FCC PART 15.407, JUNE 2017
ISEDC RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

GoPro, Inc.

3000 Clearview Way,

Santa Clara, CA 95050, USA

FCC ID: CNFSPCH1
IC: 10193A-SPCH1

Report Type:	**Product Type:**
Original Report	Wireless Video Camera

Prepared By:	Vincent Licata Test Engineer
Report Number:	R1704261-407
Report Date:	2017-06-23
Reviewed By:	Jin Yang RF Engineer
	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1704261-407	Original Report	2017-06-23

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *GoPro, Inc.*, and their product model: *SPCH1,* FCC ID: CNFSPCH1, IC: 10193A-SPCH1 or the "EUT" as referred to in this report. It is a Wireless video camera

1.2 Objective

This report is prepared on behalf of GoPro, Inc in accordance with FCC CFR47 §15.407 and ISEDC RSS-247 Issue 2, February2017.

The objective is to determine compliance with FCC Part 15.407 and ISEDC RSS-247 rules for Output Power, Antenna Requirements, AC Line Conducted Emissions, Emission Bandwidth, Power spectral density, Conducted and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment DSS with FCC ID: CNFSPCH1, IC ID: 10193A-SPCH1
FCC Part 15, Subpart C, Equipment DTS with FCC ID: CNFSPCH1, IC ID: 10193A-SPCH1
FCC Part 15, Subpart E, Equipment DTS with FCC ID: CNFSPCH1, IC ID: 10193A-SPCH1

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 v01r04.

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 Efficienct 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 and Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime and 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 and 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: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I and 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 2004/108/EC US-EU EMC and Telecom MRA CAB
  - Radio and Teleterminal Equipment (RandTTE) Directive 1995/5/EC US -EU EMC and Telecom MRA CAB
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I and Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I and 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;
- 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 v01r04.

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 QRCT provided by *GoPro, Inc.,* the software is comply with the standard requirements being tested against.

Please refer to the following power setting table.

Modulation	Channel	Frequency (MHz)	Power Setting
802.11a mode	36	5180	12.0
	40	5200	12.0
	48	5240	12.0
	52	5260	12.0
	56	5280	12.0
	64	5320	12.0
	100	5500	12.0
	116	5580	12.0
	140	5700	12.0
	144	5720	12.0
	149	5745	10.5
	157	5785	10.5
	165	5825	10.5

Modulation	Channel	Frequency (MHz)	Power Setting
802.11n20 mode	36	5180	12.0
	40	5200	12.0
	48	5240	12.0
	52	5260	12.0
	56	5280	12.0
	64	5320	12.0
	100	5500	12.0
	116	5580	12.0
	140	5700	12.0
	144	5720	12.0
	149	5745	10.5
	157	5785	10.5
	165	5825	10.5
802.11n40 mode	38	5190	12.0
	46	5230	12.0
	54	5270	11.5
	62	5310	11.5
	102	5510	11.5
	110	5550	11.5
	134	5670	11.5
	142	5710	11.5
	151	5755	10.5
	159	5795	10.5
802.11ac20 mode	36	5180	12.0
	40	5200	12.0
	48	5240	12.0
	52	5260	12.0
	56	5280	12.0
	64	5320	12.0
	100	5500	12.0
	116	5580	12.0
	140	5700	12.0
	144	5720	12.0
	149	5745	10.5
	157	5785	10.5
	165	5825	10.5

Modulation	Channel	Frequency (MHz)	Power Setting
802.11ac40 mode	38	5190	12.0
	46	5230	12.0
	54	5270	11.5
	62	5310	11.5
	102	5510	11.5
	110	5550	11.5
	134	5670	11.5
	142	5710	11.5
	151	5755	10.5
	159	5795	10.5
802.11ac80 mode	42	5210	11.5
	58	5290	12.0
	106	5530	11.5
	122*	5610	11.5
	138	5690	11.5
	155	5775	10.5

* Note: This is only an FCC channel.

*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 v01r04 section B:

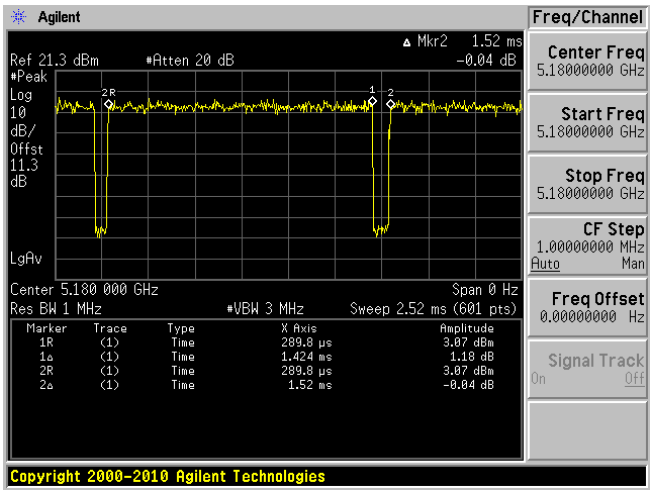
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	1.424	1.52	93.68	0.2835
802.11n20	1.331	1.407	94.60	0.2411
802.11n40	0.630	0.736	85.60	0.6753
802.11ac20	1.34	1.42	94.37	0.2517
802.11ac40	0.6333	0.7433	85.20	0.6956
802.11ac80	0.295	0.305	96.72	0.1448

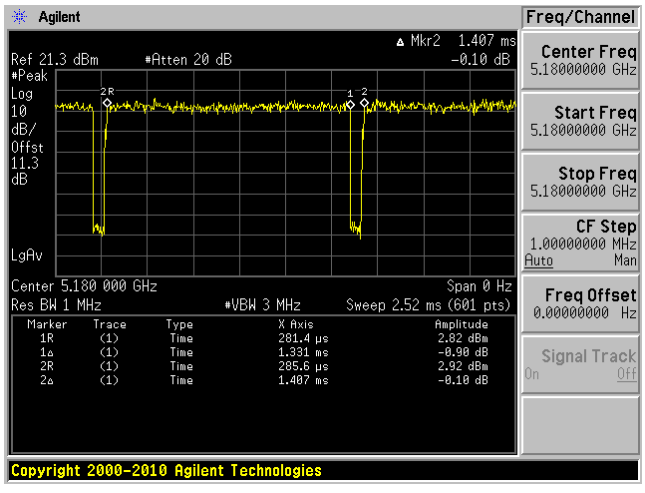
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

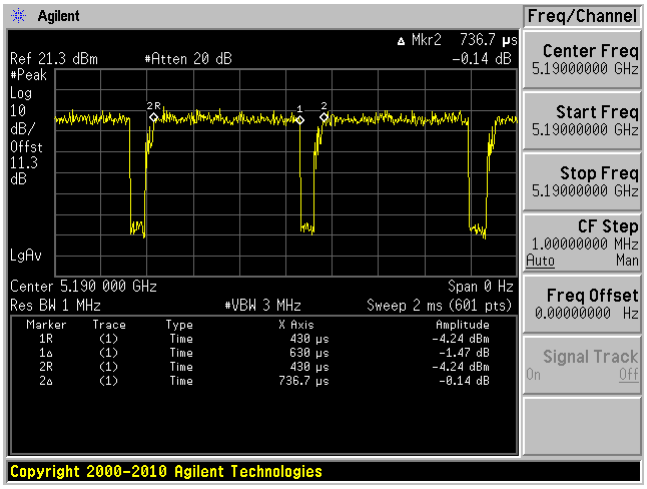
802.11a mode



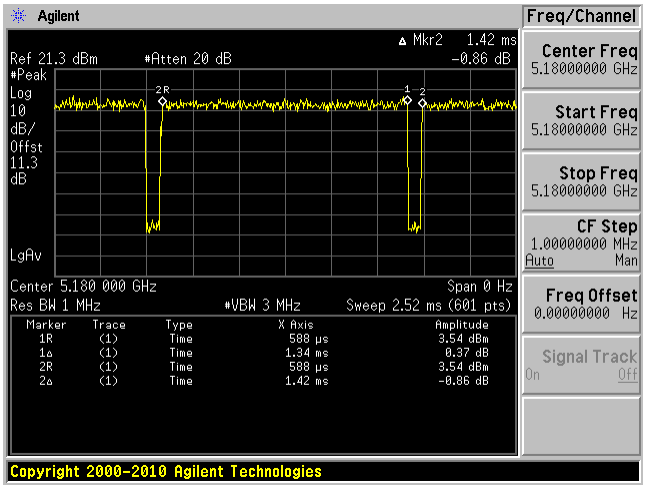
802.11n20 mode



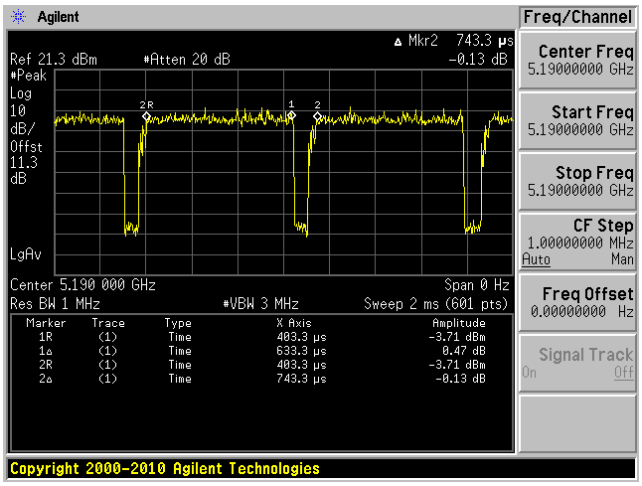
802.11n40 mode



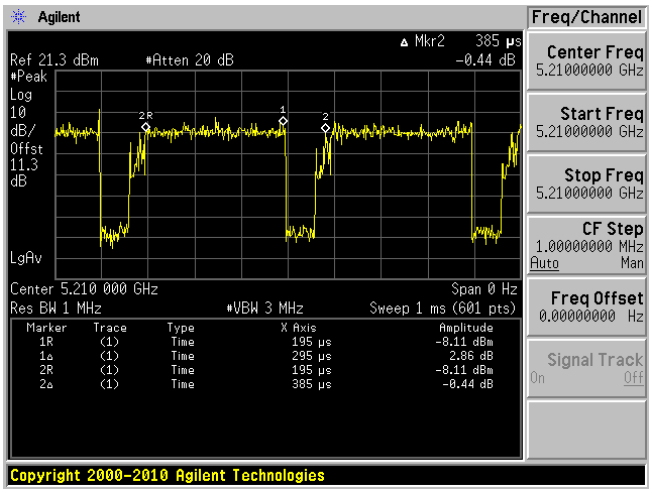
802.11ac20 mode



802.11ac40 mode



802.11ac80 mode



2.4 Equipment Modifications

A hole was cut in the side of the EUT with a RF cable coming out to connect antenna ports to power spectrum analyzer.

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E7450

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
USB Cable	< 1 m	Laptop	EUT
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

FCC and ISEDC Rules	Description of Test	Result
FCC §2.1093, §15.407(f), ISEDC RSS-102	RF Exposure	Compliant[1]
FCC §15.203 ISEDC RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Power Line Conducted Emissions	Compliant
FCC §2.1053, §15.205, §15.209, 15.407(b) ISEDC RSS-247 §6.2	Spurious Radiated Emissions	Compliant
FCC §15.407(e) ISEDC RSS-Gen §6.2	Emission Bandwidth	Compliant
FCC §407(a) ISEDC RSS-247 §6.2	Output Power	Compliant
FCC §2.1051, §15.407(b) ISEDC RSS-247 §6.2	Band Edges	Compliant
FCC §15.407(a) ISEDC RSS-247 §6.2	Power Spectral Density	Compliant
FCC §2.1051, §15.407(b) ISEDC RSS-247 §6.2	Spurious Emissions at Antenna Terminals	Compliant
FCC §15.407(h) ISEDC RSS-247 §6.3	Dynamic Frequency Selection (DFS)	Compliant[2]

Note[1]: RF exposure analysis is recorded in a separate report.
Note[2]: DFS measurement is recorded in a separate report.

4 FCC §2.1093, §15.407(f) & ISEDC RSS-102 - RF Exposure

4.1 Applicable Standard

FCC §2.1093, §15.407(f) and ISEDC RSS-102

4.2 Test Results

Please refer to the SAR Report: R1704261- SAR.

5 FCC §15.203 & ISEDC RSS-Gen §8.3 - 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 §15.247 (b) (4), 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.

According to ISEDC RSS-Gen §8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the license-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

License-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotopically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the license-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of license-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. 9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

5.2 Antenna List

The antennas used by the EUT are permanent attached antennas.

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Wi-Fi/Bluetooth	2400-2500	-1.0
Wi-Fi	5180-5720	4.5
Wi-Fi	5745-5825	3.0

6 FCC §15.207 & ISEDC RSS-Gen §8.8 - AC Power Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and ISEDC RSS GEN §8.8

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 and and ISEDC RSS GEN §8.8.

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.

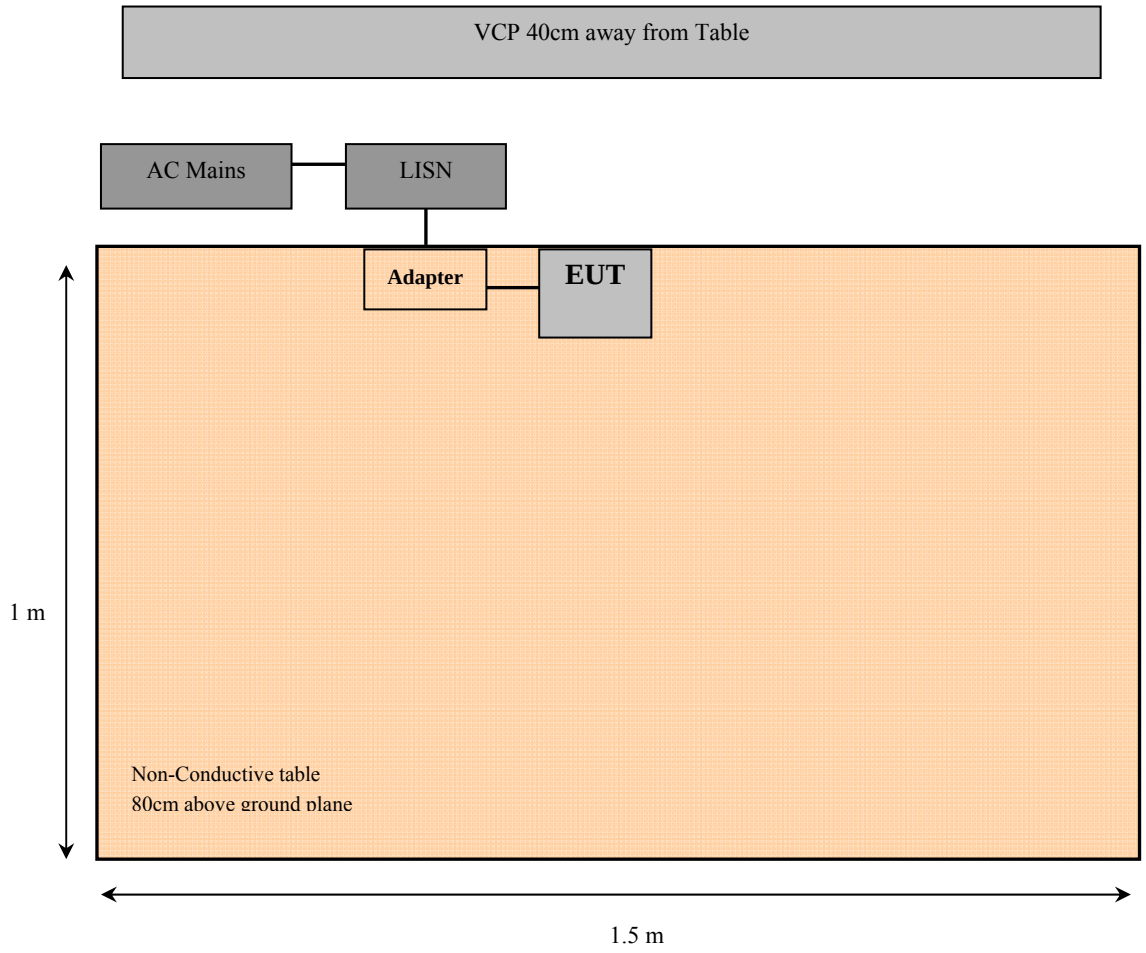
6.3 Test Procedure

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	2016-07-22	1 year
Keysight Technologies	RF Limiter	11867A	MY42242931	2017-01-12	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 calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.7 Test Environmental Conditions

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

The testing was performed by Vincent Licata on 2017-05-24 at chamber 5m 3 test site.

6.8 Summary of Test Results

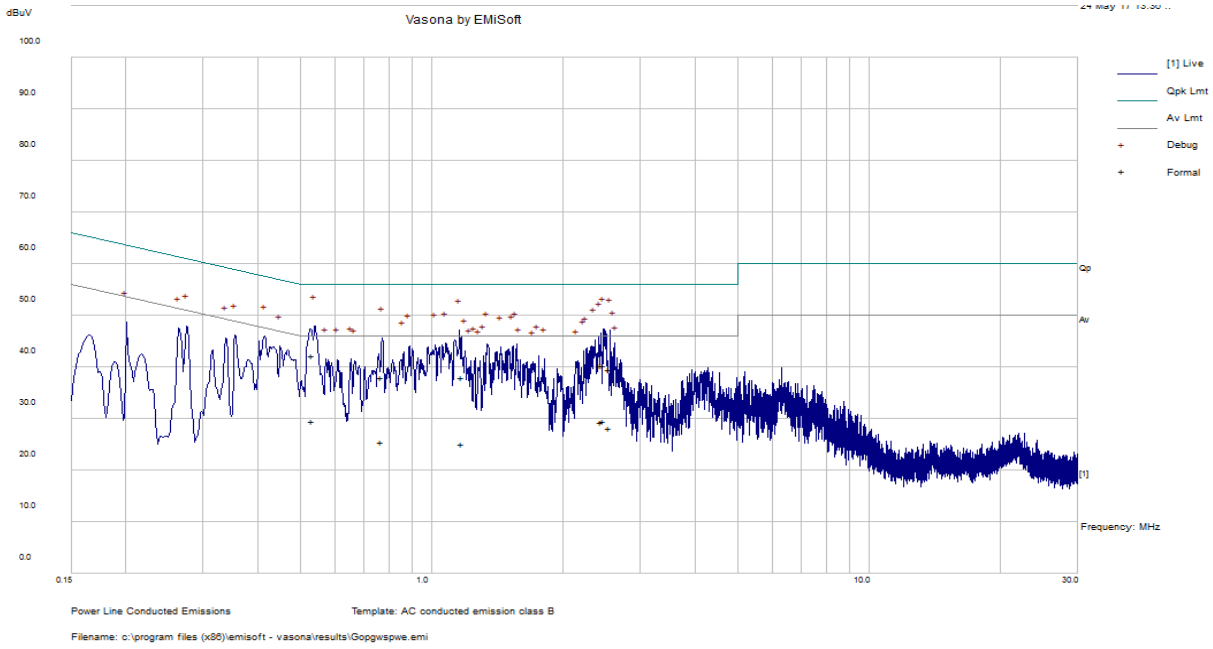
According to the recorded data in following table, the EUT complied with the FCC Part 15 and RSS-Gen standards' conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-13.68	0.53206	Live	0.15-30

6.9 Conducted Emissions Test Plots and Data

Note: testing was prefromed at worst case.

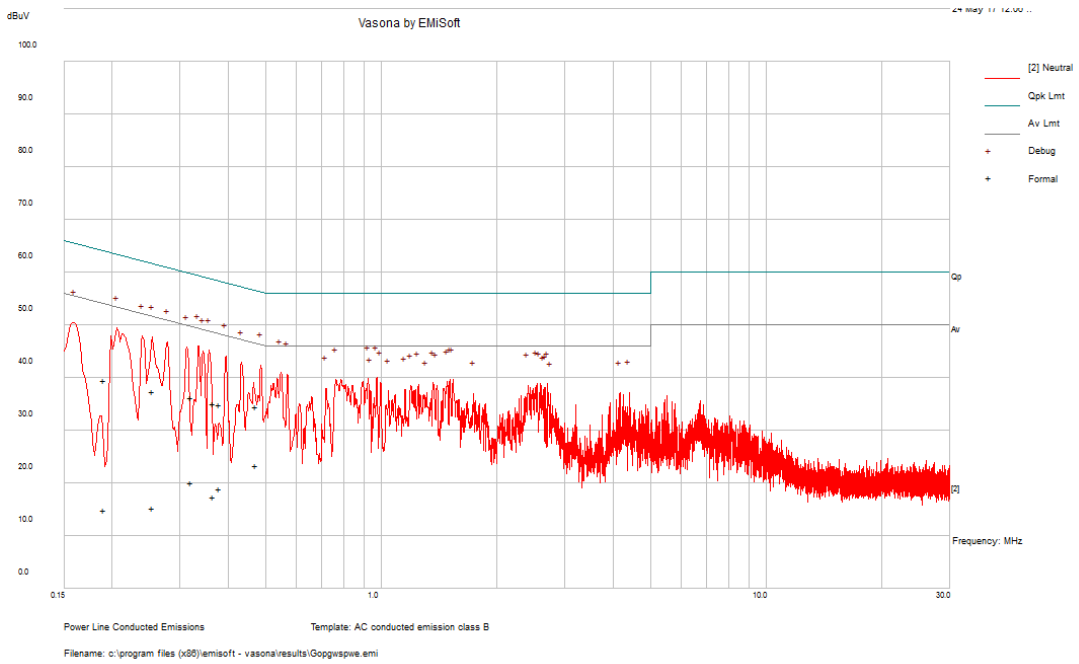
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.53206	42.32	Line	56	**-13.68**	QP
2.47415	40.26	Line	56	-15.74	QP
2.55128	39.56	Line	56	-16.44	QP
1.171878	38.02	Line	56	-17.98	QP
2.436558	40.38	Line	56	-15.62	QP
0.765344	38.04	Line	56	-17.96	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.53206	29.63	Line	46	-16.37	Ave.
2.47415	29.6	Line	46	-16.4	Ave.
2.55128	28.12	Line	46	-17.88	Ave.
1.171878	25.15	Line	46	-20.85	Ave.
2.436558	29.37	Line	46	-16.63	Ave.
0.765344	25.46	Line	46	-20.54	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.321455	36.37	Neutral	59.67	-23.3	QP
0.367205	35.14	Neutral	58.56	-23.43	QP
0.380377	34.9	Neutral	58.27	-23.37	QP
0.47175	34.56	Neutral	56.48	-21.92	QP
0.190629	39.46	Neutral	64.01	-24.55	QP
0.255098	37.52	Neutral	61.59	-24.07	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.321455	20.18	Neutral	49.67	-29.49	Ave.
0.367205	17.41	Neutral	48.56	-31.15	Ave.
0.380377	19.06	Neutral	48.27	-29.21	Ave.
0.47175	23.49	Neutral	46.48	-22.99	Ave.
0.190629	14.99	Neutral	54.01	-39.02	Ave.
0.255098	15.42	Neutral	51.59	-36.17	Ave.

7 FCC §15.209, §15.407(b) & ISEDC RSS-247 §6.2 - 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.

As per ISEDC RSS-247 §6.2

For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250- 5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250-5350 MHz

For devices with both operating frequencies and channel bandwidths contained within the band 5250-5350 MHz, the device shall comply with the following:

1. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. if the equipment is intended for outdoor use; or
2. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of Section 6.2.1. The device shall be labelled “for indoor use only.”

For devices with operating frequencies in the band 5250-5350 MHz but having a channel bandwidth that overlaps the band 5150-5250 MHz, the devices’ unwanted emission shall not exceed -27 dBm/MHz e.i.r.p. outside the band 5150-5350 MHz and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device shall be labelled “for indoor use only.”

For transmitters operating in the band 5470-5725 MHz, emissions outside the band shall not exceed -27 dBm/MHz e.i.r.p.

For the band 5725-5850 MHz, emissions at frequencies from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p. For emissions at frequencies more than 10 MHz above or below the band edges, the emissions power shall not exceed -27 dBm/MHz.

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 and ISEDC RSS-247 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	E4440A	US44300386	2016-06-10	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	2 years
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 years
Agilent	Amplifier, Pre	8447D	2944A06639	2016-06-28	1 year
IW	AOBOR Hi frequency Co AX Cable	DC 1531	KPS-1501A3960KPS	2016-08-05	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	3008A01978	2016-10-06	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
A.R.A.	Antenna, Horn	DRG-118/A	1132	2015-09-21	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 *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

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 and Jose Martinez 2017-05-12 to 2017-05-14 in 5m chamber 3.

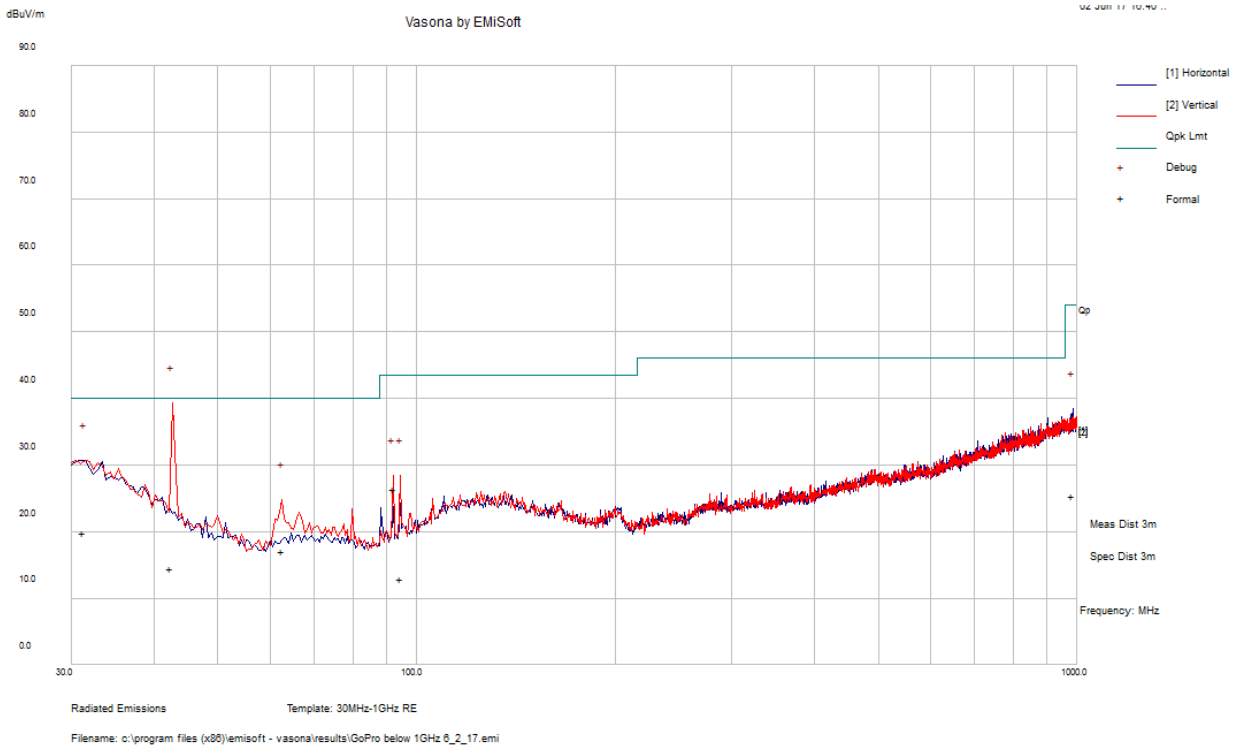
7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.407 and RSS-247 standards' radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.28	5150	Horizontal	802.11ac40 mode, 5190 MHz

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.)
42.38425	14.46	115	V	9	40	-25.54	QP
31.325	19.88	197	V	251	40	-20.12	QP
92.32175	26.41	101	V	260	43.5	-17.09	QP
94.4335	12.87	283	V	269	43.5	-30.63	QP
62.52325	17.02	123	V	168	40	-22.98	QP
985.6175	25.37	282	H	50	54	-28.63	QP

2) 1–40 GHz

5150 - 5250 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/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5180	70.51	85	100	H	33.61	6.88	0.00	111.00	-	-	PK
5180	62.08	82	100	H	33.61	6.88	0.00	102.57	-	-	AV
5180	64.38	82	100	V	33.61	6.88	0.00	104.87	-	-	PK
5180	55.36	81	100	V	33.61	6.88	0.00	95.85	-	-	AV
5150	69.72	78	100	H	33.61	7.46	38.54	72.25	74.00	-1.75	PK
5150	46.89	80	100	H	33.61	7.46	38.54	49.42	54.00	-4.58	AV
10360	35.40	215	100	H	38.25	15.95	38.33	51.27	54.00	-2.73	AV
10360	35.50	257	210	V	38.25	15.95	38.33	51.37	54.00	-2.63	AV
15540	45.68	121	100	H	39.41	14.47	36.99	62.57	74.00	-11.43	PK
15540	33.98	175	100	H	39.41	14.47	36.99	50.87	54.00	-3.13	AV
15540	46.23	296	115	V	39.41	14.47	36.99	63.12	74.00	-10.88	PK
15540	34.54	268	100	V	39.41	14.47	36.99	51.43	54.00	-2.57	AV
Middle Channel 5200 MHz											
5200	72.65	80	110	H	33.61	6.88	0.00	113.14	-	-	PK
5200	65.04	82	102	H	33.61	6.88	0.00	105.53	-	-	AV
5200	67.42	68	109	V	33.61	6.88	0.00	107.91	-	-	PK
5200	59.71	68	109	V	33.61	6.88	0.00	100.20	-	-	AV
10400	46.90	290	100	H	38.25	14.04	38.21	60.98	74.00	-13.02	PK
10400	34.97	360	100	H	38.25	14.04	38.21	49.05	54.00	-4.95	AV
10400	46.81	0	115	V	38.25	16.11	38.21	62.96	74.00	-11.04	PK
10400	34.74	291	100	V	38.25	16.11	38.21	50.89	54.00	-3.11	AV
15600	46.44	0	115	H	39.41	14.98	36.99	63.84	74.00	-10.16	PK
15600	34.37	0	100	H	39.41	14.98	36.99	51.77	54.00	-2.23	AV
15600	46.18	348	100	V	39.41	14.98	36.99	63.58	74.00	-10.42	PK
15600	34.98	52	100	V	39.41	14.98	36.99	52.38	54.00	-1.62	AV
High Channel 5240 MHz											
5240	71.47	77	130	H	33.61	8.35	0.00	113.43	-	-	PK
5240	62.73	77	130	H	33.61	8.35	0.00	104.69	-	-	AV
5240	66.13	77	118	V	33.61	8.35	0.00	108.09	-	-	PK
5240	58.49	77	118	V	33.61	8.35	0.00	100.45	-	-	AV
10480	35.43	324	100	H	38.33	13.74	38.21	49.29	54.00	-4.71	AV
10480	35.58	0	100	V	38.33	13.74	38.21	49.44	54.00	-4.56	AV
15720	47.53	65	100	H	38.91	14.48	38.99	61.93	74.00	-12.07	PK
15720	35.83	235	100	H	38.91	14.48	38.99	50.23	54.00	-3.77	AV
15720	47.84	20	105	V	38.91	14.48	38.99	62.24	74.00	-11.76	PK
15720	35.65	328	100	V	38.91	14.48	38.99	50.05	54.00	-3.95	AV

802.11 ac40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5190 MHz											
5190	61.31	84	100	H	33.61	8.35	0.00	103.27	-	-	PK
5190	53.68	81	127	H	33.61	8.35	0.00	95.64	-	-	AV
5190	54.93	65	100	V	33.61	8.35	0.00	96.89	-	-	PK
5190	46.92	65	100	V	33.61	8.35	0.00	88.88	-	-	AV
5150	68.30	81	100	H	33.61	9.36	38.54	72.73	74.00	-1.27	PK
5150	49.29	80	120	H	33.61	9.36	38.54	53.72	54.00	**-0.28**	AV
5150	63.64	66	249	V	33.61	9.36	38.54	68.07	74.00	-5.93	PK
5150	43.11	63	140	V	33.61	9.36	38.54	47.54	54.00	-6.46	AV
10380	46.77	80	100	H	38.25	15.95	38.33	62.64	74.00	-11.36	PK
10380	34.88	0	100	H	38.25	15.95	38.33	50.75	54.00	-3.25	AV
10380	46.47	170	100	V	38.25	15.95	38.33	62.34	74.00	-11.66	PK
10380	35.05	130	100	V	38.25	15.95	38.33	50.92	54.00	-3.08	AV
High Channel 5230 MHz											
5230	67.63	86	100	H	33.61	8.35	0.00	109.59	-	-	PK
5230	57.56	86	110	H	33.61	8.35	0.00	99.52	-	-	AV
5230	61.70	86	100	V	33.61	8.35	0.00	103.66	-	-	PK
5230	52.21	86	100	V	33.61	8.35	0.00	94.17	-	-	AV
10460	46.00	313	100	H	38.33	15.98	38.21	62.10	74.00	-11.90	PK
10460	34.01	335	100	H	38.33	15.98	38.21	50.11	54.00	-3.89	AV
10460	46.00	180	100	V	38.33	15.98	38.21	62.10	74.00	-11.90	PK
10460	33.88	150	300	V	38.33	15.98	38.21	49.98	54.00	-4.02	AV

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5210 MHz											
5210	63.28	76	130	H	33.61	8.35	0.00	105.24	-	-	PK
5210	53.04	76	130	H	33.61	8.35	0.00	95.00	-	-	AV
5210	57.15	63	280	V	33.61	8.35	0.00	99.11	-	-	PK
5210	48.35	63	280	V	33.61	8.35	0.00	90.31	-	-	AV
5150	61.47	94	107	H	33.49	9.36	38.54	65.78	74.00	-8.22	PK
5150	46.34	90	100	H	33.49	9.36	38.54	50.65	54.00	-3.35	AV
10420	46.15	295	100	H	38.25	16.12	38.21	62.31	74.00	-11.69	PK
10420	34.31	116	100	H	38.25	16.12	38.21	50.47	54.00	-3.53	AV
10420	45.47	160	100	V	38.25	16.12	38.21	61.63	74.00	-12.37	PK
10420	34.26	180	120	V	38.25	16.12	38.21	50.42	54.00	-3.58	AV

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/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5260 MHz											
5260	72.40	81	130	H	33.48	7.00	0.00	112.88	-	-	PK
5260	64.48	82	100	H	33.48	7.00	0.00	104.96	-	-	AV
5260	67.26	67	118	V	33.48	7.00	0.00	107.74	-	-	PK
5260	59.86	67	140	V	33.48	7.00	0.00	100.34	-	-	AV
10520	47.34	325	100	H	38.33	13.76	38.21	61.22	74.00	-12.78	PK
10520	36.60	170	100	H	38.33	13.76	38.21	50.48	54.00	-3.52	AV
10520	47.55	325	100	V	38.33	13.76	38.21	61.43	74.00	-12.57	PK
10520	36.89	65	180	V	38.33	13.76	38.21	50.77	54.00	-3.23	AV
15780	46.91	210	100	H	38.71	14.48	36.99	63.11	74.00	-10.89	PK
15780	35.70	318	100	H	38.71	14.48	36.99	51.90	54.00	-2.10	AV
15780	47.03	43	165	V	38.71	14.48	36.99	63.23	74.00	-10.77	PK
15780	35.78	325	100	V	38.71	14.48	36.99	51.98	54.00	-2.02	AV
Middle Channel 5280 MHz											
5280	72.30	77	100	H	33.48	8.46	0.00	114.24	-	-	PK
5280	63.73	77	100	H	33.48	8.46	0.00	105.67	-	-	AV
5280	67.73	77	100	V	33.48	8.46	0.00	109.67	-	-	PK
5280	60.45	77	100	V	33.48	8.46	0.00	102.39	-	-	AV
10560	46.78	341	100	H	38.26	13.64	38.21	60.47	74.00	-13.53	PK
10560	36.69	315	100	H	38.26	13.64	38.21	50.38	54.00	-3.62	AV
10560	47.50	30	100	V	38.26	13.64	38.21	61.19	74.00	-12.81	PK
10560	36.02	346	100	V	38.26	13.64	38.21	49.71	54.00	-4.29	AV
High Channel 5320 MHz											
5320	67.11	70	100	H	33.48	8.46	0.00	109.05	-	-	PK
5320	60.76	70	168	H	33.48	8.46	0.00	102.70	-	-	AV
5320	60.60	70	116	V	33.48	8.46	0.00	102.54	-	-	PK
5320	53.43	70	115	V	33.48	8.46	0.00	95.38	-	-	AV
5350	60.32	70	100	H	33.48	9.67	38.54	64.93	74.00	-9.07	PK
5350	48.12	70	190	H	33.48	9.67	38.54	52.73	54.00	-1.27	AV
5350	56.98	70	115	V	33.48	9.67	38.54	61.59	74.00	-12.41	PK
5350	42.11	70	130	V	33.48	9.67	38.54	46.72	54.00	-7.28	AV
10640	45.56	84	100	H	38.22	16.32	38.21	61.89	74.00	-12.11	PK
10640	35.98	80	100	H	38.22	16.32	38.21	52.31	54.00	-1.69	AV
10640	44.47	137	100	V	38.22	16.32	38.21	60.80	74.00	-13.20	PK
10640	35.80	0	100	V	38.22	16.32	38.21	52.13	54.00	-1.87	AV

802.11ac40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5270 MHz											
5270	66.91	86	100	H	33.48	8.46	0.00	108.85	-	-	PK
5270	58.34	86	120	H	33.48	8.46	0.00	100.28	-	-	AV
5270	60.21	86	100	V	33.48	8.46	0.00	102.15	-	-	PK
5270	52.61	86	100	V	33.48	8.46	0.00	94.55	-	-	AV
10540	46.92	80	140	H	38.33	15.95	38.21	62.99	74.00	-11.01	PK
10540	35.82	290	300	H	38.33	15.95	38.21	51.89	54.00	-2.11	AV
10540	46.93	83	115	V	38.33	15.95	38.21	63.00	74.00	-11.00	PK
10540	35.69	65	100	V	38.33	15.95	38.21	51.76	54.00	-2.24	AV
High Channel 5310 MHz											
5310	65.53	73	160	H	33.48	8.46	0.00	107.47	-	-	PK
5310	56.57	73	160	H	33.48	8.46	0.00	98.51	-	-	AV
5310	59.01	61	260	V	33.48	8.46	0.00	100.95	-	-	PK
5310	50.71	61	260	V	33.48	8.46	0.00	92.65	-	-	AV
5350	64.46	83	100	H	33.58	9.67	38.54	69.17	74.00	-4.83	PK
5350	43.87	85	130	H	33.58	9.67	38.54	48.58	54.00	-5.42	AV
5350	57.39	65	280	V	33.58	9.67	38.54	62.10	74.00	-11.90	PK
5350	37.86	66	100	V	33.58	9.67	38.54	42.57	54.00	-11.43	AV
10620	46.74	85	100	H	38.26	16.32	38.21	63.11	74.00	-10.89	PK
10620	34.58	85	100	H	38.26	16.32	38.21	50.95	54.00	-3.05	AV
10620	45.80	65	100	V	38.26	16.32	38.21	62.17	74.00	-11.83	PK
10620	34.71	65	100	V	38.26	16.32	38.21	51.08	54.00	-2.92	AV

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5290 MHz											
5290	65.69	75	130	H	33.48	7.00	0.00	106.17	-	-	PK
5290	54.05	75	130	H	33.48	7.00	0.00	94.53	-	-	AV
5290	59.19	75	250	V	33.48	7.00	0.00	99.67	-	-	PK
5290	49.01	75	250	V	33.48	7.00	0.00	89.49	-	-	AV
5350	62.15	80	106	H	33.48	9.67	38.33	66.97	74.00	-7.03	PK
5350	48.41	80	106	H	33.48	9.67	38.33	53.23	54.00	-0.77	AV
10580	46.50	312	100	H	38.26	15.87	38.21	62.42	74.00	-11.58	PK
10580	35.45	342	100	H	38.26	15.87	38.21	51.37	54.00	-2.63	AV
10580	46.32	310	120	V	38.26	15.87	38.21	62.24	74.00	-11.76	PK
10580	35.42	100	120	V	38.26	15.87	38.21	51.34	54.00	-2.66	AV

5470 - 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/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5500 MHz											
5500	66.94	120	82	H	33.85	7.29	0.00	108.08	-	-	PK
5500	58.86	115	79	H	33.85	7.29	0.00	100.00	-	-	AV
5500	61.87	150	62	V	33.85	7.29	0.00	103.01	-	-	PK
5500	53.84	150	61	V	33.85	7.29	0.00	94.98	-	-	AV
5470	65.59	80	120	H	33.85	8.29	38.33	69.40	74.00	-4.60	PK
5470	45.08	78	120	H	33.85	8.29	38.33	48.89	54.00	-5.11	AV
11000	45.95	20	100	V	38.28	14.60	38.07	60.76	74.00	-13.24	PK
11000	34.12	80	100	V	38.28	14.60	38.07	48.93	54.00	-5.07	AV
11000	45.55	65	100	H	38.28	14.60	38.07	60.36	74.00	-13.64	PK
11000	34.09	75	100	H	38.28	14.60	38.07	48.90	54.00	-5.10	AV
Middle Channel 5580 MHz											
5580	69.90	77	100	H	33.92	7.29	0.00	111.11	-	-	PK
5580	60.96	77	100	H	33.92	7.29	0.00	102.17	-	-	AV
5580	64.14	76	106	V	33.92	7.29	0.00	105.35	-	-	PK
5580	56.07	77	100	V	33.92	7.29	0.00	97.28	-	-	AV
11160	46.18	0	100	H	38.53	14.74	38.07	61.38	74.00	-12.62	PK
11160	34.29	0	0	H	38.53	14.74	38.07	49.49	54.00	-4.51	AV
11160	45.86	0	150	V	38.53	14.74	38.07	61.06	74.00	-12.94	PK
11160	34.18	0	275	V	38.53	14.74	38.07	49.38	54.00	-4.62	AV
5700 MHz											
5700	69.98	76	128	H	33.87	6.88	0.00	110.73	-	-	PK
5700	61.39	76	126	H	33.87	6.88	0.00	102.14	-	-	AV
5700	60.84	80	200	V	33.87	6.88	0.00	101.59	-	-	PK
5700	56.69	80	200	V	33.87	6.88	0.00	97.44	-	-	AV
5725	67.09	80	120	H	33.87	8.04	38.33	70.67	74.00	-3.33	PK
5725	45.88	80	120	H	33.87	8.04	38.33	49.46	54.00	-4.54	AV
11400	45.75	300	100	V	38.50	15.60	38.07	61.78	74.00	-12.22	PK
11400	34.04	172	250	V	38.50	15.60	38.07	50.07	54.00	-3.93	AV
11400	45.40	315	100	H	38.50	15.60	38.07	61.43	74.00	-12.57	PK
11400	34.17	339	115	H	38.50	15.60	38.07	50.20	54.00	-3.80	AV

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5720 MHz											
5720	69.34	77	100	H	33.87	8.87	0.00	112.08	-	-	PK
5720	60.77	77	100	H	33.87	8.87	0.00	103.51	-	-	AV
5720	63.24	77	100	V	33.87	8.87	0.00	105.98	-	-	PK
5720	54.30	77	100	V	33.87	8.87	0.00	97.04	-	-	AV
11440	44.96	0	295	H	38.50	16.13	37.80	61.79	74.00	-12.21	PK
11440	33.39	305	100	H	38.50	16.13	37.80	50.22	54.00	-3.78	AV
11440	44.88	346	100	V	38.50	16.13	37.80	61.71	74.00	-12.29	PK
11440	33.06	251	100	V	38.50	16.13	37.80	49.89	54.00	-4.11	AV

802.11ac40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5510 MHz											
5510	65.02	74	170	H	33.85	8.72	0.00	107.59	-	-	PK
5510	56.59	74	170	H	33.85	8.72	0.00	99.16	-	-	AV
5510	55.66	61	280	V	33.85	8.72	0.00	98.23	-	-	PK
5510	47.45	61	280	V	33.85	8.72	0.00	90.02	-	-	AV
5470	67.52	80	100	H	33.85	9.55	38.33	72.59	74.00	-1.41	PK
5470	47.84	85	100	H	33.85	9.55	38.33	52.91	54.00	-1.09	AV
11020	47.26	80	100	H	38.28	16.49	38.07	63.96	74.00	-10.04	PK
11020	36.78	83	100	H	38.28	16.49	38.07	53.48	54.00	-0.52	AV
11020	45.73	0	100	V	38.28	16.49	38.07	62.43	74.00	-11.57	PK
11020	35.02	0	100	V	38.28	16.49	38.07	51.72	54.00	-2.28	AV
Middle Channel 5550 MHz											
5550	64.15	0	100	H	33.87	8.81	0.00	106.83	-	-	PK
5550	55.04	80	115	H	33.87	8.81	0.00	97.72	-	-	AV
5550	57.08	269	100	V	33.87	8.81	0.00	99.76	-	-	PK
5550	48.01	63	150	V	33.87	8.81	0.00	90.69	-	-	AV
11100	47.28	60	100	H	38.37	16.63	38.07	64.21	74.00	-9.79	PK
11100	35.75	119	100	H	38.37	16.63	38.07	52.68	54.00	-1.32	AV
11100	46.84	249	100	V	38.37	16.63	38.07	63.77	74.00	-10.23	PK
11100	35.74	145	100	V	38.37	16.63	38.07	52.67	54.00	-1.33	AV
5670 MHz											
5670	63.89	76	160	H	33.87	8.87	0.00	106.63	-	-	PK
5670	56.22	76	160	H	33.87	8.87	0.00	98.96	-	-	AV
5670	54.42	62	280	V	33.87	8.87	0.00	97.16	-	-	PK
5670	46.42	62	280	V	33.87	8.87	0.00	89.16	-	-	AV
5725	61.07	0	100	H	33.91	8.87	38.33	65.52	74.00	-8.48	PK
5725	41.38	0	100	H	33.91	8.87	38.33	45.83	54.00	-8.17	AV
11340	46.06	120	100	H	38.57	17.00	38.07	63.56	74.00	-10.44	PK
11340	34.34	311	100	H	38.57	17.00	38.07	51.84	54.00	-2.16	AV
11340	45.97	330	100	V	38.57	17.00	38.07	63.47	74.00	-10.53	PK

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5710 MHz											
5710	63.71	88	120	H	33.87	8.87	0.00	106.45	-	-	PK
5710	54.31	88	120	H	33.87	8.87	0.00	97.05	-	-	AV
5710	55.74	193	100	V	33.87	8.87	0.00	98.48	-	-	PK
5710	44.71	193	100	V	33.87	8.87	0.00	87.45	-	-	AV
11420	46.15	208	130	V	38.50	17.12	37.80	63.97	74.00	-10.03	PK
11420	34.40	0	168	V	38.50	17.12	37.80	52.22	54.00	-1.78	AV
11420	46.13	4	100	H	38.50	17.12	37.80	63.95	74.00	-10.05	PK
11420	34.49	40	100	H	38.50	17.12	37.80	52.31	54.00	-1.69	AV

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5530 MHz											
5530	66.17	78	120	H	33.87	7.29	0.00	107.33	-	-	PK
5530	54.32	78	120	H	33.87	7.29	0.00	95.48	-	-	AV
5530	55.55	78	240	V	33.87	7.29	0.00	96.71	-	-	PK
5530	45.09	78	240	V	33.87	7.29	0.00	86.25	-	-	AV
5470	62.56	80	100	H	33.67	9.55	38.33	67.45	74.00	-6.55	PK
5470	45.89	78	100	H	33.67	9.55	38.33	50.78	54.00	-3.22	AV
11060	46.71	81	100	H	38.35	16.63	38.07	63.62	74.00	-10.38	PK
11060	35.42	263	169	H	38.35	16.63	38.07	52.33	54.00	-1.67	AV
11060	46.62	333	100	V	38.35	16.63	38.07	63.53	74.00	-10.47	PK
11060	35.64	181	100	V	38.35	16.63	38.07	52.55	54.00	-1.45	AV
Middle Channel: 5610 MHz											
5610	65.30	78	100	H	33.92	7.06	0.00	106.28	-	-	PK
5610	54.12	78	100	H	33.92	7.06	0.00	95.10	-	-	AV
5610	55.81	77	290	V	33.92	7.06	0.00	96.79	-	-	PK
5610	44.95	77	290	V	33.92	7.06	0.00	85.93	-	-	AV
5725	55.98	80	100	H	33.91	8.04	38.33	59.60	74.00	-14.40	PK
5725	41.86	80	100	H	33.91	8.04	38.33	45.48	54.00	-8.52	AV
11220	45.76	124	100	H	38.53	14.82	38.07	61.04	74.00	-12.96	PK
11220	34.72	244	100	H	38.53	14.82	38.07	50.00	54.00	-4.00	AV
11220	45.35	112	213	V	38.53	14.82	38.07	60.63	74.00	-13.37	PK
11220	34.82	274	100	V	38.53	14.82	38.07	50.10	54.00	-3.90	AV
High Channel: 5690 MHz											
5690	65.41	78	100	H	33.92	7.06	0.00	106.39	-	-	PK
5690	54.02	78	100	H	33.92	7.06	0.00	95.00	-	-	AV
5690	53.95	230	100	V	33.92	7.06	0.00	94.93	-	-	PK
5690	43.33	230	100	V	33.92	7.06	0.00	84.31	-	-	AV
11380	45.17	244	100	H	38.50	14.93	37.80	60.80	74.00	-13.20	PK
11380	34.07	343	100	H	38.50	14.93	37.80	49.70	54.00	-4.30	AV
11380	45.24	180	100	V	38.50	14.93	37.80	60.87	74.00	-13.13	PK
11380	34.74	200	100	V	38.50	14.93	37.80	50.37	54.00	-3.63	AV

5725 - 5850 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/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
5745	65.18	77	100	H	33.89	8.87	0.00	107.94	-	-	PK
5745	56.15	77	100	H	33.89	8.87	0.00	98.91	-	-	AV
5745	59.63	77	100	V	33.89	8.87	0.00	102.39	-	-	PK
5745	50.72	77	100	V	33.89	8.87	0.00	93.48	-	-	AV
5725	47.29	30	250	H	33.89	8.87	38.33	51.72	122.26	-70.54	PK
5650	45.99	0	100	H	33.87	10.03	38.33	51.56	74.00	-22.44	PK
5650	35.07	0	100	H	33.87	10.03	38.33	40.64	54.00	-13.36	AV
11490	45.25	80	100	H	38.96	17.14	37.80	63.55	74.00	-10.45	PK
11490	33.78	80	100	H	38.96	17.14	37.80	52.08	54.00	-1.92	AV
Middle Channel 5785 MHz											
5785	65.12	77	100	H	33.86	8.88	0.00	107.86	-	-	PK
5785	55.89	77	125	H	33.86	8.88	0.00	98.63	-	-	AV
5785	61.08	76	200	V	33.86	8.88	0.00	103.82	-	-	PK
5785	52.12	76	220	V	33.86	8.88	0.00	94.86	-	-	AV
11570	46.41	97	100	H	39.10	16.99	37.80	64.70	74.00	-9.30	PK
11570	34.05	75	100	H	39.10	16.99	37.80	52.34	54.00	-1.66	AV
High Channel 5825 MHz											
5825	63.91	6	100	H	33.86	8.88	0.00	106.65	-	-	PK
5825	55.43	6	100	H	33.86	8.88	0.00	98.17	-	-	AV
5825	59.96	76	220	V	33.86	8.88	0.00	102.70	-	-	PK
5825	51.83	76	220	V	33.86	8.88	0.00	94.57	-	-	AV
5850	58.58	130	100	H	34.22	10.24	38.33	64.71	122.26	-57.55	PK
5925	47.10	85	100	H	34.22	10.24	38.33	53.23	74.00	-20.77	PK
5925	34.83	85	100	H	34.22	10.24	38.33	40.96	54.00	-13.04	AV
11650	46.29	0	100	H	39.33	16.06	37.80	63.88	74.00	-10.12	PK
11650	35.12	0	100	H	39.33	16.06	37.80	52.71	54.00	-1.29	AV

802.11ac40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5755 MHz											
5755	62.46	80	100	H	33.91	8.88	0.00	105.25	-	-	PK
5755	53.73	80	100	H	33.91	8.88	0.00	96.52	-	-	AV
5755	57.10	68	250	V	33.91	8.88	0.00	99.89	-	-	PK
5755	48.40	68	250	V	33.91	8.88	0.00	91.19	-	-	AV
5725	70.99	0	100	H	33.91	8.87	38.33	75.44	122.26	-46.82	PK
5725	53.08	0	100	H	33.91	8.87	38.33	57.53	122.26	-64.73	AV
11510	45.72	15	100	H	38.41	17.12	37.80	63.45	74.00	-10.55	PK
11510	34.24	29	100	H	38.41	17.12	37.80	51.97	54.00	-2.03	AV
11510	45.44	0	140	V	38.41	17.12	37.80	63.17	74.00	-10.83	PK
11510	34.18	0	100	V	38.41	17.12	37.80	51.91	54.00	-2.09	AV
High Channel 5795 MHz											
5795	62.95	79	100	H	33.96	8.88	0.00	105.79	-	-	PK
5795	53.92	79	100	H	33.96	8.88	0.00	96.76	-	-	AV
5795	58.52	69	240	V	33.96	8.88	0.00	101.36	-	-	PK
5795	48.85	69	240	V	33.96	8.88	0.00	91.69	-	-	AV
11590	45.63	75	100	H	38.30	17.04	37.80	63.17	74.00	-10.83	PK
11590	33.88	0	100	H	38.30	17.04	37.80	51.42	54.00	-2.58	AV
11590	45.58	179	130	V	38.30	17.04	37.80	63.12	74.00	-10.88	PK
11590	34.40	326	100	V	38.30	17.04	37.80	51.94	54.00	-2.06	AV

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
5775 MHz											
5775	61.90	79	100	H	33.92	7.06	0.00	102.88	-	-	PK
5775	52.06	79	100	H	33.92	7.06	0.00	93.04	-	-	AV
5775	53.19	229	130	V	33.92	7.06	0.00	94.17	-	-	PK
5775	42.34	229	130	V	33.92	7.06	0.00	83.32	-	-	AV
5725	65.51	0	108	H	33.91	10.03	38.33	71.12	122.26	-51.14	PK
5725	50.77	72	100	H	33.91	10.03	38.33	56.38	122.26	-65.88	AV
5650	55.51	0	100	H	33.91	10.03	38.33	61.12	74.00	-12.88	PK
5650	41.56	72	100	H	33.87	10.03	38.33	47.13	54.00	-6.87	AV
5925	49.12	10	100	H	34.08	10.24	38.33	55.11	74.00	-18.89	PK
5925	36.37	68	293	H	34.08	10.24	38.33	42.36	54.00	-11.64	AV
11550	46.34	154	100	H	38.36	16.99	37.80	63.89	74.00	-10.11	PK
11550	34.69	0	105	H	38.36	16.99	37.80	52.24	54.00	-1.76	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: The worst-case modulations were used to show compliance.

