FCC 47 CFR PART 15 SUBPART E

TEST REPORT

For

802.11a/b/g/n access point

Model: HiveAP 320

Trade Name: Aerohive

Issued to

Aerohive Networks, Inc.

3150-C Coronado Drive Santa Clara, California 95054

Prepared by

COMPLIANCE CERTIFICATION SERVICES (KUNSHAN) INC.
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TESTING CERT #2541.01

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Testing Laboratory
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1. TEST RESULT CERTIFICATION

Applicant:	Aerohive Networks, Inc. 3150-C Coronado Drive Santa Clara, California 95054
Equipment Under Test:	802.11a/b/g/n access point
Trade Name:	Aerohive
Model:	HiveAP 320
Date of Test:	August 22,2008~February 11, 2009

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart E	No non-compliance noted

We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

Miro Chueh
EMC Manager
Compliance Certification Services Inc.

Reviewed by:

Lin Zhang
EMC Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	802.11a/b/g/n access point
Trade Name	Aerohive
Model Number	HiveAP 320
Frequency Range	5.15 ~5.25 GHz ， 5.25~5.35 GHz and 5.47~5.725 GHz
Transmit Power	IEEE 802.11a mode: 12. 65dBm draft 802.11n Standard-20 MHz Channel mode: 16.70dBm draft 802.11n Wide-40 MHz Channel mode: 19.09 dBm (the EUT transmitting and receiving with three antennas simultaneously working at n mode)
Modulation Technique	IEEE 802.11a mode: 54, 48, 36, 24, 18, 12, 9, 6 Mbps draft 802.11n Standard-20 MHz Channel mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps) draft 802.11n Wide-40 MHz Channel mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)
Number of Channels	IEEE 802.11a mode: 5150~5250MHz：4 CH 5250 ~ 5350 MHz: 4 CH 5470 ~ 5725 MHz: 11 CH draft 802.11n Standard-20 MHz Channel mode: 5150~5250MHz：4 CH 5250 ~ 5350 MHz: 4 CH 5470 ~ 5725 MHz: 11 CH draft 802.11n Standard-40 MHz Channel mode: 5150~5250MHz：2CH 5250 ~ 5350 MHz: 2 CH 5470 ~ 5725 MHz: 5 CH
Antenna Specification	Three antennas for 5 GHz Gain 3 dBi (total gain 7.77dBi)
Antenna designation	Three TX&RX diversity dual-band Puck antennas for 5GHz

Operation Frequency:

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)	
CHANNEL	**MHz**
36	5180（802.11a mode/802.11n Standard-20 MHz Channel mode）
38	5190（802.11n Standard-40 MHz Channel mode）
42	5200（802.11a mode/802.11n Standard-20 MHz Channel mode）
44	5220（802.11a mode/802.11n Standard-20 MHz Channel mode）
46	5230（802.11n Standard-40 MHz Channel mode）
48	5240（802.11a mode/802.11n Standard-20 MHz Channel mode）
52	5260（802.11a mode/802.11n Standard-20 MHz Channel mode）
54	5270（802.11n Standard-40 MHz Channel mode）
56	5280（802.11a mode/802.11n Standard-20 MHz Channel mode）
60	5300（802.11a mode/802.11n Standard-20 MHz Channel mode）
62	5310（802.11n Standard-40 MHz Channel mode）
64	5320（802.11a mode/802.11n Standard-20 MHz Channel mode）
100	5500（802.11a mode/802.11n Standard-20 MHz Channel mode）
102	5510（802.11n Standard-40 MHz Channel mode）
104	5520（802.11a mode/802.11n Standard-20 MHz Channel mode）
108	5540（802.11a mode/802.11n Standard-20 MHz Channel mode）
112	5560（802.11a mode/802.11n Standard-20 MHz Channel mode）
116	5580（802.11a mode/802.11n Standard-20 MHz Channel mode）
118	5590（802.11n Standard-40 MHz Channel mode）
120	5600（802.11a mode/802.11n Standard-20 MHz Channel mode）
122	5610（802.11a mode/802.11n Standard-40 MHz Channel mode）
124	5620（802.11a mode/802.11n Standard-20 MHz Channel mode）
128	5640（802.11a mode/802.11n Standard-20 MHz Channel mode）
130	5650（802.11a mode/802.11n Standard-40 MHz Channel mode）
132	5660（802.11a mode/802.11n Standard-20 MHz Channel mode）
134	5670（802.11n Standard-40 MHz Channel mode）
136	5680（802.11a mode/802.11n Standard-20 MHz Channel mode）
140	5700（802.11a mode/802.11n Standard-20 MHz Channel mode）

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **WBV-HIVEAP320DFS**filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.*

3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 Radiated testing was performed at an antenna to EUT distance 3 meters.

EUT CONFIGURATION

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

EUT EXERCISE

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

Radiated Emissions

The EUT is placed on the turntable, which is 0.8 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

DESCRIPTION OF TEST MODES

The EUT transmitting and receiving with one (chain 0) antenna working at a mode, so one antenna working configuration was used for a mode testing in this report.

The EUT transmitting and receiving with three antennas simultaneously working at n mode, so 3x3 configuration was used for all testing in this report.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

IEEE 802.11a mode:

Channel Low (5180MHz), Channel Mid (5200MHz) and Channel High (5240MHz) with 6Mbps data rate were chosen for full testing.

Channel Low (5260MHz), Channel Mid (5300MHz) and Channel High (5320MHz) with 6Mbps data rate were chosen for full testing.

Channel Low (5500MHz), Channel Mid (5600MHz) and Channel High (5700MHz) with 6Mbps data rate were chosen for full testing

draft 802.11n Standard-20 MHz Channel mode:

Channel Low (5180MHz), Channel Mid (5200MHz) and Channel High (5240MHz) with 6.5Mbps data rate were chosen for full testing.

Channel Low (5260MHz), Channel Mid (5300MHz) and Channel High (5320MHz) with 6.5Mbps data rate were chosen for full testing.

Channel Low (5500MHz), Channel Mid (5600MHz) and Channel High (5700MHz) with 6.5Mbps data rate were chosen for full testing

draft 802.11n Wide-40 MHz Channel mode:

Channel Low (5190MHz)and Channel Mid (5230MHz) with 13.5Mbps data rate were chosen for full testing.

Channel Low (5270MHz)and Channel Mid (5310MHz) with 13.5Mbps data rate were chosen for full testing.

Channel Low (5510MHz), Channel Mid (5590MHz) and Channel High (5670MHz) with 13.5Mbps data rate were chosen for full testing.

The following test mode was scanned during the preliminary test:

Mode 1: Wall, ceiling mounting, set the EUT vertically on the table top with power from AC power.

Mode 2: Wall, ceiling mounting, set the EUT vertically on the table top With power from Ethernet .

Mode 3: Table top mounting, set the EUT horizontally on the table top with power from AC power.

Mode 4: Table top mounting, set the EUT horizontally on the table top With power from Ethernet.

After the preliminary scan, the following test mode was found to produce the highest emission level.

Mode 3: Table top mounting, set the EUT horizontally on the table top with power from AC power.

Then, the EUT configuration and cable configuration of the above highest emission mode was recorded for all final test items.

4. INSTRUMENT CALIBRATION

MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY43360131	01/30/2010
3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	08/01/2009
Test Receiver	Rohde&Schwarz	ESCI	100064	11/13/2009
Switch Controller	TRC	Switch Controller	SC94050010	05/04/2009
4 Port Switch	TRC	4 Port Switch	SC94050020	05/04/2009
Horn-Antenna	TRC	HA-0502	06	06/05/2009
Horn-Antenna	TRC	HA-0801	04	06/20/2009
Horn-Antenna	TRC	HA-1201A	01	07/09/2009
Horn-Antenna	TRC	HA-1301A	01	07/17/2009
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/29/2009
SHF-EHF Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170171	04/12/2009
Loop antenna	A.R.A	PLA-1030/B	1026	05/08/2009
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R.
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R.
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R.
Site NSA	CCS	N/A	FCC: 965860 IC: IC 6106	09/25/2009
Test S/W	LABVIEW (V 6.1)			

Remark: *The measurement uncertainty is less than +/-2.0065dB (30MHz ~ 1GHz), +/-3.0958dB (Above 1GHz) which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

Powerline Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI TEST RECEIVER 9kHz-30MHz	ROHDE & SCHWARZ	ESHS30	828144/003	10/31/2009
TWO-LINE V-NETWORK 9kHz-30MHz	SCHAFFNER	NNB41	03/10013	06/12/2009
LISN 10kHz-100MHz	EMCO	3825/2	9106-1809	04/01/2009
Test S/W	LABVIEW (V 6.1)			

Remark: *The measurement uncertainty is less than +/- 2.81dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

Dynamic Frequency Selection				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Rohde&Schwarz	FSEK 30	100264	02/19/2010
Signal Generator	Agilent	E8267C	US42340162	12/05/2009

5. FACILITIES AND ACCREDITATIONS

FACILITIES

All measurement facilities used to collect the measurement data are located at
CCS China Kunshan Lab at 10#Weiye Rd, Innovation Park Eco. & Tec. Development Zone

Kunshan city JiangSu, (215300), CHINA.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	47 CFR FCC Part 15/18 (using ANSI C63.4:2003)； VCCI V3; CNS 13438; CNS 13439; CNS 13803; CISPR 11; EN 55011; CISPR 13; EN 55013; CISPR 22:2005; CISPR 22:1997 +A1 :2000+A2 :2002； EN 55022:2006; EN55022 :1998 +A1 :2001+A2 :2003； EN 61000-6-3 (excluding discontinuous interference); EN 61000-6-4; AS/NZS CISPR 22； CAN/CSA-CEI/IEC CISPR 22；EN 61000-3-2；EN 61000-3-3；EN550024； EN 61000-4-2； EN 61000-4-3；EN61000-4-4；EN 61000-4-5； EN 61000-4-6；IEC 61000-4-8；EN 61000-4-11； IEC61000-3-2；IEC61000-3-3；IEC 61000-4-2； IEC 61000-4-3；IEC 61000-4-4； IEC 61000-4-5； IEC 61000-4-6；IEC 61000-4-8；IEC 61000-4-11； EN 300 220-3; EN 300 328; EN 300 330-2; EN 300 440-1; EN 300-440-2; EN 300 893; EN 301 489-01; EN 301 489-3; EN 301 489-07; EN 301 489-17； 47 CFR FCC Part 15, 22, 24	A2LA ACCREDITED TESTING CERT #2541.01
USA	FCC	3/10 meter Sites to perform FCC Part 15/18 measurements	FC 238958,424105
Japan	VCCI	3/10 meter Sites and conducted test sites to perform radiated/conducted measurements	VCCI R-1600 C-1707

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6. SETUP OF EQUIPMENT UNDER TEST

SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID
1.	Notebook pc	IBM	X31	32P4413	DOC
2.	Notebook pc	DELL	4150	CN-04P20	DOC

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

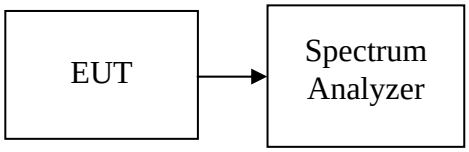
7. FCC PART 15 REQUIREMENTS

26 DB EMISSION BANDWIDTH

LIMIT

According to §15.303(c), for purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW > 1%EBW, VBW > RBW, Span >26dB bandwidth, and Sweep = auto.
4. Mark the peak frequency and –26dB (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5180	22.961
Mid	5200	22.336
High	5240	21.315

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	22.566
Mid	5300	21.313
High	5320	22.651

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5500	21.396
Mid	5600	22.071
High	5700	22.833

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5180	23.786
Mid	5200	23.464
High	5240	23.921

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	23.636
Mid	5300	23.056
High	5320	23.318

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5500	22.983
Mid	5600	23.193
High	5700	23.359

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5180	23.532
Mid	5200	23.108
High	5240	23.412

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	22.538
Mid	5300	23.557
High	5320	23.604

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5500	22.787
Mid	5600	23.966
High	5700	23.004

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 2

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5180	22.474
Mid	5200	23.391
High	5240	23.165

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	23.399
Mid	5300	23.427
High	5320	23.542

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5500	23.619
Mid	5600	22.338
High	5700	22.847

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5190	45.984
High	5230	45.515

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5270	46.168
High	5310	45.818

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5510	44.166
Mid	5590	45.756
High	5670	43.967

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5190	45.102
High	5230	44.745

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5270	45.569
High	5310	45.413

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5510	45.484
Mid	5590	43.403
High	5670	44.410

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 2

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5190	45.601
High	5230	45.842

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5270	45.593
High	5310	44.111

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5510	44.986
Mid	5590	45.710
High	5670	46.118

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0+ Chain 1 +Chain 2

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5180	24.016
Mid	5200	23.816
High	5240	23.073

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5260	22.915
Mid	5300	22.600
High	5320	24.253

5470~5725MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5500	22.884
Mid	5600	22.834
High	5700	23.465

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0+ Chain 1 +Chain 2

5150~5250MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5190	46.550
High	5230	45.686

5250~5350MHz

Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5270	45.648
High	5310	45.673

5470~5725MHz

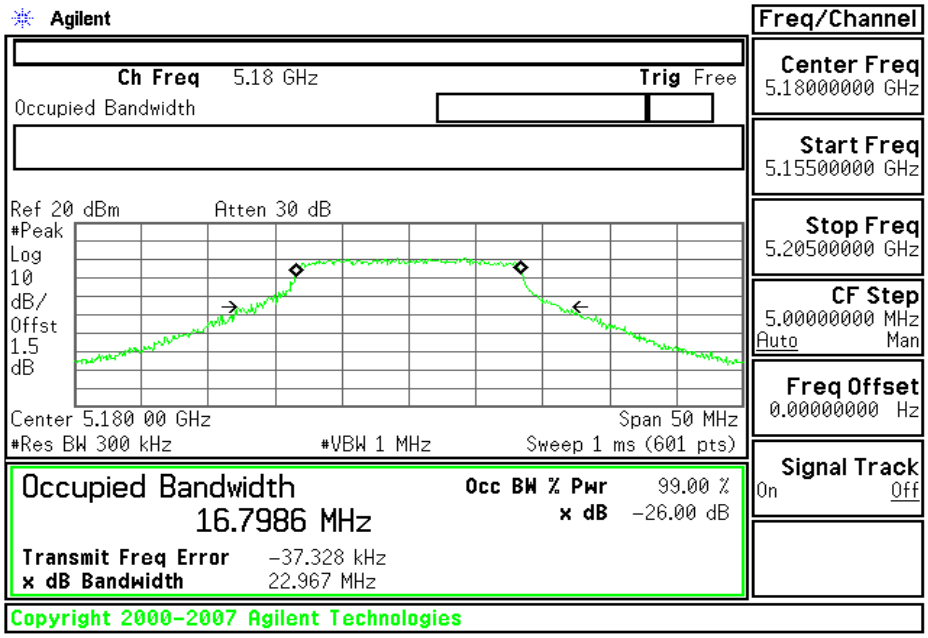
Channel	Frequency (MHz)	Bandwidth (B) (MHz)
Low	5510	45.931
Mid	5590	45.445
High	5670	45.239

Test Plot

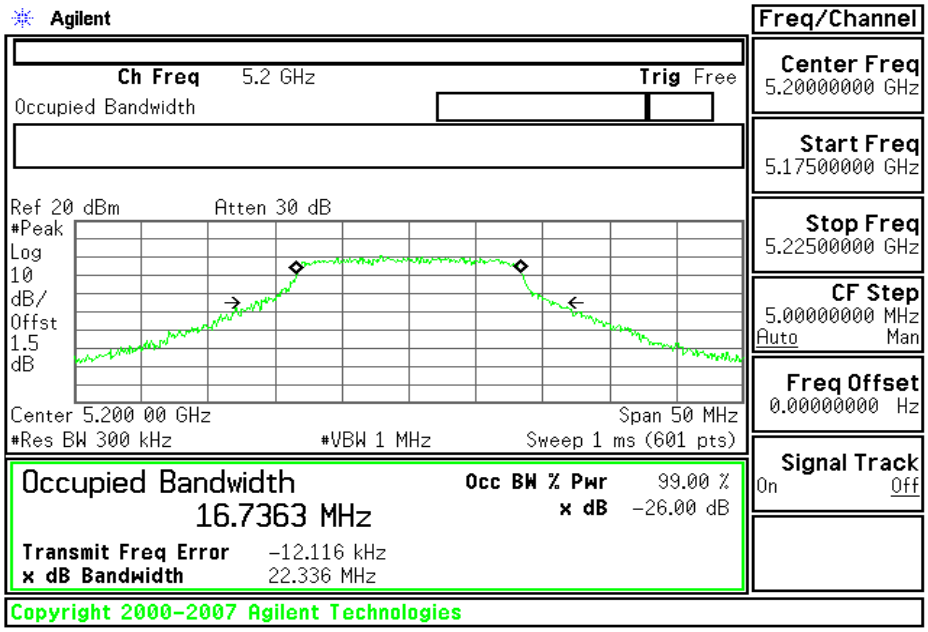
IEEE 802.11a mode:

5150~5250MHz

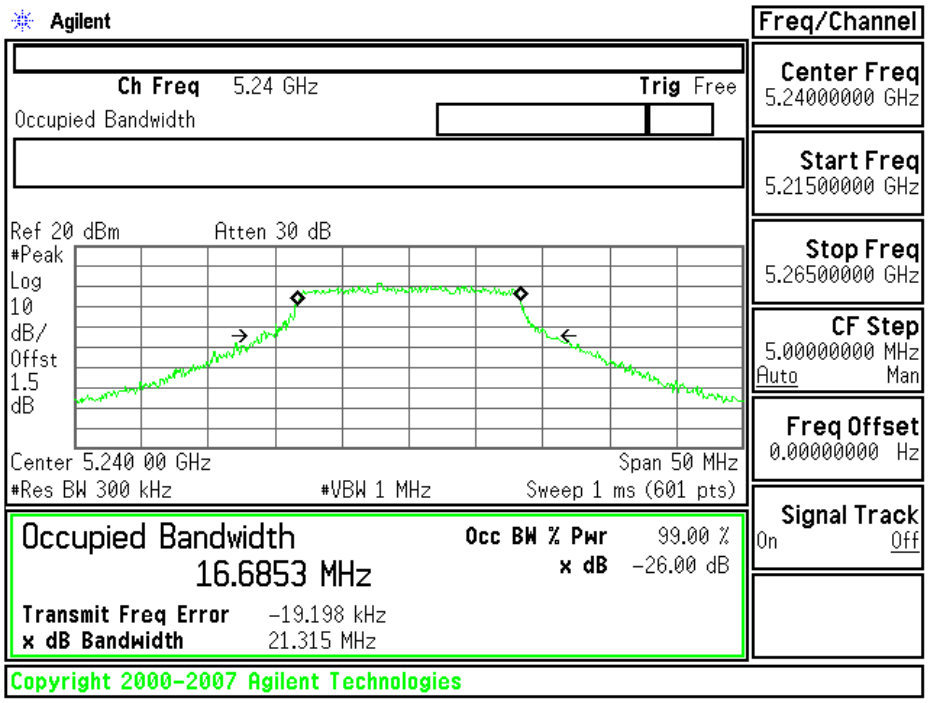
CH Low



CH Mid

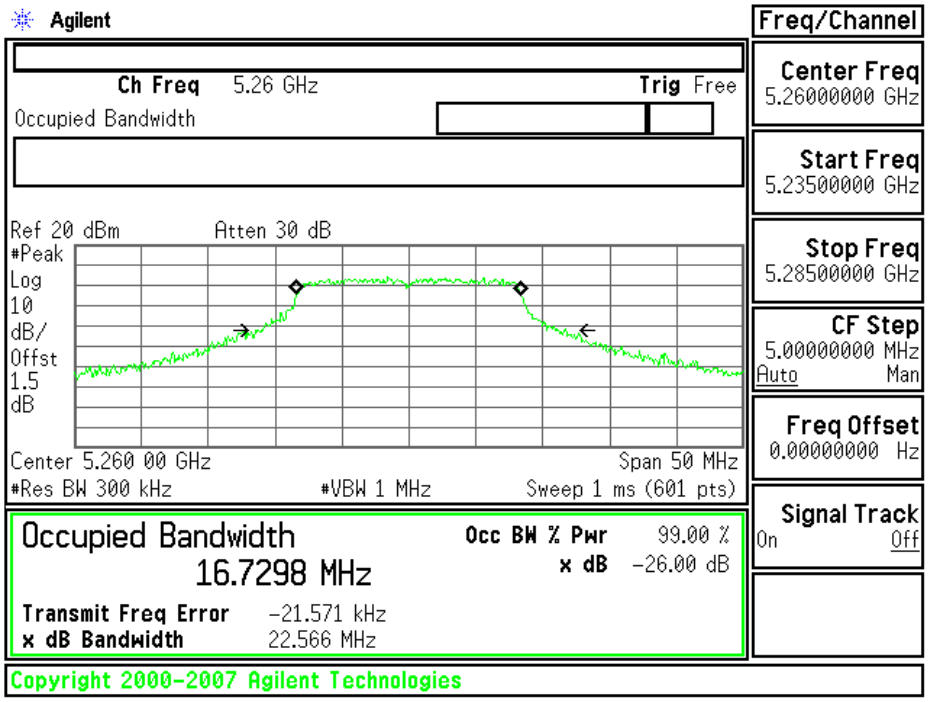


CH High

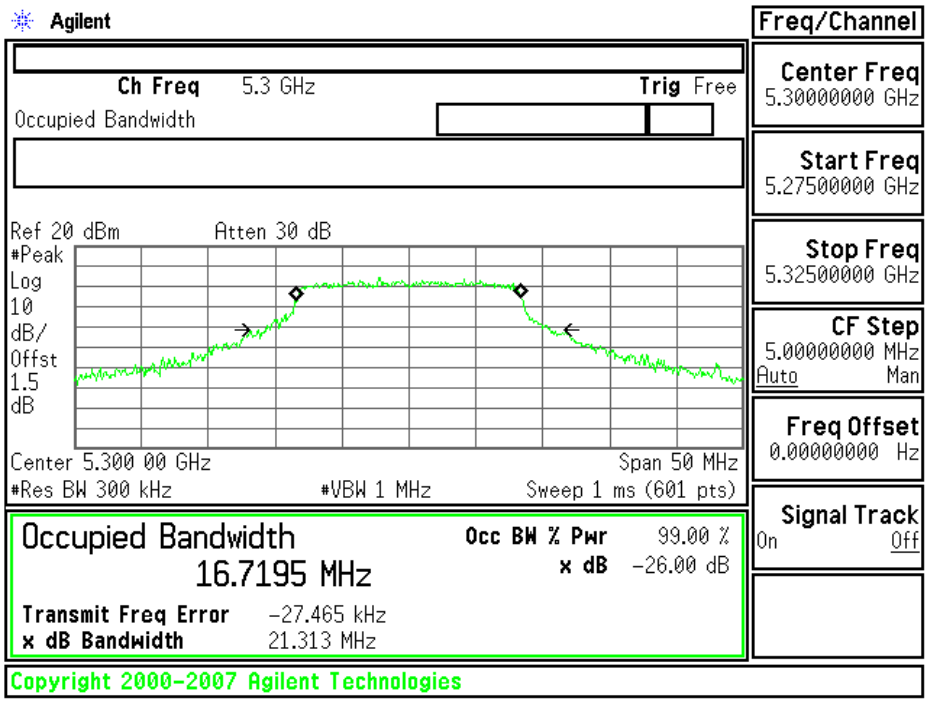


5250~5350MHz

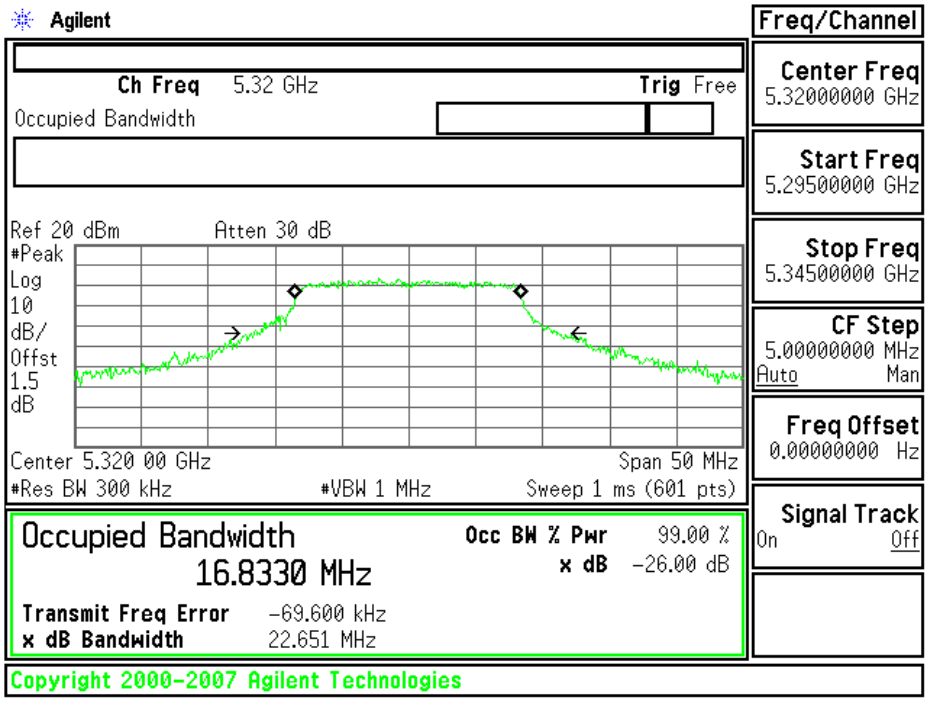
CH Low



CH Mid

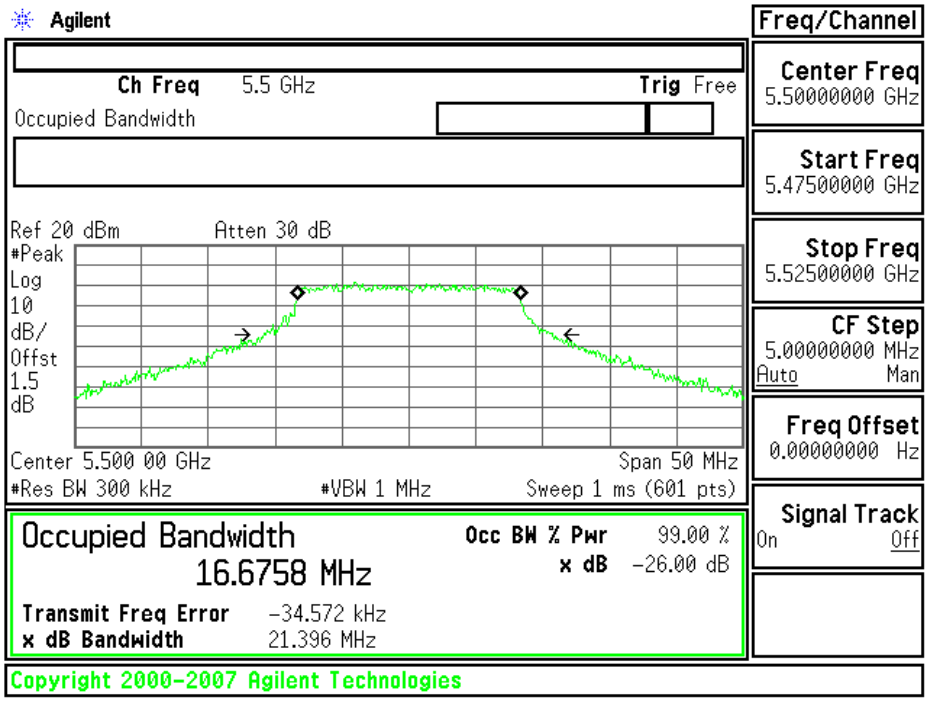


CH High

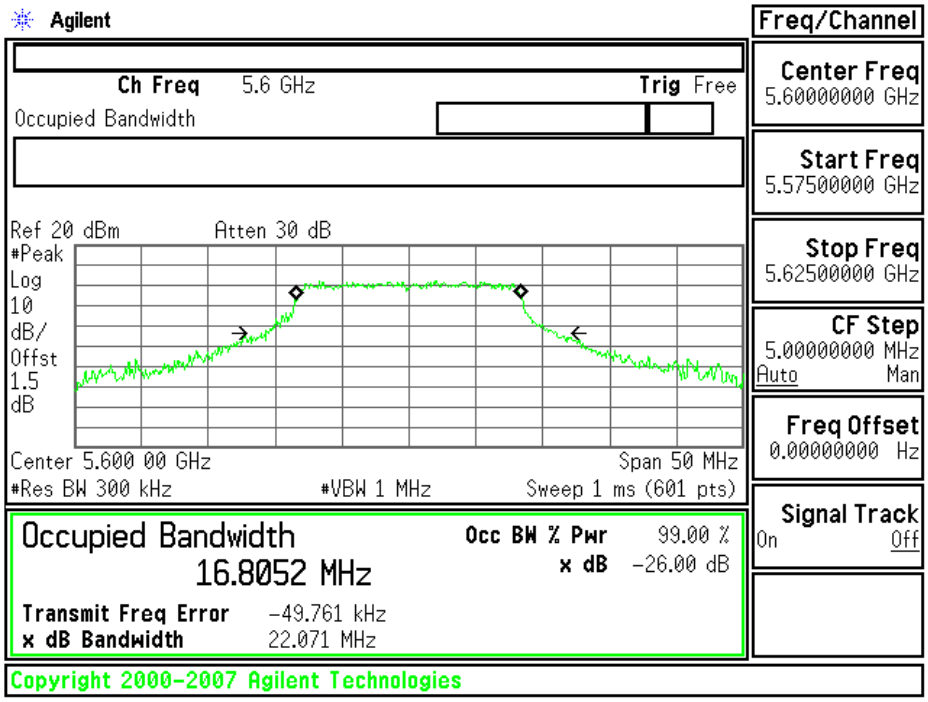


5470~5725MHz

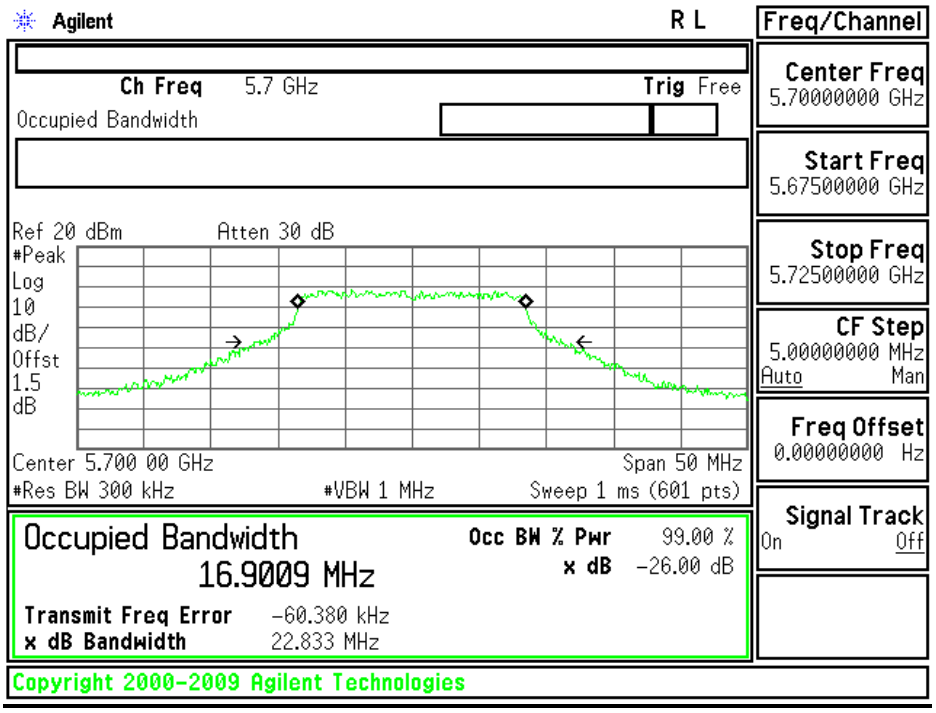
CH Low



CH Mid



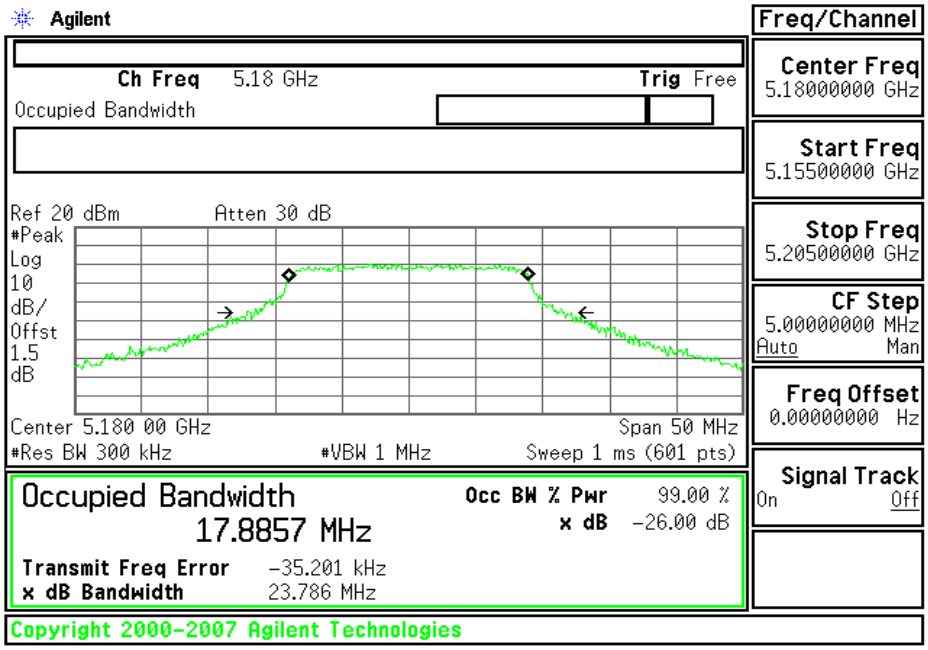
CH High



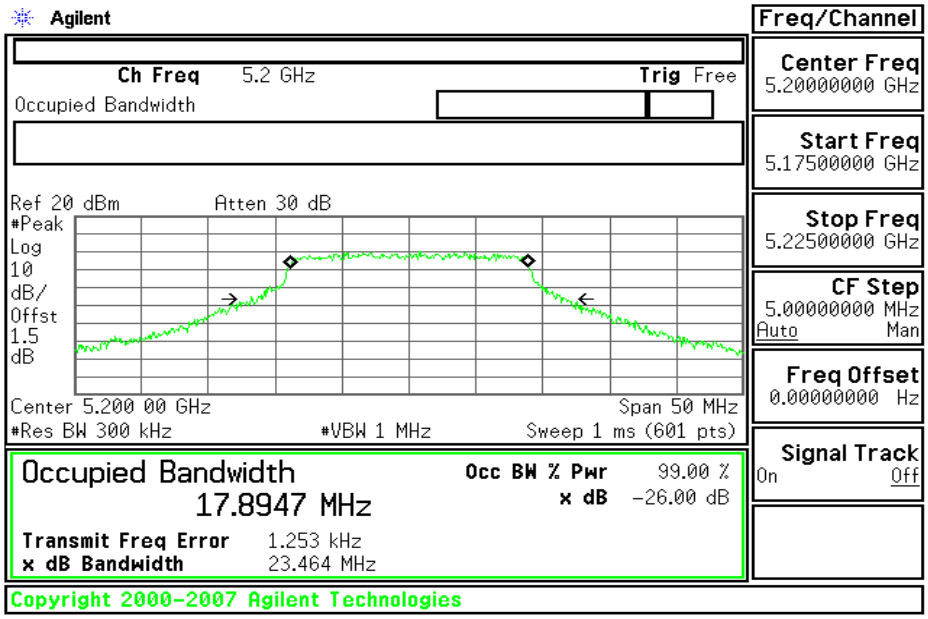
draft 802.11n Standard-20 MHz Channel mode / Chain 0

