FCC PART 15.407

TEST REPORT

For

Actiontec Electronics, Inc.

3301 Olcott Street,

Santa Clara, CA 95054, USA

FCC ID: LNQC3000A

Report Type:	Product Type:
CIIPC	802.11n and 802.11ac Wi-Fi Router

Prepared By:	Vincent Licata Test Engineer
Report Number:	R1711062-407 (W53&W56)
Report Date:	2018-03-15
Reviewed By:	Jin Yang RF Lead

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue,
Sunnyvale, CA 94089, USA
Tel: (408) 732-9162
Fax: (408) 732-9164

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

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1711062-407(W53&W56)	CIIPC report	2018-03-15

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Actiontec Electronics, Inc.*, and their product model: *C3000A, multiple Models: T3260,* FCC ID: LNQC3000A or the "EUT" as referred to in this report. The EUT is an indoor access point.

1.2 Objective

This report is prepared on behalf of *Actiontec Electronics, Inc.*in accordance with FCC CFR47 §15.407.

The objective is to determine compliance with FCC Part 15.407 rules for Output Power, Antenna Requirements, AC Line Conducted Emissions, Emission Bandwidth, Power spectral density, Radiated Spurious Emissions, and Dynamic Frequency Selection.

1.3 Related Submittal(s)/Grant(s)

Equipment Class DTS with FCC ID: LNQC3000A, IC: 2469A-C3000A.

1.4 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz, and FCC KDB 789033 D02 General UNII Test Procedure New Rules v02r01.

1.5 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.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Power Spectral Density, conducted	±1.48dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 º C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.6 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03)*** to certify

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISEDC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
  - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 EUT Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test firmware used was CRT 5.0 provided by *Actiontec Electronics, Inc.*, the software is complied with the standard requirements being tested against.

Please refer to the following power setting table.

Modulation	Channel	Frequency (MHz)	Power Setting
802.11a	52	5260	15
	60	5300	15
	64	5320	15
	100	5500	15
	116	5580	15
	140	5700	15
	144	5720	15

Modulation	Channel	Frequency (MHz)	Power Setting
802.11HT/VHT20	52	5260	15
	60	5300	15
	64	5320	15
	100	5500	15
	116	5580	15
	140	5700	15
	144	5720	15
802.11HT/VHT40	54	5270	16
	62	5310	16
	102	5510	16
	110	5550	17
	118	5590	17
	134	5670	17
	142	5710	17
802.11VHT80	58	5290	17
	106	5530	16
	122	5610	17
	138	5690	17

*Data rates tested:
802.11a mode: 6Mbps
802.11n HT20: MCS0
802.11n HT40: MCS0
802.11ac VHT20: MCS0
802.11ac VHT40: MCS0
802.11ac VHT80: MCS0

2.3 Duty Cycle Correction Factor

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 section B:

All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

5.3 GHz Results

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Correction Factor (dB)
802.11a	2.067	2.173	95.12	0.22
802.11HT/VHT20	1.933	2.04	94.75	0.23
802.11HT/VHT40	0.9333	1.053	88.63	0.52
802.11VHT80	0.460	0.4933	93.25	0.30

5.6 GHz Results

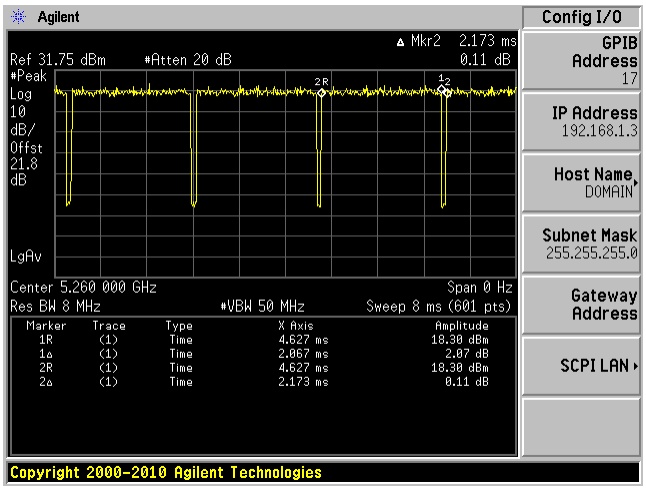
Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Correction Factor (dB)
802.11a	2.053	2.173	94.48	0.25
802.11HT/VHT20	1.907	2.013	94.73	0.23
802.11HT/VHT40	0.9467	1.047	90.42	0.44
802.11VHT80	0.460	0.490	93.88	0.27

Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

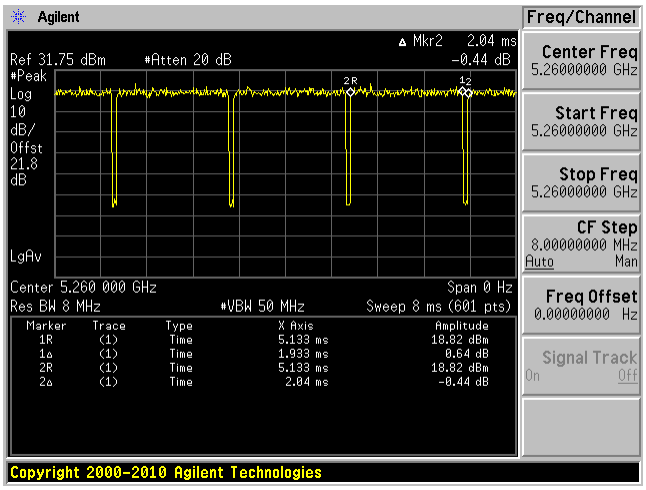
Please refer to the following plots.

5.3 GHz

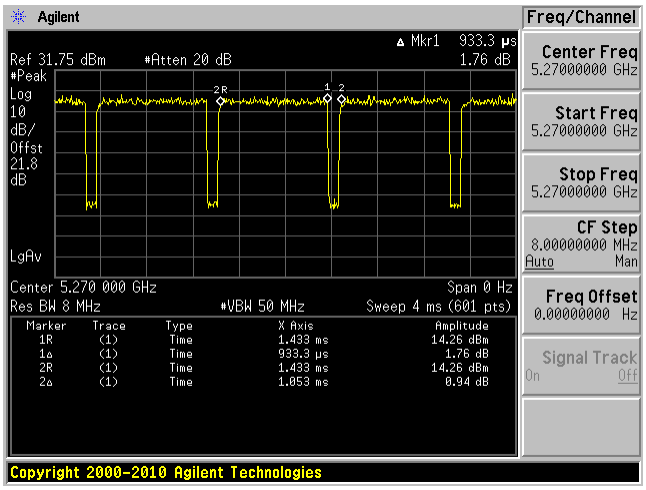
802.11a mode



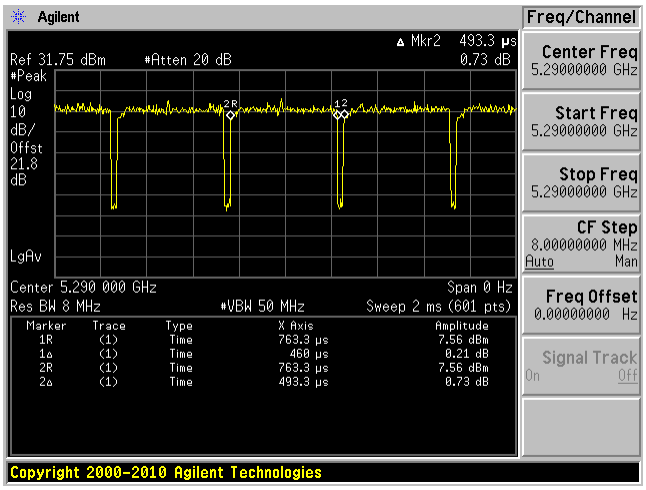
802.11HT/VHT20 mode



802.11HT/VHT40 mode

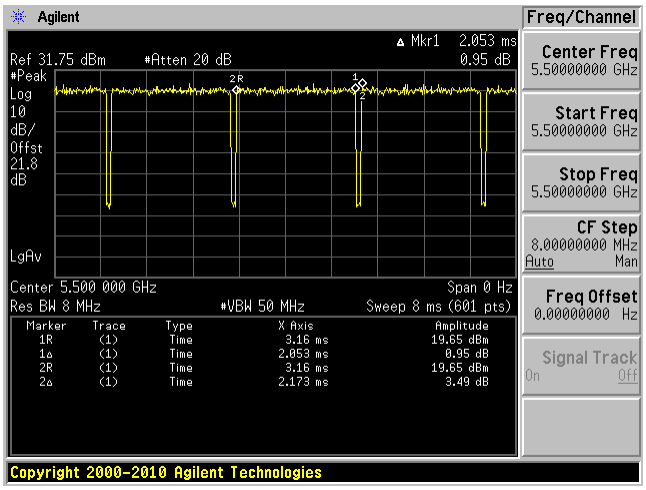


802.11VHT80 mode

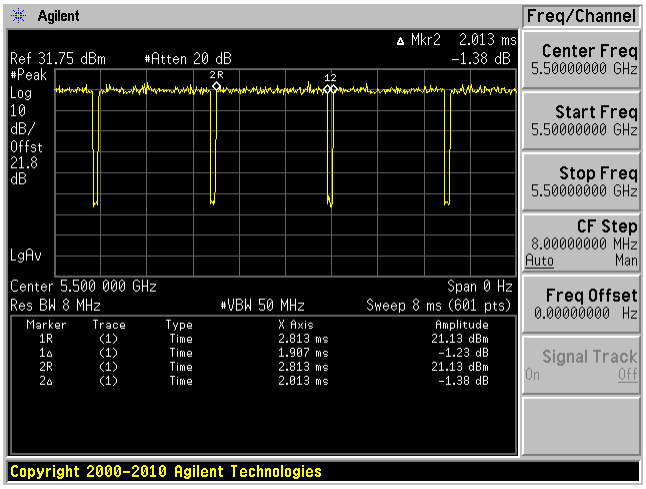


5.6 GHz

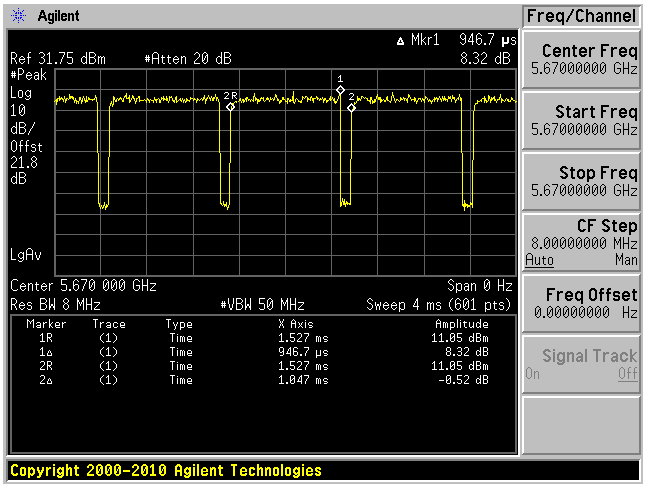
802.11a mode



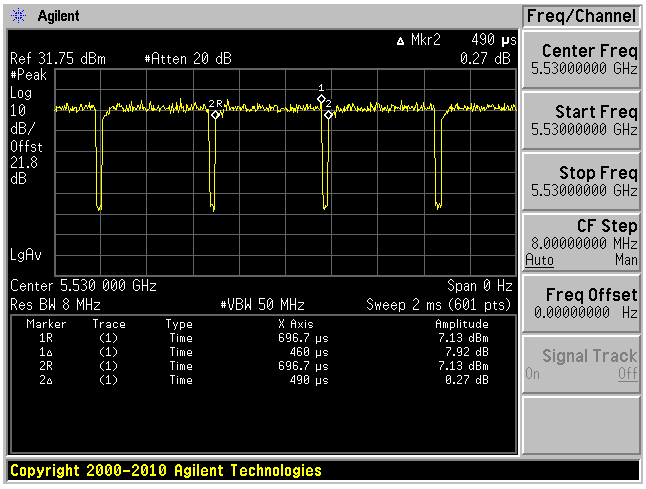
802.11HT/VHT20 mode



802.11HT/VHT40 mode



802.11VHT80 mode



2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E6410	3CKRAQ1

2.6 Support Equipment

There was no support equipment included, or intended for use with EUT during these tests.

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
Ethernet Cable	< 1 m	Laptop	EUT
RF Cable	< 1 m	EUT	PSA
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

FCC Rules	Description of Test	Result
FCC §2.1091, §15.407(f)	RF Exposure	Compliant
FCC §15.203	Antenna Requirement	Compliant
FCC §15.207	AC Power Line Conducted Emissions	Compliant
FCC §2.1053, §15.205, §15.209, 15.407(b)	Spurious Emissions	Compliant
FCC §15.407(a) (2)	Emission Bandwidth	Compliant
FCC §407(a)	Output Power	Compliant
FCC §2.1051, §15.407(b)	Band Edges	Compliant
FCC §15.407(a)	Power Spectral Density	Compliant
FCC §15.407(h)	Dynamic Frequency Selection (DFS)	Compliant[1]

Note[1]: DFS measurement was recorded in a separate report.

4 FCC §2.1091 & §15.407(f) - RF Exposure

According to FCC §15.407(f) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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 (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

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

4.1 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

4.2 MPE Results

Standalone 5 GHz Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	22.81
Maximum peak output power at antenna input terminal (mW):	190.985
Prediction distance (cm):	30
Prediction frequency (MHz):	5610
Maximum Antenna Gain, typical (dBi):	5.906
Maximum Antenna Gain (numeric):	3.8958
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.066
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.066 mW/cm^2. Limit is 1.0 mW/cm^2.

The conducted power used for MPE calculation is the total power acorss all chains, and the maximum antenna gain used for MPE calculation is the directional gain.

Standalone 2.4 GHz Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	29.05
Maximum peak output power at antenna input terminal (mW):	803.526
Prediction distance (cm):	30
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	4.384
Maximum Antenna Gain (numeric):	2.744
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.195
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.195 mW/cm^2. Limit is 1.0 mW/cm^2. Please refer to Report: R1711062-247 for the output power measurement result.

Radio Co-location

5 GHz and 2.4 GHz Wi-Fi are able to transmit simultaneously. Per FCC KDB 447498, when RF sources have difference frequencies, the fraction of the FCC power density limit shall be determined and the sum of all fractional components shall be less than 1.

Frequency Band	Max Conducted Power (dBm)	Evaluated Distance (cm)	Worst Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst Case MPE Ratios	Sum of MPE Ratios	Limit
Worst Case							
2.4 GHz Wi-Fi	29.05	30	0.195	1.0	19.5 %	26.1 %	100 %
5 GHz Wi-Fi	22.81	30	0.066	1.0	6.6 %		

5 FCC §15.203 - Antenna Requirements

5.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.407 (a) (ii), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna List

The antennas used by the EUT are permanent attached antennas.

Frequency Range (GHz)	PCB No. and Gain (dBi)			Correlated Gain (dBi)
	X6	X4	X5	
2.40	-6.100	-0.896	1.535	3.479
2.45	-8.662	0.141	3.428	4.384
2.50	-9.263	1.679	3.024	4.695

Frequency Range (GHz)	PCB No. and Gain (dBi)				Correlated Gain (dBi)
	X13	X7	X12	X15	
5.15	2.353	3.001	-3.782	-3.146	6.165
5.25	2.435	2.760	-5.916	-3.282	5.776
5.35	3.872	3.229	-9.772	-4.280	5.906
5.725	5.287	0.914	-6.033	-7.128	5.775
5.825	3.069	2.960	-5.396	-6.626	5.651

6 FCC §15.207 - AC Power Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note1	56 to 46 Note2
0.5-5	56	46
5-30	60	50

Note1: Decreases with the logarithm of the frequency.
Note2: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used was FCC §15.207 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.
The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

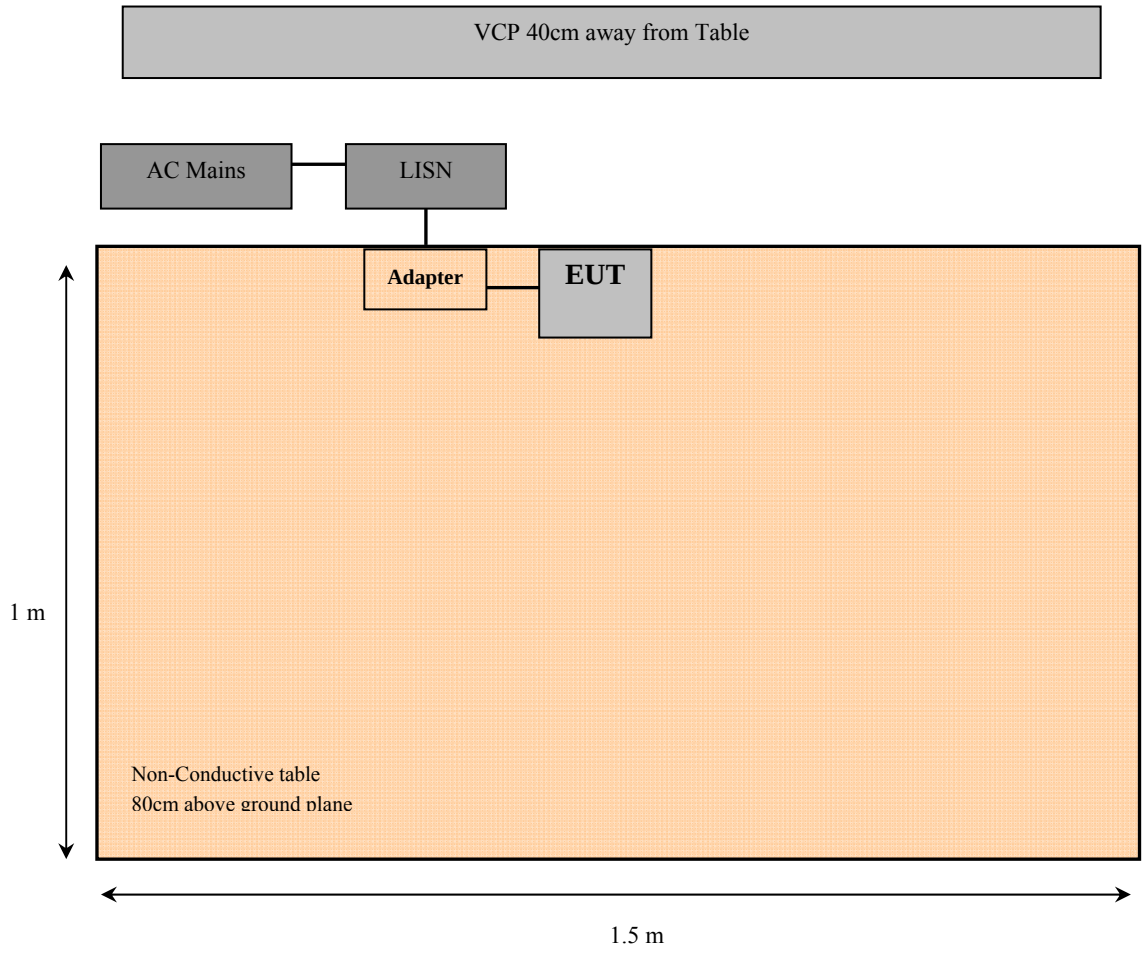
6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cords of support equipment were connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100338	2016-02-04	2 years
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101964	2017-07-24	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2017-03-13	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2017-04-24	1 year

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

6.7 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.31 kPa

The testing was performed by Vincent Licata on 2018-01-29 at open area test site.

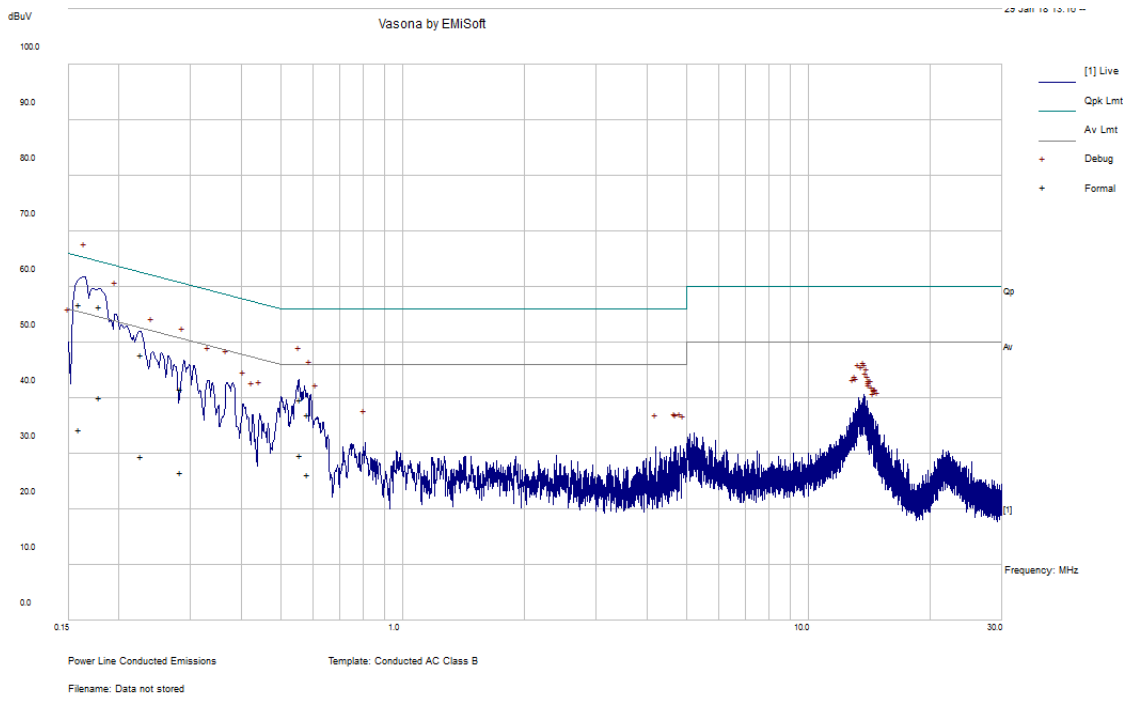
6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC Part 15 standards' conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-8.04	0.179466	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line

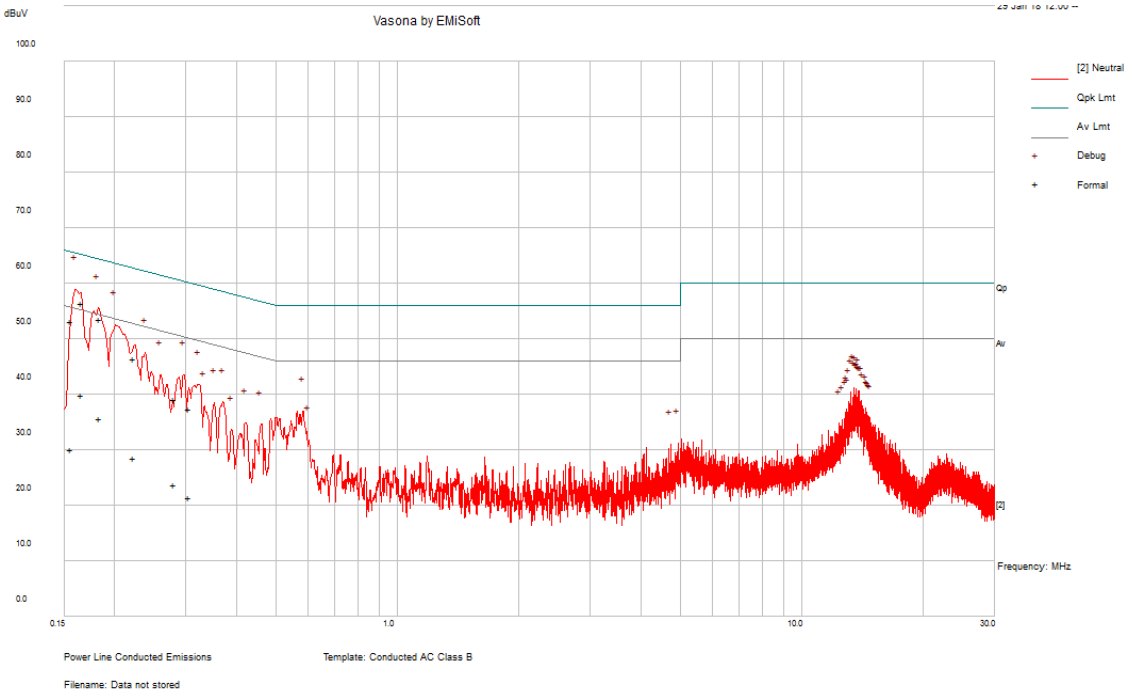


Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.159434	56.87	Line	65.49	-8.62	QP
0.179466	**56.47**	**Line**	**64.51**	**-8.04**	**QP**
0.560502	39.67	Line	56	-16.33	QP
0.226542	47.84	Line	62.58	-14.74	QP
0.283331	41.66	Line	60.72	-19.05	QP
0.583718	36.98	Line	56	-19.02	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.159434	34.26	Line	55.49	-21.23	Ave.
0.179466	40.03	Line	54.51	-14.48	Ave.
0.560502	29.67	Line	46	-16.33	Ave.
0.226542	29.64	Line	52.58	-22.94	Ave.
0.283331	26.68	Line	50.72	-24.04	Ave.
0.583718	26.22	Line	46	-19.78	Ave.

Note: testing was prefromed at worst case 5550 MHz 802.11VHT40.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.155908	53.15	Neutral	65.68	-12.52	QP
0.165784	56.44	Neutral	65.17	-8.73	QP
0.183935	53.65	Neutral	64.31	-10.65	QP
0.223405	46.43	Neutral	62.69	-16.26	QP
0.281055	39.21	Neutral	60.78	-21.58	QP
0.305492	37.35	Neutral	60.09	-22.74	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.155908	30.11	Neutral	55.68	-25.57	Ave.
0.165784	39.95	Neutral	55.17	-15.22	Ave.
0.183935	35.72	Neutral	54.31	-18.58	Ave.
0.223405	28.55	Neutral	52.69	-24.14	Ave.
0.281055	23.79	Neutral	50.78	-27	Ave.
0.305492	21.58	Neutral	50.09	-28.52	Ave.

Note: testing was prefromed at worst case 5550 MHz 802.11VHT40.

7 FCC §15.209, §15.407(b) - Spurious Radiated Emissions

7.1 Applicable Standard

As Per FCC §15.205(a) except as show 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	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209: The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 Note 1	3
88 - 216	150 Note 1	3
216 - 960	200 Note 1	3
Above 960	500	3

Note 1: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC Part 15.407 (b)

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47 -5.725 GHz band: All emissions outside of the 5.47-5725 GHz band shall not exceed an ei.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall noet exceed an e.i.r.p. of -27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15.407 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

7.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter or 1.5 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 3MHz / Sweep = 100ms
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

7.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit for Class A. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100338	2016-02-04	2 years
Agilent	Analyzer, Spectrum	E4446A	US44300386	2017-04-20	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	31 Months
Agilent	Amplifier, Pre	8447D	2944A06639	2017-06-28	1 year
Wisewave	Antenna, Horn 18-26.5GHz	ARH-4223-02	10555-02	2017-12-15	2 years
Wisewave	Antenna, Horn 26.5-40GHz	ARH-2823-02	10555-02	2017-12-15	2 years
AH Systems	Pre-Amplifier 18-40GHz	PAM-1840VH	170	2017-02-28	14 Months
IW	AOBOR Hi frequency Co AX Cable	DC 1531	KPS-1501A3960KPS	2017-08-05	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	N-Type Cable	-	C00012	Each time[1]	N/A
-	N-Type Cable	-	C00014	Each time[1]	N/A
Agilent	Pre-Amplifier	8449B	3147A00400	2017-06-15	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note[1]: cables and attenuators included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

7.6 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Vincent Licata 2017-12-13 to 2018-01-25 in 5m chamber 3.

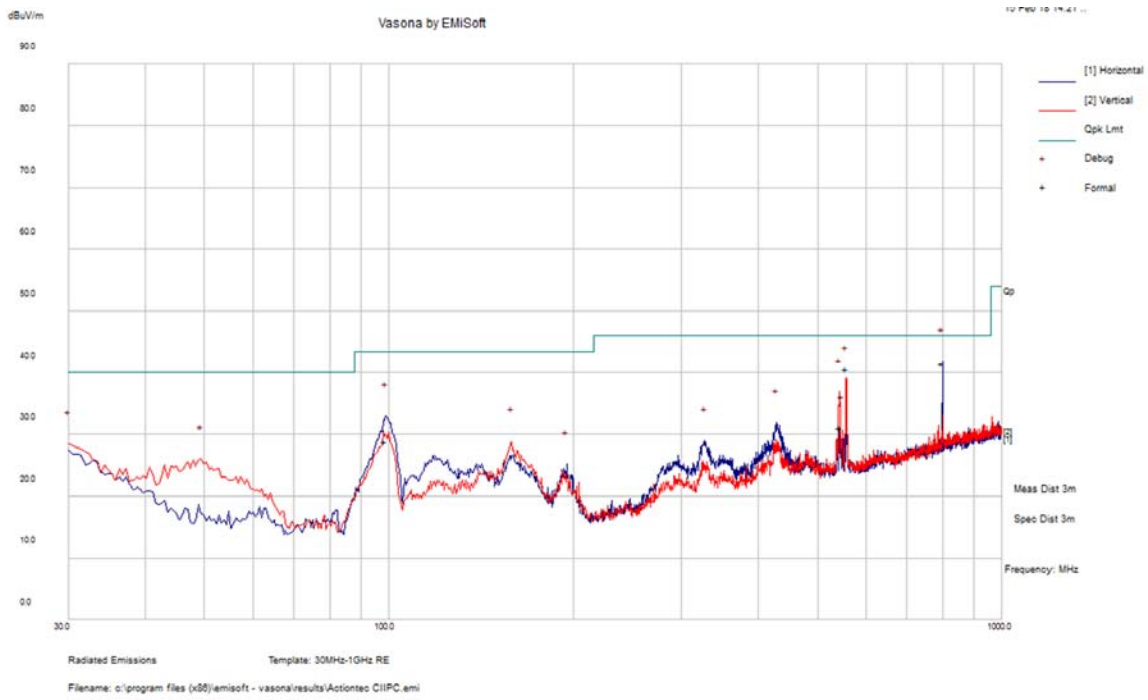
7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.407 standards' radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.82	5470	Vertical	802.11VHT80 mode Low Channel

7.8 Radiated Emissions Test Result Data

1) 30 MHz – 1 GHz



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments (PK/QP/Ave.)
799.193	41.42	99	V	281	46	-4.58	QP
557.4815	40.53	124	H	278	46	-5.47	QP
543.055	31.07	137	H	257	46	-14.93	QP
98.497	28.83	254	H	84	43.5	-14.67	QP

Note: Only four emissions were present because all of the other emissions were 20 dB below the limit during pre-scan.
Note: Testing was prefromed at worst case 5550 MHz 802.11VHT40.

2) 1–40 GHz

5250 - 5350 MHz

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5260 MHz											
5260	68.15	270	242	H	33.48	8.83	0.00	110.46	-	-	PK
5260	59.30	270	242	H	33.48	8.83	0.00	101.61	-	-	AV
5260	70.25	254	298	V	33.48	8.83	0.00	112.56	-	-	PK
5260	60.74	254	298	V	33.48	8.83	0.00	103.06	-	-	AV
10520	43.92	0	100	H	38.25	12.63	35.44	59.36	74.00	-14.7	PK
10520	32.51	0	100	H	38.25	12.63	35.44	47.95	54.00	-6.06	AV
10520	44.44	0	100	V	38.25	12.63	35.44	59.88	74.00	-14.1	PK
10520	32.83	0	100	V	38.25	12.63	35.44	48.27	54.00	-5.74	AV
Middle Channel 5300 MHz											
5300	67.94	267	205	H	33.48	8.83	0.00	110.25	-	-	PK
5300	59.12	267	205	H	33.48	8.83	0.00	101.43	-	-	AV
5300	68.59	261	292	V	33.48	8.83	0.00	110.90	-	-	PK
5300	59.54	261	292	V	33.48	8.83	0.00	101.86	-	-	AV
10600	43.04	0	100	H	38.28	13.23	35.41	59.14	74.00	-14.9	PK
10600	31.60	0	100	H	38.28	13.23	35.41	47.70	54.00	-6.31	AV
10600	43.20	0	100	V	38.28	13.23	35.41	59.30	74.00	-14.7	PK
10600	32.09	0	100	V	38.28	13.23	35.41	48.19	54.00	-5.82	AV
High Channel 5320 MHz											
5320	69.49	151	197	H	33.48	8.83	0.00	111.80	-	-	PK
5320	60.88	151	197	H	33.48	8.83	0.00	103.19	-	-	AV
5320	75.10	270	271	V	33.48	8.83	0.00	117.41	-	-	PK
5320	66.00	270	271	V	33.48	8.83	0.00	108.32	-	-	AV
5350	50.20	104	100	H	33.76	8.83	36.13	56.66	74.00	-17.3	PK
5350	37.78	104	100	H	33.76	8.83	36.13	44.24	54.00	-9.76	AV
5350	54.65	123	290	V	33.61	8.83	36.13	60.96	74.00	-13.0	PK
5350	43.24	123	290	V	33.61	8.83	36.13	49.55	54.00	-4.45	AV
10640	43.51	0	100	H	38.28	13.23	35.41	59.61	74.00	-14.4	PK
10640	31.76	0	100	H	38.28	13.23	35.41	47.86	54.00	-6.15	AV
10640	43.87	0	100	V	38.28	13.23	35.41	59.97	74.00	-14.0	PK
10640	31.87	0	100	V	38.28	13.23	35.41	47.97	54.00	-6.04	AV

802.11VHT20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5260 MHz											
5260	67.51	152	187	H	33.48	8.83	0.00	109.82	-	-	PK
5260	58.37	152	187	H	33.48	8.83	0.00	100.68	-	-	AV
5260	70.57	0	300	V	33.48	8.83	0.00	112.88	-	-	PK
5260	61.01	0	300	V	33.48	8.83	0.00	103.33	-	-	AV
10520	44.20	0	100	H	38.25	12.63	35.44	59.64	74.00	-14.4	PK
10520	32.60	0	100	H	38.25	12.63	35.44	48.04	54.00	-5.97	AV
10520	43.18	0	100	V	38.25	12.63	35.44	58.62	74.00	-15.4	PK
10520	32.97	0	100	V	38.25	12.63	35.44	48.41	54.00	-5.60	AV
Middle Channel 5300 MHz											
5300	67.81	303	259	H	33.48	8.83	0.00	110.12	-	-	PK
5300	58.03	303	259	H	33.48	8.83	0.00	100.34	-	-	AV
5300	70.03	0	300	V	33.48	8.83	0.00	112.34	-	-	PK
5300	61.24	0	300	V	33.48	8.83	0.00	103.56	-	-	AV
10600	43.20	0	100	H	38.28	13.23	35.41	59.30	74.00	-14.7	PK
10600	32.22	0	100	H	38.28	13.23	35.41	48.32	54.00	-5.69	AV
10600	43.30	0	100	V	38.28	13.23	35.41	59.40	74.00	-14.6	PK
10600	32.83	0	100	V	38.28	13.23	35.41	48.93	54.00	-5.08	AV
High Channel 5320 MHz											
5320	68.69	150	201	H	33.48	8.83	0.00	111.00	-	-	PK
5320	59.06	150	201	H	33.48	8.83	0.00	101.37	-	-	AV
5320	73.72	273	256	V	33.48	8.83	0.00	116.03	-	-	PK
5320	63.85	273	256	V	33.48	8.83	0.00	106.17	-	-	AV
5350	54.61	104	100	H	33.76	8.83	36.13	61.07	74.00	-12.9	PK
5350	38.48	104	100	H	33.76	8.83	36.13	44.94	54.00	-9.06	AV
5350	59.57	274	215	V	33.61	8.83	36.13	65.88	74.00	-8.12	PK
5350	42.40	274	215	V	33.61	8.83	36.13	48.71	54.00	-5.29	AV
10640	42.74	0	100	H	38.28	13.23	35.41	58.84	74.00	-15.2	PK
10640	31.49	0	100	H	38.28	13.23	35.41	47.59	54.00	-6.42	AV
10640	43.60	0	100	V	38.28	13.23	35.41	59.70	74.00	-14.3	PK
10640	32.23	0	100	V	38.28	13.23	35.41	48.33	54.00	-5.68	AV

