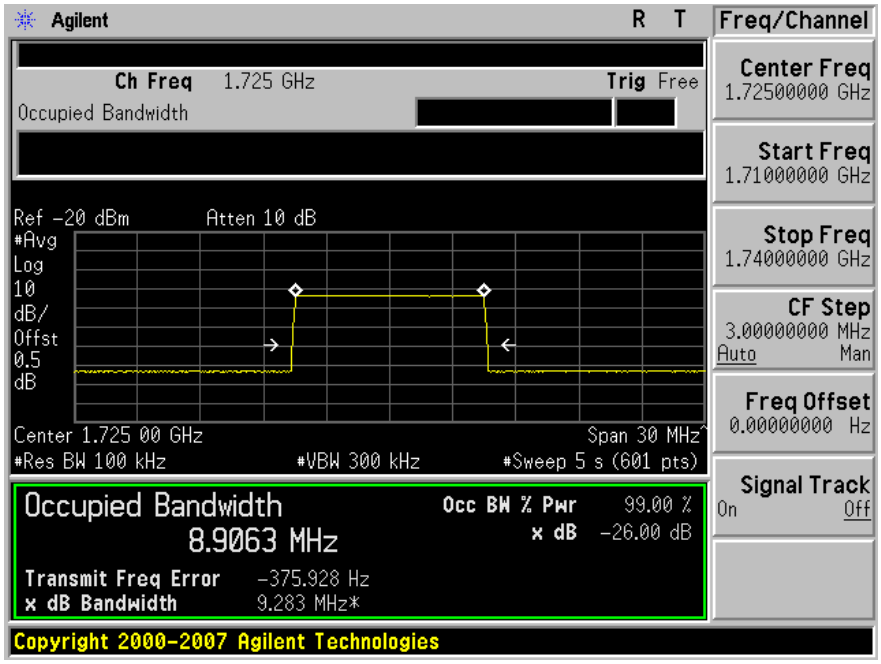


Output

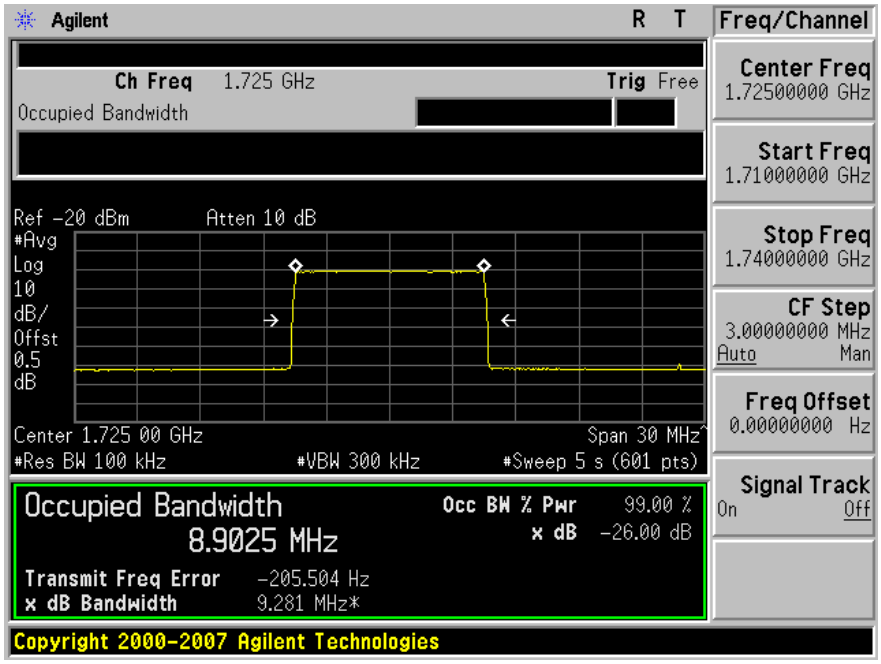


LTE-16QAM, Frequency: 1725 MHz

Input

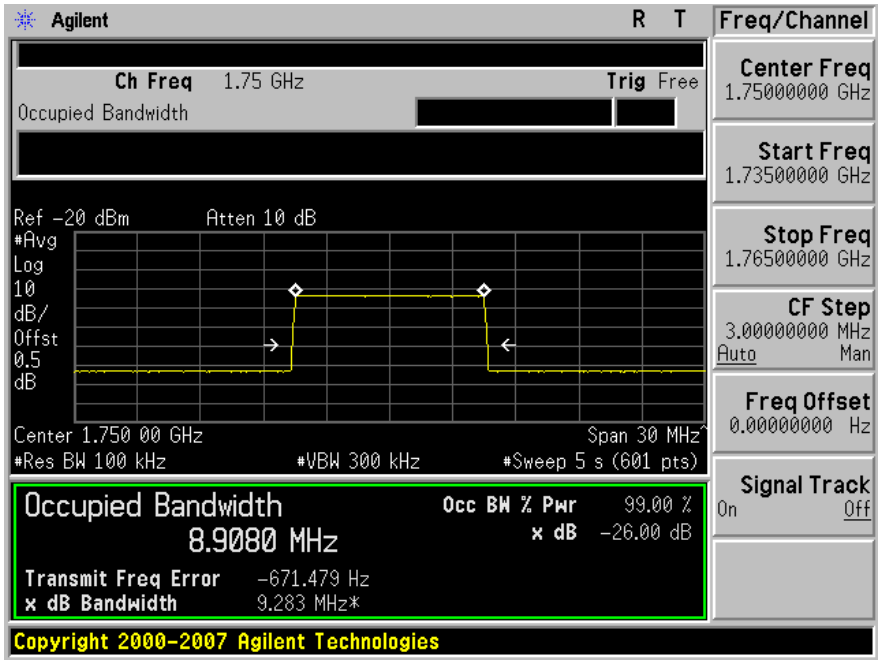


Output

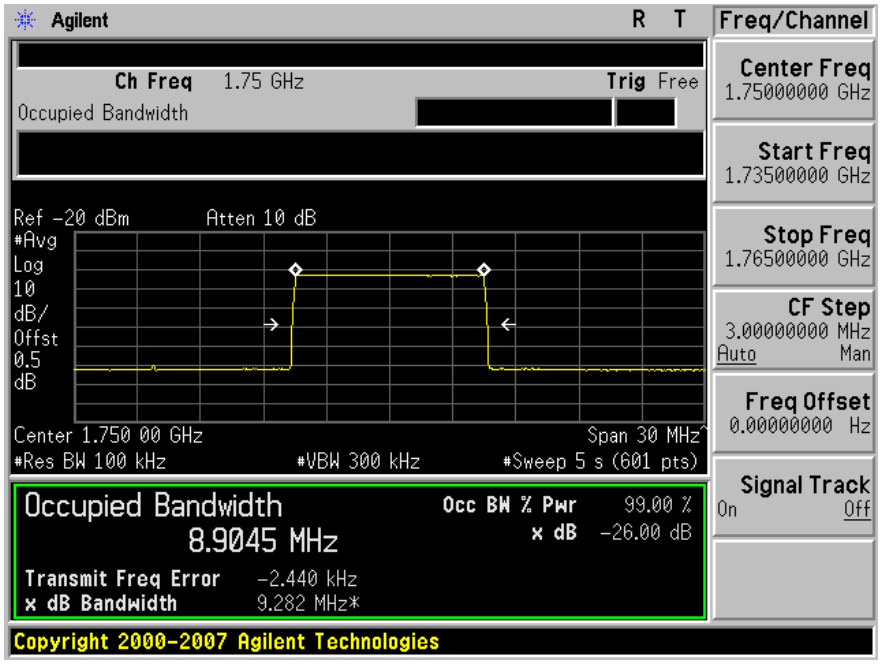


LTE-16QAM, Frequency: 1750 MHz

Input

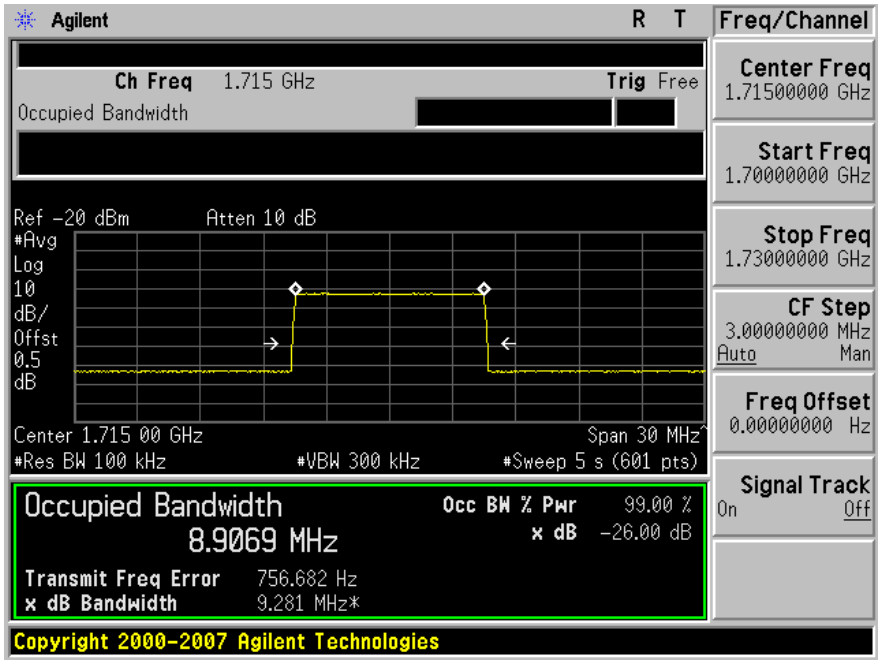


Output

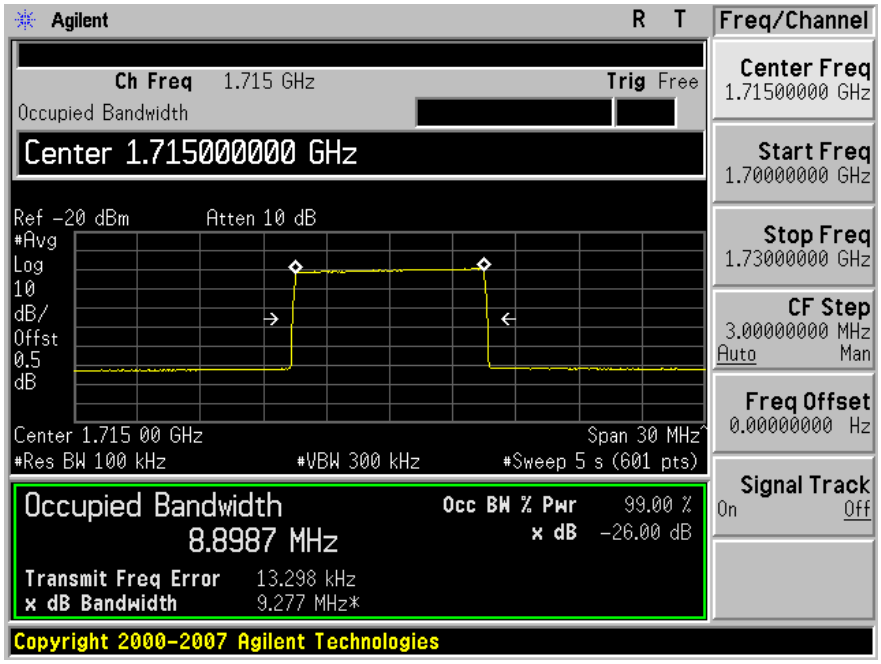


LTE-64QAM, Frequency: 1715 MHz

Input

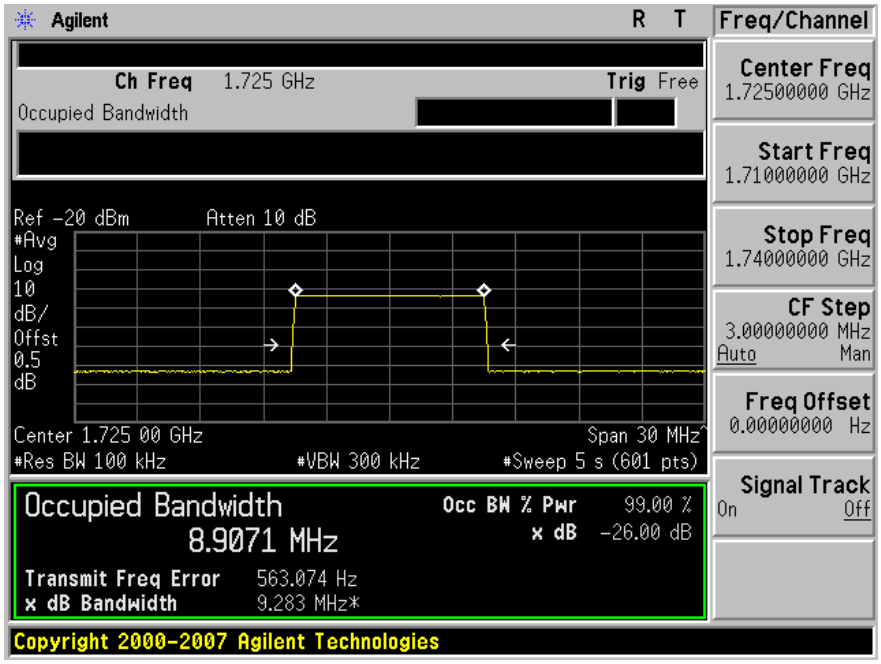


Output

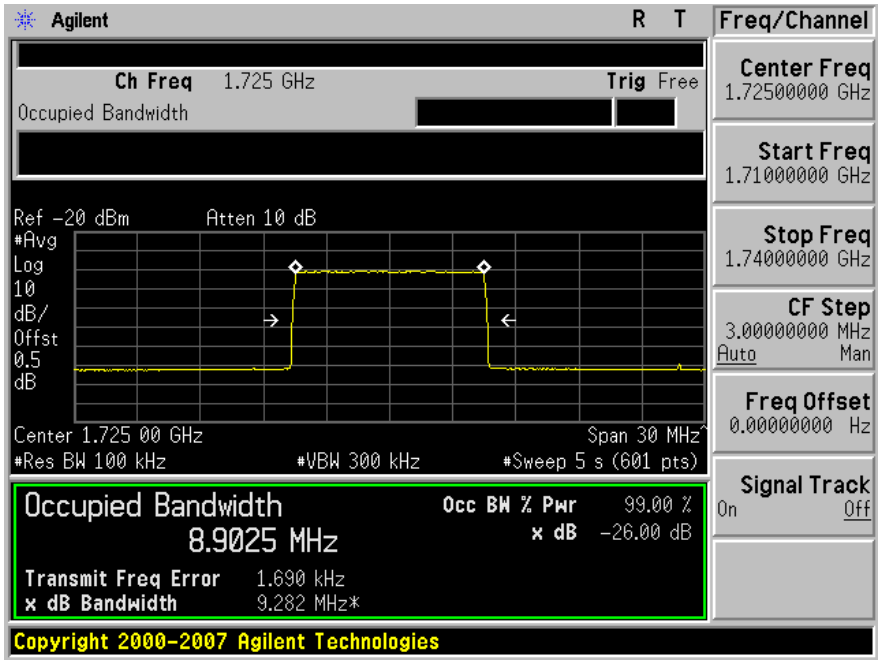


LTE-64QAM, Frequency: 1725 MHz

Input

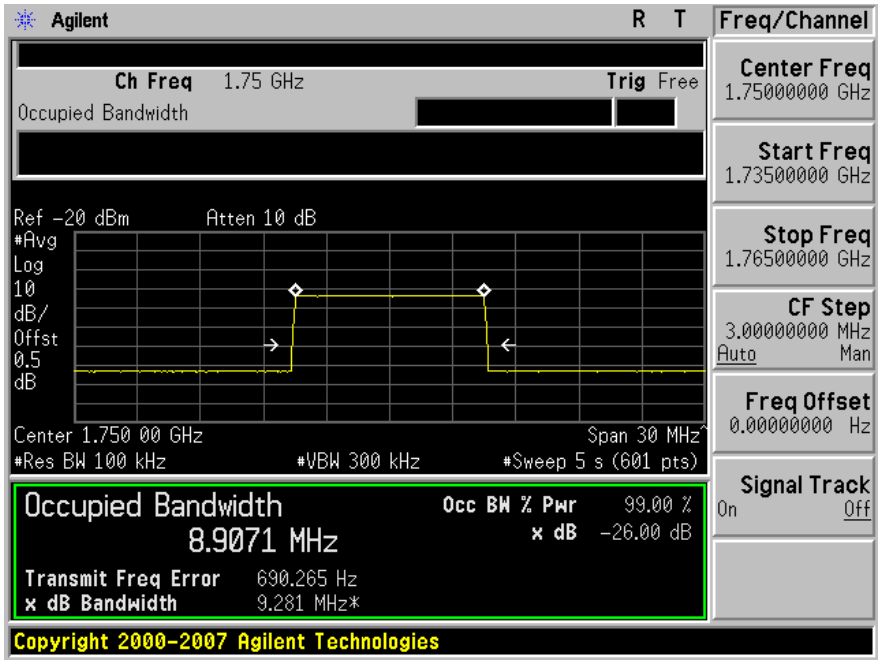


Output

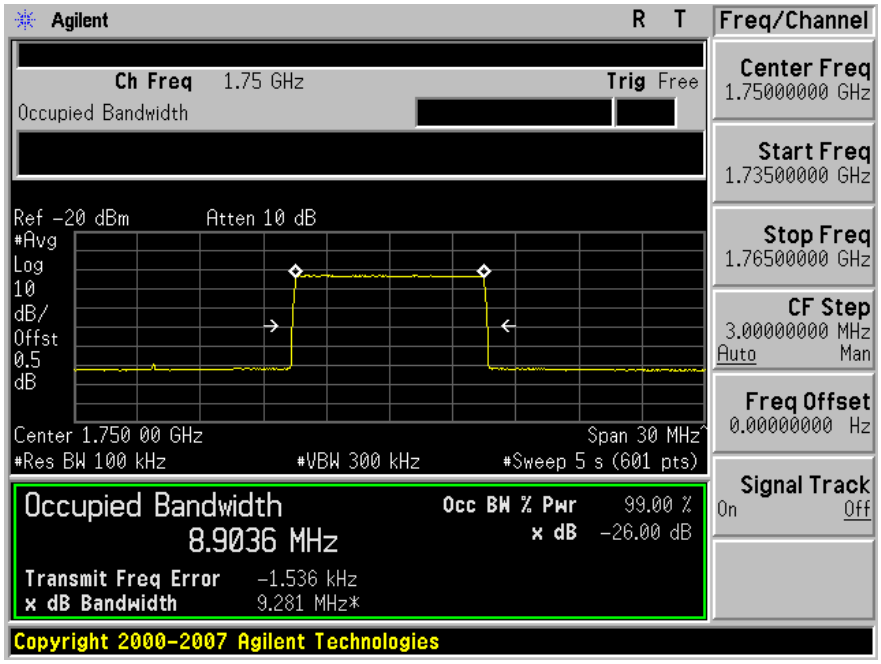


LTE-64QAM, Frequency: 1750 MHz

Input

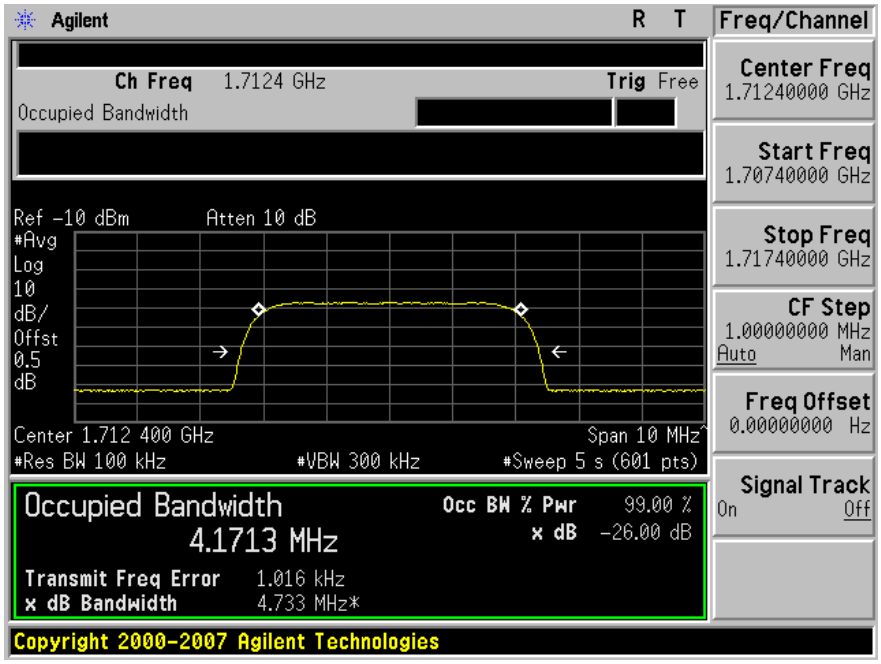


Output

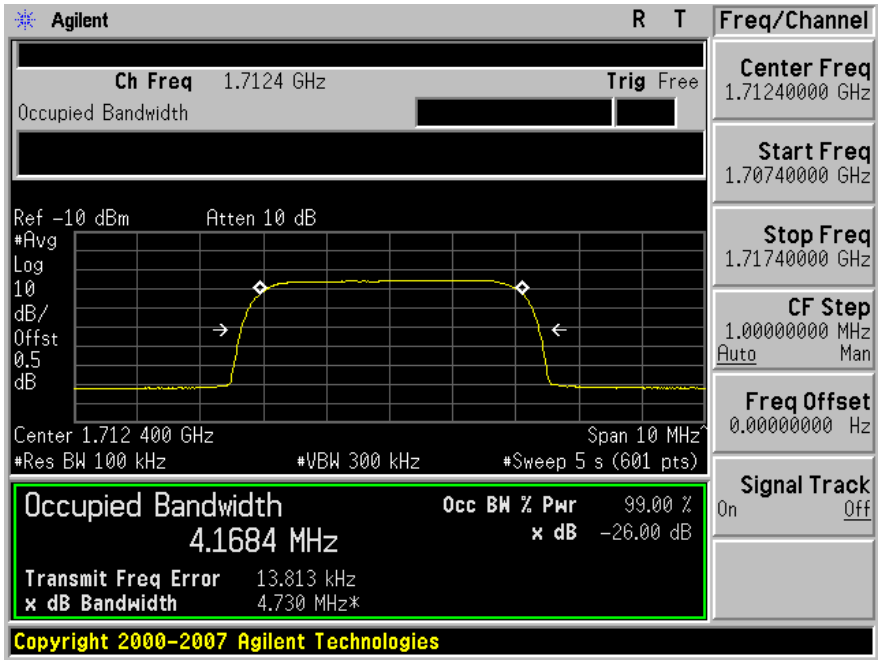


WCDMA, Frequency: 1712.4 MHz

Input

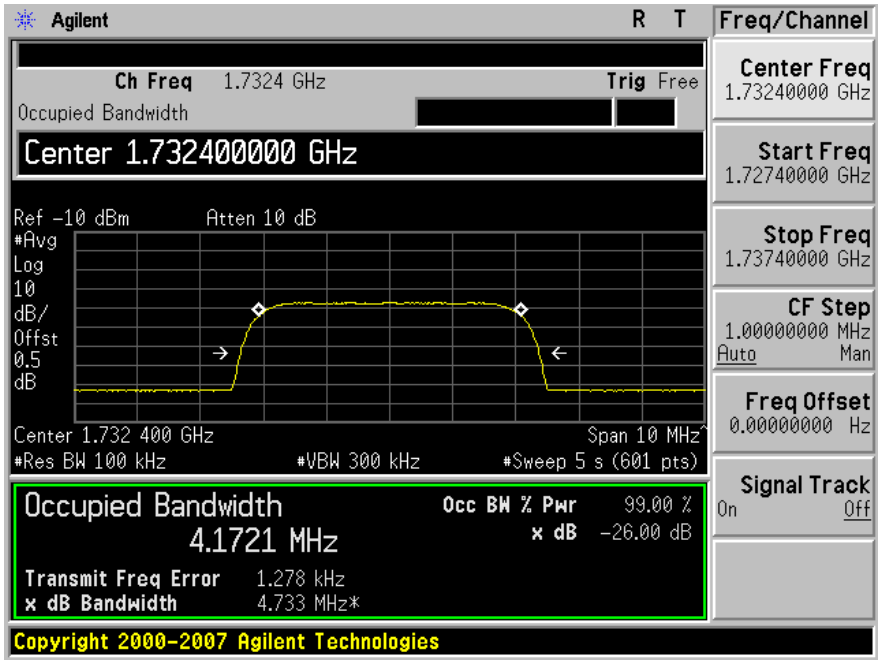


Output

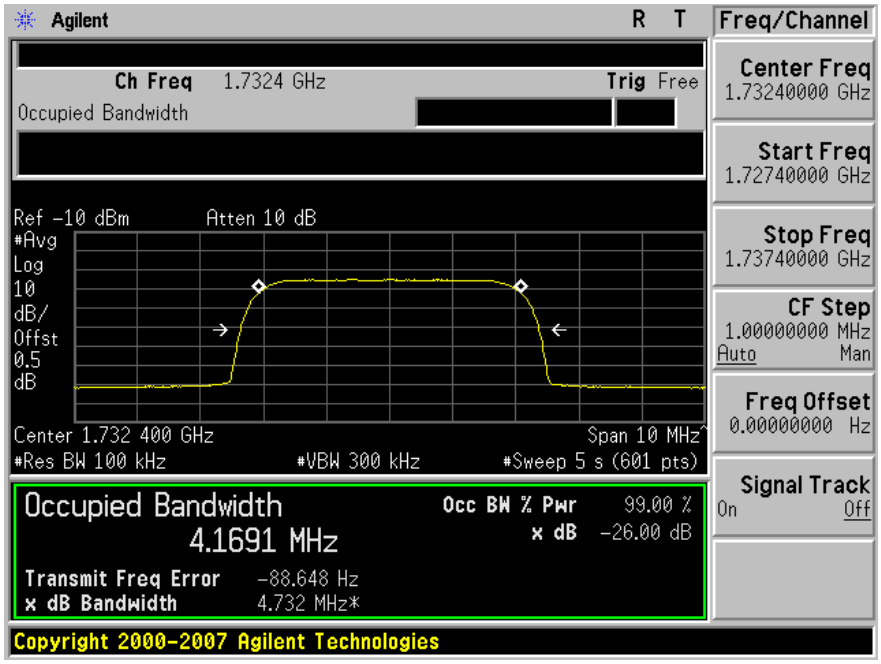


WCDMA, Frequency: 1732.4 MHz

Input

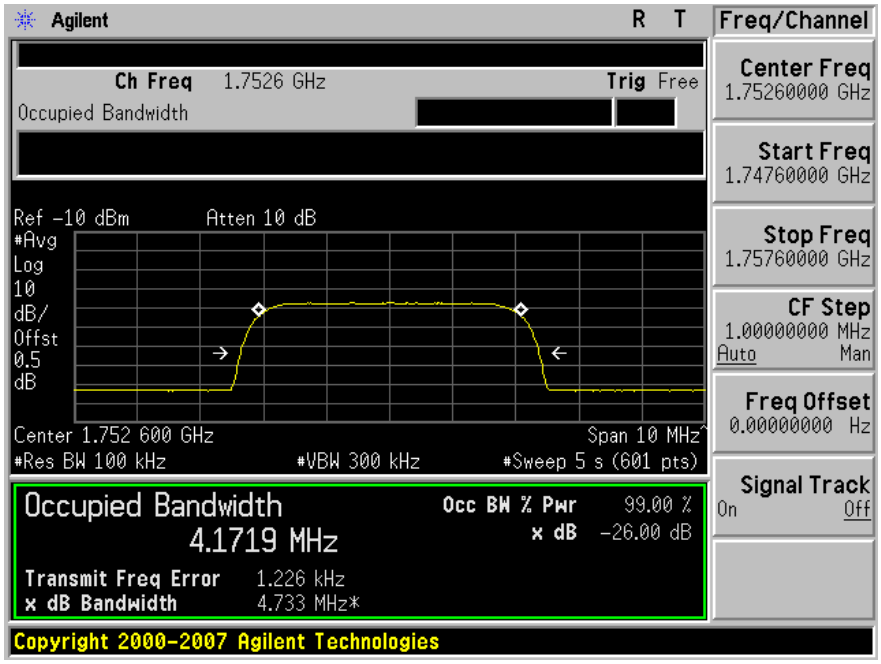


Output

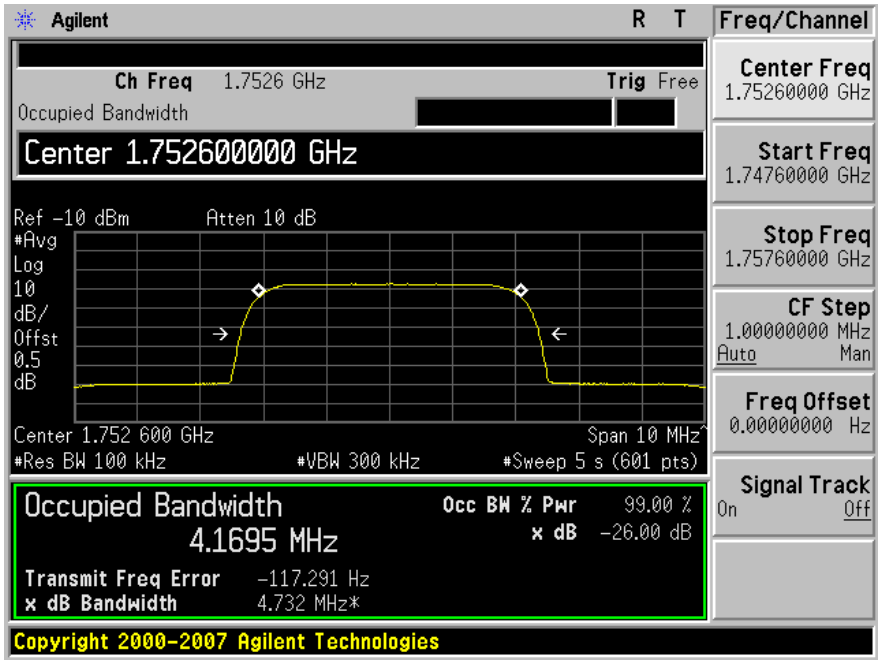


WCDMA, Frequency: 1752.6 MHz

Input



Output



7 FCC §2.1053 & §27.53 - SPURIOUS RADIATED EMISSIONS

7.1 Applicable Standard

Requirements: CFR 47, § 2.1053, § 27.53.