5150~5250MHz

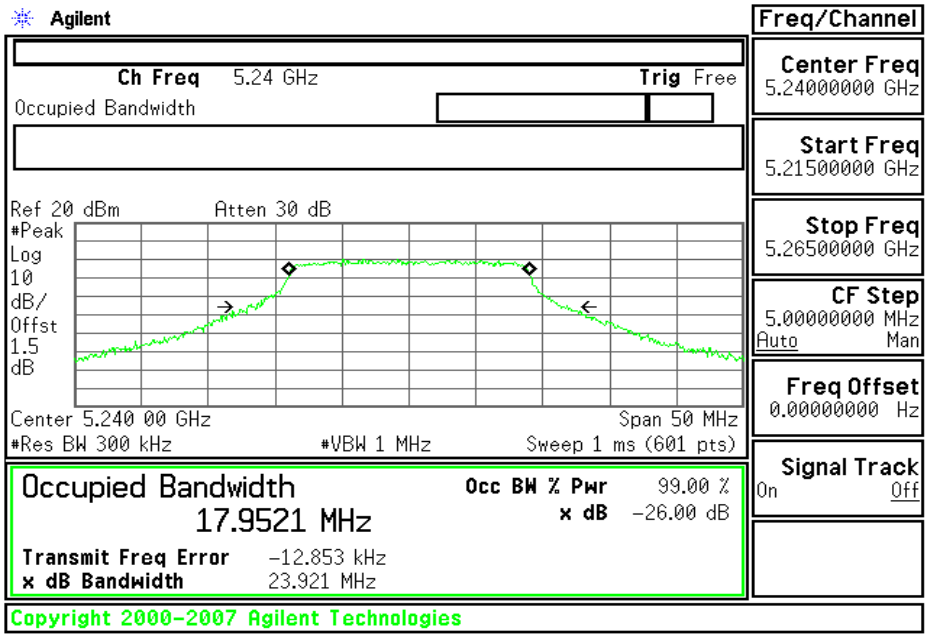
CH Low



CH Mid

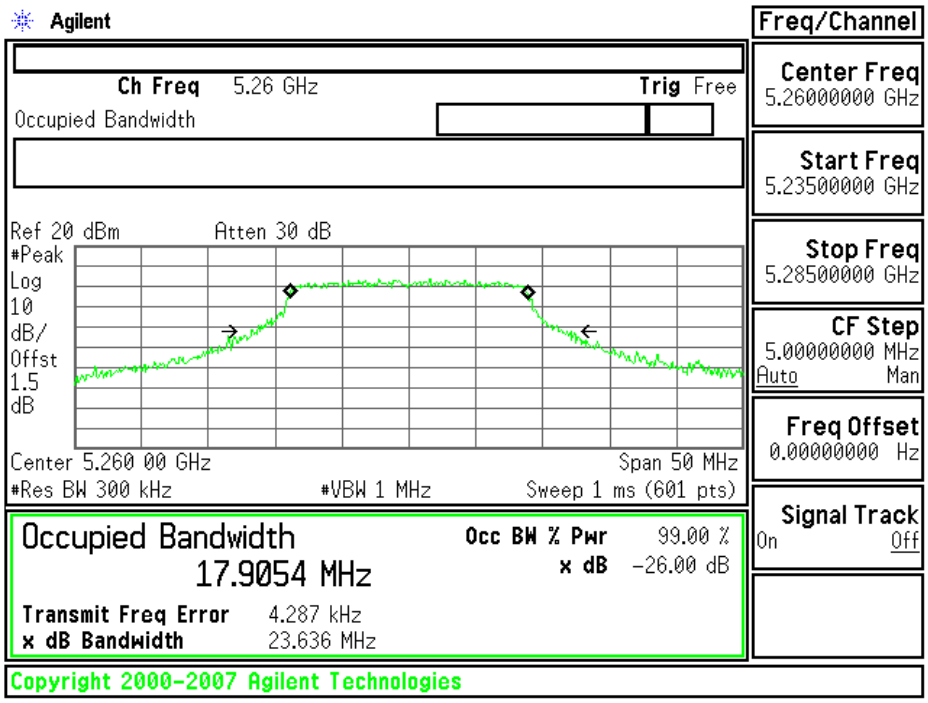


CH High

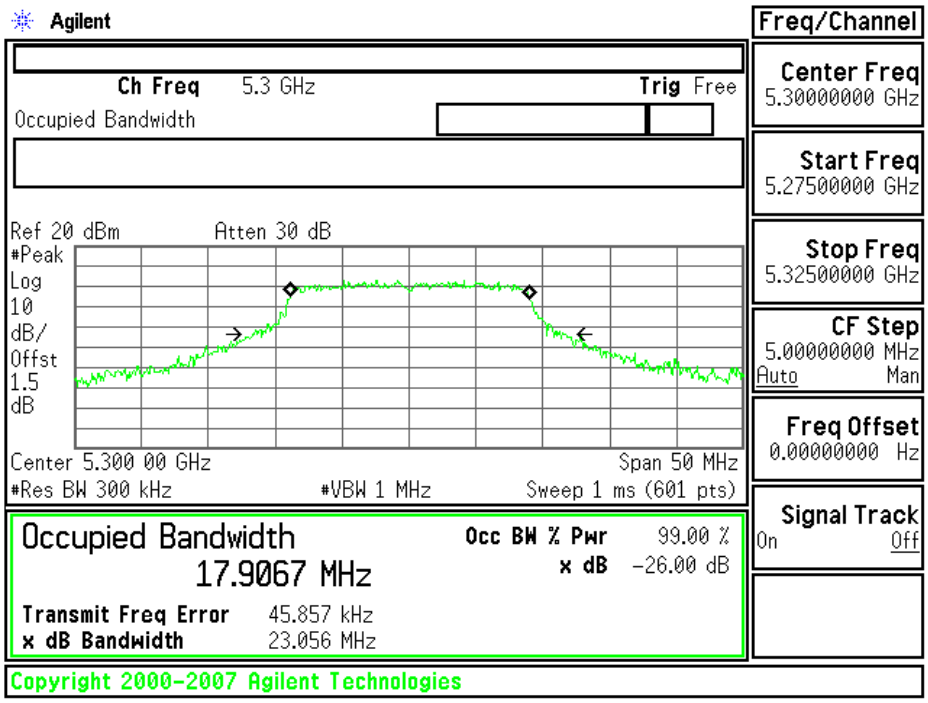


5250~5350MHz

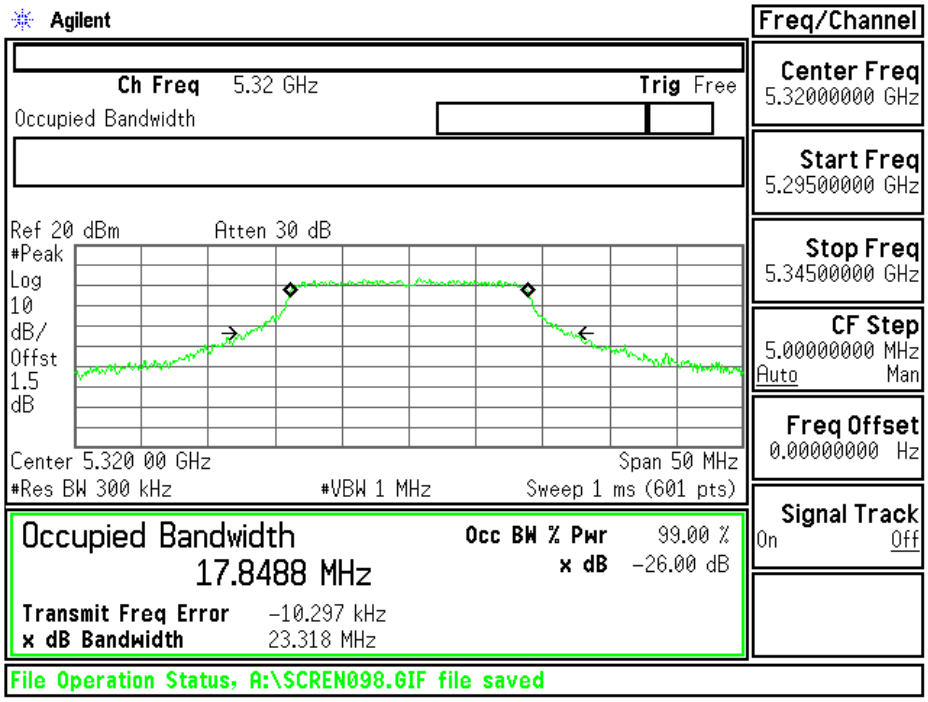
CH Low



CH Mid

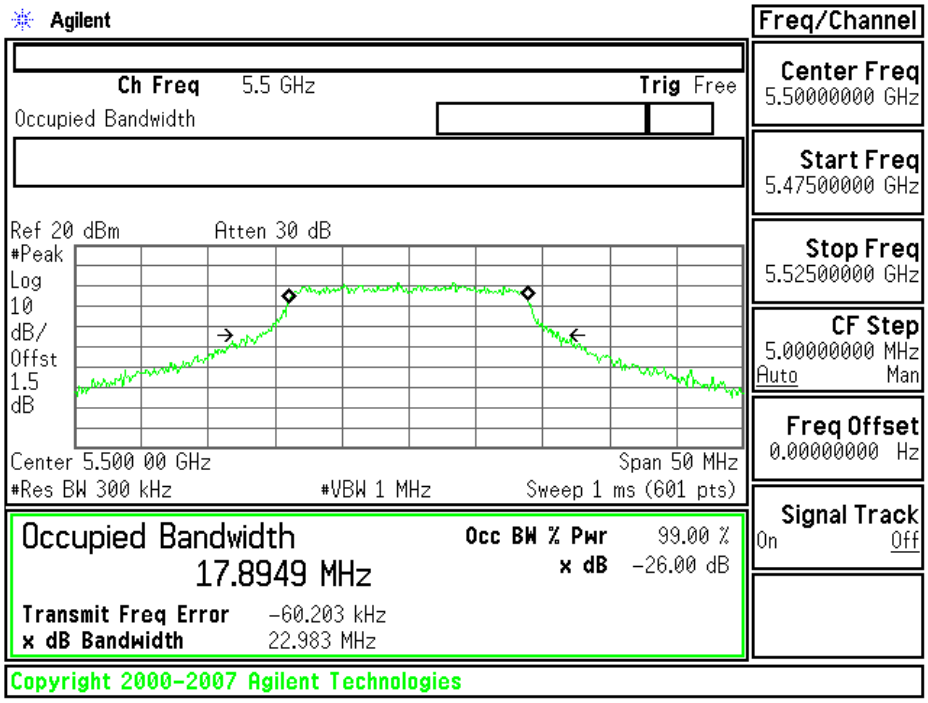


CH High

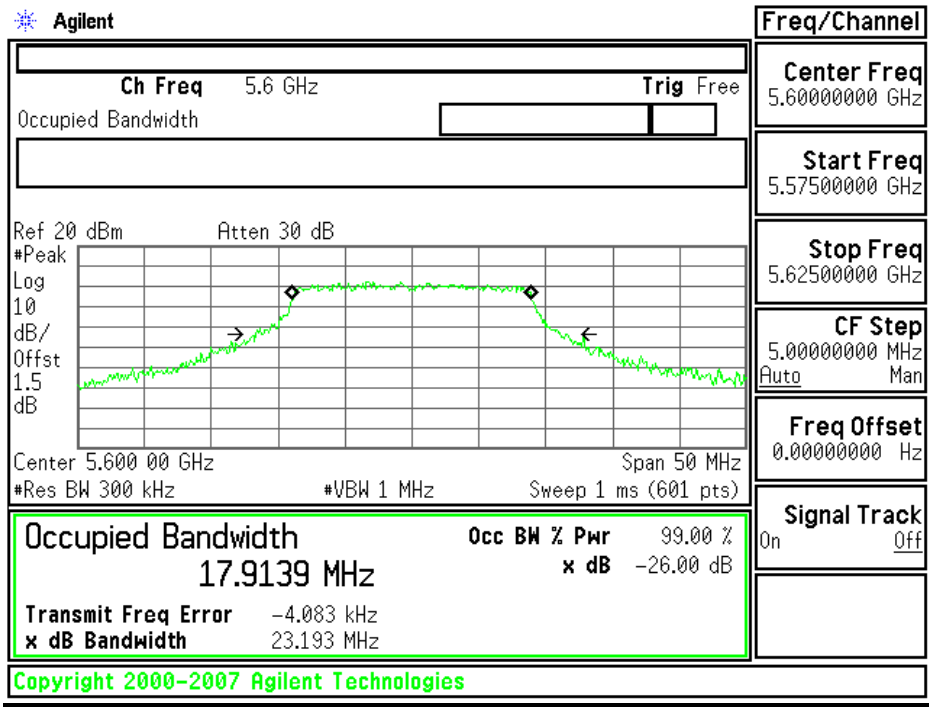


5470~5725MHz

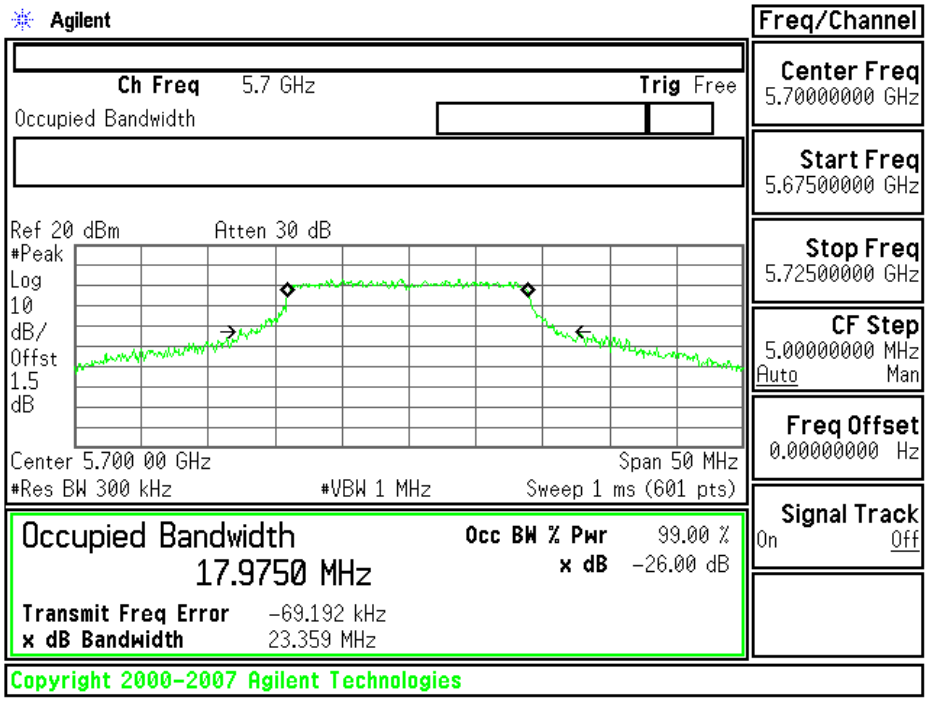
CH Low



CH Mid



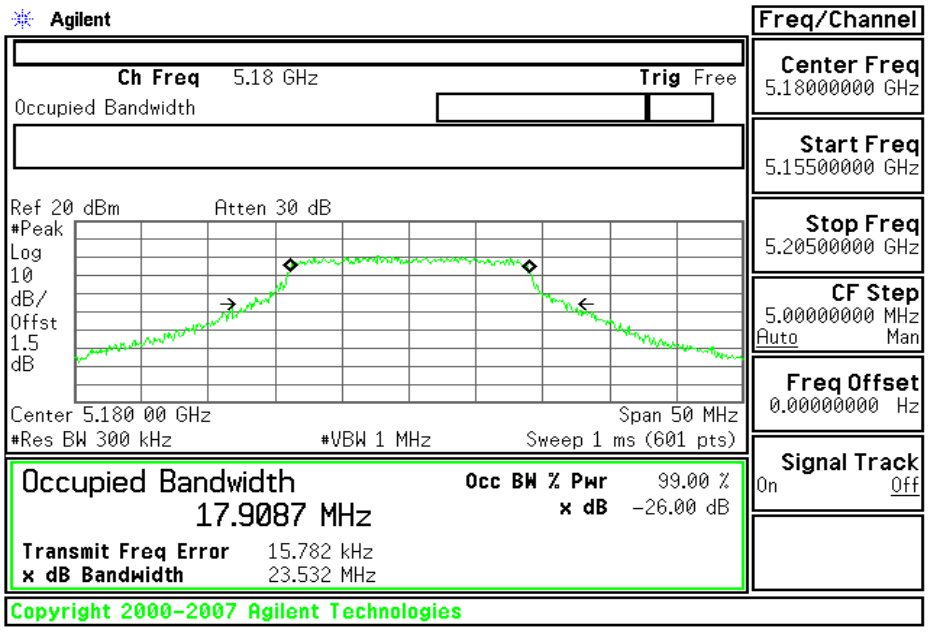
CH High



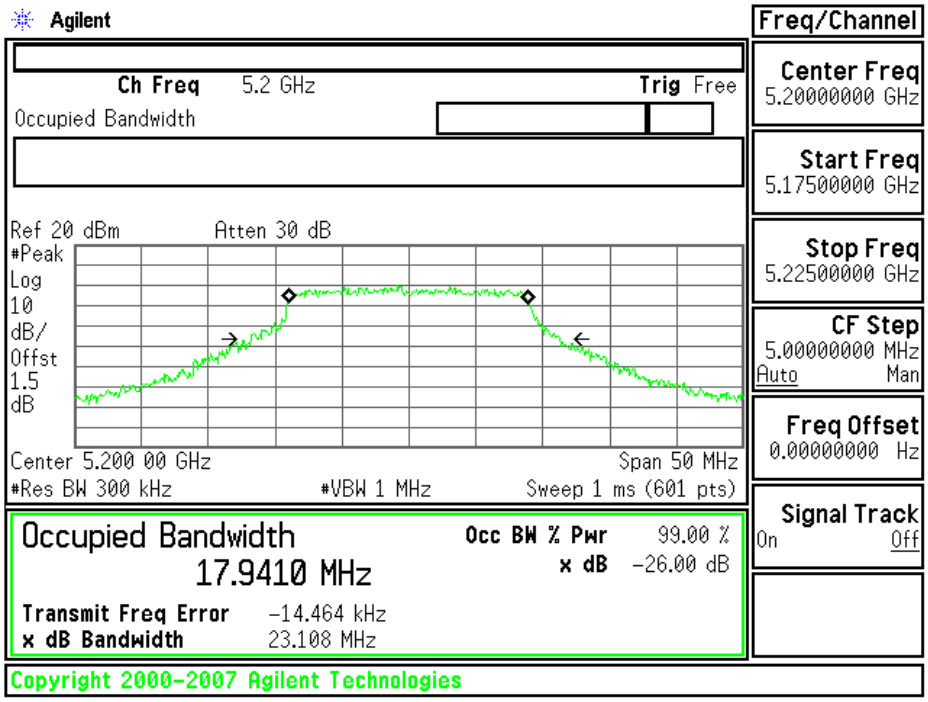
draft 802.11n Standard-20 MHz Channel mode / Chain 1

5150~5250MHz

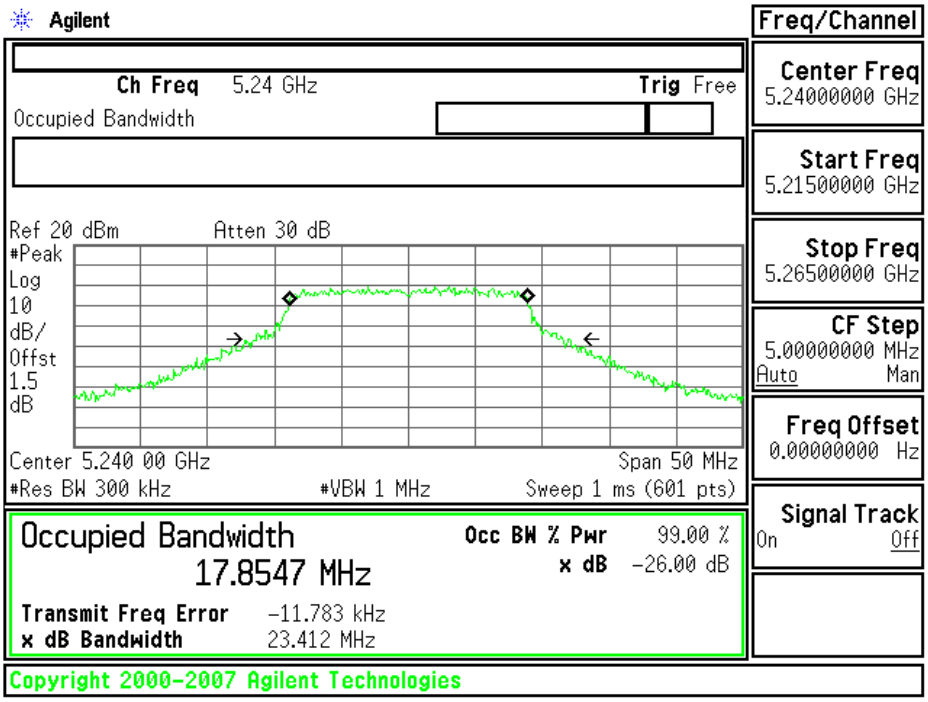
CH Low



CH Mid

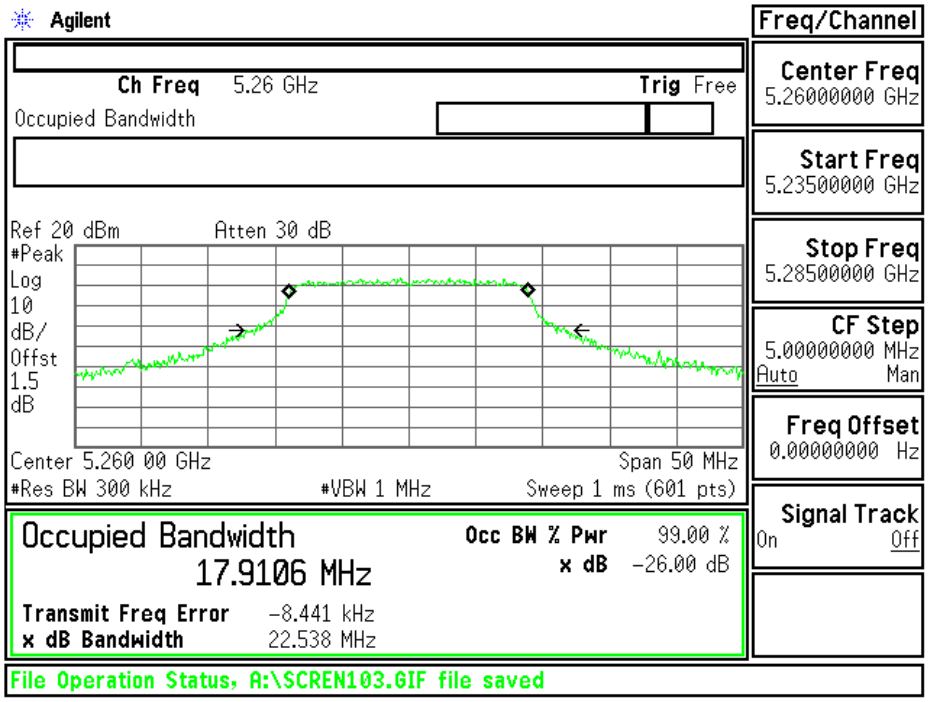


CH High

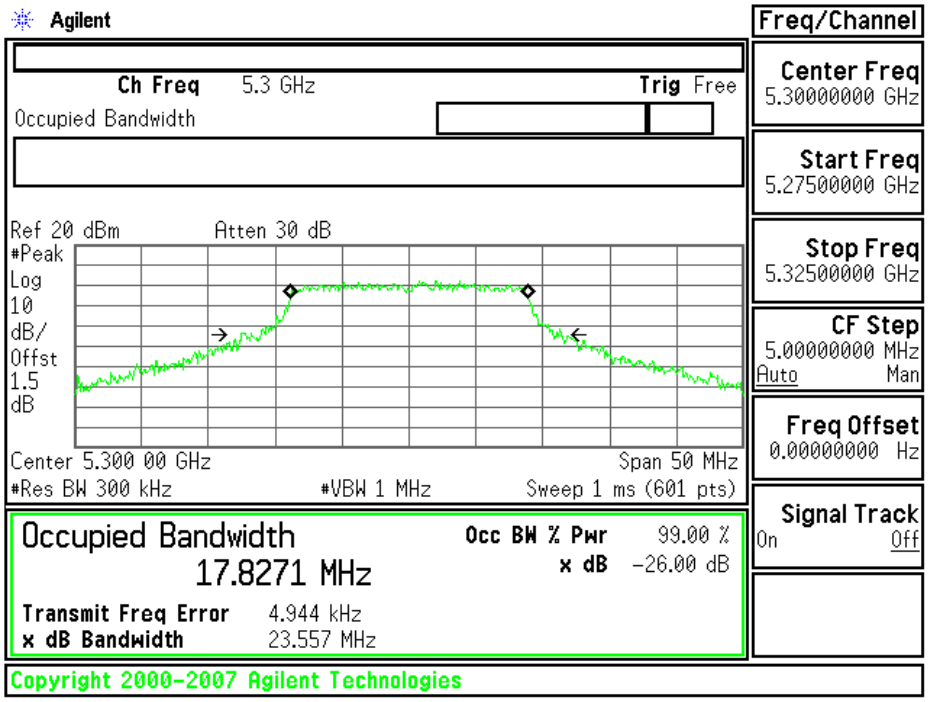


5250~5350MHz

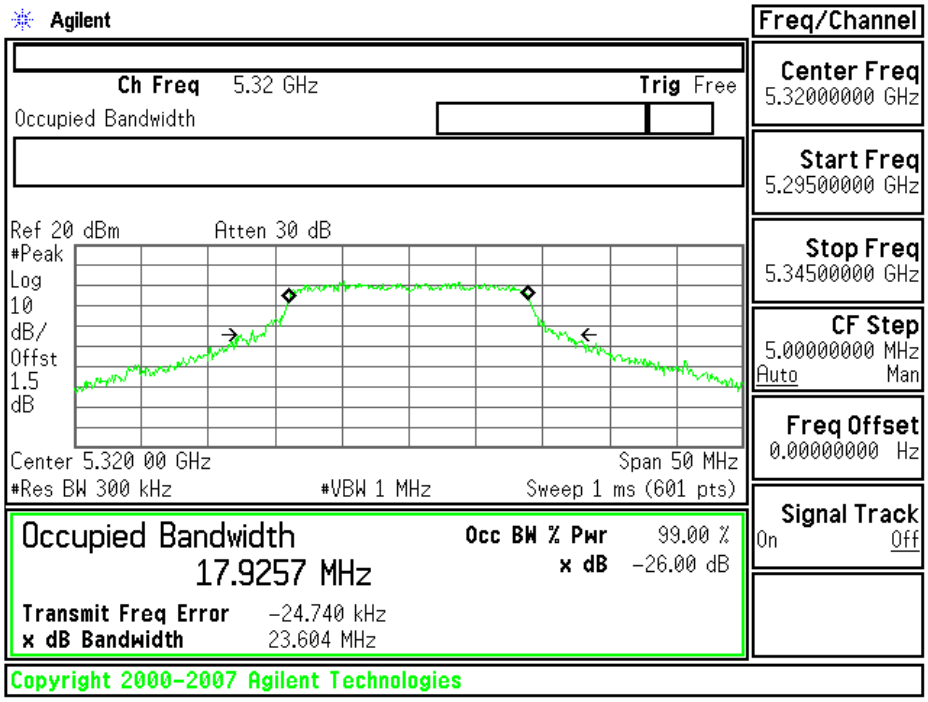
CH Low



CH Mid

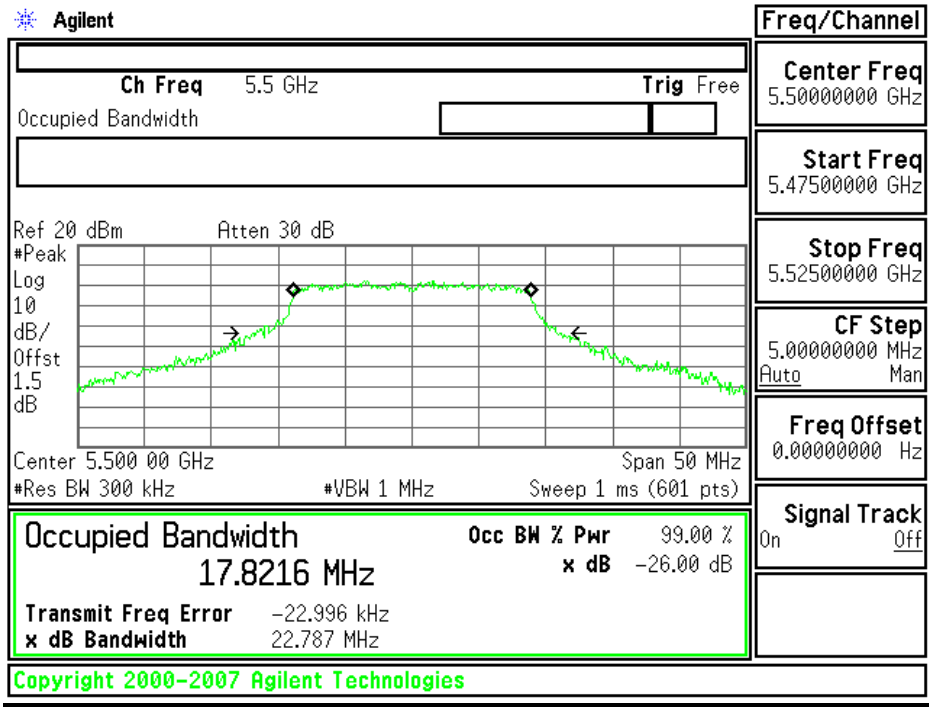


CH High

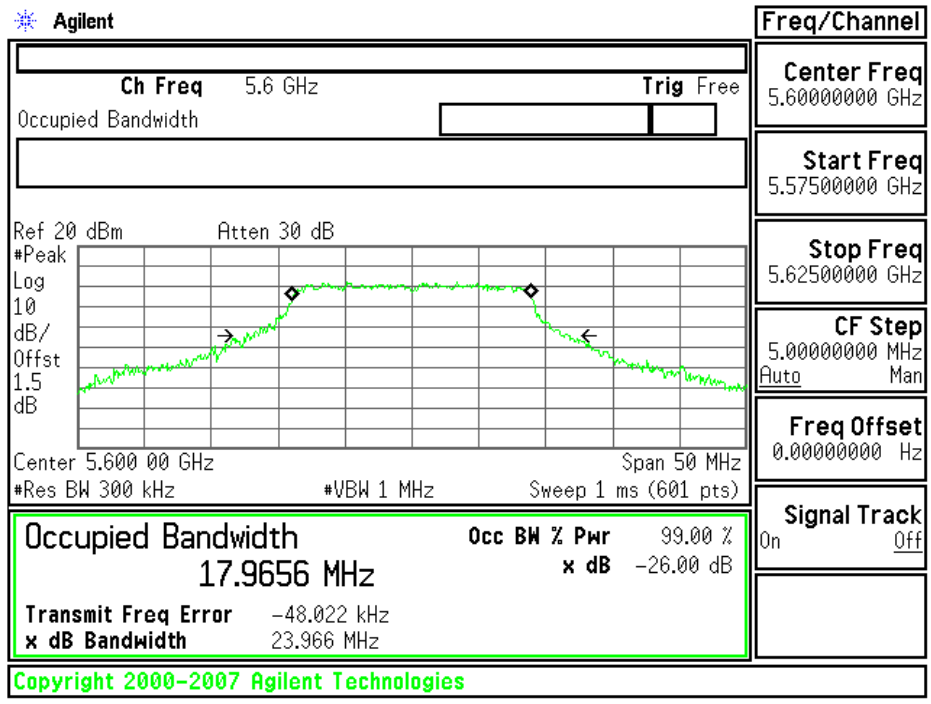


5470~5725MHz

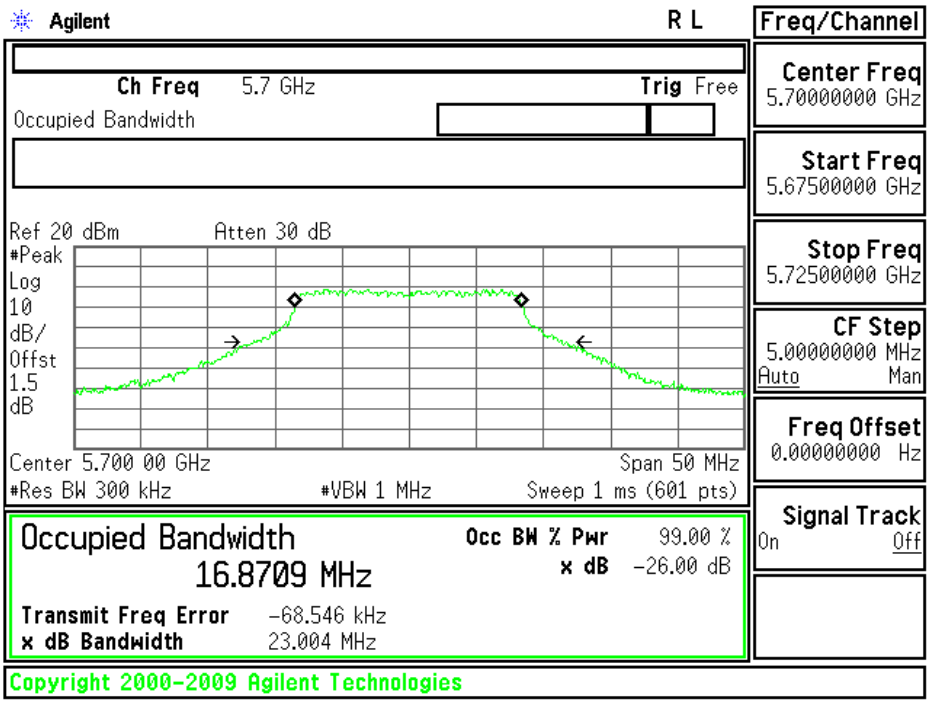
CH Low



CH Mid



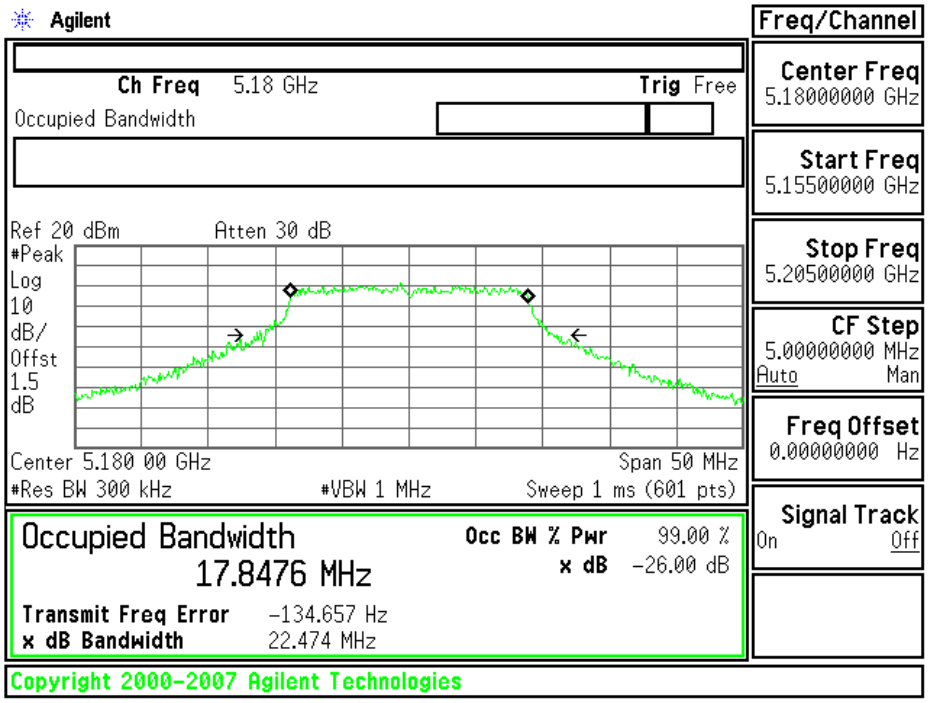
CH High



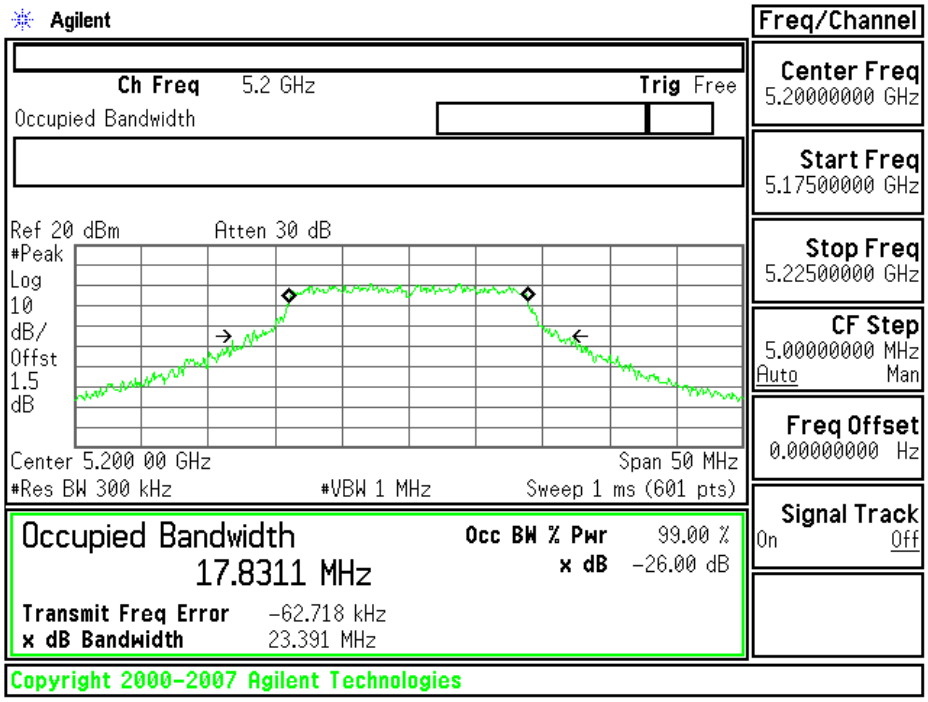
draft 802.11n Standard-20 MHz Channel mode / Chain 2