8 FCC §15.407(e) & ISEDC RSS-247 §6.2 - 6 dB, 26 dB, & 99% - Occupied Bandwidth

8.1 Applicable Standards

As per FCC §15.407(e) and ISEDC RSS-247 6.2.4(1): for equipment operating in the band 5725 – 5850 MHz, the minimum 6 dB bandwidth of U-NII devices shall be 500 kHz.

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 6 or 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
-	10dB attenuator	-	-	Each time[1]	N/A
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

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 and Chin Ming Lui on 2017-05-17 at RF site.

8.5 Test Results

Please refer to the following tables and plots.

5150 - 5250 MHz

Channel	Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
36	5180	16239.4	18071
40	5200	16277.8	19156
48	5240	16306.1	18575
802.11n20 mode			
36	5180	17465.5	19332
40	5200	17406.8	19836
48	5240	17396.5	19192
802.11n40 mode			
38	5190	35767.9	39446
46	5230	35737.0	40025
802.11ac20 mode			
36	5180	17379.5	19816
40	5200	17446.9	19587
48	5240	17380.7	19575
802.11ac40 mode			
38	5190	35768.3	40.850
46	5230	35792.9	40361
802.11ac80 mode			
42	5210	74916.8	81914

5250 - 5350 MHz

Channel	Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
52	5260	16272.1	18713
56	5280	16263.6	19614
64	5320	16237.0	18625
802.11n20 mode			
52	5260	17377.9	19728
56	5280	17420.0	19402
64	5320	17397.8	19560
802.11n40 mode			
54	5270	35744.0	39139
62	5310	35813.3	38809
802.11ac20 mode			
52	5260	17472.7	19505
56	5280	17448.3	19347
64	5320	17398.2	19277
802.11ac40 mode			
54	5270	35755.3	39324
62	5310	35796.1	40322
802.11ac80 mode			
58	5290	74863.0	82280

5470 - 5725 MHz

Channel	Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
100	5500	16278.3	18880
116	5580	16277.5	18510
140	5700	16274.2	18958
144	5720	16260.4	18578
802.11n20 mode			
100	5500	17418.8	19470
116	5580	17379.6	19467
140	5700	17424.4	19722
144	5720	17434.7	19171
802.11n40 mode			
102	5510	35787.8	40035
110	5550	35890.3	39766
134	5670	35792.5	39459
142	5710	35834.3	39978
802.11ac20 mode			
100	5500	17418.7	19715
116	5580	17417.4	19299
140	5700	17425.4	19639
144	5720	17416.8	19824
802.11ac40 mode			
102	5510	35811.1	40050
110	5550	35703.6	40092
134	5670	35746.5	39757
142	5710	35691.8	41755
802.11ac80 mode			
106	5530	74948.7	80914
122	5610	75082.9	82743
138	5690	74797.0	81323

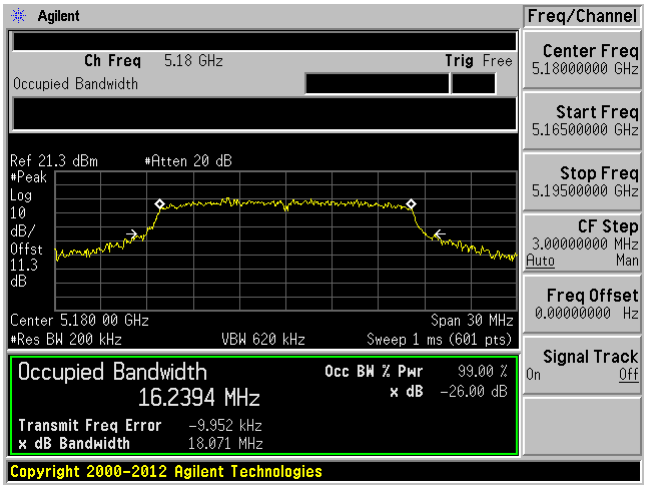
5725 - 5850 MHz

Channel	Frequency (MHz)	99% OBW (kHz)	26 dB OBW (kHz)
802.11 a mode			
149	5745	16316.6	18302
157	5785	16249.2	18430
165	5825	16250.4	18207
802.11n20 mode			
149	5745	17358.4	18862
157	5785	17363.8	18843
165	5825	17380.9	19173
802.11n40 mode			
151	5755	35789.2	42907
159	5795	35733.6	42203
802.11ac20 mode			
149	5745	17356.1	18986
157	5785	17358.9	19011
165	5825	17369.2	19004
802.11ac40 mode			
151	5755	35815.5	40353
159	5795	35768.3	40453
802.11ac80 mode			
155	5775	74923.6	81423