7.2 Test Procedure

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

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

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

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

7.3 Test Environmental Conditions

Temperature:	21-24 °C
Relative Humidity:	42-44 %
ATM Pressure:	101-103 kPa

** The testing was performed by Victor Zhang from 2009-09-14 to 2009-09-16 in 5 Meter Chamber #3.*

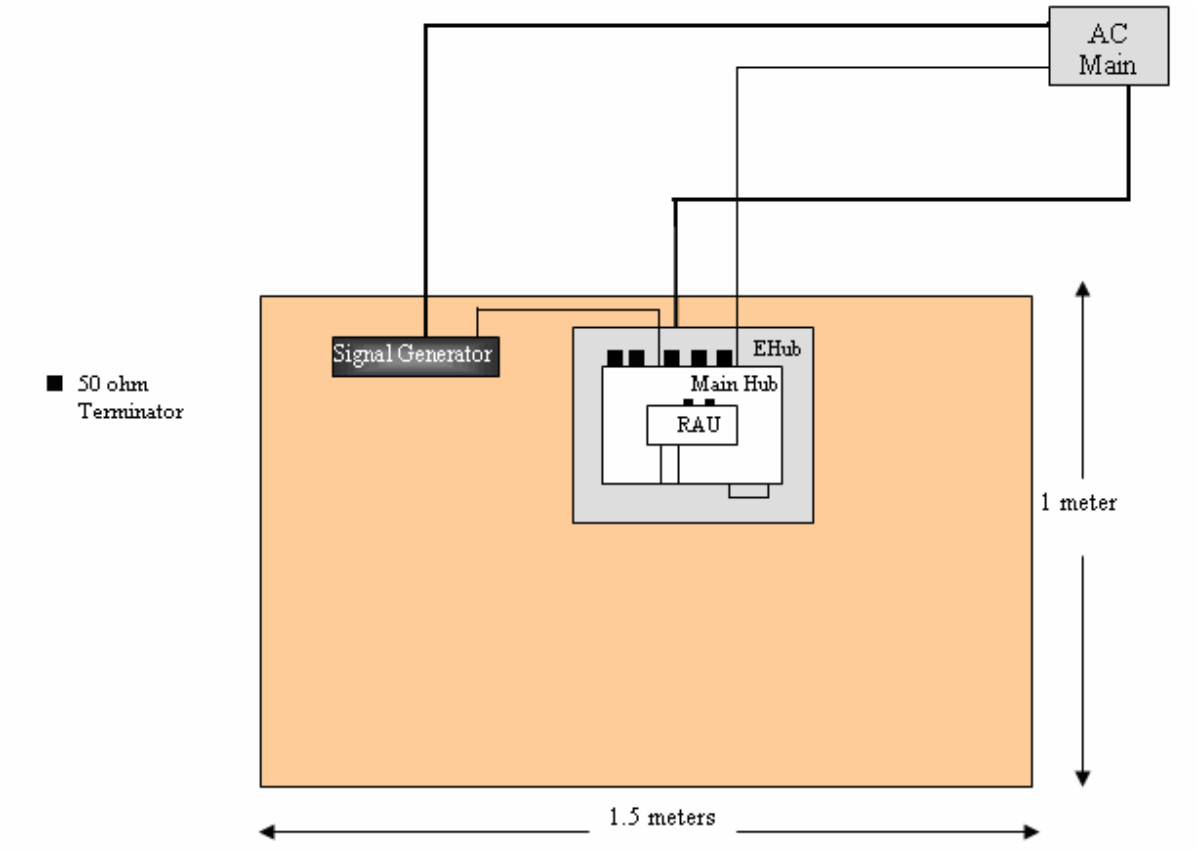
7.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23
Sunol Sciences	Antenna	JB1	A020106-1	2009-04-17
A.R.A	Horn Antenna	DRG-118/A	1132	2009-07-28
Agilent	Signal Generator	E4438C	MY45094317	2009-09-01
Ducommun	Amplifier	ALN-09173030-01	988251-03R	2009-03-04
HP	Pre-Amplifier	8447D	2944A06639	2009-06-05

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

7.5 Test Setup Block Diagram

Radiated Emission



7.6 Summary of Test Results

The worst case reading as follows:

DL: 746-757 MHz

Modulation: LTE-QPSK

Frequency: 752 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-15.90	1825	Horizontal	30 MHz – 10 GHz

UL: 776-787 MHz

Modulation: LTE-QPSK

Frequency: 782 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-16.82	1825	Horizontal	30 MHz – 10 GHz

DL: 728-746 MHz

Modulation: LTE-QPSK

Frequency: 733 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-17.21	1825	Horizontal	30 MHz – 10 GHz

Modulation: WCDMA

Frequency: 737 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-15.90	1825	Horizontal	30 MHz – 10 GHz

UL: 698-716 MHz

Modulation: LTE-QPSK

Frequency: 703 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-16.90	1825	Horizontal	30 MHz – 10 GHz

Modulation: WCDMA

Frequency: 707 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-16.40	1825	Horizontal	30 MHz – 10 GHz

DL: 2110-2155 MHz

Modulation: LTE-QPSK

Frequency: 2125 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-16.98	1825	Horizontal	30 MHz – 25 GHz

Modulation: WCDMA

Frequency: 2132.4 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-16.57	1825	Horizontal	30 MHz – 25 GHz

UL: 1710-1755 MHz

Modulation: LTE-QPSK

Frequency: 1725 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-17.90	1825	Horizontal	30 MHz – 25 GHz

Modulation: WCDMA

Frequency: 1732.4 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-16.80	1825	Horizontal	30 MHz – 25 GHz

7.7 Test Results

DL: 746-757 MHz

Modulation: LTE-QPSK – 752 MHz (Scan from 30 MHz to 10 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	70.79	103	1.17	H	1825.00	-38.03	9.50	0.37	-28.90	-13.00	-15.90
1825.00	68.49	161	1.18	V	1825.00	-40.33	9.50	0.37	-31.20	-13.00	-18.20
3648.70	55.48	214	1.37	H	3648.70	-52.64	10.30	0.57	-42.91	-13.00	-29.91
3648.70	53.80	193	1.27	V	3648.70	-54.32	10.30	0.57	-44.59	-13.00	-31.59
1225.10	56.52	103	1.38	H	1225.10	-56.95	6.90	0.29	-50.34	-13.00	-37.34
1225.10	54.64	12	1.40	V	1225.10	-58.83	6.90	0.29	-52.22	-13.00	-39.22
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62
1504.00	45.97	183	1.00	V	1504.00	-67.94	8.80	0.34	-59.48	-13.00	-46.48
1504.00	45.66	137	1.22	H	1504.00	-68.25	8.80	0.34	-59.79	-13.00	-46.79

UL: 776-787 MHz

Modulation: LTE-QPSK – 782 MHz (Scan from 30 MHz to 10 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	69.87	103	1.21	H	1825.00	-38.95	9.50	0.37	-29.82	-13.00	-16.82
1825.00	67.79	170	1.19	V	1825.00	-41.03	9.50	0.37	-31.90	-13.00	-18.90
3648.70	55.41	215	1.40	H	3648.70	-52.71	10.30	0.57	-42.98	-13.00	-29.98
3648.70	53.13	189	1.30	V	3648.70	-54.99	10.30	0.57	-45.26	-13.00	-32.26
1225.10	56.78	107	1.39	H	1225.10	-56.69	6.90	0.29	-50.08	-13.00	-37.08
1225.10	54.01	10	1.40	V	1225.10	-59.46	6.90	0.29	-52.85	-13.00	-39.85
936.500	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.500	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62

DL: 728-746 MHz

Modulation: LTE-QPSK – 733 MHz (Scan from 30 MHz to 10 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	69.48	103	1.17	H	1825.00	-39.34	9.50	0.37	-30.21	-13.00	-17.21
1825.00	68.32	161	1.18	V	1825.00	-40.50	9.50	0.37	-31.37	-13.00	-18.37
3648.70	55.48	214	1.37	H	3648.70	-52.64	10.30	0.57	-42.91	-13.00	-29.91
3648.70	53.80	193	1.27	V	3648.70	-54.32	10.30	0.57	-44.59	-13.00	-31.59
6375.00	44.94	110	1.00	V	6375.00	-59.57	11.50	0.80	-48.87	-13.00	-35.87
1225.10	56.52	103	1.38	H	1225.10	-56.95	6.90	0.29	-50.34	-13.00	-37.34
6375.00	43.11	171	1.53	H	6375.00	-61.40	11.50	0.80	-50.70	-13.00	-37.70
1225.10	54.64	12	1.40	V	1225.10	-58.83	6.90	0.29	-52.22	-13.00	-39.22
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62

DL: 728-746 MHz

Modulation: WCDMA – 737 MHz (Scan from 30 MHz to 10 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	70.79	103	1.17	H	1825.00	-38.03	9.50	0.37	-28.90	-13.00	-15.90
1825.00	68.49	161	1.18	V	1825.00	-40.33	9.50	0.37	-31.20	-13.00	-18.20
3648.70	55.48	214	1.37	H	3648.70	-52.64	10.30	0.57	-42.91	-13.00	-29.91
3648.70	53.80	193	1.27	V	3648.70	-54.32	10.30	0.57	-44.59	-13.00	-31.59
1225.10	56.52	103	1.38	H	1225.10	-56.95	6.90	0.29	-50.34	-13.00	-37.34
1225.10	54.64	12	1.40	V	1225.10	-58.83	6.90	0.29	-52.22	-13.00	-39.22
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62
1474.00	45.23	210	1.19	H	1474.00	-68.68	8.80	0.34	-60.22	-13.00	-47.22
1474.00	44.92	137	1.21	V	1474.00	-68.99	8.80	0.34	-60.53	-13.00	-47.53

UL: 698-716 MHz

Modulation: LTE-QPSK – 703 MHz (Scan from 30 MHz to 10 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	69.79	103	1.17	H	1825.00	-39.03	9.50	0.37	-29.90	-13.00	-16.90
1825.00	68.49	161	1.18	V	1825.00	-40.33	9.50	0.37	-31.20	-13.00	-18.20
3648.70	55.48	214	1.37	H	3648.70	-52.64	10.30	0.57	-42.91	-13.00	-29.91
3648.70	53.80	193	1.27	V	3648.70	-54.32	10.30	0.57	-44.59	-13.00	-31.59
6375.00	44.94	110	1.00	V	6375.00	-59.57	11.50	0.80	-48.87	-13.00	-35.87
1225.10	56.52	103	1.38	H	1225.10	-56.95	6.90	0.29	-50.34	-13.00	-37.34
6375.00	43.11	171	1.53	H	6375.00	-61.40	11.50	0.80	-50.70	-13.00	-37.70
1225.10	54.64	12	1.40	V	1225.10	-58.83	6.90	0.29	-52.22	-13.00	-39.22
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62

UL: 698-716 MHz

Modulation: WCDMA – 707 MHz (Scan from 30 MHz to 10 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	70.29	103	1.17	H	1825.00	-38.53	9.50	0.37	-29.40	-13.00	-16.40
1825.00	68.49	161	1.18	V	1825.00	-40.33	9.50	0.37	-31.20	-13.00	-18.20
3648.70	55.48	214	1.37	H	3648.70	-52.64	10.30	0.57	-42.91	-13.00	-29.91
3648.70	53.80	193	1.27	V	3648.70	-54.32	10.30	0.57	-44.59	-13.00	-31.59
1225.10	56.52	103	1.38	H	1225.10	-56.95	6.90	0.29	-50.34	-13.00	-37.34
1225.10	54.64	12	1.40	V	1225.10	-58.83	6.90	0.29	-52.22	-13.00	-39.22
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62

DL: 2110-2155 MHz

Modulation: LTE-QPSK – 2125 MHz (Scan from 30 MHz to 25 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	69.71	112	1.31	H	1825.00	-39.11	9.50	0.37	-29.98	-13.00	-16.98
1825.00	68.32	156	1.34	V	1825.00	-40.50	9.50	0.37	-31.37	-13.00	-18.37
4250.00	63.74	173	1.51	H	4250.00	-42.48	10.90	0.61	-32.19	-13.00	-19.19
4250.00	63.14	155	1.10	V	4250.00	-43.08	10.90	0.61	-32.79	-13.00	-19.79
3648.70	55.21	210	1.38	H	3648.70	-52.91	10.30	0.57	-43.18	-13.00	-30.18
3648.70	53.17	189	1.29	V	3648.70	-54.95	10.30	0.57	-45.22	-13.00	-32.22
6375.00	44.94	110	1.00	V	6375.00	-59.57	11.50	0.80	-48.87	-13.00	-35.87
1225.10	56.84	12	1.40	V	1225.10	-56.63	6.90	0.29	-50.02	-13.00	-37.02
6375.00	43.11	171	1.53	H	6375.00	-61.40	11.50	0.80	-50.70	-13.00	-37.70
1225.10	55.95	103	1.38	H	1225.10	-57.52	6.90	0.29	-50.91	-13.00	-37.91
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62

DL: 2110-2155 MHz

Modulation: WCDMA – 2132.4 MHz (Scan from 30 MHz to 25 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	70.12	110	1.21	H	1825.00	-38.70	9.50	0.37	-29.57	-13.00	-16.57
1825.00	69.01	161	1.20	V	1825.00	-39.81	9.50	0.37	-30.68	-13.00	-17.68
4264.80	65.25	171	1.04	V	4250.00	-41.51	10.90	0.61	-31.22	-13.00	-18.22
4264.80	58.06	173	1.55	H	4250.00	-48.70	10.90	0.61	-38.41	-13.00	-25.41
3648.70	55.49	214	1.37	H	3648.70	-52.63	10.30	0.57	-42.90	-13.00	-29.90
3648.70	53.28	193	1.27	V	3648.70	-54.84	10.30	0.57	-45.11	-13.00	-32.11
1225.10	57.01	103	1.38	H	1225.10	-56.46	6.90	0.29	-49.85	-13.00	-36.85
1225.10	52.17	12	1.40	V	1225.10	-61.30	6.90	0.29	-54.69	-13.00	-41.69
936.300	55.18	69	1.09	V	936.300	-56.18	0.00	0.24	-56.42	-13.00	-43.42
936.300	52.98	103	1.47	H	936.300	-58.38	0.00	0.24	-58.62	-13.00	-45.62

UL: 1710-1755 MHz

Modulation: LTE-QPSK – 1725 MHz (Scan from 30 MHz to 25 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	68.79	96	1.56	H	1825.00	-40.03	9.50	0.37	-30.90	-13.00	-17.90
1825.00	67.47	165	1,32	V	1825.00	-41.35	9.50	0.37	-32.22	-13.00	-19.22
3648.70	55.37	210	1.40	H	3648.70	-52.75	10.30	0.57	-43.02	-13.00	-30.02
3648.70	53.98	176	1.31	V	3648.70	-54.14	10.30	0.57	-44.41	-13.00	-31.41
1225.10	56.42	112	1.39	H	1225.10	-57.05	6.90	0.29	-50.44	-13.00	-37.44
1225.10	54.17	15	1.42	V	1225.10	-59.30	6.90	0.29	-52.69	-13.00	-39.69
936.300	54.98	69	1.09	V	936.300	-56.38	0.00	0.24	-56.62	-13.00	-43.62
936.300	52.71	103	1.47	H	936.300	-58.65	0.00	0.24	-58.89	-13.00	-45.89

UL: 1710-1755 MHz

Modulation: WCDMA – 1725 MHz (Scan from 30 MHz to 25 GHz @ 3 Meter Distance)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1825.00	69.89	132	1.21	H	1825.00	-38.93	9.50	0.37	-29.80	-13.00	-16.80
1825.00	68.21	173	1.19	V	1825.00	-40.61	9.50	0.37	-31.48	-13.00	-18.48
3648.70	54.98	214	1.37	H	3648.70	-53.14	10.30	0.57	-43.41	-13.00	-30.41
3648.70	53.87	193	1.27	V	3648.70	-54.25	10.30	0.57	-44.52	-13.00	-31.52
1225.10	56.21	103	1.38	H	1225.10	-57.26	6.90	0.29	-50.65	-13.00	-37.65
1225.10	54.32	12	1.40	V	1225.10	-59.15	6.90	0.29	-52.54	-13.00	-39.54
936.300	53.46	69	1.09	V	936.300	-57.90	0.00	0.24	-58.14	-13.00	-45.14
936.300	52.17	103	1.47	H	936.300	-59.19	0.00	0.24	-59.43	-13.00	-46.43

8 FCC §2.1051 & §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Applicable Standard

Requirements: CFR 47, § 2.1051. § 27.53.

The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB

8.2 Test Procedure

The RF output of the 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.

8.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	40-43 %
ATM Pressure:	101-103 kPa

** The testing was performed by Victor Zhang on from 2009-09-08 to 2009-09-18 in RF Site.*

8.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY45094317	2009-09-01

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

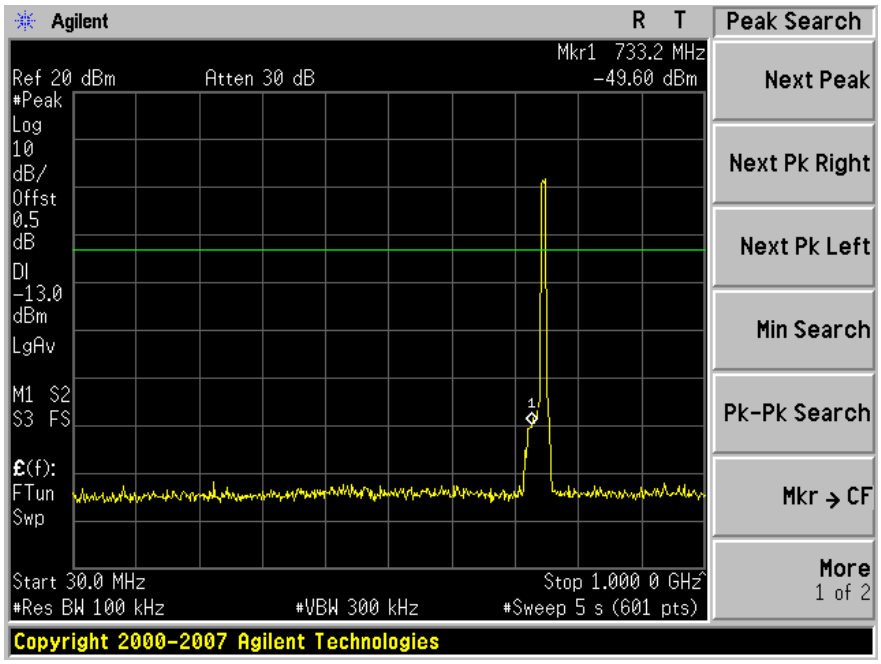
8.5 Test Results

Please refer to the following plots.