5150~5250MHz

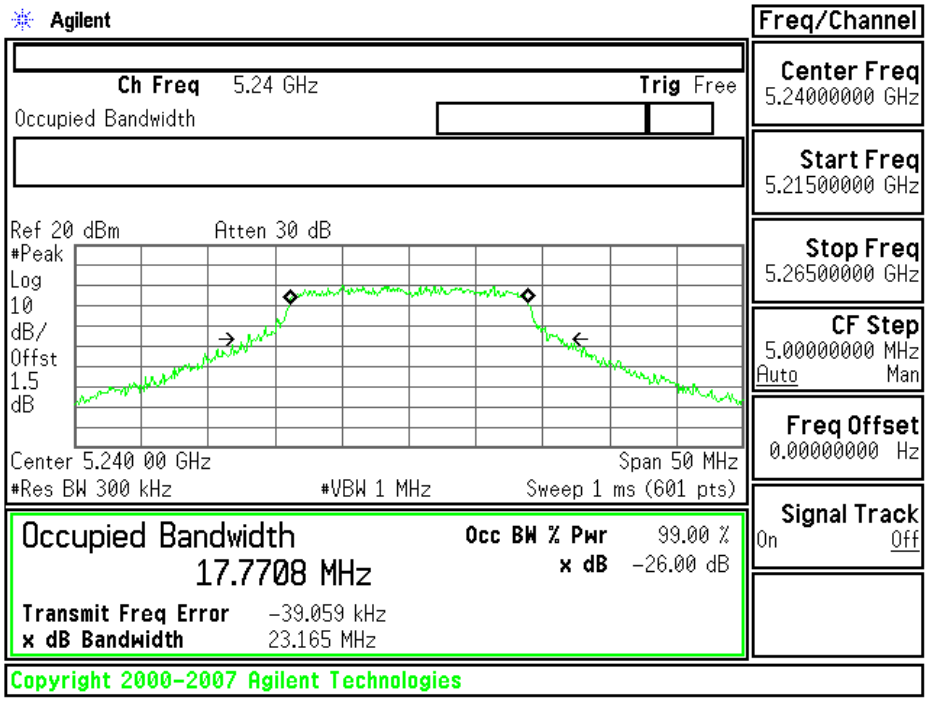
CH Low



CH Mid

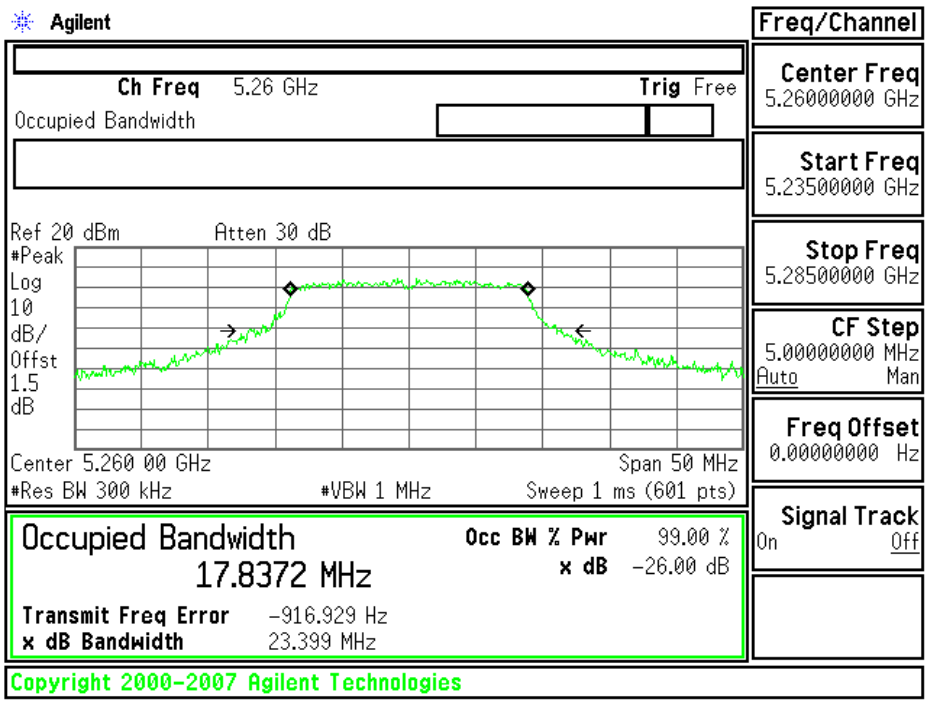


CH High

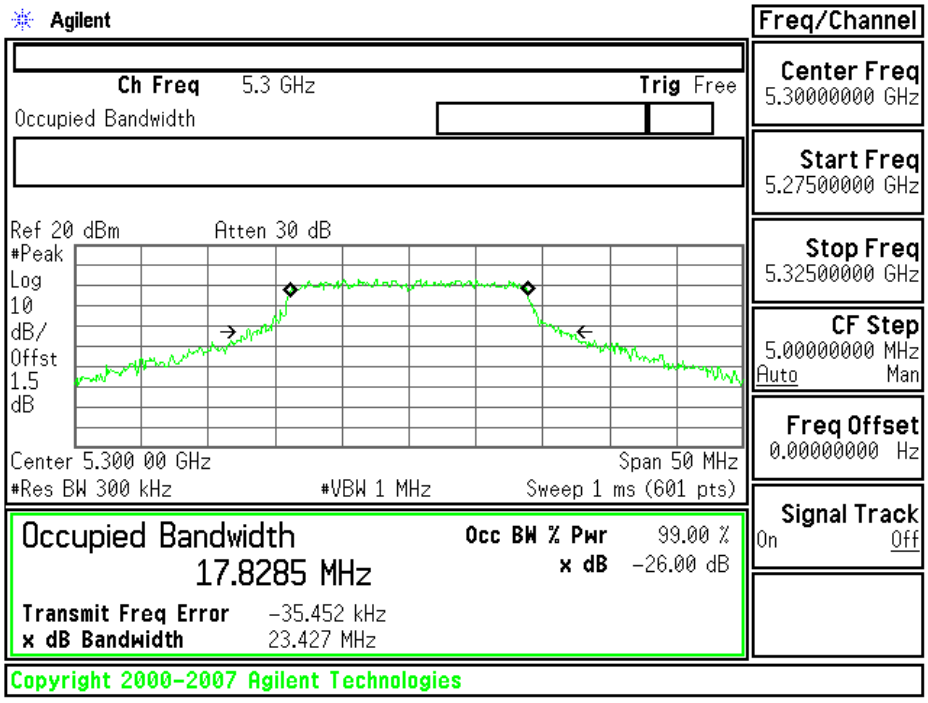


5250~5350MHz

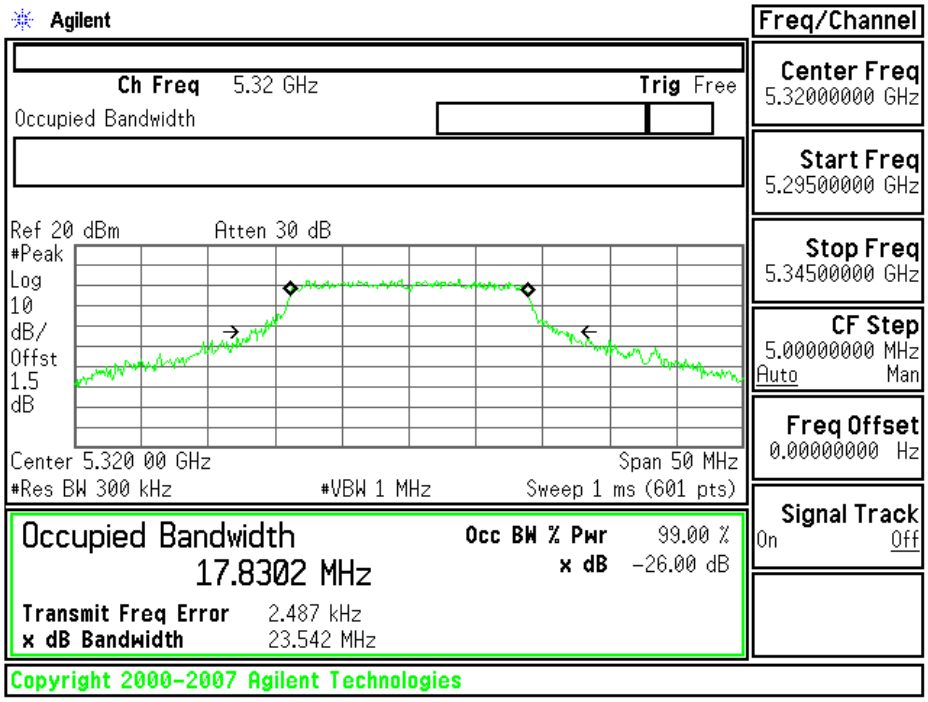
CH Low



CH Mid

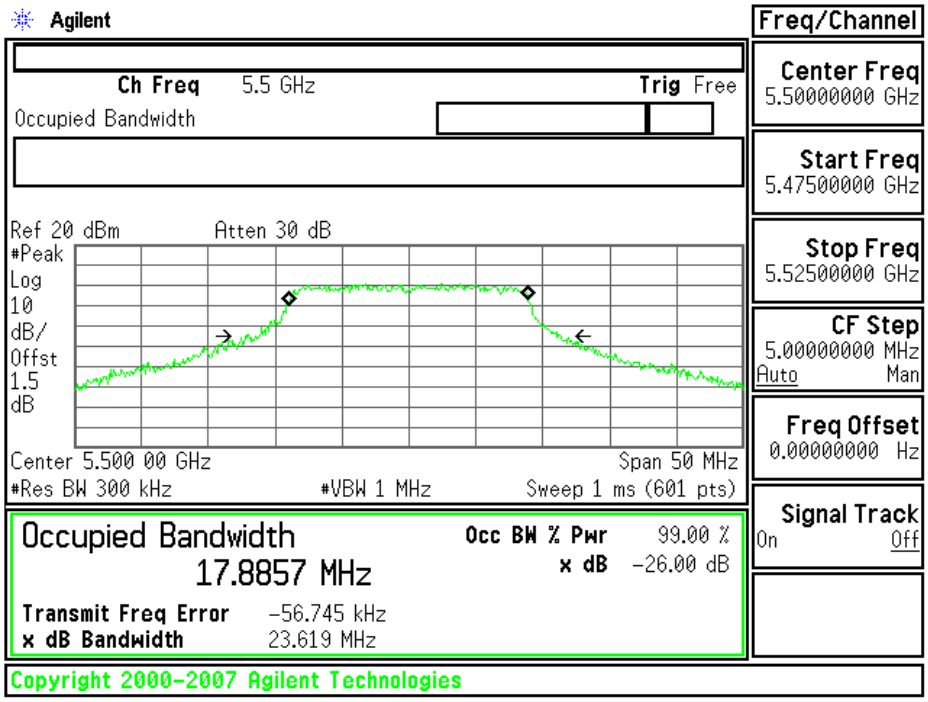


CH High

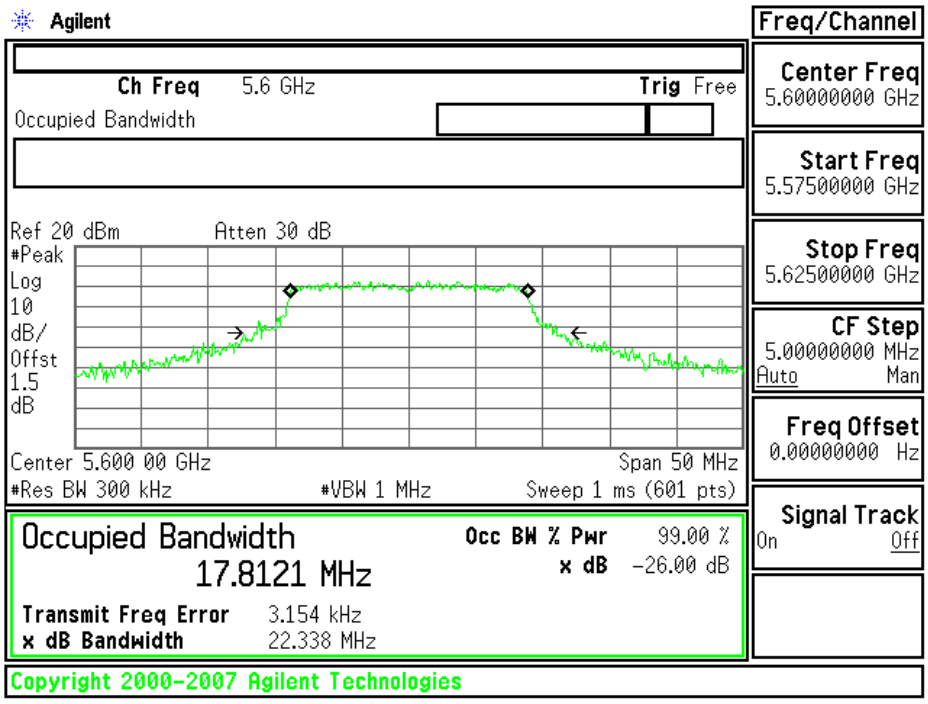


5470~5725MHz

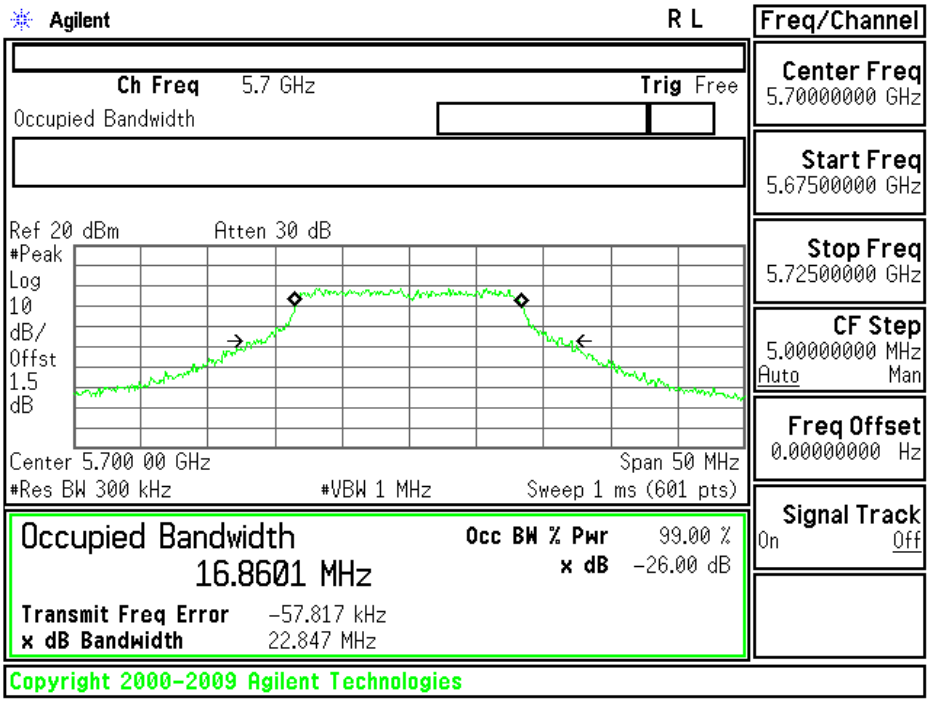
CH Low



CH Mid



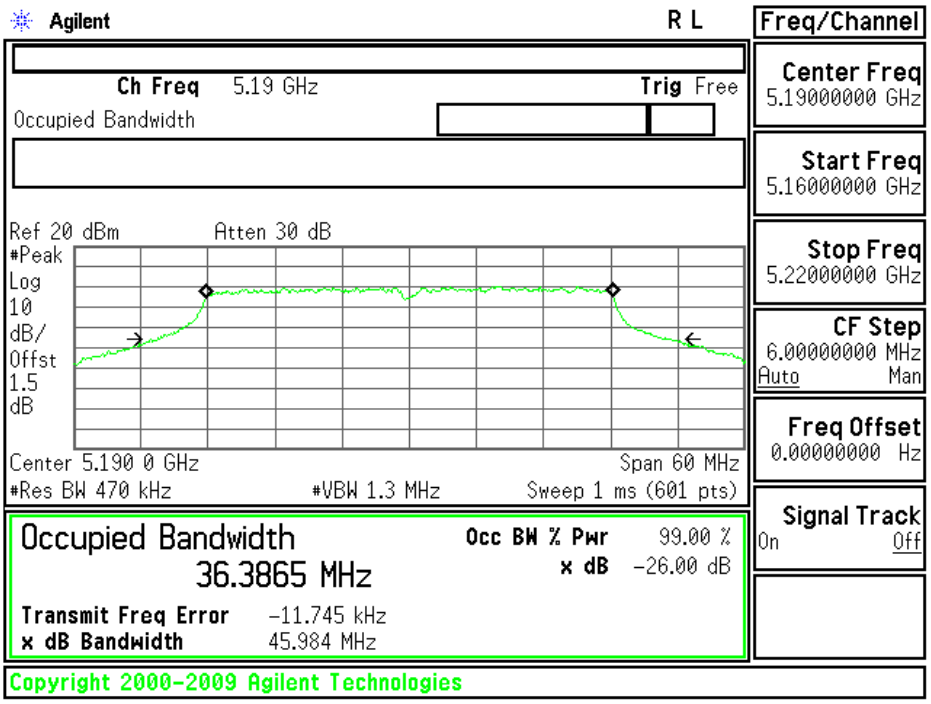
CH High



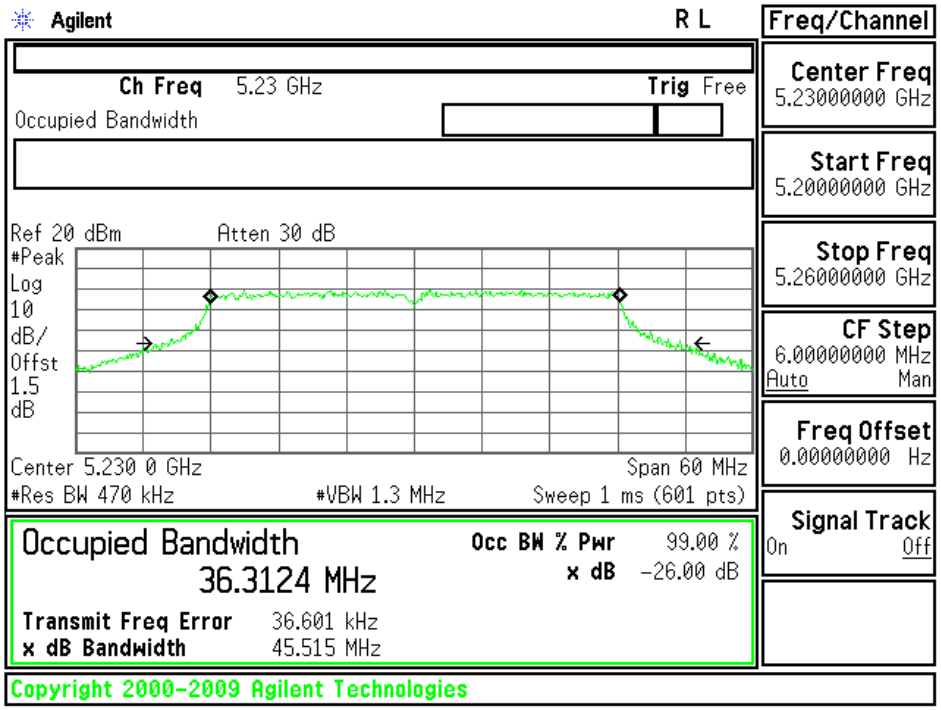
draft 802.11n Wide-40 MHz Channel mode / Chain 0

5150~5250MHz

CH Low

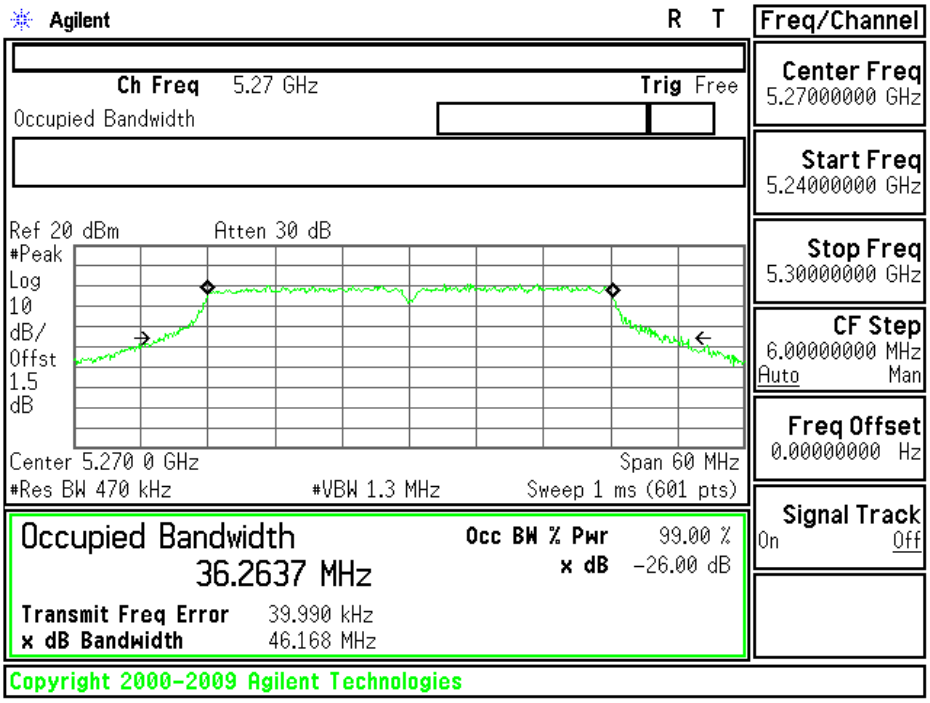


CH High

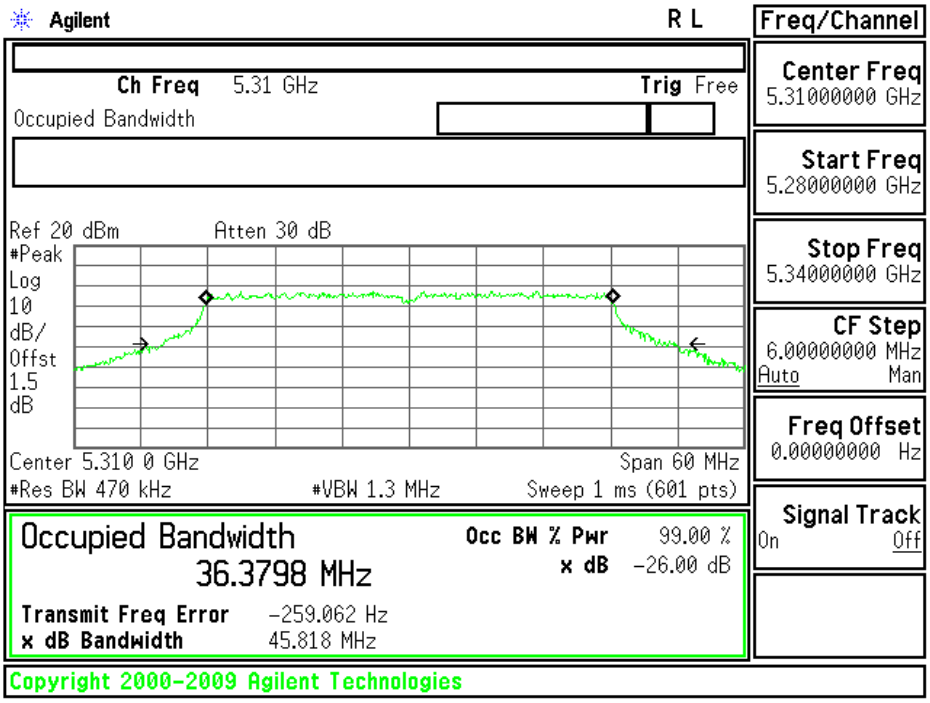


5250~5350MHz

CH Low

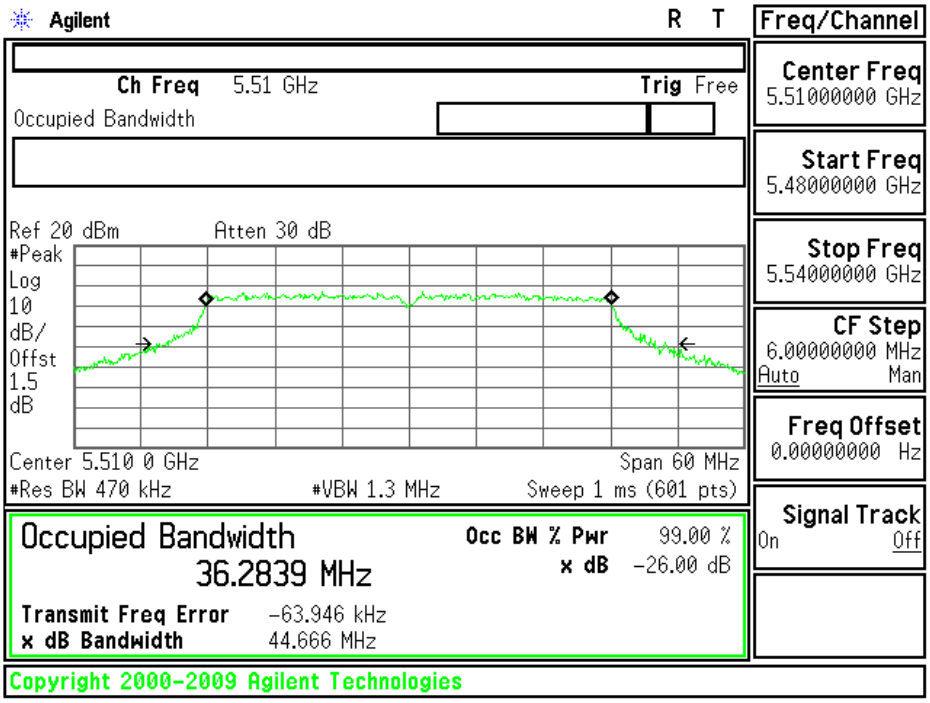


CH High

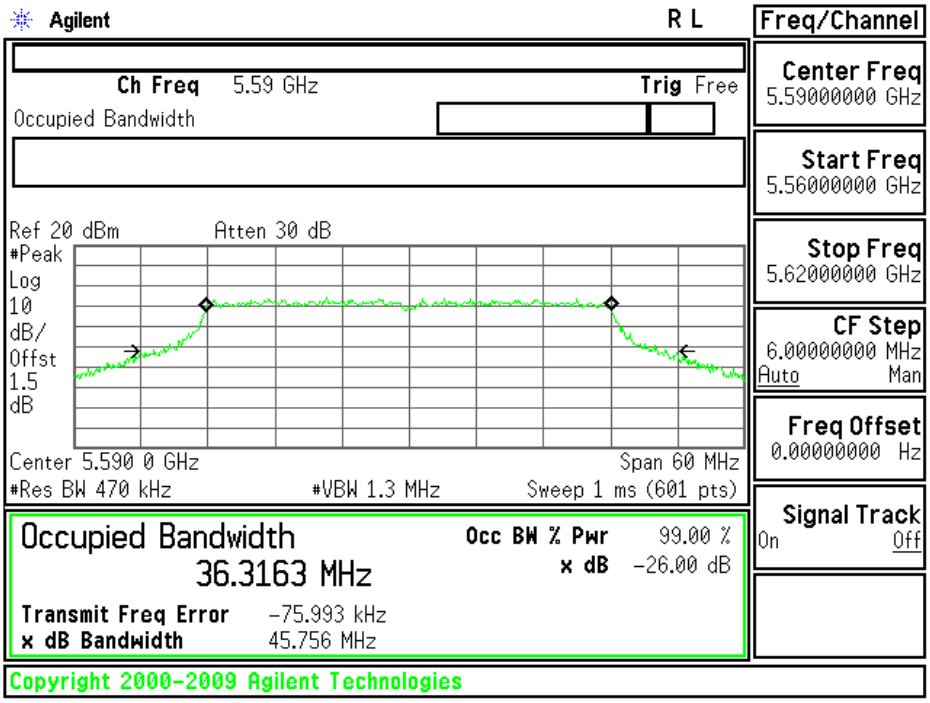


5470~5725MHz

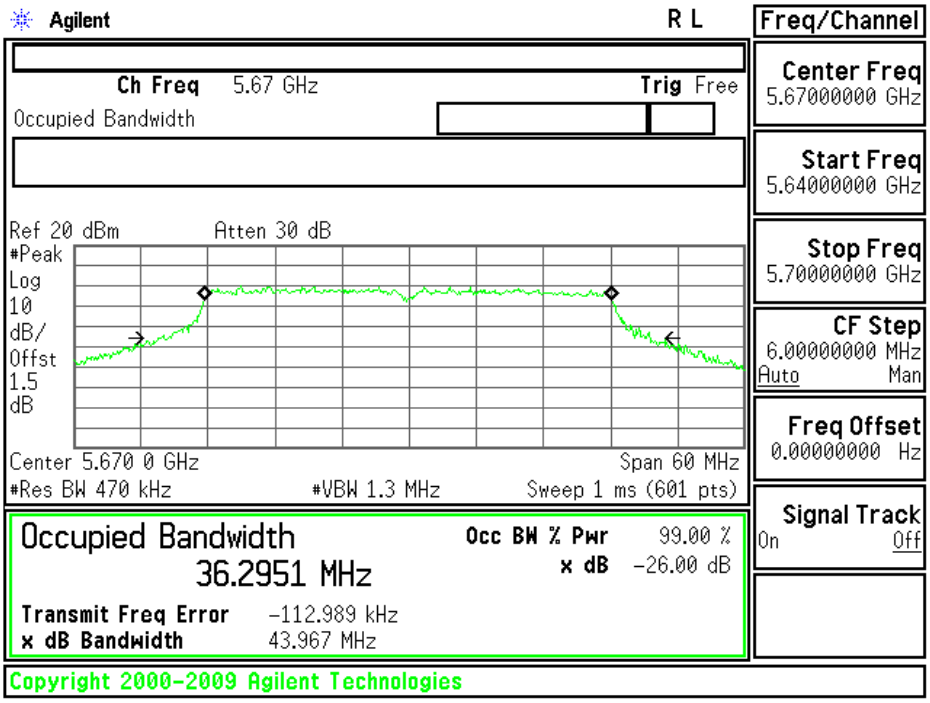
CH Low



CH Mid



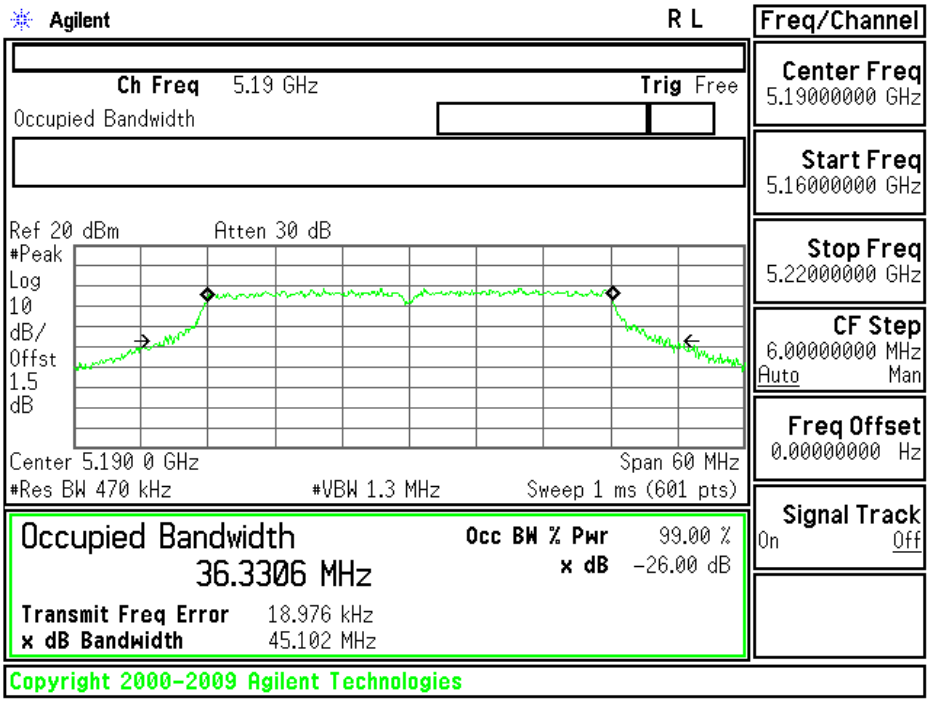
CH High



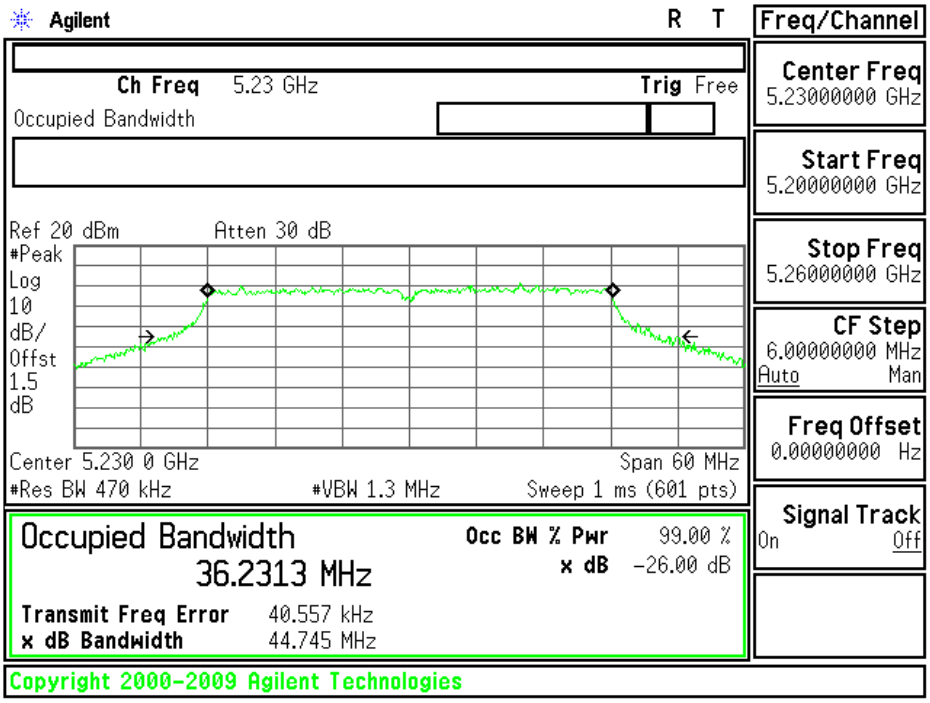
draft 802.11n Wide-40 MHz Channel mode / Chain 1

5150~5250MHz

CH Low

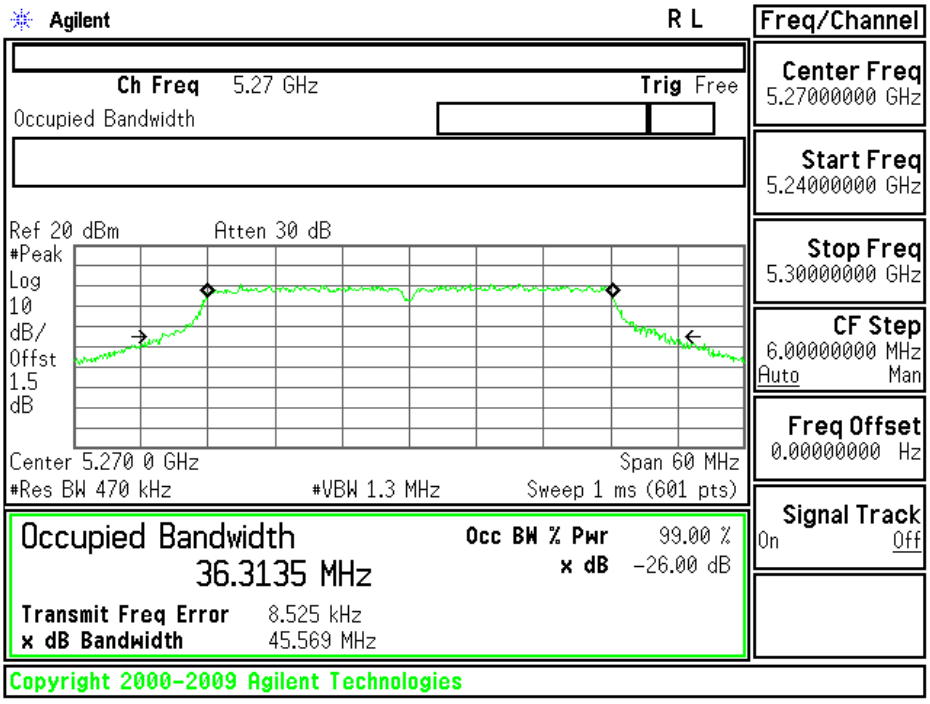


CH High

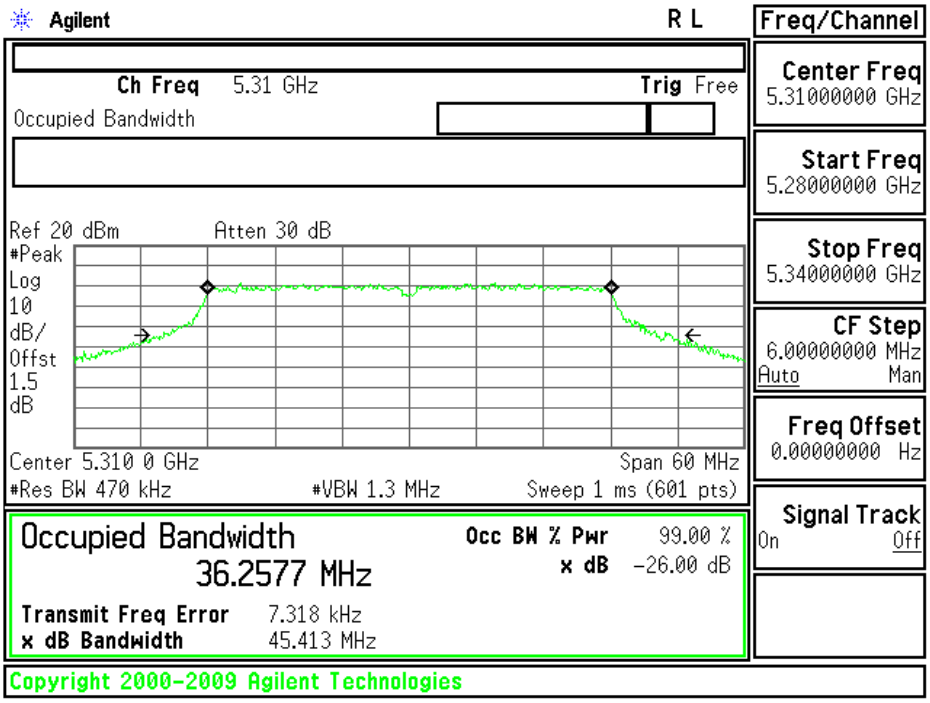


5250~5350MHz

CH Low

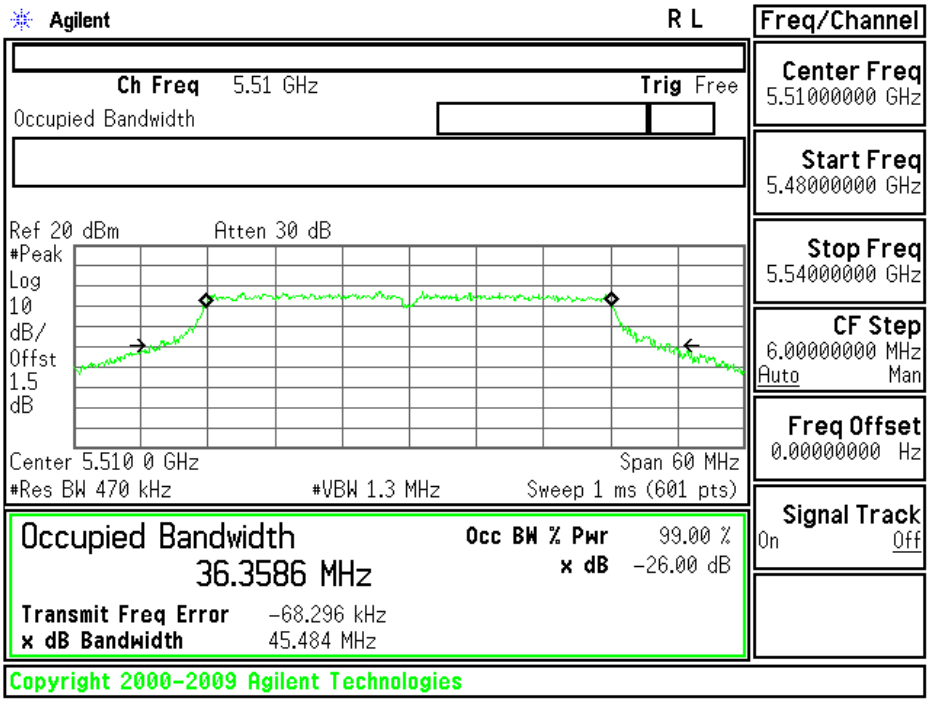


CH High

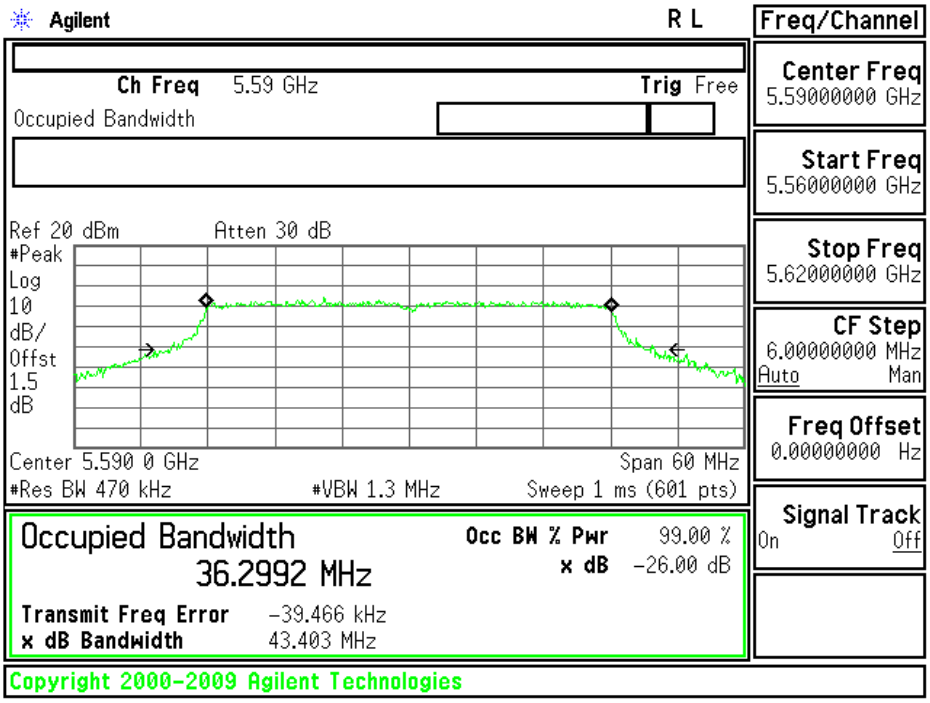


5470~5725MHz

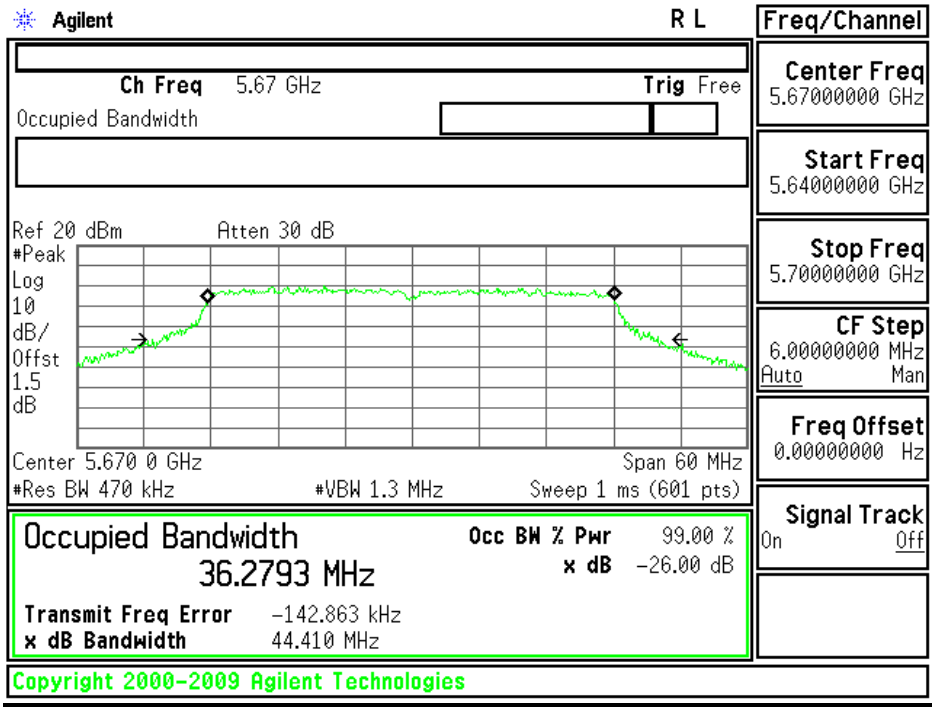
CH Low



CH Mid



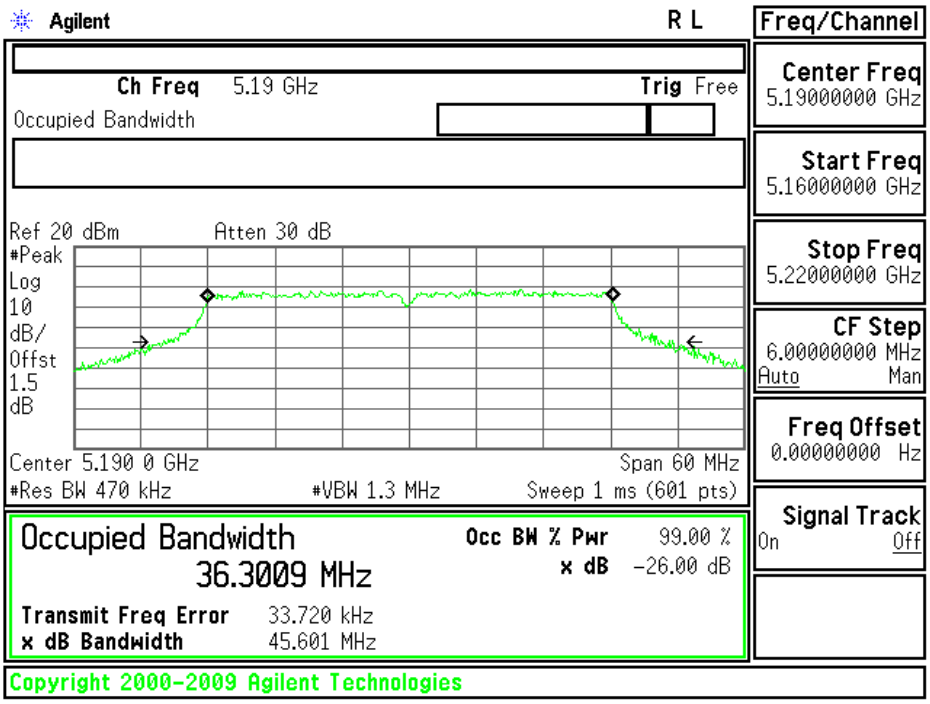
CH High



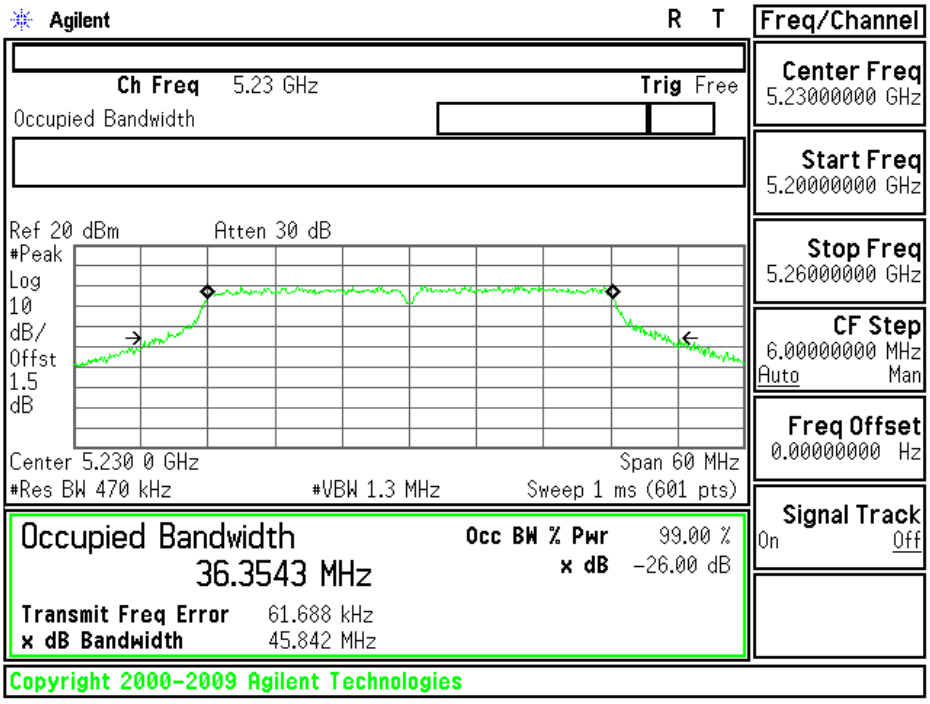
draft 802.11n Wide-40 MHz Channel mode / Chain 2