802.11VHT40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5270 MHz											
5270	64.29	273	242	H	33.48	8.83	0.00	106.60	-	-	PK
5270	55.66	273	242	H	33.48	8.83	0.00	97.97	-	-	AV
5270	67.04	0	300	V	33.48	8.83	0.00	109.35	-	-	PK
5270	58.23	0	300	V	33.48	8.83	0.00	100.55	-	-	AV
5350	48.78	233	227	H	33.76	8.83	36.13	55.24	74.00	-18.8	PK
5350	39.16	233	227	H	33.76	8.83	36.13	45.62	54.00	-8.38	AV
5350	52.08	0	300	V	33.61	8.83	36.13	58.39	74.00	-15.6	PK
5350	43.17	0	300	V	33.61	8.83	36.13	49.48	54.00	-4.52	AV
10540	42.82	0	100	H	38.25	12.63	35.44	58.26	74.00	-15.8	PK
10540	32.49	0	100	H	38.25	12.63	35.44	47.93	54.00	-6.07	AV
10540	43.02	0	100	V	38.25	12.63	35.44	58.46	74.00	-15.6	PK
10540	32.63	0	100	V	38.25	12.63	35.44	48.07	54.00	-5.94	AV
High Channel 5310 MHz											
5310	67.04	155	214	H	33.48	8.83	0.00	109.35	-	-	PK
5310	57.09	155	214	H	33.48	8.83	0.00	99.40	-	-	AV
5310	70.07	213	188	V	33.48	8.83	0.00	112.38	-	-	PK
5310	60.57	213	188	V	33.48	8.83	0.00	102.89	-	-	AV
5350	56.12	105	100	H	33.76	8.83	36.13	62.58	74.00	-11.4	PK
5350	40.31	105	100	H	33.76	8.83	36.13	46.77	54.00	-7.23	AV
5350	57.99	87	170	V	33.61	8.83	36.13	64.30	74.00	-9.70	PK
5350	43.26	87	170	V	33.61	8.83	36.13	49.57	54.00	-4.43	AV
10620	43.31	0	100	H	38.28	13.23	35.41	59.41	74.00	-14.6	PK
10620	31.84	0	100	H	38.28	13.23	35.41	47.94	54.00	-6.07	AV
10620	43.67	0	100	V	38.28	13.23	35.41	59.77	74.00	-14.2	PK
10620	32.20	0	100	V	38.28	13.23	35.41	48.30	54.00	-5.71	AV

802.11VHT80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5290 MHz											
5290	61.59	161	138	H	33.48	8.83	0.00	103.90	-	-	PK
5290	53.37	161	138	H	33.48	8.83	0.00	95.68	-	-	AV
5290	66.30	0	290	V	33.48	8.83	0.00	108.61	-	-	PK
5290	57.90	0	290	V	33.48	8.83	0.00	100.22	-	-	AV
5350	61.21	29	300	H	33.76	8.83	36.13	67.67	74.00	-6.33	PK
5350	44.01	29	300	H	33.76	8.83	36.13	50.47	54.00	-3.53	AV
5350	62.15	242	300	V	33.61	8.83	36.13	68.46	74.00	-5.54	PK
5350	46.14	242	300	V	33.61	8.83	36.13	52.45	54.00	-1.55	AV
10580	43.74	0	100	H	38.28	13.23	35.41	59.84	74.00	-14.2	PK
10580	32.82	0	100	H	38.28	13.23	35.41	48.92	54.00	-5.09	AV
10580	44.20	0	100	V	38.28	13.23	35.41	60.30	74.00	-13.7	PK
10580	33.19	0	100	V	38.28	13.23	35.41	49.29	54.00	-4.72	AV

5500 - 5725 MHz

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5500 MHz											
5500	65.87	105	131	H	34.06	8.80	0.00	108.73	-	-	PK
5500	58.02	105	131	H	34.06	8.80	0.00	100.88	-	-	AV
5500	69.58	274	295	V	34.06	8.80	0.00	112.44	-	-	PK
5500	60.64	274	295	V	34.06	8.80	0.00	103.50	-	-	AV
5264	50.77	159	199	H	33.78	8.76	36.11	57.20	74.00	-16.8	PK
5264	40.90	159	199	H	33.73	8.76	36.11	47.28	54.00	-6.72	PK
5264	52.33	306	300	V	33.78	8.76	36.11	58.76	74.00	-15.3	PK
5264	41.01	306	300	V	33.73	8.76	36.11	47.39	54.00	-6.61	PK
5467	51.38	159	199	H	33.78	8.76	36.11	57.81	74.00	-16.2	PK
5467	39.88	159	199	H	33.78	8.76	36.11	46.31	54.00	-7.69	AV
5467	54.09	290	300	V	33.73	8.76	36.11	60.47	74.00	-13.5	PK
5467	40.53	290	300	V	33.73	8.76	36.11	46.91	54.00	-7.09	AV
11000	43.27	0	100	H	38.45	13.05	35.16	59.61	74.00	-14.4	PK
11000	31.84	0	100	H	38.45	13.05	35.16	48.18	54.00	-5.82	AV
11000	43.53	0	100	V	38.45	13.05	35.16	59.87	74.00	-14.1	PK
11000	32.25	0	100	V	38.45	13.05	35.16	48.59	54.00	-5.41	AV
Middle Channel 5580 MHz											
5580	65.78	253	184	H	34.08	8.91	0.00	108.77	-	-	PK
5580	57.59	253	184	H	34.08	8.91	0.00	100.58	-	-	AV
5580	66.33	84	100	V	34.08	8.91	0.00	109.32	-	-	PK
5580	57.95	84	100	V	34.08	8.91	0.00	100.94	-	-	AV
11160	43.19	0	100	H	38.49	13.33	34.97	60.04	74.00	-13.9	PK
11160	31.64	0	100	H	38.49	13.33	34.97	48.49	54.00	-5.51	AV
11160	43.66	0	100	V	38.49	13.33	34.97	60.51	74.00	-13.5	PK
11160	31.71	0	100	V	38.49	13.33	34.97	48.56	54.00	-5.44	AV
High Channel 5700 MHz											
5700	67.30	150	160	H	34.02	9.00	0.00	110.32	-	-	PK
5700	57.84	150	160	H	34.02	9.00	0.00	100.86	-	-	AV
5700	68.96	89	132	V	34.02	9.00	0.00	111.98	-	-	PK
5700	60.20	89	132	V	34.02	9.00	0.00	103.22	-	-	AV
5725	57.73	154	180	H	34.02	8.21	36.16	63.81	68.26	-4.46	PK
5725	59.12	92	255	V	34.02	8.21	36.16	65.20	68.26	-3.07	PK
5944	52.02	154	180	H	33.93	8.21	36.16	58.01	68.26	-10.3	PK
5944	54.06	92	255	V	33.93	8.21	36.16	60.05	68.26	-8.22	PK
11400	43.22	0	100	H	38.41	14.00	35.03	60.60	74.00	-13.4	PK
11400	31.81	0	100	H	38.41	14.00	35.03	49.19	54.00	-4.81	AV
11400	43.70	0	100	V	38.41	14.00	35.03	61.08	74.00	-12.9	PK
11400	31.88	0	100	V	38.41	14.00	35.03	49.26	54.00	-4.74	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Straddle Channel 5720 MHz											
5720	69.39	157	190	H	34.02	9.00	0.00	112.41	-	-	PK
5720	59.90	157	190	H	34.02	9.00	0.00	102.92	-	-	AV
5720	70.45	89	193	V	34.02	9.00	0.00	113.47	-	-	PK
5720	61.47	89	193	V	34.02	9.00	0.00	104.49	-	-	AV
11440	42.58	0	100	H	38.41	14.00	35.03	59.96	74.00	-14.0	PK
11440	31.77	0	100	H	38.41	14.00	35.03	49.15	54.00	-4.85	AV
11440	42.83	0	100	V	38.41	14.00	35.03	60.21	74.00	-13.8	PK
11440	31.91	0	100	V	38.41	14.00	35.03	49.29	54.00	-4.71	AV

802.11VHT20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5500 MHz											
5500	67.19	268	300	H	34.06	8.80	0.00	110.05	-	-	PK
5500	57.70	268	300	H	34.06	8.80	0.00	100.56	-	-	AV
5500	67.88	280	291	V	34.06	8.80	0.00	110.74	-	-	PK
5500	58.42	280	291	V	34.06	8.80	0.00	101.28	-	-	AV
5263	51.31	299	160	H	33.78	8.76	36.11	57.74	68.26	-10.5	PK
5263	55.58	0	300	V	33.73	8.76	36.11	61.96	68.26	-6.30	PK
5470	56.33	299	160	H	33.78	8.76	36.11	62.76	74.00	-11.3	PK
5470	42.02	299	160	H	33.78	8.76	36.11	48.45	54.00	-5.55	AV
5470	61.52	0	300	V	33.73	8.76	36.11	67.90	74.00	-6.10	PK
5470	44.18	0	300	V	33.73	8.76	36.11	50.56	54.00	-3.44	AV
11000	43.22	0	100	H	38.45	13.05	35.16	59.56	74.00	-14.4	PK
11000	31.47	0	100	H	38.45	13.05	35.16	47.81	54.00	-6.19	AV
11000	43.77	0	100	V	38.45	13.05	35.16	60.11	74.00	-13.9	PK
11000	31.73	0	100	V	38.45	13.05	35.16	48.07	54.00	-5.93	AV
Middle Channel 5580 MHz											
5580	66.76	205	232	H	34.08	8.91	0.00	109.75	-	-	PK
5580	57.56	205	232	H	34.08	8.91	0.00	100.55	-	-	AV
5580	66.78	93	135	V	34.08	8.91	0.00	109.77	-	-	PK
5580	57.84	93	135	V	34.08	8.91	0.00	100.83	-	-	AV
11160	43.20	0	100	H	38.49	13.33	34.97	60.05	74.00	-13.9	PK
11160	31.58	0	100	H	38.49	13.33	34.97	48.43	54.00	-5.57	AV
11160	43.58	0	100	V	38.49	13.33	34.97	60.43	74.00	-13.6	PK
11160	31.64	0	100	V	38.49	13.33	34.97	48.49	54.00	-5.51	AV
High Channel 5700 MHz											
5700	67.26	154	173	H	34.02	9.00	0.00	110.28	-	-	PK
5700	58.06	154	173	H	34.02	9.00	0.00	101.08	-	-	AV
5700	68.27	98	121	V	34.02	9.00	0.00	111.29	-	-	PK
5700	58.83	98	121	V	34.02	9.00	0.00	101.85	-	-	AV
5725	61.09	101	248	V	33.93	8.21	36.16	67.08	68.26	-1.18	PK
5725	61.16	164	100	H	34.02	8.21	36.16	67.24	68.26	-1.02	PK
5946	50.87	101	248	V	33.93	8.21	36.16	56.86	68.26	-11.4	PK
5946	49.71	164	100	H	34.02	8.21	36.16	55.79	68.26	-12.5	PK
11400	42.67	0	100	H	38.41	14.00	35.03	60.05	74.00	-13.9	PK
11400	31.68	0	100	H	38.41	14.00	35.03	49.06	54.00	-4.94	AV
11400	42.51	0	100	V	38.41	14.00	35.03	59.89	74.00	-14.1	PK
11400	31.88	0	100	V	38.41	14.00	35.03	49.26	54.00	-4.74	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Straddle Channel 5720 MHz											
5720	68.22	128	140	H	34.02	9.00	0.00	111.24	-	-	PK
5720	57.84	128	140	H	34.02	9.00	0.00	100.86	-	-	AV
5720	68.81	94	128	V	34.02	9.00	0.00	111.83	-	-	PK
5720	59.57	94	128	V	34.02	9.00	0.00	102.59	-	-	AV
11440	42.72	0	100	H	38.41	14.00	35.03	60.10	74.00	-13.9	PK
11440	31.84	0	100	H	38.41	14.00	35.03	49.22	54.00	-4.78	AV
11440	42.96	0	100	V	38.41	14.00	35.03	60.34	74.00	-13.7	PK
11440	31.95	0	100	V	38.41	14.00	35.03	49.33	54.00	-4.67	AV

802.11VHT40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5510 MHz											
5510	62.62	106	196	H	34.06	8.80	0.00	105.48	-	-	PK
5510	53.99	106	196	H	34.06	8.80	0.00	96.85	-	-	AV
5510	63.64	294	265	V	34.06	8.80	0.00	106.50	-	-	PK
5510	54.58	294	265	V	34.06	8.80	0.00	97.44	-	-	AV
5470	59.95	12	100	H	33.78	8.76	36.11	66.38	74.00	-7.63	PK
5470	41.67	12	100	H	33.78	8.76	36.11	48.10	54.00	-5.90	AV
5470	62.28	251	110	V	33.73	8.76	36.11	68.66	74.00	-5.34	PK
5470	44.92	251	110	V	33.73	8.76	36.11	51.30	54.00	-2.70	AV
11020	43.64	0	100	H	38.45	13.05	35.16	59.98	74.00	-14.0	PK
11020	32.61	0	100	H	38.45	13.05	35.16	48.95	54.00	-5.05	AV
11020	43.77	0	100	V	38.45	13.05	35.16	60.11	74.00	-13.9	PK
11020	32.59	0	100	V	38.45	13.05	35.16	48.93	54.00	-5.07	AV
Middle Channel 5550 MHz											
5550	63.32	121	215	H	34.08	8.80	0.00	106.20	-	-	PK
5550	55.09	121	215	H	34.08	8.80	0.00	97.97	-	-	AV
5550	64.21	83	152	V	34.08	8.80	0.00	107.09	-	-	PK
5550	55.27	83	152	V	34.08	8.80	0.00	98.15	-	-	AV
11100	43.61	0	100	H	38.49	13.33	34.97	60.46	74.00	-13.5	PK
11100	32.48	0	100	H	38.49	13.33	34.97	49.33	54.00	-4.67	AV
11100	43.82	0	100	V	38.49	13.33	34.97	60.67	74.00	-13.3	PK
11100	32.59	0	100	V	38.49	13.33	34.97	49.44	54.00	-4.56	AV
Channel 118 5590 MHz											
5590	63.34	106	103	H	34.08	8.91	0.00	106.33	-	-	PK
5590	55.24	106	103	H	34.08	8.91	0.00	98.23	-	-	AV
5590	64.61	87	151	V	34.08	8.91	0.00	107.60	-	-	PK
5590	55.65	87	151	V	34.08	8.91	0.00	98.64	-	-	AV
11180	43.71	0	100	H	38.49	13.33	34.97	60.56	74.00	-13.4	PK
11180	32.32	0	100	H	38.49	13.33	34.97	49.17	54.00	-4.83	AV
11180	43.99	0	100	V	38.49	13.33	34.97	60.84	74.00	-13.2	PK
11180	32.46	0	100	V	38.49	13.33	34.97	49.31	54.00	-4.69	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5670 MHz											
5670	64.80	157	178	H	34.02	9.00	0.00	107.82	-	-	PK
5670	54.51	157	178	H	34.02	9.00	0.00	97.53	-	-	AV
5670	64.95	98	118	V	34.02	9.00	0.00	107.97	-	-	PK
5670	55.76	98	118	V	34.02	9.00	0.00	98.78	-	-	AV
5725	58.13	0	300	V	33.93	8.21	36.16	64.12	68.26	-4.15	PK
5725	54.63	160	260	H	34.02	8.21	36.16	60.71	68.26	-7.56	PK
5820	51.26	0	300	V	33.93	8.21	36.16	57.25	68.26	-11.0	PK
5820	49.02	160	260	H	34.02	8.21	36.16	55.10	68.26	-13.2	PK
11340	42.87	0	100	H	38.41	14.00	35.03	60.25	74.00	-13.8	PK
11340	31.97	0	100	H	38.41	14.00	35.03	49.35	54.00	-4.65	AV
11340	43.41	0	100	V	38.41	14.00	35.03	60.79	74.00	-13.2	PK
11340	32.01	0	100	V	38.41	14.00	35.03	49.39	54.00	-4.61	AV
Straddle Channel 5710 MHz											
5710	65.12	163	196	H	34.02	9.00	0.00	108.14	-	-	PK
5710	54.81	163	196	H	34.02	9.00	0.00	97.83	-	-	AV
5710	65.70	85	191	V	34.02	9.00	0.00	108.72	-	-	PK
5710	55.96	85	191	V	34.02	9.00	0.00	98.98	-	-	AV
11420	42.93	0	100	H	38.41	14.00	35.03	60.31	74.00	-13.7	PK
11420	31.91	0	100	H	38.41	14.00	35.03	49.29	54.00	-4.71	AV
11420	42.99	0	100	V	38.41	14.00	35.03	60.37	74.00	-13.6	PK
11420	32.10	0	100	V	38.41	14.00	35.03	49.48	54.00	-4.52	AV

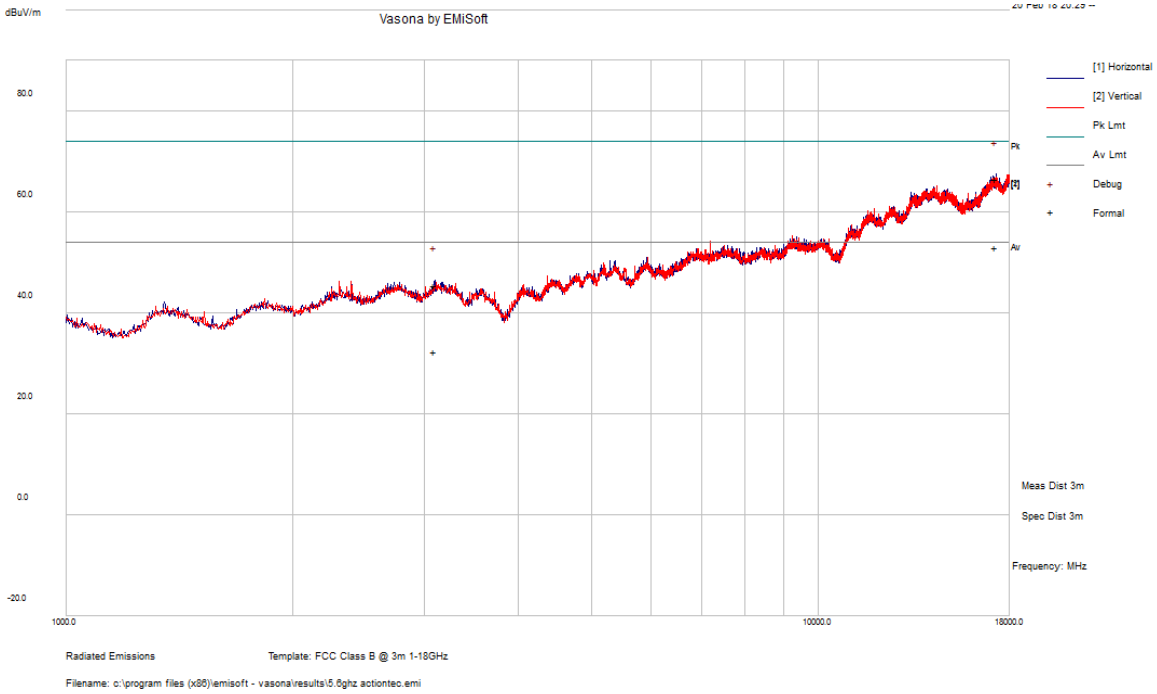
802.11VHT80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5530 MHz											
5530	60.40	125	208	H	34.06	8.80	0.00	103.26	-	-	PK
5530	51.11	125	208	H	34.06	8.80	0.00	93.97	-	-	AV
5530	61.14	94	170	V	34.06	8.80	0.00	104.00	-	-	PK
5530	52.88	94	170	V	34.06	8.80	0.00	95.74	-	-	AV
5470	60.99	0	166	H	33.78	8.76	36.11	67.42	74.00	-6.58	PK
5470	45.55	0	166	H	33.78	8.76	36.11	51.98	54.00	-2.03	AV
5470	62.43	236	300	V	33.73	8.76	36.11	68.81	74.00	-5.19	PK
5470	**46.80**	**236**	**300**	**V**	**33.73**	**8.76**	**36.11**	**53.18**	**54.00**	**-0.82**	**AV**
11060	44.24	0	100	H	38.45	13.05	35.16	60.58	74.00	-13.4	PK
11060	33.01	0	100	H	38.45	13.05	35.16	49.35	54.00	-4.65	AV
11060	44.46	0	100	V	38.45	13.05	35.16	60.80	74.00	-13.2	PK
11060	33.11	0	100	V	38.45	13.05	35.16	49.45	54.00	-4.55	AV
High Channel 5610 MHz											
5610	61.66	123	150	H	34.02	8.91	0.00	104.59	-	-	PK
5610	53.05	123	150	H	34.02	8.91	0.00	95.98	-	-	AV
5610	62.53	90	121	V	34.02	8.91	0.00	105.46	-	-	PK
5610	53.51	90	121	V	34.02	8.91	0.00	96.44	-	-	AV
5725	50.32	247	275	H	33.93	8.21	36.16	56.31	68.26	-11.9	PK
5725	48.59	98	125	V	33.93	8.21	36.16	54.58	68.26	-13.7	PK
11220	42.93	0	100	H	38.49	13.33	34.97	59.78	74.00	-14.2	PK
11220	32.88	0	100	H	38.49	13.33	34.97	49.73	54.00	-4.27	AV
11220	42.83	0	100	V	38.49	13.33	34.97	59.68	74.00	-14.3	PK
11220	32.67	0	100	V	38.49	13.33	34.97	49.52	54.00	-4.48	AV
Straddle Channel 5690 MHz											
5690	61.92	126	151	H	34.02	8.91	0.00	104.85	-	-	PK
5690	53.41	126	151	H	34.02	8.91	0.00	96.34	-	-	AV
5690	63.10	87	133	V	34.02	8.91	0.00	106.03	-	-	PK
5690	53.74	87	133	V	34.02	8.91	0.00	96.67	-	-	AV
11380	43.05	0	100	H	38.49	13.33	34.97	59.90	74.00	-14.1	PK
11380	32.97	0	100	H	38.49	13.33	34.97	49.82	54.00	-4.18	AV
11380	42.96	0	100	V	38.49	13.33	34.97	59.81	74.00	-14.2	PK
11380	32.78	0	100	V	38.49	13.33	34.97	49.63	54.00	-4.37	AV

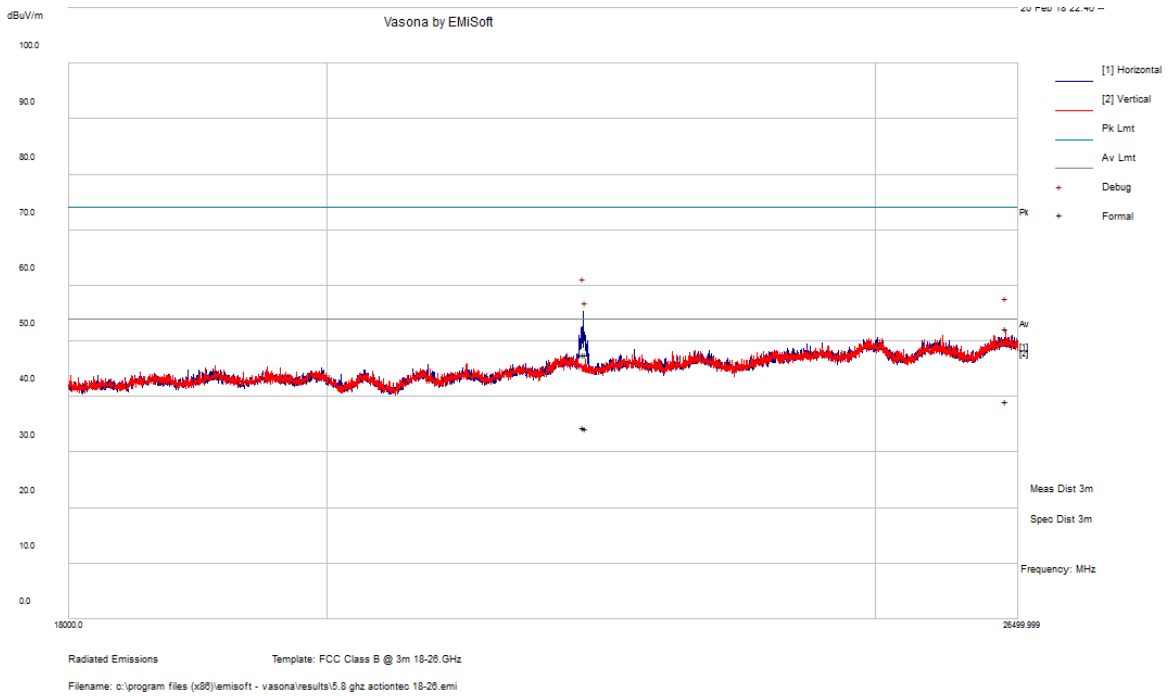
Note 1: Any emissions above 12 GHz are emissions from the noise floor.
Note 2: Duty Cycle Correction Factor has been added to the measurements.
Note 3: After pre-scan 802.11ac and 802.11n, 802.11ac was determined to be the worst-case modulation used to show compliance.

Please refer to the following graphes for the worst case 5550 MHz 802.11VHT40.

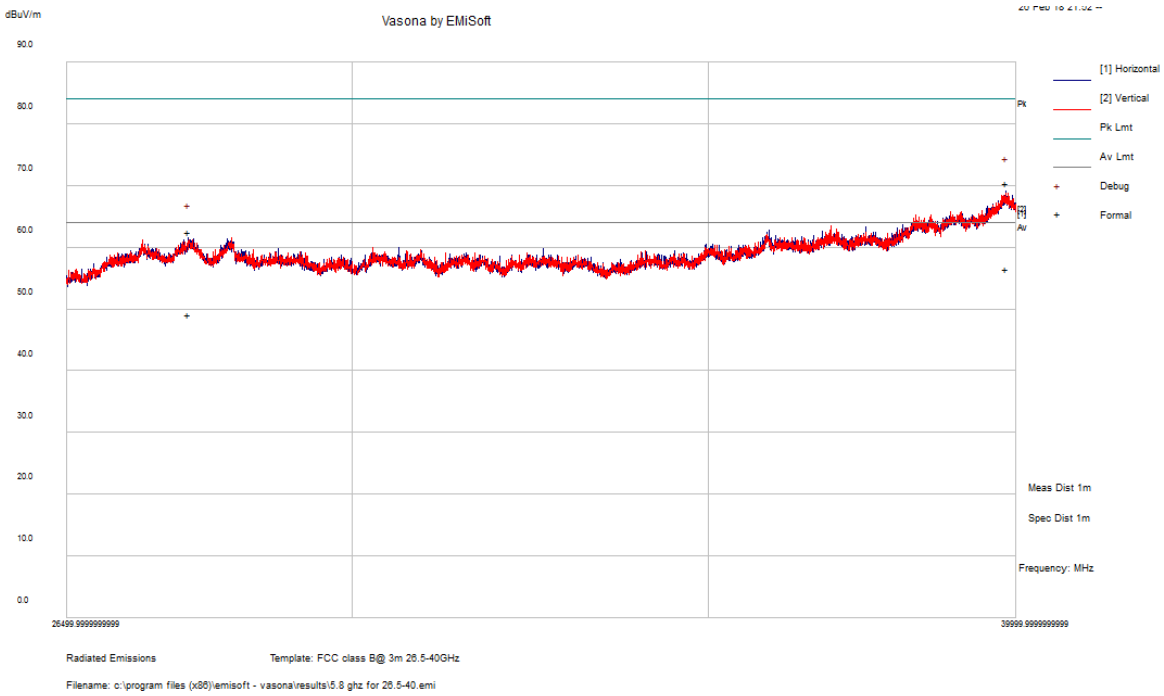
1) 1 GHz – 18 GHz



2) 18 GHz – 26.5 GHz



3) 26.5 GHz – 40 GHz



8 FCC §15.407(a) (2) - 26 dB, and 99% Occupied Bandwidth

8.1 Applicable Standards

FCC §15.407(a) (2)

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 26 dB from the reference level. Record the frequency difference as the minimum emission or emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2017-04-20	1 year
-	20dB attenuator	-	-	Each time[1]	N/A
-	RF cable	-	-	Each time[1]	N/A
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cables and attenuators included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

8.4 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Vincent Licata on 2018-01-22 at RF site.

8.5 Test Results

Please refer to the following tables and plots.

5250 - 5350 MHz

ANT 0 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11a mode			
52	5260	16608.9	21049
60	5300	16621.1	21183
64	5320	16681.9	21065
802.11HT/VHT20 mode			
52	5260	17769.4	21244
60	5300	17813.6	21195
64	5320	17758.3	21224
802.11HT/VHT40 mode			
54	5270	36197.5	39602
62	5310	36198.1	39802
802.11VHT80 mode			
58	5290	75579.8	80415

ANT 1 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
52	5260	16657.7	20951
60	5300	16603.0	20632
64	5320	16621.0	20633
802.11HT/VHT20 mode			
52	5260	1744.6	21072
60	5300	17742.0	20914
64	5320	17776.0	21042
802.11HT/VHT40 mode			
54	5270	36111.8	39417
62	5310	36193.7	39038
802.11VHT80 mode			
58	5290	75548.1	80327

ANT 2 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
52	5260	16663.1	20934
60	5300	16571.1	20855
64	5320	16602.7	21229
802.11HT/VHT20 mode			
52	5260	17738.2	20683
60	5300	17778.2	21173
64	5320	17709.3	21172
802.11HT/VHT40 mode			
54	5270	36170.6	39353
62	5310	36163.3	39303
802.11VHT80 mode			
58	5290	75548.2	80843

ANT 3 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
52	5260	16549.0	20739
60	5300	16588.3	20943
64	5320	16603.8	20894
802.11HT/VHT20 mode			
52	5260	17734.5	21174
60	5300	17795.3	20918
64	5320	17783.4	21069
802.11HT/VHT40 mode			
54	5270	36097.5	39124
62	5310	36214.9	39133
802.11VHT80 mode			
58	5290	75674.1	80903

5500 - 5725 MHz

ANT 0 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
100	5500	16623.0	20984
116	5580	16620.7	21042
140	5700	16570.9	21062
144	5720	16612.6	20897
802.11HT/VHT20 mode			
100	5500	17751.0	21266
116	5580	17760.8	21495
140	5700	17826.2	21401
144	5720	17740.9	21085
802.11HT/VHT40 mode			
102	5510	36139.5	39235
110	5550	36179.5	39872
118	5590	36172.6	39532
134	5670	36266.4	39312
142	5710	36235.3	39486
802.11VHT80 mode			
106	5530	75696.0	81594
122	5610	75588.2	81125
138	5690	75690.6	81675

ANT 1 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
100	5500	16630.0	20583
116	5580	16571.0	20975
140	5700	16575.6	20769
144	5720	16655.4	20798
802.11HT/VHT20 mode			
100	5500	17743.9	20817
116	5580	17719.4	20553
140	5700	17729.7	20984
144	5720	17731.6	21121
802.11HT/VHT40 mode			
102	5510	36293.5	38847
110	5550	36196.1	38692
118	5590	36368.7	39131
134	5670	36272.5	39281
142	5710	36177.0	39396
802.11VHT80 mode			
106	5530	75581.7	80826
122	5610	75756.6	80645
138	5690	75578.0	81082

ANT 2 MIMO

Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
100	5500	16562.7	20691
116	5580	16624.7	20770
140	5700	16669.5	20689
144	5720	16546.9	21059
802.11HT/VHT20 mode			
100	5500	17728.4	21015
116	5580	17778.5	20947
140	5700	17754.5	21161
144	5720	17797.1	21387
802.11HT/VHT40 mode			
102	5510	36107.0	39120
110	5550	36145.6	39104
118	5590	36194.9	39065
134	5670	36061.2	39206
142	5710	36313.6	39015
802.11VHT80 mode			
106	5530	75633.4	80728
122	5610	75651.9	80400
138	5690	75701.2	81032

ANT 3 MIMO

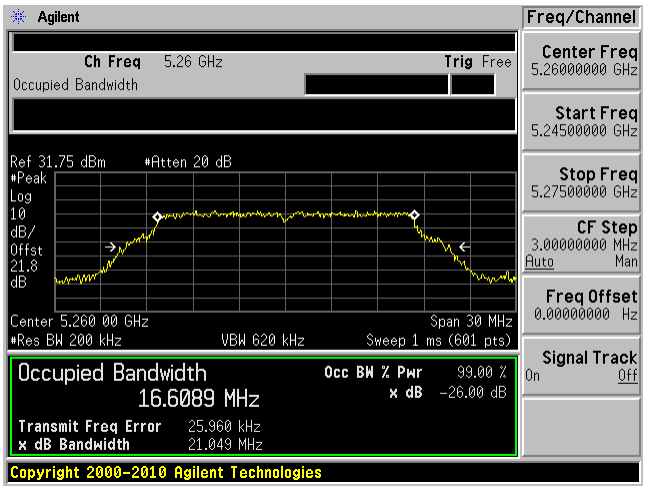
Channel Number	Center Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
100	5500	16518.5	20612
116	5580	16569.1	20682
140	5700	16589.6	20914
144	5720	16519.9	21161
802.11HT/VHT20 mode			
100	5500	17755.5	21547
116	5580	17787.1	21009
140	5700	17734.6	21298
144	5720	17806.8	21237
802.11HT/VHT40 mode			
102	5510	36224.3	39158
110	5550	36293.5	39593
118	5590	36178.5	39115
134	5670	36223.8	40055
142	5710	36246.8	39908
802.11VHT80 mode			
106	5530	75628.6	80525
122	5610	75690.0	80369
138	5690	75712.2	80365