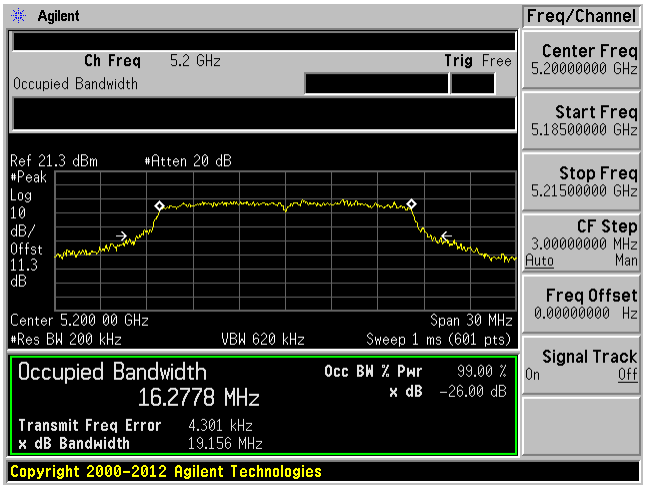
5150 – 5250 MHz

802.11a mode

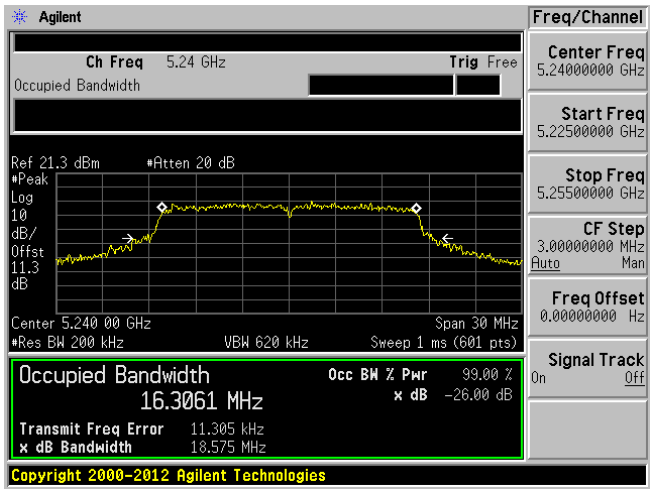
5180 MHz



5200 MHz

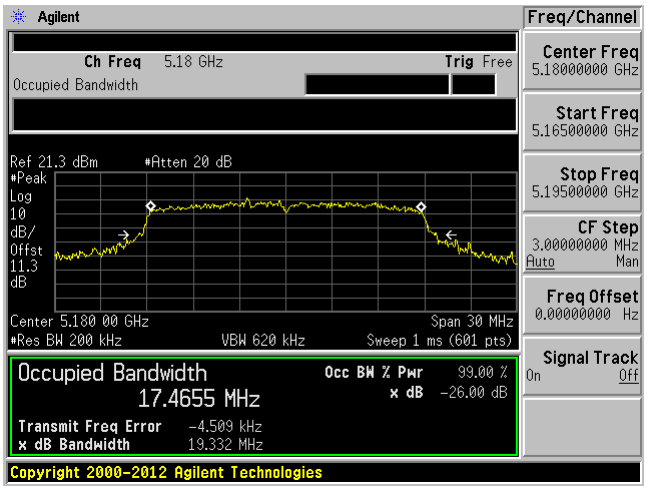


5240 MHz

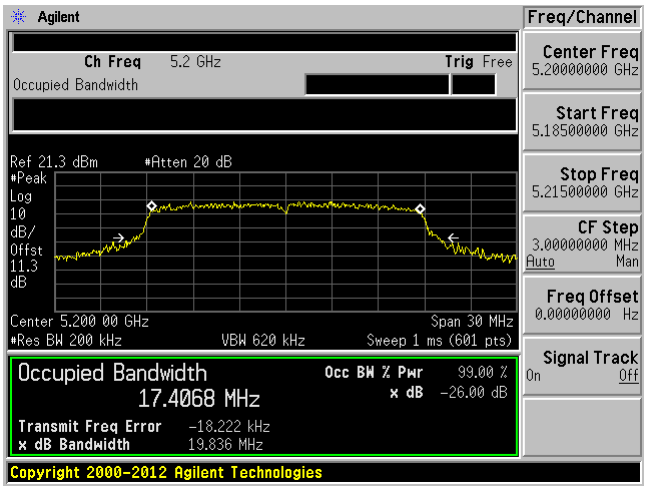


802.11n20 mode

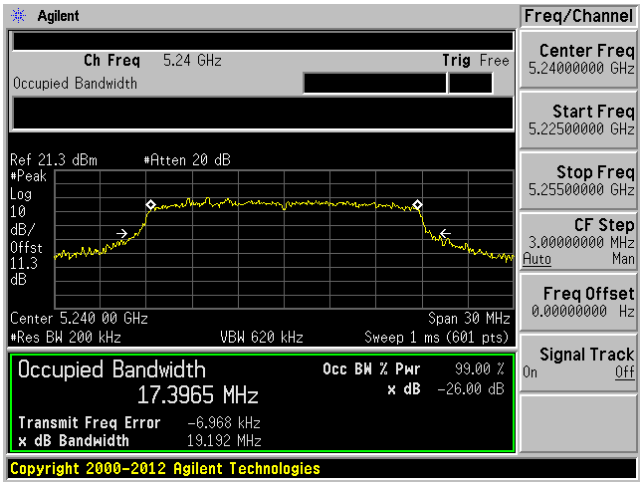
5180 MHz



5200 MHz

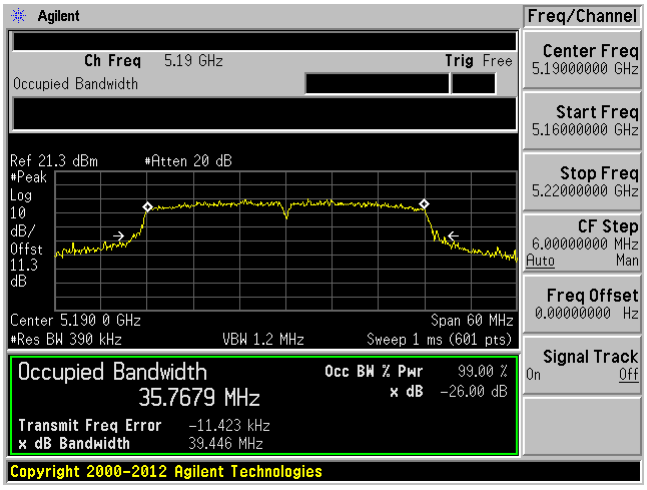


5240 MHz

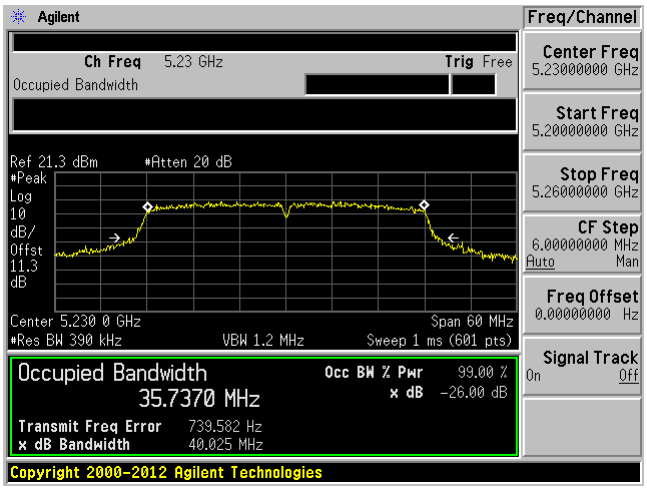


802.11n40 mode

5190 MHz

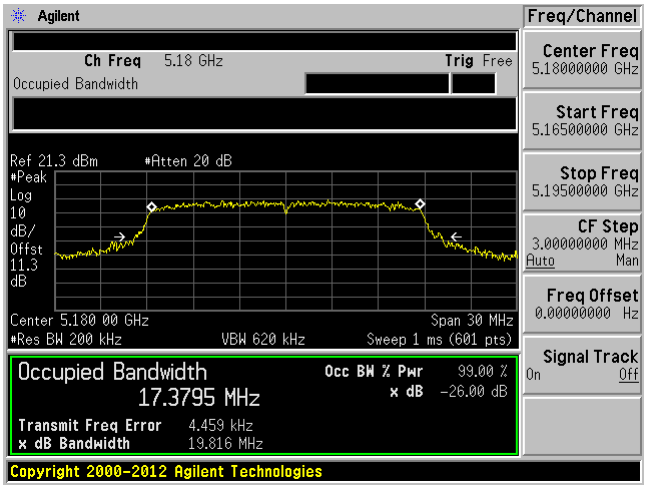


5230 MHz

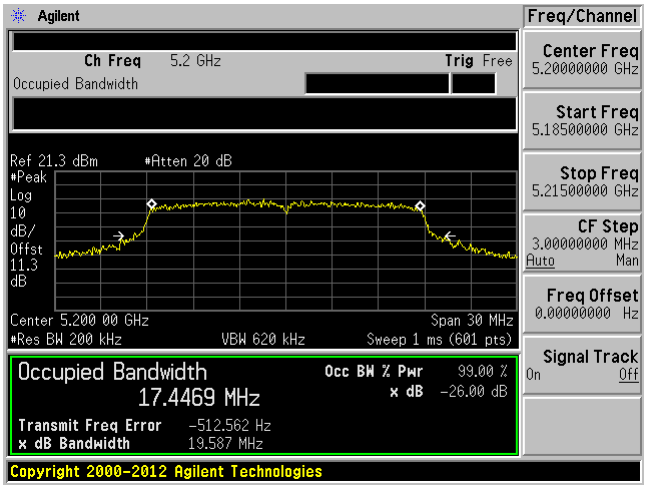


802.11ac20 mode

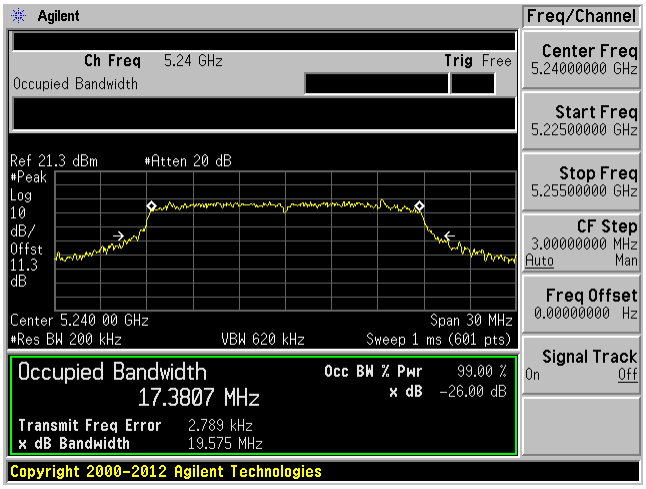
5180 MHz



5200 MHz

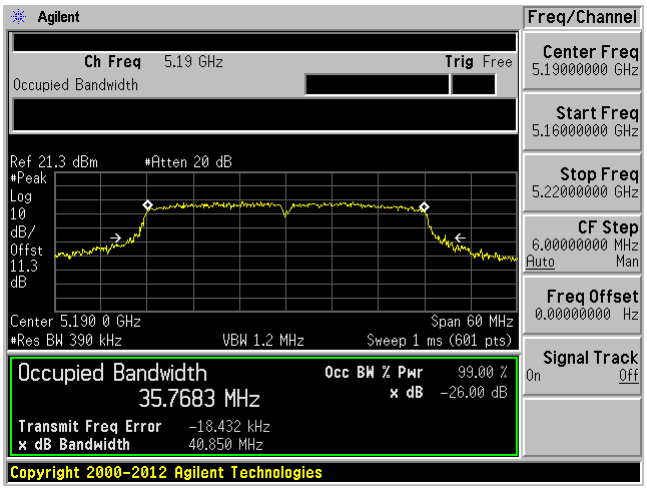


5240 MHz

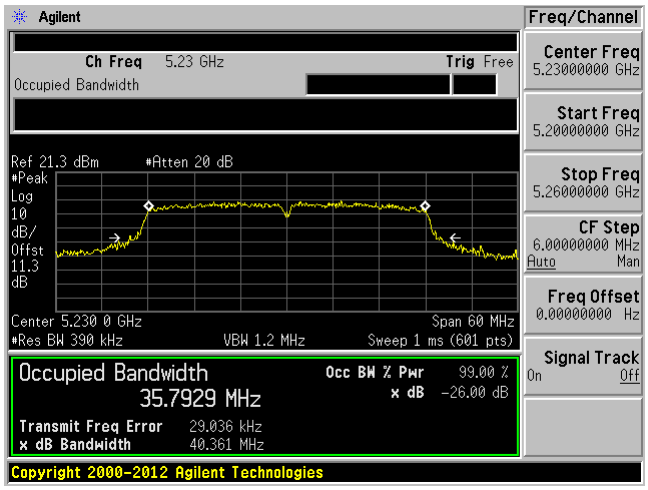


802.11ac40 mode

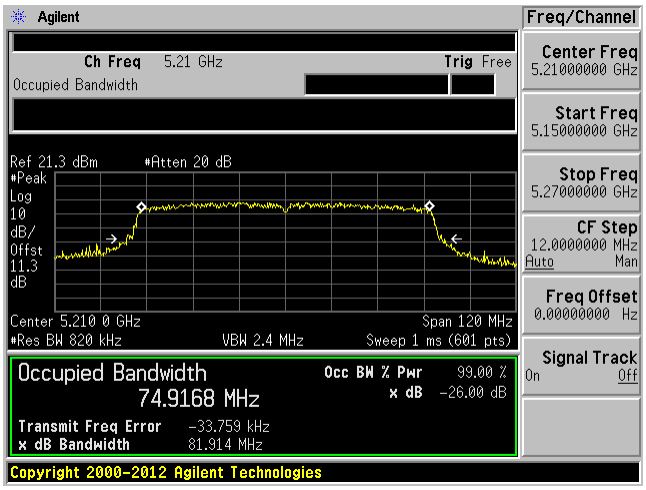
5190 MHz



5230 MHz



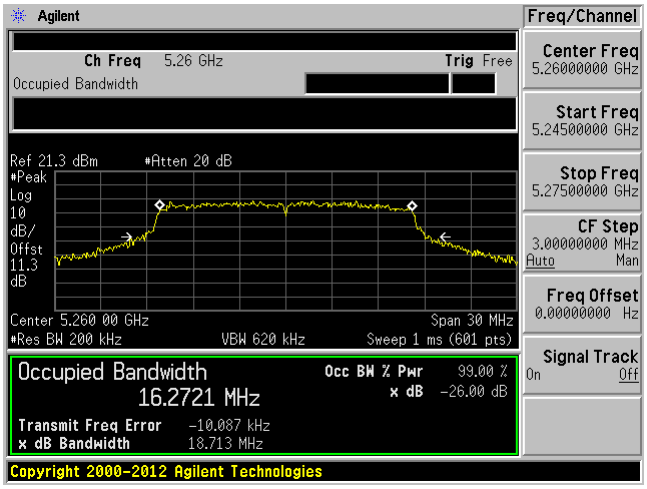
802.11ac80 mode, 5210 MHz



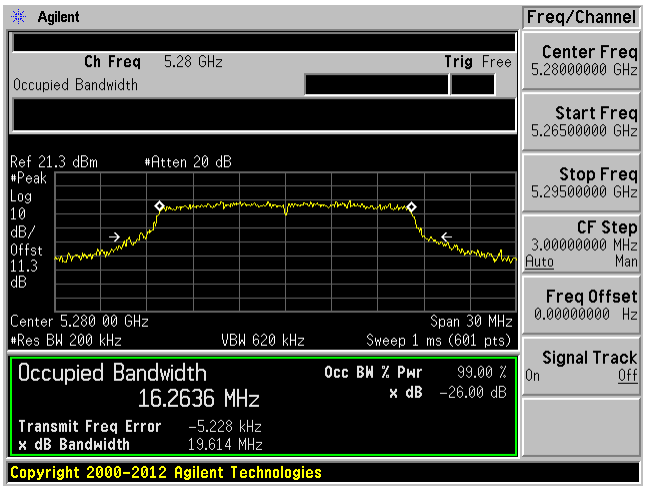
5250 – 5350 MHz

802.11a mode

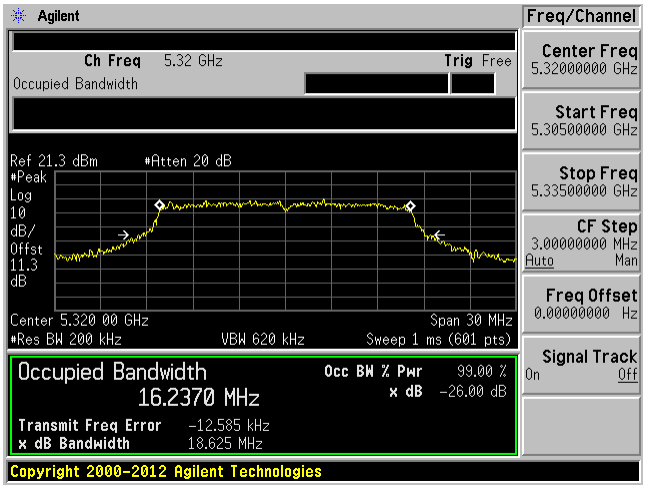
5260 MHz



5280 MHz

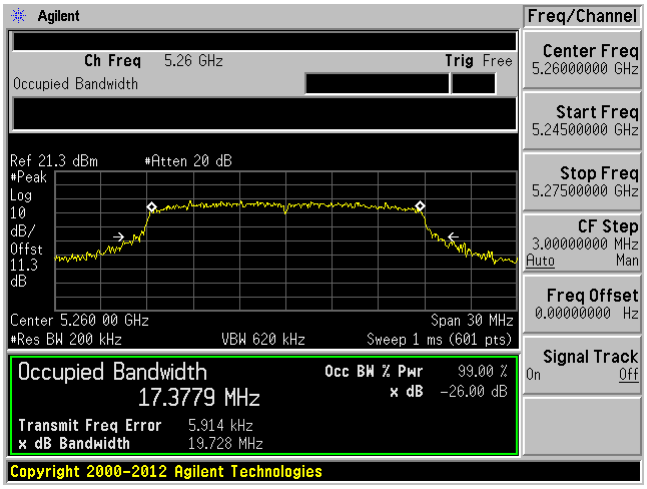


5320 MHz

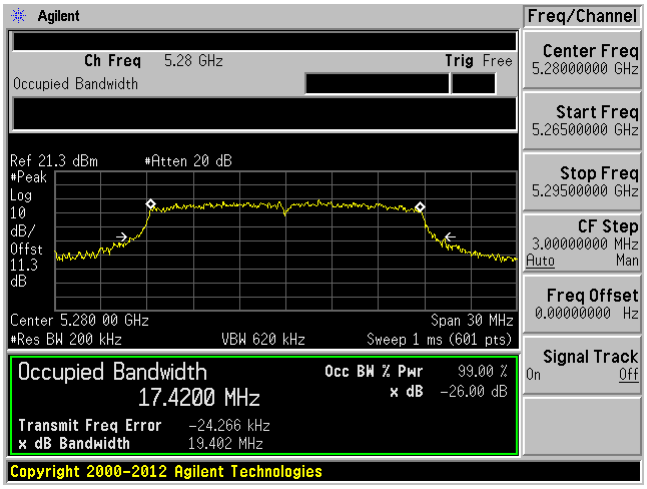


802.11n20 mode

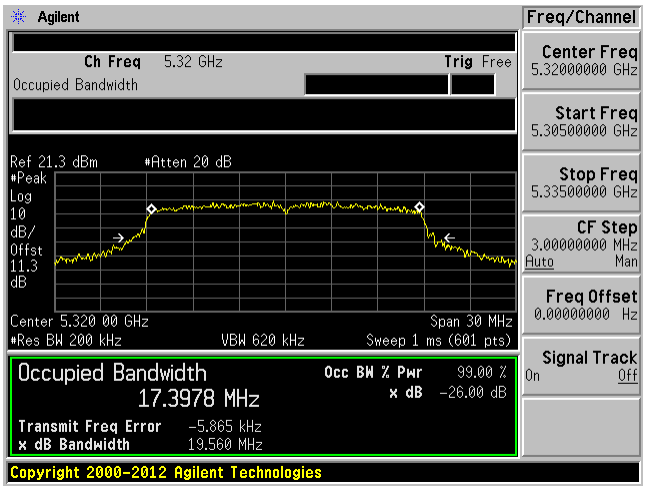
5260 MHz



5280 MHz

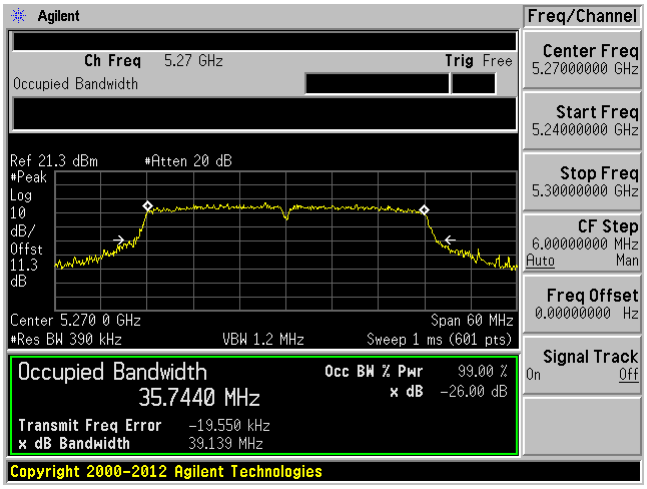


5320 MHz

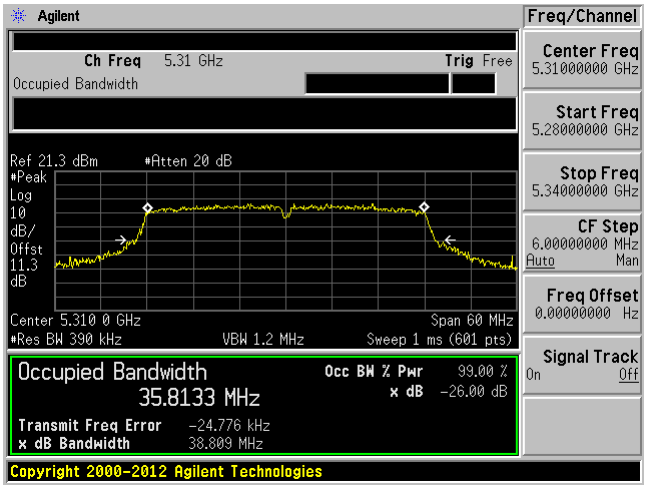


802.11n40 mode

5270 MHz

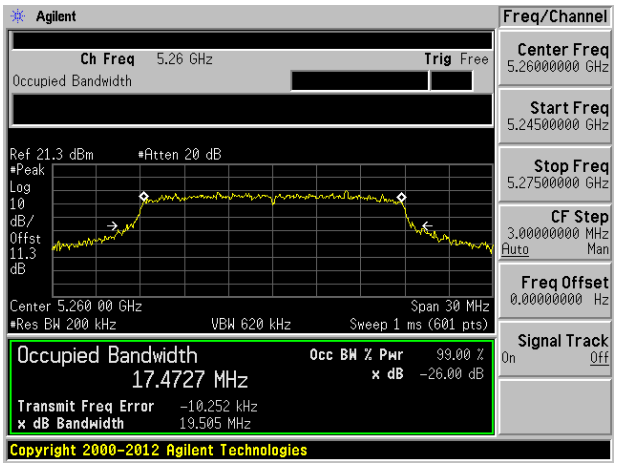


5310 MHz

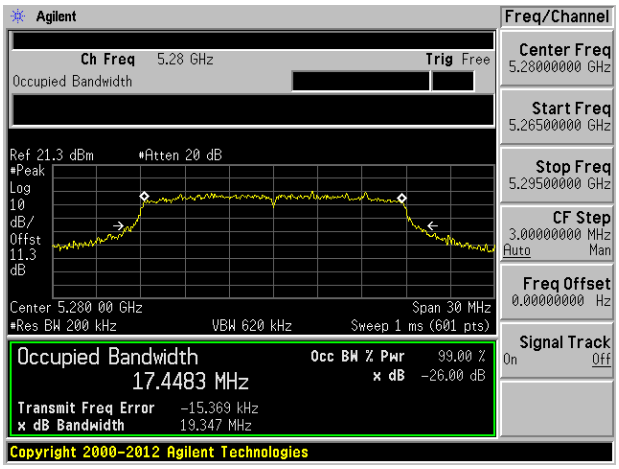


802.11ac20 mode

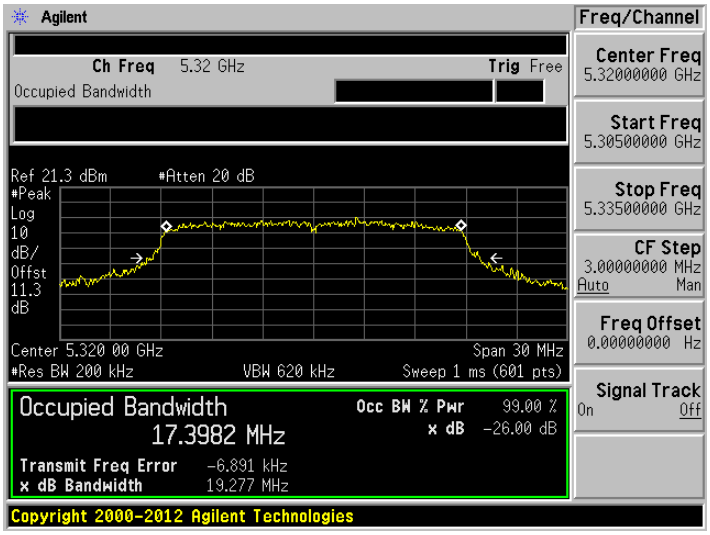
5260 MHz



5280 MHz

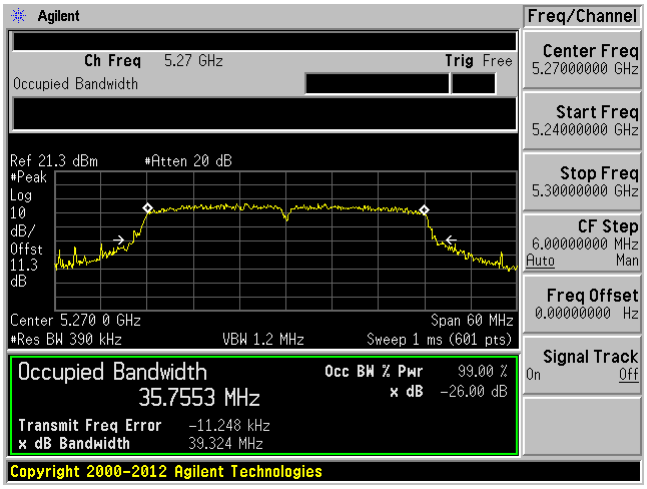


5320 MHz

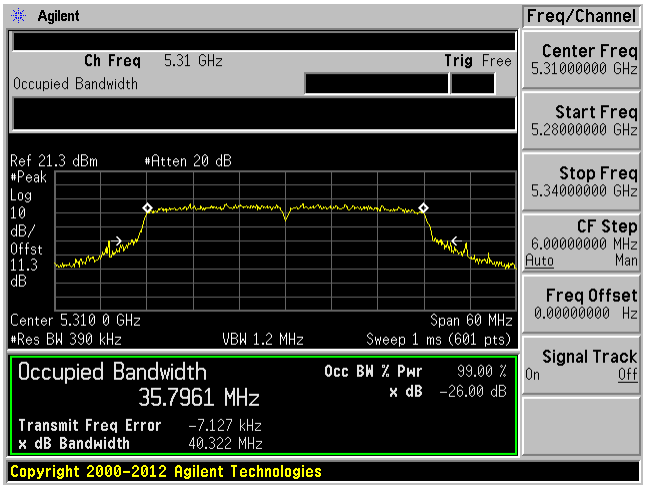


802.11ac40 mode

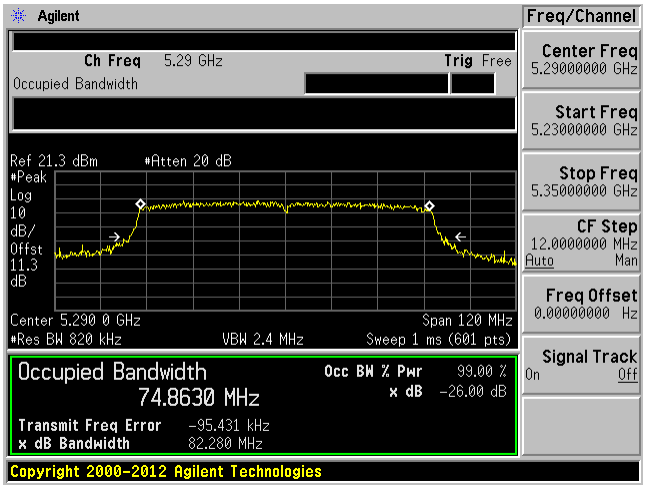
5270 MHz



5310 MHz



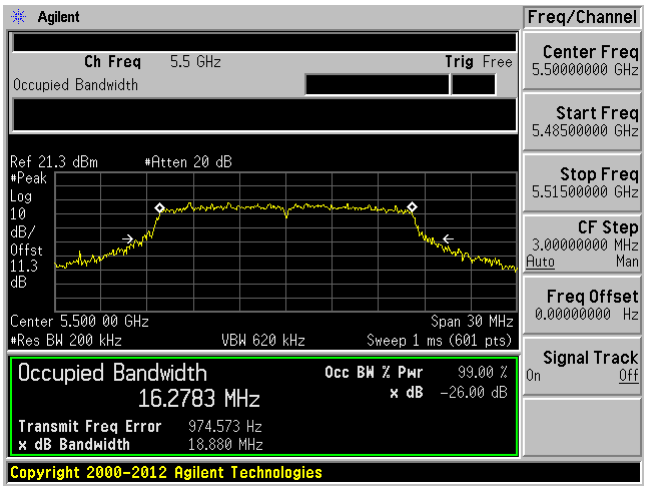
802.11ac80 mode, 5290 MHz



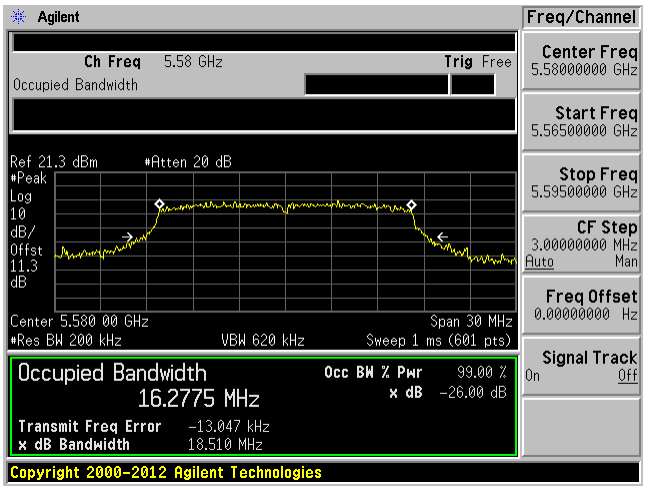
5470 – 5725 MHz

802.11a mode

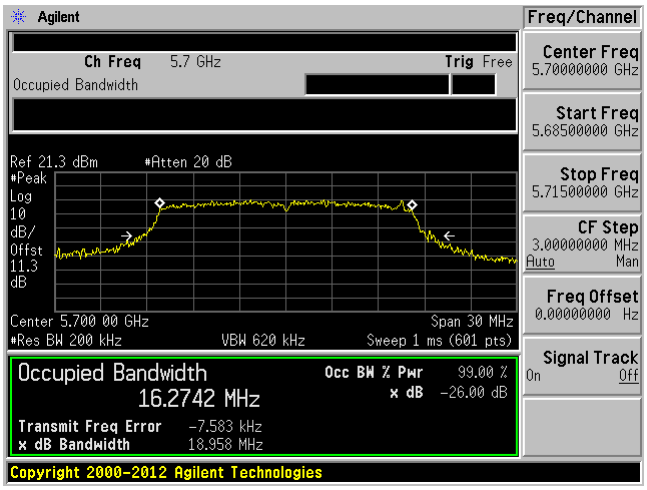
5500 MHz



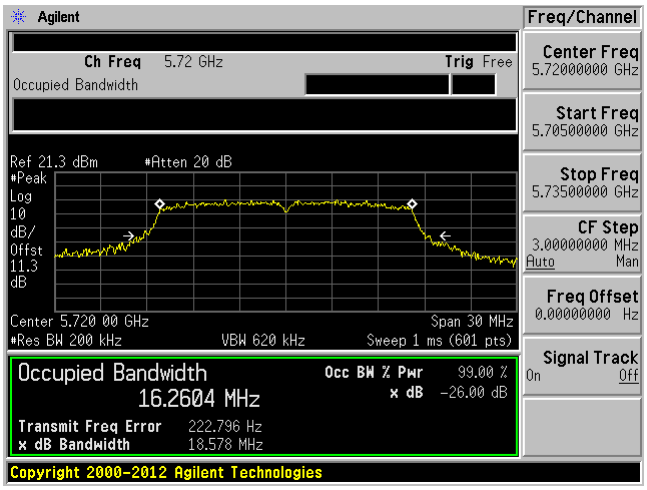
5580 MHz



5700 MHz

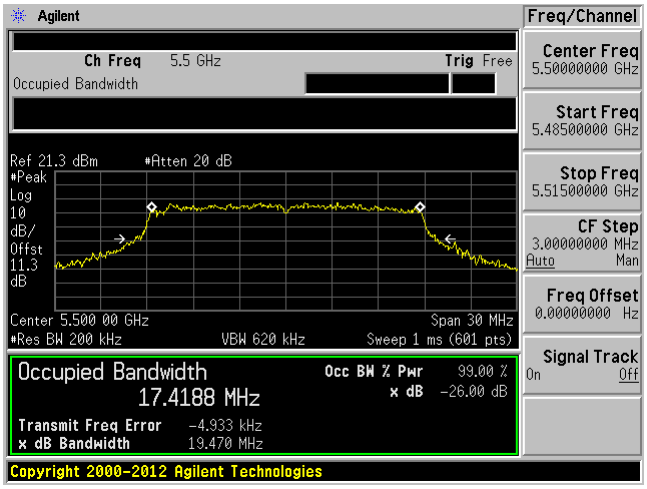


5720 MHz

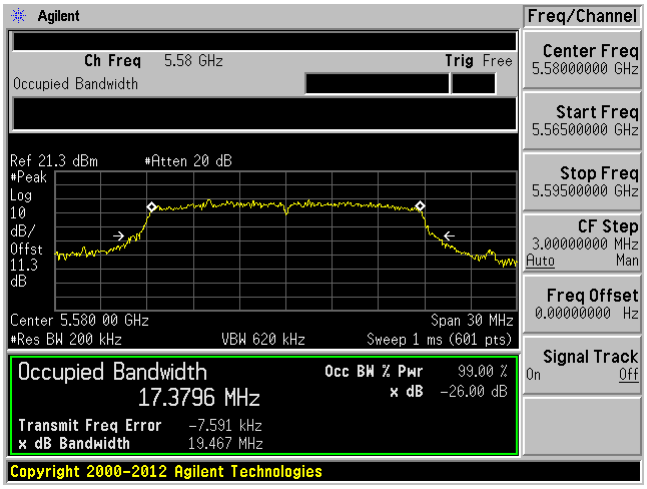


802.11n20 mode

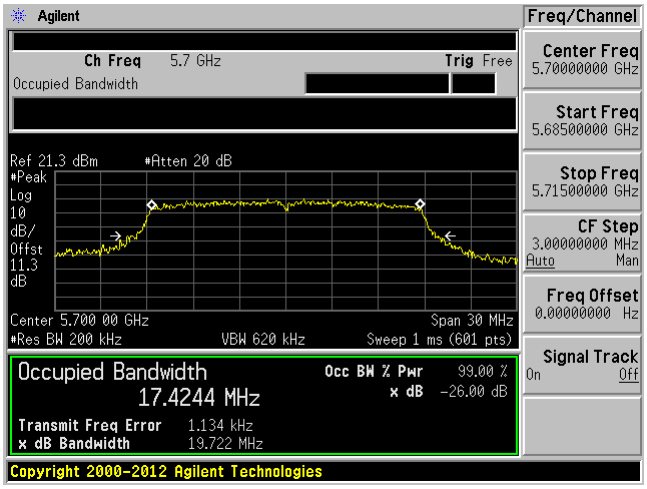
5500 MHz



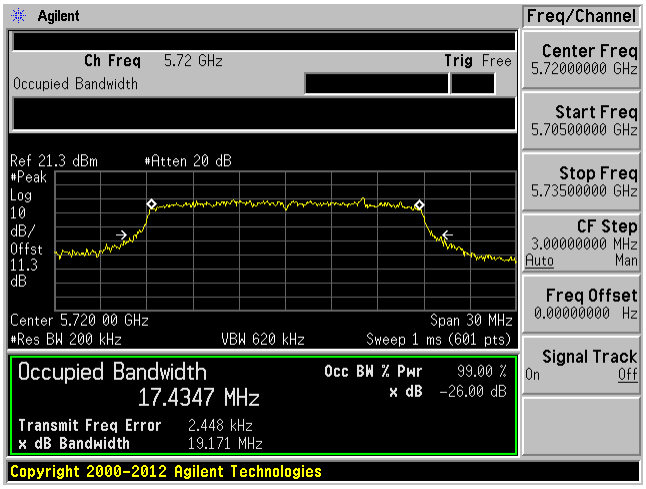
5580 MHz



5700 MHz

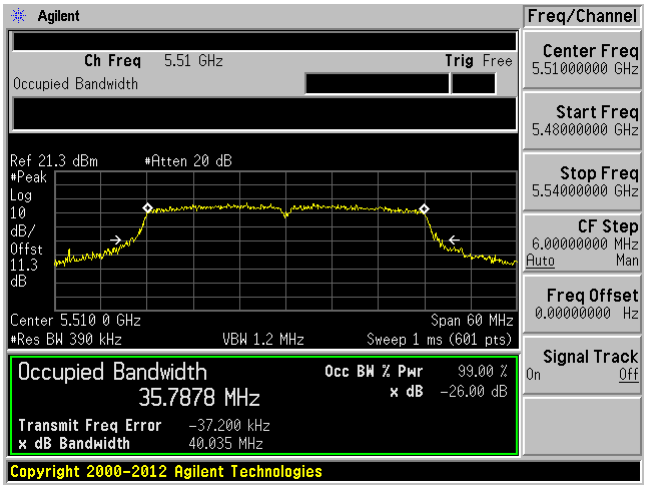


5720 MHz

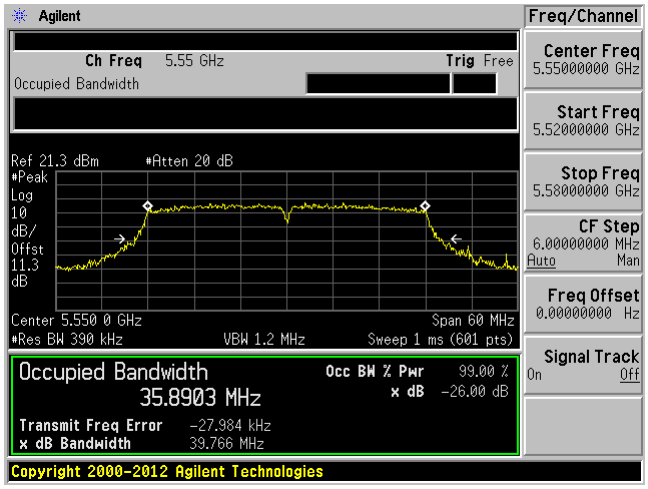


802.11n40 mode

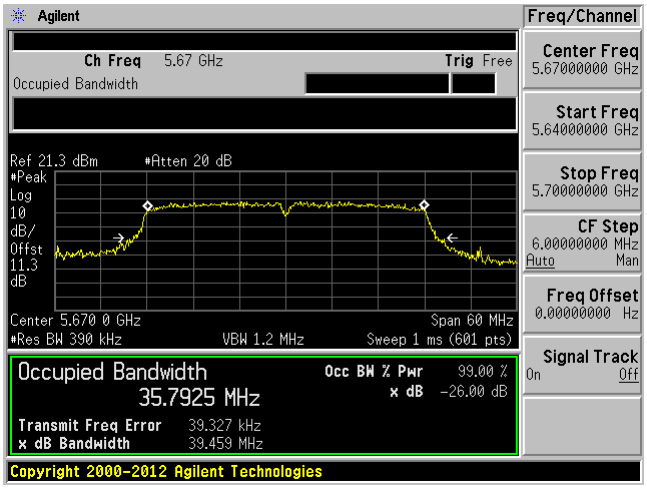
5510 MHz



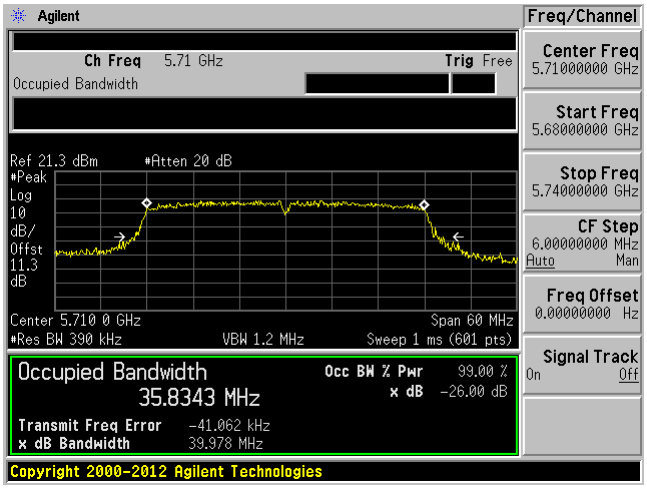
5550 MHz



5670 MHz

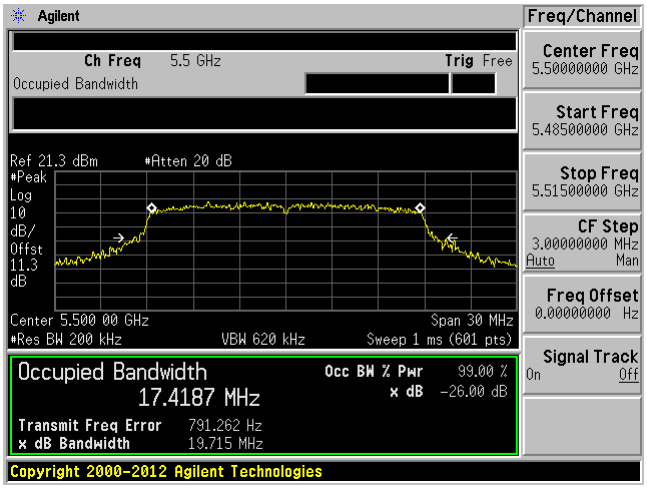


5710 MHz

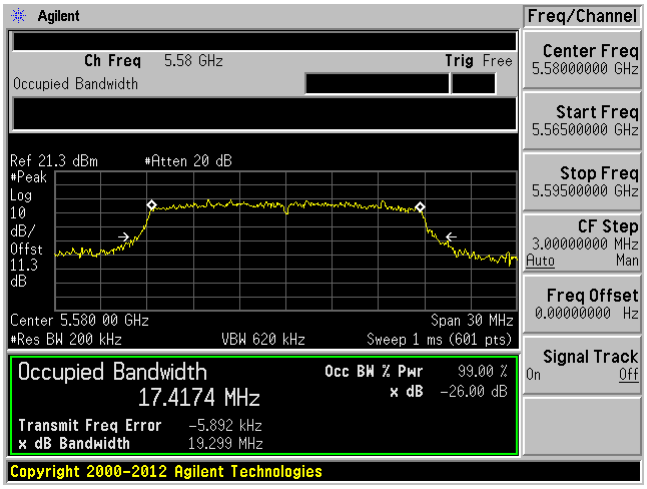


802.11ac20 mode

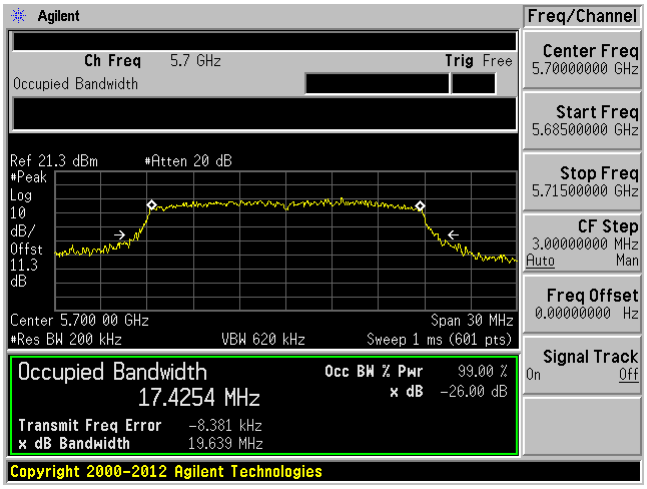
5500 MHz



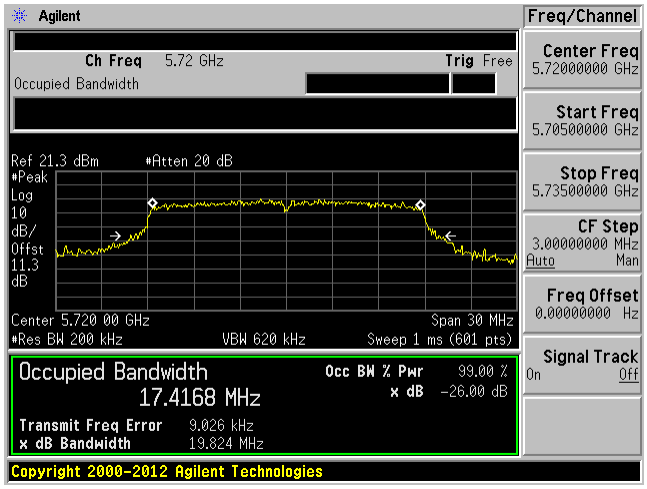
5580 MHz



5700 MHz

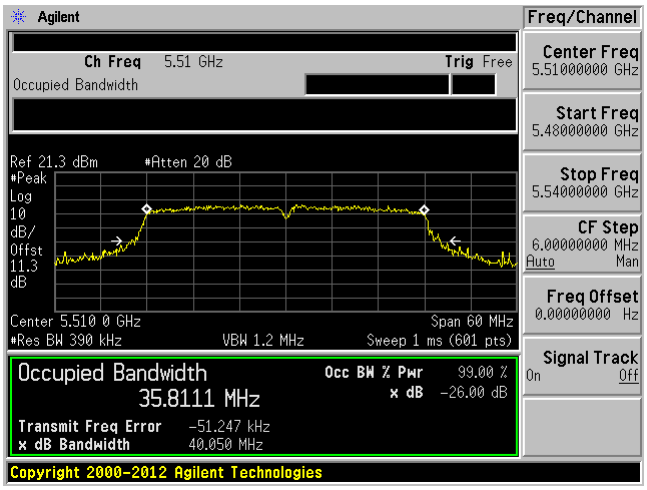


5720 MHz

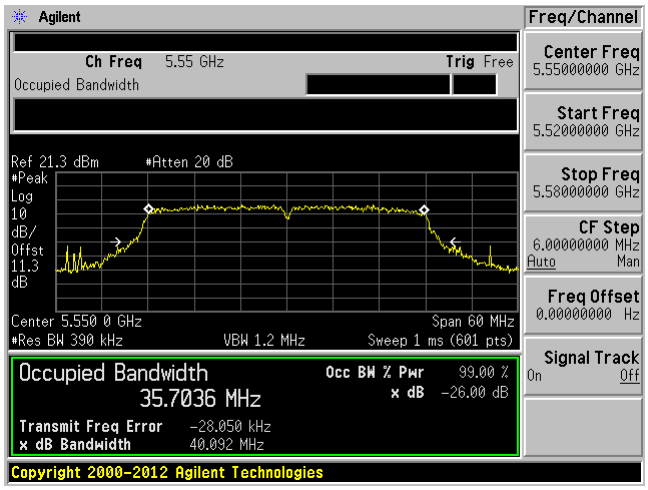


802.11ac40 mode

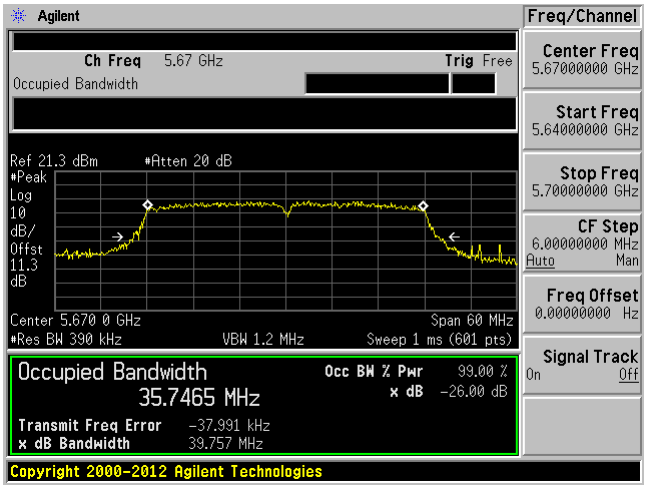
5510 MHz



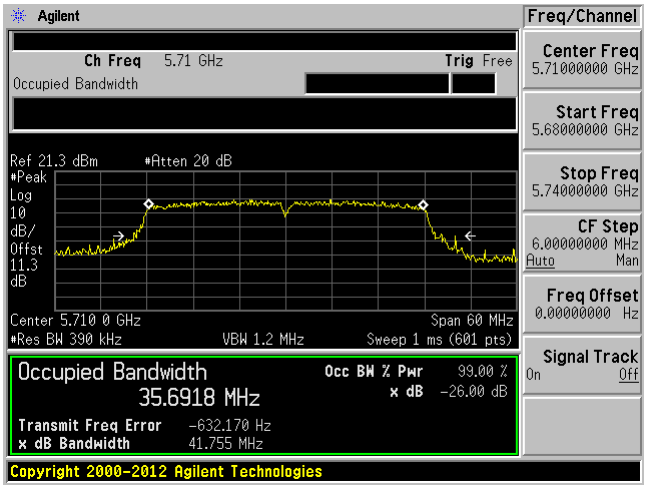
5550 MHz



5670 MHz

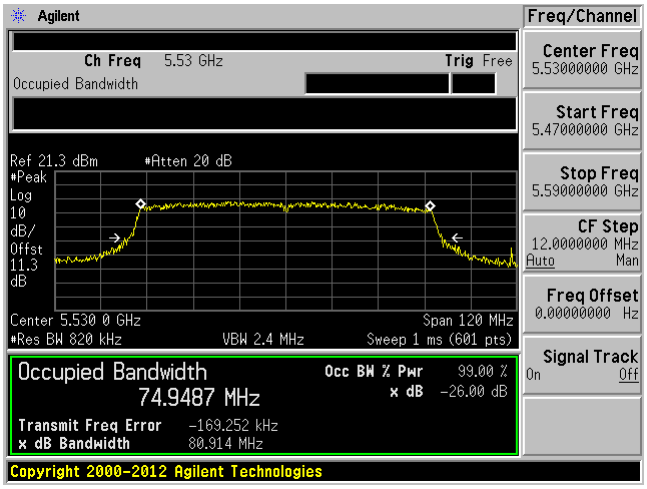


5710 MHz

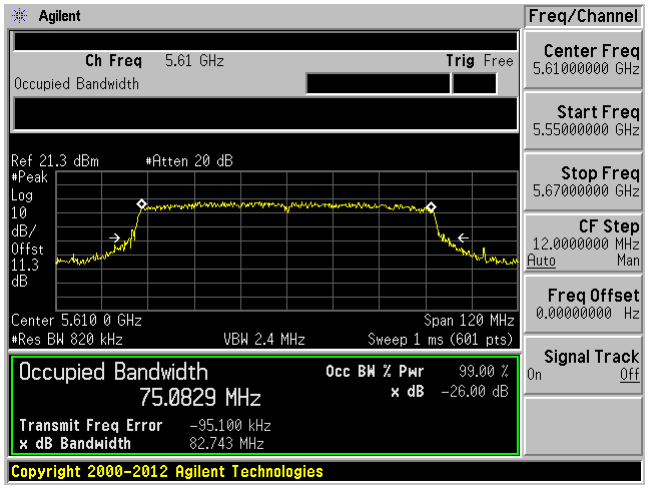


802.11ac80 mode

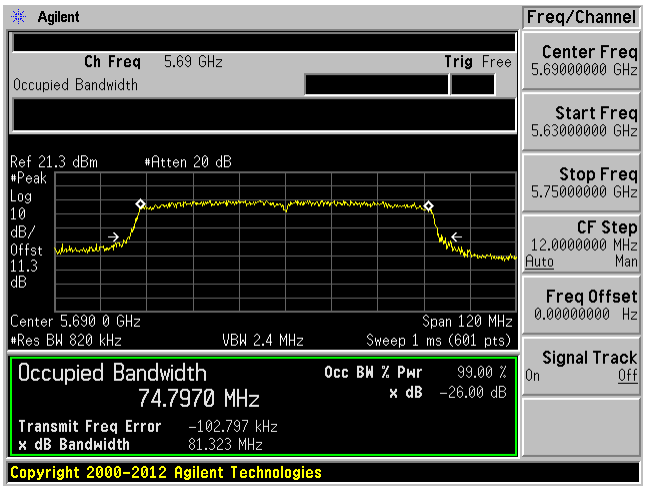
5530 MHz



5610 MHz



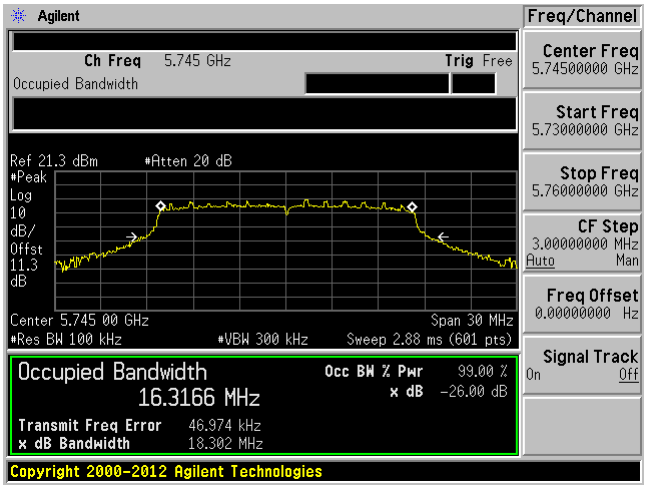
5690 MHz



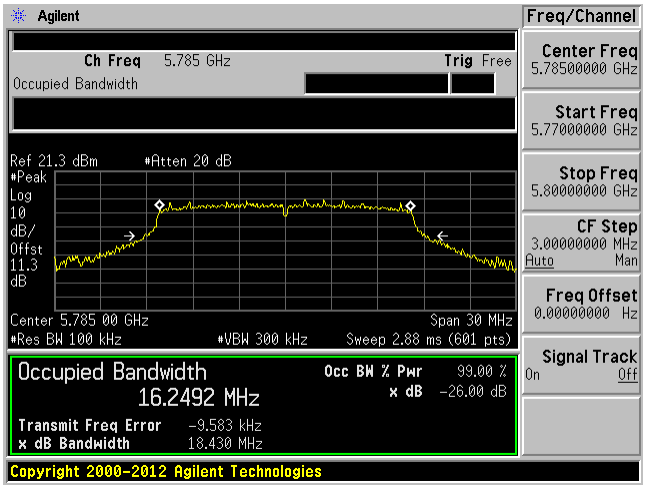
5725 – 5850 MHz

802.11a mode

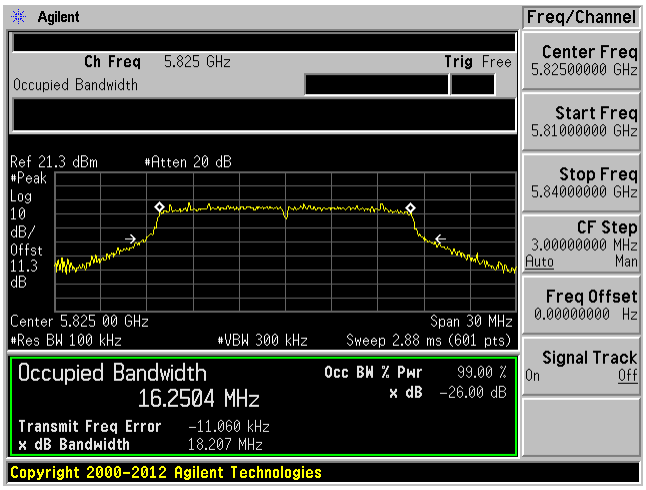
5745 MHz



5785 MHz

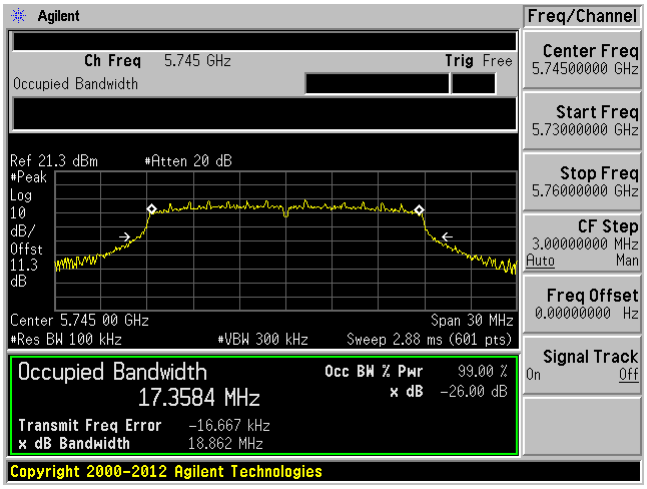


5825 MHz

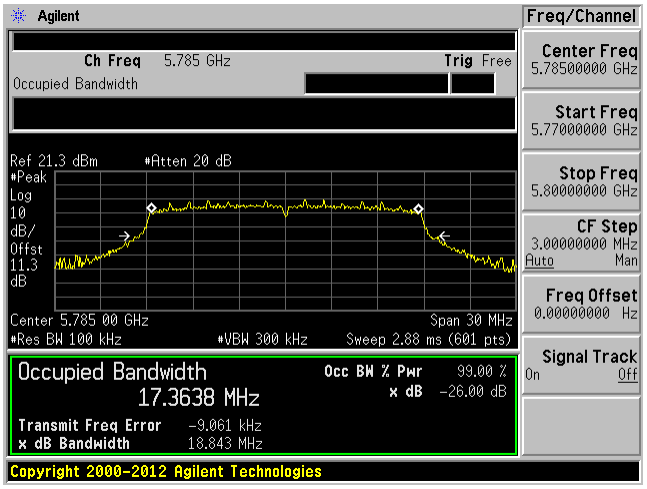


802.11n20 mode

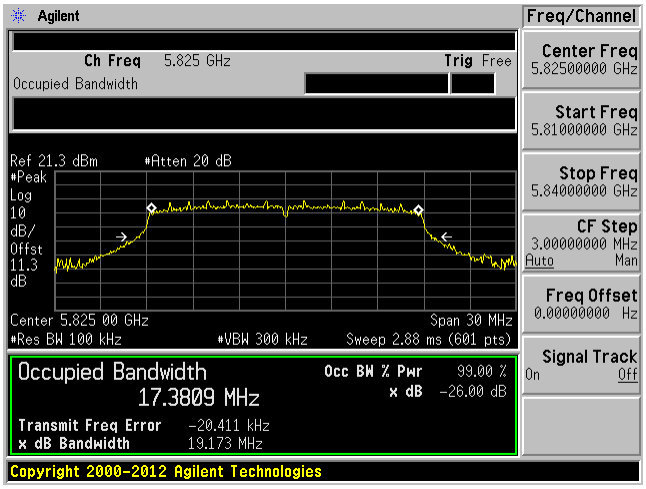
5745 MHz



5785 MHz

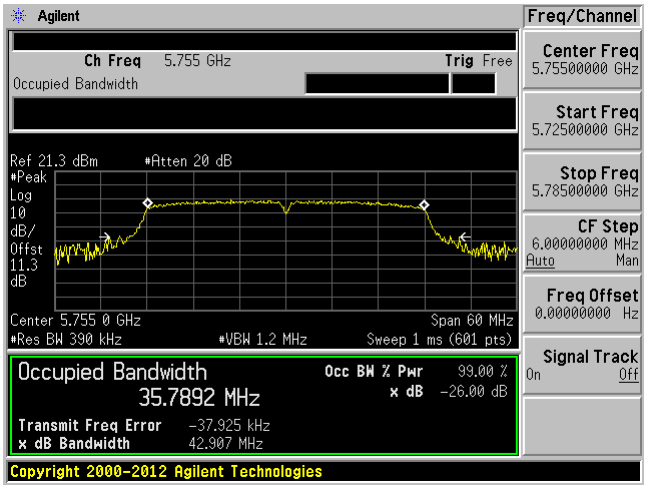


5825 MHz

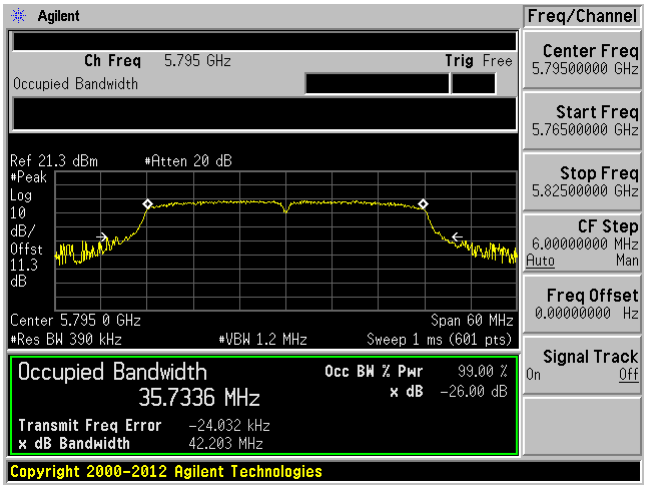


802.11n40 mode

5755 MHz

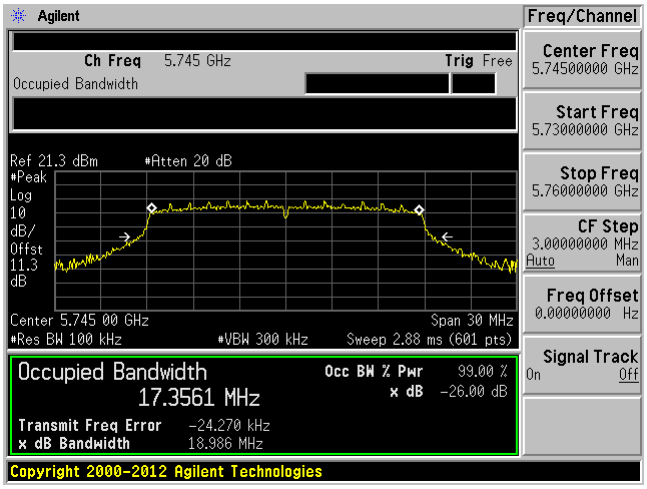


5795 MHz

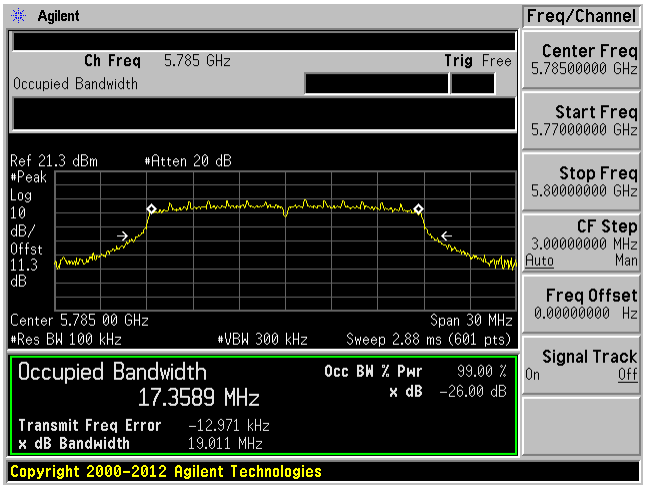


802.11ac20 mode

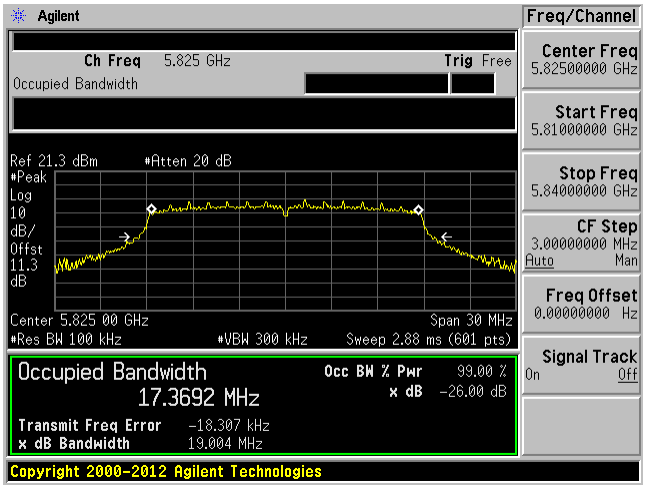
5745 MHz



5785 MHz

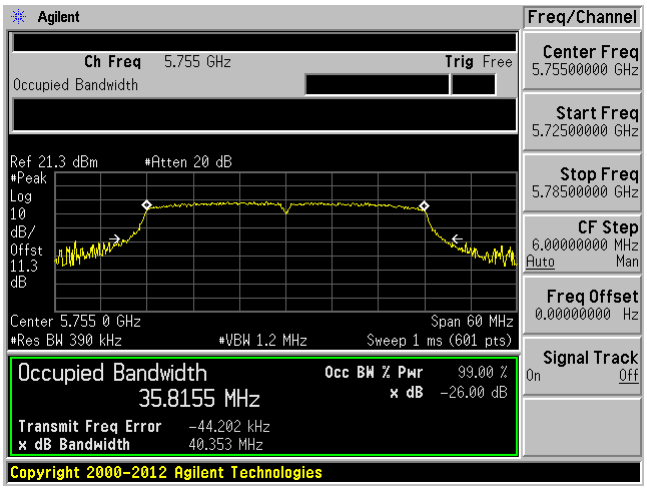


5825 MHz

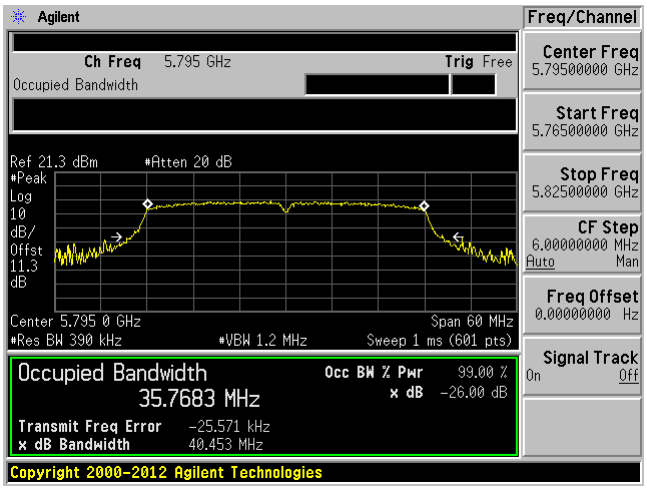


802.11ac40 mode

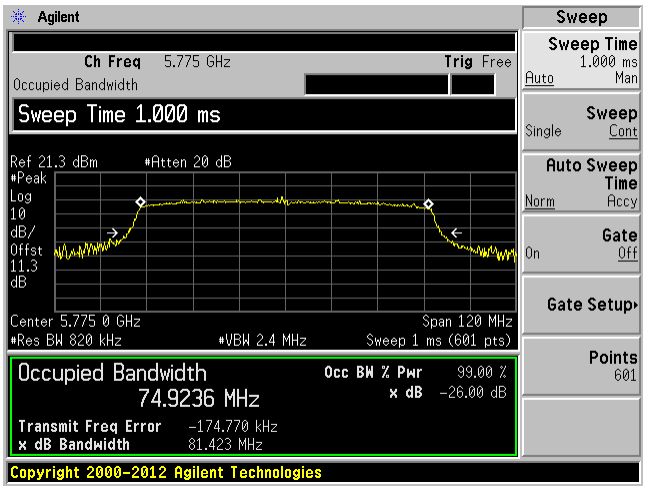
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz



9 FCC §407(a) & ISEDC RSS-247 §6.2 - Output Power

9.1 Applicable Standards

According to FCC §15.407(a):

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. 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 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.

According to ISEDC RSS-247 §6.2.1 for frequency band 5150-5250 MHz:

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

According to ISEDC RSS-247 §6.2.2 for frequency band 5250-5350 MHz:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.3 for frequency band 5470-5600 MHz and 5650-5725 MHz:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.
The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.4 for frequency band 5725-5850 MHz:

The maximum conducted output power shall not exceed 1 W. The 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 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 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.

9.2 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect 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
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2017-02-24	1 year
ETS- Lingerin	Power Sensor	7002-006	160097	2016-12-05	2 years
-	RF Cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

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

The testing was performed by Vincent Licata and Chin Ming Lui on 2017-05-12 in RF site.

9.5 Test Results

5150 - 5250 MHz

FCC Results

Frequency (MHz)	Conducted Average Power (dBm)	FCC Limit (dBm)
802.11a mode		
5180	12.60	24
5200	12.42	24
5240	12.60	24
802.11n20 mode		
5180	12.22	24
5200	12.20	24
5240	12.36	24
802.11n40 mode		
5190	12.12	24
5230	12.38	24
802.11ac20 mode		
5180	12.13	24
5200	12.21	24
5240	12.41	24
802.11ac40 mode		
5190	12.10	24
5230	12.37	24
802.11ac80 mode		
5210	11.19	24

ISED Results

Modulation	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP Output Power (dBm)	ISEDC Limit (dBm)
a	5180	12.60	4.50	17.10	22.1
	5200	12.42	4.50	16.92	22.1
	5240	12.60	4.50	17.10	22.1
n20	5180	12.22	4.50	16.72	22.4
	5200	12.20	4.50	16.70	22.4
	5240	12.36	4.50	16.86	22.4
n40	5190	12.12	4.50	16.62	23
	5230	12.38	4.50	16.88	23
ac20	5180	12.13	4.50	16.63	22.4
	5200	12.21	4.50	16.71	22.4
	5240	12.41	4.50	16.91	22.4
ac40	5190	12.10	4.50	16.60	23
	5230	12.37	4.50	16.87	23
ac80	5210	11.19	4.50	15.69	23

5250 - 5350 MHz

Frequency (MHz)	Conducted Average Power (dBm)	FCC Limit (dBm)	ISEDC Limit (dBm)
802.11a mode			
5260	12.69	24	23.1
5280	13.14	24	23.1
5320	12.87	24	23.1
802.11n20 mode			
5260	12.48	24	23.4
5280	12.90	24	23.4
5320	12.87	24	23.4
802.11n40 mode			
5270	10.70	24	24
5310	10.81	24	24
802.11ac20 mode			
5260	12.42	24	23.4
5280	12.90	24	23.4
5320	12.78	24	23.4
802.11ac40 mode			
5270	10.64	24	24
5310	10.78	24	24
802.11ac80 mode			
5290	13.12	24	24

5470 - 5725 MHz

Frequency (MHz)	Conducted Average Power (dBm)	FCC Limit (dBm)	ISEDC Limit (dBm)
802.11a mode			
5500	11.80	24	23.1
5580	13.30	24	23.1
5700	13.34	24	23.1
5720	13.15	24	23.1
802.11n20 mode			
5500	11.67	24	23.4
5580	13.15	24	23.4
5700	13.14	24	23.4
5720	12.88	24	23.4
802.11n40 mode			
5510	11.30	24	24
5550	11.45	24	24
5670	12.51	24	24
5710	12.30	24	24
802.11ac20 mode			
5500	11.63	24	23.4
5580	13.09	24	23.4
5700	13.02	24	23.4
5720	12.81	24	23.4
802.11ac40 mode			
5510	11.26	24	24
5550	11.49	24	24
5670	12.65	24	24
5710	12.44	24	24
802.11ac80 mode			
5530	11.75	24	24
5610	11.67	24	24
5690	12.88	24	24

5725 - 5850 MHz

Frequency (MHz)	Conducted Average Power (dBm)	FCC/ ISED Limit (dBm)
802.11a mode		
5745	10.15	30
5785	10.36	30
5825	10.22	30
802.11n20 mode		
5745	9.81	30
5785	10.14	30
5825	9.93	30
802.11n40 mode		
5755	9.95	30
5795	10.15	30
802.11ac20 mode		
5745	9.81	30
5785	10.10	30
5825	9.98	30
802.11ac40 mode		
5755	9.97	30
5795	10.10	30
802.11ac80 mode		
5775	10.25	30

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

10 FCC §15.407(a) & ISEDC RSS-247 §6.2 - Power Spectral Density

10.1 Applicable Standards

According to FCC §15.407(a):

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. 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 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.

According to ISEDC RSS-247 §6.2.1 for frequency band 5150-5250 MHz:

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

According to ISEDC RSS-247 §6.2.2 for frequency band 5250-5350 MHz:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.3 for frequency band 5470-5600 MHz and 5650-5725 MHz:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.4 for frequency band 5725-5850 MHz:

The maximum conducted output power shall not exceed 1 W. The 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 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 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.

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	MY48250238	2017-02-24	1 year
-	RF Cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

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 and Chin Ming Lui on 2017-05-17 at RF site.

10.5 Test Results

5150 – 5250 MHz

FCC Results:

Frequency (MHz)	Measured PSD (dBm/MHz)	Corrected PSD (dBm/MHz)	FCC Limit (dBm/MHz)
802.11a mode			
5180	0.535	0.819	11
5200	0.188	0.472	11
5240	0.265	0.549	11
802.11n20 mode			
5180	0.668	0.909	11
5200	0.126	0.367	11
5240	-0.217	0.024	11
802.11n40 mode			
5190	-3.050	-2.375	11
5230	-3.094	-2.419	11
802.11ac20 mode			
5180	0.273	0.525	11
5200	0.137	0.389	11
5240	-0.285	-0.033	11
802.11ac40 mode			
5190	-2.912	-2.216	11
5230	-3.207	-2.511	11
802.11ac80 mode			
5210	-7.382	-7.237	11

ISEDC Results:

Frequency (MHz)	PSD (dBm/MHz)	Corrected PSD (dBm/MHz)	EIRP PSD (dBm/MHz)	ISED Limit (dBm/MHz)
802.11a mode				
5180	0.535	0.819	5.319	10
5200	0.188	0.472	4.972	10
5240	0.265	0.549	5.049	10
802.11n20 mode				
5180	0.668	0.909	5.409	10
5200	0.126	0.367	4.867	10
5240	-0.217	0.024	4.524	10
802.11n40 mode				
5190	-3.050	-2.375	2.125	10
5230	-3.094	-2.419	2.081	10
802.11ac20 mode				
5180	0.273	0.525	5.025	10
5200	0.137	0.389	4.889	10
5240	-0.285	-0.033	4.467	10
802.11ac40 mode				
5190	-2.912	-2.216	2.284	10
5230	-3.207	-2.511	1.989	10
802.11ac80 mode				
5210	-7.382	-7.237	-2.737	10

5250 – 5350 MHz

Frequency (MHz)	Measured PSD (dBm/MHz)	Corrected PSD (dBm/MHz)	FCC/ ISED Limit (dBm/MHz)
802.11a mode			
5260	-0.075	0.209	11
5280	0.122	0.406	11
5320	0.098	0.382	11
802.11n20 mode			
5260	-0.323	-0.082	11
5280	-0.066	0.175	11
5320	-0.425	-0.184	11
802.11n40 mode			
5270	-5.693	-5.018	11
5310	-5.393	-4.718	11
802.11ac20 mode			
5260	-0.401	-0.149	11
5280	-0.249	0.003	11
5320	-0.337	-0.085	11
802.11ac40 mode			
5270	-5.430	-4.734	11
5310	-5.578	-4.882	11
802.11ac80 mode			
5290	-7.774	-7.629	11

5470 – 5725 MHz

Frequency (MHz)	Measured PSD (dBm/MHz)	Corrected PSD (dBm/MHz)	FCC/ ISED Limit (dBm/MHz)
802.11a mode			
5500	-1.337	-1.054	11
5580	-0.072	0.212	11
5700	1.102	1.386	11
5720	1.010	1.294	11
802.11n20 mode			
5500	-1.275	-1.034	11
5580	0.064	0.305	11
5700	0.712	0.953	11
5720	1.077	1.318	11
802.11n40 mode			
5510	-5.379	-4.704	11
5550	-4.784	-4.109	11
5670	-3.596	-2.921	11
5710	-3.041	-2.366	11
802.11ac20 mode			
5500	-1.549	-1.297	11
5580	0.016	0.268	11
5700	0.464	0.716	11
5720	0.772	1.024	11
802.11ac40 mode			
5510	-5.222	-4.526	11
5550	-4.836	-4.140	11
5670	-3.574	-2.878	11
5710	-2.844	-2.148	11
802.11ac80 mode			
5530	-7.856	-7.711	11
5610	-7.679	-7.534	11
5690	-6.497	-6.352	11

5725 - 5850 MHz

Frequency (MHz)	Measured PSD (dBm/100 kHz)	Corrected PSD (dBm/500 kHz)	FCC/ ISED Limit (dBm/500 kHz)
802.11a mode			
5745	-10.697	-10.414	30
5785	-10.058	-9.775	30
5825	-11.061	-10.778	30
802.11n20 mode			
5745	-11.374	-11.133	30
5785	-10.772	-10.531	30
5825	-11.242	-11.001	30
802.11n40 mode			
5755	-13.951	-13.276	30
5795	-13.892	-13.217	30
802.11ac20 mode			
5745	-11.100	-10.848	30
5785	-10.630	-10.378	30
5825	-11.361	-11.109	30
802.11ac40 mode			
5755	-14.295	-13.599	30
5795	-14.293	-13.597	30
802.11ac80 mode			
5775	-17.259	-17.144	30

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

Note: For the 5725-5850 MHz band, the Corrected PSD (dBm/500 kHz) is equal to:

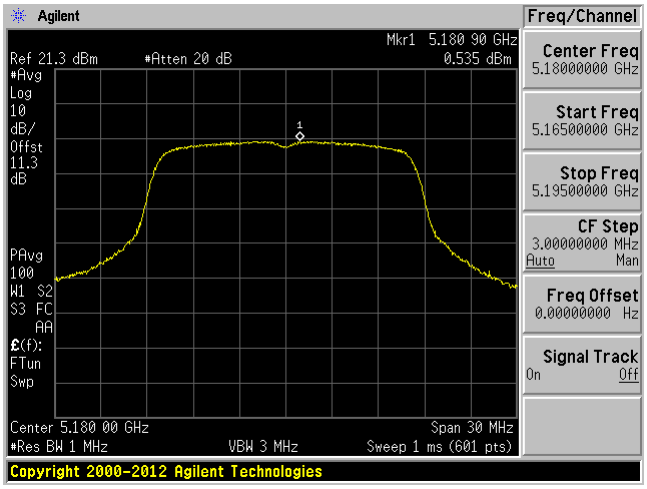
Correct PSD (dBm/500 kHz) = PSD (dBm/100 kHz) + Duty Cycle Correction (dB) + 10*log(500 kHz/100 kHz)

Please refer to the following plots.