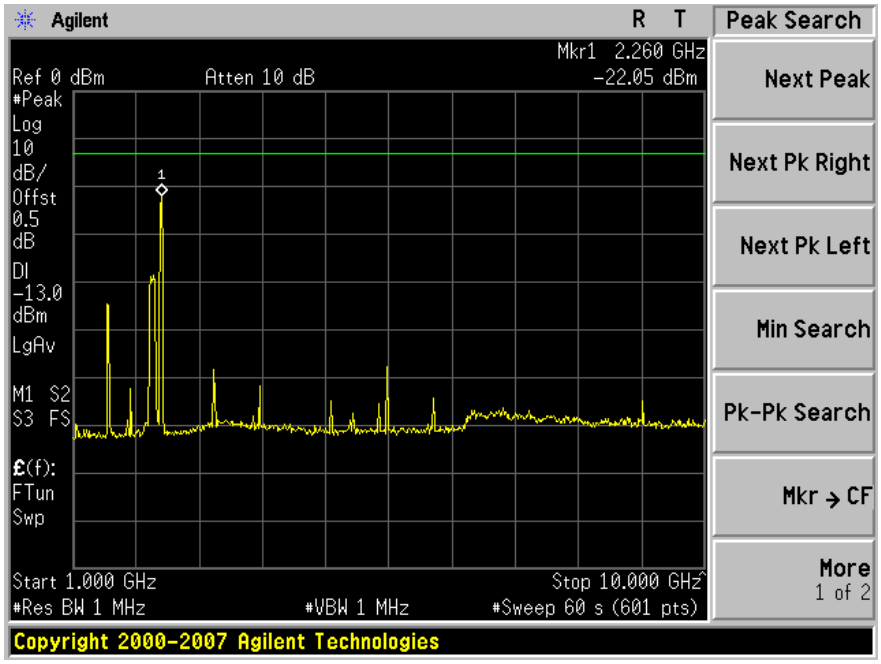
DL: 746-757 MHz

Modulation: LTE-QPSK, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz

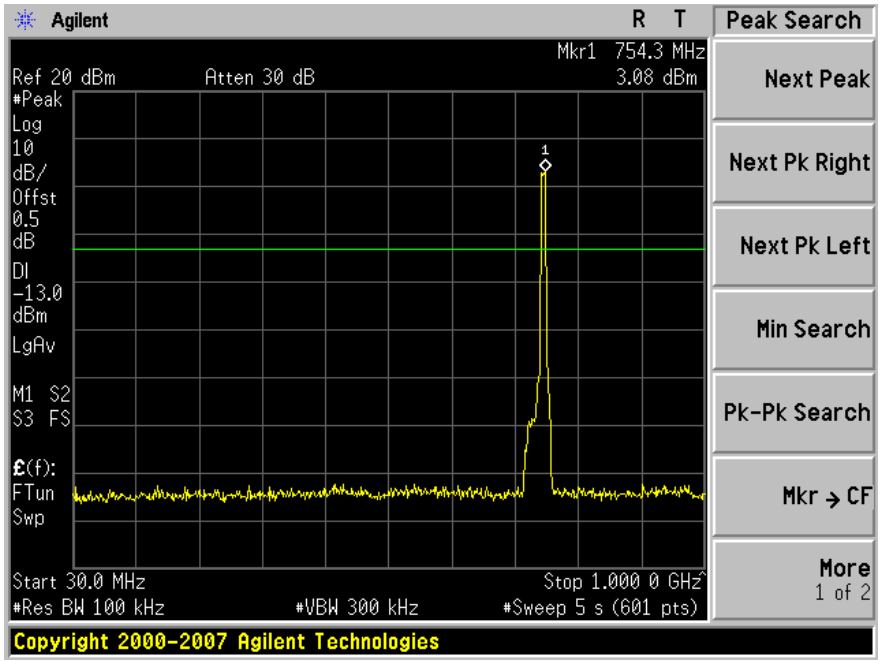


Plot 2: Above 1 GHz

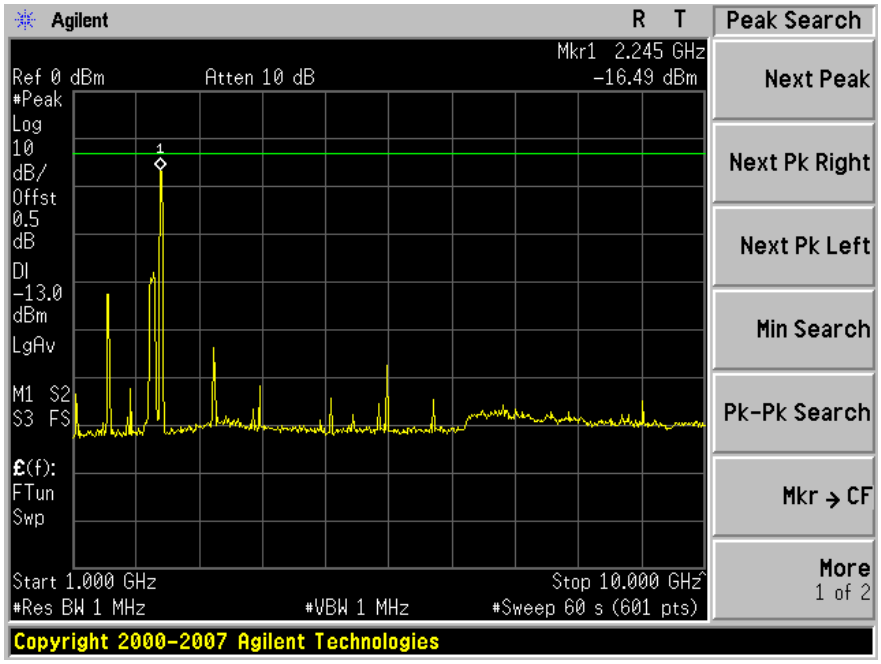


Modulation: LTE-16QAM, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz

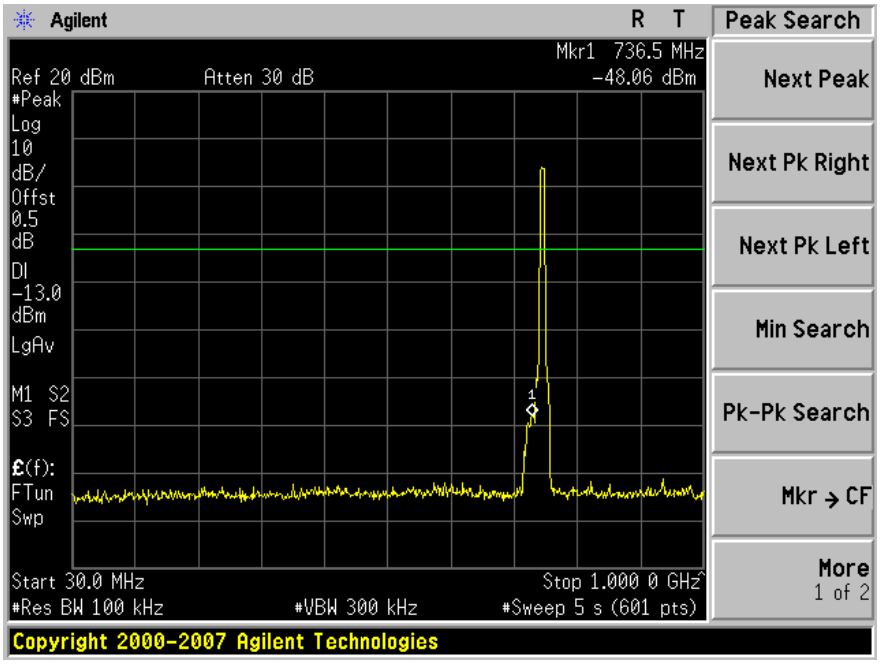


Plot 2: Above 1 GHz

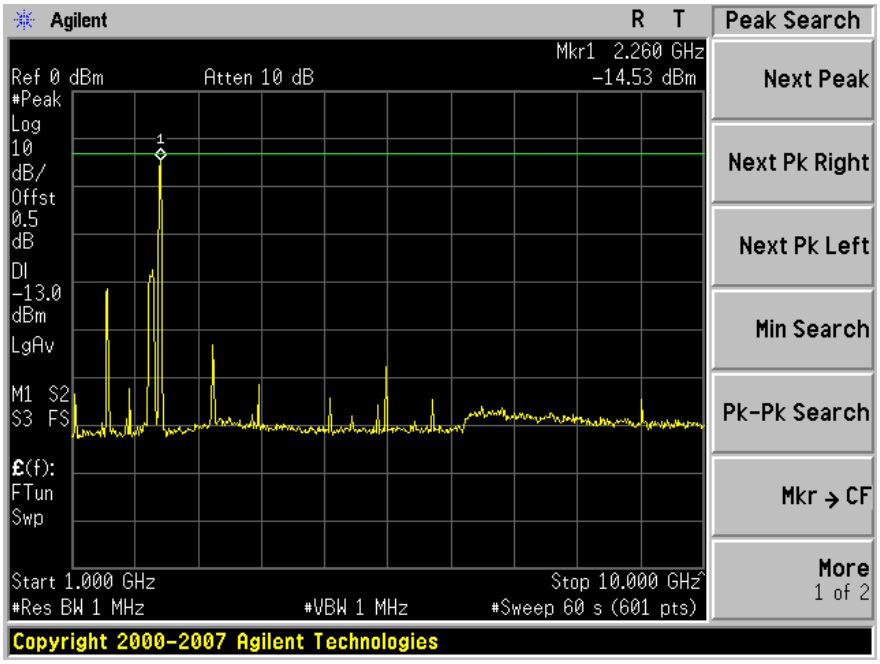


Modulation: LTE-64QAM, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz



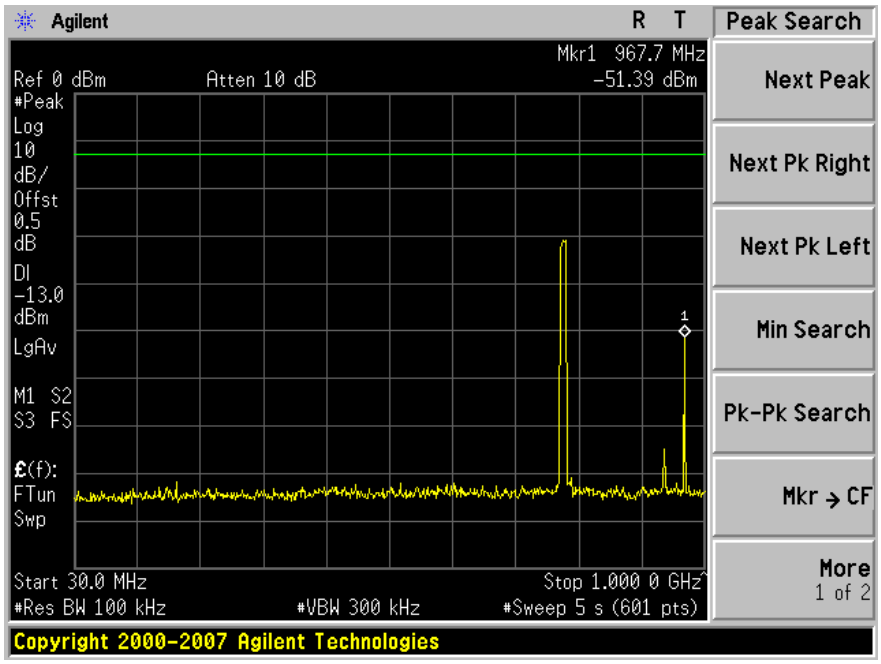
Plot 2: Above 1 GHz



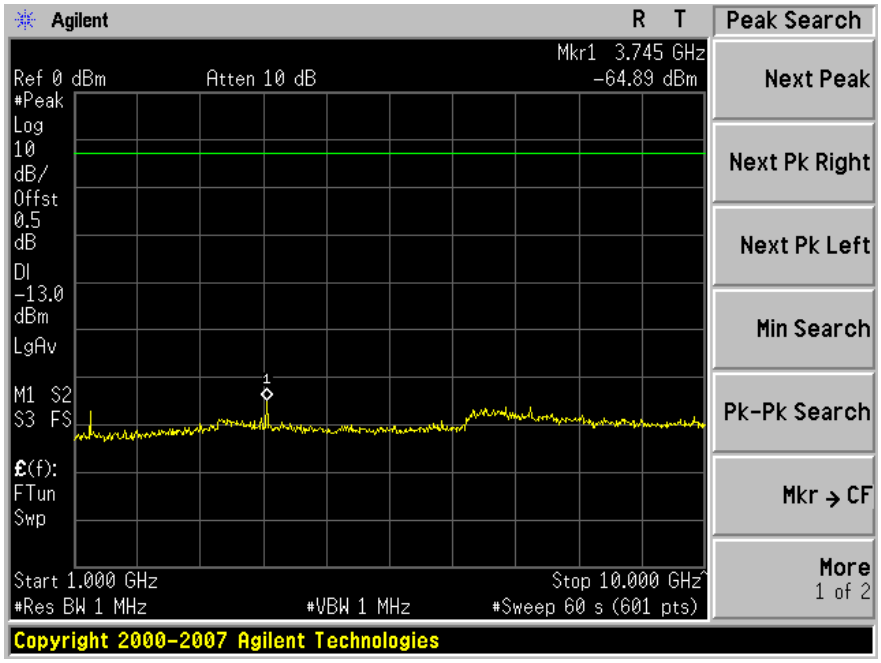
UL: 776-787 MHz

Modulation: LTE-QPSK, Frequency: 782 MHz

Plot 1: 30 MHz to 1 GHz

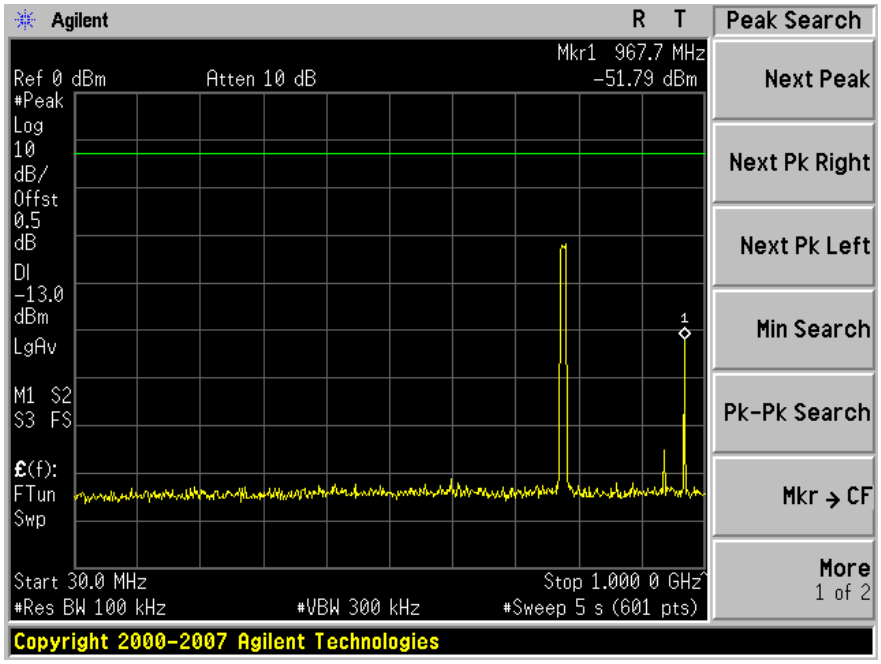


Plot 2: Above 1 GHz

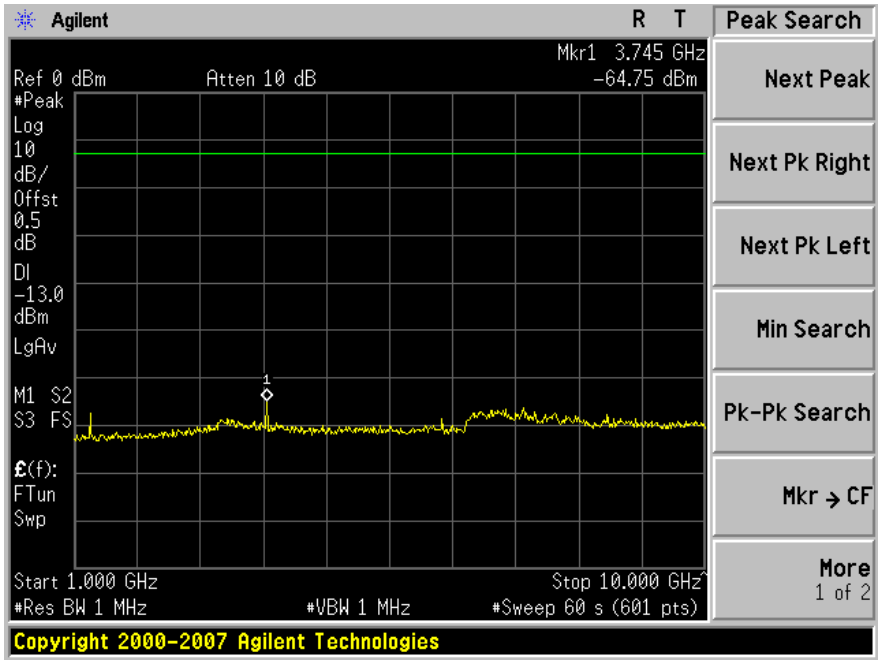


Modulation: LTE-16QAM, Frequency: 782 MHz

Plot 1: 30 MHz to 1 GHz

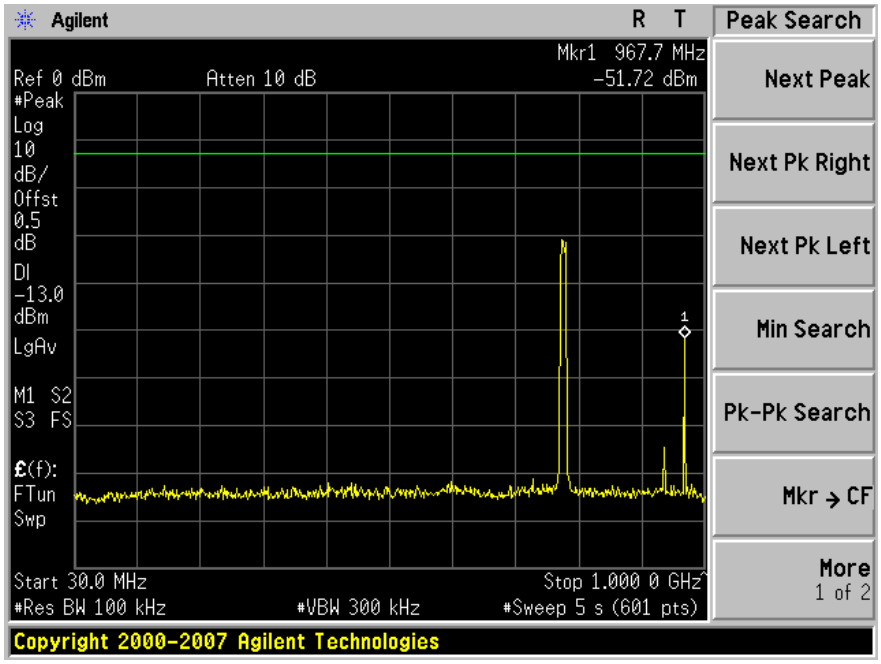


Plot 2: Above 1 GHz

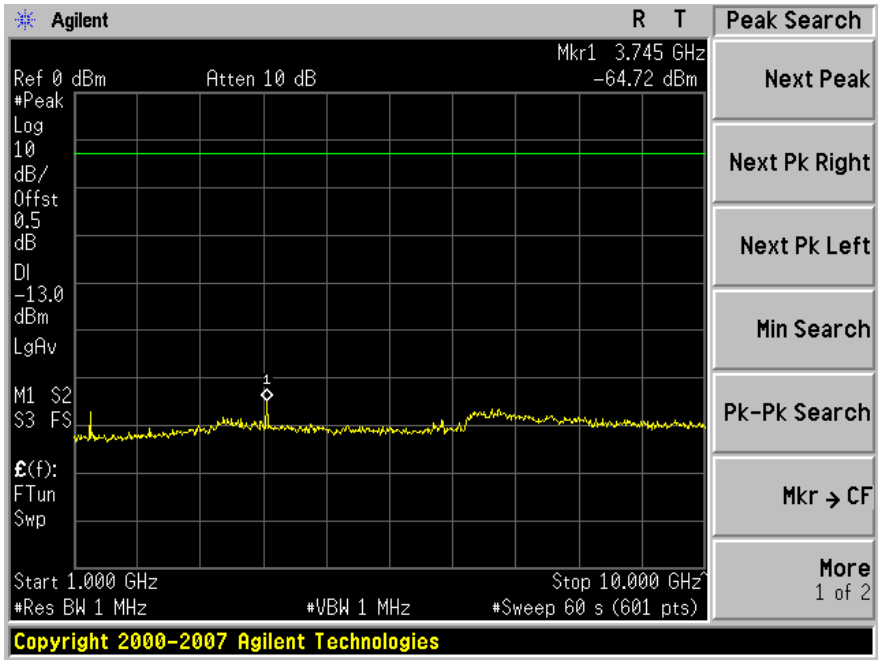


Modulation: LTE-64QAM, Frequency: 782 MHz

Plot 1: 30 MHz to 1 GHz



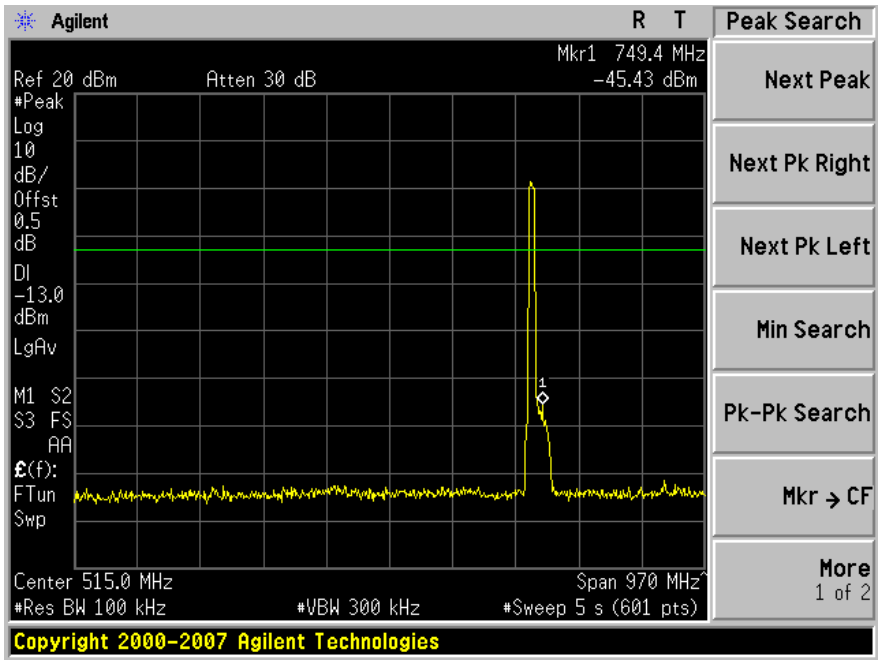
Plot 2: Above 1 GHz



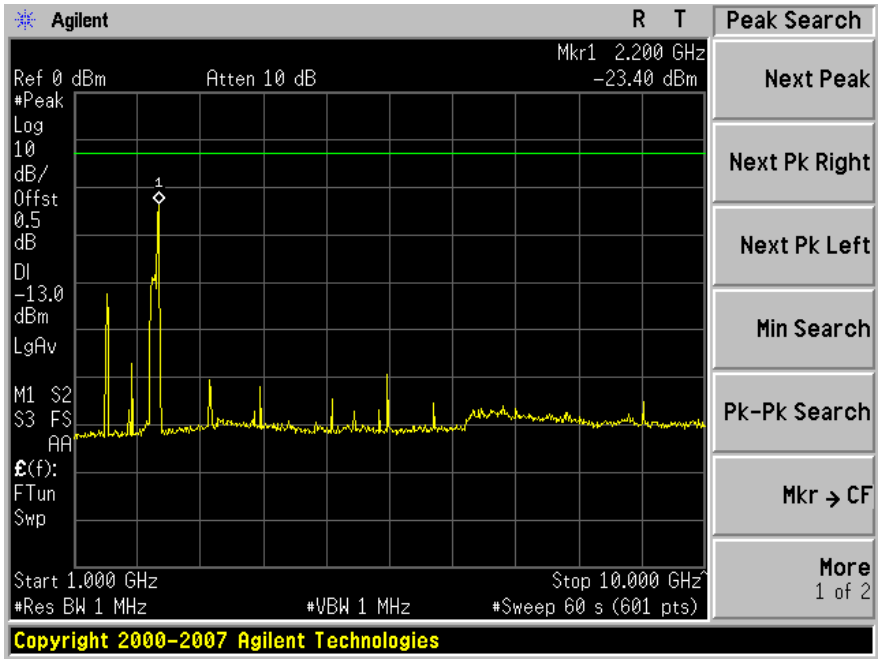
DL: 728-746 MHz

Modulation: LTE-QPSK, Frequency: 733 MHz

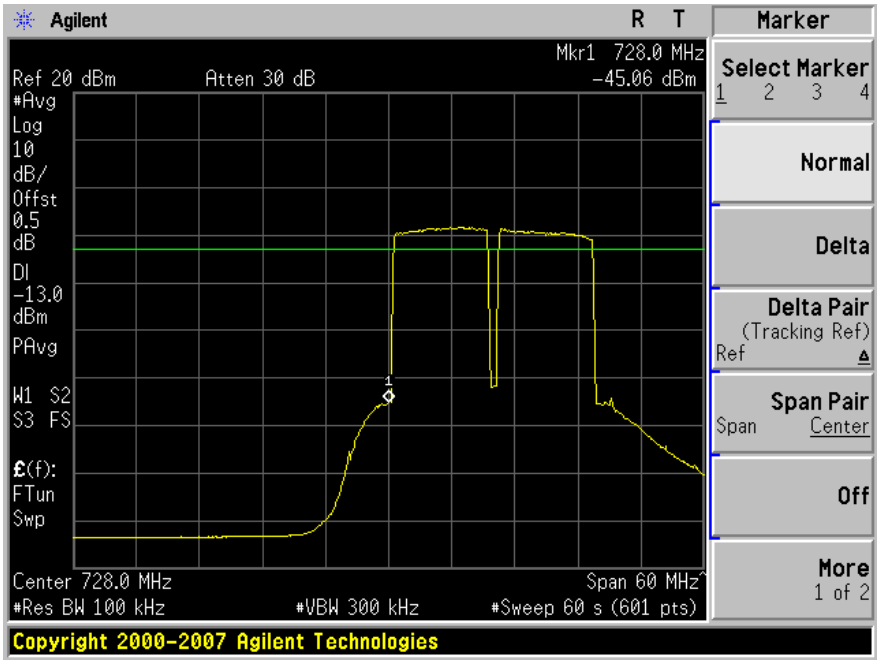
Plot 1: 30 MHz to 1 GHz



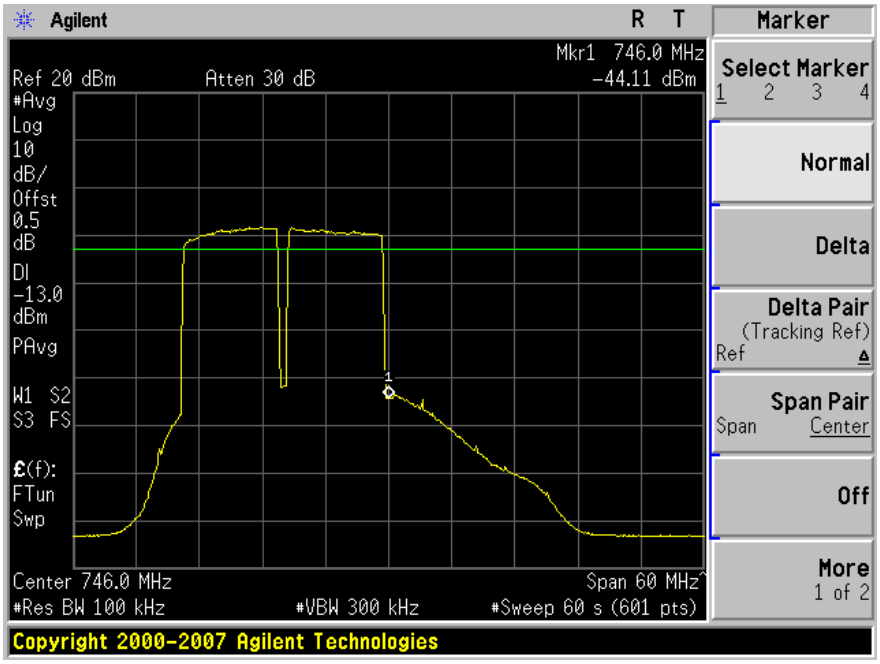
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

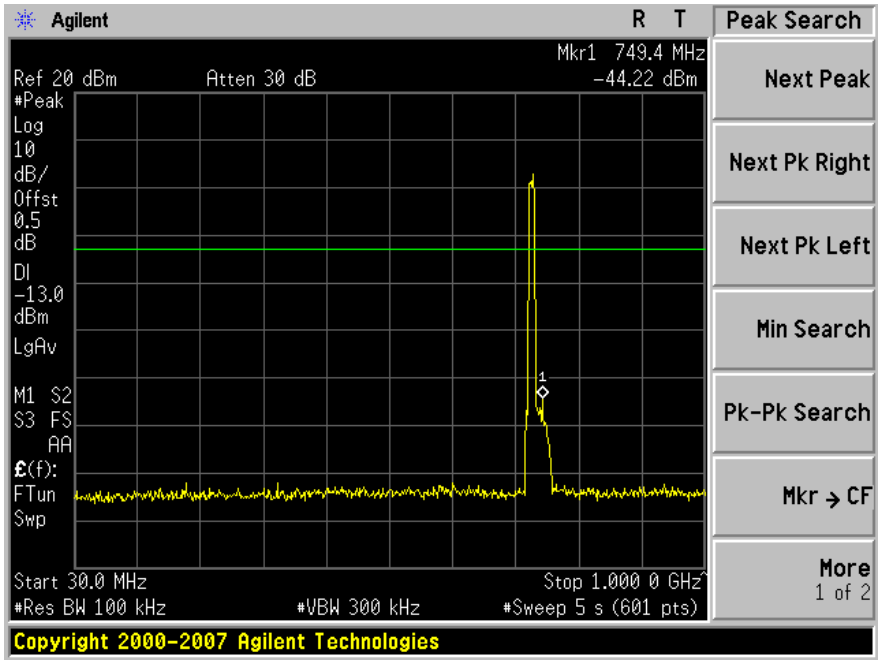


Plot 4: Inter-Modulation Highest Frequency

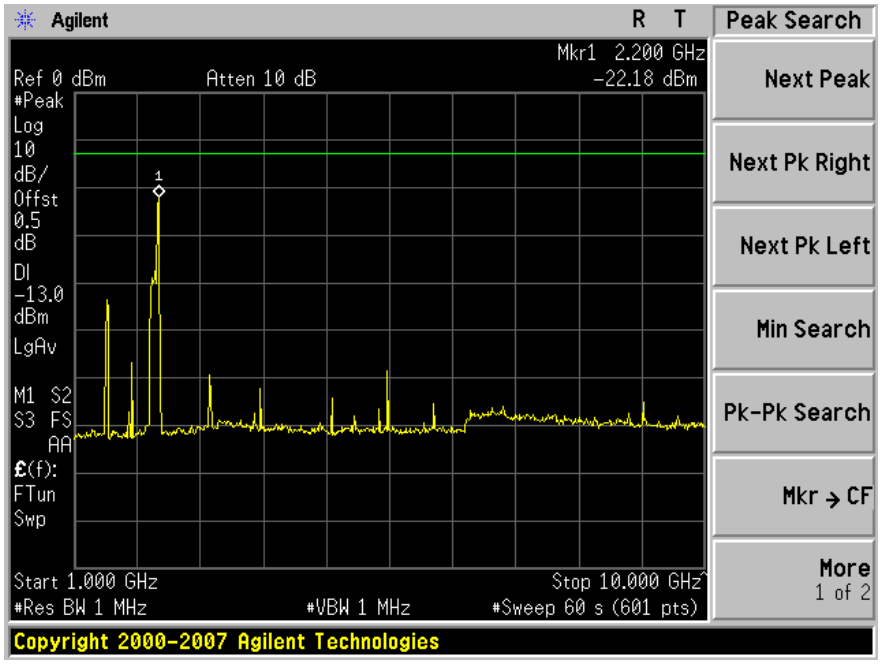


Modulation: LTE-16QAM, Frequency: 733 MHz

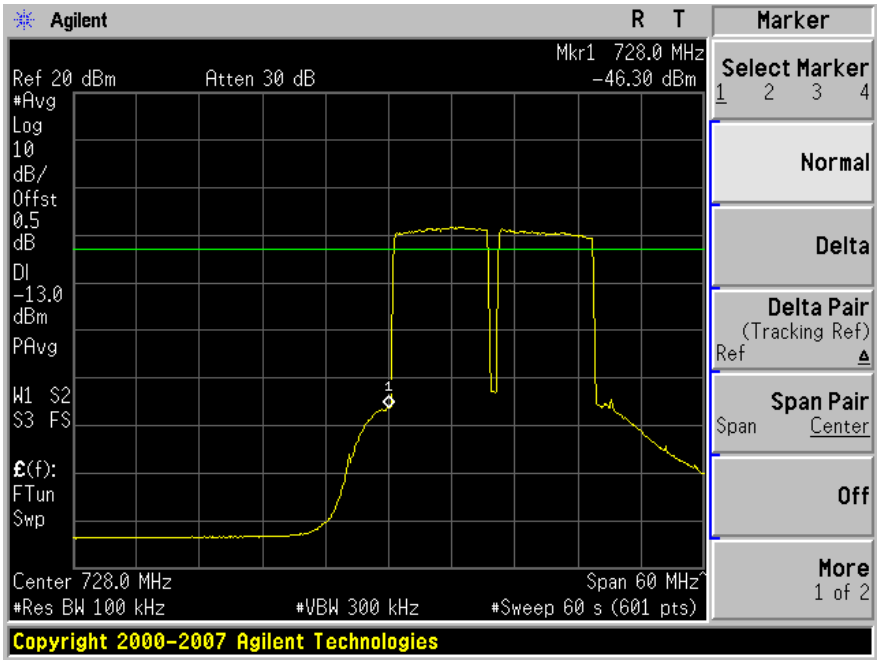
Plot 1: 30 MHz to 1 GHz



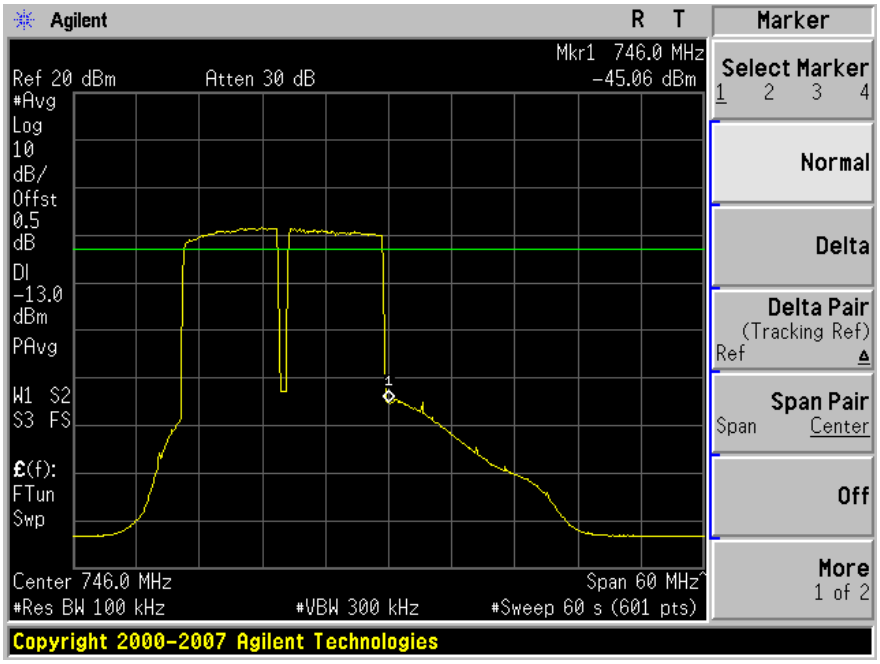
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

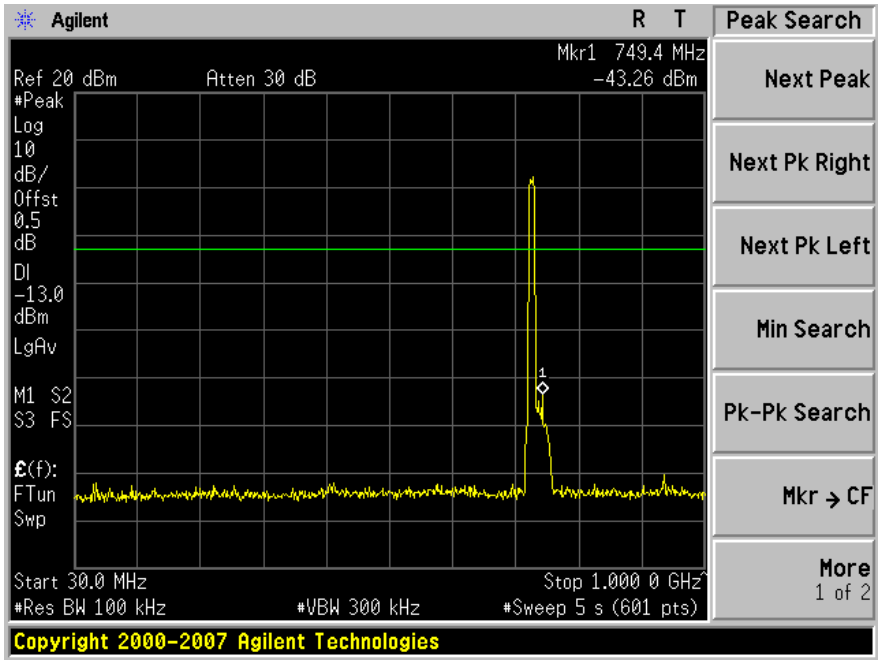


Plot 4: Inter-Modulation Highest Frequency

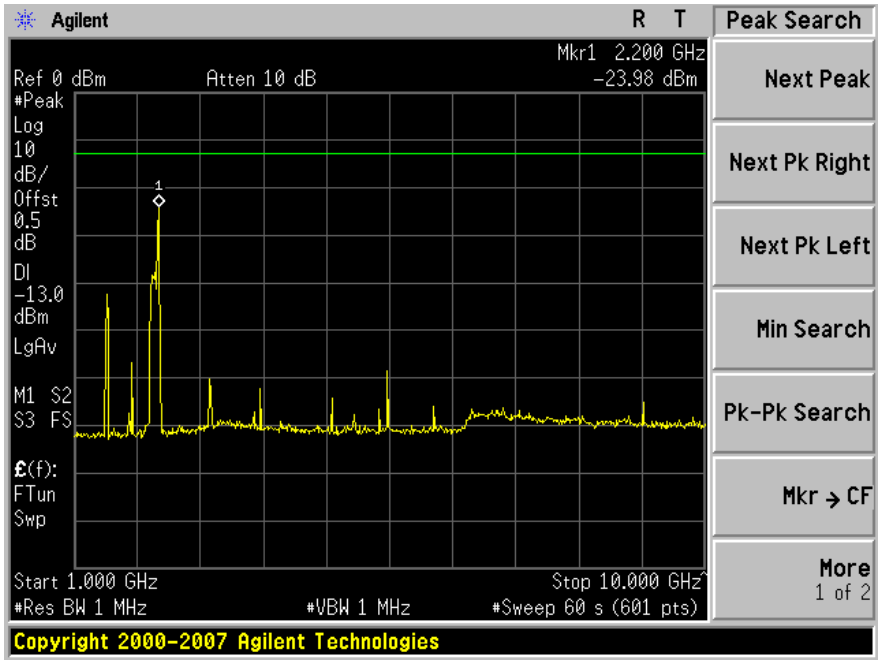


Modulation: LTE-64QAM, Frequency: 733 MHz

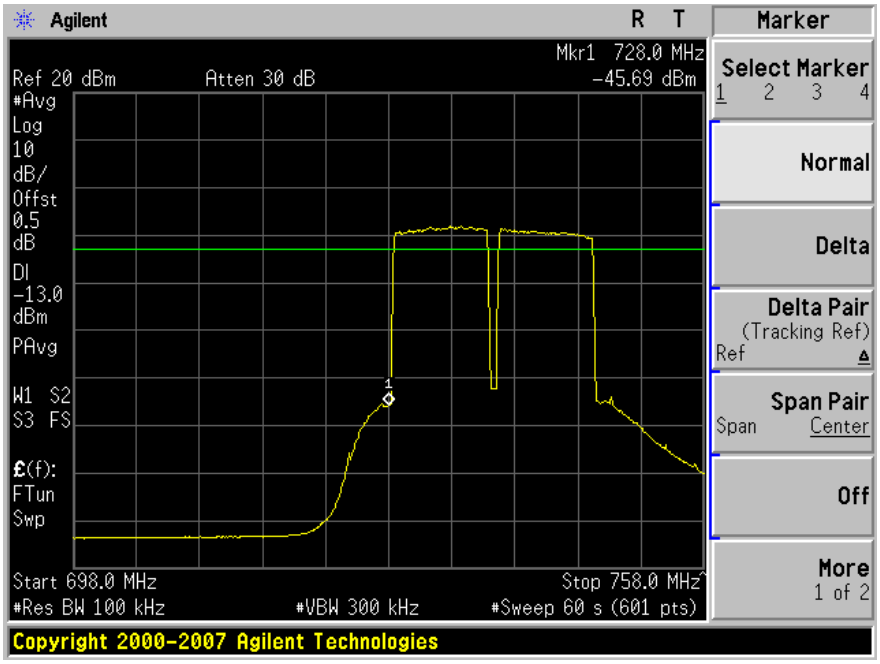
Plot 1: 30 MHz to 1 GHz



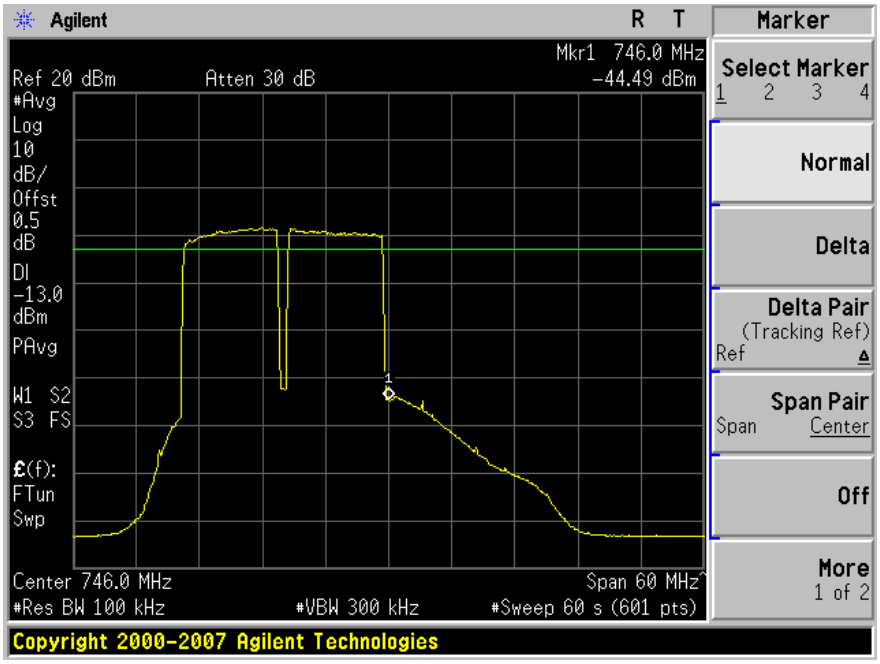
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

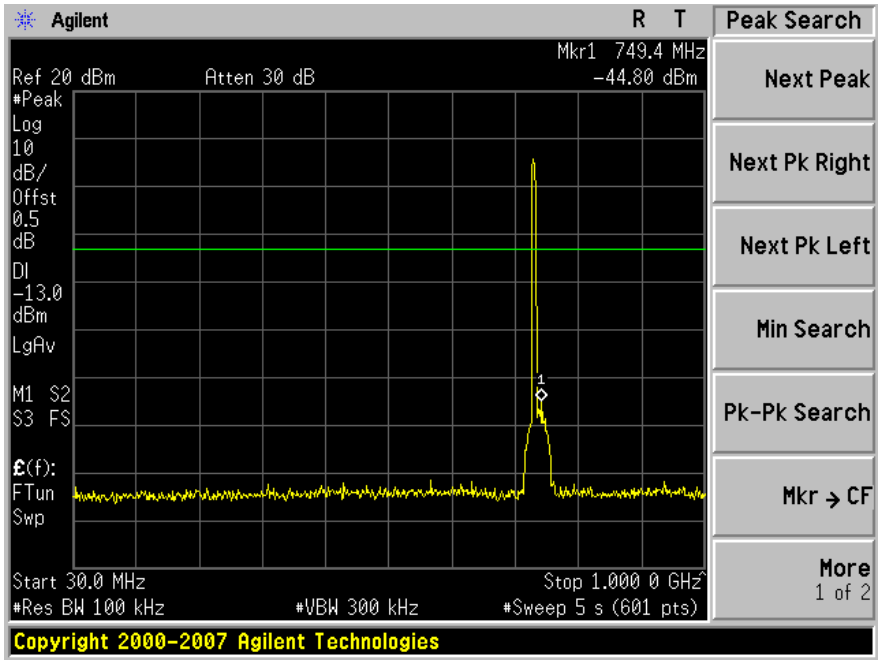


Plot 4: Inter-Modulation Highest Frequency

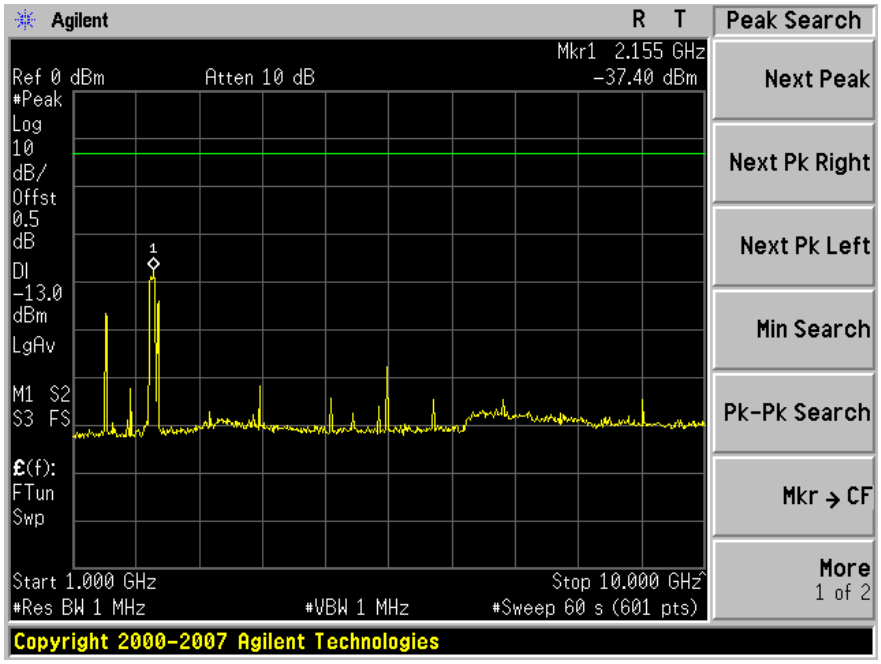


Modulation: WCDMA, Frequency: 737 MHz

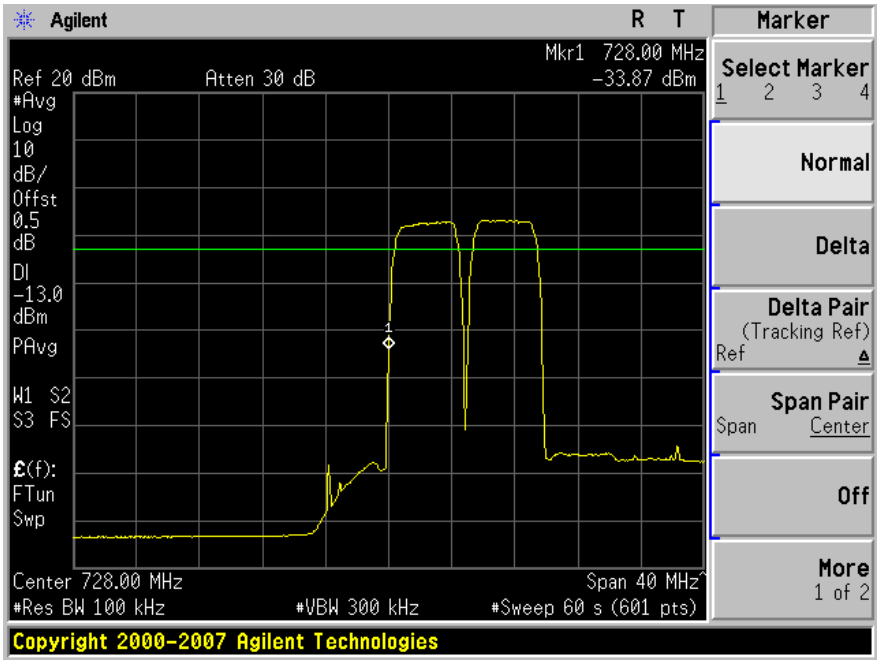
Plot 1: 30 MHz to 1 GHz



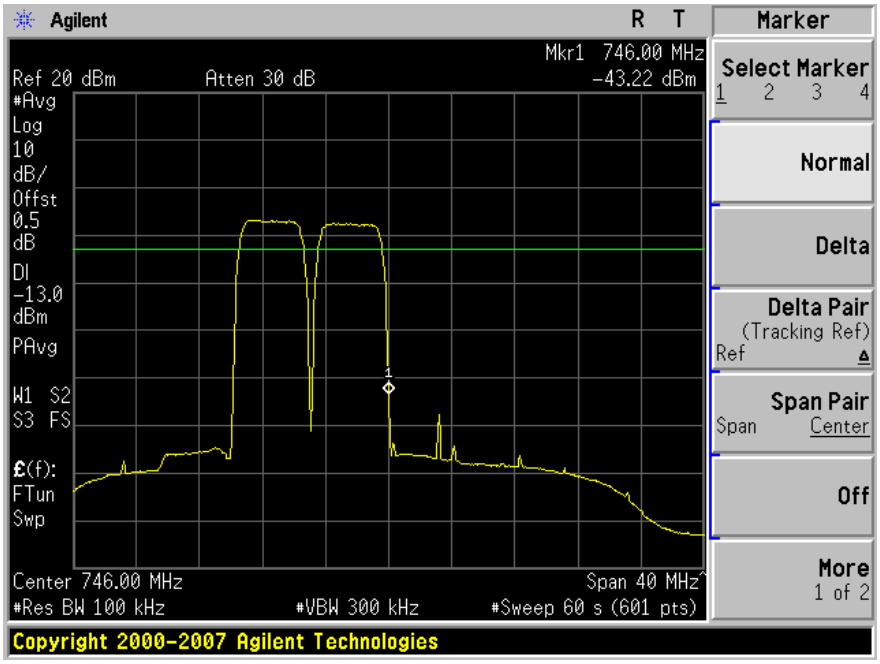
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency



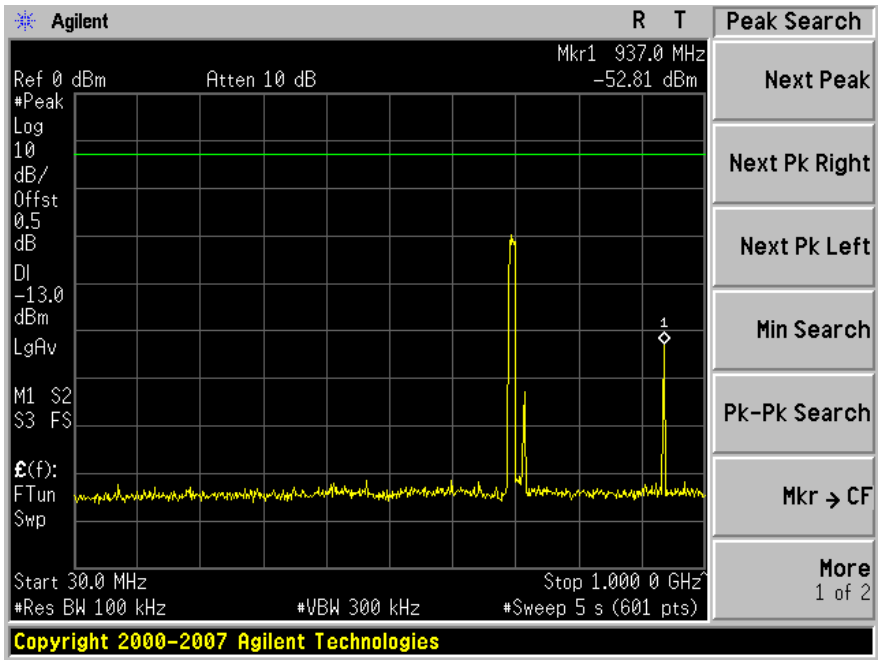
Plot 4: Inter-Modulation Highest Frequency



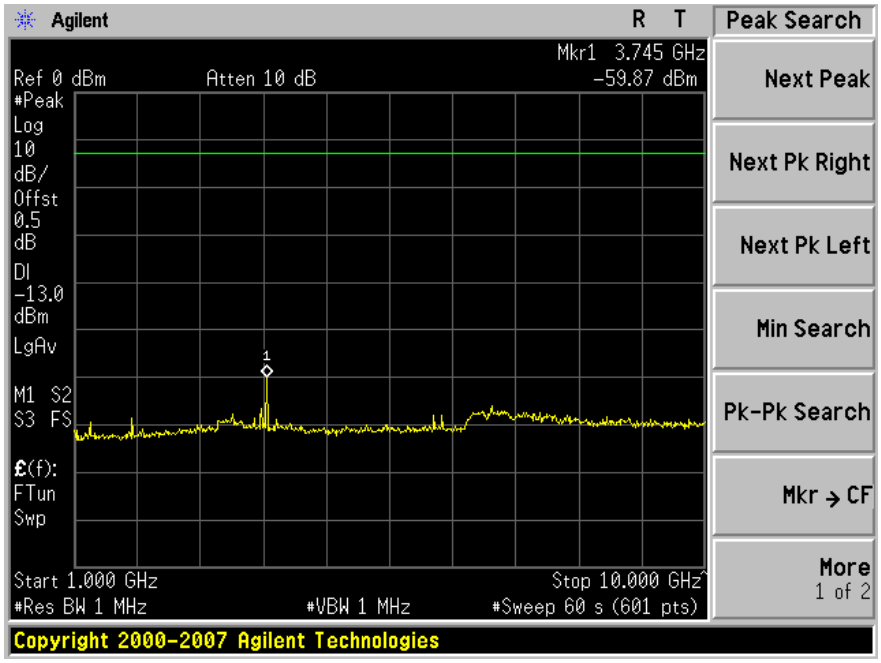
UL: 696-716MHz

Modulation: LTE-QPSK, Frequency: 703 MHz

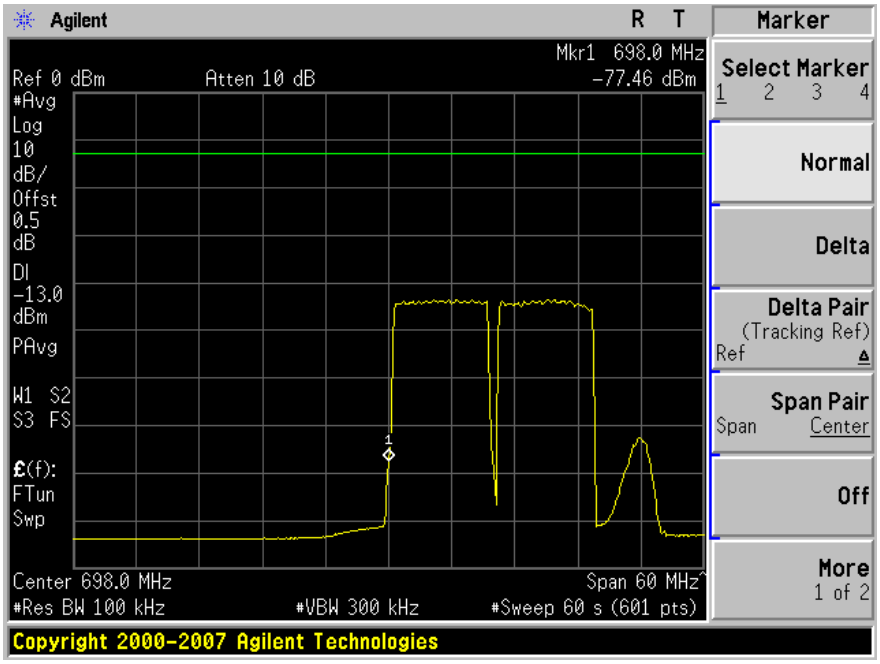
Plot 1: 30 MHz to 1 GHz



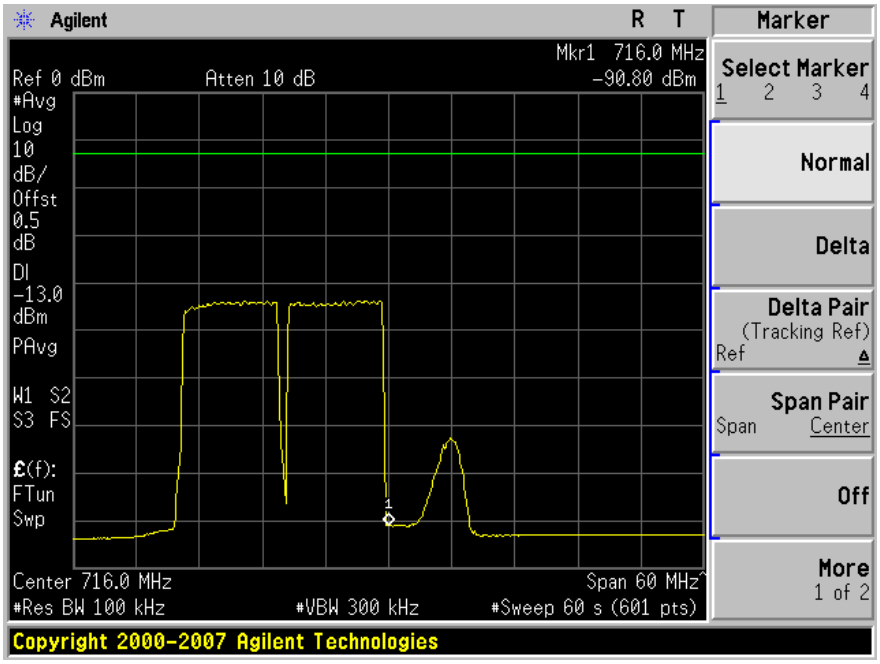
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