5150~5250MHz

CH Low

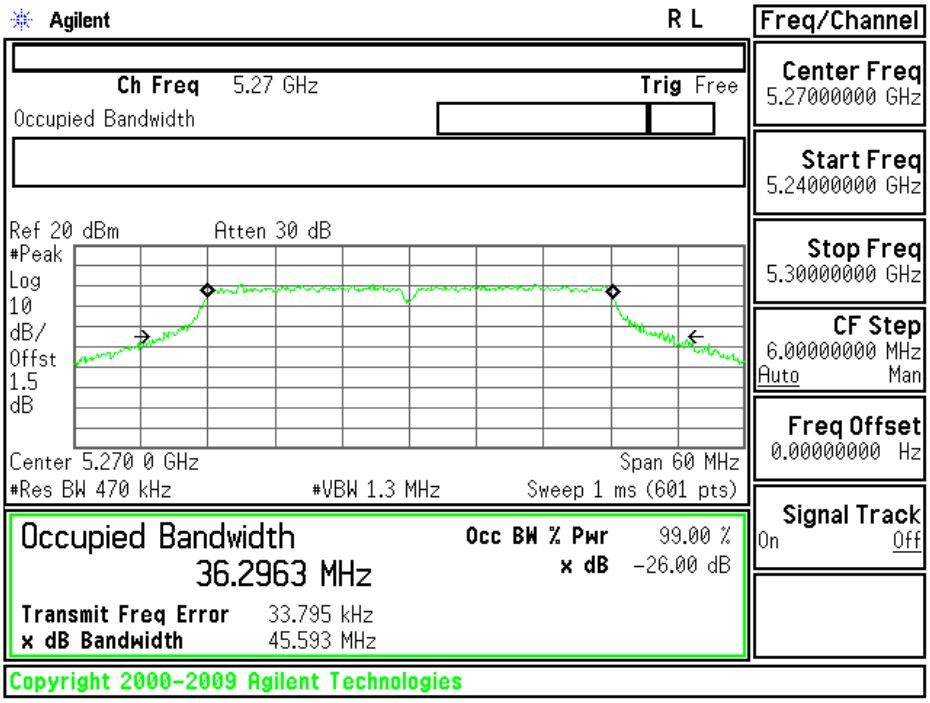


CH High

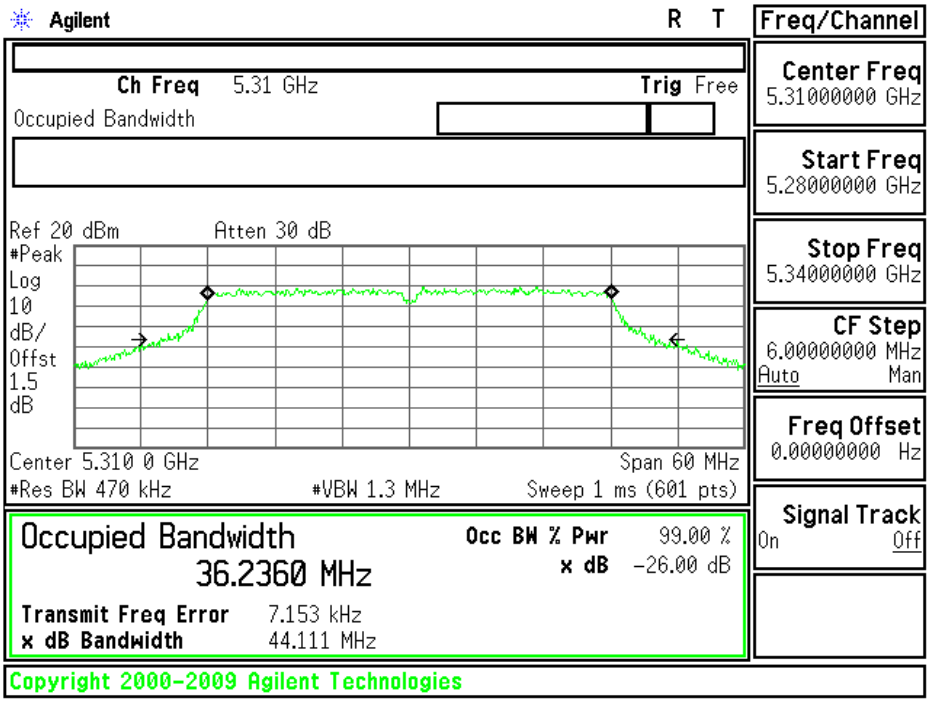


5250~5350MHz

CH Low

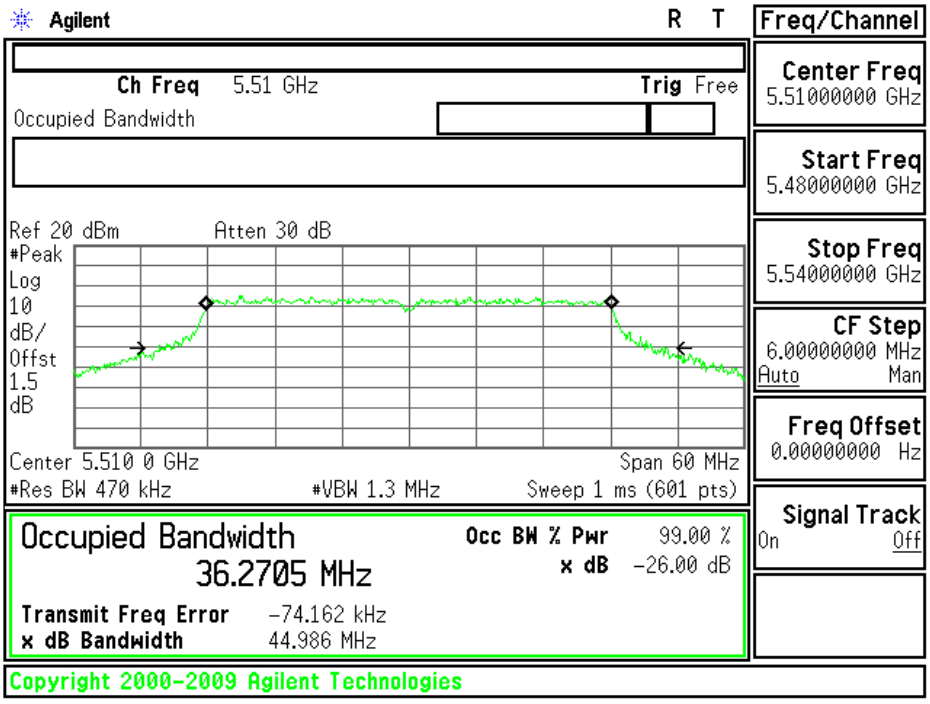


CH High

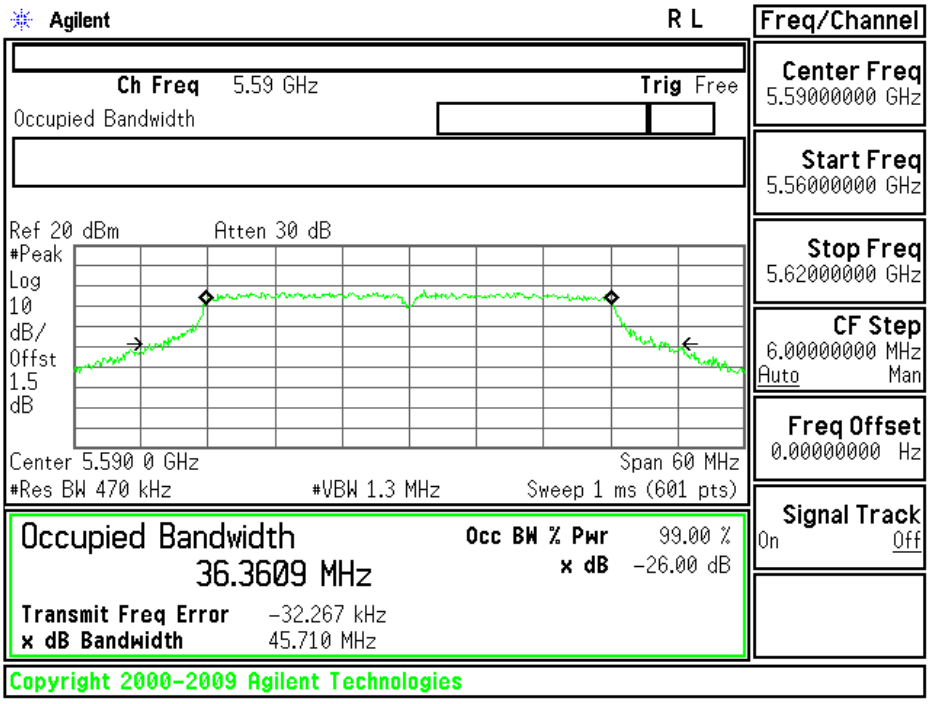


5470~5725MHz

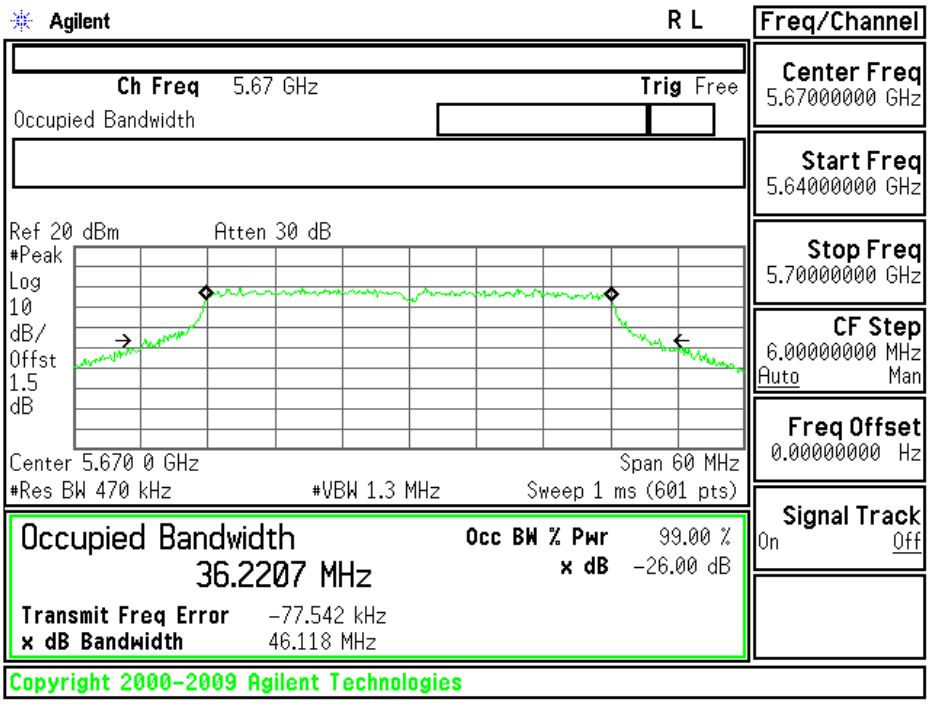
CH Low



CH Mid



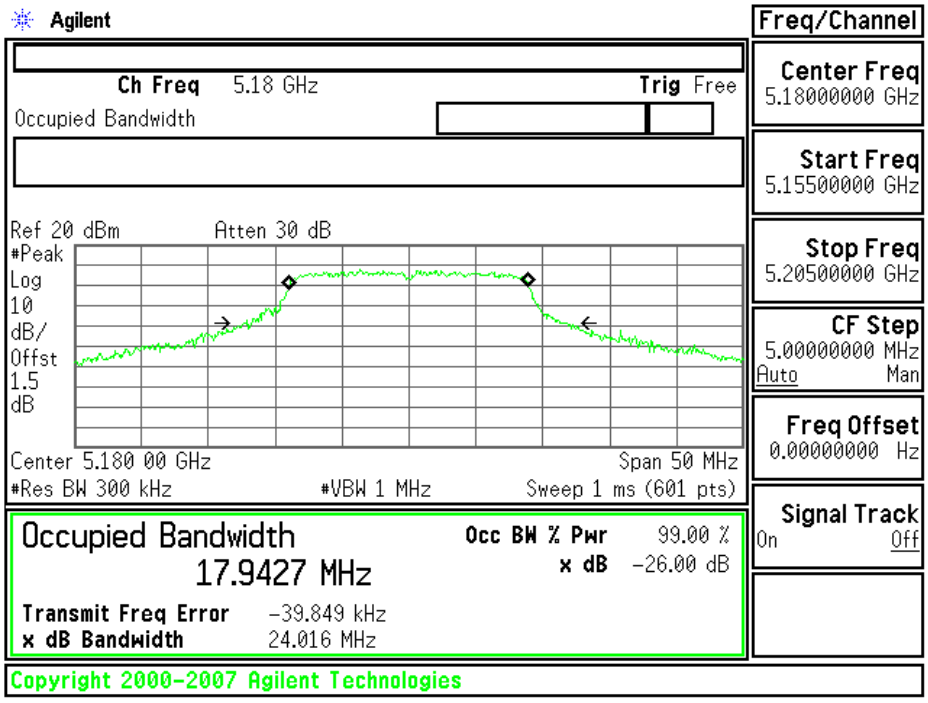
CH High



draft 802.11n Standard-20 MHz Channel mode / Chain 0+ Chain 1+ Chain 2

5150~5250MHz

CH Low



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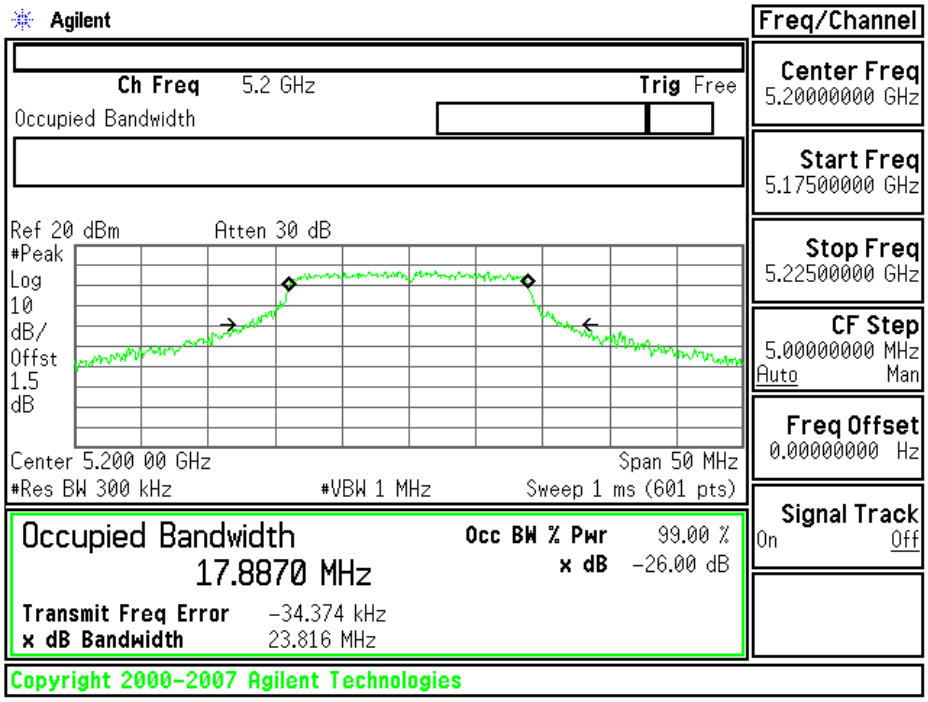

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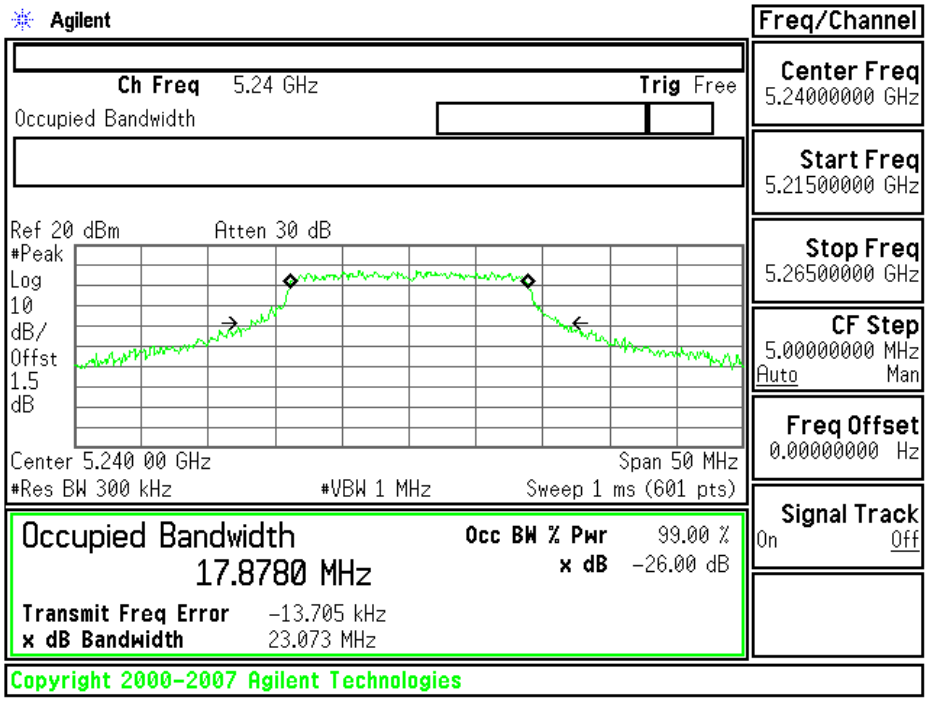
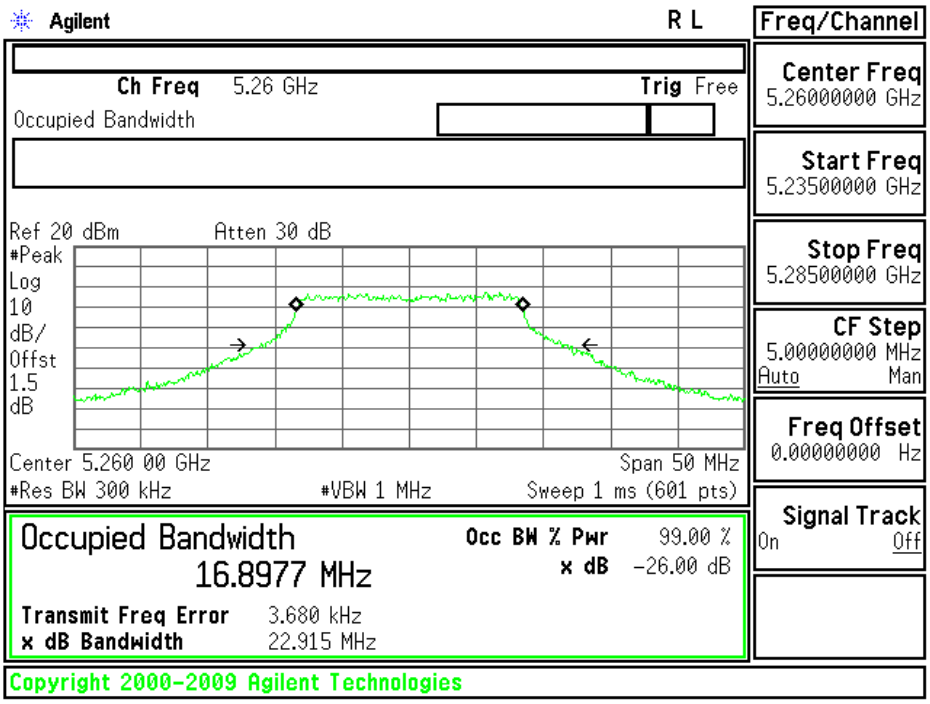


5250~5350MHz

CH Low



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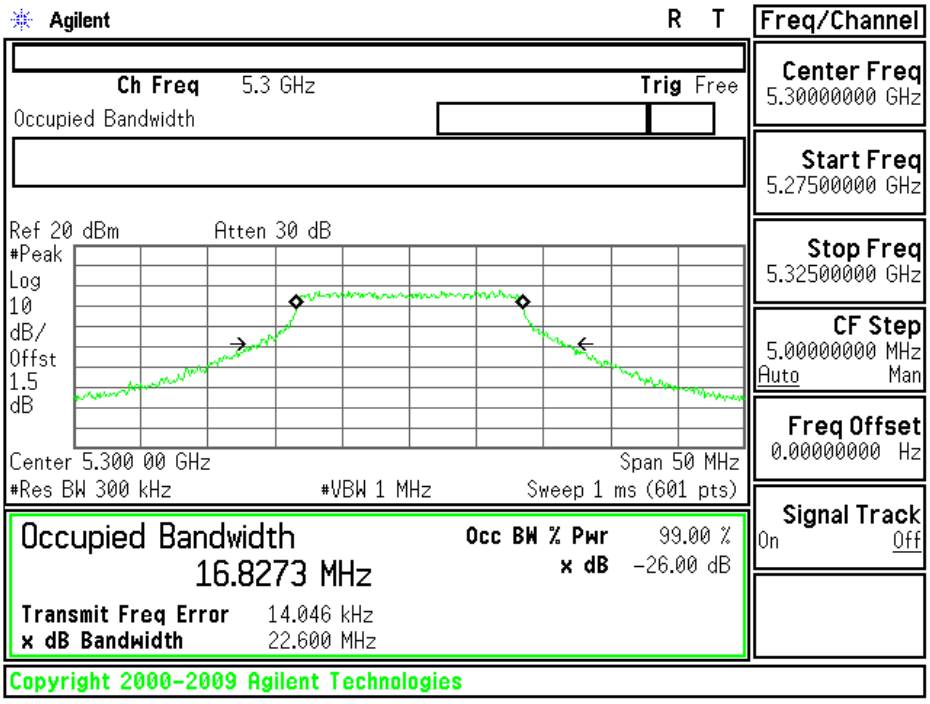

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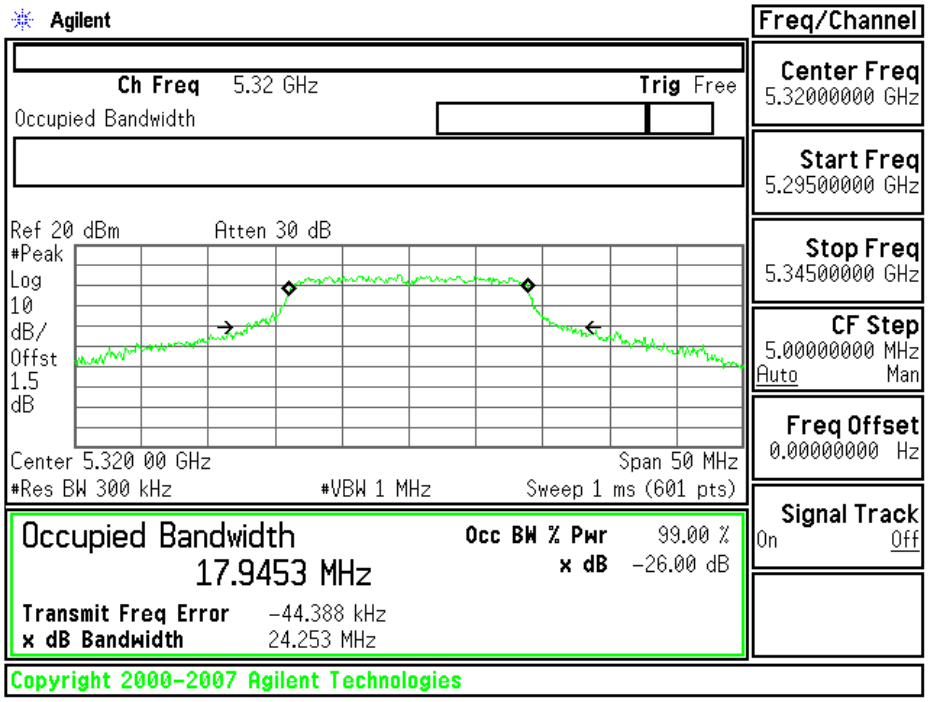
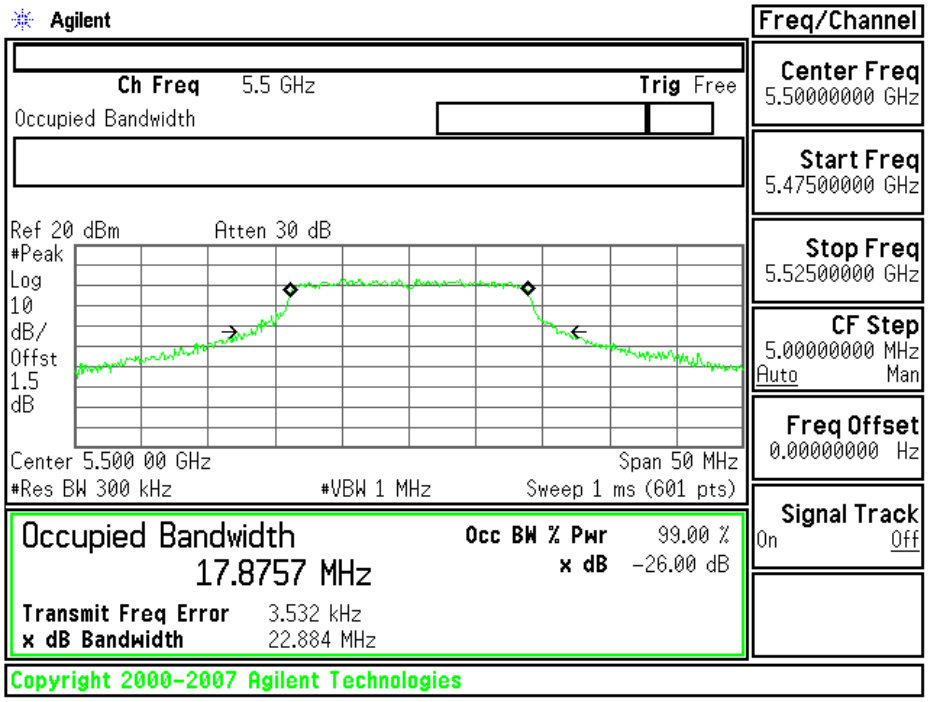


5470~5725MHz

CH Low



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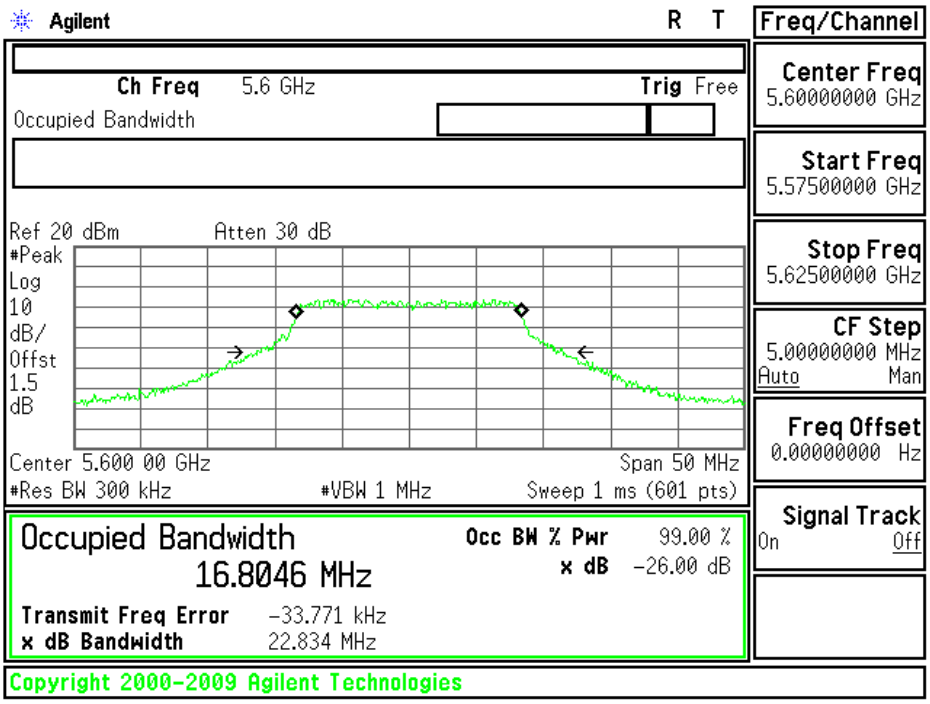

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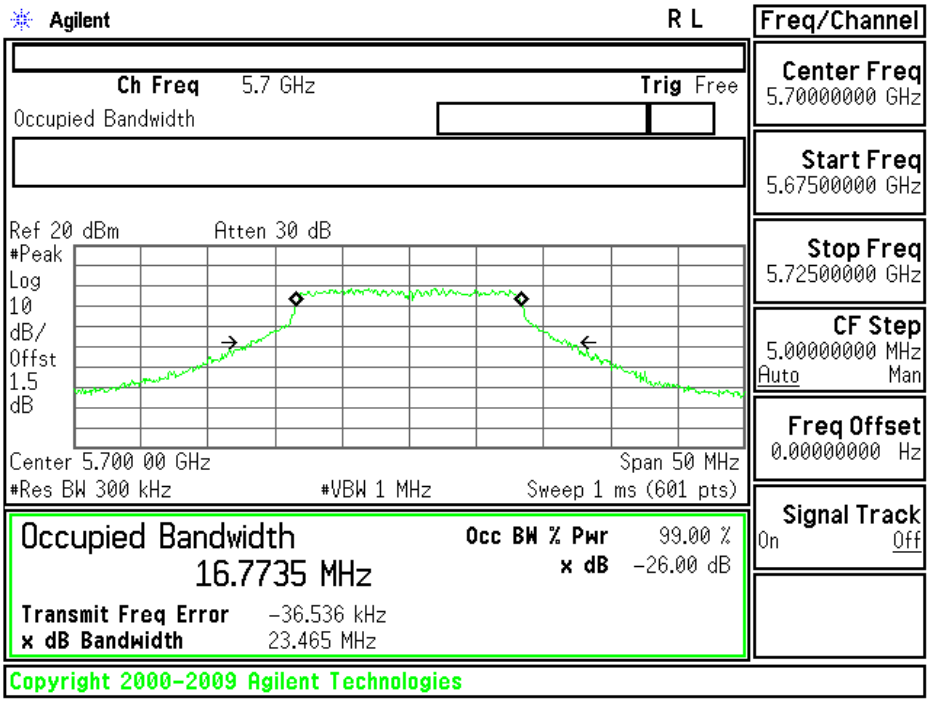
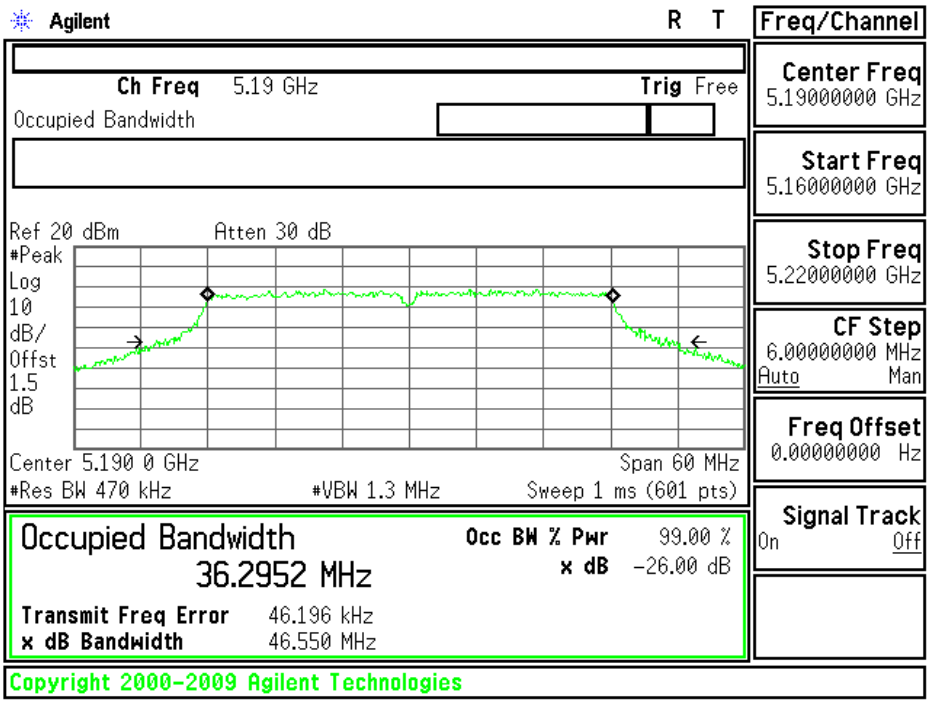


draft 802.11n Wide-40 MHz Channel mode / Chain 0+ Chain 1+ Chain 2

5150~5250MHz

CH Low



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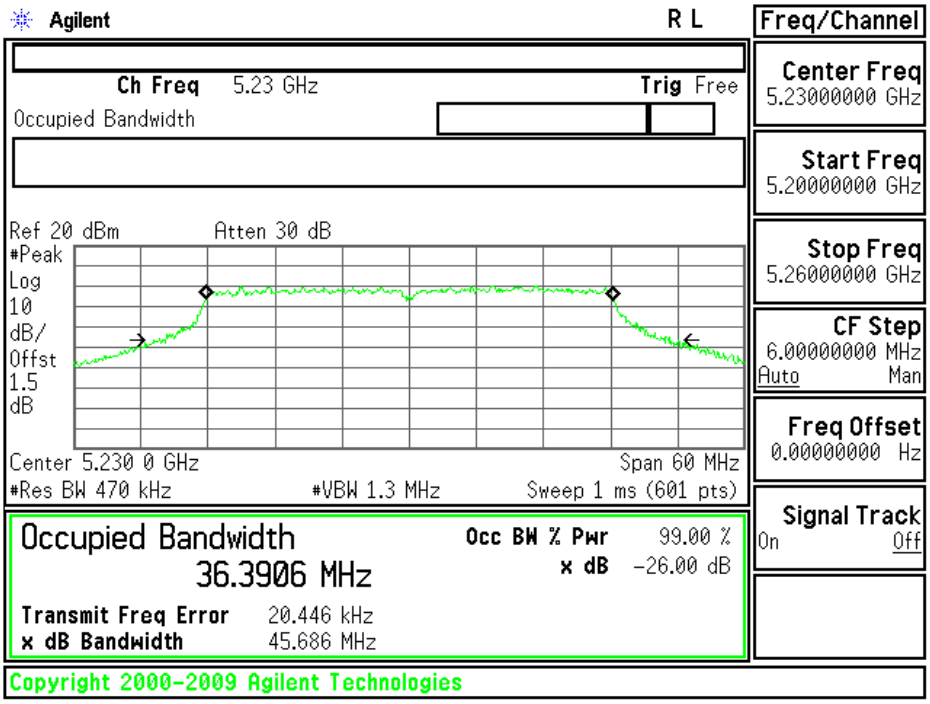
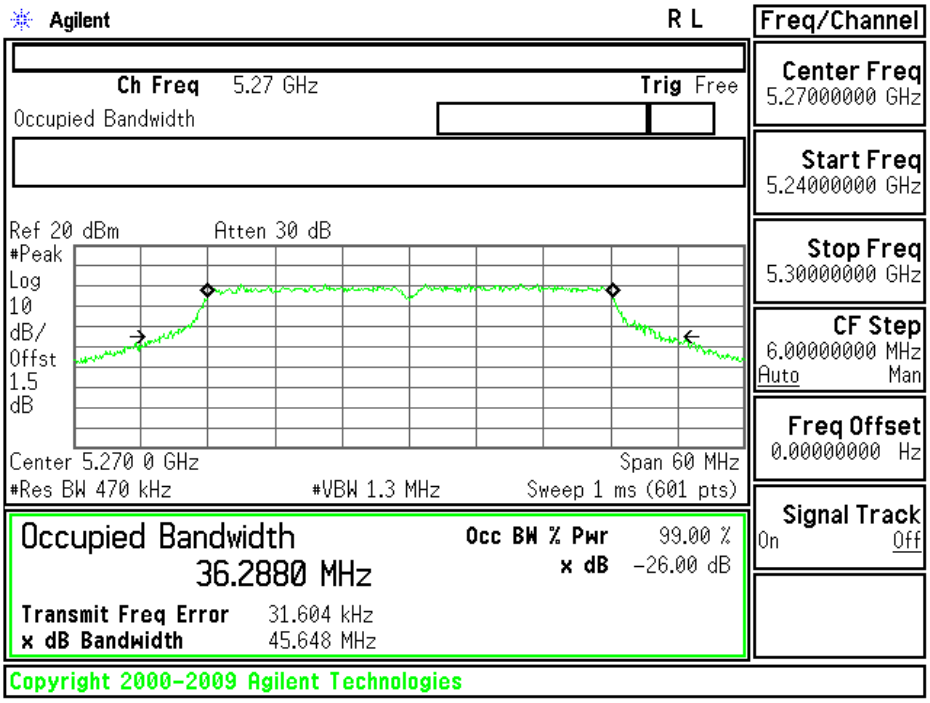
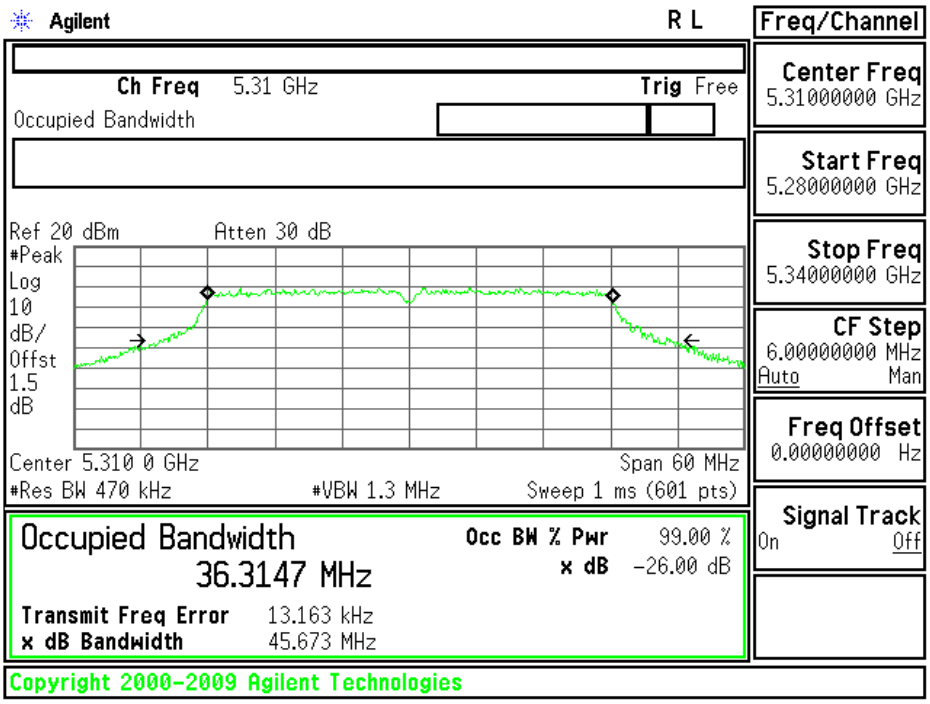


5250~5350MHz

CH Low

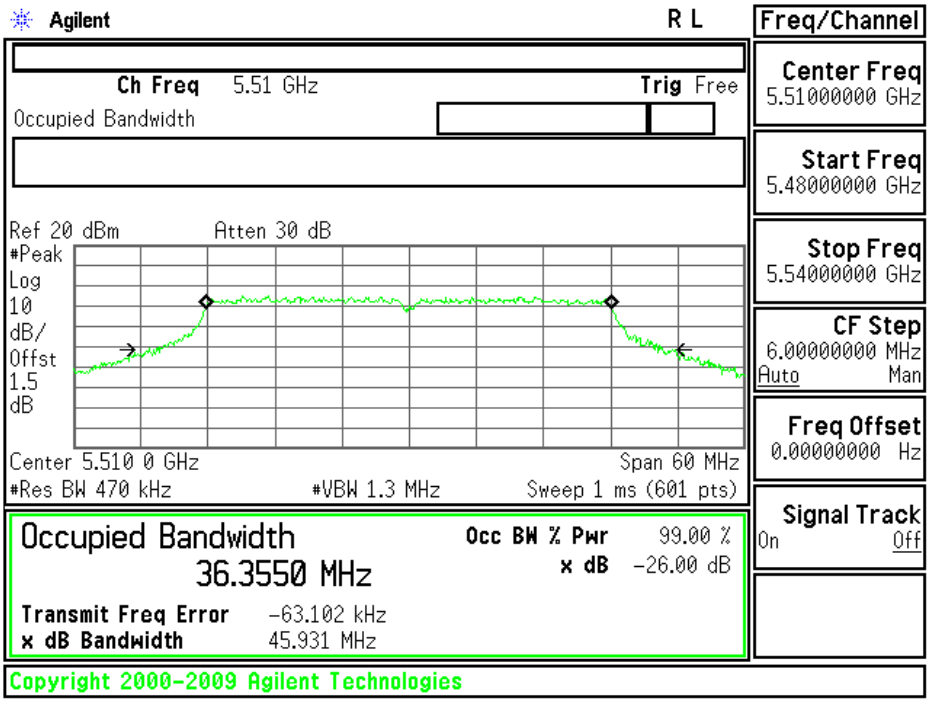


CH High

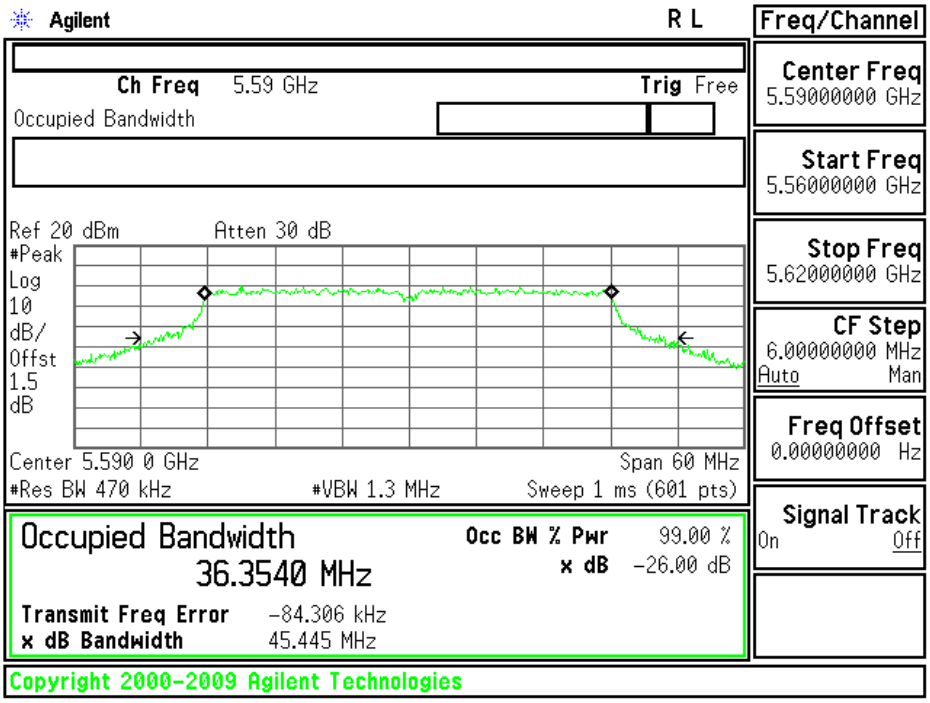


5470~5725MHz

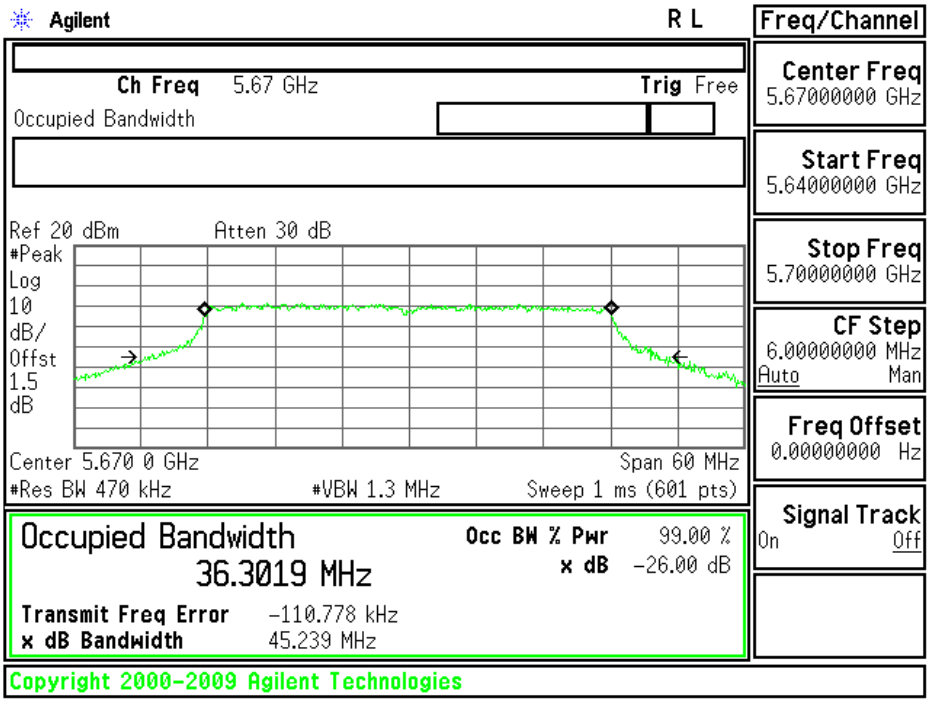
CH Low



CH Mid



CH High


Agilent
R L
Freq/Channel
Ch Freq 5.67 GHz
Trig Free
Occupied Bandwidth
Center Freq
5.67000000 GHz
Start Freq
5.64000000 GHz
Stop Freq
5.70000000 GHz
CF Step
6.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1.5
dB
Center 5.670 0 GHz
Span 60 MHz
#Res BW 470 kHz
#VBW 1.3 MHz
Sweep 1 ms (601 pts)
Occupied Bandwidth
36.3019 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -110.778 kHz
x dB Bandwidth 45.239 MHz
Copyright 2000-2009 Agilent Technologies

MAXIMUM CONDUCTED OUTPUT POWER

LIMIT

According to §15.407(a),

(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26 dB emission bandwidth in MHz.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in MHz.