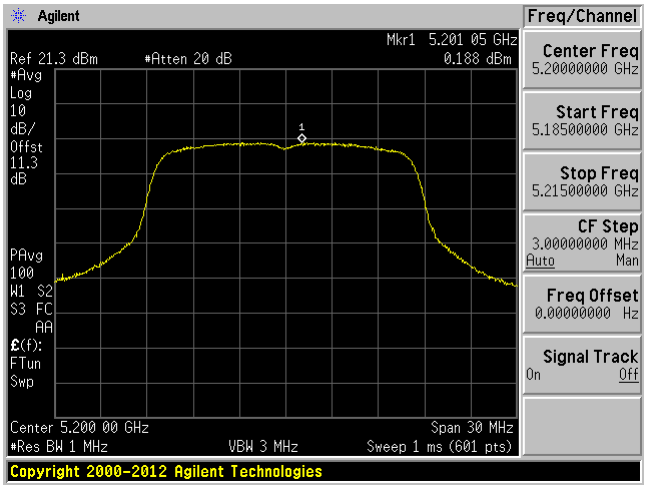
5150 – 5250 MHz

802.11a mode

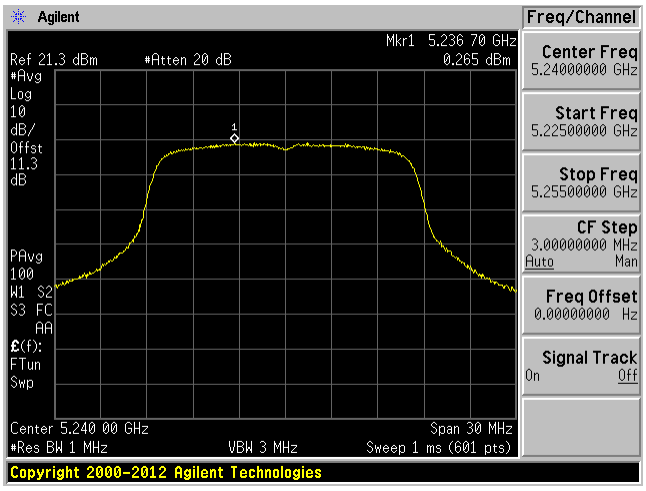
5180 MHz



5200 MHz

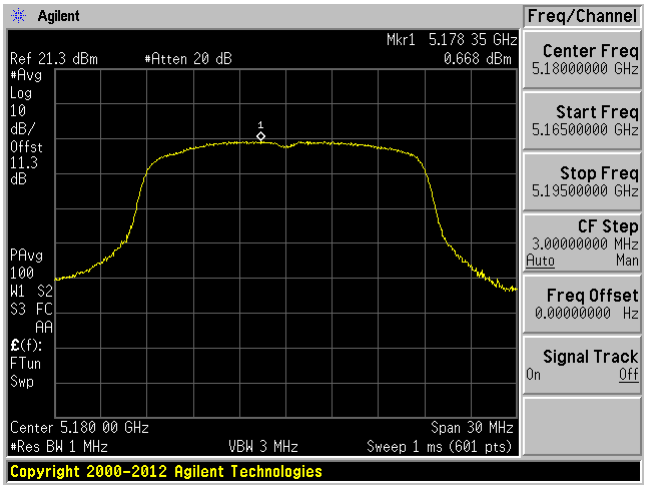


5240 MHz

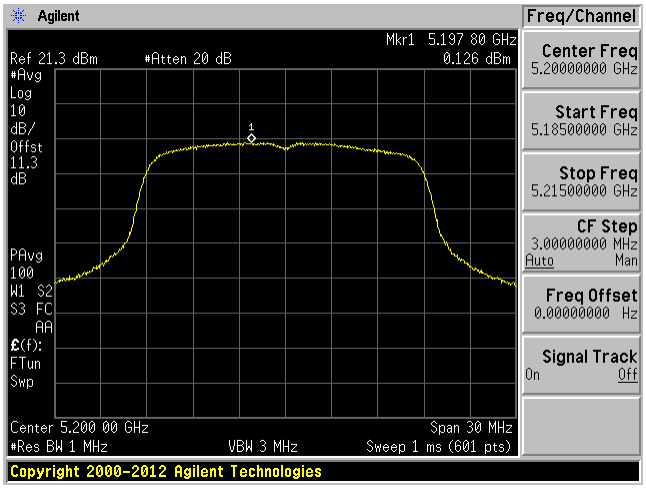


802.11n20 mode

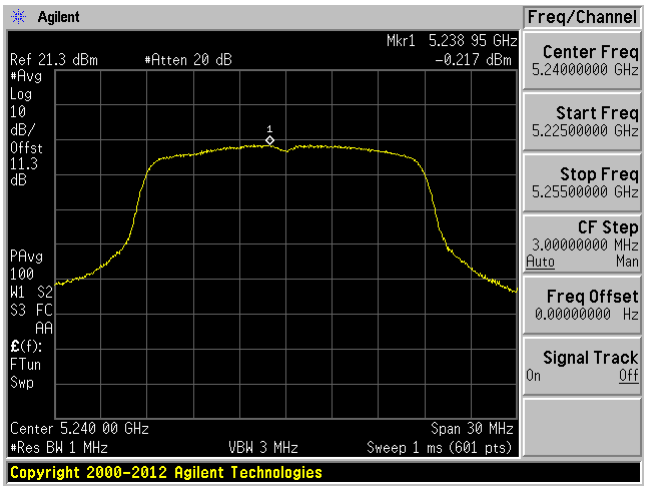
5180 MHz



5200 MHz

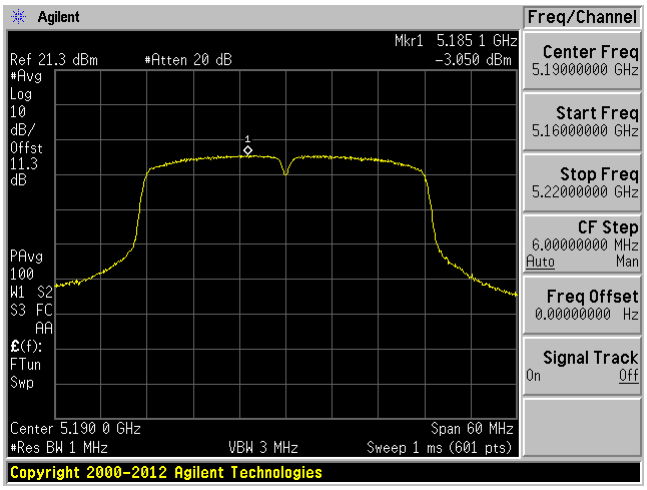


5240 MHz

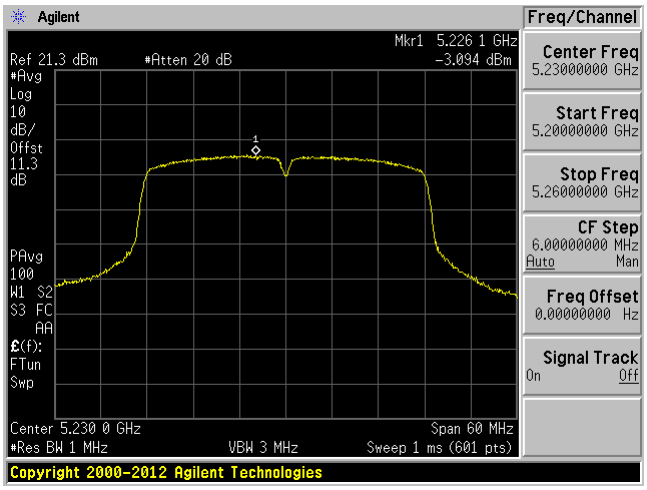


802.11n40 mode

5190 MHz

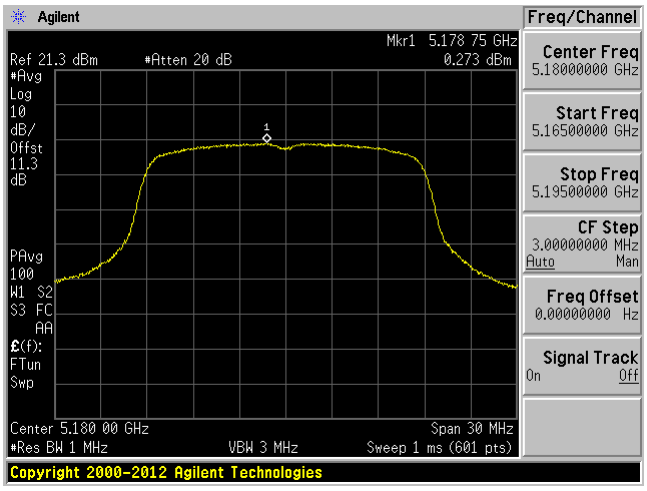


5230 MHz

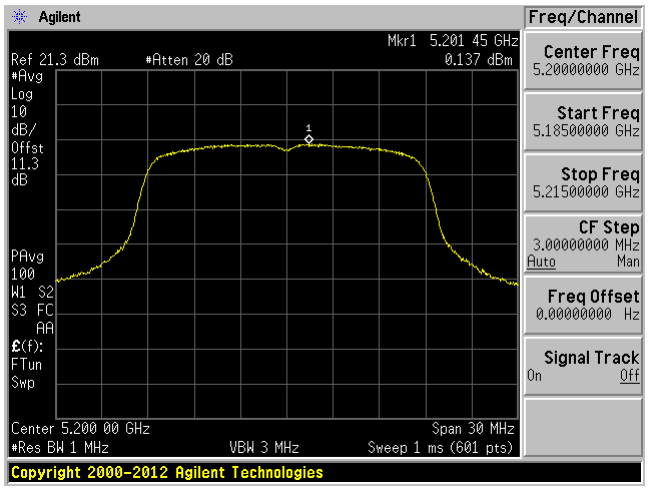


802.11ac20 mode

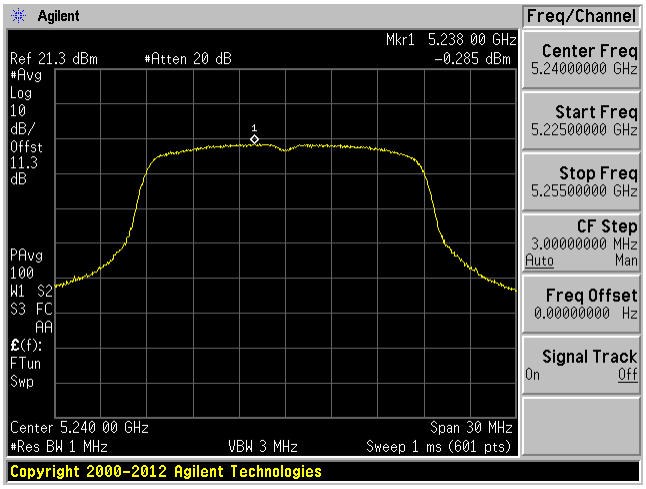
5180 MHz



5200 MHz

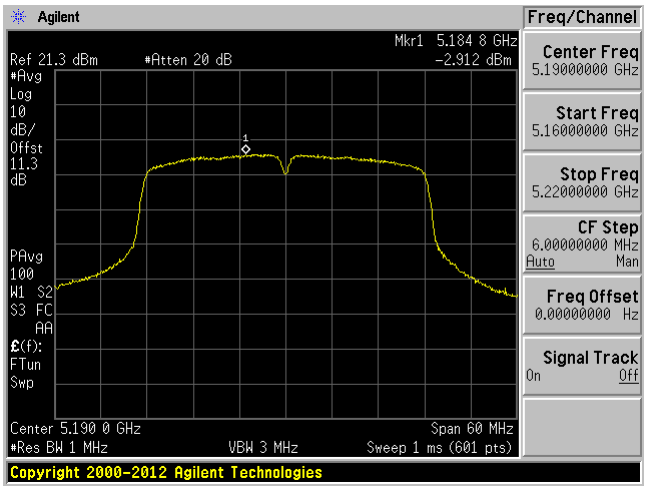


5240 MHz

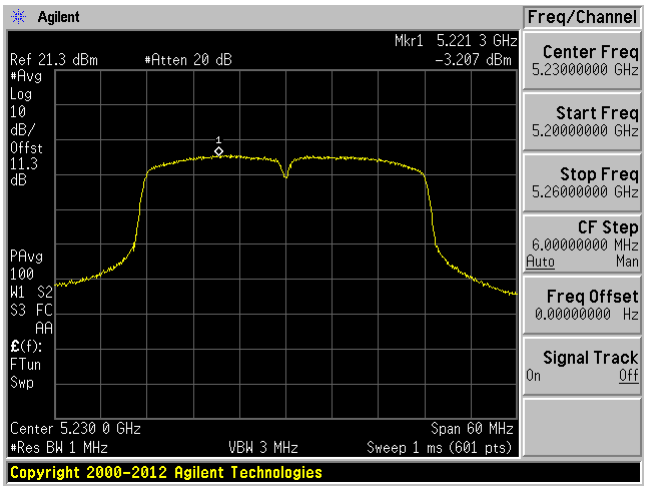


802.11ac40 mode

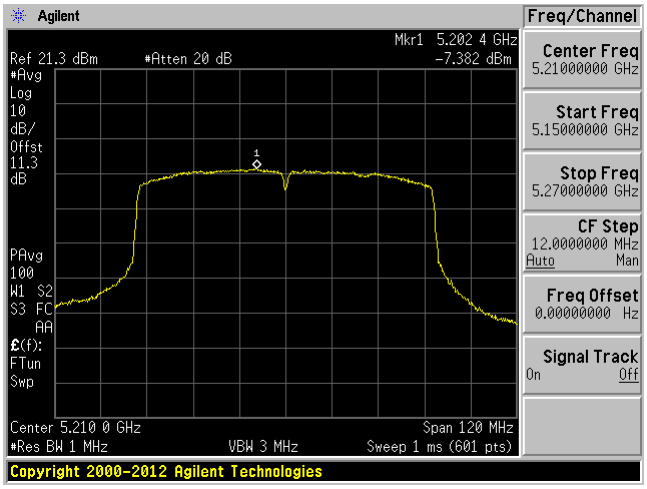
5190 MHz



5230 MHz



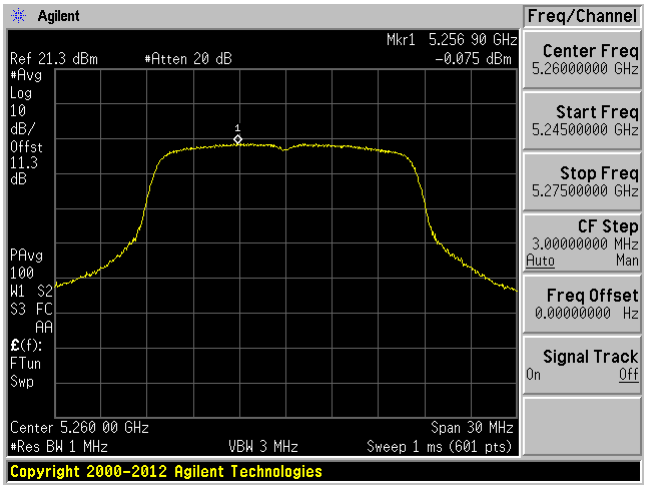
802.11ac80 mode, 5210 MHz



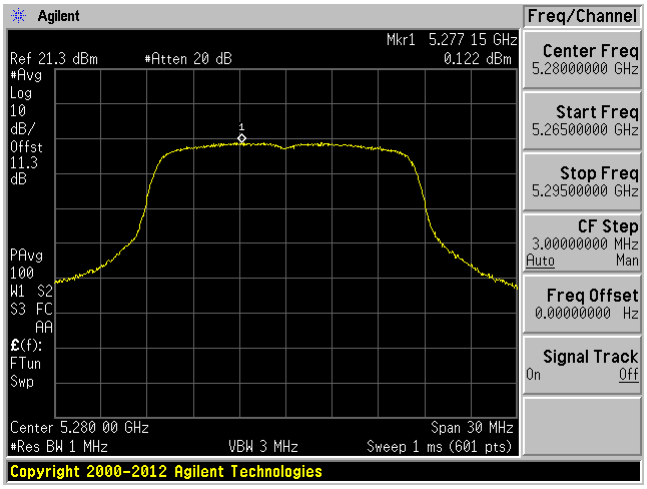
5250 – 5350 MHz

802.11a mode

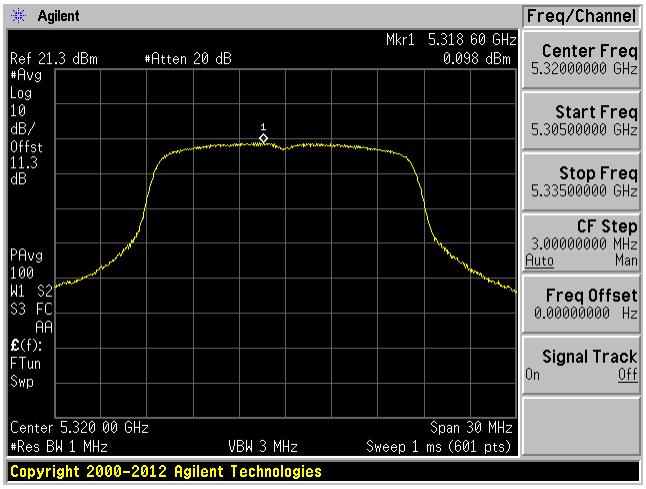
5260 MHz



5280 MHz

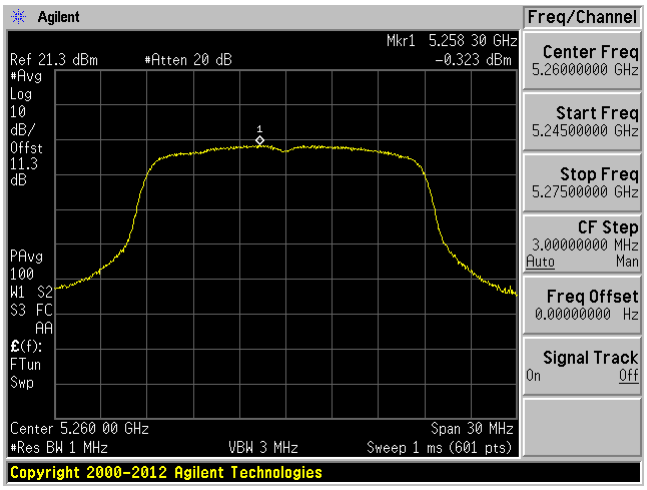


5320 MHz

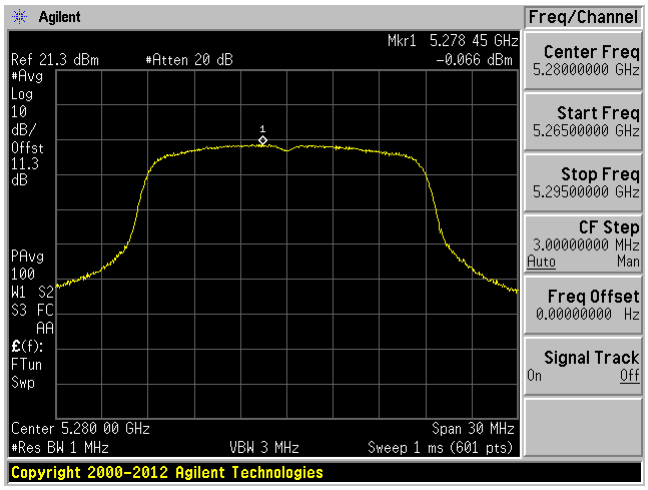


802.11n20 mode

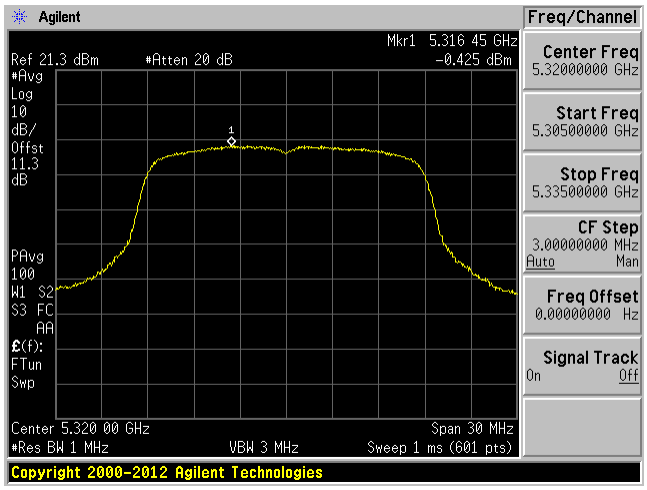
5260 MHz



5280 MHz

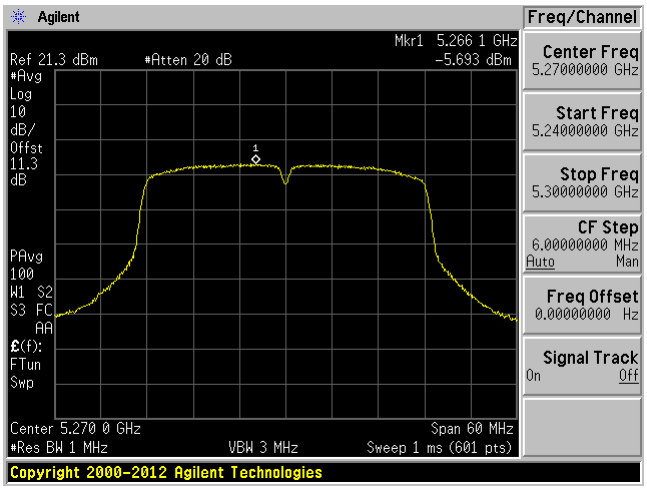


5320 MHz

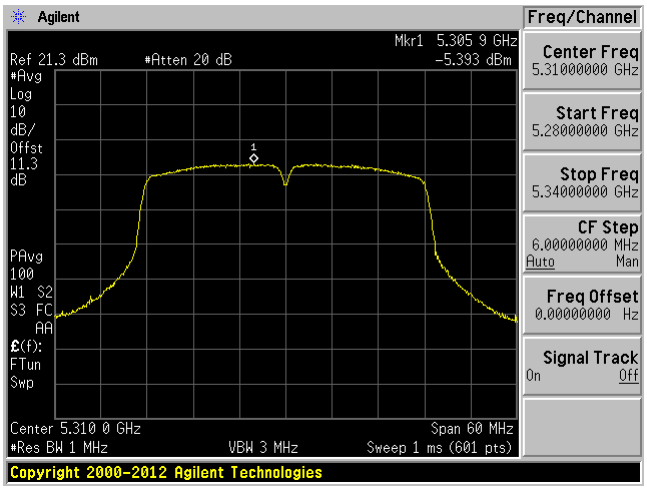


802.11n40 mode

5270 MHz

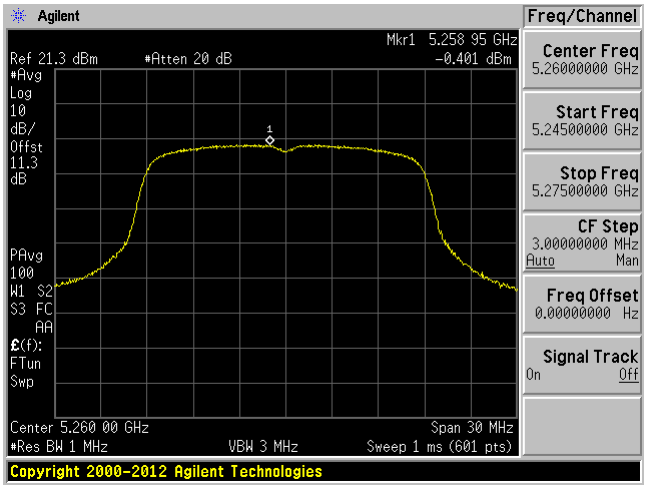


5310 MHz

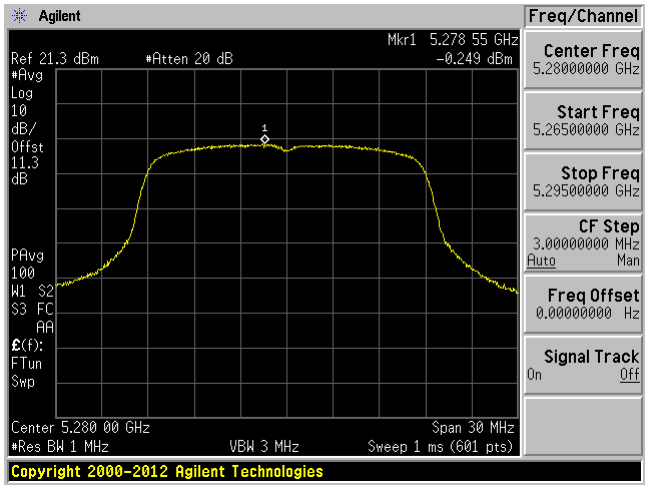


802.11ac20 mode

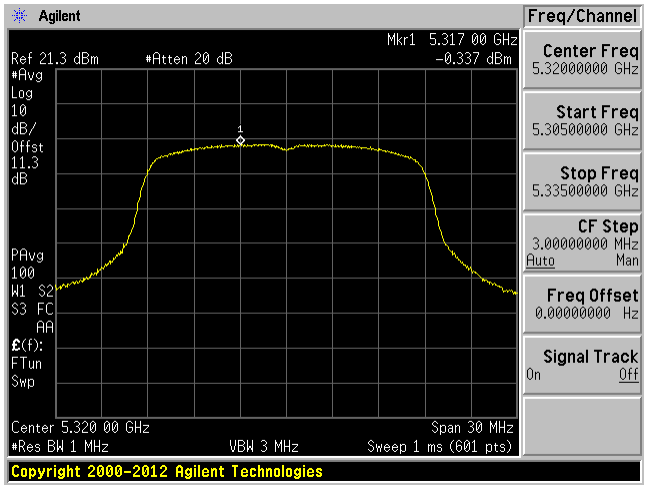
5260 MHz



5280 MHz

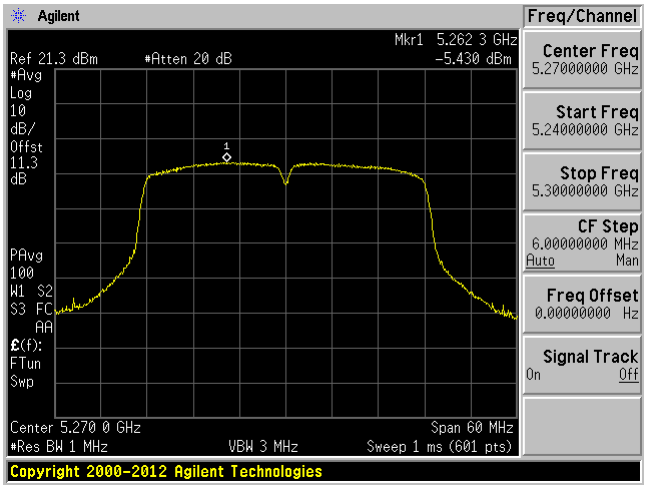


5320 MHz

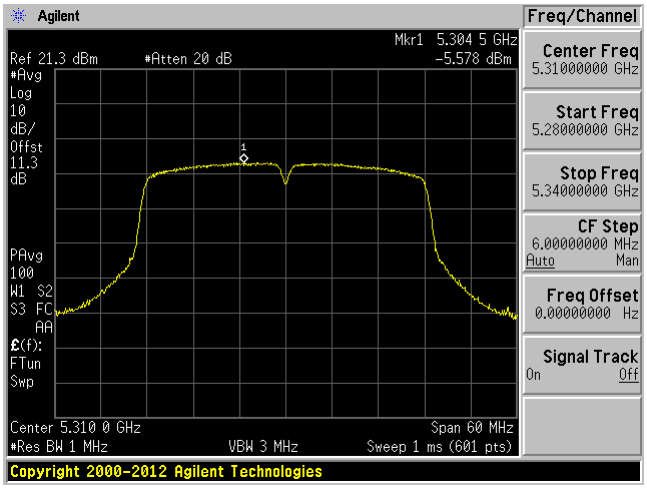


802.11ac40 mode

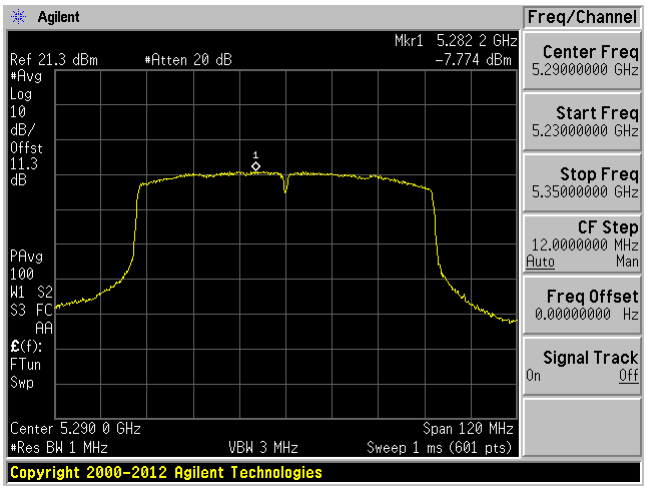
5270 MHz



5310 MHz



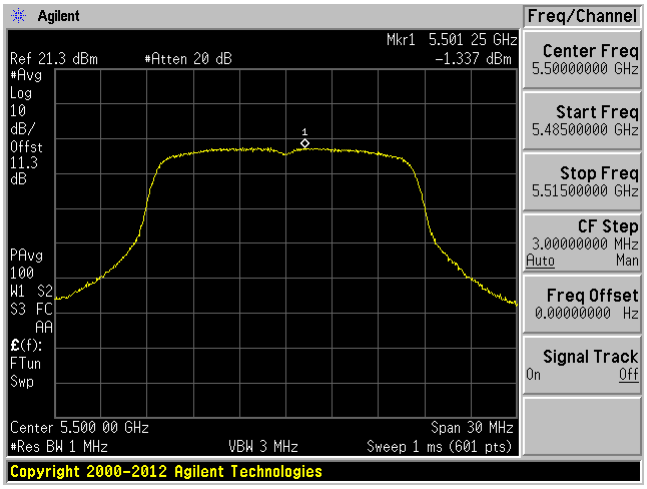
802.11ac80 mode, 5290 MHz



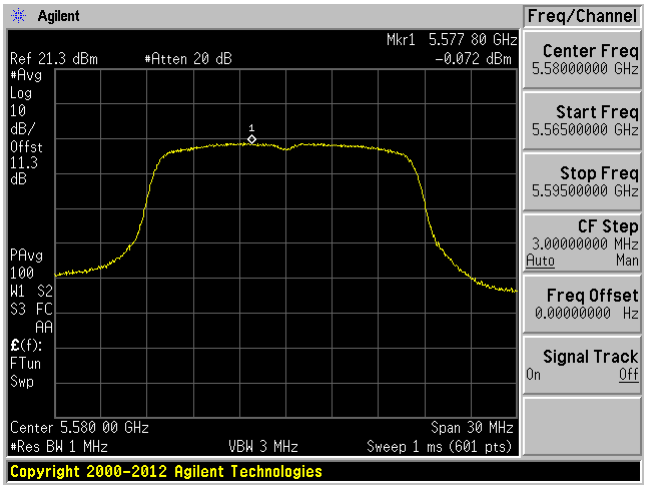
5470 – 5725 MHz

802.11a mode

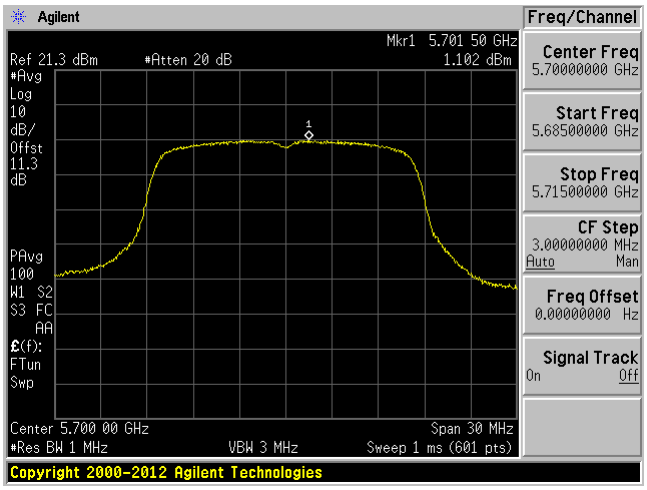
5500 MHz



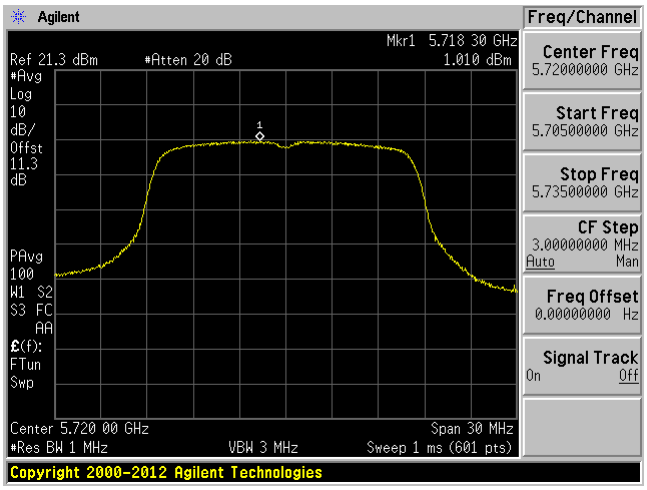
5580 MHz



5700 MHz

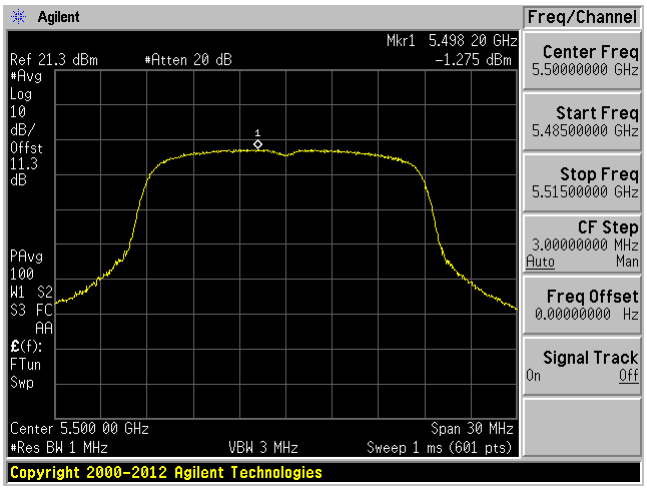


5720 MHz

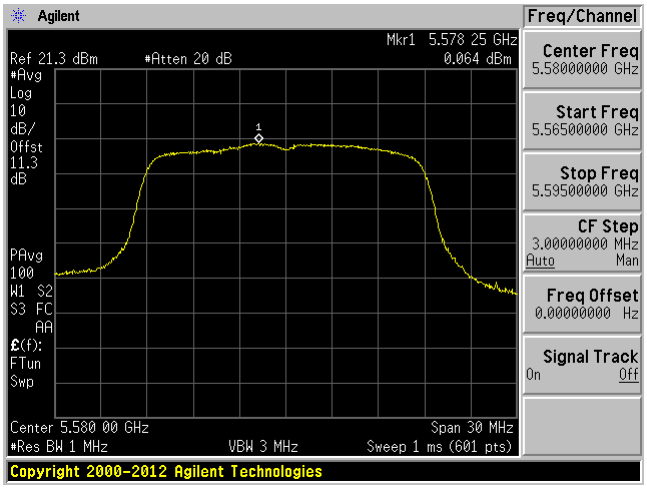


802.11n20 mode

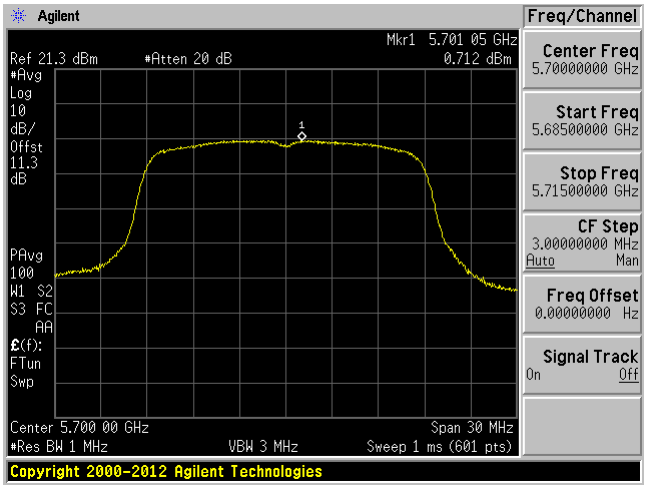
5500 MHz



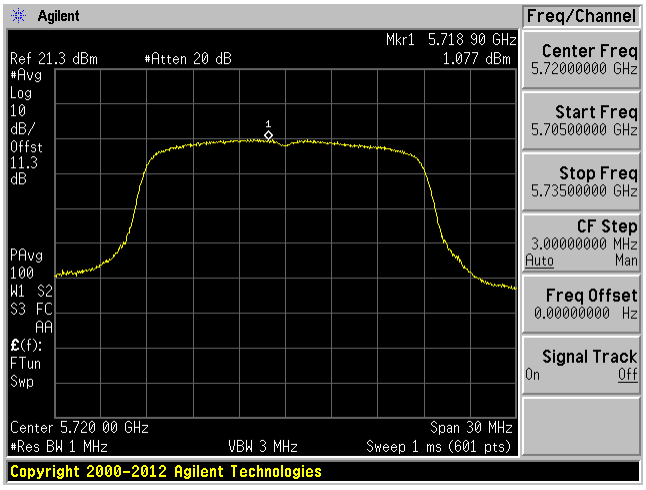
5580 MHz



5700 MHz

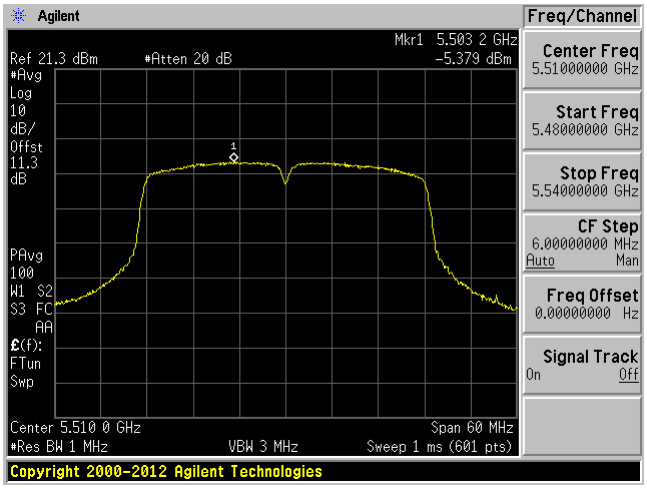


5720 MHz

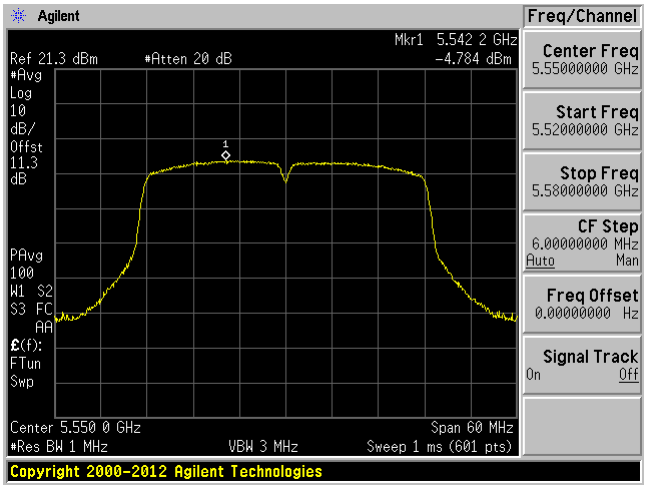


802.11n40 mode

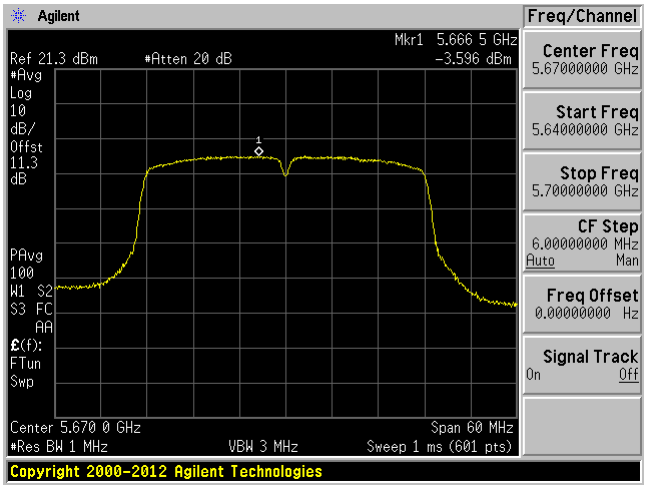
5510 MHz



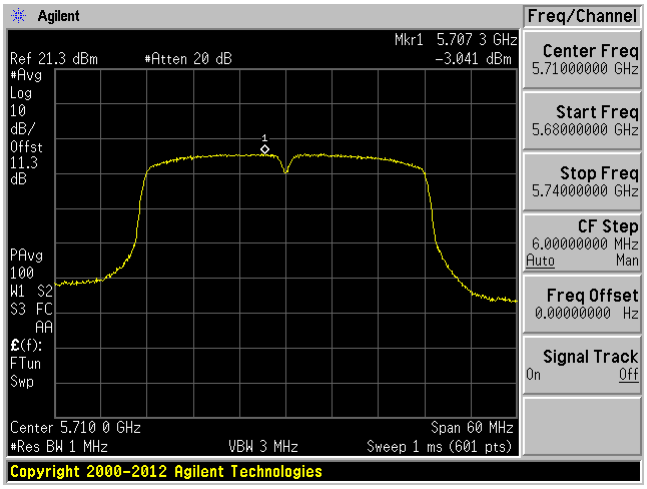
5550 MHz



5670 MHz

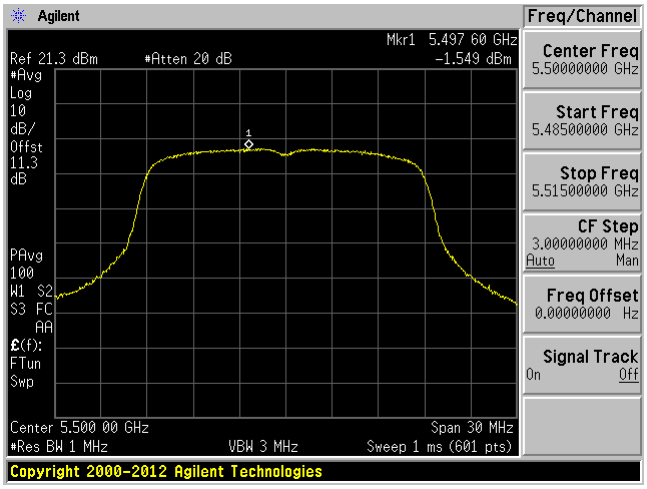


5710 MHz

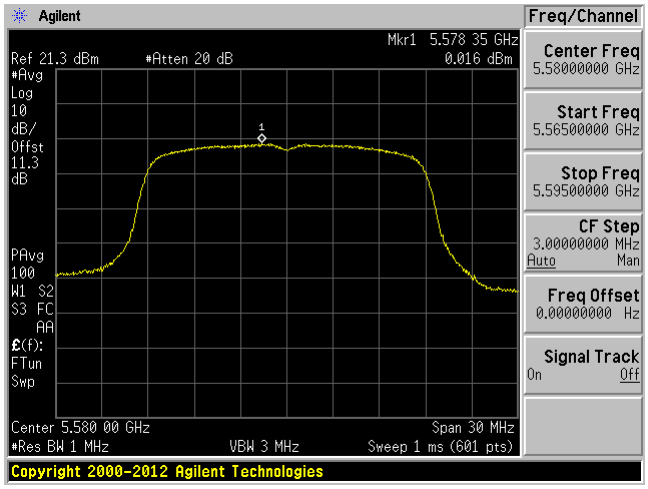


802.11ac20 mode

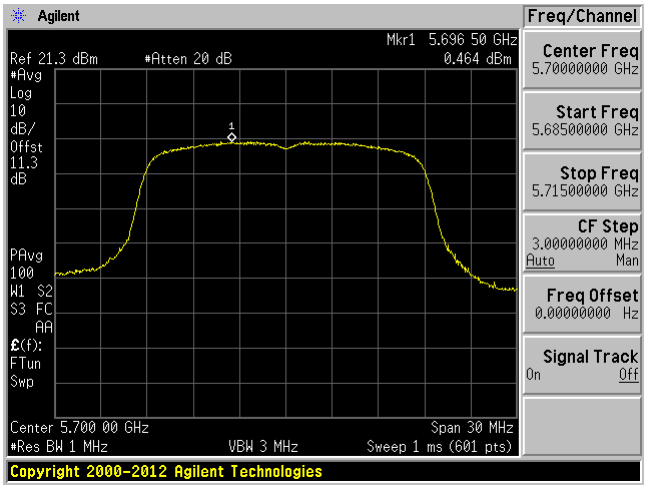
5500 MHz



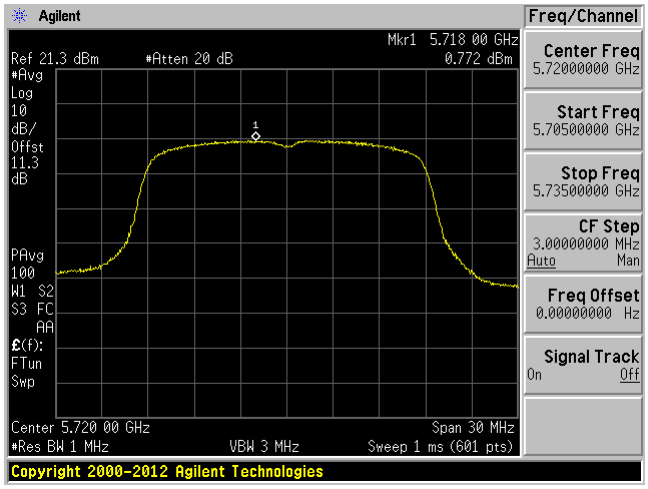
5580 MHz



5700 MHz

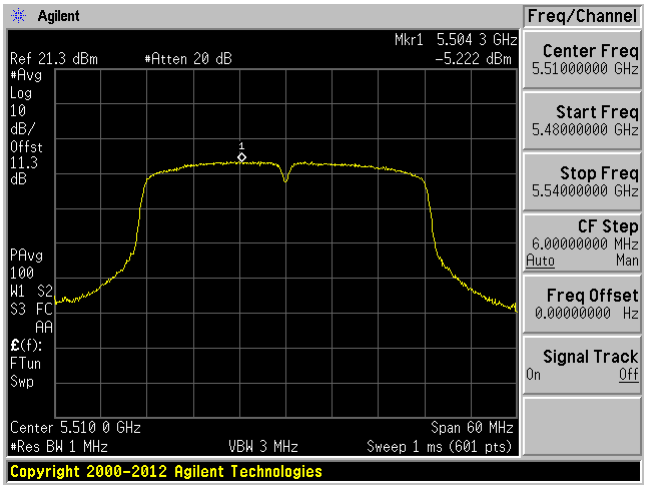


5720 MHz

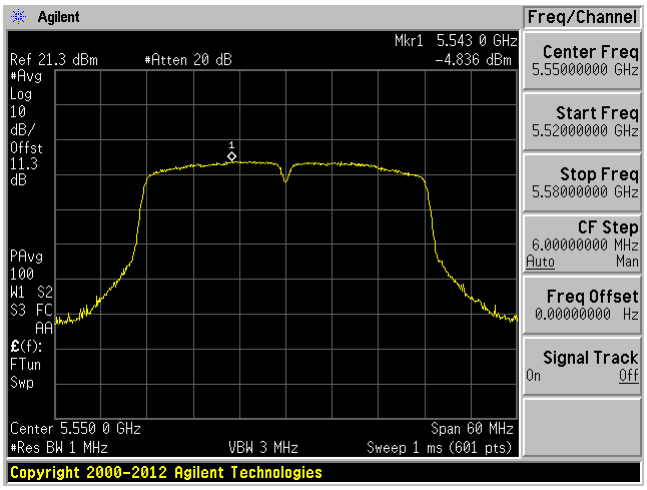


802.11ac40 mode

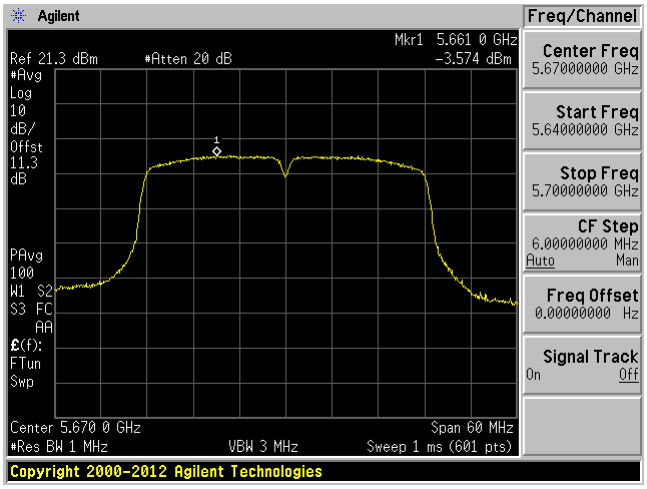
5510 MHz



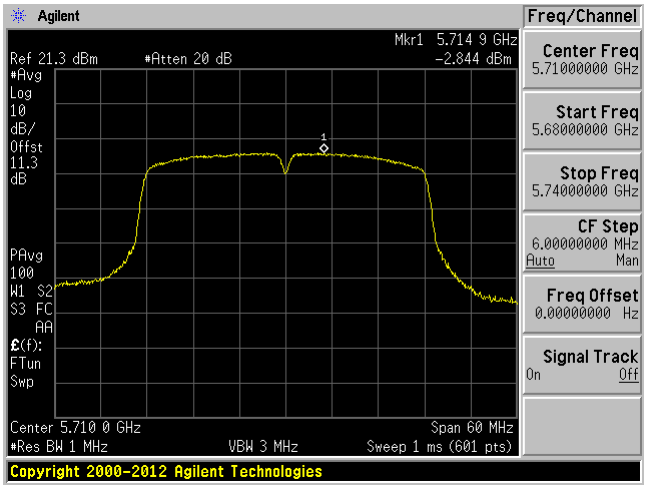
5550 MHz



5670 MHz

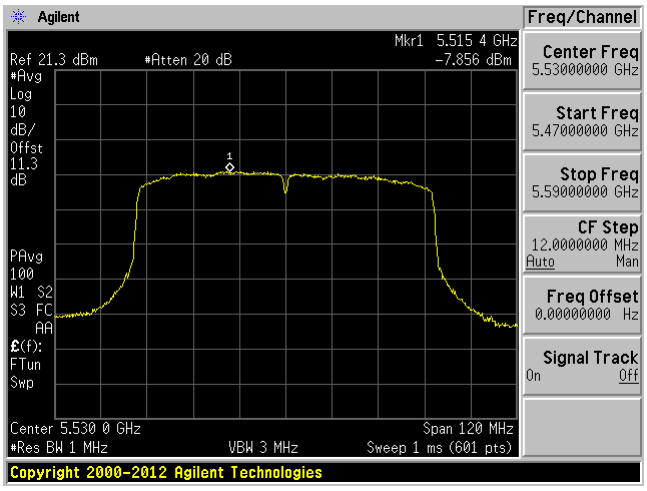


5710 MHz

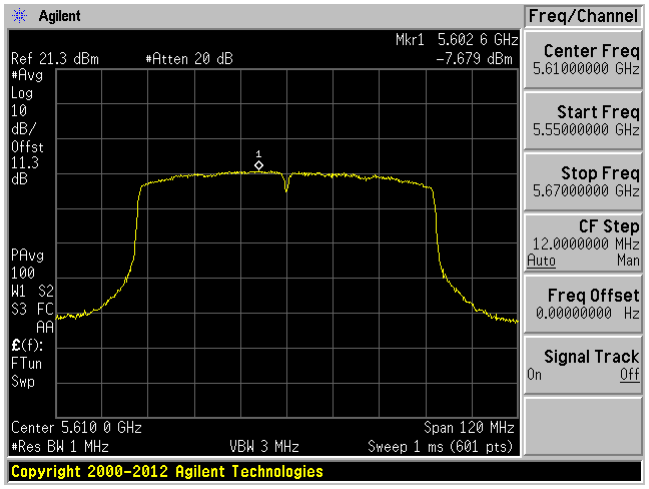


802.11ac80 mode

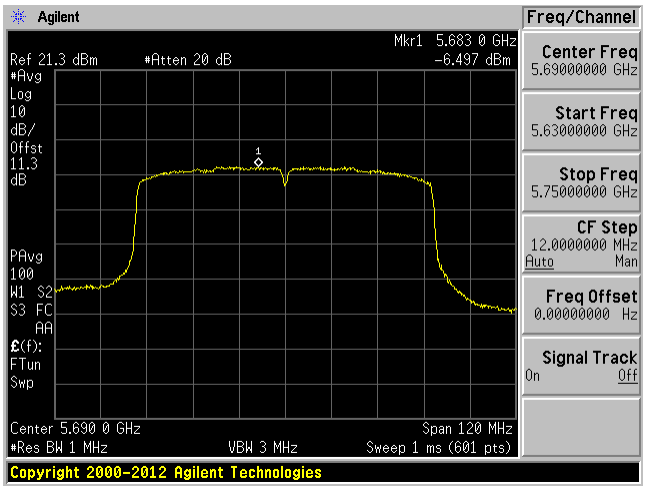
5530 MHz



5610 MHz



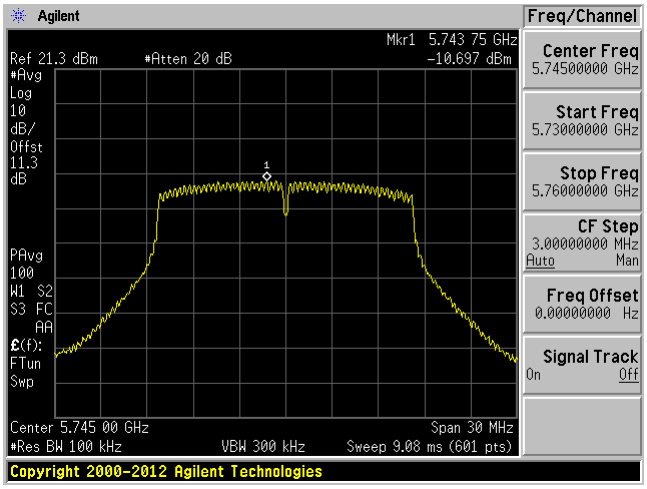
5690 MHz



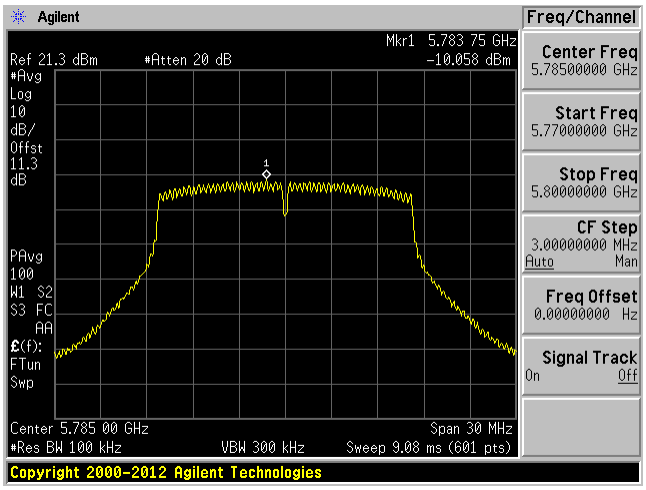
5725 – 5850 MHz

802.11a mode

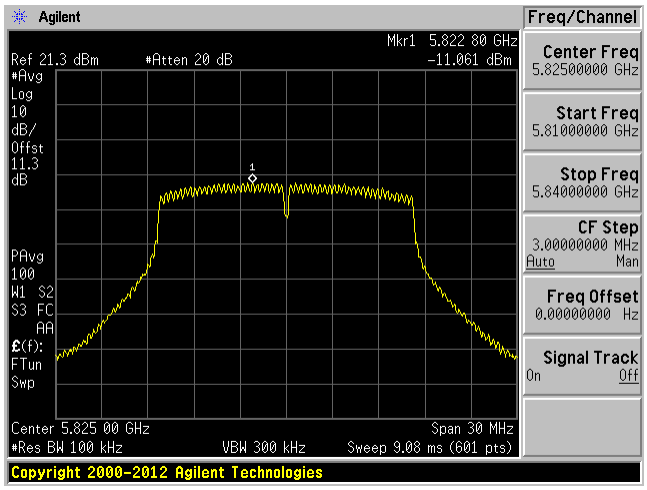
5745 MHz



5785 MHz

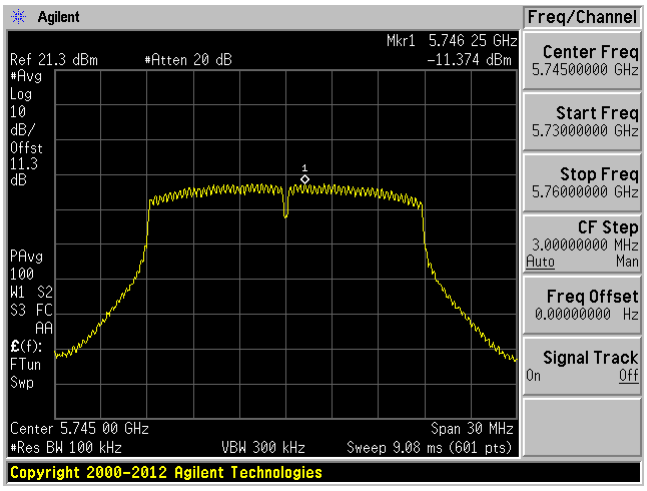


5825 MHz

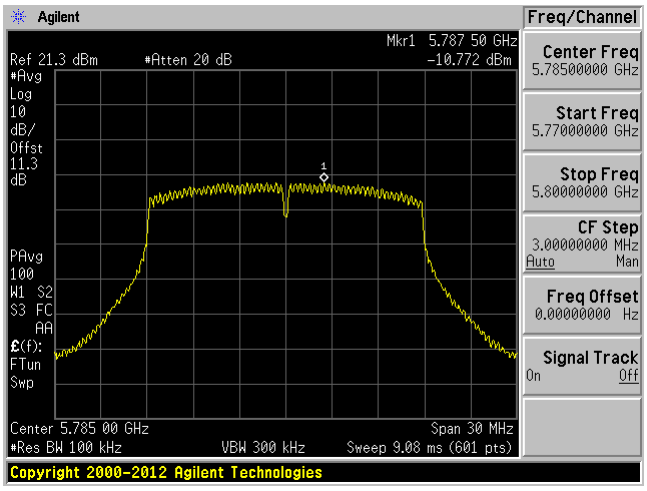


802.11n20 mode

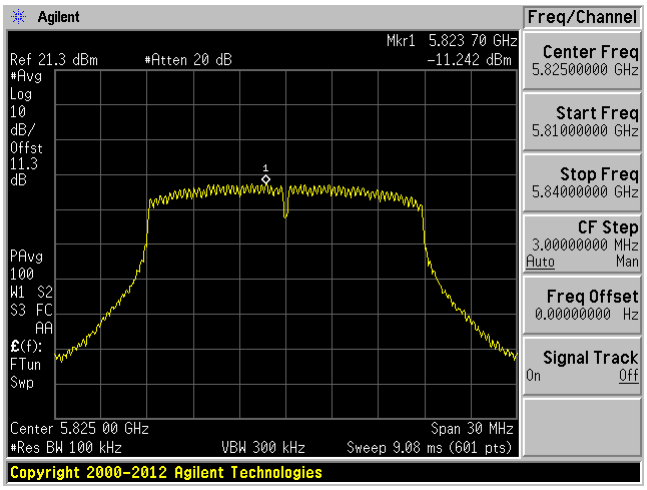
5745 MHz



5785 MHz

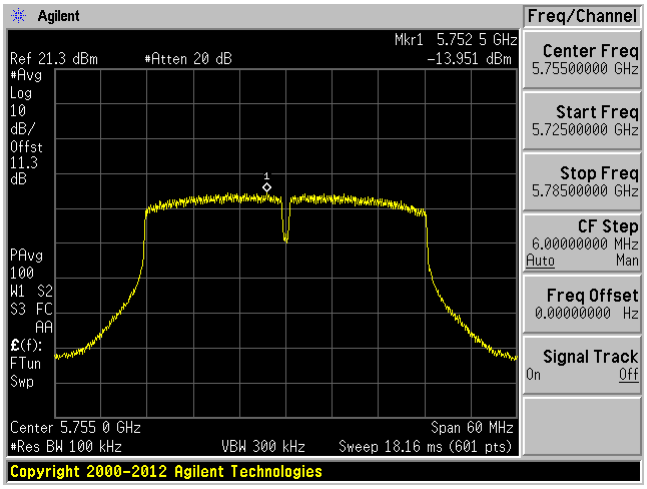


5825 MHz

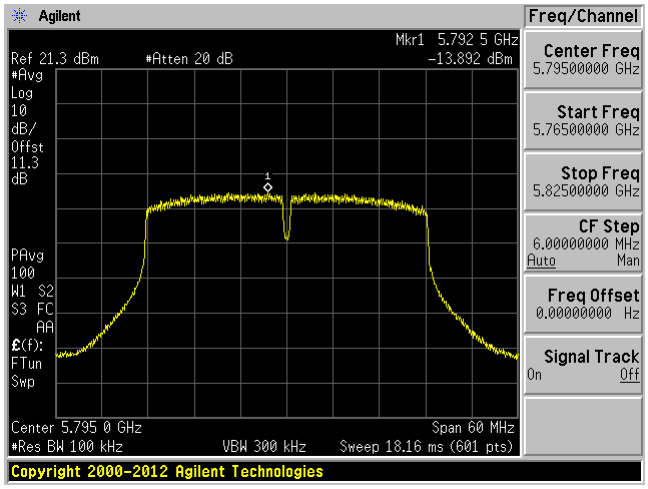


802.11n40 mode

5755 MHz

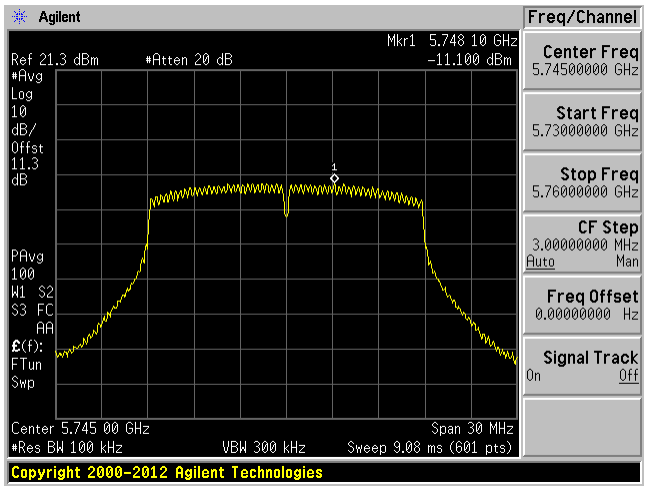


5795 MHz

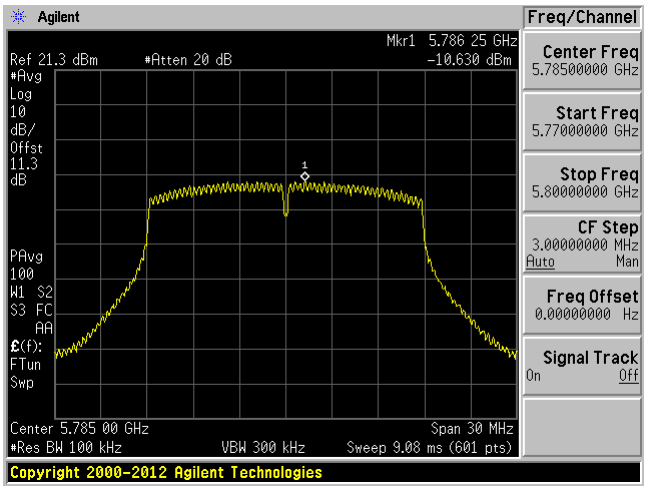


802.11ac20 mode

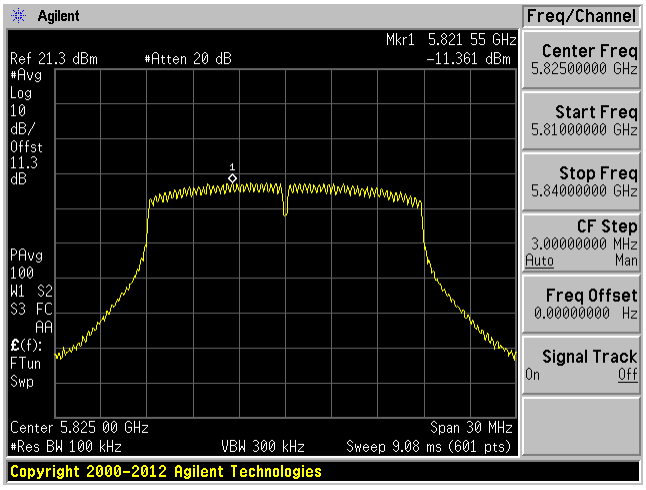
5745 MHz



5785 MHz

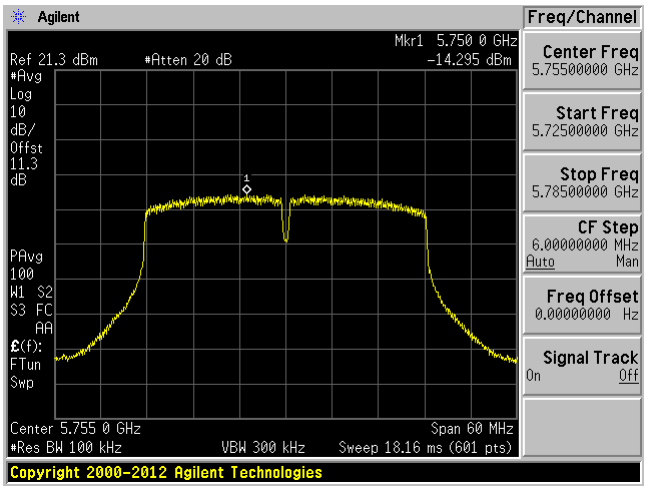


5825 MHz

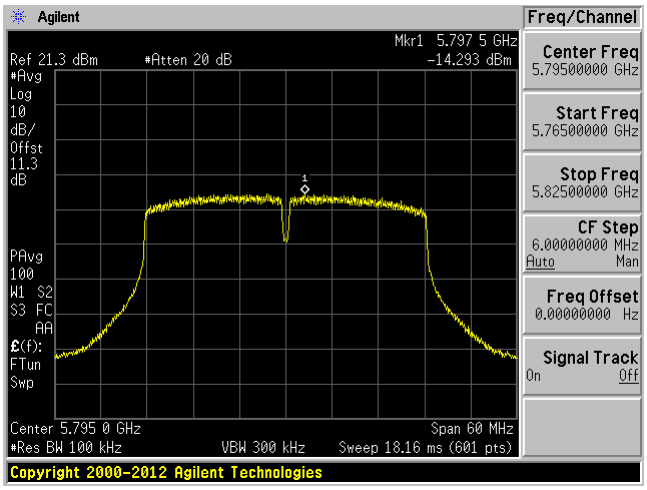


802.11ac40 mode

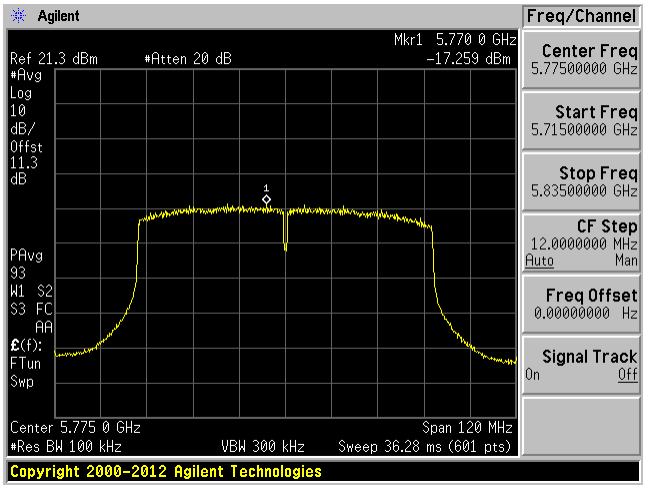
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz



11 FCC §15.407(b) & ISEDC RSS-247 §6.2 - Out of Band Emissions

11.1 Applicable Standards

According to FCC §15.407(b):

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.