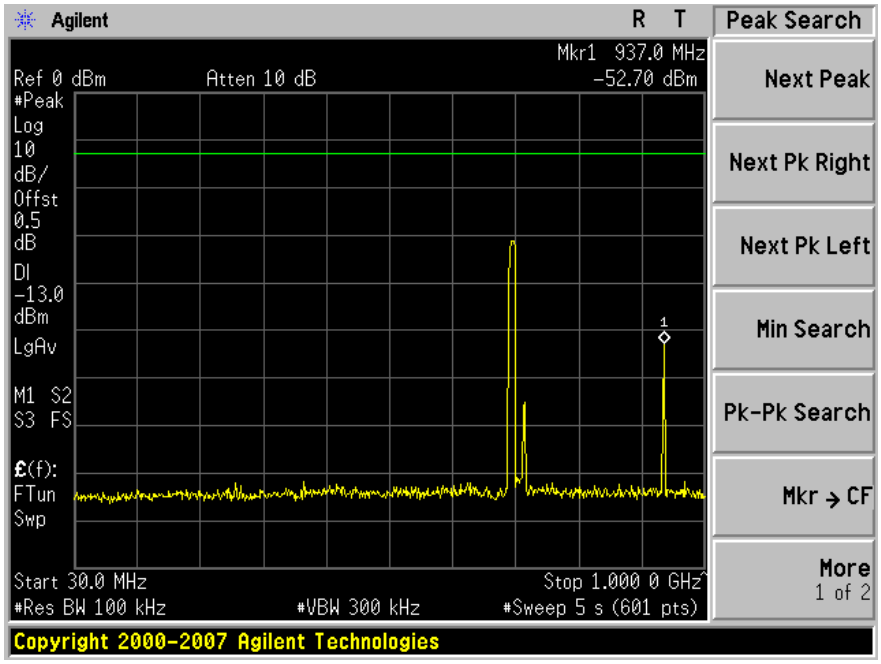


Plot 4: Inter-Modulation Highest Frequency

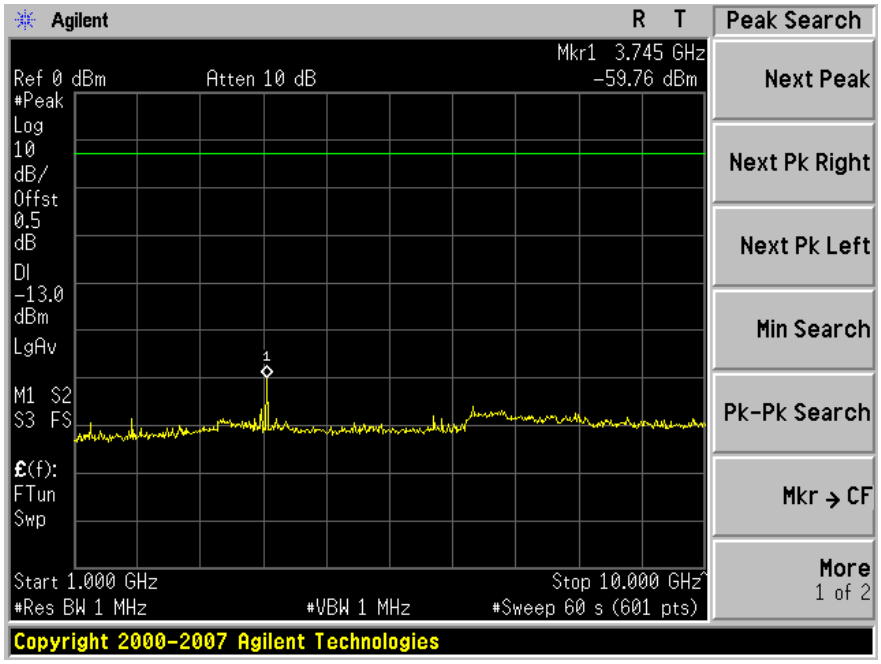


Modulation: LTE-16QAM, Frequency: 703 MHz

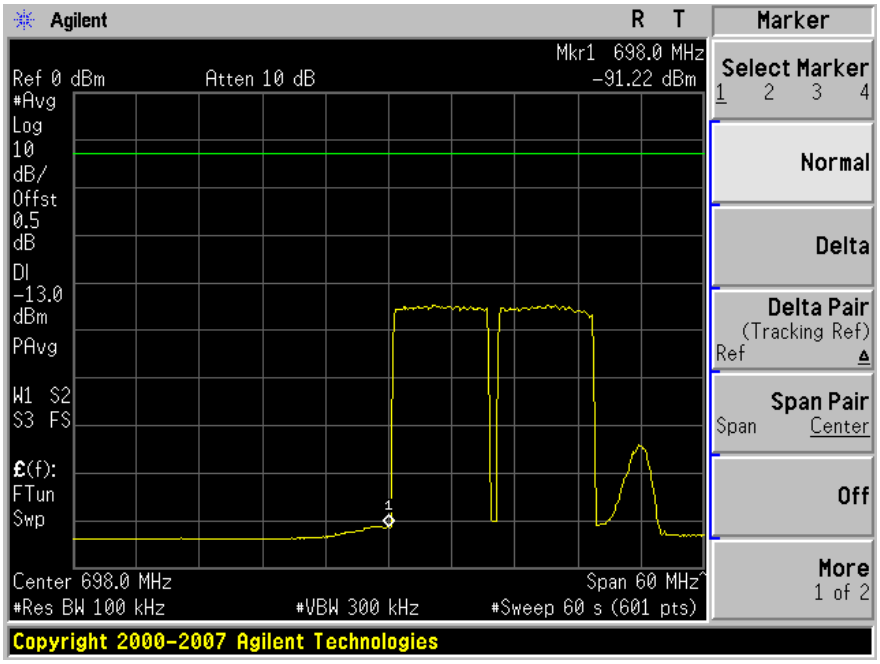
Plot 1: 30 MHz to 1 GHz



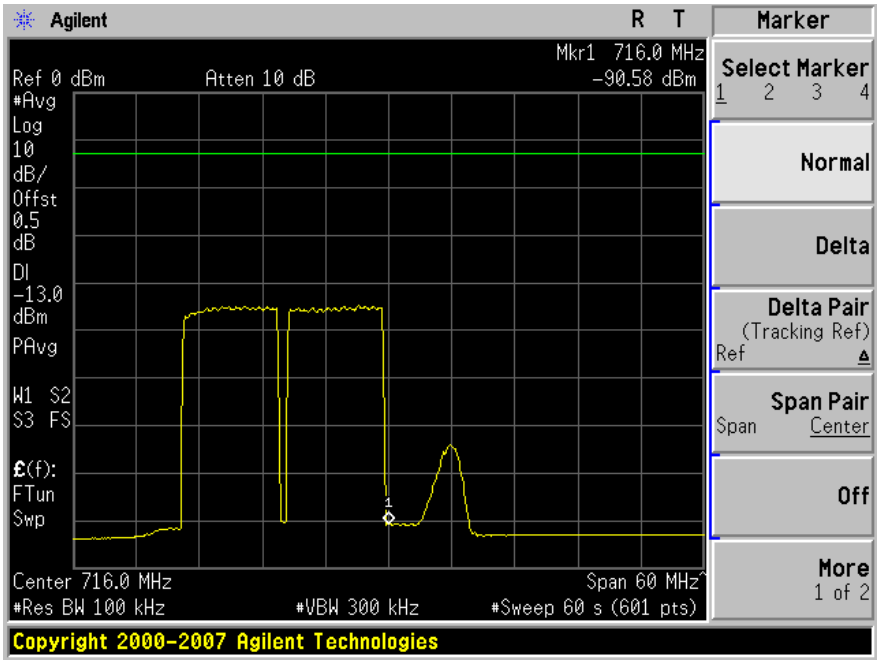
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

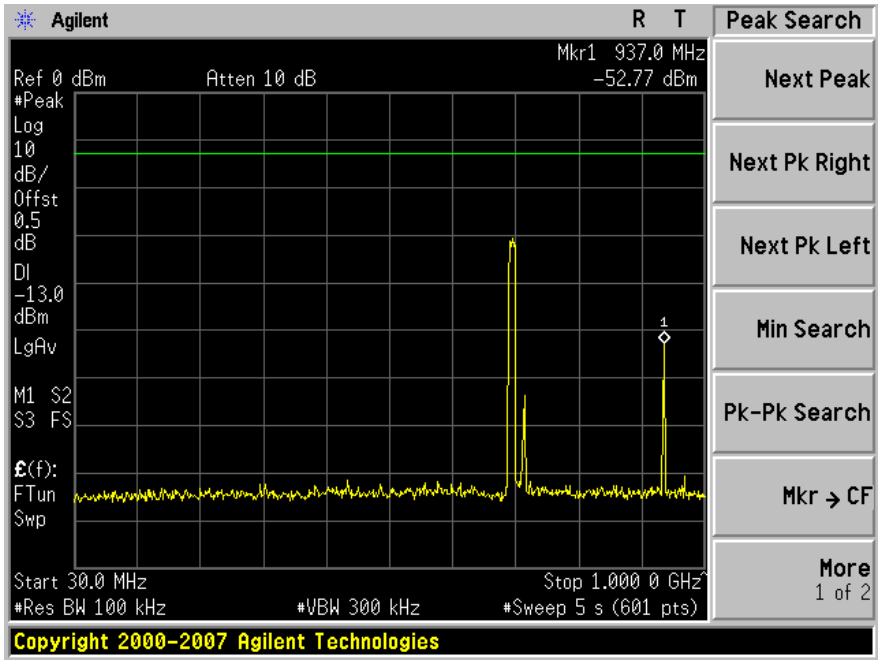


Plot 4: Inter-Modulation Highest Frequency

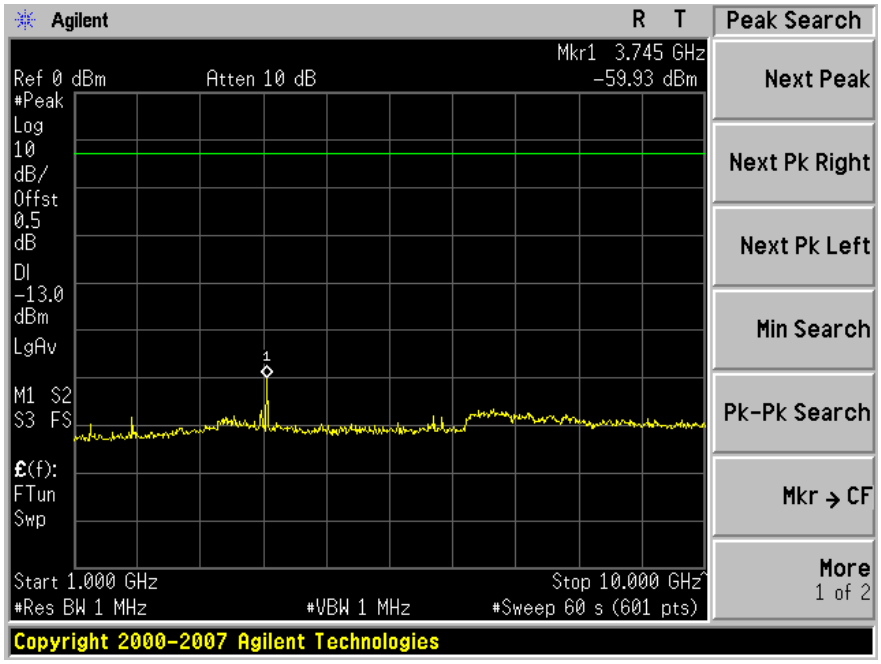


Modulation: LTE-64QAM, Frequency: 703 MHz

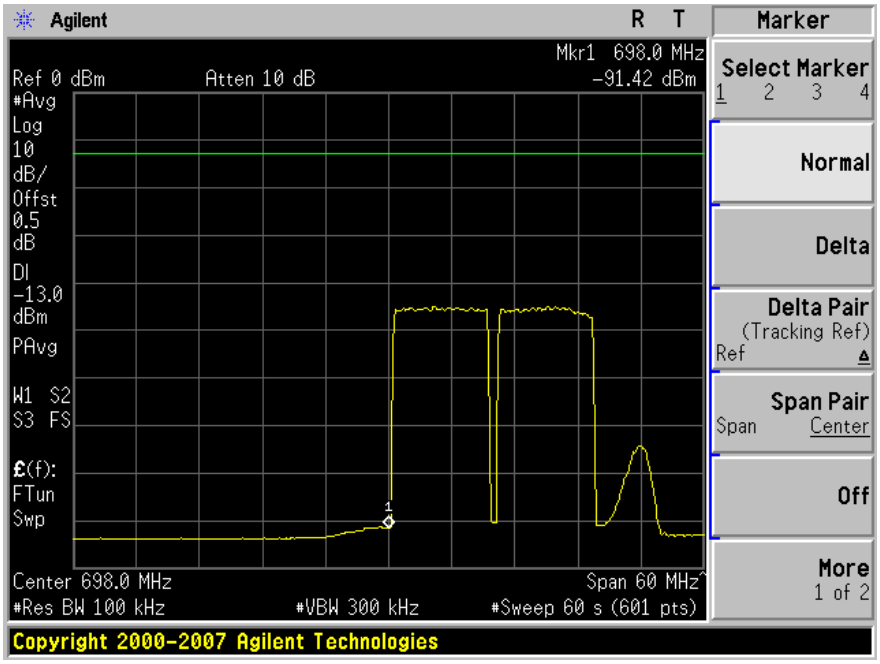
Plot 1: 30 MHz to 1 GHz



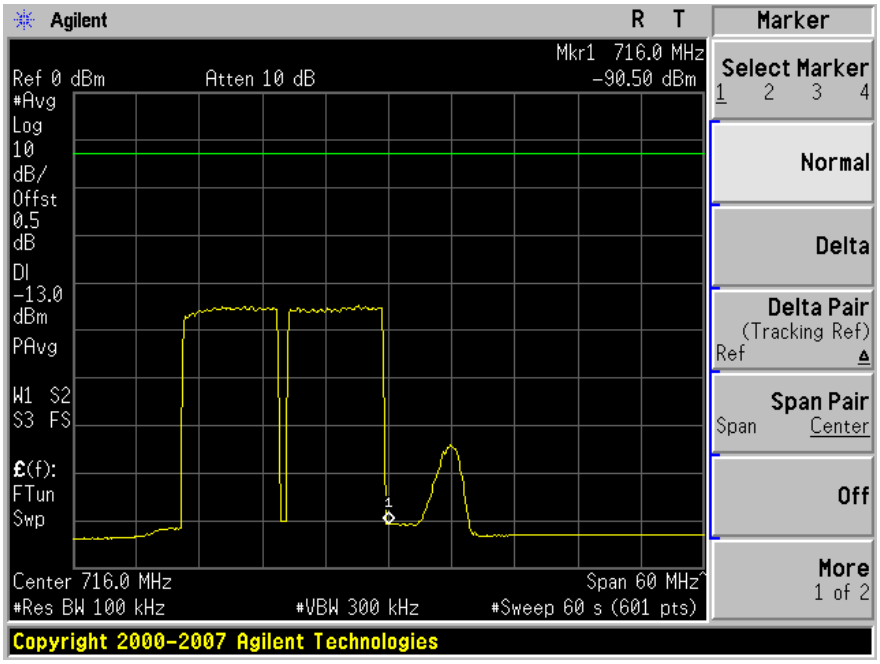
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

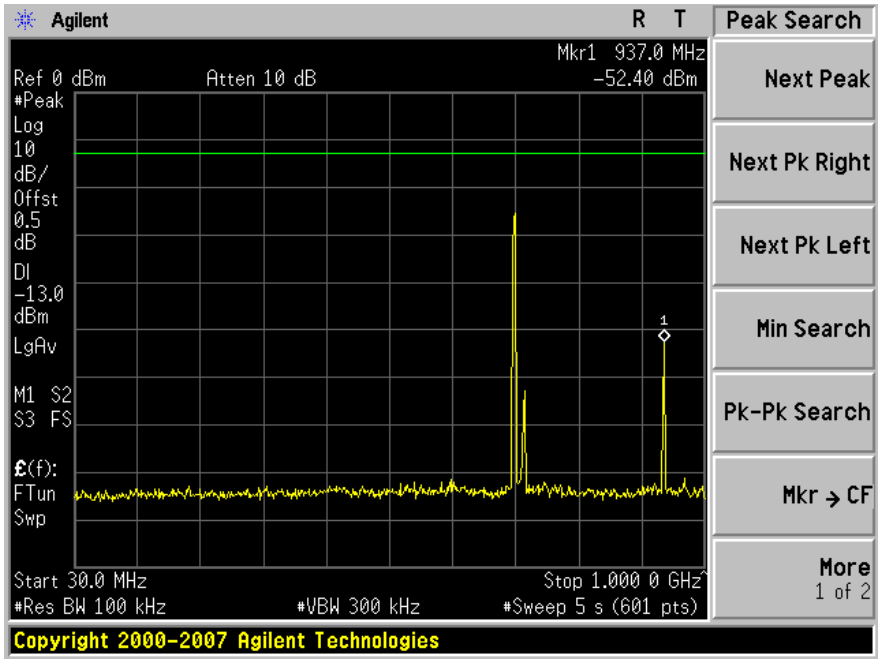


Plot 4: Inter-Modulation Highest Frequency

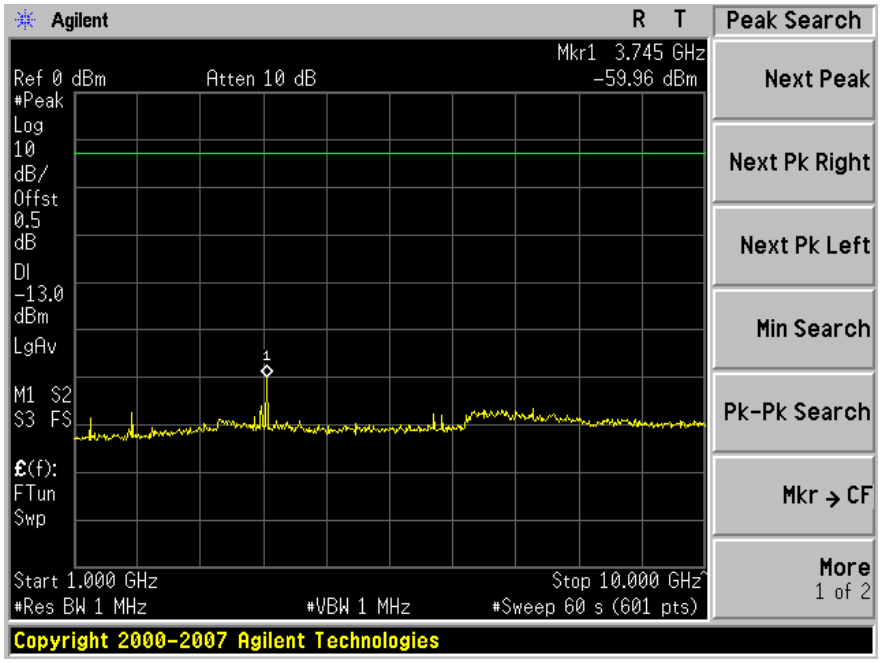


Modulation: WCDMA, Frequency: 707 MHz

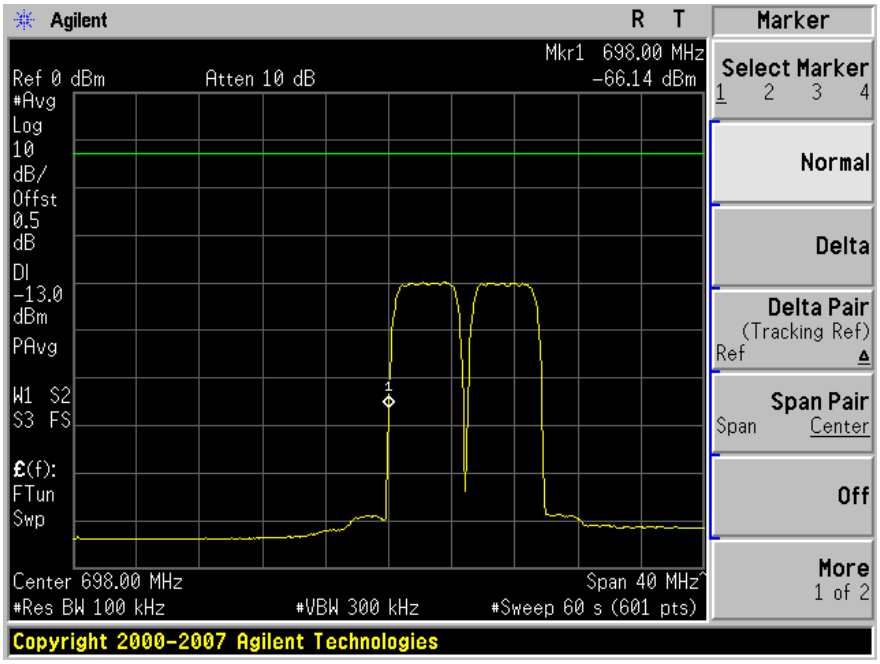
Plot 1: 30 MHz to 1 GHz



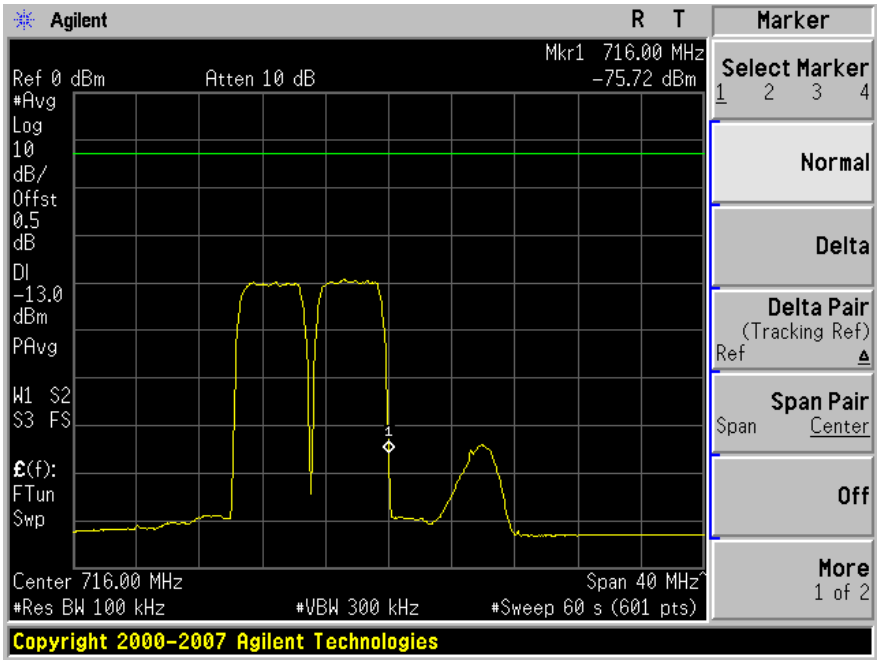
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency



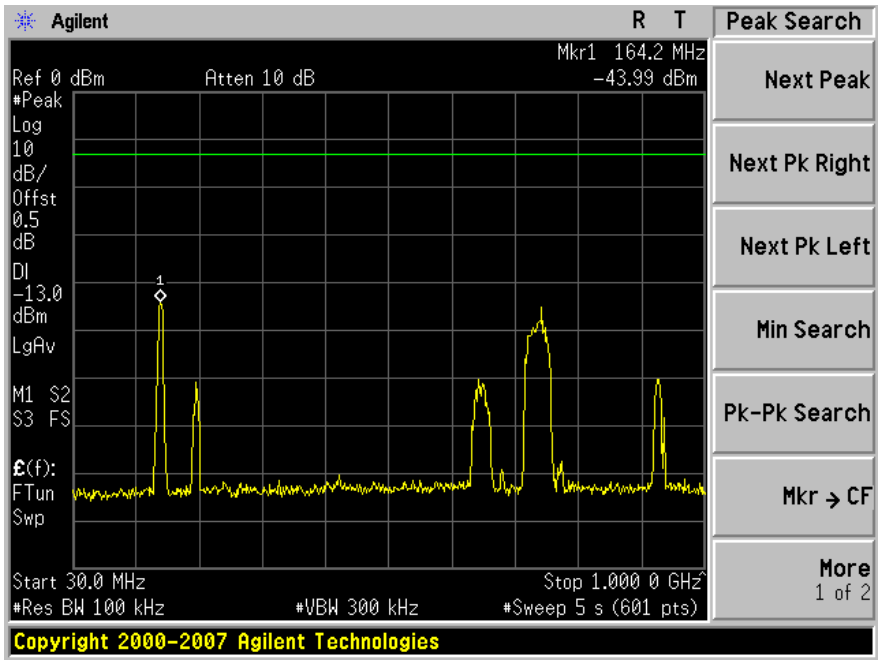
Plot 4: Inter-Modulation Highest Frequency



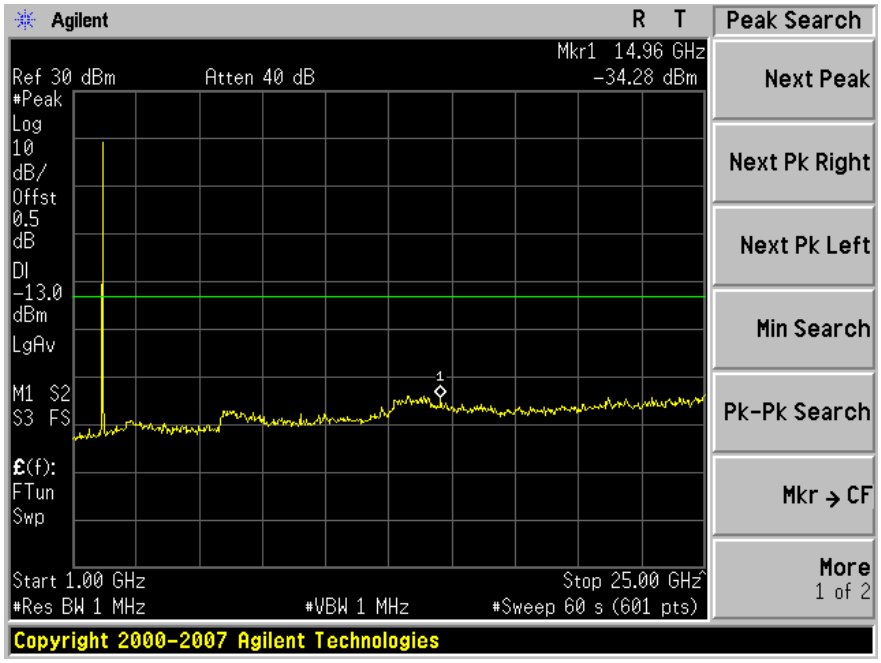
DL: 2110-2155 MHz

Modulation: LTE-QPSK, Frequency: 2125 MHz

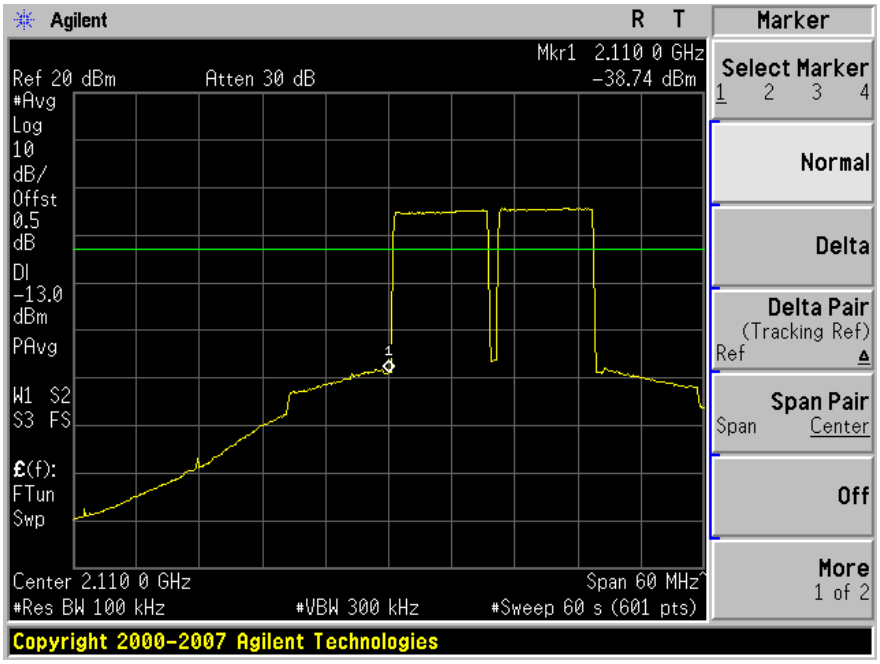
Plot 1: 30 MHz to 1 GHz



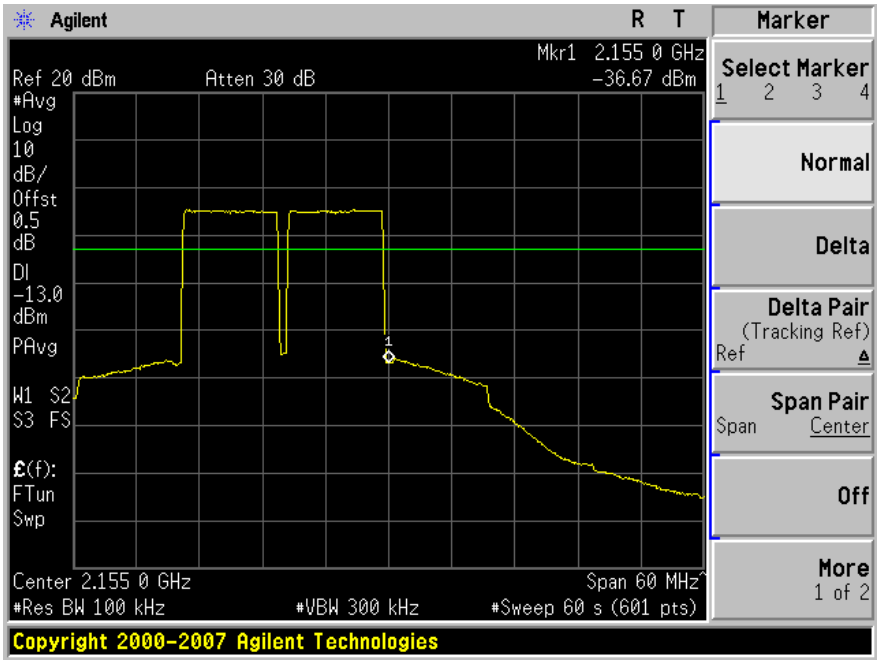
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