5250 – 5350 MHz

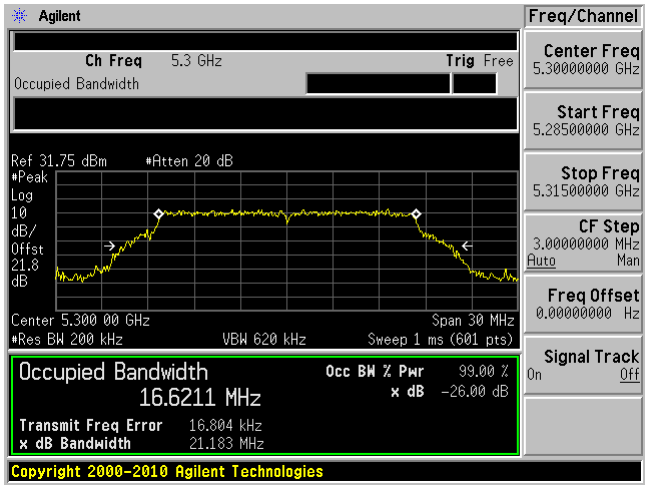
ANT 0 MIMO

802.11a mode

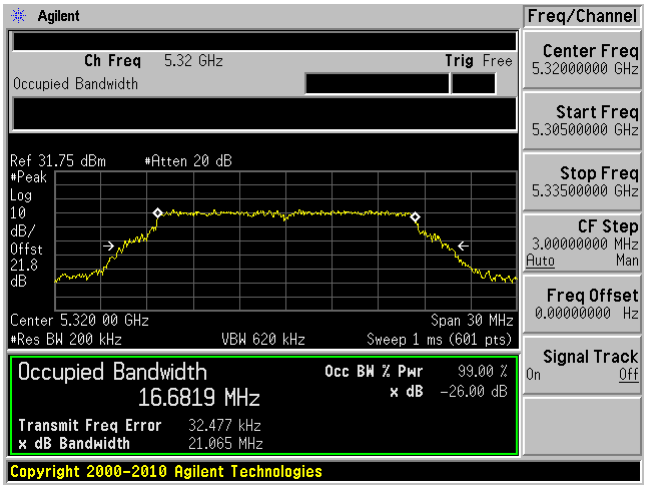
5260 MHz



5300 MHz

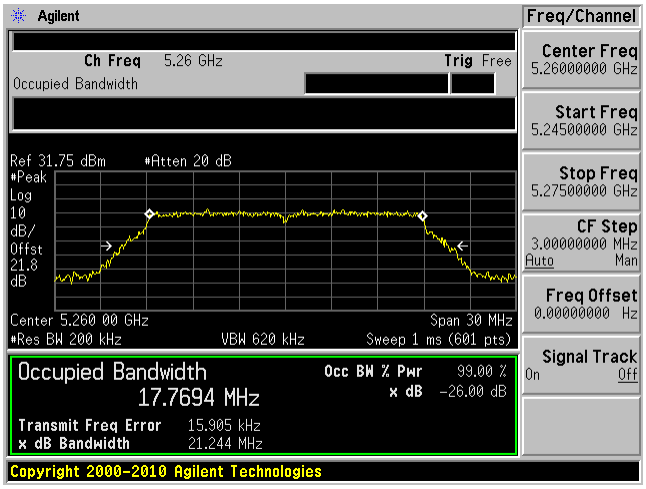


5320 MHz

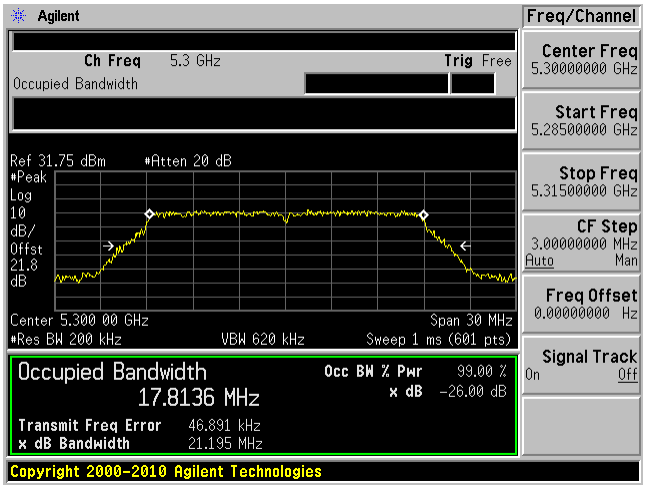


802.11HT/VHT20 mode

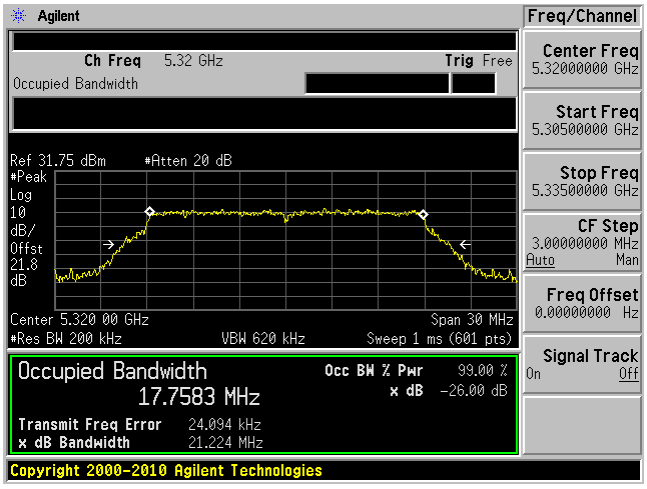
5260 MHz



5300 MHz

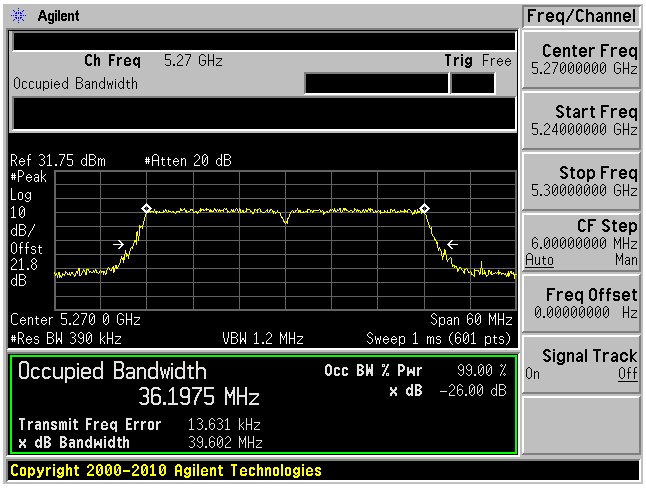


5320 MHz

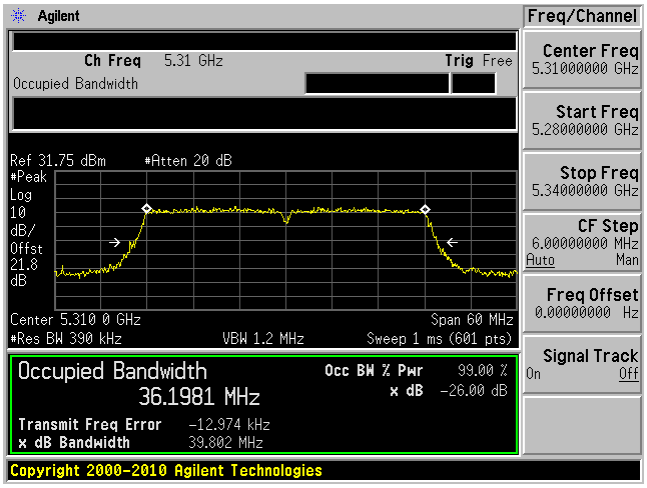


802.11HT/VHT40 mode

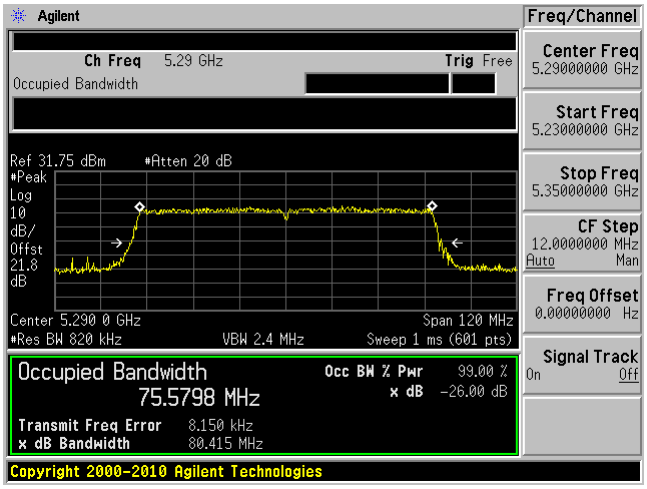
5270 MHz



5310 MHz



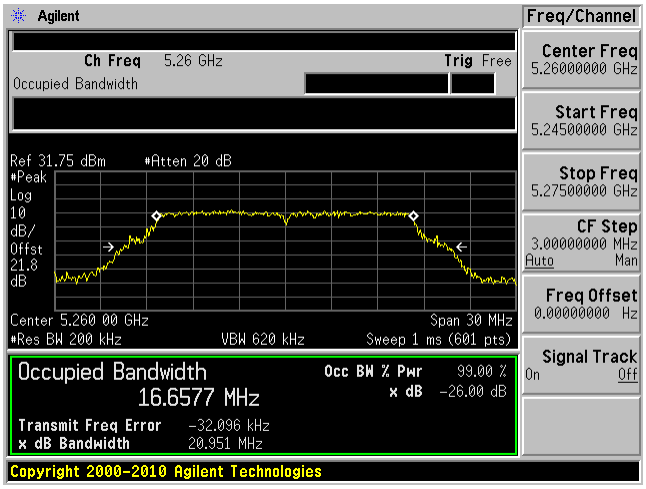
802.11VHT80 mode, 5290 MHz



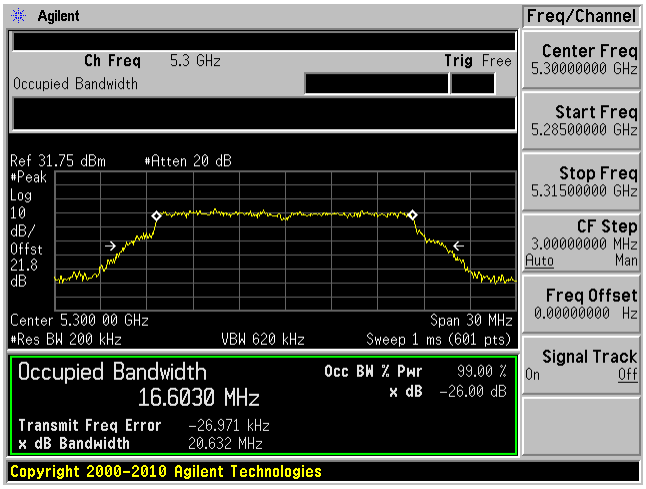
ANT 1 MIMO

802.11a mode

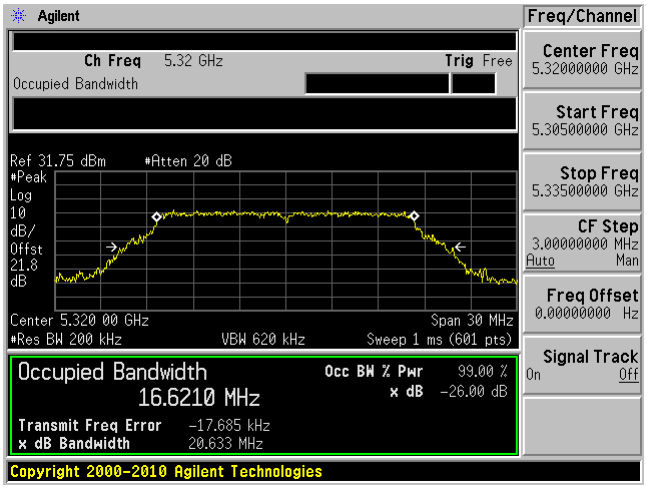
5260 MHz



5300 MHz

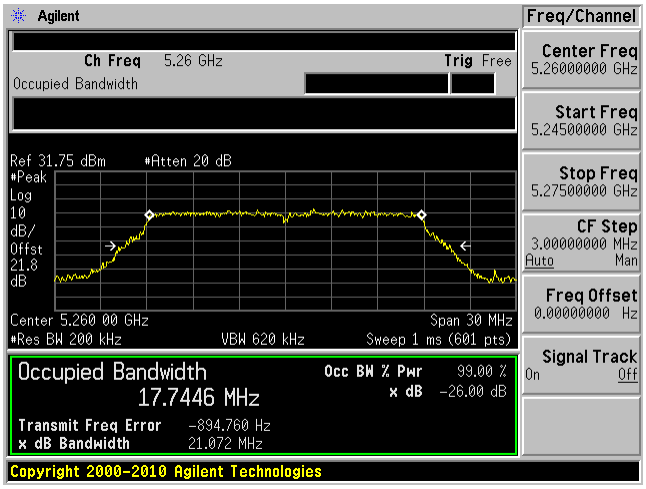


5320 MHz

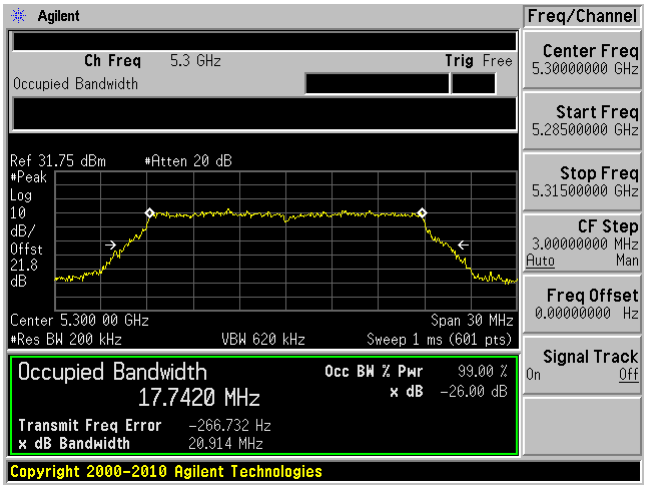


802.11HT/VHT20 mode

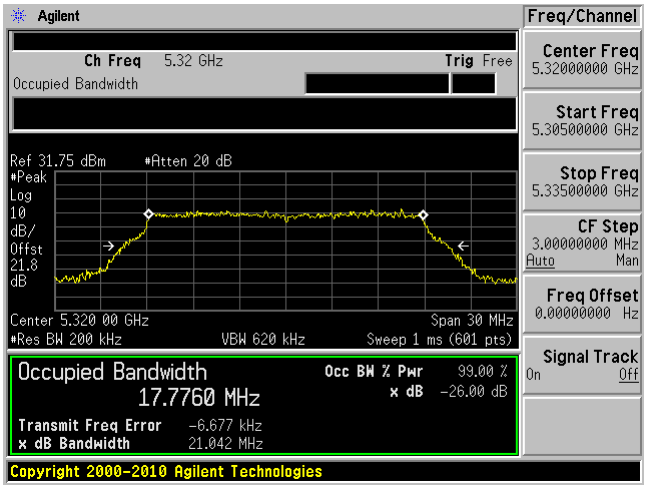
5260 MHz



5300 MHz

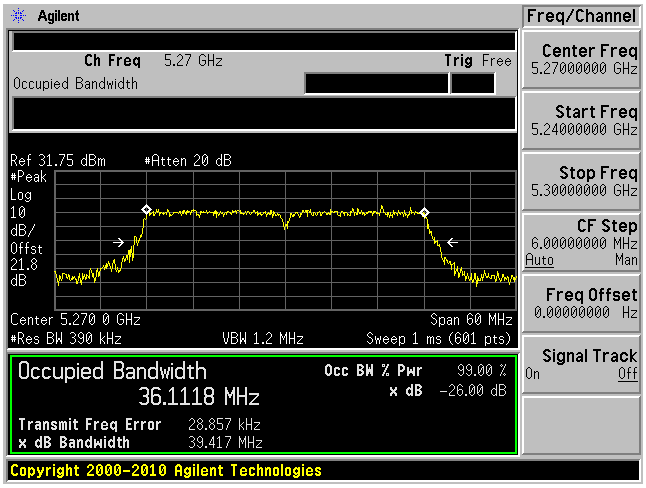


5320 MHz

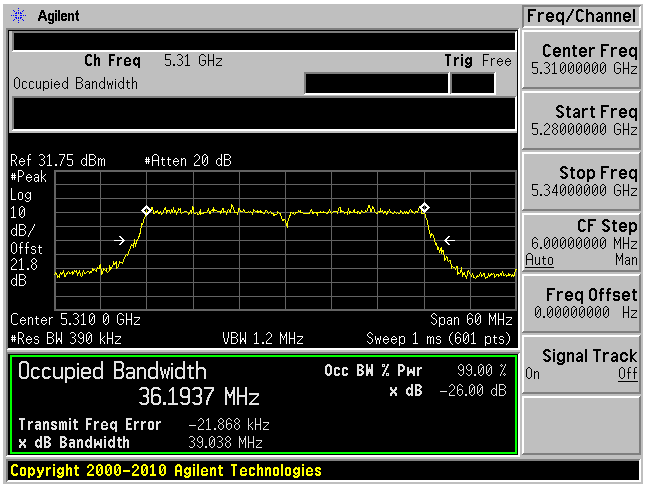


802.11HT/VHT40 mode

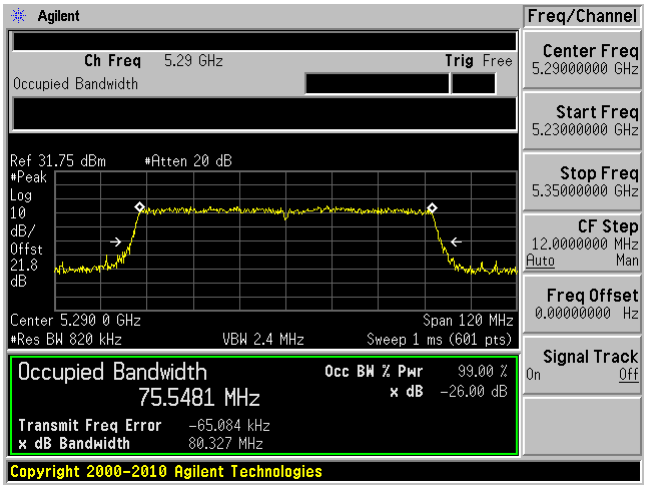
5270 MHz



5310 MHz



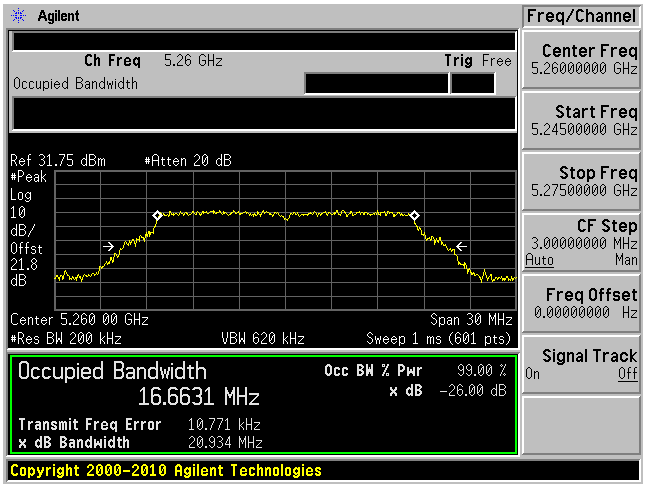
802.11VHT80 mode, 5290 MHz



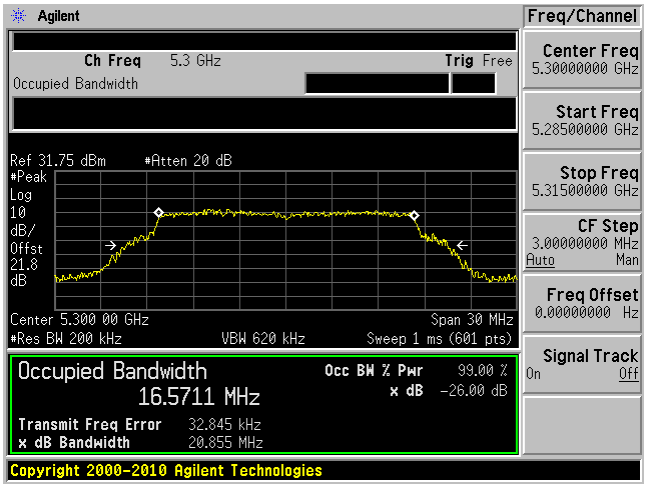
ANT 2 MIMO

802.11a mode

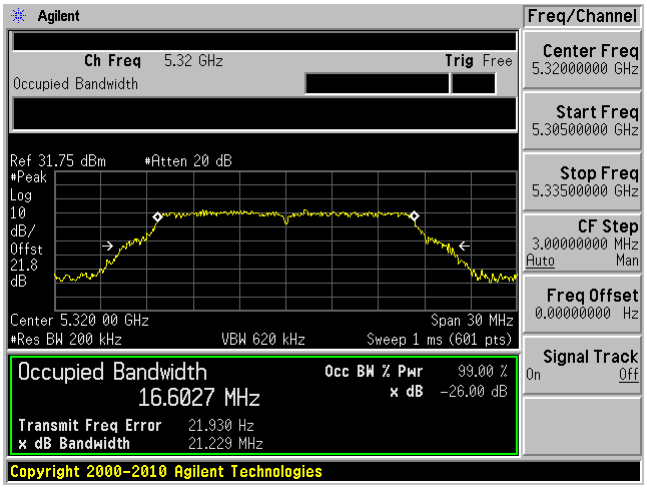
5260 MHz



5300 MHz

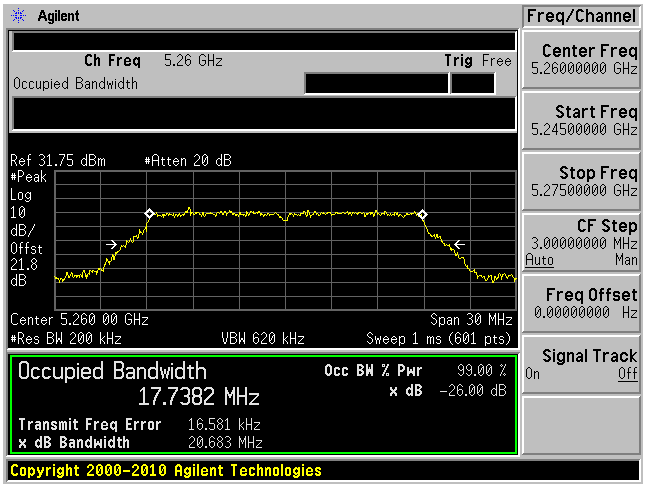


5320 MHz

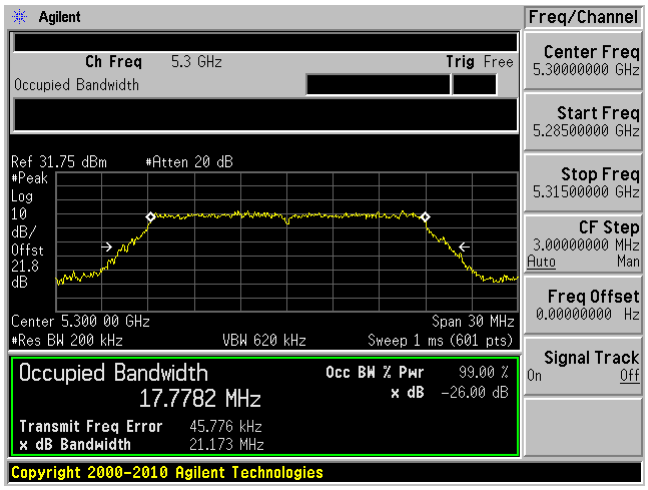


802.11HT/VHT20 mode

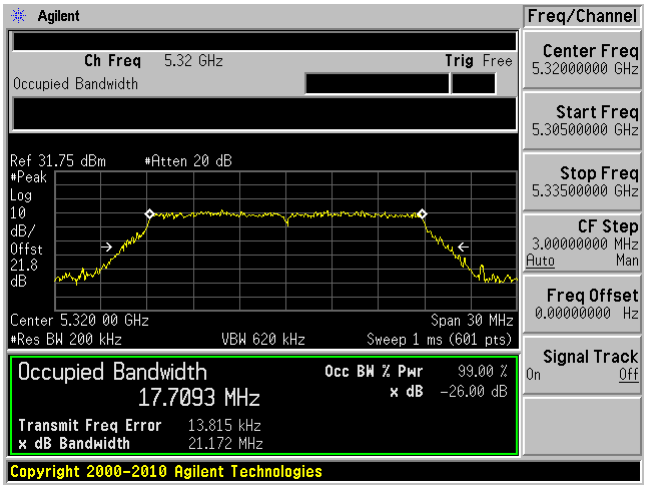
5260 MHz



5300 MHz

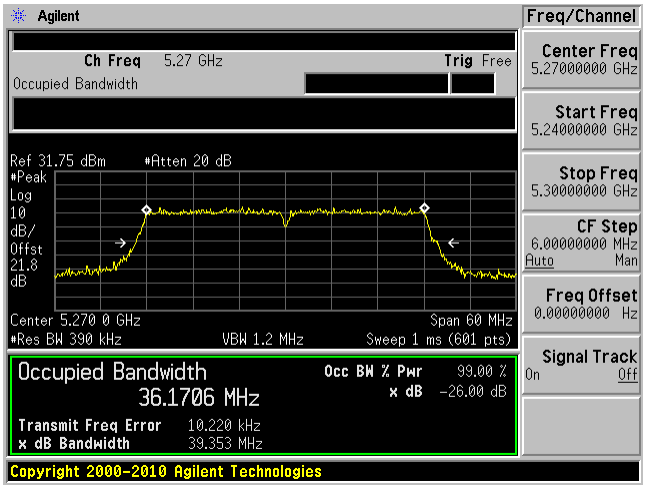


5320 MHz

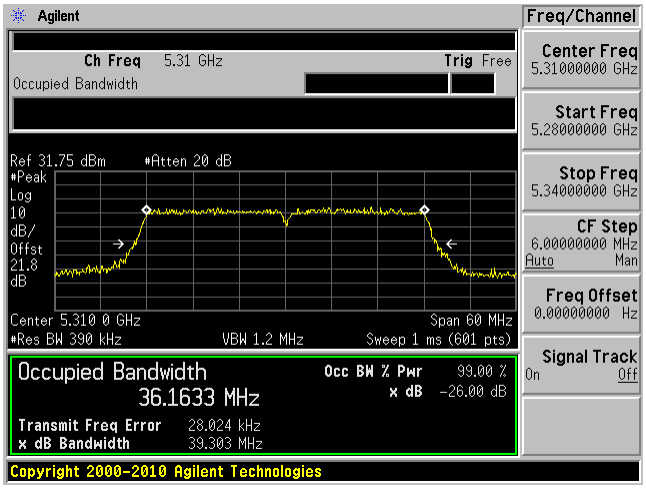


802.11HT/VHT40 mode

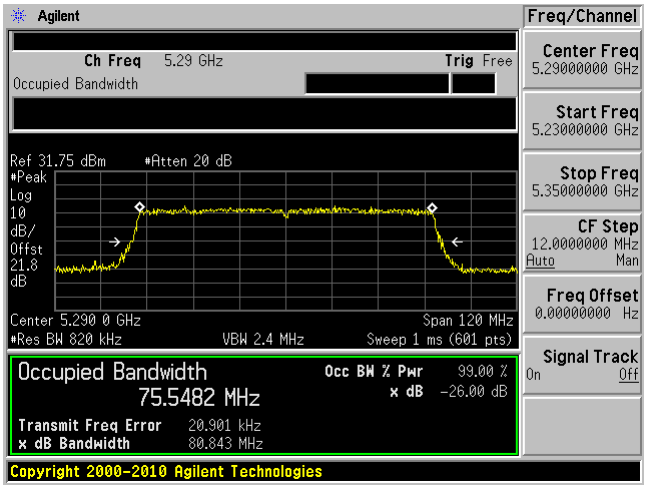
5270 MHz



5310 MHz



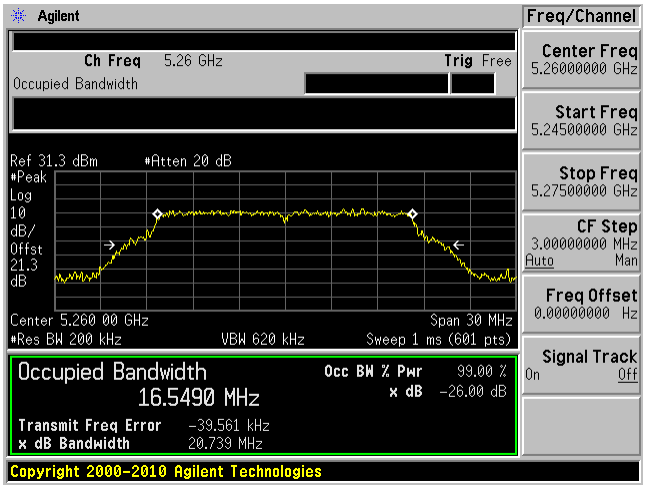
802.11VHT80 mode, 5290 MHz



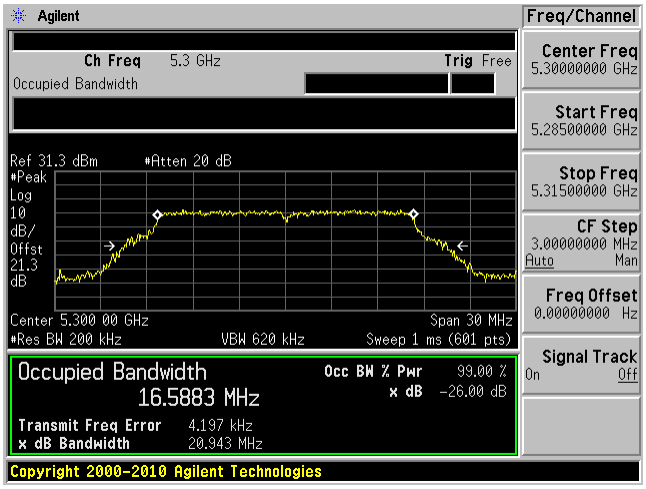
ANT 3 MIMO

802.11a mode

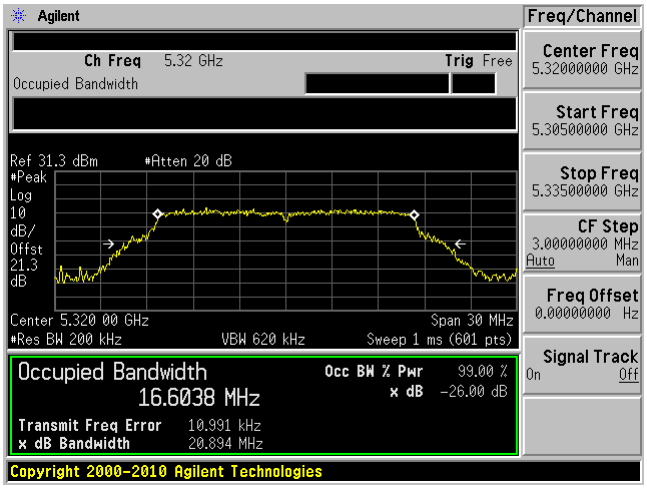
5260 MHz



5300 MHz

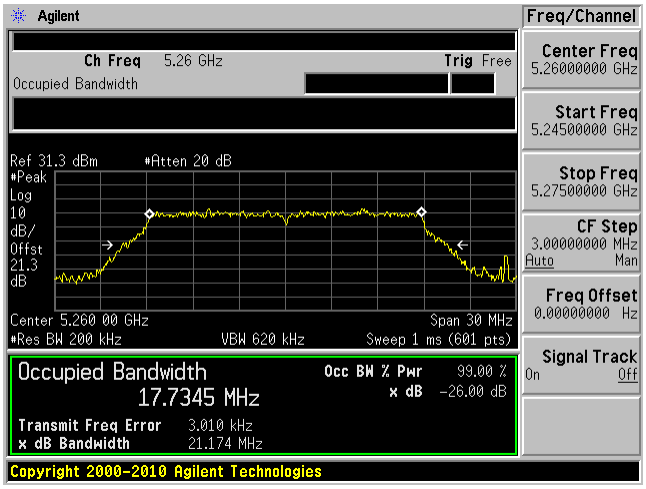


5320 MHz

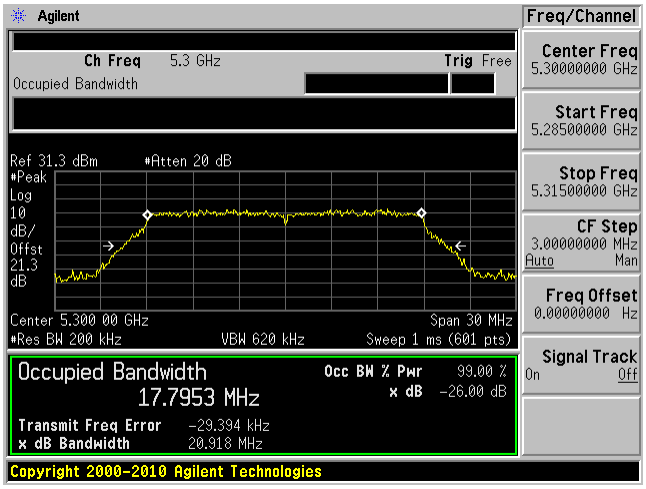


802.11HT/VHT20 mode

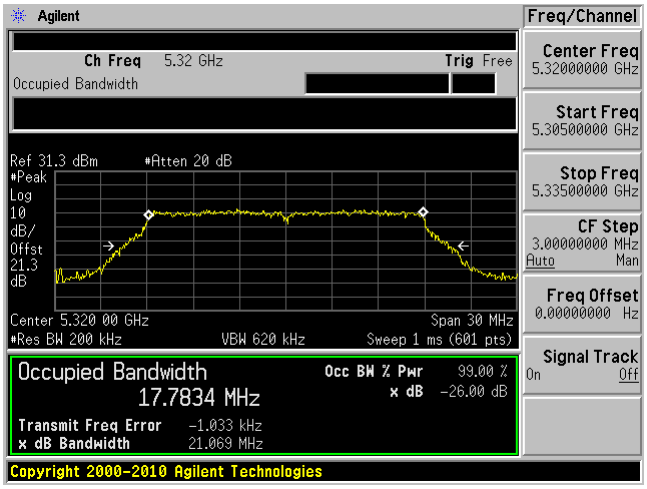
5260 MHz



5300 MHz

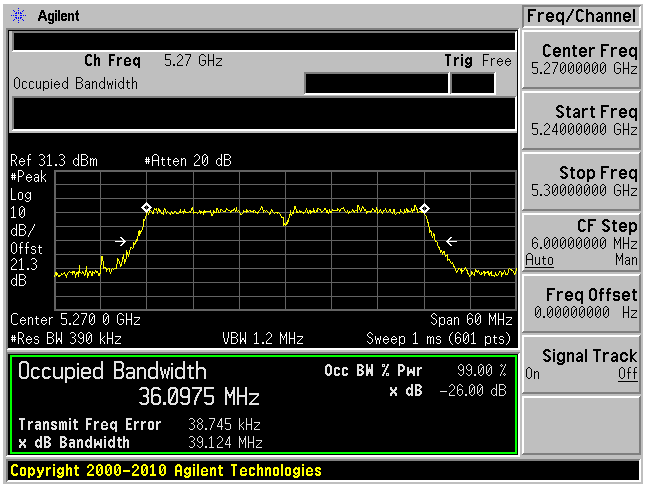


5320 MHz

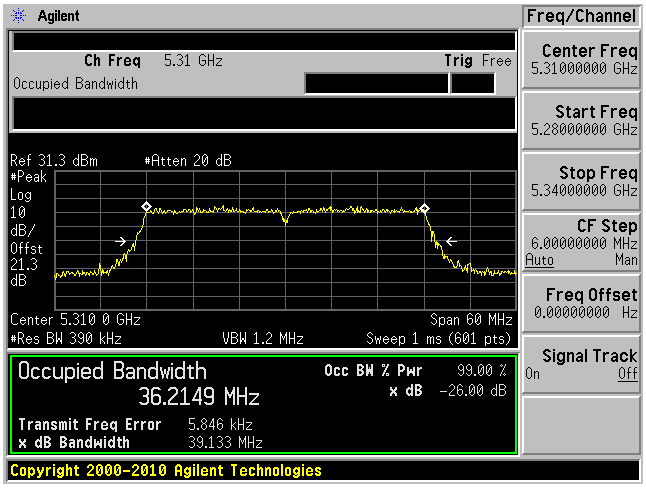


802.11HT/VHT40 mode

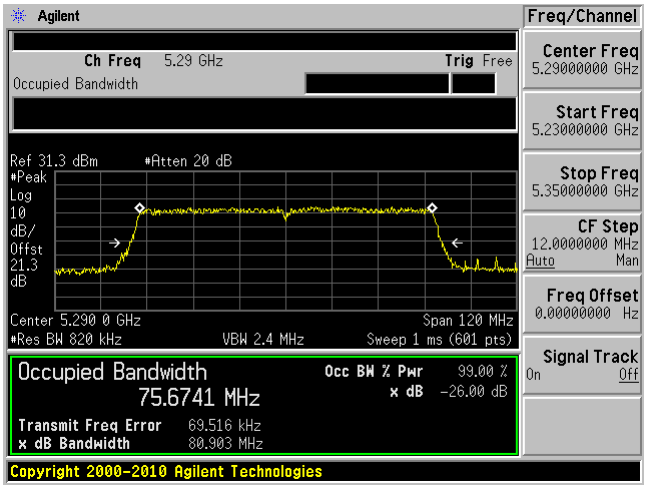
5270 MHz



5310 MHz



802.11VHT80 mode, 5290 MHz

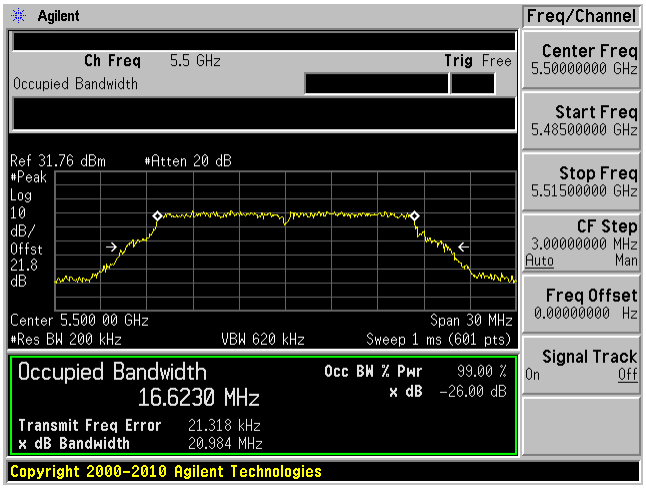


5500 – 5725 MHz

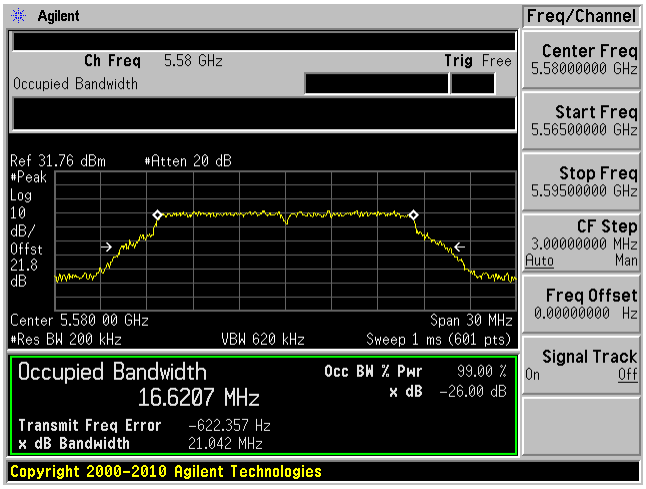
ANT 0 MIMO

802.11a mode

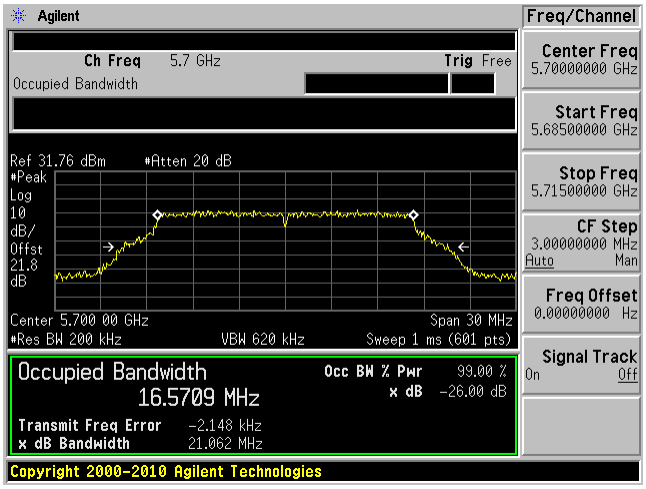
5500 MHz



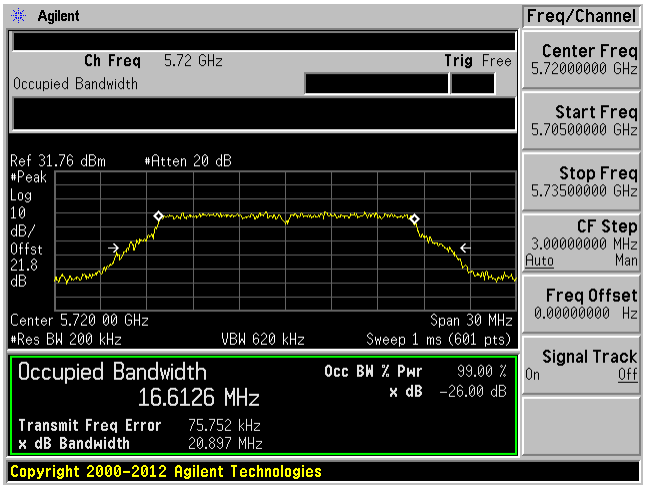
5580 MHz



5700 MHz

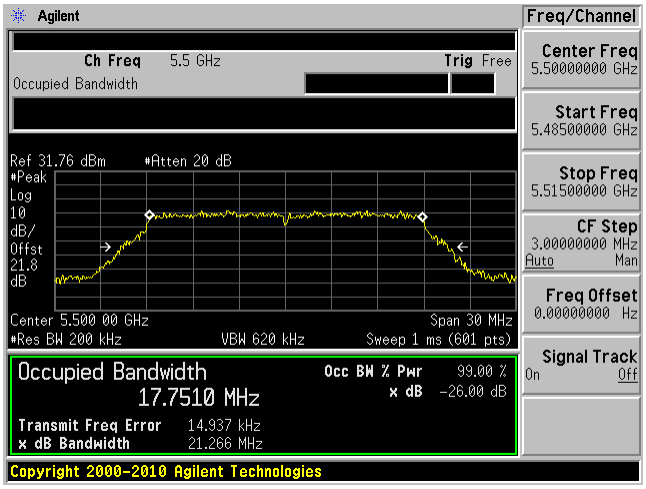


5720 MHz

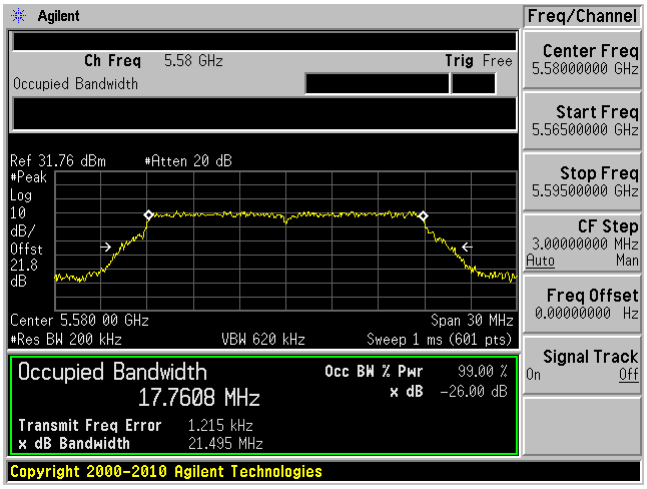


802.11HT/VHT20 mode

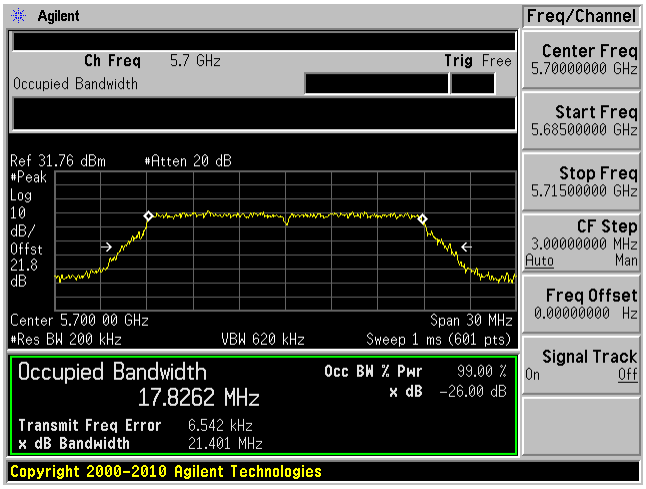
5500 MHz



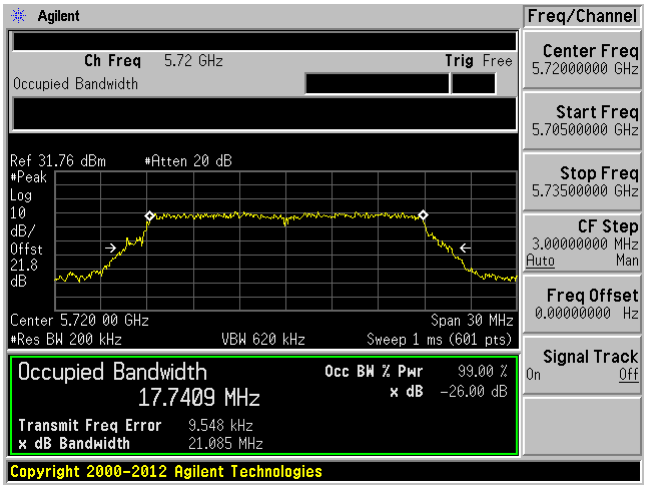
5580 MHz



5700 MHz

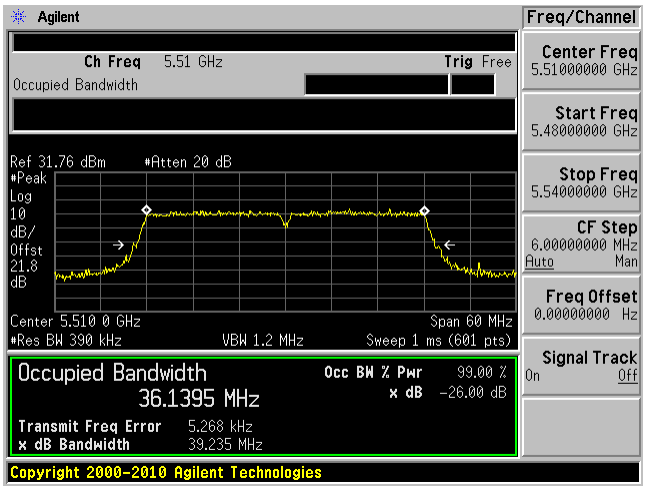


5720 MHz

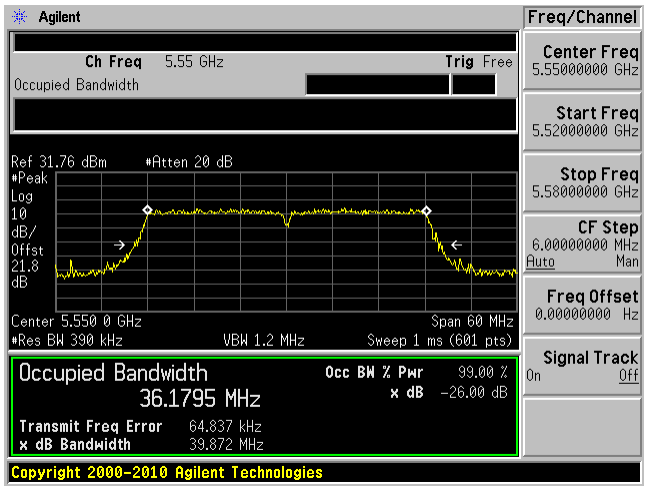


802.11HT/VHT40 mode

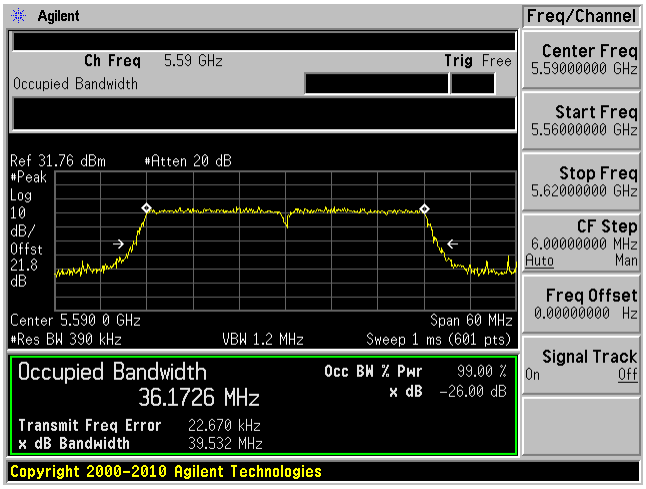
5510 MHz



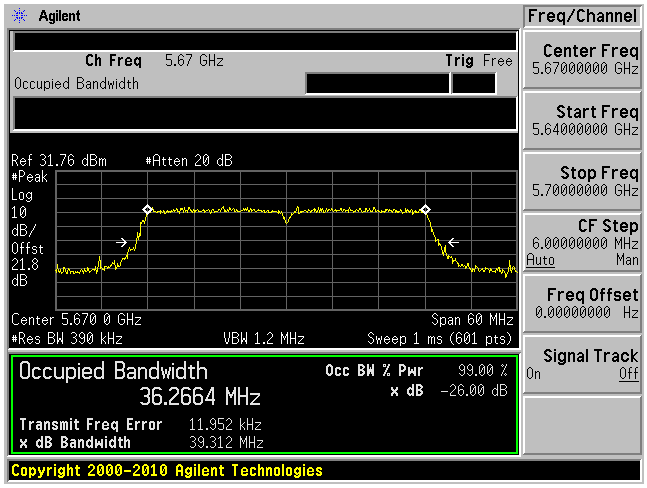
5550 MHz



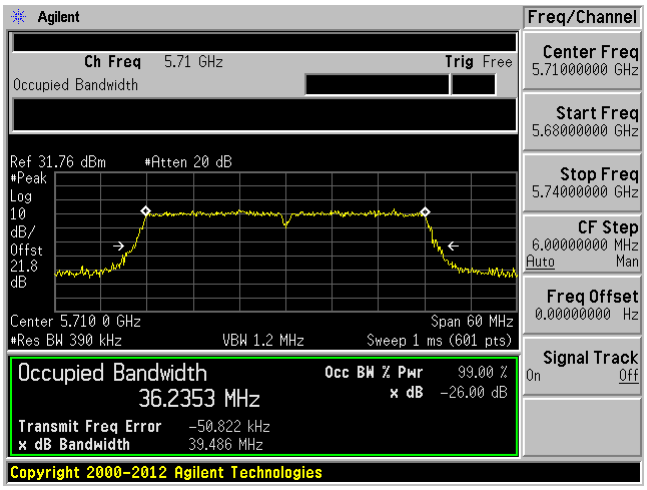
5590 MHz



5670 MHz

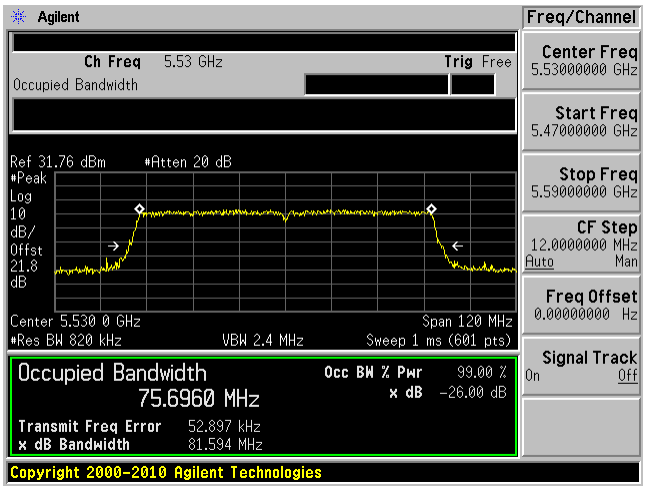


5710 MHz

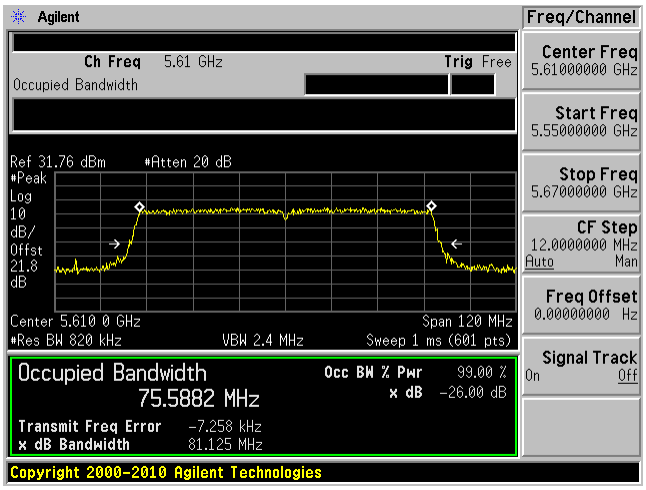


802.11VHT80 mode

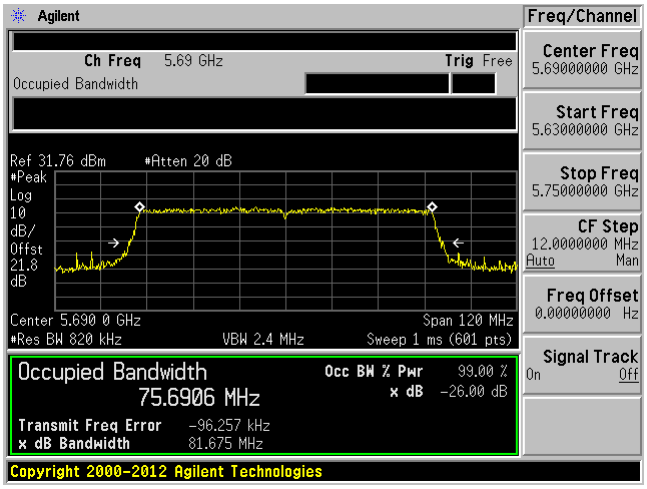
5530 MHz



5610 MHz



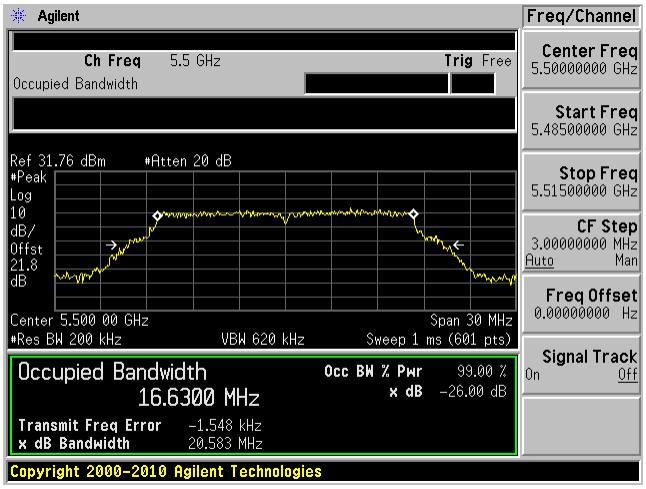
5690 MHz



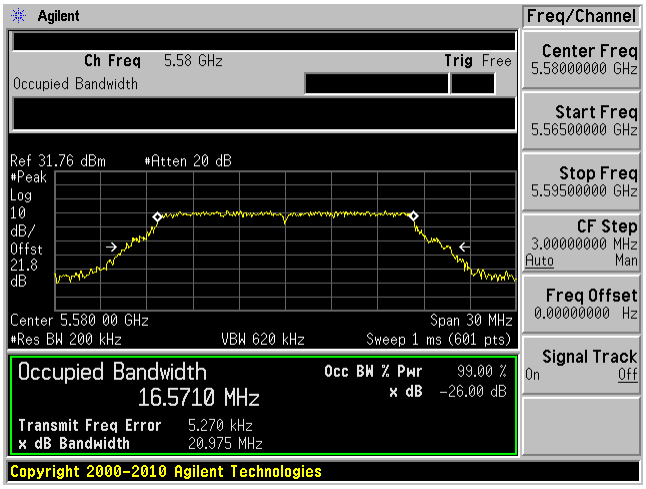
ANT 1 MIMO

802.11a mode

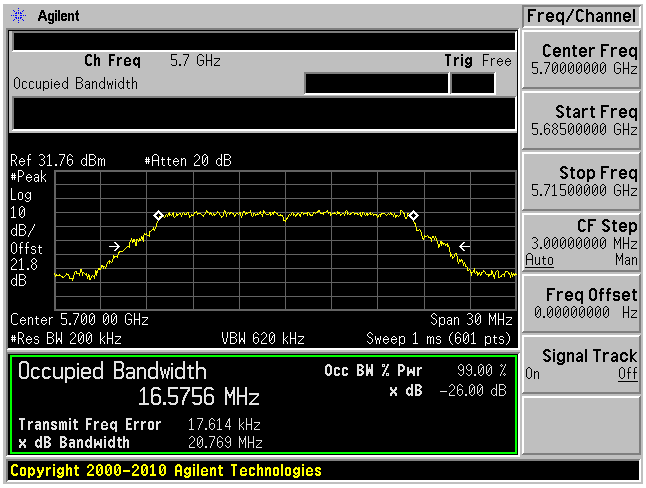
5500 MHz



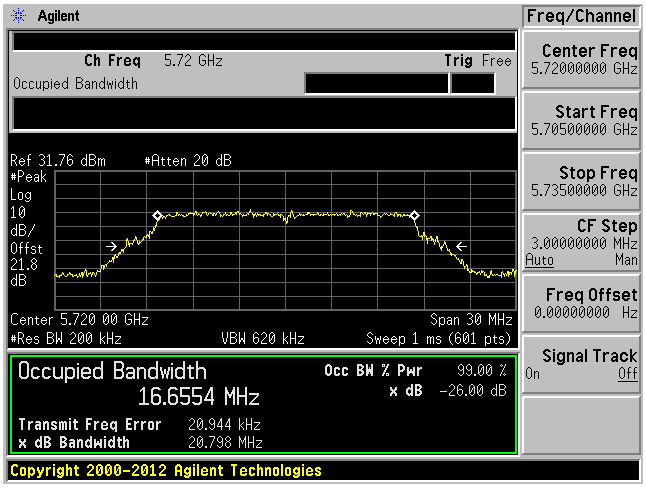
5580 MHz



5700 MHz

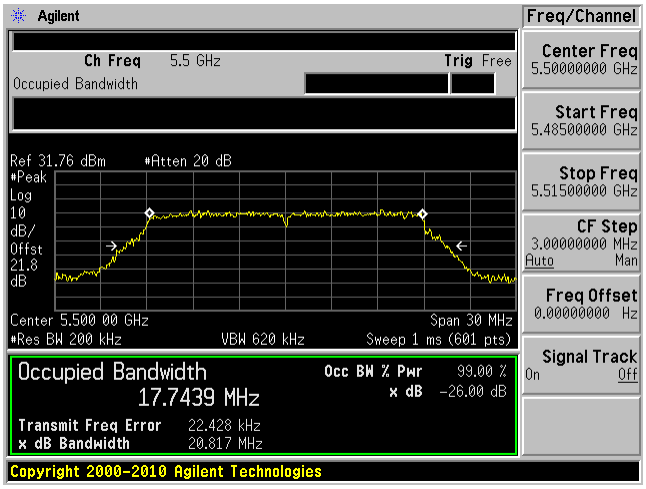


5720 MHz

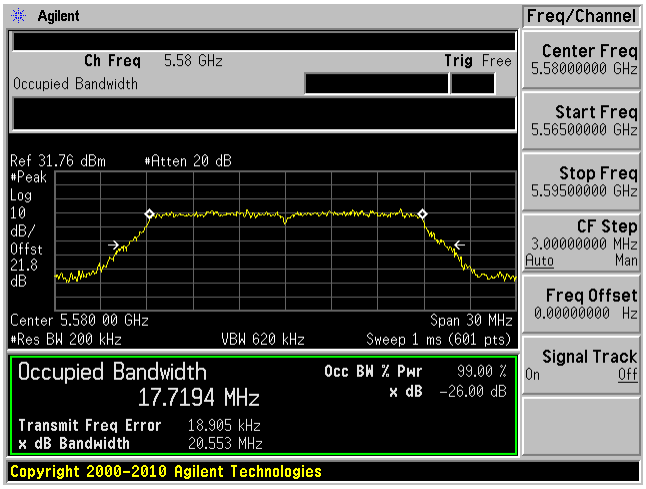


802.11HT/VHT20 mode

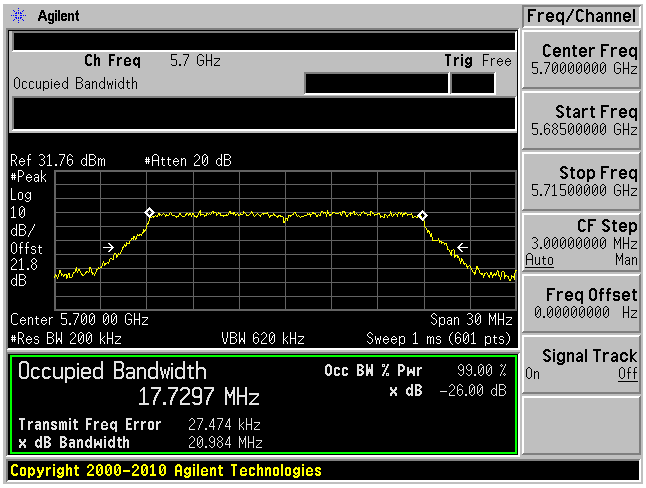
5500 MHz



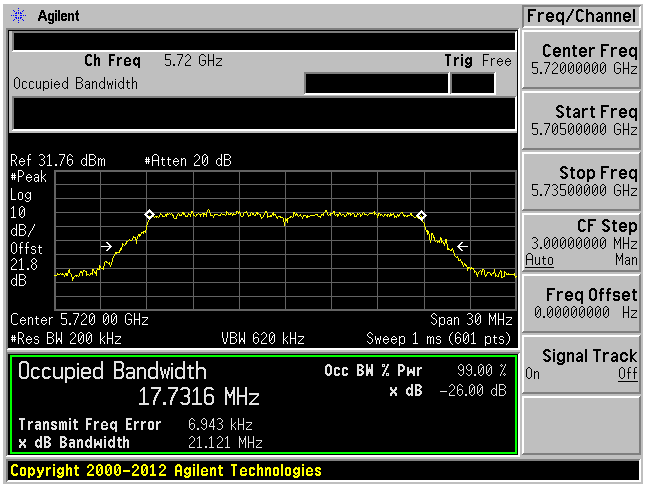
5580 MHz



5700 MHz

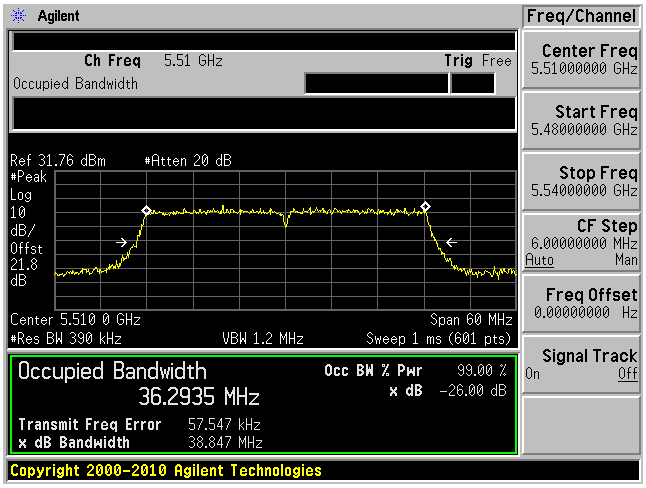


5720 MHz

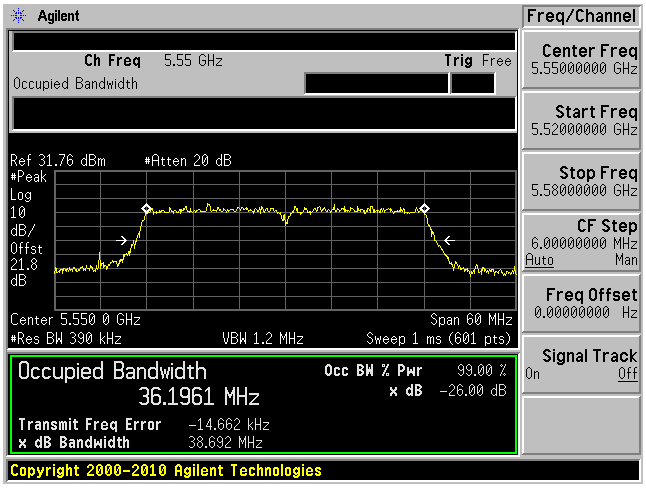


802.11HT/VHT40 mode

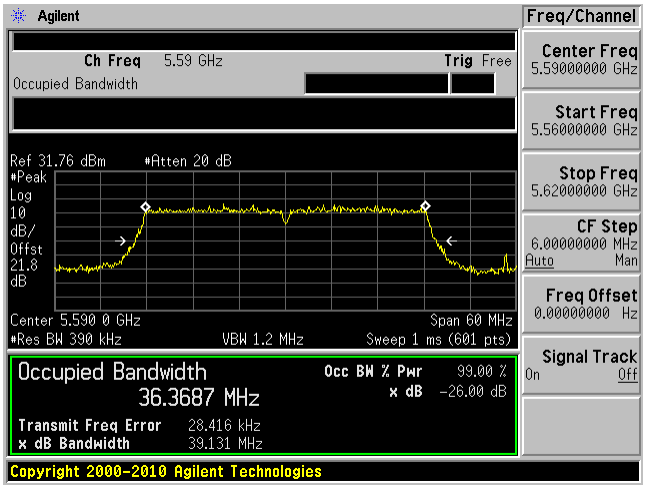
5510 MHz



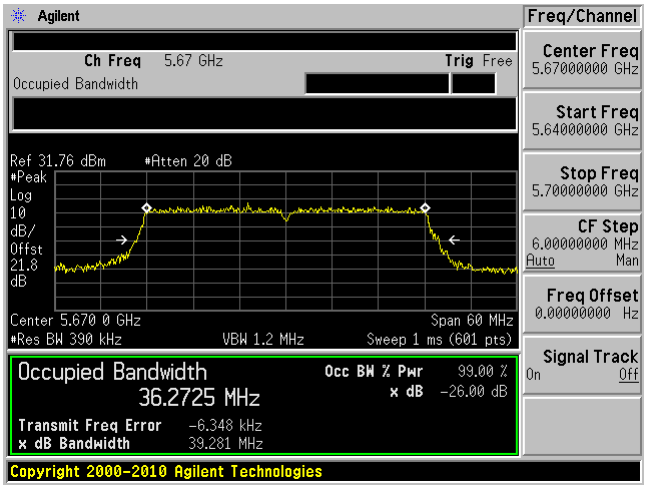
5550 MHz



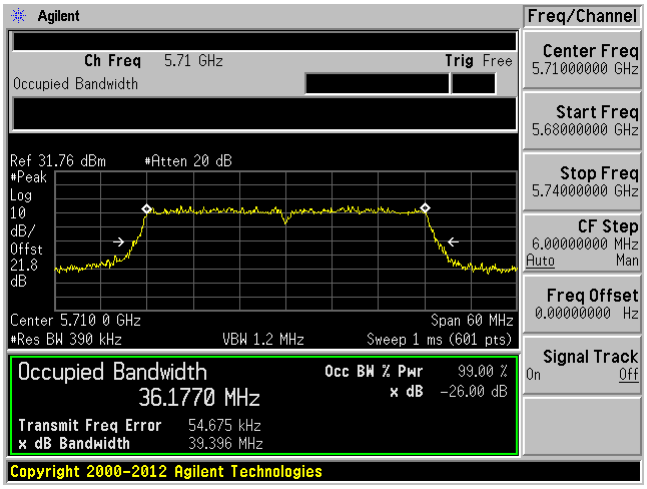
5590 MHz



5670 MHz

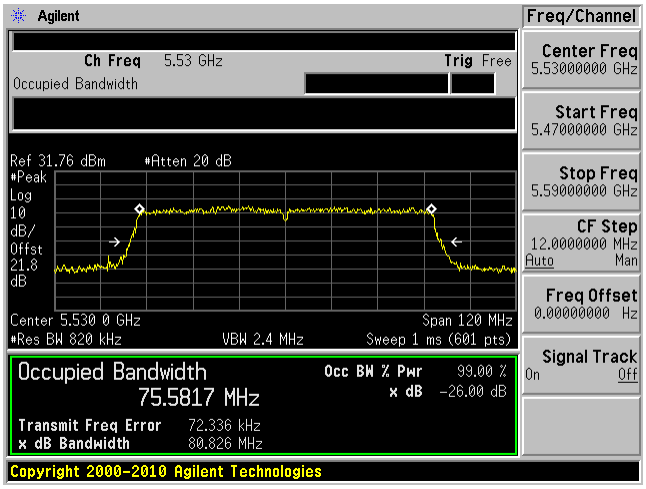


5710 MHz

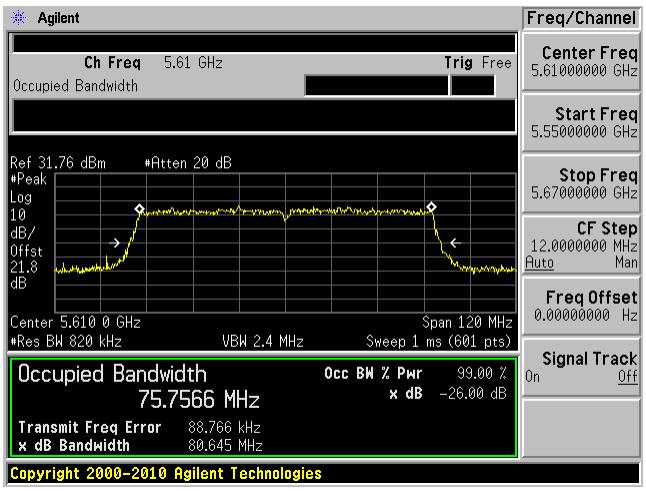


802.11VHT80 mode

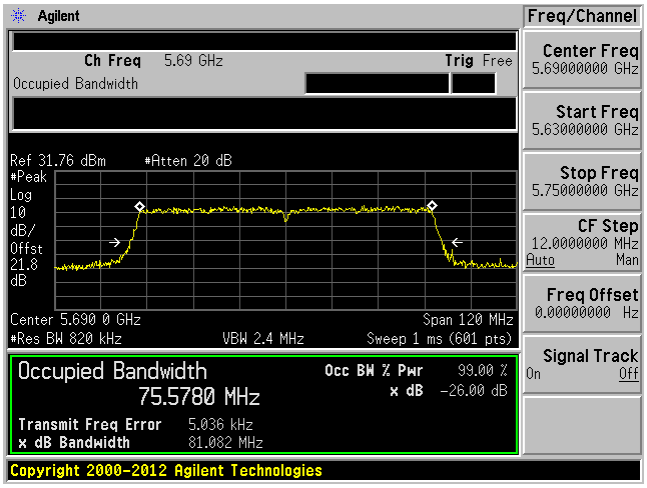
5530 MHz



5610 MHz



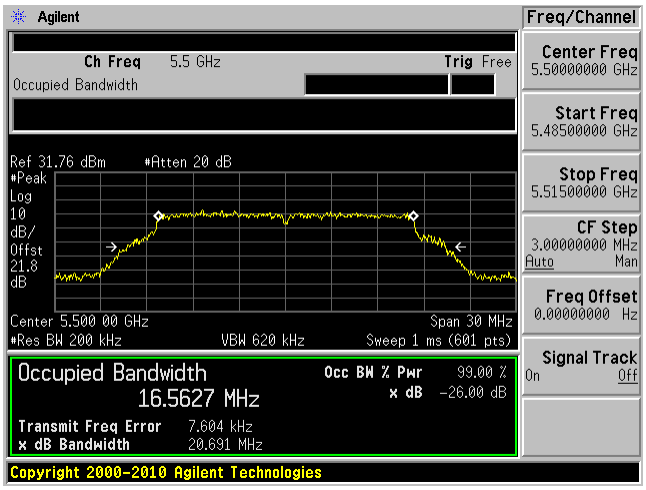
5690 MHz



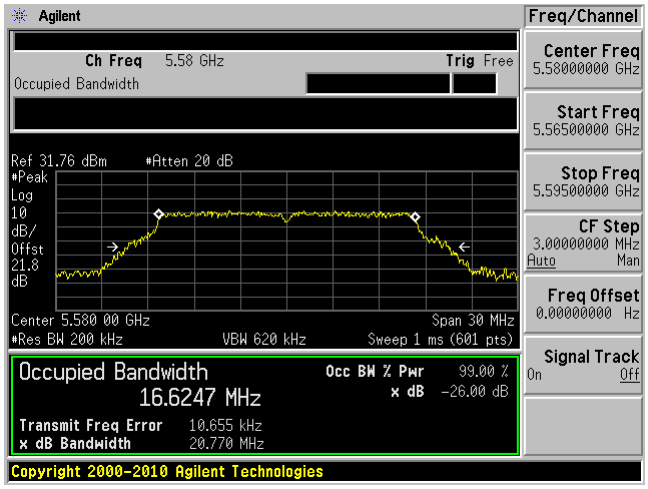
ANT 2 MIMO

802.11a mode

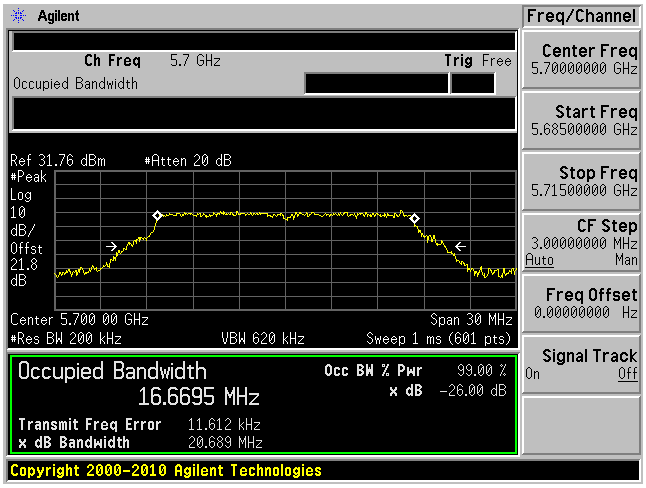
5500 MHz



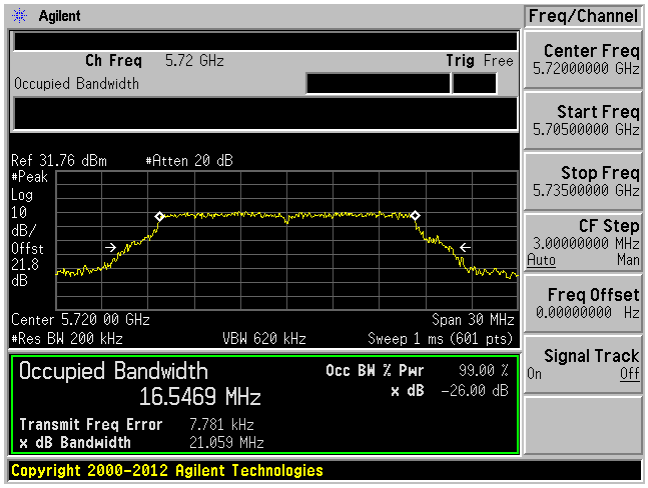
5580 MHz



5700 MHz

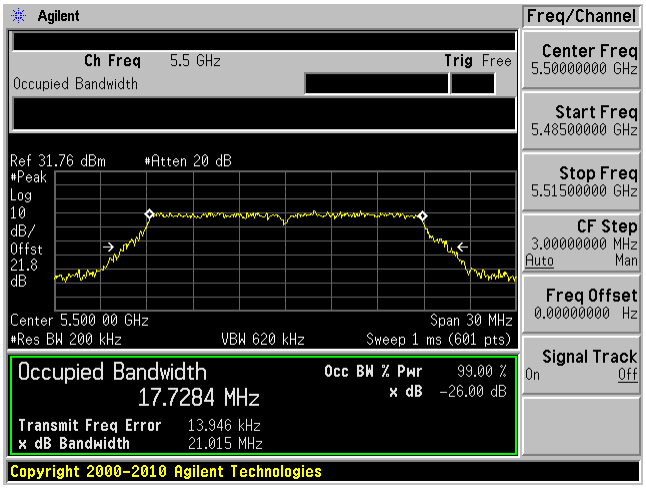


5720 MHz

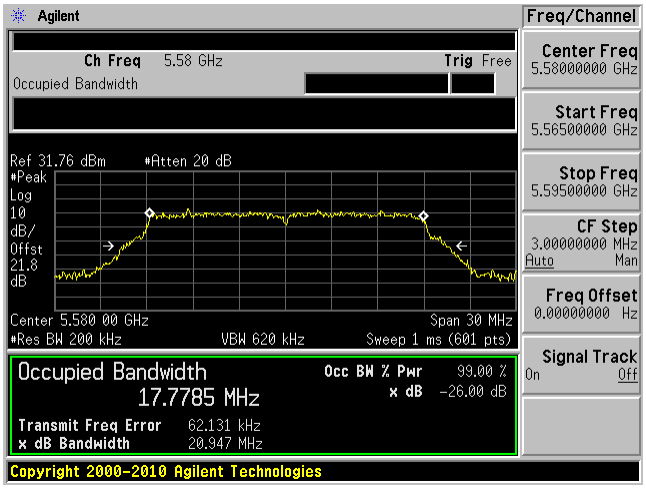


802.11HT/VHT20 mode

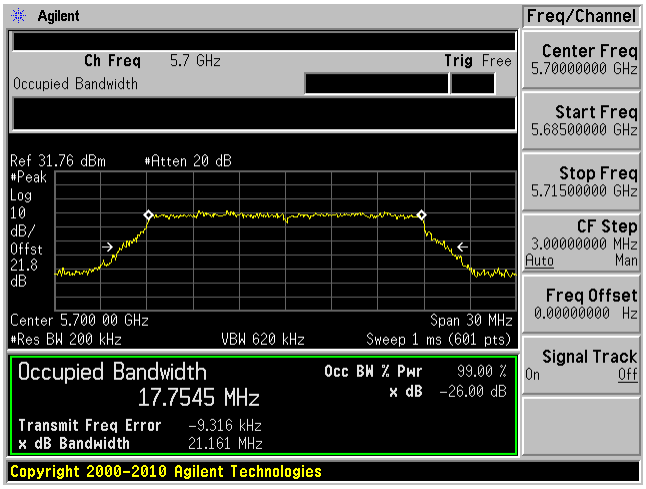
5500 MHz



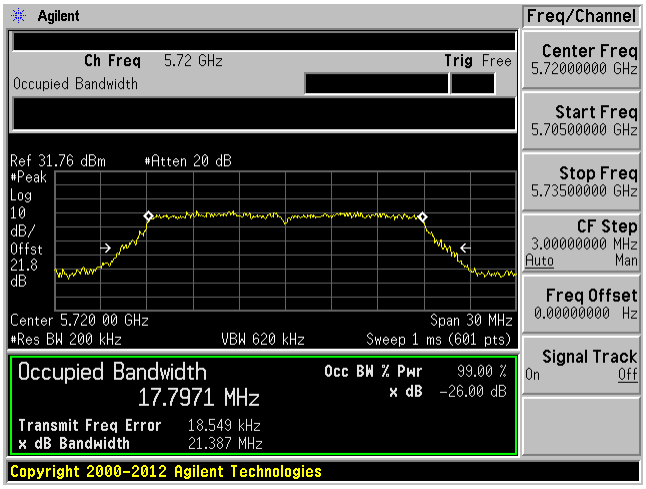
5580 MHz



5700 MHz

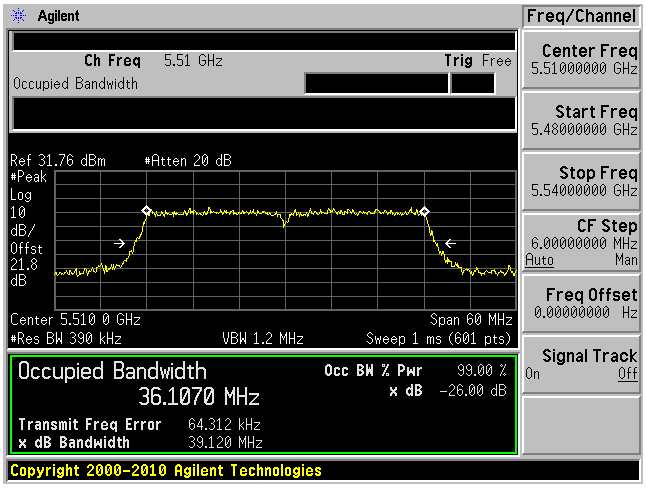


5720 MHz

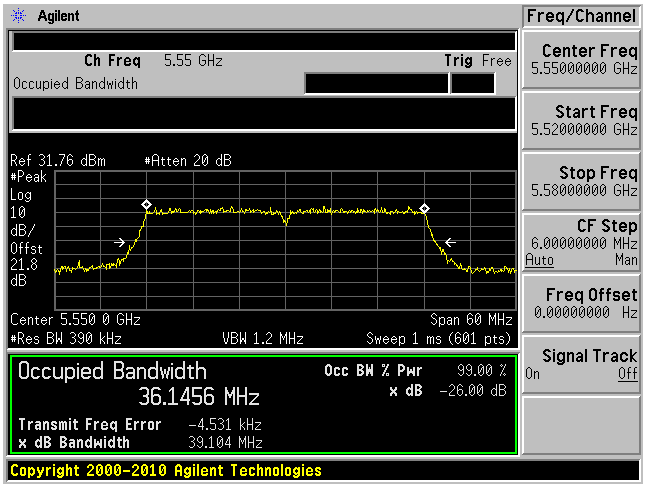


802.11HT/VHT40 mode

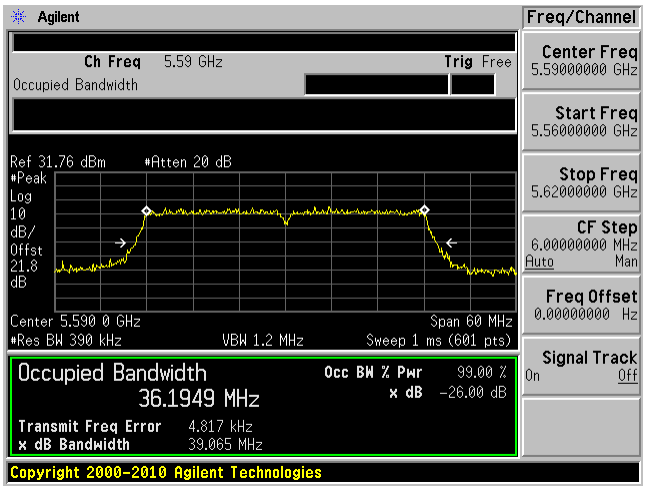
5510 MHz