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

The peak power shall not exceed the limit as follow:

Specified Limit of the Peak Power

Test mode: IEEE 802.11a mode

5150~5250MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	22.961	13.61	17.61	17.00
Mid	5200	22.336	13.49	17.49	17.00
High	5240	21.315	13.29	17.29	17.00

5250~5350MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10 Log B (dB)	11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5260	22.566	13.53	24.53	24.00
Mid	5300	21.313	13.29	24.29	24.00
High	5320	22.651	13.55	24.55	24.00

5470~5725MHz

Channel	Frequency (MHz)	26 dB Bandwidth (B) (MHz)	10 Log B (dB)	11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	21.396	13.30	24.30	24.00
Mid	5600	22.071	13.44	24.44	24.00
High	5700	22.833	13.59	24.59	24.00

Test mode: draft 802.11n Standard-20 MHz Channel mode

5150~5250MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Chain 2 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	23.786	23.532	22.474	24.016	13.81	17.81	17.00
Mid	5200	23.464	23.108	23.391	23.816	13.77	17.77	17.00
High	5240	23.921	23.412	23.165	23.073	13.63	17.63	17.00

5250~5350MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Chain 2 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5260	23.636	22.538	23.399	27.99	14.47	25.47	24.00
Mid	5300	23.056	23.557	23.427	28.12	14.49	25.49	24.00
High	5320	23.318	23.604	23.542	28.26	14.51	25.51	24.00

5470~5725MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Chain 2 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5500	22.983	22.787	23.619	27.92	14.46	25.46	24.00
Mid	5600	23.193	23.966	22.338	27.99	14.47	25.47	24.00
High	5700	23.359	23.004	22.847	27.85	14.45	25.45	24.00

Test mode: draft 802.11n Wide-40 MHz Channel mode

5150~5250MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Chain2 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	4 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5190	45.984	45.102	45.601	50.35	17.02	28.02	17.00
High	5230	45.515	44.745	45.842	50.16	17.00	28.00	17.00

5250~5350MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Chain2 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5270	46.168	45.569	45.593	50.56	17.04	28.04	24.00
High	5310	45.818	45.413	44.111	49.94	16.98	27.98	24.00

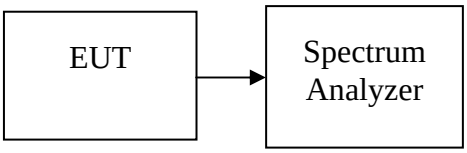
5470~5725MHz

Channel	Frequency (MHz)	Chain 0 26 dB Bandwidth (B) (MHz)	Chain 1 26 dB Bandwidth (B) (MHz)	Chain 2 26 dB Bandwidth (B) (MHz)	Total 26 dB Bandwidth (B) (MHz)	10 Log B (dB)	11 + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5510	44.666	45.484	44.986	49.83	16.97	27.97	24.00
Mid	5590	45.756	43.403	45.710	49.86	16.98	27.98	24.00
High	5670	43.967	44.410	46.118	49.71	16.96	27.96	24.00

*(**Remark:** Maximum antenna gain = 3dBi, therefore there is no reduction due to antenna gain.)*

Test Configuration

The EUT was connected to a spectrum analyzer through a 50Ω RF cable.



TEST PROCEDURE

Set span to encompass the entire emission bandwidth (EBW) of the signal.

Set RBW = 1 MHz / Set VBW = 3 MHz.

Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run".·Trace average 100 traces in power averaging mode. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode

5150~5250MHz

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	9.29	17.00
Mid	5200	9.90	17.00
High	5240	9.21	17.00

5250~5350MHz

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5260	12.65	24.00
Mid	5300	12.22	24.00
High	5320	12.02	24.00

5470~5725MHz

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5500	9.67	24.00
Mid	5600	11.22	24.00
High	5700	12.23	24.00

Test mode: draft 802.11n Standard-20 MHz Channel mode

5150~5250MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	10.94	9.52	9.65	14.86	17.00
Mid	5200	10.61	9.29	9.84	14.72	17.00
High	5240	11.07	9.13	8.56	14.50	17.00

Total maximum conducted power Chain 0+Chain 1+Chain 2:

Maximum Conducted Output Power(dBm)=10log(10^(chain0outputpower/10)+ 10^(chain1outputpower/10)+ 10^(chain2outputpower/10))

5250~5350MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5260	11.78	11.59	12.37	16.70	24.00
Mid	5300	11.82	10.50	11.97	16.25	24.00
High	5320	11.62	10.79	11.72	16.17	24.00

Total maximum conducted power Chain 0+Chain 1+Chain 2:

Maximum Conducted Output Power(dBm)=10log(10^(chain0outputpower/10)+ 10^(chain1outputpower/10)+ 10^(chain2outputpower/10))

5470~5725MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5500	9.52	10.70	9.87	14.83	24.00
Mid	5600	10.78	10.85	11.80	15.94	24.00
High	5700	10.59	10.93	13.48	16.64	24.00

Total maximum conducted power Chain 0+Chain 1+Chain 2:

Maximum Conducted Output Power(dBm)=10log(10^(chain0outputpower/10)+ 10^(chain1outputpower/10)+ 10^(chain2outputpower/10))

Test mode: draft 802.11n Wide-40 MHz Channel mode

5150~5250MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5190	10.41	9.52	10.51	14.94	17.00
High	5230	10.14	9.85	9.93	14.75	17.00

Total maximum conducted power Chain 0+Chain 1+Chain 2:

Maximum Conducted Output Power(dBm)=10log(10^(chain0outputpower/10)+ 10^(chain1outputpower/10)+ 10^(chain2outputpower/10))

5250~5350MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5270	14.95	13.52	14.36	19.09	24.00
High	5310	13.61	12.94	13.84	18.25	24.00

Total maximum conducted power Chain 0+Chain 1+Chain 2:

Maximum Conducted Output Power(dBm)=10log(10^(chain0outputpower/10)+ 10^(chain1outputpower/10)+ 10^(chain2outputpower/10))

5470~5725MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5510	12.06	13.33	11.66	17.18	24.00
Mid	5590	10.63	10.68	11.23	15.63	24.00
High	5670	11.09	11.09	12.69	16.46	24.00

Total maximum conducted power Chain 0+Chain 1+Chain 2:

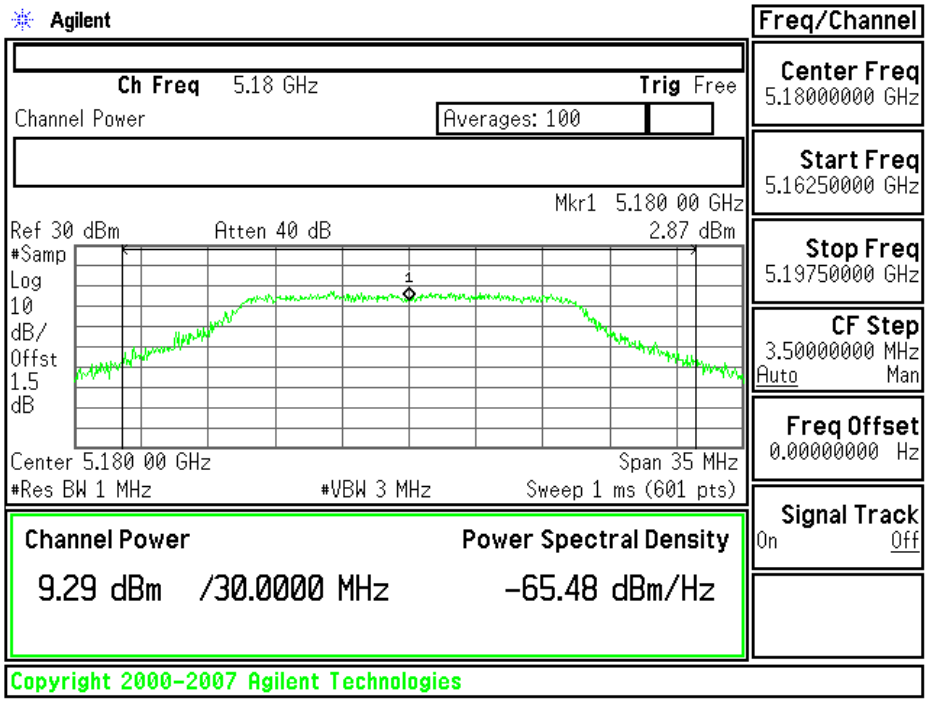
Maximum Conducted Output Power(dBm)=10log(10^(chain0outputpower/10)+ 10^(chain1outputpower/10)+ 10^(chain2outputpower/10))

Test Plot

Test mode: IEEE 802.11a mode:

5150~5250MHz

CH Low



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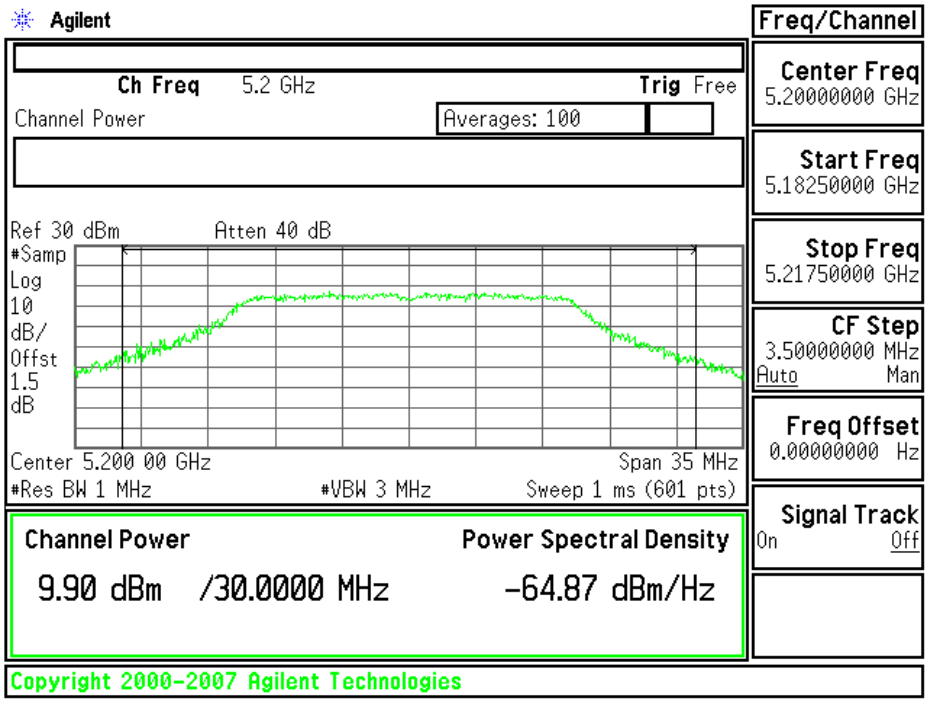
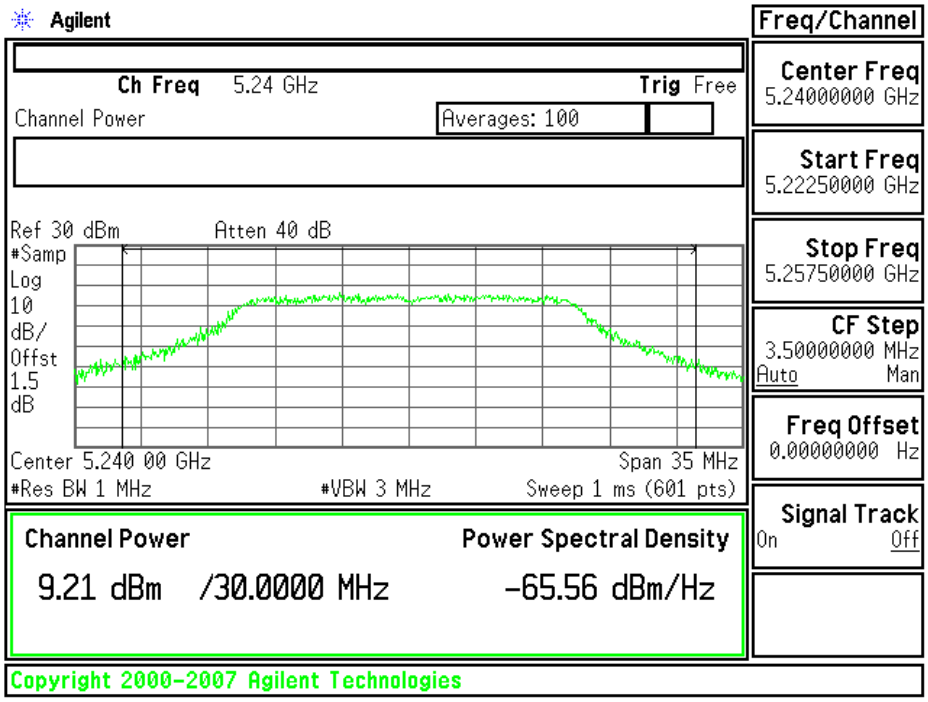
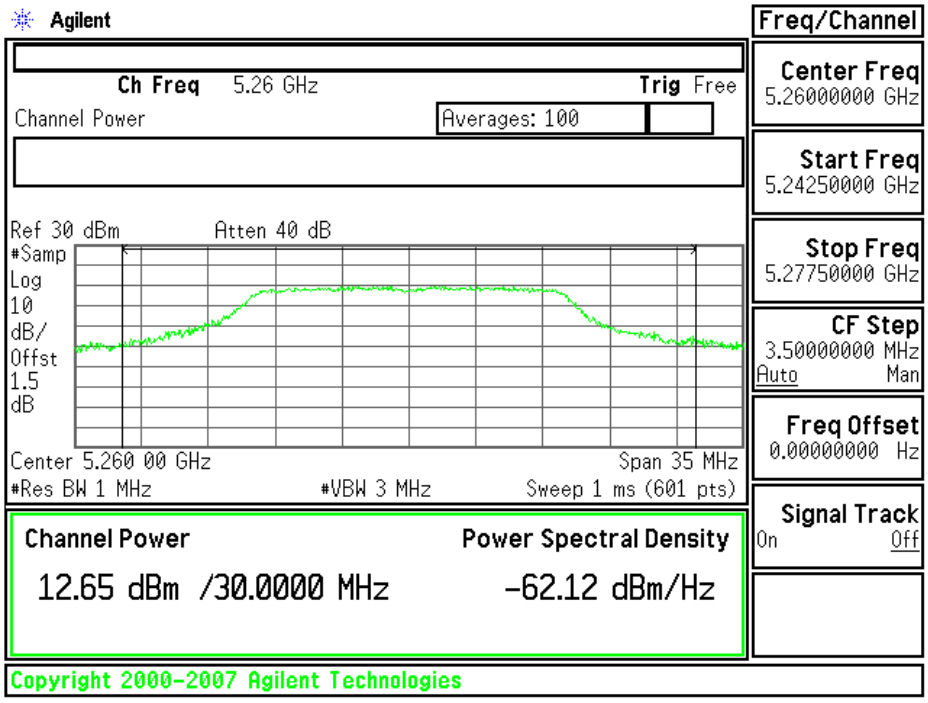


CH High



5250~5350MHz

CH Low



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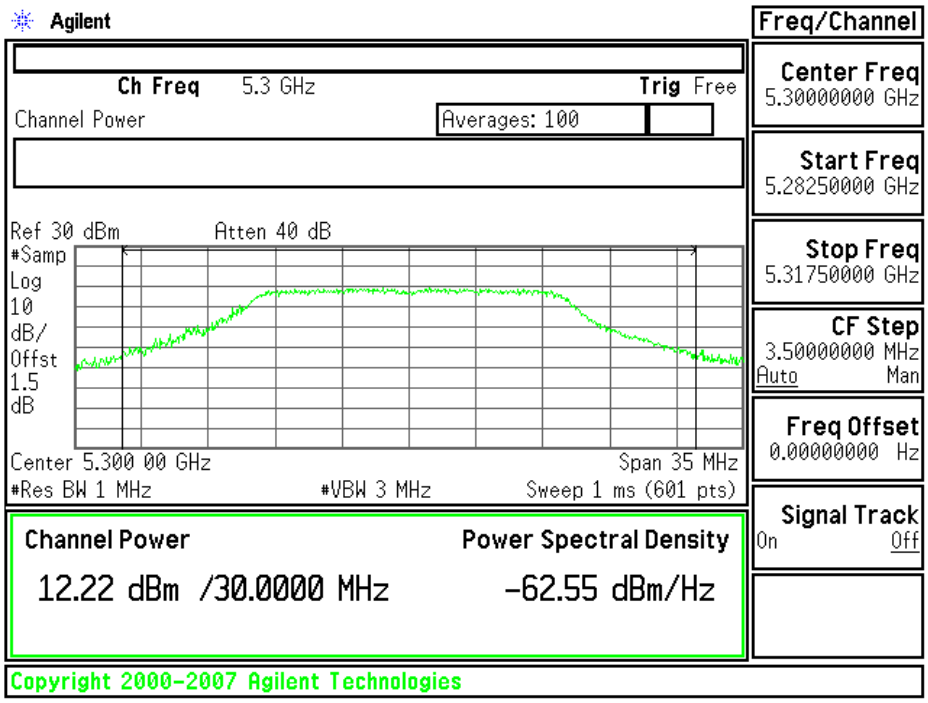

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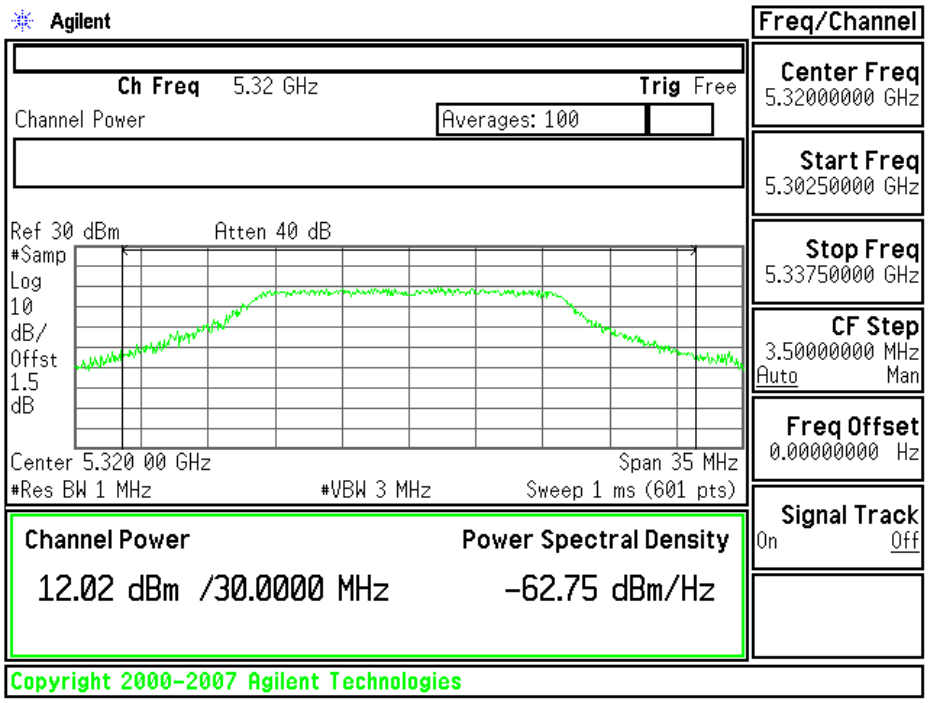
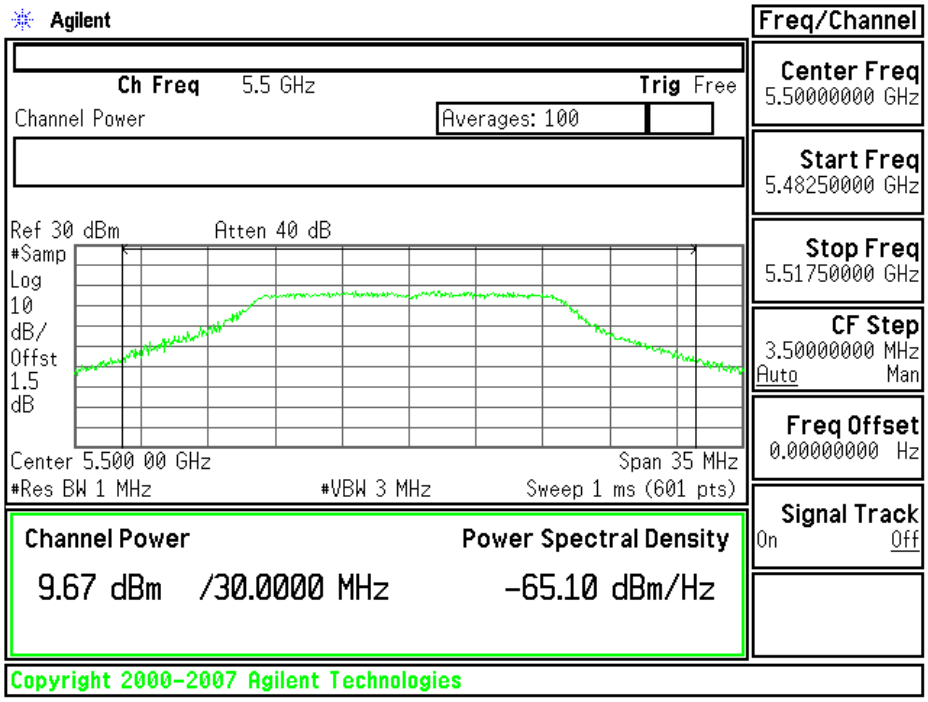
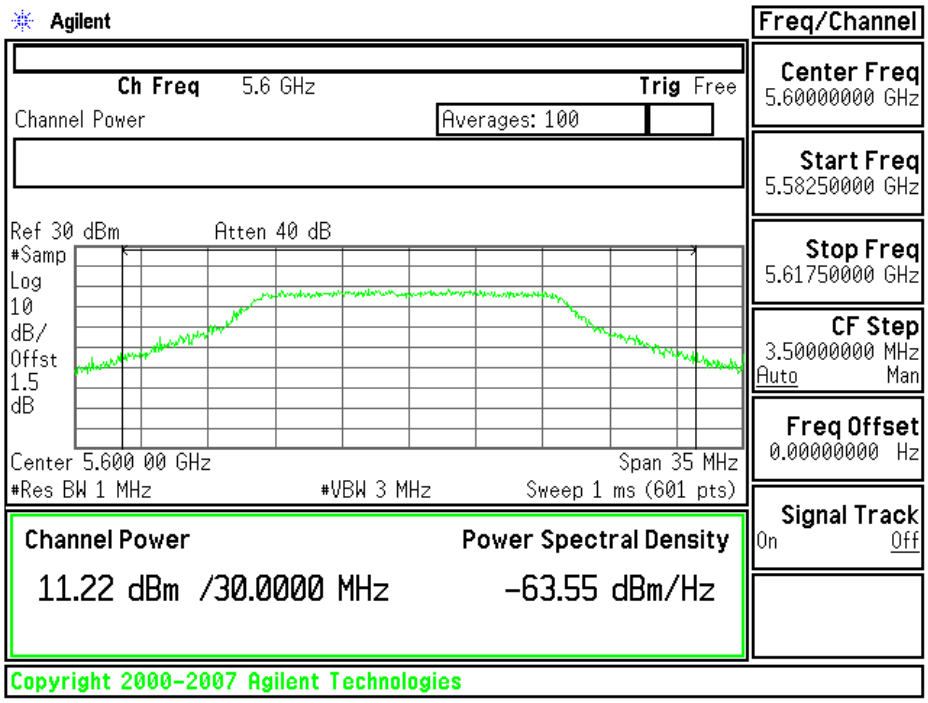


5470~5725MHz

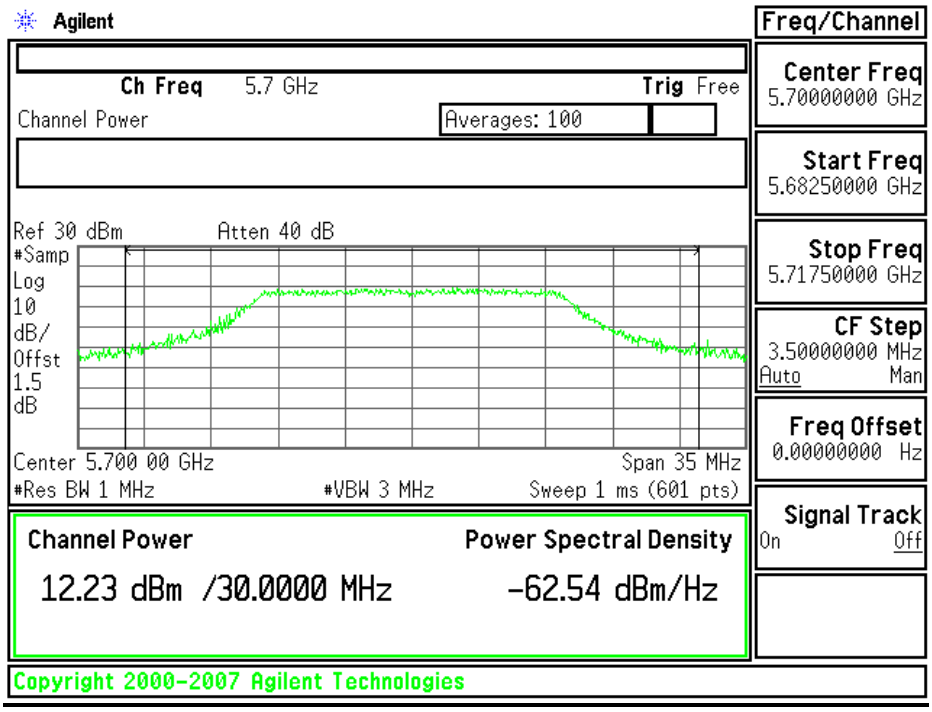
CH Low



CH Mid



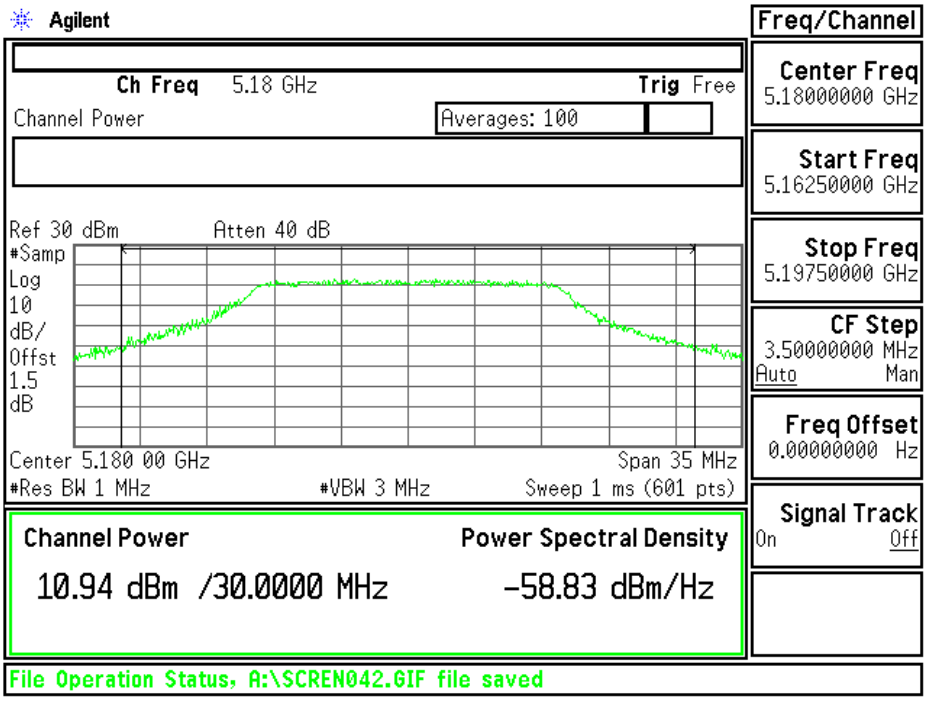
CH High



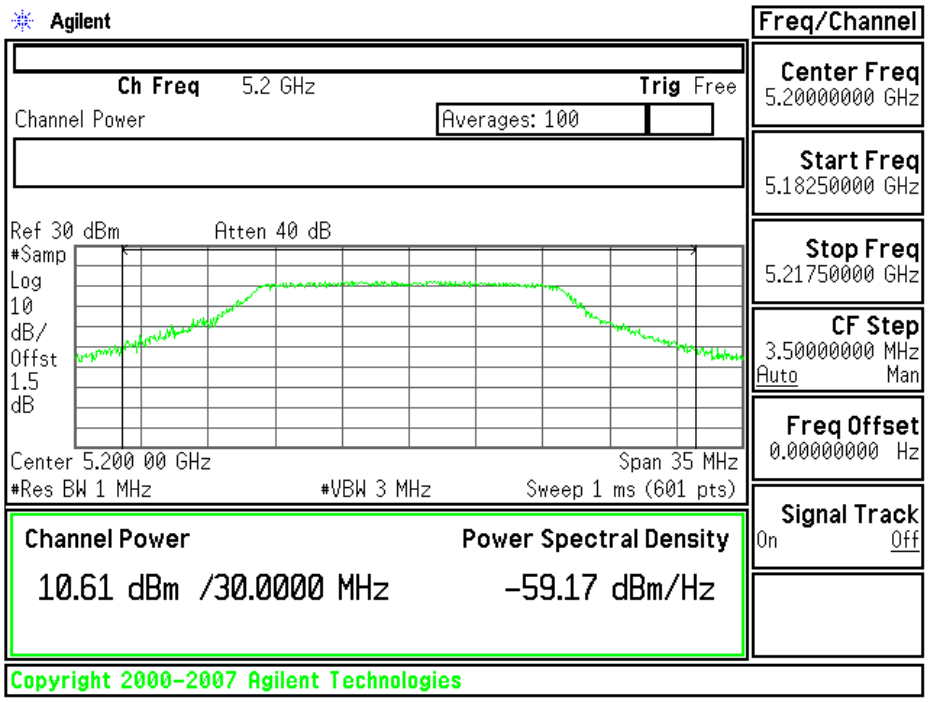
Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0:

5150~5250MHz

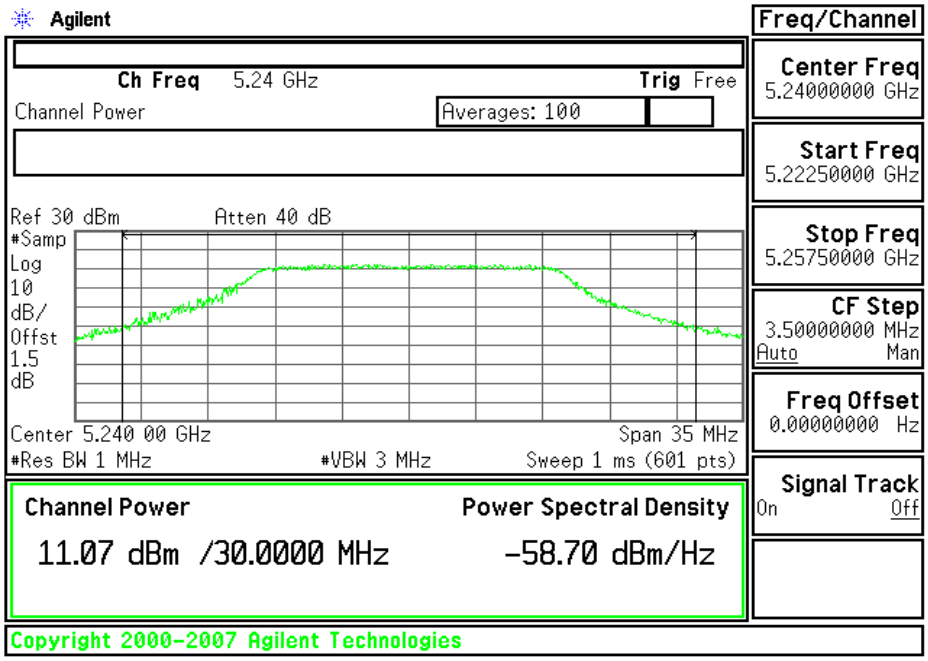
CH Low



CH Mid

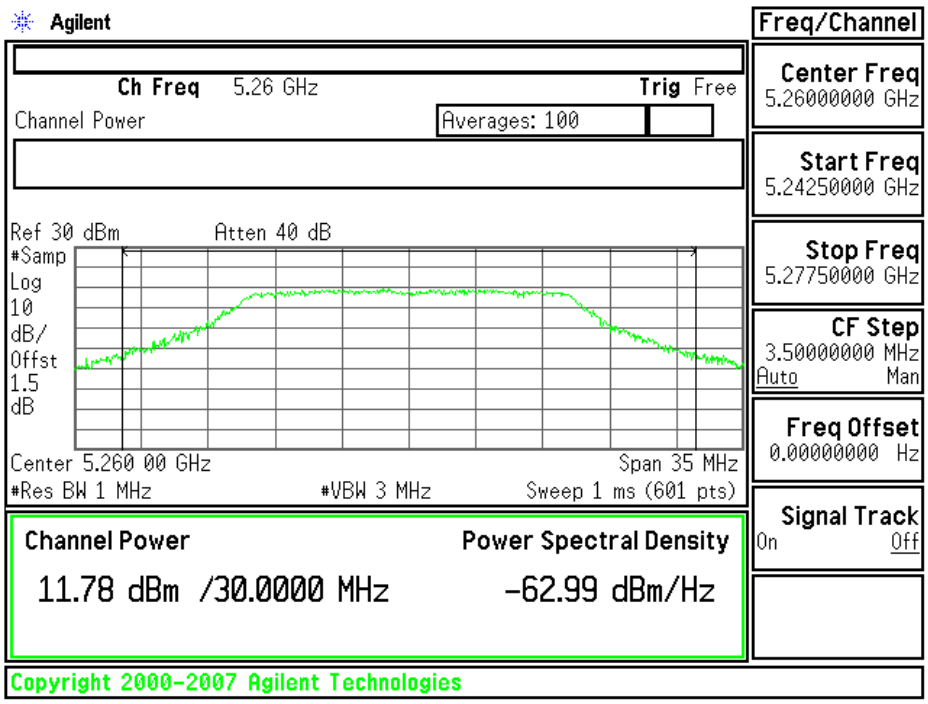


CH High

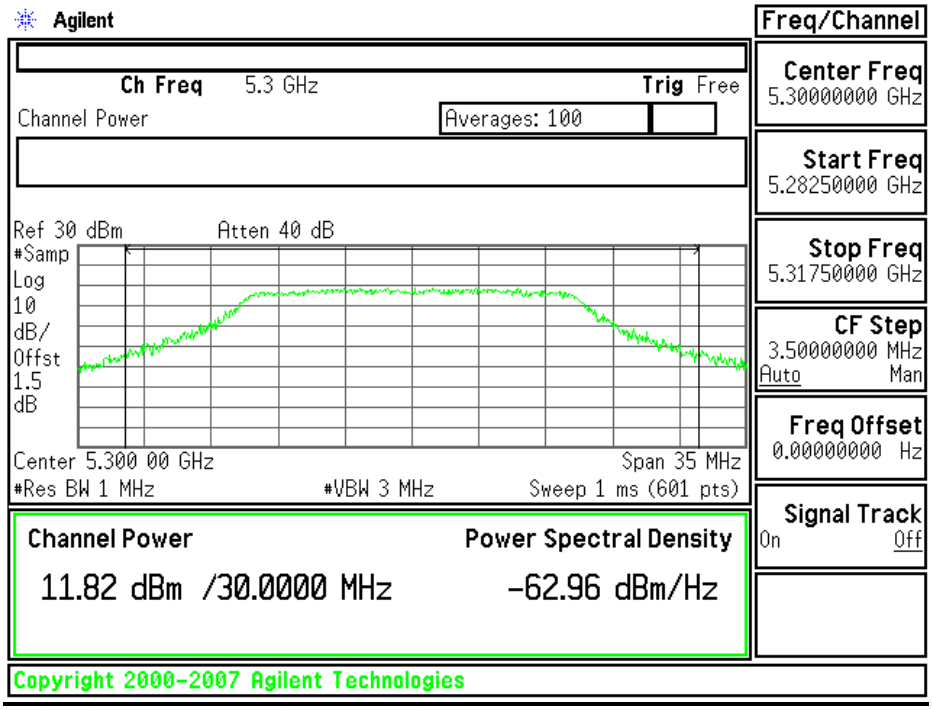


5250~5350MHz

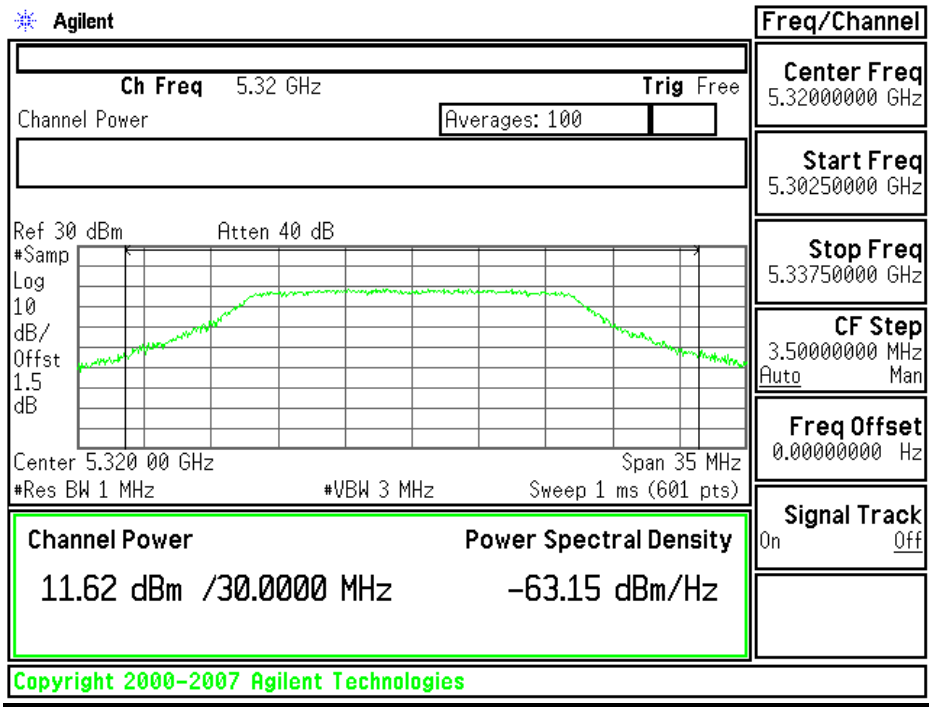
CH Low



CH Mid

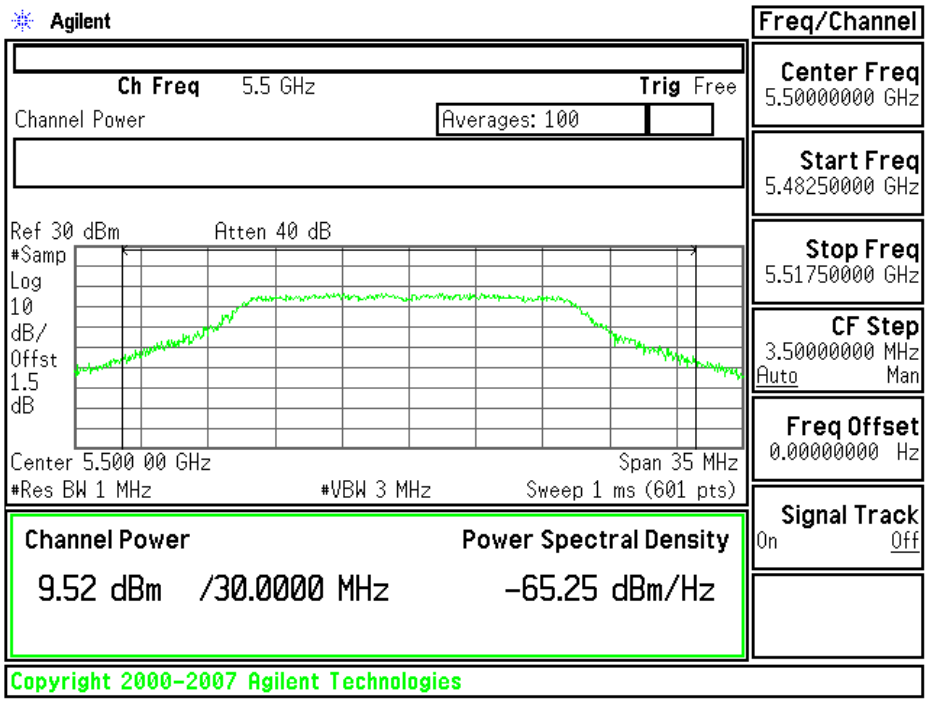


CH High



5470~5725MHz

CH Low



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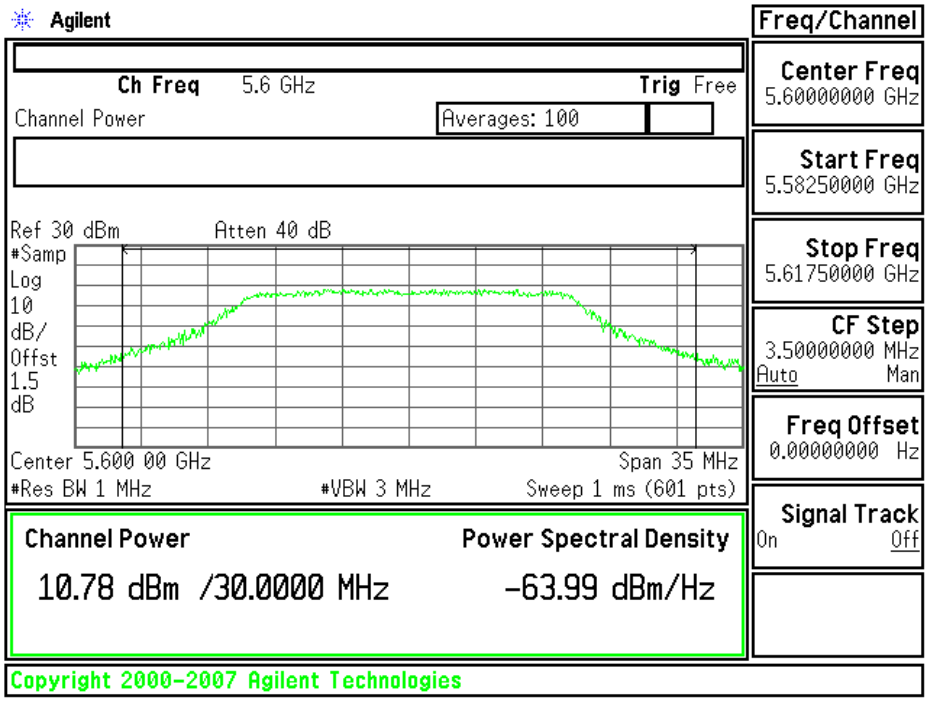
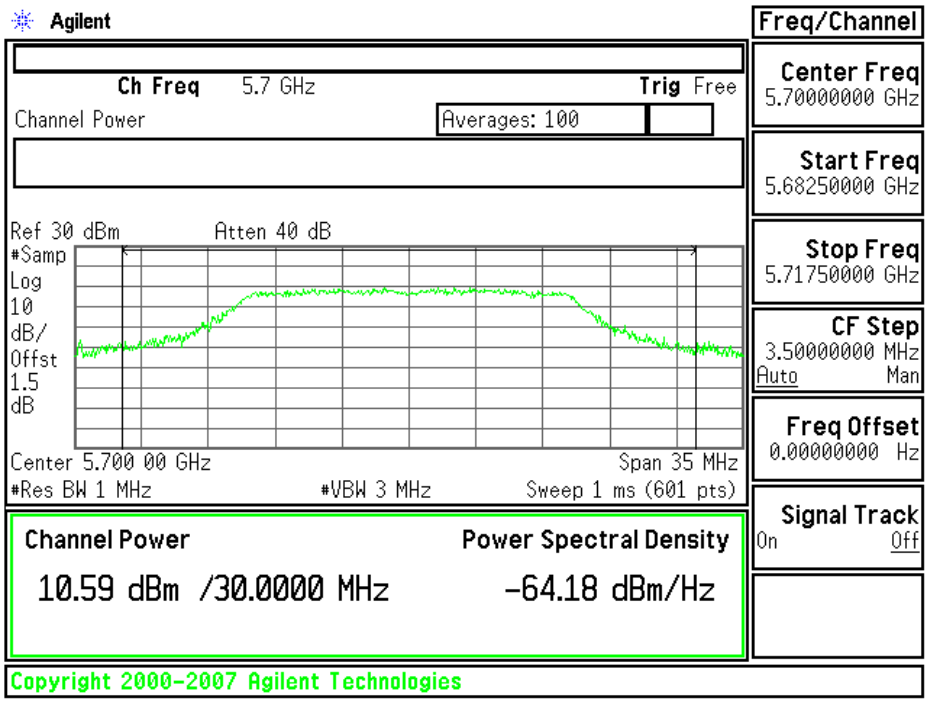