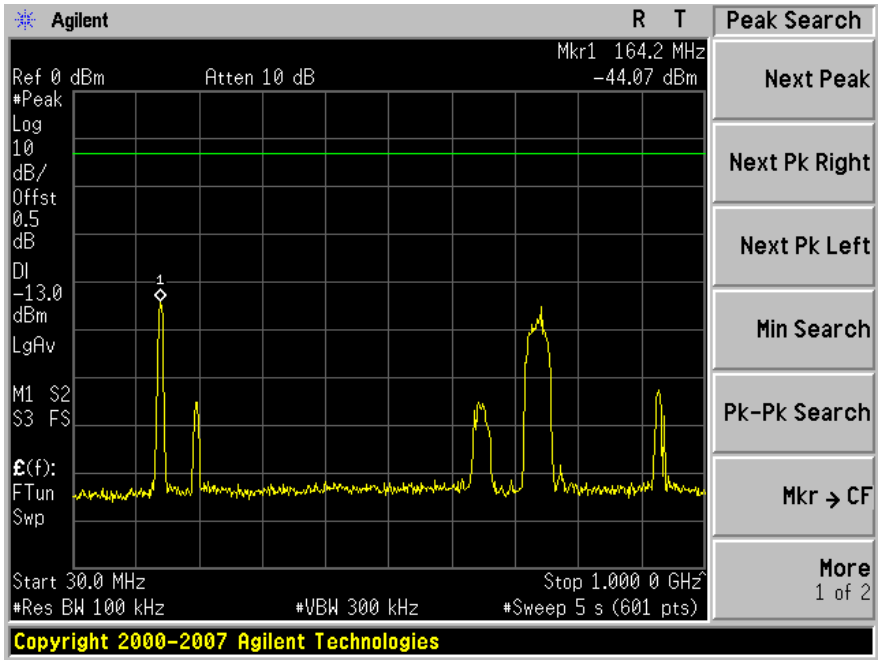


Plot 4: Inter-Modulation Highest Frequency

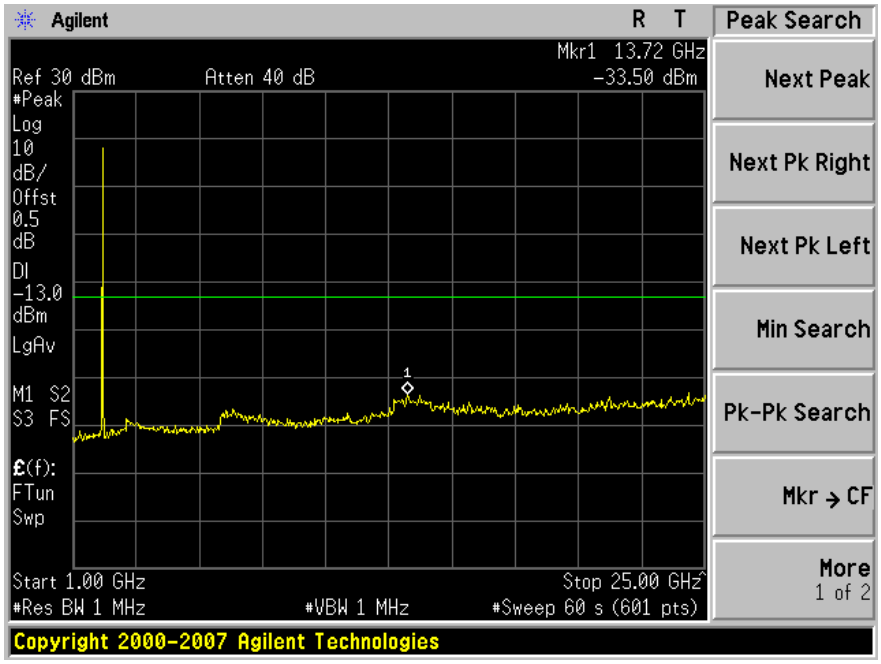


Modulation: LTE-16QAM, Frequency: 2125 MHz

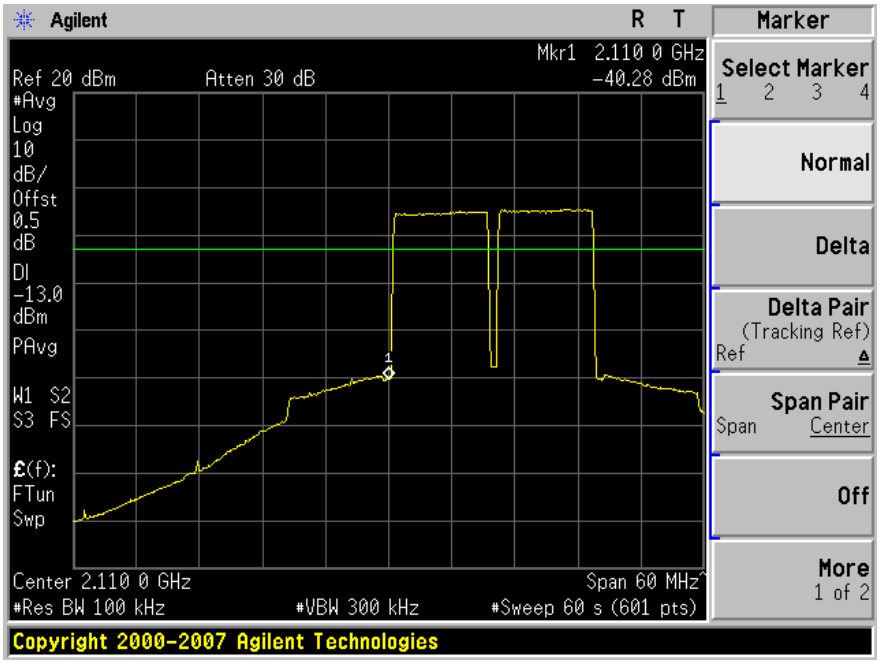
Plot 1: 30 MHz to 1 GHz



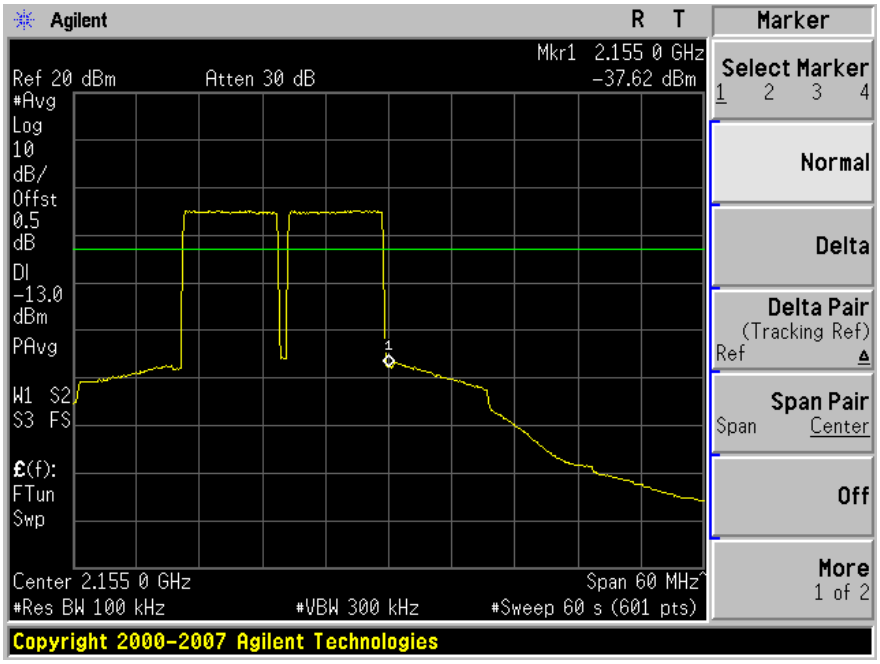
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

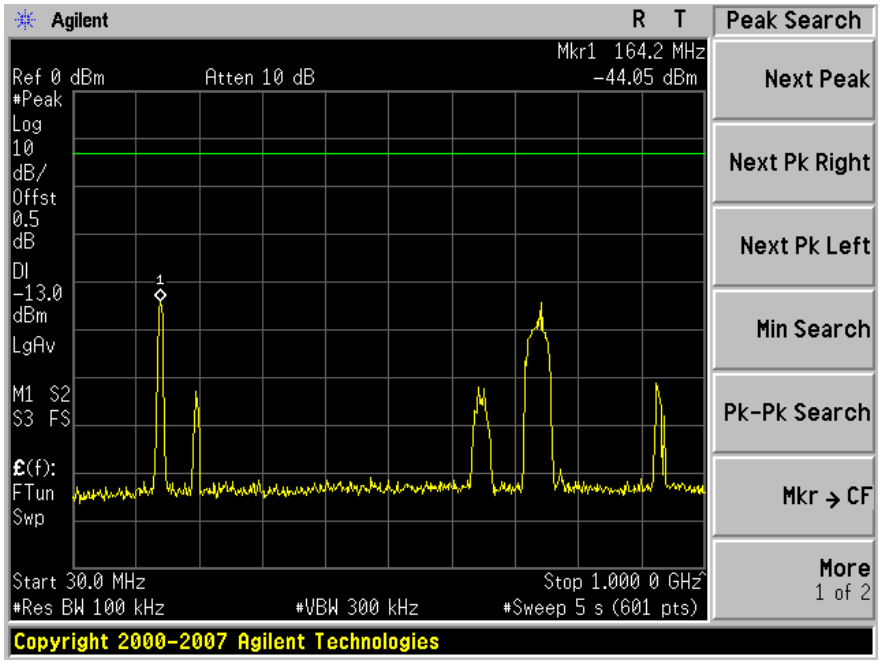


Plot 4: Inter-Modulation Highest Frequency

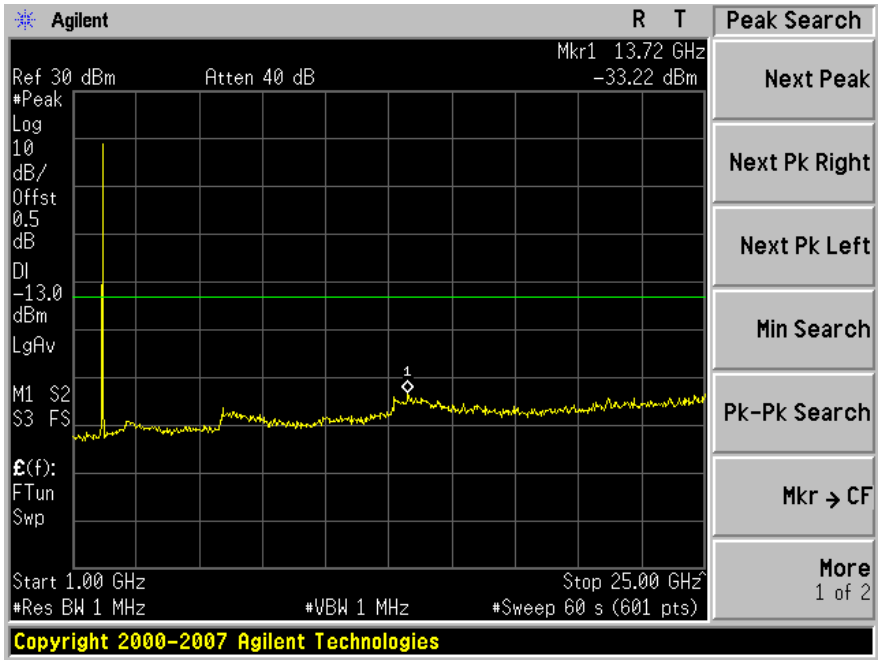


Modulation: LTE-64QAM, Frequency: 2125 MHz

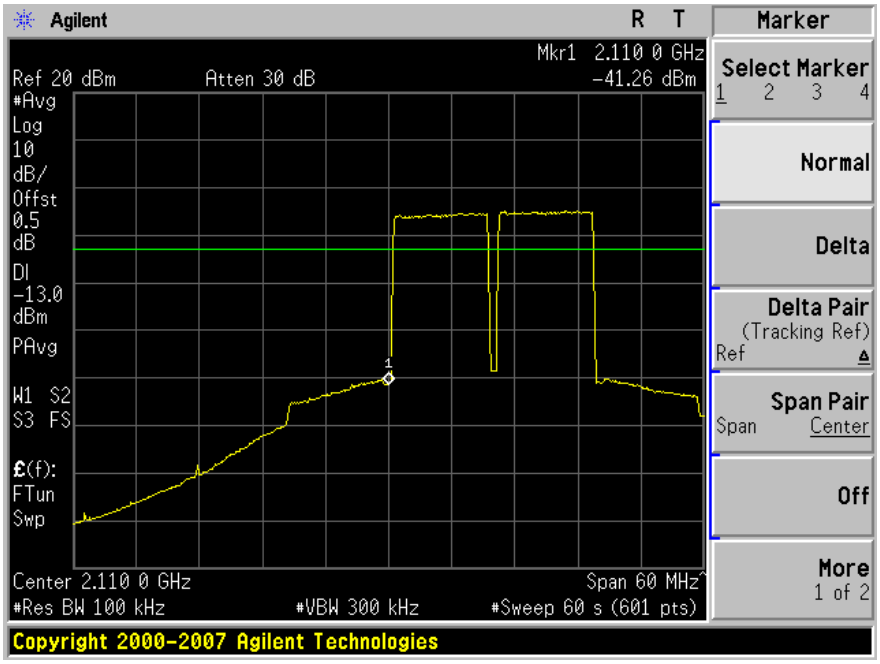
Plot 1: 30 MHz to 1 GHz



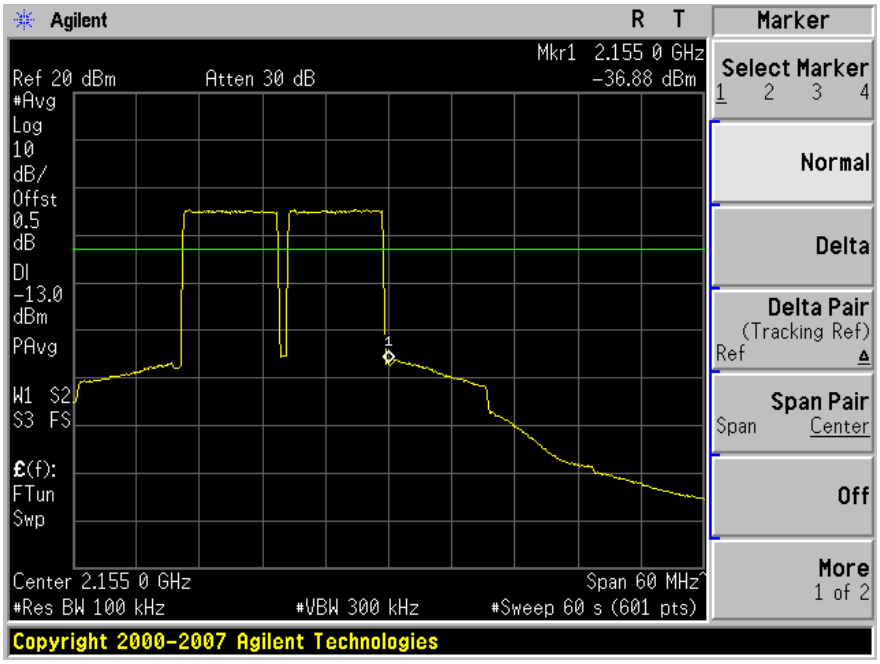
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

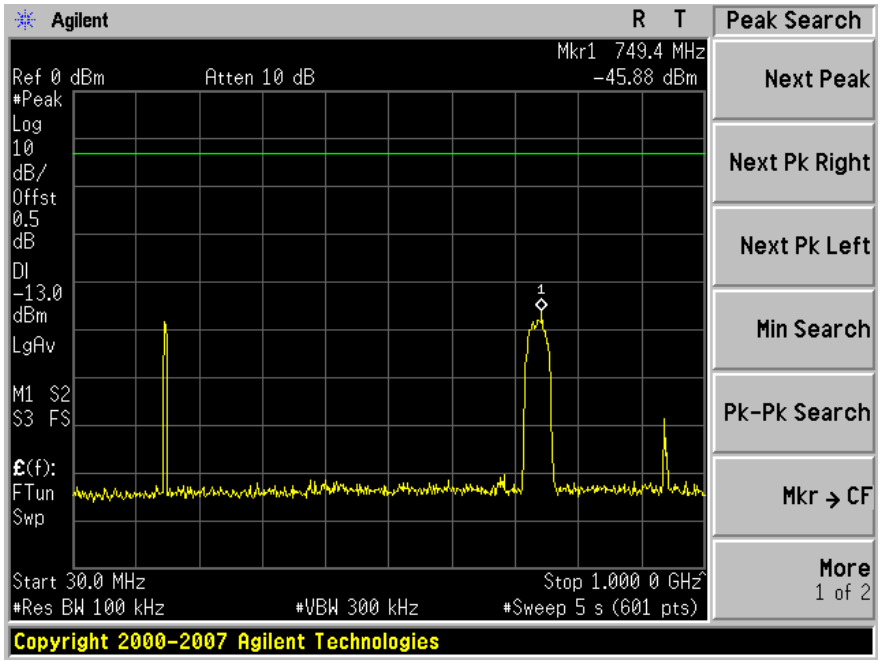


Plot 4: Inter-Modulation Highest Frequency

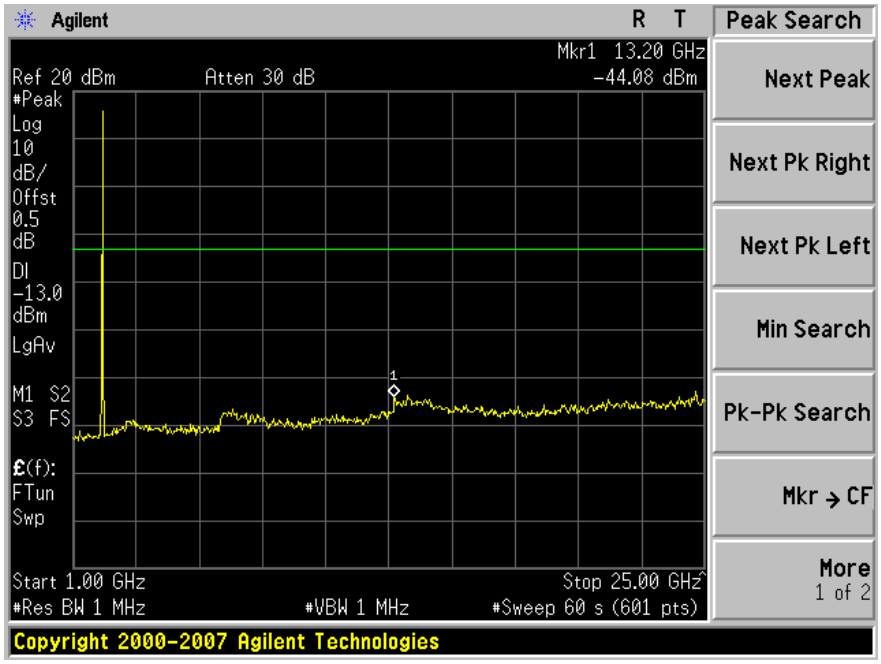


Modulation: WCDMA, Frequency: 2132.4 MHz

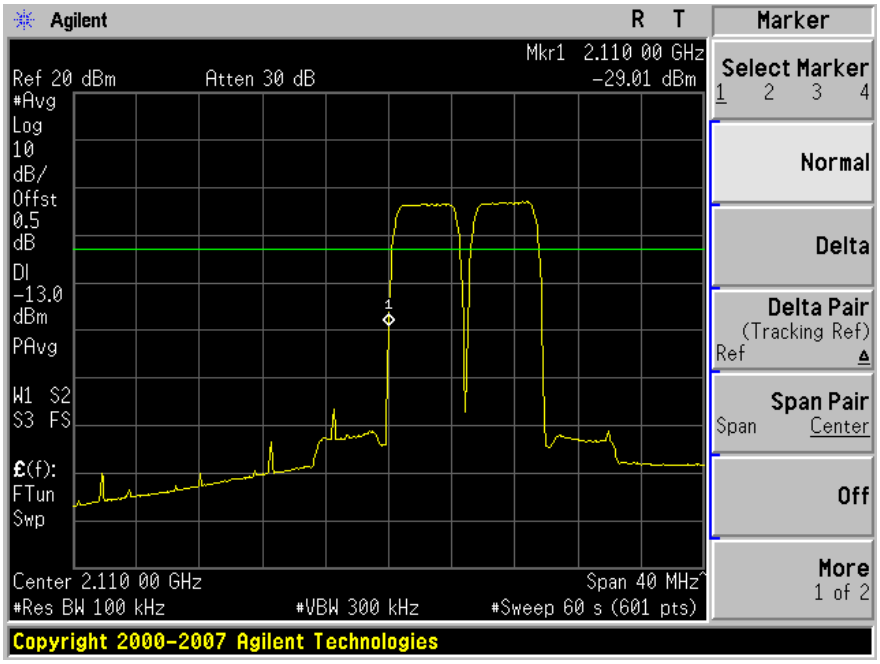
Plot 1: 30 MHz to 1 GHz



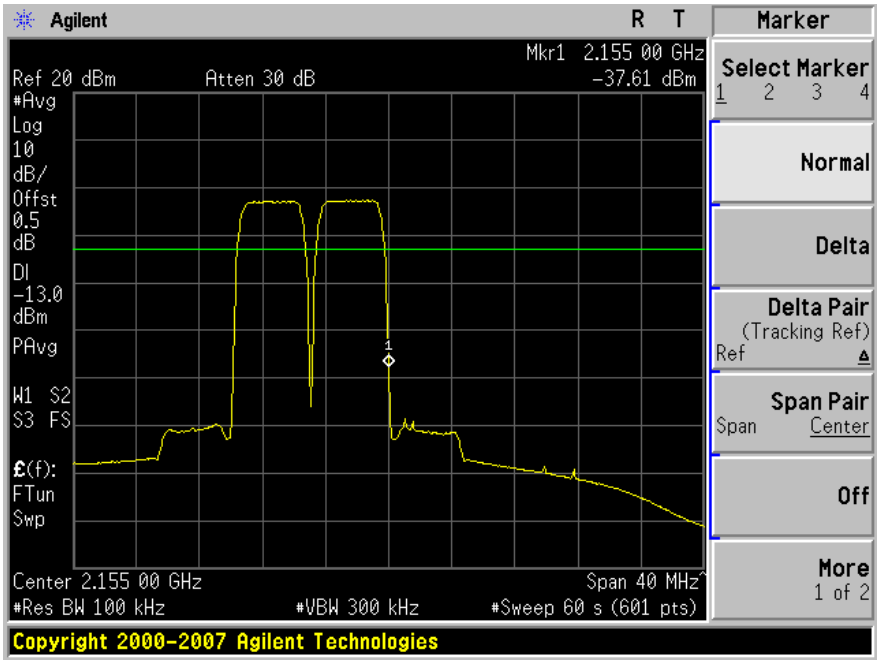
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency



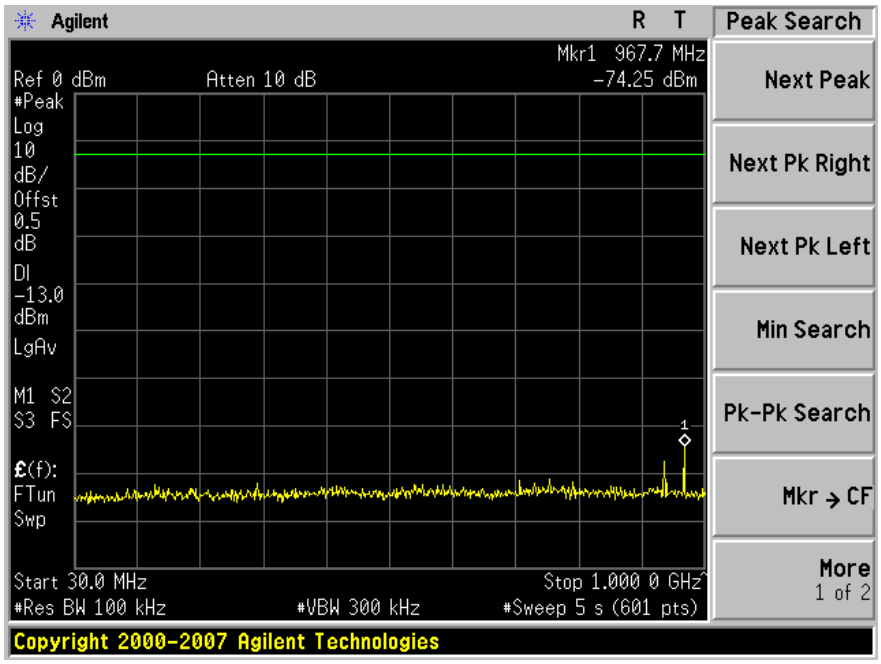
Plot 4: Inter-Modulation Highest Frequency



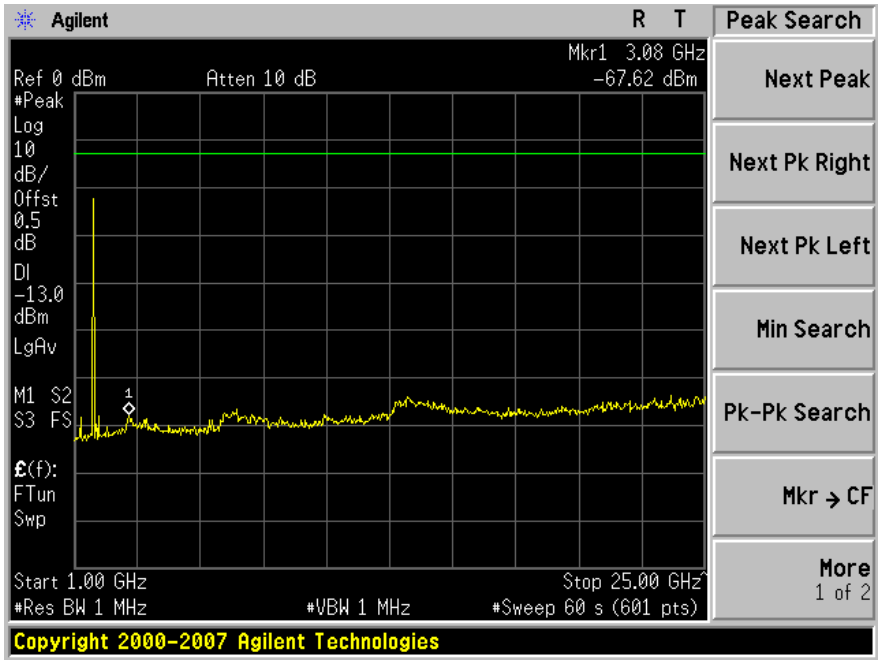
UL: 1710-1755 MHz

Modulation: LTE-QPSK, Frequency: 1725 MHz

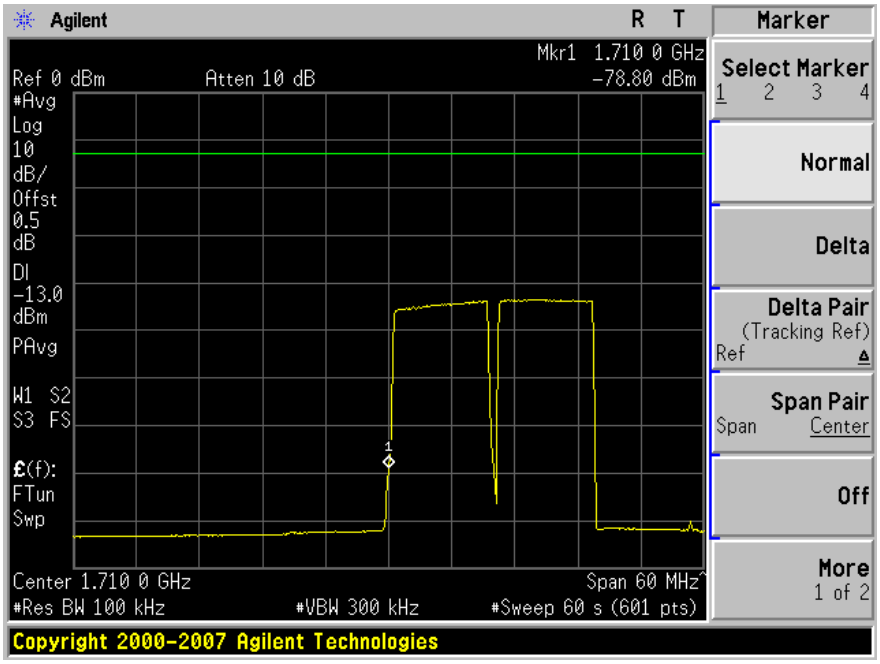
Plot 1: 30 MHz to 1 GHz



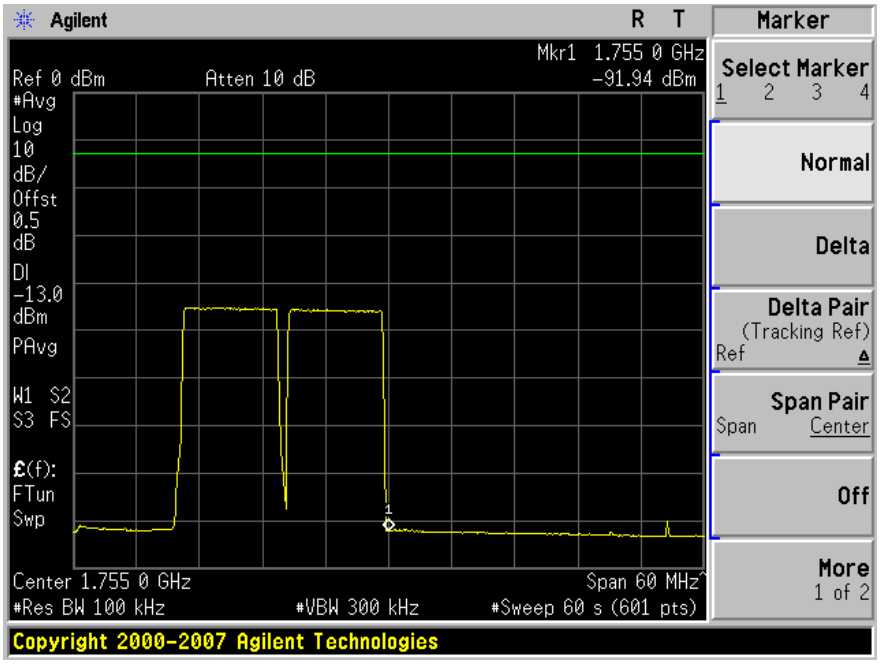
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

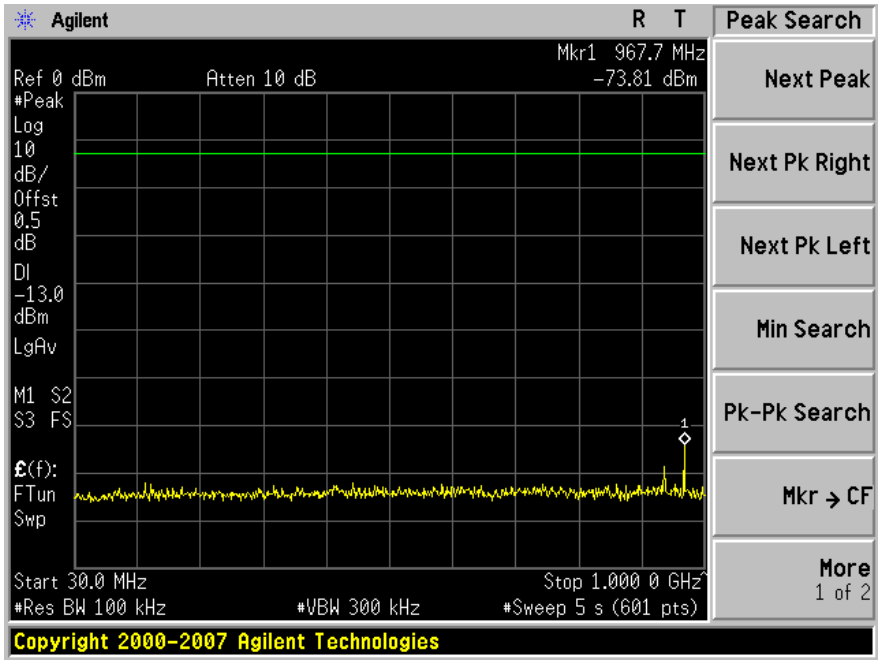


Plot 4: Inter-Modulation Highest Frequency

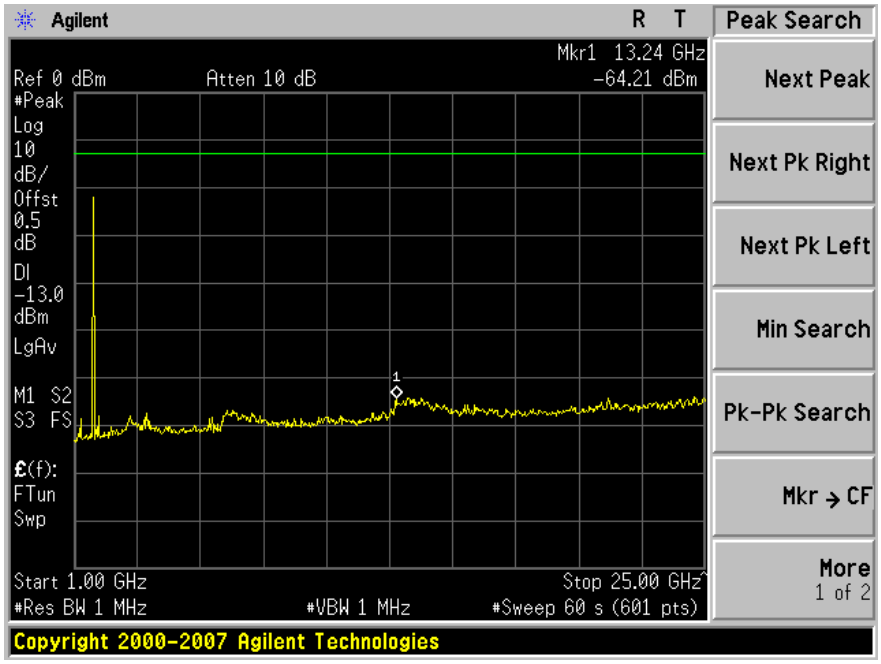


Modulation: LTE-16QAM, Frequency: 1725 MHz

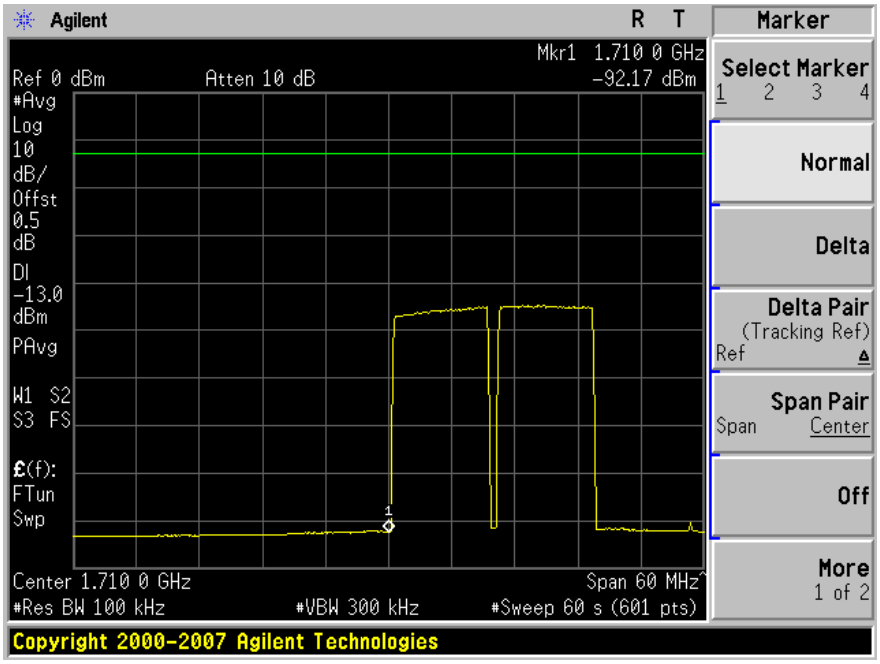
Plot 1: 30 MHz to 1 GHz



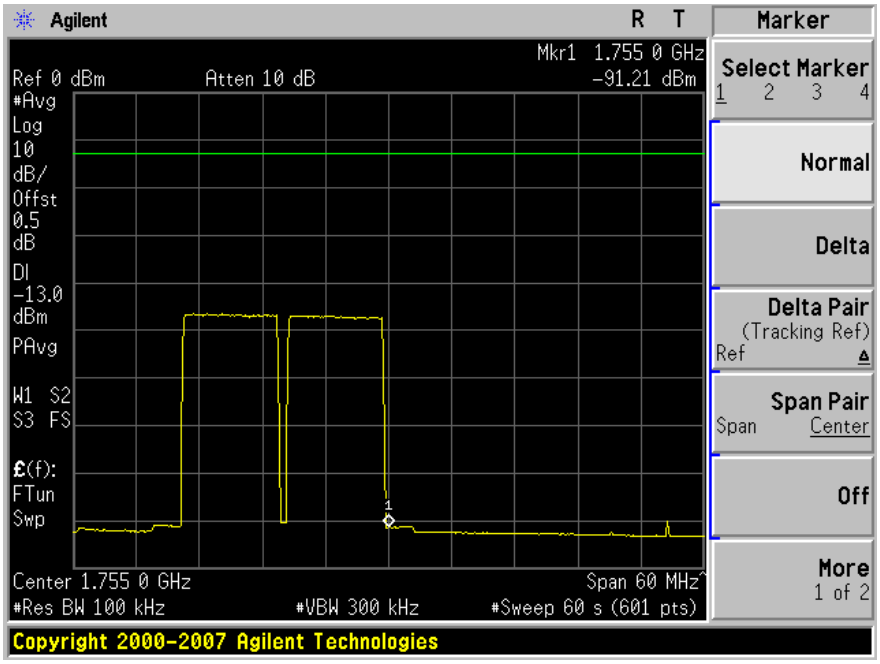
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

