Lab Code: 200167-0

FCC PART 27

TEST AND MEASUREMENT REPORT

For

ADC Telecommunications Inc.

P.O. Box 1101, Minneapolis, Minnesota 55440, USA

FCC ID: NOO-S2783-011

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

Test Engineer:	Dennis Huang
Report Number:	R0912021-27
Report Date:	2010-01-07
Reviewed By:	Boni Baniqued EMC/RF Supervisor
Prepared By: (84)	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0912021-27	Original Report	2010-01-07

1 General Information

1.1 Product Description for Equipment under Test (EUT)

The *ADC Telecommunications, Inc.* FCC ID: *NOO-S2783-011*, Model: *SPT-S1-7070-1MIMO 700 MIMO RAU* or the "EUT" as referred to in this report is a wireless network systems operate for LTE technology for Band 13 (700 MHz MIMO). It consists of a Host Unit, an Expansion Unit (comprised of a DART Remote Module (DRU), IF Expansion Module (IFEU), and Power Supply), and Remote Amplifiers Units (RAUs). The Host, DRU and IFEU are intended for telecom closet indoor use. The RAU is intended to be installed above a false ceiling in an environmentally controlled office. LTE operating frequency range is 728-757 MHz for Downlink.

1.2 Mechanical Description of EUT

The EUT *measures* approximately 211 mm **(L)** x 272 mm **(W)** x 76 mm **(H)**, and weighs approximately 3.4 kg.

**The test data gathered are from production sample, serial number: unit6 DL B2 (SRAU) provided by the manufacturer.*

1.3 EUT Photo

Slave RAU
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-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: R-2463 and C-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 EIA/TIA-603-C.

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

2.2 EUT Exercise Software

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	MXG Vector Signal Generator	-	MY47420502
Agilent	Signal Generator	8648C	4108A05591
MRAU	Master RAU	-	RAU 13
URH	Host	-	MDF3018A
DRH	DART Remote Unit	-	7109A00S
IFEU	IF Expansion Module	-	S/N7

2.5 Interface Ports and Cables

Cable Description	Length (m)	To	From
Shielded Cable (Duplex Fiber Optic)	3	Host Unit	DRU (Dart Remote Unit)
75 Ohm Coax Cable	3	IF Expansion Unit (IFEU)	SRAU
75 Ohm Coax Cable	100	IF Expansion Unit (IFEU)	MRAU
50 ohm CATV cable	< 1	DRU	IF Expansion Unit
RF Cable	< 1	Main Hub/RAU	Spectrum Analyzer
RF Cable	< 1	Main Hub/RAU	Signal Generator

2.6 Internal Configurations of EUT

Manufacturer	Description	Model	Serial Number
ADC Telecommunication	SRAU RF UC1/ABC1 PCB Board	712763-0 REV8	R0935G0015NC
ADC Telecommunication	SRAU RF UC2/ABC2 PCB Board	712764-0 REV1	R0935G0028NC
ADC Telecommunication	SRAU IF PCB Board	712751-0 REV2	R0932G0025NC
Unipower Corporation	AC/DC Power Supply	RPXP48122-Z	26097N0062

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
§27.54	Frequency Stability	Compliant
§27.52, §2.1091	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:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102kPa

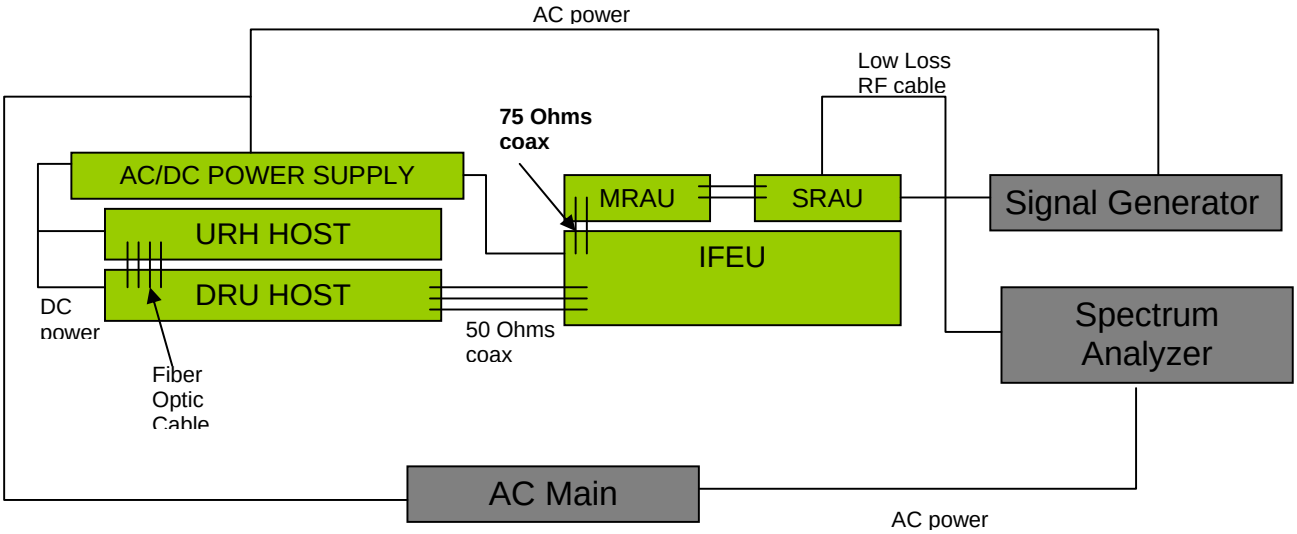
** The testing was performed by Dennis Huang from 2009-12-11 to 2009-12-15 in RF Site.*

4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	MXG Vector Signal Generator	-	MY47420502	2009-9-18

*** 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



4.6 Summary of Test Results

Maximum Output Power – Downlink

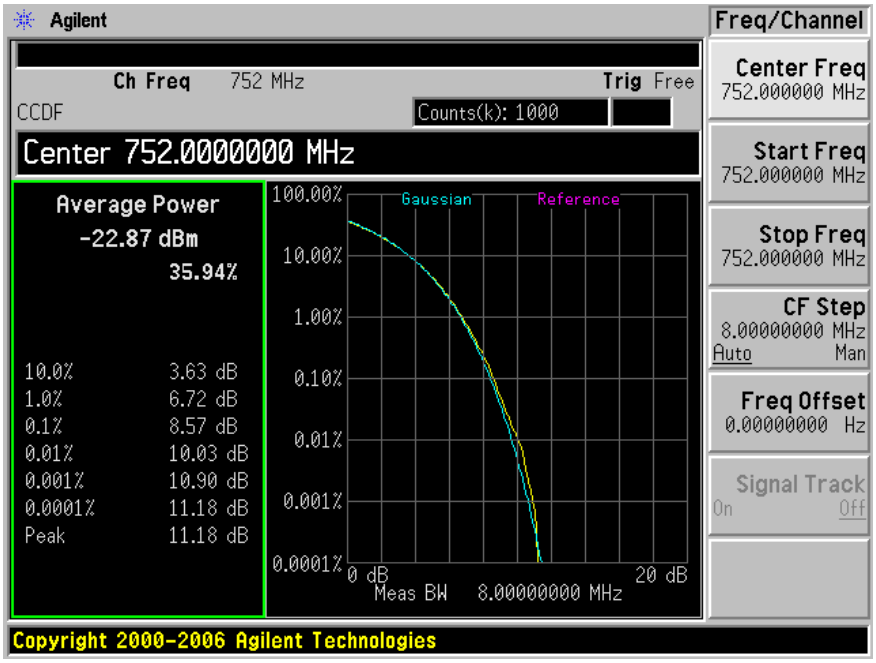
Band	Antenna Port	Modulation	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	CCDF (dB)
746-757 MHz	# 1	QPSK	752	15.02	31.769	11.23
		16 QAM	752	14.95	31.261	11.27
		64 QAM	752	15.08	32.211	11.52
	# 2	QPSK	752	14.38	27.416	11.60
		16 QAM	752	14.39	27.479	11.39
		64 QAM	752	14.35	27.227	11.79
728-746 MHz	# 1	QPSK	733	14.80	30.200	11.86
		QPSK	741	14.83	30.409	11.23
		16 QAM	733	14.40	27.542	11.47
		16 QAM	741	15.24	33.420	11.50
		64 QAM	733	14.83	30.409	11.34
		64 QAM	741	14.78	30.061	11.10
	# 2	QPSK	733	14.98	31.477	11.65
		QPSK	741	14.94	31.189	11.41
		16 QAM	733	14.31	26.977	11.57
		16 QAM	741	14.32	27.040	11.44
		64 QAM	733	14.37	27.353	11.36
		64 QAM	741	14.32	27.040	11.29

Please refer to the following plots for details.

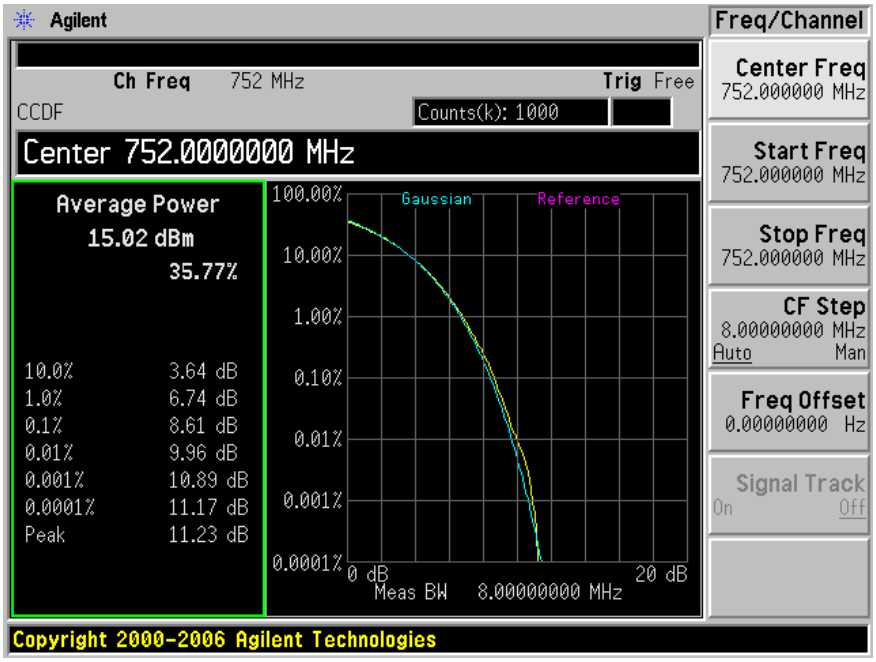
746-757 MHz Band, Antenna Port #1:

Modulation: QPSK, Frequency: 752 MHz

Input

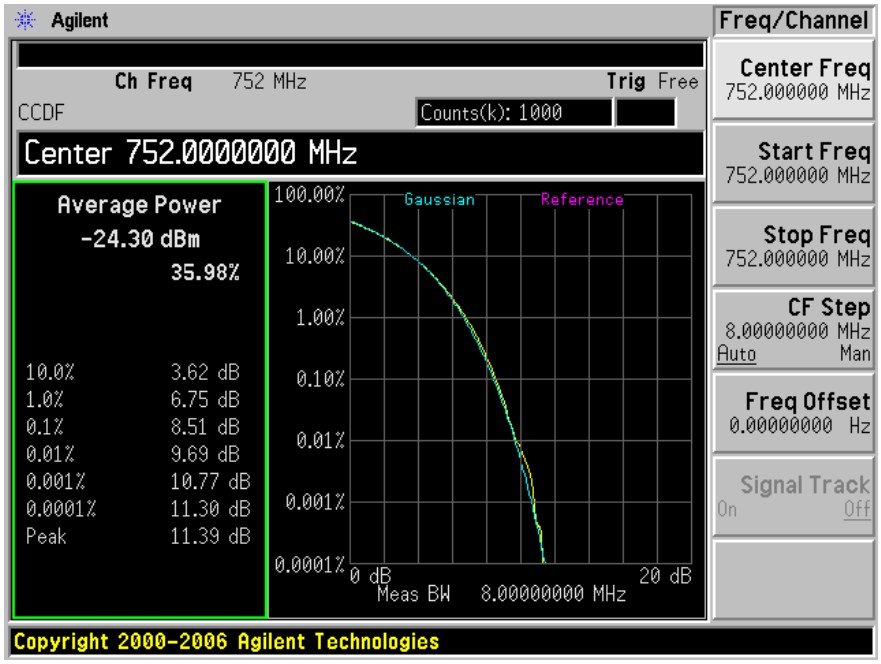


Output

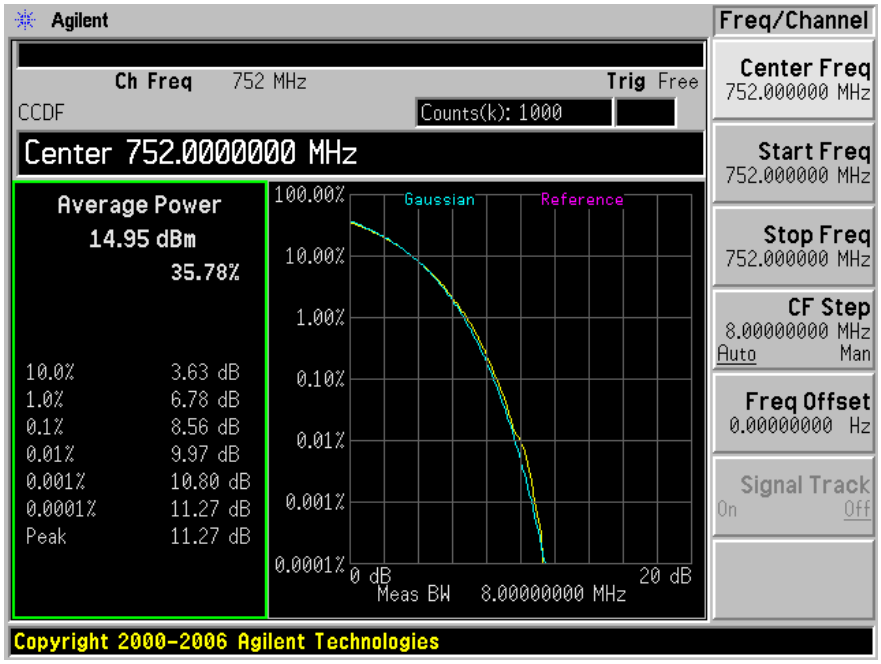


Modulation: 16 QAM, Frequency: 752 MHz

Input

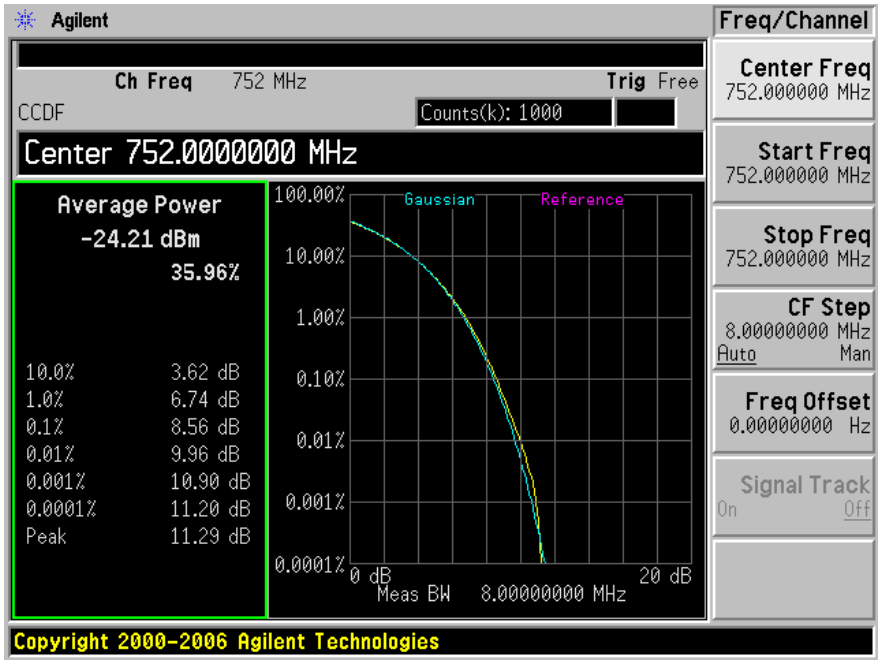


Output

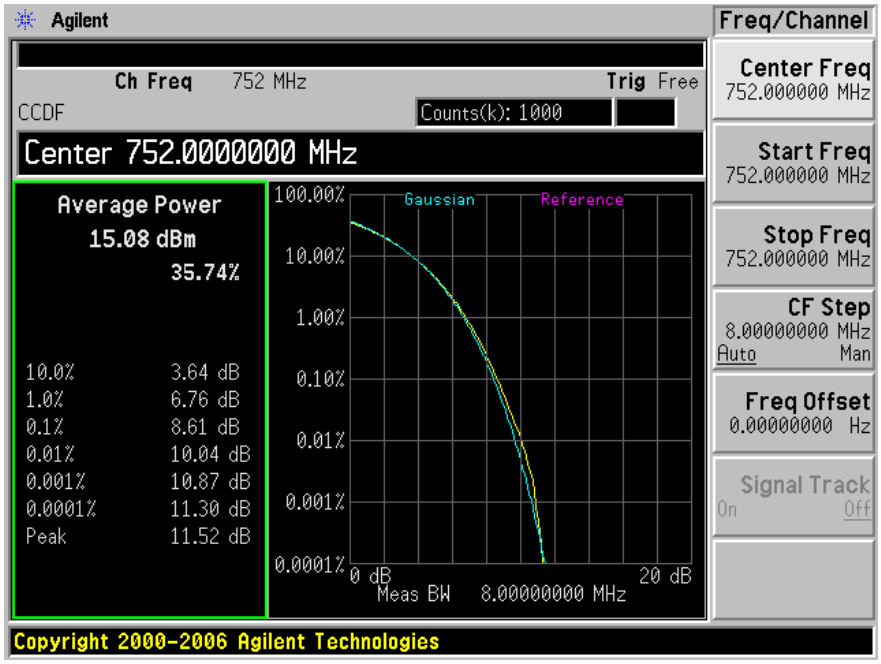


Modulation: 64 QAM, Frequency: 752 MHz

Input



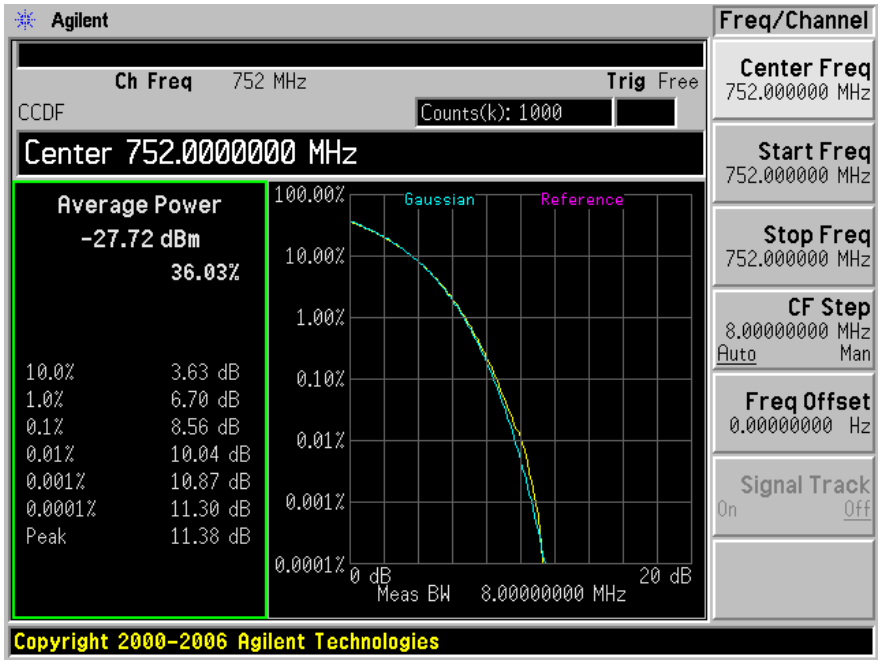
Output



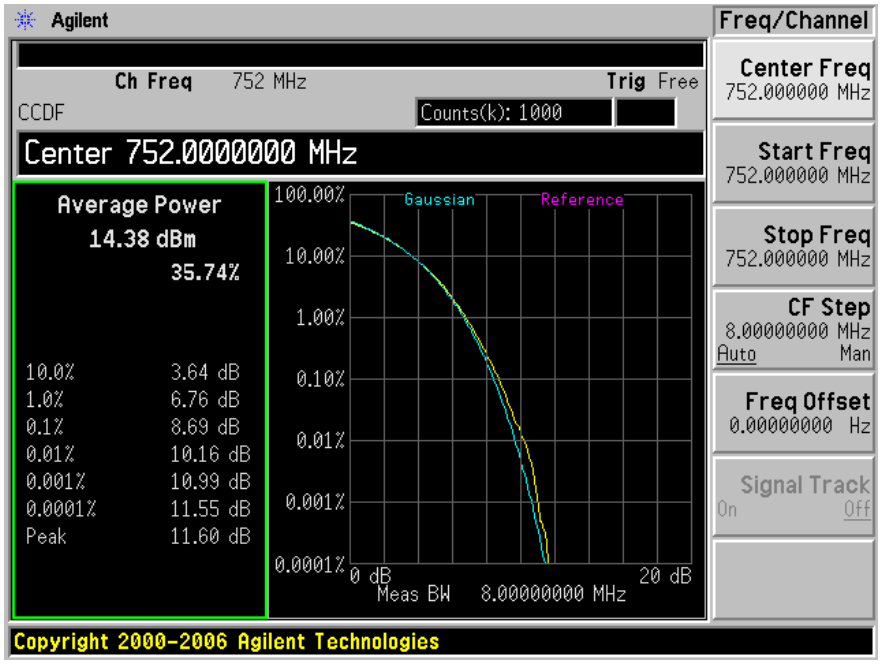
746-757 MHz Band, Antenna Port #2:

Modulation: QPSK, Frequency: 752 MHz

Input

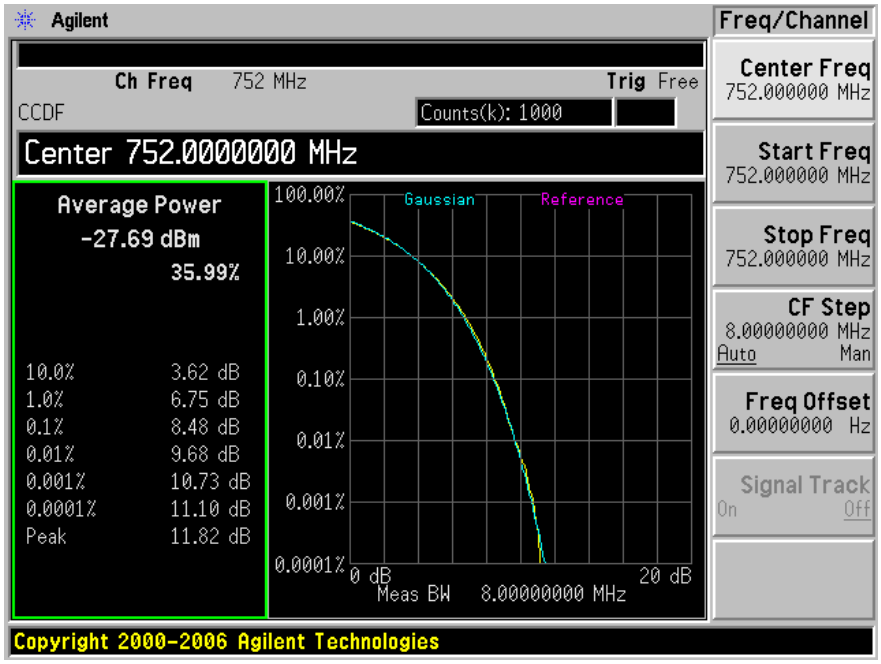


Output



Modulation: 16 QAM, Frequency: 752 MHz

Input



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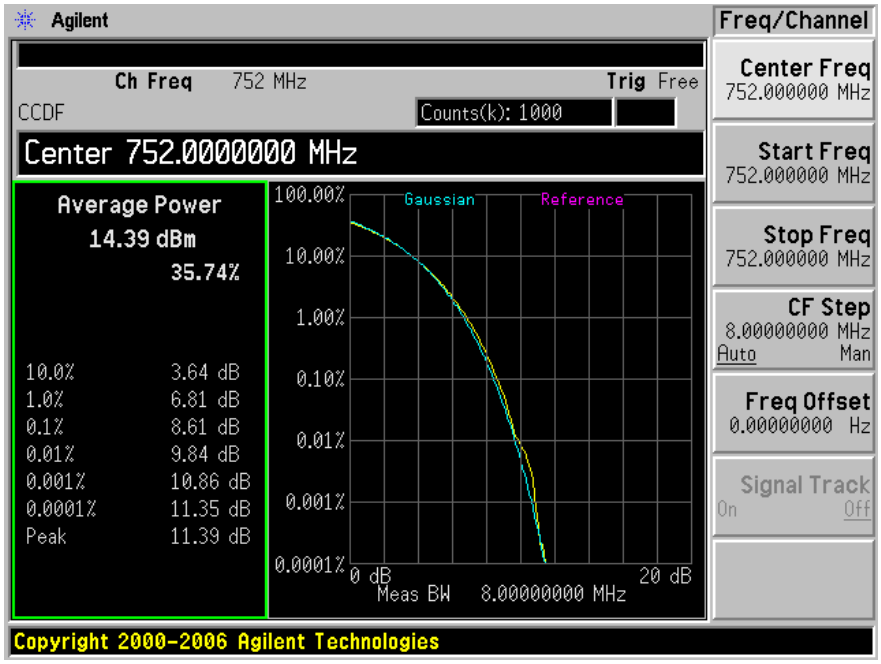
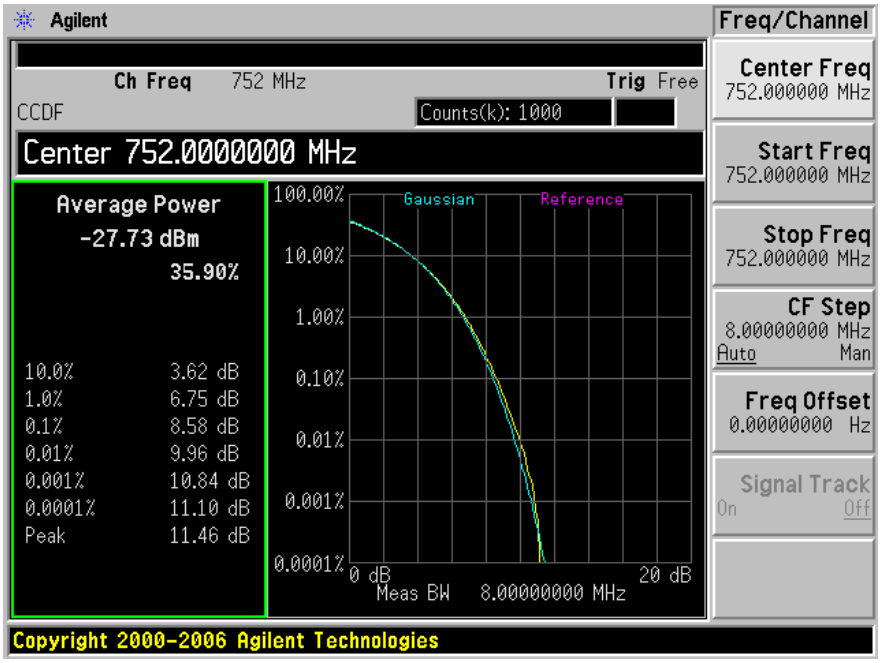
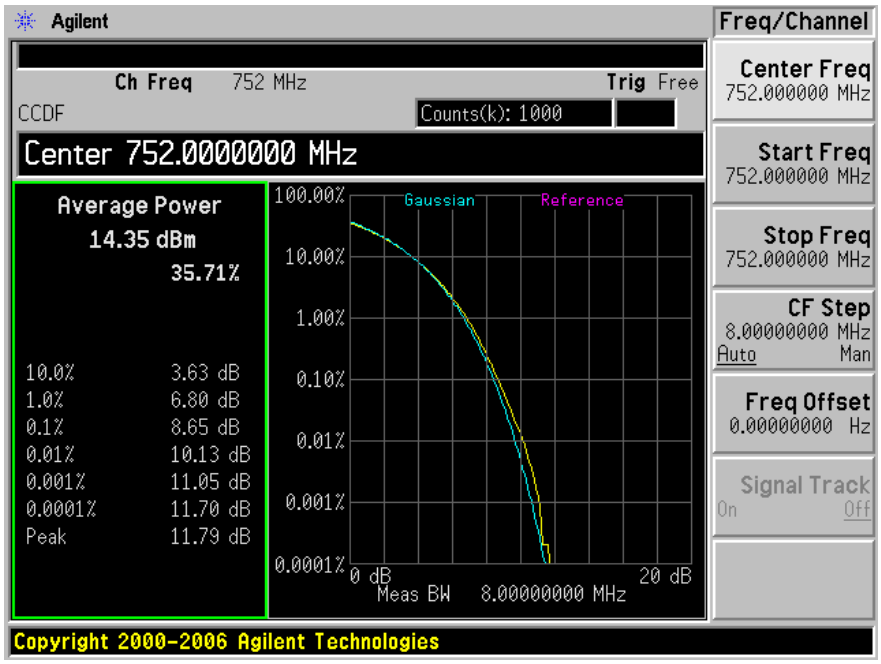


Modulation: 64 QAM, Frequency: 752 MHz

Input



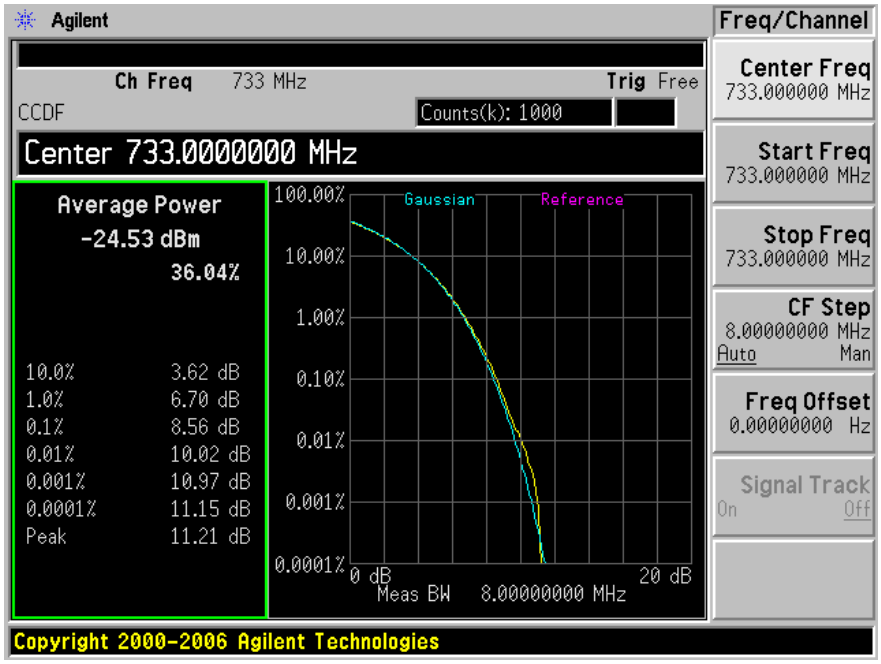
Output



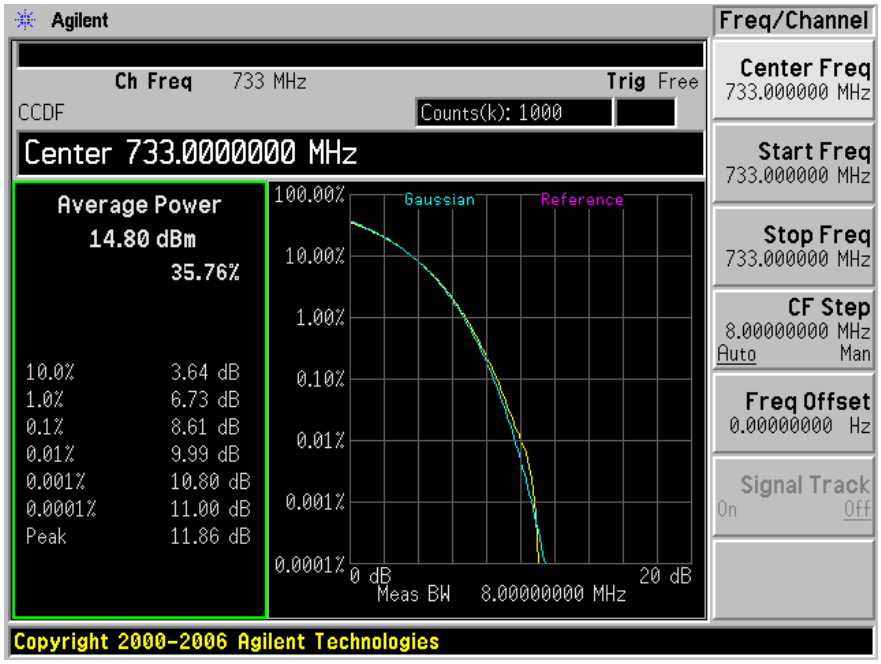
728-746 MHz, Antenna Port #1:

Modulation: QPSK, Frequency: 733 MHz

Input

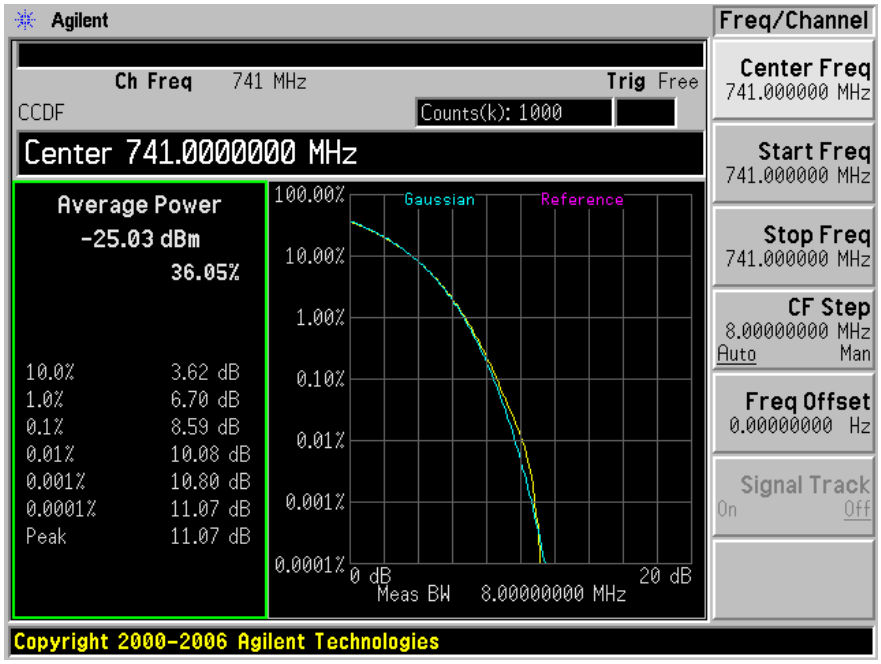


Output

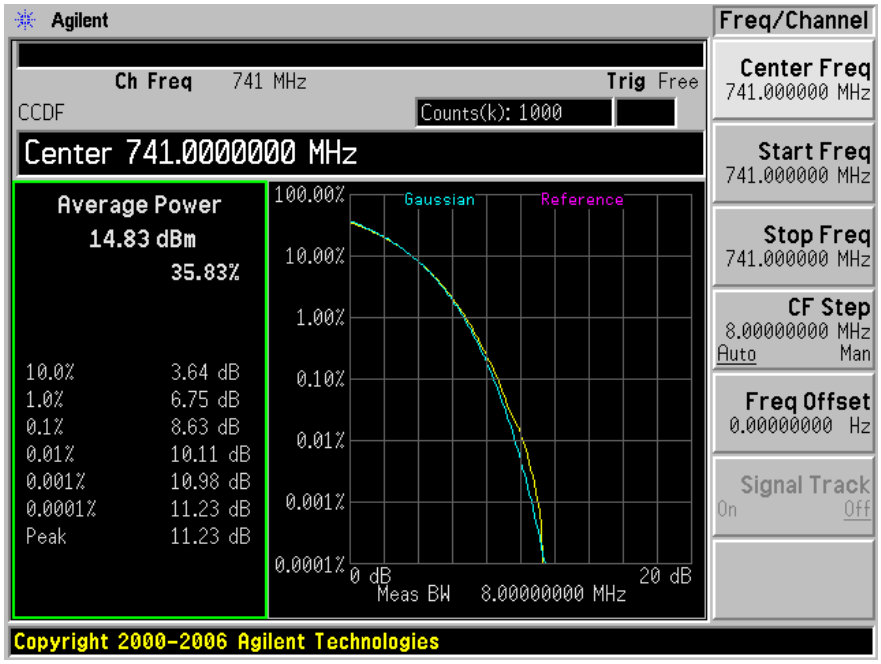


Modulation: QPSK, Frequency: 741 MHz

Input

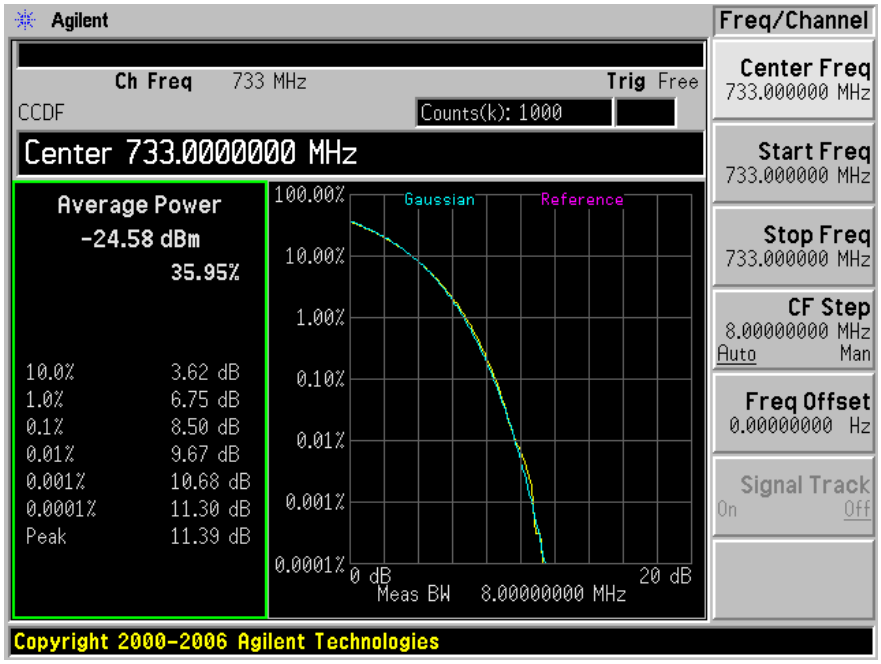


Output

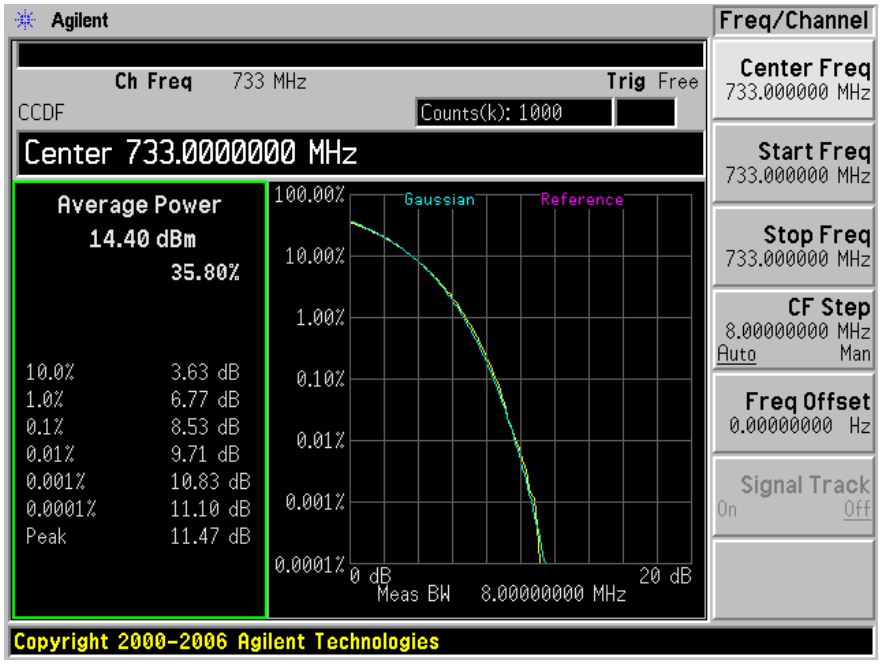


Modulation: 16 QAM, Frequency: 733 MHz

Input

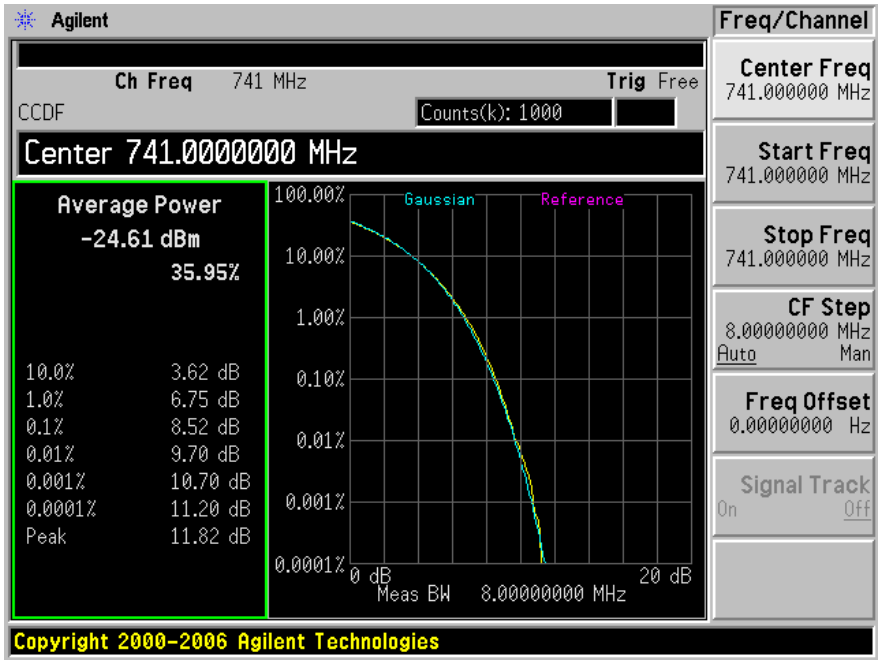


Output

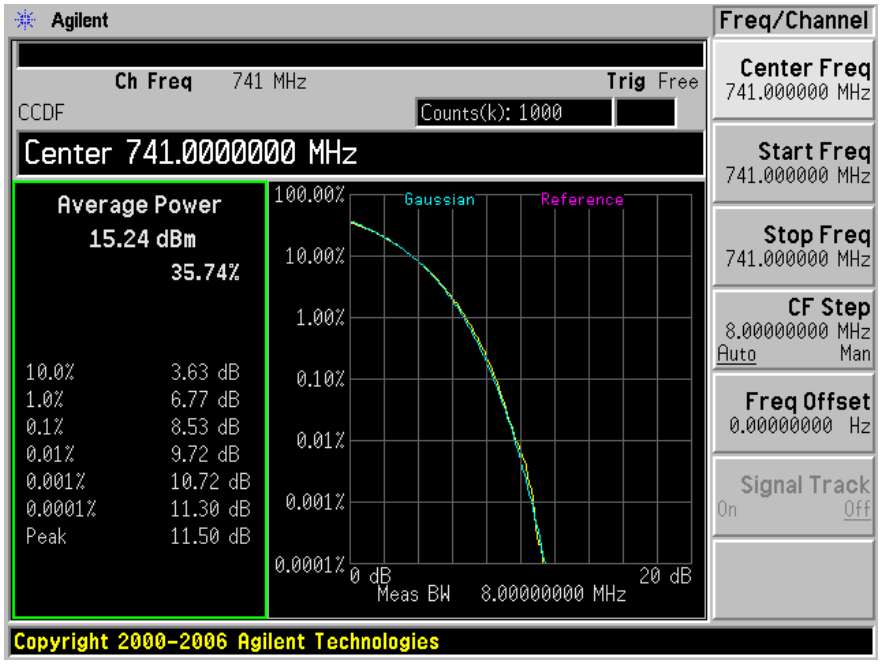


Modulation: 16 QAM, Frequency: 741 MHz

Input

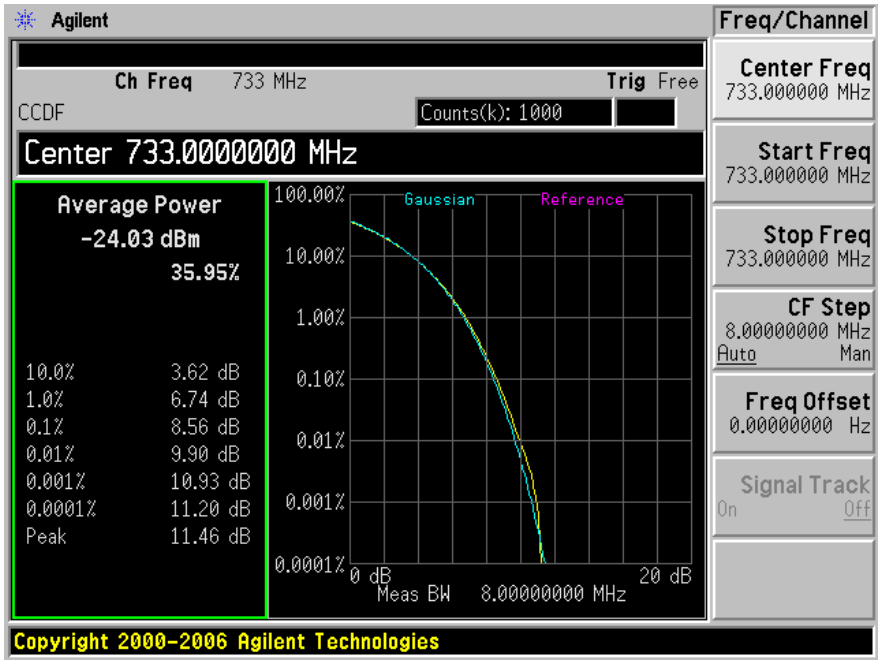


Output

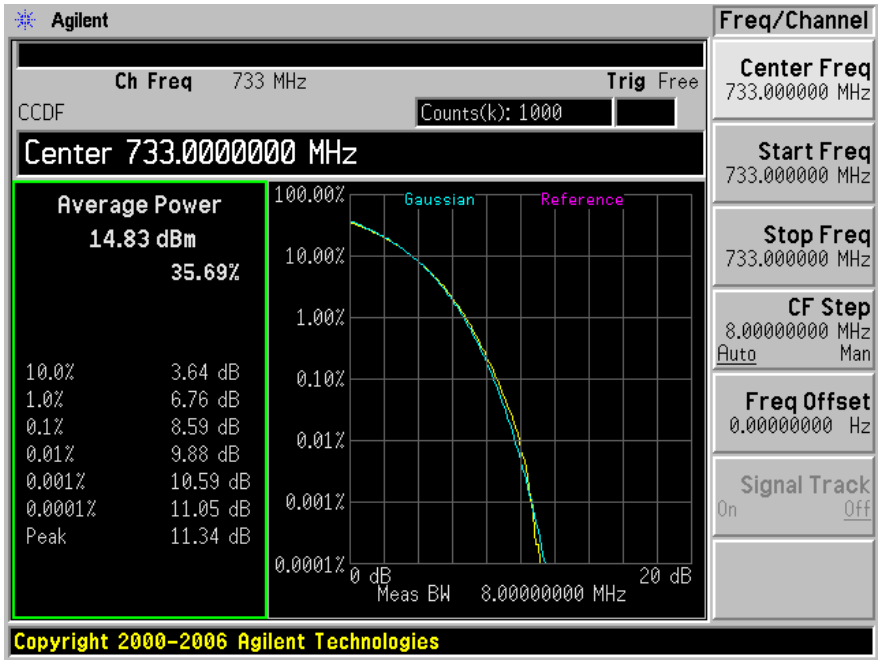


Modulation: 64 QAM, Frequency: 733 MHz

Input

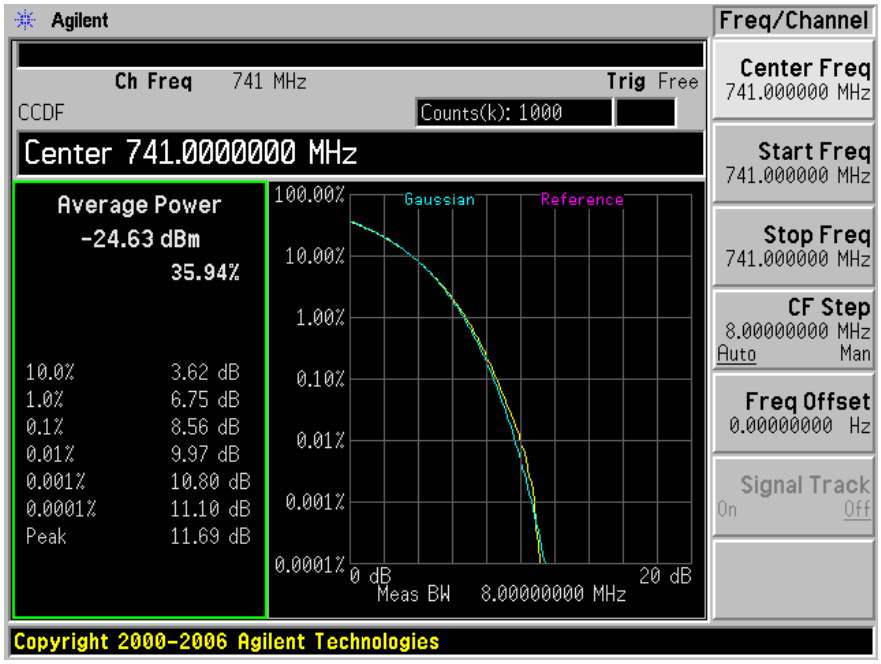


Output

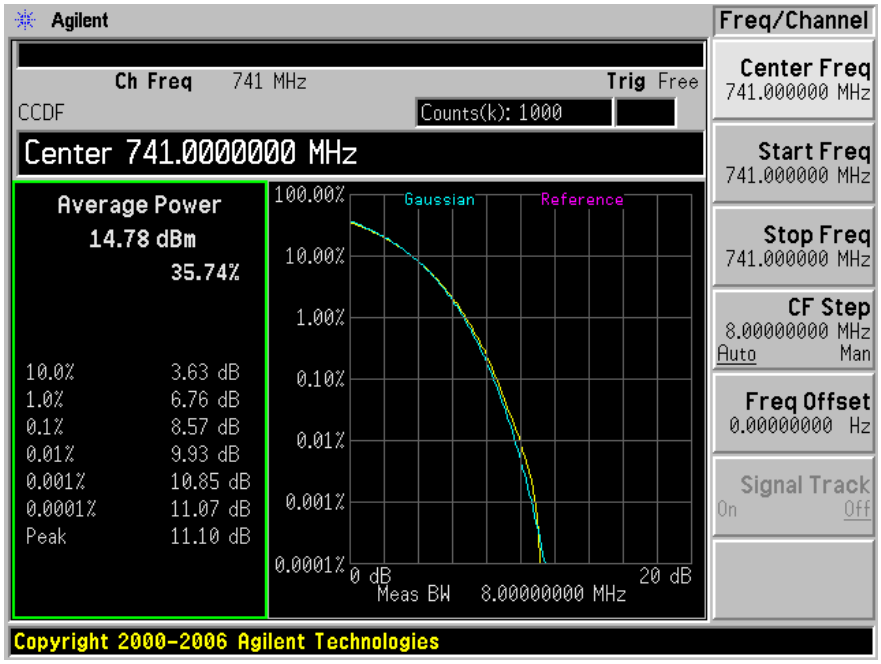


Modulation: 64 QAM, Frequency: 741 MHz

Input



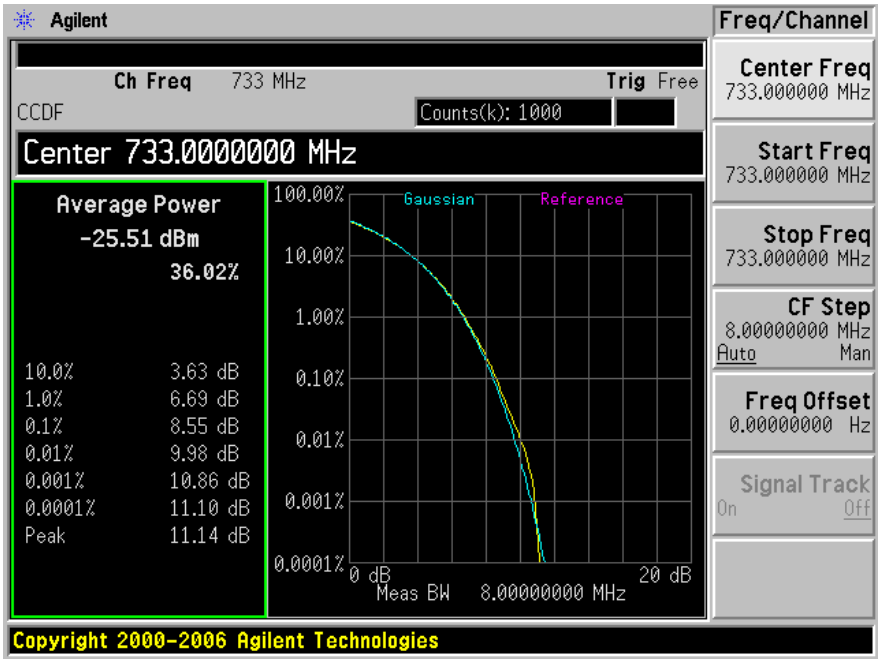
Output



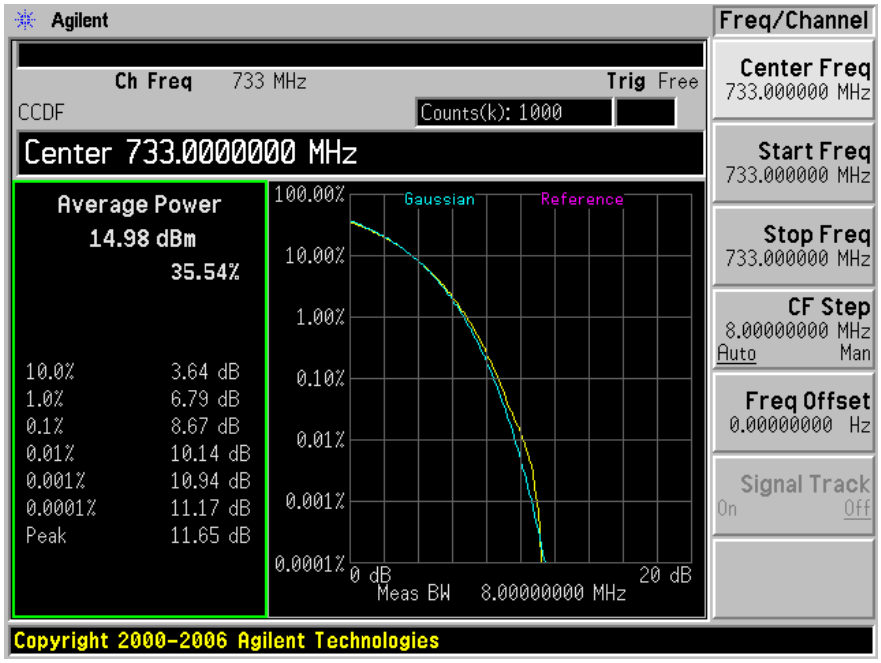
728-746 MHz, Antenna Port #2:

Modulation: QPSK, Frequency: 733 MHz

Input

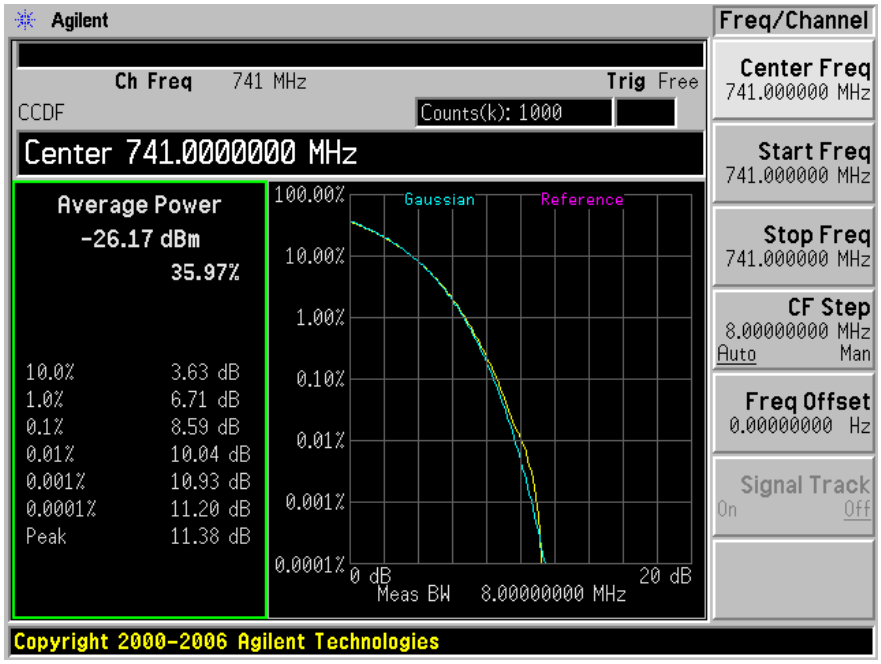


Output

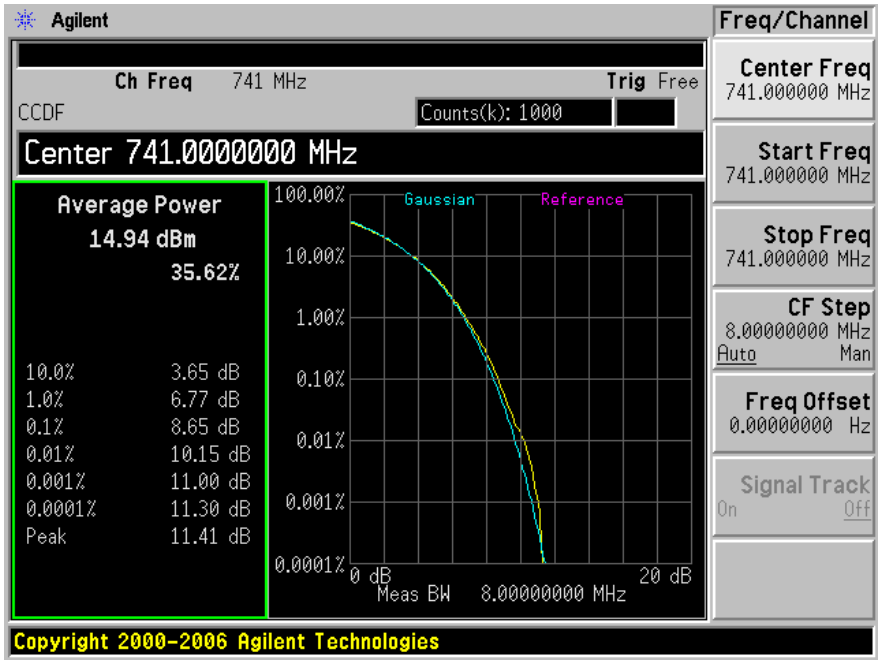


Modulation: QPSK, Frequency: 741 MHz

Input

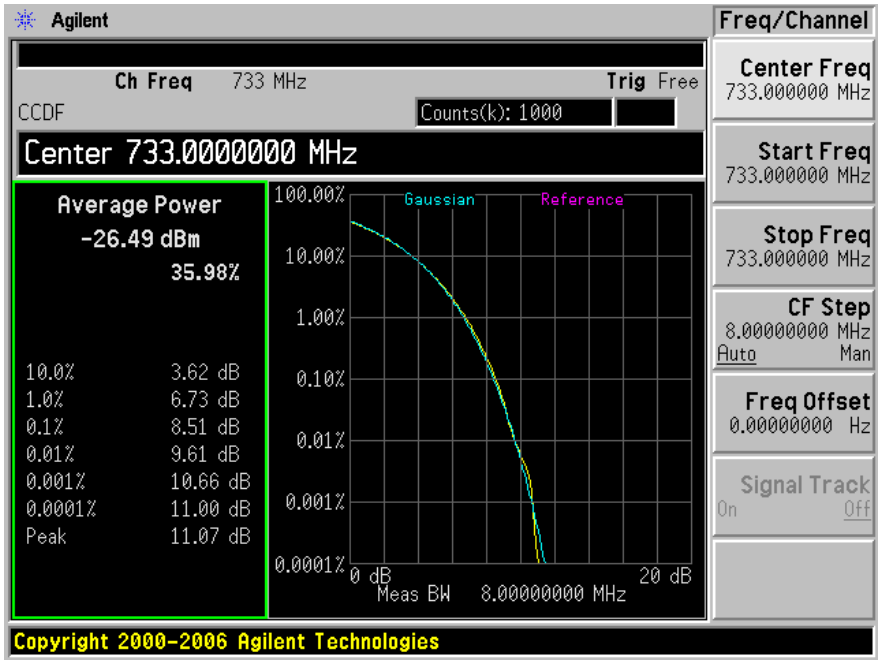


Output

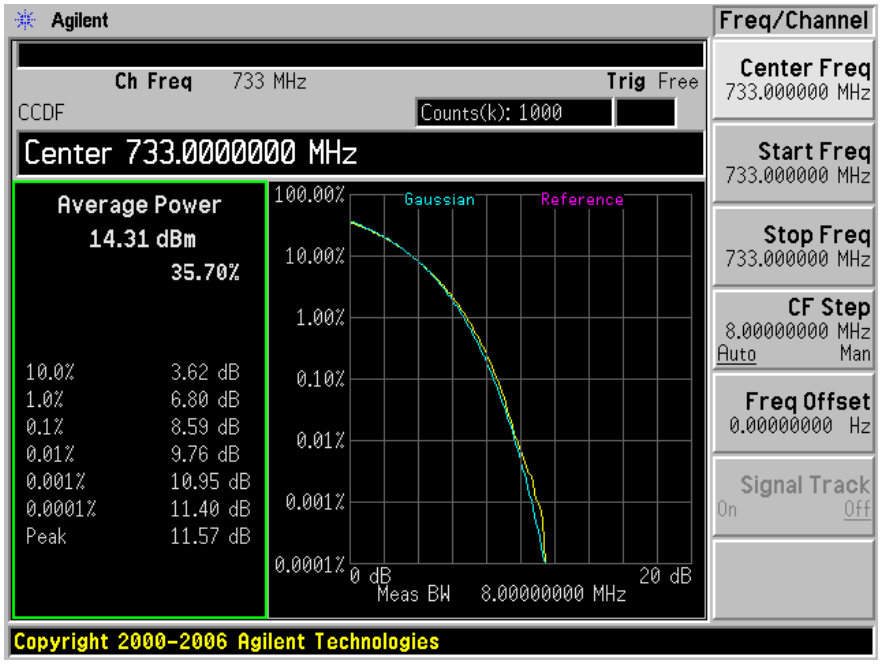


Modulation: 16 QAM, Frequency: 733 MHz

Input

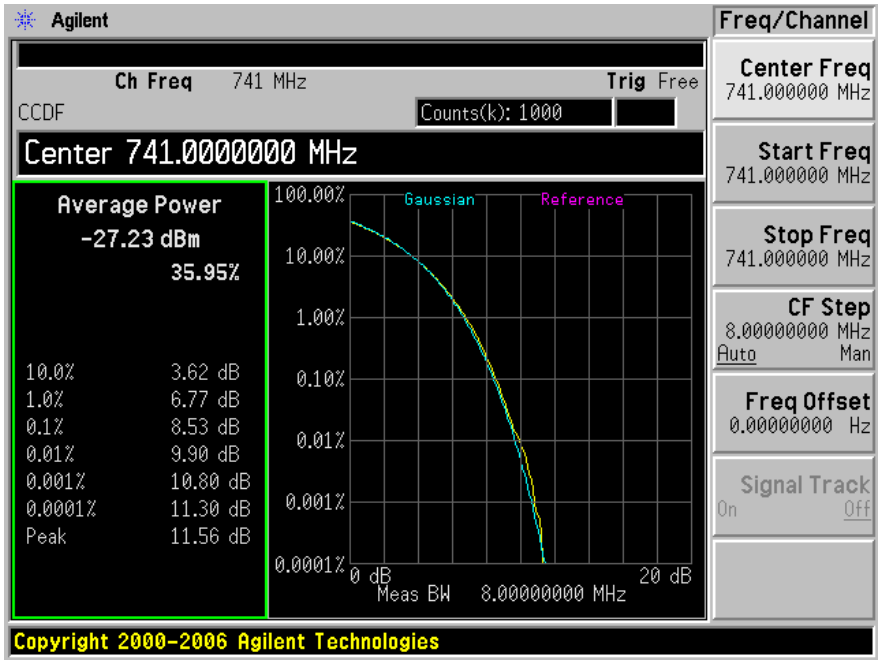


Output

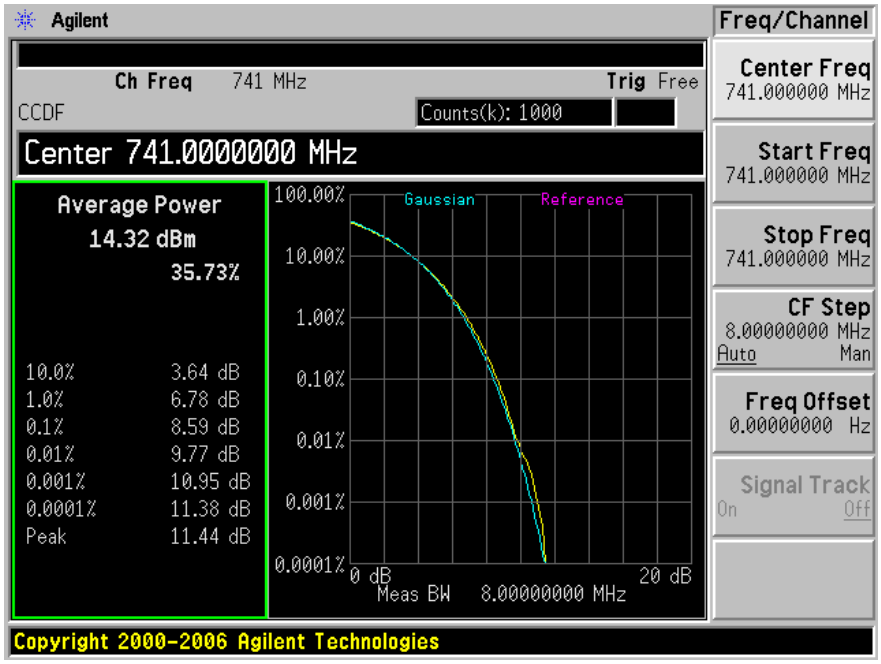


Modulation: 16 QAM, Frequency: 741 MHz

Input

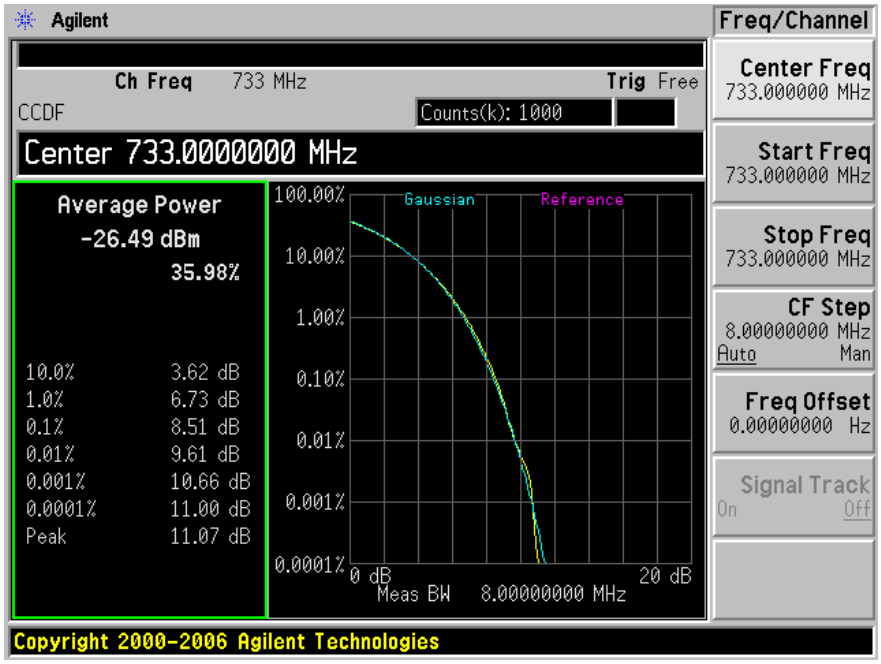


Output

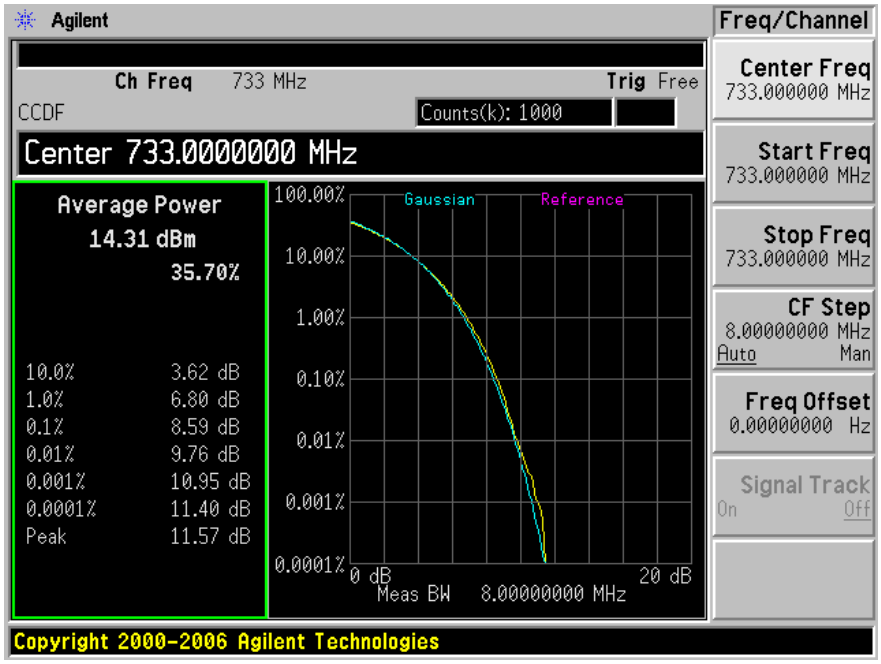


Modulation: 64 QAM, Frequency: 733 MHz

Input

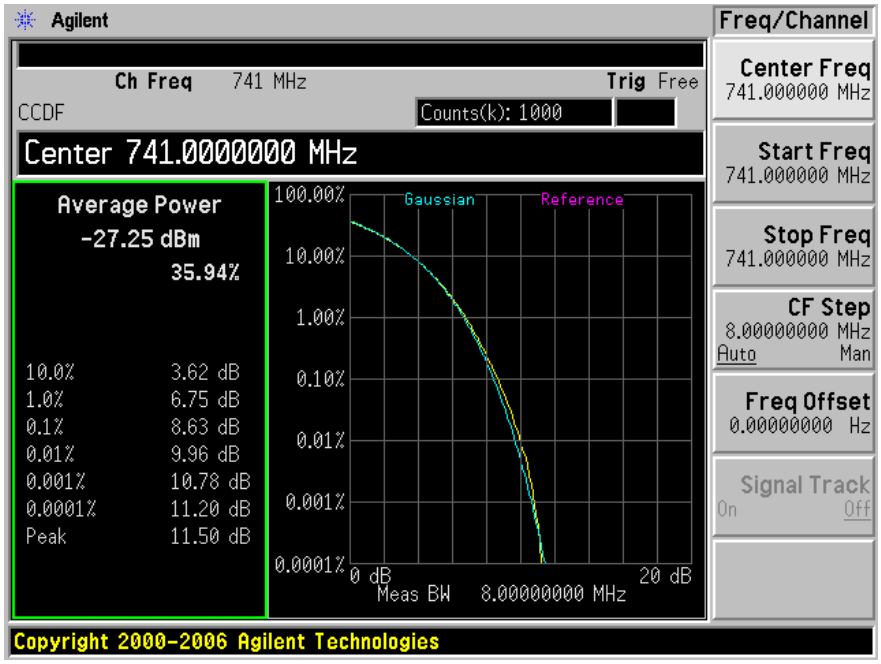


Output

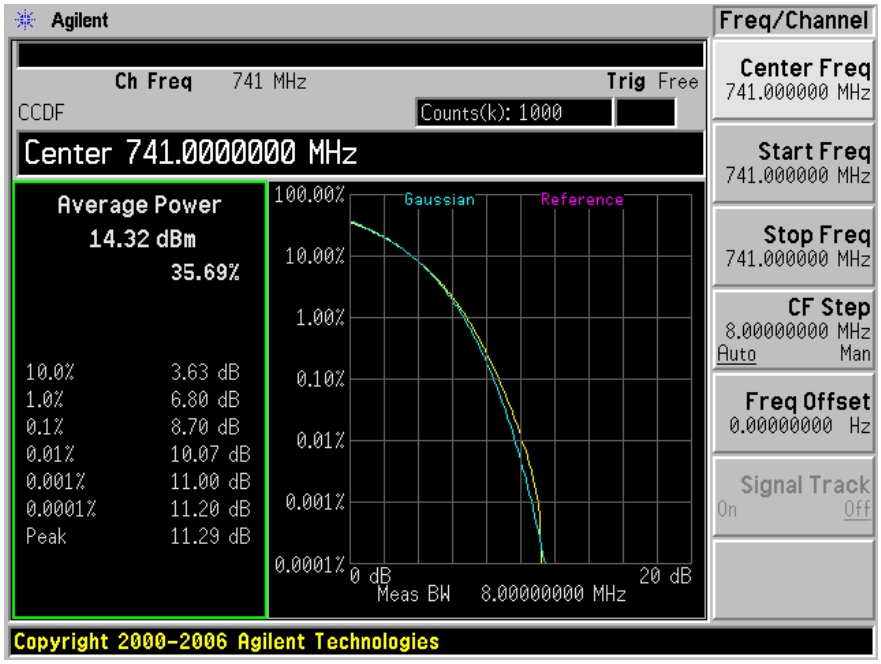


Modulation: 64 QAM, Frequency: 741 MHz

Input



Output



5 FCC §2.1047 - Modulation Characteristic

5.1 Applicable Standard

According to FCC § 2.1047(d) and Part 27, 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:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102kPa

** The testing was performed by Dennis Huang from 2009-12-11 to 2009-12-15 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	MXG Vector Signal Generator	-	MY47420502	2009-9-18

*** 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

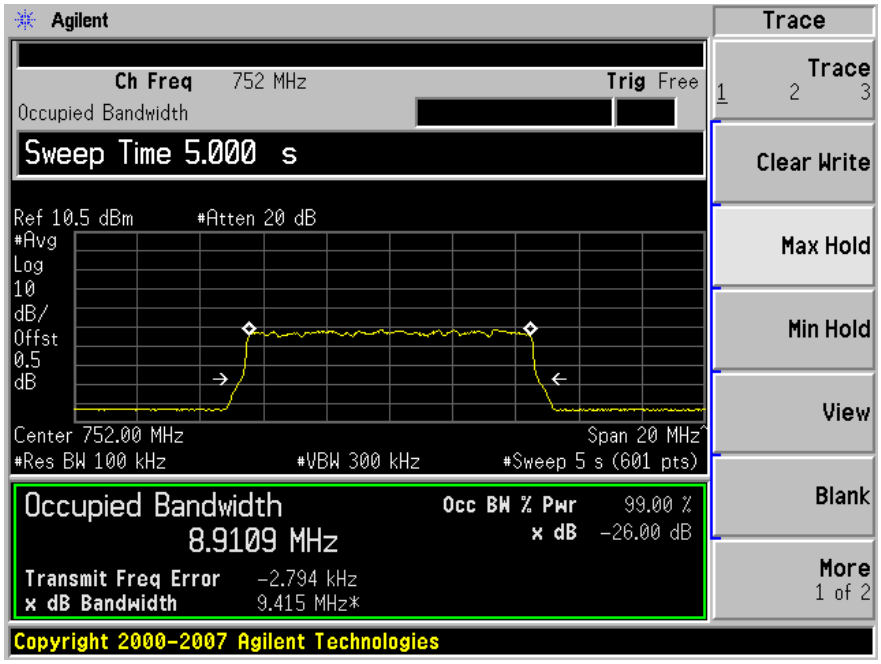
Band	Antenna Port	Modulation	Frequency (MHz)	99% Emission Bandwidth	
				Input (MHz)	Output (MHz)
746-757 MHz	# 1	QPSK	752	8.9109	8.9499
		16 QAM	752	8.9358	8.8969
		64 QAM	752	9.0142	8.9529
	# 2	QPSK	752	8.9109	8.8692
		16 QAM	752	8.9358	8.8862
		64 QAM	752	9.0142	8.8956
728-746 MHz	# 1	QPSK	733	8.9164	8.8953
		QPSK	741	8.9144	8.8961
		16 QAM	733	8.9278	8.9055
		16 QAM	741	8.9233	8.9093
		64 QAM	733	8.9292	8.9151
		64 QAM	741	8.9298	8.9152
	# 2	QPSK	733	8.9164	8.8985
		QPSK	741	8.9144	8.8892
		16 QAM	733	8.9278	8.9134
		16 QAM	741	8.9233	8.9060
		64 QAM	733	8.9292	8.9222
		64 QAM	741	8.9298	8.9123

Please refer to the following plots for details.

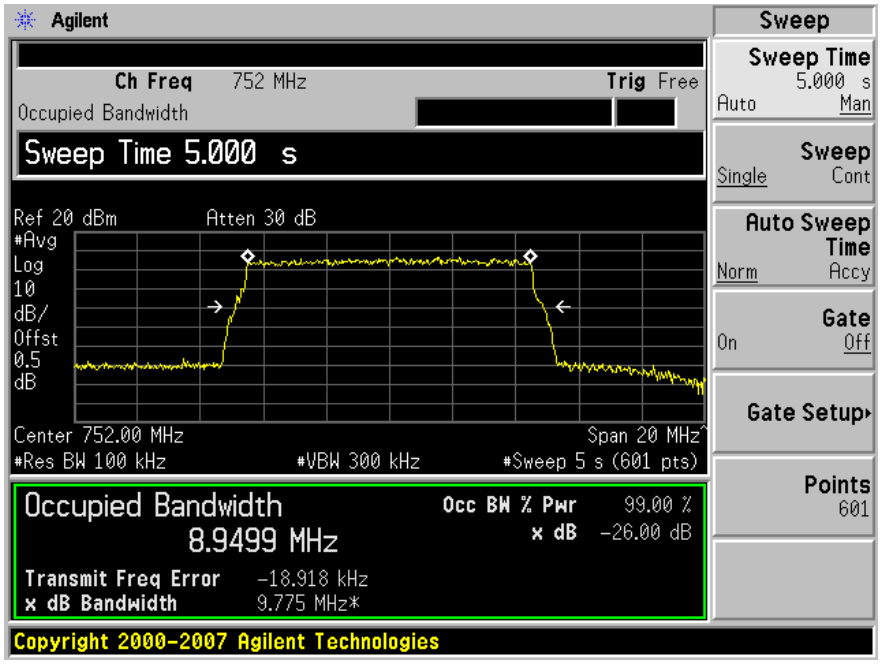
746-757 MHz Band, Antenna Port #1:

Modulation: QPSK, Frequency: 752 MHz

Input

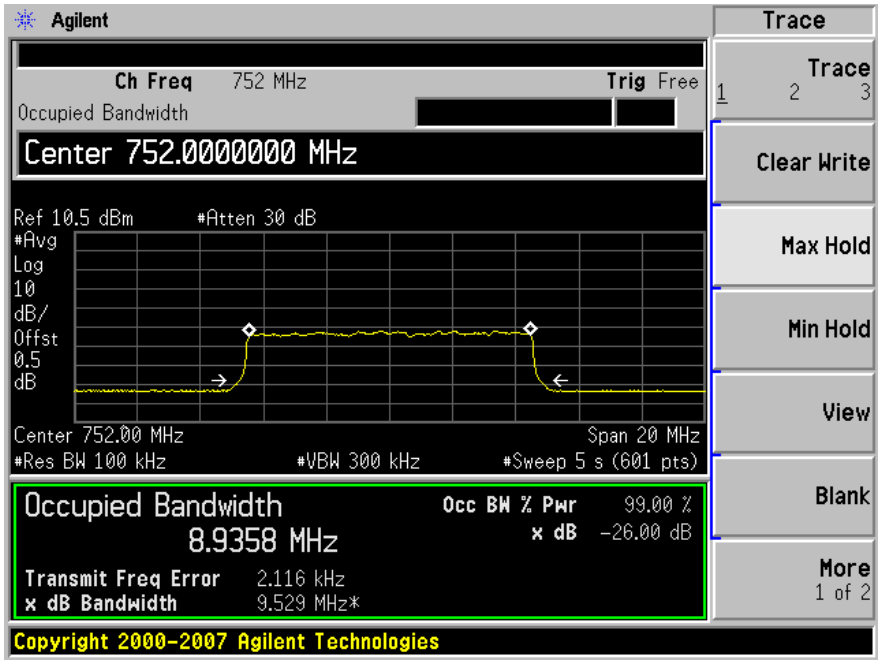


Output

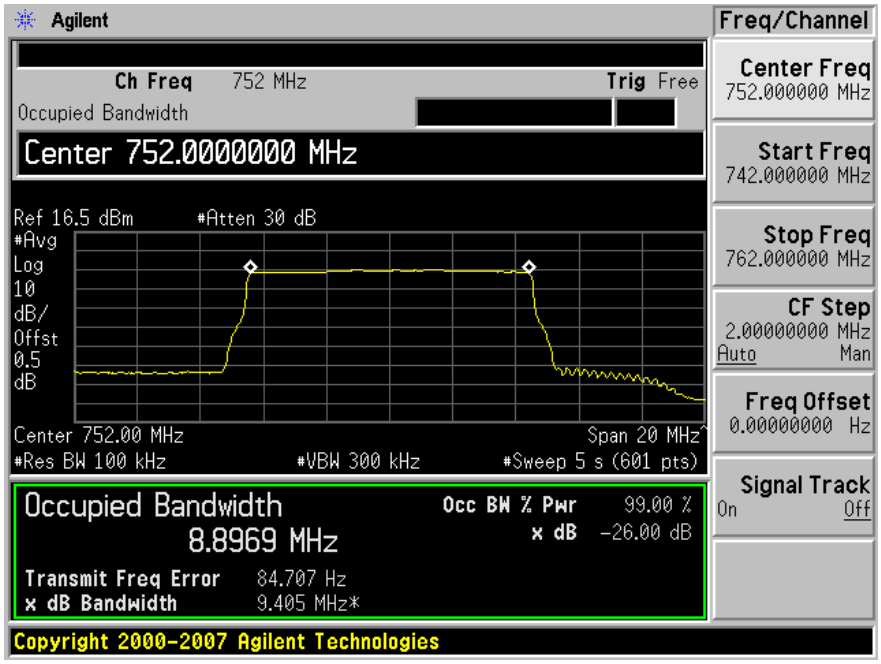


Modulation: 16 QAM, Frequency: 752 MHz

Input

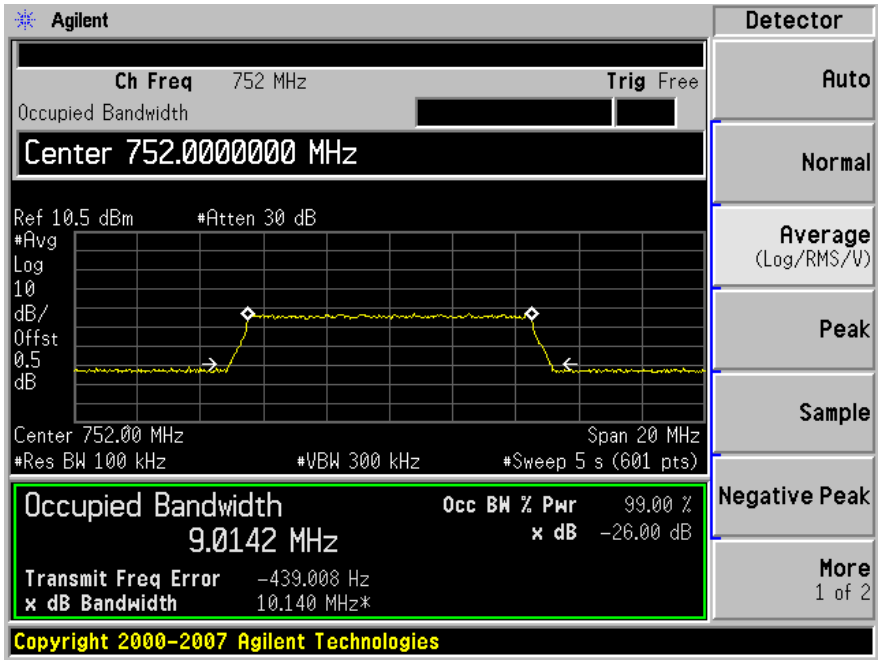


Output

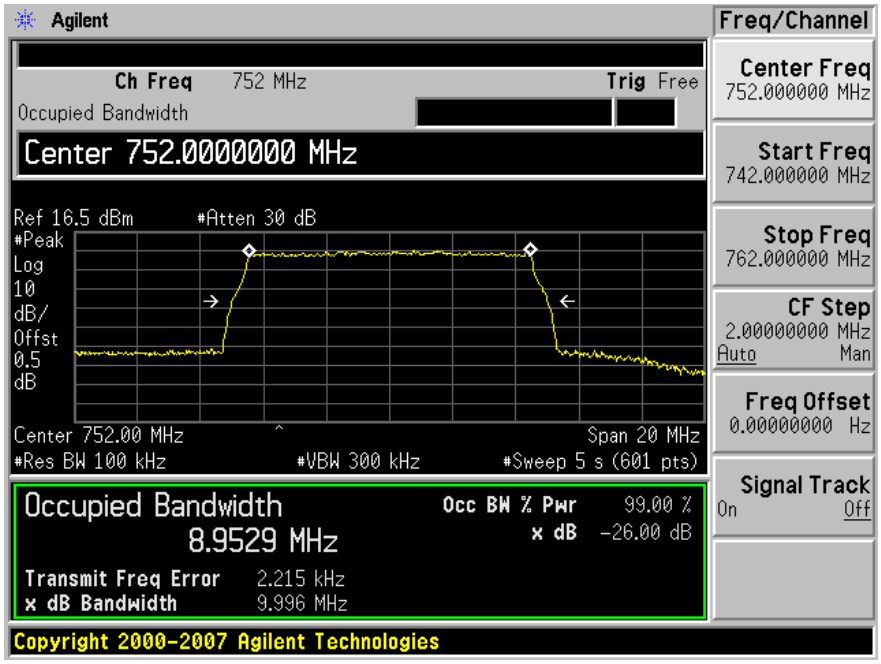


Modulation: 64 QAM, Frequency: 752 MHz

Input



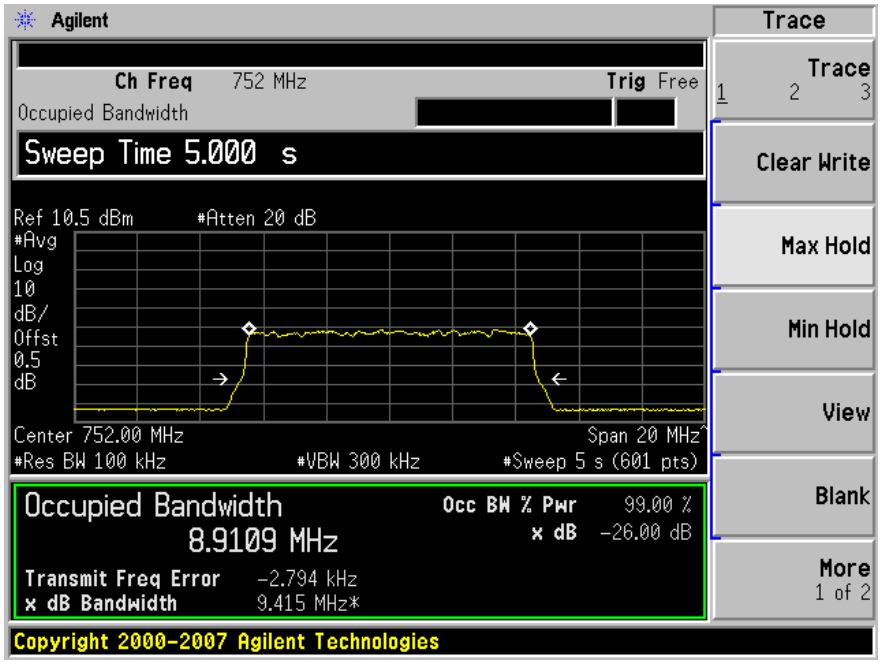
Output



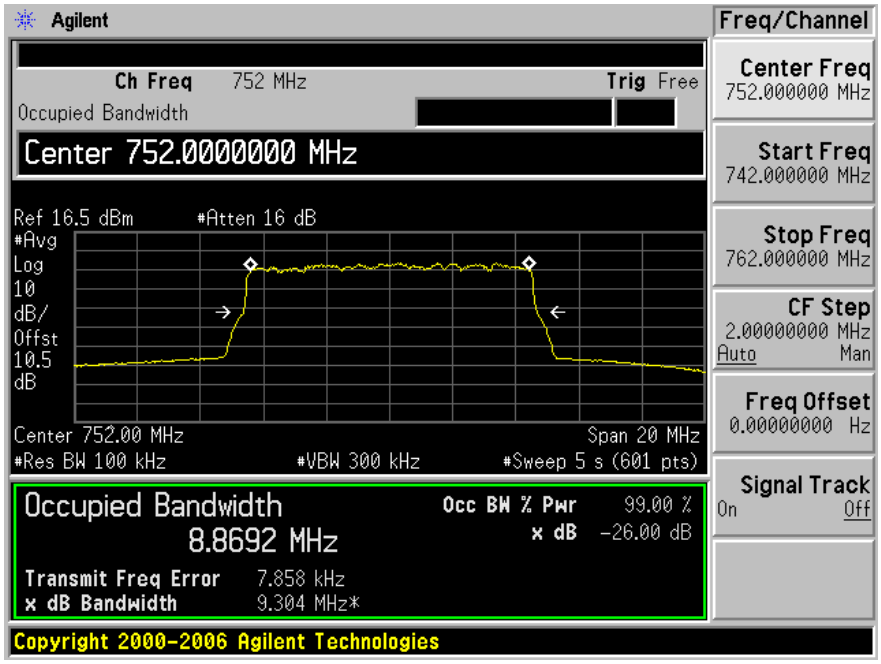
746-757 MHz Band, Antenna Port #2:

Modulation: QPSK, Frequency: 752 MHz

Input

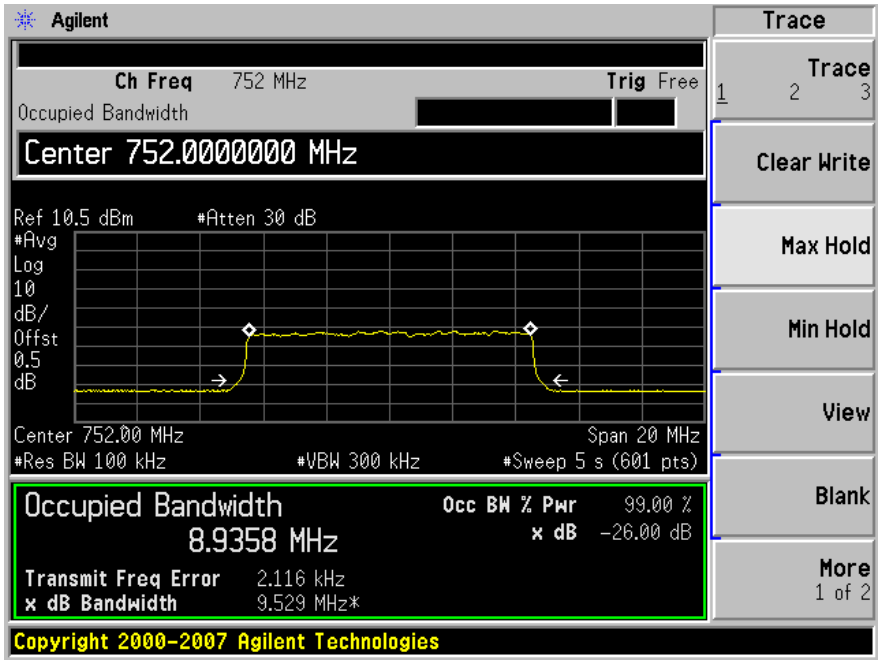


Output

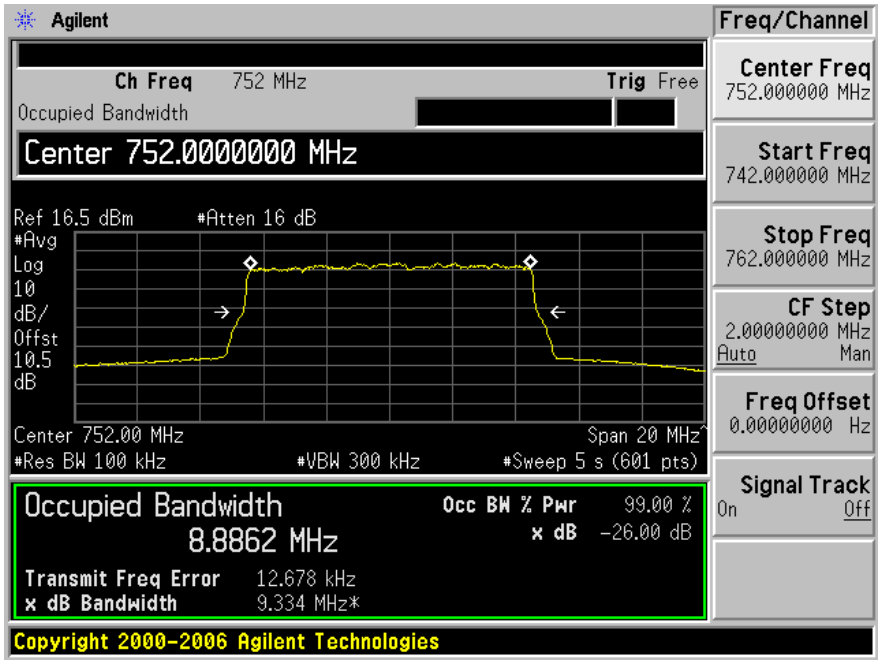


Modulation: 16 QAM, Frequency: 752 MHz

Input

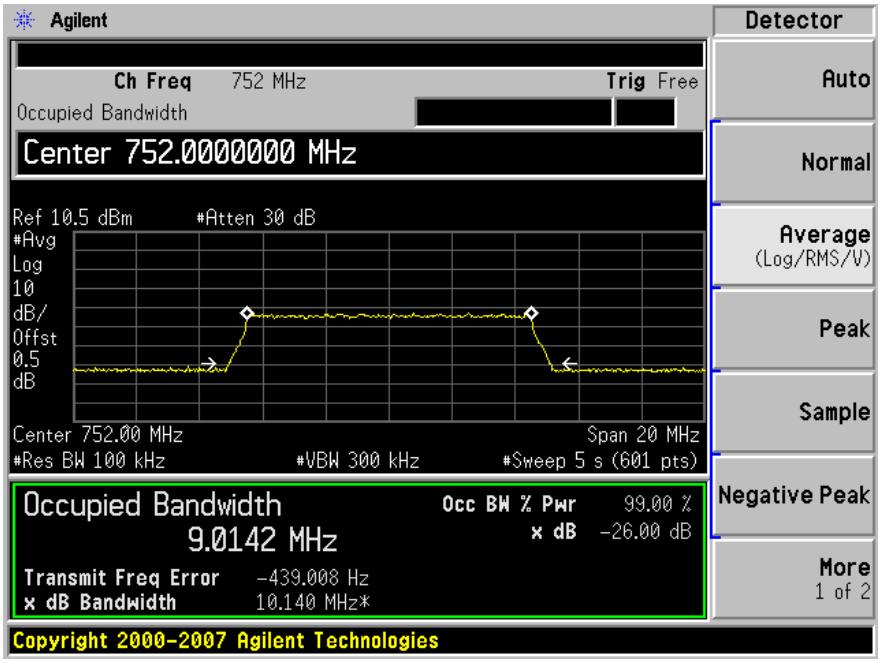


Output

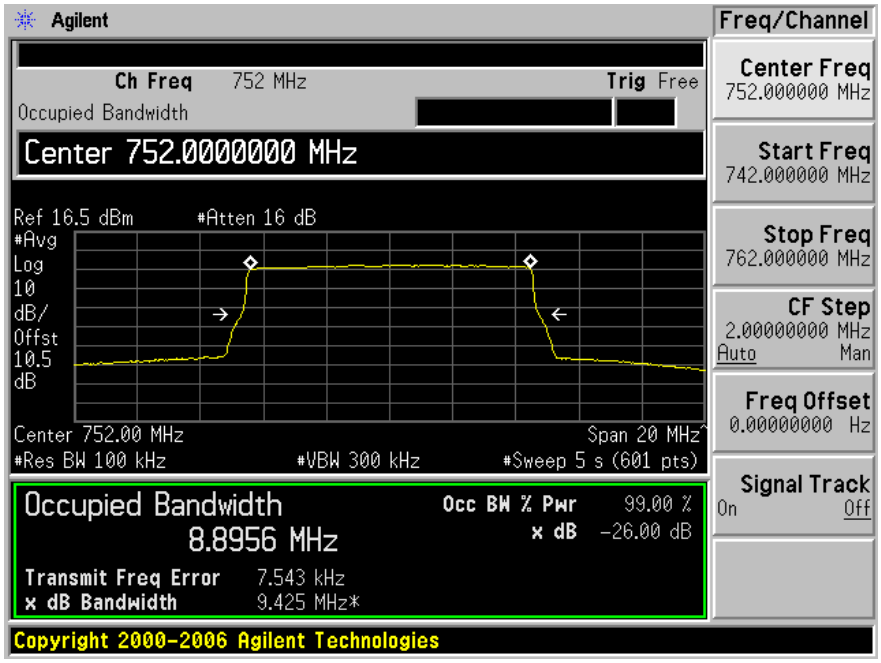


Modulation: 64 QAM, Frequency: 752 MHz

Input



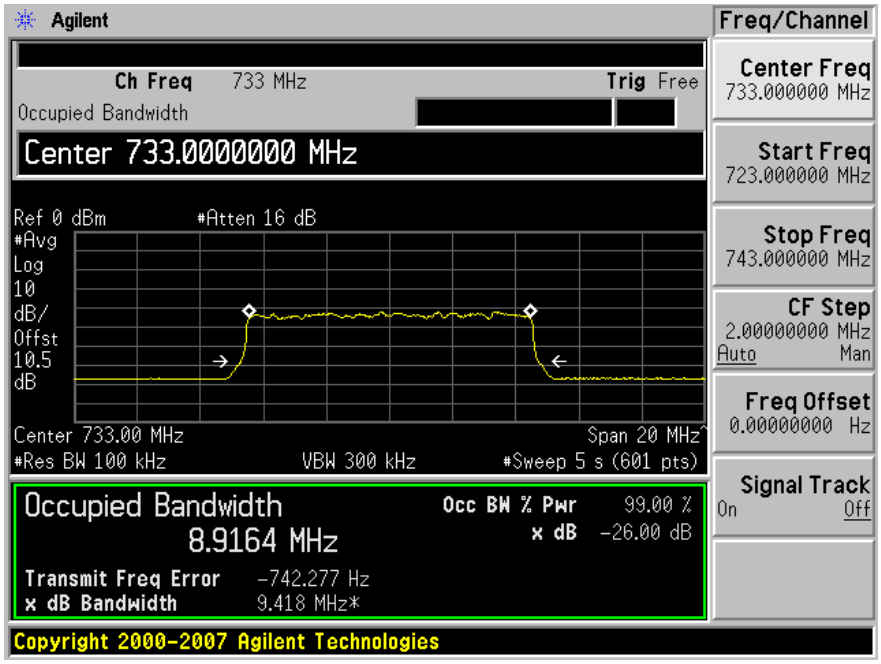
Output



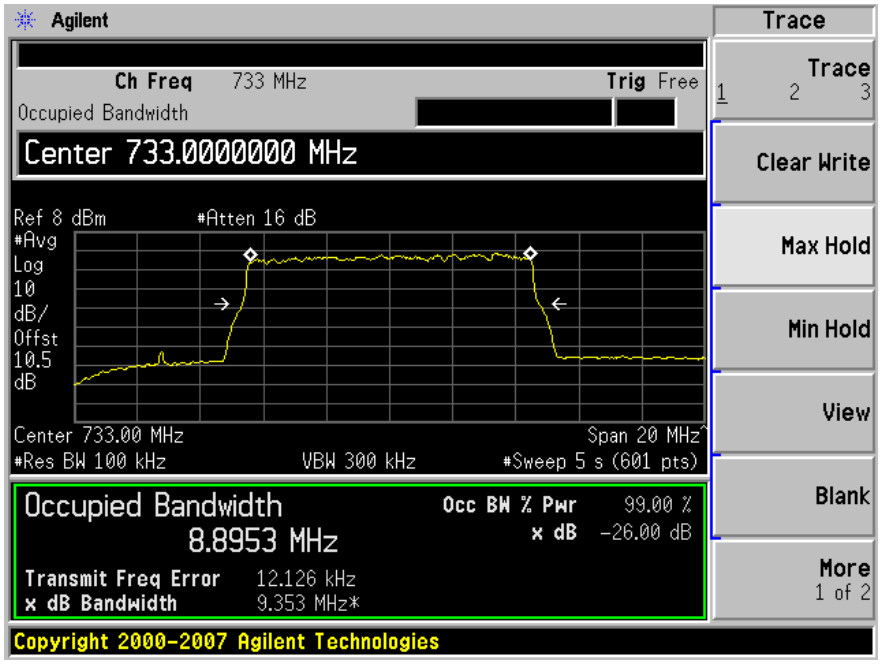
748-746 MHz Band, Antenna Port #1:

Modulation: QPSK, Frequency: 733 MHz

Input

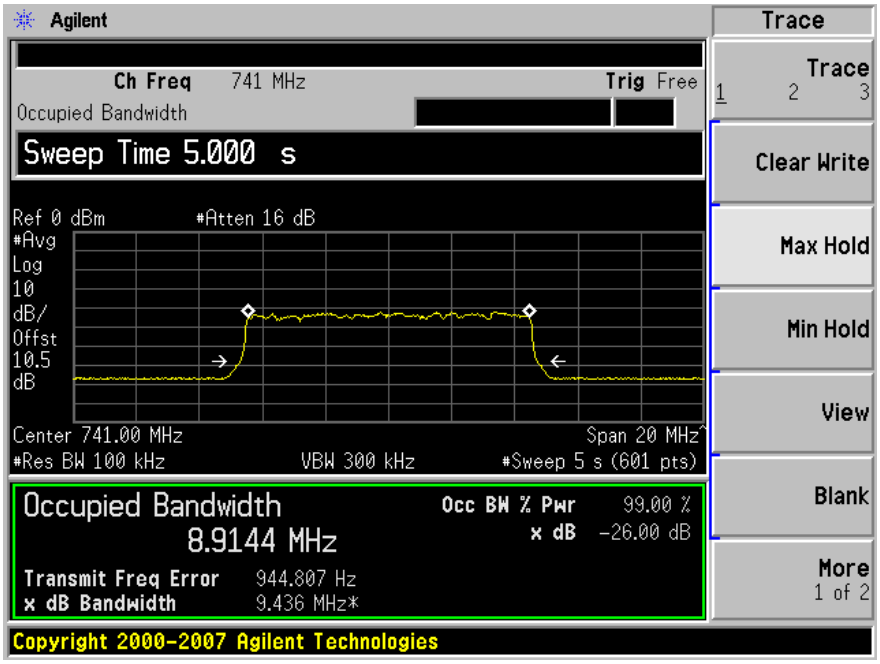


Output

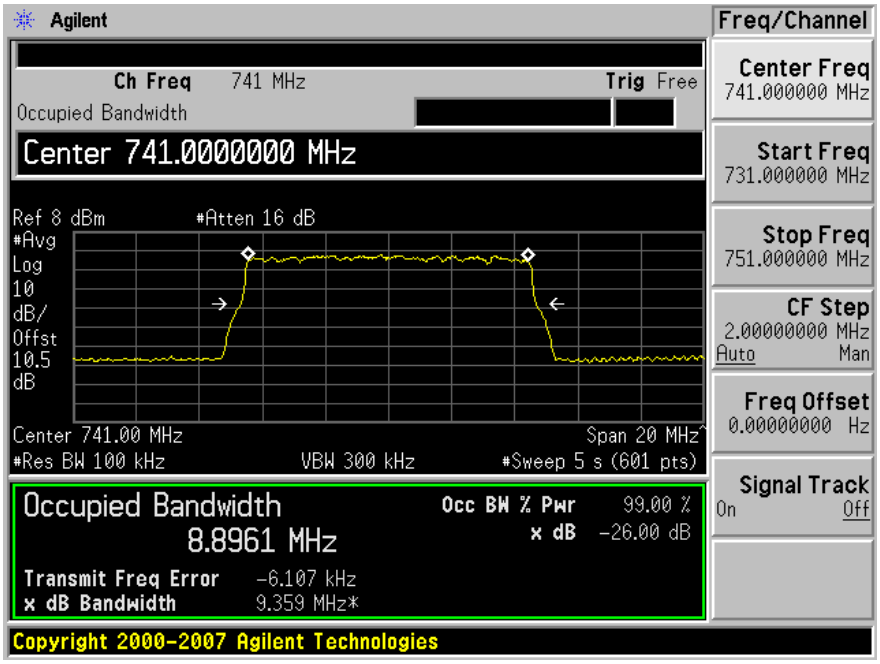


Modulation: QPSK, Frequency: 741 MHz

Input

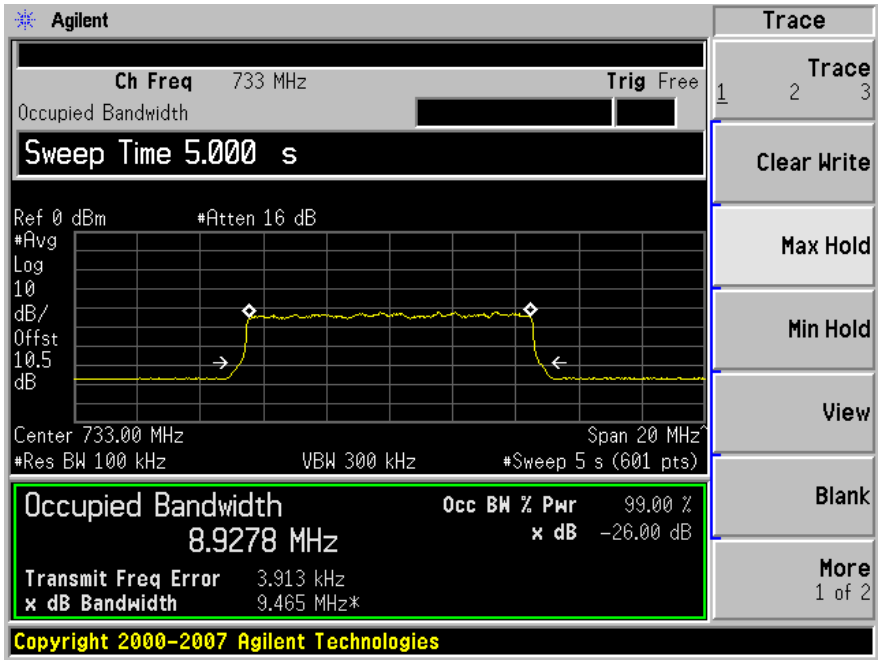


Output

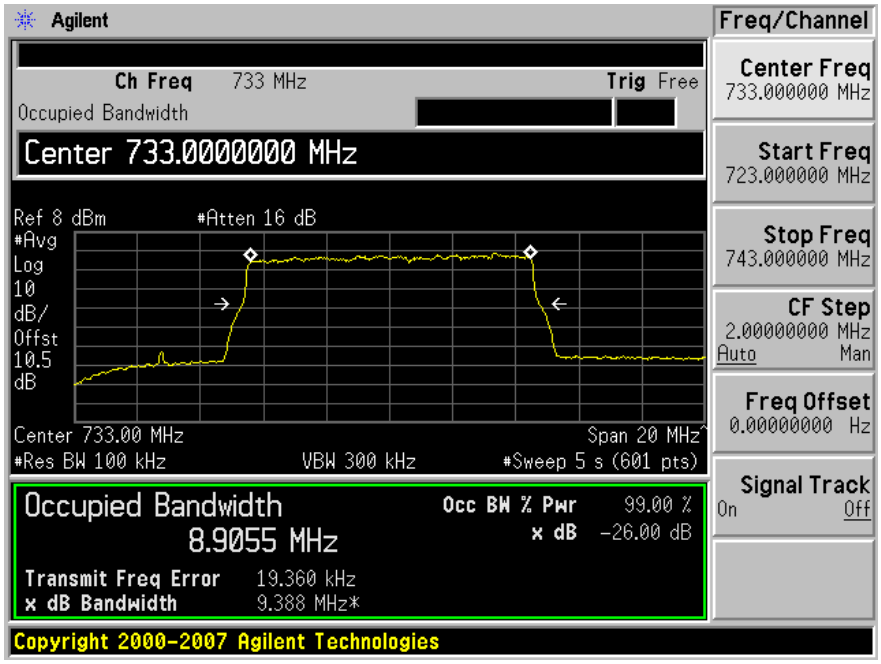


Modulation: 16 QAM, Frequency: 733 MHz

Input

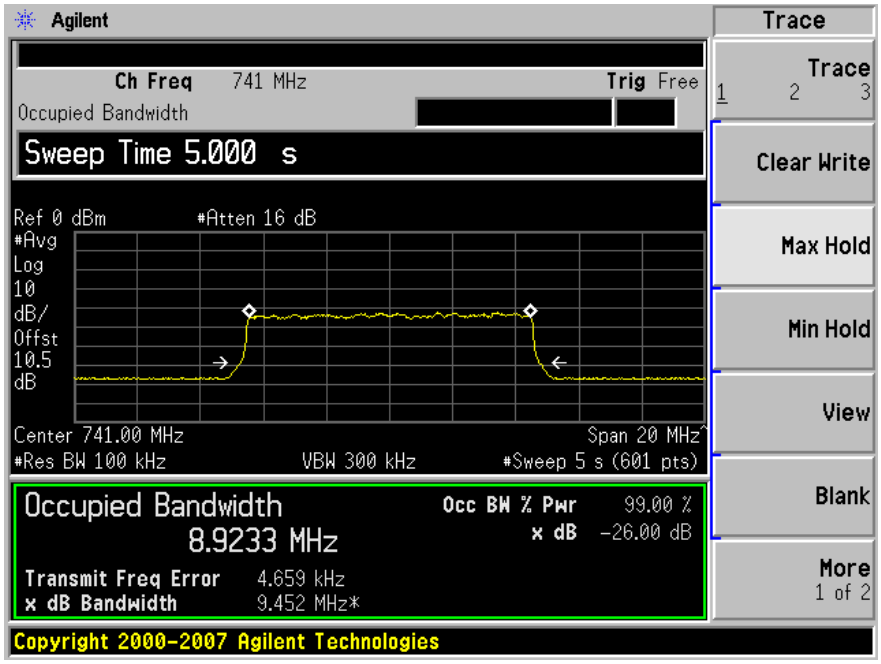


Output

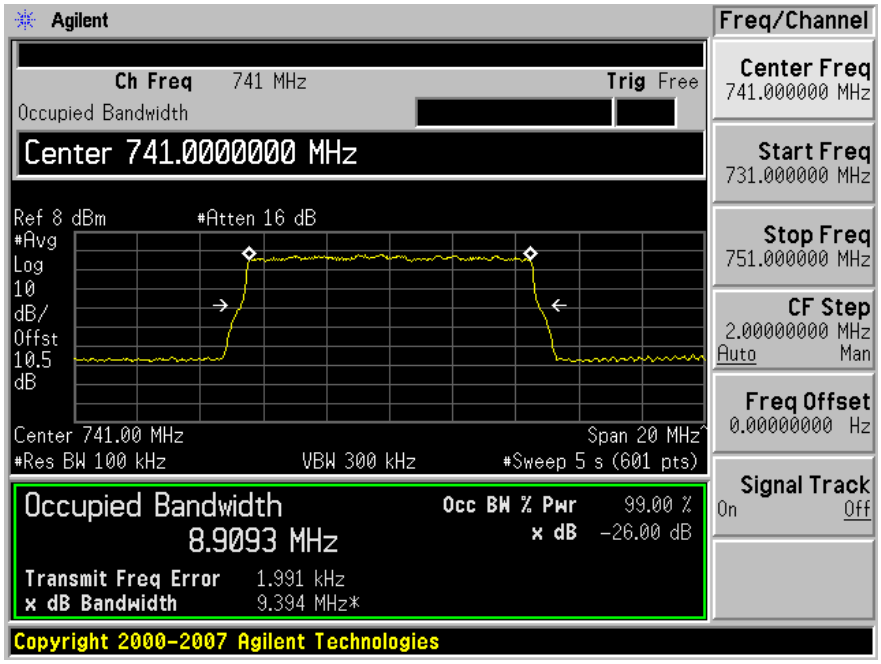


Modulation: 16 QAM, Frequency: 741 MHz

Input

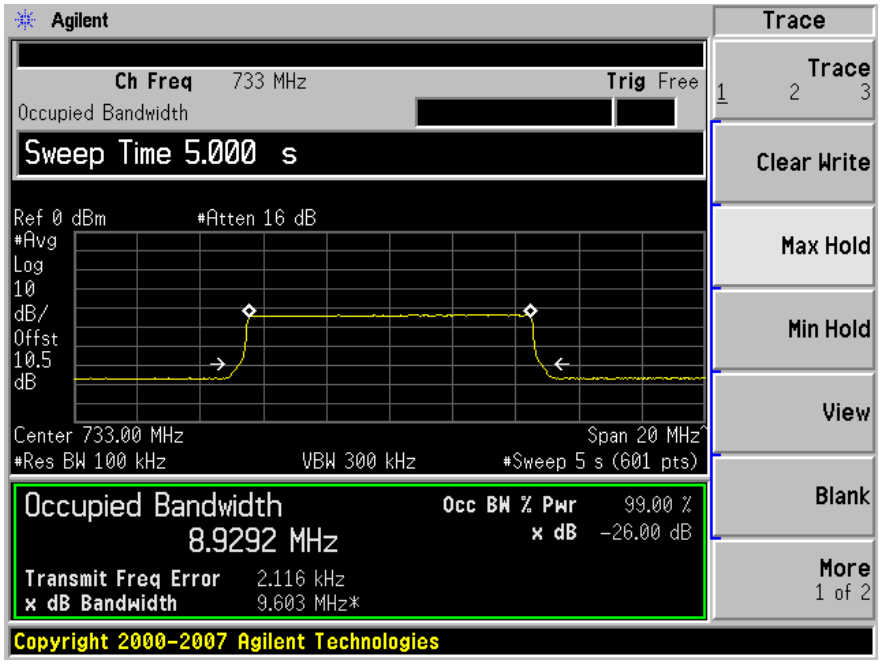


Output

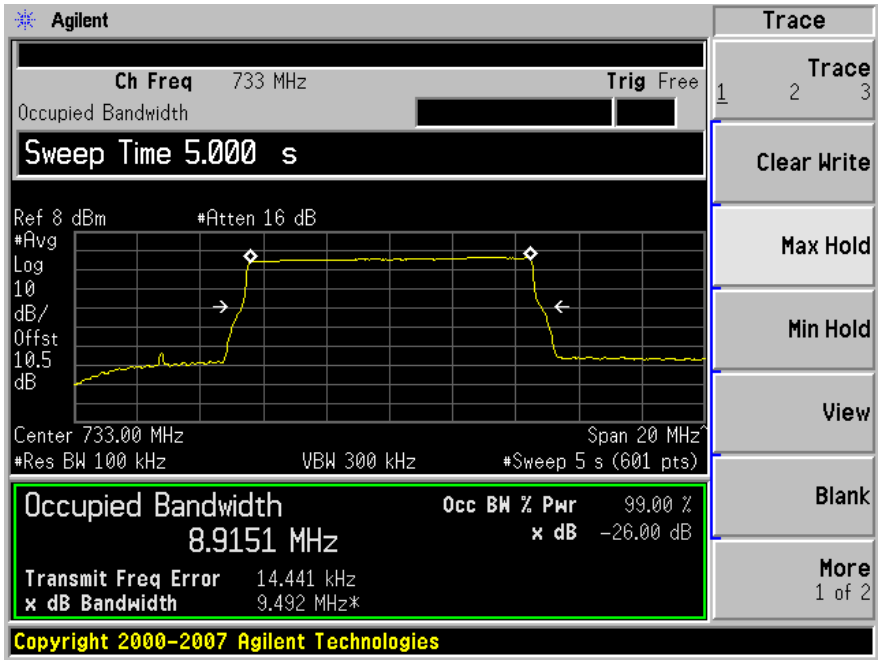


Modulation: 64 QAM, Frequency: 733 MHz

Input

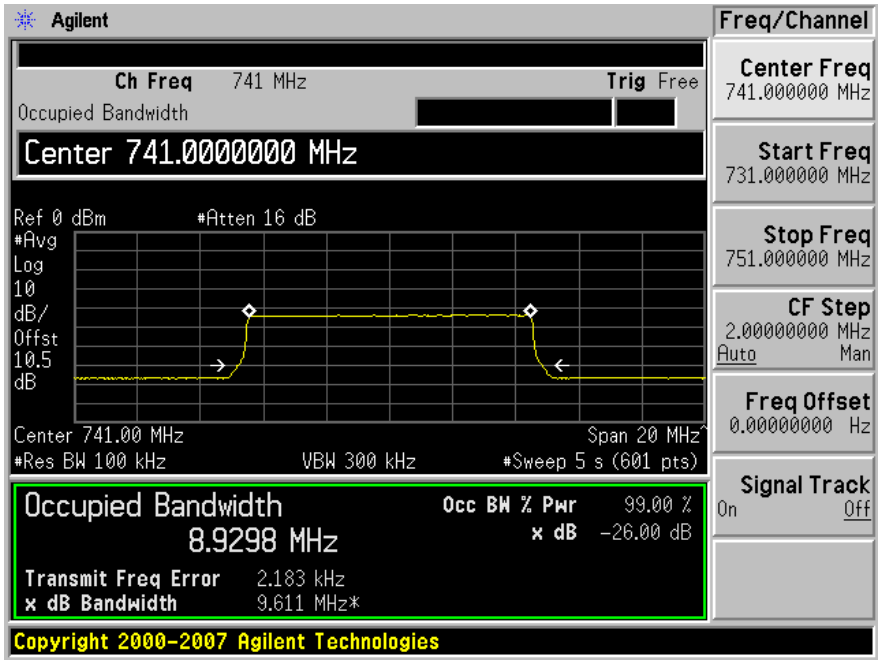


Output

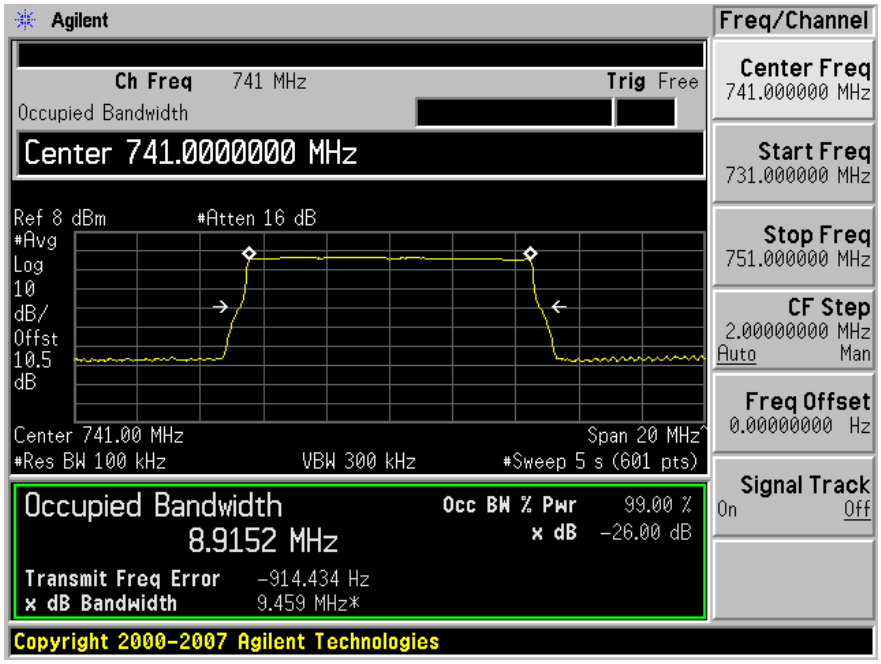


Modulation: 64 QAM, Frequency: 741 MHz

Input



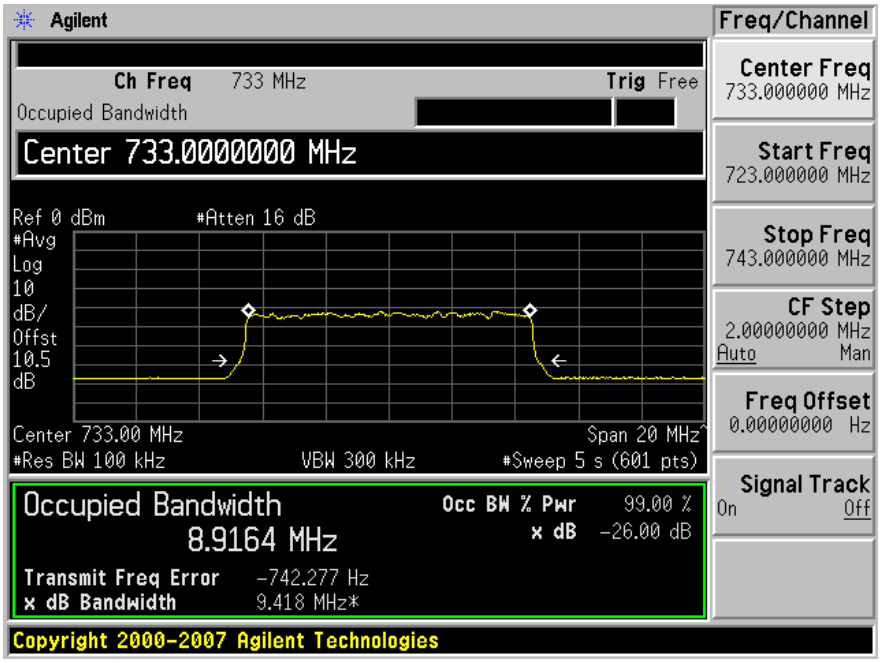
Output



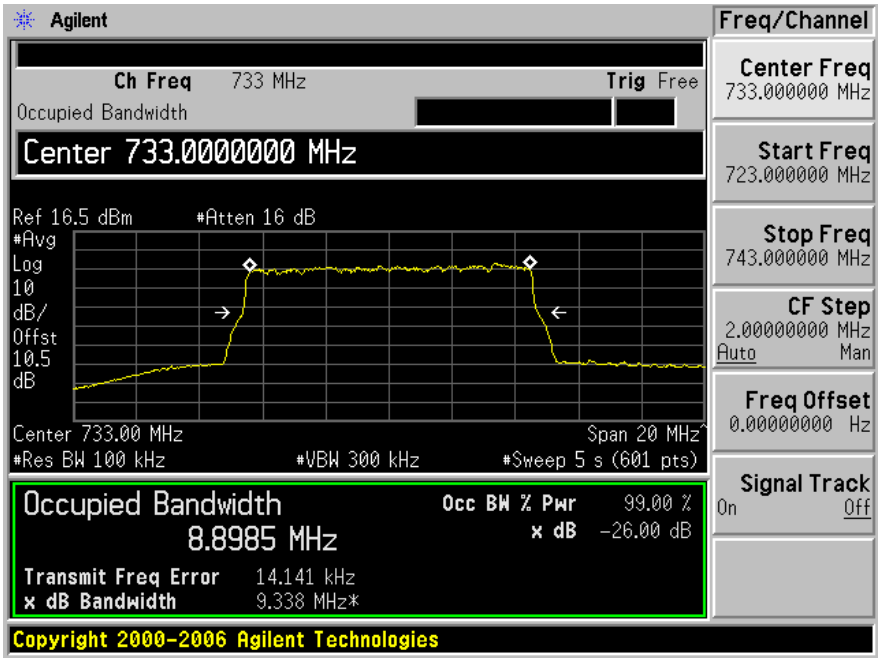
748-746 MHz Band, Antenna Port #2:

Modulation: QPSK, Frequency: 733 MHz

Input

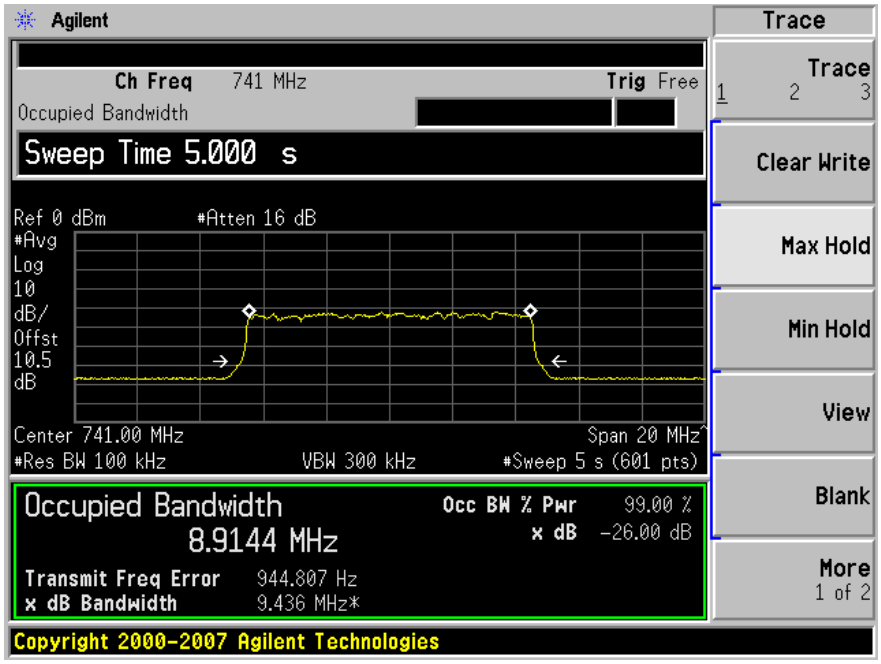


Output

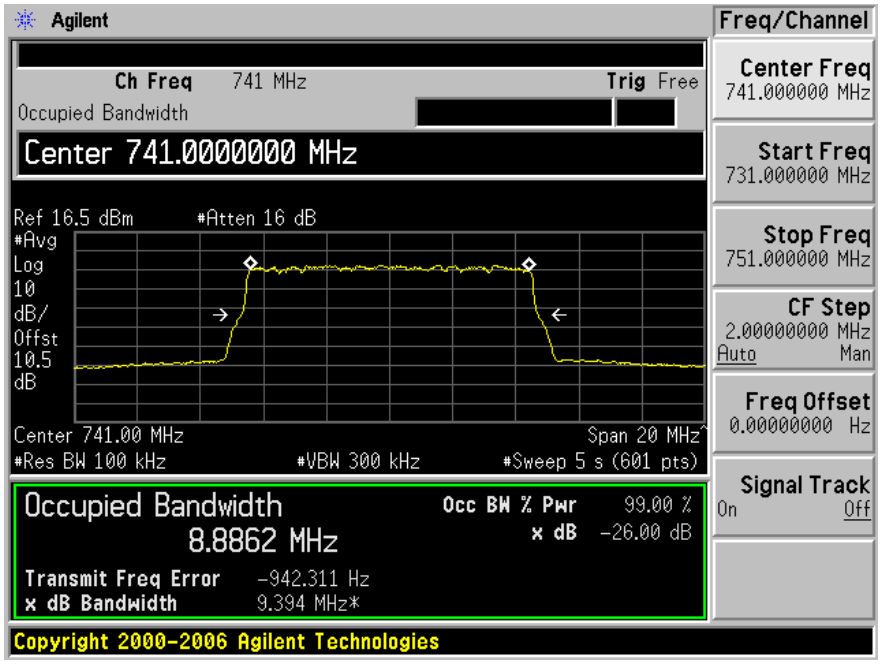


Modulation: QPSK, Frequency: 741 MHz

Input

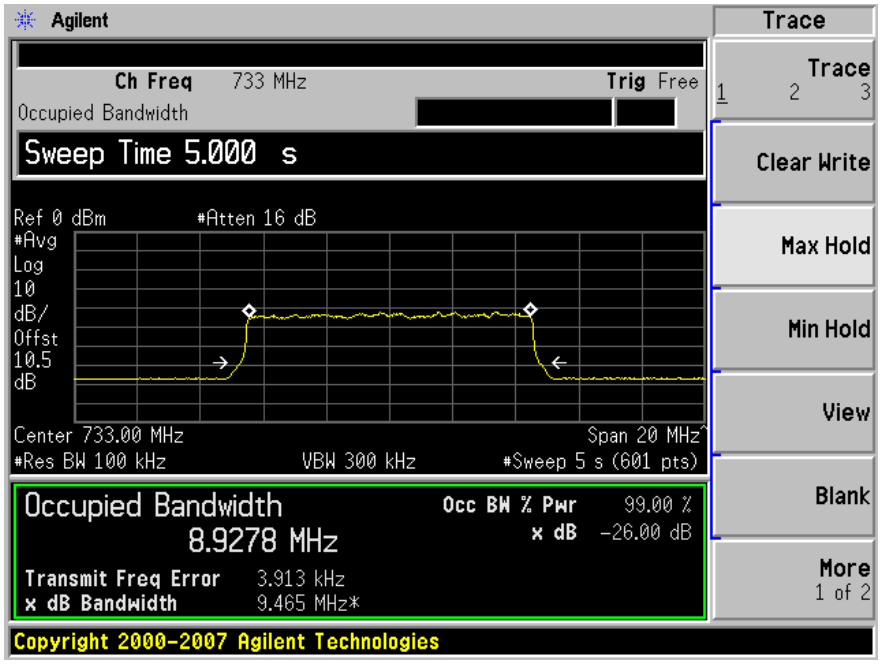


Output

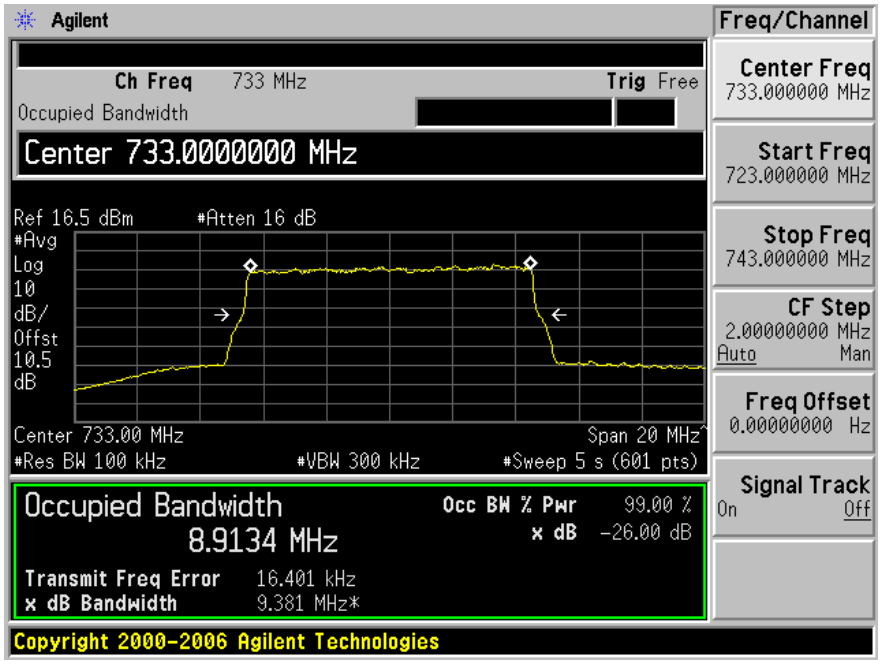


Modulation: 16 QAM, Frequency: 733MHz

Input

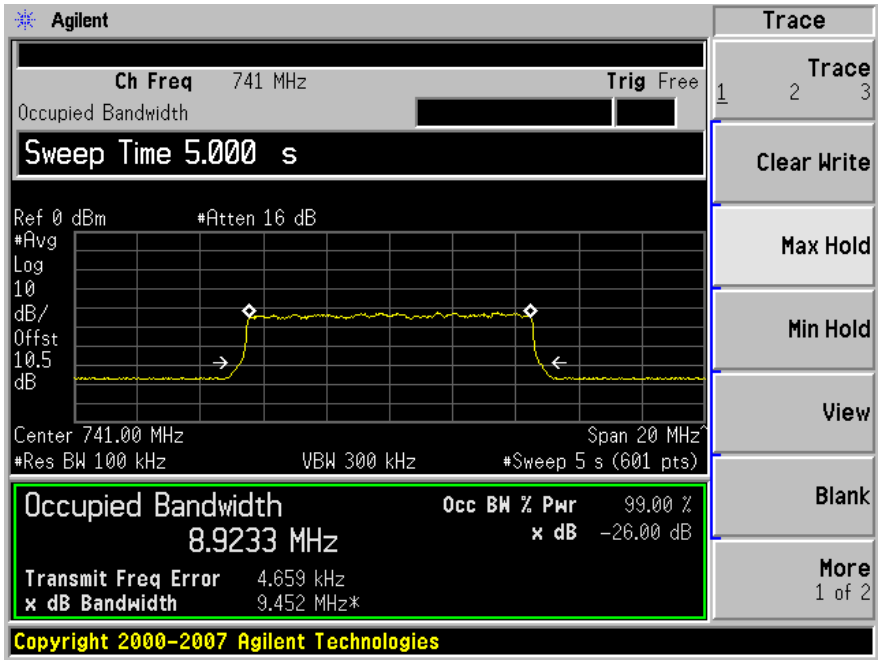


Output

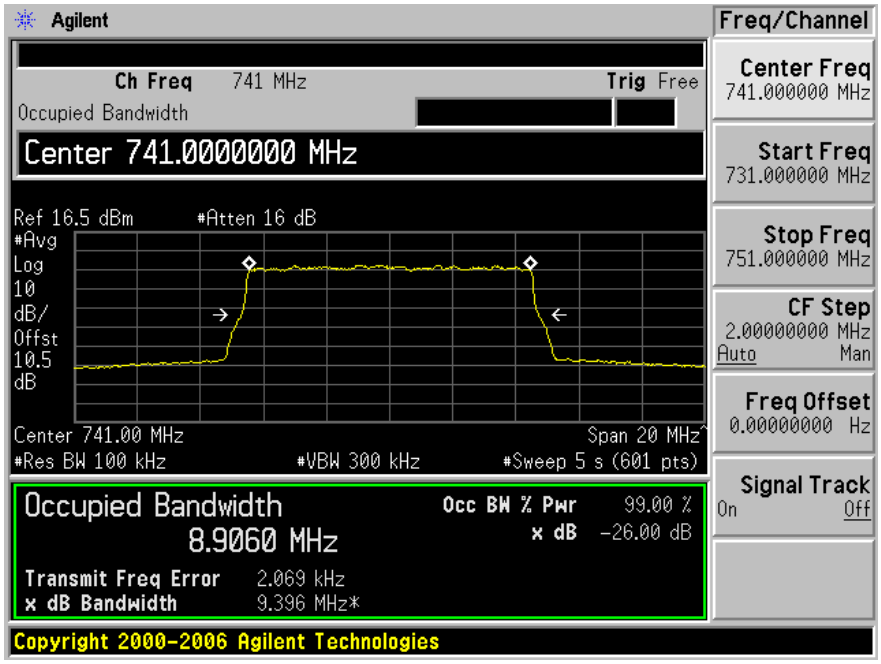


Modulation: 16 QAM, Frequency: 741 MHz

Input

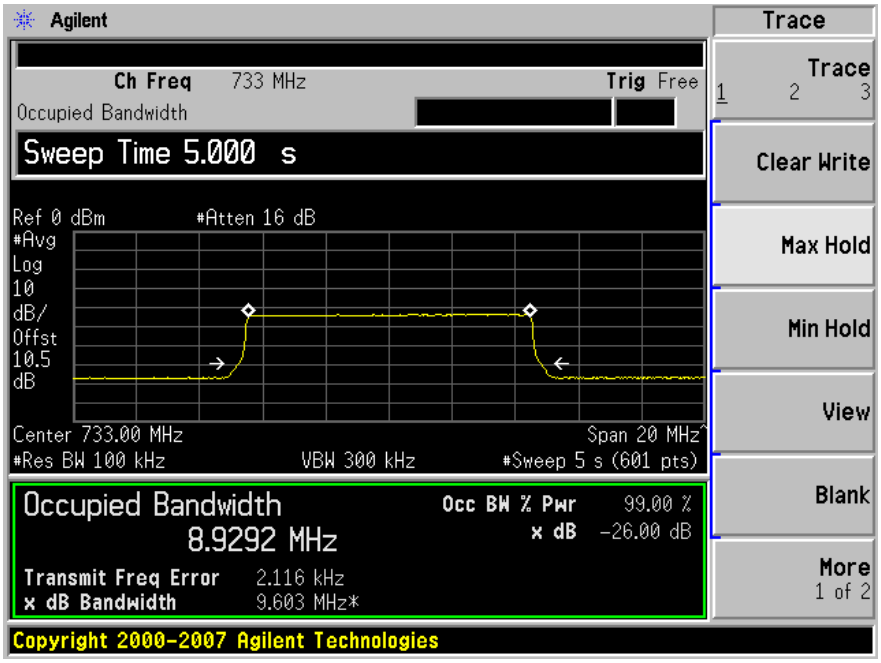


Output

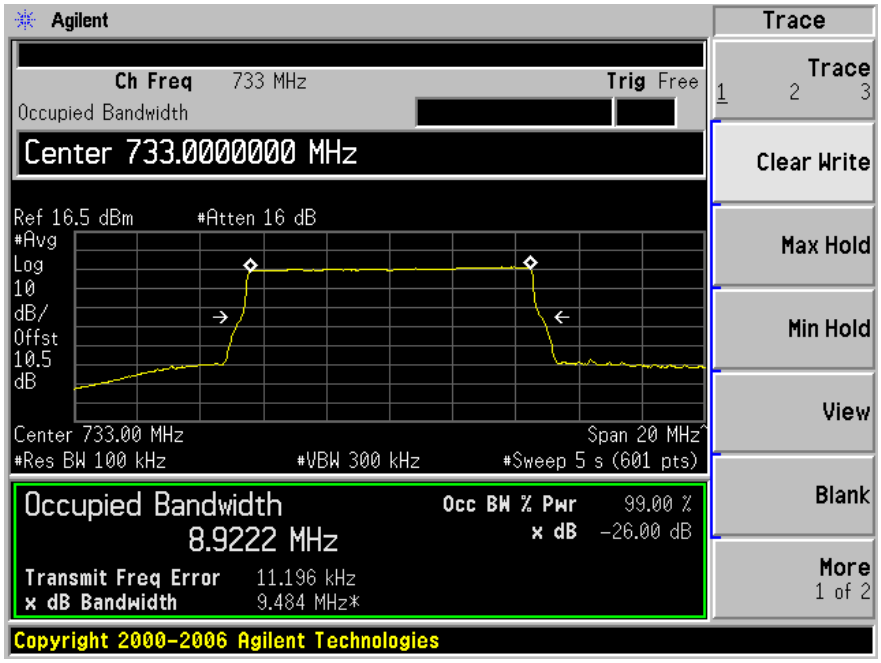


Modulation: 64 QAM, Frequency: 733 MHz

Input

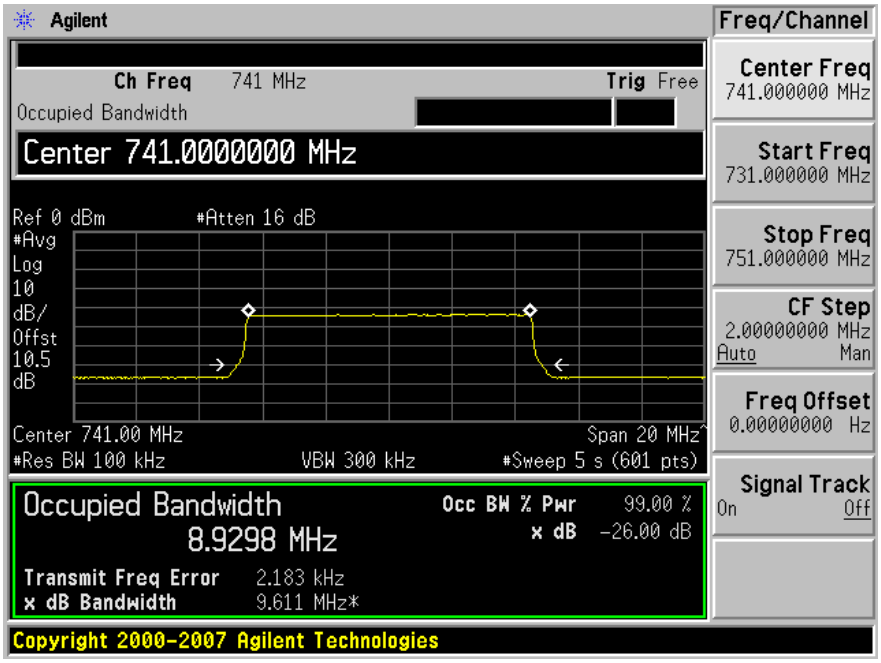


Output

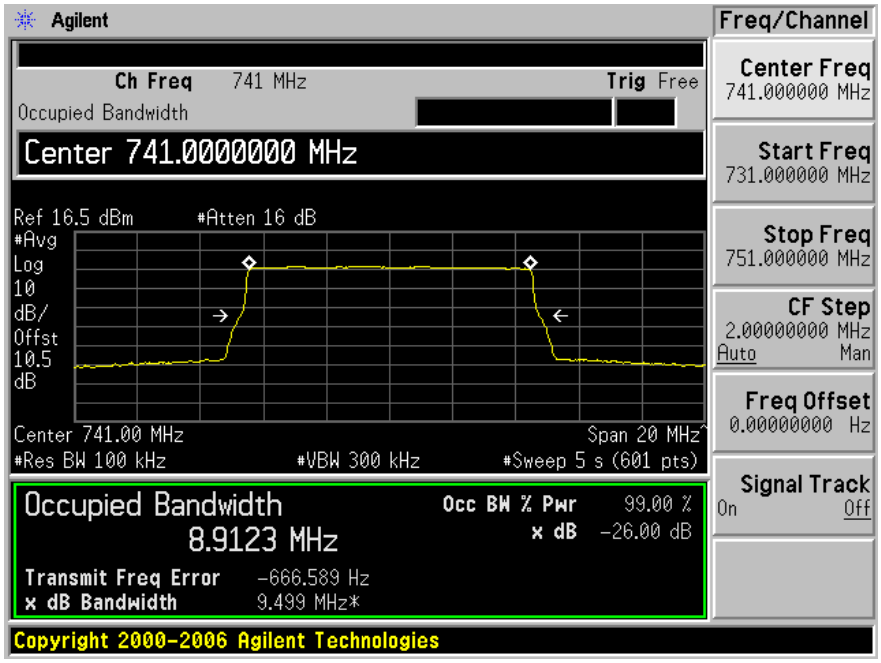


Modulation: 64 QAM, Frequency: 741 MHz

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:	22.7 °C
Relative Humidity:	44 %
ATM Pressure:	101.7kPa

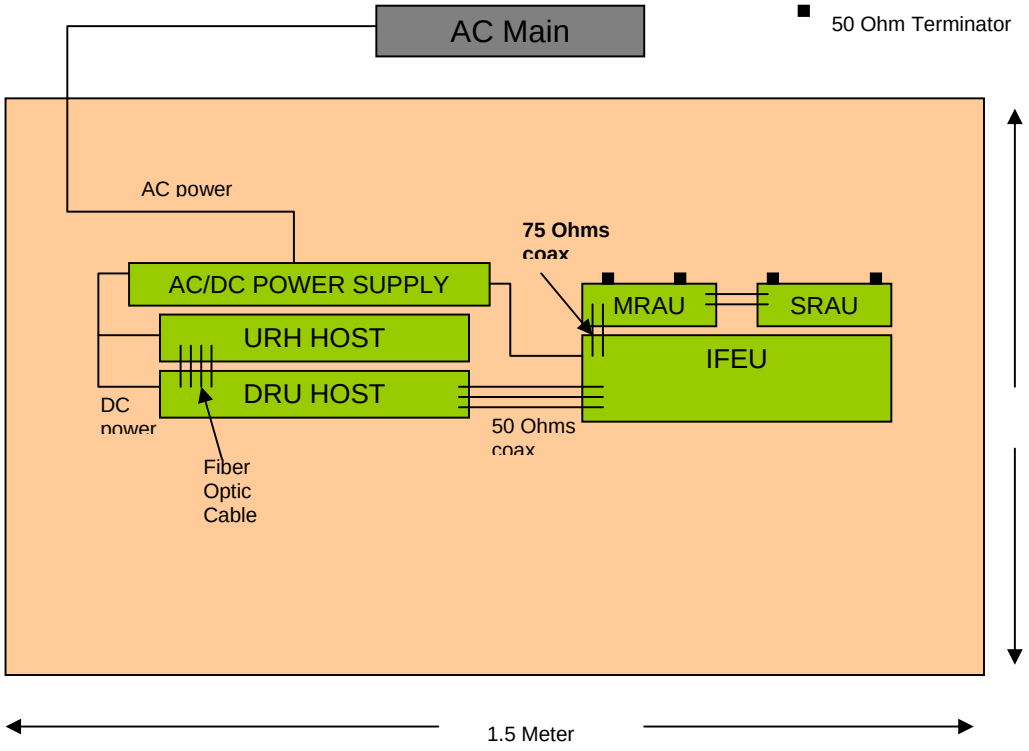
** The testing was performed by Dennis Huang on 2009-12-04 in 5 Meter Chamber #3.*

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	MY47271125	2009-04-13
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



7.6 Summary of Test Results

746-757 MHz Band

Downlink - Middle Channel (752 MHz)			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Input Frequency
-17.62	7542	Horizontal	752 MHz

728-757 MHz Band

Downlink - Middle Channel (733 MHz)			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Input Frequency
-16.40	7542	Horizontal	733 MHz
Downlink - Middle Channel (741 MHz)			
-14.47	7542	Horizontal	741 MHz

Please refer to the following plots for detailed results.

7.7 Test Results

746-757 MHz Band, (Input frequency = 752 MHz)

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)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1250	66.33	303	1.00	V	1250	-46.96	5.8	0.94	-42.10	-13	-29.10
1250	67.21	63	1.00	H	1250	-46.08	5.8	0.94	-41.22	-13	-28.22
3072	61.00	17	1.25	V	3072	-42.87	8.9	1.51	-35.48	-13	-22.48
3072	62.14	334	1.09	H	3072	-41.73	8.9	1.51	-34.34	-13	-21.34
7542	52.92	323	1.00	V	7542	-37.36	8.7	2.93	-31.59	-13	-18.59
7542	53.89	30	1.27	H	7542	-36.39	8.7	2.93	-30.62	-13	-17.62

728-757 MHz, (Input frequency = 733 MHz)

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)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1250	68.16	21	1.60	V	1250	-45.13	5.8	0.94	-40.27	-13	-27.27
1250	67.21	68	1.00	H	1250	-46.08	5.8	0.94	-41.22	-13	-28.22
3072	60.86	18	1.36	V	3072	-43.01	8.9	1.51	-35.62	-13	-22.62
3072	61.53	323	1.19	H	3072	-42.34	8.9	1.51	-34.95	-13	-21.95
7542	53.56	357	1.10	V	7542	-36.72	8.7	2.93	-30.95	-13	-17.95
7542	55.11	44	1.27	H	7542	-35.17	8.7	2.93	-29.4	-13	-16.40

(Input frequency = 741 MHz)

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)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1250	68.00	20	1.39	V	1250	-45.29	5.8	0.94	-40.43	-13	-27.43
1250	67.12	64	1.00	H	1250	-46.17	5.8	0.94	-41.31	-13	-28.31
3072	60.77	16	1.24	V	3072	-43.10	8.9	1.51	-35.71	-13	-22.71
3072	61.69	332	1.19	H	3072	-42.18	8.9	1.51	-34.79	-13	-21.79
7542	53.76	356	1.05	V	7542	-36.52	8.7	2.93	-30.75	-13	-17.75
7542	55.04	44	1.27	H	7542	-35.24	8.7	2.93	-29.47	-13	-16.47

8 FCC §2.1051 & §27.53 - 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 10^{th} harmonic.

8.3 Test Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102kPa

** The testing was performed by Dennis Huang from 2009-12-11 to 2009-12-15 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	MXG Vector Signal Generator	-	MY47420502	2009-9-18

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

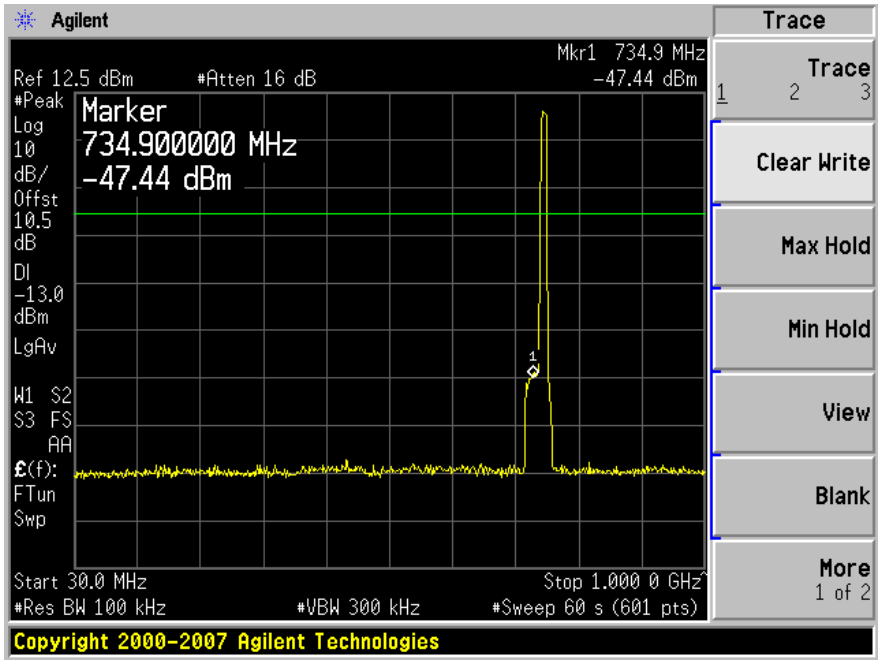
8.5 Test Results

Please refer to the following plots.

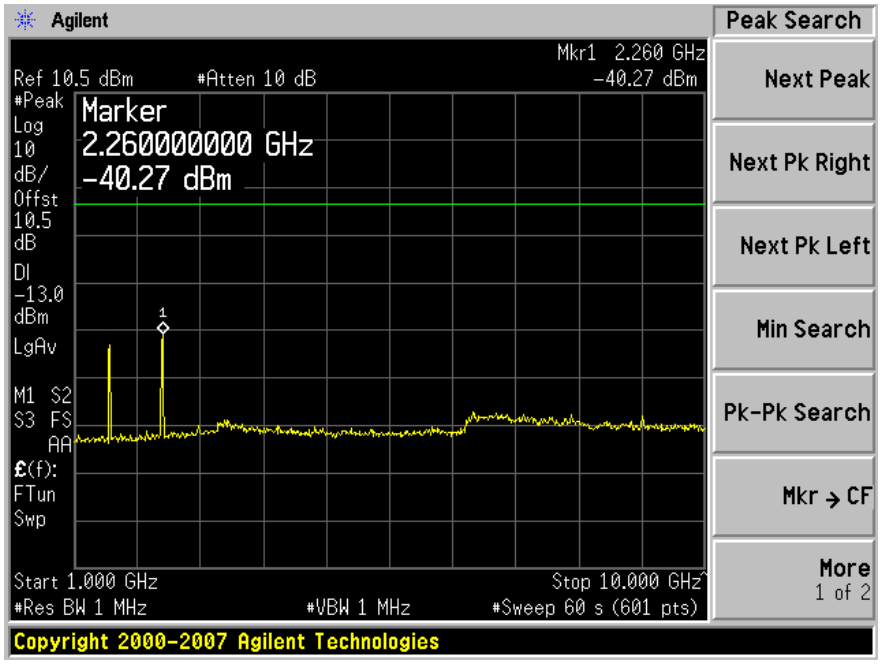
746-757 MHz Band, Antenna Port #1:

Modulation: QPSK, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz

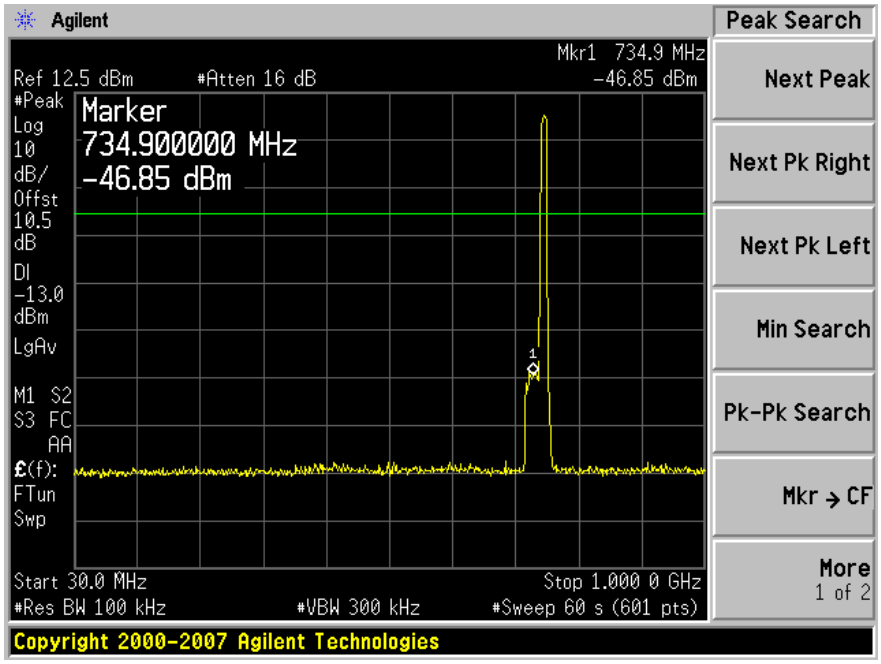


Plot 2: Above 1 GHz

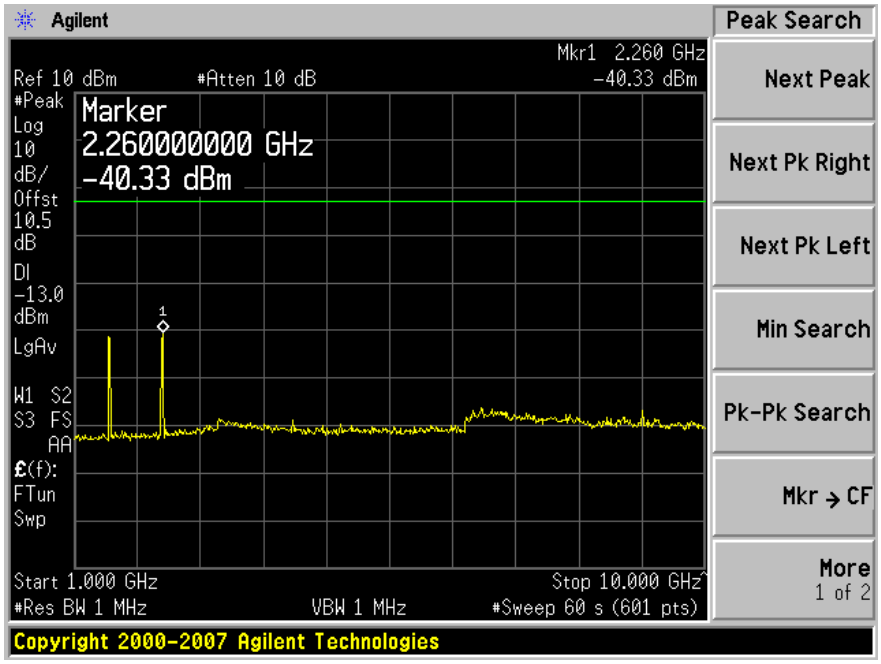


Modulation: 16 QAM, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz

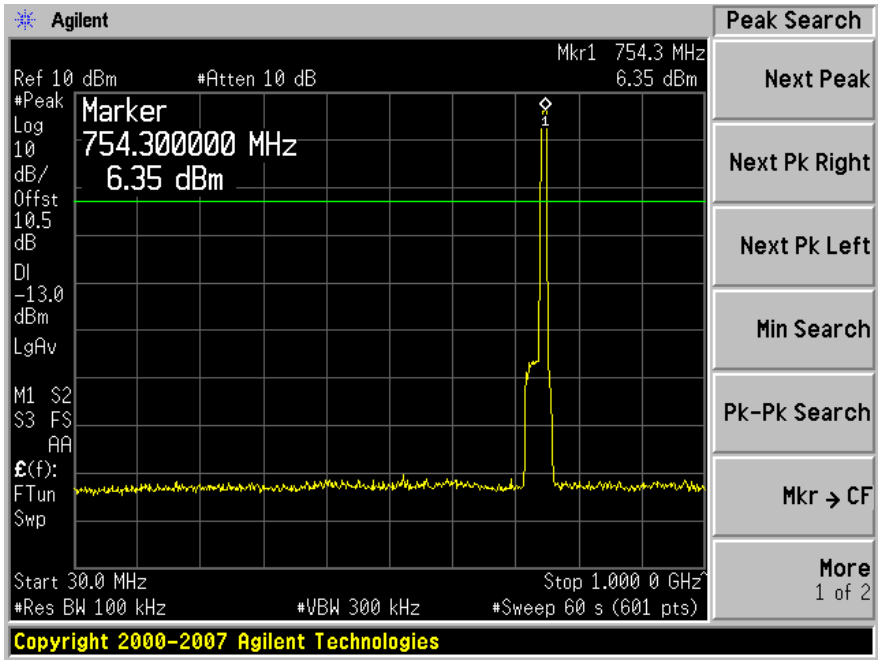


Plot 2: Above 1 GHz

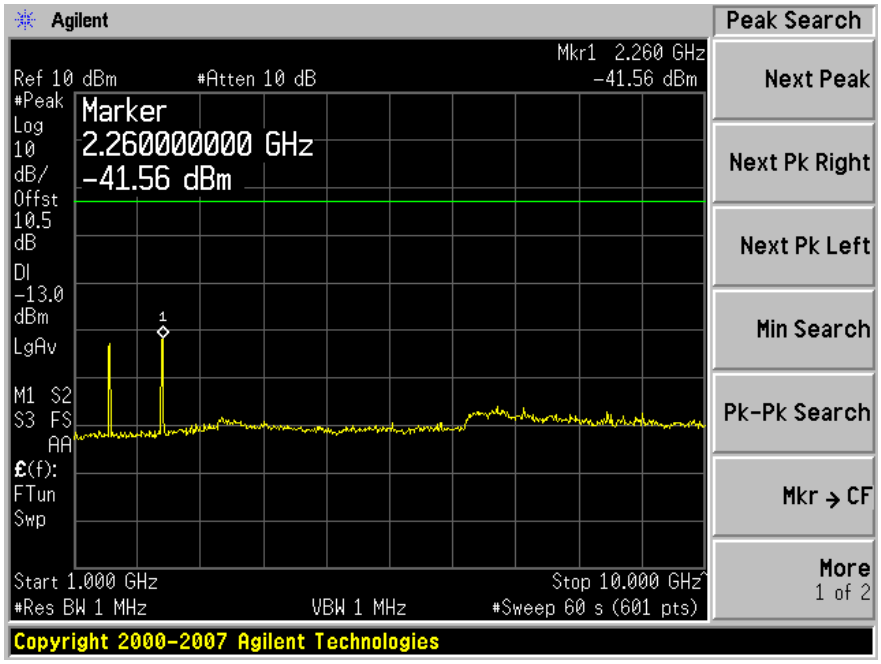


Modulation: 64 QAM, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz



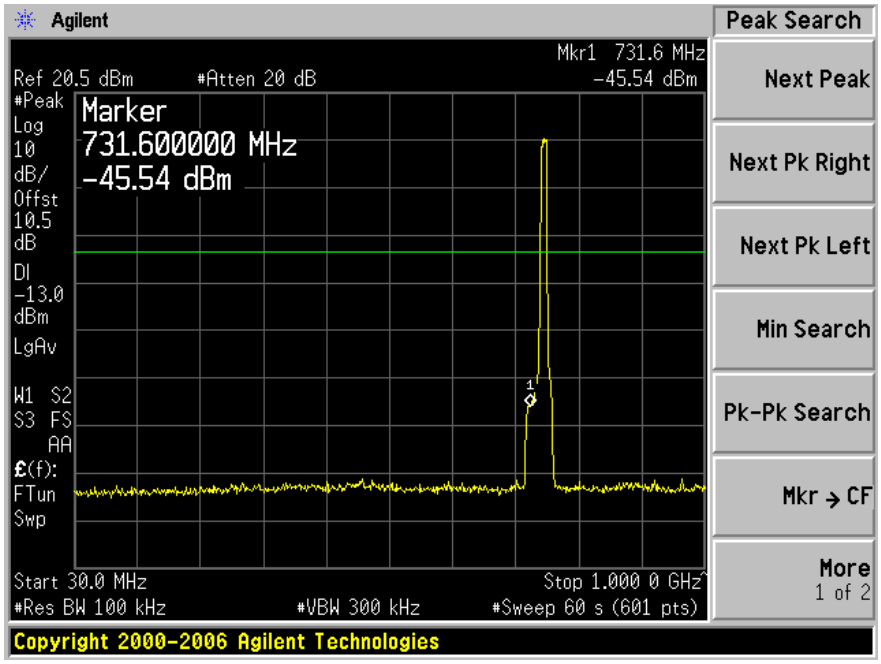
Plot 2: Above 1 GHz



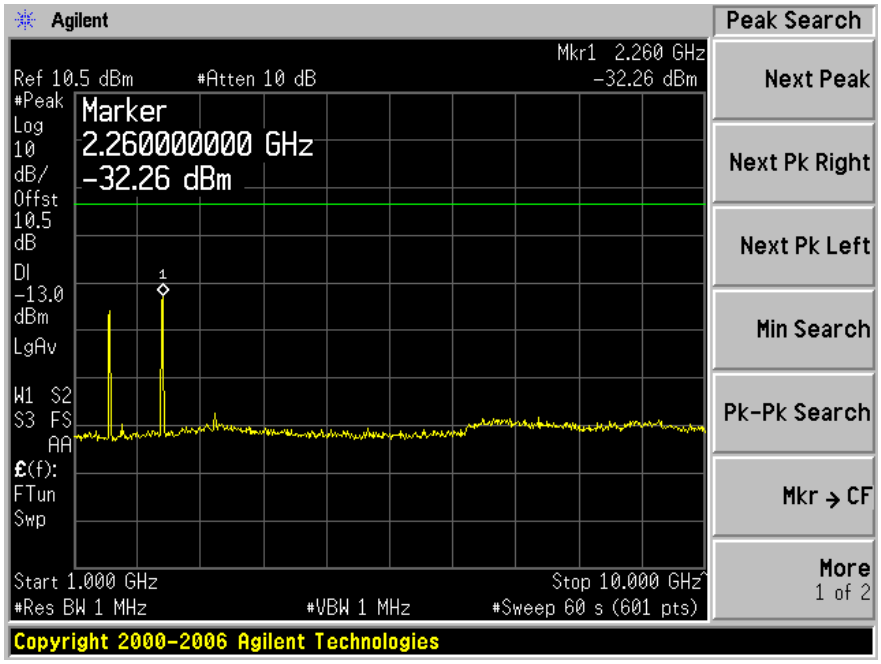
746-757 MHz Band, Antenna Port #2:

Modulation: QPSK, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz

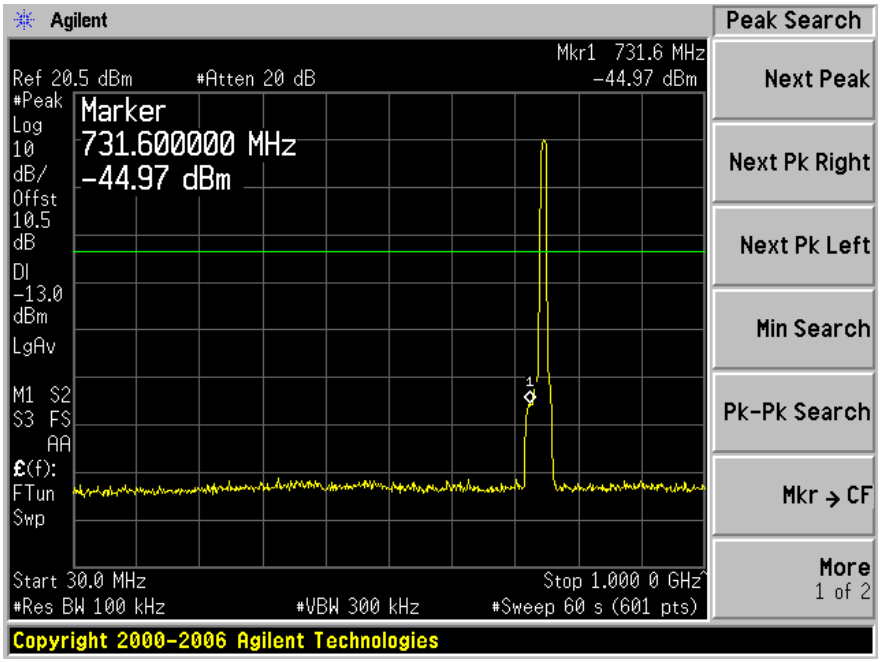


Plot 2: Above 1 GHz

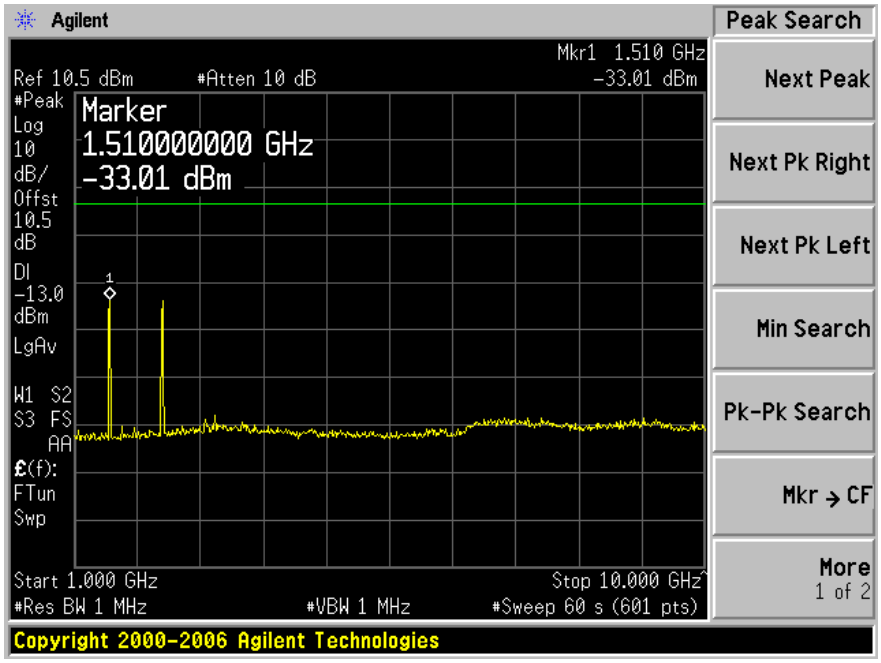


Modulation: 16 QAM, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz

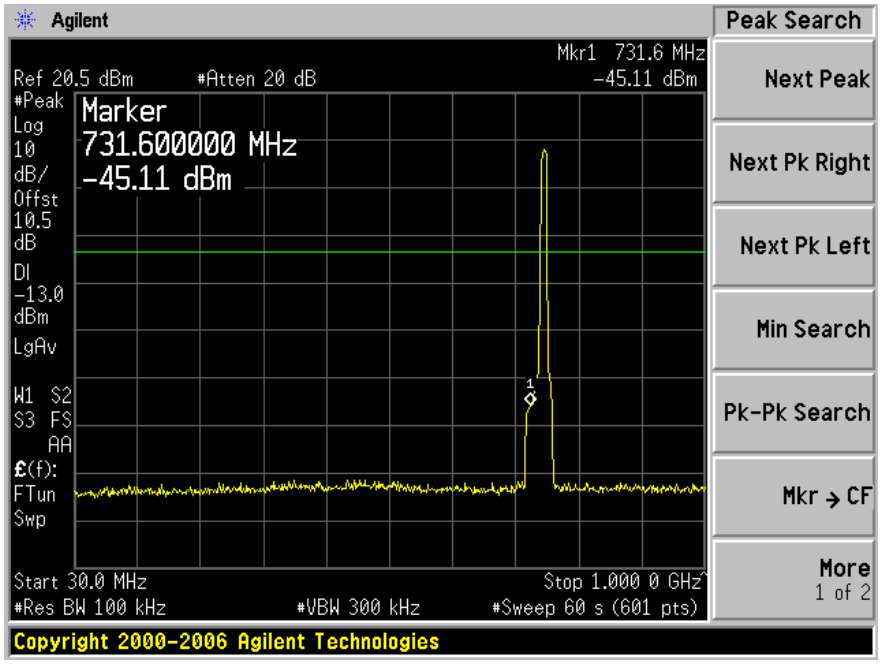


Plot 2: Above 1 GHz

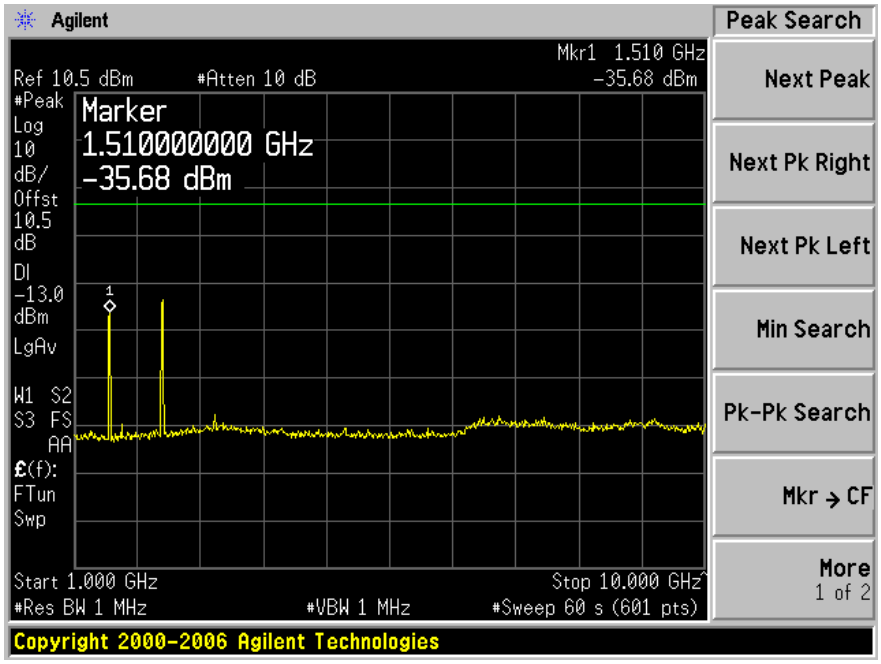


Modulation: 64 QAM, Frequency: 752 MHz

Plot 1: 30 MHz to 1 GHz



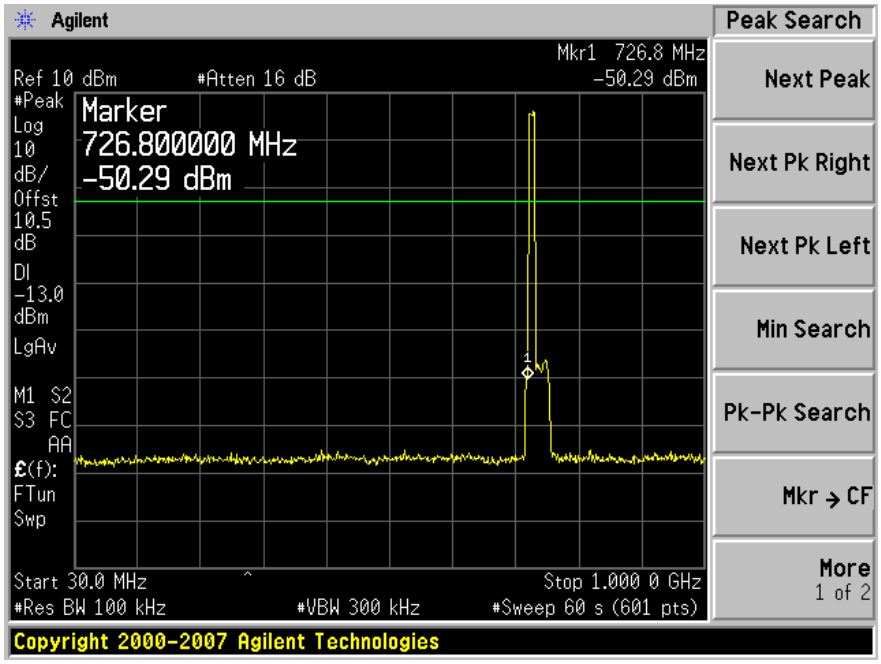
Plot 2: Above 1 GHz



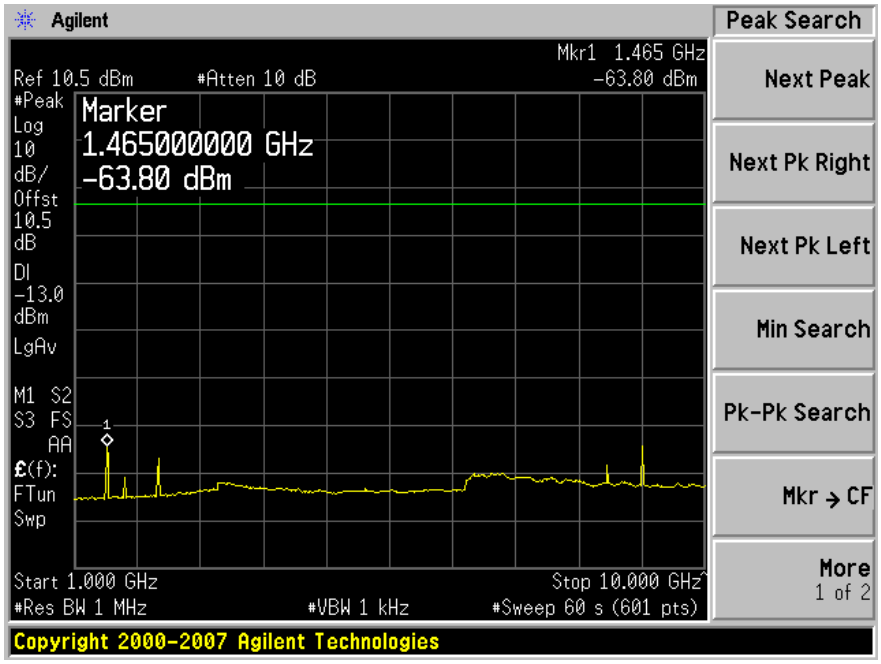
728-746 MHz Band, Antenna Port #1:

Modulation: QPSK, Frequency: 733 MHz

Plot 1: 30 MHz to 1 GHz

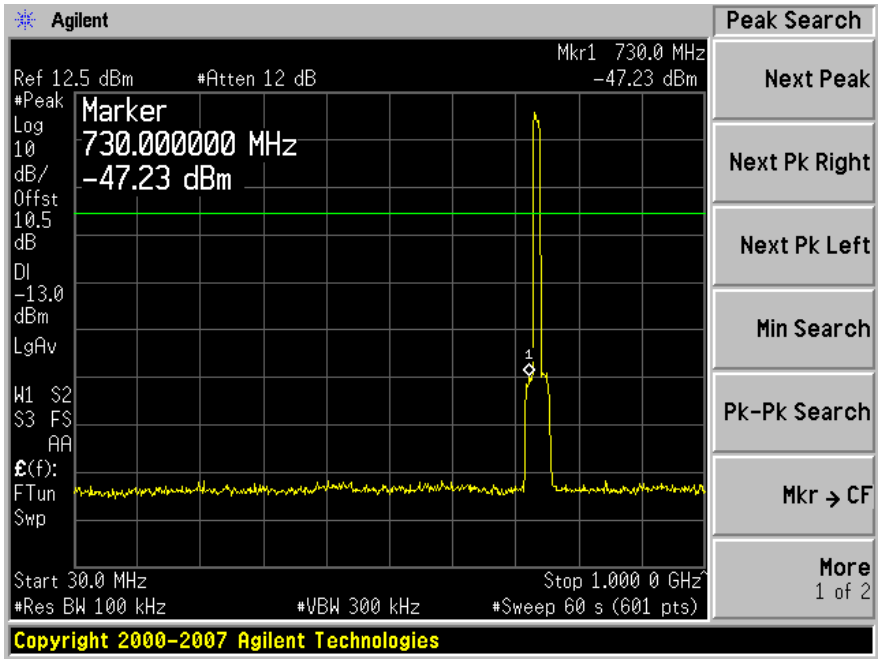


Plot 2: Above 1 GHz

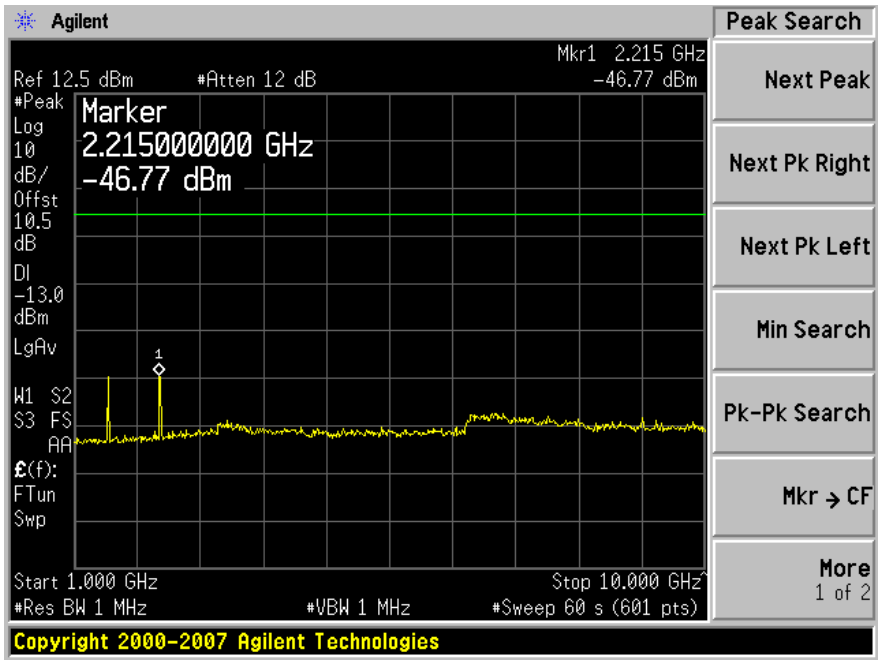


Modulation: QPSK, Frequency: 741 MHz

Plot 1: 30 MHz to 1 GHz

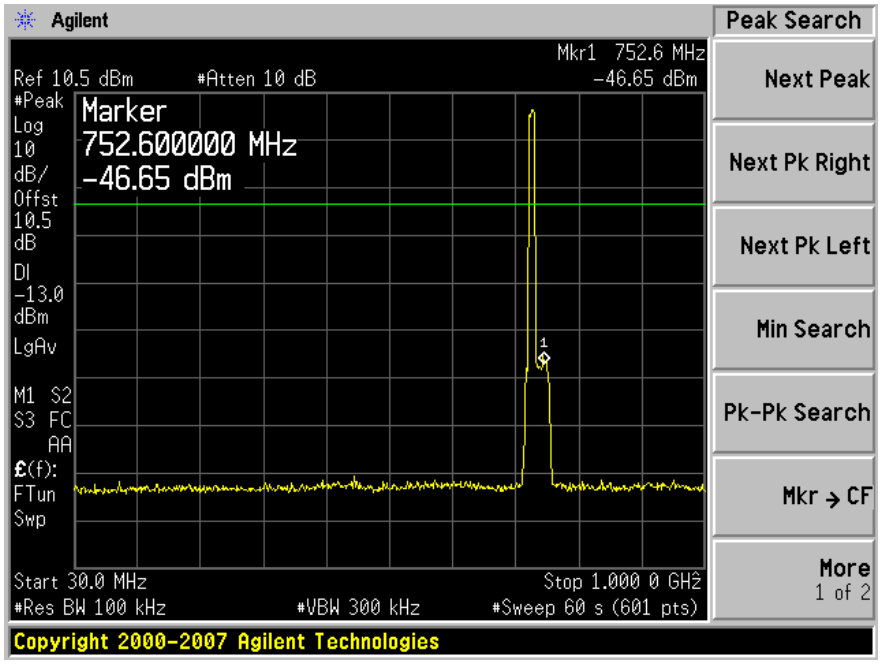


Plot 2: Above 1 GHz

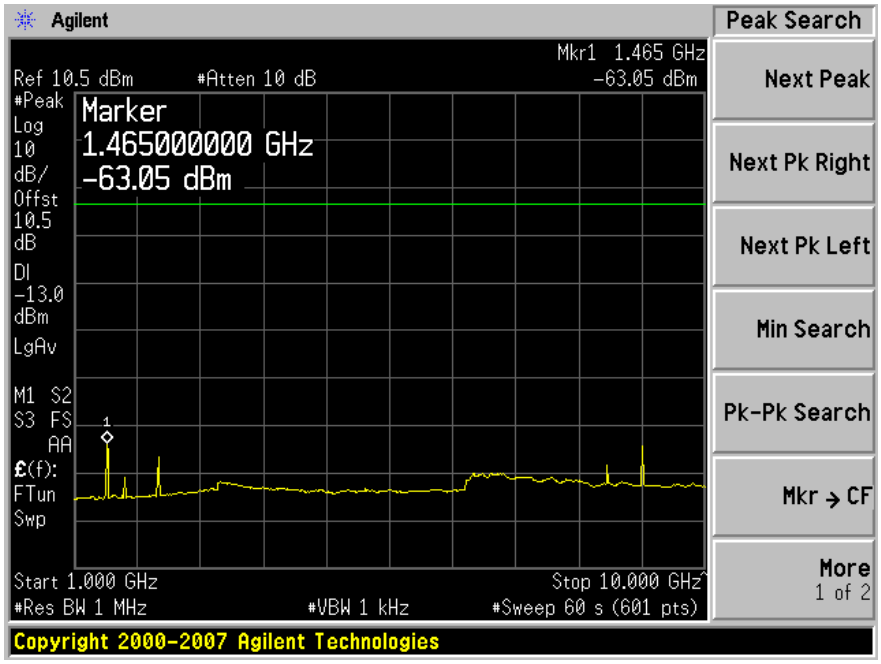


Modulation: 16 QAM, Frequency: 733 MHz

Plot 1: 30 MHz to 1 GHz

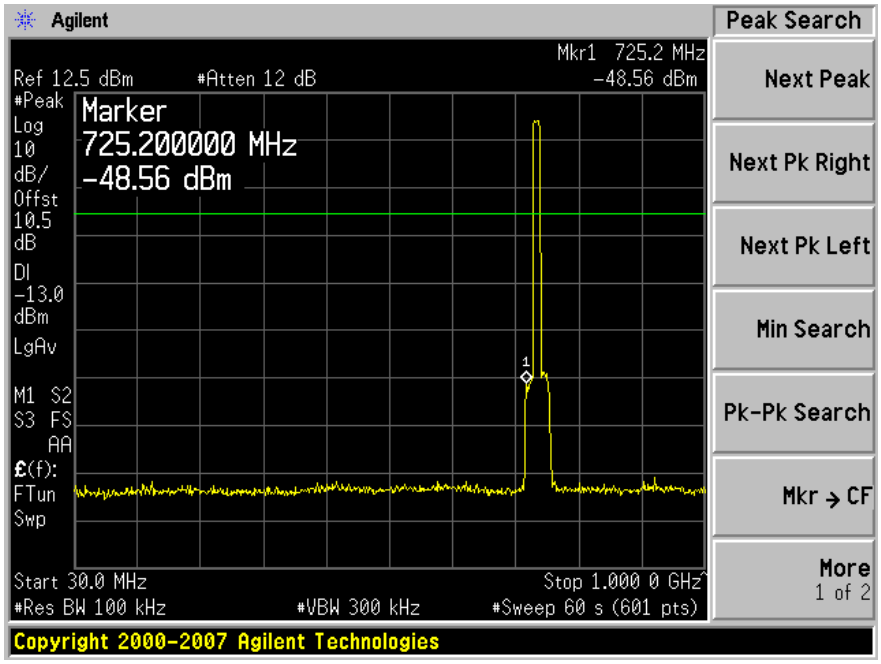


Plot 2: Above 1 GHz

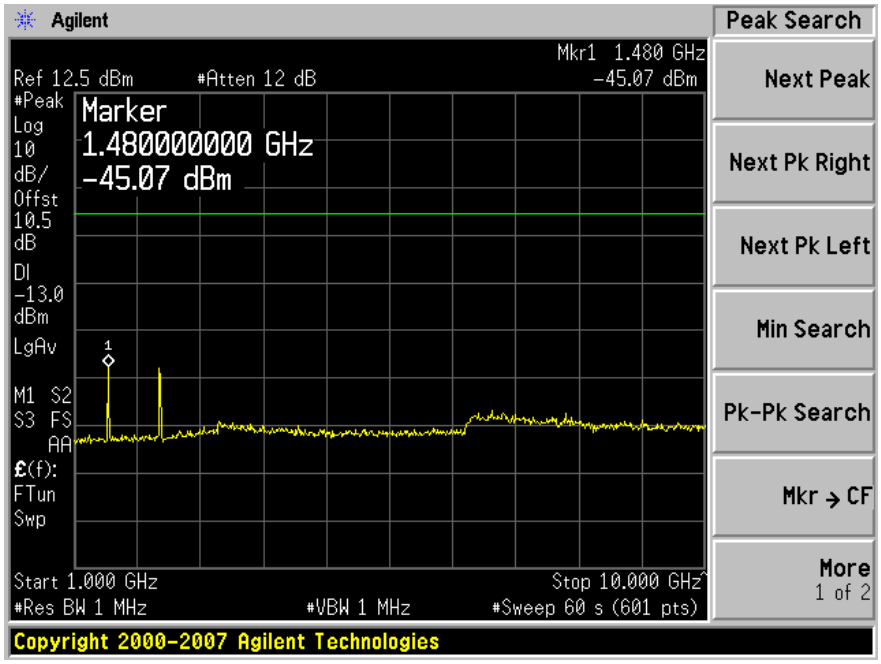


Modulation: 16 QAM, Frequency: 741 MHz

Plot 1: 30 MHz to 1 GHz

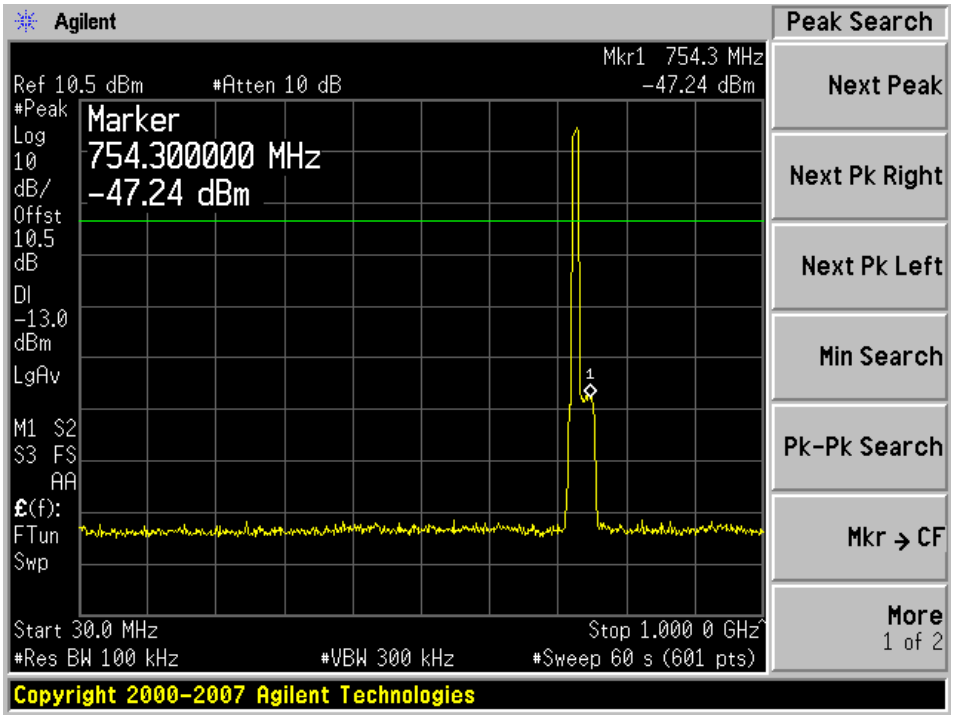


Plot 2: Above 1 GHz

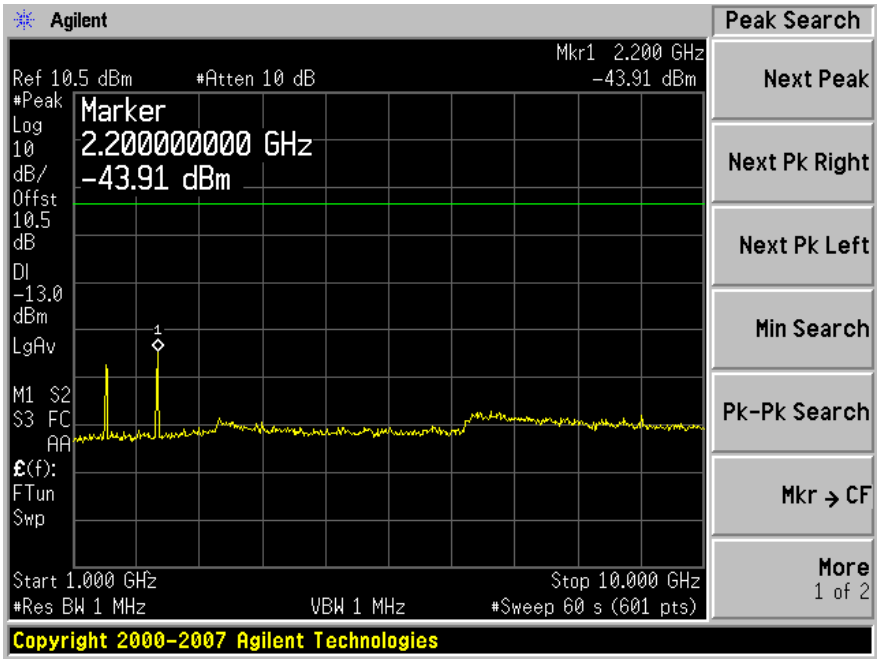


Modulation: 16 QAM, Frequency: 733 MHz

Plot 1: 30 MHz to 1 GHz

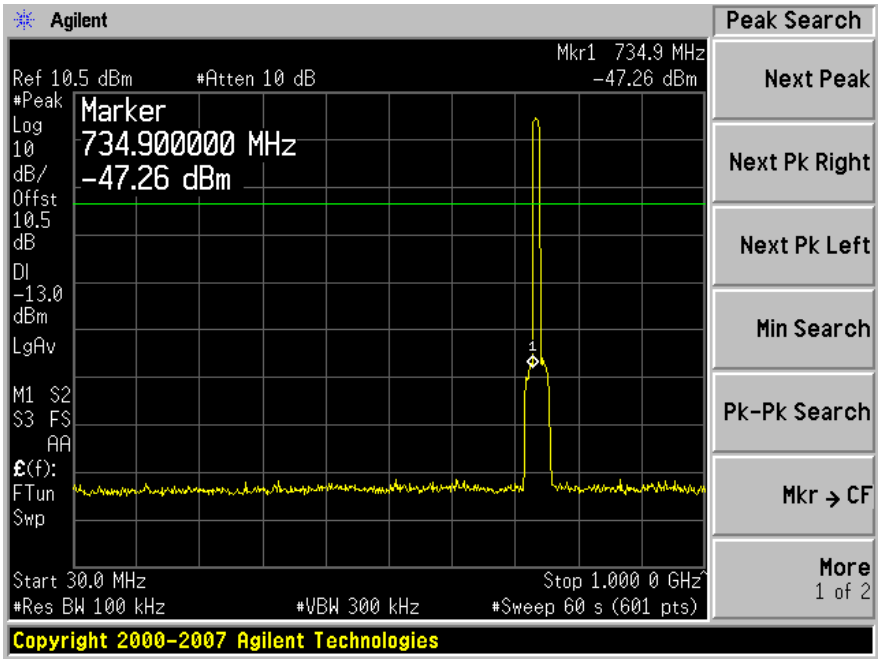


Plot 2: Above 1 GHz

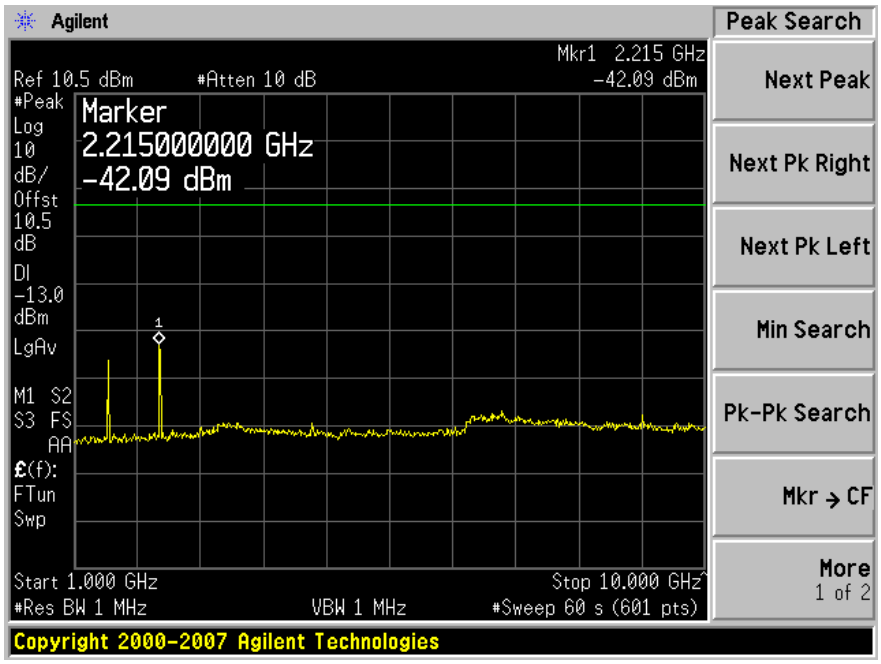


Modulation: 64 QAM, Frequency: 741 MHz

Plot 1: 30 MHz to 1 GHz

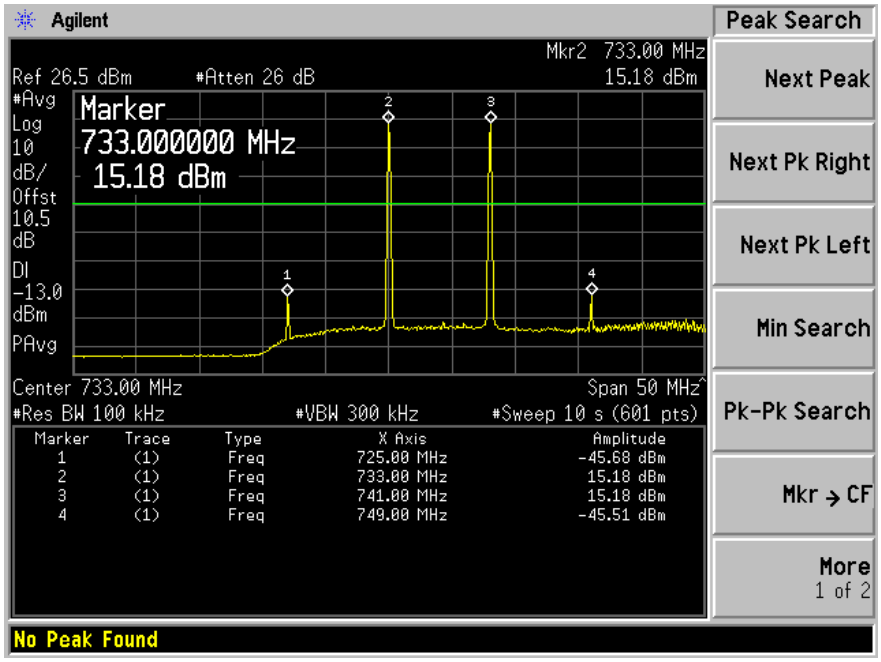


Plot 2: Above 1 GHz

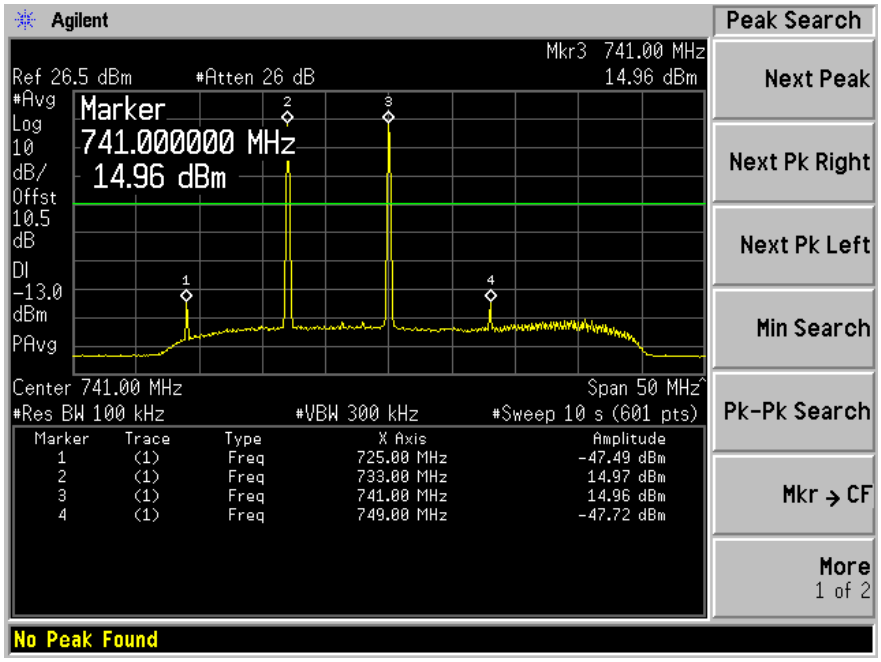


728-746 MHz Band, CW Inter-Modulation Antenna Port #1

Inter-Modulation Lowest Frequency



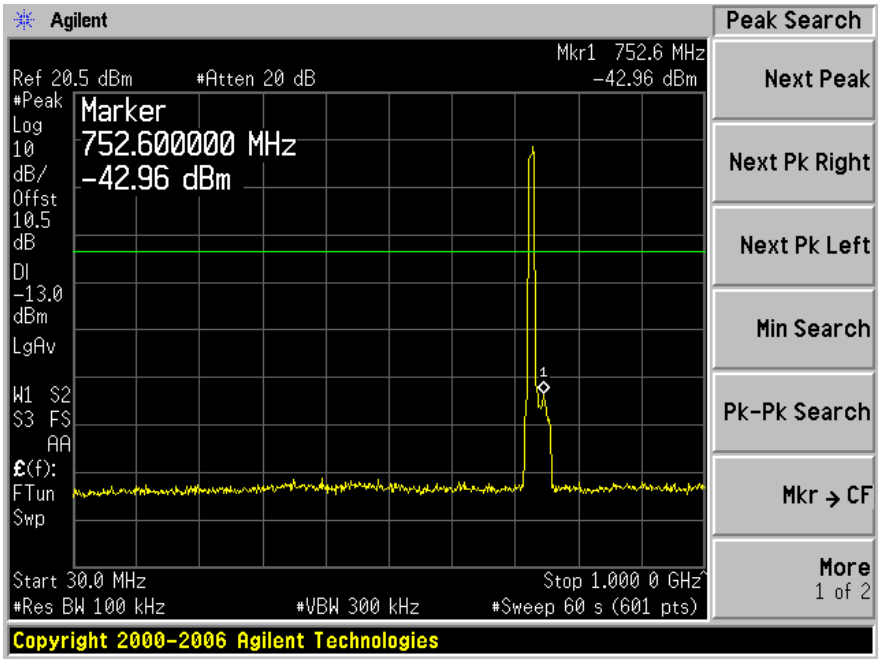
Inter-Modulation Highest Frequency



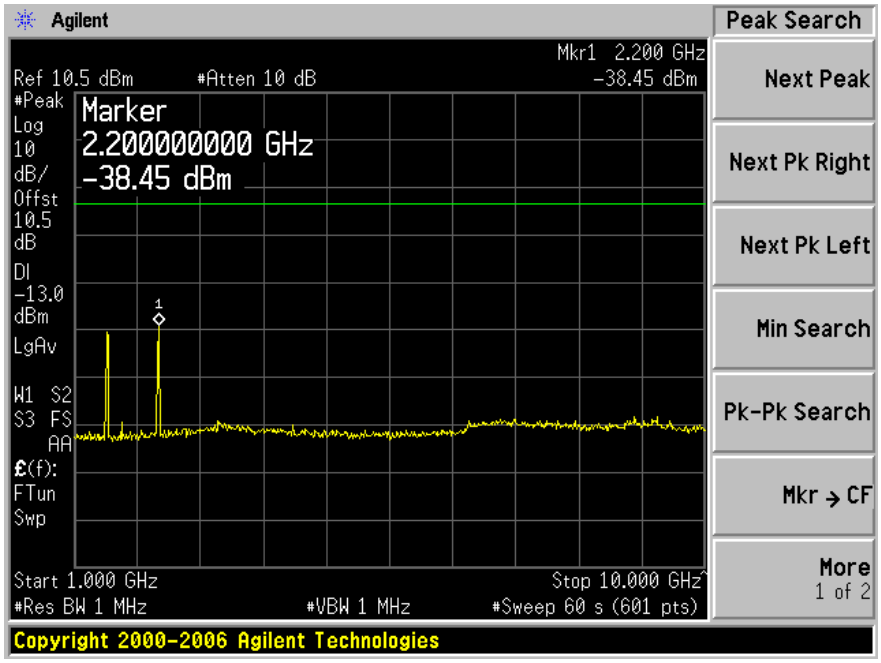
728-746 MHz Band, Antenna Port #2:

Modulation: QPSK, Frequency: 733 MHz

Plot 1: 30 MHz to 1 GHz

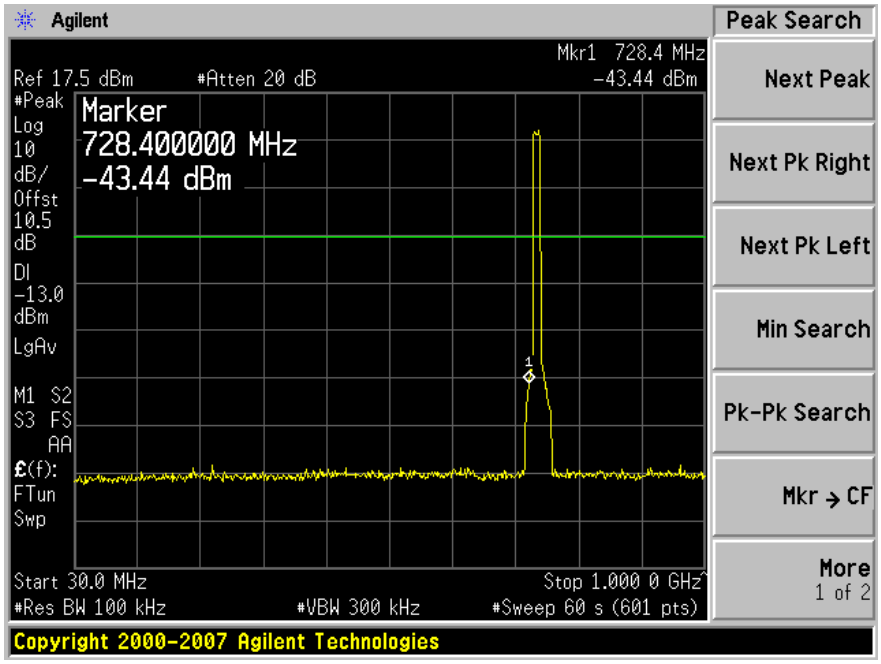


Plot 2: Above 1 GHz

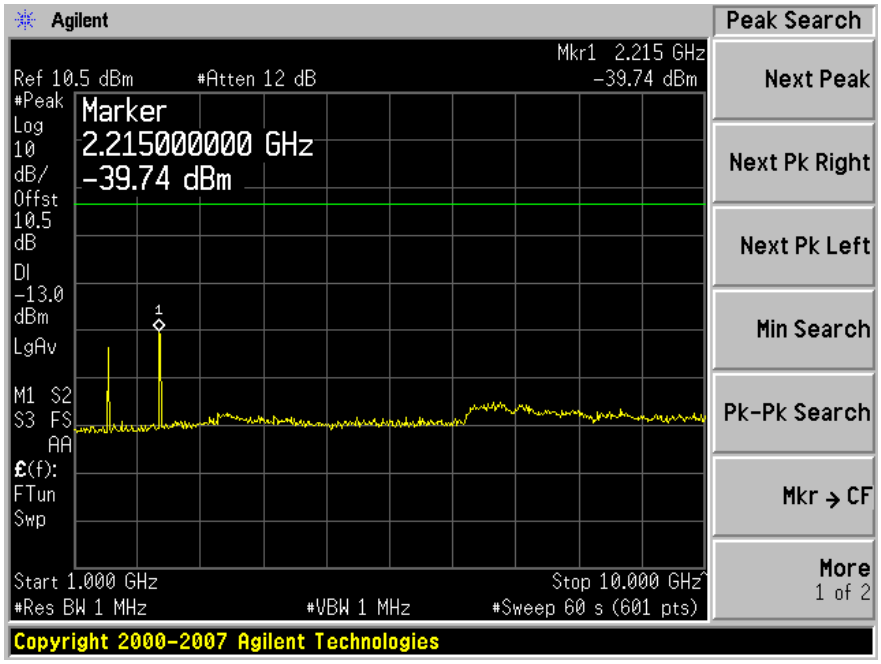


Modulation: QPSK, Frequency: 741 MHz

Plot 1: 30 MHz to 1 GHz

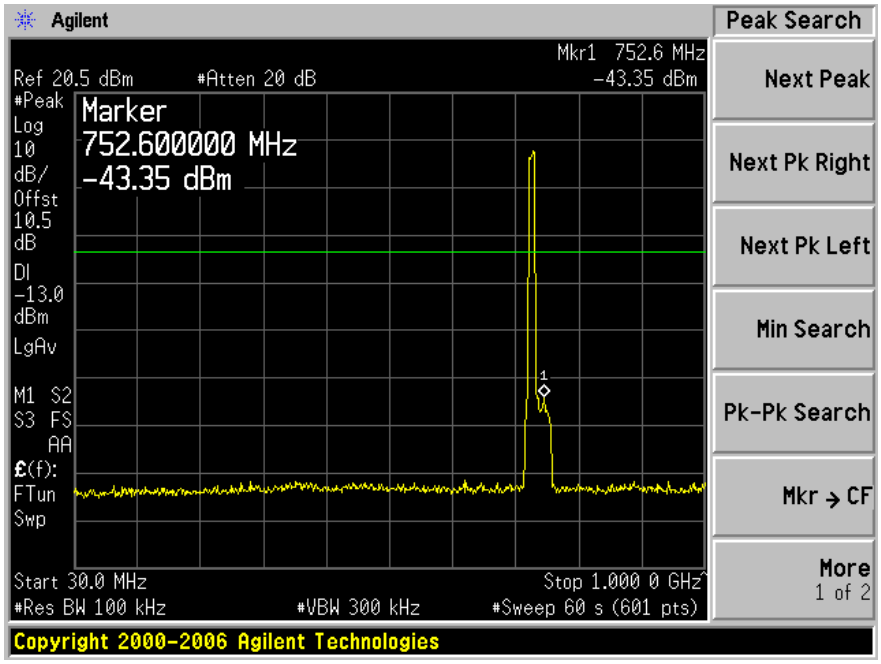


Plot 2: Above 1 GHz

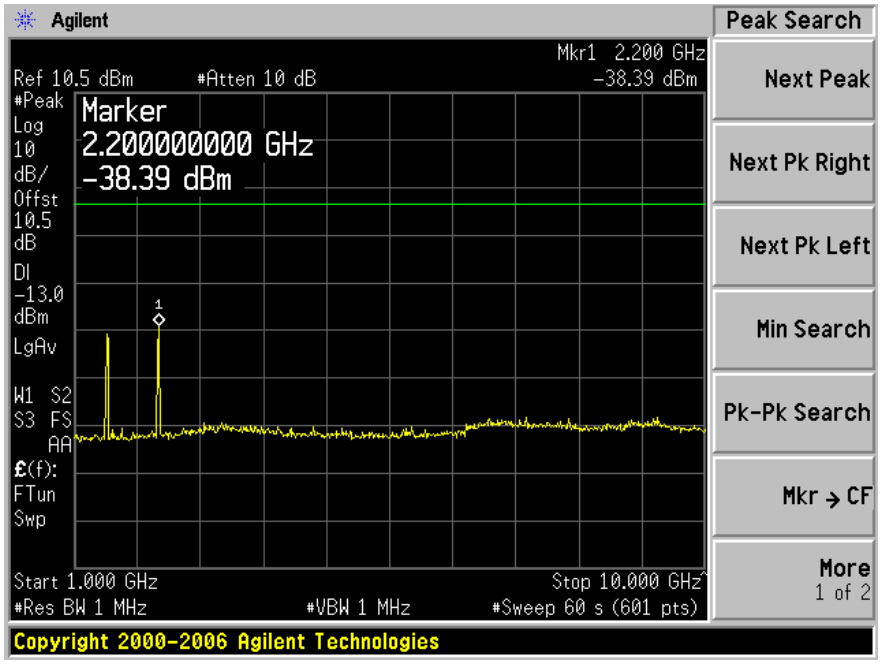


Modulation: 16 QAM, Frequency: 733 MHz

Plot 1: 30 MHz to 1 GHz

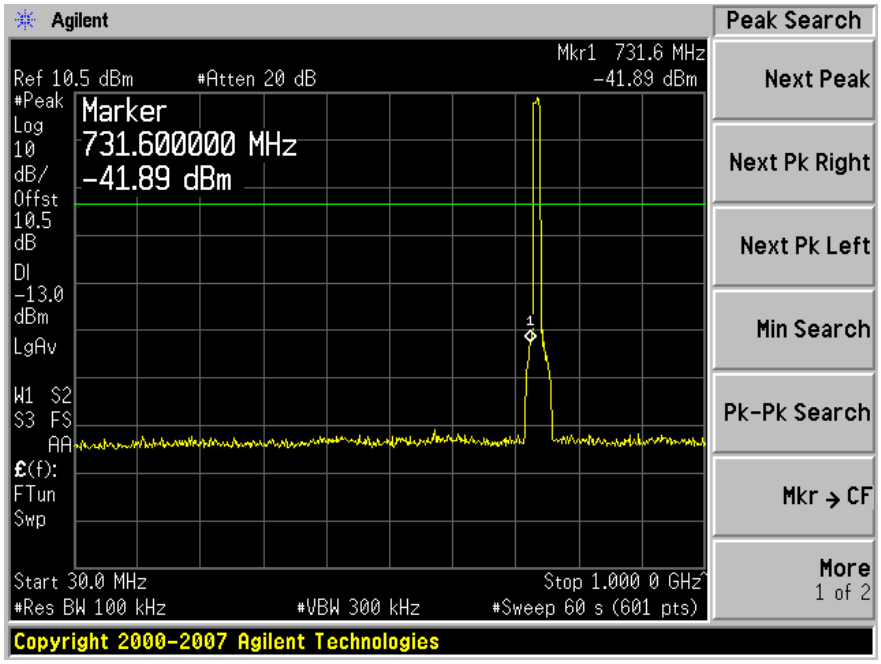


Plot 2: Above 1 GHz

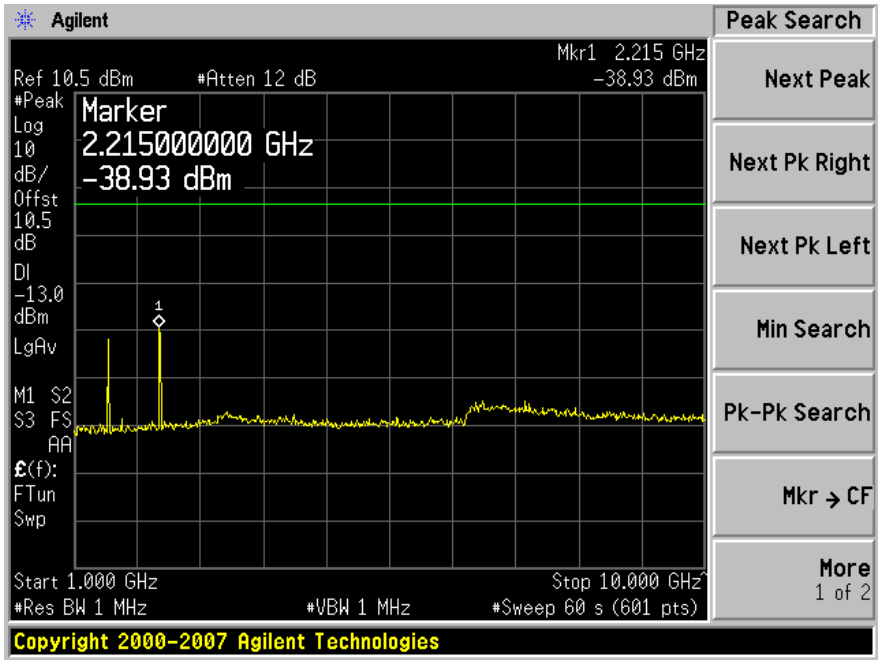


Modulation: 16 QAM, Frequency: 741 MHz

Plot 1: 30 MHz to 1 GHz

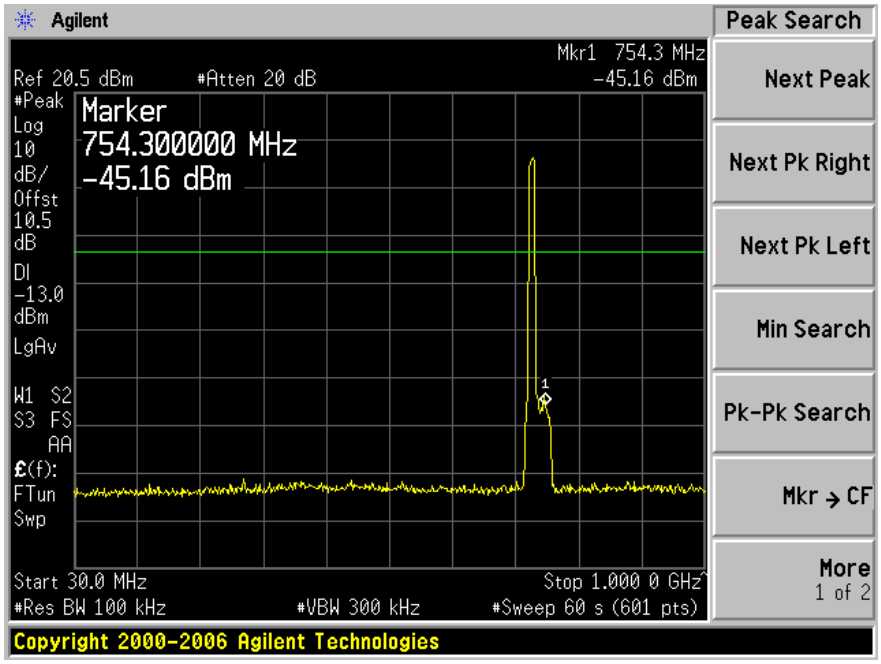


Plot 2: Above 1 GHz

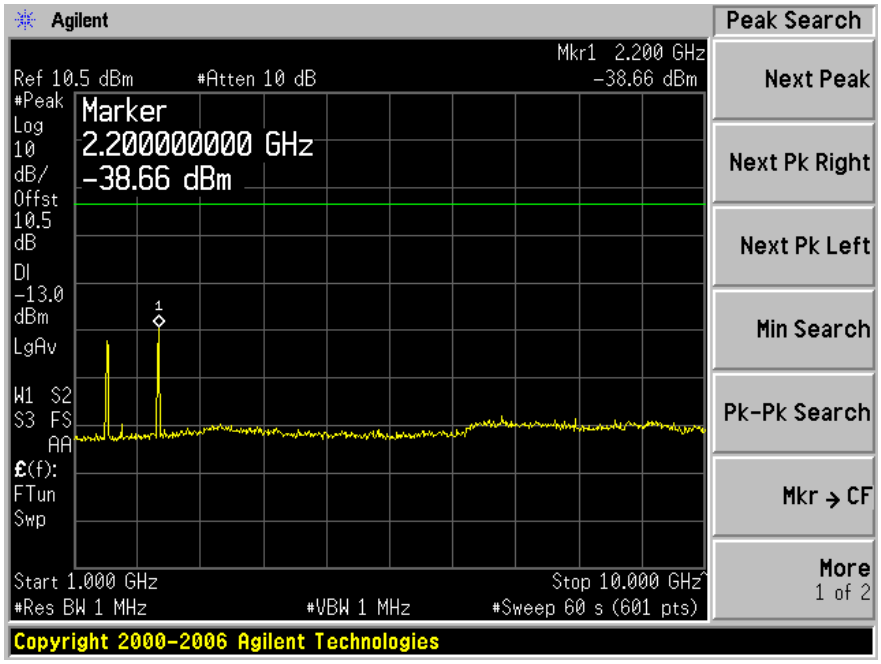


Modulation: 64 QAM, Frequency: 733 MHz

Plot 1: 30 MHz to 1 GHz

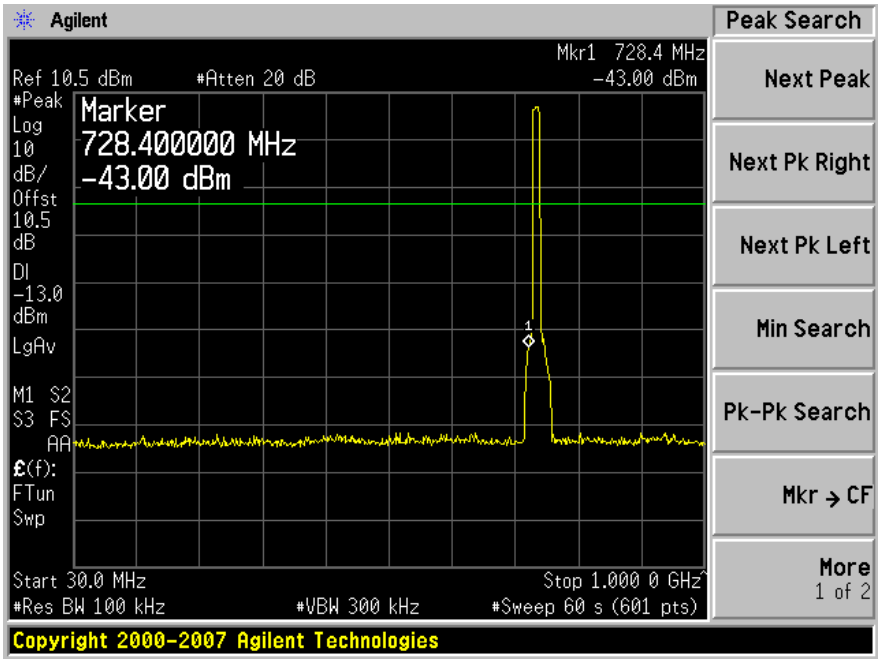


Plot 2: Above 1 GHz

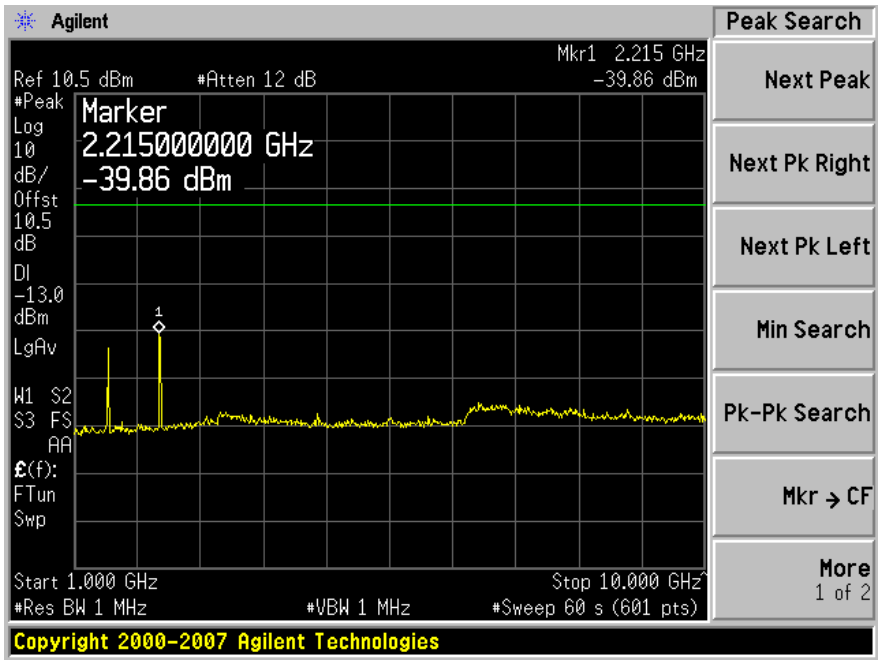


Modulation: 64 QAM, Frequency: 741 MHz

Plot 1: 30 MHz to 1 GHz

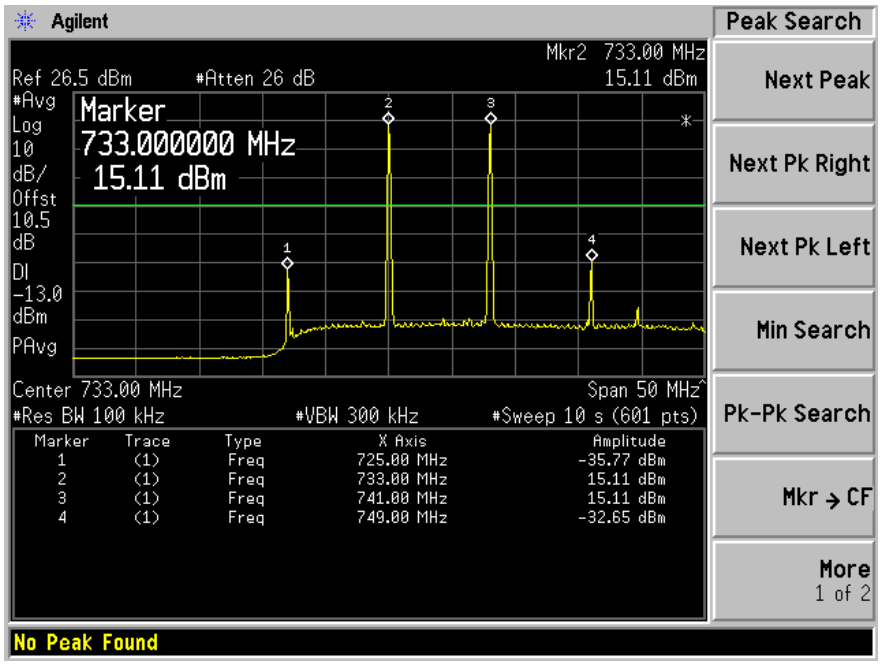


Plot 2: Above 1 GHz

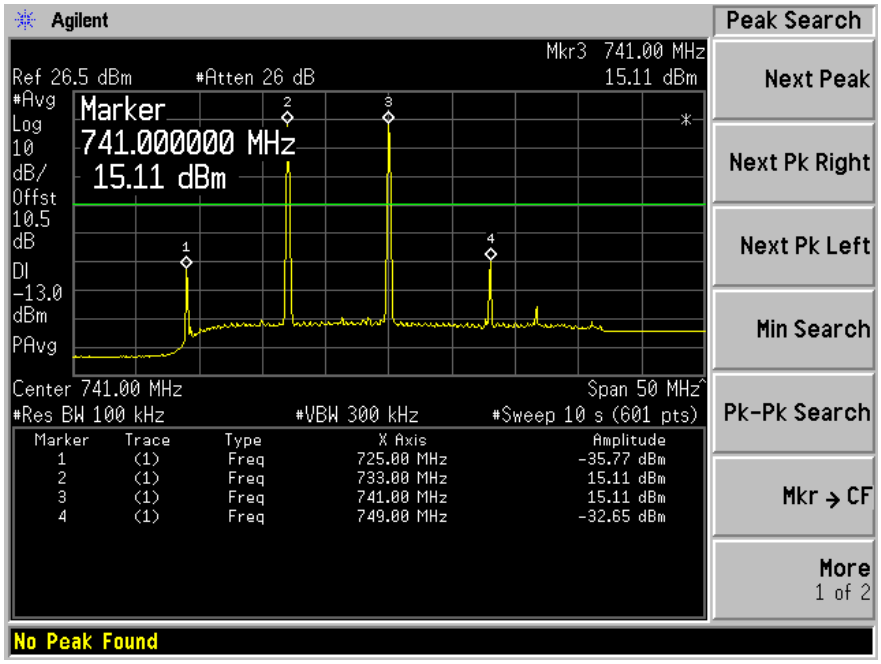


728-746 MHz Band, CW Inter-Modulation Antenna Port #2

Inter-Modulation Lowest Frequency



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:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102kPa

** The testing was performed by Dennis Huang from 2009-12-11 to 2009-12-15 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	MXG Vector Signal Generator	-	MY47420502	2009-9-18

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

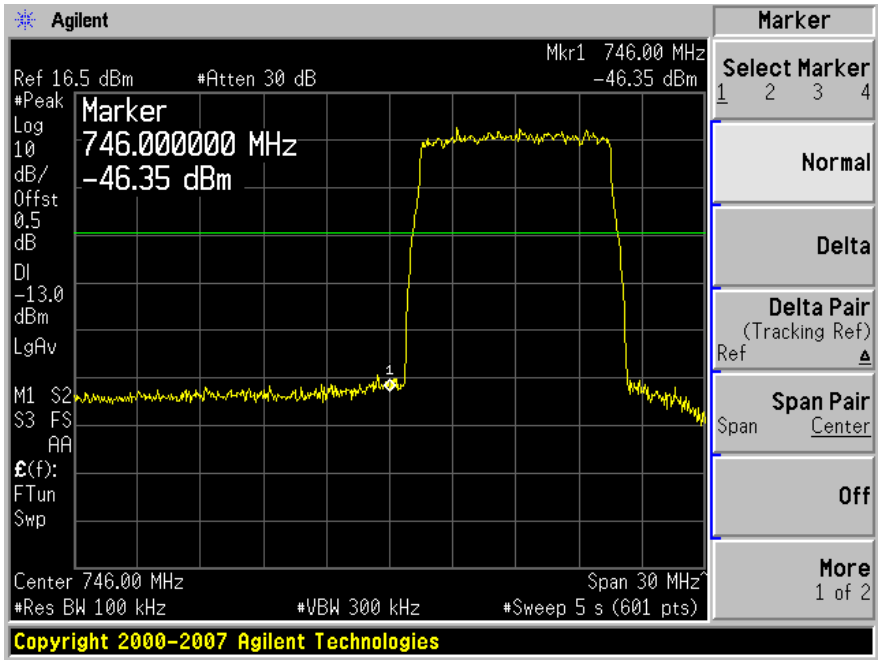
9.5 Test Results

Please refer to the following plots.

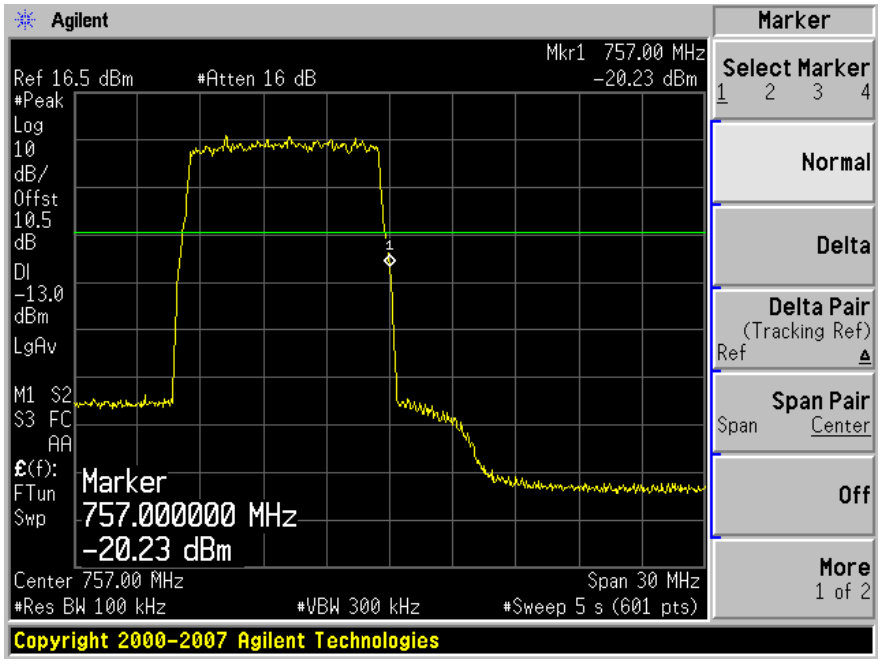
746-757 MHz Band, Antenna Port #1:

Modulation: QPSK

Plot 1: Lowest Edge

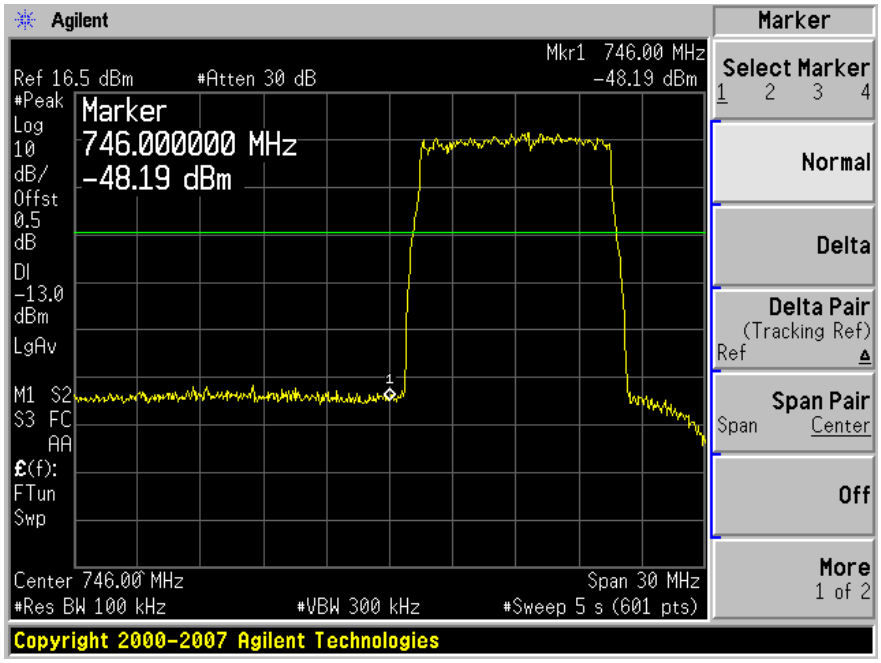


Plot 2: Highest Edge

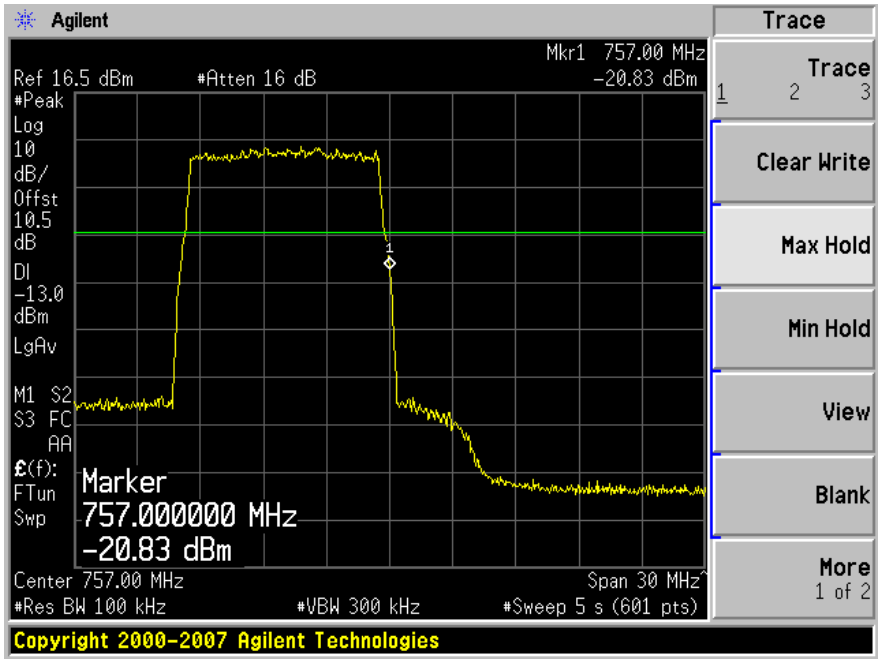


Modulation: 16 QAM

Plot 1: Lowest Edge

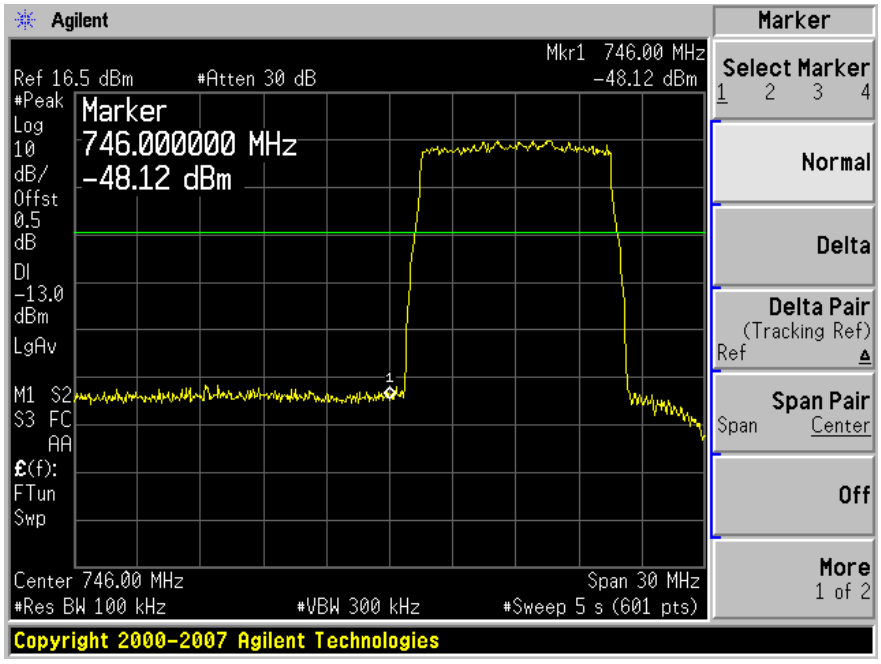


Plot 2: Highest Edge

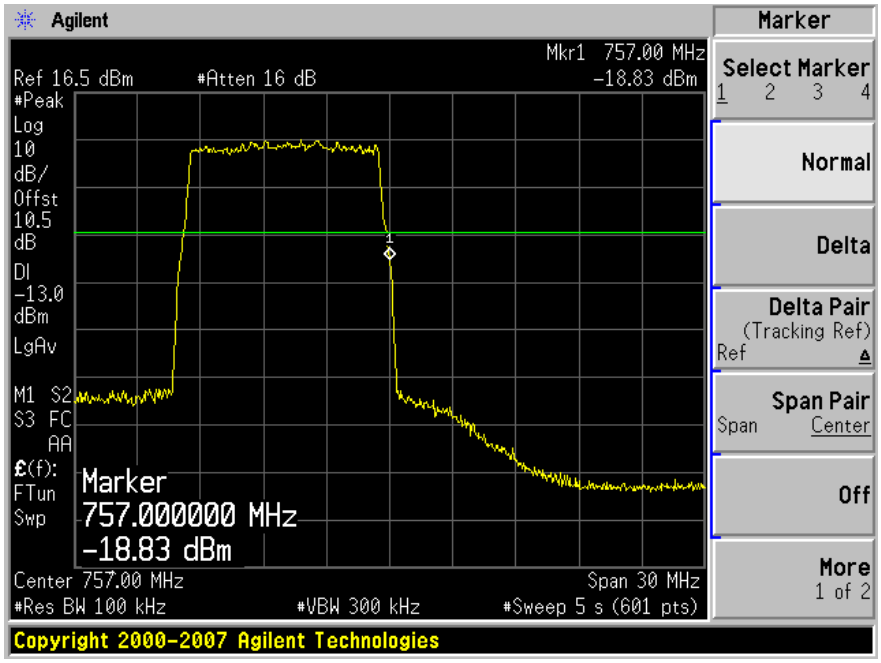


Modulation: 64 QAM

Plot 1: Lowest Edge



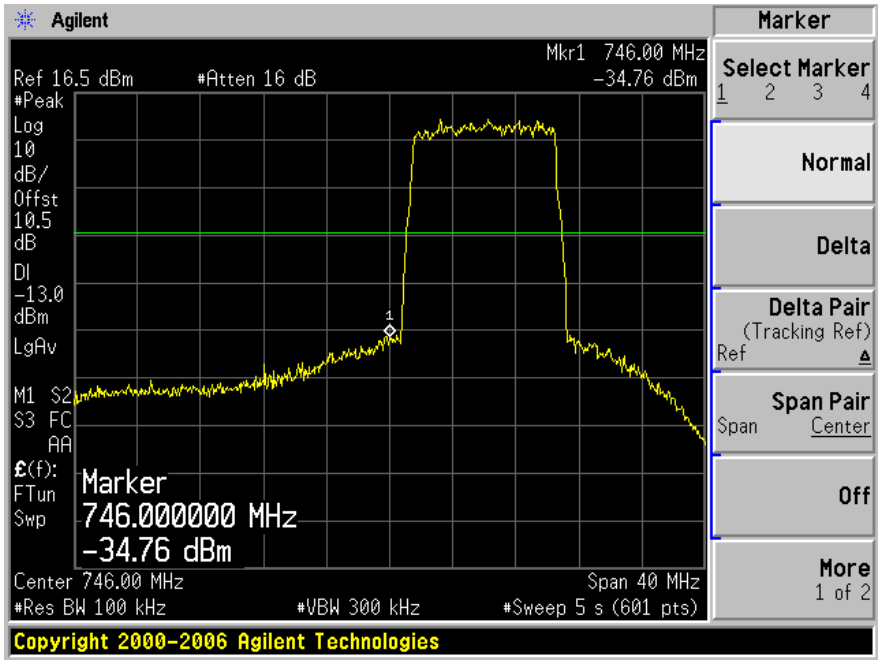
Plot 2: Highest Edge



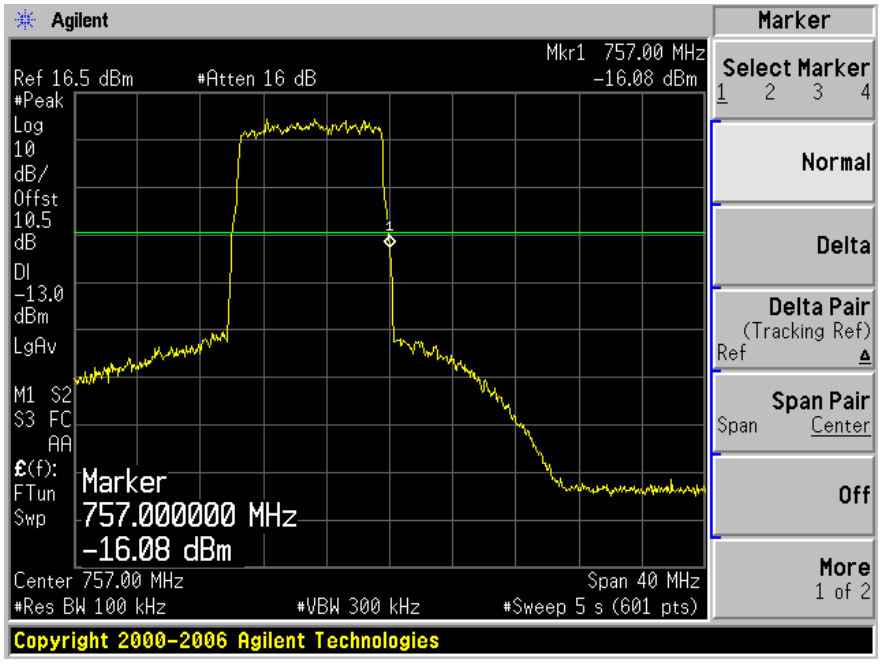
746-757 MHz Band, Antenna Port #2:

Modulation: QPSK

Plot 1: Lowest Edge

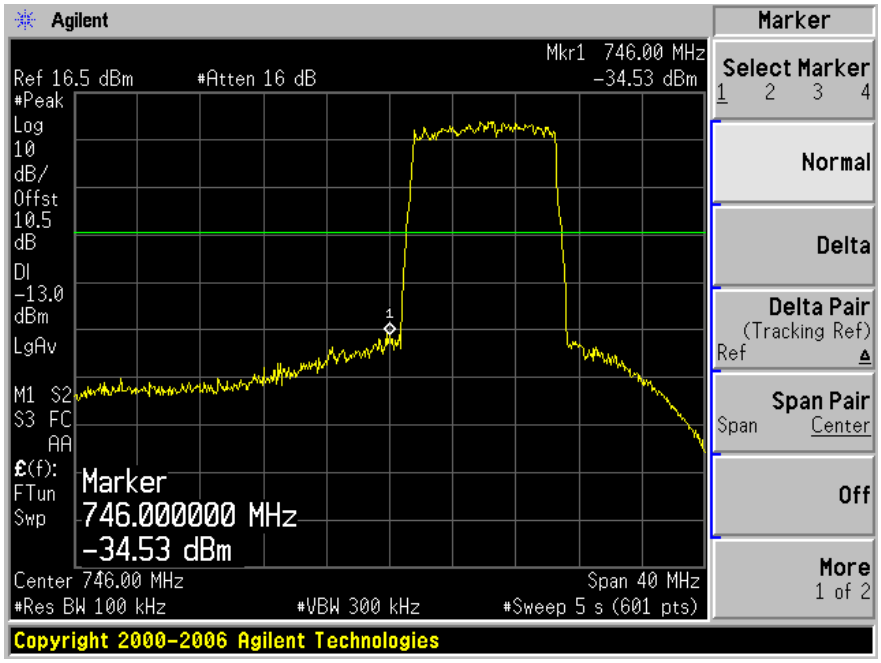


Plot 2: Highest Edge

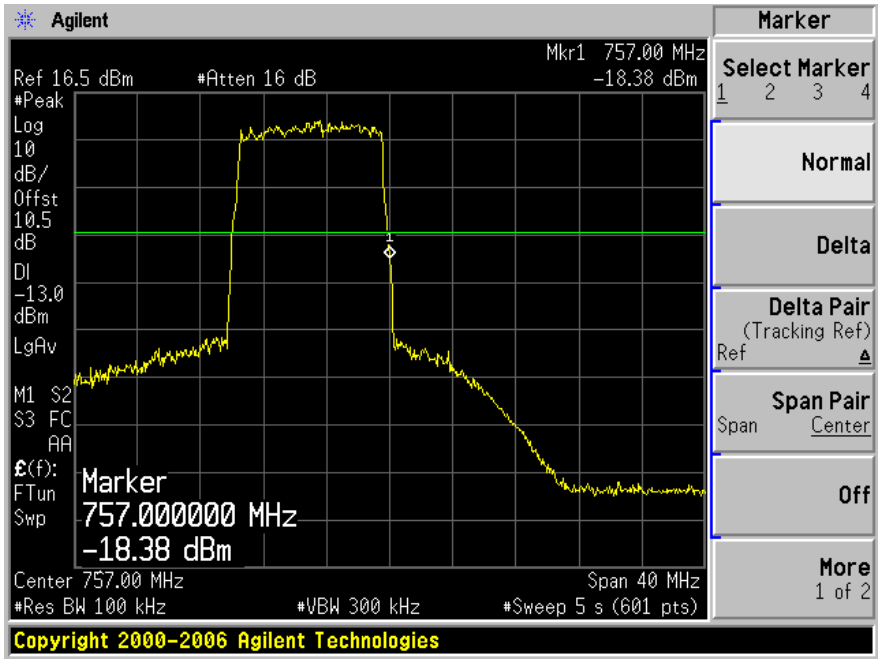


Modulation: 16 QAM

Plot 1: Lowest Edge

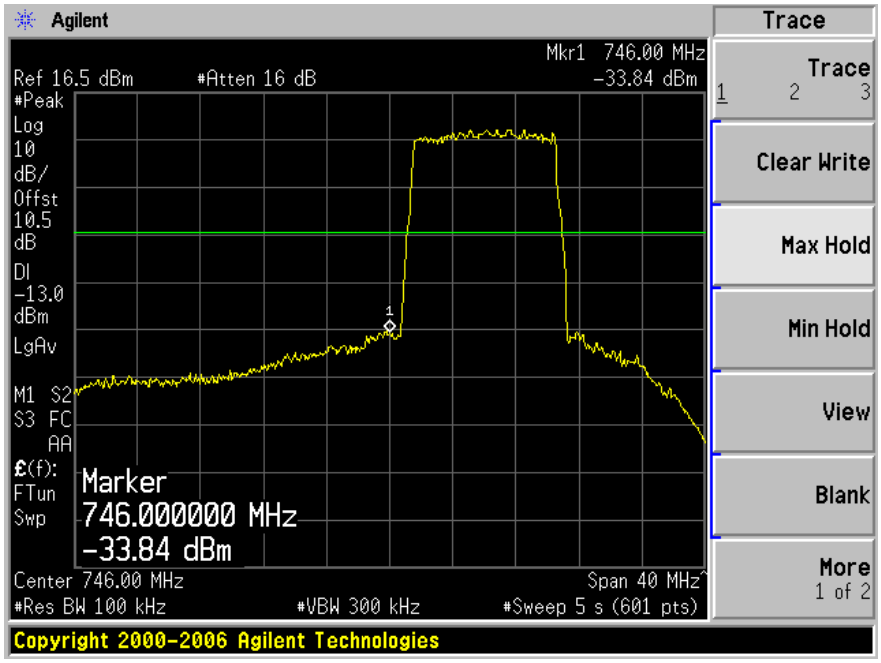


Plot 2: Highest Edge

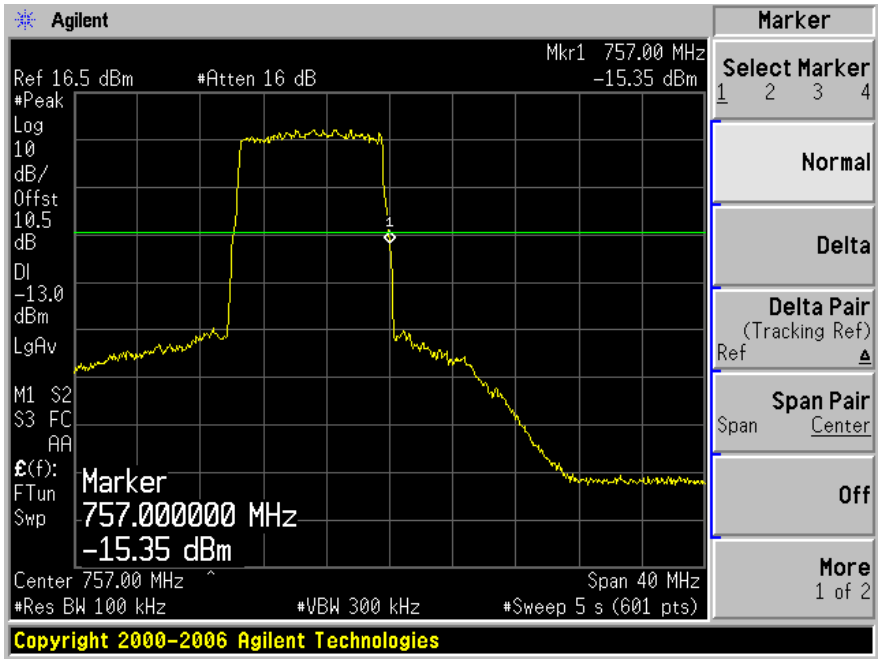


Modulation: 64 QAM

Plot 1: Lowest Edge



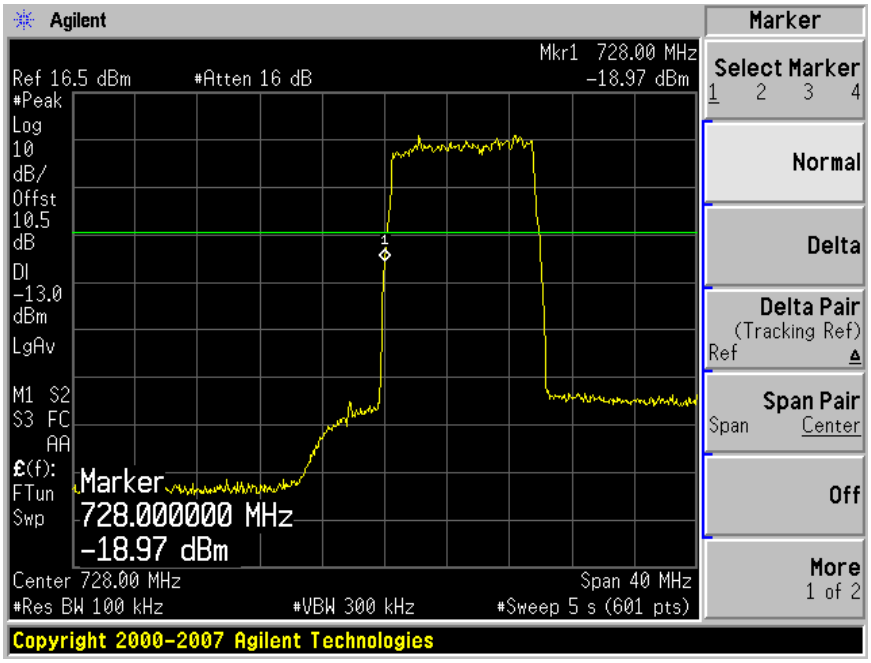
Plot 2: Highest Edge



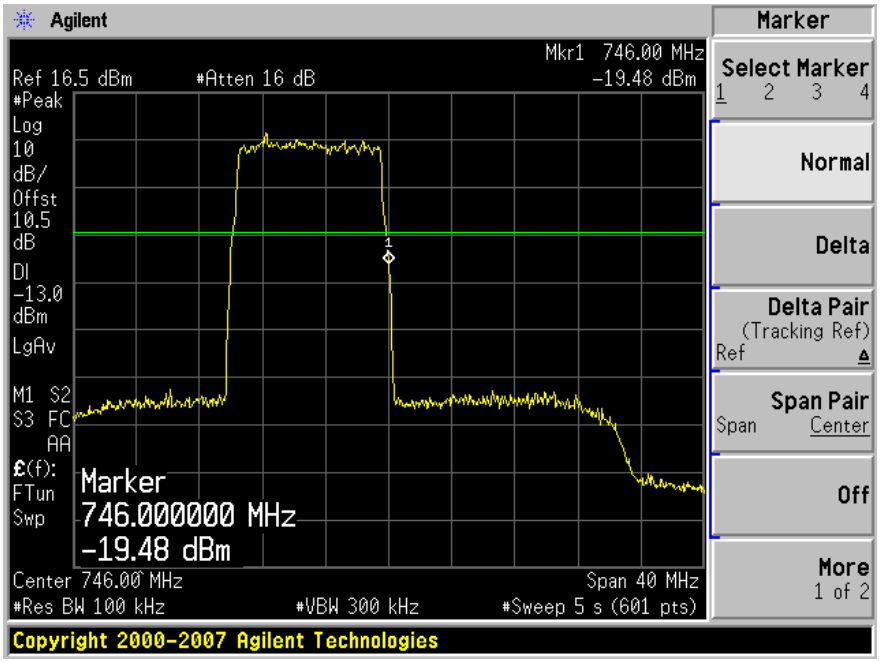
728-746 MHz Band, Antenna Port #1:

Modulation: QPSK

Plot 1: Lowest Edge

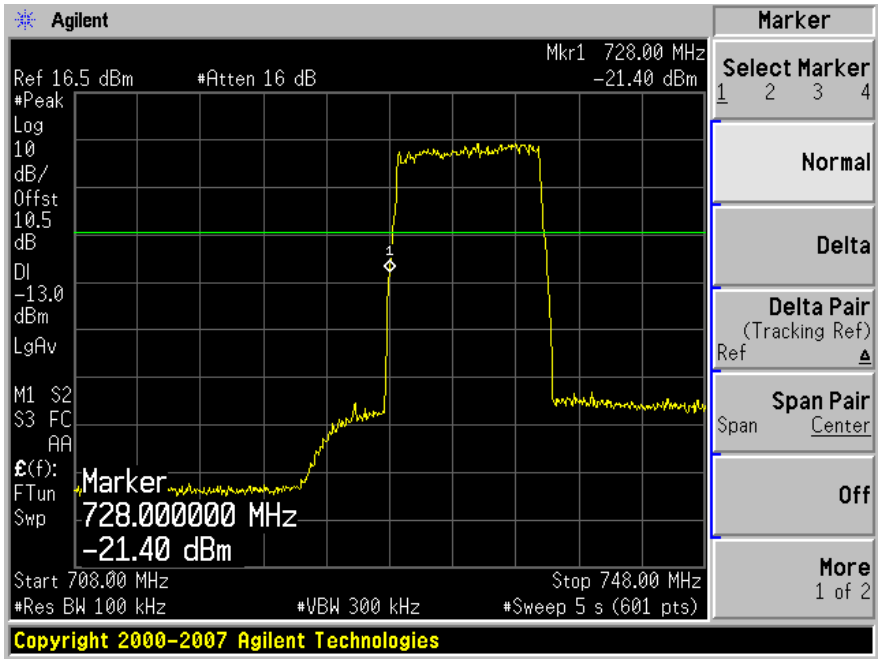


Plot 2: Highest Edge

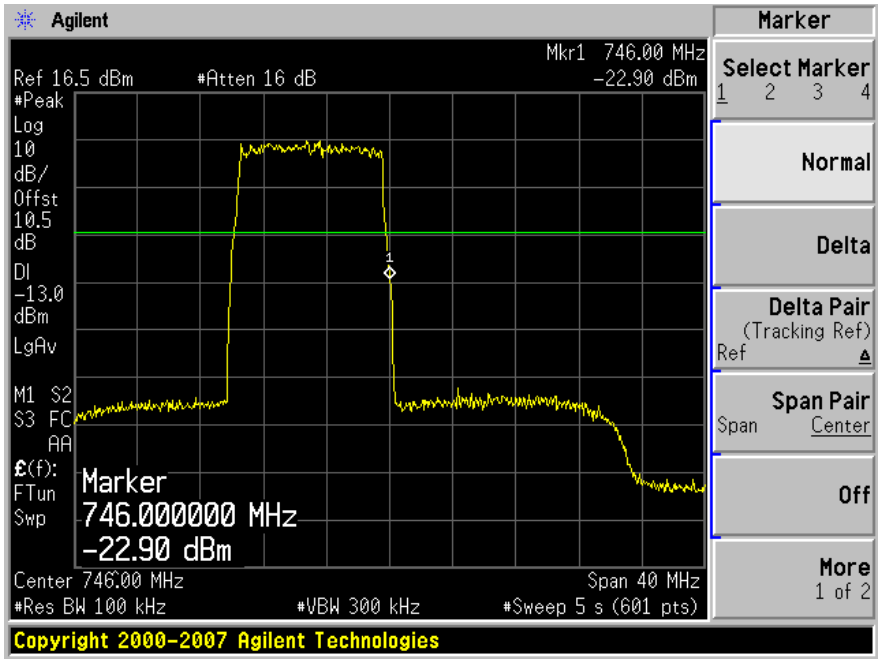


Modulation: 16 QAM

Plot 1: Lowest Edge

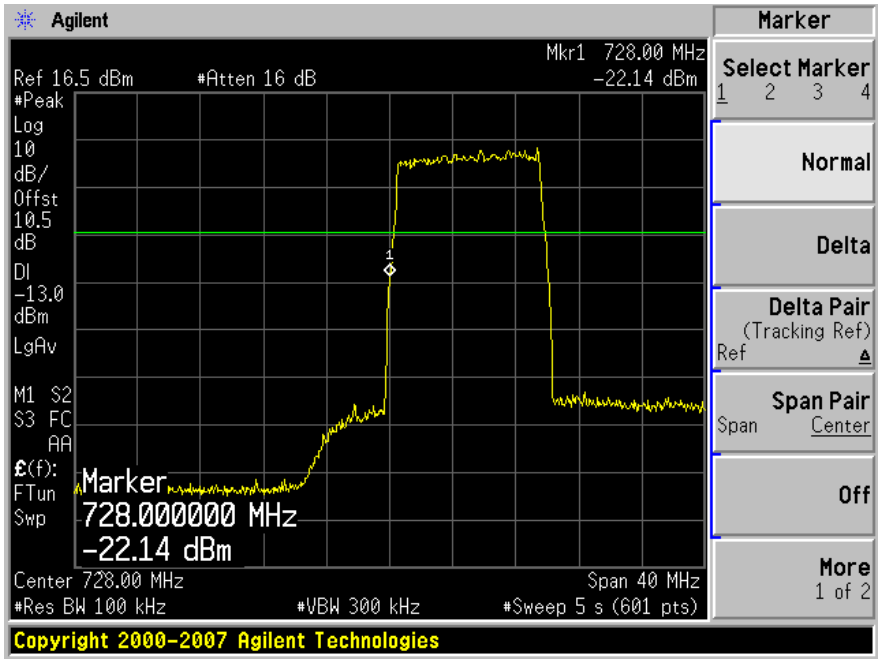


Plot 2: Highest Edge

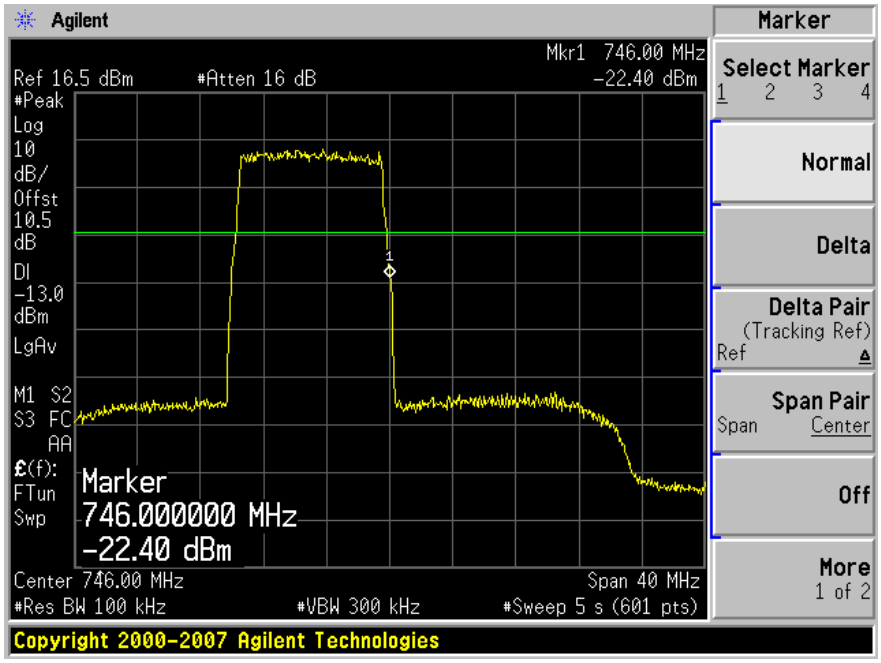


Modulation: 64 QAM

Plot 1: Lowest Edge



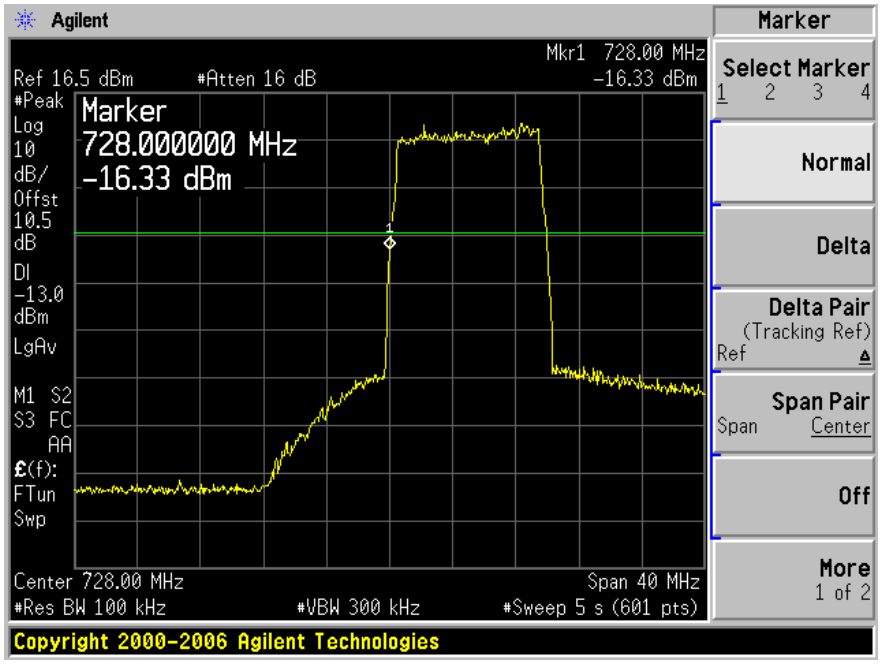
Plot 2: Highest Edge



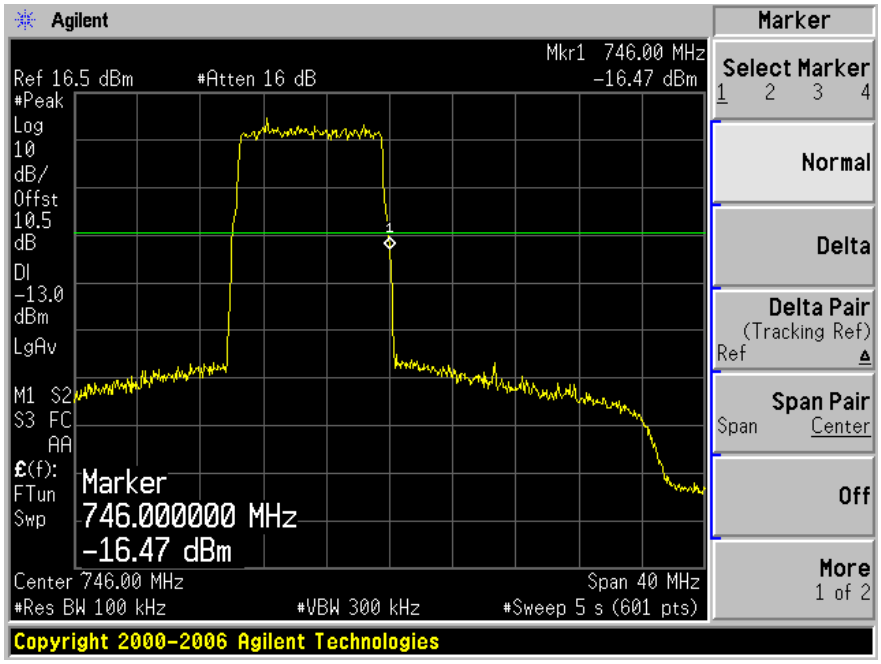
728-746 MHz Band, Antenna Port #2:

Modulation: QPSK

Plot 1: Lowest Edge

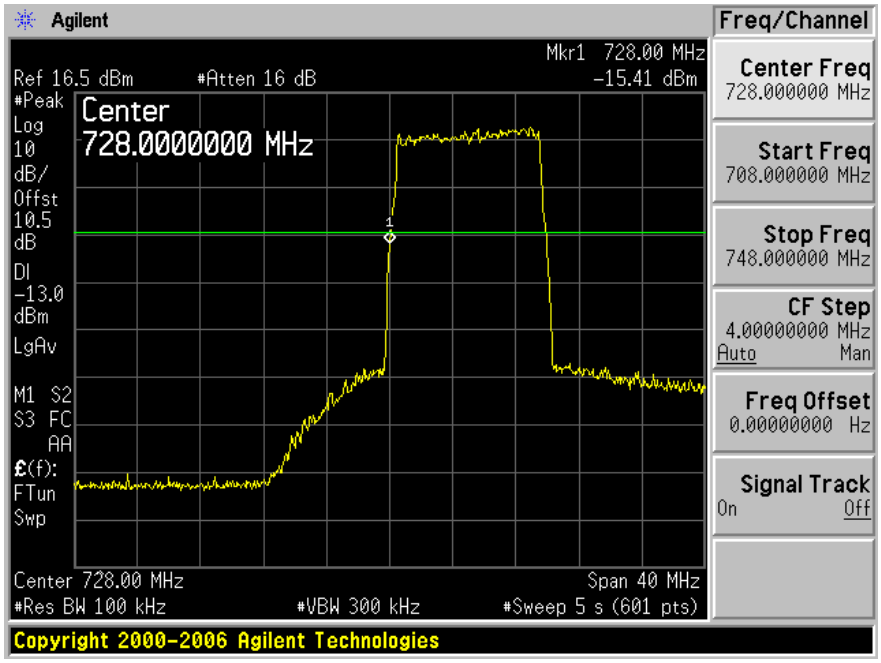


Plot 2: Highest Edge

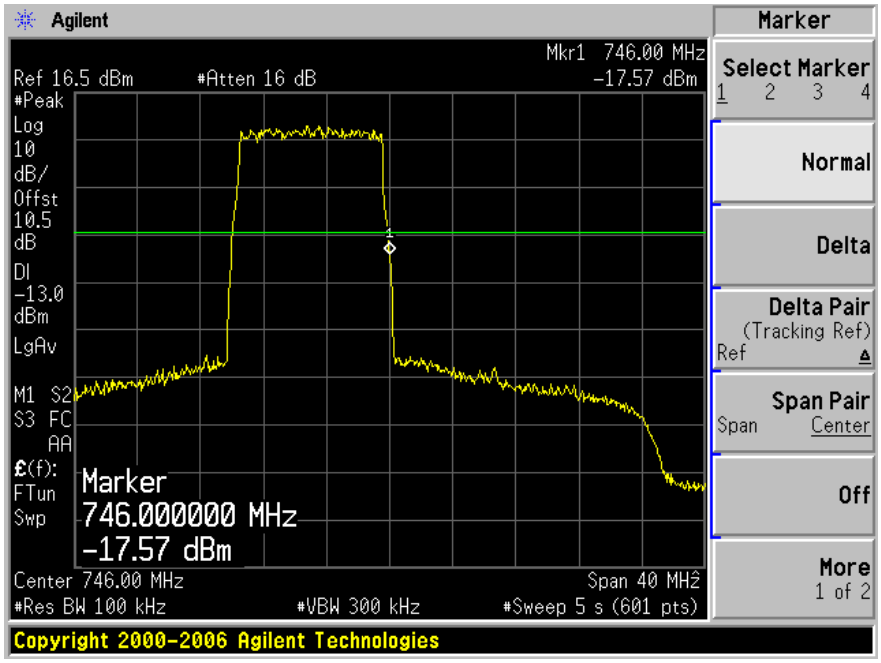


Modulation: 16 QAM

Plot 1: Lowest Edge

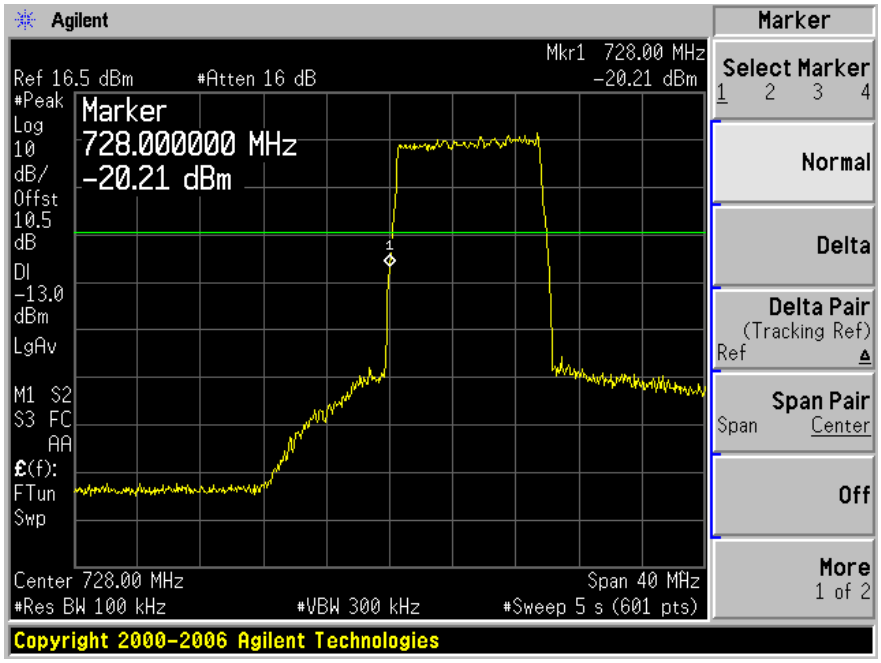


Plot 2: Highest Edge

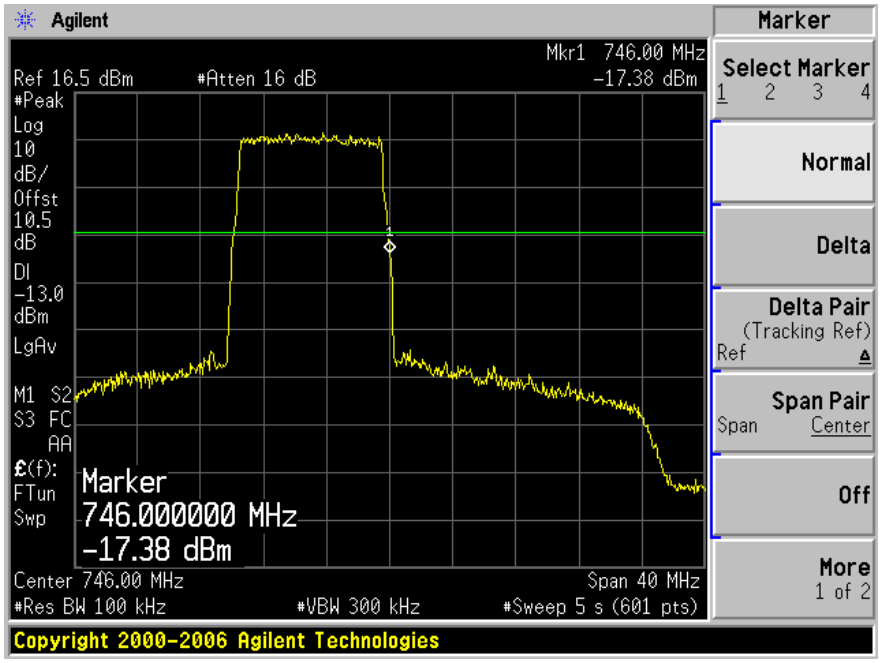


Modulation: 64 QAM

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:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102kPa

** The testing was performed by Dennis Huang on 2009-12-05 in RF Site.*

10.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13
Tenney	Temperature Oven	Versa Tenn	12.431-8	2009-12-20

*** 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.

746-757 MHz Band:

The EUT is tested at 752 MHz with CW, Antenna Port #1

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Frequency Error (ppm)
102	-140	-0.186170213
120	-135	-0.179521277
138	-140	-0.186170213

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
50	-120	-0.159574468
-20	-80	-0.106382979

The EUT is tested at 752 MHz with CW, Antenna Port #2

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Frequency Error (ppm)
102	-135	-0.179521277
120	-135	-0.179521277
138	-140	-0.186170213

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
50	-120	-0.159574468
-20	-115	-0.152925532

746-757 MHz Band:

The EUT is tested at 733 MHz with CW, Antenna Port #1

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Frequency Error (ppm)
102	-135	-0.184174625
120	-130	-0.177353342
138	-130	-0.177353342

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
50	-110	-0.150068213
-20	-100	-0.136425648

The EUT is tested at 733 MHz with CW, Antenna Port #2

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Frequency Error (ppm)
102	-125	-0.17053206
120	-130	-0.177353342
138	-130	-0.177353342

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
50	-115	-0.156889495
-20	-100	-0.136425648

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

Note: 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

Maximum peak output power at antenna input terminal (dBm):	15.08
Maximum peak output power at antenna input terminal (mW):	32.21
Prediction distance (cm):	20
Prediction frequency (MHz):	752
Antenna Gain, typical (dBi):	8.0
Maximum Antenna Gain (numeric):	6.310
Power density at predication frequency and distance (mW/cm^2):	0.0404
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5013

Test Result

For Downlink, the highest power density level at 20 cm is 0.0404mW/cm², which is below the uncontrolled exposure limit.

Note: Antenna gain is restricted to 1.5 Watt ERP (2.49 Watt EIRP) in order to satisfy RF exposure 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.