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.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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.

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

According to ISEDC RSS-247 §6.2.1 for devices operatinging in the frequency band 5150-5250 MHz:

For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250-5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250-5350 MHz.

According to ISEDC RSS-247 §6.2.2 for devices operatinging in the frequency band 5250-5350 MHz:

For devices with both operating frequencies and channel bandwidths contained within the band 5250-5350 MHz, the device shall comply with the following:

1. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. if the equipment is intended for outdoor use; or
2. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of Section 6.2.1. The device shall be labelled “for indoor use only.”

For devices with operating frequencies in the band 5250-5350 MHz but having a channel bandwidth that overlaps the band 5150-5250 MHz, the devices’ unwanted emission shall not exceed -27 dBm/MHz e.i.r.p. outside the band 5150-5350 MHz and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device shall be labelled “for indoor use only.”
According to ISEDC RSS-247 §6.2.3 for devices operatinging in the frequency band 5470-5600 MHz and 5650-5725 MHz. Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

According to ISEDC RSS-247 §6.2.4 for devices operatinging in the frequency band 5725-5850 MHz:
For the band 5725-5850 MHz, emissions at frequencies from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p.
For emissions at frequencies more than 10 MHz above or below the band edges, the emissions power shall not exceed -27 dBm/MHz.

11.2 Measurement Procedure

Add a correction factor (antenna gain+ Attenuator loss+cable loss) to the offset of the spectrum analyzer.
Integration Method

1. For peak emissions measurements, follow the procedures described in section H)5), "Procedures for Peak Unwanted Emissions Measurements above 1000 MHz", except for the following changes:
- Set RBW = 100 kHz
- Set VBW = 3RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured. CAUTION: You must ensure that the spectrum analyzer or EMI receiver is set for peak-detection and max-hold for this measurement.
2. For average emissions measurements, follow the procedures described in section H)6), "Procedures for Average Unwanted Emissions Measurements above 1000 MHz", except for the following changes:
- Set RBW = 100 kHz
- Set VBW = 3RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US453156	2016-06-10	1 year
-	RF cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

11.4 Test Environmental Conditions

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

The testing was performed by Vincent Licata 2017-05-17 at RF site.

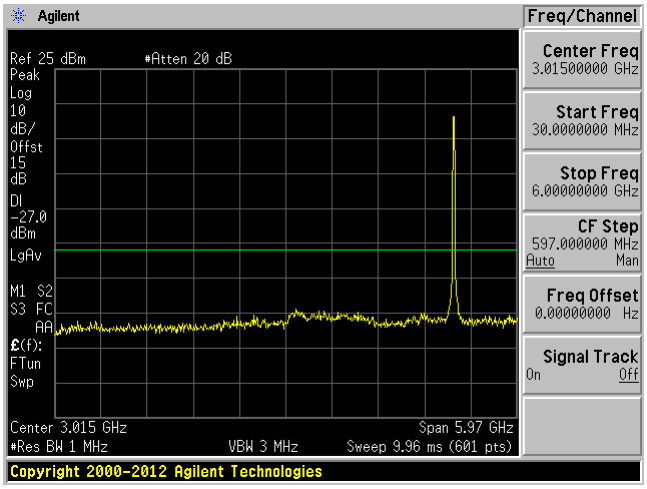
11.5 Test Results

Please refer to the following plots

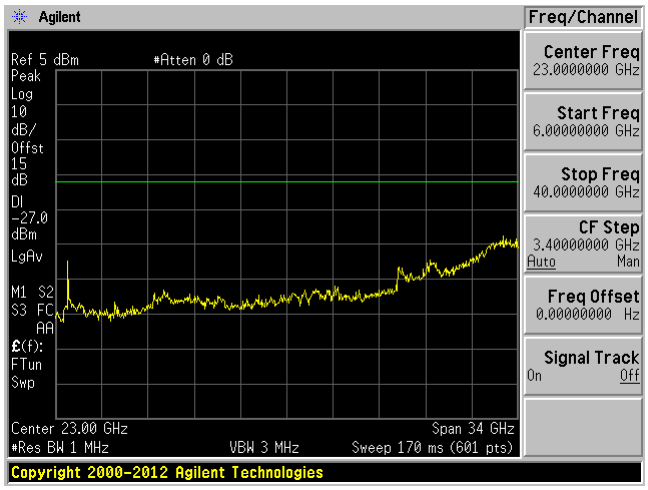
5150 - 5250 MHz

802.11a mode

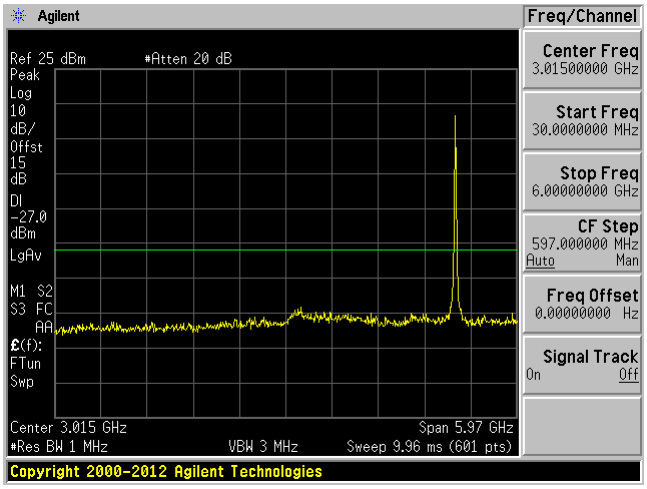
Low Channel 5180MHz (30MHz-6GHz)



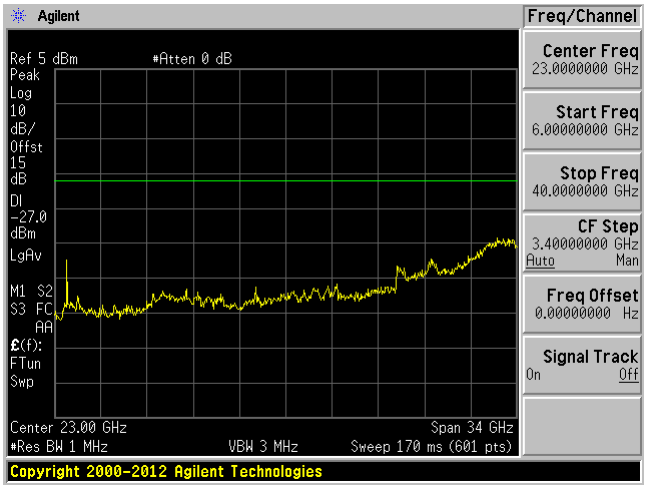
Low Channel 5180 MHz (6-40GHz)



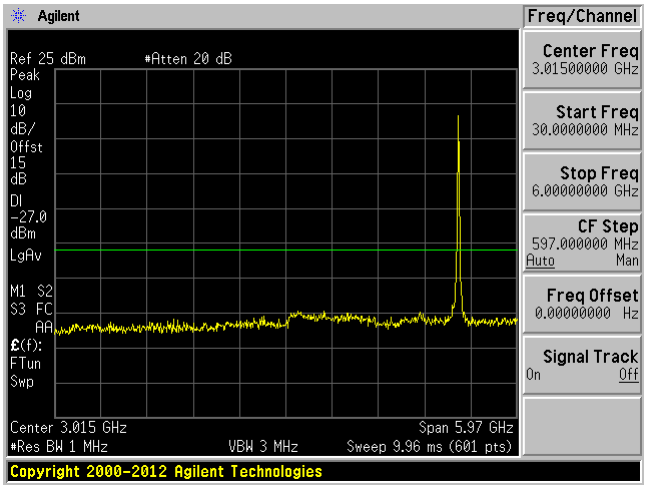
Middle Channel 5200MHz (30MHz-6GHz)



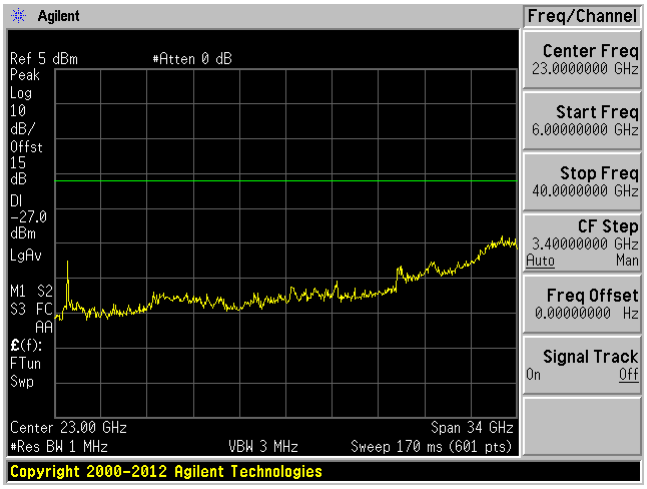
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

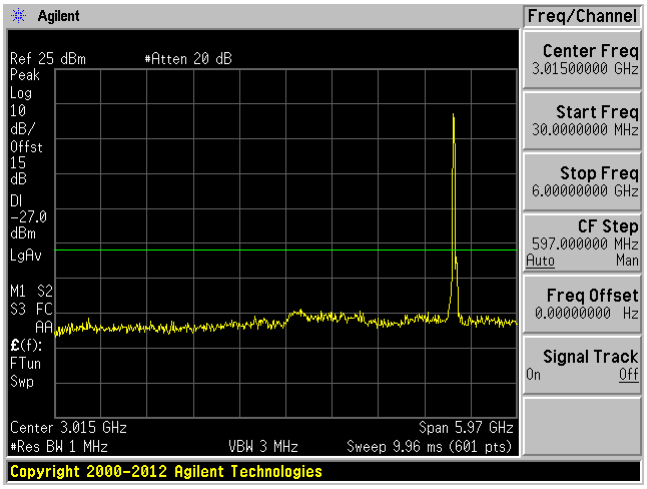


High Channel 5240 MHz (6-40GHz)



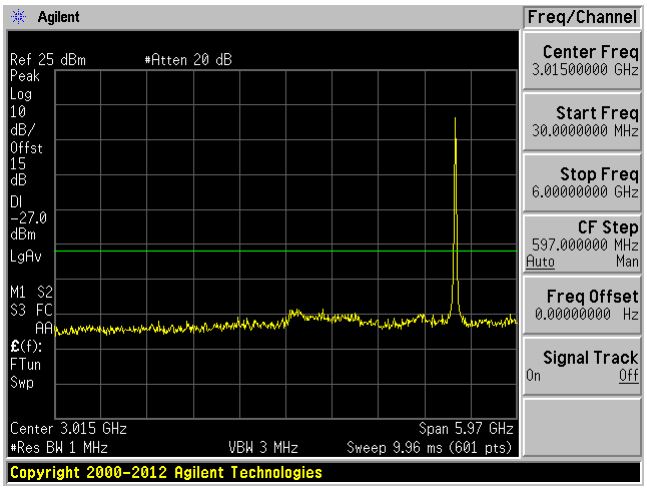
802.11n20 mode

Low Channel 5180MHz (30MHz-6GHz)

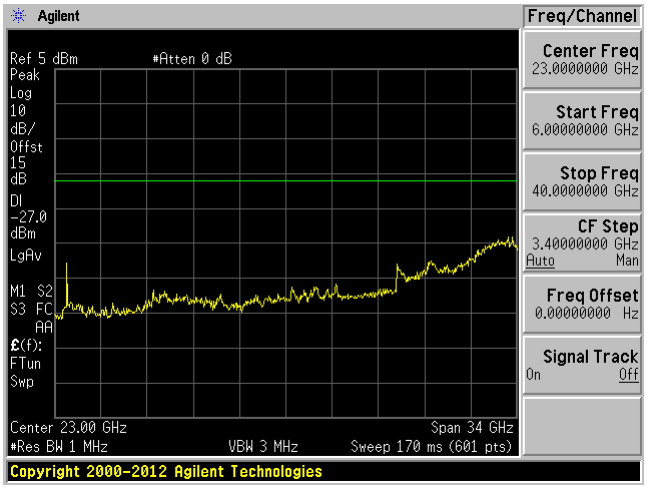


Low Channel 5180 MHz (6-40GHz)

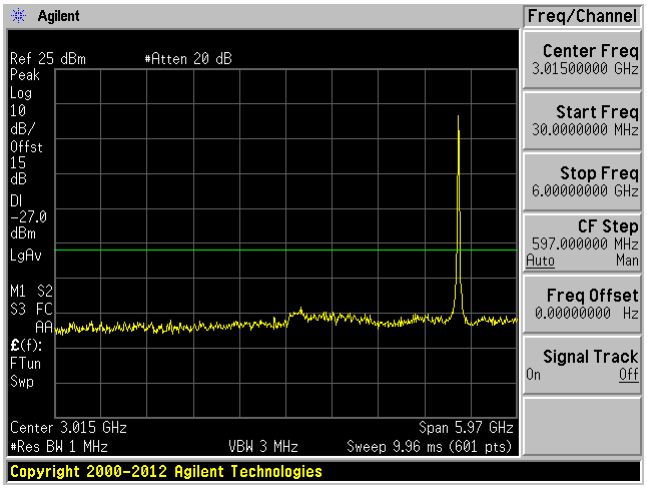
Middle Channel 5200MHz (30MHz-7GHz)



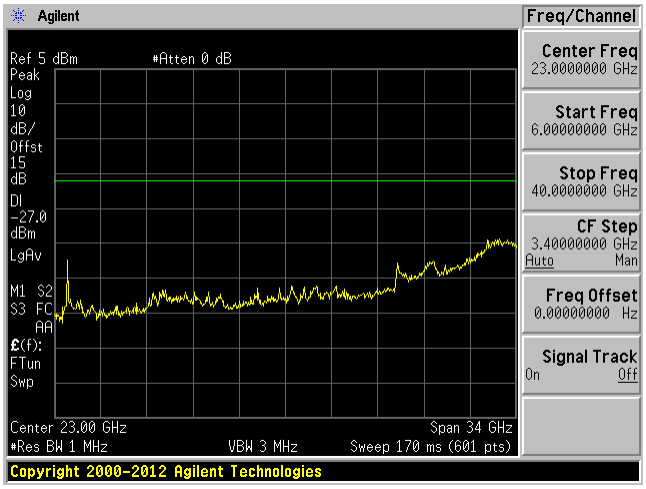
Middle Channel 5200 MHz (6-40GHz)



High Channel 5240MHz (30MHz-6GHz)

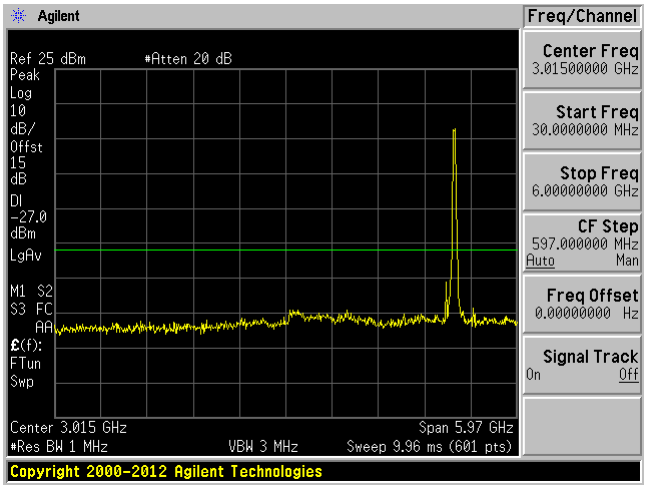


High Channel 5240 MHz (6-40GHz)

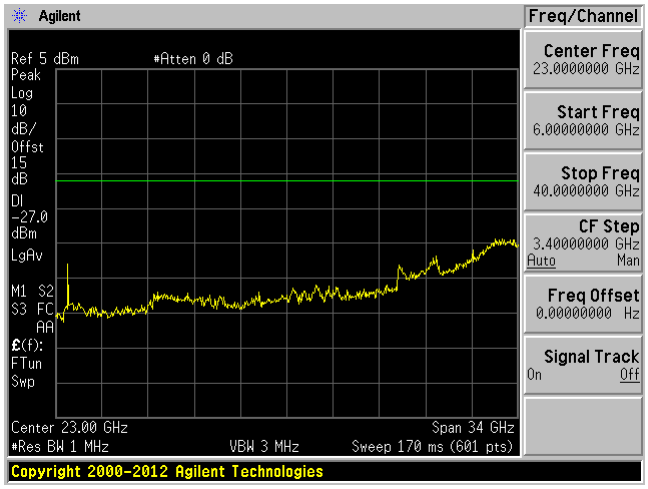


802.11n40 mode

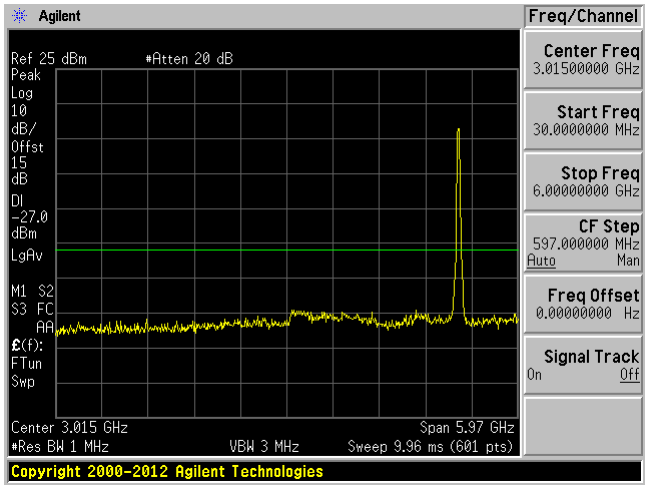
Low Channel 5190MHz (30MHz-6GHz)



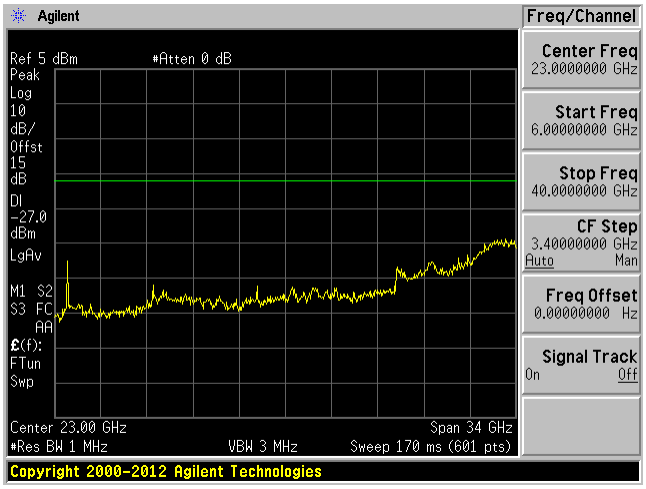
Low Channel 5190 MHz (6-40GHz)



High Channel 5230MHz (30MHz-6GHz)

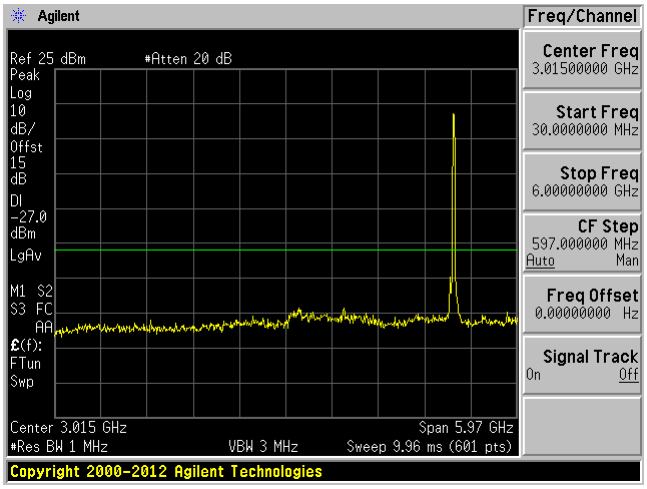


High Channel 5230 MHz (6-40GHz)

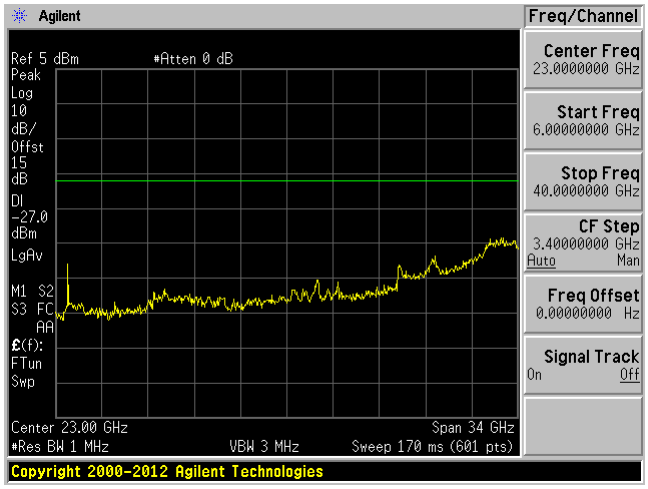


802.11ac20 mode

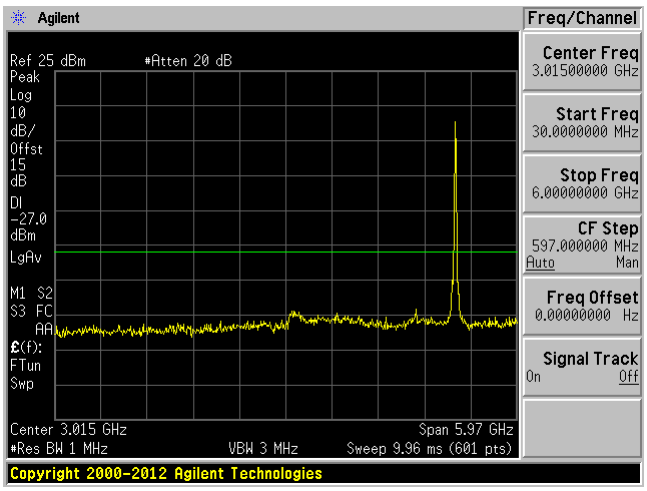
Low Channel 5180MHz (30MHz-6GHz)



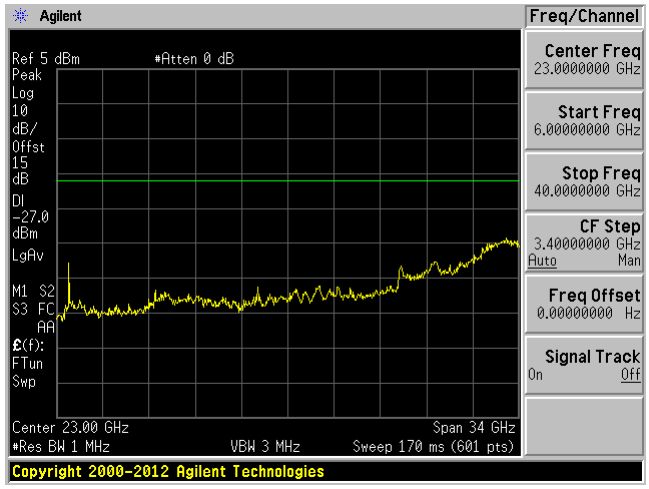
Low Channel 5180 MHz (6-40GHz)



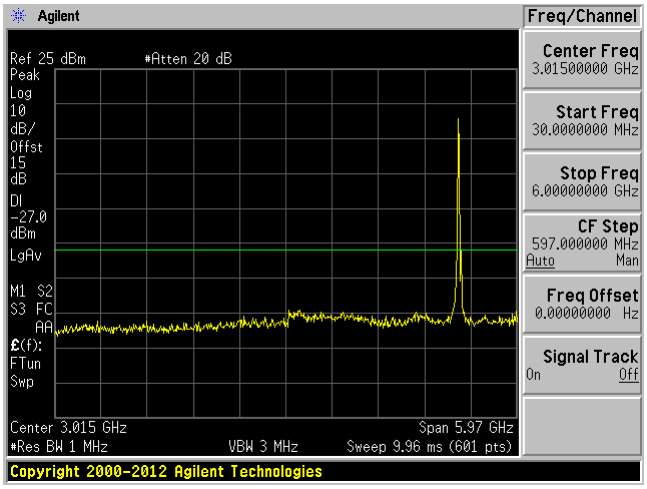
Middle Channel 5200MHz (30MHz-6GHz)



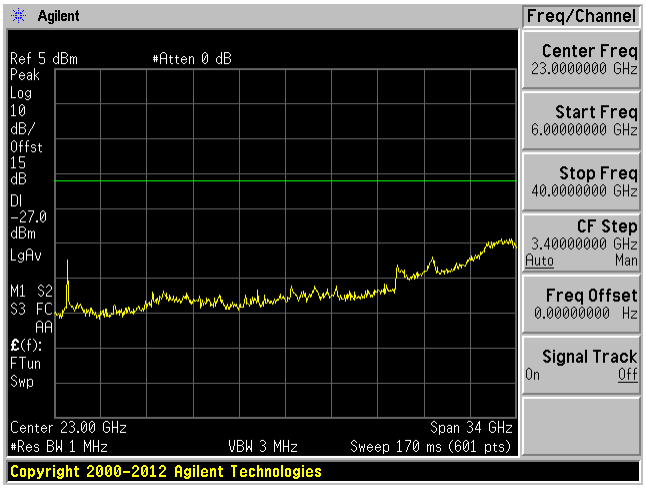
Middle Channel 5200 MHz (6GHz – 40GHz)



High Channel 5240MHz (30MHz-6GHz)

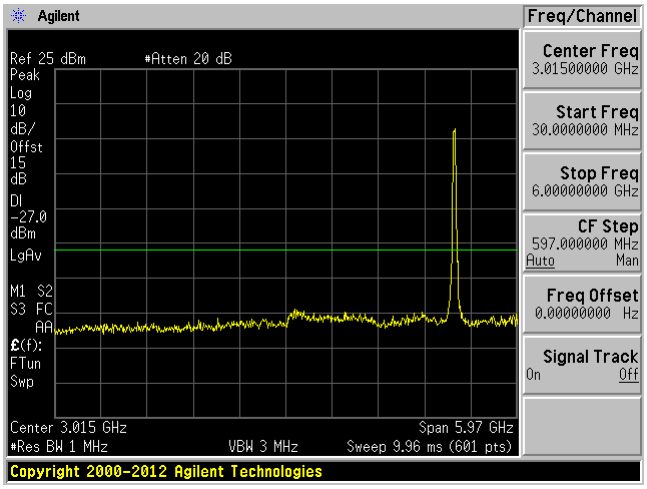


High Channel 5240 MHz (6GHz – 40GHz)

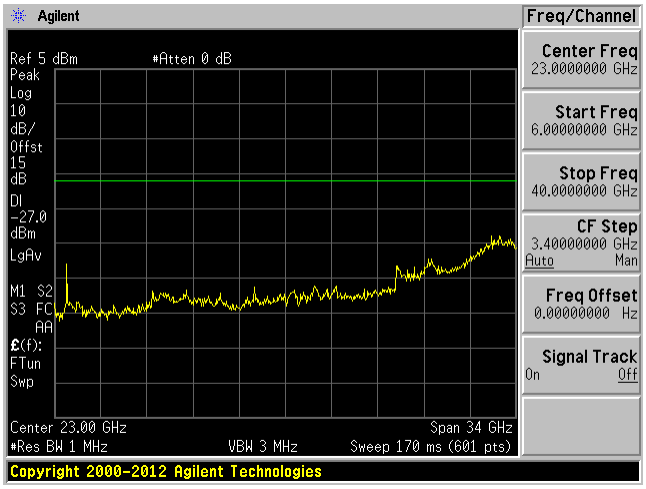


802.11ac40 mode

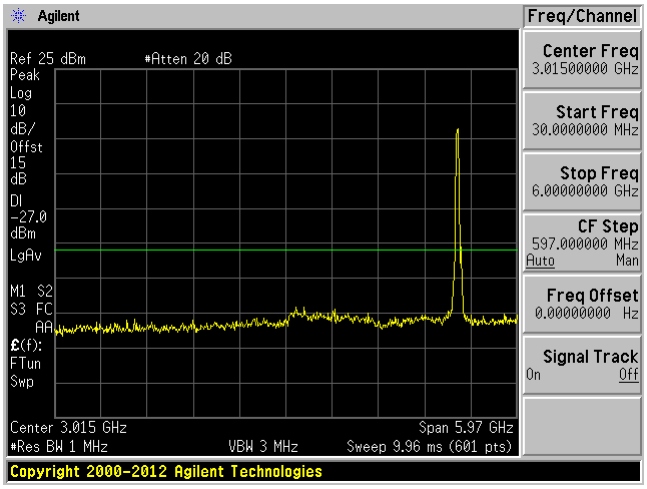
Low Channel 5190MHz (30MHz-6GHz)



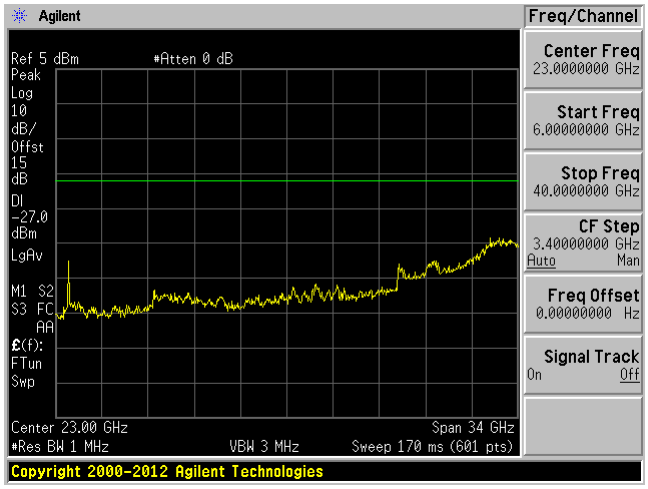
Low Channel 5190 MHz (6-40GHz)



High Channel 5230MHz (30MHz-6GHz)

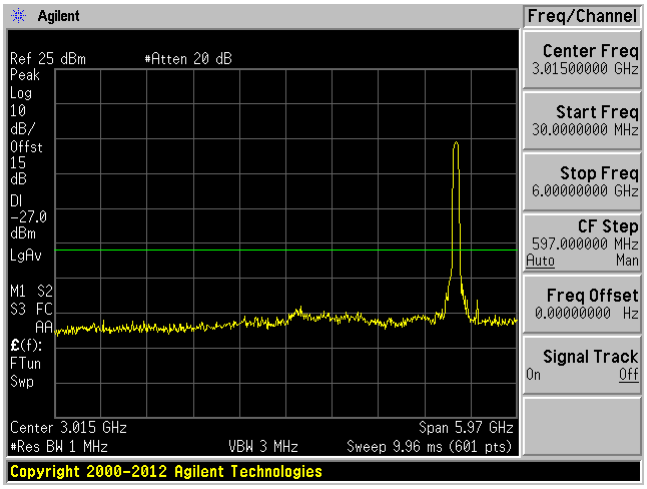


High Channel 5230 MHz (6GHz – 40GHz)

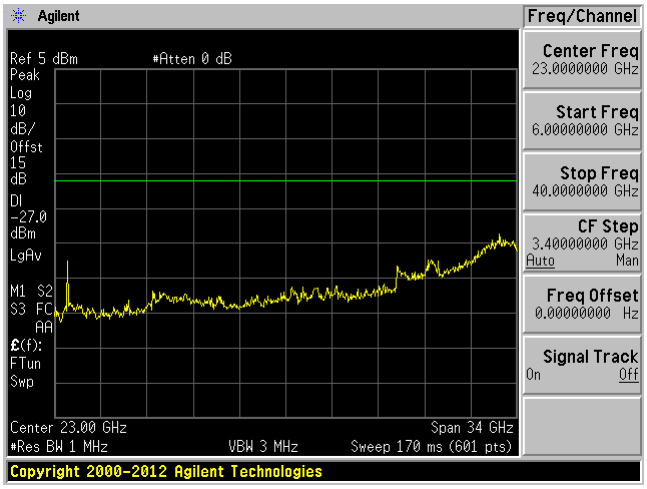


802.11ac80 mode

5210 MHz (30MHz-6GHz)



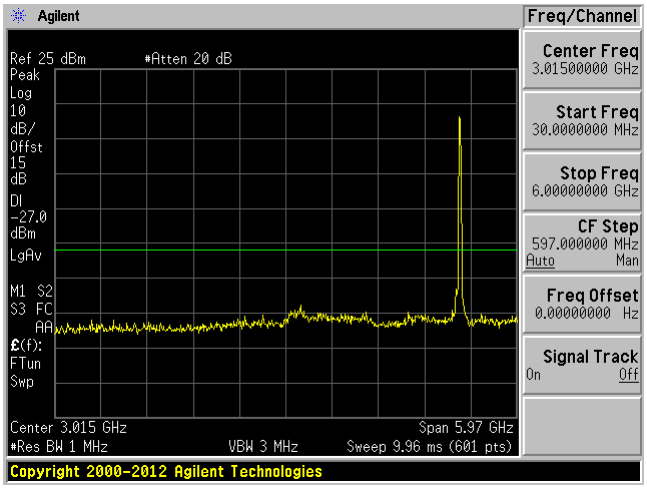
5210 MHz (6GHz – 40GHz)



5250 – 5350 MHz

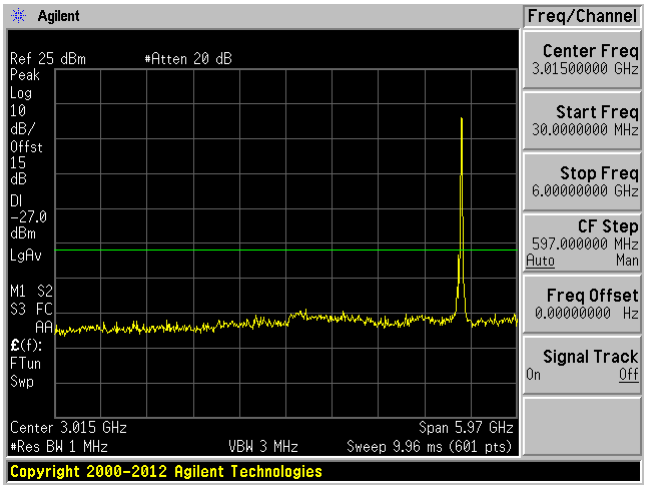
802.11a mode

Low Channel 5260 MHz (30MHz-6GHz)

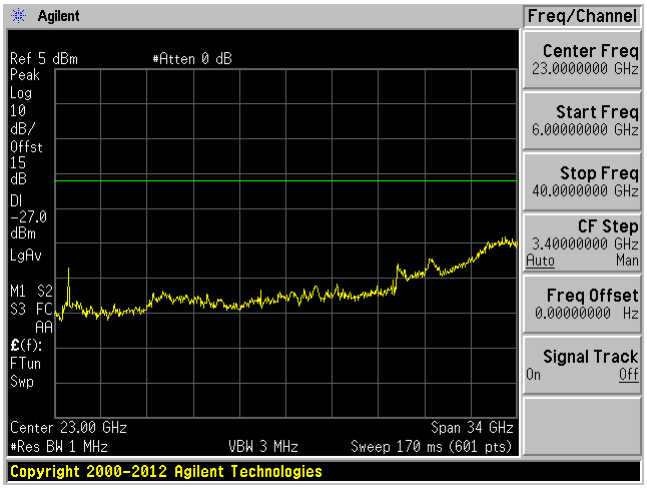


Low Channel 5260 MHz (6-40GHz)

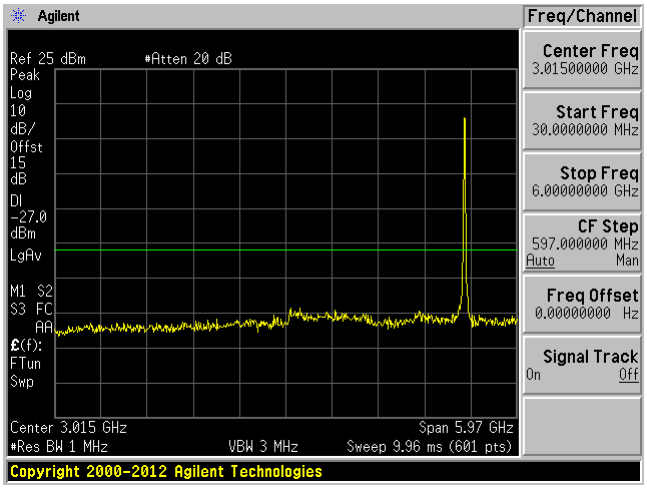
Middle Channel 5280 MHz (30MHz-6GHz)



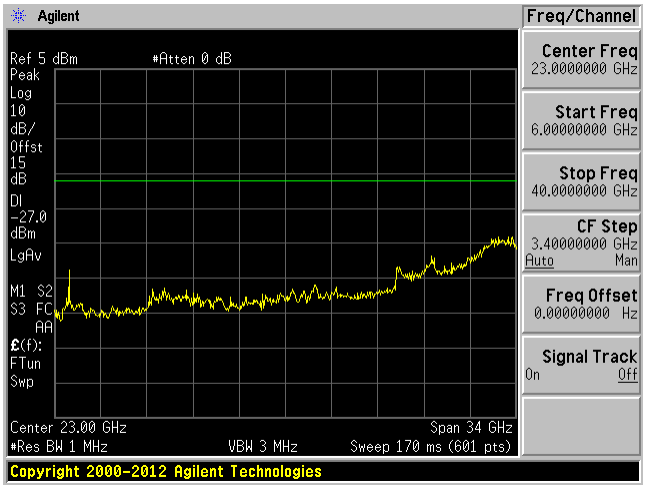
Middle Channel 5280 MHz (6-40GHz)



High Channel 5320 MHz (30MHz-6GHz)

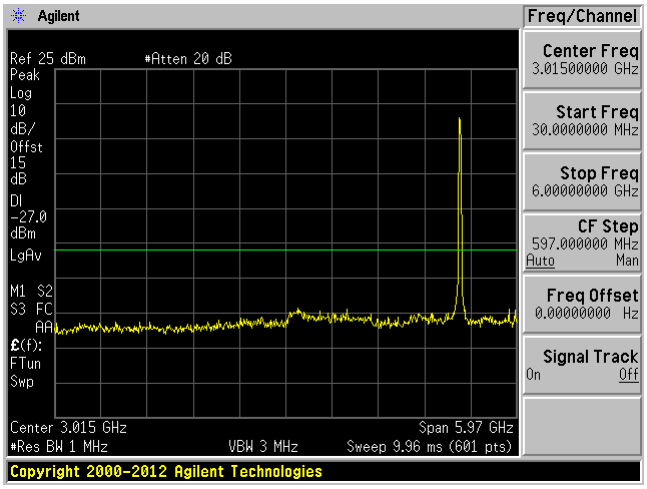


High Channel 5320 MHz (7-40GHz)

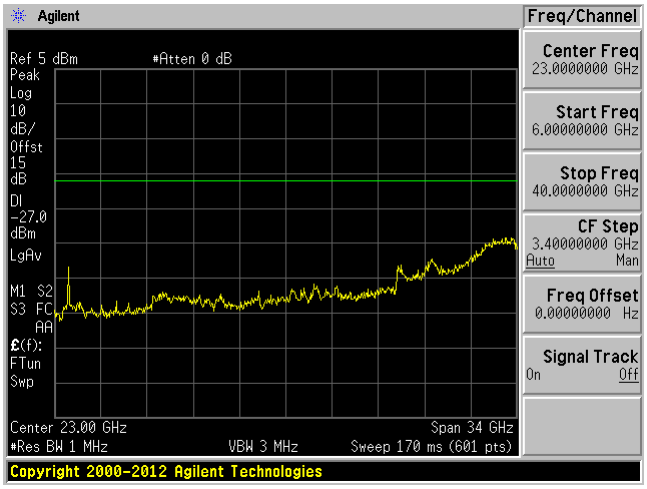


802.11n20 mode

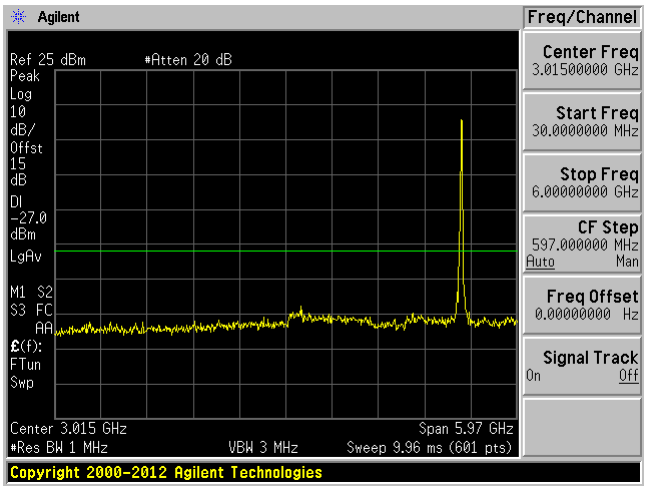
Low Channel 5260 MHz (30MHz-6GHz)



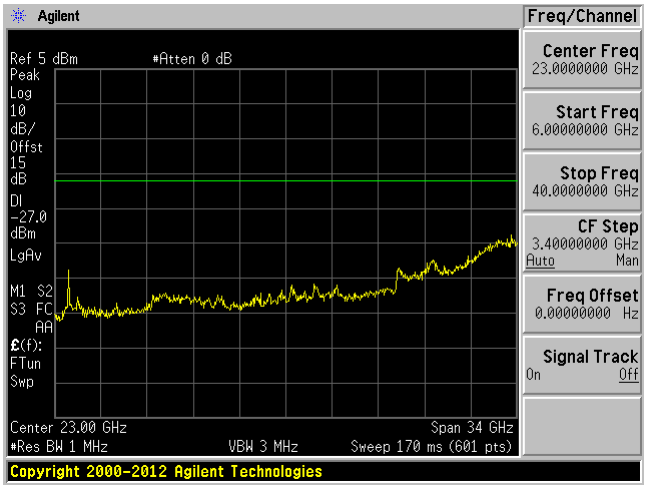
Low Channel 5260 MHz (6-40GHz)



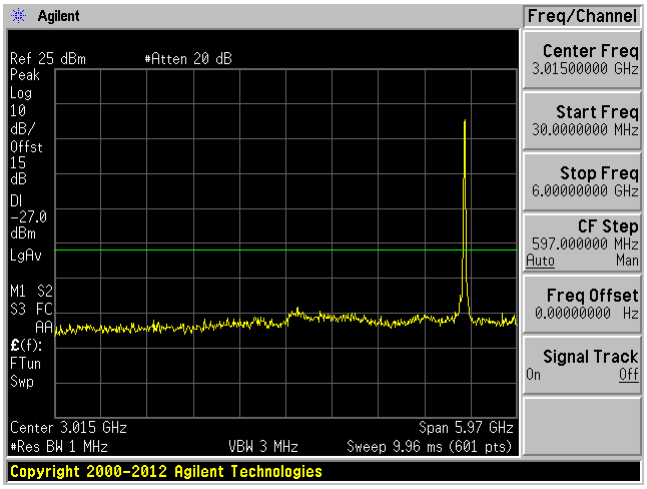
Middle Channel 5280MHz (30MHz-6GHz)



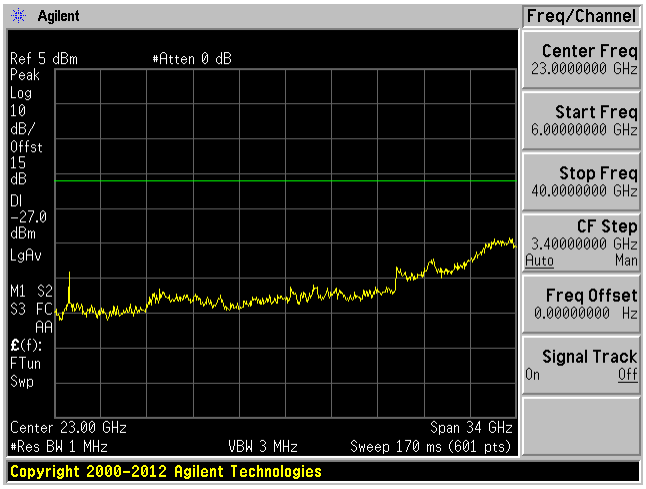
Middle Channel 5280 MHz (6-40GHz)



High Channel 5320 MHz (30MHz-6GHz)

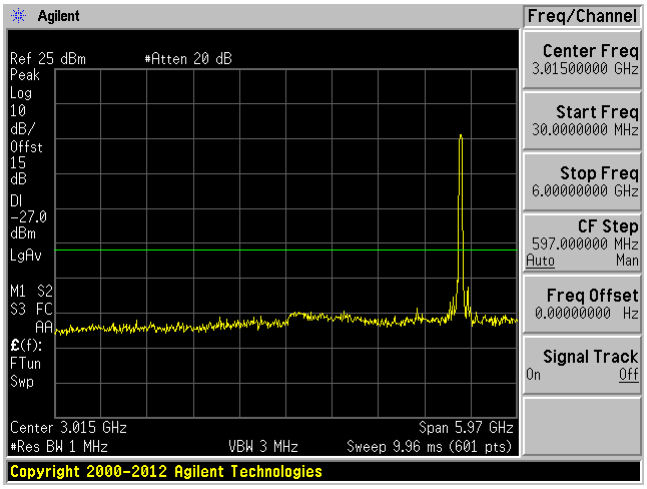


High Channel 5320 MHz (6-40GHz)