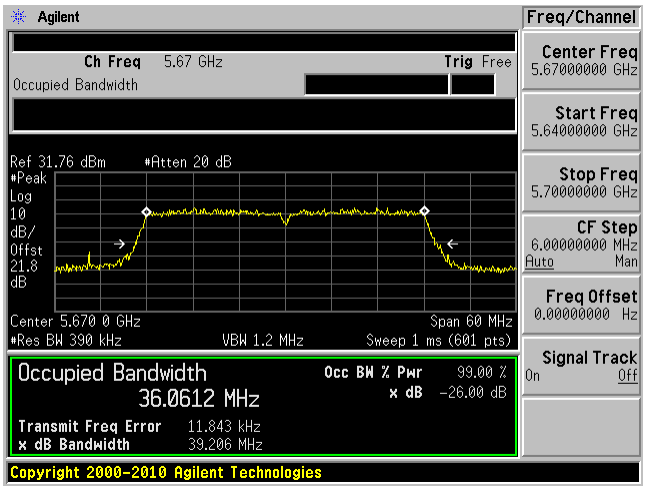
5550 MHz



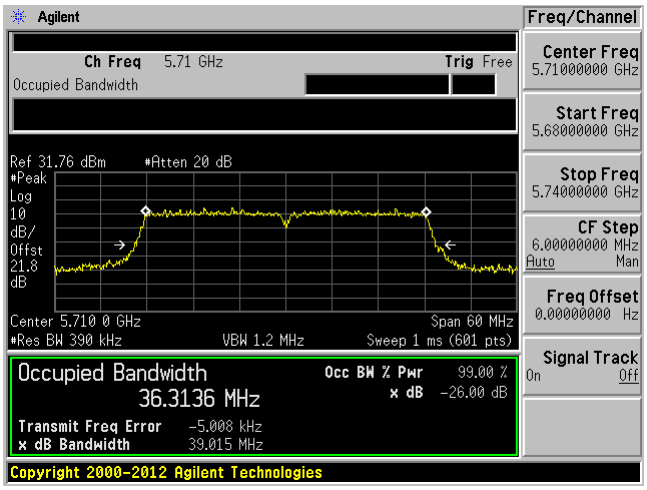
5590 MHz



5670 MHz

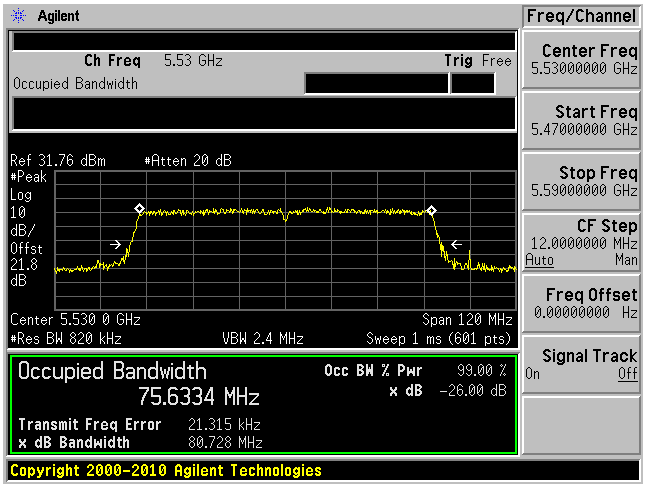


5710 MHz

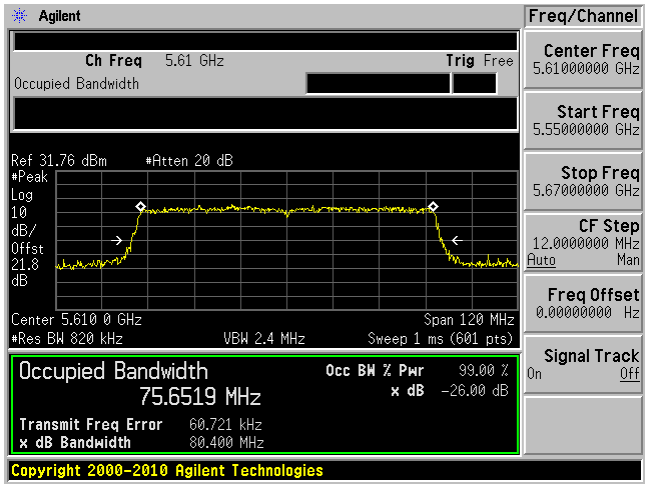


802.11VHT80 mode

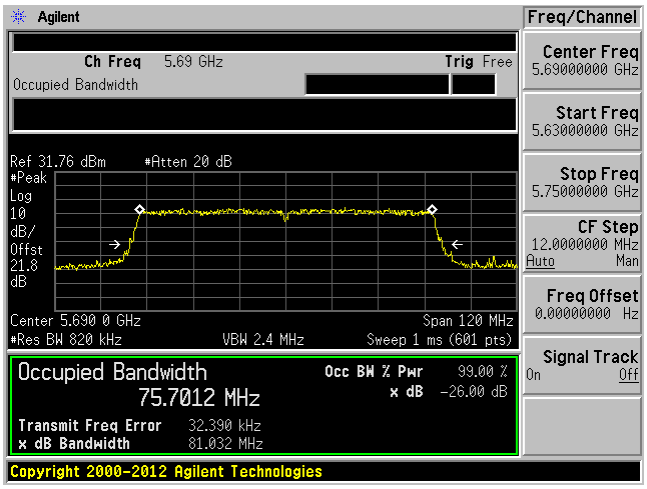
5530 MHz



5610 MHz



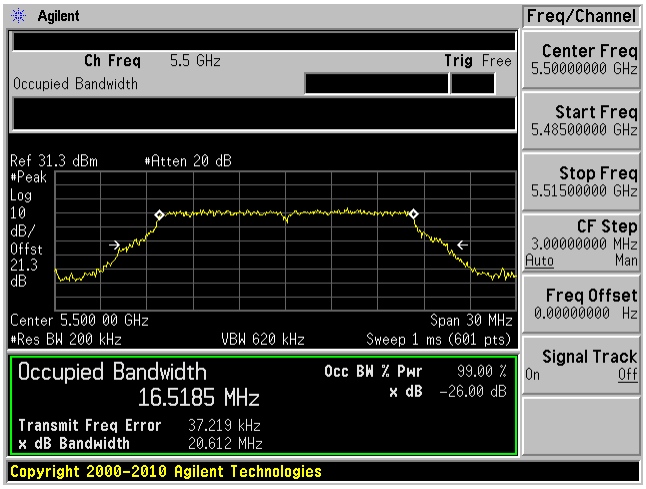
5690 MHz



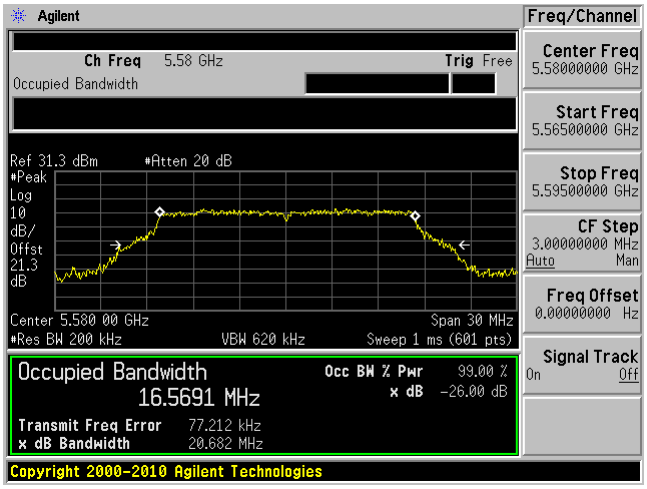
ANT 3 MIMO

802.11a mode

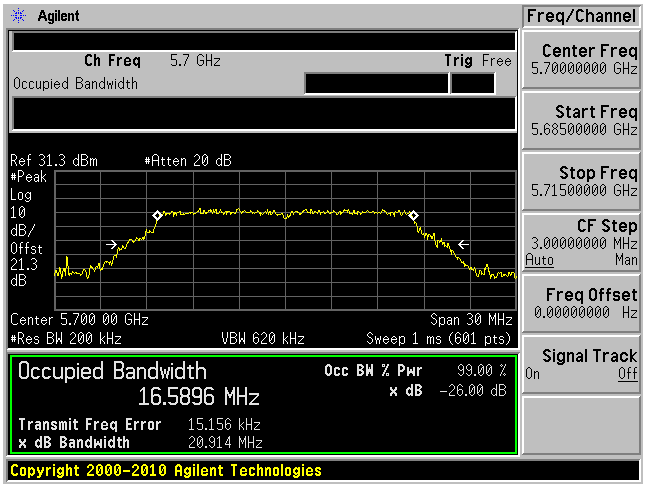
5500 MHz



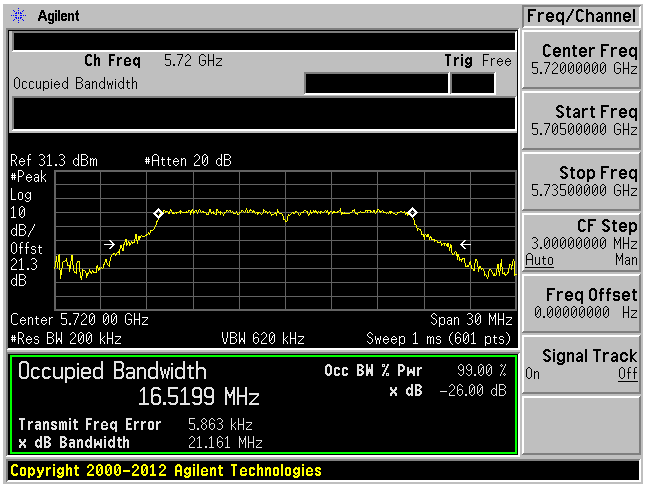
5580 MHz



5700 MHz

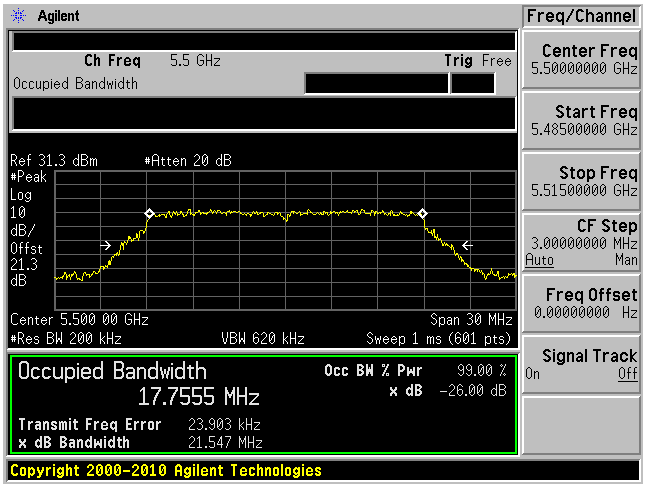


5720 MHz

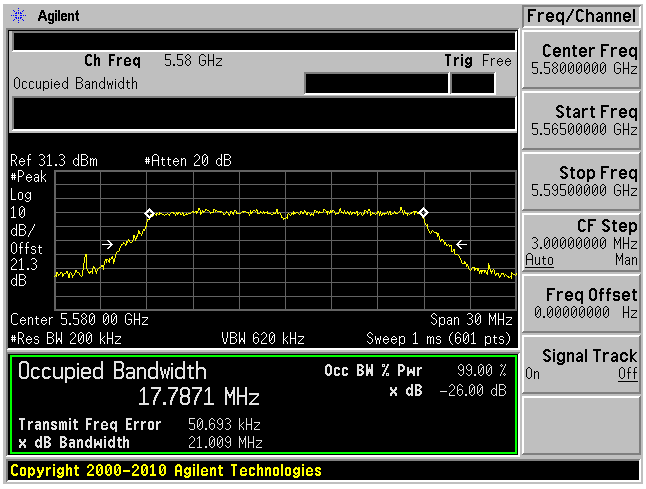


802.11HT/VHT20 mode

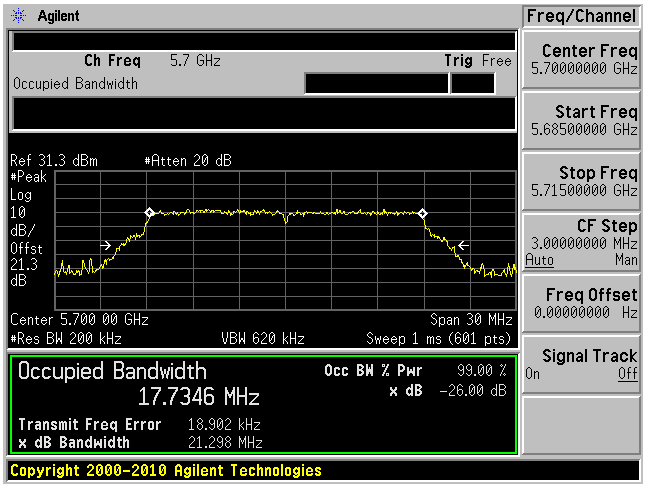
5500 MHz



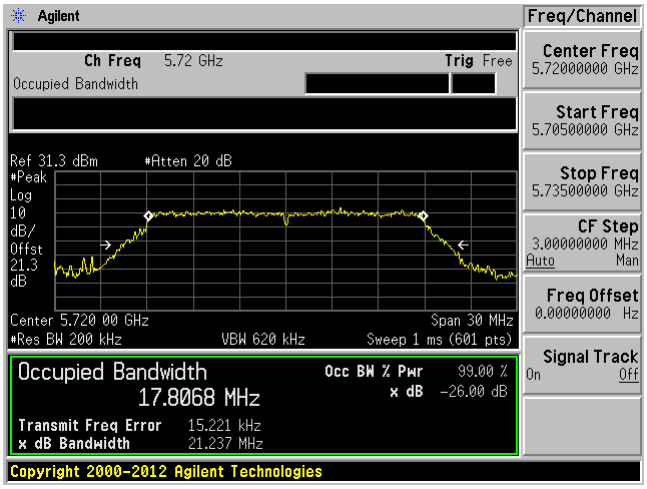
5580 MHz



5700 MHz

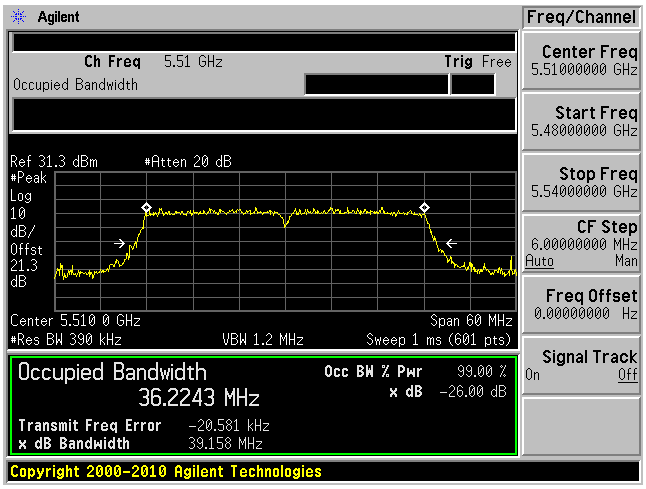


5720 MHz

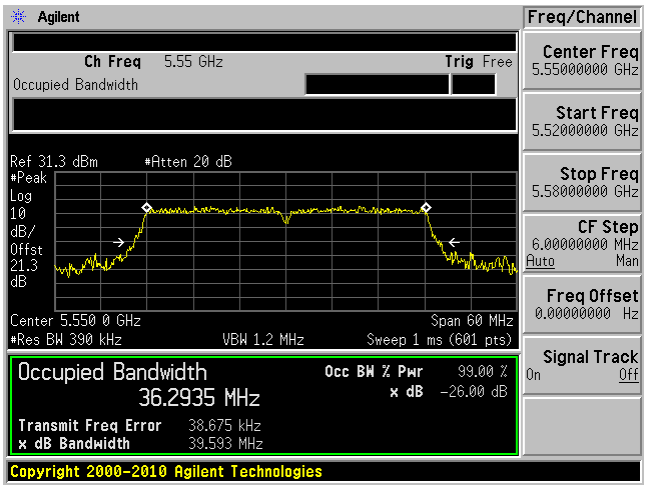


802.11HT/VHT40 mode

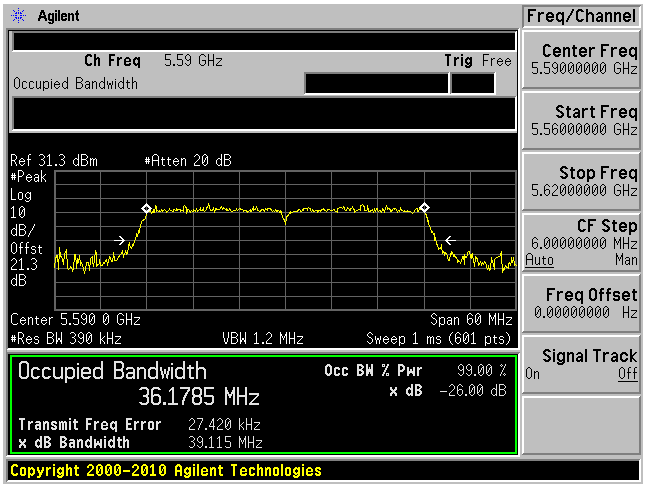
5510 MHz



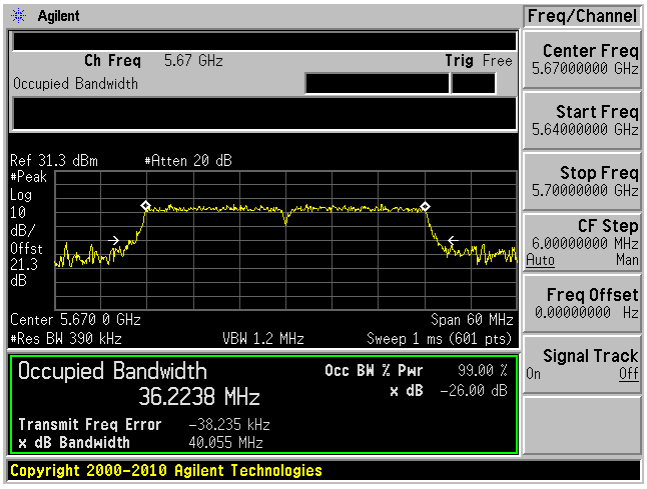
5550 MHz



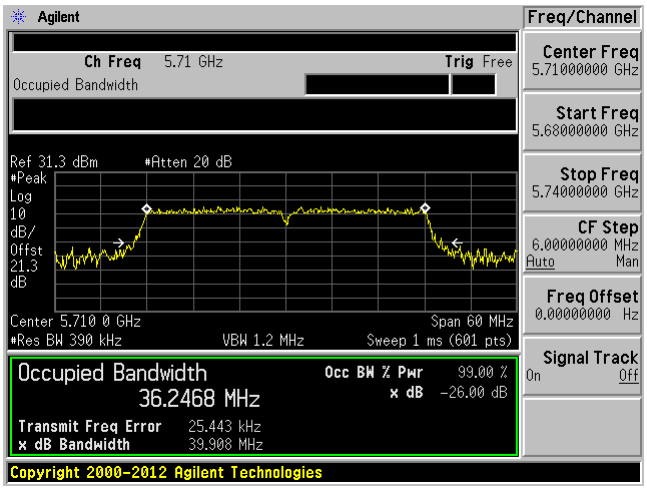
5590 MHz



5670 MHz

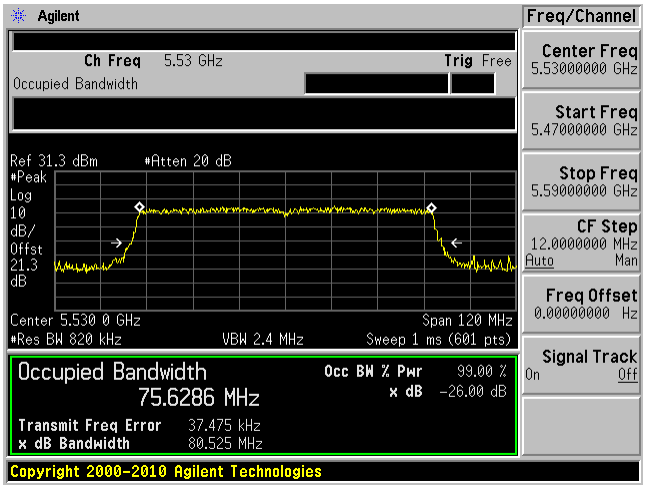


5710 MHz

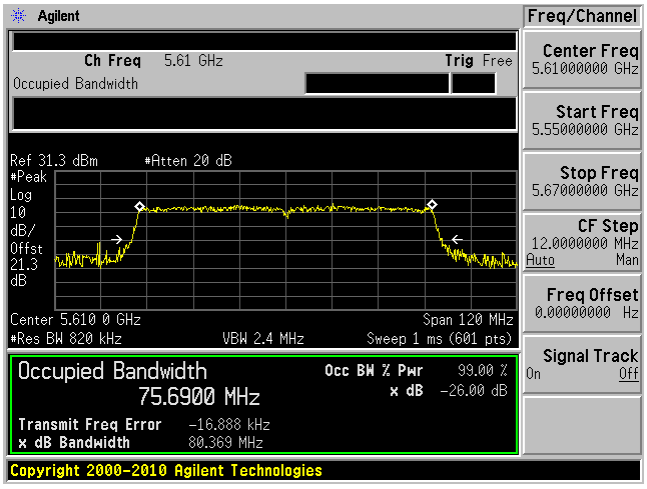


802.11VHT80 mode

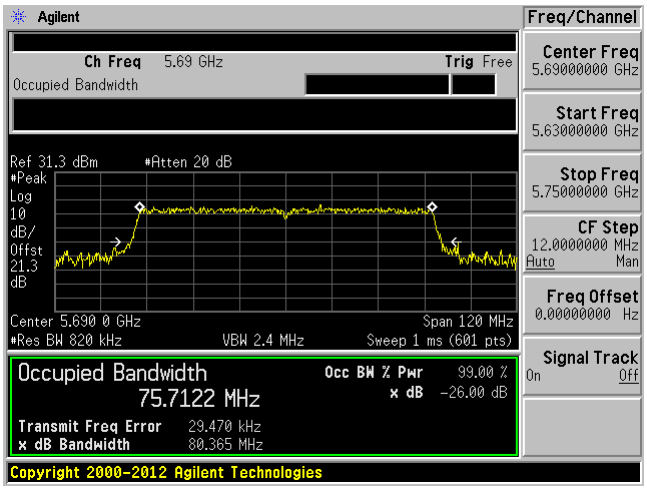
5530 MHz



5610 MHz



5690 MHz



9 FCC §407(a) §6.2 - Output Power

9.1 Applicable Standards

According to FCC §15.407(a):

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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 + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

9.2 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Connect EUT to a low loss RF cable from the antenna port to a power meter.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
ETS- Lingerin	Power Sensor	7002-006	160097	2016-12-05	2 years
-	RF Cable	-	-	Each time[1]	N/A
-	RF Cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note[1]: cables and attenuators included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Vincent Licata on 2018-01-29 in RF site.

9.5 Test Results

5250 - 5350 MHz

Frequency (MHz)	Mode	TX Paths	Ant-0 (dBm)	Ant-1 (dBm)	Ant-2 (dBm)	Ant-3 (dBm)	Total Conducted Average Power (dBm)	Limit (dBm)
5260	802.11a	4	14.57	14.75	14.15	14.27	20.46	24.00
	802.11 HT/VHT20	4	14.86	14.59	14.21	14.54	20.58	24.00
5300	802.11a	4	14.65	14.43	14.23	14.66	20.52	24.00
	802.11 HT/VHT20	4	14.84	14.57	14.01	14.81	20.59	24.00
5320	802.11a	4	14.67	14.5	14.07	14.87	20.56	24.00
	802.11 HT/VHT20	4	14.89	14.29	14.18	14.95	20.61	24.00
5270	802.11 HT/VHT40	4	15.43	15.28	15.05	15.58	21.36	24.00
5310	802.11 HT/VHT40	4	15.58	15.22	14.92	15.76	21.40	24.00
5290	802.11VHT80	4	16.51	16.28	16.15	16.32	22.34	24.00

5500 - 5725 MHz

Frequency (MHz)	Mode	TX Paths	Ant-0 (dBm)	Ant-1 (dBm)	Ant-2 (dBm)	Ant-3 (dBm)	Total Conducted Average Power (dBm)	Limit (dBm)
5500	802.11a	4	13.97	14.69	14.22	14.92	20.49	24.00
	802.11 HT/VHT20	4	14.19	14.52	14.2	14.87	20.47	24.00
5580	802.11a	4	13.99	14.39	14.03	14.98	20.39	24.00
	802.11 HT/VHT20	4	14.05	14.32	14.1	14.83	20.36	24.00
5700	802.11a	4	13.95	14.18	13.85	15.05	20.30	24.00
	802.11 HT/VHT20	4	13.86	13.97	13.81	14.91	20.18	24.00
5720	802.11a	4	15.03	15.29	14.67	16.56	21.47	24.00
	802.11 HT/VHT20	4	13.81	14.15	14.52	14.92	20.39	24.00
5510	802.11 HT/VHT40	4	15.38	15.28	14.99	16.02	21.45	24.00
5550	802.11 HT/VHT40	4	16.25	16.73	15.94	16.97	22.51	24.00
5590	802.11 HT/VHT40	4	16.23	16.31	15.58	16.94	22.31	24.00
5670	802.11 HT/VHT40	4	16.18	16.57	15.54	17.01	22.38	24.00
5710	802.11 HT/VHT40	4	15.94	16.67	15.91	16.93	22.41	24.00
5530	802.11VHT80	4	15.46	15.52	15.24	16.13	21.62	24.00
5610	802.11VHT80	4	16.6	17.18	16.29	17.03	22.81	24.00
5690	802.11VHT80	4	16.05	16.14	16.06	16.52	22.22	24.00

Note: Duty cycle correction factor has already been added to the measurements.

10 FCC §15.407(a) - Power Spectral Density

10.1 Applicable Standards

According to FCC §15.407(a):

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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 + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

10.2 Measurement Procedure

(i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
(ii) Set RBW = 1 MHz.
(iii) Set VBW ≥ 3 MHz.
(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(v) Sweep time = auto.
(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
(ix) Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer’s band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2017-04-20	1 year
-	20dB attenuator	-	-	Each time[1]	N/A
-	RF cable	-	-	Each time[1]	N/A
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cables and attenuators included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

10.4 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Vincent Licata on 2018-01-22 at RF site.

10.5 Test Results

Please refer to the following tables.