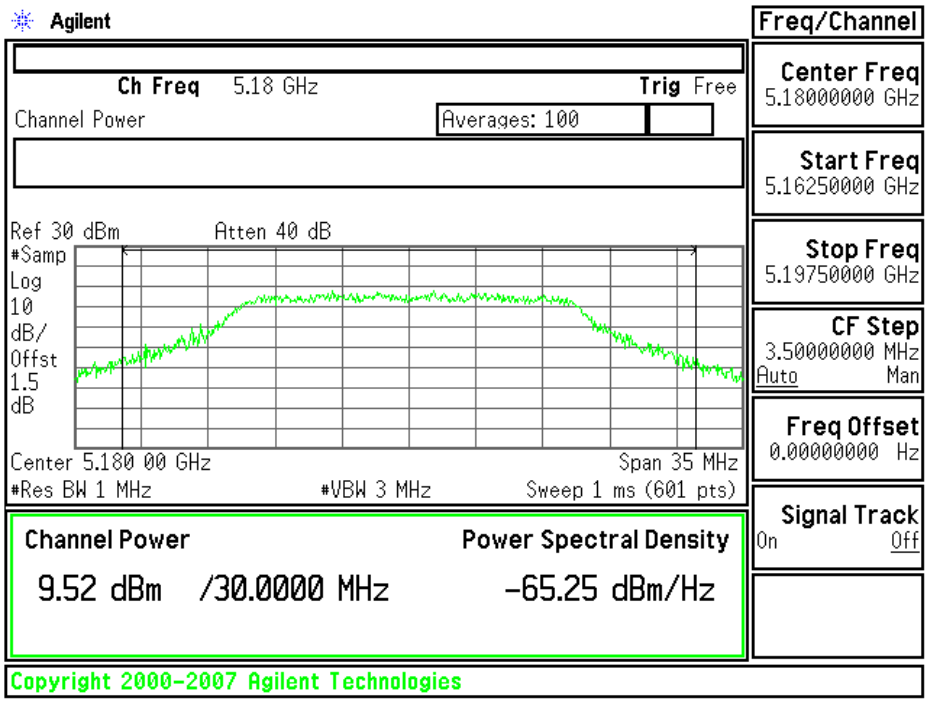
CH High



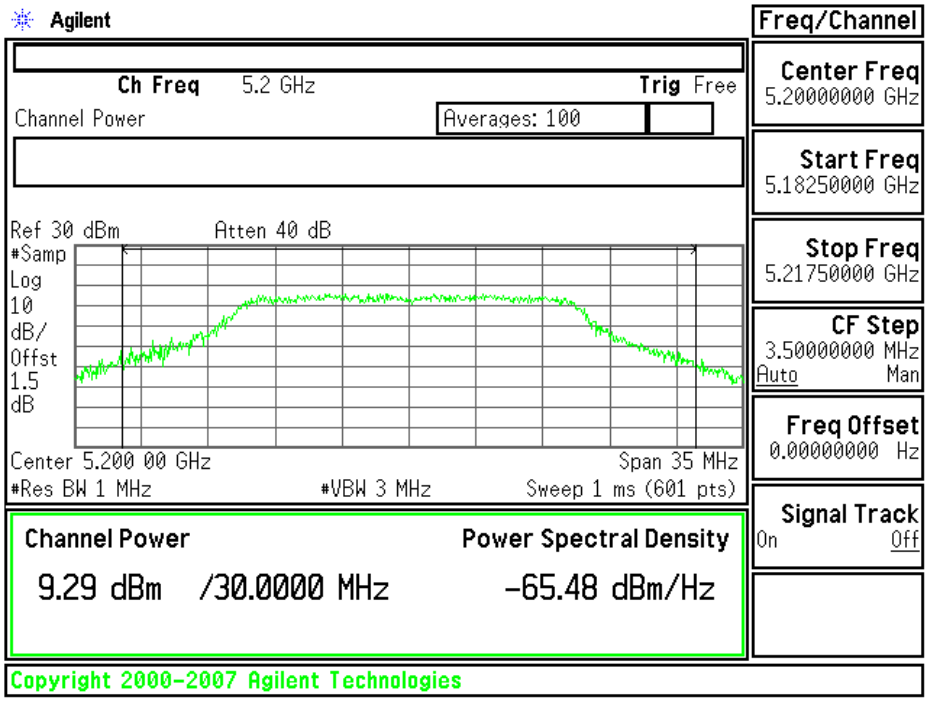
Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1:

5150~5250MHz

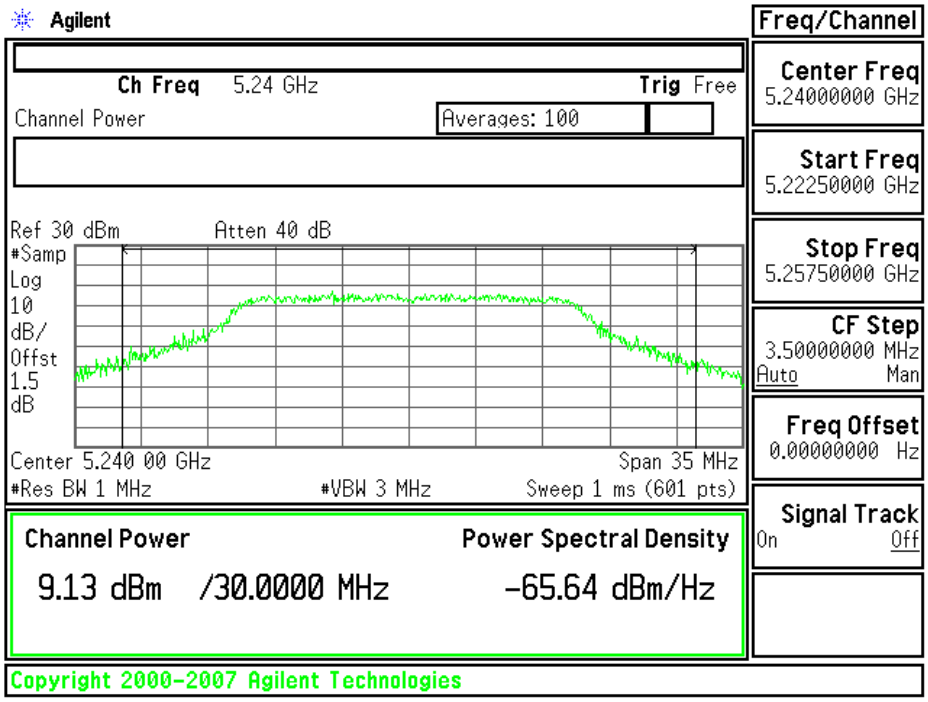
CH Low



CH Mid

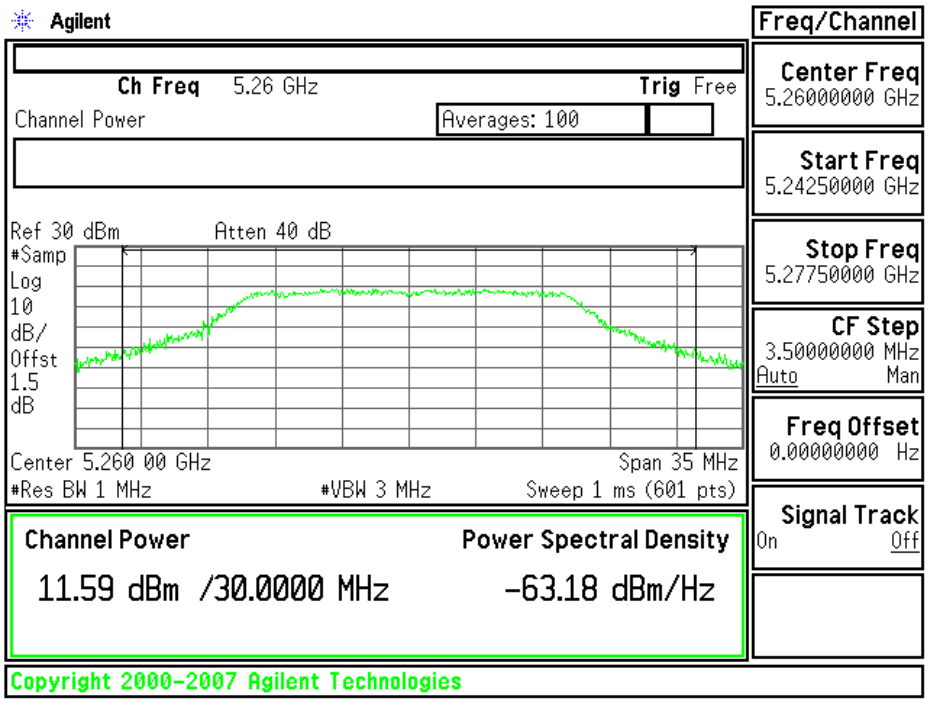


CH High



5250~5350MHz

CH Low



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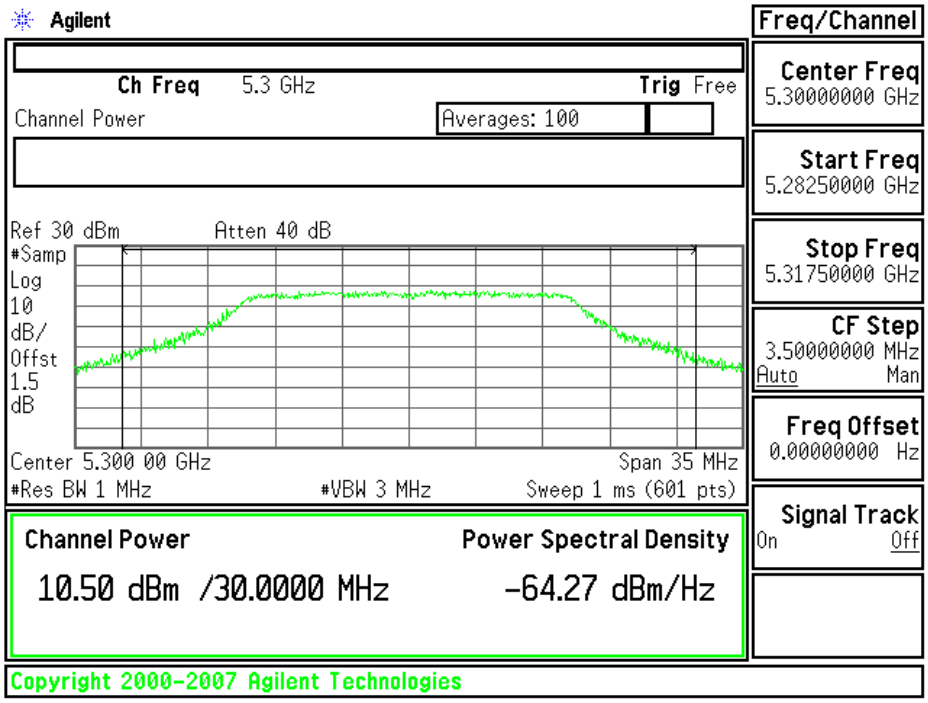

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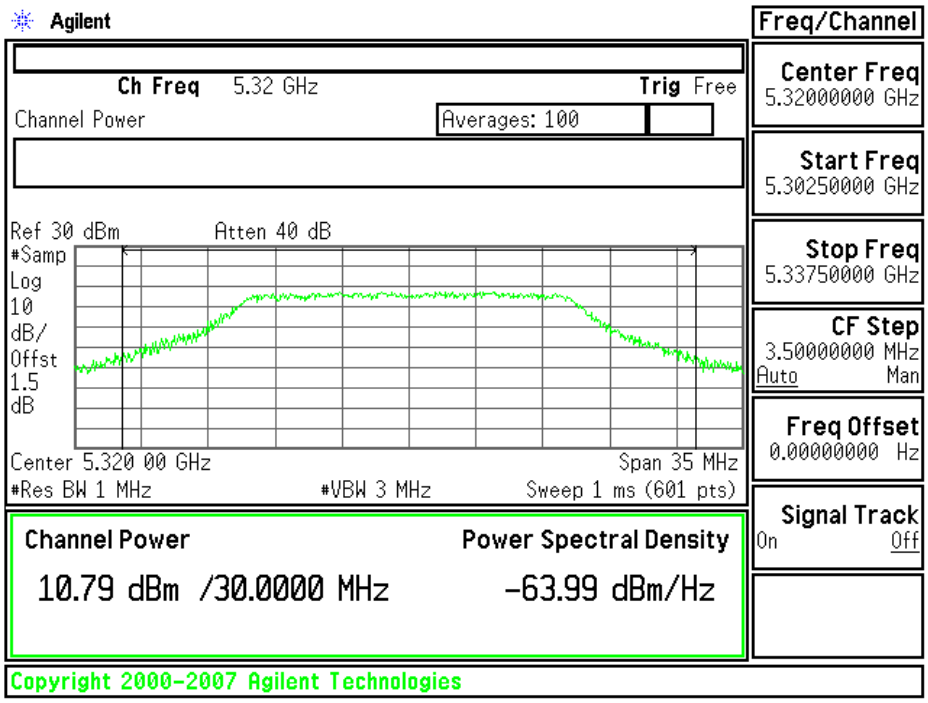
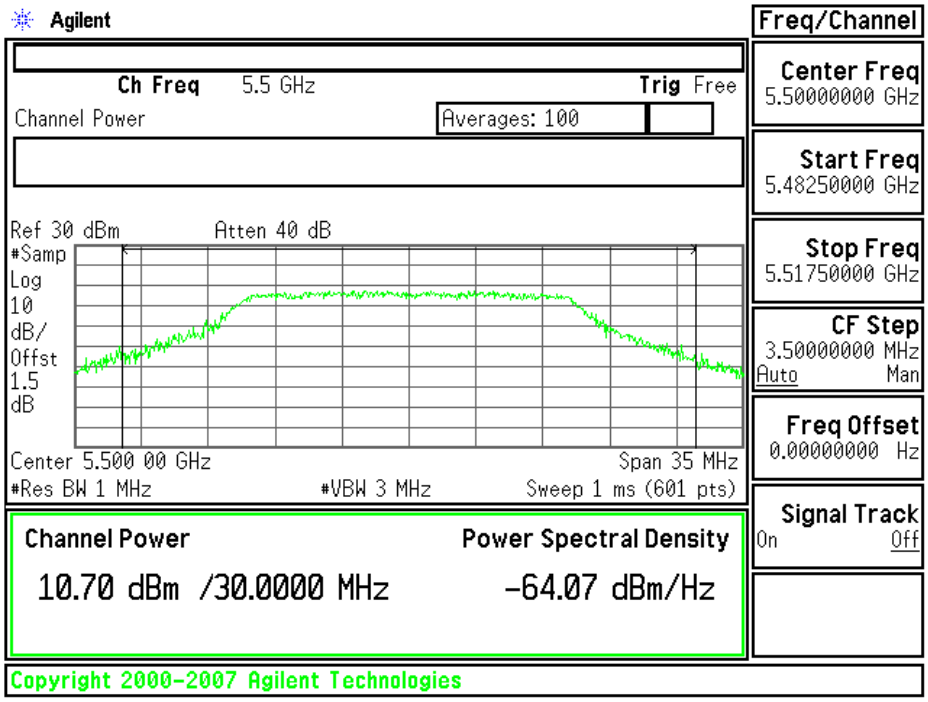
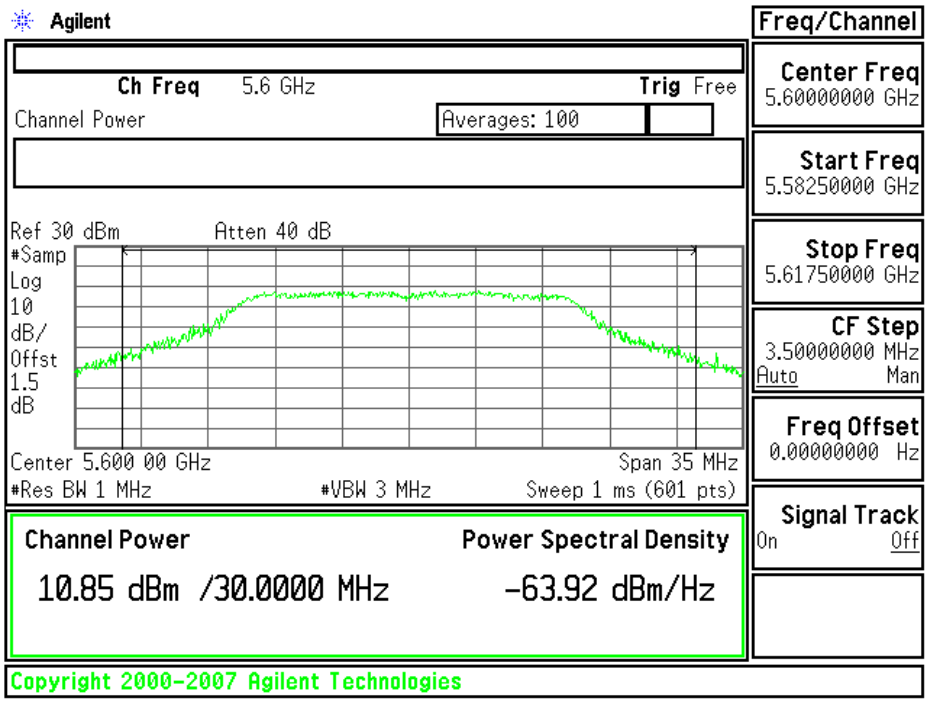


5470~5725MHz

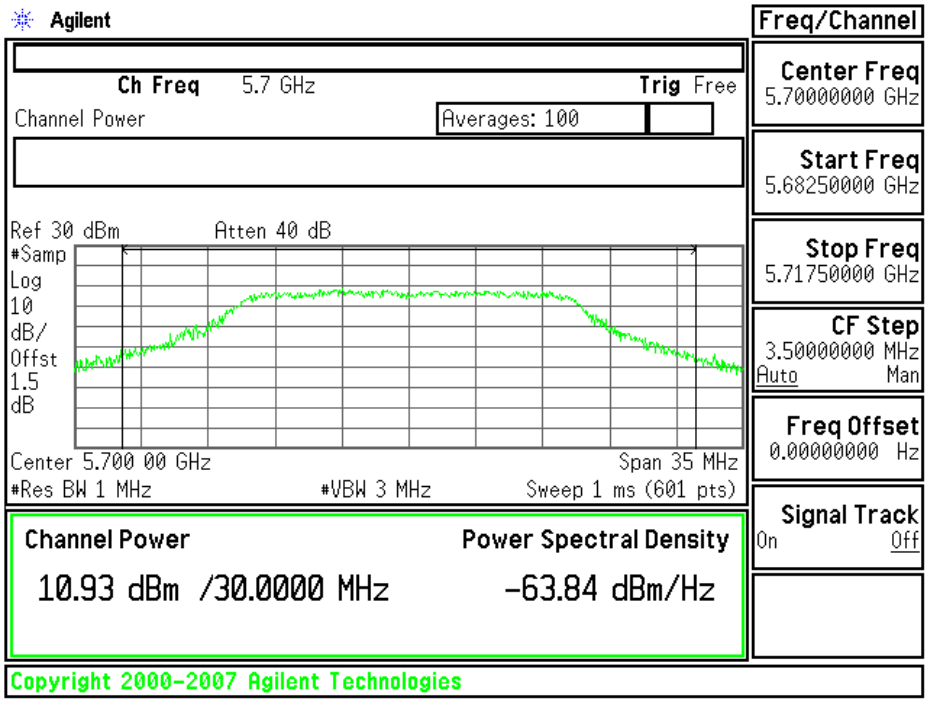
CH Low



CH Mid



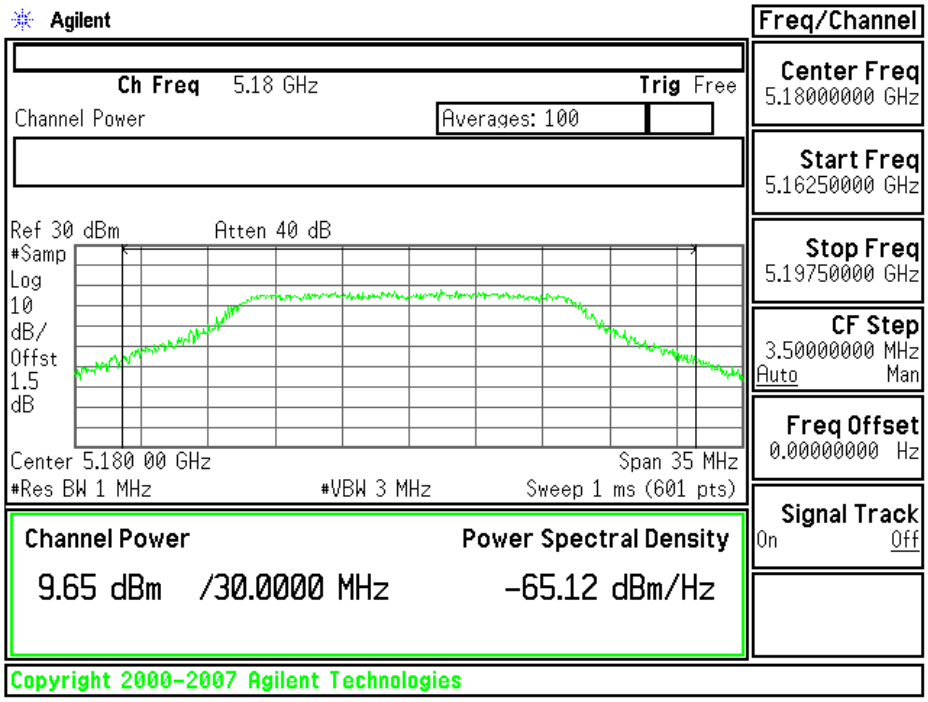
CH High



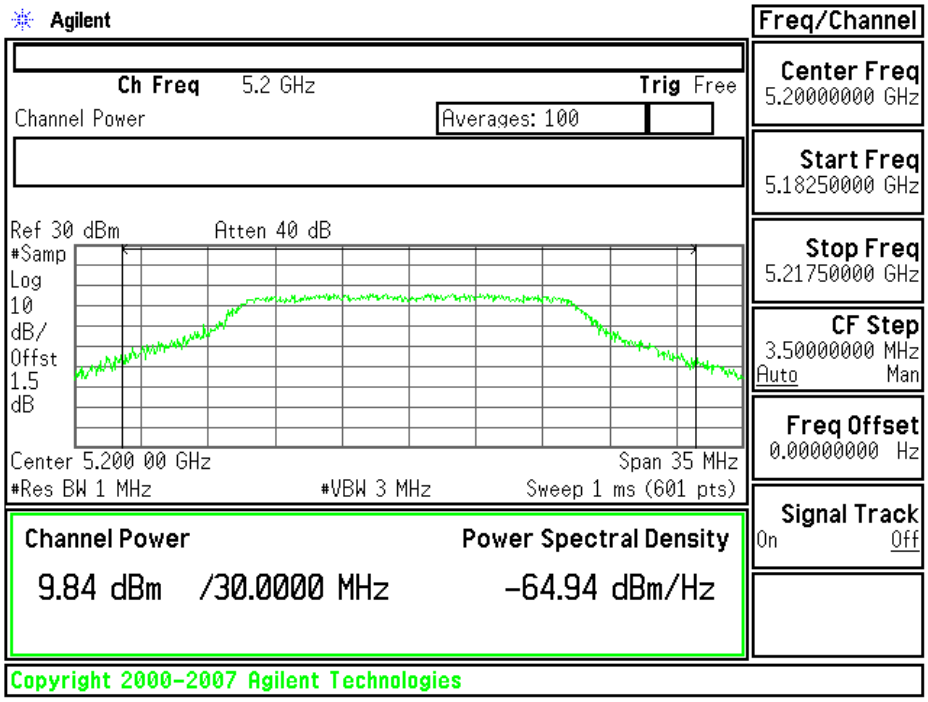
Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 2:

5150~5250MHz

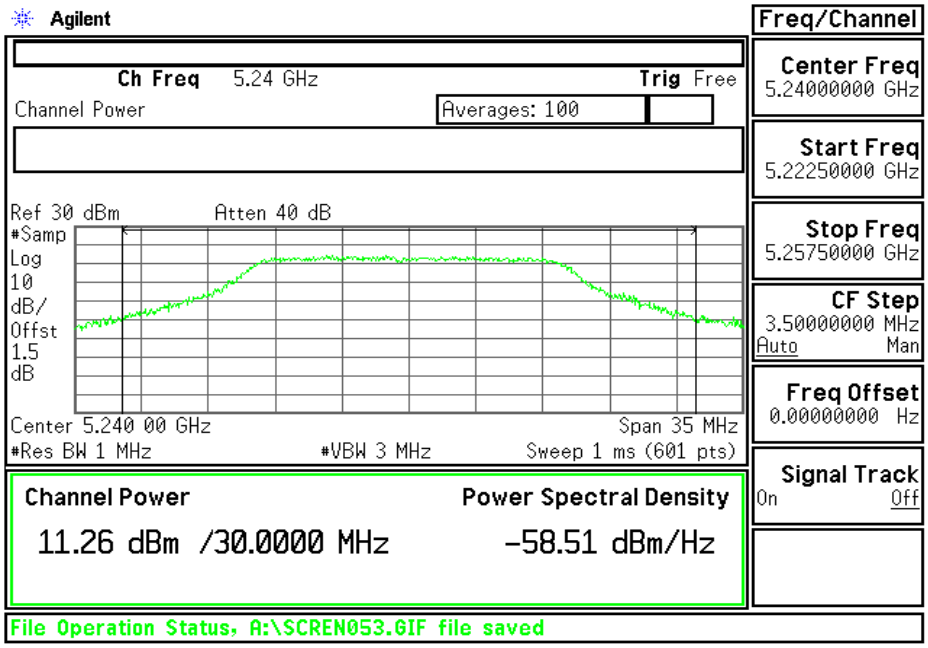
CH Low



CH Mid

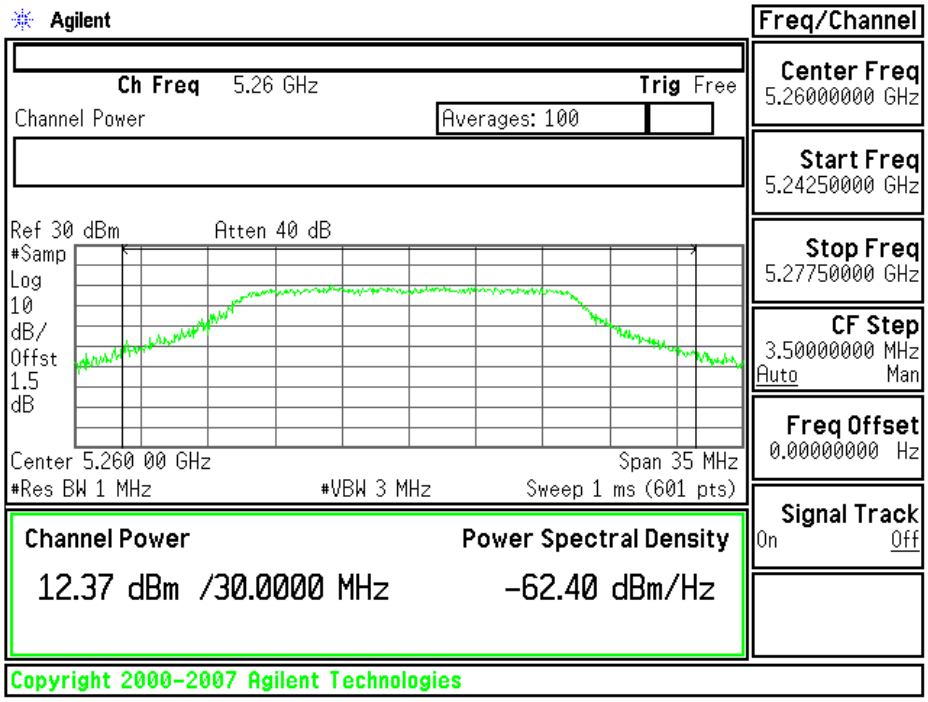


CH High



5250~5350MHz

CH Low



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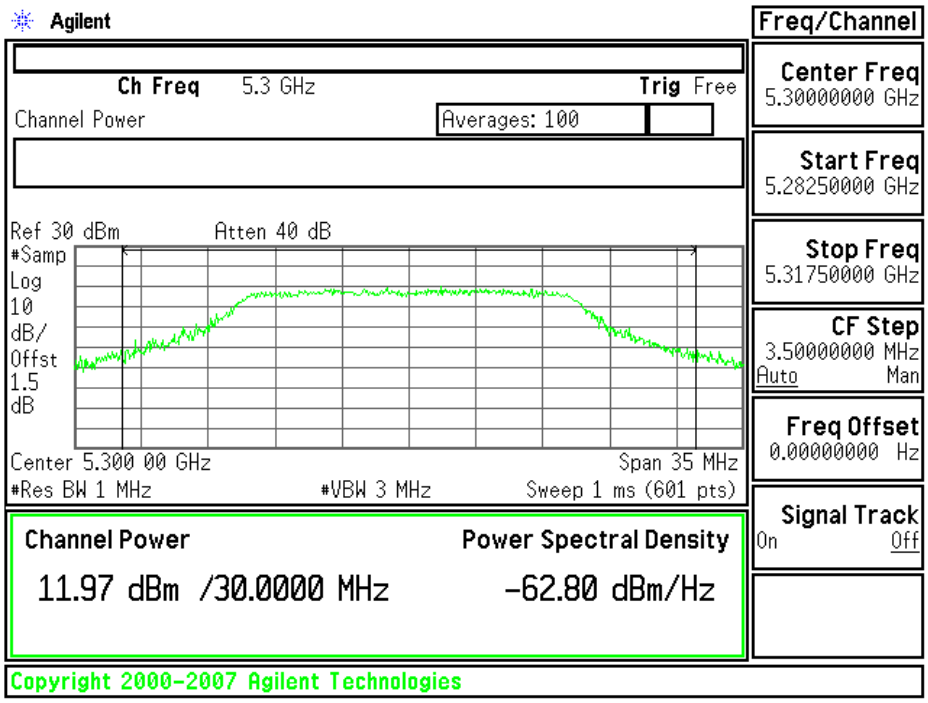

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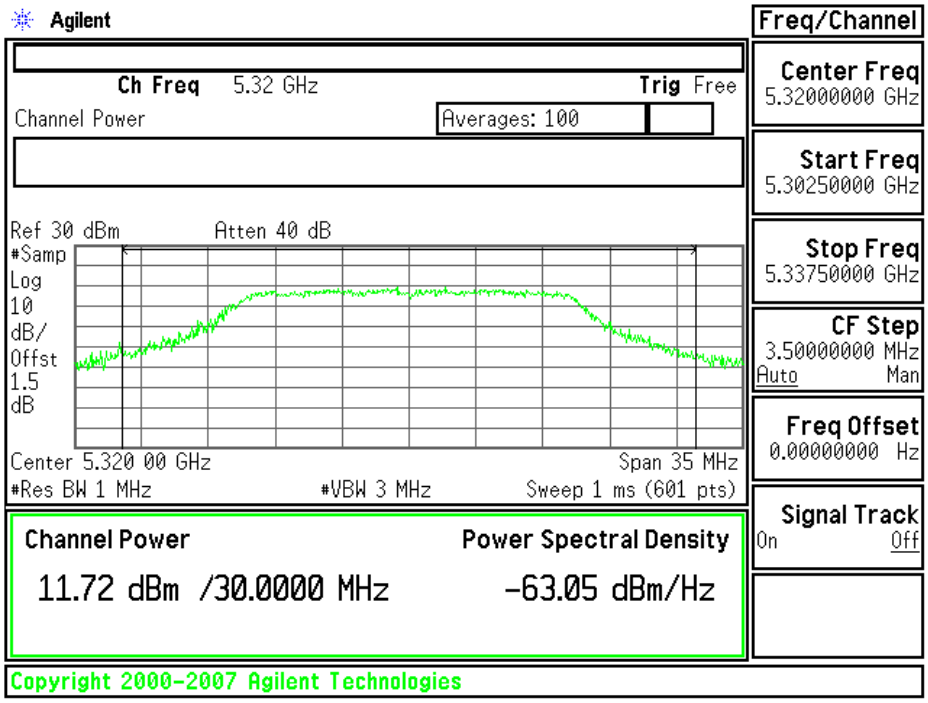
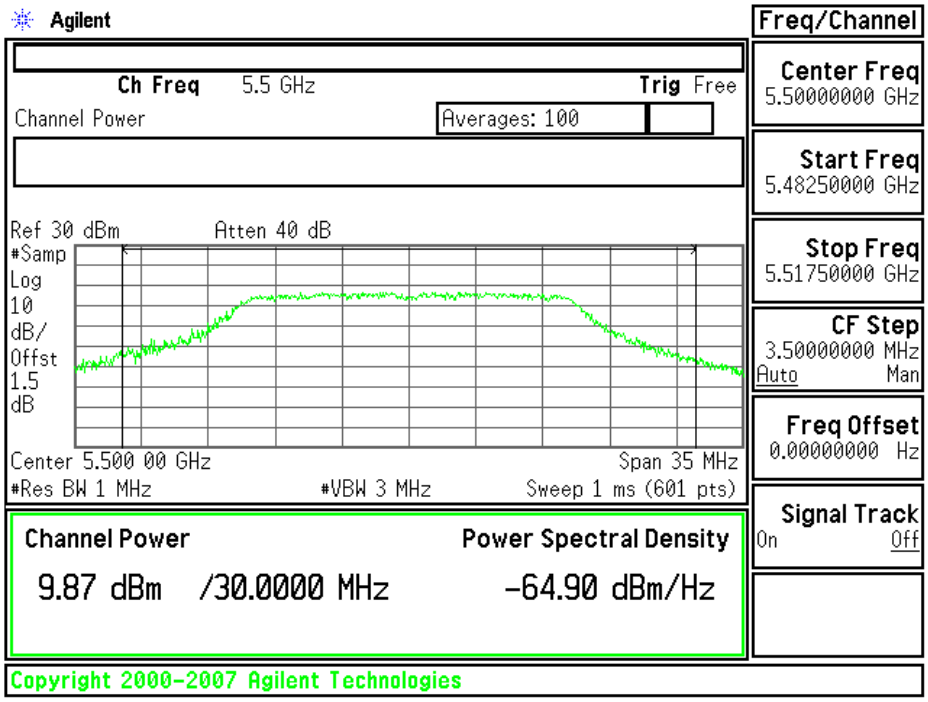
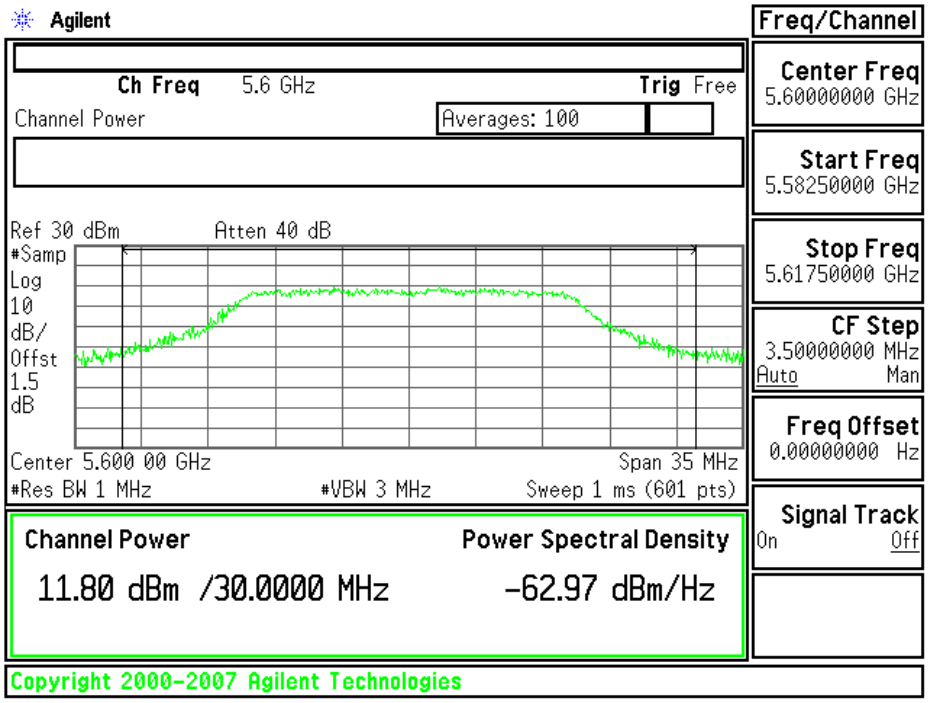