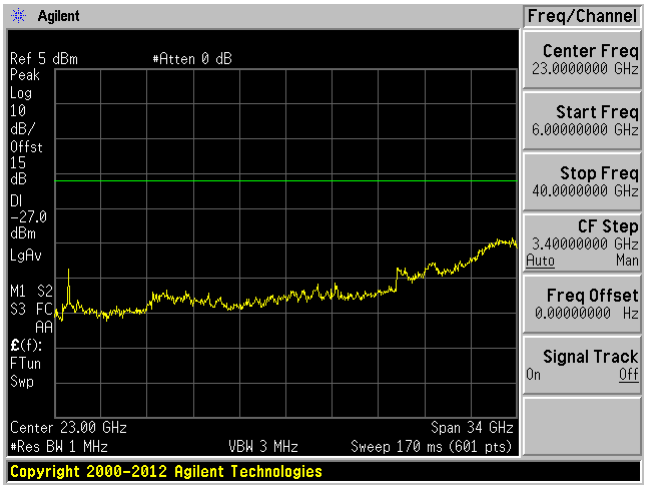


802.11n40 mode

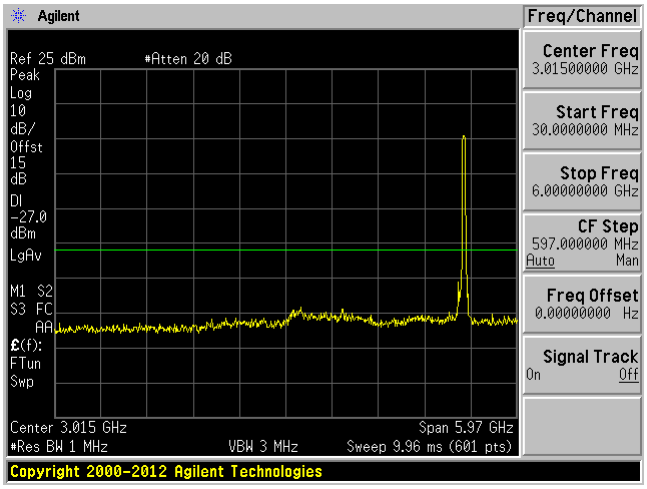
Low Channel 5270 MHz (30MHz-6GHz)



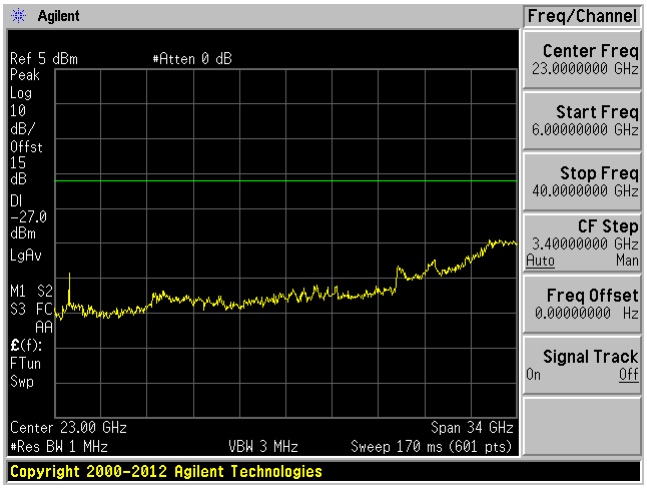
Low Channel 5270 MHz (6-40GHz)



High Channel 5310 MHz (30MHz-6GHz)

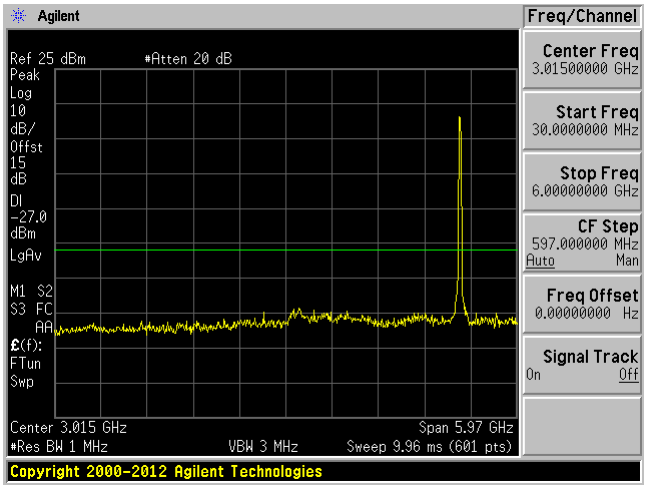


High Channel 5310 MHz (6-40GHz)

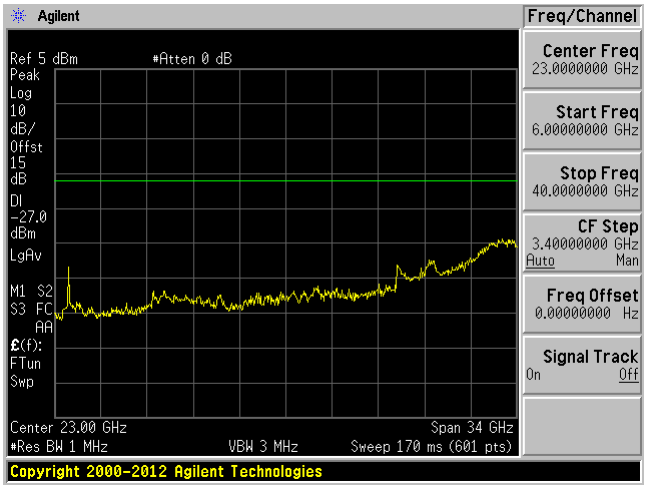


802.11ac20 mode

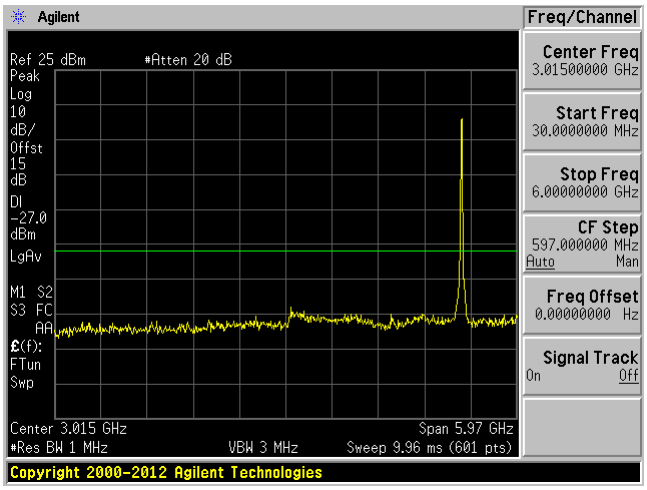
Low Channel 5260MHz (30MHz-6GHz)



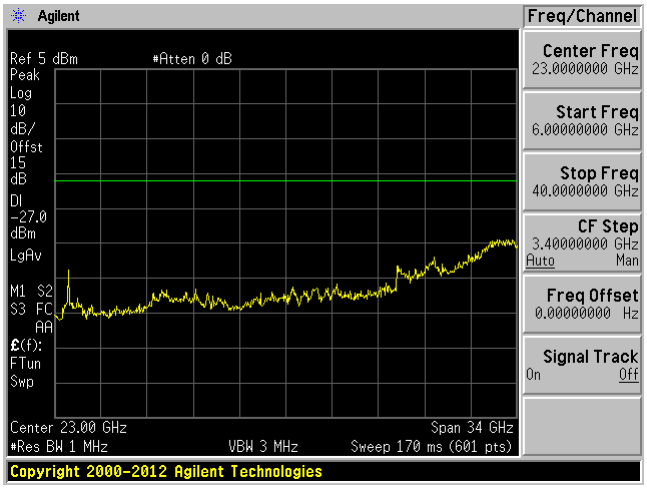
Low Channel 5260 MHz (6-40GHz)



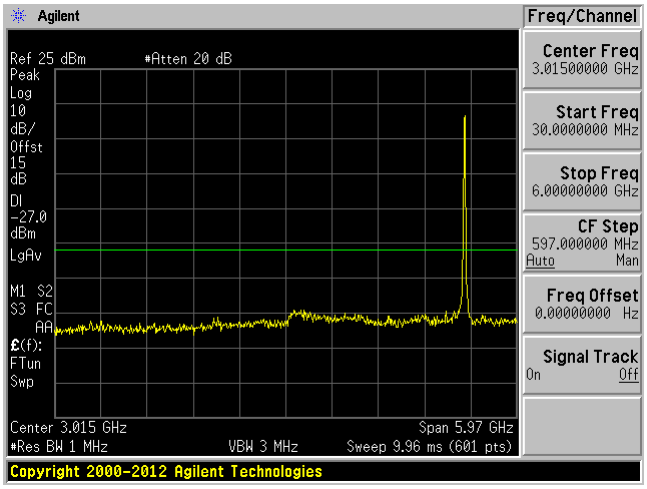
Middle Channel 5280 MHz (30MHz-6GHz)



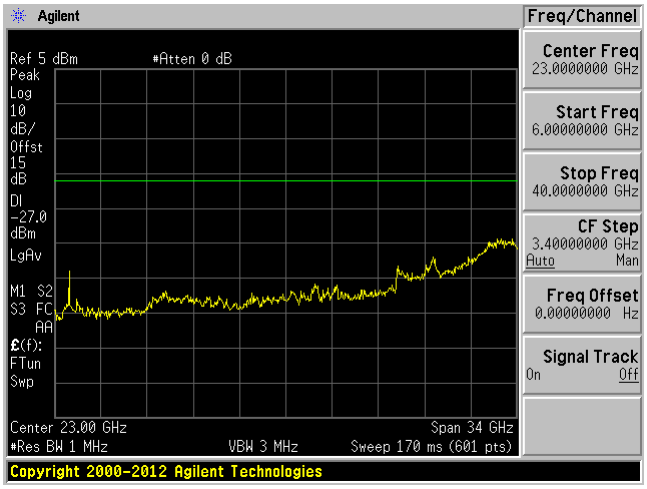
Middle Channel 5280 MHz (6GHz – 40GHz)



High Channel 5320 MHz (30MHz-6GHz)

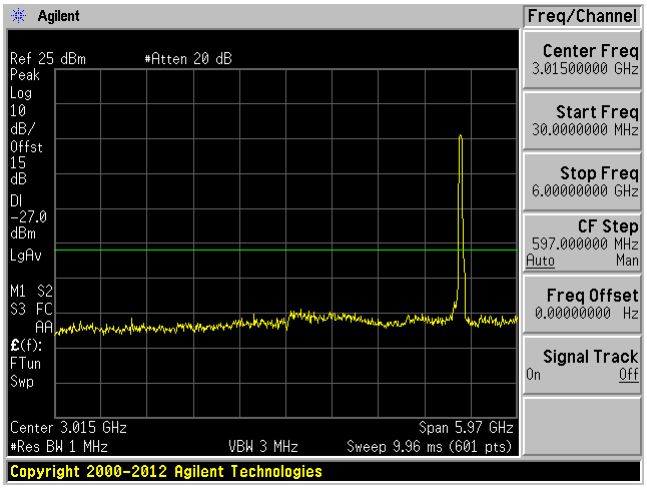


High Channel 5320 MHz (6GHz – 40GHz)

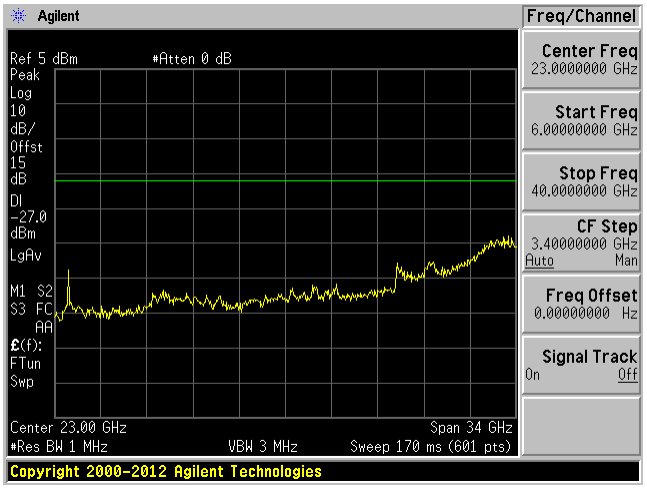


802.11ac40 mode

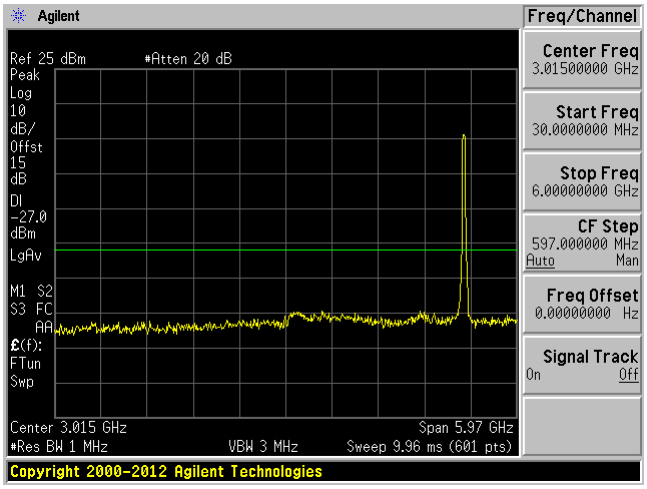
Low Channel 5270 MHz (30MHz-6GHz)



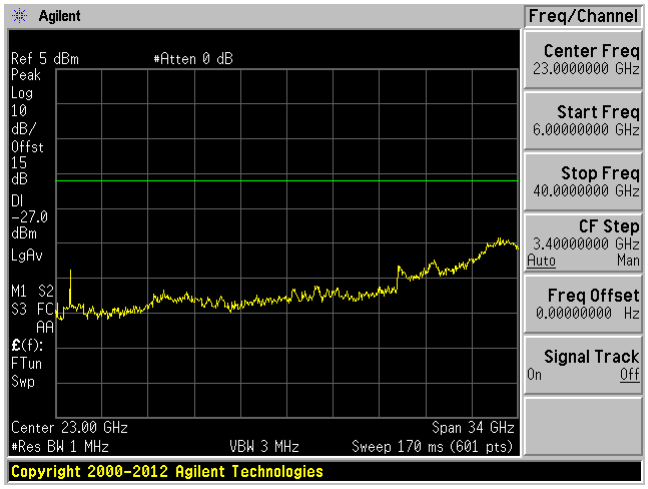
Low Channel 5270 MHz (6-40GHz)



High Channel 5310 MHz (30MHz-6GHz)

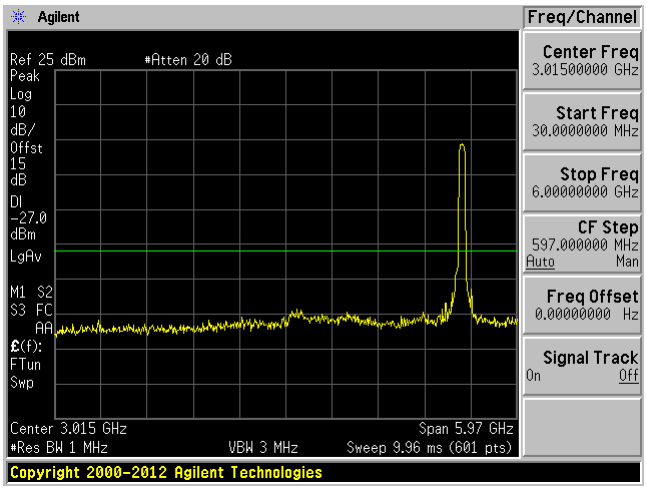


High Channel 5310 MHz (6GHz – 40GHz)

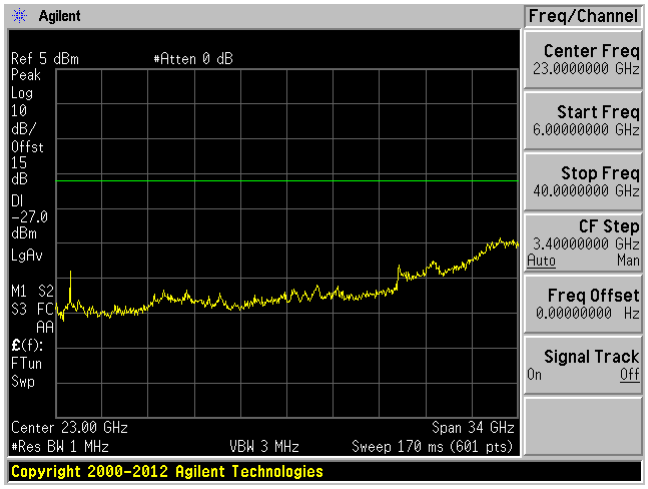


802.11ac80 mode

5290 MHz (30MHz-6GHz)



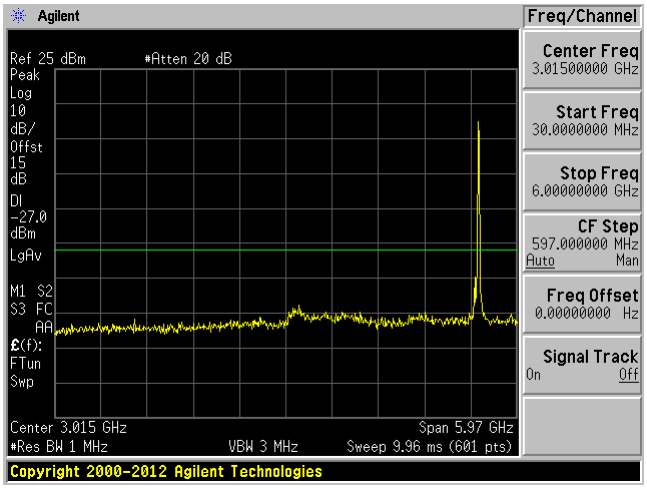
5290 MHz (6GHz – 40GHz)



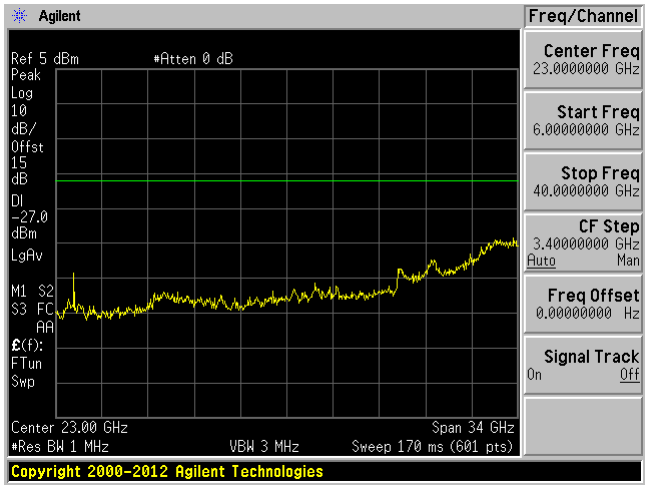
5470 – 5725 MHz

802.11a mode

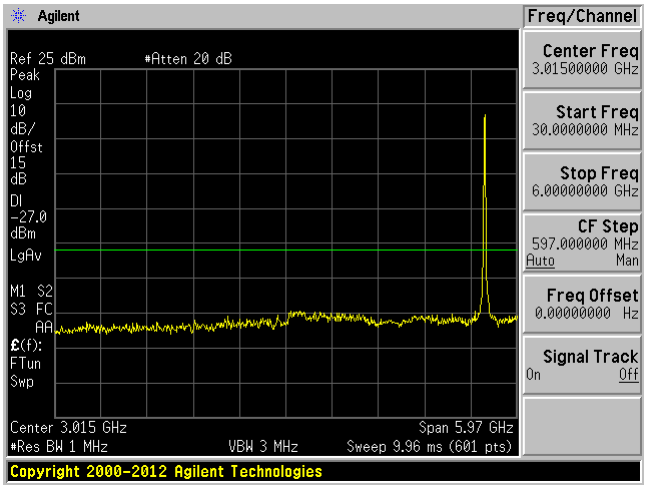
Low Channel 5500 MHz (30MHz-6GHz)



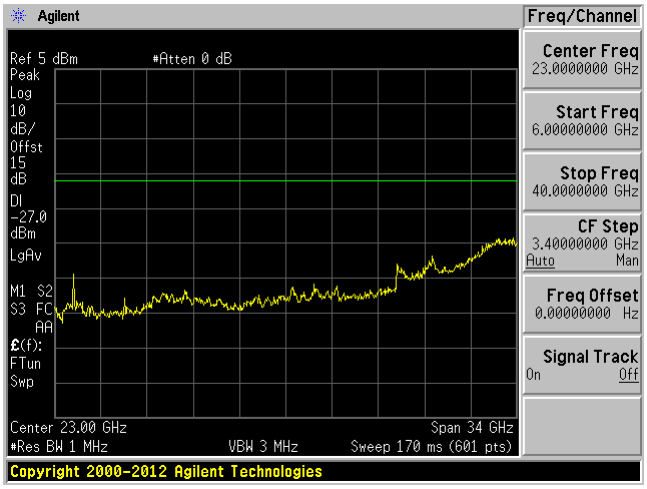
Low Channel 5500 MHz (6-40GHz)



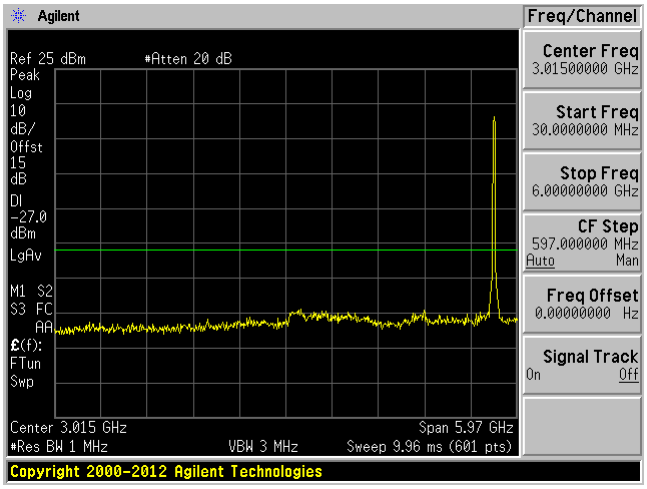
Middle Channel 5580 MHz (30MHz-6GHz)



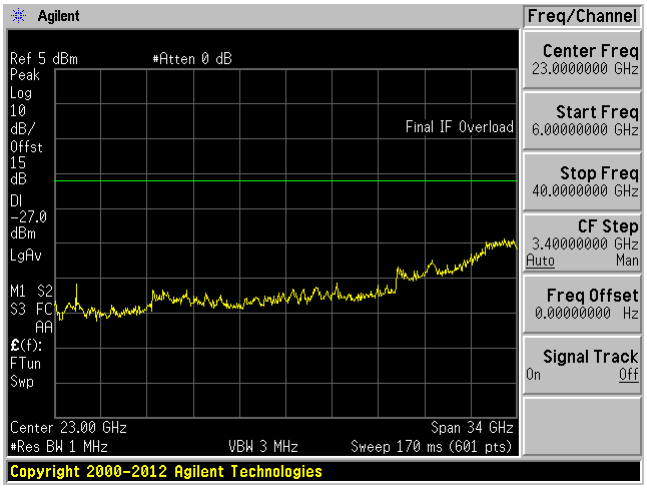
Middle Channel 5580 MHz (6-40GHz)



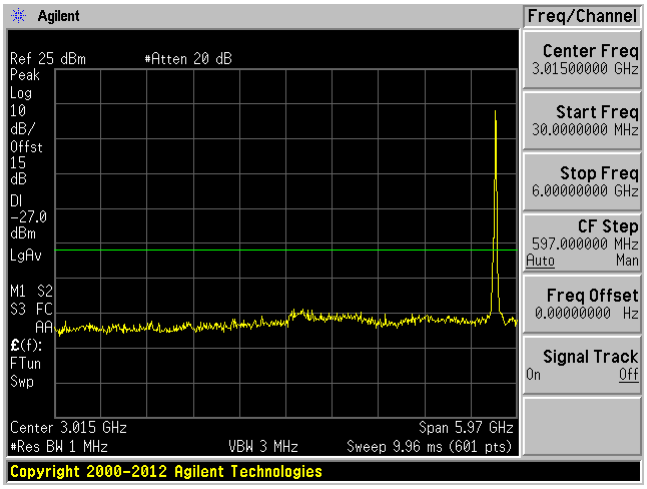
Middle Channel 5700 MHz (30MHz-6GHz)



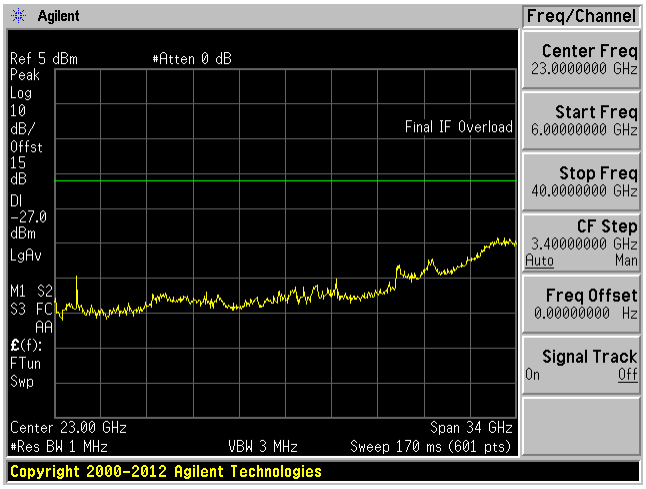
Middle Channel 5700 MHz (6-40GHz)



High Channel 5720 MHz (30MHz-6GHz)

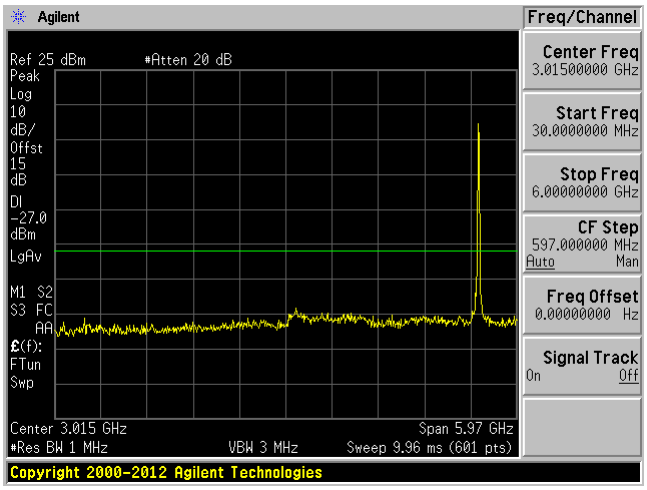


High Channel 5720 MHz (6-40GHz)

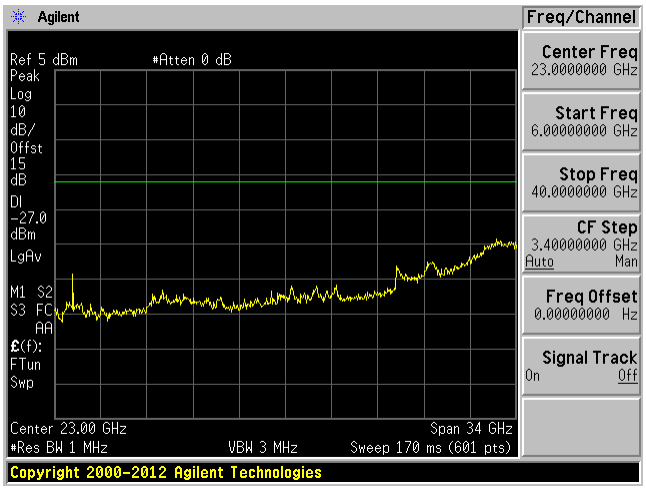


802.11n20 mode

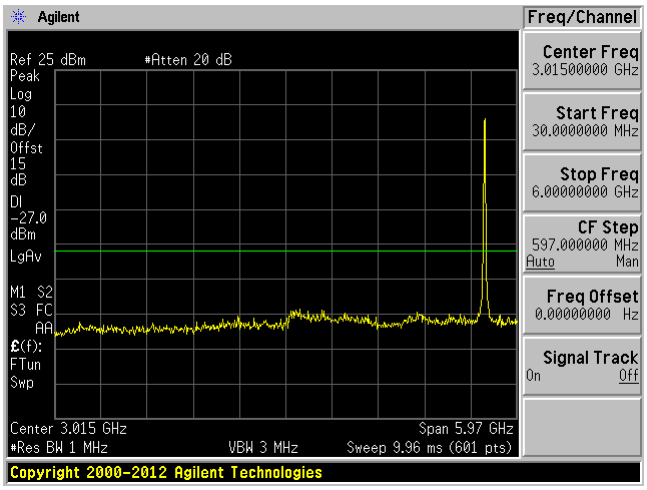
Low Channel 5500 MHz (30MHz-6GHz)



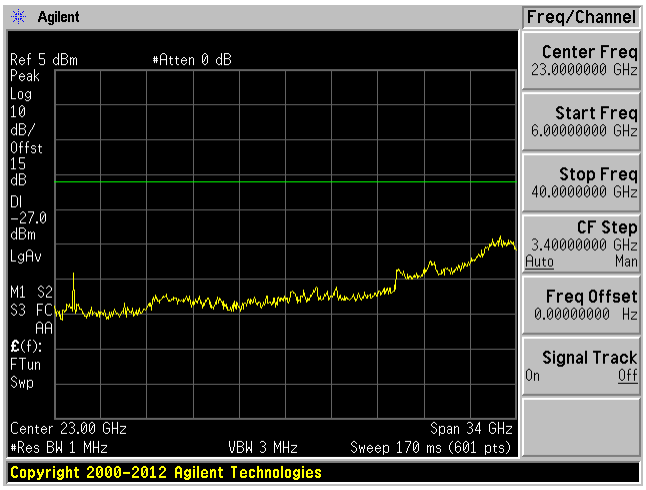
Low Channel 5500 MHz (6-40GHz)



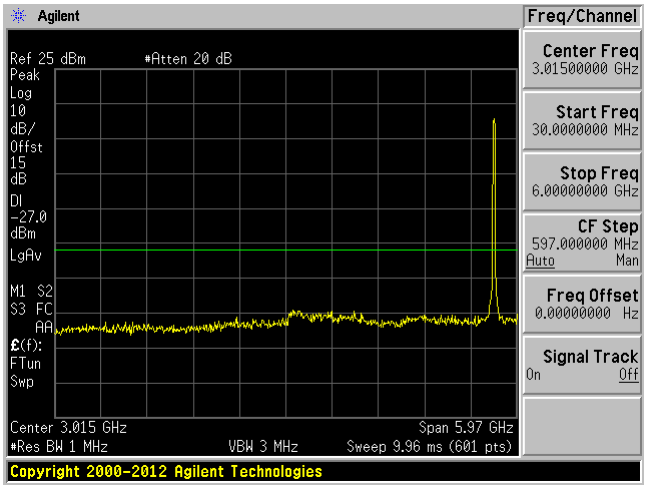
Middle Channel 5580 MHz (30MHz-6GHz)



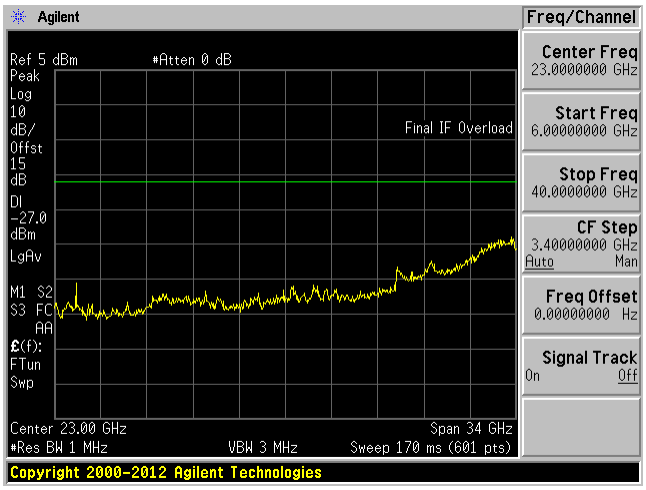
Middle Channel 5580 MHz (6-40GHz)



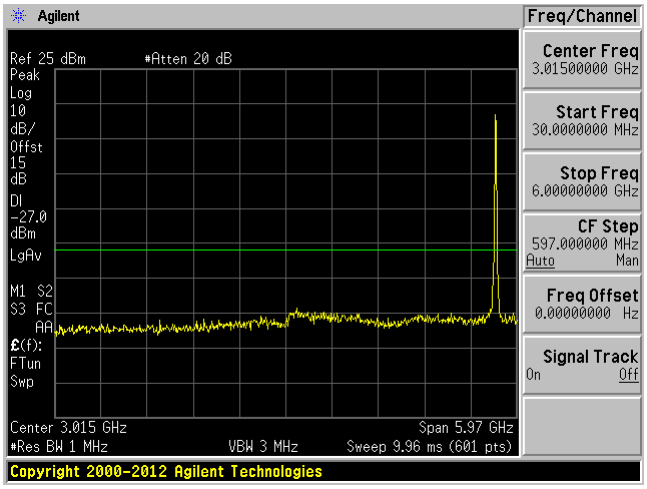
Middle Channel 5700 MHz (30MHz-6GHz)



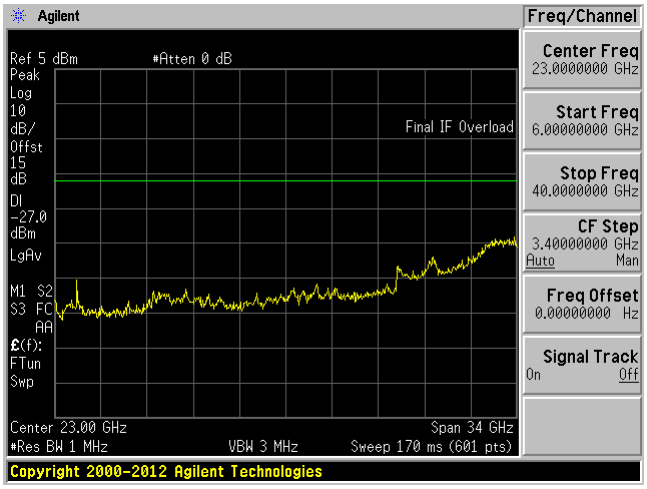
Middle Channel 5700 MHz (6-40GHz)



High Channel 5720 MHz (30MHz-6GHz)

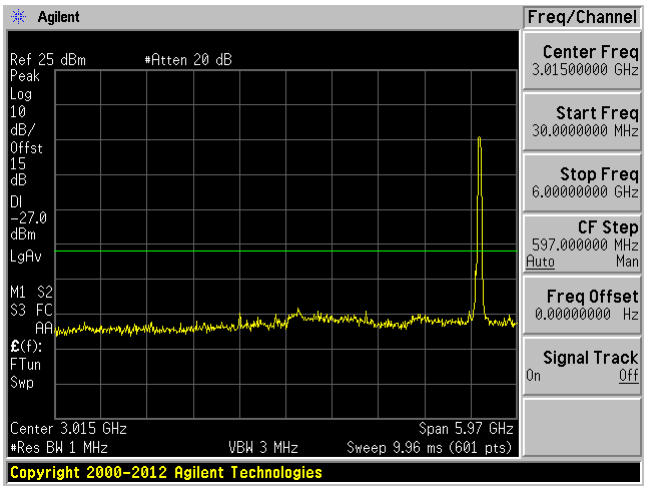


High Channel 5720 MHz (6-40GHz)

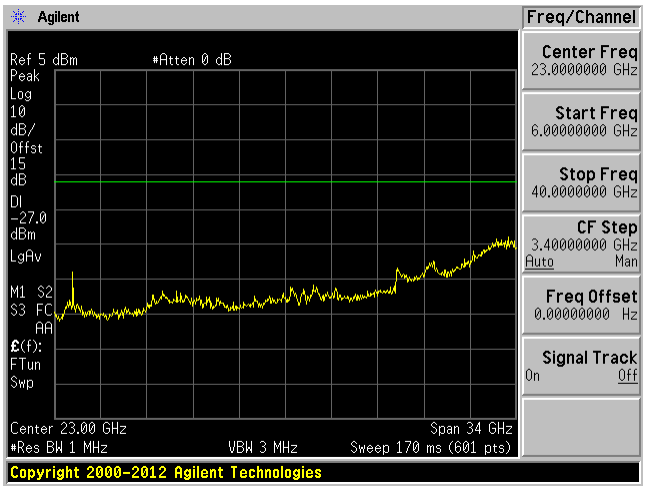


802.11n40 mode

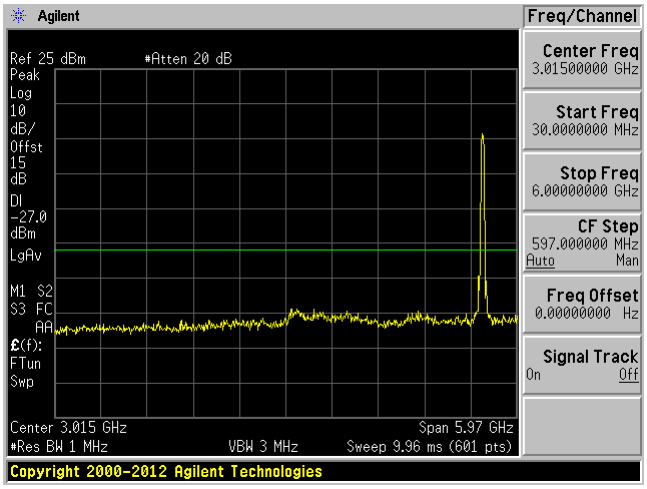
Low Channel 5510 MHz (30MHz-6GHz)



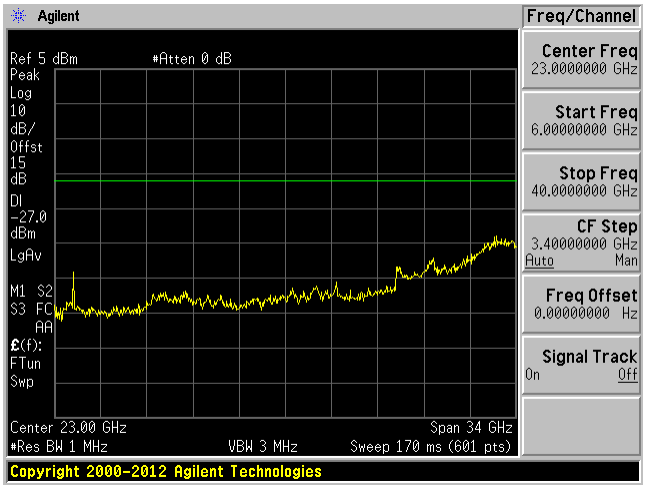
Low Channel 5510 MHz (6-40GHz)



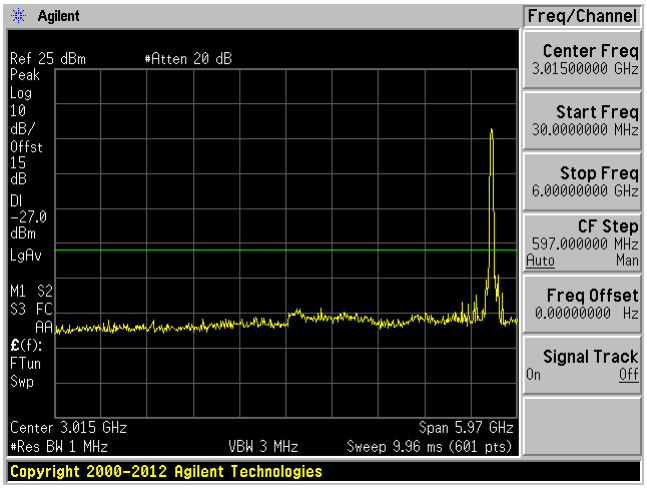
Middle Channel 5550 MHz (30MHz-6GHz)



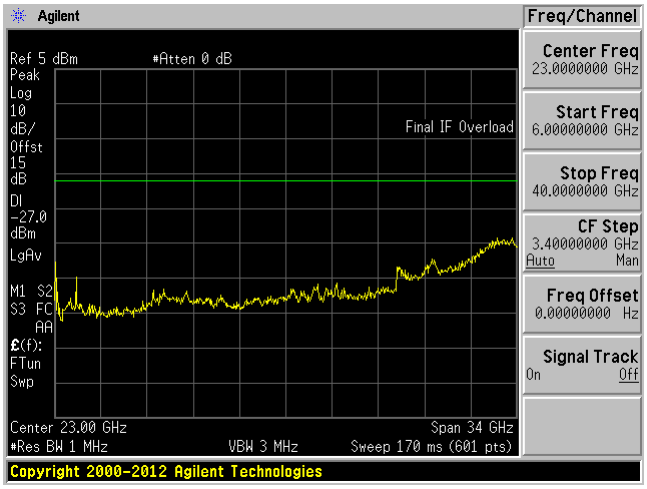
Middle Channel 5550 MHz (6-40GHz)



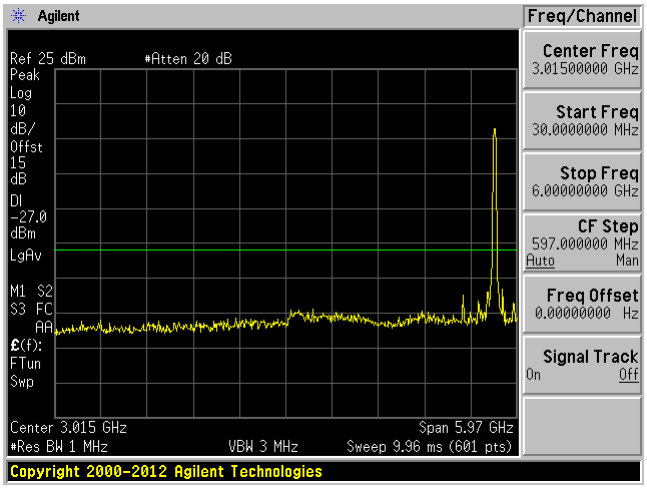
Middle Channel 5670 MHz (30MHz-6GHz)



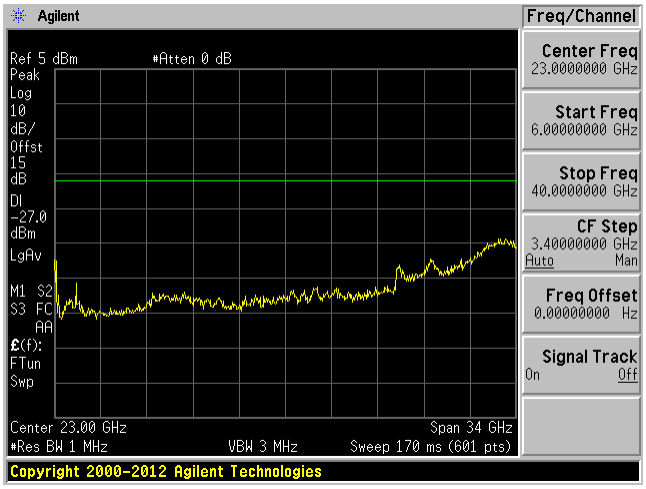
Middle Channel 5670 MHz (6-40GHz)



High Channel 5710 MHz (30MHz-6GHz)

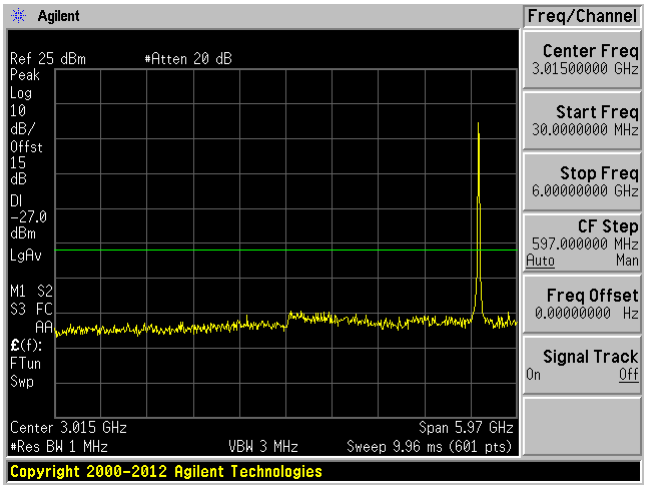


High Channel 5710 MHz (6-40GHz)

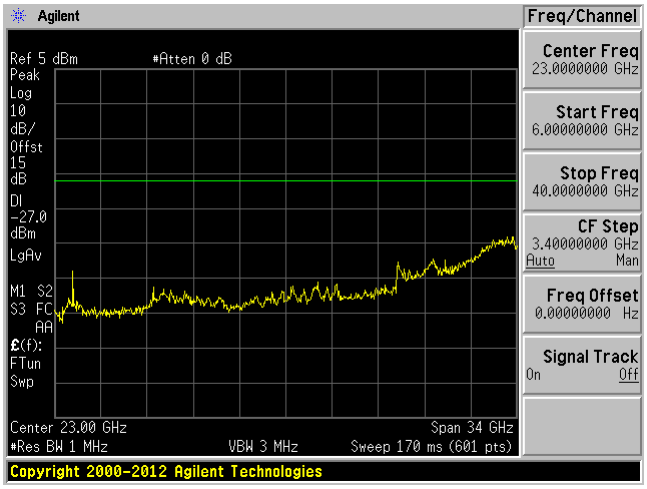


802.11ac20 mode

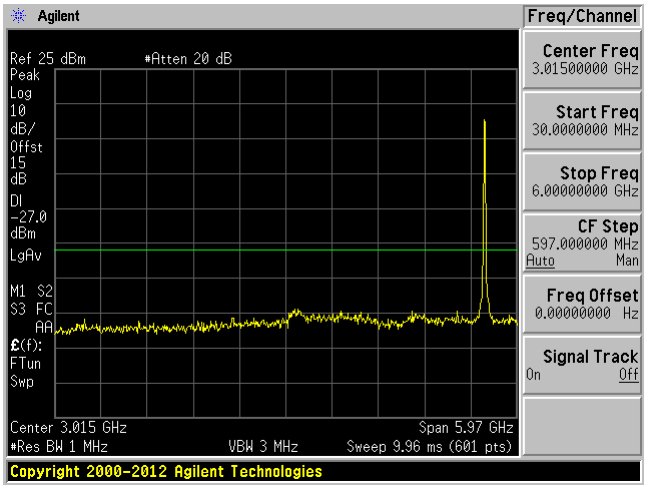
Low Channel 5500 MHz (30MHz-6GHz)



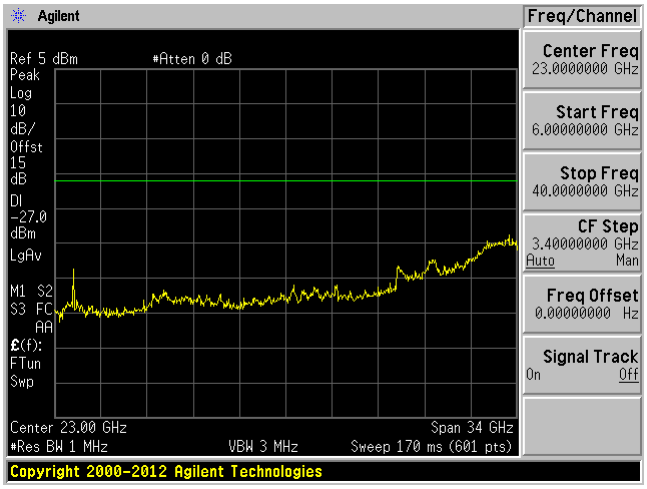
Low Channel 5500 MHz (6-40GHz)



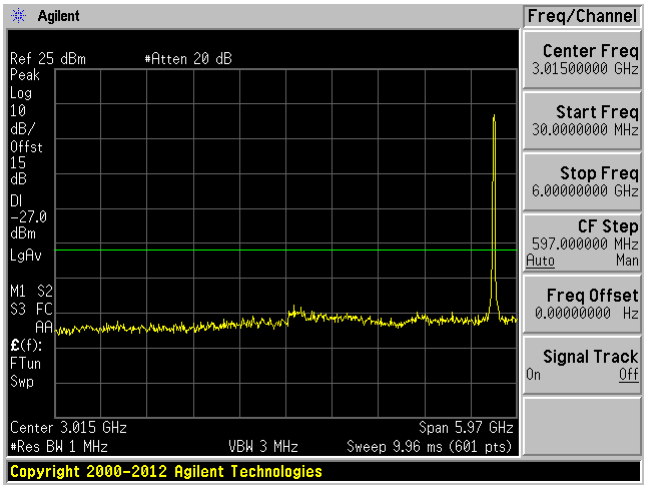
Middle Channel 5580 MHz (30MHz-6GHz)



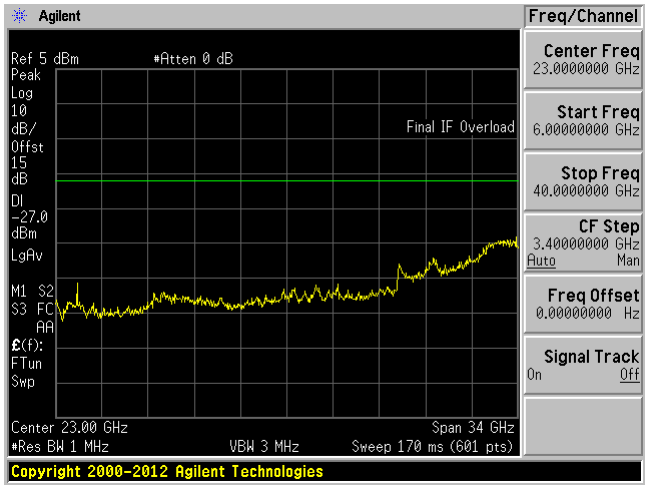
Middle Channel 5580 MHz (6GHz – 40GHz)



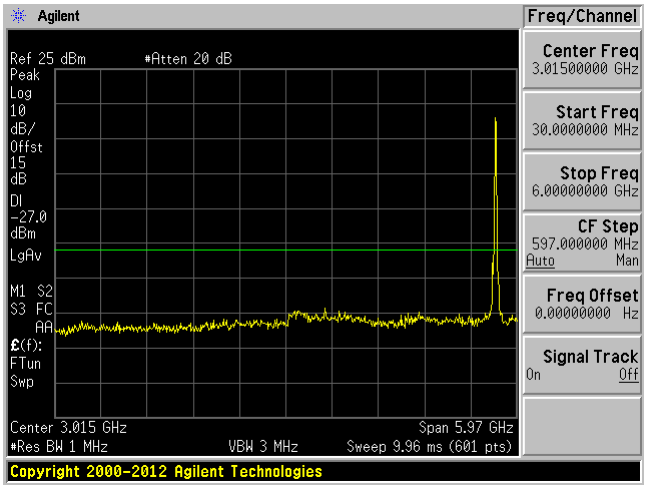
Middle Channel 5700 MHz (30MHz-6GHz)