5250 – 5350 MHz

Frequency (MHz)	Mode	Ant-0 (dBm/MHz)	Ant-1 (dBm/MHz)	Ant-2 (dBm/MHz)	Ant-3 (dBm/MHz)	DC Correction	Total (dBm/MHz)	Limit (dBm/MHz)
5260	802.11a	3.989	4.213	3.883	3.697	0.22	10.19	11.00
5300	802.11a	4.601	4.179	3.887	4.065	0.22	10.43	11.00
5320	802.11a	4.569	4.033	3.767	4.342	0.22	10.43	11.00
5260	802.11 HT/VHT20	3.997	4.016	3.737	3.372	0.23	10.04	11.00
5300	802.11 HT/VHT20	4.345	3.731	3.658	4.174	0.23	10.24	11.00
5320	802.11 HT/VHT20	4.365	3.654	3.533	4.074	0.23	10.17	11.00
5270	802.11 HT/VHT40	2.101	2.591	1.742	1.565	0.52	8.56	11.00
5310	802.11 HT/VHT40	2.36	1.732	1.765	2.056	0.52	8.53	11.00
5290	802.11 VHT80	-0.81	-0.931	-1.215	-1.319	0.30	5.26	11.00

Note: Corrected PSD (dBm/MHz) = PSD (dBm/MHz) + Duty Cycle Correction (dB)

5500 – 5725 MHz

Frequency (MHz)	Mode	Ant-0 (dBm/MHz)	Ant-1 (dBm/MHz)	Ant-2 (dBm/MHz)	Ant-3 (dBm/MHz)	DC Correction	Total (dBm/MHz)	Limit (dBm/MHz)
5500	802.11a	3.519	4.403	3.826	4.858	0.25	10.45	11.00
5580	802.11a	3.828	4.028	4.014	4.627	0.25	10.40	11.00
5700	802.11a	3.618	3.78	3.479	4.327	0.25	10.08	11.00
5720	802.11a	2.413	3.252	2.744	4.316	0.25	9.51	11.00
5500	802.11 HT/VHT20	3.338	4.099	3.853	4.194	0.24	10.14	11.00
5580	802.11 HT/VHT20	3.509	3.867	3.636	4.332	0.24	10.10	11.00
5700	802.11 HT/VHT20	2.834	3.577	3.202	4.111	0.24	9.71	11.00
5720	802.11 HT/VHT20	2.721	2.784	2.667	4.133	0.24	9.38	11.00
5510	802.11 HT/VHT40	1.383	2.102	1.001	1.433	0.44	7.96	11.00
5550	802.11 HT/VHT40	2.672	2.58	2.406	2.925	0.44	9.11	11.00
5590	802.11 HT/VHT40	2.603	2.908	2.275	2.429	0.44	9.02	11.00
5670	802.11 HT/VHT40	2.512	2.963	1.898	3.335	0.44	9.17	11.00
5710	802.11 HT/VHT40	1.222	2.494	1.605	2.653	0.44	8.49	11.00
5530	802.11 VHT80	-1.801	-1.024	-1.477	-1.077	0.27	4.96	11.00
5610	802.11 VHT80	-0.522	-0.397	-0.494	-0.291	0.27	5.87	11.00
5690	802.11 VHT80	-0.835	-1.345	-1.481	-0.74	0.27	5.21	11.00

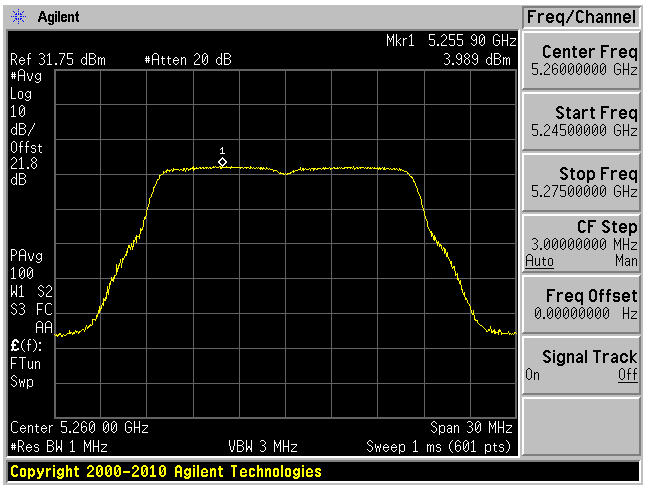
Note: Corrected PSD (dBm/MHz) = PSD (dBm/MHz) + Duty Cycle Correction (dB)