5470~5725MHz

CH Low



CH Mid



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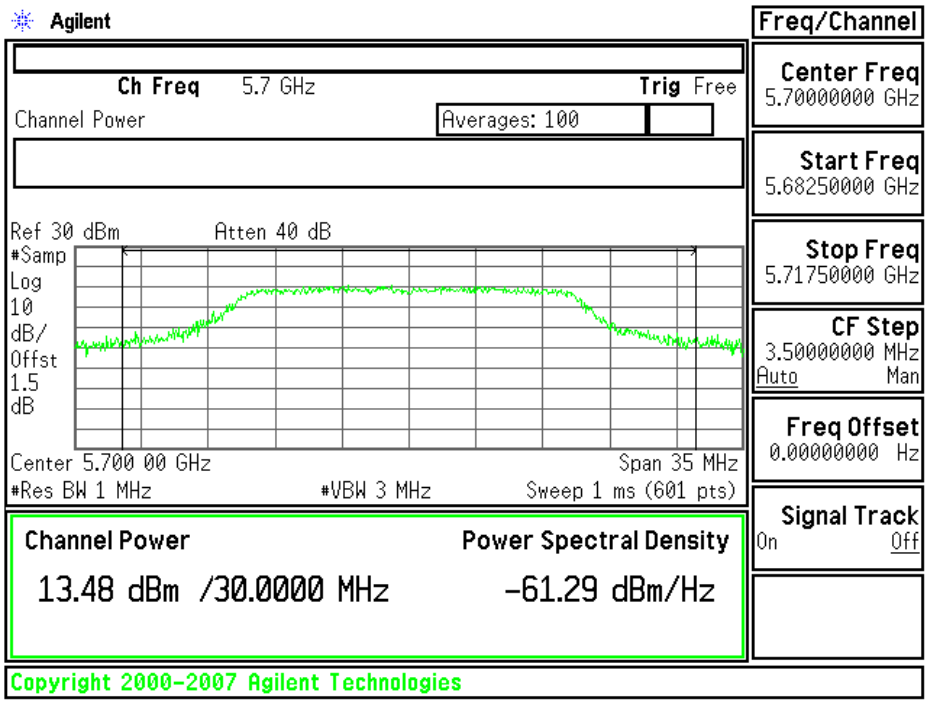
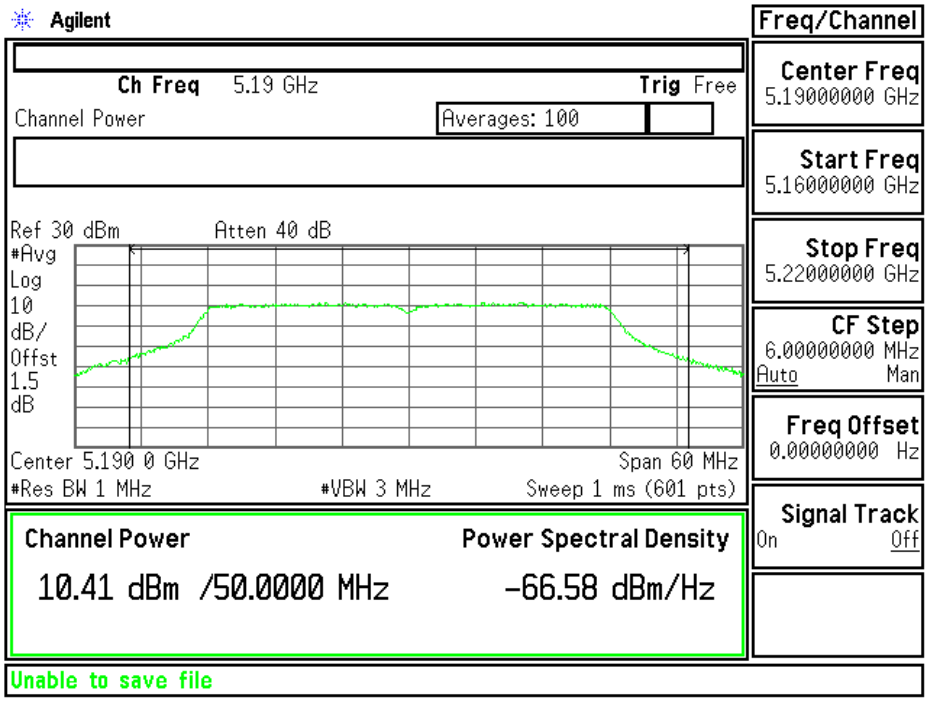


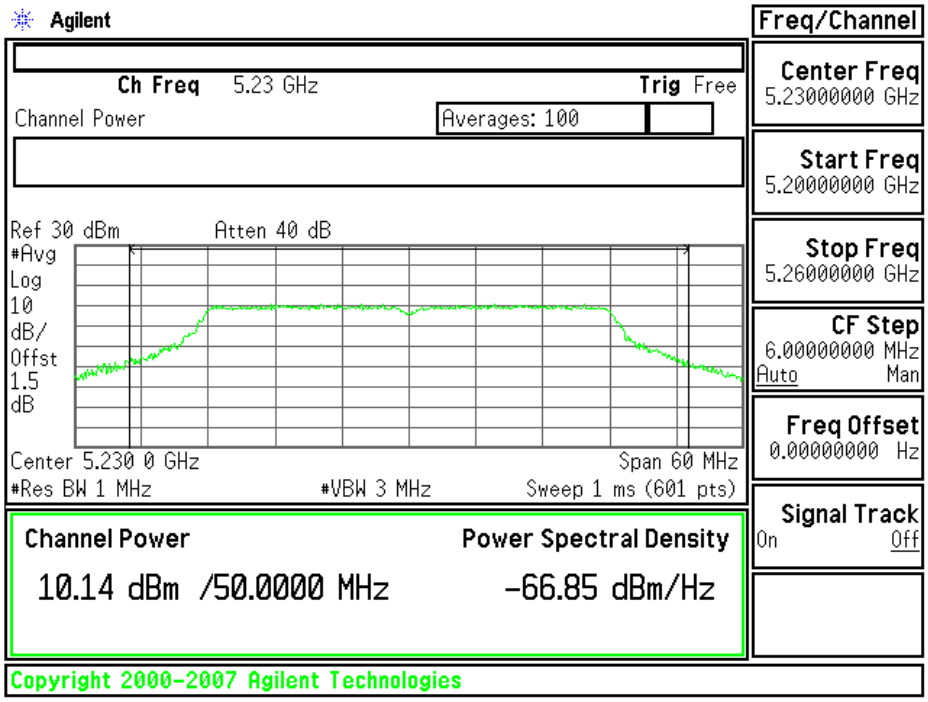
Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0:

5150~5250MHz

CH Low

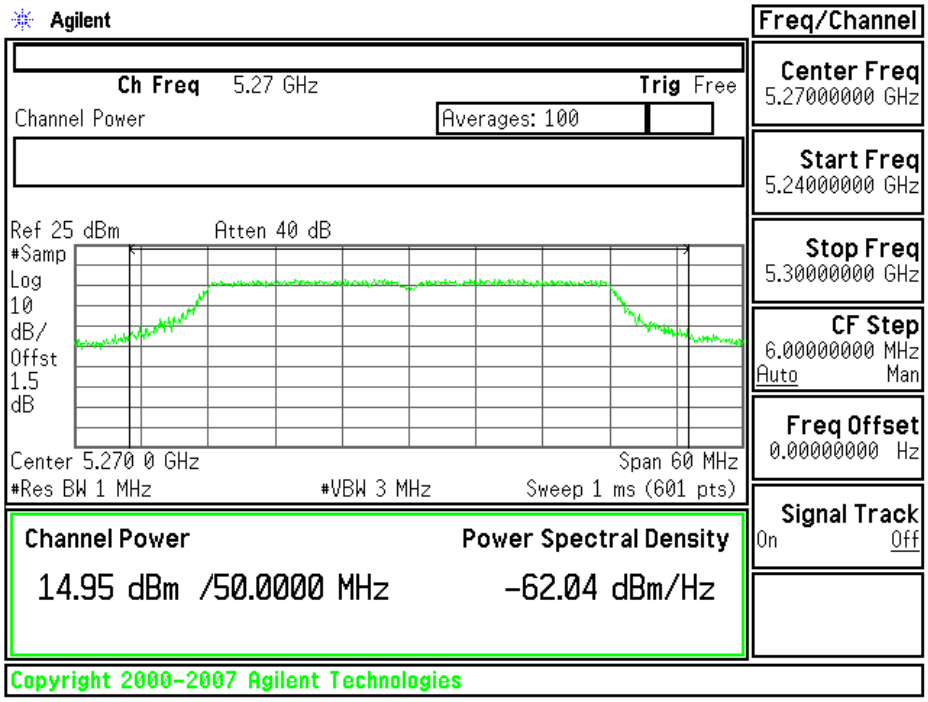


CH High

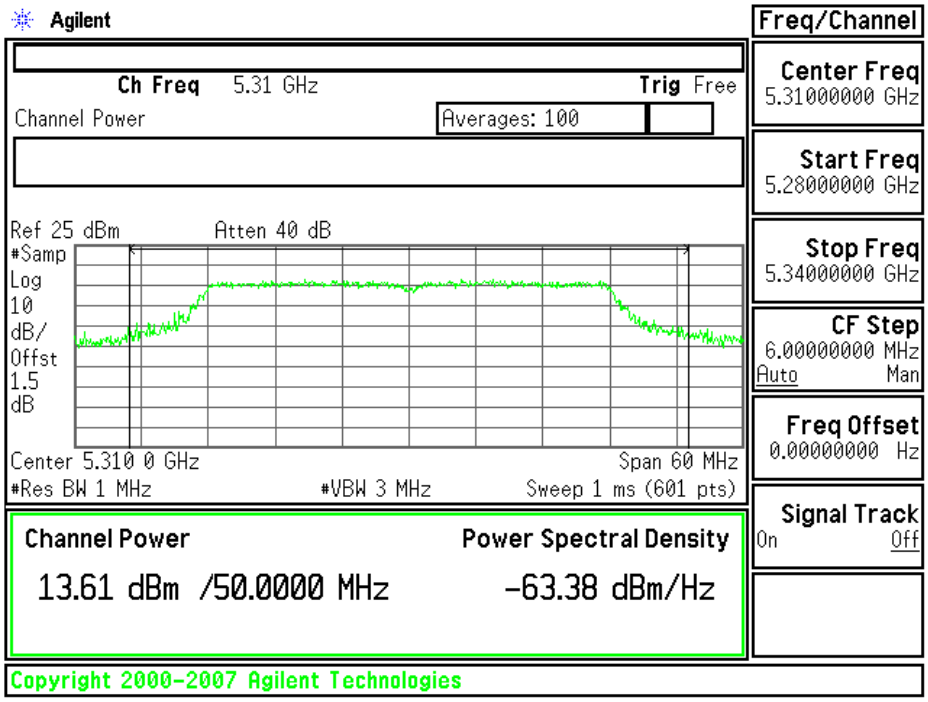


5250~5350MHz

CH Low

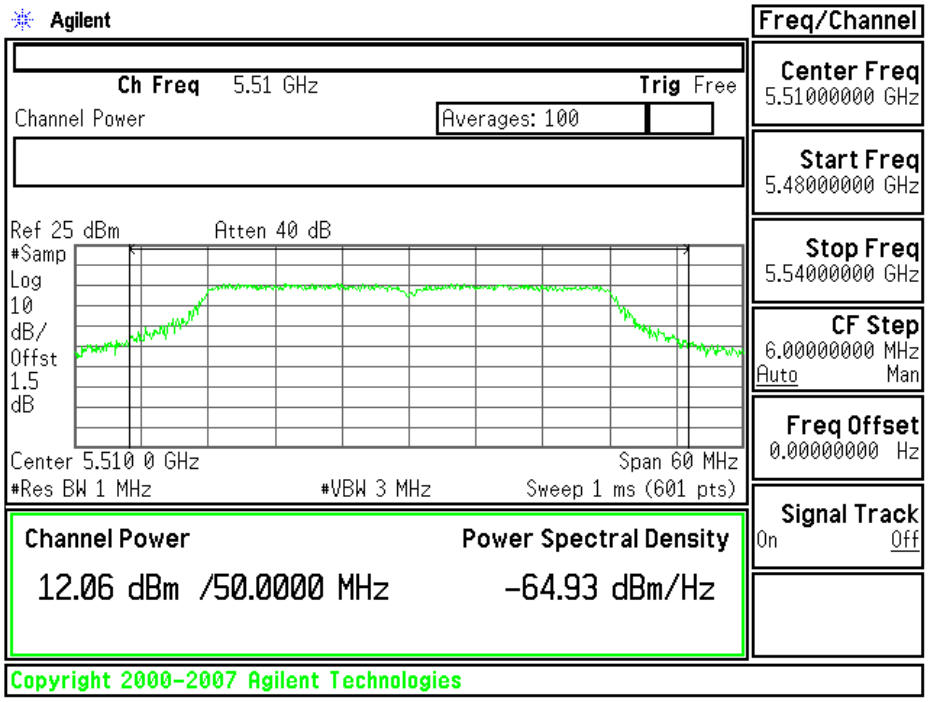


CH High

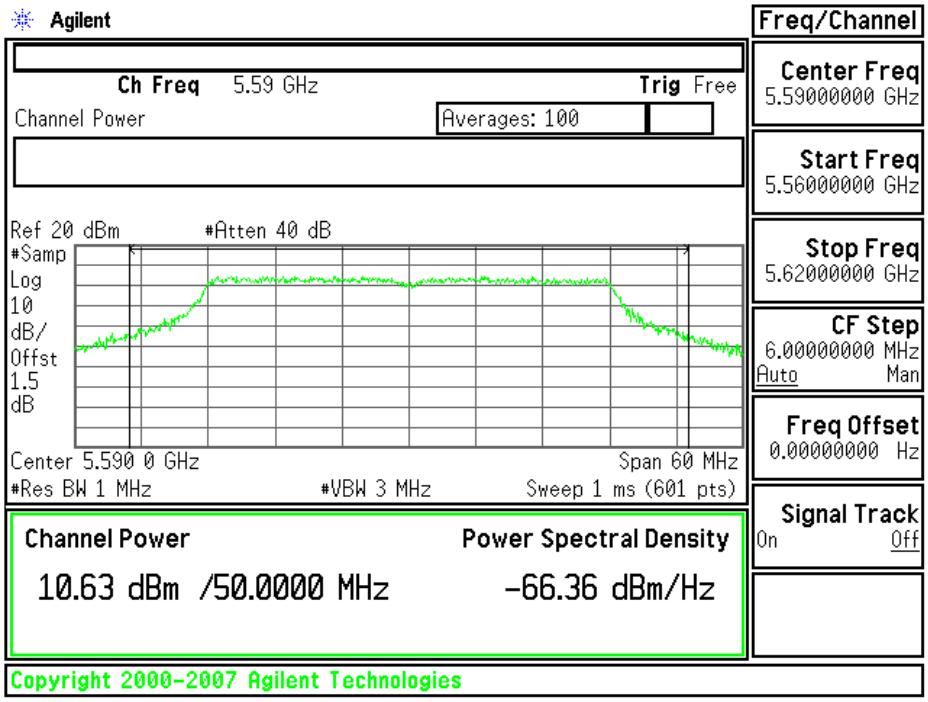


5470~5725MHz

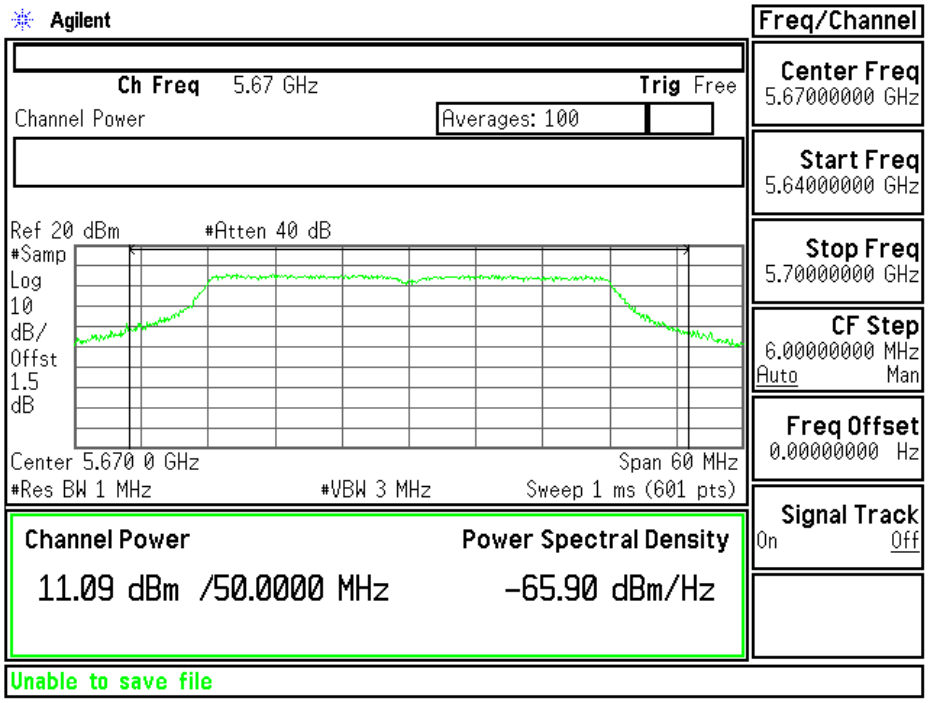
CH Low



CH Mid

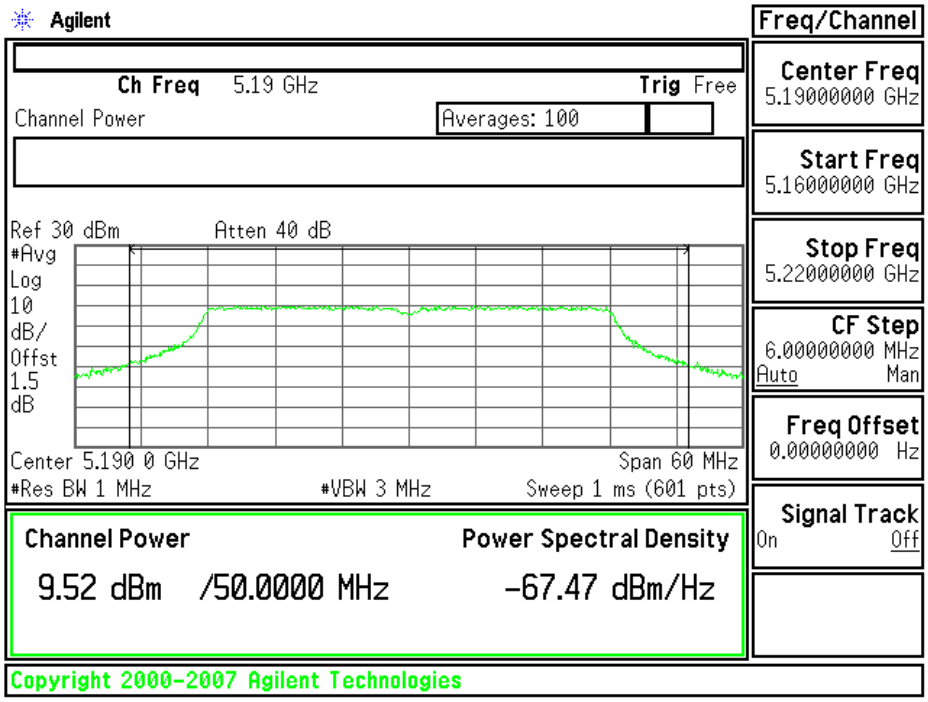


CH High

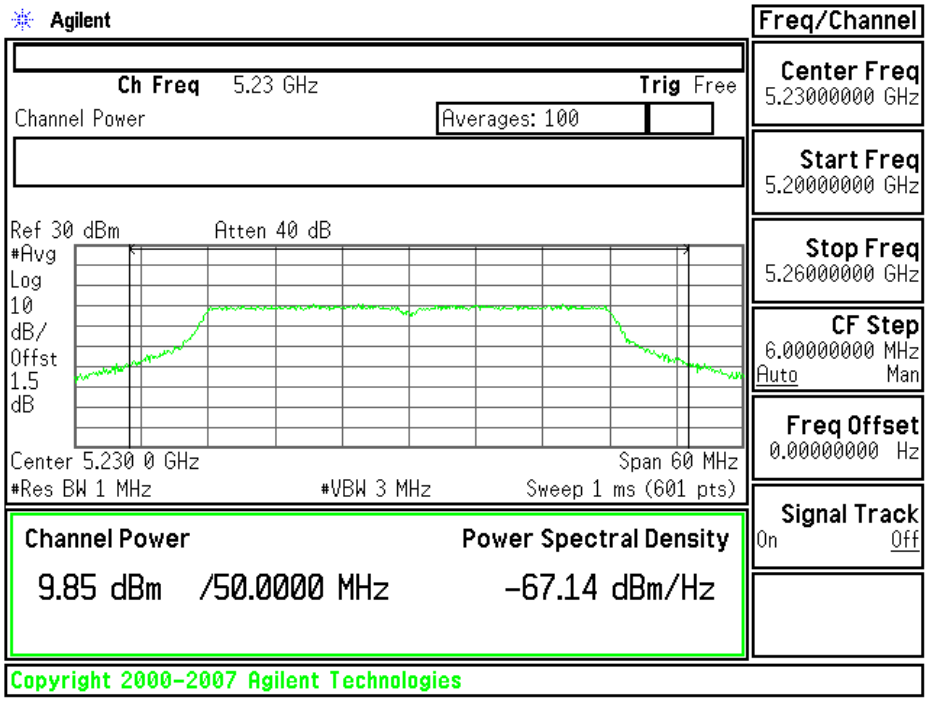


Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1:
5150~5250MHz

CH Low

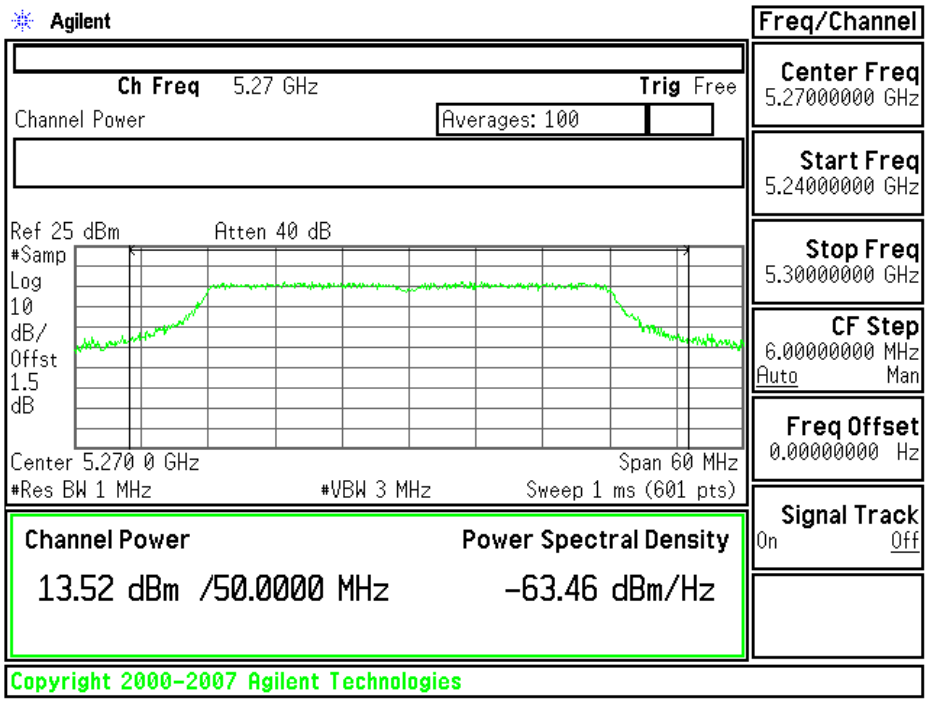


CH High

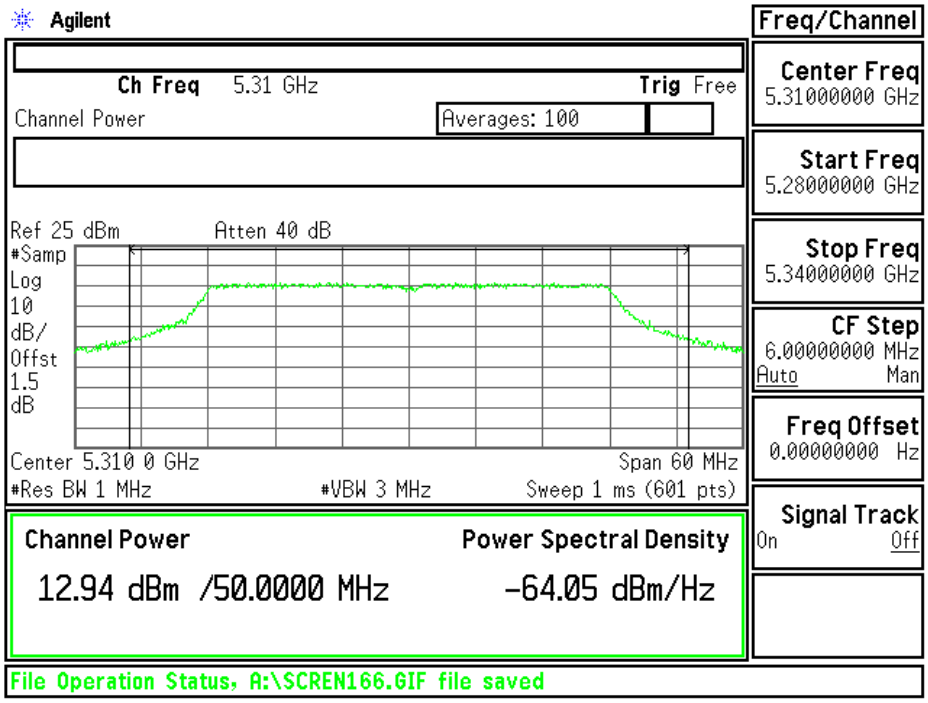


5250~5350MHz

CH Low

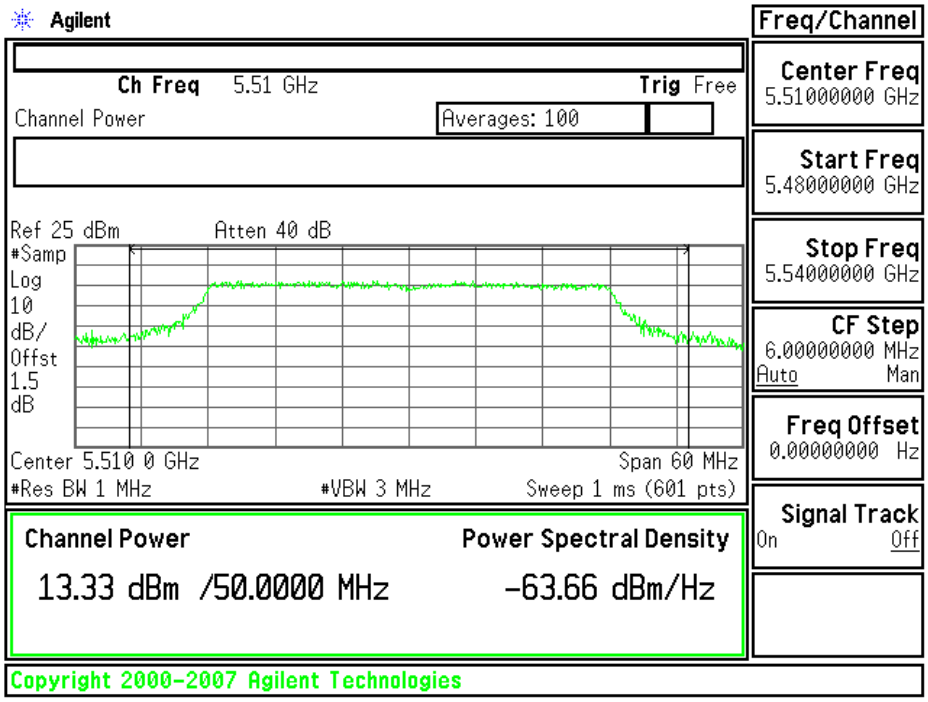


CH High

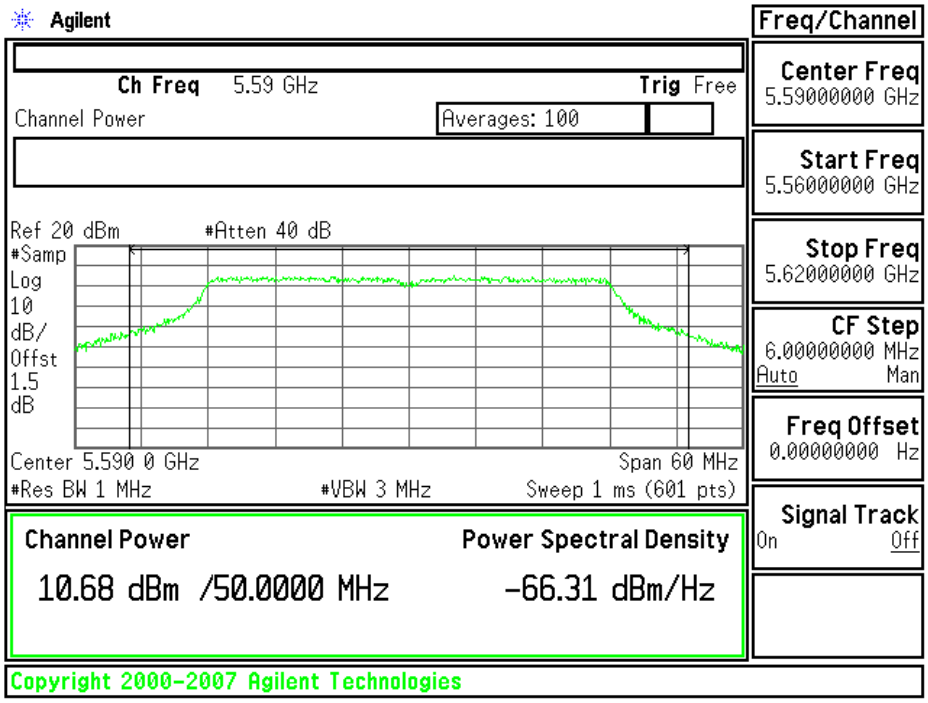


5470~5725MHz

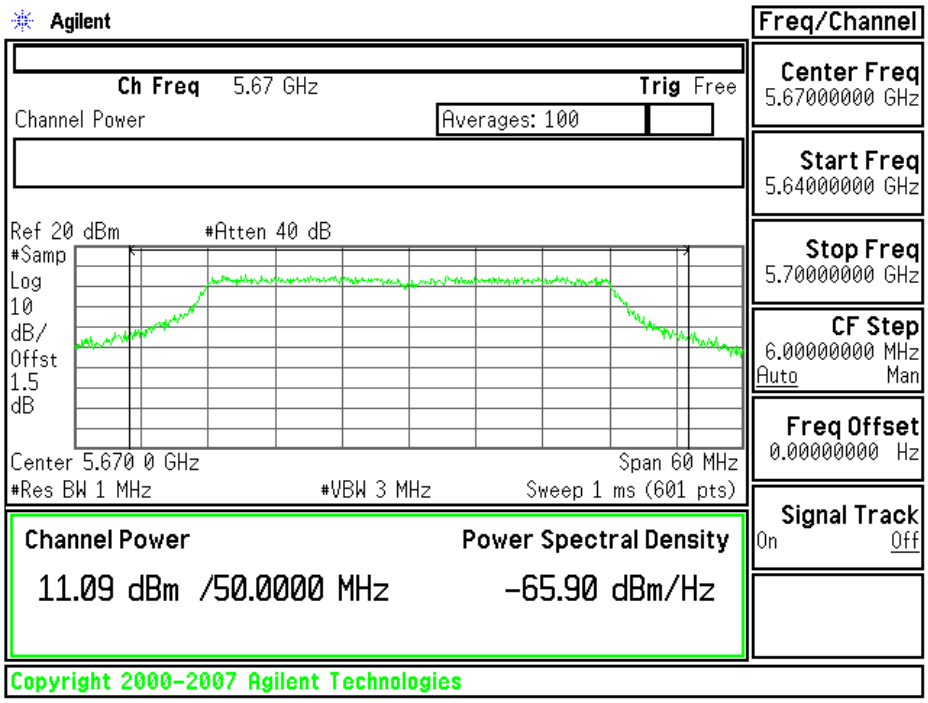
CH Low



CH Mid



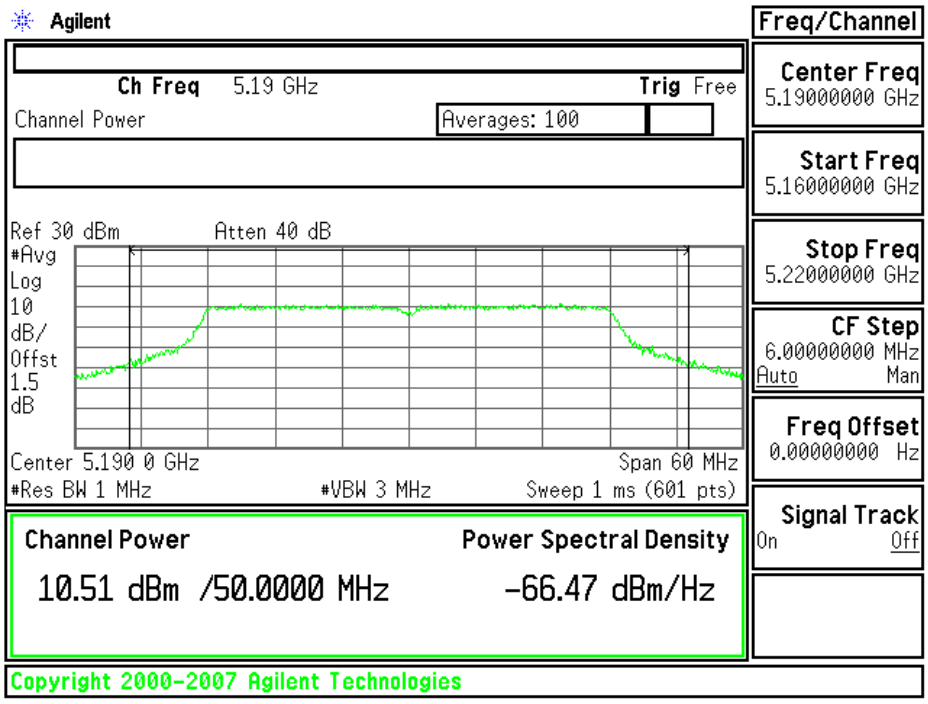
CH High



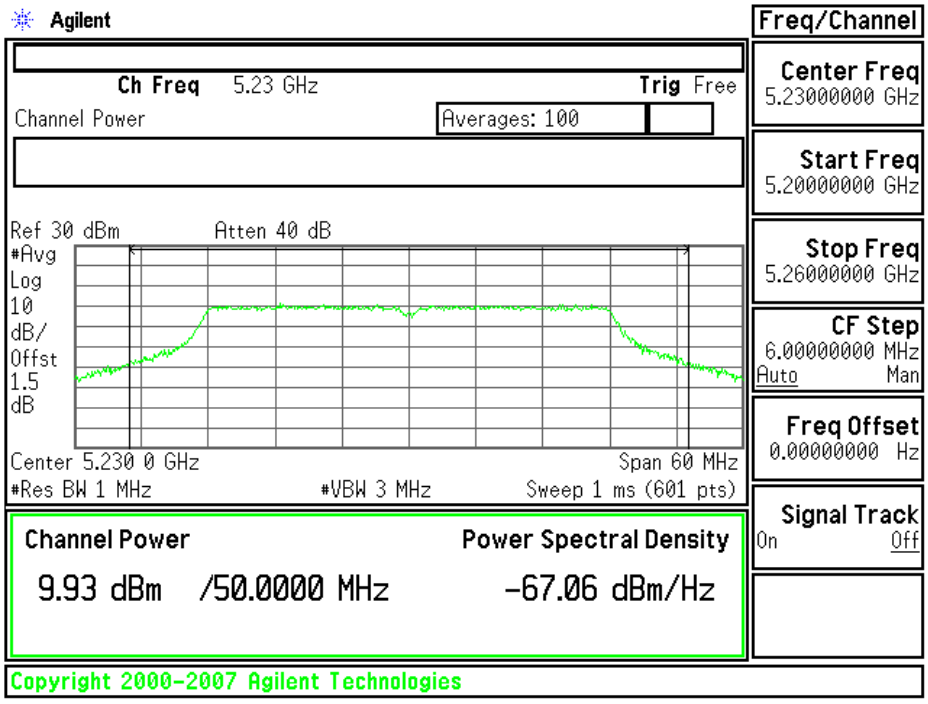
Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 2:

5150~5250MHz

CH Low

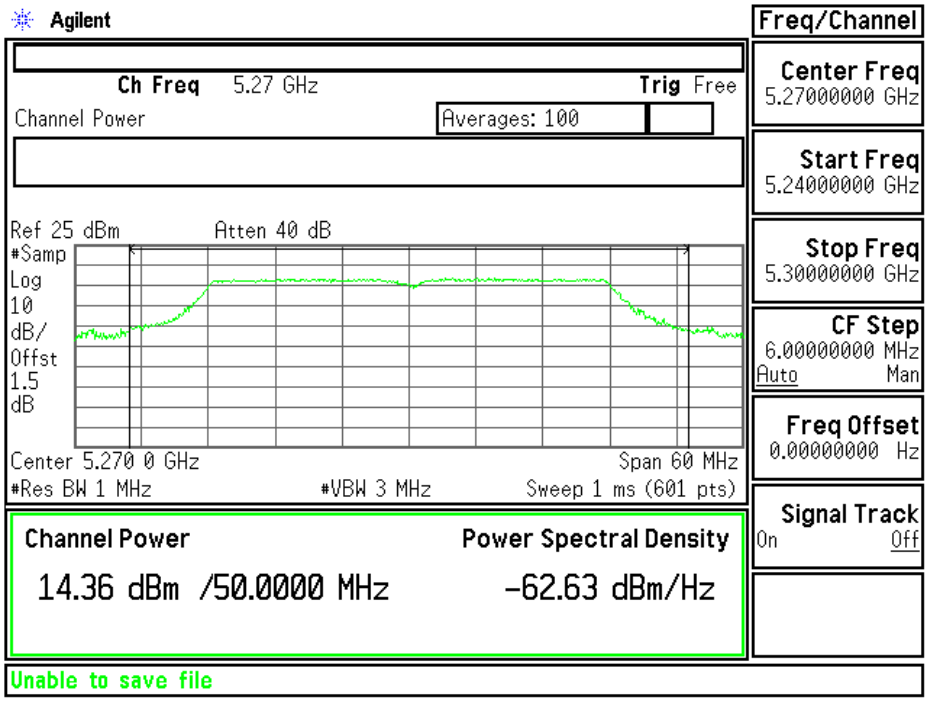


CH High

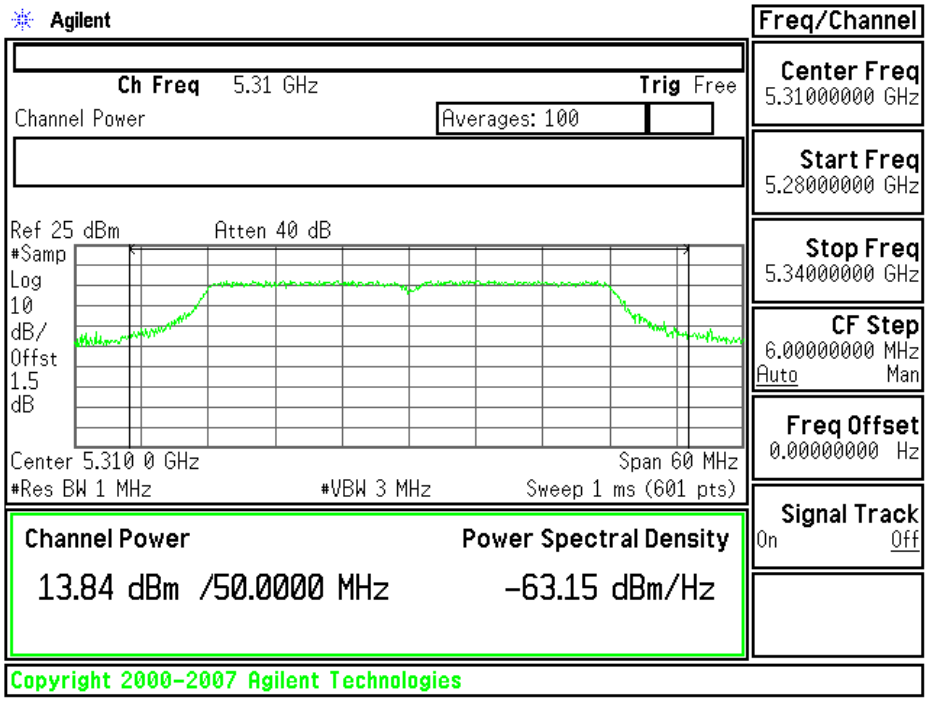


5250~5350MHz

CH Low

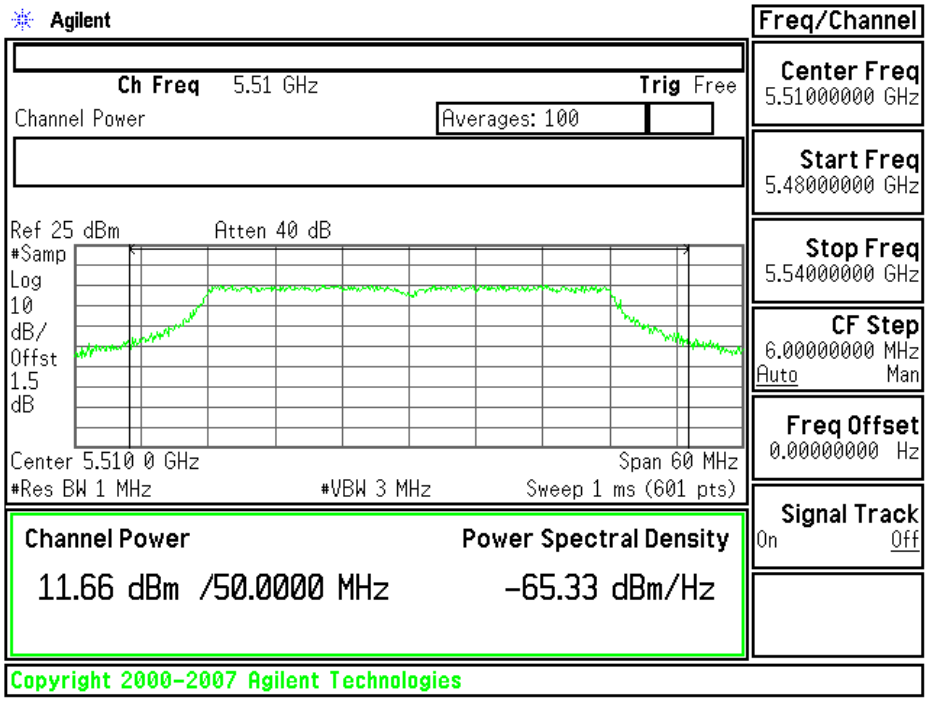


CH High

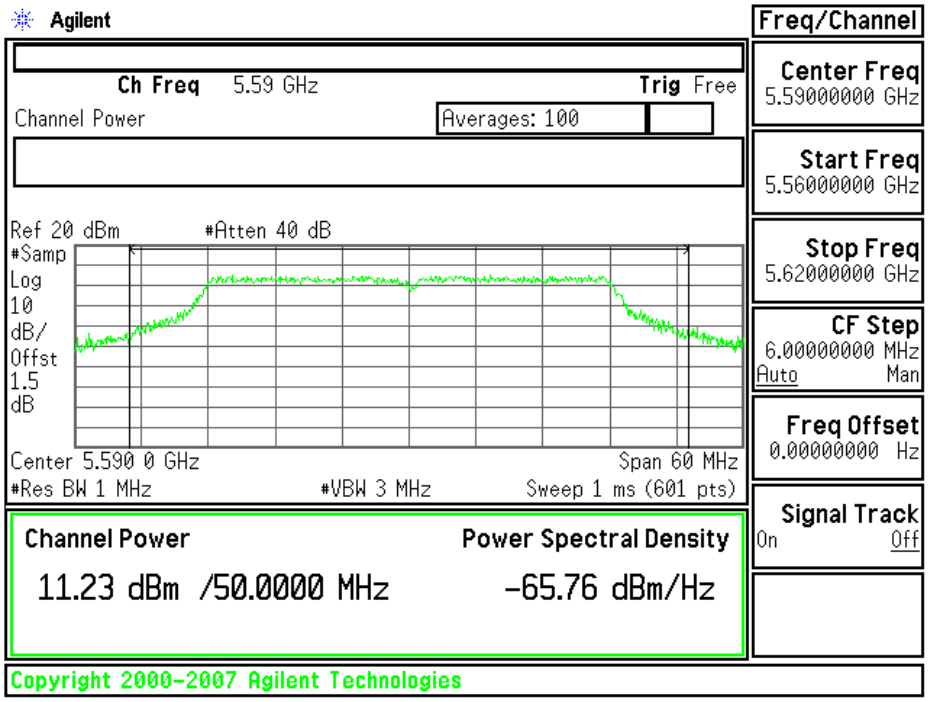


5470~5725

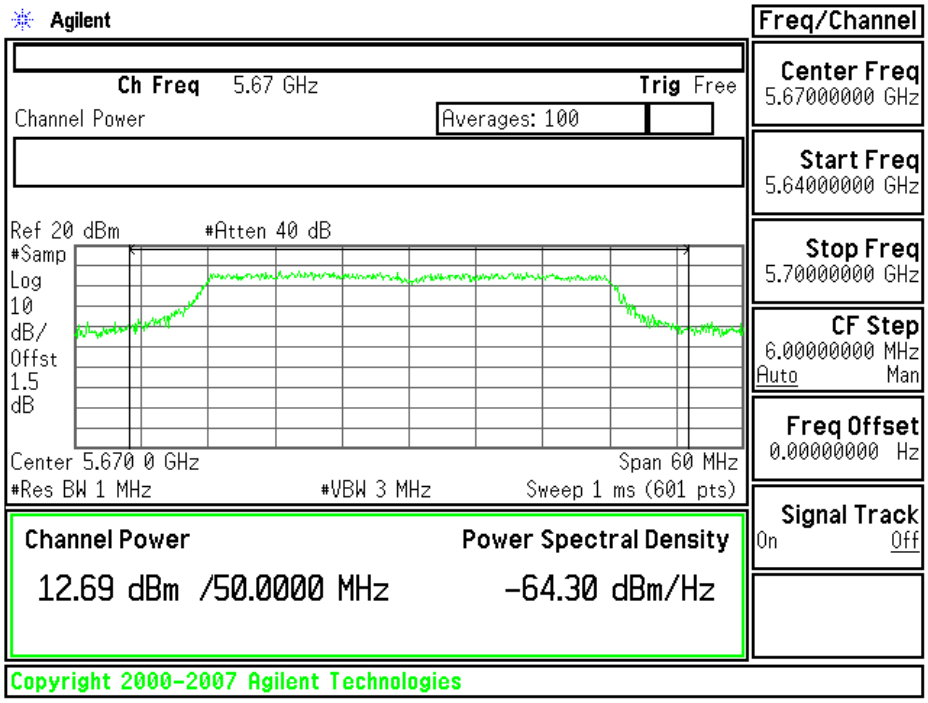
CH Low



CH Mid



CH High

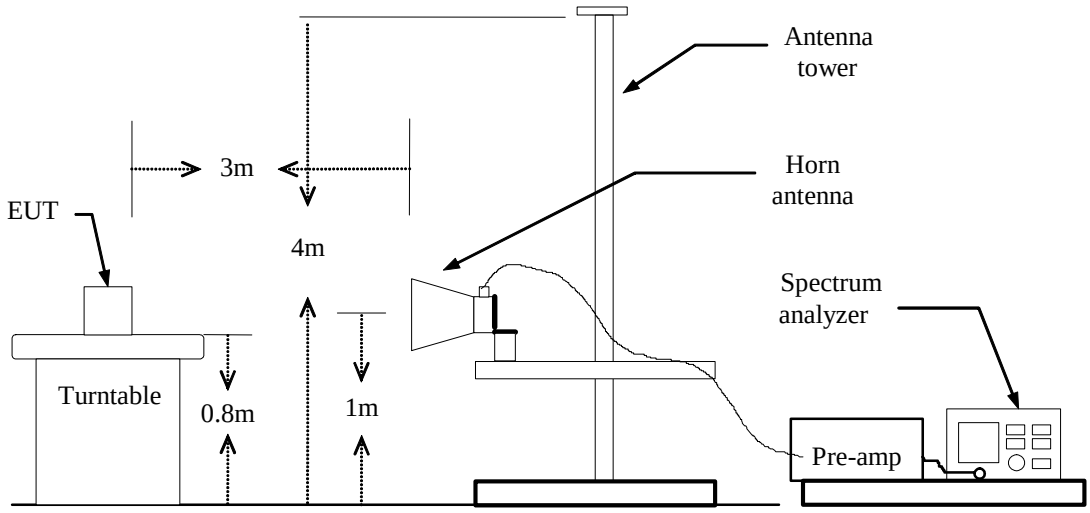

Agilent
Freq/Channel
Ch Freq 5.67 GHz
Trig Free
Channel Power
Averages: 100
Center Freq
5.67000000 GHz
Start Freq
5.64000000 GHz
Stop Freq
5.70000000 GHz
CF Step
6.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Ref 20 dBm
#Atten 40 dB
#Samp
Log
10
dB/
Offst
1.5
dB
Center 5.670 0 GHz
Span 60 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 1 ms (601 pts)
Channel Power
12.69 dBm /50.0000 MHz
Power Spectral Density
-64.30 dBm/Hz
Copyright 2000-2007 Agilent Technologies