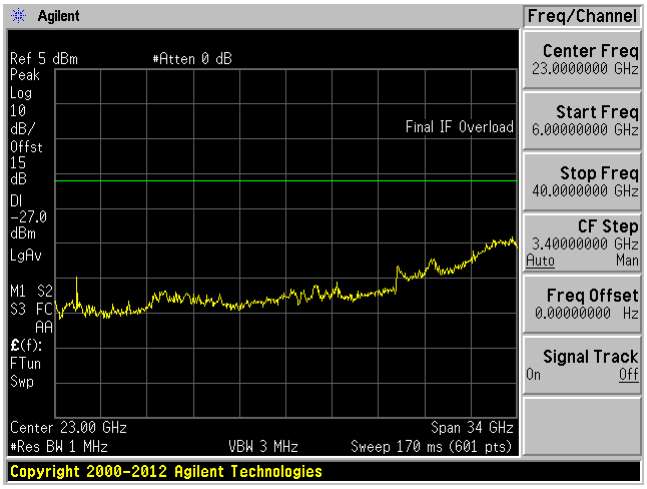
Middle Channel 5700 MHz (6GHz – 40GHz)



High Channel 5720MHz (30MHz-6GHz)

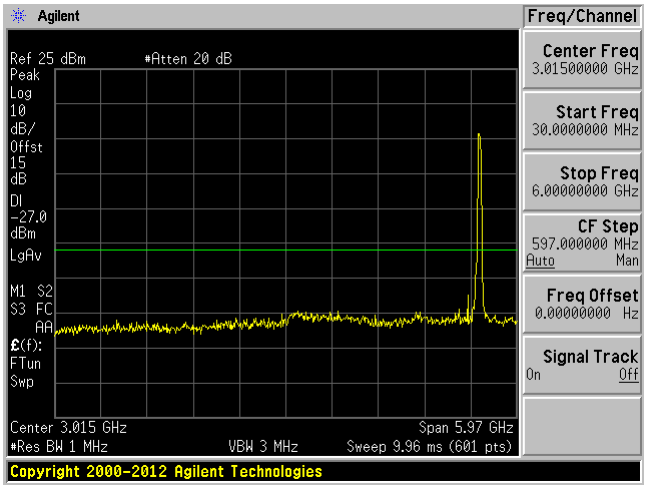


High Channel 5720 MHz (6-40GHz)

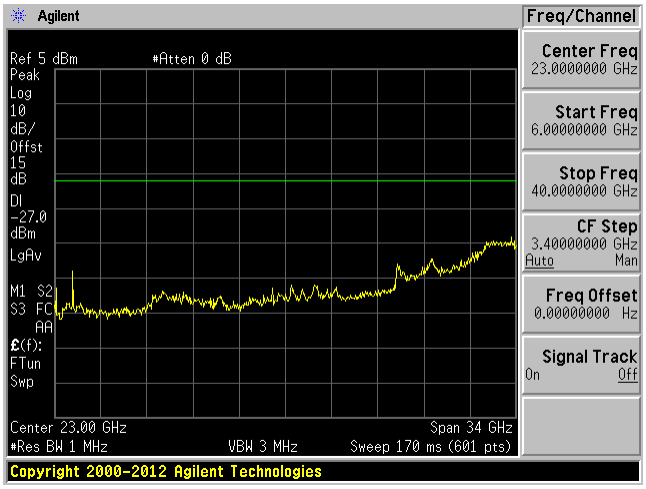


802.11ac40 mode

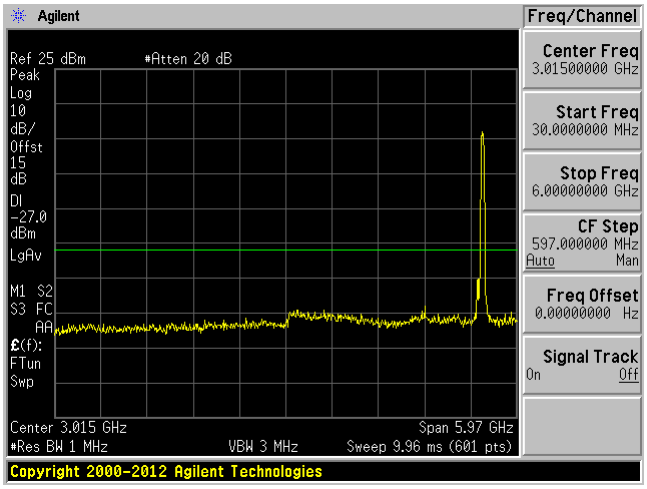
Low Channel 5510 MHz (30MHz-6GHz)



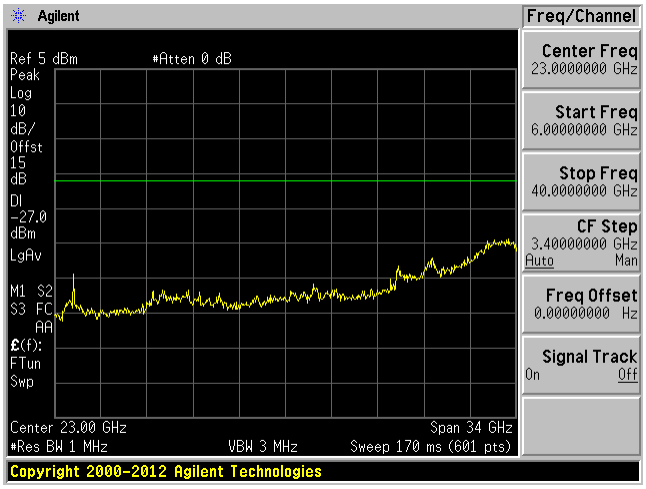
Low Channel 5510 MHz (6-40GHz)



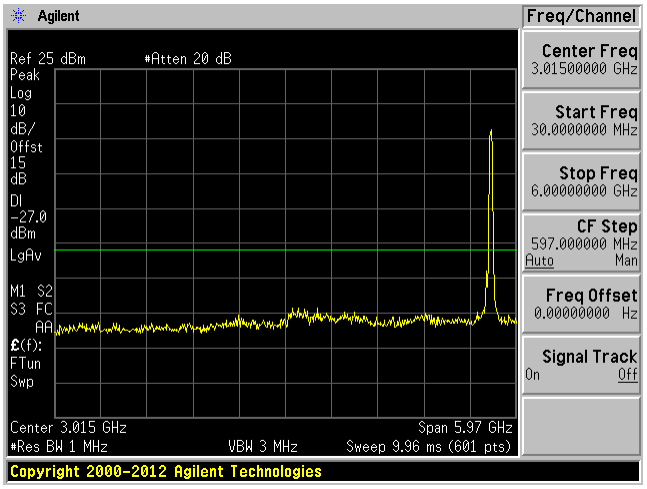
Middle Channel 5550 MHz (30MHz-6GHz)



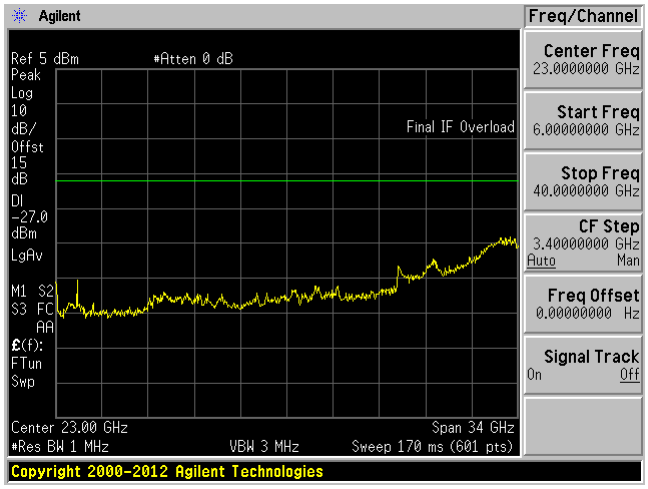
Middle Channel 5550 MHz (6-40GHz)



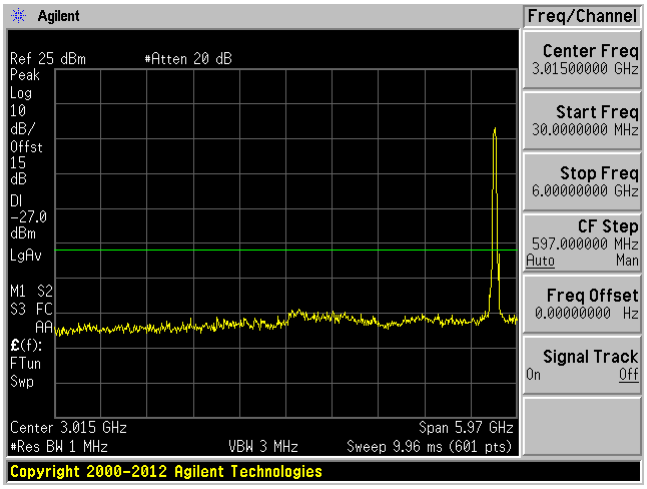
Middle Channel 5670 MHz (30MHz-6GHz)



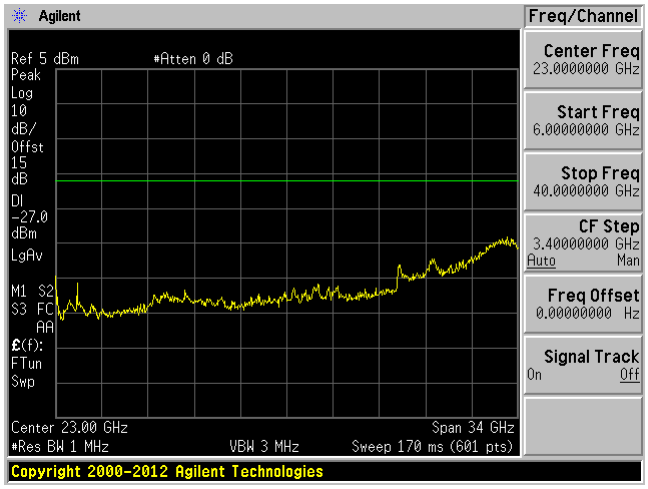
Middle Channel 5670 MHz (6-40GHz)



High Channel 5710 MHz (30MHz-6GHz)

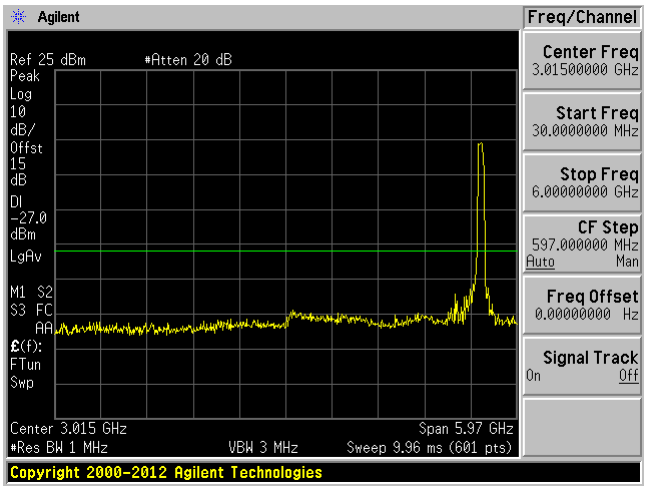


High Channel 5710 MHz (6-40GHz)

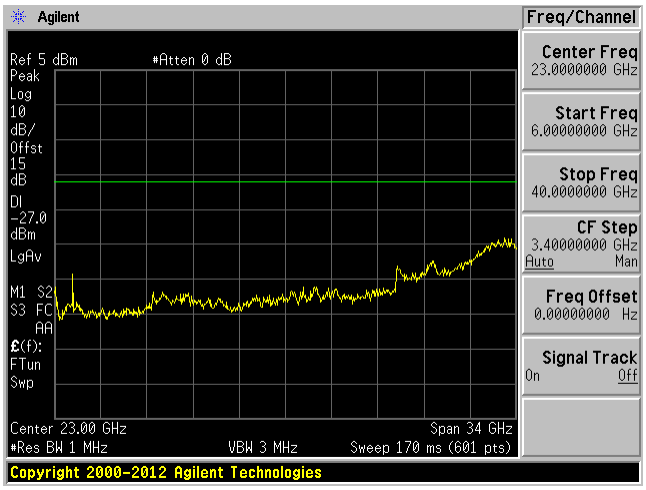


802.11ac80 mode

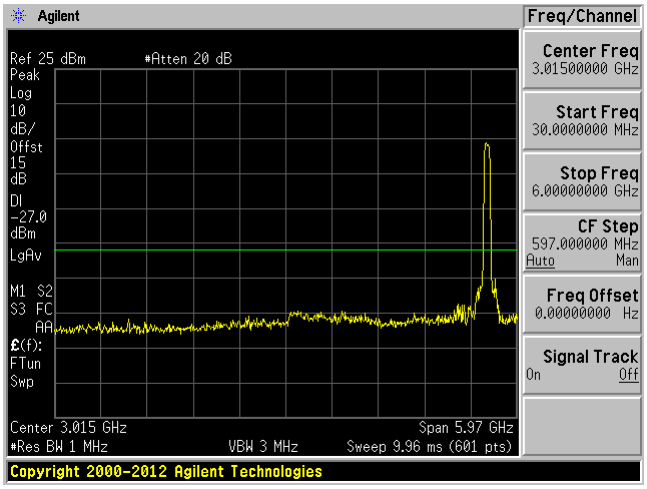
Low Channel 5530 MHz (30MHz-6GHz)



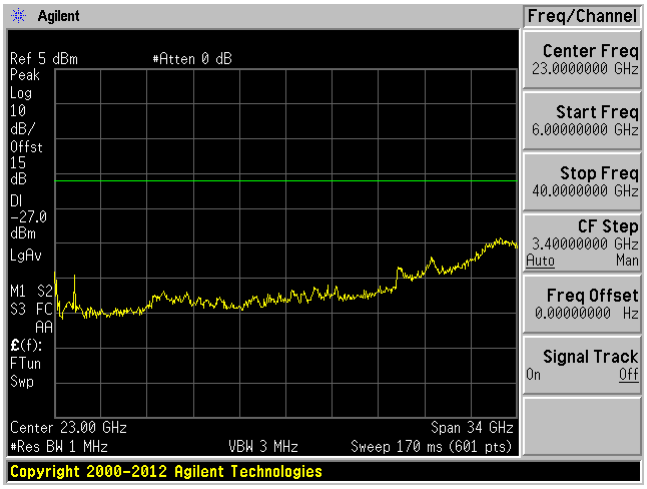
Low Channel 5530 MHz (6GHz – 40GHz)



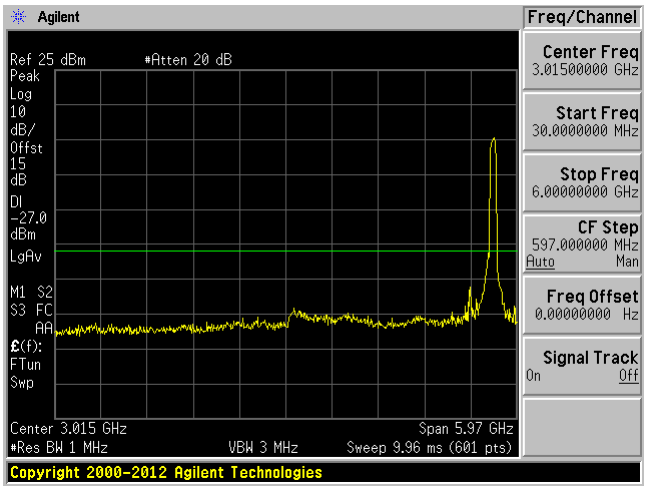
Middle Channel 5610 MHz (30MHz-6GHz)



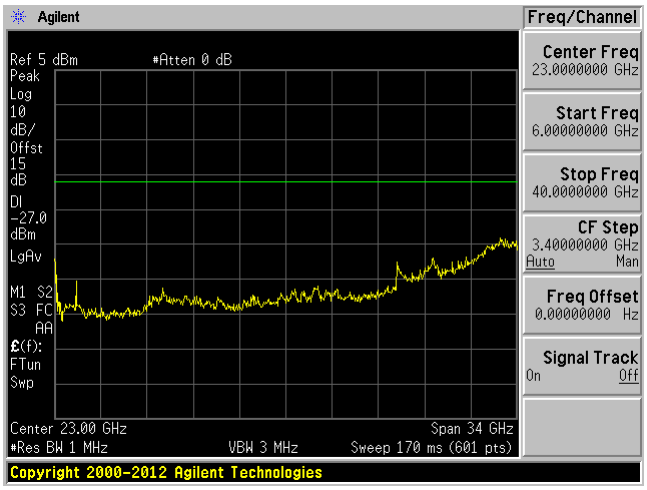
Middle Channel 5610 MHz (6GHz – 40GHz)



High Channel 5690 MHz (30MHz-6GHz)



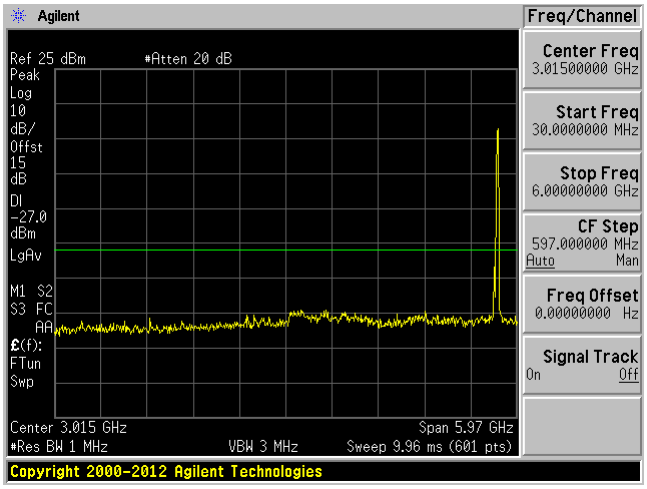
High Channel 5690 MHz (6GHz – 40GHz)



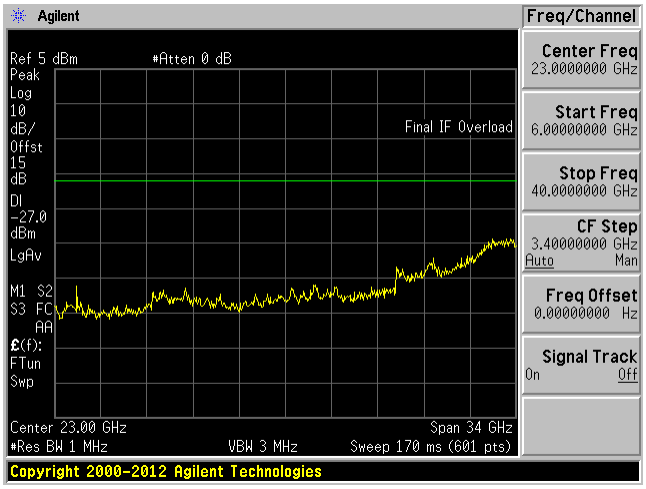
5725 – 5850 MHz

802.11a

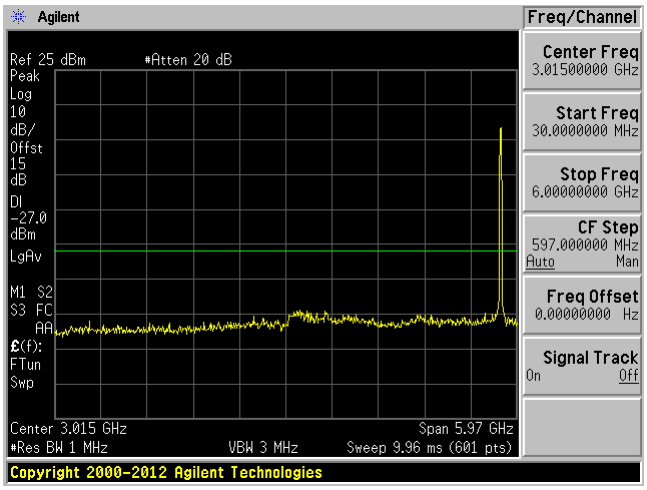
Low Channel 5745 MHz (30MHz-6GHz)



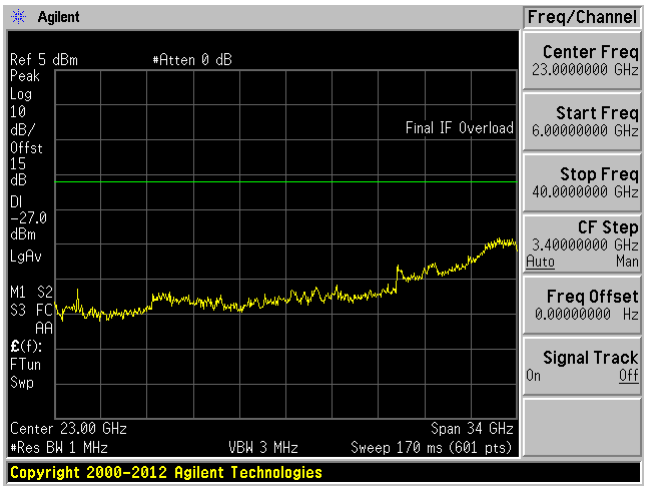
Low Channel 5745 MHz (6-40GHz)



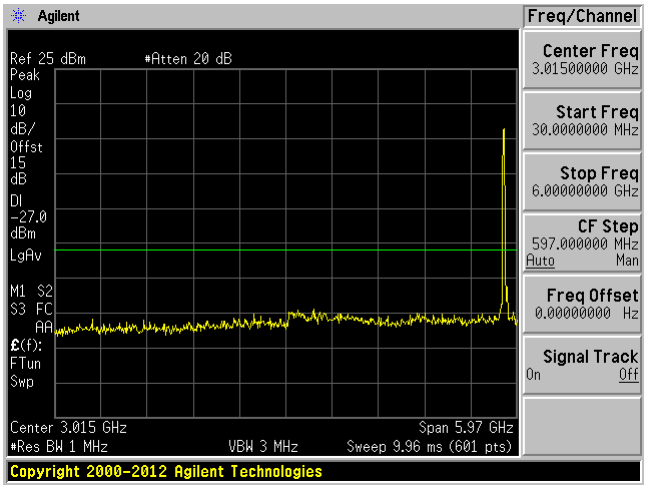
Middle Channel 5785 MHz (30MHz-6GHz)



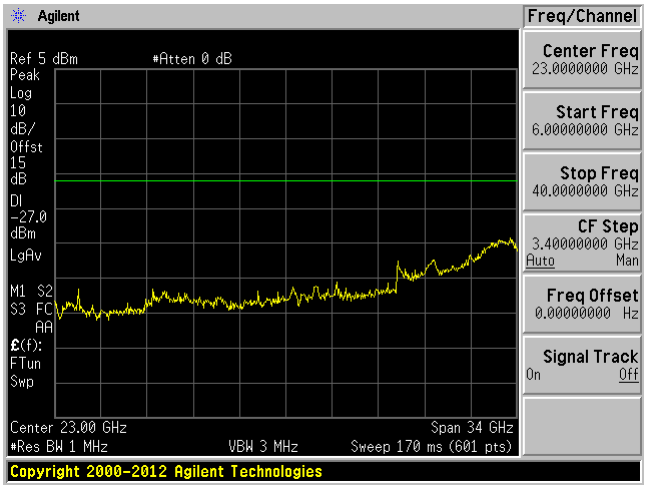
Middle Channel 5785 MHz (6-40GHz)



High Channel 5825 MHz (30MHz-6GHz)

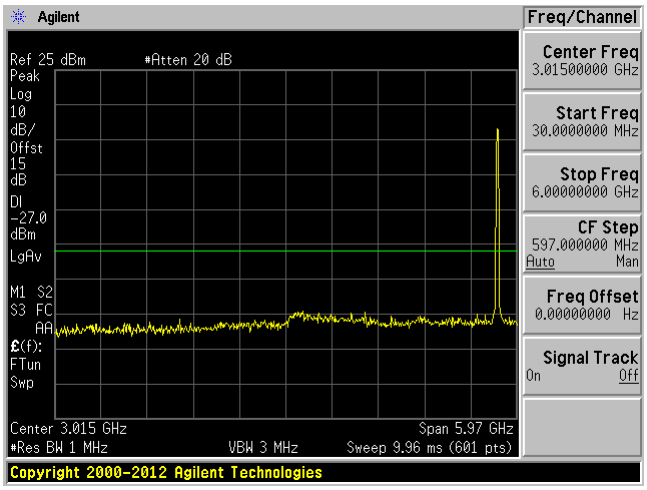


High Channel 5825 MHz (6-40GHz)

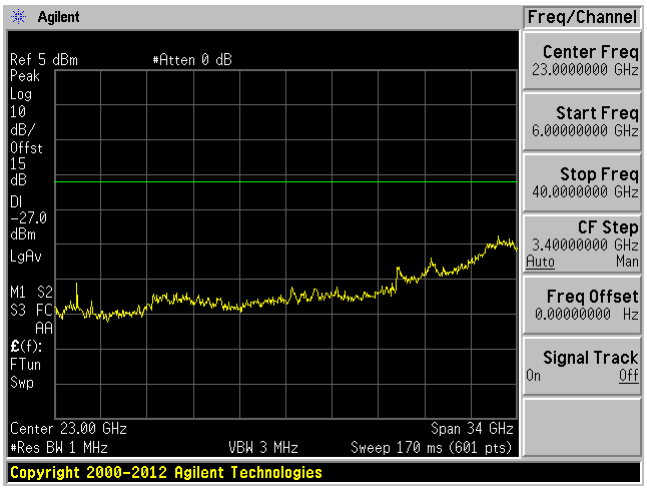


802.11n20 mode

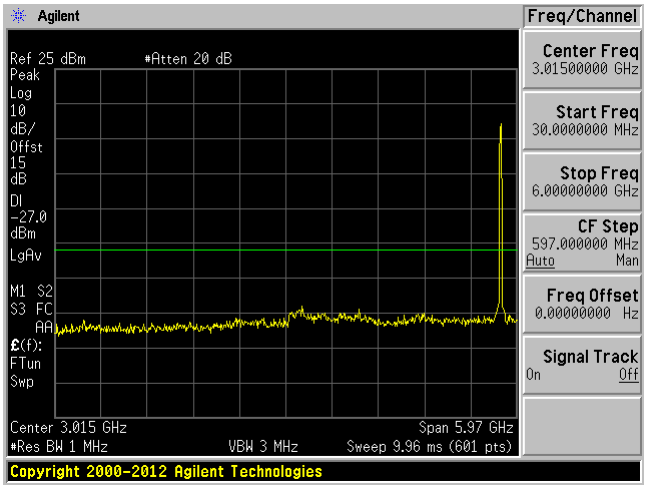
Low Channel 5745 MHz (30MHz-6GHz)



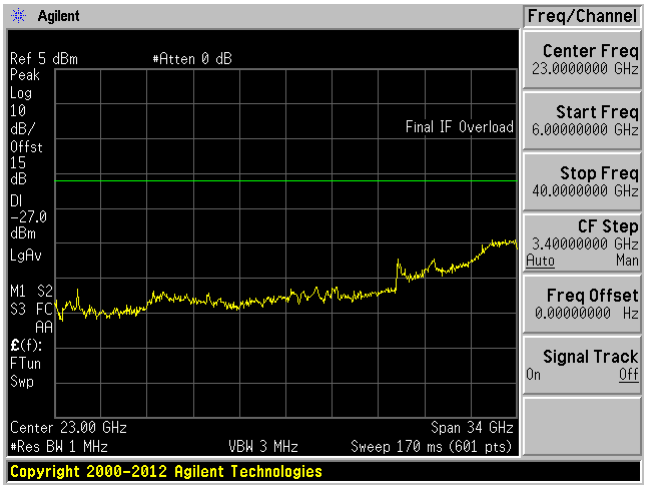
Low Channel 5745 MHz (6-40GHz)



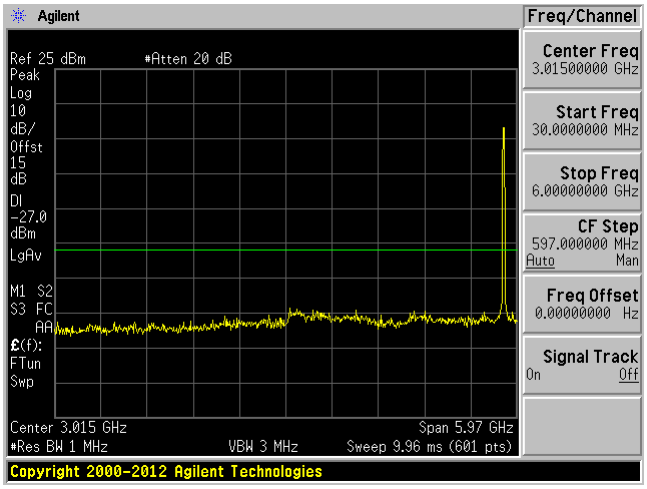
Middle Channel 5785 MHz (30MHz-6GHz)



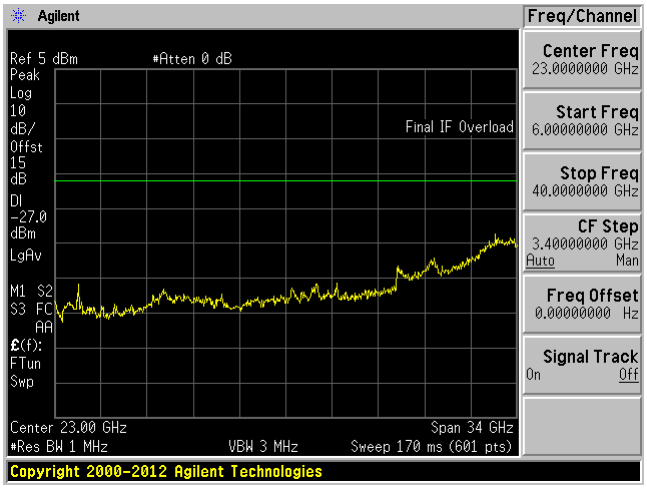
Middle Channel 5785 MHz (6-40GHz)



High Channel 5825 MHz (30MHz-6GHz)

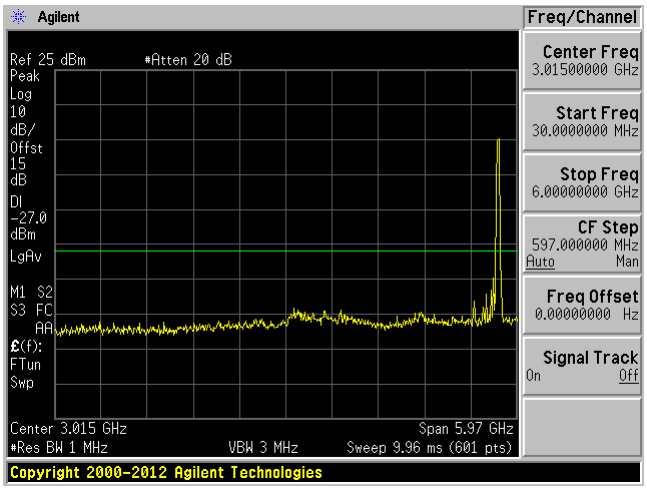


High Channel 5825 MHz (6-40GHz)

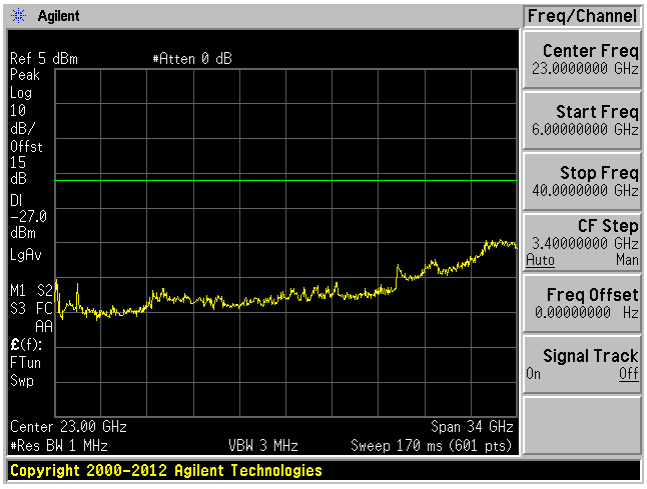


802.11n40 mode

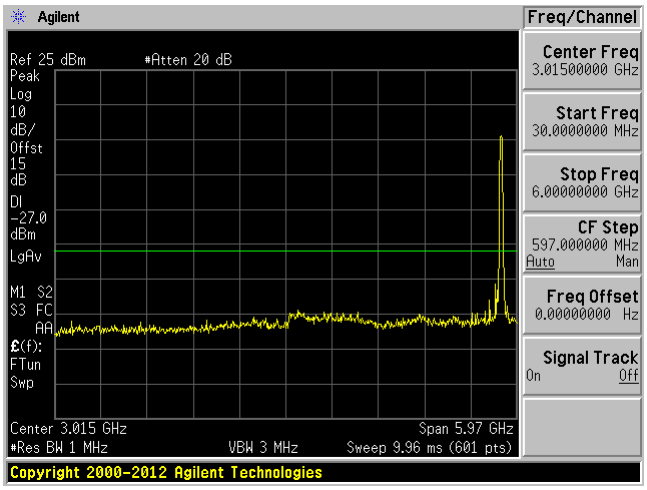
Low Channel 5755 MHz (30MHz-6GHz)



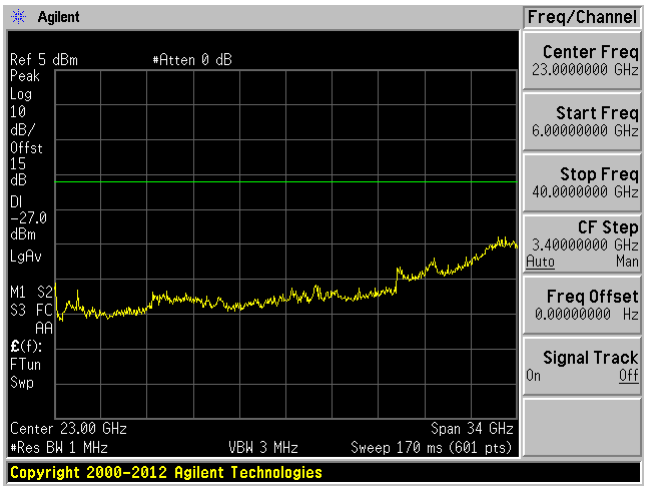
Low Channel 5755 MHz (6-40GHz)



High Channel 5795 MHz (30MHz-6GHz)

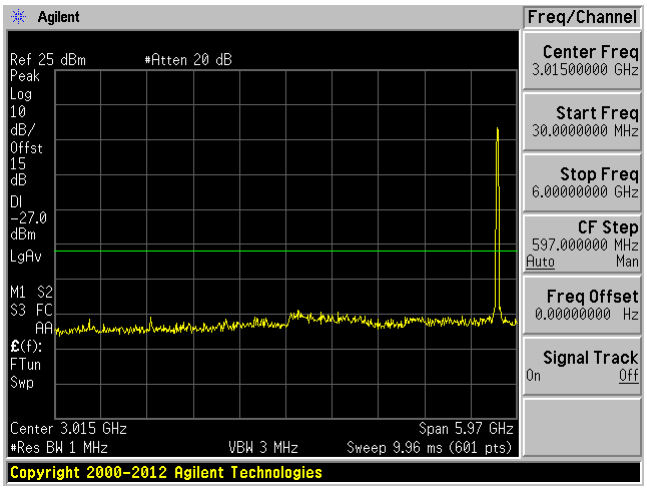


High Channel 5795 MHz (6-40GHz)

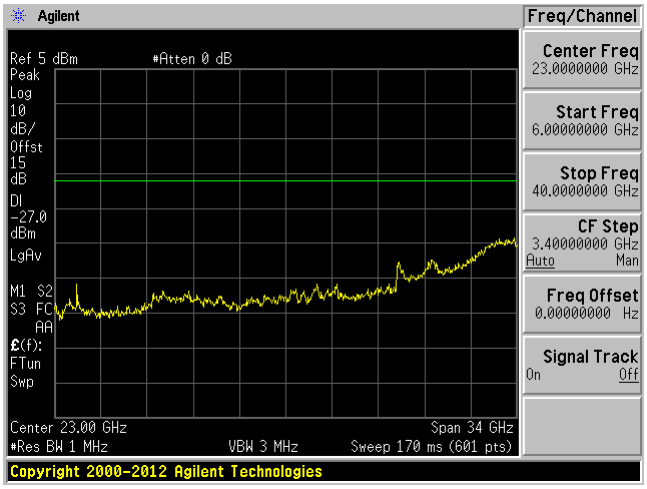


802.11ac20 mode

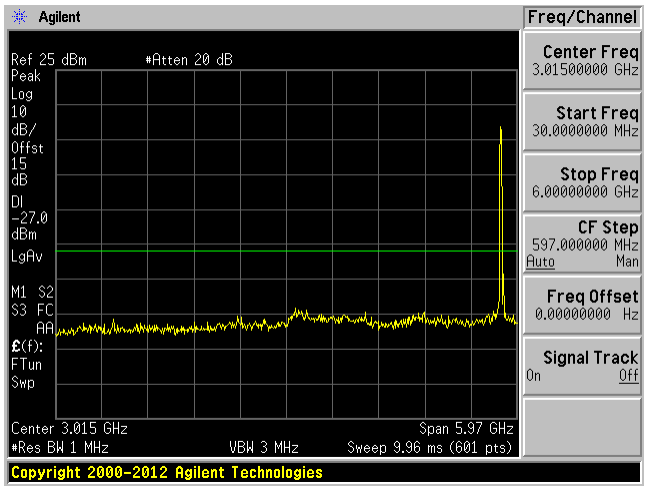
Low Channel 5745 MHz (30MHz-6GHz)



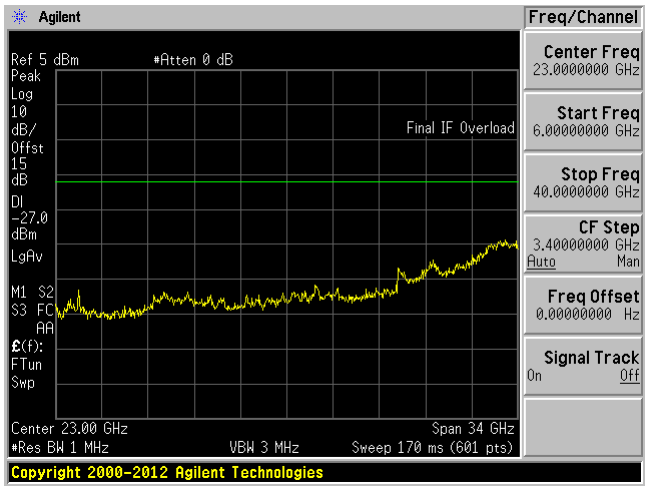
Low Channel 5745 MHz (6-40GHz)



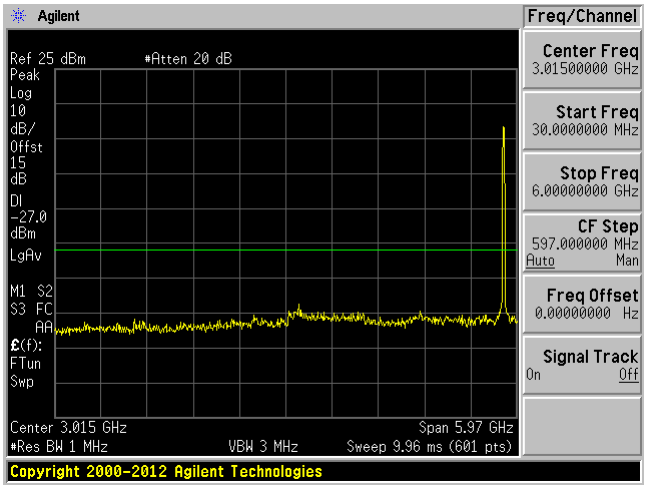
Middle Channel 5785 MHz (30MHz-6GHz)



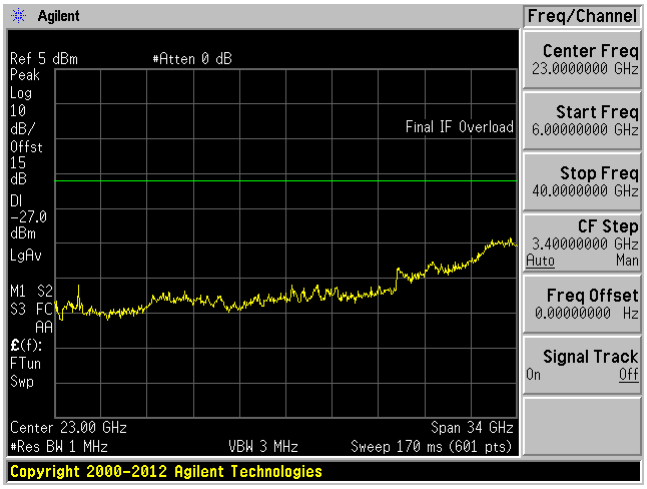
Middle Channel 5785 MHz (6-40GHz)



High Channel 5825 MHz (30MHz-6GHz)

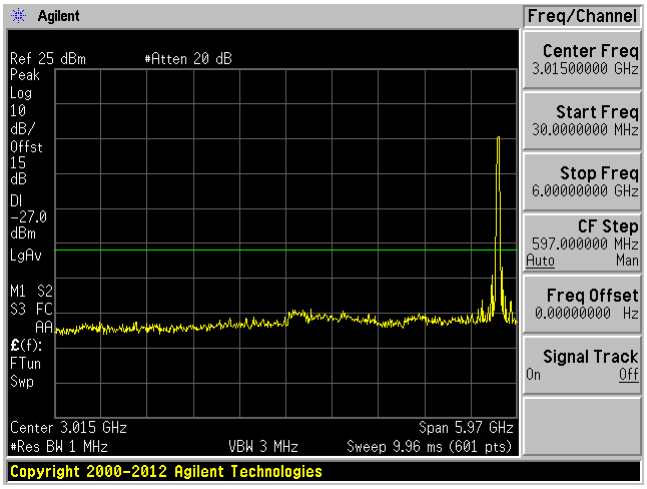


High Channel 5825 MHz (6-40GHz)

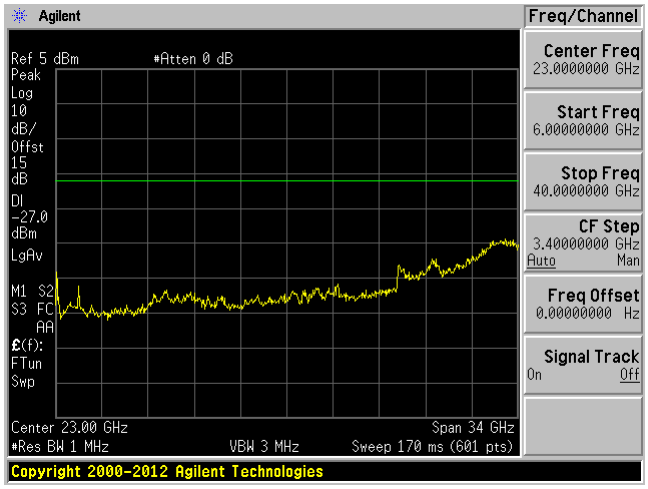


802.11ac40 mode

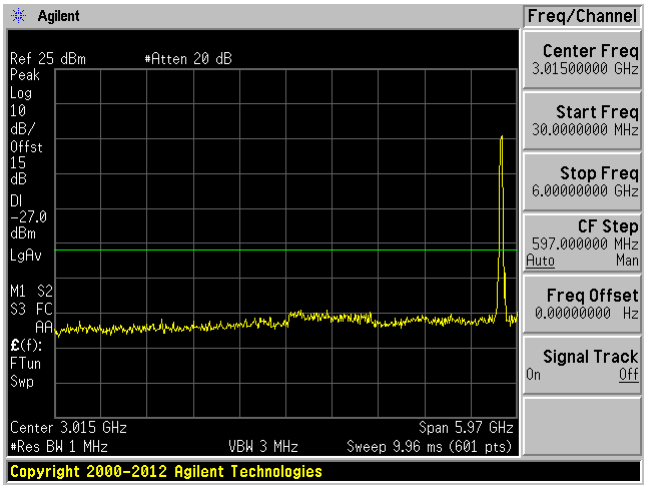
Low Channel 5755 MHz (30MHz-6GHz)



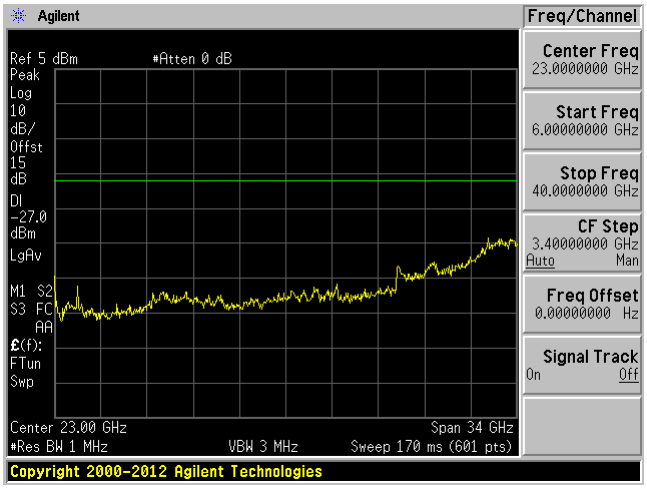
Low Channel 5755 MHz (6-40GHz)



High Channel 5795 MHz (30MHz-6GHz)

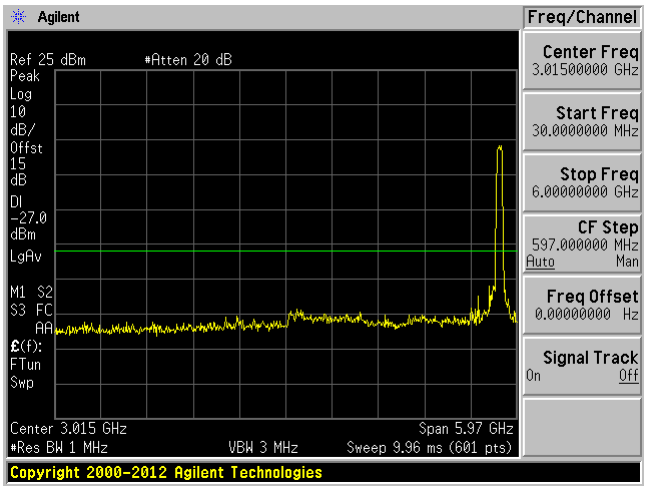


High Channel 5795 MHz (6-40GHz)