5250 – 5350 MHz

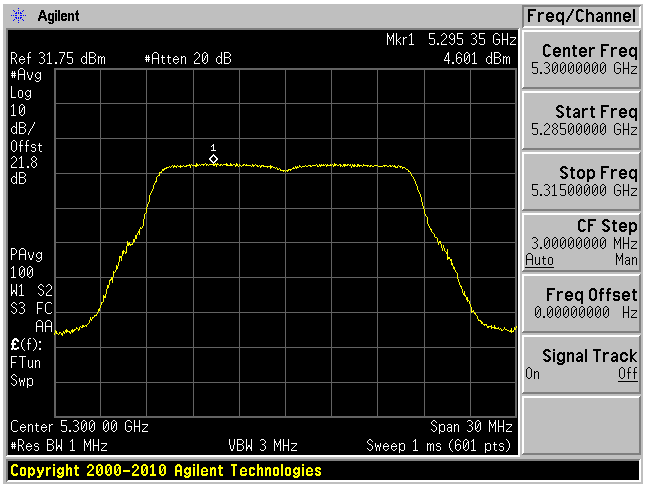
ANT 0 MIMO

802.11a mode

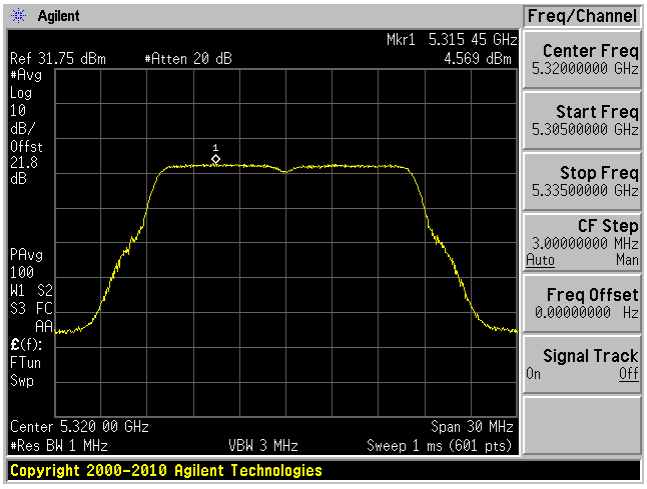
5260 MHz



5300 MHz

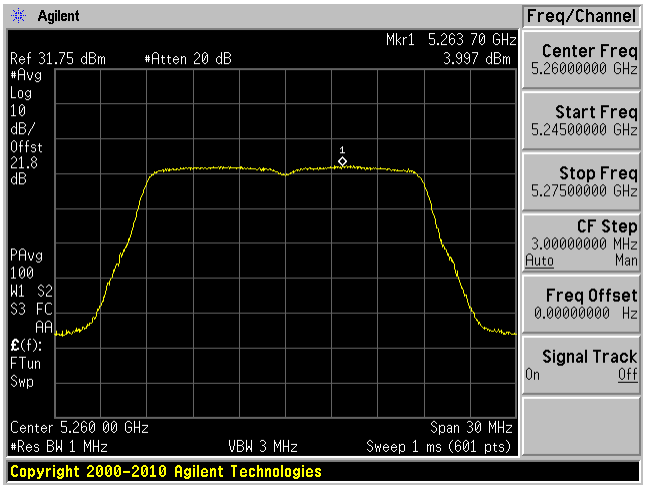


5320 MHz

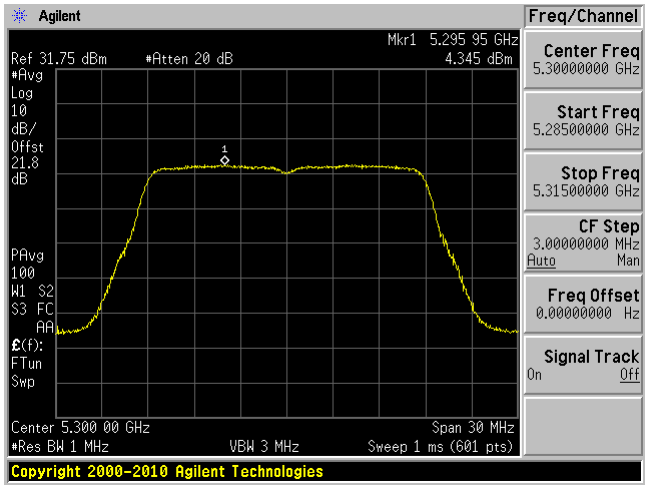


802.11HT/VHT20 mode

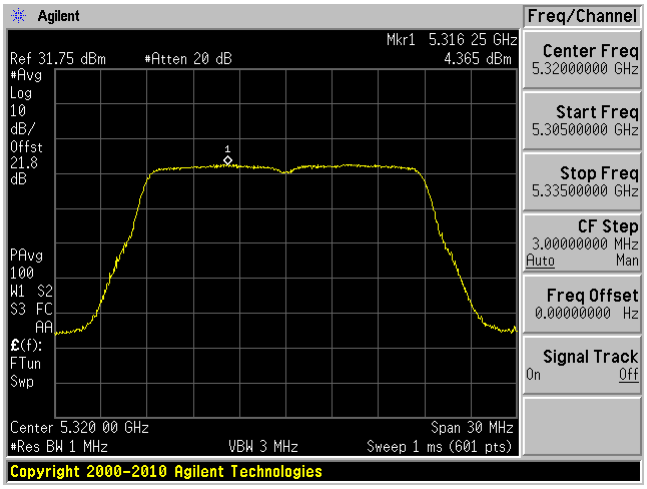
5260 MHz



5300 MHz

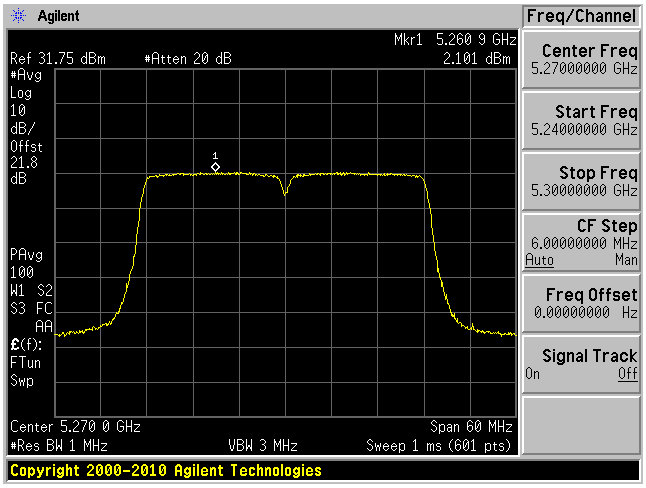


5320 MHz

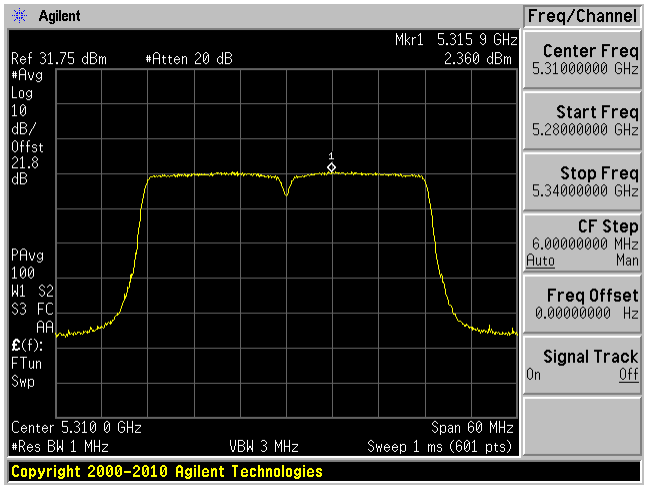


802.11HT/VHT40 mode

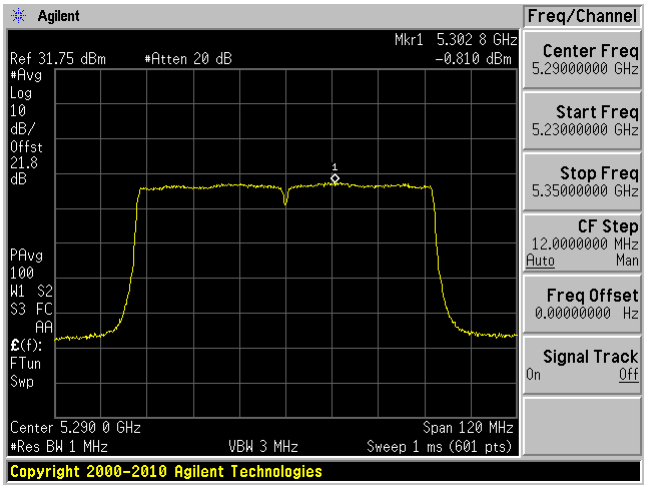
5270 MHz



5310 MHz



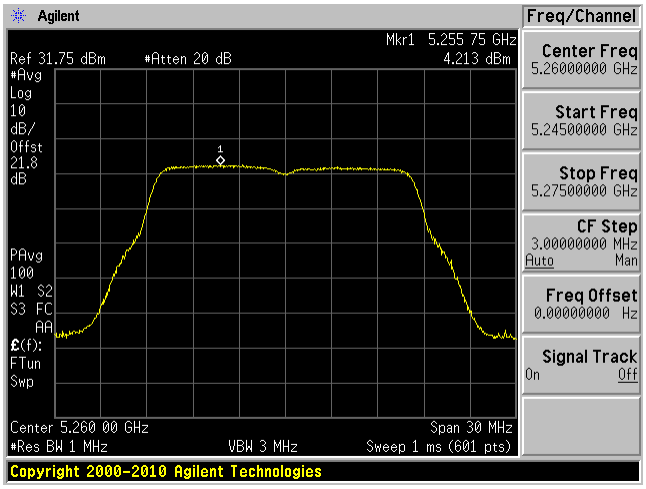
802.11VHT80 mode, 5290 MHz



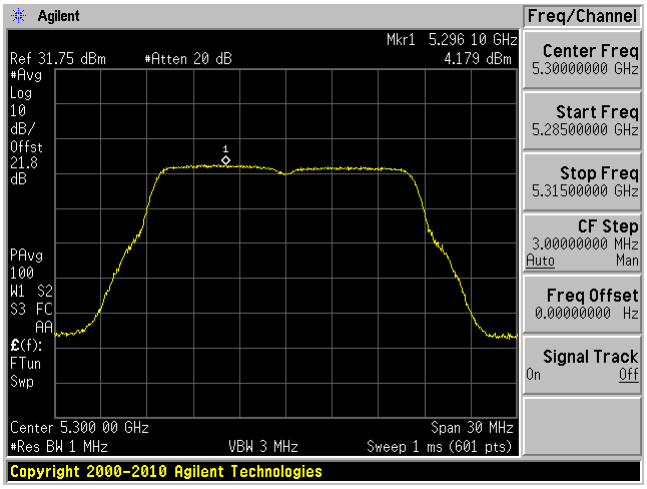
ANT 1 MIMO

802.11a mode

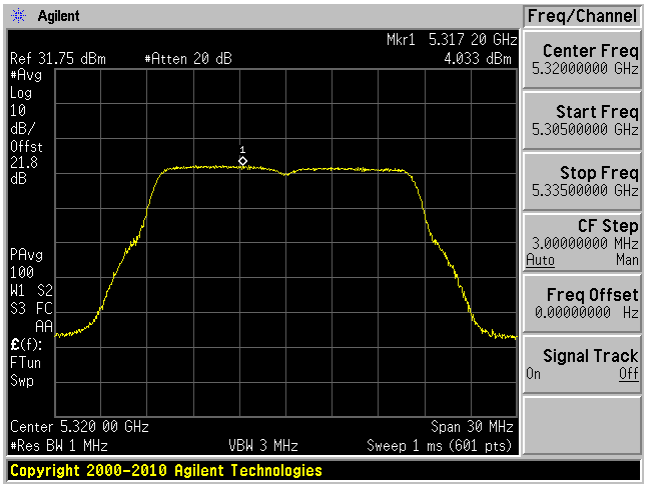
5260 MHz



5300 MHz

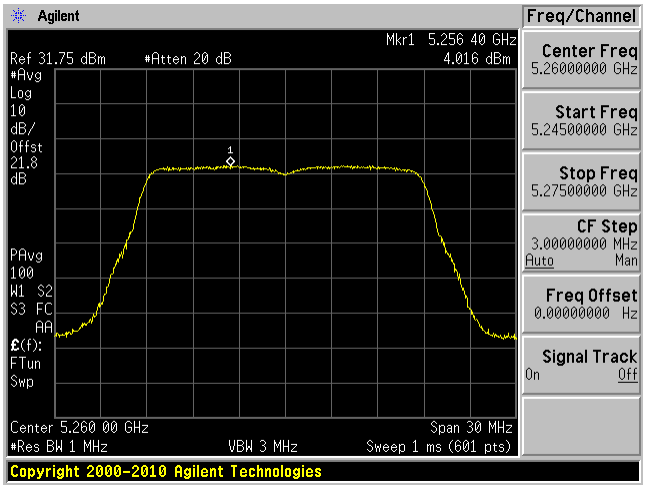


5320 MHz

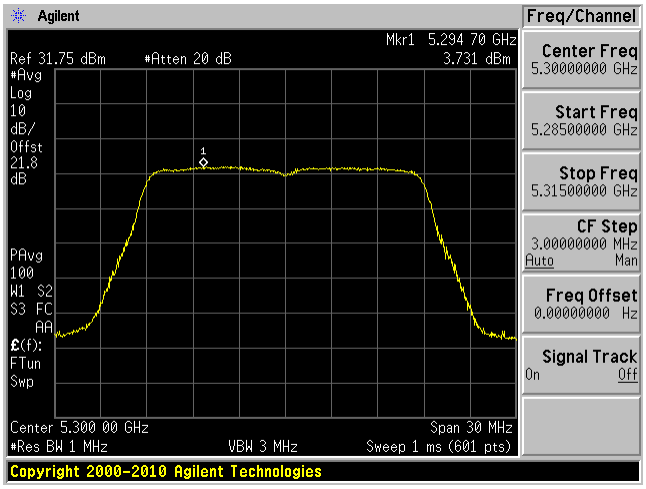


802.11HT/VHT20 mode

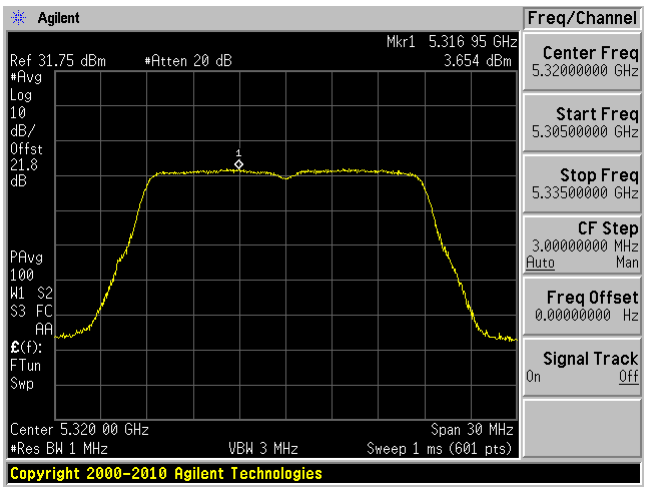
5260 MHz



5300 MHz

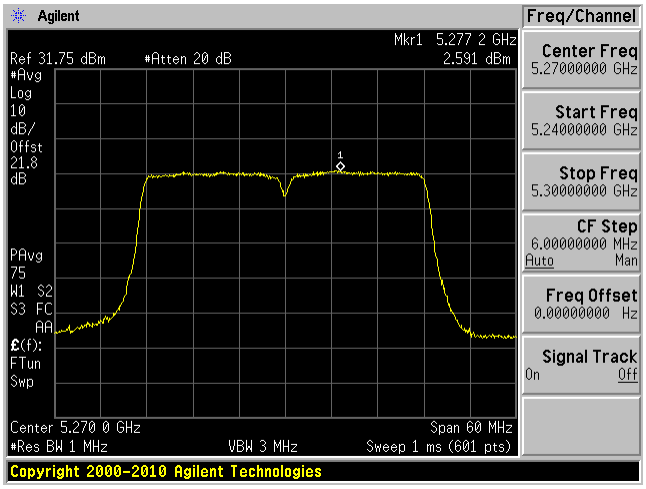


5320 MHz

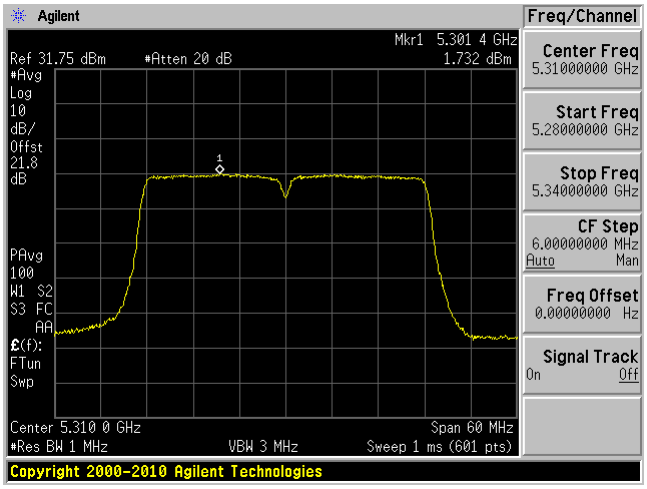


802.11HT/VHT40 mode

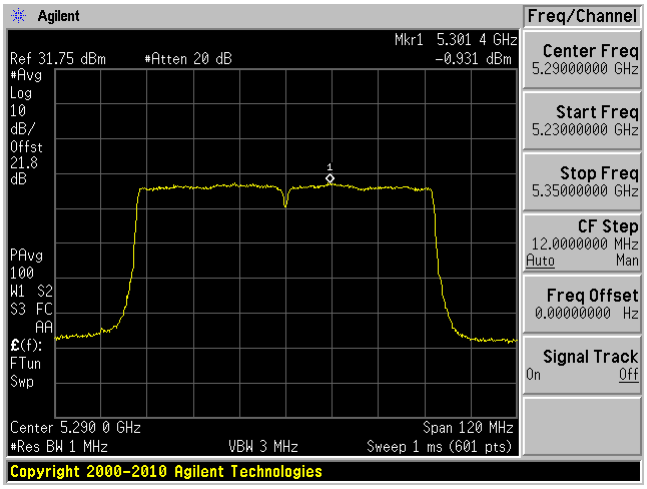
5270 MHz



5310 MHz



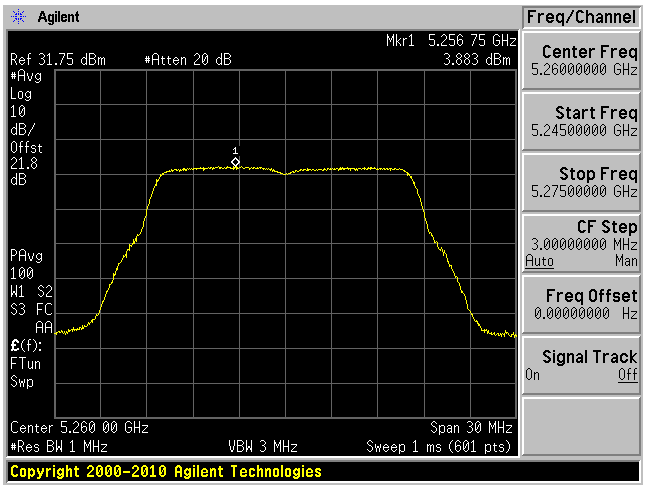
802.11VHT80 mode, 5290 MHz



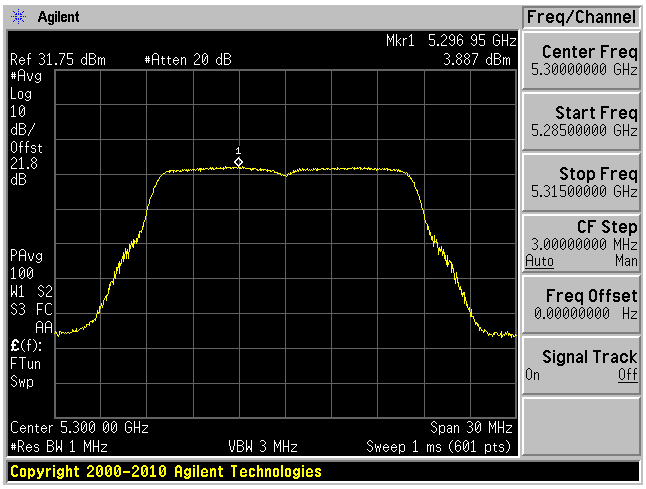
ANT 2 MIMO

802.11a mode

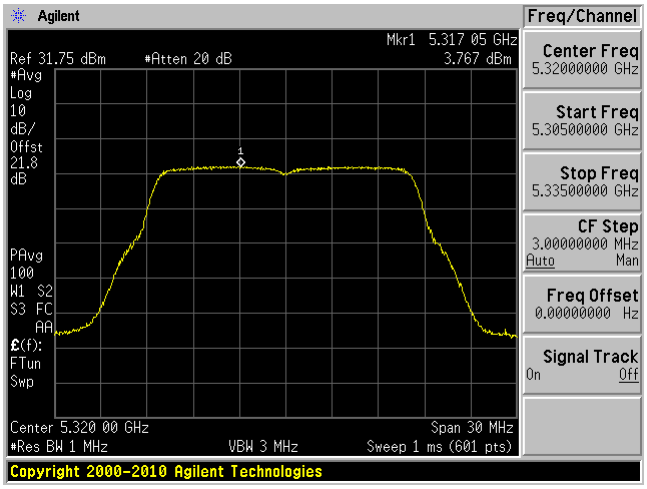
5260 MHz



5300 MHz

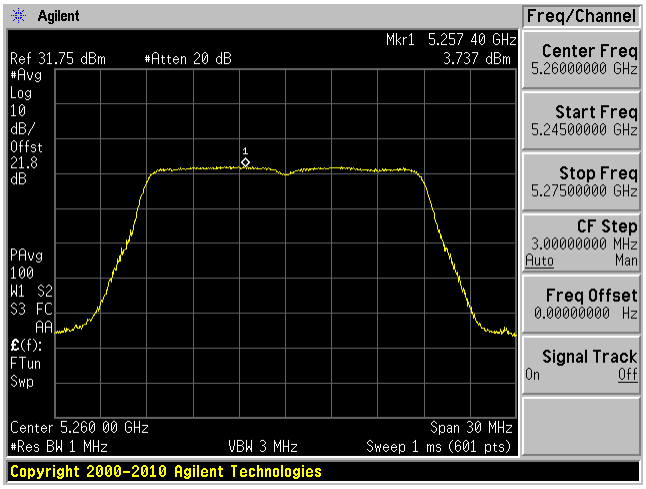


5320 MHz

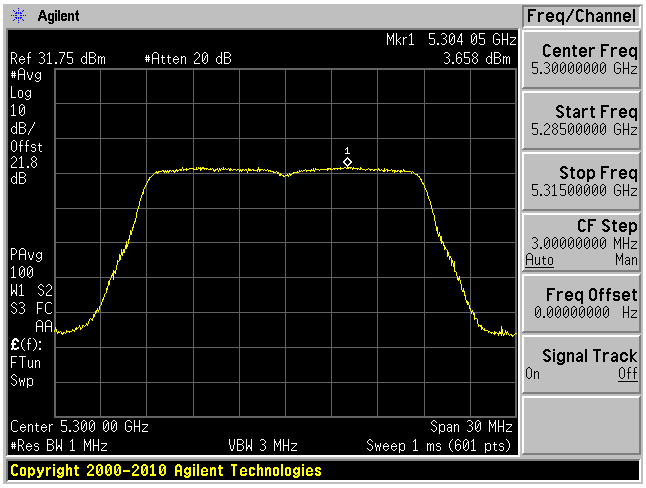


802.11HT/VHT20 mode

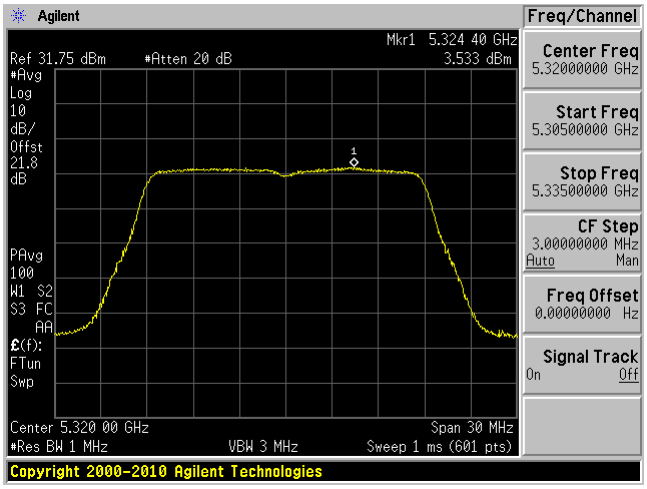
5260 MHz



5300 MHz

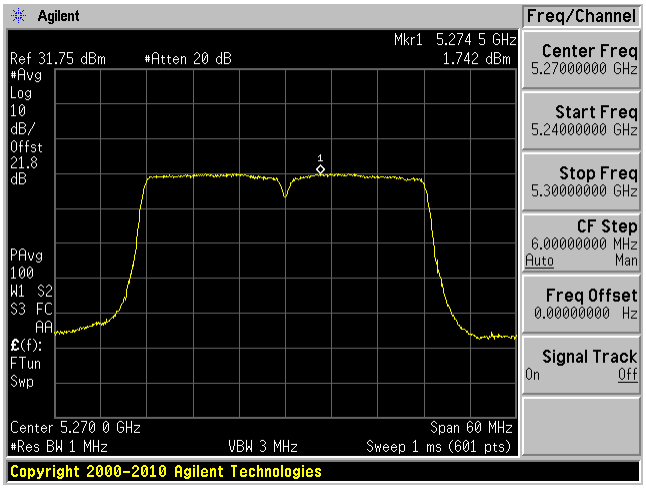


5320 MHz

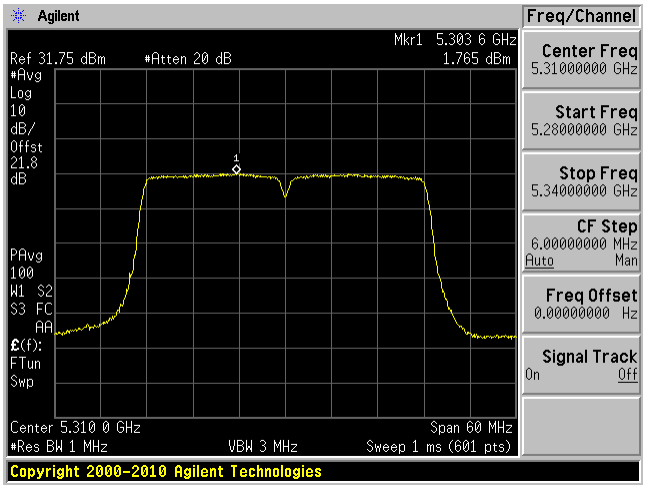


802.11HT/VHT40 mode

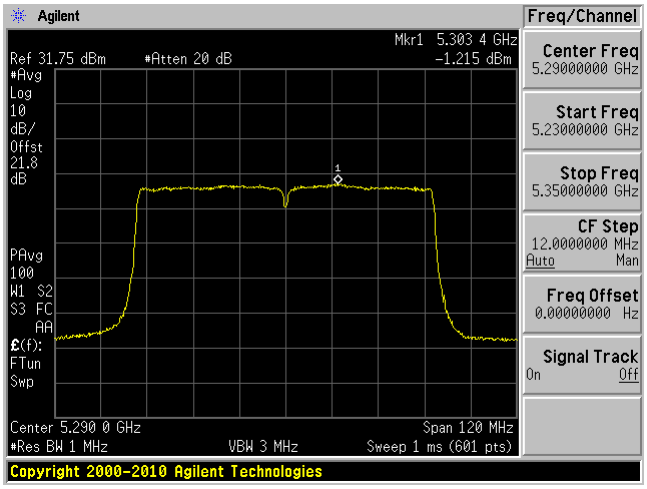
5270 MHz



5310 MHz



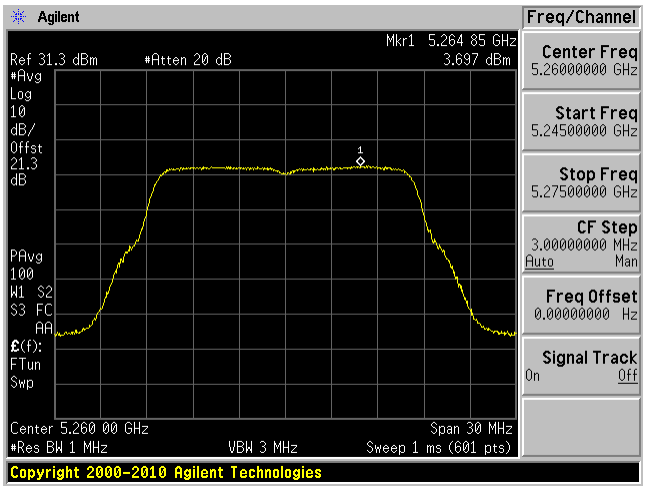
802.11VHT80 mode, 5290 MHz



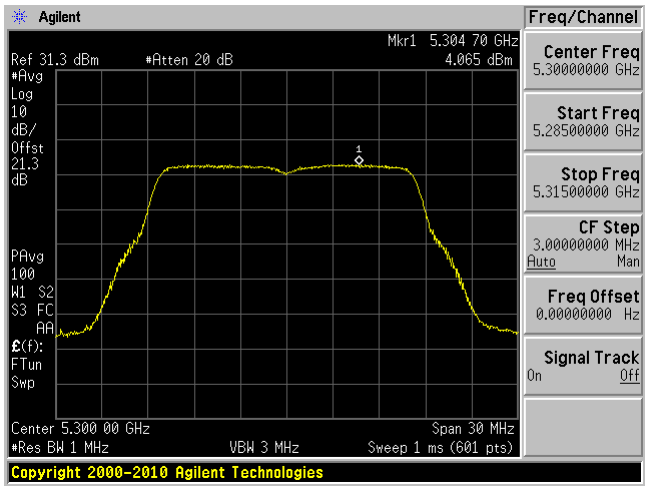
ANT 3 MIMO

802.11a mode

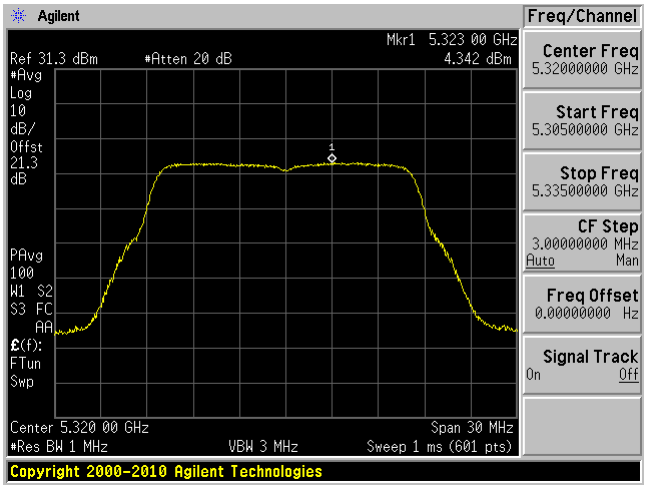
5260 MHz



5300 MHz

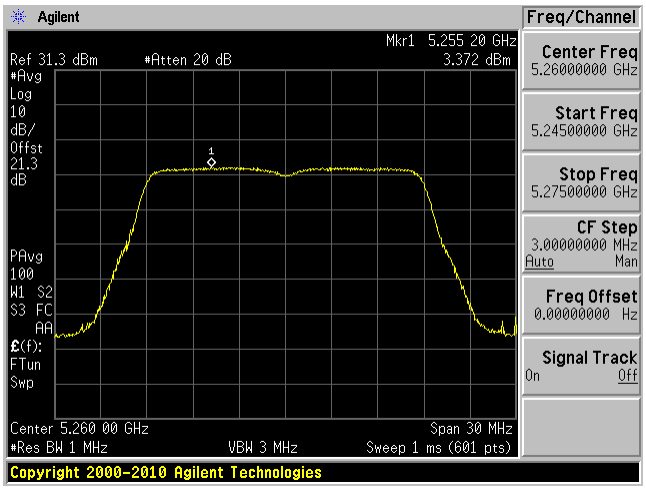


5320 MHz

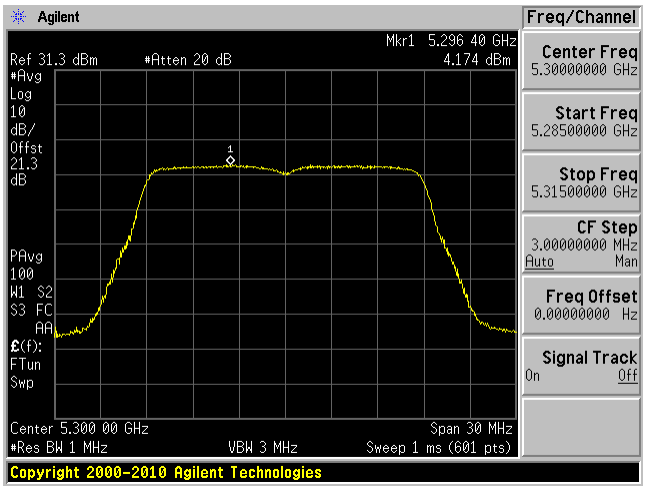


802.11HT/VHT20 mode

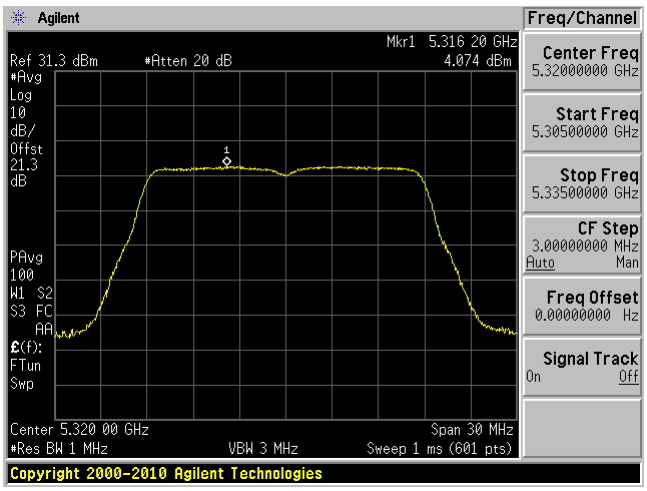
5260 MHz



5300 MHz

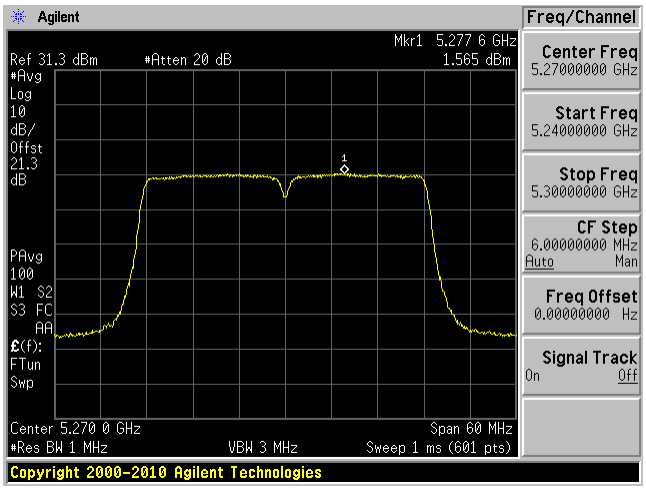


5320 MHz

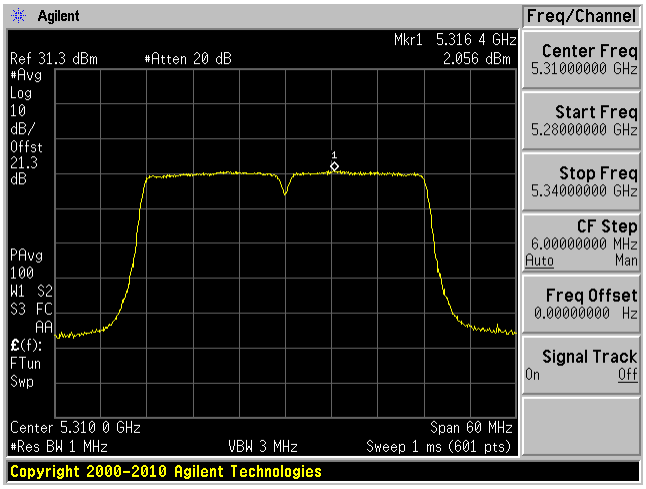


802.11HT/VHT40 mode

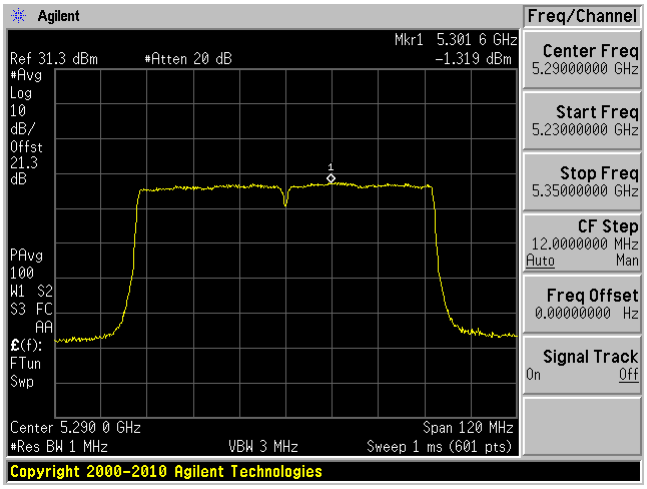
5270 MHz



5310 MHz



802.11VHT80 mode, 5290 MHz

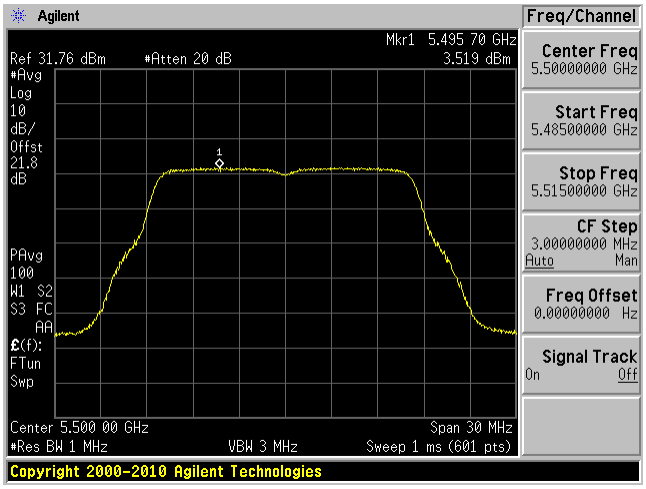


5500 – 5725 MHz

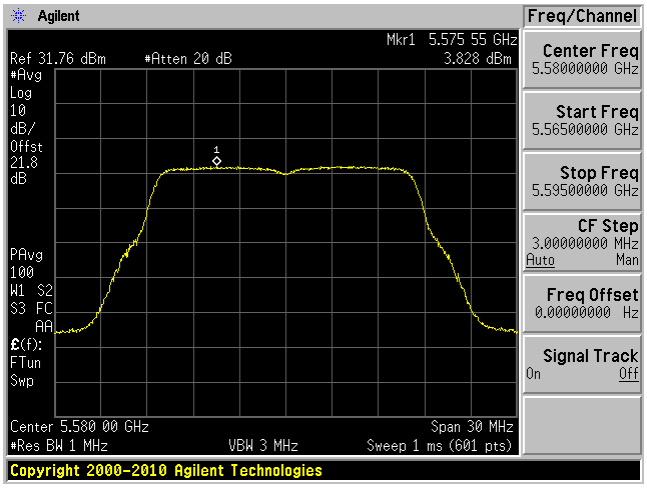
ANT 0 MIMO

802.11a mode

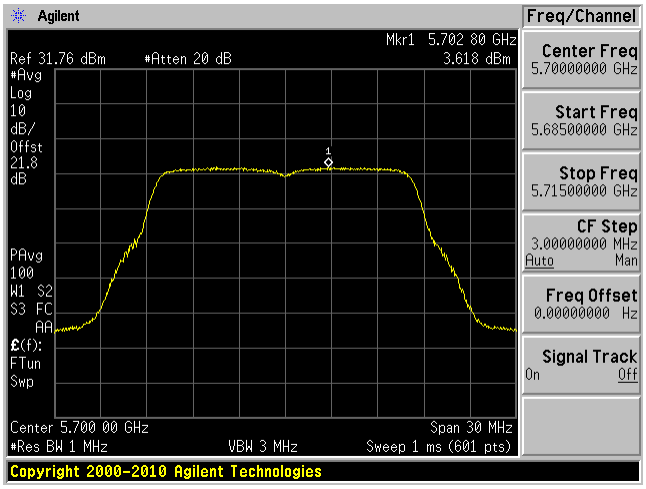
5500 MHz



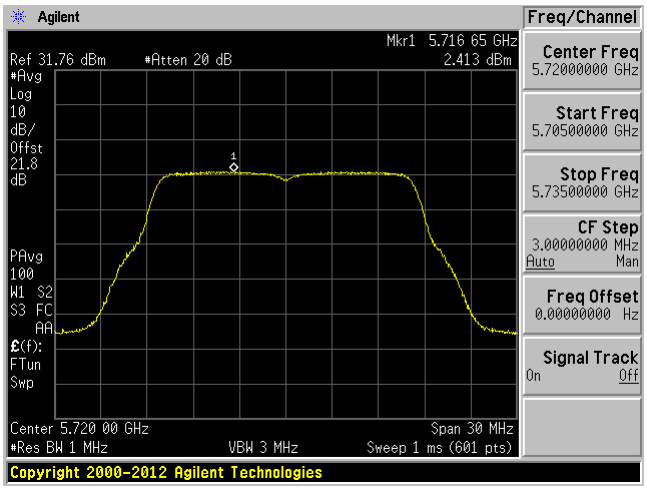