BAND EDGES MEASUREMENT

LIMIT

According to §15.407(b),
(1) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

Test Configuration



TEST PROCEDURE

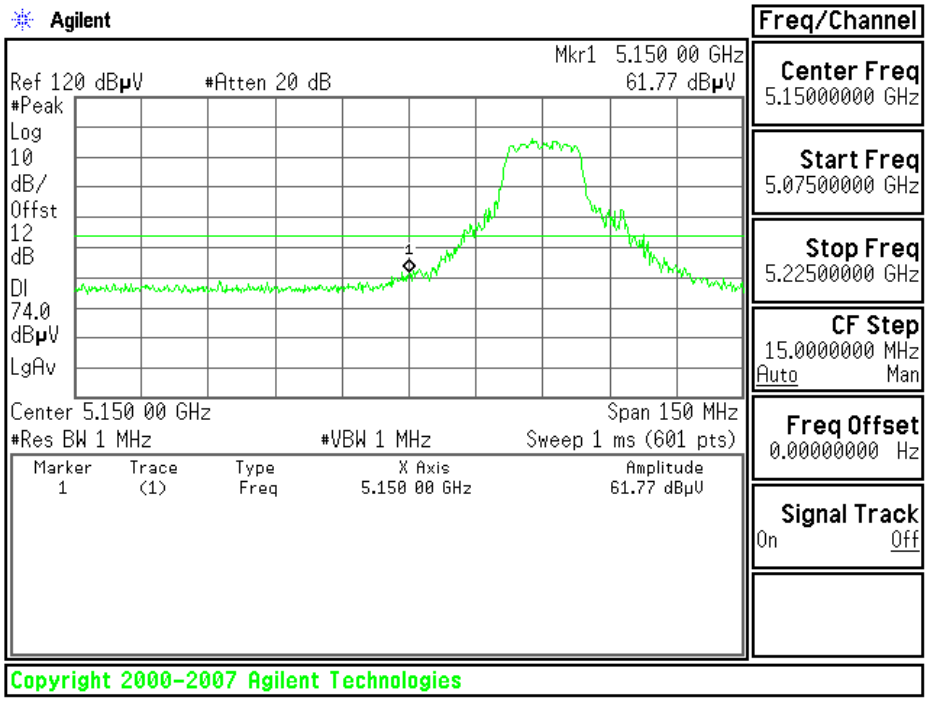
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

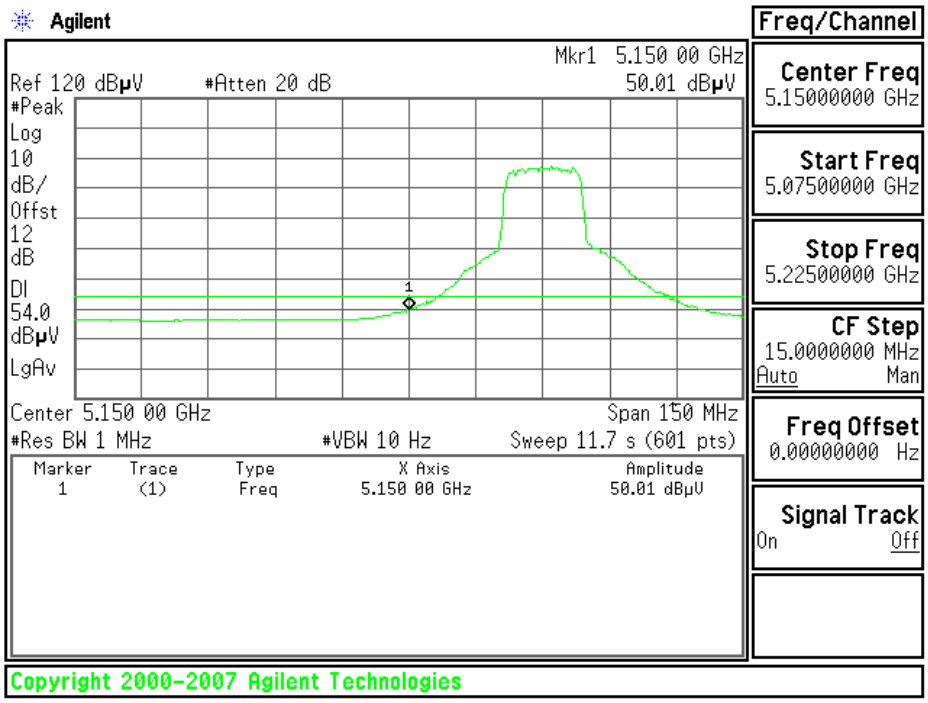
Refer to attach spectrum analyzer data chart.

Band Edges (draft 802.11a mode /5180MHz)

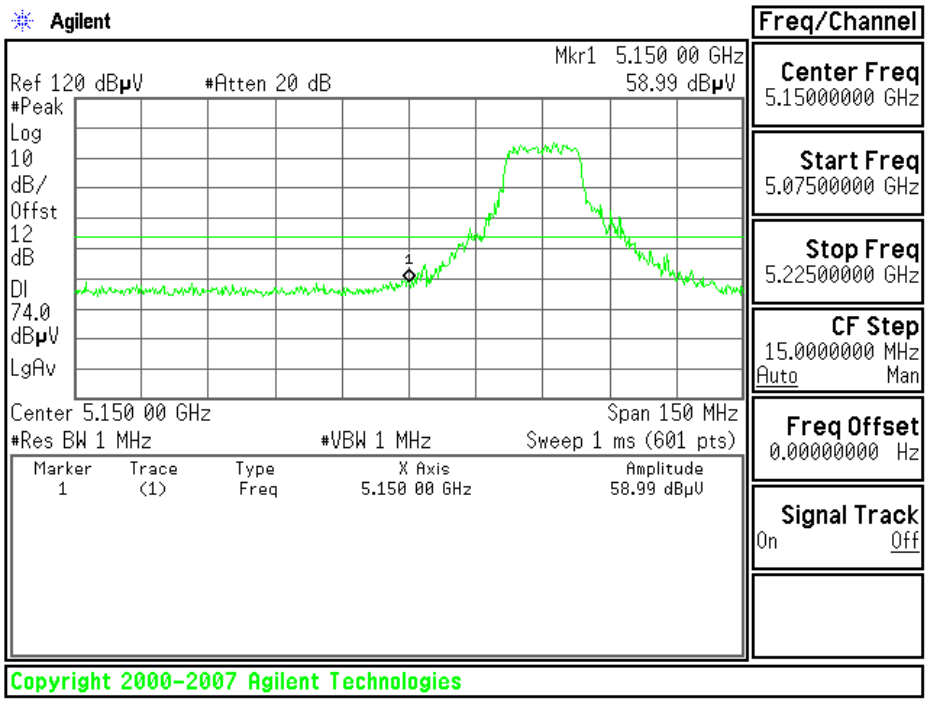
Detector mode: Peak **Polarity: Vertical**



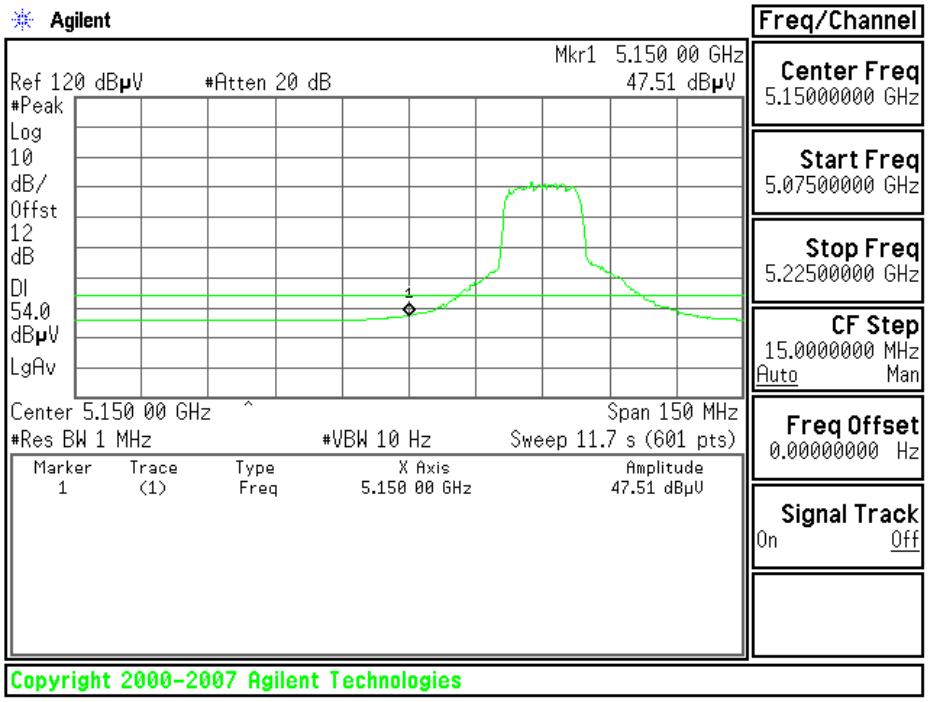
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

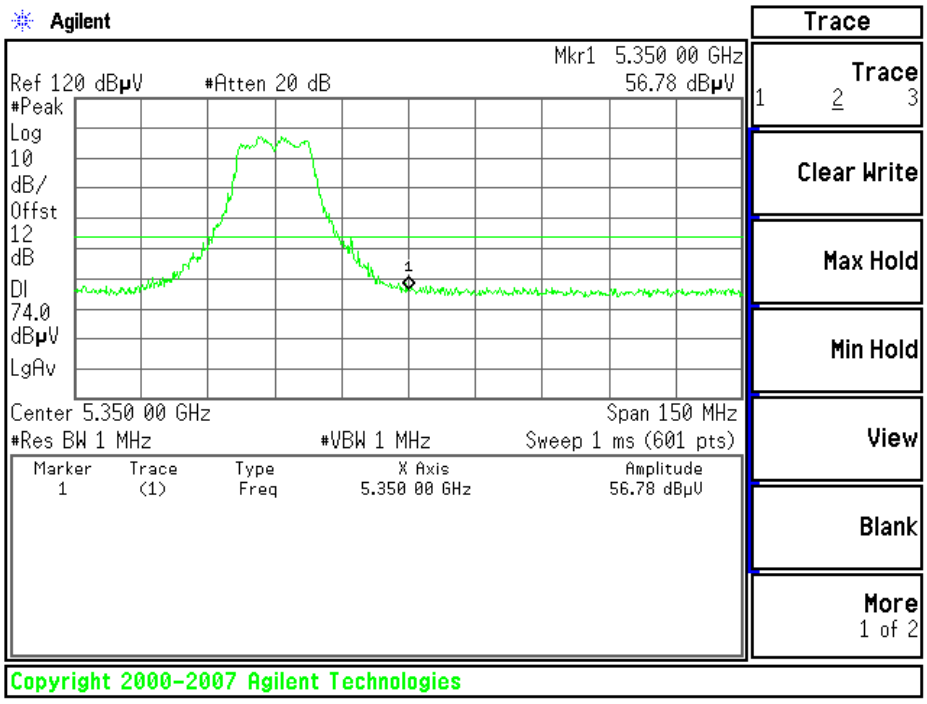


Detector mode: Average **Polarity: Horizontal**

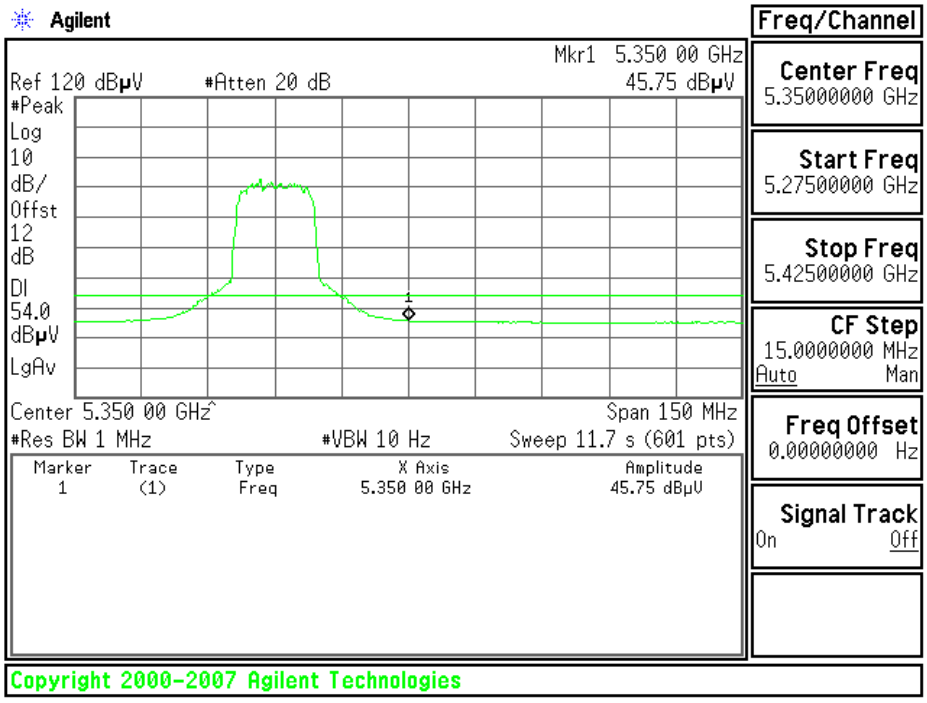


Band Edges (draft 802.11a mode /5320MHz)

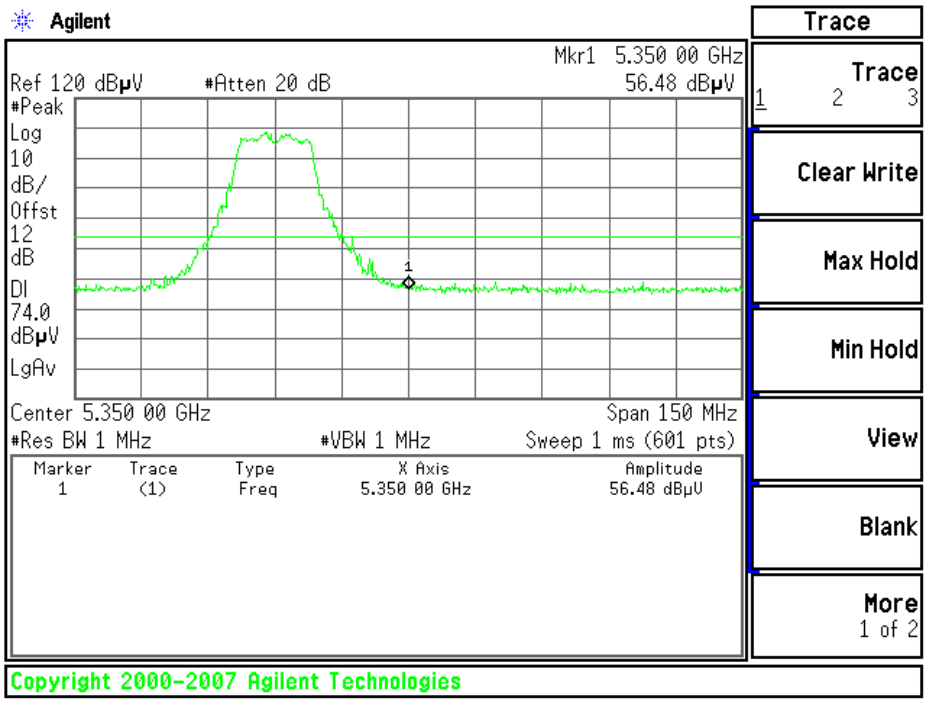
Detector mode: Peak **Polarity: Vertical**



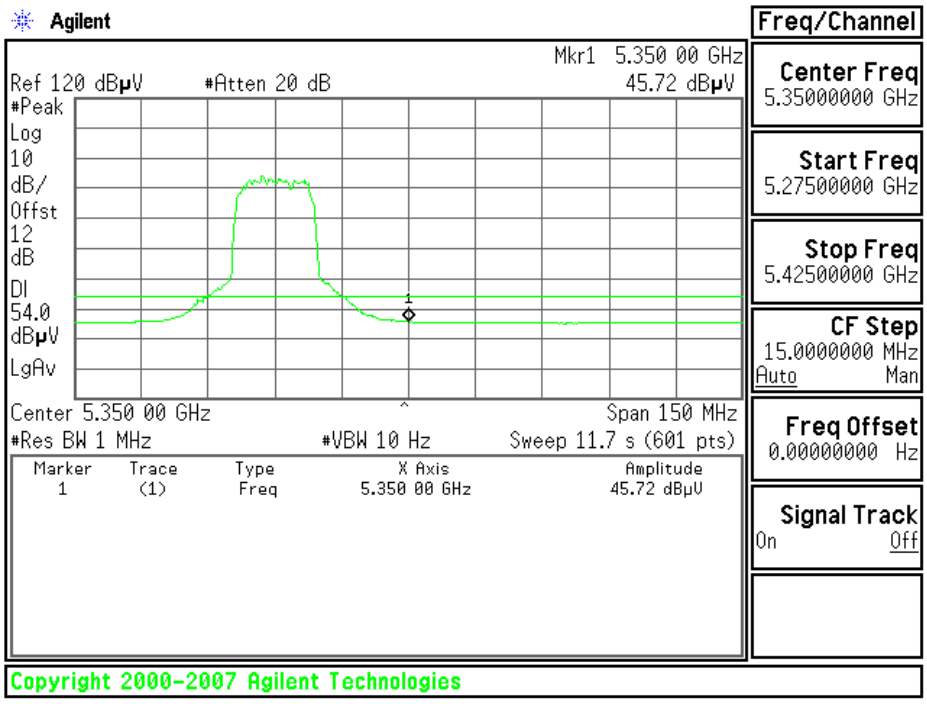
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

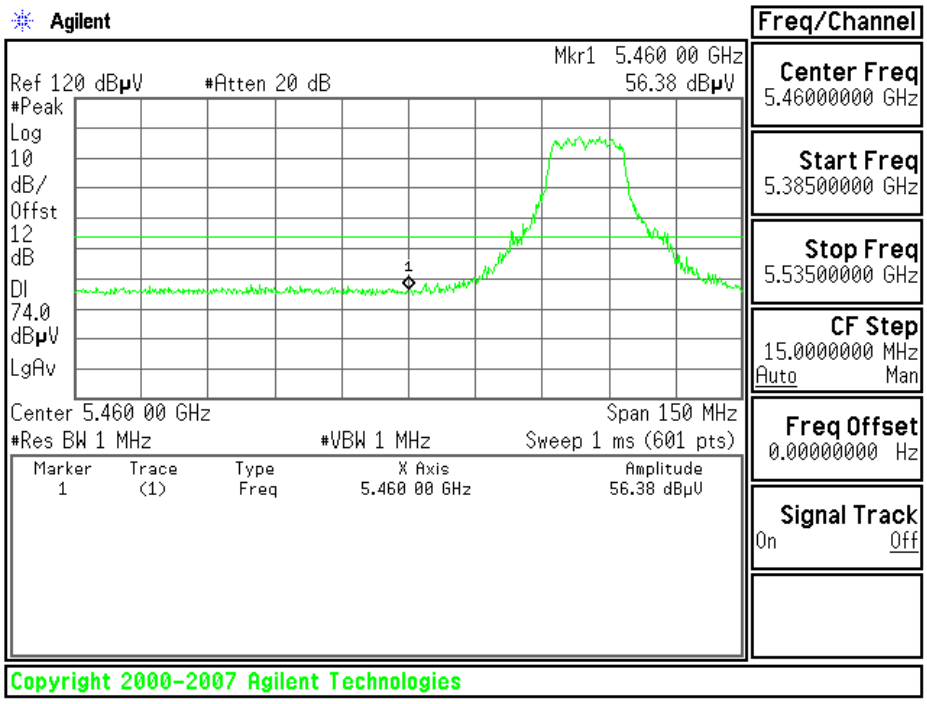


Detector mode: Average **Polarity: Horizontal**

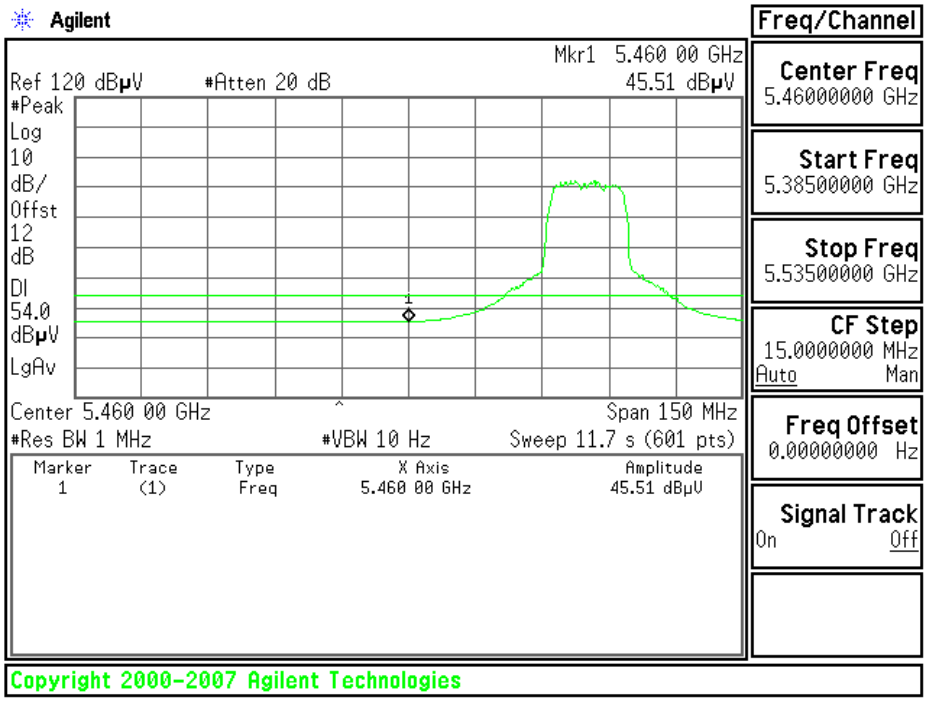


Band Edges (draft 802.11a mode /5500MHz)

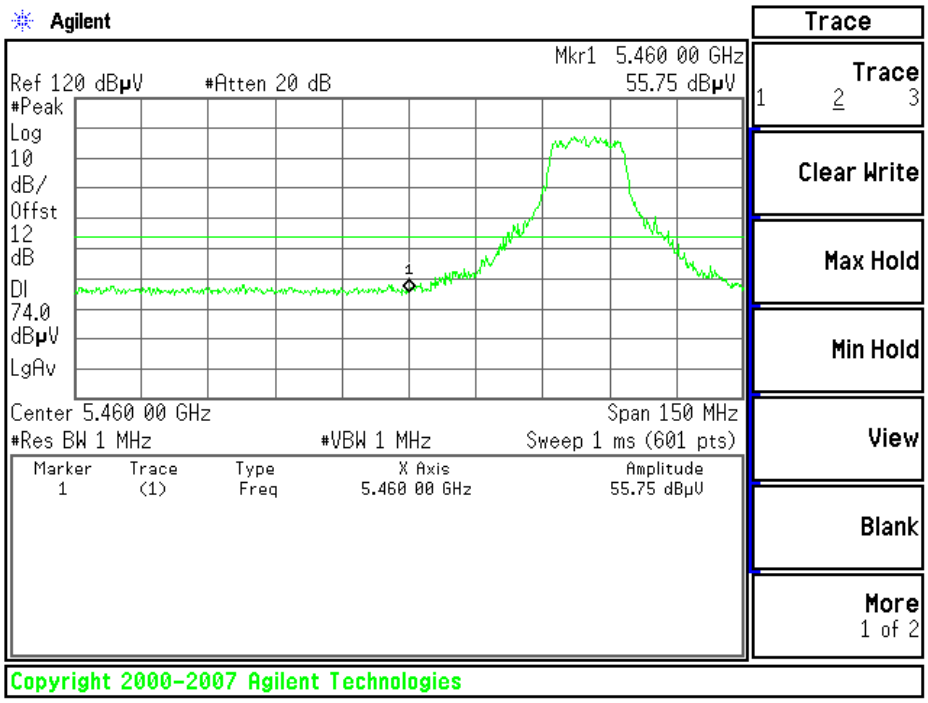
Detector mode: Peak **Polarity: Vertical**



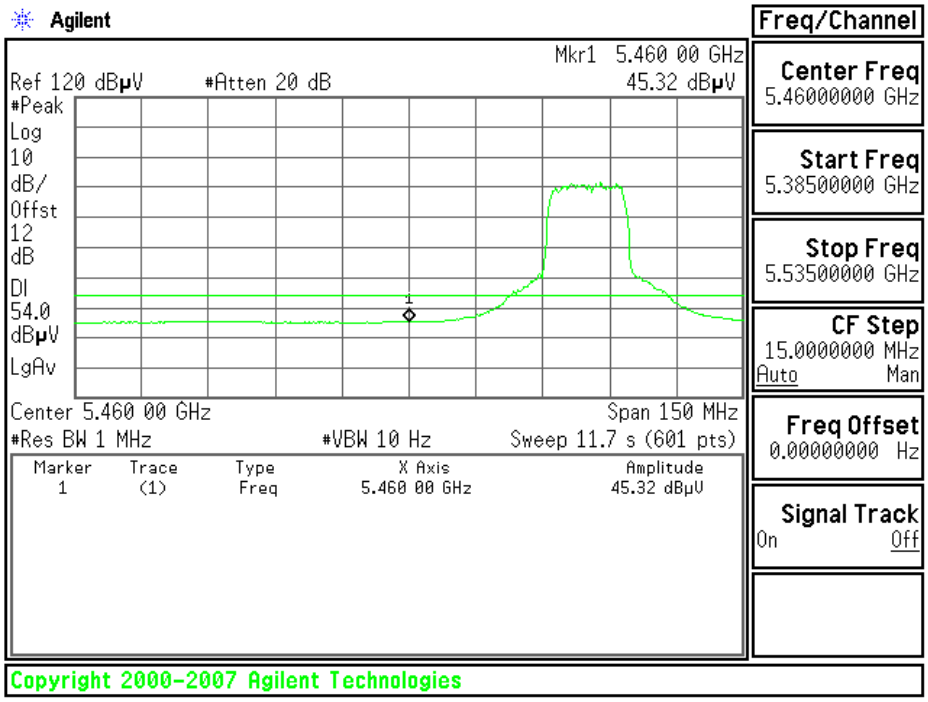
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

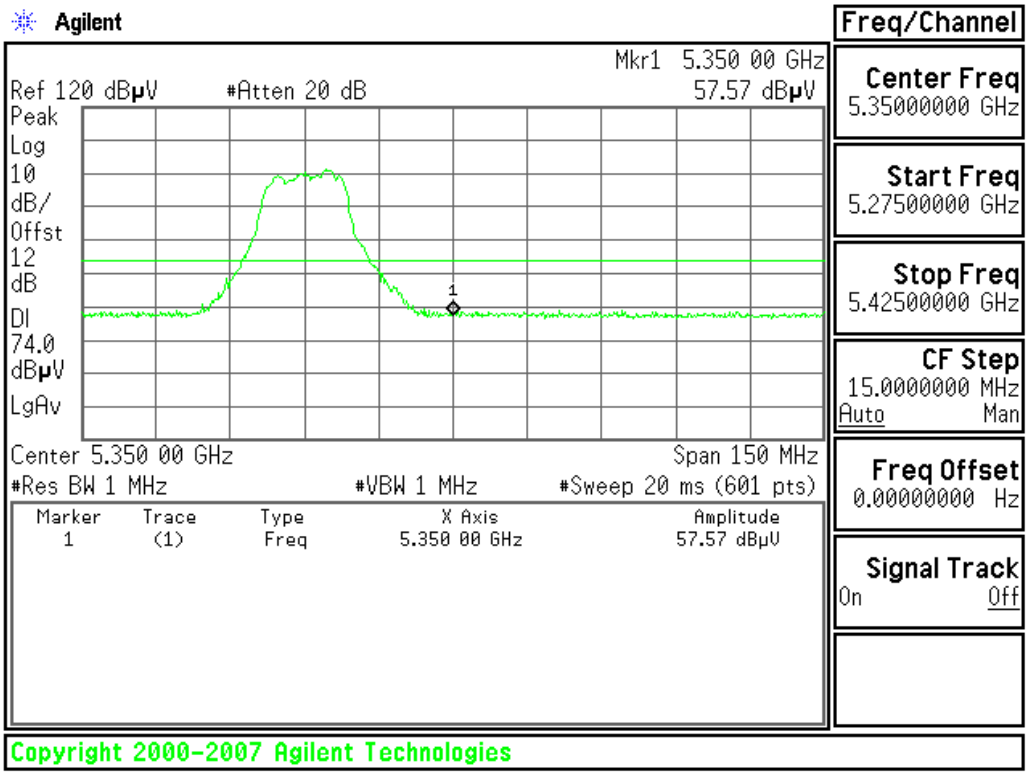


Detector mode: Average **Polarity: Horizontal**

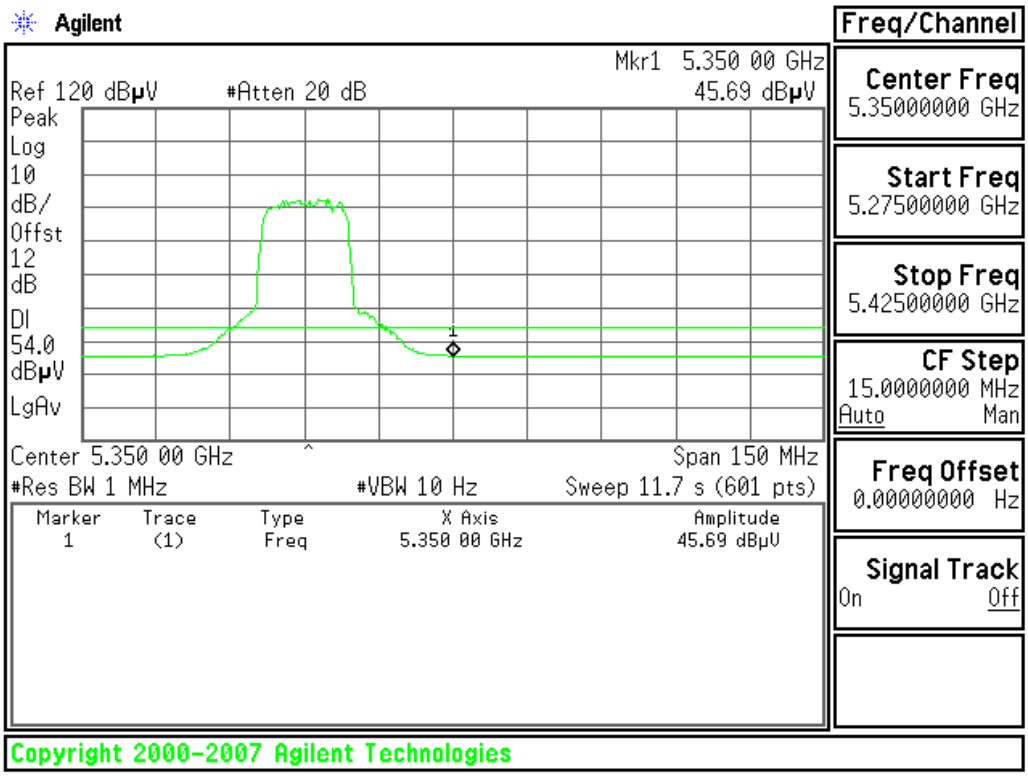


Band Edges (draft 802.11a mode 5320MHz)

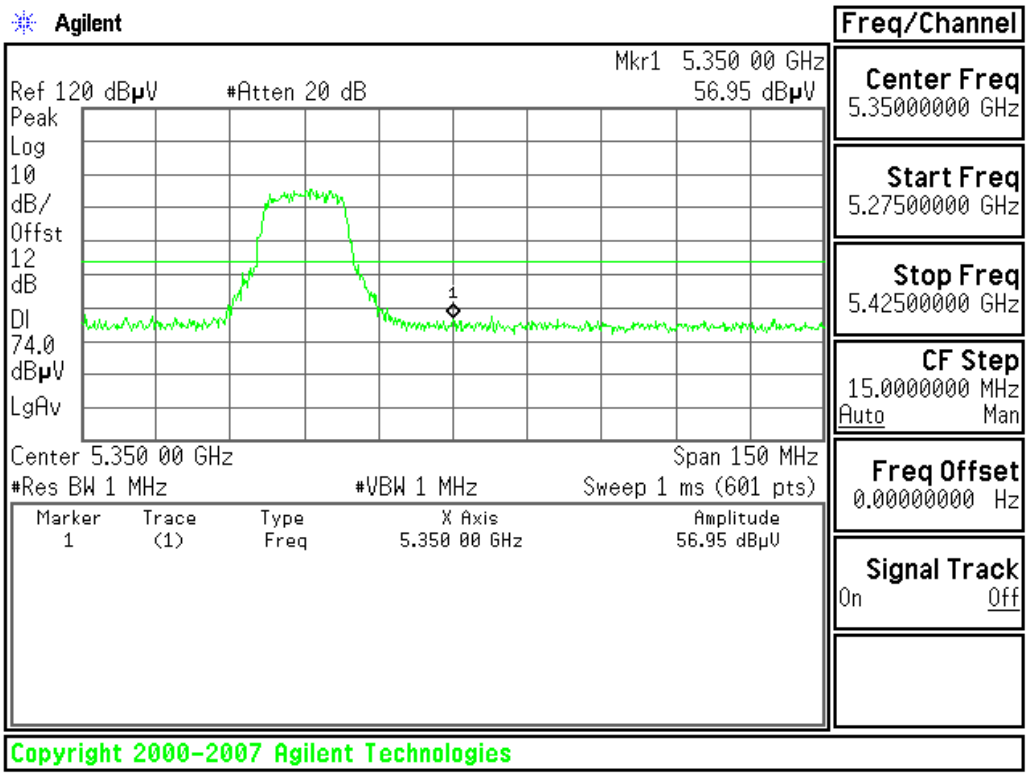
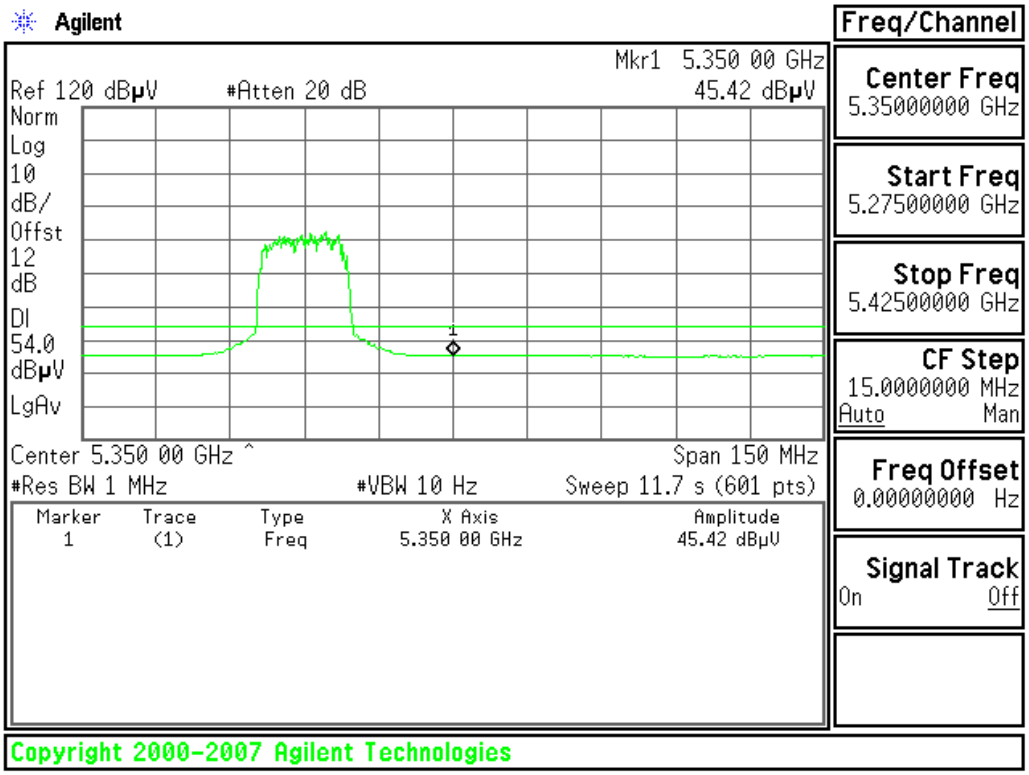
Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**