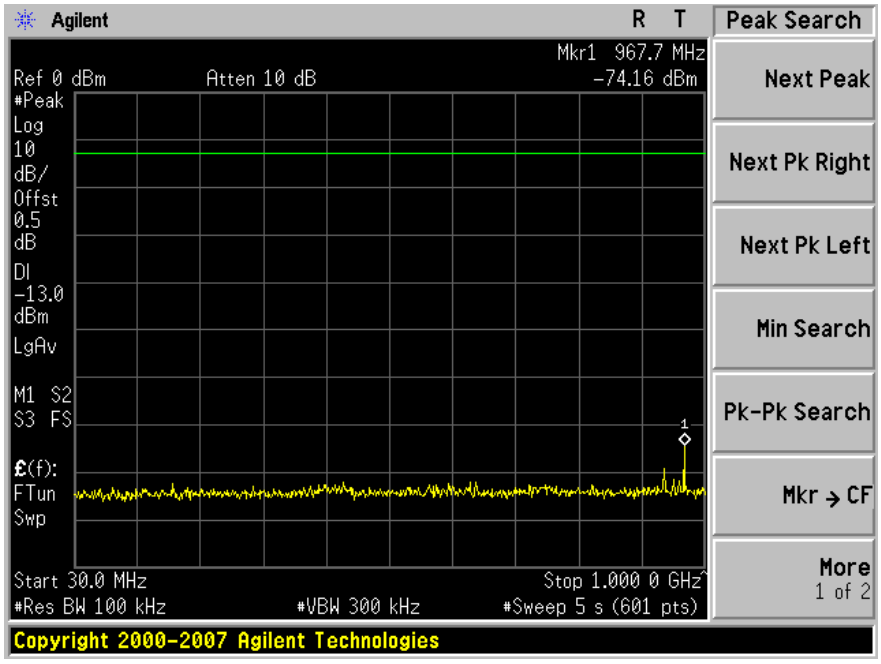


Plot 4: Inter-Modulation Highest Frequency

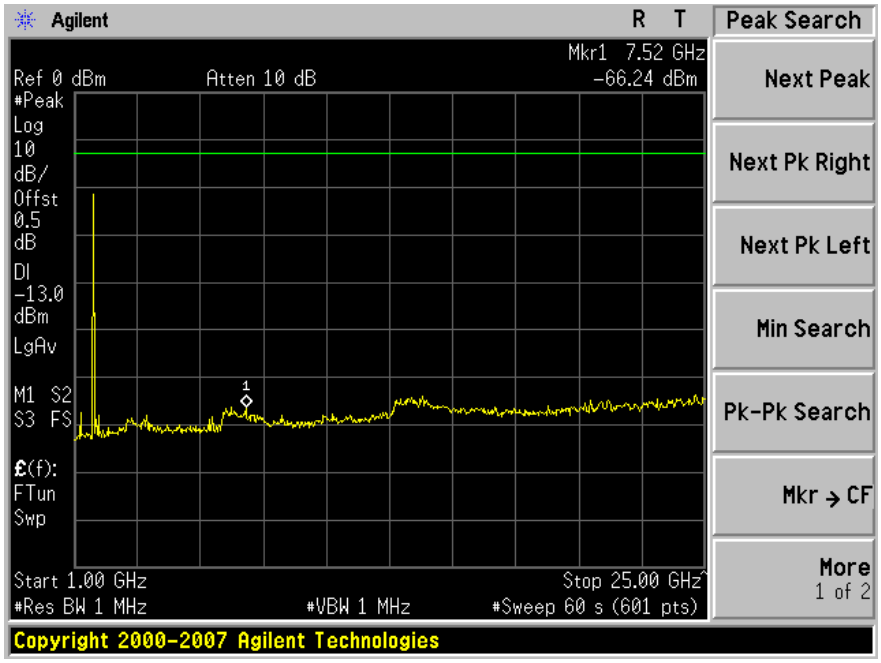


Modulation: LTE-64QAM, Frequency: 1725 MHz

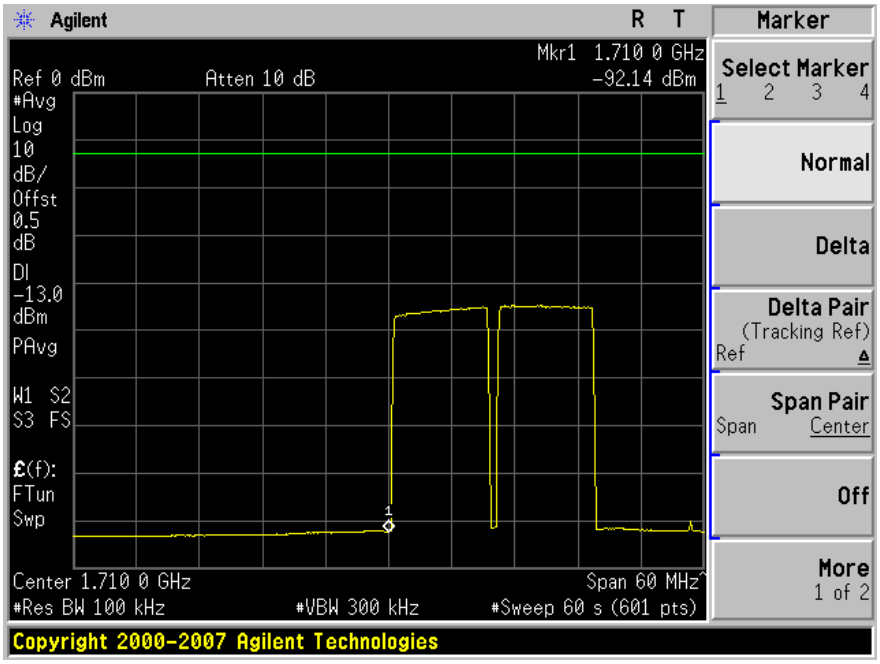
Plot 1: 30 MHz to 1 GHz



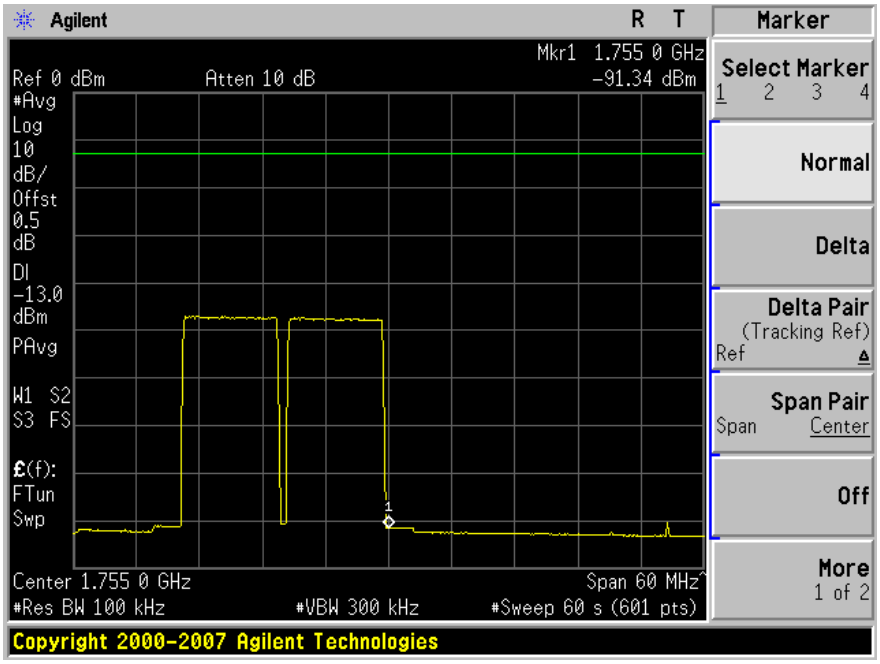
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency

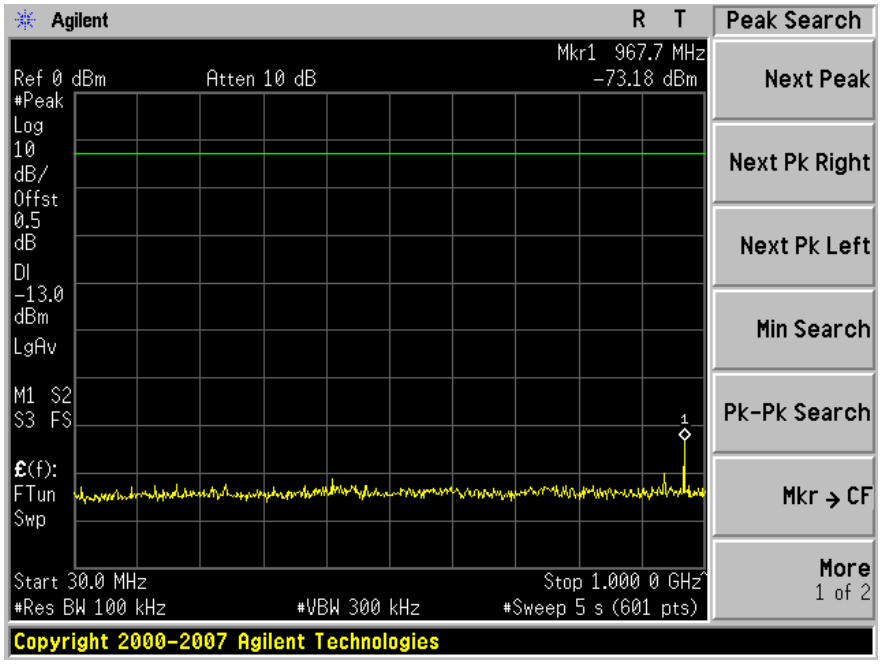


Plot 4: Inter-Modulation Highest Frequency

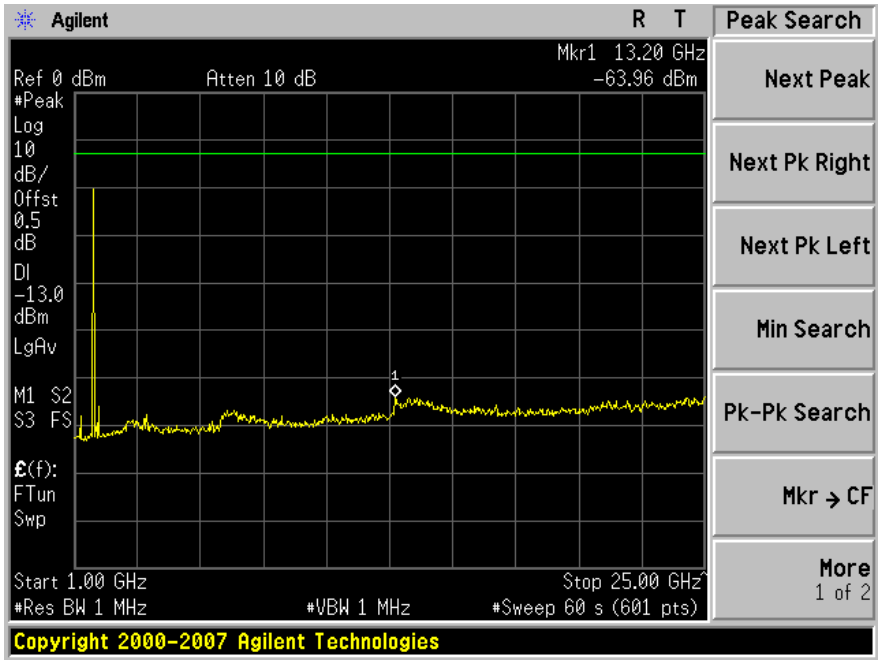


Modulation: WCDMA, Frequency: 1732.4 MHz

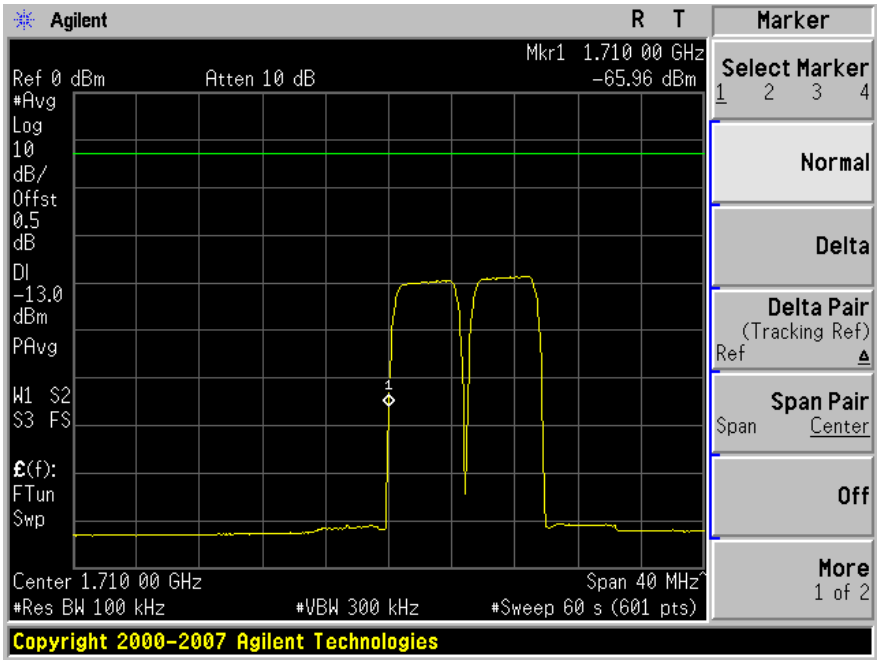
Plot 1: 30 MHz to 1 GHz



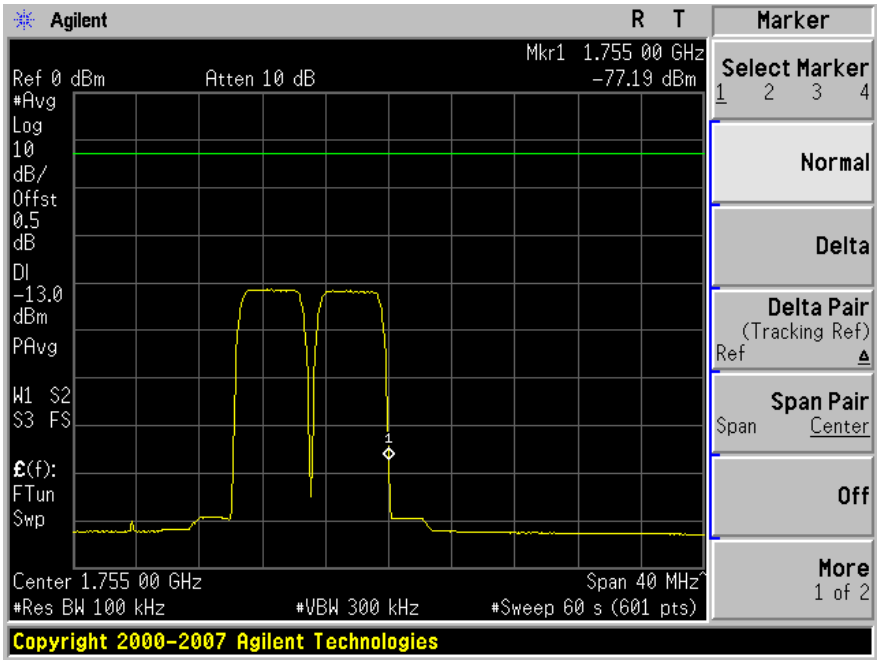
Plot 2: Above 1 GHz



Plot 3: Inter-Modulation Lowest Frequency



Plot 4: Inter-Modulation Highest Frequency



9 FCC §27.53 – BAND EDGE

9.1 Applicable Standard

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

9.2 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.

9.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	40-43 %
ATM Pressure:	101-103 kPa

** The testing was performed by Victor Zhang on from 2009-09-08 to 2009-09-18 in RF Site.*

9.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY45094317	2009-09-01

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

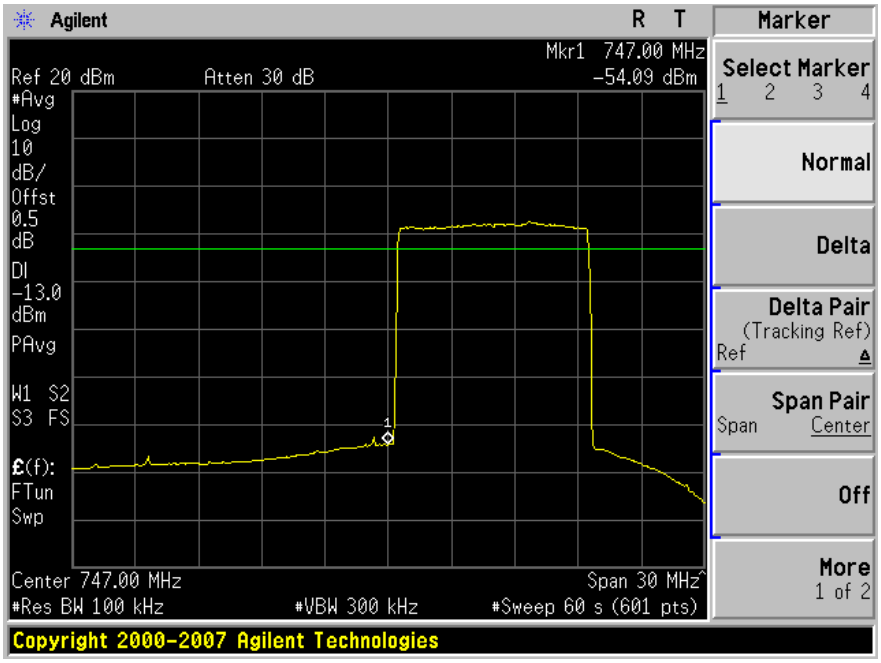
9.5 Test Results

Please refer to the following plots.

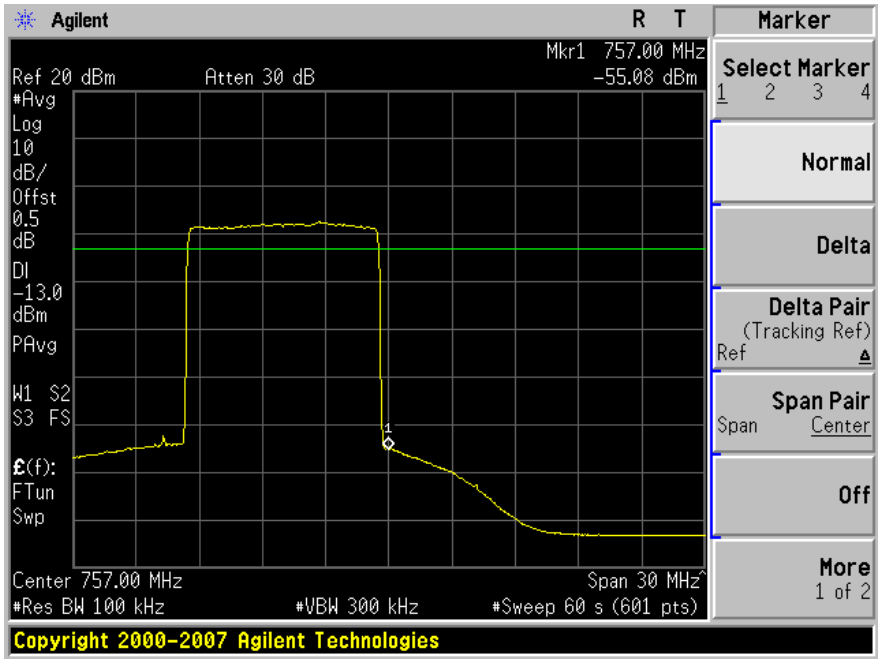
DL: 746-757 MHz

Modulation: LTE-QPSK:

Plot 1: Lowest Edge

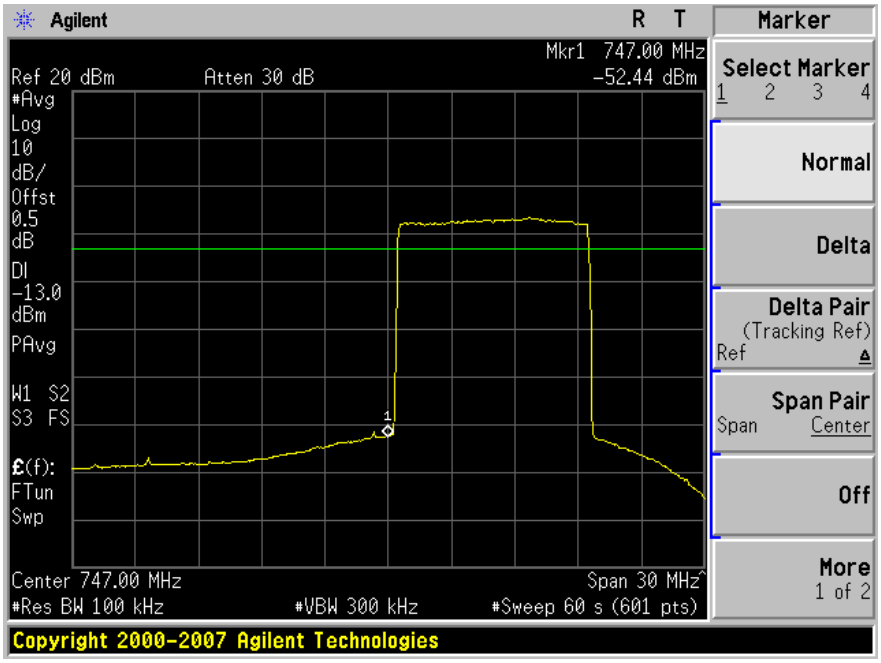


Plot 2: Highest Edge

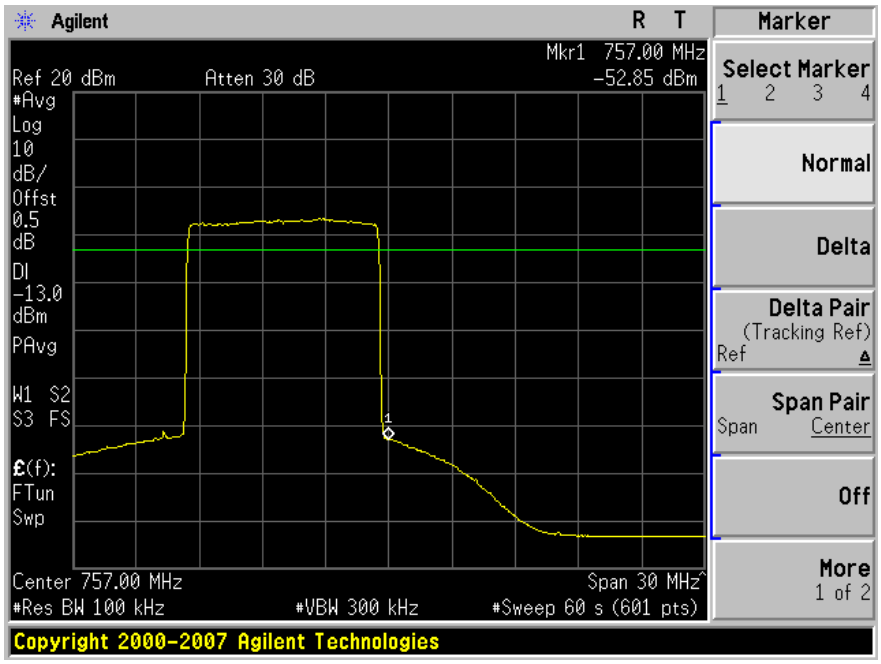


Modulation: LTE-16QAM:

Plot 1: Lowest Edge

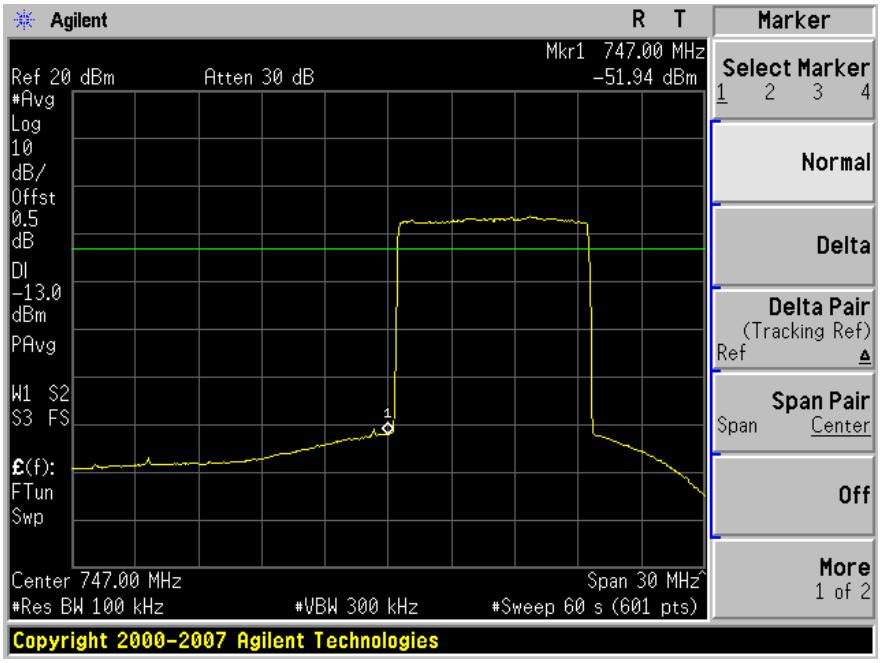


Plot 2: Highest Edge

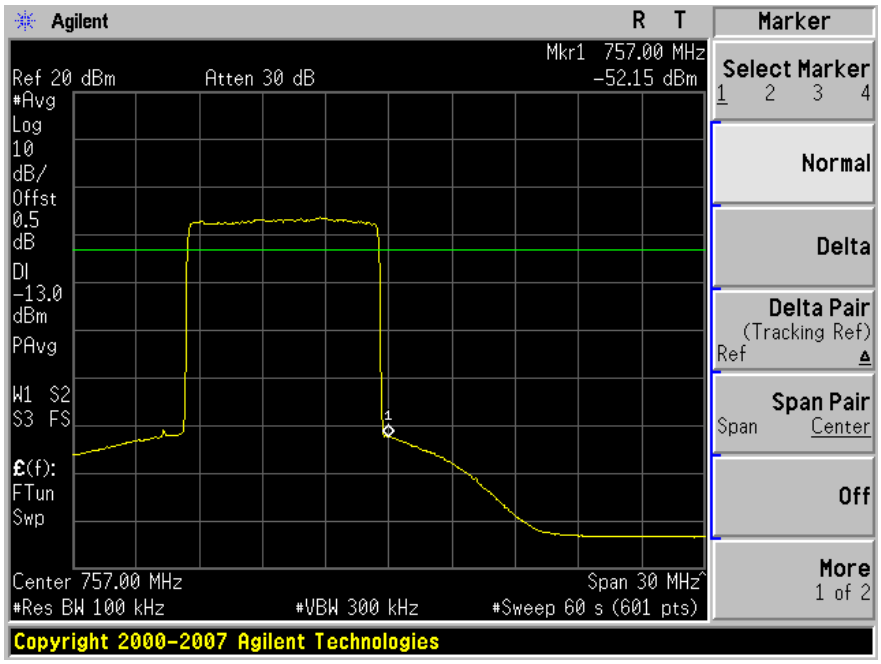


Modulation: LTE-64QAM:

Plot 1: Lowest Edge



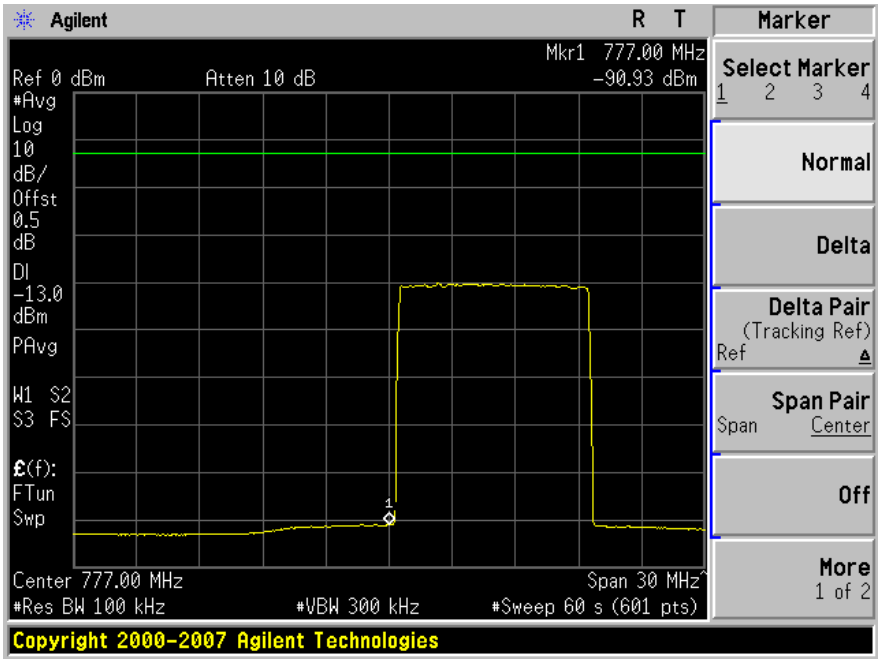
Plot 2: Highest Edge



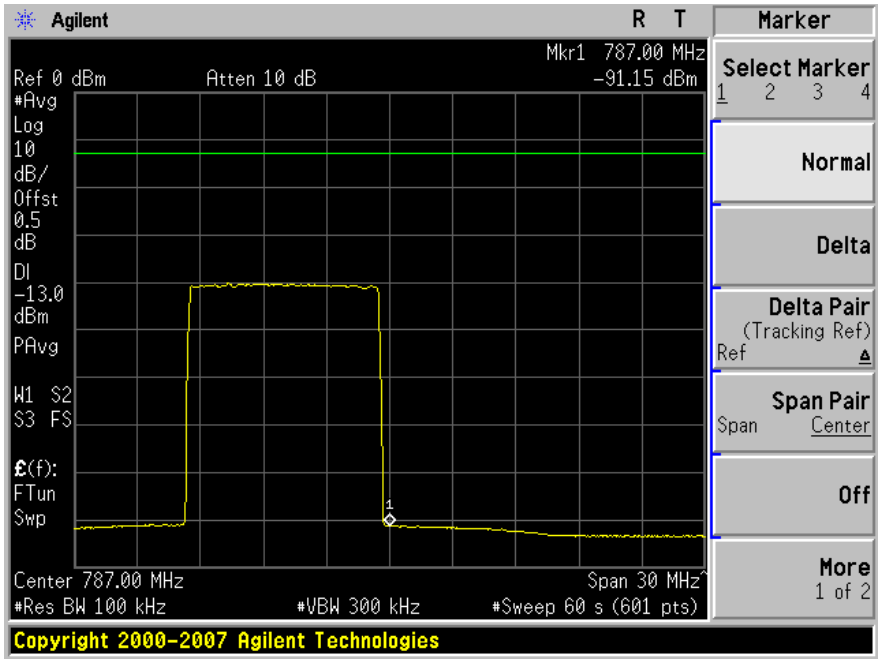
UL: 776-787 MHz

Modulation: LTE-QPSK:

Plot 1: Lowest Edge

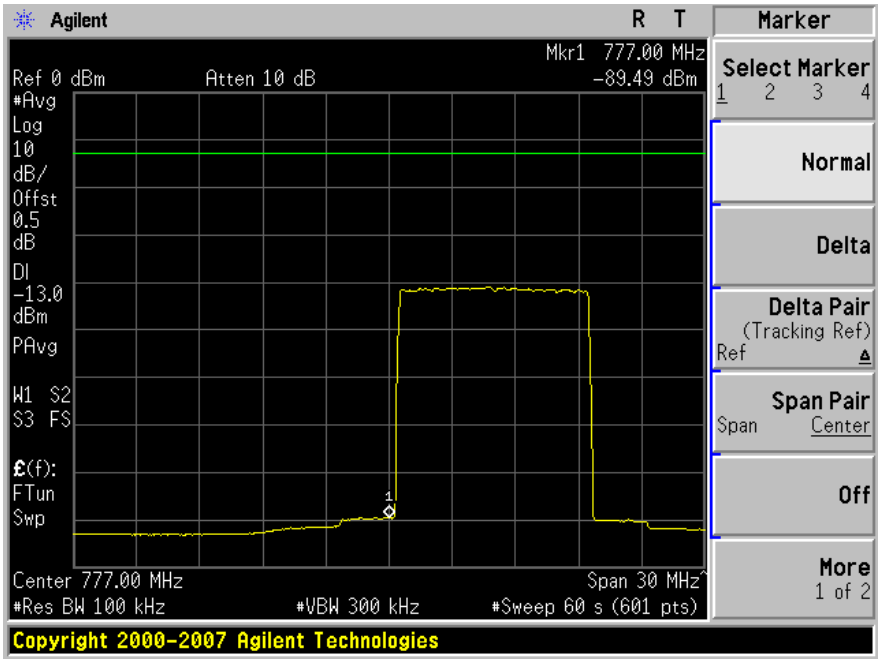


Plot 2: Highest Edge

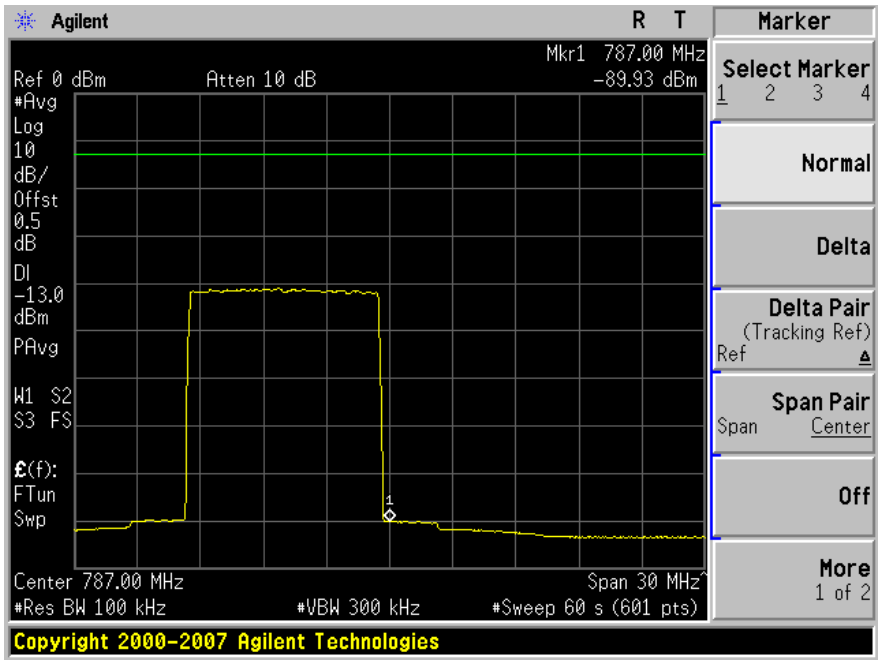


Modulation: LTE-16QAM:

Plot 1: Lowest Edge

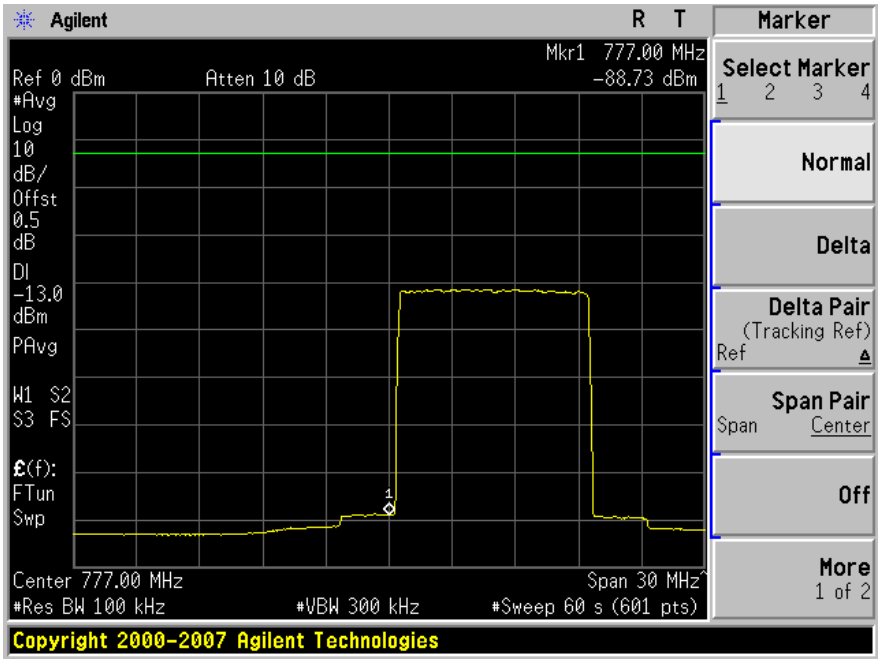


Plot 2: Highest Edge

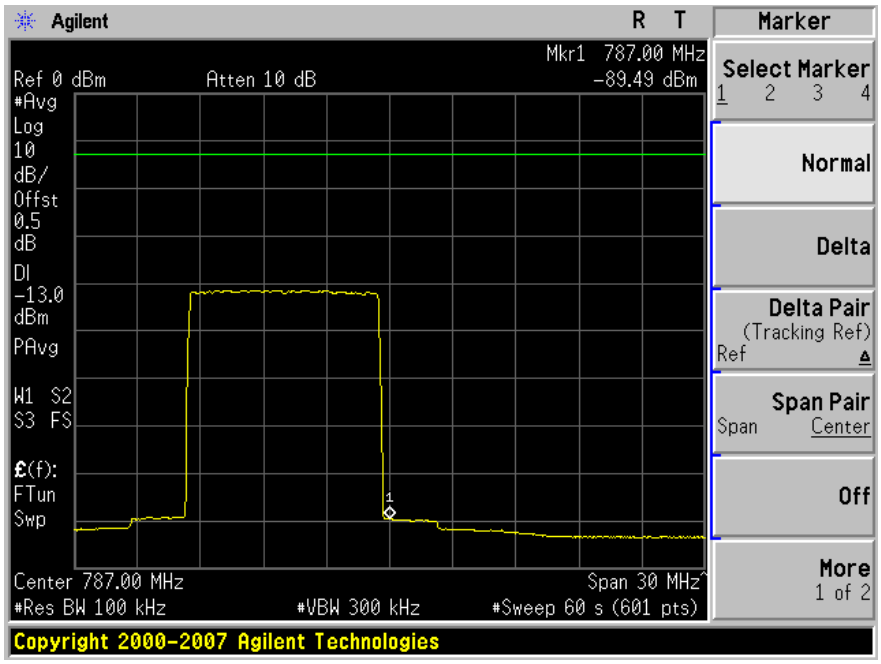


Modulation: LTE-64QAM:

Plot 1: Lowest Edge

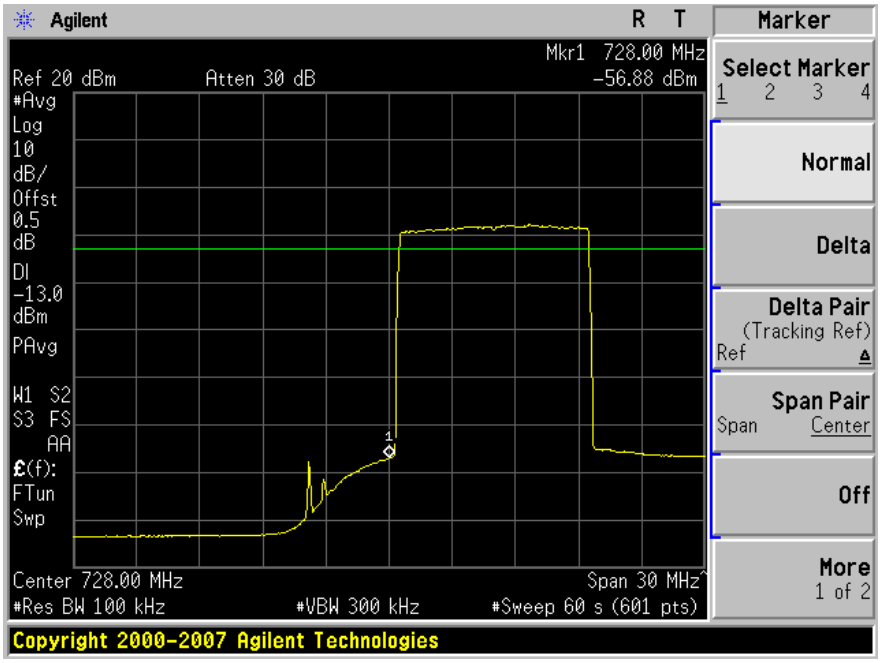


Plot 2: Highest Edge

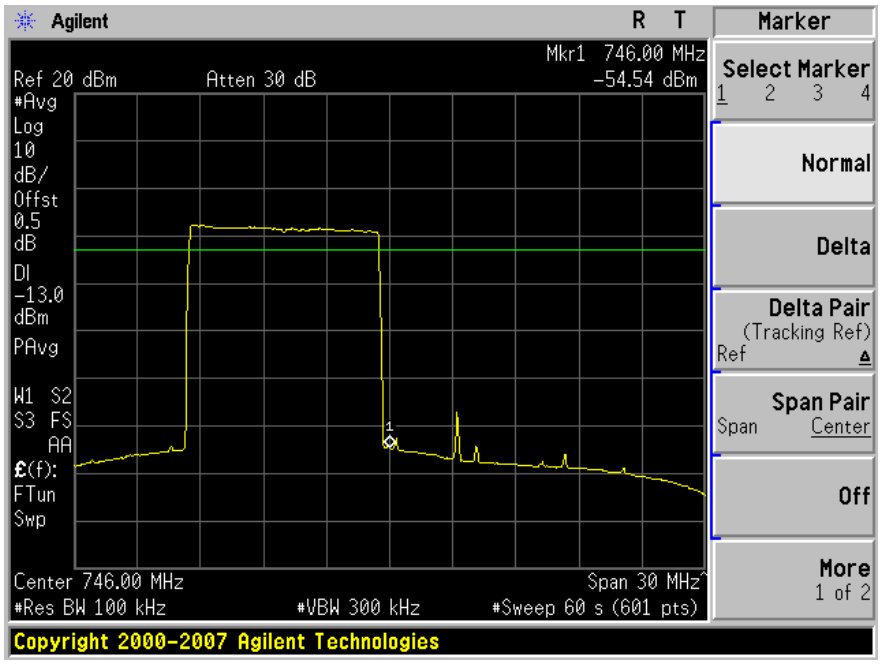


Modulation: LTE-QPSK:

Plot 1: Lowest Edge



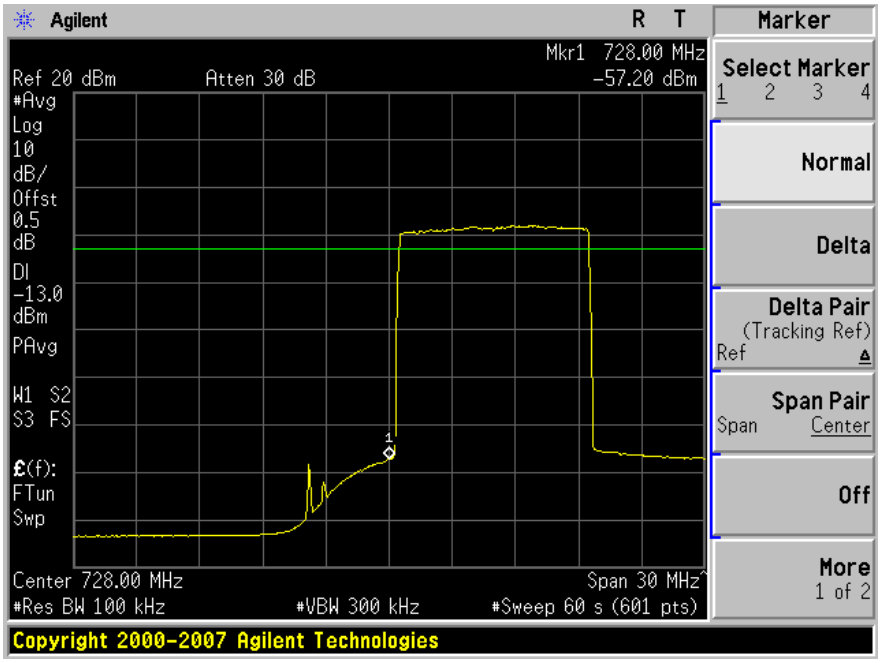
Plot 2: Highest Edge



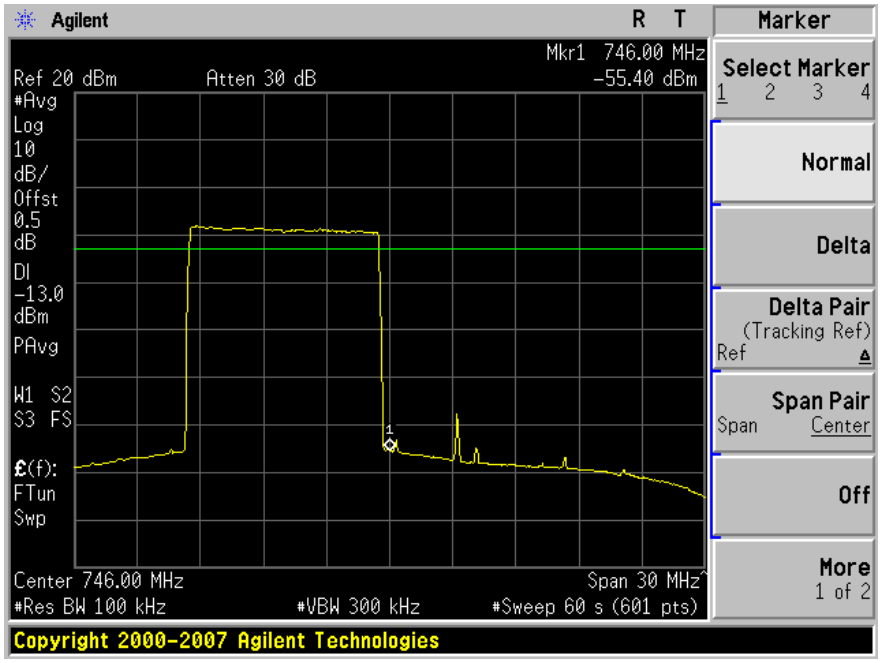
DL: 728-746 MHz

Modulation: LTE-16QAM:

Plot 1: Lowest Edge

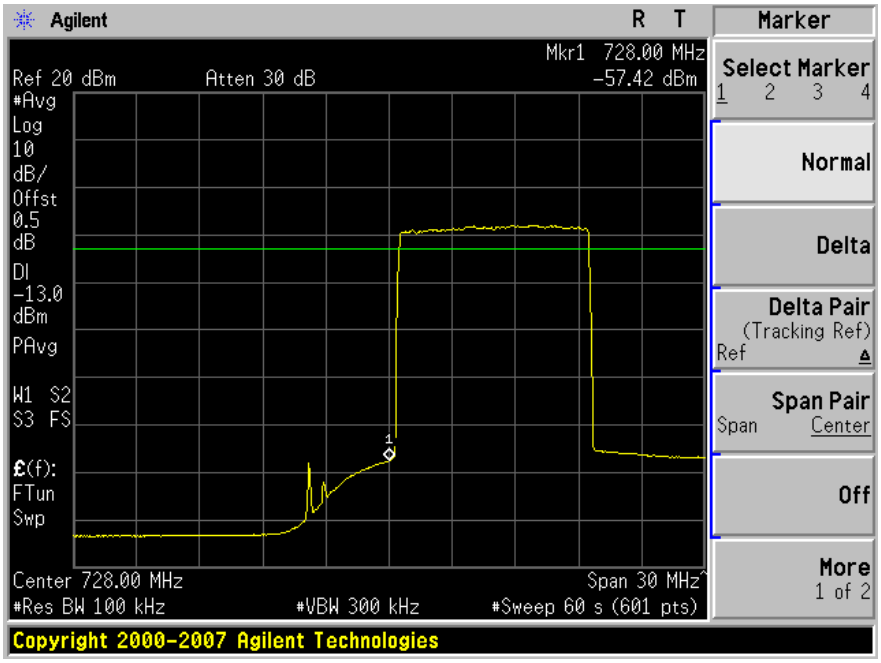


Plot 2: Highest Edge

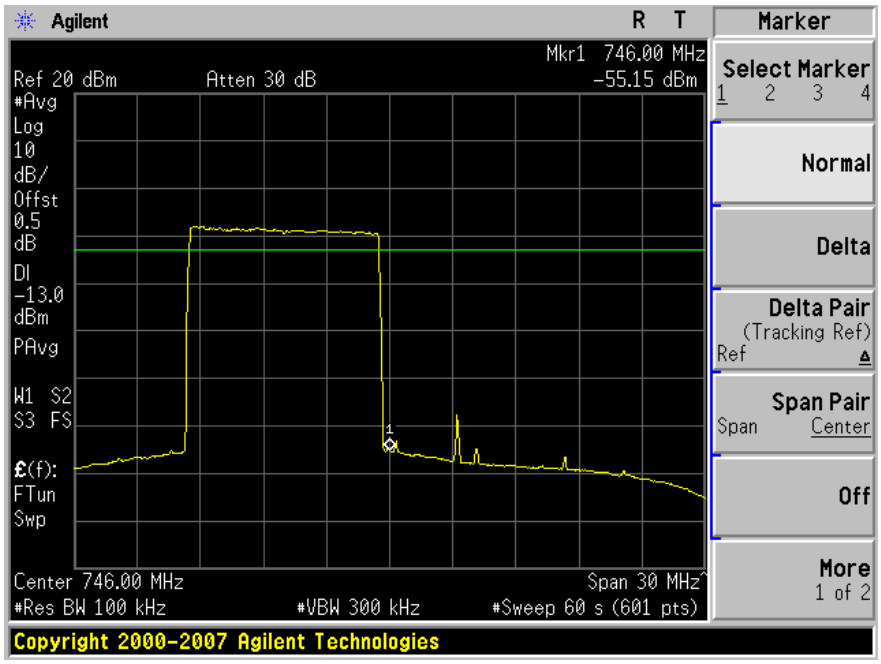


Modulation: LTE-64QAM:

Plot 1: Lowest Edge

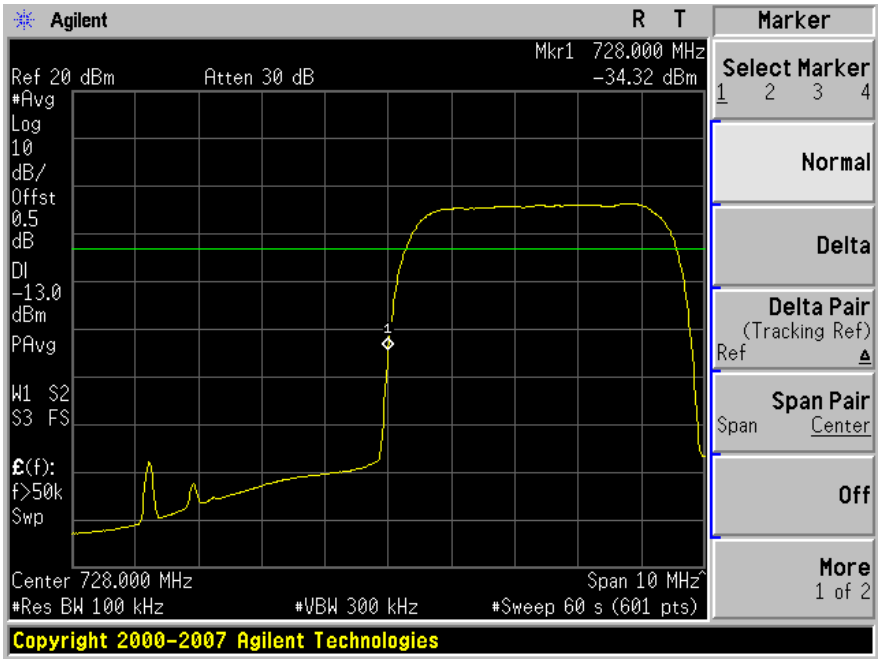


Plot 2: Highest Edge

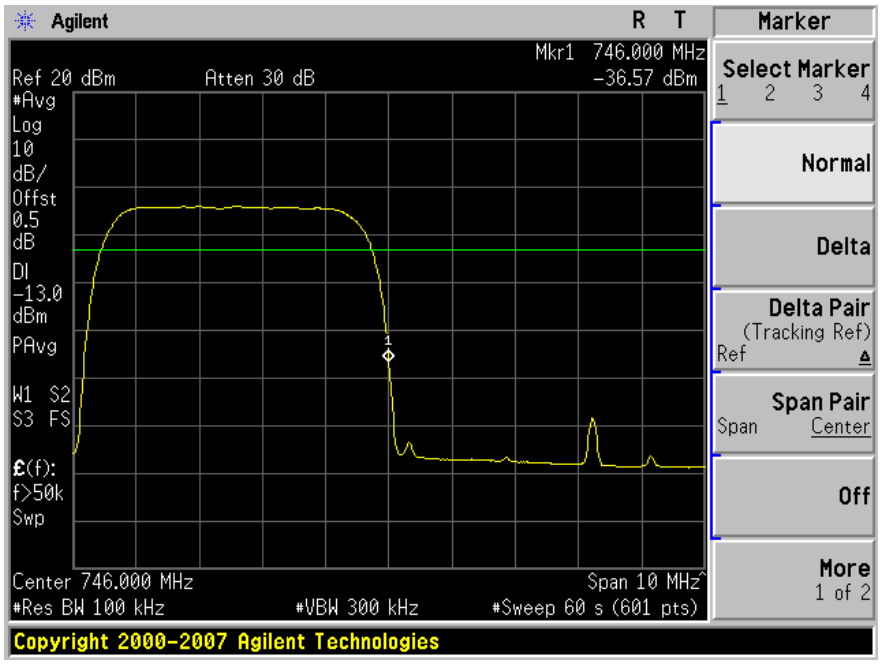


Modulation: WCDMA:

Plot 1: Lowest Edge



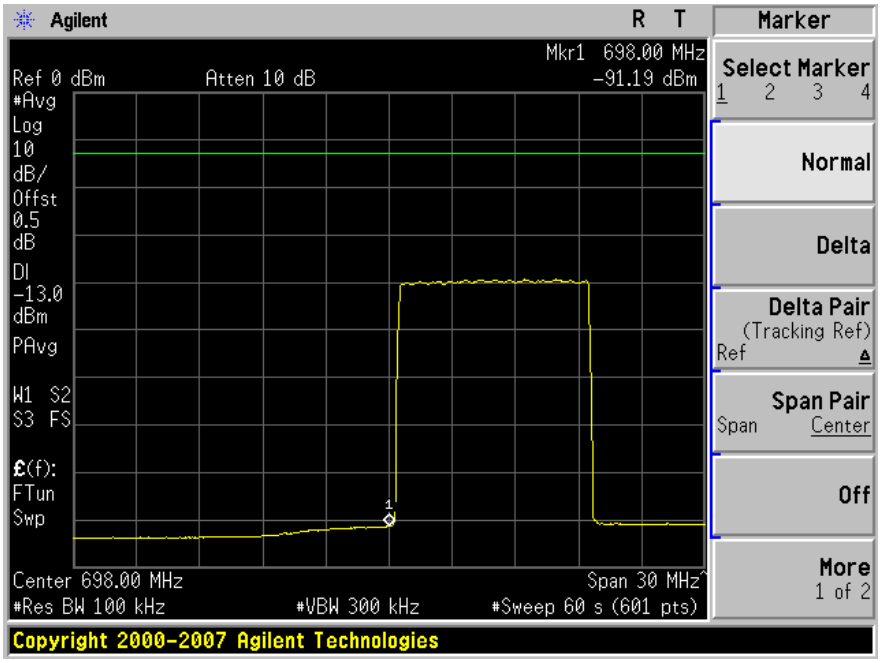
Plot 2: Highest Edge



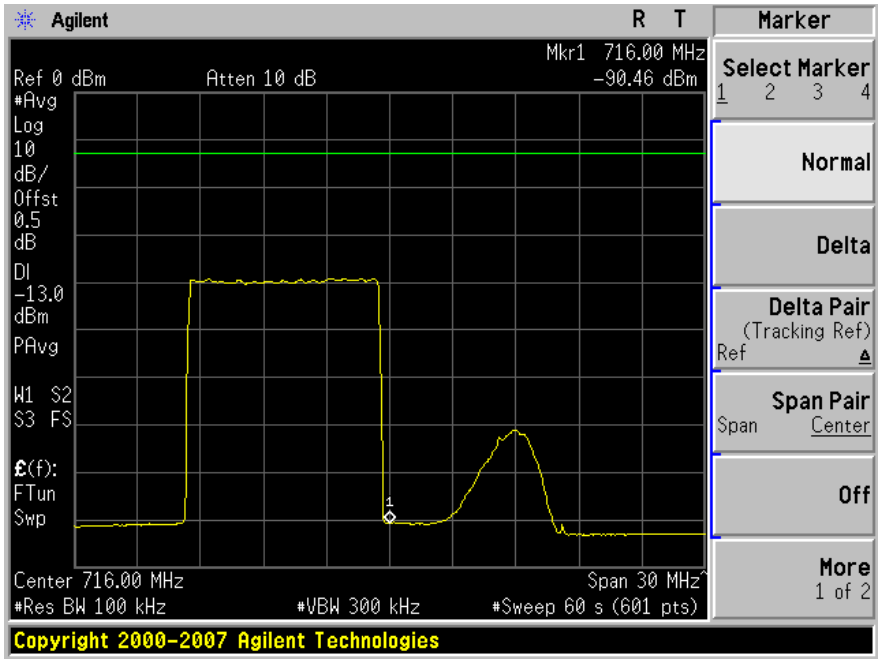
UL: 698-716 MHz

Modulation: LTE-QPSK:

Plot 1: Lowest Edge

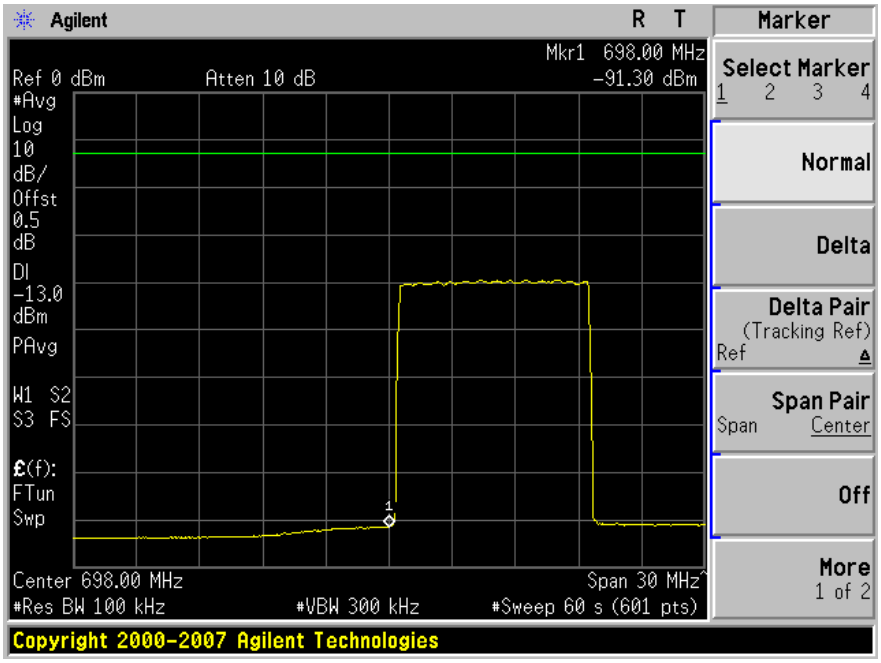


Plot 2: Highest Edge

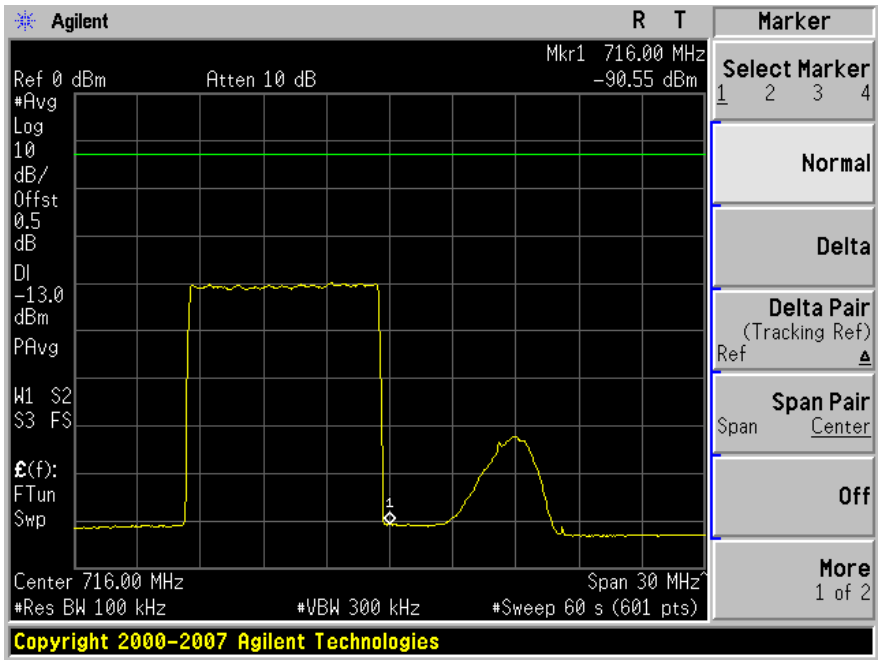


Modulation: LTE-16QAM:

Plot 1: Lowest Edge

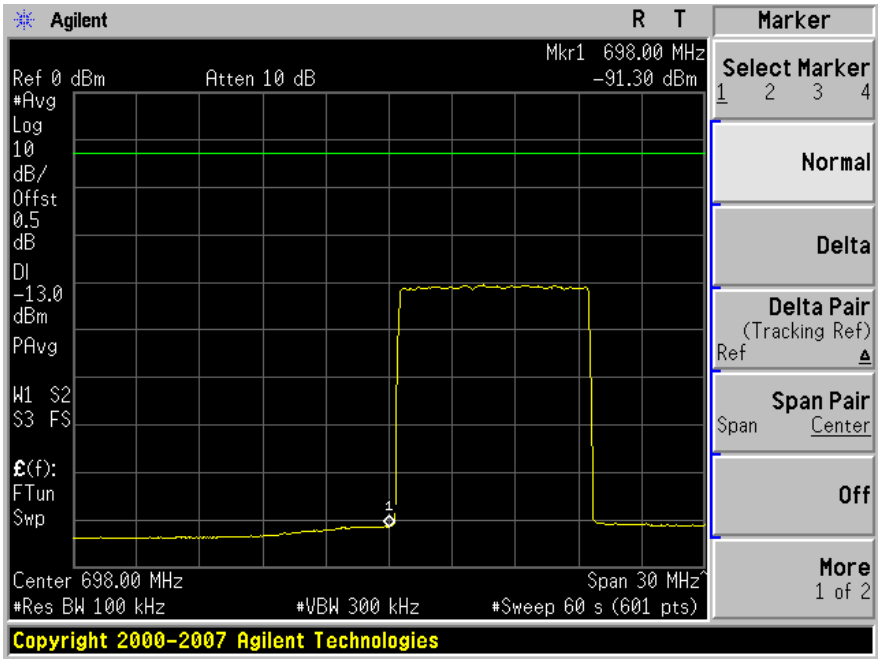


Plot 2: Highest Edge

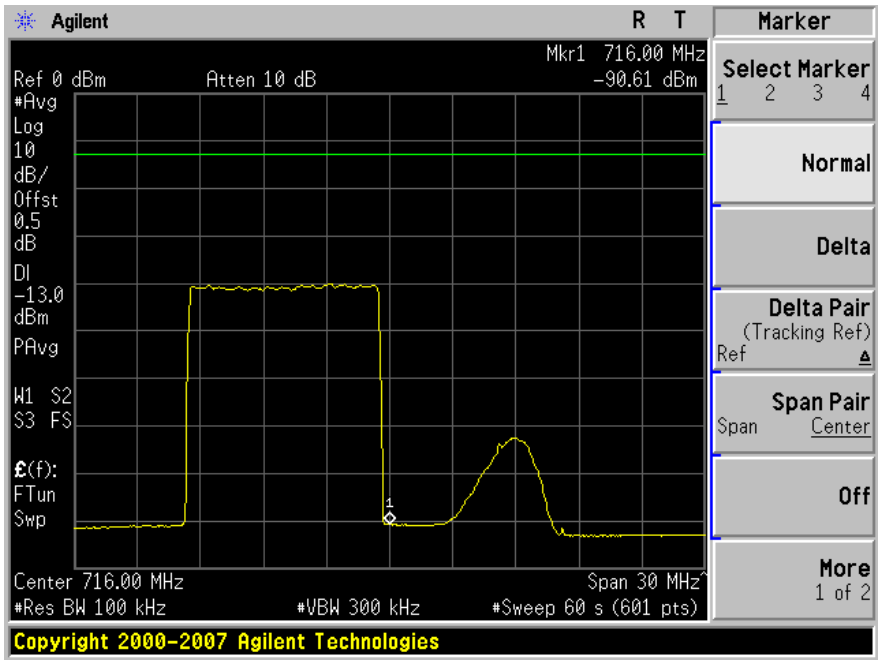


Modulation: LTE-64QAM:

Plot 1: Lowest Edge

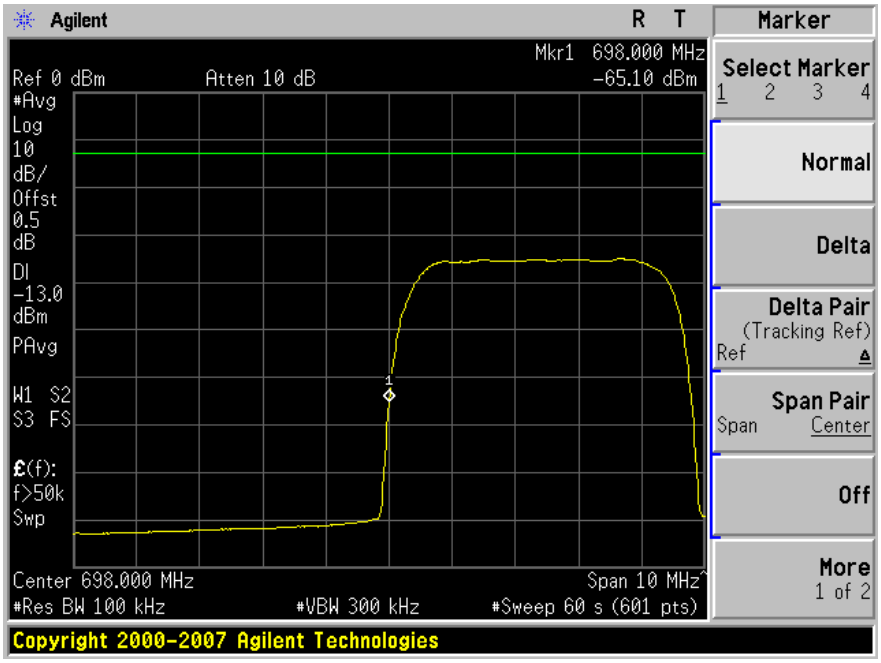


Plot 2: Highest Edge

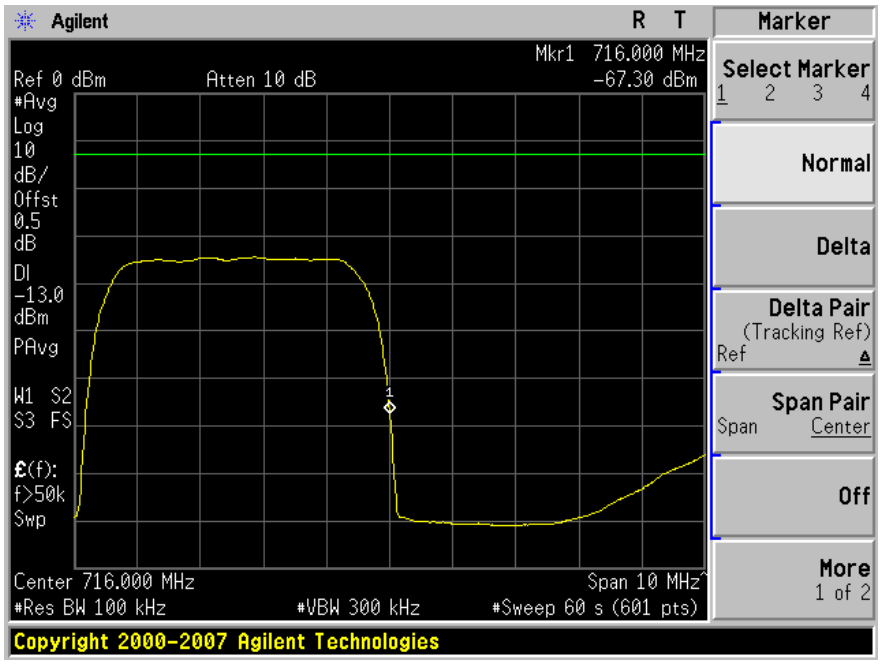


Modulation: WCDMA:

Plot 1: Lowest Edge



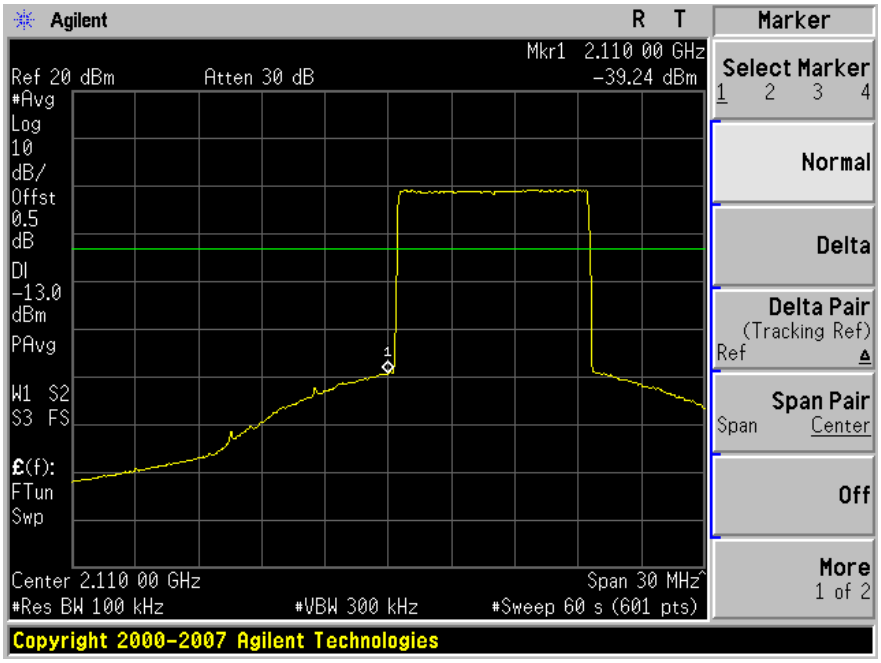
Plot 2: Highest Edge



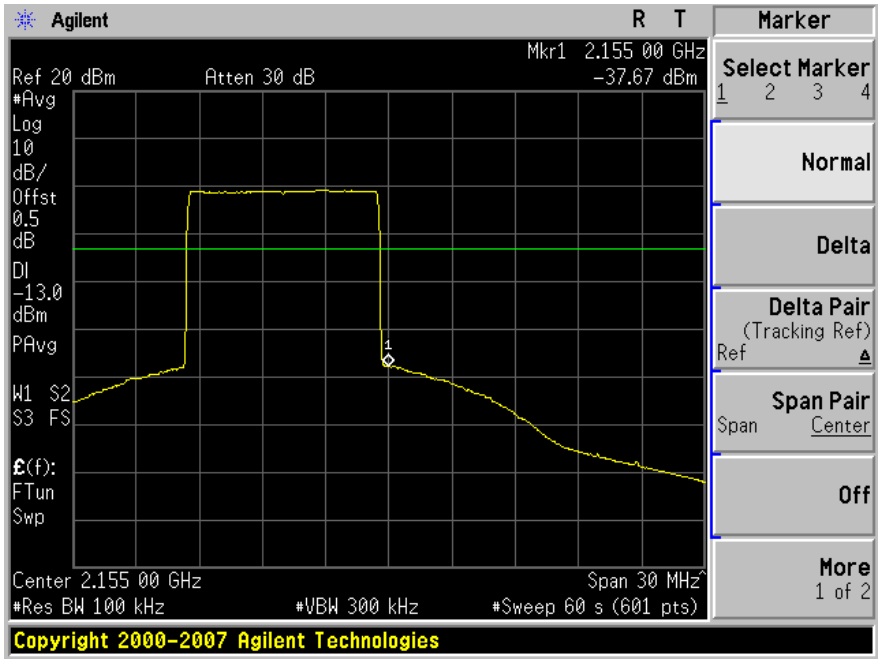
DL: 2110-2155 MHz

Modulation: LTE-QPSK:

Plot 1: Lowest Edge

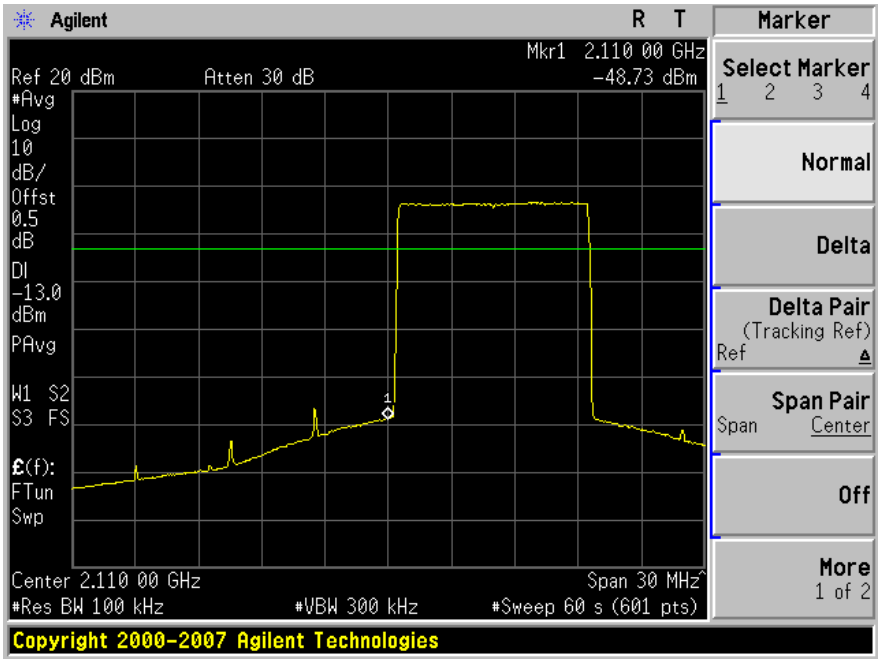


Plot 2: Highest Edge

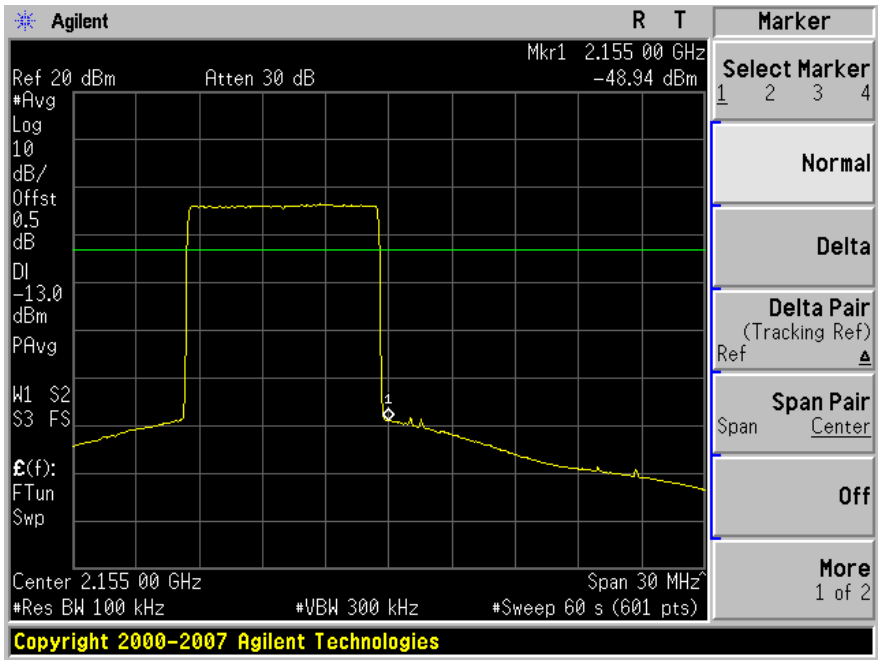


Modulation: LTE-16QAM:

Plot 1: Lowest Edge

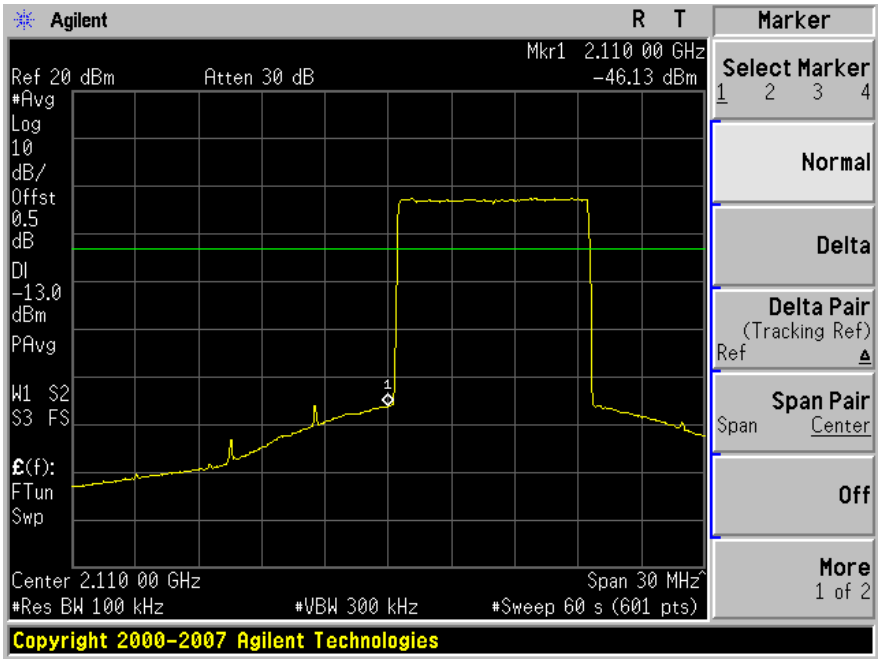


Plot 2: Highest Edge

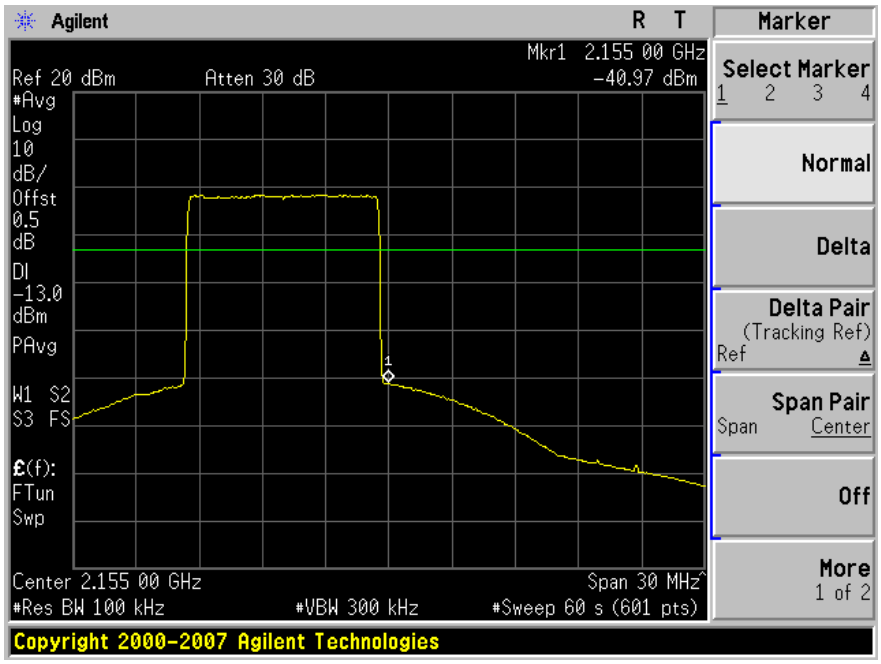


Modulation: LTE-64QAM:

Plot 1: Lowest Edge

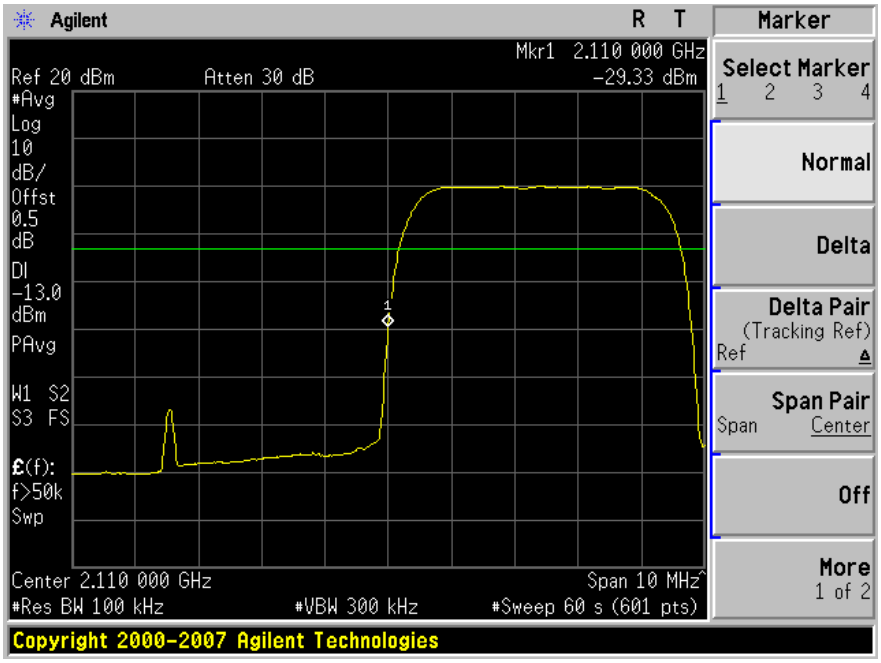


Plot 2: Highest Edge

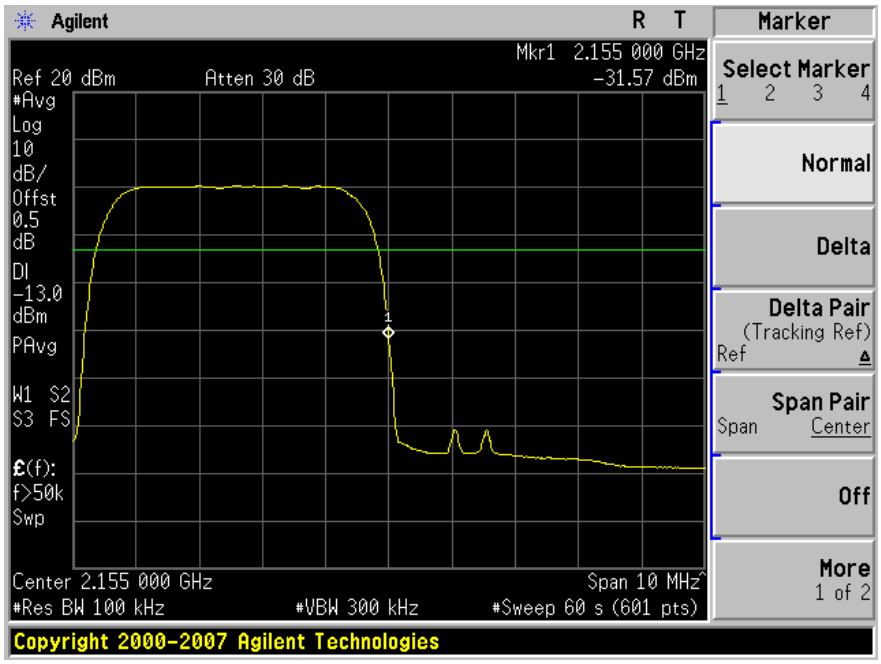


Modulation: WCDMA:

Plot 1: Lowest Edge



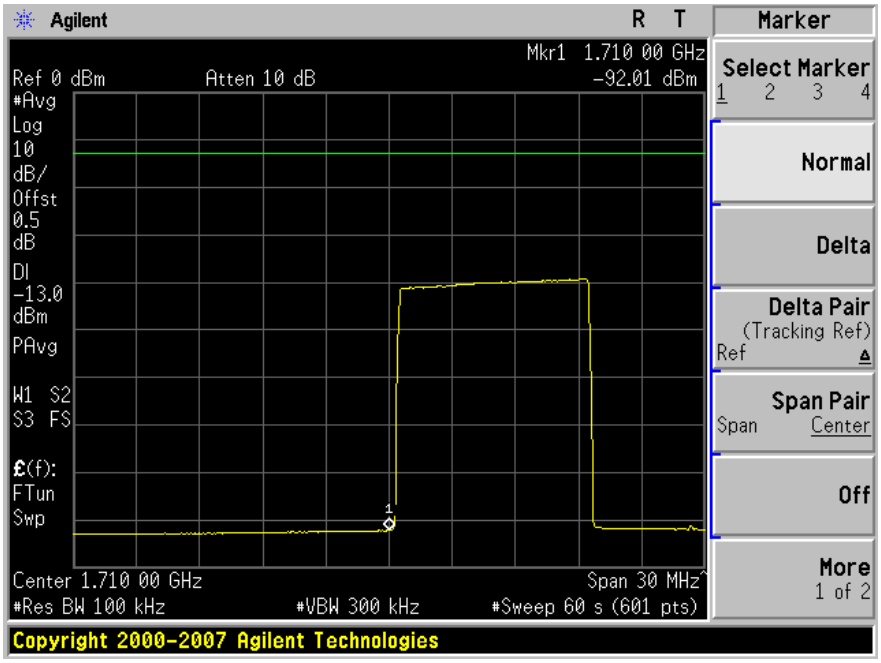
Plot 2: Highest Edge



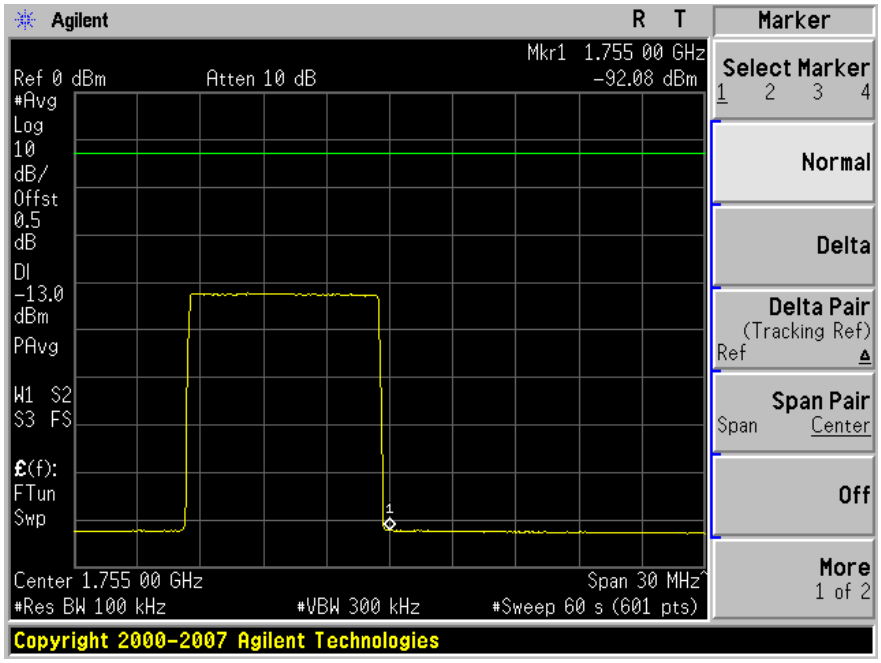
UL: 1710-1755 MHz

Modulation: LTE-QPSK:

Plot 1: Lowest Edge

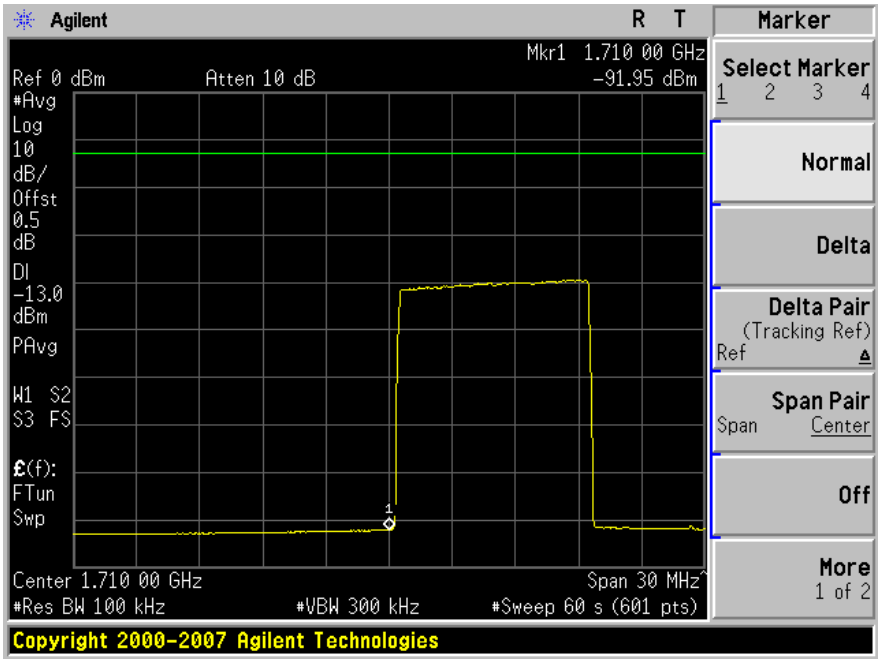


Plot 2: Highest Edge

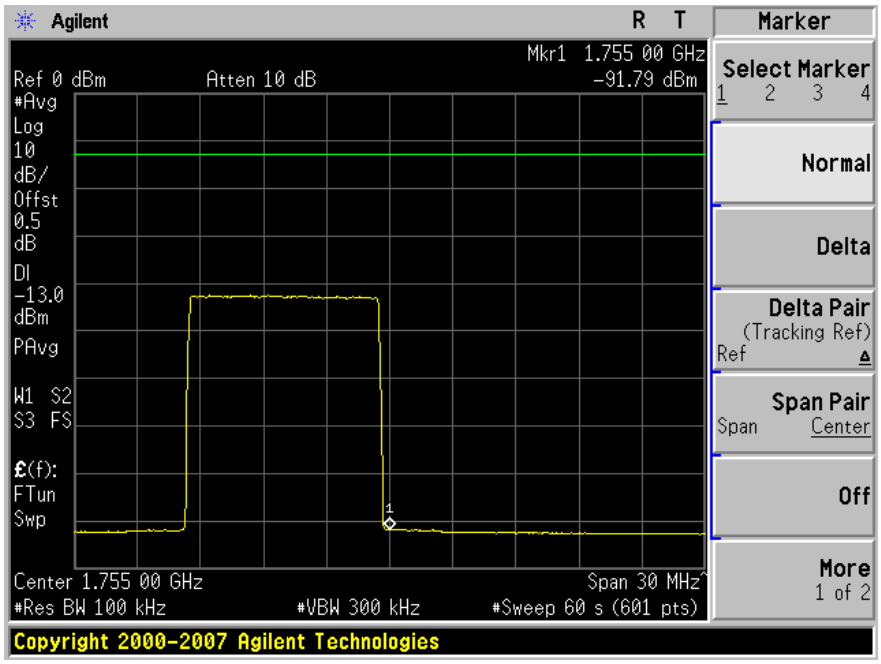


Modulation: LTE-16QAM:

Plot 1: Lowest Edge

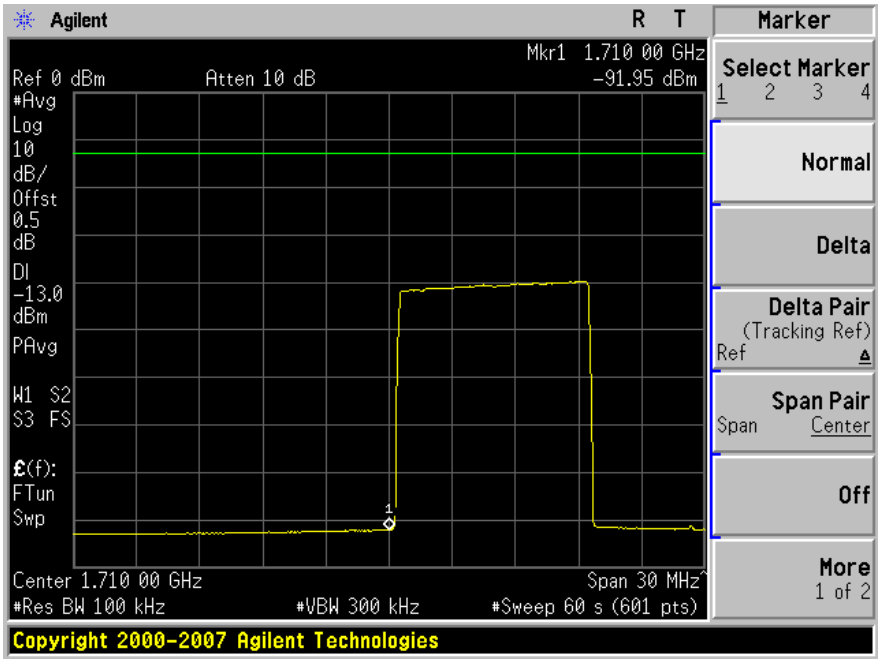


Plot 2: Highest Edge

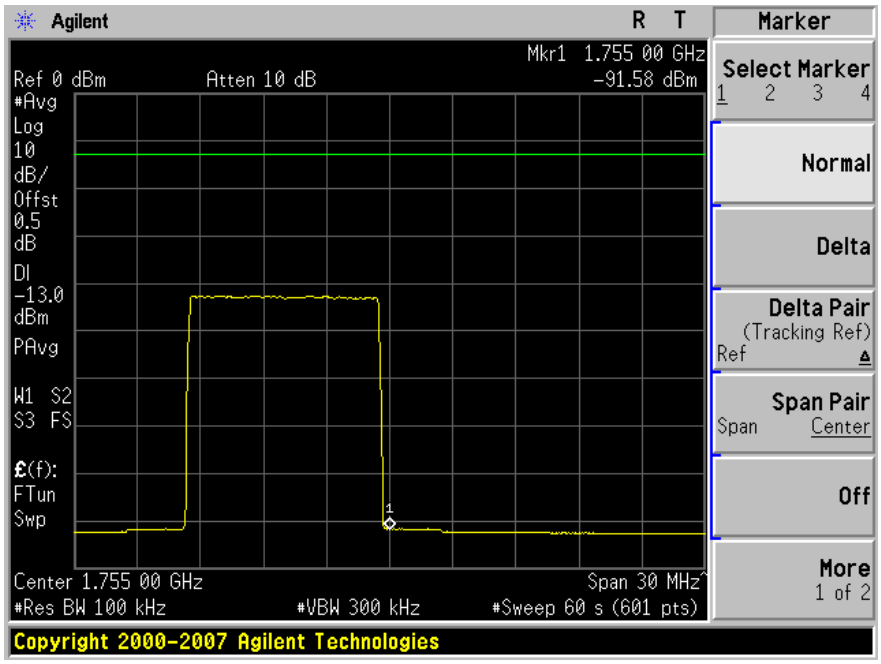


Modulation: LTE-64QAM:

Plot 1: Lowest Edge

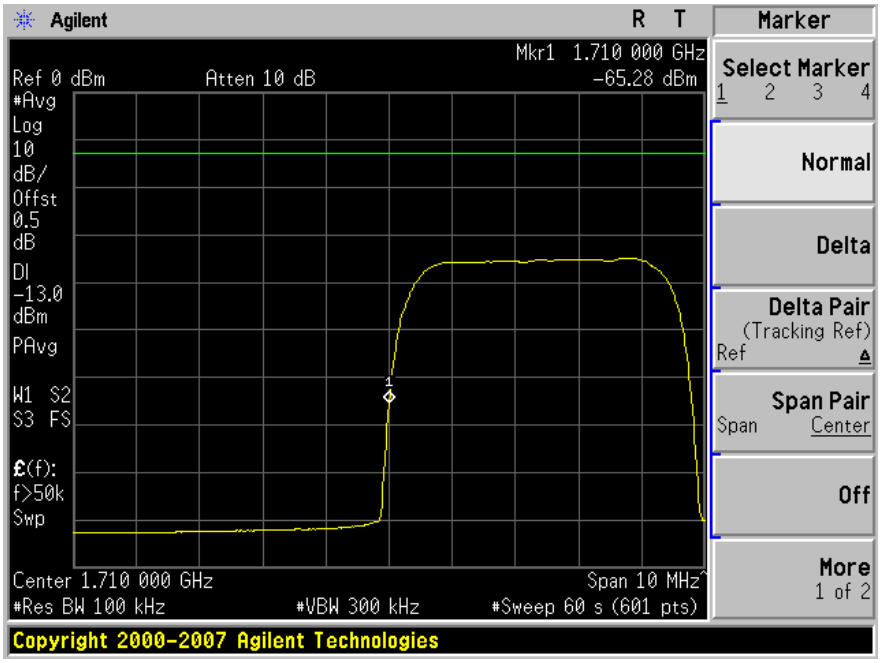


Plot 2: Highest Edge

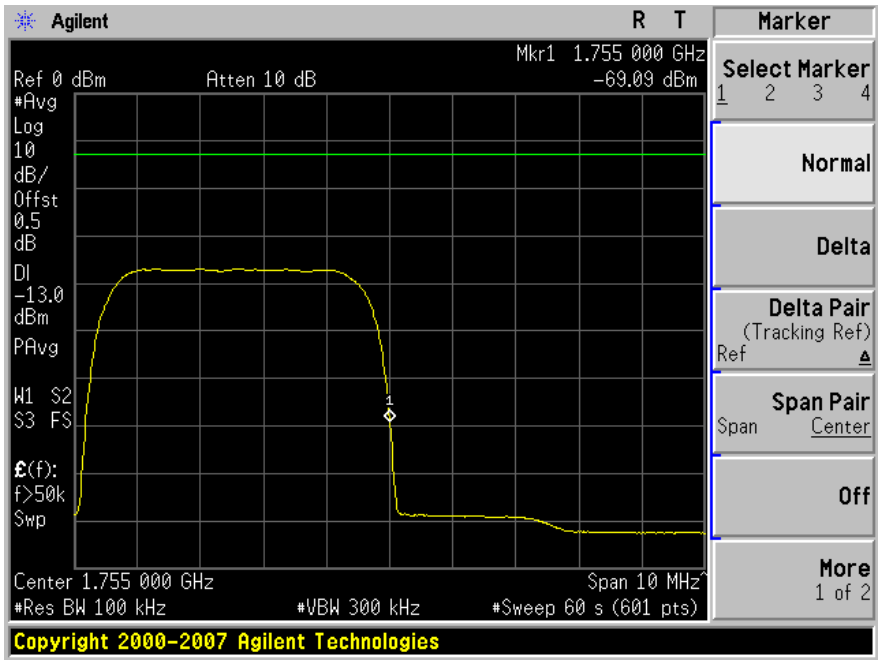


Modulation: WCDMA:

Plot 1: Lowest Edge



Plot 2: Highest Edge



10 FCC §2.1055 & §27.54 – Frequency Stability

10.1 Applicable Standard

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

10.2 Test Procedure

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.
b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency.

10.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	40-43 %
ATM Pressure:	101-103 kPa

** The testing was performed by Victor Zhang on from 2009-09-08 to 2009-09-18 in RF Site.*

10.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Espec	Chamber, Humidity & Temperature	ESL-4CA	18010	2008-12-10
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY45094317	2009-09-01

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

10.5 Test Results

Please refer to the following tables.

DL: 746-757 MHz

Modulation: LTE-QPSK (752 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-77	-26	-0.10239
120	-51	0	-0.06782
138	-92	-41	-0.12234

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-73	-22	-0.09707
40	-36	15	-0.04787
30	-38	13	-0.05053
20	-51	0	-0.06782
10	-41	10	-0.05452
0	-48	3	-0.06383
-10	-43	8	-0.05718
-20	-39	12	-0.05186

UL: 776-787 MHz

Modulation: LTE-QPSK (782 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-12	27	-0.01535
120	-39	0	-0.04987
138	-53	-14	-0.06777

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-47	-8	-0.06010
40	-59	-20	-0.07545
30	-38	1	-0.04859
20	-39	0	-0.04987
10	-41	-2	-0.05243
0	-33	6	-0.04220
-10	-31	8	-0.03964
-20	-33	6	-0.04220

DL: 728-746 MHz

Modulation: LTE-QPSK (733 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-33	-50	-0.045020
120	17	0	0.023192
138	19	2	0.025921

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-33	-50	-0.045020
40	-29	-46	-0.039560
30	33	16	0.045020
20	17	0	0.023192
10	-34	-51	-0.046380
0	8	-9	0.010914
-10	-17	-34	-0.023190
-20	-8	-25	-0.010910

UL: 698-716 MHz

Modulation: LTE-QPSK (703 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	34	72	0.048364
120	-38	0	-0.054050
138	-73	-35	-0.103840

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-63	-25	-0.08962
40	-56	-18	-0.07966
30	-41	-3	-0.05832
20	-38	0	-0.05405
10	-51	-13	-0.07255
0	-28	10	-0.03983
-10	-38	0	-0.05405
-20	-38	0	-0.05053

DL: 728-746 MHz

Modulation: WCDMA (737 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-59	-86	-0.080050
120	27	0	0.036635
138	37	10	0.050204

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-56	-83	-0.075980
40	33	6	0.044776
30	21	-6	0.028494
20	27	0	0.036635
10	-36	-63	-0.048850
0	-67	-94	-0.090910
-10	-85	-112	-0.115330
-20	-51	-78	-0.069200

UL: 698-716 MHz

Modulation: WCDMA (707MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-71	-35	-0.100420
120	-36	0	-0.050920
138	12	48	0.016973

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	12	48	0.016973
40	-56	-20	-0.079210
30	-57	-21	-0.080620
20	-36	0	-0.050920
10	-37	-1	-0.052330
0	2	38	0.002829
-10	-59	-23	-0.083450
-20	-77	-41	-0.108910

DL: 2110-2155 MHz

Modulation: LTE-QPSK (2125 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-72	11	-0.03388
120	-83	0	-0.03906
138	-113	-30	-0.05318

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-103	-20	-0.04847
40	-94	-11	-0.04424
30	-104	-21	-0.04894
20	-83	0	-0.03906
10	-68	15	-0.03200
0	-74	9	-0.03482
-10	-74	9	-0.03482
-20	-78	5	-0.03671

UL: 1710-1755 MHz

Modulation: LTE-QPSK (1725 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-53	40	-0.03072
120	-93	0	-0.05391
138	-87	6	-0.05043

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-45	48	-0.02609
40	-73	20	-0.04232
30	-107	-14	-0.06203
20	-93	0	-0.05391
10	-69	24	-0.04000
0	-89	4	-0.05159
-10	-69	24	-0.04000
-20	-71	22	-0.04116

DL: 2110-2155 MHz

Modulation: WCDMA (2132.4 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-41	-18	-0.01923
120	-23	0	-0.01079
138	-109	-86	-0.05112

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-52	-29	-0.02439
40	-67	-44	-0.03142
30	-54	-31	-0.02532
20	-23	0	-0.01079
10	-27	-4	-0.01266
0	-65	-42	-0.03048
-10	-87	-64	-0.04080
-20	-79	-56	-0.03705

UL: 1710-1755 MHz

Modulation: WCDMA (1732.4 MHz)

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	-32	7	-0.01847
120	-39	0	-0.02251
138	-71	-32	-0.04098

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-47	-8	-0.02713
40	-56	-17	-0.03233
30	-46	-7	-0.02655
20	-39	0	-0.02251
10	-49	-10	-0.02828
0	-69	-30	-0.03983
-10	-37	2	-0.02136
-20	-44	-5	-0.02540

11 FCC §1.1307(b), §27.52 & §2.1091 - RF EXPOSURE

11.1 Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

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

11.2 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

DL: 746-757 MHz

Worst Case: LTE-QPSK

Maximum peak output power at antenna input terminal (dBm):	11.19
Maximum peak output power at antenna input terminal (mW):	13.15
Prediction distance (cm):	20
Prediction frequency (MHz):	752
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.01806
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5013

UL: 776-787 MHz

Worst Case: LTE-QPSK

Maximum peak output power at antenna input terminal (dBm):	-21.56
Maximum peak output power at antenna input terminal (mW):	0.007
Prediction distance (cm):	20
Prediction frequency (MHz):	782
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.00000959
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5213

DL: 728-746 MHz

Worst Case: LTE-QPSK

Maximum peak output power at antenna input terminal (dBm):	10.98
Maximum peak output power at antenna input terminal (mW):	12.53
Prediction distance (cm):	20
Prediction frequency (MHz):	733
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.01721
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4887

UL: 698-716 MHz

Worst Case: WCDMA

Maximum peak output power at antenna input terminal (dBm):	-19.43
Maximum peak output power at antenna input terminal (mW):	0.011
Prediction distance (cm):	20
Prediction frequency (MHz):	707
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.0000157
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4317

DL: 2110-2155 MHz

Worst Case: LTE-16QAM

Maximum peak output power at antenna input terminal (dBm):	15.34
Maximum peak output power at antenna input terminal (mW):	34.20
Prediction distance (cm):	20
Prediction frequency (MHz):	2125
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.04696
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

UL: 1710-1755 MHz

Worst Case: WCDMA

Maximum peak output power at antenna input terminal (dBm):	-19.85
Maximum peak output power at antenna input terminal (mW):	0.0103
Prediction distance (cm):	20
Prediction frequency (MHz):	1732.4
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.00001421
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Test Result

For DL 746-757 MHz Band, the highest power density level at 20 cm is 0.01806 mW/cm², which is below the uncontrolled exposure limit of 0.5013 mW/cm² at 752 MHz.
For UL 776-787 MHz Band, the highest power density level at 20 cm is 0.00000959 mW/cm², which is below the uncontrolled exposure limit of 0.5213 mW/cm² at 782 MHz.
For DL 728-746 MHz Band, the highest power density level at 20 cm is 0.01721 mW/cm², which is below the uncontrolled exposure limit of 0.4887 mW/cm² at 733 MHz.
For UL 698-716 MHz Band, the highest power density level at 20 cm is 0.0000157 mW/cm², which is below the uncontrolled exposure limit of 0.4317 mW/cm² at 707 MHz.
For DL 2110-2155 MHz Band, the highest power density level at 20 cm is 0.04696 mW/cm², which is below the uncontrolled exposure limit of 1.0 mW/cm² at 2125 MHz.
For UL 1710-1755 MHz Band, the highest power density level at 20 cm is 0.00001421 mW/cm², which is below the uncontrolled exposure limit of 1.0 mW/cm² at 1732.4 MHz.

Note:
Antenna gain is restricted to 1.5 Watt ERP (2.49 Watt EIRP) in order to satisfy RF expo- sure compliance requirements. If higher than 1.5 Watt ERP, routine MPE evaluation is needed. The antennas should be installed to provide at least 20 cm from all persons to satisfy MPE requirements of FCC Part 2, 2.1091.