5580 MHz



5700 MHz

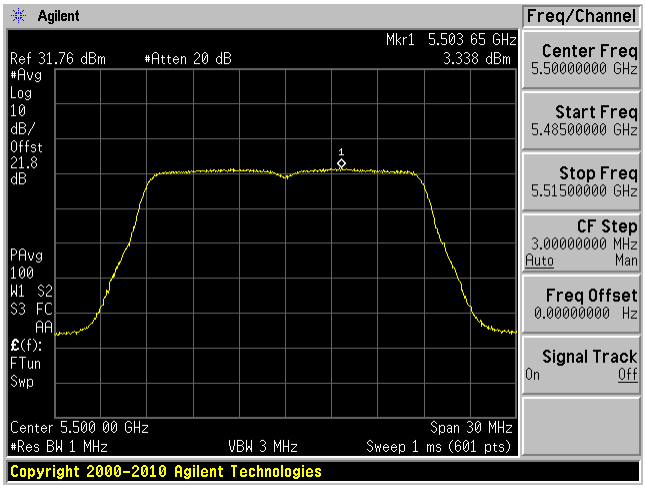


5720 MHz

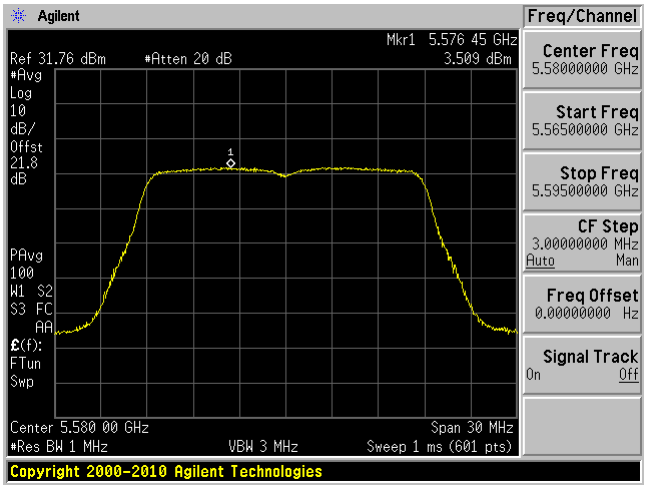


802.11HT/VHT20 mode

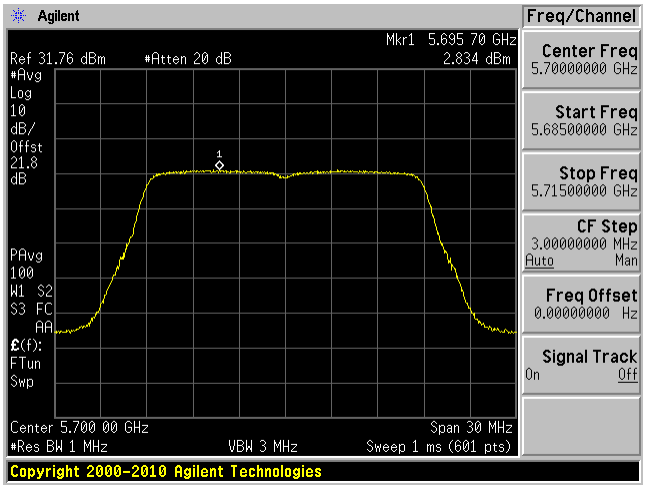
5500 MHz



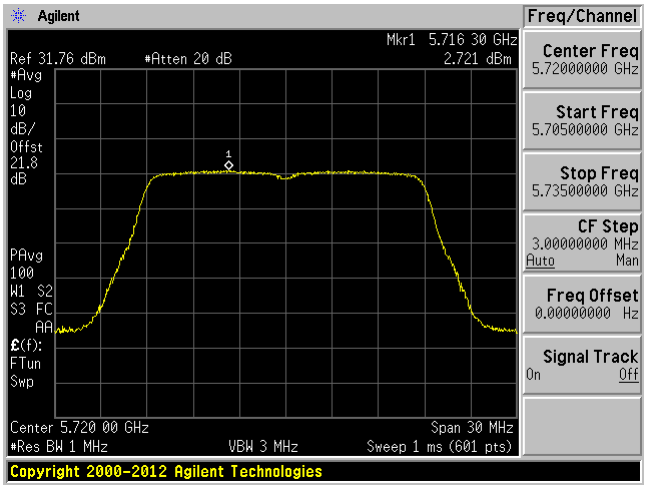
5580 MHz



5700 MHz

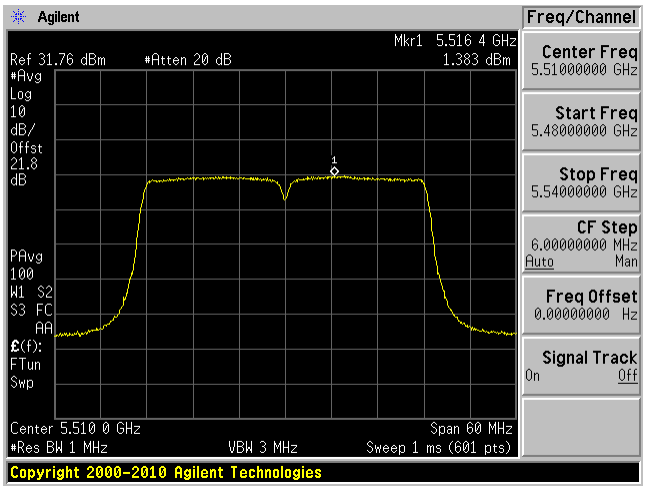


5720 MHz

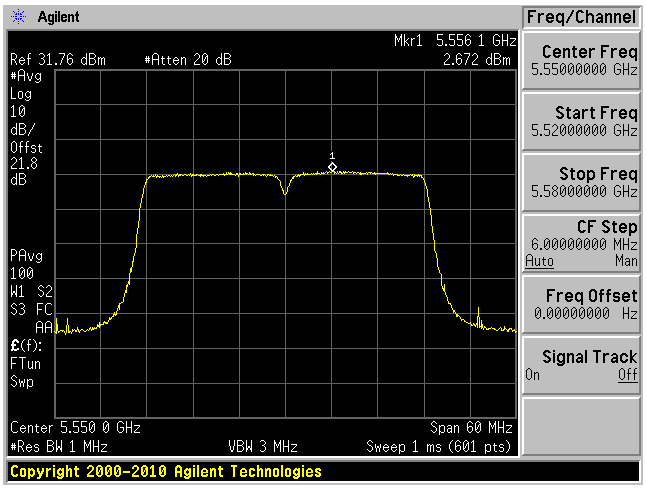


802.11HT/VHT40 mode

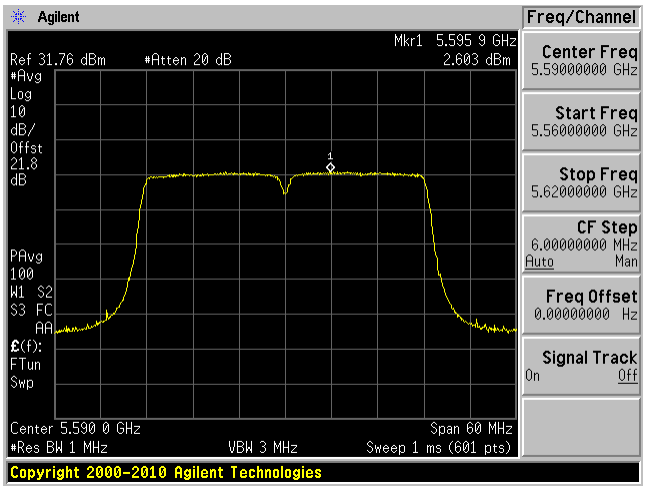
5510 MHz



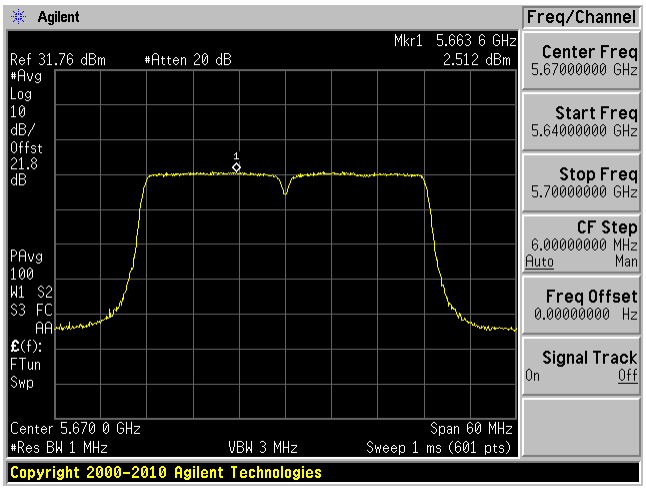
5550 MHz



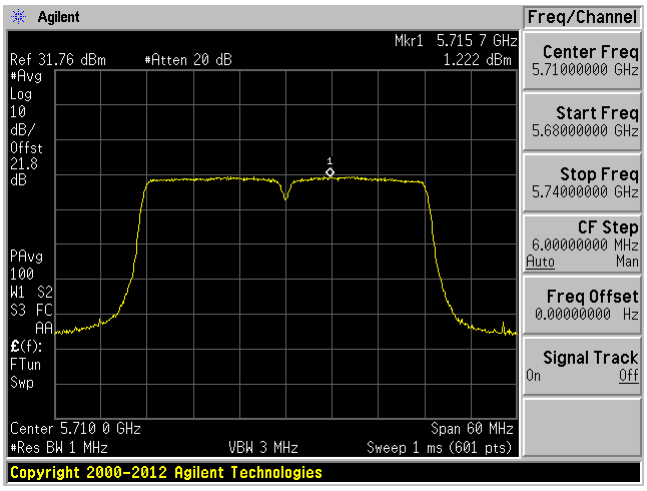
5590 MHz



5670 MHz

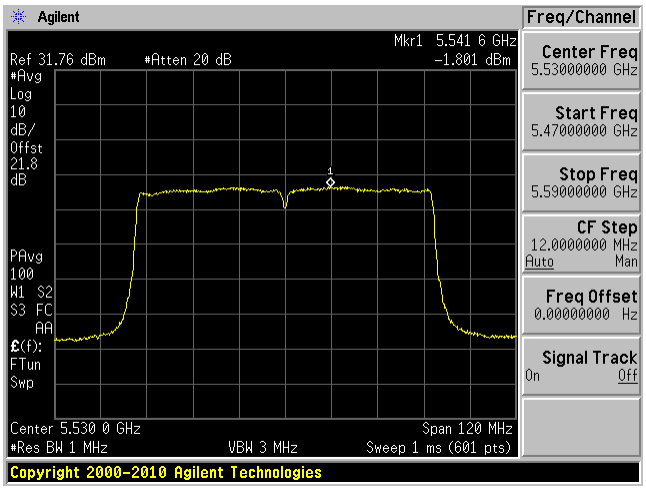


5710 MHz

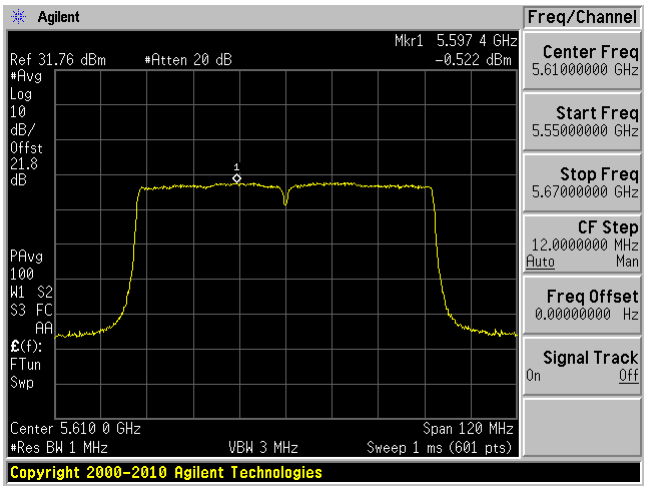


802.11VHT80 mode

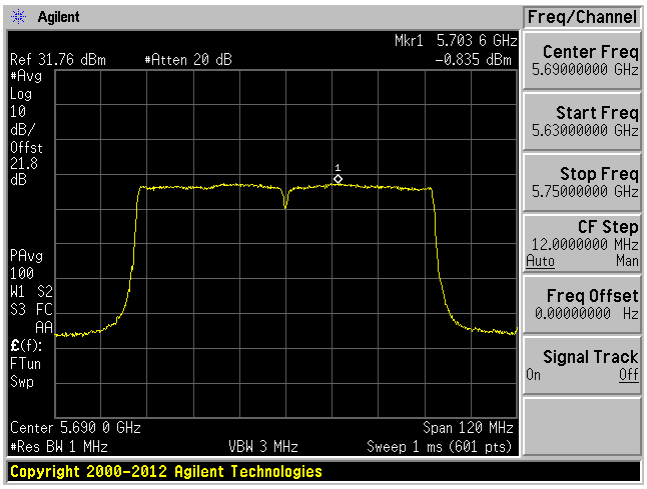
5530 MHz



5610 MHz



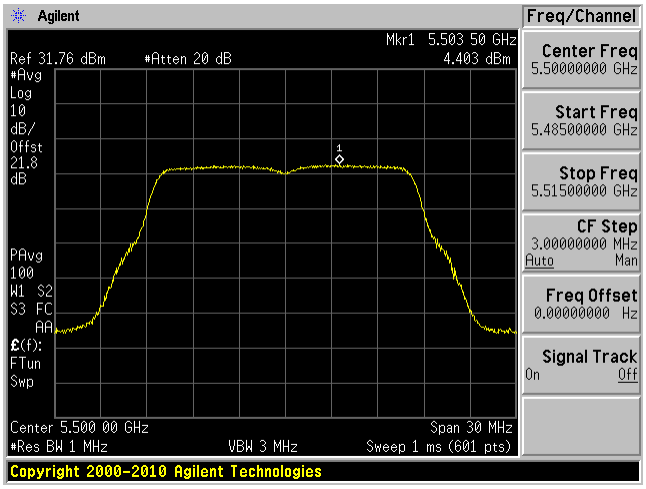
5690 MHz



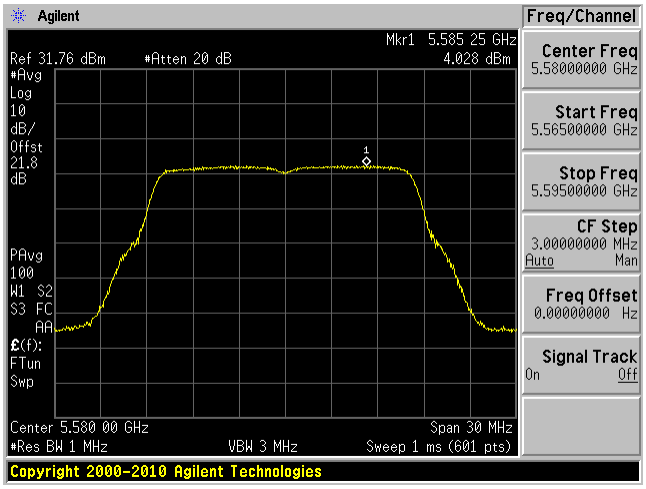
ANT 1 MIMO

802.11a mode

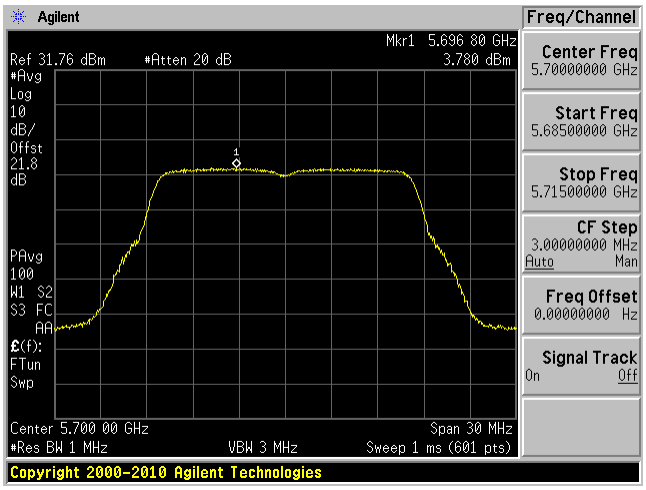
5500 MHz



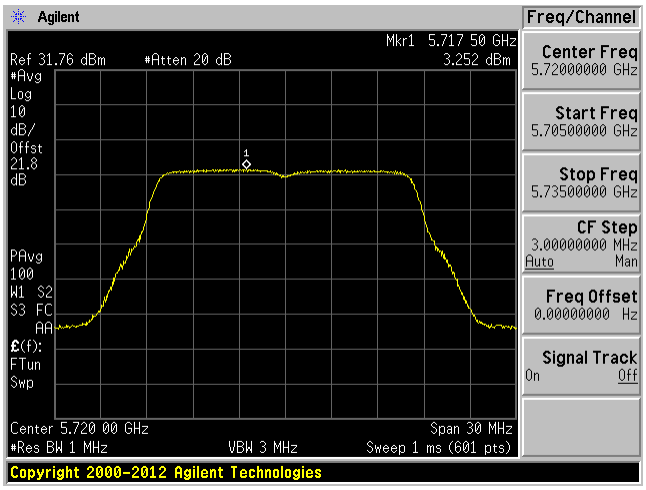
5580 MHz



5700 MHz

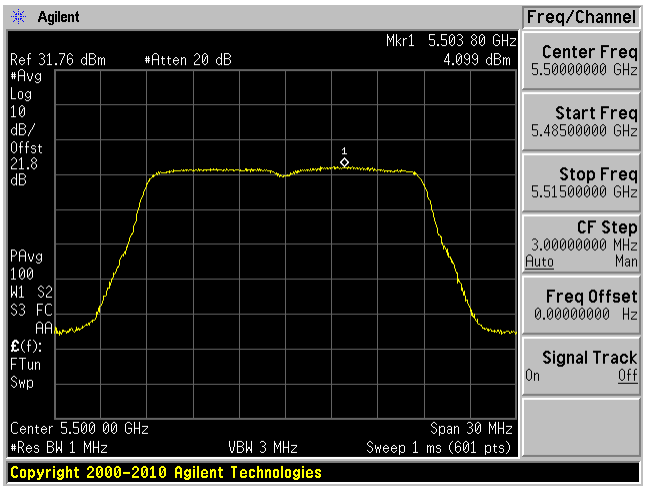


5720 MHz

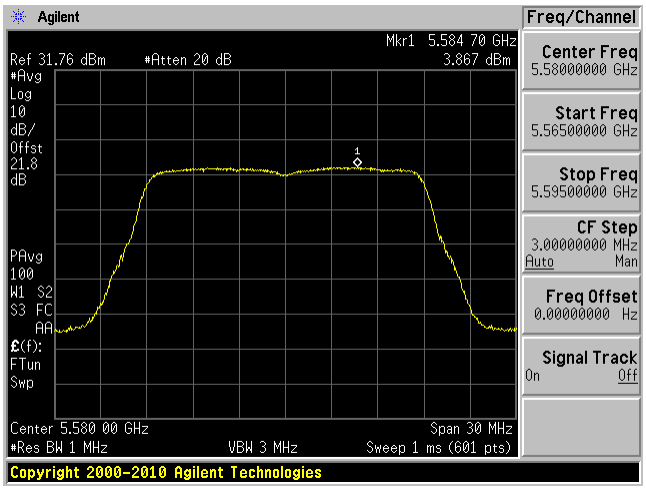


802.11HT/VHT20 mode

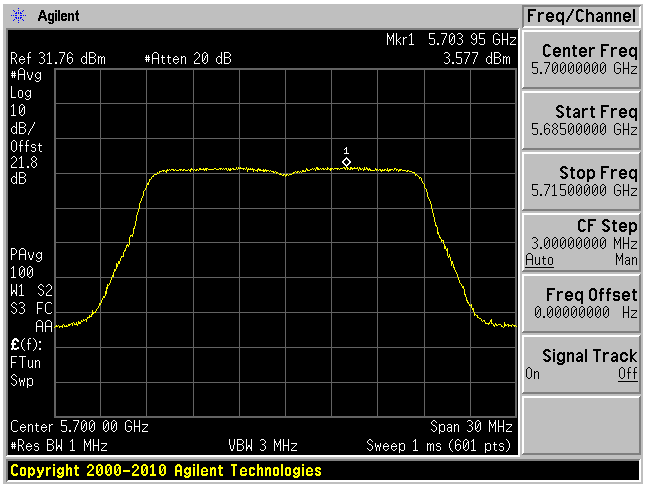
5500 MHz



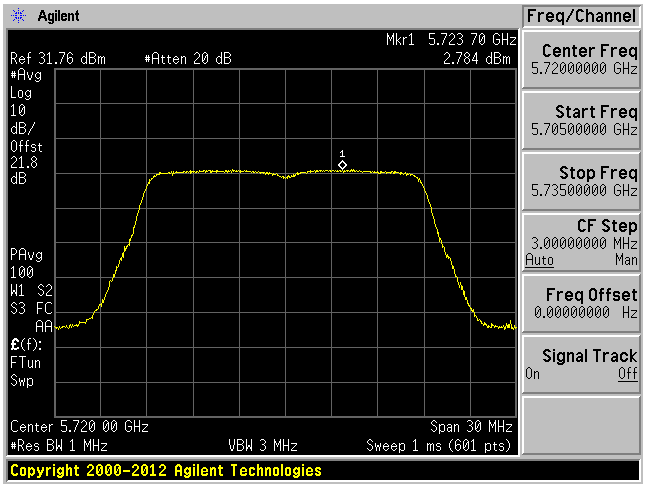
5580 MHz



5700 MHz

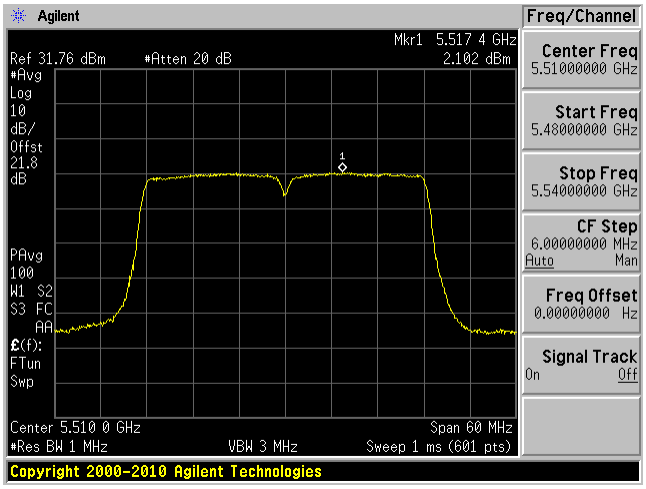


5720 MHz

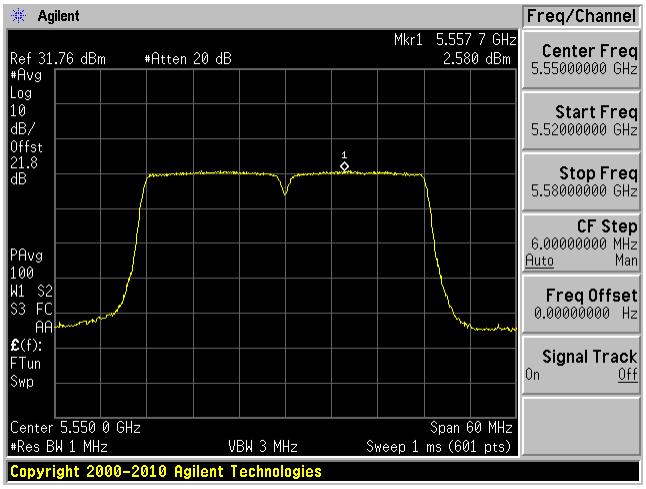


802.11HT/VHT40 mode

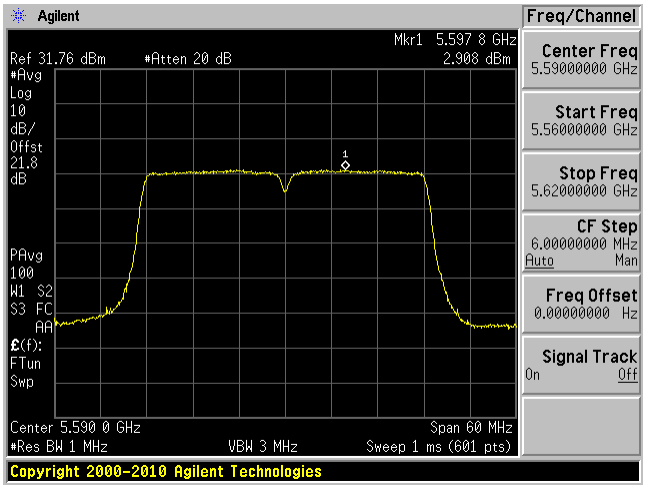
5510 MHz



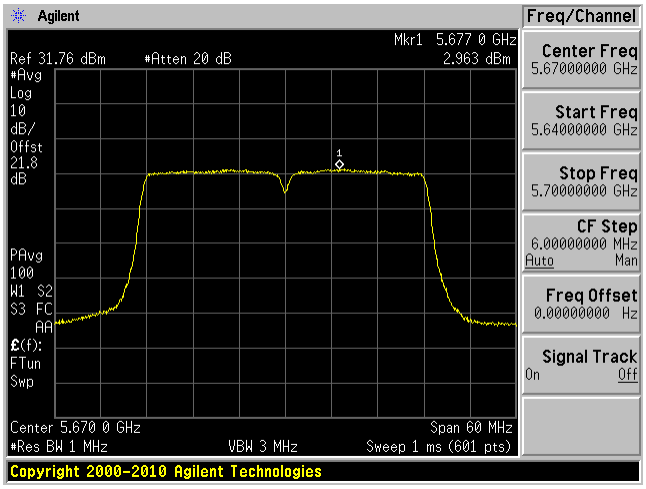
5550 MHz



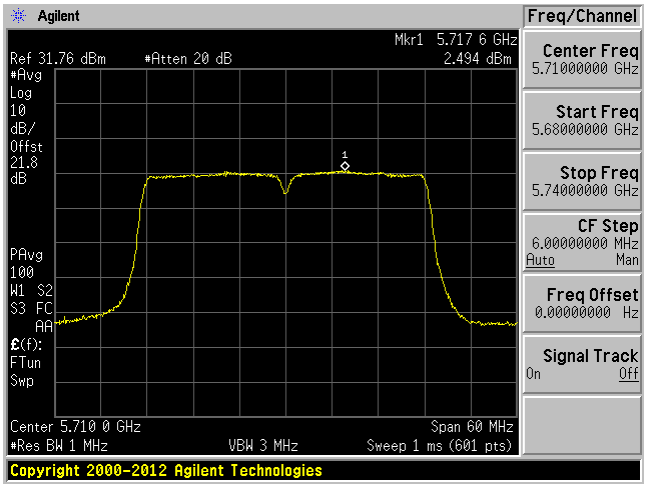
5590 MHz



5670 MHz

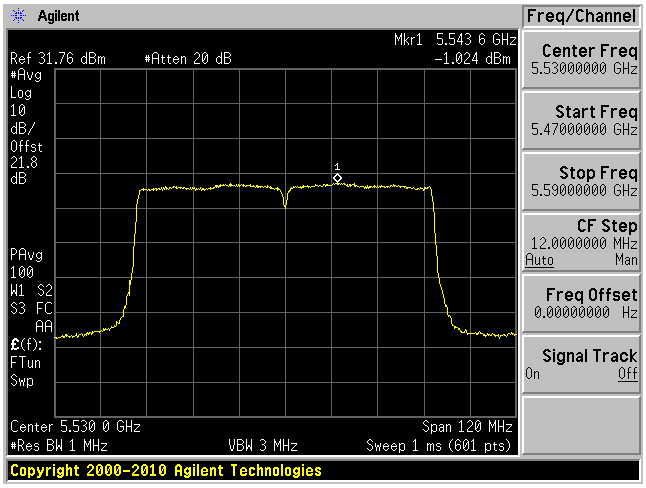


5710 MHz

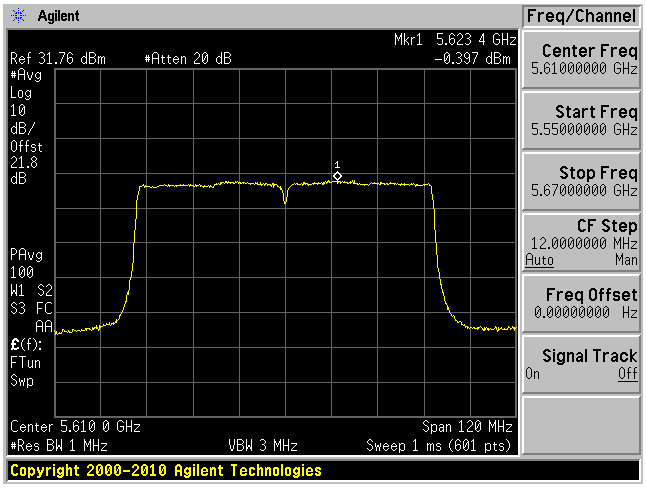


802.11VHT80 mode

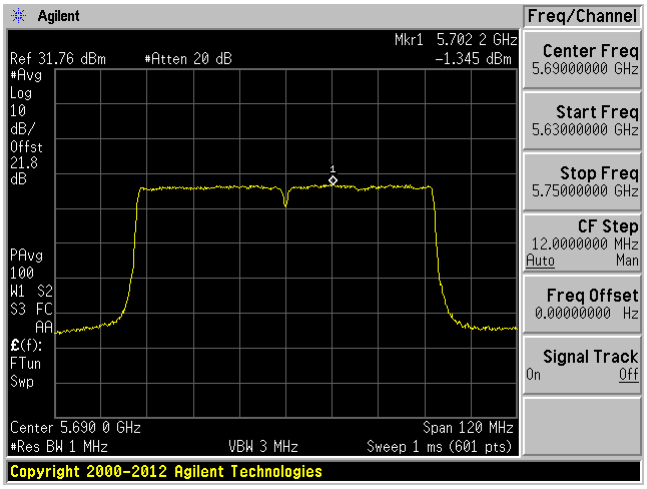
5530 MHz



5610 MHz



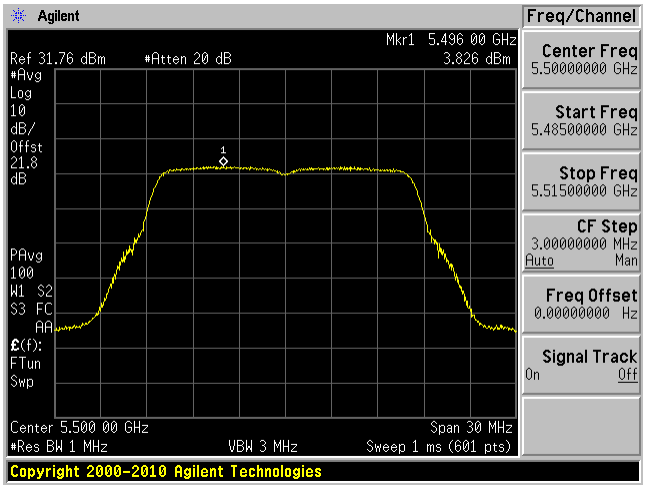
5690 MHz



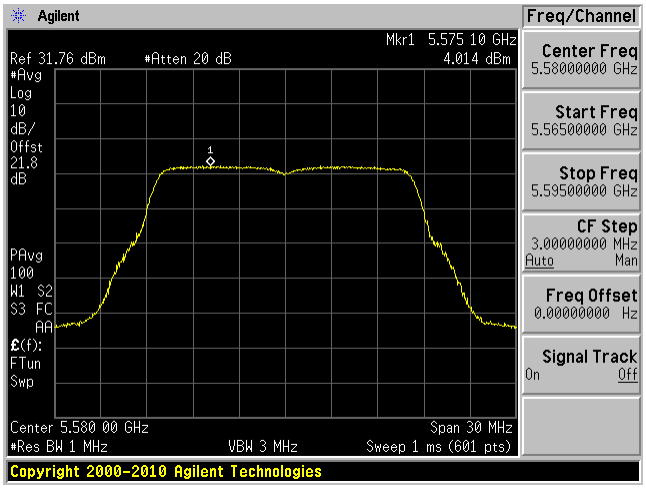
ANT 2 MIMO

802.11a mode

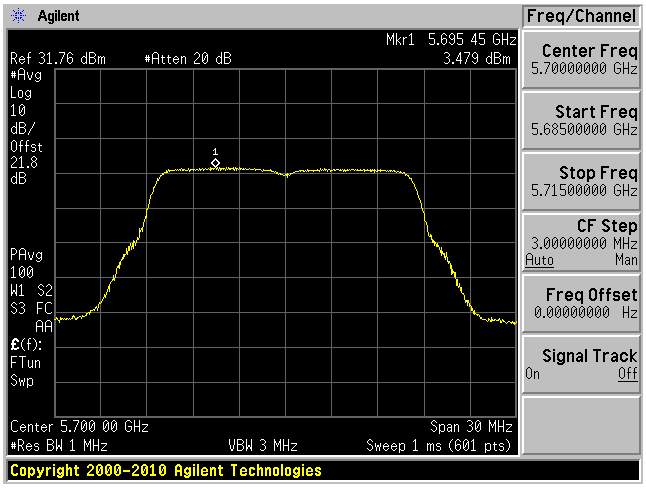
5500 MHz



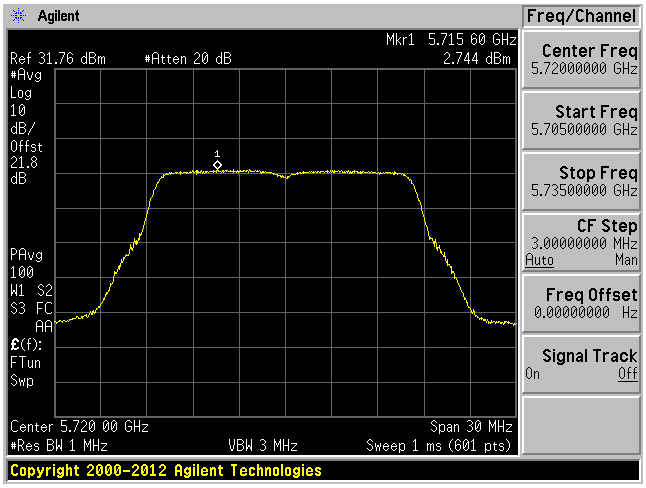
5580 MHz



5700 MHz

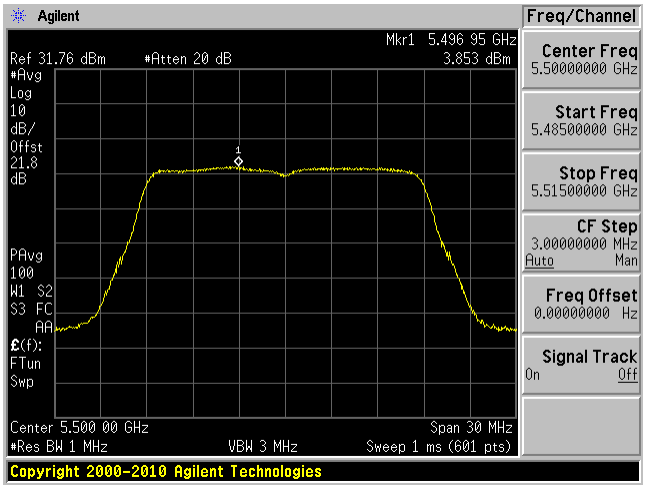


5720 MHz

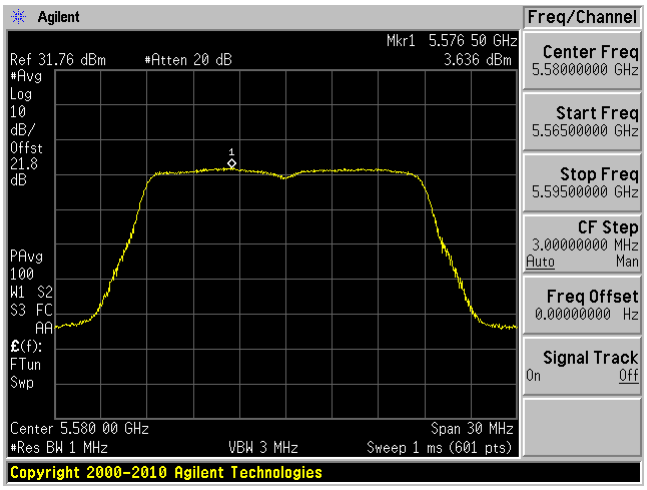


802.11HT/VHT20 mode

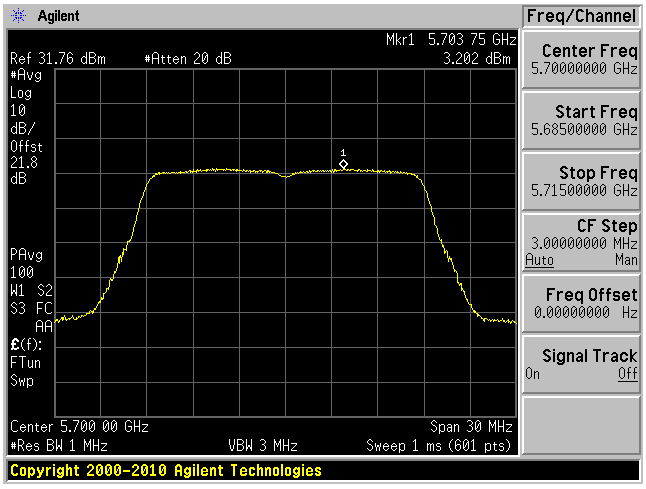
5500 MHz



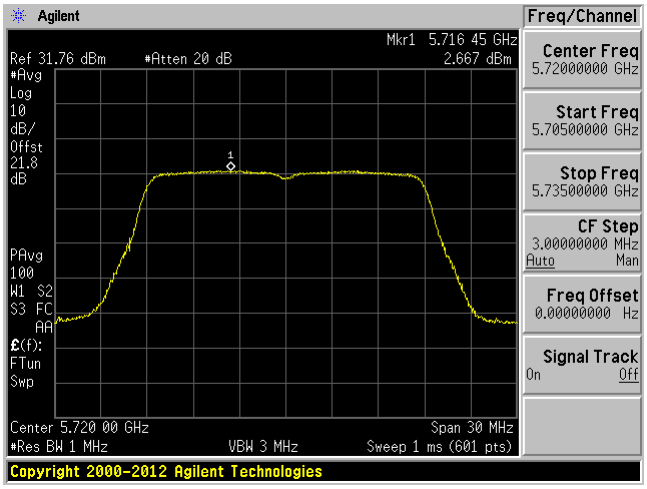
5580 MHz



5700 MHz

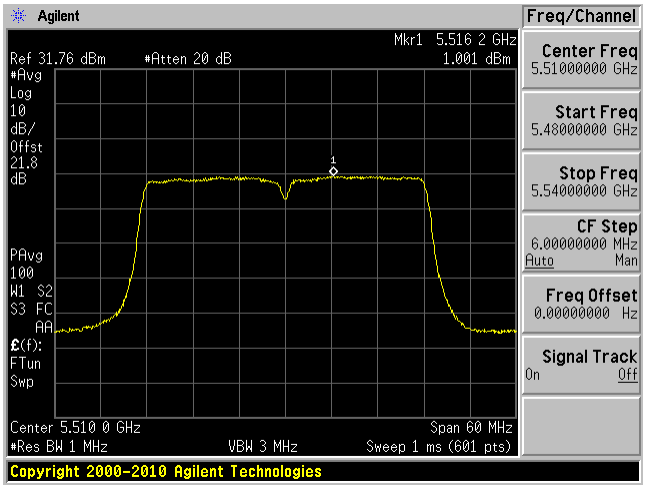


5720 MHz

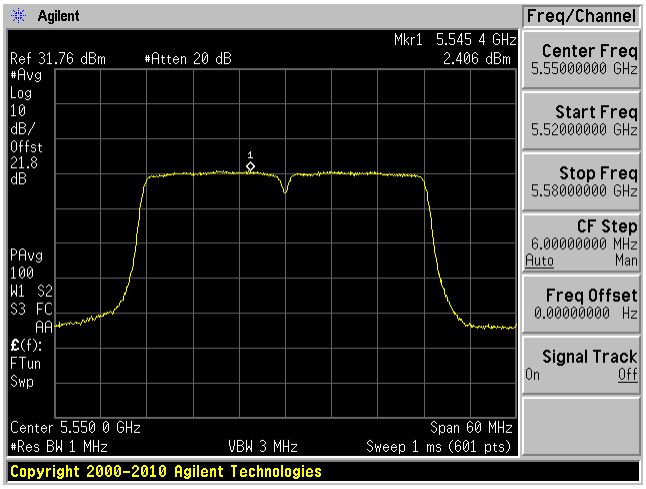


802.11HT/VHT40 mode

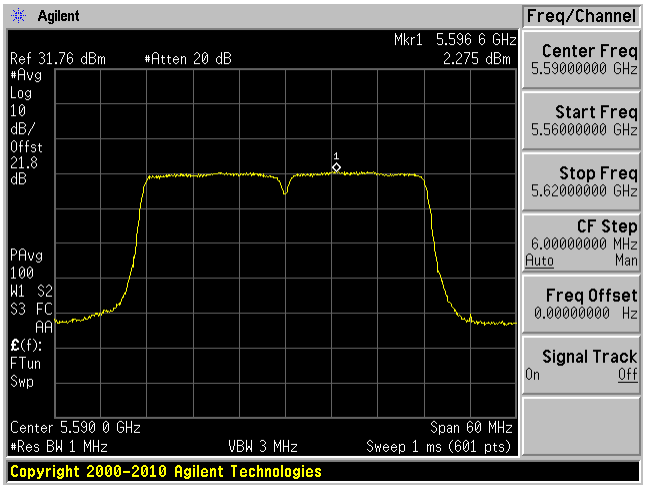
5510 MHz



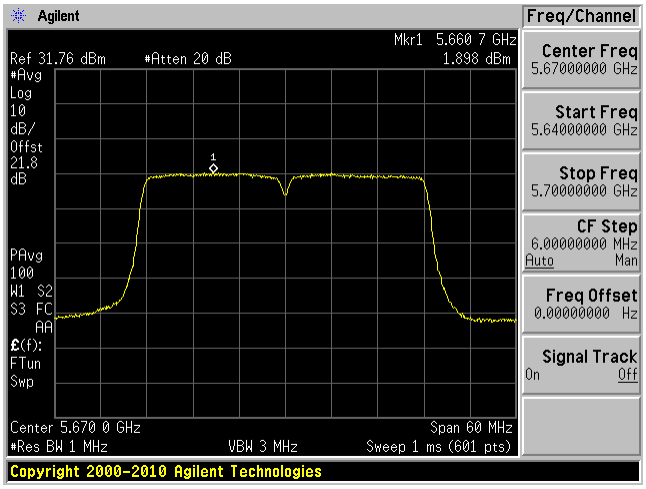
5550 MHz



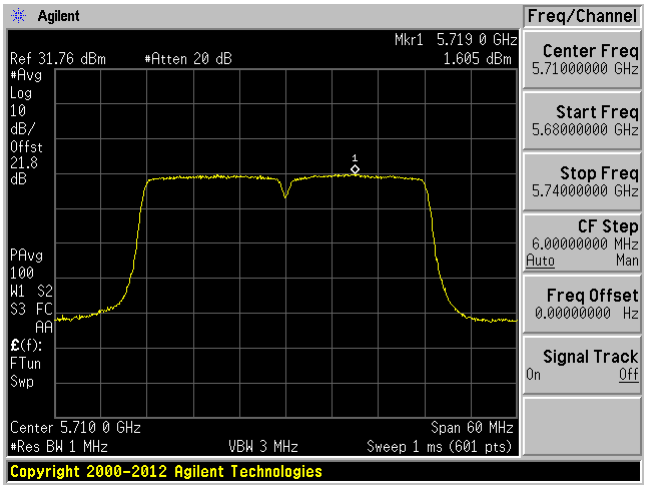
5590 MHz



5670 MHz

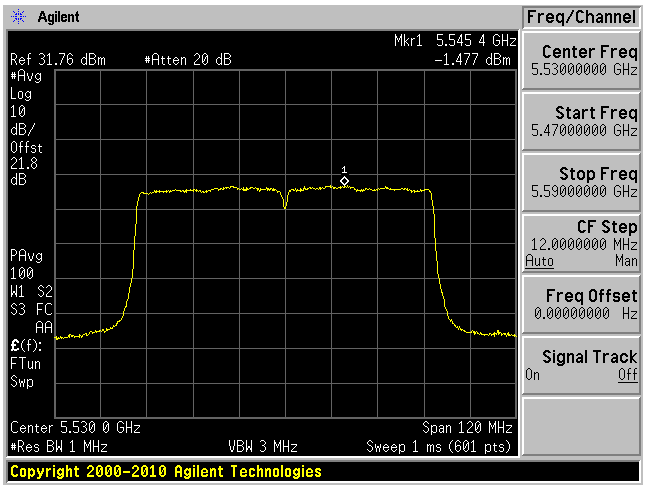