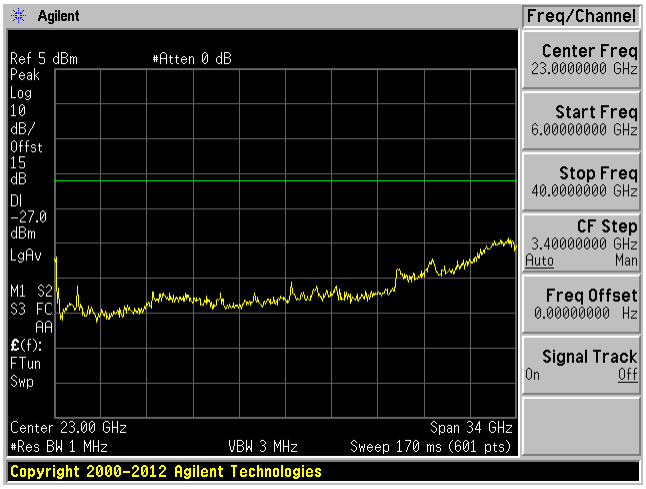


802.11ac80 mode

5755 MHz (30MHz-6GHz)



5755 MHz (6GHz – 40GHz)

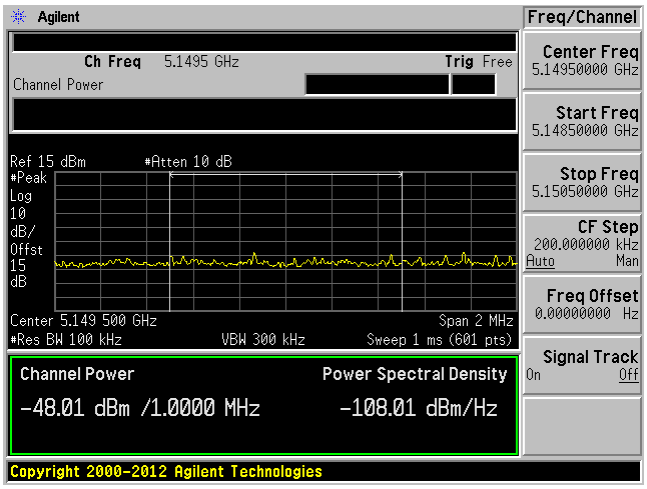


Band Edge Emissions

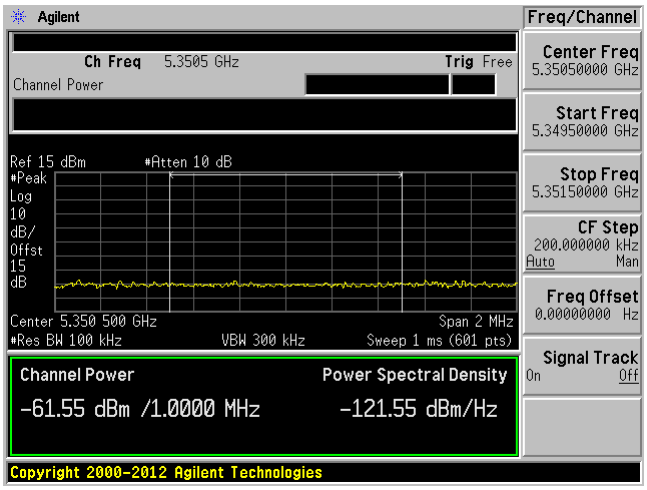
5150 - 5250 MHz

802.11a mode

Low Channel: 5180 MHz

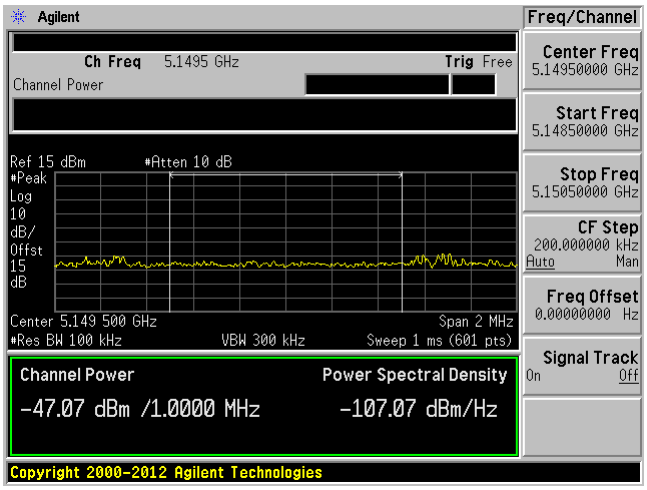


High channel: 5240 MHz

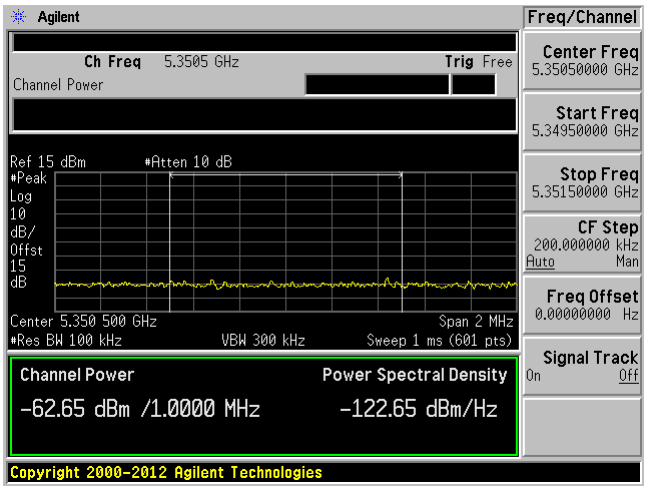


802.11n20 mode

Low Channel: 5180 MHz

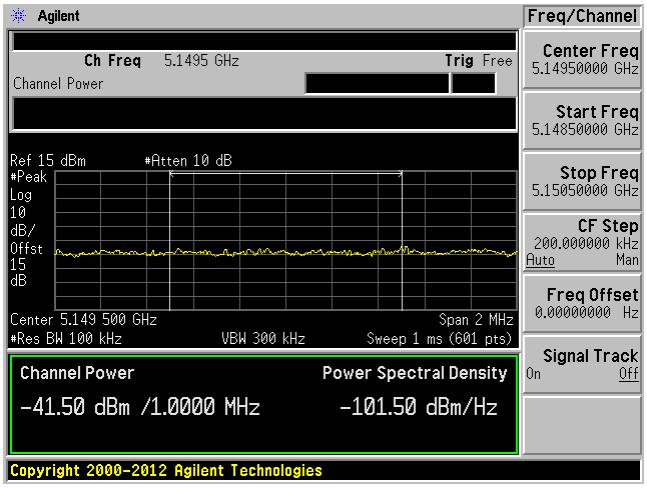


High channel: 5240 MHz

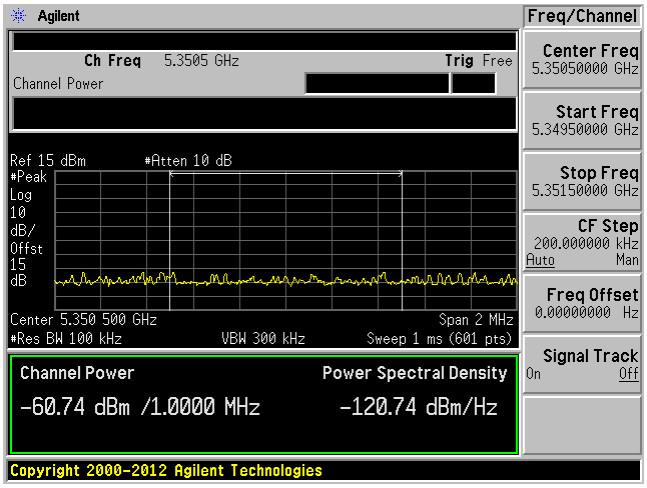


802.11n40 mode

Low Channel: 5190 MHz

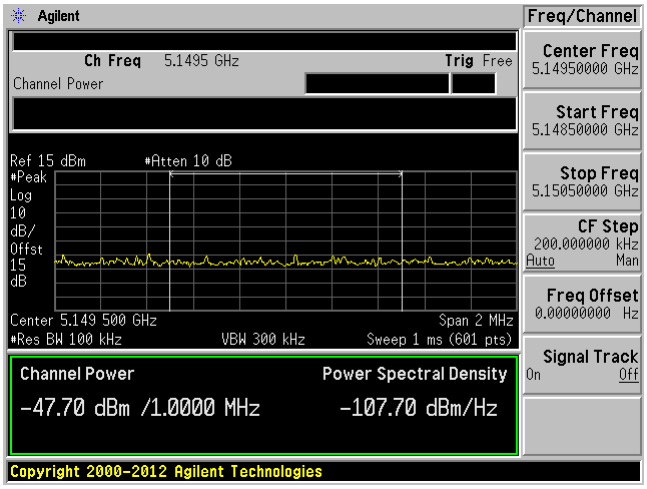


High channel: 5230 MHz

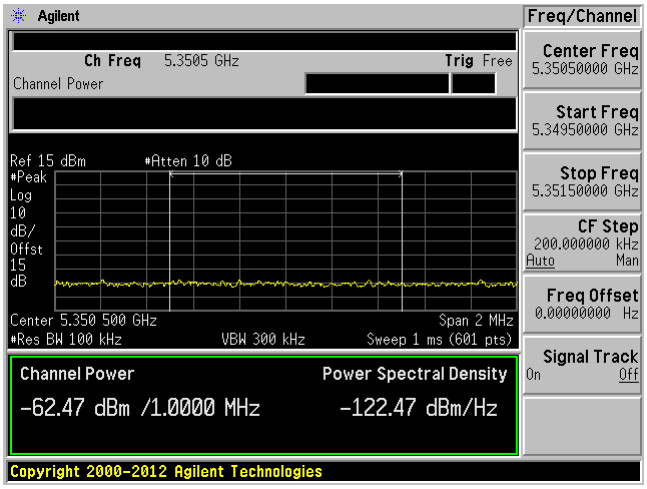


802.11ac20 mode

Low Channel: 5180 MHz

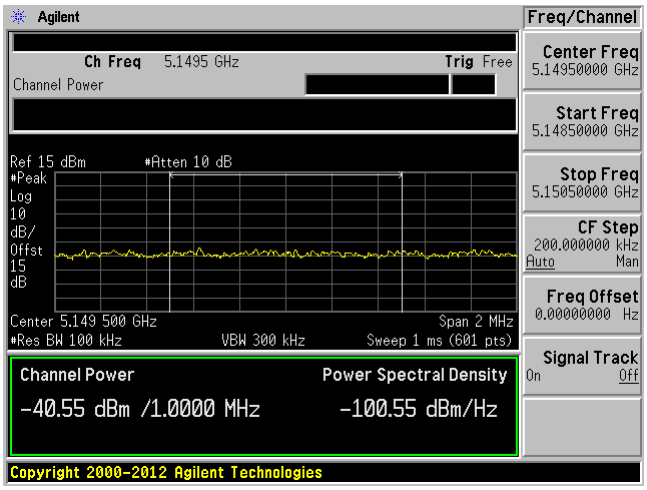


High channel: 5240 MHz

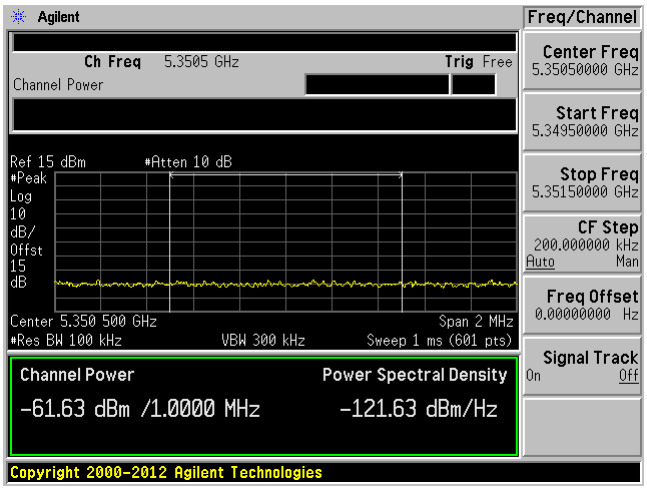


802.11ac40 mode

Low Channel: 5190 MHz

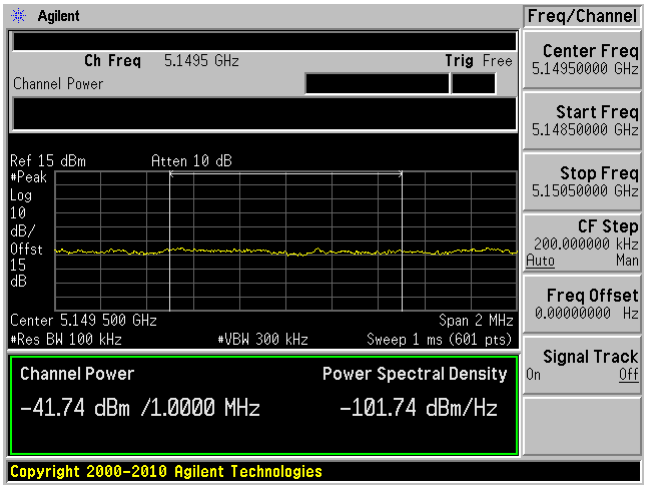


High channel: 5230 MHz

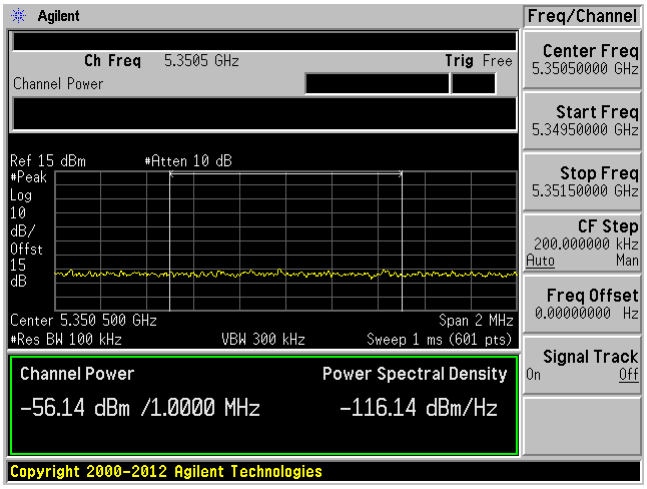


802.11ac80 mode 5210 MHz

Lower band edge



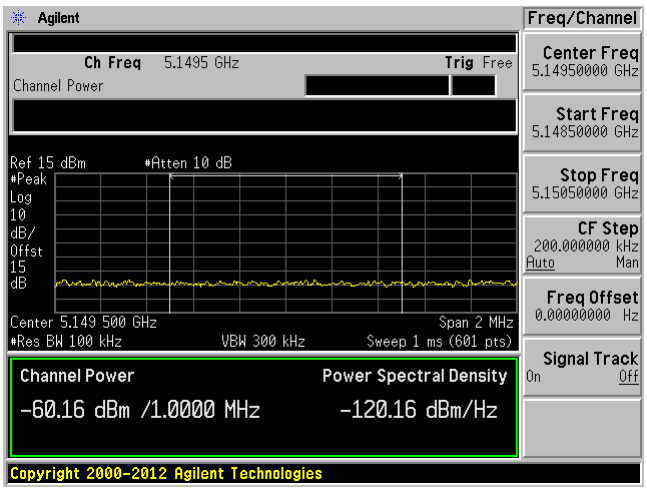
Upper band edge



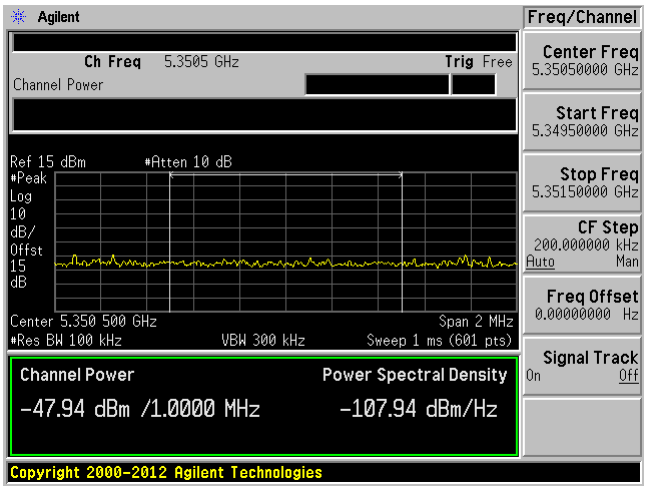
5250 – 5350 MHz

802.11a mode

Low Channel: 5260 MHz

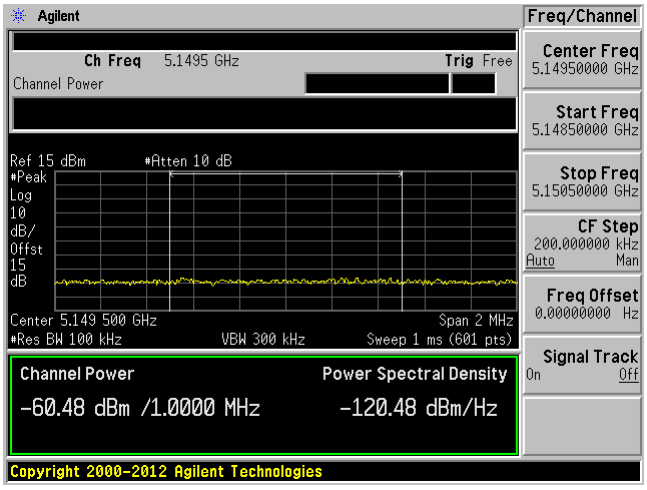


High channel: 5320 MHz

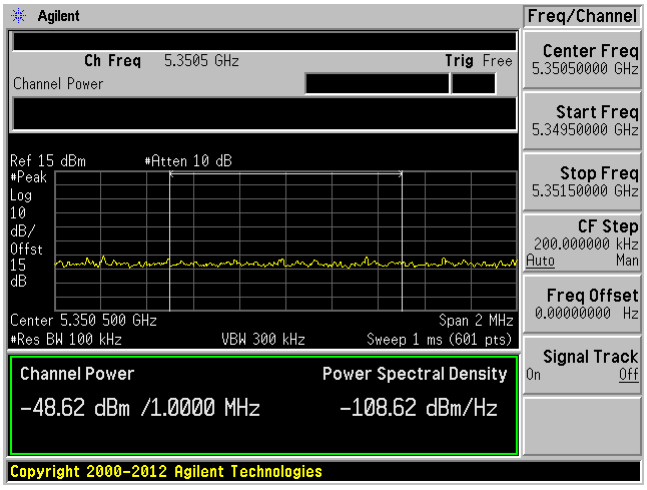


802.11n20 mode

Low Channel: 5260 MHz

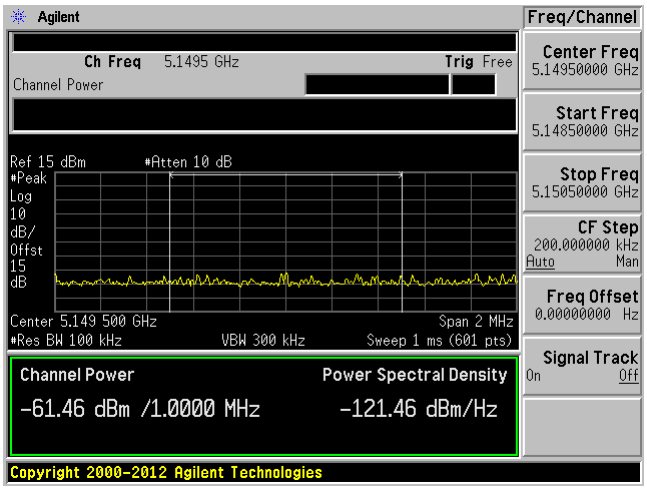


High channel: 5320 MHz

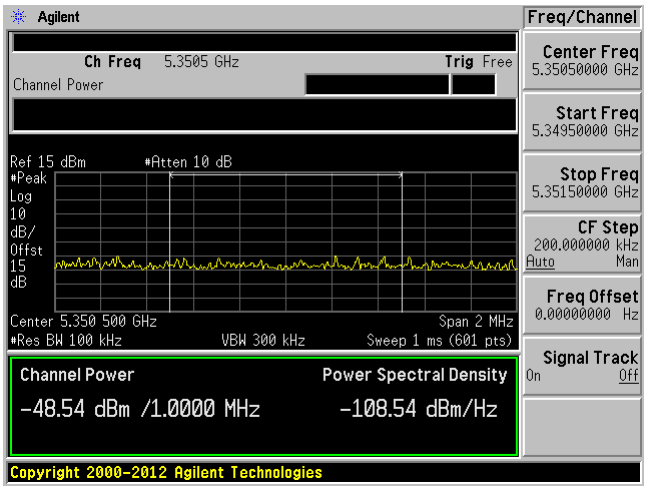


802.11n40 mode

Low Channel: 5270 MHz

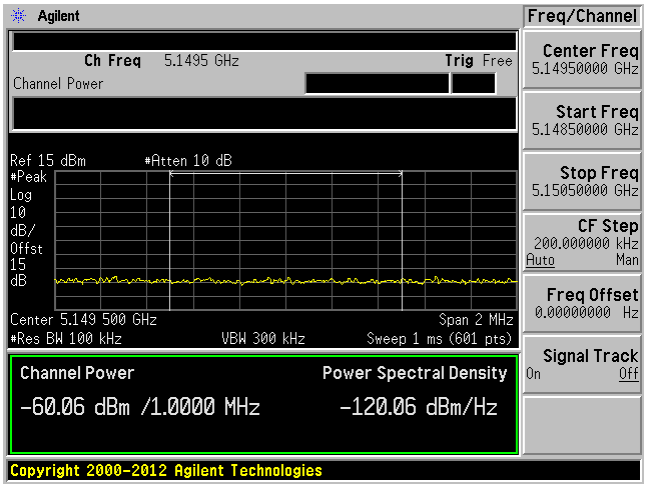


High channel: 5310 MHz

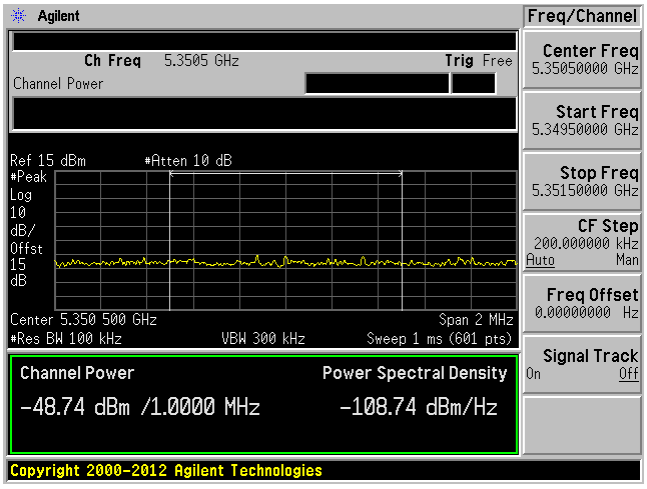


802.11ac20 mode

Low Channel: 5260 MHz

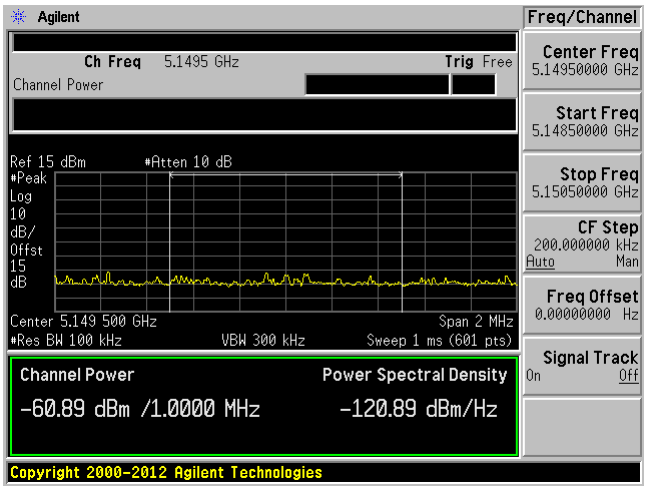


High channel: 5320 MHz

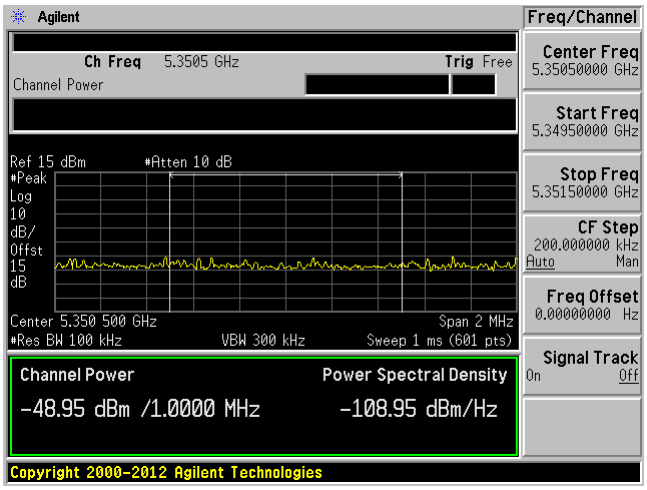


802.11ac40 mode

Low Channel: 5270 MHz

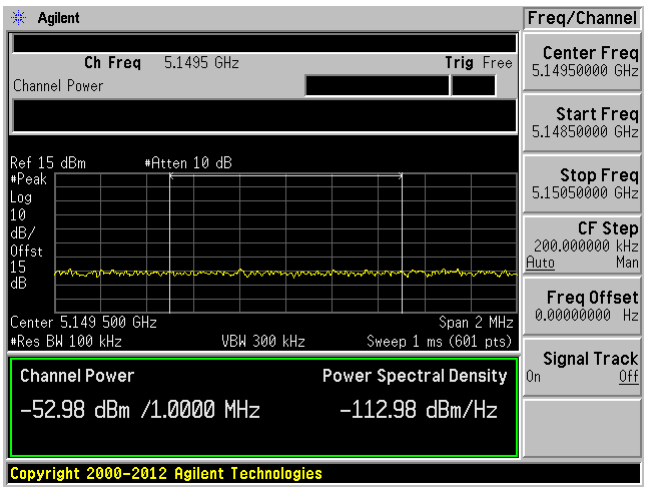


High channel: 5310 MHz

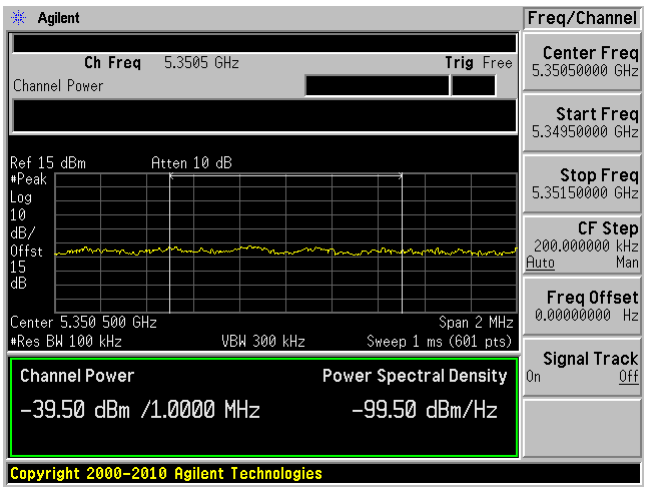


802.11ac80 mode 5290 MHz

Lower Band Edge



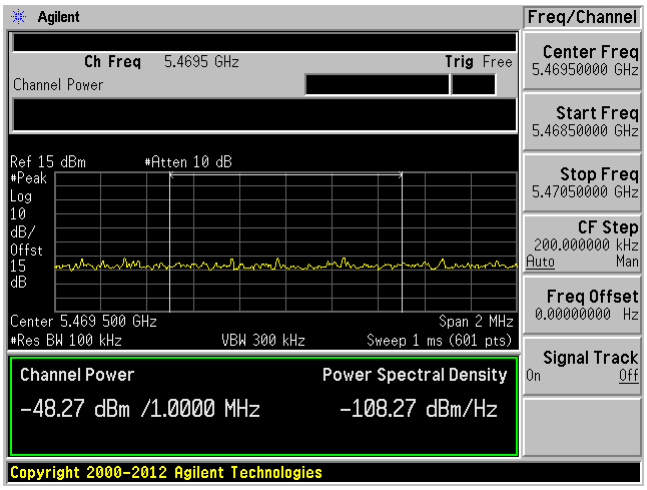
Upper Band Edge



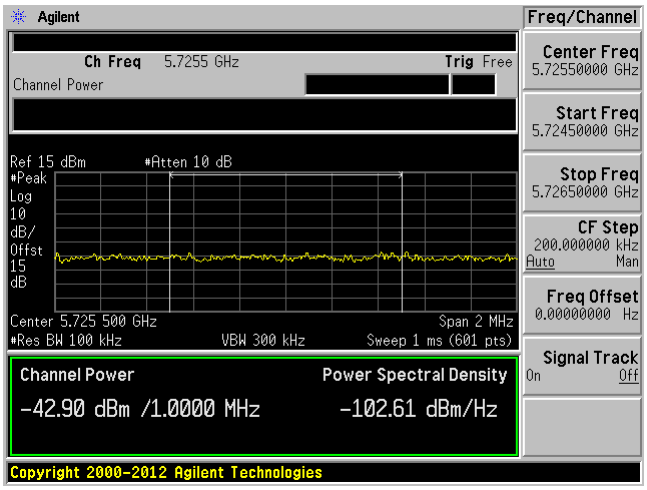
5470 - 5725 MHz

802.11a mode

Low Channel: 5500 MHz

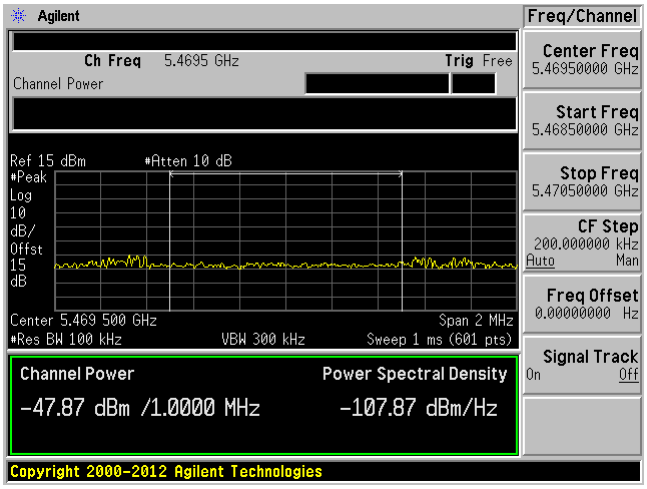


High channel: 5700 MHz

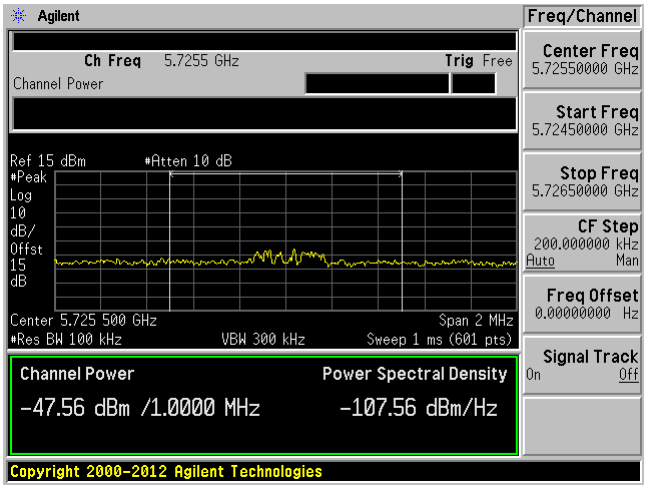


802.11n20 mode

Low Channel: 5500 MHz

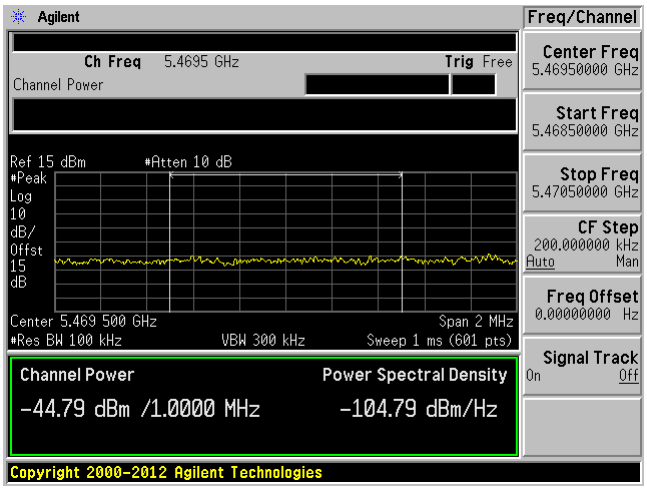


High channel: 5700 MHz

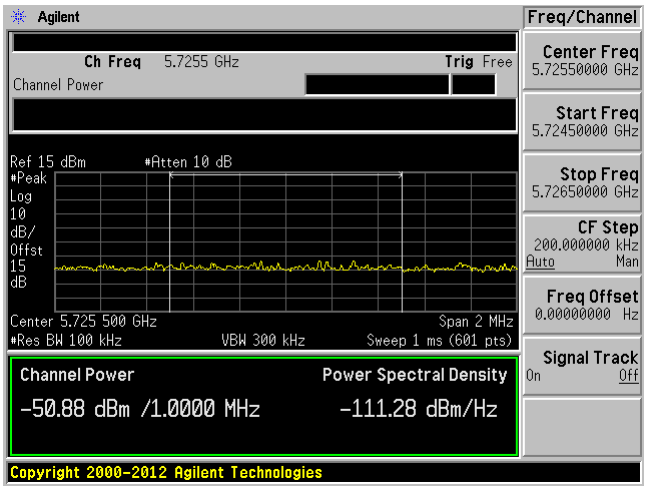


802.11n40 mode

Low Channel: 5510 MHz

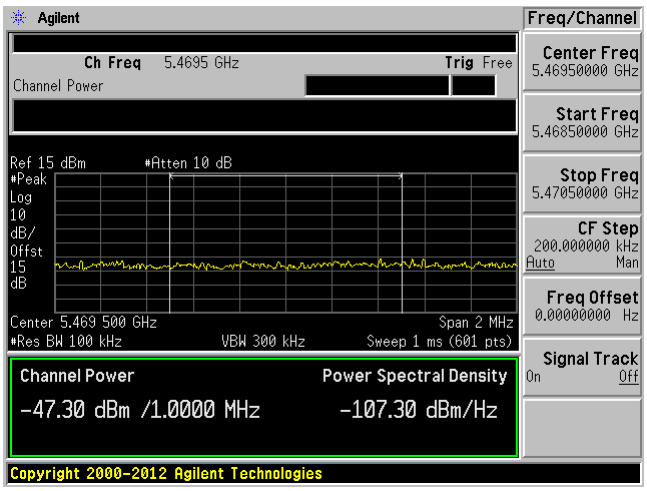


High channel: 5670 MHz

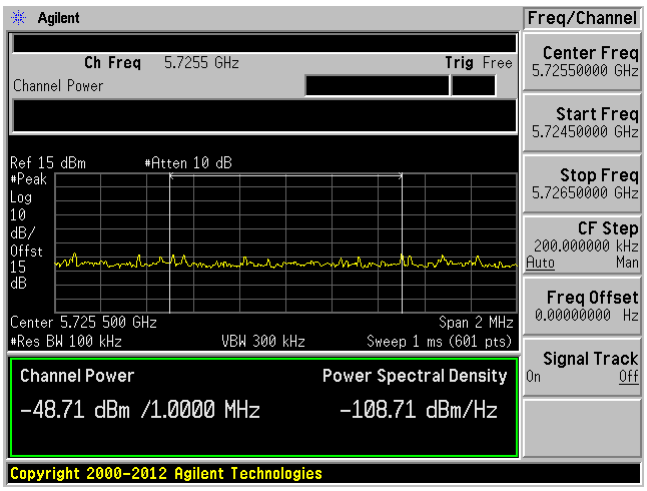


802.11ac20 mode

Low Channel: 5500 MHz

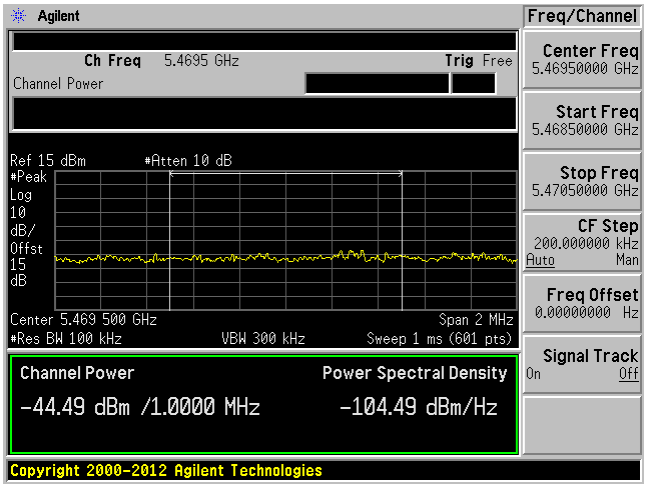


High channel: 5700 MHz

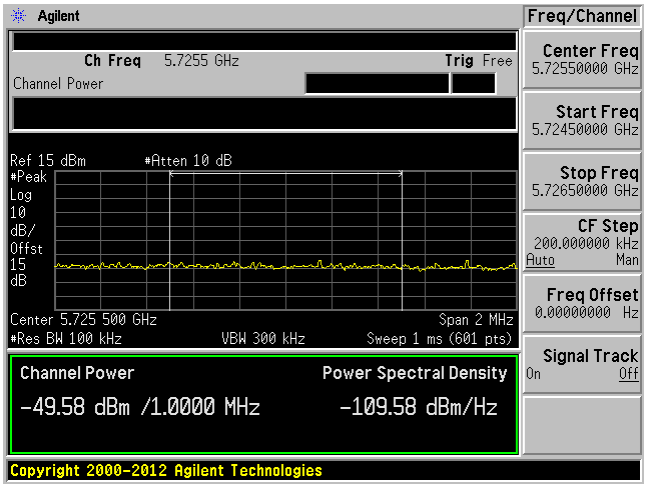


802.11ac40 mode

Low Channel: 5510 MHz



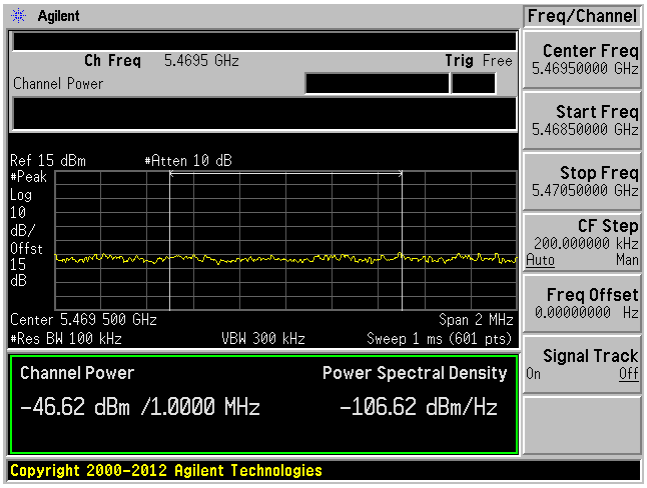
High channel: 5670 MHz



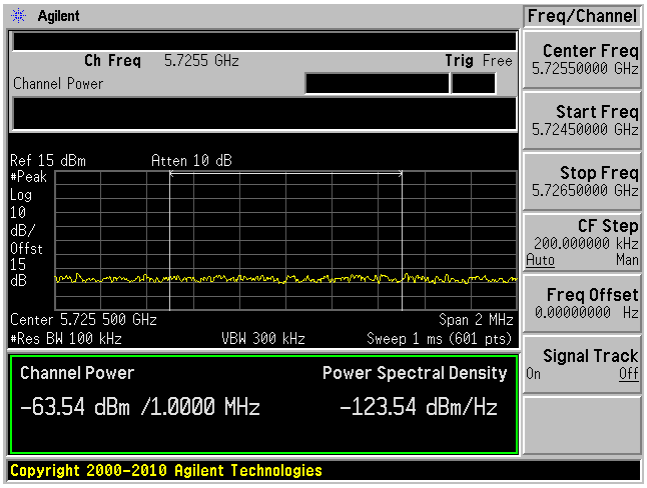
802.11ac80 mode

5530 MHz

Lower Band Edge

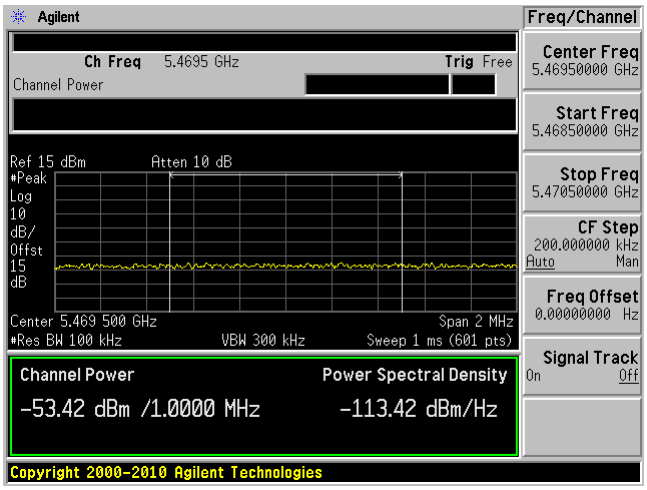


Upper Band Edge

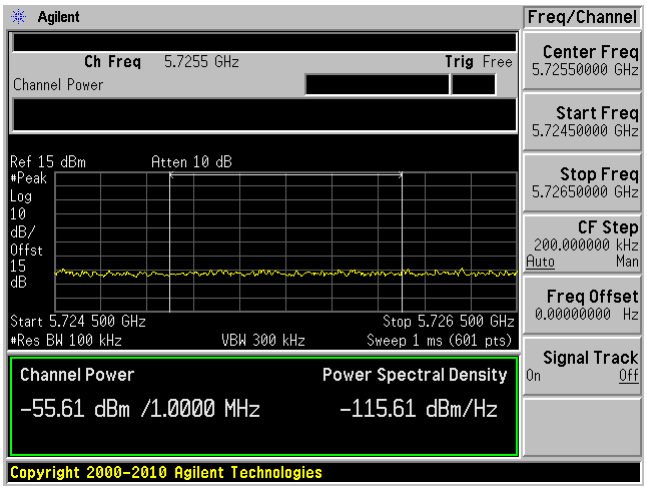


5610 MHz

Lower Band Edge



Upper Band Edge

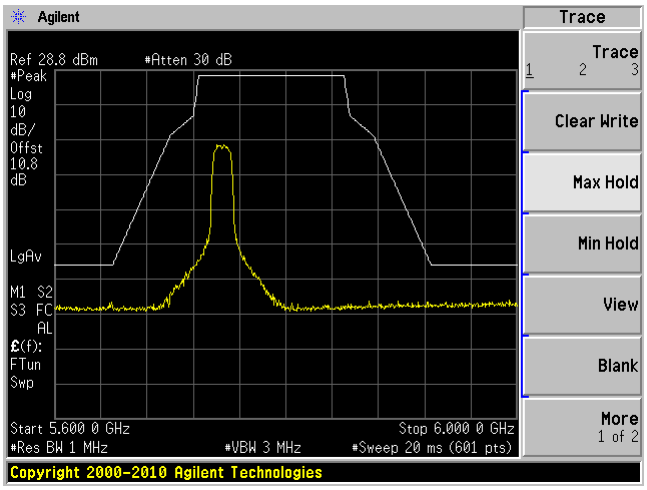


5725 – 5850 MHz

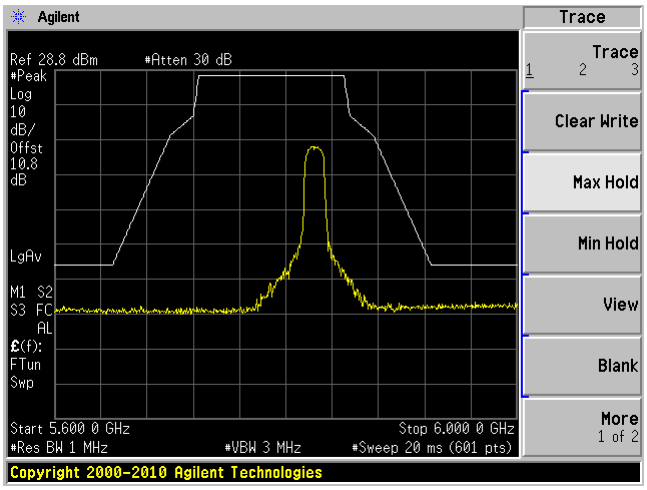
FCC Emission Mask

802.11a mode

5745 MHz

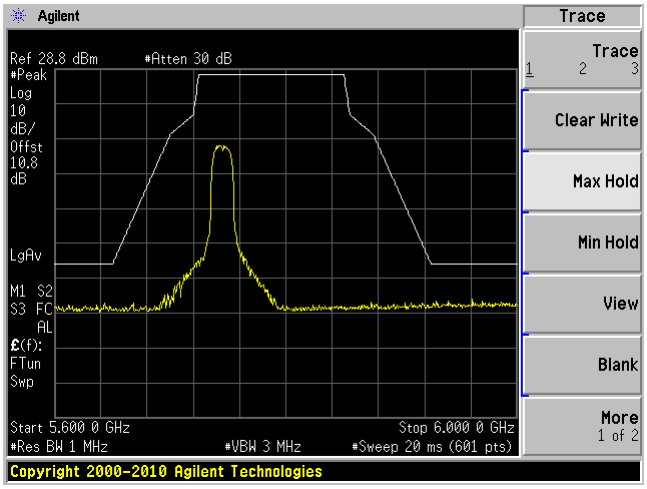


5825 MHz

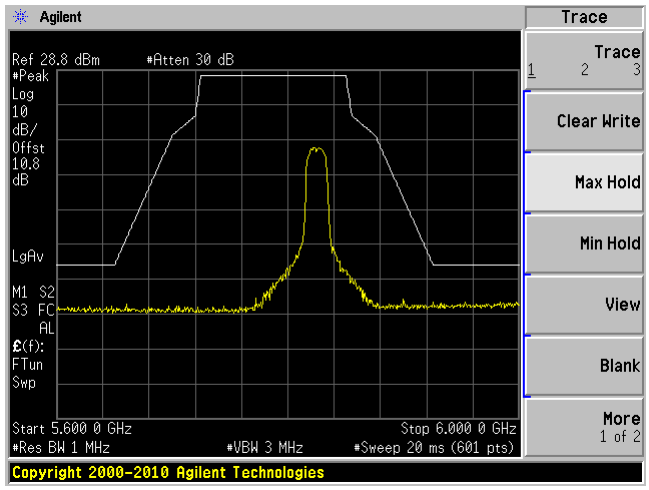


802.11n20 mode

5745 MHz

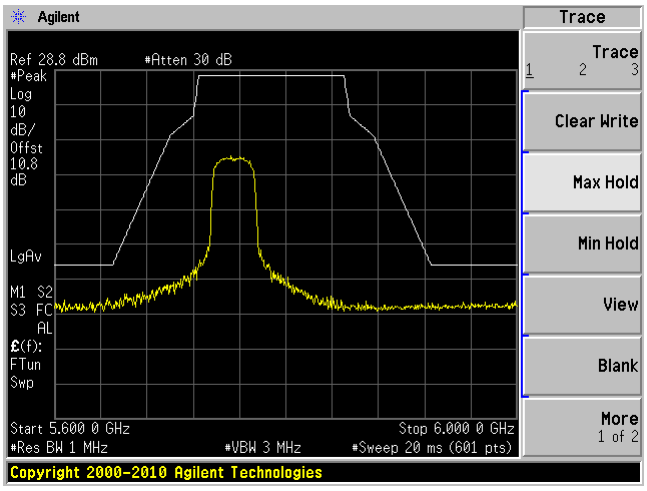


5825 MHz

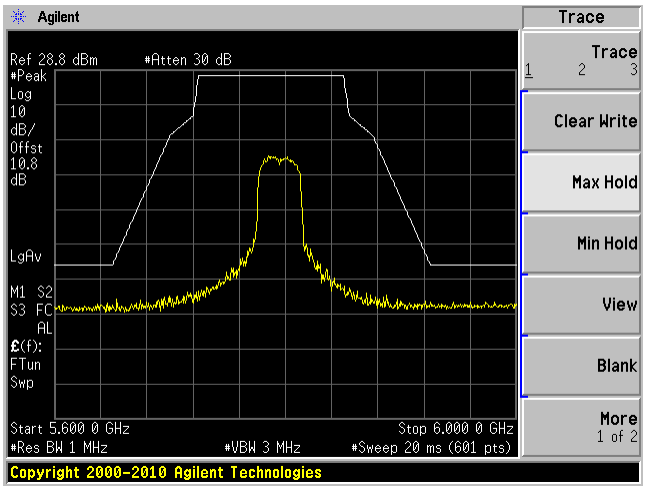


802.11n40 mode

5755 MHz

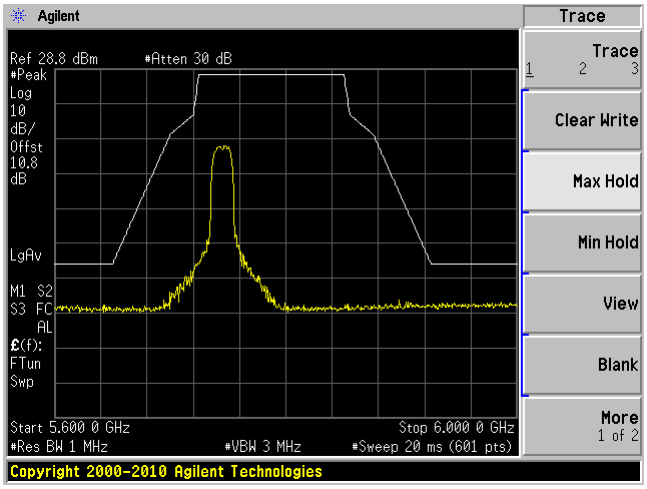


5795 MHz

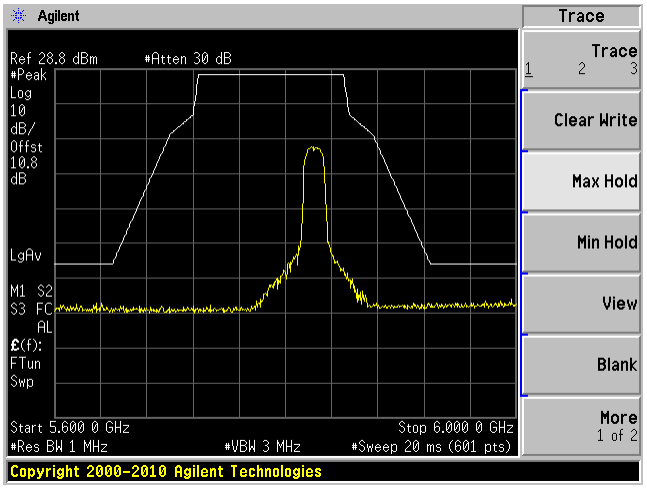


802.11ac20 mode

5745 MHz

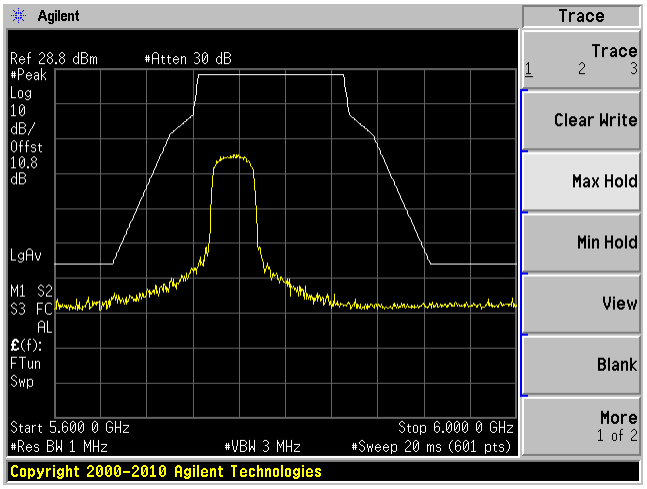


5825 MHz

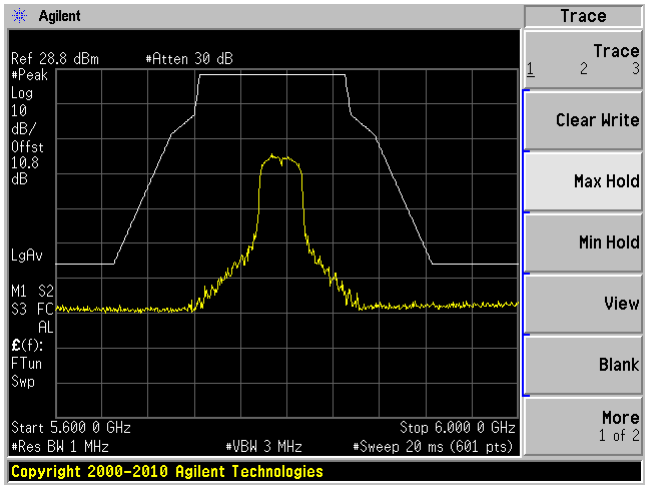


802.11ac40 mode

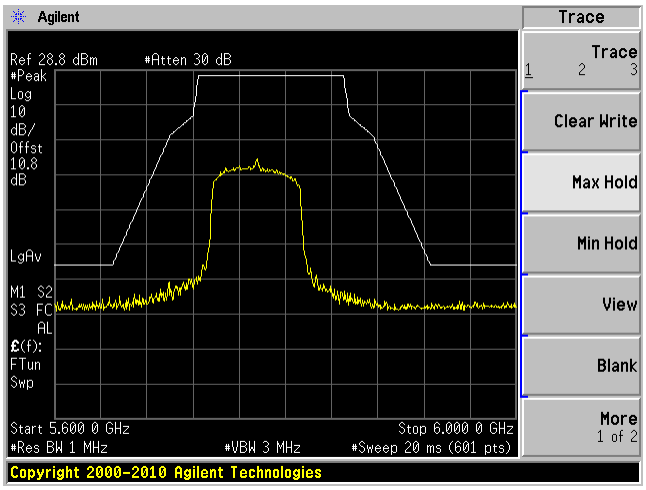
5755 MHz



5795 MHz



802.11ac80 mode, 5775 MHz



12 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 -----