5710 MHz

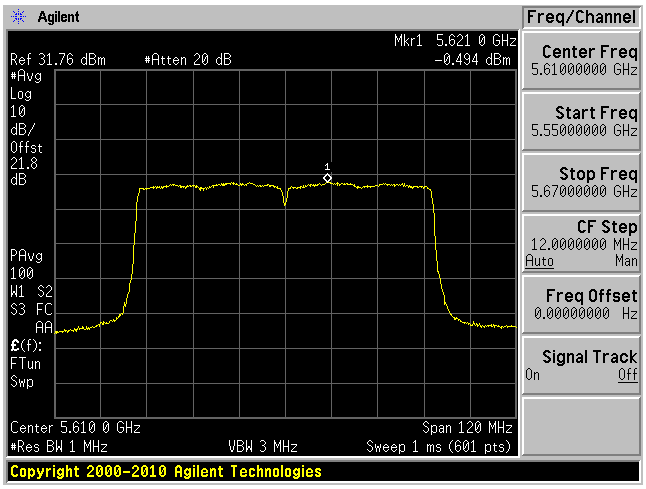


802.11VHT80 mode

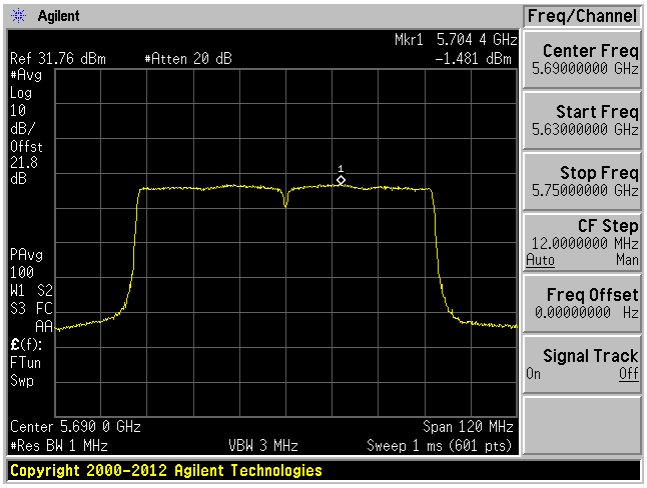
5530 MHz



5610 MHz



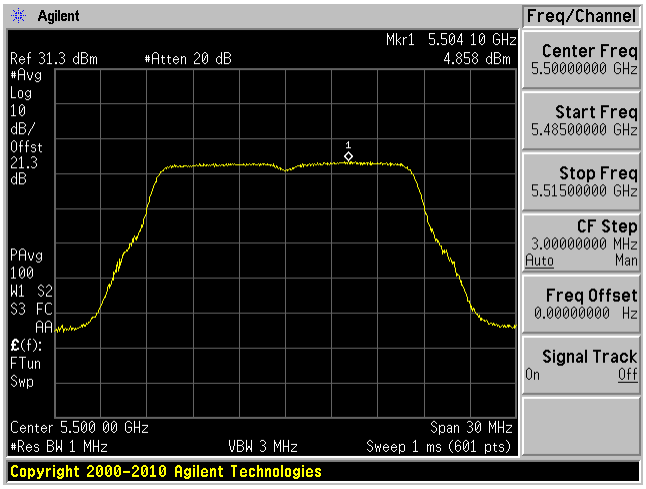
5690 MHz



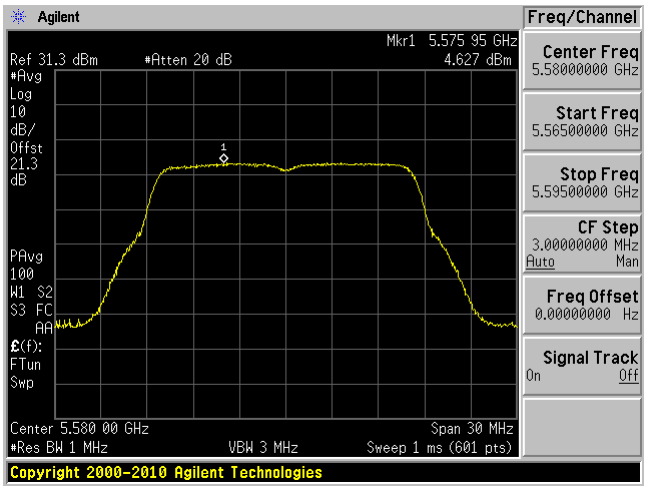
ANT 3 MIMO

802.11a mode

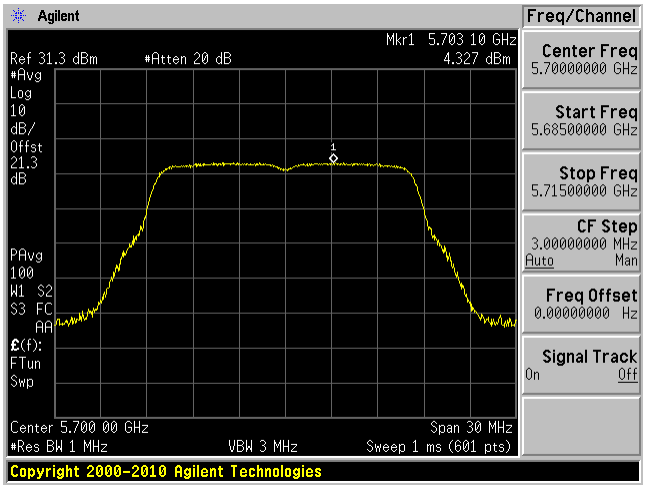
5500 MHz



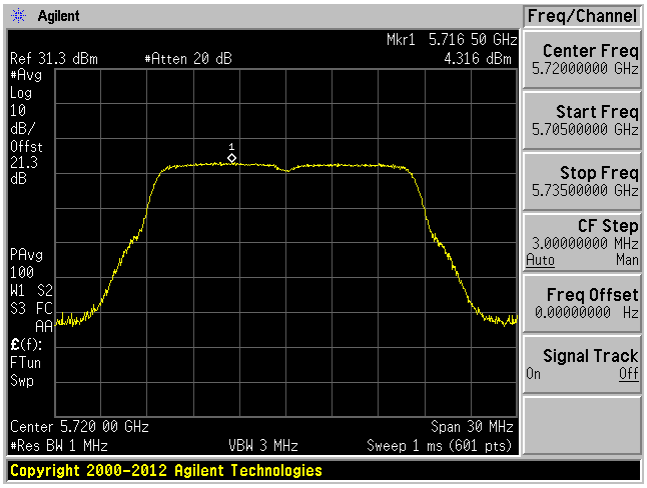
5580 MHz



5700 MHz

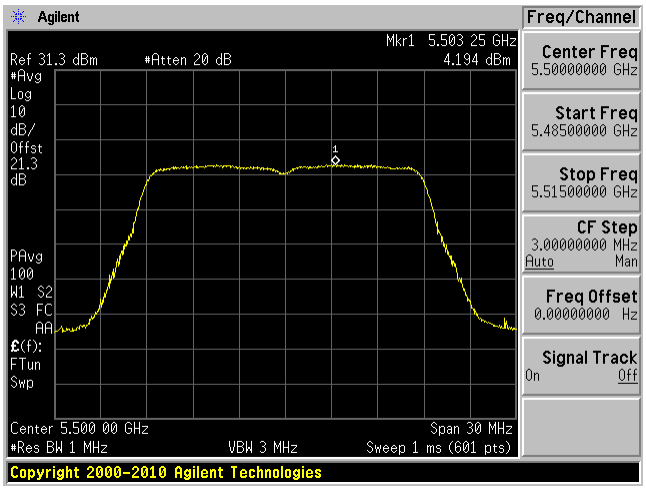


5720 MHz

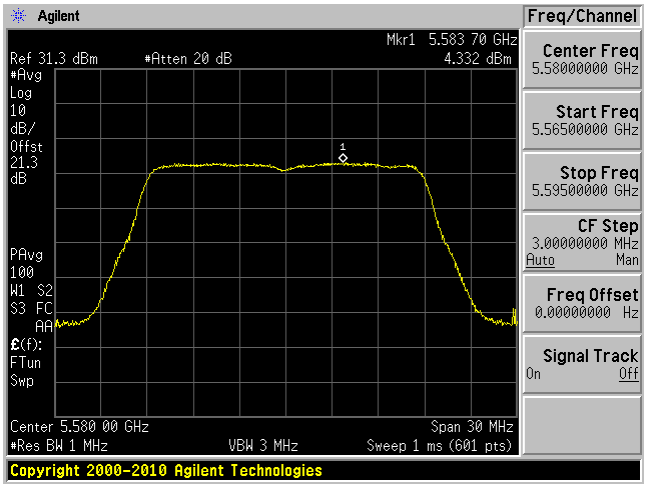


802.11HT/VHT20 mode

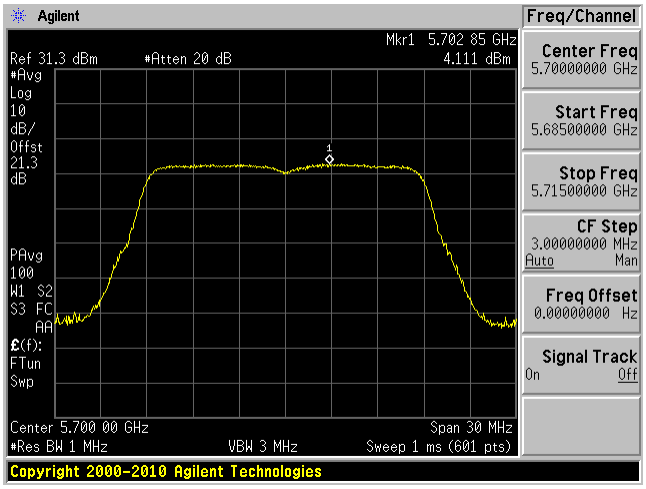
5500 MHz



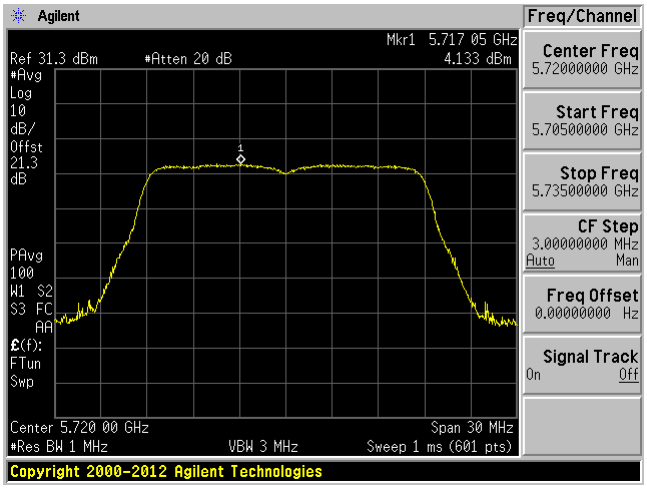
5580 MHz



5700 MHz

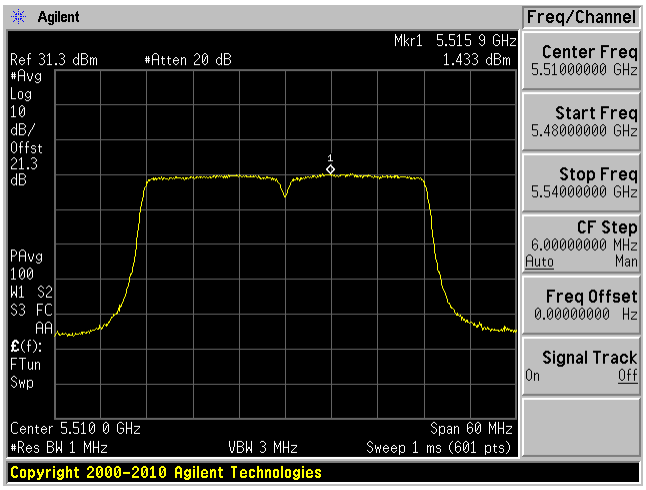


5720 MHz

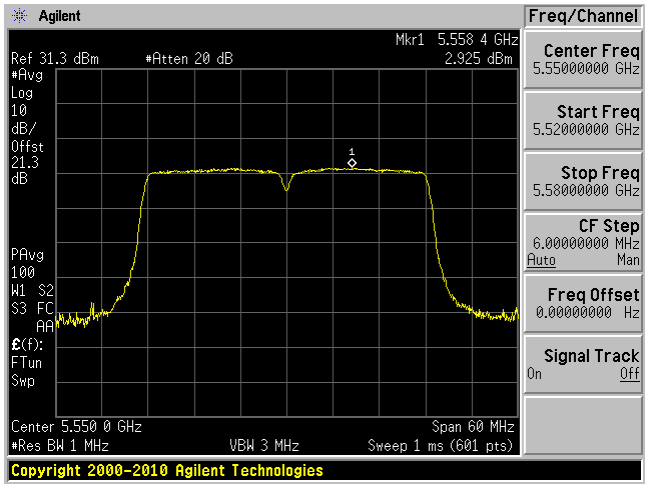


802.11HT/VHT40 mode

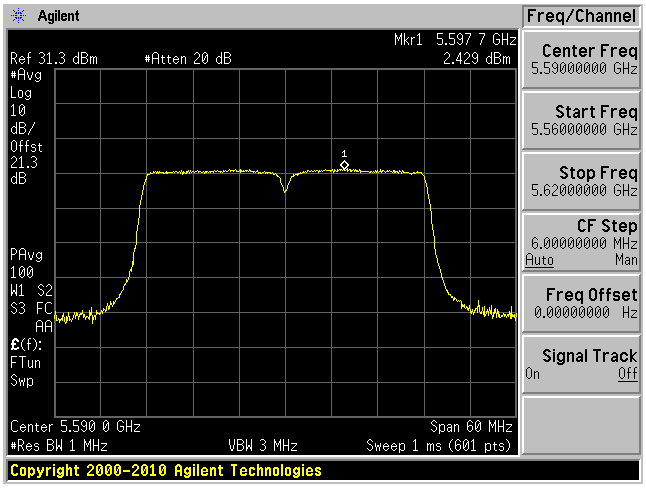
5510 MHz



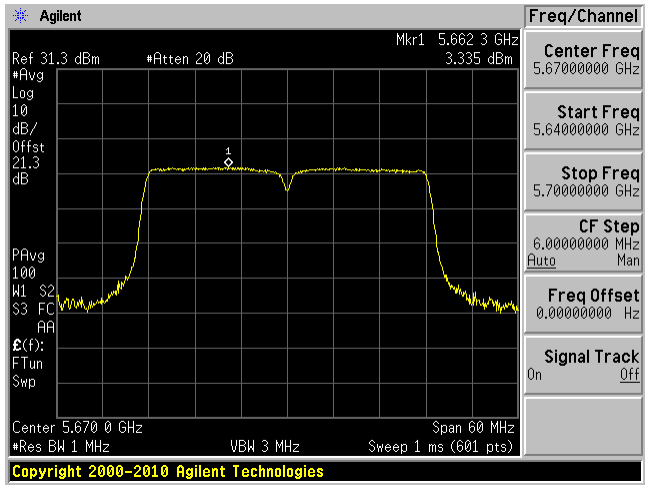
5550 MHz



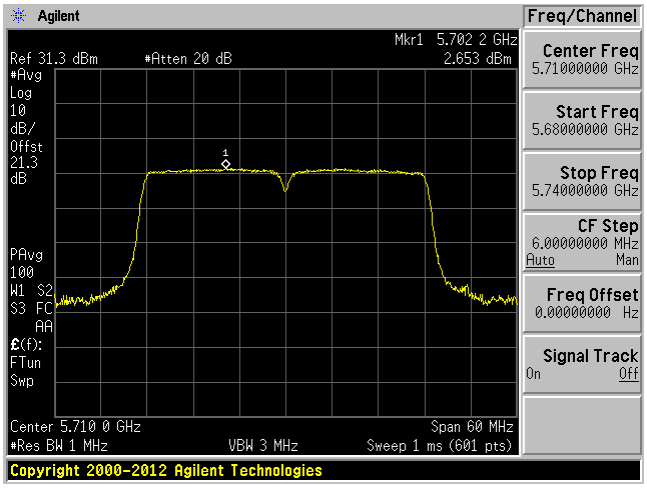
5590 MHz



5670 MHz

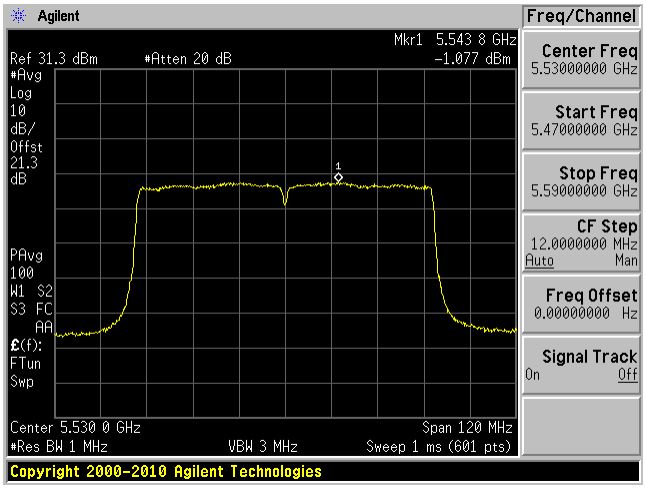


5710 MHz

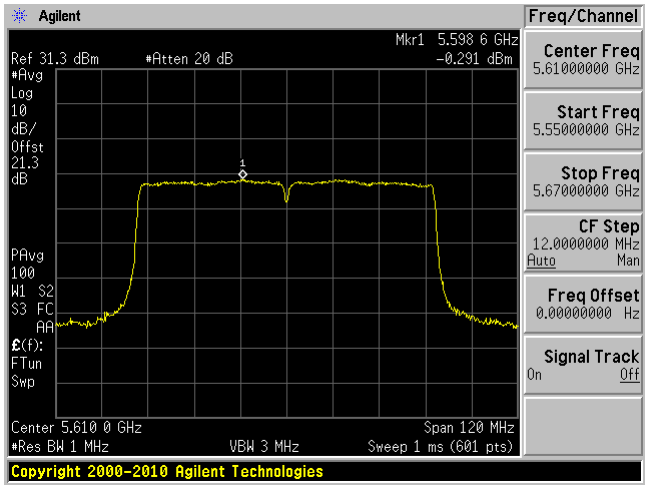


802.11VHT80 mode

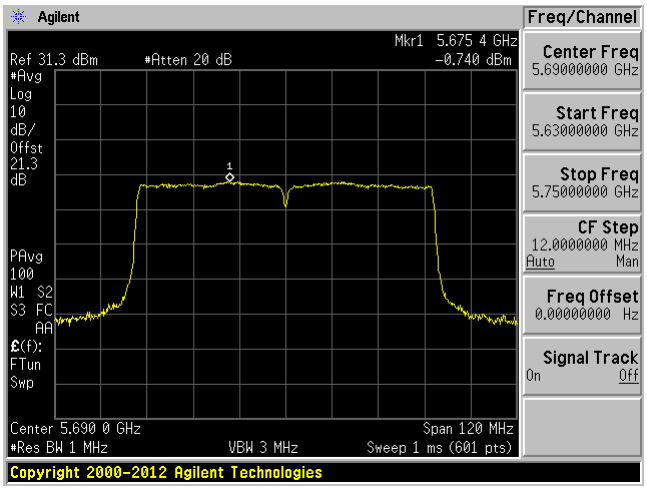
5530 MHz



5610 MHz



5690 MHz



11 Exhibit A - FCC Equipment Labeling Requirements

11.1 FCC ID Label Requirements

As per FCC §2.925,

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

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

Example: FCC ID: XXX123

Where: XXX—Grantee Code, 123—Equipment Product Code

As per FCC §15.19,

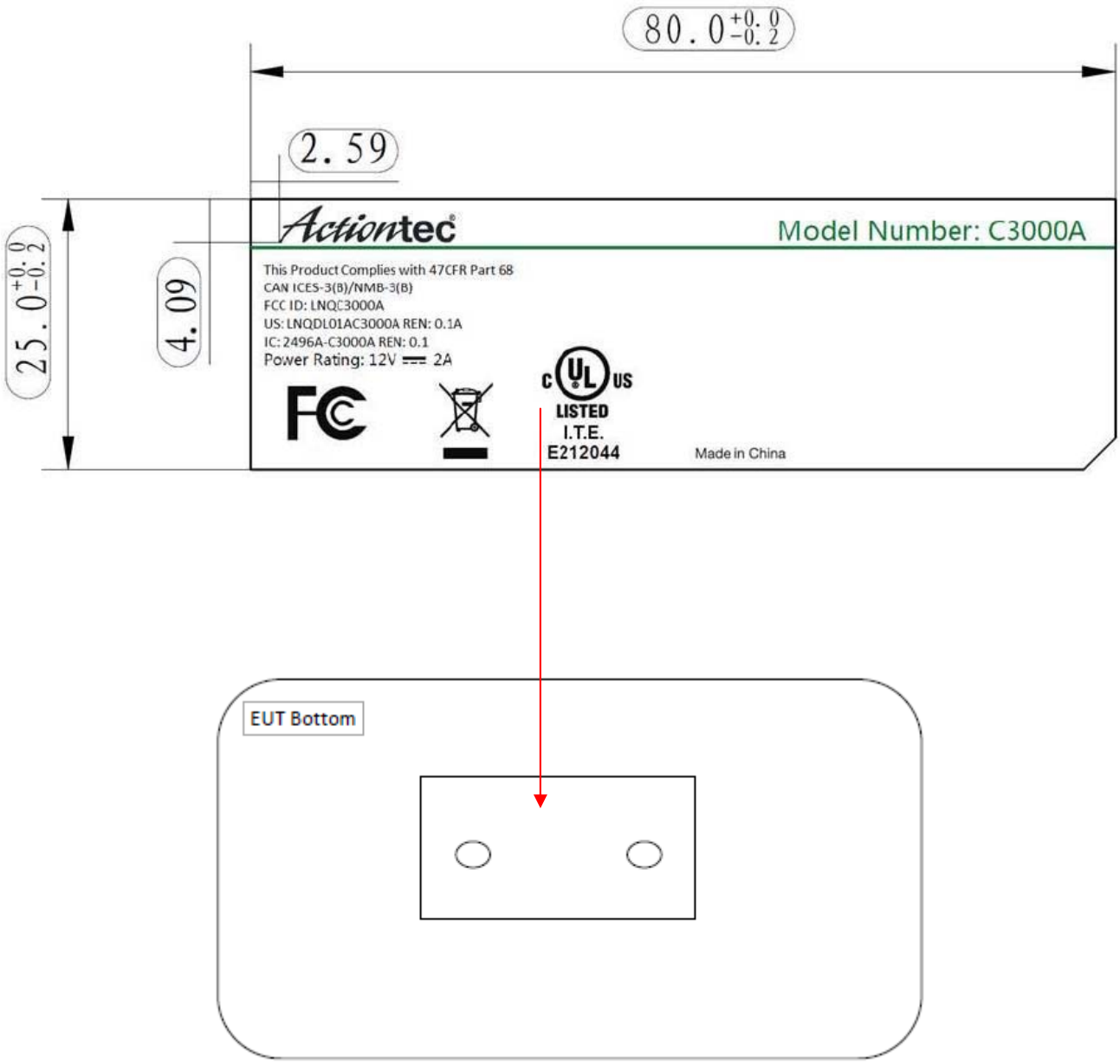
(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or verification shall be labeled as follows:

(3) All other devices shall bear the following statement in a conspicuous location on the device:
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified above is required to be affixed only to the main control unit. If the EUT is integrated within another device then a label affixed to the host shall also state, "Contains FCC ID: XXXXXX"

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

11.2 FCC ID Label Contents and Location



12 Appendix

The following exhibits can be found in R1711062-407 Photo Reports:

- Annex B – EUT Test Setup Photographs

13 Annex A (Informative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of A2LA *R222 - Specific Requirements - EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 30th day of August 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2018

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

--- END OF REPORT ---